



**Z750**  
**Z750 ABS**



# **Motorcycle Service Manual**



# Quick Reference Guide

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

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







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# Motorcycle Service Manual

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

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

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## LIST OF ABBREVIATIONS

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

## COUNTRY AND AREA CODES

AT	Austria	GB	United Kingdom
AU	Australia	MY	Malaysia
CH	Switzerland	WVTA	Whole Vehicle Type Approval
DE	Germany		



# Foreword

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

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

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

To get the longest life out of your vehicle.

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

## How to Use This Manual

In this manual, the product is divided into its major systems and these systems make up the manual's chapters. The Quick Reference

Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

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

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

### WARNING

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

### CAUTION

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

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

### NOTE

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

- Indicates a procedural step or work to be done.
- Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.
- ★ Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

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

# General Information

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## 1-2 GENERAL INFORMATION

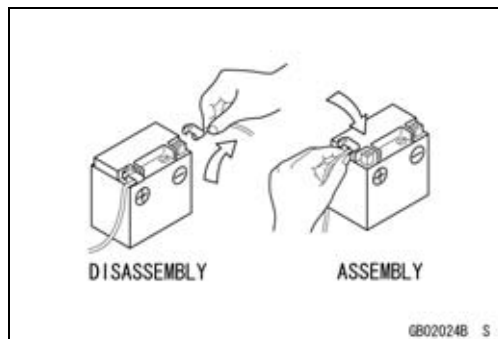
### Before Servicing

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

Especially note the following.

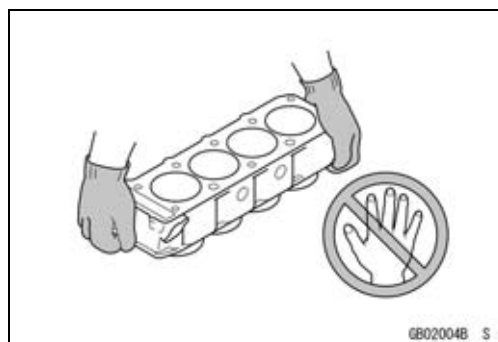
#### **Battery Ground**

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



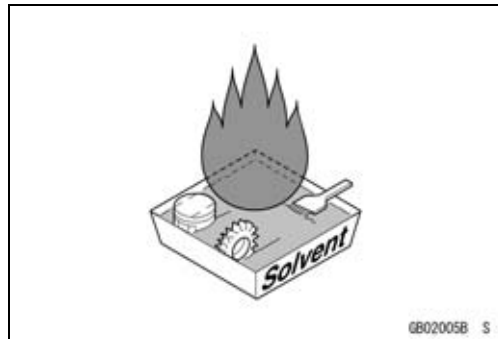
#### **Edges of Parts**

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



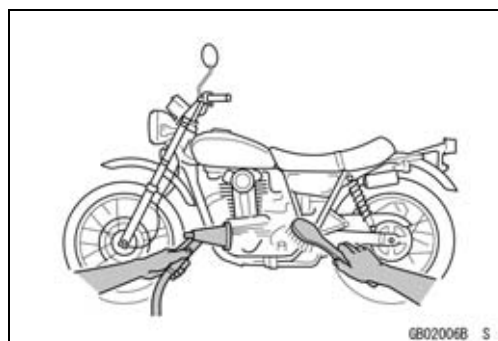
#### **Solvent**

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



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

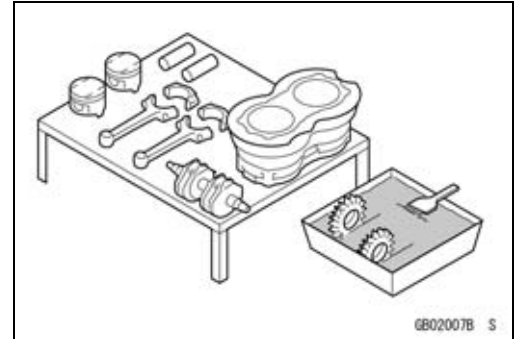
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



## Before Servicing

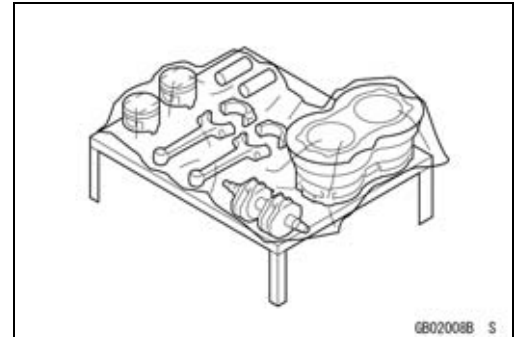
### Arrangement and Cleaning of Removed Parts

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



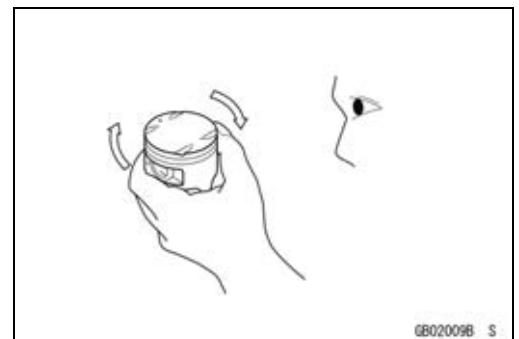
### Storage of Removed Parts

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



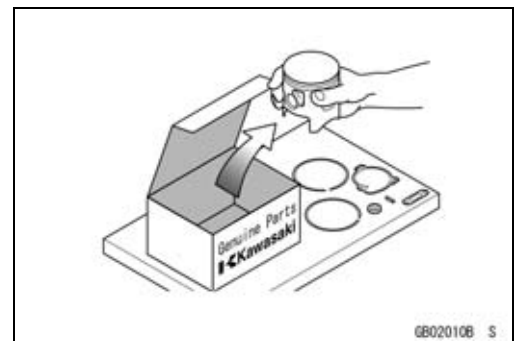
### Inspection

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



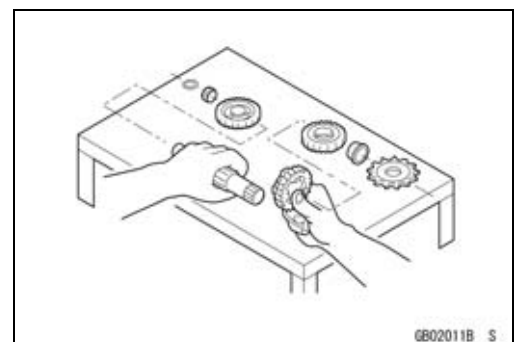
### Replacement Parts

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



### Assembly Order

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

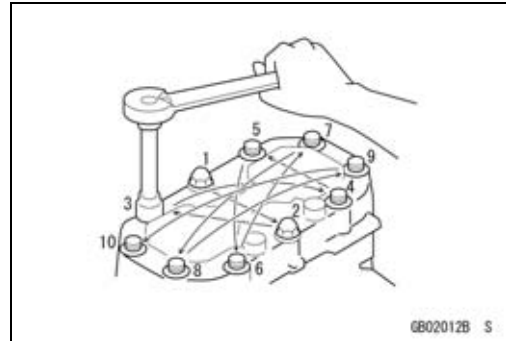


## 1-4 GENERAL INFORMATION

### Before Servicing

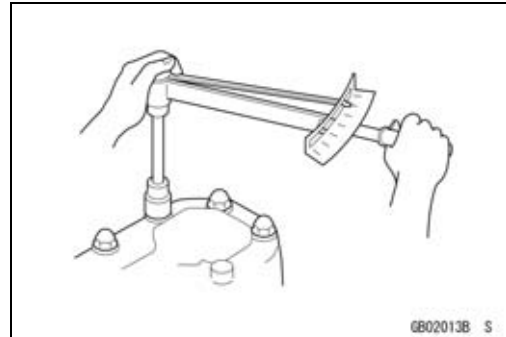
#### **Tightening Sequence**

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



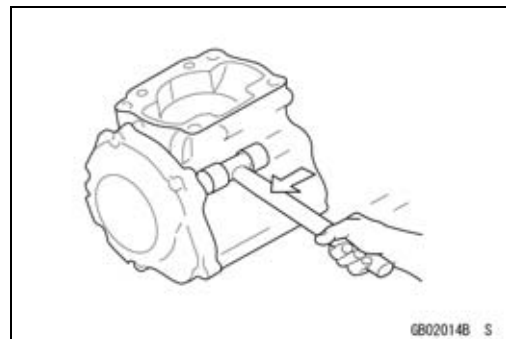
#### **Tightening Torque**

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



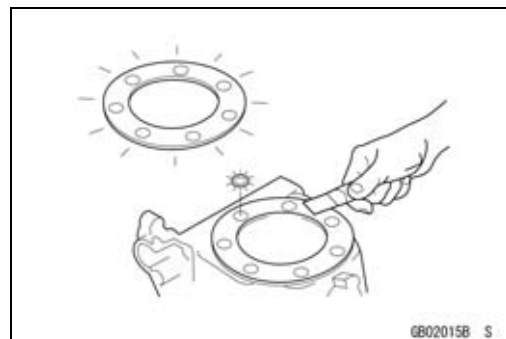
#### **Force**

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



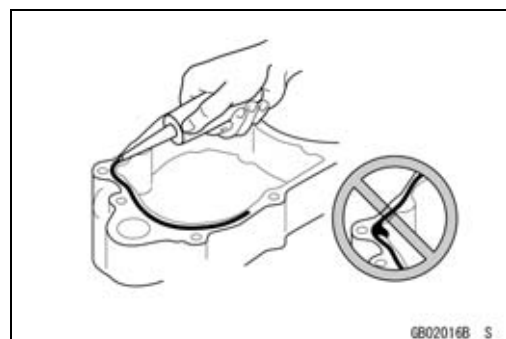
#### **Gasket, O-ring**

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



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

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

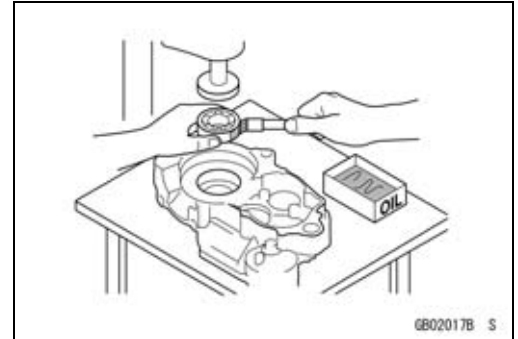




## Before Servicing

### Press

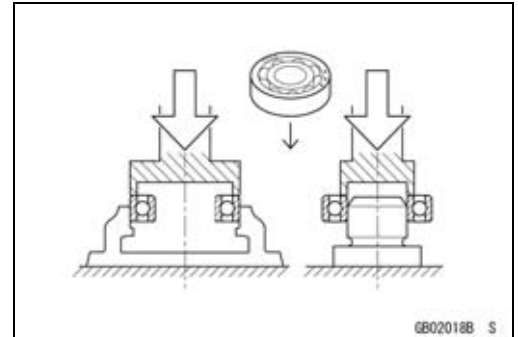
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



### Ball Bearing and Needle Bearing

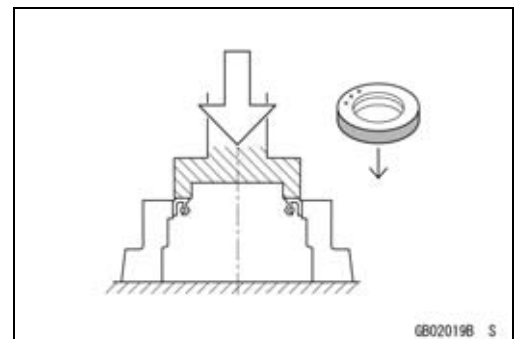
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

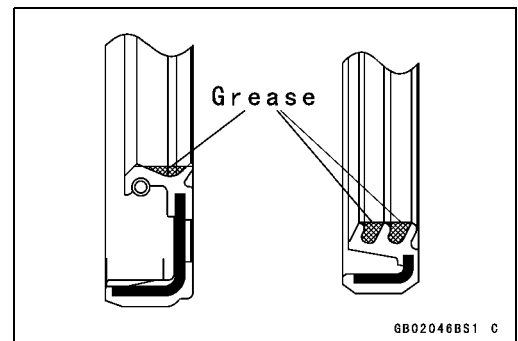


### Oil Seal, Grease Seal

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

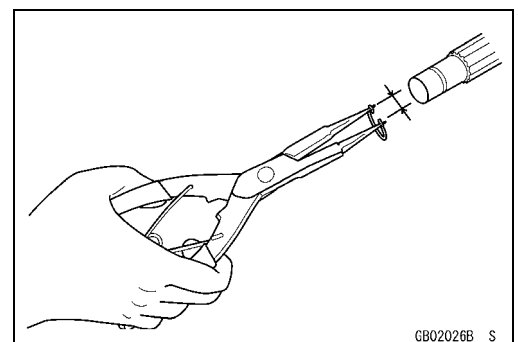


Apply specified grease to the lip of seal before installing the seal.



### Circlips, Cotter Pins

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



## 1-6 GENERAL INFORMATION

### Before Servicing

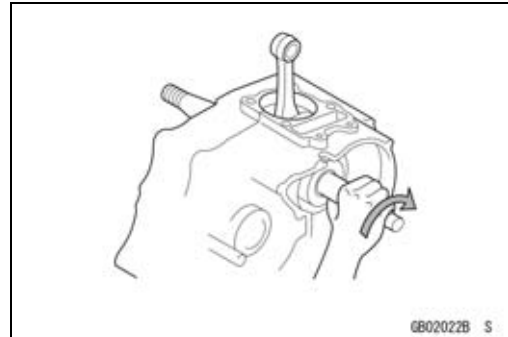
#### **Lubrication**

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



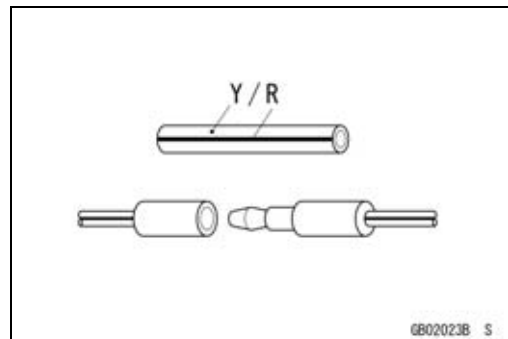
#### **Direction of Engine Rotation**

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



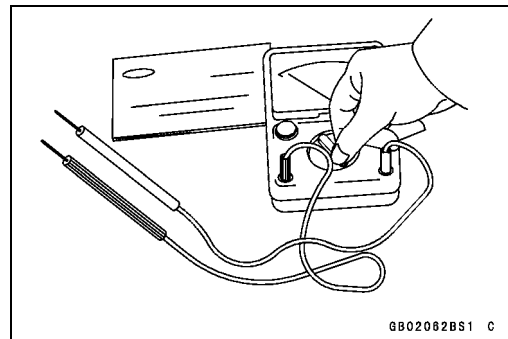
#### **Electrical Wires**

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



#### **Instrument**

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



## Model Identification

ZR750L7F (Europe) Left Side View



ZR750L7F (Europe) Right Side View



## Model Identification

A close-up photograph of the engine area of a Honda CBR600F4i. A prominent oval sticker with a double-line border is affixed to the engine casing, displaying the text "CAPPINET 30000KM". The engine components are dark and metallic, with various pipes and structural elements visible.

## General Specifications

Items	ZR750L7F, ZR750M7F
<b>Dimensions</b>	
Overall Length	2 085 mm (82.09 in.)
Overall Width	805 mm (31.69 in.)
Overall Height	1 100 mm (43.31 in.)
Wheelbase	1 440 mm (56.69 in.)
Road Clearance	155 mm (6.10 in.)
Seat Height	815 mm (32.09 in.)
Dry Mass:	
ZR750L7F	203 kg (447.6 lb)
ZR750M7F	207 kg (456.4 lb)
Curb Mass:	
Front:	
ZR750L7F	113 kg (249.2 lb)
ZR750M7F	115 kg (253.6 lb)
Rear:	
ZR750L7F	113 kg (249.2 lb)
ZR750M7F	115 kg (253.6 lb)
Fuel Tank Capacity	18.5 L (4.9 US gal.)
<b>Performance</b>	
Minimum Turning Radius	3.0 m (9.8 ft)
<b>Engine</b>	
Type	4-stroke, DOHC, 4-cylinder
Cooling System	Liquid-cooled
Bore and Stroke	68.4 × 50.9 mm (2.69 × 2.00 in.)
Displacement	748 cm <sup>3</sup> (45.64 cu in.)
Compression Ratio	11.3 : 1
Maximum Horsepower	77.7 kW (106 PS) @10 500 r/min (rpm) (MY) 73.2 kW (100 PS) @9 000 r/min (rpm)
Maximum Torque	78.0 N·m (8.0 kgf·m, 57.5 ft·lb) @8 300 r/min (rpm)
Carburetion System	FI (Fuel Injection) KEIHIN TTK32 × 4
Starting System	Electric starter
Ignition System	Battery and coil (transistorized)
Timing Advance	Electronically advanced (digital igniter)
Ignition Timing	From 10° BTDC @1 100 r/min (rpm) to 37.0° BTDC @5 000 r/min (rpm)
Spark Plug	NGK CR9EK
Cylinder Numbering Method	Left to right, 1-2-3-4
Firing Order	1-2-4-3
Valve Timing:	
Inlet:	
Open	38° BTDC
Close	66° ABDC
Duration	284°

## 1-10 GENERAL INFORMATION

### General Specifications

Items	ZR750L7F, ZR750M7F
Exhaust: Open Close Duration Lubrication System Engine Oil: Type Viscosity Capacity	51° BBDC 25° ATDC 256° Forced lubrication (wet sump)  API SE, SF or SG API SH, SJ or SL with JASO MA SAE 10W-40 3.8 L (4.0 US qt)
<b>Drive Train</b> Primary Reduction System: Type Reduction Ratio Clutch Type Transmission: Type Gear Ratios: 1st 2nd 3rd 4th 5th 6th Final Drive System: Type Reduction Ratio Overall Drive Ratio	Gear 1.714 (84/49) Wet multi disc  6-speed, constant mesh, return shift  2.571 (36/14) 1.941 (33/17) 1.556 (28/18) 1.333 (28/21) 1.200 (24/20) 1.095 (23/21)  Chain drive 2.867 (43/15) 5.382 @Top gear
<b>Frame</b> Type Caster (Rake Angle) Trail Front Tire: Type Size Rim Size Rear Tire: Type Size Rim Size Front Suspension: Type Wheel Travel	Tubular, diamond 24.5° 103 mm (4.06 in.)  Tubeless 120/70 ZR17 M/C (58W) 17 × 3.50  Tubeless 180/55 ZR17 M/C (73W) 17 × 5.50  Telescopic fork 120 mm (4.72 in.)

## General Specifications

Items	ZR750L7F, ZR750M7F
Rear Suspension: Type Wheel Travel Brake Type: Front Rear	Swingarm (uni-trak) 125 mm (4.92 in.) Dual discs Single disc
<b>Electrical Equipment</b> Battery Headlight: Type Bulb Tail/Brake Light Alternator: Type Rated Output	12 V 8 Ah Semi-sealed beam 12 V 55 W × 2/55 W (Hi/Lo) 12 V 0.5/4.1 W (LED) 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.

1-12 GENERAL INFORMATION

Unit Conversion Table

Prefixes for Units:

Prefix	Symbol	Power
mega	M	× 1 000 000
kilo	k	× 1 000
centi	c	× 0.01
milli	m	× 0.001
micro	μ	× 0.000001

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

L	×	0.2642	=	gal (US)
L	×	0.2200	=	gal (imp)
L	×	1.057	=	qt (US)
L	×	0.8799	=	qt (imp)
L	×	2.113	=	pint (US)
L	×	1.816	=	pint (imp)
mL	×	0.03381	=	oz (US)
mL	×	0.02816	=	oz (imp)
mL	×	0.06102	=	cu in

Units of Force:

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

Units of Length:

km	×	0.6214	=	mile
m	×	3.281	=	ft
mm	×	0.03937	=	in

Units of Torque:

N·m	×	0.1020	=	kgf·m
N·m	×	0.7376	=	ft·lb
N·m	×	8.851	=	in·lb
kgf·m	×	9.807	=	N·m
kgf·m	×	7.233	=	ft·lb
kgf·m	×	86.80	=	in·lb

Units of Pressure:

kPa	×	0.01020	=	kgf/cm <sup>2</sup>
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cmHg
kgf/cm <sup>2</sup>	×	98.07	=	kPa
kgf/cm <sup>2</sup>	×	14.22	=	psi
cmHg	×	1.333	=	kPa

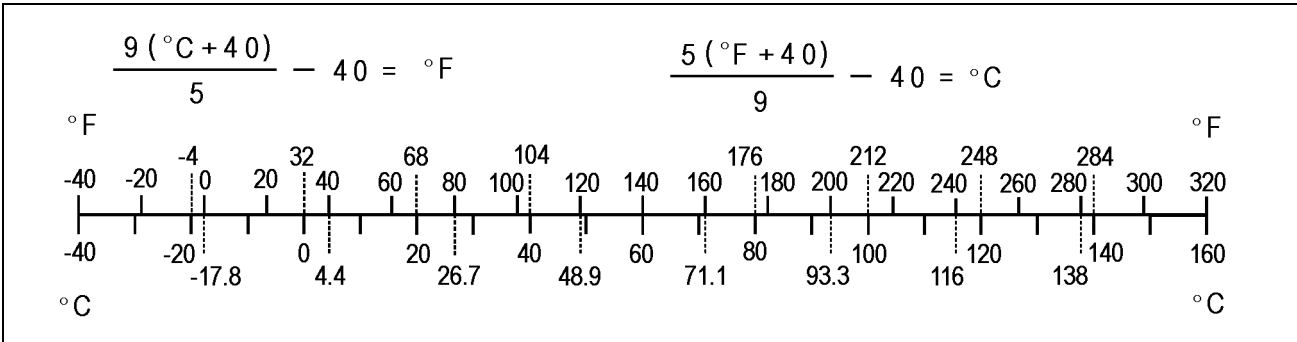
Units of Speed:

km/h	×	0.6214	=	mph
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Units of Power:

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

Units of Temperature:





# Periodic Maintenance

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## 2-2 PERIODIC MAINTENANCE

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## Periodic Maintenance Chart

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

### Periodic Inspection

FREQUENCY		Whichever comes first ↓ Every		* ODOMETER READING × 1 000 km (× 1 000 mile) 1 6 12 18 24 30 36 (0.6) (4) (7.5) (12) (15) (20) (24)						See Page
INSPECTION										
Fuel System										
Air cleaner element - clean						•			•	2-15
Throttle control system (play, smooth return, no drag) - inspect		year	•		•		•		•	2-15
Engine vacuum synchronization - inspect					•		•		•	2-16
Idle speed - inspect			•		•		•		•	2-19
Fuel leak (fuel hose and pipe) - inspect		year	•		•		•		•	2-20
Fuel hose and pipe damage - inspect		year	•		•		•		•	2-20
Fuel hose and pipe installation condition - inspect		year	•		•		•		•	2-20
Cooling System										
Coolant level - inspect			•		•		•		•	2-22
Coolant leak (radiator hose and pipe) - inspect		year	•		•		•		•	2-22
Radiator hose damage - inspect		year	•		•		•		•	2-22
Radiator hose installation condition - inspect		year	•		•		•		•	2-22
Engine Top End										
Valve clearance - inspect	AU Model						•			2-23
	Other than AU Model		Every 42 000 km (26 000 mile)							2-23
Exhaust butterfly valve cable - inspect			•	•	•	•	•	•	•	2-27
Air Suction System										
Air suction system damage - inspect					•		•		•	2-31
Clutch										
Clutch operation (play, disengagement, engagement) - inspect			•		•		•		•	2-31
Wheels and Tires										
Tire air pressure - inspect		year			•		•		•	2-32
Wheel/tire damage - inspect					•		•		•	2-33
Tire tread wear, abnormal wear - inspect					•		•		•	2-33
Wheel bearing damage - inspect		year			•		•		•	2-34
Drive Train										
Drive chain lubrication condition - inspect #		Every 600 km (400 mile)								2-34
Drive chain slack - inspect #		Every 1 000 km (600 mile)								2-35
Drive chain wear - inspect #					•		•		•	2-37
Drive chain guide wear - inspect					•		•		•	2-37

## 2-4 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

INSPECTION	FREQUENCY	* ODOMETER READING							See Page
	↓ Every	× 1 000 km (× 1 000 mile)							
		1 (0.6)	6 (4)	12 (7.5)	18 (12)	24 (15)	30 (20)	36 (24)	
Brake System									
Brake fluid leak (brake hose and pipe) - inspect	year	●	●	●	●	●	●	●	2-38
Brake hose and pipe damage - inspect	year	●	●	●	●	●	●	●	2-39
Brake hose and pipe installation condition - inspect	year	●	●	●	●	●	●	●	2-39
Brake operation (effectiveness, play, no drag) - inspect	year	●	●	●	●	●	●	●	2-39
Brake fluid level - inspect	6 months	●	●	●	●	●	●	●	2-39
Brake pad wear - inspect #			●	●	●	●	●	●	2-40
Brake light switch operation - inspect		●	●	●	●	●	●	●	2-41
Suspensions									
Front forks/rear shock absorber operation (damping and smooth stroke) - inspect				●		●		●	2-41
Front forks/rear shock absorber oil leak - inspect	year			●		●		●	2-42
Rocker arm operation - inspect				●		●		●	2-42
Tie-rods operation - inspect				●		●		●	2-42
Steering System									
Steering play - inspect	year	●		●		●		●	2-43
Steering stem bearings - lubricate	2 years					●			2-44
Electrical System									
Spark plug condition - inspect				●		●		●	2-45
Lights and switches operation - inspect	year			●		●		●	2-46
Headlight aiming - inspect	year			●		●		●	2-48
Sidestand switch operation - inspect	year			●		●		●	2-49
Engine stop switch operation - inspect	year			●		●		●	2-50
Others									
Chassis parts - lubricate	year			●		●		●	2-50
Bolts and nuts tightness - inspect		●		●		●		●	2-52

#: 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.

**Periodic Maintenance Chart**
**Periodic Replacement Parts**

CHANGE/REPLACE ITEM	FREQUENCY	* ODOMETER READING × 1 000 km (× 1 000 mile)					See Page
	Whichever comes first ↓ Every	1 (0.6)	12 (7.5)	24 (15)	36 (24)	48 (30)	
Air cleaner element #					•		2-53
Fuel hose	4 years					•	2-54
Coolant	3 years				•		2-56
Radiator hose and O-ring	3 years				•		2-58
Engine oil #	year	•	•	•	•	•	2-58
Oil filter	year	•	•	•	•	•	2-59
Brake hose and pipe	4 years					•	2-60
Brake fluid	2 years			•		•	2-62
Rubber parts of master cylinder and caliper	4 years					•	2-63, 2-64
Spark plug			•	•	•	•	2-67

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

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

## 2-6 PERIODIC MAINTENANCE

### Torque and Locking Agent

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

Letters used in the "Remarks" column mean:

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

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide grease oil solution.

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

R: Replacement Parts

S: Follow the specified tightening sequence.

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

SS: Apply silicone sealant.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Fuel System (DFI)</b>				
Air Cleaner Duct Screws	3.8	0.39	34 in·lb	
Air Cleaner Housing Mounting Bolts	9.8	1.0	87 in·lb	
Air Cleaner Housing Tapping Screws	1.2	0.12	11 in·lb	
Air Duct Clamp Bolts	2.0	0.20	18 in·lb	
Bypass Screws	0.2	0.02	1.8 in·lb	
Camshaft Position Sensor Bolt	12	1.2	106 in·lb	
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Delivery Pipe Assy Mounting Screws	3.4	0.35	30 in·lb	
Exhaust Butterfly Valve Actuator Bracket Bolt	6.9	0.70	61 in·lb	
Exhaust Butterfly Valve Actuator Mounting Bolts	6.9	0.70	61 in·lb	
Exhaust Butterfly Valve Actuator Pulley Bolt	5.0	0.51	44 in·lb	
Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
Idle Adjusting Cable Clamp Screw	3.4	0.35	30 in·lb	
Oxygen Sensor (Equipped Models)	44.1	4.50	32.5	
Speed Sensor Bolt	12	1.2	106 in·lb	
Throttle Body Assy Holder Bolts	13	1.3	115 in·lb	
Throttle Body Assy Holder Clamp Bolts	2.0	0.20	18 in·lb	
Throttle Cable Plate Bolt	5.9	0.60	52 in·lb	
Throttle Link Holder Screws	2.0	0.20	18 in·lb	
Vehicle-down Sensor Bolts	6.0	0.61	53 in·lb	
Water Temperature Sensor	25	2.5	18	
<b>Cooling System</b>				
Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
Coolant Drain Bolt (Water Pump)	11	1.1	97 in·lb	
Radiator Bracket Mounting Bolt	6.9	0.70	61 in·lb	
Radiator Lower Bolt	6.9	0.70	61 in·lb	
Radiator Upper Bolts	6.9	0.70	61 in·lb	
Radiator (Water) Hose Clamp Screws	3.0	0.31	27 in·lb	
Reserve Tank Bolts	9.8	1.0	87 in·lb	

**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Thermostat Bracket Bolt	6.9	0.70	61 in·lb	L
Thermostat Housing Ground Bolt	6.9	0.70	61 in·lb	
Thermostat Housing Screws	5.9	0.60	52 in·lb	
Water Pipe Bolts	11	1.1	97 in·lb	
Water Pump Cover Bolts	11	1.1	97 in·lb	
Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
Water Temperature Sensor	25	2.5	18	
Engine Top End				
Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	S
Camshaft Cap Bolts (L = 45 mm)	12	1.2	106 in·lb	
Camshaft Cap Bolts (L = 40 mm)	12	1.2	106 in·lb	S
Camshaft Chain Tensioner Cap Bolt	20	2.0	15	S
Camshaft Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	
Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	S
Cylinder Head Bolts (M10 New Bolts)	54	5.5	40	
Cylinder Head Bolts (M10 Used Bolts)	49	5.0	36	S
Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
Cylinder Head Jacket Plugs	22	2.2	16	L
Exhaust Butterfly Valve Actuator Bracket Bolt	6.9	0.70	61 in·lb	S
Exhaust Butterfly Valve Actuator Mounting Bolts	6.9	0.70	61 in·lb	
Exhaust Butterfly Valve Actuator Pulley Bolt	5.0	0.51	44 in·lb	S
Exhaust Butterfly Valve Cable Adjuster Locknuts	6.9	0.70	61 in·lb	
Exhaust Butterfly Valve Cable Locknuts	6.9	0.70	61 in·lb	S
Exhaust Butterfly Valve Cover Bolts	6.9	0.70	61 in·lb	
Exhaust Pipe Manifold Holder Nuts	17	1.7	13	S
Front Camshaft Chain Guide Bolt (Lower)	12	1.2	106 in·lb	S
Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
Muffler Body Clamp Bolt	15	1.5	11	S
Muffler Body Mounting Bolt	4.9	0.50	43 in·lb	S
Muffler Body Mounting Nut	34	3.5	25	S
Muffler Body Side Cover Bolts	6.9	0.70	61 in·lb	S
Rear Camshaft Chain Guide Bolt	25	2.5	18	
Spark Plugs	13	1.3	115 in·lb	S
Throttle Body Assy Holder Bolts	13	1.3	115 in·lb	
Throttle Body Assy Holder Clamp Bolts	2.0	0.20	18 in·lb	S
Clutch				
Clutch Cover Mounting Bolts	11	1.1	97 in·lb	R
Clutch Hub Nut	135	13.8	99.6	
Clutch Lever Clamp Bolts	7.8	0.80	69 in·lb	S
Clutch Spring Bolts	8.8	0.90	78 in·lb	S
Oil Filler Plug	2.0	0.20	18 in·lb	

## 2-8 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Engine Lubrication System				
Coolant Drain Bolt (Water Pump)	11	1.1	97 in·lb	G, R EO
Engine Oil Drain Bolt	29	3.0	21	
Oil Filter	17	1.7	13	
Oil Filter Holder	78	8.0	58	
Oil Filler Plug	2.0	0.20	18 in·lb	L
Oil Jet Nozzle Bolts	6.9	0.70	61 in·lb	
Oil Pan Bolts	11	1.1	97 in·lb	L
Oil Pan Side Dummy Bolts	6.9	0.70	61 in·lb	
Oil Passage Plugs	20	2.0	15	L
Oil Pipe Holder Bolts	13	1.3	115 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	2.0	0.20	18 in·lb	HG
Water Pump Cover Bolts	11	1.1	97 in·lb	
Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
Engine Removal/Installation				
Adjusting Collar Lock Bolt	34	3.5	25	S
Adjusting Collar Locknut	49	5.0	36	S
Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
Front Engine Mounting Bolts	44	4.5	32	S
Lower Engine Mounting Nut	44	4.5	32	S
Middle Engine Mounting Nut	44	4.5	32	S
Rear Engine Bracket Bolts	25	2.5	18	S
Subframe Bolts	25	2.5	18	S
Upper Engine Bracket Bolts	44	4.5	32	S
Crankshaft/Transmission				
Breather Plate Bolts (M6)	9.8	1.0	87 in·lb	L
Breather Plate Bolts (M5)	5.9	0.60	52 in·lb	L
Connecting Rod Big End Nuts	see the text	←	←	MO
Crankcase Bolts (M9)	42	4.3	31	MO, S
Crankcase Bolts (M8)	27	2.8	20	S
Crankcase Bolts (M7)	20	2.0	15	S
Crankcase Bolts (M6)	12	1.2	106 in·lb	S
Front Footpeg Bracket Bolts	25	2.5	18	
Gear Positioning Lever Bolt	12	1.2	106 in·lb	
Neutral Switch	15	1.5	11	
Oil Jet Nozzle Bolts	6.9	0.70	61 in·lb	L
Oil Passage Plugs	20	2.0	15	L
Oil Pipe Holder Bolts	13	1.3	115 in·lb	L
Shift Drum Bearing Holder Bolt	13	1.3	115 in·lb	L
Shift Drum Bearing Holder Screw	5.9	0.60	52 in·lb	L
Shift Drum Cam Holder Bolt	12	1.2	106 in·lb	L



**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Shift Lever Bolt	6.9	0.70	61 in·lb	
Shift Pedal Mounting Bolt	34	3.5	25	L
Shift Shaft Return Spring Pin	29	3.0	21	L
Starter Motor Clutch Bolts	12	1.2	106 in·lb	L
Tie-Rod Locknuts	6.9	0.70	61 in·lb	
<b>Wheels/Tires</b>				
Front Axle	108	11.0	79.7	
Front Axle Clamp Bolt	20	2.0	15	
Rear Axle Nut	108	11.0	79.7	
<b>Final Drive</b>				
Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
Engine Sprocket Cover Plate Bolts	9.8	1.0	87 in·lb	
Engine Sprocket Nut	125	12.7	92.2	MO
Rear Axle Nut	108	11.0	79.7	
Rear Sprocket Nuts	59	6.0	44	
<b>Brakes</b>				
Bleed Valves	7.8	0.80	69 in·lb	
Brake Hose Banjo Bolts	25	2.5	18	
Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Brake Pedal Bolt	34	3.5	25	L
Brake Pipe Joint Nuts (ABS Equipped Models)	18	1.8	13	
Front Brake Disc Mounting Bolts	27	2.8	20	L
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Front Brake Pad Pin Plugs	2.5	0.25	25 in·lb	
Front Brake Pad Pins	17.2	1.8	13	
Front Brake Reservoir Cap Stopper Screw	1.2	0.12	11 in·lb	
Front Caliper Holder Pin Bolt	22	2.2	16	L, Si
Front Caliper Mounting Bolts	25	2.5	18	
Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
Rear Brake Disc Mounting Bolts	27	2.8	20	L
Rear Brake Pad Pin	17.2	1.8	13	
Rear Brake Pad Pin Plug	2.5	0.25	25 in·lb	
Rear Caliper Mounting Bolt	22	2.2	16	
Rear Caliper Pin Bolt	27	2.8	20	Si
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	17.2	1.8	13	
<b>Suspension</b>				
Front Axle Clamp Bolt	20	2.0	15	
Front Fork Bottom Allen Bolts	40	4.1	30	L
Front Fork Top Plugs	23	2.3	17	
Lower Front Fork Clamp Bolts	21	2.1	15	AL
Piston Rod Nuts	15	1.5	11	

## 2-10 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Rear Shock Absorber Nut (Lower)	34	3.5	25	
Rear Shock Absorber Nut (Upper)	34	3.5	25	
Swingarm Pivot Shaft	9.8	1.0	87 in·lb	
Swingarm Pivot Shaft Locknut	98	10.0	72.3	
Swingarm Pivot Shaft Nut	108	11.0	79.7	
Tie-Rod Nuts	59	6.0	44	
Uni-Trak Rocker Arm Nut	34	3.5	25	
Upper Front Fork Clamp Bolts	20	2.0	15	
<b>Steering</b>				
Handlebar Holder Bolts	25	2.5	18	S
Handlebar Lower Clamp Nuts	34	3.5	25	AL
Lower Front Fork Clamp Bolts	21	2.1	15	
Steering Stem Head Bolt	108	11.0	79.7	
Steering Stem Nut	27	2.8	20	
Switch Housing Screws	3.5	0.36	31 in·lb	
Upper Front Fork Clamp Bolts	20	2.0	15	
<b>Frame</b>				
Front Fender Bolts	3.9	0.40	35 in·lb	
Front Footpeg Bracket Bolts	25	2.5	18	
Rear Footpeg Bracket Bolts	25	2.5	18	
Sidestand Bolt	44	4.5	32	
Sidestand Switch Bolt	8.8	0.90	78 in·lb	L
<b>Electrical System</b>				
Alternator Cover Bolts	11	1.1	97 in·lb	L
Alternator Lead Holding Plate Bolt	12	1.2	106 in·lb	
Alternator Rotor Bolt	155	15.8	114	S
Camshaft Position Sensor Bolt	12	1.2	106 in·lb	
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Crankshaft Sensor Cover Bolts	11	1.1	97 in·lb	
Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Fuel Level Sensor Bolts	6.9	0.70	61 in·lb	L
License Plate Light Cover Mounting Screws	0.9	0.09	8 in·lb	
License Plate Light Mounting Screws	1.2	0.12	11 in·lb	
Meter Mounting Screws	1.2	0.12	11 in·lb	
Neutral Switch	15	1.5	11	
Oil Pressure Switch	15	1.5	11	
Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·lb	SS HG
Oxygen Sensor (Equipped Models)	44.1	4.50	32.5	
Regulator/Rectifier Bolts	6.9	0.70	61 in·lb	
Regulator/Rectifier Bracket Bolts	6.9	0.70	61 in·lb	
Sidestand Switch Bolt	8.8	0.90	78 in·lb	
Spark Plugs	13	1.3	115 in·lb	

**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Speed Sensor Bolt	12	1.2	106 in·lb	L
Starter Motor Mounting Bolts	11	1.1	97 in·lb	
Starter Relay Cable Terminal Bolts	3.9	0.40	35 in·lb	
Stator Coil Bolts	12	1.2	106 in·lb	
Switch Housing Screws	3.5	0.36	31 in·lb	
Tail/Brake Light Mounting Screws	1.2	0.12	11 in·lb	
Timing Rotor Bolt	39	4.0	29	
Vehicle-down Sensor Bolts	6.0	0.61	53 in·lb	
Water Temperature Sensor	25	2.5	18	

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

**Basic Torque for General Fasteners**

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

## 2-12 PERIODIC MAINTENANCE

### Specifications

Item	Standard	Service Limit
<b>Fuel System (DFI)</b>		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
Idle Speed	1 100 ±50 r/min (rpm)	— — —
Bypass Screws (Turn Out)	2 1/2 (for reference)	— — —
Throttle Body Vacuum	35.3 ±1.3 kPa (265 ±10 mmHg) at idle speed	— — —
Air Cleaner Element	Paper filter	— — —
<b>Cooling System</b>		
Coolant:		
Type (Recommended)	Permanent type of antifreeze	— — —
Color	Green	— — —
Mixed Ratio	Soft water 50%, Coolant 50%	— — —
Freezing Point	−35°C (−31°F)	— — —
Total Amount	2.9 L (3.1 US qt)	— — —
<b>Engine Top End</b>		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	— — —
Inlet	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	— — —
<b>Clutch</b>		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
<b>Engine Lubrication System</b>		
Engine Oil:		
Type	API SE, SF or SG API SH, SJ or SL with JASO MA	— — —
Viscosity	SAE 10W-40	— — —
Capacity	3.1 L (3.3 US qt) (when filter is not removed) 3.3 L (3.5 US qt) (when filter is removed) 3.8 L (4.0 US qt) (when engine is completely dry)	— — — — — — — — —
Level	Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)	— — —
<b>Wheels/Tires</b>		
Tread Depth:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.), (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	5.0 mm (0.20 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.), Over 130 km/h (80 mph): 3 mm (0.12 in.)
Air Pressure (when Cold):		
Front	Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)	— — —
Rear	Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm <sup>2</sup> , 42 psi)	— — —

## Specifications

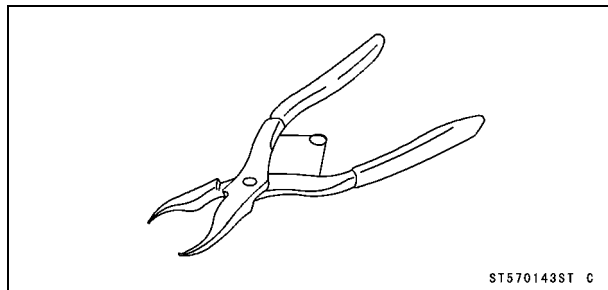
Item	Standard	Service Limit
<b>Final Drive</b>		
Drive Chain Slack	30 ~ 40 mm (1.2 ~ 1.6 in.)	— — —
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	ENUMA	— — —
Type	EK520MVXL1	— — —
Link	112 Links	— — —
<b>Brakes</b>		
Brake Fluid:		
Grade	DOT4	— — —
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Light Timing:		
Front	Pulled ON	— — —
Rear	ON after about 10 mm (0.39 in.) of pedal travel	— — —
<b>Electrical System</b>		
Spark Plug:		
Type	NGK CR9EK	— — —
Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	— — —

## 2-14 PERIODIC MAINTENANCE

### Special Tools

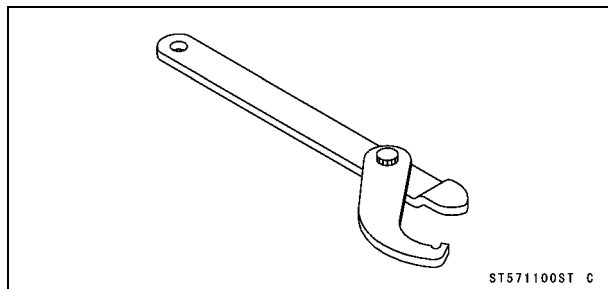
**Inside Circlip Pliers:**

**57001-143**



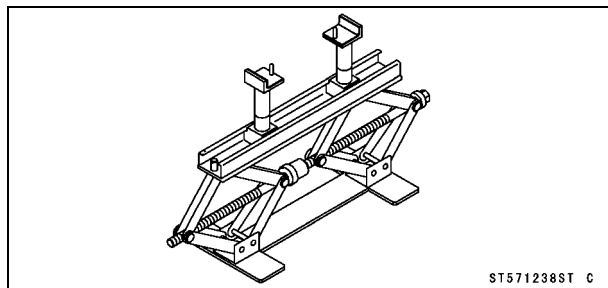
**Steering Stem Nut Wrench:**

**57001-1100**



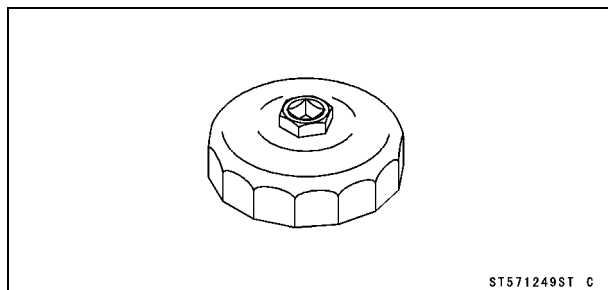
**Jack:**

**57001-1238**



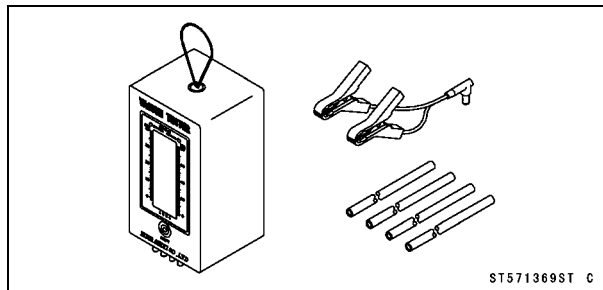
**Oil Filter Wrench:**

**57001-1249**



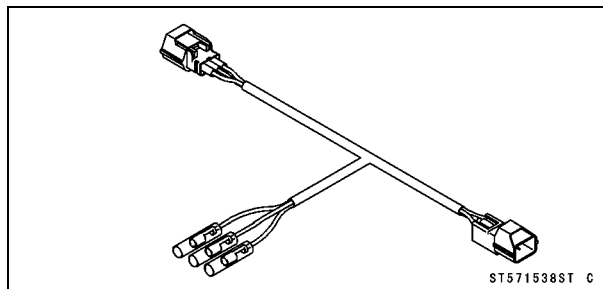
**Vacuum Gauge:**

**57001-1369**



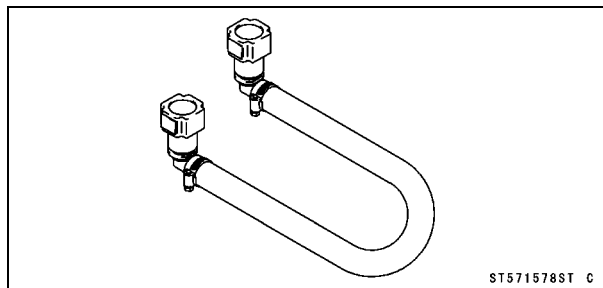
**Throttle Sensor Setting Adapter:**

**57001-1538**



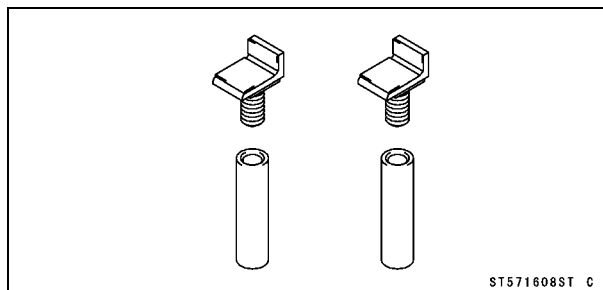
**Extension Tube:**

**57001-1578**



**Jack Attachment:**

**57001-1608**



## Periodic Maintenance Procedures

### Fuel System (DFI)

#### Air Cleaner Element Cleaning

##### NOTE

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

##### ⚠ WARNING

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

##### CAUTION

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

- Remove the element (see Air Cleaner Element Replacement).
- 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.

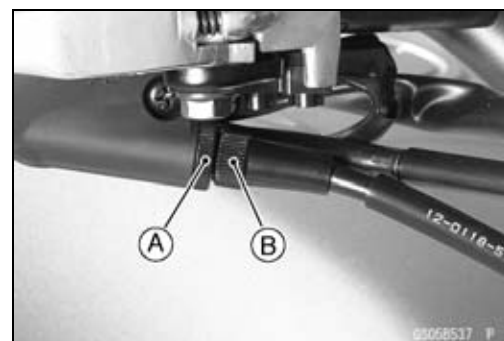
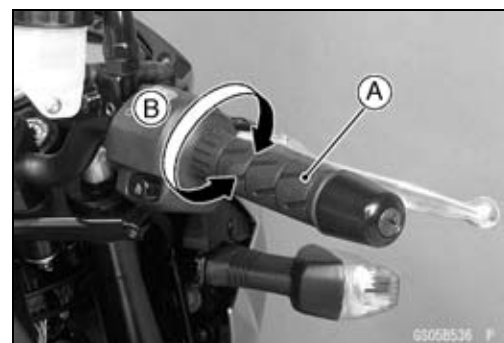
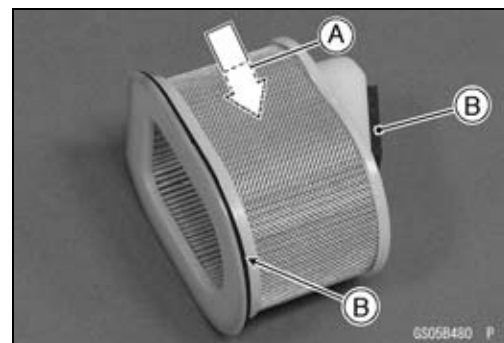
#### Throttle Control System Inspection

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

##### Throttle Grip Free Play

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

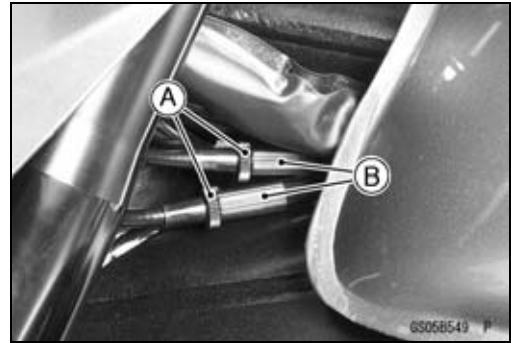
- ★ If the free play is incorrect, adjust the throttle cable as follows.
- Loosen the locknut [A].
- Turn the adjuster [B] until the proper amount of free play can be obtained.
- Tighten the locknut against the adjuster securely.
- ★ If the throttle grip free play can not be adjusted with the adjuster,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



## 2-16 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Loosen the locknuts [A], and turn the lower adjusters [B] until the proper amount of throttle grip free play is obtained.
- Tighten the locknuts against the adjusters securely.
- ★ If the throttle grip free play can not be adjusted with the lower adjusters, use the adjuster at the upper end of the cable again.

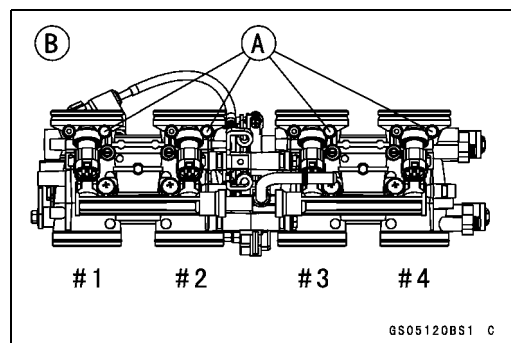
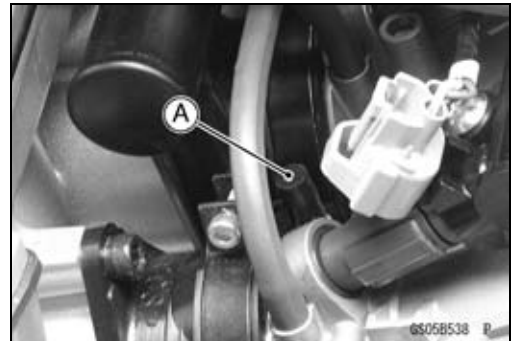


### Engine Vacuum Synchronization Inspection

#### 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 Tank Removal in the Fuel System (DFI) chapter).
  - Pull off the rubber caps [A] from the fittings of each throttle body.
- Upside View [B]



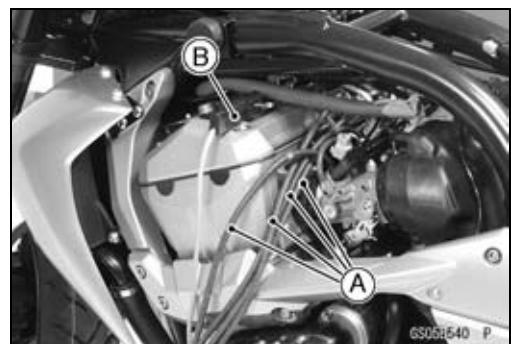
- Pull off the air switching valve hose [A] from the air cleaner housing.
- Plug the air switching valve hose end and air cleaner housing fitting.



- Connect a vacuum gauge (special tool) and hoses [A] to the fittings on the throttle body.

**Special Tool - Vacuum Gauge: 57001-1369**

- Connect a highly accurate tachometer [B] to one of the stick coil primary leads.

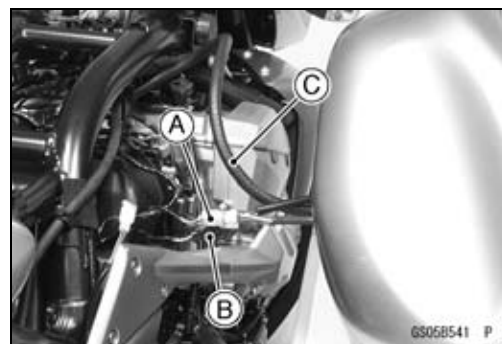




## Periodic Maintenance Procedures

- Remove the fuel outlet hose (see Fuel Hose Replacement).
- Connect the following parts temporary.  
Fuel Pump Lead Connector [A]  
Fuel Level Sensor Lead Connector [B]  
Extension Tube [C]

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

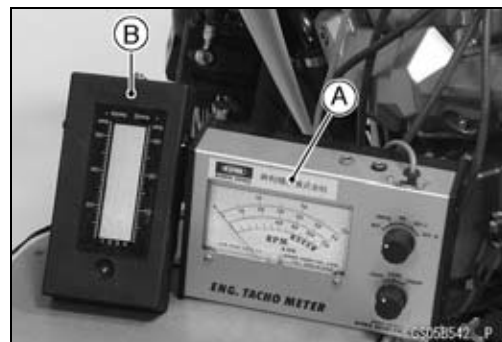


- Start the engine and warm it up thoroughly.
- Check the idle speed, using a highly accurate tachometer [A].

### Idle Speed

**Standard: 1 100 ±50 r/min (rpm)**

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



### CAUTION

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

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

### Throttle Body Vacuum

**Standard: 35.3 ±1.3 kPa (265 ±10 mmHg) at idle speed**

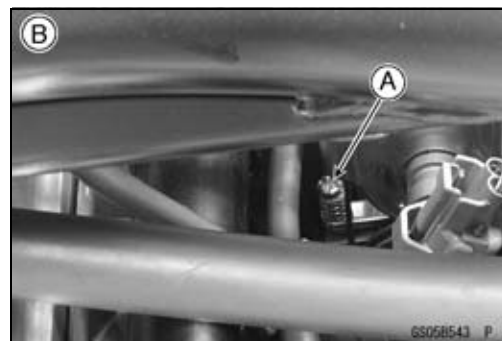
- ★ If any vacuum is not within specifications, first synchronize the balance of the left (#1, #2 throttle valves) and right (#3, #4 throttle valves) assemblies.

### Example:

- #1: 260 mmHg
- #2: 290 mmHg
- #3: 250 mmHg
- #4: 270 mmHg

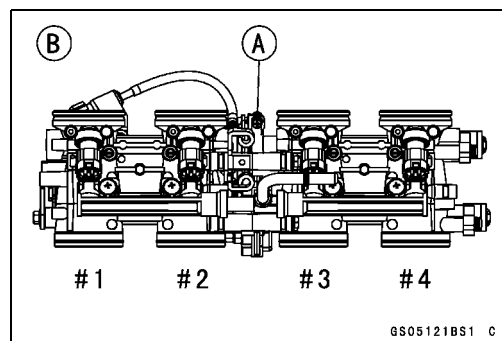
- With the engine at the correct idle speed, equalize higher vacuum of #1 or #2 (for example 290 mmHg) to higher vacuum of #3 or #4 (for example 270 mmHg) by turning the center adjusting screw [A].

Upside View [B]



### NOTE

- After adjustment, the final vacuum measurement between the highest throttle valves may not be 290 mmHg (for example). The goal is to have the highest two vacuums between the left (#1 and #2) and right (#3 and #4) banks be the same.



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

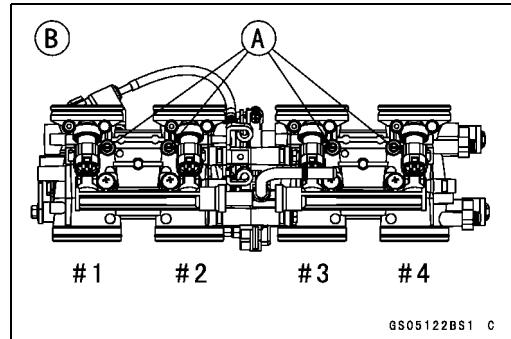
## 2-18 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- ★ If any one vacuum measurement is out of the specified range after left (#1, #2) and right (#2, #3) synchronization, adjust the bypass screws [A].

Upside View [B]

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



- Turn in the bypass screw [A] with counting the number of turns until it seals fully but not tightly. Record the number of turns.

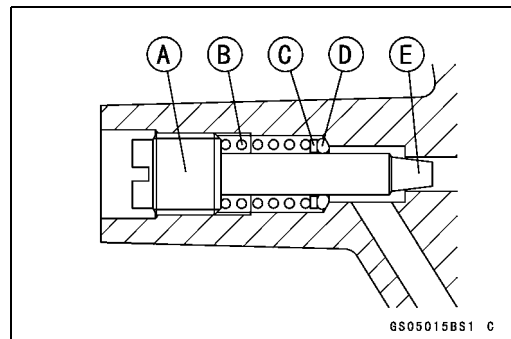
**Torque - Bypass Screws: 0.2 N·m (0.02 kgf·m, 1.8 in·lb)**

#### CAUTION

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

- Remove:
  - Bypass Screw
  - Spring [B]
  - Washer [C]
  - O-ring [D]
- Check the bypass screw and its hole for carbon deposits.
- ★ If any carbons accumulate, wipe the carbons off from 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 Screws: 0.2 N·m (0.02 kgf·m, 1.8 in·lb)**



## 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. On setting the bypass screw, use the “turns out” determined during disassembly.

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

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

### Main Throttle Sensor Output Voltage

#### Connections to Adapter:

Digital Meter (+) → R (sensor Y/W) lead

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

**Standard: DC 0.985 ~ 1.015 V at idle throttle opening**

- ★ If the output voltage is out of the standard, check the input voltage of the main throttle sensor (see Main Throttle Sensor Input Voltage Inspection in the Fuel System (DFI) chapter).
- Remove the vacuum gauge hoses and install the rubber caps on the original position.

### Idle Speed Inspection

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



### WARNING

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

- Check the idle speed.

#### Idle Speed

**Standard: 1 100 ±50 r/min (rpm)**

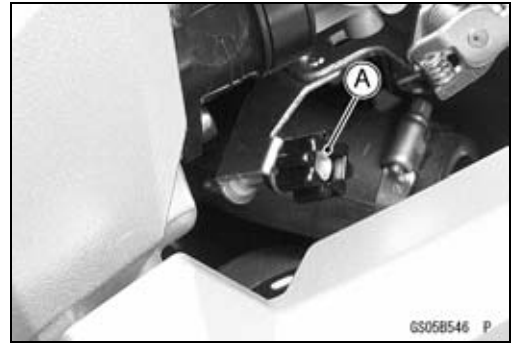
- ★ If the idle speed is out of the specified range, adjust it.

## 2-20 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Idle Speed Adjustment

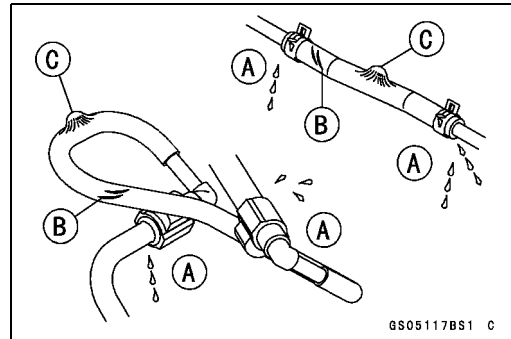
- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.
- Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.



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

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

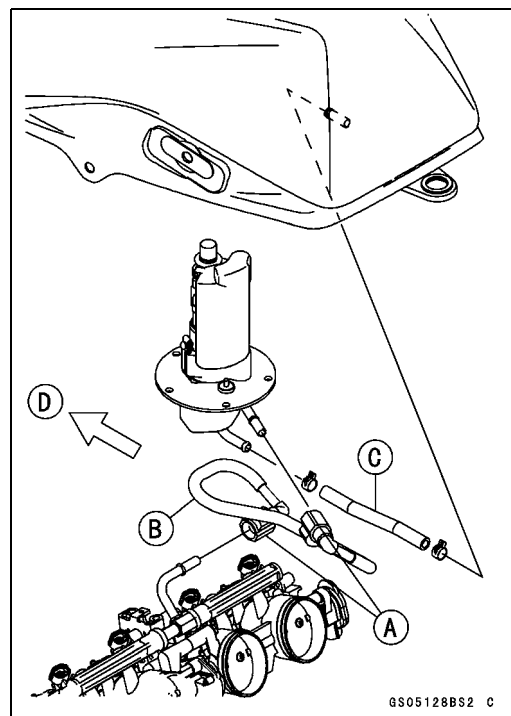
- ★ Replace the hose if any fraying, cracks [B] or bulges [C] are noticed.



- 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]  
Fuel Outlet Hose [B]  
Fuel Inlet Hose [C]  
Front [D]



## Periodic Maintenance Procedures

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

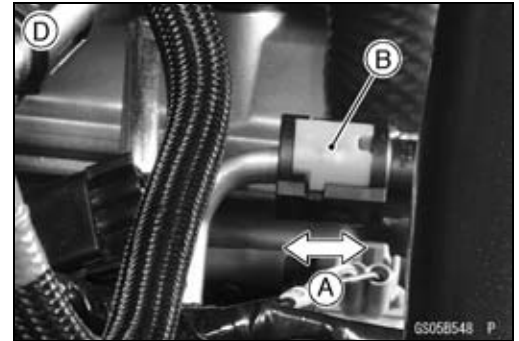
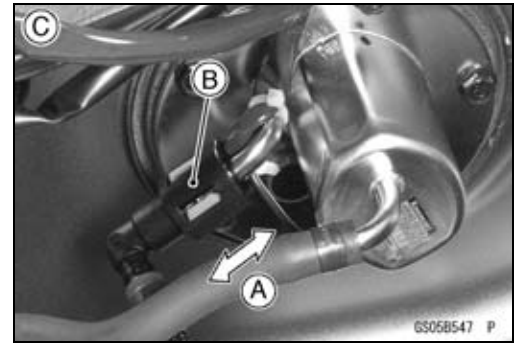
Fuel Pump Side [C]

Throttle Body Assy Side [D]

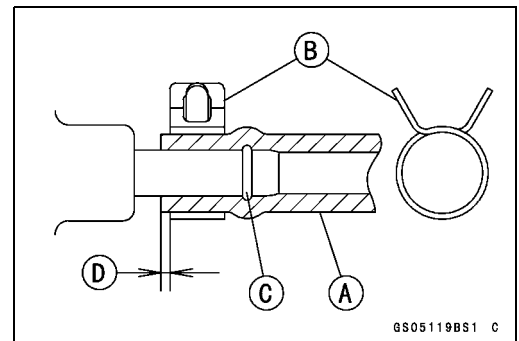
### **⚠ WARNING**

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

★ If it comes off, reinstall the hose joint.



- Check that the inlet hose [A] is onto the pipe fully and the clamps [B] are installed beyond the raised rib [C].  
1 ~ 2 mm (0.039 ~ 0.079 in.) [D]



## 2-22 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

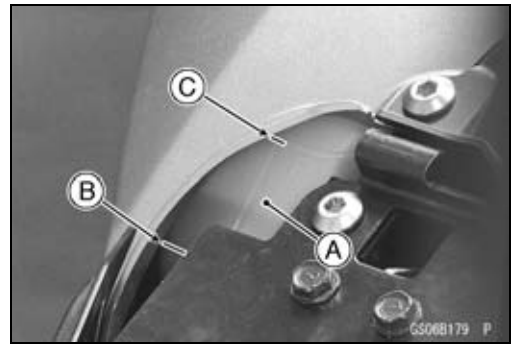
#### Cooling System

##### Coolant Level Inspection

###### NOTE

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

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Check the coolant level in the reserve tank [A] with the motorcycle held perpendicular (Do not use the side-stand.).
- ★ If the coolant level is lower than the “L” level line [B], unscrew the reserve tank cap and add coolant to the “F” level line [C].
  - “L”: low
  - “F”: full



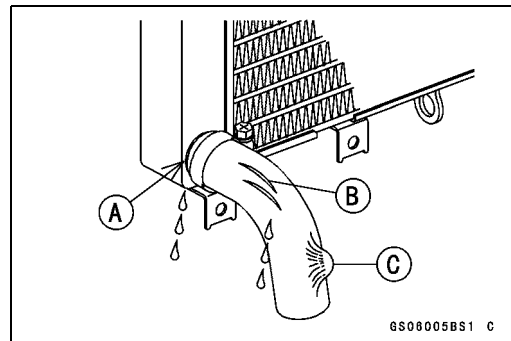
###### CAUTION

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

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

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

**Torque - Radiator (Water) Hose Clamp Screws: 3.0 N·m  
(0.31 kgf·m, 27 in·lb)**



## Periodic Maintenance Procedures

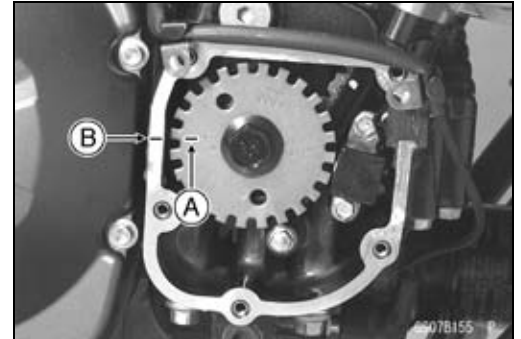
### Engine Top End

#### Valve Clearance Inspection

##### NOTE

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

- Remove:  
Crankshaft Sensor Cover (see Crankshaft Sensor Removal in the Electrical System chapter)  
Cylinder Head Cover (see Cylinder Head Cover Removal in the Engine Top End chapter)
- Position the crankshaft at 1,4 piston TDC.  
TDC Mark [A] for #1, 4 Pistons  
Timing Mark [B] (Crankcase Halves Mating Surface)



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

##### Valve Clearance

###### Standard:

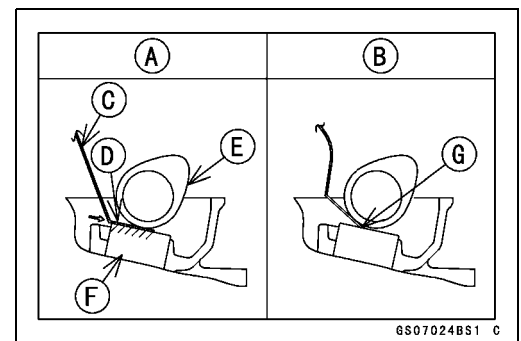
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)
Inlet	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)



##### NOTE

○ Thickness gauge is horizontally inserted on the valve lifter.

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

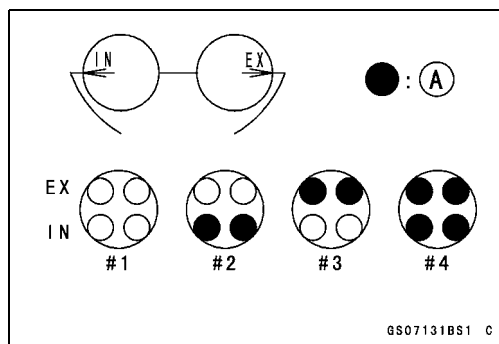


## 2-24 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

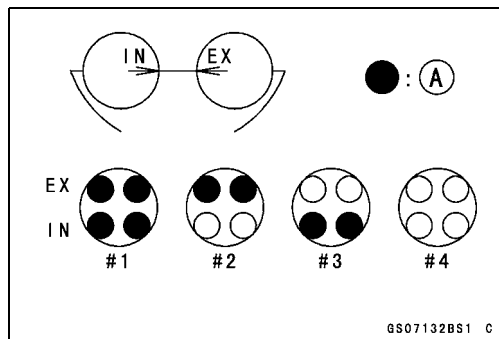
#### ○When positioning #1 piston TDC at the end of the compression stroke:

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



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

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



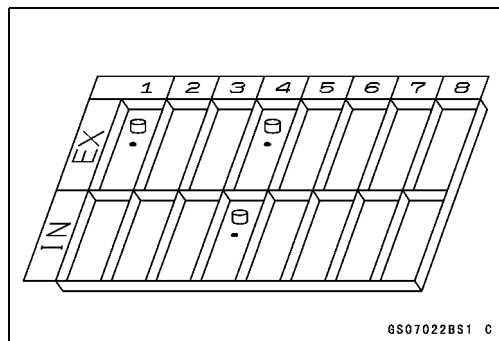
- ★If the valve clearance is not within the specified range, first record the clearance, and then adjust it.

#### Valve Clearance Adjustment

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

#### NOTE

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

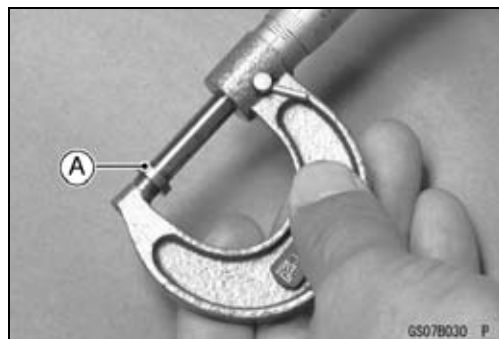


- Besides the standard shims in the valve clearance adjustment charts, the following additional shims may be used.

#### Adjustment Shims

Part Number	Thickness
92180-0276	3.225 mm
92180-0277	3.275 mm
92180-0278	3.325 mm

- Clean the shim to remove any dust or oil.
- Measure the thickness of the removed shim [A].







## Periodic Maintenance Procedures

		PRESENT SHIM																Example				
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	05	10	15	20	25	30	35	40	45	50	
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
VALVE CLEARANCE MEASUREMENT	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.

Replace **2.95 mm** shim with **3.15 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

## Periodic Maintenance Procedures

### CAUTION

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

- If there is no valve clearance, use a shim that is a few sizes smaller, and remeasure the valve clearance.
- When installing the shim, face the marked side toward the valve lifter. At this time, apply engine oil to the shim or the valve lifter to keep the shim in place during camshaft installation.

### CAUTION

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

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

### Exhaust Butterfly Valve Cable Inspection

- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Confirm whether pulley [A] is an angle shown in the figure.  
 $41.7^\circ \pm 7^\circ$  [B]
- This position is original position of the pulley.

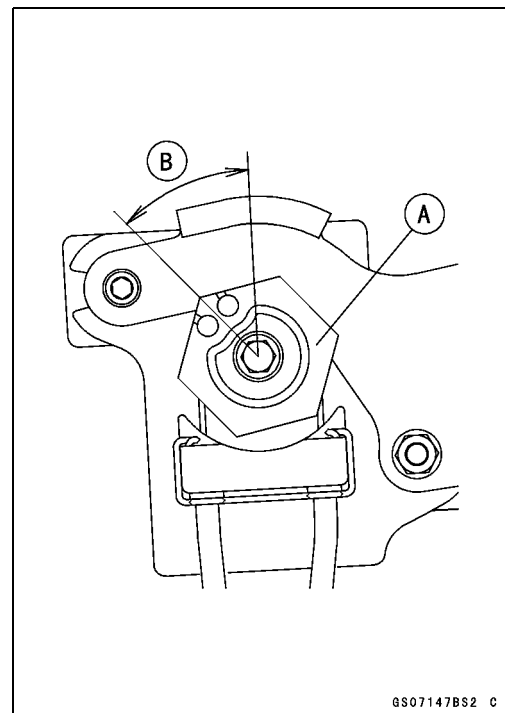
### NOTE

- *Correct the position electrically after confirming the use is discontinued and there no damage when differing from the angle of shown in the figure.*

### CAUTION

**Do not correct the pulley position with the tool, forcibly. The actuator damage will occur.**

- ★ If the pulley angle is wrong, adjust the angle as follows.
  - Turn the ignition switch ON.
  - Confirm the pulley turns clockwise and then counterclockwise, and clockwise again.
  - The pulley returns to the original position.
  - Turn the ignition switch OFF.
- ★ If the operation of the pulley is different, adjust the exhaust butterfly valve cables (see Exhaust Butterfly Valve Cable Adjustment).
- ★ If the pulley does not return to the original position, adjust the pulley (see Exhaust Butterfly Valve Actuator Installation in the Fuel System (DFI) chapter).

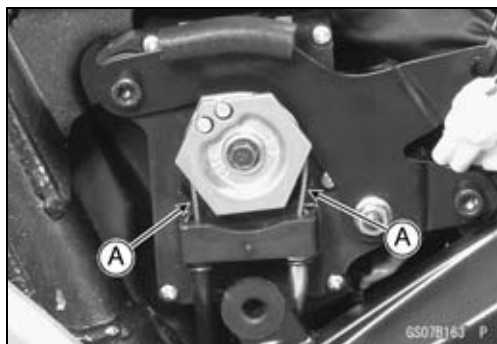


GS07147BS2 C

## 2-28 PERIODIC MAINTENANCE

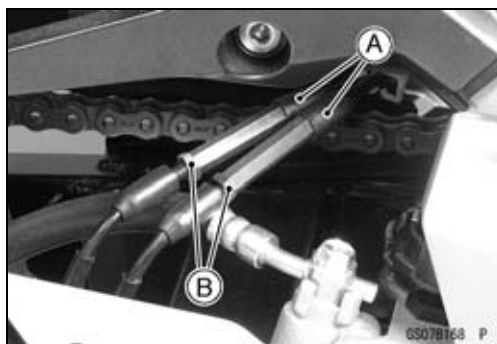
### Periodic Maintenance Procedures

- Check that there is no play in the inner cables [A] by pulling them lightly.
- ★ If there is play in the inner cables, adjust them (see Exhaust Butterfly Valve Cable Adjustment).



#### ***Exhaust Butterfly Valve Cable Adjustment***

- Slide the dust covers [A].
- Loosen the locknuts [B].



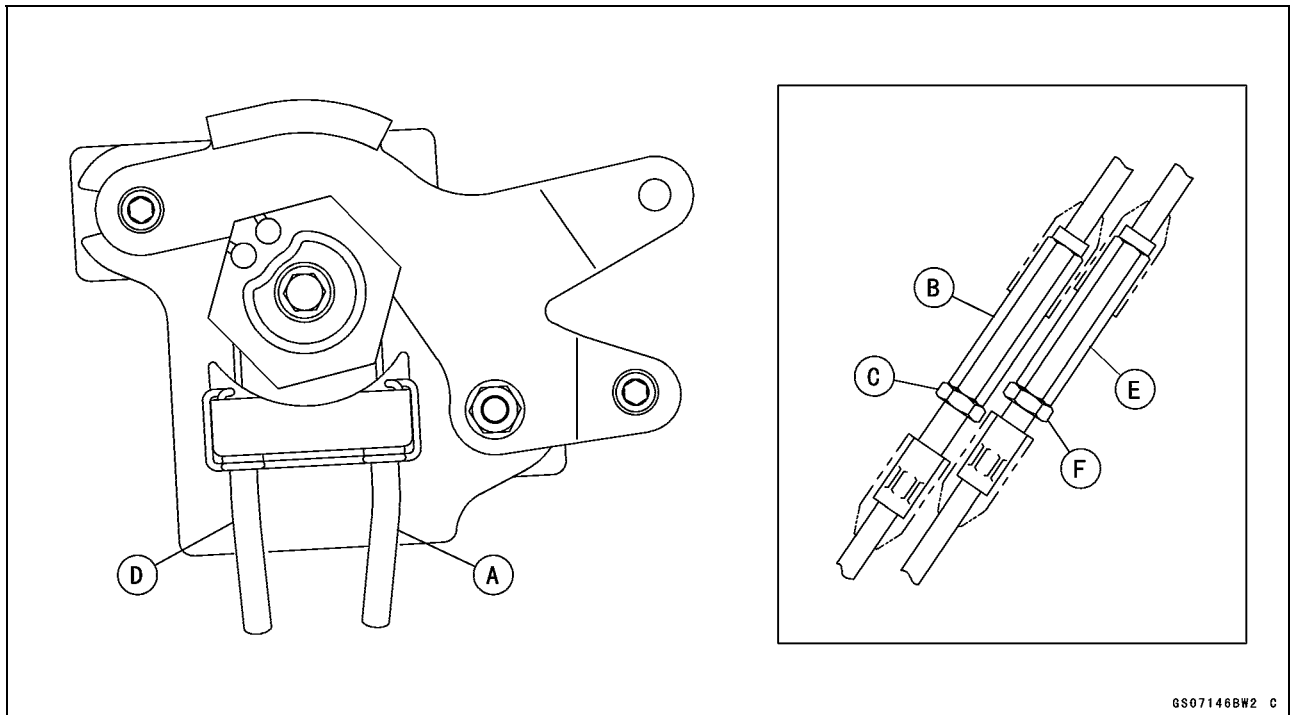
## Periodic Maintenance Procedures

- Stretch the open cable (white) [A] first by using the adjuster [B].
- Turn the adjuster counterclockwise until it becomes hard to turn.  
Locknut of White [C]

### CAUTION

**To keep the correct exhaust butterfly valve position, adjust the open cable first.**  
**Do not overstretch. If the adjustment of the exhaust butterfly valve cables are incorrect, the exhaust butterfly valve actuator does not operate correctly.**

- Then, stretch the close cable (black) [D] by using the adjuster [E].
- Turn the adjuster counterclockwise until it becomes hard to turn.  
Locknut of Black [F]



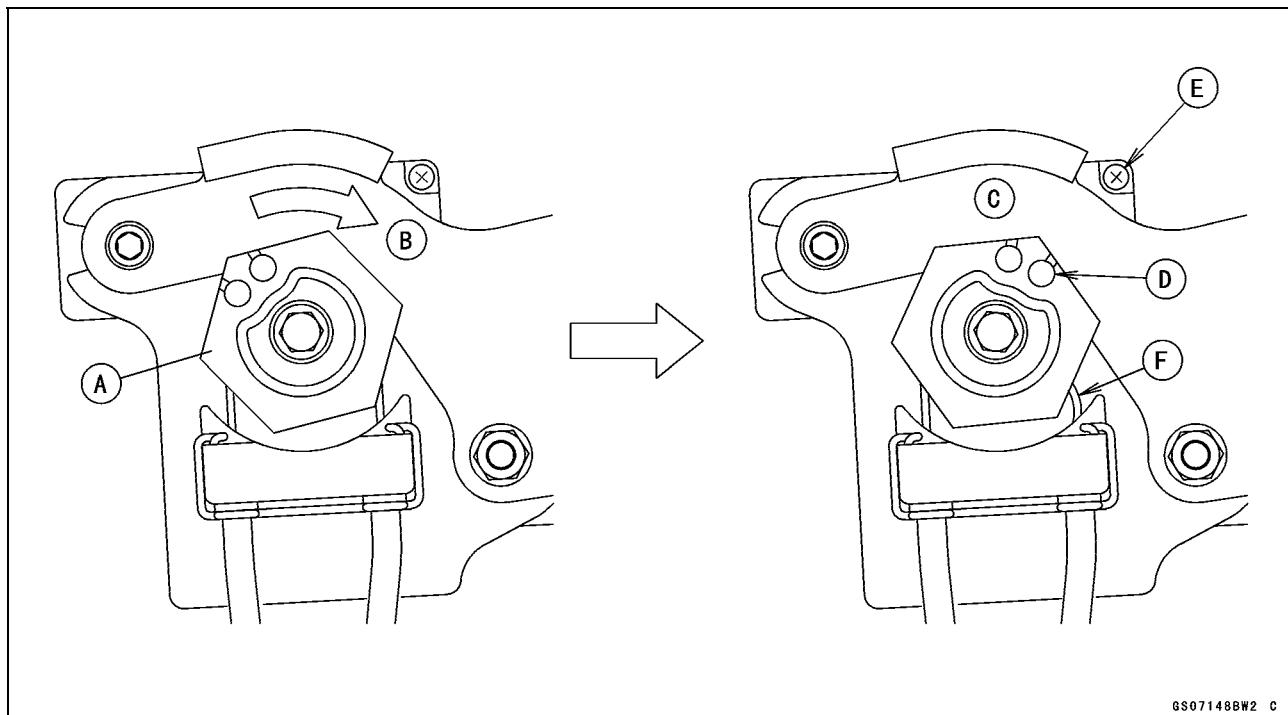
## 2-30 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Turn the ignition switch ON and wait until the pulley [A] turns fully clockwise [B].
- Turn off the ignition switch when the pulley become fully clockwise position [C] as shown in the figure.
- The target position is a position in which the upper end [D] of the open cable and the screw [E] of the actuator become almost straight.
- The pulley stops at fully clockwise position.

#### NOTE

- The exhaust butterfly valve is full closed position when the pulley turned fully clockwise. Therefore, the play [F] appears in the open cable when pulley is fully clockwise position. The open and close cables can be evenly stretching by adjusting this play.



## Periodic Maintenance Procedures

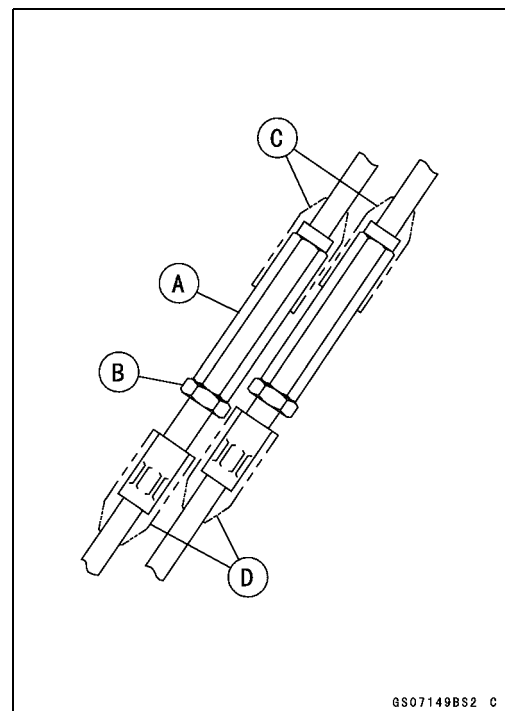
- Stretch the open cable (white) by using the adjuster [A].
- Turn the adjuster counterclockwise until it becomes hard to turn.

Locknut of White [B]

### CAUTION

**Do not overstretch. If the adjustment of the exhaust butterfly valve cables are incorrect, the exhaust butterfly valve actuator does not operate correctly.**

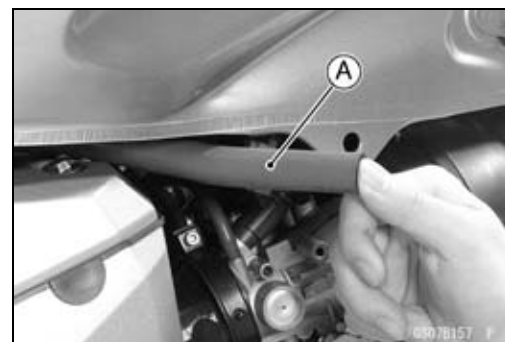
- Tighten:
  - Torque - Exhaust Butterfly Valve Cable Adjuster Locknuts:  
6.9 N·m (0.70 kgf·m, 61 in·lb)
- Cover the dust covers [C].
- Be sure that the dust covers [D] are in positions as shown.
- Turn the ignition switch ON, and confirm the pulley turns counterclockwise and then clockwise.
- ★ If the operation of the pulley is different, readjust the exhaust butterfly valve cables.
- Confirm the pulley is original position.
- ★ If the pulley is not at original position, adjust the pulley (see Exhaust Butterfly Valve Actuator Installation in the Fuel System (DFI) chapter).
- Check that the exhaust butterfly valve actuator operate correctly (see Exhaust Butterfly Valve Cable Installation in the Engine Top End chapter).



## Air Suction System

### Air Suction System Damage Inspection

- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Pull the air switching valve hose [A] out of the air cleaner housing.
- Start the engine and run it at idle speed.
- Plug the air switching valve hose end with your finger and feel vacuum pulsing in the hose.
- ★ If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the air switching valve (see Air Switching Valve Unit Test in the Electrical System chapter) or air suction valve (see Air Suction Valve Inspection in the Engine Top End chapter).



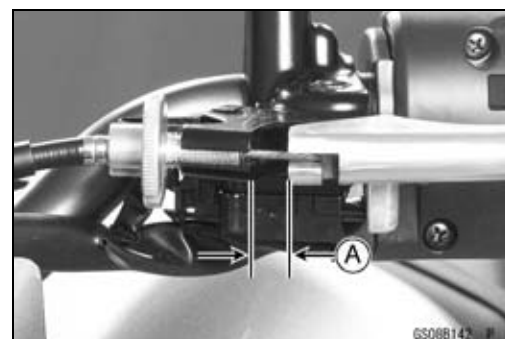
## Clutch

### Clutch Operation Inspection

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

#### Clutch Lever Free Play

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



## 2-32 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **⚠ WARNING**

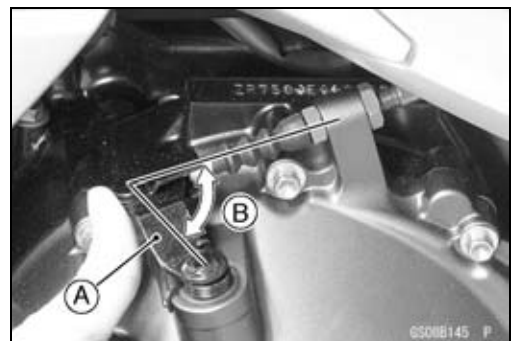
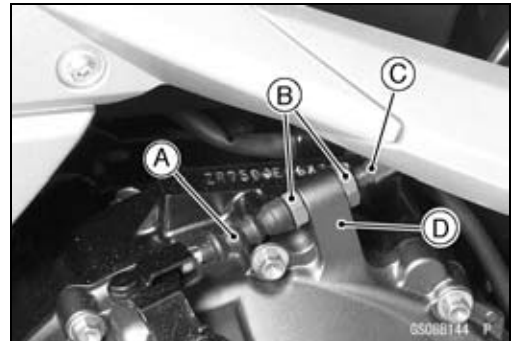
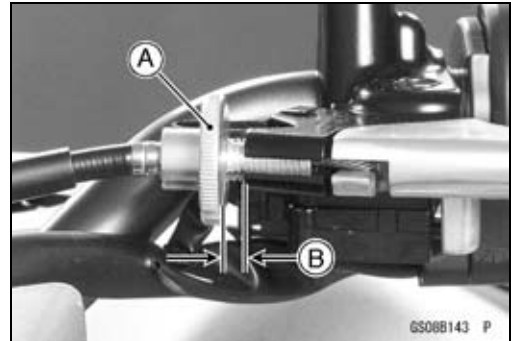
**To avoid a serious burn, never touch the engine or exhaust pipe during clutch adjustment.**

- 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 clutch cover [D].
- Slip the 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 motor-cycle until it becomes hard to turn.
- At this time, the release lever should have the proper angle shown.  
60° [B]
- ★ If the angle is wrong, check the clutch and release parts for wear.

#### **⚠ WARNING**

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

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



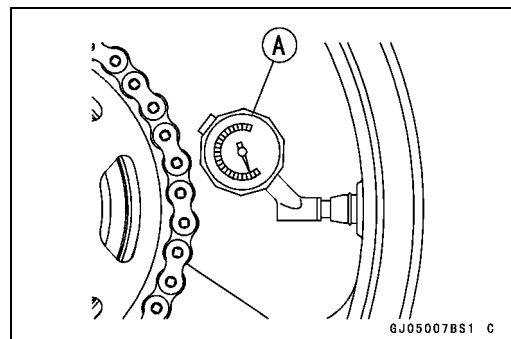
### Wheels/Tires

#### **Air Pressure Inspection**

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

#### **Air Pressure (when Cold)**

- |        |   |
|--------|---|
| Front: | Up to 180 kg (397 lb)<br>250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi) |
| Rear:  | Up to 180 kg (397 lb)<br>290 kPa (2.9 kgf/cm <sup>2</sup> , 42 psi) |

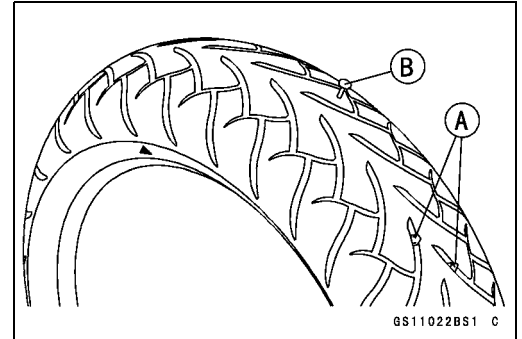




## Periodic Maintenance Procedures

### Wheel/Tire Damage Inspection

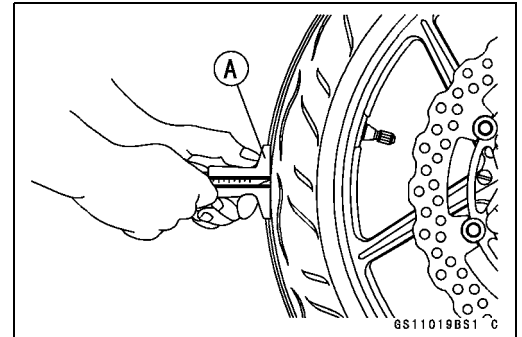
- Remove any imbedded stones [A] or other foreign particles [B] from tread.
  - Visually inspect the tire for cracks and cuts, and replace the tire if necessary. Swelling or high spots indicate internal damage, requiring tire replacement.
  - Visually inspect the wheel for cracks, cuts and dents damage.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



### Tire Tread Wear Inspection

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

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



#### Tread Depth

##### Standard:

Front 4.0 mm (0.16 in.)

Rear 5.0 mm (0.20 in.)

##### Service Limit:

Front 1 mm (0.04 in.)  
(AT, CH, DE) 1.6 mm (0.06 in.)

Rear 2 mm (0.08 in.)  
(Up to 130 km/h (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

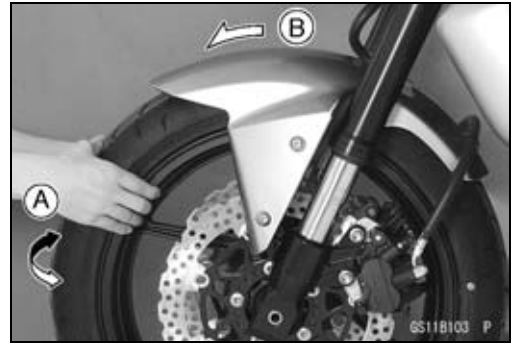
- Most countries may have their own regulations a minimum tire tread depth: be sure to follow them.
- Check and balance the wheel when a tire is replaced with a new one.

## 2-34 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **Wheel Bearing Damage Inspection**

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



#### **Drive Train**

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

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

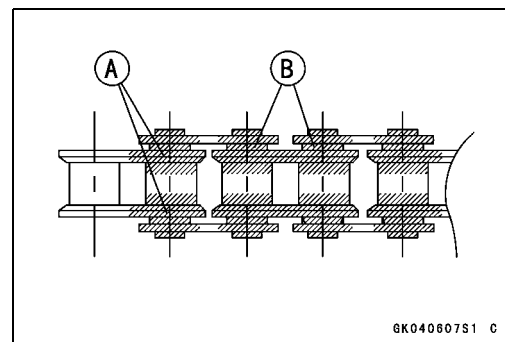
#### **CAUTION**

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

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

## Periodic Maintenance Procedures

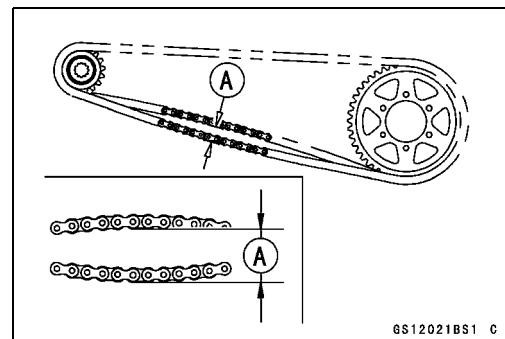
- Apply oil to the sides of the rollers so that oil will penetrate to the rollers and bushings. Apply the oil to the O-rings so that the O-rings will be coated with oil.
- Wipe off any excess oil.
  - Oil Applied Areas [A]
  - O-rings [B]



### Drive Chain Slack Inspection

#### NOTE

- Check the slack with the motorcycle setting on its side-stand.
- Clean the chain if it is dirty, and lubricate it if it appears dry.
- Check the wheel alignment (see Wheel Alignment Inspection).
- Rotate the rear wheel to find the position where the chain is tightest.
- Measure the vertical movement (chain slack) [A] midway between the sprockets.
- ★ If the chain slack exceeds the standard, adjust it.

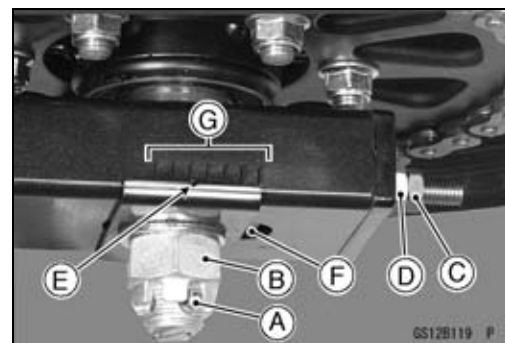


#### Chain Slack

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

### Drive Chain Slack Adjustment

- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].
- ★ If the chain is too loose, turn out the left and right chain adjusters [D] evenly.
- ★ If the chain is too tight, turn in the left and right chain adjusters evenly, and kick the wheel forward.
- Turn 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.**

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

**Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**

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

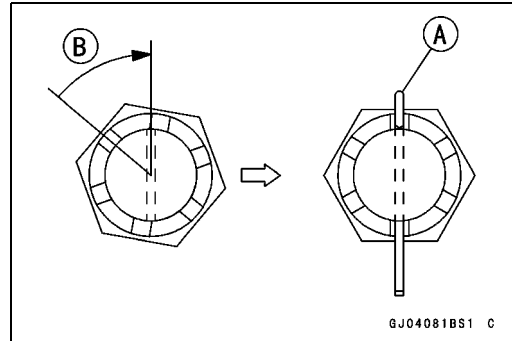
## 2-36 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Insert a new cotter pin [A].

#### NOTE

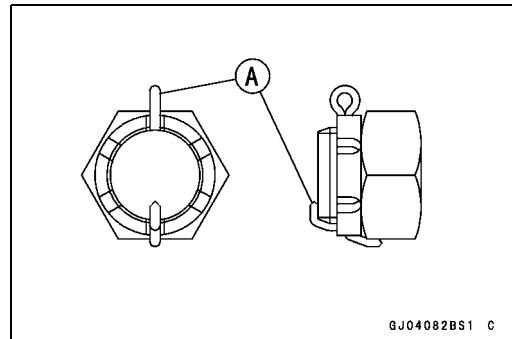
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30°.
- Loosen once and tighten again when the slot goes past the nearest hole.



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

#### ⚠ WARNING

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

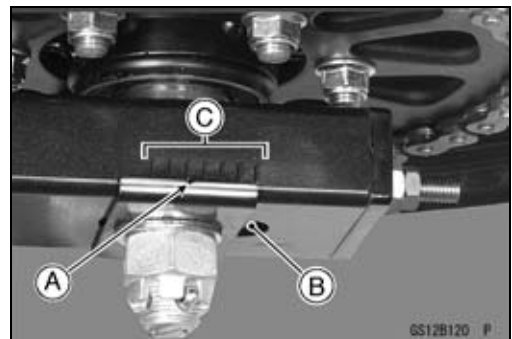


#### Wheel Alignment Inspection

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

#### NOTE

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



#### ⚠ WARNING

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

## Periodic Maintenance Procedures

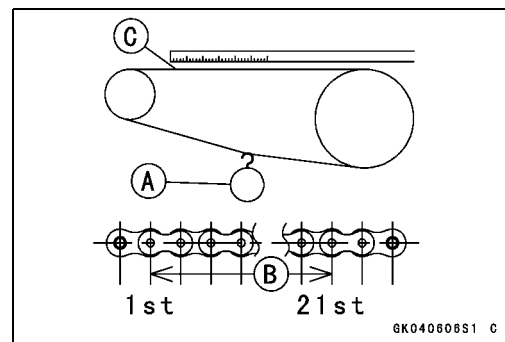
### Drive Chain Wear Inspection

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

#### Drive Chain 20-link Length

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

**Service Limit:** 323 mm (12.7 in.)



### **⚠ 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:** EK520MVXL1  
**Link:** 112 Links

### Chain Guide Wear Inspection

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



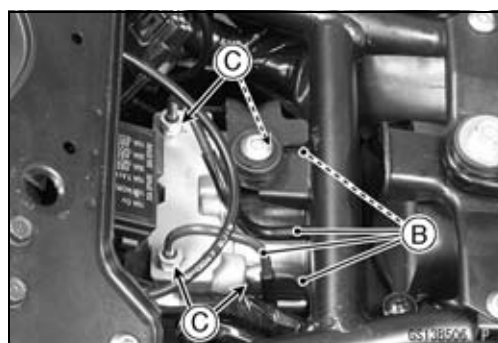
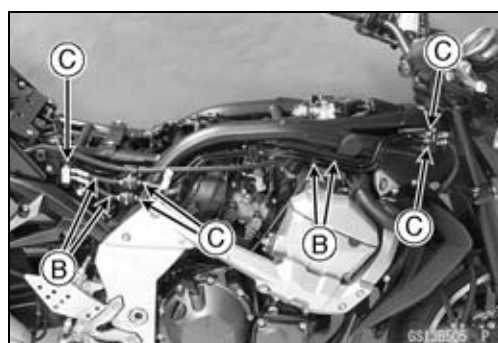
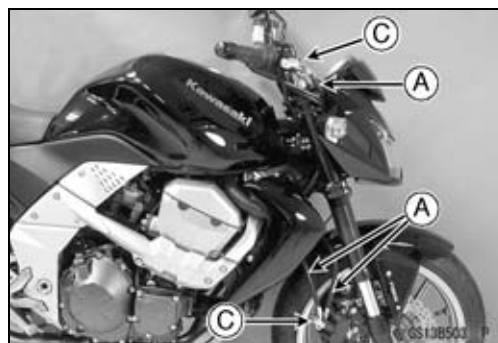
## 2-38 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Brake System

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

- For ABS equipped models; note the following.
  - Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
  - Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A], pipes [B] (ABS equipped models) and fittings [C].
- ★ If the brake fluid leaked from any position, inspect or replace the problem part.



## Periodic Maintenance Procedures

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

- For ABS equipped models; note the following.
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Inspect the brake hoses, pipes and fittings for deterioration, cracks and signs of leakage.
- The high pressure inside the brake line can cause fluid to leak [A] or the hose, pipes (ABS equipped models) to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.
- ★ Replace the hose and pipe (ABS equipped models) if any crack [B], bulge [C] or leakage is noticed.
- ★ Tighten any brake hose banjo bolts and brake pipe joint nuts.

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

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

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

### Brake Operation Inspection

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

### ⚠ WARNING

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

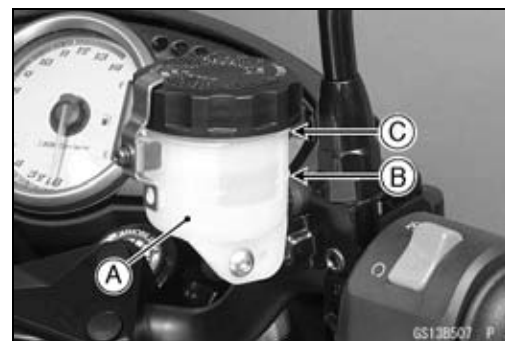
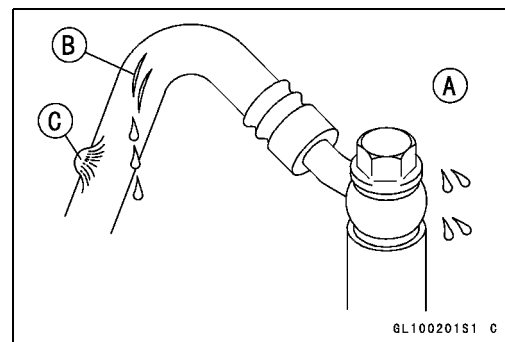
### Brake Fluid Level Inspection

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

#### NOTE

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

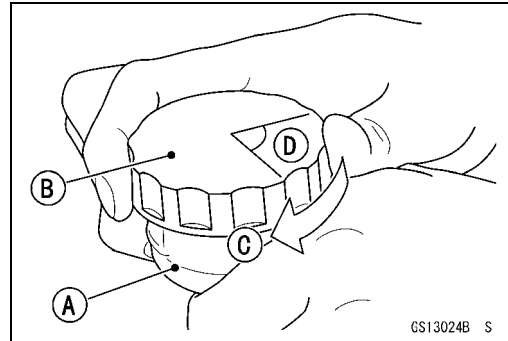
- ★ If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C].



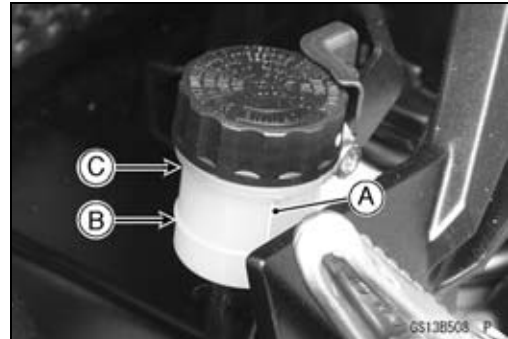
## 2-40 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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



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

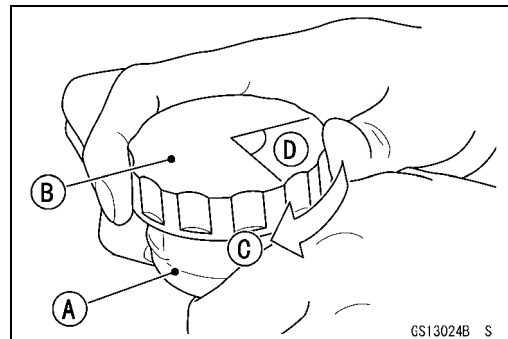


#### **⚠ WARNING**

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

**Recommended Disc Brake Fluid**  
**Grade: DOT4**

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



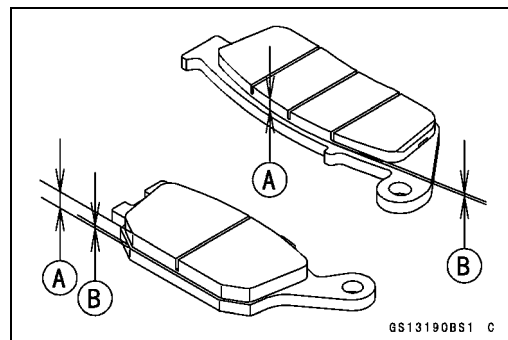
### **Brake Pad Wear Inspection**

- Remove the brake pads (see Front/Rear Brake Pad Removal in the Brakes chapter).
- Check the lining thickness [A] of the pads in each caliper.
- ★ If the lining thickness of either pad is less than the service limit [B], replace both pads in the caliper as a set.

#### **Pad Lining Thickness**

**Standard:**

<b>Front</b>	<b>4.0 mm (0.16 in.)</b>
<b>Rear</b>	<b>5.0 mm (0.20 in.)</b>
<b>Service Limit:</b>	<b>1 mm (0.04 in.)</b>

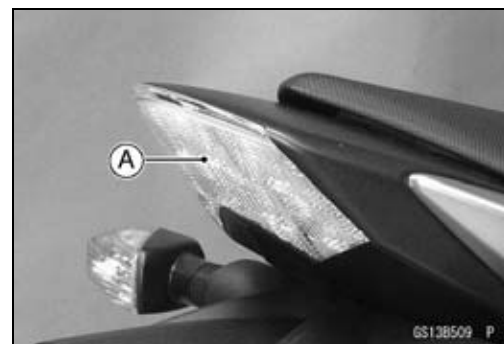




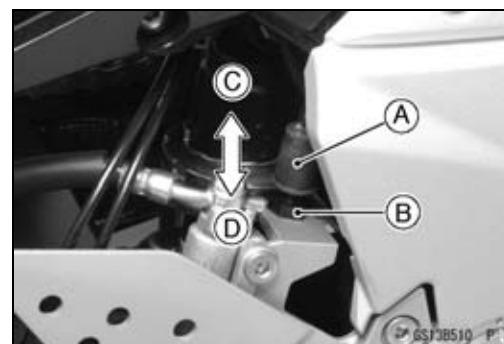
## Periodic Maintenance Procedures

### Brake Light Switch Operation Inspection

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



- ★ If it does not, adjust the brake light switch.
- While holding the switch body, turn the adjusting nut to adjust the switch.  
 Switch Body [A]  
 Adjusting Nut [B]  
 Light sooner as the body rises [C]  
 Light later as the body lowers [D]



### CAUTION

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

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



## Suspensions

### Front Forks/Rear Shock Absorber Operation Inspection

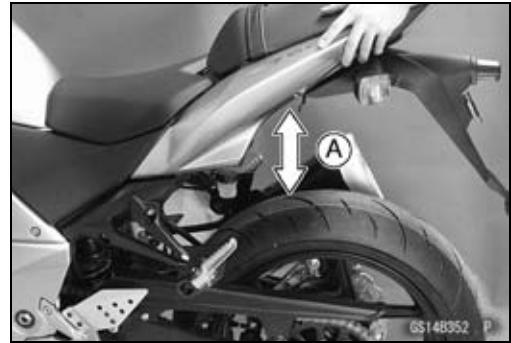
- Pump the forks down and up [A] 4 or 5 times, and inspect the smooth stroke.
- ★ If the forks do not smoothly or noise is found, inspect the fork oil level or fork clamps (see Front Fork Oil Change in the Suspension chapter).



## 2-42 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Pump the seat down and up [A] 4 or 5 times, and inspect the smooth stroke.
- ★ If the shock absorber does not smoothly stroke or noise is found, inspect the oil leak (see Rear Shock Absorber Oil Leak Inspection).



#### **Front Fork Oil Leak Inspection**

- Visually inspect the front forks [A] for oil leakage.
- ★ Replace or repair any defective parts, if necessary.



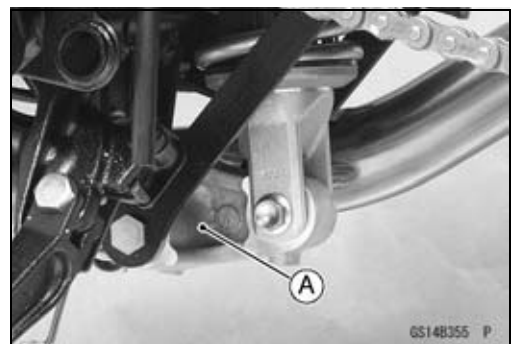
#### **Rear Shock Absorber Oil Leak Inspection**

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



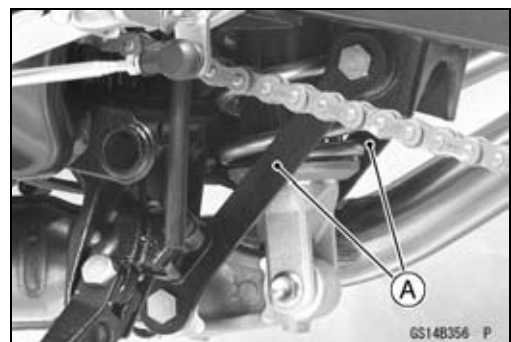
#### **Rocker Arm Operation Inspection**

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



#### **Tie-Rod Operation Inspection**

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



## Periodic Maintenance Procedures

### Steering System

#### Steering Play Inspection

- Raise the front wheel off the ground with the jack.

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

**Jack Attachment: 57001-1608**

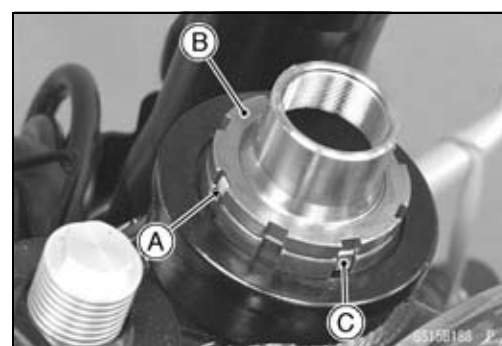
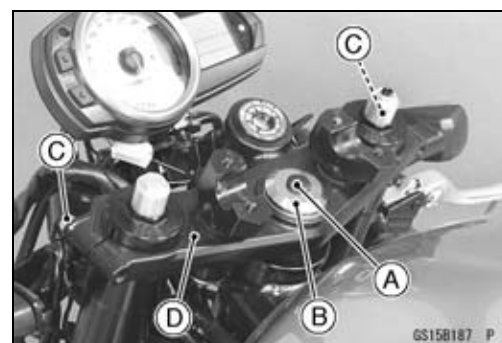
- With the front wheel pointing straight ahead, alternately tap each end of the handlebar. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.
- ★ If the wheel binds or catches before the stop, the steering is too tight.
- Feel for steering looseness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

#### NOTE

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

#### Steering Play Adjustment

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Handlebar (see Handlebar Removal in the Steering chapter)
  - Steering Stem Head Bolt Plug [A]
  - Steering Stem Head Bolt [B]
  - Upper Front Fork Clamp Bolts [C] (Loosen)
  - Upper Fairing Bracket Bolts (see Upper Fairing Bracket Removal in the Frame chapter)
  - Stem Head [D]
- Bend the claws [A] of the claw washer straighten.
- Remove the steering stem locknut [B] and claw washer [C].



## 2-44 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

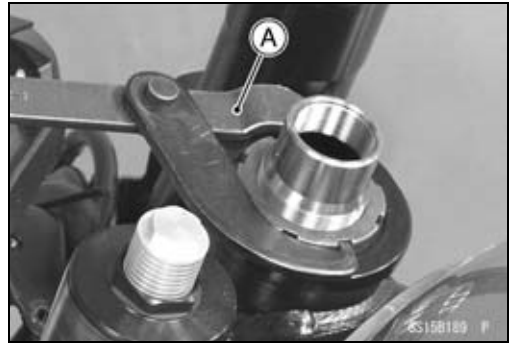
- Adjust the steering.

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

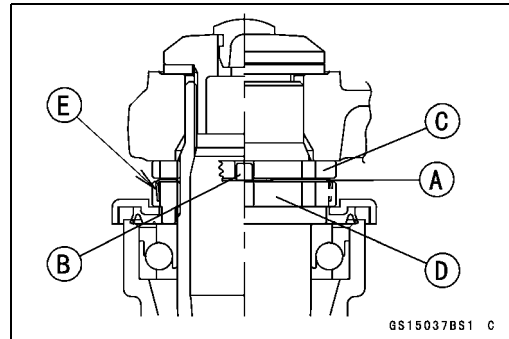
- ★ If the steering is too tight, loosen the stem nut a fraction of a turn.
- ★ If the steering is too loose, tighten the stem nut a fraction of a turn.

#### 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].
- Install the stem head.
- Tighten:



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

**Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**

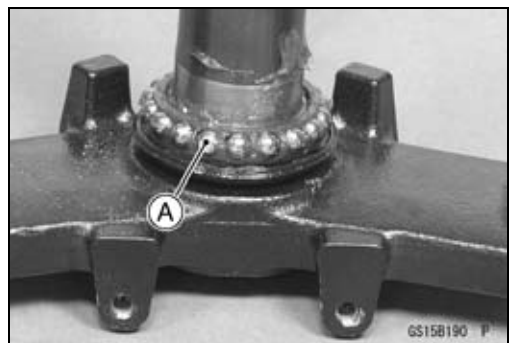
#### NOTE

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

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

### Steering Stem Bearing Lubrication

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



## Periodic Maintenance Procedures

### Electrical System

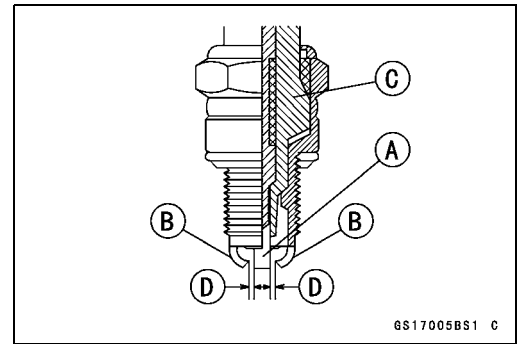
#### **Spark Plug Condition Inspection**

- Remove the spark plugs (see Spark Plug Replacement), and visually inspect.
- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high-flash point solvent and a wire brush or other suitable tool.
- ★ If the spark plug center electrode [A] and/or side electrode [B] are corrected or damaged, or if the insulator [C] is cracked, replace the spark plug.
- 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.)**

- Use the standard spark plug or its equivalent.

**Spark Plug:              NGK CR9EK**



## 2-46 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Lights and Switches Operation Inspection

##### First Step

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

City Lights [A]	go on
Taillight [B]	goes on
License Plate Light [C]	goes on
Meter Panel LCD [D]	goes on
Neutral Indicator Light (LED) [E]	goes on
Oil Pressure Warning Indicator Symbol and Light (LED) [F]	flash
ABS Indicator Light (LED) [G] (ABS Equipped Models)	goes on

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

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

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

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

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

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

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

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

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

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

Harness (see Wiring Inspection in the Electrical System chapter)

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

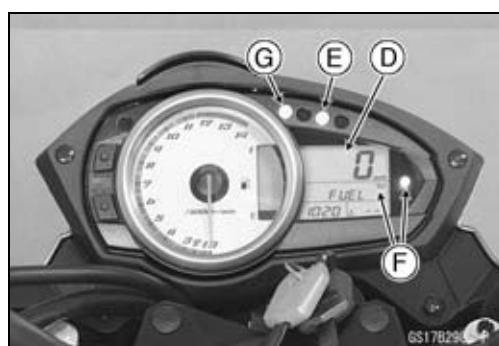
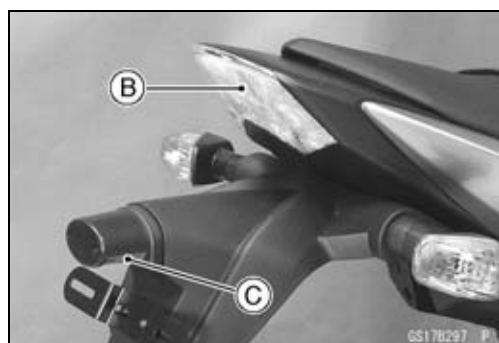
- Turn off the ignition switch.
  - The all lights should go off.
- ★ If the light does not go off, replace the ignition switch.

##### Second Step

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

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

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



## Periodic Maintenance Procedures

### Third Step

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

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

Turn Signal Light Bulb (see Turn Signal Light Bulb Replacement in the Electrical System chapter)

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

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

Turn Signal Switch (see Switch Inspection in the Electrical System chapter)

Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)

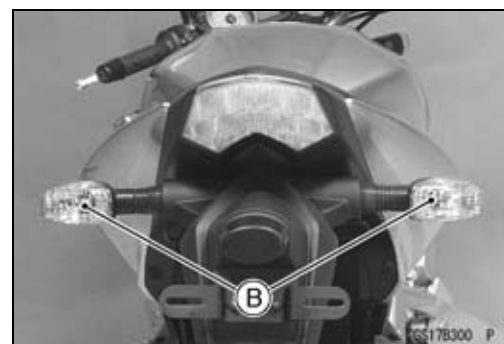
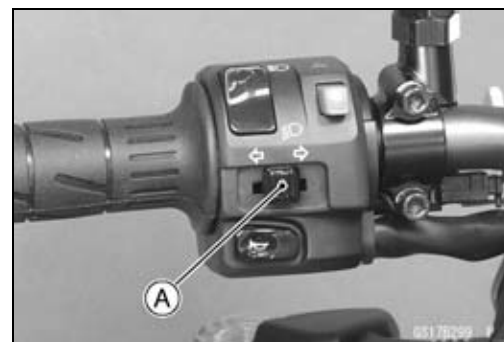
Harness (see Wiring Inspection in the Electrical System chapter)

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

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

Turn Signal Switch (see Switch Inspection in the Electrical System chapter)

Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)



### Fourth Step

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

★ If the low beam headlight does not go on, inspect or replace the following item.

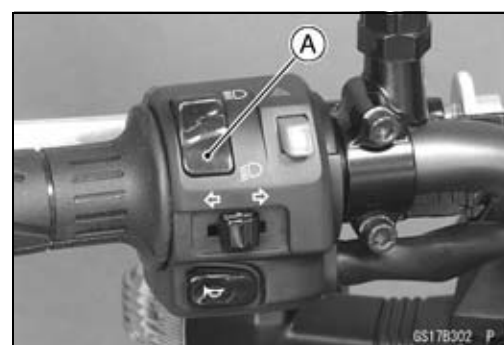
Headlight Low Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)

Headlight Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

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

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

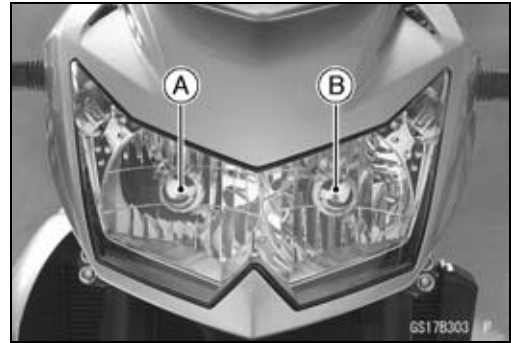
Harness (see Wiring Inspection in the Electrical System chapter)



## 2-48 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

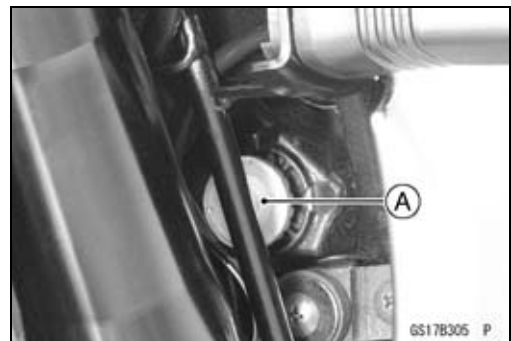


#### Headlight Aiming Inspection

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

#### Headlight Beam Horizontal Adjustment

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



#### Headlight Beam Vertical Adjustment

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



#### NOTE

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



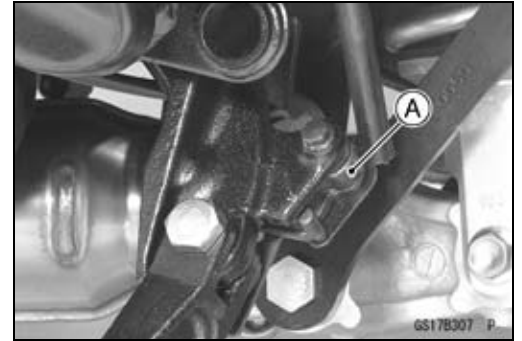
## Periodic Maintenance Procedures

### Sidestand Switch Operation Inspection

- Inspect the sidestand switch [A] operation accordance to the following table.

#### Sidestand Switch Operation

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



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

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

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

Ignition Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

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

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

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

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

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

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

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

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

Harness (see Wiring Inspection in the Electrical System chapter)

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

## 2-50 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Engine Stop Switch Operation Inspection

##### First Step

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



##### Second Step

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



#### Others

##### Chassis Parts Lubrication

- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

##### NOTE

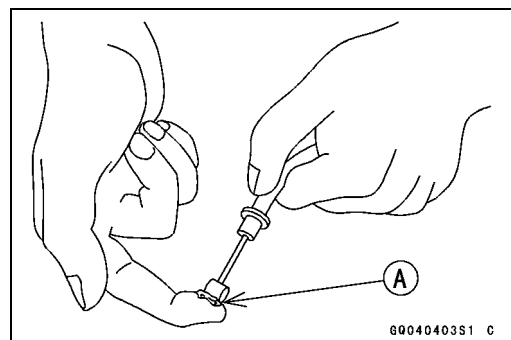
○ *Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

##### Pivots: Lubricate with Grease.

Brake Lever  
Brake Pedal  
Clutch Lever  
Rear Brake Joint Pin  
Sidestand

##### Points: Lubricate with Grease.

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

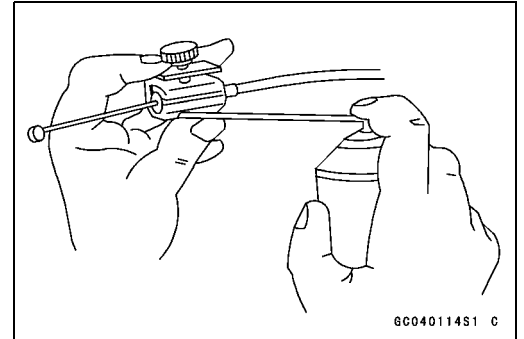


## Periodic Maintenance Procedures

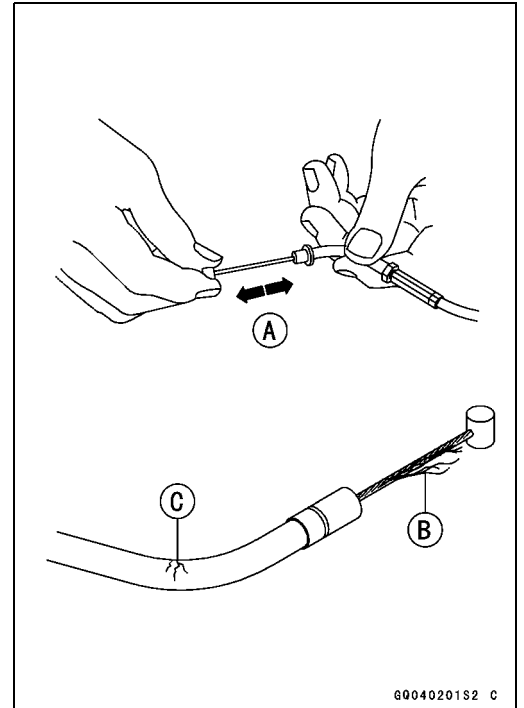
### Cables: Lubricate with Rust Inhibitor.

Clutch Cable  
Throttle Cables

- Lubricate the cables by seeping the oil between the cable and housing.
- The cable may be lubricated by using a commercially available pressure cable lubricator with an aerosol cable lubricant.



- With the cable disconnected at both ends, the 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.



## 2-52 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

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

#### **NOTE**

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

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

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

Engine:

- Clutch Lever Pivot Bolt Locknut
- Engine Mounting Bolts and Nuts
- Exhaust Pipe Manifold Holder Nuts
- Muffler Body Clamp Bolt
- Muffler Body Mounting Bolt and Nut
- Radiator Upper and Lower Bolts
- Subframe Bolts

Wheels:

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

Brakes:

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

Suspension:

- Front Fork Clamp Bolts
- Rear Shock Absorber Nuts
- Swingarm Pivot Shaft Locknut
- Swingarm Pivot Shaft Nut
- Tie-Rod Nuts
- Uni-Trak Rocker Arm Nut

Steering:

- Handlebar Holder Bolts
- Steering Stem Head Bolt

Others:

- Footpeg Bracket Bolts
- Front Fender Bolts
- Sidestand Bolt

## Periodic Maintenance Procedures

### Replacement Parts

#### Air Cleaner Element Replacement

##### NOTE

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

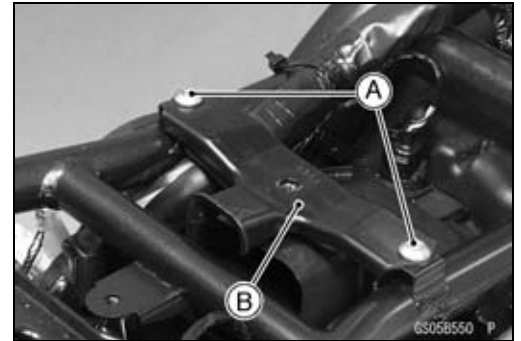
##### ⚠ WARNING

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

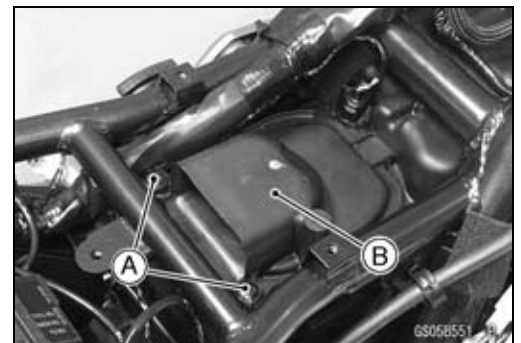
##### CAUTION

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

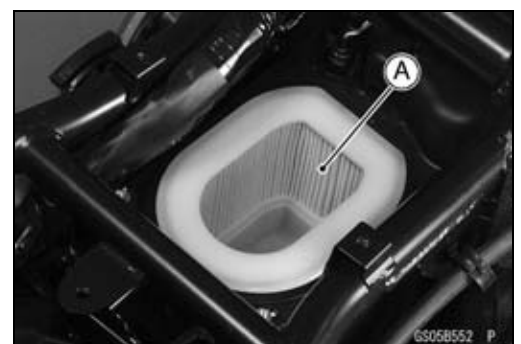
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Bolts [A]
  - Fuel Tank Bracket [B]



- Remove the air cleaner duct screws [A].
- Remove the air cleaner duct [B] backward.



- Discard the air cleaner element [A].

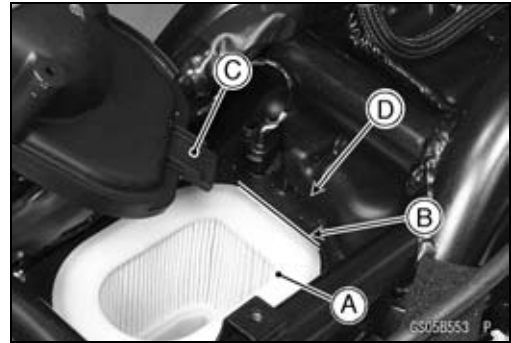


## 2-54 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Install a new element [A] so that flat side [B] faces forward.
- Fit the tongue [C] of the air cleaner duct into the slot [D] of the air cleaner housing.
- Tighten:

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



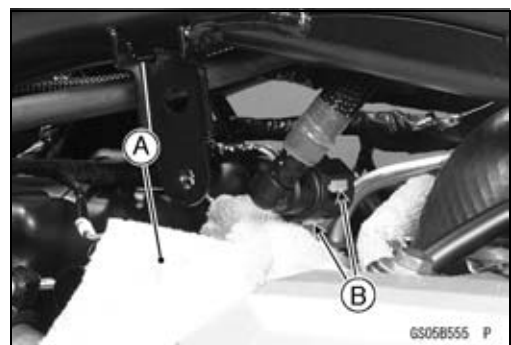
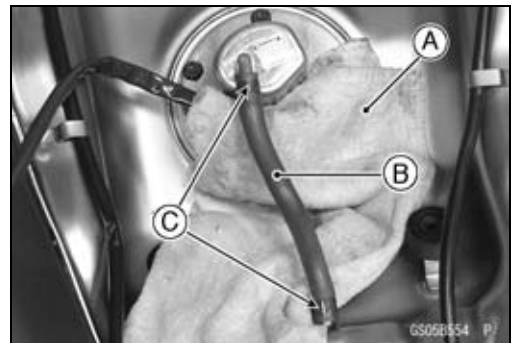
### Fuel Hose Replacement

#### **⚠ WARNING**

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

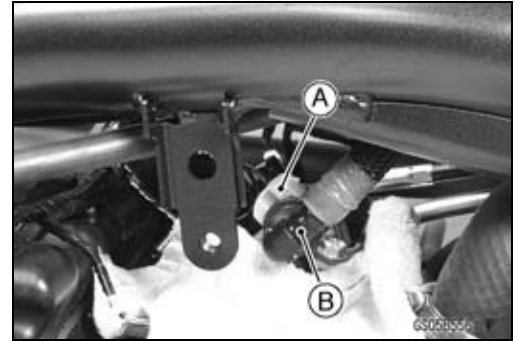
**When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.**

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- 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.
- Be sure to place a piece of cloth [A] around the fuel inlet hose [B].
- Remove:
  - Clamps [C]
  - Fuel Inlet Hose
- Be sure to place a piece of cloth [A] around the fuel outlet hose joint.
- Push the joint lock claws [B].

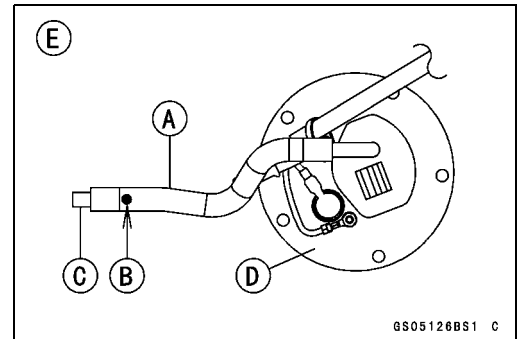


## Periodic Maintenance Procedures

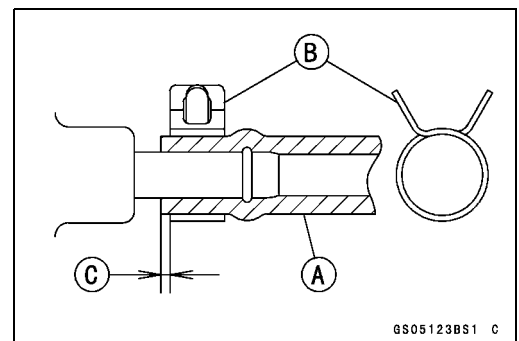
- Pull the joint lock [A] as shown in the figure.
- Pull the fuel outlet hose joint [B] out of the delivery pipe.



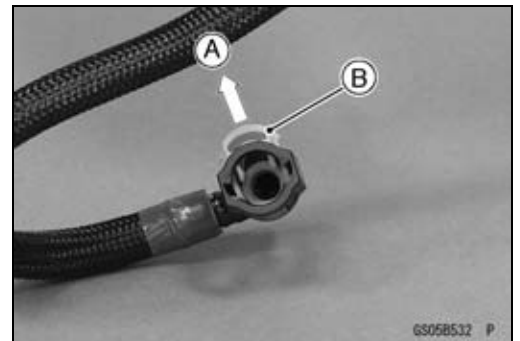
- Install a new fuel inlet hose [A] so that the white mark side [B] faces outlet pipe [C] of the fuel tank.  
Fuel Pump [D]  
Bottom View [E]



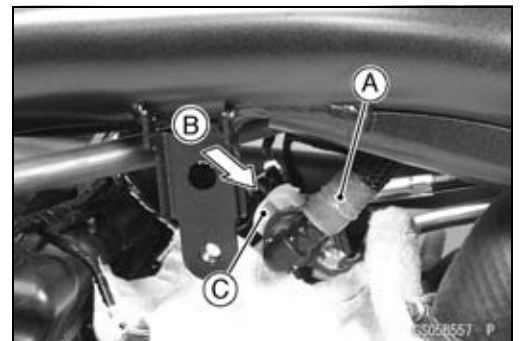
- Fix the both ends of the fuel inlet hose [A] with the clamps [B] as shown in the figure.  
1 ~ 2 mm (0.039 ~ 0.079 in.) [C]



- Replace the fuel outlet hose with a new one.
- Pull [A] the joint lock [B] fully as shown in the figure.



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



## 2-56 PERIODIC MAINTENANCE

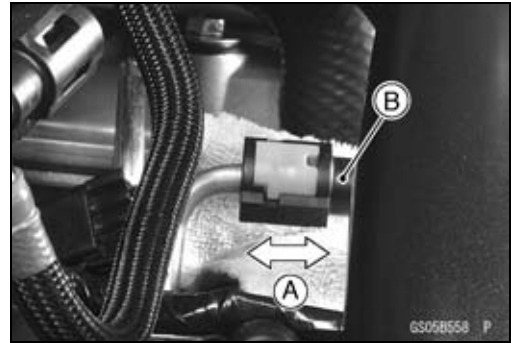
### Periodic Maintenance Procedures

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

#### **⚠ WARNING**

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

- ★ If it comes off, reinstall the hose joint.
- Run the fuel outlet hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
- Start the engine and check the fuel hose for leaks.

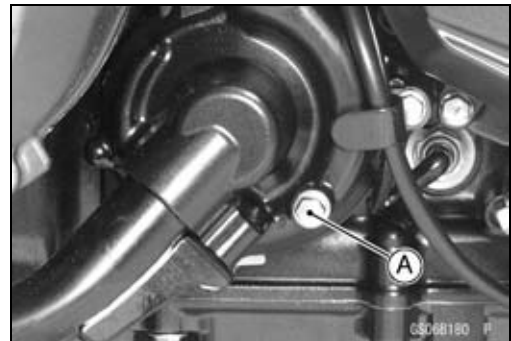


### Coolant Change

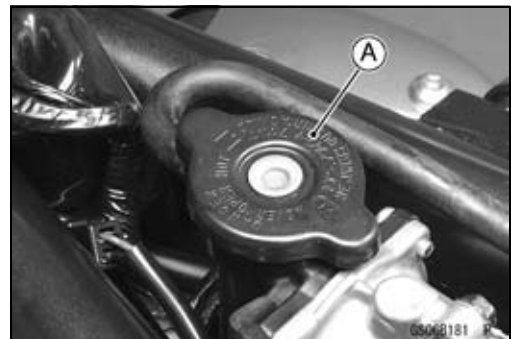
#### **⚠ WARNING**

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

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



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





## Periodic Maintenance Procedures

- Remove:
  - Right Seat Cover (see Seat Cover Removal in the Frame chapter)
  - Hose [A]
  - Reserve Tank Bolts [B]
- Turn over the reserve tank, remove the cap, and pour the coolant into a suitable container.
- Install the reserve tank.
- Tighten:
  - Torque - Reserve Tank Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Tighten the drain bolt with the gasket.
- Replace the drain bolt gasket with a new one.

**Torque - Coolant Drain Bolt (Water Pump): 11 N·m (1.1 kgf·m, 97 in·lb)**

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

### CAUTION

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

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

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

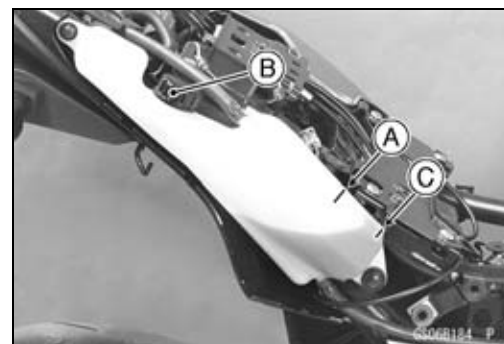
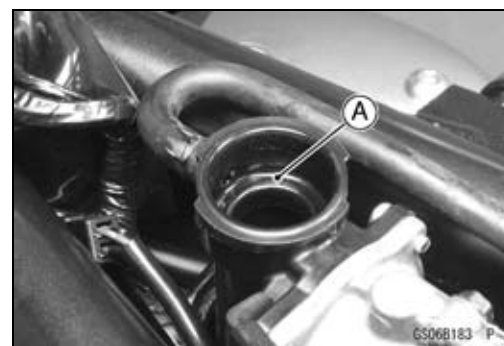
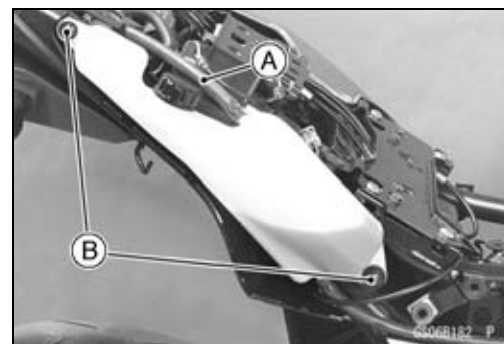
- Fill the radiator up to the filler neck [A] with coolant.

### NOTE

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

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

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



### CAUTION

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

## 2-58 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

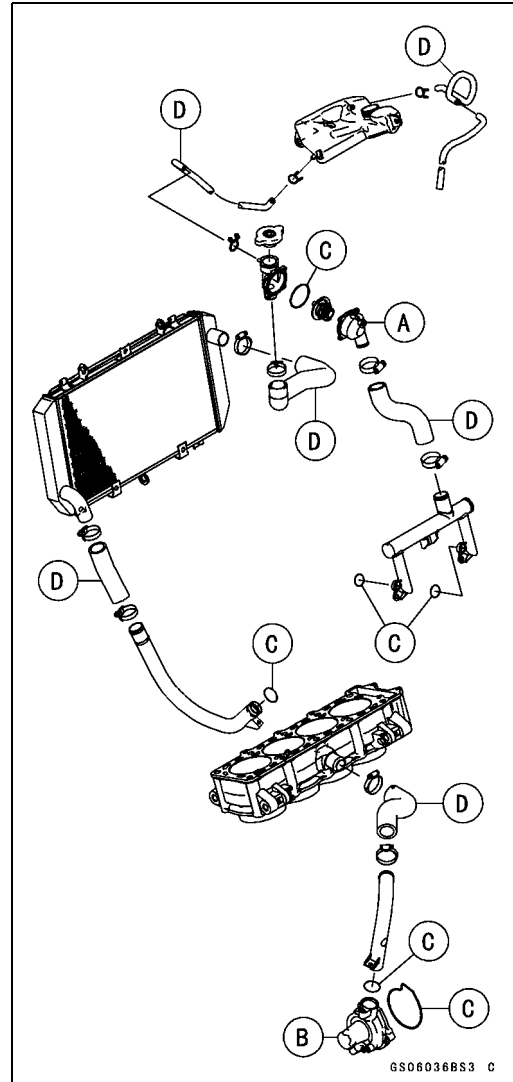
#### ***Radiator Hose and O-ring Replacement***

- Drain the coolant (see Coolant Change).
- Remove:
  - Thermostat Housing [A] (see Thermostat Removal in the Cooling System chapter)
  - Water Pump Cover [B] (see Water Pump Removal in the Cooling System chapter)
  - O-rings [C]
  - Hoses [D]

- Apply grease to the new O-rings and install them.
- Install the new hoses and tighten the clamps securely.

**Torque - Radiator (Water) Hose Clamp Screws: 3.0 N·m  
(0.31 kgf·m, 27 in·lb)**

- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.

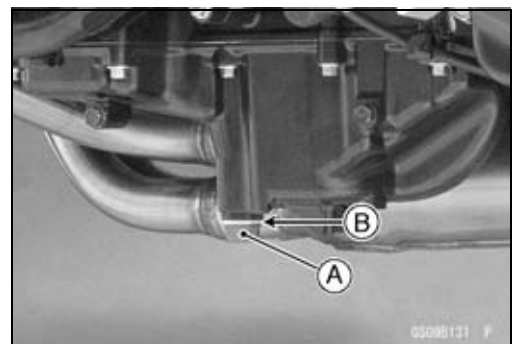


#### ***Engine Oil Change***

- Situate the motorcycle so that it is vertical after warming up the engine.
- Remove the engine oil drain bolt [A] to drain the oil.
- The oil in the oil filter can be drained by removing the filter (see Oil Filter Replacement).
- Replace the drain bolt gasket [B] with a new one.
- Tighten the drain bolt.

**Torque - Engine Oil Drain Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)**

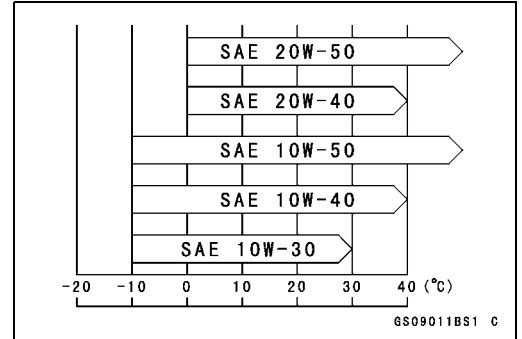
- Pour in the specified type and amount of oil.



## Periodic Maintenance Procedures

### Recommended Engine Oil

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



### NOTE

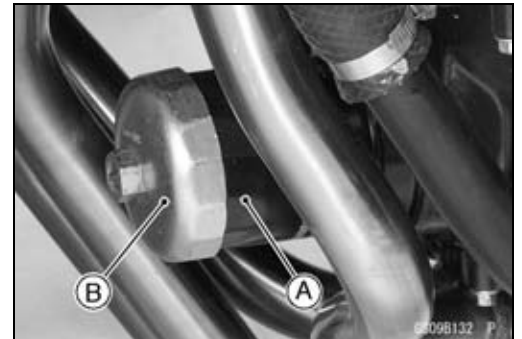
○Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.

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

### Oil Filter Replacement

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

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



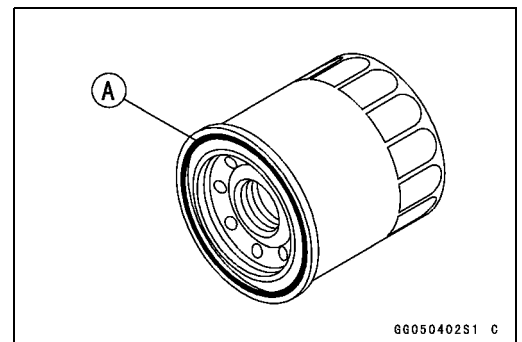
- Replace the filter with a new one.
- Apply grease to the gasket [A] before installation.
- Tighten the filter with the oil filter wrench.

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

### NOTE

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

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



## 2-60 PERIODIC MAINTENANCE

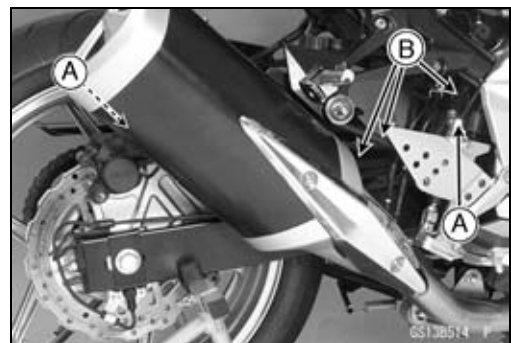
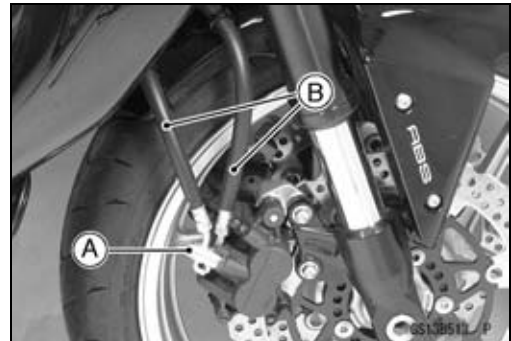
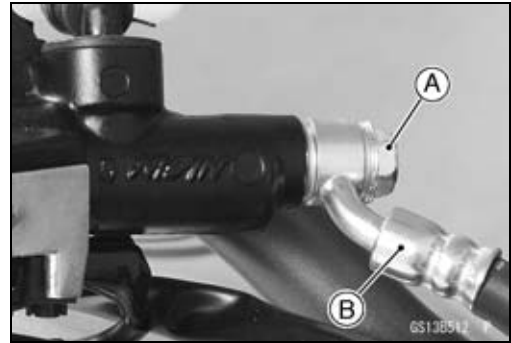
### Periodic Maintenance Procedures

#### Brake Hose and Pipe Replacement

##### CAUTION

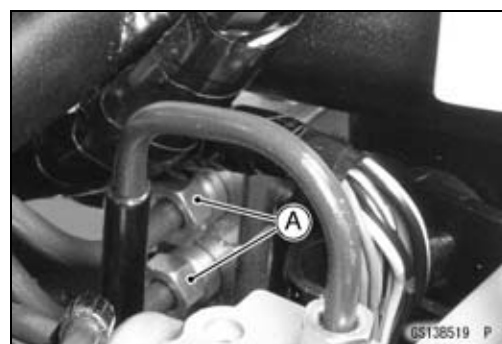
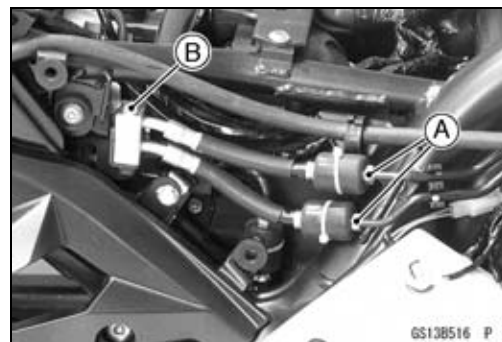
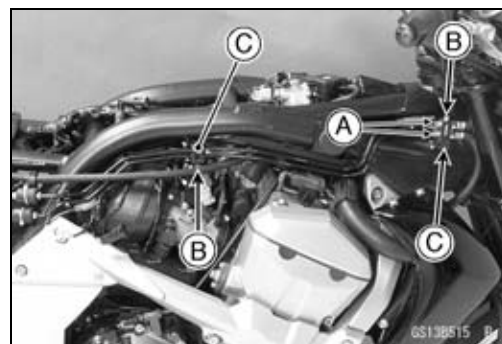
**Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.**

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



## Periodic Maintenance Procedures

- For ABS equipped models; note the following.
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Rear Fender (see Flap and Rear Fender Removal in the Frame chapter)
  - ABS Hydraulic Unit (see ABS Hydraulic Unit Removal in the Brakes chapter)
  - Brake Pipe Joint Nuts [A]
  - Bolts [B]
  - Brackets [C]
- There are washers on each side of the brake hose fitting. Replace them with new ones when installing.
- Tighten:
  - Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Brake Pipe Joint Nuts (ABS Equipped Models): 18 N·m (1.8 kgf·m, 13 ft·lb)**
- When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Fill the brake line after installing the brake hose (see Brake Fluid Change).



## 2-62 PERIODIC MAINTENANCE

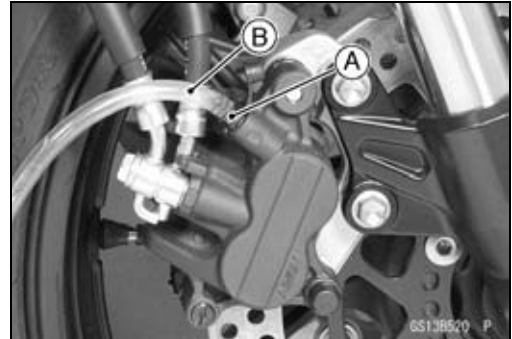
### Periodic Maintenance Procedures

#### Brake Fluid Change

##### NOTE

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

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

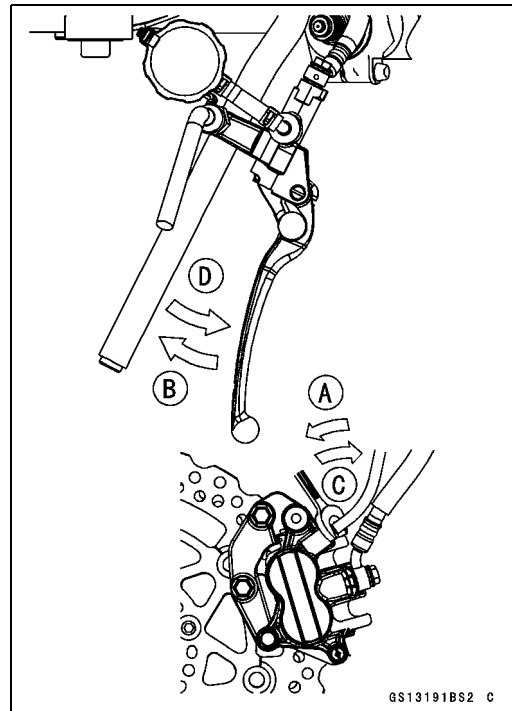


- Change the brake fluid.
- Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
  1. Open the bleed valve [A].
  2. Apply the brake and hold it [B].
  3. Close the bleed valve [C].
  4. Release the brake [D].

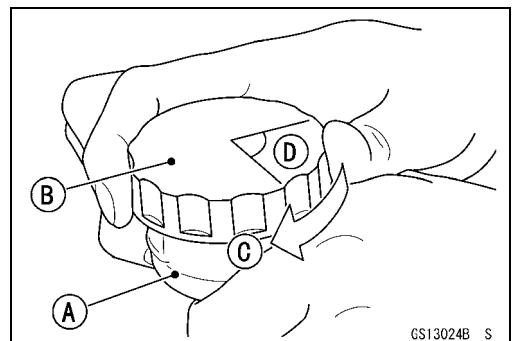
##### NOTE

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

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



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



- Tighten the bleed valve, and install the rubber cap.
- Torque - Bleed Valves: 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.

## Periodic Maintenance Procedures

### Master Cylinder Rubber Parts Replacement

#### Front Master Cylinder Disassembly

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

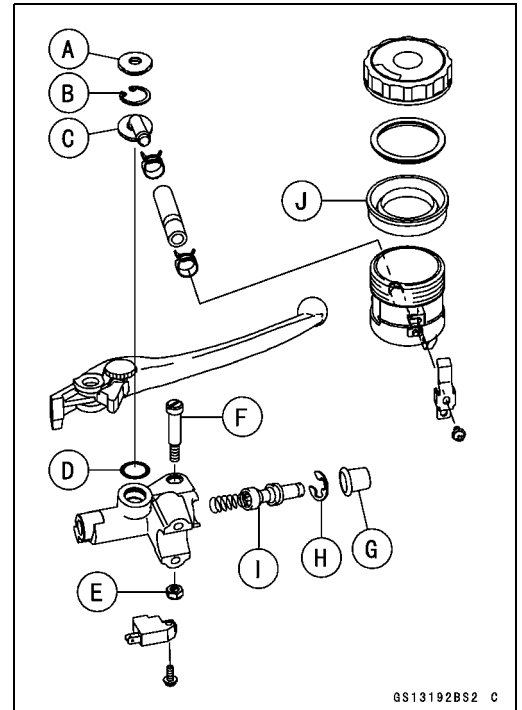
**Special Tool - Inside Circlip Pliers: 57001-143**

- Unscrew the locknut [E] and pivot bolt [F], and remove the brake lever.
- Remove the dust cover [G] and circlip [H].
- Pull out the piston assy [I].

#### CAUTION

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

- Replace:
  - Seal Cover [A]
  - Circlip [B]
  - O-ring [D]
  - Circlip [H]
  - Piston Assy [I]
  - Diaphragm [J]



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#### Rear Master Cylinder Disassembly

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

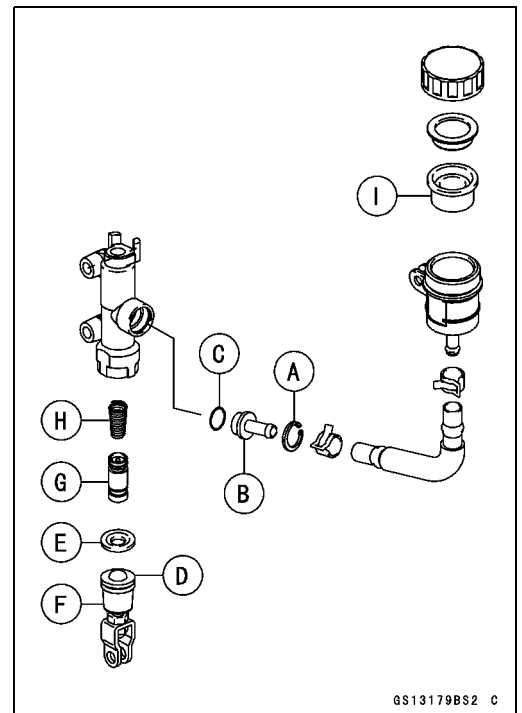
**Special Tool - Inside Circlip Pliers: 57001-143**

- Slide the dust cover [D] out of place, and remove the circlip [E].
- Pull out the push rod assy [F].
- Take off the piston assy [G] and return spring [H].

#### CAUTION

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

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



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## 2-64 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Master Cylinder Assembly

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

#### CAUTION

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

- Apply brake fluid to the new parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Apply silicone grease to the brake lever pivot bolt.
- Tighten the brake lever pivot bolt and the locknut.

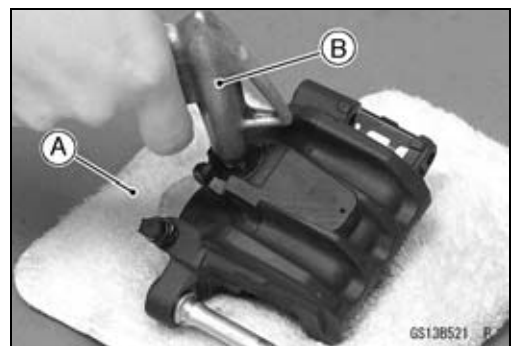
**Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 9 in·lb)**

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

#### Caliper Rubber Parts Replacement

##### Front Caliper Disassembly

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



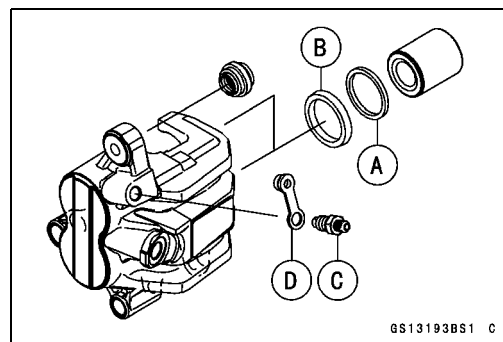


## Periodic Maintenance Procedures

### **⚠ WARNING**

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

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



### **NOTE**

- If compressed air is not available, 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 pad spring and pads (see Front Brake Pad Removal in the Brakes chapter).
- Pump the brake lever until the pistons come out of the cylinders, and then disassemble the caliper.

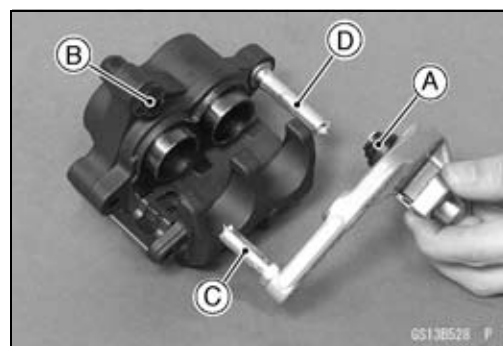
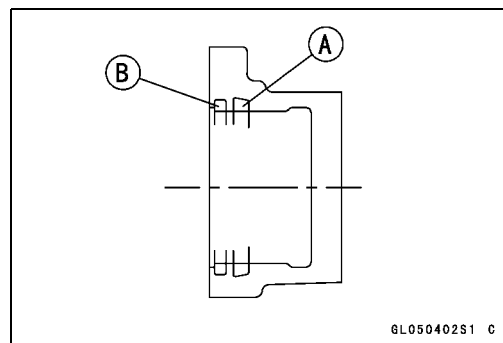
### Front Caliper Assembly

- Clean the caliper parts except for the pads.

### **CAUTION**

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

- Install the bleed valve and rubber cap.
- Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Apply brake fluid to the cylinder bore.
- Replace the fluid seals [A] with new ones.
- Apply silicone grease to the fluid seals, and install them into the cylinders by hand.
- Replace the dust seals [B] with new ones if they are damaged.
- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
- Check the dust cover [A] and the friction boot [B] replace them with new ones if they are damaged.
- Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shaft [C] and pin bolt [D] (PBC is a special high temperature, water-resistance grease).
- Install the caliper holder.
- Install the pads (see Front Brake Pad Installation in the Brakes chapter).
- Wire up any spilled brake fluid on the caliper with wet cloth.



## 2-66 PERIODIC MAINTENANCE

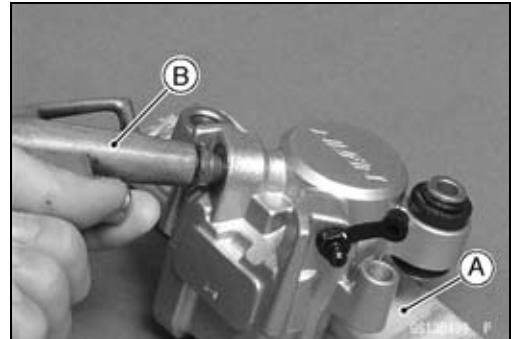
### Periodic Maintenance Procedures

#### Rear Caliper Disassembly

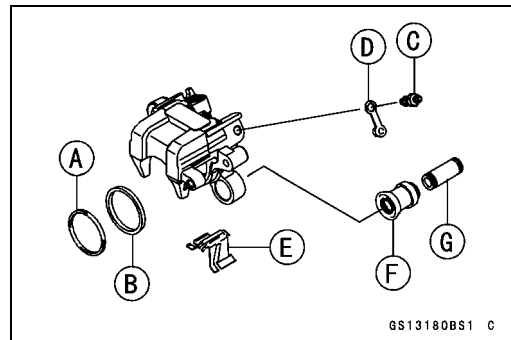
- Remove:
  - Rear Caliper (see Rear Caliper Removal in the Brakes chapter)
  - Brake Pads (see Rear Brake Pad Removal in the Brakes chapter)
- Using compressed air, remove the piston.
  - Cover the piston area with a wooden board [A].
  - Blow compressed air [B] into the hole for the banjo bolt to remove the piston.

#### **⚠ WARNING**

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



- Remove:
  - Dust Seal [A] and Fluid Seal [B]
  - Bleed Valve [C] and Rubber Cap [D]
  - Pad Spring [E]
  - Rubber Boot [F]
  - Sleeve [G]



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#### **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 (see Rear Brake Pad Removal in the Brakes chapter).
- Pump the brake pedal to remove the caliper piston.

#### Rear Caliper Assembly

- Clean the caliper parts except for the pads.

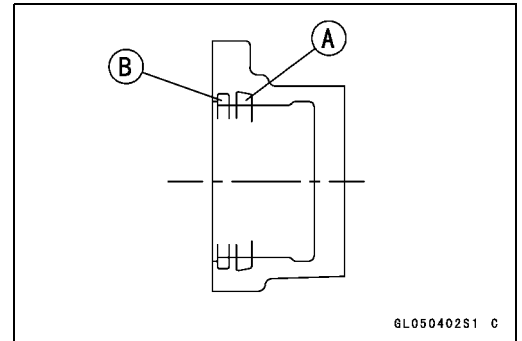
#### **CAUTION**

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

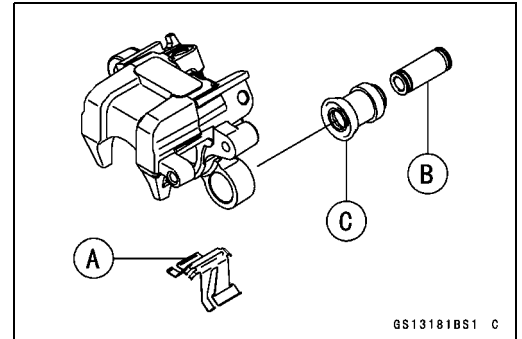
- Install the bleed valve and rubber cap.
  - Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

## Periodic Maintenance Procedures

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



- Install the pad spring [A].
- Apply silicone grease to the sleeve [B].
- Install the rubber boot [C] and sleeve.



- Install the pads (see Rear Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.

### Spark Plug Replacement

- Remove the stick coils (see Stick Coil Removal in the Electrical System chapter).
- Remove the spark plugs using the 16 mm (0.63 in.) plug wrench [A] vertically.



- Replace the spark plug with a new one.

#### Standard Spark Plug

Type: NGK CR9EK

- Insert the new spark plug in the plug hole, and finger-tighten it first.
- Using the plug wrench [A] vertically, tighten the plug.



### CAUTION

The insulator of the spark plug may break if when the wrench is inclined during tightening.

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

- Install the stick coils securely.
- Be sure the stick coils are installed by pulling up it lightly.



# Fuel System (DFI)

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## 3-2 FUEL SYSTEM (DFI)

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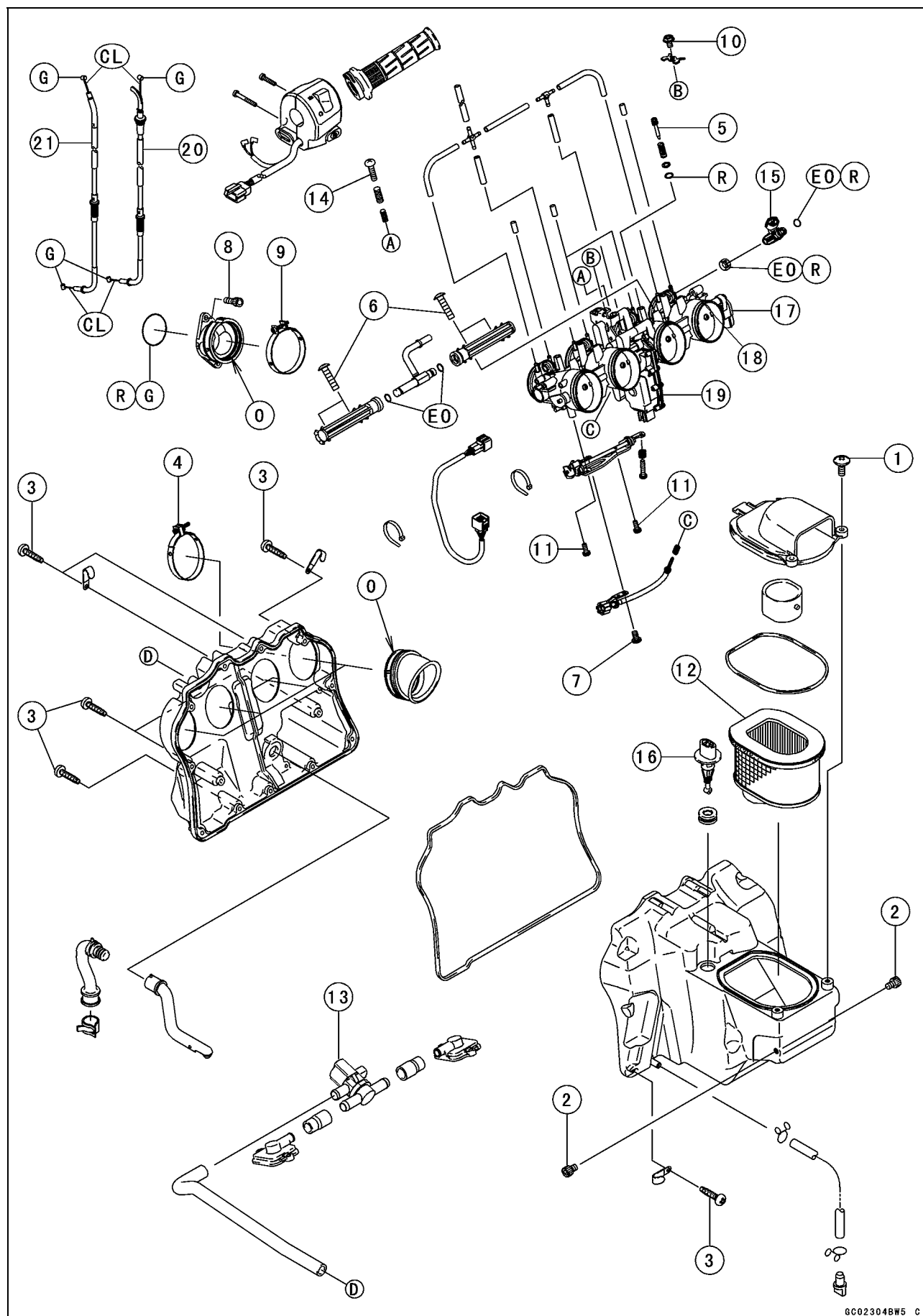
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## 3-4 FUEL SYSTEM (DFI)

### Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Cleaner Duct Screws	3.8	0.39	34 in·lb	
2	Air Cleaner Housing Mounting Bolts	9.8	1.0	87 in·lb	
3	Air Cleaner Housing Tapping Screws	1.2	0.12	11 in·lb	
4	Air Duct Clamp Bolts	2.0	0.20	18 in·lb	
5	Bypass Screws	0.2	0.02	1.8 in·lb	
6	Delivery Pipe Assy Mounting Screws	3.4	0.35	30 in·lb	
7	Idle Adjusting Cable Clamp Screw	3.4	0.35	30 in·lb	
8	Throttle Body Assy Holder Bolts	13	1.3	115 in·lb	
9	Throttle Body Assy Holder Clamp Bolts	2.0	0.20	18 in·lb	
10	Throttle Cable Plate Bolt	5.9	0.60	52 in·lb	
11	Throttle Link Holder Screws	2.0	0.20	18 in·lb	

12. Air Cleaner Element

13. Air Switching Valve

14. Center Adjusting Screw

15. Fuel Injectors

16. Inlet Air Temperature Sensor

17. Main Throttle Sensor

18. Subthrottle Sensor

19. Subthrottle Valve Actuator

20. Throttle Cable (Accelerator)

21. Throttle Cable (Decelerator)

CL: Apply cable lubricant.

EO: Apply engine oil.

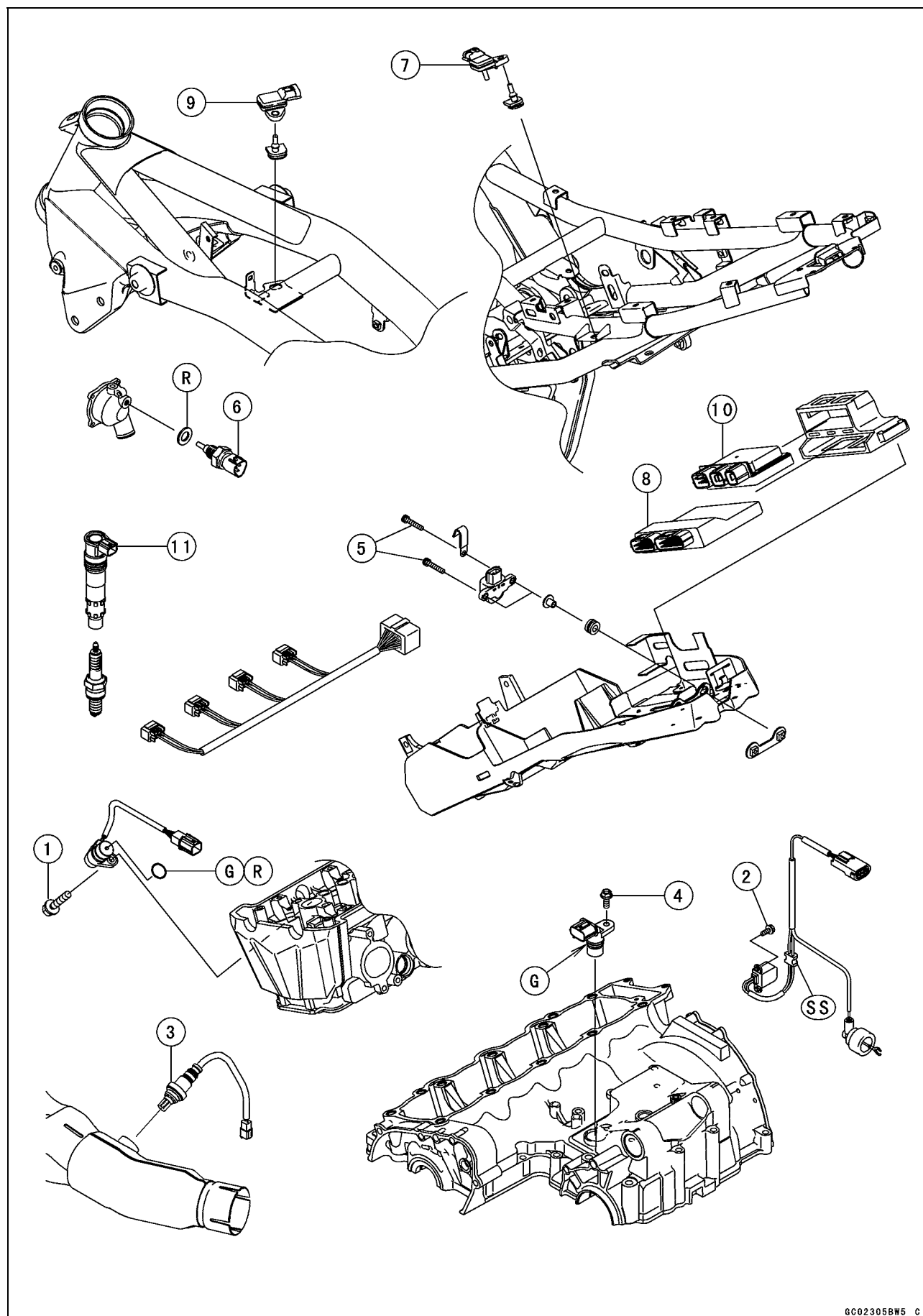
G: Apply grease.

O: Apply 2-stroke oil.

R: Replacement Parts

## 3-6 FUEL SYSTEM (DFI)

### Exploded View



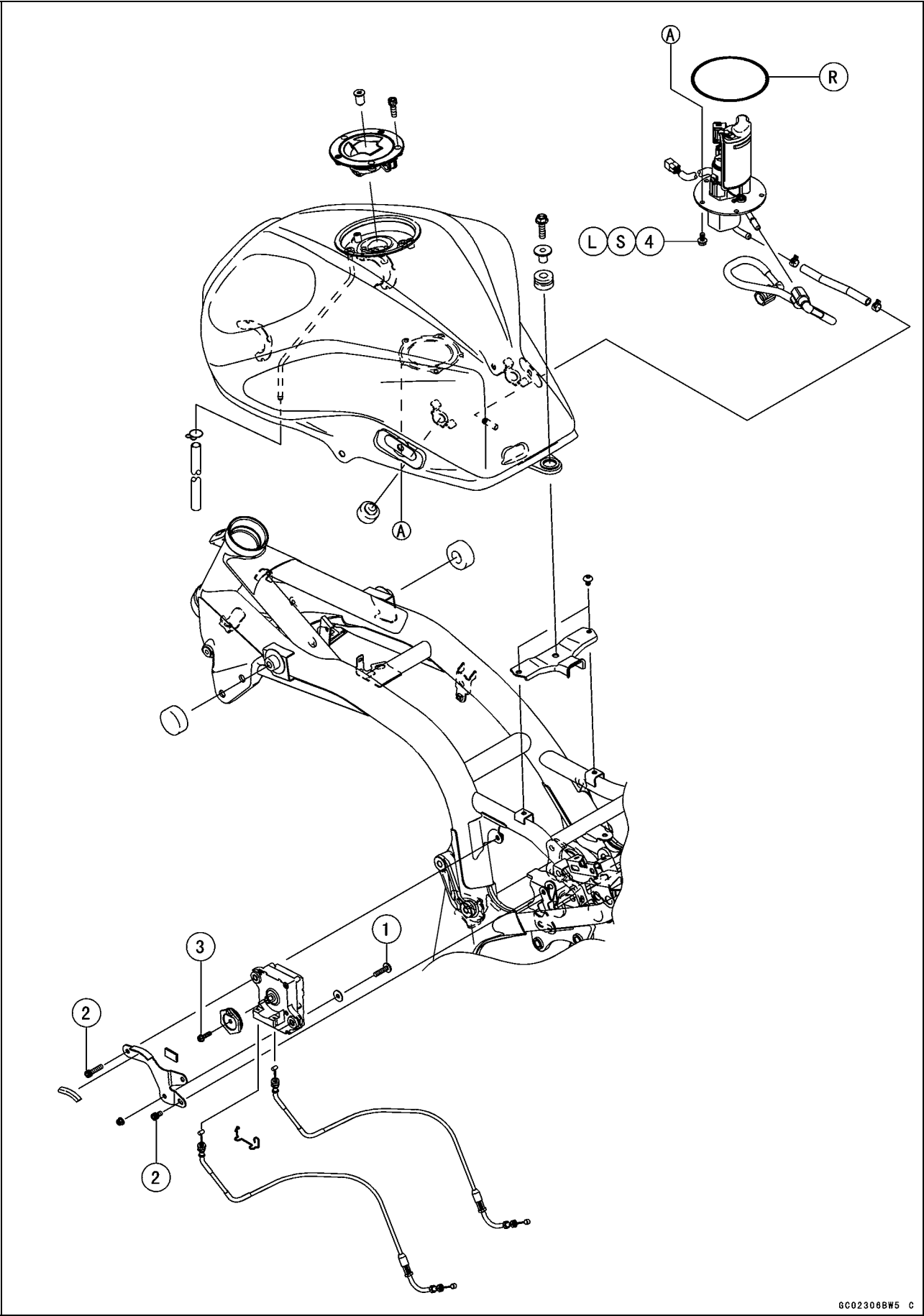
## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Camshaft Position Sensor Bolt	12	1.2	106 in·lb	
2	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
3	Oxygen Sensor (Equipped Models)	44.1	4.50	32.5	
4	Speed Sensor Bolt	12	1.2	106 in·lb	
5	Vehicle-down Sensor Bolts	6.0	0.61	53 in·lb	
6	Water Temperature Sensor	25	2.5	18	

- 7. Atmospheric Pressure Sensor
- 8. ECU
- 9. Inlet Air Pressure Sensor
- 10. Relay Box
- 11. Stick Coils
- G: Apply grease.
- R: Replacement Parts
- SS: Apply silicone sealant.

3-8 FUEL SYSTEM (DFI)

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Butterfly Valve Actuator Bracket Bolt	6.9	0.70	61 in·lb	
2	Exhaust Butterfly Valve Actuator Mounting Bolts	6.9	0.70	61 in·lb	
3	Exhaust Butterfly Valve Actuator Pulley Bolt	5.0	0.51	44 in·lb	
4	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S

L: Apply a non-permanent locking agent.

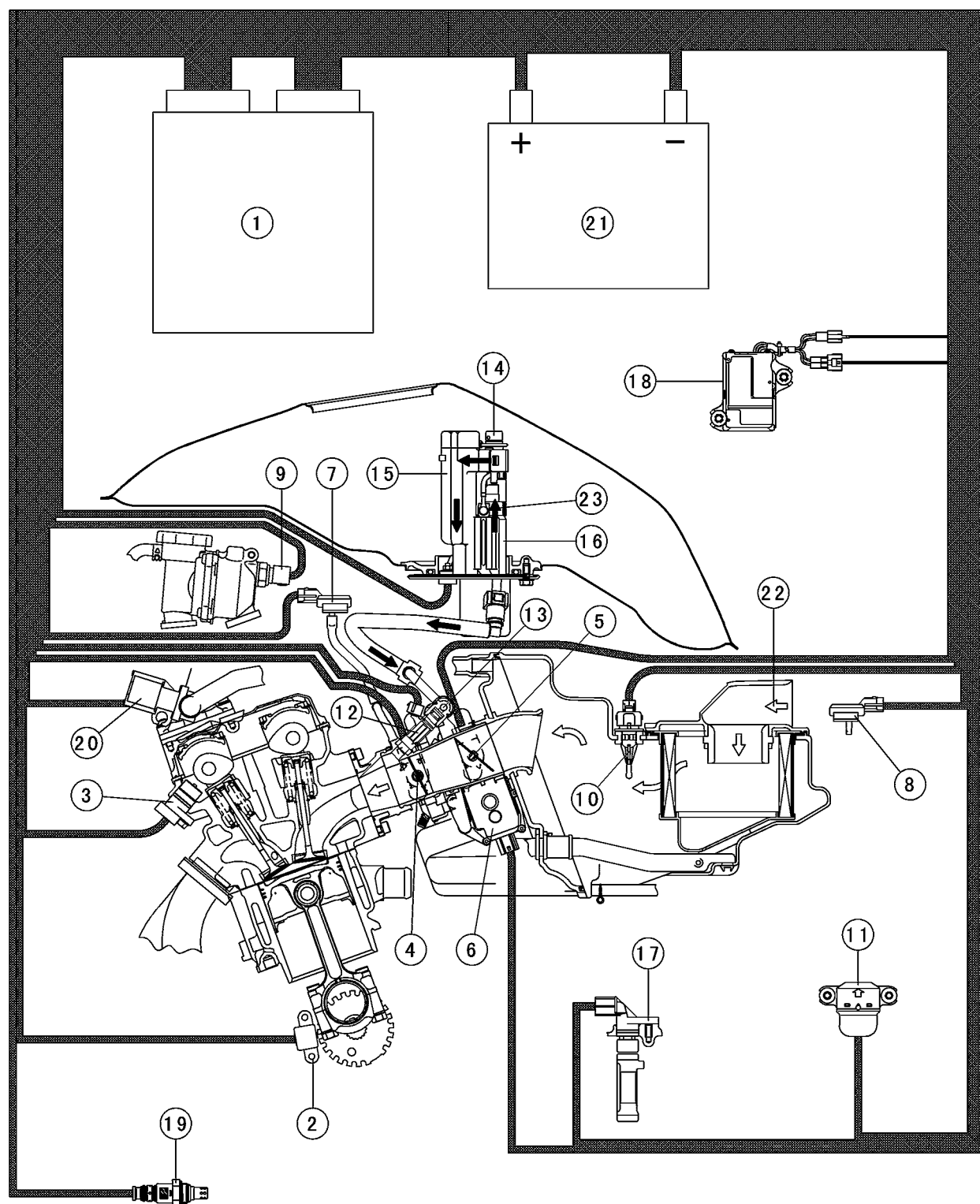
R: Replacement Parts

S: Follow the specified tightening sequence.

## 3-10 FUEL SYSTEM (DFI)

### DFI System

### DFI System



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**DFI System**

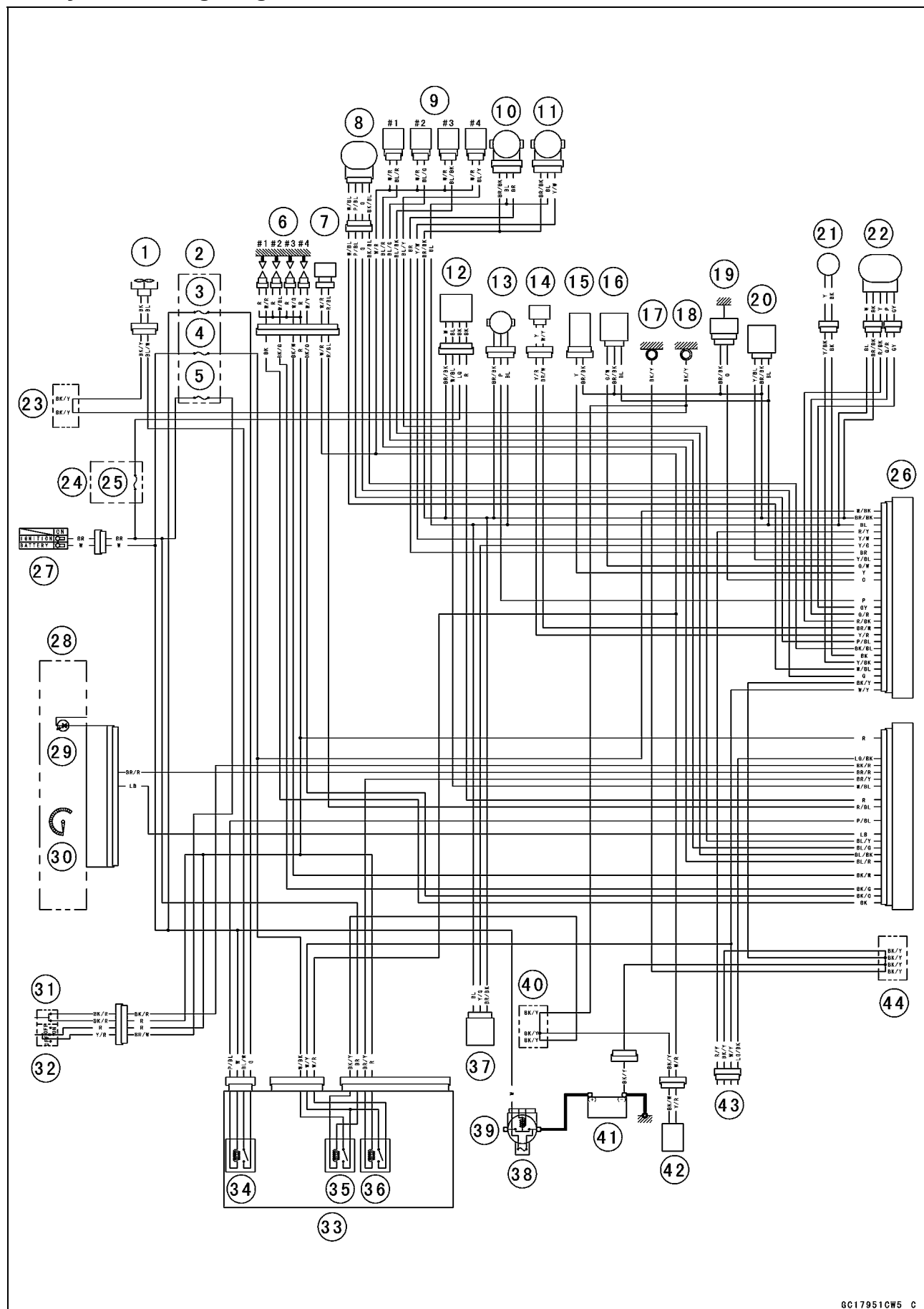
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1. ECU
2. Crankshaft Sensor
3. Camshaft Position Sensor
4. Main Throttle Sensor
5. Subthrottle Sensor
6. Subthrottle Valve Actuator
7. Inlet Air Pressure Sensor
8. Atmospheric Pressure Sensor
9. Water Temperature Sensor
10. Inlet Air Temperature Sensor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

# 3-12 FUEL SYSTEM (DFI)

## DFI System

### DFI System Wiring Diagram





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**DFI System**

---

**Part Names**

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

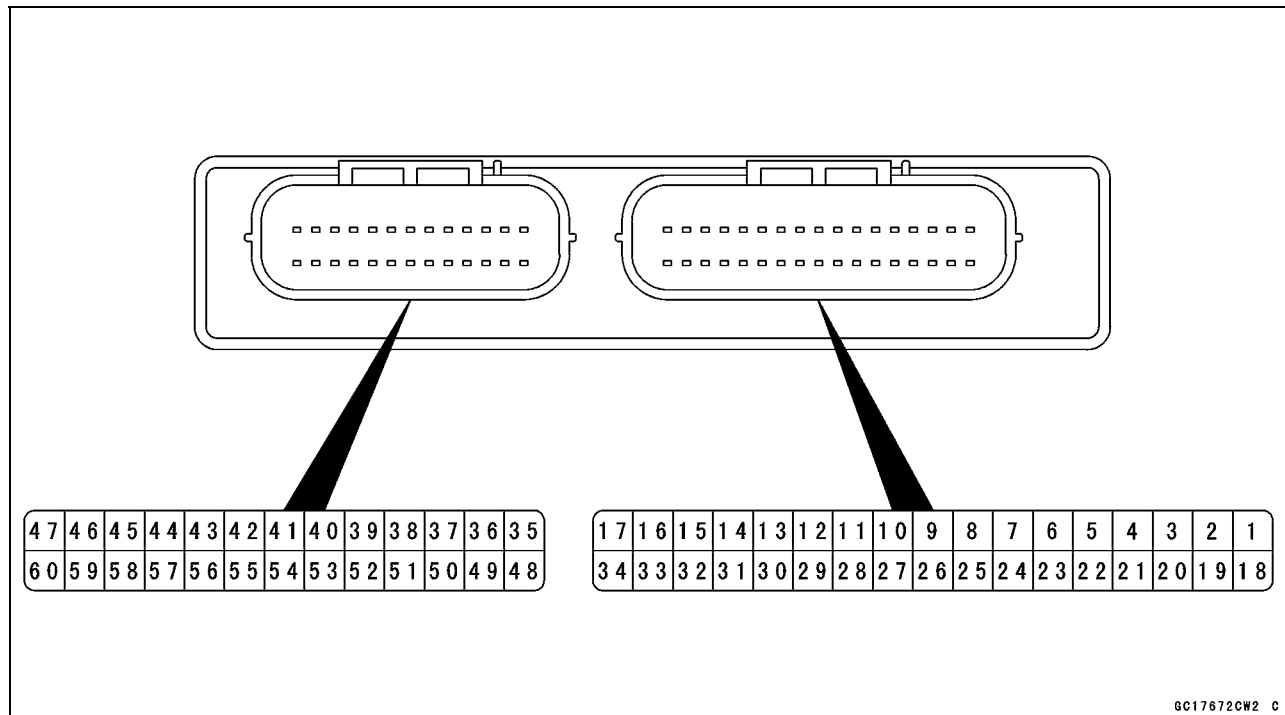
## ○Color Codes:

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

## 3-14 FUEL SYSTEM (DFI)

### DFI System

#### Terminal Numbers of ECU Connectors



#### Terminal Names

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

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**DFI System**

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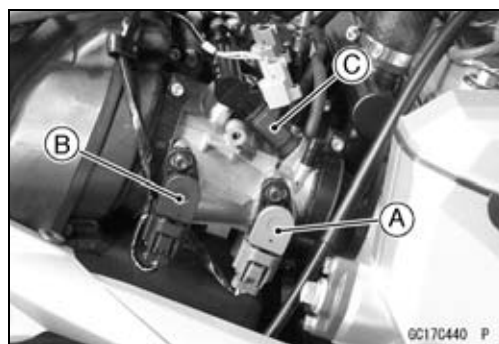
- 35. Engine Stop Switch: R
- 36. Starter Lockout Switch: R/G
- 37. Starter Button: BK/R
- 38. Fuel Pump Relay: BR/Y
- 39. Oxygen Sensor (Equipped Models): W/BL
- 40. Unused
- 41. Neutral Switch: LG
- 42. Radiator Fan Relay: P/BL
- 43. Injector #2: BL/G
- 44. Injector #1: BL/R
- 45. Stick Coil #3: BK/W
- 46. Stick Coil #2: BK/G
- 47. Stick Coil #1: BK
- 48. Sidestand Switch: G/BK
- 49. Ground: P
- 50. External Communication Line (Immobilizer System (Equipped Models)/KDS): LG/BK
- 51. Meter Unit (Tachometer): LB
- 52. Warning Indicator Light (LED) (FI/Immobilizer (Equipped Models)): BR/R
- 53. Unused
- 54. Oxygen Sensor Heater (Equipped Models): R
- 55. Air Switching Valve: R/BL
- 56. Injector #4: BL/Y
- 57. Injector #3: BL/BK
- 58. Ground for Fuel System: BK/Y
- 59. Ground for Ignition System: BK/Y
- 60. Stick Coil #4: BK/O

\*: KDS (Kawasaki Diagnostic System)

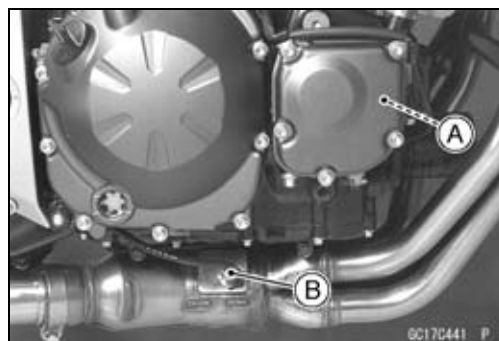
## 3-16 FUEL SYSTEM (DFI)

### DFI Parts Location

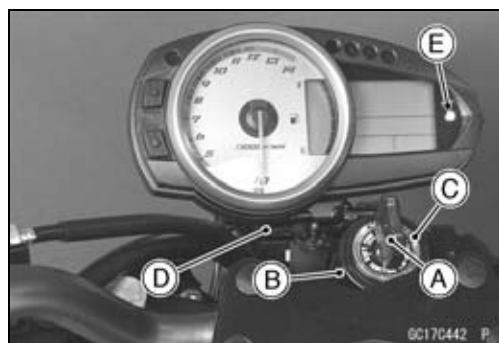
Main Throttle Sensor [A]  
Subthrottle Sensor [B]  
Fuel Injectors #1, #2, #3, #4 [C]



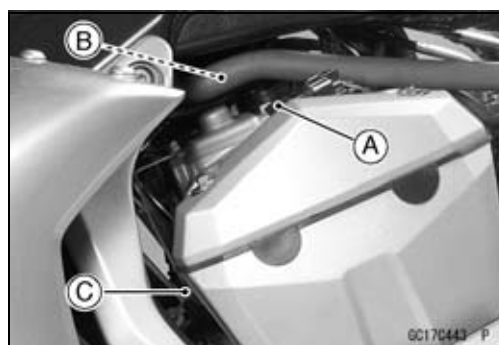
Crankshaft Sensor [A]  
Oxygen Sensor [B] (Equipped Models)



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



Stick Coils #1, #2, #3, #4 [A]  
Air Switching Valve [B]  
Camshaft Position Sensor [C]

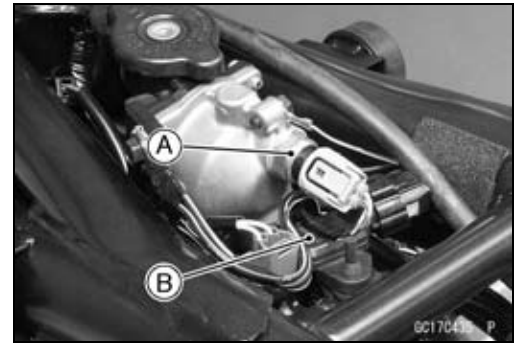


Subthrottle Valve Actuator [A]  
Speed Sensor [B]

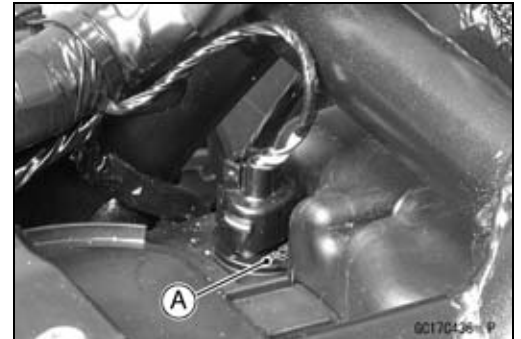


## DFI Parts Location

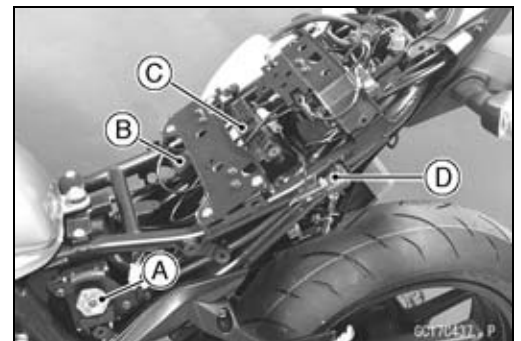
Water Temperature Sensor [A]  
Inlet Air Pressure Sensor [B]



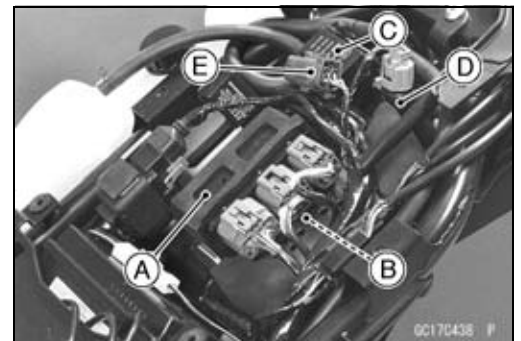
Inlet Air Temperature Sensor [A]



Exhaust Butterfly Valve Actuator [A]  
Fuse Box 1 (Oxygen Sensor Heater Fuse 10 A, (Equipped Models)) [B]  
Battery 12 V 8 Ah [C]  
Atmospheric Pressure Sensor [D]



Relay Box (ECU Main Relay, Radiator Fan Relay, Fuel Pump Relay) [A]  
ECU [B]  
Fuse Box 2 (ECU Fuse 10 A, Ignition Fuse 10 A, Radiator Fan Fuse 15 A) [C]  
Vehicle-down Sensor [D]  
Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector [E]



Fuel Pump [A]



### 3-18 FUEL SYSTEM (DFI)

#### Specifications

Item	Standard
<b>Digital Fuel Injection System</b>	
Idle Speed	1 100 ±50 r/min (rpm)
Throttle Body Assy:	
Type	Four oval type
Bore	φ32 mm (1.26 in.)
Throttle Body Vacuum	35.3 ±1.3 kPa (265 ±10 mmHg) at idle speed
Bypass Screws (Turn Out)	2 1/2 (for reference)
ECU:	
Make	DENSO
Type	Digital memory type, with built in IC igniter, sealed with resin
Usable Engine Speed	100 ~ 12 100 r/min (rpm)
Fuel Pressure (High Pressure Line)	294 kPa (3.0 kgf/cm <sup>2</sup> , 43 psi) with engine idling
Fuel Pump:	
Type	In-tank friction pump
Discharge	50 mL (1.7 US oz.) or more for 3 seconds
Fuel Injectors:	
Type	INP-288
Nozzle Type	Fine atomizing type with 8 holes
Resistance	About 11.7 ~ 12.3 Ω at 20°C (68°F)
Main Throttle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 0.985 ~ 1.015 V at idle throttle opening DC 4.18 ~ 4.38 V at full throttle opening (for reference)
Resistance	4 ~ 6 kΩ
Inlet Air Pressure Sensor/Atmospheric Pressure Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.80 ~ 4.20 V at standard atmospheric pressure (see this text for details)
Inlet Air Temperature Sensor:	
Output Voltage	About DC 2.25 ~ 2.50 V at inlet air temperature 20°C (68°F)
Resistance	2.21 ~ 2.69 kΩ at 20°C (68°F) About 0.322 kΩ at 80°C (176°F)
Water Temperature Sensor:	
Output Voltage	About DC 2.80 ~ 2.97 V at 20°C (68°F)
Speed Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	About DC 0.05 ~ 0.09 V or DC 4.5 ~ 4.9 at ignition switch ON and 0 km/h
Vehicle-down Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V

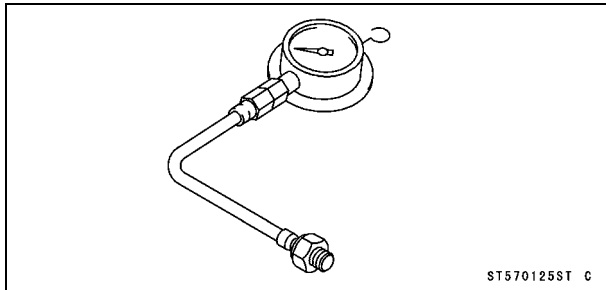
**Specifications**

Item	Standard
Output Voltage	With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V
Subthrottle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 0.48 ~ 0.52 V at idle throttle opening DC 3.8 ~ 4.0 V at full throttle opening (for reference)
Resistance	4 ~ 6 kΩ
Exhaust Butterfly Valve Actuator Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.46 ~ 3.76 V at pulley original position
Resistance	4 ~ 6 kΩ
Immobilizer Antenna (Equipped Models):	
Resistance	About 0.6 ~ 0.9 Ω
Exhaust Butterfly Valve Actuator:	
Resistance	5 ~ 200 Ω (for reference)
Subthrottle Valve Actuator:	
Resistance	About 5.2 ~ 7.8 Ω
Input Voltage	About DC 8.5 ~ 10.5 V
Oxygen Sensor (Equipped Models):	
Output Voltage (Rich)	DC 0.7 V or more
Output Voltage (Lean)	DC 0.2 V or less
Heater Resistance	11.7 ~ 15.5 Ω at 20°C (68°F)
<b>Throttle Grip and Cables</b>	
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
<b>Air Cleaner</b>	
Element	Paper filter

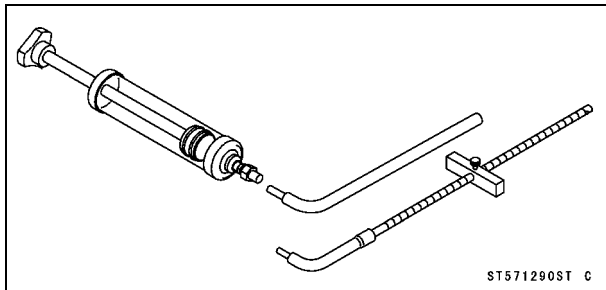
## 3-20 FUEL SYSTEM (DFI)

### Special Tools and Sealant

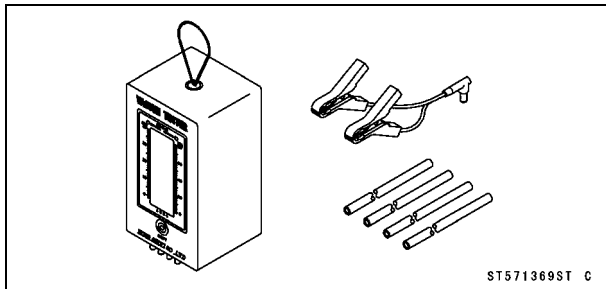
**Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>:**  
**57001-125**



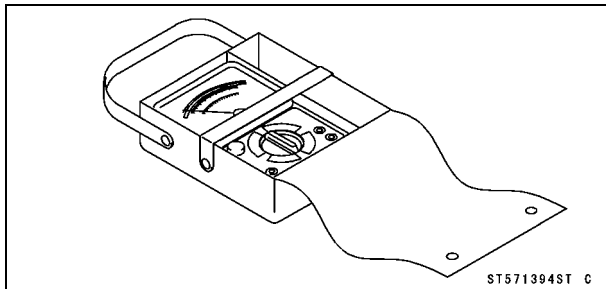
**Fork Oil Level Gauge:**  
**57001-1290**



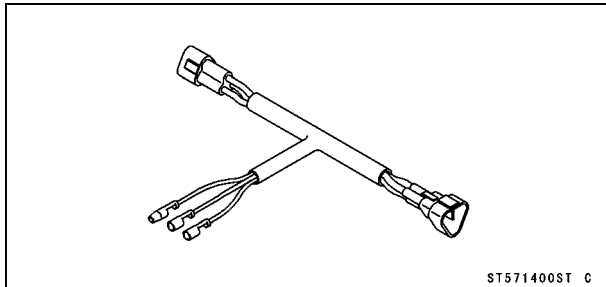
**Vacuum Gauge:**  
**57001-1369**



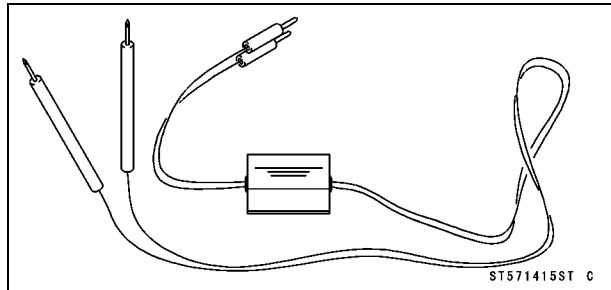
**Hand Tester:**  
**57001-1394**



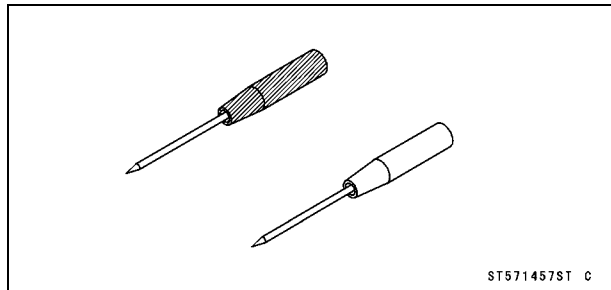
**Throttle Sensor Setting Adapter #1:**  
**57001-1400**



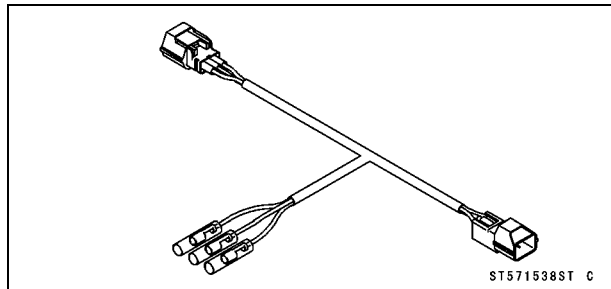
**Peak Voltage Adapter:**  
**57001-1415**



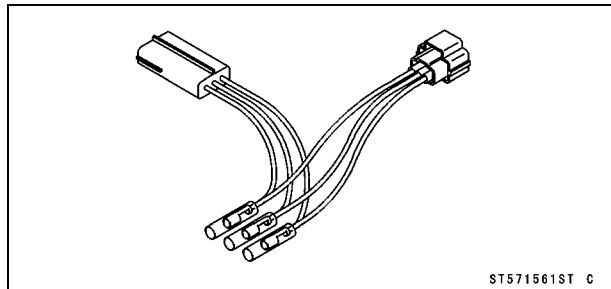
**Needle Adapter Set:**  
**57001-1457**



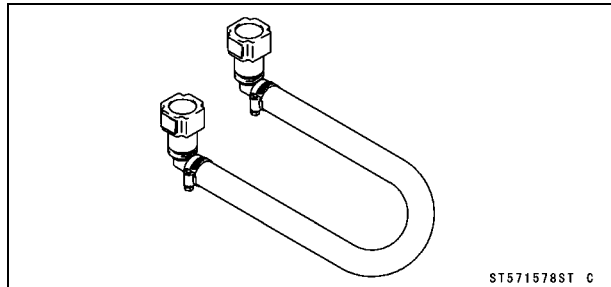
**Throttle Sensor Setting Adapter:**  
**57001-1538**



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



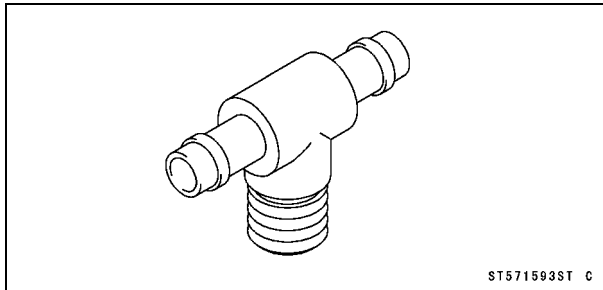
**Extension Tube:**  
**57001-1578**



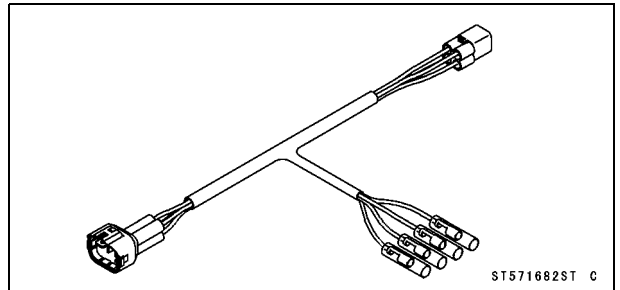


## Special Tools and Sealant

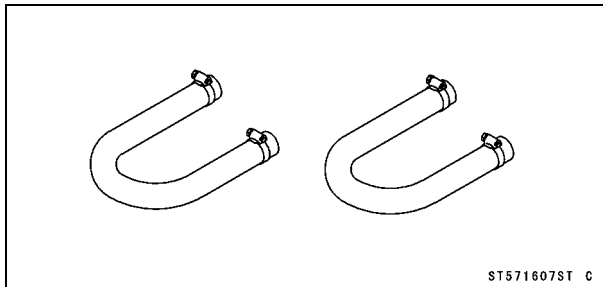
**Fuel Pressure Gauge Adapter:  
57001-1593**



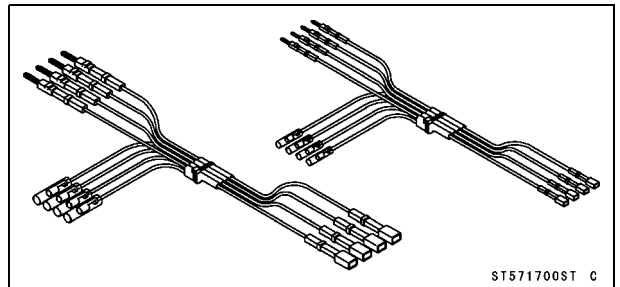
**Oxygen Sensor Measuring Adapter:  
57001-1682**



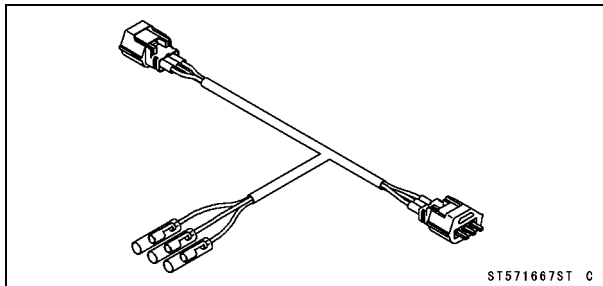
**Fuel Hose:  
57001-1607**



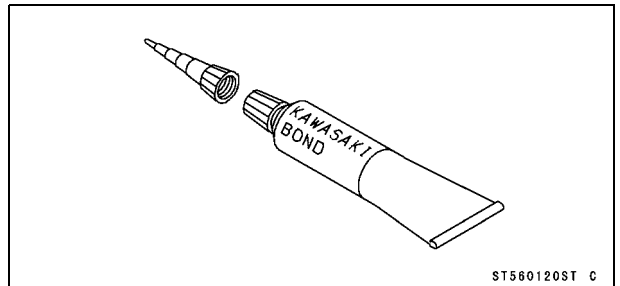
**Measuring Adapter:  
57001-1700**



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



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



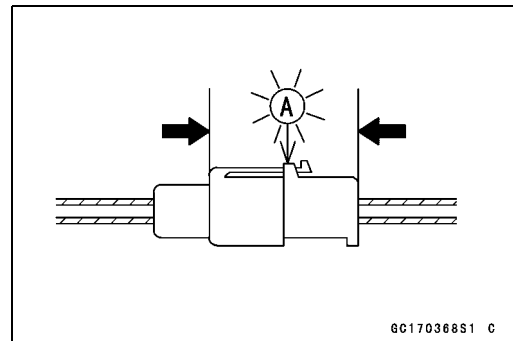
## 3-22 FUEL SYSTEM (DFI)

### DFI Servicing Precautions

#### DFI Servicing Precautions

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

- This DFI system is designed to be used with a 12 V sealed battery as its power source. Do not use any other battery except for a 12 V sealed battery as a power source.
- Do not reverse the battery cable connections. This will damage the ECU.
- To prevent damage to the DFI parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- When charging, remove the battery from the motorcycle. This is to prevent ECU damage by excessive voltage.
- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition switch, and disconnect the battery (–) terminal. Do not pull the lead, only the connector. Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- Connect these connectors until they click [A].



- Do not turn the ignition switch ON while any of the DFI electrical connectors are disconnected. The ECU memorizes service codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the DFI system is not influenced by electric wave radiated from the antenna. Check operation of the system with the engine at idle. Locate the antenna as far as possible away from the ECU.
- When any fuel hose is disconnected, do not turn on the ignition switch. Otherwise, the fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if the pump is completely dry. This is to prevent pump seizure.
- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- When any fuel hose is disconnected, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.
- Run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.

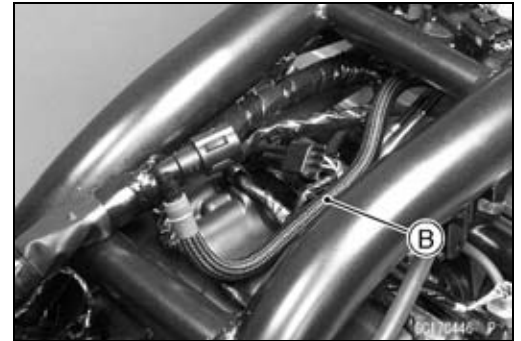
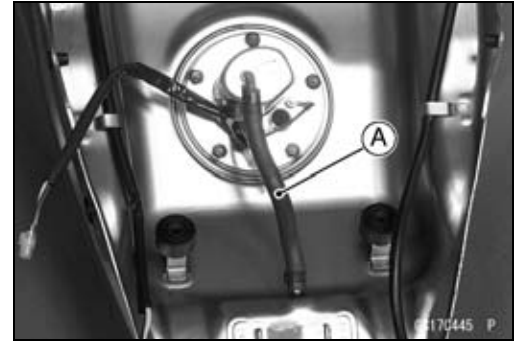
**DFI Servicing Precautions**

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

Fuel Inlet Hose [A]

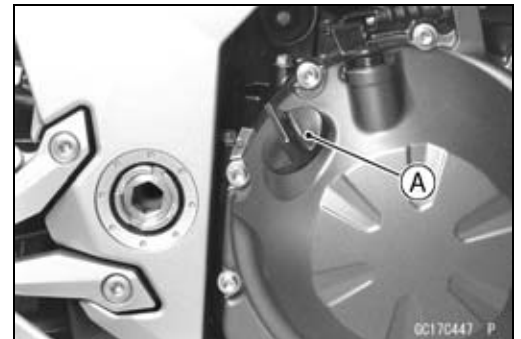
Fuel Outlet Hose [B]

★Replace the fuel hose if any fraying, cracks or bulges are noticed.



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

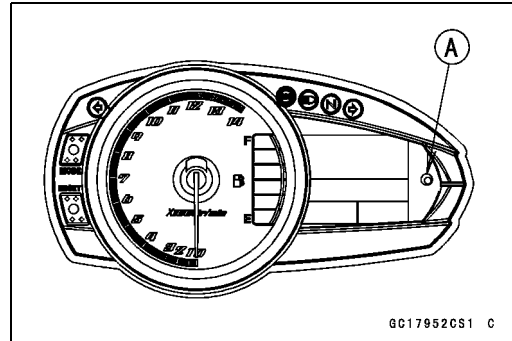
**Torque - Oil Filler Plug: 2.0 N·m (0.20 kgf·m, 18 in·lb)**



## 3-24 FUEL SYSTEM (DFI)

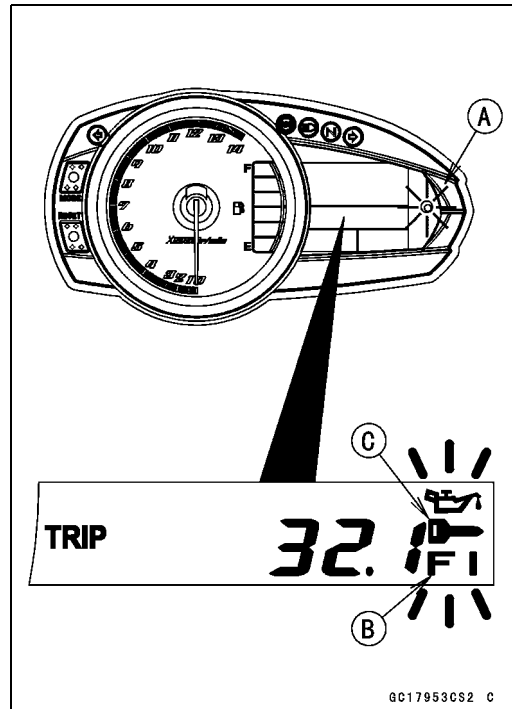
### Troubleshooting the DFI System

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



#### Outline

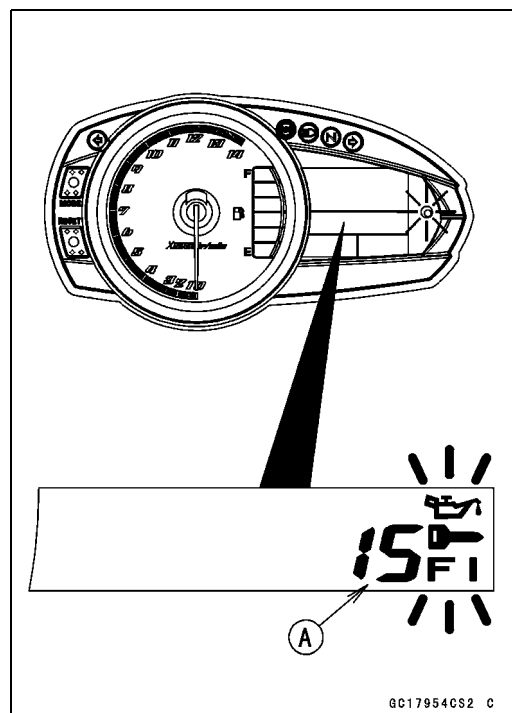
When a problem occurs with DFI system, the warning indicator light (LED) [A] and FI warning symbol [B] blinks to alert the rider. In addition, the condition of the problem is stored in the memory of the ECU. For models equipped with an immobilizer system, the warning indicator light (LED) and immobilizer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



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

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

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

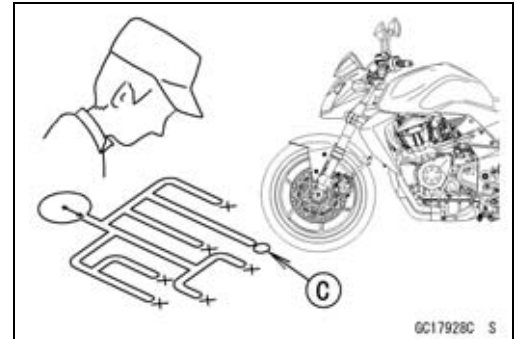
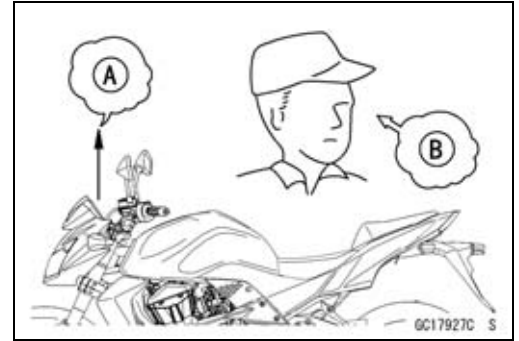


## Troubleshooting the DFI System

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

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

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



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

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

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

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

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

## 3-26 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

- When checking the DFI parts, use a digital meter which can be read two decimal place voltage or resistance.
- The DFI part connectors [A] have seals [B], including the ECU. When measuring the input or output voltage with the connector joined, use the needle adapter set [C]. Insert the needle adapter inside the seal until the needle adapter reaches the terminal.

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

#### CAUTION

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

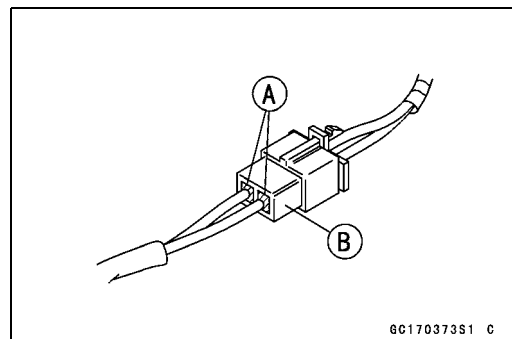
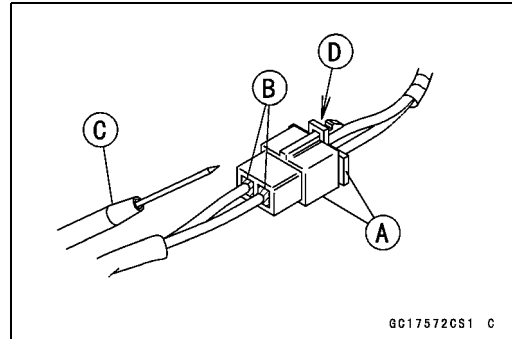
- Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of a digital meter.
- Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.
- Turn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

#### CAUTION

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

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

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



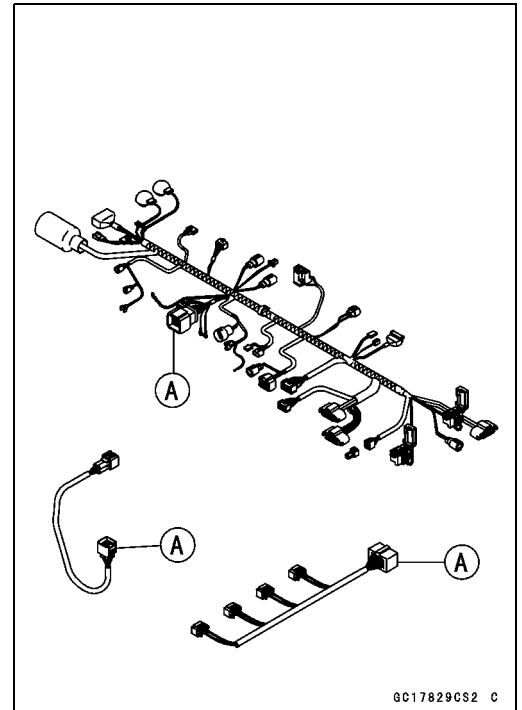
- Always check battery condition before replacing the DFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.
  - Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused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

## Troubleshooting the DFI System

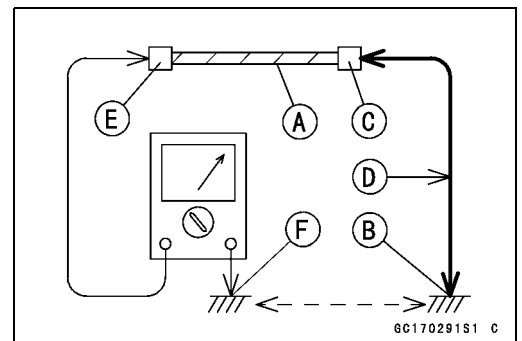
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which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

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

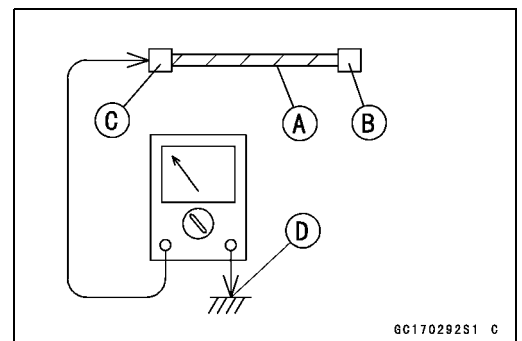
- Set the tester to the  $\times 1 \Omega$  range, and read the tester.
- ★ If the tester does not read  $0 \Omega$ , the lead is defective. Replace the lead or the main harness or the subharness.



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



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

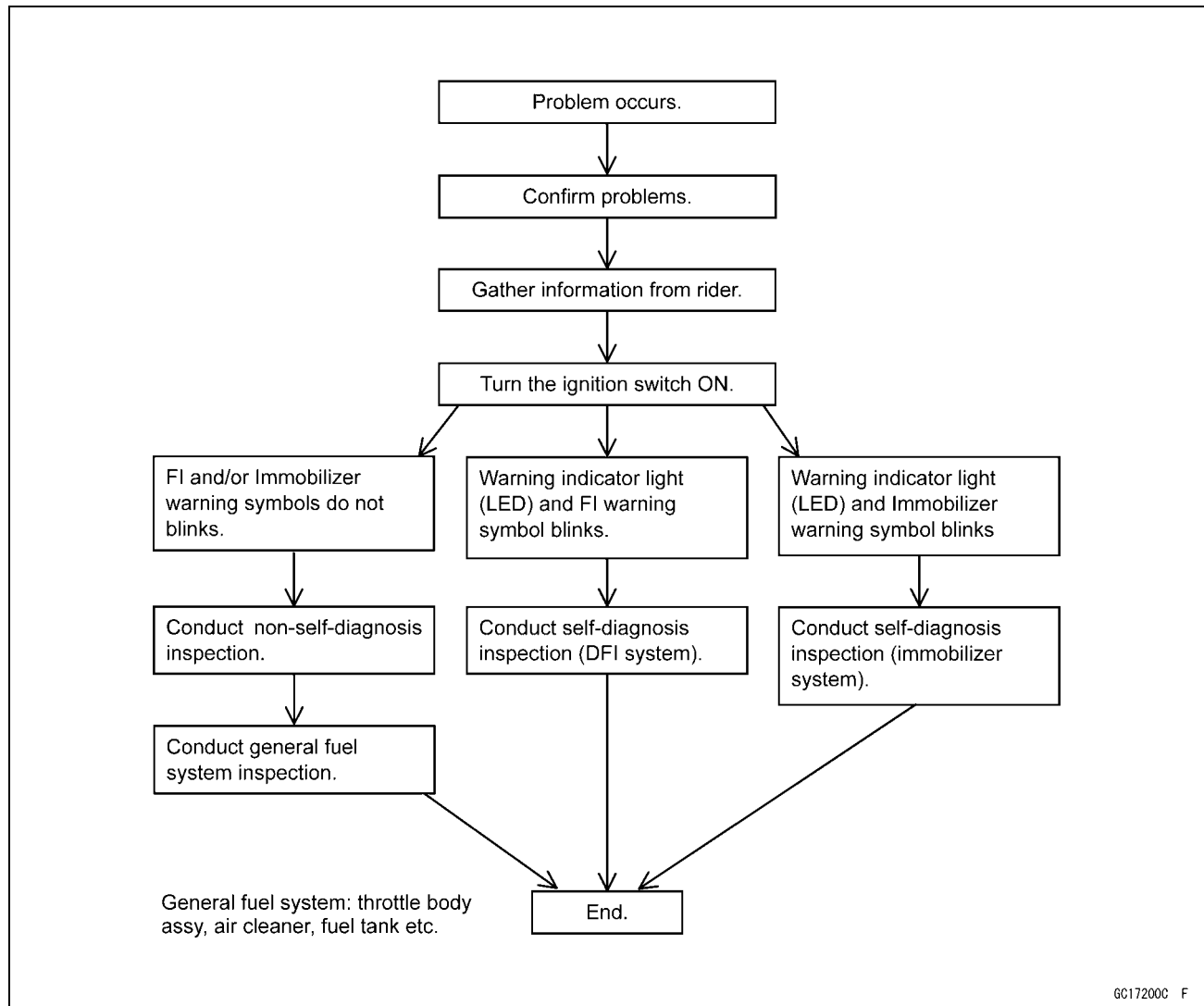


- Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.
- ★ If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.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

## 3-28 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

#### DFI Diagnosis Flow Chart



#### Inquiries to Rider

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



**Troubleshooting the DFI System**
**Sample Diagnosis Sheet**

<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, <input type="checkbox"/> other:		
Problem frequency	<input type="checkbox"/> chronic, <input type="checkbox"/> often, <input type="checkbox"/> once		
Road	<input type="checkbox"/> street, <input type="checkbox"/> highway, <input type="checkbox"/> mountain road ( <input type="checkbox"/> uphill, <input type="checkbox"/> downhill), <input type="checkbox"/> bumpy, <input type="checkbox"/> pebble		
Altitude	<input type="checkbox"/> normal, <input type="checkbox"/> high (about 1 000 m or more)		
<b>Motorcycle conditions when problem occurred.</b>			
Warning indicator light (LED)	<input type="checkbox"/> Starts blinking about 3 seconds after from ignition switch ON, and goes off after engine pressure becomes high enough (with engine running).		
	<input type="checkbox"/> Starts blinking about 3 seconds after from ignition switch ON, and the FI warning symbol on the LCD starts blinking (DFI system problem).		
	<input type="checkbox"/> Starts blinking about 3 seconds after from ignition switch ON, and the immobilizer warning symbol on the LCD starts blinking (immobilizer system problem).		
	<input type="checkbox"/> Starts blinking about 3 seconds after from ignition switch ON, and about 10 seconds after, the FI warning symbol on the LCD starts blinking (ECU communication error).		
	<input type="checkbox"/> Does not blink about 3 seconds after ignition switch ON.		
	<input type="checkbox"/> light up (ECU or meter unit replace).		
Starting difficulty	<input type="checkbox"/> starter motor not rotating.		
	<input type="checkbox"/> starter motor rotating but engine do not turn over.		
	<input type="checkbox"/> starter motor and engine do not turn over.		
	<input type="checkbox"/> no fuel flow ( <input type="checkbox"/> no fuel in tank, <input type="checkbox"/> no fuel pump sound).		
	<input type="checkbox"/> no spark.		
	<input type="checkbox"/> other:		
Engine stalls	<input type="checkbox"/> right after starting.		
	<input type="checkbox"/> when opening throttle grip.		
	<input type="checkbox"/> when closing throttle grip.		
	<input type="checkbox"/> when moving off.		
	<input type="checkbox"/> when stopping the motorcycle.		
	<input type="checkbox"/> when cruising.		
	<input type="checkbox"/> other:		

### 3-30 FUEL SYSTEM (DFI)

#### Troubleshooting the DFI System

Poor running at low speed	<input type="checkbox"/> very low idle speed, <input type="checkbox"/> very high idle speed, <input type="checkbox"/> rough idle speed.
	<input type="checkbox"/> battery voltage is low (charge the battery).
	<input type="checkbox"/> spark plug loose (tighten it).
	<input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (remedy it).
	<input type="checkbox"/> backfiring.
	<input type="checkbox"/> afterfiring.
	<input type="checkbox"/> hesitation when acceleration.
	<input type="checkbox"/> engine oil viscosity too high.
	<input type="checkbox"/> brake dragging.
	<input type="checkbox"/> engine overheating.
	<input type="checkbox"/> clutch slipping.
	<input type="checkbox"/> other:
Poor running or no power at high speed	<input type="checkbox"/> spark plug loose (tighten it).
	<input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (remedy it).
	<input type="checkbox"/> spark plug incorrect (replace it).
	<input type="checkbox"/> knocking (fuel poor quality or incorrect, → use high-octane gasoline).
	<input type="checkbox"/> brake dragging.
	<input type="checkbox"/> clutch slipping.
	<input type="checkbox"/> engine overheating.
	<input type="checkbox"/> engine oil level too high.
	<input type="checkbox"/> engine oil viscosity too high.
	<input type="checkbox"/> other:

## DFI System Troubleshooting Guide

### NOTE

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

### Engine Won't Turn Over

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

### Poor Running at Low Speed

Symptoms or Possible Causes	Actions (chapter)
<b>Spark weak:</b>	
Stick coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU trouble	Inspect (see chapter 3).
<b>Fuel/air mixture incorrect:</b>	
Little fuel in tank	Supply fuel (see Owner's Manual).
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 2).
Air duct loose	Reinstall (see chapter 3).
Throttle body assy holder loose	Reinstall (see chapter 3).
Throttle body assy dust seal damage	Replace (see chapter 3).
Fuel Injector O-ring damage	Replace (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).

### 3-32 FUEL SYSTEM (DFI)

#### DFI System Troubleshooting Guide

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

# DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Stick coil trouble	Inspect (see chapter 16).
<b>Stumble:</b>	
Fuel pressure too low	Inspect (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
<b>Surge:</b>	
Unstable fuel pressure	Fuel pressure regulator trouble (Inspect and replace fuel pump) or kinked fuel line (Inspect and replace fuel pump) (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
<b>Backfiring when deceleration:</b>	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Fuel pressure too low	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Air switching valve trouble	Inspect and replace (see chapter 16).
Air suction valve trouble	Inspect and replace (see chapter 5).
<b>After fire:</b>	
Spark plug burned or gap maladjusted	Replace (see chapter 2).
Fuel Injector trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).

### 3-34 FUEL SYSTEM (DFI)

#### DFI System Troubleshooting Guide

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

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

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

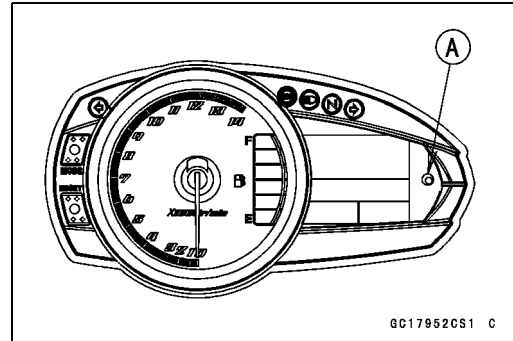
**DFI System Troubleshooting Guide**

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

## 3-36 FUEL SYSTEM (DFI)

### Self-Diagnosis

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

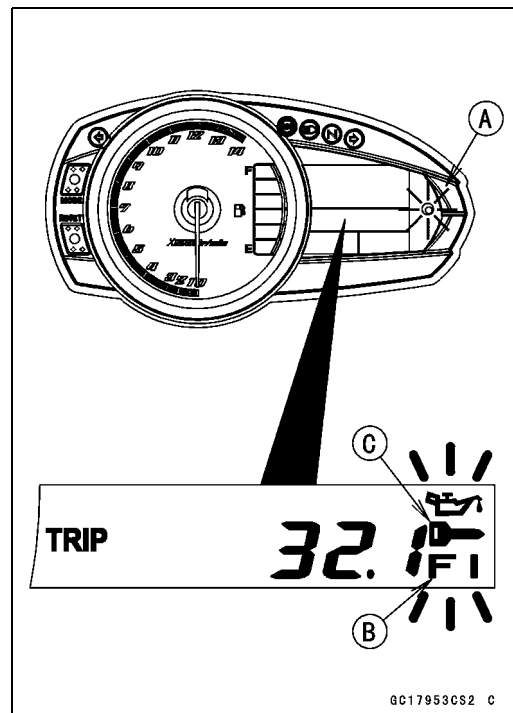


### Self-diagnosis Outline

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

#### User Mode

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

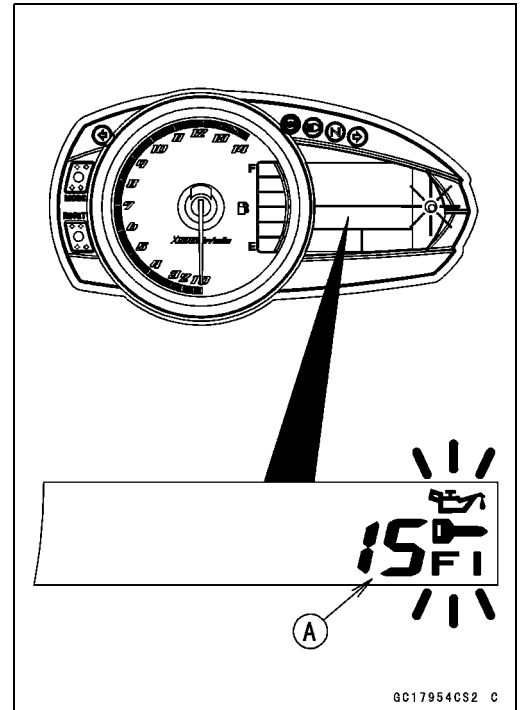




## Self-Diagnosis

### Dealer Mode

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

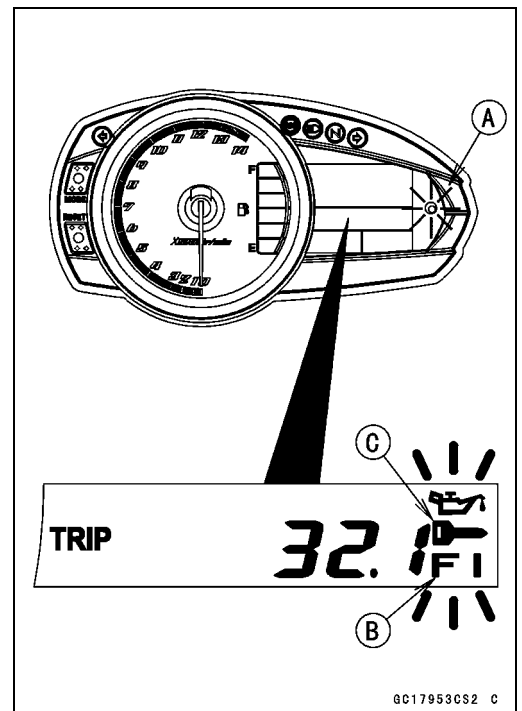


### Self-diagnosis Procedures

- When a problem occurs with the DFI system and ignition system, the warning indicator light (LED) [A] and FI warning symbol [B] blinks.
- For models equipped with an immobilizer system, when a problem occurs with the system, the warning indicator light (LED) and immobilizer warning symbol [C] blinks.

#### NOTE

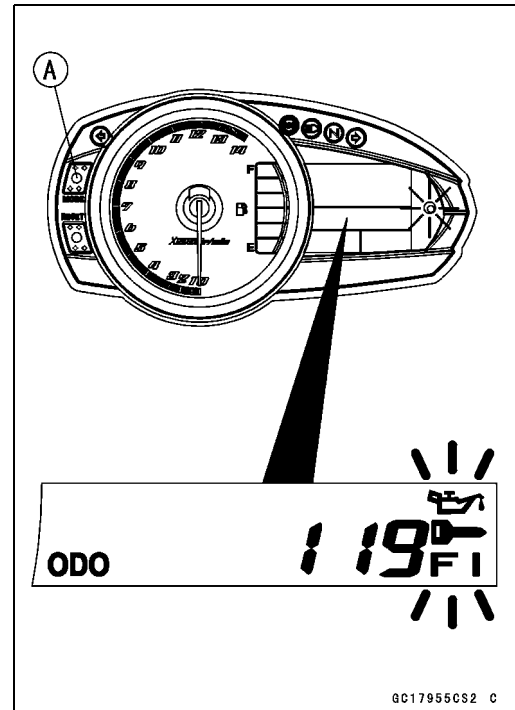
- Use a fully charged battery when conducting self-diagnosis. Otherwise, the light (LED) and symbol blinks very slowly or do not blink.



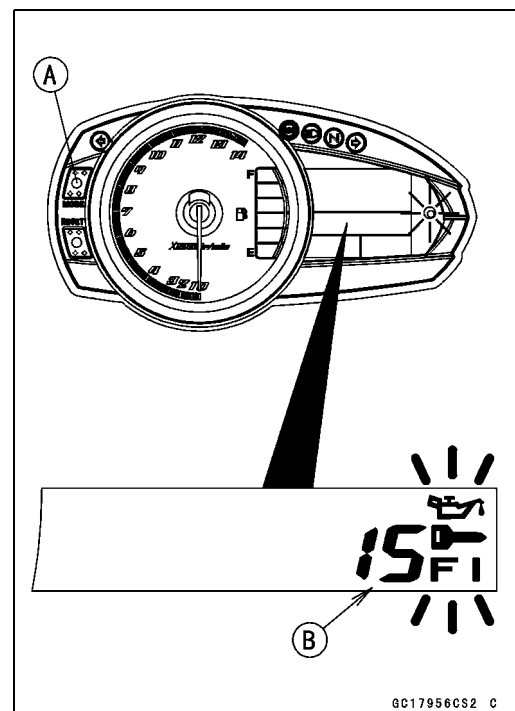
### 3-38 FUEL SYSTEM (DFI)

#### Self-Diagnosis

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



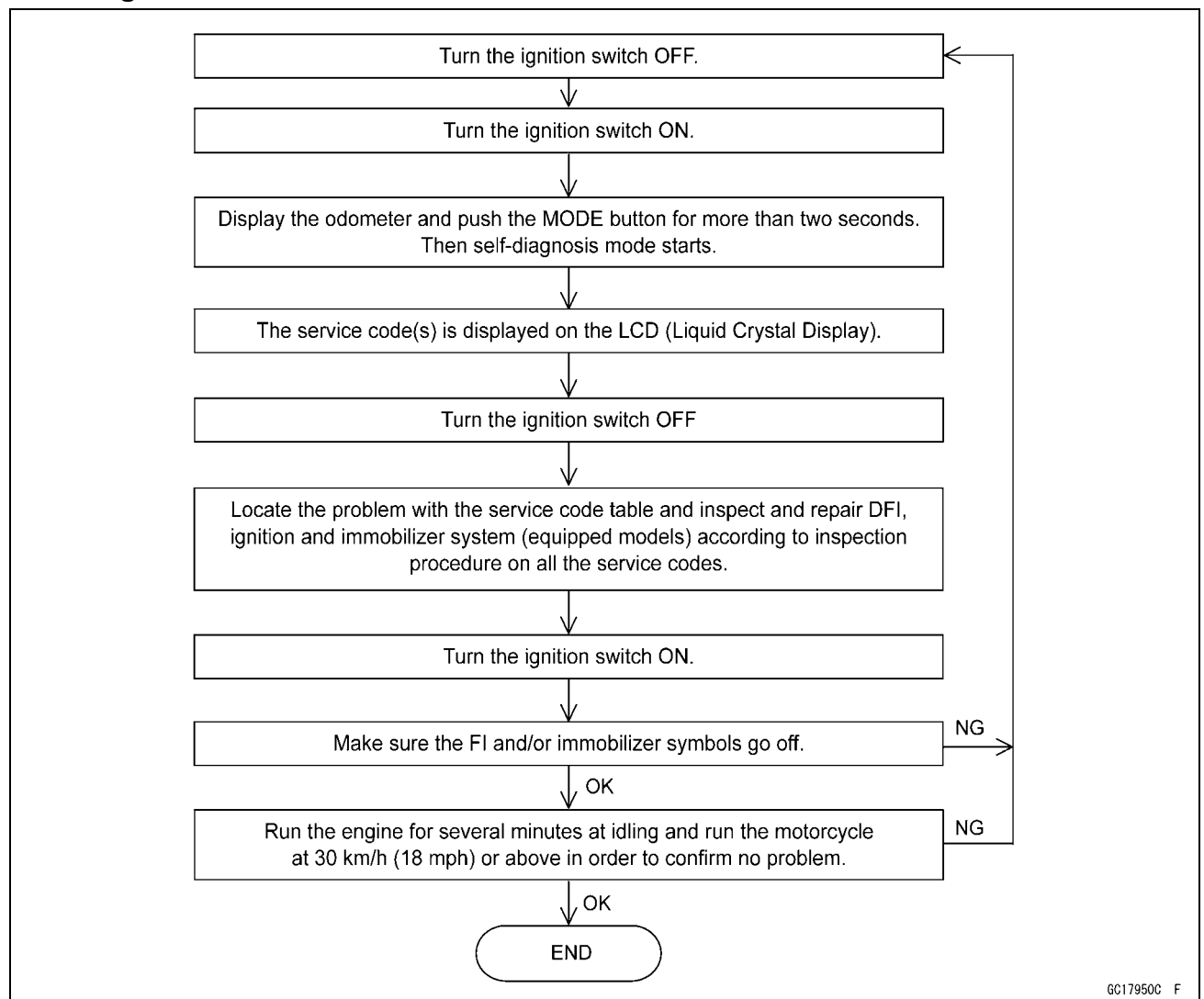
- Push the MODE button [A] for more than two seconds.
- The service code [B] is displayed on the LCD by the number of two digits.



- Any of the following procedures ends self-diagnosis.
- When the service code is displayed on the LCD, push the MODE button for more than two seconds.
- When the ignition switch is turned OFF.

# Self-Diagnosis

## Self-Diagnosis Flow Chart

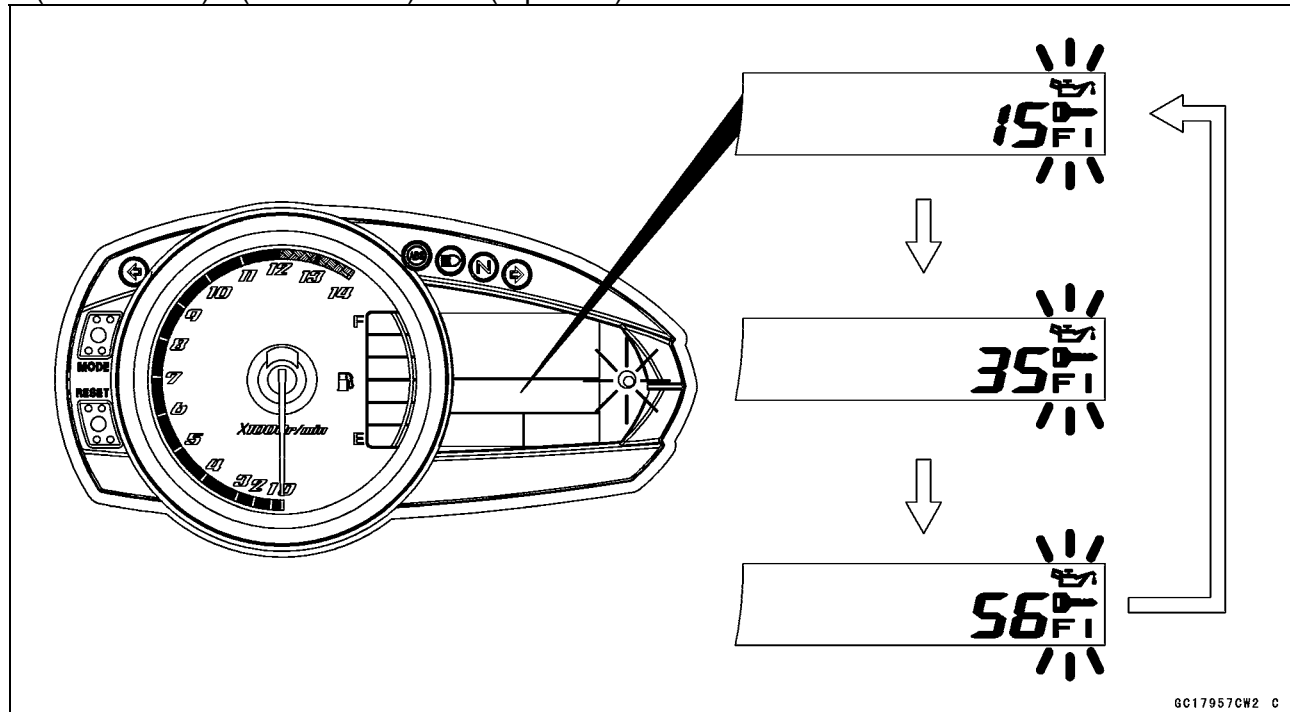


### 3-40 FUEL SYSTEM (DFI)

#### Self-Diagnosis

##### Service Code Reading

- The service code(s) is displayed on the LCD by the number of two digits.
- When there are a number of problems, all the service codes can be stored and the display will begin starting from the lowest number service code in the numerical order.
- Then after completing all codes, the display is repeated until the ignition switch is turned OFF or MODE button is pushed for more than two seconds.
- For example, if three problems occurred in the order of 56, 15, 35, the service codes are displayed (each two seconds) from the lowest number in the order listed as shown below. (15→35→56)→(15→35→56)→···(repeated)



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

##### Service Code Erasing

- When repair has been done, FI and/or immobilizer warning symbols go off and service code is not displayed.
- ★But the service codes stored in memory of the ECU are not erased to preserve the problem history. In this model, the problem history can not be erased.

## Self-Diagnosis

**Service Code Table**

Service Code	Problems
<b>11</b>	Main throttle sensor malfunction, wiring open or short
<b>12</b>	Inlet air pressure sensor malfunction, wiring open or short
<b>13</b>	Inlet air temperature sensor malfunction, wiring open or short
<b>14</b>	Water temperature sensor malfunction, wiring open or short
<b>15</b>	Atmospheric pressure sensor malfunction, wiring open or short
<b>21</b>	Crankshaft sensor malfunction, wiring open or short
<b>23</b>	Camshaft position sensor malfunction, wiring open or short
<b>24 and 25</b>	Speed sensor malfunction, wiring open or short First 24 is displayed and then 25, repeatedly
<b>31</b>	Vehicle-down sensor malfunction, wiring open or short
<b>32</b>	Subthrottle sensor malfunction, wiring open or short
<b>33</b>	Oxygen sensor inactivation, wiring open or short (Equipped Models)
<b>34</b>	Exhaust butterfly valve actuator sensor malfunction, wiring open or short
<b>35</b>	Immobilizer amplifier malfunction (Equipped Models)
<b>36</b>	Blank Key detection (Equipped Models)
<b>39</b>	ECU communication error
<b>51</b>	Stick coil #1 malfunction, wiring open or short
<b>52</b>	Stick coil #2 malfunction, wiring open or short
<b>53</b>	Stick coil #3 malfunction, wiring open or short
<b>54</b>	Stick coil #4 malfunction, wiring open or short
<b>56</b>	Radiator fan relay malfunction, wiring open or short
<b>62</b>	Subthrottle valve actuator malfunction, wiring open or short
<b>63</b>	Exhaust butterfly valve actuator malfunction, wiring open or short
<b>64</b>	Air switching valve malfunction, wiring open or short
<b>67</b>	Oxygen sensor heater malfunction, wiring open or short (Equipped Models)
<b>94</b>	Oxygen sensor malfunction, wiring open or short (Equipped Models)

**Notes:**

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

## 3-42 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### Backups

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Main Throttle Sensor	Output Voltage 0.2 ~ 4.8 V	If the main throttle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure (Absolute) $P_v = 100 \sim 900$ mmHg	If the inlet air pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets the DFI in the $\alpha$ -N method (1).
13	Inlet Air Temperature Sensor	Inlet Air Temperature $T_a = -47 \sim +178^\circ\text{C}$	If the inlet air temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets $T_a$ at $30^\circ\text{C}$ .
14	Water Temperature Sensor	Water Temperature $T_w = -30 \sim +120^\circ\text{C}$	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 $80^\circ\text{C}$ . When an radiator fan is turning on, ECU sets $T_w$ at $110^\circ\text{C}$ .
15	Atmospheric Pressure Sensor	Atmospheric Pressure (Absolute) $P_a = 100 \sim 900$ 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 22 signals to the ECU at the 1 cranking.	If the crankshaft sensor generates less than 22 or more signals, the engine stops by itself.
23	Camshaft Position Sensor	Camshaft position sensor must send 1 signal to the ECU at the 2 crankings.	If the camshaft position sensor system fails (the signal is missing, wiring short or open), the ECU continues to ignite cylinders in the same sequence following the last good signal.
24 and 25	Speed Sensor	Speed sensor must send 23 signals to the ECU at the one rotation of the drive shaft. 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	Output Voltage 0.65 ~ 4.45 V	If the vehicle-down sensor system has failures (the output voltage is out of the usable range, wiring short or open), the ECU shuts off the fuel pump relay, the fuel injectors and the ignition system.
32	Subthrottle Sensor	Output Voltage 0.15 ~ 4.85 V	If the subthrottle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU drive the subthrottle valve to the full closed position, and it stops the current to the subthrottle valve actuator.

**Self-Diagnosis**

<b>Service Codes</b>	<b>Parts</b>	<b>Output Signal Usable Range or Criteria</b>	<b>Backups by ECU</b>
<b>33</b>	Oxygen Sensor (Equipped Models)	The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU.	If the oxygen sensor is not activated, the ECU stops the feedback mode of the oxygen sensor.
<b>34</b>	Exhaust Butterfly Valve Actuator Sensor	Output Voltage 0.1 ~ 4.8 V	If the exhaust butterfly valve sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU locks the exhaust butterfly valve at full open position near, and it stops the current to the exhaust butterfly valve actuator.
<b>35</b>	Immobilizer Amplifier (Equipped Models)	–	If the immobilizer system fails (no signal, wiring short or open), the vehicle is no start and run.
<b>36</b>	Master or User Key (Equipped Models)	The user or master key must use register key.	If the blank key or broken key is used, the vehicle is no start and run.
<b>39</b>	ECU	The ECU send the data (for service code and key registration) to the meter unit.	–
<b>51</b>	Stick Coil #1*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #1 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running.
<b>52</b>	Stick Coil #2*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #2 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running.
<b>53</b>	Stick Coil #3*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #3 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #3 to stop fuel to the cylinder #3, though the engine keeps running.
<b>54</b>	Stick Coil #4*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #4 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #4 to stop fuel to the cylinder #4, though the engine keeps running.
<b>56</b>	Radiator Fan Relay	When the relay OFF condition, the fan relay is open.	–
<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 to the usable range, wiring short or open), the ECU stops the current to the actuator.
<b>63</b>	Exhaust Butterfly Valve Actuator	The actuator operates open and close of the exhaust butterfly valve by the pulse signal from the ECU.	If the exhaust butterfly valve actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator.

### 3-44 FUEL SYSTEM (DFI)

#### Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
64	Air Switching Valve	The air switching valve controls the flow of the secondary air by opening and shutting the solenoid valve.	—
67	Oxygen Sensor Heater (Equipped Models)	The oxygen sensor heater raise temperature of the sensor for its earlier activation. 12V-6.6W, 0.55A	If the oxygen sensor heater fails (wiring short or open), the ECU stops the current to the heater, and it stops the feedback mode of the oxygen sensor.
94	Oxygen Sensor (Equipped Models)	The oxygen sensor must send signals (output voltage) continuously to the ECU	If the oxygen sensor output voltage is incorrect, the ECU stops the feedback mode of the oxygen sensor.

**Note:**

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

\*: This depends on the number of stopped cylinders.



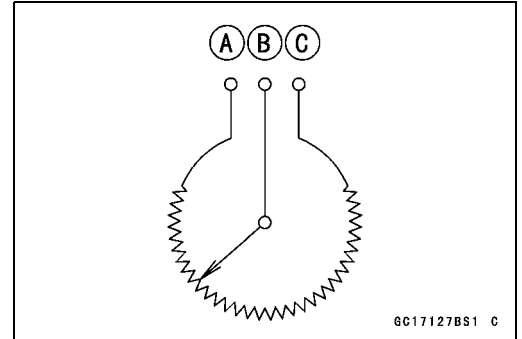
## Main Throttle Sensor (Service Code 11)

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

Input Terminal [A]

Output Terminal [B]

Ground Terminal [C]

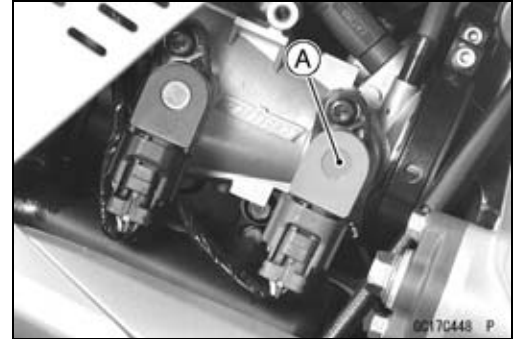


### Main Throttle Sensor Removal/Adjustment

#### 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 throttle body assy, especially on a hard surface. Such a shock to the main throttle sensor can damage it.**



### Main Throttle Sensor Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the main throttle sensor connector and connect the harness adapter [A] between these connectors.

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

- Connect a digital meter to the harness adapter leads.

#### Main Throttle Sensor Input Voltage

##### Connections to Adapter:

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

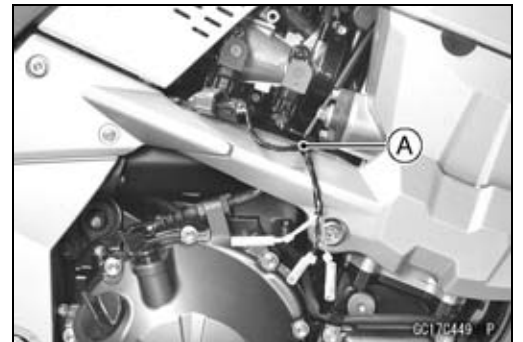
**Digital Meter (–) → W (sensor BR/BK) lead**

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

#### Input Voltage

**Standard: DC 4.75 ~ 5.25 V**

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



## 3-46 FUEL SYSTEM (DFI)

### Main Throttle Sensor (Service Code 11)

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Inspection

ECU Connector [A] ↔

Main Throttle Sensor Connector [B]

BL lead (ECU terminal 10) [C]

BR/BK lead (ECU terminal 28) [D]

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

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

#### Main Throttle Sensor Output Voltage Inspection

● Measure the output voltage at the main throttle sensor in the same way as input voltage inspection, note the following.

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

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

#### Main Throttle Sensor Output Voltage

Connections to Adapter:

Digital Meter (+) → R (sensor Y/W) lead

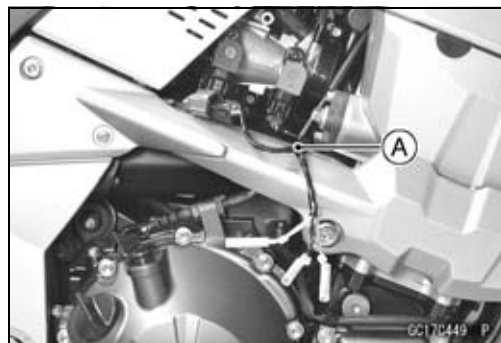
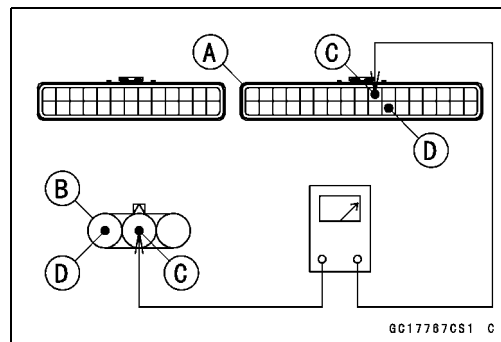
Digital Meter (–) → W (sensor BR/BK) lead

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

#### Idle Speed

Standard: 1 100 ±50 r/min (rpm)

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



## Main Throttle Sensor (Service Code 11)

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

### Output Voltage

**Standard:** DC 0.985 ~ 1.015 V at idle throttle opening  
DC 4.18 ~ 4.38 V at full throttle opening (for reference)

### NOTE

- Open the throttle, confirm the output voltage will be raise.
- The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.
- When the input voltage reading shows other than 5 V, derive a voltage range as follows.

Example:

In the case of a input voltage of 4.75 V.

$$0.985 \times 4.75 \div 5.00 = 0.936 \text{ V}$$

$$1.015 \times 4.75 \div 5.00 = 0.964 \text{ V}$$

Thus, the valid range is 0.936 ~ 0.964 V

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the main throttle sensor resistance (see Main Throttle Sensor Resistance Inspection).
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

### Wiring Inspection

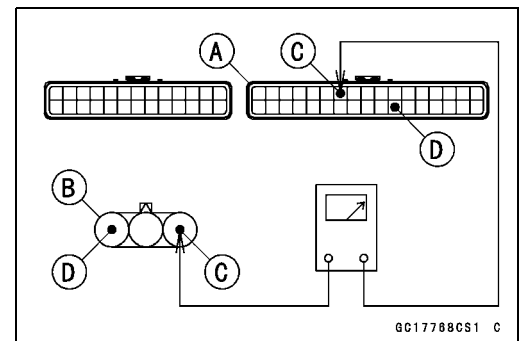
ECU Connector [A] ↔

Main Throttle Sensor Connector [B]

Y/W lead (ECU terminal 7) [C]

BR/BK lead (ECU terminal 28) [D]

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



### Main Throttle Sensor Resistance Inspection

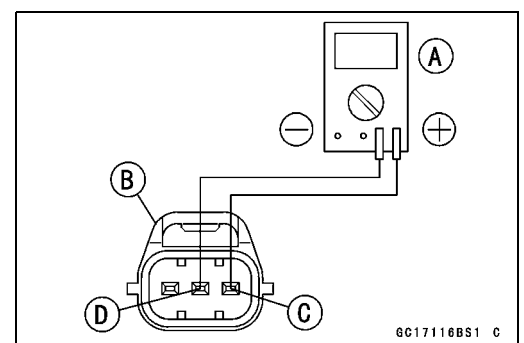
- Turn the ignition switch OFF.
- Disconnect the main throttle sensor connector.
- Connect a digital meter [A] to the main throttle sensor connector [B].
- Measure the main throttle sensor resistance.

### Main Throttle Sensor Resistance

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

**Standard:** 4 ~ 6 kΩ

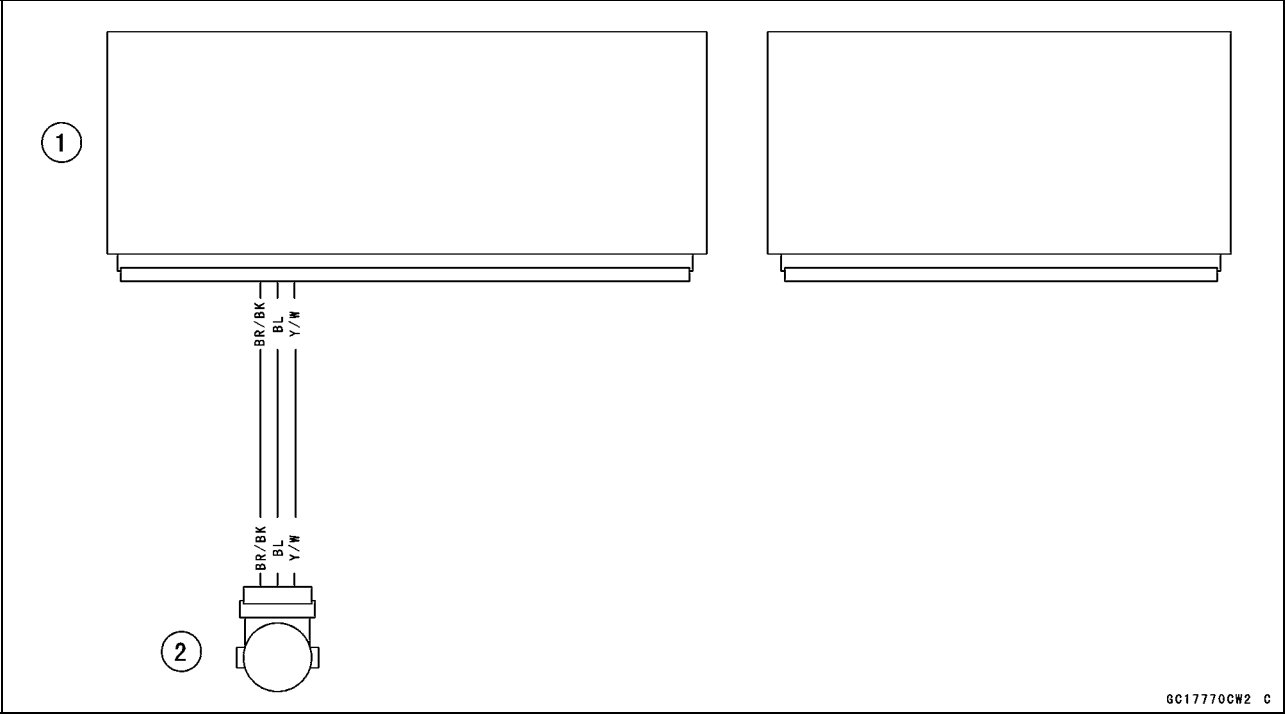
- ★ If the reading is out of the standard, replace the throttle body assy.
- ★ If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).



### 3-48 FUEL SYSTEM (DFI)

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

#### Main Throttle Sensor Circuit



- 1. ECU
- 2. Main Throttle Sensor

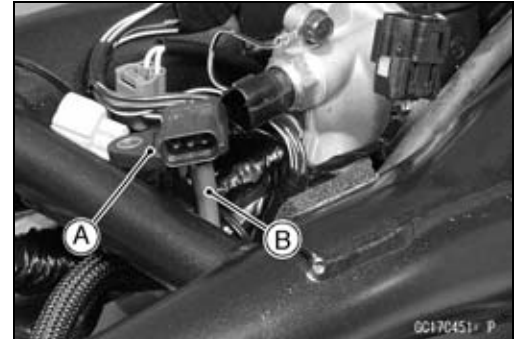
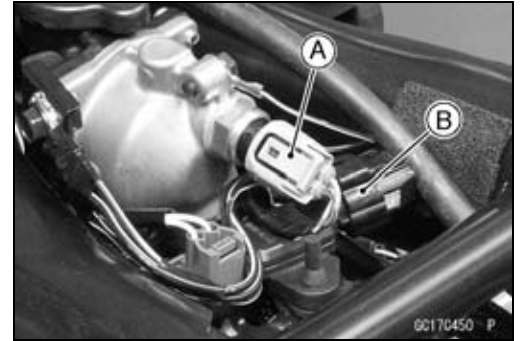
## Inlet Air Pressure Sensor (Service Code 12)

### Inlet Air Pressure Sensor Removal

#### CAUTION

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

- Remove:  
Fuel Tank (see Fuel Tank Removal)  
Water Temperature Sensor Connector [A] (Disconnect)  
Inlet Air Pressure Sensor Connector [B] (Disconnect)
- Remove the inlet air pressure sensor [A] from the rubber damper in the frame and separate the vacuum hose [B].



### Inlet Air Pressure Sensor Installation

#### NOTE

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

- Installation is the reverse of removal.

### Inlet Air Pressure Sensor Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

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

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

- Connect a digital meter to the harness adapter leads.

#### Inlet Air Pressure Sensor Input Voltage

##### Connections to Adapter:

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

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

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

#### Input Voltage

**Standard: DC 4.75 ~ 5.25 V**

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



## 3-50 FUEL SYSTEM (DFI)

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

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Inspection

ECU Connector [A] ↔

Inlet Air Pressure Sensor Connector [B]

BL lead (ECU terminal 10) [C]

BR/BK lead (ECU terminal 28) [D]

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

#### Inlet Air Pressure Sensor Output Voltage Inspection

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

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

#### Inlet Air Pressure Sensor Output Voltage

Connections to Adapter:

Digital Meter (+) → G/W (sensor Y/BL) lead

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

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

#### Output Voltage

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

#### NOTE

○ The output voltage changes according to local atmospheric pressure.

- Turn the ignition switch OFF.
  - ★ If the reading is out of the usable range, replace the sensor.
- ★ If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness side connector.
- Disconnect the ECU and sensor connectors.

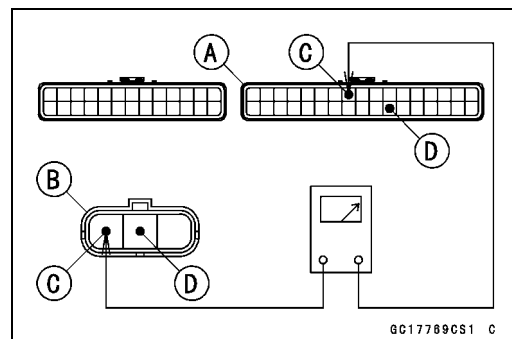
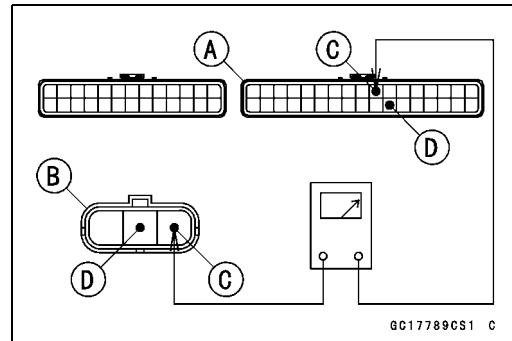
#### Wiring Inspection

ECU Connector [A] ↔

Inlet Air Pressure Sensor Connector [B]

Y/BL lead (ECU terminal 8) [C]

BR/BK lead (ECU terminal 28) [D]



## Inlet Air Pressure Sensor (Service Code 12)

- ★ If the wiring is good, check the sensor for various vacuum.
- Remove the inlet air pressure sensor [A] and disconnect the vacuum hose from the sensor.
- Connect an auxiliary hose [B] to the inlet air pressure sensor.
- Temporarily install the inlet air pressure sensor.
- Connect a digital meter [C], vacuum gauge [D], the fork oil level gauge [E] and the harness adapter to the inlet air pressure sensor.

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

### Inlet Air Pressure Sensor Output Voltage

#### Connections to Adapter:

- Digital Meter (+) → G (sensor Y/BL) lead**
- Digital Meter (–) → BK (sensor BR/BK) lead**

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

Suppose:

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

then

$$P_v = P_I - P_g$$

For example, suppose the following data is obtained:

- Pg = 8 cmHg (Vacuum Gauge Reading)
- PI = 70 cmHg (Barometer Reading)
- Vv = 3.2 V (Digital Meter Reading)

then

$$P_v = 70 - 8 = 62 \text{ cmHg (Absolute)}$$

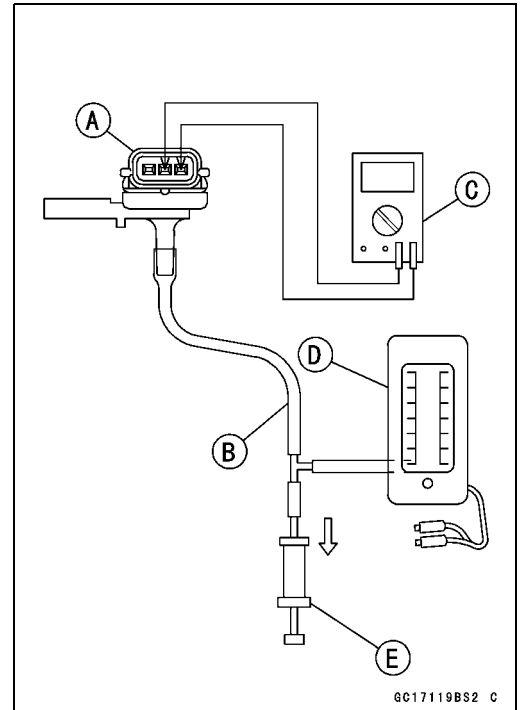
Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.

Usable range = 3.08 ~ 3.48 V

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

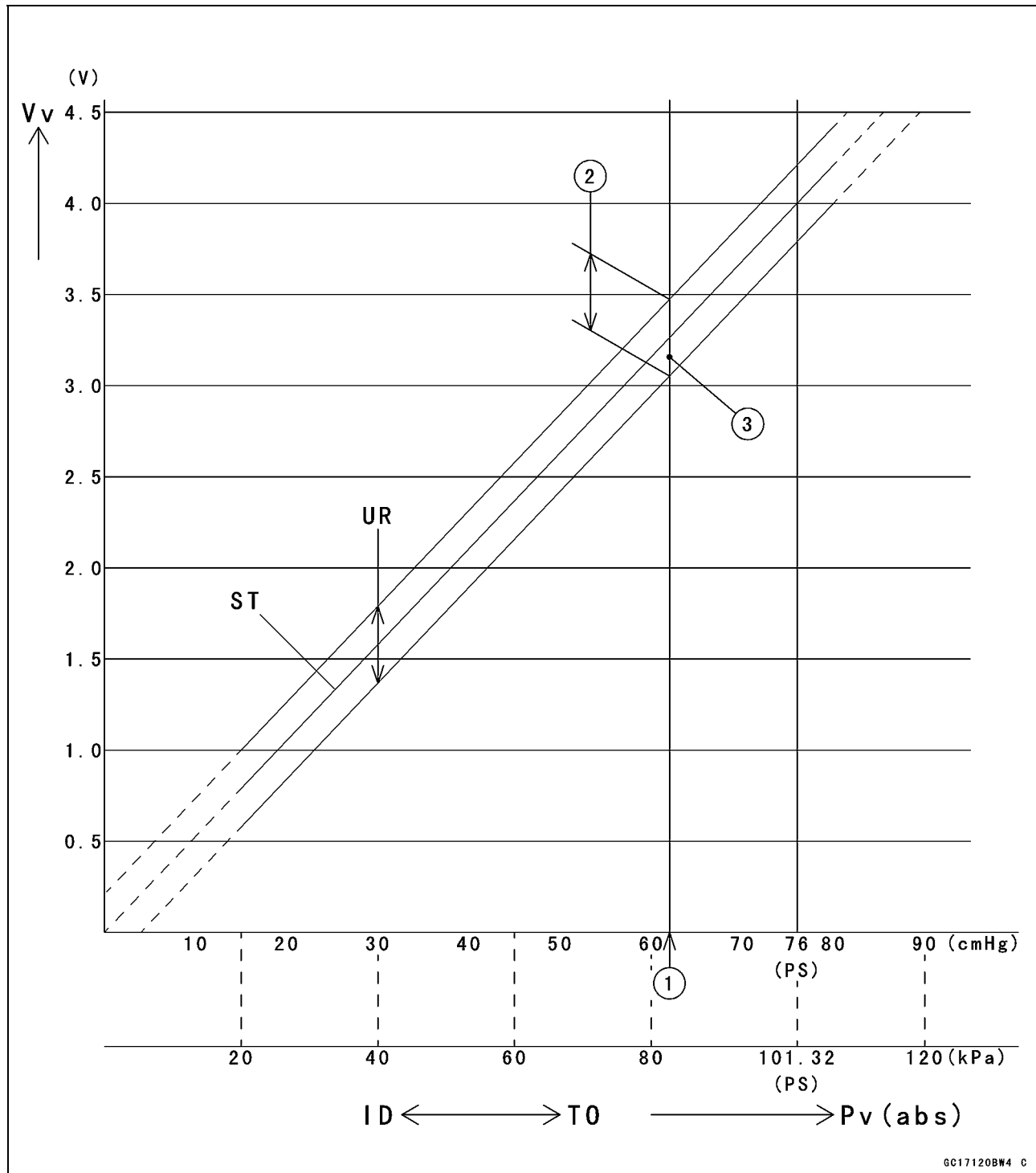
**Results: In the chart, Vv is within the usable range and the sensor is normal.**

- ★ If the reading is out of the usable range, replace the sensor.
- ★ If the reading is within the usable range, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



### 3-52 FUEL SYSTEM (DFI)

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



ID: Idling

Ps: Standard Atmospheric Pressure (Absolute)

Pv: Throttle Vacuum Pressure (Absolute)

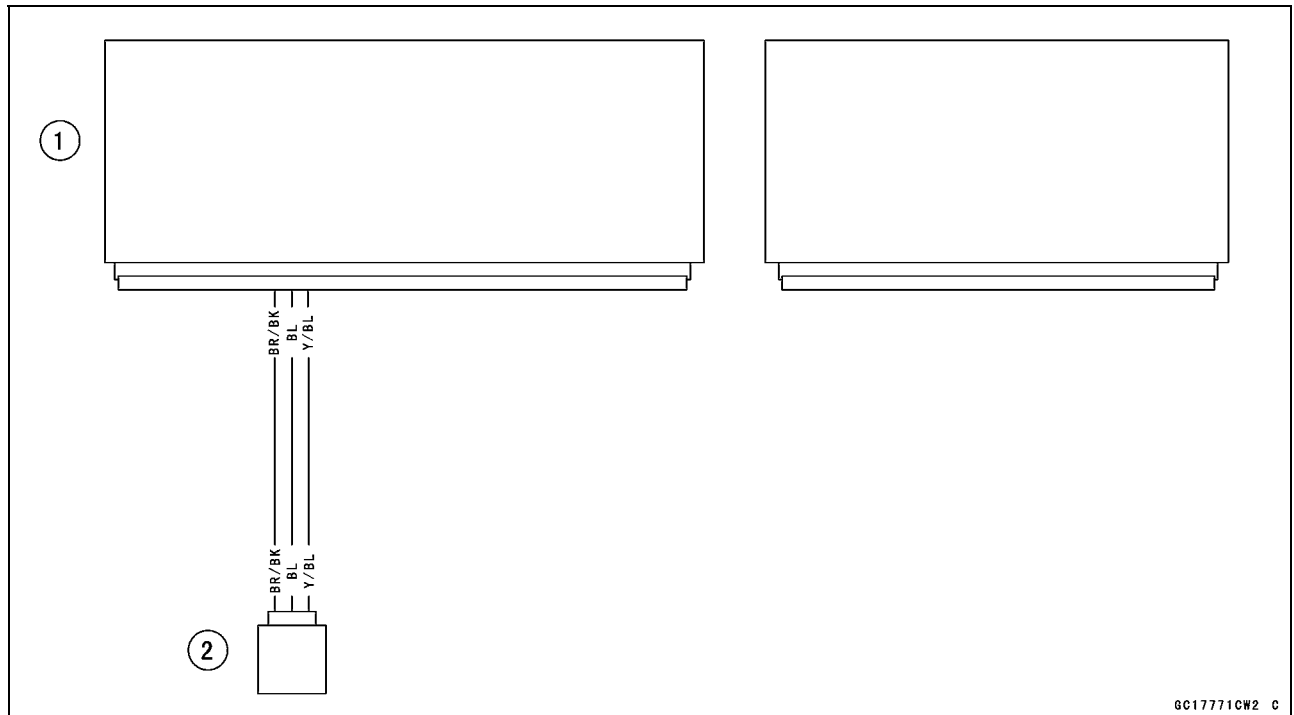
ST: Standard of Sensor Output Voltage (V)

TO: Throttle Full Open

UR: Usable Range of Sensor Output Voltage (V)

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



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

1. ECU
2. Inlet Air Pressure Sensor

## 3-54 FUEL SYSTEM (DFI)

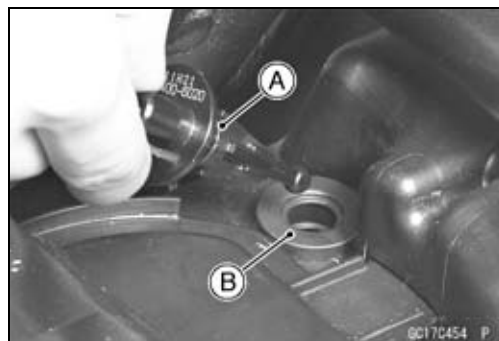
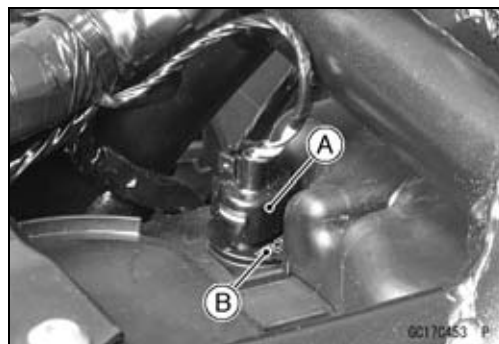
### Inlet Air Temperature Sensor (Service Code 13)

#### Inlet Air Temperature Sensor Removal/Installation

##### CAUTION

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

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the connector [A] from the inlet air temperature sensor [B].
- Pull out the inlet air temperature sensor.
- Put the inlet air temperature sensor [A] into the grommet [B].



#### Inlet Air Temperature Sensor Output Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

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

Main Harness [B]

Inlet Air Temperature Sensor [C]

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

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

##### Inlet Air Temperature Sensor Output Voltage

###### Connections to Adapter:

Digital Meter (+) → R (sensor Y) lead

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

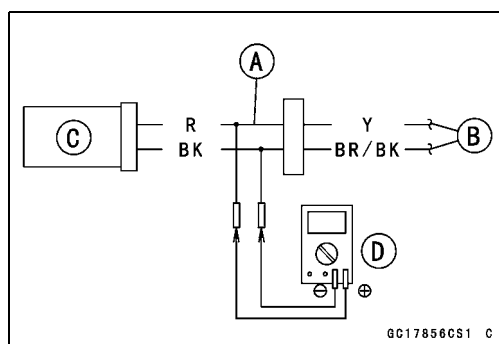
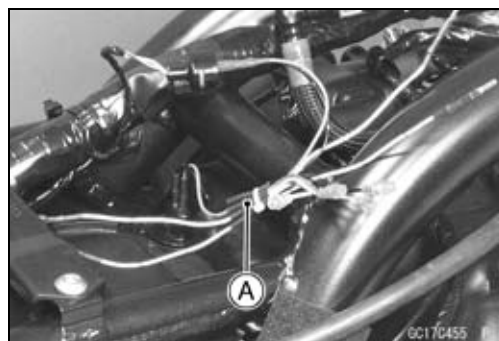
- Measure the output voltage with the engine stopped and the connector joined.
- Turn the ignition switch ON.

##### Output Voltage

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

##### NOTE

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



## Inlet Air Temperature Sensor (Service Code 13)

- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

### Wiring Inspection

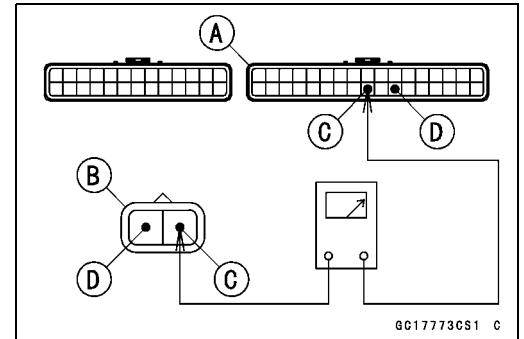
ECU Connector [A] ↔

Inlet Air Temperature Sensor Connector [B]

Y lead (ECU terminal 26) [C]

BR/BK lead (ECU terminal 28) [D]

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



### Inlet Air Temperature Sensor Resistance Inspection

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

#### NOTE

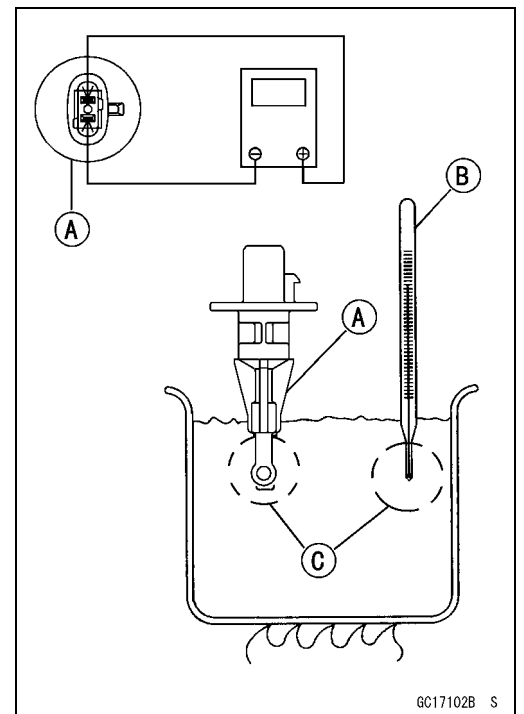
- *The sensor and thermometer must not touch the container side or bottom.*
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the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

#### Inlet Air Temperature Sensor Resistance

Standard: 2.21 ~ 2.69 kΩ at 20°C (68°F)

About 0.322 kΩ at 80°C (176°F)

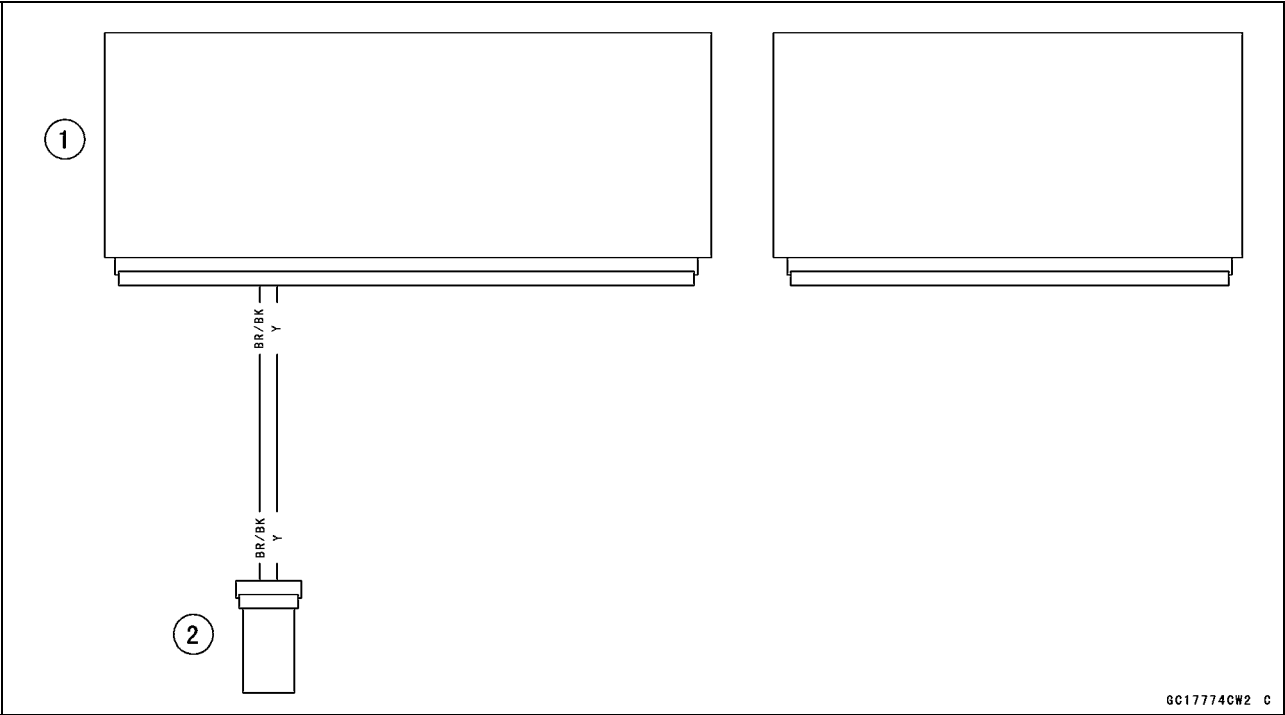
- ★ If the reading is out of the standard, replace the sensor.
- ★ If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).



3-56 FUEL SYSTEM (DFI)

Inlet Air Temperature Sensor (Service Code 13)

Inlet Air Temperature Sensor Circuit



- 1. ECU
- 2. Inlet Air Temperature Sensor

## Water Temperature Sensor (Service Code 14)

### Water Temperature Sensor Removal/Installation

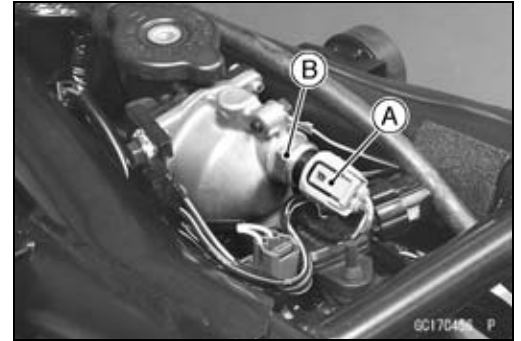
#### CAUTION

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

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  - Connector [A] (Disconnect)
  - Water Temperature Sensor [B]
- Replace the gasket with a new one, and tighten the water temperature sensor.

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

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



### Water Temperature Sensor Output Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

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

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

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

#### Water Temperature Sensor Output Voltage

##### Connections to Adapter:

**Digital Meter (+) → R (sensor O) lead**

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

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

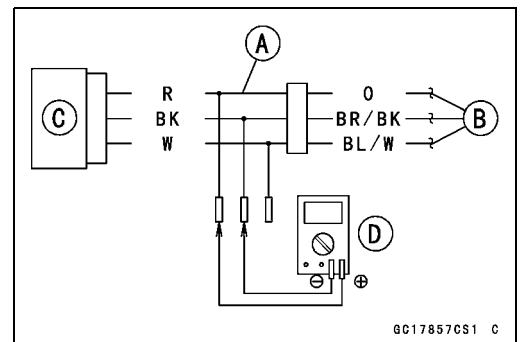
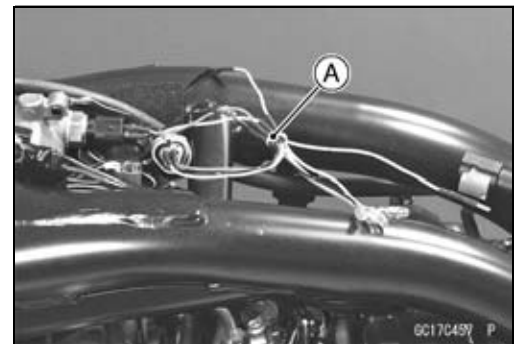
#### Output Voltage

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

#### NOTE

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

- Turn the ignition switch OFF.
- ★If the reading is within the standard, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).
- ★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



## 3-58 FUEL SYSTEM (DFI)

### Water Temperature Sensor (Service Code 14)

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Inspection

ECU Connector [A] ↔

Subthrottle Sensor Connector [B]

O lead (ECU terminal 9) [C]

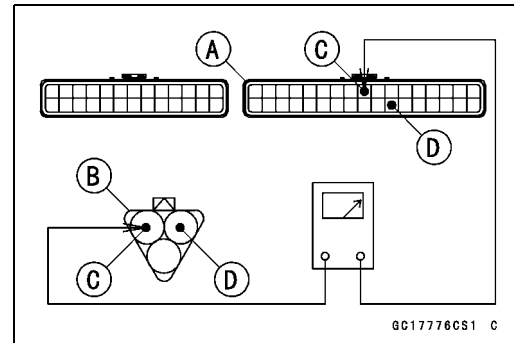
BR/BK lead (ECU terminal 28) [D]

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

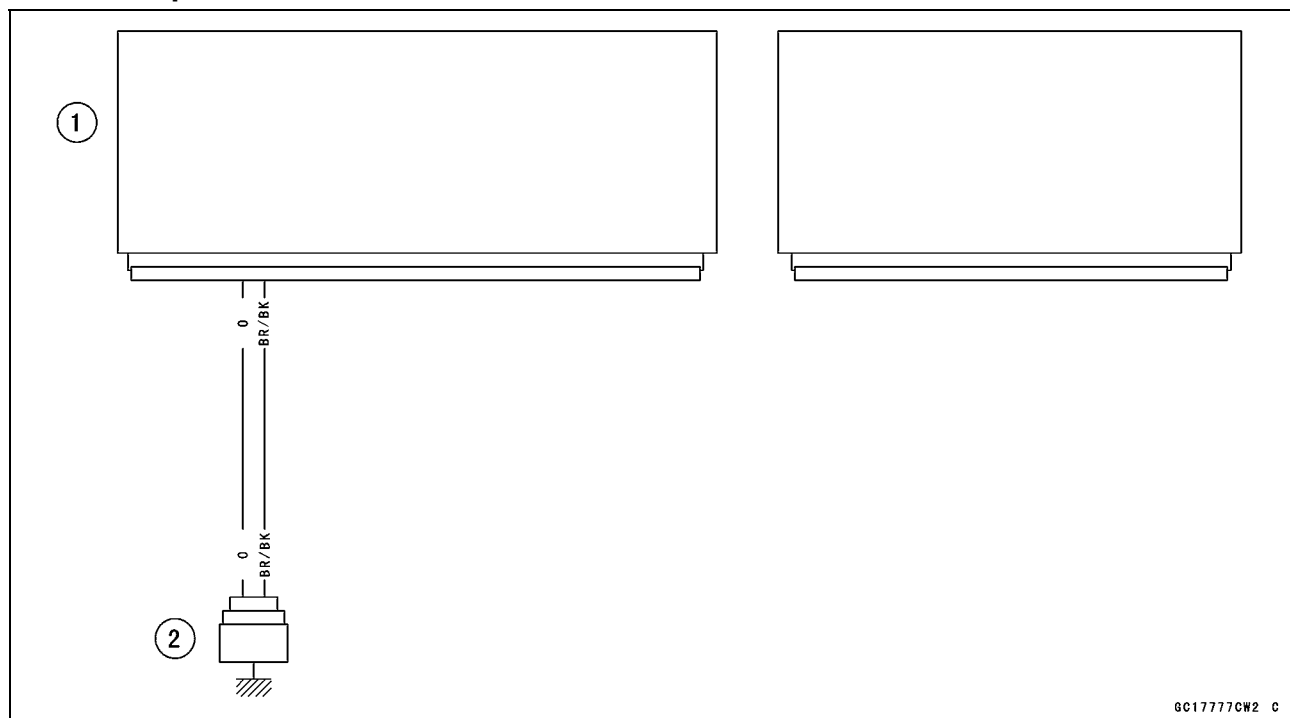
#### Water Temperature Sensor Resistance Inspection

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

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



#### Water Temperature Sensor Circuit



1. ECU

2. Water Temperature Sensor

## Atmospheric Pressure Sensor (Service Code 15)

### Atmospheric Pressure Sensor Removal

#### CAUTION

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

- Remove:  
Left Seat Cover (see Seat Cover Removal in the Frame chapter)  
Sensor Connector [A] (Disconnect)
- Remove the atmospheric pressure sensor [B] from the rubber damper in the frame.



### Atmospheric Pressure Sensor Installation

#### NOTE

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

- Installation is the reverse of removal.

### Atmospheric Pressure Sensor Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

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



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

- Connect a digital meter to the harness adapter leads.

#### Atmospheric Pressure Sensor Input Voltage

##### Connections to Adapter:

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

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

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

#### Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

### 3-60 FUEL SYSTEM (DFI)

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

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

○ Disconnect the ECU and sensor connectors.

##### Wiring Inspection

ECU Connector [A] ↔

Atmospheric Pressure Sensor Connector [B]

BL lead (ECU terminal 10) [C]

BR/BK lead (ECU terminal 28) [D]

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

#### Atmospheric Pressure Sensor Output Voltage Inspection

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

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

##### Atmospheric Pressure Sensor Output Voltage

Connections to Adapter:

Digital Meter (+) → G/W (sensor G/W) lead

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

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

##### Output Voltage

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

##### NOTE

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

- Turn the ignition switch OFF.
  - ★ If the reading is out of the usable range, replace the sensor.
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connector.
- Disconnect the ECU and sensor connectors.

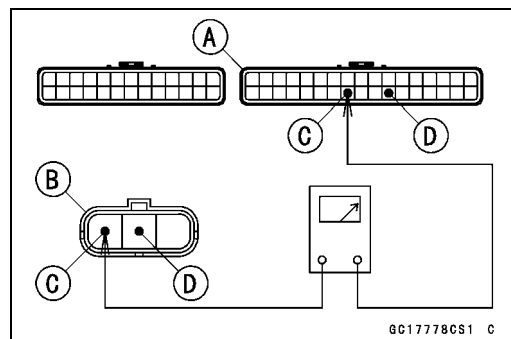
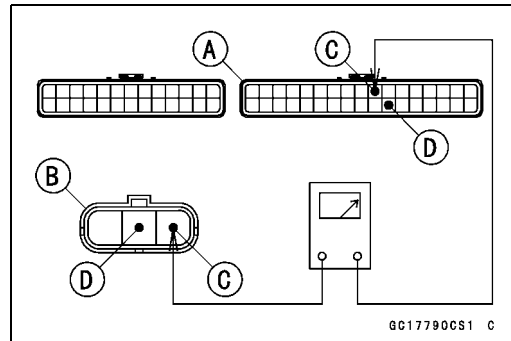
##### Wiring Inspection

ECU Connector [A] ↔

Atmospheric Pressure Sensor Connector [B]

G/W lead (ECU terminal 25) [C]

BR/BK lead (ECU terminal 28) [D]





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

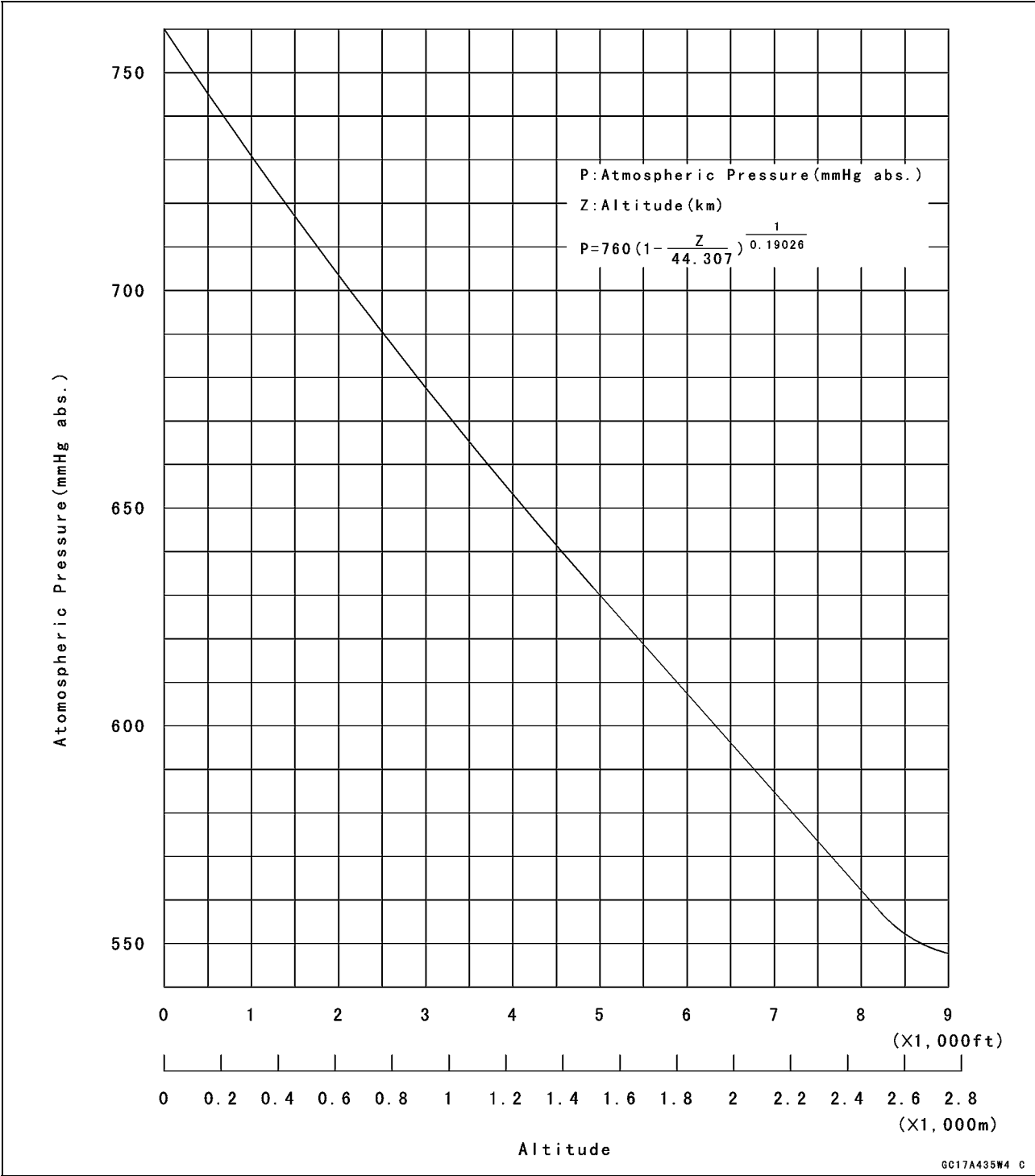
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- ★ If the wiring is good, check the sensor for various vacuum.
- Determine the local altitude (elevation).
- ★ If you know the local altitude, use the chart in this section.
- ★ If you know the local atmospheric pressure using a barometer, substitute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

3-62 FUEL SYSTEM (DFI)

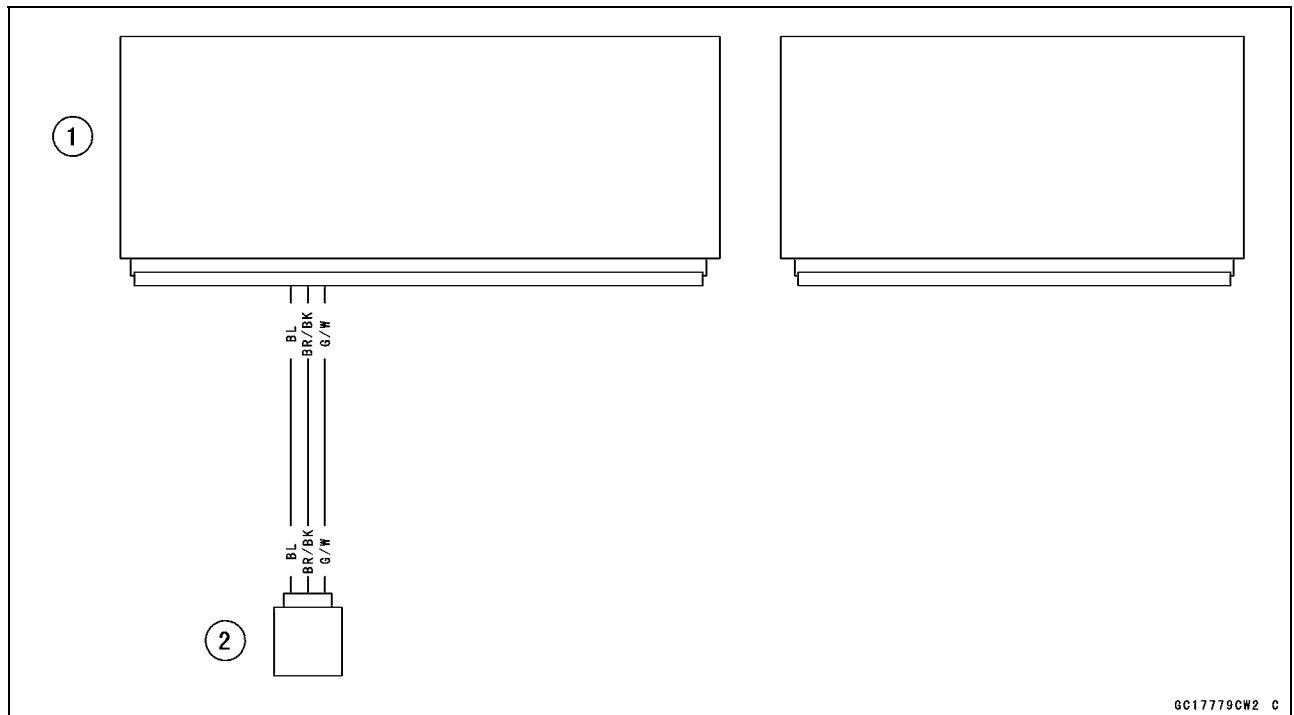
Atmospheric Pressure Sensor (Service Code 15)

Atmospheric Pressure/Altitude Relationship



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

**Atmospheric Pressure Sensor Circuit**



1. ECU

2. Atmospheric Pressure Sensor

## 3-64 FUEL SYSTEM (DFI)

### Crankshaft Sensor (Service Code 21)

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

#### **Crankshaft Sensor Removal/Installation**

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

#### **Crankshaft Sensor Resistance Inspection**

- Refer to the Crankshaft Sensor Inspection in the Electrical System chapter.
- ★ If the reading is within the standard, check the peak voltage (see Crankshaft Sensor Peak Voltage Inspection).

#### **Crankshaft Sensor Peak Voltage Inspection**

- Refer to the Crankshaft Sensor Peak Voltage Inspection in the Electrical System chapter.
  - ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

#### **Wiring Inspection**

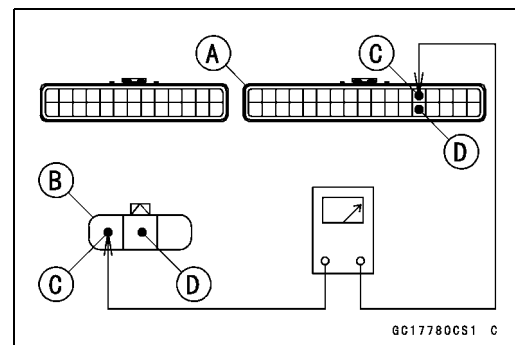
**ECU Connector [A] ←→**

**Crankshaft Sensor Connector [B]**

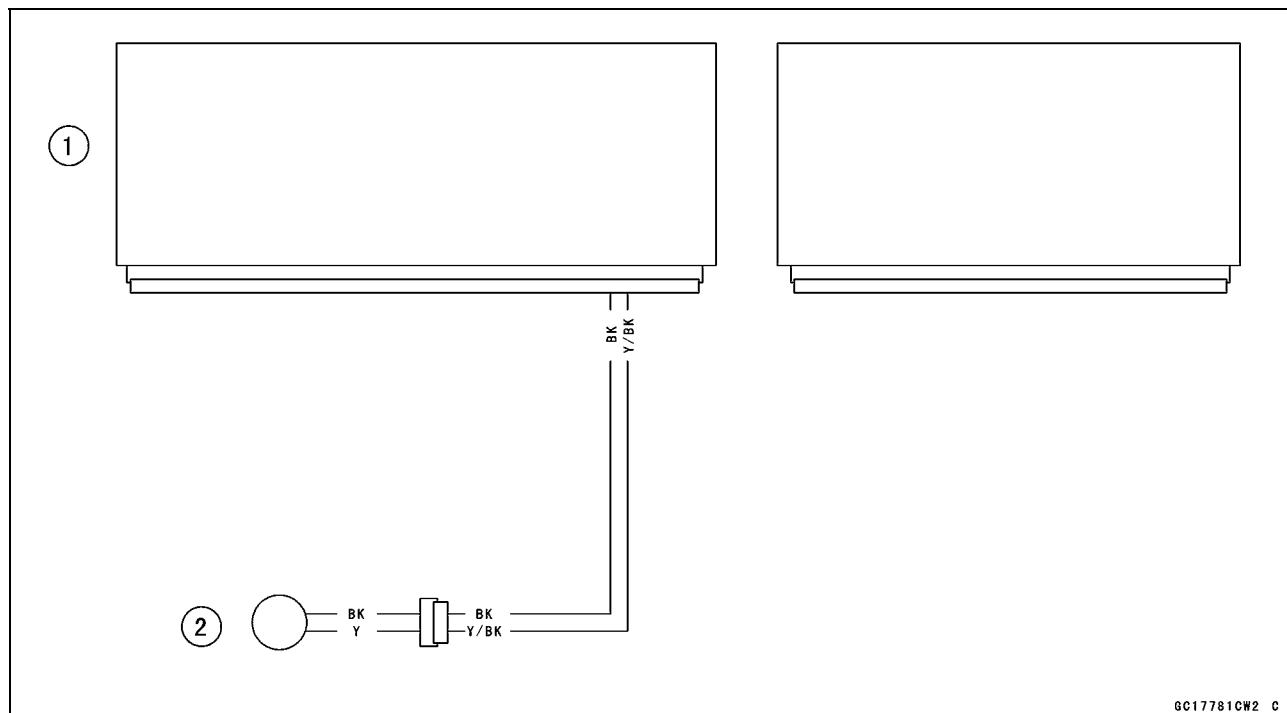
**Y/BK lead (ECU terminal 13) [C]**

**BK lead (ECU terminal 30) [D]**

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



#### **Crankshaft Sensor Circuit**



1. ECU
2. Crankshaft Sensor

## Camshaft Position Sensor (Service Code 23)

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

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

### Camshaft Position Sensor Removal/Installation

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

### Camshaft Position Sensor Resistance Inspection

- Refer to the Camshaft Position Sensor Inspection in the Electrical System chapter.
- ★ If the reading is within the standard, check the peak voltage (see Camshaft Position Sensor Peak Voltage Inspection).

### Camshaft Position Sensor Peak Voltage Inspection

- Refer to the Camshaft Position Sensor Peak Voltage Inspection in the Electrical System chapter.
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Inspection

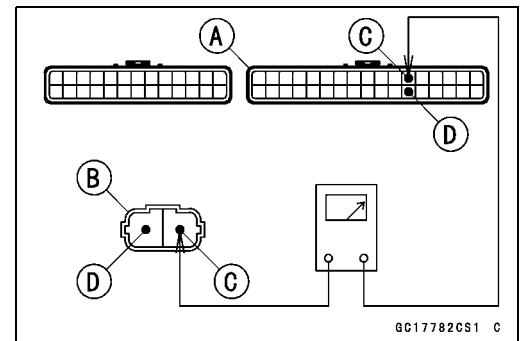
ECU Connector [A] ↔

Camshaft Position Sensor Connector [B]

Y/R lead (ECU terminal 12) [C]

BR/W lead (ECU terminal 29) [D]

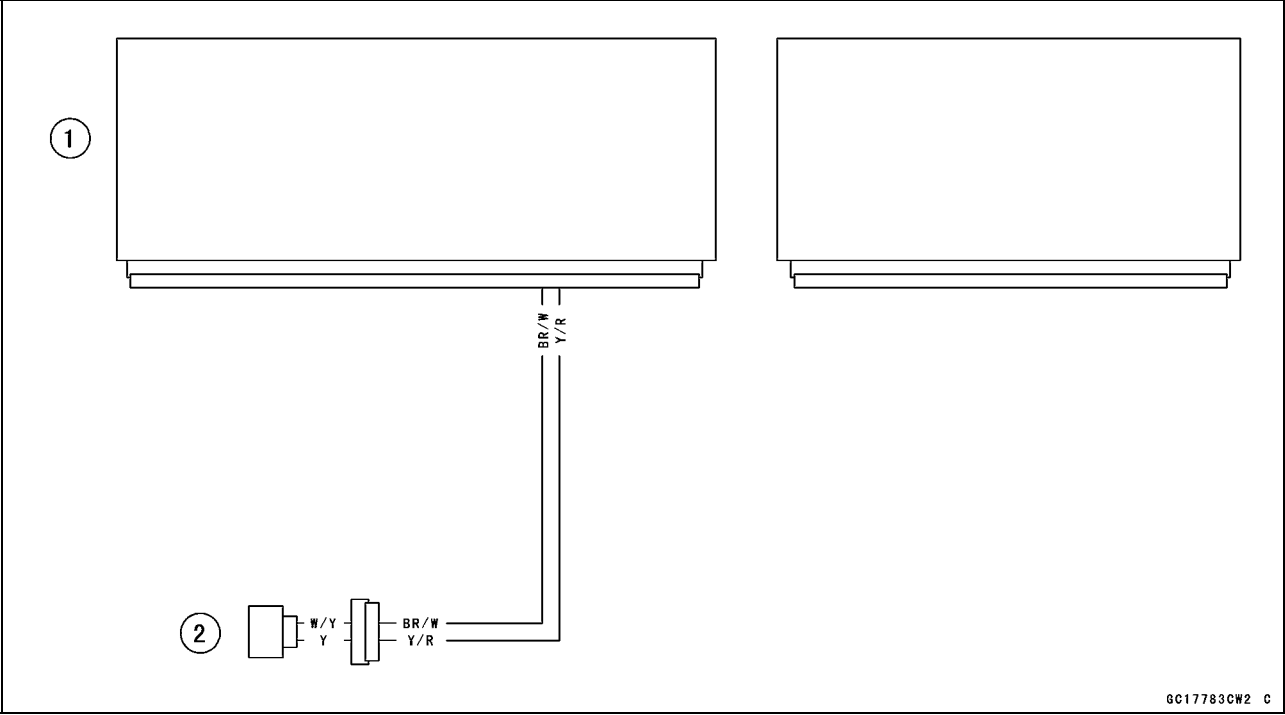
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



### 3-66 FUEL SYSTEM (DFI)

#### Camshaft Position Sensor (Service Code 23)

##### Camshaft Position Sensor Circuit



- 1. ECU
- 2. Camshaft Position Sensor

## Speed Sensor (Service Code 24, 25)

### Speed Sensor Removal/Installation

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

### Speed Sensor Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the speed sensor connector and connect the harness adapter [A] between these connectors.

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

- Connect a digital meter to the harness adapter leads.

#### Speed Sensor Input Voltage

##### Connections to Adapter:

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

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

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

#### Input Voltage

**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the output voltage (see Speed Sensor Output Voltage Inspection).
- ★ If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Inspection

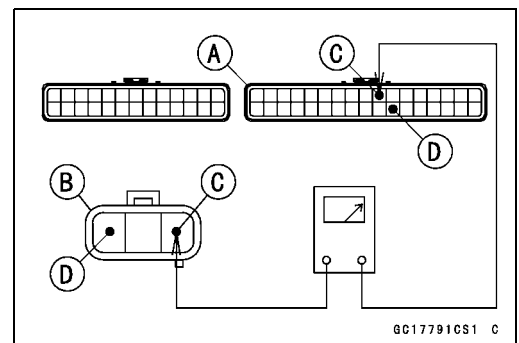
**ECU Connector [A] ↔**

**Speed Sensor Connector [B]**

**BL lead (ECU terminal 10) [C]**

**BR/BK lead (ECU terminal 28) [D]**

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



## 3-68 FUEL SYSTEM (DFI)

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

#### Speed Sensor Output Voltage Inspection

- Raise the rear wheel off the ground with the stand.
- Measure the output voltage at the speed sensor in the same way as input voltage inspection, note the following.
- Disconnect the speed sensor connector and connect the harness adapter [A] between these connectors.

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

#### Speed Sensor Output Voltage Connections to Adapter:

**Digital Meter (+) → BL/Y (sensor P) lead**

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

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

#### Output Voltage

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

#### NOTE

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

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, replace the sensor.
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Inspection

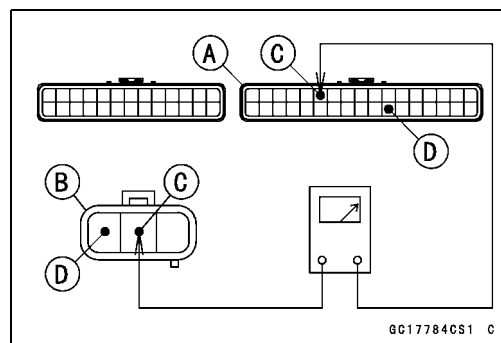
**ECU Connector [A] ↔**

**Speed Sensor Connector [B]**

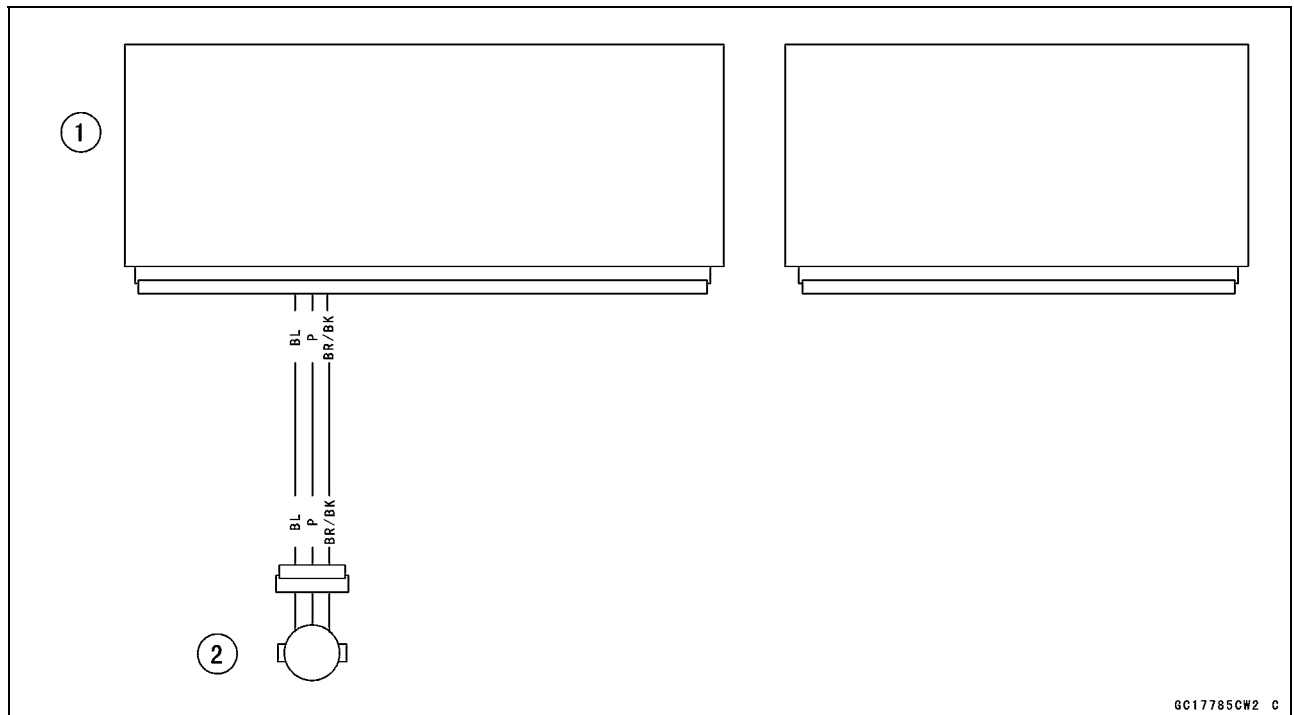
**P lead (ECU terminal 6) [C]**

**BR/BK lead (ECU terminal 28) [D]**

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





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

- 1. ECU
- 2. Speed Sensor

## 3-70 FUEL SYSTEM (DFI)

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

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

Hall IC [B]

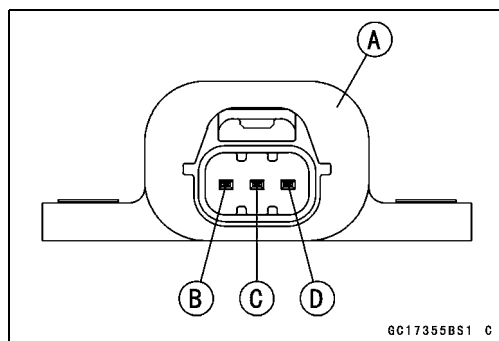
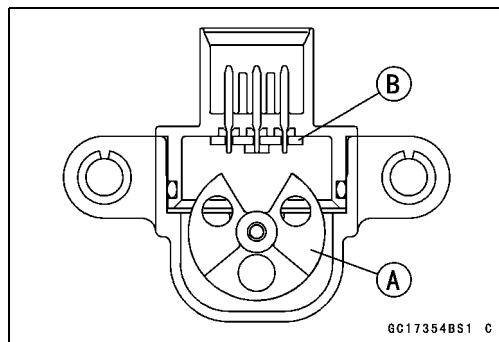
When the motorcycle is down, the ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON.

Vehicle-down Sensor [A]

Ground Terminal BR/BK [B]

Output Terminal Y/G [C]

Power Source Terminal BL [D]

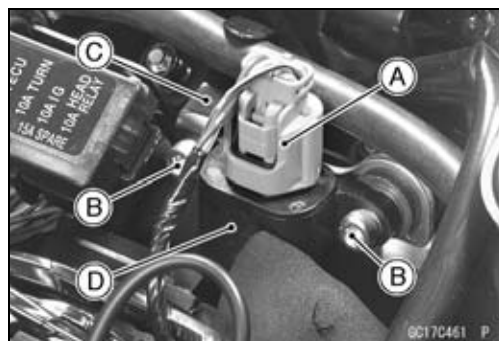


### Vehicle-down Sensor Removal

#### CAUTION

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

- Remove:
  - Rear Seat (see Rear Seat Removal in the Frame chapter)
  - Connector [A] (Disconnect)
  - Bolts [B] and Clamp [C]
  - Vehicle-down Sensor [D]



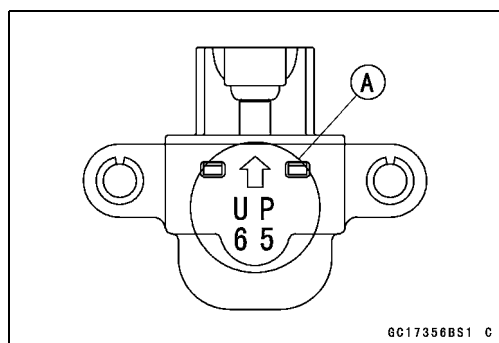
### Vehicle-down Sensor Installation

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

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

#### ⚠ WARNING

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



## Vehicle-down Sensor (Service Code 31)

### Vehicle-down Sensor Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

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

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

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

#### Vehicle-down Sensor Input Voltage

##### Connections to Adapter:

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

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

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

#### Input Voltage

**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the output voltage (see Vehicle-down Sensor Output Voltage Inspection).
- ★ If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness side connectors.

#### Wiring Inspection

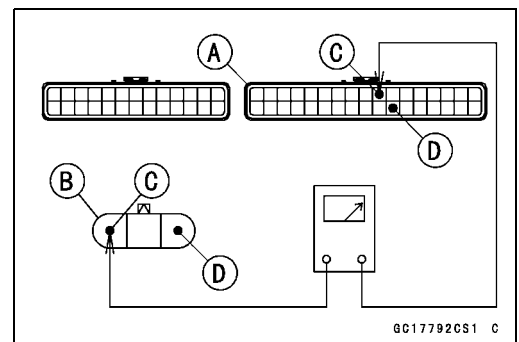
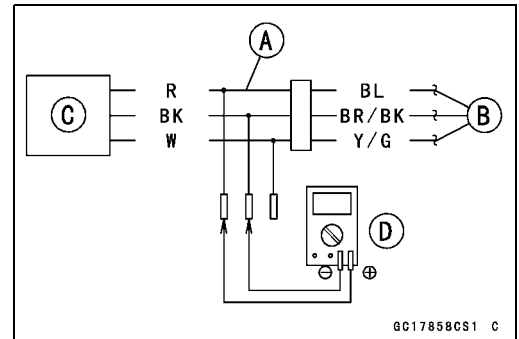
**ECU Connector [A] ↔**

**Vehicle-down Sensor Connector [B]**

**BL lead (ECU terminal 10) [C]**

**BR/BK lead (ECU terminal 28) [D]**

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



## 3-72 FUEL SYSTEM (DFI)

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

#### Vehicle-down Sensor Output Voltage Inspection

- Remove the vehicle-down sensor (see Vehicle-down Sensor Removal).
- Connect the harness adapter [A] to the vehicle-down sensor connectors as shown in the figure.

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

Main Harness [B]

Vehicle-down Sensor [C]

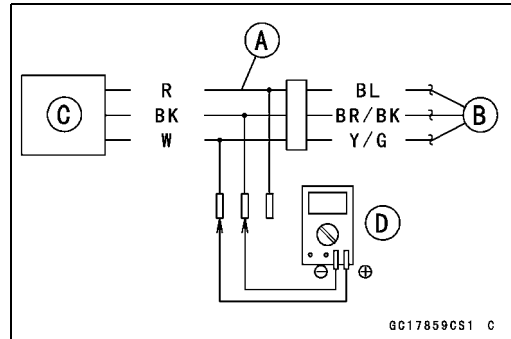
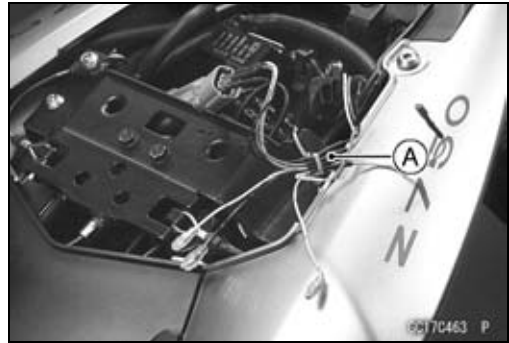
- Connect a digital meter [D] to the harness adapter leads.

#### Vehicle-down Sensor Output Voltage

**Connections to Adapter:**

**Digital Meter (+) → W (sensor Y/G) lead**

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



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

#### Output Voltage

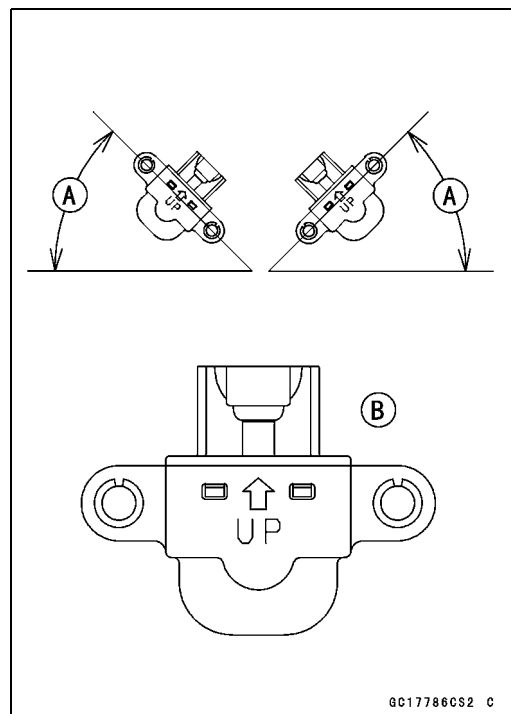
**Standard:** With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V

With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V

#### NOTE

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

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, replace the sensor.



## Vehicle-down Sensor (Service Code 31)

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

○ Disconnect the ECU and sensor connectors.

### Wiring Inspection

ECU Connector [A] ↔

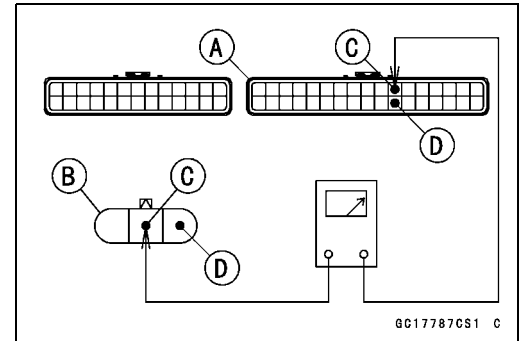
Vehicle-down Sensor Connector [B]

Y/G lead (ECU terminal 11) [C]

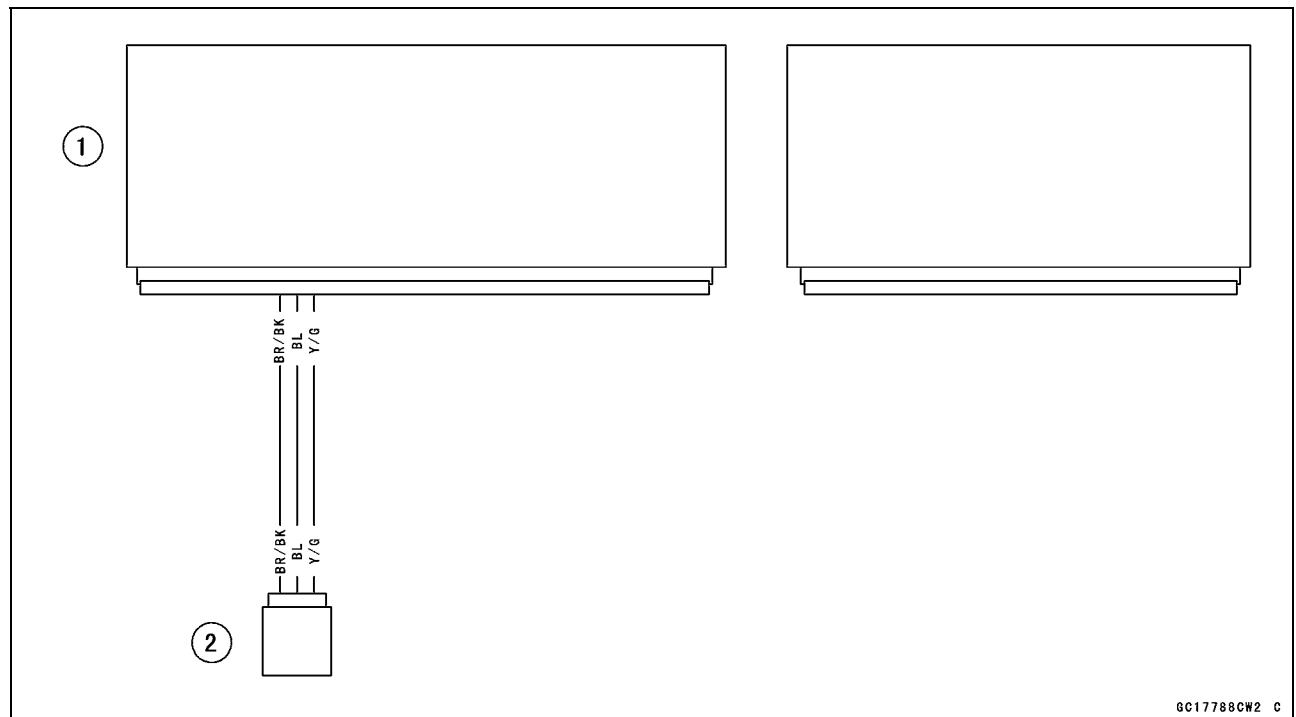
BR/BK lead (ECU terminal 28) [D]

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

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



## Vehicle-down Sensor Circuit



1. ECU

2. Vehicle-down Sensor

## 3-74 FUEL SYSTEM (DFI)

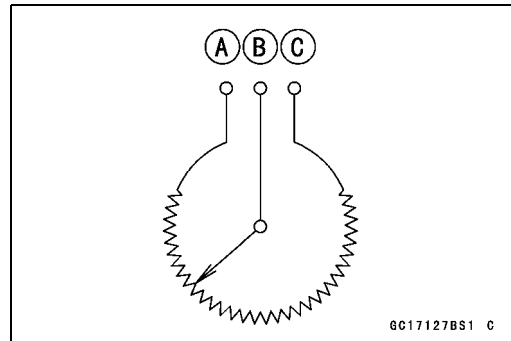
### Subthrottle Sensor (Service Code 32)

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

Input Terminal [A]

Output Terminal [B]

Ground Terminal [C]

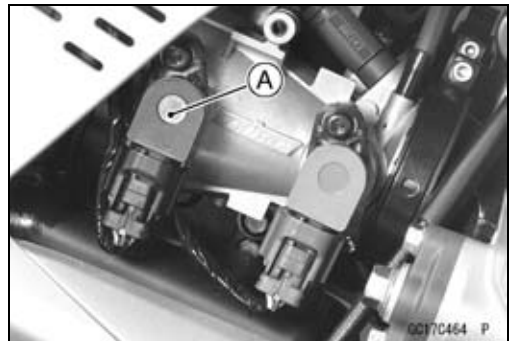


### Subthrottle Sensor Removal/Adjustment

#### 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 throttle body assy, especially on a hard surface. Such a shock to the subthrottle sensor can damage it.**



### Subthrottle Sensor Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the subthrottle sensor and connect the harness adapter [A] between these connectors.

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

- Connect a digital meter to the harness adapter leads.

#### Subthrottle Sensor Input Voltage

##### Connections to Adapter:

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

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

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

#### Input Voltage

**Standard: DC 4.75 ~ 5.25 V**

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



## Subthrottle Sensor (Service Code 32)

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

○ Disconnect the ECU and sensor connectors.

### Wiring Inspection

ECU Connector [A] ↔

Subthrottle Sensor Connector [B]

BL lead (ECU terminal 10) [C]

BR/BK lead (ECU terminal 28) [D]

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

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

### Subthrottle Sensor Output Voltage Inspection

● Measure the output voltage at the subthrottle sensor in the same way as input voltage inspection. Note the following.

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

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

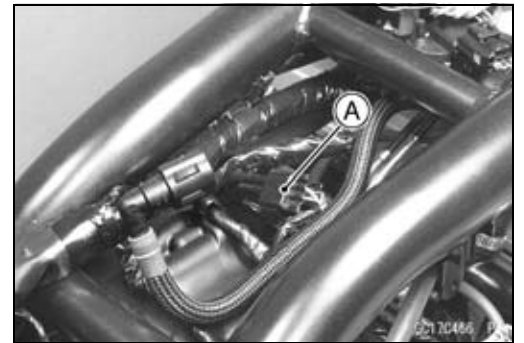
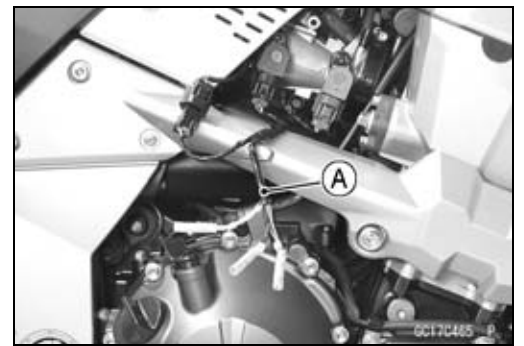
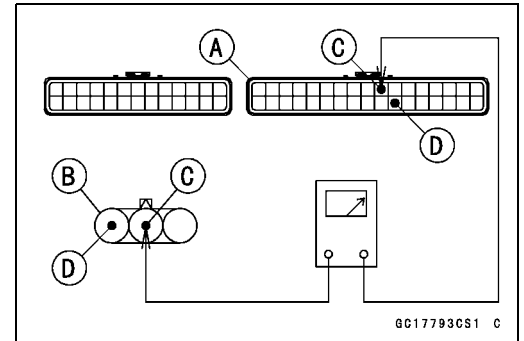
### Subthrottle Sensor Output Voltage

Connections to Adapter:

Digital Meter (+) → R (sensor BR) lead

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

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the subthrottle valve actuator harness connector [A].



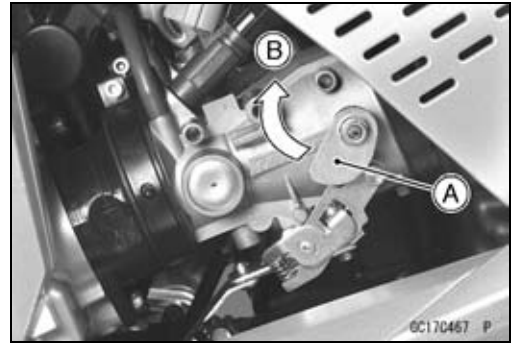
## 3-76 FUEL SYSTEM (DFI)

### Subthrottle Sensor (Service Code 32)

- Measure the output voltage with the engine stopped with the connector joined.
- Turn the ignition switch ON.
- Measure the output voltage when the subthrottle valve is completely closed by turning the lever [A] fully clockwise [B].

#### Output Voltage

**Standard:** DC 0.48 ~ 0.52 V at idle throttle opening  
DC 3.8 ~ 4.0 V at full throttle opening (for reference)



#### NOTE

- Turn the lever counterclockwise, confirm the output voltage will be raise.
  - The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.
  - When the input voltage reading shows other than 5 V, derive a voltage range as follows.  
*Example:*  
In the case of a input voltage of 4.75 V.  
 $0.48 \times 4.75 \div 5.00 = 0.46 \text{ V}$   
 $0.52 \times 4.75 \div 5.00 = 0.49 \text{ V}$   
Thus, the valid range is 0.46 ~ 0.49 V
- ★ If the reading is out of the standard, check the subthrottle sensor resistance (see Subthrottle Sensor Resistance Inspection).
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

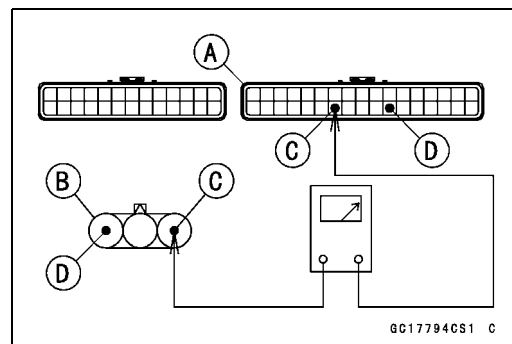
#### Wiring Inspection

**ECU Connector [A] ↔**

**Subthrottle Sensor Connector [B]**

**BR lead (ECU terminal 24) [C]**

**BR/BK lead (ECU terminal 28) [D]**



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

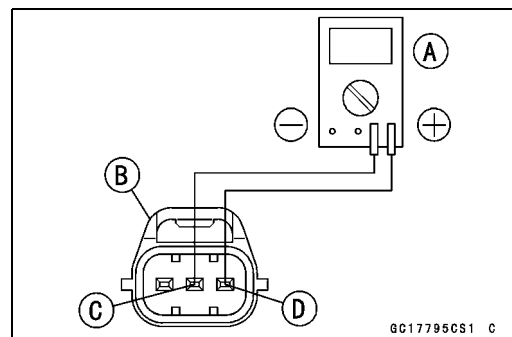
#### Subthrottle Sensor Resistance Inspection

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

#### Subthrottle Sensor Resistance

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

**Standard:** 4 ~ 6 kΩ

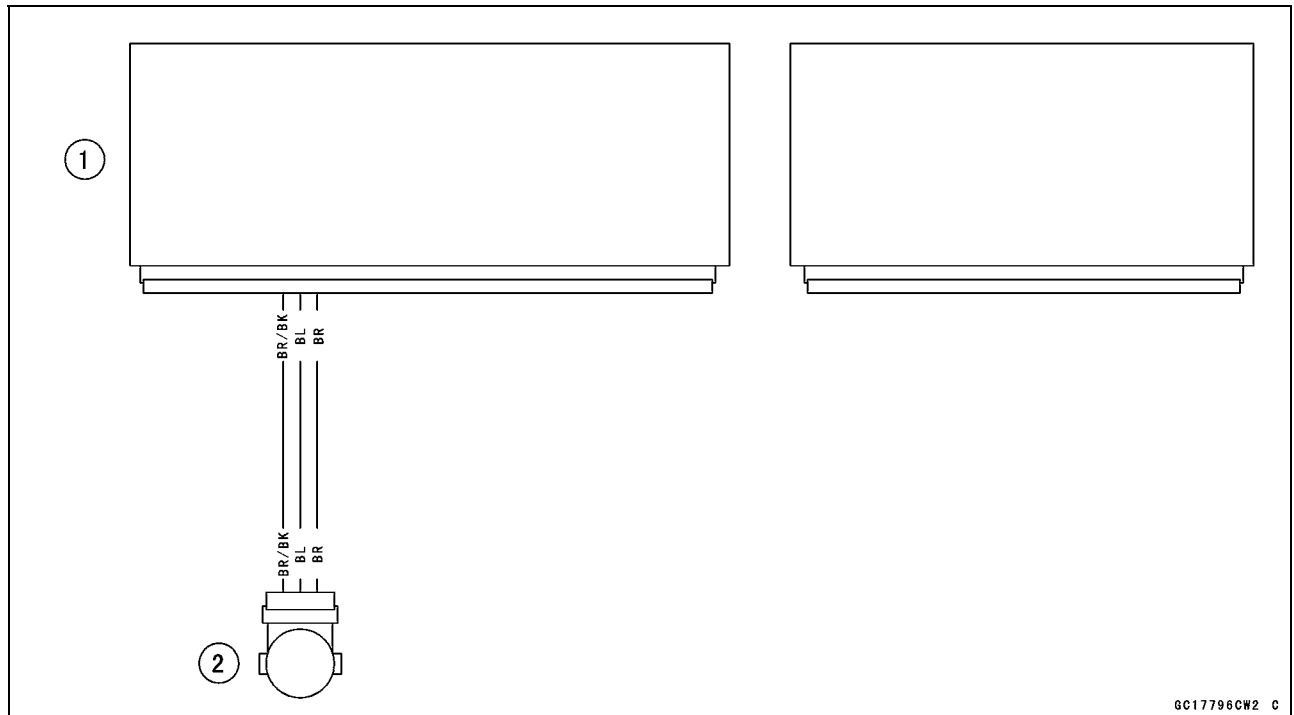


- ★ If the reading is out of the standard, replace the throttle body assy.
- ★ If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).



**Subthrottle Sensor (Service Code 32)**

**Subthrottle Sensor Circuit**



1. ECU

2. Subthrottle Sensor

## 3-78 FUEL SYSTEM (DFI)

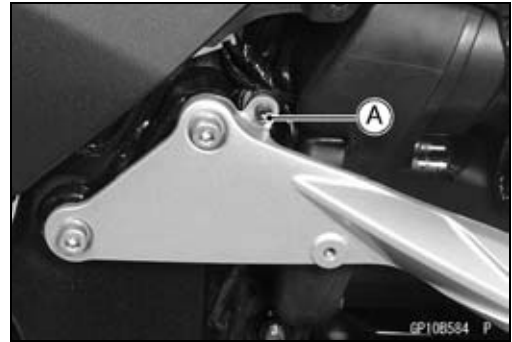
### Oxygen Sensor - not activated (Service Code 33 (Equipped Models))

#### **Oxygen Sensor Removal/Installation**

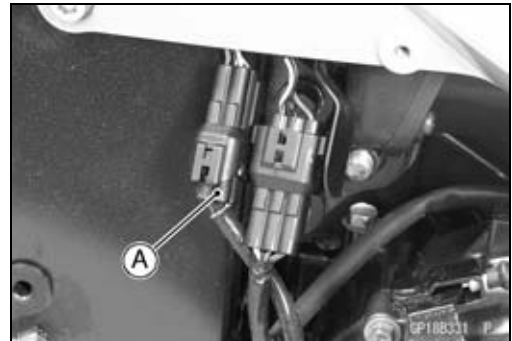
- Refer to the Oxygen Sensor Removal/Installation in the Electrical System chapter.

#### **Oxygen Sensor Inspection**

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch OFF.
- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Bolt [A]



- Pull the oxygen sensor lead connector [A], crankshaft sensor lead connector and bracket downward.



- Disconnect the oxygen sensor lead connector (4 pins connector) and connect the harness adapter [A] between these connectors.

**Special Tool - Oxygen Sensor Measuring Adapter: 57001-1682**

- Connect a digital meter to the harness adapter leads.

#### **Oxygen Sensor Output Voltage**

##### **Connections to Adapter:**

**Digital Meter (+) → BL/Y (sensor BL) lead**

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

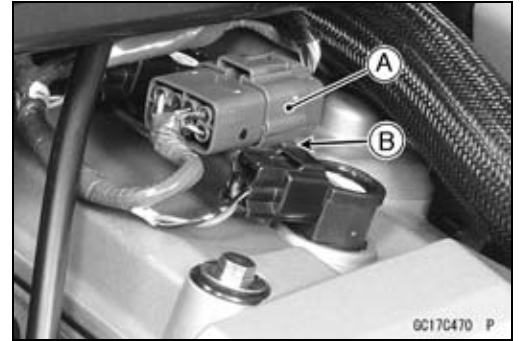


- Remove the fuel tank (see Fuel Tank Removal).
- Separate the hose [A] from the air cleaner housing.



## Oxygen Sensor - not activated (Service Code 33 (Equipped Models))

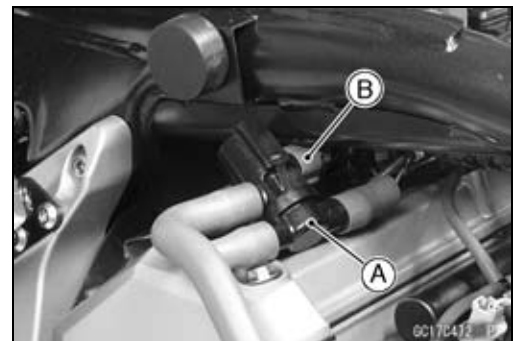
- Remove the connector [A] from the clamp [B].



- Separate the hoses [A] from the air suction valve covers.



- Pull the air switching valve [A] and hoses out to the left side of the motorcycle.
- Do not disconnect the air switching valve connector [B].

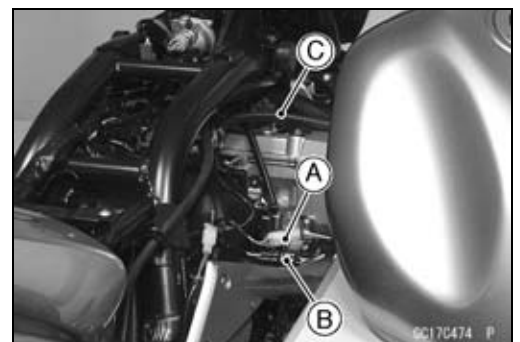


- Install the suitable plugs [A] on the fitting of the air suction valve covers, and shut off the secondary air.



- Remove the fuel outlet hose (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Connect the following parts temporary.
  - Fuel Pump Lead Connector [A]
  - Fuel Level Sensor Lead Connector [B]
  - Extension Tube [C]

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



### 3-80 FUEL SYSTEM (DFI)

#### Oxygen Sensor - not activated (Service Code 33 (Equipped Models))

- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

##### Output Voltage (with Plugs)

Standard: DC 0.7 V or more

- Next, remove the plugs from the fittings [A] with idling.
- Measure the output voltage with the connector joined.

##### Output Voltage (without Plugs)

Standard: DC 0.2 V or less

- Turn the ignition switch OFF.



- ★ If the reading is out of the standard (with plugs: 0.7 V or more, without plugs: 0.2 V or less), remove the ECU and check the wiring for continuity between main harness side connectors.

○ Disconnect the ECU and sensor connectors.

##### Wiring Inspection

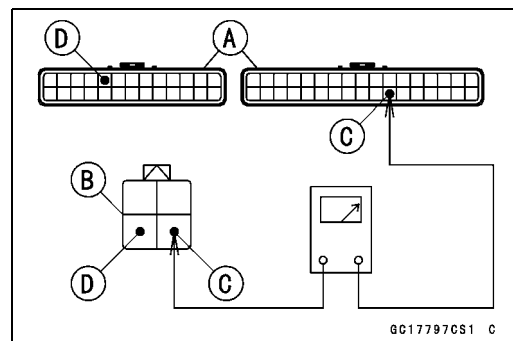
ECU Connectors [A] ←→

Oxygen Sensor Connector [B]

BR/BK lead (ECU terminal 28) [C]

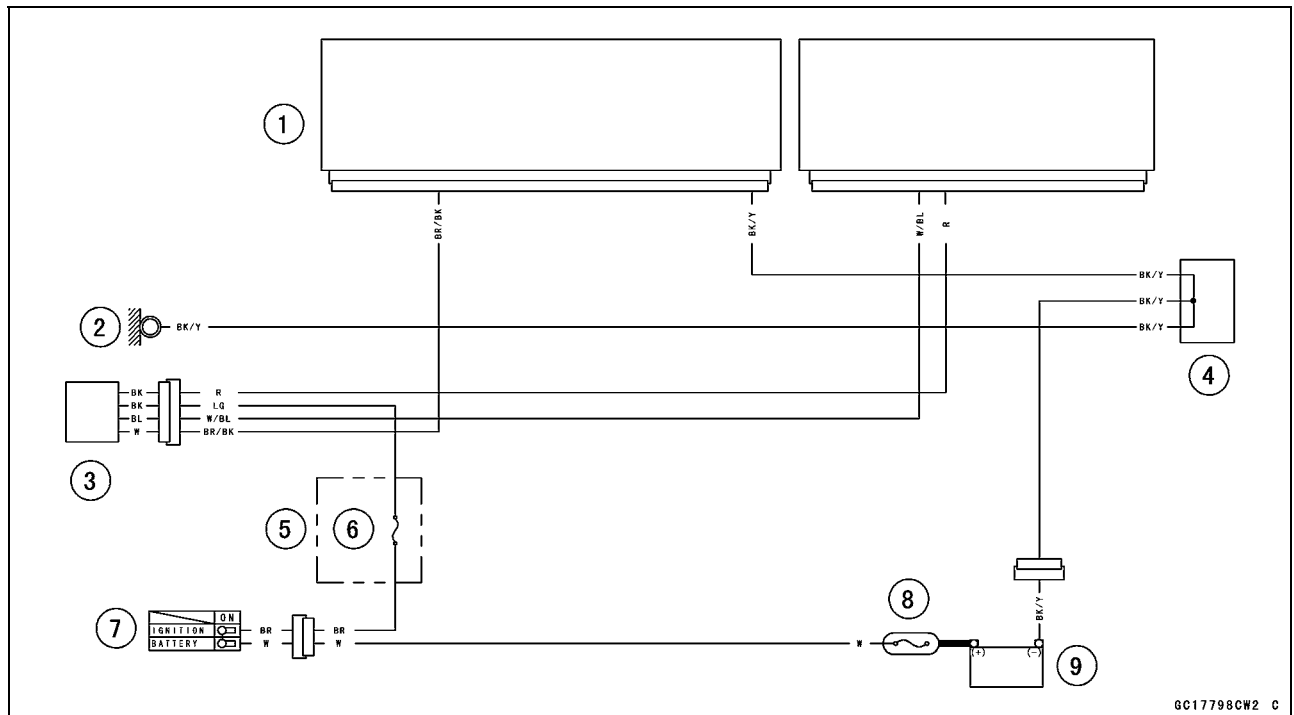
W/BL lead (ECU terminal 39) [D]

- ★ If the wiring is good, replace the sensor.
- ★ If the reading is within the standard (with plugs: 0.7 V or more, without plugs: 0.2 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



## Oxygen Sensor - not activated (Service Code 33 (Equipped Models))

## Oxygen Sensor Circuit



1. ECU
2. Meter Ground
3. Oxygen Sensor
4. Water-proof Joint C
5. Fuse Box 1
6. Oxygen Sensor Heater Fuse 10 A
7. Ignition Switch
8. Main Fuse 30 A
9. Battery 12 V 8 Ah

## 3-82 FUEL SYSTEM (DFI)

### Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

#### Exhaust Butterfly Valve Actuator Sensor Removal/Installation

The exhaust butterfly valve actuator sensor is built in the exhaust butterfly valve actuator. So, the sensor itself can not be removed. Remove the exhaust butterfly valve actuator (see Exhaust Butterfly Valve Actuator Removal).

#### Exhaust Butterfly Valve Actuator Sensor Input Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the exhaust butterfly valve actuator sensor lead connector (3 pins connector) [A] and connect the harness adapter [B] between these connector.

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

- Connect a digital meter to the harness adapter leads.

#### Exhaust Butterfly Valve Actuator Sensor Input Voltage Connections to Adapter:

**Digital Meter (+) → Y/W (actuator W) lead**

**Digital Meter (-) → BK/BL (actuator BK) lead**

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

#### Input Voltage

**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the output voltage (see Exhaust Butterfly Valve Actuator Sensor Output Voltage Inspection).
- ★ If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Inspection

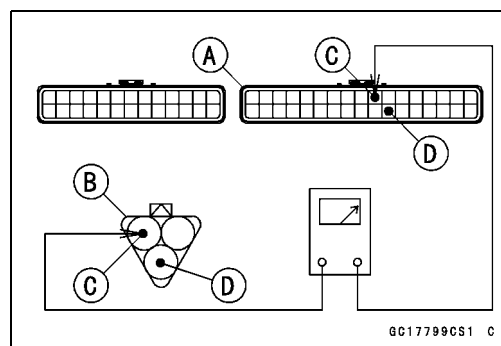
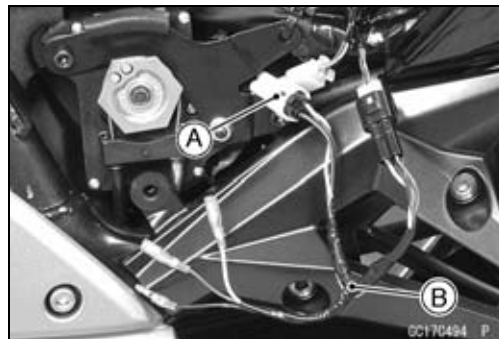
**ECU Connector [A] ↔**

**Exhaust Butterfly Valve Actuator Sensor Connector [B]**

**BL lead (ECU terminal 10) [C]**

**BR/BK lead (ECU terminal 28) [D]**

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



## Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

### Exhaust Butterfly Valve Actuator Sensor Output Voltage Inspection

#### NOTE

○ Before this inspection, confirm the pulley [A] is original position (see Exhaust Butterfly Valve Actuator Installation).

- Disconnect:
  - 2 pins Connector [B]
  - 3 pins Connector [C]
- Connect the harness adapter [A] between the 3 pins connectors.

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

- Connect a digital meter to the harness adapter leads.

**Exhaust Butterfly Valve Actuator Sensor Output Voltage Connections to Adapter:**

**Digital Meter (+) → BL (actuator Y) lead**

**Digital Meter (-) → BK/BL (actuator BK) lead**

- Measure the output voltage at the 3 pins connector of the exhaust butterfly valve actuator when the pulley is original position.
- Turn the ignition switch ON.

#### Output Voltage

**Standard: DC 3.46 ~ 3.76 V at pulley original position**

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the exhaust butterfly valve actuator sensor resistance (see Exhaust Butterfly Valve Actuator Sensor Resistance Inspection).
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness side connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Inspection

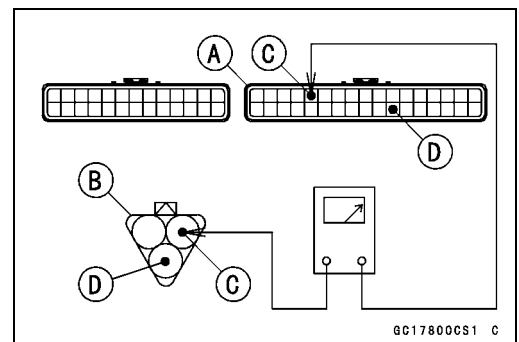
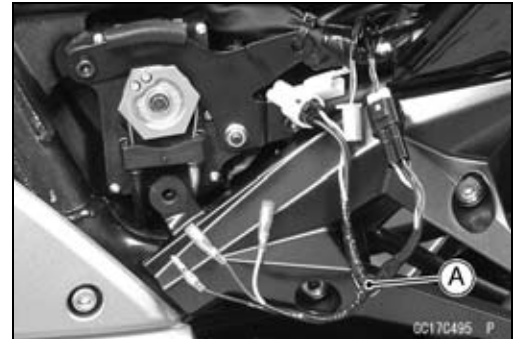
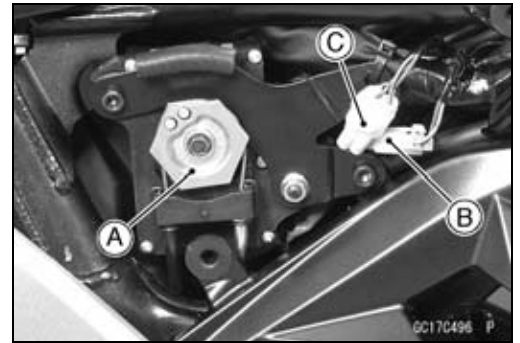
**ECU Connector [A] ↔**

**Exhaust Butterfly Valve Actuator Sensor Connector [B]**

**R/BK lead (ECU terminal 5) [C]**

**BR/BK lead (ECU terminal 28) [D]**

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

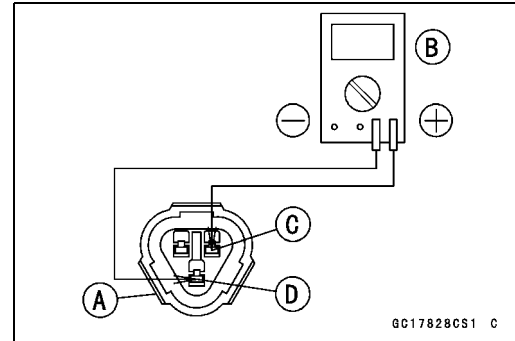


## 3-84 FUEL SYSTEM (DFI)

### Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

#### Exhaust Butterfly Valve Actuator Sensor Resistance Inspection

- Turn the ignition switch OFF.
- Disconnect the exhaust butterfly valve actuator sensor connector (3 pins connector) [A].
- Connect a digital meter [B] to the exhaust butterfly valve actuator sensor connector.
- Measure the exhaust butterfly valve actuator sensor resistance.



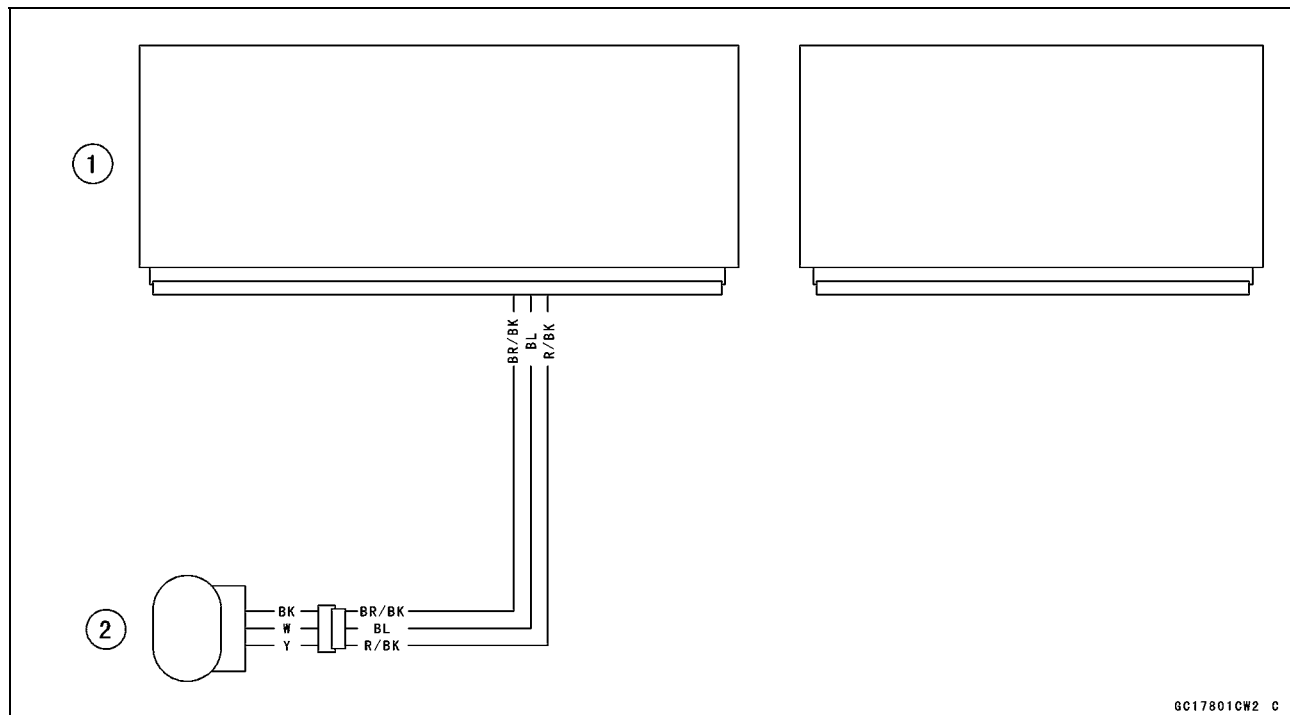
#### Exhaust Butterfly Valve Actuator Sensor Resistance

Connections: W lead [C] ↔ BK lead [D]

Standard: 4 ~ 6 kΩ

- ★ If the reading is out of the standard, replace the exhaust butterfly valve actuator.
- ★ If the reading within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

#### Exhaust Butterfly Valve Actuator Sensor Circuit



1. ECU

2. Exhaust Butterfly Valve Actuator



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

### **Antenna Resistance Inspection**

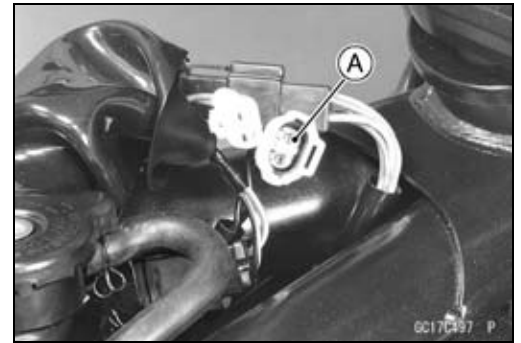
- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the antenna lead connector [A].
- Measure the antenna resistance.

#### **Antenna Resistance**

**Connections:** BK lead ↔ BK lead

**Standard:** About 0.6 ~ 0.9 Ω

- ★ If the reading is out of the standard, replace the antenna (see Immobilizer System Parts Replacement in the Electrical System chapter).
- ★ If the reading is within the standard, check the wiring to the amplifier (see wiring diagram in next section).
- ★ If the wiring is good, check the input voltage of the amplifier (see Amplifier Input Voltage Inspection).



### **Amplifier Input Voltage Inspection**

#### **NOTE**

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the upper fairing (see Upper Fairing Removal in the Frame chapter).
- Do not disconnect the connectors.
- Connect a digital meter to the amplifier connector [A] with needle adapter set.

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

#### **Amplifier Input Voltage**

**Connections to Amplifier Connector:**

**Digital Meter (+) → BR/W lead**

**Digital Meter (–) → BK/Y lead**

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

#### **Input Voltage**

**Standard:** Battery Voltage

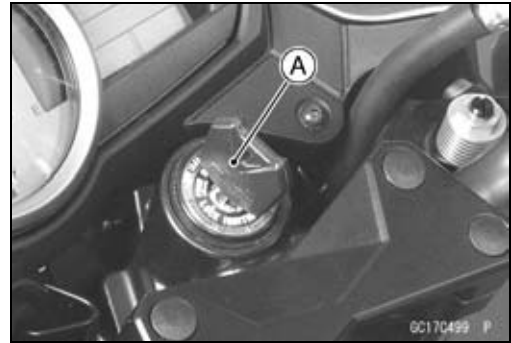
- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the wiring (see wiring diagram in next section).
- ★ If the reading is within the standard, check the wiring to ECU (see wiring diagram in next section).
- ★ If the wiring is good, replace the amplifier (see Immobilizer System Parts Replacement in the Electrical System chapter).



## 3-86 FUEL SYSTEM (DFI)

### Blank Key Detection (Service Code 36 (Equipped Models))

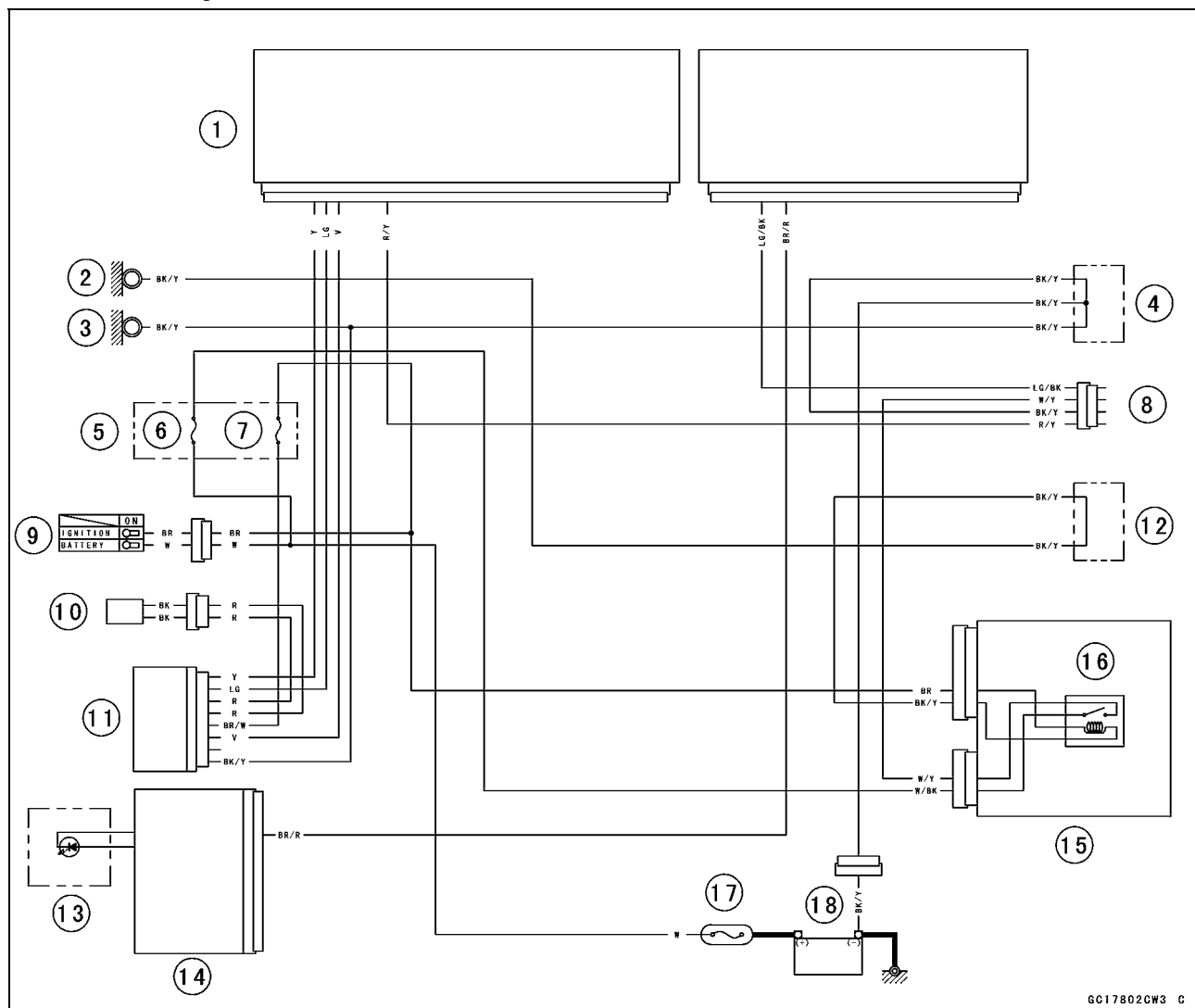
- This code appears in the following conditions.
  - The transponder [A] in the master and/or user key is malfunction.
  - When the spare key of unregistration is used.
  - When the master key is registered in the registered ECU.
- Therefore, the service code 36 will disappear when the above issue is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



#### User Key Inspection

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

#### Immobilizer System Circuit



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

## ECU Communication Error (Service Code 39)

### ECU Communication Line Inspection

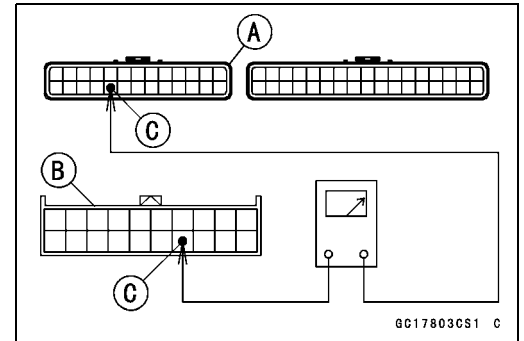
- When the data is not sent from the ECU to the meter unit for more than about 10 seconds, the service code 39 is displayed.
- The service code 39 is detected with meter unit.
- Remove the ECU and meter unit, check the wiring for continuity between main harness side connector.
- Disconnect the ECU and meter unit connectors.

#### Wiring Inspection

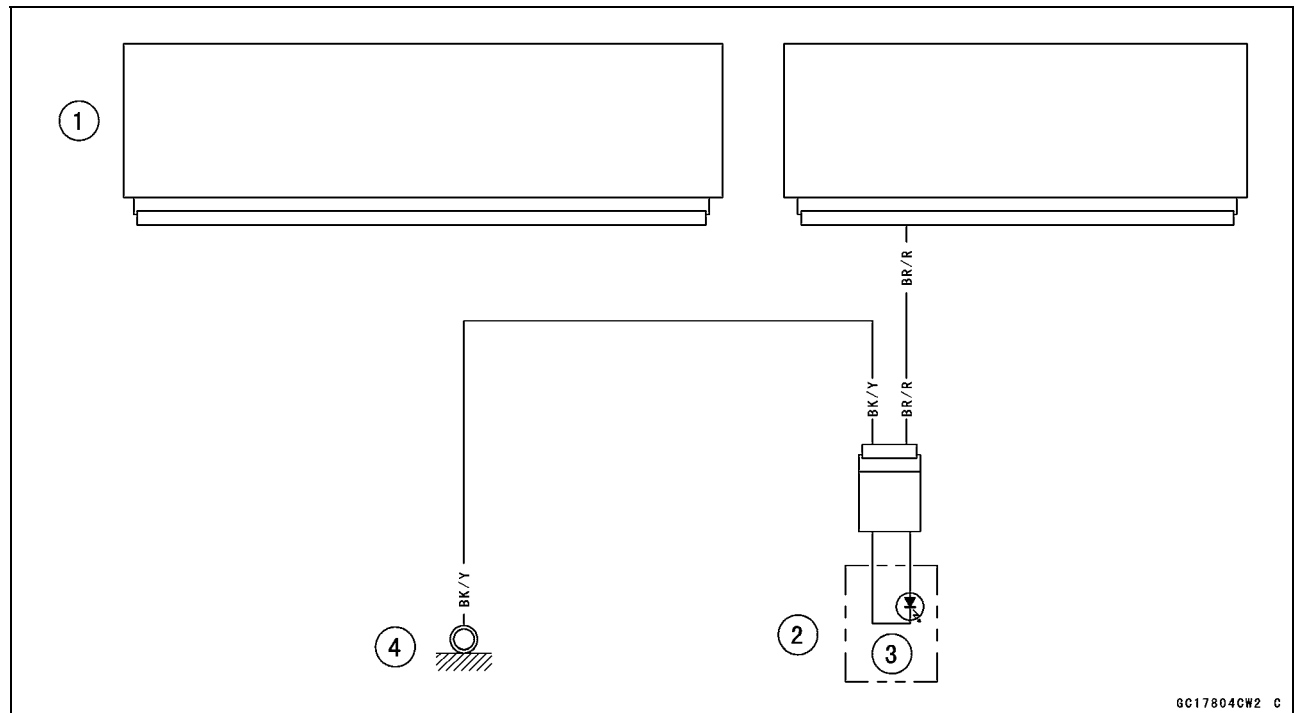
ECU Connector [A] ↔ Meter Unit Connector [B]

BR/R lead (ECU terminal 52) [C]

- ★ If the wiring is good, check the meter unit (see Meter Unit Inspection in the Electrical System chapter).
- ★ If the meter unit is normal, replace the ECU (see ECU Removal/Installation).



### ECU Communication Line Circuit



1. ECU
2. Meter Unit
3. Warning Indicator Light (LED)
4. Meter Ground

## 3-88 FUEL SYSTEM (DFI)

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

Stick Coil #1: Service Code 51

Stick Coil #2: Service Code 52

Stick Coil #3: Service Code 53

Stick Coil #4: Service Code 54

#### Stick Coil Removal/Installation

- Refer to the Stick Coil Removal/Installation in the Electrical System chapter.

#### Stick Coil Primary Winding Resistance Inspection

- Refer to the Stick Coil Inspection in the Electrical System chapter.
- ★ If the reading is within the standard, check the input voltage (see Stick Coil Input Voltage Inspection).

#### Stick Coil Input Voltage Inspection

##### NOTE

○ Be sure the battery is fully charged.

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

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

#### Stick Coil Input Voltage

##### Connections to ECU Connector:

##### For Stick Coil #1

Digital Meter (+) → BK lead (terminal 47)

Digital Meter (-) → BK/Y lead (terminal 59)

##### For Stick Coil #2

Digital Meter (+) → BK/G lead (terminal 46)

Digital Meter (-) → BK/Y lead (terminal 59)

##### For Stick Coil #3

Digital Meter (+) → BK/W lead (terminal 45)

Digital Meter (-) → BK/Y lead (terminal 59)

##### For Stick Coil #4

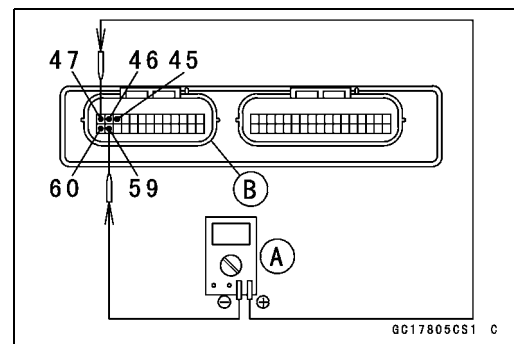
Digital Meter (+) → BK/O lead (terminal 60)

Digital Meter (-) → BK/Y lead (terminal 59)

- Measure the input voltage to each primary winding of the stick coils with the engine stopped, and with the connectors joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

#### Input Voltage

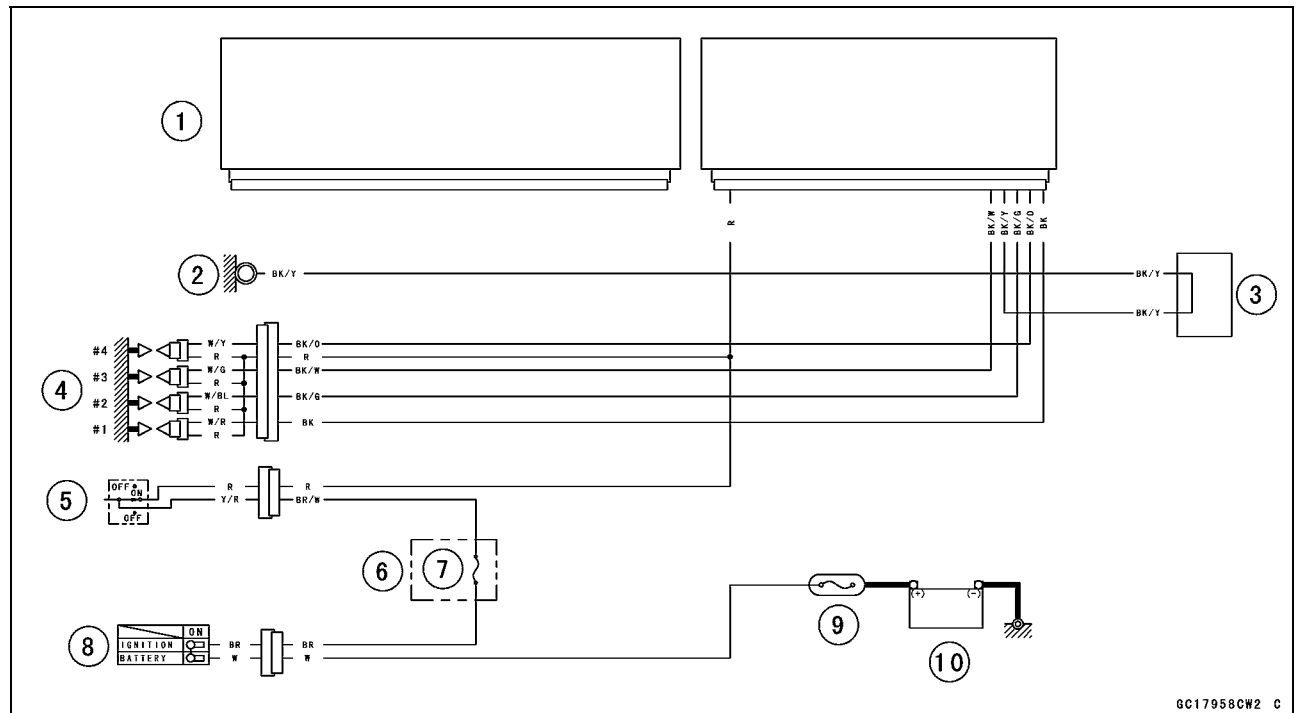
**Standard: Battery Voltage**



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

- Turn the ignition switch OFF.
- ★ If the input voltage is out of the standard, check the wiring for continuity (see wiring diagram in this section).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the input voltage is within the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection)
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

**Stick Coil Circuit**



1. ECU
2. Frame Ground
3. Water-proof Joint B
4. Stick Coil #1, #2, #3, #4
5. Engine Stop Switch
6. Fuse Box 2
7. Ignition Fuse 10 A
8. Ignition Switch
9. Main Fuse 30 A
10. Battery 12 V 8 Ah

## 3-90 FUEL SYSTEM (DFI)

### Radiator Fan Relay (Service Code 56)

#### Radiator Fan Relay Removal/Installation

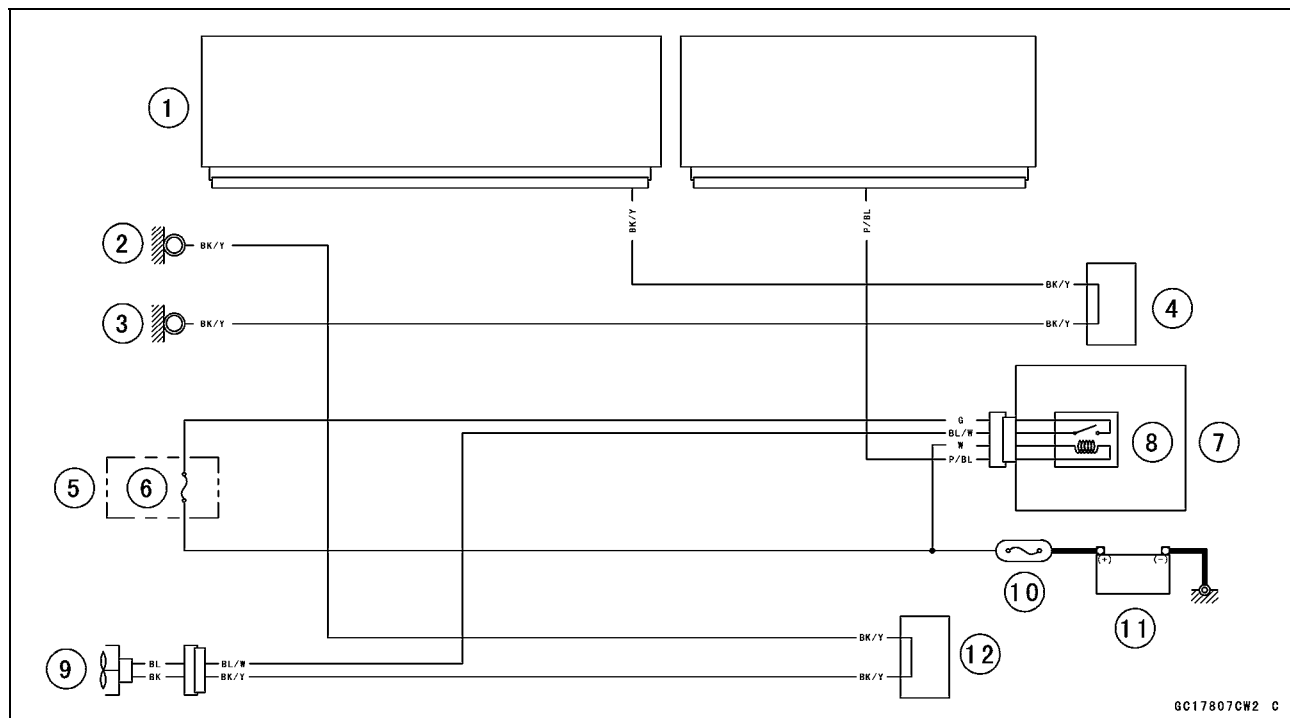
- The radiator fan relay is built in the relay box [A].
- Refer to the Relay Box Removal in the Electrical System chapter.



#### Radiator Fan Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.
- ★ If the radiator fan relay is normal, check the wiring for continuity (see wiring diagram in this section).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

#### Radiator Fan Relay Circuit



1. ECU
2. Frame Ground
3. Meter Ground
4. Water-proof Joint C
5. Fuse Box 2
6. Radiator Fan Fuse 15 A

7. Relay Box
8. Radiator Fan Relay
9. Fan Motor
10. Main Fuse 30 A
11. Battery 12 V 8 Ah
12. Water-proof Joint A

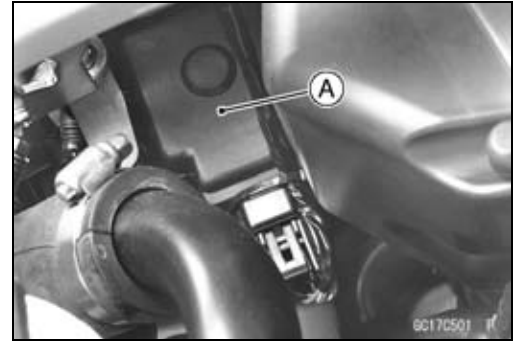
## Subthrottle Valve Actuator (Service Code 62)

### 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 throttle body assy, especially on a hard surface. Such a shock to the Subthrottle valve actuator can damage it.

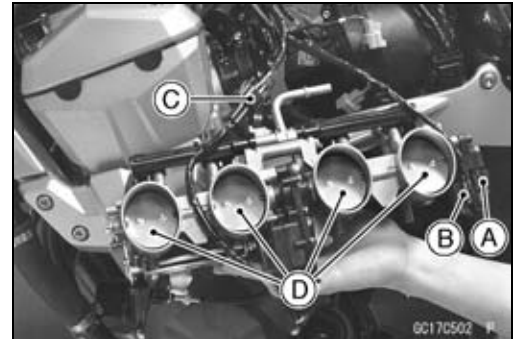


### Subthrottle Valve Actuator Inspection

#### NOTE

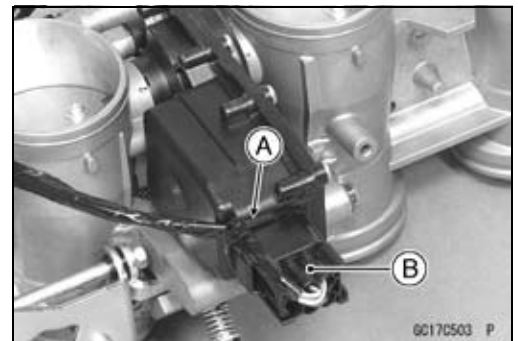
○Be sure the battery is fully charged.

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Connect the following parts temporally.
  - Main Throttle Sensor Connector [A]
  - Subthrottle Sensor Connector [B]
  - Subthrottle Valve Actuator Harness Connector [C]
- Turn the ignition switch ON.
- Check to see that all the subthrottle valves [D] open and close smoothly.
- Turn the ignition switch OFF.
- ★ If the subthrottle valves do not operate, check the subthrottle valve actuator resistance (see Subthrottle Valve Actuator Resistance Inspection).



### Subthrottle Valve Actuator Resistance Inspection

- Turn the ignition switch OFF.
- Cut the band [A], and disconnect the subthrottle valve actuator connector [B].



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

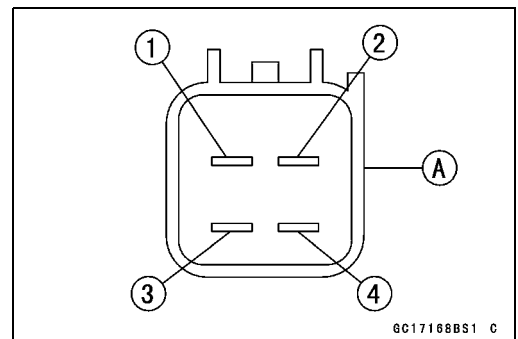
#### Subthrottle Valve Actuator Resistance

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

G lead [3] ↔ W/BL lead [4]

Standard: About 5.2 ~ 7.8 Ω

- ★ If the reading is out of the standard, replace the throttle body assy.
- ★ If the reading is within the standard, check the input voltage (see Subthrottle Valve Actuator Input Voltage Inspection).



## 3-92 FUEL SYSTEM (DFI)

### Subthrottle Valve Actuator (Service Code 62)

#### Subthrottle Valve Actuator Input Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the subthrottle valve actuator connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]

Subthrottle Valve Actuator [C]

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

- Connect the peak voltage adapter [D] and a digital meter [E] to the harness adapter leads.

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

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

#### Subthrottle Valve Actuator Input Voltage

##### Connections to Adapter:

(I) Digital Meter (+) → R (actuator BK/BL) lead

Digital Meter (-) → BK (actuator P/BL) lead

(II) Digital Meter (+) → W (actuator G) lead

Digital Meter (-) → Y (actuator W/BL) lead

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

##### Input Voltage

**Standard: About DC 8.5 ~ 10.5 V, and then 0 V**

- Turn the ignition switch OFF.
  - ★ If the reading is in specification, but the actuator does not operate, replace the throttle body assy.
  - ★ If the reading is out of the specification, remove the ECU and check the wiring for continuity between main harness side connector.
- Disconnect the ECU and actuator connectors.

##### Wiring Inspection

**ECU Connector [A] ↔**

**Subthrottle Valve Actuator Connector [B]**

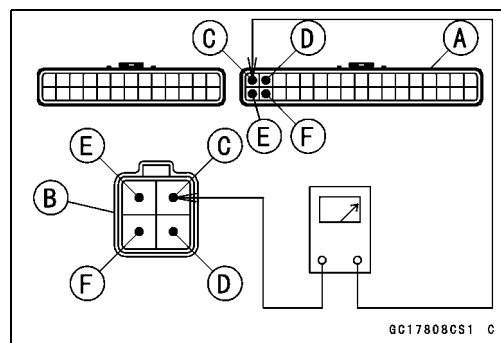
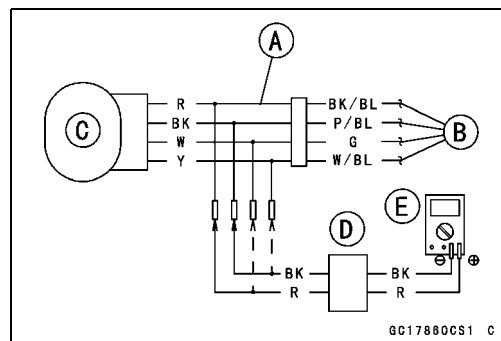
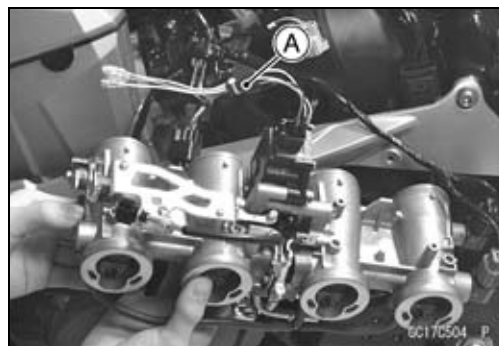
**BK/BL lead (ECU terminal 1) [C]**

**G lead (ECU terminal 2) [D]**

**P/BL lead (ECU terminal 18) [E]**

**W/BL lead (ECU terminal 19) [F]**

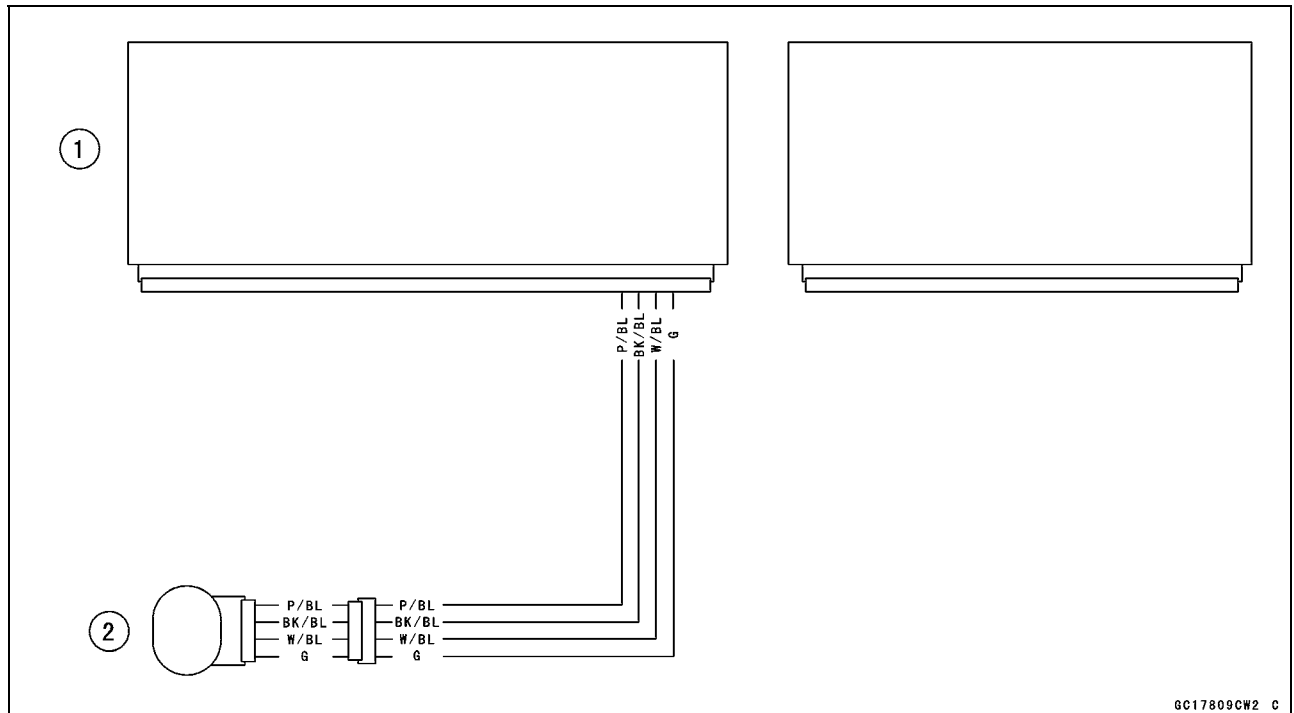
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).





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

**Subthrottle Valve Actuator Circuit**



1. ECU
2. Subthrottle Valve Actuator

## 3-94 FUEL SYSTEM (DFI)

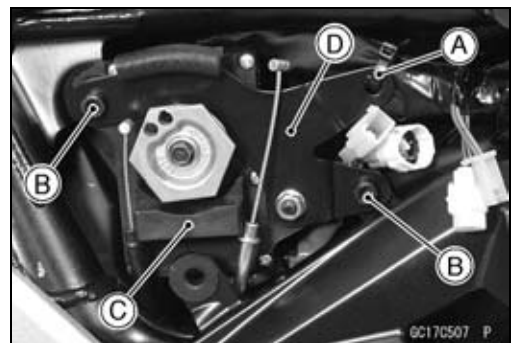
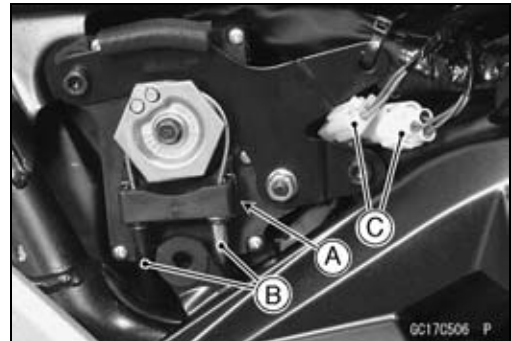
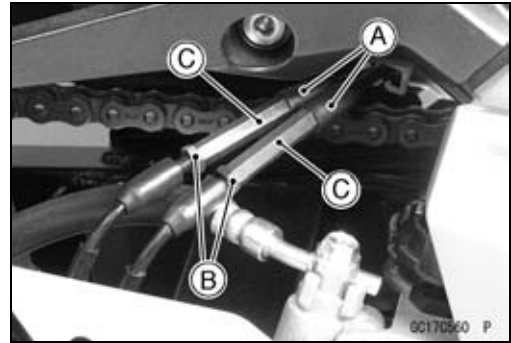
### Exhaust Butterfly Valve Actuator (Service Code 63)

#### Exhaust Butterfly Valve Actuator Removal

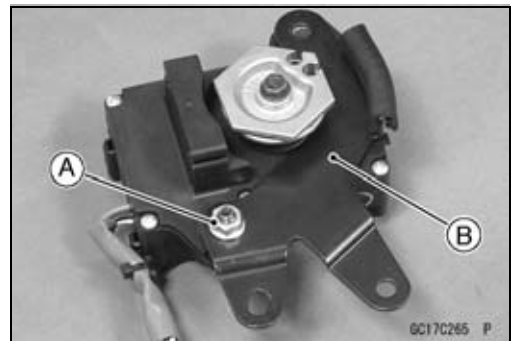
##### CAUTION

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

- Slide the dust covers [A].
- Loosen the locknuts [B], and turn the adjuster [C] to give the cable plenty of play.
- Remove:
  - Left Side Cover (see Side Cover Removal in the Frame chapter)
  - Clamp [A]
  - Exhaust Butterfly Valve Cables [B]
  - Connectors [C] (Disconnect)
- Cut the band [A].
- Remove:
  - Bolts [B]
  - Exhaust Butterfly Valve Actuator [C] and Bracket [D]



- Remove:
  - Nut [A] and Bolt
  - Bracket [B]

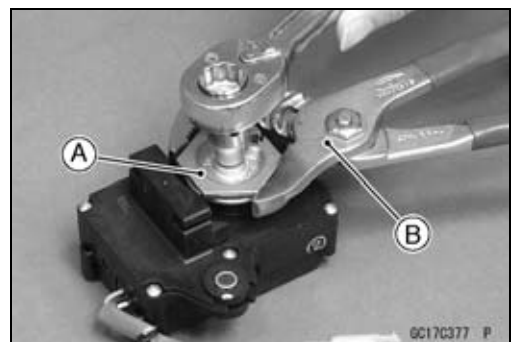


- Remove the pulley bolt while holding the pulley [A] with the suitable tool [B].

##### CAUTION

If the pulley bolt is removed without holding, the actuator damage will occur.

- Remove the pulley from the actuator.



## Exhaust Butterfly Valve Actuator (Service Code 63)

### Exhaust Butterfly Valve Actuator Installation

- Install the pulley [A] on the actuator as shown in the figure.
- Tighten the pulley bolt [B] while holding the pulley with the suitable tool [C].

**Torque - Exhaust Butterfly Valve Actuator Pulley Bolt: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

#### CAUTION

**If the pulley bolt is tightened without holding, the actuator damage will occur.**

- After tightening the pulley bolt, confirm whether pulley [A] is an angle shown in the figure.  
41.7° ±7° [B]
- This position is original position of the pulley.

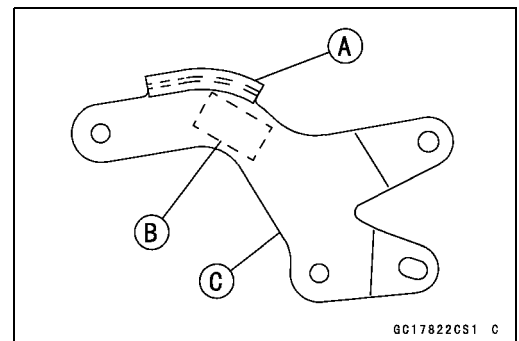
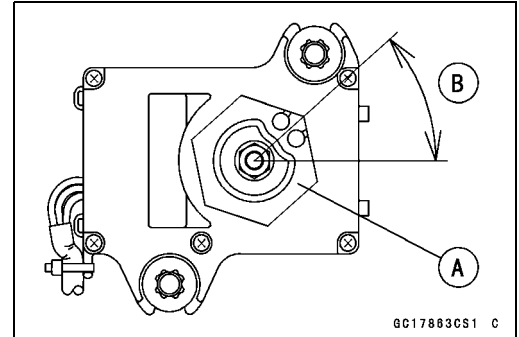
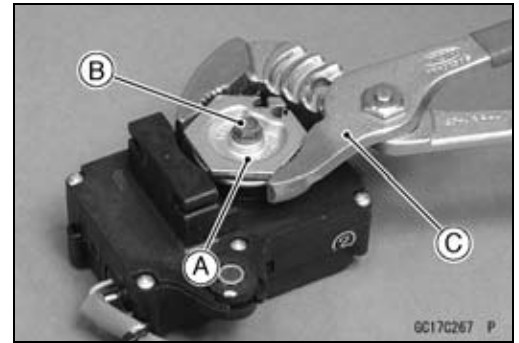
#### NOTE

- *Correct the position electrically after confirming the use is discontinued and there is no damage when differing from the angle of shown in the figure.*

#### CAUTION

**Do not correct the pulley position with the tool, forcibly. The actuator damage will occur.**

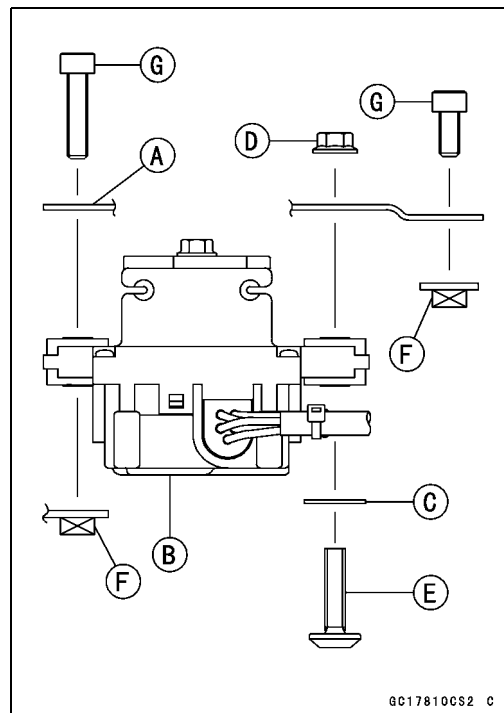
- ★ If the pulley angle is wrong, adjust the angle as follows.
  - Connect:
    - 2 pins Connector
    - 3 pins Connector
  - Turn the ignition switch ON.
  - Confirm the pulley turns clockwise and then counterclockwise.
  - The pulley returns to the original position.
  - Turn the ignition switch OFF.
- ★ If the position is not within the specified angle above, replace the exhaust butterfly valve actuator.
- Be sure that the trim [A] and damper [B] are in positions on the bracket [C] as shown in the figure.



## 3-96 FUEL SYSTEM (DFI)

### Exhaust Butterfly Valve Actuator (Service Code 63)

- Install the bracket [A] on the actuator [B].  
Washer [C]  
Nut [D]  
Bolt [E]
- Tighten:  
**Torque - Exhaust Butterfly Valve Actuator Bracket Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Install the actuator and bracket on the frame [F].  
Bolts [G]
- Tighten:  
**Torque - Exhaust Butterfly Valve Actuator Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Install the close cable first and then open cable (see Exhaust Butterfly Valve Cable Installation in the Engine Top End chapter).

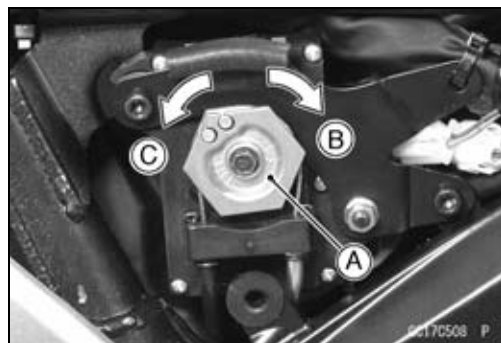


### Exhaust Butterfly Valve Actuator Inspection

#### NOTE

○Be sure the battery is fully charged

- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Turn the ignition switch ON.
- Check to see the pulley [A] clockwise [B] and counter-clockwise [C] smoothly.
- The pulley turns clockwise and then counterclockwise, and clockwise again.
- Turn the ignition switch OFF.
- ★If the pulley does not operate, check the exhaust butterfly valve actuator resistance (see Exhaust Butterfly Valve Actuator Inspection Resistance Inspection).



### Exhaust Butterfly Valve Actuator Resistance Inspection

- Turn the ignition switch OFF.
- Disconnect the exhaust butterfly valve actuator lead connector (2 pins connector) [A].
- Set the hand tester to the  $\times 1 \Omega$  range and connect it to the exhaust butterfly valve actuator connector.

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

- Measure the exhaust butterfly valve actuator resistance.

#### Exhaust Butterfly Valve Actuator Resistance

**Connections:** P lead  $\longleftrightarrow$  GY lead

**Standard:** Any Reading Resistance (reference 5 ~ 200  $\Omega$ )

- ★If the reading is 0 or infinity ( $\infty$ )  $\Omega$ , replace the exhaust butterfly valve actuator.



## Exhaust Butterfly Valve Actuator (Service Code 63)

★ If the reading is in specification, remove the ECU and check the wiring for continuity between main harness side connectors.

○ Disconnect the ECU and actuator connectors.

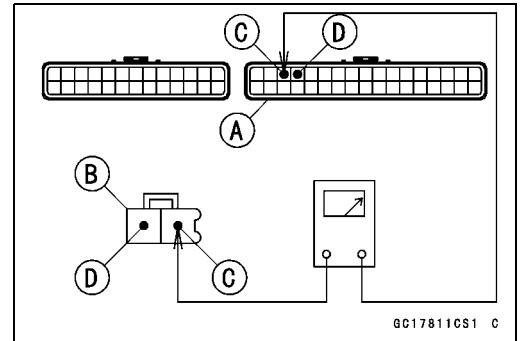
### Wiring Inspection

ECU Connector [A] ↔

Exhaust Butterfly Valve Actuator Connector [B]

GY lead (ECU terminal 3) [C]

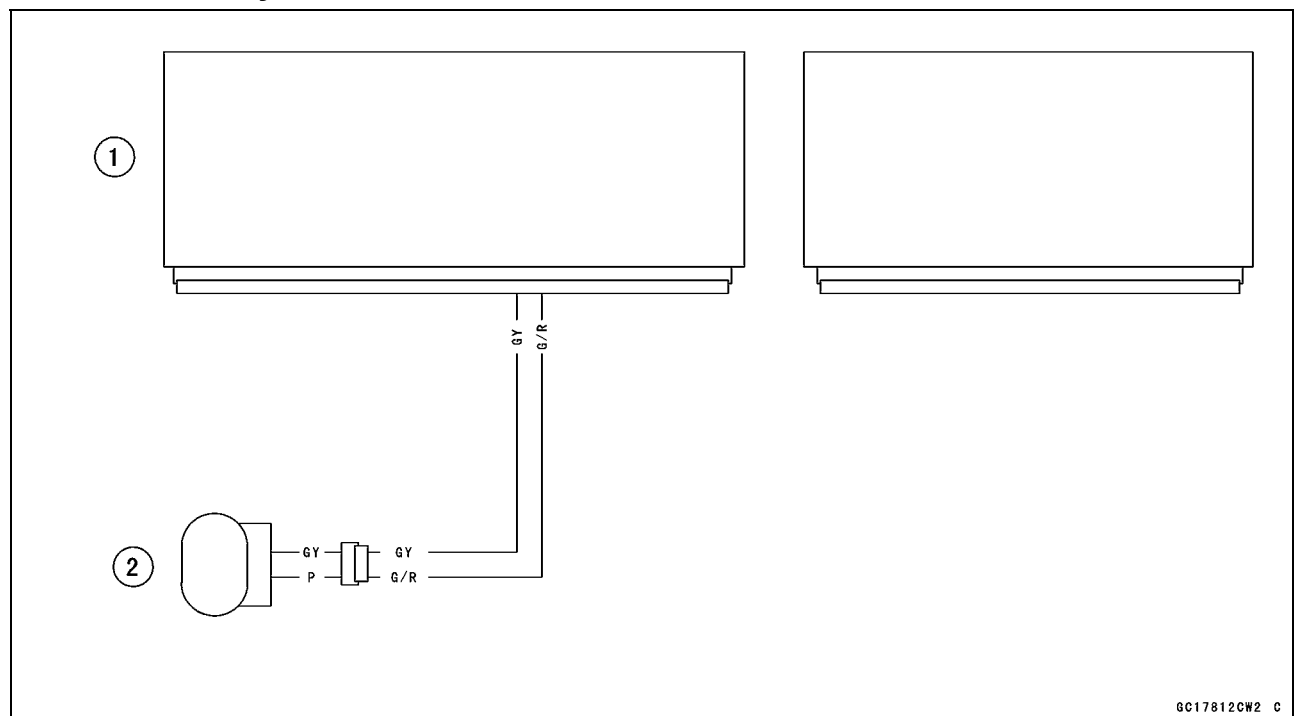
G/R lead (ECU terminal 4) [D]



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

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

## Exhaust Butterfly Valve Actuator Circuit



1. ECU

2. Exhaust Butterfly Valve Actuator

## Air Switching Valve (Service Code 64)

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

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

- ## Air Switching Valve Circuit



GC17959CW2 C

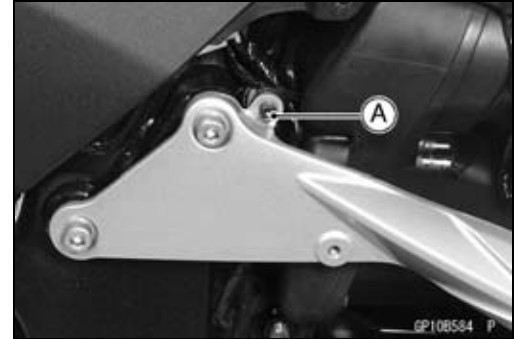
## Oxygen Sensor Heater (Service Code 67 (Equipped Models))

### Oxygen Sensor Heater Removal/Installation

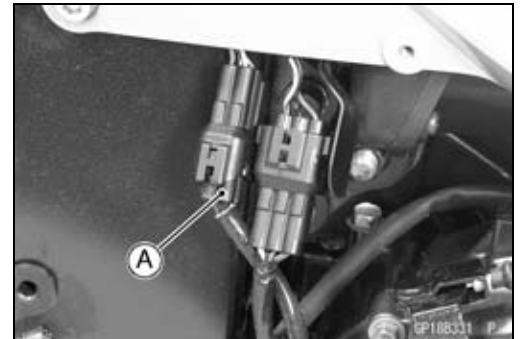
The oxygen sensor heater is built in the oxygen sensor. So, the heater itself can not be removed. Remove the oxygen sensor (see Oxygen Sensor Removal (Equipped Models) in the Electrical System chapter).

### Oxygen Sensor Heater Resistance Inspection

- Turn the ignition switch OFF.
- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Bolt [A]



- Pull the oxygen sensor lead connector [A], crankshaft sensor lead connector and bracket downward.
- Disconnect the oxygen sensor lead connector.



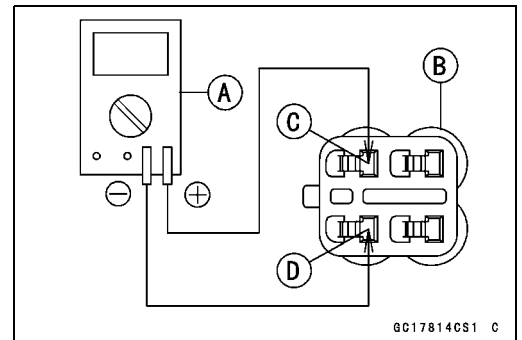
- Connect a digital meter [A] to the oxygen sensor lead connector [B].
- Measure the oxygen sensor heater resistance.

#### Oxygen Sensor Heater Resistance

Connections: BK lead [C] ↔ BK lead [D]

Standard: 11.7 ~ 15.5  $\Omega$  at 20° (68°F)

- ★ If the reading is out of the standard, replace the sensor.
- ★ If the reading is within the standard, check the power source voltage (see Oxygen Sensor Heater Power Source Voltage Inspection).



## 3-100 FUEL SYSTEM (DFI)

### Oxygen Sensor Heater (Service Code 67 (Equipped Models))

#### Oxygen Sensor Heater Power Source Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the oxygen sensor lead connector and connect the harness adapter [A] between these connectors.

**Special Tool - Oxygen Sensor Measuring Adapter: 57001-1682**

- Connect a digital meter to the harness adapter lead.

##### Oxygen Sensor Power Source Voltage

###### Connections to Adapter:

**Digital Meter (+) → W/Y (sensor BK) lead**

**Digital Meter (–) → Battery (–) terminal**

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

##### Power Source Voltage

###### Standard: Battery Voltage

- Turn the ignition switch OFF.
- ★ If the reading is in specification, but the problem still exists, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is out of the standard, check the following.
  - Oxygen Sensor Heater Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
  - Power Source Wiring (see wiring diagram in this section)

- ★ If the fuse and wiring are good, remove the ECU and check the wiring for continuity between main harness side connectors.

○Disconnect the ECU and sensor connectors.

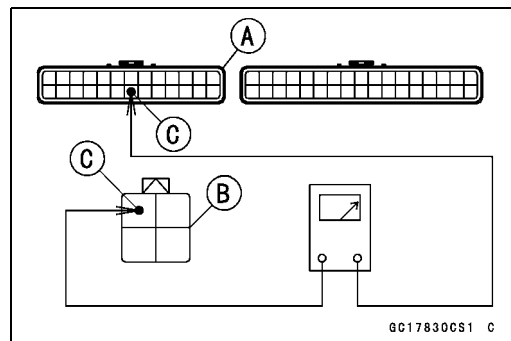
##### Wiring Inspection

**ECU Connector [A] ↔**

**Oxygen Sensor Connector [B]**

**R lead (ECU terminal 54) [C]**

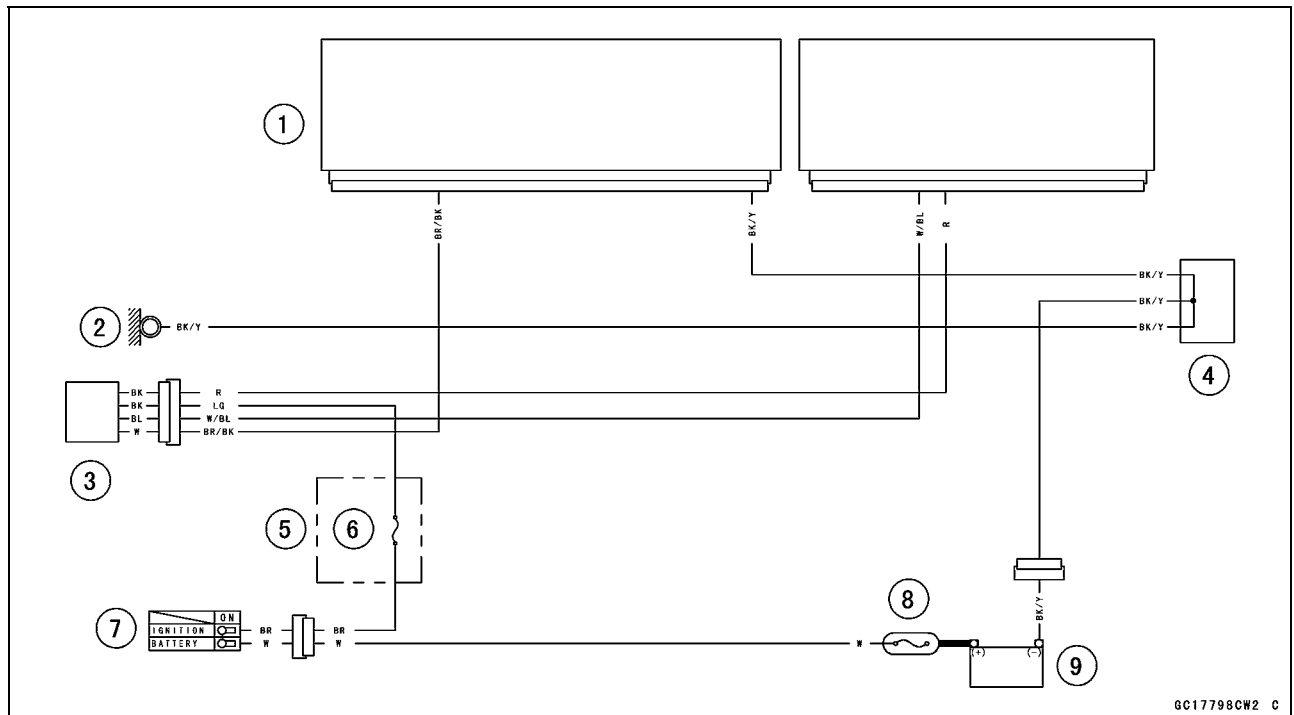
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).





## Oxygen Sensor Heater (Service Code 67 (Equipped Models))

## Oxygen Sensor Circuit



1. ECU
2. Meter Ground
3. Oxygen Sensor
4. Water-proof Joint C
5. Fuse Box 1
6. Oxygen Sensor Heater Fuse 10 A
7. Ignition Switch
8. Main Fuse 30 A
9. Battery 12 V 8 Ah

## 3-102 FUEL SYSTEM (DFI)

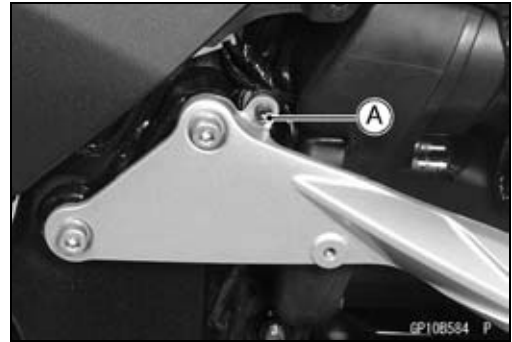
### Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))

#### **Oxygen Sensor Removal/Installation**

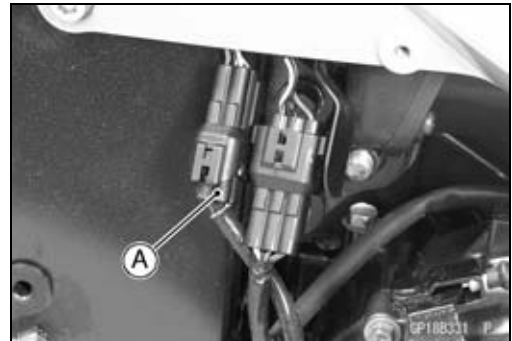
- Refer to the Oxygen Sensor Removal/Installation (Equipped Models) in the Electrical System chapter.

#### **Oxygen Sensor Inspection**

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch OFF.
- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Bolt [A]



- Pull the oxygen sensor lead connector [A], crankshaft sensor lead connector and bracket downward.



- Disconnect the oxygen sensor lead connector (4 pins connector) and connect the harness adapter [A] between these connectors.

**Special Tool - Oxygen Sensor Measuring Adapter: 57001-1682**

- Connect a digital meter to the harness adapter leads.

#### **Oxygen Sensor Output Voltage**

##### **Connections to Adapter:**

**Digital Meter (+) → BL/Y (sensor BL) lead**

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

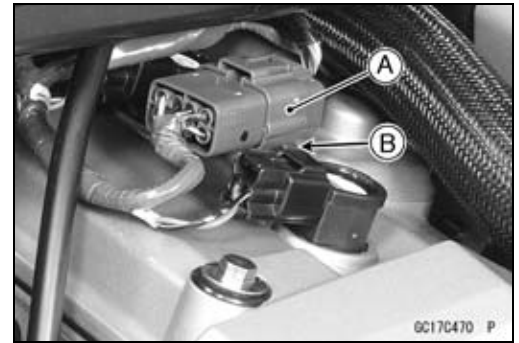


- Remove the fuel tank (see Fuel Tank Removal).
- Separate the hose [A] from the air cleaner housing.



## Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))

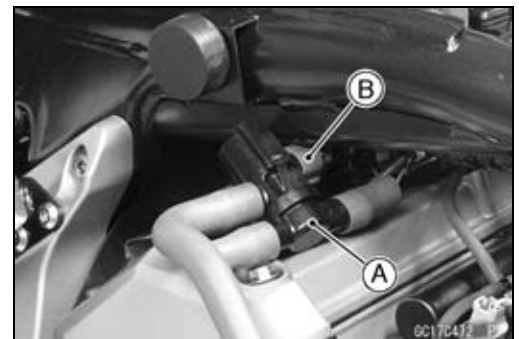
- Remove the connector [A] from the clamp [B].



- Separate the hoses [A] from the air suction valve covers.



- Pull the air switching valve [A] and hoses out to the left side of the motorcycle.
- Do not disconnect the air switching valve connector [B].

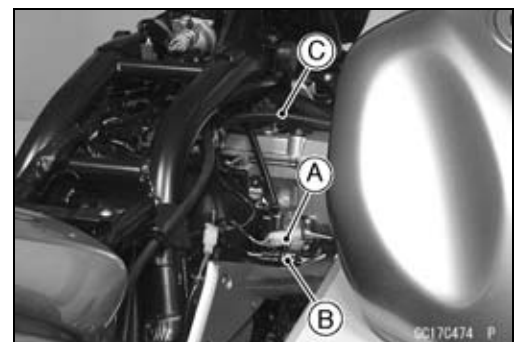


- Install the suitable plugs [A] on the fitting of the air suction valve covers, and shut off the secondary air.



- Remove the fuel outlet hose (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Connect the following parts temporary.
  - Fuel Pump Lead Connector [A]
  - Fuel Level Sensor Lead Connector [B]
  - Extension Tube [C]

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



### 3-104 FUEL SYSTEM (DFI)

#### Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))

- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

##### Output Voltage (with Plugs)

Standard: DC 0.7 V or more

- Next, remove the plugs from the fittings [A] with idling.
- Measure the output voltage with the connector joined.

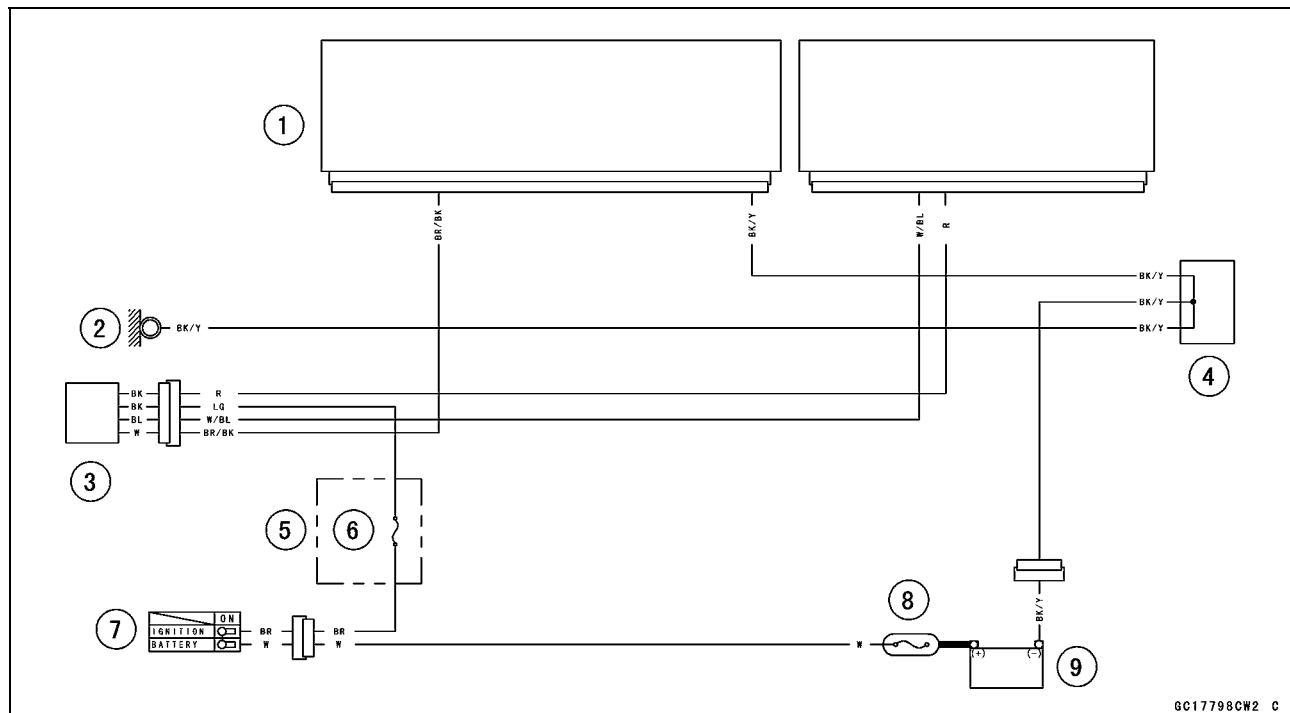
##### Output Voltage (without Plugs)

Standard: DC 0.2 V or less

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard (with plugs: 0.7 V or more, without plugs: 0.2 V or less), check the following.
  - Fuel Pressure (see Fuel Pressure Inspection)
  - Fuel Injector (see Fuel Injectors section)
- ★ If the fuel pressure and fuel injectors are good, replace the sensor.
- ★ If the reading is within the standard (with plugs: 0.7 V or more, without plugs: 0.2 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



#### Oxygen Sensor Circuit

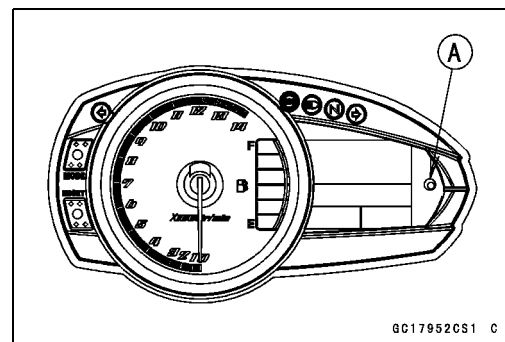


- |                        |                                   |
|------------------------|-----------------------------------|
| 1. ECU                 | 6. Oxygen Sensor Heater Fuse 10 A |
| 2. Meter Ground        | 7. Ignition Switch                |
| 3. Oxygen Sensor       | 8. Main Fuse 30 A                 |
| 4. Water-proof Joint C | 9. Battery 12 V 8 Ah              |
| 5. Fuse Box 1          |                                   |

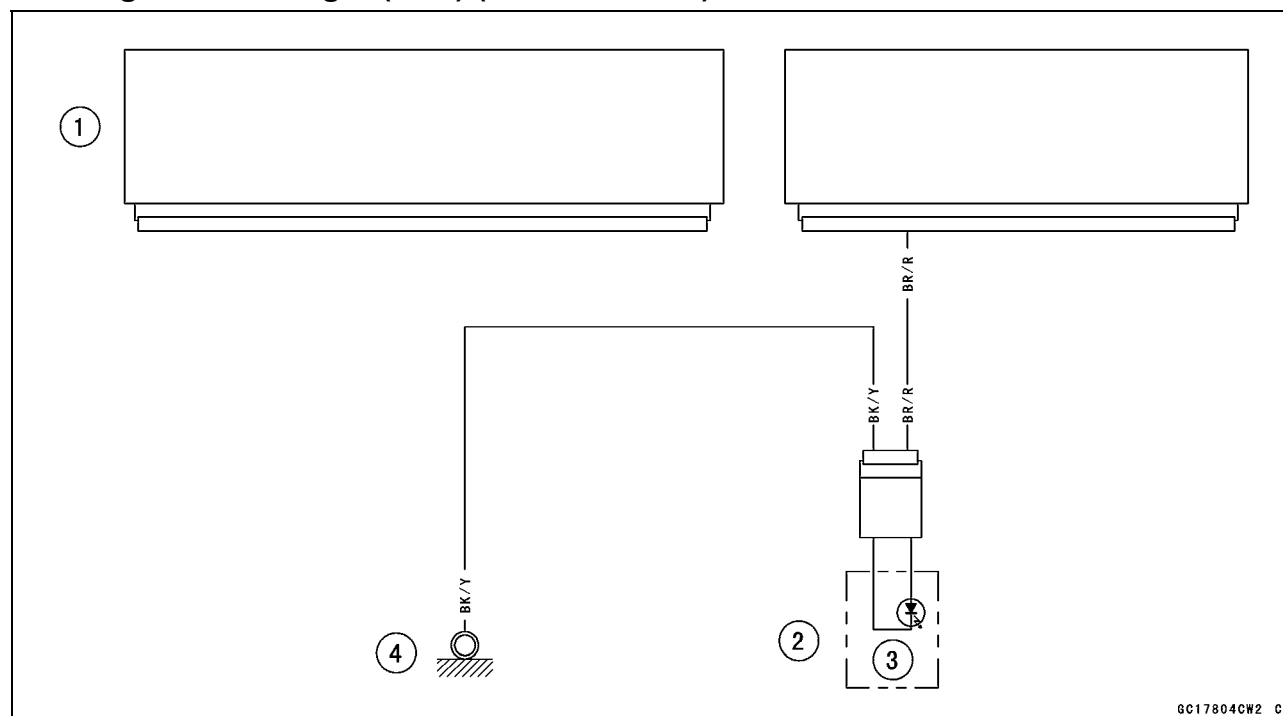
## Warning Indicator Light (LED)

### Light (LED) Inspection

- The warning indicator light (LED) [A] is used for the FI indicator, immobilizer indicator (immobilizer equipped models) and oil pressure warning indicator.
- In this model, the warning indicator light (LED) (FI/immobilizer) blink by the data sent from the ECU.
- Refer to the Meter Unit Inspection in the Electrical System chapter for the warning indicator light (LED) (FI/immobilizer) inspection.



## Warning Indicator Light (LED) (FI/Immobilizer) Circuit



1. ECU
2. Meter Unit
3. Warning Indicator Light (LED)
4. Meter Ground

## 3-106 FUEL SYSTEM (DFI)

### ECU

#### ECU Identification

○Most countries have their own regulations, so each ECU has different characteristics. So, do not confuse ECU with each other and use only the ECU for your model. Otherwise, the motorcycle cannot clear the regulation.

#### ECU Identification

Part Number [A]	Specification
21175-0098	Europe, WVTA, Full, H, with Immobilizer U.K., WVTA, Full, H, with Immobilizer
21175-0141	Australia, with Immobilizer
21175-0144	Malaysia, with Immobilizer

Full: Full Power

H: Honeycomb Type Catalyst

#### ECU Removal

##### CAUTION

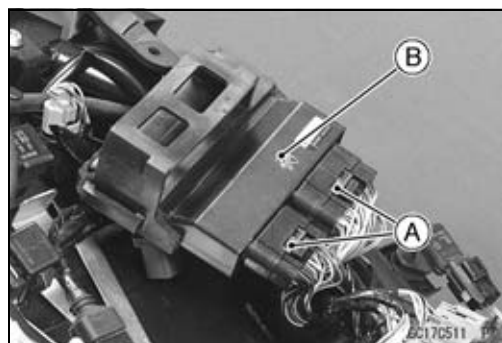
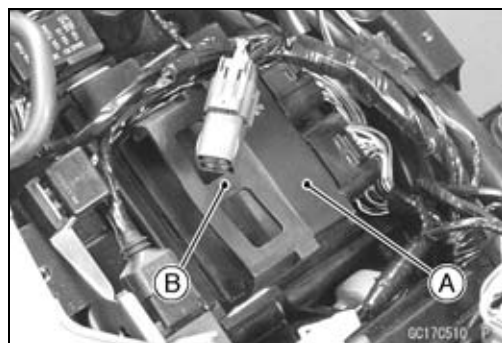
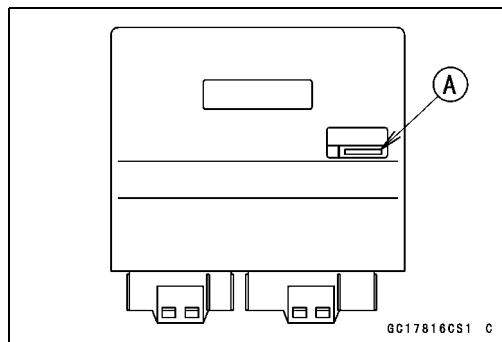
**Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.**

##### NOTE

○Refer to the Immobilizer System Parts Replacement in the Electrical System chapter for the immobilizer models (see Immobilizer System Parts Replacement in the Electrical System chapter).

- Remove the relay box (see Relay Box Removal in the Electrical System chapter).
- Lift up the ECU [A] with rubber protector [B].

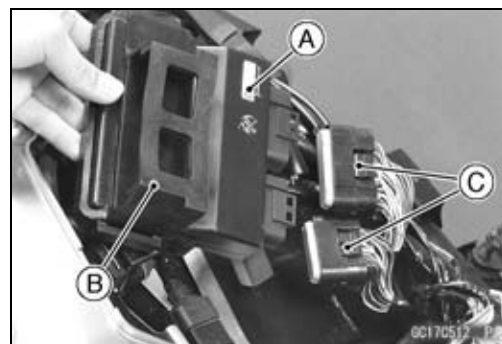
- Remove:
  - ECU Connectors [A] (Disconnect)
  - ECU [B]



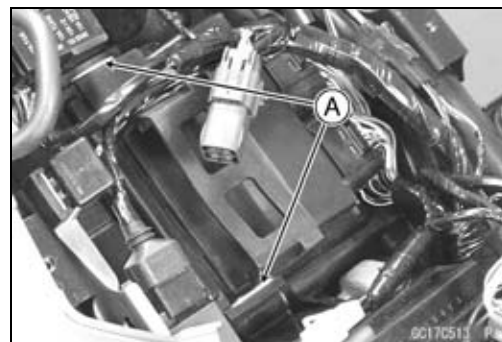
## ECU

### ECU Installation

- Install:
  - ECU [A] (In Rubber Protector [B])
  - ECU Connectors [C] (Connect)

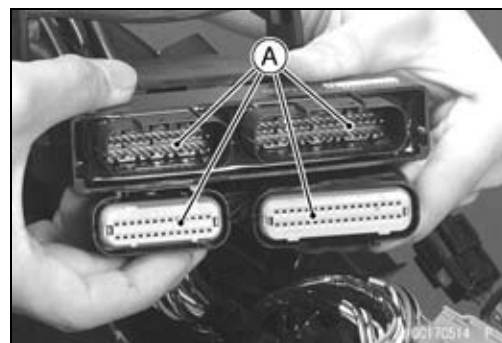


- Insert the slits of the rubber protector to the projections [A] of the bracket.



### ECU Power Supply Inspection

- Remove the relay box (see Relay Box Removal in the Electrical System chapter).
- Visually inspect the ECU connectors.
- ★ If the connector is clogged with mud or dust, blow it off with compressed air.
- Remove the ECU (see ECU Removal).
- Visually inspect the terminals [A] of the ECU connectors.
- ★ If the terminals of the main harness connectors are damaged, replace the main harness.
- ★ If the terminals of the ECU connectors are damaged, replace the ECU.
- Turn the ignition switch OFF.
- Disconnect the ECU connectors [A].
- Set the hand tester [B] to the  $\times 1 \Omega$  range and check the following wiring for continuity.



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

### ECU Grounding Inspection

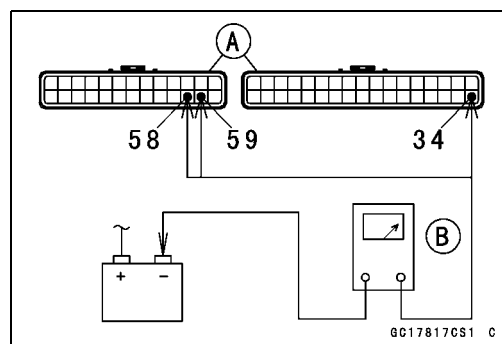
#### Connections:

- (I) BK/Y leads (ECU terminal 34, 58 or 59)  $\longleftrightarrow$  Battery (-) Terminal
- (II) Engine Ground  $\longleftrightarrow$  Battery (-) Terminal

#### Criteria:

**Both: 0  $\Omega$**

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



## 3-108 FUEL SYSTEM (DFI)

### ECU

★ If the wiring is good, check the power source voltage of the ECU.

#### NOTE

○ Be sure the battery is fully charged.

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

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

#### ECU Power Supply Inspection

##### Connections:

- (I) Digital Meter (+) → Terminal 16 (W/Y)  
Digital Meter (–) → Battery (–) terminal
- (II) Digital Meter (+) → Terminal 17 (W/BK)  
Digital Meter (–) → Battery (–) terminal

##### Ignition Switch OFF:

Terminal 16 (W/Y): 0 V

Terminal 17 (W/BK): Battery Voltage

##### Ignition Switch ON:

Both: Battery Voltage

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

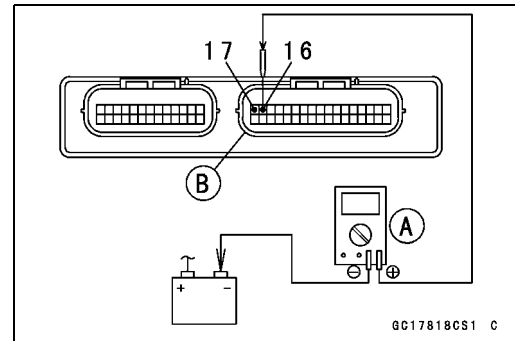
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)

ECU Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

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

Power Source Wiring (see wiring diagram in this section )

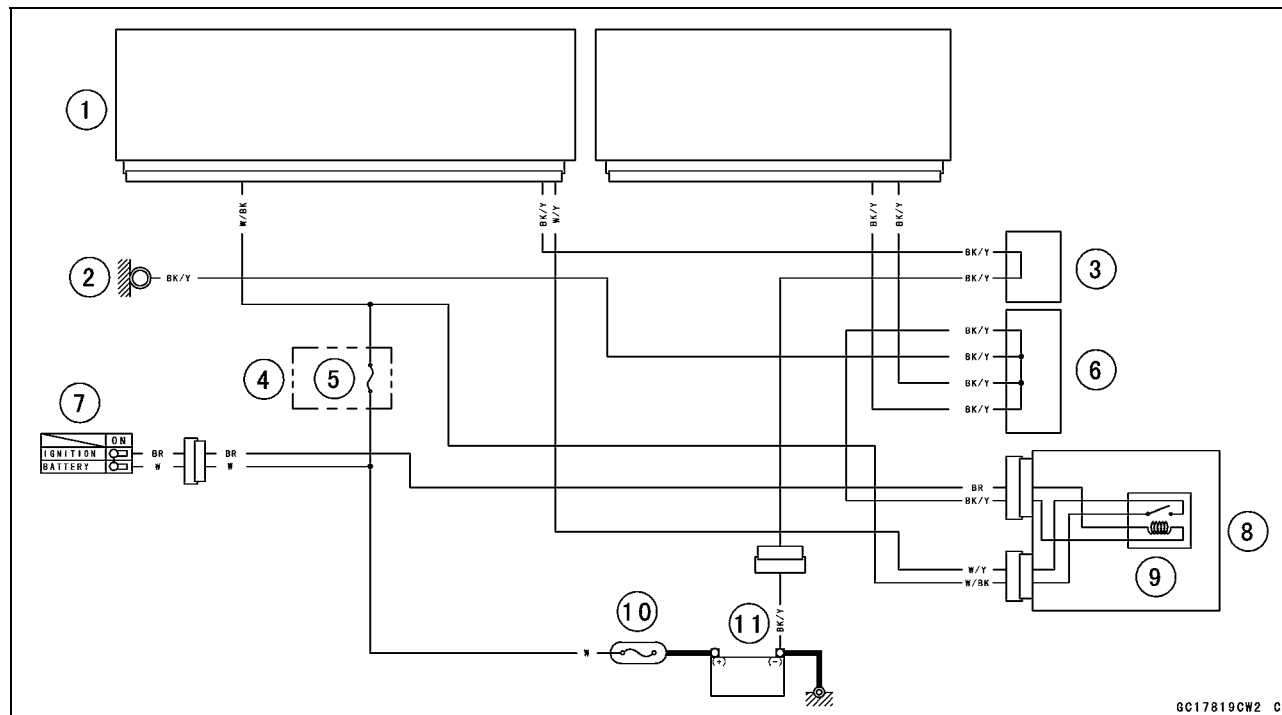
★ If the fuse, wiring and relay are good, replace the ECU (see ECU Removal/Installation).





ECU

ECU Power Source Circuit



GC17819CW2 C

1. ECU
2. Frame Ground
3. Water-proof Joint C
4. Fuse Box 2
5. ECU Fuse 10 A
6. Water-proof Joint B
7. Ignition Switch
8. Relay Box
9. ECU Main Relay
10. Main Fuse 30 A
11. Battery 12 V 8 Ah

## 3-110 FUEL SYSTEM (DFI)

### DFI Power Source

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#### ***ECU Fuse Removal***

- Refer to the 10 A ECU Fuse Removal in the Electrical System chapter.

#### ***ECU Fuse Installation***

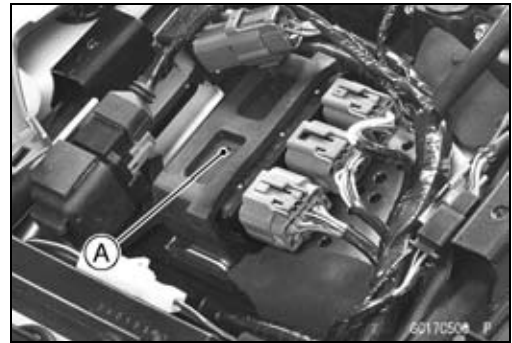
- ★ If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.
- Refer to the Fuse Installation in the Electrical System chapter.

#### ***ECU Fuse Inspection***

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

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

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



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

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

## Fuel Line

### Fuel Pressure Inspection

#### NOTE

○Be sure the battery is fully charged.

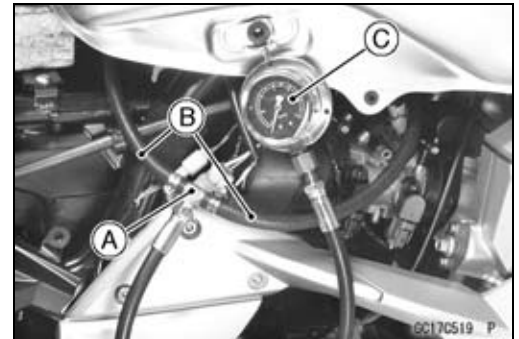
- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Outlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

#### ⚠ WARNING

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

- Install the fuel pressure gauge adapter [A] and fuel hoses (Special Tool: 57001-1607) [B] between the fuel outlet pipe and delivery pipe.
- Secure the fuel hoses with the clamps.
- Connect the pressure gauge [C] to the fuel pressure gauge adapter.

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



#### ⚠ WARNING

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

- Connect:
  - Fuel Pump Lead Connector
  - Fuel Level Sensor Lead Connector
- Turn the engine stop switch run position.
- Turn the ignition switch ON.
- The fuel pump should operate for 3 seconds, and then should stop.

#### NOTE

○After turning on the engine stop switch and ignition switch, inspect the fuel leakage from the connected portion of the special tools.

#### CAUTION

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

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

**Fuel Pressure (with Engine Idling)**

**Standard: 294 kPa (3.0 kgf/cm<sup>2</sup>, 43 psi)**

## 3-112 FUEL SYSTEM (DFI)

### Fuel Line

#### NOTE

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

- Turn the ignition switch OFF.
- ★ If the fuel pressure is much higher than specified, replace the fuel pump because the fuel pressure regulator in the fuel pump have been clogged or stuck.
- ★ If the fuel pressure is much lower than specified, check the following.
  - Fuel Line Leakage (see Fuel Injector Fuel Line Inspection)
  - Amount of Fuel Flow (see Fuel Flow Rate Inspection)
- After above checks, measure the fuel pressure again.
- Remove the fuel pressure gauge, hoses and adapter.
- Install:
  - Fuel Outlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  - Fuel Tank (see Fuel Tank Installation)
- Start the engine and check for fuel leakage.

#### Fuel Flow Rate Inspection

#### ⚠ WARNING

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

#### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Wait until the engine cools down.
- Prepare a fuel hose (Special Tool: 57001-1607) and a measuring cylinder.

**Special Tool - Fuel Hose: 57001-1607**

- Remove the fuel tank bolt (see Fuel Tank Removal).
- Open the fuel tank cap [A] to lower the pressure in the tank.
- Remove the fuel outlet hose from the fuel pump (see Fuel Tank Removal).
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.

#### ⚠ WARNING

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



## Fuel Line

- Connect the prepared fuel hose [A] to the fuel outlet pipe.
- Secure the fuel hose with a clamp.
- Insert the fuel hose into the measuring cylinder [B].

### **⚠ WARNING**

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

- Close the fuel tank cap.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- The fuel pump should operate for 3 seconds, and then should stop.

### **CAUTION**

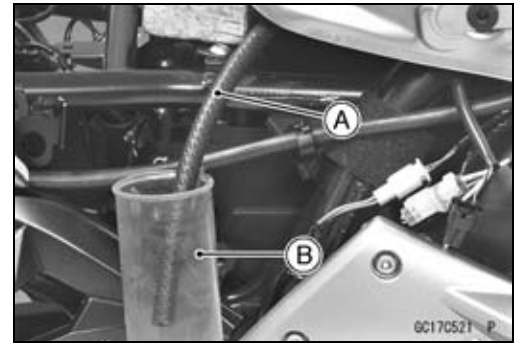
**Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.**

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

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

**Standard: 50 mL (1.7 US oz.) or more for 3 seconds**

- Turn the ignition switch OFF.
- ★ If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).
- Install the fuel tank (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.



## 3-114 FUEL SYSTEM (DFI)

### Fuel Pump

#### Fuel Pump Removal

##### WARNING

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

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

##### CAUTION

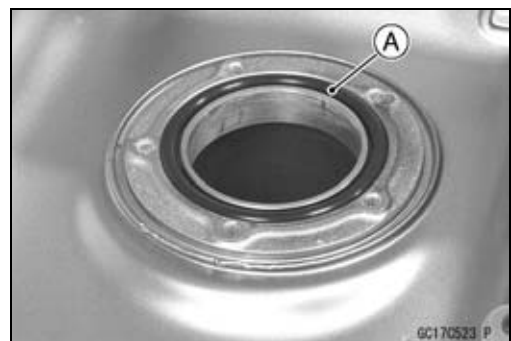
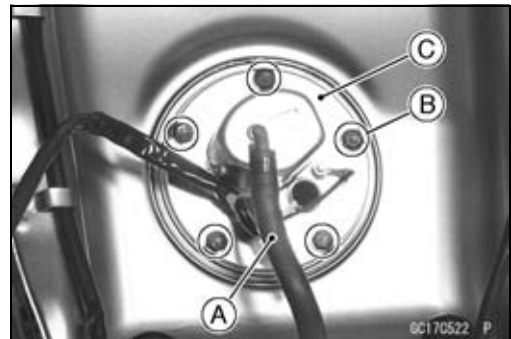
Never drop the fuel pump, especially on a hard surface. Such a shock to the pump can damage it.

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

##### CAUTION

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

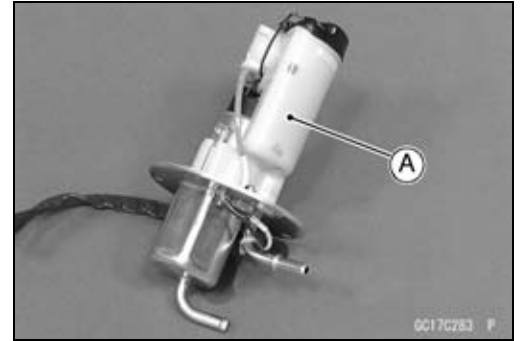
- Discard the fuel pump gasket [A].



## Fuel Pump

### Fuel Pump Installation

- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.



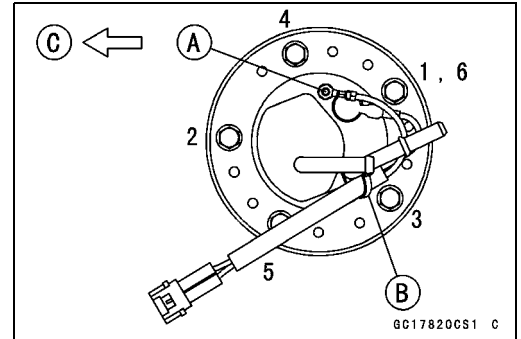
- Check that the fuel pump terminal [A] and band [B] are in place.

Front [C]

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

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

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



### Fuel Pump Operation Inspection

#### NOTE

○Be sure the battery is fully charged.

- Turn the engine stop switch to run position.
- Turn the ignition switch ON and make sure that the fuel pump operates (make light sounds) for 3 seconds, and then stops.
- Turn the ignition switch OFF.
- ★ If the pump does not operate as described above, check the operating voltage (see Fuel Pump Operating Voltage Inspection).

## 3-116 FUEL SYSTEM (DFI)

### Fuel Pump

#### Fuel Pump Operating Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]

Fuel Pump [C]

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

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

#### Fuel Pump Operating Voltage

##### Connections to Adapter:

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

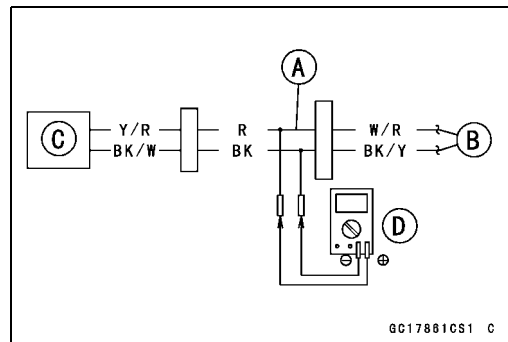
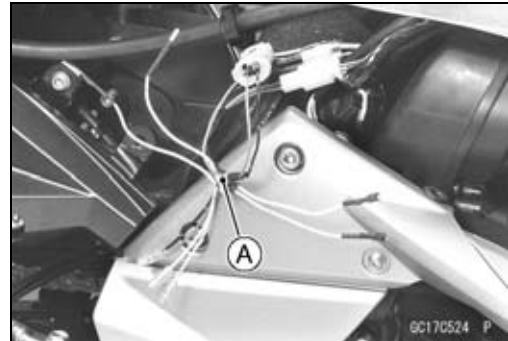
**Digital Meter (–) → BK (pump BK/W) lead**

- Measure the operating voltage with engine stopped and with the connector joined.
- Turn the engine stop switch run position.
- Turn the ignition switch ON.

#### Operating Voltage

**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.
- ★ If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If there is still no battery voltage, check the ECU main relay and fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the main relay and pump relay are normal, check the wiring for continuity (see wiring diagram in this section).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is in specification, but the pump does not operate, replace the fuel pump (see Fuel Pump Removal/Installation).

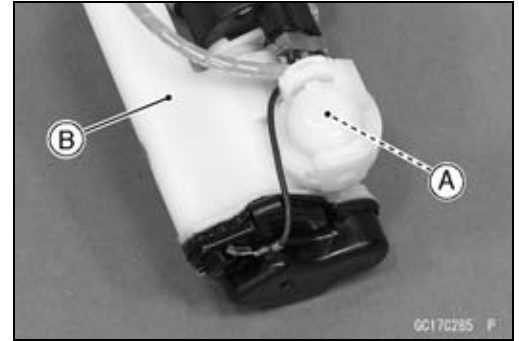




## Fuel Pump

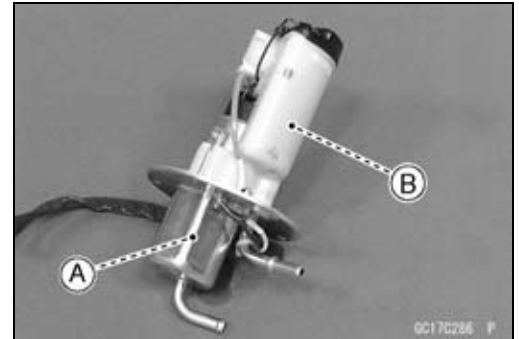
### **Pressure Regulator Removal**

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



### **Pump Screen, Fuel Filter Cleaning**

- The pump screen [A] and fuel filter [B] are built into the pump and can not 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 Relay Removal/Installation**

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



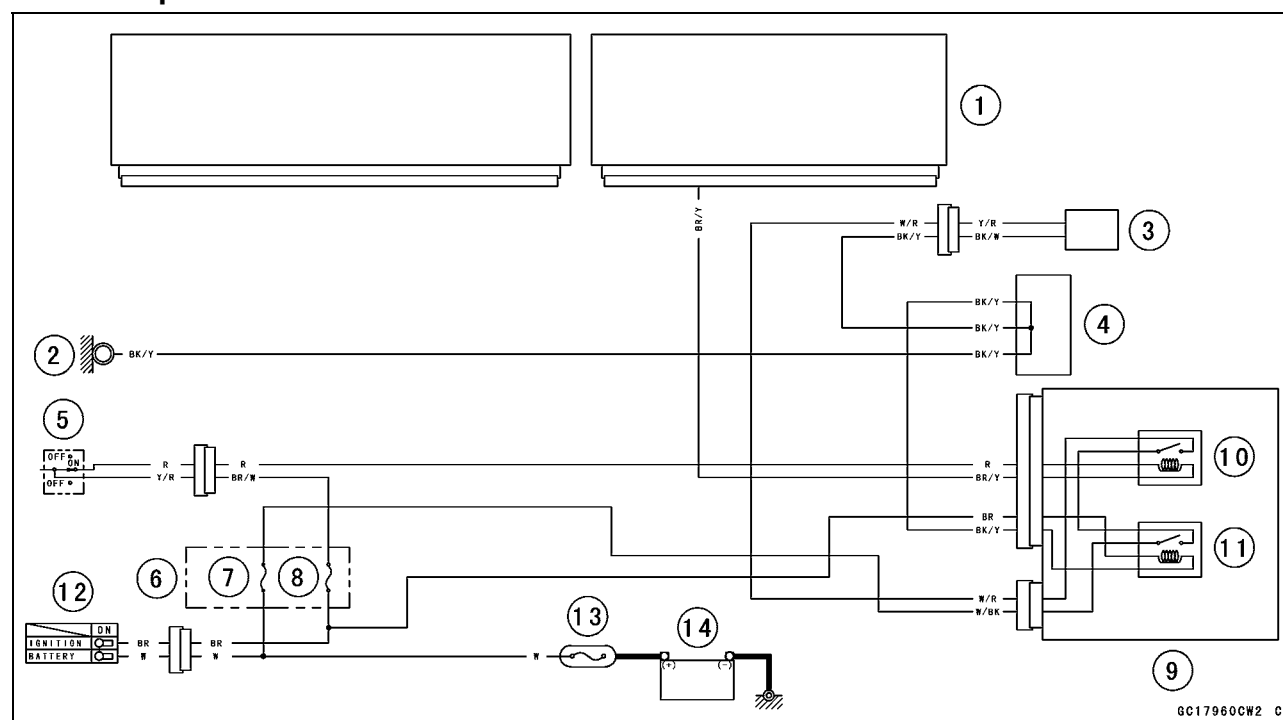
### **Fuel Pump Relay Inspection**

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

## 3-118 FUEL SYSTEM (DFI)

### Fuel Pump

#### Fuel Pump Circuit



1. ECU
2. Frame Ground
3. Fuel Pump
4. Water-proof Joint B
5. Engine Stop Switch
6. Fuse Box 2
7. ECU Fuse 10A
8. Ignition Fuse 10 A
9. Relay Box
10. Fuel Pump Relay
11. ECU Main Relay
12. Ignition Switch
13. Main Fuse 30 A
14. Battery 12 V 8 Ah

## Fuel Injectors

### Fuel Injector Removal/Installation

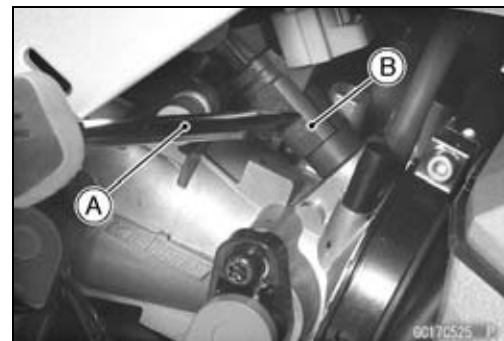
- Refer to the Throttle Body Assy Disassembly/Assembly.

### Fuel Injector Audible Inspection

#### NOTE

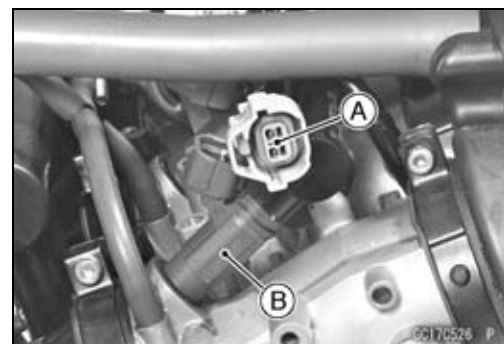
○ Be sure the battery is fully charged.

- Start the engine, and let it idle.
- Apply the tip of a screwdriver [A] to the fuel injector [B]. Put the grip end onto your ear, and listen whether the fuel injector is clicking or not.
- A sound scope can also be used.
- The click interval becomes shorter as the engine speed rises.
- Do the same for the other fuel injectors.
- ★ If all the fuel injectors click at a regular intervals, the fuel injectors are normal.
- Turn the ignition switch OFF.
- ★ If any fuel injector does not click, check the fuel injector resistance (see Fuel Injector Resistance Inspection).



### Fuel Injector Resistance Inspection

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Outlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Disconnect the injector connector [A].
- Connect a digital meter to the terminals of the injector [B].
- Measure the fuel injector resistance.



#### Fuel Injector Resistance

##### Connections:

For Fuel Injector #1

W/R ↔ BL/R terminal

For Fuel Injector #2

W/R ↔ BL/G terminal

For Fuel Injector #3

W/R ↔ BL/BK terminal

For Fuel Injector #4

W/R ↔ BL/Y terminal

**Standard: About 11.7 ~ 12.3 Ω at 20°C (68°F)**

- ★ If the reading is out of the standard, replace the injector.
- ★ If the reading is within the standard, check the power source voltage (see Fuel Injector Power Source Voltage Inspection).

## 3-120 FUEL SYSTEM (DFI)

### Fuel Injectors

#### Fuel Injector Power Source Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the injector connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]

Fuel Injector #1 [C]

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

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

#### Fuel Injector Power Source Voltage

##### Connections to Adapter:

**For Fuel Injector #1, #2, #3, #4**

**Digital Meter (+) → R (injector W/R) lead**

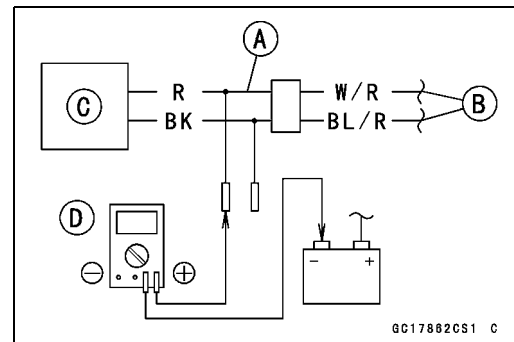
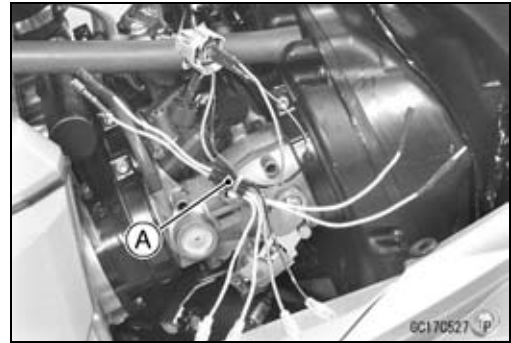
**Digital Meter (–) → Battery (–) terminal**

- Measure the power source voltage with the engine stopped.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

#### Power Source Voltage

**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.
- ★ If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If there is still no battery voltage, check the ECU main relay and fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the main relay and pump relay are normal, check the power source wiring (see wiring diagram in this section).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is in specification, check the output voltage (see Fuel Injector Output Voltage Inspection).



## Fuel Injectors

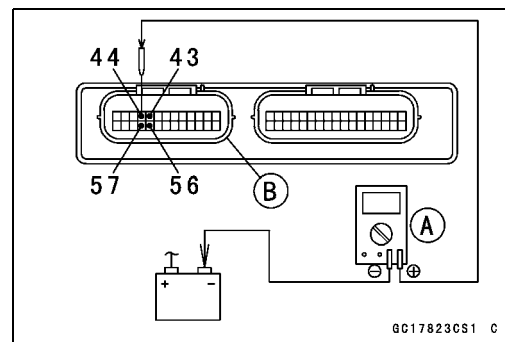
### Fuel Injector Output Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

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

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



### Fuel Injector Output Voltage

#### Connections to ECU Connector:

##### For Fuel Injector #1

Digital Meter (+) → BL/R lead (ECU terminal 44)

Digital Meter (–) → Battery (–) terminal

##### For Fuel Injector #2

Digital Meter (+) → BL/G lead (ECU terminal 43)

Digital Meter (–) → Battery (–) terminal

##### For Fuel Injector #3

Digital Meter (+) → BL/BK lead (ECU terminal 57)

Digital Meter (–) → Battery (–) terminal

##### For Fuel Injector #4

Digital Meter (+) → BL/Y lead (ECU terminal 56)

Digital Meter (–) → Battery (–) terminal

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

#### Output Voltage

**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.
- ★ If the reading is in specification, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## 3-122 FUEL SYSTEM (DFI)

### Fuel Injectors

- ★ If the reading is out of the specification, remove the ECU and check the wiring for continuity between main harness side connector.

○ Disconnect the ECU and injector connector.

#### Wiring Inspection

ECU Connector [A] ↔ Fuel Injector Connector [B]

For Fuel Injector #1 [C]

BL/R lead (ECU terminal 44) [D]

For Fuel Injector #2

BL/G lead (ECU terminal 43)

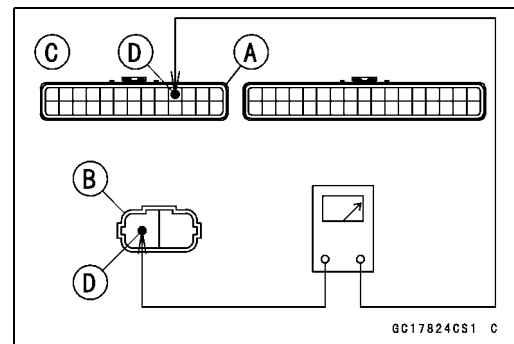
For Fuel Injector #3

BL/BK lead (ECU terminal 57)

For Fuel Injector #4

BL/Y lead (ECU terminal 56)

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



#### Fuel Injector Fuel Line Inspection

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Outlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

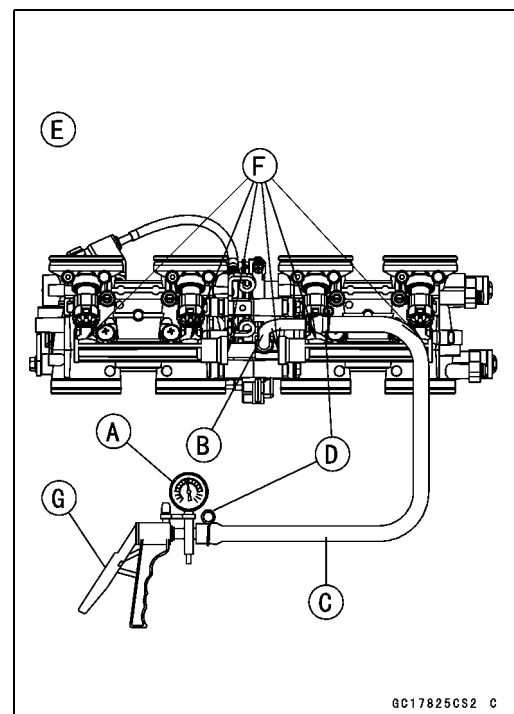
#### ⚠ WARNING

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

- Check the injector fuel line for leakage as follows.
  - Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamps [D]) as shown in the figure.
- Upside View [E]
- Apply soap and water solution to the areas [F] as shown in the figure.
- Watching the pressure gauge, squeeze the pump lever [G], 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)



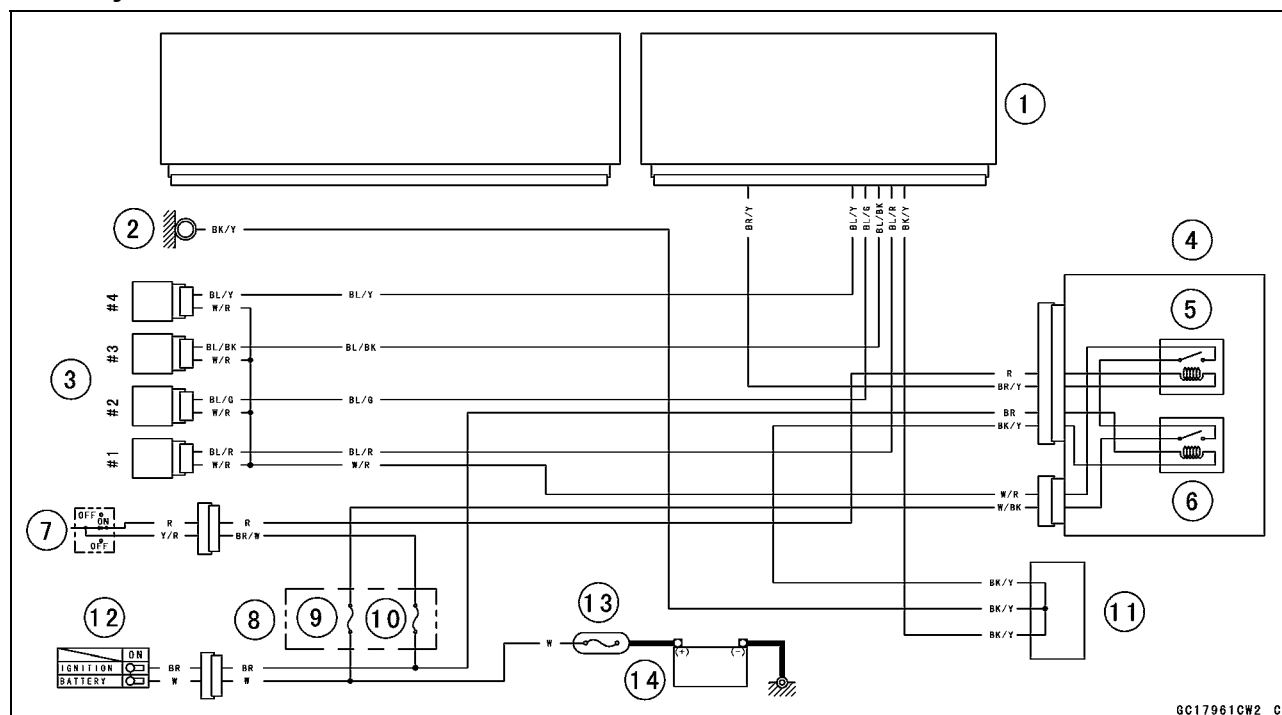
#### CAUTION

**During pressure testing, do not exceed the maximum pressure for which the system is designed.**

## Fuel Injectors

- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the fuel line is good.
- ★ If the pressure drops at once or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, injectors and related parts.
- Repeat the leak test, and check the fuel line for no leakage.
- Install:
  - Fuel Outlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  - Fuel Tank (see Fuel Tank Installation)
- Start the engine and check for fuel leakage.

## Fuel Injector Circuit



GC17961CW2 C

- |                                 |                         |
|---------------------------------|-------------------------|
| 1. ECU                          | 8. Fuse Box 2           |
| 2. Frame Ground                 | 9. ECU Fuse 10 A        |
| 3. Fuel Injector #1, #2, #3, #4 | 10. Ignition Fuse 10 A  |
| 4. Relay Box                    | 11. Water-proof Joint B |
| 5. Fuel Pump Relay              | 12. Ignition Switch     |
| 6. ECU Main Relay               | 13. Main Fuse 30 A      |
| 7. Engine Stop Switch           | 14. Battery 12 V 8 Ah   |

## 3-124 FUEL SYSTEM (DFI)

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### Throttle Grip and Cables

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#### ***Free Play Inspection***

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

#### ***Free Play Adjustment***

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

#### ***Cable Installation***

- Install the throttle cables in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the lower ends of the throttle cables in the cable bracket on the throttle body assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly (see Throttle Control System Inspection in the Periodic Maintenance chapter).

#### **⚠ WARNING**

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

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

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



## Throttle Body Assy

### Idle Speed Inspection/Adjustment

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

### Synchronization Inspection/Adjustment

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

### Throttle Body Assy Removal

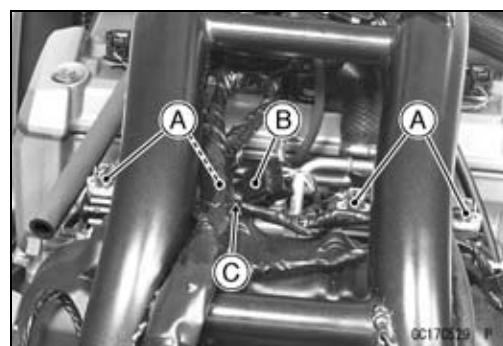
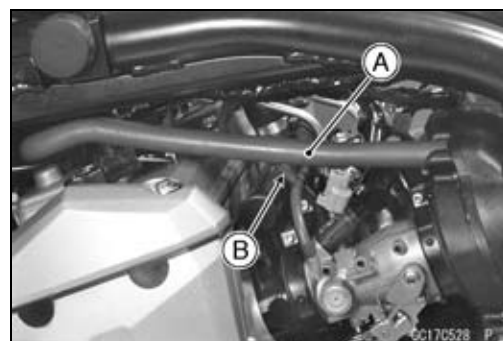
#### **⚠ WARNING**

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

#### **CAUTION**

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

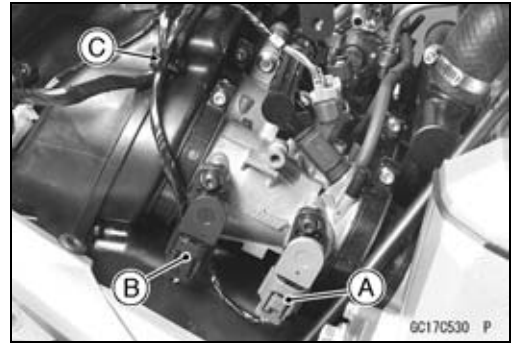
- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Air Switching Valve Hose [A]
  - Vacuum Hose [B]
- Disconnect:
  - Fuel Injector Connectors [A]
  - Subthrottle Valve Actuator Harness Connector [B]
- Open the clamp [C].



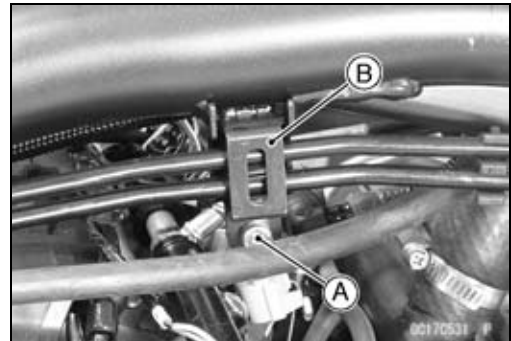
## 3-126 FUEL SYSTEM (DFI)

### Throttle Body Assy

- Disconnect:
  - Main Throttle Sensor Connector [A]
  - Subthrottle Sensor Connector [B]
- Open the clamp [C].

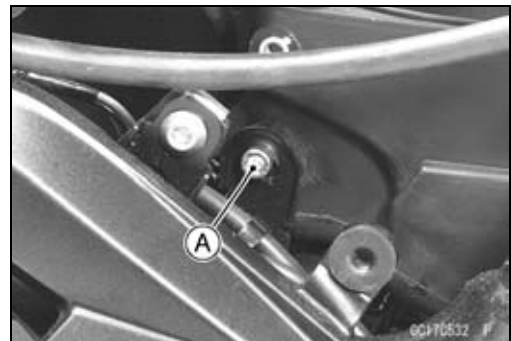


- For models equipped with an ABS, remove the bolt [A] and bracket [B].

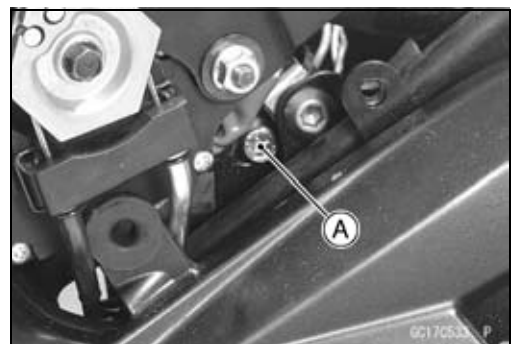


- Remove:
  - Air Cleaner Duct (see Air Cleaner Element Replacement in the Periodic Maintenance chapter)
  - Inlet Air Temperature Sensor (see Inlet Air Temperature Sensor Removal)
  - Right Air Cleaner Housing Mounting Bolt [A]

○ Do not disconnect the inlet air temperature sensor connector.



- Remove:
  - Exhaust Butterfly Valve Actuator Mounting Bolts (see Exhaust Butterfly Valve Actuator Removal)
  - Left Air Cleaner Housing Mounting Bolt [A]

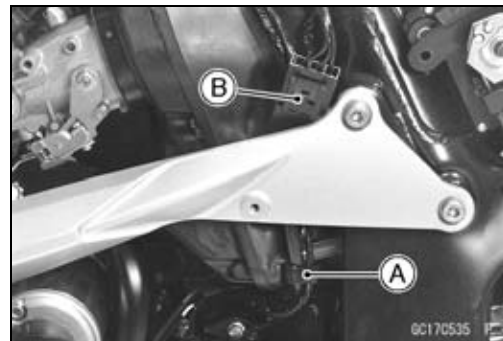


- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Bolt [A]
- Pull the oxygen sensor lead connector (equipped models), crankshaft sensor lead connector and bracket downward.

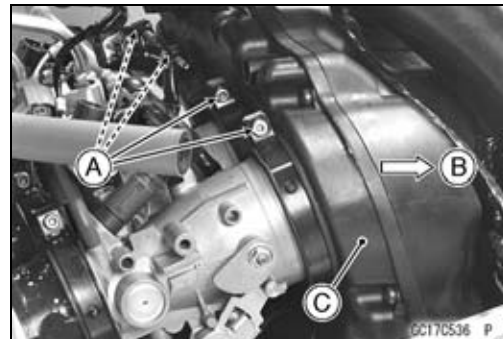


## Throttle Body Assy

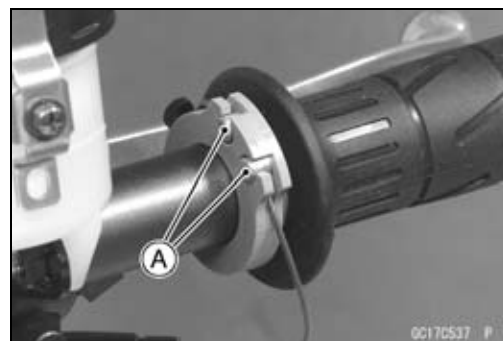
- Remove the left frame cover (see Frame Cover Removal in the Frame chapter).
- Open the clamp [A] and pull the alternator lead connector [B] downward.



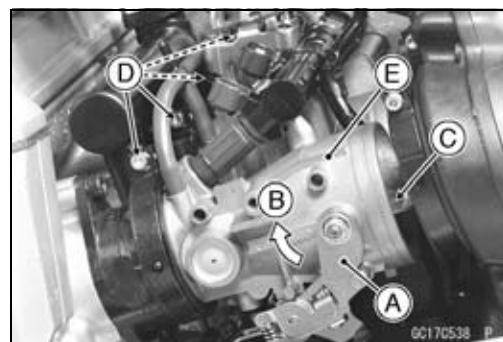
- Loosen the air duct clamp bolts [A].
- Move [B] the air cleaner housing [C] backward, and pull out the air ducts from the throttle body assy.



- Remove:  
Right Switch Housing  
Throttle Cable Upper Ends [A]



- Turn the lever [A] fully clockwise [B], and close the sub-throttle valves [C] until completely closed position.
- Loosen the throttle body assy holder clamp bolts [D], and pull out the throttle body assy [E] backward.



- Remove the throttle body assy [A] to left side of motorcycle.
- After removing the throttle body assy, stuff pieces of lint-free, clean cloth into the throttle body assy holders.



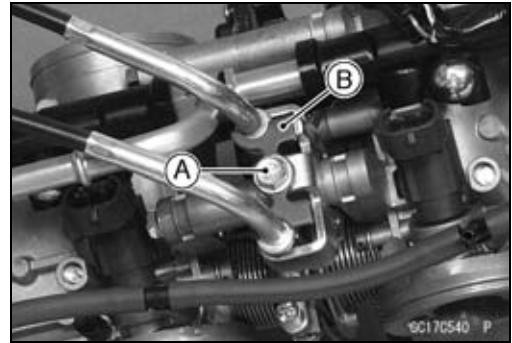
### CAUTION

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

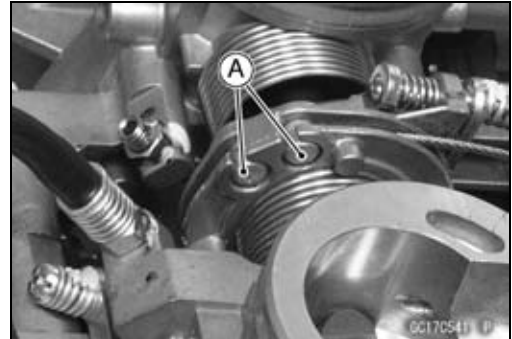
## 3-128 FUEL SYSTEM (DFI)

### Throttle Body Assy

- Remove the bolt [A] and the throttle cable plate [B] from the throttle body assy.

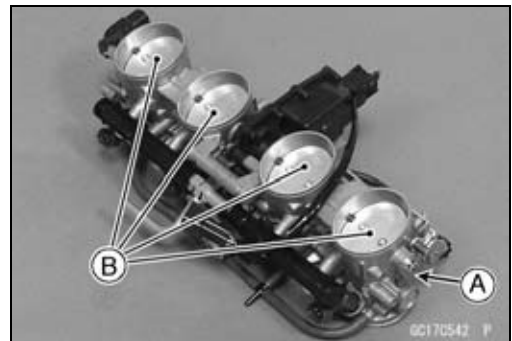


- Remove the throttle cable lower ends [A] from the throttle pulley.



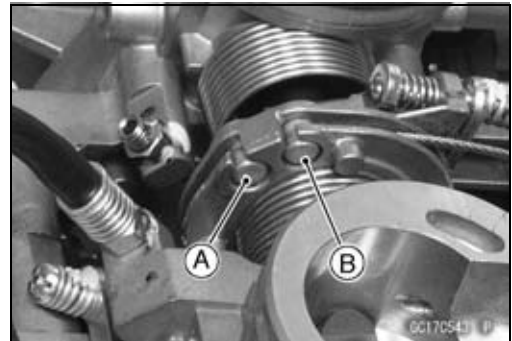
### Throttle Body Assy Installation

- Turn the lever [A] fully clockwise, and close the subthrottle valves [B] until completely closed position.



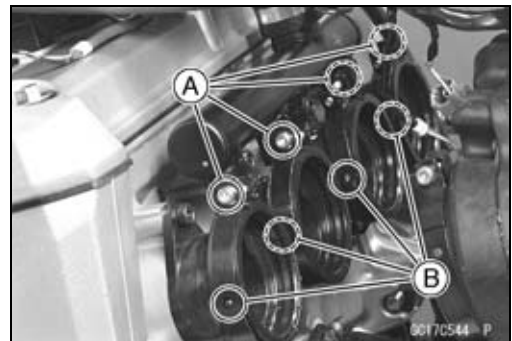
- Apply a thin coating of grease to the throttle cable lower ends.
- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley.
- Tighten:

**Torque - Throttle Cable Plate Bolt: 5.9 N·m (0.60 kgf·m, 52 in·lb)**



- Install the throttle body assy holder clamp bolts in the direction as shown.  
Bolt Heads [A]
- Fit the projections [B] of the holder into the holes in the clamps.
- Install the throttle body assy to the throttle body assy holders.
- Apply a small amount of 2-stroke oil to the throttle body assy holder for easy installation.
- Tighten:

**Torque - Throttle Body Assy Holder Clamp Bolts: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

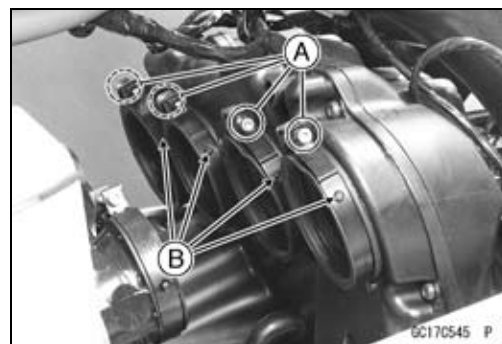


## Throttle Body Assy

- Install the air duct clamp bolts in the direction as shown.  
Bolt Heads [A]
- Fit the projections [B] of the holder into the holes in the clamps.
- Install the air ducts to the throttle body assy.
- Apply a small amount of 2-stroke oil to the throttle body assy holder for easy installation.
- Tighten:

**Torque - Air Duct Clamp Bolts: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

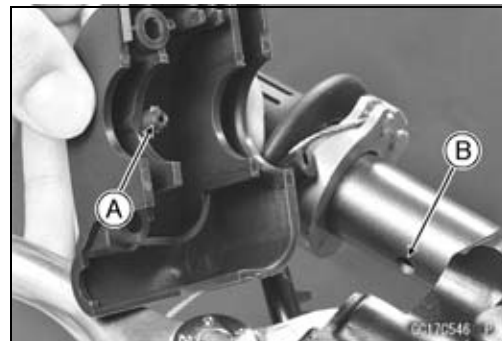
**Air Cleaner Housing Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



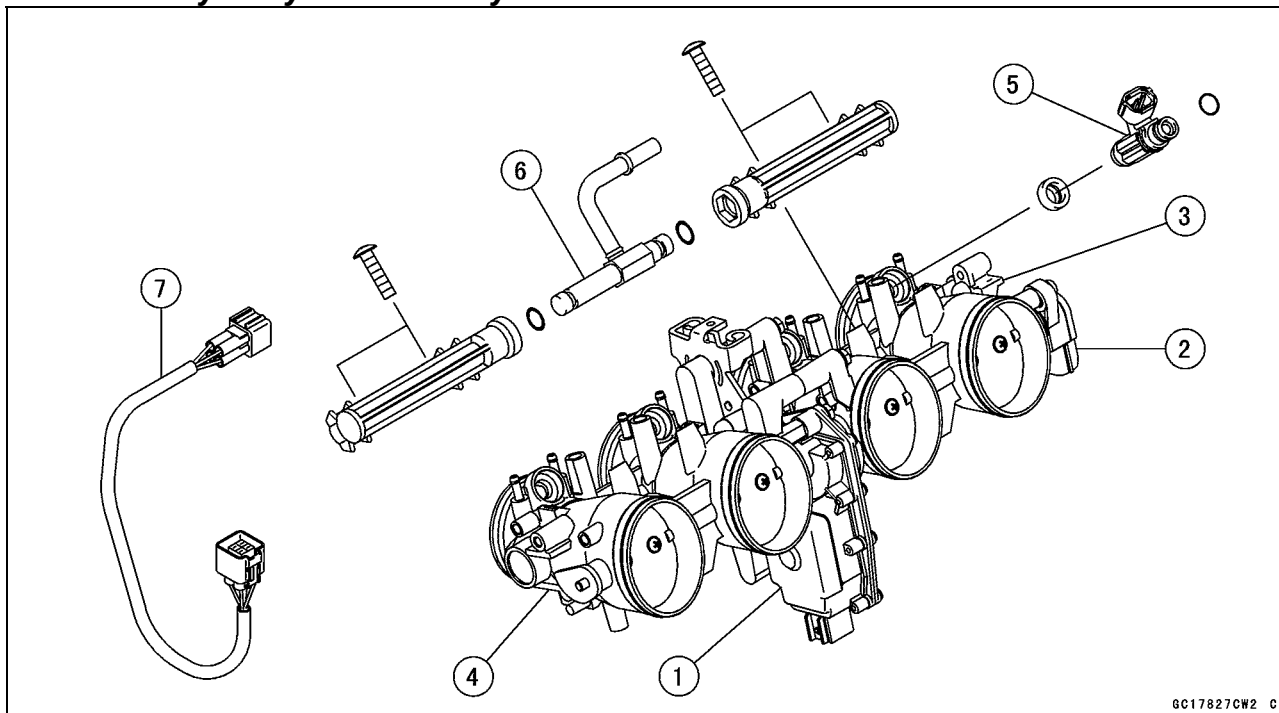
- Apply a thin coating of grease to the throttle cable upper ends.
- Install the upper ends of the throttle cables in the grip.
- Fit the projection [A] of the right switch housing into the hole [B] of the handlebar.
- Turn the throttle grip and make sure that the throttle valves move smoothly and return by spring force.
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust:

Throttle Grip Free Play (see Throttle Control System Inspection in the Periodic Maintenance chapter)

Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)



## Throttle Body Assy Disassembly



1. Subthrottle Valve Actuator
2. Subthrottle Sensor
3. Main Throttle Sensor
4. Throttle Body Assy
5. Fuel Injectors
6. Delivery Pipe Assy
7. Subthrottle Valve Actuator Connector Harness

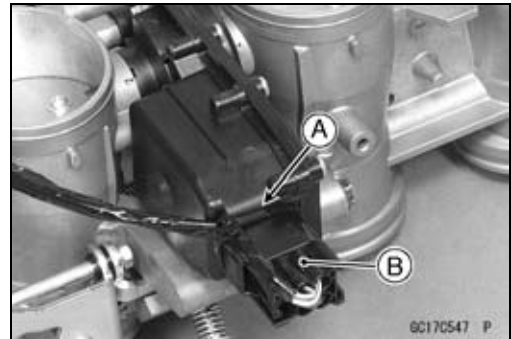
## 3-130 FUEL SYSTEM (DFI)

### Throttle Body Assy

#### CAUTION

Do not remove, disassemble or adjust the main throttle sensor, subthrottle sensor, subthrottle valve actuator, throttle link mechanism and throttle body assy, because they are adjust or set surely at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.

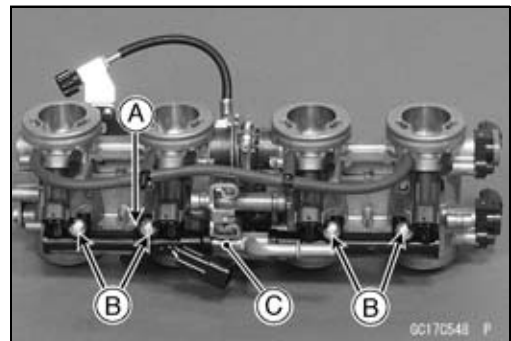
- Remove the throttle body assy (see Throttle Body Assy Removal).
- Cut the band [A], and disconnect the subthrottle valve actuator connector [B].



- Cut the band [A].
- Remove the screws [B] to pull out the injectors from the throttle body assy together with the delivery pipe assy [C].

#### NOTE

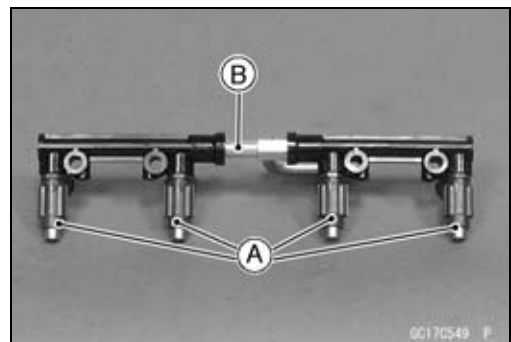
○Do not damage the insertion portions of the injectors when they are pulled out from the throttle body.



- Pull out the injectors [A] from the delivery pipe assy [B].

#### NOTE

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

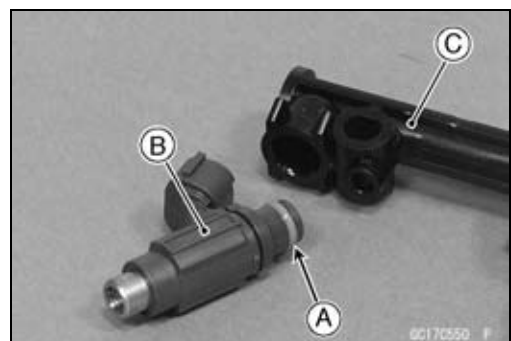


#### CAUTION

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

### Throttle Body Assy Assembly

- Before assembling, blow away dirt or dust from the throttle body and delivery pipe by applying compressed air.
- Replace the O-rings [A] of each injector [B] with new ones.
- Apply engine oil to the new O-rings, insert them to the delivery pipe assy [C] and confirm whether the injectors turn smoothly or not.



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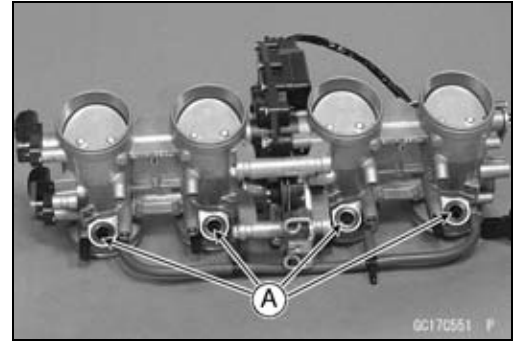
**Throttle Body Assy**

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- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the injectors along with the delivery pipe Assy to the throttle body.
- Tighten:

**Torque - Delivery Pipe Assy Mounting Screws: 3.4 N·m  
(0.35 kgf·m, 30 in·lb)**

- Connect the subthrottle valve actuator connector, and bind the harness with band.
- Install the throttle body Assy (see Throttle Body Assy Installation).



## 3-132 FUEL SYSTEM (DFI)

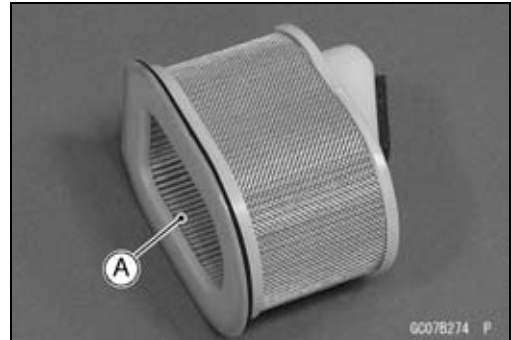
### Air Cleaner

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

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

#### **Air Cleaner Element Inspection**

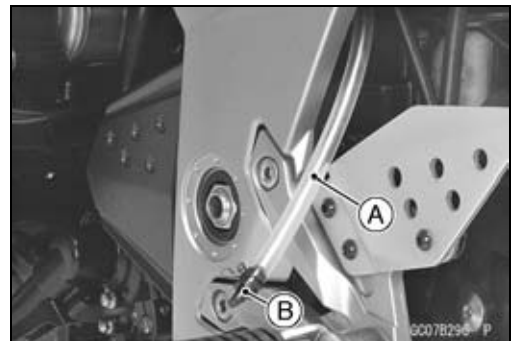
- Remove the air cleaner element (see Air Cleaner Element Replacement in the Periodic Maintenance chapter).
- Visually check the element [A] for tears or breaks.
- ★ If the element has any tears or breaks, replace the element.



#### **Air Cleaner Oil Draining**

A drain hose is connected to the bottom of the air cleaner to drain water or oil accumulated in the cleaner part.

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

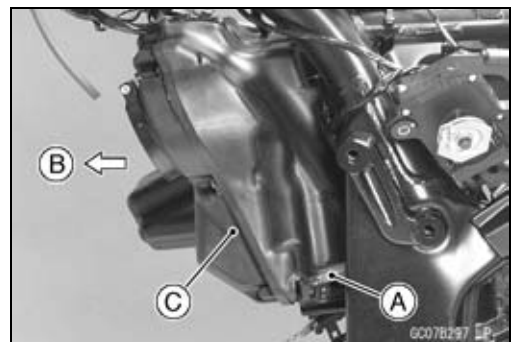


#### **⚠ WARNING**

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

#### **Air Cleaner Housing Removal**

- Remove:
  - Engine (see Engine Removal in the Engine Removal/Installation chapter)
  - Air Cleaner Element (see Air Cleaner Element Replacement in the Periodic Maintenance chapter)
  - Air Cleaner Drain Hose [A]
- Pull [B] the air cleaner housing [C] forward, and remove it from 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 and disconnect the battery (–) terminal.

To avoid fire, do not remove the fuel tank when the engine is still hot. Wait until it cools down.

To make fuel spillage minimum, draw the fuel out from the fuel tank when the engine is cold.

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

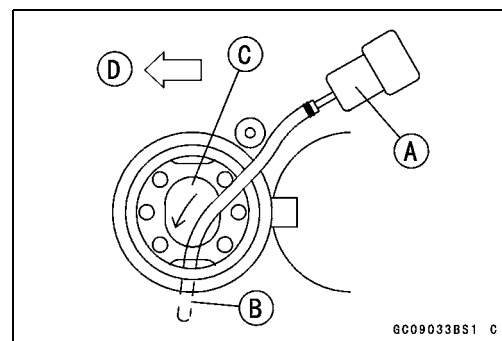
- Turn the ignition switch OFF.
- Wait until the engine cools down.
- Disconnect the battery (–) terminal (see Battery Removal in the Electrical System chapter).
- Remove:
  - Side Covers (see Side Cover Removal in the Frame chapter)
  - Fuel Tank Bolt [A]



- Open the fuel tank cap [A] to lower the pressure in the tank.
- During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.



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



#### **⚠ WARNING**

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

## 3-134 FUEL SYSTEM (DFI)

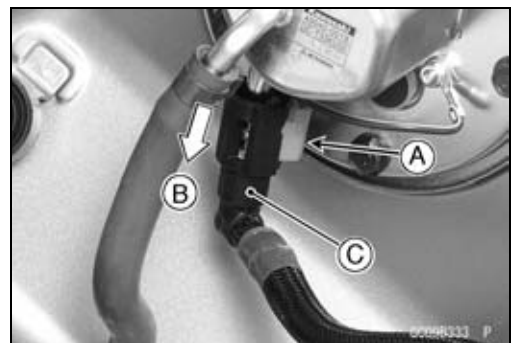
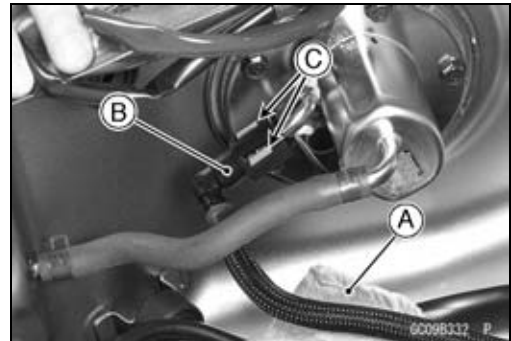
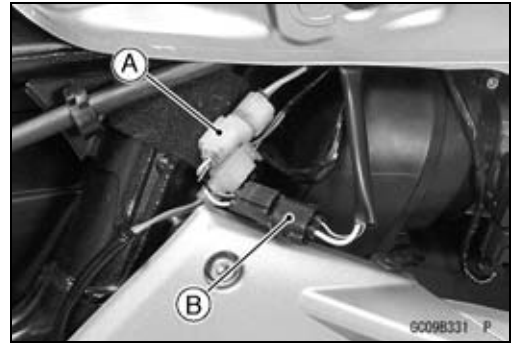
### Fuel Tank

- Disconnect:
  - Fuel Pump Lead Connector [A]
  - Fuel Level Sensor Lead Connector [B]
- Be sure to place a piece of cloth [A] around the fuel outlet hose joint [B].
- Push the joint lock claws [C].
- Pull the joint lock [A] as shown in the figure.
- Pull [B] the fuel outlet hose joint [C] out of the fuel outlet pipe.

#### **⚠ WARNING**

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

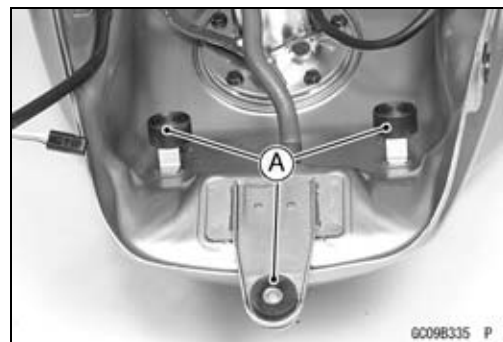
- Close the fuel tank cap.
- Remove the fuel tank, and place it on a flat surface.
- Do not apply the load to the fuel inlet pipe of the fuel pump.



## Fuel Tank

### Fuel Tank Installation

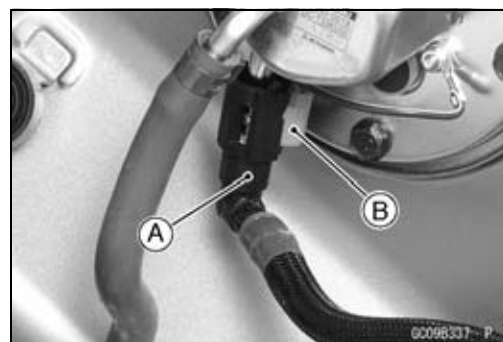
- Note the above WARNING (see Fuel Tank Removal).
- Run the hoses correctly (see Cable, Wire, and Hose Routing in the Appendix chapter).
- Check that the dampers [A] are in place on the frame and the fuel tank.
- ★ If the dampers are damaged or deteriorated, replace them.



- Pull the joint lock [A] as shown in the figure.



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

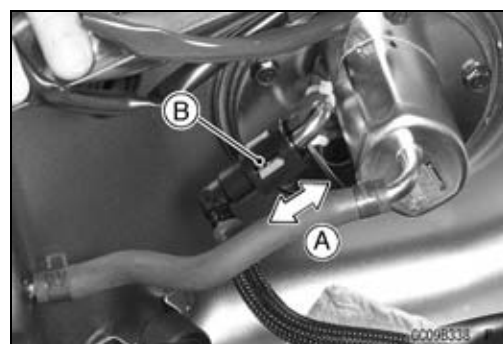


- Push and pull [A] the hose joint [B] back and forth more than two times, and make sure it is locked and does not come off.

### **⚠ WARNING**

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

- ★ If it comes off, reinstall the hose joint.
- Connect the fuel pump, fuel level sensor lead connectors and the battery (–) terminal (see Battery Installation in the Electrical System chapter).



## 3-136 FUEL SYSTEM (DFI)

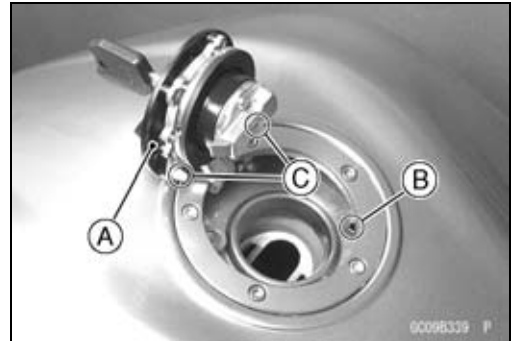
### Fuel Tank

#### **Fuel Tank Inspection**

- Visually inspect the gasket [A] on the tank cap for any damage.
- ★ Replace the gasket if it is damaged.
- Check to see if the water drain pipe [B] 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 [C] 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:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Inlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  - Fuel Pump (see Fuel Pump Removal)
- Pour some high-flash point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Draw the solvent out of the fuel tank.
- Dry the tank with compressed air.
- Install:
  - Fuel Pump (see Fuel Pump Installation)
  - Fuel Inlet Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  - Fuel Tank (see Fuel Tank Installation)

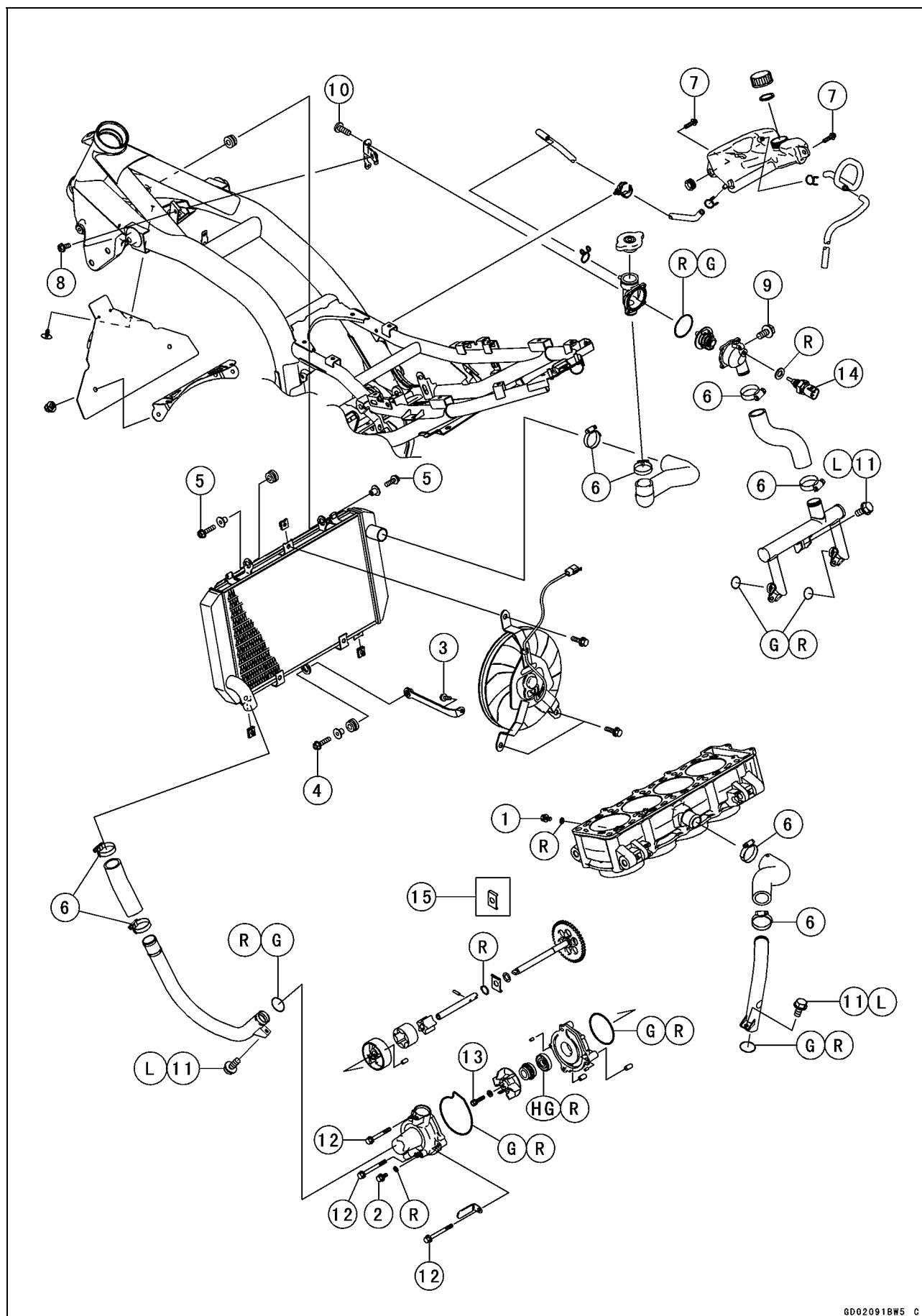
# Cooling System

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## 4-2 COOLING SYSTEM

### Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
2	Coolant Drain Bolt (Water Pump)	11	1.1	97 in·lb	
3	Radiator Bracket Mounting Bolt	6.9	0.70	61 in·lb	
4	Radiator Lower Bolt	6.9	0.70	61 in·lb	
5	Radiator Upper Bolts	6.9	0.70	61 in·lb	
6	Radiator (Water) Hose Clamp Screws	3.0	0.31	27 in·lb	
7	Reserve Tank Bolts	9.8	1.0	87 in·lb	
8	Thermostat Bracket Bolt	6.9	0.70	61 in·lb	
9	Thermostat Housing Ground Bolt	6.9	0.70	61 in·lb	
10	Thermostat Housing Screws	5.9	0.60	52 in·lb	
11	Water Pipe Bolts	11	1.1	97 in·lb	L
12	Water Pump Cover Bolts	11	1.1	97 in·lb	
13	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
14	Water Temperature Sensor	25	2.5	18	

15. Washer: Frame No. ; ~

G: Apply grease.

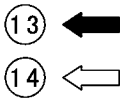
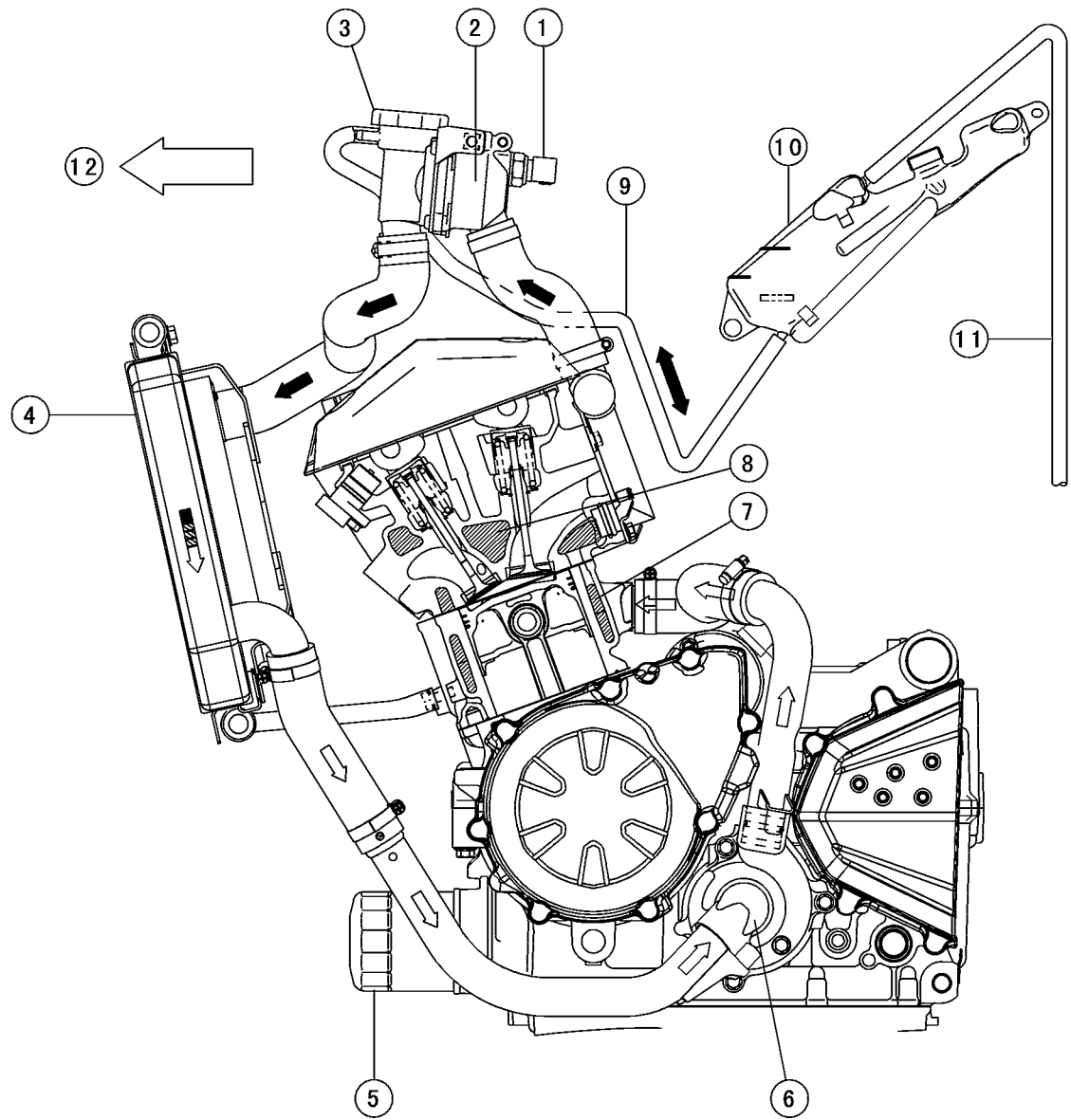
HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

4-4 COOLING SYSTEM

Coolant Flow Chart





---

**Coolant Flow Chart**

---

- |                             |                                |
|-----------------------------|--------------------------------|
| 1. Water Temperature Sensor | 8. Cylinder Head Jacket        |
| 2. Thermostat Housing       | 9. Reserve Tank Hose           |
| 3. Radiator Cap             | 10. Reserve Tank               |
| 4. Radiator                 | 11. Reserve Tank Overflow Hose |
| 5. Oil Filter               | 12. Front                      |
| 6. Water Pump               | 13. Hot Coolant                |
| 7. Cylinder Jacket          | 14. Cold Coolant               |

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

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

When the coolant temperature goes up beyond 100°C (212°F), the radiator fan relay conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the coolant temperature is below 97°C (207°F), the fan relay opens and the radiator fan stops.

In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.

The system is pressurized by the radiator cap to suppress boiling and the resultant air bubbles which can cause engine overheating. As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conversely, as the engine cools down, the coolant in the radiator and the water jacket contracts, and the stored coolant flows back to the radiator from the reserve tank.

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 13 ~ 18 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 13 ~ 18 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

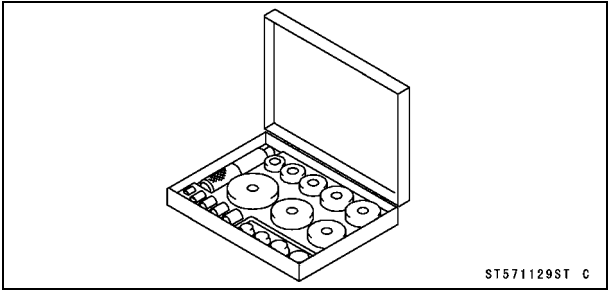
## 4-6 COOLING SYSTEM

### Specifications

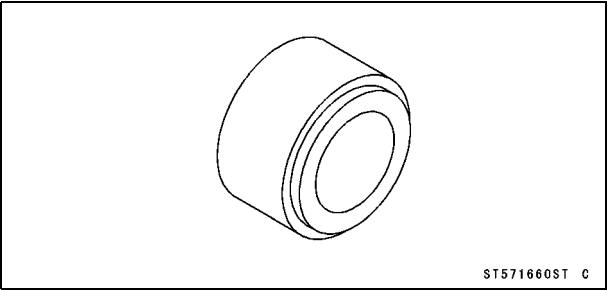
Item	Standard
<b>Coolant Provided when Shipping</b> Type (Recommended)  Color Mixed Ratio Freezing Point Total Amount	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators) Green Soft water 50%, coolant 50% -35°C (-31°F) 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 ~ 18 psi)
<b>Thermostat</b> Valve Opening Temperature Valve Full Opening Lift	58 ~ 62°C (136 ~ 144°F) 8 mm (0.31 in.) or more at 75°C (167°F)

**Special Tools**

**Bearing Driver Set:  
57001-1129**



**Oil Seal Driver:  
57001-1660**

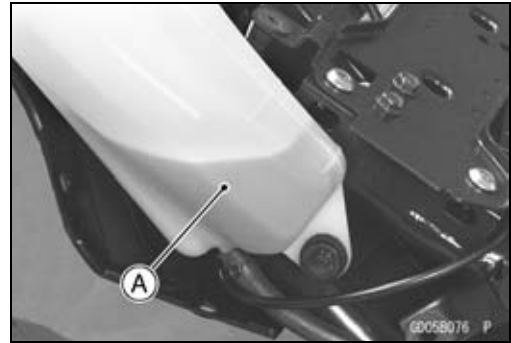


## 4-8 COOLING SYSTEM

### Coolant

#### **Coolant Deterioration Inspection**

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



#### **Coolant Level Inspection**

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

#### **Coolant Draining**

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

#### **Coolant Filling**

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

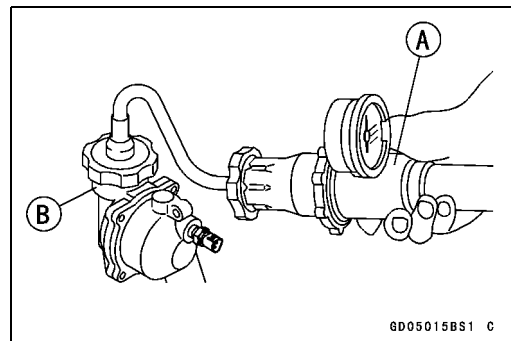
#### **Pressure Testing**

- Remove the fuel tank (see Fuel Tank Removal in the 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>, 18 psi).



#### **CAUTION**

**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm<sup>2</sup>, 18 psi).**

- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the system is all right.
- ★ If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the water pump.
- Remove the pressure tester, replenish the coolant, and install the radiator cap.
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).

Coolant

**Cooling System Flushing**

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

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

**CAUTION**

**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**

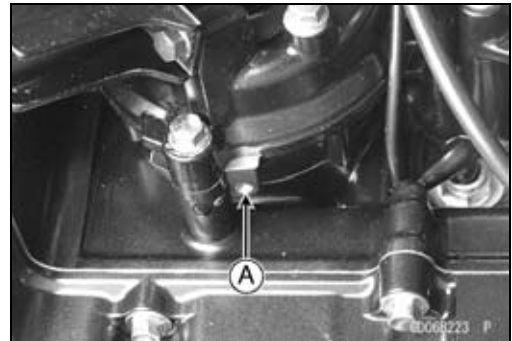
- Refer to the Oil Pump Removal in the Engine Lubrication System chapter.

#### **Water Pump Installation**

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

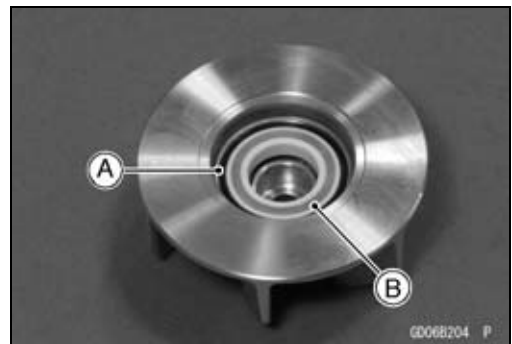
#### **Water Pump Inspection**

- Check the drainage outlet passage [A] at the bottom of the water pump body for coolant leaks.
- ★ If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal unit.



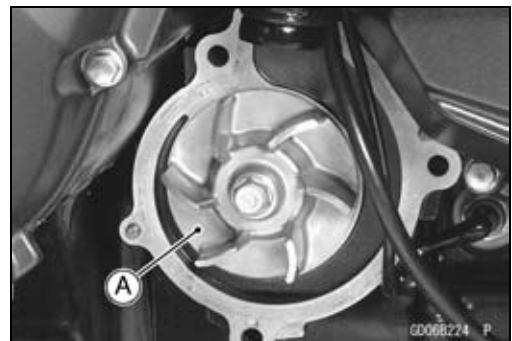
#### **Water Pump Impeller Disassembly/Assembly**

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



#### **Water Pump Impeller Inspection**

- Remove the water pump cover (see Water Pump Removal).
- Visually inspect the water pump impeller [A].
- ★ If the surface is corroded or if the blades are damaged, replace the impeller.

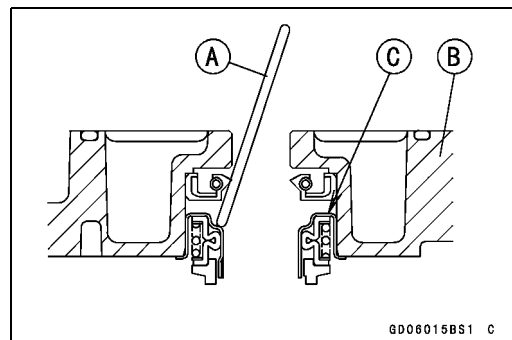


#### **Water Pump Housing Disassembly**

##### **CAUTION**

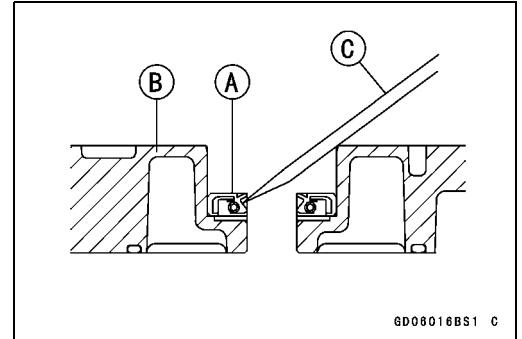
**Do not damage the hole wall of the water pump housing.**

- Insert a bar [A] into the pump housing [B], and hammer evenly around the circumference of the mechanical seal bottom [C].



## Water Pump

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



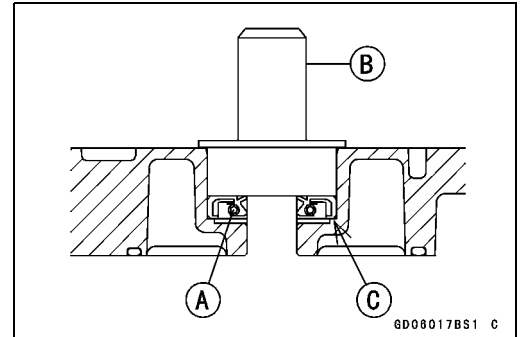
## Water Pump Housing Assembly

### CAUTION

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

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

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

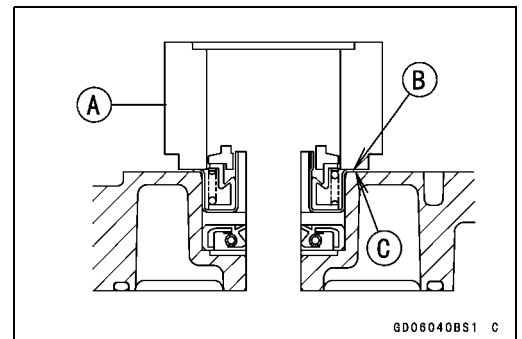


### CAUTION

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

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

**Special Tool - Oil Seal Driver: 57001-1660**



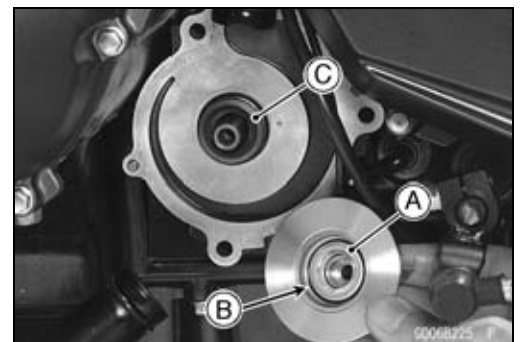
## Mechanical Seal Inspection

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

Impeller Sealing Seat Surface [A]

Rubber Seal [B]

Mechanical Seal [C]



## 4-12 COOLING SYSTEM

### Radiator

#### Radiator and Radiator Fan Removal

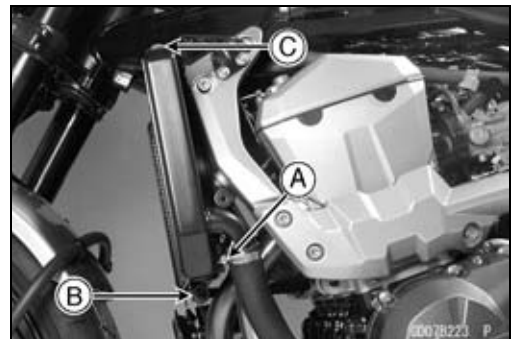
##### WARNING

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

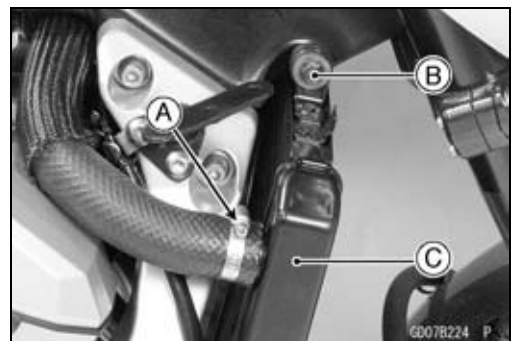
- Remove:  
Center Fairings (see Center Fairing Removal in the Frame chapter)  
Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)  
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)  
Radiator Fan Motor Lead Connector [A] (Disconnect)



- Remove:  
Radiator Hose Clamp Screw [A] (Loosen)  
Radiator Lower Bolt [B]  
Radiator Upper Bolt (Left) [C]



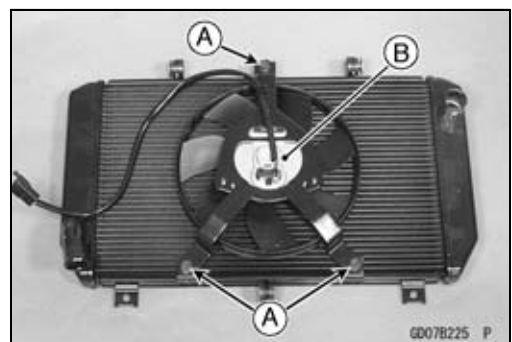
- Remove:  
Radiator Hose Clamp Screw [A] (Loosen)  
Radiator Upper Bolt (Right) [B]  
Radiator [C]



##### CAUTION

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

- Remove:  
Radiator Fan Mounting Bolts [A]  
Radiator Fan [B]





## Radiator

### **Radiator and Radiator Fan Installation**

- Installation is the reverse of removal.
- Run the radiator fan motor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the radiator bracket collars [A] as shown in the figure.

Rubber Dampers [B]

Upside [C]

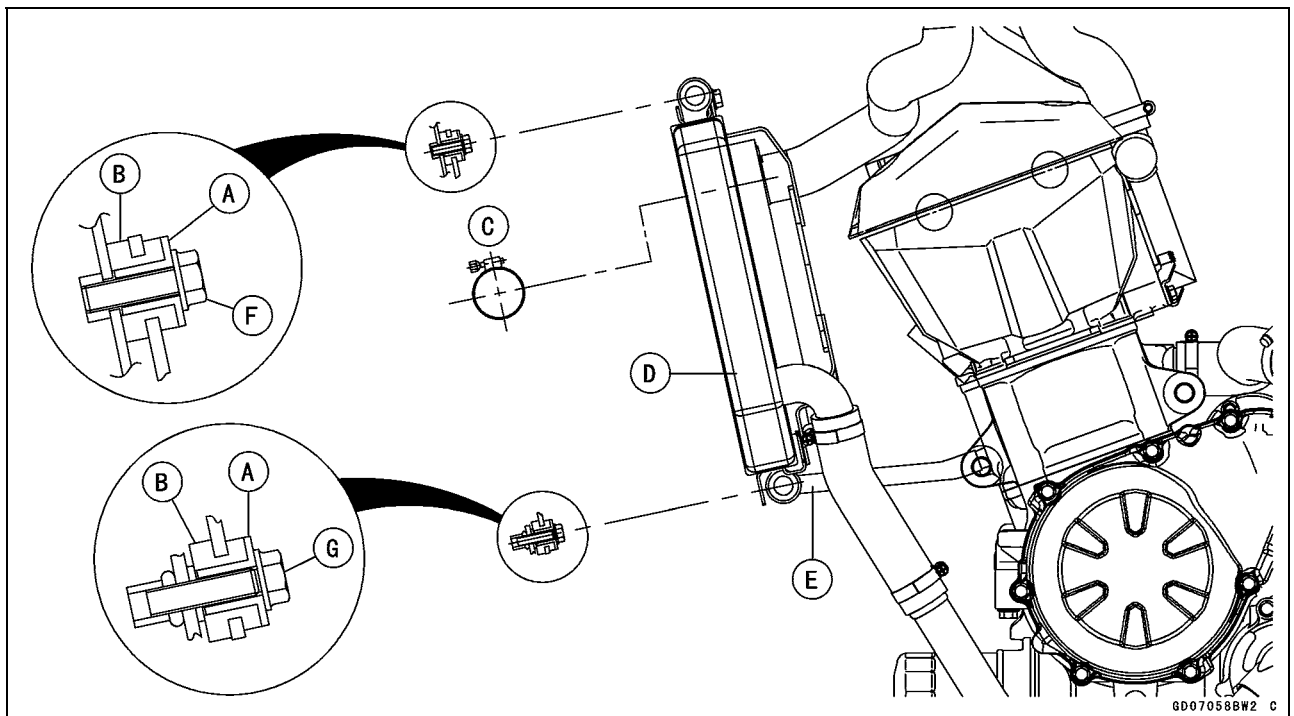
Radiator [D]

Bracket [E]

- Tighten:

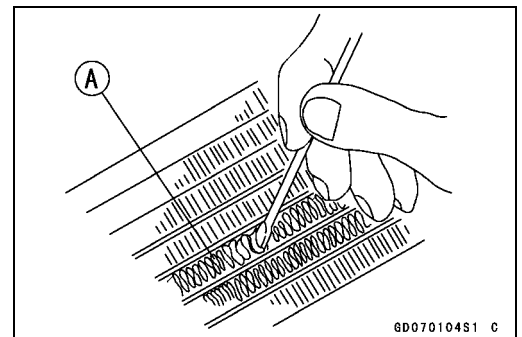
**Torque - Radiator Upper Bolts [F]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

**Radiator Lower Bolt [G]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**



### **Radiator Inspection**

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

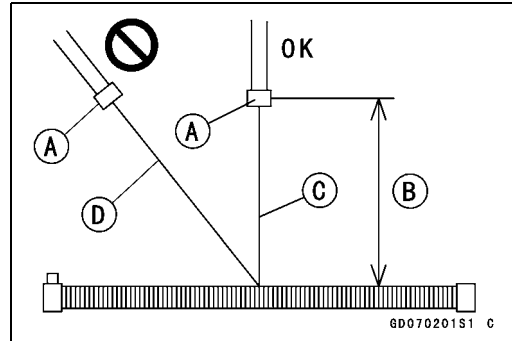


## 4-14 COOLING SYSTEM

### Radiator

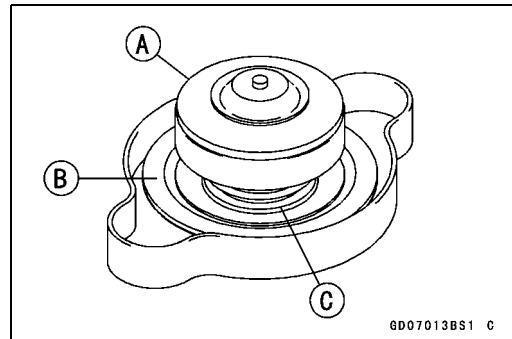
#### CAUTION

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

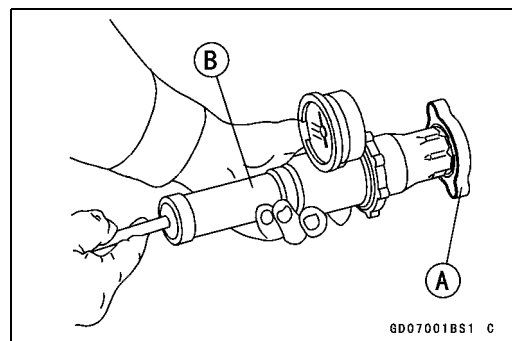
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Radiator Cap
- Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].
- ★ If any one of them shows visible damage, replace the cap with a new one.
- Install the cap [A] on a cooling system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



#### NOTE

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

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



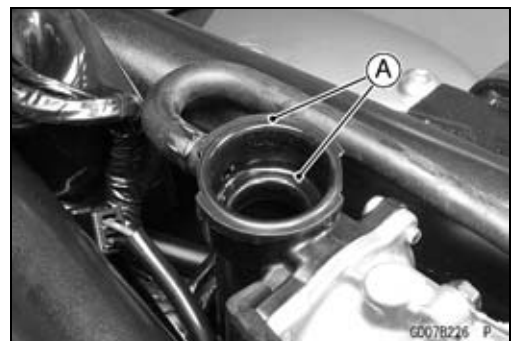
#### Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 13 ~ 18 psi)

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

#### Radiator Filler Neck Inspection

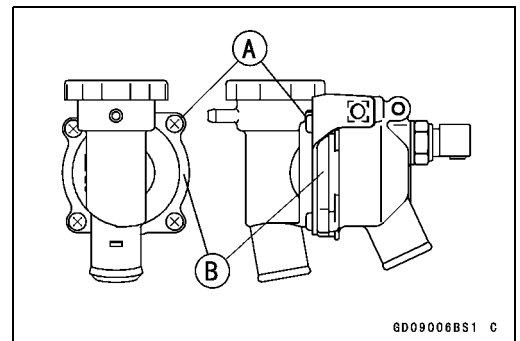
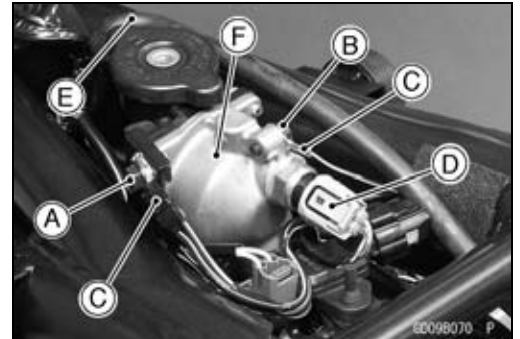
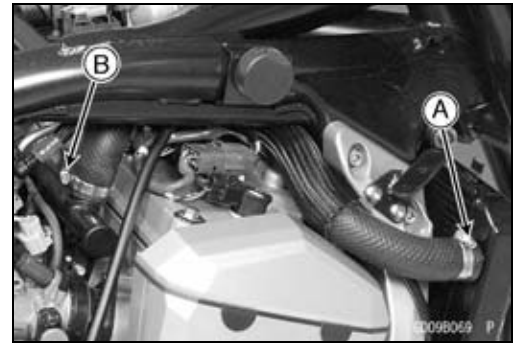
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Radiator Cap
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



## Thermostat

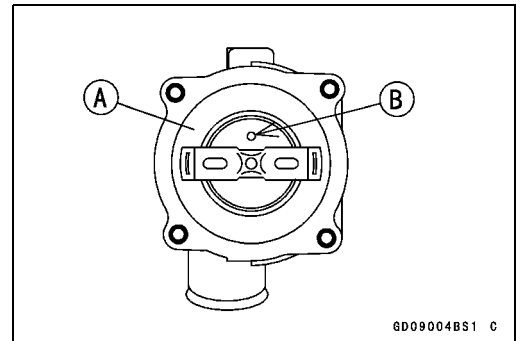
### Thermostat Removal

- Remove:
  - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Right Center Fairing (see Center Fairing Removal in the Frame chapter)
  - Radiator Hose Clamp Screw [A] (Loosen)
  - Water Hose Clamp Screw [B] (Loosen)
- Remove:
  - Thermostat Bracket Bolt [A]
  - Ground Bolt [B]
  - Ground Leads [C]
  - Water Temperature Sensor Lead Connector [D] (Disconnect)
  - Water Hose [E]
  - Thermostat Housing [F]
- Remove the screws [A], take off the cap [B], and take out the thermostat.



### Thermostat Installation

- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.
- Apply grease to the new O-ring.
- Install a new O-ring into the housing.
- Tighten:
  - Torque - Thermostat Housing Screws: 5.9 N·m (0.60 kgf·m, 52 in·lb)**
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:
  - Torque - Thermostat Bracket Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
  - Thermostat Housing Ground Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
  - Radiator (Water) Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)**
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

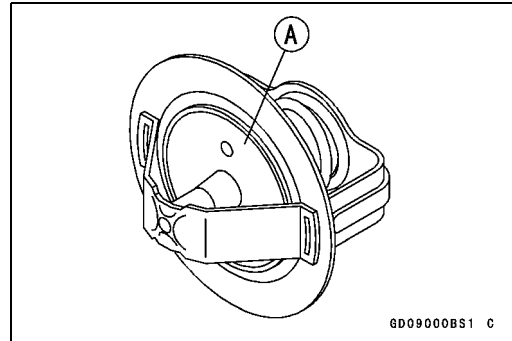


## 4-16 COOLING SYSTEM

### Thermostat

#### ***Thermostat Inspection***

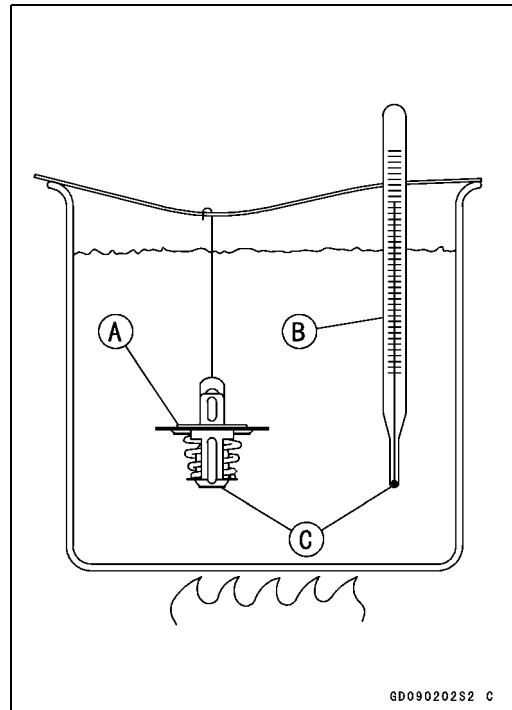
- Remove the thermostat (see Thermostat Removal), and inspect the thermostat valve [A] at room temperature.
- ★ If the valve is open, replace the thermostat with a new one.



- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.
- The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth. It must not touch the container, either.
- ★ If the measurement is out of the specified range, replace the thermostat with a new one.

#### **Thermostat Valve Opening Temperature**

**58 ~ 62°C (136 ~ 144°F)**



## Hose and Pipes

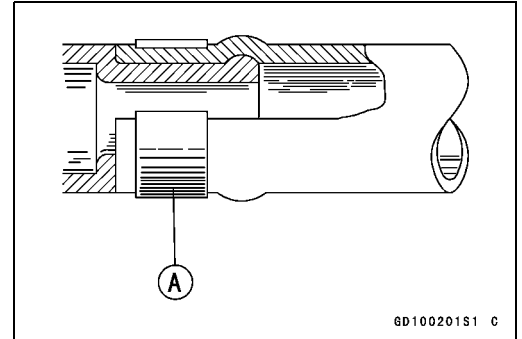
### **Hose Installation**

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

**Torque - Radiator (Water) Hose Clamp Screws: 3.0 N·m  
(0.31 kgf·m, 27 in·lb)**

### **Hose Inspection**

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



## 4-18 COOLING SYSTEM

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### Water Temperature Sensor

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

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

- Refer to the Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter.

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

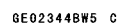
- Refer to the Water Temperature Sensor Inspection in the Electrical System chapter.

# Engine Top End

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## Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	
2	Camshaft Cap Bolts (L = 45 mm)	12	1.2	106 in·lb	S
3	Camshaft Cap Bolts (L = 40 mm)	12	1.2	106 in·lb	S
4	Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
5	Camshaft Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	
6	Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
7	Cylinder Head Bolts (M10 New Bolts)	54	5.5	40	S
	Cylinder Head Bolts (M10 Used Bolts)	49	5.0	36	S
8	Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
9	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
10	Cylinder Head Jacket Plugs	22	2.2	16	L
11	Front Camshaft Chain Guide Bolt (Lower)	12	1.2	106 in·lb	
12	Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
13	Rear Camshaft Chain Guide Bolt	25	2.5	18	
14	Spark Plugs	13	1.3	115 in·lb	
15	Throttle Body Assy Holder Bolts	13	1.3	115 in·lb	
16	Throttle Body Assy Holder Clamp Bolts	2.0	0.20	18 in·lb	

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

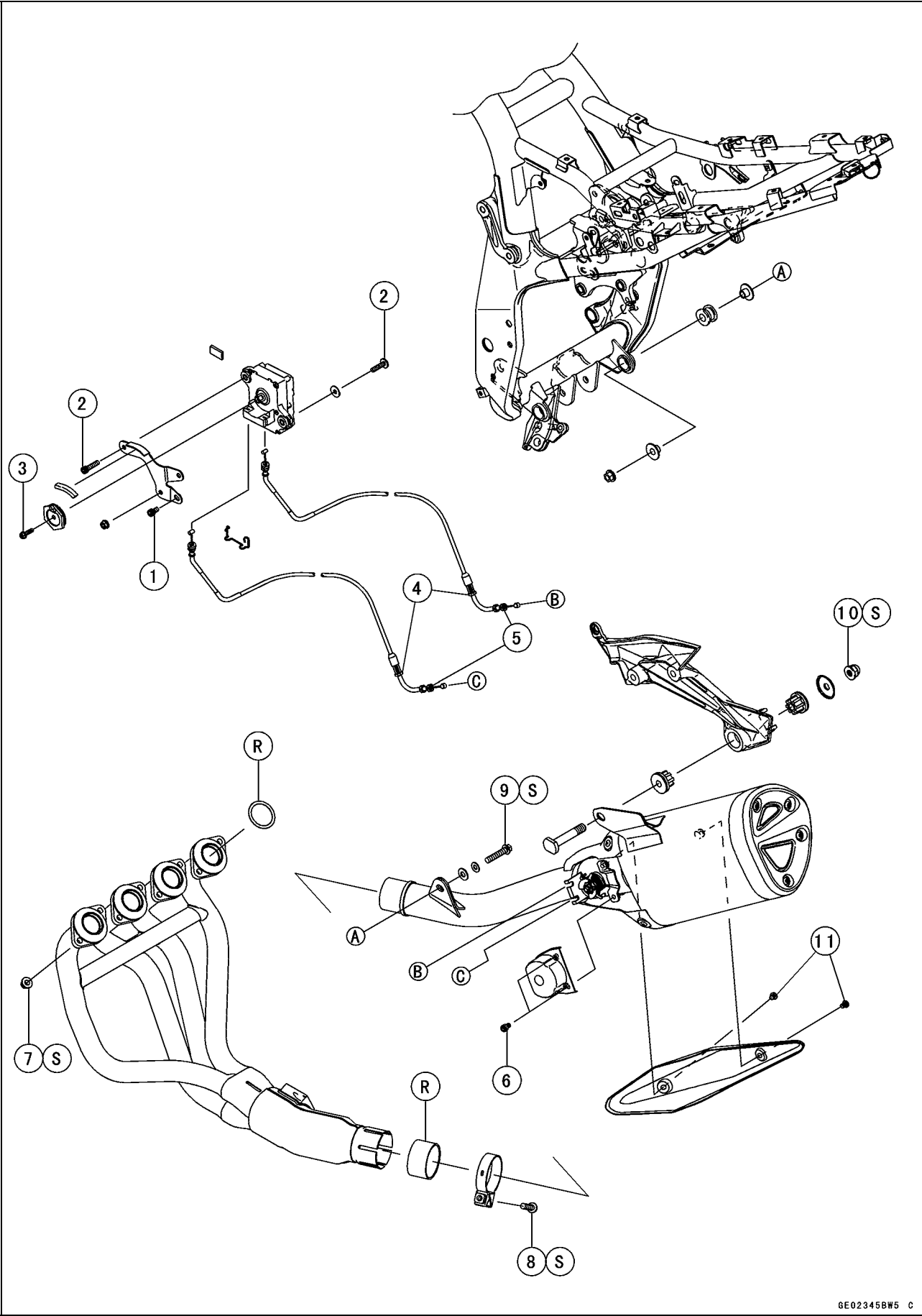
R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

5-4 ENGINE TOP END

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Butterfly Valve Actuator Bracket Bolt	6.9	0.70	61 in·lb	
2	Exhaust Butterfly Valve Actuator Mounting Bolts	6.9	0.70	61 in·lb	
3	Exhaust Butterfly Valve Actuator Pulley Bolt	5.0	0.51	44 in·lb	
4	Exhaust Butterfly Valve Cable Adjuster Locknuts	6.9	0.70	61 in·lb	
5	Exhaust Butterfly Valve Cable Locknuts	6.9	0.70	61 in·lb	
6	Exhaust Butterfly Valve Cover Bolts	6.9	0.70	61 in·lb	
7	Exhaust Pipe Manifold Holder Nuts	17	1.7	13	S
8	Muffler Body Clamp Bolt	15	1.5	11	S
9	Muffler Body Mounting Bolt	4.9	0.50	43 in·lb	S
10	Muffler Body Mounting Nut	34	3.5	25	S
11	Muffler Body Side Cover Bolts	6.9	0.70	61 in·lb	

R: Replacement Parts

S: Follow the specified tightening sequence.

5-6 ENGINE TOP END

Exhaust System

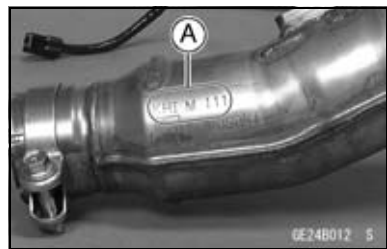
Exhaust System

MANIFOLD	SILENCER	SPECIFICATION	MARKETING CODE
<div><div>Honeycomb Type Catalyst</div><div>P/No. 39178-0086</div><div>Mark: KHI M 111</div></div>	<div><div>Honeycomb Type Catalyst</div><div>P/No. 18091-0485</div><div>Mark : KHI K 516</div><div>EPA Noise Emission Control Information</div></div>	AUSTRALIA	ZR750L7F
	<div><div>Honeycomb Type Catalyst</div><div>P/No. 18091-0486</div><div>Mark : KHI K 524</div><div>EPA Noise Emission Control Information</div></div>	MALAYSIA	ZR750L7F
<div><div>Honeycomb Type Catalyst</div><div>P/No. 39178-0097</div><div>Mark: KHI M 111</div></div>	<div><div>Honeycomb Type Catalyst</div><div>P/No. 18091-0485</div><div>Mark : KHI K 516</div><div>EPA Noise Emission Control Information</div></div>	WVTA (FULL H) GB WVTA (FULL H)	ZR750L7F, ZR750M7F ZR750L7F, ZR750M7F

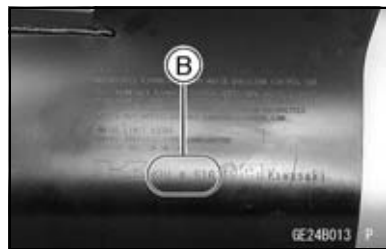
GE24090B F

Full: Full Power  
H: Honeycomb Type Catalyst

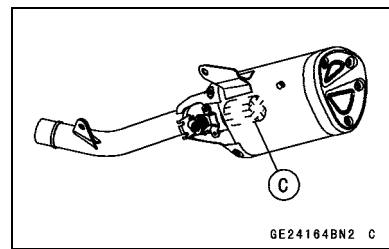
Manifold Mark Position [A]



Muffler Body Mark Position [B]



Honeycomb Type Catalyst Position [C]

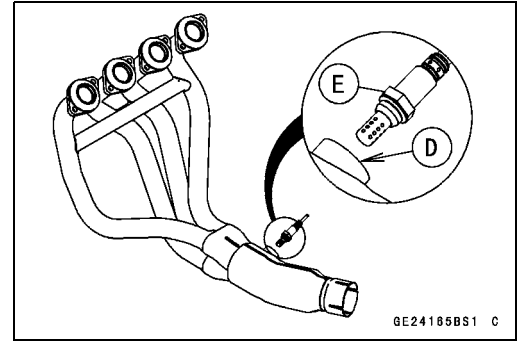


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**Exhaust System**

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Manifold with Hole [D] for Oxygen Sensor.  
Oxygen Sensor [E]



## 5-8 ENGINE TOP END

### Specifications

Item	Standard	Service Limit
<b>Camshafts</b>		
Cam Height:		
Exhaust	35.743 ~ 35.857 mm (1.4072 ~ 1.4117 in.)	35.64 mm (1.403 in.)
Inlet	35.943 ~ 36.057 mm (1.4151 ~ 1.4196 in.)	35.84 mm (1.411 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) 945 ~ 1 350 kPa (9.6 ~ 13.8 kgf/cm <sup>2</sup> , 137 ~ 196 psi) at 265 r/min (rpm)	— — —
Cylinder Head Warp	— — —	0.05 mm (0.002 in.)
<b>Valves</b>		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	— — —
Inlet	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	— — —
Valve Head Thickness:		
Exhaust	1.0 mm (0.039 in.)	0.5 mm (0.020 in.)
Inlet	0.5 mm (0.020 in.)	0.3 mm (0.012 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	3.955 ~ 3.970 mm (0.1557 ~ 0.1563 in.)	3.94 mm (0.155 in.)
Inlet	3.975 ~ 3.990 mm (0.1565 ~ 0.1571 in.)	3.96 mm (0.156 in.)
Valve Guide Inside Diameter:		
Exhaust	4.000 ~ 4.012 mm (0.1575 ~ 0.1580 in.)	4.08 mm (0.161 in.)
Inlet	4.000 ~ 4.012 mm (0.1575 ~ 0.1580 in.)	4.08 mm (0.161 in.)
Valve/Valve Guide Clearance (Wobble Method):		
Exhaust	0.10 ~ 0.18 mm (0.0039 ~ 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	32°, 45°, 60°	— — —
Valve Seating Surface:		
Width:		
Exhaust	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	— — —
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	— — —
Outside Diameter:		
Exhaust	21.6 ~ 21.8 mm (0.850 ~ 0.858 in.)	— — —
Inlet	26.4 ~ 26.6 mm (1.039 ~ 1.047 in.)	— — —
Valve Spring Free Length:		
Exhaust	40.7 mm (1.602 in.)	38.9 mm (1.531 in.)
Inlet	40.7 mm (1.602 in.)	38.9 mm (1.531 in.)

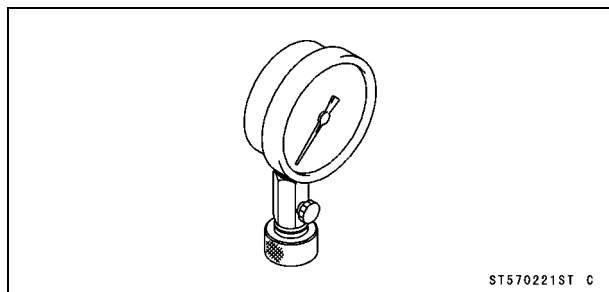
## Specifications

Item	Standard	Service Limit
<b>Cylinder, Pistons</b>		
Cylinder Inside Diameter	68.400 ~ 68.412 mm (2.6929 ~ 2.6934 in.)	68.50 mm (2.6969 in.)
Piston Diameter	68.345 ~ 68.360 mm (2.6907 ~ 2.6913 in.)	68.20 mm (2.6850 in.)
Piston/Cylinder Clearance	0.040 ~ 0.067 mm (0.0016 ~ 0.0026 in.)	— — —
Piston Ring/Groove Clearance:		
Top	0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Second	0.02 ~ 0.05 mm (0.0008 ~ 0.0020 in.)	0.15 mm (0.0059 in.)
Piston Ring Groove Width:		
Top	0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)	0.93 mm (0.037 in.)
Second	0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)	0.91 mm (0.036 in.)
Piston Ring Thickness:		
Top	0.78 ~ 0.79 mm (0.0307 ~ 0.0311 in.)	0.71 mm (0.028 in.)
Second	0.78 ~ 0.79 mm (0.0307 ~ 0.0311 in.)	0.71 mm (0.028 in.)
Piston Ring End Gap:		
Top	0.30 ~ 0.40 mm (0.0118 ~ 0.0157 in.)	0.7 mm (0.028 in.)
Second	0.45 ~ 0.55 mm (0.0177 ~ 0.0217 in.)	0.9 mm (0.035 in.)

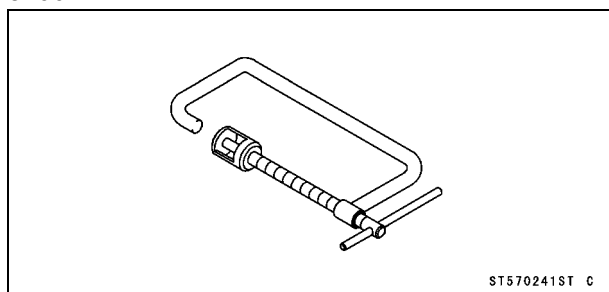
## 5-10 ENGINE TOP END

### Special Tools and Sealant

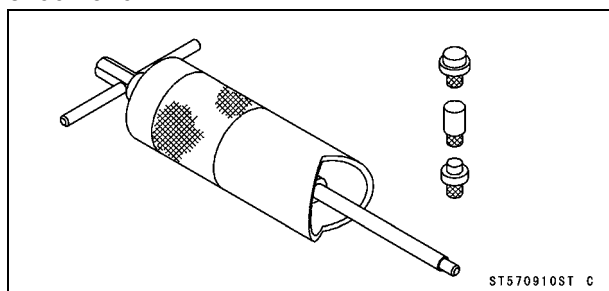
**Compression Gauge, 20 kgf/cm<sup>2</sup>:  
57001-221**



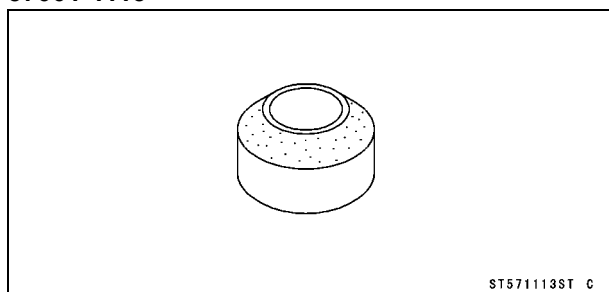
**Valve Spring Compressor Assembly:  
57001-241**



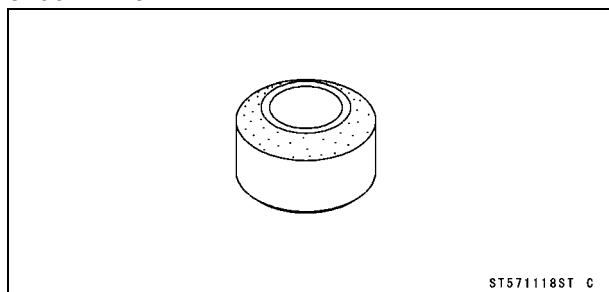
**Piston Pin Puller Assembly:  
57001-910**



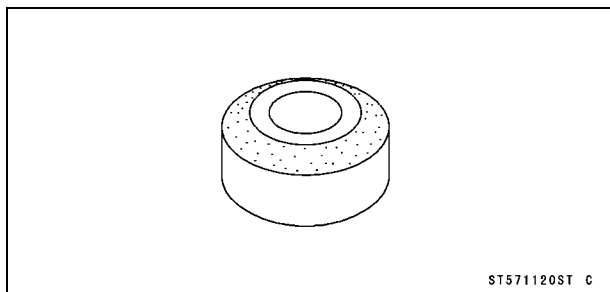
**Valve Seat Cutter, 45° -  $\phi$ 24.5:  
57001-1113**



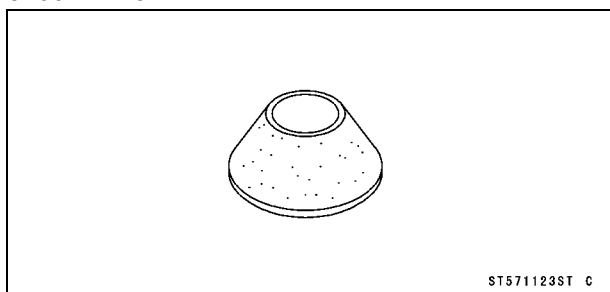
**Valve Seat Cutter, 32° -  $\phi$ 25:  
57001-1118**



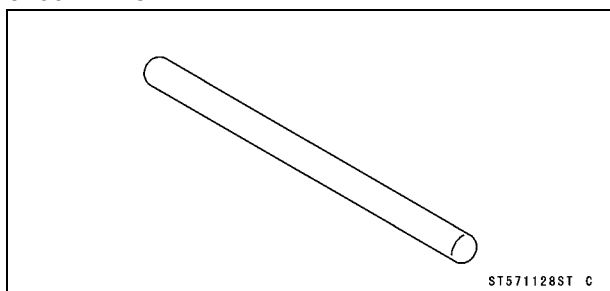
**Valve Seat Cutter, 32° -  $\phi$ 30:  
57001-1120**



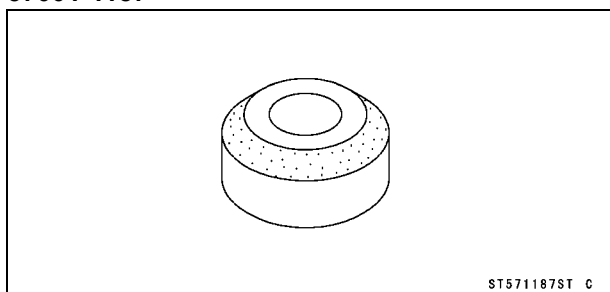
**Valve Seat Cutter, 60° -  $\phi$ 30:  
57001-1123**



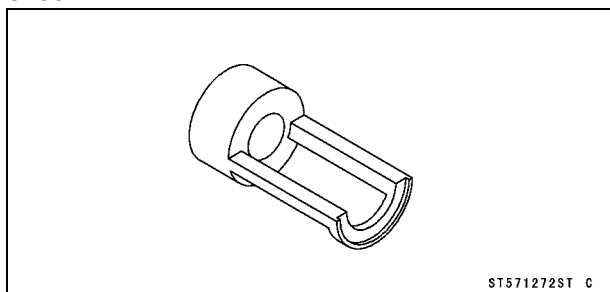
**Valve Seat Cutter Holder Bar:  
57001-1128**



**Valve Seat Cutter, 45° -  $\phi$ 30:  
57001-1187**



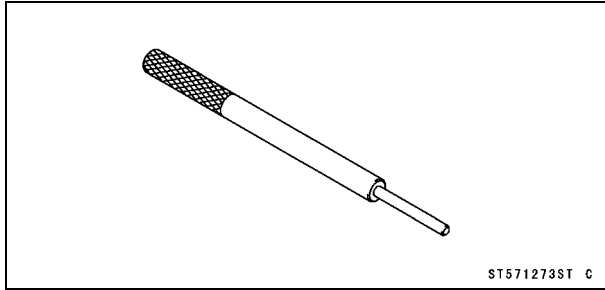
**Valve Spring Compressor Adapter,  $\phi$ 21:  
57001-1272**



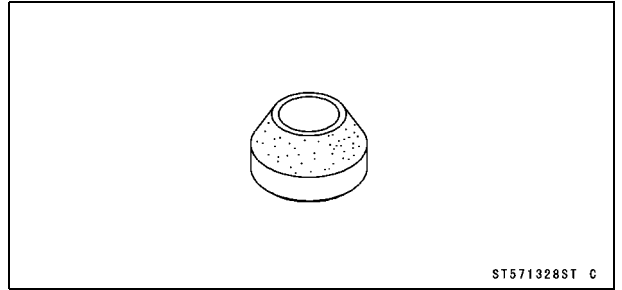


## Special Tools and Sealant

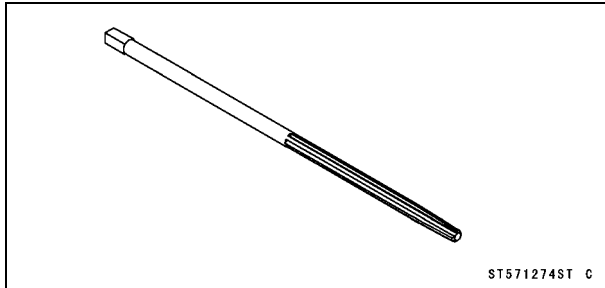
**Valve Guide Arbor,  $\phi 4$ :**  
**57001-1273**



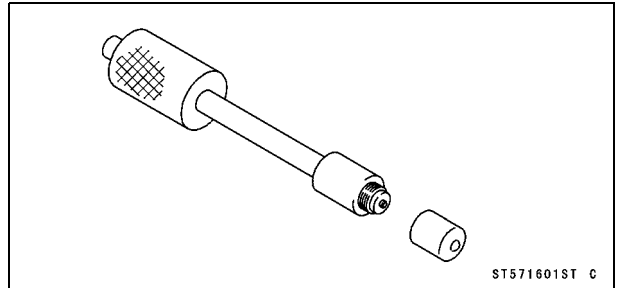
**Valve Seat Cutter, 60° -  $\phi 25$ :**  
**57001-1328**



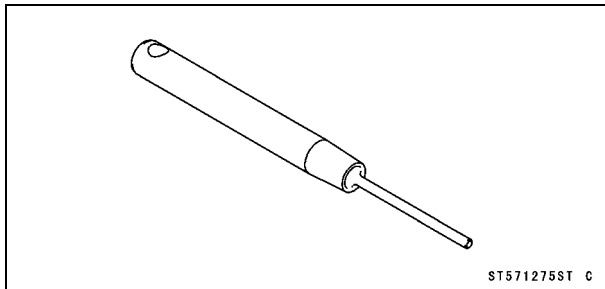
**Valve Guide Reamer,  $\phi 4$ :**  
**57001-1274**



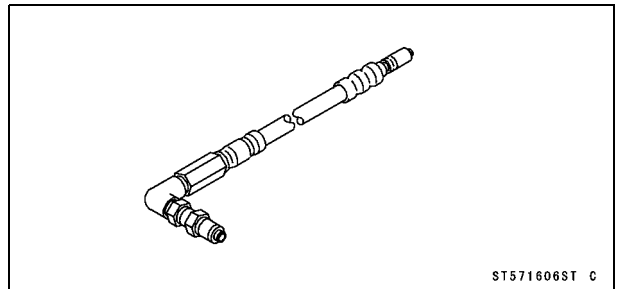
**Compression Gauge Adapter, M10  $\times$  1.0:**  
**57001-1601**



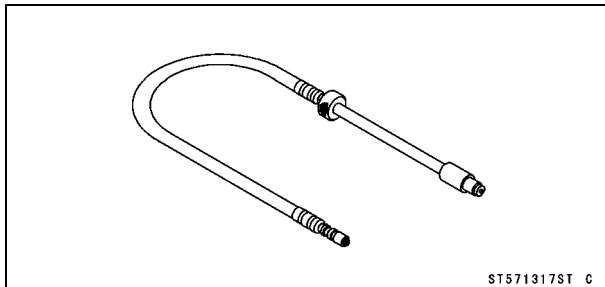
**Valve Seat Cutter Holder,  $\phi 4$ :**  
**57001-1275**



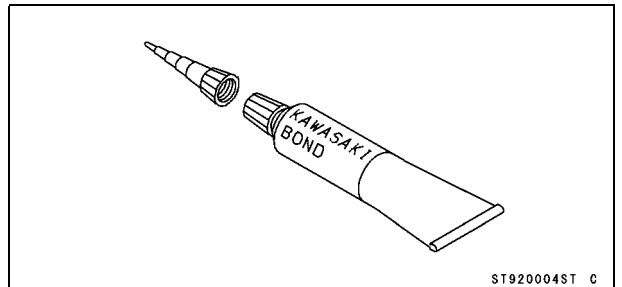
**L-Shape Hose:**  
**57001-1606**



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



**Kawasaki Bond (Silicone Sealant):**  
**92104-0004**

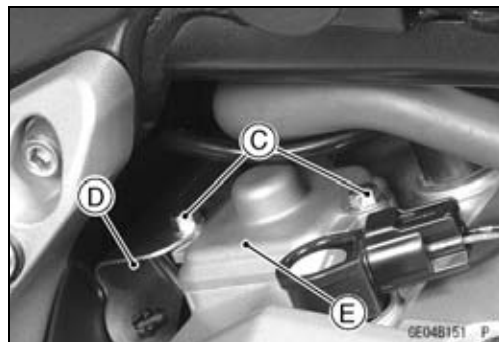
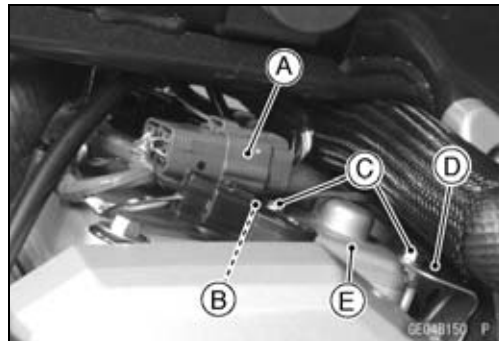


## 5-12 ENGINE TOP END

### Clean Air System

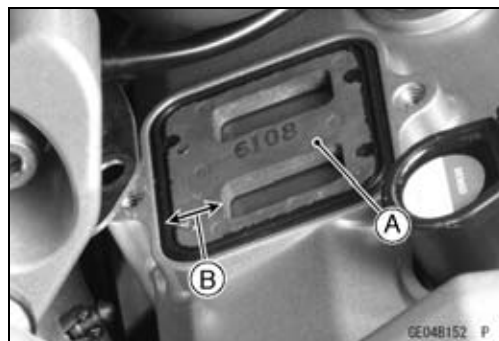
#### **Air Suction Valve Removal**

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Connector [A] (from Clamp [B])
  - Air Suction Valve Cover Bolts [C] and Bracket [D]
  - Air Suction Valve Covers [E]
  - Air Suction Valves



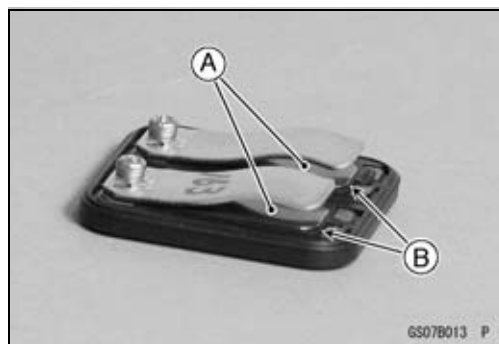
#### **Air Suction Valve Installation**

- 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)**
- Install the removed parts (see appropriate chapters).



#### **Air Suction Valve Inspection**

- Remove the air suction valve (see Air Suction Valve Removal).
- Visually inspect the reeds for cracks, folds, warps, heat damage or other damage.
- ★ If there is any doubt as to the condition of the reeds [A], replace the air suction valve as an assembly.
- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.
- If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high-flash point solvent.



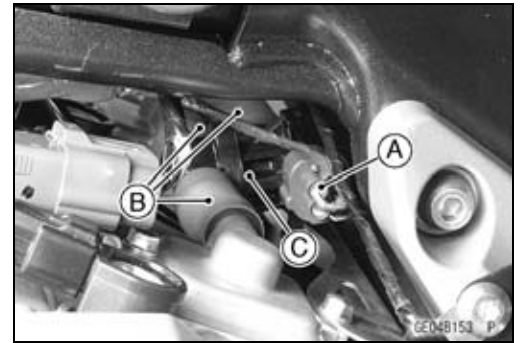
#### **CAUTION**

**Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.**

## Clean Air System

### Air Switching Valve Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Thermostat Housing (see Thermostat Removal in the Cooling System chapter)
  - Connector [A] (Disconnect)
- Separate the hoses [B] from the air suction valve covers and air cleaner housing holder, and remove the air switching valve [C].

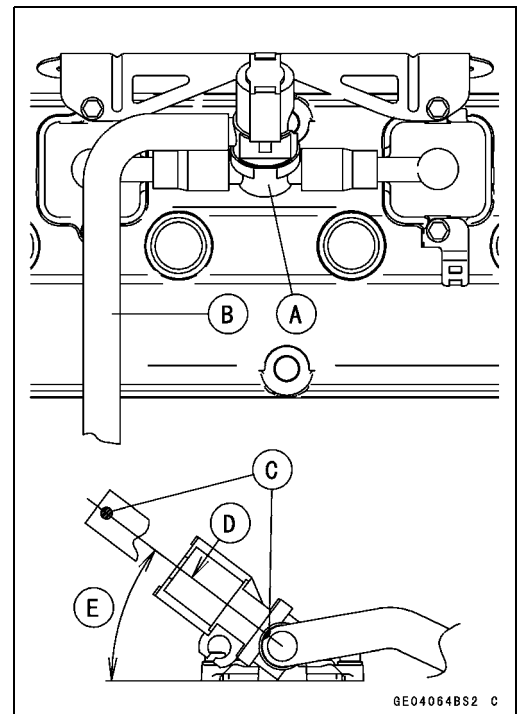


### CAUTION

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

### Air Switching Valve Installation

- Install the air switching valve [A] with hose [B] as shown in the figure.
- Align the white mark [C] of the hose and center line [D] of the air switching valve.  
30 ~ 40° [E]



### Air Switching Valve Operation Test

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

### Air Switching Valve Unit Test

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

### Clean Air System Hose Inspection

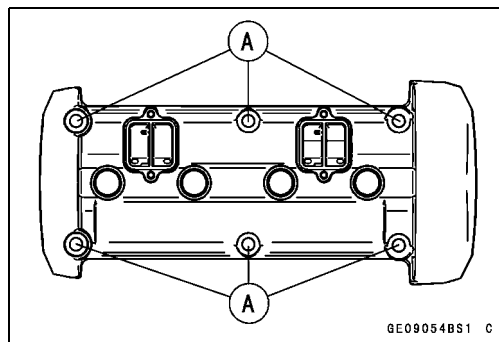
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, air switching valve and air suction valve covers.
- ★ If they are not, correct them. Replace them if they are damaged.

## 5-14 ENGINE TOP END

### Cylinder Head Cover

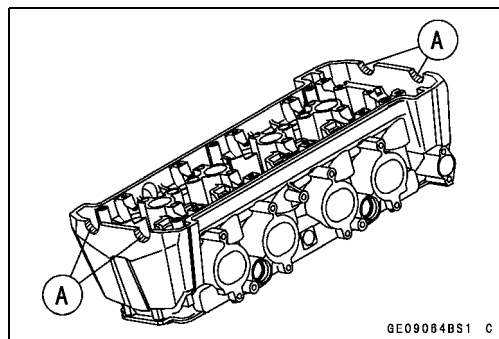
#### Cylinder Head Cover Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Air Switching Valve (see Air Switching Valve Removal)
  - Stick Coils (see Stick Coil Removal in the Electrical System chapter)
  - Air Suction Valve Covers (see Air Suction Valve Removal)
  - Cylinder Head Cover Bolts [A]
  - Cylinder Head Cover

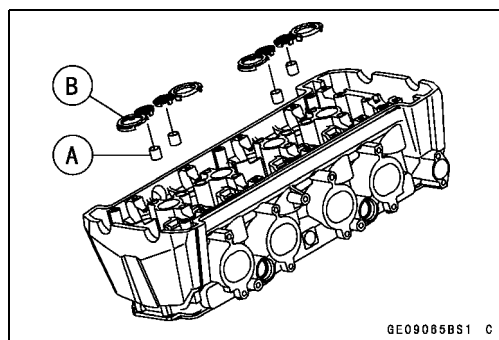


#### Cylinder Head Cover Installation

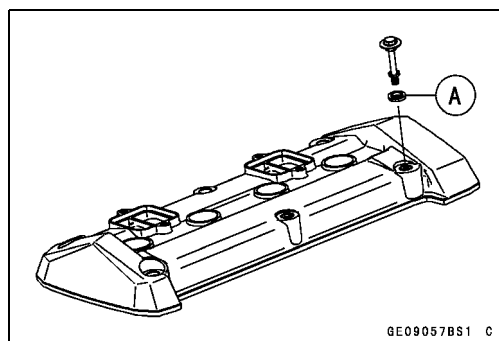
- Replace the head cover gasket with a new one.
  - Apply silicone sealant [A] to the cylinder head as shown in the figure.
- Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**
- Install the new head cover gasket.



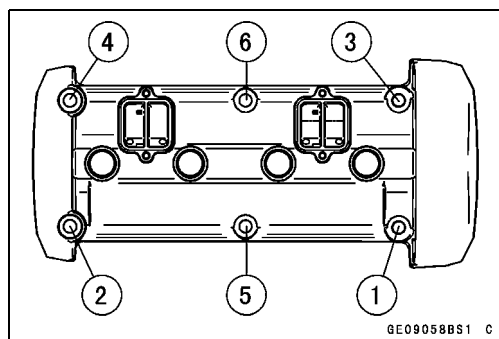
- Install:
  - Dowel Pins [A]
  - Plug Hole Gaskets [B]



- Install the cylinder head cover.
- Install the washer [A] with the metal side faces upward.



- Tighten the cover bolts following the specified tightening sequence.
- Torque - Cylinder Head Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the removed parts (see appropriate chapters).



## Camshaft Chain Tensioner

### Camshaft Chain Tensioner Removal

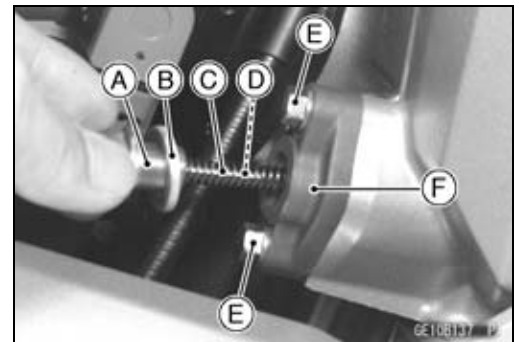
#### CAUTION

This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below.

When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation".

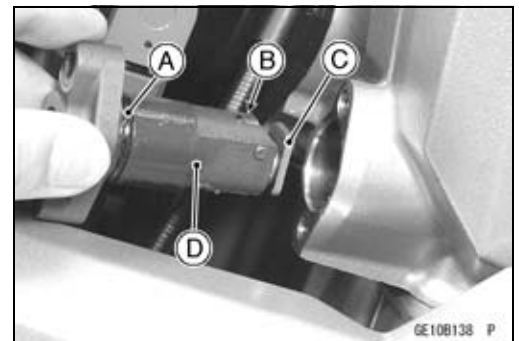
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.

- Remove:
  - Cap Bolt [A]
  - Washer [B]
  - Spring [C]
  - Rod [D]
  - Mounting Bolts [E]
  - Camshaft Chain Tensioner [F]

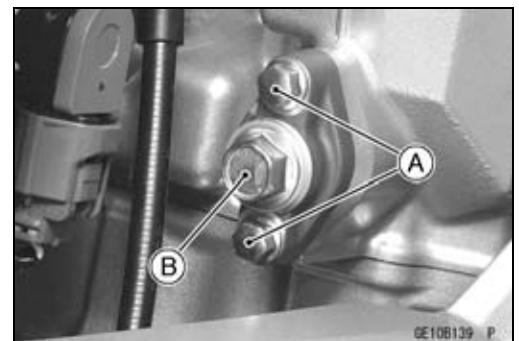


### Camshaft Chain Tensioner Installation

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Release the stopper [B] and push the push rod [C] into the tensioner body [D].
- 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, 97 in·lb)**
- Install the rod, spring and washer.
- Tighten the cap bolt [B].
  - Torque - Camshaft Chain Tensioner Cap Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.

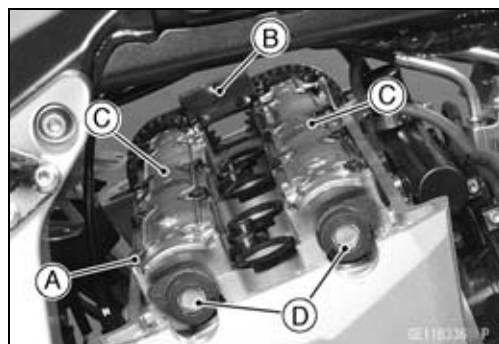
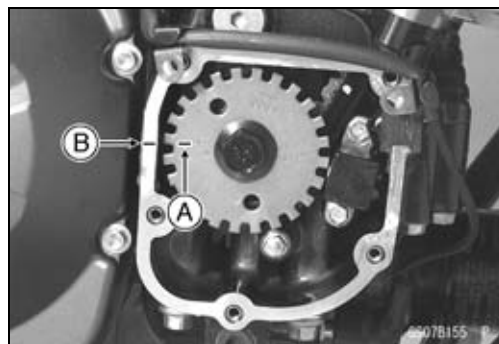


## 5-16 ENGINE TOP END

### Camshaft, Camshaft Chain

#### Camshaft Removal

- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Crankshaft Sensor Cover (see Crankshaft Sensor Removal in the Electrical System chapter)
- Position the crankshaft at #1, 4 piston TDC.
  - TDC mark [A] for #1, 4 Pistons
  - Timing Mark (Crankcase Halves Mating Surface) [B]
- Remove:
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  - Camshaft Cap Bolts [A]
  - Upper Chain Guide [B]
  - Camshaft Caps [C]
  - Camshafts [D]
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.



#### CAUTION

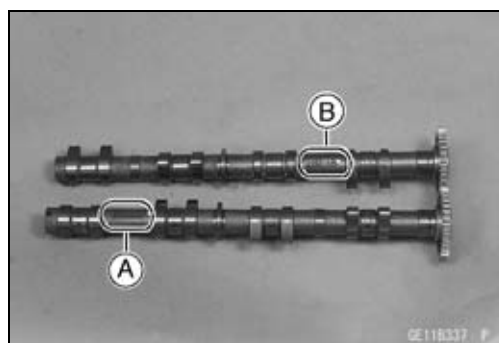
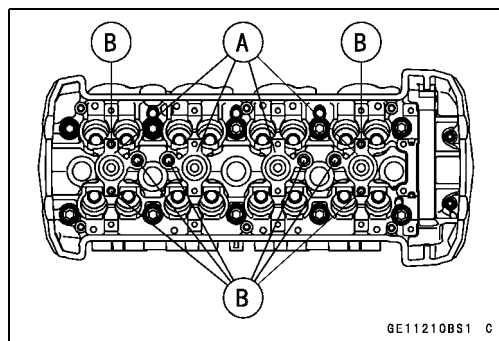
The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

#### Camshaft Installation

- Be sure to install the following parts.
  - Plug Hole Gaskets [A]
  - Dowel Pins [B]
- Apply molybdenum disulfide oil solution to all cam parts and journals.
- If a new camshaft is to be used, apply a thin coat of molybdenum disulfide grease to the cam surfaces.

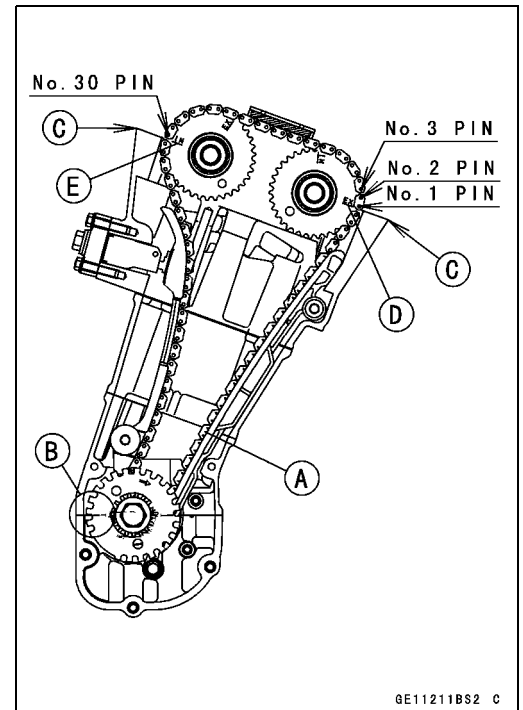
#### NOTE

- The exhaust camshaft has a 1883 EX mark [A] and the inlet camshaft has a 1182 IN mark [B]. Be careful not to mix up these shafts.



## Camshaft, Camshaft Chain

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

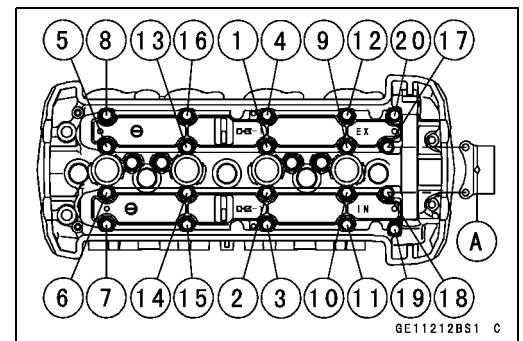


- Install the camshaft caps and upper chain guide [A].
- First tighten the all camshaft cap bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

**Torque - Camshaft Cap Bolts (L = 45 mm) (5, 6, 9, 10): 12 N·m (1.2 kgf·m, 106 in·lb)**

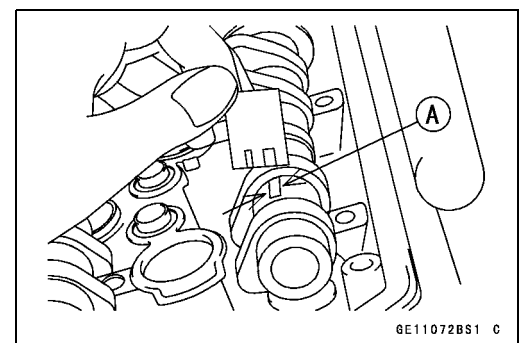
**Camshaft Cap Bolts (L = 40 mm) (1 ~ 4, 7, 8, 11 ~ 20): 12 N·m (1.2 kgf·m, 106 in·lb)**

- Install:  
Camshaft Chain Tensioner (see Camshaft Chain Tensioner Installation)  
Cylinder Head Cover (see Cylinder Head Cover Installation)



## Camshaft, Camshaft Cap Wear

- Remove:  
Upper Chain Guide (see Camshaft Removal)  
Camshaft Caps (see Camshaft Removal)
- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Measure each clearance between the camshaft journal and the camshaft cap using plastigage (press gauge) [A].
- Tighten the camshaft cap bolts (see Camshaft Installation).



### 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.)**

## 5-18 ENGINE TOP END

### Camshaft, Camshaft Chain

- ★ If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

#### Camshaft Journal Diameter

**Standard:** 23.950 ~ 23.972 mm (0.9429 ~ 0.9438 in.)

**Service Limit:** 23.92 mm (0.942 in.)

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

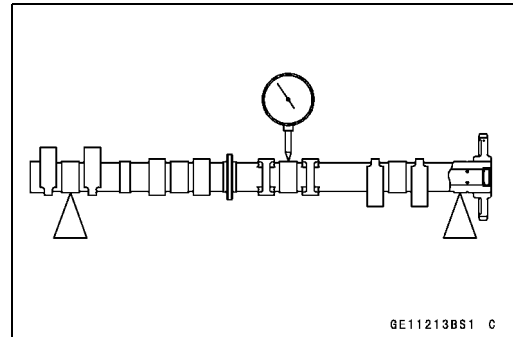
#### Camshaft Runout

- Remove the camshafts (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure runout with a dial gauge at the specified place as shown in the figure.
- ★ If the runout exceeds the service limit, replace the shaft.

#### Camshaft Runout

**Standard:** TIR 0.02 mm (0.0008 in.) or less

**Service Limit:** TIR 0.1 mm (0.004 in.)



#### Cam Wear

- Remove the camshafts (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.
- ★ If the cams are worn down past the service limit, replace the camshaft.

#### Cam Height

**Standard:**

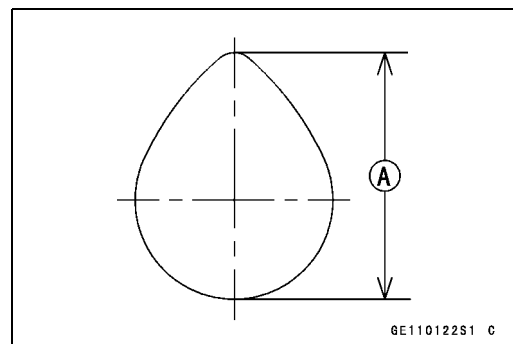
**Exhaust** 35.743 ~ 35.857 mm (1.4072 ~ 1.4117 in.)

**Inlet** 35.943 ~ 36.057 mm (1.4151 ~ 1.4196 in.)

**Service Limit:**

**Exhaust** 35.64 mm (1.403 in.)

**Inlet** 35.84 mm (1.411 in.)



#### Camshaft Chain Removal

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





## Cylinder Head

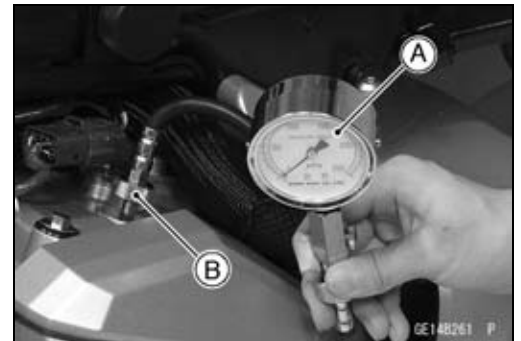
### Cylinder Compression Measurement

#### NOTE

○ Use the battery which is fully charged.

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Stick Coils (see Stick Coil Removal in the Electrical System chapter)
  - Spark Plugs (see Spark Plug Replacement in the Periodic Maintenance chapter)
- Attach the compression gauge [A] and adapter [B] firmly into the spark plug hole.
- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

**Special Tools - Compression Gauge, 20 kgf/cm<sup>2</sup>: 57001-221**  
**Compression Gauge Adapter, M10 × 1.0: 57001-1317**  
**Compression Gauge Adapter, M10 × 1.0: 57001-1601**  
**L-Shape Hose: 57001-1606**



#### Cylinder Compression

**Usable Range:** 945 ~ 1 350 kPa (9.6 ~ 13.8 kgf/cm<sup>2</sup>, 137 ~ 196 psi) at 265 r/min (rpm)

- Repeat the measurement for the other cylinders.
- Install the spark plugs.

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

○ The following table should be consulted if the obtainable compression reading is not within the usable range.

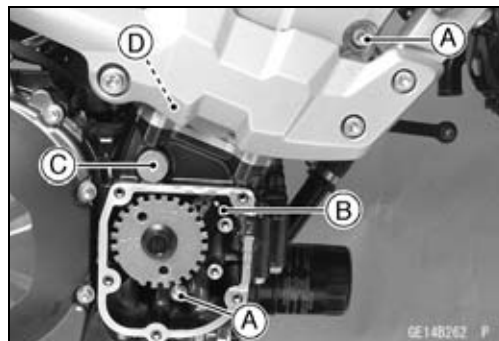
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace 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

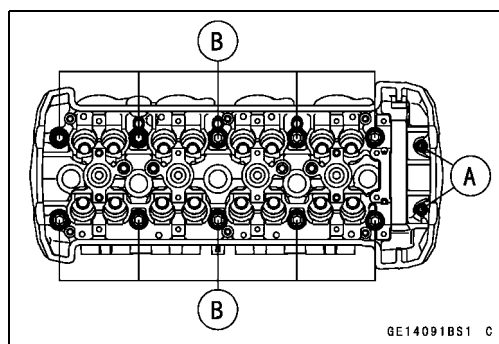
### Cylinder Head

#### Cylinder Head Removal

- Remove:
  - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Camshafts (see Camshaft Removal)
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Exhaust Pipe (see Exhaust Pipe Removal)
- Remove:
  - Crankshaft Sensor (see Crankshaft Sensor Removal in the Electrical System chapter)
  - Camshaft Position Sensor (see Camshaft Position Sensor Removal in the Electrical System chapter)
  - Front Camshaft Chain Guide Bolts [A]
  - Front Camshaft Chain Guide [B]
  - Rear Camshaft Chain Guide Bolt [C]
  - Rear Camshaft Chain Guide [D]



- Remove:
  - M6 Cylinder Head Bolts [A]
  - M10 Cylinder Head Bolts [B]
  - Cylinder Head

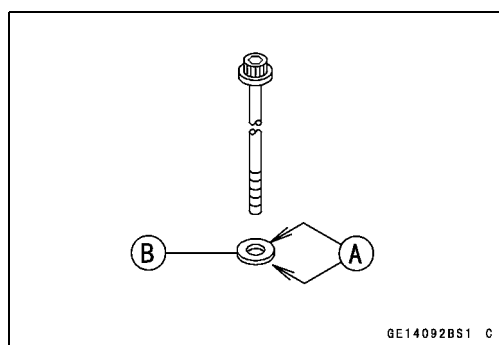


#### Cylinder Head Installation

##### 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].



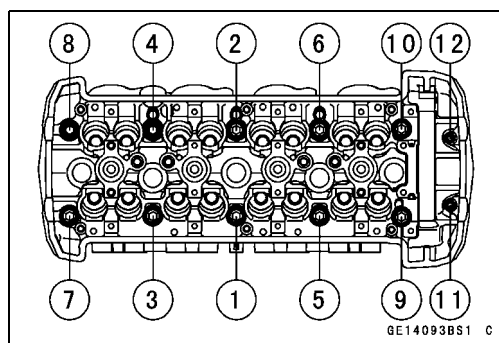
- Tighten the M10 cylinder head bolts following the tightening sequence [1 ~ 10].

##### Torque - Cylinder Head Bolts (M10):

First		20 N·m (2.0 kgf·m, 15 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)

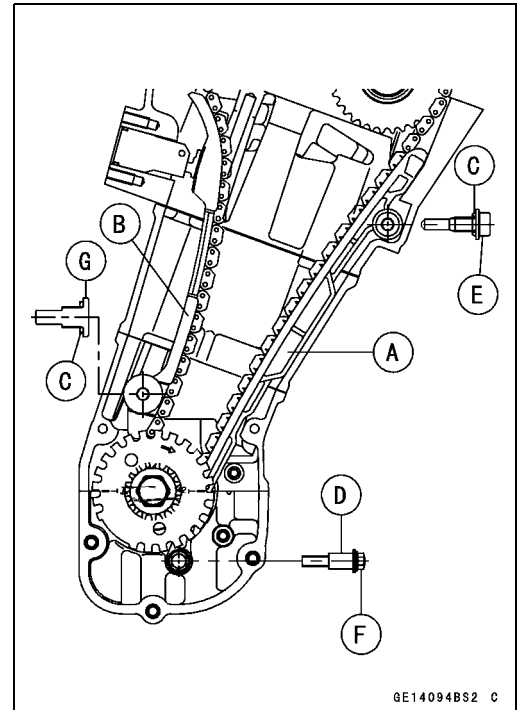
- Tighten the M6 cylinder head bolts [11 ~ 12].

**Torque - Cylinder Head Bolts (M6):** 12 N·m (1.2 kgf·m, 106 in·lb)



## Cylinder Head

- Install:
  - Front Camshaft Chain Guide [A]
  - Rear Camshaft Chain Guide [B]
  - New O-rings [C]
  - Collar [D]
- Apply grease to the new O-ring.
- Tighten:
  - Torque - Front Camshaft Chain Guide Bolt (Upper) [E]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Front Camshaft Chain Guide Bolt (Lower) [F]: 12 N·m (1.2 kgf·m, 106 in·lb)**
  - Rear Camshaft Chain Guide Bolt [G]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the removed parts (see appropriate chapters).



### Cylinder Head Warp

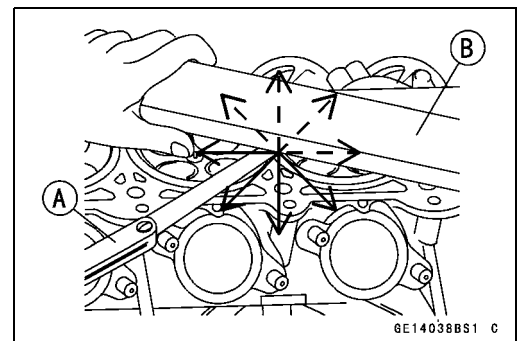
- Clean the cylinder head.
- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

#### Cylinder Head Warp

**Standard:**        - - -

**Service Limit:** 0.05 mm (0.002 in.)

- ★ If the cylinder head is warped more than the service limit, replace it.
- ★ If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).



## 5-22 ENGINE TOP END

### Valves

#### Valve Clearance Inspection

- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

#### Valve Clearance Adjustment

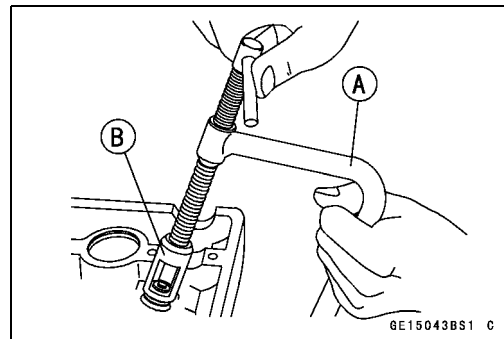
- Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

#### Valve Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Valve Lifter and Shim
- Mark and record the valve lifter and shim locations so they can be installed in their original positions.
- Using the valve spring compressor assembly, remove the valve.

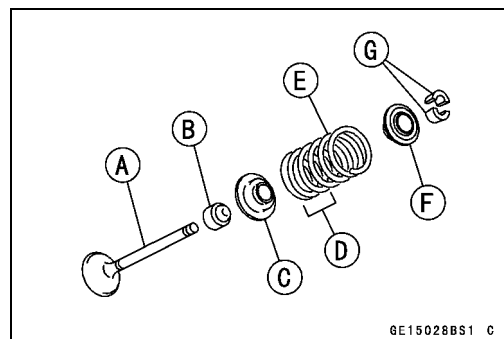
**Special Tools - Valve Spring Compressor Assembly [A]:**  
**57001-241**

**Valve Spring Compressor Adapter,  $\phi 21$  [B]:**  
**57001-1272**



#### Valve Installation

- Replace the oil seal with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
- Install the springs so that the closed coil end faces downwards.
  - Valve Stem [A]
  - Oil Seal [B]
  - Spring Seat [C]
  - Closed Coil End [D]
  - Valve Spring (White) [E]
  - Retainer [F]
  - Split Keepers [G]

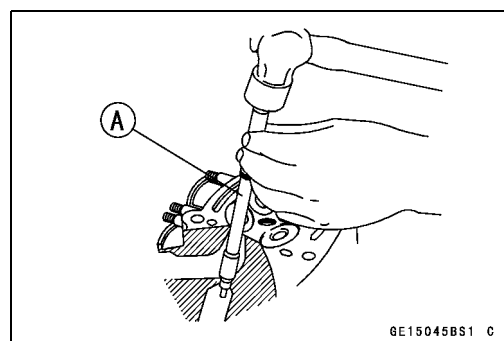


#### Valve Guide Removal

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

#### CAUTION

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



**Special Tool - Valve Guide Arbor,  $\phi 4$ : 57001-1273**

## Valves

### Valve Guide Installation

- Apply engine oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).

#### CAUTION

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

- Drive the valve guide in from the top of the head using the valve guide arbor. The flange stops the guide from going in too far.

**Special Tool - Valve Guide Arbor,  $\phi 4$ : 57001-1273**

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

**Special Tool - Valve Guide Reamer,  $\phi 4$ : 57001-1274**

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

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

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

#### NOTE

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

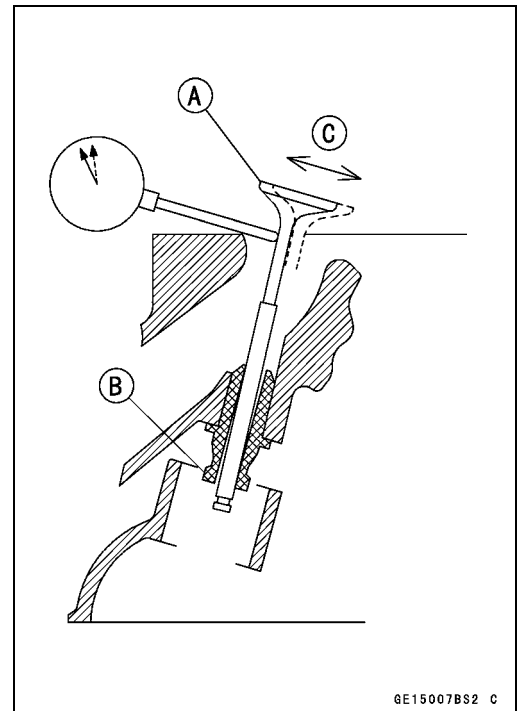
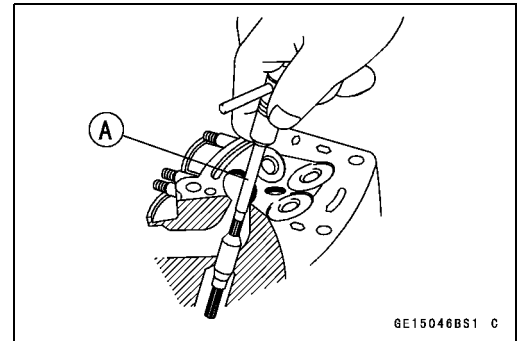
### Valve/Valve Guide Clearance (Wobble Method)

#### Standard:

Exhaust	0.10 ~ 0.18 mm (0.0039 ~ 0.0071 in.)
Inlet	0.03 ~ 0.12 mm (0.0012 ~ 0.0047 in.)

#### Service Limit:

Exhaust	0.40 mm (0.016 in.)
Inlet	0.33 mm (0.013 in.)



## 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:

Exhaust 21.6 ~ 21.8 mm (0.850 ~ 0.858 in.)

Inlet 26.4 ~ 26.6 mm (1.039 ~ 1.047 in.)

- Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

Good [F]

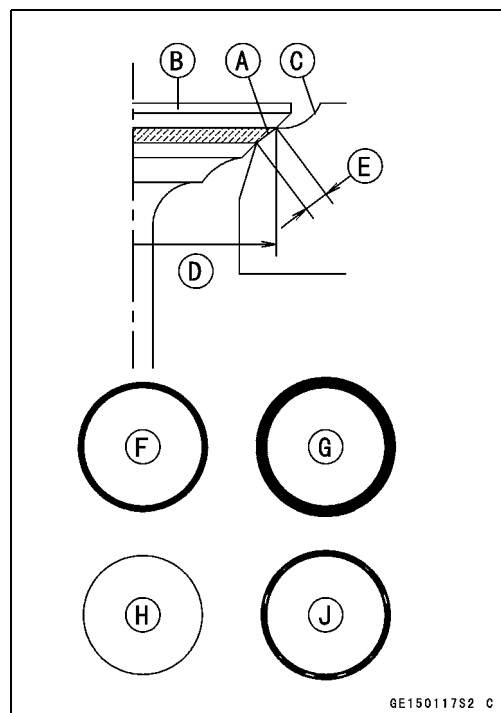
- ★ If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).

#### Valve Seating Surface Width

##### Standard:

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

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



#### Valve Seat Repair

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

Special Tools - Valve Seat Cutter Holder Bar [B]: 57001-1128

Valve Seat Cutter Holder,  $\phi 4$  [C]: 57001-1275

#### [For Exhaust Valve Seat]

Valve Seat Cutter, 45° -  $\phi 24.5$ : 57001-1113

Valve Seat Cutter, 32° -  $\phi 25$ : 57001-1118

Valve Seat Cutter, 60° -  $\phi 25$ : 57001-1328

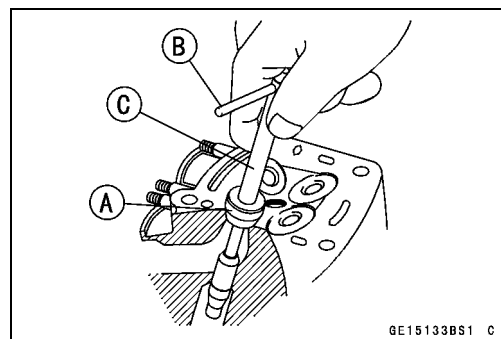
#### [For Inlet Valve Seat]

Valve Seat Cutter, 45° -  $\phi 30$ : 57001-1187

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

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

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



## Valves

### Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

#### NOTE

○Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

#### NOTE

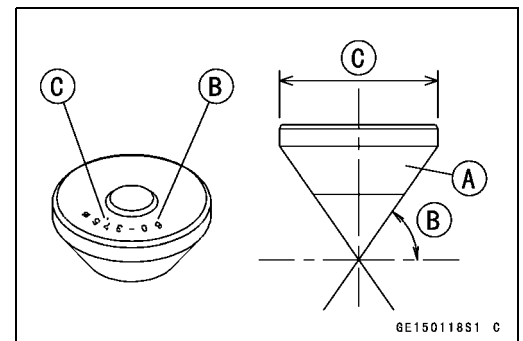
○Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.

5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

### Marks Stamped on the Cutter

The marks stamped on the back of the cutter [A] represent the following.

- 60° ..... Cutter angle [B]  
 37.5φ ..... Outer diameter of cutter [C]



### Operating Procedures

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

#### 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

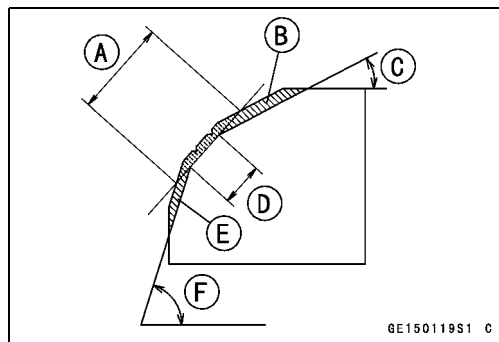
Ground Volume [B] by 32° cutter

32° [C]

Correct Width [D]

Ground Volume [E] by 60° cutter

60° [F]

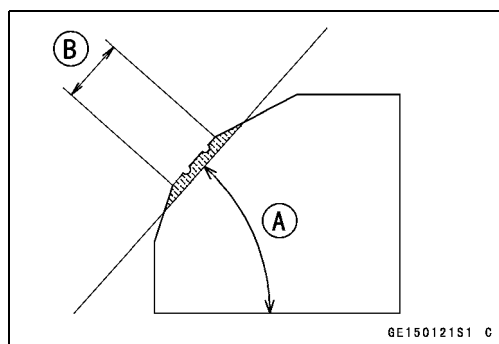


- Measure the outside diameter of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

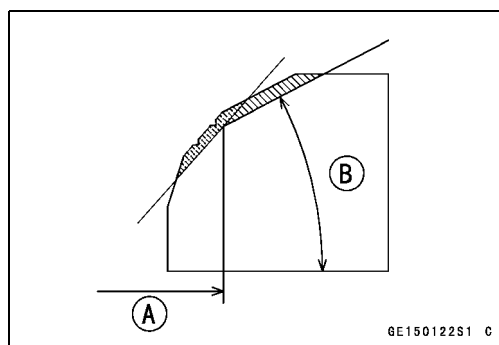
Original Seating Surface [B]

#### 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 outside diameter is within the specified range.
- To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.
- Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.



#### CAUTION

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

- After making the 32° grind, return to the seat outside diameter measurement step above.
- To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
- ★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat outside diameter measurement step above.



## Valves

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

Correct Width [B]

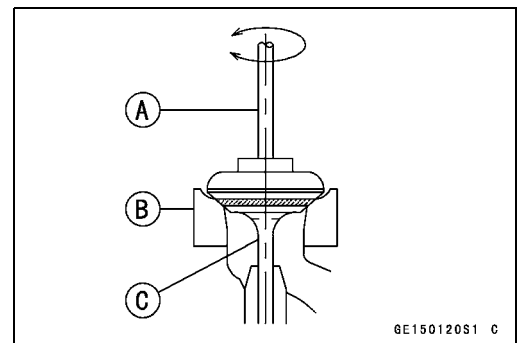
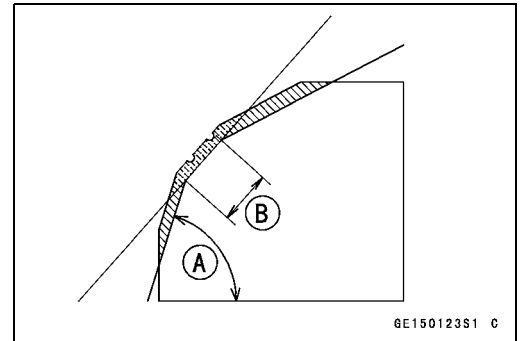
- Lap the valve to the seat, once the seat width and outside diameter are within the ranges specified above.
- Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
- Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
- Repeat the process with a fine grinding compound.

Lapper [A]

Valve Seat [B]

Valve [C]

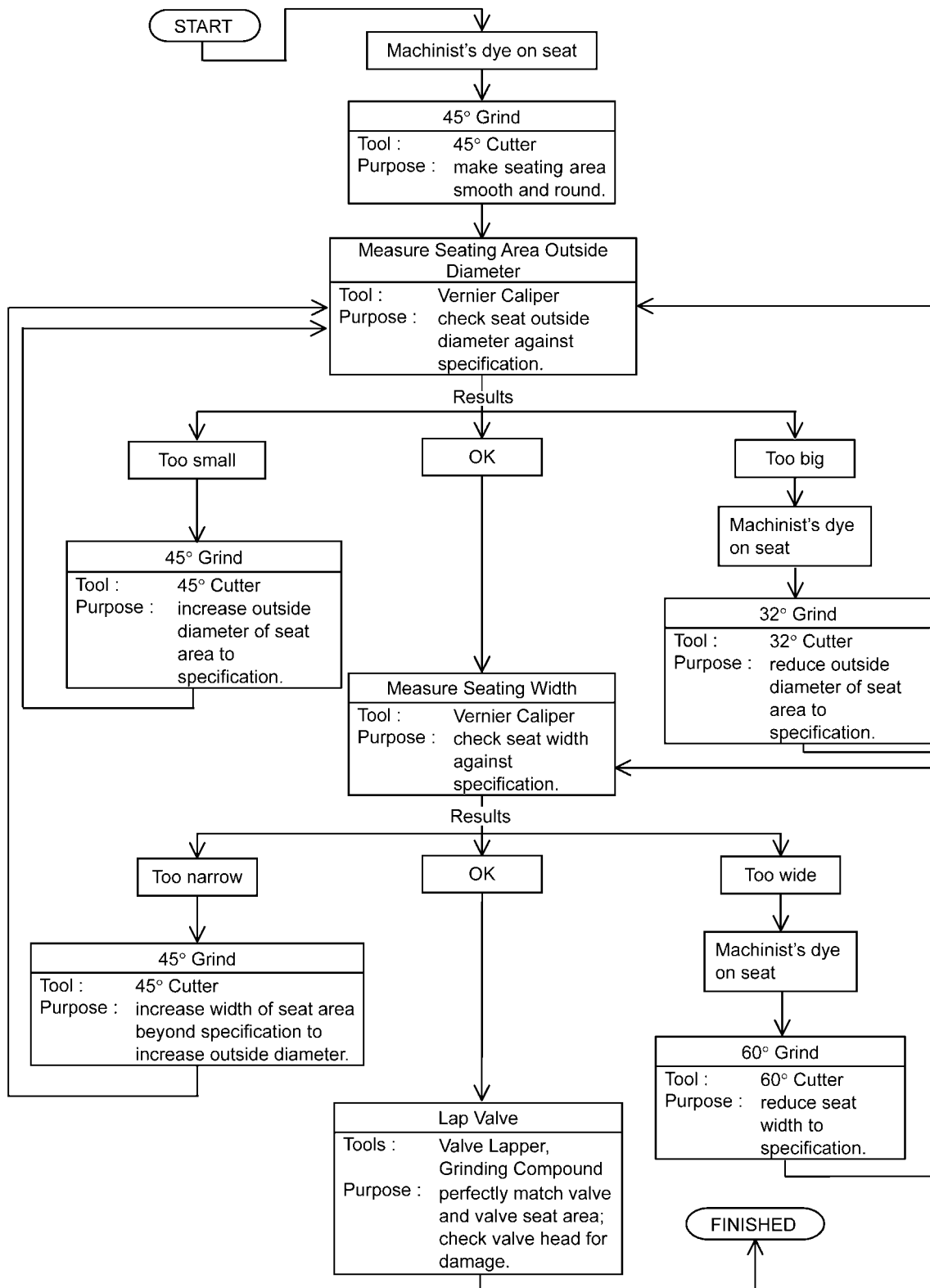
- The seating area should be marked about in the middle of the valve face.
- ★ If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).



## 5-28 ENGINE TOP END

### Valves

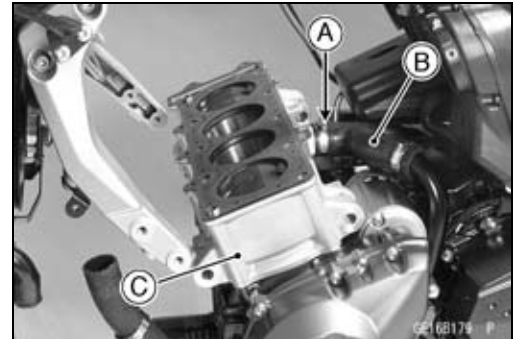
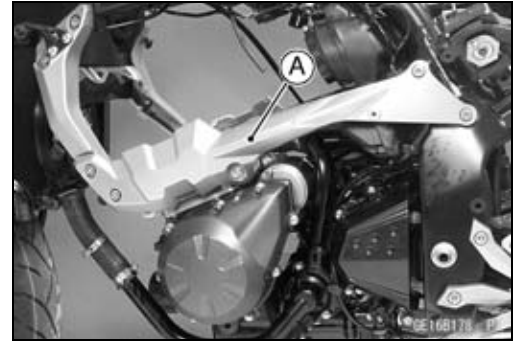
#### Valve Seat Repair



## Cylinder, Pistons

### Cylinder Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Subframe [A] (see Engine Removal in the Engine Removal/Installation chapter)
- Remove:
  - Water Hose Clamp Screw (Loosen) [A]
  - Water Hose [B]
  - Cylinder [C]

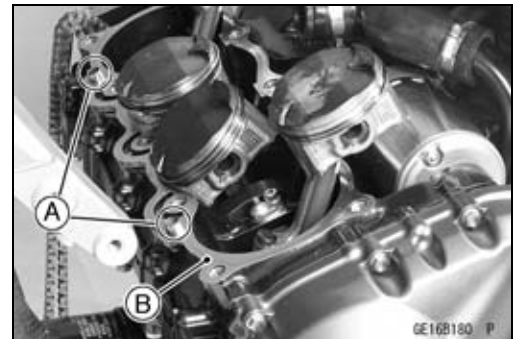


### Cylinder Installation

#### NOTE

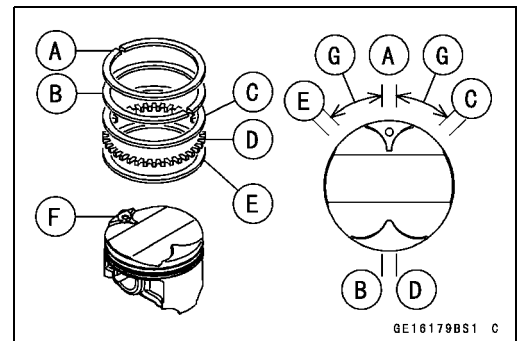
○ If a new cylinder is used, use new piston ring.

- Install the dowel pins [A] and new cylinder gasket [B].
- Apply molybdenum disulfide oil solution to the cylinder bore.

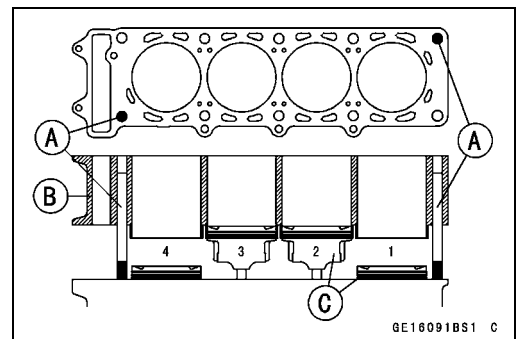


- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 ~ 40° of angle from the opening of the top ring.

Top Ring [A]  
 Second Ring [B]  
 Upper Oil Ring Steel Rail [C]  
 Oil Ring Expander [D]  
 Lower Oil Ring Steel Rail [E]  
 Hollow [F]  
 30 ~ 40° [G]



- 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.

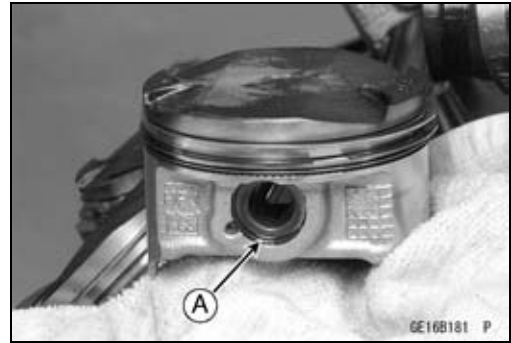


## 5-30 ENGINE TOP END

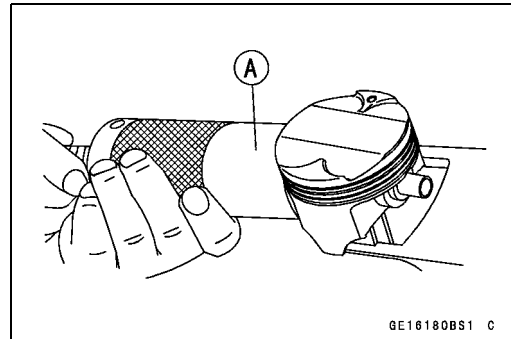
### Cylinder, Pistons

#### Piston Removal

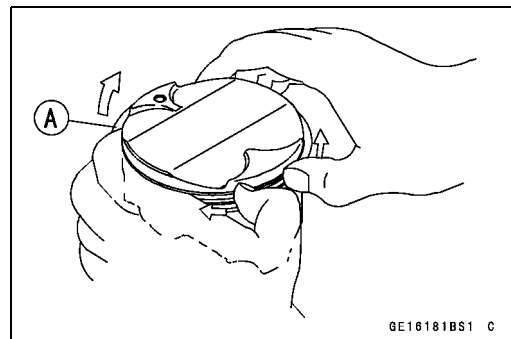
- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the pistons and remove the piston pin snap ring [A] from the outside of each piston.



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

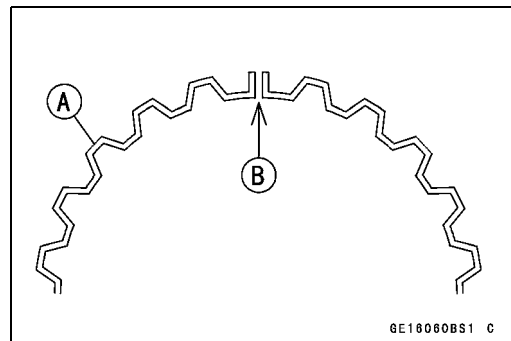


- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



#### 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] not butt together.
- Apply molybdenum disulfide oil solution to the oil ring steel rails, and install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston ring groove.

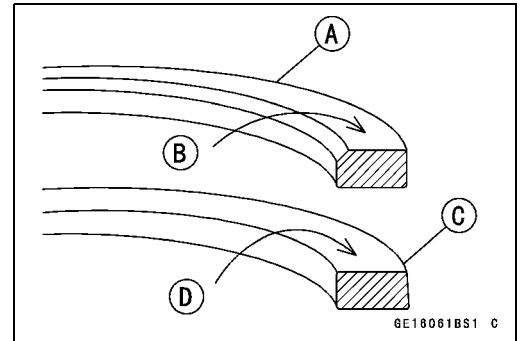


#### NOTE

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

## Cylinder, Pistons

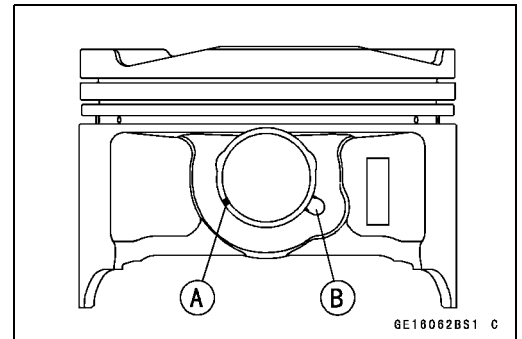
- Do not mix up the top and second ring.
- Install the top ring [A] so that the “1T” mark [B] faces up.
- Install the second ring [C] so that the “2T” mark [D] faces up.
- Apply molybdenum disulfide oil solution to the piston rings.



### NOTE

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

- Install the piston with its marking hollow facing forward.
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- Apply molybdenum disulfide oil solution to the piston pins and piston journals.
- When installing the piston pin snap ring, compress it only enough to install it and no more.



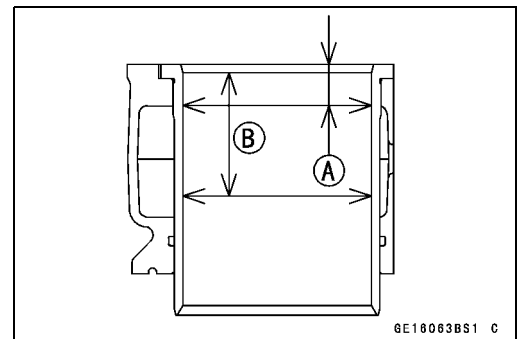
### CAUTION

**Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.**

- Install the cylinder (see Cylinder Installation).

### Cylinder Wear

- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) shown in the figure.
- ★ If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.
  - 10 mm (0.39 in.) [A]
  - 60 mm (2.36 in.) [B]



### Cylinder Inside Diameter

**Standard:** 68.400 ~ 68.412 mm (2.6929 ~ 2.6934 in.)

**Service Limit:** 68.50 mm (2.6969 in.)

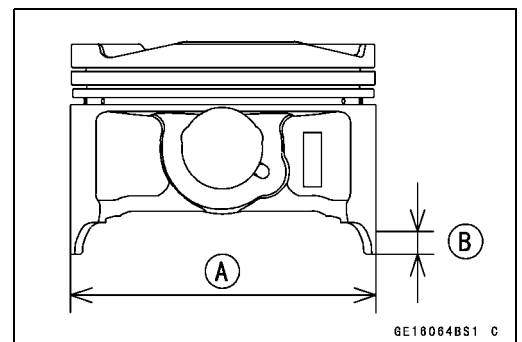
### Piston Wear

- Measure the outside diameter [A] of each piston 5 mm (0.20 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.
- ★ If the measurement is under service limit, replace the piston.

### Piston Diameter

**Standard:** 68.345 ~ 68.360 mm (2.6907 ~ 2.6913 in.)

**Service Limit:** 68.20 mm (2.6850 in.)



## 5-32 ENGINE TOP END

### Cylinder, Pistons

#### ***Piston Ring, Piston Ring Groove Wear***

- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

#### **Piston Ring/Groove Clearance**

##### **Top**

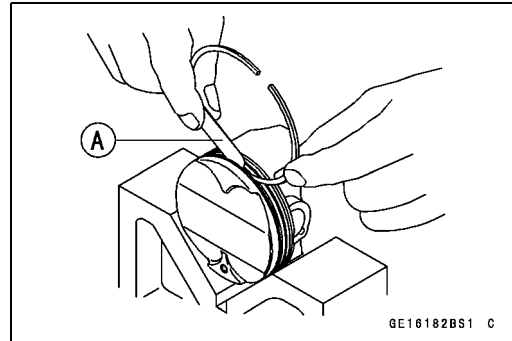
**Standard:** 0.04 ~ 0.07 mm (0.0016 ~ 0.0028 in.)

**Service Limit:** 0.17 mm (0.0067 in.)

##### **Second**

**Standard:** 0.02 ~ 0.05 mm (0.0008 ~ 0.0020 in.)

**Service Limit:** 0.15 mm (0.0059 in.)



#### ***Piston Ring Groove Width***

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

#### **Piston Ring Groove Width**

##### **Top [A]**

**Standard:** 0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)

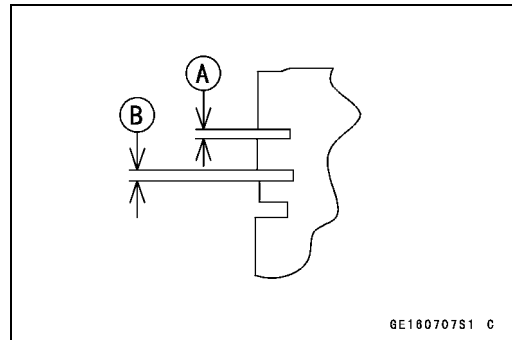
**Service Limit:** 0.93 mm (0.037 in.)

##### **Second [B]**

**Standard:** 0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)

**Service Limit:** 0.91 mm (0.036 in.)

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



#### ***Piston Ring Thickness***

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

#### **Piston Ring Thickness**

##### **Top [A]**

**Standard:** 0.78 ~ 0.79 mm (0.0307 ~ 0.0311 in.)

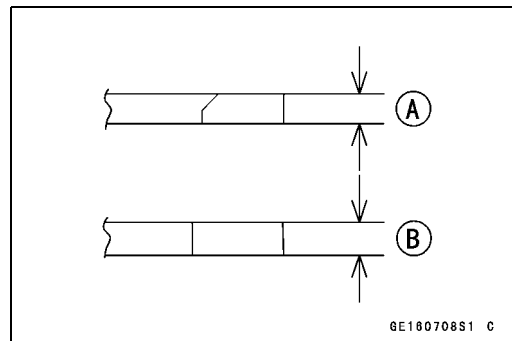
**Service Limit:** 0.71 mm (0.028 in.)

##### **Second [B]**

**Standard:** 0.78 ~ 0.79 mm (0.0307 ~ 0.0311 in.)

**Service Limit:** 0.71 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.

## Cylinder, Pistons

### ***Piston Ring End Gap***

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

#### **Piston Ring End Gap**

##### **Top**

**Standard:** 0.30 ~ 0.40 mm (0.0118 ~ 0.0157 in.)

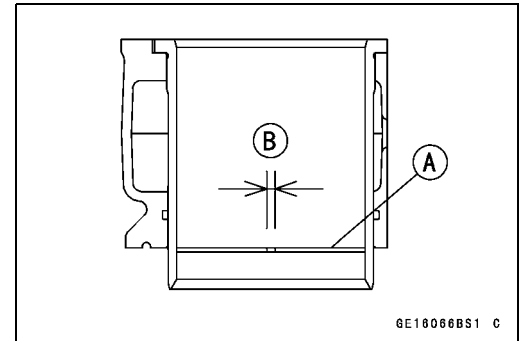
**Service Limit:** 0.7 mm (0.028 in.)

##### **Second**

**Standard:** 0.45 ~ 0.55 mm (0.0177 ~ 0.0217 in.)

**Service Limit:** 0.9 mm (0.035 in.)

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



## 5-34 ENGINE TOP END

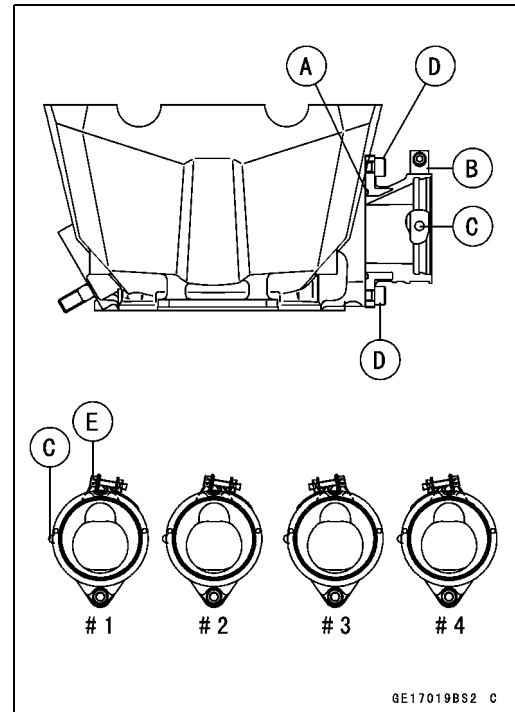
### Throttle Body Holder

#### ***Throttle Body Holder Installation***

- Apply grease to the O-rings [A].
- Be sure to install the O-rings.
- Install the clamps [B] as shown and so that its hole fit on the projection [C] of the holder.
- Tighten:

**Torque - Throttle Body Assy Holder Bolts [D]: 13 N·m (1.3 kgf·m, 115 in·lb)**

**Throttle Body Assy Holder Clamp Bolts [E]: 2.0 N·m (0.20 kgf·m, 18 in·lb)**



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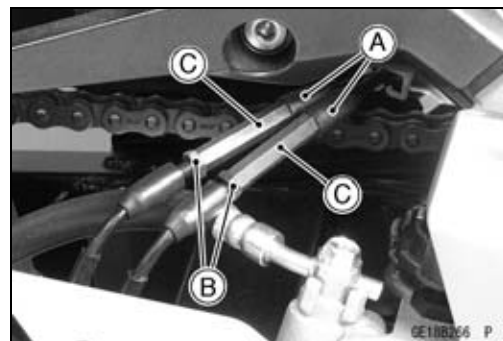
## Muffler

### **⚠ WARNING**

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

### **Muffler Body Removal**

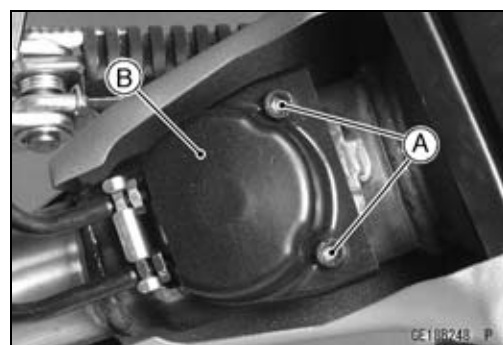
- Slide the dust covers [A].
- Loosen the locknuts [B], and turn the adjusters [C] to give the cable plenty of play.



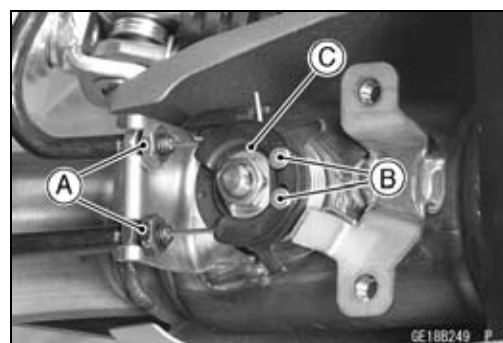
- Remove:  
Clamp Bolt [A] (Loosen)  
Mounting Bolt [B] and Nut [C]  
Muffler Body



- Remove:  
Bolts [A]  
Cover [B]



- Loosen the locknuts [A].
- Remove the exhaust butterfly valve cable lower ends [B] from the pulley [C].



## 5-36 ENGINE TOP END

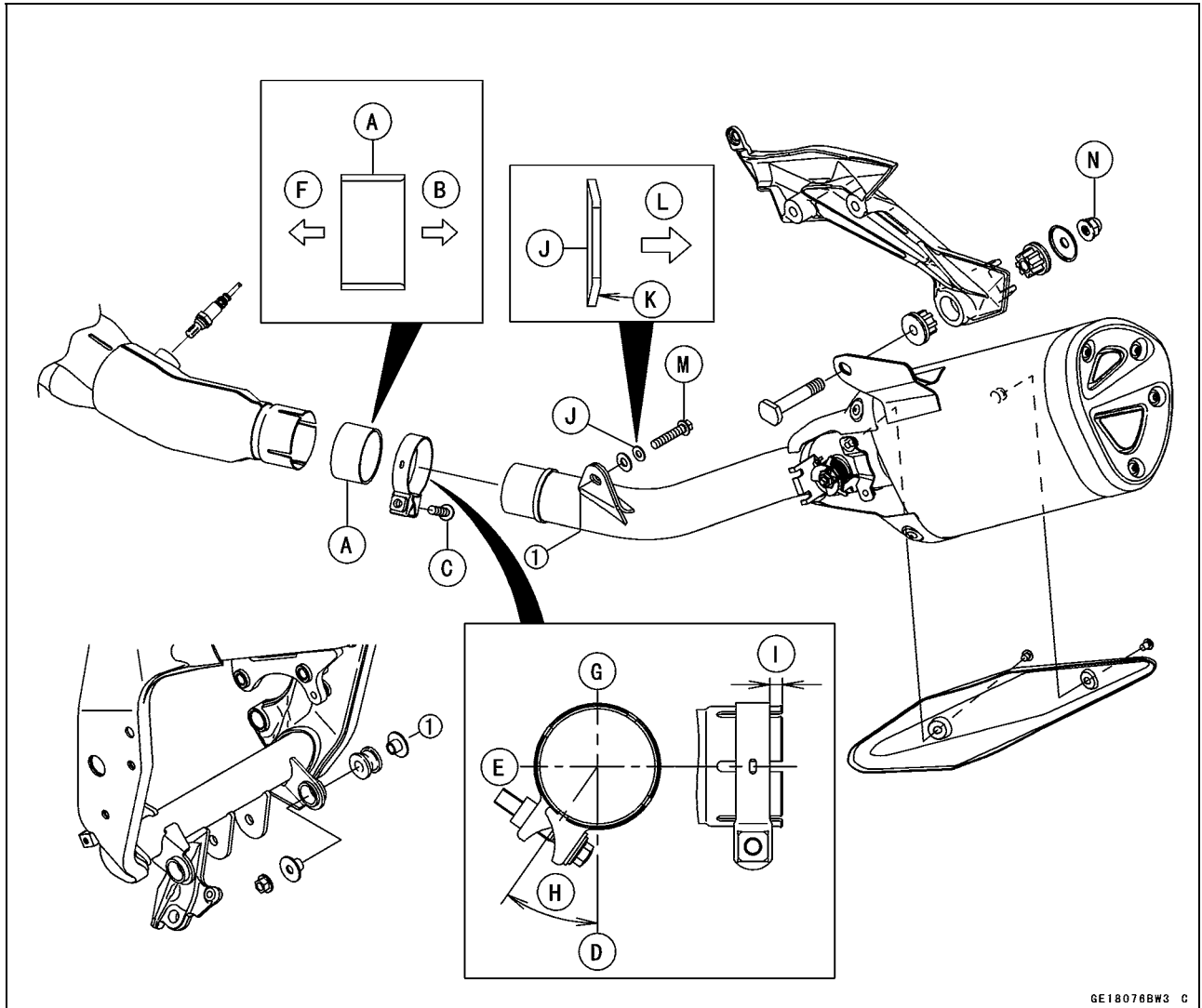
### Muffler

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#### ***Muffler Body Installation***

- Replace the muffler body gasket [A] with a new one.
- Install the muffler body gasket until it is bottomed so that the inside chamfer side faces rear [B].
- Install the muffler body clamp bolt [C] as shown in the figure.
  - Downside [D]
  - Inside [E]
  - Front [F]
  - Viewed from Rear [G]
  - 35° [H]
  - About 6 mm (0.24 in.) [I]
- Install the muffler body.
- Install the muffler body until it stops at the bottom surface of the exhaust pipe.
- Install the muffler body mounting bolt, nut and clamp bolt, following the specified installing sequence.
- First, install the washer [J] as shown in the figure.
  - Tapered Side [K]
  - Outside [L]
- Second, tighten the muffler body mounting bolt [M] temporarily.
- Third, tighten the muffler body mounting nut [N] temporarily.
- Fourth, tighten the muffler body clamp bolt [C] securely.
- Fifth, tighten the muffler body mounting bolt [M] securely.
- Sixth, tighten the muffler body mounting nut [N] securely.
- Tighten:
  - Torque - Muffler Body Clamp Bolt [C]: 15 N·m (1.5 kgf·m, 11 ft·lb)**
  - Muffler Body Mounting Bolt [M]: 4.9 N·m (0.50 kgf·m, 43 in·lb)**
  - Muffler Body Mounting Nut [N]: 34 N·m (3.5 kgf·m, 25 ft·lb)**

## Muffler

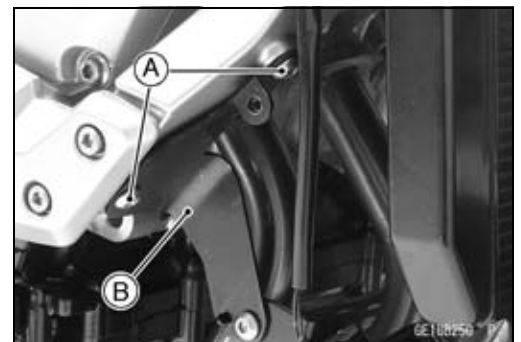


GE18076BW3 C

- Install the exhaust butterfly valve cables, and adjust them (see Exhaust Butterfly Valve Cable Installation).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nut.
- Install the removed parts (see appropriate chapters).
- When installing, run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

### Exhaust Pipe Removal

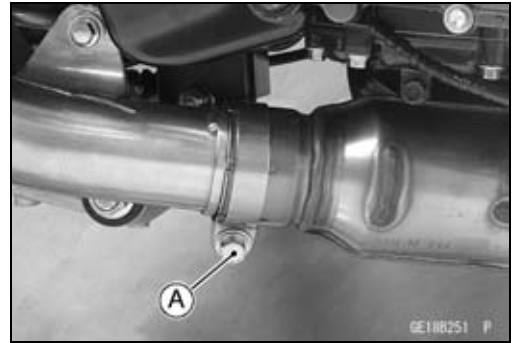
- Remove:
  - Oxygen Sensor (Equipped Models) (see Oxygen Sensor Removal (Equipped Models) in the Electrical System chapter)
  - Radiator Lower Bolt and Radiator Hoses (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  - Bolts [A]
  - Bracket [B]



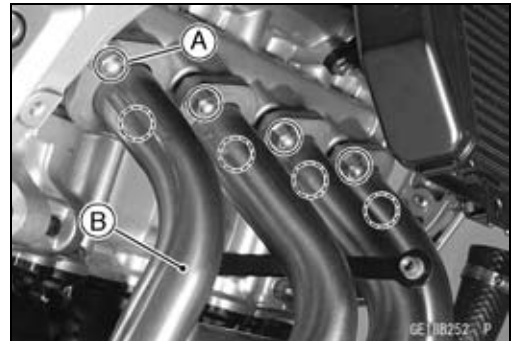
## 5-38 ENGINE TOP END

### Muffler

- Loosen the clamp bolt [A].



- Remove:
  - Exhaust Pipe Manifold Holder Nuts [A]
  - Exhaust Pipe [B]



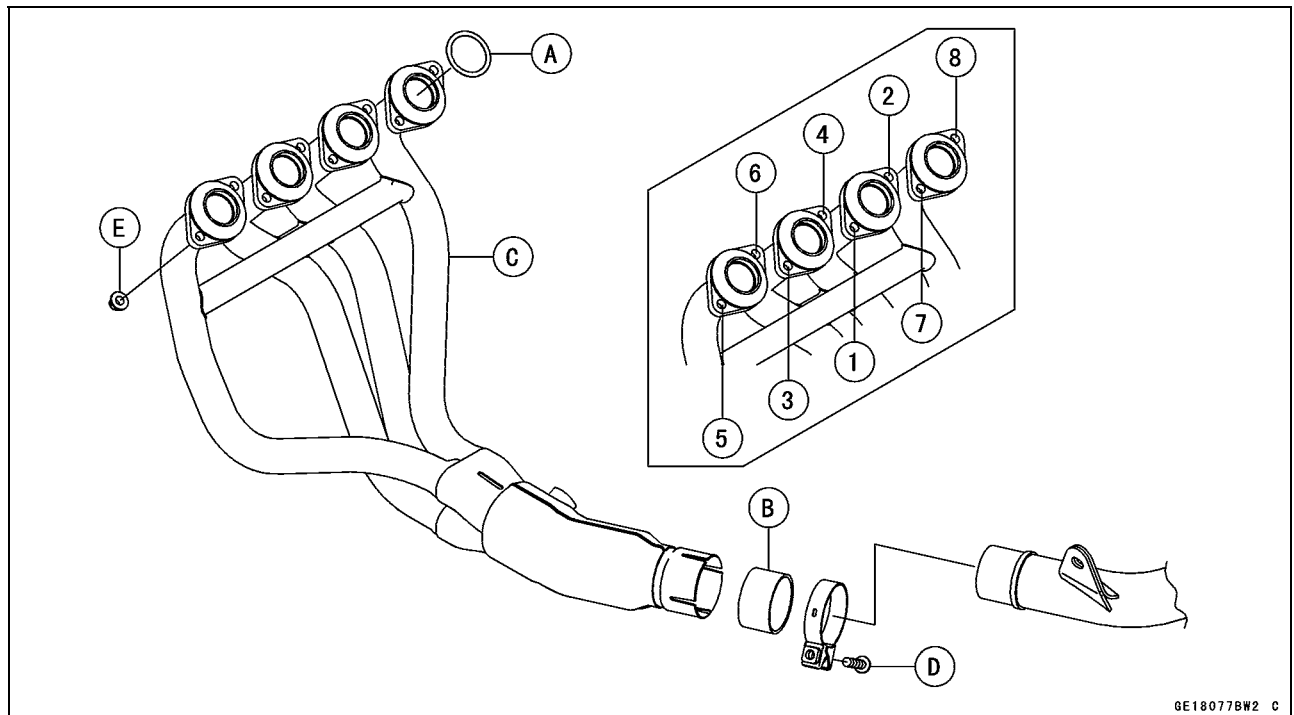
#### ***Exhaust Pipe Installation***

- Replace the exhaust pipe gaskets [A] and muffler body gasket [B] with new ones and install them.
- Install the muffler body gasket until it is bottomed so that the inside chamfer side faces rear.
- Install the exhaust pipe [C].
- Install the muffler body clamp bolt [D] (see Muffler Body Installation).
- Tighten the exhaust pipe manifold holder nuts [E] following the specified tightening sequence.
- Tighten:

**Torque - Exhaust Pipe Manifold Holder Nuts [E]: 17 N·m  
(1.7 kgf·m, 13 ft·lb)**

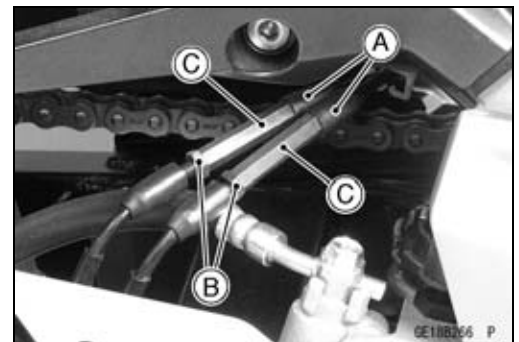
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolt and nuts.
  - Install the removed parts (see appropriate chapters).
- When installing, run the each leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Muffler

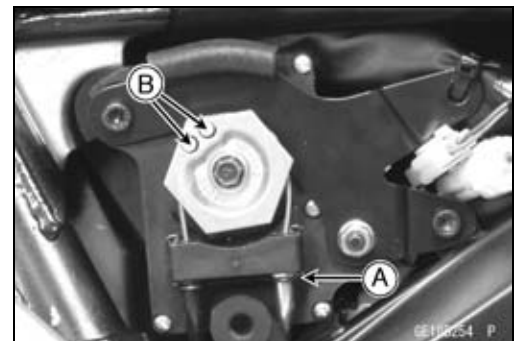


### **Exhaust Butterfly Valve Cable Removal**

- Slide the dust covers [A].
- Loosen the locknuts [B], and turn the adjusters [C] to give the cable plenty of play.



- Remove:
  - Left Side Cover (see Side Cover Removal in the Frame chapter)
  - Clamp [A]
  - Exhaust Butterfly Valve Cable Upper Ends [B]



- Remove:
  - Exhaust Butterfly Valve Cable Lower Ends (see Muffler Body Removal)
  - Exhaust Butterfly Valve Cables

## 5-40 ENGINE TOP END

### Muffler

#### Exhaust Butterfly Valve Cable Installation

- Confirm whether pulley [A] is an angle shown in the figure.  
41.7° ±7° [B]
- This position is original position of the pulley.

#### NOTE

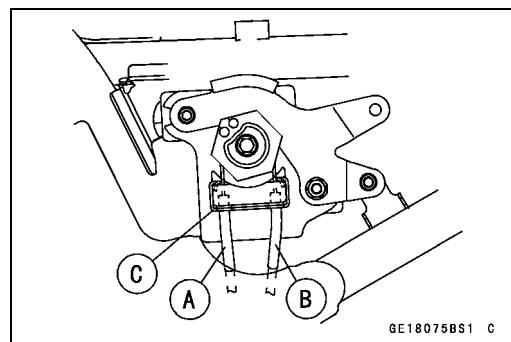
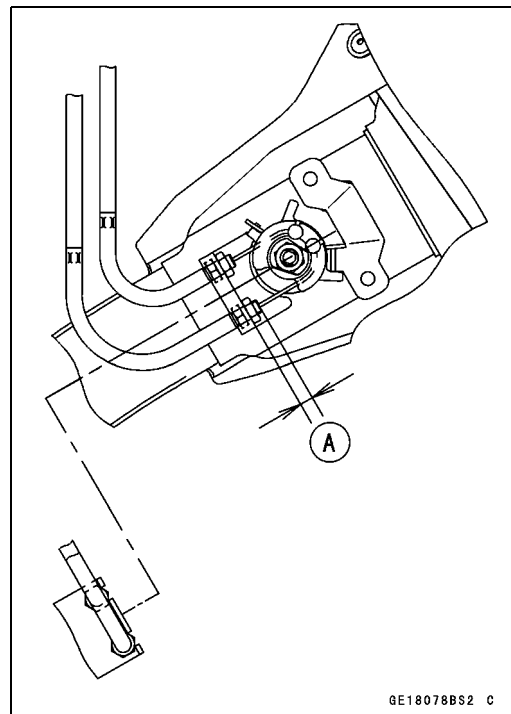
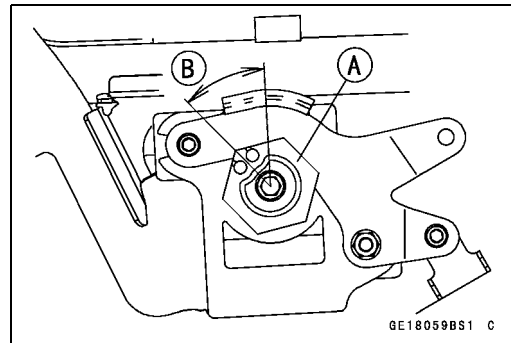
- *Correct the position electrically after confirming use is discontinued and there is no damage when differing from the angle of shown in the figure.*

#### CAUTION

**Do not correct the pulley position with the tool, forcibly. The actuator damage will occur.**

- ★ If the angle is wrong, adjust the pulley (see Exhaust Butterfly Valve Actuator Installation in the Fuel System (DFI) chapter).
- Install the exhaust butterfly valve cable lower ends to the pulley of right muffler body.  
6 mm (0.24 in.) [A]
- Tighten:  
**Torque - Exhaust Butterfly Valve Cable Locknuts: 6.9 N·m  
(0.70 kgf·m, 61 in·lb)**
- Install the cover.
- Tighten the bolts.
- Run the cables correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Install the exhaust butterfly valve cable upper ends to the pulley of actuator.  
Close Cable (Black) [A]  
Open Cable (White) [B]
- Install the clamp [C].



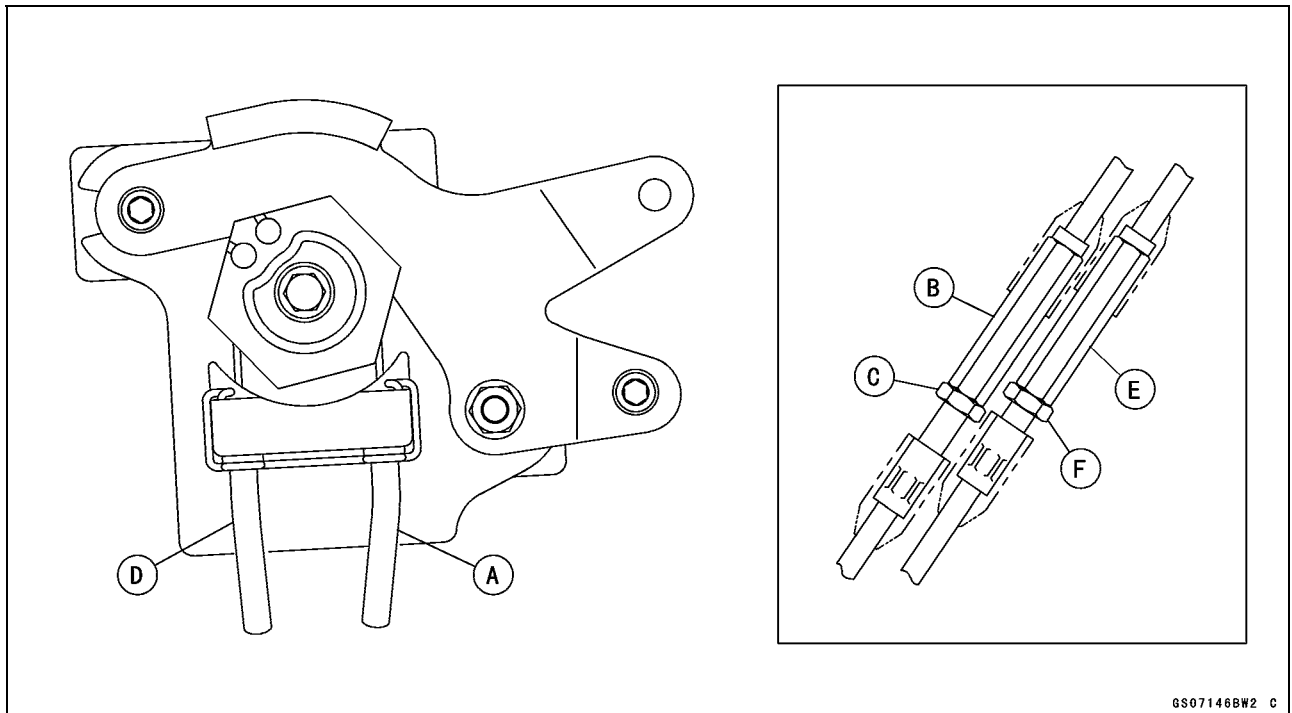
## Muffler

- Stretch the open cable (white) [A] first by using the adjuster [B].
- Turn the adjuster counterclockwise until it becomes hard to turn.  
Locknut of White [C]

### CAUTION

**To keep the correct exhaust butterfly valve position, adjust the open cable first. Do not overstretch. If the adjustment of the exhaust butterfly valve cables are incorrect, the exhaust butterfly valve actuator does not operate correctly.**

- Then, stretch the close cable (black) [D] by using the adjuster [E].
- Turn the adjuster counterclockwise until it becomes hard to turn.  
Locknut of Black [F]



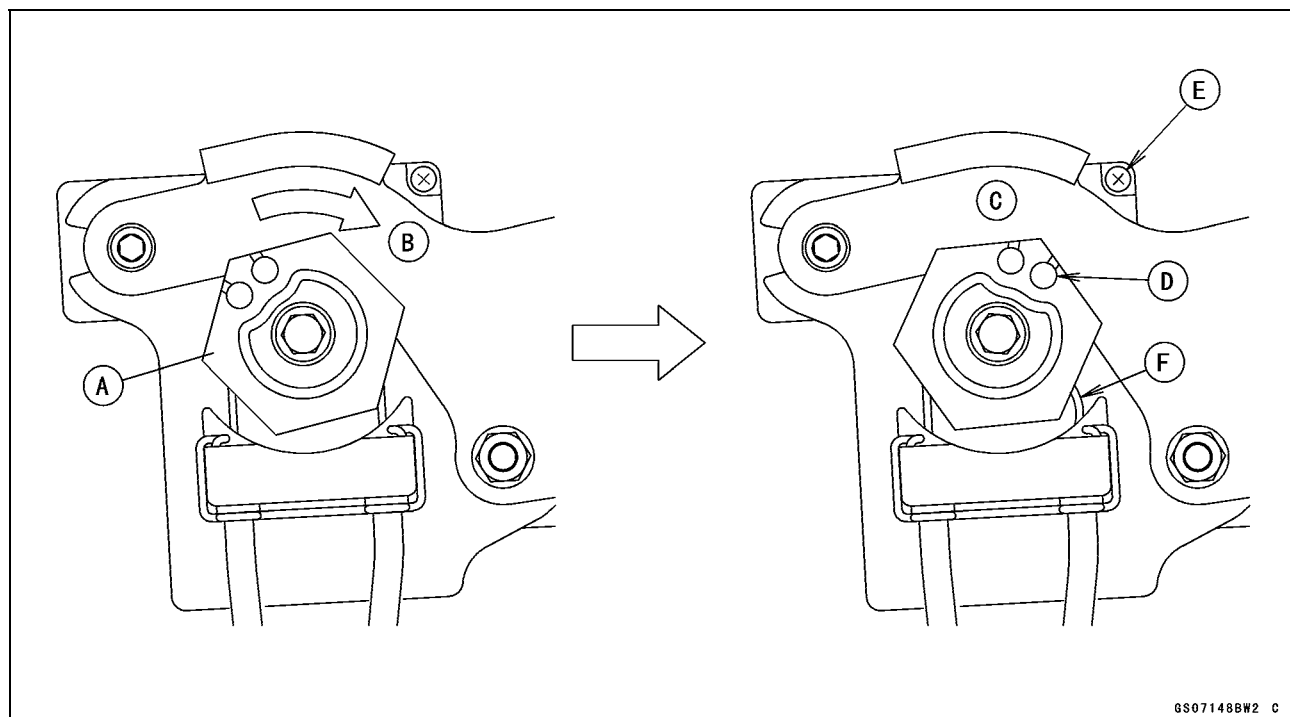
## 5-42 ENGINE TOP END

### Muffler

- Turn the ignition switch ON and wait until the pulley [A] turns fully clockwise [B].
- Turn off the ignition switch when the pulley become fully clockwise position [C] as shown in the figure.
- The target position is a position in which the upper end [D] of the open cable and the screw [E] of the actuator become almost straight.
- The pulley stops at fully clockwise position.

#### NOTE

- The exhaust butterfly valve is full closed position when the pulley turned fully clockwise. Therefore, the play [F] appears in the open cable when pulley is fully clockwise position. The open and close cables can be evenly stretching by adjusting this play.



GS07148BW2 C



## Muffler

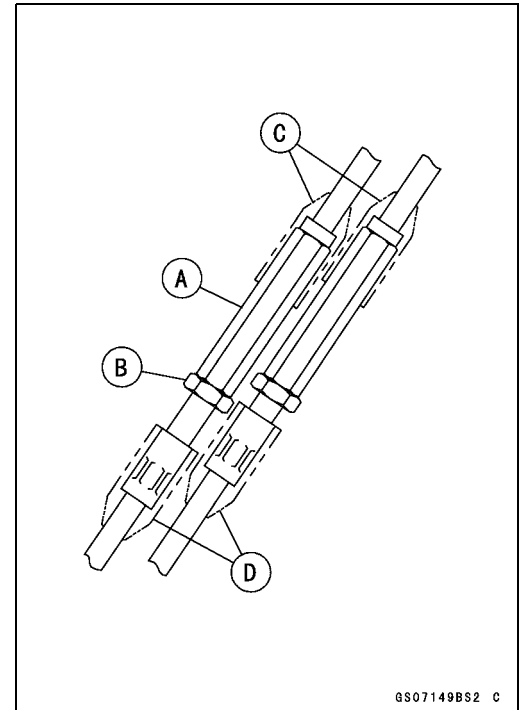
- Stretch the open cable (white) by using the adjuster [A].
- Turn the adjuster counterclockwise until it becomes hard to turn.

Locknut of White [B]

### CAUTION

**Do not overstretch. If the adjustment of the exhaust butterfly valve cables are incorrect, the exhaust butterfly valve actuator does not operate correctly.**

- Tighten:
  - Torque - Exhaust Butterfly Valve Cable Adjuster Locknuts:**  
6.9 N·m (0.70 kgf·m, 61 in·lb)
- Cover the dust covers [C].
- Be sure that the dust covers [D] are in positions as shown.
- Turn the ignition switch ON, and confirm the pulley turns counterclockwise and then clockwise.
- ★ If the operation of the pulley is different, readjust the exhaust butterfly valve cables.
- Confirm the pulley is original position.
- ★ If the pulley is no original position, adjust the pulley (see Exhaust Butterfly Valve Actuator Installation in the Fuel System (DFI) chapter).
- Confirm the operation of the pulley as follows.
  - Start the engine, and confirm the pulley turns clockwise and then it stops.
  - Open the throttle, and confirm the pulley turns counterclockwise.
- ★ If the pulley does not operate, readjust the exhaust butterfly valve cables.
- Install the removed parts (see appropriate chapters).



GS07149BS2 C

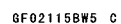


# Clutch

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### Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Cover Mounting Bolts	11	1.1	97 in·lb	
2	Clutch Hub Nut	135	13.8	99.6	R
3	Clutch Lever Clamp Bolts	7.8	0.80	69 in·lb	S
4	Clutch Spring Bolts	8.8	0.90	78 in·lb	
5	Oil Filler Plug	2.0	0.20	18 in·lb	

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

S: Follow the specified tightening sequence.

W: Apply water.

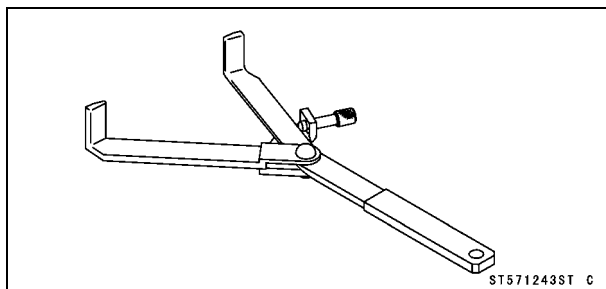
## 6-4 CLUTCH

### Specifications

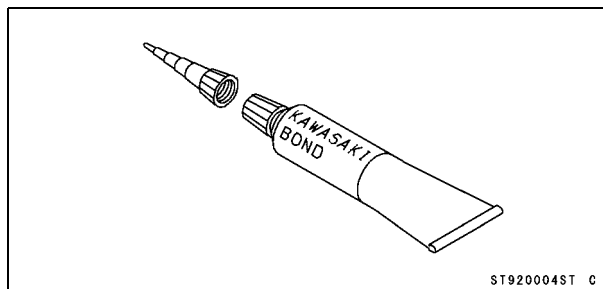
Item	Standard	Service Limit
<b>Clutch Lever Free Play</b>	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
<b>Clutch</b>		
Clutch Plate Assembly Length	37.7 ~ 38.3 mm (1.48 ~ 1.51 in.)	— — —
Friction Plate Thickness	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)	2.4 mm (0.094 in.)
Friction and Steel Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.012 in.)
Clutch Spring Free Length	80.6 mm (3.17 in.)	76.6 mm (3.02 in.)

### Special Tool and Sealant

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



**Kawasaki Bond (Silicone Sealant):**  
**92104-0004**



## 6-6 CLUTCH

### Clutch Lever and Cable

#### **Clutch Lever Free Play Inspection**

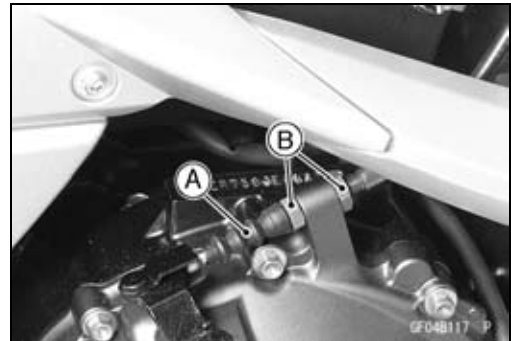
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

#### **Clutch Lever Free Play Adjustment**

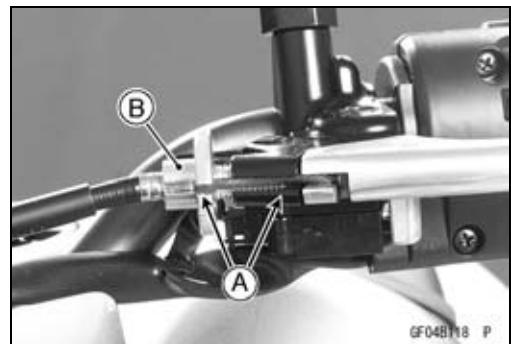
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

#### **Clutch 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.



#### **Clutch Cable Installation**

- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).

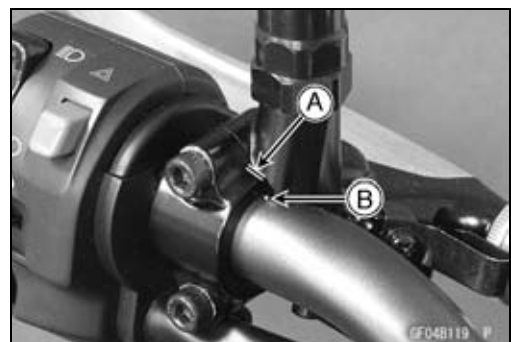
#### **Clutch Cable Lubrication**

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

#### **Clutch Lever Installation**

- Install the clutch lever so that the mating surface [A] of the clutch lever clamp is aligned with the punch mark [B].
- Tighten the upper clamp bolt first, and then the lower clamp bolt. There will be a gap at the lower part of the clamp after tightening.

**Torque - Clutch Lever Clamp Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

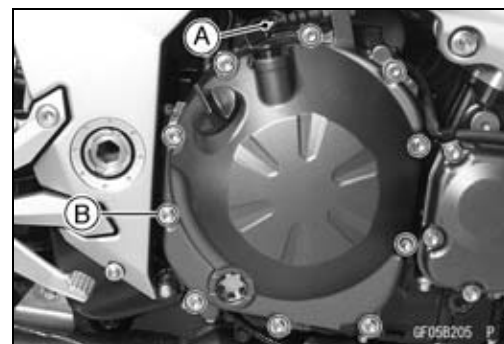




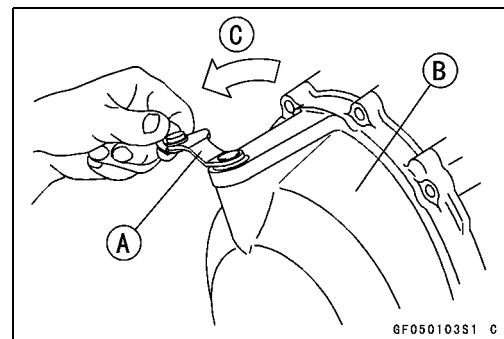
## Clutch Cover

### Clutch Cover Removal

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



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



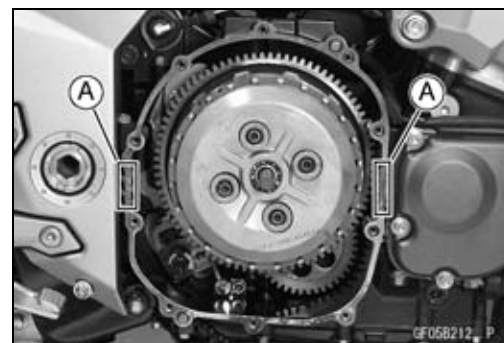
### Clutch Cover Installation

- Apply silicone sealant to the area [A] where the mating surface of the crankcase touches the clutch cover gasket.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Replace the clutch cover gasket with a new one.
- Tighten the clutch cover mounting bolts.

**Torque - Clutch Cover Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**



### Release Shaft Removal

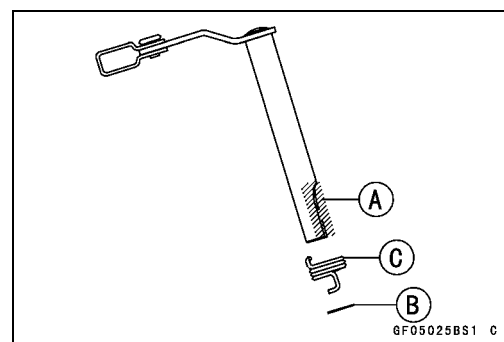
#### CAUTION

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

- Remove the clutch cover (see Clutch Cover Removal).
- Pull the lever and shaft assembly straight out of the clutch cover.

### Release Shaft Installation

- Apply high-temperature grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearings in the hole of the clutch cover.
- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Install the washer [B] and spring [C].
- Insert the release shaft straight into the upper hole of the clutch cover.



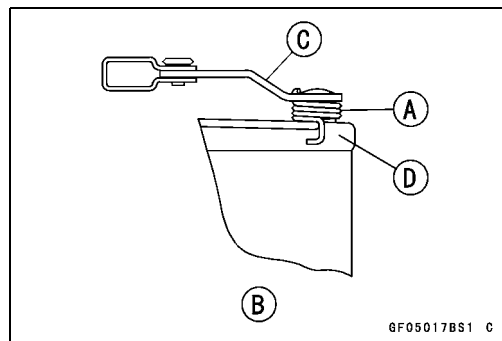
#### CAUTION

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

## 6-8 CLUTCH

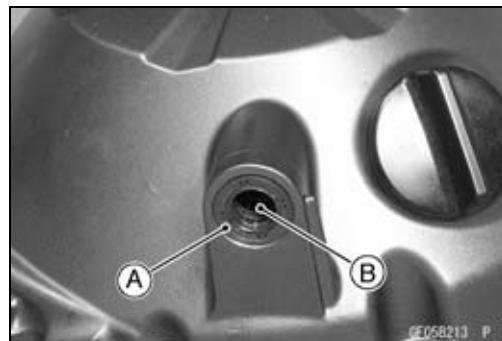
### Clutch Cover

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



### Clutch Cover Disassembly

- Remove:  
Oil Seal [A]  
Needle Bearings [B]  
Oil Level Gauge



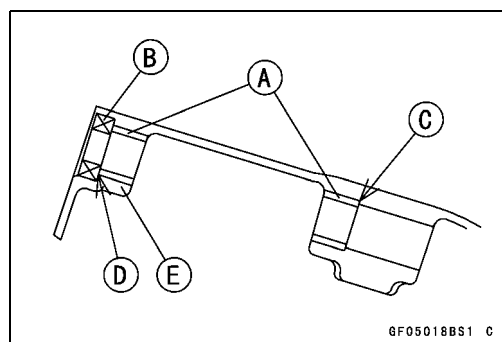
### Clutch Cover Assembly

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

#### NOTE

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

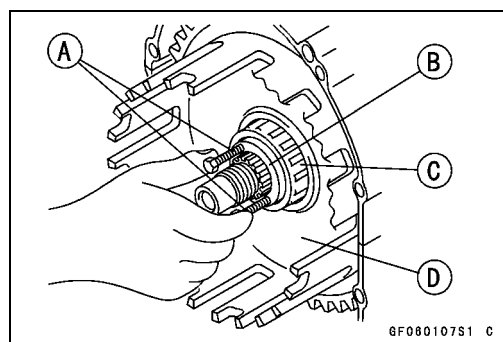
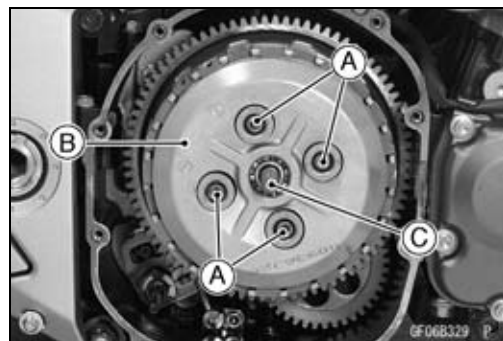
- Install the needle bearings [A] and oil seal [B] position as shown in the figure.  
Press the needle bearing until the bottom [C].  
Press the needle bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].
- Install the oil level gauge until the bottom.



## Clutch

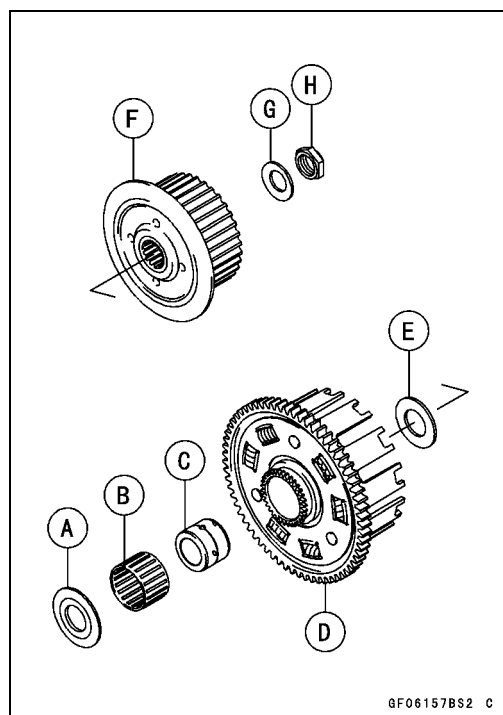
### Clutch Removal

- Remove:
  - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Clutch Cover (see Clutch Cover Removal)
  - Clutch Spring Bolts [A]
  - Clutch Springs and Spring Holders
  - Clutch Spring Plate [B] (with Thrust Bearing, Pusher [C], Spring and Washer)
- Remove:
  - Friction Plates and Steel Plates
  - Clutch Hub Nut [A]
- Holding the clutch hub [B], remove the nut and washer.
- **Special Tool - Clutch Holder [C]: 57001-1243**
- Remove:
  - Clutch Hub
  - Spacer
- Using the two 4 mm (0.16 in.) bolts [A], pull out the sleeve [B], needle bearing [C] and clutch housing [D].
- Remove the spacer.



### Clutch Installation

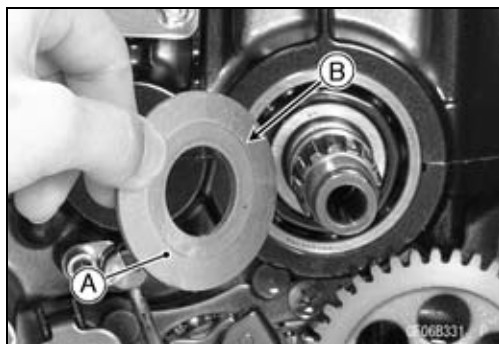
- Install the following parts on the drive shaft.
  - Spacer [A]
  - Needle Bearing [B]
  - Sleeve [C]
  - Clutch Housing [D]
  - Spacer [E]
  - Clutch Hub [F]
  - Washer [G]
  - Nut [H]



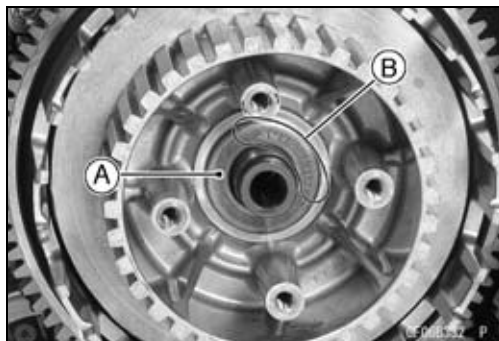
## 6-10 CLUTCH

### Clutch

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



- Install the washer [A] so that the "OUTSIDE" mark [B] faces outward.



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

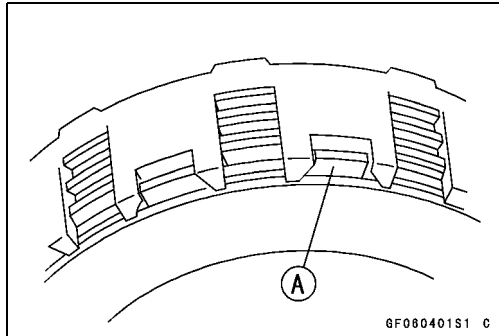
**Special Tool - Clutch Holder: 57001-1243**

**Torque - Clutch Hub Nut: 135 N·m (13.8 kgf·m, 99.6 ft·lb)**

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

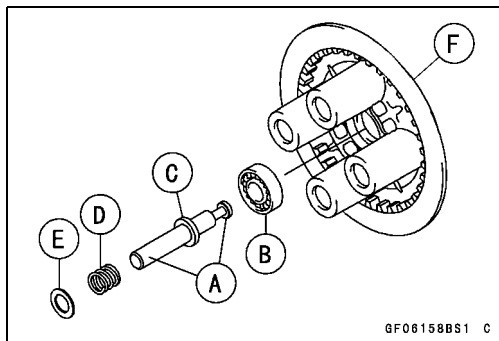
#### CAUTION

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



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

- Apply molybdenum disulfide grease to the pusher ends [A] and install the thrust bearing [B], pusher [C], spring [D] and washer [E] in the clutch spring plate [F].
- Apply engine oil to the needle bearing.

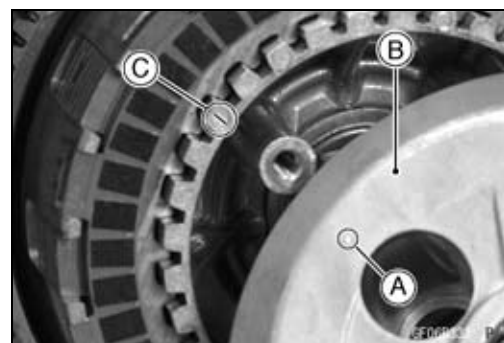


## Clutch

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

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

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



### 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 in the figure.

○ Assemble:

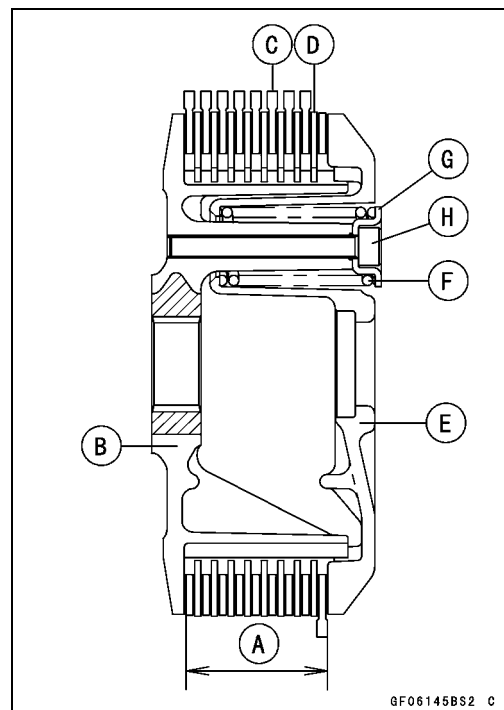
- Clutch Hub [B]
- Friction Plates [C]
- Steel Plates [D]
- Spring Plate [E]
- Springs [F]
- Spring Holders [G]
- Spring Bolts [H]

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

### Clutch Plate Assembly Length

**Standard: 37.7 ~ 38.3 mm (1.48 ~ 1.51 in.)**

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



### Clutch Plate Assembly Adjustment

- Inspect the clutch plate assembly length, and then replace the steel plate(s) which brings the length within the specified range.
- Remove:
  - Spring Bolts
  - Spring Holders
  - Springs
  - Spring Plate
- Replace the following steel plate(s).

Thickness	Part Number
1.4 mm (0.055 in.)	13089-1126
1.6 mm (0.063 in.) (STD)	13089-013
2.0 mm (0.079 in.)	13089-1073

### NOTE

○ Do not use the steel plate of 1.4 mm (0.055 in.) and 2.0 mm (0.079 in.) thickness at the same time.

- Install the removed parts, and inspect the clutch plate assembly length.

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

## 6-12 CLUTCH

### Clutch

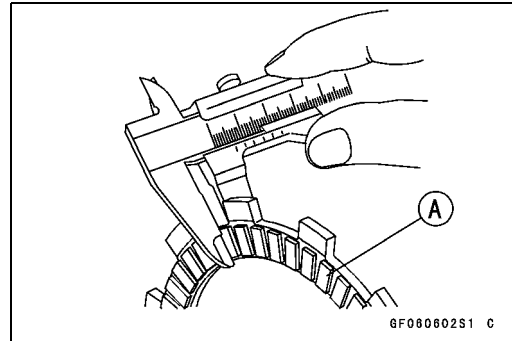
#### **Clutch Plate, Wear, Damage Inspection**

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.
- ★ If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

##### **Friction Plate Thickness**

**Standard:** 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)

**Service Limit:** 2.4 mm (0.094 in.)



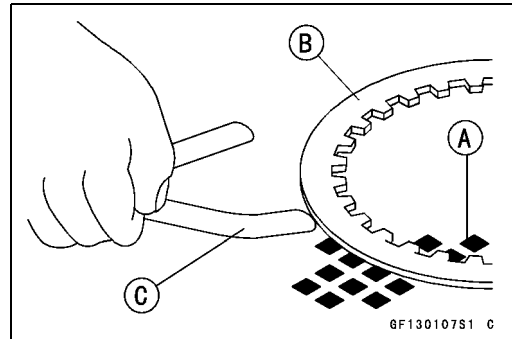
#### **Clutch Plate Warp Inspection**

- 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.)



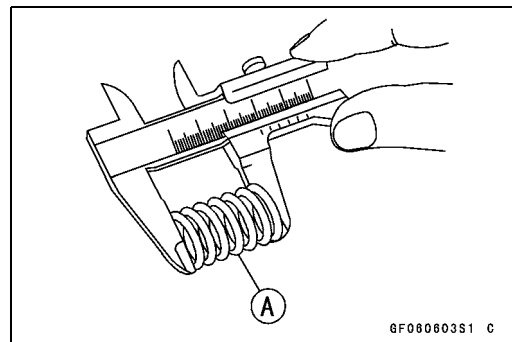
#### **Clutch Spring Free Length Measurement**

- 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:** 80.6 mm (3.17 in.)

**Service Limit:** 76.6 mm (3.02 in.)



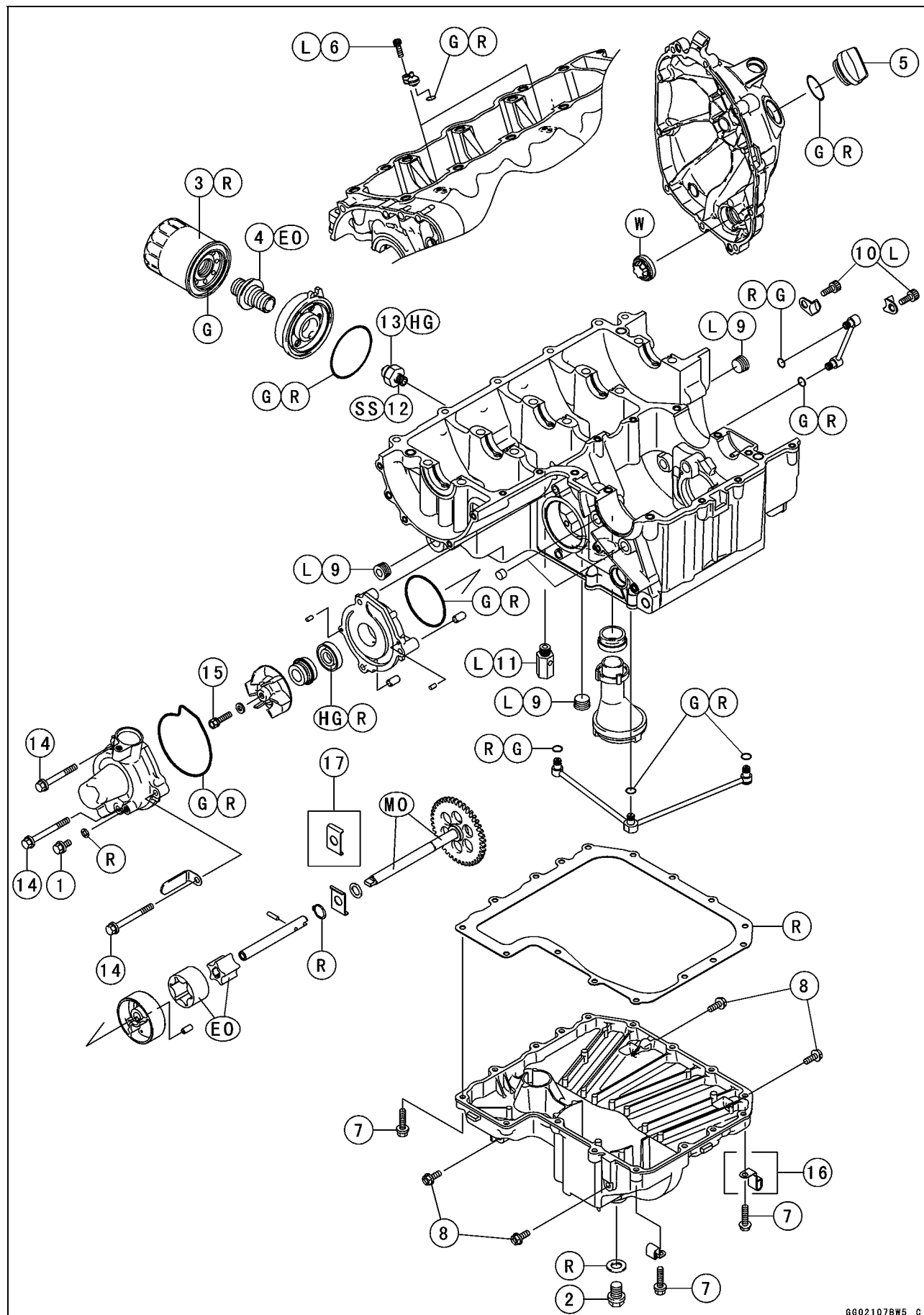
# Engine Lubrication System

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## 7-2 ENGINE LUBRICATION SYSTEM

### Exploded View





## ENGINE LUBRICATION SYSTEM 7-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coolant Drain Bolt (Water Pump)	11	1.1	97 in·lb	
2	Engine Oil Drain Bolt	29	3.0	21	
3	Oil Filter	17	1.7	13	G, R
4	Oil Filter Holder	78	8.0	58	EO
5	Oil Filler Plug	2.0	0.20	18 in·lb	
6	Oil Jet Nozzle Bolts	6.9	0.70	61 in·lb	L
7	Oil Pan Bolts	11	1.1	97 in·lb	
8	Oil Pan Side Dummy Bolts	6.9	0.70	61 in·lb	
9	Oil Passage Plugs	20	2.0	15	L
10	Oil Pipe Holder Bolts	13	1.3	115 in·lb	L
11	Oil Pressure Relief Valve	15	1.5	11	L
12	Oil Pressure Switch	15	1.5	11	SS
13	Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·lb	HG
14	Water Pump Cover Bolts	11	1.1	97 in·lb	
15	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	

16. Clamp (Oxygen Sensor Equipped Models)

17. Washer: Frame No. ; ~

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

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

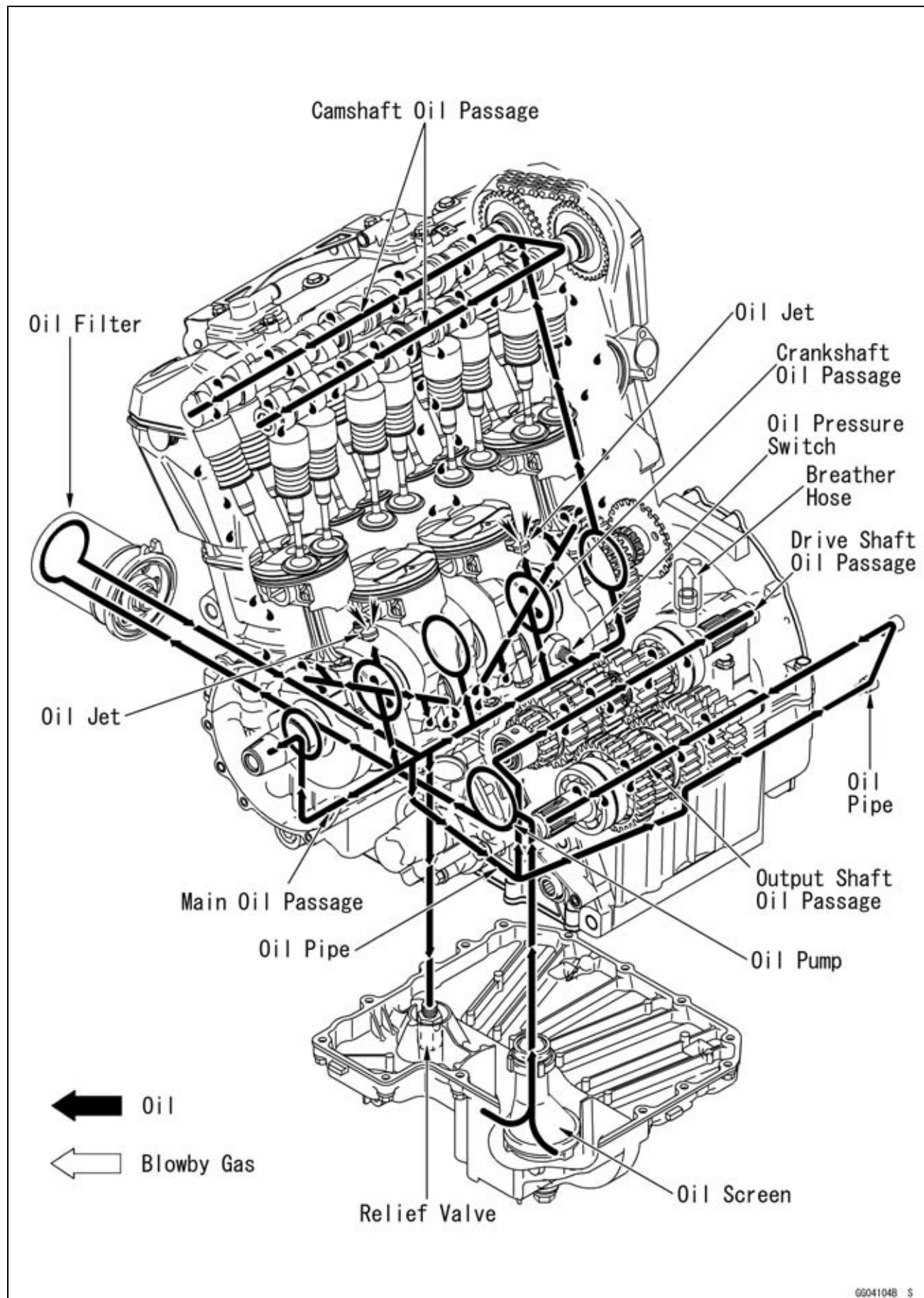
R: Replacement Parts

SS: Apply silicone sealant.

W: Apply water.

## 7-4 ENGINE LUBRICATION SYSTEM

### Engine Oil Flow Chart



## ENGINE LUBRICATION SYSTEM 7-5

### Specifications

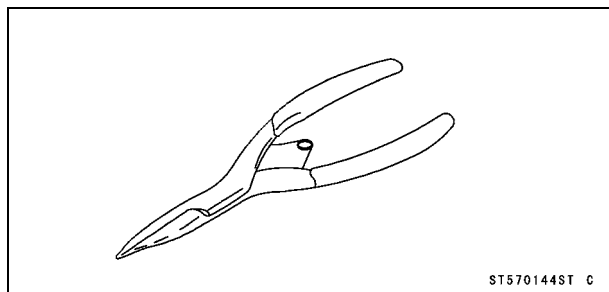
Item	Standard
<b>Engine Oil</b>	
Type	API SE, SF or SG API SH, SJ or SL with JASO MA
Viscosity	SAE 10W-40
Capacity:	3.1 L (3.3 US qt) (when filter is not removed) 3.3 L (3.5 US qt) (when filter is removed) 3.8 L (4.0 US qt) (when engine is completely dry)
Level	Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)
<b>Oil Pressure Measurement</b>	
Oil Pressure	147 ~ 226 kPa (1.5 ~ 2.3 kgf/cm <sup>2</sup> , 21 ~ 33 psi) at 4 000 r/min (rpm), Oil Temperature 90°C (194°F)

## 7-6 ENGINE LUBRICATION SYSTEM

### Special Tools and Sealant

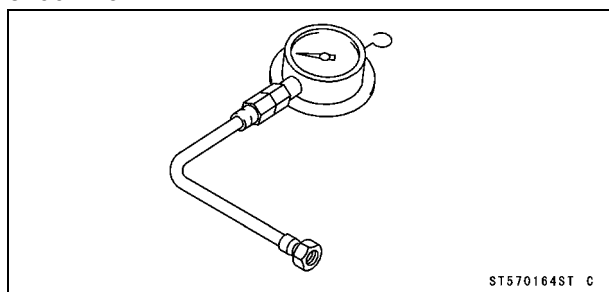
**Outside Circlip Pliers:**

**57001-144**



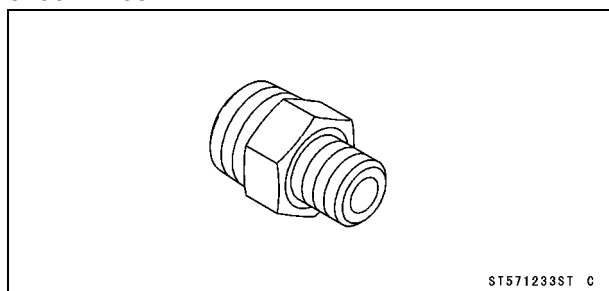
**Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>:**

**57001-164**



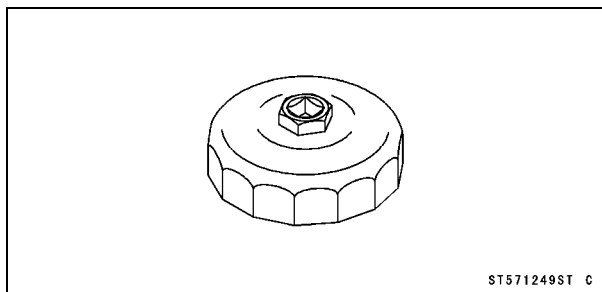
**Oil Pressure Gauge Adapter, PT3/8:**

**57001-1233**



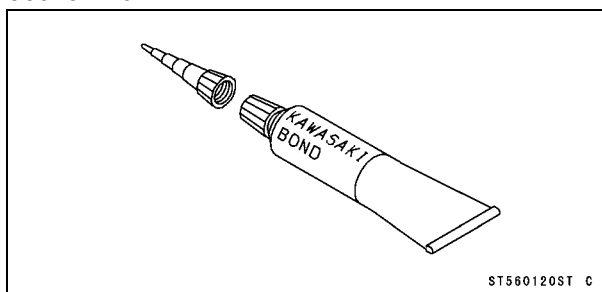
**Oil Filter Wrench:**

**57001-1249**



**Kawasaki Bond (Silicone Sealant):**

**56019-120**



## Engine Oil and Oil Filter

### **⚠ WARNING**

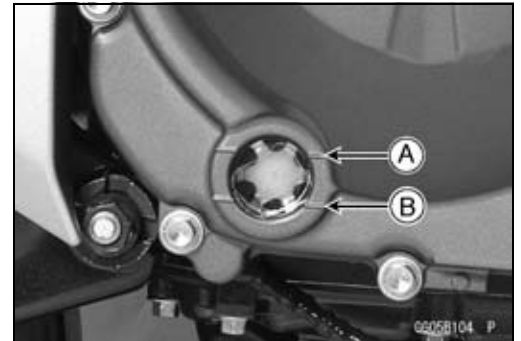
Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

### **Oil Level Inspection**

- Check that the engine oil level is between the upper [A] and lower [B] levels in the gauge.

### **NOTE**

- Situate the motorcycle so that it is perpendicular to the ground.
- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.



### **CAUTION**

Racing the engine before the oil reaches every part can cause engine seizure.

If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the warning indicator light (LED) and oil pressure warning symbol will blink. If this blink stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

- ★ If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- ★ If the oil level is too low, add the correct amount of oil through the oil filter opening. Use the same type and make of oil that is already in the engine.

### **NOTE**

- If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

### **Engine Oil Change**

- Refer to the Engine Oil Change in the Periodic Maintenance chapter.

### **Oil Filter Replacement**

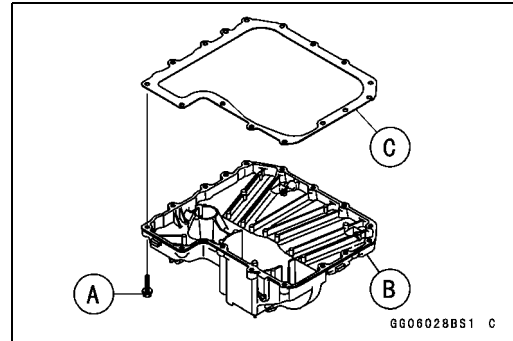
- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

## 7-8 ENGINE LUBRICATION SYSTEM

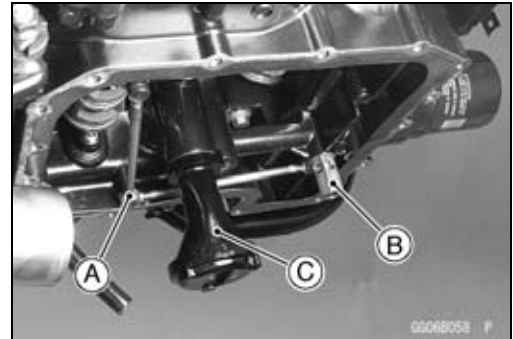
### Oil Pan

#### Oil Pan Removal

- Remove:
  - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  - Oil Pan Bolts [A] and Clamps
  - Oil Pan [B] and Gasket [C]

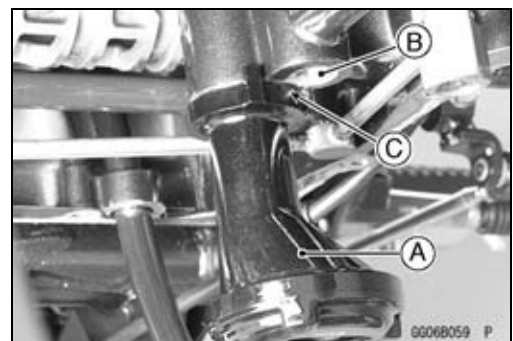


- Remove the oil pipe [A], oil pressure relief valve [B] and oil screen [C] as necessary.



#### 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 grease 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.

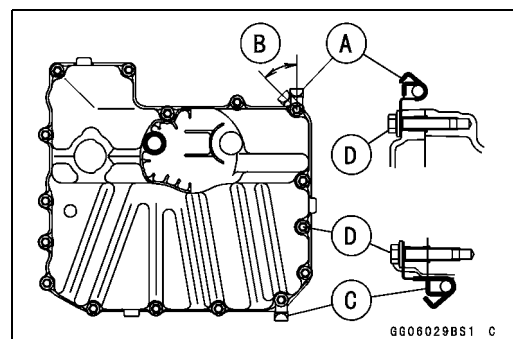


#### CAUTION

**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)**

- Replace the oil pan gasket with a new one.
- Install the clamp [A] at an angle of within 45° [B] as shown in the figure.
- Install the clamp [C] as shown in the figure (Oxygen Sensor Equipped Models).
- Tighten:
  - Torque - Oil Pan Bolts [D]: 11 N·m (1.1 kgf·m, 97 in·lb)**
- Install the removed parts (see appropriate chapters).



## Oil Pressure Relief Valve

### Oil Pressure Relief Valve Removal

- Refer to the Oil Pan Removal.

### Oil Pressure Relief Valve Installation

- Refer to the Oil Pan Installation.

### Oil Pressure Relief Valve Inspection

- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

#### NOTE

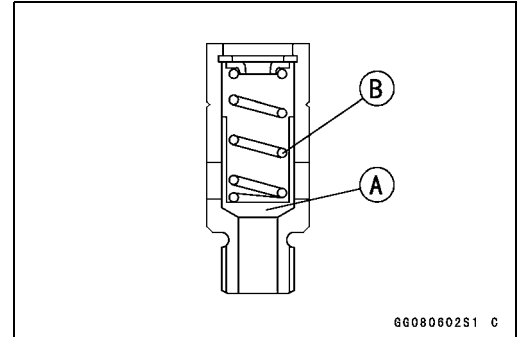
○Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.

- ★If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.

#### WARNING

Clean the oil pressure relief valve in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.

- ★If cleaning does 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.

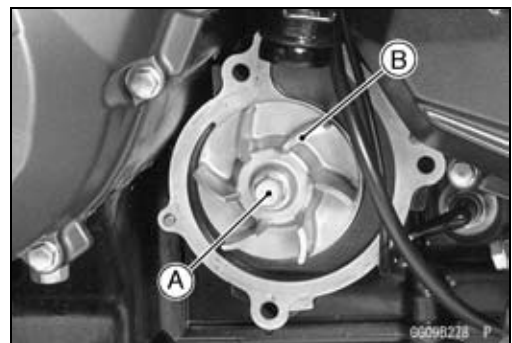
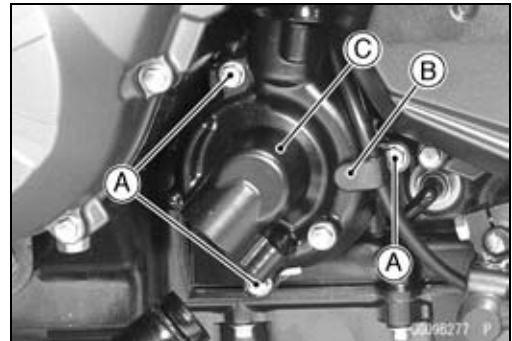
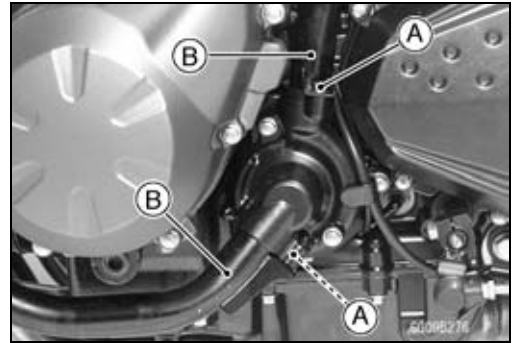


## 7-10 ENGINE LUBRICATION SYSTEM

### Oil Pump

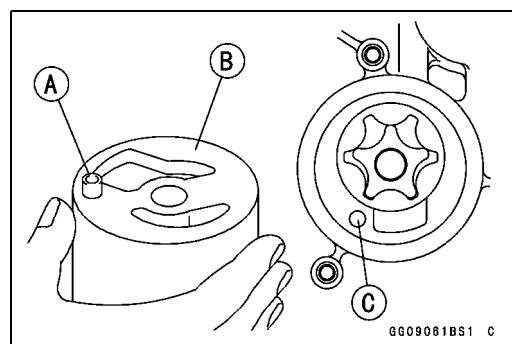
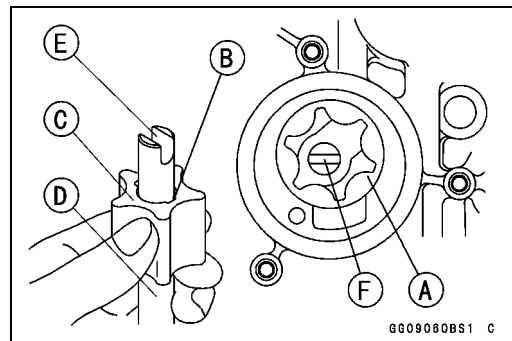
#### Oil Pump Removal

- Remove:
  - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Water Pipe Bolts [A]
  - Water Pipes [B]
- Remove:
  - Water Pump Cover Bolts [A]
  - Clamp [B]
  - Water Pump Cover [C]
- Remove:
  - Impeller Bolt [A]
  - Washer
  - Impeller [B]
  - Water Pump Body
  - Oil Pump Cover
  - Oil (Water) Pump Shaft
  - Outer Rotor and Inner Rotor



#### Oil Pump Installation

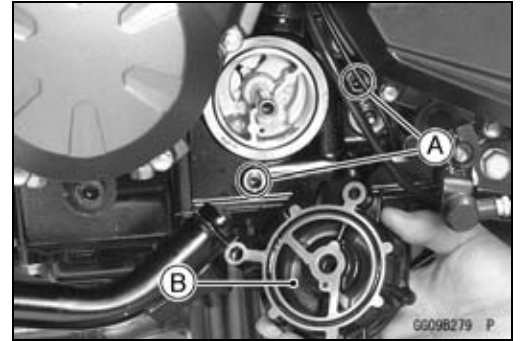
- Install the outer rotor [A] into the crankcase.
  - Install the pin [B], inner rotor [C] and oil (water) pump shaft [D].
  - Turn the pump shaft so that the slot [E] in its shaft fits onto the projection [F] of the pump drive gear shaft.
- Fit the pin [A] of the oil pump cover [B] into the hole [C]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



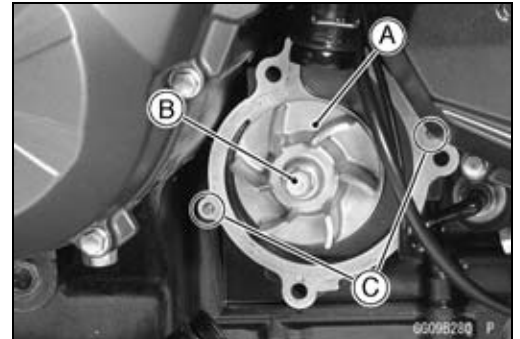


## Oil Pump

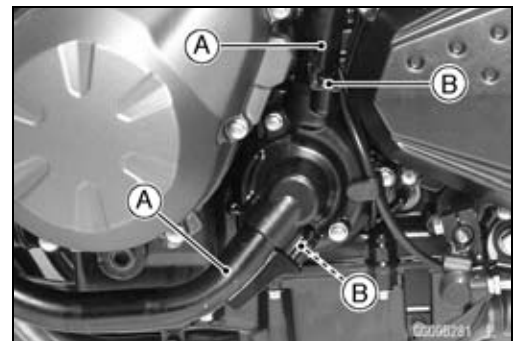
- Install:  
Pins [A]  
Water Pump Body [B]



- Install the impeller [A], washer and bolt [B].
- Tighten:  
**Torque - Water Pump Impeller Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the pins [C] and water pump cover.
- Tighten:  
**Torque - Water Pump Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**

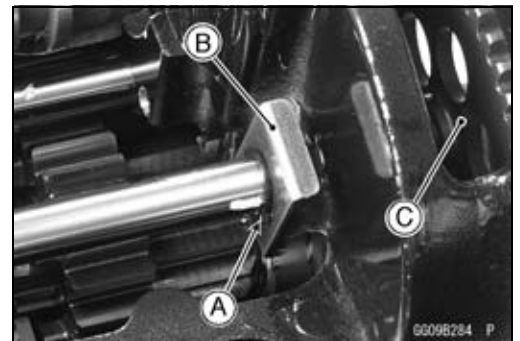


- Install the water pipes [A].
- Apply a non-permanent locking agent to the threads of the water pipe bolts [B] and tighten them.
- Torque - Water Pipe Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**



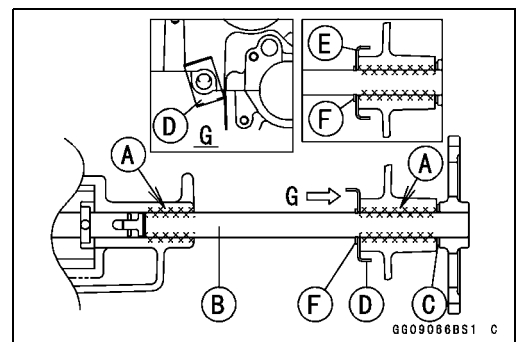
### Oil Pump Drive Gear Removal

- Remove:  
Clutch (see Clutch Removal in the Clutch chapter)  
Oil Pan (see Oil Pan Removal)  
Circlip [A] and Washer [B]  
Oil Pump Drive Gear [C] and Washer
- Special Tool - Outside Circlip Pliers: 57001-144**



### Oil Pump Drive Gear Installation

- Apply molybdenum disulfide oil solution to the journal portions [A] on the oil pump drive gear shaft [B].
- Install the washers [C] [D].  
Washer [E]: Frame No. ; ~
- Install the new circlip [F] into the groove of the oil pump drive gear shaft.
- Special Tool - Outside Circlip Pliers: 57001-144**



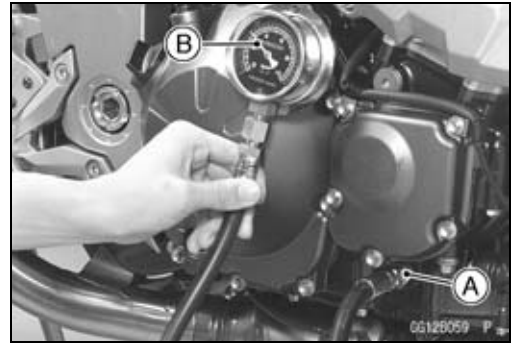
## 7-12 ENGINE LUBRICATION SYSTEM

### Oil Pressure Measurement

#### **Oil Pressure Measurement**

- Remove the oil passage plug, and attach the adapter [A] and gauge [B] to the plug hole.

**Special Tools - Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>: 57001-164**  
**Oil Pressure Gauge Adapter, PT3/8: 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:** 147 ~ 226 kPa (1.5 ~ 2.3 kgf/cm<sup>2</sup>, 21 ~ 33 psi) at 4 000 r/min (rpm), oil temperature 90°C (194°F)

- Stop the engine.
- Remove the oil pressure gauge and adapter.

#### **⚠ WARNING**

**Take care against burns from hot engine oil that will drain through the oil passage when the gauge adapter is removed.**

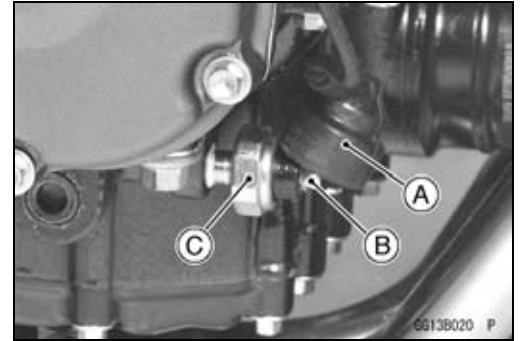
- Apply a non-permanent locking agent to the oil passage plug, and install it.

**Torque - Oil Passage Plugs: 20 N·m (2.0 kgf·m, 15 ft·lb)**

### Oil Pressure Switch

#### ***Oil Pressure Switch Removal***

- Remove:
  - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Switch Cover [A]
  - Switch Terminal Bolt [B]
  - Oil Pressure Switch [C]



#### ***Oil Pressure Switch Installation***

- Apply silicone sealant to the threads of the oil pressure switch and tighten it.

**Sealant - 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.
- Apply high-temperature grease to the terminal.
- Tighten the terminal bolt.

**Torque - Oil Pressure Switch Terminal Bolt: 2.0 N·m (0.20 kgf·m, 18 in·lb)**



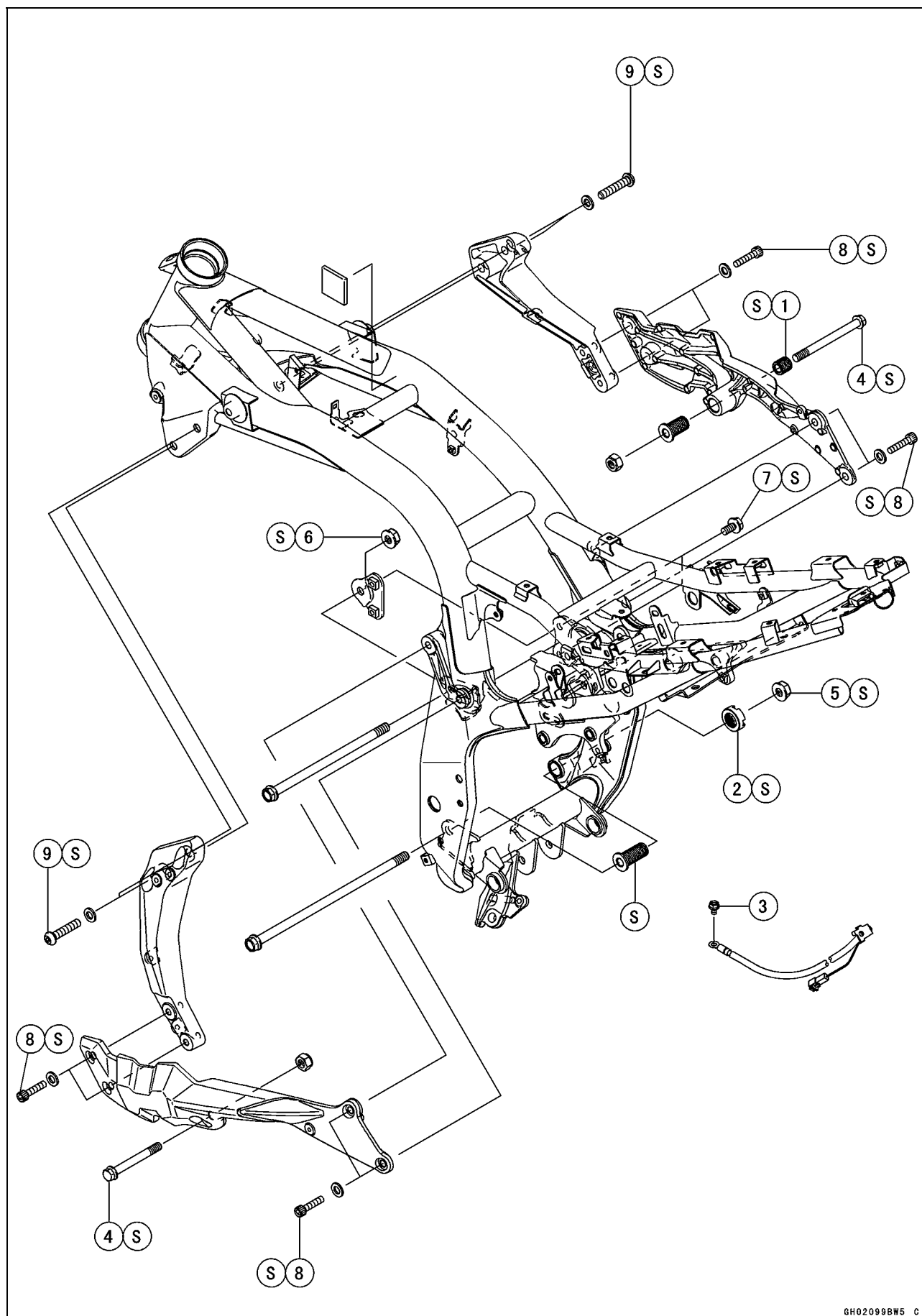
# Engine Removal/Installation

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Special Tool .....	8-4
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Engine Removal .....	8-5
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## 8-2 ENGINE REMOVAL/INSTALLATION

### Exploded View



## ENGINE REMOVAL/INSTALLATION 8-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Adjusting Collar Lock Bolt	34	3.5	25	S
2	Adjusting Collar Locknut	49	5.0	36	S
3	Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
4	Front Engine Mounting Bolts	44	4.5	32	S
5	Lower Engine Mounting Nut	44	4.5	32	S
6	Middle Engine Mounting Nut	44	4.5	32	S
7	Rear Engine Bracket Bolts	25	2.5	18	S
8	Subframe Bolts	25	2.5	18	S
9	Upper Engine Bracket Bolts	44	4.5	32	S

S: Follow the specified tightening sequence.

## 8-4 ENGINE REMOVAL/INSTALLATION

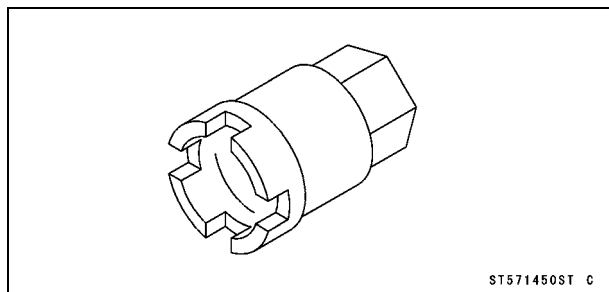
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### Special Tool

---

Engine Mount Nut Wrench:

57001-1450





## Engine Removal/Installation

### Engine Removal

- Support the rear part of the swingarm with a stand.
- Squeeze the brake lever slowly and hold it with a band [A].

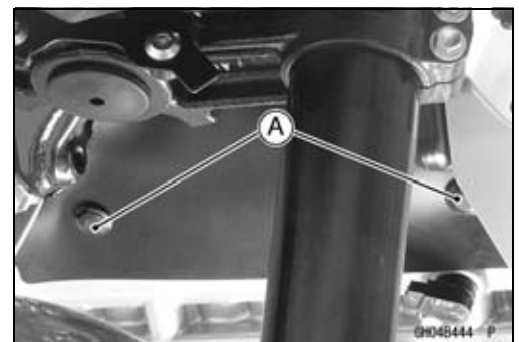
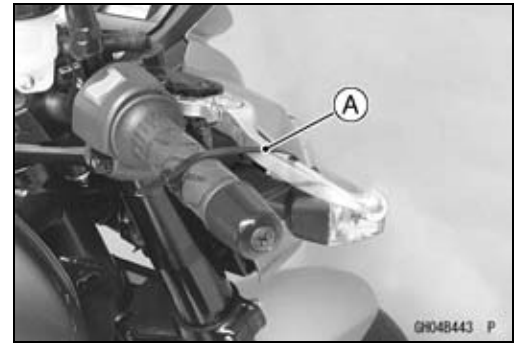
#### **⚠ WARNING**

**Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.**

#### **CAUTION**

**Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.**

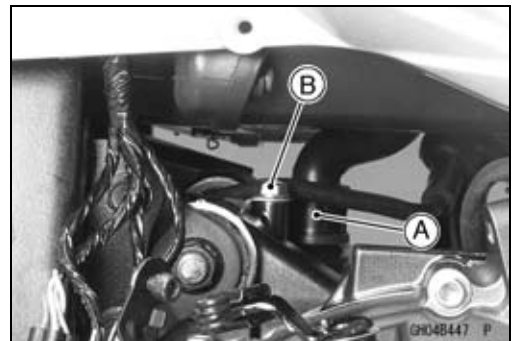
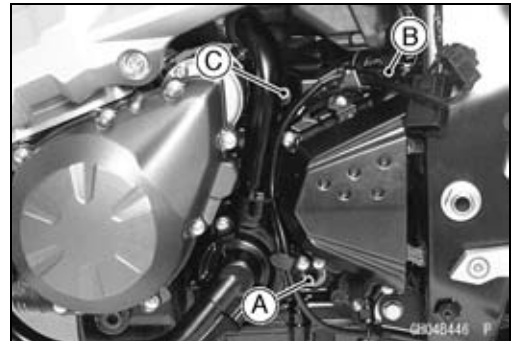
- Remove:
  - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
  - Center Fairings (see Center Fairing Removal in the Frame chapter)
  - Side Covers (see Side Cover Removal in the Frame chapter)
  - Frame Covers (see Frame Cover Removal in the Frame chapter)
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Clutch Cable Lower End (see Clutch Cable Removal in the Clutch chapter)
  - Thermostat Housing (see Thermostat Removal in the Cooling System chapter)
  - Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  - Air Switching Valve (see Air Switching Valve Removal in the Engine Top End chapter)
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Shift Lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
- Remove:
  - Quick Rivets [A]
  - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)



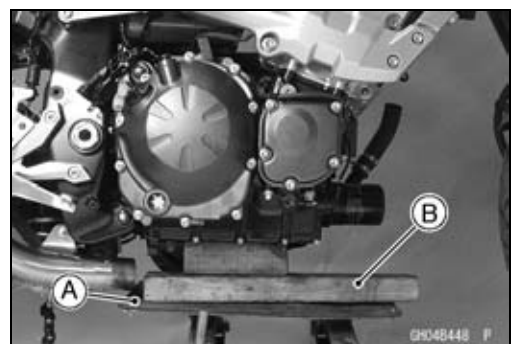
## 8-6 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

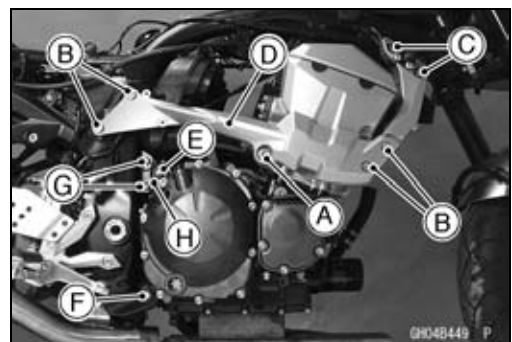
- Disconnect:
  - Stick Coil Harness Connector [A]
  - Camshaft Position Sensor Lead Connector (see Camshaft Position Sensor Removal in the Electrical System chapter)
- Disconnect:
  - Starter Motor Cable (see Starter Motor Removal in the Electrical System chapter)
  - Alternator Lead Connector (see Alternator Cover Removal in the Electrical System chapter)
  - Crankshaft Sensor Lead Connector (see Crankshaft Sensor Removal in the Electrical System chapter)
  - Neutral Switch Lead Connector [A]
  - Sidestand Switch Lead Connector [B]
  - Speed Sensor Lead Connector [C]
- Remove the engine sprocket (see Engine Sprocket Removal in the Final Drive chapter).
- Remove:
  - Breather Hose End [A]
  - Engine Ground Cable Terminal Bolt [B]



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

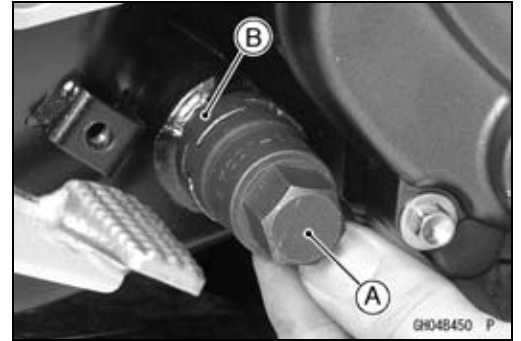


- Remove:
  - Front Engine Mounting Bolts [A] (Both Sides)
  - Adjusting Collar Lock Bolt
  - Subframe Bolts [B] (Both Sides)
  - Upper Engine Bracket Bolts [C] (Both Sides)
  - Subframes [D] (Both Sides)
  - Middle Engine Mounting Nut [E] and Bolt
  - Lower Engine Mounting Nut [F] and Bolt
  - Rear Engine Bracket Bolts [G]
  - Rear Engine Bracket [H]



### Engine Removal/Installation

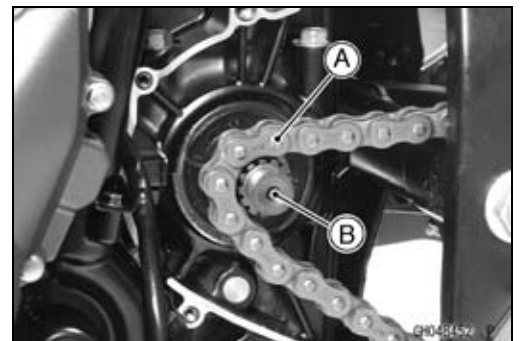
- Using the nut wrench [A], loosen the locknut [B].  
Special Tool - Engine Mount Nut Wrench: 57001-1450



- Using the Hexagon Wrench, turn the adjusting collar [A] counterclockwise to make the gap between the engine and adjusting collar.

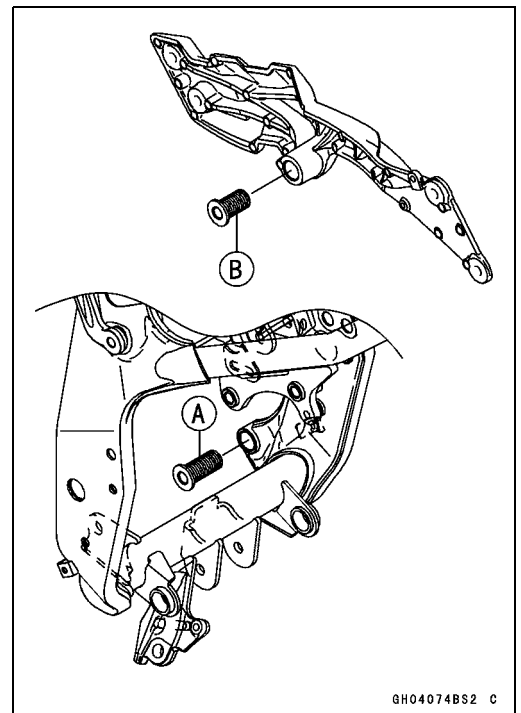


- Remove the drive chain [A] from the output shaft [B].
- Using the stand, take out the engine.



### Engine Installation

- Support the engine with a suitable stand.
- Put a plank onto the suitable stand for engine balance.
- Screw the adjusting collar [A] to the frame.
- Screw the adjusting collar [B] to the subframe.



## 8-8 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

---

- Install the engine mounting bolts and nuts, following the specified installing sequence.
  - First, hang the drive chain over the output shaft just before moving the engine into its final position in the frame.
  - Second, install the rear engine bracket [A] and tighten the bolts [B] temporarily.
  - Third, install the left upper engine bracket [C] and left subframe [D] and tighten the bolts [E] [F] [G].
  - Fourth, insert the lower [H] and middle [I] engine mounting bolts.
  - Fifth, tighten the left front engine mounting bolt [J].
  - Sixth, tighten the rear engine bracket bolts [B].
  - Seventh, tighten the adjusting collar [K] until the clearance between the crankcase and frame come to 0 mm.
  - Eighth, tighten the adjusting collar locknut [L].
  - Ninth, tighten the lower [M] and middle [N] engine mounting nuts.
  - Tenth, install the right upper engine bracket [O] and right subframe [P] and tighten the bolts [Q] [R] [S] temporarily.
  - Eleventh, insert the jig (M10 shaft) in the right subframe.
  - Twelfth, first tighten the right subframe bolts (rear).
    - Right Subframe Bolts (Rear) [S]
    - Right Subframe Bolts (Front) [R]
    - Right Upper Engine Bracket Bolts [Q]
  - Thirteenth, remove the jig (M10 shaft) in the right subframe.
  - Fourteenth, tighten the adjusting collar [T] until the clearance between the engine and subframe come to 0 mm.
  - Fifteenth, tighten the adjusting collar lock bolt [U] securely.
- Torque - Adjusting Collar Lock Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**
- Sixteenth, tighten the right front engine mounting bolt [V].
  - Lastly, tighten the locknut, nuts and bolts securely.

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

**Lower Engine Mounting Nut [M]: 44 N·m (4.5 kgf·m, 32 ft·lb)**

**Rear Engine Bracket Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

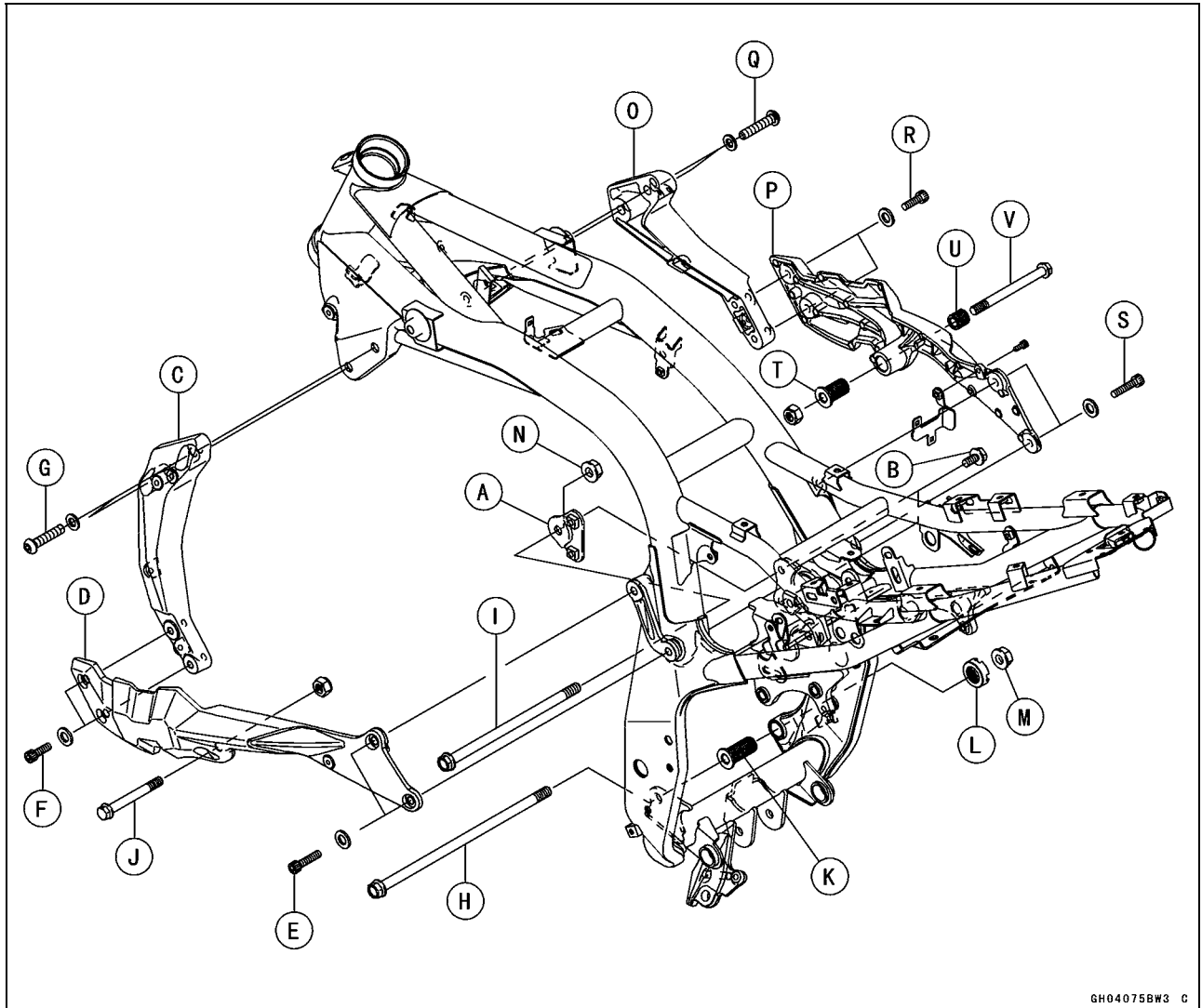
**Middle Engine Mounting Nut [N]: 44 N·m (4.5 kgf·m, 32 ft·lb)**

**Subframe Bolts [E] [F] [R] [S]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

**Upper Engine Bracket Bolts [G] [Q]: 44 N·m (4.5 kgf·m, 32 ft·lb)**

**Front Engine Mounting Bolts [J] [V] :44 N·m (4.5 kgf·m, 32 ft·lb)**

## Engine Removal/Installation



GH04075BW3 C

- Run the leads, cables and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

**Torque - Engine Ground Cable Terminal Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

- Adjust:
  - Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  - Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)
  - Drive Chain (see Drive Chain Slack Inspection in the Periodic Maintenance chapter)
- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Fill the engine with coolant (see Coolant Change in the Periodic Maintenance chapter).



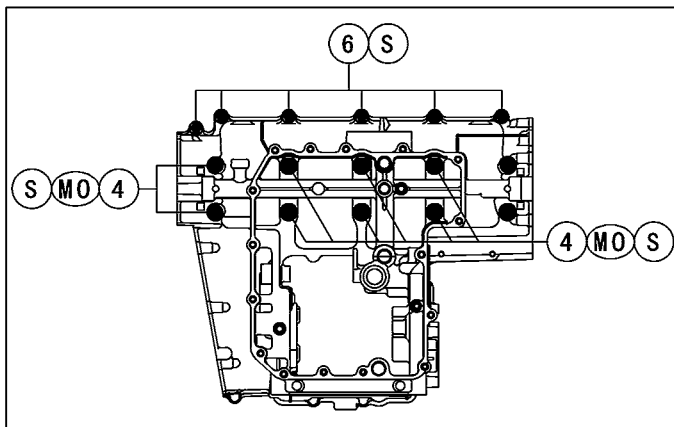
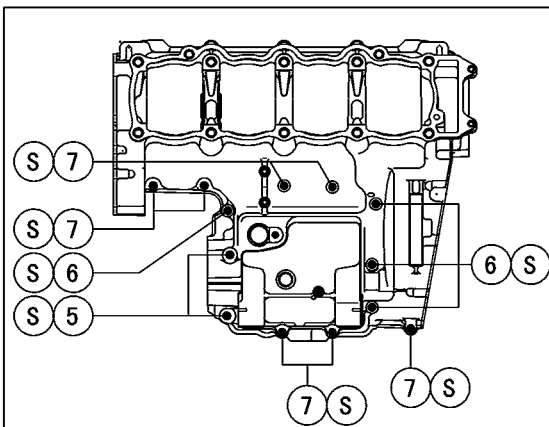
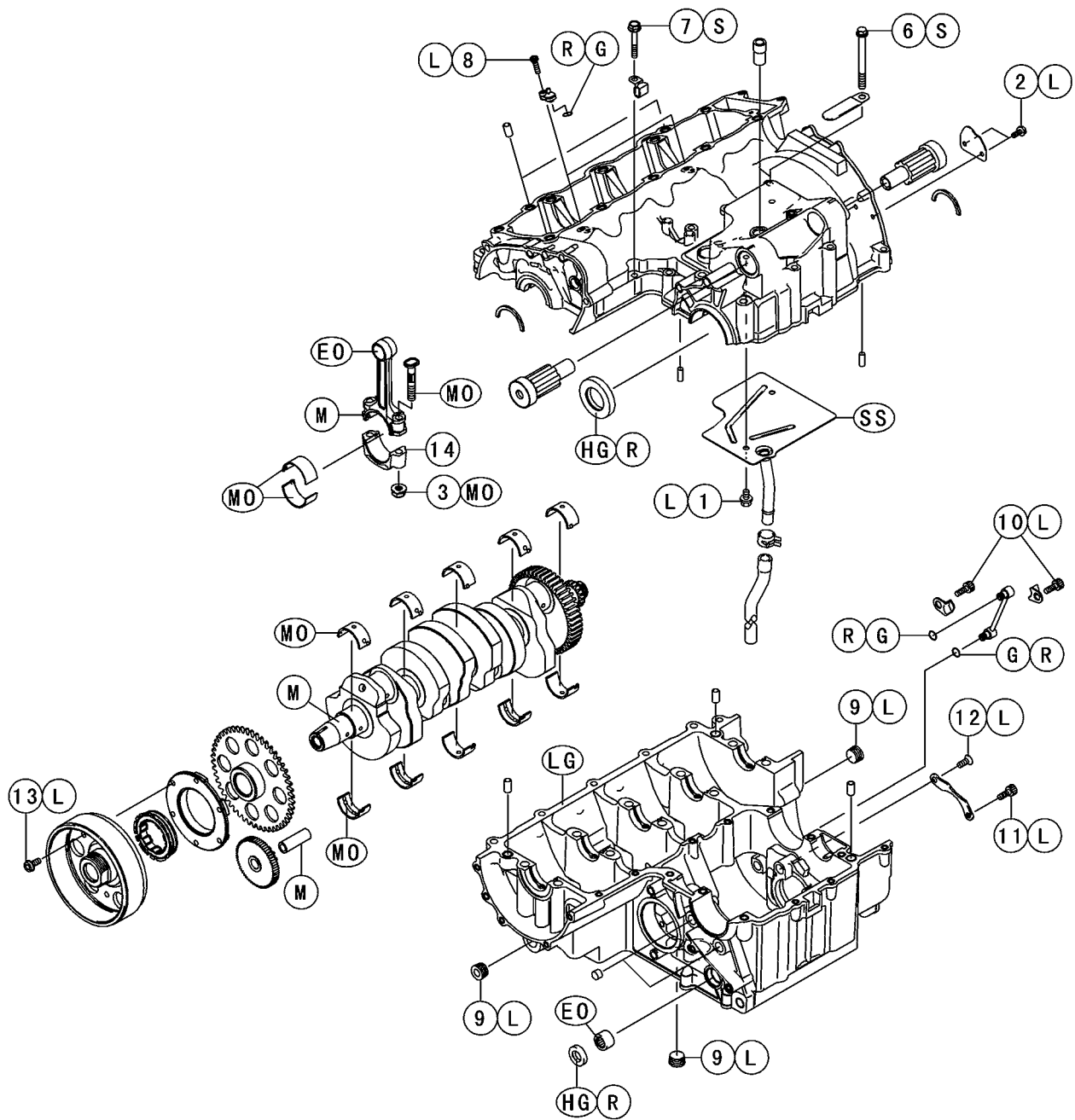
# Crankshaft/Transmission

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## 9-2 CRANKSHAFT/TRANSMISSION

### Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Breather Plate Bolts (M6)	9.8	1.0	87 in·lb	L
2	Breather Plate Bolts (M5)	5.9	0.60	52 in·lb	L
3	Connecting Rod Big End Nuts	see the text	←	←	MO
4	Crankcase Bolts (M9)	42	4.3	31	MO, S
5	Crankcase Bolts (M8)	27	2.8	20	S
6	Crankcase Bolts (M7)	20	2.0	15	S
7	Crankcase Bolts (M6)	12	1.2	106 in·lb	S
8	Oil Jet Nozzle Bolts	6.9	0.70	61 in·lb	L
9	Oil Passage Plugs	20	2.0	15	L
10	Oil Pipe Holder Bolts	13	1.3	115 in·lb	L
11	Shift Drum Bearing Holder Bolt	13	1.3	115 in·lb	L
12	Shift Drum Bearing Holder Screw	5.9	0.60	52 in·lb	L
13	Starter Motor Clutch Bolts	12	1.2	106 in·lb	L

14. Do not apply any grease or oil.

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

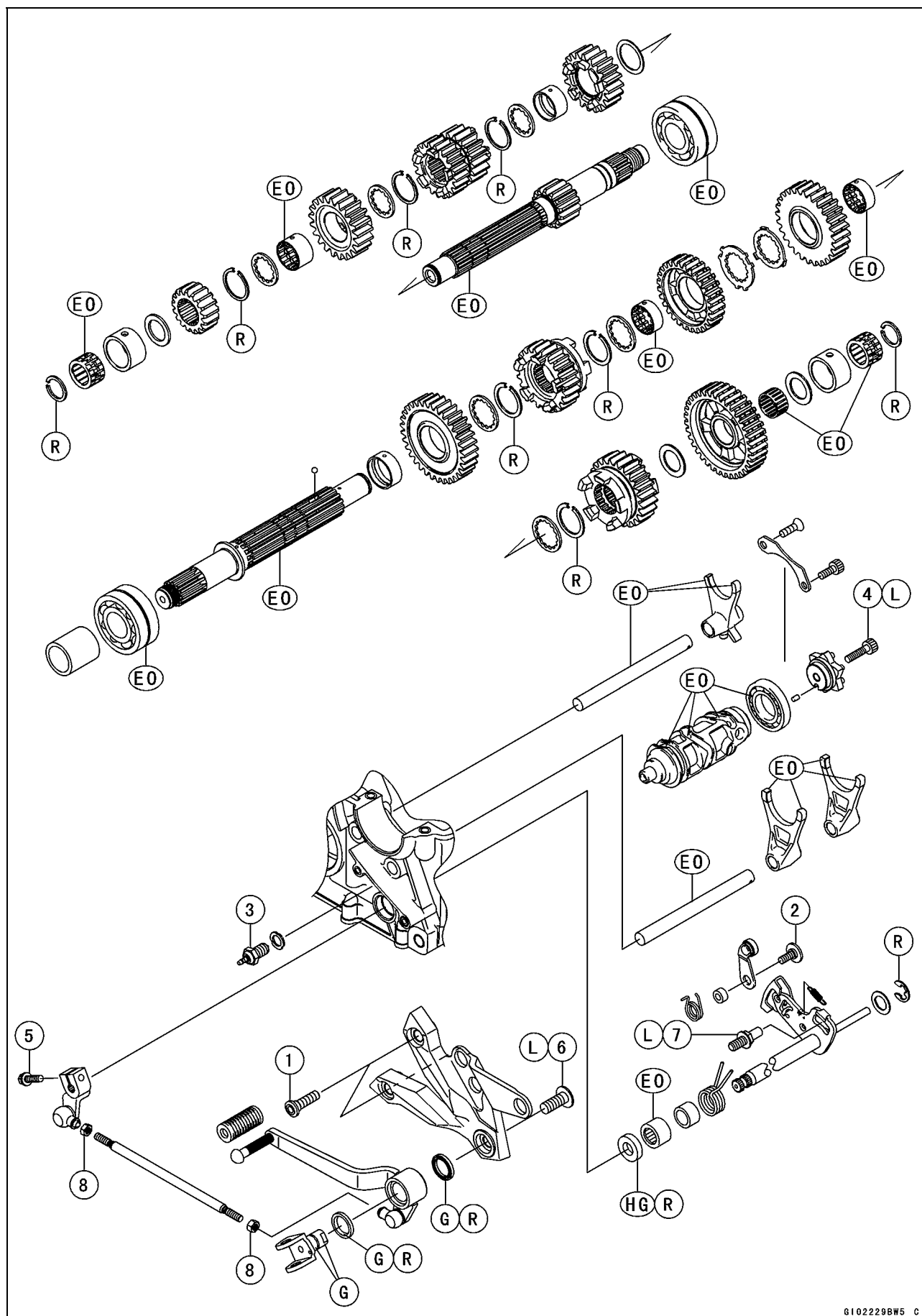
R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

## 9-4 CRANKSHAFT/TRANSMISSION

### Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Footpeg Bracket Bolts	25	2.5	18	
2	Gear Positioning Lever Bolt	12	1.2	106 in·lb	
3	Neutral Switch	15	1.5	11	
4	Shift Drum Cam Holder Bolt	12	1.2	106 in·lb	L
5	Shift Lever Bolt	6.9	0.70	61 in·lb	
6	Shift Pedal Mounting Bolt	34	3.5	25	L
7	Shift Shaft Return Spring Pin	29	3.0	21	L
8	Tie-Rod Locknuts	6.9	0.70	61 in·lb	

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 9-6 CRANKSHAFT/TRANSMISSION

### Specifications

Item			Standard	Service Limit																				
<b>Crankshaft, Connecting Rods</b>																								
Connecting Rod Bend			— — —	TIR 0.2/100 mm (0.008/3.94 in.)																				
Connecting Rod Twist			— — —	TIR 0.2/100 mm (0.008/3.94 in.)																				
Connecting Rod Big End Side Clearance			0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)	0.58 mm (0.023 in.)																				
Connecting Rod Big End Bearing Insert/Crankpin Clearance			0.041 ~ 0.071 mm (0.0016 ~ 0.0028 in.)	0.11 mm (0.0043 in.)																				
Crankpin Diameter:			34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.)	34.97 mm (1.3768 in.)																				
Marking	None		34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.)	— — —																				
	○		34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.)	— — —																				
Connecting Rod Big End Inside Diameter:			38.000 ~ 38.016 mm (1.4961 ~ 1.4967 in.)	— — —																				
Marking	None		38.000 ~ 38.008 mm (1.4961 ~ 1.4964 in.)	— — —																				
	○		38.009 ~ 38.016 mm (1.4965 ~ 1.4967 in.)	— — —																				
Connecting Rod Big End Bearing Insert Thickness:																								
			Brown	1.475 ~ 1.480 mm (0.05807 ~ 0.05827 in.)	— — —																			
			Black	1.480 ~ 1.485 mm (0.05827 ~ 0.05846 in.)	— — —																			
			Blue	1.485 ~ 1.490 mm (0.05846 ~ 0.05866 in.)	— — —																			
Connecting Rod Big End Bearing Insert Selection:																								
<table><tr><td rowspan="2">Con-rod Big End Inside Diameter Marking</td><td rowspan="2">Crankpin Diameter Marking</td><td colspan="2">Bearing Insert</td></tr><tr><td>Size Color</td><td>Part Number</td></tr><tr><td>None</td><td>○</td><td>Brown</td><td>92139-1110</td></tr><tr><td>None</td><td>None</td><td rowspan="2">Black</td><td rowspan="2">92139-1109</td></tr><tr><td>○</td><td>○</td></tr><tr><td>○</td><td>None</td><td>Blue</td><td>92139-1108</td></tr></table>					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
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																					
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 Runout			TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.0020 in.)																				

**Specifications**

Item		Standard	Service Limit
Crankshaft Main Bearing Insert/Journal Clearance		0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)	0.07 mm (0.0028 in.)
Crankshaft Main Journal Diameter:		32.984 ~ 33.000 mm (1.2986 ~ 1.2992 in.)	32.96 mm (1.2976 in.)
Marking	None	32.984 ~ 32.992 mm (1.2986 ~ 1.2989 in.)	— — —
	1	32.993 ~ 33.000 mm (1.2990 ~ 1.2992 in.)	— — —
Crankcase Main Bearing Inside Diameter:		36.000 ~ 36.016 mm (1.4173 ~ 1.4179 in.)	— — —
Marking	○	36.000 ~ 36.008 mm (1.4173 ~ 1.4176 in.)	— — —
	None	36.009 ~ 36.016 mm (1.4177 ~ 1.4179 in.)	— — —
Crankshaft Main Bearing Insert Thickness:			
	Brown	1.490 ~ 1.494 mm (0.0587 ~ 0.0588 in.)	— — —
	Black	1.494 ~ 1.498 mm (0.0588 ~ 0.0590 in.)	— — —
	Blue	1.498 ~ 1.502 mm (0.0590 ~ 0.0591 in.)	— — —

Crankshaft Main Bearing Insert Selection:

Crankcase Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92028-1868	3, 5
			92028-1829	1, 2, 4
None	1	Black	92028-1867	3, 5
○	None		92028-1828	1, 2, 4
None	None	Blue	92028-1866	3, 5
			92028-1827	1, 2, 4

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

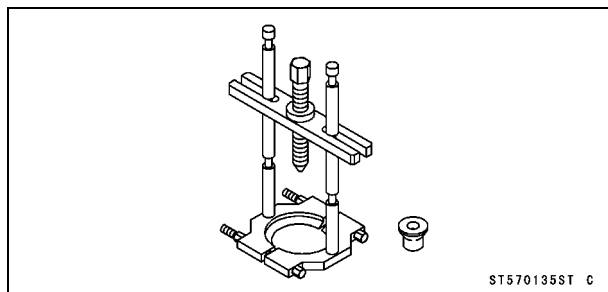
<b>Transmission</b>		
Shift Fork Ear Thickness	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Gear Groove Width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.25 mm (0.246 in.)
Shift Fork Guide Pin Diameter	6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)	6.8 mm (0.268 in.)
Shift Drum Groove Width	7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)	7.3 mm (0.287 in.)

## 9-8 CRANKSHAFT/TRANSMISSION

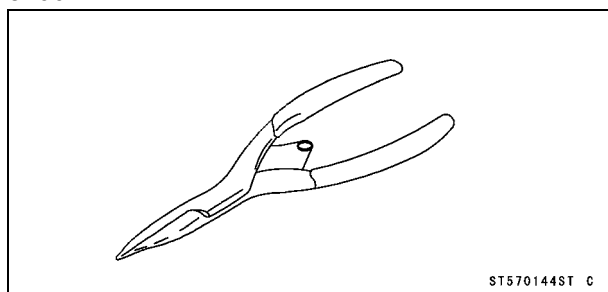
### Special Tools and Sealant

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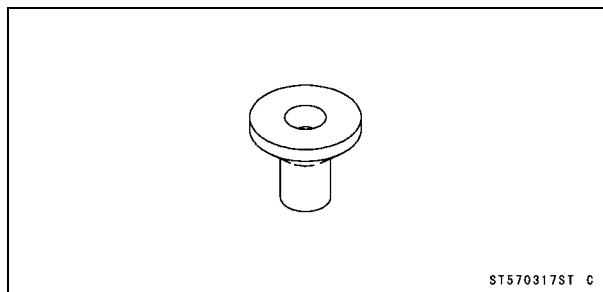
**Bearing Puller:**  
**57001-135**



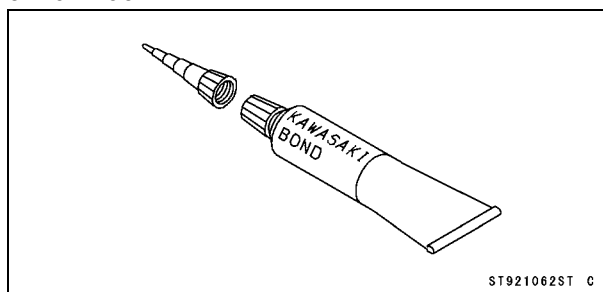
**Outside Circlip Pliers:**  
**57001-144**



**Bearing Puller Adapter:**  
**57001-317**



**Kawasaki Bond (Liquid Gasket - Black) :**  
**92104-1062**



## Crankcase Splitting

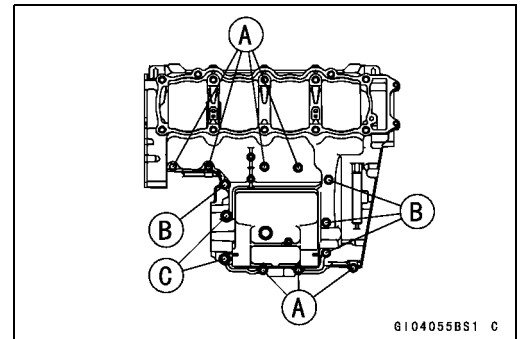
### Crankcase Splitting

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:
  - Crankshaft Sensor (see Crankshaft Sensor Removal in the Electrical System chapter)
  - Clutch (see Clutch Removal in the Clutch chapter)
  - External Shift Mechanism (see External Shift Mechanism Removal)
  - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  - Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
  - Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  - Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)
  - Oil Pan (see Oil Pan Removal in the Engine Lubrication System chapter)
- ★ If the crankshaft is to be removed, remove the pistons (see Piston Removal in the Engine Top End chapter).

- Remove the upper crankcase bolts.

○ First loosen the M6 bolts.

- M6 Bolts [A]
- M7 Bolts [B]
- M8 Bolts [C]

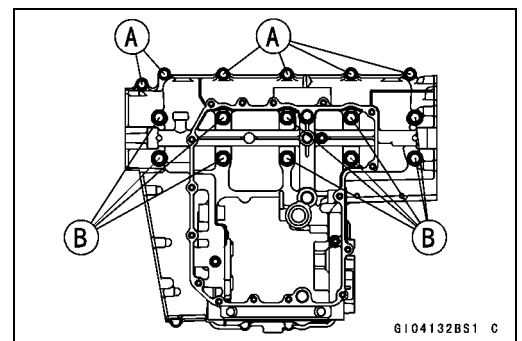


- Remove the lower crankcase bolts.

○ First loosen the M7 bolts.

- M7 Bolts [A]
- M9 Bolts [B]

- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase. Take care not to damage the crankcase.



### Crankcase Assembly

#### CAUTION

The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

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

## 9-10 CRANKSHAFT/TRANSMISSION

### Crankcase Splitting

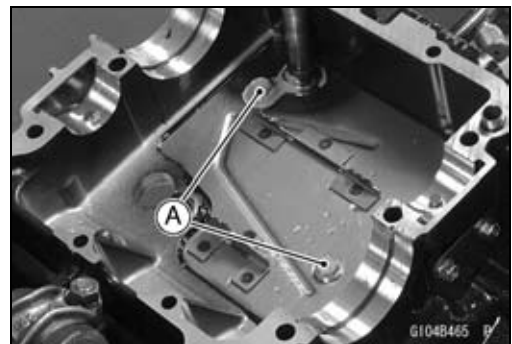
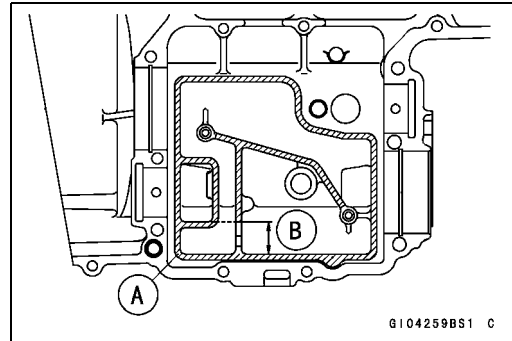
- Apply liquid gasket to the breather plate mating surface [A] 1 mm (0.04 in.) or more thick, and then install the breather plate.

22 mm (0.87 in.) [B]

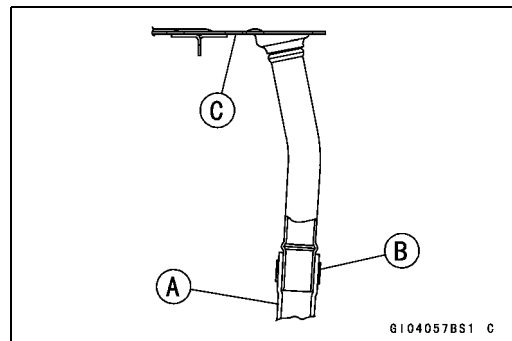
**Sealant - Three Bond: TB1207B**

#### NOTE

- Make the application finish within 7 minutes when the liquid gasket to the mating surface of the breather plate is applied.
  - Moreover fit the plate and tighten the bolts just after application of the liquid gasket.
- Apply a non-permanent locking agent to the threads of the breather plate bolts [A] and tighten them.
- Torque - Breather Plate Bolts (M6): 9.8 N·m (1.0 kgf·m, 87 in·lb)**



- Install the breather hose [A].
  - Align the white mark on the hose with the white mark on the pipe.
  - Install the clamp [B] so that its head faces to right side.
- Breather Plate [C]

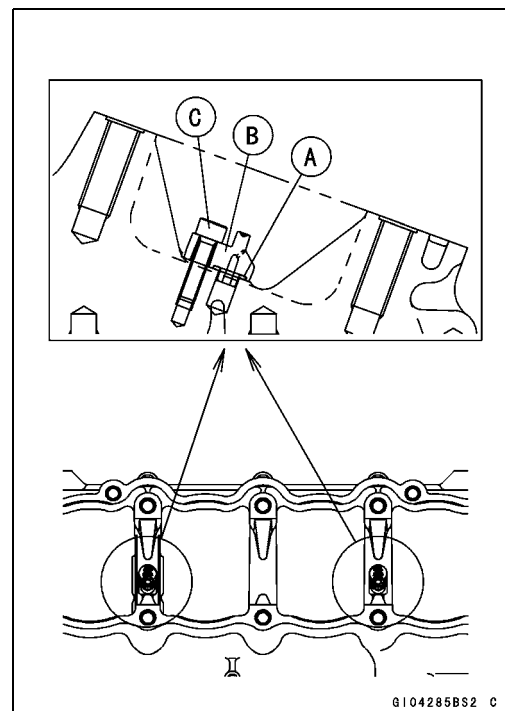




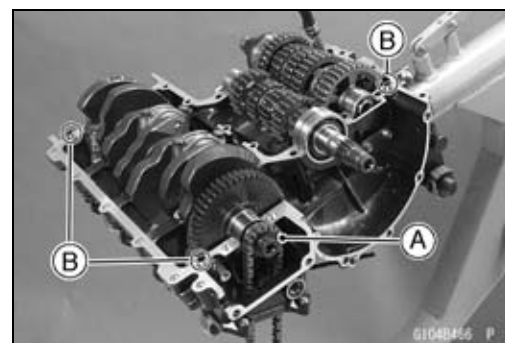
## Crankcase Splitting

- Apply grease to the O-rings [A].
- Install the oil jet nozzles [B].
- Apply a non-permanent locking agent to the threads of oil jet nozzle bolts [C].
- Tighten:

**Torque - Oil Jet Nozzle Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**



- Install:
  - Crankshaft (see Crankshaft Installation)
  - Connecting Rods (see Connecting Rod Installation)
  - Camshaft Chain [A]
  - Transmission Shafts and Gears (see Transmission Shaft Installation)
  - Dowel Pins [B]
  - Shift Drum (see Shift Drum and Fork Installation)
  - Shift Forks and Shift Rods (see Shift Drum and Fork Installation)



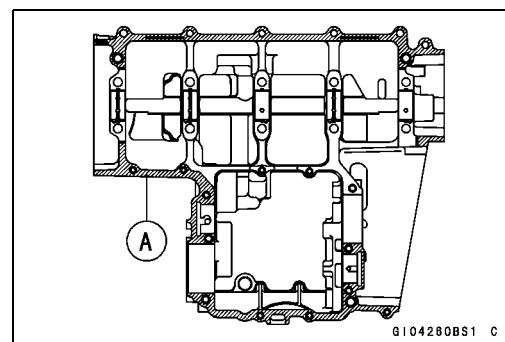
- Before fitting the lower case on the upper case, check the following.
  - Be sure to hang the camshaft chain on the crankshaft.
  - Check to see that the shift drum and transmission gears are in the neutral position.

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

**Sealant - Kawasaki Bond (Liquid Gasket - Black): 92104-1062**

### NOTE

- Especially, apply a sealant so that it shall be filled up on the grooves.



### CAUTION

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

- Fit the lower crankcase to the upper crankcase.

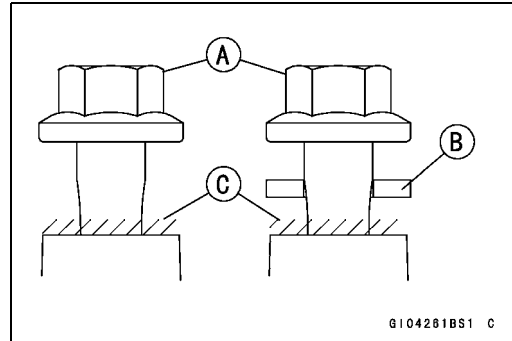
### NOTE

- Make the application finish within 60 minutes when the liquid gasket to the mating surface of the crankcase half is applied.
- Moreover fit the case and tighten the bolts just after application of the liquid gasket.

## 9-12 CRANKSHAFT/TRANSMISSION

### Crankcase Splitting

- The M9 bolts (L = 95 mm, 3.74 in.) [A] has a copper plated washer [B], replace it with a new one.
- Apply molybdenum disulfide oil solution to the seating surface [C] on the lower crankcase for the M9 bolts (L = 95 mm, 3.74 in.).



- Tighten the lower crankcase bolts using the following steps.
- Following the sequence numbers on the lower crankcase half, tighten the M9 bolts [1 ~ 6] L= 81 mm (3.19 in.).

**Torque - Crankcase Bolts (M9): 42 N·m (4.3 kgf·m, 31 ft·lb)**

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

**Torque - Crankcase Bolts (M9): 42 N·m (4.3 kgf·m, 31 ft·lb)**

- Tighten the M7 bolts [A].

**Torque - Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)**

- Tighten the upper crankcase bolts in the order listed.

**Torque - Crankcase Bolts (M8) [A]: 27 N·m (2.8 kgf·m, 20 ft·lb)**

**Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)**

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

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

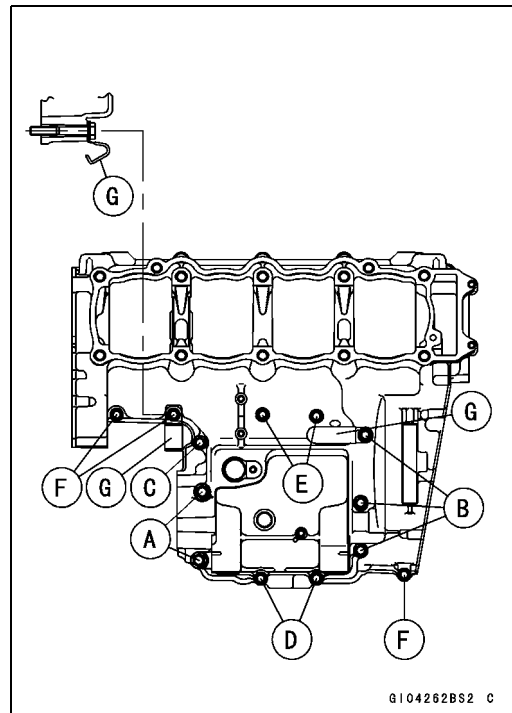
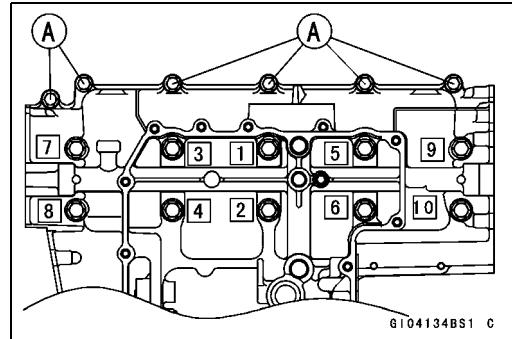
**Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**

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

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

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

Clamps [G]

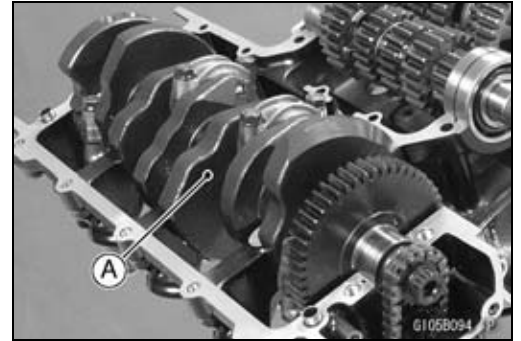


- After tightening all crankcase bolts, check the following items.
- Wipe up the liquid gasket that seeps out around the crankcase mating surface.
- Crankshaft and transmission shafts turn freely.
- While spinning the output shaft, gears shift smoothly from the 1st to 6th gear, and 6th to 1st.
- When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.
- Install the removed parts (see appropriate chapters).

## Crankshaft and Connecting Rods

### Crankshaft Removal

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

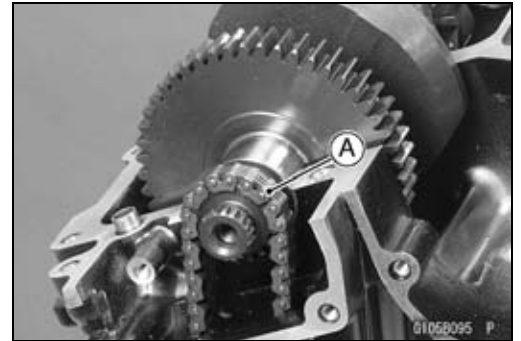


### Crankshaft Installation

#### 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 big end nuts [A].
- Remove the crankshaft.

#### NOTE

○Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.

- Remove the connecting rods from the crankshaft.



#### CAUTION

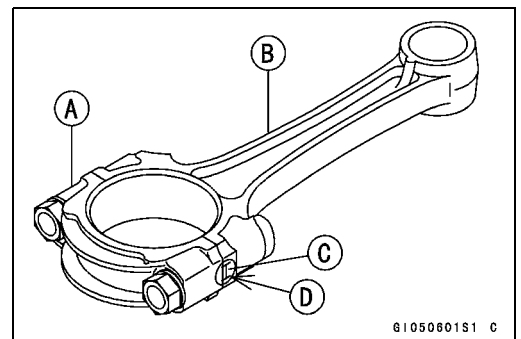
Discard the connecting rod bolts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

### Connecting Rod Installation

#### CAUTION

To minimize vibration, the connecting rods should have the same weight mark.

Big End Cap [A]  
Connecting Rod [B]  
Weight Mark, Alphabet [C]  
Diameter Mark [D]: "O" or no mark



#### CAUTION

If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

## 9-14 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

- Apply molybdenum disulfide oil solution [A] to the inner surfaces of upper and lower bearing inserts.
- Do not apply any grease or oil to the cap inside and cap insert outside [B].
- Install the inserts so that their nails [C] are on the same side and fit them into the recess of the connecting rod and cap.

#### CAUTION

**Wrong application of oil and grease could cause bearing damage.**

- When installing the inserts [A], be careful not to damage the insert surface with the edge of the connecting rod [B] or the cap [C]. One way to install inserts is as follows.

Installation [D] to Cap

Installation [E] to Connecting Rod

Push [F]

Spare Dowel Pin [G]

Connecting Rod Bolts [H]

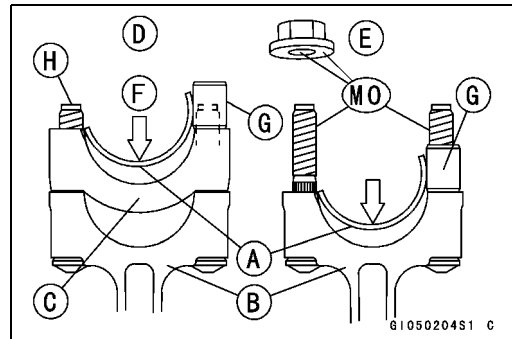
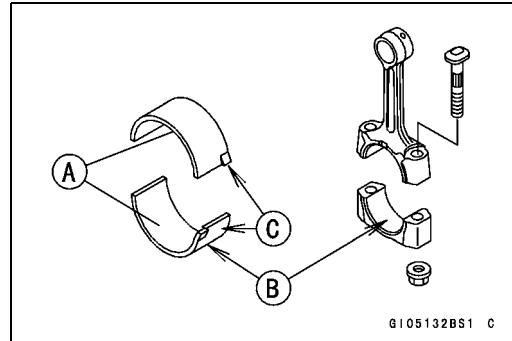
- Install the cap on the connecting rod, aligning the weight and diameter marks.
- Remove debris and clean the surface of inserts.
- Apply molybdenum disulfide oil solution [MO] to the threads and seating surfaces of the big end nuts and bolts.
- Install the crankshaft (see Crankshaft Installation).
- Install each connecting rod on its original crankpin.
- The connecting rod big end is bolted using the “plastic region fastening method”.
- This method precisely achieves the needed clamping force without exceeding it unnecessarily, allowing the use of thinner, lighter bolts further decreasing connecting rod weight.
- There are two types of the plastic region fastening. One is a bolt length measurement method and other is a rotation angle method. Observe one of the following two, but the bolt length measurement method is preferable because this is a more reliable way to tighten the big end nuts.

#### CAUTION

**The connecting rod bolts are designed to stretch when tightened. Never reuse the connecting rod bolts. See the table below for correct bolt and nut usage.**

#### CAUTION

**Be careful not to overtighten the nuts. The bolts must be positioned on the seating surface correctly to prevent the bolt heads from hitting the crankcase.**



## 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 in the figure.
- Before tightening, use a point micrometer to measure the length of new connecting rod bolts and record the values to find the bolt stretch.

Connecting Rod [A]

Mark here with a punch [B].

Nuts [C]

Fit micrometer pins into punch marks [D].

- Apply a small amount of molybdenum disulfide oil solution to the following.

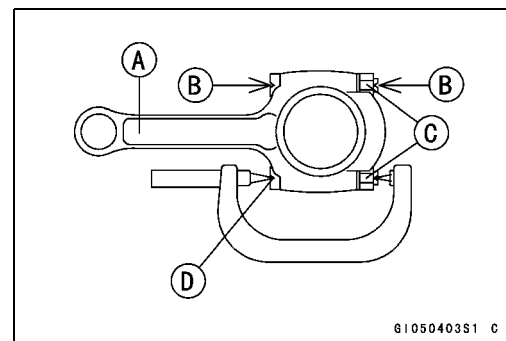
Threads of Nuts and Bolts

Seating Surfaces of Nuts and Connecting Rods

- Tighten the big end nuts until the bolt elongation reaches the length specified in the table.
- Check the length of the connecting rod bolts.
- ★ If the stretch is more than the usable range, the bolt has stretched too much. An overelongated bolt may break in use.

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

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	



6105040351 C

## 9-16 CRANKSHAFT/TRANSMISSION

### 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.

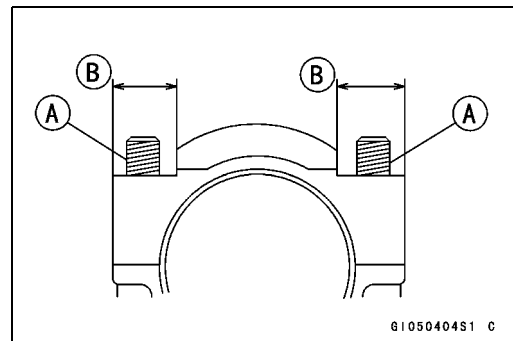
#### **⚠ WARNING**

**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**

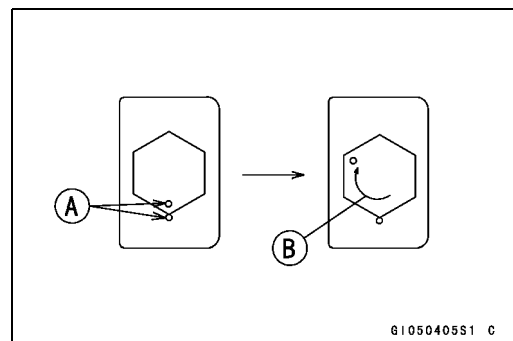
**Immediately dry the bolts and nuts with compressed air after cleaning.  
Clean and dry the bolts and nuts completely.**

- Install new bolts in reused connecting rods.
- Apply a small amount of molybdenum disulfide oil solution to the following.
  - Threads [A] of Nuts and Bolts
  - Seating Surfaces [B] of Nuts and Connecting 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) + $120^\circ$
		New	20 (2.0, 15) + $120^\circ$
Used	Replace the bolts with new ones.	Used	24 (2.4, 18) + $120^\circ$
		New	25 (2.5, 18) + $120^\circ$



#### **Crankshaft/Connecting Rod Cleaning**

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

## Crankshaft and Connecting Rods

### Connecting Rod Bend

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

#### Connecting Rod Bend

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

### Connecting Rod Twist

- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to 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

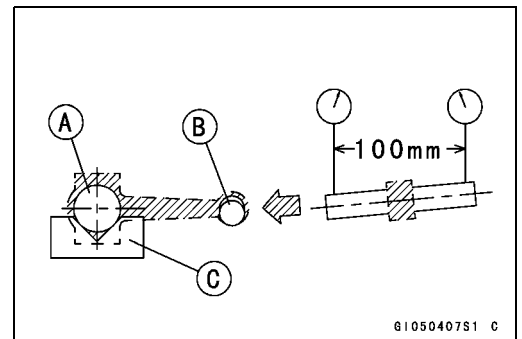
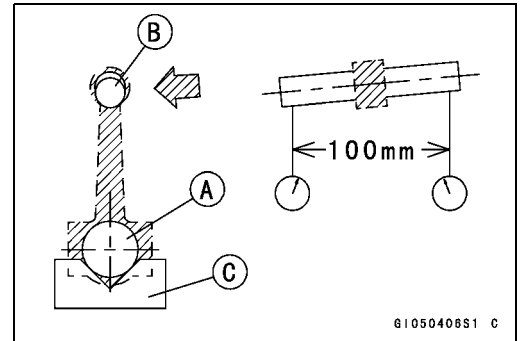
- Measure connecting rod big end side clearance.
- Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

#### 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.



## 9-18 CRANKSHAFT/TRANSMISSION

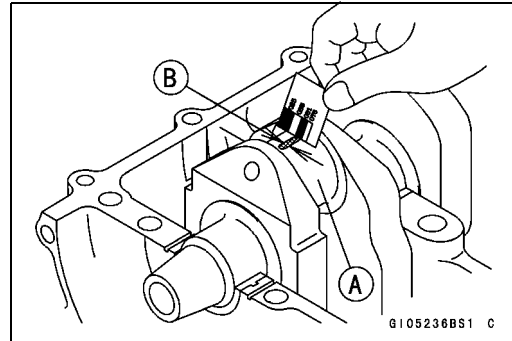
### Crankshaft and Connecting Rods

#### Connecting Rod Big End Bearing Insert/Crankpin Wear

- Measure the bearing insert/crankpin [A] clearance with plastigage [B].
- 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

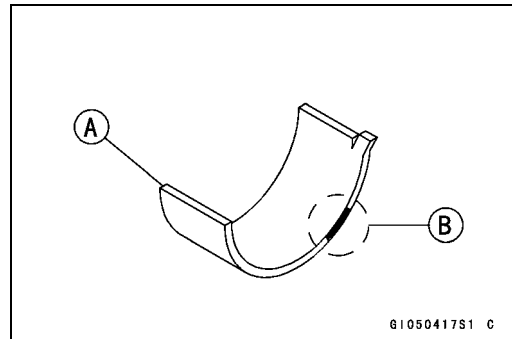
After measurement, replace the connecting rod bolts.

#### 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 (0.0028 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.)

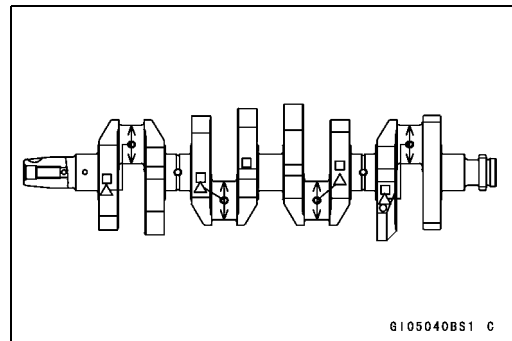
- ★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

#### 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.





## Crankshaft and Connecting Rods

- Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

### NOTE

○ The mark already on the big end should almost coincide with the measurement.

#### Connecting Rod Big End Inside Diameter Marks

None 38.000 ~ 38.008 mm (1.4961 ~ 1.4964 in.)

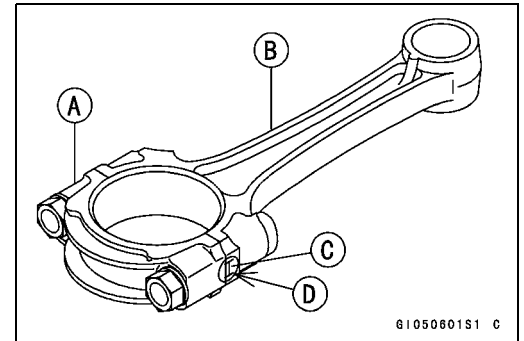
○ 38.009 ~ 38.016 mm (1.4965 ~ 1.4967 in.)

Big End Cap [A]

Connecting Rod [B]

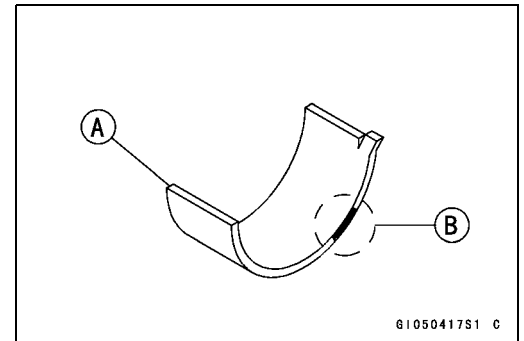
Weight Mark, Alphabet [C]

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



- Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding.  
Size Color [B]

Con-rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-1110
None	None	Black	92139-1109
○	○		
○	None	Blue	92139-1108



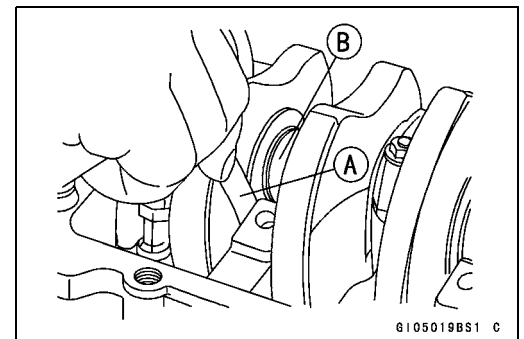
- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

### Crankshaft Side Clearance

- Insert a thickness gauge [A] between the crankcase main bearing and the crank web at the No.2 journal [B] to determine clearance.
- ★ If the clearance exceeds the service limit, replace the crankcase halves as a set.

### NOTE

○ The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.



#### Crankshaft Side Clearance

Standard: 0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)

Service Limit: 0.40 mm (0.0157 in.)

## 9-20 CRANKSHAFT/TRANSMISSION

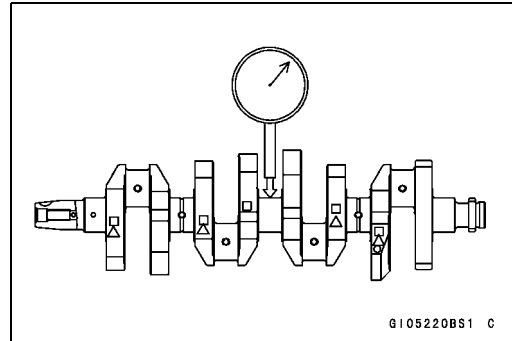
### Crankshaft and Connecting Rods

#### Crankshaft Runout

- Measure the crankshaft runout.
- ★ If the measurement exceeds the service limit, replace the crankshaft.

##### Crankshaft Runout

**Standard:** TIR 0.02 mm (0.0008 in.) or less  
**Service Limit:** TIR 0.05 mm (0.0020 in.)

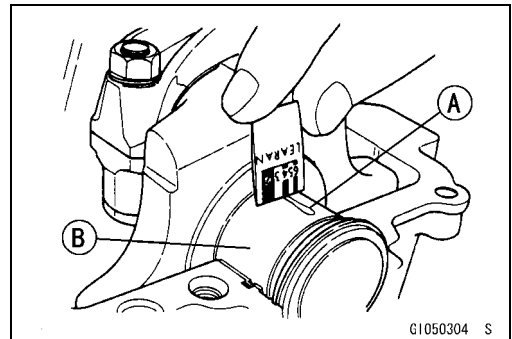


#### Crankshaft Main Bearing Insert/Journal Wear

- Using a plastigage (press gauge) [A], measure the bearing insert/journal [B] clearance.

##### NOTE

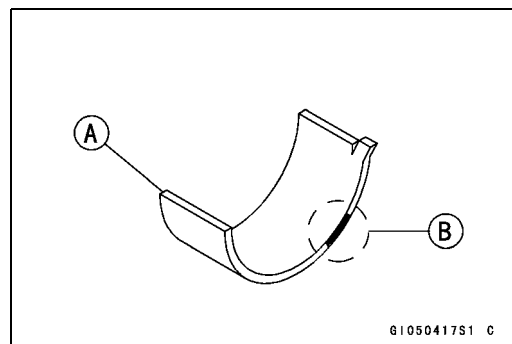
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).
- Do not turn the crankshaft during clearance measurement.
- Journal clearance less than 0.025 mm (0.00098 in.) can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.



##### 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

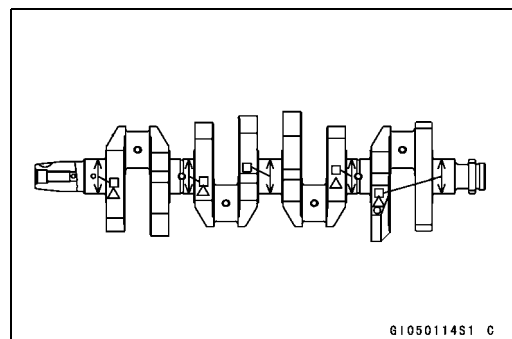
**Standard:** 32.984 ~ 33.000 mm (1.2986 ~ 1.2992 in.)  
**Service Limit:** 32.96 mm (1.2976 in.)

- ★ 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 (1.2990 ~ 1.2992 in.)

□: Crankshaft Main Journal Diameter Marks, "1" or no mark.



## Crankshaft and Connecting Rods

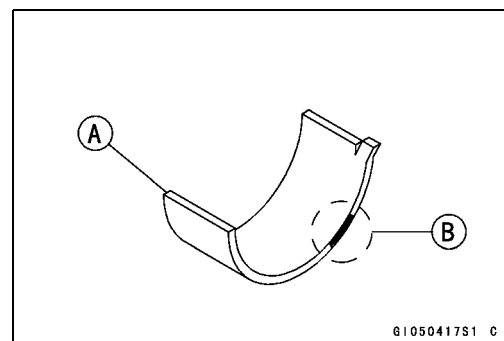
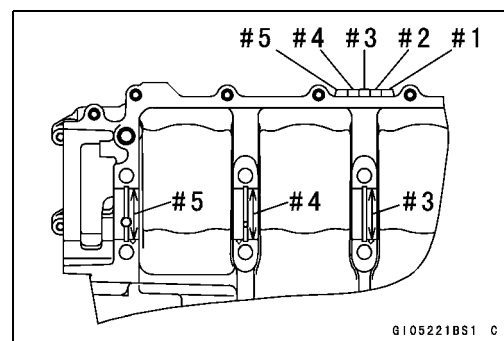
- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.  
Crankcase Main Bearing Inside Diameter Marks: “○” or no mark.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

### 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.

## 9-22 CRANKSHAFT/TRANSMISSION

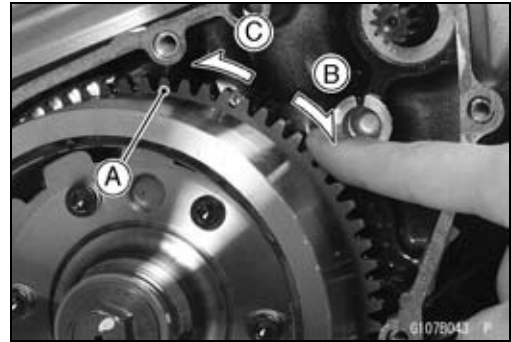
### Starter Motor Clutch

#### Starter Motor Clutch Removal/Installation

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

#### Starter Motor Clutch Inspection

- Remove:
  - Alternator Cover (see Alternator Cover Removal in the Electrical System chapter)
  - Starter Idle Gear and Shaft
- Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn clockwise [B] freely, but should not turn counterclockwise [C].
- ★ If the starter motor clutch does not operate as it should or if it makes noise, go to the next step.
- Disassemble the starter motor clutch, and visually inspect the clutch parts.
- ★ If there is any worn or damaged part, replace it.



#### NOTE

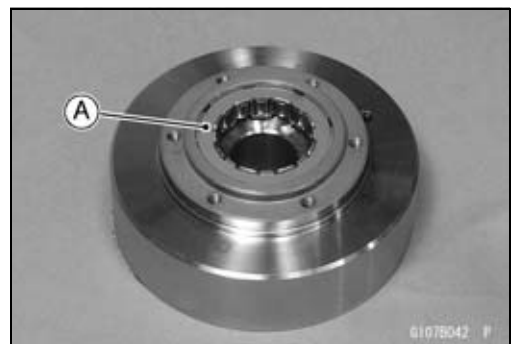
○ Examine the starter motor clutch gear as well. Replace it if it worn or damaged.

#### Starter Motor Clutch Disassembly

- Remove:
  - Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  - Starter Motor Clutch Bolts [A]



- Remove the starter motor clutch [A].



#### Starter Motor Clutch Assembly

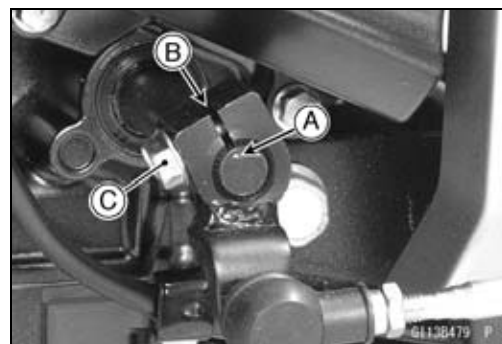
- Apply a non-permanent locking agent to the threads of the starter motor clutch bolts and tighten them.

**Torque - Starter Motor Clutch Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)**

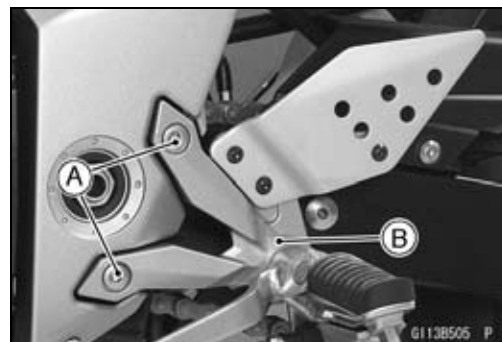
## Transmission

### Shift Pedal Removal

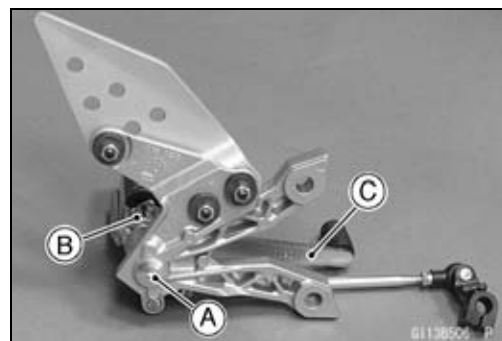
- Align the mark [A] on the shift shaft with the slit [B] on the shift lever.
- Remove:
  - Shift Lever Bolt [C]
  - Shift Lever



- Remove:
  - Front Footpeg Bracket Bolts [A]
  - Front Footpeg Bracket [B]

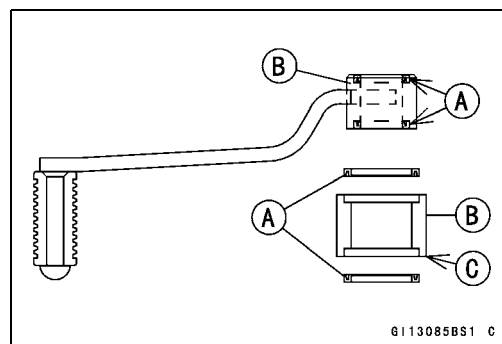


- Remove:
  - Bolt [A]
  - Front Footpeg [B]
  - Shift Pedal [C]



### Shift Pedal Installation

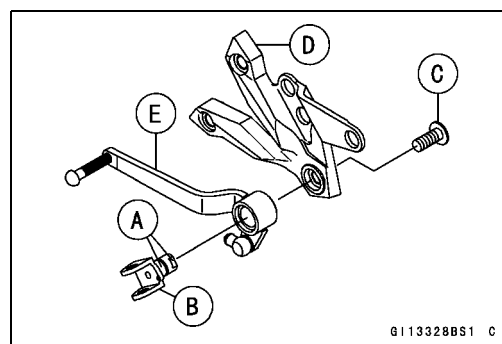
- Apply grease to the oil seal lip.
- Press the oil seals [A] in the shift pedal housing [B] so that the oil seal surfaces are flush with the housing end [C] as shown in the figure.



- 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)**

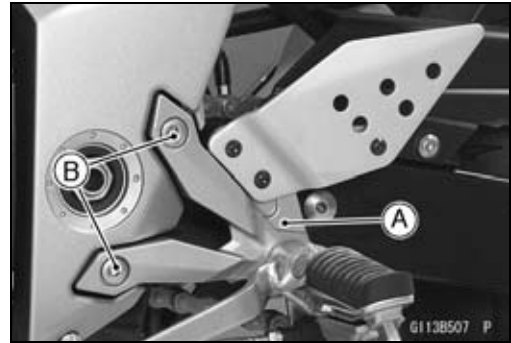
Front Footpeg Bracket [D]  
Shift Pedal [E]



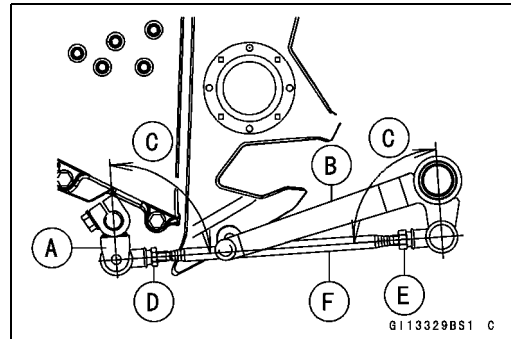
## 9-24 CRANKSHAFT/TRANSMISSION

### Transmission

- Install the front footpeg bracket [A].
- Tighten:  
**Torque - Front Footpeg Bracket Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

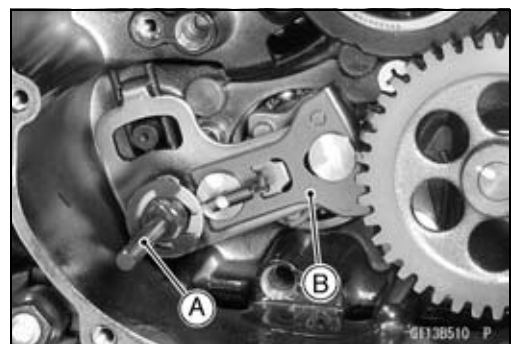


- Install the shift lever [A], aligning the mark (previously marked).
- Tighten:  
**Torque - Shift Lever Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Install the shift pedal [B] as shown in the figure.  
About 90° [C]
- To adjust the pedal position, loosen the front locknut [D] (left-hand threads) and rear locknut [E] and then turn the tie-rod [F].
- Tighten:  
**Torque - Tie-Rod Locknuts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**



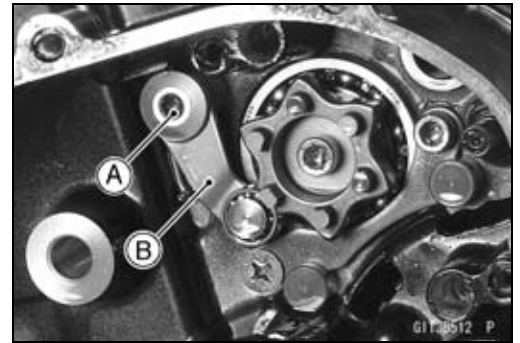
### **External Shift Mechanism Removal**

- Remove:  
Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)  
Shift Lever (see Shift Pedal Removal)  
Clutch (see Clutch Removal in the Clutch chapter)  
Oil Pipe Holder Bolts [A]  
Oil Pipe Holders [B]  
Oil Pipe [C] and O-rings
- Remove the shift shaft assembly [A] while pulling out the shift mechanism arm [B].



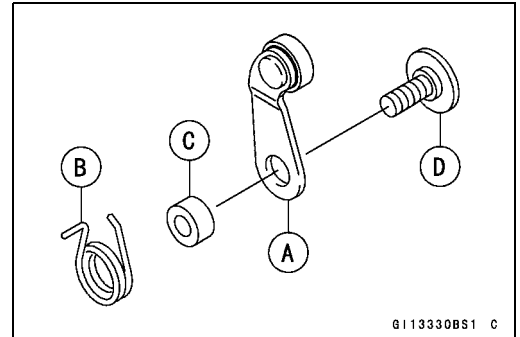
## Transmission

- Remove:
  - Oil Pump Drive Gear (see Oil Pump Drive Gear Removal in the Engine Lubrication System chapter)
  - Gear Positioning Lever Bolt [A]
  - Gear Positioning Lever [B]
  - Collar and Spring



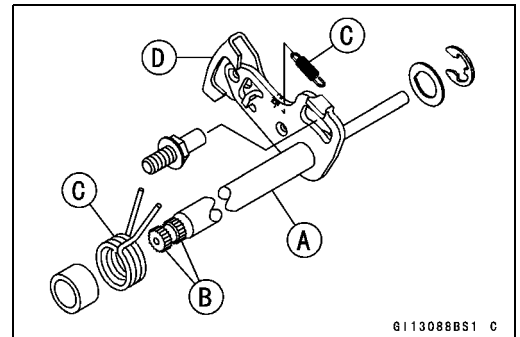
### External Shift Mechanism Installation

- Install the gear positioning lever [A] as shown in the figure.
  - Spring [B]
  - Collar [C]
  - Bolt [D]
- Tighten:
  - Torque - Gear Positioning Lever Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**
- Apply grease to the O-rings on the oil pipe ends.
- Apply a non-permanent locking agent to the threads of the oil pipe holder bolts and tighten them.
  - Torque - Oil Pipe Holder Bolts: 13 N·m (1.3 kgf·m, 115 in·lb)**
- Install the removed parts (see appropriate chapters).



### External Shift Mechanism Inspection

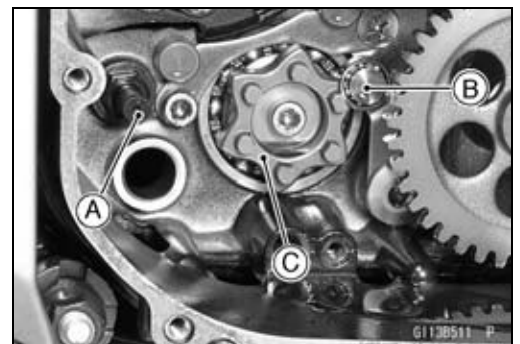
- Examine the shift shaft [A] for any damage.
  - ★ If the shaft is bent, straighten or replace it.
  - ★ If the serration [B] are damaged, replace the shaft.
  - ★ If the springs [C] are damaged in any way, replace them.
  - ★ If the shift mechanism arm [D] is damaged in any way, replace the shaft.



- Check the return spring pin [A] is not loose.
  - ★ If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

**Torque - Shift Shaft Return Spring Pin: 29 N·m (3.0 kgf·m, 21 ft·lb)**

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

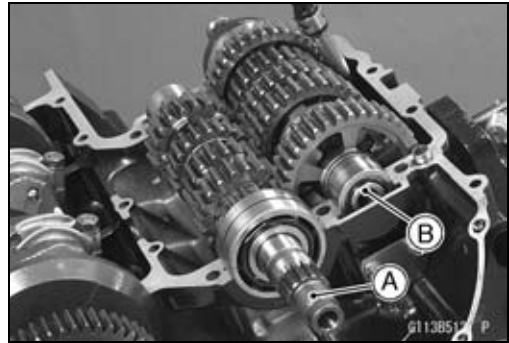


## 9-26 CRANKSHAFT/TRANSMISSION

### Transmission

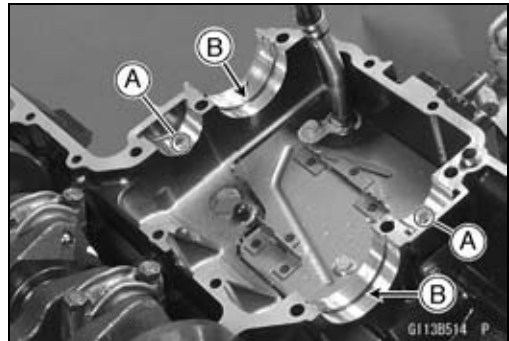
#### **Transmission Shaft Removal**

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



#### **Transmission Shaft Installation**

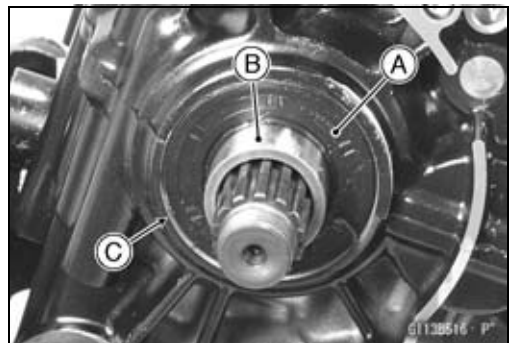
- Check to see that the set pins [A] and set rings [B] are in place.



- Install the drive shaft and output shaft into the upper crankcase half.
- Apply engine oil to the bearings.
- The bearing set pins and rings must match properly with the holes or grooves in the bearing outer races. When they are properly matched, there is no clearance [A] between the crankcase and the bearing outer races.



- Assemble the crankcase (see Crankcase Assembly).
- 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.
- Apply high-temperature grease to the oil seal lips.

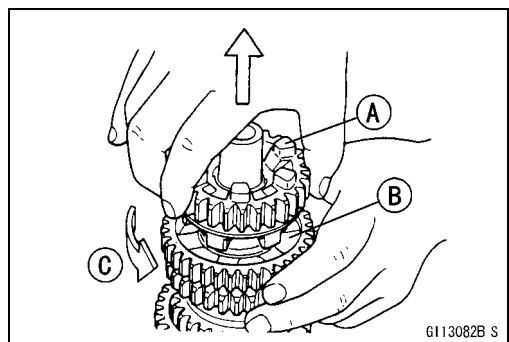


#### **Transmission Shaft Disassembly**

- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, disassemble the transmission shafts.

##### **Special Tool - Outside Circlip Pliers: 57001-144**

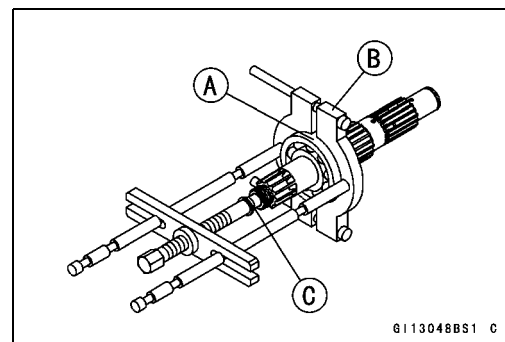
- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.
- Set the output shaft in a vertical position holding the 3rd gear [B].
- Spin the 5th gear quickly [C] and pull it off upward.





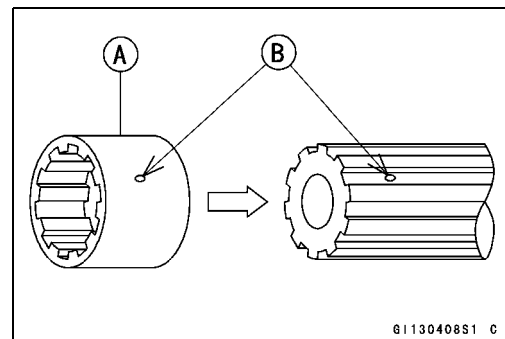
## Transmission

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

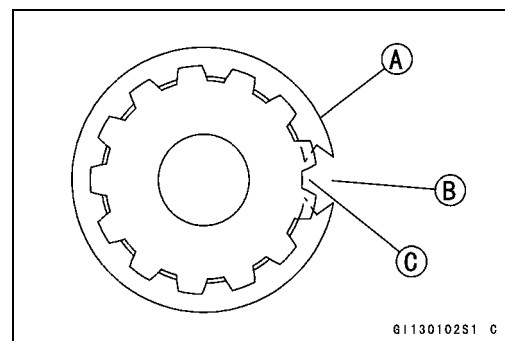


### Transmission Shaft Assembly

- Apply engine oil to the bushings, ball bearings and shafts.
- Install the gear bushings [A] on the shaft with their holes [B] aligned.



- Replace any circlips removed with new ones.
- Install the circlips [A] so that the opening [B] is aligned with a spline groove [C].



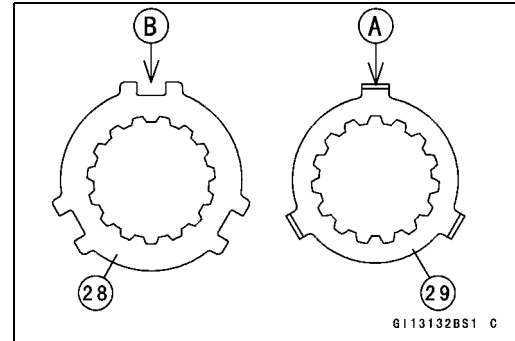
- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 3rd/4th gear onto the drive shaft with their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

## 9-28 CRANKSHAFT/TRANSMISSION

### Transmission

#### NOTE

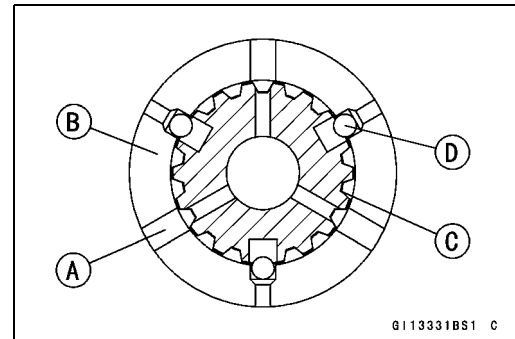
- When the toothed washers [28] [29] are assembled onto the output shaft, note the following.
- When the tangs [A] of the toothed washer [29] shall be assembled, they should be installed into the notch [B] of the toothed washer [28] (see Page 9-29).



- Fit the steel balls into the 5th gear holes in the output shaft, aligning three oil holes [A].  
5th Gear [B]  
Output Shaft [C]  
Steel Balls [D]

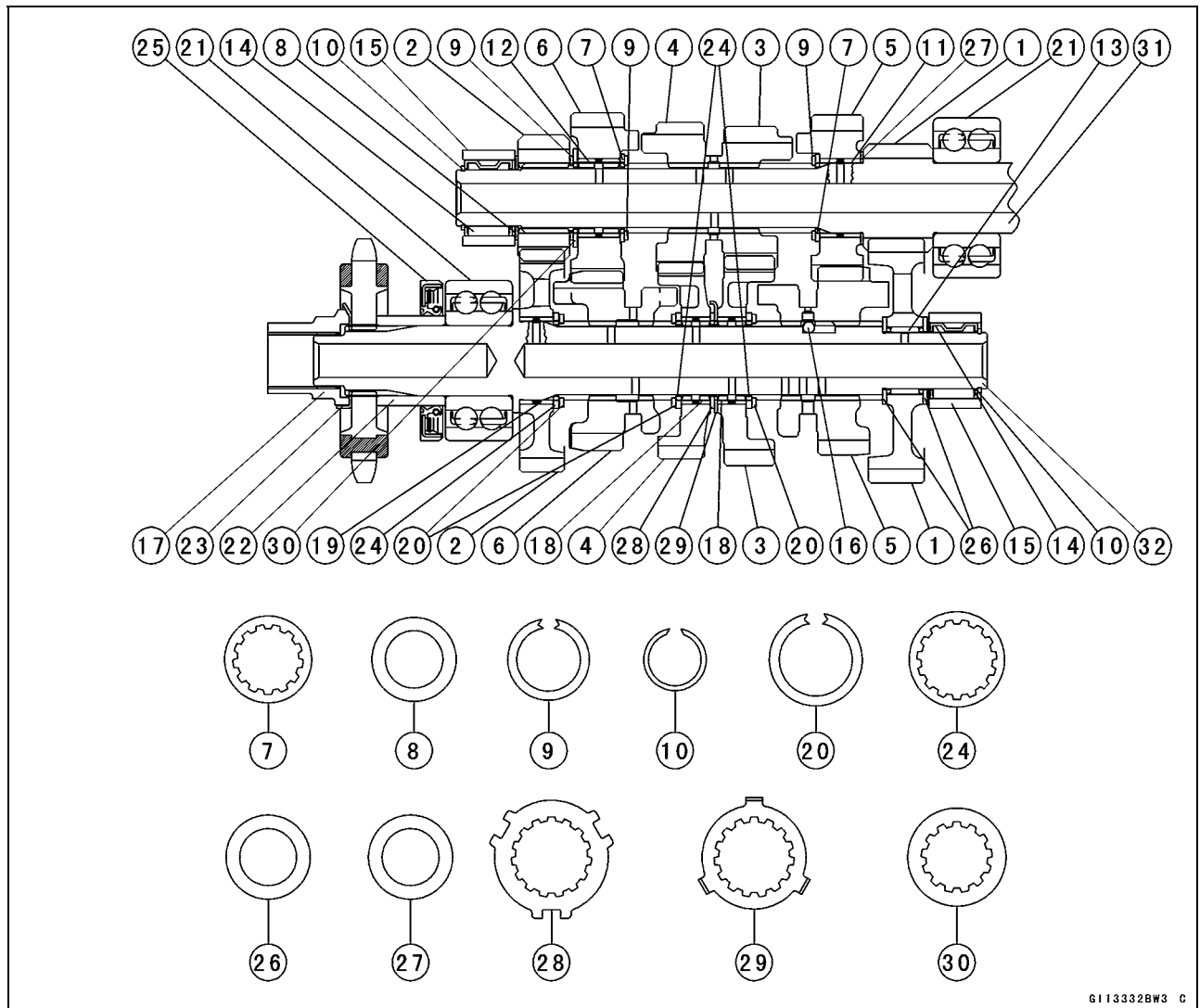
#### CAUTION

**Do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.**



- After assembling the 5th gear with steel balls in place on the output shaft, check the ball-locking effect that the 5th gear doesn't come out of the output shaft when moving it up and down by hand.
- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.

## Transmission



6113332BW3 C

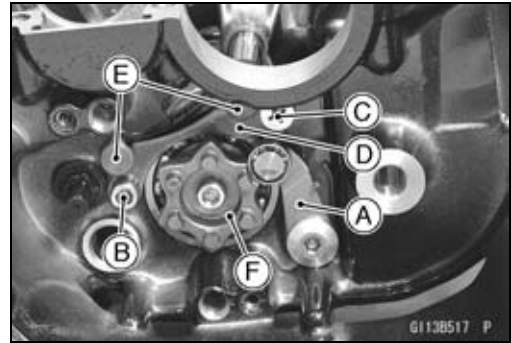
- |  |   |
|--|---|
| 1. 1st Gear                                | 17. Nut                                     |
| 2. 2nd Gear                                | 18. Bushing                                 |
| 3. 3rd Gear                                | 19. Bushing                                 |
| 4. 4th Gear                                | 20. Circlip, $\phi 33$ mm (1.30 in.)        |
| 5. 5th Gear                                | 21. Ball Bearing                            |
| 6. 6th (Top) Gear                          | 22. Collar                                  |
| 7. Toothed Washer, $\phi 31$ mm (1.22 in.) | 23. Washer                                  |
| 8. Thrust Washer, $\phi 30$ mm (1.18 in.)  | 24. Toothed Washer, $\phi 34$ mm (1.34 in.) |
| 9. Circlip, $\phi 29$ mm (1.14 in.)        | 25. Oil Seal                                |
| 10. Circlip                                | 26. Thrust Washer, $\phi 31$ mm (1.22 in.)  |
| 11. Bushing                                | 27. Thrust Washer, $\phi 33$ mm (1.30 in.)  |
| 12. Bushing                                | 28. Toothed Washer                          |
| 13. Needle Bearing                         | 29. Toothed Washer                          |
| 14. Needle Bearing                         | 30. Toothed Washer, $\phi 35$ mm (1.38 in.) |
| 15. Bearing Outer Race                     | 31. Drive Shaft                             |
| 16. Steel Ball                             | 32. Output Shaft                            |

## 9-30 CRANKSHAFT/TRANSMISSION

### Transmission

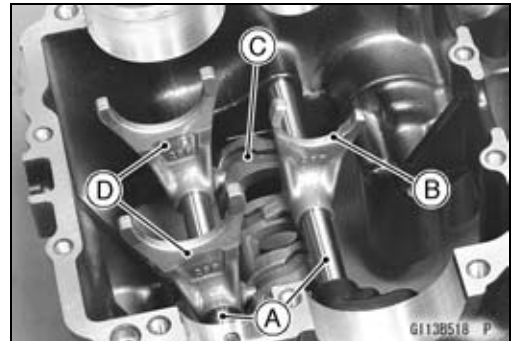
#### Shift Drum and Fork Removal

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



#### Shift Drum and Fork Installation

- Apply engine oil to the shift drum, forks and rods.
- Install the shift rods [A], noting the groove position.
- The rods are identical.
- Position the one with shortest ears [B] on the drive shaft and place the pin in the center groove in the shift drum [C].
- The two forks [D] on the output shaft are identical.
- Install the forks so that its "266" and "267" side faces clutch side.
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolt and screw, and tighten them.

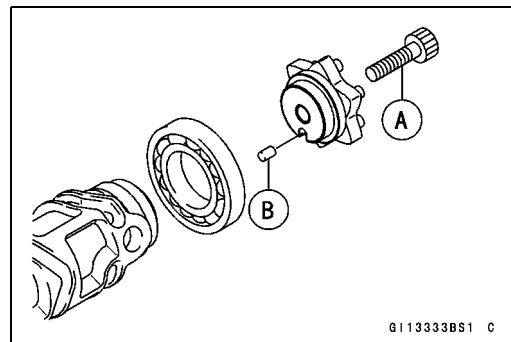


**Torque - Shift Drum Bearing Holder Bolt: 13 N·m (1.3 kgf·m, 115 in·lb)**

**Shift Drum Bearing Holder Screw: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

#### Shift Drum Disassembly

- Remove the shift drum (see Shift Drum and Fork Removal).
- While holding the shift drum with a vise, remove the shift drum cam holder bolt.
- Shift Drum Cam Holder Bolt [A]
- Dowel Pin [B]



#### Shift Drum Assembly

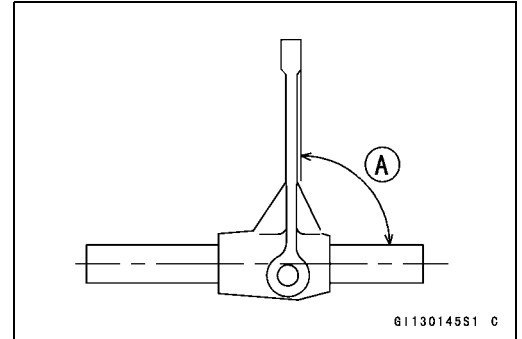
- Be sure to install the dowel pin.
- Apply a non-permanent locking agent to the threads of the shift drum cam holder bolt, and tighten it.

**Torque - Shift Drum Cam Holder Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**

## Transmission

### Shift Fork Bending

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
- 90° [A]



### Shift Fork/Gear Groove Wear

- Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves.
- ★ If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

#### Shift Fork Ear Thickness

Standard: 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)

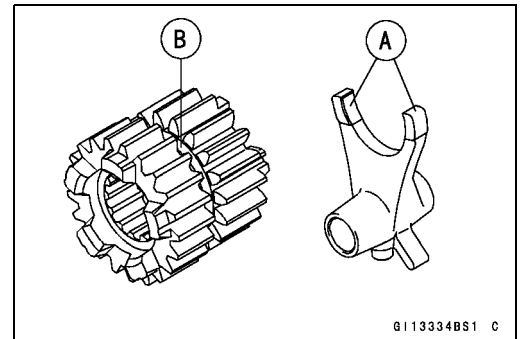
Service Limit: 5.8 mm (0.228 in.)

- ★ If the gear groove is worn over the service limit, the gear must be replaced.

#### Gear Groove Width

Standard: 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)

Service Limit: 6.25 mm (0.246 in.)



### Shift Fork Guide Pin/Drum Groove Wear

- Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.
- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

#### Shift Fork Guide Pin Diameter

Standard: 6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)

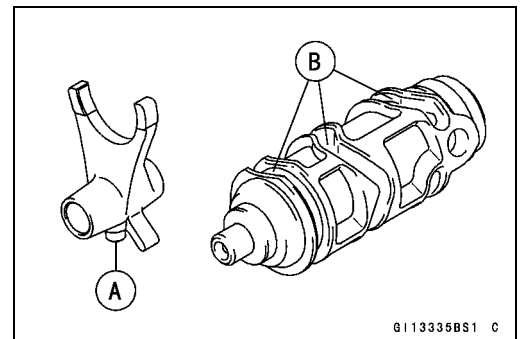
Service Limit: 6.8 mm (0.268 in.)

- ★ If any shift drum groove is worn over the service limit, the drum must be replaced.

#### Shift Drum Groove Width

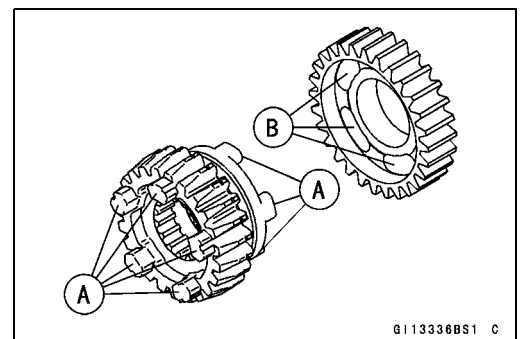
Standard: 7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)

Service Limit: 7.3 mm (0.287 in.)



### Gear Dog and Gear Dog Hole Damage

- Visually inspect the gear dogs [A] and gear dog holes [B].
- ★ Replace any damaged gears or gears with excessively worn dogs or dog holes.



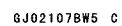


# Wheels/Tires

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## Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle	108	11.0	79.7	
2	Front Axle Clamp Bolt	20	2.0	15	
3	Rear Axle Nut	108	11.0	79.7	

4. Caliper Bracket (ABS Equipped Models)

G: Apply grease.

HG: Apply high-temperature grease.

R: Replacement Parts

WL: Apply soap and water solution or rubber lubricant.

## 10-4 WHEELS/TIRES

### Specifications

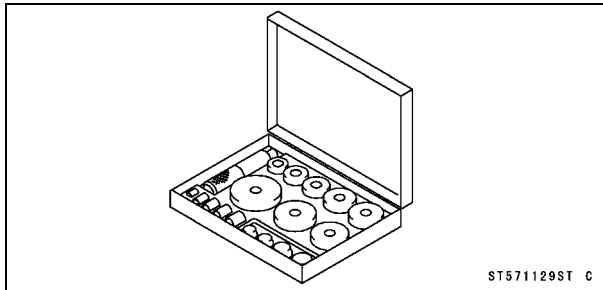
Item	Standard	Service Limit
<b>Wheels (Rims)</b>		
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 1.0 mm (0.04 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 1.0 mm (0.04 in.)
Axle Runout/100 mm (3.94 in.)	TIR 0.03 mm (0.0012 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.35 oz.) or less	— — —
Balance Weights	10 g (0.35 oz.), 20 g (0.71 oz.), 30 g (1.06 oz.)	— — —
Rim Size:		
Front	17 × 3.50	— — —
Rear	17 × 5.50	— — —
<b>Tires</b>		
Air Pressure (when Cold):		
Front	Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)	— — —
Rear	Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm <sup>2</sup> , 42 psi)	— — —
Tread Depth:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	5.0 mm (0.20 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Standard Tires:	Make, Type	Size
Front	DUNLOP, SPORTMAX Qualifier PT L	120/70 ZR17 M/C (58 W)
Rear	DUNLOP, SPORTMAX Qualifier NK	180/55 ZR17 M/C (73 W)

### WARNING

Use the same manufacturer's tires on both front and rear wheels.

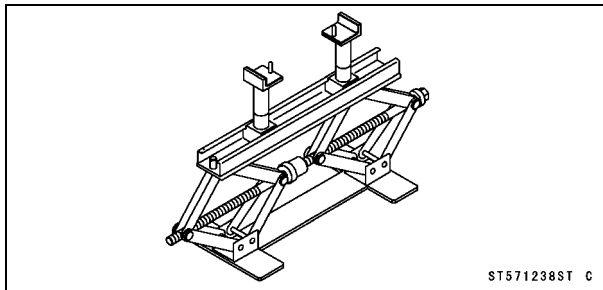
## Special Tools

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



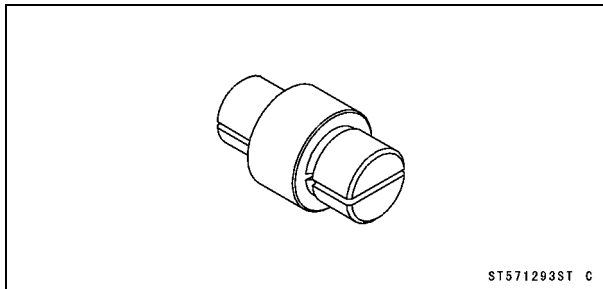
ST571129ST C

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



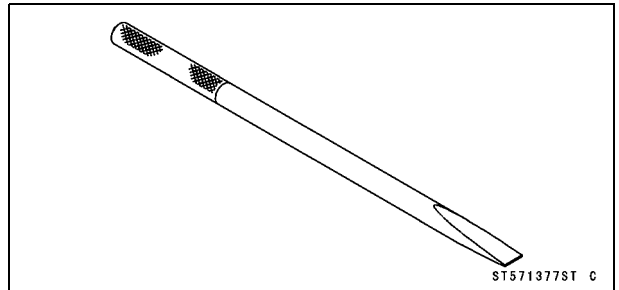
ST571238ST C

**Bearing Remover Head,  $\phi 20 \times \phi 22$ :**  
**57001-1293**



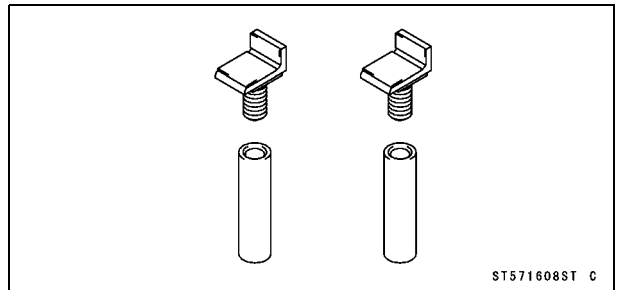
ST571293ST C

**Bearing Remover Shaft,  $\phi 13$ :**  
**57001-1377**



ST571377ST C

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



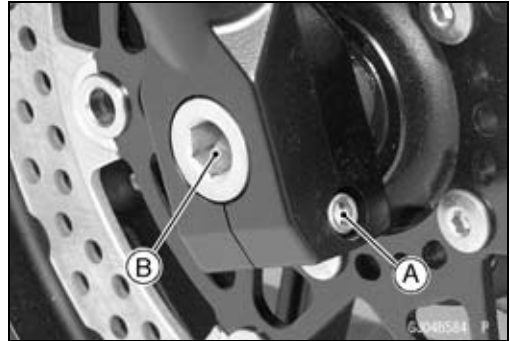
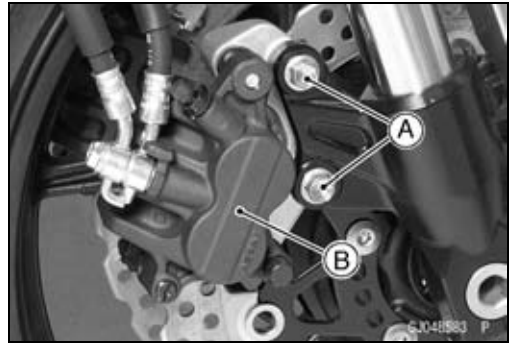
ST571608ST C

## 10-6 WHEELS/TIRES

### Wheels (Rims)

#### Front Wheel Removal

- Remove:
  - Front Caliper Mounting Bolts [A] (Both Sides)
  - Front Calipers [B] (Both Sides)
- Remove:
  - Front Fender (see Front Fender Removal in the Frame chapter)
  - Front Axle Clamp Bolt [A] (Loosen)
  - Front Axle [B]
- Raise the front wheel off the ground.
  - Special Tools - Jack: 57001-1238**
  - Jack Attachment: 57001-1608**
- Pull out the axle to the right and drop the front wheel out of the forks.



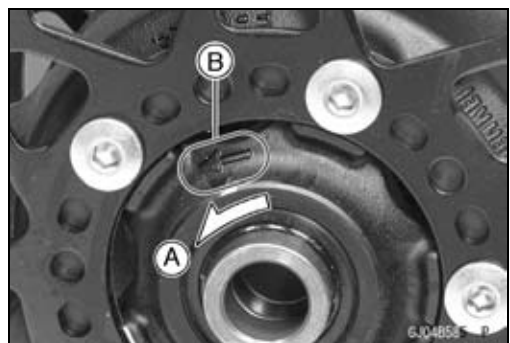
#### CAUTION

**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

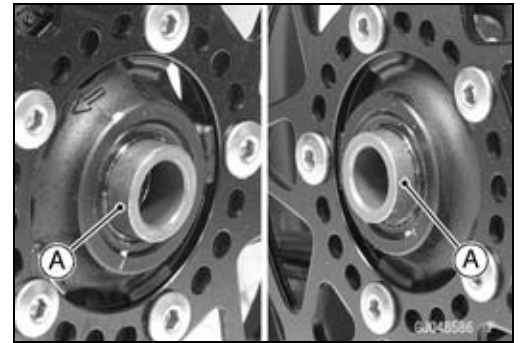
- The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel spoke.
- Check the wheel rotation mark on the front wheel and install it.



## Wheels (Rims)

- Apply high-temperature grease to the grease seal lips.
- Fit the collars [A] on the both sides of the hub.
- The collars are identical.
- Insert the front axle.
- Tighten:

**Torque - Front Axle: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**



- Before tightening the axle clamp bolt [A] 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:
  - Torque - Front Axle Clamp Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Install the removed parts (see appropriate chapters).
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

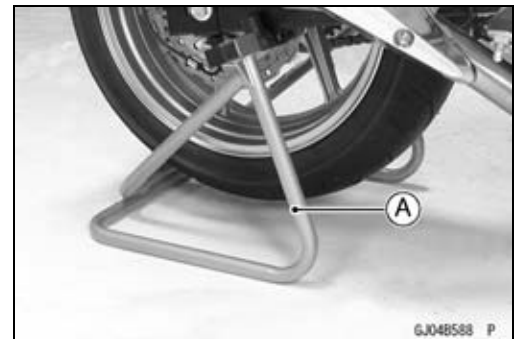


### ⚠ WARNING

**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

### Rear Wheel Removal

- Raise the rear wheel off the ground with the stand [A].



- Remove:
  - Rear Caliper Mounting Bolt [A]
  - Rear Caliper Pin Bolt [B]
  - Rear Caliper [C]



## 10-8 WHEELS/TIRES

### Wheels (Rims)

- Remove:
  - Cotter Pin [A]
  - Axle Nut [B]
  - Washer [C]
  - Axle [D] (from Right Side)
- Remove the rear wheel rotation sensor from the caliper bracket (see Rear Wheel Rotation Sensor Removal in the Brakes chapter) (ABS equipped models).
- Remove the drive chain [A] from the rear sprocket toward the left.
- Move the rear wheel back and remove it.

#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

#### Rear Wheel Installation

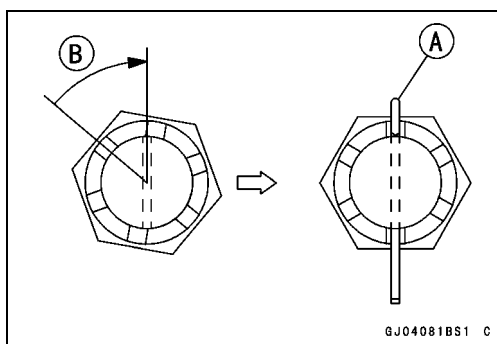
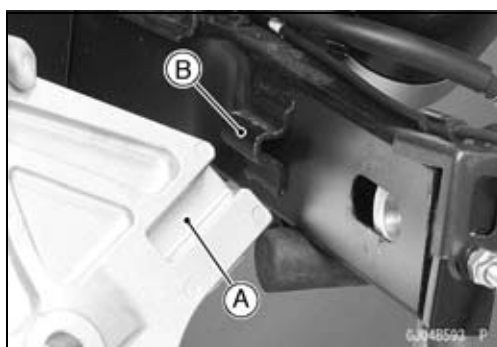
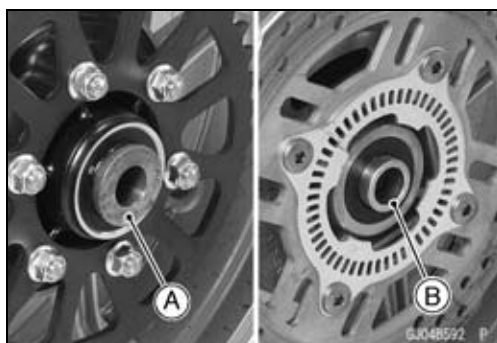
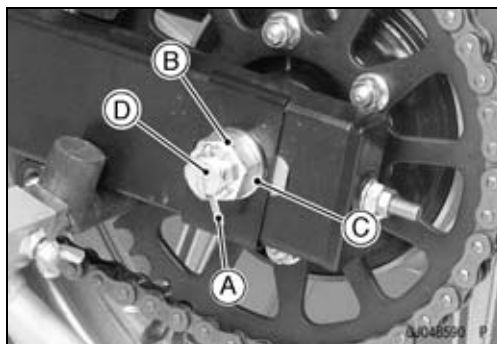
- Apply high-temperature grease to the grease seal lips.
- Fit the collars on the both sides of the hub.
  - Left Side Collar [A] (with Flange)
  - Right Side Collar [B]
- Engage the drive chain with the rear sprocket.
- Install the caliper bracket [A] onto the swingarm stop [B].
- Insert the axle from the right side of the wheel, and tighten the axle nut.

**Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 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°.
- Loosen once and tighten again when the slot goes past the nearest hole.

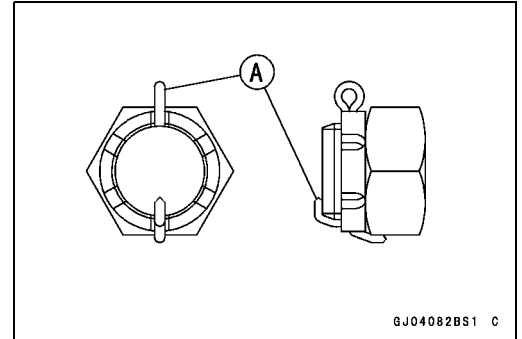


## Wheels (Rims)

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

### WARNING

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



- Adjust the drive chain slack after installation (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
- Install the rear caliper (see Caliper Installation in the Brakes chapter).
- Install the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Installation in the Brakes chapter) (ABS equipped models).
- Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

### WARNING

**Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**

## 10-10 WHEELS/TIRES

### Wheels (Rims)

#### Wheel Inspection

- Raise the front/rear wheel off the ground.

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

**Jack Attachment: 57001-1608**

- Spin the wheel lightly, and check for roughness or binding.
- ★ If roughness or binding is found, replace the hub bearings (see Hub Bearing Removal/Installation).
- Inspect the wheel for small cracks, dents, bending, or warp.
- ★ If there is any damage to the wheel, replace the wheel.
- Remove the wheel, and support it with the tire by the axle.
- Measure the rim runout, axial [A] and radial [B], with a dial gauge.
- ★ If rim runout exceeds the service limit, check the hub bearings (see Hub Bearing Inspection).
- ★ If the problem is not due to the bearings, replace the wheel.

#### Rim Runout (with tire installed)

##### Standard:

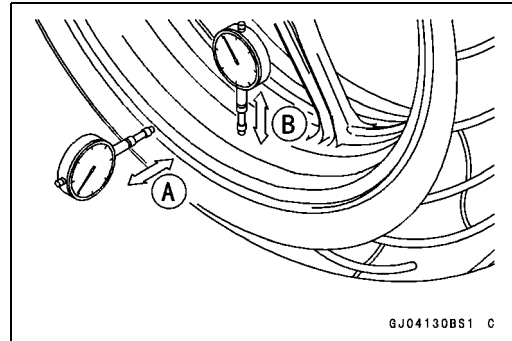
**Axial TIR 0.5 mm (0.02 in.) or less**

**Radial TIR 0.8 mm (0.03 in.) or less**

##### Service Limit:

**Axial TIR 1.0 mm (0.04 in.)**

**Radial TIR 1.0 mm (0.04 in.)**



### ⚠ WARNING

**Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.**

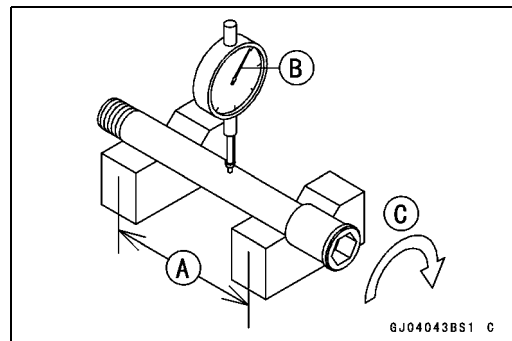
#### Axle Inspection

- Remove the front and rear axles (see Front/Rear Wheel Removal).
- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the axle at a point halfway between the blocks. Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.
- ★ If axle runout exceeds the service limit, replace the axle.

#### Axle Runout/100 mm (3.94 in.)

**Standard: TIR 0.03 mm (0.0012 in.) or less**

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

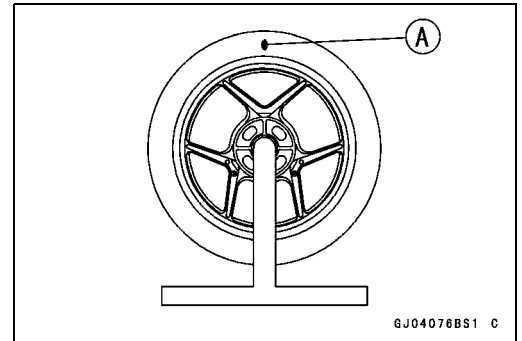




## Wheels (Rims)

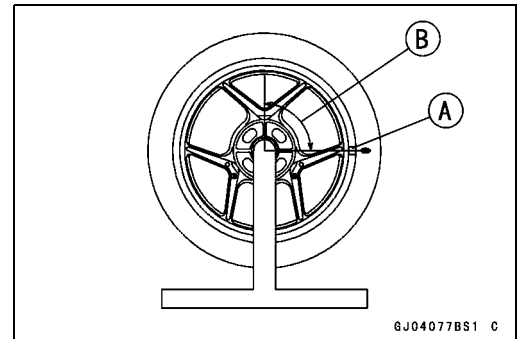
### Balance Inspection

- Remove the front and rear wheels (see Front/Rear Wheel Removal).
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.
- ★ If the wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).



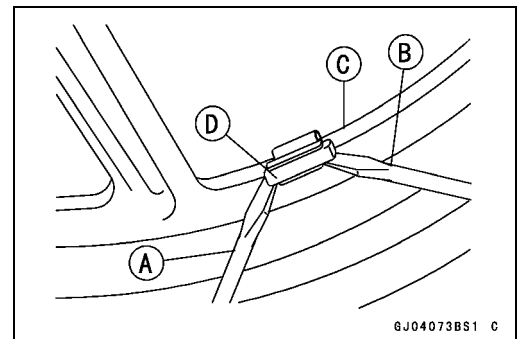
### Balance Adjustment

- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.
- ★ If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.
- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.



### Balance Weight Removal

- Insert a regular tip screwdrivers [A] [B] between the rib [C] and the weight [D] as shown in the figure.
- Pry the balance weight with two screwdrivers and remove the balance weight.
- Discard the used balance weight.



### CAUTION

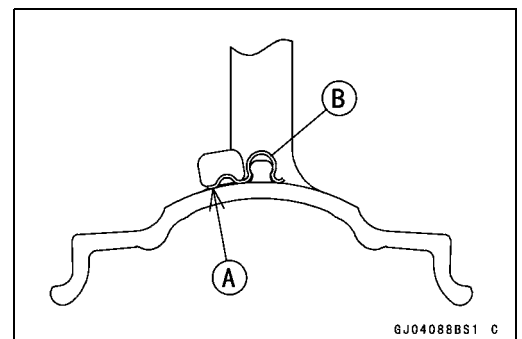
Do not tap the screwdrivers. The rim could be damaged.

### Balance Weight Installation

- Check if the weight portion has any play on the blade [A] and clip [B].
- ★ If it does, discard it.

### WARNING

If the balance weight has any play on the rib of the rim, the blade and/or clip have been stretched. Replace the loose balance weight. Do not reuse used balance weight. Unbalanced wheels can create an unsafe riding condition.



## 10-12 WHEELS/TIRES

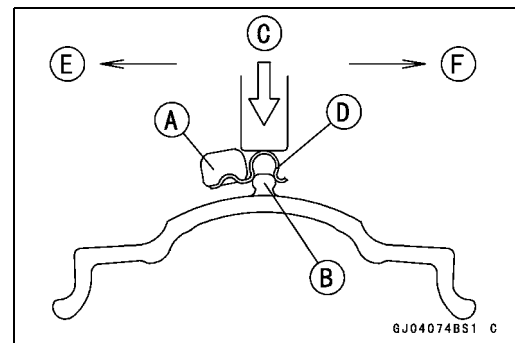
### Wheels (Rims)

#### Balance Weight

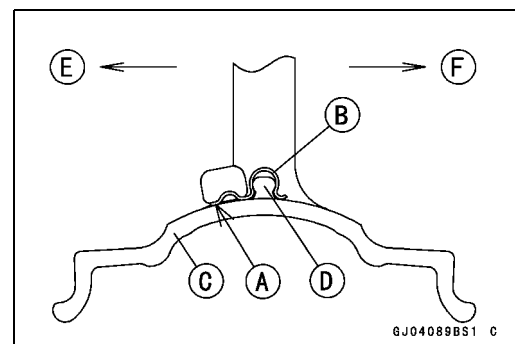
Part Number	Weight
41075-0007	10 g (0.35 oz.)
41075-0008	20 g (0.71 oz.)
41075-0009	30 g (1.06 oz.)

#### NOTE

- Balance weights are available from Kawasaki dealers in 10, 20, and 30 grams (0.35, 0.71, and 1.06 oz.) sizes. An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.
- Do not use four or more balance weight (more than 90 gram, 3.17 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.
- Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].
  - Left Side [E]
  - Right Side [F]



- Be sure to install the balance weight.
- Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].
  - Left Side [E]
  - Right Side [F]



## Tires

### Air Pressure Inspection/Adjustment

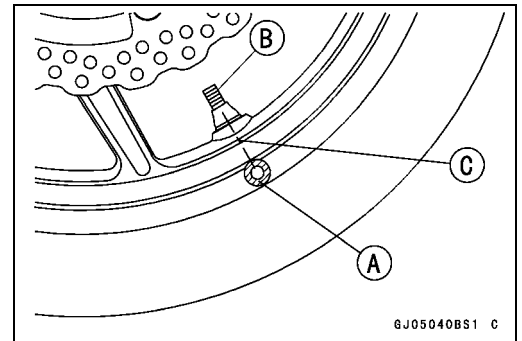
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

### Tire Inspection

- Refer to the Wheel/Tire Damage Inspection in the Periodic Maintenance chapter.

### Tire Removal

- Remove:
  - Wheels (see Front/Rear Wheel Removal)
  - Valve Core (Let out the air)
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
  - Chalk Mark or Yellow Mark [A]
  - 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

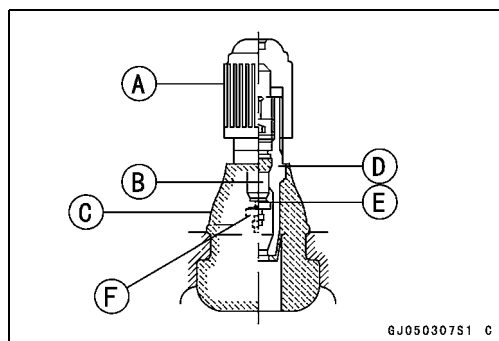
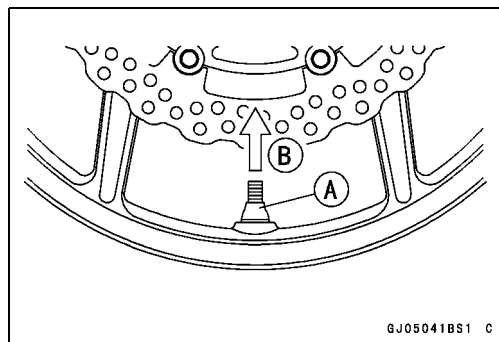
- Install a new valve in the rim.
- Remove the valve cap, lubricate the stem seal [A] with a soap and water solution or rubber lubricant, and pull [B] the valve stem through the rim from the inside out until it snaps into place.

#### CAUTION

**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**

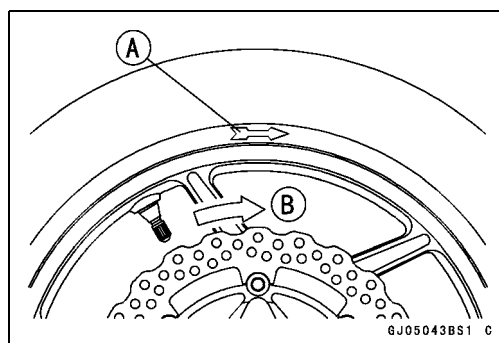
- The air valve is shown in the figure.

Valve Cap [A]  
Valve Core [B]  
Stem Seal [C]  
Valve Stem [D]  
Valve Seat [E]  
Valve Opened [F]

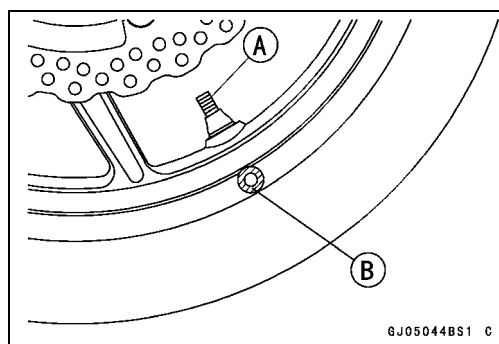


- Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

Tire Rotation Mark [A]  
Rotating Direction [B]



- Position the tire on the rim so that the air valve [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
- Install the tire bead over the rim flange using a suitable commercially available tire changer.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.

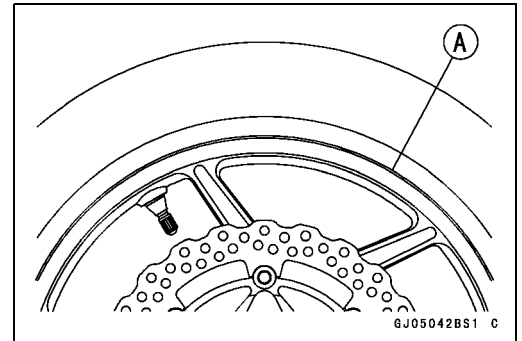


#### WARNING

**Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/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 Air Pressure Inspection in the Periodic Maintenance chapter).
- Install the air valve cap.
- Adjust the wheel balance (see Balance Adjustment).



### ***Tire Repair***

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

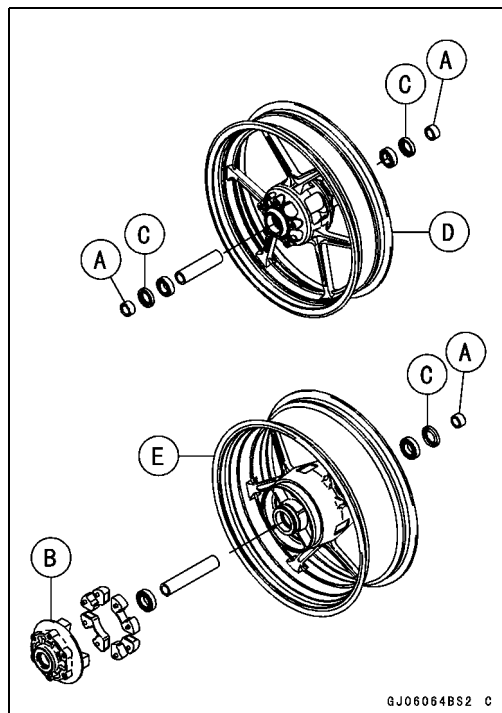
## 10-16 WHEELS/TIRES

### Hub Bearing

#### Hub Bearing Removal

- Remove the wheels (see Front/Rear Wheel Removal), and take out the following.

Collars [A]  
Coupling [B] (Out of rear hub)  
Grease Seals [C]  
Front Wheel [D]  
Rear Wheel [E]



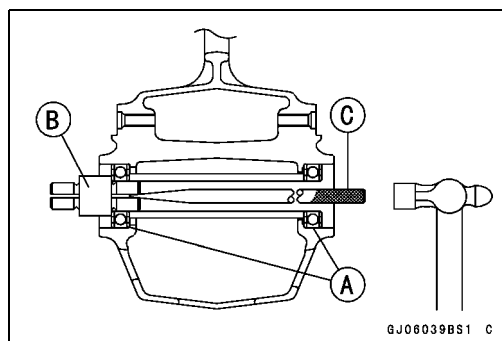
- Use the bearing remover to remove the hub bearings [A].

#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.

Special Tools - Bearing Remover Head,  $\phi 20 \times \phi 22$  [B]:  
57001-1293

Bearing Remover Shaft,  $\phi 13$  [C]: 57001-1377



#### Hub Bearing Installation

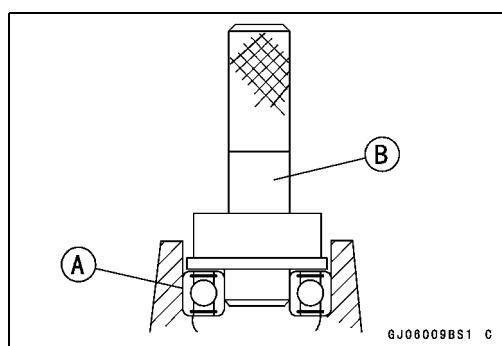
- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.
- Install the bearings by using the bearing driver set which does not contact the bearing inner race.

#### NOTE

○ Install the bearings so that the marked side faces out.

- Press in each bearing [A] right until they are bottomed.

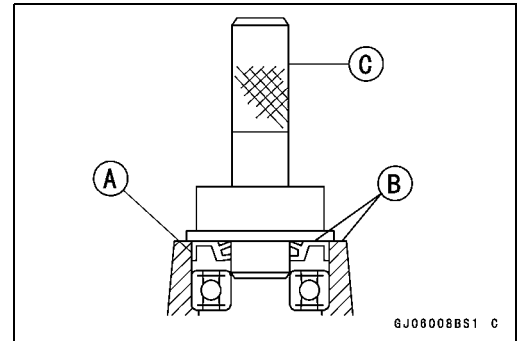
Special Tool - Bearing Driver Set [B]: 57001-1129



## Hub Bearing

- Replace the grease seals with new ones.
- Press in the grease seals [A] so that the seal surface is flush [B] with the end of the hole.
- Apply high-temperature grease to the grease seal lips.

**Special Tool - Bearing Driver Set [C]: 57001-1129**



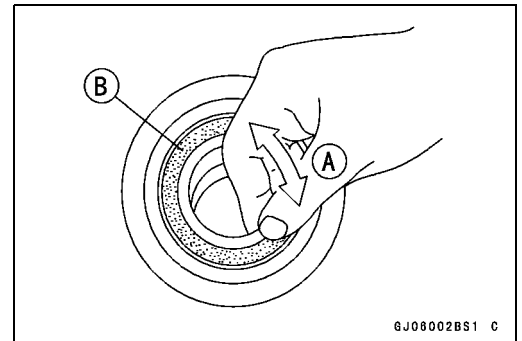
### Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

#### NOTE

○ *Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.*

- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



### Hub Bearing Lubrication

#### NOTE

○ *Since the hub bearings are packed with grease and sealed, lubrication is not required.*





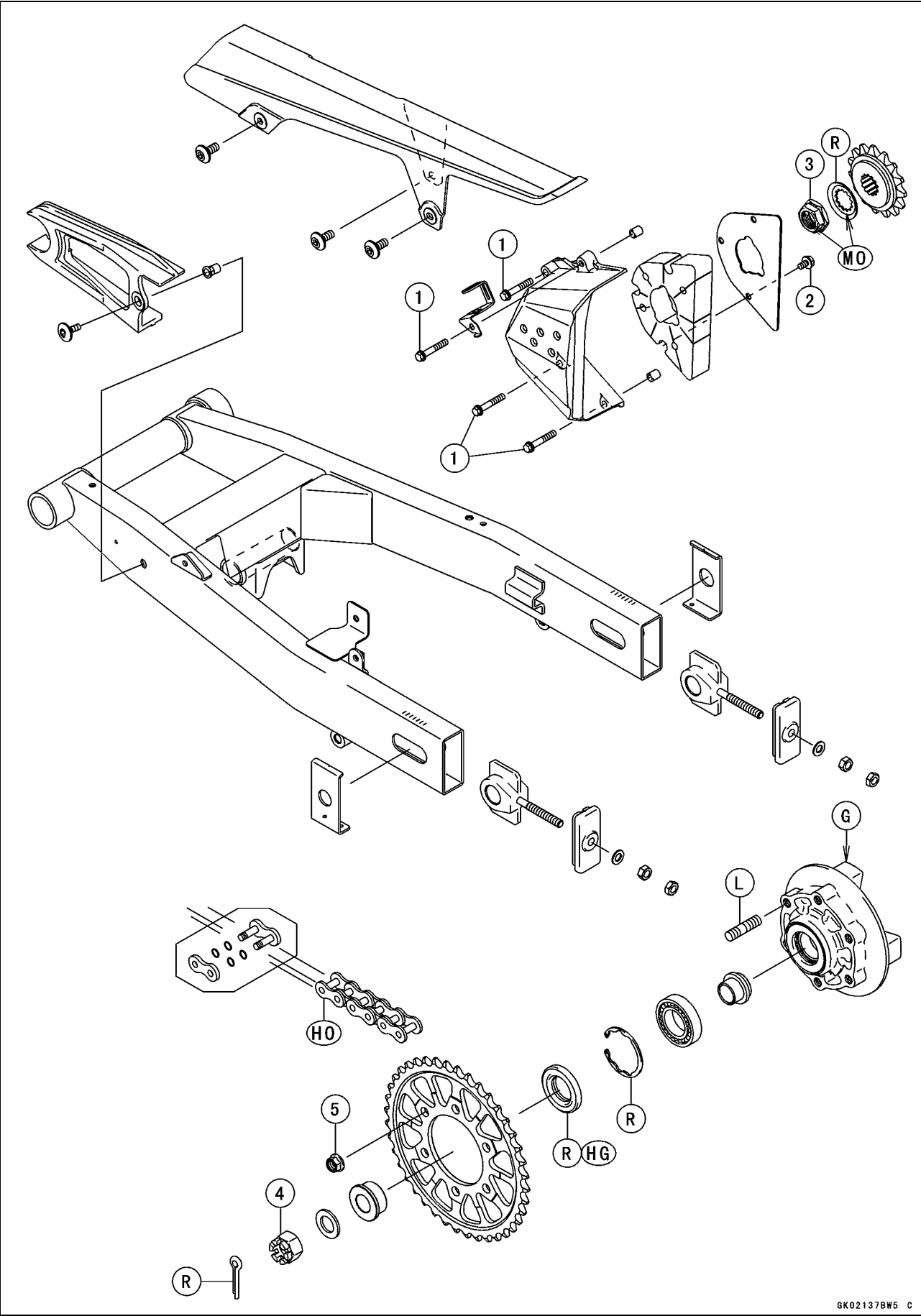
# Final Drive

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11-2 FINAL DRIVE

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
2	Engine Sprocket Cover Plate Bolts	9.8	1.0	87 in·lb	
3	Engine Sprocket Nut	125	12.7	92.2	MO
4	Rear Axle Nut	108	11.0	79.7	
5	Rear Sprocket Nuts	59	6.0	44	

G: Apply grease.

HG: Apply high-temperature grease.

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

# 11-4 FINAL DRIVE

## Specifications

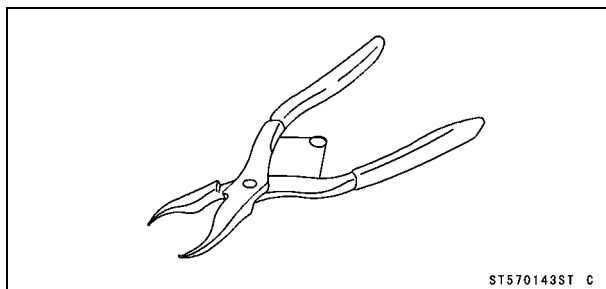
Item	Standard	Service Limit
<b>Drive Chain</b>		
Drive Chain Slack	30 ~ 40 mm (1.2 ~ 1.6 in.)	— — —
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	ENUMA	— — —
Type	EK520MVXL1	— — —
Link	112 links	— — —
<b>Sprockets</b>		
Rear Sprocket Warp	0.4 mm (0.016 in.) or less	0.5 mm (0.020 in.)

---

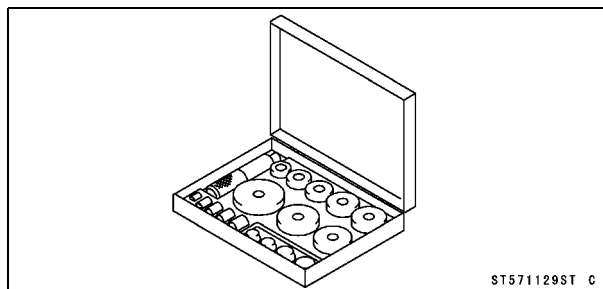
**Special Tools**

---

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



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



## 11-6 FINAL DRIVE

### Drive Chain

#### ***Drive Chain Slack Inspection***

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

#### ***Drive Chain Slack Adjustment***

- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

#### ***Wheel Alignment Inspection/Adjustment***

- Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

#### ***Drive Chain Wear Inspection***

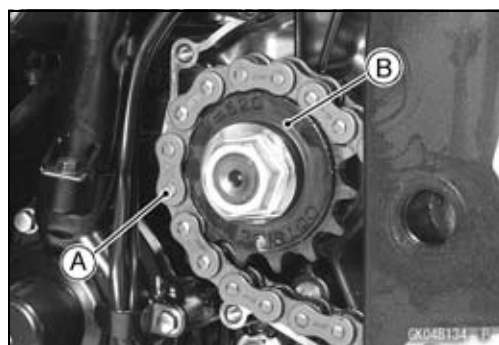
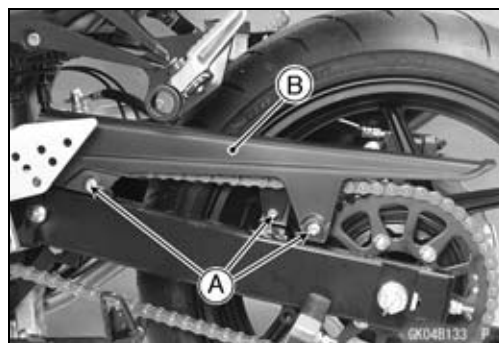
- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

#### ***Drive Chain Lubrication***

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

#### ***Drive Chain Removal***

- Remove:
  - Chain Cover Bolts [A]
  - Chain Cover [B]
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  - Swingarm (see Swingarm Removal in the Suspension chapter)
- Remove the drive chain [A] from the engine sprocket [B], and take it off the chassis.



#### ***Drive Chain Installation***

- Install the drive chain to the engine sprocket.
- Install:
  - Swingarm (see Swingarm Installation in the Suspension chapter)
  - Rear Wheel (see Rear Wheel Installation in the Wheels/Tires chapter)
  - Chain Cover
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

#### ***Drive Chain Replacement***

- Remove:
  - Chain Cover (see Drive Chain Removal)
  - Engine Sprocket Cover (see Engine Sprocket Removal)

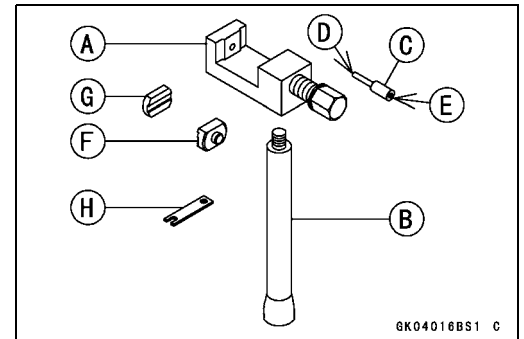
## Drive Chain

### CAUTION

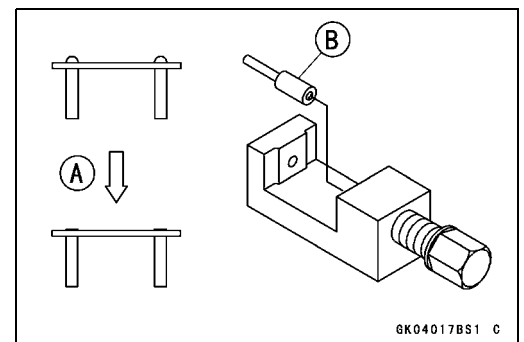
For safety, if the drive chain shall be replaced, replace it using a recommended tool.

**Recommended Tool - Type: EK Joint Tool #50**  
**Brand: ENUMA**

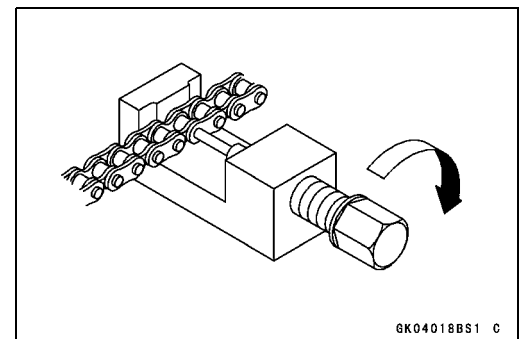
Body [A]  
Handlebar [B]  
Cutting and Riveting Pin [C]  
For Cutting [D]  
For Riveting [E]  
Plate Holder (A) [F]  
Plate Holder (B) [G]  
Gauge [H]



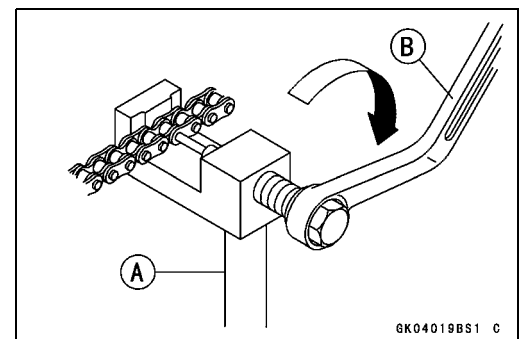
- Grind [A] the pin head to make it flat.
- Set the cutting and riveting pin [B] as shown in the figure.



- Screw the pin holder until it touches chain pin.
- Be sure that the cutting pin hits center of chain pin.



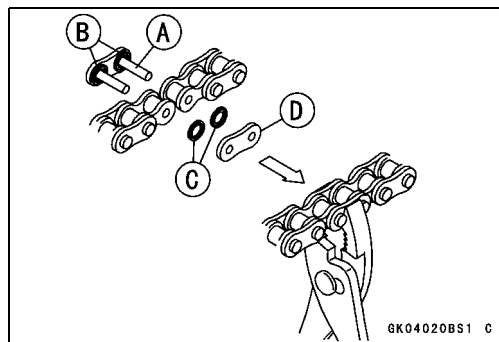
- Screw the handlebar [A] into body.
- Turn the pin holder with wrench [B] clockwise to extract chain pin.



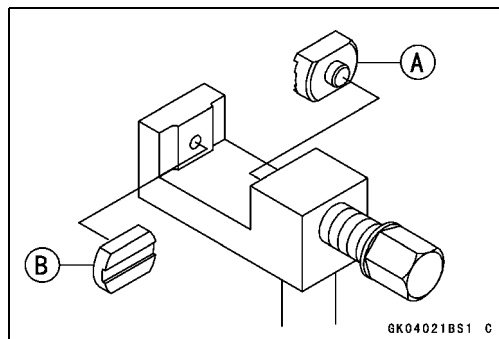
## 11-8 FINAL DRIVE

### Drive Chain

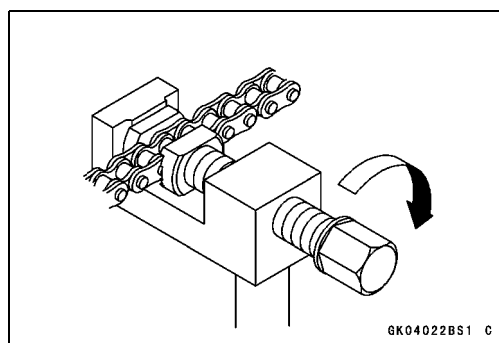
- Replace the link pin, link plate and grease seals.
- Apply grease to the link pins [A] and grease seals [B] [C].
- Engage the drive chain on the engine and rear sprockets.
- Insert the link pins in the drive chain ends.
- Install the grease seals.
- Install the link plate so that the mark [D] faces out.
- Push the link plate by hand or plier to fix it.
- In case of grease seals chain, be sure to set the grease seals correctly.



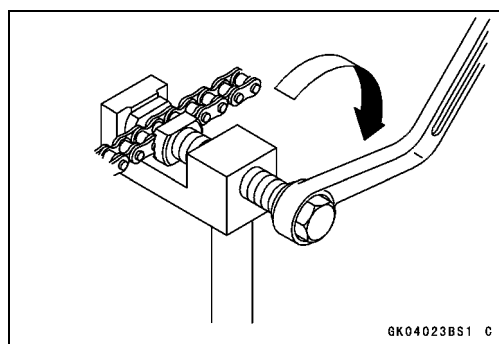
- Set the plate holder (A) [A] and plate holder (B) [B] on the body.



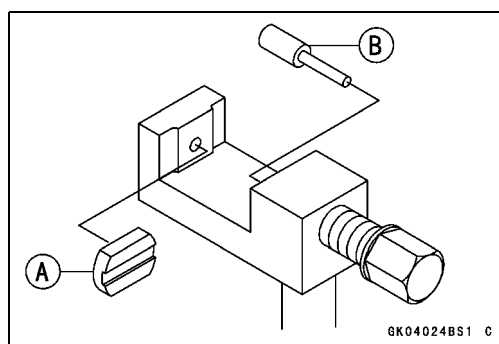
- Fit the plate holder (A) to link plate.
- Turn the pin holder by hand until plate holder (B) touches the other link plate.



- Turn the pin holder by wrench clockwise until two pins of link come into groove of plate holder (A).
- Take off the plate holder.



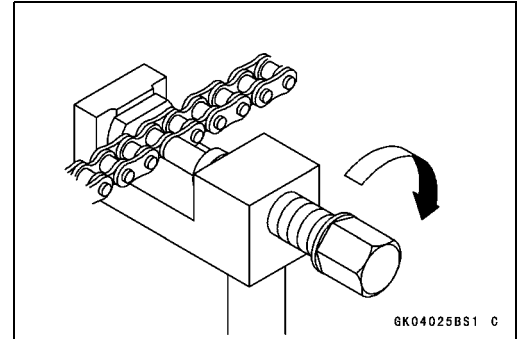
- Set the plate holder (B) [A] and cutting and riveting pin [B] as shown in the figure.



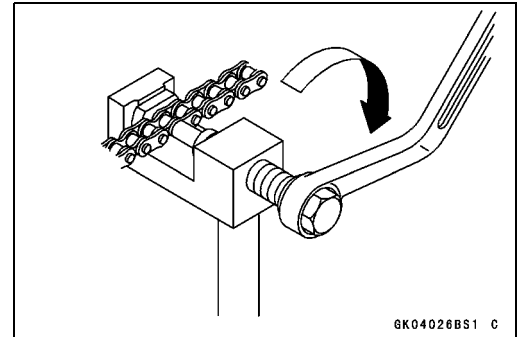


## Drive Chain

- Turn the pin holder until riveting pin touches link pin.



- Turn the wrench clockwise until tip of riveting pin hits of link pin.
- Rivet it.
- Same work for the other link pin.



- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates width [B].

### Link Pin Outside Diameter

Standard: 5.7 ~ 6.0 mm (0.22 ~ 0.24 in.)

### Link Plates Outside Width

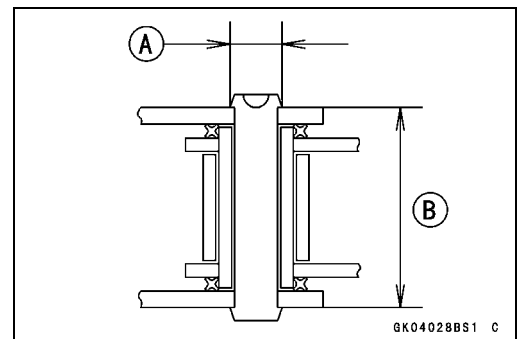
Standard: 17.25 ~ 17.45 mm (0.679 ~ 0.687 in.)

- ★ If the reading exceeds the specified length, cut and rejoin the chain again.

- Check:

Movement of the Rollers

- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

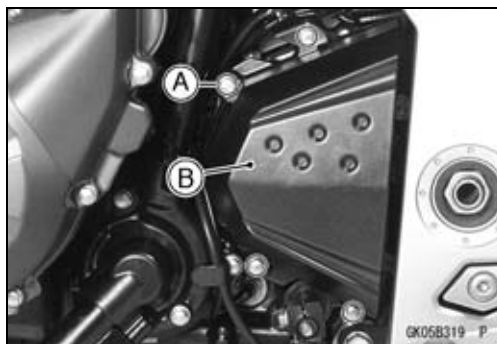


## 11-10 FINAL DRIVE

### Sprocket, Coupling

#### Engine Sprocket Removal

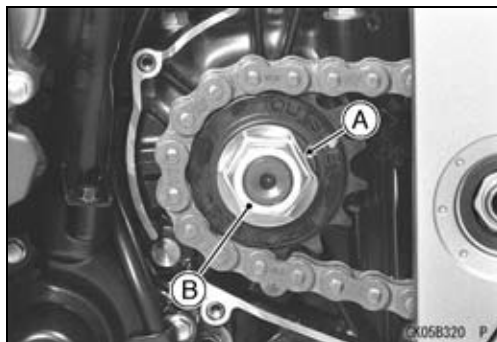
- Remove:
  - Engine Sprocket Cover Bolts [A]
  - Engine Sprocket Cover [B]



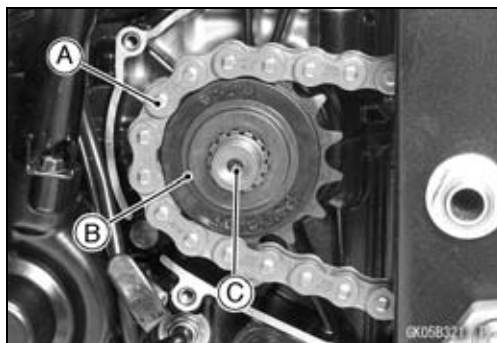
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

#### NOTE

○When loosening the engine sprocket nut, hold the rear brake on.



- Raise the rear wheel off the ground with the stand.
- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Remove the drive chain from the rear sprocket toward the right.
- Disengage the drive chain [A] from the engine sprocket [B].
- Pull the engine sprocket off the output shaft [C].



#### Engine Sprocket Installation

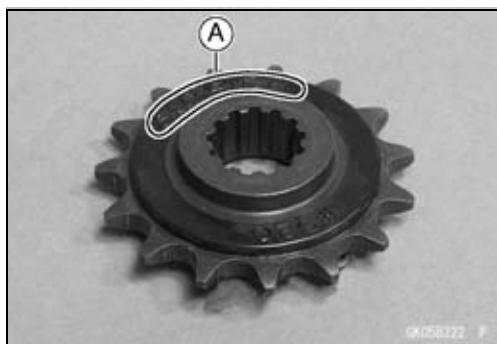
- Replace the sprocket washer and axle cotter pin.
- Install the engine sprocket so that "OUTSIDE" letters [A] face outward.
- Apply molybdenum disulfide oil solution to the threads and the seating surface of the engine sprocket nut.
- Tighten:

**Torque - Engine Sprocket Nut: 125 N·m (12.7 kgf·m, 92.2 ft·lb)**

#### NOTE

○Tighten the nut while applying the rear brake.

- After torquing the engine sprocket nut, bend the one side of the washer over the nut.

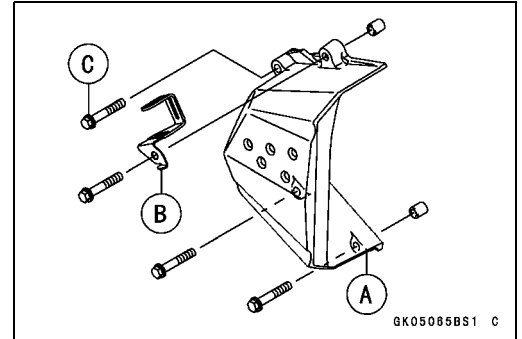


## Sprocket, Coupling

- Install the engine sprocket cover [A].
- Install the clamp [B] as shown in the figure, and tighten the cover bolts [C].

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

- Adjust the drive chain slack after installing the engine sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



### Rear Sprocket Removal

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

#### CAUTION

**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

- Remove the rear sprocket nuts [A].
- Remove the rear sprocket [B].



### Rear Sprocket Installation

- Install the sprocket facing the tooth number marking [A] outward.
- Tighten the rear sprocket nuts.

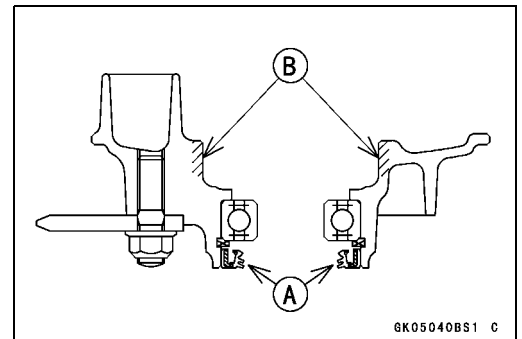
**Torque - Rear Sprocket Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**

- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).



### Coupling Installation

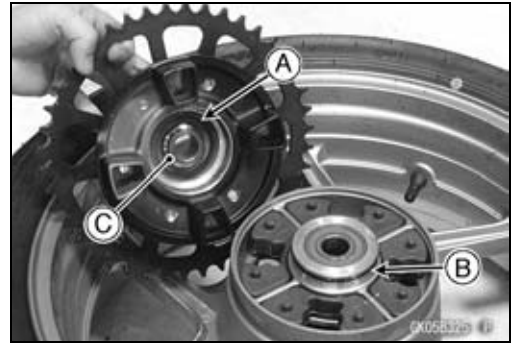
- Apply high-temperature grease to the coupling grease seal lips [A].
- Apply grease to the coupling internal surface [B].



## 11-12 FINAL DRIVE

### Sprocket, Coupling

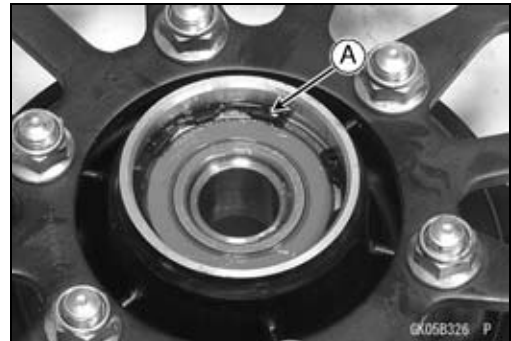
- Grease the following.
  - Wheel Flange Portion [A]
  - O-ring [B]
- Install the collar [C].



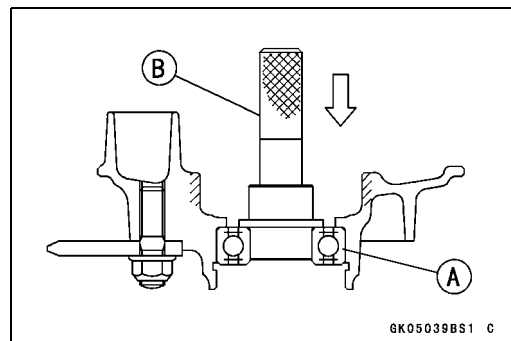
#### ***Coupling Bearing Removal***

- Remove:
  - Coupling
  - Grease Seal
  - Circlip [A]

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

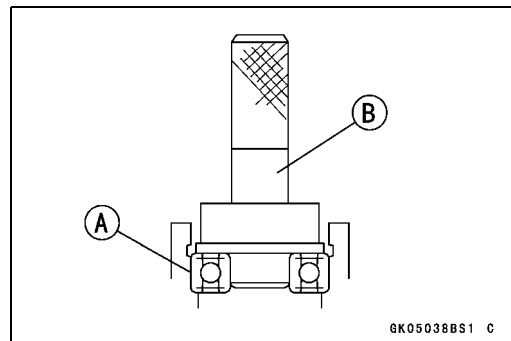


- Remove the bearing [A] by tapping from the wheel side.  
**Special Tool - Bearing Driver Set [B]: 57001-1129**



#### ***Coupling Bearing Installation***

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.  
**Special Tool - Bearing Driver Set [B]: 57001-1129**
- Replace the circlip with a new one.  
**Special Tool - Inside Circlip Pliers: 57001-143**



- 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**

## Sprocket, Coupling

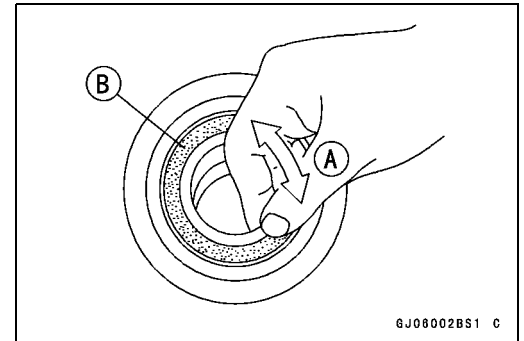
### Coupling Bearing Inspection

Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

#### NOTE

○It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.

- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness or binding.
- ★ If the bearing play, roughness or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



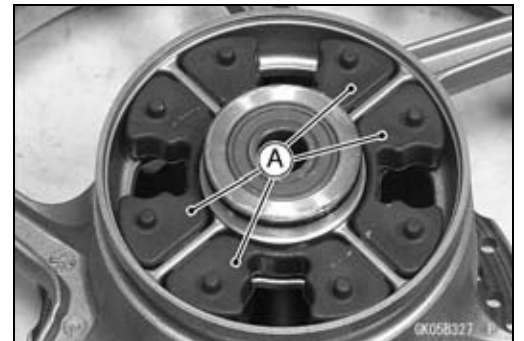
### Coupling Bearing Lubrication

#### NOTE

○Since the coupling bearing is packed with grease and sealed, lubrication is not required.

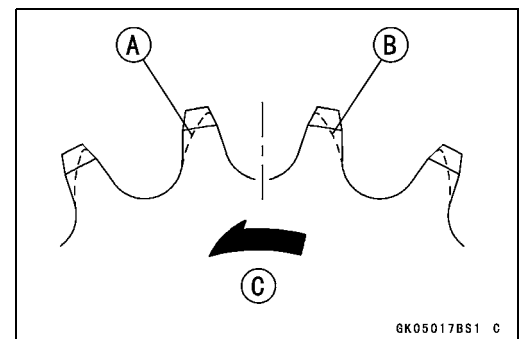
### Coupling Damper Inspection

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.



### Sprocket Wear Inspection

- Visually inspect the engine and rear sprocket teeth for wear and damage.
- ★ If the teeth are worn as illustrated, replace the sprocket, and inspect the drive chain wear (see Drive Chain Wear Inspection in the Periodic Maintenance chapter).  
 Worn Tooth (Engine Sprocket) [A]  
 Worn Tooth (Rear Sprocket) [B]  
 Direction of Rotation [C]



#### NOTE

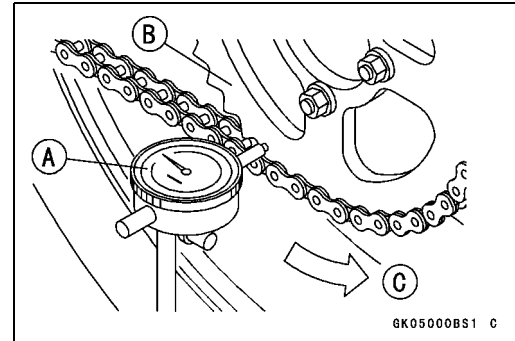
○If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.

## 11-14 FINAL DRIVE

### Sprocket, Coupling

#### ***Rear Sprocket Warp Inspection***

- Raise the rear wheel off the ground with the stand so that it will turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown in the figure, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).
- ★ If the runout exceeds the service limit, replace the rear sprocket.



#### **Rear Sprocket Warp**

**Standard:** 0.4 mm (0.016 in.) or less

**Service Limit:** 0.5 mm (0.020 in.)

# Brakes

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## 12-2 BRAKES

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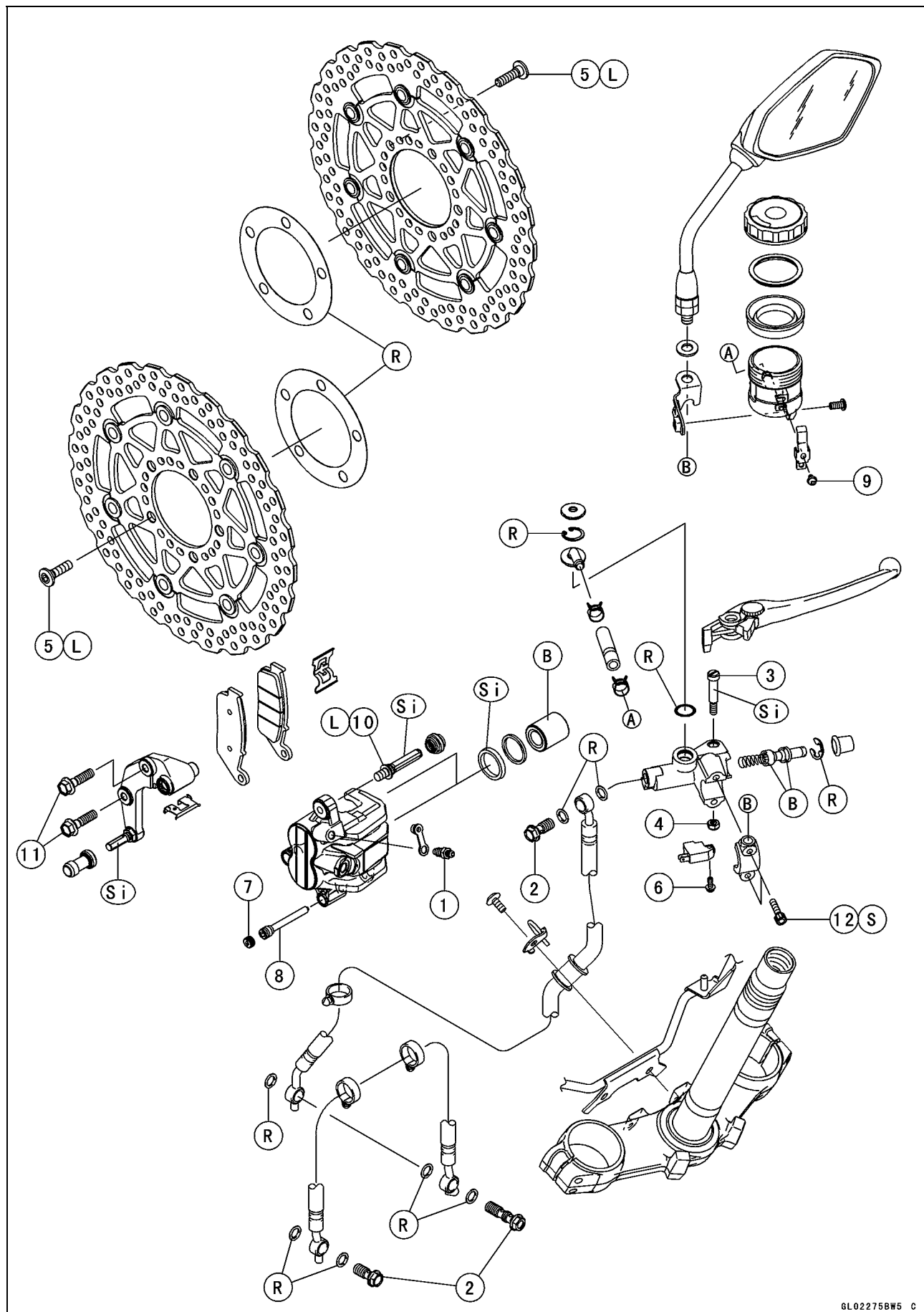
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## 12-4 BRAKES

### Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bleed Valves	7.8	0.80	69 in·lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	Si
4	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
5	Front Brake Disc Mounting Bolts	27	2.8	20	L
6	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
7	Front Brake Pad Pin Plugs	2.5	0.25	25 in·lb	
8	Front Brake Pad Pins	17.2	1.8	13	
9	Front Brake Reservoir Cap Stopper Screw	1.2	0.12	11 in·lb	
10	Front Caliper Holder Pin Bolt	22	2.2	16	L, Si
11	Front Caliper Mounting Bolts	25	2.5	18	
12	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S

B: Apply brake fluid.

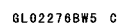
L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

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

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bleed Valve	7.8	0.80	69 in·lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Pedal Bolt	34	3.5	25	L
4	Rear Brake Disc Mounting Bolts	27	2.8	20	L
5	Rear Brake Pad Pin	17.2	1.8	13	
6	Rear Brake Pad Pin Plug	2.5	0.25	25 in·lb	
7	Rear Caliper Mounting Bolt	22	2.2	16	
8	Rear Caliper Pin Bolt	27	2.8	20	Si
9	Rear Master Cylinder Mounting Bolts	25	2.5	18	
10	Rear Master Cylinder Push Rod Locknut	17.2	1.8	13	

B: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

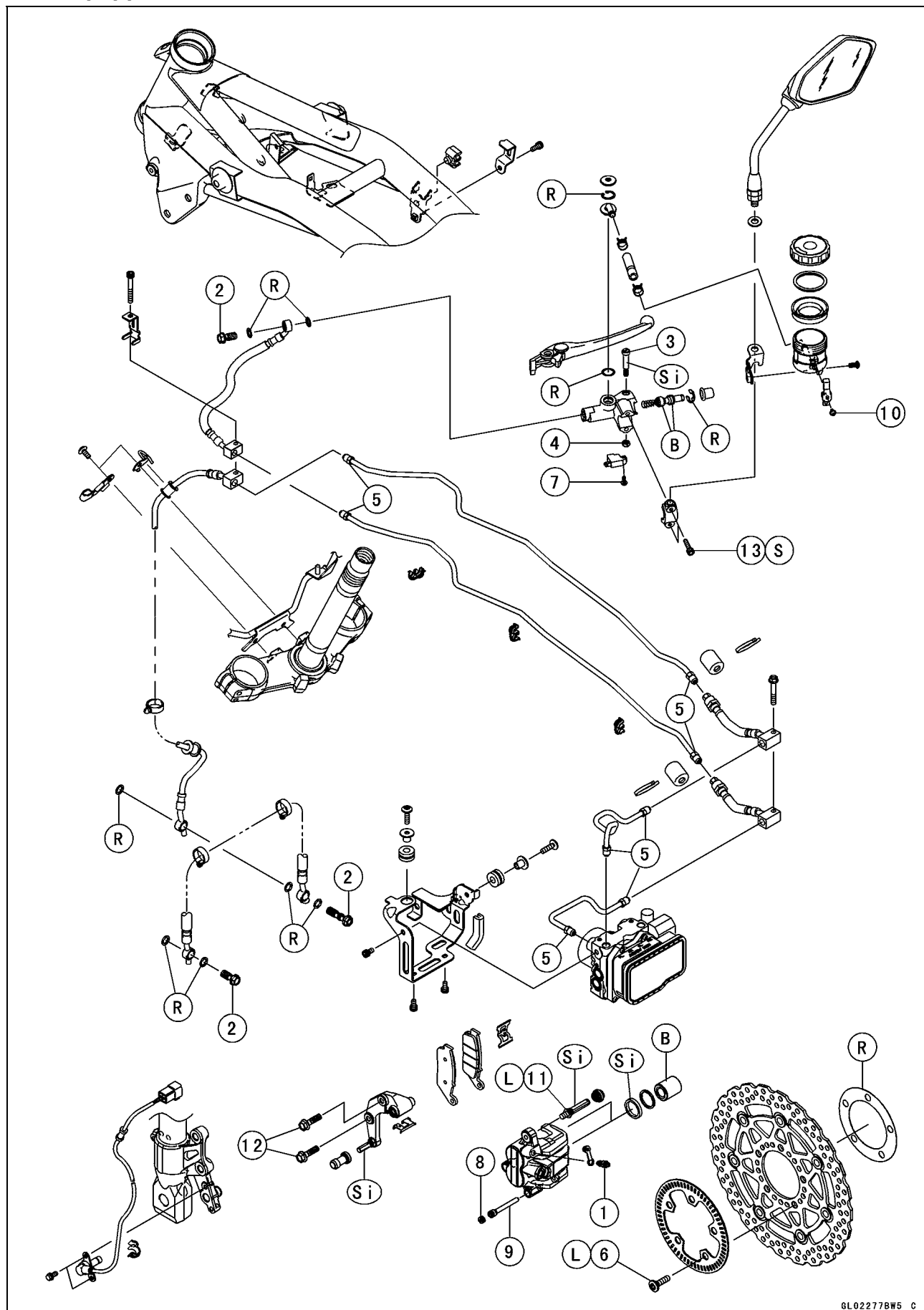
R: Replacement Parts

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

## 12-8 BRAKES

### Exploded View

#### ABS Equipped Models



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bleed Valves	7.8	0.80	69 in·lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	Si
4	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
5	Brake Pipe Joint Nuts	18	1.8	13	
6	Front Brake Disc Mounting Bolts	27	2.8	20	L
7	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
8	Front Brake Pad Pin Plugs	2.5	0.25	25 in·lb	
9	Front Brake Pad Pins	17.2	1.8	13	
10	Front Brake Reservoir Cap Stopper Screw	1.2	0.12	11 in·lb	
11	Front Caliper Holder Pin Bolt	22	2.2	16	L, Si
12	Front Caliper Mounting Bolts	25	2.5	18	
13	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S

B: Apply brake fluid.

L: Apply a non-permanent locking agent.

R: Replacement Parts

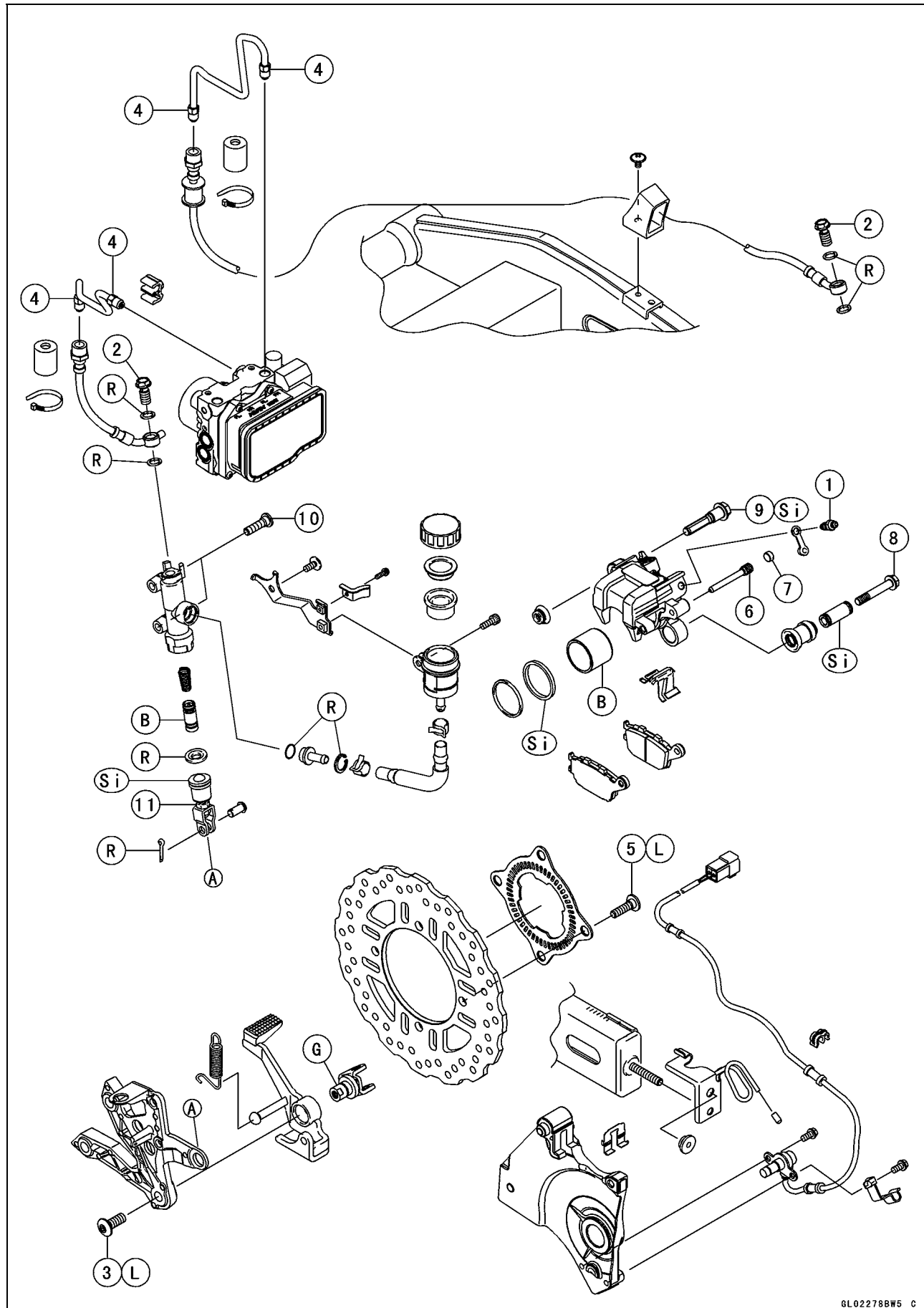
S: Follow the specified tightening sequence.

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

## 12-10 BRAKES

### Exploded View

#### ABS Equipped Models





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bleed Valve	7.8	0.80	69 in·lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Pedal Bolt	34	3.5	25	L
4	Brake Pipe Joint Nuts	18	1.8	13	
5	Rear Brake Disc Mounting Bolts	27	2.8	20	L
6	Rear Brake Pad Pin	17.2	1.8	13	
7	Rear Brake Pad Pin Plug	2.5	0.25	25 in·lb	
8	Rear Caliper Mounting Bolt	22	2.2	16	
9	Rear Caliper Pin Bolt	27	2.8	20	Si
10	Rear Master Cylinder Mounting Bolts	25	2.5	18	
11	Rear Master Cylinder Push Rod Locknut	17.2	1.8	13	

B: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

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

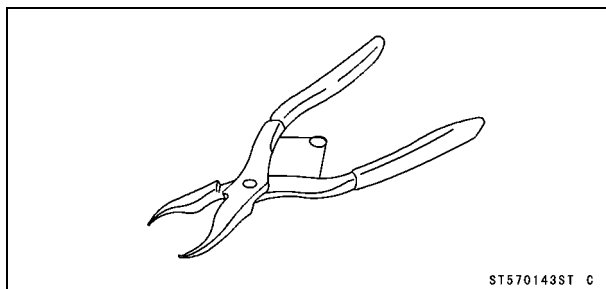
## 12-12 BRAKES

### Specifications

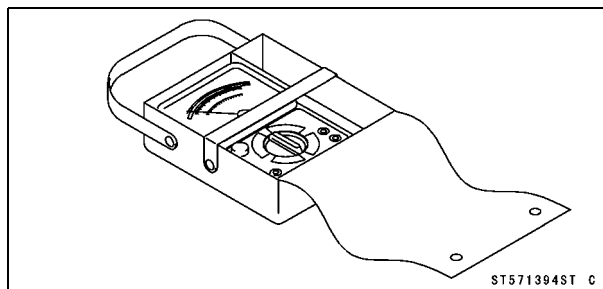
Item	Standard	Service Limit
<b>Brake Lever, Brake Pedal</b>		
Brake Lever Position	5-way adjustable (to suit rider)	— — —
Brake Lever Free Play	Non-adjustable	— — —
Pedal Free Play	Non-adjustable	— — —
Pedal Position	About 45 mm (1.77 in.) below footpeg top	— — —
<b>Brake Pads</b>		
Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
<b>Brake Discs</b>		
Thickness:		
Front	4.3 ~ 4.7 mm (0.17 ~ 0.19 in.)	4.0 mm (0.16 in.)
Rear	5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)	5.5 mm (0.22 in.)
Runout	TIR 0.15 mm (0.006 in.) or less	TIR 0.3 mm (0.01 in.)
<b>Brake Fluid</b>		
Grade	DOT4	— — —

## Special Tools

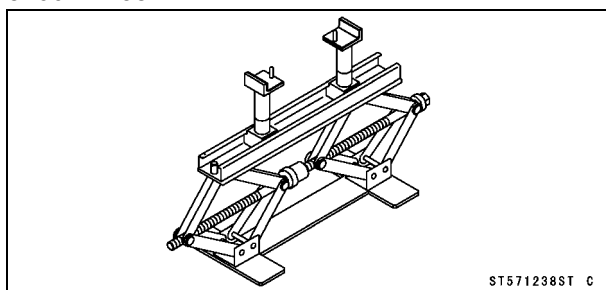
**Inside Circlip Pliers:**  
**57001-143**



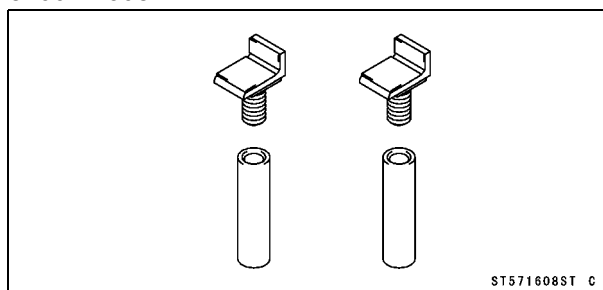
**Hand Tester:**  
**57001-1394**



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



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



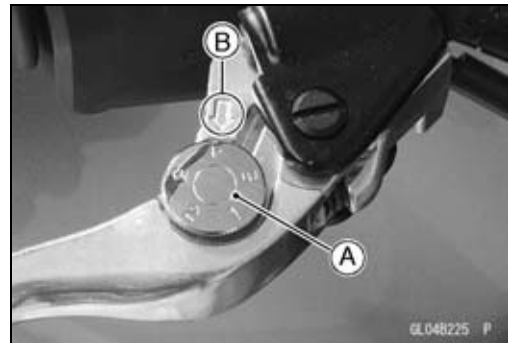
## 12-14 BRAKES

### Brake Lever, Brake Pedal

#### Brake Lever Position Adjustment

The brake lever adjuster has 5 positions so that the brake lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.
- The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



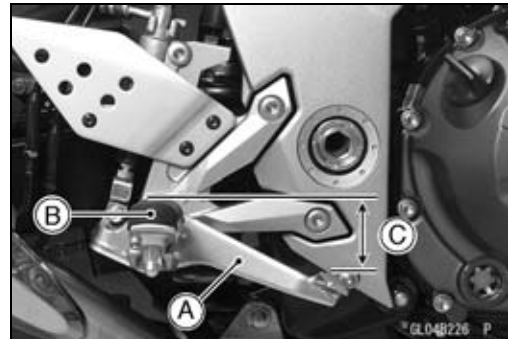
#### Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. Footpeg [B]

##### Pedal Position

**Standard:** About 45 mm (1.77 in.) [C] below top of footpeg

- ★ If it is incorrect, adjust the brake pedal position.



#### Brake Pedal Position Adjustment

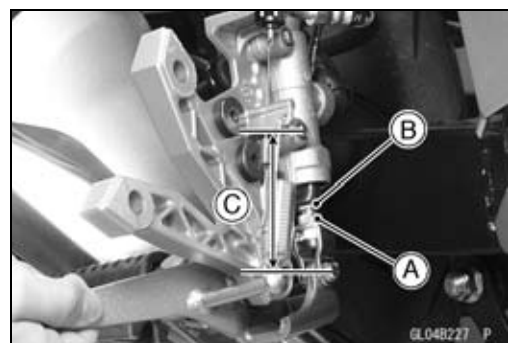
##### NOTE

○ Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.

- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.
- ★ If the length [C] shown is **70 ±1 mm (2.76 ±0.04 in.)**, the pedal position will be within the standard range.
- Tighten:

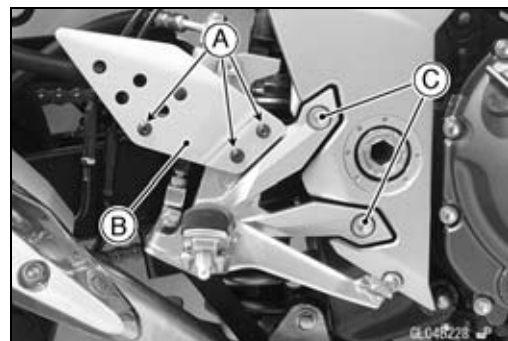
**Torque - Rear Master Cylinder Push Rod Locknut: 17.2 N·m (1.8 kgf·m, 13 ft·lb)**

- Check the brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).



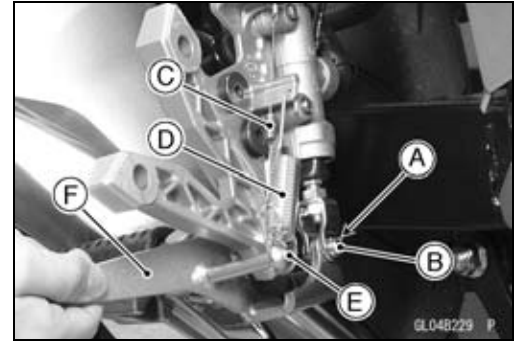
#### Brake Pedal Removal

- Remove:
  - Guard Bracket Bolts [A]
  - Guard Bracket [B]
  - Front Footpeg Bracket Bolts [C]



## Brake Lever, Brake Pedal

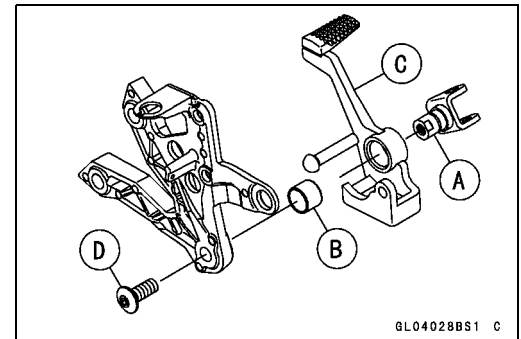
- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]
  - Rear Brake Light Switch Spring [C]
  - Return Spring [D]
  - Brake Pedal Bolt [E]
  - Brake Pedal [F]



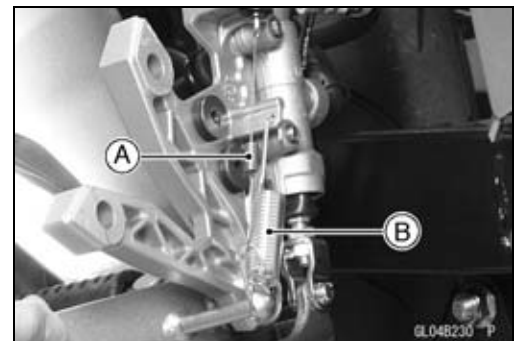
### **Brake Pedal Installation**

- Apply grease to the footpeg pivot shaft [A].
- Install:
  - Bushing [B]
  - Brake Pedal [C]
- Apply a non-permanent locking agent to the threads of the brake pedal bolt [D], and tighten it.

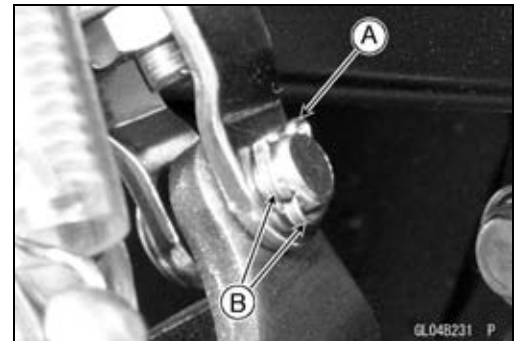
**Torque - Brake Pedal Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**



- Hook the lower end of the rear brake light switch spring [A] on the return spring lower end.
- Hook the upper end of the return spring [B] on the footpeg bracket hook.



- Replace the cotter pin with a new one.
- Insert the cotter pin [A] and bend the pin ends [B].



- Install the front footpeg bracket.
- Tighten:
  - Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install:
  - Guard Bracket
  - Guard Bracket Bolts
- Check the brake pedal position (see Brake Pedal Position Inspection).

## 12-16 BRAKES

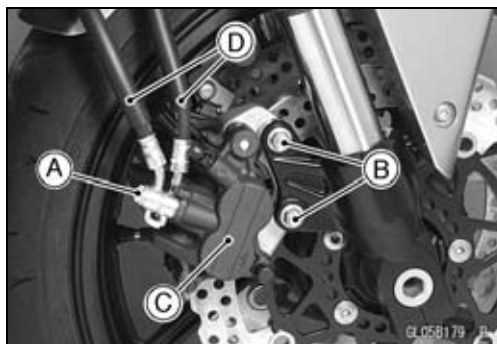
### Calipers

#### Front Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hoses [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

Immediately wash away any brake fluid that spills.



#### NOTE

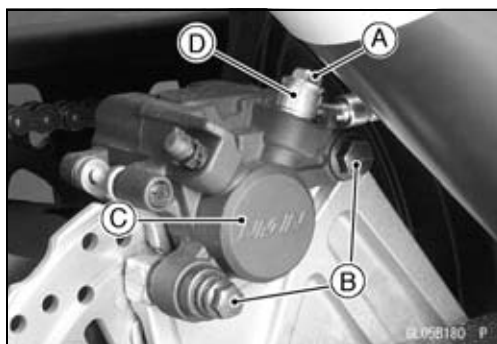
○If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Front Caliper Disassembly).

#### Rear Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

Immediately wash away any brake fluid that spills.



#### NOTE

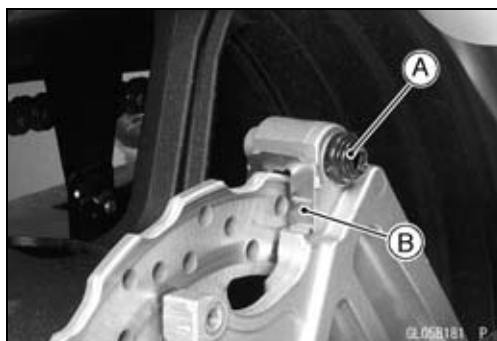
○If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Rear Caliper Disassembly).

#### Caliper Installation

- Install the caliper and brake hose lower end.
- Replace the washers on each side of hose fitting with new ones.

#### Rear Caliper

- Install:
  - Rubber Boot [A]
  - Guide [B]



## Calipers

- Fit the rear brake pads [A] to the guide [B].



- Apply silicone grease to the rear caliper pin bolt.
- Tighten:

### Torque - Caliper Mounting Bolts:

Front: 25 N·m (2.5 kgf·m, 18 ft·lb)

Rear: 22 N·m (2.2 kgf·m, 16 ft·lb)

Rear Caliper Pin Bolt: 27 N·m (2.8 kgf·m, 20 ft·lb)

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

- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

### **⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brakes will not function on the first application of the lever or pedal if this is not done.**

### **Front Caliper Disassembly**

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

### **Front Caliper Assembly**

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

### **Rear Caliper Disassembly**

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

### **Rear Caliper Assembly**

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

## 12-18 BRAKES

### Calipers

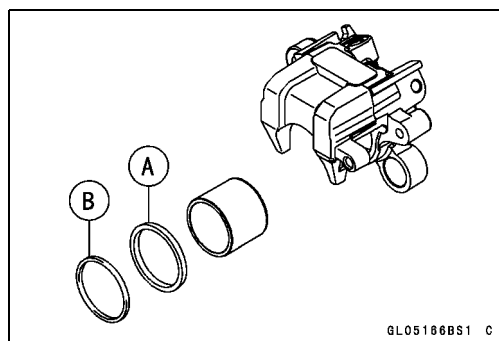
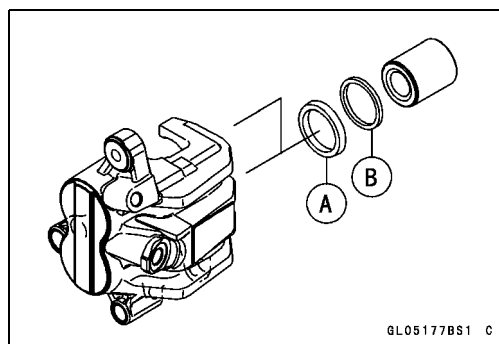
#### Caliper Fluid Seal Damage

The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

- Replace the fluid seal if it exhibits any of the conditions listed below.

- Brake fluid leakage around the pad.
- Brakes overheat.
- Considerable difference in inner and outer pad wear.
- Seal and piston are stuck together.

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



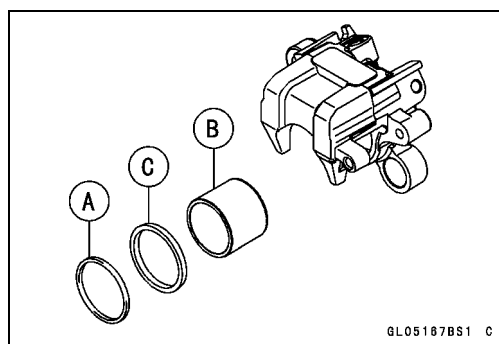
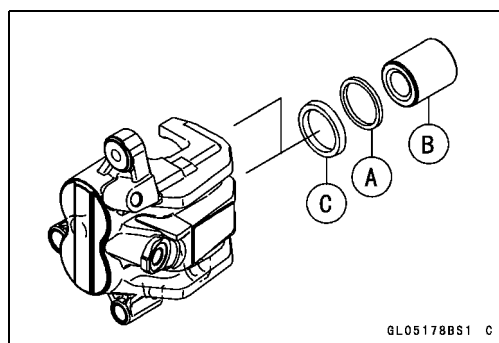
#### Caliper Dust Seal Damage

- Check that the dust seals [A] are not cracked, worn, swollen, or otherwise damaged.

- ★ If they show any damage, replace the dust seals with new ones.

Pistons [B]

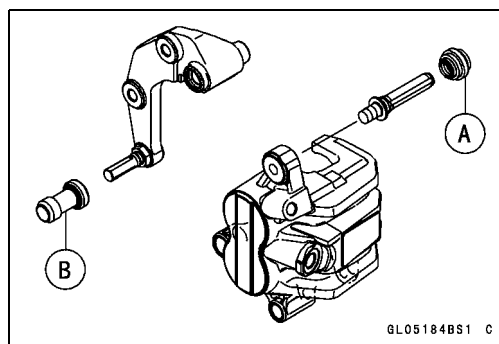
Fluid Seals [C]



#### Front Caliper Dust Boot and Friction Boot Damage

- Check that the dust boot [A] and friction boot [B] are not cracked, worn, swollen, or otherwise damaged.

- ★ If they show any damage, replace it.

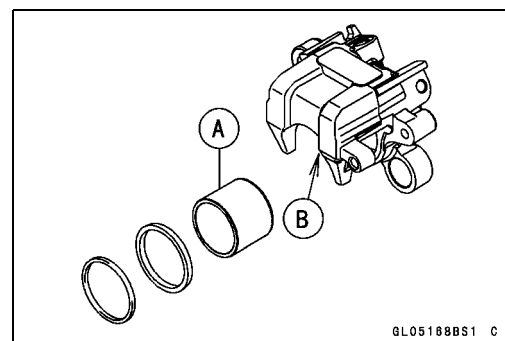
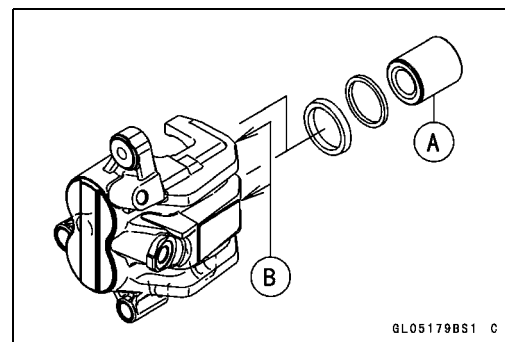




## Calipers

### **Caliper Piston and Cylinder Damage**

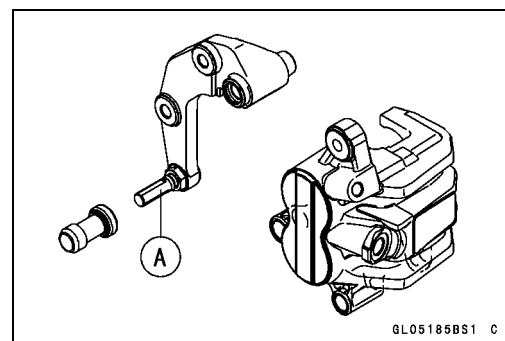
- Visually inspect the pistons [A] and cylinder surfaces [B].
- ★ Replace the caliper if the cylinder and piston are badly scores or rusty.



### **Front Caliper Holder Shaft Wear**

The caliper body must slide smoothly on the caliper holder shaft [A]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

- Check to see that the caliper holder shaft are not badly worn or stepped, and that the friction boot is not damaged.
- ★ If the friction boot is damaged, replace the friction boot. To replace the friction boot, remove the pads and the caliper holder.
- ★ If the caliper holder shaft is damage, replace the caliper holder.

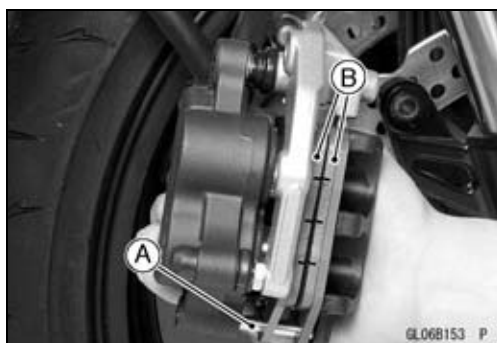
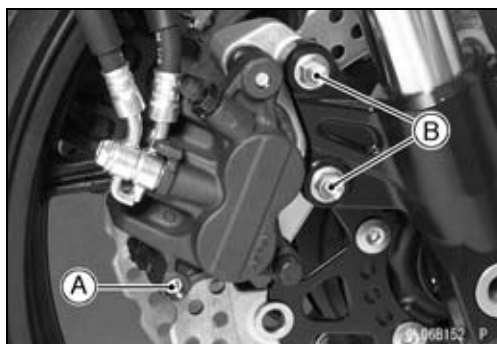


## 12-20 BRAKES

### Brake Pads

#### Front Brake Pad Removal

- Unscrew the pad pin plug [A].
- Loosen the pad pin [A].
- Unscrew the bolts [B].
- Remove the caliper with the hose installed.



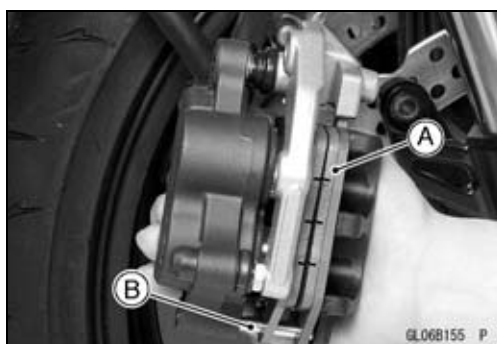
- Remove:  
Pad Pin [A]  
Brake Pads [B]

#### Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install the pad springs in its correct position.
- Install the outside pad [A] and insert the pad pin [B] as shown in the figure.



- Set:  
Inside Pad [A]  
Pad Pin [B]
  - Install the caliper (see Caliper Installation).
  - Tighten the pad pin and plug.
- Torque - Front Brake Pad Pins: 17.2 N·m (1.8 kgf·m, 13 ft·lb)**  
**Front Brake Pad Pin Plugs: 2.5 N·m (0.25 kgf·m, 25 in·lb)**



#### WARNING

Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever and the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

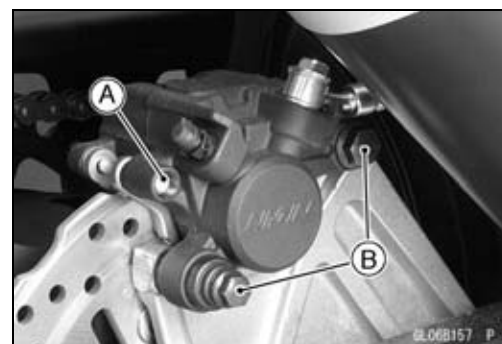
## Brake Pads

### Rear Brake Pad Removal

- Unscrew the pad pin plug [A].



- Loosen the pad pin [A].
- Unscrew the bolts [B].
- Remove the caliper with the hose installed.

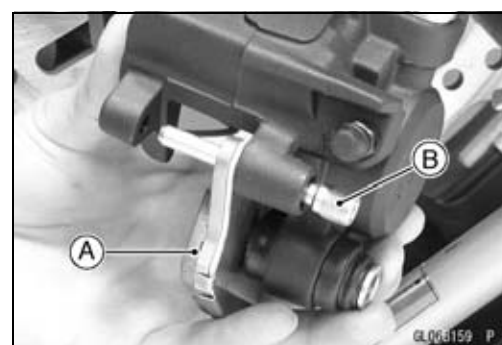


- Remove:  
Pad Pin [A]  
Brake Pads [B]



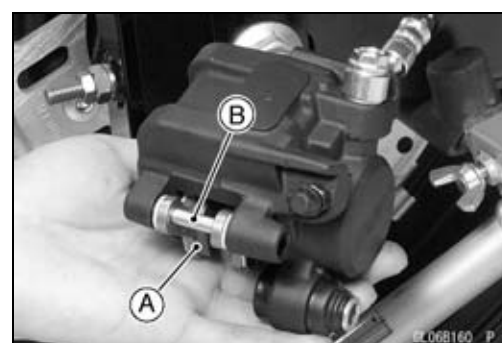
### Rear Brake Pad Installation

- Push the caliper piston in by hand as far as they will go.
- Install the outside pad [A] and insert the pad pin [B] as shown in the figure.



- Set:  
Inside Pad [A]  
Pad Pin [B]
- Install the caliper (see Caliper Installation).
- Tighten the pad pin and plug.

**Torque - Rear Brake Pad Pin: 17.2 N·m (1.8 kgf·m, 13 ft·lb)**  
**Rear Brake Pad Pin Plug: 2.5 N·m (0.25 kgf·m, 25 in·lb)**



## ⚠ 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.**

## 12-22 BRAKES

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### Brake Pads

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#### ***Brake Pad Wear Inspection***

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

## Master Cylinder

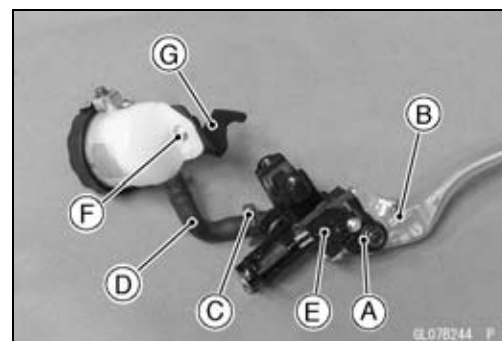
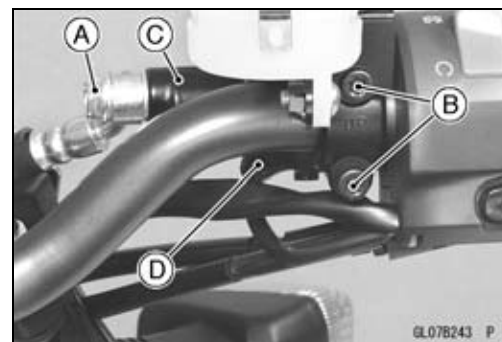
### Front Master Cylinder Removal

- Remove the banjo bolt [A] to disconnect the brake hose from the master cylinder (see Brake Hose Removal/Installation).
- Unscrew the clamp bolts [B], and take off the master cylinder [C] as an assembly with the reservoir, brake lever, and brake switch installed.
- Disconnect the front brake light switch connector [D].

#### CAUTION

**Immediately wash away any brake fluid that spills.**

- Remove:
  - Brake Lever Pivot Bolt and Nut [A]
  - Brake Lever [B]
  - Clamp [C] (Slide Out)
  - Brake Hose [D]
  - Front Brake Light Switch [E]
  - Bolt [F] and Bracket [G]



### Front Master Cylinder Installation

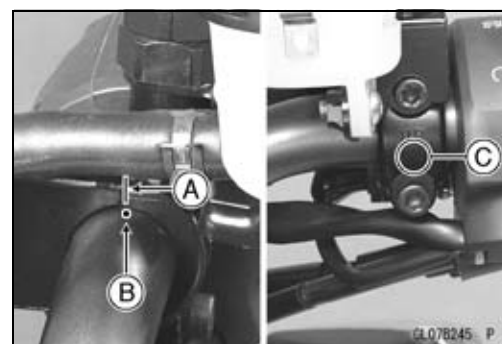
- Set the front master cylinder to match its mating surface [A] to the punch mark [B] of the handlebar.
- The master cylinder clamp must be installed with the arrow mark [C] upward.
- Tighten the upper clamp bolt first, and then the lower clamp bolt.

**Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

- Replace the washers that are on each side of the hose fitting with new ones.
- Tighten:

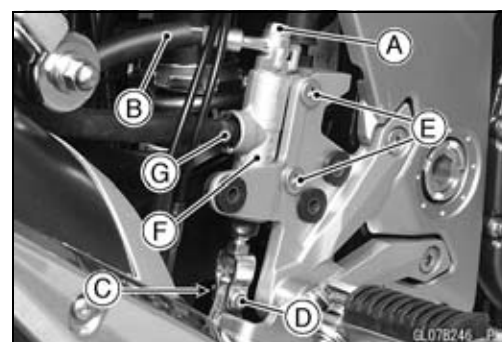
**Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.



### Rear Master Cylinder Removal

- Remove:
  - Guard Bracket (see Brake Pedal Removal)
  - Brake Hose Banjo Bolt [A]
  - Brake Hose [B]
  - Cotter Pin [C]
  - Joint Pin [D]
  - Bolts [E]
  - Rear Master Cylinder [F]
- Slide out the clamp [G].
- Pull off the reservoir hose lower end, and drain the brake fluid into a container.



## 12-24 BRAKES

### Master Cylinder

#### **Rear Master Cylinder Installation**

- Replace the cotter pin with a new one.
- Replace the washers that are on each side of hose fitting with new ones.
- Tighten:

**Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

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

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

#### **Front Master Cylinder Disassembly**

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

#### **Rear Master Cylinder Disassembly**

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

#### **Master Cylinder Assembly**

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

#### **Master Cylinder Inspection (Visual Inspection)**

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders (see Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].

★ If a master cylinder or piston shows any damage, replace them.

- Inspect the primary cup [C] and secondary cup [D].

★ If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.

★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.

- Check the dust covers [E] for damage.

★ If they are damaged, replace them.

- Check the piston return springs [F] for any damage.

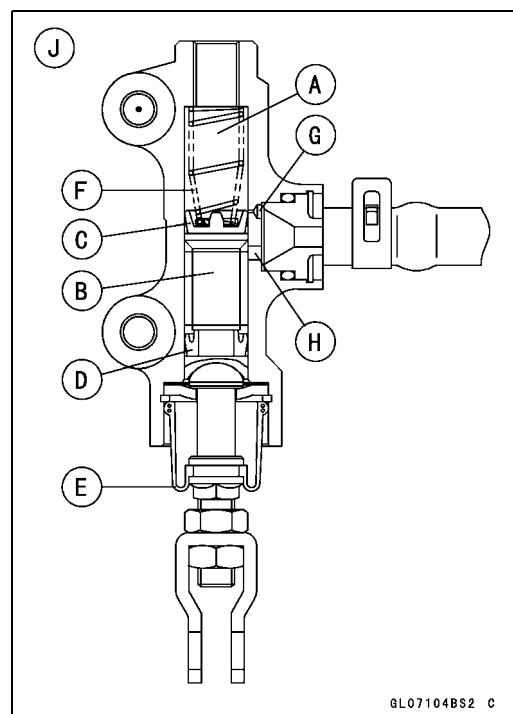
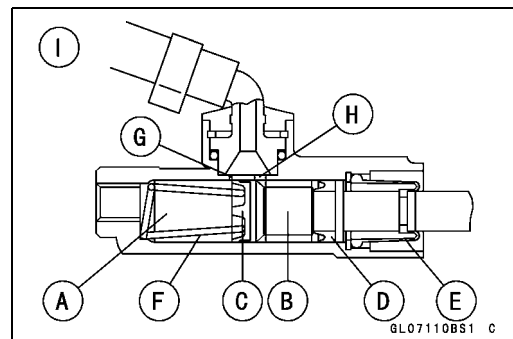
★ If the springs are damaged, replace them.

- 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.

Front Master Cylinder [I]

Rear Master Cylinder [J]



## Brake Disc

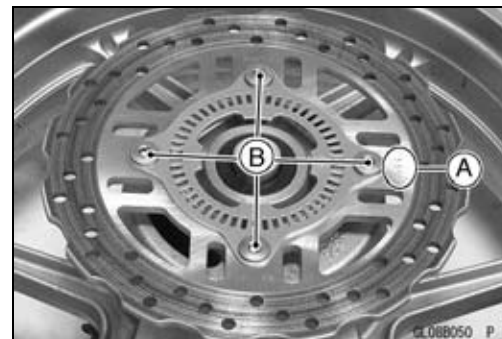
### Brake Disc Removal

- Remove the wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Unscrew the mounting bolts, and take off the disc.
- Remove the sensor rotor (ABS equipped models).
- Remove the gaskets.

### Brake Disc Installation

- Replace the gaskets with new ones.
- Install the brake disc on the wheel so that the marked side [A] faces out.
- Install the sensor rotor on the brake disc so that the marked side faces out (ABS equipped models).
- Apply a non-permanent locking agent to the threads of the front and rear brake disc mounting bolts [B], and tighten them.

**Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)**



### Brake Disc Wear

- Measure the thickness of each disc [A] at the point where it has worn the most.
  - ★ If the disc has worn past the service limit, replace it.
- Measuring Area [B]

#### Brake Discs Thickness

##### Standard:

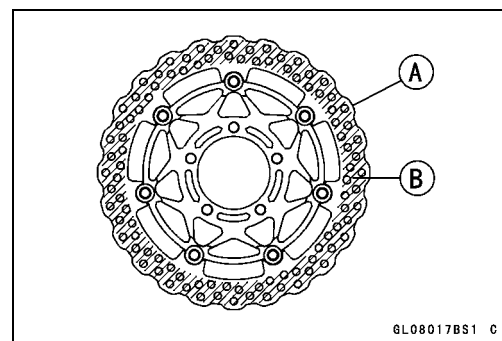
Front 4.3 ~ 4.7 mm (0.17 ~ 0.19 in.)

Rear 5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)

##### Service Limit:

Front 4.0 mm (0.16 in.)

Rear 5.5 mm (0.22 in.)



### Brake Disc Warp

- Raise the front/rear wheel off the ground.

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

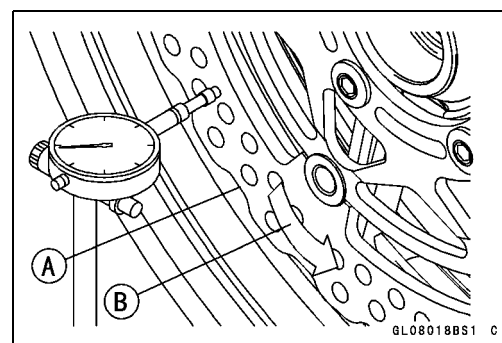
**Jack Attachment: 57001-1608**

- For front disc inspection, turn the handlebar fully to one side.
- Set up a dial gauge against the disc [A] as shown in the figure and measure disc runout, while turning [B] the wheel by hand.
- ★ If runout exceeds the service limit, replace the disc.

#### Disc Runout

**Standard: TIR 0.15 mm (0.006 in.) or less**

**Service Limit: TIR 0.3 mm (0.01 in.)**



## 12-26 BRAKES

### Brake Fluid

#### **Brake Fluid Level Inspection**

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

#### **Brake Fluid Change**

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

#### **Brake Line Bleeding**

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

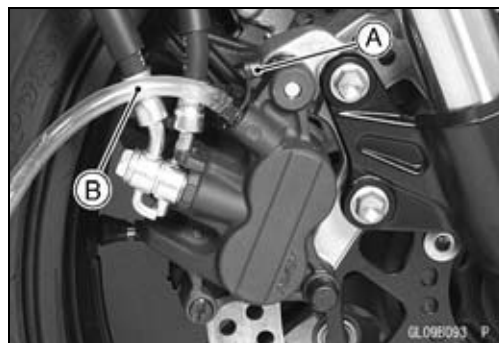
#### **⚠ WARNING**

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

#### **NOTE**

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

- Remove:
  - Screw [A]
  - Stopper [B]
  - Front Brake Reservoir Cap [C]
  - Diaphragm Plate
  - Diaphragm
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake 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 [A] from the bleed valve on the caliper.
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.



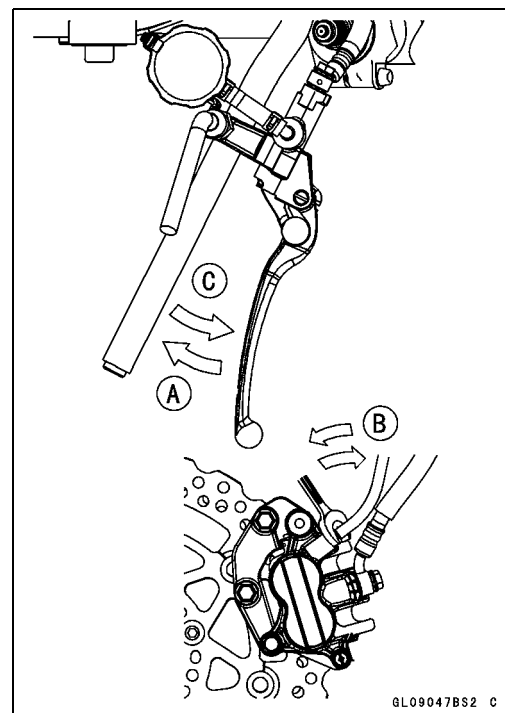


## Brake Fluid

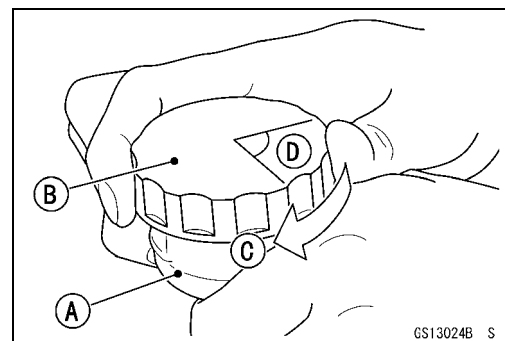
- Bleed the brake line and the caliper.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
  1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
  2. Quickly open and close [B] the bleed valve while holding the brake applied.
  3. Release the brake [C].

### NOTE

- The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.
- Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.
- Front Brake: First bleeding the right caliper then repeat the above steps for the left caliper.
- Remove the clear plastic hose.
- Install:
  - Diaphragm
  - Diaphragm Plate
  - Front Brake Reservoir Cap



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



- Install the stopper and screw.
- Tighten:
  - Torque - Front Brake Reservoir Cap Stopper Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**
- Tighten the bleed valve, and install the rubber cap.
  - Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Check the fluid level (see Brake Fluid Level Inspection in the Periodic Maintenance chapter).
- After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.

## 12-28 BRAKES

### Brake Fluid

#### WARNING

**When working with the disc brake, observe the precautions listed below.**

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high-flash point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE.**

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**Brake Hose**

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***Brake Hose and Pipe Removal/Installation***

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

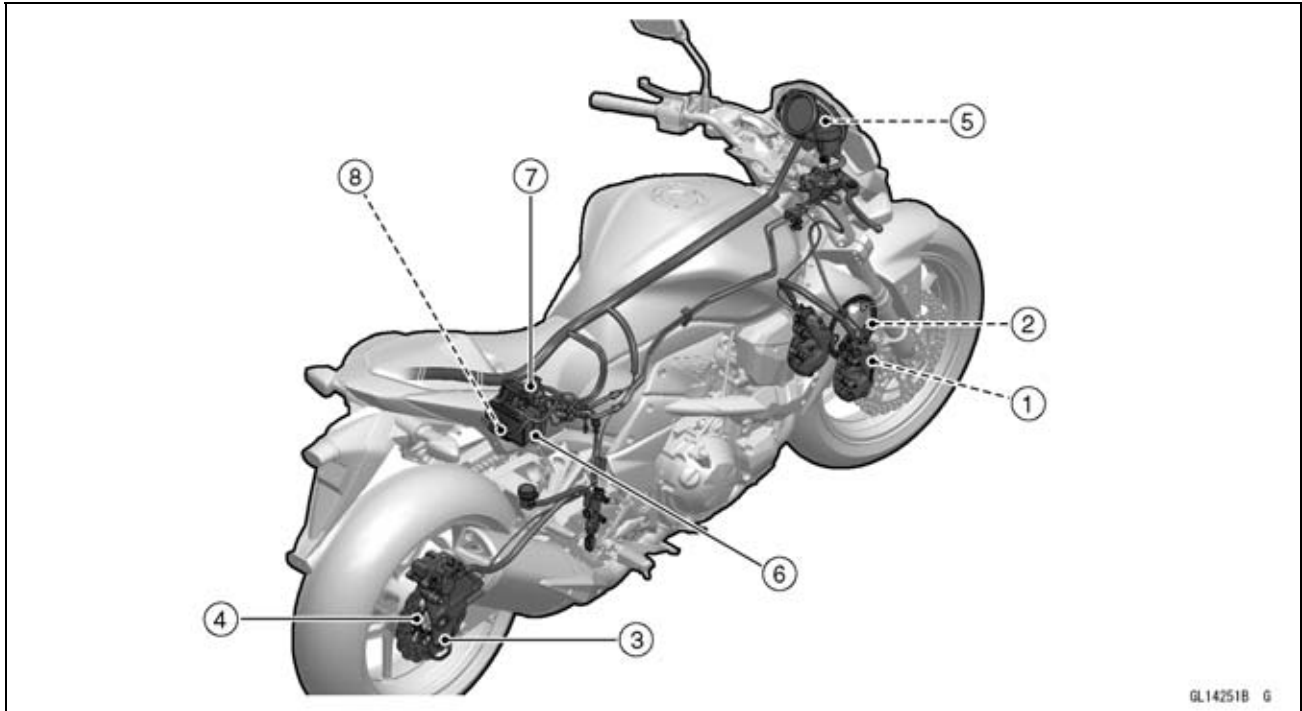
***Brake Hose and Pipe Inspection***

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

## 12-30 BRAKES

### Anti-Lock Brake System (Equipped Models)

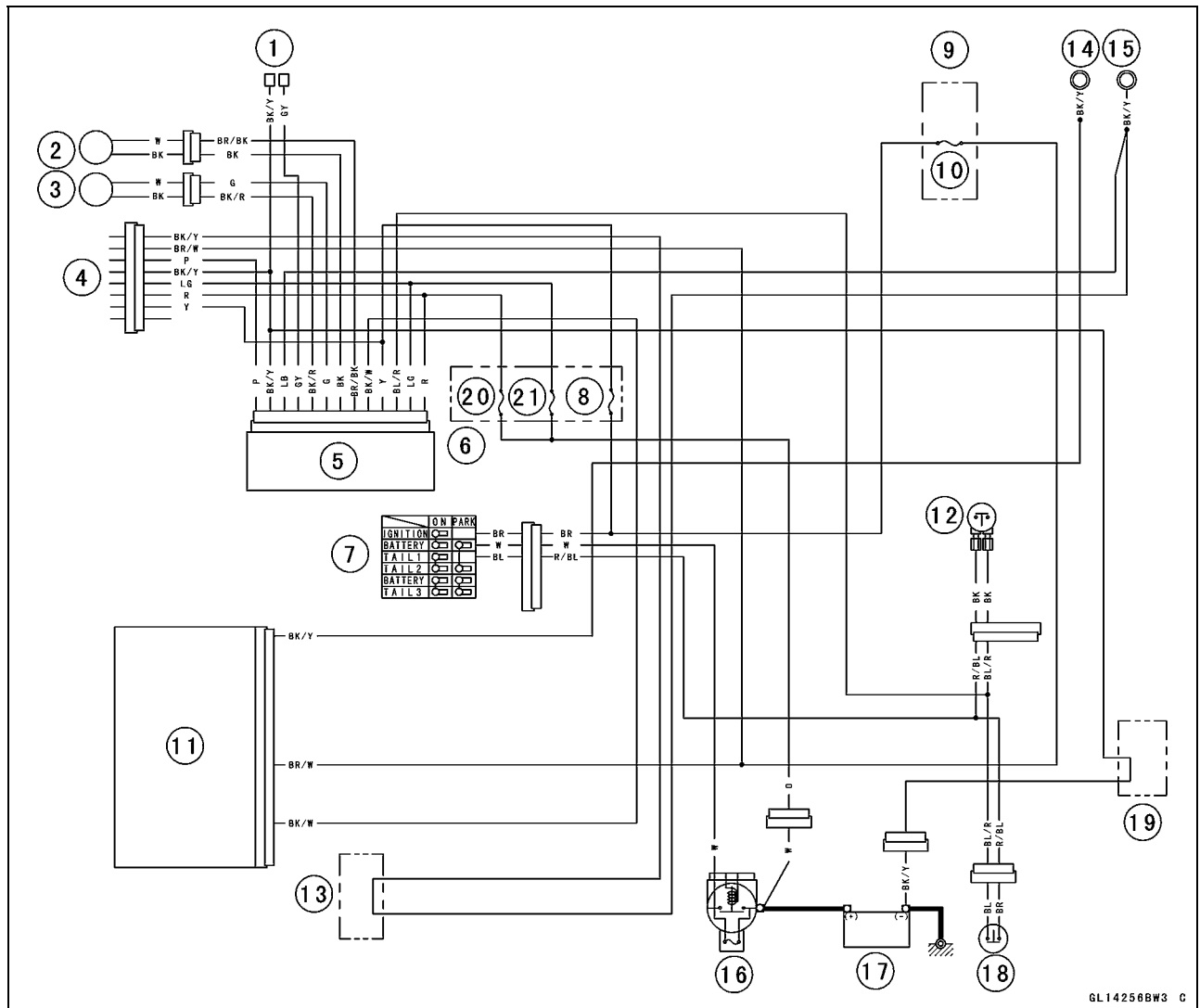
#### Parts Location



1. Front Wheel Rotation Sensor
2. Front Wheel Rotation Sensor Rotor
3. Rear Wheel Rotation Sensor
4. Rear Wheel Rotation Sensor Rotor
5. ABS Indicator Light (LED)
6. ABS Hydraulic Unit
7. ABS Fuse Box
8. ABS Kawasaki Self-diagnosis System Connector

**Anti-Lock Brake System (Equipped Models)**

**ABS System Wiring Diagram**



1. ABS Self-diagnosis Terminal
2. Rear Wheel Rotation Sensor
3. Front Wheel Rotation Sensor
4. ABS Kawasaki Self-diagnosis System Connector
5. ABS Hydraulic Unit
6. Fuse Box 1
7. Ignition Switch
8. ABS ECU Fuse 10 A
9. Fuse Box 2
10. Ignition Fuse 10 A

11. Meter Unit
12. Front Brake Switch
13. Water-proof Joint A
14. Meter Ground
15. Frame Ground
16. Main Fuse 30 A
17. Battery 12 V 8 Ah
18. Rear Brake Switch
19. Water-proof Joint C
20. ABS Motor Relay Fuse 30 A
21. ABS Solenoid Valve Relay Fuse 20 A

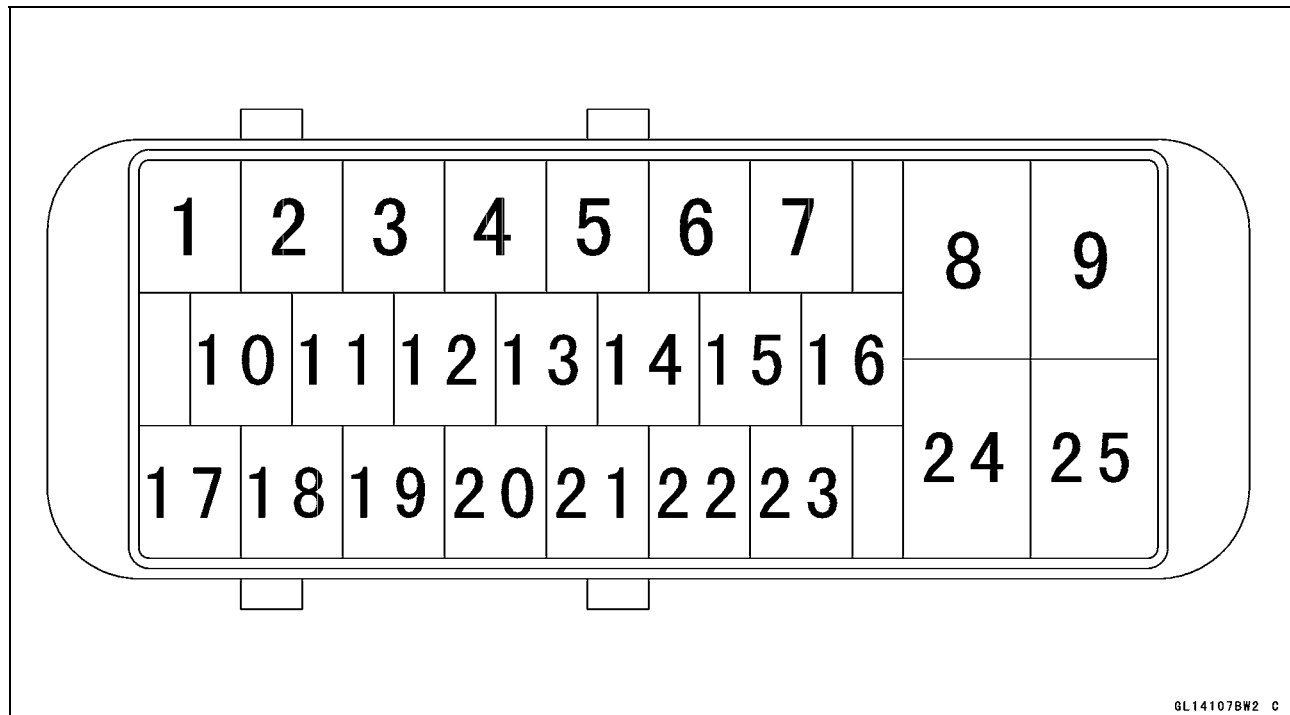
○Color Codes:

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

## 12-32 BRAKES

### Anti-Lock Brake System (Equipped Models)

#### Terminal Names



1. Unused
2. Power Supply to Rear Wheel Rotation Sensor
3. Front Wheel Rotation Sensor Signal
4. Front and Rear Brake Light Switch
5. Unused
6. Unused
7. Unused
8. Power Supply to ABS Solenoid Valve Relay
9. Power Supply to ABS Motor Relay
10. ABS Kawasaki Self-diagnosis System Terminal
11. Unused
12. Power Supply to Front Wheel Rotation Sensor
13. ABS Self-diagnosis Terminal
14. Unused
15. Unused
16. Power Supply
17. Unused
18. Rear Wheel Rotation Sensor Signal
19. Unused
20. Unused
21. ABS Indicator Light (LED)
22. Unused
23. Unused
24. Ground
25. Ground to Motor

## Anti-Lock Brake System (Equipped Models)

### ABS Servicing Precautions

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

- This ABS 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 ABS hydraulic unit.
- To prevent damage to the ABS parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is ON or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Do not turn the ignition switch ON while any of the ABS electrical connectors are disconnected. The ABS hydraulic unit memorizes service codes.
- Do not spray water on the electrical parts, ABS parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the ABS system is not influenced by electric wave radiated from the antenna. Locate the antenna as far as possible away from the ABS hydraulic unit.
- Whenever the ABS electrical connections are to be disconnected, first turn off the ignition switch.
- The ABS parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- The ABS parts cannot be disassembled. Even if a fault is found, do not try to disassemble and repair the ABS parts, replace it.
- The ABS has many brake lines, pipes, and leads. And the ABS cannot detect problems with the conventional braking system (brake disc wear, unevenly worn brake pad, and other mechanical faults). To prevent trouble, check the brake lines and pipes for correct routing and connection, the wiring for correct routing, and the brakes for proper braking power. Be sure to check for fluid leakage, and bleed the brake line thoroughly.

### WARNING

**If any of the brake line fittings, including the ABS hydraulic unit joint nuts, or the bleed valve is opened at any time, the air must be bled completely from the brake line.**

### CAUTION

**Do not ride the motorcycle with air in the brake line, or the ABS could malfunction.**

## 12-34 BRAKES

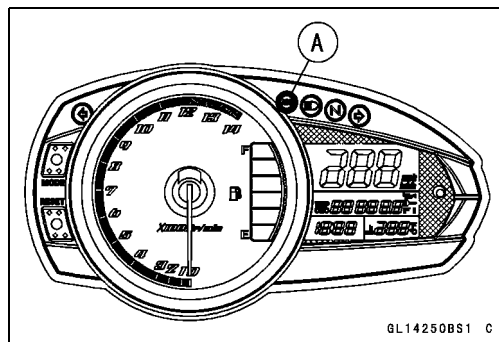
### Anti-Lock Brake System (Equipped Models)

- The ABS indicator light (LED) [A] may light if the tire pressure is incorrect, a non-recommended tire is installed, or the wheel is deformed. If the indicator light lights, remedy the problem and clear the service code.

#### **⚠ WARNING**

**Use of non-recommended tires may cause malfunctioning of ABS and can lead to extended braking distance. The rider could have an accident as a result. Always use recommended standard tires for this motorcycle.**

- The ABS indicator light (LED) may come on if the engine is run with the motorcycle on its stand and the transmission in gear. If the indicator light comes on, just turn the ignition switch OFF, then clear service code 42, which indicates a “Faulty front wheel rotation sensor”.
- When the ABS operates, the ABS makes noise and the rider feels the reaction force on the brake lever and brake pedal. This is a normal condition. It informs the rider that the ABS is operating normally.
- Service codes detected once by the ABS hydraulic unit will be memorized in the ABS hydraulic unit. Therefore, after maintenance work is finished, be sure to erase the service codes. Do not erase the service codes during troubleshooting. Wait until all the checks and repair work are finished to prevent duplication of previous service codes and unnecessary maintenance work.
- Before delivering the motorcycle to the customer, be sure to erase any service codes which might be stored in the ABS hydraulic unit. Using the self-diagnosis feature, make sure that the ABS indicator light (LED) lights. A fully charged battery is a must for conducting reliable self-diagnosis. Test run the motorcycle at a speed of more than 20 km/h (12 mph) to see that the ABS indicator light (LED) does not come on. Finally, test run the motorcycle at a speed of more than 30 km/h (20 mph) and brake suddenly to see that the motorcycle stops without loss of steering control and the ABS operates normally (The reaction force generated is felt in the brake lever and pedal.). This completes the final inspection.

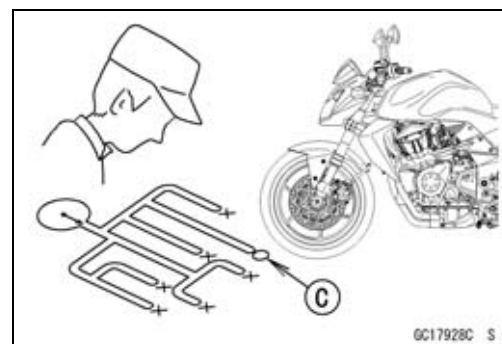
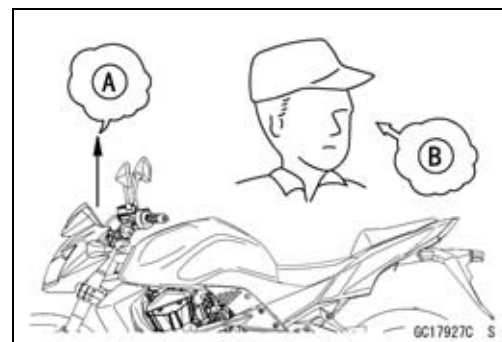




## Anti-Lock Brake System (Equipped Models)

### ABS Troubleshooting Outline

When an abnormality in the system occurs, the ABS indicator light (LED) lights up to alert the rider. In addition, the nature of the fault is stored in the memory of the ABS hydraulic unit and when in the self-diagnosis mode, the service code [A] is indicated by the number of times the ABS indicator light (LED) blinks. The service codes stored in memory are not erased until the mode has been changed to the fault erase mode after the fault has been corrected. Therefore, after correcting the problem, always erase the service codes and then run the self-diagnosis program to confirm normal signal output. When, due to a malfunction, the ABS indicator light (LED) remains lit, get a thorough understanding of the background before starting the repair work. Ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C]. Do not rely solely on the ABS self-diagnosis function, use common sense; check the brakes for proper braking power, and brake fluid level, search for leaks, etc.



Even when the ABS is operating normally, the ABS indicator light (LED) may light up under the conditions listed below. Turn the ignition switch OFF to stop the indicator light. If the motorcycle runs without erasing the service code, the light may light up again.

- After continuous riding on a rough road.
- When the engine is started with the stand raised and the transmission engaged, and the rear wheel turns.
- When accelerating so abruptly that the front wheel leaves the ground.
- When the ABS has been subjected to strong electrical interference.
- When tire pressure is abnormal. Adjust tire pressure.
- When a tire different in size from the standard size is being used. Replace with standard size.
- When the wheel is deformed. Replace the wheel.

Much of the ABS troubleshooting work consists of confirming continuity of the wiring. The ABS parts are assembled and adjusted by the manufacturer, so there is no need to disassemble or repair them. Replace the ABS hydraulic unit.

The basic troubleshooting procedures are listed below.

- Carry out pre-diagnosis inspections as a preliminary inspection.
- Determine the fault using the self-diagnosis function.
- Check wiring and connections from the ABS hydraulic unit connector to the suspected faulty ABS part, using the hand tester.

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

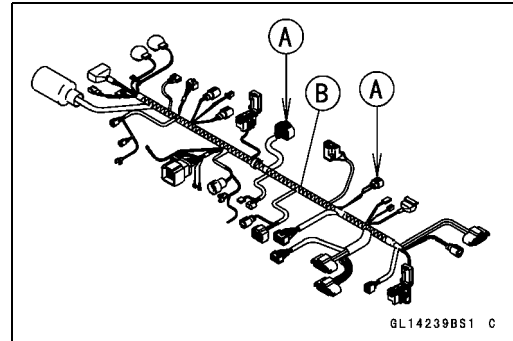
## 12-36 BRAKES

### Anti-Lock Brake System (Equipped Models)

- Visually inspect the wiring for signs of burning or fraying.
- ★ 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.

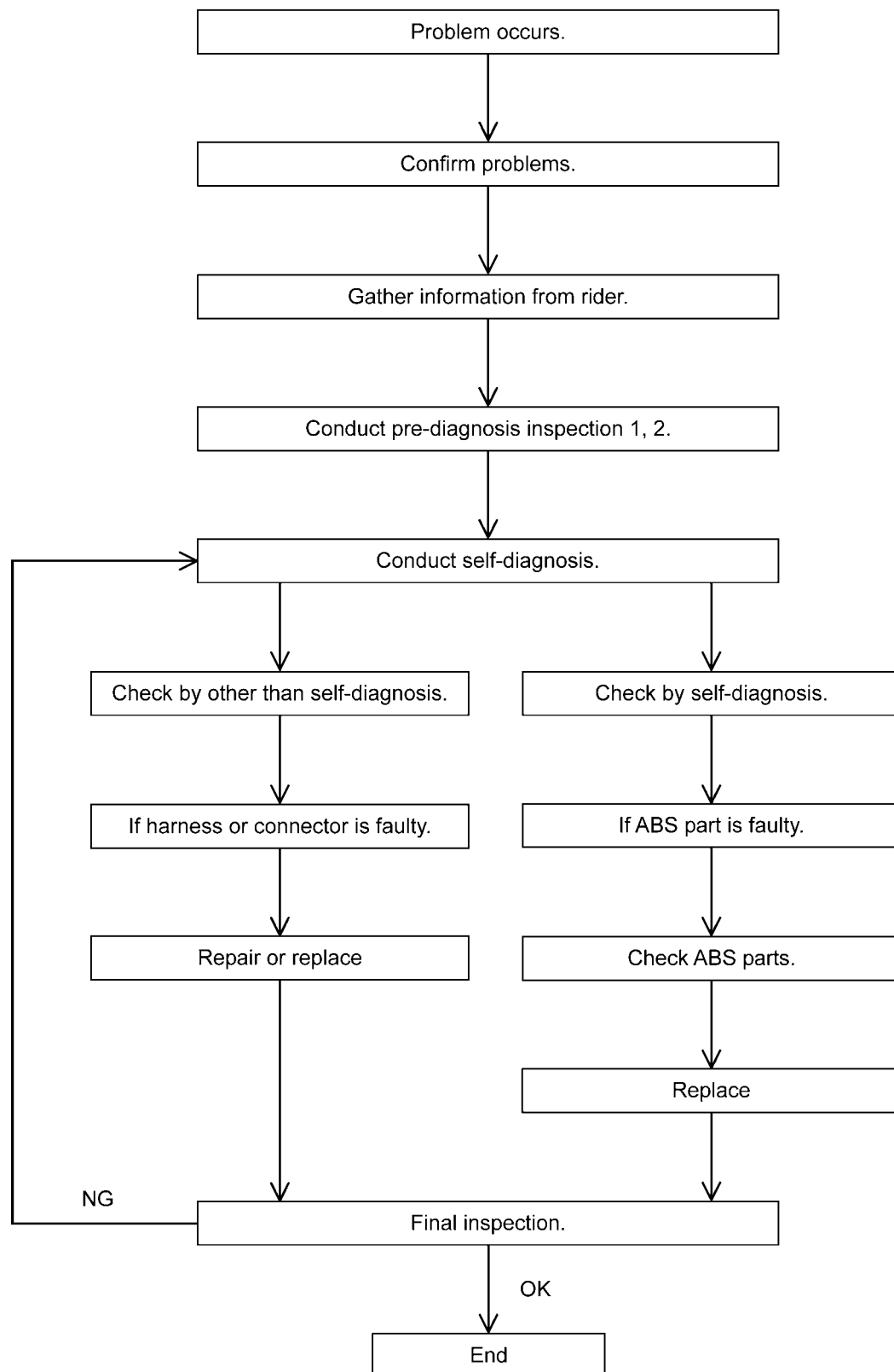
#### **Special Tool - Hand Tester: 57001-1394**

- 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 main harness [B] if necessary.
- Narrow down suspicious parts and close in on the faulty ABS part by repeating the continuity tests.
- ★ If no abnormality is found in the wiring or connectors, the ABS parts are the next likely suspects. Check each part one by one.
- ★ If an abnormality is found, replace the affected ABS part.



## Anti-Lock Brake System (Equipped Models)

## ABS Diagnosis Flow Chart



## 12-38 BRAKES

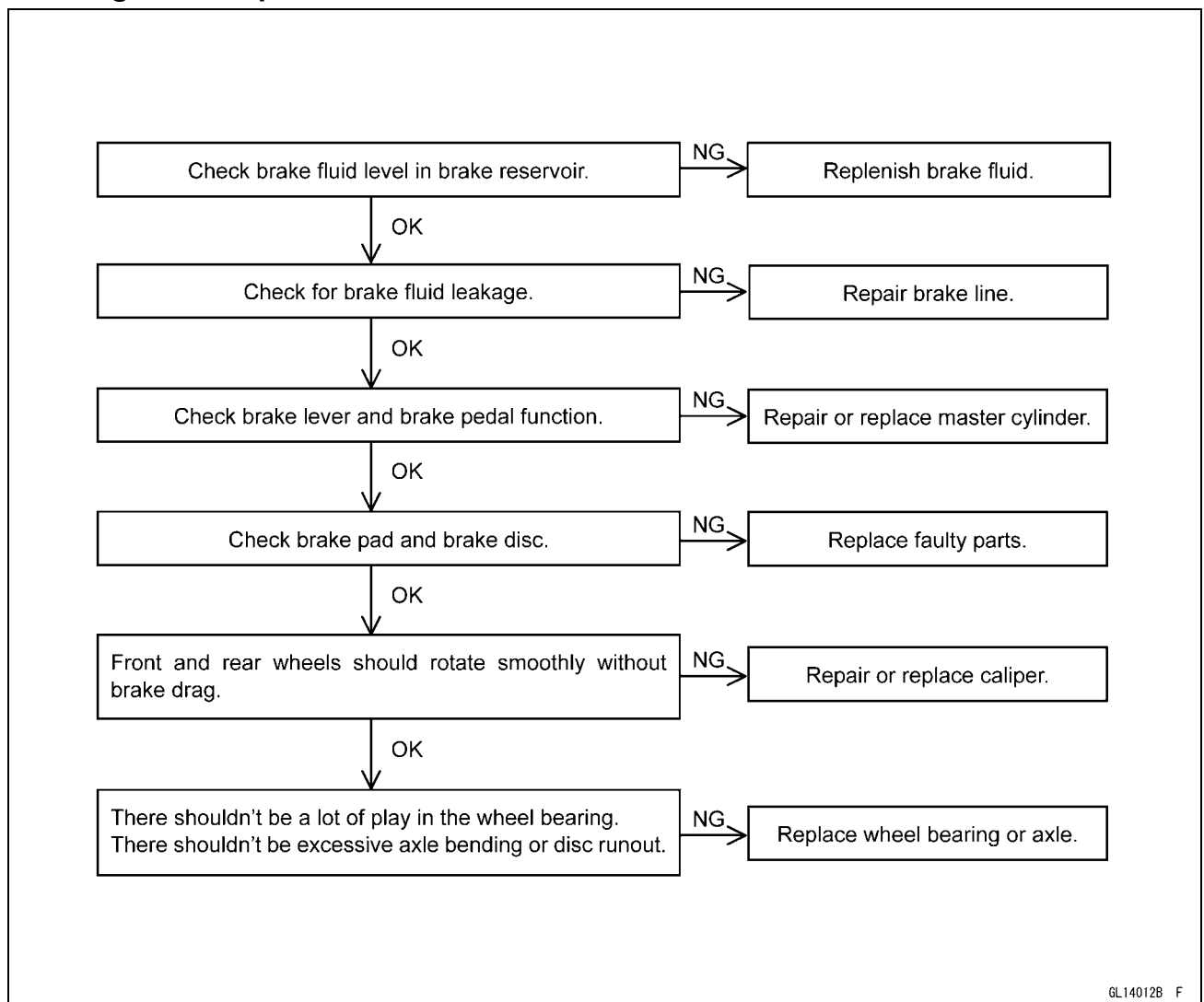
### Anti-Lock Brake System (Equipped Models)

#### *Inquiries to Rider*

- Each rider reacts to problems in different ways, so it is important to confirm what kind of condition the rider is dissatisfied with.
- Try to find out exactly what problem occurs under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem in the shop.
- The diagnosis sheet will help prevent you from overlooking any keys, so always use it.

#### Sample Diagnosis Sheet

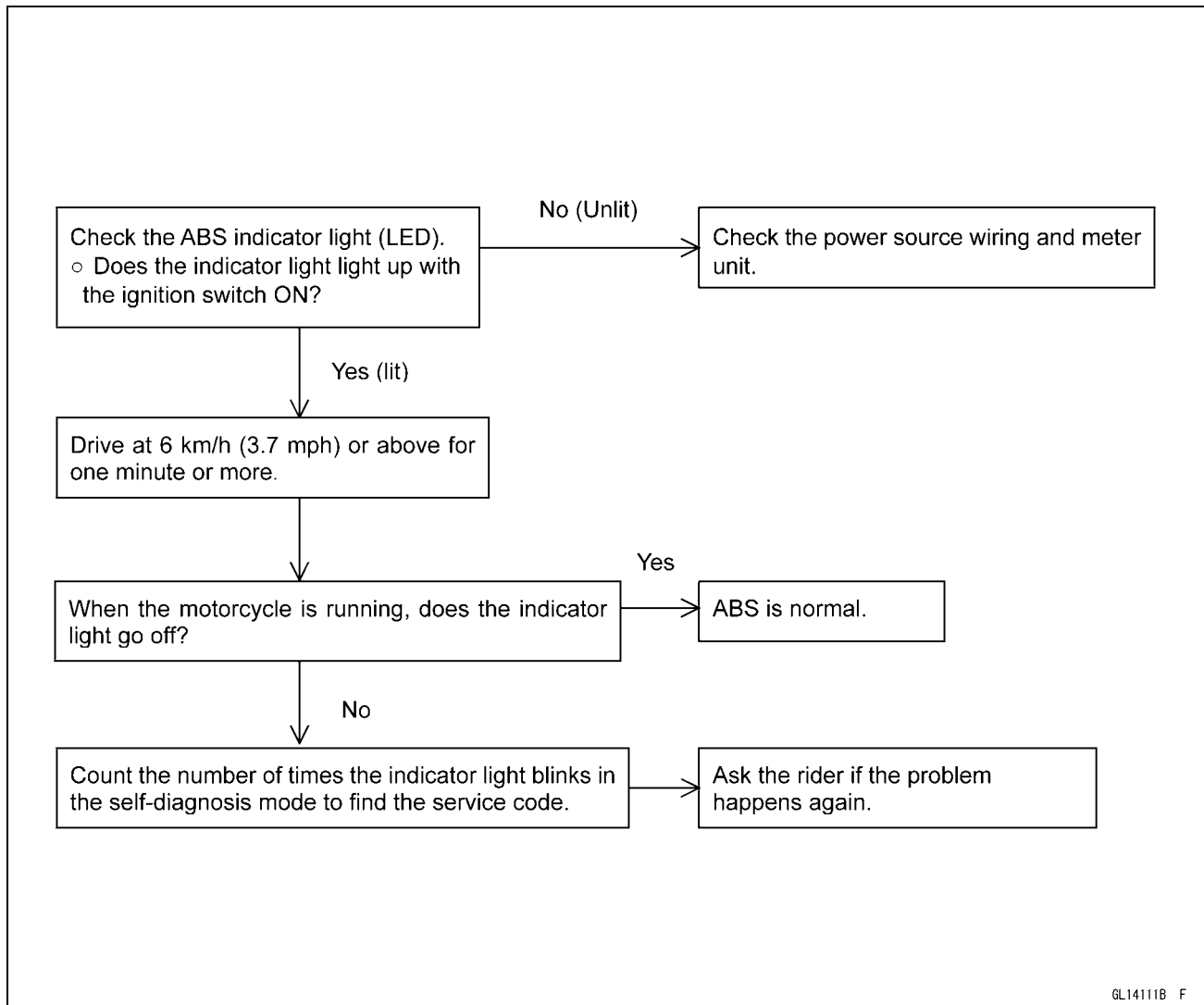
Rider name:				Registration No. (license plate No.):			
Year of initial registration:				Model:			
Engine No.:				Frame No.:			
Date problem occurred:				Frequency:			
Weather:				Mileage:			
Phenomenon	<input type="checkbox"/> Brake lever vibration or noise	<input type="checkbox"/> Indicator light blinks	<input type="checkbox"/> Braking distance too long	<input type="checkbox"/> Abnormal brake lever movement	<input type="checkbox"/> ABS not working	<input type="checkbox"/> ABS works but indicator light doesn't light up	<input type="checkbox"/> ABS operating too frequently
	<input type="checkbox"/> Pedal vibration or noise	<input type="checkbox"/> Indicator light remains lit up		<input type="checkbox"/> Abnormal pedal movement			
Engine conditions at problem	<input type="checkbox"/> At start-up <input type="checkbox"/> After starting <input type="checkbox"/> At 5 000 r/min (rpm) or more						
Road conditions	<input type="checkbox"/> Slippery road                      ( <input type="checkbox"/> snow, <input type="checkbox"/> gravel, <input type="checkbox"/> other        ) <input type="checkbox"/> Rough surface <input type="checkbox"/> Other						
Driving conditions	<input type="checkbox"/> High-speed cornering <input type="checkbox"/> Driving 10 km/h (6 mph) or above <input type="checkbox"/> Driving below 10 km/h (6 mph) <input type="checkbox"/> When stopping <input type="checkbox"/> When turning						
Brake application	<input type="checkbox"/> Gradual <input type="checkbox"/> Abrupt						
Other conditions	<input type="checkbox"/> Large brake lever stroke <input type="checkbox"/> Large pedal stroke						

**Anti-Lock Brake System (Equipped Models)****Pre-Diagnosis Inspection 1**

## 12-40 BRAKES

### Anti-Lock Brake System (Equipped Models)

#### Pre-Diagnosis Inspection 2



#### Self-diagnosis Outline

When the indicator light has blinked or come on, the ABS hydraulic unit memorizes and stores the service code for the service person to troubleshoot easily. The service code memory is powered directly by the battery and cannot be canceled by the ignition switch.

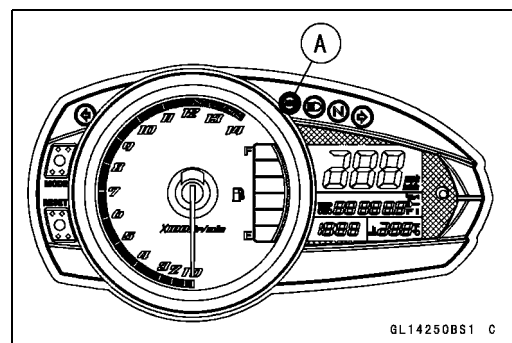
The ABS hydraulic unit can memorize up to all service codes (14 codes). Further service codes are memorized after erasing the preceding all service codes (14 codes). If there is no fault, the ABS indicator light (LED) lights, indicating that "The ABS is normal".

#### Self-diagnosis Procedures

○When a problem occurs with the ABS system, the ABS indicator light (LED) [A] lights.

##### NOTE

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

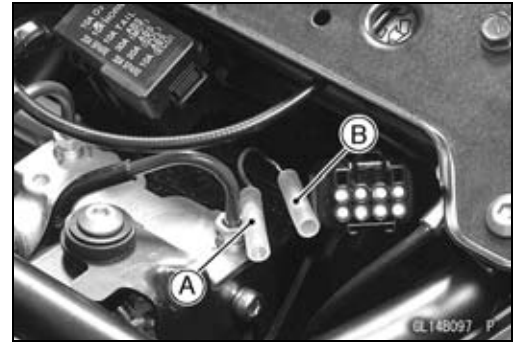


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**Anti-Lock Brake System (Equipped Models)**

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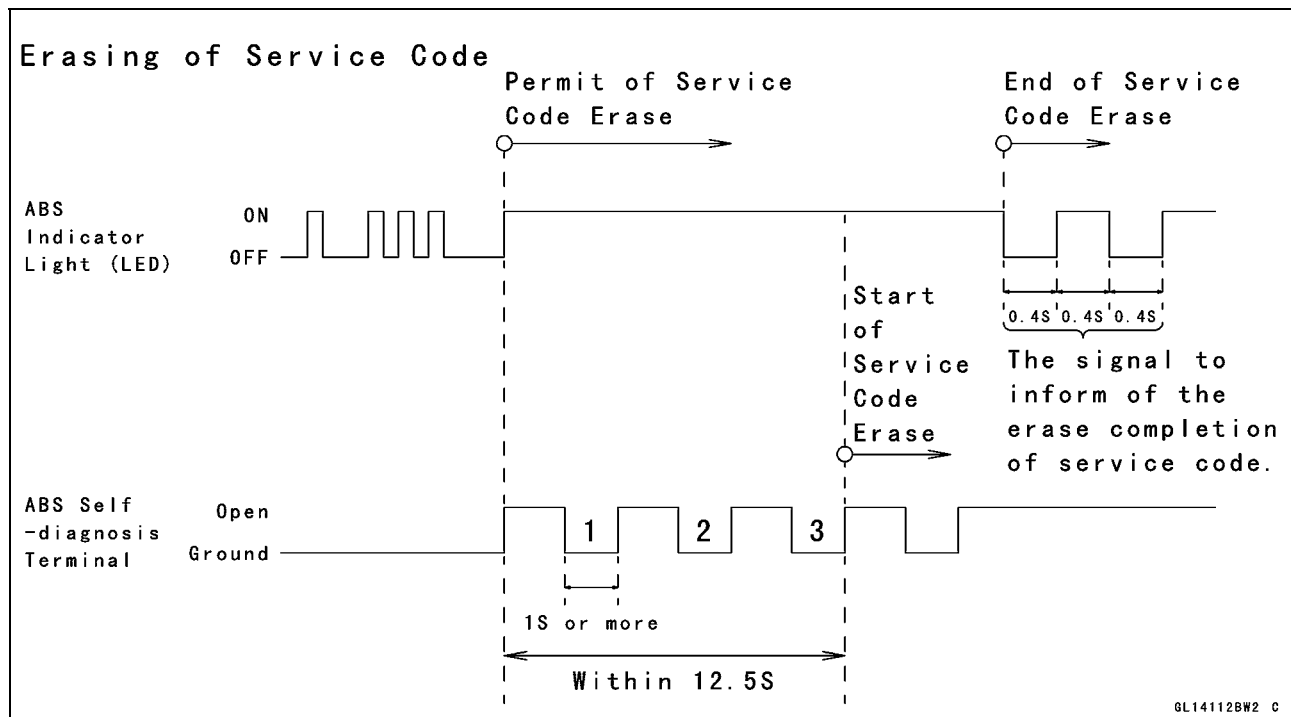
- Remove the seats (see Rear/Front Seat Removal in the Frame chapter).
- Ground the self-diagnosis terminal [A] (Gray) to the ground terminal [B] (Black/Yellow), using a lead.
- Turn on the ignition switch.
- Count the blinks of the light to read the service code. Keep the auxiliary lead ground until you finish reading the service code.

**Service Code Clearing Procedures**

- Start the service code erase mode with the following procedure.
- The erase mode starts when the ABS self-diagnosis terminal is disconnected from the ground terminal after starting the self-diagnosis mode.
- The service code can be erased by grounding and ungrounding (each time for at least one second) the ABS self-diagnosis terminal three times or more within about 12.5 seconds after starting the erase mode.
- The ABS indicator light (LED) remains lit during the erase mode.
- After erasing, the ABS indicator light (LED) blinks and lights.
- Once erasing is finished, enter the self-diagnosis mode again to confirm that the service codes have been erased. If the ABS has been reset and all codes have been erased, the ABS indicator light (LED) lights.

## 12-42 BRAKES

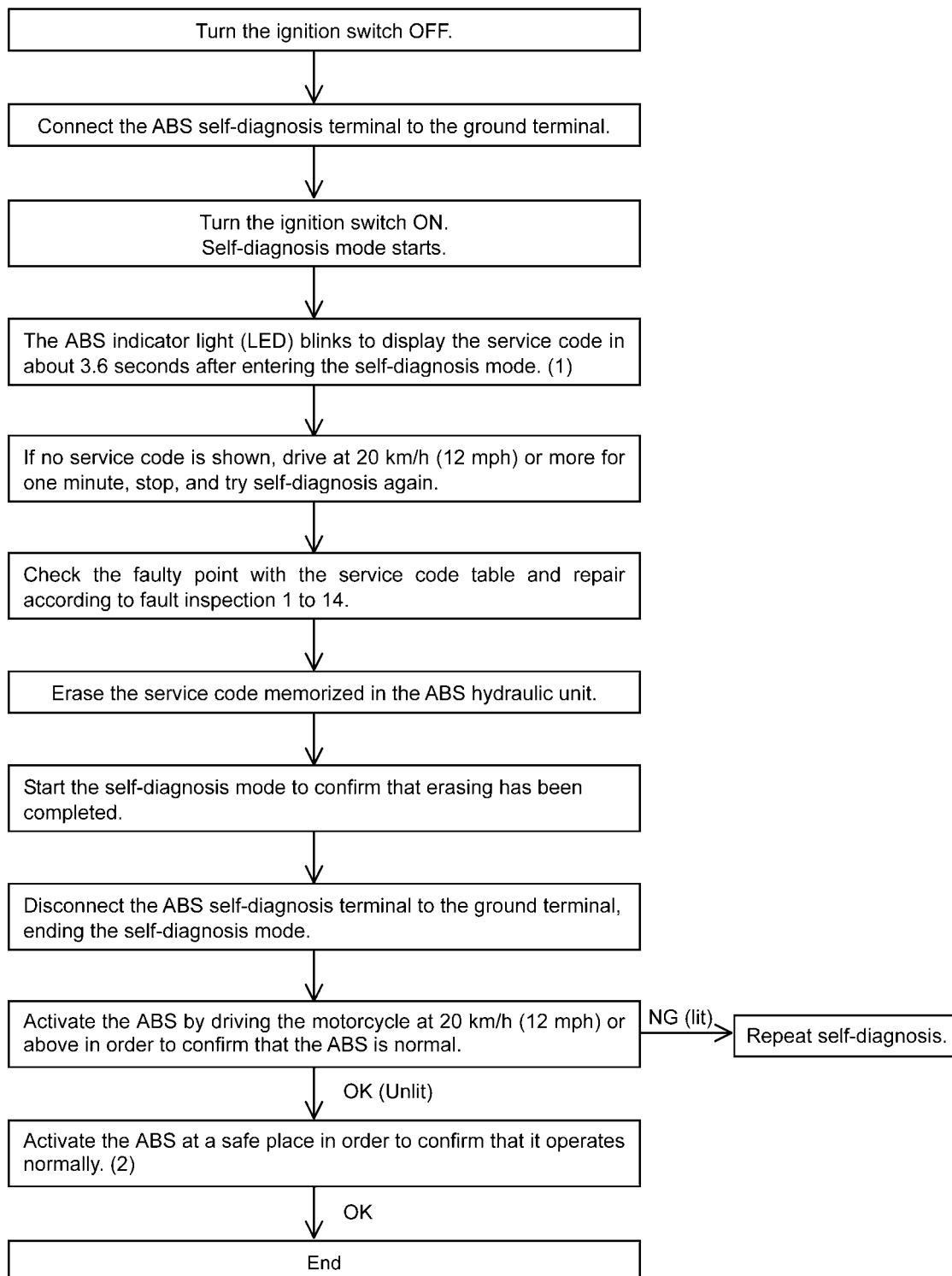
### Anti-Lock Brake System (Equipped Models)





## Anti-Lock Brake System (Equipped Models)

### Self-diagnosis Flow Chart



(1): The self-diagnosis mode ends following.

When the ignition switch is OFF.

When the motorcycle is driven while in the self-diagnosis mode.

When the self-diagnosis terminal disconnects.

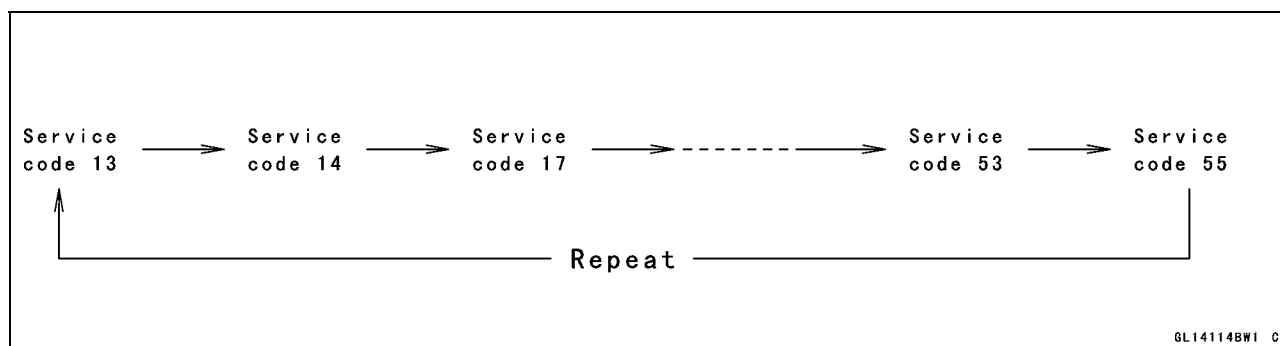
(2): Apply brake suddenly at 30 km/h (19 mph) or more to confirm that the motorcycle stops smoothly and steady with pulsation on the brake lever and pedal.

## 12-44 BRAKES

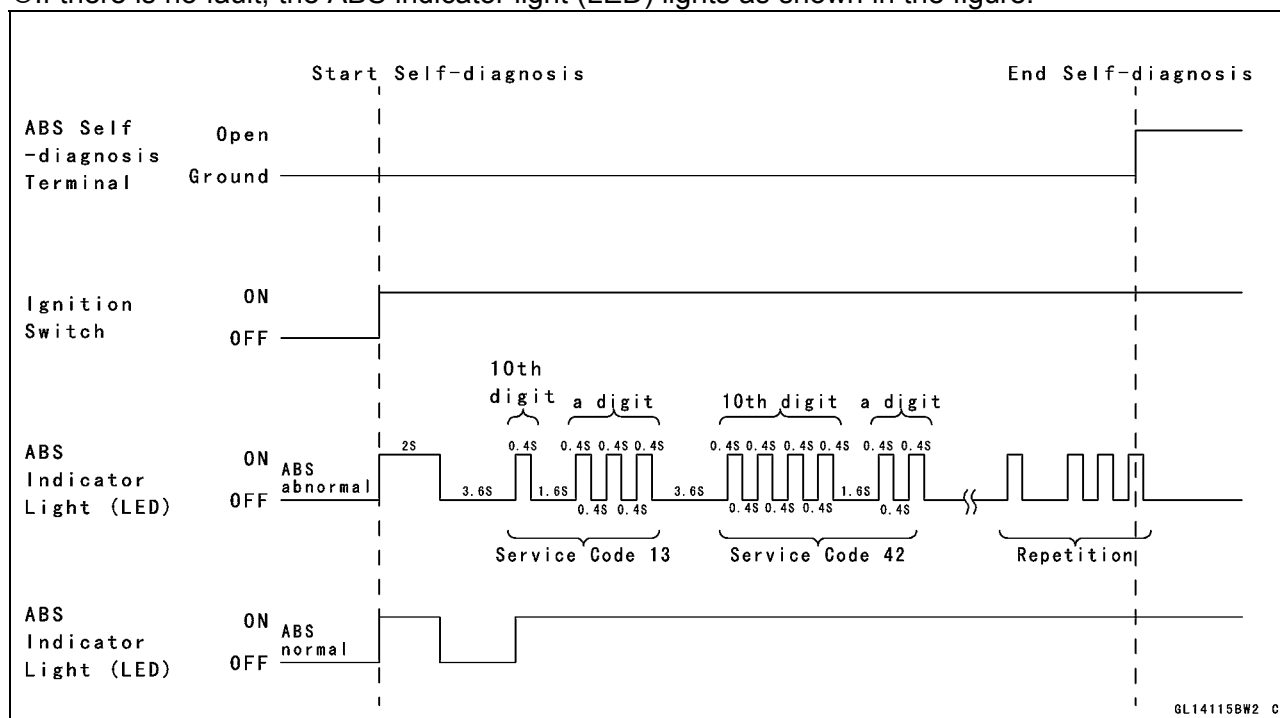
### Anti-Lock Brake System (Equipped Models)

#### How to Read Service Codes

- Service codes are shown by a series of long and short blinks of the ABS indicator light (LED) as shown below.
- Read 10th digit and unit digit as the ABS indicator light (LED) blinks.
- When there are a number of faults, a maximum of all service codes (14 codes) can be stored and the display will begin starting from the small number code entered.
- For the display pattern, first the smallest number code is shown, next up to all service codes (14 codes) starting with the last one stored, then the display is repeated from the smallest number code once again.



- If there is no fault, the ABS indicator light (LED) lights as shown in the figure.






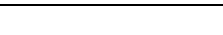
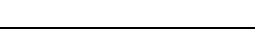

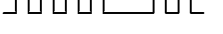
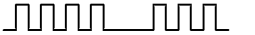


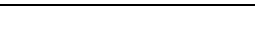
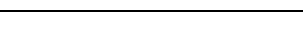


#### How to Erase Service Codes

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

## Anti-Lock Brake System (Equipped Models)

### Service Code Table

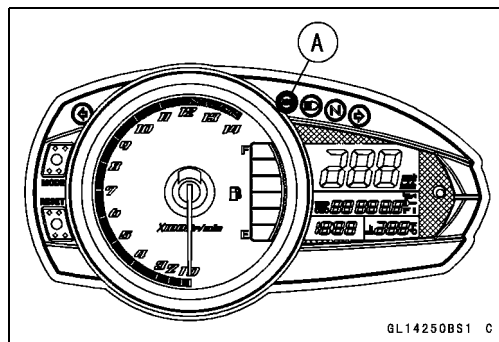
Service Code	ABS Indicator Light (LED)	Problems	Light State
13	 ON OFF	Rear inlet solenoid valve trouble (shorted or open, stuck valve (ON))	ON
14		Rear outlet solenoid valve trouble (shorted or open, stuck valve (ON))	ON
17		Front inlet solenoid valve trouble (shorted or open, stuck valve (ON))	ON
18		Front outlet solenoid valve trouble (shorted or open, stuck valve (ON))	ON
19		ABS solenoid valve relay trouble (wiring shorted or open, stuck relay (ON or OFF))	ON
25		Front, rear tire abnormal (substandard tire, deformation wheel, sensor rotor teeth number wrong)	ON
35		ABS motor relay trouble (wiring shorted, open or lock, stuck relay (ON or OFF))	ON
42		Front wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)	ON
43		Front wheel rotation sensor wiring abnormal (wiring shorted or open)	ON
44		Rear wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)	ON
45		Rear wheel rotation sensor wiring abnormal (wiring shorted or open)	ON
52		Power supply voltage abnormal (under-voltage)	ON
53		Power supply voltage abnormal (over-voltage)	ON
55		ECU trouble (ECU operation abnormal)	ON

## 12-46 BRAKES

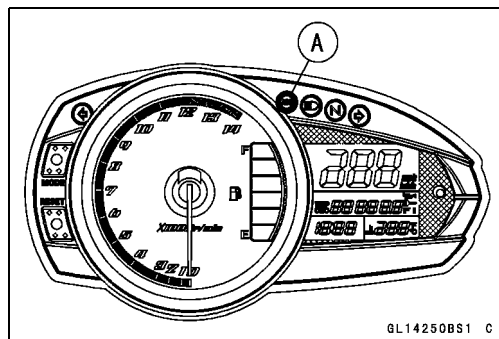
### Anti-Lock Brake System (Equipped Models)

#### **ABS Indicator Light (LED) Inspection**

- Turn the ignition switch ON.
- ★ If the ABS indicator light (LED) [A] lights, it is normal.
- ★ If the ABS indicator light (LED) does not light, go to step “ABS Indicator Light (LED) is Unlit (When the Ignition Switch turned to ON)”.



- Turn the ignition switch OFF.
- ★ If the ABS indicator light (LED) [A] does not light, it is normal.
- ★ If the ABS indicator light (LED) lights, go to step “ABS Indicator Light (LED) Lights (When the Motorcycle is Running, - No Service Code)”.



#### **ABS Indicator Light (LED) is Unlit (When the Ignition Switch turned to ON)**

- Do the 1st step test.
- Check the terminal voltage between the black/white lead terminal of the meter connector [A] and ground.

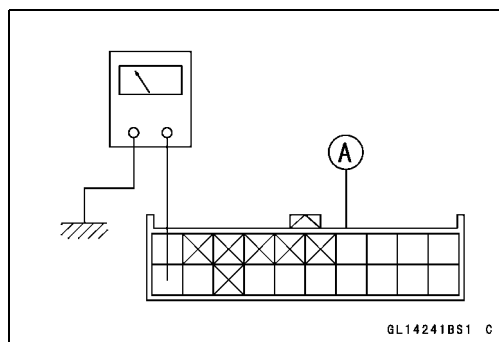
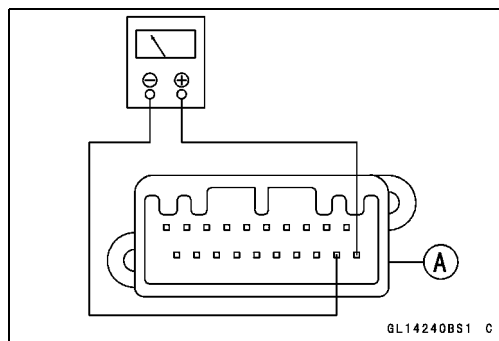
**Special Tool - Hand Tester: 57001-1394**

- Turn the ignition switch ON.

##### **Terminal Voltage**

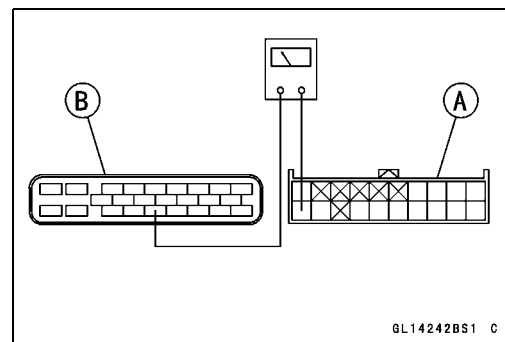
**Standard: About 10 V**

- ★ If the terminal voltage is not within the specification, 2nd step.
- ★ If the terminal voltage correct, replace the meter assembly.
- Do the 2nd step test.
- Disconnect the meter connector.
- Check for continuity between the black/white lead terminal of the main harness side connector [A] and ground.
- ★ If there is the continuity in the lead, replace or repair the main harness.
- ★ If there is not the continuity in the lead, 3rd step.



## Anti-Lock Brake System (Equipped Models)

- Do the 3rd step test.
- Disconnect the ABS hydraulic unit connector.
- Check for continuity between the black/white lead terminal of the main harness side connector [A] and black/white lead terminal of the main harness side connector [B].
- ★ If there is the continuity in the lead, replace the ABS hydraulic unit.
- ★ If there is not the continuity in the lead, replace or repair the main harness.

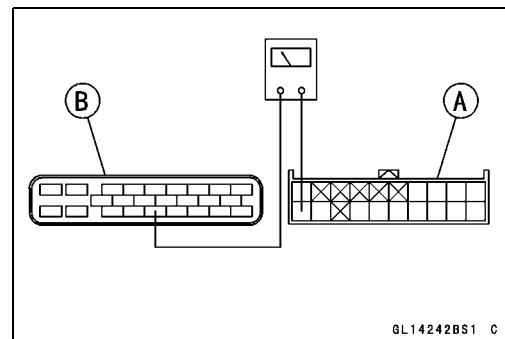


### **ABS Indicator Light (LED) Lights (When the Motorcycle is Running, - No Service Code)**

- Do the 1st step test.
- Disconnect the ABS hydraulic unit connector and meter connector.
- Check for continuity between the black/white lead terminal of the main harness side connector [A] and black/white lead terminals of the main harness side connector [A].

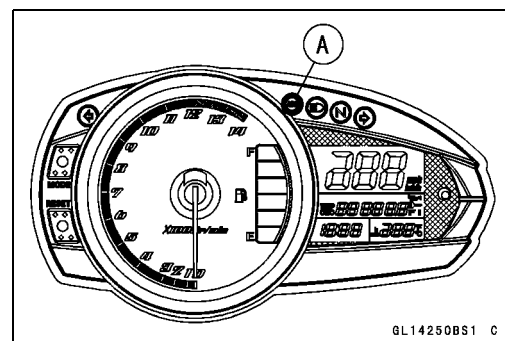
**Special Tool - Hand Tester: 57001-1394**

- ★ If there is the continuity in the lead, replace the ABS hydraulic unit.
- ★ If there is not the continuity in the lead, replace or repair the main harness.



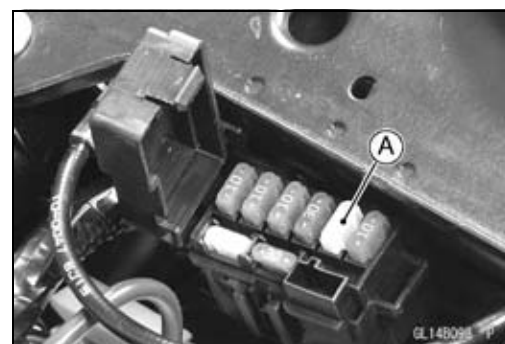
### **Solenoid Valve Inspection (Service Code 13,14,17,18)**

- Do the 1st step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty solenoid valve in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



### **ABS Solenoid Valve Relay Inspection (Service Code 19)**

- Do the 1st step test.
- Check the ABS solenoid valve relay fuse (20 A) [A].
- ★ If the fuse blown, 2nd step.
- ★ If the fuse correct, 4th step.

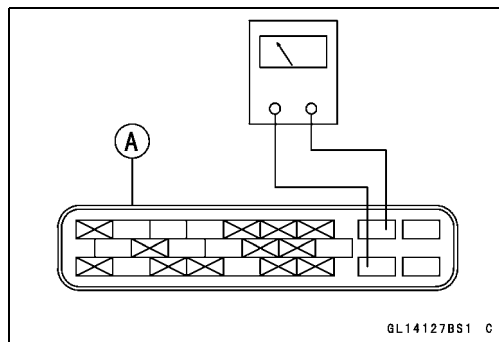


## 12-48 BRAKES

### Anti-Lock Brake System (Equipped Models)

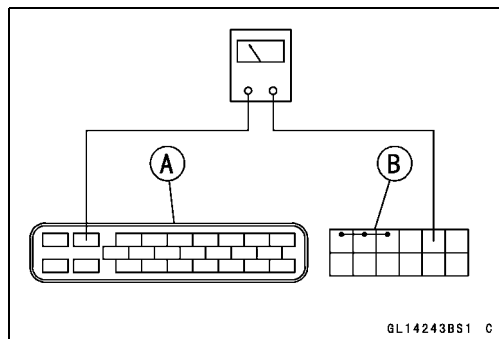
- Do the 2nd step test.

- Disconnect the ABS hydraulic unit connector [A].
- Check for continuity between the light green and black/yellow lead terminals of the ABS hydraulic unit connector.
- ★ If there is the continuity in the lead, replace the ABS hydraulic unit.
- ★ If there is not the continuity in the lead, 3rd step.



- Do the 3rd step test.

- Check for continuity between the light green lead terminal of the main harness side connector [A] and light green lead terminal of the fuse box [B].
- ★ If there is the continuity in the lead, replace the fuse.
- ★ If there is not the continuity in the lead, replace or repair the main harness.



- Do the 4th step test.

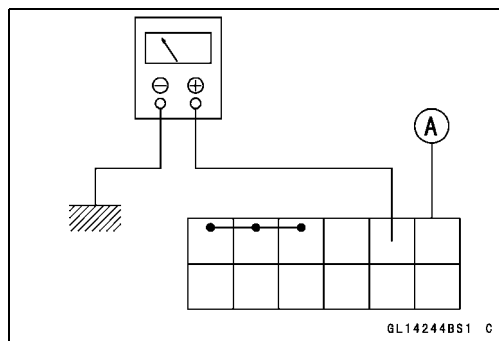
- Check the battery terminal voltage between the light green lead terminal of the fuse box [A] and ground.

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

**Battery Terminal Voltage**

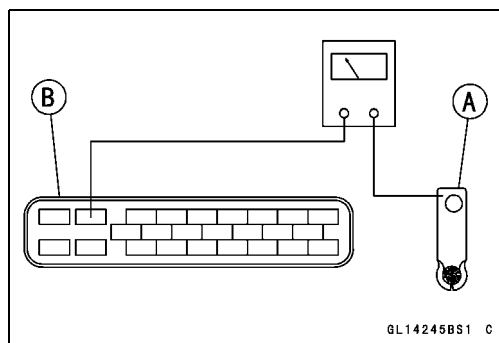
**Standard: Battery Voltage**

- ★ If the battery terminal voltage is not within the specification, 5th step.
- ★ If the battery terminal voltage correct, 6th step.



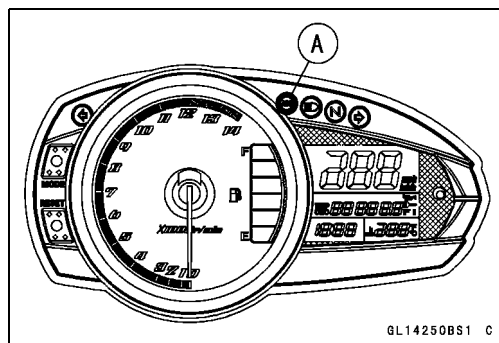
- Do the 5th step test.

- Check for continuity between the positive cable [A] of the battery and light green lead terminal of the main harness side connector [B].
- ★ If there is the continuity in the lead, 4th step.
- ★ If there is not the continuity in the lead, replace or repair the main harness.



- Do the 6th step test.

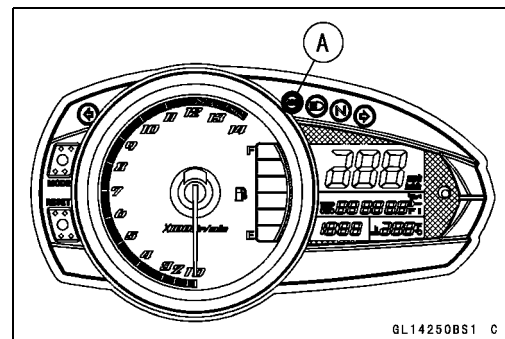
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ABS solenoid valve relay in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



## Anti-Lock Brake System (Equipped Models)

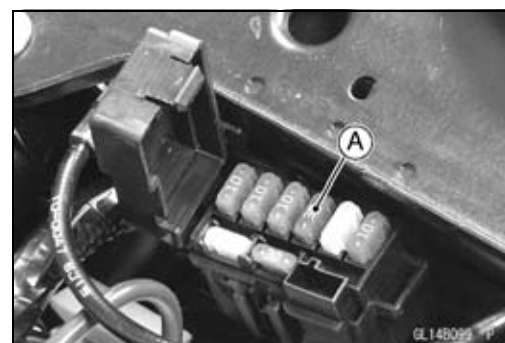
### Front, Rear Wheel Rotation Difference Abnormal (Service Code 25)

- Do the 1st step test.
- Check the following and correct the faulty part.
  - Incorrect the tire pressure.
  - Tires not recommended for the motorcycle were installed (incorrect tire size).
  - Deformation of the wheel or tire.
  - Sensor rotor for missing teeth and clogging with foreign matter.
- ★ If the all parts correct, 2nd step.
- Do the 2nd step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).

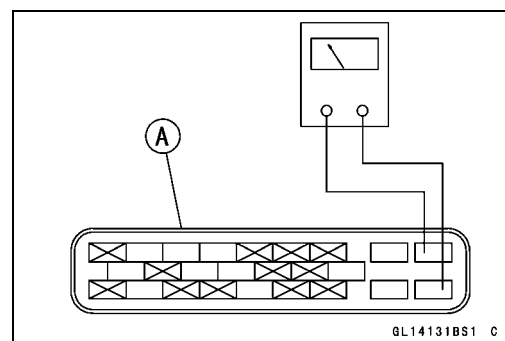


### ABS Pump Motor Relay Inspection (Service Code 35)

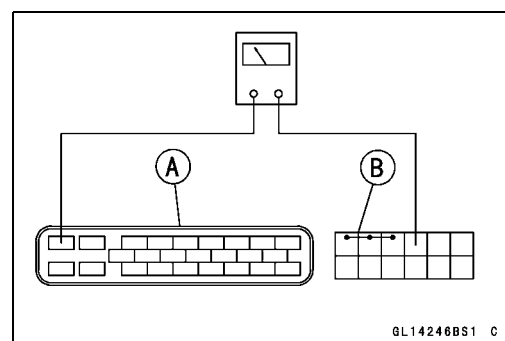
- Do the 1st step test.
- Check the ABS pump motor relay fuse (30 A) [A].
- ★ If the fuse blown, 2nd step.
- ★ If the fuse correct, 4th step.



- Do the 2nd step test.
- Disconnect the ABS hydraulic unit connector.
- Check for continuity between the red and light blue lead terminals of the ABS hydraulic unit connector [A].
- ★ If there is the continuity in the lead, replace the ABS hydraulic unit.
- ★ If there is not the continuity in the lead, 3rd step.



- Do the 3rd step test.
- Check for continuity between the red lead terminal of the main harness side connector [A] and red lead terminal of the fuse box [B].
- ★ If there is the continuity in the lead, replace the fuse.
- ★ If there is not the continuity in the lead, replace or repair the main harness.



## 12-50 BRAKES

### Anti-Lock Brake System (Equipped Models)

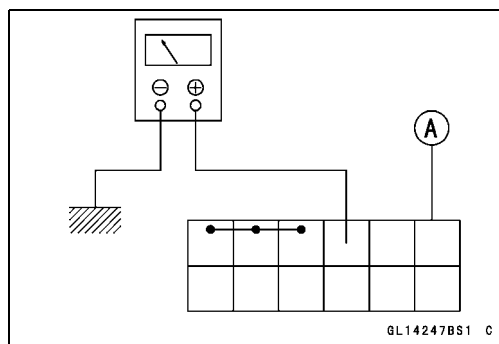
- Do the 4th step test.
- Check the battery terminal voltage between the red lead terminal of the fuse box [A] and ground.

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

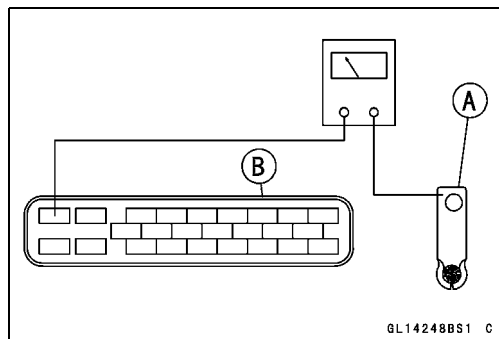
#### Battery Terminal Voltage

**Standard:            Battery Voltage**

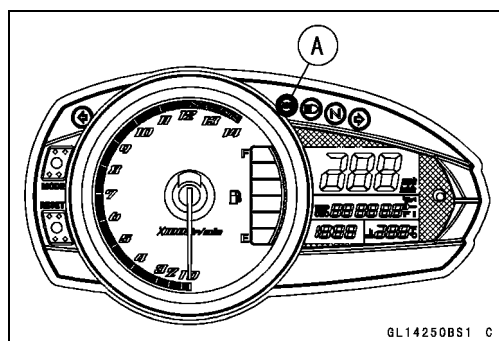
- ★ If the battery terminal voltage is not within the specification, 5th step.
- ★ If the battery terminal voltage correct, 6th step.



- Do the 5th step test.
- Check for continuity between the positive cable [A] of the battery and red lead terminal of the main harness side connector [B].
- ★ If there is the continuity in the lead, 4th step.
- ★ If there is not the continuity in the lead, replace or repair the main harness.



- Do the 6th step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ABS pump motor relay in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



#### Front Wheel Rotation Sensor Signal Abnormal (Service Code 42)

- Do the 1st step test.
- Measure the air gap between the front wheel rotation sensor and sensor rotor.

Thickness Gauge [A]

#### Air Gap

**Standard:            0.7 ~ 0.9 mm (0.028 ~ 0.035 in.)**

- ★ If the measurement is over standard, check each part for deformation and looseness and correct accordingly. Recheck the air gap.
- ★ If the measurement is correct, 2nd step.



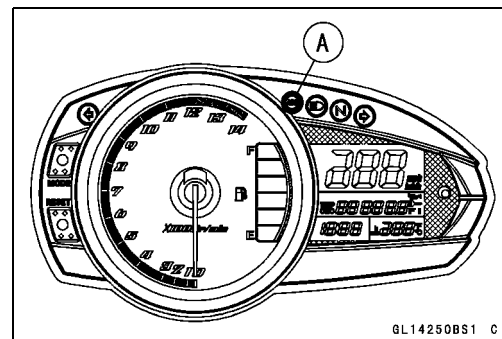


## Anti-Lock Brake System (Equipped Models)

- Do the 2nd step test.
- Check that there is iron or other magnetic deposits between the sensor [A] and sensor rotor [B], and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor and sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).
- ★ If the sensor and sensor rotor in bad condition, remove the any deposits. Install the properly or replace faulty part.
- ★ If the all correct, 3rd step.

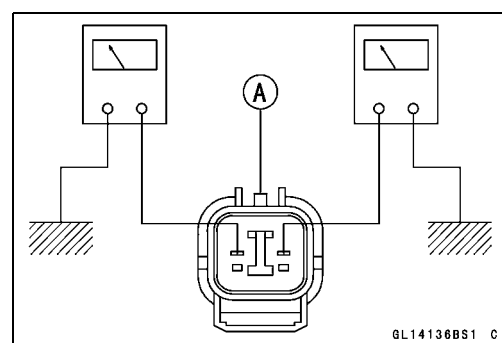
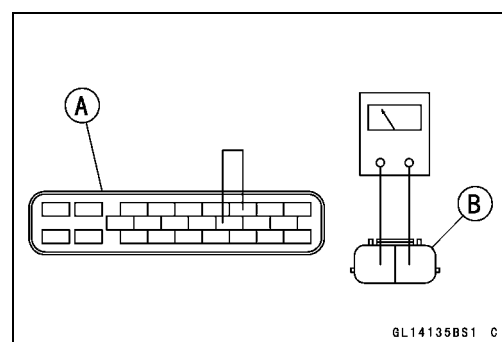


- Do the 3rd step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



### Front Wheel Rotation Sensor Wiring Inspection (Service Code 43)

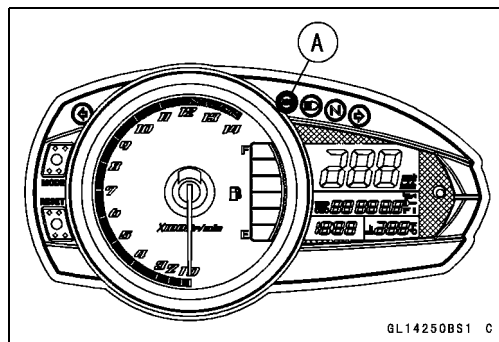
- Do the 1st step test.
- Disconnect the ABS hydraulic unit connector and front wheel rotation sensor connector.
- Short the black/red and green lead terminals of the main harness side connector [A] with a jumper lead, and check for continuity between the black/red and green lead terminals of the main harness side connector [B].
- ★ If there is the continuity in the lead, 2nd step.
- ★ If there is not the continuity in the lead, replace or repair the main harness.
- Do the 2nd step test.
- Check for continuity between the black lead terminal of the sensor connector [A] and ground, and white lead terminal of the sensor connector and ground.
- ★ If there is the continuity in the lead, replace the front wheel rotation sensor.
- ★ If there is not the continuity in the lead, 3rd step.



## 12-52 BRAKES

### Anti-Lock Brake System (Equipped Models)

- Do the 3rd step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



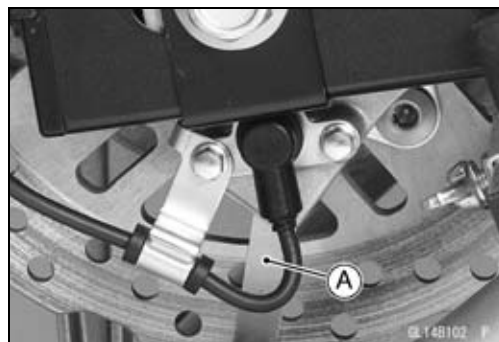
#### **Rear Wheel Rotation Sensor Signal Abnormal (Service Code 44)**

- Do the 1st step test.
- Measure the air gap between the rear wheel rotation sensor and sensor rotor.  
Thickness Gauge [A]

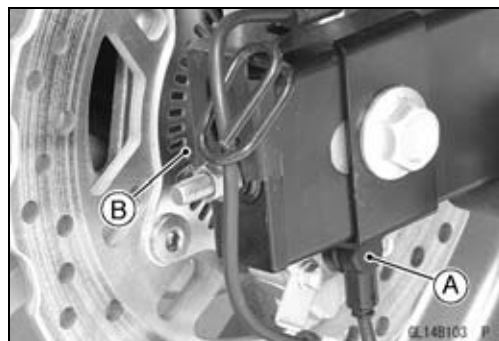
##### **Air Gap**

**Standard:** 0.7 ~ 0.9 mm (0.028 ~ 0.035 in.)

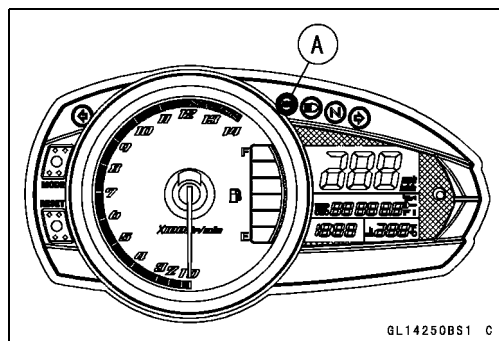
- ★ If the measurement is over standard, check each part for deformation and looseness and correct accordingly. Recheck the air gap.
- ★ If the measurement is correct, 2nd step.



- Do the 2nd step test.
- Check that there is iron or other magnetic deposits between the sensor [A] and sensor rotor [B], and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor and sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).
- ★ If the sensor and sensor rotor in bad condition, remove the any deposits. Install the properly or replace faulty part.
- ★ If the all correct, 3rd step.



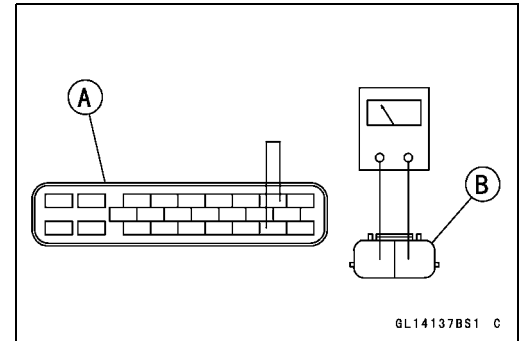
- Do the 3rd step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



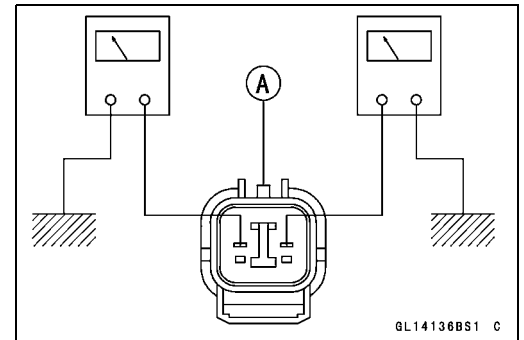
## Anti-Lock Brake System (Equipped Models)

### Rear Wheel Rotation Sensor Wiring Inspection (Service Code 45)

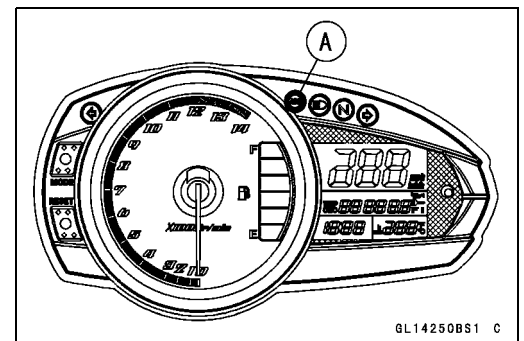
- Do the 1st step test.
- Disconnect the ABS hydraulic unit connector and rear wheel rotation sensor connector.
- Short the black and brown/black lead terminals of the main harness side connector [A] with a jumper lead, and check for continuity between the black and brown/black lead terminals of the main harness side connector [B].
- ★ If there is the continuity in the lead, 2nd step.
- ★ If there is not the continuity in the lead, replace or repair the main harness.



- Do the 2nd step test.
- Check for continuity between the black lead terminal of the sensor connector [A] and ground, and white lead terminal of the sensor connector and ground.
- ★ If there is the continuity in the lead, replace the rear wheel rotation sensor.
- ★ If there is not the continuity in the lead, 3rd step.

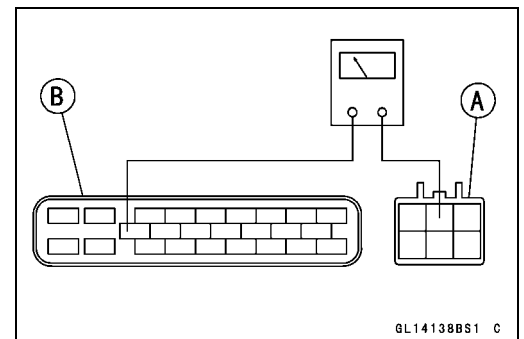


- Do the 3rd step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



### Power Supply Voltage Abnormal (Under-Voltage) (Service Code 52)

- Do the 1st step test.
- Disconnect the ignition switch connector and ABS hydraulic unit connector.
- Check for continuity between the brown lead terminal of the main harness side connector [A] and yellow lead terminal of the main harness side connector [B].
- ★ If there is the continuity in the lead, 2nd step.
- ★ If there is not the continuity in the lead, inspect the ABS ECU fuse (10 A) (see Fuse Inspection in the Electrical System chapter) and replace or repair the main harness.



## 12-54 BRAKES

### Anti-Lock Brake System (Equipped Models)

- Do the 2nd step test.
- Connect the ignition switch connector and ABS hydraulic unit connector.
- Check the battery terminal voltage, connect the hand tester to the brown terminal of ignition switch connector [A] and ground.

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

- Turn the ignition switch ON.

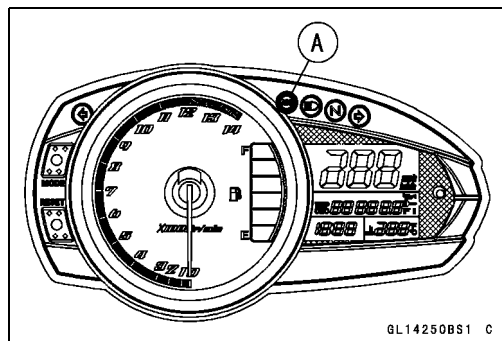
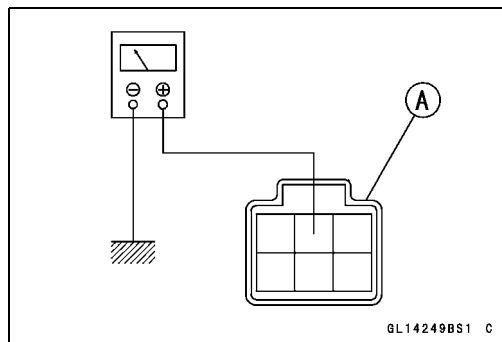
#### Battery Terminal Voltage

**Standard: 10 V or more**

- ★ If the battery terminal voltage is not within the specification, 3rd step.
- ★ If the battery terminal voltage correct, 4th step.

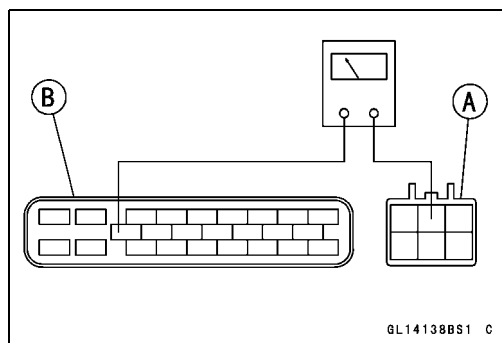
- Do the 3rd step test.
- Inspect the following parts.
  - Battery (see Charging Condition Inspection in the Electrical System chapter)
  - Ignition Switch (see Switch Inspection in the Electrical System chapter)
  - Main Harness (see Wiring Inspection in the Electrical System chapter)
  - Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)

- Do the 4th step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).



#### Power Supply Voltage Abnormal (Over-Voltage) (Service Code 53)

- Do the 1st step test.
- Disconnect the ignition switch connector and ABS hydraulic unit connector.
- Check for continuity between the brown lead terminal of the main harness side connector [A] and yellow lead terminal of the main harness side connector [B].
- ★ If there is the continuity in the lead, 2nd step.
- ★ If there is not the continuity in the lead, inspect the ABS ECU fuse (10 A) (see Fuse Inspection in the Electrical System chapter) and replace or repair the main harness.



## Anti-Lock Brake System (Equipped Models)

- Do the 2nd step test.
- Connect the ignition switch connector and ABS hydraulic unit connector.
- Check the battery terminal voltage, connect the hand tester to the brown terminal of ignition switch connector [A] and ground.

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

- Turn the ignition switch ON.

### Battery Terminal Voltage

**Standard: 16 V or less**

- ★ If the battery terminal voltage is not within the specification, 3rd step.
- ★ If the battery terminal voltage correct, 4th step.

- Do the 3rd step test.
- Check the battery condition and regulator/rectifier (see Charging Condition Inspection, Regulator/Rectifier Inspection in the Electrical System chapter).

- Do the 4th step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).

### ECU Inspection (Service Code 55)

- Do the 1st step test.
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
- ★ If the ABS indicator light (LED) [A] lit, faulty ECU in the ABS hydraulic unit. Replace the ABS hydraulic unit.
- ★ If the ABS indicator light (LED) unlit, ABS system is normal (service code is not stored; temporary failure.).

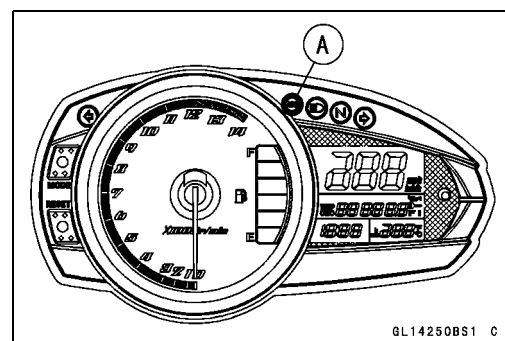
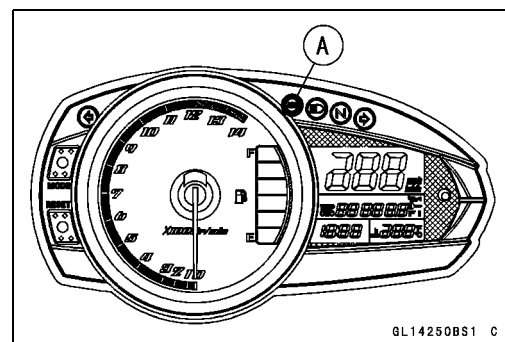
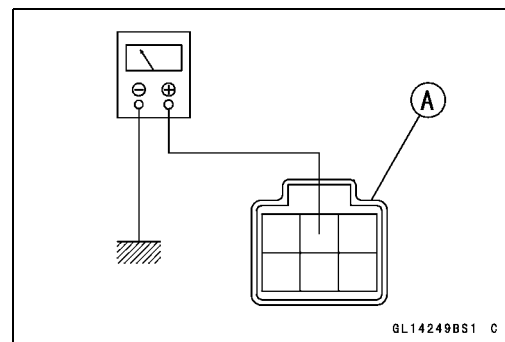
### ABS Hydraulic Unit Removal

#### CAUTION

The ABS hydraulic unit [A] has been adjusted and set with precision at the factory. Therefore, it should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface.

Be careful not to get water or mud on the ABS hydraulic unit.

- Drain the brake fluid from the front and rear brake lines.
- Drain the brake fluid through the bleed valve by pumping the brake lever and pedal.



## 12-56 BRAKES

### Anti-Lock Brake System (Equipped Models)

- Remove:
  - Seats (see Rear/Front Seat Removal in the Frame chapter)
  - Rear Fender (see Flap and Rear Fender Removal in the Frame chapter)
- Clean the ABS hydraulic unit.

#### CAUTION

**Clean all fittings on the ABS hydraulic unit and the rear master cylinder because dirt around the banjo bolts could contaminate the brake fluid in the line during removal/installation.**

**Spread out a shop towel around the ABS hydraulic unit before removing the brake line so that brake fluid does not leak on the parts.**

- Remove the bolt [A].



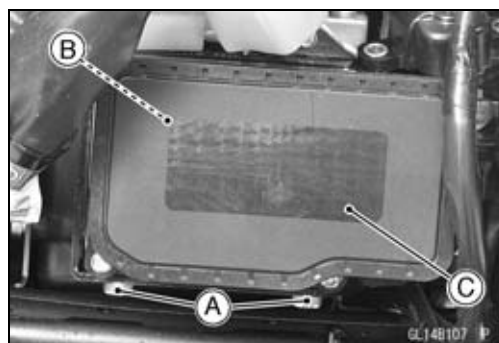
- Disconnect the connector [A].
- Unlock the joint lock [B] as shown in the figure.
- Remove:
  - Bolts [C]
  - Brake Pipe Joint Nuts [D] [E] [F]
- Tape the brake line opening to prevent brake fluid leakage or contamination by foreign matter.



#### CAUTION

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

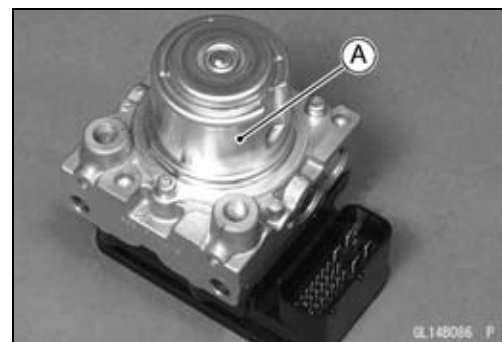
- Remove:
  - Bolts [A]
  - Brake Pipe Joint Nut [B]
  - ABS Hydraulic Unit [C]



## Anti-Lock Brake System (Equipped Models)

### CAUTION

The ABS hydraulic unit [A] has been adjusted and set with precision at the factory. Do not try to disassemble and repair the ABS hydraulic unit.



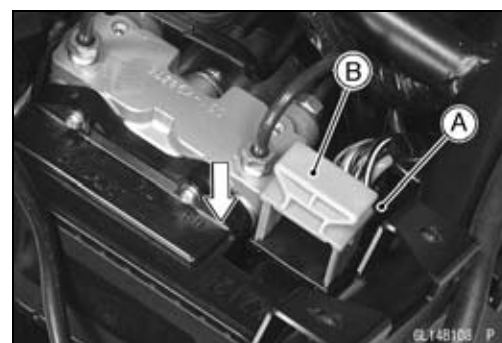
### ABS Hydraulic Unit Installation

- Install the ABS hydraulic unit to the bracket.

### CAUTION

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

- Install the brake pipes correctly.
- Tighten the joint nuts.  
Torque - Brake Pipe Joint Nuts: 18 N·m (1.8 kgf·m, 13 ft·lb)
- Tighten the bolts.
- Run the lead correctly, and connect the connector [A] securely.
- Lock the joint lock [B] as shown in the figure.



- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.
- Install the removed parts (see appropriate chapters).

### ABS Hydraulic Unit Inspection

- Remove the ABS hydraulic unit (see ABS Hydraulic Unit Removal).
- Visually inspect the ABS hydraulic unit.
- ★ Replace the ABS hydraulic unit if any of them are cracked, or otherwise damaged.

## 12-58 BRAKES

### Anti-Lock Brake System (Equipped Models)

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

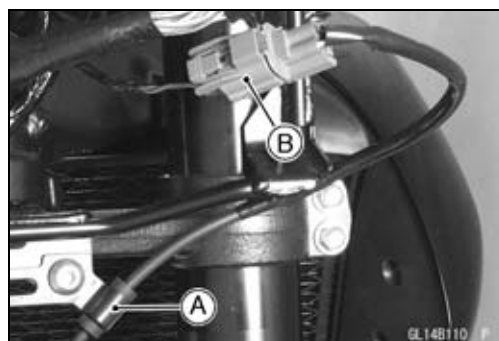


#### Front Wheel Rotation Sensor Removal

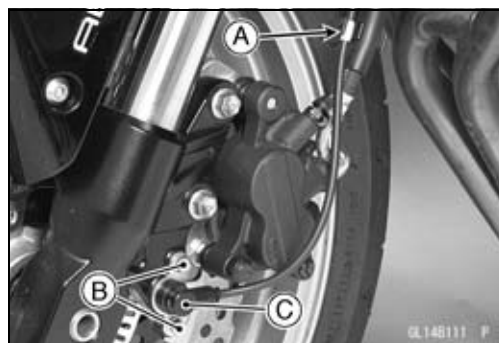
##### CAUTION

The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor. Do not try to disassemble or repair the wheel rotation sensor.

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Clamp [A]
  - Connector [B] (Disconnect)



- Remove:
  - Clamp [A]
  - Bolts [B]
  - Front Wheel Rotation Sensor [C]



#### Front Wheel Rotation Sensor Installation

- Installation is the reverse of removal.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



## Anti-Lock Brake System (Equipped Models)

### Rear Wheel Rotation Sensor Removal

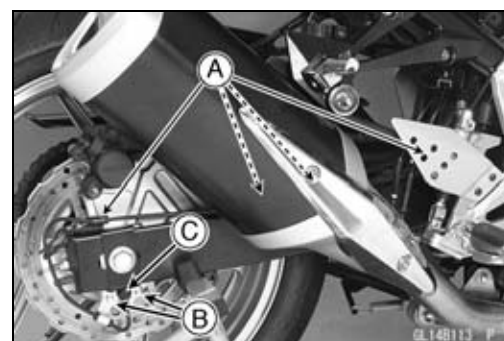
#### CAUTION

The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor. Do not try to disassemble or repair the wheel rotation sensor.

- Remove:  
Right Side Cover (see Side Cover Removal in the Frame chapter)  
Connector [A] (Disconnect)



- Remove:  
Clamps [A]  
Bolts [B]  
Rear Wheel Rotation Sensor [C]



### Rear Wheel Rotation Sensor Installation

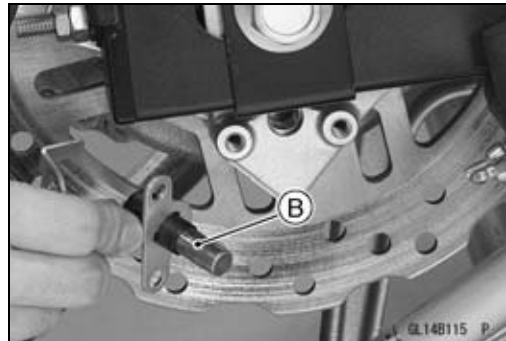
- Installation is the reverse of removal.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## 12-60 BRAKES

### Anti-Lock Brake System (Equipped Models)

#### Wheel Rotation Sensor Inspection

- Remove the front wheel rotation sensor [A] from the front fork.
- Remove the rear wheel rotation sensor [B] from the caliper bracket.
- Visually inspect the wheel rotation sensors.
- ★ Replace the wheel rotation sensor if it is cracked, bent, or otherwise damaged.



#### Wheel Rotation Sensor Air Gap Inspection

- Raise the front/rear wheel off the ground (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Measure the air gap between the sensor and sensor rotor at several points by turning the wheel slowly.  
Thickness Gauge [A]

##### Air Gap

##### Standard:

Front	0.7 ~ 0.9 mm (0.028 ~ 0.035 in.)
Rear	0.7 ~ 0.9 mm (0.028 ~ 0.035 in.)



#### NOTE

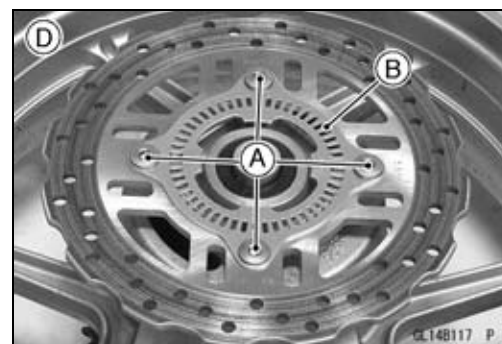
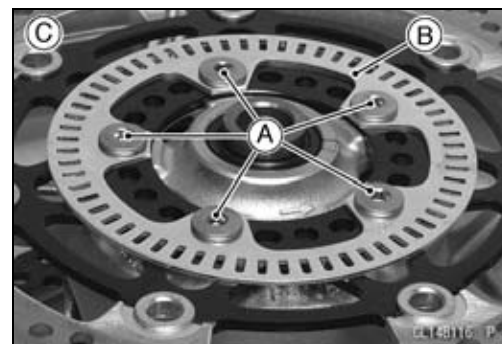
○ The sensor air gap cannot be adjusted.

- ★ If the air gap is not within the specification, inspect the hub bearing (see Hub Bearing Inspection in the Wheels/Tires chapter), sensor installation condition and sensor (see Wheel Rotation Sensor Inspection).

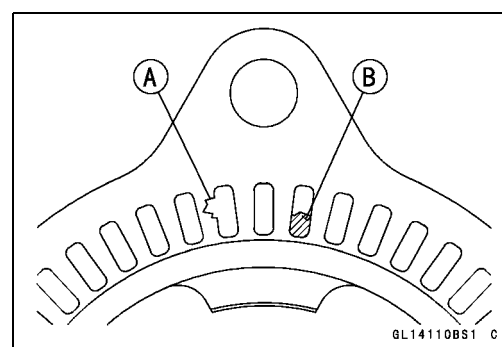
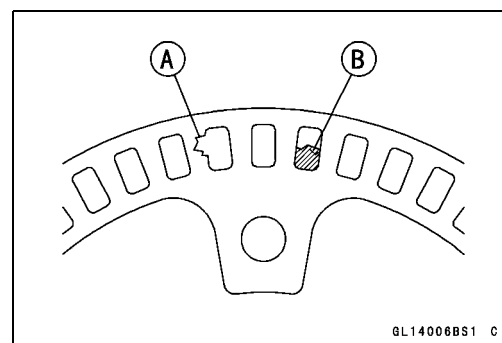
## Anti-Lock Brake System (Equipped Models)

### Wheel Rotation Sensor Rotor Inspection

- Remove:
  - Wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter)
  - Brake Disc Mounting Bolts [A]
  - Sensor Rotor [B]
  - Front Wheel [C]
  - Rear Wheel [D]



- Visually inspect the wheel rotation sensor rotor.
- ★ If the rotor is deformed or damaged (chipped teeth [A]), replace the sensor rotor with a new one.
- ★ If there is iron or other magnetic deposits [B], remove the deposits.



### ABS Solenoid Valve Relay Fuse (20 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

### ABS Motor Relay Fuse (30 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

### ABS ECU Fuse (10 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

## 12-62 BRAKES

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### Anti-Lock Brake System (Equipped Models)

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#### ***Fuse Installation***

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

#### ***Fuse Inspection***

- Remove the fuses (see ABS Solenoid Valve Relay Fuse (20 A)/ABS Motor Relay Fuse (30 A)/ABS ECU Fuse (10 A) Removal).
- Refer to the Fuse Inspection in the Electrical System chapter.

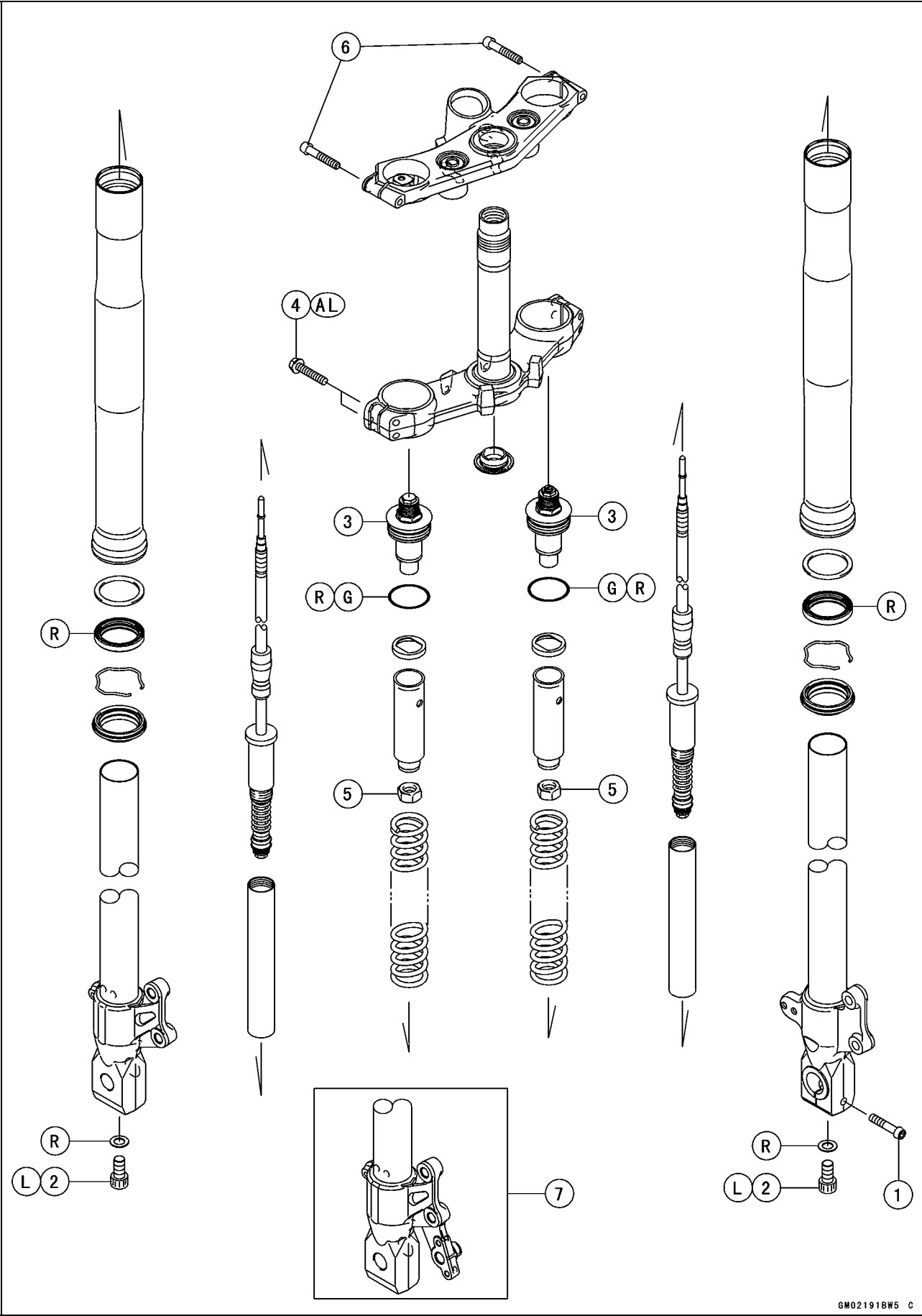
# Suspension

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13-2 SUSPENSION

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Clamp Bolt	20	2.0	15	
2	Front Fork Bottom Allen Bolts	40	4.1	30	L
3	Front Fork Top Plugs	23	2.3	17	
4	Lower Front Fork Clamp Bolts	21	2.1	15	AL
5	Piston Rod Nuts	15	1.5	11	
6	Upper Front Fork Clamp Bolts	20	2.0	15	

7. Inner Tube (ABS Equipped Models)

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

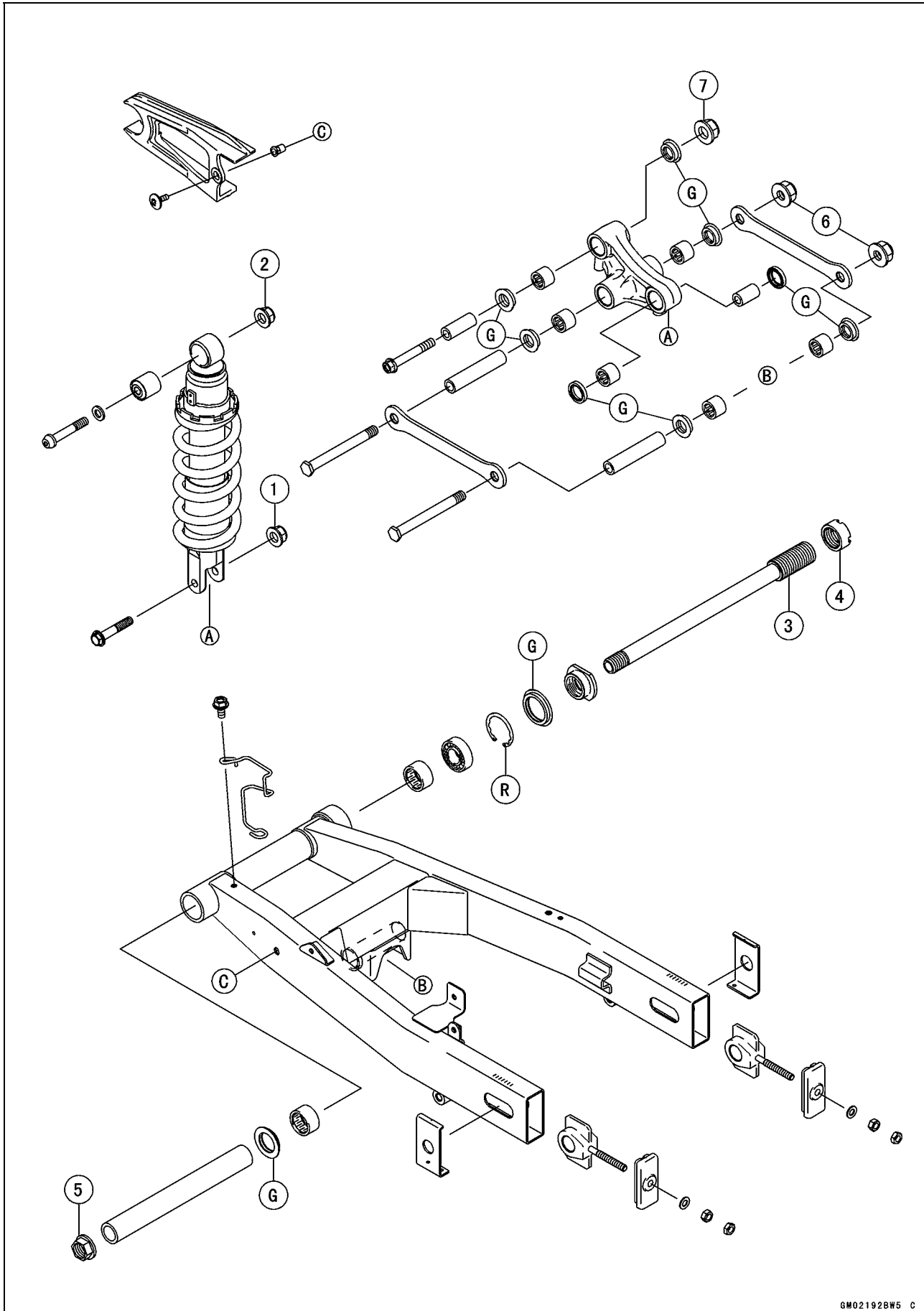
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 13-4 SUSPENSION

### Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Shock Absorber Nut (Lower)	34	3.5	25	
2	Rear Shock Absorber Nut (Upper)	34	3.5	25	
3	Swingarm Pivot Shaft	9.8	1.0	87 in·lb	
4	Swingarm Pivot Shaft Locknut	98	10.0	72.3	
5	Swingarm Pivot Shaft Nut	108	11.0	79.7	
6	Tie-Rod Nuts	59	6.0	44	
7	Uni-Trak Rocker Arm Nut	34	3.5	25	

G: Apply grease.

R: Replacement Parts

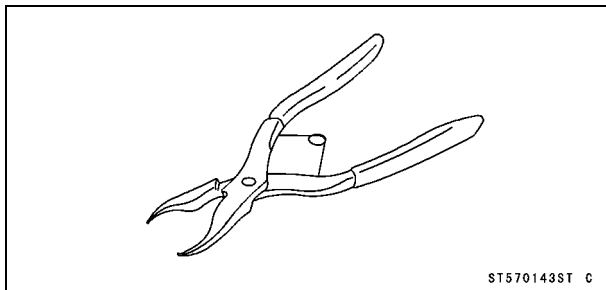
## 13-6 SUSPENSION

### Specifications

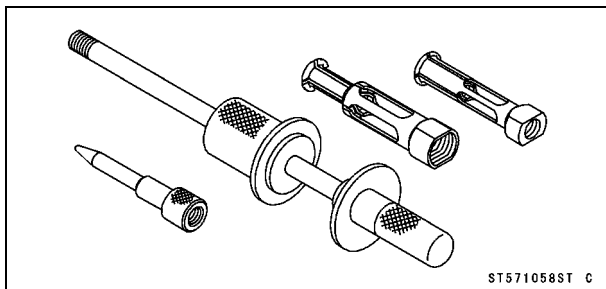
Item	Standard
<b>Front Fork (Per One Unit)</b>	
Fork Inner Tube Diameter	φ41 mm (1.6 in.)
Air Pressure	Atmospheric pressure (Non-adjustable)
Rebound Damper Setting (Only Right Fork Leg)	7th click from the 1st click of the fully clockwise position (Usable Range: 0 ←→ 11 clicks)
Fork Spring Preload Setting	Adjuster protrusion is 12 mm (0.47 in.) (Usable Range: 4 ~ 19 mm (0.16 ~ 0.75 in.))
Fork Oil:	
Viscosity	KAYABA 01 (KHL15-10) or equivalent SAE 5W
Amount:	
Right Fork Leg	Approx. 400 mL (13.5 US oz.) (when changing oil) 469 ±4 mL (15.9 ±0.135 US oz.) (after disassembly and completely dry)
Left Fork Leg	Approx. 410 mL (13.9 US oz.) (when changing oil) 485 ±4 mL (16.4 ±0.135 US oz.) (after disassembly and completely dry)
Fork Oil Level:	
Right Fork Leg	106 ±2 mm (4.17 ±0.08 in.) (fully compressed, without fork spring, below from the top of the outer tube)
Left Fork Leg	100 ±2 mm (3.94 ±0.08 in.) (fully compressed, without fork spring, below from the top of the outer tube)
Fork Spring Free Length	260.6 mm (10.26 in.) (Service limit 255 mm (10.04 in.))
<b>Rear Shock Absorber</b>	
Rebound Damper Setting	1 2/4 turns out from the fully clockwise position (Usable Range: 0 ←→ 3 turns out)
Spring Preload Setting	3rd position (Adjustable Range: 1st ~ 7th position)
Gas Pressure	980 kPa (10 kgf/cm <sup>2</sup> , 142 psi, Non-adjustable)

## Special Tools

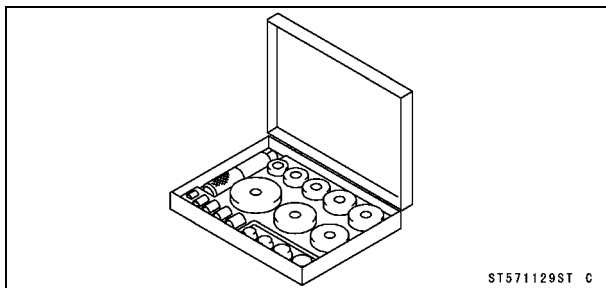
**Inside Circlip Pliers:**  
**57001-143**



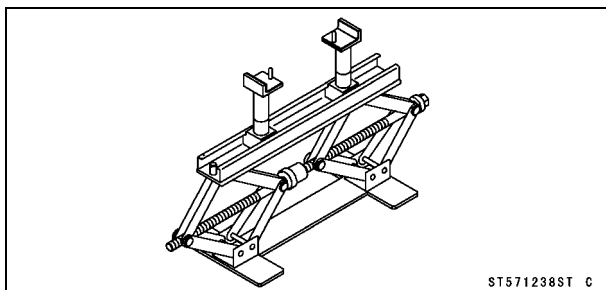
**Oil Seal & Bearing Remover:**  
**57001-1058**



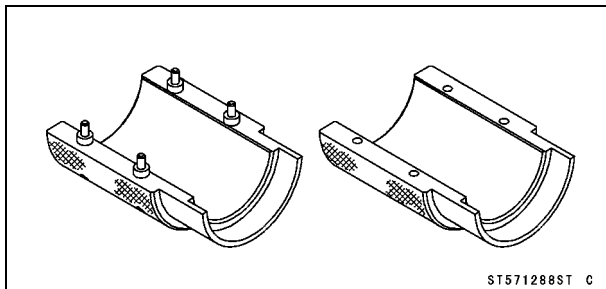
**Bearing Driver Set:**  
**57001-1129**



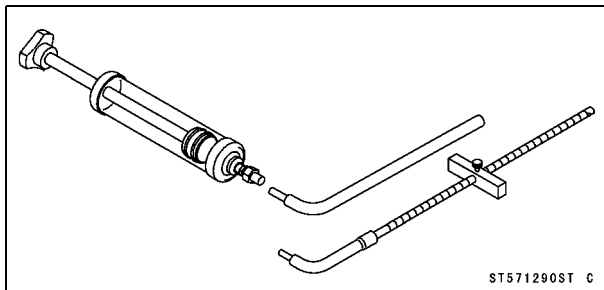
**Jack:**  
**57001-1238**



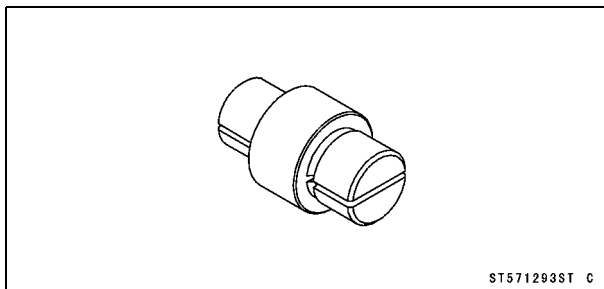
**Fork Oil Seal Driver,  $\phi 41$ :**  
**57001-1288**



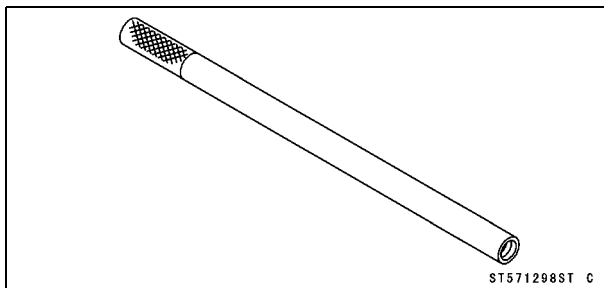
**Fork Oil Level Gauge:**  
**57001-1290**



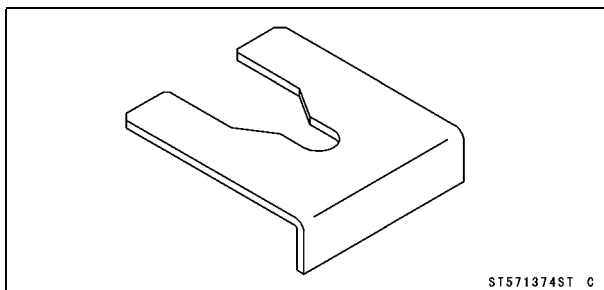
**Bearing Remover Head,  $\phi 20 \times \phi 22$ :**  
**57001-1293**



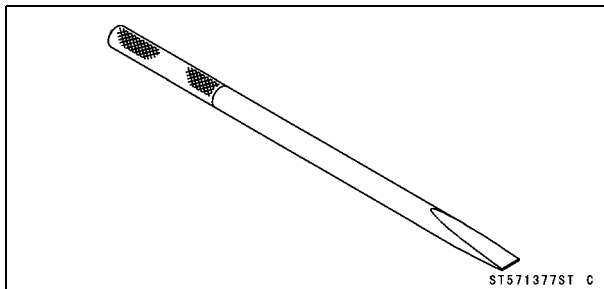
**Fork Piston Rod Puller, M10  $\times$  1.0:**  
**57001-1298**



**Fork Spring Stopper:**  
**57001-1374**



**Bearing Remover Shaft,  $\phi 13$ :**  
**57001-1377**

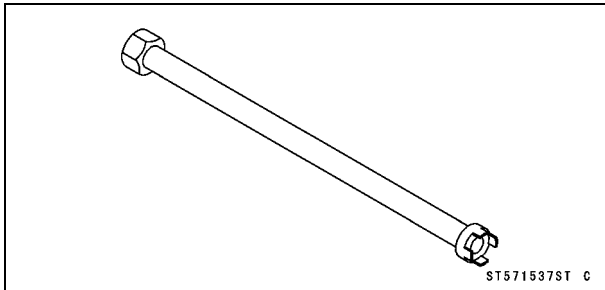


## 13-8 SUSPENSION

### Special Tools

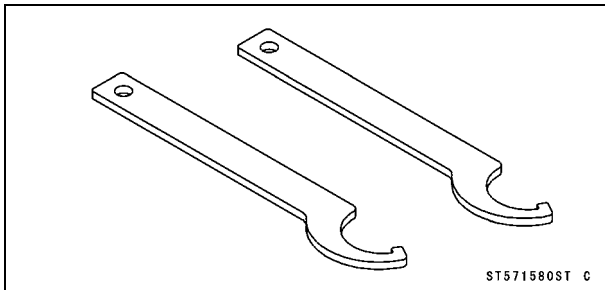
**Fork Cylinder Holder, Hex 24:**

**57001-1537**



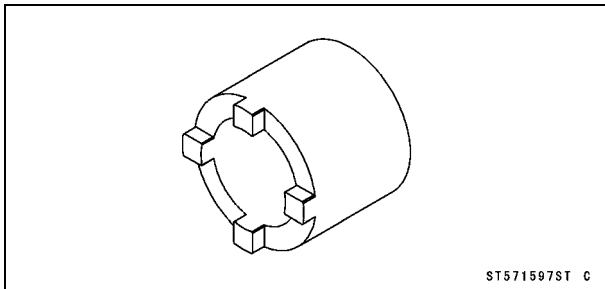
**Hook Wrench R=35**

**57001-1580**



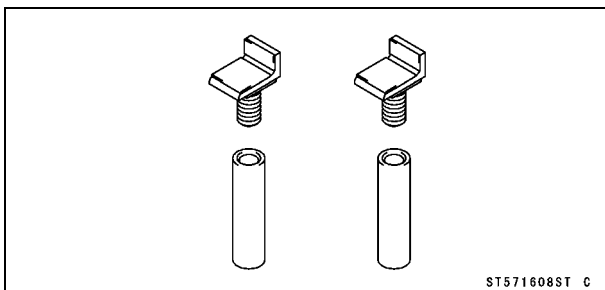
**Swingarm Pivot Nut Wrench:**

**57001-1597**



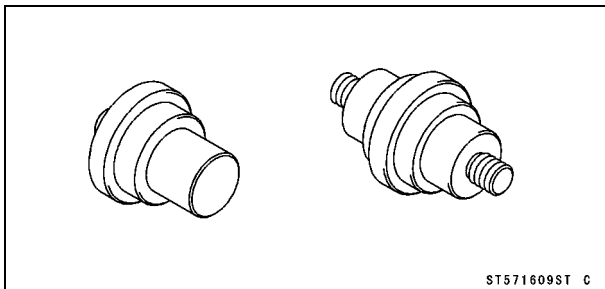
**Jack Attachment:**

**57001-1608**



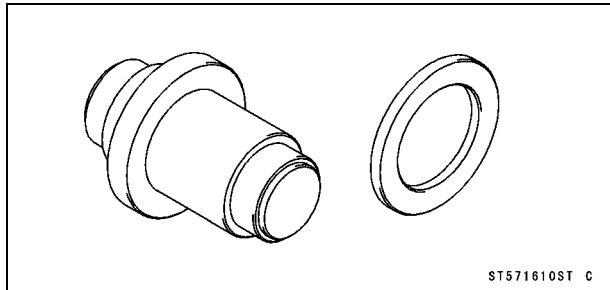
**Needle Bearing Driver,  $\phi 17/\phi 18$ :**

**57001-1609**



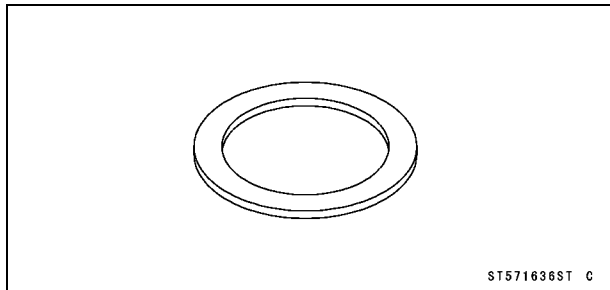
**Needle Bearing Driver,  $\phi 28$ :**

**57001-1610**



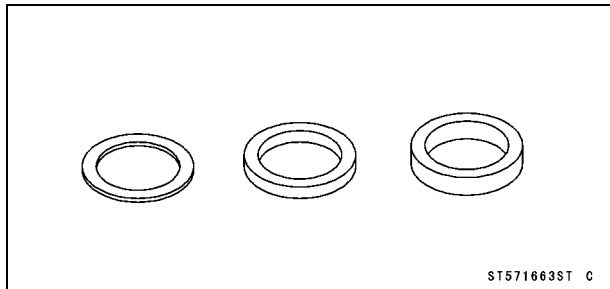
**Spacer,  $\phi 18$ :**

**57001-1636**



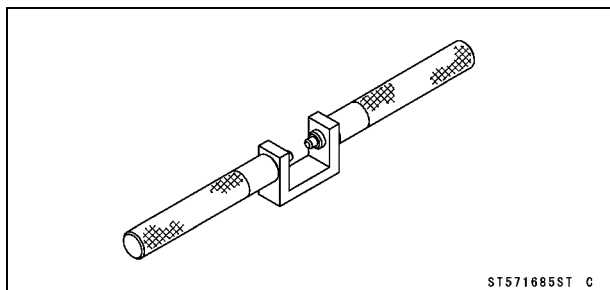
**Spacer  $\phi 28$ :**

**57001-1663**



**Fork Spring Compressor:**

**57001-1685**



## Front Fork

### Rebound Damping Force Adjustment

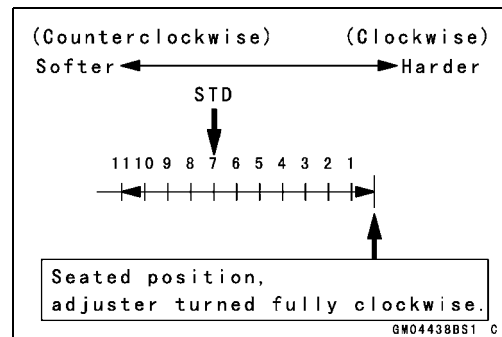
- To adjust the rebound damping force, turn the rebound damping adjuster [A] until you feel a click.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **7th click** from the 1st click of the fully clockwise position.



- 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
11	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High



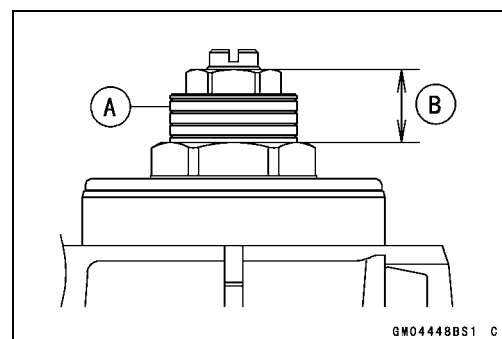
### Spring Preload Adjustment

- 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 12 mm (0.47 in.) [B] from top as shown in the figure.

#### Adjuster Protrusion (from top)

**Standard:** 12 mm (0.47 in.)

**Usable Range:** 4 ~ 19 mm (0.16 ~ 0.75 in.)



### ⚠ WARNING

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**

- The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

### Spring Action

Adjuster Position	Damping Force	Setting	Load	Road	Speed
19 mm	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
4 mm	Strong	Hard	Heavy	Bad	High

## 13-10 SUSPENSION

### Front Fork

#### Front Fork Removal (Each Fork Leg)

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Front Fender (see Front Fender Removal in the Frame chapter)
- ★ Loosen the upper front fork clamp bolt [A] and fork top plug [B] beforehand if the fork leg is to be disassembled.



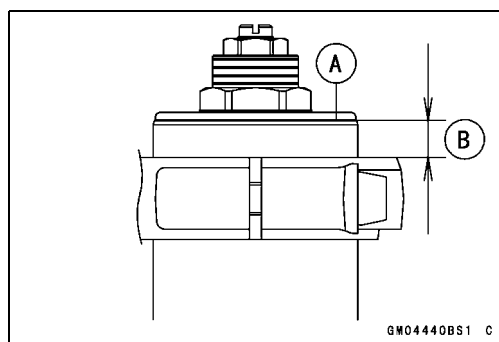
#### NOTE

○ Loosen the top plug after loosening the upper front fork clamp bolt.

- Loosen the lower front fork clamp bolts [C].
- 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 as shown in the figure.
  - 9 mm (0.35 in.) [B]
- Tighten:
  - Torque - Lower Front Fork Clamp Bolts: 21 N·m (2.1 kgf·m, 15 ft·lb)**
  - Front Fork Top Plugs: 23 N·m (2.3 kgf·m, 17 ft·lb)**
  - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**



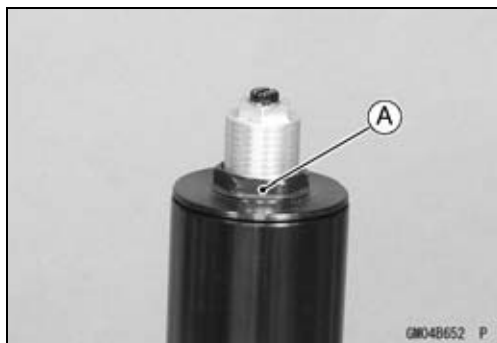
#### NOTE

- Tighten the top plug before tightening the upper front fork clamp bolt.
- Tighten the two clamp bolts alternately two times to ensure even tightening torque.

- Install the removed parts (see appropriate chapters).
- Adjust:
  - Spring Preload (see Spring Preload Adjustment)
  - Rebound Damping Force (see Rebound Damping Force Adjustment)

#### Front Fork Oil Change

- Remove the front fork (see Front Fork Removal).
- Hold the inner tube lower end in a vice.
- Unscrew the top plug [A] out of the outer tube.



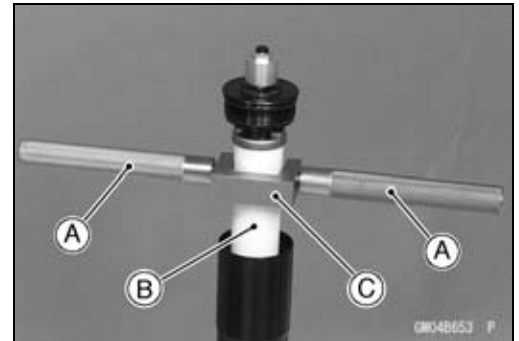
## Front Fork

- Install the fork spring compressor as shown in the figure.

### NOTE

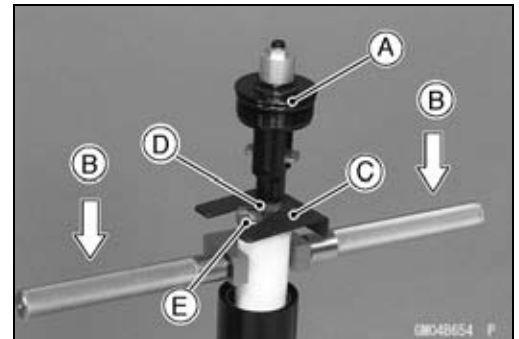
- Set the fork spring compressor so that the end of the handle [A] passes the upper side hole on the spacer [B] by screwing the handle in the holder [C] to the bottom.

**Special Tool - Fork Spring Compressor: 57001-1685**

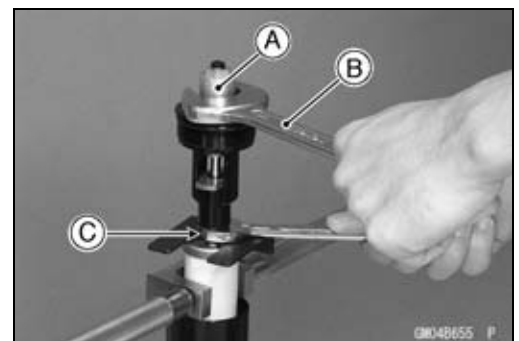


- While holding up the top plug [A] by one person, push down [B] the fork spring compressor and insert the fork spring stopper [C] between the piston rod nut [D] and the washer [E].

**Special Tool - Fork Spring Stopper: 57001-1374**



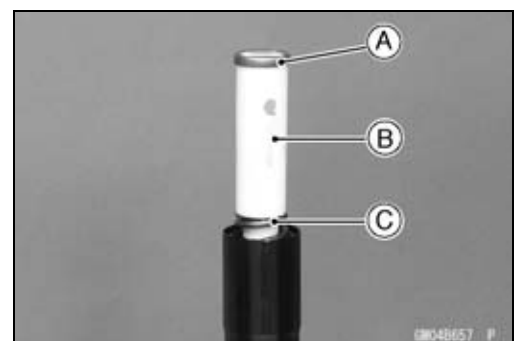
- Holding the spring preload adjuster [A] with a wrench [B], loosen the piston rod nut [C].



- Remove the top plug from the piston rod.
- For the right fork leg, remove the top plug and rebound damping adjuster rod [A].



- Remove:  
Washer [A]  
Spacer [B]  
Fork Spring [C]

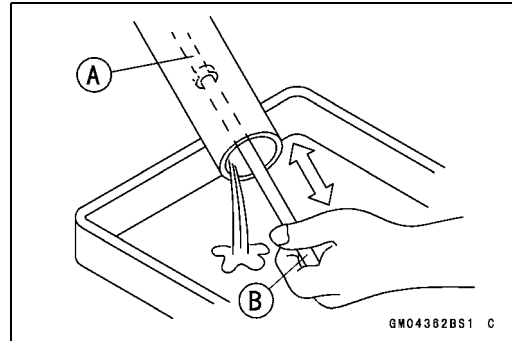


## 13-12 SUSPENSION

### Front Fork

- Drain the fork oil into a suitable container.
- Pump the piston rod [A] up and down at least ten times to expel the oil from the fork.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0 [B]: 57001-1298**



- Hold the fork tube upright, press the outer tube [A] and the piston rod all the way down.
- Pour in the type and amount of fork oil specified.

#### Fork Oil

##### Viscosity:

**KAYABA 01 (KHL15-10) or equivalent SAE 5W**

##### Amount (Right Fork Leg):

**When changing oil:**

**Approx. 400 mL (13.5 US oz.)**

**After disassembly and completely dry:**

**469 ±4 mL (15.9 ±0.135 US oz.)**

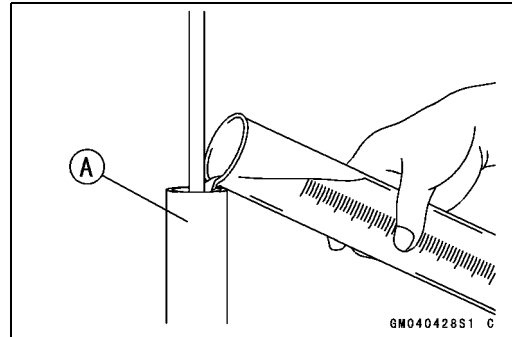
##### Amount (Left Fork Leg):

**When changing oil:**

**Approx. 410 mL (13.9 US oz.)**

**After disassembly and completely dry:**

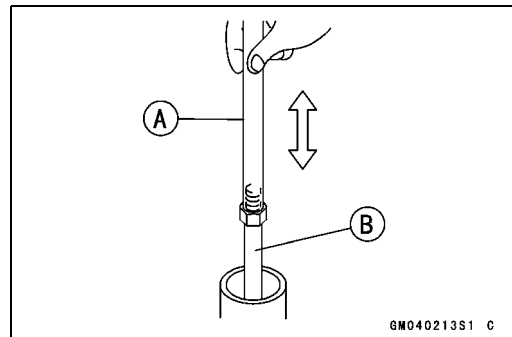
**485 ±4 mL (16.4 ±0.135 US oz.)**



- ★ If necessary, measure the oil level as follows.
- Hold the inner tube vertically in a vise.
- Using the piston rod puller [A], move the piston rod [B] up and down more than ten times in order to expel all the air from the fork oil.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001-1298**

- Remove the piston rod puller.
- Wait until the oil level settles.
- With the fork fully compressed and the piston rod fully pushed in, insert a tape measure or rod into the inner tube, and measure the distance from the top of the outer tube to the oil.





## Front Fork

**Oil Level (fully compressed, without spring)**

**Standard:**

**Right Fork Leg:** 106 ±2 mm (4.17 ±0.08 in.) (from the top of the outer tube)

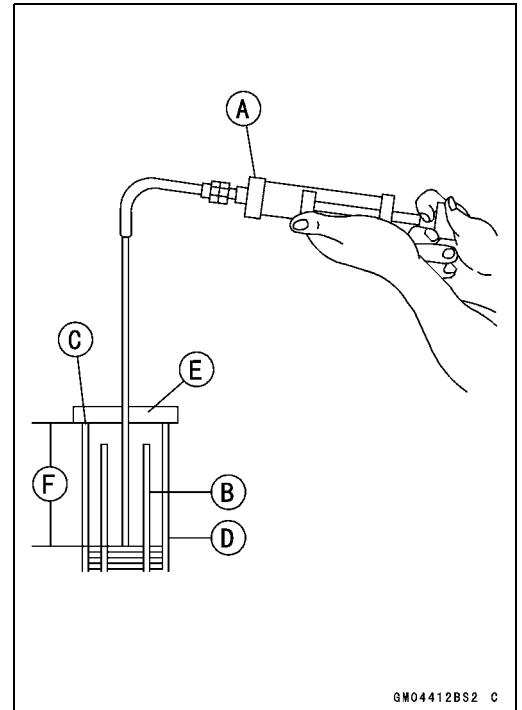
**Left Fork Leg:** 100 ±2 mm (3.94 ±0.08 in.) (from the top of the outer tube)

### NOTE

○Fork oil level may also be measured using the fork oil level gauge.

**Special Tool - Fork Oil Level Gauge [A]: 57001-1290**

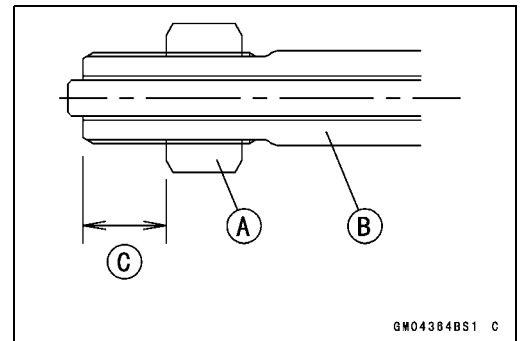
- With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [B] and position the stopper across the top end [C] of the outer tube [D].
- Set the gauge stopper [E] so that its lower side shows the oil level distance specified [F].
- Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
- ★If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



### Right Fork Leg

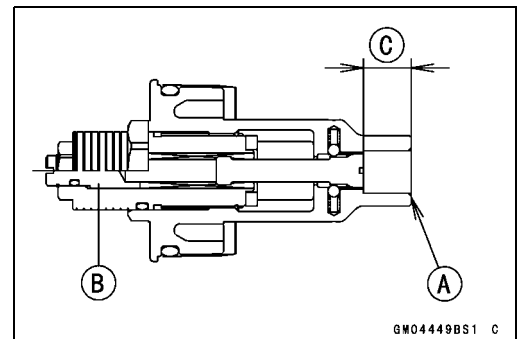
- Screw the rod nut [A] onto the piston rod [B] as shown in the figure.

12 mm (0.47 in.) or more [C]



- Check the distance between the bottom end [A] of the top plug and rebound damping adjust [B] with a pair of vernier caliper.

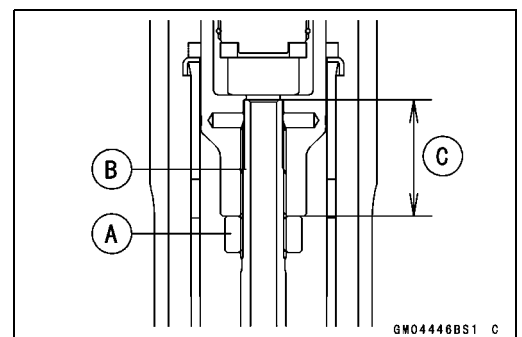
13 mm (0.51 in.) [C]



### Left Fork Leg

- Screw the rod nut [A] onto the piston rod [B] as shown in the figure.

25.5 mm (1.00 in.) [C]



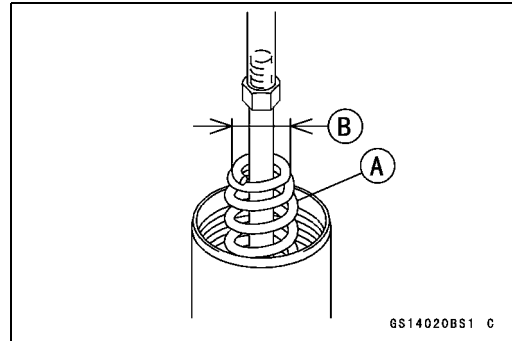
## 13-14 SUSPENSION

### Front Fork

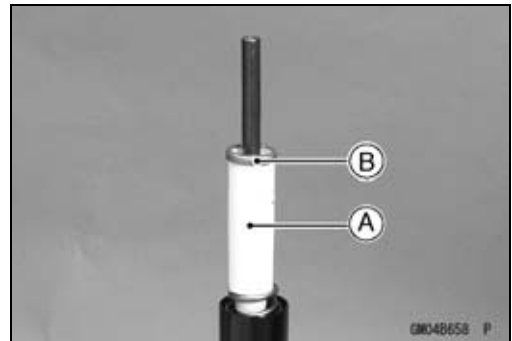
- Screw the fork piston rod puller onto the end of the piston rod.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001-1298**

- Pull the puller up above the outer tube top.
- Install the fork spring [A] with the smaller end [B] facing upward.



- Install:  
Spacer [A]  
Washer [B]



- Set the fork spring compressor on the spacer.

**Special Tool - Fork Spring Compressor: 57001-1685**

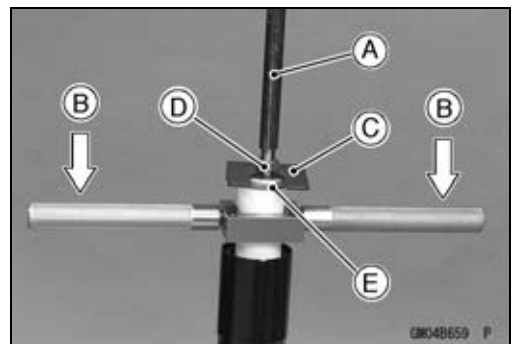
#### NOTE

○Set the fork spring compressor so that the end of the handle passes the upper side hole on the spacer by screwing the handle in the holder to the bottom.

- While holding up the piston rod puller [A] by one person, push down [B] the fork spring compressor, and insert the fork spring stopper [C] between the piston rod nut [D] and the washer [E].

**Special Tool - Fork Spring Stopper: 57001-1374**

- Remove the piston rod puller.

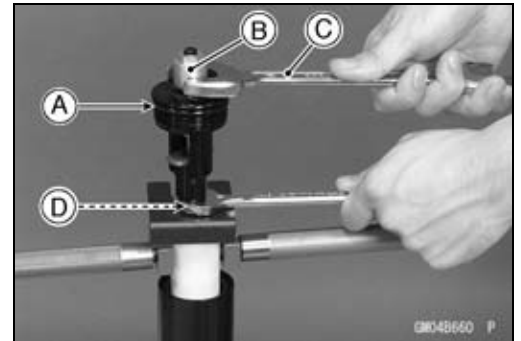


- For the right fork leg, insert the rebound damping adjuster rod into the holes of the piston rod.
- Screw in the top plug stopped onto the piston rod.

## Front Fork

- Check the O-ring [A] on the top plug and replace it with a new one if damaged.
- Apply grease to the new O-ring.
- Holding the spring preload adjuster [B] with a wrench [C], tighten the piston rod nut [D] against the top plug.

**Torque - Piston Rod Nuts: 15 N·m (1.5 kgf·m, 11 ft·lb)**



- While holding up the top plug by one person, push down the fork spring compressor, and pull out the fork spring stopper.
- Align the plate [A] with the washer [B].
- Remove the fork spring compressor.
- Raise the outer tube and screw the top plug into it.
- Install the front fork (see Front Fork Installation).

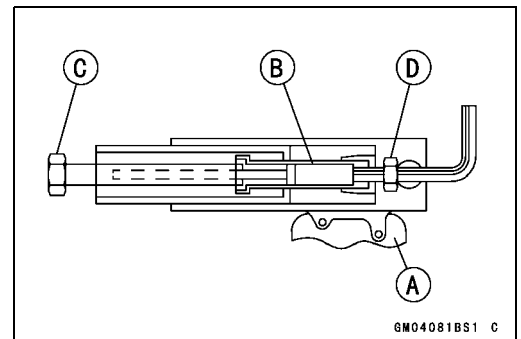


### Front Fork Disassembly

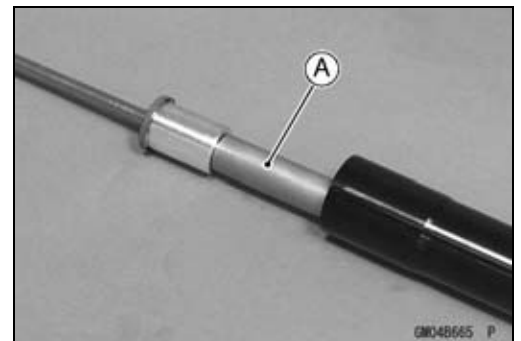
- Remove the front fork (see Front Fork Removal).
- Drain the fork oil (see Front Fork Oil Change).
- Hold the fork leg with a vise [A].
- Stop the cylinder [B] from turning by using the fork cylinder holder [C].

**Special Tool - Fork Cylinder Holder, Hex 24: 57001-1537**

- Unscrew the Allen bolt [D], then take the bolt and gasket out of the bottom of the inner tube.



- Take the cylinder unit [A].
- Do not disassemble the cylinder unit.



- Separate the outer tube from the inner tube.
- Pull out the dust seal.
- Remove the retaining ring [A] from the outer tube.
- Remove the oil seal [B] and washer [C].



## 13-16 SUSPENSION

### Front Fork

#### Front Fork Assembly

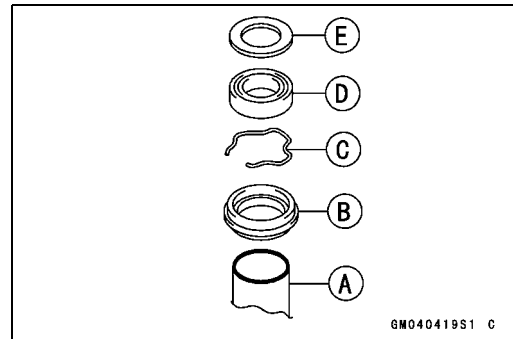
- Replace the following parts with a new one.
  - Oil Seal
  - Bottom Allen Bolt Gasket
- Insert the cylinder unit into the inner tube.
- Stop the cylinder from turning by using the fork cylinder holder.

**Special Tool - Fork Cylinder Holder, Hex 24: 57001-1537**

- Apply a non-permanent locking agent to the thread of the Allen bolt, and tighten it.

**Torque - Front Fork Bottom Allen Bolts: 40 N·m (4.1 kgf·m, 30 ft·lb)**

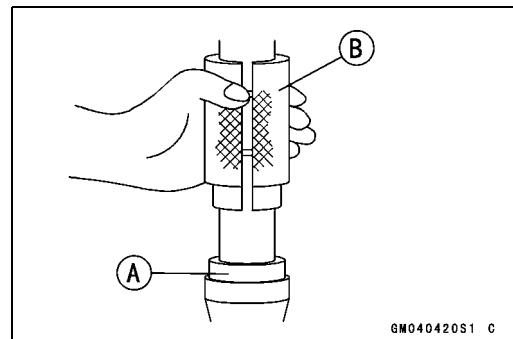
- Install the following parts into the inner tube [A].
  - Dust Seal [B]
  - Retaining Ring [C]
  - Oil Seal [D]
  - Washer [E]



- Insert the inner tube to the outer tube.
- After installing the washer, install the oil seal [A] by using the fork oil seal driver [B].

**Special Tool - Fork Oil Seal Driver,  $\phi 41$ : 57001-1288**

- Install the retaining ring and dust seal into the outer tube.
- Pour in the specified type of oil (see Front Fork Oil Change).



## Front Fork

### Inner Tube, Outer Tube Inspection

- Visually inspect the inner tube [A], and repair any damage.
- Nicks or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas 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 and outer tubes, and pump them back and forth manually to check for smooth operation.
- ★ If you feel binding or catching, the inner and outer tubes must be replaced.

#### ⚠ WARNING

**A straightened inner or outer fork tube may fall in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.**

### Dust Seal Inspection

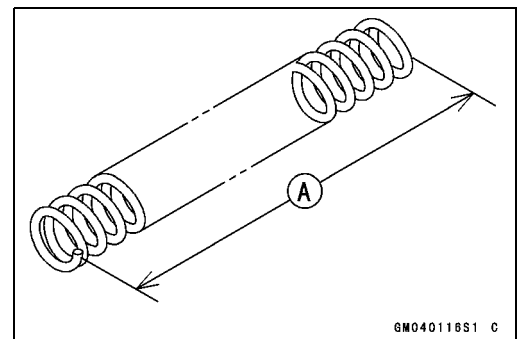
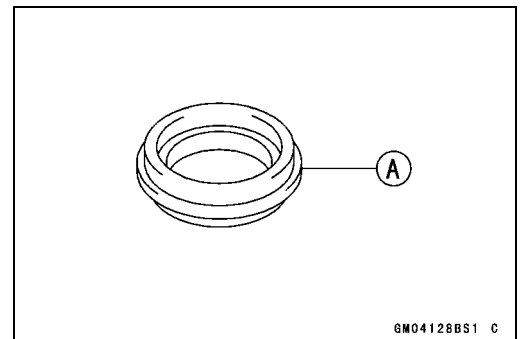
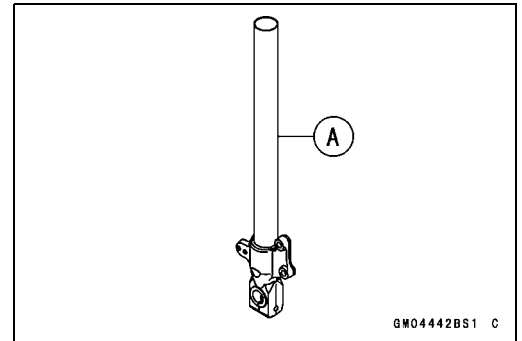
- Inspect the dust seal [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.

### Spring Tension Inspection

- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.
- ★ If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

#### Spring Free Length

**Standard: 260.6 mm (10.26 in.)**  
**Service Limit: 255 mm (10.04 in.)**



# 13-18 SUSPENSION

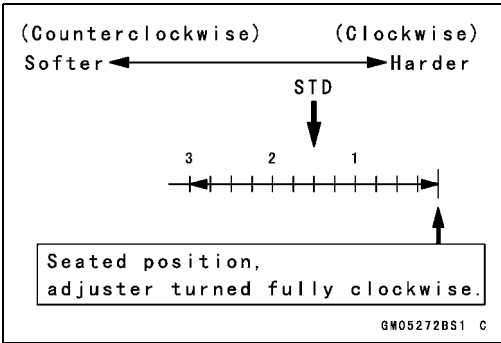
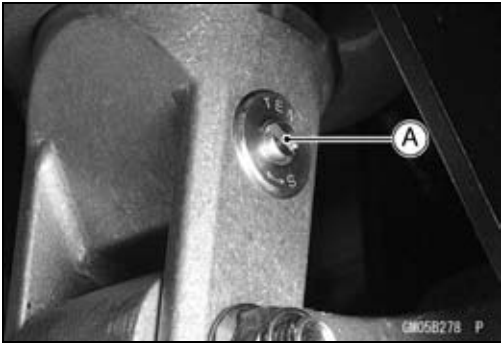
## Rear Shock Absorber

### Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the lower damping adjuster [A] to the desired position, until you feel a click.
- The standard adjuster setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **1 2/4 turns out** from the fully clockwise position.

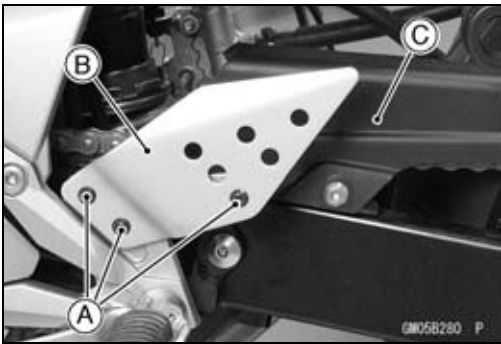
### Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
3 turns out	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High



### Spring Preload Adjustment

- Remove the bolts [A], left foot guard [B] and chain cover [C] (see Drive Chain Removal in the Final Drive chapter) for turning the hook wrench easily.



### Spring Preload Adjustment

- Using the hook wrench [A], turn the adjusting nut to adjust the spring preload.

**Special Tool - Hook Wrench R=35: 57001-1580**

- The standard adjuster setting for average-build rider of 68 kg (150 lb) with no passenger and no accessories is 3rd position.

### Spring Preload Setting

**Standard Position: 3rd position**

**Adjustable Range: 1st ~ 7th position**

- If the compression of the spring is not suited to the operating conditions, adjust it to an appropriate position by referring to the table below.

### Spring Preload Adjustment

Adjuster Position	Damping Force	Shock Absorber Hardness	Load	Road Conditions	Driving Speed
1st	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
7th	Strong	Hard	Heavy	Bad	Highway



## Rear Shock Absorber

### **Rear Shock Absorber Removal**

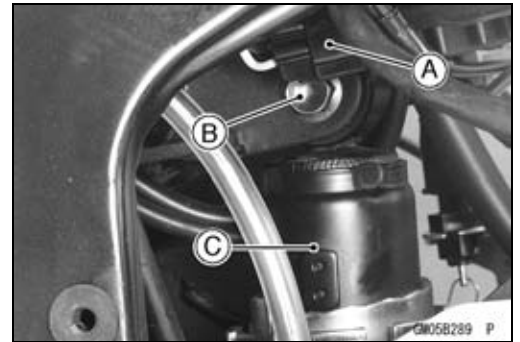
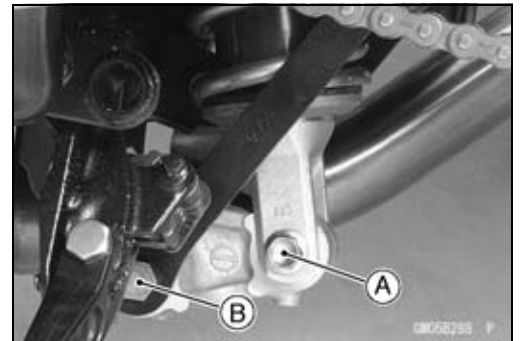
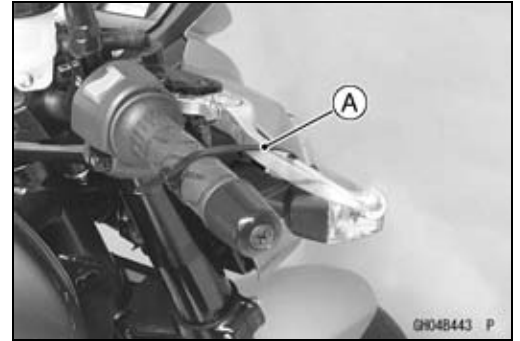
- Raise the rear wheel off the ground with the jack.  
**Special Tools - Jack: 57001-1238**  
**Jack Attachment: 57001-1608**
- Squeeze the brake lever slowly and hold it with a band [A].

### **⚠ WARNING**

**Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.**

- Remove:  
 Frame Covers (see Frame Cover Removal in the Frame chapter)  
 Lower Shock Absorber Nut and Bolt [A]  
 Lower Tie-Rod Nut and Bolt [B]

- Disconnect the regulator/rectifier lead connector [A].
- Remove the upper shock absorber nut and bolt [B].
- Remove the shock absorber [C] from downside.



### **Rear Shock Absorber Installation**

- Tighten:  
**Torque - Rear Shock Absorber Nuts (Upper and Lower): 34 N·m (3.5 kgf·m, 25 ft·lb)**  
**Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**

### **Rear Shock Absorber Inspection**

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.  
 Smooth Stroke  
 Oil Leakage  
 Crack or Dent
- ★ If there is any damage to the rear shock absorber, replace it.
- Visually inspect the rubber bushing.
- ★ If it show any signs of damage, replace it.

## 13-20 SUSPENSION

### Swingarm

#### **Swingarm Removal**

- Remove:
  - Frame Covers (see Frame Cover Removal in the Frame chapter)
  - Chain Cover (see Drive Chain Removal in the Final Drive chapter)
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)

- Remove:
  - Screw [A]
  - Clamps [B] [C]

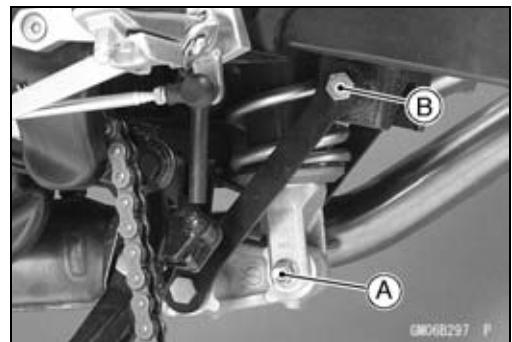


- Raise the rear wheel off the ground with jack.

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

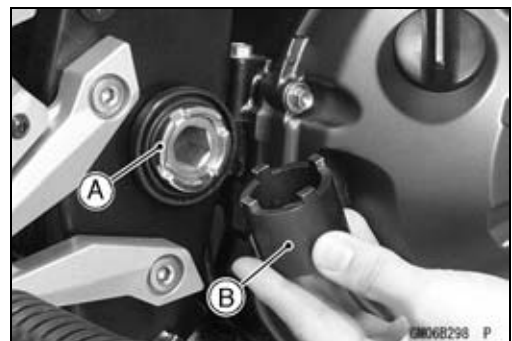
**Jack Attachment: 57001-1608**

- Remove:
  - Lower Shock Absorber Nut and Bolt [A]
  - Upper Tie-Rod Nut and Bolt [B]



- Unscrew the swingarm pivot shaft locknut [A], using the nut wrench [B].

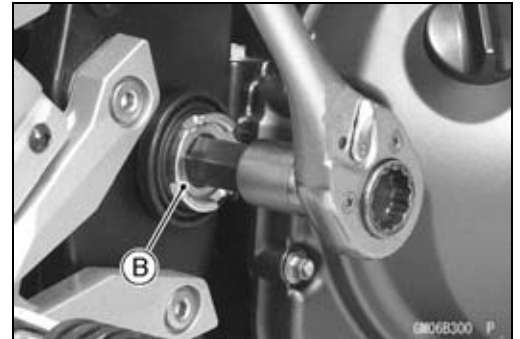
**Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**





## Swingarm

- Unscrew the swingarm pivot shaft nut [A] and the swingarm pivot shaft [B].
- Pull out the pivot shaft and remove the swingarm.



### Swingarm Installation

- Place the collar [A] on the stopper [B] inside the frame [C].
- Insert the pivot shaft into the frame from the right side.
- Tighten the pivot shaft so that the clearance [D] between the collar and the frame come to 0 mm.  
Right Side [E]
- Loosen the pivot shaft once, and tighten the pivot shaft securely.

**Torque - Swingarm Pivot Shaft: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

- Tighten the pivot shaft locknut, using the nut wrench.

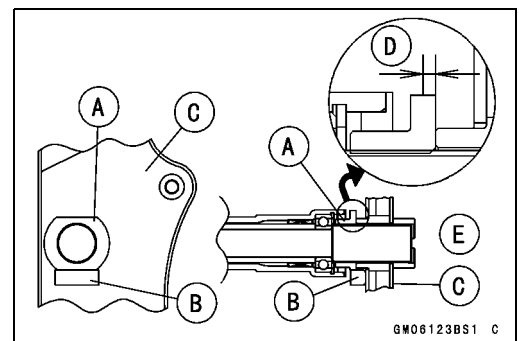
**Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**

**Torque - Swingarm Pivot Shaft Locknut: 98 N·m (10.0 kgf·m, 72.3 ft·lb)**

- Tighten:

**Torque - Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**

- Install the removed parts (see appropriate chapters).



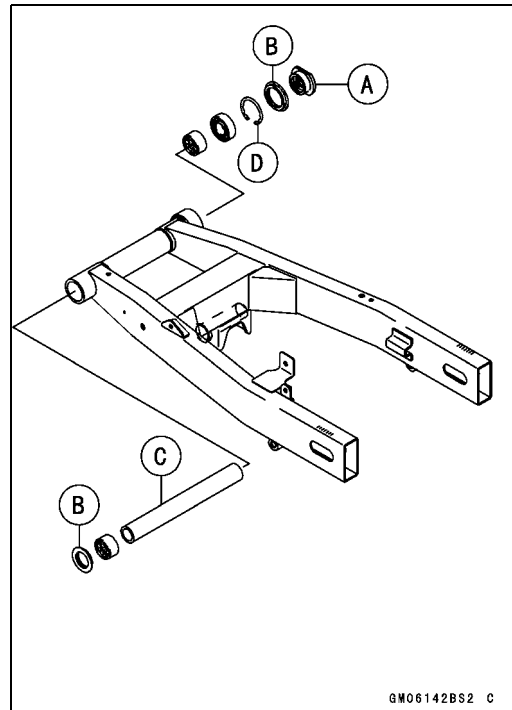
## 13-22 SUSPENSION

### Swingarm

#### Swingarm Bearing Removal

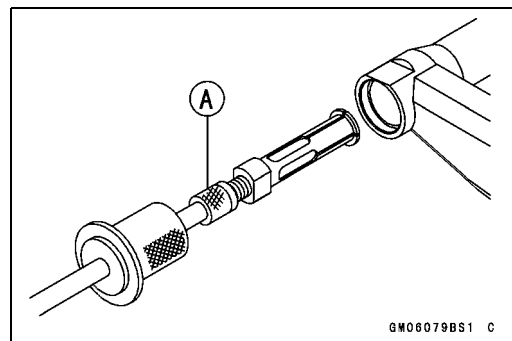
- Remove:
  - Swingarm (see Swingarm Removal)
  - Collar [A]
  - Oil Seals [B]
  - Sleeve [C]
  - Circlip [D] (Right Side)

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



- Remove the ball bearing and needle bearings.

**Special Tool - Oil Seal & Bearing Remover [A]: 57001-1058**



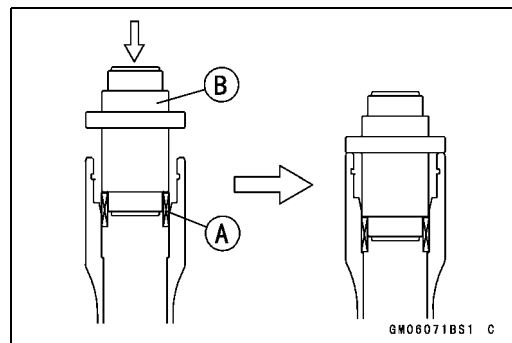
#### Swingarm Bearing Installation

- Replace the ball and needle bearings [A] with new ones.
- Install the ball and needle bearings so that the manufacturer's marks face out.

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

**Needle Bearing Driver,  $\phi 28$  [B]: 57001-1610**

**Spacer  $\phi 28$ : 57001-1663**



## Swingarm

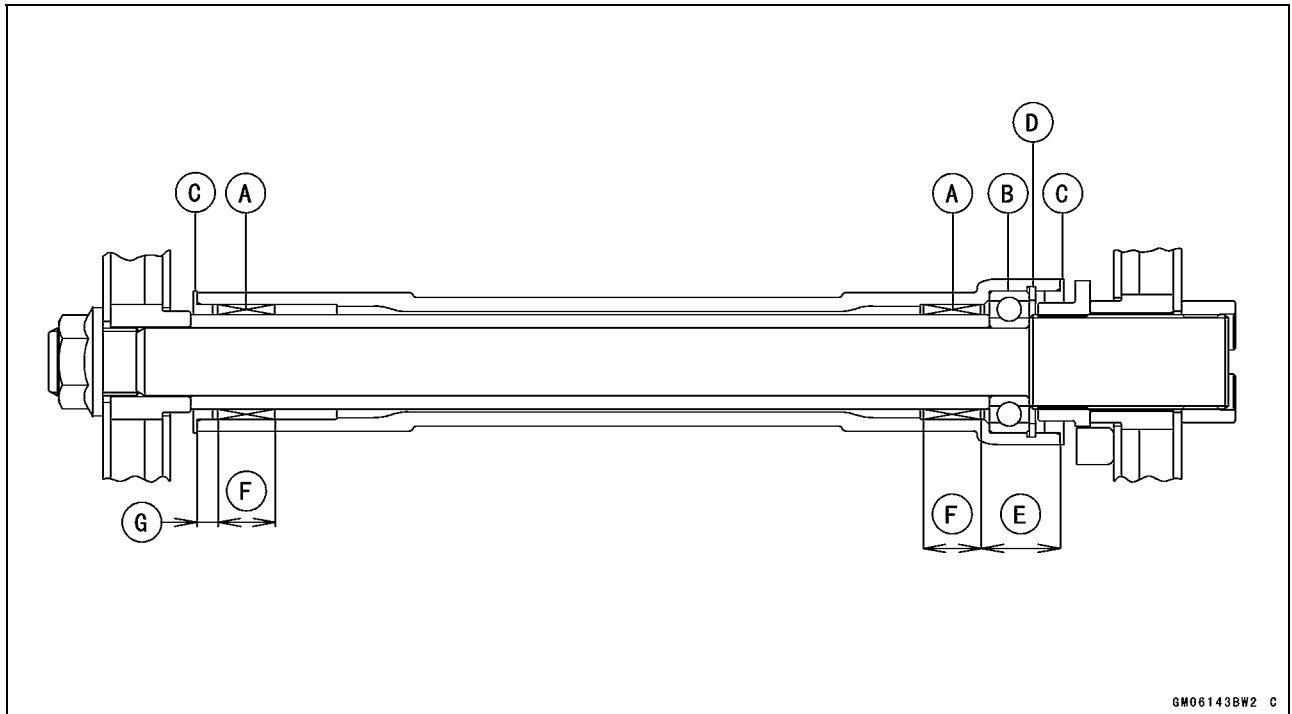
- Install the needle bearings [A], ball bearing [B] and oil seals [C] position as shown in the figure.

Circlip [D]

23.5 mm (0.93 in.) [E]

17 mm (0.67 in.) [F]

6 mm (0.24 in.) [G]

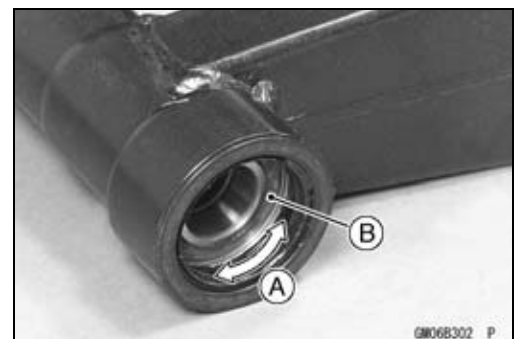
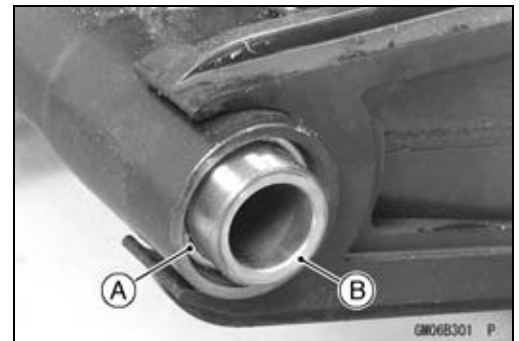


### Swingarm Bearing, Sleeve Inspection

#### CAUTION

**Do not remove the bearings for inspection. Removal may damage them.**

- Inspect the needle bearings [A] and ball bearing installed in the swingarm.
- The rollers and ball in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.
- ★ If the needle bearing and sleeve [B] show any signs of abnormal wear, discoloration, or damage, replace them as a set.
- Turn the bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



## 13-24 SUSPENSION

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### Swingarm

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#### ***Swingarm Bearing Lubrication***

##### **NOTE**

- *Since the bearings are packed with grease and sealed, lubrication is not required.*

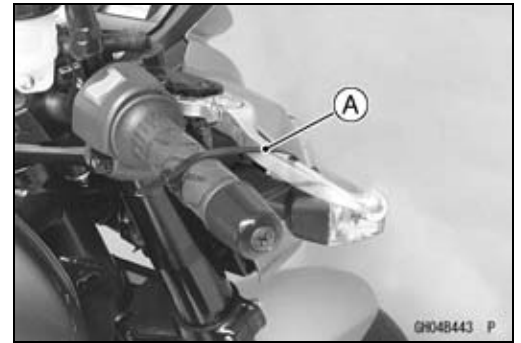
#### ***Chain Guide Inspection***

- Refer to the Chain Guide Wear Inspection in the Periodic Maintenance chapter.

## **Tie-Rod, Rocker Arm**

### ***Tie-Rod Removal***

- Squeeze the brake lever slowly and hold it with a band [A].

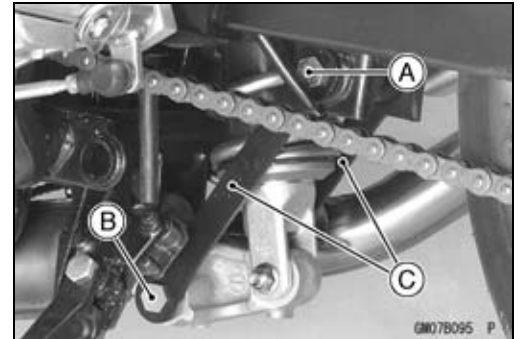


- Raise the rear wheel off the ground with the jack.

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

**Jack Attachment: 57001-1608**

- Remove:
  - Upper Tie-Rod Nut and Bolt [A]
  - Lower Tie-Rod Nut and Bolt [B]
  - Tie-Rods [C]



### ***Tie-Rod Installation***

- Apply grease to the inside of the oil seals.
- Install the tie-rods so that the marked side faces [A] outside.
- Tighten:
  - Torque - Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**



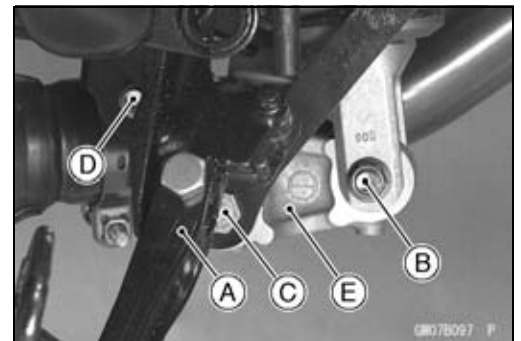
### ***Rocker Arm Removal***

- Squeeze the brake lever slowly and hold it with a band.
- Remove the sidestand [A] (see Sidestand Removal in the Frame chapter).
- Raise the rear wheel off the ground with the jack.

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

**Jack Attachment: 57001-1608**

- Remove:
  - Lower Rear Shock Absorber Nut and Bolt [B]
  - Lower Tie-Rod Nut and Bolt [C]
  - Rocker Arm Nut and Bolt [D]
  - Rocker Arm [E]



### ***Rocker Arm Installation***

- Apply grease to the inside of the oil seals.
- Tighten:
  - Torque - Uni-Trak Rocker Arm Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**
  - Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**
  - Rear Shock Absorber Nut (Lower): 34 N·m (3.5 kgf·m, 25 ft·lb)**
- Install the removed parts (see appropriate chapters).

## 13-26 SUSPENSION

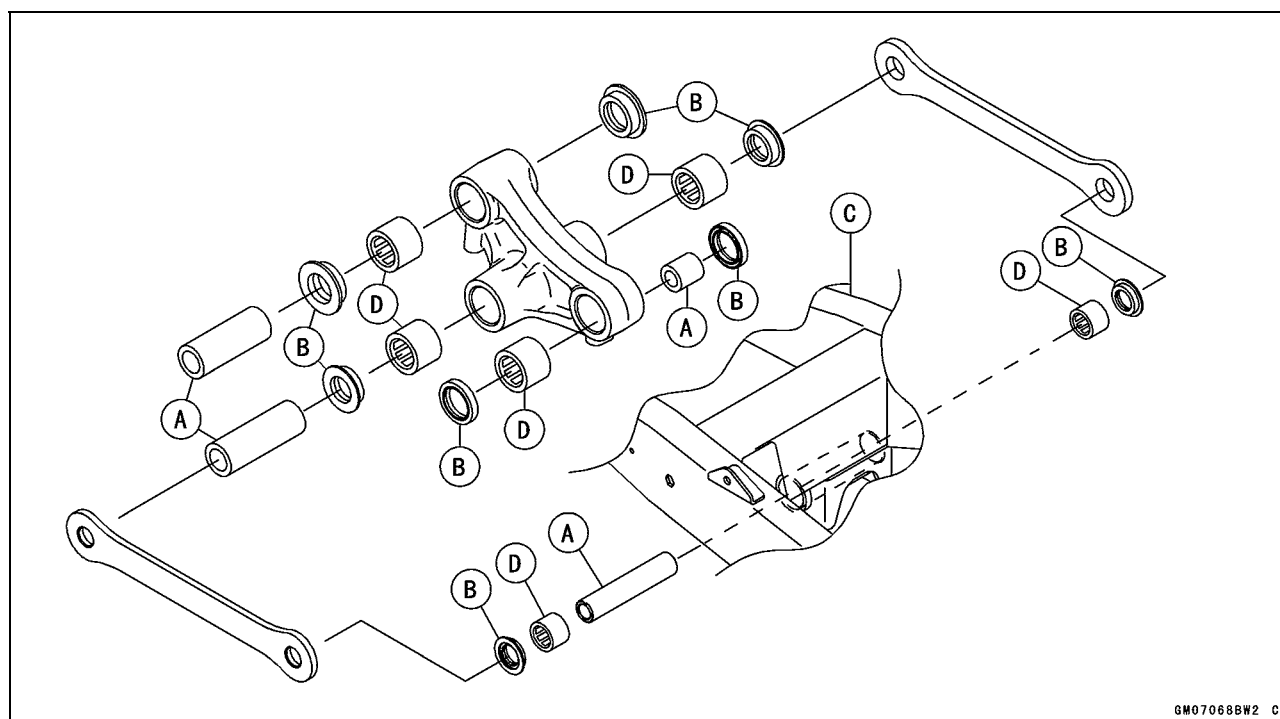
### Tie-Rod, Rocker Arm

#### ***Tie-Rod and Rocker Arm Bearing Removal***

- Remove:
  - Tie-Rods (see Tie-Rod Removal)
  - Rocker Arm (see Rocker Arm Removal)
  - Sleeves [A]
  - Oil Seals [B]
  - Swingarm [C] (see Swingarm Removal)
- Remove the needle bearings [D], using the bearing remover head and bearing remover shaft.

**Special Tools - Bearing Remover Head,  $\phi 20 \times \phi 22$ : 57001-1293**

**Bearing Remover Shaft,  $\phi 13$ : 57001-1377**



#### ***Tie-Rod and Rocker Arm Bearing Installation***

- Replace the needle bearings and oil seals with new ones.
- Apply plenty of grease to the lips of the oil seals.
- Install the needle bearings and oil seals position as shown in the figure.

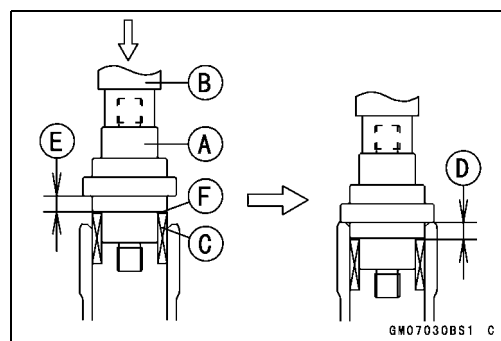
○Screw the needle bearing driver [A] into the driver holder [B].

○Insert the needle bearing driver into the needle bearing [C] and press the needle bearing into the housing until the driver contacts the end surface of the housing.

Bearing Pressing Depth: 5.5 mm (0.22 in.) [D]  
5.0 mm (0.20 in.) [E]

#### **NOTE**

○For a bearing of inner diameter  $\phi 18$ , select the pressing side of the needle bearing driver according to its pressing depth.



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

**Needle Bearing Driver,  $\phi 17/\phi 18$ : 57001-1609**

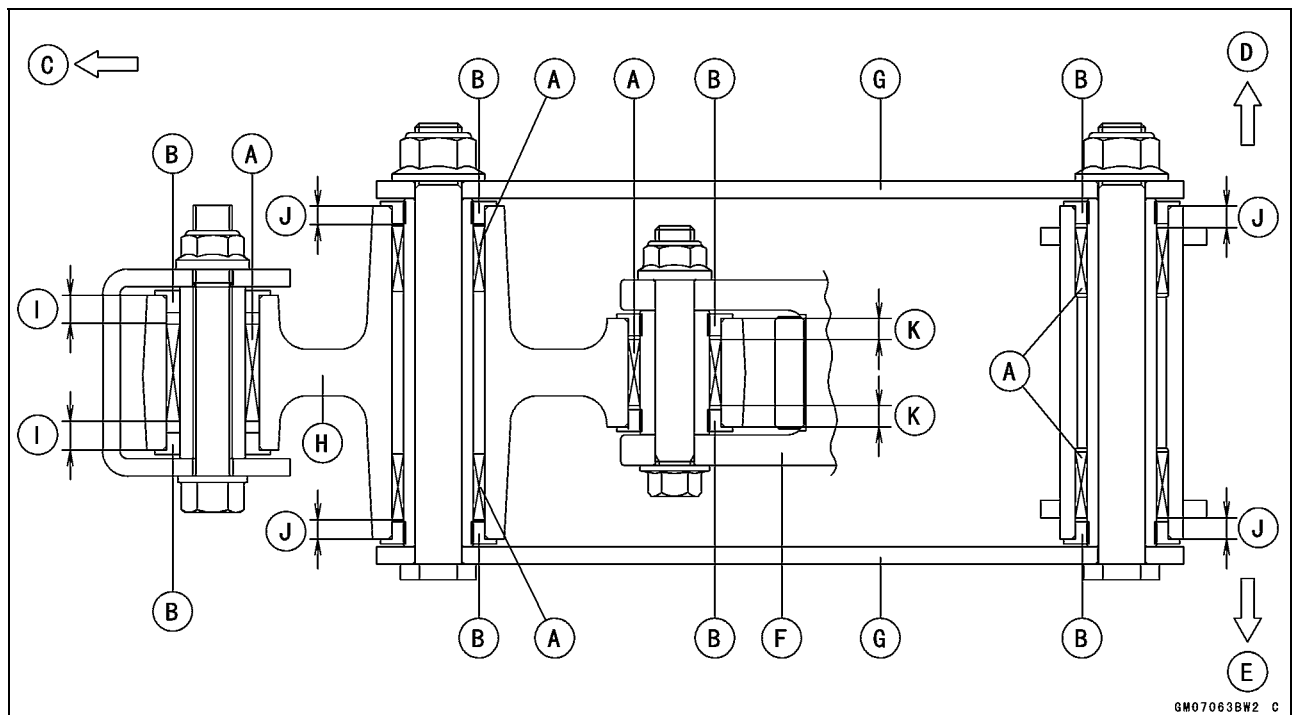
**Spacer,  $\phi 18$  [F]: 57001-1636**

## Tie-Rod, Rocker Arm

### NOTE

○Install the needle bearings so that the marked side faces in.

Needle Bearings [A]  
 Oil Seals [B]  
 Front [C]  
 Right Side [D]  
 Left Side [E]  
 Rear Shock Absorber [F]  
 Tie-Rods [G]  
 Rocker Arm [H]  
 7.5 mm (0.30 in.) [I]  
 5.0 mm (0.20 in.) [J]  
 5.5 mm (0.22 in.) [K]



### Rocker Arm/Tie-Rod Bearing, Sleeve Inspection

#### CAUTION

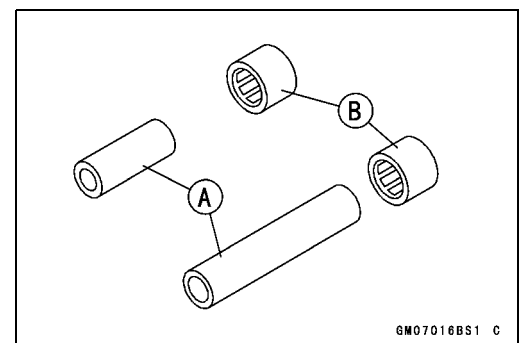
**Do not remove the bearings for inspection. Removal may damage them.**

- Visually inspect the rocker arm, or tie-rod sleeves [A] and needle bearings [B].
- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
- ★ If there is any doubt as to the condition of any of the needle bearings or sleeve, replace the sleeve and needle bearings as a set.

### Rocker Arm/Tie-Rod Bearing Lubrication

#### NOTE

○Since the bearings are packed with grease, lubrication is not required.







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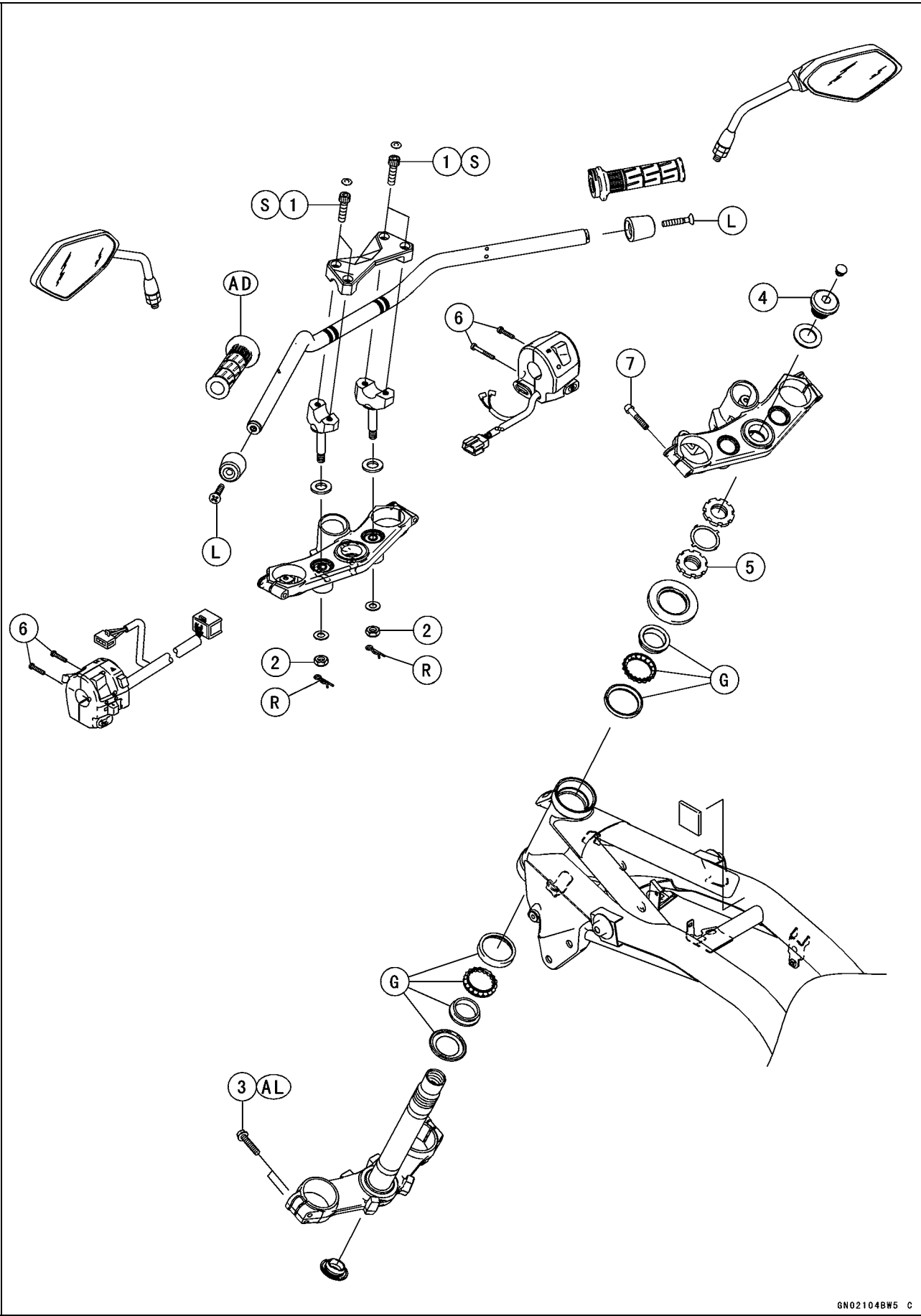
# Steering

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14-2 STEERING

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Holder Bolts	25	2.5	18	S
2	Handlebar Lower Clamp Nuts	34	3.5	25	
3	Lower Front Fork Clamp Bolts	21	2.1	15	AL
4	Steering Stem Head Bolt	108	11.0	79.7	
5	Steering Stem Nut	27	2.8	20	
6	Switch Housing Screws	3.5	0.36	31 in·lb	
7	Upper Front Fork Clamp Bolts	20	2.0	15	

AD: Apply adhesive.

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

G: Apply grease.

L: Apply a non-permanent locking agent.

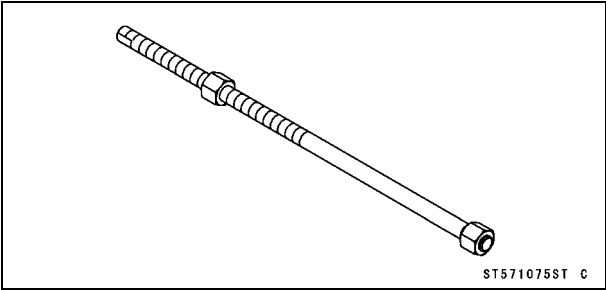
R: Replacement Parts

S: Follow the specified tightening sequence.

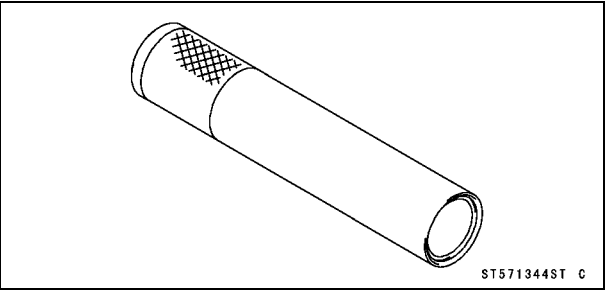
# 14-4 STEERING

## Special Tools

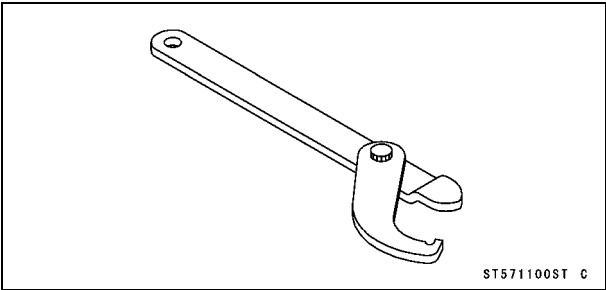
Head Pipe Outer Race Press Shaft:  
57001-1075



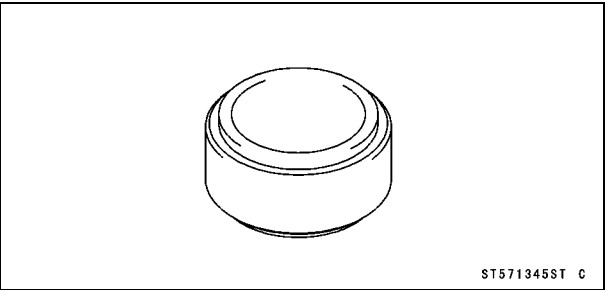
Steering Stem Bearing Driver,  $\phi 42.5$ :  
57001-1344



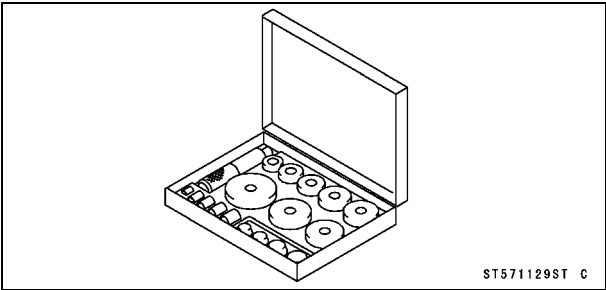
Steering Stem Nut Wrench:  
57001-1100



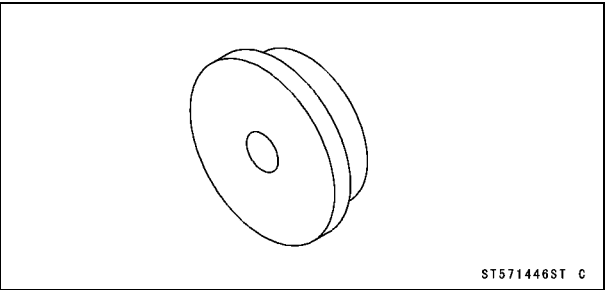
Steering Stem Bearing Driver Adapter,  $\phi 41.5$ :  
57001-1345



Bearing Driver Set:  
57001-1129



Head Pipe Outer Race Driver,  $\phi 55$ :  
57001-1446



**Steering**

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***Steering Inspection***

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

***Steering Adjustment***

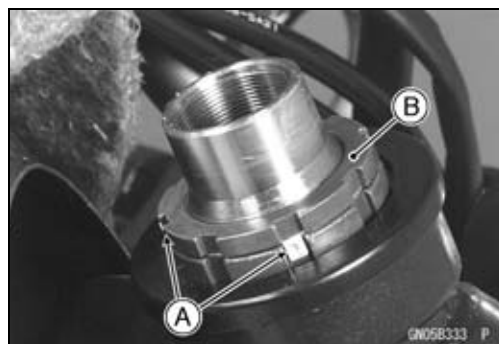
- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

## 14-6 STEERING

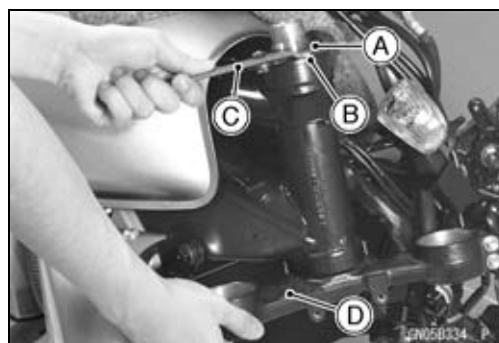
### Steering Stem

#### Stem, Stem Bearing Removal

- Remove:
  - Inner Cover (see Inner Cover Removal in the Frame chapter)
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Upper Fairing Bracket (see Upper Fairing Bracket Removal in the Frame chapter)
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Handlebar (see Handlebar Removal)
  - Front Forks (see Front Fork Removal in the Suspension chapter)
  - Steering Stem Head (see Steering Play Adjustment in the Periodic Maintenance chapter)
- Bend the claws [A] of claw washer straighten.
- Remove the steering stem locknut [B].  
**Special Tool - Steering Stem Nut Wrench: 57001-1100**
- Remove the claw washer.



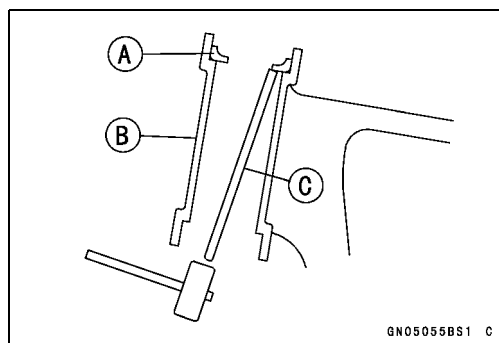
- Pushing up the stem base, and remove the steering stem nut [A] with stem cap [B].  
**Special Tool - Steering Stem Nut Wrench [C]: 57001-1100**
- Remove:
  - Steering Stem [D]
  - Upper Ball Bearing Inner Race and Ball Bearing



- To remove the ball bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses of head pipe, and applying it to both recess alternately hammer it to drive the race out.

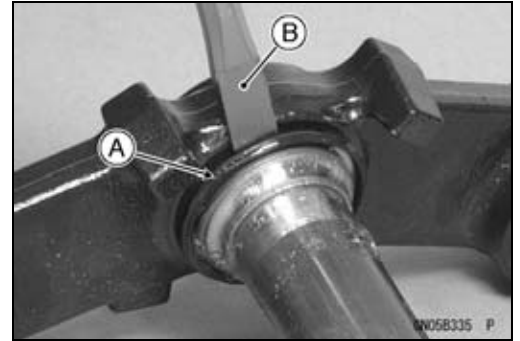
#### NOTE

- If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.



## Steering Stem

- Remove the lower ball bearing inner race (with its oil seal) [A] which is pressed onto the steering stem with a suitable commercially available chisel [B].



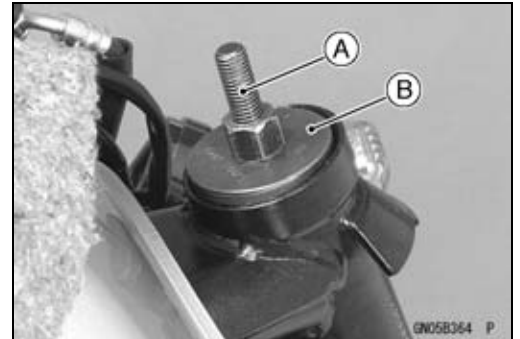
### Stem, Stem Bearing Installation

- Replace the bearing outer races with new ones.
- Drive them into the head pipe at the same time.

**Special Tools - Head Pipe Outer Race Press Shaft [A]:**  
57001-1075

**Bearing Driver Set: 57001-1129**

**Head Pipe Outer Race Driver,  $\phi 55$  [B]: 57001-1446**

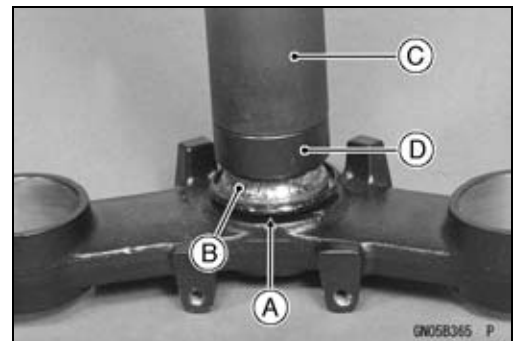


- Apply grease to the outer races.

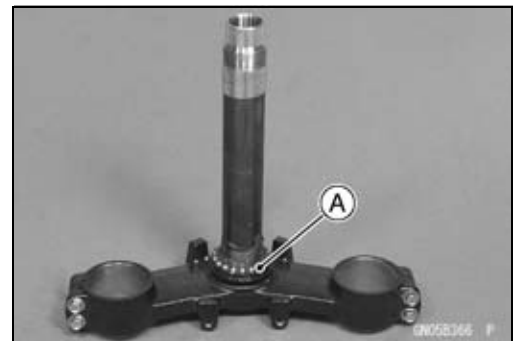
- Replace the bearing inner races and oil seal with new ones.
- Apply grease to the oil seal.
- Install the oil seal [A] on the steering stem, and drive the lower ball bearing inner race [B] applied the grease onto the stem.

**Special Tools - Steering Stem Bearing Driver,  $\phi 42.5$  [C]:**  
57001-1344

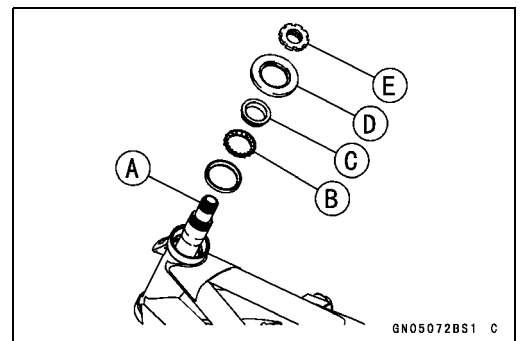
**Steering Stem Bearing Driver Adapter,  $\phi 41.5$  [D]: 57001-1345**



- Install the lower ball bearing [A] onto the stem.
- Grease the following.
  - Inner and Outer Races
  - Lower and Upper Ball Bearings
- The lower and upper ball bearings are identical.



- Install the stem [A] through the head pipe and install the ball bearing [B] and inner race [C] on it.
- Install:
  - Stem Cap [D]
  - Steering Stem Nut [E]



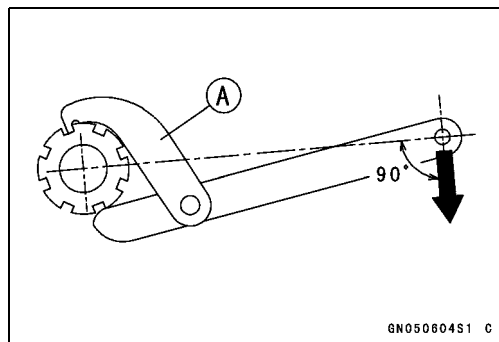
## 14-8 STEERING

### Steering Stem

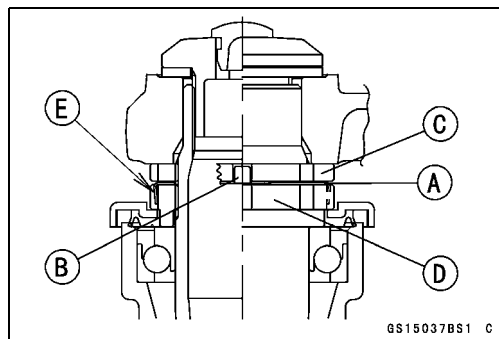
- Settle the bearings in place as follows.
- Tighten the steering stem nut with **55 N·m (5.6 kgf·m, 41 ft·lb)** of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using a steering stem nut wrench [A].

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

**Torque - Steering Stem Nut: 27 N·m (2.8 kgf·m, 20 ft·lb)**



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



#### NOTE

- Tighten the upper front fork clamp bolts first, next the stem head bolt, last the lower front fork clamp bolts.
- Tighten the two front fork clamp bolts alternately two times to ensure even tightening torque.

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

**Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**

**Lower Front Fork Clamp Bolts: 21 N·m (2.1 kgf·m, 15 ft·lb)**

#### WARNING

**Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).**

- Install the removed parts (see appropriate chapters).

#### **Steering Stem Bearing Lubrication**

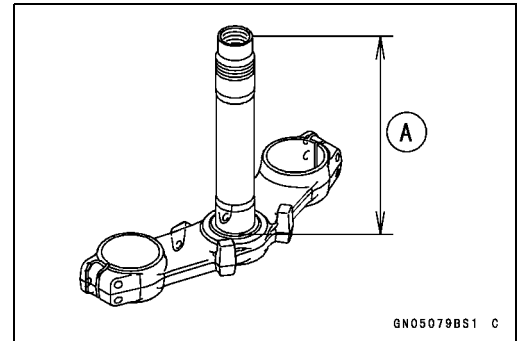
- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.



## Steering Stem

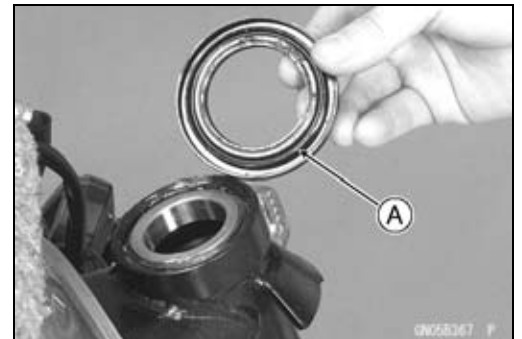
### ***Steering Stem Warp***

- Whenever the steering stem is removed, or if the steering can not be adjusted for smooth action, check the steering stem for straightness.
- ★ If the steering stem [A] is bent, replace the steering stem.



### ***Stem Cap Deterioration, Damage***

- ★ Replace the stem cap if its oil seal [A] shows damage.

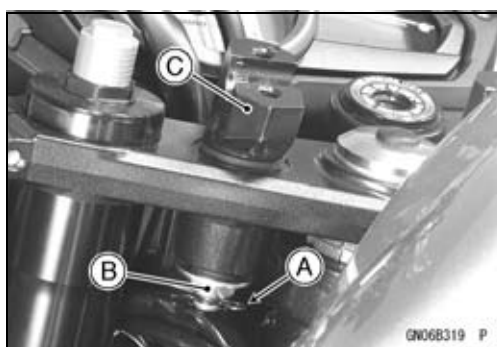
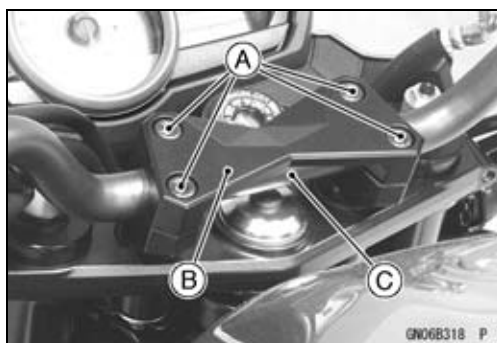
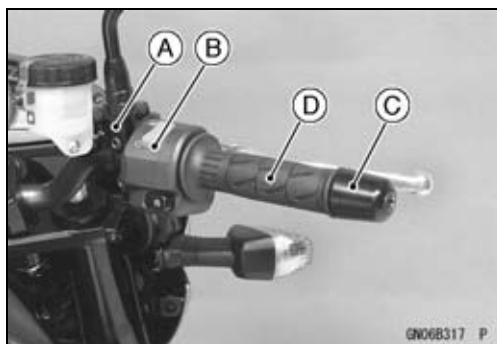
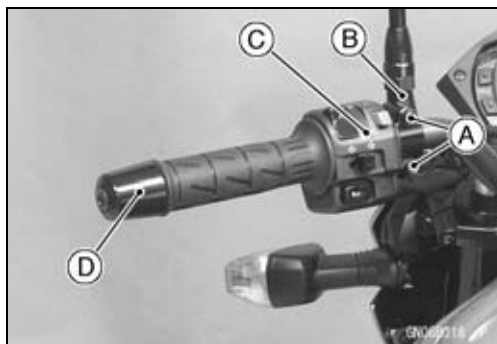


## 14-10 STEERING

### Handlebar

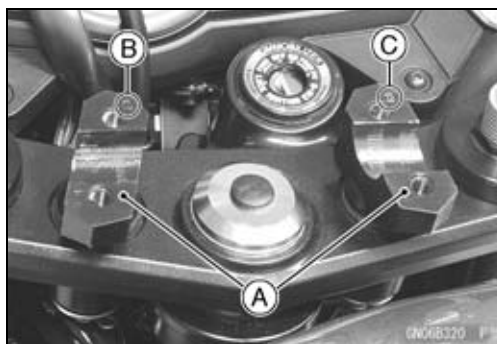
#### Handlebar Removal

- Remove:
  - Clutch Lever Clamp Bolts [A]
  - Clutch Lever Assembly [B]
  - Left Switch Housing [C]
  - Handlebar Weight [D]
- Remove:
  - Front Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
  - Right Switch Housing [B]
  - Handlebar Weight [C]
  - Throttle Grip [D]
- Remove:
  - Handlebar Holder Plugs
  - Handlebar Holder Bolts [A]
- Remove the handlebar holder [B], and then pull out the handlebar [C].
- Remove:
  - Cotter Pins [A]
  - Lower Clamp Nuts [B]
  - Washers
  - Handlebar Lower Clamps [C]



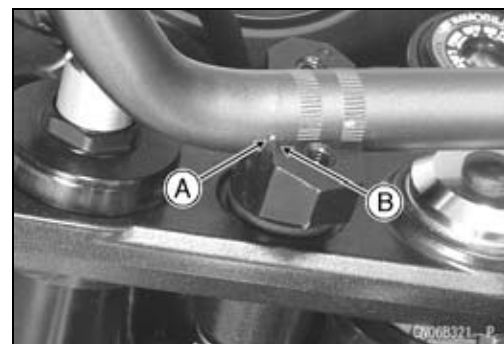
#### Handlebar Installation

- Install the handlebar lower clamps [A], noting the letters "L" [B] and "R" [C].
- Install the washers.
- Tighten:
  - Torque - Handlebar Lower Clamp Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)**
- Install the cotter pins.



## Handlebar

- Align the punch mark [A] on the handlebar and the corner edge [B] on the lower clamp.



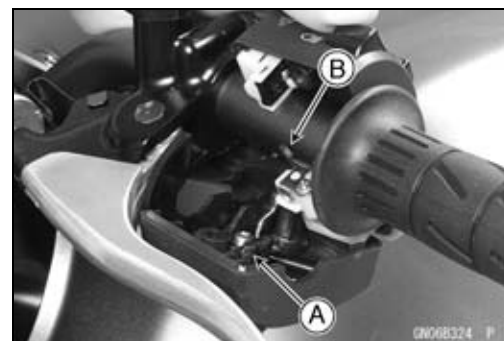
- Tighten the front holder bolts first, and then the rear holder bolts. There will be a gap [A] at the rear part of the holder after tightening.

**Torque - Handlebar Holder Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Install the handlebar holder plugs.



- Install the clutch lever (see Clutch Lever Installation in the Clutch chapter).
- Apply adhesive cement to the inside of the left handlebar grip.
- Apply a non-permanent locking agent to the left handlebar weight screw.
- Install the left switch housing.
- Fit the projection [A] into a hole [B] in the handlebar.
- Tighten:



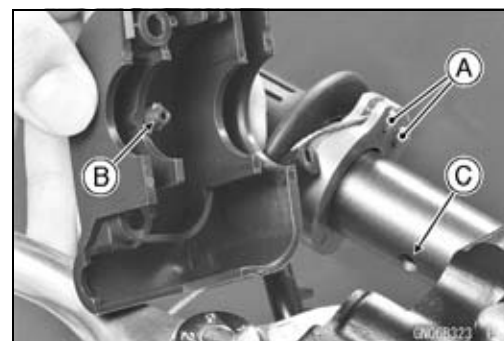
**Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**

- Install:
  - Throttle Grip
  - Throttle Cable Tips [A]
  - Right Switch Housing
- Fit the projection [B] into a hole [C] in the handlebar.

- Tighten:

**Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**

- Apply a non-permanent locking agent to the right handlebar weight screw.
- Install the front brake master cylinder (see Front Master Cylinder Installation in the Brakes chapter).





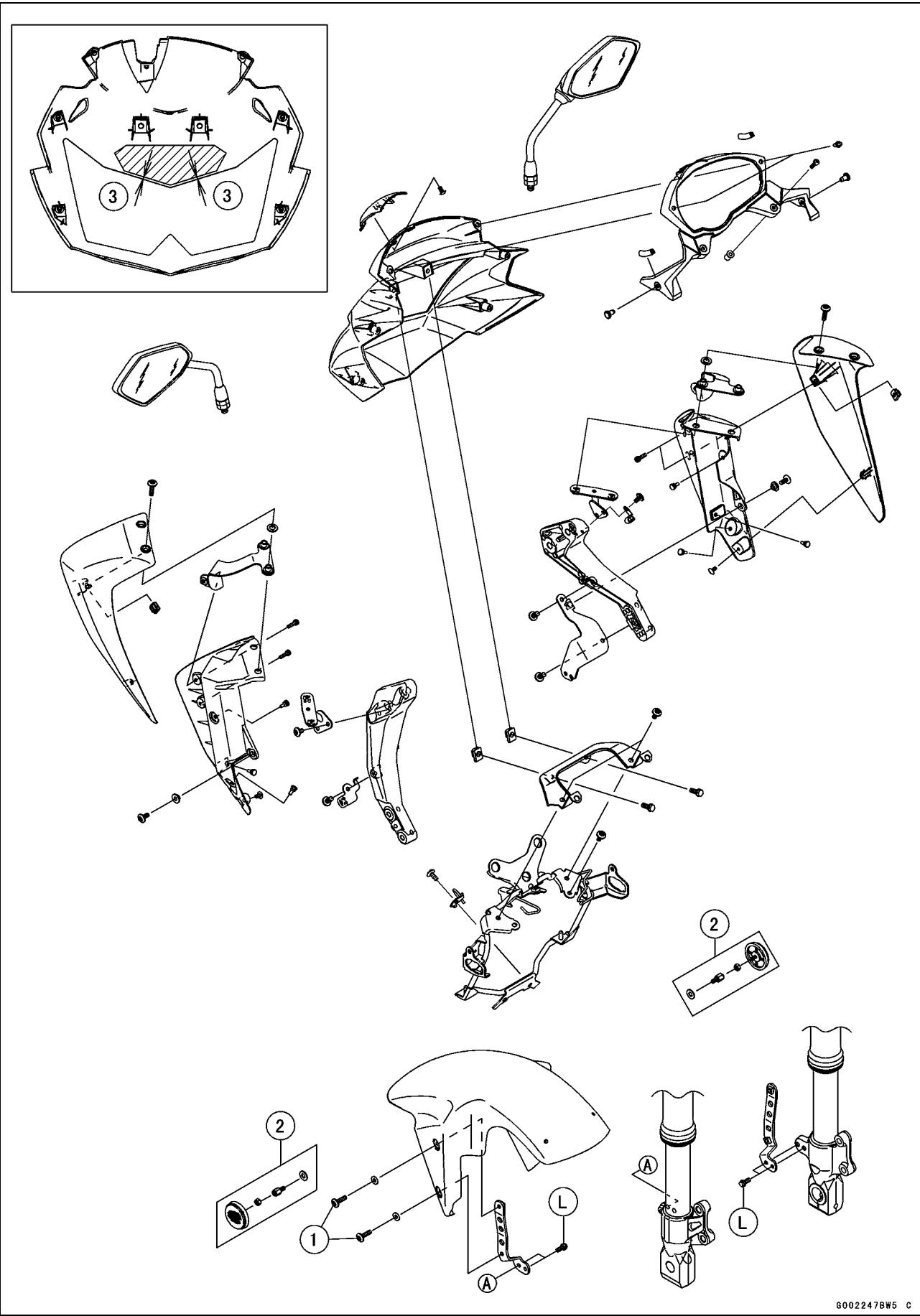
# Frame

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15-2 FRAME

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fender Bolts	3.9	0.40	35 in·lb	

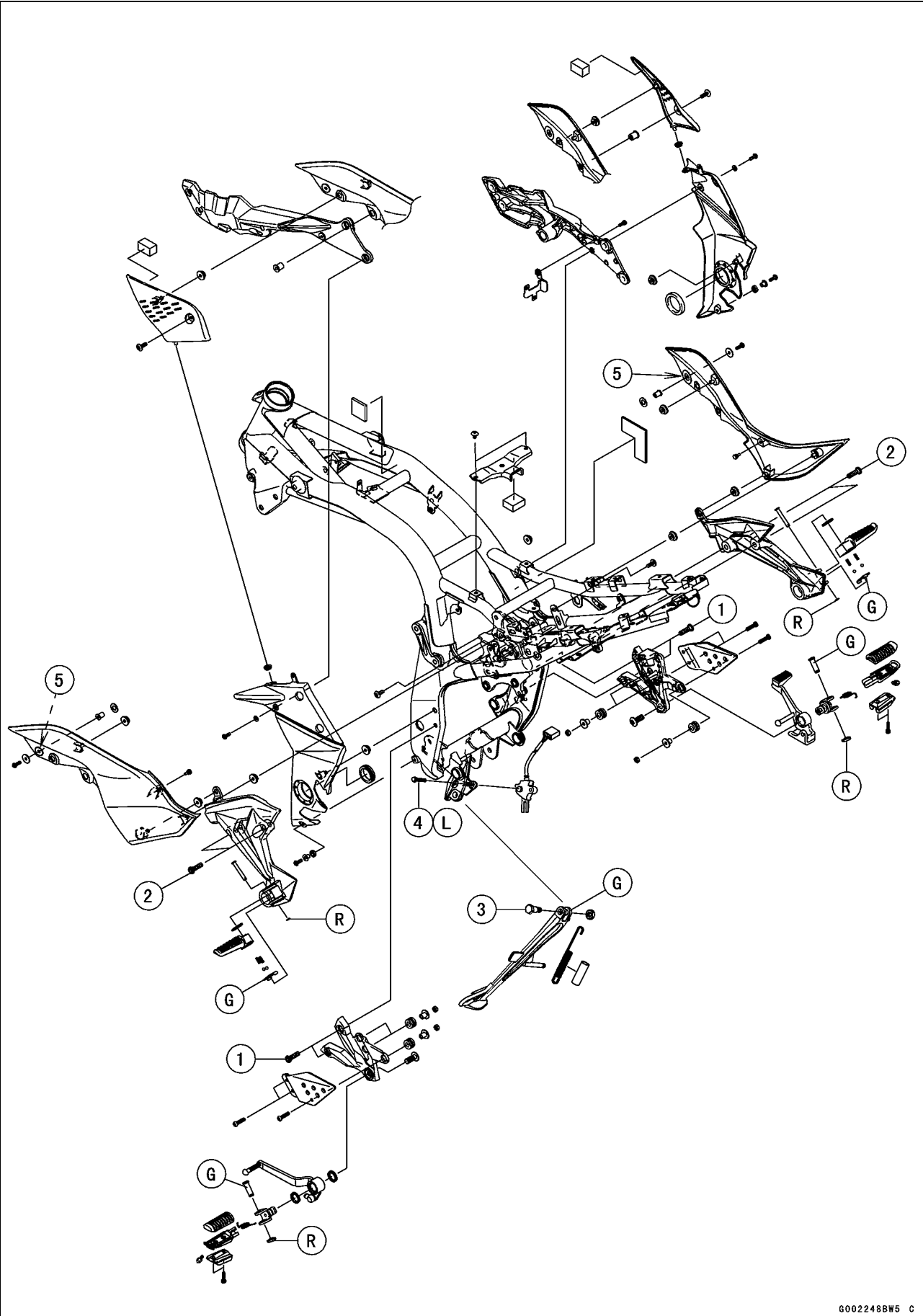
2. Reflector (AU Model)

3. 2 ~ 3 mm (0.08 ~ 0.12 in.)

L: Apply a non-permanent locking agent.

15-4 FRAME

Exploded View





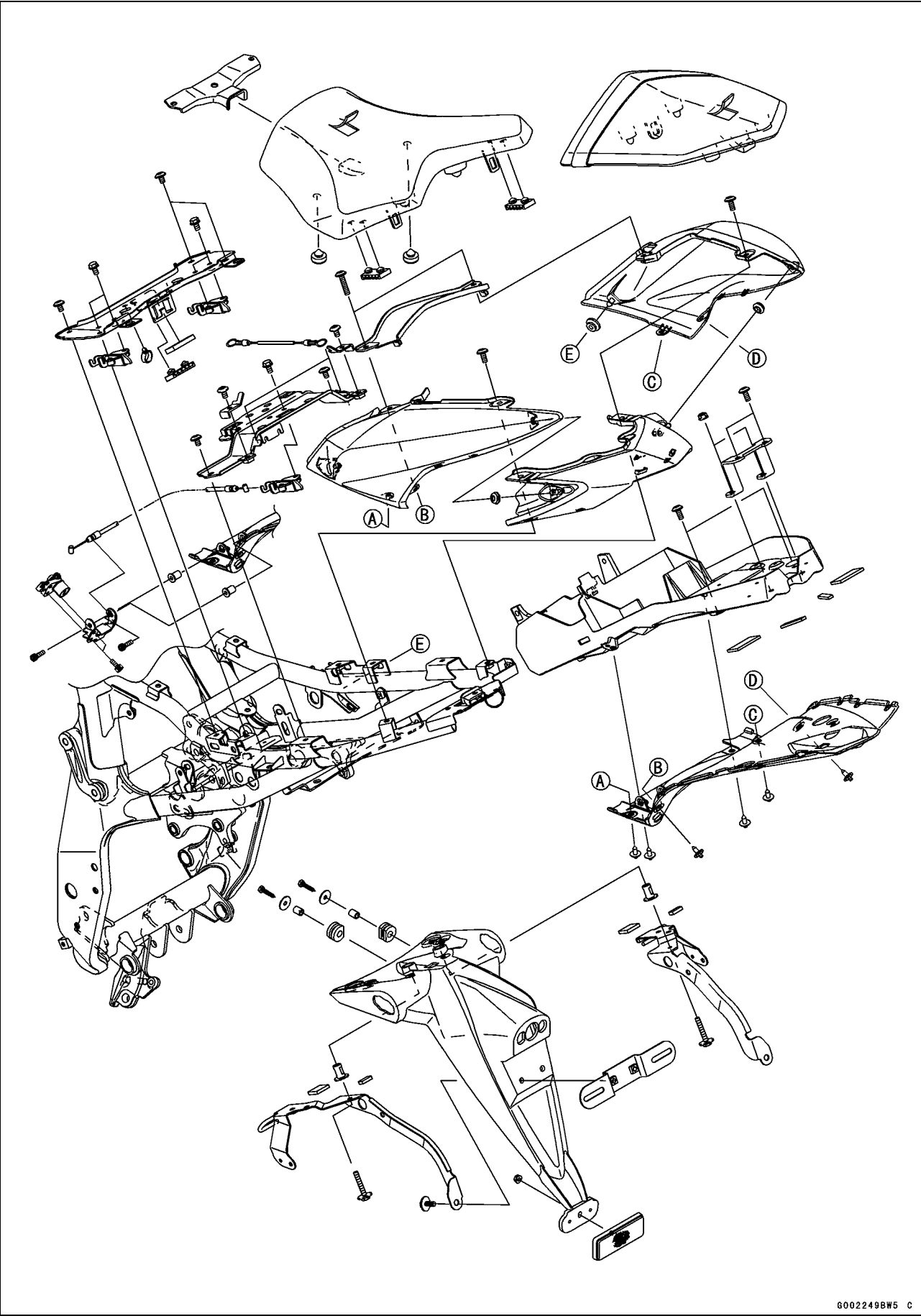
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Footpeg Bracket Bolts	25	2.5	18	
2	Rear Footpeg Bracket Bolts	25	2.5	18	
3	Sidestand Bolt	44	4.5	32	
4	Sidestand Switch Bolt	8.8	0.90	78 in·lb	L

5. With guard on the side cover: Frame No.; ~  
 Without guard on the side cover: Frame No.; ~  
 G: Apply grease.  
 L: Apply a non-permanent locking agent.  
 R: Replacement Parts

15-6 FRAME

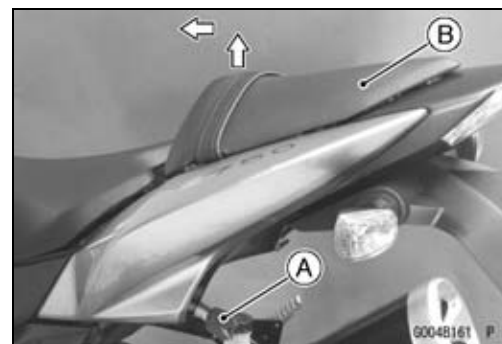
Exploded View



## Seats

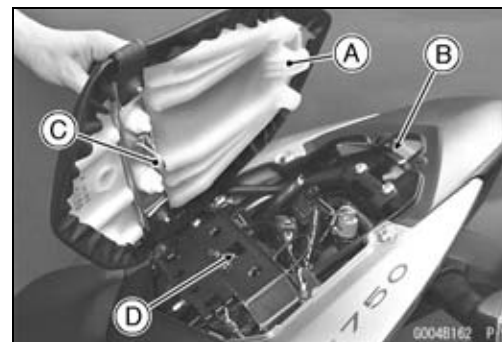
### **Rear Seat Removal**

- Insert the ignition switch key [A] into the seat lock, turning the key clockwise, pulling the front part of the seat [B] up, and pull the seat forward.



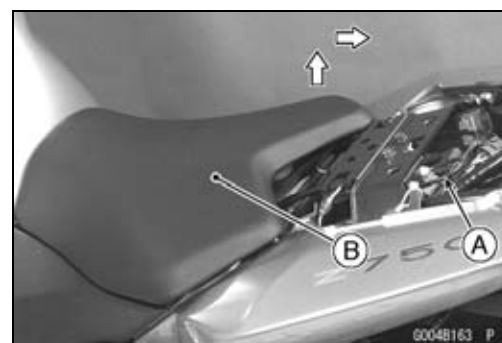
### **Rear Seat Installation**

- Insert the rear seat hook [A] into the bracket [B] of the frame.
- Insert the seat hook [C] into the latch hole [D].
- Push down the front part of the seat until the lock clicks.



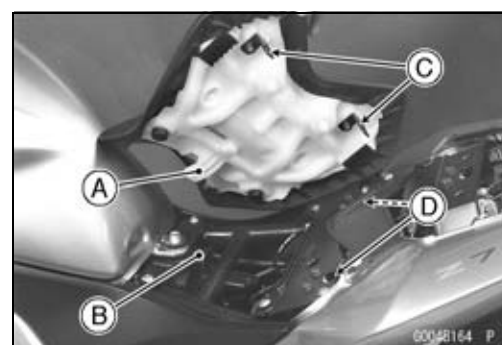
### **Front Seat Removal**

- Remove the rear seat (see Rear Seat Removal).
- Pull the seat lock cable [A], and then remove the front seat [B] by pulling the rear of it up and backward.



### **Front Seat Installation**

- Insert the front seat hook [A] under the brace [B] of the fuel tank bracket.
- Insert the seat hooks [C] into the latch holes [D].
- Push down the rear part of the seat until the lock clicks.

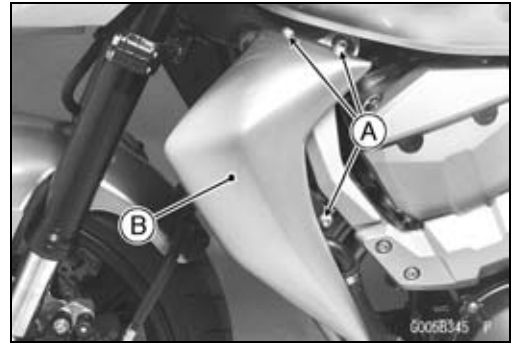


## 15-8 FRAME

### Fairings

#### **Center Fairing Removal**

- Remove:
  - Bolts [A]
  - Center Fairing [B]



- Remove:
  - Inner Fairing (see Inner Fairing Removal)
  - Bracket

#### **Center Fairing Installation**

- Installation is the reverse of removal.

#### **Upper Fairing Removal**

- Remove:
  - Inner Cover (see Inner Cover Removal)
  - Bolts [A] (Both Sides)
- Pull out the upper fairing forward.

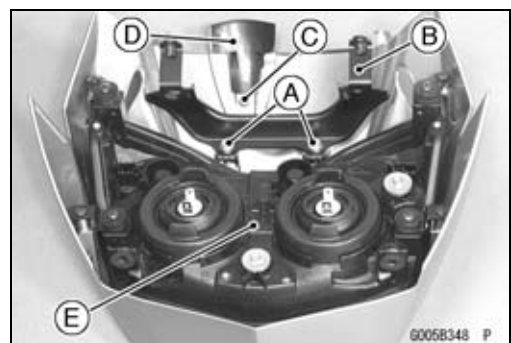


- Disconnect:
  - Headlight Lead Connectors [A]
  - City Light Lead Connectors [B]
- Remove the upper fairing [C].



#### **Upper Fairing Disassembly**

- Remove:
  - Upper Fairing (see Upper Fairing Removal)
  - Bolts [A]
  - Bracket [B]
  - Screw [C]
  - Cover [D]
  - Headlight [E] (see Headlight Removal in the Electrical System chapter)



#### **Upper Fairing Assembly**

- Installation is the reverse of removal.

## Fairings

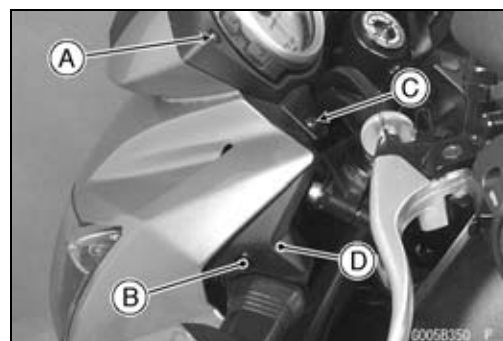
### Upper Fairing Installation

- Connect:
  - City Light Lead Connectors
  - Headlight Lead Connectors
- Fit the projections [A] on the upper fairing bracket into the holes [B] of the headlight.
- Tighten the bolts.



### Inner Cover Removal

- Push the central pin, and then remove the quick rivets [A].
- Remove:
  - Rivets [B] (Both Sides)
  - Bolts [C] (Both Sides)
  - Inner Cover [D]

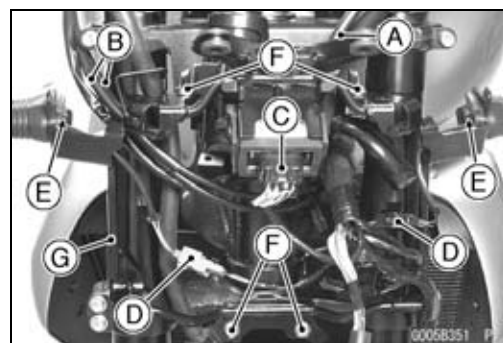


### Inner Cover Installation

- Installation is the reverse of removal.

### Upper Fairing Bracket Removal

- Remove:
  - Upper Fairing (see Upper Fairing Removal)
  - Meter Unit (see Meter Unit Removal/Installation in the Electrical System chapter)
  - Clutch Cable [A]
  - Throttle Cables [B]
  - Left and Right Switch Housing Lead Connectors (Disconnect)
  - Immobilizer Amplifier Lead Connector [C] (Equipped Models)
  - Left and Right Turn Signal Light Lead Connectors [D]
  - Screw [E] and Turn Signal Lights
  - Bolts [F]
  - Upper Fairing Bracket [G]

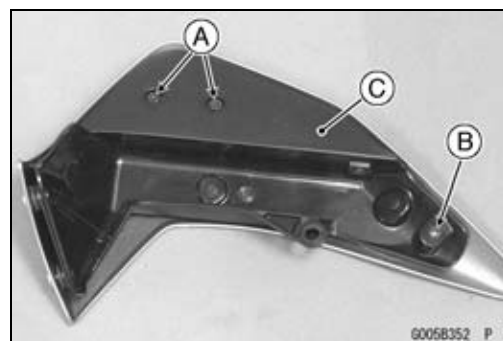


### Upper Fairing Bracket Installation

- Installation is the reverse of removal.
- Run the cables and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

### Inner Fairing Removal

- Remove:
  - Center Fairings (see Center Fairing Removal)
  - Bolts [A]
  - Screw [B]
  - Inner Fairing [C]



### Inner Fairing Installation

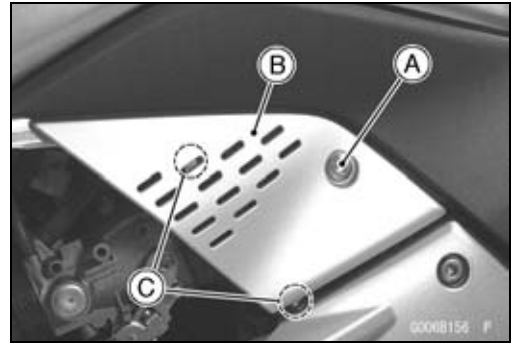
- Installation is the reverse of removal.

## 15-10 FRAME

### Side Covers

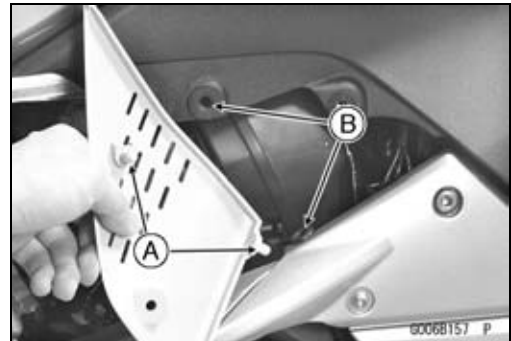
#### **Sub Side Cover Removal**

- Remove the bolt [A].
- Pull the sub side cover [B] to clear the stoppers [C].



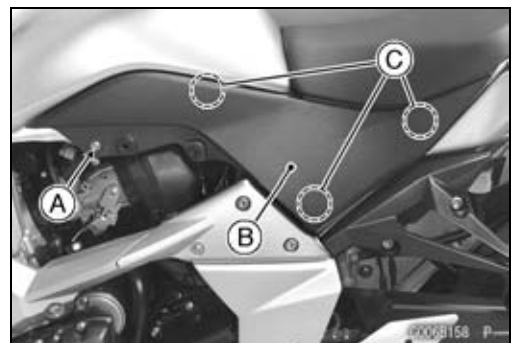
#### **Sub Side Cover Installation**

- Insert the projections [A] into the holes [B].
- Tighten the bolt.



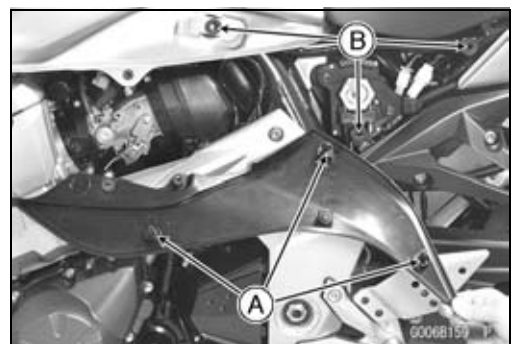
#### **Side Cover Removal**

- Remove:
  - Sub Side Cover (see Sub Side Cover Removal)
  - Bolt [A]
- Pull the side cover [B] evenly outward to clear the stoppers [C].



#### **Side Cover Installation**

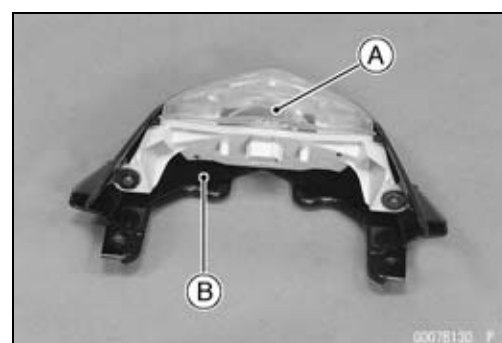
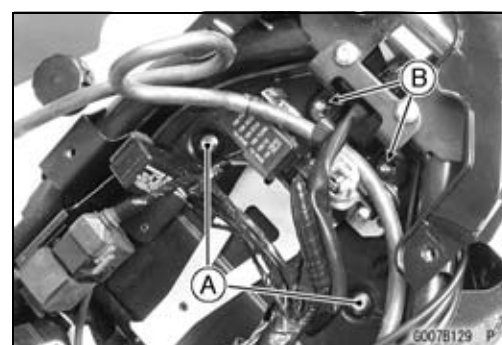
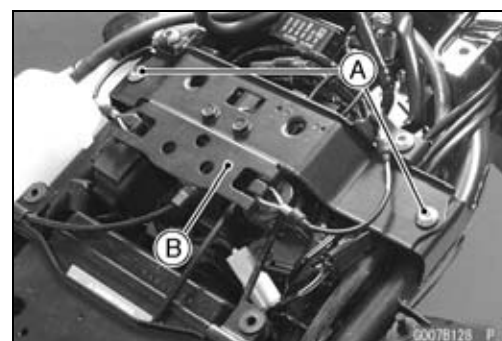
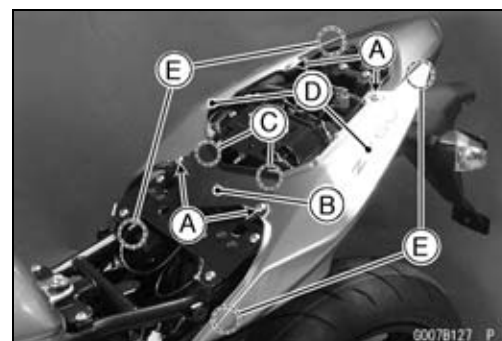
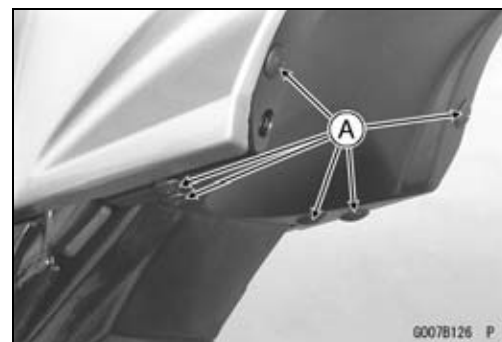
- Insert the projections [A] into the holes [B].
- Install:
  - Bolt
  - Sub Side Cover (see Sub Side Cover Installation)



## Seat Covers

### Seat Cover Removal

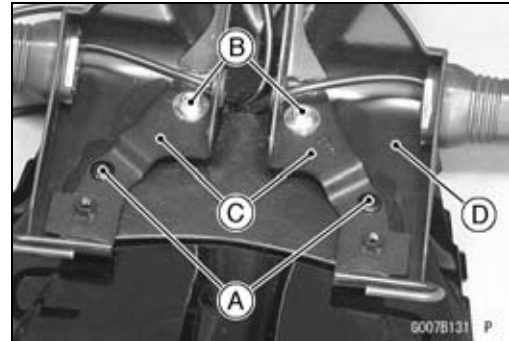
- Remove:
  - Seats (see Rear/Front Seat Removal)
  - Side Covers (see Side Cover Removal)
  - Rivet Screws [A]
  
- Remove the bolts [A].
- Pull the front seat cover [B] to clear the stoppers [C].
- Pull the left and right seat covers [D] to clear the stoppers [E].
  
- Remove:
  - Bolts [A]
  - Seat Bracket [B]
  - Turn Signal Light Lead Connectors (Disconnect)
  - License Plate Light Lead Connector (Disconnect)
  
- Remove:
  - Bolts [A]
  - Nuts [B]
  - Seat Lock Cable
- Remove the center seat cover from the lower seat cover.
  
- Remove:
  - Tail/Brake Light [A] (see Tail/Brake Light (LED) Removal in the Electrical System chapter)
  - Center Seat Cover [B]



## 15-12 FRAME

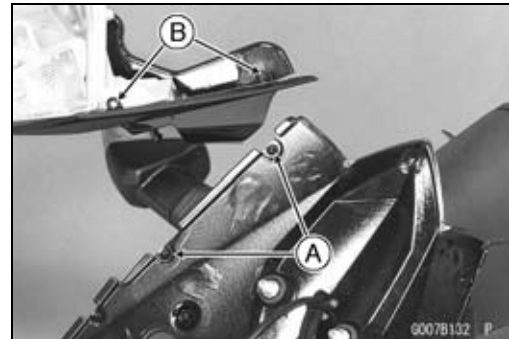
### Seat Covers

- Remove:
  - Rivets [A]
  - Bolts [B]
  - Brackets [C]
  - Flap [D] (with Turn Signal and License Plate Lights)
  - Bolts and Seat Lock Bracket
  - Lower Seat Cover

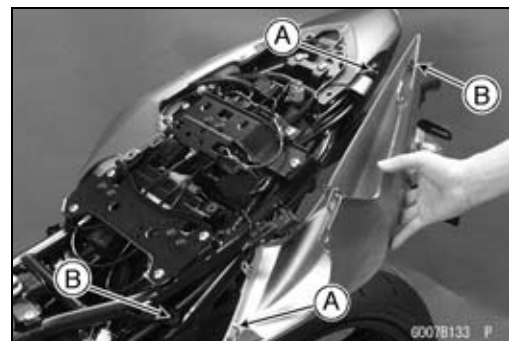


#### **Seat Cover Installation**

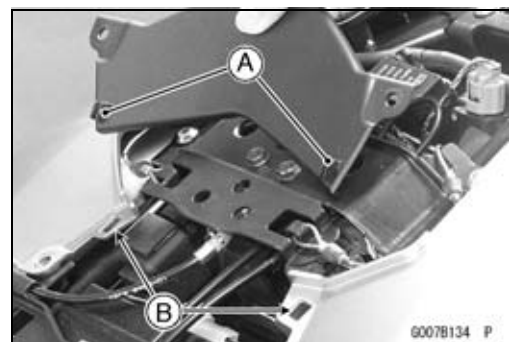
- Installation is the reverse of removal.
- Put the projections [A] into the holes [B] of the center seat cover.



- Run the cables, leads and hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Put the projections [A] into the holes [B].



- Put the projections [A] into the holes [B].
- Install the removed parts (see appropriate chapters).

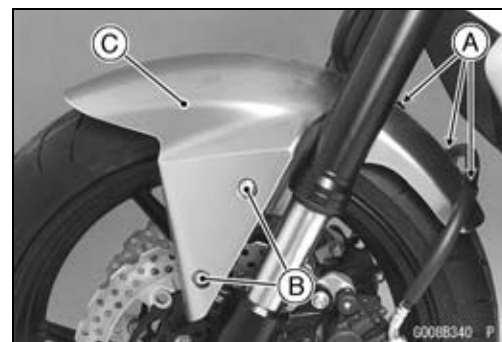




## Fenders

### Front Fender Removal

- Remove:
  - Brake Hose Clamps [A] (Both Sides)
  - Bolts [B] with Washers (Both Sides)
  - Front Fender [C]

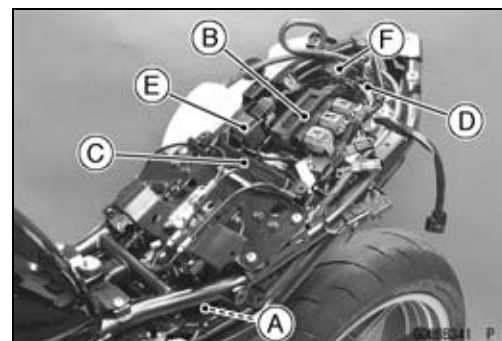


### Front Fender Installation

- Install the front fender to the front fork.
- Tighten:
  - Torque - Front Fender Bolts: 3.9 N·m (0.40 kgf·m, 35 in·lb)**
- Install the brake hose clamps to the front fender holes.

### Flap and Rear Fender Removal

- Remove:
  - Seats (see Rear/Front Seat Removal)
  - Seat Covers (see Seat Cover Removal)
  - Exhaust Butterfly Valve Actuator Mounting Bolts (see Exhaust Butterfly Valve Actuator Removal in the Fuel System (DFI) chapter)
  - Owner's Tool [A]
  - Relay Box [B] (see Relay Box Removal in the Electrical System chapter)
  - ECU (see ECU Removal in the Fuel System (DFI) chapter)
  - Battery [C] (see Battery Removal in the Electrical System chapter)
  - Vehicle-down Sensor [D] (see Vehicle-down Sensor Removal in the Fuel System (DFI) chapter)
  - Starter Relay [E] (see Starter Relay Inspection in the Electrical System chapter)
  - Fuse Box [F]
  - Flap (see Seat Cover Removal)



- Remove the bolts [A].
- Pull out the rear fender [B] backward.



### Flap and Rear Fender Installation

- Installation is the reverse of removal.
- Install the removed parts (see appropriate chapters).
- Run the cables, leads, harness and hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## 15-14 FRAME

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### Frame

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#### ***Frame Inspection***

- Visually inspect the frame for cracks, dents, bending, or warp.

○ If there is any damage to the frame, replace it.

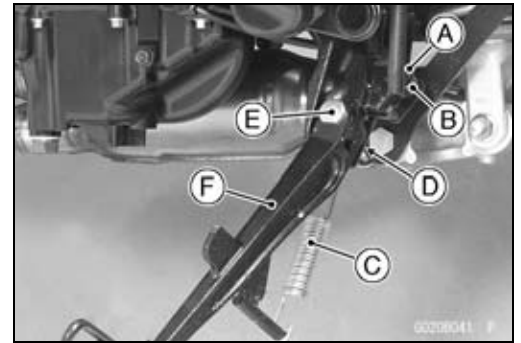
#### **WARNING**

**A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.**

## Sidestand

### **Sidestand Removal**

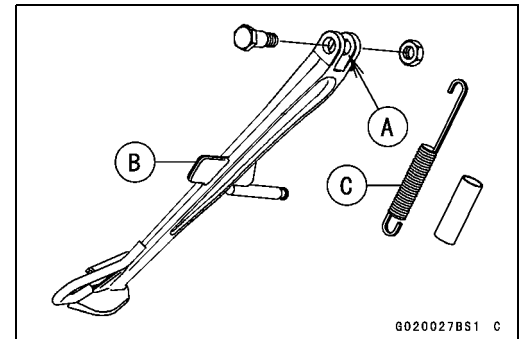
- Raise the rear wheel off the ground with the stand.
- Remove:
  - Sidestand Switch Bolt [A]
  - Sidestand Switch [B]
  - Spring [C]
  - Sidestand Nut [D]
  - Sidestand Bolt [E]
  - Sidestand [F]



### **Sidestand Installation**

- Apply grease to the sliding area [A] of the sidestand [B].
  - Tighten the bolt and lock them with the nut.
- Torque - Sidestand Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**
- Hook the spring [C] so that face the long spring end upward.
  - Install the spring hook direction as shown in the figure.
  - Install the sidestand switch.
  - Apply a non-permanent locking agent to the thread of the switch bolt, and tighten it.

**Torque - Sidestand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



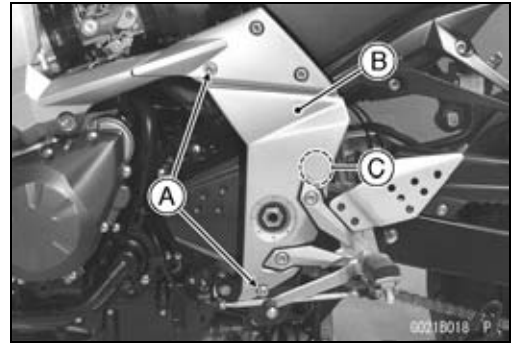
## 15-16 FRAME

### Frame Cover

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#### ***Frame Cover Removal***

- Remove:
  - Sub Side Covers (see Sub Side Cover Removal)
  - Bolts [A]
- Pull out the frame cover [B], and clear the stopper [C].



#### ***Frame Cover Installation***

- Insert the projection [A] into the hole [B].
- Tighten the bolts.



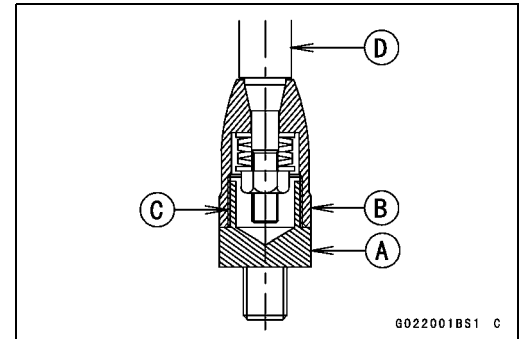
## Rear View Mirrors

### Rear View Mirrors Removal

- Loosen the lower hexagonal area [A] for tightening to remove the rear view mirror from the holder.

#### CAUTION

Do not force to tighten and/or loosen the upper hexagonal area (adapter) [B] with a pair of spanners. Disassembly of this area is Not Available. Non-permanent locking agent [C] is already applied to the threads of this inner area. Forcible loosening may damage the adapter and/or the turning mechanism of the stay [D].



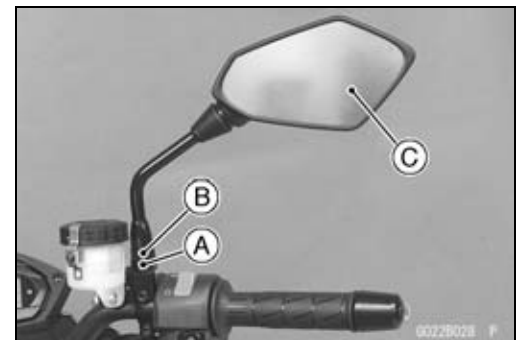
### Rear View Mirrors Installation

- 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.

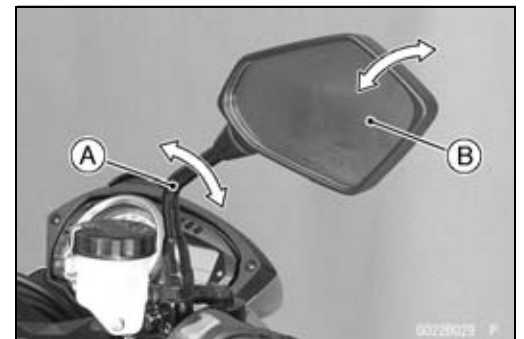
Lower Hexagonal Area for Tightening [A]

Upper Hexagonal Area (Adapter) [B]

Rear View Mirror (Right) [C]



- Turn the stay [A] to assure the safe conditions of the rear with the operator sat on the motorcycle.
  - Adjust the rear view mirror slightly with its mirror [B].
- Installation and adjustment of the left side are common with those of the right side. Follow the procedure specified at the right side.





# Electrical System

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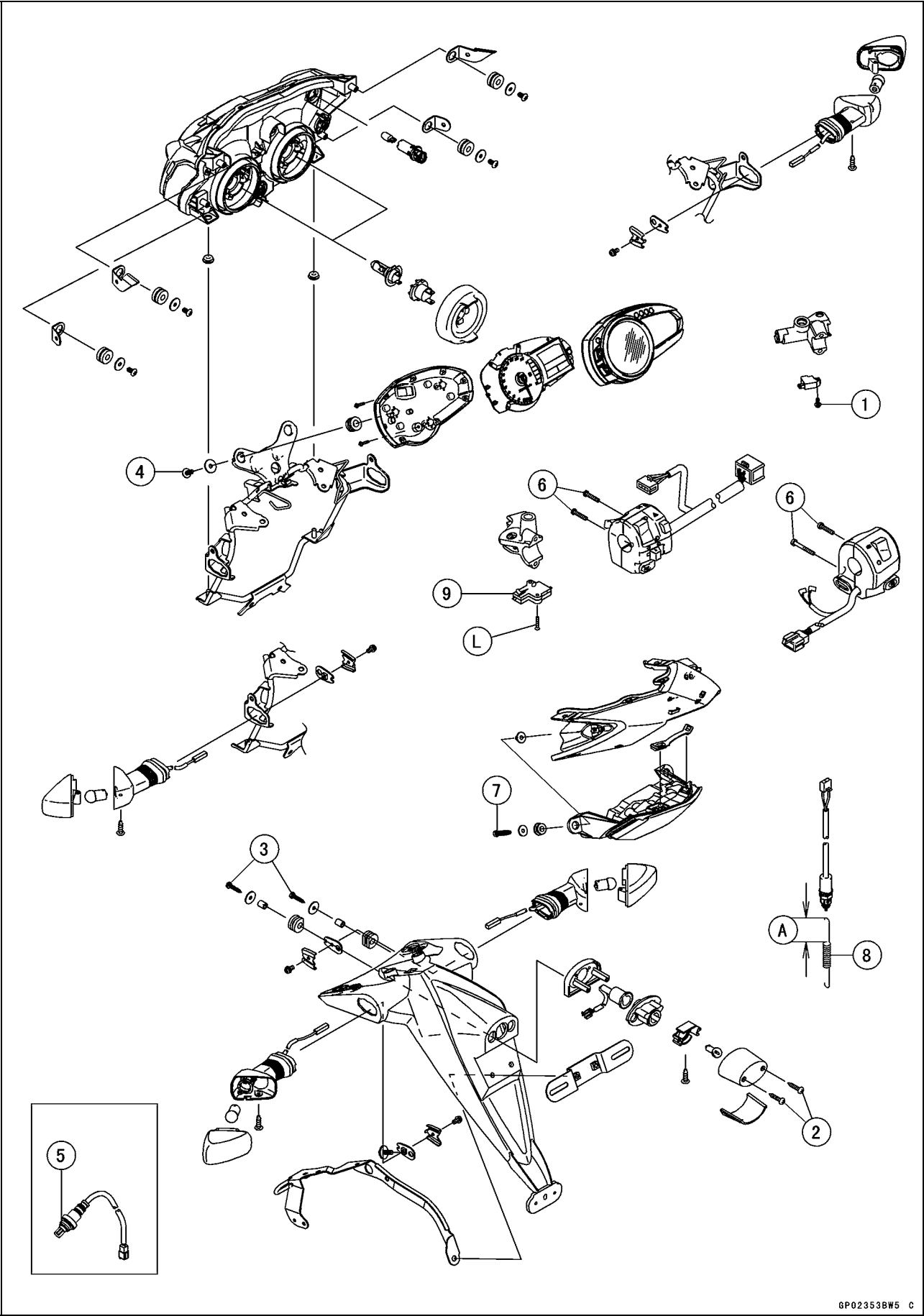
**Exploded View**

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16-4 ELECTRICAL SYSTEM

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
2	License Plate Light Cover Mounting Screws	0.9	0.09	8 in·lb	
3	License Plate Light Mounting Screws	1.2	0.12	11 in·lb	
4	Meter Mounting Screws	1.2	0.12	11 in·lb	
5	Oxygen Sensor (Equipped Models)	44.1	4.50	32.5	
6	Switch Housing Screws	3.5	0.36	31 in·lb	
7	Tail/Brake Light Mounting Screws	1.2	0.12	11 in·lb	

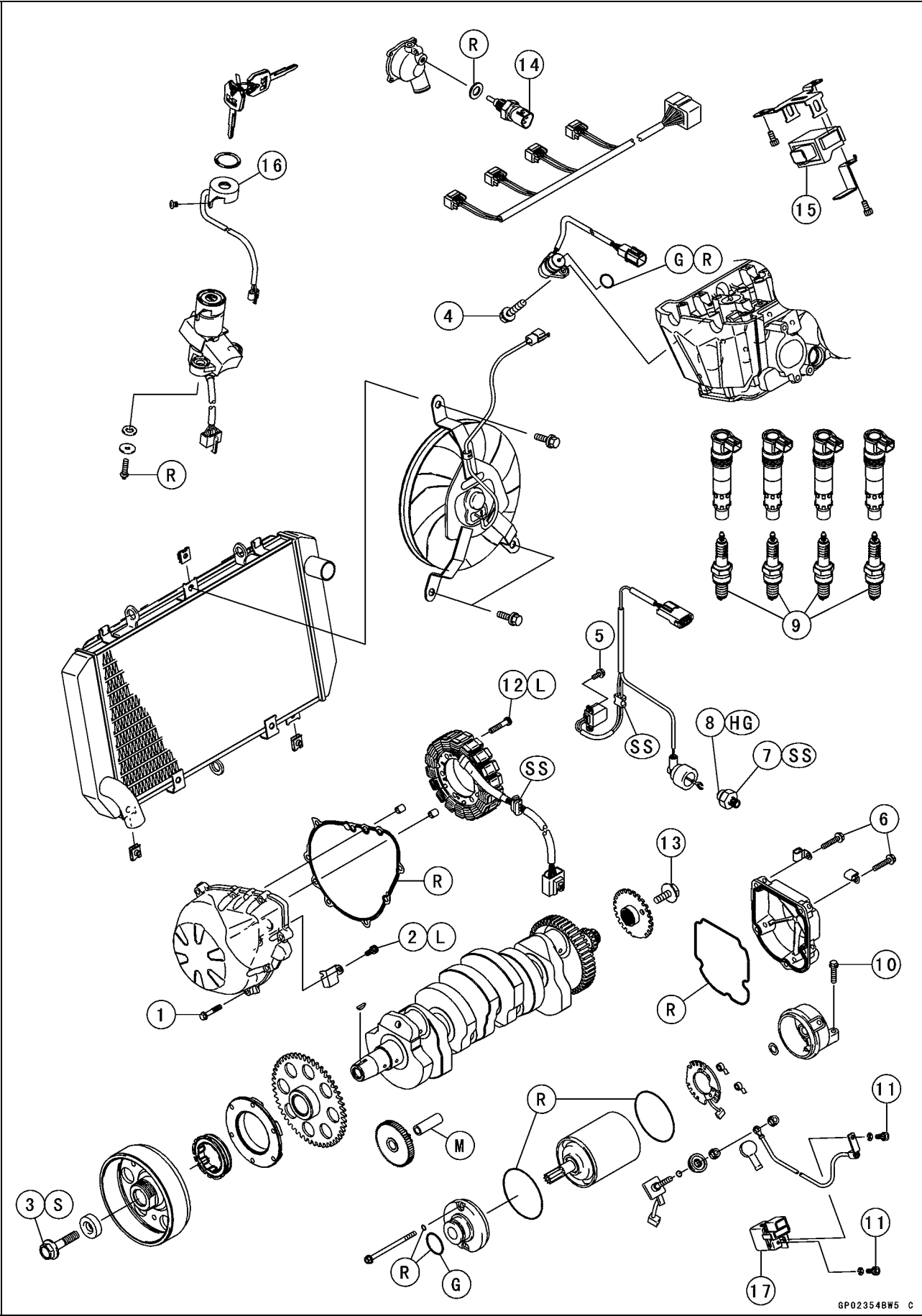
8. Install the rear brake light switch spring so that the longer side [A] faces upward.

9. Starter Lockout Switch

L: Apply a non-permanent locking agent.

16-6 ELECTRICAL SYSTEM

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Alternator Cover Bolts	11	1.1	97 in·lb	
2	Alternator Lead Holding Plate Bolt	12	1.2	106 in·lb	L
3	Alternator Rotor Bolt	155	15.8	114	S
4	Camshaft Position Sensor Bolt	12	1.2	106 in·lb	
5	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
6	Crankshaft Sensor Cover Bolts	11	1.1	97 in·lb	
7	Oil Pressure Switch	15	1.5	11	SS
8	Oil Pressure Switch Terminal Bolt	2.0	0.20	18 in·lb	HG
9	Spark Plugs	13	1.3	115 in·lb	
10	Starter Motor Mounting Bolts	11	1.1	97 in·lb	
11	Starter Relay Cable Terminal Bolts	3.9	0.40	35 in·lb	
12	Stator Coil Bolts	12	1.2	106 in·lb	L
13	Timing Rotor Bolt	39	4.0	29	
14	Water Temperature Sensor	25	2.5	18	

15. Immobilizer Amplifier

16. Immobilizer Antenna

17. Starter Relay

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

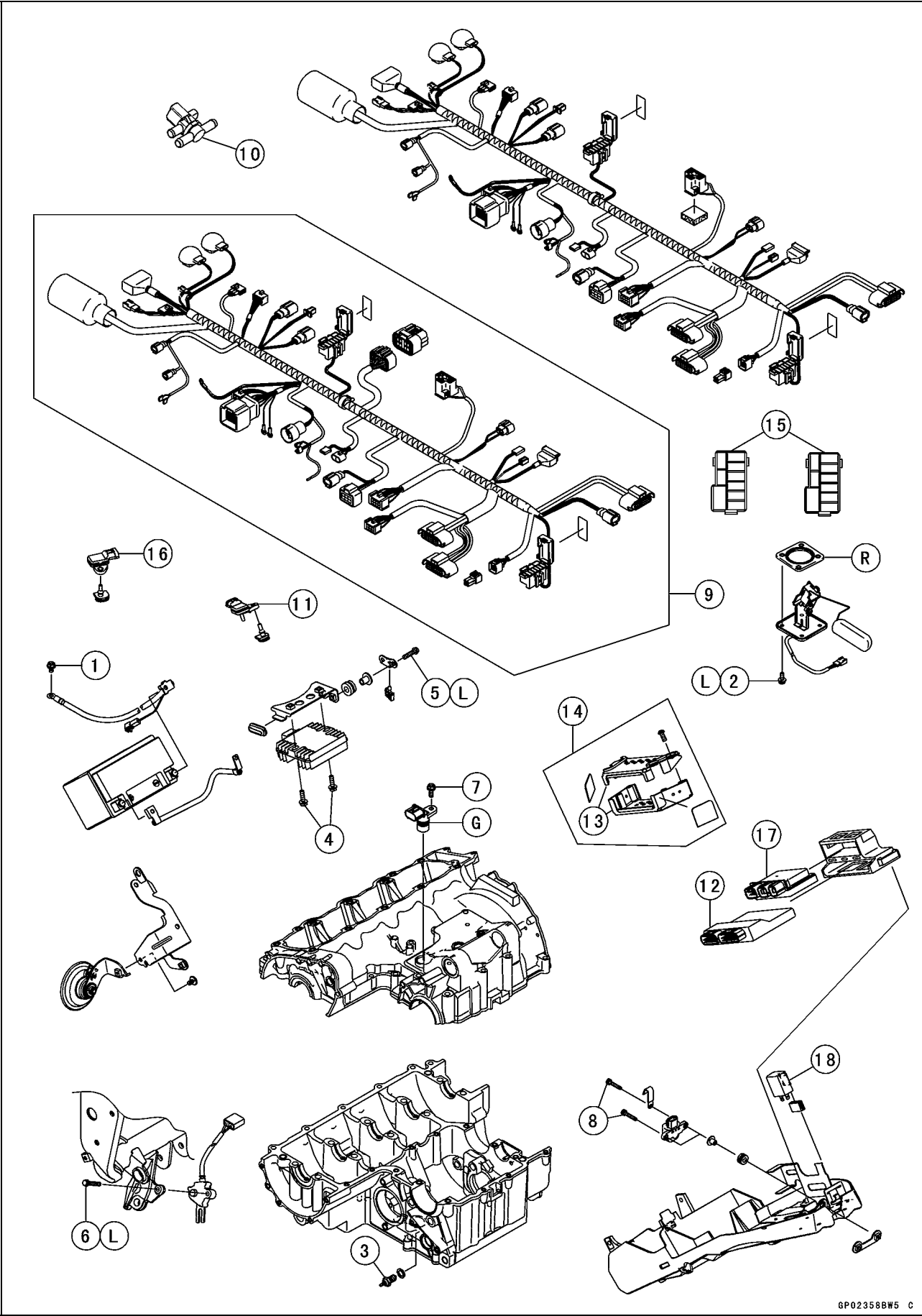
R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

16-8 ELECTRICAL SYSTEM

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
2	Fuel Level Sensor Bolts	6.9	0.70	61 in·lb	L
3	Neutral Switch	15	1.5	11	
4	Regulator/Rectifier Bolts	6.9	0.70	61 in·lb	
5	Regulator/Rectifier Bracket Bolts	6.9	0.70	61 in·lb	L
6	Sidestand Switch Bolt	8.8	0.90	78 in·lb	L
7	Speed Sensor Bolt	12	1.2	106 in·lb	
8	Vehicle-down Sensor Bolts	6.0	0.61	53 in·lb	

9. ABS Equipped Models

10. Air Switching Valve

11. Atmospheric Pressure Sensor

12. ECU

13. ECU Guards

14. Europe Models

15. Fuse Boxes

16. Inlet Air Pressure Sensor

17. Relay Box

18. Turn Signal Relay

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 16-10 ELECTRICAL SYSTEM

### Specifications

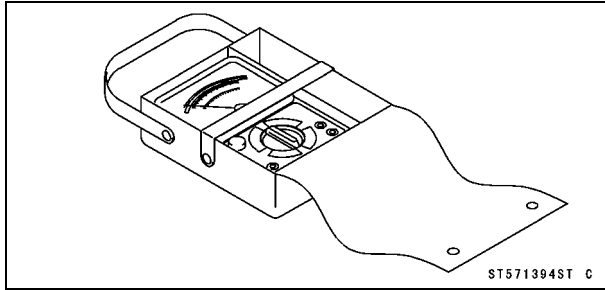
Item	Standard
<b>Battery</b> Type Model Name Capacity Voltage	Sealed Battery YTX9-BS 12 V 8 Ah 12.8 V or more
<b>Charging System</b> Type Alternator Output Voltage Stator Coil Resistance Charging Voltage (Regulator/Rectifier Output Voltage)	Three-phase AC 39 V or more at 4 000 r/min (rpm) 0.18 ~ 0.28 $\Omega$ at 20°C (68°F) 14.2 ~ 15.2 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: Type Gap	376 ~ 564 $\Omega$ 2.0 V or more 400 ~ 460 $\Omega$ at 20°C (68°F) 0.2 V or more  1.0 ~ 1.6 $\Omega$ 10.8 ~ 16.2 k $\Omega$ 100 V or more  NGK CR9EK 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)
<b>Electric Starter System</b> Starter Motor: Brush Length Commutator Diameter	  12 mm (0.47 in.) (Service limit: 8.5 mm, 0.33 in.) 28 mm (1.10 in.) (Service limit: 27 mm, 1.06 in.)
<b>Air Switching Valve</b> Resistance	18 ~ 22 $\Omega$ at 20°C (68°F)
<b>Switches and Sensors</b> Rear Brake Light Switch Timing Engine Oil Pressure Switch Connections  Water Temperature Sensor Resistance Fuel Level Sensor Resistance: Full Position Empty Position	ON after about 10 mm (0.39 in.) pedal travel When engine is stopped: ON When engine is running: OFF in the text   6 ~ 10 $\Omega$ 90 ~ 100 $\Omega$



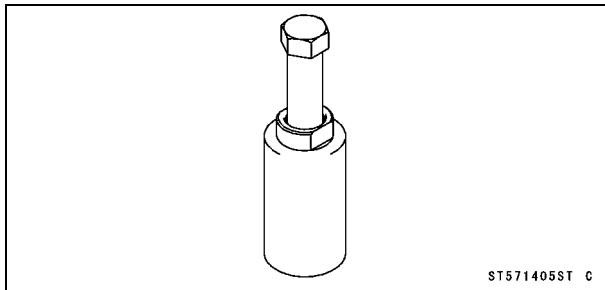
## Special Tools and Sealant

**Hand Tester:**

**57001-1394**

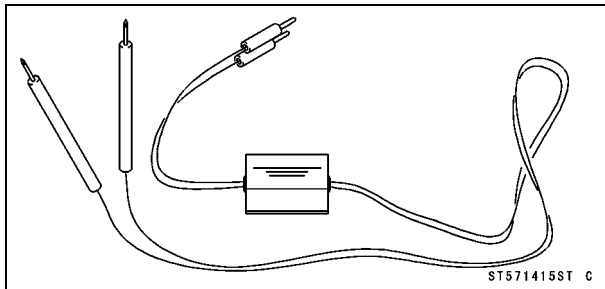


**Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:**  
**57001-1405**



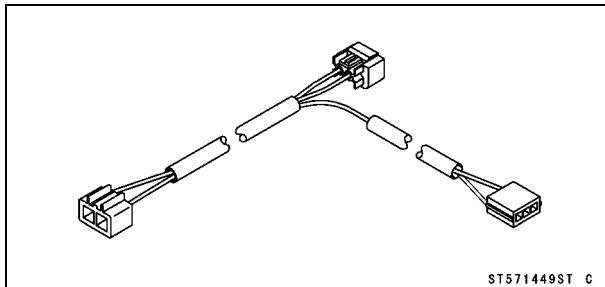
**Peak Voltage Adapter:**

**57001-1415**



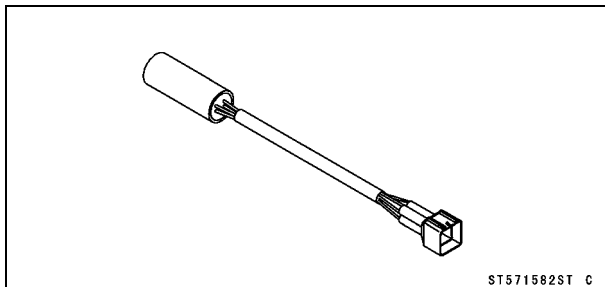
**Lead Wire - Peak Voltage Adapter:**

**57001-1449**



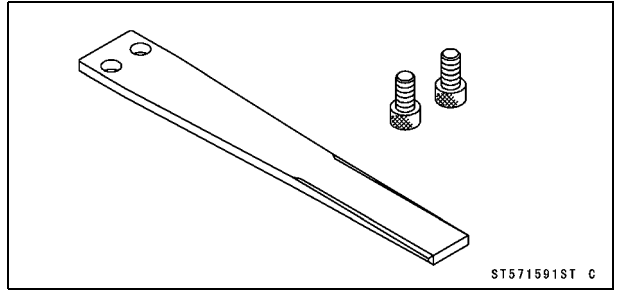
**Key Registration Unit:**

**57001-1582**



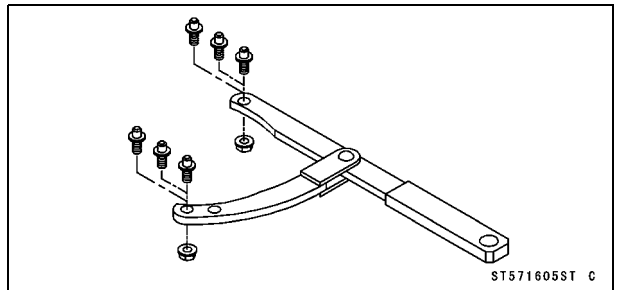
**Grip:**

**57001-1591**



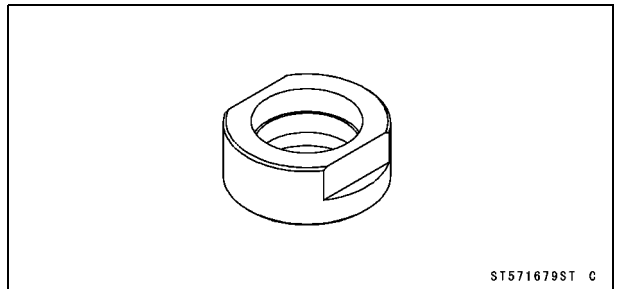
**Flywheel & Pulley Holder:**

**57001-1605**



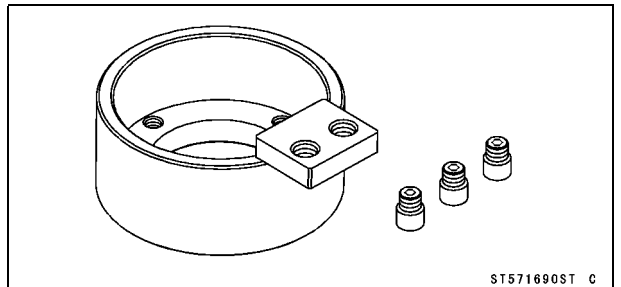
**Stopper:**

**57001-1679**



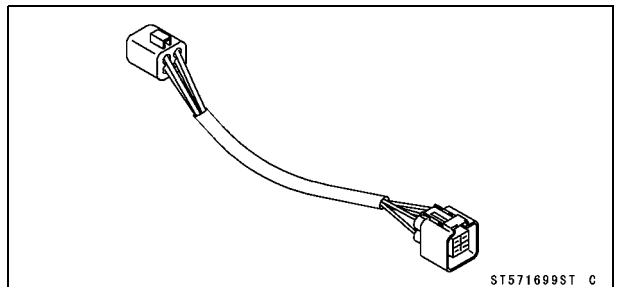
**Rotor Holder:**

**57001-1690**



**Connection Cable:**

**57001-1699**



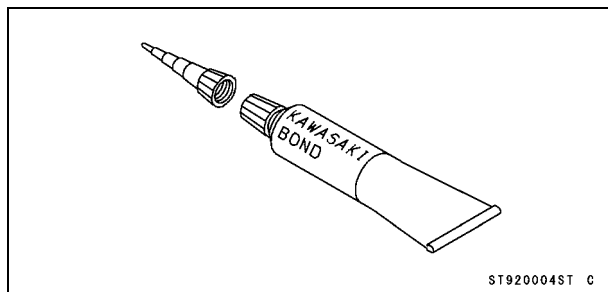
## 16-12 ELECTRICAL SYSTEM

### Special Tools and Sealant

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Kawasaki Bond (Silicone Sealant):

92104-0004



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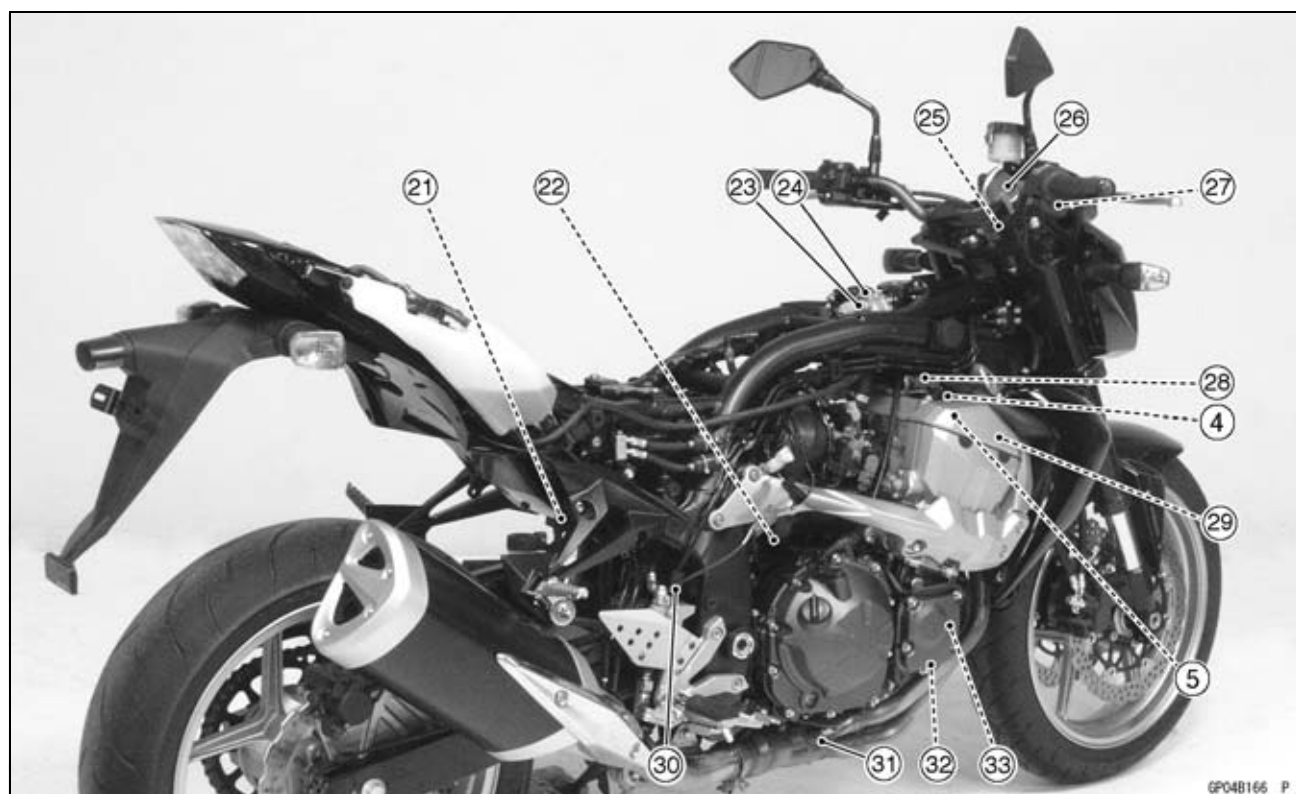
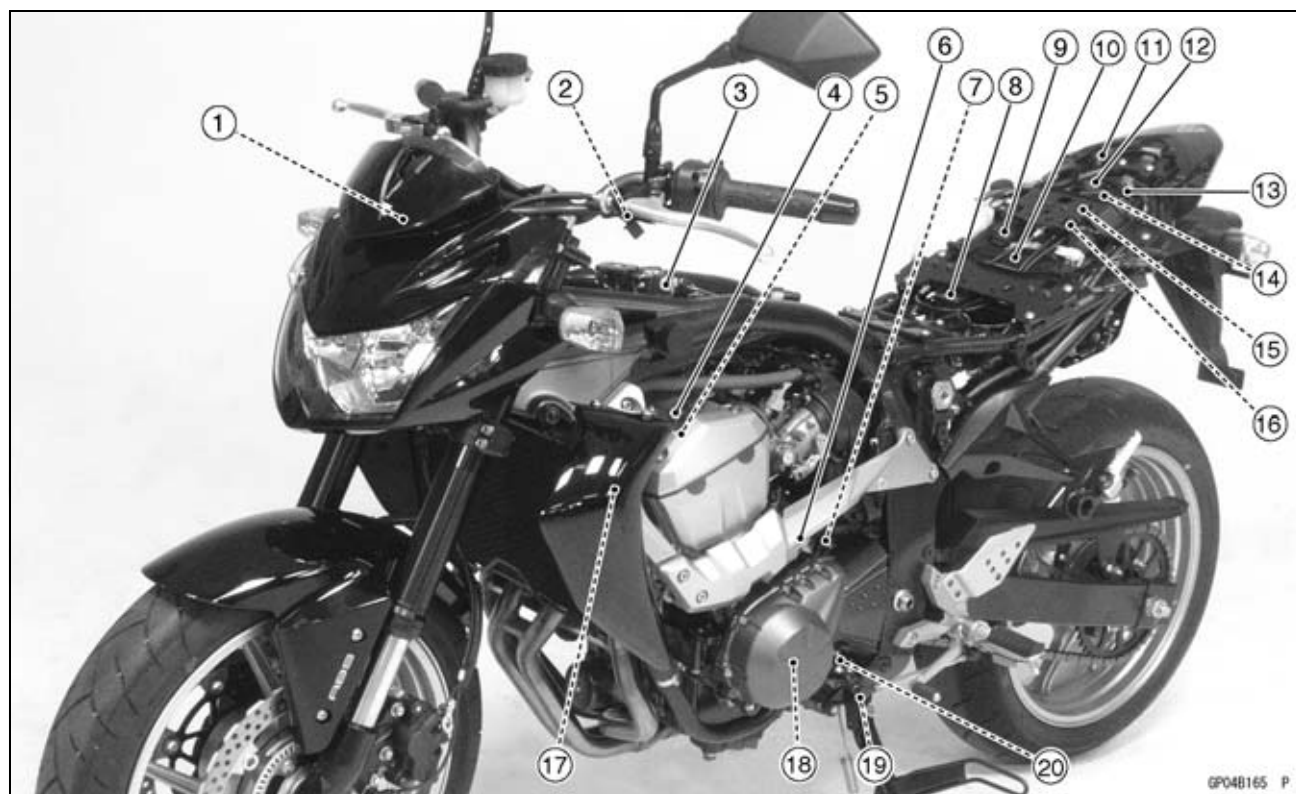
**Parts Location**

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## 16-14 ELECTRICAL SYSTEM

### Parts Location



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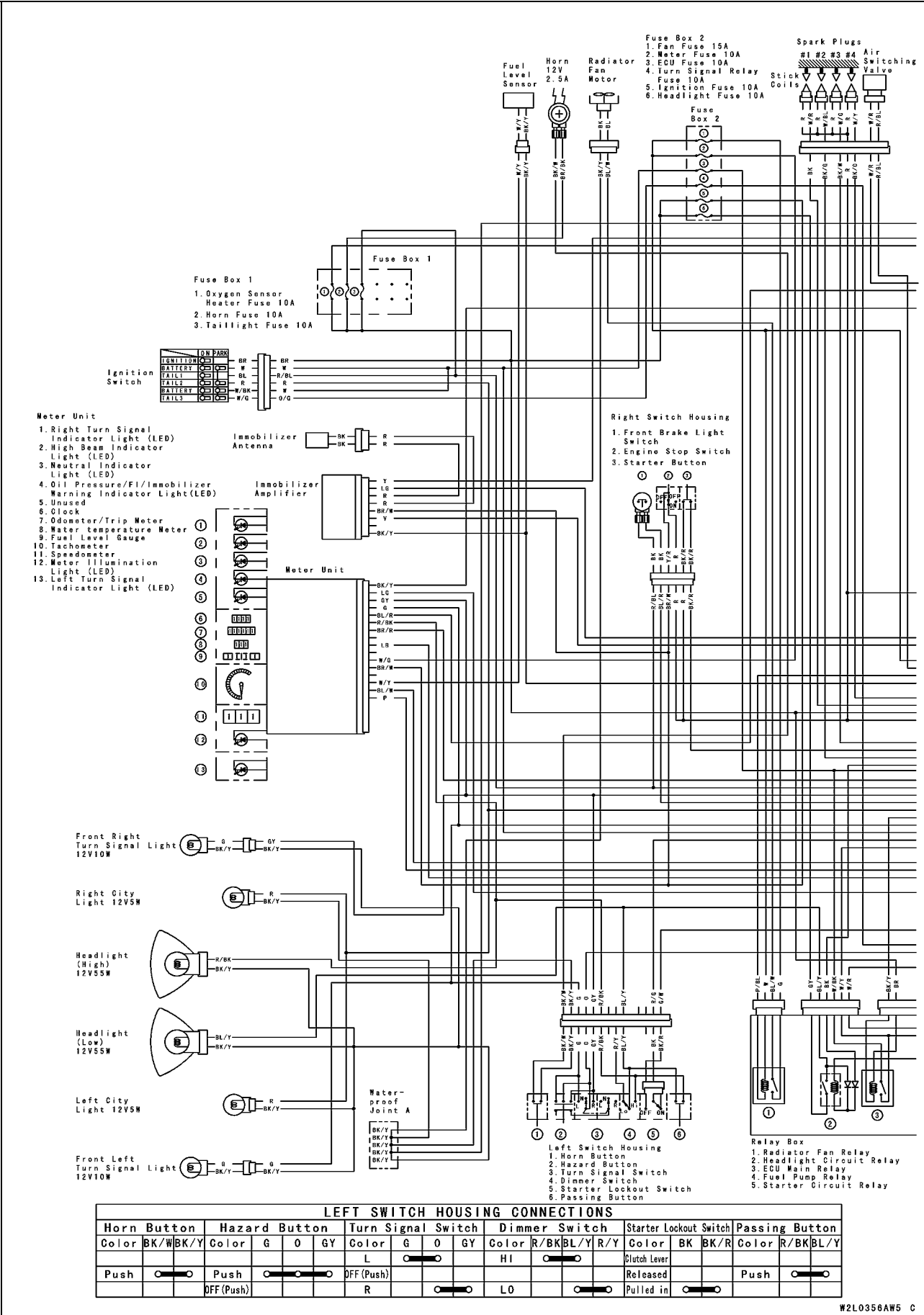
**Parts Location**

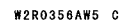
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1. Immobilizer Amplifier (Immobilizer Equipped Models)
2. Starter Lockout Switch
3. Frame Ground
4. Stick Coils
5. Spark Plugs
6. Starter Motor
7. Speed Sensor
8. Fuse Box 1
9. Starter Relay
10. Battery 12 V 8 Ah
11. Turn Signal Relay
12. Fuse Box 2
13. Vehicle-down Sensor
14. Kawasaki Diagnostic System Connector
15. Relay Box
16. ECU
17. Camshaft Position Sensor
18. Alternator
19. Sidestand Switch
20. Neutral Switch
21. Regulator/Rectifier
22. Engine Ground
23. Water Temperature Sensor
24. Meter Ground
25. Ignition Switch  
(Immobilizer Equipped Models: Including Immobilizer Antenna)
26. Meter Unit
27. Front Brake Light Switch
28. Air Switching Valve
29. Radiator Fan Motor
30. Rear Brake Light Switch
31. Oxygen Sensor (Equipped Models)
32. Oil Pressure Switch
33. Crankshaft Sensor

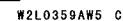
# 16-16 ELECTRICAL SYSTEM

## Wiring Diagram



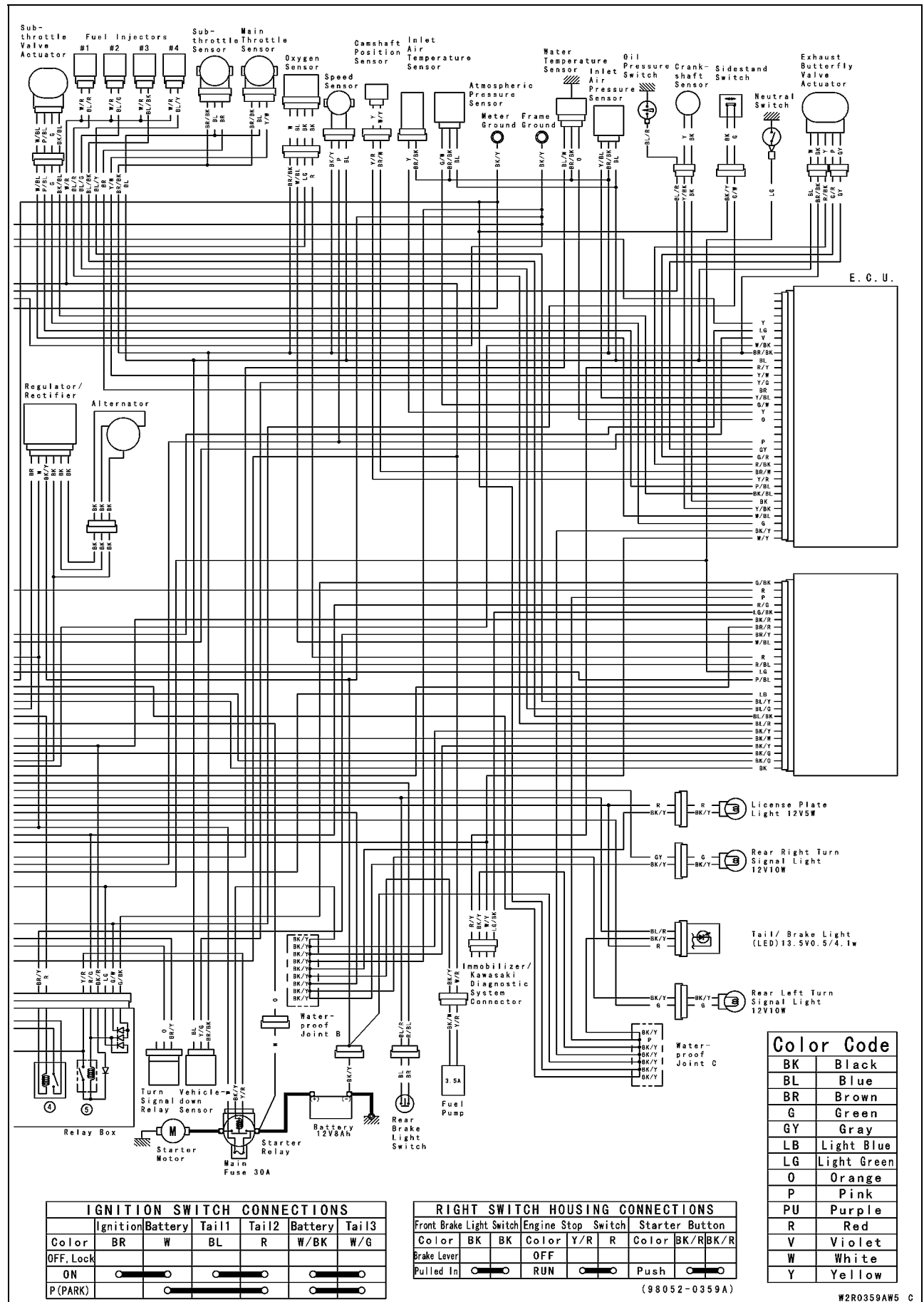


### Wiring Diagram (ABS Equipped Models)





## Wiring Diagram (ABS Equipped Models)



## 16-20 ELECTRICAL SYSTEM

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### Precautions

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There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Take care not to short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

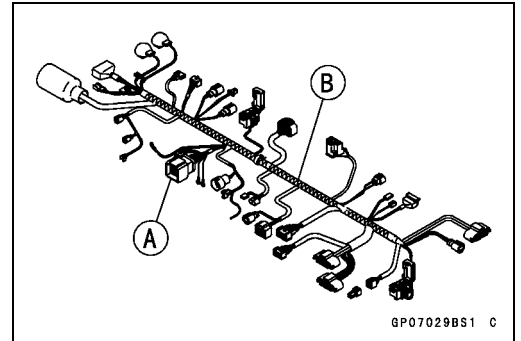
## Electrical Wiring

### Wiring Inspection

- Visually inspect the wiring for signs of burning, fraying, etc.
- ★ If any wiring is poor, replace the damaged wiring.
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
- Connect 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] if necessary.



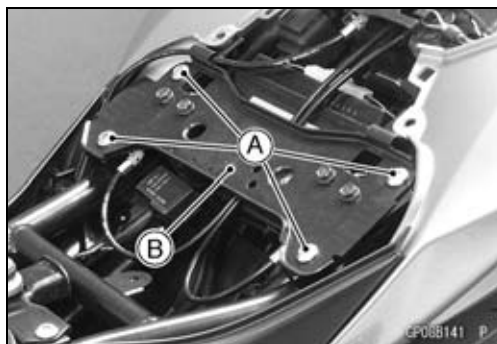
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## 16-22 ELECTRICAL SYSTEM

### Battery

#### Battery Removal

- Turn off the ignition switch.
- Remove:
  - Seats (see Rear/Front Seat Removal in the Frame chapter)
  - Front Seat Cover (see Seat Cover Removal in the Frame chapter)
  - Bolts [A] and Front Seat Bracket [B]
- Push the stopper [A] and pull up the fuse box from the front seat bracket [B].



- Disconnect the ground lead connector [A].
- Take out the battery from the rear fender.



- Slide out the negative (–) terminal cap [A] and disconnect the negative (–) cable.

<b>CAUTION</b>
----------------

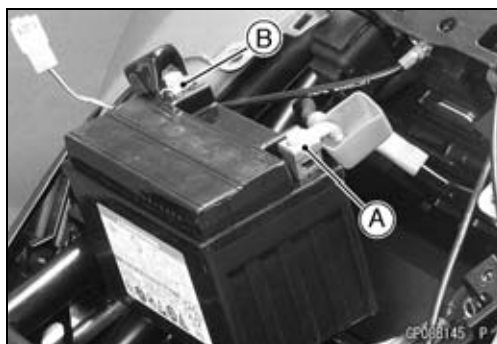
<b>Be sure to disconnect the negative (–) cable first.</b>
--

- Slide out the positive (+) terminal cap [B] and disconnect the positive (+) cable.
- Remove the battery.



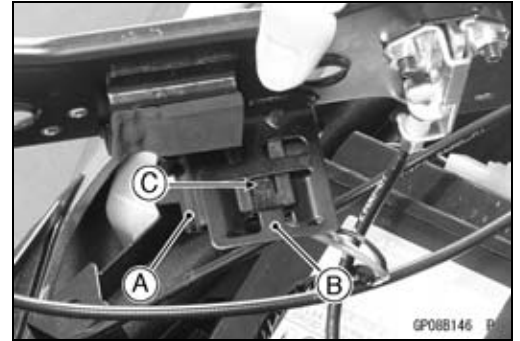
#### Battery Installation

- Turn off the ignition switch.
- Install the positive (+) cable [A] first.
- Install the negative (–) cable [B].
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the terminals with the caps.
- Put the battery into the rear fender.

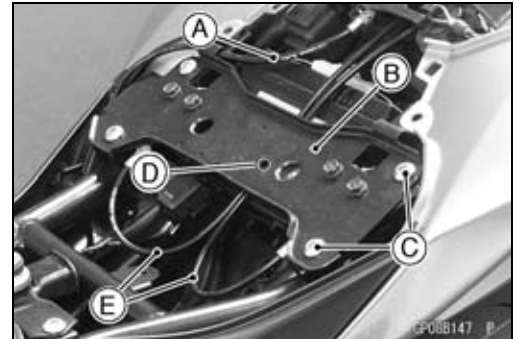


## Battery

- Slide in the fuse box [A] into the front seat bracket [B] until the stopper [C] fits in the bracket.



- Run the seat lock cable [A] under the front seat bracket [B] and then install the bracket.
- Tighten the left side bolts [C] of the front seat bracket first.
- Confirm that the clamp [D] for the front seat lock cables [E] is in the front seat bracket.



### Battery Activation

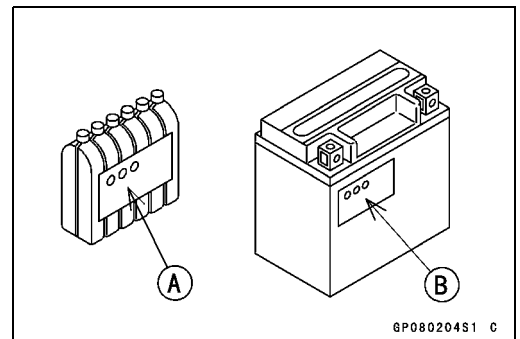
#### Electrolyte Filling

- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

**Battery Model Name for ZR750L/M: YTX9-BS**

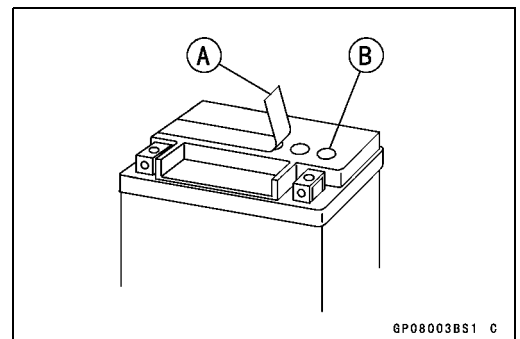
#### CAUTION

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.



#### CAUTION

Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.



- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

#### NOTE

- The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.

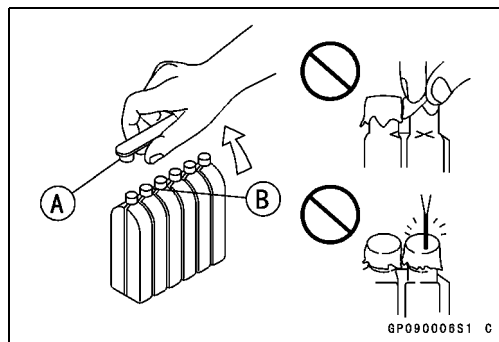
## 16-24 ELECTRICAL SYSTEM

### Battery

- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.

#### NOTE

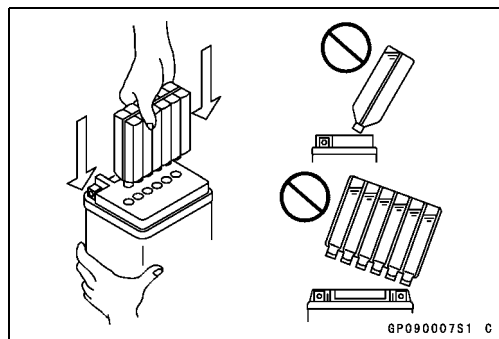
○Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.



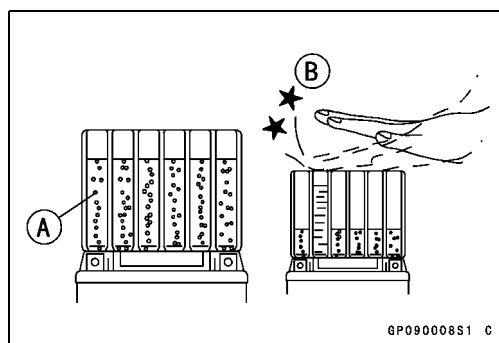
- Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

#### NOTE

○Do not tilt the electrolyte container



- Check the electrolyte flow.
- ★ If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.
- Keep the container in place for **20** minutes or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.



#### CAUTION

**Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.**

- Gently remove the container from the battery.
- Let the battery sit for **30** minutes prior to charging to allow the electrolyte to permeate into the plates for optimum performance.

#### NOTE

○Charging the battery immediately after filling can shorten service life. Let the battery sit for at least **30** minutes after filling.

## Battery

### Initial Charge

- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

**Standard Charge: 0.9 A × 5 ~ 10 hours**

- ★ If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

**Kawasaki-recommended chargers:**

**Optimate III**

**Yuasa 1.5 Amp Automatic Charger**

**Battery Mate 150-9**

- ★ If the above chargers are not available, use equivalent one.

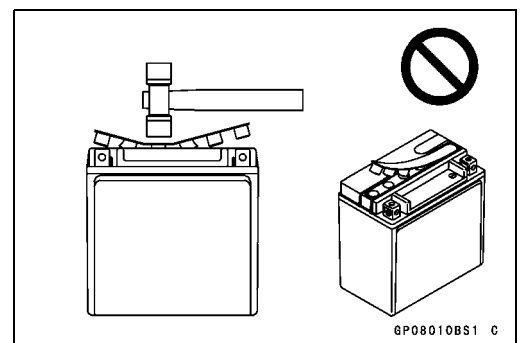
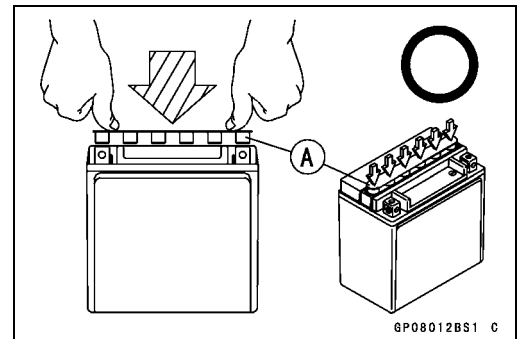
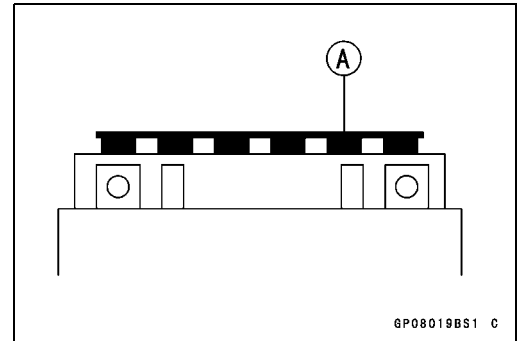
### NOTE

- *Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.8 V, repeat charging cycle.*

- After charging is completed, press down firmly with both hands to seat the strip of caps [A] into the battery (don't pound or hammer). When properly installed, the strip of the caps will be level with the top of the battery.

### CAUTION

**Once the strip of the caps is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.**



### NOTE

- *To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds. Re-check voltage and if less than 12.8 V repeat the charging cycle and load test. If still below 12.8 V the battery is defective.*

## 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 seal cap to add water is very dangerous. Never do that.

- 2) Refreshing charge.

If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see Refreshing Charge).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

#### CAUTION

**This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge.**

**If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.**

- 3) When you do not use the motorcycle for months.

Give a refresh charge before you store the motorcycle and store it with the negative cable removed. Give a refresh charge **once a month** during storage.

- 4) Battery life.

If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

#### ⚠ WARNING

**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.**

**This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

**No fire should be drawn near the battery, or no terminals should have the tightening loosened.**

**The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medical attention if severe.**

#### Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

#### Charging Condition Inspection

- Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].
- Remove the battery (see Battery Removal).
- Disconnect the battery terminals.

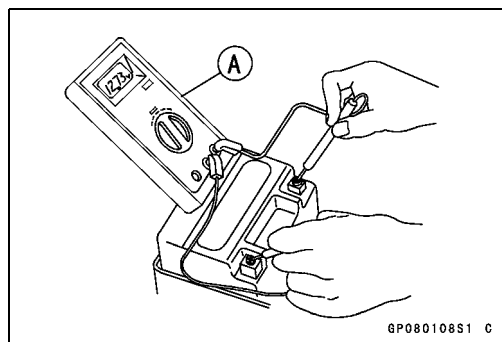
#### CAUTION

**Be sure to disconnect the negative (–) cable first.**

- Measure the battery terminal voltage.

#### NOTE

- Measure with a digital voltmeter which can be read one decimal place voltage.





## Battery

- ★ If the reading is 12.8 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

### Battery Terminal Voltage

**Standard:** 12.8 V or more

Terminal Voltage (V) [A]

Battery Charge Rate (%) [B]

Good [C]

Refresh charge is required [D]

### Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

### ⚠ WARNING

**This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.**

**Terminal Voltage:** 11.5 ~ less than 12.8 V

**Standard Charge** 0.9 A × 5 ~ 10 h (see following chart)

**Quick Charge** 4 A × 1 h

### CAUTION

**If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.**

**Terminal Voltage:** less than 11.5 V

**Charging Method:** 0.9 A × 20 h

### NOTE

- Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.

Battery [A]

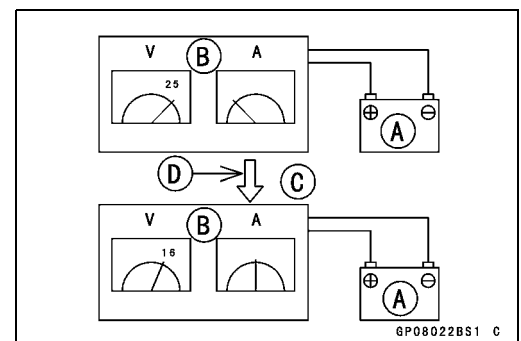
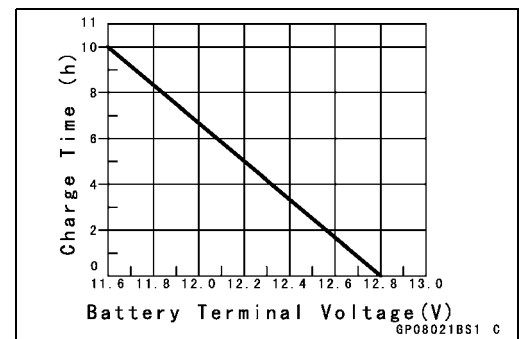
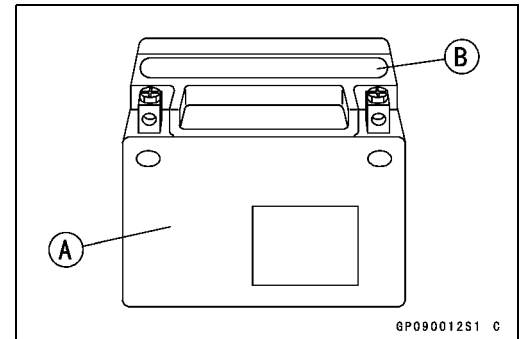
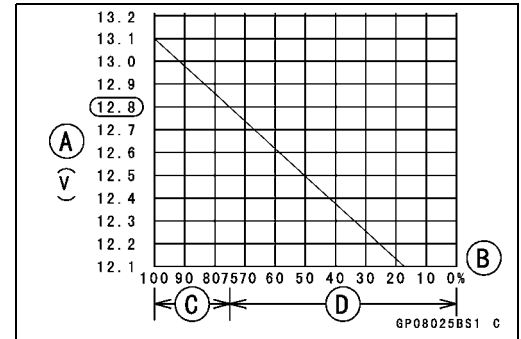
Battery Charger [B]

Standard Value [C]

Current starts to flow [D]

- Determine the battery condition after refresh charge.
- Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

Criteria	Judgement
12.8 V or higher	Good
12.0 ~ lower than 12.8 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace

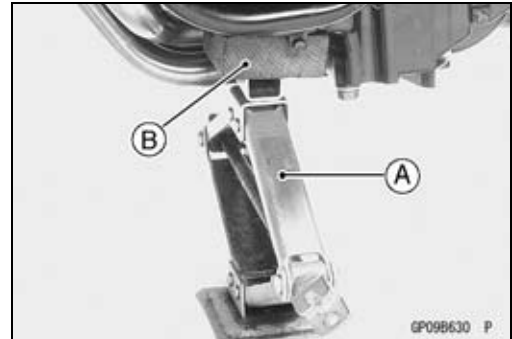


## 16-28 ELECTRICAL SYSTEM

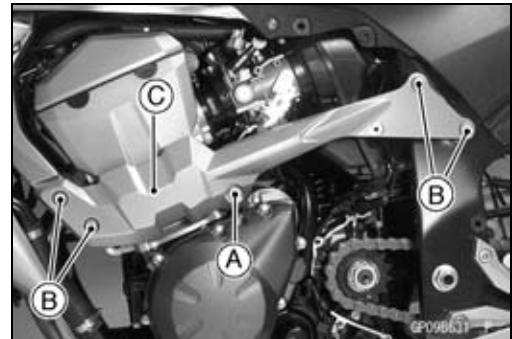
### Charging System

#### **Alternator Cover Removal**

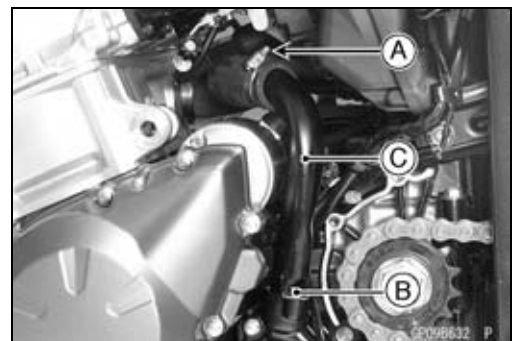
- Remove:
  - Left Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
- Support the engine with a suitable jack [A].  
Wooden Block [B]



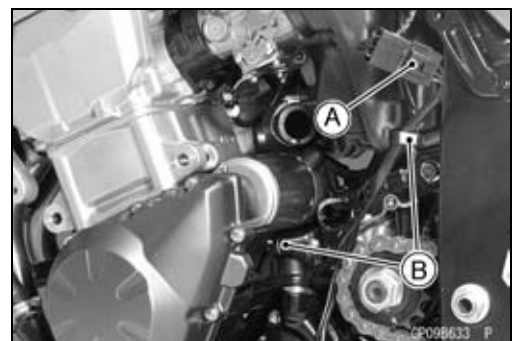
- Remove:
  - Front Engine Mounting Bolt [A]
  - Left Subframe Bolts [B]
  - Left Subframe [C]



- Remove:
  - Clamp Screw (Loosen) [A]
  - Water Pipe Bolt [B]
  - Water Pipe [C]



- Disconnect the alternator lead connector [A].
- Take out the alternator lead from the clamps [B].



## Charging System

- Place a suitable container under the alternator cover [A].
- Remove:
  - Alternator Cover Bolts [B]
  - Alternator Cover



### Alternator Cover Installation

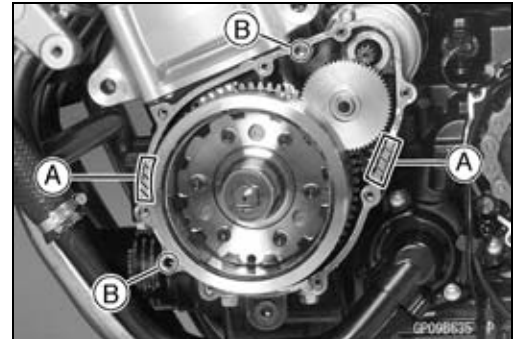
- Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Check that dowel pins [B] are in place on the crankcase.
- Install a new gasket and the alternator cover.
- Tighten:

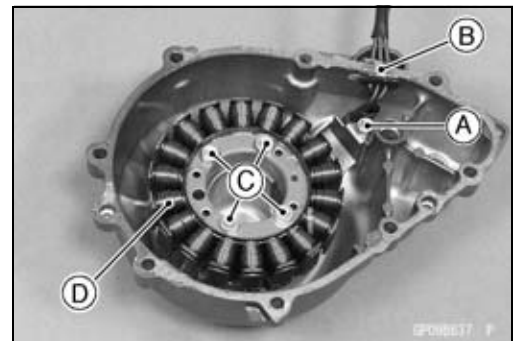
**Torque - Alternator Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**

- Run the alternator lead [A] correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Clamp the alternator lead with the clamps [B].
- Install the removed parts (see appropriate chapters).



### Stator Coil Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
  - Holding Plate Bolt [A] and Plate
  - Alternator Lead Grommet [B]
  - Stator Coil Bolts [C]
  - Stator Coil [D]



## 16-30 ELECTRICAL SYSTEM

### Charging System

#### Stator Coil Installation

- Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.

**Torque - Stator Coil Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)**

- Secure the alternator lead with a holding plate.
- Apply a non-permanent locking agent to the threads of the plate bolt and tighten it.

**Torque - Alternator Lead Holding Plate Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**

- Apply silicone sealant to the circumference of the alternator lead grommet, and fit the grommet into the notch of the cover securely.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Install the alternator cover (see Alternator Cover Installation).

#### Alternator Rotor Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
  - Shaft [A]
  - Starter Idle Gear [B]

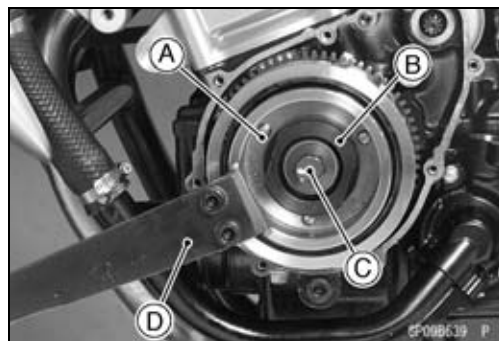


- Hold the alternator rotor steady with the rotor holder [A] and stopper [B].
- Remove the rotor bolt [C] and washer.

**Special Tools - Grip [D]: 57001-1591**

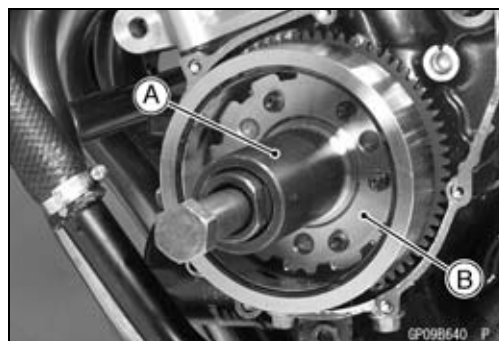
**Stopper: 57001-1679**

**Rotor Holder: 57001-1690**



- Using the flywheel puller [A], remove the alternator rotor [B] from the crankshaft.

**Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1405**



#### CAUTION

**Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.**

## Charging System

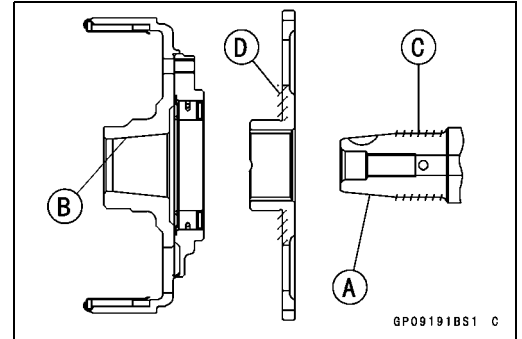
### Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.

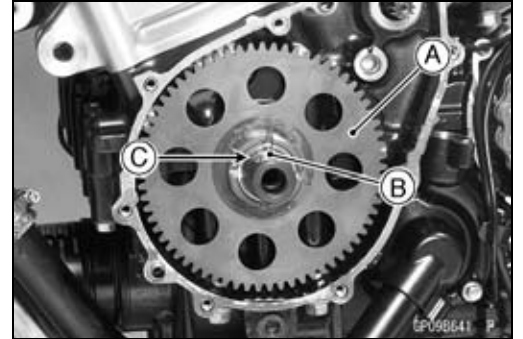
Crankshaft Tapered Portion [A]

Alternator Rotor Tapered Portion [B]

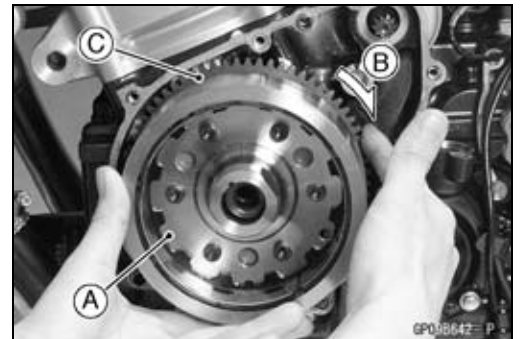
- Apply a thin coat of molybdenum disulfide grease to the crankshaft [C] and the face [D] of the starter clutch gear.



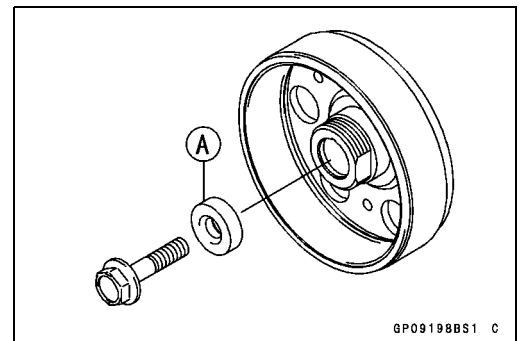
- Install the starter clutch gear [A].
- Again, clean the crankshaft tapered portion [B] and dry there.
- Fit the woodruff key [C] securely in the slot in the crankshaft before installing the alternator rotor.



- Install the alternator rotor [A] while turning [B] the starter clutch gear [C].



- Using a cleaning fluid, clean off any oil or dirt on the washer [A] and dry it with a clean cloth.



## 16-32 ELECTRICAL SYSTEM

### Charging System

- Install the washer and alternator rotor bolt [A].

#### NOTE

○ Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.

- Install the rotor bolt and tighten it with 70 N·m (7.0 kgf·m, 52 ft·lb) of torque.

**Special Tools - Grip [B]: 57001-1591**

**Stopper [C]: 57001-1679**

**Rotor Holder [D]: 57001-1690**

- Remove the rotor bolt and washer.
- Check the tightening torque with flywheel puller.

**Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1405**

- ★ If the rotor is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
- ★ If the rotor is pulled out with under 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion and washer, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.
- Tighten the alternator rotor bolt while holding the alternator rotor steady with the rotor holder.

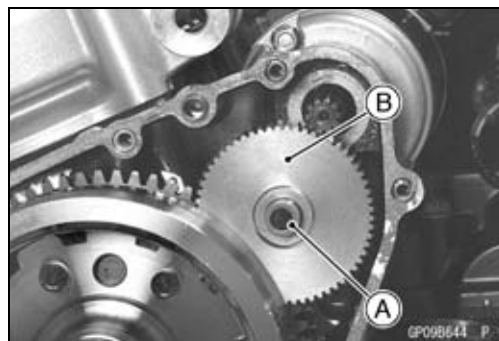
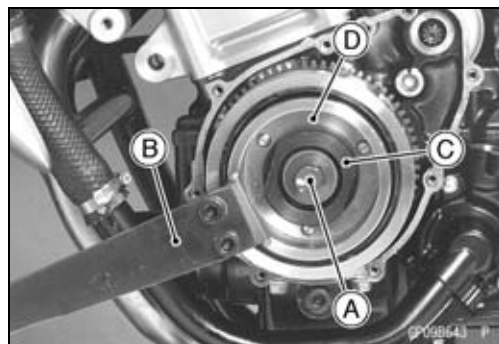
**Special Tools - Grip: 57001-1591**

**Stopper: 57001-1679**

**Rotor Holder: 57001-1690**

**Torque - Alternator Rotor Bolt: 155 N·m (15.8 kgf·m, 114 ft·lb)**

- 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).

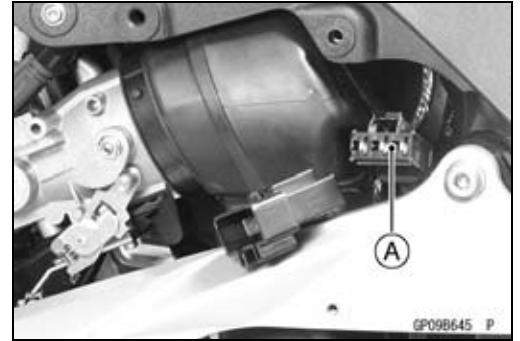


#### Alternator Inspection

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.

## Charging System

- To check the alternator output voltage, do the following procedures.
  - Turn off the ignition switch.
  - Remove the left frame cover (see Frame Cover Removal in the Frame chapter).
  - 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 at 4 000 r/min (rpm)**

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
250 V AC	One Black lead	Another Black lead	39 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 at 20°C (68°F)**

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
× 1 Ω	One Black lead	Another Black lead	0.18 ~ 0.28 Ω

- ★ 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.

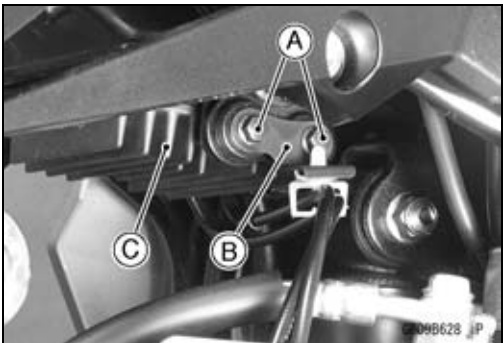
**Special Tool - Hand Tester: 57001-1394**

16-34 ELECTRICAL SYSTEM

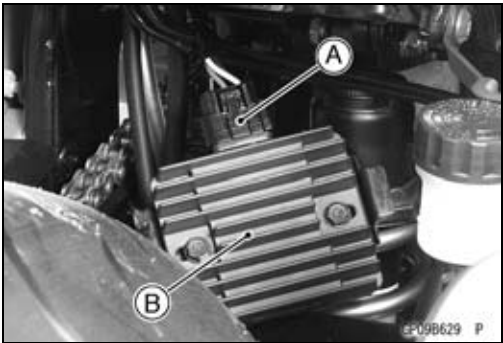
Charging System

Regulator/Rectifier Inspection

- Remove:  
Bolts [A] and Bracket [B]  
Regulator/Rectifier Assembly [C]



- Remove:  
Connector [A] (Disconnect)  
Regulator/Rectifier [B]



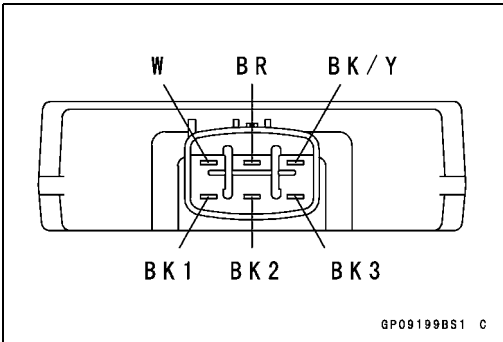
Rectifier Circuit Check

- 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 terminals are low or high in both directions, the rectifier is defective and the regulator/rectifier must be replaced.



NOTE

○ The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking the lower reading should be from zero to one half the scale.

Regulator Circuit Check

To test the regulator out of circuit, use three 12 V batteries and a test light (12 V 3 ~ 6 W bulb in a socket with leads).

**CAUTION**

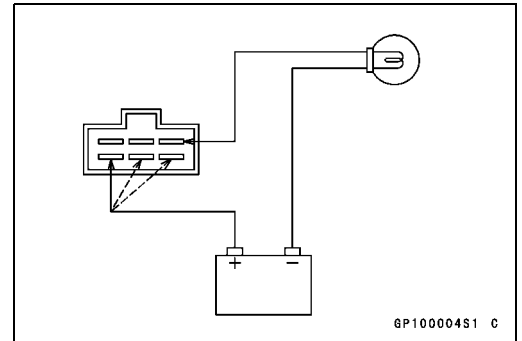
The test light works as an indicator and also a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.

- Check to be sure the rectifier circuit is normal before continuing.

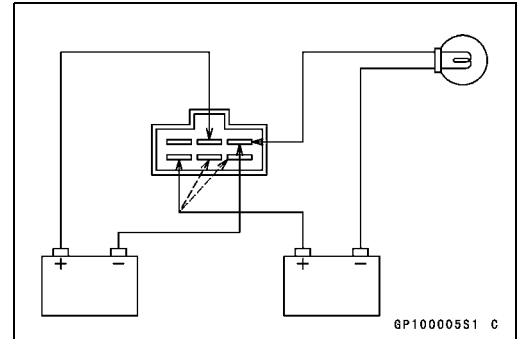


## Charging System

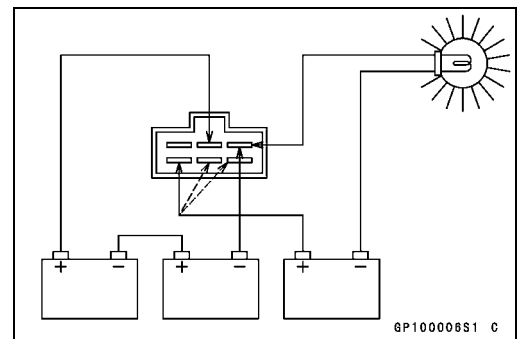
- Do the 1st step regulator circuit test.
- Connect the test light and the 12 V battery to the regulator/rectifier as shown in the figure.
- Check the BK1, BK2 and BK3 terminal respectively.
- ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
- ★ If the test light does not 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 BR terminal.
- Check the 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 BR terminal by adding a 12 V battery.
- Check the BK1, BK2 and BK3 terminals respectively.



### CAUTION

**Do not apply more than 24 V. If more than 24 V is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 V is applied for more than a few seconds, the regulator/rectifier may be damaged.**

- ★ If the test light did not light when the 24 V was applied momentarily to the voltage monitoring terminal, the regulator/rectifier is defective. Replace it.
- ★ If the regulator/rectifier passes all of the tests described, it may still be defective. If the charging system still does not work properly after checking all of the components and the battery, test the regulator/rectifier by replacing it with a known good unit.

## 16-36 ELECTRICAL SYSTEM

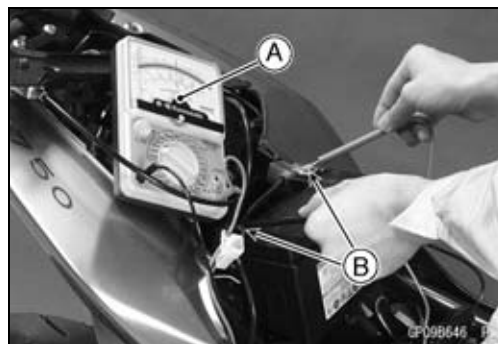
### Charging System

#### **Charging Voltage Inspection**

- Check the battery condition (see Charging Condition Inspection).
- Warm up the engine to obtain actual alternator operating conditions.
- Take out the battery from the rear fender with the cables connected (see Battery Removal).
- Check that the ignition switch is turned off, and connect the hand tester [A] to the battery terminals [B].

#### **Special Tool - Hand Tester: 57001-1394**

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight, disconnect the headlight connector on the headlight unit.). The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.



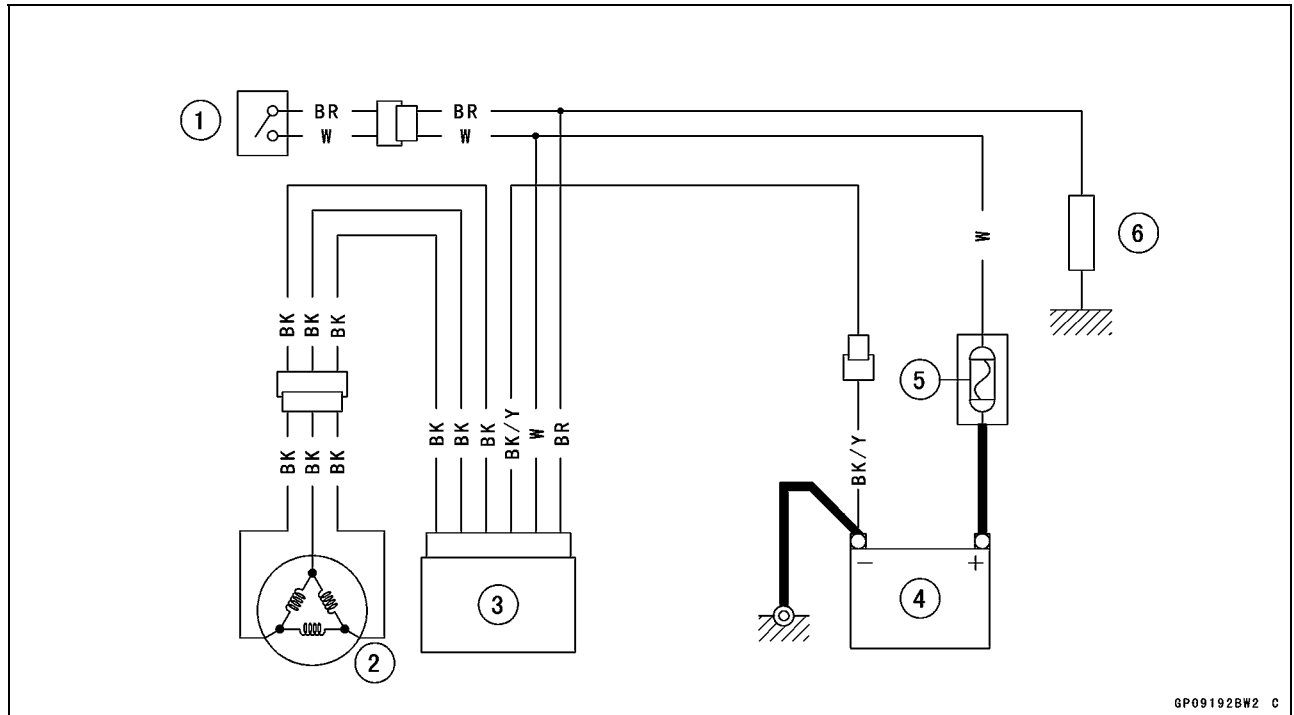
#### **Charging Voltage**

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
25 V DC	Battery (+)	Battery (-)	14.2 ~ 15.2 V

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.
- ★ If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.
- ★ If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.
- ★ If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

## Charging System

## Charging System Circuit



1. Ignition Switch
2. Alternator
3. Regulator/Rectifier
4. Battery 12 V 8 Ah
5. Main Fuse 30 A
6. Load

## 16-38 ELECTRICAL SYSTEM

### Ignition System

#### **⚠ WARNING**

The ignition system produces extremely high voltage. Do not touch the spark plugs or stick coils while the engine is running, or you could receive a severe electrical shock.

#### **CAUTION**

Do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running. This is to prevent ECU damage.

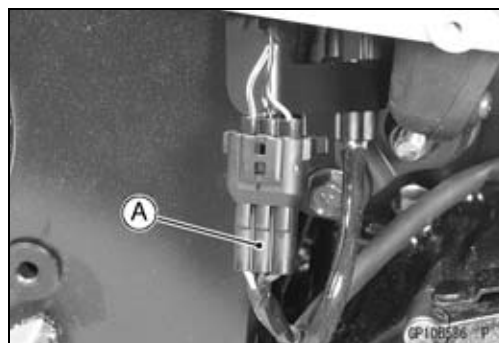
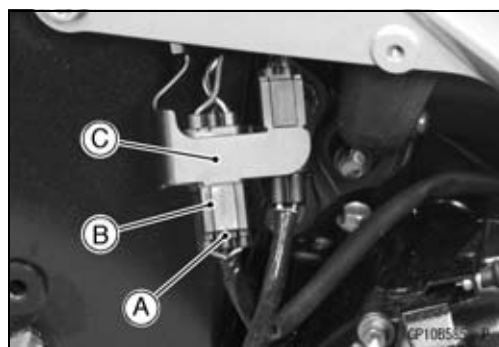
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.

### *Crankshaft Sensor Removal*

#### **CAUTION**

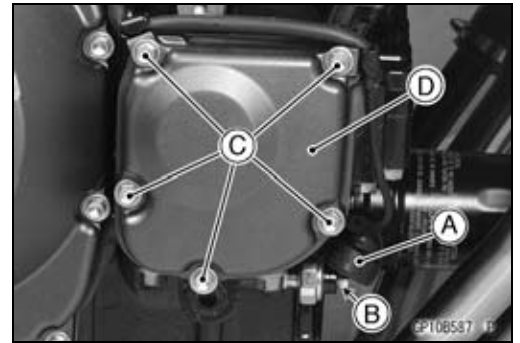
Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.

- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Bolt [A] and Connector Bracket
- Push the tongue [A] and take out the crankshaft sensor lead connector [B] from the bracket [C].
- Disconnect the crankshaft sensor lead connector [A].

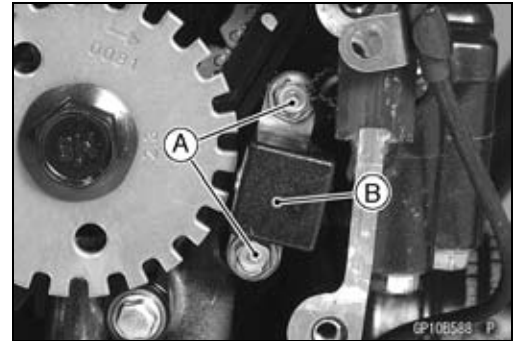


## Ignition System

- Remove:
  - Rubber Boot (Slide Out) [A]
  - Oil Pressure Switch Lead Terminal [B]
  - Crankshaft Sensor Cover Bolts [C] with Clamps
  - Crankshaft Sensor Cover [D]



- Remove:
  - Crankshaft Sensor Bolts [A]
  - Crankshaft Sensor [B]



### Crankshaft Sensor Installation

- Run the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Crankshaft Sensor Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

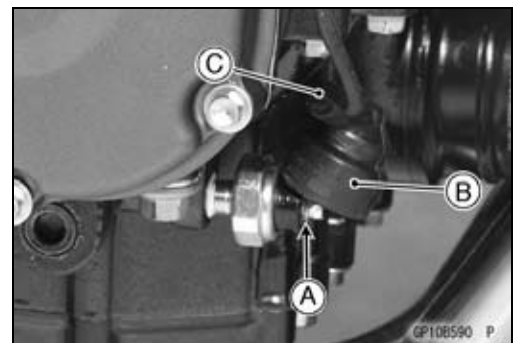
- Apply silicone sealant [A] to the crankshaft sensor lead grommet and crankcase halves mating surface on the front and rear sides of the crankshaft sensor cover mount.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Install the oil pressure switch lead terminal [A] securely.
- Install the lead terminal direction upward.

**Torque - Oil Pressure Switch Terminal Bolt: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

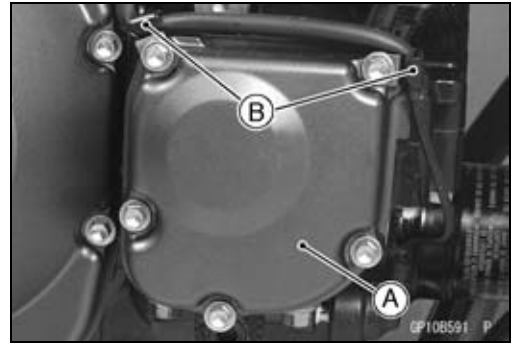
- Apply high-temperature grease to the switch terminal to prevent rust.
- Do not protrude the grease from the rubber boot.
- Install the rubber boot [B] and confirm the tube [C] is contact to the rubber boot.
- Install the removed parts (see appropriate chapters).



## 16-40 ELECTRICAL SYSTEM

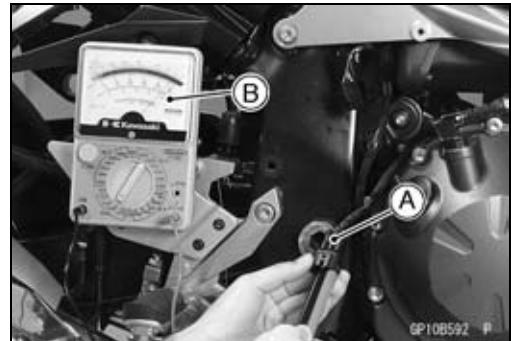
### Ignition System

- Replace the O-ring in the crankshaft sensor cover [A] with a new one.
- Install:
  - Crankshaft Sensor Cover
  - Clamps [B]
- Tighten:  
**Torque - Crankshaft Sensor Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**



### *Crankshaft Sensor Inspection*

- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Crankshaft Sensor Lead Connector [A] (see Crankshaft Sensor Removal)
- Set the hand tester [B] to the  $\times 100 \Omega$  range and connect (+) lead to the yellow lead and (-) lead to the black lead in the connector.



**Special Tool - Hand Tester: 57001-1394**

**Crankshaft Sensor Resistance: 376 ~ 564  $\Omega$**

- ★ If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.
- ★ Any tester reading less than infinity ( $\infty$ ) indicates a short, necessitating replacement of the crankshaft sensor assembly.

## Ignition System

### Crankshaft Sensor Peak Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Remove:
  - Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  - Crankshaft Sensor Lead Connector [A] (see Crankshaft Sensor Removal)
- Set the hand tester [B] to the DC 10 V range.
- Connect the peak voltage adapter [C] to the hand tester and crankshaft sensor leads in the connector.

**Special Tools - Hand Tester: 57001-1394**

**Peak Voltage Adapter: 57001-1415**

**Type: KEK-54-9-B**

#### Connections:

Crankshaft Sensor Lead		Peak Voltage Adapter		Hand Tester
Yellow	←	Red	→	(+)
Black	←	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 crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

#### Crankshaft Sensor Peak Voltage

**Standard: 2.0 V or more**

- ★ If the tester reading is not specified one, inspect the crankshaft sensor (see Crankshaft Sensor Inspection).

### Timing Rotor Removal

- Remove the crankshaft sensor cover (see Crankshaft Sensor Removal).
- Remove the timing rotor [A].
- Holding the timing rotor with the flywheel & pulley holder [B] and remove the rotor bolt [C].

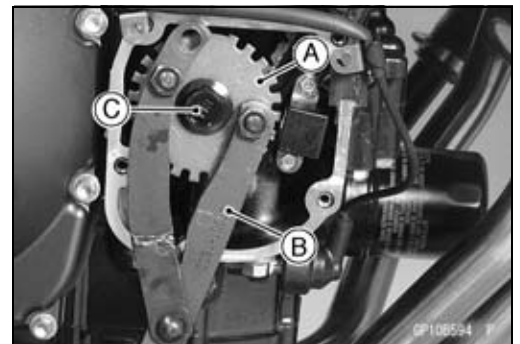
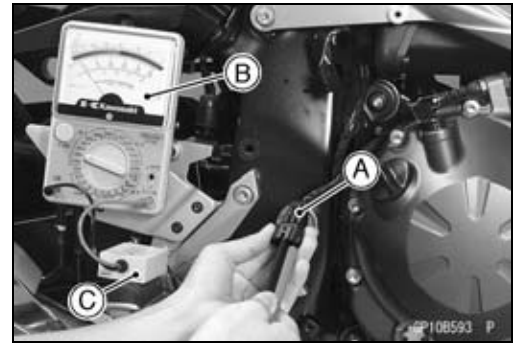
**Special Tool - Flywheel & Pulley Holder: 57001-1605**

### Timing Rotor Installation

- Fit the rotor to the crankshaft.
- Tighten the rotor bolt.

**Torque - Timing Rotor Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)**

- Install the removed parts (see appropriate chapters).



## 16-42 ELECTRICAL SYSTEM

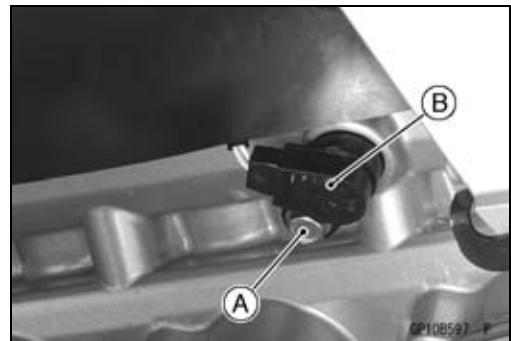
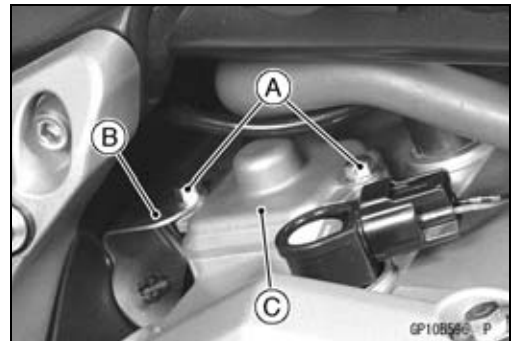
### Ignition System

#### Camshaft Position Sensor Removal

##### CAUTION

**Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.**

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  - Camshaft Position Sensor Lead Connector [A] (Disconnect)
- Remove:
  - Air Suction Valve Cover Bolts [A]
  - Heat Insulation Rubber Plate Bracket [B]
  - Air Suction Valve Cover [C]
- Remove:
  - Camshaft Position Sensor Bolt [A]
  - Camshaft Position Sensor [B]



#### Camshaft Position Sensor Installation

- Apply grease to the O-ring on the camshaft position sensor.
- Tighten:
  - Torque - Camshaft Position Sensor Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**



## Ignition System

### Camshaft Position Sensor Inspection

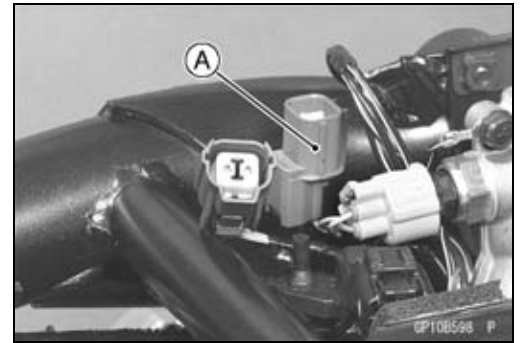
- Disconnect the camshaft position sensor lead connector [A] (see Camshaft Position Sensor Removal).
- Set the hand tester to the  $\times 10 \Omega$  range and connect it to the yellow and white/yellow leads in the connector.

**Special Tool - Hand Tester: 57001-1394**

**Camshaft Position Sensor Resistance:**

**400 ~ 460  $\Omega$  at 20°C (68°F)**

- ★ If there is more resistance than the specified value, the sensor coil has an open lead and must be replaced. Much less than this resistance means the sensor coil is shorted, and must be replaced.
- Using the highest resistance range of the tester, measure the resistance between the camshaft position sensor leads and chassis ground.
- ★ Any tester reading less than infinity ( $\infty$ ) indicates a short, necessitating replacement of the camshaft position sensor.



### Camshaft Position Sensor Peak Voltage Inspection

#### NOTE

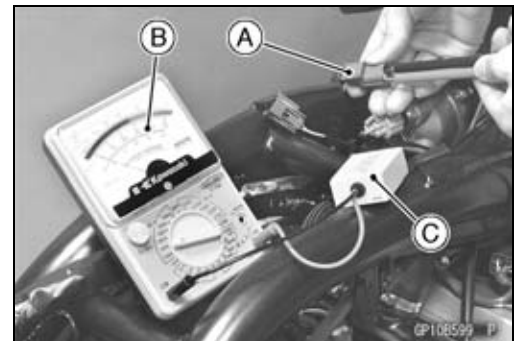
○ Be sure the battery is fully charged.

- Disconnect the camshaft position sensor lead connector [A] (see Camshaft Position Sensor Removal).
- Set the hand tester [B] to the DC 10 V range.
- Connect the peak voltage adapter [C] to the hand tester and camshaft position sensor leads in the connector.

**Special Tools - Hand Tester: 57001-1394**

**Peak Voltage Adapter: 57001-1415**

**Type: KEK-54-9-B**



#### Connections:

Camshaft Position Sensor Lead		Peak Voltage Adapter		Hand Tester
White/Yellow	←	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 (see Camshaft Position Sensor Inspection).

## 16-44 ELECTRICAL SYSTEM

### Ignition System

#### Stick Coil Removal

##### CAUTION

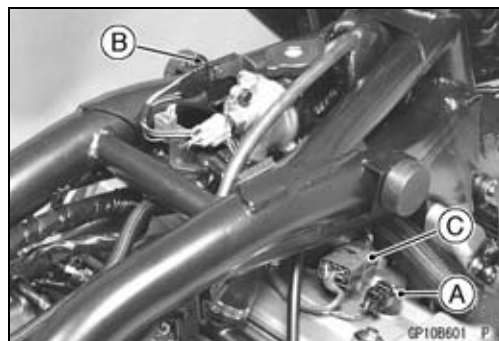
**Never drop the stick coils, especially on a hard surface.  
Such a shock to the stick coils can damage it.**

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the stick coil connector and pull the stick coil #4 [A] off the spark plug.

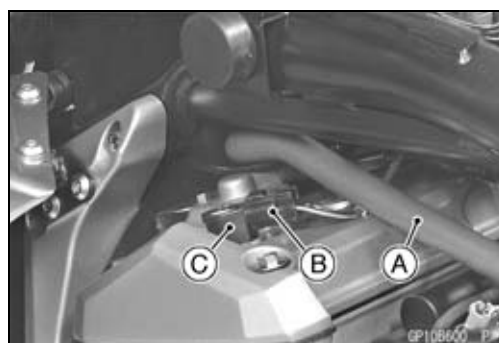
##### CAUTION

**Do not pry the connector part of the coil while removing the coil.**

- Remove:
  - Bolt [B] (for Stick Coil #2 and #3)
  - Stick Coil Harness Connector [C] with Bracket and Bolt (for Stick Coil #3)
- Disconnect the stick coil connector and pull the stick coil #3 [A] off the spark plug.
- Take out the stick coil #3 from between the frame and thermostat housing.



- Remove the air switching valve hose [A] (for Stick Coil #2).
- Disconnect the stick coil connectors [B].
- Pull the stick coil #1 [C] and #2 off the spark plugs.



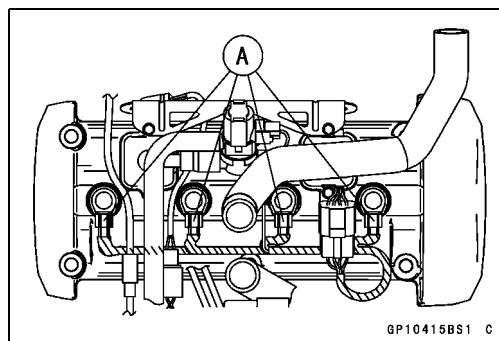
#### Stick Coil Installation

- Insert the coil as shown being careful of the coil heads [A] direction.
- Be sure the stick coils are installed by pulling up it lightly.
- Connect the connectors.

##### CAUTION

**Do not tap the coil head while installing the coil.**

- Run the hoses and harness correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



## Ignition System

### Stick Coil Inspection

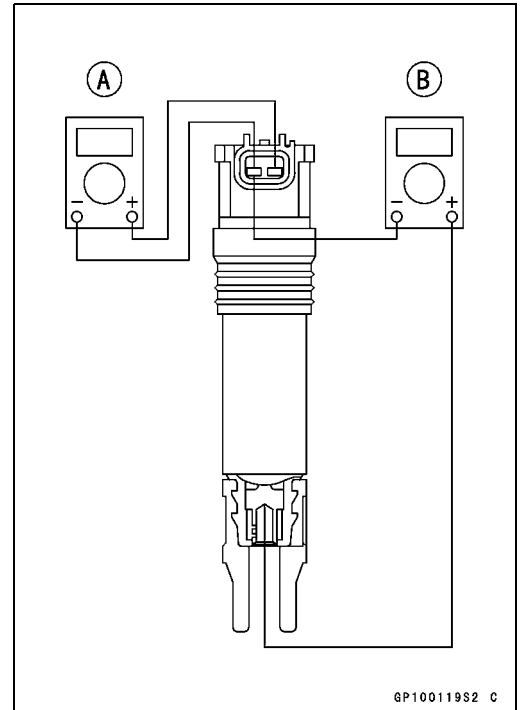
- Remove the stick coils (see Stick Coil Removal).
- Measure the primary winding resistance [A] as follows.
  - Connect the hand tester between the coil terminals.
  - Set the tester to the  $\times 1 \Omega$  range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
  - 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.

#### Stick Coil Winding Resistance

Primary Windings: 1.0 ~ 1.6  $\Omega$

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

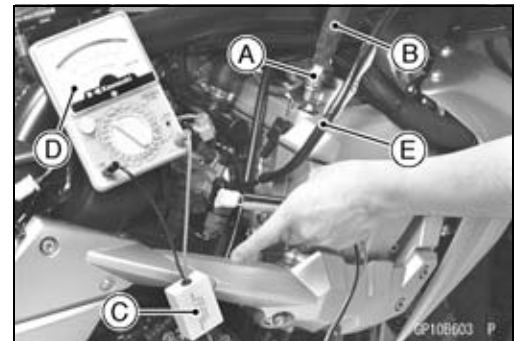
#### NOTE

○ Be sure the battery is fully charged.

- Remove the stick coils (see Stick Coil Removal), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.
  - Install the new spark plug [A] into each stick coil [B], and ground them onto the engine.
  - Connect the peak voltage adapter [C] into the hand tester [D] which is set to the DC 250 V range.
  - Connect the adapter to the lead wire-peak voltage adapter [E] which is connected between the stick coil connector and stick coil.

ECU [F]

Battery [G]



Special Tools - Hand Tester: 57001-1394

Peak Voltage Adapter: 57001-1415

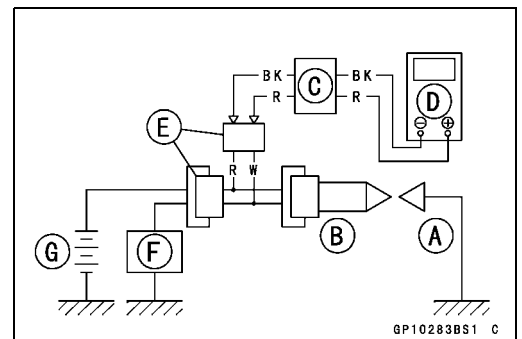
Type: KEK-54-9-B

Lead Wire-Peak Voltage Adapter: 57001-1449

#### Primary Lead Connection

Adapter (R, +) to lead wire-peak voltage adapter (W)

Adapter (BK, –) to lead wire-peak voltage adapter (R)



## 16-46 ELECTRICAL SYSTEM

### Ignition System

#### **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: 100 V or more**

- Repeat the test for the other stick coil.
- ★ If the reading is less than the specified value, check the following.
  - Stick Coils (see Stick Coil Inspection)
  - Crankshaft Sensor (see Crankshaft Sensor Inspection)
  - ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)

#### **Spark Plug Removal**

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

#### **Spark Plug Installation**

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

#### **Spark Plug Condition Inspection**

- Refer to the Spark Plug Condition Inspection in the Periodic Maintenance chapter.

#### **Interlock Operation Inspection**

- Raise the rear wheel off the ground with stand.
- Turn the engine stop switch ON (run position).

#### **1st Check**

- Start the engine to the following conditions.

#### **Condition:**

**Transmission Gear → 1st Position**

**Clutch Lever → Release**

**Sidestand → Down or Up**

- Turn the ignition switch ON and push the starter button.
- Then the starter motor should not turn when the starter system circuit is normality.
- ★ If the engine is start, inspect the starter lockout switch, neutral switch and relay box.
- ★ If their parts are normality, replace the ECU.

## Ignition System

### 2nd Check

- Start the engine to the following conditions.

**Condition:**

**Transmission Gear → 1st Position**

**Clutch Lever → Pulled in**

**Sidestand → Up**

- Turn the ignition switch ON and push the starter button.
- Then the starter motor should turn when the starter system circuit is normality.
- ★ If the starter motor is not turn, inspect the starter lockout switch, neutral switch, sidestand switch and relay box.
- ★ If their parts are normality, replace the ECU.

### 3rd Check

- Inspect the engine for its secure stop after the following operations are completed.
- Run the engine to the following conditions.

**Condition:**

**Transmission Gear → 1st Position**

**Clutch Lever → Pulled in**

**Sidestand → Up**

- Set the sidestand on the ground, then the engine will stop.
- ★ If the engine does not stop, inspect the neutral switch, sidestand switch and relay box.
- ★ If their parts are normality, replace the ECU.

### IC Igniter Inspection

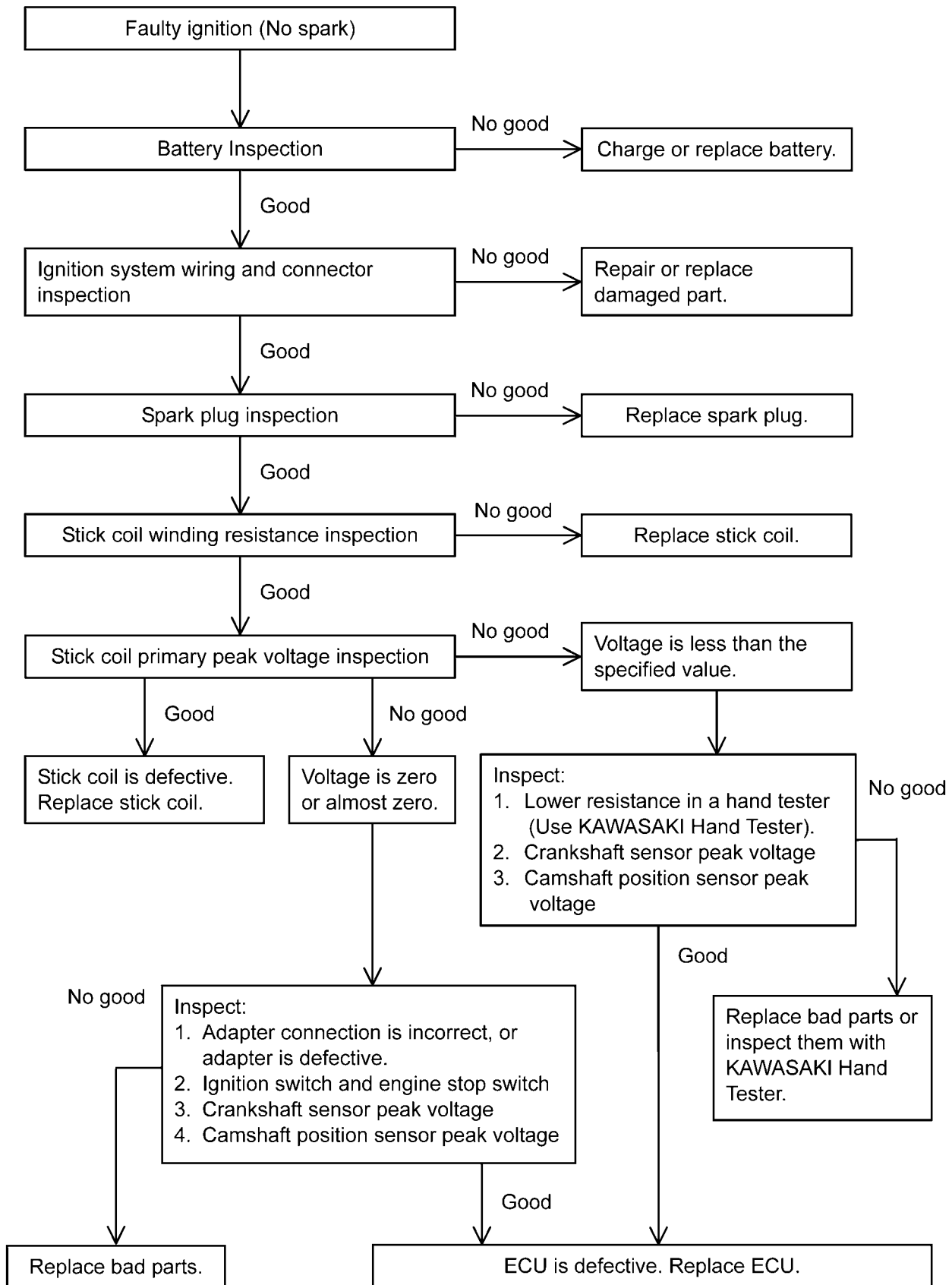
- The IC igniter is built in the ECU [A].
- Refer to the following items.
  - Interlock Operation Inspection (see Interlock Operation Inspection)
  - Ignition System Troubleshooting (see Ignition System section)
  - ECU Power Supply Inspection (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)



## 16-48 ELECTRICAL SYSTEM

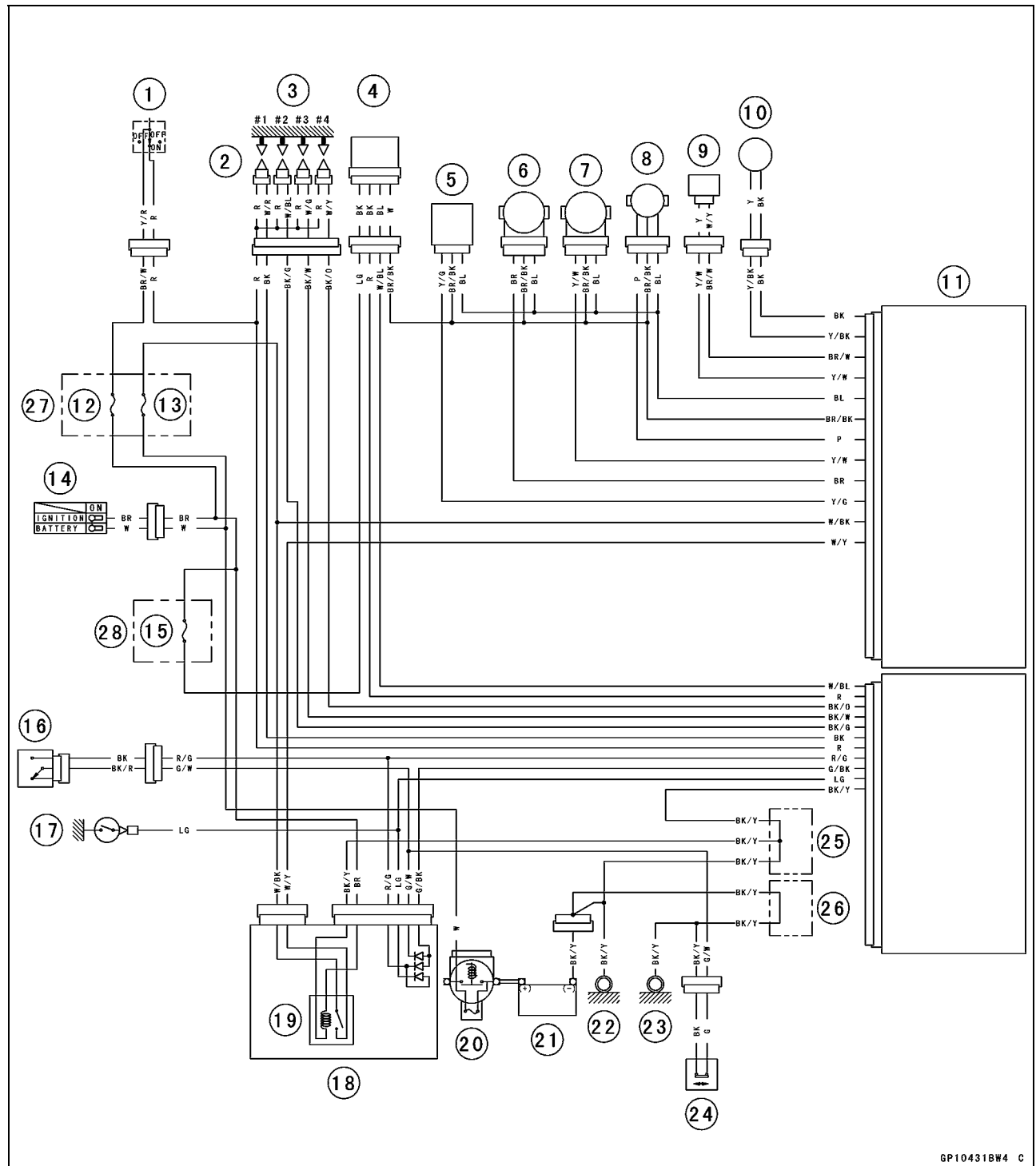
### Ignition System

#### Ignition System Troubleshooting



## Ignition System

## Ignition System Circuit



GP10431BW4 C

- |                                    |  |                         |
|------------------------------------|--|-------------------------|
| 1. Engine Stop Switch              | 11. ECU  | 20. Main Fuse 30 A      |
| 2. Stick Coils                     | 12. Ignition Fuse 10 A                               | 21. Battery 12 V 8 Ah   |
| 3. Spark Plugs                     | 13. ECU Fuse 10 A                                    | 22. Frame Ground        |
| 4. Oxygen Sensor (Equipped Models) | 14. Ignition Switch                                  | 23. Meter Ground        |
| 5. Vehicle-down Sensor             | 15. Oxygen Sensor Heater Fuse 10 A (Equipped Models) | 24. Sidestand Switch    |
| 6. Subthrottle Sensor              | 16. Starter Lockout Switch                           | 25. Water-proof Joint B |
| 7. Main Throttle Sensor            | 17. Neutral Switch                                   | 26. Water-proof Joint C |
| 8. Speed Sensor                    | 18. Relay Box  | 27. Fuse Box 2          |
| 9. Camshaft Position Sensor        | 19. ECU Main Relay                                   | 28. Fuse Box 1          |
| 10. Crankshaft Sensor              |  |                         |

## 16-50 ELECTRICAL SYSTEM

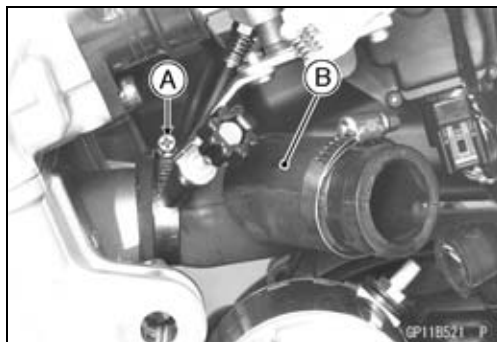
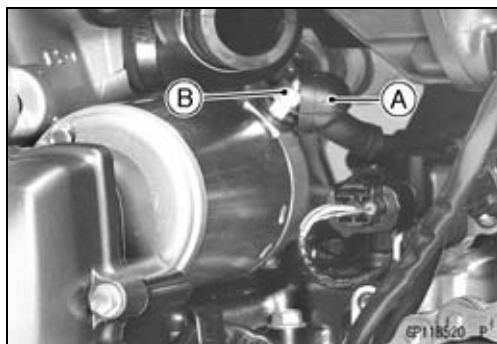
### Electric Starter System

#### Starter Motor Removal

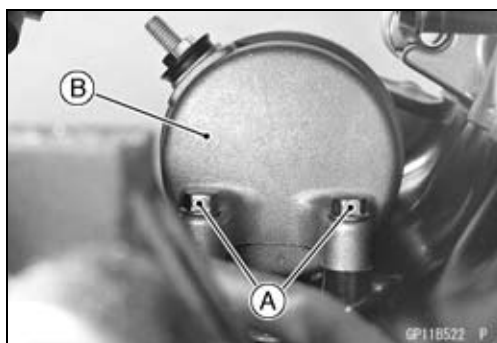
##### CAUTION

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- Remove the water pipe (see Alternator Cover Removal).
  - Slide back the rubber cap [A].
  - Remove the starter motor cable terminal nut [B].
- 
- Loosen the clamp screw [A] and remove the water hose [B].



- Remove the mounting bolts [A].
- Pull out the starter motor [B].

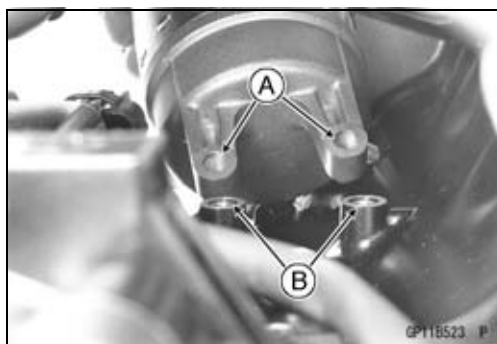


#### Starter Motor Installation

##### CAUTION

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.
- 
- Replace the O-ring [A] with a new one.
  - Apply grease to the O-ring.
  - Tighten:  
Torque - Starter Motor Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

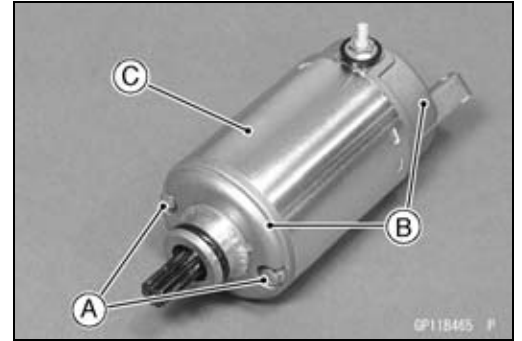




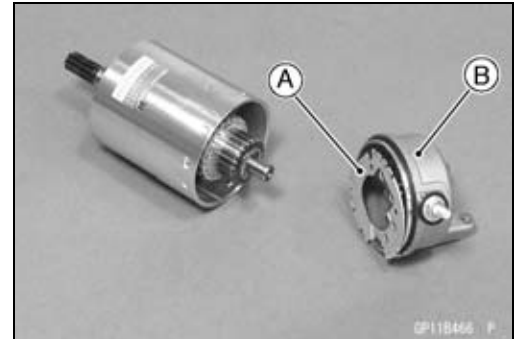
## Electric Starter System

### Starter Motor Disassembly

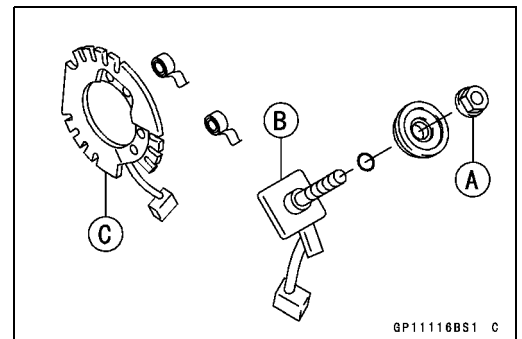
- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor through bolts [A] and remove the both end covers [B] and pull the armature out of the yoke [C].



- The brush plate [A] and brushes come off with the right-hand end cover [B].

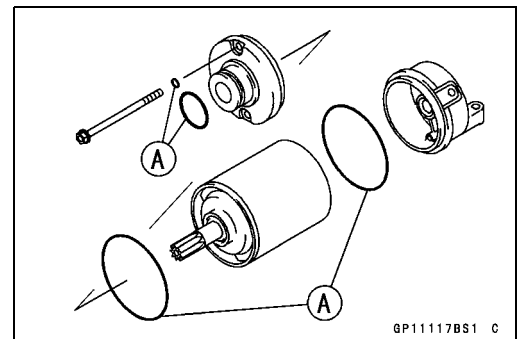


- Remove the terminal locknut [A] and terminal bolt [B], and then remove the brush with the brush plate [C] from the right-hand end cover.

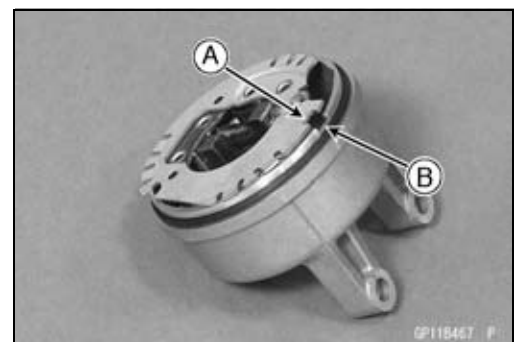


### Starter Motor Assembly

- Replace the O-rings [A] with new ones.



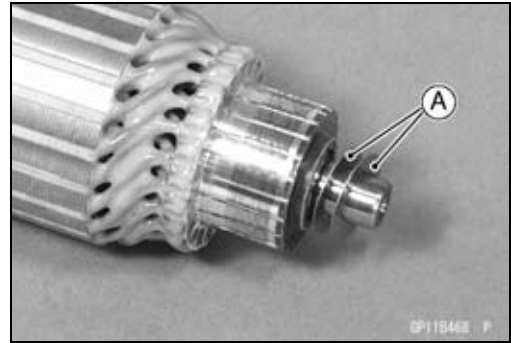
- Install the brush plate so that the notch [A] of the brush plate aligns with the notch [B] of the end cover.



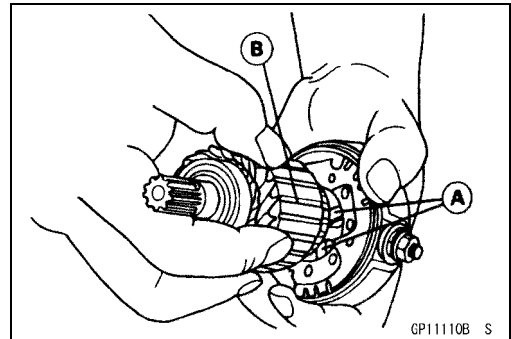
## 16-52 ELECTRICAL SYSTEM

### Electric Starter System

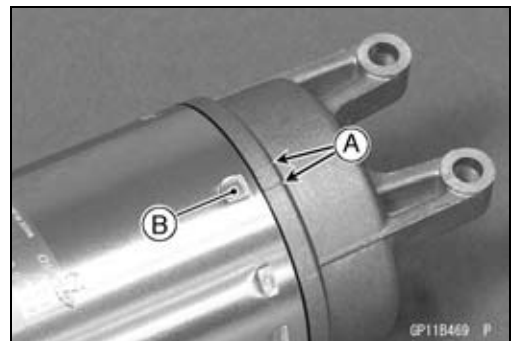
- Install the shims [A] on the armature shaft.



- Install the armature [A] among the brushes [B].



- Align the line marks [A] of the end cover with the square mark [B] on the yoke.



- Align the line marks [A] of the yoke with the through bolt hole [B] in the end cover.
- Replace the O-rings on the through bolts with new ones and tighten them.



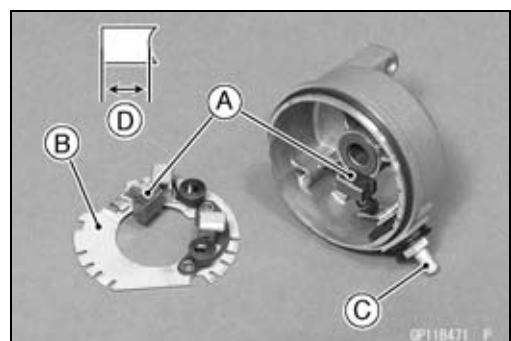
#### **Brush Inspection**

- Measure the length of each brush [A].
- ★ If any is worn down to the service limit, replace the brush plate assembly [B] and the terminal bolt assembly [C].

#### **Starter Motor Brush Length [D]**

Standard: 12 mm (0.47 in.)

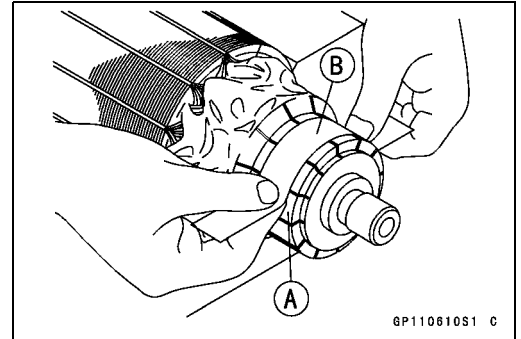
Service Limit: 8.5 mm (0.33 in.)



## Electric Starter System

### Commutator Cleaning and Inspection

- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.

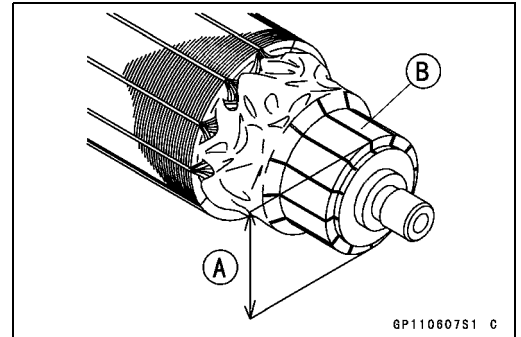


- Measure the diameter [A] of the commutator [B].
- ★ If the commutator diameter is less than the service limit, replace the starter motor with a new one.

#### Commutator Diameter

Standard: 28 mm (1.10 in.)

Service Limit: 27 mm (1.06 in.)

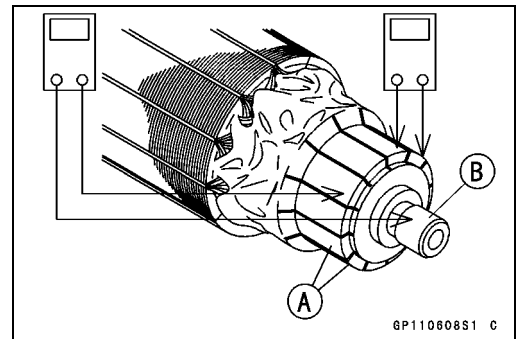


### Armature Inspection

- 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.



### 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

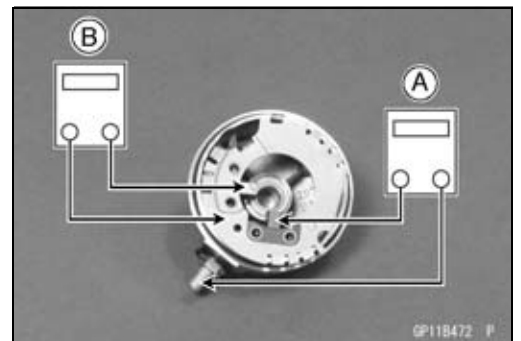
- Using the  $\times 1 \Omega$  hand tester range, measure the resistance as shown in the figure.

Terminal Bolt and Positive Brush [A]

Brush Plate and Negative Brush [B]

#### Special Tool - Hand Tester: 57001-1394

- ★ If there is not close to zero ohms, the brush lead has an open. Replace the terminal bolt assembly and/or the brush plate assembly.



## 16-54 ELECTRICAL SYSTEM

### Electric Starter System

#### Brush Plate and Terminal Bolt Inspection

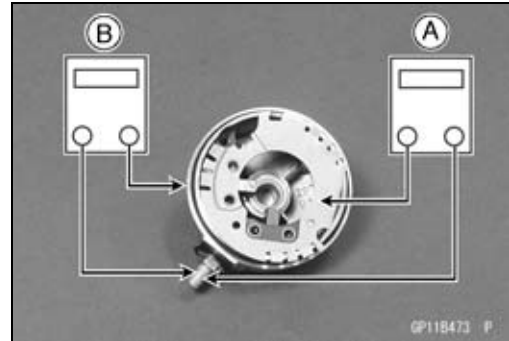
- Using the highest hand tester range, measure the resistance as shown in the figure.

Terminal Bolt and Brush Plate [A]

Terminal Bolt and Right-hand End Cover [B]

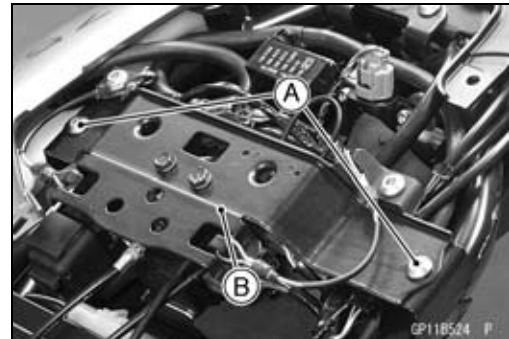
**Special Tool - Hand Tester: 57001-1394**

- ★ If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.

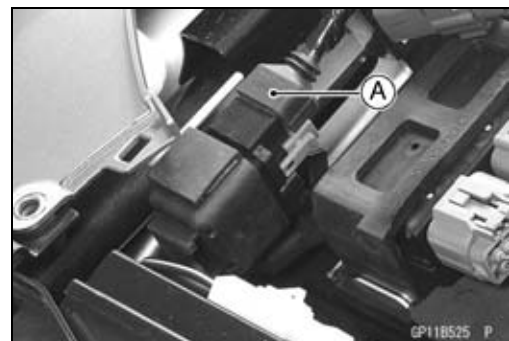


#### Starter Relay Inspection

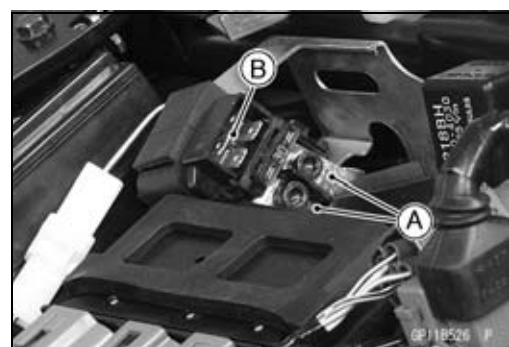
- Remove:
  - Battery Negative (–) Cable (see Battery Removal)
  - Left Seat Cover (see Seat Cover Removal in the Frame chapter)
  - Rear Seat Bracket Bolts [A]
  - Rear Seat Bracket [B]



- Disconnect the connector [A].



- Remove:
  - Cable Terminals [A] (Disconnect)
  - Starter Relay [B]



- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown in the figure.

**Special Tool - Hand Tester: 57001-1394**

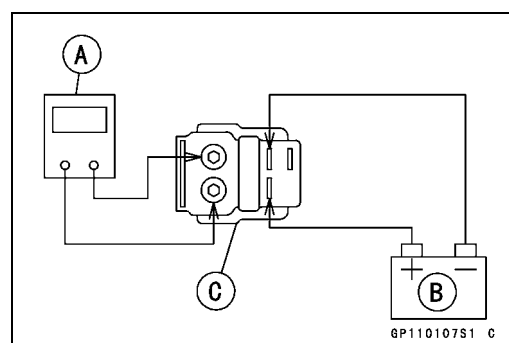
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

#### Testing Relay

**Tester Range:** × 1 Ω range

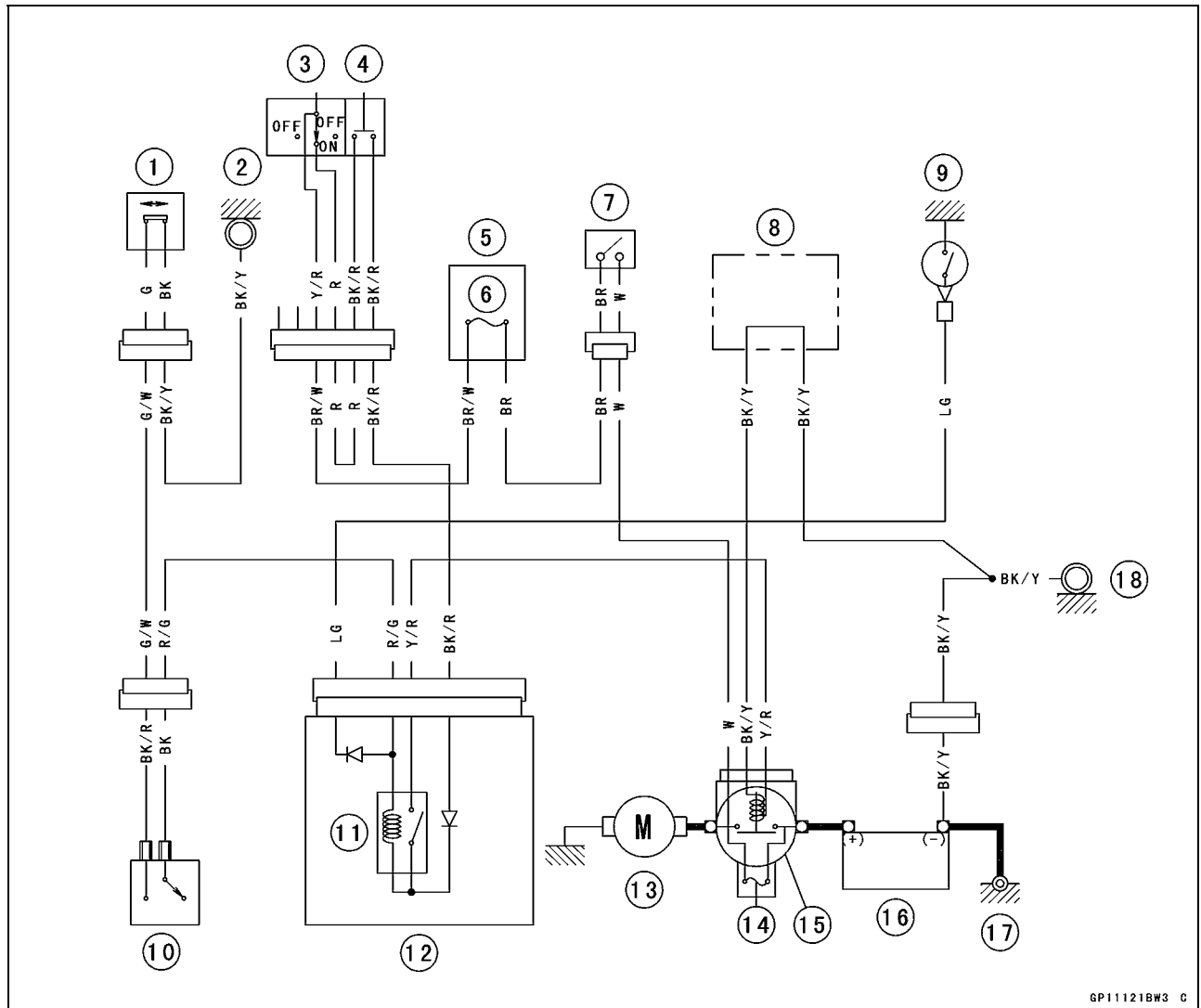
**Criteria:** When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω



## Electric Starter System

## Electric Starter Circuit



GP11121BW3 C

1. Sidestand Switch
2. Meter Ground
3. Engine Stop Switch
4. Starter Button
5. Fuse Box 2
6. Ignition Fuse 10 A
7. Ignition Switch
8. Water-proof Joint B
9. Neutral Switch
10. Starter Lockout Switch
11. Starter Circuit Relay
12. Relay Box
13. Starter Motor
14. Main Fuse 30 A
15. Starter Relay
16. Battery 12 V 8 Ah
17. Engine Ground
18. Frame Ground

## 16-56 ELECTRICAL SYSTEM

### Lighting System

This motorcycle adopt the daylight system and have a headlight relay in the relay box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

#### **Headlight Beam Horizontal Adjustment**

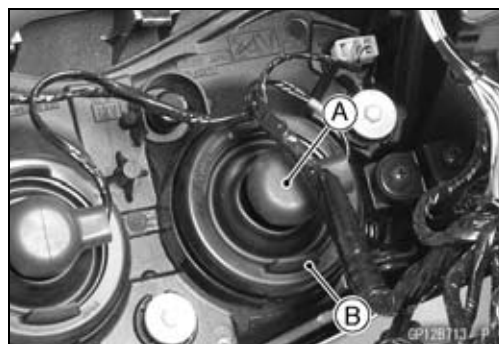
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

#### **Headlight Beam Vertical Adjustment**

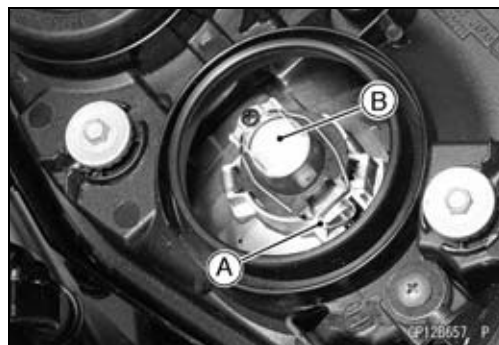
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

#### **Headlight Bulb Replacement**

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Headlight Connector [A]
  - Headlight Bulb Dust Cover [B]



- Remove:
  - Hook [A]
  - Headlight Bulb [B]

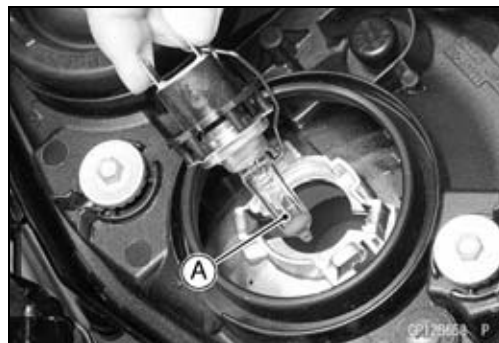


#### **CAUTION**

When handling the quartz-halogen bulb [A], 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.

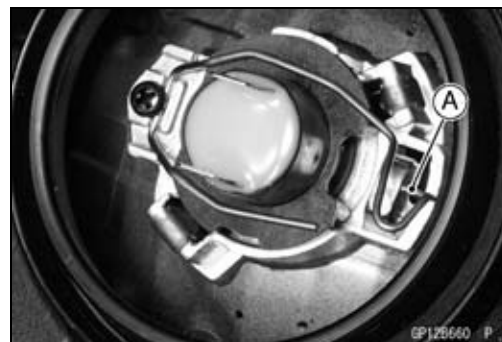


## Lighting System

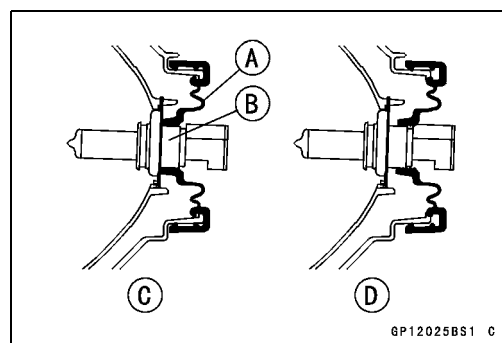
- Replace the headlight bulb.
- Fit the projection [A] of the bulb in the hollow [B] of the headlight.



- Install the hook [A].



- Fit the dust cover [A] onto the bulb [B] firmly as shown in the figure.  
Good [C]  
Bad [D]
- After installation, adjust the headlight aim (see Headlight Aiming Inspection in the Periodic Maintenance chapter).



### Headlight Removal/Installation

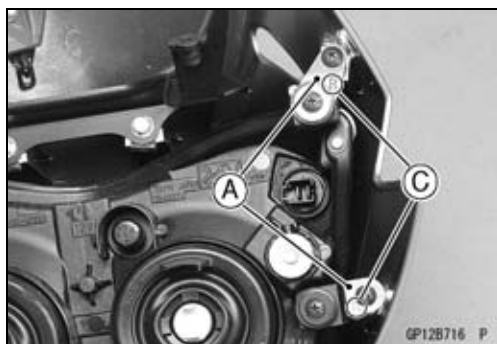
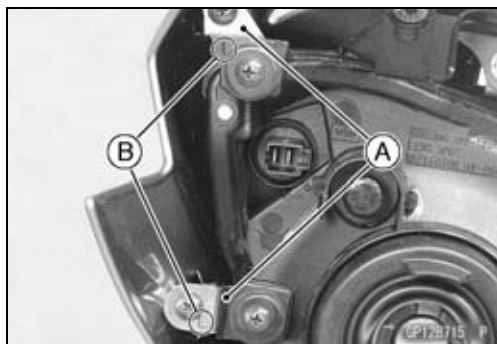
- Remove:  
Upper Fairing (see Upper Fairing Removal in the Frame chapter)  
Screws [A]  
Screws [B] and Brackets  
Headlight Assy [C]



## 16-58 ELECTRICAL SYSTEM

### Lighting System

- Install the bracket [A]; noting the letters “L” [B] and “R” [C].



#### **City Light Bulb Replacement**

- Remove the upper fairing (see Upper Fairing Removal in the Frame chapter).
- Turn the socket [A] counterclockwise and remove it with the bulb.

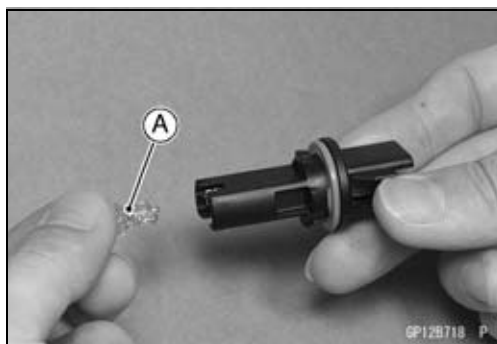


- Pull out the bulb [A] straight from the socket.

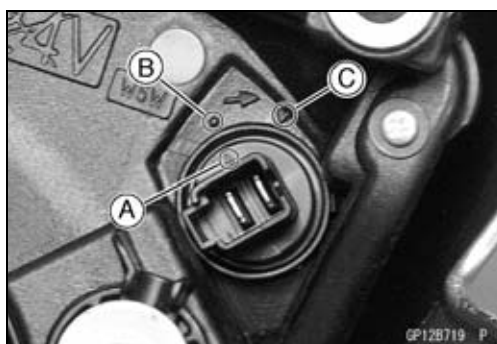
#### **CAUTION**

**Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.**

- Replace the bulb with a new one.



- Align the triangle mark [A] of the socket with mark [B].
- Turn the socket clockwise until the triangle mark aligns with the triangle mark [C].

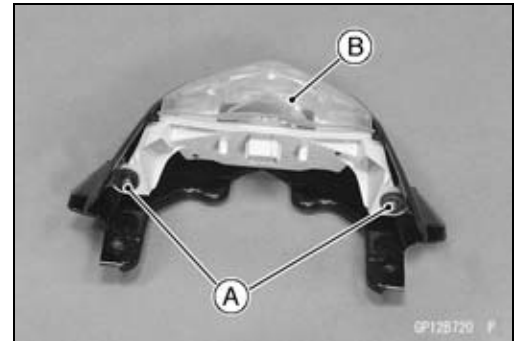




## Lighting System

### ***Tail/Brake Light (LED) Removal***

- Remove:
  - Center Seat Cover (see Seat Cover Removal in the Frame chapter)
  - Tail/Brake Light Mounting Screws [A]
  - Tail/Brake Light (LED) [B]

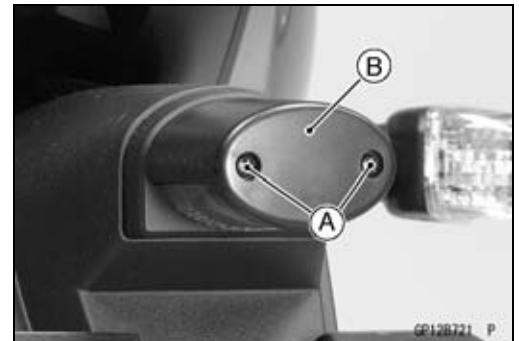


### ***Tail/Brake Light (LED) Installation***

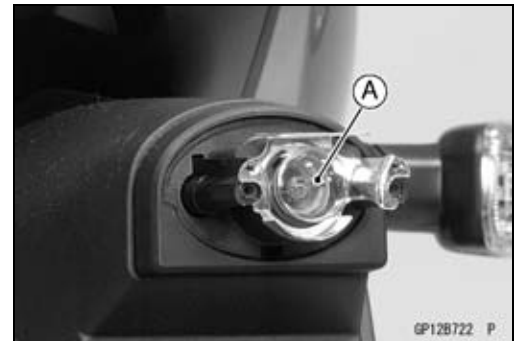
- Installation is the reverse of removal.
- Tighten the tail/brake light mounting screws.
  - Torque - Tail/Brake Light Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

### ***License Plate Light Bulb Replacement***

- Remove:
  - Screws [A]
  - License Plate Light Cover [B]

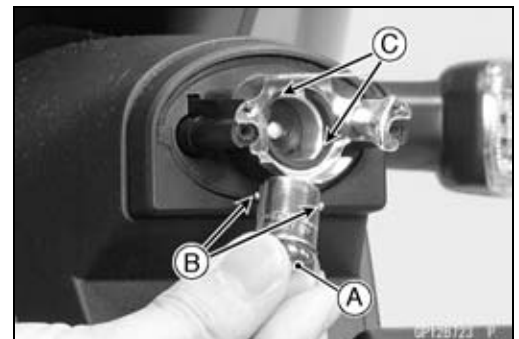


- Push and turn the bulb [A] counterclockwise and remove it.
- Replace the bulb with a new one.



- 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°.
- Tighten:

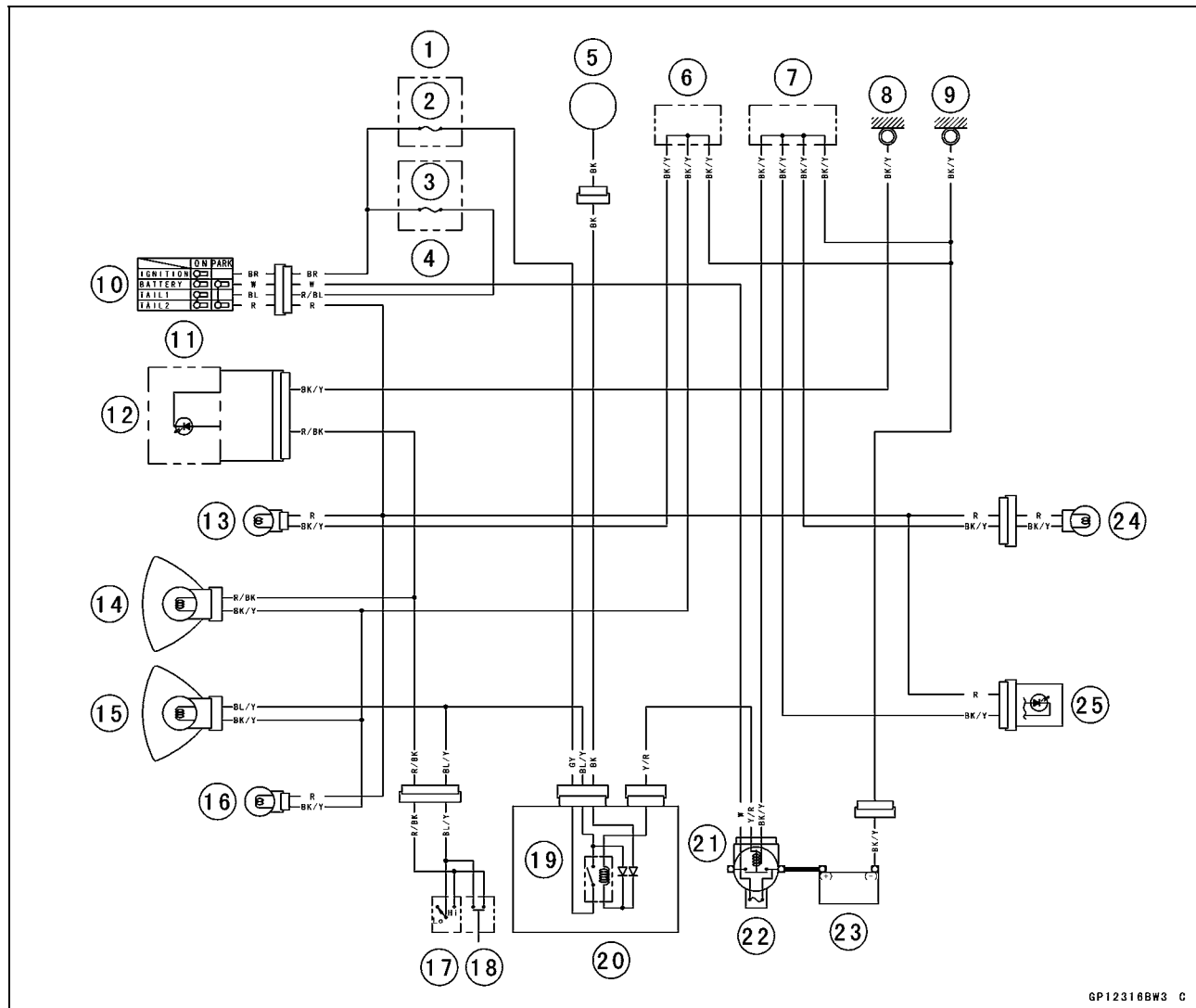
**Torque - License Plate Light Cover Mounting Screws: 0.9 N·m (0.09 kgf·m, 8 in·lb)**



# 16-60 ELECTRICAL SYSTEM

## Lighting System

### Headlight/Tail Light Circuit

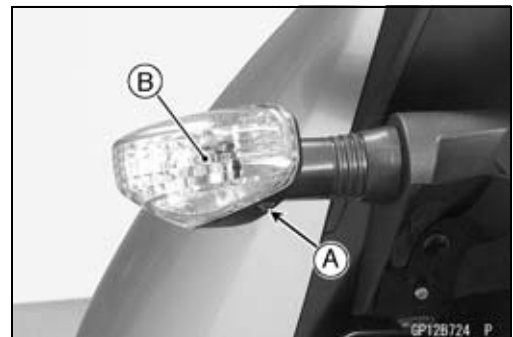


GP12316BW3 C

- |                        |                                     |                                  |
|------------------------|-------------------------------------|----------------------------------|
| 1. Fuse Box 2          | 10. Ignition Switch                 | 18. Passing Button               |
| 2. Headlight Fuse 10 A | 11. Meter Unit                      | 19. Relay Box                    |
| 3. Taillight Fuse 10 A | 12. High Beam Indicator Light (LED) | 20. Headlight Circuit Relay      |
| 4. Fuse Box 1          | 13. Right City Light 12 V 5 W       | 21. Starter Relay                |
| 5. Alternator          | 14. Headlight (High) 12 V 55 W      | 22. Main Fuse 30 A               |
| 6. Water-proof Joint A | 15. Headlight (Low) 12 V 55 W       | 23. Battery 12 V 8 Ah            |
| 7. Water-proof Joint B | 16. Left City Light 12 V 5 W        | 24. License Plate Light 12 V 5 W |
| 8. Meter Ground        | 17. Dimmer Switch                   | 25. Tail/Brake Light (LED)       |
| 9. Frame Ground        |                                     | 13.5 V 0.5/4.1 W                 |

### Turn Signal Light Bulb Replacement

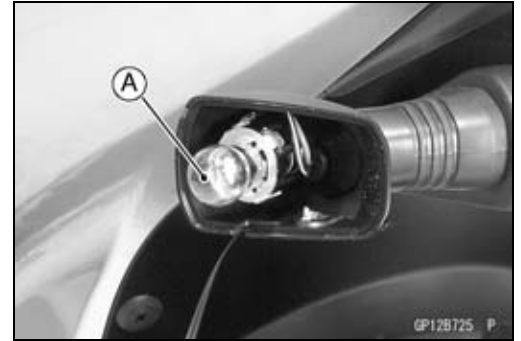
- Unscrew the screw [A] and remove the lens [B].



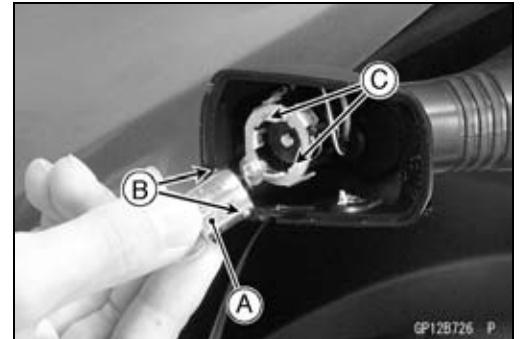
GP128724 P

## Lighting System

- Push and turn the bulb [A] counterclockwise and remove it.



- Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.
- Turn the bulb about 15°.



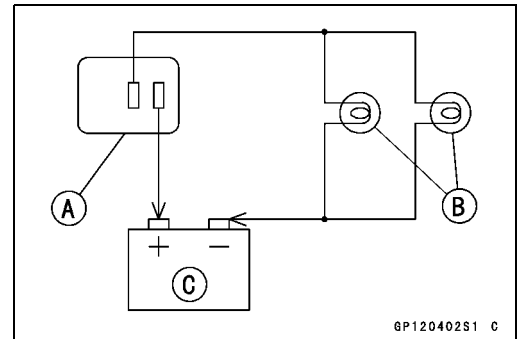
### Turn Signal Relay Inspection

- Remove:
  - Rear Seat (see Rear Seat Removal in the 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**	10	140 ~ 250
2	20	75 ~ 95

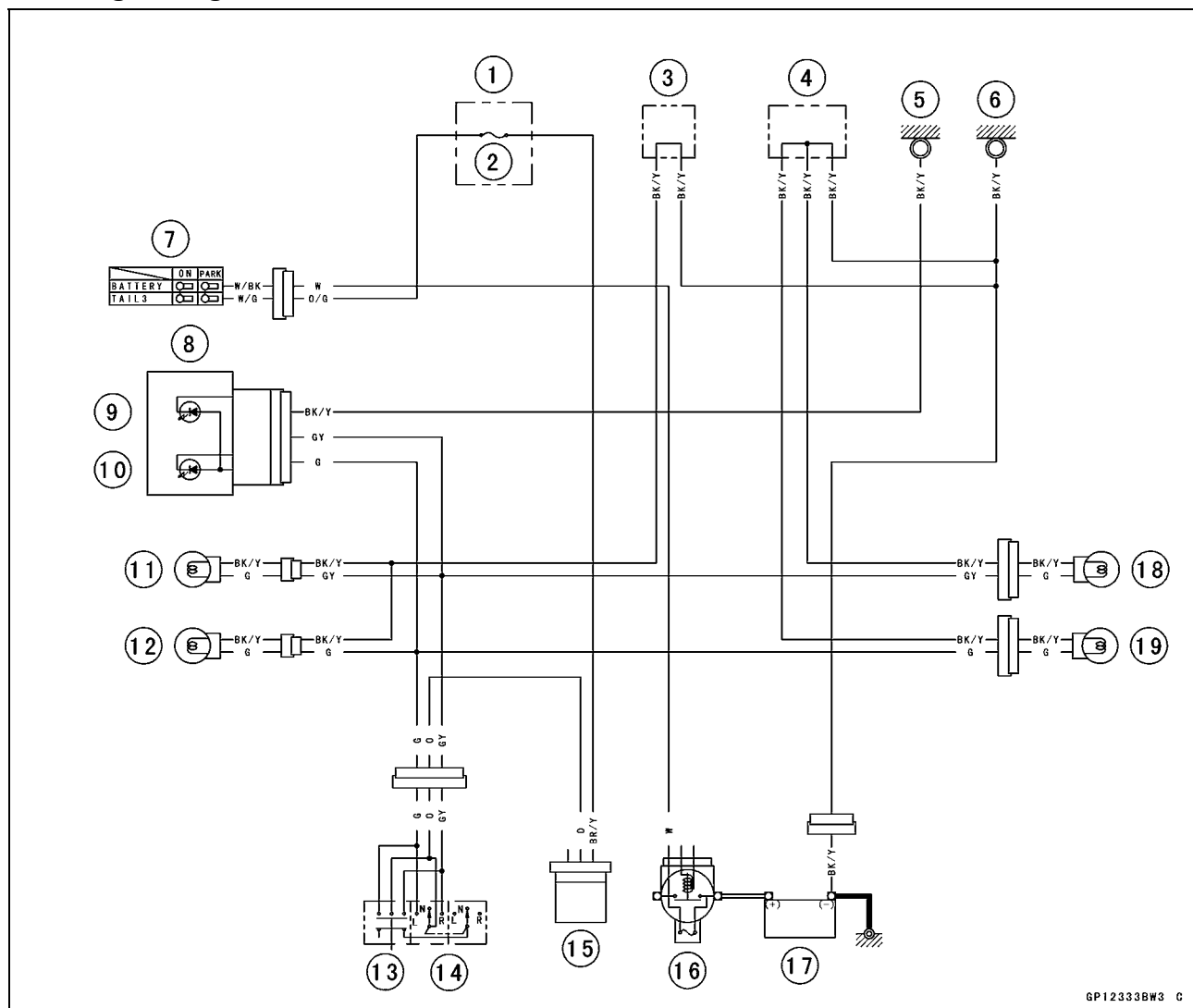
(\*): Cycle(s) per minute

(\*\*): Corrected to "one light burned out".

# 16-62 ELECTRICAL SYSTEM

## Lighting System

### Turn Signal Light Circuit



1. Fuse Box 2
2. Turn Signal Relay Fuse 10 A
3. Water-proof Joint A
4. Water-proof Joint B
5. Meter Ground
6. Frame Ground
7. Ignition Switch
8. Meter Unit
9. Right Turn Signal Indicator Light (LED)
10. Left Turn Signal Indicator Light (LED)
11. Front Right Turn Signal Light 12 V 10 W
12. Front Left Turn Signal Light 12 V 10 W
13. Hazard Button
14. Turn Signal Switch
15. Turn Signal Relay
16. Main Fuse 30 A
17. Battery 12 V 8 Ah
18. Rear Right Turn Signal Light 12 V 10 W
19. Rear Left Turn Signal Light 12 V 10 W

## Air Switching Valve

### Air Switching Valve Operation Test

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

### Air Switching Valve Unit Test

- Remove the air switching valve (see Air Switching Valve Removal in the Engine Top End chapter).
- Set the hand tester [A] to the  $\times 1 \Omega$  range and connect it to the air switching valve terminals as shown in the figure.

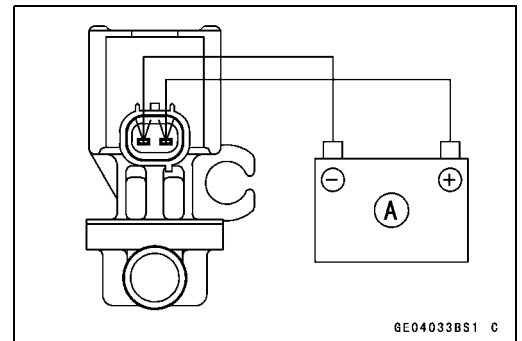
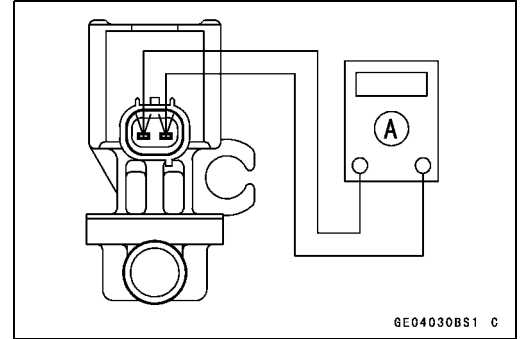
**Special Tool - Hand Tester: 57001-1394**

#### Air Switching Valve Resistance

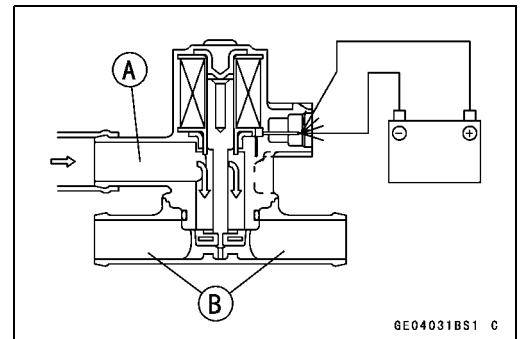
**Standard:** 18 ~ 22  $\Omega$  at 20°C (68°F)

- ★ If the tester does not read as specified value, replace it with a new one.

- Connect the 12 V battery [A] to the air switching valve terminals as shown in the figure.



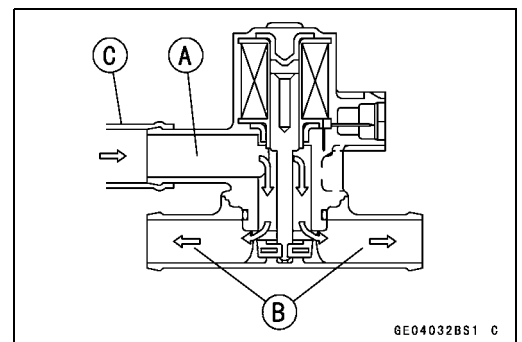
- Blow the air to the inlet air duct [A], and make sure does not flow the blown air from the outlet air duct [B].



- Disconnect the 12 V battery.
- Blow the air to the inlet air duct [A] again, and make sure flow the blown air from the outlet air duct [B].
- ★ If the air switching valve does not operate as described, replace it with a new one.

### NOTE

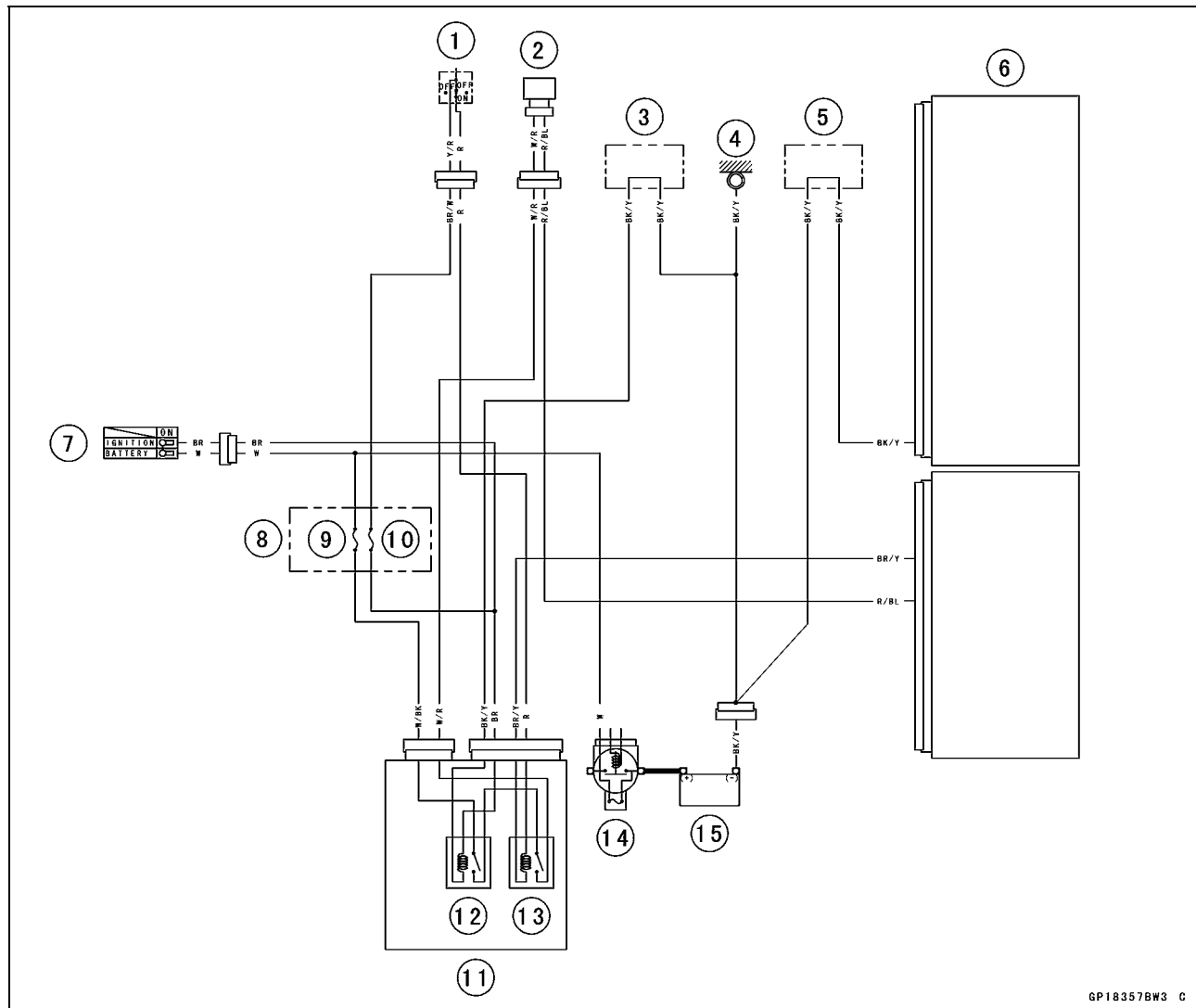
- To check air flow through the air switching valve, just blow through the air switching valve hose (inlet side) [C].



## 16-64 ELECTRICAL SYSTEM

### Air Switching Valve

#### Air Switching Valve Circuit



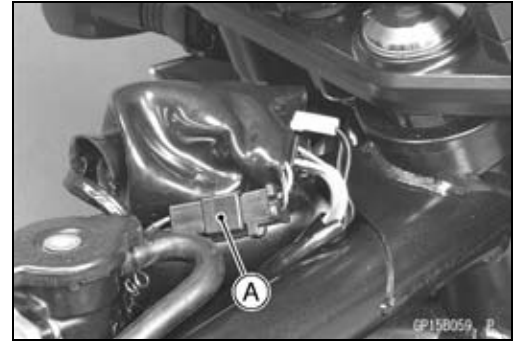
GP18357BW3 C

1. Engine Stop Switch
2. Air Switching Valve
3. Water-proof Joint B
4. Frame Ground
5. Water-proof Joint C
6. ECU
7. Ignition Switch
8. Fuse Box 2
9. ECU Fuse 10 A
10. Ignition Fuse 10 A
11. Relay Box
12. ECU Main Relay
13. Fuel Pump Relay
14. Main Fuse 30 A
15. Battery 12 V 8 Ah

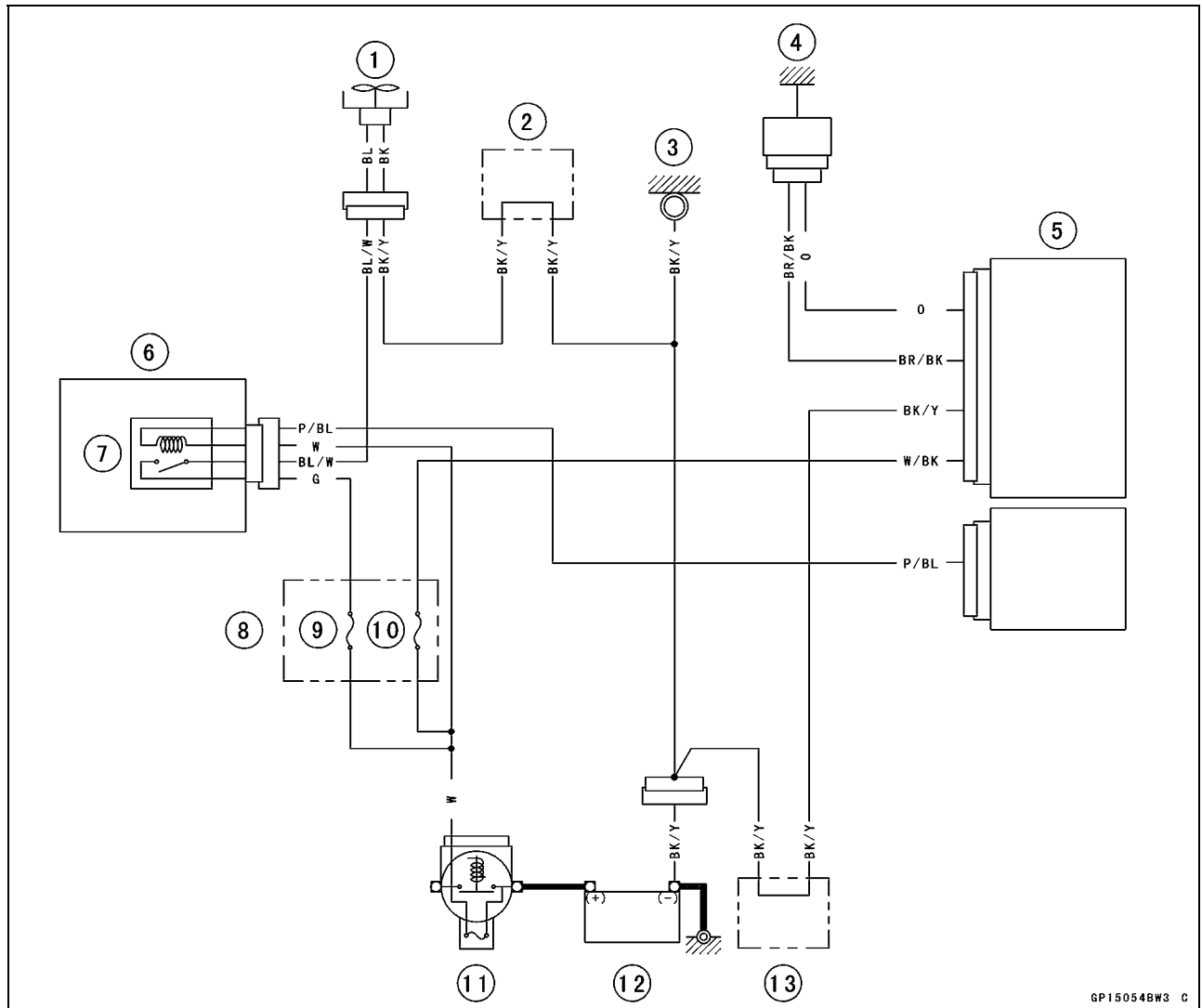
## Radiator Fan System

### Fan Motor Inspection

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
  - Disconnect the connector [A].
  - Using an auxiliary leads, supply battery power to the fan motor.
- ★ If the fan does not rotate, the fan motor is defective and must be replaced.



### Radiator Fan Circuit



1. Radiator Fan Motor
2. Water-proof Joint A
3. Frame Ground
4. Water Temperature Sensor
5. ECU
6. Relay Box
7. Radiator Fan Relay
8. Fuse Box 2
9. Fan Fuse 15 A
10. ECU Fuse 10 A
11. Main Fuse 30 A
12. Battery 12 V 8 Ah
13. Water-proof Joint C

GP15054BW3 C

## 16-66 ELECTRICAL SYSTEM

### Meter, Gauge, Indicator Unit

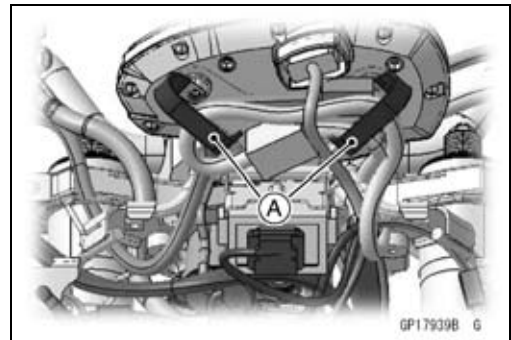
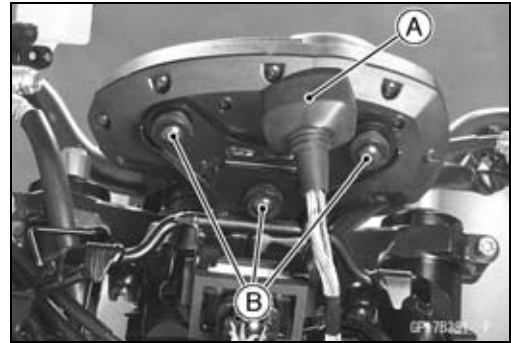
#### **Meter Unit Removal/Installation**

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
- Slide the dust cover [A] and disconnect the connector.
- Remove the meter unit by taking off the mounting screws [B] with the washers and two clamps.

#### **CAUTION**

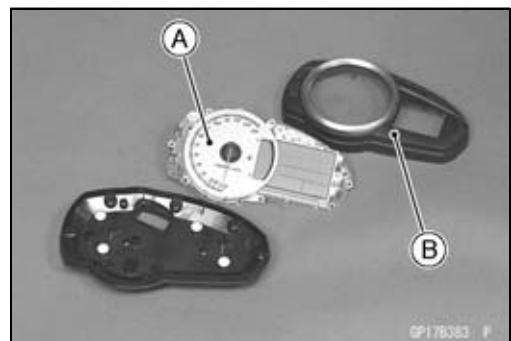
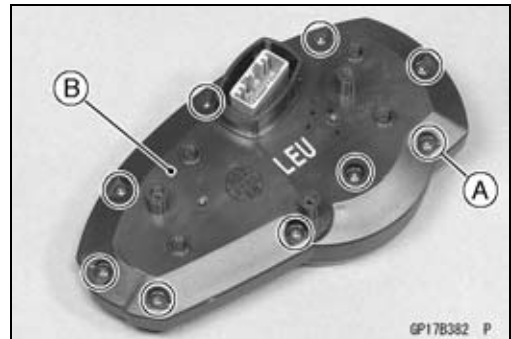
**Place the meter unit so that the face is up. If a meter unit is left upside down or sideways for any length of time, it will malfunction.**

- Installation is the reverse of removal.
- Install the clamps [A] with two upper screws.
- Hold the right and left switch housing leads with clamps (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:
  - Torque - Meter Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)**



#### **Meter, Gauge Disassembly**

- Remove:
  - Meter Unit (see Meter Unit Removal/Installation)
  - Screws [A]
  - Lower Meter Cover [B]
- Separate the meter assembly [A] and upper meter cover [B].

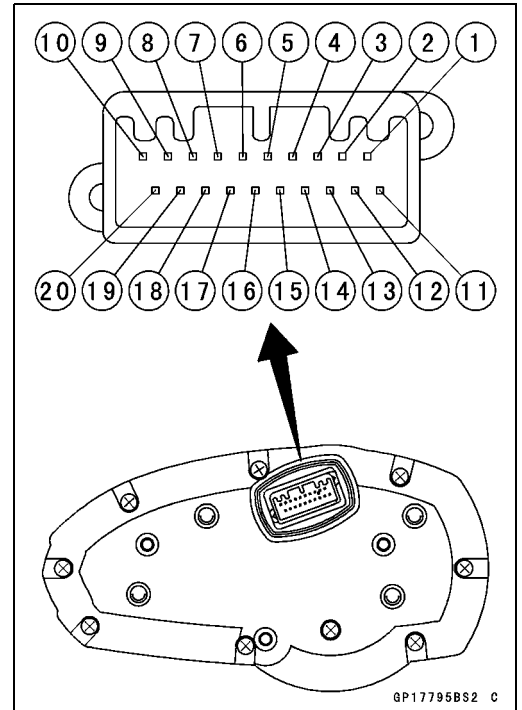




## Meter, Gauge, Indicator Unit

### Electronic Combination Meter Unit Inspection

- Remove the meter unit [A].
  - [1] Left Turn Signal Indicator Light (LED) (+)
  - [2] Unused
  - [3] Unused
  - [4] Unused
  - [5] Unused
  - [6] Unused
  - [7] Water Temperature Sensor
  - [8] High Beam Indicator Light (LED)
  - [9] Right Turn Signal Light (LED) (+)
  - [10] Neutral Indicator Light (LED) Ground (-)
  - [11] ABS Indicator Light (LED) Ground (-) (Equipped Models)
  - [12] Ground (-)
  - [13] Unused
  - [14] Battery (+)
  - [15] Ignition
  - [16] Fuel Level Sensor
  - [17] FI Indicator Light (LED) Ground (-)
  - [18] Speed Sensor Pulse
  - [19] Tachometer Pulse
  - [20] Oil Pressure Warning Indicator Light (LED) Ground (-)

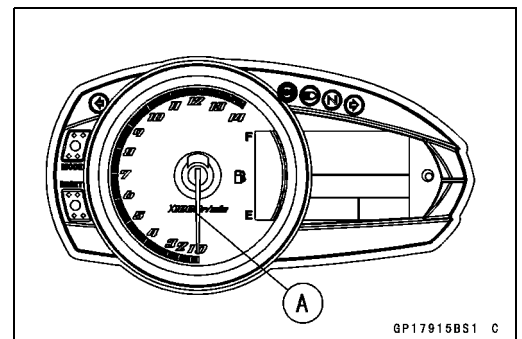
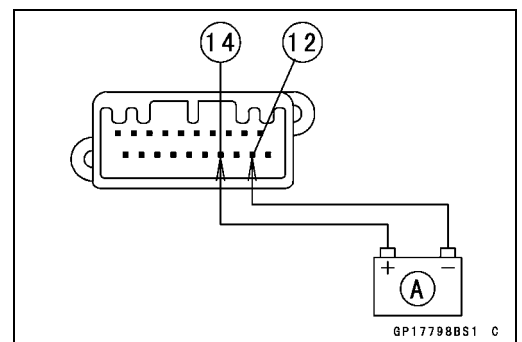


### CAUTION

**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.**

### Check 1: Meter Unit Primary Operation Check

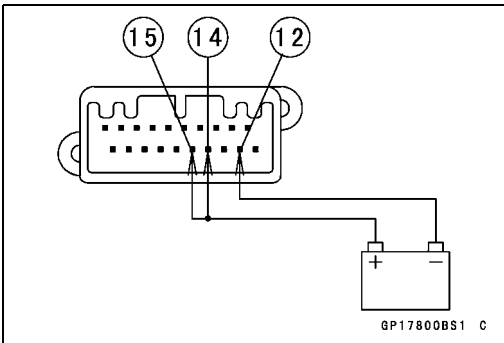
- Using the auxiliary leads, the 12 V battery [A] to the meter unit connector as follows.
  - Connect the battery positive (+) terminal to the terminal [14].
  - Connect the battery negative (-) terminal to the terminal [12].
- Check that the tachometer needle [A] momentarily points their last readings and back to the minimum position.
- ★ If the meter unit does not work, replace the meter assembly.



# 16-68 ELECTRICAL SYSTEM

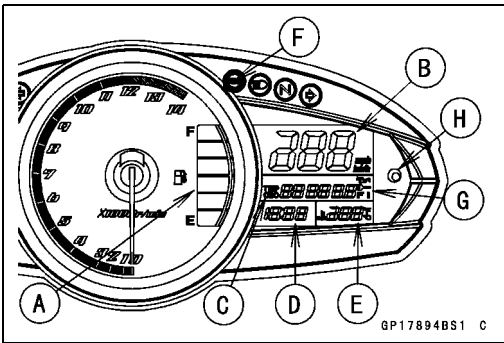
## Meter, Gauge, Indicator Unit

- Connect the terminal [15] to the battery (+) terminal.



- Check the following items.
- The tachometer needle momentarily points their last readings and back to the minimum position.
- The following LCD (Liquid Crystal Display) will display the action (1, 2, 3) within about 1.5 seconds.

	Fuel Gauge [A]	Speedometer [B], Odometer [C], Clock [D] and Water Temperature Gauge [E]
Action 1	Segments appear from up.	Segments appear from left.
Action 2	Segments disappear from up.	Segments disappear from left.
Action 3	Segments appear from up.	Segments appear from left.



- After the above indication, all the segments appear for one second.
- The all segments of the fuel gauge and FUEL in the display will flash. (This function is Fuel Level Sensor Line Self-Diagnosis Mode. Refer to Fuel Level Sensor Line Self-Diagnosis Mode Inspection.)
- The ABS warning light (LED) [F] goes on. (Equipped Models)
- The FI [G] in the display and warning light (LED) [H] will flash 10 seconds after the terminal 15 is connected.

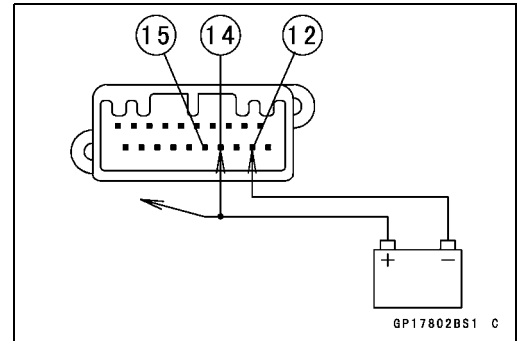
★ If the meter unit does not work, replace the meter assembly.

### NOTE

- Currently, the wiring that relates to flashing has been disconnected for the meter is removed from main harness. Therefore, the above flash has occurred.

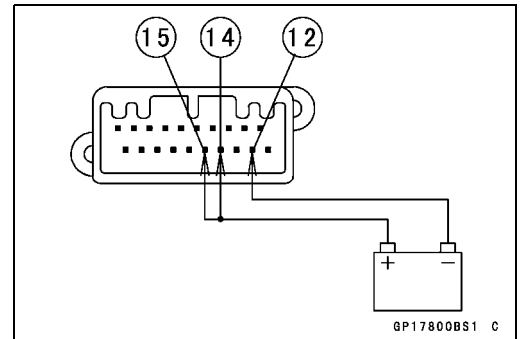
## Meter, Gauge, Indicator Unit

- Disconnect the terminal [15].
- All the LCD segments and LED warning lights disappear.
- ★ If the meter unit does not work, replace the meter assembly.

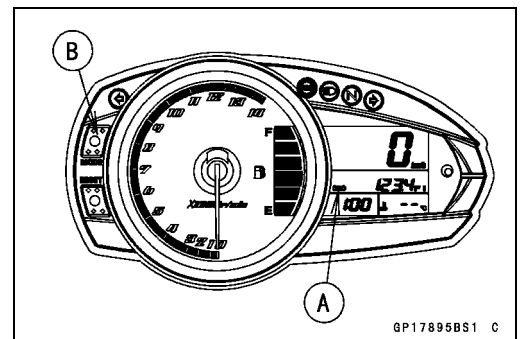


### Check 2: Meter Communication Line (Service Code 39) Check

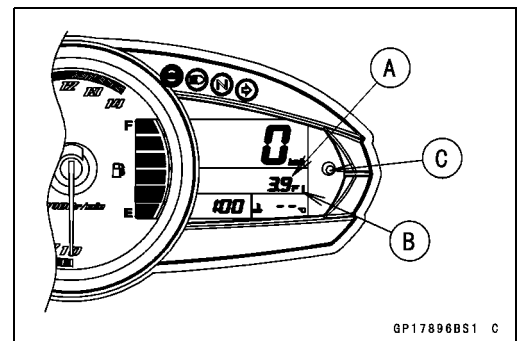
- Connect the leads in the same circuit as Check 1.
- Wait 10 seconds and the FI in the display and warning light (LED) flash.



- Set the ODO mode [A] by pushing the MODE button [B].
- Push the MODE button for more than 2 seconds.



- Check the following items.
- The number 39 [A] and FI [B] in the display appear and flash.
- The warning light (LED) [C] flashes.
- Push the MODE button for more than 2 seconds.
- Check the following items.
- The display returns ODO mode from number 39.
- The FI in the display and warning light (LED) flash.
- ★ If the meter unit does not work, replace the meter assembly.



### NOTE

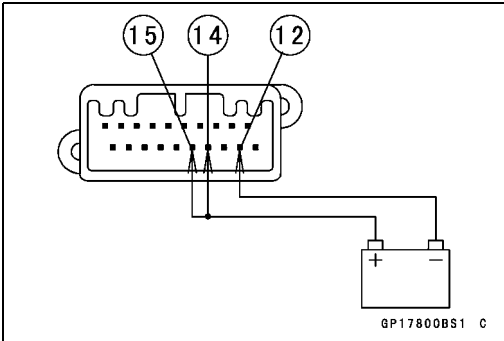
- The number 39 is service code of Self-Diagnosis (see Fuel System chapter). It is the service code of the meter communication line error.
- The number 39 and FI in the display disappear when the meter unit is connected to main harness of the normal motorcycle.

# 16-70 ELECTRICAL SYSTEM

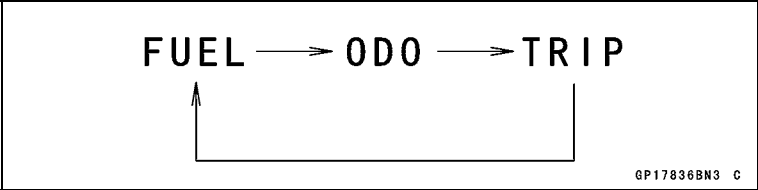
## Meter, Gauge, Indicator Unit

### Check 3: MODE Button Operation Check

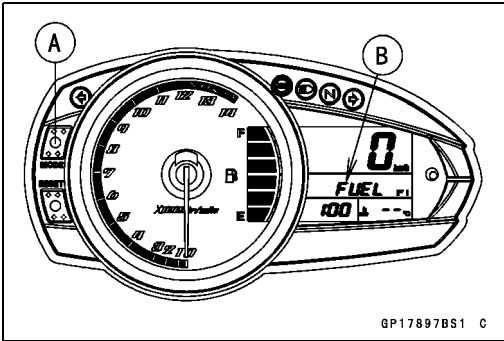
- Connect the leads in the same circuit as Check 1.



- By pushing the MODE button [A] each time, check that the display [B] changes as follows.

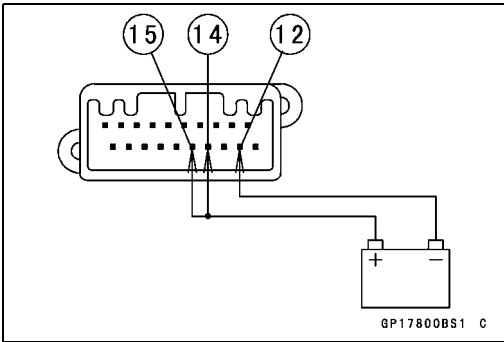


- ★ If the display function does not work, replace the meter assembly.

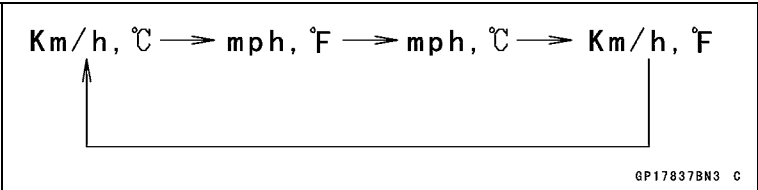


### Check 4: Unit Changing Check

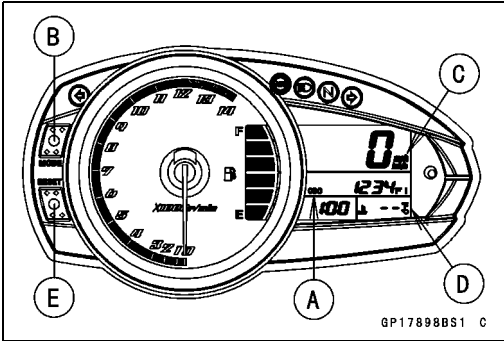
- Connect the leads in the same circuit as Check 1.



- Set the ODO mode [A] by pushing the MODE button [B].
- During the MODE button pushing, the unit of the distance [C] and temperature [D] change every time the RESET button [E] is pushed within 2 seconds.



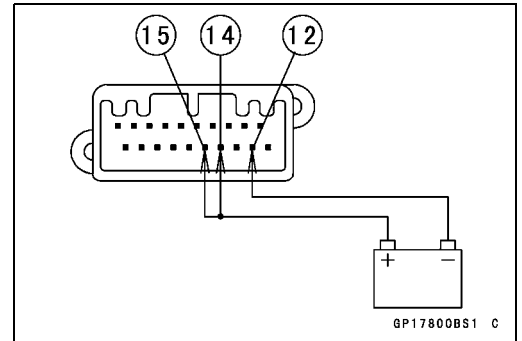
- ★ If the meter function does not work, replace the meter assembly.



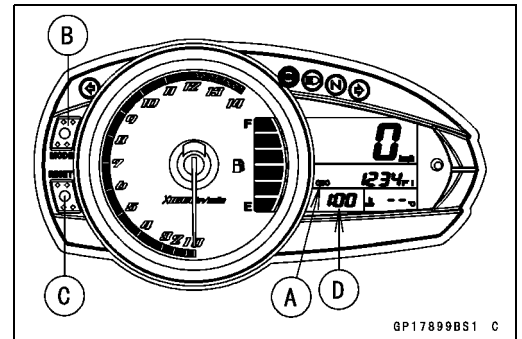
## Meter, Gauge, Indicator Unit

### Check 5: Clock Setting Check

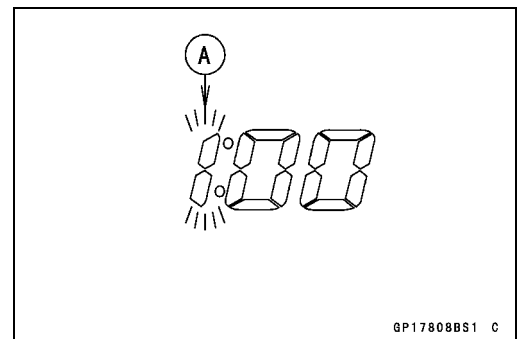
- Connect the leads in the same circuit as Check 1.



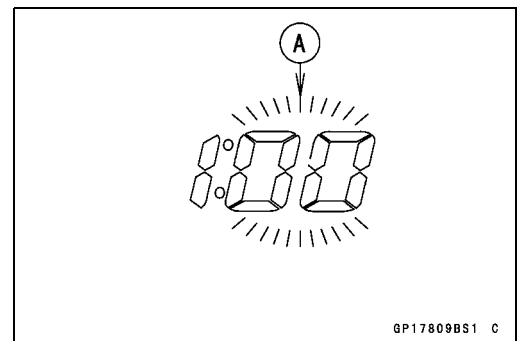
- Set the ODO mode [A] by pushing the MODE button [B].
- Push the REST button [C] for more than two seconds.
- The clock setting menu (hour and minute) [D] should flash.
- Push the RESET button.



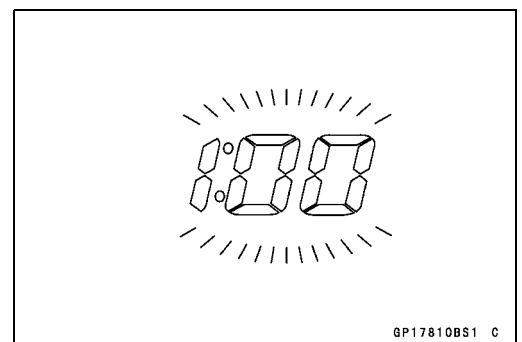
- The hour display [A] starts flashing.
- By pushing the MODE button each time, check that the hour display changes.



- By pushing the RESET button, check that the hour display decodes and minute display [A] starts flashing.
- By pushing the MODE button each time, check that the minute display changes.



- By pushing the RESET button, check that the hour and minute display start flashing.
- By pushing the MODE button, check that the hour and minute display decide.
- When both hour and minute display is flashing, by pushing the RESET button, check that the hour display start flashing. This flashing returns the hour setting display.
- ★ If the display function does not work, replace the meter assembly.
- If the terminal 15 disconnected when the clock is setting, clock is set at time of that time.

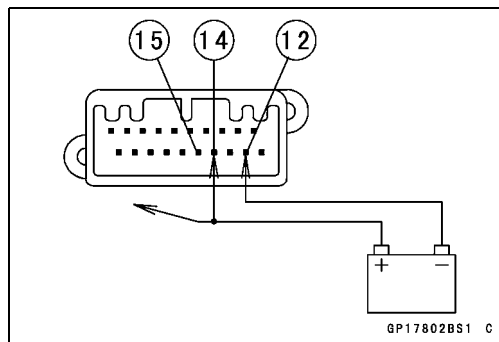


## 16-72 ELECTRICAL SYSTEM

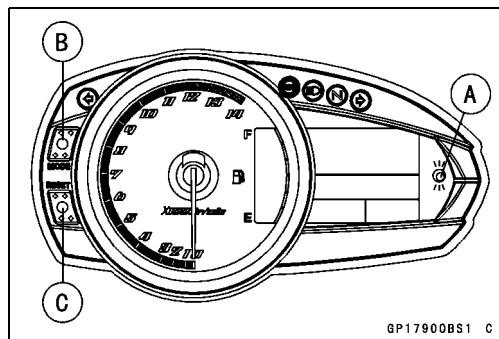
### Meter, Gauge, Indicator Unit

#### Check 6: Immobilizer Flashing Mode Inspection (Equipped Models)

- Connect the leads in the same circuit as Check 1.
- Disconnect the terminal [15].



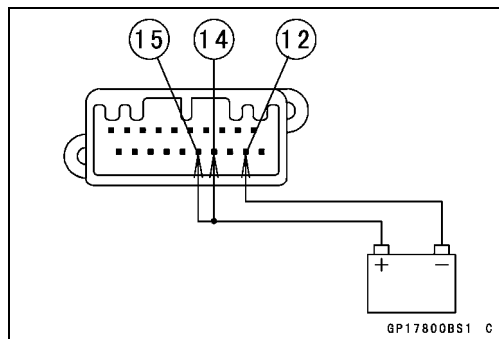
- Check that the warning light (LED) [A] starts flashing (Immobilizer Warning Light Flashing Mode).
- Push the MODE [B] and RESET [C] buttons more than 2 second, within 20 seconds after the terminal [15] disconnected.
- Check that the warning light (LED) goes on one second, and then the light goes off (Immobilizer Warning Light No Flashing Mode).



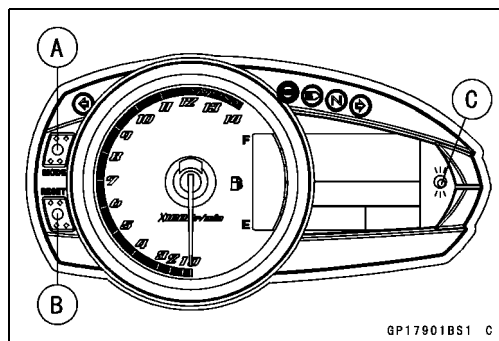
#### NOTE

○For this inspection, be sure the battery is 12.2 V or more. Immobilizer Warning Light Flashing Mode does not work, when the battery voltage is less than  $12 \pm 0.2$  V.

- Connect the terminal [15] to the battery (+) terminal.
- And then, disconnect the terminal [15].



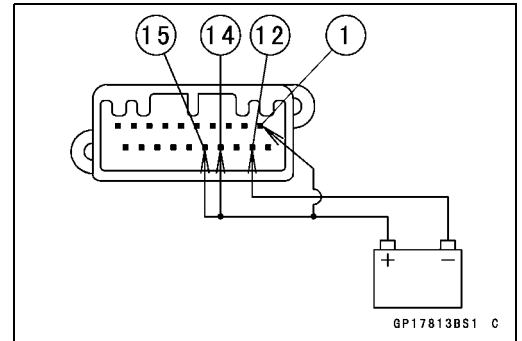
- Push the MODE [A] and RESET [B] buttons more than 2 second, within 20 seconds after the terminal [15] disconnected.
- Check that the warning light (LED) [C] goes on one second, and then the light starts flashing (Immobilizer Warning Light Flashing Mode).
- ★ If the meter function does not work, replace the meter assembly.



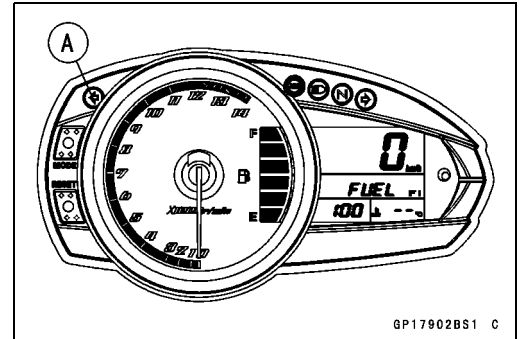
## Meter, Gauge, Indicator Unit

### Check 7: Left Turn Signal Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 1.
- Connect the terminal [1] to the battery (+) terminal.

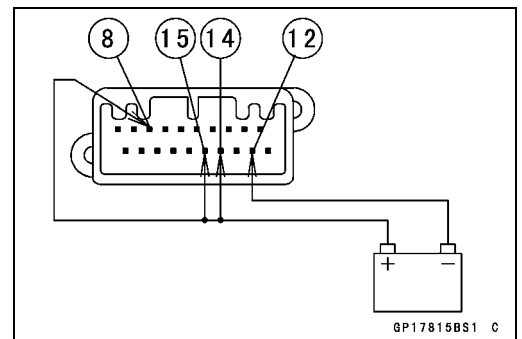


- Check that the left turn signal indicator light (LED) [A] goes on.
- ★ If the indicator light (LED) does not go on, replace the meter assembly.

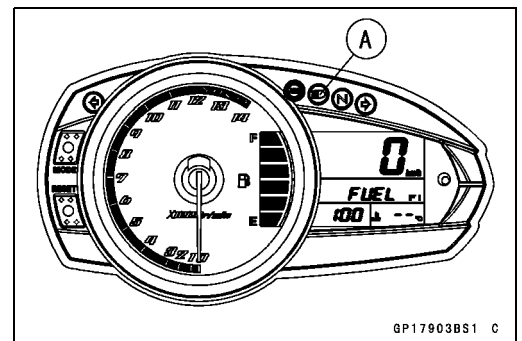


### Check 8: High Beam Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 1.
- Connect the terminal [8] to the battery (+) terminal.

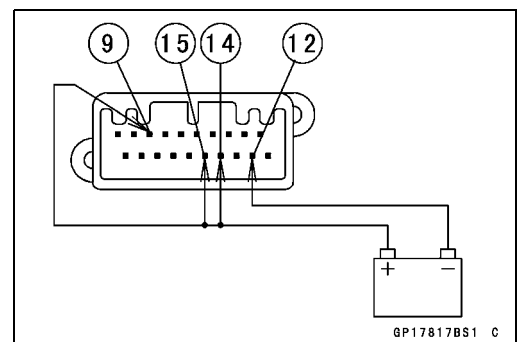


- Check that the high beam indicator light (LED) [A] goes on.
- ★ If the indicator light (LED) does not go on, replace the meter assembly.



### Check 9: Right Turn Signal Indicator Light (LED) Inspection

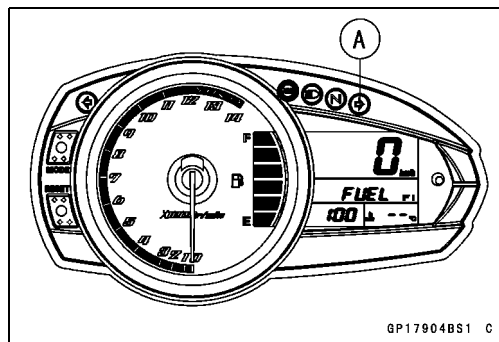
- Connect the leads in the same circuit as Check 1.
- Connect the terminal [9] to the battery (+) terminal.



## 16-74 ELECTRICAL SYSTEM

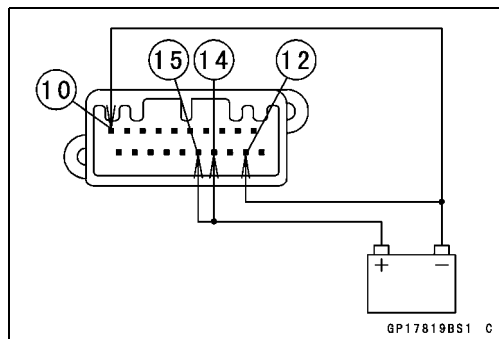
### Meter, Gauge, Indicator Unit

- Check that the right turn signal indicator light (LED) [A] goes on.
- ★ If the indicator light (LED) does not go on, replace the meter assembly.

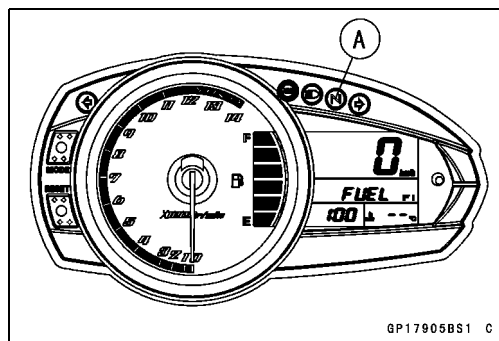


#### Check 10: Neutral Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 1.
- Connect the terminal [10] to the battery (-) terminal.

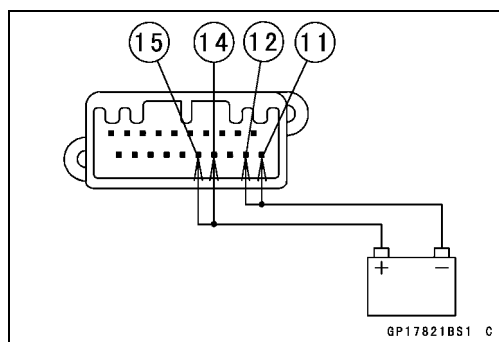


- Check that the neutral indicator light (LED) [A] goes on.
- ★ If the indicator light (LED) does not go on, replace the meter assembly.

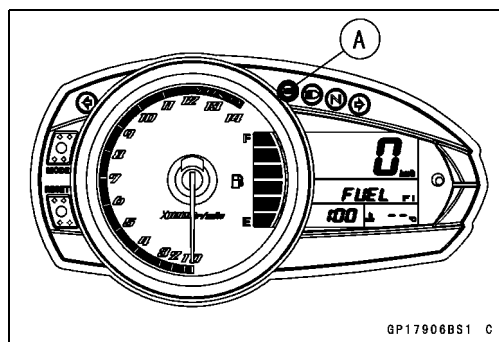


#### Check 11: ABS Indicator Light (LED) Inspection (Equipped Models)

- Connect the leads in the same circuit as Check 1.
- The ABS warning light (LED) goes on.
- Connect the terminal [11] to the battery (-) terminal.



- Check that the ABS warning light (LED) goes off.
- ★ If the indicator light (LED) does not go off, replace the meter assembly.

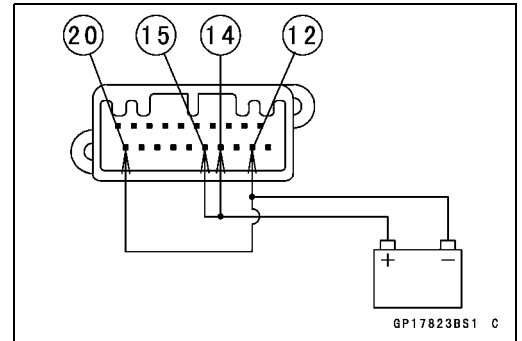




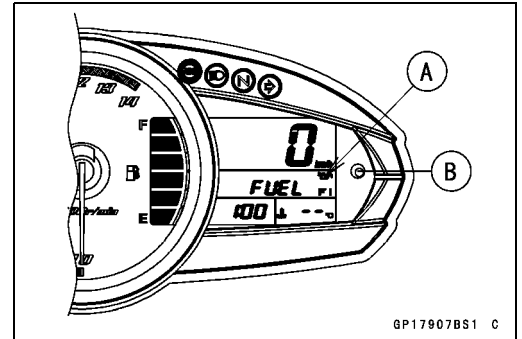
## Meter, Gauge, Indicator Unit

### Check 12: Oil Pressure Warning Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 1.
- Connect the terminal [20] to the battery (–) terminal.

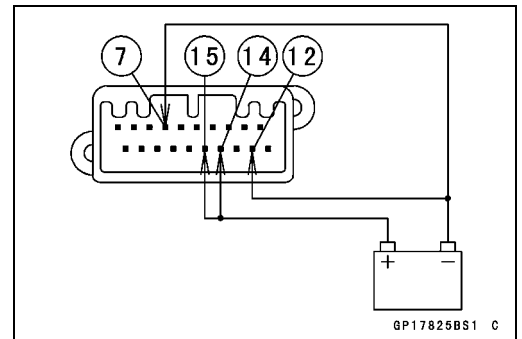


- Check that the oil symbol [A] and oil pressure warning indicator light (LED) [B] flash.
- ★ If the oil symbol and indicator light (LED) do not flash, replace the meter assembly.

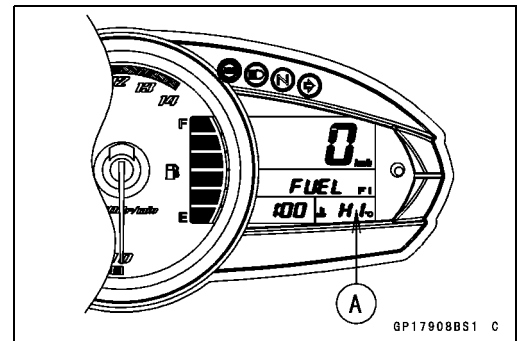


### Check 13: Water Temperature Meter Inspection

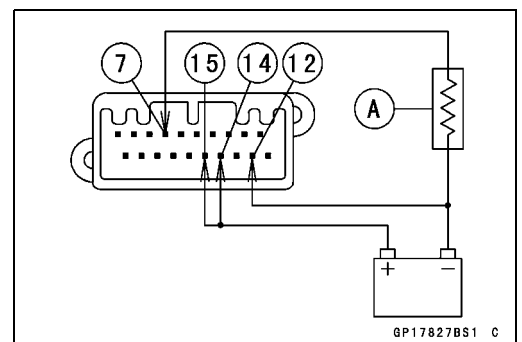
- Connect the leads in the same circuit as Check 1.
- The “–” indication in the display of the water temperature meter appears.
- Connect the terminal [7] to the battery (–) terminal.



- Check that the display of the water temperature meter [A] changes from “–” to “HI”.
- ★ If the water temperature meter does not work, replace the meter assembly.



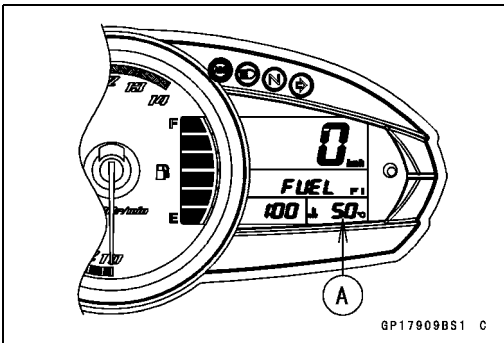
- Connect the resistor [A] (about 210  $\Omega$ ) to the terminal [7] and the battery (–) terminal.



# 16-76 ELECTRICAL SYSTEM

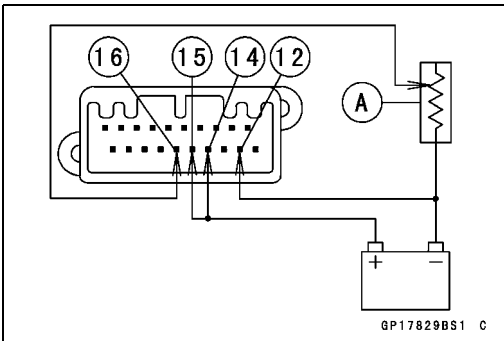
## Meter, Gauge, Indicator Unit

- Check that the display of the water temperature meter [A] indicates approximately 50 °C (122 °F).
- ★ If the water temperature meter does not indicate temperature, replace the meter assembly.



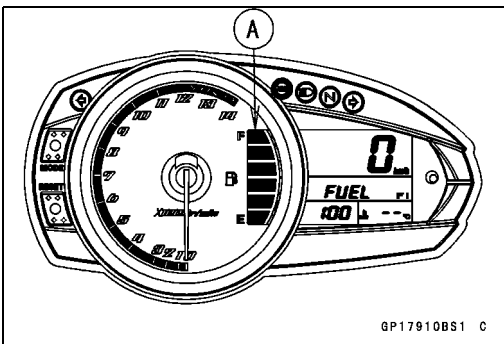
### Check 14: Fuel Gauge Inspection

- Connect the leads in the same circuit as Check 1.
- The all segments of the fuel gauge and FUEL in the display will flash.
- Connect the variable rheostat [A] to the terminal [16] and the battery (–) terminal.



- Check that the segments number of the fuel level gauge [A] matches the resistance value of the variable rheostat.
- When the terminal [16] is connected, one segment in the fuel level gauge should appear about every 15 seconds.

Variable Rheostat Resistance (Ω)	Display Condition
10	6 segments go on
about 80	1 segment goes on
100	1 segment and "FUEL" flash



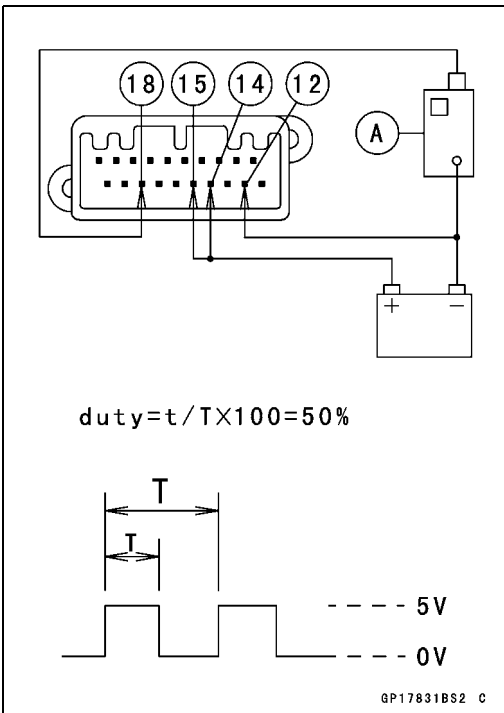
- ★ If the display function does not work, replace the meter assembly.

### Check 15: Speedometer Inspection

- Connect the leads in the same circuit as Check 1.
- The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [18].
- Indicates approximately 60 km/h if the input frequency is approximately 560 Hz.
- Indicates approximately 60 mph if the input frequency is approximately 896 Hz.
- ★ If the meter function does not work, replace the meter assembly.

#### NOTE

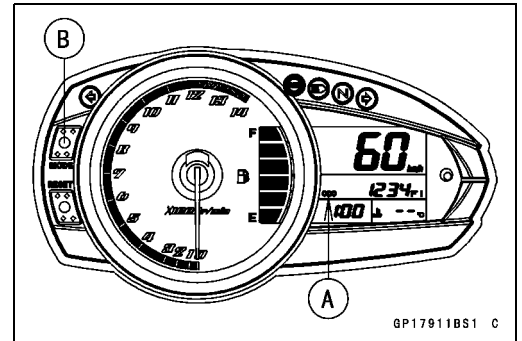
- The input frequency of the oscillator adds the integrated value of the odometer.
- The integrated value of the odometer cannot be reset.



## Meter, Gauge, Indicator Unit

### Check 16: Odometer Inspection

- Connect the leads in the same circuit as Check 15.
- Set the ODO mode [A] by pushing the MODE button [B].
- Raise the input frequency of the oscillator to see the result of this inspection.
- Example: Indicates the increase of approximately 1 km/h, if the input frequency is approximately 525 Hz for one minute.
- Example: Indicates the increase of approximately 1 mile, if the input frequency is approximately 840 Hz for one minute.
- ★ If the value indicated by the odometer does not increase, replace the meter assembly.

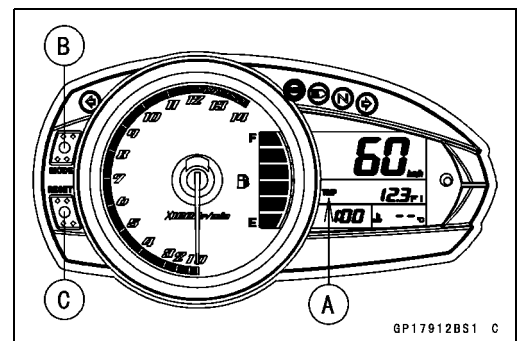


#### NOTE

- The integrated value of the odometer cannot be reset.

### Check 17: Trip Meter Inspection

- Connect the leads in the same circuit as Check 15.
- Set the TRIP mode [A] by pushing the MODE button [B].
- Raise the input frequency of the oscillator to see the result of odometer inspection.
- ★ If the value indicated by the trip meter does not increase, replace the meter assembly.
- When pushing the RESET button [C] for more than two seconds, check that the display changes 0.0.
- ★ If the display function does not change, replace the meter assembly.

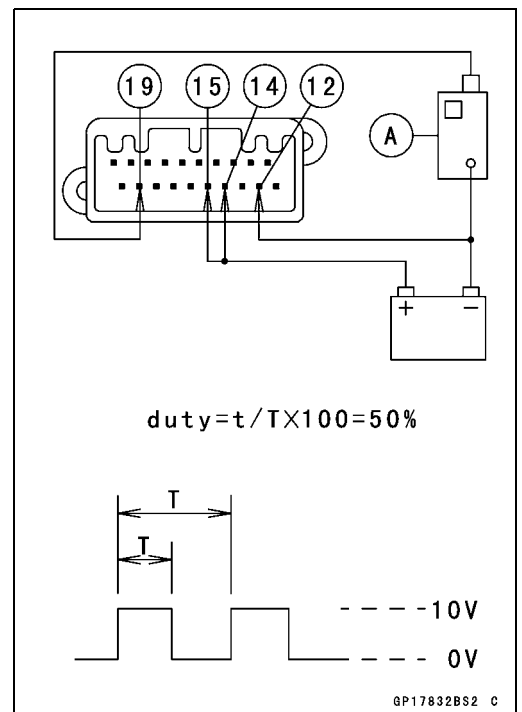


#### NOTE

- The integrated value of the odometer cannot be reset.

### Check 18: Tachometer Inspection

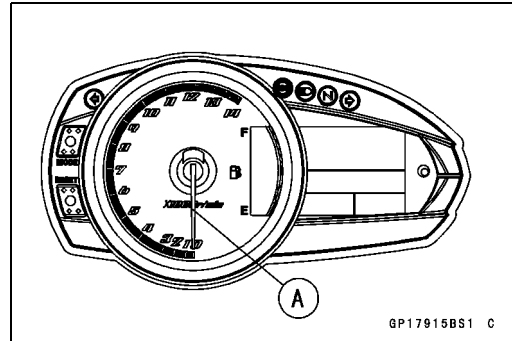
- Connect the leads in the same circuit as Check 1.
- The engine speed (rpm) equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [19].
- Indicates approximately 4 000 rpm if the input frequency is approximately 133.3 Hz.
- ★ If the meter function does not work, replace the meter assembly.



## 16-78 ELECTRICAL SYSTEM

### Meter, Gauge, Indicator Unit

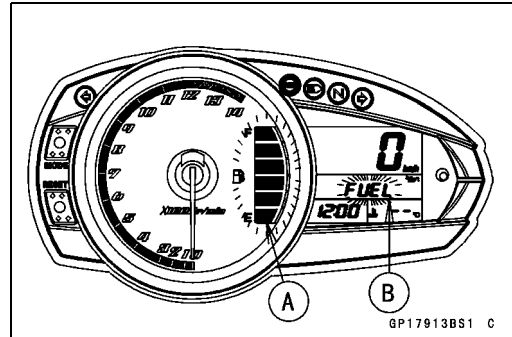
- Disconnect the terminal [15].
- Check that the tachometer needle [A] back to the minimum (0) position.
- ★ If the meter unit does not work, replace the meter assembly.



### Fuel Level Sensor Line Self-Diagnosis Mode Inspection

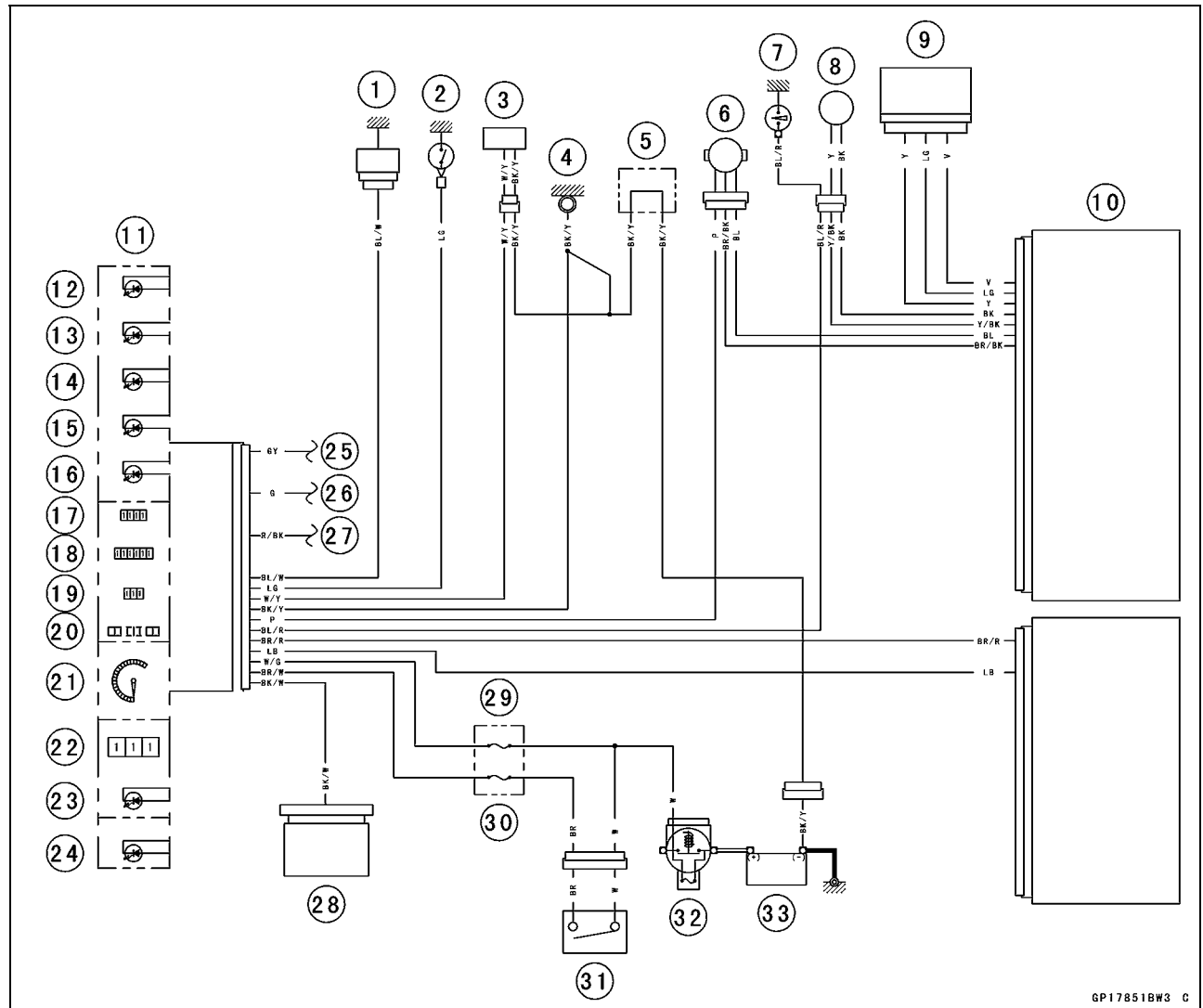
#### NOTE

- Usually when the open or short of the fuel level sensor circuit is detected, it becomes the Fuel Level Sensor Line Self-Diagnosis Mode.
- The all segments of the fuel gauge [A] and FUEL [B] in the display will flash. (This function is Fuel Level Sensor Line Self-Diagnosis Mode.)
- ★ If the meter enters the self-diagnostic mode when the meter is installed in the motorcycle, check the fuel level sensor (see Fuel Level Sensor Inspection) and wiring.
- ★ If the fuel level sensor and wiring are good, replace the meter assembly.



## Meter, Gauge, Indicator Unit

## Meter Circuit



GP17851BW3 C

- |   |  |
|---|--|
| 1. Water Temperature Sensor                                   | 17. Clock                                  |
| 2. Neutral Switch   | 18. Odometer/Trip Meter                    |
| 3. Fuel Level Sensor  | 19. Water Temperature Meter                |
| 4. Meter Ground   | 20. Fuel Gauge                             |
| 5. Water-proof Joint C  | 21. Tachometer                             |
| 6. Speed Sensor   | 22. Speedometer                            |
| 7. Oil Pressure Switch  | 23. Meter Illumination Light (LED)         |
| 8. Crankshaft Sensor  | 24. Left Turn Signal Indicator Light (LED) |
| 9. Immobilizer Amplifier (Equipped Models)                    | 25. Turn Signal Switch (Right)             |
| 10. ECU   | 26. Turn Signal Switch (Left)              |
| 11. Meter Unit  | 27. Dimmer Switch                          |
| 12. Right Turn Signal Indicator Light (LED)                   | 28. ABS Hydraulic Unit (Equipped Models)   |
| 13. High Beam Indicator Light (LED)                           | 29. Meter Fuse 10 A                        |
| 14. Neutral Indicator Light (LED)                             | 30. Ignition Fuse 10 A                     |
| 15. Oil Pressure/FI/Immobilizer Warning Indicator Light (LED) | 31. Ignition Switch                        |
| 16. ABS Indicator Light (LED) (Equipped Models)               | 32. Main Fuse 30 A                         |
|   | 33. Battery 12 V 8 Ah                      |

## 16-80 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

This motorcycle is equipped with an immobilizer system to protect the motorcycle from theft. This system provides a theft proof device by means of matching a code between the inbuilt key transponder and ECU (Electronic Control Unit). If the code does not match, ignition system, injectors and subthrottle valve actuator will not operate and the engine will not start.

#### Abstract

- Do not keep more than one immobilizer key of any system on a key ring. Jamming of the key code signal may occur and the operation of the system may be affected.
- The warning indicator light (LED) will flash for a period of 24 hours once the ignition switch has been switched off and the key removed. This flashing can be set to on or off as desired by holding the Mode and Reset buttons down for two seconds within twenty seconds of switching the ignition off.
- If all coded keys (master key and user keys) are lost the ECU and ignition switch will have to be replaced.
- The immobilizer system can not function until the master key code is registered in the ECU.
- A total of six keys can be registered in the ECU at any one time (one master key and five user keys).
- If the master key is lost it is not possible to register new user keys.

#### Operational Cautions

1. Do not put two keys of any immobilizer system on the same key ring.
2. Do not submerge any key in water.
3. Do not expose any key to excessively high temperature.
4. Do not place any key close to magnet.
5. Do not place a heavy item on any key.
6. Do not grind any key or alter its shape.
7. Do not disassemble the plastic part of any key.
8. Do not drop the key and/or apply any shocks to the key.
9. When a user key is lost, the user should go to his dealer to invalidate the lost key registration in the ECU.
10. When the master key is lost, the user should go to his dealer and have a new ECU installed and register a new master key and user keys.

#### NOTE

○No.9 and 10 are strongly recommended to the customer to ensure security of the motorcycle.

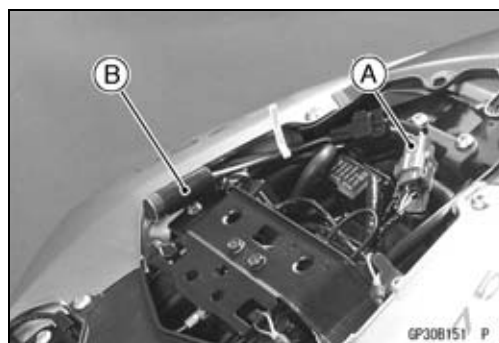
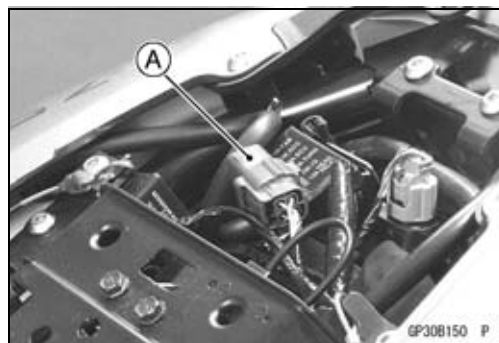
#### Key Registration

**Case 1: When the user key has been lost or additional spare user key is required.**

- Prepare a new spare user key.
- Cut the key in accordance with the shape of the current user key.
- Remove:  
Rear Seat (see Rear Seat Removal in the Frame chapter)
- Disconnect the immobilizer/Kawasaki diagnostic system connector [A].
- Connect the connection cable [A] and key registration unit [B].

**Special Tools - Key Registration Unit: 57001-1582**

**Connection Cable: 57001-1699**

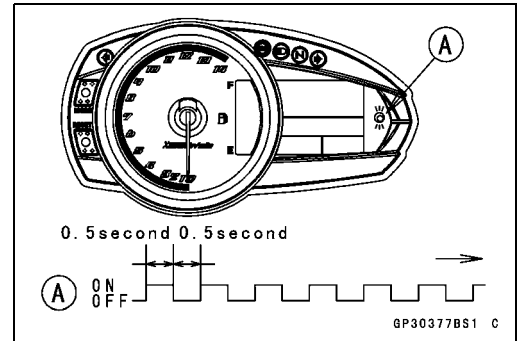


## Immobilizer System (Equipped Models)

- Insert the master key to the ignition switch and turn it ON.

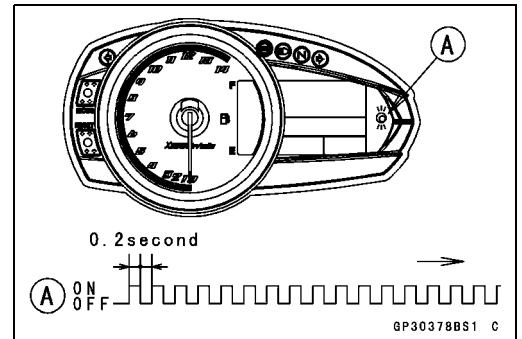
### Verified

- The warning indicator light (LED) [A] blinks to display the registration mode (go to the next step).

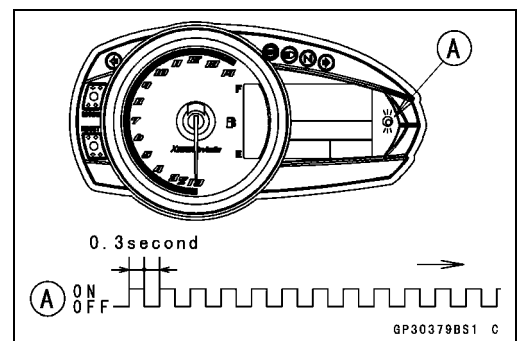


### Not Verified

- The warning indicator light (LED) [A] blinks to display the collation error (refer to the following failure illustrations).  
Immobilizer Amplifier Failure



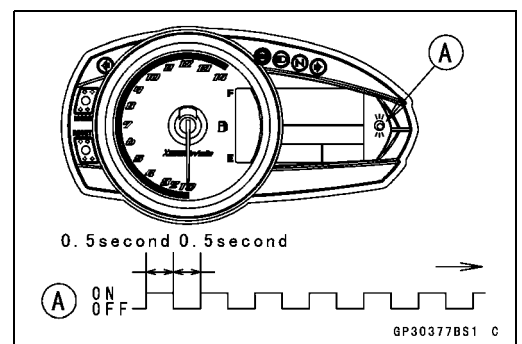
### Master Key Collation Error



- Turn the master key OFF and remove the master key.
- The warning indicator light (LED) [A] blinks continuously to display that the ECU is in the registration mode for 15 seconds.

### NOTE

- Insert next key and turn ON within 15 seconds after previous key is turned OFF and removed otherwise registration mode will be ended and the warning indicator light (LED) stops flashing.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.



- Insert the user key 1 to the ignition switch and turn it ON.

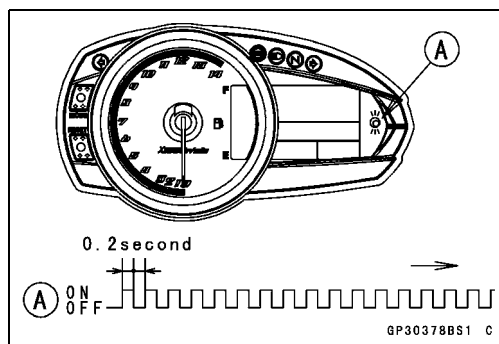
### NOTE

- Keep the other user key away from the immobilizer antenna.

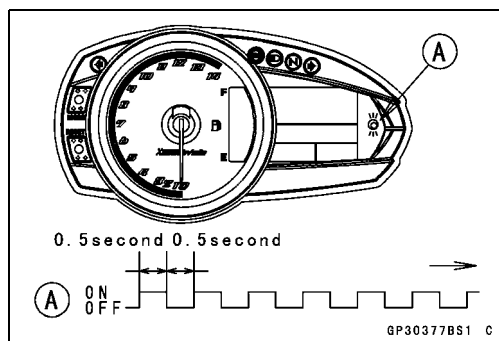
## 16-82 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

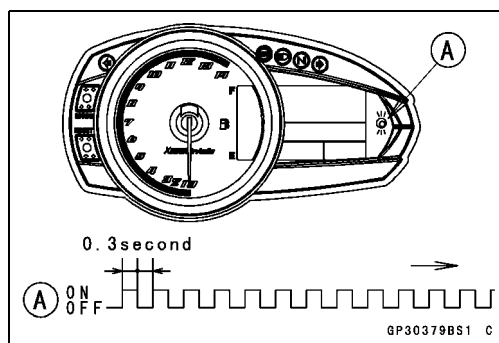
- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



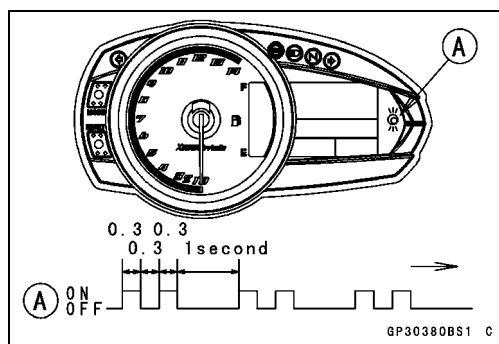
When Registered User Key is Inserted.



User Key Collation Error



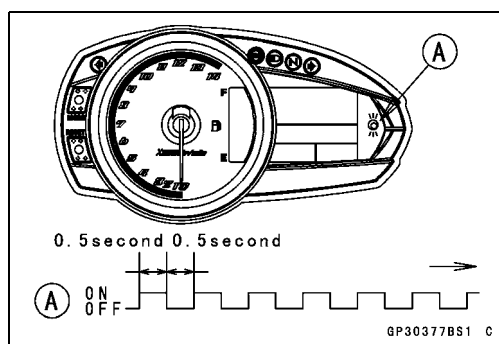
- The user key 1 is successfully registered in the ECU.
- The warning indicator light (LED) [A] blinks 2 times and stops for 1 second and then repeats this cycle.



- Turn the user key 1 OFF and remove the user key 1.
- The warning indicator light (LED) [A] blinks to display the registration mode.

#### NOTE

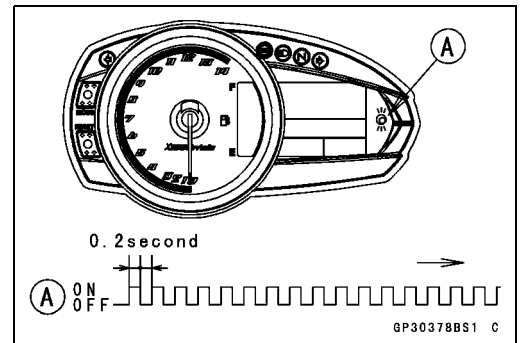
- Turn OFF the ignition switch and wait for the period of 15 seconds or more. The registration mode automatically finishes and the warning indicator light (LED) will switch off.
- This procedure registered the master key and one user key.
- Continue with the procedure to register the second and later keys before the 15 seconds period has elapsed.



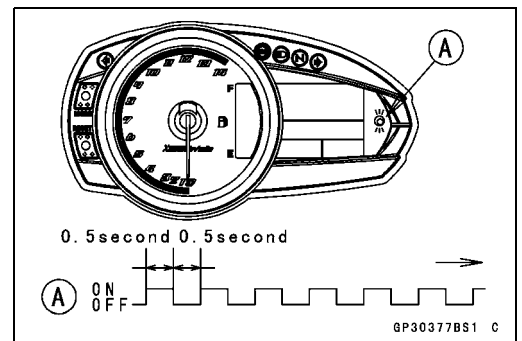


## Immobilizer System (Equipped Models)

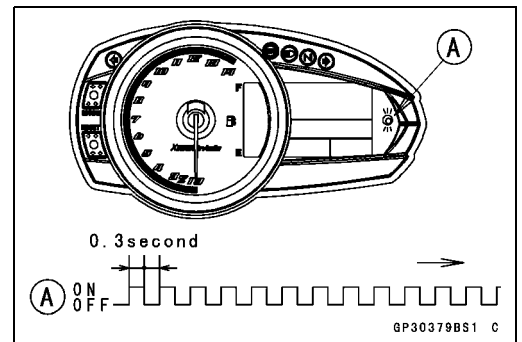
- Insert the user key 2 to the ignition switch and turn it ON.
- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



When Registered User Key is Inserted.



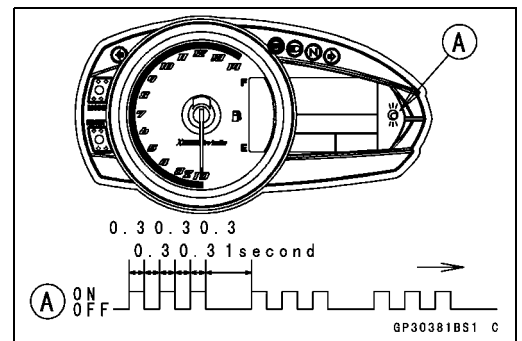
User Key Collation Error



- The user key 2 is registered in the ECU.
- The warning indicator light (LED) [A] blinks 3 times and stops for 1 second and then repeats this cycle.
- This procedure has registered the master key and 2 user keys.
- Continue with the procedure to register an additional 3 user keys.

### NOTE

- The ECU can store up the six key codes (master key × 1 and user key × 5).



### User Key Indicator Flashes

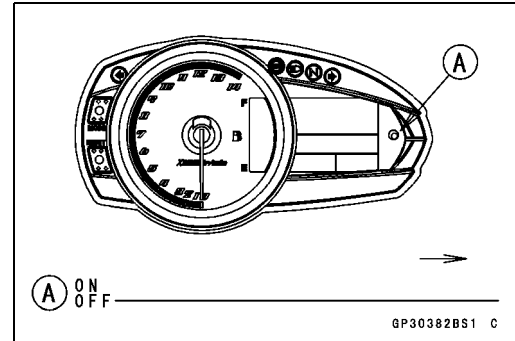
	Indicator Light Blinks	Indicator Light Stop	Remarks
<b>User Key 3</b>	4 times	1 seconds	Repeat
<b>User Key 4</b>	5 times	1 seconds	Repeat
<b>User Key 5</b>	6 times	1 seconds	Repeat

- Turn OFF the ignition switch and wait for period of more than 15 seconds.
- The registration mode automatically ends.

## 16-84 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

- Warning indicator light (LED) [A] goes off.



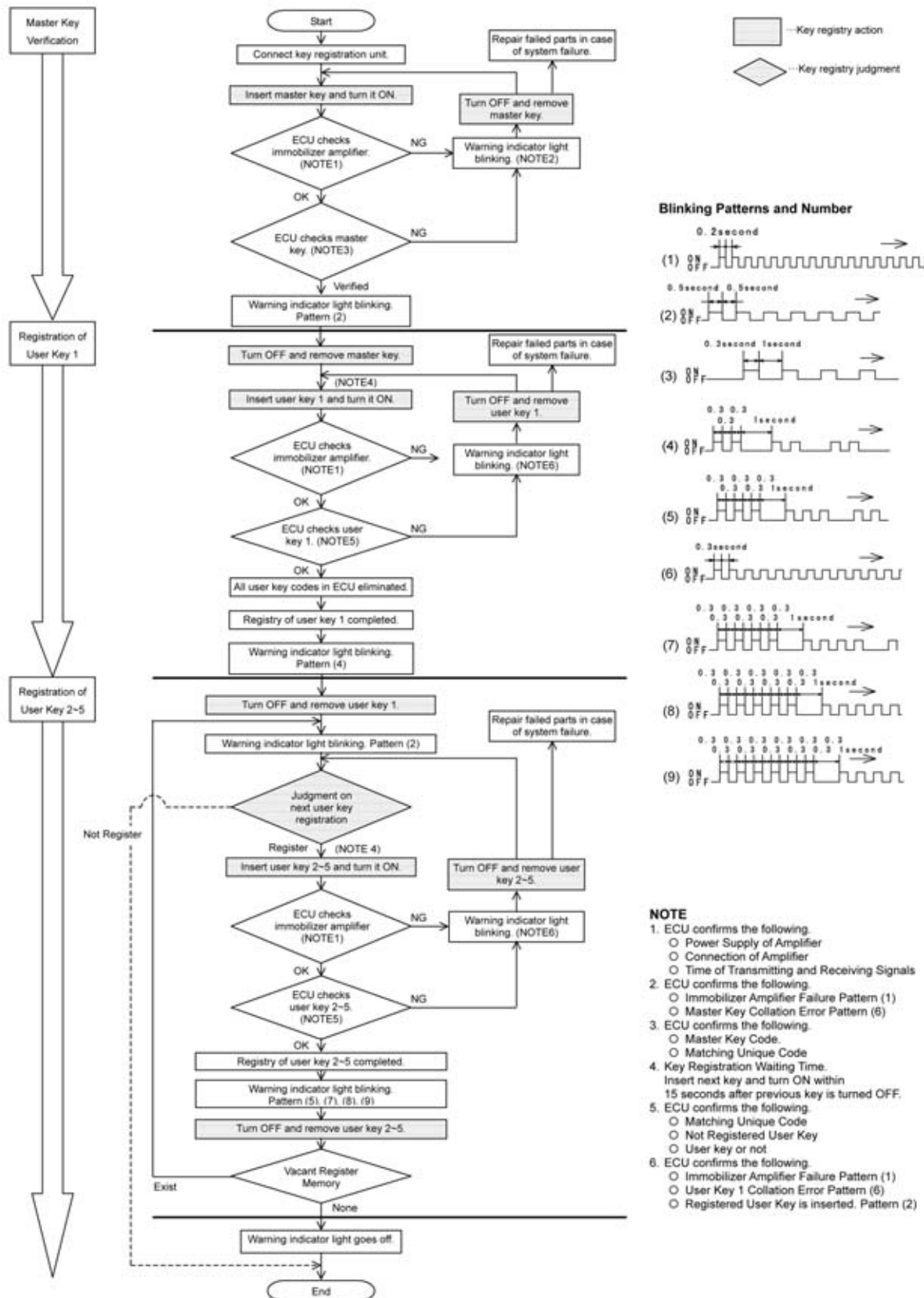
- Remove the key registration unit and connect the immobilizer Kawasaki diagnostic system connector.

#### NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

### Immobilizer System (Equipped Models)

## Spare User Key Registration Flow Chart

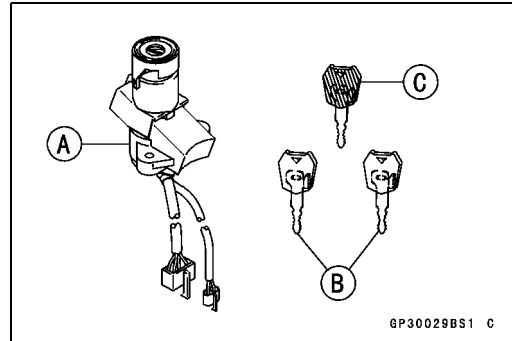


## 16-86 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

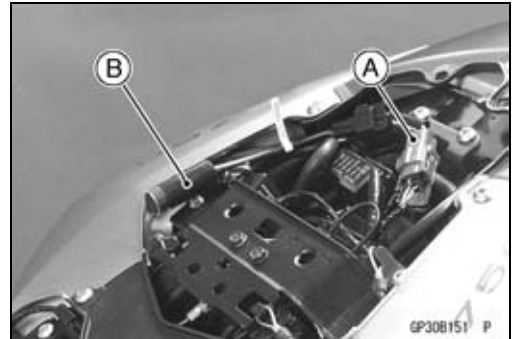
**Case 2: When the ignition switch is faulty and to be replaced.**

- Prepare a new ignition switch [A] and two new user keys [B].
- These parts are available as a set. Prepare the current master key [C].



- Remove:
  - Ignition Switch and Immobilizer Antenna (see Immobilizer System Parts Replacement)
  - Rear Seat (see Rear Seat Removal in the Frame chapter)
- Disconnect the immobilizer/Kawasaki diagnostic system connector.
- Connect the connection cable [A] and key registration unit [B].

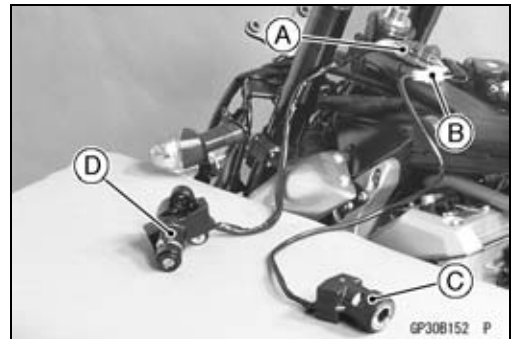
**Special Tools - Key Registration Unit: 57001-1582**  
**Connection Cable: 57001-1699**



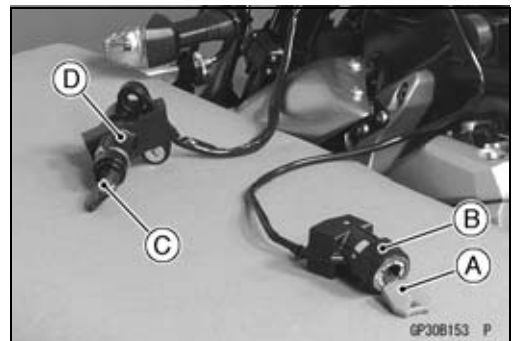
- Connect:
  - New Ignition Switch Lead Connector [A]
  - Immobilizer Antenna Lead Connector [B]

#### NOTE

○ Keep the antenna [C] more than 15 cm (5.9 in.) from the ignition switch [D].



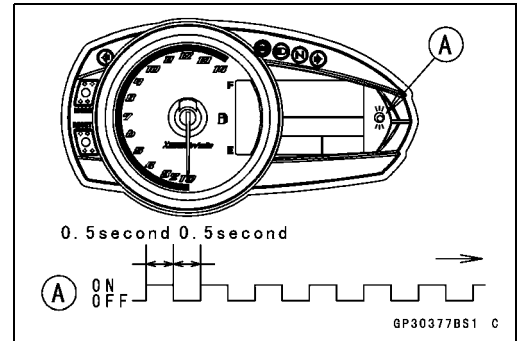
- Put the current master key [A] at the antenna [B].
- Insert the new user key 1 [C] to the new ignition switch [D] and turn it ON.



## Immobilizer System (Equipped Models)

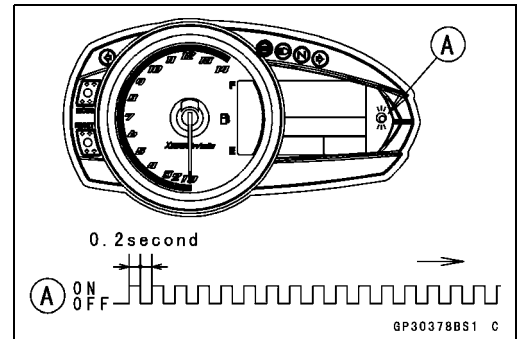
### Verified

- The warning indicator light (LED) [A] blinks to display the ECU is in the registration mode (go to the next step).

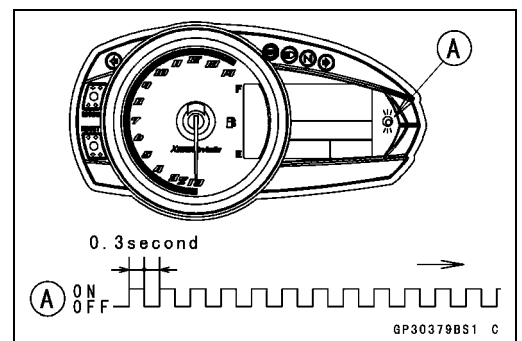


### Not Verified

- The warning indicator light (LED) [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



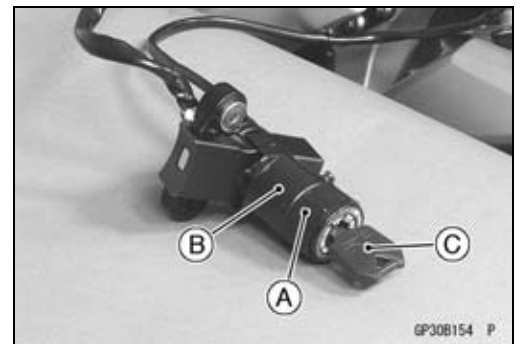
Master Key Collation Error



- Turn OFF and remove the new user key 1.
- Temporarily place the antenna [A] on the new ignition switch [B].
- Insert the user key 1 [C] again into the new ignition switch and turn it ON.

### NOTE

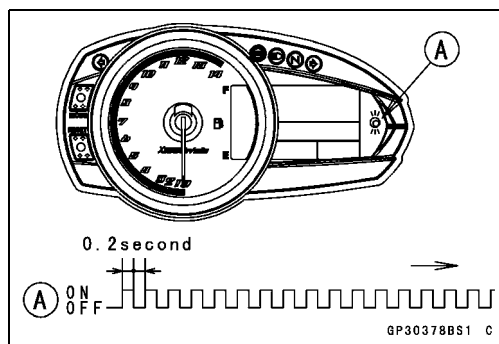
- Place the antenna on the ignition switch, insert the next key and turn ON within 15 seconds after previous key is turned OFF and removed otherwise registration mode will be ended and the warning indicator light (LED) stops flashing.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.
- Keep other user keys away from the immobilizer antenna.



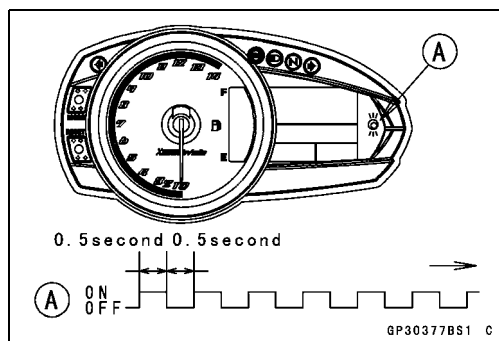
## 16-88 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

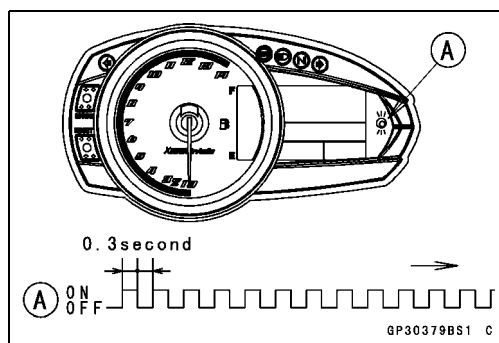
- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



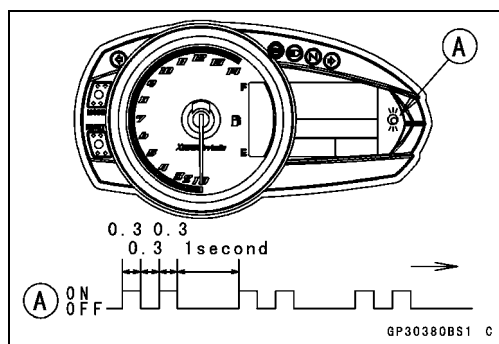
When Registered User Key is Inserted.



User Key Collation Error



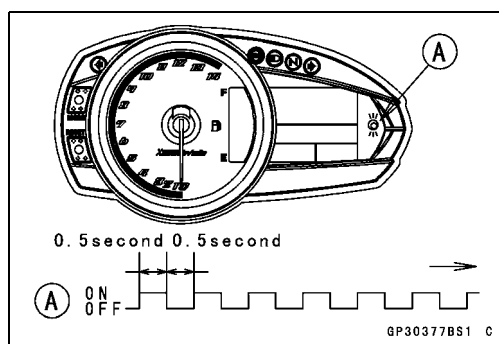
- The user key 1 is successfully registered in the ECU.
- The warning indicator light (LED) [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registering of user key 1.



- Turn OFF and remove user key 1.
- The warning indicator light (LED) [A] blinks to display the registration mode.

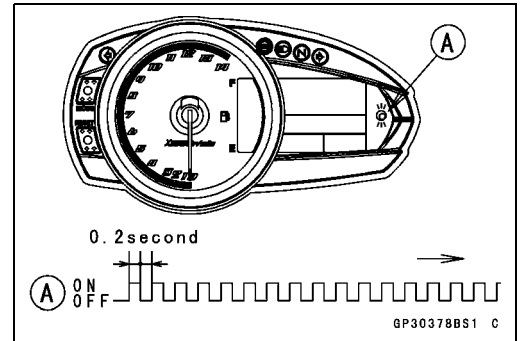
#### NOTE

- Turn OFF the ignition switch and wait for the period more than 15 seconds. The registration mode automatically ends and warning indicator light (LED) goes off.
  - This procedure has , registered the master key and one user key.
  - Continue the procedure to program the second and later keys.
- Insert the user key 2 to the ignition switch and turn it ON.

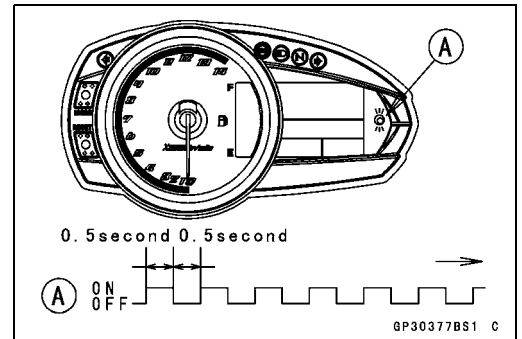


## Immobilizer System (Equipped Models)

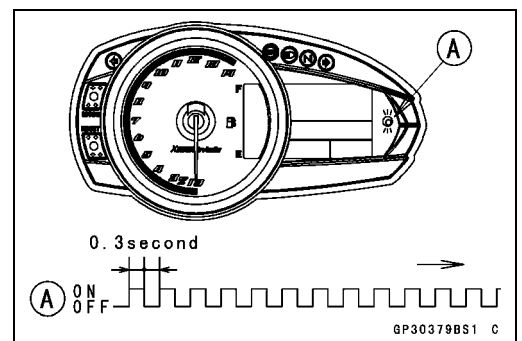
- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



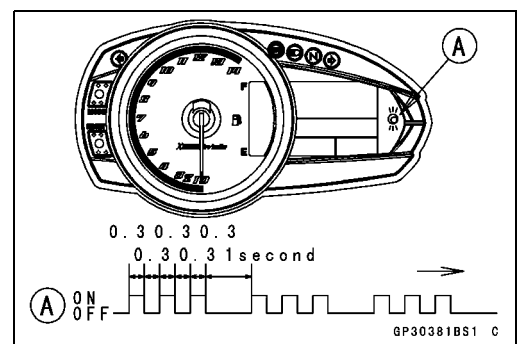
When Registered User Key is Inserted.



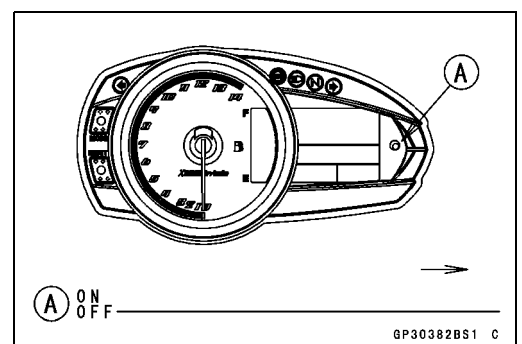
User Key Collation Error



- The user key 2 is successfully registered in the ECU.
- The warning indicator light (LED) [A] blinks 3 times and stops for 1 second and then repeat this cycle to indicate successful programming of user key 2.
- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- Warning indicator light (LED) [A] goes off.



## 16-90 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

- Remove the key registration unit and connect the immobilizer/Kawasaki diagnostic system connector.

#### NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

- Install the new ignition switch and antenna.

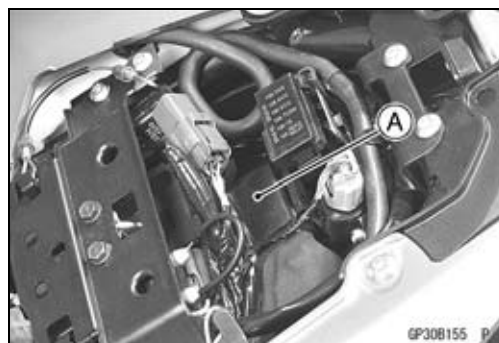
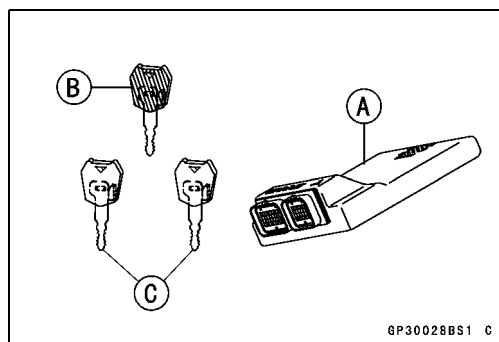
#### Case 3: When the electric control unit (ECU) is faulty and has to be replaced.

- Prepare a new ECU [A], current master key [B] and current user keys [C].

#### NOTE

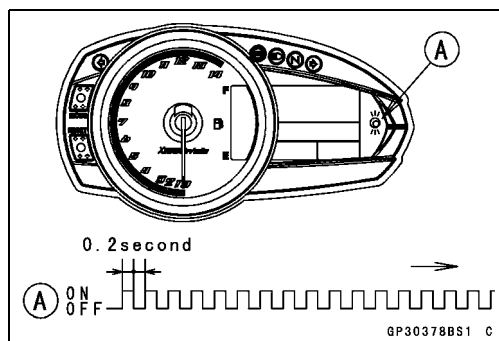
- The key registration unit is not required.

- Replace:  
ECU [A] (see Immobilizer System Parts Replacement)

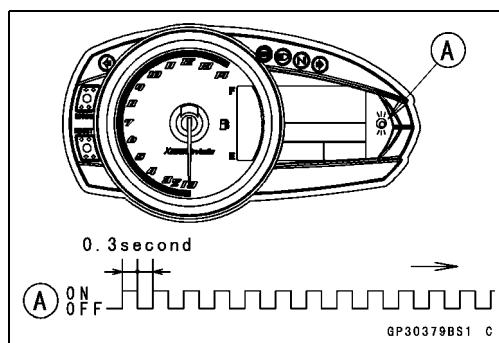


- Insert the current master key into the ignition switch and turn it ON.

- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



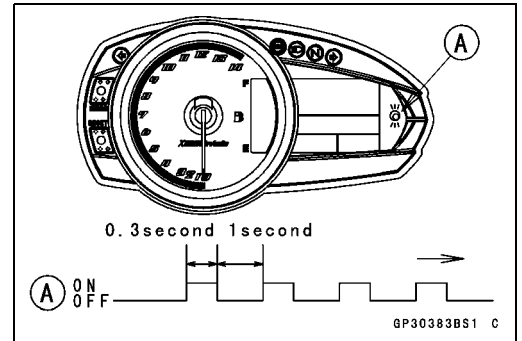
#### Master Key Collation Error





## Immobilizer System (Equipped Models)

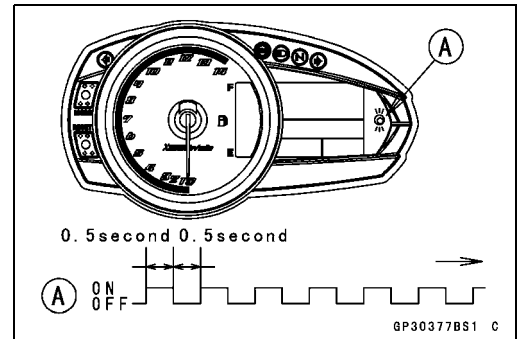
- The master key is registered in the ECU.
- The warning indicator light (LED) [A] blinks 1 time and stops for 1 second and repeats this cycle to indicate successful registration of the master key.



- Turn OFF the master key and remove it.
- The warning indicator light (LED) [A] blinks to display the registration mode.

### NOTE

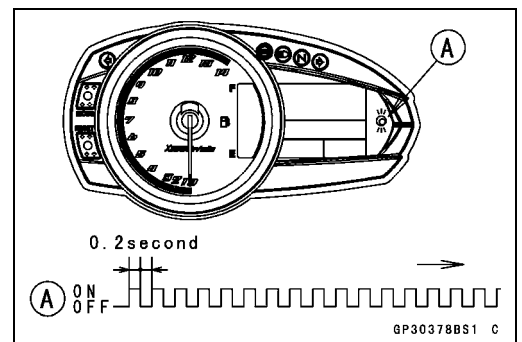
- Insert next key and turn ON within 15 seconds after previous key is turned OFF and removed otherwise registration mode will be ended and the warning indicator light (LED) goes off.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.



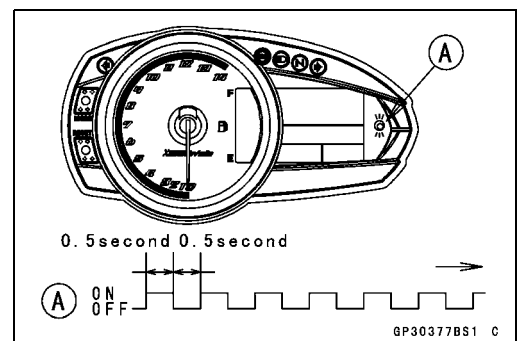
- Insert the user key 1 to the ignition switch and turn it ON.

### NOTE

- Keep the other user keys away from the immobilizer antenna.
- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error. Immobilizer Amplifier Failure



When Registered User Key is Inserted.

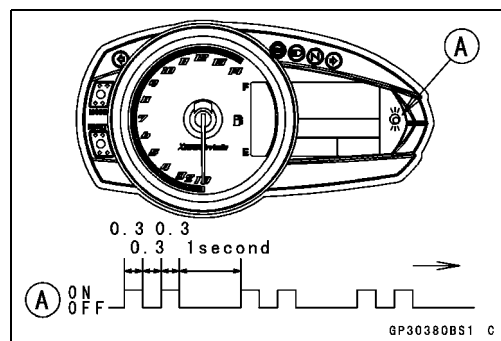
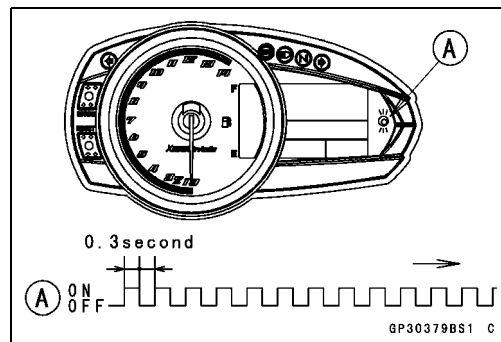


## 16-92 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

#### User Key Collation Error

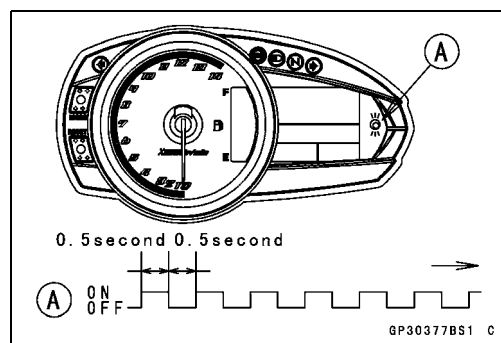
- The user key 1 is registered in the ECU.
- The warning indicator light (LED) [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key.



- Turn OFF and remove the user key 1.
- The warning indicator light (LED) [A] blinks to display the registration mode codes.

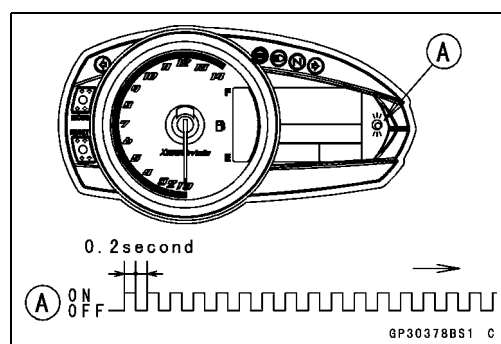
#### NOTE

- Insert next key and turn ON within 15 seconds after previous key is turned OFF and removed otherwise registration mode will be ended and the warning indicator light (LED) goes off.
  - To return to the registration mode start the master key verification procedure. This applies to all user key registration.
- Insert the user key 2 to the ignition switch and turn it ON.



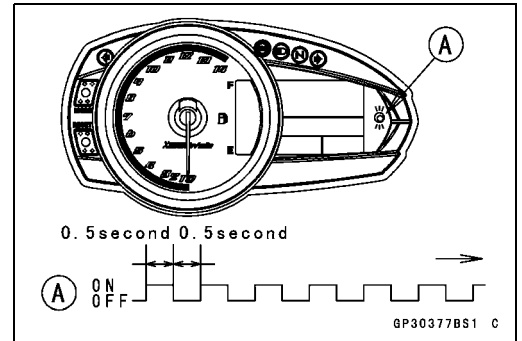
- If there is any problem in the registration, the warning indicator light (LED) [A] blinks to display the collation error code.

#### Immobilizer Amplifier Failure

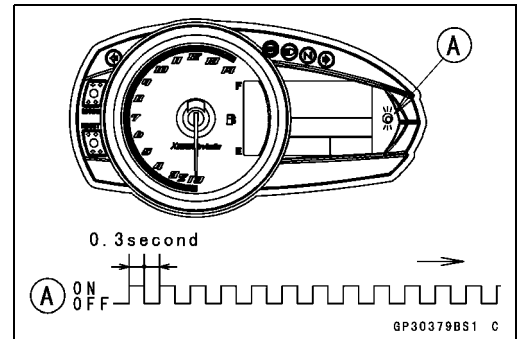


## Immobilizer System (Equipped Models)

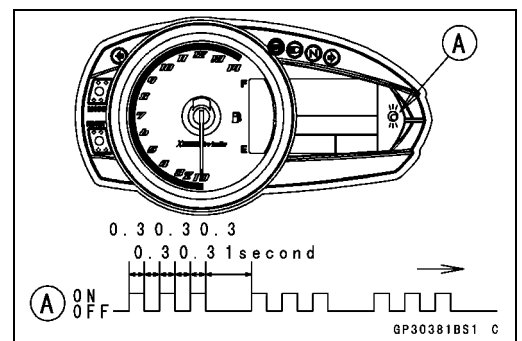
When Registered User Key is Inserted.



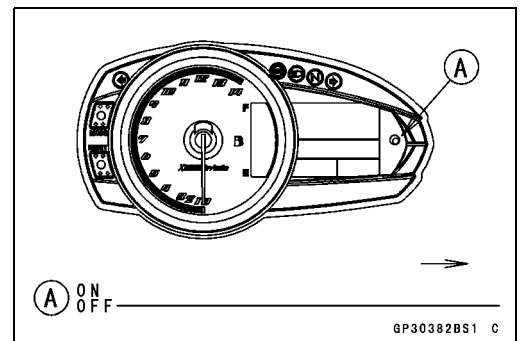
User Key Collation Error



- The user key 2 is registered in the ECU.
- The warning indicator light (LED) [A] blinks 3 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key 2.
- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- Warning indicator light (LED) [A] goes off.



### NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

### Case 4: When master key is faulty or lost.

The master key replacement is considered very rare case. However if it is required, the following is necessary.

### NOTE

- The ECU must be replaced with a new one because the master key code that is registered in the current ECU can not be rewritten.

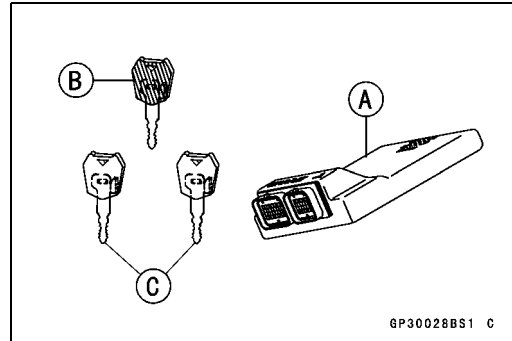
## 16-94 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

- Prepare a new ECU [A], new master key [B] and current user keys [C].

#### NOTE

- The key registration unit is not required.
- The key registration process is same as the ECU replacement.



#### Case 5: When replacing the antenna.

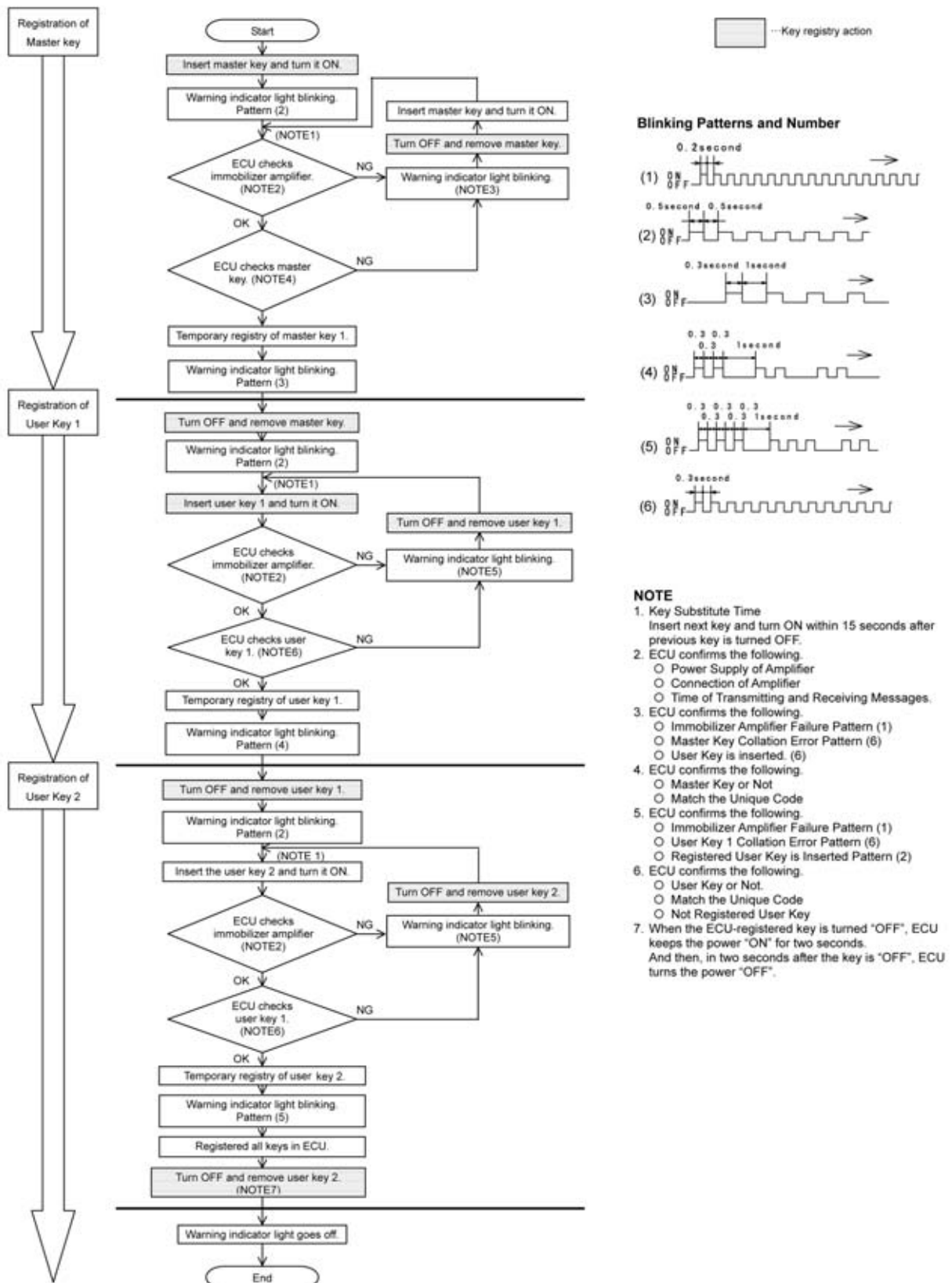
- Prepare a new antenna.
- Refer to the Immobilizer System Parts Replacement.

#### NOTE

- No key registration is required.

## Immobilizer System (Equipped Models)

## All Keys Initial Registration Flow Chart



## 16-96 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

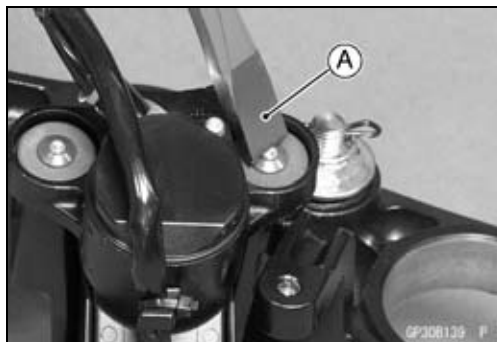
#### Immobilizer System Parts Replacement

##### Immobilizer Antenna Replacement

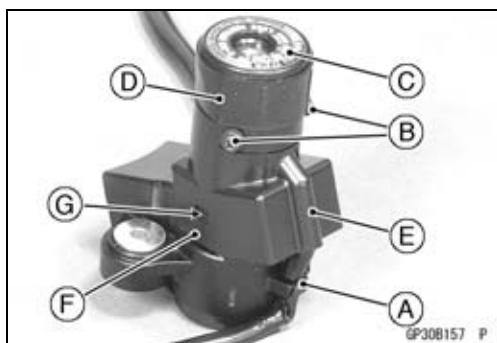
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Disconnect the lead connectors [A].



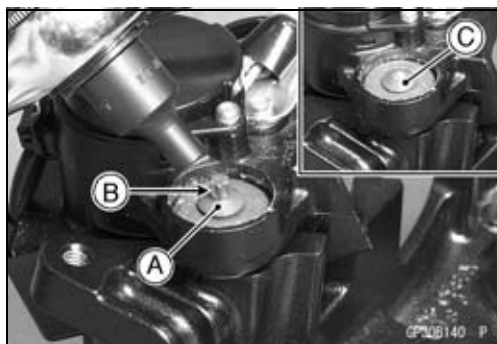
- Remove:
  - Handlebar (see Handlebar Removal in the Steering chapter)
  - Steering Stem Head (see Stem, Stem Bearing Removal in the Steering chapter)
- Using a small chisel [A] or punch, turn out the Torx bolts.



- Cut the band [A].
  - Remove the screws [B].
  - Remove the antenna [C] with the rubber cover [D] and cover [E].
- Pull the lower parts [F] of the cover outside to clear the projections [G] of the ignition switch.

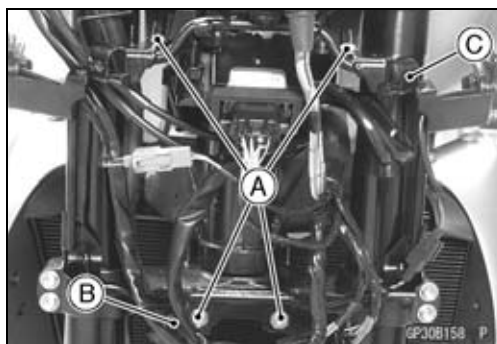


- Tighten a new Torx bolt [A] until the bolt head [B] is broken [C].
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



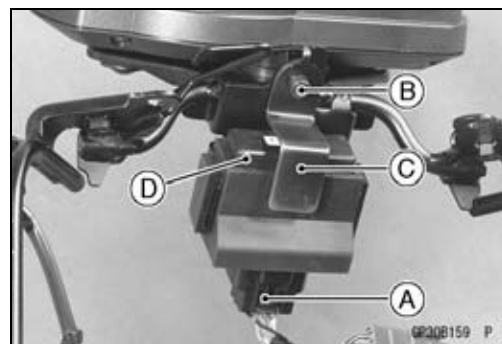
##### Immobilizer Amplifier Replacement

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Bolts [A] and Brake Hose Bracket [B]
  - Bracket [C]

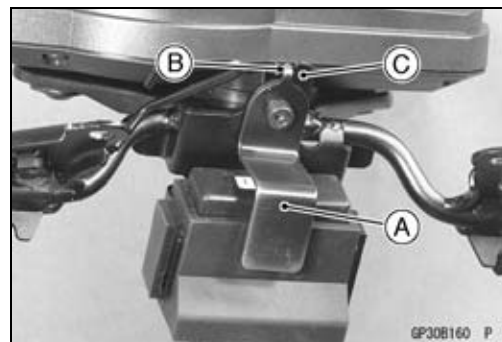


## Immobilizer System (Equipped Models)

- Remove:  
Connector [A] (Disconnect)  
Bolt [B] and Holder [C]  
Immobilizer Amplifier [D]



- When the holder [A] is installing, contact the projection [B] to bracket [C].

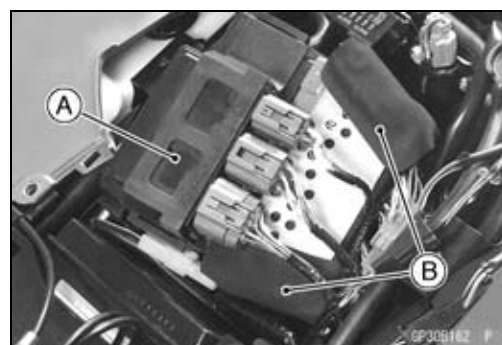
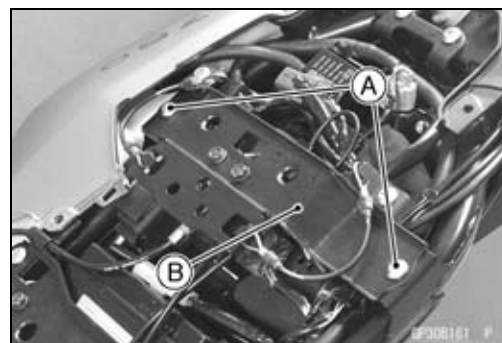


## ECU (Electronic Control Unit) Replacement (for Immobilizer Models)

### CAUTION

**Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.**

- Remove:  
Rear Seat (see Rear Seat Removal in the Frame chapter)  
Left Seat Cover (see Seat Cover Removal in the Frame chapter)  
Bolts [A] and Rear Seat Bracket [B]
- Remove:  
Relay Box [A]  
Pads [B]



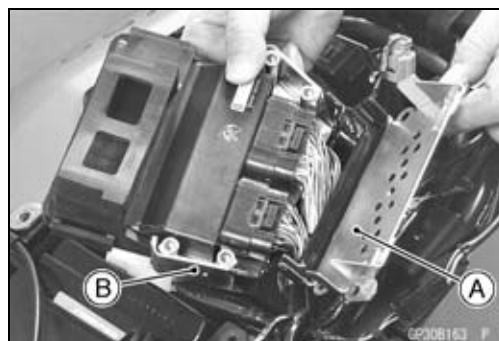
## 16-98 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

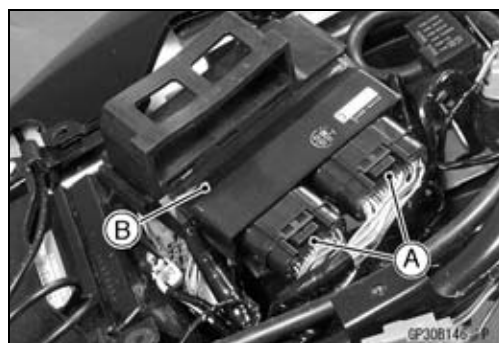
- Using a small chisel [A] or other suitable tool, remove the screws.



- Remove the upper guard [A] and lower guard [B].



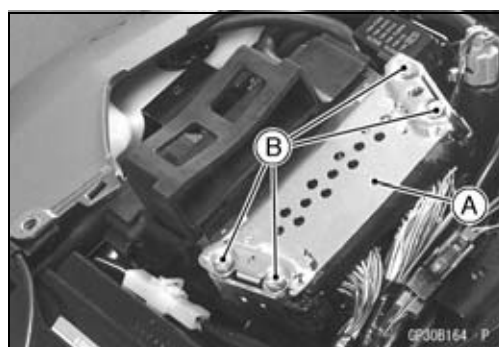
- Disconnect the connectors [A].
- Remove the ECU [B].



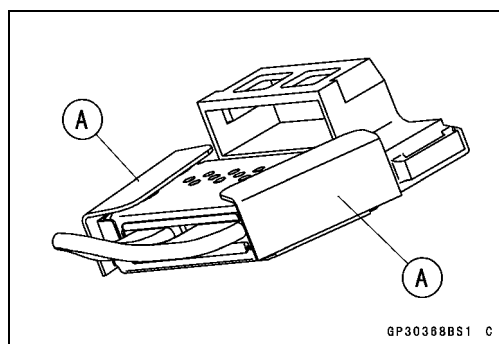
- Connect the connectors to the ECU.
- Install the lower and upper [A] guard to the ECU.

<b>CAUTION</b>
<b>Do not pinch the leads.</b>

- Tighten the new screws [B] using the Kawasaki genuine screws of which threads are coated with locking agent.



- Install the pads [A] over the guard as shown in the figure.





## Immobilizer System (Equipped Models)

### Immobilizer Relational Parts Replacement Chart

		Failed or Lost Part					
		Master Key (Red)	User Key (Black)	Ignition Switch	Antenna	Amplifier	ECU
*	Master Key (Red)	●					
	User Key (Black)		●	○			
	Ignition Switch			●			
	Antenna				●		
	Amplifier					●	
	ECU	○					●
*		Replacement Part					
●		Main Replacement Part					
○		Additional Replacement Part					

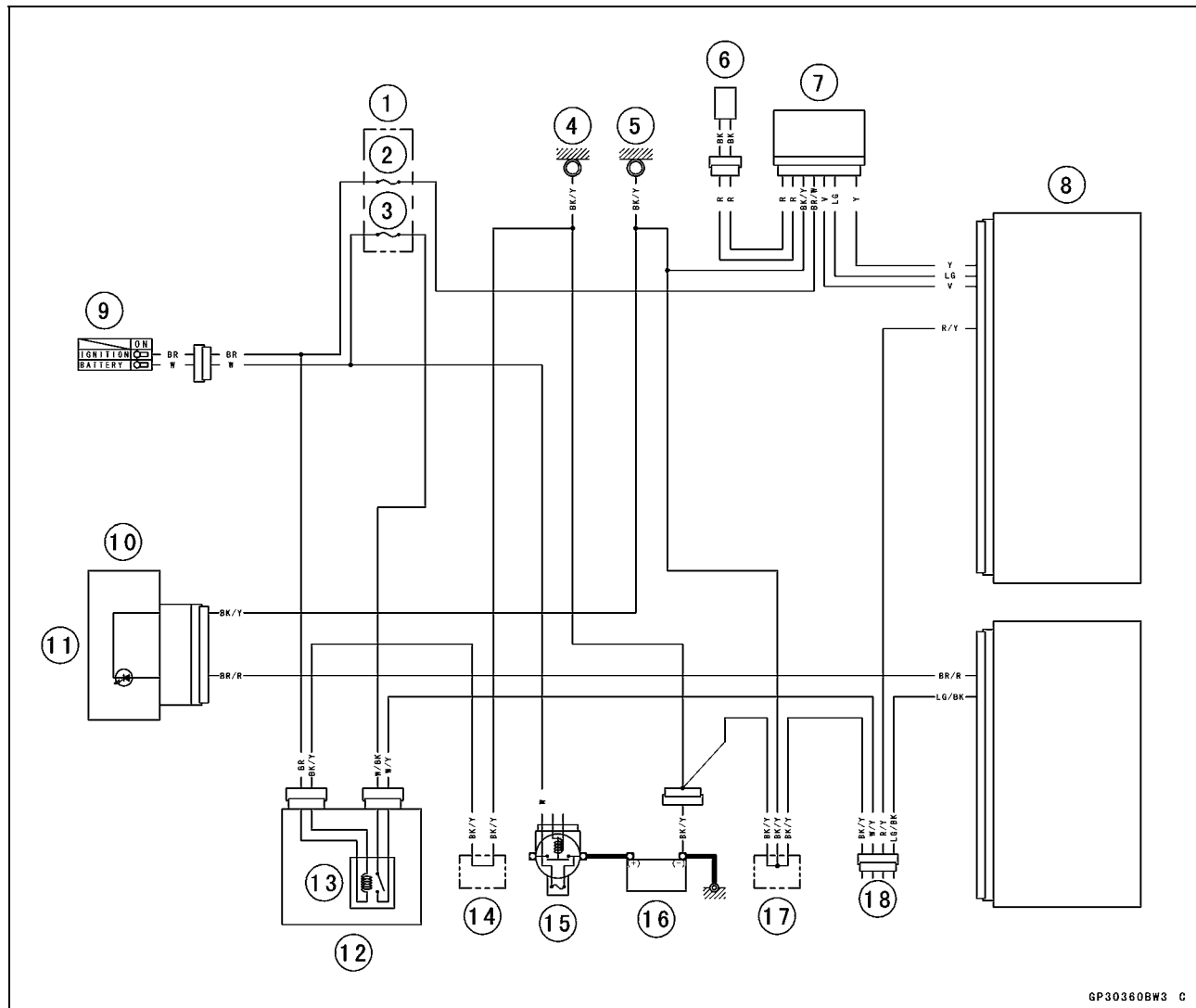
### Immobilizer System Inspection

- Refer to the Immobilizer Amplifier and Blank Key Detection section in the Fuel System (DFI) chapter.

## 16-100 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

#### Immobilizer System Circuit



1. Fuse Box 2
2. Ignition Fuse 10 A
3. ECU Fuse 10 A
4. Frame Ground
5. Meter Ground
6. Immobilizer Antenna
7. Immobilizer Amplifier
8. ECU
9. Ignition Switch
10. Meter Unit
11. Oil Pressure/FI/Immobilizer Warning Indicator Light (LED)
12. Relay Box
13. ECU Main Relay
14. Water-proof Joint B
15. Main Fuse 30 A
16. Battery 12 V 8 Ah
17. Water-proof Joint C
18. Kawasaki Diagnostic System Connector

## Switches and Sensors

### Brake Light Timing Inspection

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

### Brake Light Timing Adjustment

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

### Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).
- For the switch housings and the ignition switch, refer to the tables in the Wiring Diagram.
- ★ If the switch has an open or short, repair it or replace it with a new one.

**Special Tool - Hand Tester: 57001-1394**

### Rear Brake Light Switch Connections

Rear Brake Light Switch Connections		
Color	BR	BL
When brake pedal is pushed down	○ —	— ○
When brake pedal is released		

### Sidestand Switch Connections

Sidestand Switch Connections		
Color	BK	G
When sidestand is down		
When sidestand is up	○ —	— ○

### Neutral Switch Connections

Neutral Switch Connections		
Color	SW. Terminal	Ground
When transmission is in neutral	○ —	— ○
When transmission is not in neutral		

### Oil Pressure Switch Connections\*

Oil Pressure Switch Connections *		
Color	SW. Terminal	Ground
When engine is stopped	○ —	— ○
When engine is running		

\*: Engine lubrication system is in good condition.

## 16-102 ELECTRICAL SYSTEM

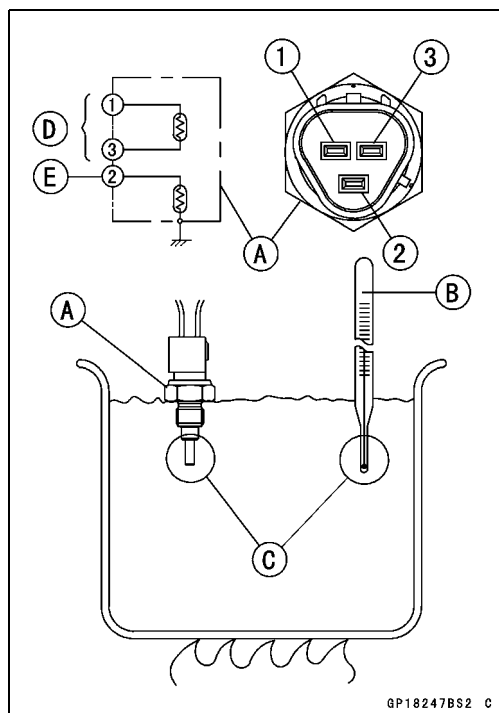
### Switches and Sensors

#### Water Temperature Sensor Inspection

- Remove the water temperature sensor (see Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter).
- Suspend the sensor [A] in a container of coolant so that the threaded portion is submerged.
- Suspend an accurate thermometer [B] with temperature sensing portions [C] located in almost the same depth.

#### NOTE

- The sensor and thermometer must not touch the container side or bottom.
- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.
- The sensor sends electric signals to the ECU and coolant temperature gauge in the meter unit.
- Measure the resistance across the terminals and the body (for the gauge) at the temperatures shown in the table.
- ★ If the hand tester does not show the specified values, replace the sensor.



#### Water Temperature Sensor

Resistance for ECU [D]	
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

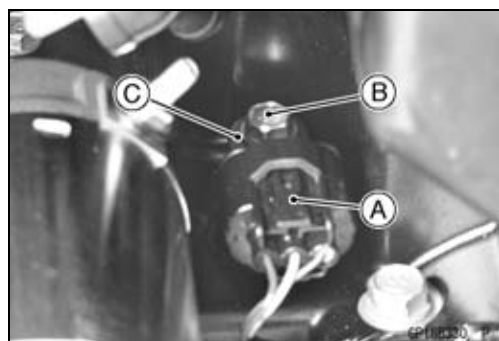
Resistance for Water Temperature Gauge [E]	
Temperature	Resistance (Ω) (Terminal [2]-Body)
50°C (122°F)	210 ±40
120°C (248°F)	21.2 ±1.5

#### Speed Sensor Removal

#### CAUTION

**Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.**

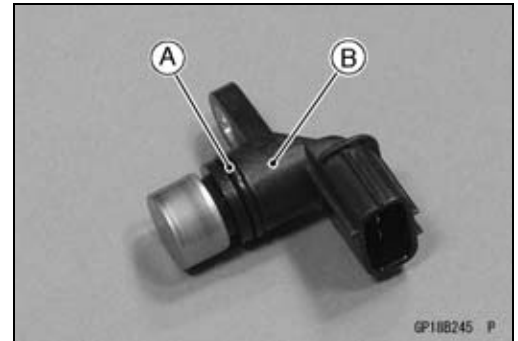
- Remove:
  - Water Pipe (see Alternator Cover Removal)
  - Water Hose (see Starter Motor Removal)
  - Connector [A]
  - Speed Sensor Bolt [B]
  - Speed Sensor [C]



## Switches and Sensors

### Speed Sensor Installation

- Apply grease to the O-ring [A] on the speed sensor [B].
- Tighten:  
Torque - Speed Sensor Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)
- Install the removed parts (see appropriate chapters).



### Speed Sensor Inspection

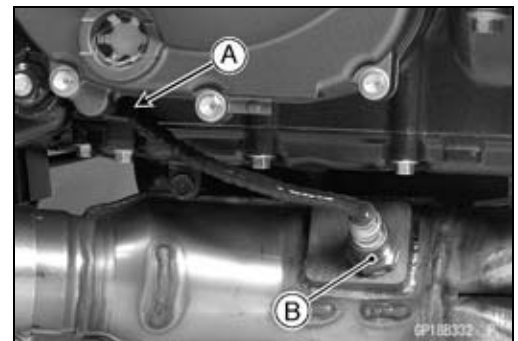
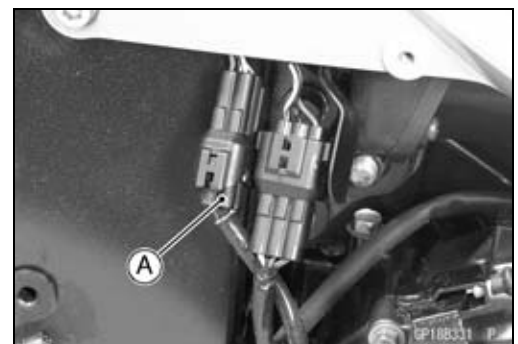
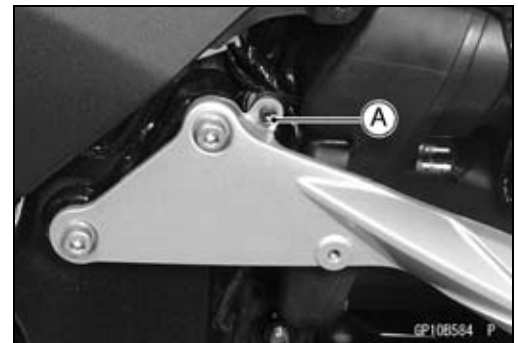
- Refer to the Speed Sensor section in the Fuel System (DFI) chapter (see Speed Sensor section in the Fuel System (DFI) chapter).

### Oxygen Sensor Removal (Equipped Models)

#### CAUTION

**Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.**

- Remove:  
Right Frame Cover (see Frame Cover Removal in the Frame chapter)  
Bolt [A] and Connector Bracket
- Disconnect the oxygen sensor lead connector [A].
- Free the lead from the clamp [A].
- Remove the oxygen sensor [B].



## 16-104 ELECTRICAL SYSTEM

### Switches and Sensors

#### Oxygen Sensor Installation (Equipped Models)

##### CAUTION

Never drop the oxygen sensor [A], especially on a hard surface. Such a shock to the unit can damage it. Do not touch the sensing part [B] and filter holes [C] of the sensor to prevent oil contact. Oil contamination from hands can reduce sensor performance.

- Tighten:  
Torque - Oxygen Sensor: 44.1 N·m (4.50 kgf·m, 32.5 ft·lb)
- Run the oxygen sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

#### Oxygen Sensor Inspection (Equipped Models)

- Refer to the Oxygen Sensor Inspection in the Fuel System (DFI) chapter.

#### Fuel Level Sensor Inspection

- Remove:  
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)  
Clamps [A] (Open)  
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]

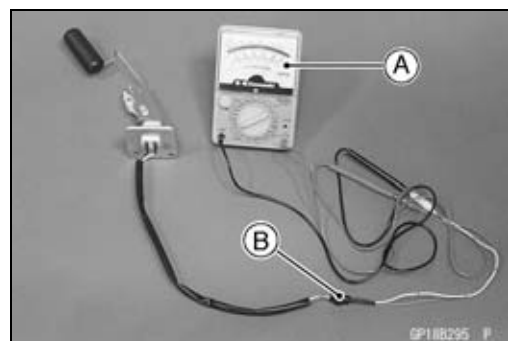
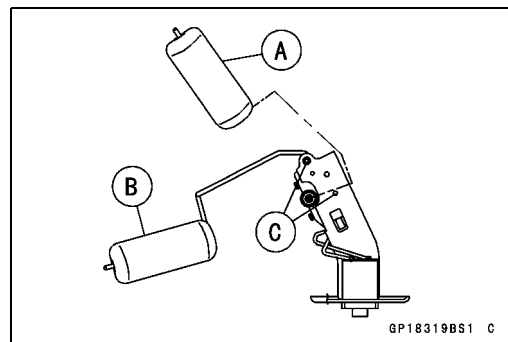
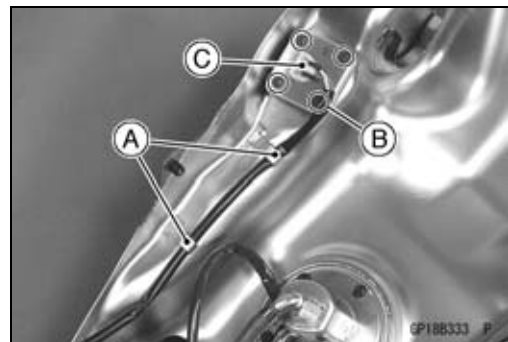
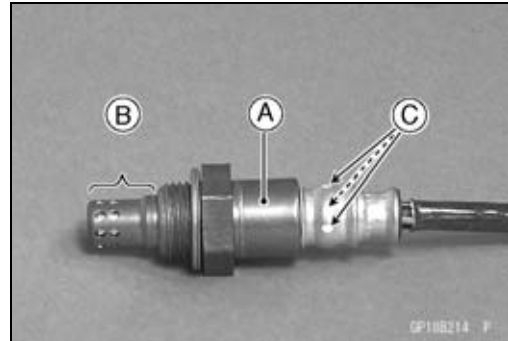
- Using the hand tester [A], measure the resistance across the terminals in the fuel level sensor lead connector [B].

**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: 6 ~ 10  $\Omega$   
Empty position: 90 ~ 100  $\Omega$



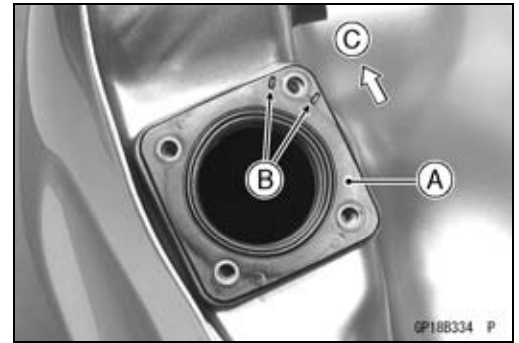
---

**Switches and Sensors**

---

- Install a new gasket [A] on the fuel level sensor as shown in the figure.  
Hollows [B]  
Front [C]
- Apply a non-permanent locking agent to the threads of the fuel level sensor bolts and tighten them.

**Torque - Fuel Level Sensor Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**



## 16-106 ELECTRICAL SYSTEM

### Relay Box

The relay box [A] has relays and diodes. The relays and diodes can not be removed.

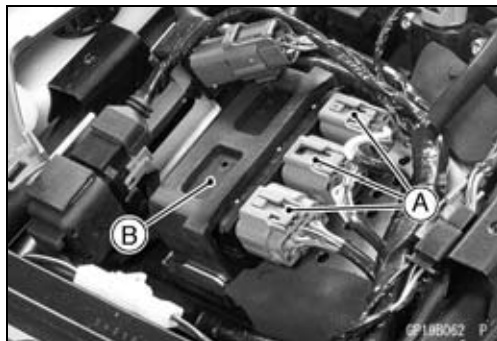
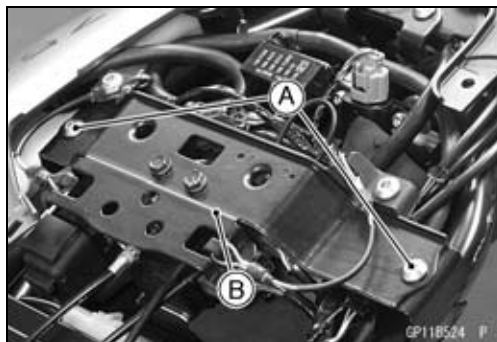


### Relay Box Removal

#### CAUTION

**Never drop the relay box, especially on a hard surface.  
Such a shock to the relay box can damage it.**

- Remove:  
Left Seat Cover (see Seat Cover Removal in the Frame chapter)  
Rear Seat Bracket Bolts [A]  
Rear Seat Bracket [B]
- Remove:  
Connectors [A] (Disconnect)  
Relay Box [B]



### Relay Circuit Inspection

- Remove the relay box (see Relay Box Removal).
  - Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the relay box as shown (see Relay Box Internal Circuit in this section).
- ★ If the tester does not read as specified, replace the relay box.

#### Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading ( $\Omega$ )
Headlight Relay	1-3	$\infty$
ECU Main Relay	7-6	$\infty$
	4-5	Not $\infty^*$
Fuel Pump Relay	7-8	$\infty$
	9-10	Not $\infty^*$
Starter Circuit Relay	11-16	$\infty$
	11-12	$\infty$
Fan Relay	17-20	$\infty$
	18-19	Not $\infty^*$

\*: The actual reading varies with the hand tester used.



## Relay Box

### Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (-)	Tester Connection	Tester Reading ( $\Omega$ )
ECU Main Relay	2-11	1-3	0
	4-5	7-6	0
Fuel Pump Relay	9-10	7-8	0
Fan Relay	18-19	17-20	0

	Battery Connection (+) (-)	Tester Connection DC 25 V Range (+) (-)	Tester Reading (V)
Starter Circuit Relay	16-12	11-12	Battery Voltage

(+): Apply positive lead.

(-): Apply negative lead.

### Diode Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit in this section).

### Diode Circuit Inspection

Tester Connection	1-11, 2-11, 12-13, 12-15, 12-16, 13-14, 13-15
-------------------	---

- ★ The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

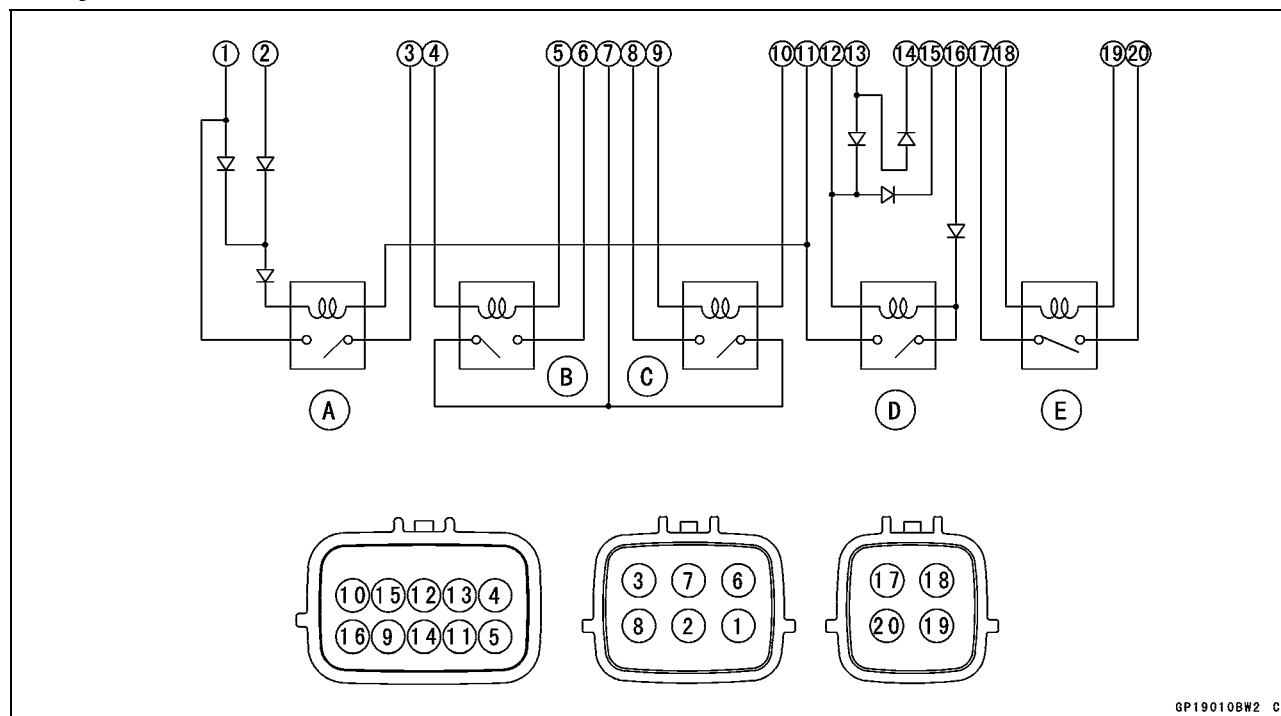
### NOTE

- *The actual meter reading varies with the meter or tester used and the individual diodes, but generally speaking, the lower reading should be from zero to one half the scale.*

## 16-108 ELECTRICAL SYSTEM

### Relay Box

#### Relay Box Internal Circuit

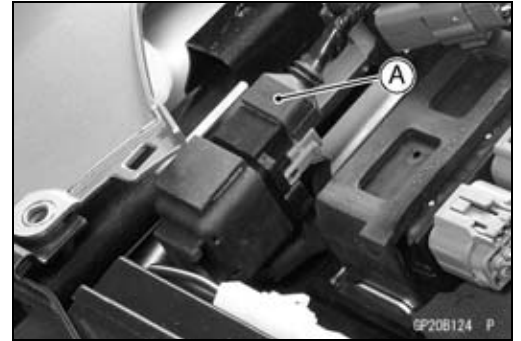


- A: Headlight Relay
- B: ECU Main Relay
- C: Fuel Pump Relay
- D: Starter Circuit Relay
- E: Fan Relay

## Fuse

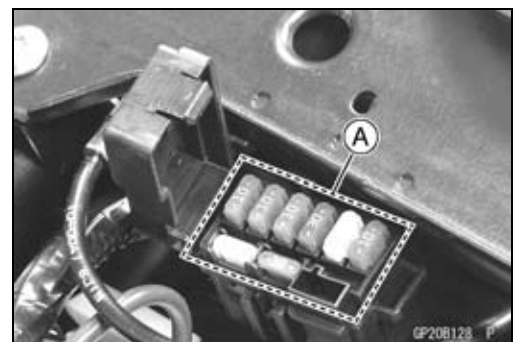
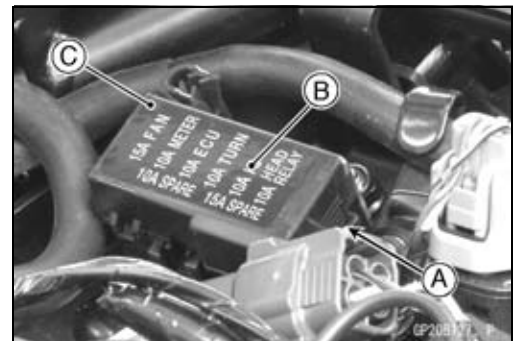
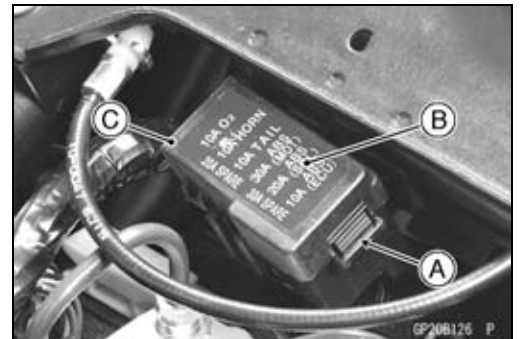
### 30 A Main Fuse Removal

- Remove:
  - Rear Seat Bracket (see Relay Box Removal)
  - 30 A Main Fuse Connector [A] (Disconnect)
- Pull out the main fuse [A] from the starter relay with a needle nose pliers.



### Fuse Box Fuse Removal

- Remove the seats (see Rear/Front Seat Removal in the Frame chapter).
- Unlock the hook [A] to lift up the lid [B].
  - Fuse Box 1 [C] (Front Side)
- Unlock the hook [A] to lift up the lid [B].
  - Fuse Box 2 [C] (Rear Side)
- Pull the fuses [A] straight out of the fuse box with needle nose pliers.

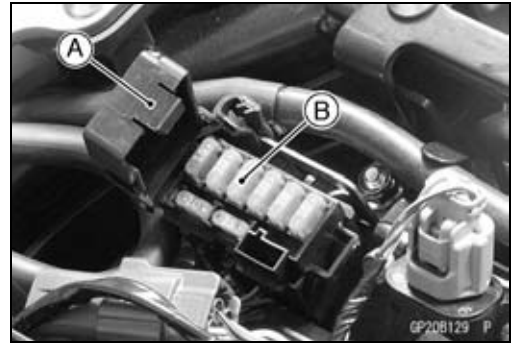


## 16-110 ELECTRICAL SYSTEM

### Fuse

#### 10 A ECU Fuse Removal

- Remove the rear seat (see Rear Seat Removal in the Frame chapter)
- Unlock the hook to lift up the lid [A].
- Pull out the ECU fuse [B] from the fuse box 2.



#### Fuse Installation

- If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.
- Install the fuse box fuses on the original position as specified on the lid.

#### Fuse Inspection

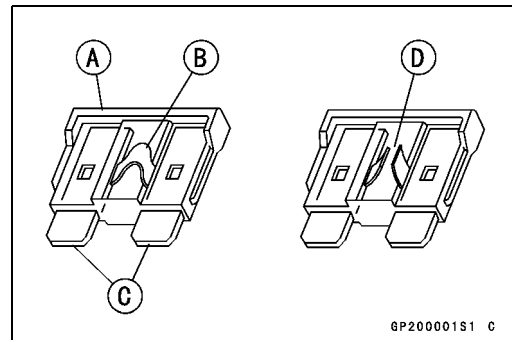
- Remove the fuse (see 30 A Main/Fuse Box/10 A ECU Fuse Removal).
- Inspect the fuse element.
- ★ If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

Housing [A]

Fuse Element [B]

Terminals [C]

Blown Element [D]



GP200001S1 C

#### CAUTION

**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**

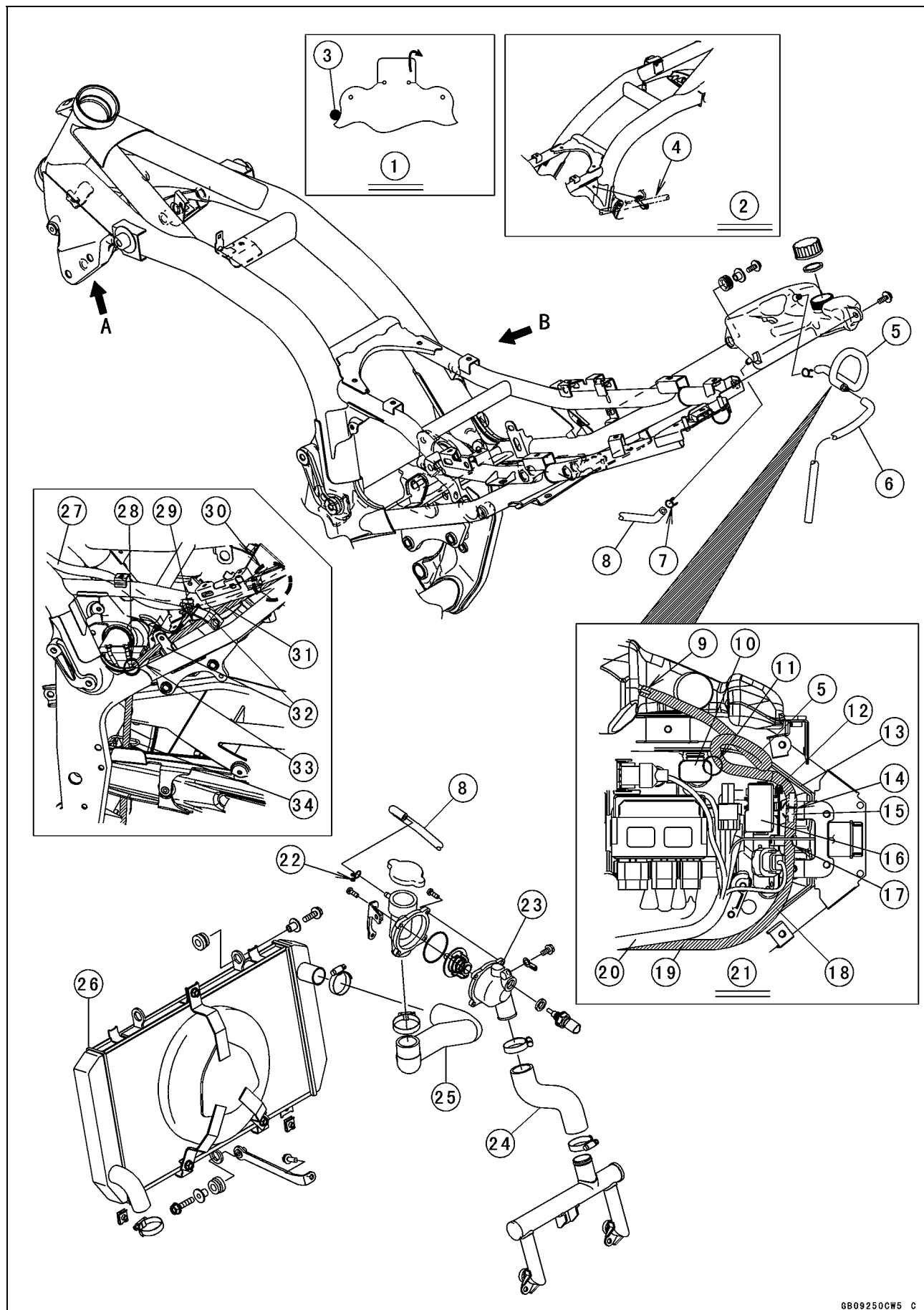
# Appendix

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Troubleshooting Guide .....	17-60

## 17-2 APPENDIX

### Cable, Wire, and Hose Routing



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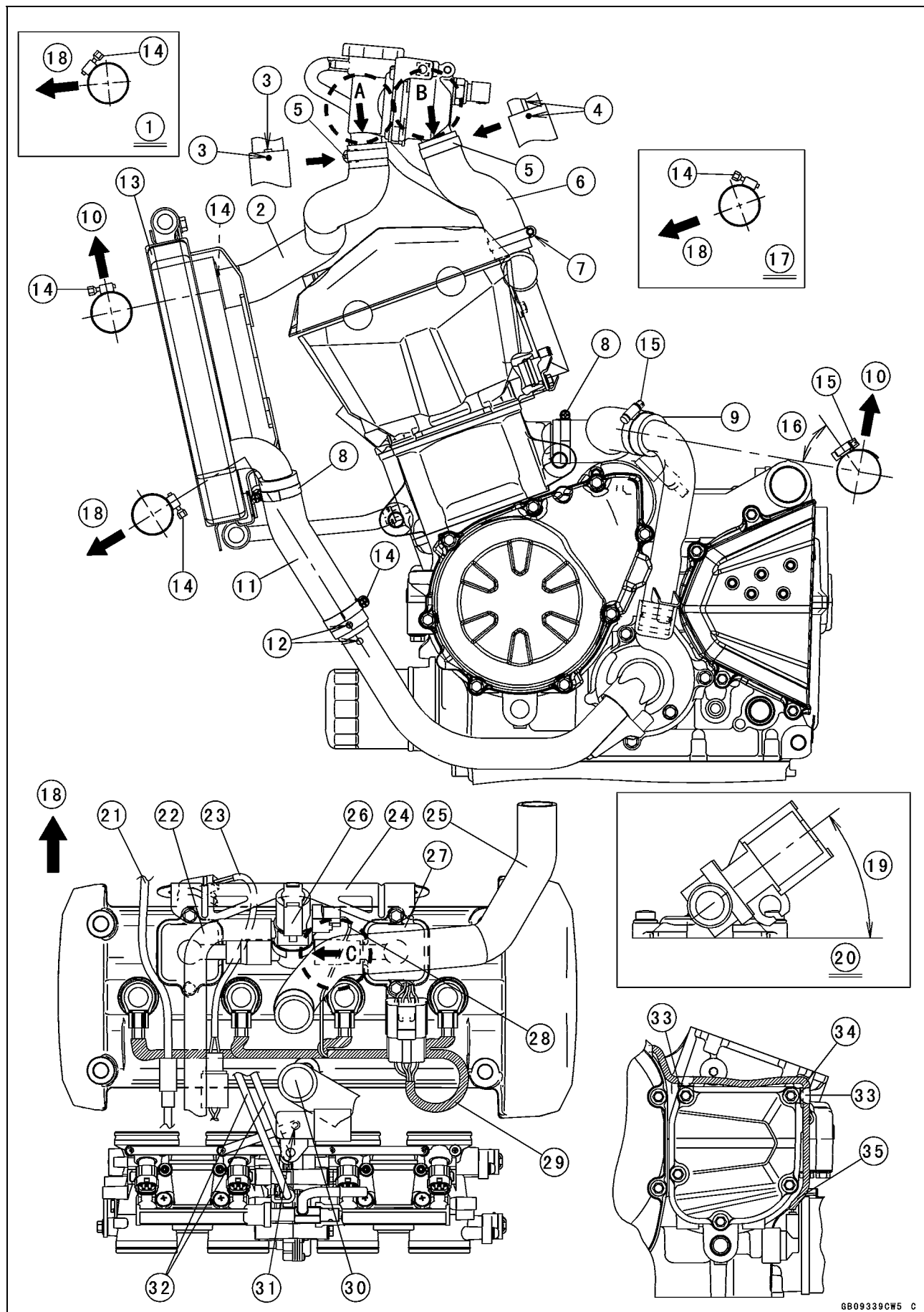
**Cable, Wire, and Hose Routing**

---

1. Viewed A
2. Viewed B
3. After installing the heat insulation rubber plate, run the radiator fan motor lead under the rivet of the left side.
4. Run the reserve tank hose and main harness into the clamp.
5. Reserve Tank Overflow Hose (From Reserve Tank to Fitting)
6. Reserve Tank Overflow Hose (From Fitting)
7. Install the clamp so that knob of the clamp faces outside of the frame as shown in the figure.
8. Reserve Tank Hose
9. Install the reserve tank overflow hose (from reserve tank to fitting) so that white paint of the hose faces the upward.
10. Turn Signal Relay
11. Run the reserve tank overflow hose (from reserve tank to fitting) so as not to touch the turn signal relay as shown in the figure.
12. Trim (Install the trim to the fuse box bracket.)
13. Rear Fender
14. Reserve Tank Overflow Hose (From Fitting) (After installing the reserve tank overflow hose (from reserve tank to fitting), and insert the reserve tank overflow hose (from fitting) between the rear fender and trim.)
15. Install the fitting at this position as shown in the figure.
16. Fuse Box 2
17. Hold the reserve tank overflow hose (from fitting) as shown in the figure.
18. Do not slacken the reserve tank overflow hose (from fitting).
19. Reserve Tank Overflow Hose (From Fitting)
20. Main Harness
21. Viewed Upper Side
22. Install the clamp so that knob of the clamp faces left side of the frame as shown in the figure.
23. Thermostat Housing
24. Water Hose
25. Radiator Hose
26. Radiator
27. Main Harness
28. Run the reserve tank overflow hose (from fitting) outside the exhaust butterfly valve cable.
29. Run the reserve tank overflow hose (from fitting) outside the rear fender.
30. Run the reserve tank overflow hose (from fitting) under the main harness as shown in the figure.
31. Reserve Tank Overflow Hose (From Fitting)
32. Run the reserve tank overflow hose (from fitting) behind the frame bracket.
33. Run the reserve tank overflow hose (from fitting) to the front of the frame cross pipe as shown in the figure.
34. Clamp (Run the reserve tank overflow hose (from fitting) into the clamp.)

## 17-4 APPENDIX

### Cable, Wire, and Hose Routing





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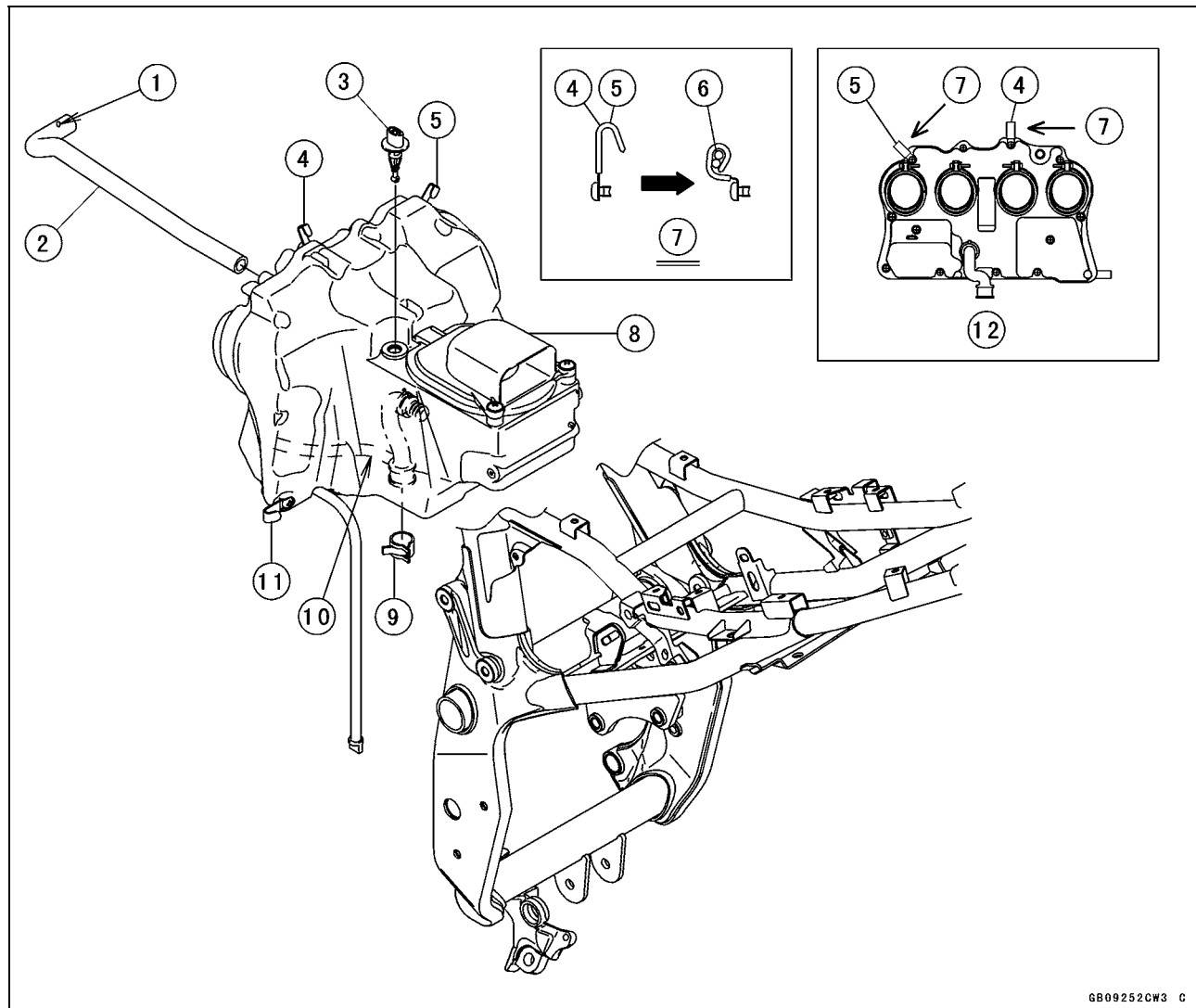
**Cable, Wire, and Hose Routing**

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1. Viewed A
2. Radiator Hose (From Thermostat Housing to Radiator)
3. Align the white paint of the radiator hose (from thermostat housing to radiator) with projection of the thermostat housing.
4. Align the white paint of the water hose (from cylinder head to thermostat housing) with rib of the thermostat housing.
5. Clamp
6. Water Hose (From Cylinder Head to Thermostat Housing)
7. Clamp (Install the clamp so that the bolt head faces right side as shown in the figure.)
8. Clamps
9. Water Hose (From Water Pump to Cylinder)
10. Upper Side
11. Radiator Hose (From Radiator to Water Pump)
12. Align the white paint of the radiator hose (from radiator to water pump) with projection of the water pipe.
13. Radiator
14. Install the clamp as shown in the figure.
15. Install the clamp within the angle as shown in the figure.
16. 30 ~ 45°
17. Viewed B
18. Front
19. 30 ~ 40°
20. Viewed C
21. Radiator Fan Motor Lead
22. Air Switching Valve Hose (From Air Switching Valve to Air Cleaner Housing)
23. Camshaft Position Sensor Lead (Run the camshaft position sensor lead under the bracket.)
24. Bracket (Install the heat insulation rubber plate from the front side with the rivets.
25. Radiator Hose (From Thermostat Housing to Radiator)
26. Air Switching Valve
27. Right Air Suction Valve Cover
28. Run the air switching valve lead over the air switching valve hose (from air switching valve to right air suction valve cover).
29. Stick Coil Harness
30. Water Hose (From Cylinder Head to Thermostat Housing)
31. Vacuum Hose
32. Throttle Cables
33. Clamps
34. Oil Pressure Switch/Crankshaft Sensor Lead
35. Install the rubber boot and confirm the tube is contact to the rubber boot.

## 17-6 APPENDIX

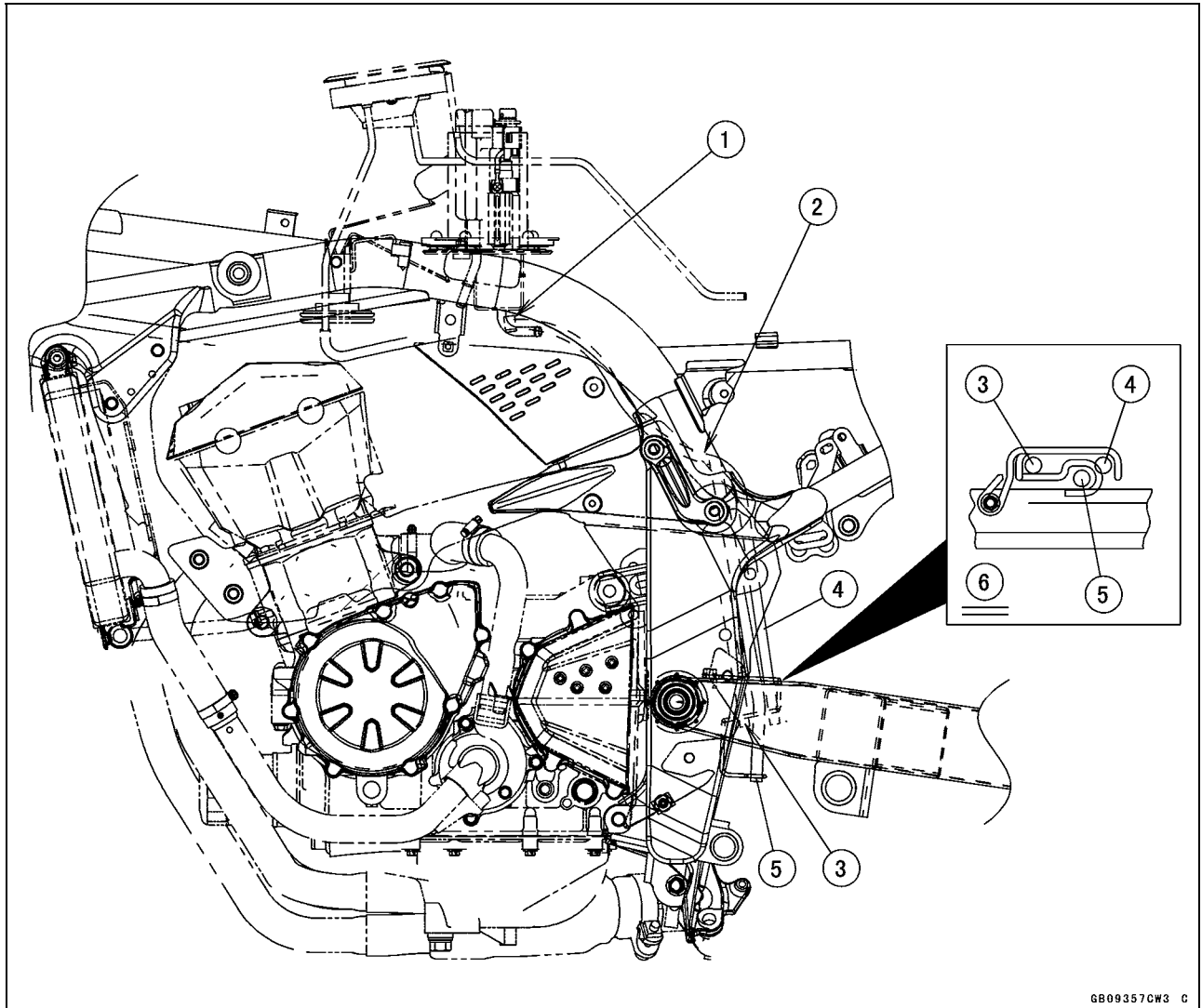
### Cable, Wire, and Hose Routing



GB09252CW3 C

1. White Paint
2. Air Switching Valve Hose (From Air Switching Valve to Air Cleaner Housing)
3. Inlet Air Temperature Sensor
4. Clamp
5. Clamp
6. Main Harness (Main Throttle and Subthrottle Sensor Leads)
7. Viewed A (Bend the clamp as shown in the figure. Do not touch the main harness (main throttle and subthrottle sensor leads) to the corner of the clamp.)
8. Air Cleaner Housing
9. Install the clamp as shown in the figure.
10. Run the starter motor cable to the right side of the breather hose.
11. Hold the neutral switch, sidestand switch and alternator leads.
12. Viewed Front Side

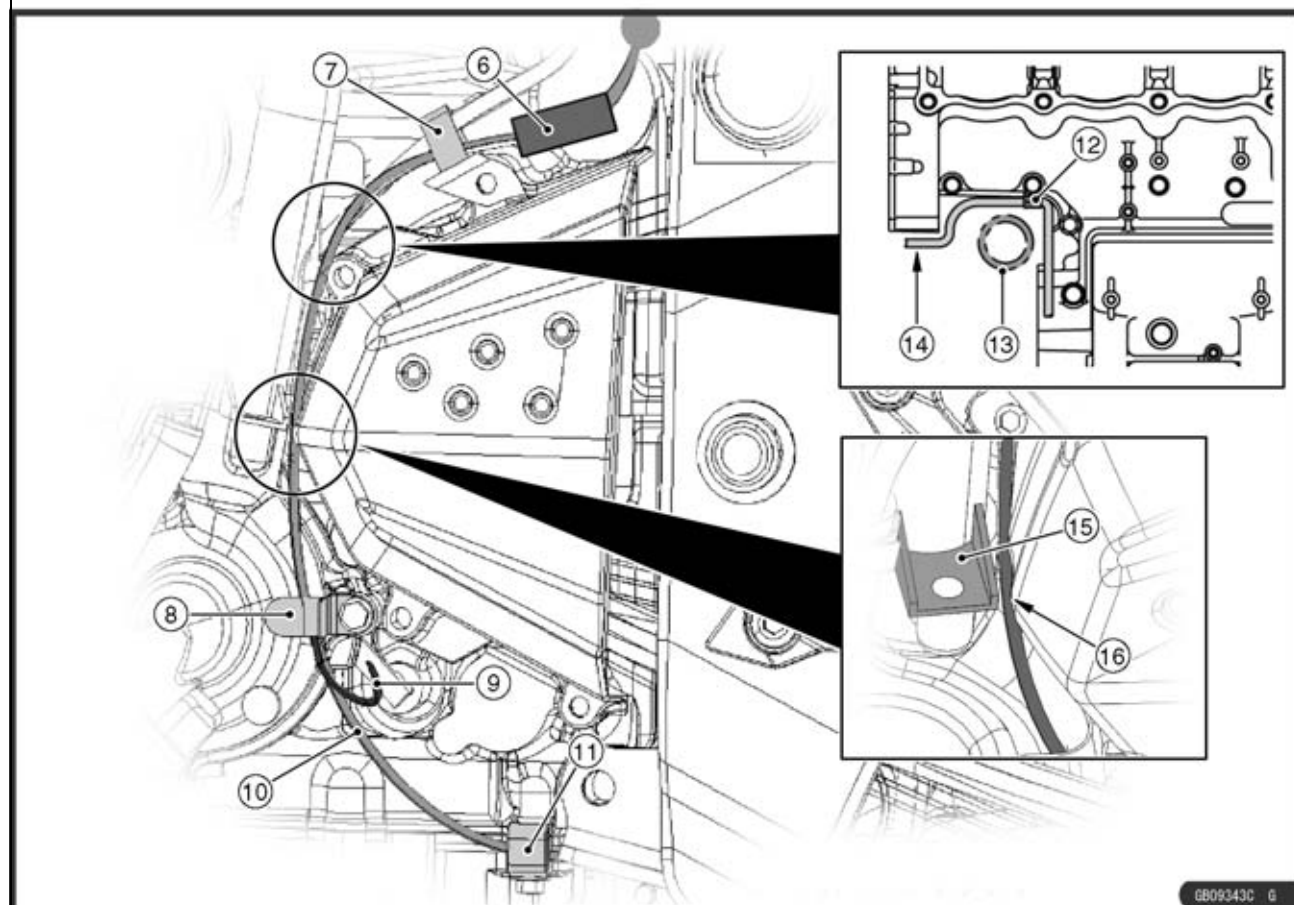
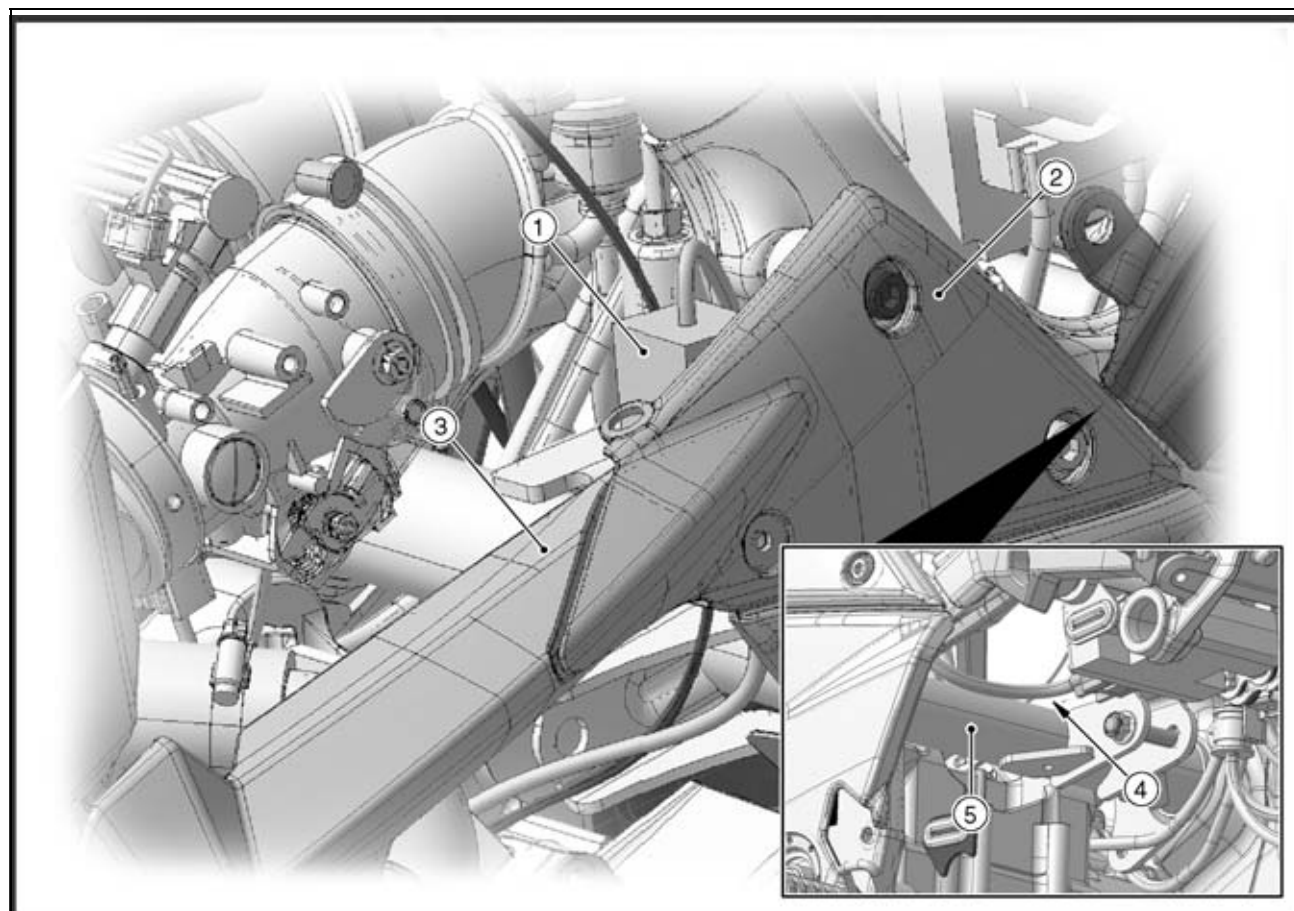
## Cable, Wire, and Hose Routing



1. Hold the fuel tank drain hose with the left side clamp of the fuel tank.
2. Run the fuel tank drain hose between the air cleaner housing and frame.
3. Air Cleaner Drain Hose
4. Fuel Tank Drain Hose
5. Reserve Tank Overflow Hose (Run the reserve tank overflow hose (from fitting) into the lower loop clamp as shown in the figure.)
6. Swingarm Left Side

## 17-8 APPENDIX

### Cable, Wire, and Hose Routing



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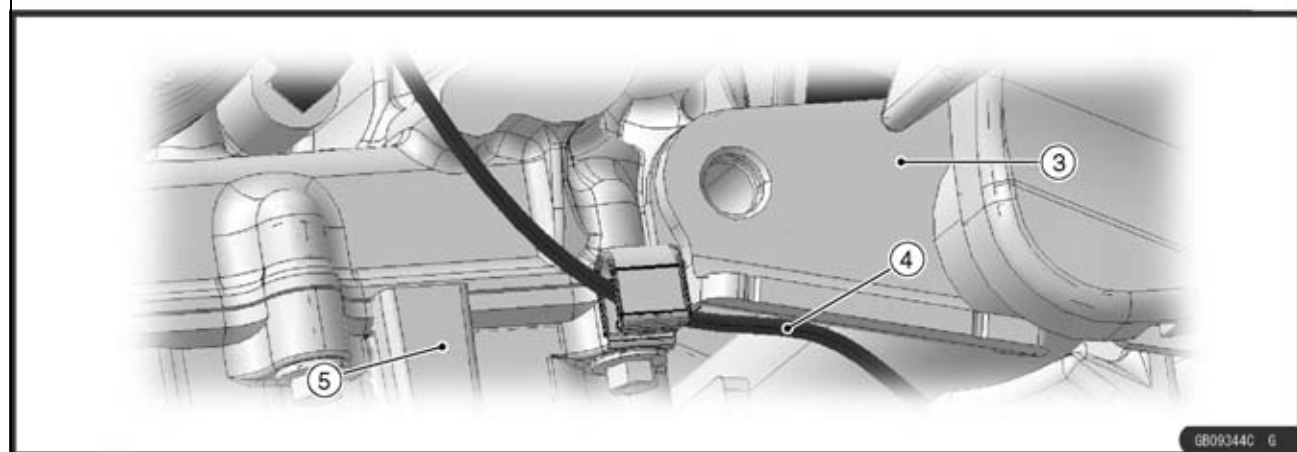
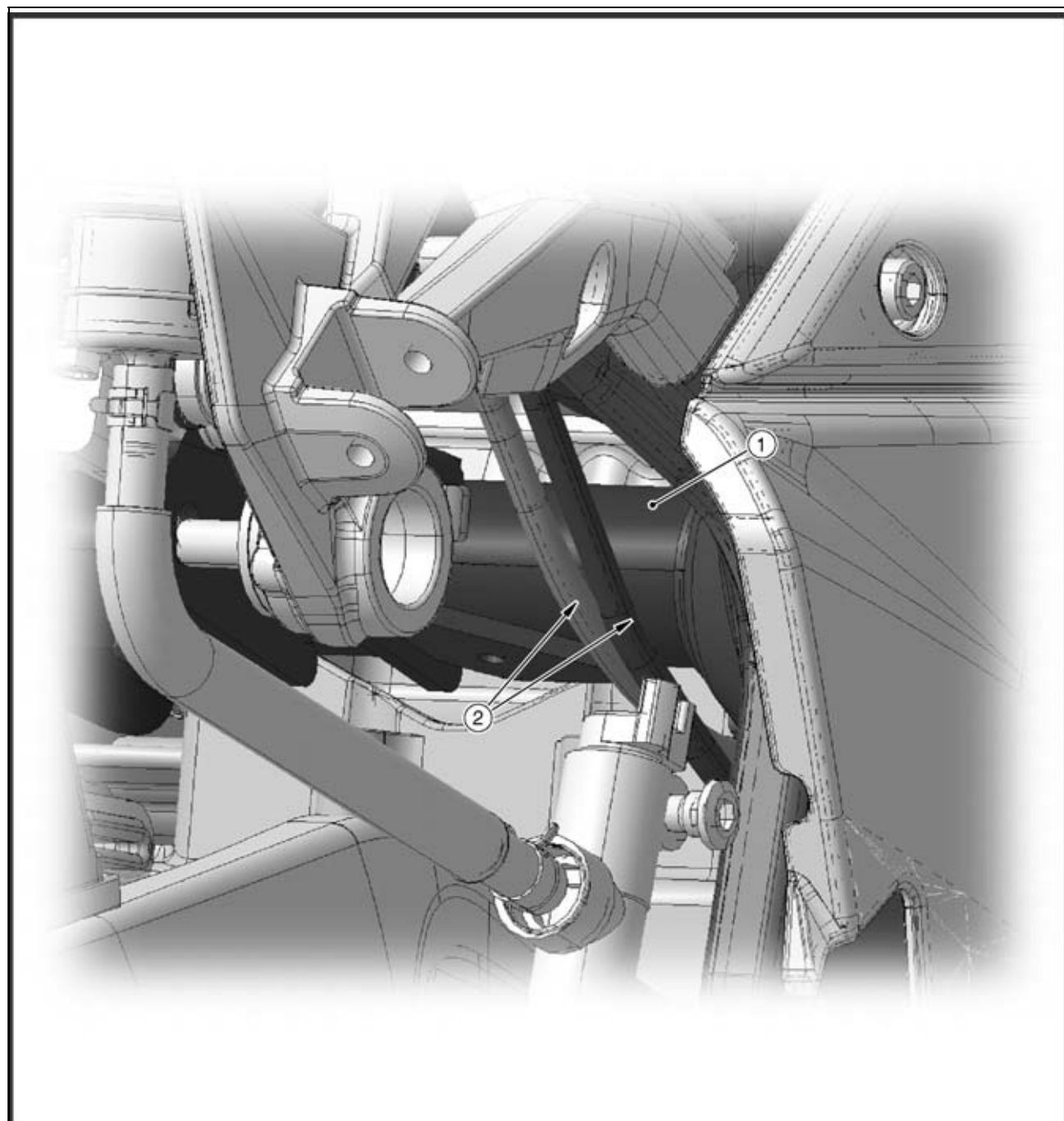
**Cable, Wire, and Hose Routing**

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1. Put the alternator lead connector to the inside of the left frame cover and left subframe.
2. Left Frame Cover
3. Left Subframe
4. Run the alternator lead over the frame cross pipe.
5. Frame Cross Pipe
6. Sidestand Switch Lead Connector
7. Clamp (Hold the sidestand switch ,neutral switch and alternator leads.)
8. Clamp (Hold the sidestand switch and neutral switch leads.)
9. Neutral Switch Lead
10. Sidestand Switch Lead
11. Clamp (Hold the sidestand switch lead.)
12. Clamp (Hold the alternator lead.)
13. Water Pipe (From Water Pump to Cylinder)
14. Run the alternator lead between the water pipe (from water pump to cylinder) and crankcase as shown in the figure.
15. Bracket of the Water Pipe (From Water Pump to Cylinder)
16. Run the sidestand switch and neutral switch leads to the inside of the bracket of the water pipe (from water pump to cylinder).

## 17-10 APPENDIX

### Cable, Wire, and Hose Routing



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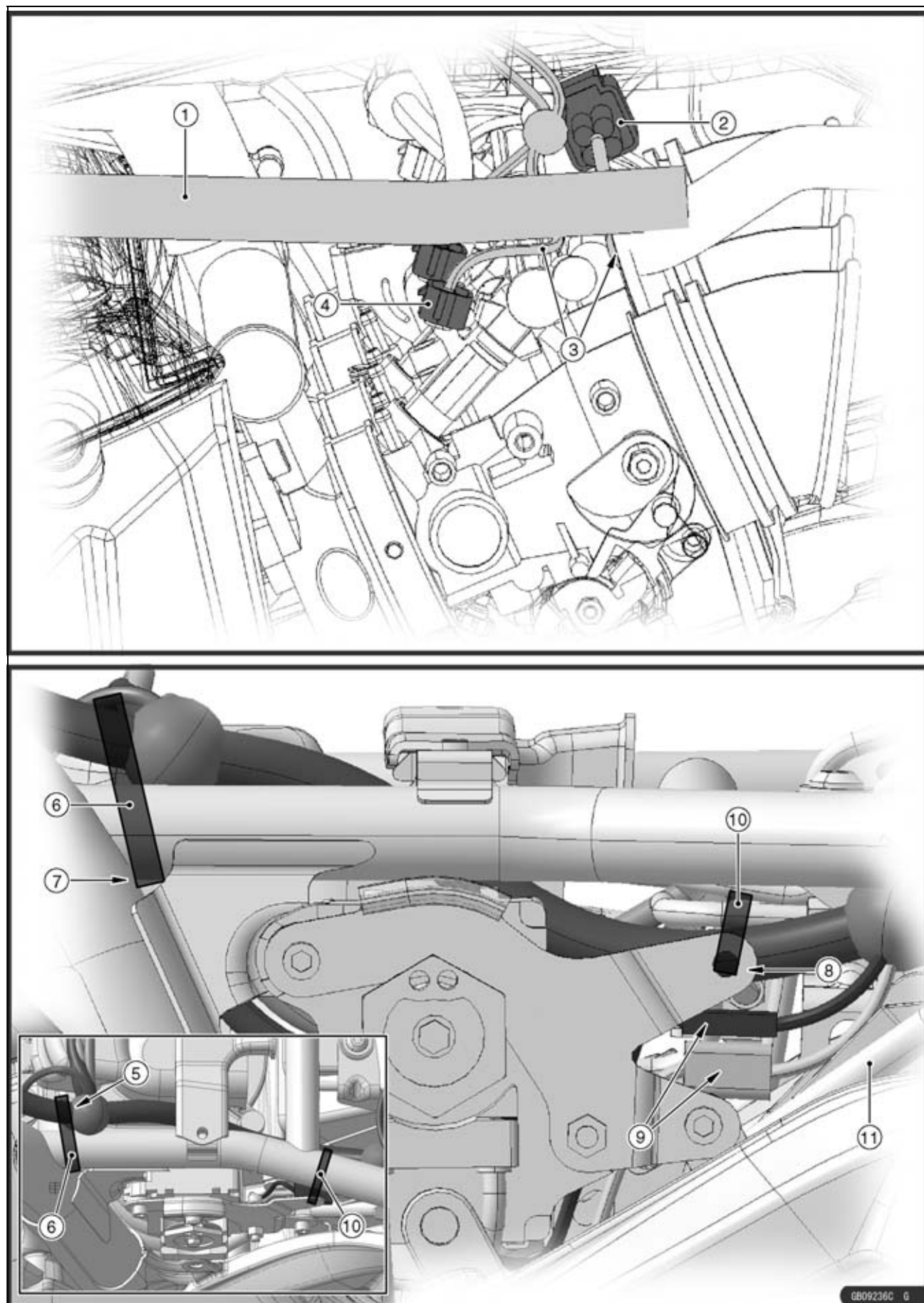
**Cable, Wire, and Hose Routing**

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1. Frame Cross Pipe
2. Run the starter motor cable and battery negative cable under the frame cross pipe.
3. Frame Cross Pipe
4. Run the sidestand switch lead under the frame cross pipe.
5. Oil Pan

## 17-12 APPENDIX

### Cable, Wire, and Hose Routing





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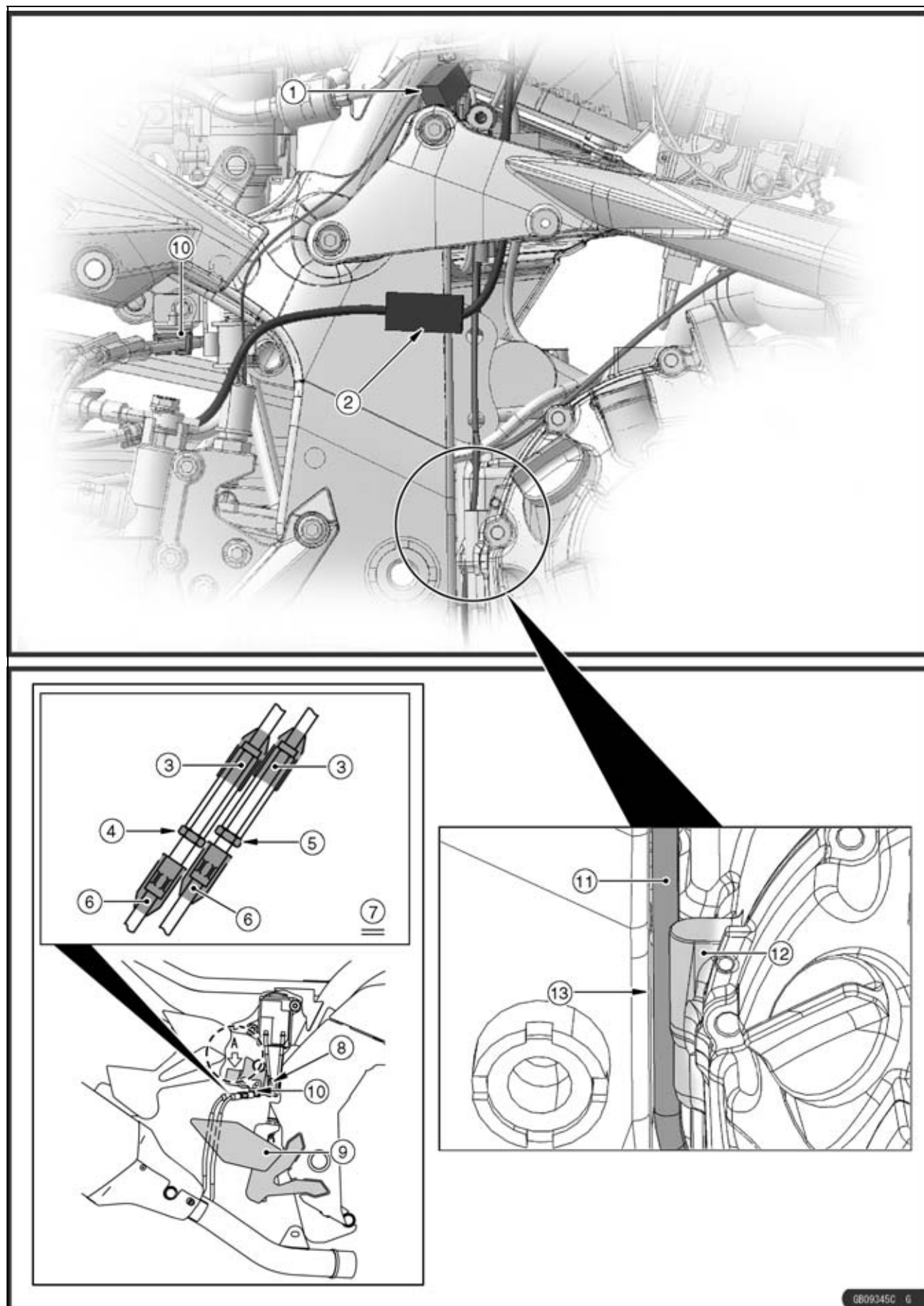
**Cable, Wire, and Hose Routing**

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1. Air Switching Valve Hose (From Air Switching Valve to Air Cleaner Housing)
2. Subthrottle Valve Actuator Lead Connector
3. Run the subthrottle valve actuator and fuel injector leads under the air switching valve hose (from air switching valve to air cleaner housing).
4. Fuel Injector Connector
5. Hold the front at the interchange point of the inlet air temperature sensor lead.
6. Band (Hold the main harness and frame as shown in the figure.)
7. Insert the band into the corner of the frame as shown in the figure.
8. Band (Insert the band into the hole of the exhaust butterfly valve actuator bracket.)
9. Run the exhaust butterfly valve actuator sensor leads to the outside of the main harness.
10. Band (Hold the main harness and exhaust butterfly valve actuator bracket as shown in the figure.  
Run the main harness over the reserve tank overflow hose (from fitting).)
11. Reserve Tank Overflow Hose (From Fitting)

## 17-14 APPENDIX

### Cable, Wire, and Hose Routing



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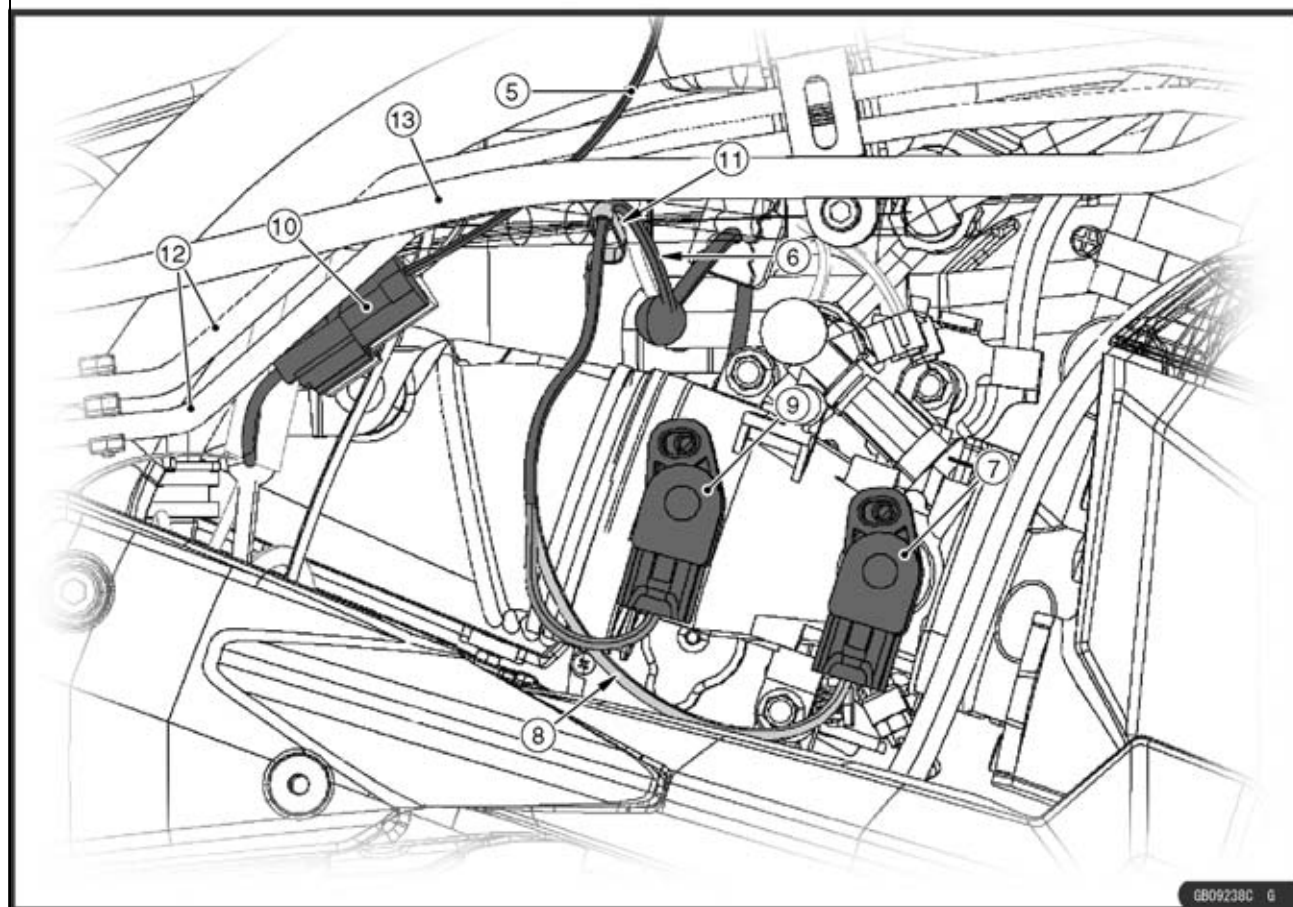
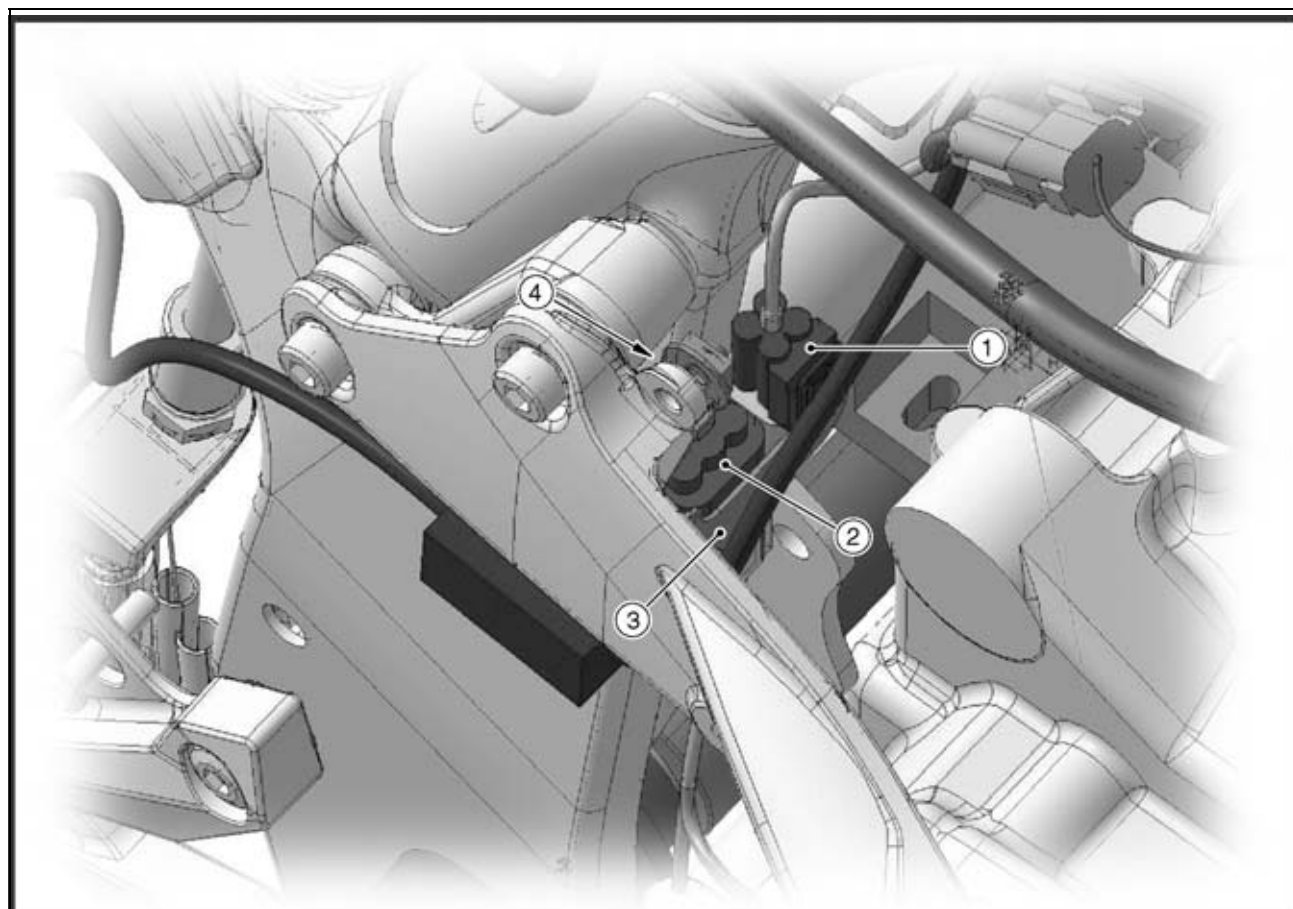
**Cable, Wire, and Hose Routing**

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1. Put the rear brake light switch lead connector to the inside of the right sub side cover.
2. Put the rear wheel rotation sensor lead connector to the inside of the right frame cover.
3. Dust Covers
4. Exhaust Butterfly Valve Open Cable (White)
5. Exhaust Butterfly Valve Close Cable (Black)
6. Dust Covers
7. Viewed A
8. Regulator/Rectifier
9. Right Guard Bracket
10. Clamp
11. Oxygen Sensor Lead
12. Crankcase Boss
13. Do not pinch the oxygen sensor lead between the engine and frame (Run the oxygen sensor lead to the inside of the crankcase boss.).

## 17-16 APPENDIX

### Cable, Wire, and Hose Routing



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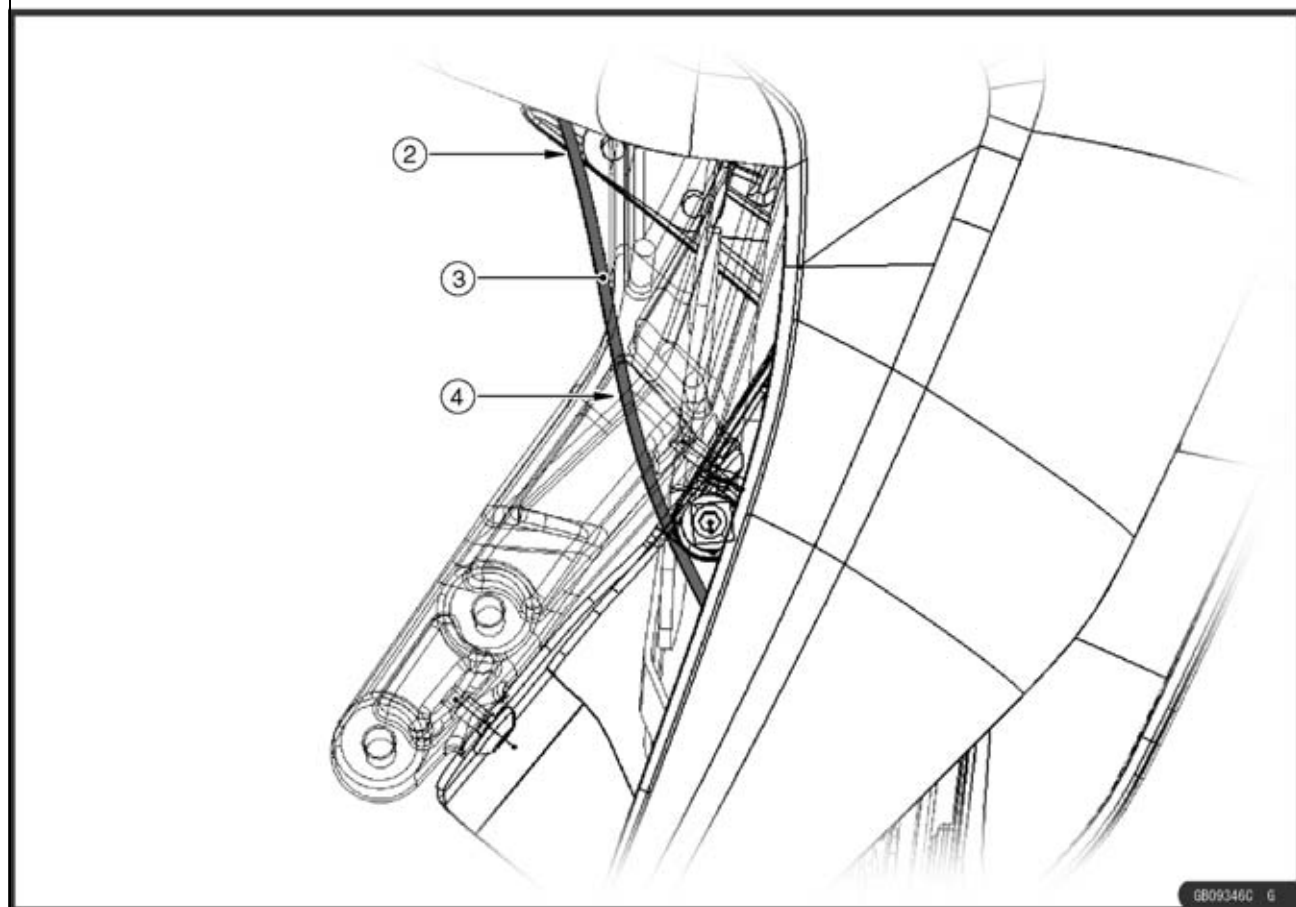
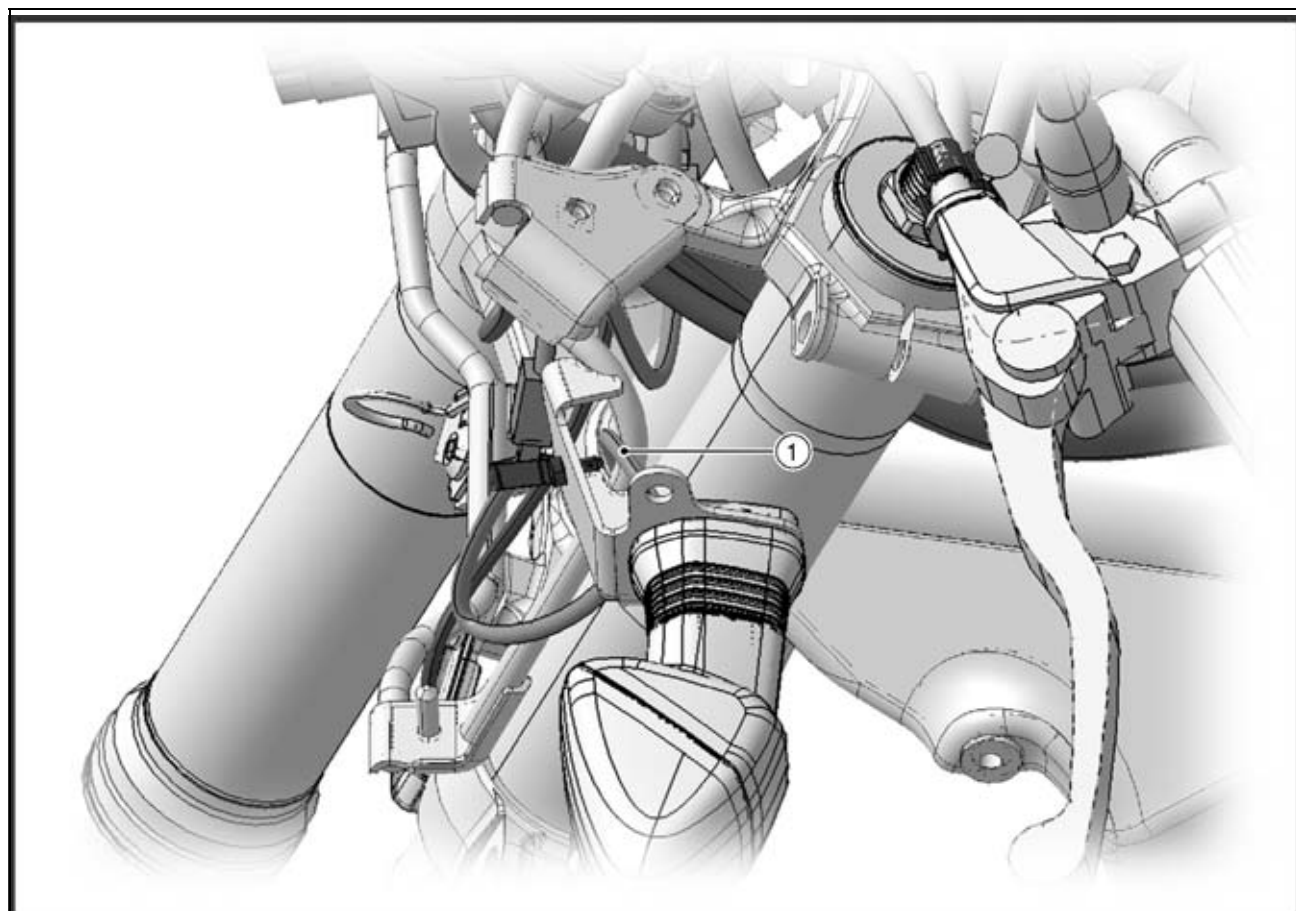
**Cable, Wire, and Hose Routing**

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1. Oxygen Sensor Lead Connector
2. Oil Pressure Switch/Crankshaft Sensor Lead Connector
3. Install the oxygen sensor and oil pressure switch/crankshaft sensor lead connectors to the bracket.
4. After installing the connectors to the bracket, tighten the bolt to the bracket and subframe.
5. Run the fuel level sensor lead to the inside of the reserve tank hose.  
Run the fuel level sensor lead to the inside of the reserve tank hose and green and white hoses (California model).  
Run the fuel level sensor lead to the inside of the reserve tank hose and outside of the brake pipes (ABS equipped models).
6. Run the main harness (to main throttle sensor and subthrottle sensor) under the reserve tank hose.  
Run the main harness (to main throttle sensor and subthrottle sensor) under the reserve tank hose and green and white hoses (California model).  
Run the main harness (to main throttle sensor and subthrottle sensor) under the reserve tank hose and brake pipes (ABS equipped models).
7. Main Throttle Sensor Lead Connector
8. Run the main throttle sensor lead to the inside of the subthrottle sensor lead.
9. Subthrottle Sensor Lead Connector
10. Fuel Level Sensor Lead onnector
11. When clamping the main harness (to main throttle sensor and subthrottle sensor), do not stretch the main harness.
12. Brake Pipes (ABS Equipped Models)
13. Reserve Tank Hose

## 17-18 APPENDIX

### Cable, Wire, and Hose Routing



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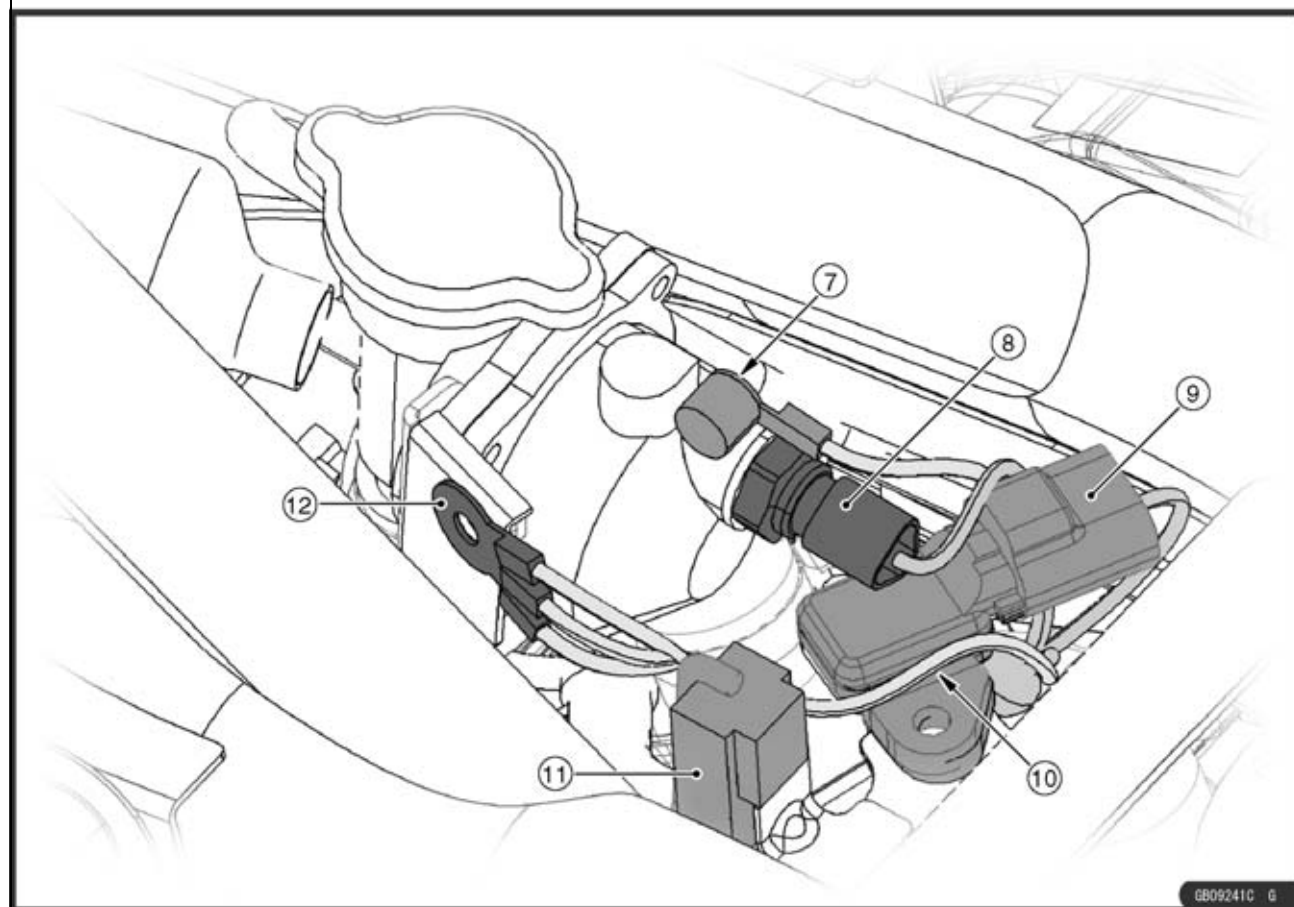
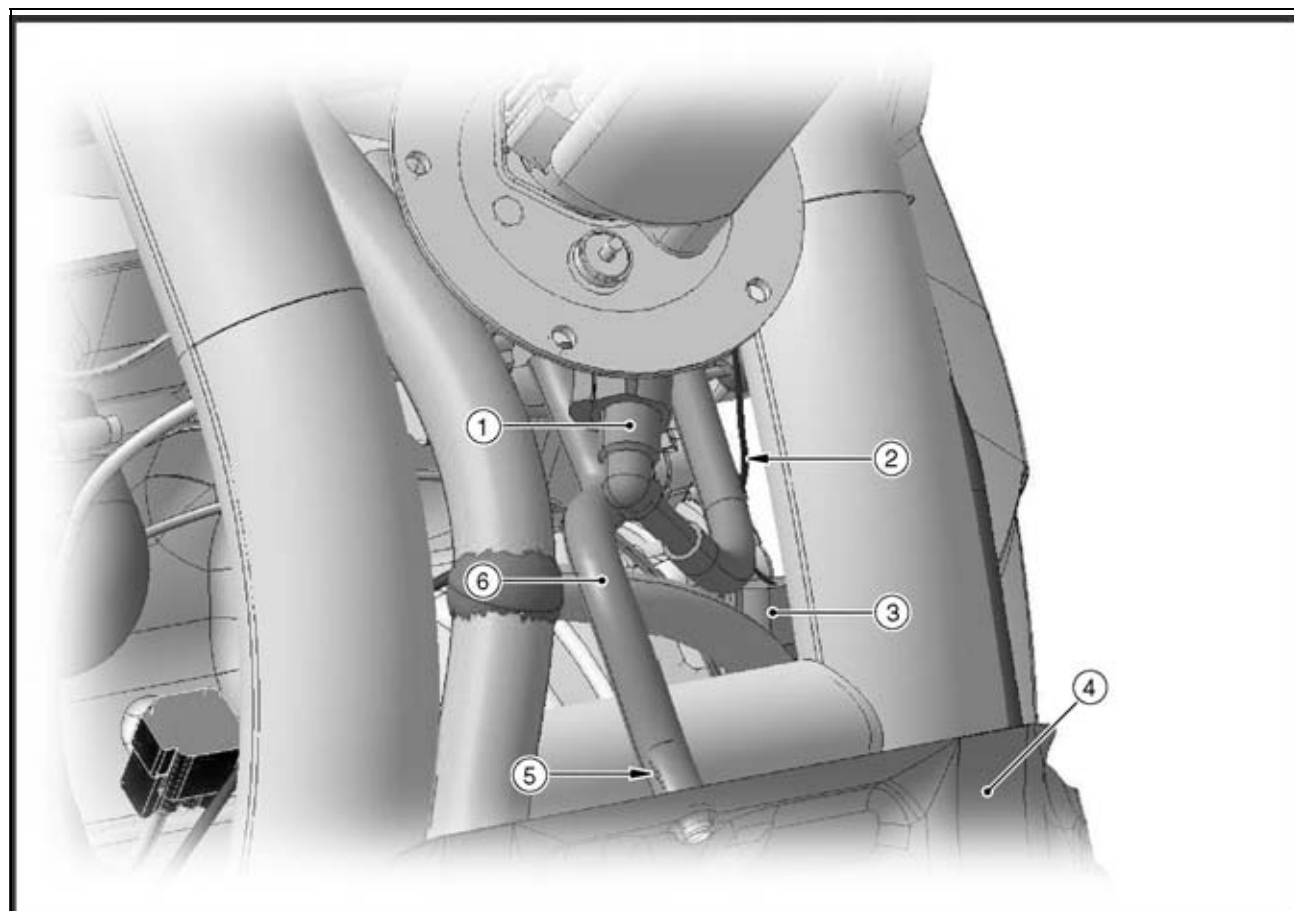
**Cable, Wire, and Hose Routing**

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1. Left Front Turn Signal Light Lead (Run the right and left front turn signal light leads inside the fairing bracket).
2. Run the horn lead inside the radiator hose.
3. Horn Lead
4. Run the horn lead outside the subframe.

## 17-20 APPENDIX

### Cable, Wire, and Hose Routing





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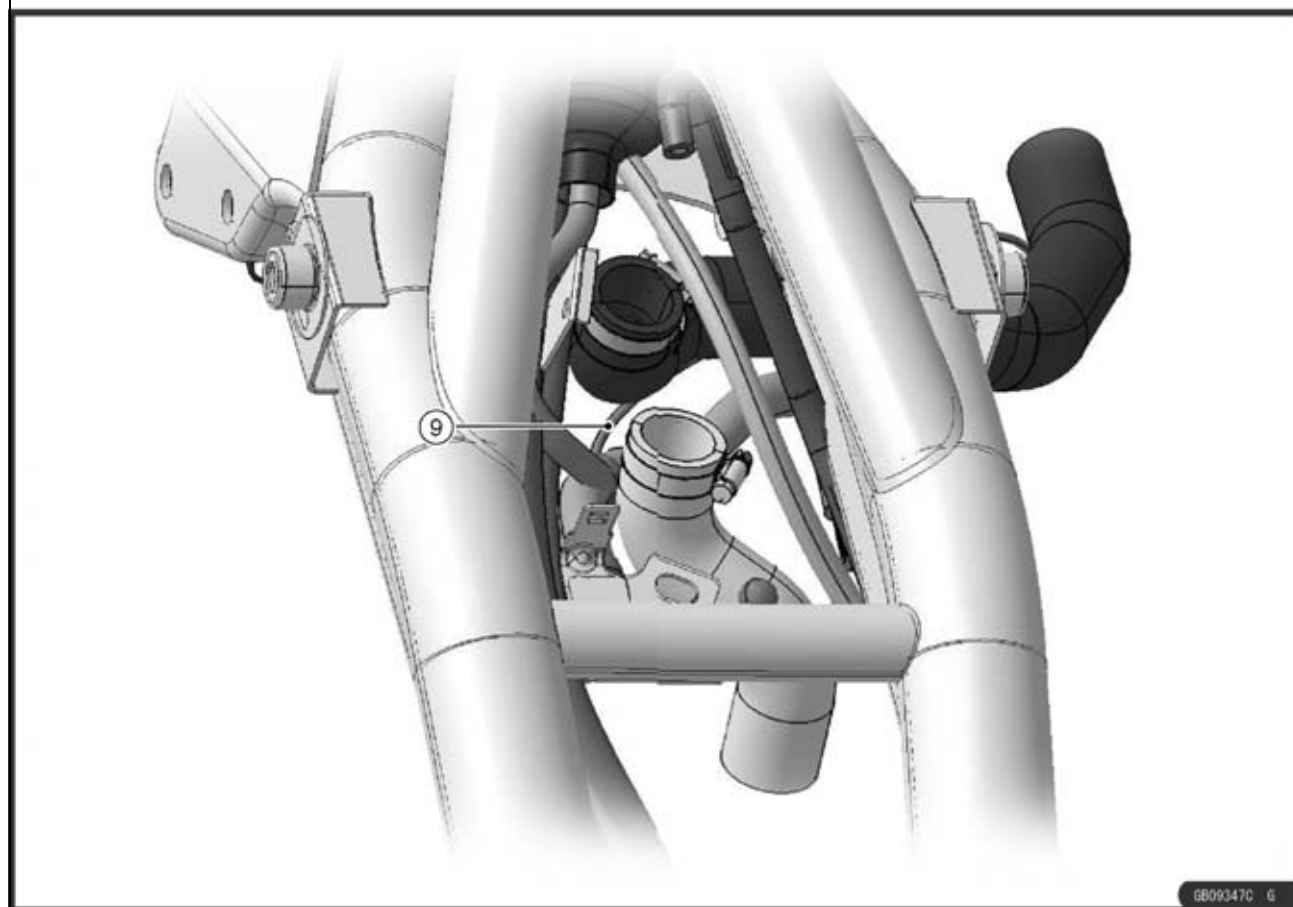
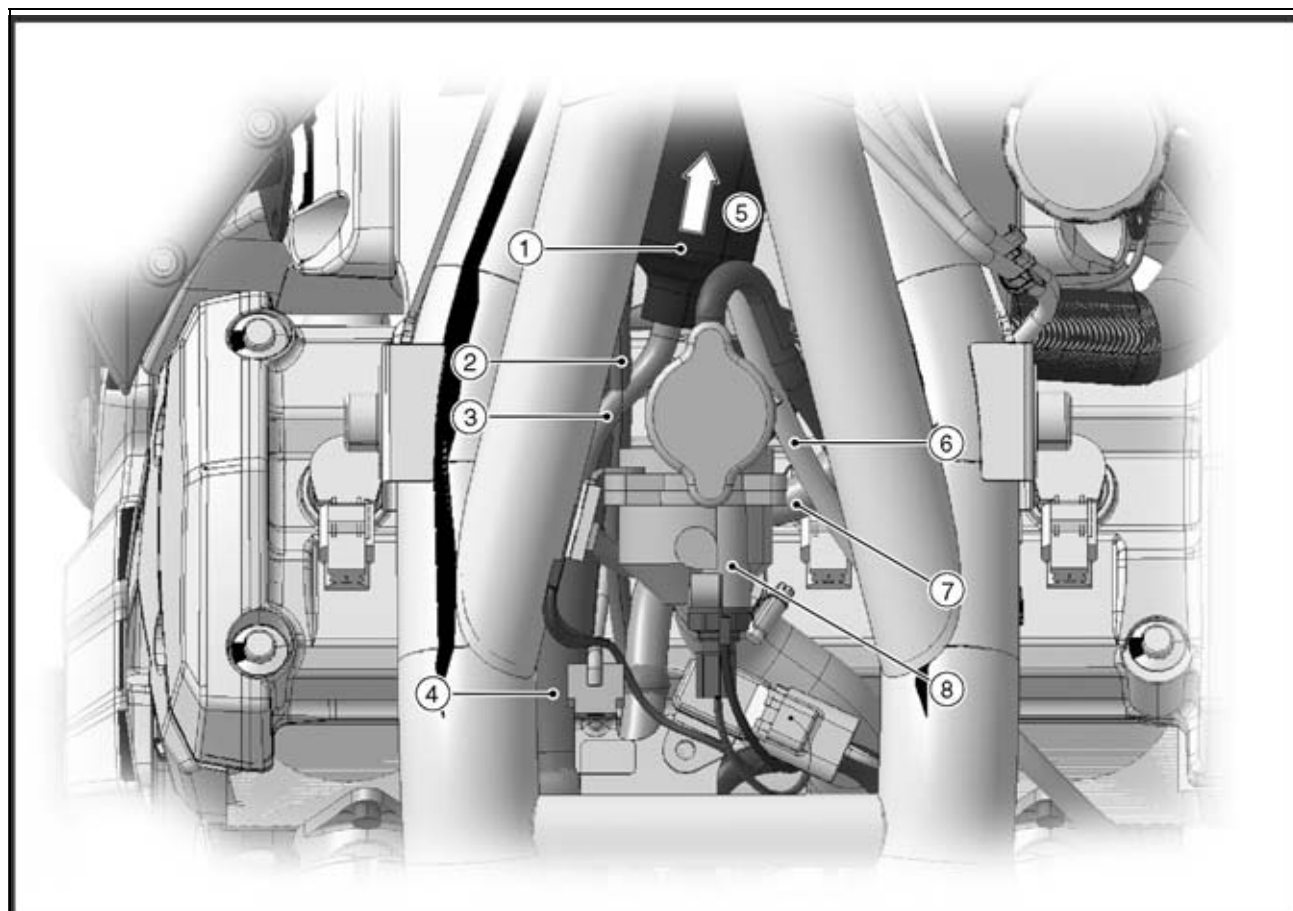
**Cable, Wire, and Hose Routing**

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1. Fuel Outlet Hose
2. Run the fuel pump lead to the outside of the fuel outlet hose.
3. Fuel Pump Lead Connector
4. Fuel Tank Bottom
5. Install the fuel inlet hose so that the white mark side faces outlet pipe of the fuel tank.
6. Fuel Inlet Hose
7. Meter Ground Lead
8. Water Temperature Sensor
9. Inlet Air Pressure Sensor Lead Connector
10. Run the frame ground lead over the inlet air pressure sensor.
11. Camshaft Position Sensor Lead Connector
12. Frame Ground Lead

## 17-22 APPENDIX

### Cable, Wire, and Hose Routing



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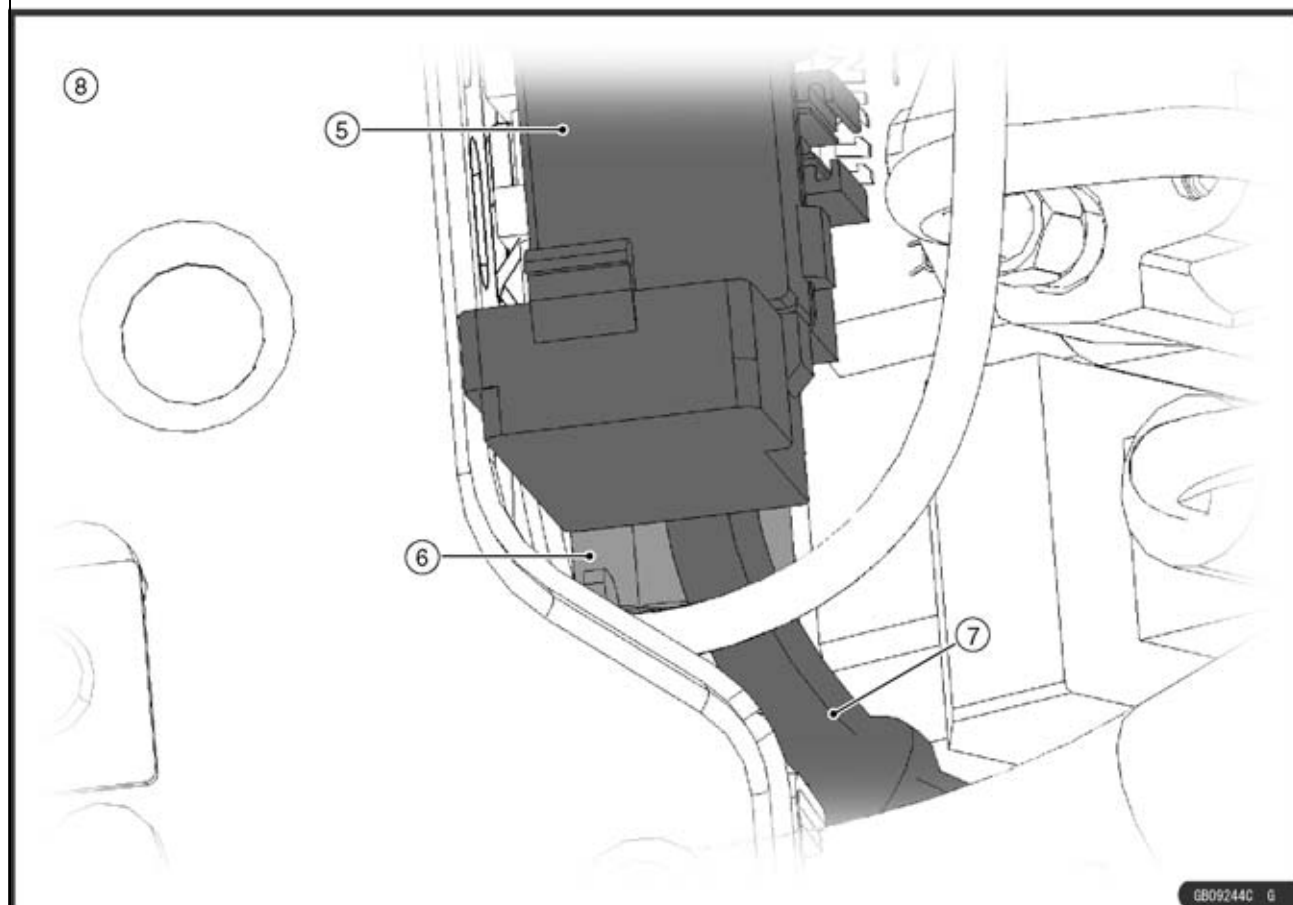
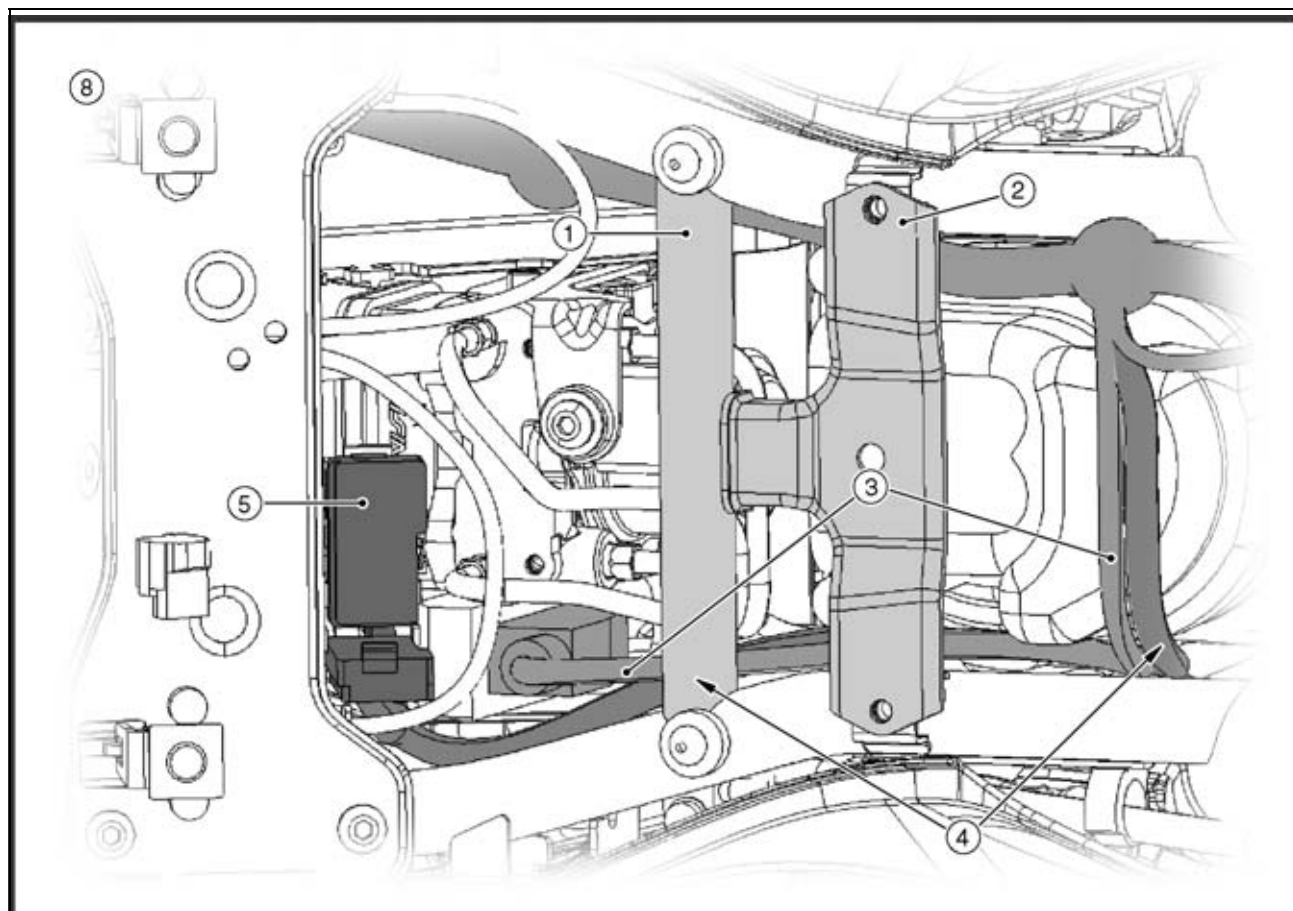
**Cable, Wire, and Hose Routing**

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1. Put the rubber cover to the inside of the frame as shown in the figure.
2. Run the throttle cables under the immobilizer antenna and stick coil leads.
3. Run the immobilizer antenna, ignition switch and radiator fan motor leads under the left side of the thermostat housing and over the main harness.
4. Main Harness
5. To Immobilizer Antenna, Ignition Switch and Radiator Fan Motor
6. Run the clutch cable over the stick coil lead.
7. Stick Coil Lead
8. Thermostat Housing
9. Run the horn lead under the radiator hose (from thermostat housing to radiator).

## 17-24 APPENDIX

### Cable, Wire, and Hose Routing



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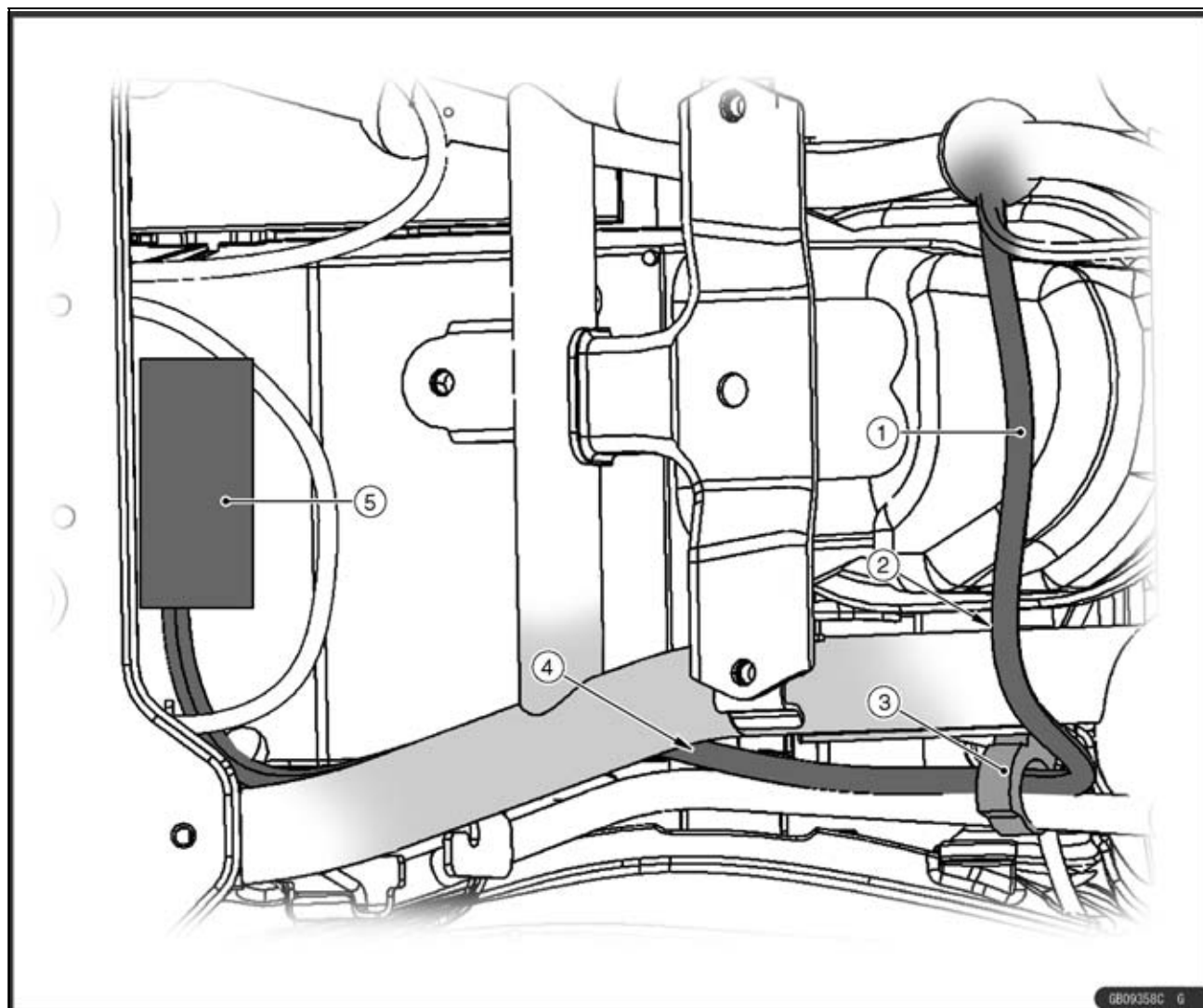
**Cable, Wire, and Hose Routing**

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1. Frame Cross Pipe
2. Fuel Tank Bracket
3. Run the ABS hydraulic unit lead under the fuel tank bracket and frame cross pipe.
4. Run the main harness (to fuse box 1) under the fuel tank bracket and frame cross pipe.
5. Fuse Box 1
6. Put the ABS Kawasaki self-diagnosis system connector under the fuse box 1.
7. Main Harness (To Fuse Box 1)
8. ABS Equipped Models

## 17-26 APPENDIX

### Cable, Wire, and Hose Routing



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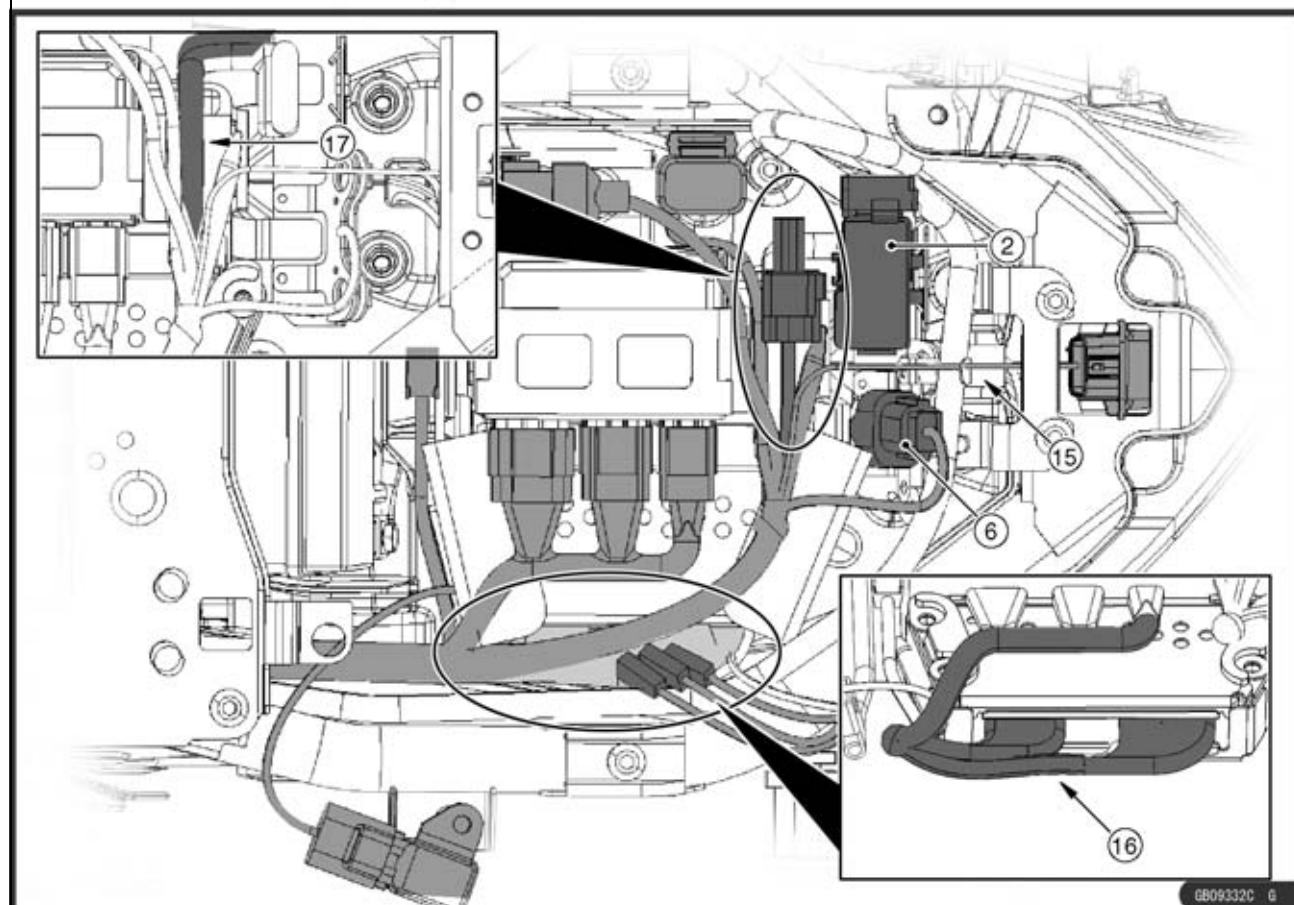
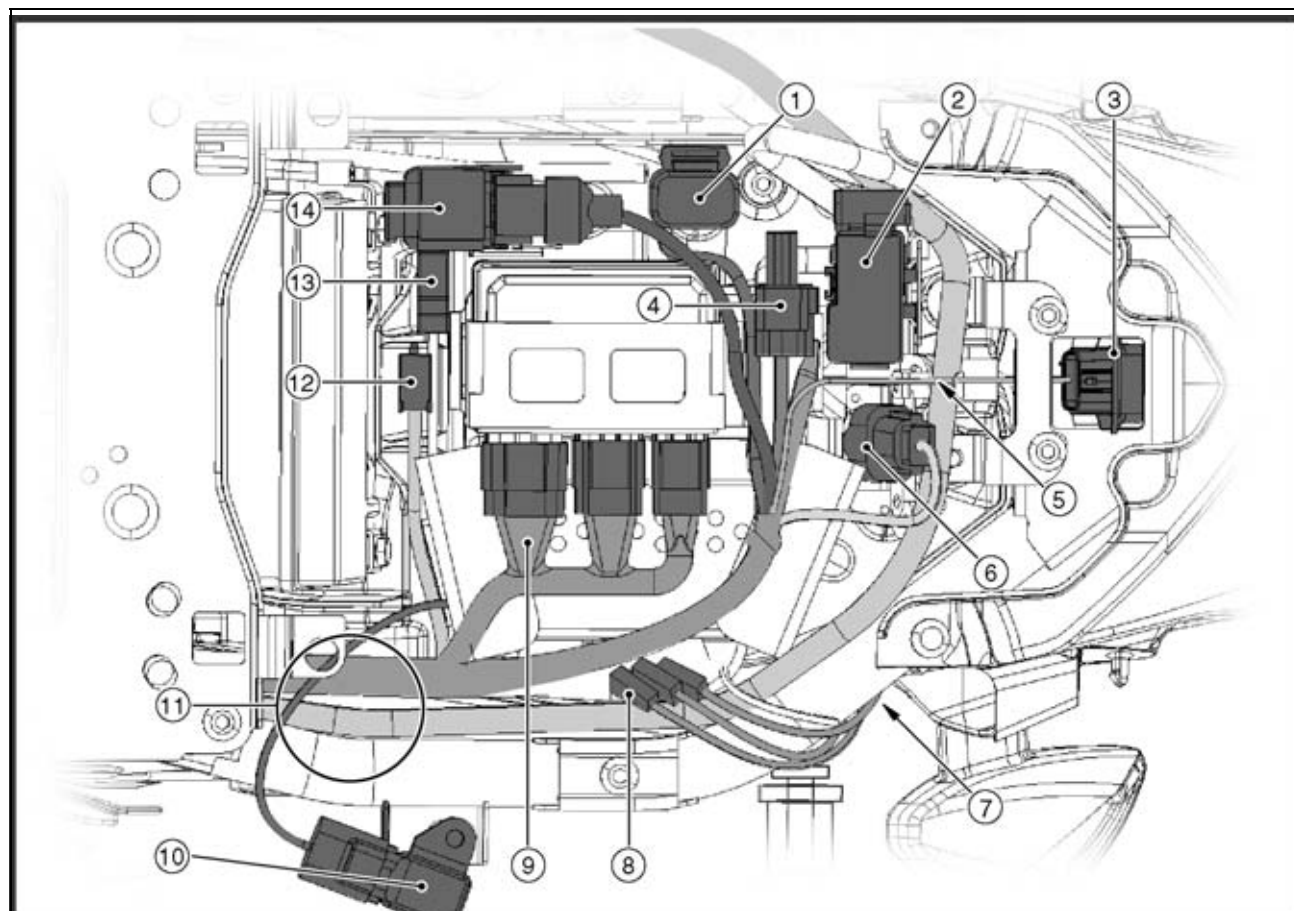
**Cable, Wire, and Hose Routing**

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1. Main Harness (To Fuse Box 1)
2. Run the main harness (to fuse box 1) over the frame.
3. Hold the main harness (to fuse box 1) and reserve tank hose.
4. Run the main harness (to fuse box 1) under the frame and over the reserve tank hose.
5. Fuse Box 1

## 17-28 APPENDIX

### Cable, Wire, and Hose Routing





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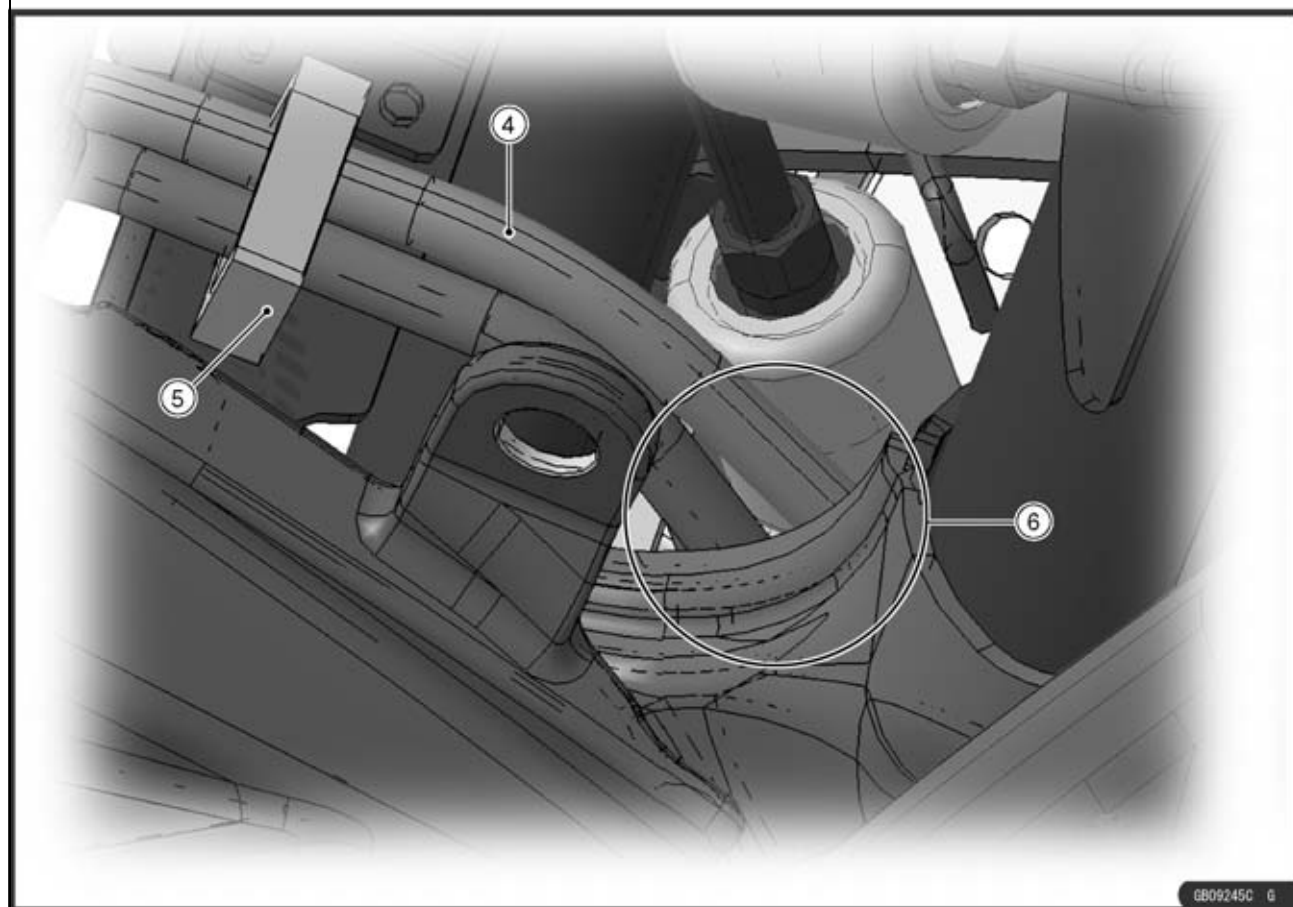
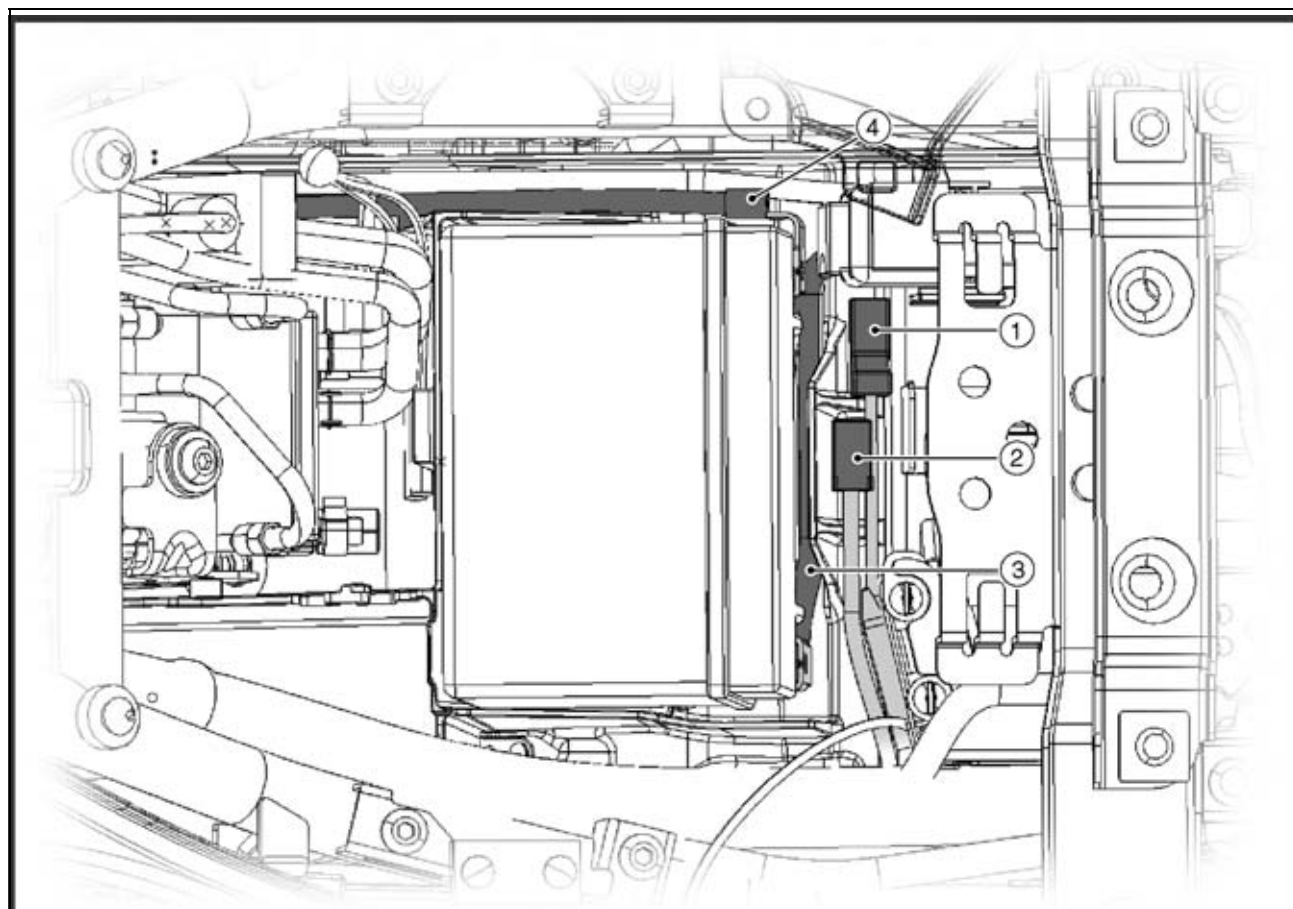
**Cable, Wire, and Hose Routing**

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1. Turn Signal Relay (Position the turn signal relay lead in the lower side.)
2. Fuse Box 2
3. Tail/Brake Light (LED) Lead Connector
4. Immobilizer/Kawasaki Diagnostic System Connector
5. Run the tail/brake light (LED) lead over the reserve tank overflow hose (from fitting).
6. Vehicle-down Sensor
7. Run the license plate light, left and right rear turn signal light leads to the outside of the frame.
8. Run the license plate light, left and right rear turn signal light lead connectors over the reserve tank overflow hose (from fitting).
9. Relay Box Lead
10. Atmospheric Pressure Sensor
11. From this position, Run the reserve tank overflow hose (from fitting) under the main harness as shown in the figure.
12. Battery Positive Lead Connector (ABS Equipped Models)
13. Ground Lead Connector
14. Starter Relay
15. Do not run the tail/brake light (LED) lead to the lower side of the vehicle-down sensor.
16. Run the ECU lead connector (34 pin) under the ECU lead connector (26 pin).
17. Do not run the main harness (to fuse box 2) to the lower side of the vehicle-down sensor.

## 17-30 APPENDIX

### Cable, Wire, and Hose Routing



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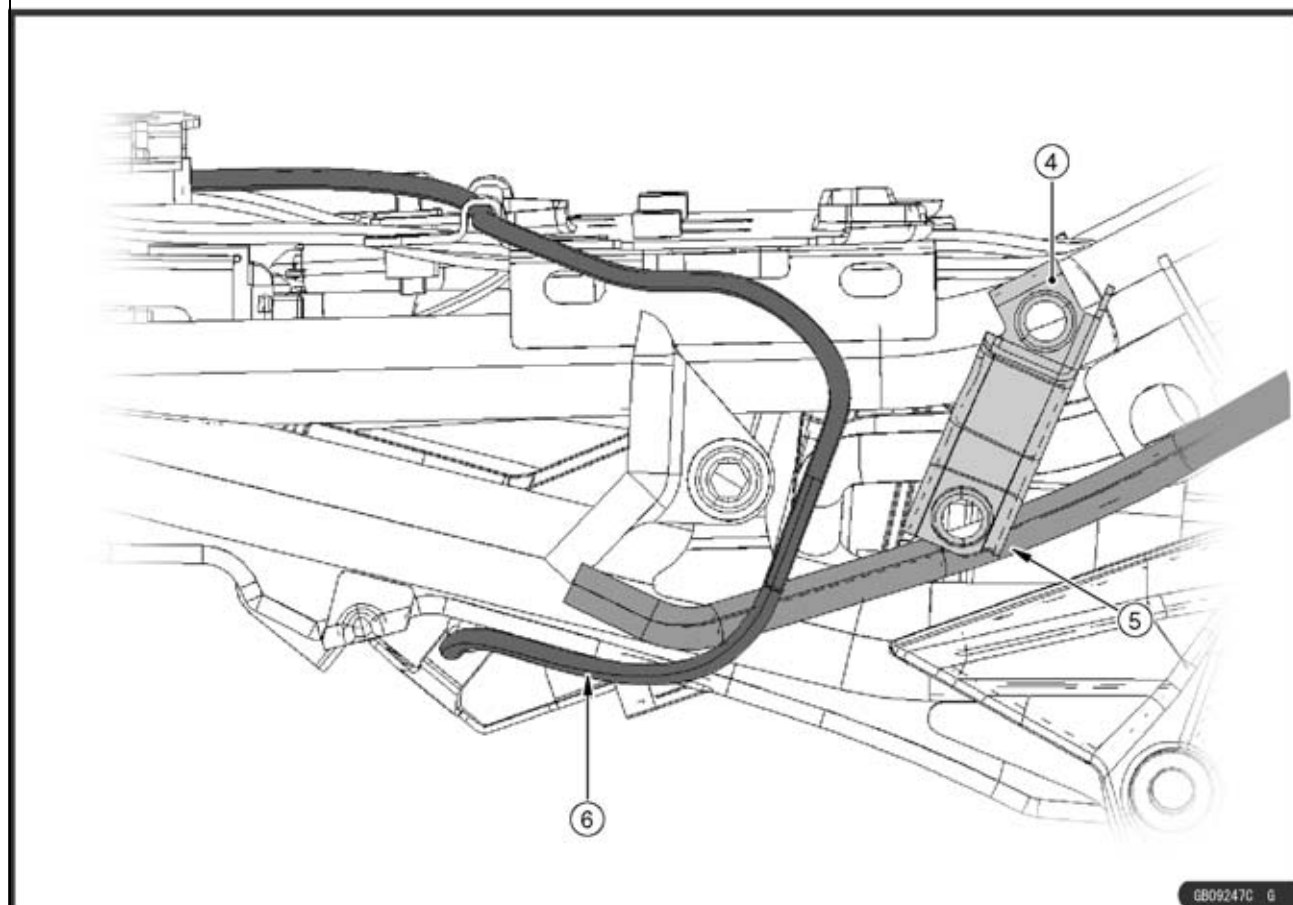
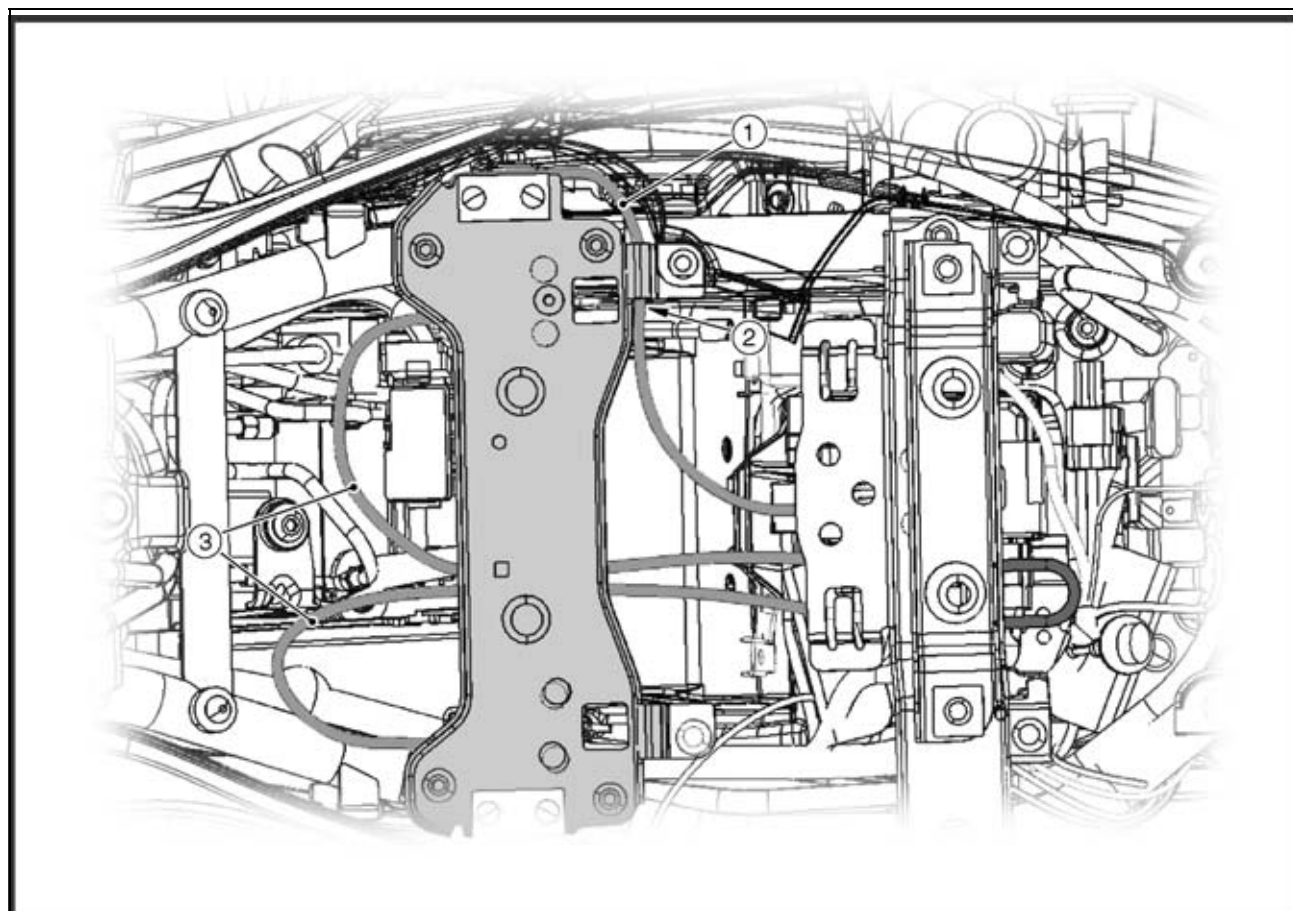
**Cable, Wire, and Hose Routing**

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1. Ground Lead Connector
2. Battery Positive Lead Connector
3. Battery Positive Cable
4. Battery Negative Cable
5. Run the battery negative cable and starter motor cable into the clamp.
6. Run the battery negative cable and starter motor cable to the outside of the brake hose.

## 17-32 APPENDIX

### Cable, Wire, and Hose Routing



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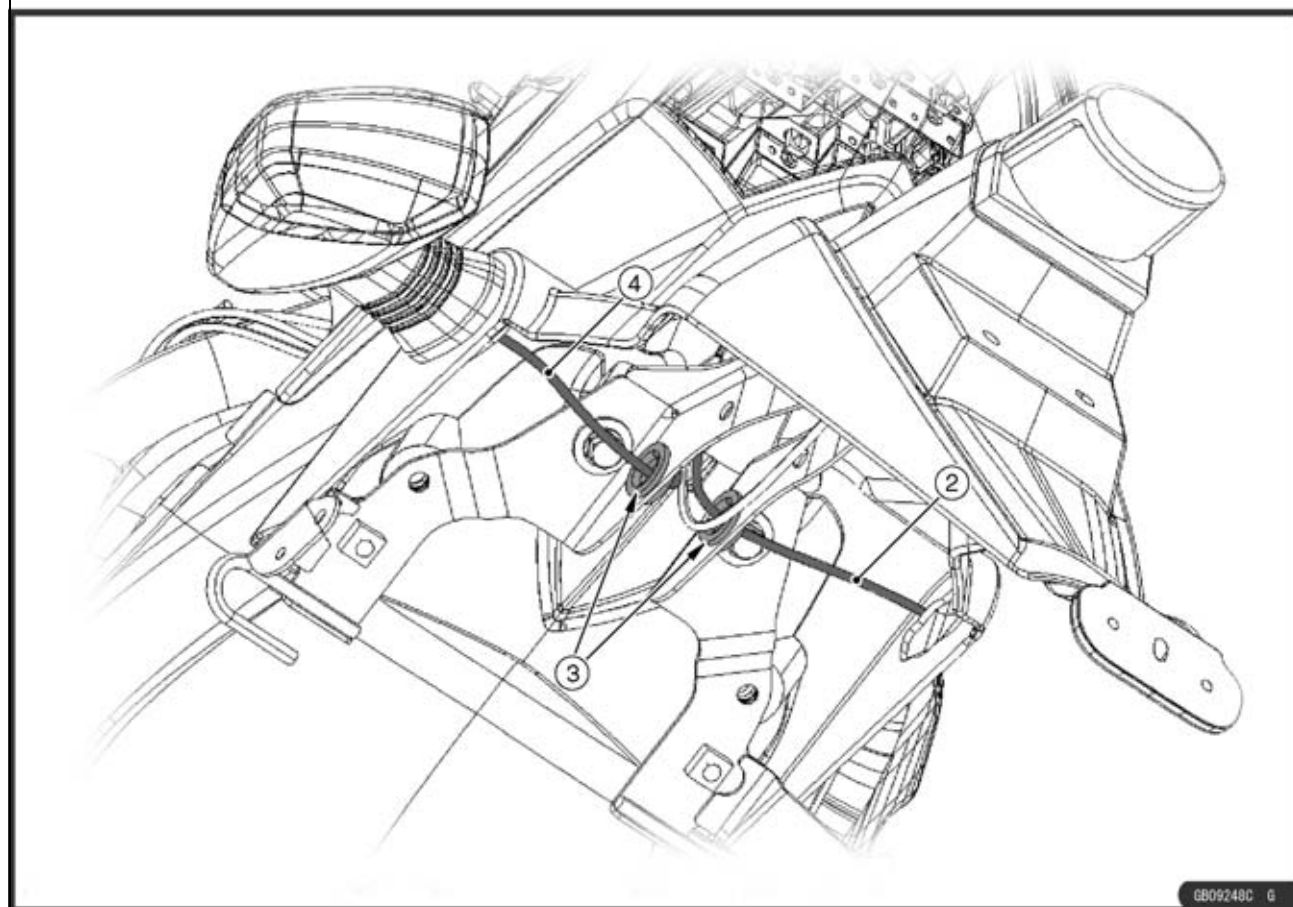
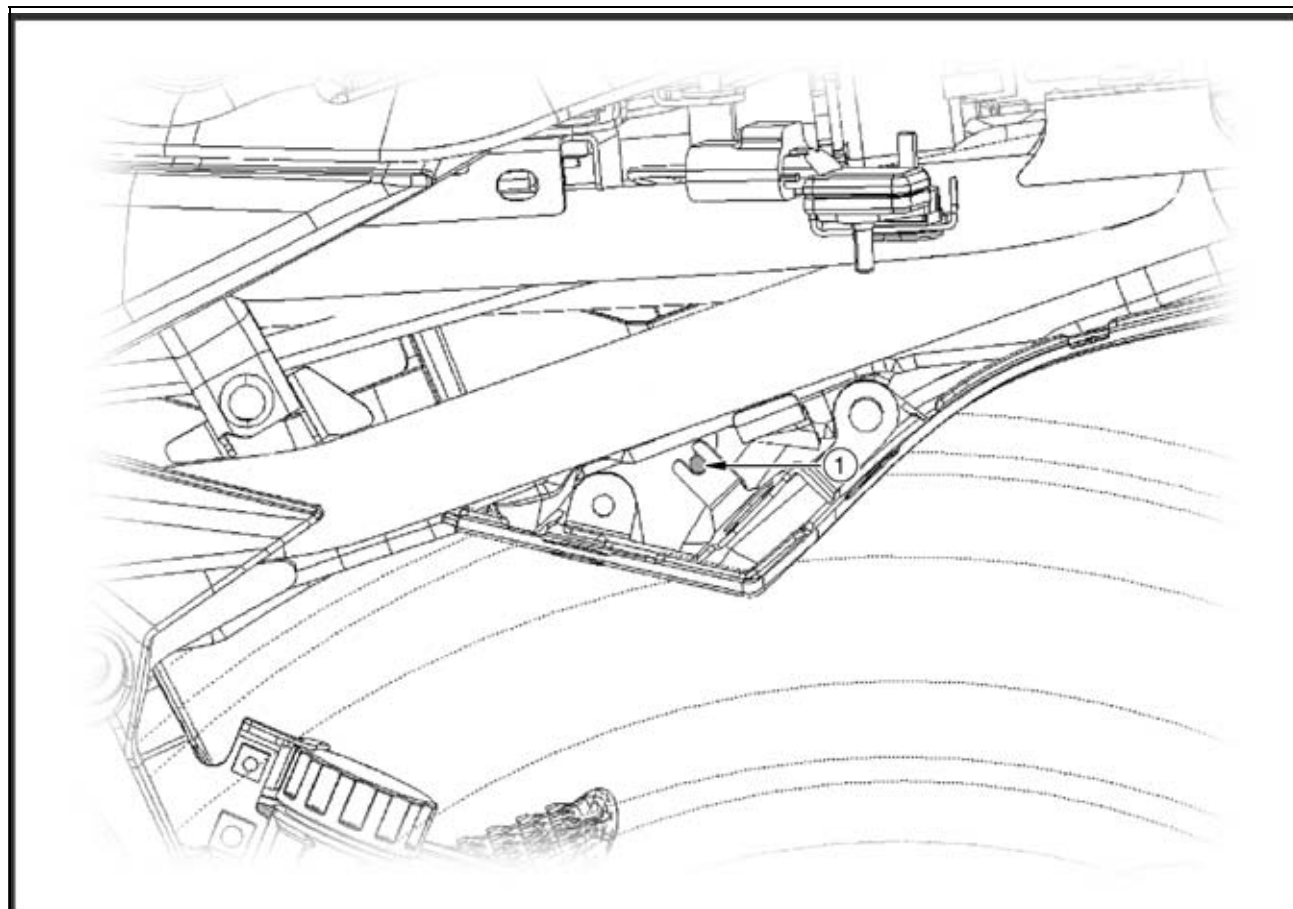
**Cable, Wire, and Hose Routing**

---

1. Rear Seat Lock Cable
2. Run the rear seat lock cable under the front seat bracket.
3. Front Seat Lock Cables
4. Bracket
5. Run the reserve tank hose to the inside of the bracket.
6. Run the rear seat lock cable to the outside of the reserve tank hose.

## 17-34 APPENDIX

### Cable, Wire, and Hose Routing



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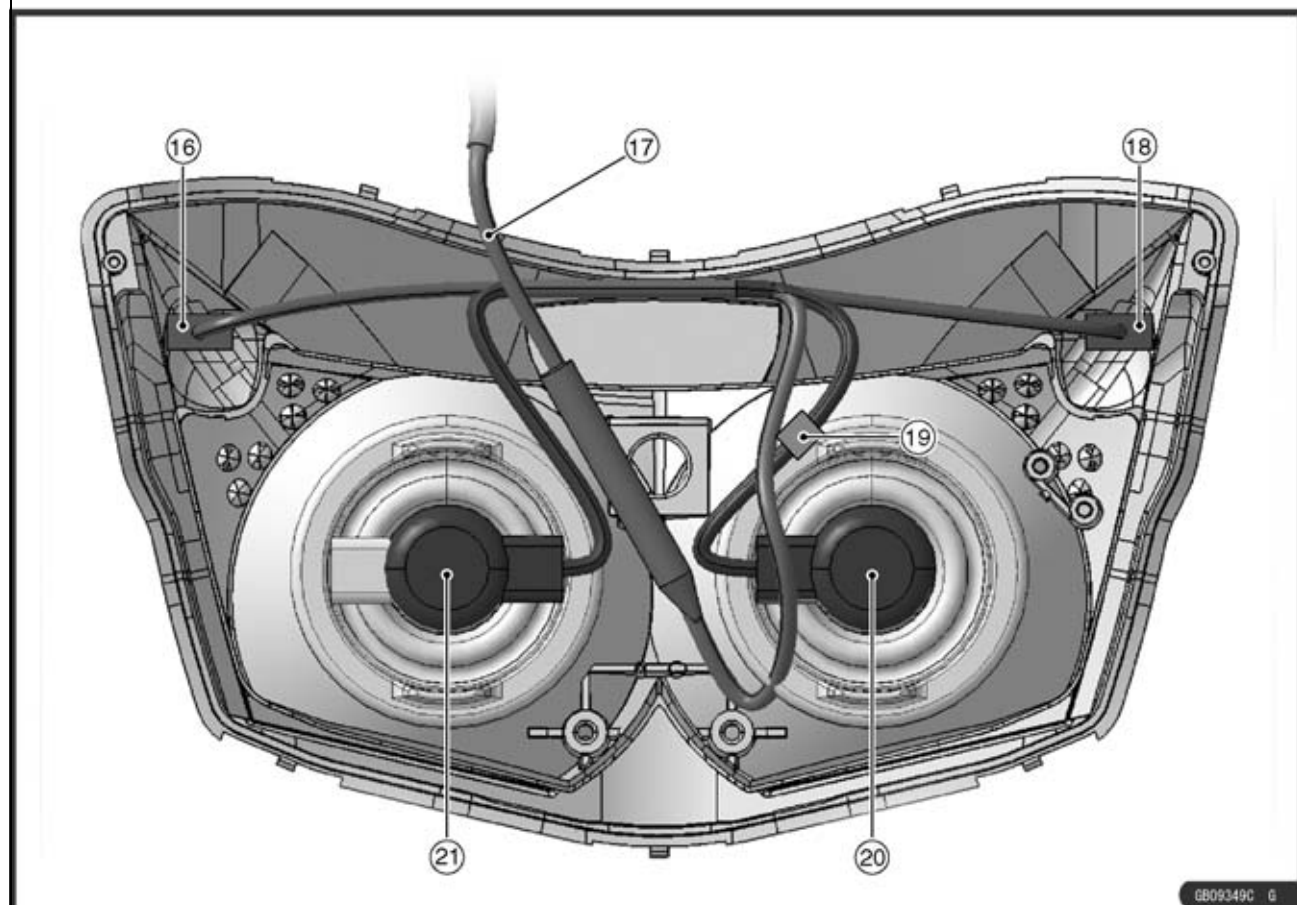
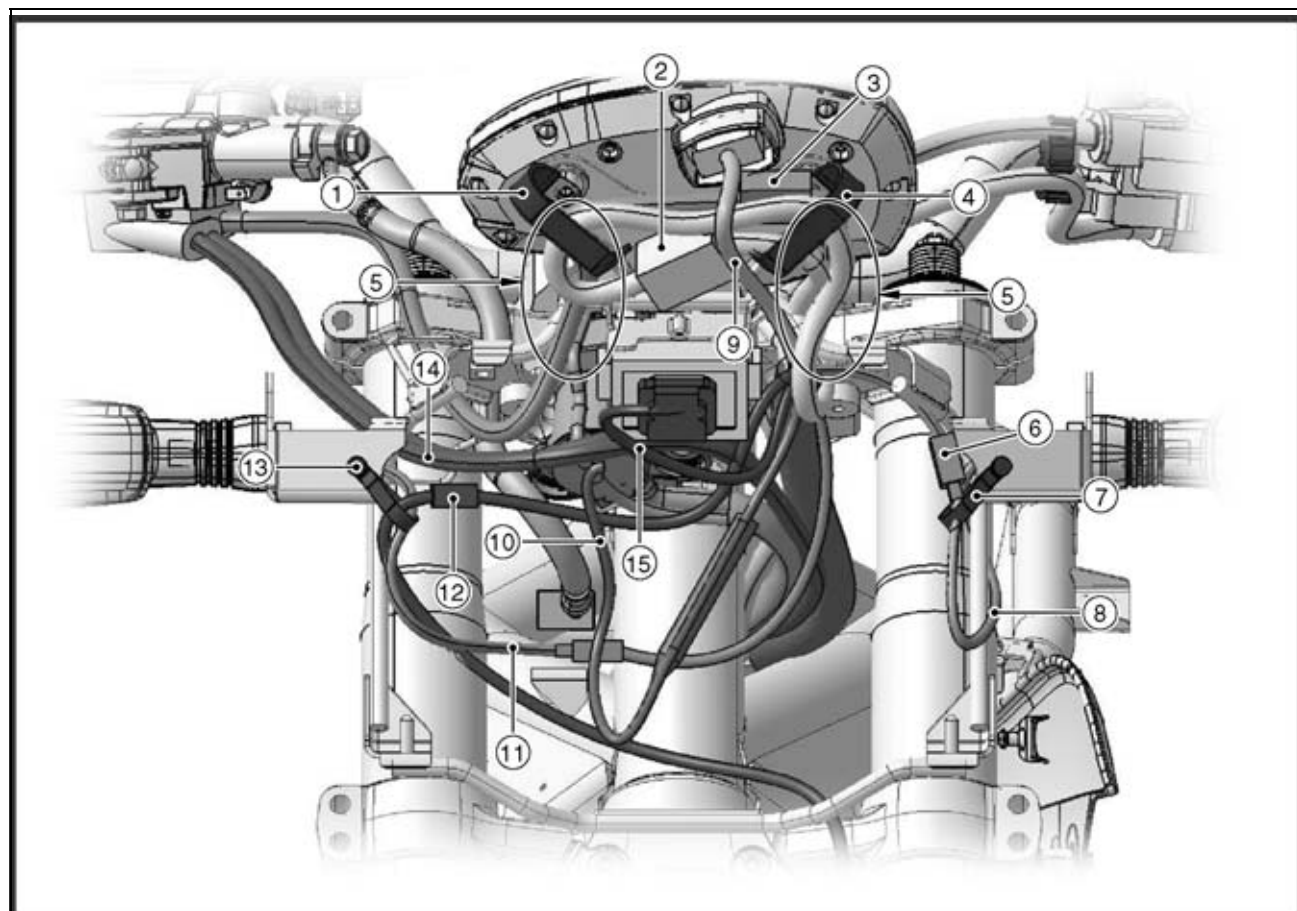
**Cable, Wire, and Hose Routing**

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1. Rear Seat Lock Cable
2. Right Rear Turn Signal Light Lead
3. After inserting the dampers in the brackets, run the right and left turn signal light leads into the dampers.
4. Left Rear Turn Signal Light Lead

## 17-36 APPENDIX

### Cable, Wire, and Hose Routing



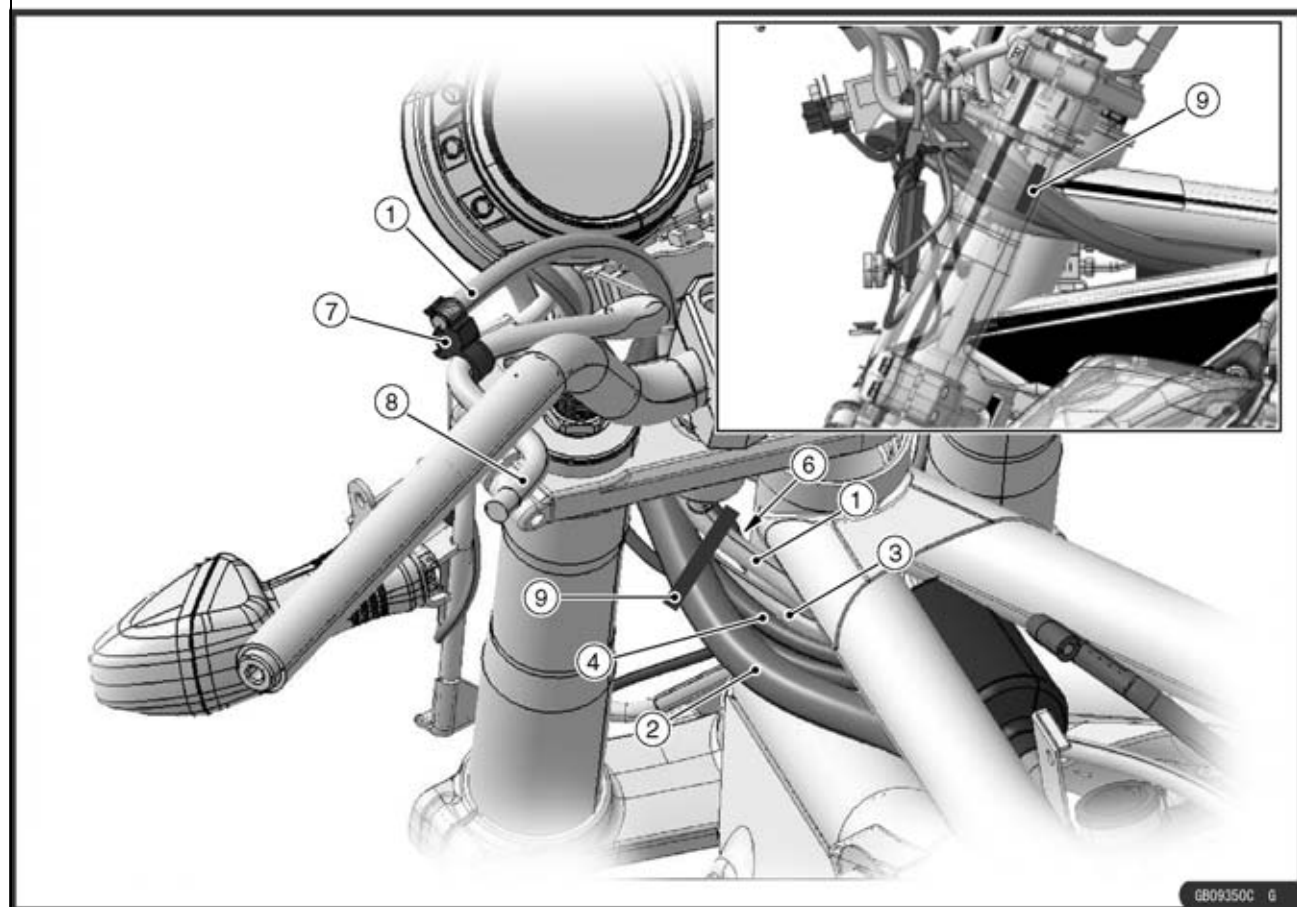
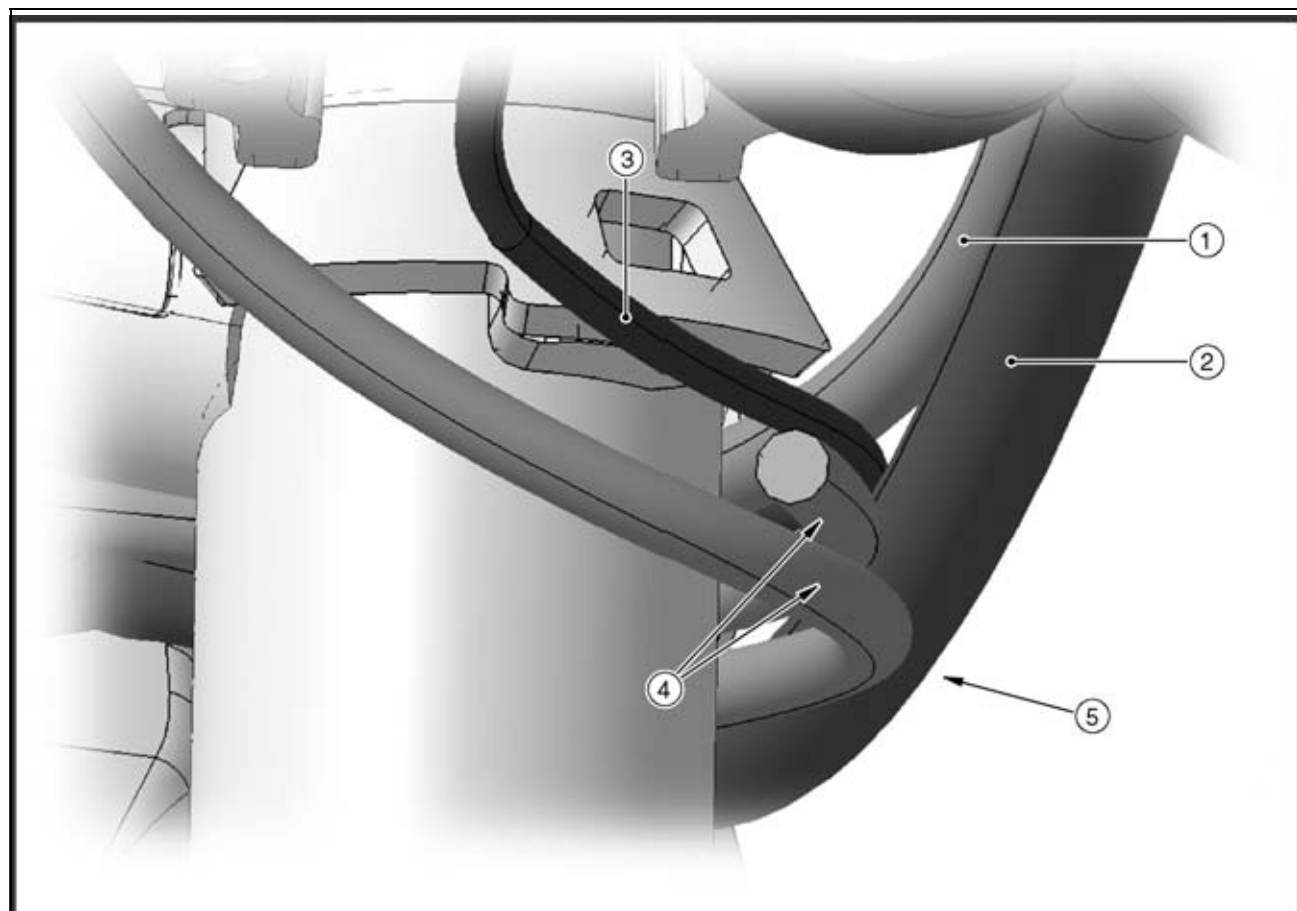


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**Cable, Wire, and Hose Routing**

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1. Clamp (Install the clamp with the meter mounting screw and hold the right and left switch housing leads.)
2. Left Switch Housing Lead Connector
3. Position the left switch housing lead connector inside the clamp.
4. Clamp (Install the clamp with the meter mounting screw and hold the right and left switch housing leads.)
5. Position the right and left leads to the center of the frame as much as possible and clamp them.
6. Position the left front turn signal light lead connector to upper side of the clamp.
7. Clamp (Hold the turn signal light lead.)
8. Run the left front turn signal light lead the backside of the fairing bracket.
9. Run the meter lead the side of the immobilizer amplifier.
10. To Headlight
11. Right Front Turn Signal Light Lead
12. Front Wheel Rotation Sensor Lead Connector (ABS Equipped Models)
13. Clamp (Hold the turn signal light lead and front wheel rotation sensor lead.)
14. Run the throttle cables under the right switch housing lead.
15. Immobilizer Amplifier Lead
16. Left City Light Lead Connector
17. To Main Harness
18. Right City Light Lead Connector
19. Green Tape
20. Head Light (High and Low Beams)
21. Head Light (High Beam)

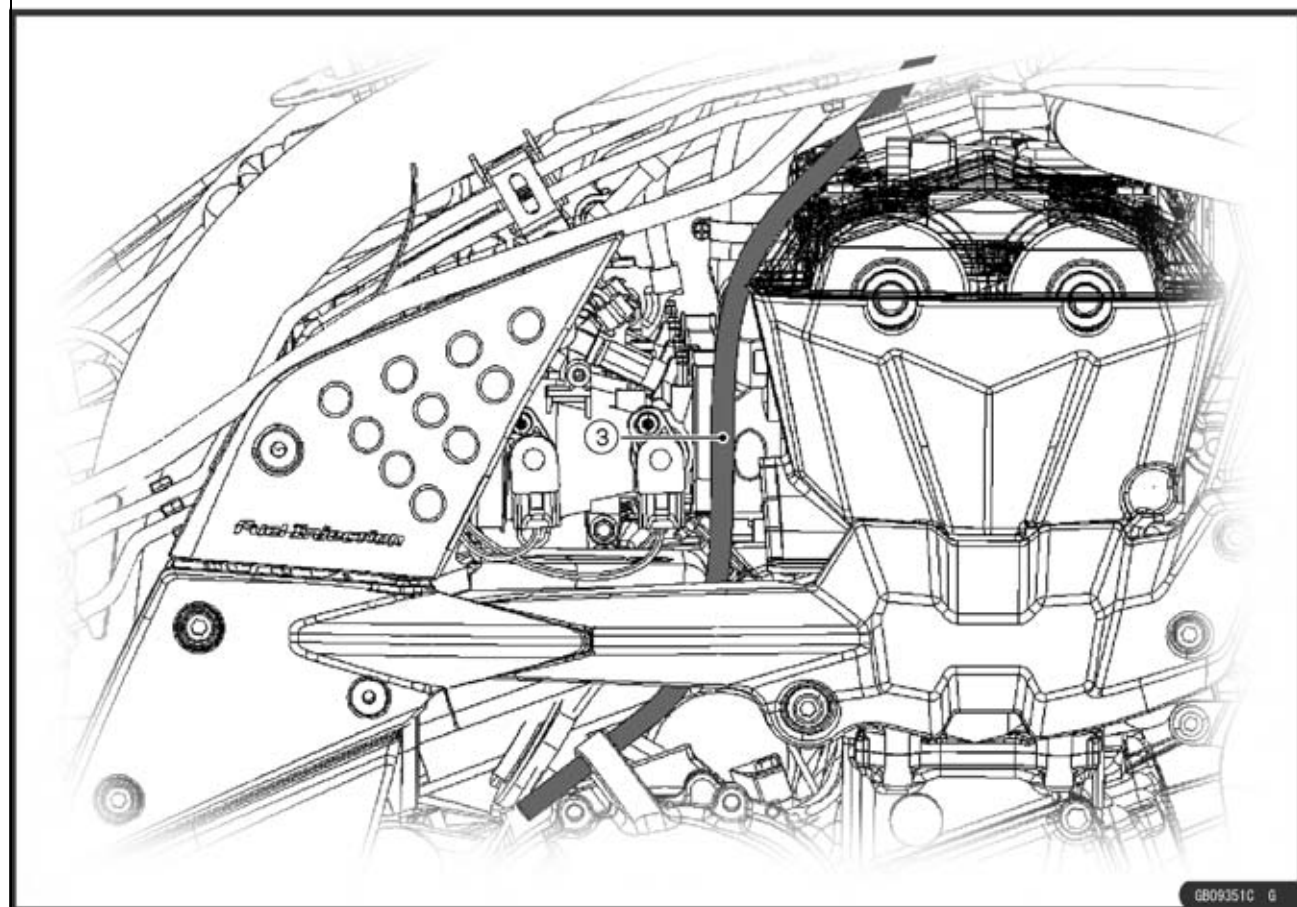
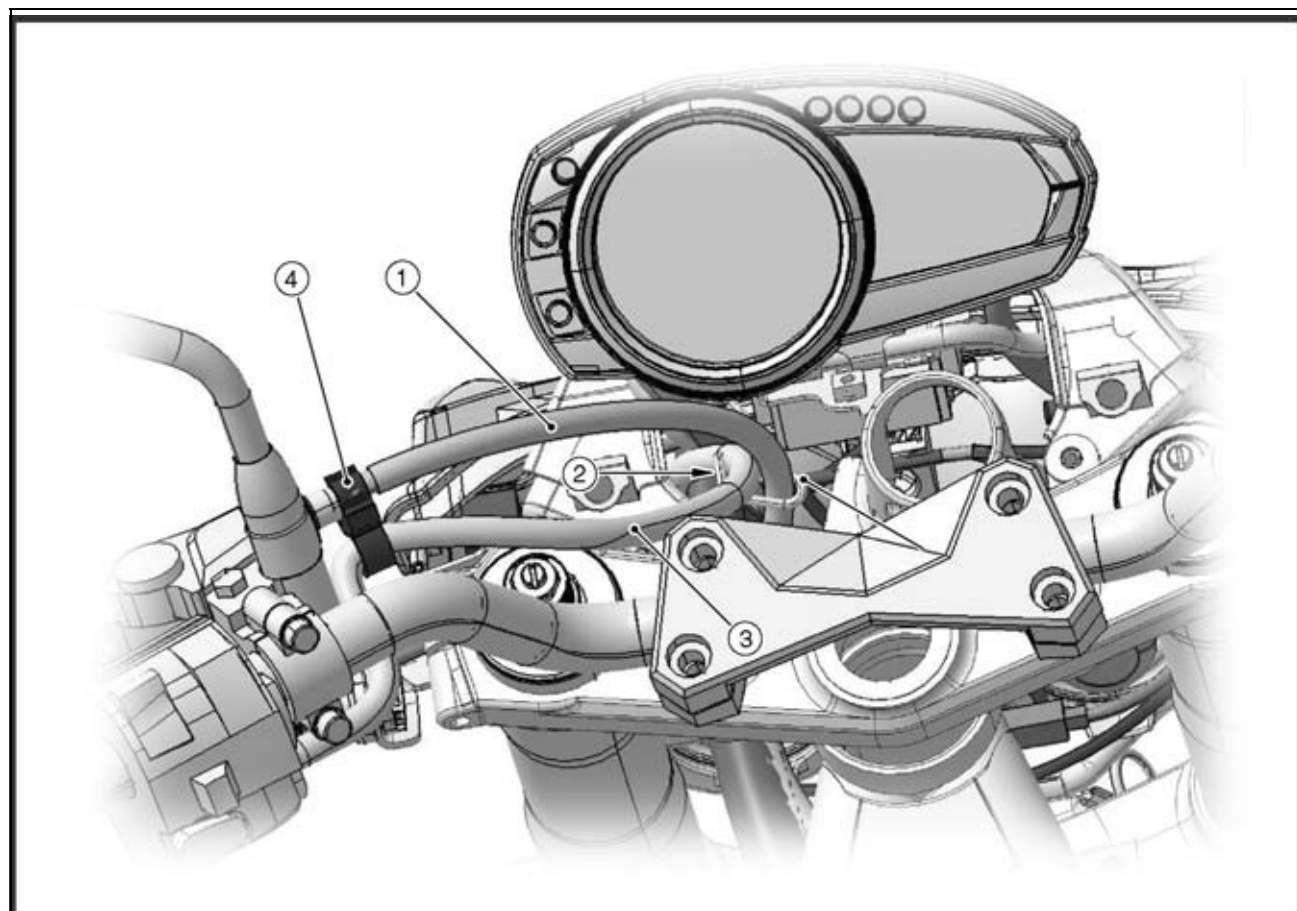


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**Cable, Wire, and Hose Routing**

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1. Clutch Cable
2. Main Harness
3. Ignition Switch and Immobilizer Antenna Leads
4. Throttle Cables
5. From head pipe side, run the clutch cable, ignition switch and immobilizer antenna leads, throttle cables and main harness.
6. From chassis upper side, run the clutch cable, ignition switch and immobilizer antenna leads, throttle cables and main harness.
7. Clamp (Hold the clutch cable and left switch housing lead from the backside of the chassis.)
8. Left Switch Housing Lead
9. Band (Hold the main harness and clutch cable at inside of the front fork. Position the band at 20 mm (0.79 in.) from the end of PVC-sheet on the main harness.

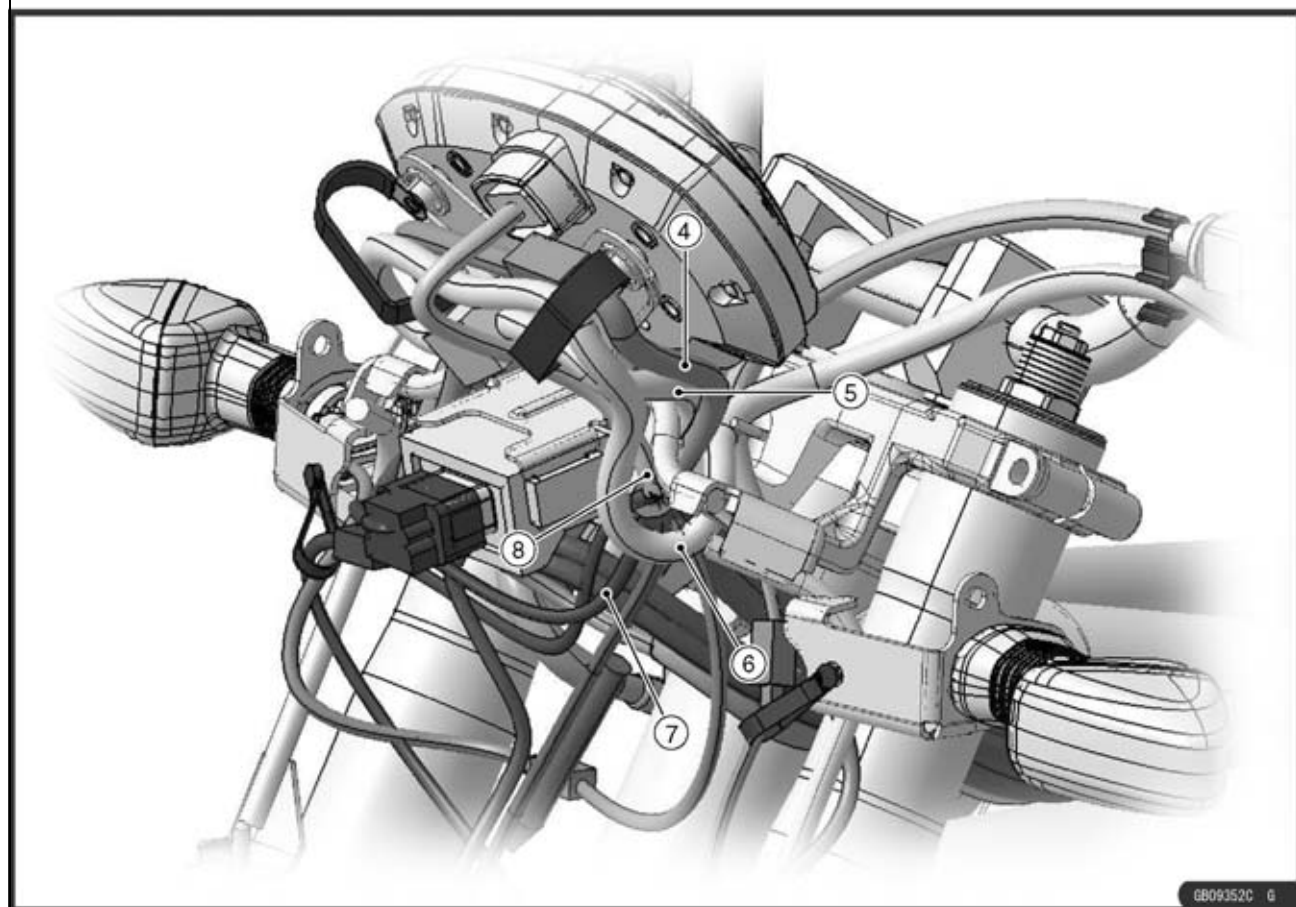
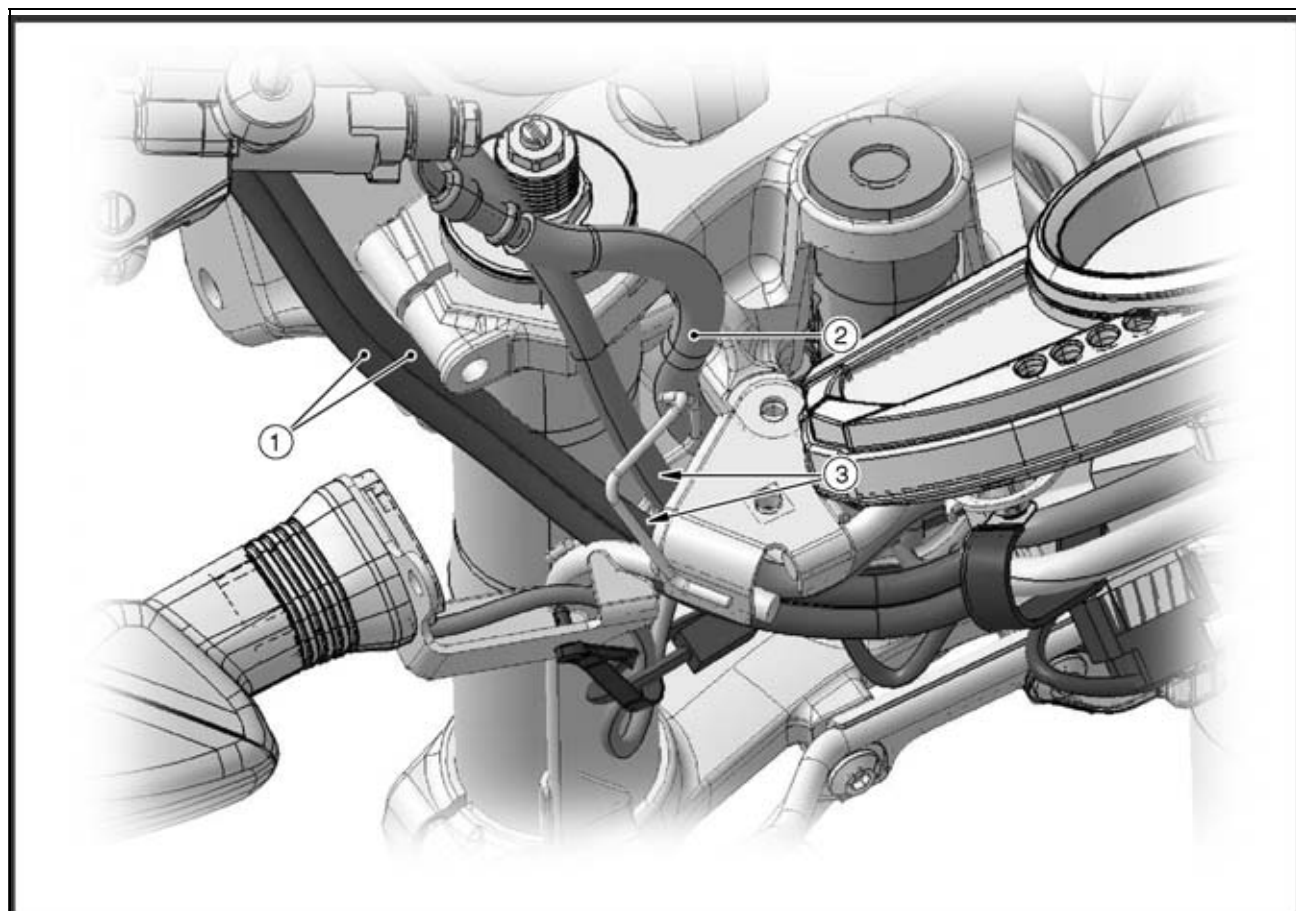


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**Cable, Wire, and Hose Routing**

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1. Clutch Cable
2. Run the clutch cable and left switch housing lead inside the guide of the upper fairing bracket.  
Run the left switch housing lead to the front of the clutch cable.
3. Left Switch Housing Lead
4. Insert the clamp from backside of the chassis.



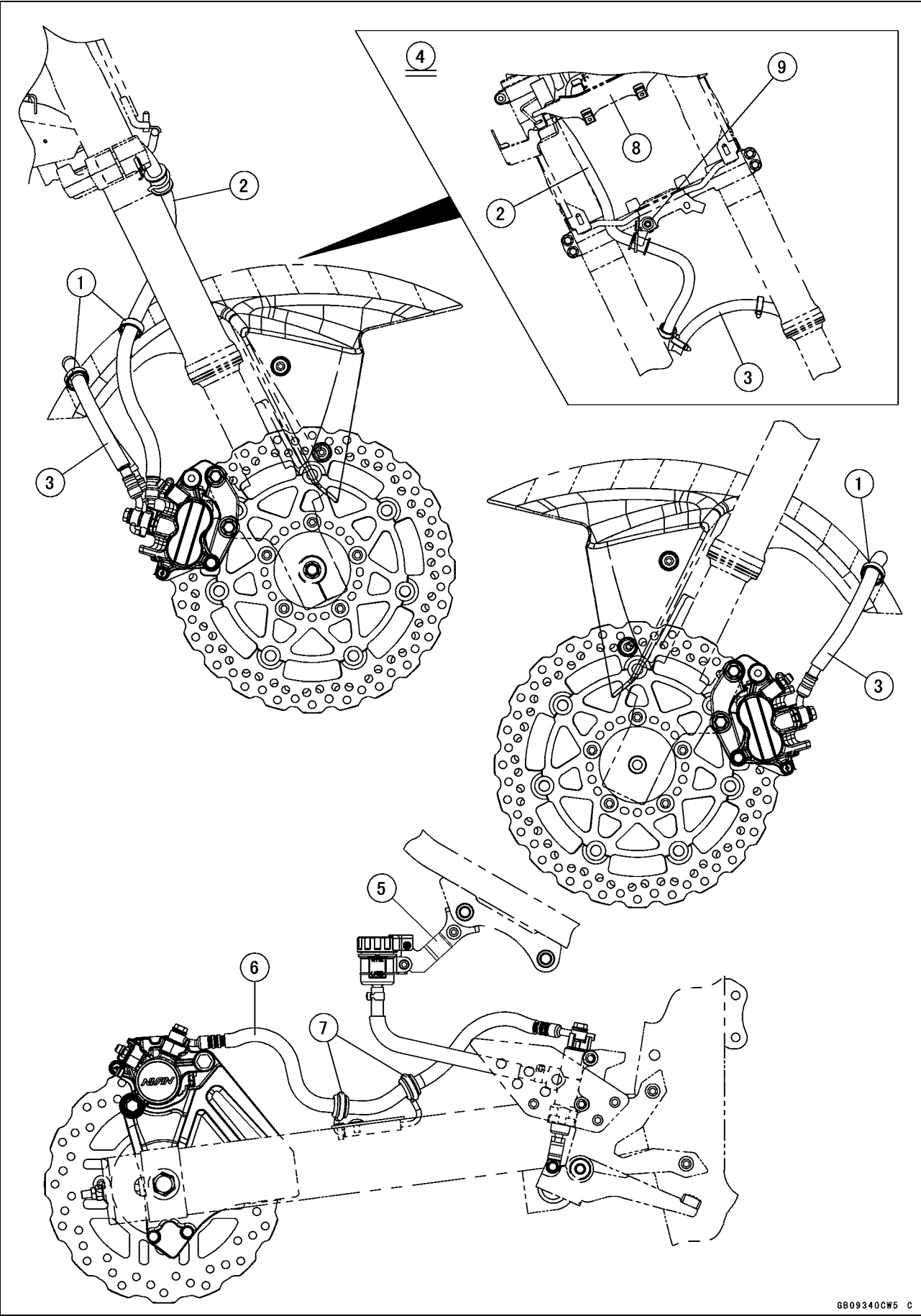
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**Cable, Wire, and Hose Routing**

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1. Run the throttle cables under the upper fairing bracket.
2. Run the brake hose outside the guide of the upper fairing bracket.
3. Run the throttle cables and right switch housing lead inside the guide of the upper fairing bracket.
4. Run the left switch housing lead over the upper fairing bracket.
5. Run the right switch housing lead (main harness side) over the upper fairing bracket.
6. Run the right switch housing lead (switch housing side) under the upper fairing bracket.
7. Run the immobilizer amplifier lead under the upper fairing bracket.
8. Run the meter lead under the upper fairing bracket.

Cable, Wire, and Hose Routing





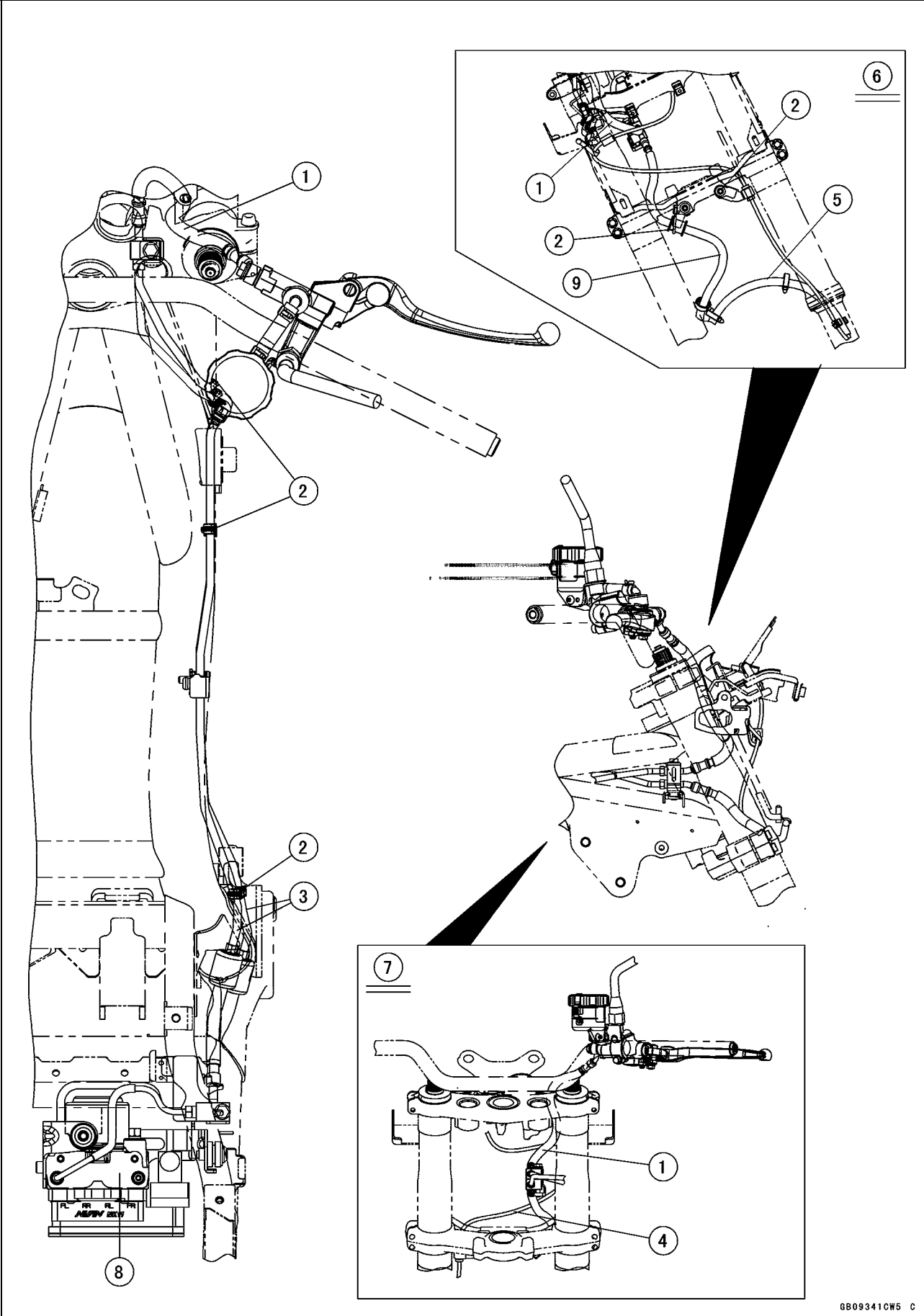
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**Cable, Wire, and Hose Routing**

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1. Clamps
2. Brake Hose (From Front Master Cylinder to Right Front Caliper)
3. Brake Hose (From Right Front Caliper to Left Front Caliper)
4. Viewed Front Side
5. Bracket
6. Brake Hose (From Rear Master Cylinder to Rear Caliper)
7. Clamps
8. Upper Fairing Bracket
9. Clamp

ABS Equipped Models



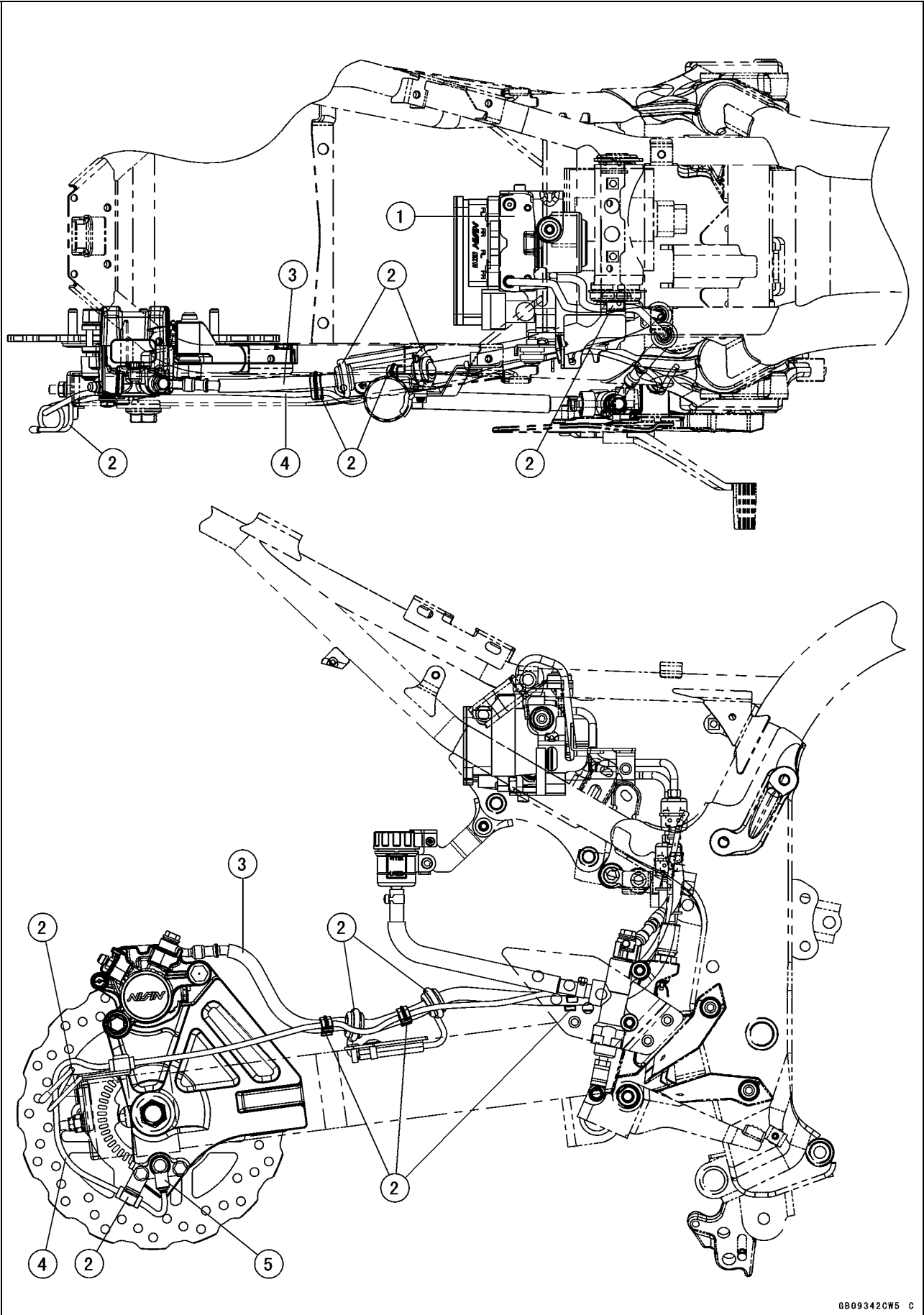
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**Cable, Wire, and Hose Routing**

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1. Brake Hose (From Front Master Cylinder to ABS Hydraulic Unit)
2. Clamps
3. Brake Pipes
4. Front Wheel Rotation Sensor Lead
5. Brake Hose (From Right Front Caliper to Left Front Caliper)
6. Viewed Front Side
7. Viewed Back Side
8. ABS Hydraulic Unit
9. Brake Hose (From ABS Hydraulic Unit to Right Front Caliper)

ABS Equipped Models



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**Cable, Wire, and Hose Routing**

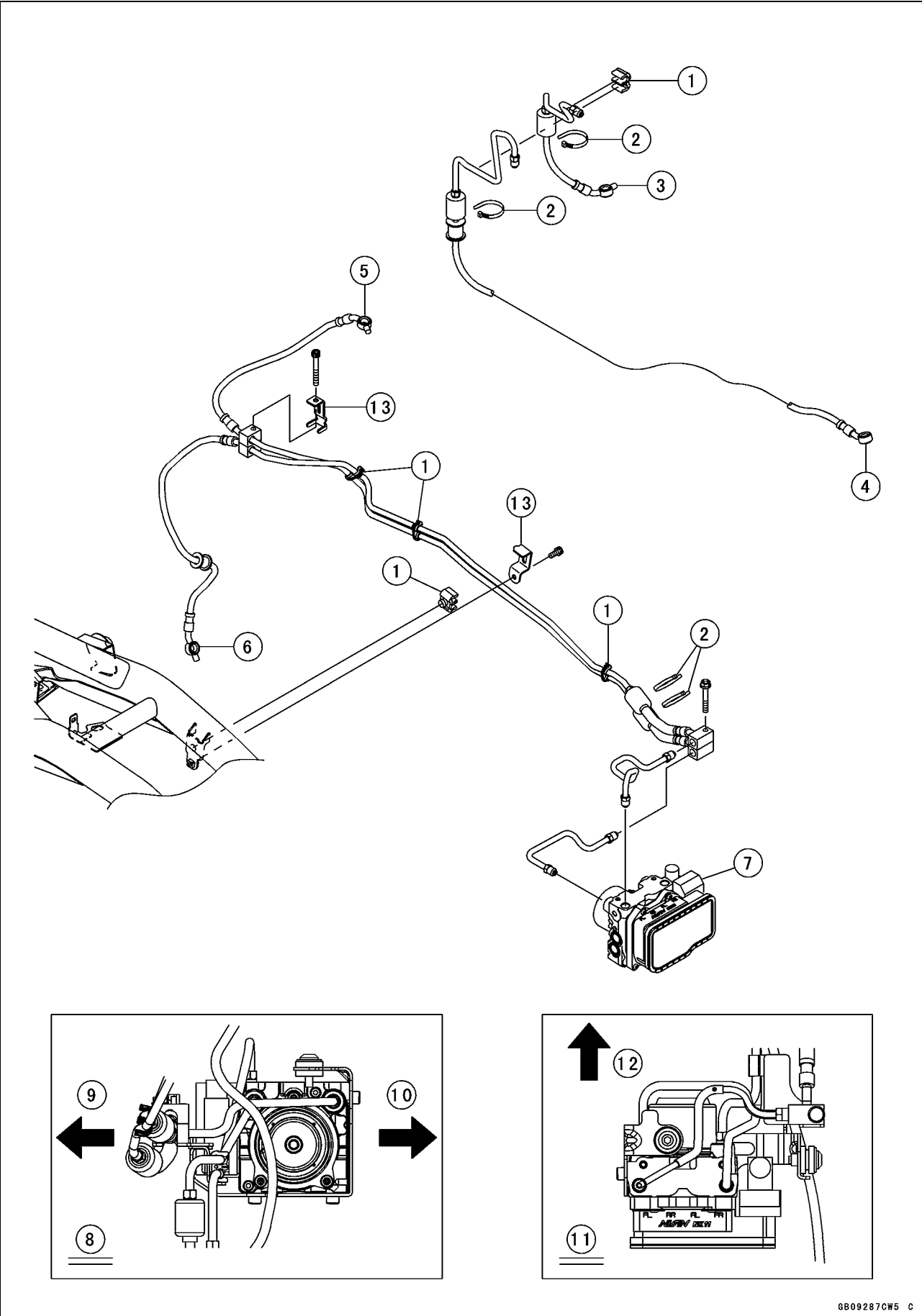
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1. ABS Hydraulic Unit
2. Clamps
3. Brake Hose (From ABS Hydraulic Unit to Rear Caliper)
4. Rear Wheel Rotation Sensor Lead
5. Rear Wheel Rotation Sensor

17-50 APPENDIX

Cable, Wire, and Hose Routing

ABS Equipped Models



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**Cable, Wire, and Hose Routing**

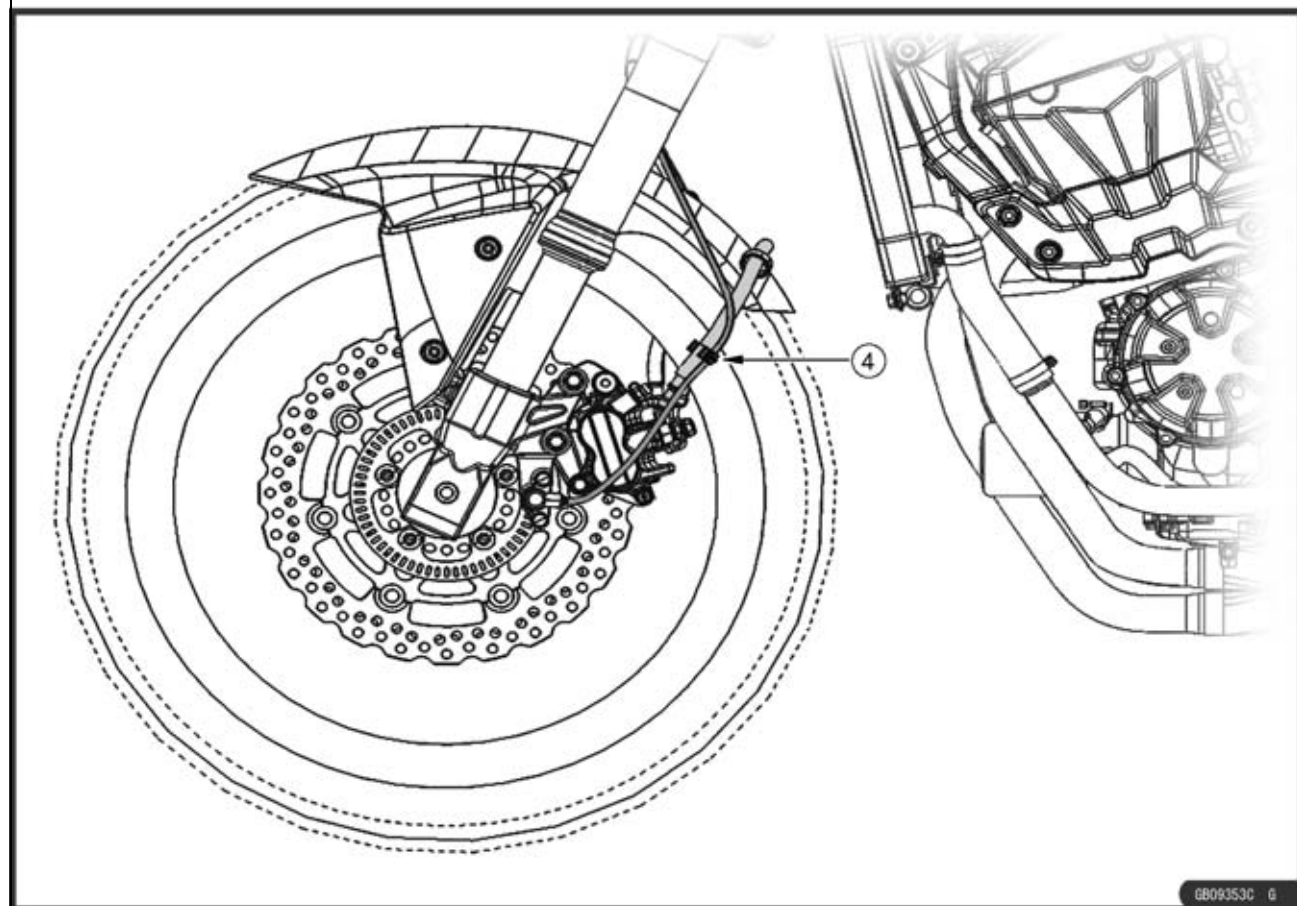
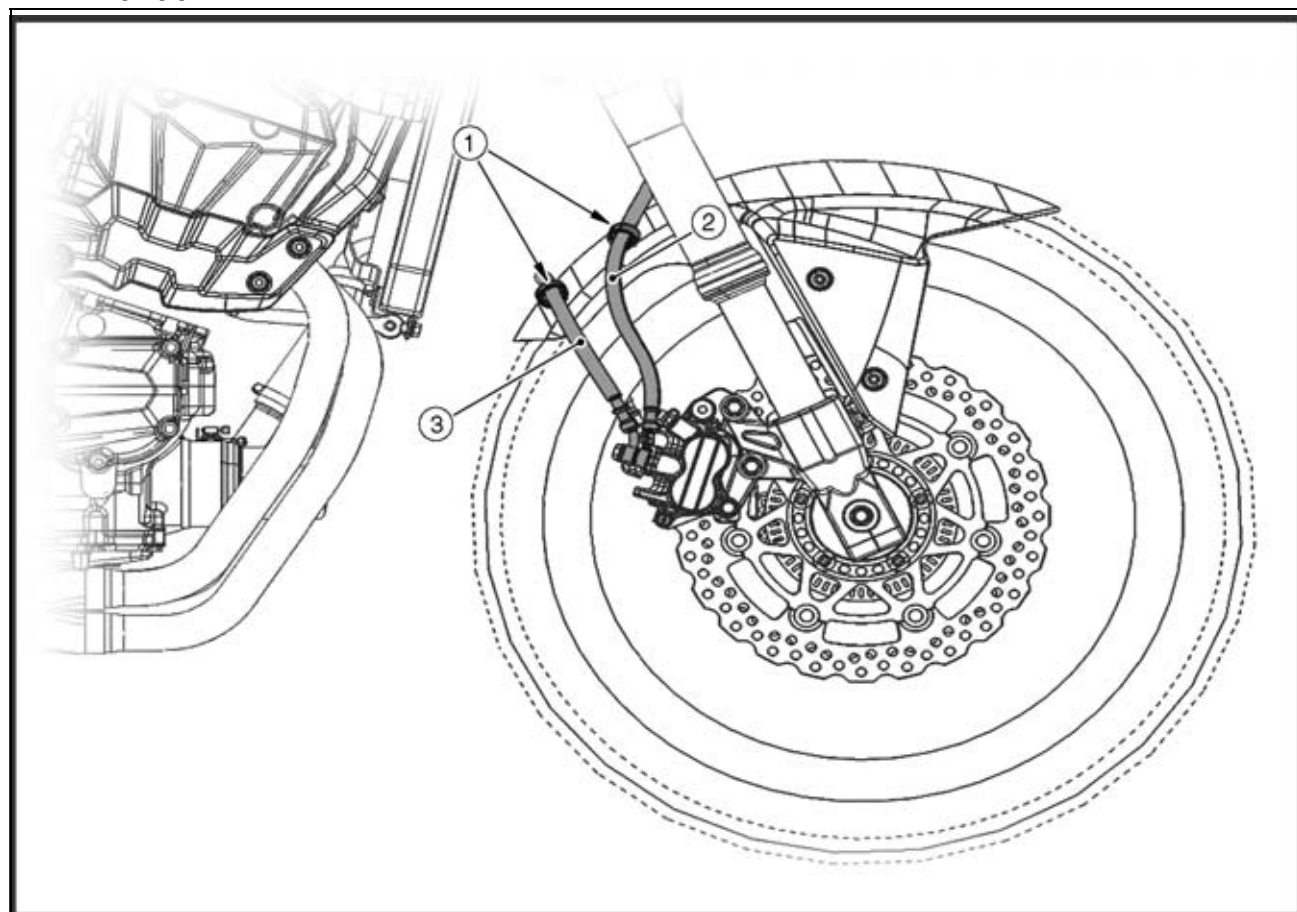
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1. Clamps
2. Bands
3. To Rear Master Cylinder
4. To Rear Caliper
5. To Front Master Cylinder
6. To Right Front Caliper
7. ABS Hydraulic Unit
8. Viewed Front Side
9. Left Side
10. Right Side
11. Viewed Upper Side
12. Front
13. Brackets

## 17-52 APPENDIX

### Cable, Wire, and Hose Routing

#### ABS Equipped Models





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**Cable, Wire, and Hose Routing**

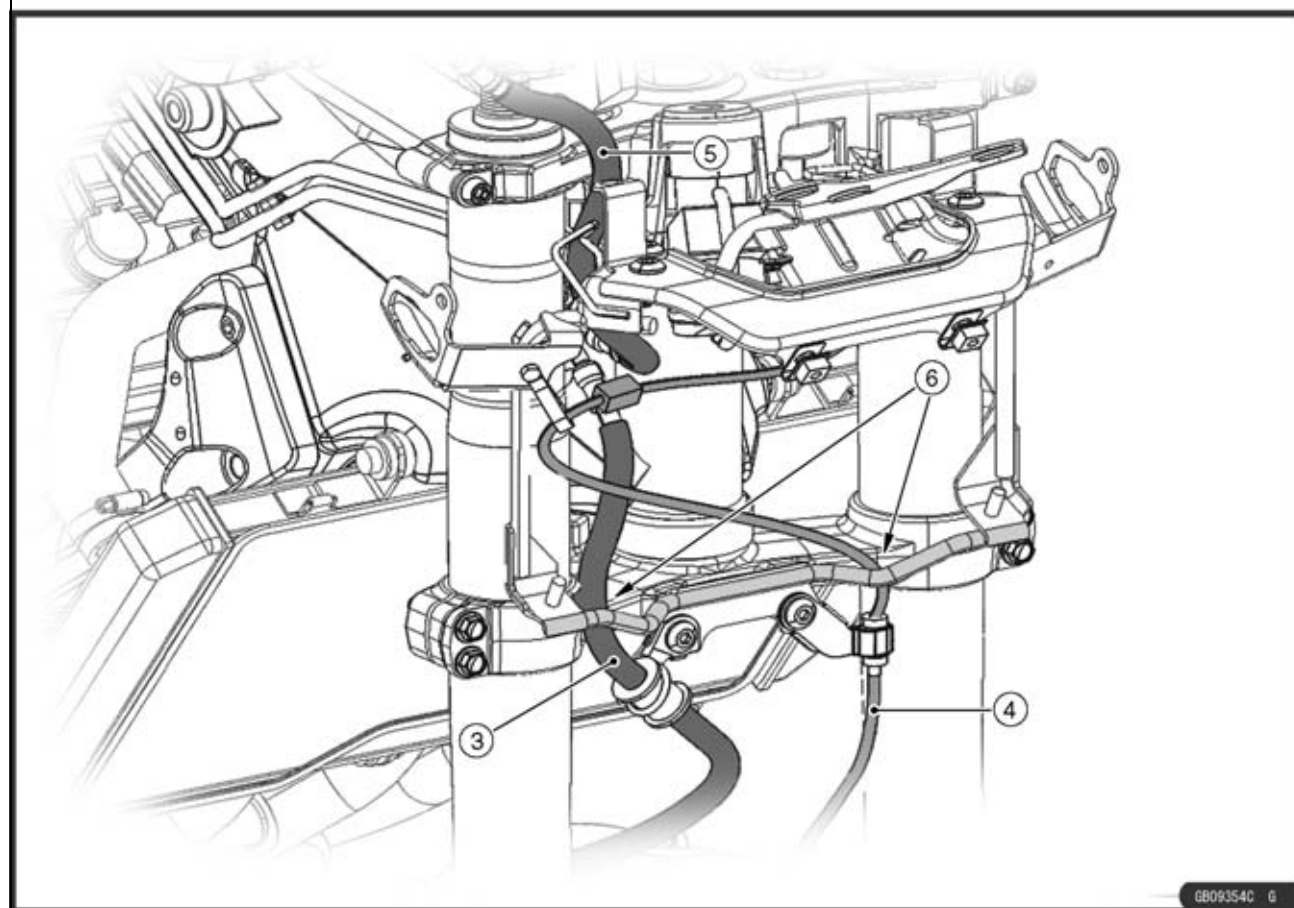
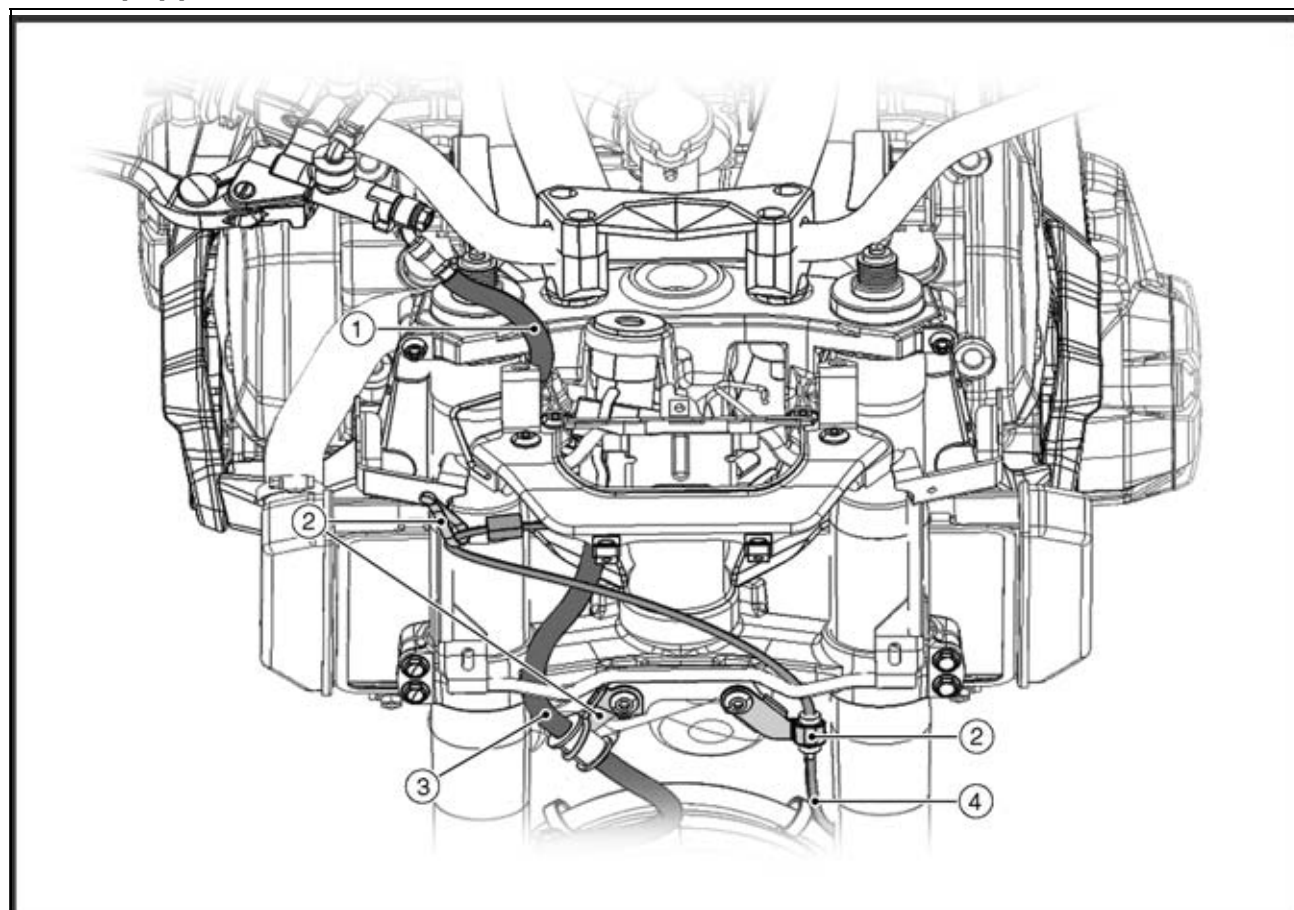
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1. Clamps
2. Brake Hose (From ABS Hydraulic Unit to Right Front Caliper)
3. Brake Hose (From Right Front Caliper to Left Front Caliper)
4. Clamp (Hold the brake hose (from right front caliper to left front caliper) and front wheel rotation sensor lead on the white tape.)

## 17-54 APPENDIX

### Cable, Wire, and Hose Routing

#### ABS Equipped Models



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**Cable, Wire, and Hose Routing**

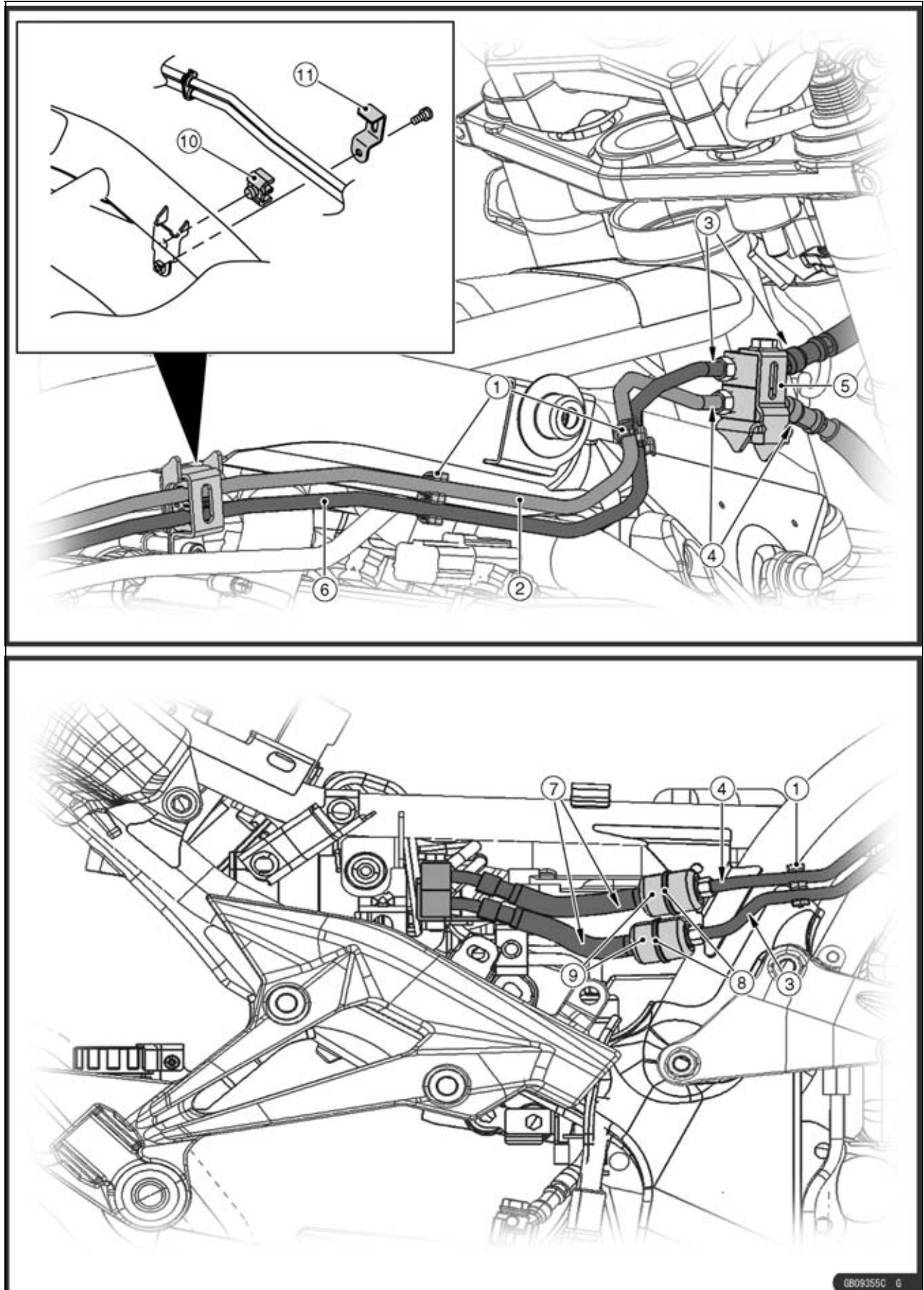
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1. Run the brake hose (from front master cylinder to ABS hydraulic unit) between the steering stem head and guide of the upper fairing bracket.
2. Clamps
3. Brake Hose (From ABS Hydraulic Unit to Right Front Caliper)
4. Front Wheel Rotation Sensor Lead
5. Brake Hose (From Front Master Cylinder to ABS Hydraulic Unit)
6. Run the brake hose and front wheel rotation sensor lead between the steering stem and upper fairing bracket.

## 17-56 APPENDIX

### Cable, Wire, and Hose Routing

#### ABS Equipped Models



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**Cable, Wire, and Hose Routing**

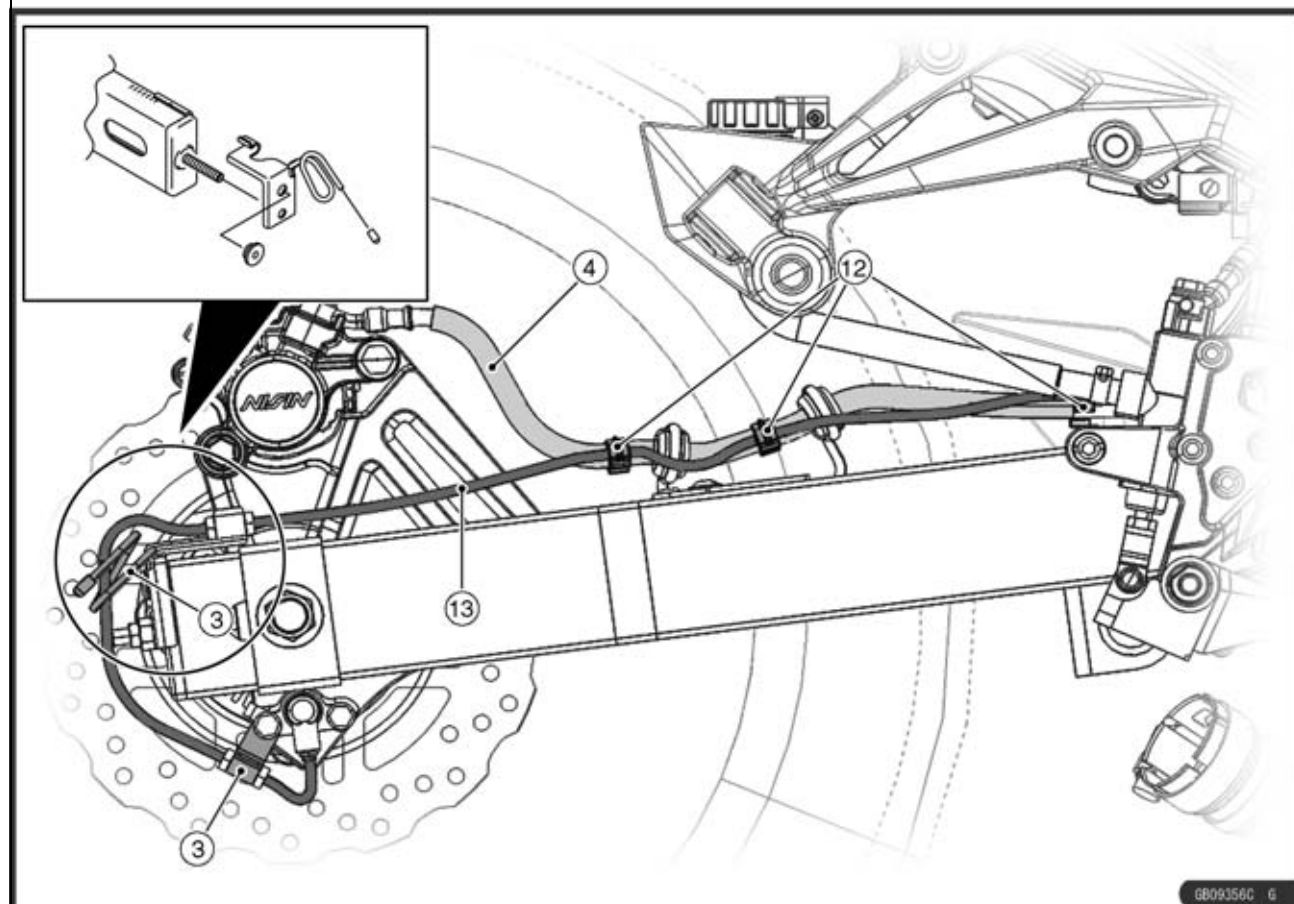
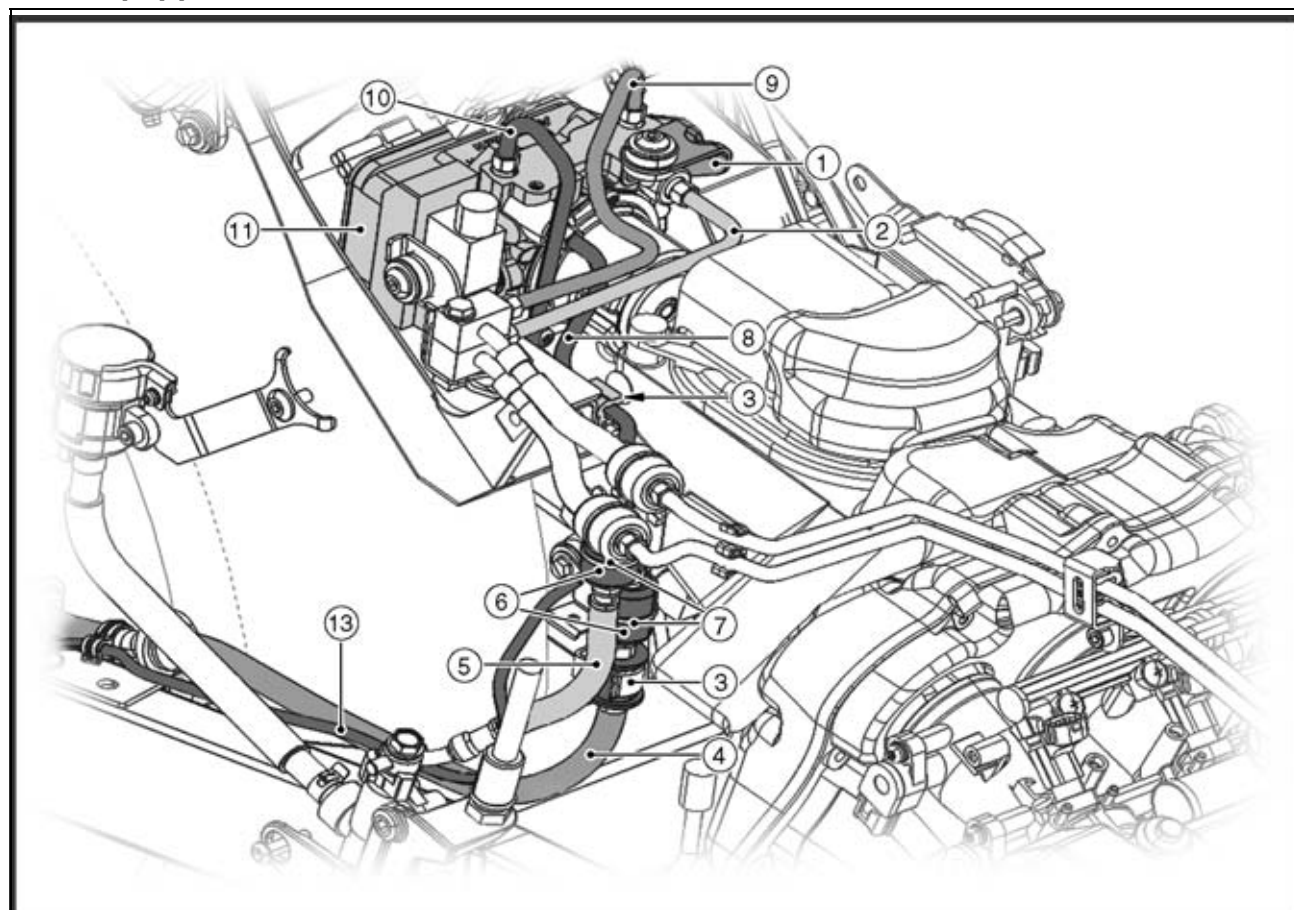
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1. Clamps
2. Brake Pipe
3. One White Paint Mark
4. One Blue Paint Mark
5. Bracket
6. Brake Pipe
7. Brake Hoses (One White Paint Mark)
8. Bands
9. Grommets
10. Clamp
11. Bracket

## 17-58 APPENDIX

### Cable, Wire, and Hose Routing

#### ABS Equipped Models



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**Cable, Wire, and Hose Routing**

---

1. Bracket
2. Brake Pipe (One White Paint Mark)
3. Clamps
4. Brake Hose (Two Blue Paint Marks)
5. Brake Hose (Two White Paint Marks)
6. Grommets
7. Bands
8. Brake Pipe (Two White Paint Marks)
9. Brake Pipe (One Blue Paint Mark)
10. Brake Pipe (Two Blue Paint Marks)
11. ABS Hydraulic Unit
12. Clamps (Hold the brake hose (ABS hydraulic unit to rear caliper) and rear wheel rotation sensor lead on the white tape.)
13. Rear Wheel Rotation Sensor Lead

## Troubleshooting Guide

### NOTE

- Refer to the *Fuel System* chapter for most of DFI trouble shooting guide.
- This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.

### Engine Doesn't Start, Starting Difficulty:

#### **Starter motor not rotating:**

- Ignition and engine stop switch not ON
- Starter lockout switch or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relay not contacting or operating
- Starter button not contacting
- Starter system wiring shorted or open
- Ignition switch trouble
- Engine stop switch trouble
- Main 30 A or ignition fuse blown

#### **Starter motor rotating but engine doesn't turn over:**

- Vehicle-down sensor (DFI) coming off
- Immobilizer system trouble
- Starter clutch trouble
- Starter idle gear trouble

#### **Engine won't turn over:**

- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure

#### **No fuel flow:**

- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

#### **No spark; spark weak:**

- Vehicle-down sensor (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned OFF
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- Immobilizer system trouble
- Spark plug dirty, broken, or gap maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact

- Stick coil trouble
- ECU trouble
- Camshaft position sensor trouble
- Neutral, starter lockout, or sidestand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine stop switch shorted
- Starter system wiring shorted or open
- Main 30 A or ignition fuse blown

#### **Fuel/air mixture incorrect:**

- Bypass screw and/or idle adjusting screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Leak from oil filler cap, crankcase breather hose or air cleaner drain hose.

#### **Compression Low:**

- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- No valve clearance
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

### Poor Running at Low Speed:

#### **Spark weak:**

- Battery voltage low
- Immobilizer system trouble
- Stick coil trouble
- Stick coil shorted or not in good contact
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble
- Camshaft position sensor trouble
- Crankshaft sensor trouble

#### **Fuel/air mixture incorrect:**

- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Throttle body assy holder loose
- Air cleaner duct loose



## Troubleshooting Guide

### Compression low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
- Camshaft cam worm

### Run-on (dieseling):

- Ignition switch trouble
- Engine stop switch trouble
- Fuel injector trouble
- Loosen terminal of battery (–) cable or ECU ground lead
- Carbon accumulating on valve seating surface
- Engine overheating

### Other:

- ECU trouble
- Throttle body assy not synchronizing
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging
- Clutch slipping
- Engine overheating
- Air suction valve trouble
- Air switching valve trouble

## Poor Running or No Power at High Speed:

### Firing incorrect:

- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact trouble
- Stick coil trouble
- ECU trouble

### Fuel/air mixture incorrect:

- Air cleaner clogged, poorly sealed, or missing
- Air cleaner duct loose
- Water or foreign matter in fuel
- Throttle body assy holder loose
- Fuel to injector insufficient
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble

### Compression low:

- Spark plug loose

- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

### Knocking:

- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- ECU trouble

### Miscellaneous:

- Throttle valve won't fully open
- Brake dragging
- Clutch slipping
- Engine overheating
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Camshaft cam worm
- Air suction valve trouble
- Air switching valve trouble
- Catalytic converter melt down due to muffler overheating (KLEEN)

## Overheating:

### Firing incorrect:

- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble

### Muffler overheating:

- For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)

- For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)

- For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil

- For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)

- ECU trouble

### Fuel/air mixture incorrect:

- Throttle body assy holder loose
- Air cleaner duct loose
- Air cleaner poorly sealed, or missing

### Troubleshooting Guide

---

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

**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 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:**

Thermostat trouble

**Clutch Operation Faulty:**

**Clutch slipping:**

Friction plate worn or warped

Steel plate worn or warped

Clutch spring broken or weak

Clutch hub or housing unevenly worn

No clutch lever play

Clutch inner cable trouble

Clutch release mechanism trouble

**Clutch not disengaging properly:**

Clutch plate warped or too rough

Clutch spring compression uneven

Engine oil deteriorated

Engine oil viscosity too high

Engine oil level too high

Clutch housing frozen on drive shaft

Clutch hub nut loose

Clutch hub spline damaged

Clutch friction plate installed wrong

Clutch lever play excessive

Clutch release mechanism trouble

**Gear Shifting Faulty:**

**Doesn't go into gear; shift pedal doesn't return:**

Clutch not disengaging

Shift fork bent or seized

Gear stuck on the shaft

Gear positioning lever binding

Shift return spring weak or broken

Shift return spring pin loose

Shift mechanism arm spring broken

Shift mechanism arm broken

Shift pawl broken

**Jumps out of gear:**

Shift fork ear worn, bent

Gear groove worn

Gear dogs and/or dog holes worn

Shift drum groove worn

Gear positioning lever spring weak or broken

Shift fork guide pin worn

Drive shaft, output shaft, and/or gear splines worn

**Overshifts:**

Gear positioning lever spring weak or broken

Shift mechanism arm spring broken

**Abnormal Engine Noise:**

**Knocking:**

ECU trouble

Carbon built up in combustion chamber

Fuel poor quality or incorrect

Spark plug incorrect

Overheating

**Piston slap:**

Cylinder/piston clearance excessive

Cylinder, piston worn

Connecting rod bent

Piston pin, piston pin hole worn

**Valve noise:**

Valve clearance incorrect

Valve spring broken or weak

Camshaft bearing worn

Valve lifter worn

**Other noise:**

Connecting rod small end clearance excessive

Connecting rod big end clearance excessive

Piston ring/groove clearance excessive

Piston ring worn, broken, or stuck

Piston ring groove worn

Piston seizure, damage

Cylinder head gasket leaking

## Troubleshooting Guide

Exhaust pipe leaking at cylinder head connection  
 Crankshaft runout excessive  
 Engine mount loose  
 Crankshaft bearing worn  
 Primary gear worn or chipped  
 Camshaft chain tensioner trouble  
 Camshaft chain, sprocket, guide worn  
 Air suction valve damaged  
 Air switching valve damaged  
 Alternator rotor loose  
 Catalytic converter melt down due to muffler overheating (KLEEN)  
 Exhaust butterfly valve cable loose

### 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 poorly sealed or missing

### Handling and/or Stability

#### Unsatisfactory:

##### Handlebar hard to turn:

Cable routing incorrect  
 Hose routing incorrect  
 Wiring routing incorrect  
 Steering stem nut too tight  
 Steering stem bearing damaged  
 Steering stem bearing lubrication inadequate  
 Steering stem bent  
 Tire air pressure too low

##### Handlebar shakes or excessively vibrates:

Tire worn  
 Swingarm pivot bearing worn  
 Rim warped, or not balanced  
 Wheel bearing worn  
 Handlebar holder bolt loose  
 Steering stem nut loose  
 Front, rear axle runout excessive  
 Engine mounting 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

##### 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

## 17-64 APPENDIX

### Troubleshooting Guide

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- Front fork oil insufficient and/or leaking
- Front fork oil viscosity too low
- Rear shock adjustment too soft
- Front fork, rear shock absorber spring weak
- Rear shock absorber oil leaking

#### **Brake Doesn't Hold:**

- Air in the brake line
- Pad or disc worn
- Brake fluid leakage
- Disc warped
- Contaminated pad
- Brake fluid deteriorated
- Primary or secondary cup damaged in master cylinder
- Master cylinder scratched inside

#### **Battery Trouble:**

##### **Battery discharged:**

- Charge insufficient
- Battery faulty (too low terminal voltage)
- Battery cable making poor contact
- Load excessive (e.g., bulb of excessive wattage)
- Ignition switch trouble
- Alternator trouble
- Wiring faulty
- Regulator/rectifier trouble

##### **Battery overcharged:**

- Alternator trouble
- Regulator/rectifier trouble
- Battery faulty

## MODEL APPLICATION

Year	Model	Beginning Frame No.
2007	ZR750L7F	JKAZRDL1□7A000001 JKAZR750LLA000001 ZR750L-000001
2007	ZR750M7F	JKAZR750LMA000001

□: This digit in the frame number changes from one machine to another.



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