

**Kawasaki**

**KLR650**



# **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.





**Kawasaki**

**KLR650**

# **Motorcycle Service Manual**

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

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

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

## LIST OF ABBREVIATIONS

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

## COUNTRY AND AREA CODES

AU	Australia	MY	Malaysia
CA	Canada	US	United States
CAL	California	VE	Venezuela

## EMISSION CONTROL INFORMATION

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

### 1. Crankcase Emission Control System

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

### 2. Exhaust Emission Control System

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

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

### 3. Evaporative Emission Control System

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

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

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

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

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

### NOTE

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

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

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

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

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

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

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



# Foreword

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

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

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

To get the longest life out of your vehicle.

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

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## How to Use This Manual

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

### **DANGER**

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

### **WARNING**

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

### **NOTICE**

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

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

### **NOTE**

○ *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

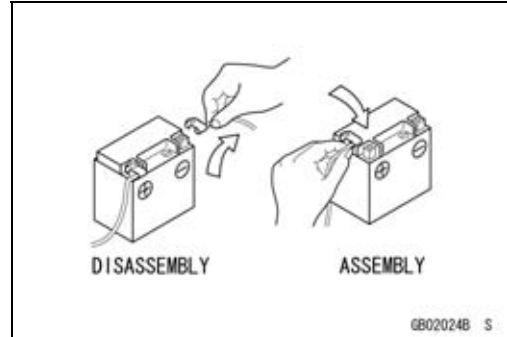
## Before Servicing

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.

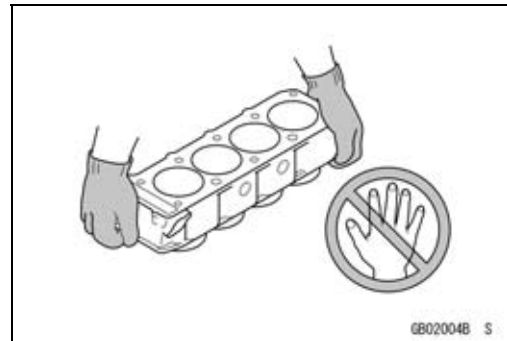
### **Battery Ground**

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.



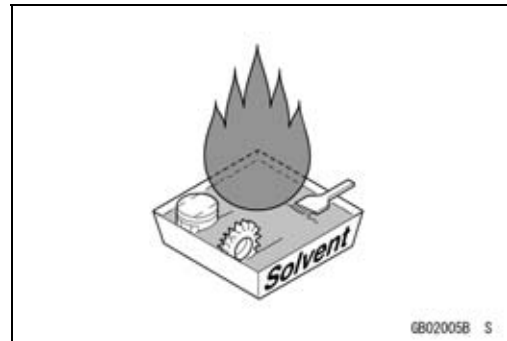
### **Edges of Parts**

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



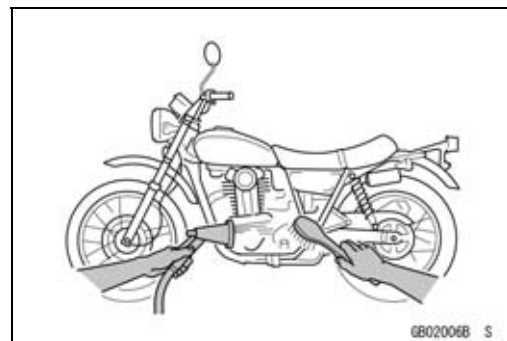
### **Solvent**

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**

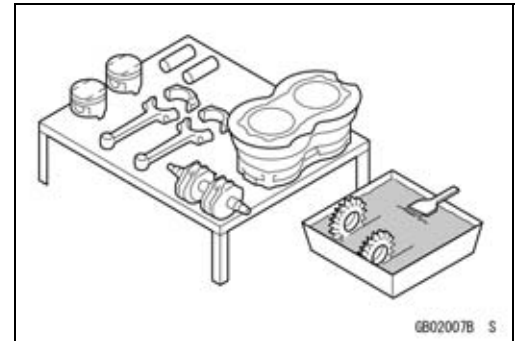
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



## Before Servicing

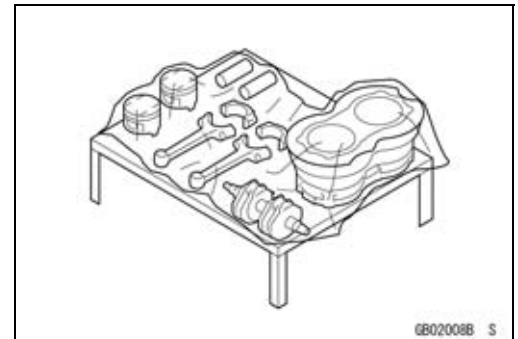
### **Arrangement and Cleaning of Removed Parts**

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.



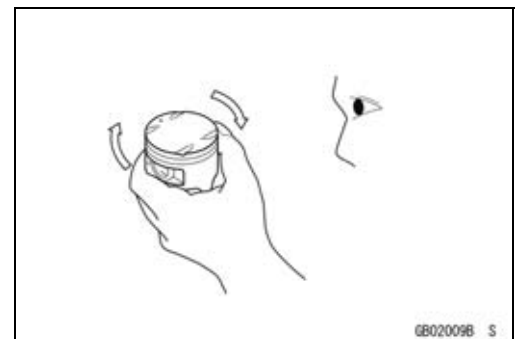
### **Storage of Removed Parts**

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.



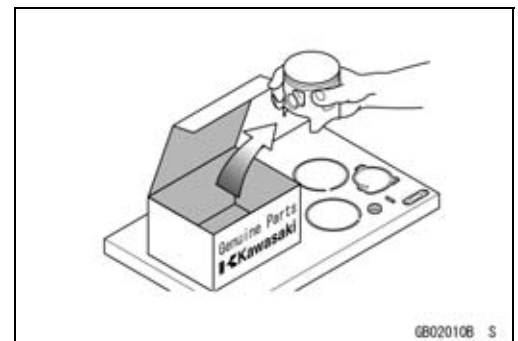
### **Inspection**

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.



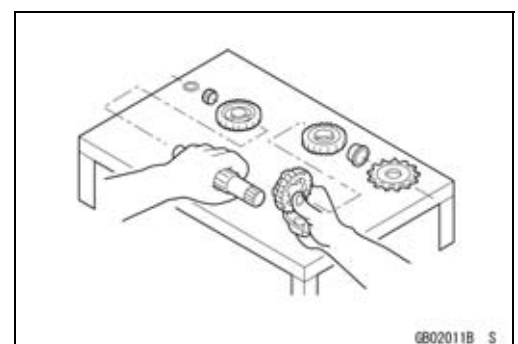
### **Replacement Parts**

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



### **Assembly Order**

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

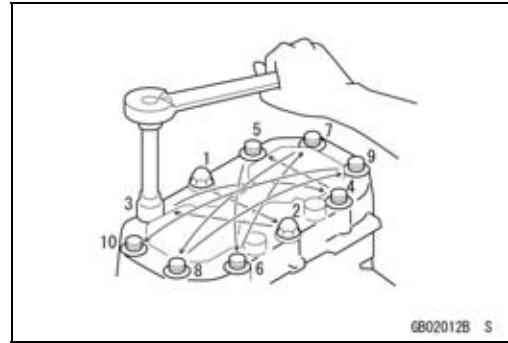


## 1-4 GENERAL INFORMATION

### Before Servicing

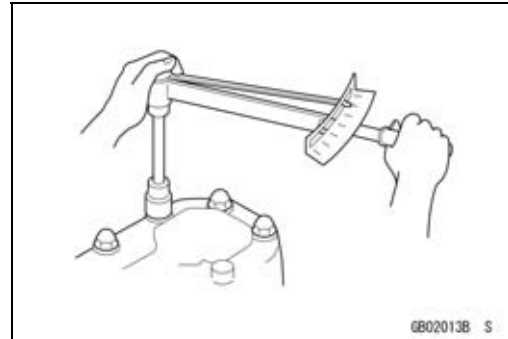
#### **Tightening Sequence**

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



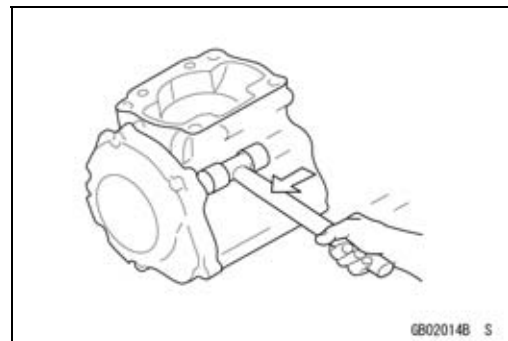
#### **Tightening Torque**

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



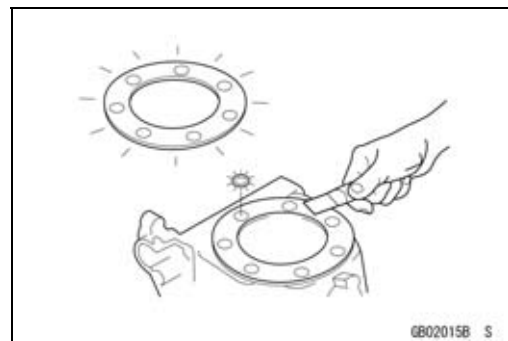
#### **Force**

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**

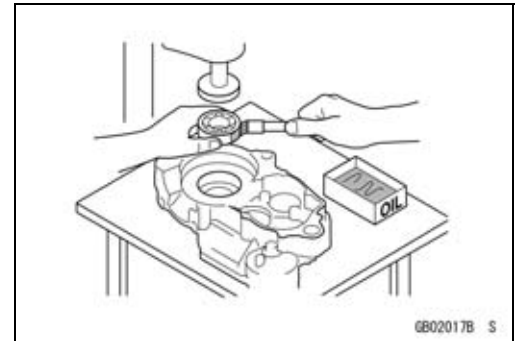
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



**Before Servicing**

**Press**

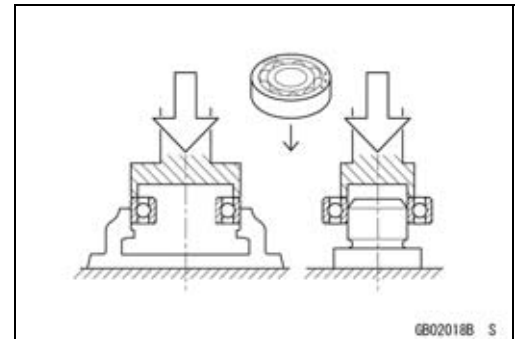
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



**Ball Bearing and Needle Bearing**

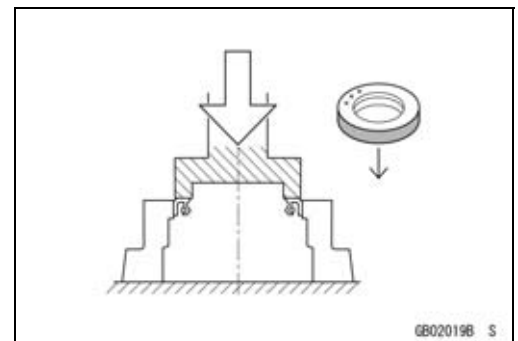
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

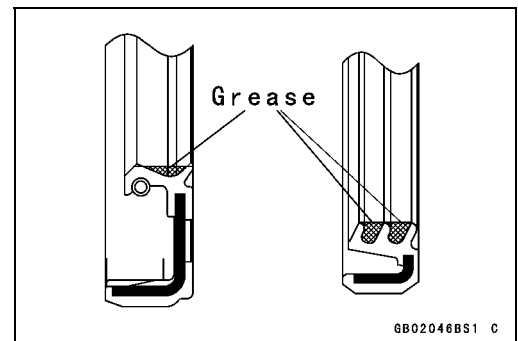


**Oil Seal, Grease Seal**

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.

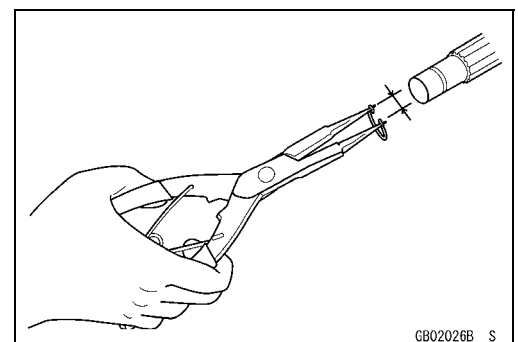


Apply specified grease to the lip of seal before installing the seal.



**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.

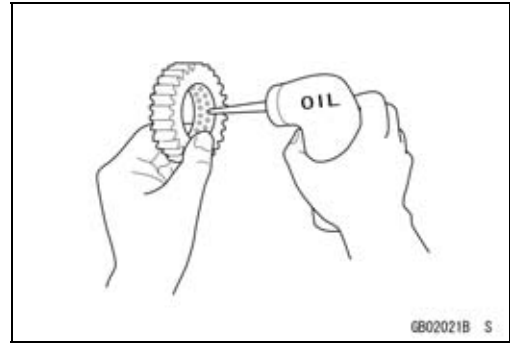


# 1-6 GENERAL INFORMATION

## Before Servicing

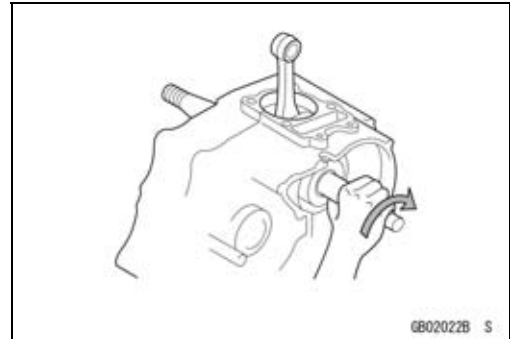
### **Lubrication**

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.



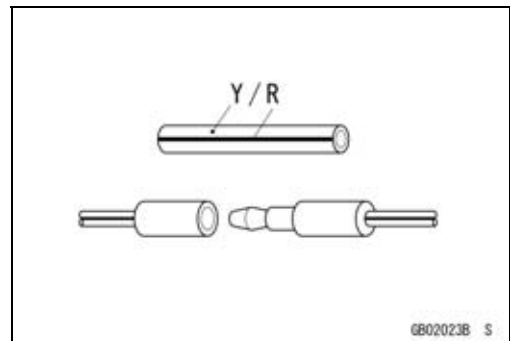
### **Direction of Engine Rotation**

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).



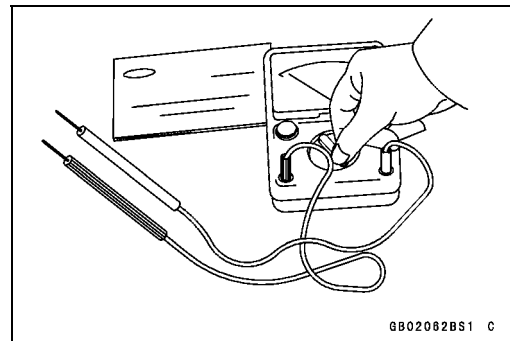
### **Electrical Wires**

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

KL650E8 Left Side View



KL650E8 Right Side View



Frame Number



Engine Number



# 1-8 GENERAL INFORMATION

## General Specifications

Items	KL650E8 ~ EC
<b>Dimensions</b> Overall Length Overall Width Overall Height Wheelbase Road Clearance Seat Height Dry Mass KL650E8  Curb Mass: KL650E9 ~ EC  Front Rear KL650E8  KL650E9 ~ EC  Fuel tank Capacity KL650E8 KL650E9 ~ EC	2 295 mm (90.4 in.) 960 mm (37.8 in.) 1 350 mm (53.1 in.) 1 480 mm (58.3 in.) 210 mm (8.27 in.) 890 mm (35.0 in.)  175 kg (386 lb.) (AU) 173 kg (381 lb.)  196 kg (432 lb.) (AU) 194 kg (428 lb.)  91 kg (201 lb.)  105 kg (232 lb.) (AU) 104 kg (229 lb.)  105 kg (232 lb.) (AU) 103 kg (227 lb.)  22.1 L (5.8 US gal.) 22 L (5.8 US gal.)
<b>Performance</b> Minimum Turning Radius	2.4 m (7.9 ft.)
<b>Engine</b> Type Cooling System Bore and Stroke Displacement Compression Ratio Maximum Horsepower  Maximum Torque  Carburetion System Starting System Ignition System Timing Advance Ignition Timing  Spark Plugs	4-stroke, DOHC, 1-cylinder Liquid-cooled 100.0 × 83.0 mm (3.94 × 3.27 in.) 651 cm <sup>3</sup> (39.72 cu in.) 9.8:1 15 kW (20.4 PS) @4 500 r/min (rpm) (CA), (CAL), (US) — — — 40 N·m (4.1 kgf·m, 30 ft·lb) @3 000 r/min (rpm) (CA), (CAL), (US) — — — Carburetor, Keihin CVK40 × 1 Electric starter Battery and coil (transistorized) Electronically Advanced (digital) From 10° BTDC @1 300 r/min (rpm) to 30° BTDC @4 000 r/min (rpm) NGK DPR8EA-9 or ND X24EPR-U9

**General Specifications**

Items	KL650E8 ~ EC
Valve Timing: Inlet Open Close Duration Exhaust Open Close Duration Lubrication System Engine Oil: Type Viscosity Capacity	19° BTDC 69° ABDC 268° 57° BBDC 37° ATDC 274° Forced lubrication API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2 SAE10W-40 2.1 L (2.2 US qt)
<b>Drive Train</b> Primary Reduction System: Type Reduction Ratio Clutch Type Transmission: Type Gear Ratios: KL650E8 1st 2nd 3rd 4th 5th KL650E9 ~ EC 1st 2nd 3rd 4th 5th Final Drive System: Type Reduction Ratio KL650E8 KL650E9 ~ EC Overall Drive Ratio KL650E8 KL650E9 ~ EC	Gear 2.272 (75/33) Wet multi disc 5-speed constant mesh, return shift 2.266 (34/15) 1.444 (26/18) 1.136 (25/22) 0.954 (21/22) 0.791 (19/24) 2.267 (34/15) 1.444 (26/18) 1.136 (25/22) 0.955 (21/22) 0.792 (19/24) Chain drive 2.866 (43/15) 2.867 (43/15) 5.157 @Top gear 5.158 @Top gear

# 1-10 GENERAL INFORMATION

## General Specifications

Items	KL650E8 ~ EC
<b>Frame</b>	
Type	Tubular, double cradle
Caster (Rake Angle)	28°
Trail	112 mm (4.41 in.)
Rim Size:	
Front	21 × 1.60
Rear	17 M/C × MT2.50
Front Tire:	
Type	Tube
Size	90/90-21 M/C 54S
Rear Tire:	
Type	Tube
Size	130/80-17 M/C 65S
Front Suspension:	
Type	Telescopic fork
Wheel Travel	200 mm (7.87 in.)
Rear Suspension:	
Type	Swingarm (uni-trak)
Wheel Travel	185 mm (7.28 in.)
Brake Type:	
Front	Single disc
Rear	Single disc
<b>Electrical Equipment</b>	
Battery	12 V 14 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 55/55 W (quartz-halogen)
Tail/Brake Light:	
Bulb	12 V 21/5 W
Alternator:	
Type	Three-phase AC
Rated output:	
KL650E8 ~ EA	17 A × 14 V @7 000 r/min (rpm)
KL650EB ~ EC	17.5 A × 14 V @7 000 r/min (rpm)

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

**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

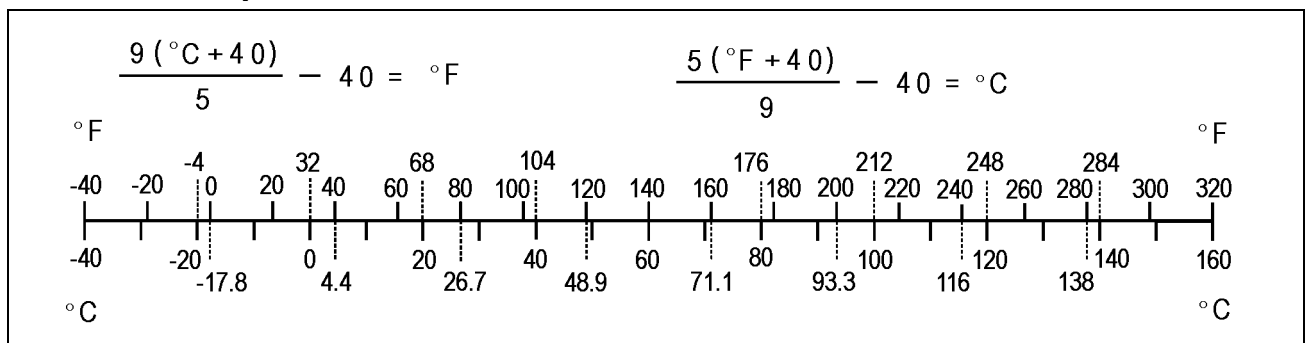
**Units of Speed:**

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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**Periodic Maintenance Chart**

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

**Periodic Inspection**

INSPECTION	FREQUENCY	* ODOMETER READING							See Page
	Whichever comes first ↓	1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	36 (22.5)	
<b>Fuel System</b>									
Air cleaner element - clean				•		•		•	2-15
Throttle control system (play, smooth return, no drag) - inspect	year	•		•		•		•	2-16
Choke Operation - inspect	year	•		•		•		•	2-16
Idle speed - inspect		•		•		•		•	2-17
Fuel leak (fuel hose and pipe) - inspect	year	•		•		•		•	2-18
Fuel hose and pipe damage - inspect	year	•		•		•		•	2-18
Fuel hose and pipe installation condition - inspect	year	•		•		•		•	2-18
Evaporative emission control system function (CAL) - inspect		•	•	•	•	•	•	•	2-18
<b>Cooling System</b>									
Coolant level - inspect		•		•		•		•	2-19
Coolant leak (water hose and pipe) - inspect	year	•		•		•		•	2-19
Water hose damage - inspect	year	•		•		•		•	2-19
Water hose installation condition - inspect	year	•		•		•		•	2-19
<b>Engine Top End</b>									
Valve clearance - inspect	US, CA, CAL Models					•			2-19
	Other than US, CA, CAL Models	Every 42 000 km (26 250 mile)							
Spark arrester - clean			•	•	•	•	•	•	2-23
<b>Air Suction System (Other than AU Model)</b>									
Air suction system damage - inspect				•		•		•	2-24
<b>Clutch</b>									
Clutch operation (play, disengagement, engagement) - inspect		•		•		•		•	2-24
<b>Crankshaft/Transmission</b>									
Balancer chain tension - adjust				•		•		•	2-25

## 2-4 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

FREQUENCY	* ODOMETER READING × 1 000 km (× 1 000 mile)								See Page
	Whichever comes first ↓	1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	36 (22.5)	
INSPECTION	Every								
<b>Wheels and Tires</b>									
Tire air pressure - inspect	year			•		•		•	2-26
Wheel/tire damage - inspect				•		•		•	2-26
Tire tread wear, abnormal wear - inspect				•		•		•	2-26
Wheel bearings damage - inspect	year			•		•		•	2-27
Spoke tightness and rim runout		•	•	•	•	•	•	•	2-28
<b>Drive Train</b>									
Drive chain lubrication condition - inspect #		Every 600 km (375 mile)							2-29
Drive chain slack - inspect #		Every 1 000 km (600 mile)							2-29
Drive chain wear - inspect #				•		•		•	2-32
Drive chain guide wear - inspect				•		•		•	2-33
<b>Brake System</b>									
Brake fluid leak (brake hose and pipe) - inspect	year	•	•	•	•	•	•	•	2-34
Brake hose and pipe damage - inspect	year	•	•	•	•	•	•	•	2-35
Brake hose and pipe installation condition - inspect	year	•	•	•	•	•	•	•	2-35
Brake operation (effectiveness, play, no drag) - inspect	year	•	•	•	•	•	•	•	2-35
Brake fluid level - inspect	6 months	•	•	•	•	•	•	•	2-35
Brake pad wear - inspect #			•	•	•	•	•	•	2-36
Brake light switch operation - inspect		•	•	•	•	•	•	•	2-36
<b>Suspension</b>									
Front forks/rear shock absorber operation (damping and smooth stroke) - inspect				•		•		•	2-37
Front forks/rear shock absorber oil leak - inspect	year			•		•		•	2-38
Rocker arm operation - inspect				•		•		•	2-38
Rocker arm bearings - lubricate						•			2-38
Tie-rods operation - inspect				•		•		•	2-39
Tie-rods bearings - lubricate						•			2-39
Swingarm pivot - lubricate						•			2-39
<b>Steering</b>									
Steering play - inspect	year	•		•		•		•	2-39

**Periodic Maintenance Chart**

FREQUENCY	Whichever comes first ↓	* ODOMETER READING × 1 000 km (× 1 000 mile)							See Page
		1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	36 (22.5)	
INSPECTION	Every								
Steering stem bearings - lubricate	2 years					•			2-40
<b>Electrical System</b>									
Lights and switches operation - inspect	year			•		•		•	2-41
Headlight aiming - inspect	year			•		•		•	2-43
Sidestand switch operation - inspect	year			•		•		•	2-44
Engine stop switch operation - inspect	year			•		•		•	2-45
Battery electrolyte level - inspect	6 months		•	•	•	•	•	•	2-46
<b>Others</b>									
Chassis parts - lubricate	year			•		•		•	2-46
Bolts and nuts tightness - inspect		•		•		•		•	2-48

#: 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 Replacement Parts**

FREQUENCY	Whichever comes first ↓	* ODOMETER READING × 1 000 km (× 1 000 mile)					See Page
		1 (0.6)	12 (7.5)	24 (15)	36 (22.5)	48 (30)	
ITEM	Every						
Air cleaner element # - replace	2 years						2-49
Fuel hose - replace	5 years						2-50
Coolant - change	3 years				•		2-51
Radiator hose and O-ring - replace	3 years				•		2-53
Engine oil # - change	year	•	•	•	•	•	2-53
Oil filter - replace	year	•	•	•	•	•	2-54
Brake hose and pipe - replace	4 years					•	2-56
Brake fluid - change	2 years			•		•	2-56
Rubber parts of master cylinder and caliper - replace	4 years					•	2-58, 2-59
Spark plug - change			•	•	•	•	2-62

#: 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.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

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</b>				
Air Cleaner Duct Clamp Screw	2.0	0.20	18 in·lb	
Air Cleaner Housing Bolt	8.8	0.90	78 in·lb	
Canister Bracket Bolts	8.8	0.90	78 in·lb	
Carburetor Holder Clamp Screw	2.0	0.20	18 in·lb	
Fuel Tap Bolts	2.5	0.25	22 in·lb	
Fuel Tap Diaphragm Cover Screws	1.0	0.10	9.0 in·lb	
Fuel Tap Lever Plate Screws	0.8	0.08	7 in·lb	
Separator Bracket Bolts	8.8	0.90	78 in·lb	
Throttle Case Screws	3.8	0.39	34 in·lb	
<b>Cooling System</b>				
Coolant Drain Bolt	8.8	0.90	78 in·lb	
Impeller Mounting Nut	9.8	1.0	87 in·lb	
Radiator Bolts	8.8	0.90	78 in·lb	
Radiator Fan Switch	18	1.8	13	
Reserve Tank Bolts	8.8	0.90	78 in·lb	
Reserve Tank Cap	–	–	–	Hand-tighten
Thermostat Housing Bolts	8.8	0.90	78 in·lb	
Water Hose Fitting Bolts	8.8	0.90	78 in·lb	
Water Pump Cover Bolts	8.8	0.90	78 in·lb	
Water Temperature Sensor	15	1.5	11	SS
<b>Engine Top End</b>				
Camshaft Cap Bolts	12	1.2	106 in·lb	
Camshaft Chain Tensioner Bolts	8.8	0.90	78 in·lb	
Camshaft Sprocket Bolts	49	5.0	36	L
Carburetor Holder Clamp Screw	2.0	0.20	18 in·lb	
Carburetor Holder Screws	4.4	0.45	39 in·lb	
Clean Air System Pipe Bolt (M5) (Other than AU Model)	5.9	0.60	52 in·lb	
Clean Air System Pipe Bolt (M6) (Other than AU Model)	9.8	1.0	87 in·lb	

**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Coolant Hose Fitting Bolts	8.8	0.90	78 in·lb	
Cylinder Bolt (M6)	9.8	1.0	87 in·lb	
Cylinder Bolt (M8)	18	1.8	13	
Cylinder Head Bolts (First)	20	2.0	15	M
Cylinder Head Bolts (Final)	65	6.6	48	M
Cylinder Head Cover Bolts (L = 34.5)	7.8	0.80	69 in·lb	
Cylinder Head Cover Bolts (L = 46.5)	7.8	0.80	69 in·lb	
Cylinder Nuts	25	2.5	18	
Exhaust Pipe Cover Bolts	4.4	0.45	39 in·lb	
Exhaust Pipe Holder Clamp Bolt	21	2.1	15	
Exhaust Pipe Holder Nuts	21	2.1	15	
Heat Guard Plate Bolts	4.4	0.45	39 in·lb	
Lower Camshaft Chain Guide Bolt (M6)	12	1.2	106 in·lb	L
Lower Camshaft Chain Guide Bolt (M8)	25	2.5	18	L
Muffler Body Mounting Bolts	25	2.5	18	
Muffler Joint Clamp Bolt	21	2.1	15	
Oil Pipe Banjo Bolts	20	2.0	15	
Oil Pipe Bolt	8.8	0.90	78 in·lb	
Plugs	2.5	0.25	22 in·lb	
Rear Camshaft Chain Guide Bolt	19	1.9	14	
Upper Camshaft Chain Guide Bolt (L = 12)	8.8	0.90	78 in·lb	L
Upper Camshaft Chain Guide Bolts (L = 85)	9.8	1.0	87 in·lb	
Upper Rear Camshaft Chain Guide Screw	4.4	0.45	39 in·lb	L
Vacuum Switch Valve Bolts (Other than AU Model)	8.8	0.90	78 in·lb	
Vacuum Switch Valve Nuts (Other than AU Model)	8.8	0.90	78 in·lb	
<b>Clutch</b>				
Clutch Cable Holder Bolt	8.8	0.90	78 in·lb	
Clutch Cover Bolts	8.8	0.90	78 in·lb	
Clutch Cover Damper Plate Bolts	8.8	0.90	78 in·lb	L
Clutch Hub Nut	135	14	100	R
Clutch Spring Bolts	9.8	1.0	87 in·lb	
Crankshaft Oil Seal Holder Plate Bolts	12.5	1.3	111 in·lb	
Oil Filler Cap	–	–	–	Hand-tighten
Oil Passage Plug	25	2.5	18	
<b>Engine Lubrication System</b>				
Engine Oil Drain Bolt	29	3.0	21	
Engine Oil Feed Fitting Bolts	8.8	0.90	78 in·lb	
Oil Filter Cap Bolts	6.9	0.70	61 in·lb	
Oil Filler Cap	–	–	–	Hand-tighten
Oil Passage Plug	25	2.5	18	

## 2-8 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Pipe Banjo Bolts	20	2.0	15	
Oil Pipe Bolt	8.8	0.90	78 in·lb	S
Oil Pressure Relief Valve	15	1.5	11	L
Oil Pump Mounting Screws	4.4	0.45	39 in·lb	
Oil Pump Cover Screw	4.2	0.43	37 in·lb	L
<b>Engine Removal/Installation</b>				
Front Engine Bracket Nuts	25	2.5	18	R, S
Front Engine Mounting Nut	44	4.5	32	S
Lower Engine Mounting Nut	44	4.5	32	
Upper Engine Bracket Nuts	25	2.5	18	R, S
Upper Engine Mounting Bolt	25	2.5	18	L
<b>Crankshaft/Transmission</b>				
Bearing Retaining Screws	4.4	0.45	39 in·lb	L
Crankcase Bolts (L = 30)	8.8	0.90	78 in·lb	
Crankcase Bolts (L = 50)	8.8	0.90	78 in·lb	
Crankcase Bolts (L = 60)	8.8	0.90	78 in·lb	L
Crankcase Bolts (L = 80)	16.5	1.7	12	
Engine Oil Drain Bolt	29	3.0	21	
Engine Oil Feed Fitting Bolts	8.8	0.90	78 in·lb	
Front Right Balancer Weight Nut	44	4.5	32	
Gear Positioning Lever Bolt	8.8	0.90	78 in·lb	
Idle Shaft Lever Bolt	8.8	0.90	78 in·lb	
Neutral Switch	15	1.5	11	
Primary Gear Nut	155	16	114	
Rear Balancer Chain Guide Bolts	8.8	0.90	78 in·lb	L
Shift Drum Cam Bolt	12	1.2	106 in·lb	L
Shift Pedal Bolt	12.5	1.3	111 in·lb	
Shift Shaft Return Spring Pin	20	2.0	15	L
<b>Wheels/Tires</b>				
Front Axle Clamp Bolts	20	2.0	15	
Front Axle Nut	88	9.0	65	
Rear Axle Nut	98	10	72	
Spoke Nipples	4.0	0.41	35 in·lb	
<b>Final Drive</b>				
Engine Sprocket Cover Bolts	8.8	0.90	78 in·lb	
Engine Sprocket Nut	98	10	72	MO
Rear Sprocket Nuts	32	3.3	24	
<b>Brakes</b>				
Brake Hose Banjo Bolts	25	2.5	18	
Brake Lever Adjusting Bolt Locknut	5.9	0.60	52 in·lb	
Brake Lever Pivot Bolt	5.9	0.60	52 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Brake Pedal Bolt	8.8	0.90	78 in·lb	

**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Bleed Valve	7.8	0.80	69 in·lb	
Front Brake Disc Mounting Bolts	27	2.8	20	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Front Brake Pad Pins	17	1.7	12	
Front Caliper Holder Shaft	17	1.7	12	Si
Front Caliper Mounting Bolts	34	3.5	25	
Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
Front Master Cylinder Reservoir Cap Screws	1.5	0.15	13 in·lb	
Rear Brake Disc Mounting Bolts	27	2.8	20	
Rear Brake Pad Pins	17	1.7	12	
Rear Caliper Holder Shaft	17	1.7	12	Si
Rear Caliper Mounting Bolts	25	2.5	18	
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	17	1.7	12	
Rear Master Cylinder Reservoir Tank Mounting Bolt	6.9	0.70	61 in·lb	
<b>Suspension</b>				
Front Axle Clamp Bolts	20	2.0	15	
Front Fork Bottom Allen Bolts	30	3.0	22	L
Front Fork Top Plugs	30	3.0	22	
Lower Fork Clamp Bolts	20	2.0	15	
Lower Rear Shock Absorber Nut	98	10	72	
Rocker Arm Nut	98	10	72	
Swingarm Pivot Shaft Nut	88	9.0	65	
Tie-rod Nuts	98	10	72	
Upper Fork Clamp Bolts	20	2.0	15	AL
Upper Rear Shock Absorber Bolt	59	6.0	44	
<b>Steering</b>				
Brake Hose Clamp Bolt	6.9	0.70	61 in·lb	
Handlebar Clamp Bolts	25	2.5	18	S
Left Switch Housing Screws	3.5	0.36	31 in·lb	
Lower Fork Clamp Bolts	20	2.0	15	
Right Switch Housing Screws	3.5	0.36	31 in·lb	
Steering Stem Head Nut	49	5.0	36	
Steering Stem Nut	4.9	0.50	43 in·lb	
Throttle Case Screws	3.8	0.39	34 in·lb	
Upper Fork Clamp Bolts	20	2.0	15	AL
<b>Frame</b>				
Front Footpeg Bracket Bolts	25	2.5	18	
Lower Rear Frame Bolts	25	2.5	18	
Lower Fairing Mounting Bolts	8.8	0.90	78 in·lb	
Rear Footpeg Bracket Bolts	25	2.5	18	
Sidestand Bolt and Nut	44	4.5	33	R (1)

## 2-10 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Sidestand Switch Mounting Bolt	8.8	0.9	78 in·lb	L
Upper Fairings Mounting Bolts	0.9	0.09	8 in·lb	
Upper Left and Right Fairings Mounting Screws	0.4	0.04	4 in·lb	
Upper Rear Frame Bolts	44	4.5	33	
Windshieid Mounting Screws	0.4	0.04	4 in·lb	
<b>Electrical System</b>				
Alternator and Crankshaft Sensor Lead Hold Plate Screw	4.4	0.45	39 in·lb	
Alternator Inner Cover Bolts	8.8	0.90	78 in·lb	
Alternator Outer Cover Bolts	8.8	0.90	78 in·lb	
Alternator Outer Cover Damper Plate Bolts	8.8	0.90	78 in·lb	L
Alternator Rotor Bolt	195	20	144	S
Alternator Rotor Bolt Cap	2.5	0.25	22 in·lb	
Crankshaft Sensor Lead Hold Plate Screws	2.5	0.25	22 in·lb	
Crankshaft Sensor Screws	2.5	0.25	22 in·lb	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Ignition Coil Bolts	5.9	0.60	52 in·lb	
Left Handlebar Switch Housing Screws	3.5	0.36	31 in·lb	
License Plate Light Lens Screws	0.9	0.09	8 in·lb	
License Plate Light Mounting Screws	5.9	0.60	52 in·lb	
Meter Unit Mounting Screws	1.2	0.12	11 in·lb	
Neutral Switch	15	1.5	11	
Radiator Fan Switch	18	1.8	13	
Regulator/Rectifier Bolts	8.8	0.90	78 in·lb	
Right Handlebar Switch Housing Screws	3.5	0.36	31 in·lb	
Sidestand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
Spark Plug	14	1.4	10	
Stator Coil Bolts	4.4	0.45	39 in·lb	
Starter Motor Cable Terminal Nut	4.9	0.50	43 in·lb	
Starter Motor Clutch Bolts	34	3.5	25	
Starter Motor Mounting Bolts	8.8	0.90	78 in·lb	
Starter Motor Through Bolts	4.9	0.50	43 in·lb	
Starter Motor Terminal Locknut	10.8	1.1	96 in·lb	
Starter Relay Terminal Screws	4.4	0.45	39 in·lb	
Tail/Brake Light Mounting Nuts	5.9	0.60	52 in·lb	
Timing Inspection Cap	2.5	0.25	22 in·lb	
Water Temperature Sensor	15	1.5	11 in·lb	SS



**Torque and Locking Agent**

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

**Basic Torque for General Fasteners**

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

## 2-12 PERIODIC MAINTENANCE

### Specifications

Item	Standard	Service Limit
<b>Fuel System</b>		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
Choke Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
Idle Speed	1 300 ±100 r/min (rpm)	— — —
Air Cleaner Element	Polyurethane Foam	— — —
<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	1.55 L (1.64 US qt)	— — —
<b>Engine Top End</b>		
Valve Clearance:		
Exhaust	0.15 ~ 0.25 mm (0.0059 ~ 0.0098 in.)	— — —
Inlet	0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.)	— — —
<b>Clutch</b>		
Clutch Lever Free Play	8 ~ 12 mm (0.31 ~ 0.47 in.)	— — —
<b>Engine Lubrication System</b>		
Engine Oil:		
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2	— — —
Viscosity	SAE 10W-40	— — —
Capacity	1.9 L (2.0 US qt) (when filter is not removed)	— — —
	2.0 L (2.1 US qt) (when filter is removed)	— — —
	2.1 L (2.2 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	6.4 mm (0.25 in.) (AU) 6.9 mm (0.27 in.)	2 mm (0.08 in.) 2 mm (0.08 in.)
Rear	8.8 mm (0.35 in.)	2 mm (0.08 in.)
Air Pressure (When Cold):		
Front	150 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi)	— — —
Rear	Up to 97.5 kg (215 lb) load: 150 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi)	— — —
	97.5 ~ 182.0 kg (215 ~ 401 lb) load: 200 kPa (2.0 kgf/cm <sup>2</sup> , 28 psi)	— — —
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 2.0 mm (0.08 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 2.0 mm (0.08 in.)

**Specifications**

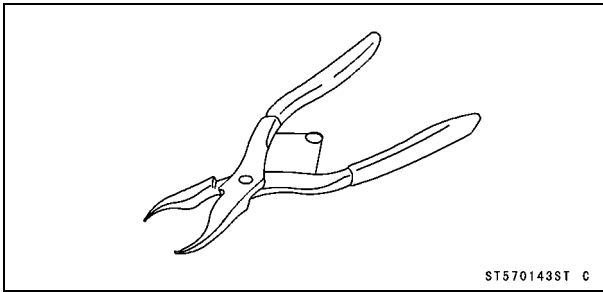
Item	Standard	Service Limit
<b>Final Drive</b>		
Drive Chain Slack	35 ~ 45 mm (1.4 ~ 1.8 in.)	- - -
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.) (KL650E8 ~ EA) 319 mm (12.56 in.) (KL650EB ~ EC)
Standard Chain:		
Make	ENUMA (KL650E8 ~ EA) DAIDO (KL650EB ~ EC)	- - -
Type	EK525SR-O <sub>2</sub> (KL650E8 ~ EA) DID520VP2 (KL650EB ~ EC)	- - -
Link	106 links	- - -
<b>Brakes</b>		
Brake Fluid:		
Grade	DOT4	- - -
Brake Pad Lining Thickness:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.)
Rear	5.5 mm (0.22 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>		
Battery Electrolyte Level	Between upper and lower level lines	- - -
Spark Plug:		
Type	NGK DPR8EA-9 or ND X24EPR-U9	- - -

## 2-14 PERIODIC MAINTENANCE

### Special Tools

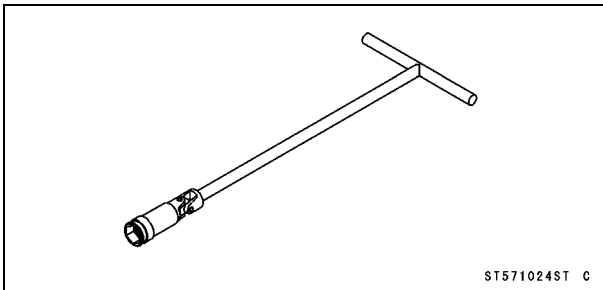
**Inside Circlip Pliers:**

**57001-143**



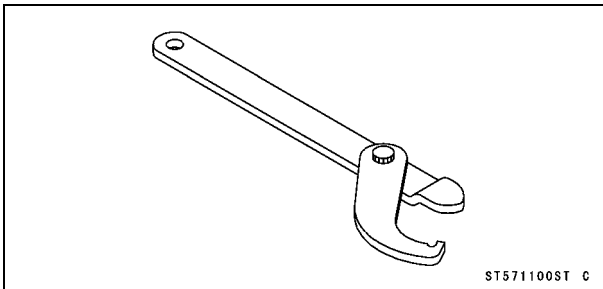
**Spark Plug Wrench, Hex 18:**

**57001-1024**



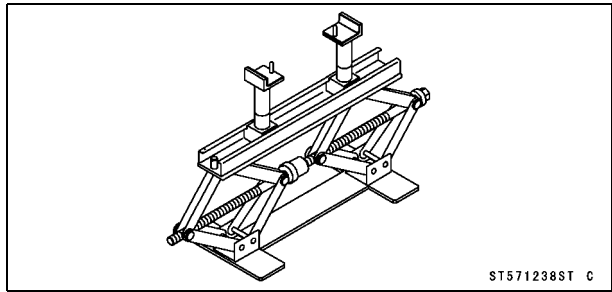
**Steering Stem Nut Wrench:**

**57001-1100**



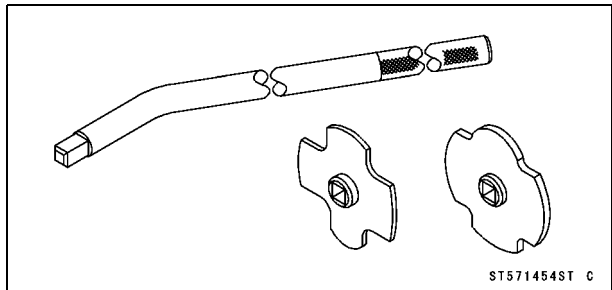
**Jack:**

**57001-1238**



**Filler Cap Driver:**

**57001-1454**



Periodic Maintenance Procedures

Fuel System

**Air Cleaner Element Cleaning**

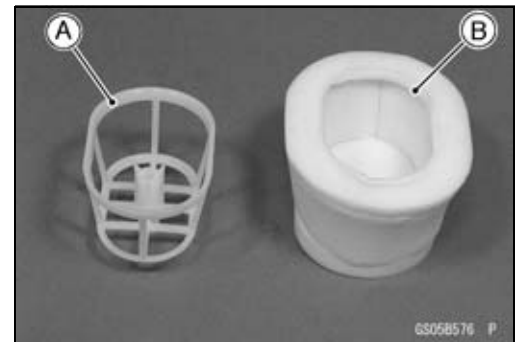
**NOTE**

- 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.

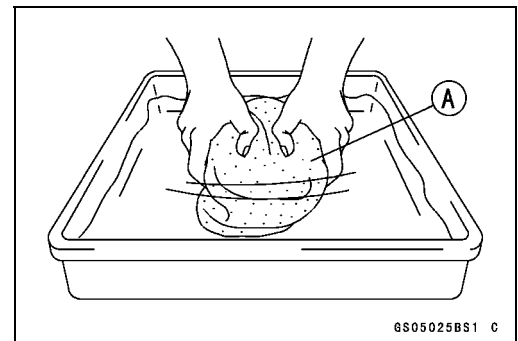
**⚠ WARNING**

Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the element in a well ventilated area, and take care that there is no spark or flame anywhere near the working areas. Do not use gasoline or low-flash point solvents to clean the element.

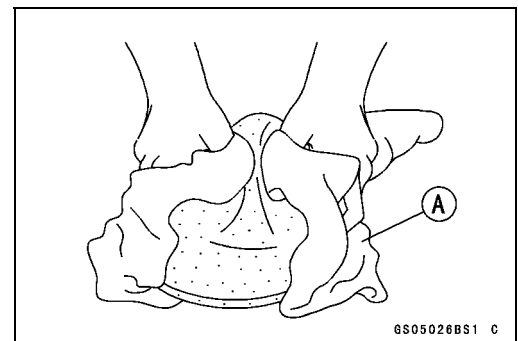
- Remove the air cleaner element (see Air Cleaner Element Replacement).
- Separate the frame [A] from the element [B].



- Soak the element [A] in a bath of high-flash point solvent, and clean it by using a soft bristle brush.



- Squeeze it dry in a clean towel [A]. Do not wring the element or blow it dry; the element can be damaged.
- Check all the parts of the element for visible damage.
- ★ If any of the parts of the element are damaged, replace them.
- After cleaning, saturate the element with a high-quality foam-air-filter oil, squeeze out the excess, then wrap it in a clean towel and squeeze it as dry as possible.
- Be careful not to tear the sponge filter.



## 2-16 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Throttle Control System Inspection

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

#### Throttle Grip Free Play

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

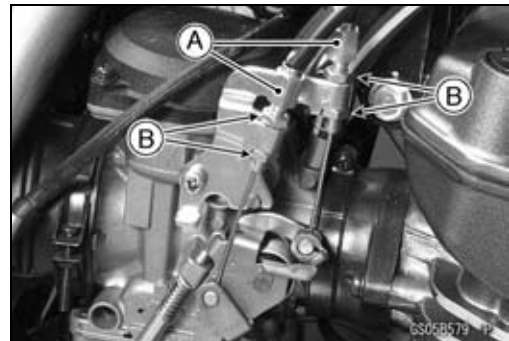
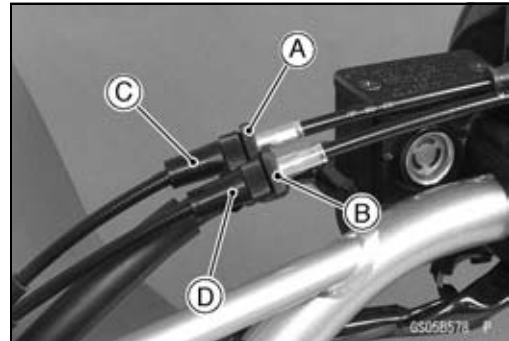
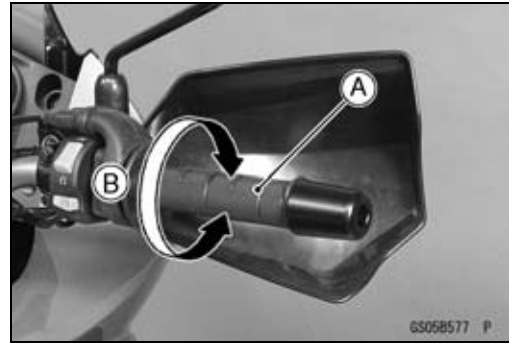
- ★ If the free play is incorrect, adjust the throttle cable as follows.
- Loosen the locknuts [A] [B] at the throttle cable upper ends.
- Screw both throttle cable adjusters [C] [D] to give the throttle grip plenty of play.
- Turn the decelerator cable adjuster [C] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [A].
- Turn the accelerator cable adjuster [D] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [B].
- ★ If the free play can not be adjusted with adjusters at the upper end of the throttle cables, remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter) and use the adjusters [A] at the lower end of throttle cables.
- Make the necessary free play adjustment at the adjusters, tighten the locknuts [B] securely.
- ★ If the free play can not be adjusted with the adjusters, replace the cable.

#### **⚠ WARNING**

Operation with improperly adjusted, incorrectly routed or damaged cables could result in an unsafe riding Condition. Follow the service manual to be make sure to correct any of these conditions.

#### Choke Operation Inspection

- Pull and push the choke lever [A] all the way and check that it moves smoothly.
- ★ If the choke lever does not move smoothly, check the choke cable routing, lever free play, and cable damage. Then lubricate the choke cable.

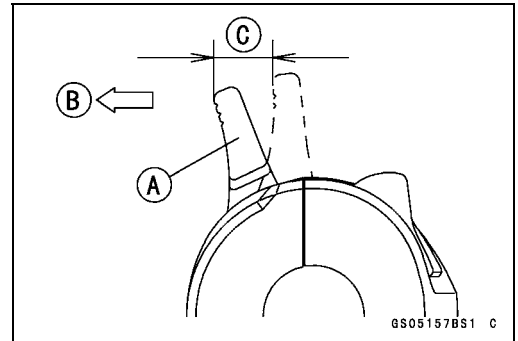


**Periodic Maintenance Procedures**

- Push the choke lever [A] all the way to the front [B].
- Check the choke lever free play [C].

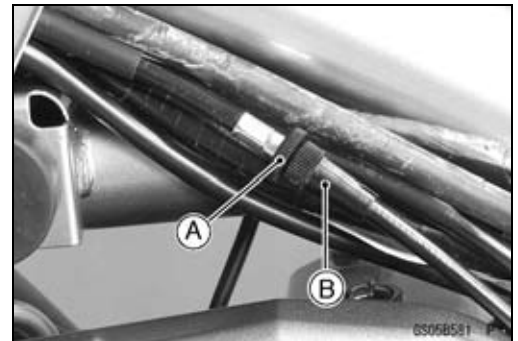
**Choke Lever Free Play**

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



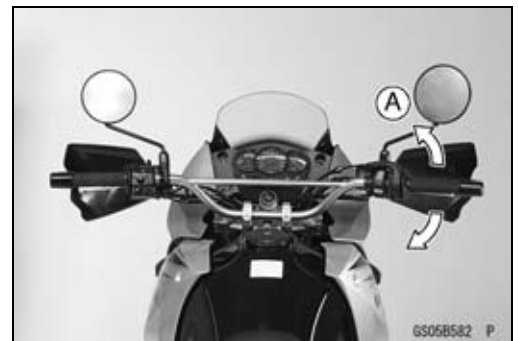
★ If the free play is incorrect, adjust the choke cable as follows.

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Loosen the locknut [A] and turn the adjuster [B] until the cable has the proper amount of free play.
- Tighten the locknut securely.
- ★ If the free play can not be adjusted with adjuster, replace the cable.



**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. Follow the service manual to be make sure to correct any of these conditions.**

- Check the idle speed.

**Idle Speed**

**Standard:** 1 300 ±100 r/min (rpm)

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

**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.

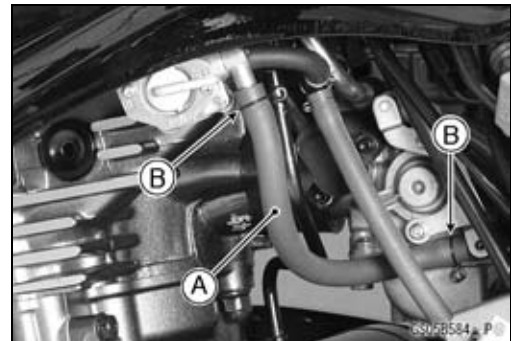
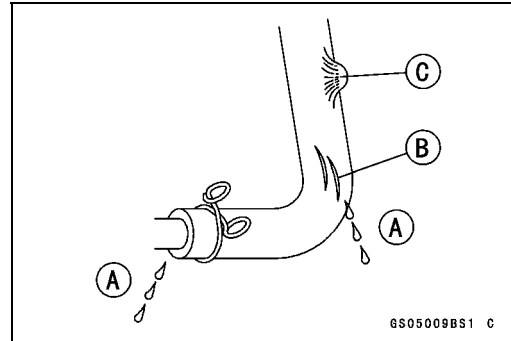


## 2-18 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **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 burst.
  - Remove the starter relay bracket (see Fuel Hose Replacement) and check the fuel hose.
  - ★ Replace the fuel hose if any fraying, cracks [B] or bulges [C] are noticed.
- 
- Check that the fuel hose [A] is securely connected and clamps [B] are tightened correctly.
  - Check that the fuel hose is routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.
  - When installing the fuel hose, avoid sharp bending, kinking, flattening or twist, and route the fuel hose with a minimum of bending so that fuel flow will not be obstructed.
  - ★ Replace the hose if it has been sharply bent or kinked.



#### **Evaporative Emission Control System (CAL Model)**

##### **Evaporative Emission Control System Inspection**

- Inspect the canister as follows.
- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Remove the canister [A], and disconnect the hoses from the canister.
- Visually inspect the canister for cracks or other damage.
- ★ If the canister has any cracks or bad damage, replace it with a new one.



#### **NOTE**

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

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





Periodic Maintenance Procedures

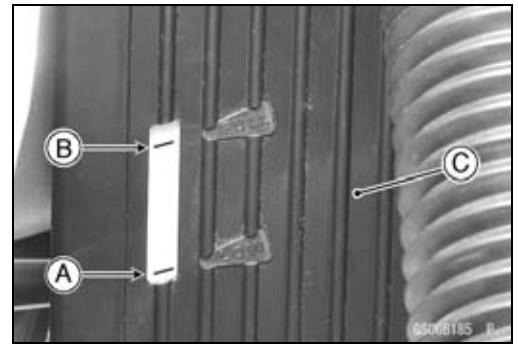
Cooling System

Coolant Level Inspection

NOTE

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

- Check the coolant level in the reserve tank with the motorcycle held perpendicular (Do not use the sidestand.).
  - ★ If the coolant level is lower than the “LOW” level line [A], unscrew the reserve tank cap and add coolant to the “FULL” level line [B].
- Coolant Reserve Tank Cover [C]

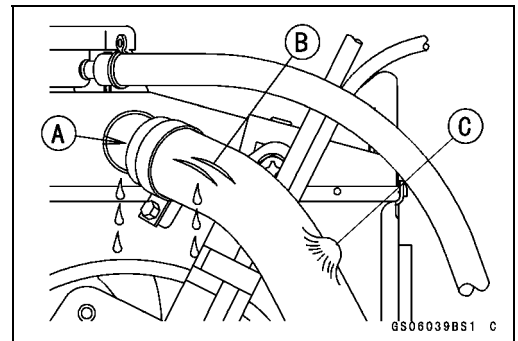


NOTICE

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

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 water hose clamp screws are tightened correctly.



Engine Top End

Valve Clearance Inspection

NOTE

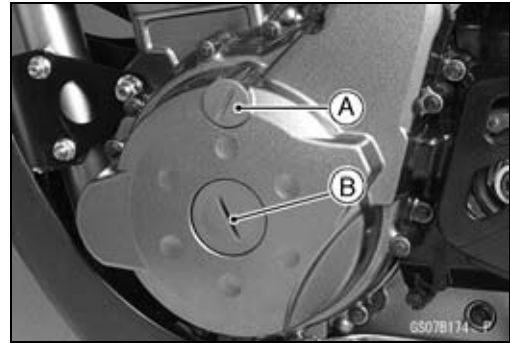
○ Valve clearance must be checked and adjusted when the engine is cold (room temperature).

## 2-20 PERIODIC MAINTENANCE

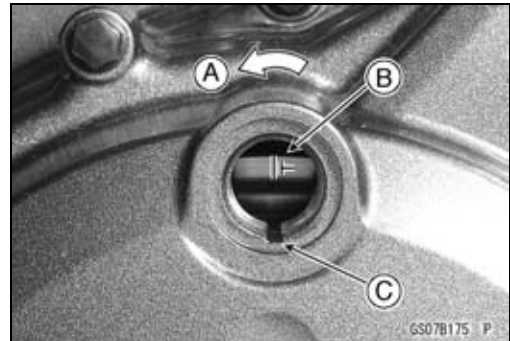
### Periodic Maintenance Procedures

- Remove the cylinder head cover (see Cylinder Head Cover Removal in the Engine Top End chapter).
- Remove the timing inspection cap [A] and alternator rotor bolt cap [B], using the filler cap driver.

**Special Tool - Filler Cap Driver: 57001-1454**



- Using a wrench on the alternator rotor bolt, turn the crankshaft counterclockwise [A] until the "T" mark [B] on the alternator rotor is aligned with notch [C] in the edge of the timing inspection hole.



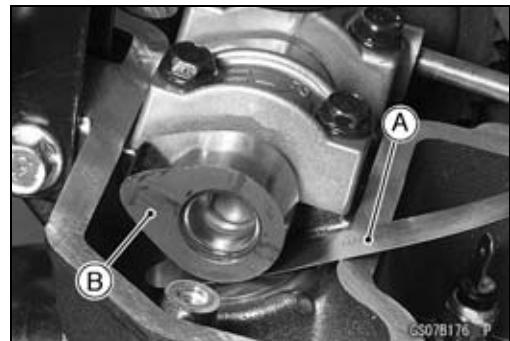
- Using the thickness gauge [A], measure the valve clearance between cam and shim of all four valves.
- Measure the valve clearance of the valves for which the cam [B] are turned away from each other.

#### Valve Clearance

##### Standard:

Exhaust 0.15 ~ 0.25 mm (0.0059 ~ 0.0098 in.)

Inlet 0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.)



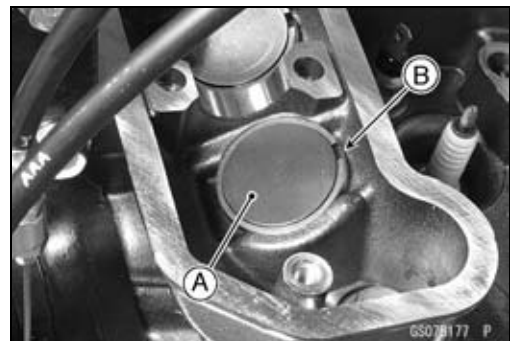
#### NOTE

○ Check the valve clearance using this method only. Checking the clearance at any other cam position may result in improper valve clearance.

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

#### Valve Clearance Adjustment

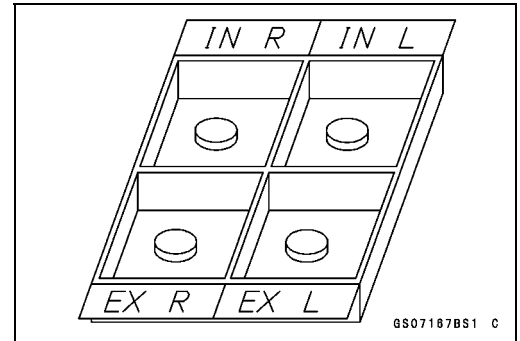
- Remove the camshafts (see Camshaft Removal in the Engine Top End chapter).
- Remove the shim [A] from the valve lifter.
- Position the groove [B] of the valve lifter upward, and using the groove, remove the shim.
- Replace the shim with one of a different thickness.



Periodic Maintenance Procedures

**NOTE**

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



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

$$a + b - c = d$$

[a] Present Shim Thickness

[b] Measured Valve Clearance

[c] Specified Valve Clearance (Mean Value = 0.20 mm (Exhaust), 0.15 mm (Inlet))

[d] Replace Shim Thickness

**Example (Inlet):**

$$2.50 + 0.25 - 0.15 = 2.60 \text{ mm}$$

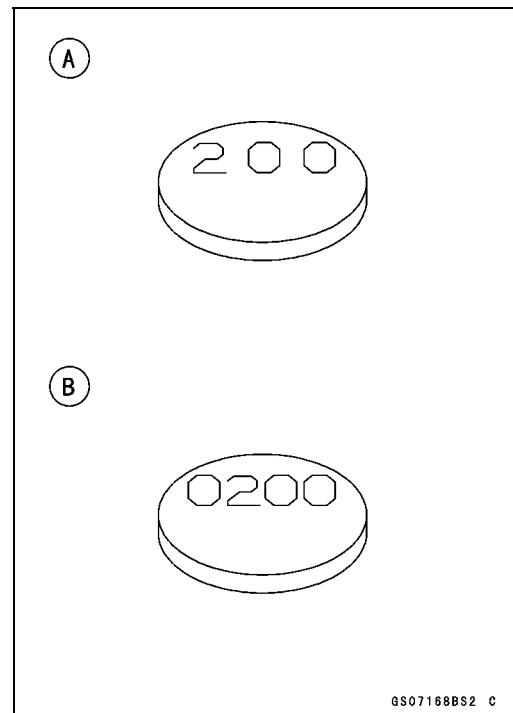
- Exchange the shim for the 2.60 size shim

## 2-22 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Adjustment Shims

Thickness	Part Number	Mark
2.00	12037-001	200 or 0200
2.05	12037-002	205 or 0205
2.10	12037-003	210 or 0210
2.15	12037-004	215 or 0215
2.20	12037-005	220 or 0220
2.25	12037-006	225 or 0225
2.30	12037-007	230 or 0230
2.35	12037-008	235 or 0235
2.40	12037-009	240 or 0240
2.45	12037-010	245 or 0245
2.50	12037-011	250 or 0250
2.55	12037-012	255 or 0255
2.60	12037-013	260 or 0260
2.65	12037-014	265 or 0265
2.70	12037-015	270 or 0270
2.75	12037-016	275 or 0275
2.80	12037-017	280 or 0280
2.85	12037-018	285 or 0285
2.90	12037-019	290 or 0290
2.95	12037-020	295 or 0295
3.00	12037-021	300 or 0300
3.05	12037-022	305 or 0305
3.10	12037-023	310 or 0310
3.15	12037-024	315 or 0315
3.20	12037-025	320 or 0320



#### NOTE

○ There are two kinds of marks [A] [B] in the shim.

Periodic Maintenance Procedures

**NOTICE**

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

- If there is no valve clearance, use a shim that is a few sizes smaller, and remeasure the valve clearance.
- When installing the shim, face the marked side toward the valve lifter.

**NOTICE**

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

- Install the camshafts (see Camshaft Installation in the Engine Top End chapter).
- Recheck the valve clearance and readjust if necessary.
- Replace the O-ring of the timing inspection cap and alternator rotor bolt cap with new ones.
- Apply grease to the new O-rings.
- Tighten:
  - Torque - Timing Inspection Cap: 2.5 N·m (0.25 kgf·m, 22 in·lb)
  - Alternator Rotor Bolt Cap: 2.5 N·m (0.25 kgf·m, 22 in·lb)
- Install the removed parts (see appropriate chapters).

**Spark Arrester Cleaning (US and CA Models)**

This motorcycle is equipped with a spark arrester approved for off-road use by U.S. Forest Service. It must be properly maintained to ensure its efficiency.

**⚠ WARNING**

**The muffler can become extremely hot during normal operation and cause severe burns. Since the engine must be running during this procedure, wear heat-resistant gloves while cleaning the spark arrester.**

- Remove the drain plugs [A].
- In open area away from combustible materials, start the engine with the transmission in neutral.
- Raise and lower engine speed while tapping on the muffler body with a rubber mallet until carbon particles are purged from the muffler.

**⚠ DANGER**

**Exhaust gas contains carbon monoxide, a colorless, odorless poisonous gas. Inhaling carbon monoxide can cause serious brain injury or death. DO NOT run the engine in enclosed areas. Operate only in a well-ventilated area.**

- Stop the engine.
- Tighten the drain plugs securely.



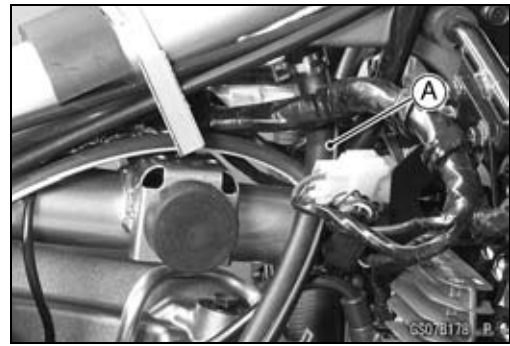
## 2-24 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Air Suction System (Other than AU Model)

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

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Separate the vacuum switch valve hose [A] from the fitting on the frame.



- Install the fuel tank temporary (see Fuel Tank Installation in the Fuel System chapter).
- Start the engine and run it at idle speed.
- Plug the vacuum switch valve hose end [A] with your finger and feel vacuum pulsing in the hose.
- ★ If there is no vacuum pulsation, check the hose line for leak.
- ★ If there is no leak, check the vacuum switch valve (see Vacuum Switch Valve Test in the Engine Top End chapter).



#### Clutch

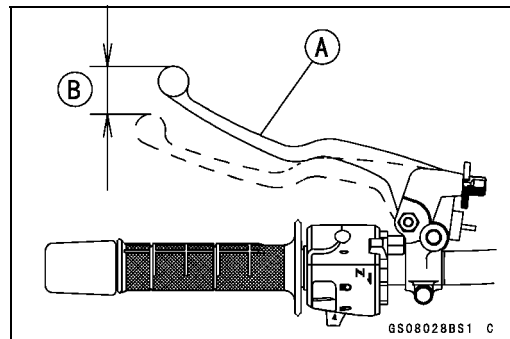
##### **Clutch Operation Inspection**

- Pull the clutch lever [A] just enough to take up the free play.
- Check the clutch lever free play [B].

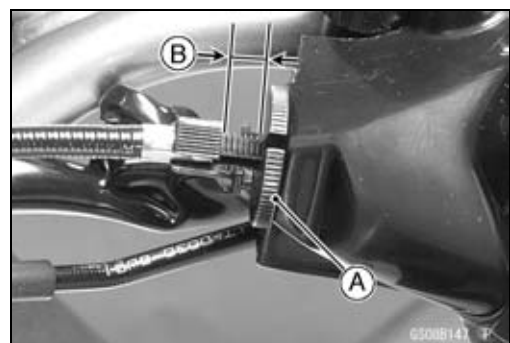
##### **Clutch Lever Free Play**

Standard: 8 ~ 12 mm (0.31 ~ 0.47 in.)

- ★ If the free play is incorrect, adjust it.



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

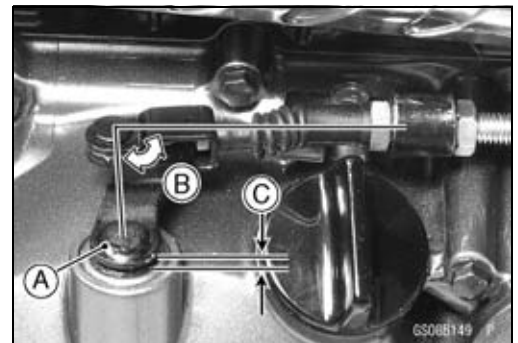
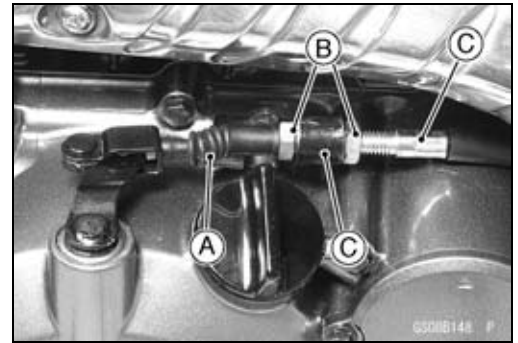


Periodic Maintenance Procedures

**⚠ WARNING**

The engine and exhaust system get extremely hot during normal operation and can cause serious burns. Never touch the engine or exhaust pipe during clutch adjustment.

- 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 cable holder.
  - 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 motorcycle until it becomes hard to turn.
- At this time, the release lever should have the proper clearance and angle shown.
- 80 ~ 90° [B]
- 1 ~ 3 mm (0.04 ~ 0.12 in.) [C]
- ★If the clearance and angle are wrong, check the clutch and release parts for wear.



**⚠ WARNING**

Too much cable play can prevent clutch disengagement and cause an accident resulting in serious injury or death. When adjusting the clutch or replacing the cable, be sure the upper end of the clutch outer cable is fully seated in its fitting, 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.

**Crankshaft/Transmission**

**Balancer Chain Tension Adjustment**

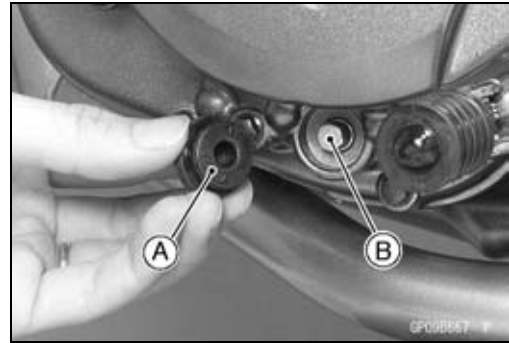
**NOTE**

○Balancer chain wear and chain guide wear cause the chain to develop slack, which will make noise and may result in engine damage. To prevent this, adjust the chain tension.

## 2-26 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

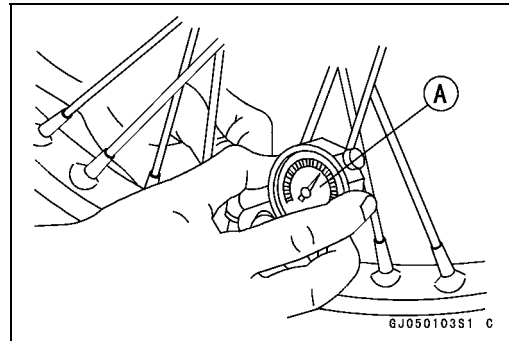
- Remove the engine guard (see Engine Guard Removal in the Frame chapter).
- Remove the plug [A], and loosen the idle shaft lever bolt [B] a few turns.
- Tighten the idle shaft lever bolt to the specified torque.  
**Torque - Idle Shaft Lever Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Install the plug on the idle shaft lever bolt securely.



### 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.

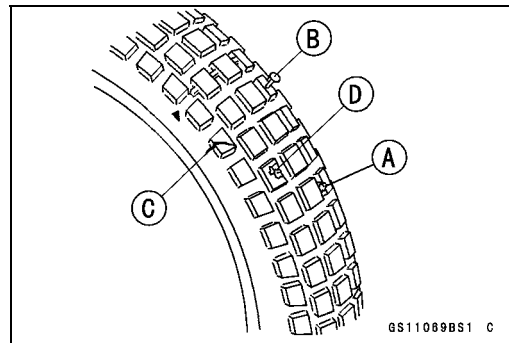


#### Air Pressure (When Cold)

Front:	150 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi)
Rear:	Up to 97.5 kg (215 lb) 150 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi) 97.5 ~ 182.0 kg (215 ~ 401 lb) 200 kPa (2.0 kgf/cm <sup>2</sup> , 28 psi)

#### Wheel/Tire Damage Inspection

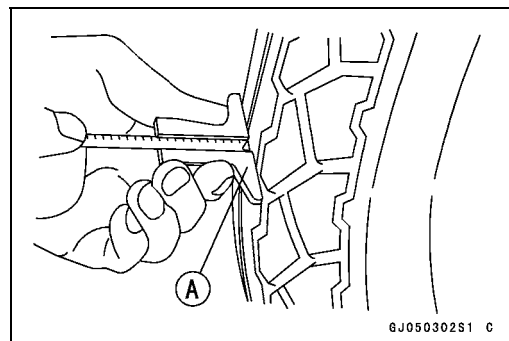
- Remove any imbedded stones [A] or other foreign particles [B] from tread.
- Visually inspect the tire for cracks [C] and cuts [D], and replace the tire if necessary. Swelling or high spots indicate internal damage, requiring tire replacement.
- Visually inspect the wheel for cracks, cuts and dents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





Periodic Maintenance Procedures

Tread Depth

Standard:

Front 6.4 mm (0.25 in.)  
(AU) 6.9 mm (0.27 in.)

Rear 8.8 mm (0.35 in.)

Service Limit:

Front 2 mm (0.08 in.)

Rear 2 mm (0.08 in.)

**⚠ WARNING**

Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

**NOTE**

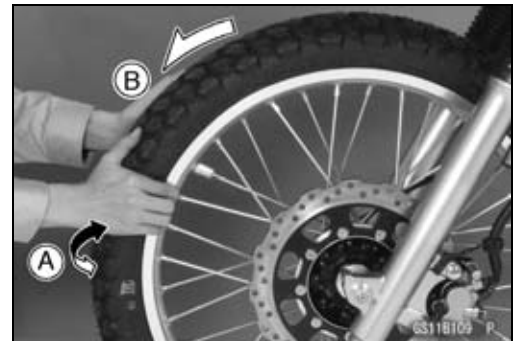
○ Check and balance the wheel when a tire is replaced with a new one.

**Wheel Bearing Damage Inspection**

- Raise the front wheel off the ground with jack.

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

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



- Raise the rear wheel off the ground with jack.

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

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



## 2-28 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Spoke Tightness and Rim Runout Inspection

- Check that all the spokes are tightened evenly.
- ★ If spoke tightness is uneven or loose, tighten the spoke nipples evenly.

**Torque - Spoke Nipples: 4.0 N·m (0.41 kgf·m, 35 in·lb)**

- Check the rim runout.

#### **⚠ WARNING**

**A missing spoke places an additional load on the other spokes, which will eventually cause other spokes to break, creating the potential for an accident resulting in serious injury or death. Immediately replace any broken spoke(s).**

- Raise the front/rear wheel off the ground with jack.  
**Special Tool - Jack: 57001-1238**
- Inspect the rim for small cracks, dents, bending, or warping.
- ★ If there is any damage to the rim, it must be replaced.
- Set a dial gauge against the side of the rim, and rotate the rim to measure the axial runout [A]. The difference between the highest and lowest dial readings is the amount of runout.
- Set a dial gauge against the outer circumference of the rim, and rotate the rim to measure radial runout [B]. The difference between the highest and lowest dial readings is the amount of runout.
- ★ If rim runout exceeds the service limit, check the wheel bearings first. Replace them if they are damaged. If the problem is not due to the bearings, correct the rim warp (runout). A certain amount of rim warp can be corrected by recentering the rim. Loosen some spokes and tighten others within the standard torque to change the position of different parts of the rim. If the rim is badly bent, however, it must be replaced.

#### Rim Runout (with tire installed)

##### Standard:

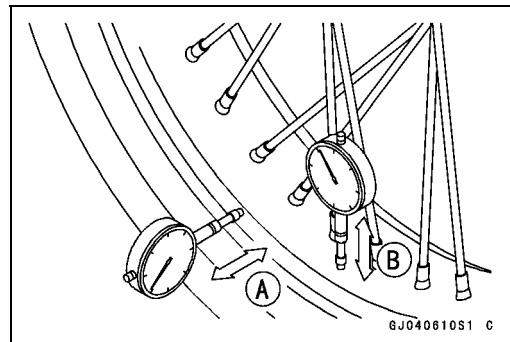
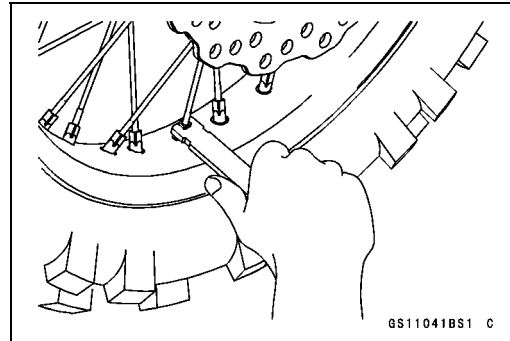
**Axial TIR 0.5 mm (0.02 in.) or less**

**Radial TIR 0.8 mm (0.03 in.) or less**

##### Service Limit:

**Axial TIR 2.0 mm (0.08 in.)**

**Radial TIR 2.0 mm (0.08 in.)**



Periodic Maintenance Procedures

Drive Train

**Drive Chain Lubrication Condition Inspection**

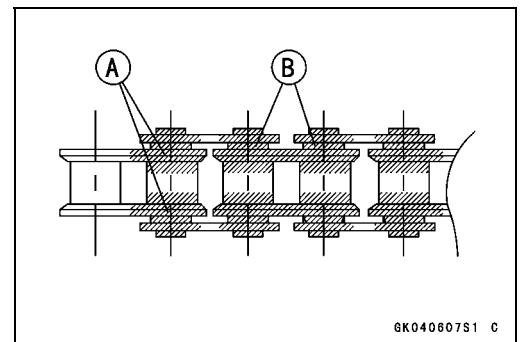
- If a special lubricant is not available, a heavy oil such as SAE 90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.
- If the chain appears especially dirty, clean it before lubrication.

**NOTICE**

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

Use only 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.

- 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]

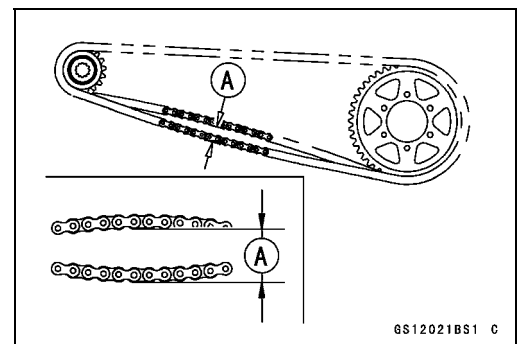


**Drive Chain Slack Inspection**

**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**

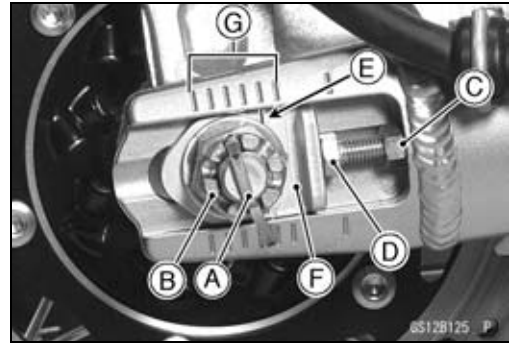
Standard: 35 ~ 45 mm (1.4 ~ 1.8 in.)

## 2-30 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Drive Chain Slack Adjustment

- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].
- ★ If the chain is too loose, turn out the right and left chain adjusters [D] evenly.
- ★ If the chain is too tight, turn in the right and left 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 right wheel alignment indicator [F] should align with the same swingarm mark or position [G] that the left indicator notch aligns with.



#### **⚠ WARNING**

**Misalignment of the wheel will result in abnormal wear and may result in an unsafe riding condition. Be sure the wheel is properly aligned.**

- Tighten both chain adjuster locknuts securely.
- Tighten the axle nut.
- Torque - Rear Axle Nut: 98 N·m (10 kgf·m, 72 ft·lb)**
- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin [A].

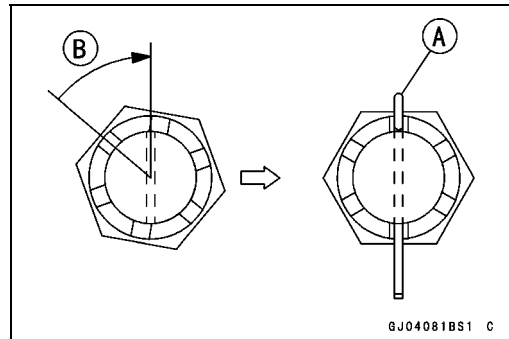
#### **NOTE**

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

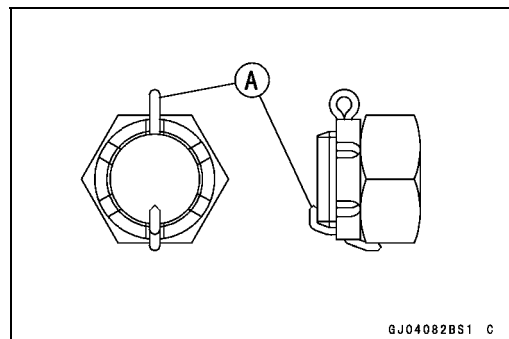
- Bend the cotter pin [A] over the nut.

#### **⚠ WARNING**

**A loose axle nut can lead to an accident resulting in serious injury or death. Tighten the axle nut to the proper torque and install a new cotter pin.**



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GJ04082BS1 C

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**Periodic Maintenance Procedures**

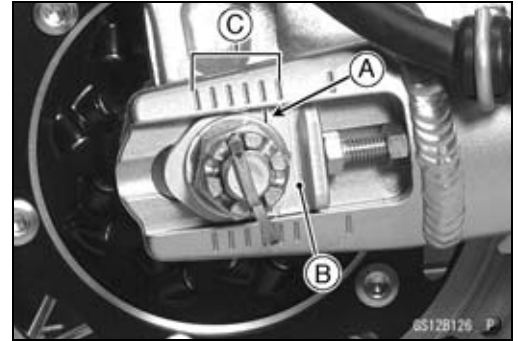
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**Wheel Alignment Inspection**

- Check that the notch [A] on the right alignment indicator [B] aligns with the same swingarm mark or position [C] that the left 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**

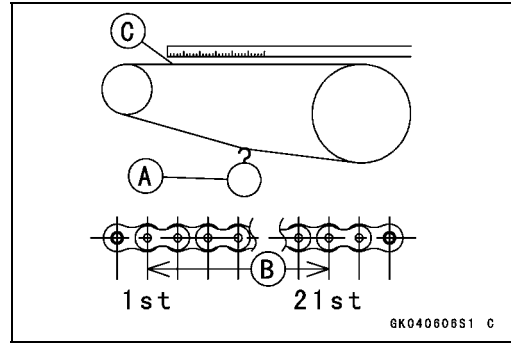
**Misalignment of the wheel will result in abnormal wear and may result in an unsafe riding condition. Be sure the wheel is properly aligned.**

## 2-32 PERIODIC MAINTENANCE

### 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:

KL650E8 ~ EA 323 mm (12.7 in.)

KL650EB ~ EC 319 mm (12.56 in.)

### **⚠ WARNING**

A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control. Inspect the chain for damage and proper adjustment before each ride. If chain wear exceeds the service limit, replace it with the standard chain. It is an endless type and should not be cut for installation.

#### Standard Chain

##### Make:

KL650E8 ~ EA ENUMA

KL650EB ~ EC DAIDO

##### Type:

KL650E8 ~ EA EK525SR-O<sub>2</sub>

KL650EB ~ EC DID520VP2

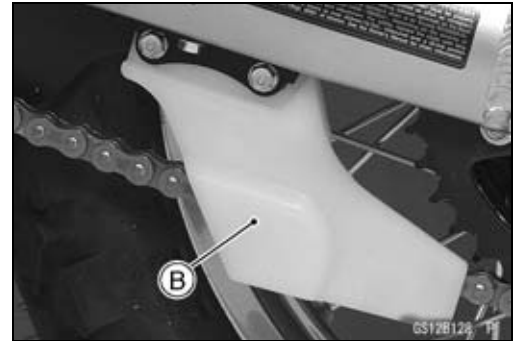
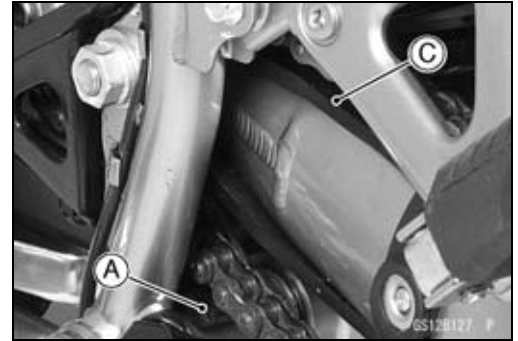
##### Link:

106 Links

**Periodic Maintenance Procedures**

***Chain Guide Wear Inspection***

- Visually inspect the front chain guide [A], rear chain guide [B] and chain slipper [C].
- ★ If the chain guides and chain slipper show any signs of abnormal wear or damage, replace them.



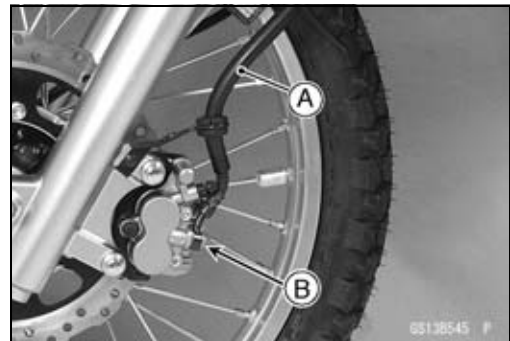
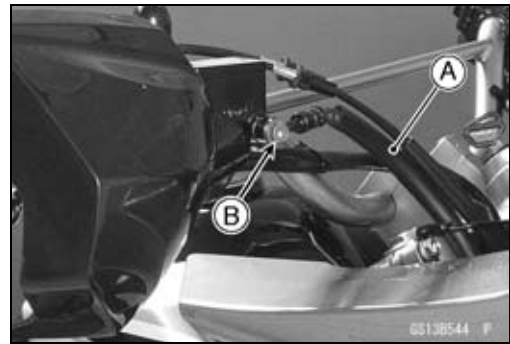
## 2-34 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Brake System

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

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





**Periodic Maintenance Procedures**

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

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

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

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

**Brake Operation Inspection**

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

**⚠ WARNING**

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

**Brake Fluid Level Inspection**

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

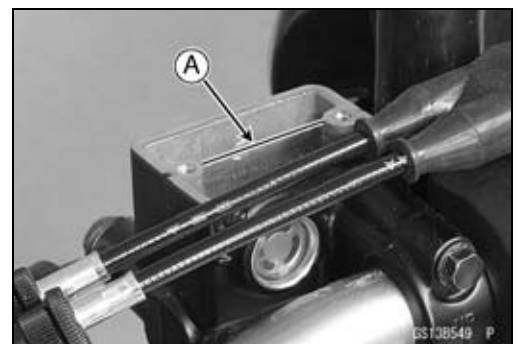
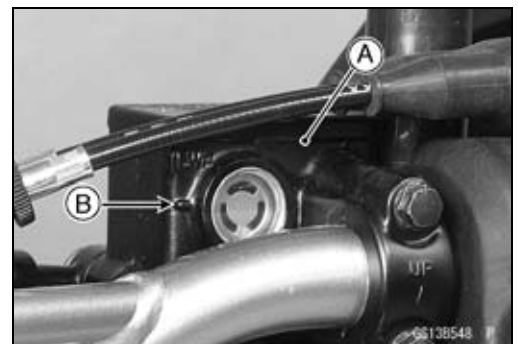
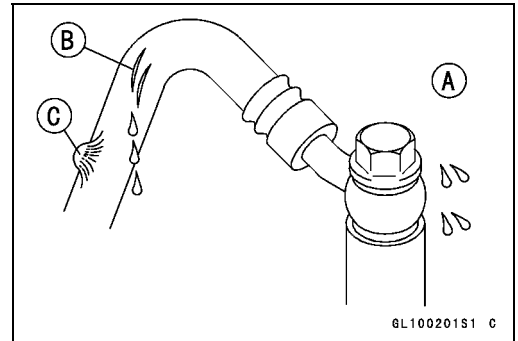
**NOTE**

○ 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 [A] in the reservoir [B].

- Install the front master cylinder reservoir cap.

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



## 2-36 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- 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].

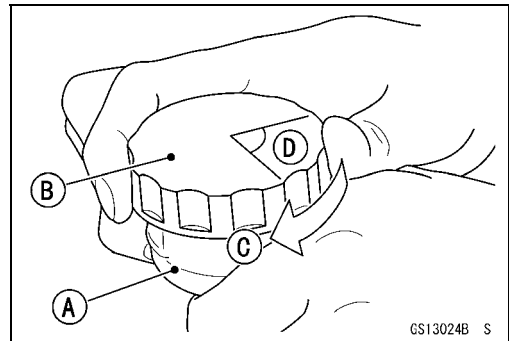
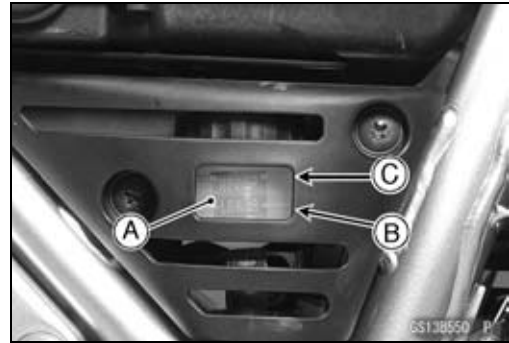
#### **⚠ WARNING**

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

#### Recommended Disc Brake Fluid

Grade: DOT4

- Follow 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.

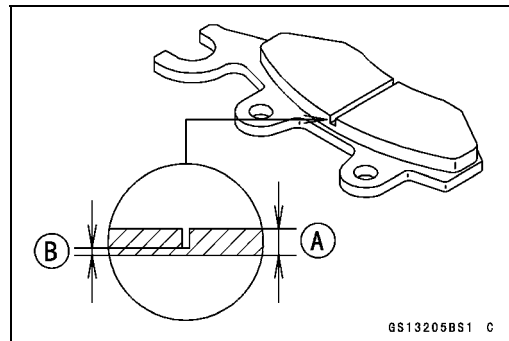
#### Pad Lining Thickness

Standard:

Front 4.5 mm (0.18 in.)

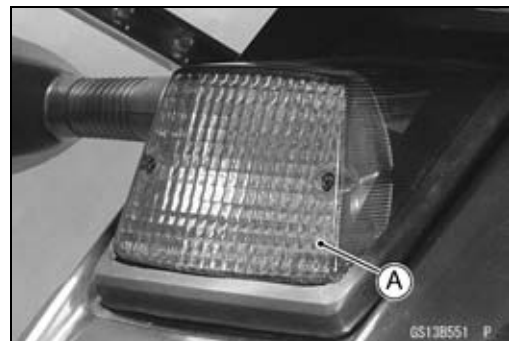
Rear 5.5 mm (0.22 in.)

Service Limit: 1 mm (0.04 in.)



#### **Brake Light Switch Operation Inspection**

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

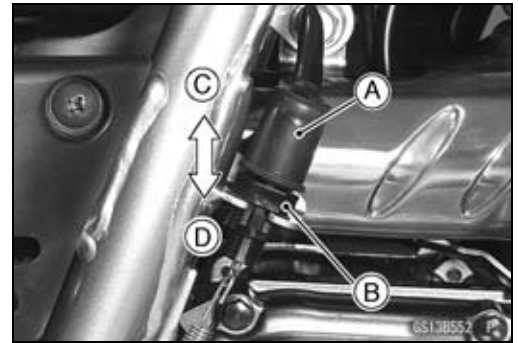


## Periodic Maintenance Procedures

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

### NOTICE

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



- ★ If it does not go on, inspect or replace the following items.
  - Battery (see Battery Condition in the Electrical System chapter)
  - Brake Light (see Tail/Brake Light Bulb Replacement in the Electrical System chapter)
  - Main Fuse 20 A (see Fuse Inspection in the Electrical System chapter)
  - Front Brake Light Switch [A] (see Switch Inspection in the Electrical System chapter)
  - Rear Brake Light Switch (see Switch Inspection in the Electrical System chapter)
  - Harness (see Wiring Inspection in the Electrical System chapter)



## Suspensions

### Front Forks/Rear Shock Absorber Operation Inspection

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



## 2-38 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

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



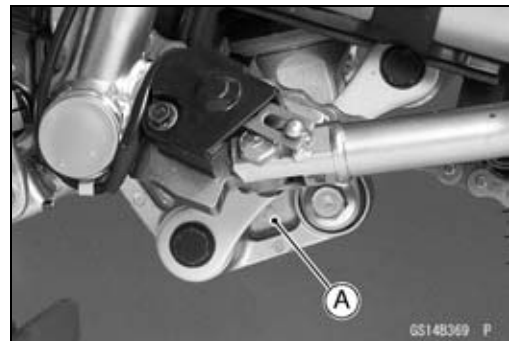
#### **Rear Shock Absorber Oil Leak Inspection**

- 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.



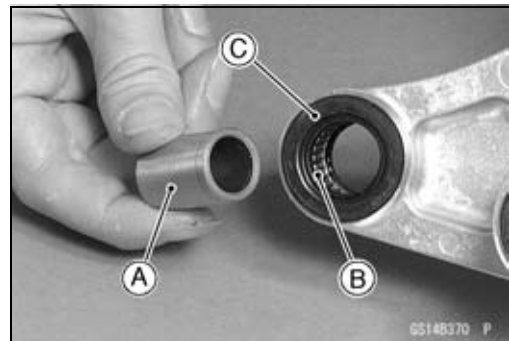
#### **Rocker Arm Operation Inspection**

- Pump the tail grip 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).



#### **Rocker Arm Bearing Lubrication**

- Remove the rocker arm (see Rocker Arm Removal in the Suspension chapter).
- Remove the sleeves [A].
- Using a high-flash point solvent, clean the old grease out of the needle bearings [B].
- Apply plenty of grease to the inner surface of the needle bearings.
- Apply thin coat of grease to the lips of the grease seals [C].
- Install the rocker arm (see Rocker Arm Installation in the Suspension chapter).



## Periodic Maintenance Procedures

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

- Pump the tail grip 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).

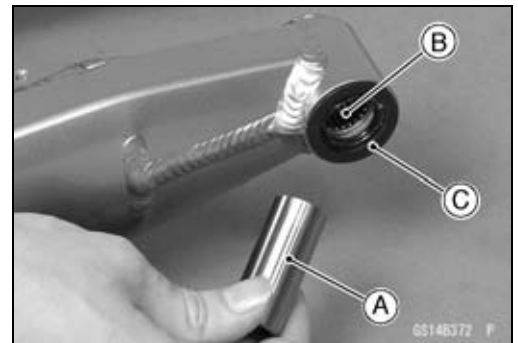


### **Tie-Rod Bearing Lubrication**

- Remove the tie-rods (see Tie-Rod Removal in the Suspension chapter).
- Lubricate the tie-rod bearings in the same way as rocker arm bearings (see Rocker Arm Bearing Lubrication).
- Install the tie-rods (see Tie-Rod Installation in the in the Suspension chapter).

### **Swingarm Pivot Lubrication**

- Remove the swingarm (see Swingarm Removal in the Suspension chapter).
- Remove the sleeves [A].
- Using a high-flash point solvent, clean the old grease out of the needle bearings [B].
- Apply plenty of grease to the inner surface of the needle bearings.
- Apply thin coat of grease to the lips of the grease seals [C].
- Install the swingarm (see Swingarm Installation in the Suspension chapter).



## Steering System

### **Steering Play Inspection**

- Raise the front wheel off the ground with jack.
  - **Special Tools - Jack: 57001-1238**
- With the front wheel pointing straight ahead, alternately tap each end of the handlebar. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.
- ★ If the wheel binds or catches before the stop, the steering is too tight.
- Feel for steering looseness by pushing and pulling the forks.
- ★ If you feel looseness, the steering is too loose.



### **NOTE**

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

## 2-40 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Steering Play Adjustment

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Lower Fairings (see Lower Fairing Removal in the Frame chapter)
  - Handlebar (see Handlebar Removal in the Steering chapter)
- Loosen:
  - Upper Fork Clamp Bolts (see Front Fork Removal in the Suspension chapter)
  - Steering Stem Head Nut [A]
- Adjust the steering, using the steering stem nut wrench [B].  
**Special Tool - Steering Stem Nut Wrench: 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.

- Tighten:
  - Torque - Steering Stem Head Nut: 49 N·m (5.0 kgf·m, 36 ft·lb)**
  - Upper Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

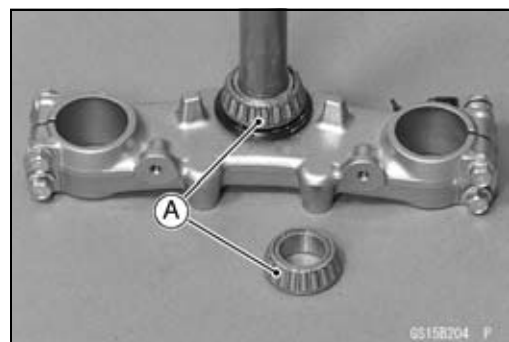
#### NOTE

○ Tighten the two upper fork clamp bolts alternately two times to ensure even tightening torque.

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

#### 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 tapered roller bearings [A] in the cages, and wipe the upper and lower tapered outer races, which are press-fitted into the frame head pipe, clean off grease and dirt.
- Visually check the outer races and rollers.
- ★ If the rollers or races are worn, or if either race is dented, replace both races and all the bearings as a set.
- Pack the upper and lower tapered roller bearings in the cages with grease, and apply a light coat of grease to the upper and lower outer races.
- Install the steering stem (see Stem, Stem Bearing Installation in the Steering chapter).
- Adjust the steering (see Steering Play Adjustment).



Periodic Maintenance Procedures

Electrical System

Lights and Switches Operation Inspection

First Step

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

Headlights (High and/or Low) [A]	go on
Taillight [B]	goes on
License Plate Light [C]	goes on
Meter Lights [D]	go on
Neutral Indicator Light [E]	goes on

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

Battery (see Battery Condition in the Electrical System chapter)

Main Fuse 20 A and Headlight Fuse 15 A (see Fuse Inspection in the Electrical System chapter)

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

Taillight Bulb (see Tail/Brake Light Bulb Replacement in the Electrical System chapter)

License Plate Light Bulb (see License Plate Light Bulb Replacement in the Electrical System chapter)

Meter Unit for Meter Lights (see Meter, Indicator Light Bulb Replacement in the Electrical System chapter)

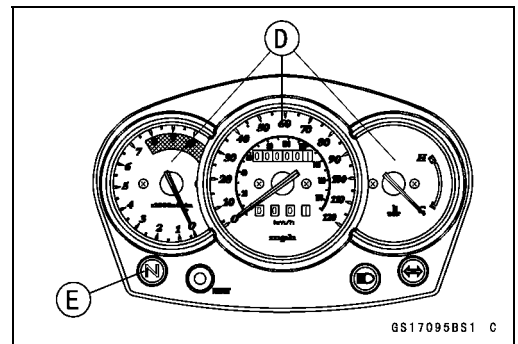
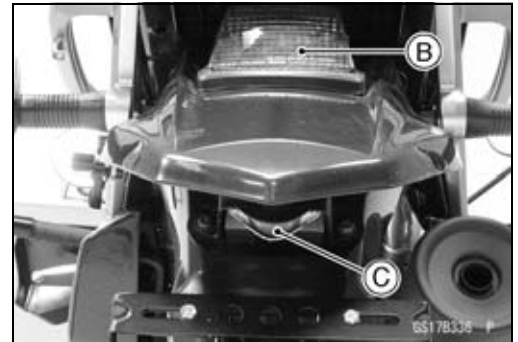
Meter Unit for Neutral Indicator Light (see Meter, Indicator Light Bulb Replacement in the Electrical System chapter)

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)

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



## 2-42 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Second Step

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

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

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

Meter Unit for Turn Signal Light Indicator Light (see Meter, Indicator Light Bulb Replacement in the Electrical System chapter)

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

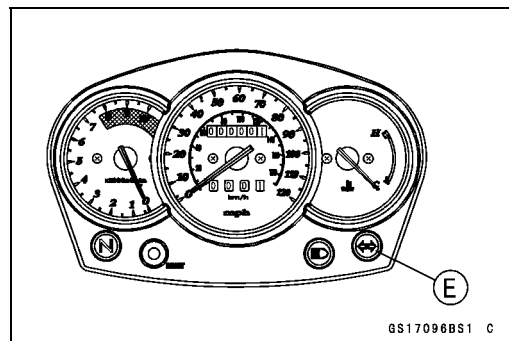
Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)

Harness (see Wiring Inspection in the Electrical System chapter)

- Push the turn signal switch.
  - The turn signal lights and indicator light 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)



#### Third Step

- Set the dimmer switch [A] to low beam position.
  - Turn the ignition switch ON.
  - 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 15 A (see Fuse Inspection in the Electrical System chapter)

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

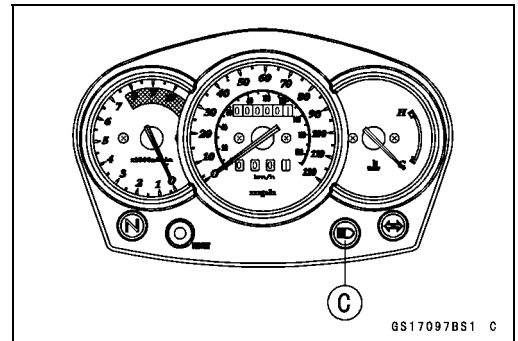
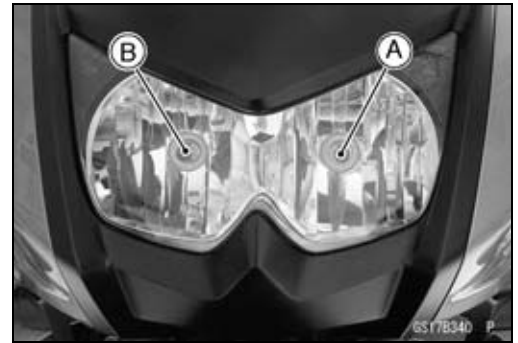
Harness (see Wiring Inspection in the Electrical System chapter)





**Periodic Maintenance Procedures**

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

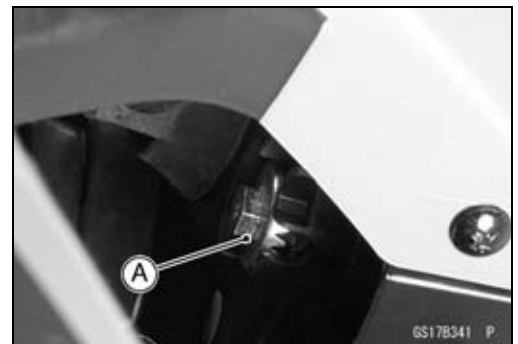


**Headlight Aiming Inspection**

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

**Headlight Beam Horizontal Adjustment**

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



**Headlight Beam Vertical Adjustment**

- Remove the windshield (see Windshield Removal in the Frame chapter)
- Turn the vertical adjuster [A] on the headlight with the screwdriver 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.

## 2-44 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### NOTE

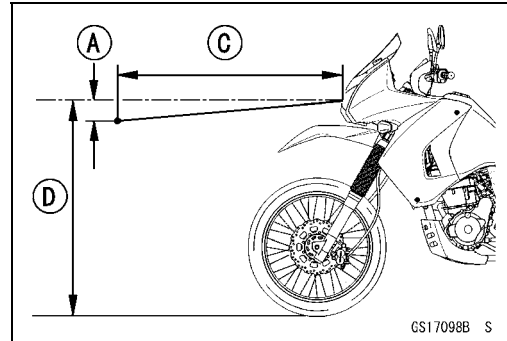
○For US model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2 in.) drop at 7.6 m (25 ft) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.

50 mm (2 in.) [A]

Center of Brightest Spot [B]

7.6 m (25 ft) [C]

Height of Headlight Center [D]



GS17098B S

#### Sidestand Switch Operation Inspection

- Raise the rear wheel off the ground with jack.

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

- 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



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## Periodic Maintenance Procedures

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

Battery (see Battery Condition in the Electrical System chapter)

Main Fuse 20 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)

Interlock Diode Unit (see Interlock Diode Unit Inspection in the Electrical System chapter)

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

Harness (see Wiring Inspection in the Electrical System chapter)

★ If the all parts are good condition, replace the IC Igniter (see IC Igniter Removal in the Electrical System chapter).

### Engine Stop Switch Operation Inspection

#### First Step

- Turn the ignition switch ON.
  - 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 the ignition switch ON.
  - 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)



## 2-46 PERIODIC MAINTENANCE

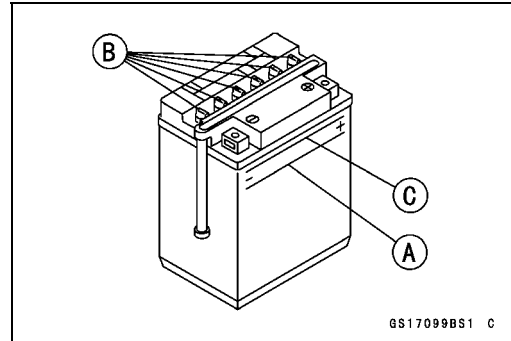
### Periodic Maintenance Procedures

#### Battery Electrolyte Level Inspection

- Remove the battery (see Battery Removal in the Electrical System chapter).
- Visually check the electrolyte level in the battery.
- ★ If the electrolyte level in any cell is lower than the lower level line [A] on the battery, unscrew the battery filler caps [B] and add distilled water only to that cell until the level is at the upper level line [C].

#### NOTICE

Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.



#### 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

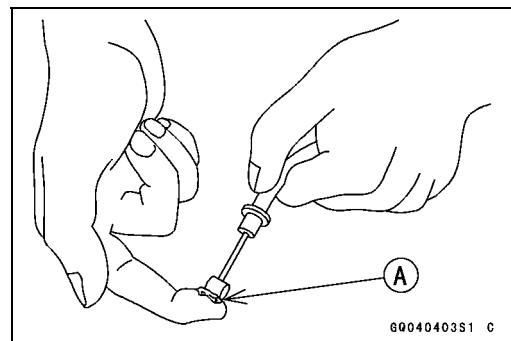
○ Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.

##### Pivots: Lubricate with Grease.

Brake Lever  
Brake Pedal  
Clutch Lever  
Rear Brake Joint Pin  
Sidestand

##### Points: Lubricate with Grease.

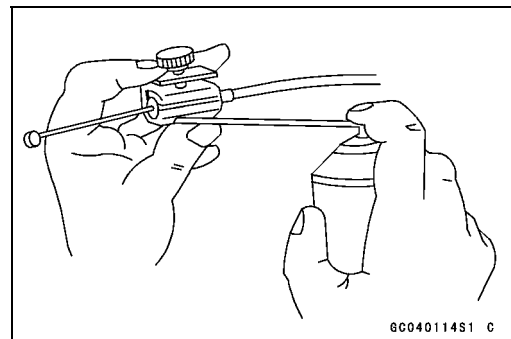
Clutch Inner Cable Upper and Lower Ends [A]  
Throttle Inner Cable Upper and Lower Ends  
Choke Inner Cable Upper and Lower Ends



##### Cables: Lubricate with Rust Inhibitor.

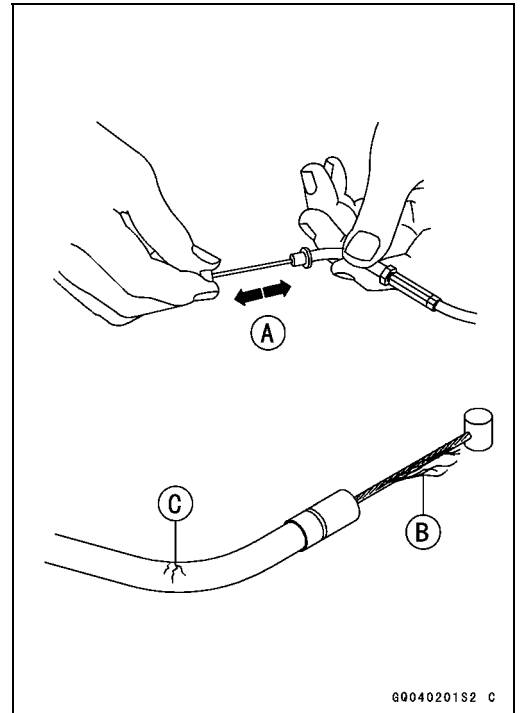
Clutch Cable  
Throttle Cables  
Choke Cable

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



**Periodic Maintenance Procedures**

- With the cable disconnected at both ends, the cable should move freely [A] within the cable housing.
- ★ If cable movement is not free after lubricating, if the cable is frayed [B], or if the cable housing is kinked [C], replace the cable.



## 2-48 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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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 Bracket Nuts
- Engine Mounting Bolt and Nuts
- Exhaust Pipe Holder Nuts
- Exhaust Pipe Holder Clamp Bolt
- Muffler Joint Clamp Bolt
- Muffler Body Mounting Bolts and Nut
- Radiator Bolts

Wheels:

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

Brakes:

- Brake Lever Pivot Bolt and Locknut
- Brake Pedal Bolt
- Brake Rod Joint Cotter Pin
- Caliper Mounting Bolts
- Front Master Cylinder Clamp Bolts
- Brake Pad Pins
- Rear Master Cylinder Mounting Bolts

Suspension:

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

Steering:

- Handlebar Holder Bolts
- Steering Stem Head Nut

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 carburetor, the throttle may become stuck, possibly causing accident. Replace the air cleaner element according to the maintenance chart.**

- Remove:
  - Right Side Cover (see Side Cover Removal in the Frame chapter)
  - Screw [A]
  - Air Cleaner Cap [B]



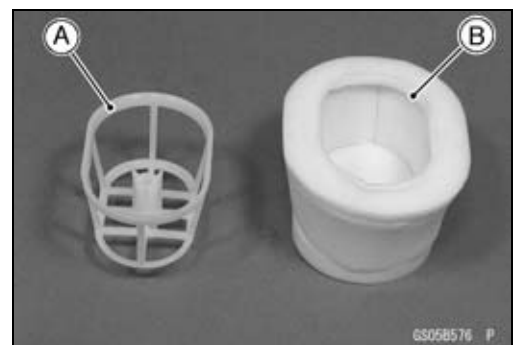
- Remove:
  - Wing Bolt [A]
  - Air Cleaner Element [B]
- Stuff pieces of lint-free, clean cloth into the air cleaner housing to keep dirt out of the carburetor and engine.

**NOTICE**

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



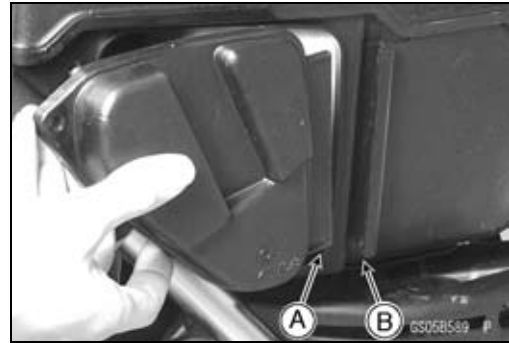
- Separate the frame [A] from the element [B].
- Discard the air cleaner element.



## 2-50 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Install the frame into the new element.
- Install the element and tighten the wing bolt securely.
- Fit the tongue [A] of the air cleaner cap into the slot [B] of the air cleaner housing and tighten the screw securely.

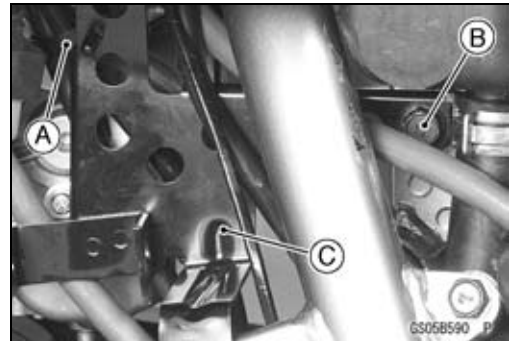


### Fuel Hose Replacement

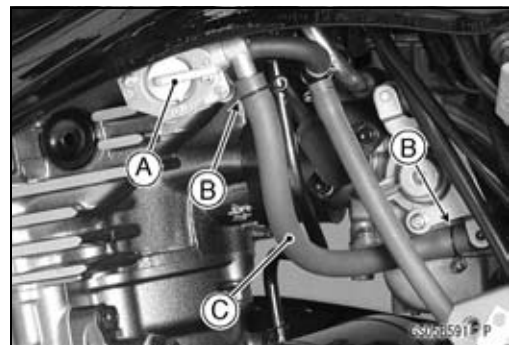
#### **⚠ WARNING**

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

- Remove the starter relay (see Starter Relay Inspection in the Electrical System chapter).
- Open the clamp [A].
- Remove:
  - Bolt [B]
  - Starter Relay Bracket [C]



- Turn the fuel tap lever [A] to the OFF position.
- Remove:
  - Clamps [B]
  - Fuel Hose [C]



- Replace the fuel hose with a new one.
- Run the fuel hose correctly (see cable, Wire, and Hose Routing section in the Appendix chapter).
- Fix the both ends of the fuel hose with the clamps securely.
- Install the removed parts (see appropriate chapters).
- Start the engine and check the fuel hose for leaks.



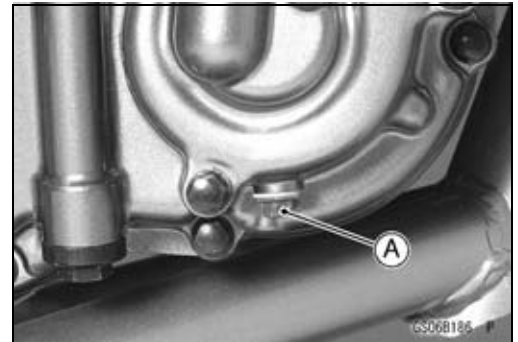
Periodic Maintenance Procedures

Coolant Change

**⚠ WARNING**

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

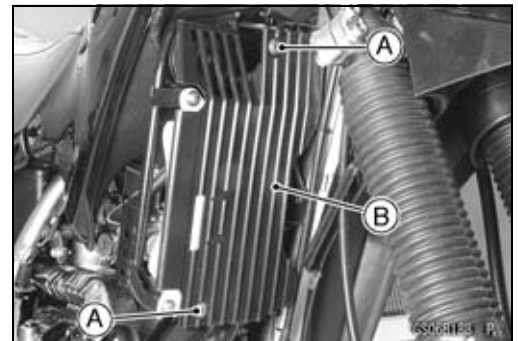
- Remove:
  - Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  - Engine Guard (see Engine Guard Removal in the Frame chapter)
- Place a container under the coolant drain bolt [A], then remove the drain bolt.



- 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.



- Remove:
  - Screws [A]
  - Reserve Tank Cover [B]

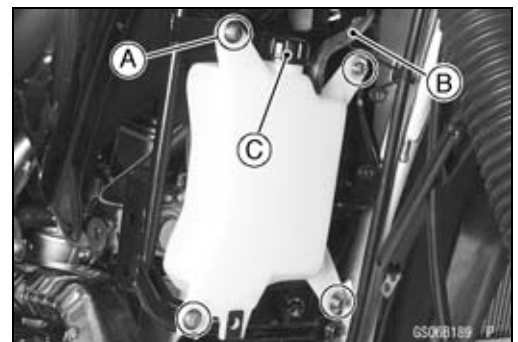


- Remove:
  - Bolts [A]
  - Reserve Tank Overflow Hose [B]
- Remove the cap [C], and pour the coolant into a container.
- Install the reserve tank.

**Torque - Reserve Tank Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

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

**Torque - Coolant Drain Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



## 2-52 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

#### NOTICE

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

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

Soft Water:	50%
Coolant:	50%
Freezing Point:	-35°C (-31°F)
Total Amount:	1.55 L (1.64 US qt)

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

#### NOTE

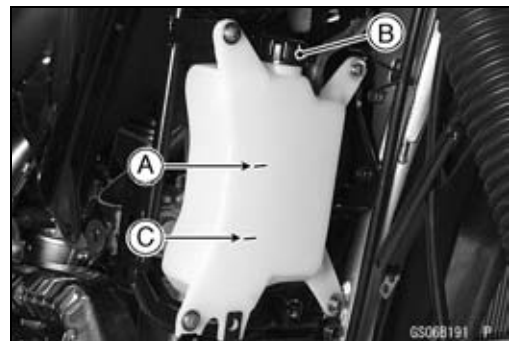
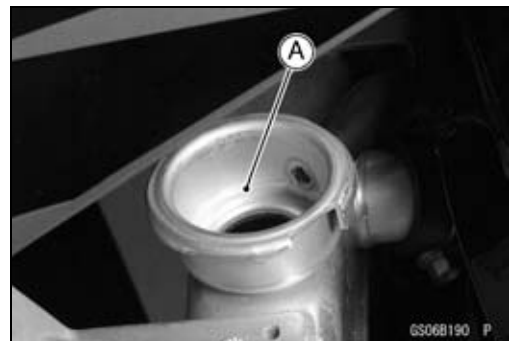
○ *Pour in the coolant slowly so that it can expel the air from the engine and radiator.*

- 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 upper level line [A] with coolant and install the cap [B].

**Torque - Reserve Tank Cap: Hand-tighten**

- 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 lower level line [C], add coolant to the upper level line.



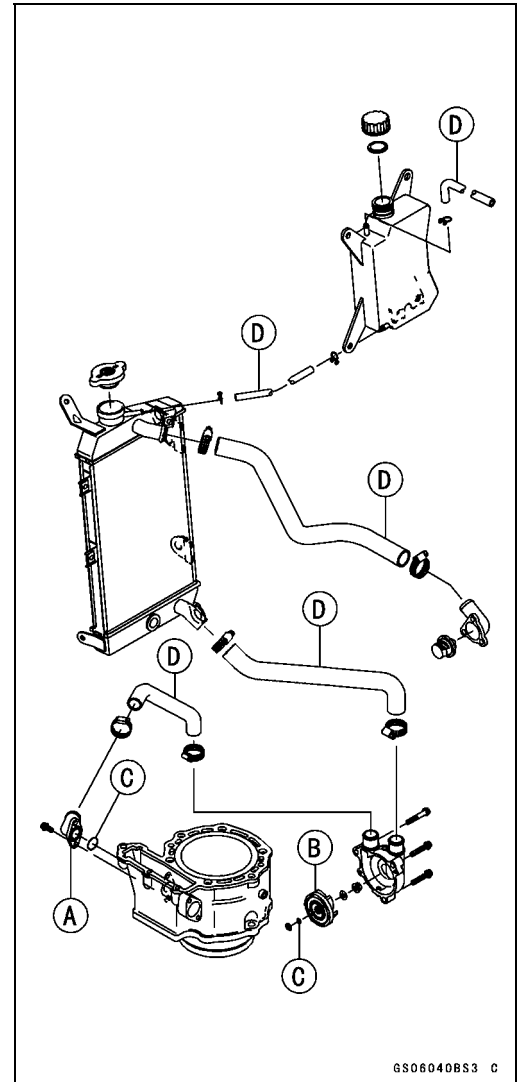
#### NOTICE

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

**Periodic Maintenance Procedures**

**Radiator Hose and O-ring Replacement**

- Drain the coolant (see Coolant Change).
- Remove:
  - Water Hose Fitting [A]
  - Water Pump Impeller [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.
- Tighten:
  - Torque - Water Hose Fitting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Install the new hoses and tighten the hose clamp screws securely.
- 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.
- Replace the drain bolt gasket 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.



## 2-54 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Recommended Engine Oil

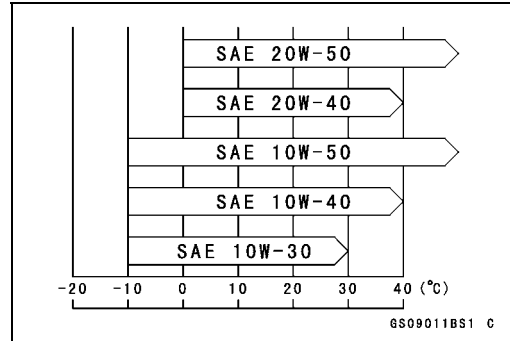
Type: API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2

Viscosity: SAE 10W-40

Capacity: 1.9 L (2.0 US qt) (when filter is not removed)

2.0 L (2.1 US qt) (when filter is removed)

2.1 L (2.2 US qt) (when engine is completely dry)



#### NOTE

- Do not add any chemical additive to the oil. Oils fulfilling the above requirements are fully formulated and provide adequate lubrication for both the engine and the clutch.
- Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.

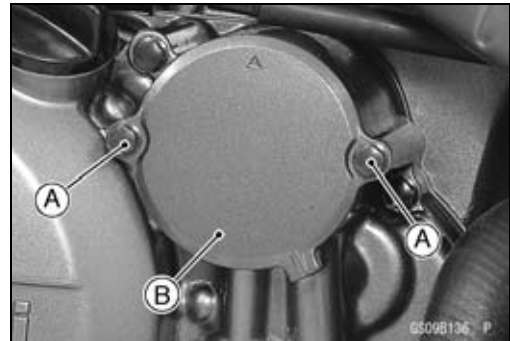
#### ● Tighten:

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

- 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:
  - Bolts [A]
  - Oil Filter Cap [B]

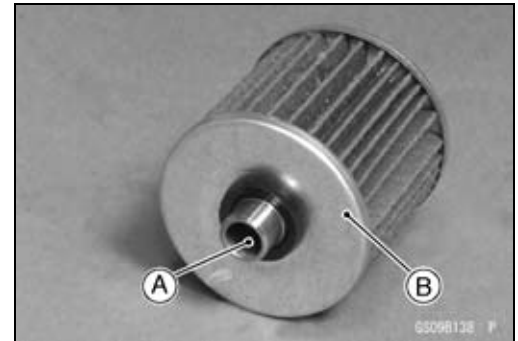


- Remove the oil filter assembly [A].



**Periodic Maintenance Procedures**

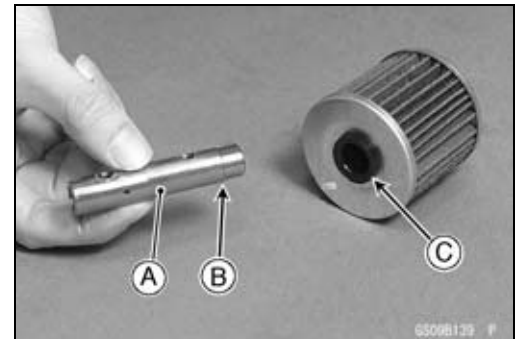
- Remove the bypass valve [A] from the oil filter [B].
- Replace the oil filter with a new one.



- Apply grease to the grommets.
- Insert the bypass valve [A] into the oil filter.

**NOTE**

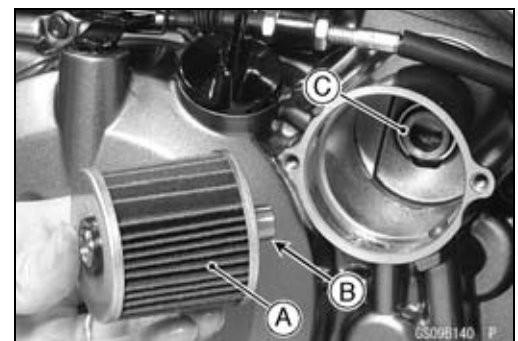
○Align the stepped portion [B] of the bypass valve and upper surface [C] of the grommet.



- Install the oil filter assembly [A] so that longer side [B] of the bypass valve faces inside.
- Fit the bypass valve into the collar [C] on the crankcase.

**NOTICE**

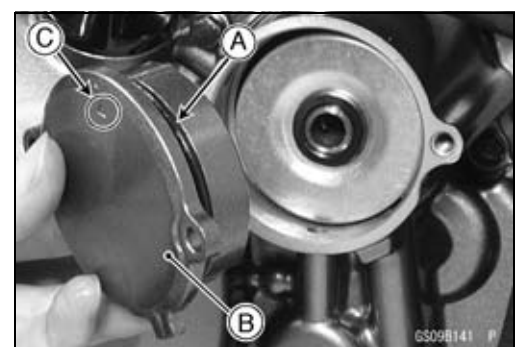
**Inside-out installation stop the oil flow, causing engine seizure.**



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Install the oil filter cap [B] so that the mark [C] faces up-side.
- Tighten:

**Torque - Oil Filter Cap Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

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



## 2-56 PERIODIC MAINTENANCE

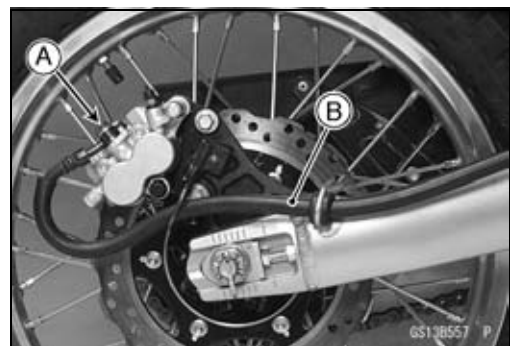
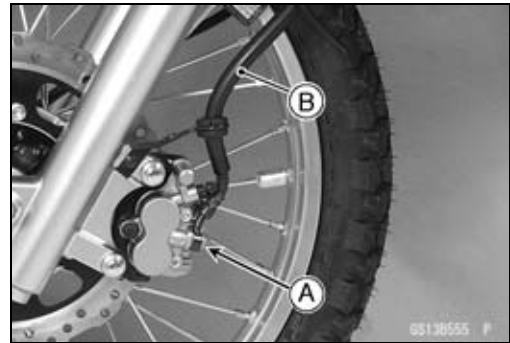
### Periodic Maintenance Procedures

#### Brake Hose and Pipe Replacement

##### NOTICE

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

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



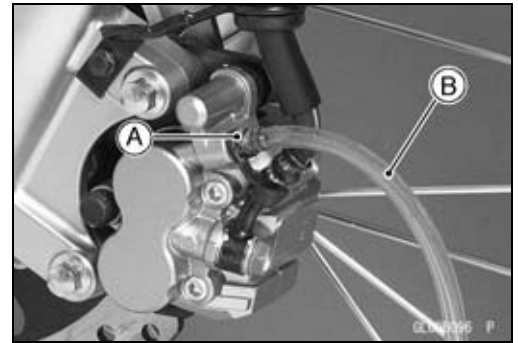
#### Brake Fluid Change

##### NOTE

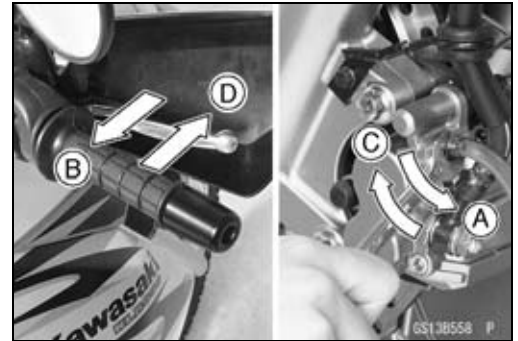
- *The procedure to change the front brake fluid is as follows. Changing the rear brake fluid is the same as for the front brake.*

Periodic Maintenance Procedures

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



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



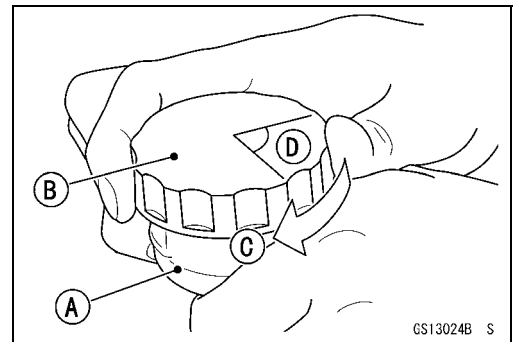
**NOTE**

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

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

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

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



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

**Torque - Bleed 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.

## 2-58 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Master Cylinder Rubber Parts Replacement

##### Front Master Cylinder Disassembly

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

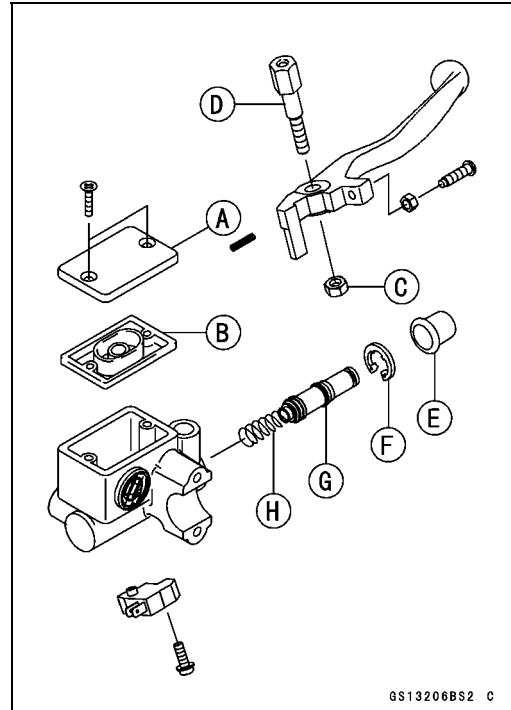
**Special Tool - Inside Circlip Pliers: 57001-143**

- Pull out the piston assy [G] and return spring [H].

#### NOTICE

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

- Replace:
  - Diaphragm [A]
  - Dust Cover [E]
  - Circlip [F]
  - Piston Assy [G]



GS13206BS2 C

##### Rear Master Cylinder Disassembly

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

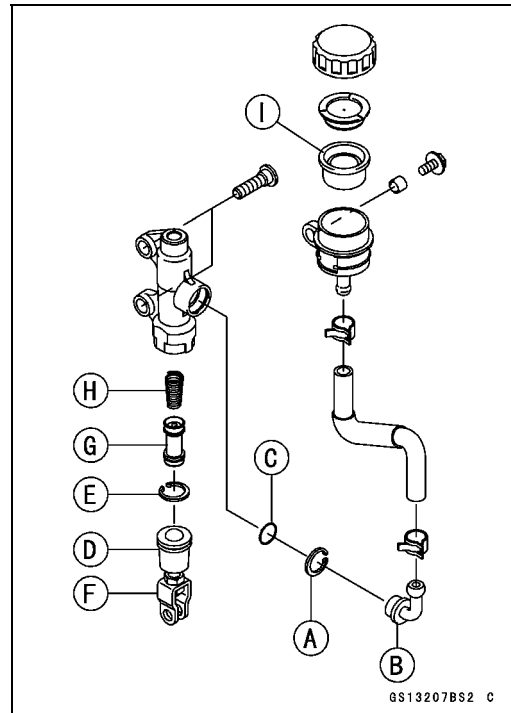
**Special Tool - Inside Circlip Pliers: 57001-143**

- 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].

#### NOTICE

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

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



GS13207BS2 C



Periodic Maintenance Procedures

Master Cylinder Assembly

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

**NOTICE**

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

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

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

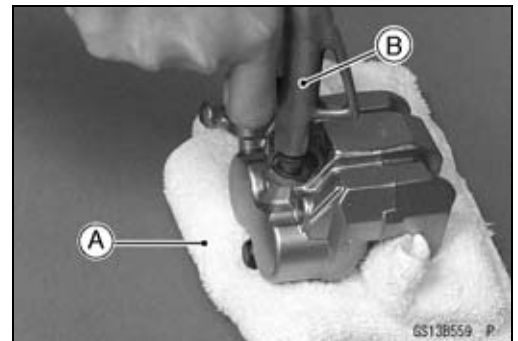
**Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

**Front Master Cylinder Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 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)
- Using compressed air, remove the pistons.
  - Cover the piston area with a clean, thick cloth [A].
  - Blow compressed air [B] into the hole for the banjo bolt to remove the piston.



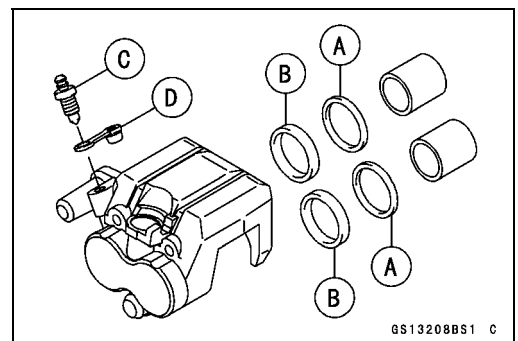
**⚠ WARNING**

The piston in the brake caliper can crush hands and fingers. Never place your hand or fingers in front of the piston.

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

**NOTE**

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



## 2-60 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

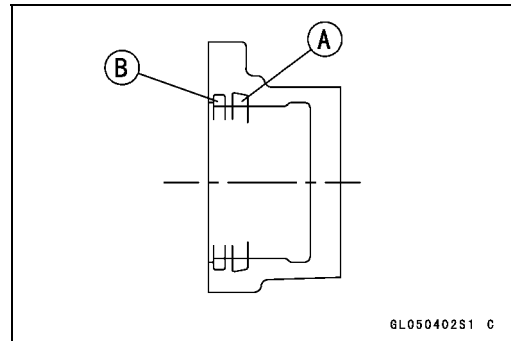
#### Front Caliper Assembly

- Clean the caliper parts except for the pads.

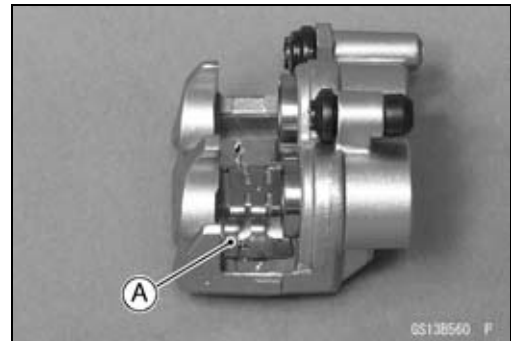
#### NOTICE

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

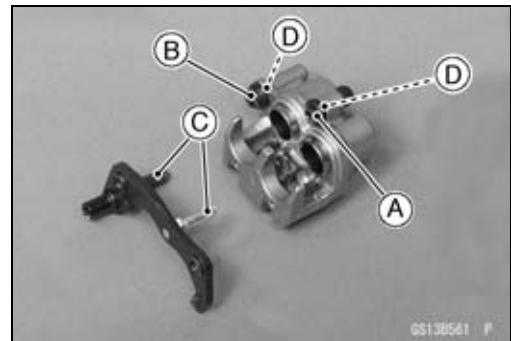
- Install the bleed valve and rubber cap.  
**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Replace the fluid seals [A] with new ones.
  - Apply brake fluid to the fluid seals, and install them into the cylinders by hand.
- Replace the dust seals [B] with new ones if they are damaged.
  -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



- Install the anti-rattle spring [A] as shown.



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

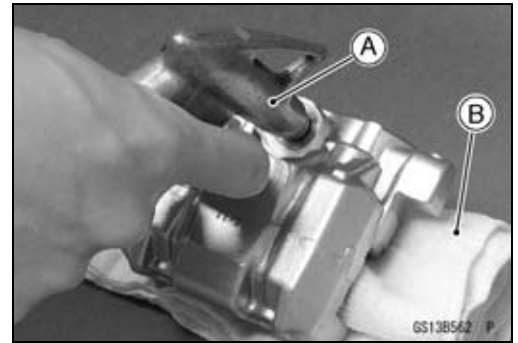


- Install the pads (see Front Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.

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 pistons.
  - Cover the piston area with a clean, thick cloth [B].
  - Blow compressed air [A] into the hole for the banjo bolt to remove the piston.



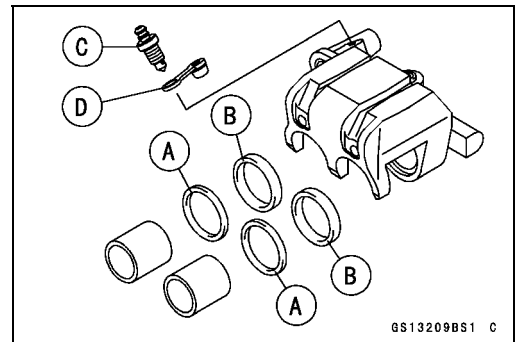
**⚠ WARNING**

**The piston in the brake caliper can crush hands and fingers. Never place your hand or fingers in front of the piston.**

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

**NOTE**

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



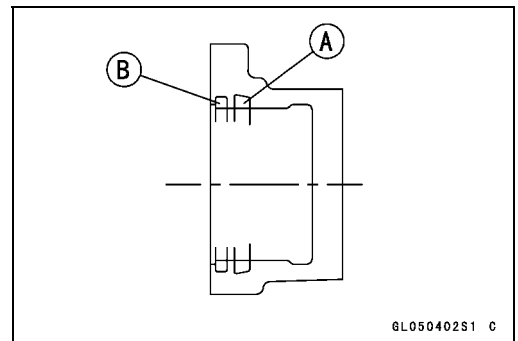
Rear Caliper Assembly

- Clean the caliper parts except for the pads.

**NOTICE**

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

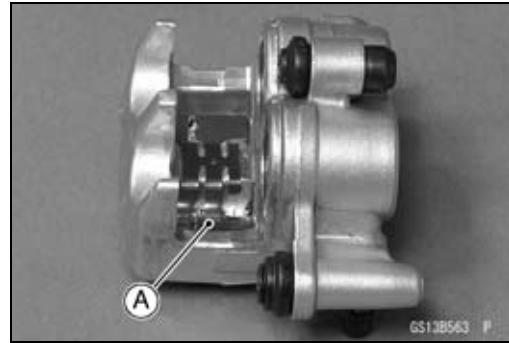
- Install the bleed valve and rubber cap.
  - Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Replace the fluid seals [A] with new ones.
  - Apply brake fluid to the fluid seals, and install them into the cylinder by hand.
- Replace the dust seals [B] with new ones if they are damaged.
  - Apply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



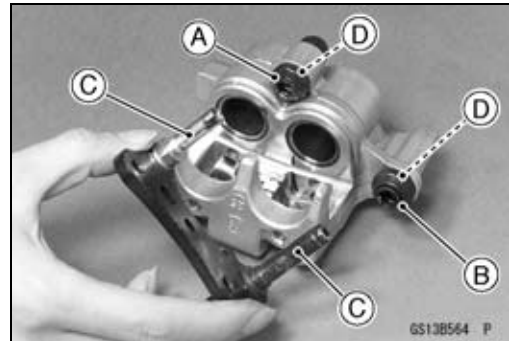
## 2-62 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Install the anti-rattle spring [A] in the caliper as shown.



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

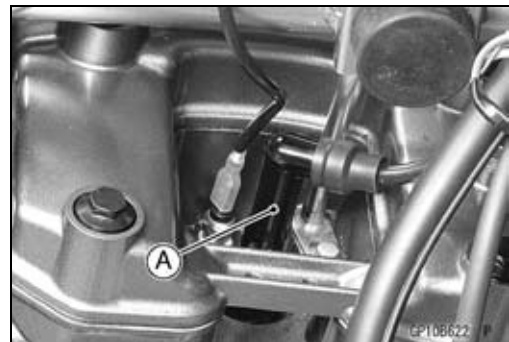


- Install the pads (see Rear Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.

#### **Spark Plug Replacement**

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Remove the spark plug cap [A] from the spark plug.
- Remove the spark plug using the 18 mm (0.7 in.) plug wrench vertically.

**Special Tool - Spark Plug Wrench, Hex 18: 57001-1024**



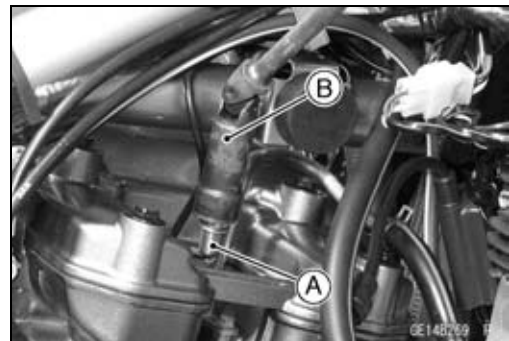
- Replace the spark plug with a new one.

#### **Standard Spark Plug**

**Type: NGK DPR8EA-9 or ND X24EPR-U9**

- Insert the spark plug [A] vertically into the plug hole with the spark plug installed in the plug wrench [B].

**Special Tool - Spark Plug Wrench, Hex 18: 57001-1024**



#### **NOTICE**

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

- Tighten:  
**Torque - Spark Plugs: 14 N·m (1.4 kgf·m, 10 ft·lb)**
- Install the spark plug cap securely.
- Be sure the spark plug cap is installed by pulling up it lightly.

# Fuel System

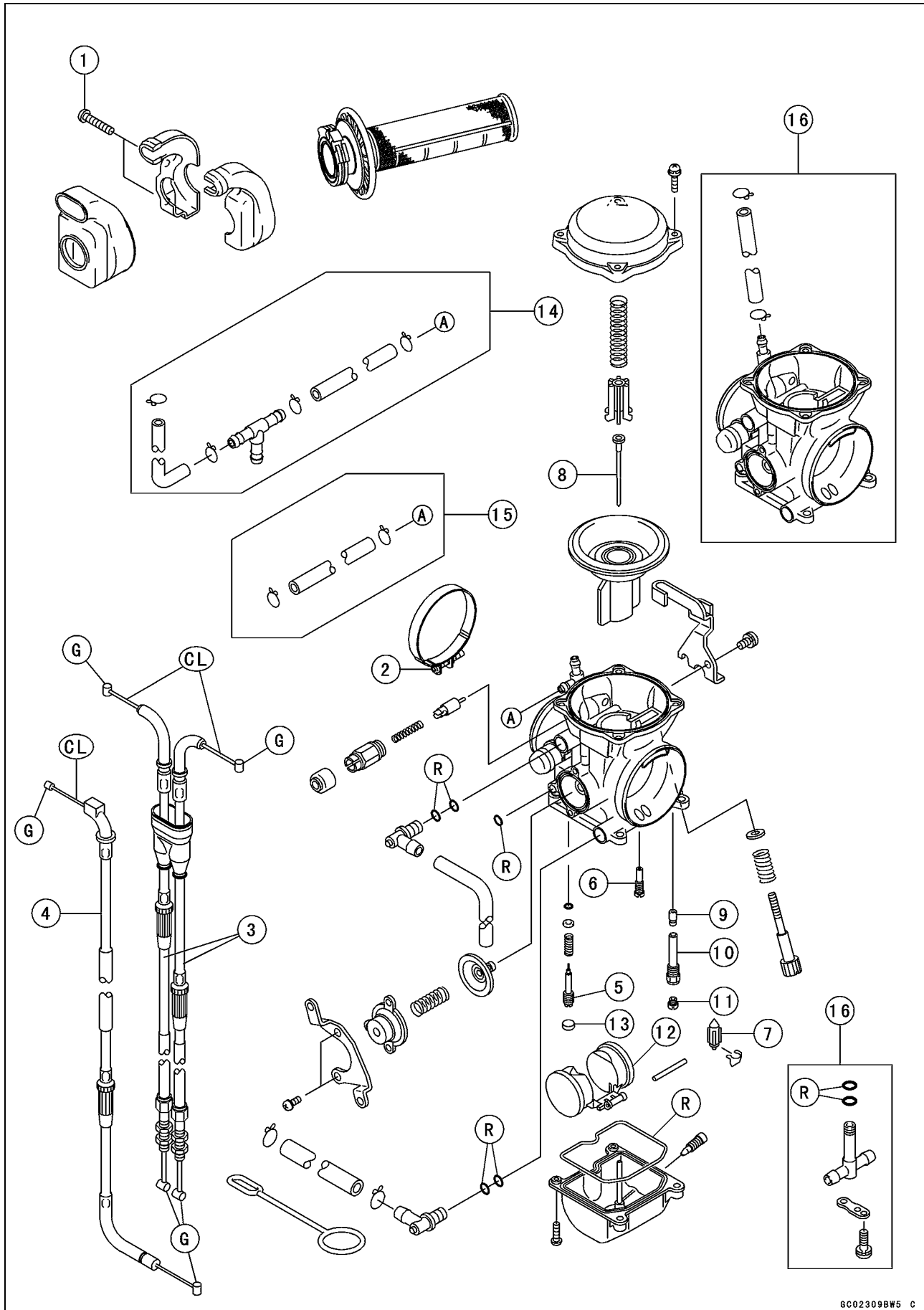
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# 3-2 FUEL SYSTEM

## Exploded View

KL650E8 ~ KL650E9 Models



**Exploded View**

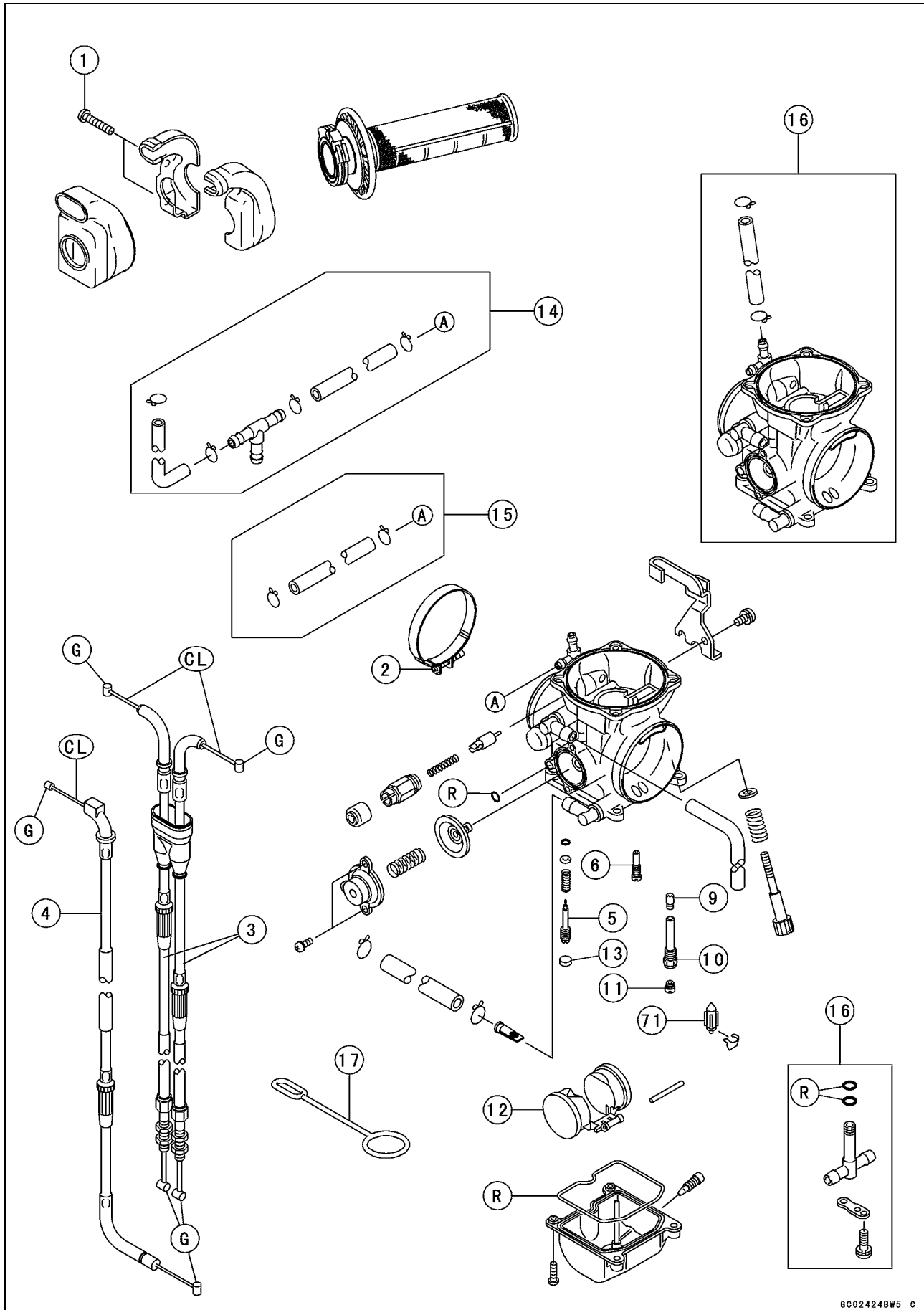
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle Case Screws	3.8	0.39	34 in·lb	
2	Carburetor Holder Clamp Screw	2.0	0.20	18 in·lb	

- 3. Throttle Cables
  - 4. Choke Cable
  - 5. Pilot Screw
  - 6. Pilot Jet
  - 7. Float Valve
  - 8. Jet Needle
  - 9. Needle Jet
  - 10. Needle Jet Holder
  - 11. Main Jet
  - 12. Float
  - 13. Plug (Other than AU Model)
  - 14. CAL Model
  - 15. Other than AU and CAL Models
  - 16. AU Model
- CL: Apply cable lubricant.  
 G: Apply grease.  
 R: Replacement Parts

# 3-4 FUEL SYSTEM

## Exploded View

KL650EA ~ EC Model





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle Case Screws	3.8	0.39	34 in·lb	
2	Carburetor Holder Clamp Screw	2.0	0.20	18 in·lb	

- 3. Throttle Cables
- 4. Choke Cable
- 5. Pilot Screw
- 6. Pilot Jet
- 7. Float Valve
- 8. Jet Needle
- 9. Needle Jet
- 10. Needle Jet Holder
- 11. Main Jet
- 12. Float
- 13. Plug (Other than AU Model)
- 14. CAL Model
- 15. Other than AU and CAL Models
- 16. AU Model
- 17. Other than CAL Model
- CL: Apply cable lubricant.
- G: Apply grease.
- R: Replacement Parts



**Exploded View**

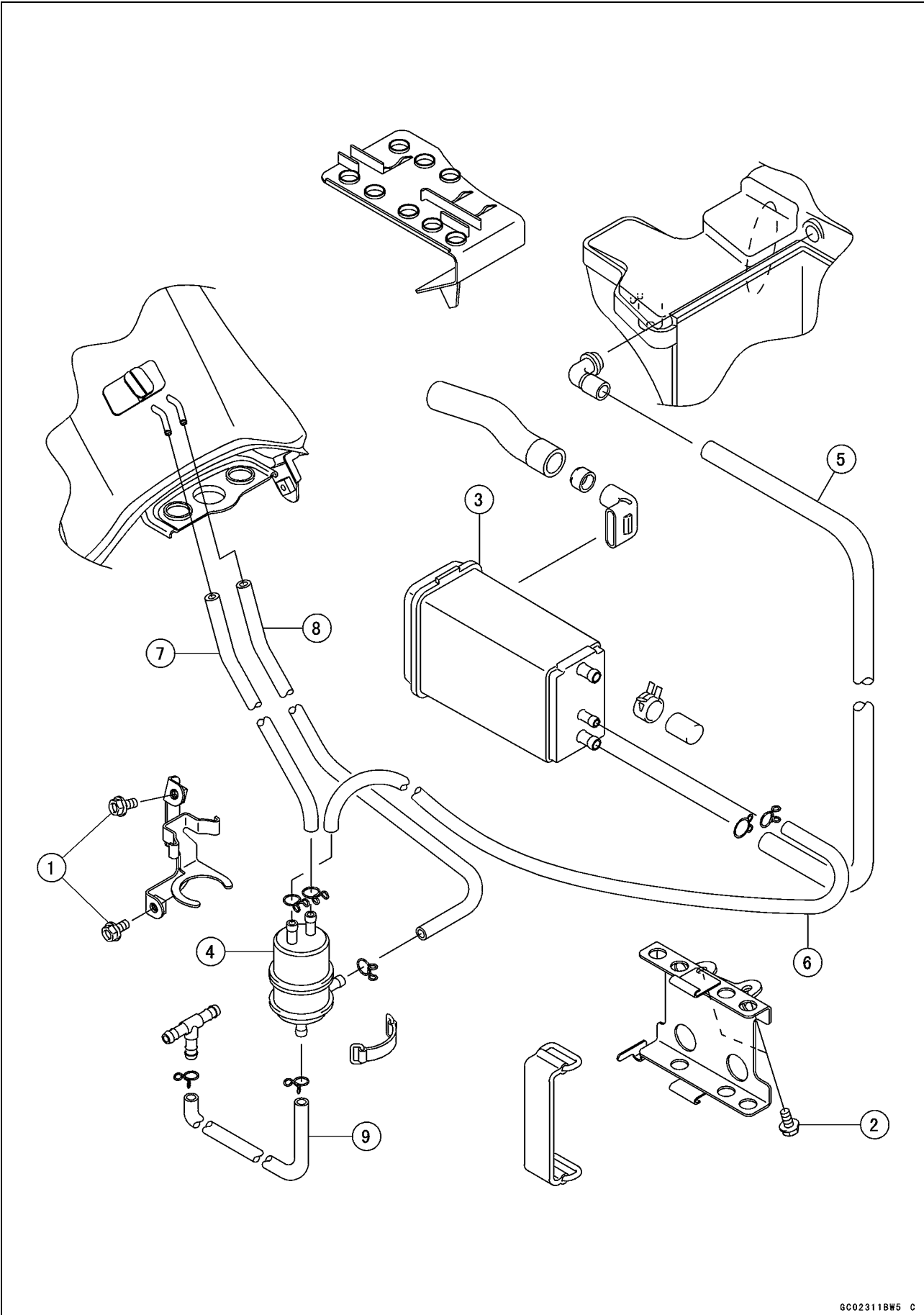
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Cleaner Duct Clamp Screw	2.0	0.20	18 in·lb	
2	Fuel Tap Diaphragm Cover Screws	1.0	0.10	9.0 in·lb	
3	Fuel Tap Bolts	2.5	0.25	22 in·lb	
4	Fuel Tap Lever Plate Screws	0.8	0.08	7 in·lb	
5	Air Cleaner Housing Bolt	8.8	0.90	78 in·lb	

- 6. Vacuum Switch Valve
  - 7. Air Cleaner Housing
  - 8. Air Cleaner Element
  - 9. CAL Model
  - 10. Other than CAL Model
  - 11. Other than AU Model
- AD: Apply adhesive.  
 R: Replacement Parts

# 3-8 FUEL SYSTEM

## Exploded View

CAL Model (KL650E8)



**Exploded View**

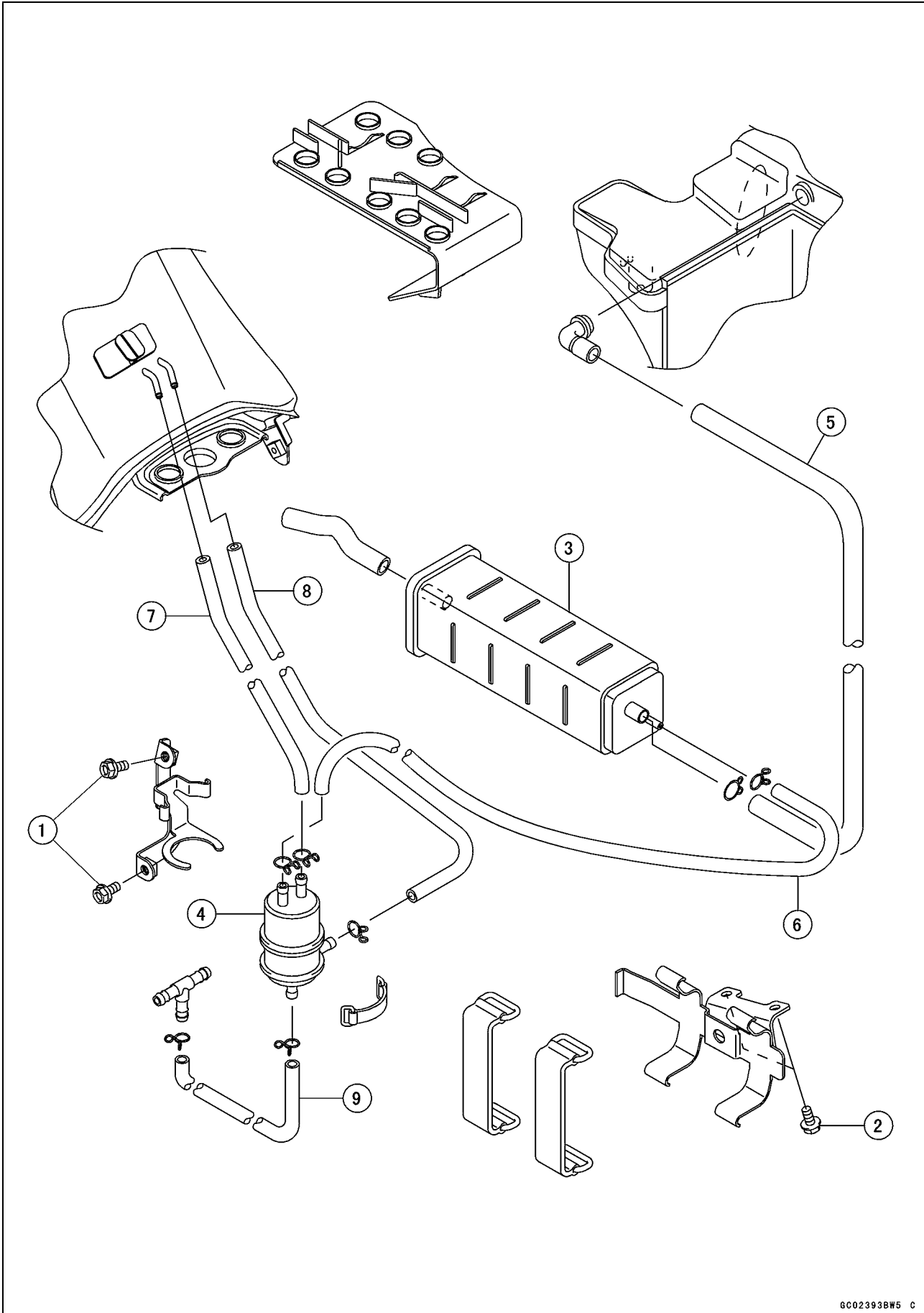
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Separator Bracket Bolts	8.8	0.90	78 in·lb	
2	Canister Bracket Bolts	8.8	0.90	78 in·lb	

- 3. Canister
- 4. Separator
- 5. Green Hose
- 6. Blue Hose
- 7. Blue Hose
- 8. Red Hose
- 9. White Hose

# 3-10 FUEL SYSTEM

## Exploded View

CAL Model (KL650E9 ~ EC)



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Separator Bracket Bolts	8.8	0.90	78 in·lb	
2	Canister Bracket Bolts	8.8	0.90	78 in·lb	

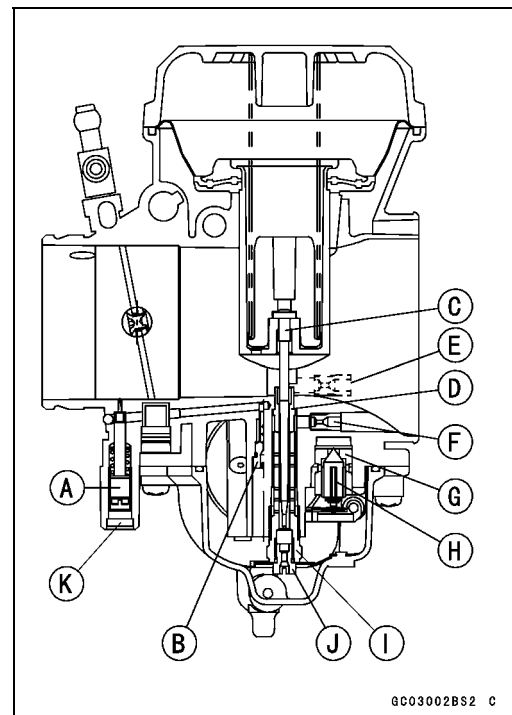
- 3. Canister
- 4. Separator
- 5. Green Hose
- 6. Blue Hose
- 7. Blue Hose
- 8. Red Hose
- 9. White Hose

## 3-12 FUEL SYSTEM

### Specifications

Item	Standard
<b>Carburetors</b>	
Mark, Type	KEIHIN CVK40
Idle Speed	1 300 ±100 r/min (rpm)
Pilot Screw (Turns Out)	1 5/8 (for reference)
Service Fuel Level	0.5 ±1 mm (0.02 ±0.04 in.) above the bottom edge of carburetor body
Float Height	17.5 ±2 mm (0.69 ±0.08 in.)
Main Jet	#145
Main Air Jet	#50
Needle Jet	#6
Jet Needle Mark	N6NJ
Pilot Jet	#40
Pilot Air Jet	#70
Starter Jet	#52
<b>Air Cleaner</b>	
Element	Polyurethane Foam
<b>Throttle Grip Free Play</b>	2 ~ 3 mm (0.08 ~ 0.12 in.)
<b>Choke Lever Free Play</b>	2 ~ 3 mm (0.08 ~ 0.12 in.)

- Pilot Screw [A]
- Pilot Jet [B]
- Jet Needle [C]
- Needle Jet [D]
- Pilot Air Jet [E]
- Main Air Jet [F]
- Valve Seat [G]
- Float Valve [H]
- Needle Jet Holder [I]
- Main Jet [J]
- Plug [K] (Other than AU Model)

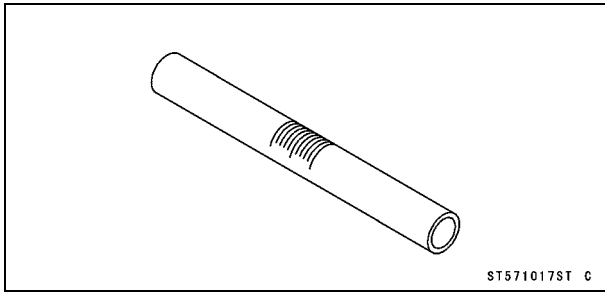


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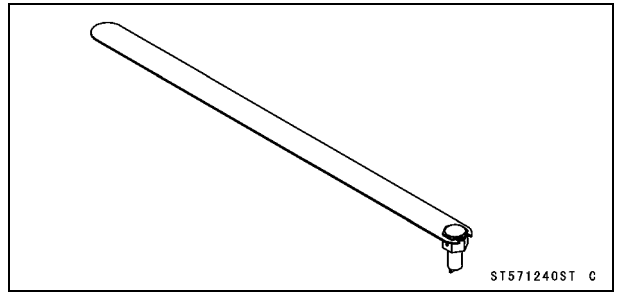


Special Tools

Fuel Level Gauge:  
57001-1017



Pilot Screw Adjuster, B:  
57001-1240



## 3-14 FUEL SYSTEM

### Throttle Grip and Cables

#### **Throttle Grip Free Play Inspection**

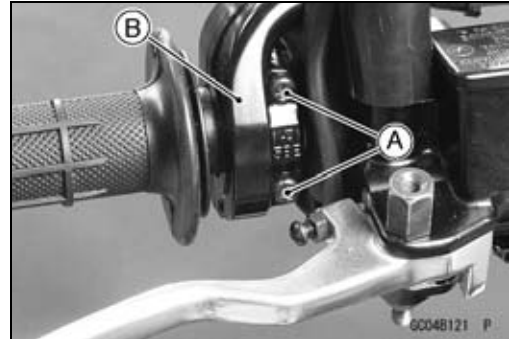
- Refer to the Throttle Control System Inspection in the Periodic Maintenance chapter.

#### **Throttle Grip Free Play Adjustment**

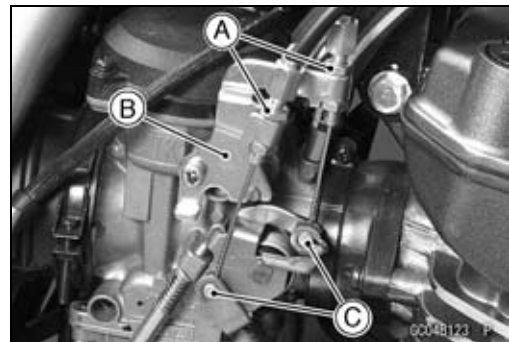
- Refer to the Throttle Control System Inspection in the Periodic Maintenance chapter.

#### **Throttle Cable Removal**

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Right Handle Cover (see Handle Cover Removal)
- Slide up the dust cover.
- Remove the screws [A], and split the throttle case [B].
- Remove the throttle cable upper ends [A] from the throttle grip.



- Loosen the locknuts [A] and pull the throttle cables out of cable holder [B].
- Remove the throttle cable lower ends [C] from the carburetor pulley.
- Pull the throttle cables out of the frame.



#### **Throttle Cable Installation**

- Install the throttle cables in accordance with the cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the throttle cable lower ends in the carburetor pulley and tighten the locknuts.
- Install the throttle cables upper ends in the throttle grips.
- Install the throttle case (see Handlebar Installation in the Steering chapter).
- 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. Be sure the cables are routed correctly and properly adjusted.**

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## Throttle Grip and Cables

---

### *Throttle Cable Lubrication*

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

## 3-16 FUEL SYSTEM

### Choke Cable

#### **Choke Lever Free Play Inspection**

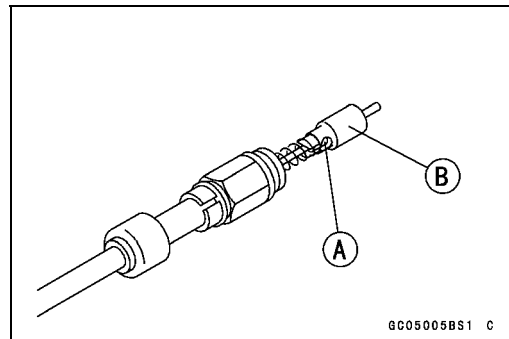
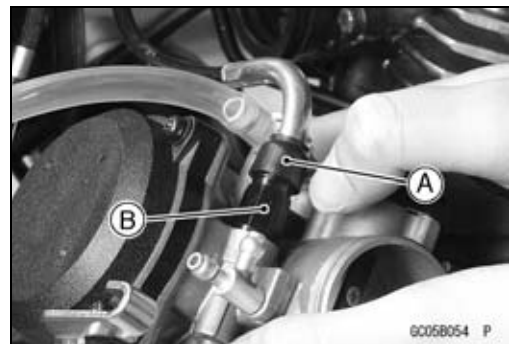
- Refer to the Choke Operation Inspection in the Periodic Maintenance chapter.

#### **Choke Lever Free Play Adjustment**

- Refer to the Choke Operation Inspection in the Periodic Maintenance chapter.

#### **Choke Cable Removal**

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Left Handle Cover (see Handle Cover Removal in the Frame chapter)
  - Left Switch Housing
- Remove the carburetor from the holder (see Carburetor Removal).
- Slide up the dust cover [A].
- Unscrew the choke cable plunger cap [B], and remove the choke cable with the plunger.
- Hold the choke plunger spring compressed, and free the choke cable lower end [A] from the plunger [B].
- Pull the choke cable out of the frame.



#### **Choke Cable Installation**

- Install the choke cable in accordance with the cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the choke cable and the plunger in the carburetor, and tighten the plunger cap.
- Install the left switch housing (see Handlebar Installation in the Steering chapter).
- After installation, adjust the cable properly (see Choke Operation Inspection in the Periodic Maintenance chapter).

#### **⚠ WARNING**

Operation with incorrectly routed or improperly adjusted cable could result in an unsafe riding condition. Be sure the cable is routed correctly and properly adjusted.

#### **Choke Cable Lubrication**

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

## Carburetor

### Idle Speed Inspection

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

### Idle Speed Adjustment

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

### Pilot Screw Adjustment (AU Model)

#### NOTE

○ For the other than Australia model, there is plug on the pilot screw.

- ★ If the engine idle is still not stable, adjust the pilot screw to obtain the proper idle speed using the pilot screw adjuster [A].

**Special Tool - Pilot Screw Adjuster, B: 57001-1240**

- Turn in the pilot screw fully but not tightly, and then back it out the specified turns. To set the screw to its original position.

**Pilot Screw Setting: 1 5/8 turns out**



#### NOTICE

**Does not over-tighten the pilot screw. It could be damaged, requiring replacement.**

#### NOTE

○ The standard number of turns the pilot screw must be backed out varies by carburetor. The values given in the specifications should be used only when the number of the original back out turns is unavailable.

### Service Fuel Level Inspection

#### ⚠ WARNING

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

## 3-18 FUEL SYSTEM

### Carburetor

- Remove the carburetor, and hold it upright on a stand (see Carburetor Removal).
- Prepare an auxiliary fuel tank and connect the fuel hose to the carburetor.
- Pour the fuel into the carburetor.
- Prepare a rubber hose (6 mm (0.24 in.) inside diameter and about 300 mm (11.81 in.) long) and connect it to the fitting at the bottom of float bowl.
- Connect the fuel level gauge [A] to the rubber hose.

#### Special Tool - Fuel Level Gauge: 57001-1017

- Hold the gauge vertically against the side of the carburetor body so that the middle line is several millimeters higher than the bottom edge [B] of the carburetor body
- Turn the carburetor drain plug [C] out a few turns.
- Wait until the fuel level in the gauge settles.
- Keeping the gauge vertical, slowly lower the gauge until the middle line is even with the bottom edge of the carburetor body.

#### NOTE

○ Do not lower the middle line below the bottom edge of the carburetor body. If the gauge is lowered and then raised again, the fuel level measured shows somewhat higher than the actual fuel level. If the gauge is lowered too far, dump the fuel out of it into a suitable container and start the procedure over again.

- Read the fuel level [D] in the gauge and compare to the specification.

#### Service Fuel Level

Standard:  $0.5 \pm 1$  mm ( $0.02 \pm 0.04$  in.) above the bottom edge of carburetor body.

- Tighten the drain plug and remove the fuel level gauge.
- ★ If the fuel level is incorrect, adjust the float height (see Float Height Adjustment).

### Float Height Adjustment

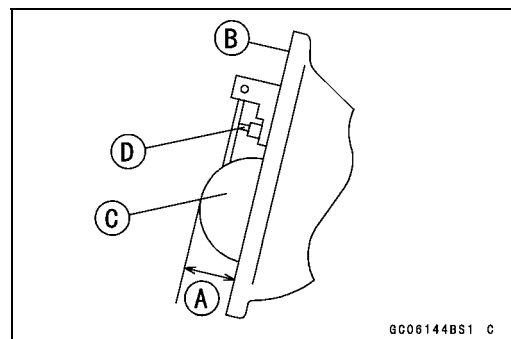
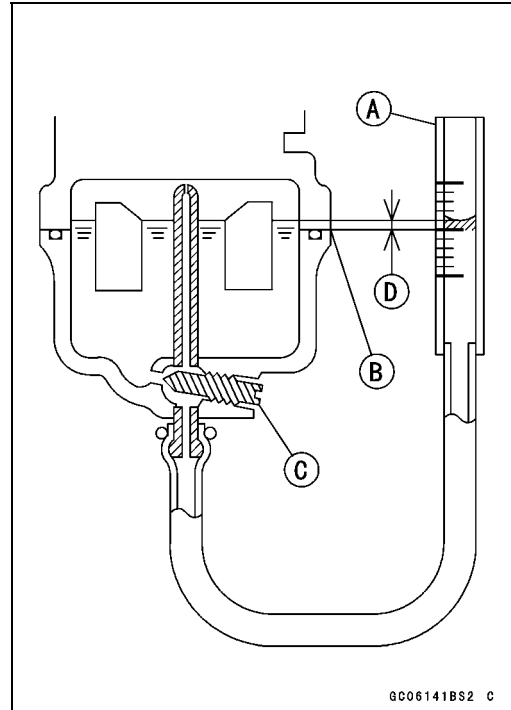
#### ⚠ WARNING

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

- Remove the float bowl (see Carburetor Disassembly).
- Measure the float height [A] from the mating surface [B] of carburetor body to the top of the float by tilting the carburetor so that the tang of the float [C] just touches the needle rod [D] of the float valve.
- When measuring the float height, the needle rod must not be depressed.

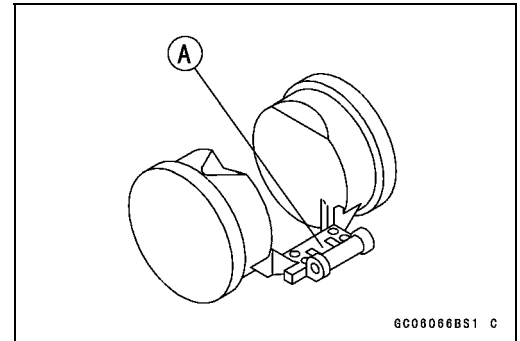
#### Float height

Standard:  $17.5 \pm 2$  mm ( $0.69 \pm 0.08$  in.)



## Carburetor

- ★ If the float height is out of the standard range, adjust the float height according to the following procedure.
- Bend the tang [A] on the float arm very slightly to change the float height.
- Increasing the float height lowers the fuel level and decreasing the float height raises the fuel level.



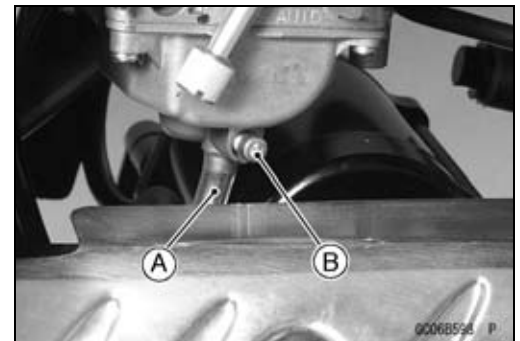
- Assemble the carburetor, and recheck the fuel level.
- ★ If the fuel level can not be adjusted by this method, the float or the float valve is damaged.

### Fuel System Cleanliness Inspection

**⚠ WARNING**

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

- Connect a suitable hose [A] to the fitting at the bottom of the float bowl.
- Run the lower end of the carburetor drain hose into a suitable container.
- Turn out the carburetor drain plug [B] a few turns and drain the float bowl.
- Check to see if water or dirt comes out.
- Tighten the drain plug.
- ★ If any water or dirt appears during the above inspection, clean the carburetor and the fuel tank (see Carburetor Cleaning and Fuel Tank Cleaning).



### Carburetor Removal

**⚠ WARNING**

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

## 3-20 FUEL SYSTEM

### Carburetor

- Remove:
  - Starter Relay (see Starter Relay Inspection in the Electrical System chapter)
  - Starter Relay Bracket (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- For the other than Australia model, drain the coolant and remove the water hoses from the fitting on the carburetor.
- For the California model, remove the hose [A] of the separator from the fitting.
- Remove the air vent hose [B] from the fitting on the carburetor.
  
- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Left Switch Housing
- For the other than Australia model, remove the vacuum switch valve hose [A] from the fitting on the carburetor.
- Loosen:
  - Carburetor Holder Clamp Screw [B]
  - Air Cleaner Duct Clamp Screw [C]
- Remove the air cleaner duct clamp [D] to make easy to remove carburetor.
- Pull the carburetor out of the air cleaner duct [E], and then pull it out of the carburetor holder [F].
- Take out the carburetor from the right side of the motorcycle.
- Remove the choke cable from the carburetor (see Choke Cable Removal).
- Stuff pieces of lint-free, clean clothe into the carburetor holder and the air cleaner duct to keep dirt out of the engine and air cleaner.

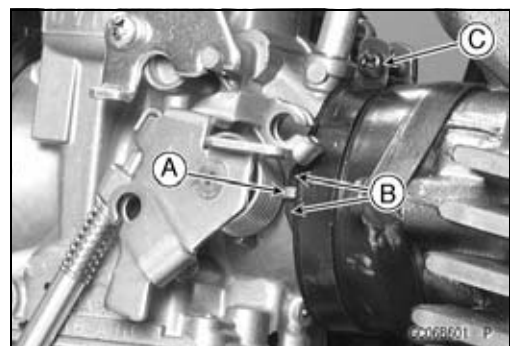
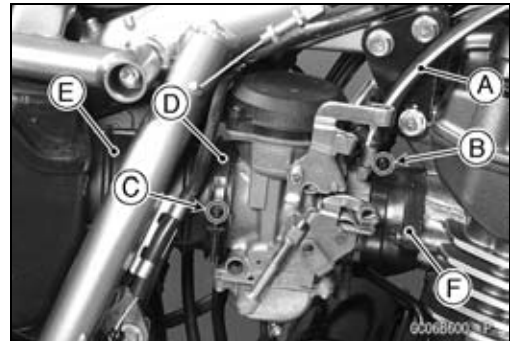
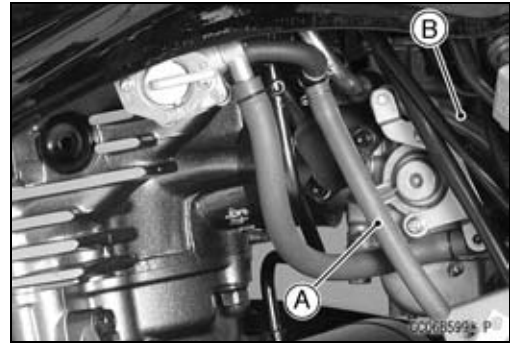
#### NOTICE

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

#### Carburetor Installation

- Install the choke cable to the carburetor before installing the carburetor.
- Fit the projection [A] of the carburetor into the stopper [B] of the carburetor holder.
- Install the holder clamp screw [C] in the direction as shown and tighten it.

**Torque - Carburetor Holder Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**





## Carburetor

- Insert the air cleaner duct into the carburetor until the stopper [A] attach to the duct end [B].
- Install the duct clamp screw [C] in the direction as shown and tighten it.

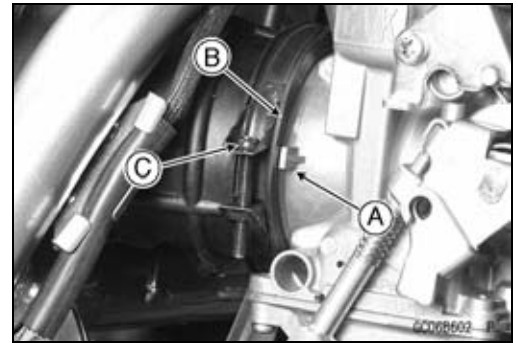
**Torque - Air Cleaner Duct Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

- Check the fuel leakage from the carburetor.

**⚠ WARNING**

**Fuel spilled from the carburetor is hazardous.**

- Run the 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)
  - Choke Lever Free Play (see Choke Operation Inspection in the Periodic Maintenance chapter)
  - Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)



### Carburetor Disassembly

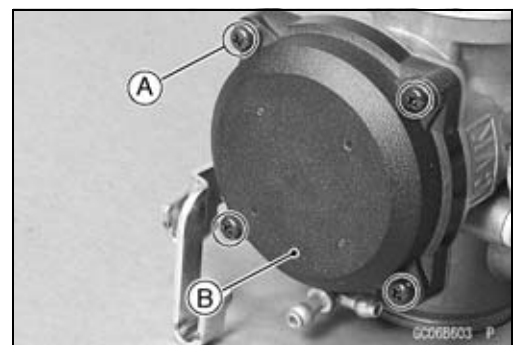
**⚠ WARNING**

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

**NOTICE**

**During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.**

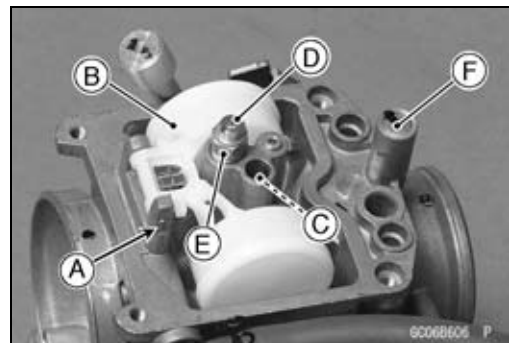
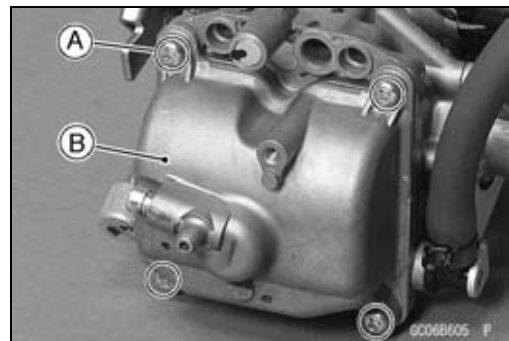
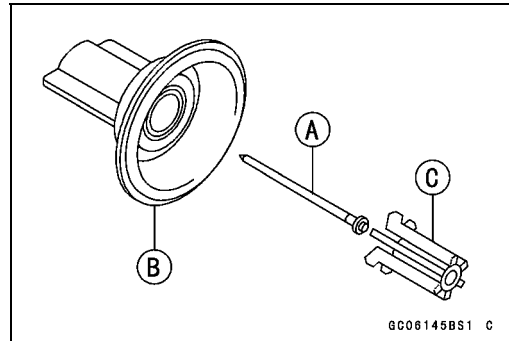
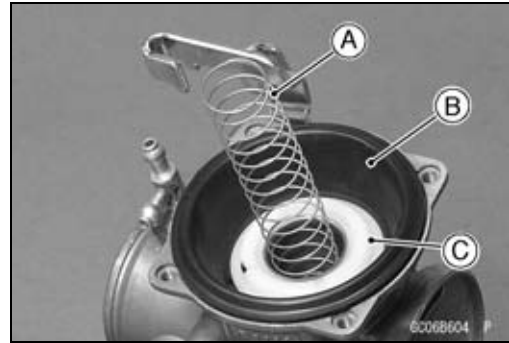
- Remove:
  - Carburetor (see Carburetor Removal)
  - Screws [A]
  - Upper Chamber Cover [B]



## 3-22 FUEL SYSTEM

### Carburetor

- Remove:
  - Spring [A]
  - Diaphragm [B] and Vacuum Piston [C]
- Remove the jet needle [A] from the vacuum piston [B] along with the spring seat [C].
- Remove:
  - Screws [A]
  - Float Bowl [B]
- Remove:
  - Pivot Pin [A]
  - Float [B] and Float Valve
  - Pilot Jet [C]
  - Main Jet [D]
  - Needle Jet Holder [E] and Needle Jet
- For the other than Australia model, remove the plug [F] on the pilot screw as follows.
  - Punch a hole in the plug and pry it out with an awl or other suitable tool.
  - Turn in the pilot screw and count the number of turns until it seats fully but not tightly, and record the number of turns.
  - This is to set the pilot screw to its original position when assembling.
  - Remove the pilot screw.



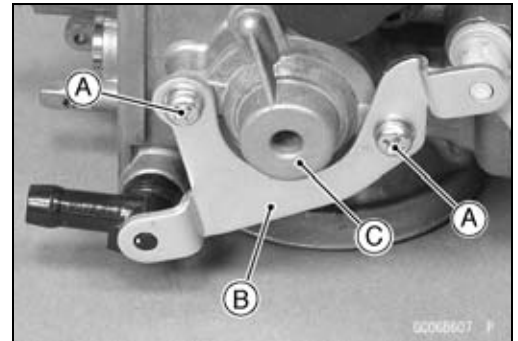
#### NOTICE

**Does not over-tighten the pilot screw. It could be damaged, requiring replacement.**

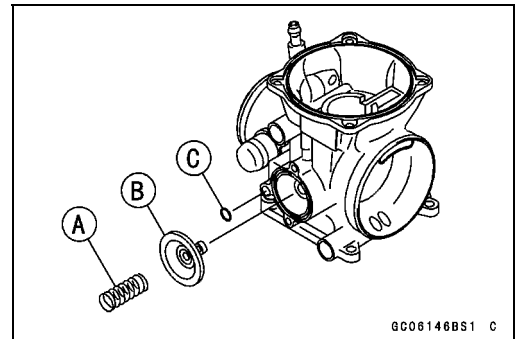
## Carburetor

### KL650E8 ~ E9 Models

- Remove:
  - Screws [A]
  - Plate [B]
  - Coasting Enricher Cover [C]

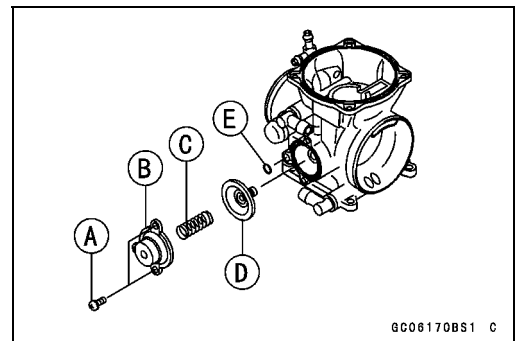


- Remove:
  - Spring [A]
  - Diaphragm [B]
  - O-ring [C]



### KL650EA ~ EC Model

- Remove:
  - Screws [A]
  - Coasting Enricher Cover [B]
  - Spring [C]
  - Diaphragm [D]
  - O-ring [E]



## Carburetor Assembly

### **⚠ WARNING**

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

### **NOTICE**

Do not apply force to the jet or overtighten it, as this could damage the jet or the carburetor body, requiring replacement.

## 3-24 FUEL SYSTEM

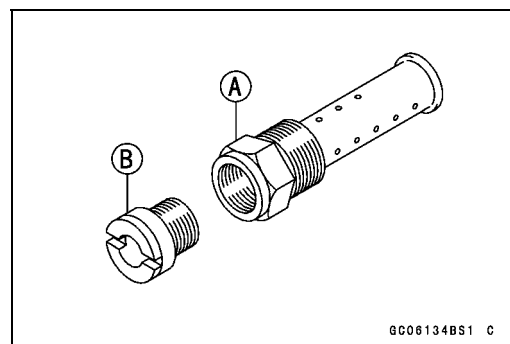
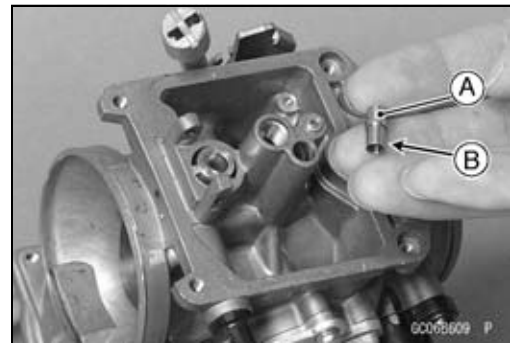
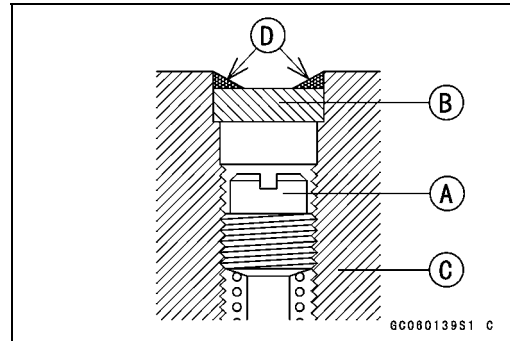
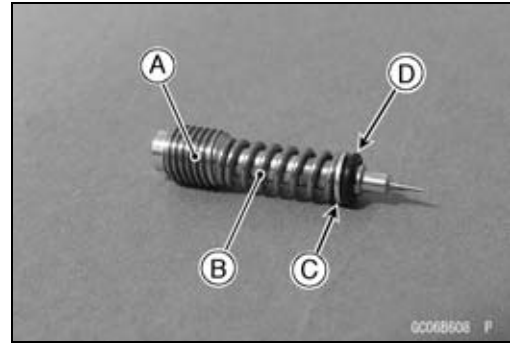
### Carburetor

- Install the following on the pilot screw [A].
  - Spring [B]
  - Spring Seat [C]
  - O-ring [D]
- Turn in the pilot screw [A] fully but not tightly, and then back it same number of turns counted during disassembly.
- For the other than Australia model, install the plug [B] on the pilot screw as follows.
- Install a new plug in the pilot screw hole of the carburetor body [C], and then apply a small amount of a bonding agent [D] to the circumference of the plug to fix the plug.

#### NOTICE

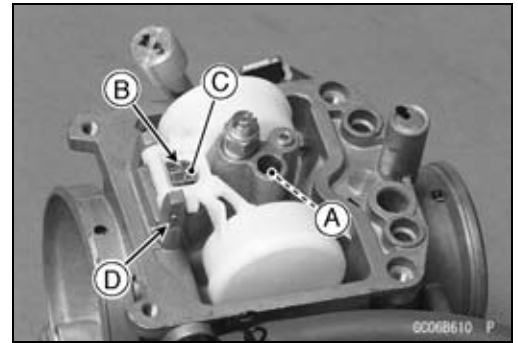
**Do not apply too much bonding agent to the plug or the pilot screw itself may become fixed.**

- To install the needle jet [A], turn the carburetor upside down, and drop the needle jet into place so that the longer side [B] of the jet goes first.
- Carefully screw in the needle jet holder [A]. It will seat against the needle jet, pushing the end of the jet into the carburetor bore.
- Carefully screw in the main jet [B] on the needle jet holder.

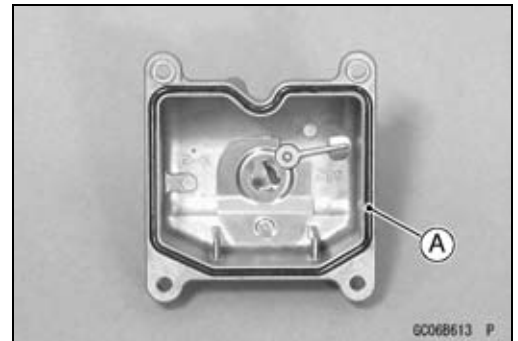


## Carburetor

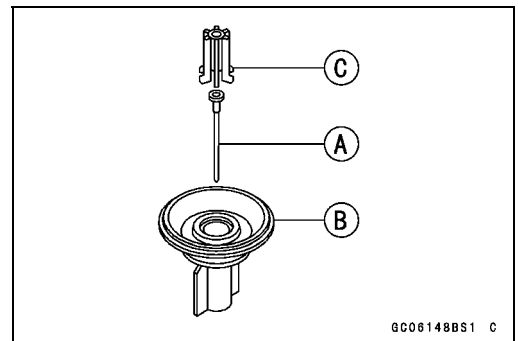
- Carefully screw in the pilot jet [A] on the carburetor.
- Hook the needle hanger [B] onto the float tangs [C] and install the float valve needle in the valve seat.
- Insert the float pivot pin [D].
- After installation, check the float height (see Float Height Adjustment).



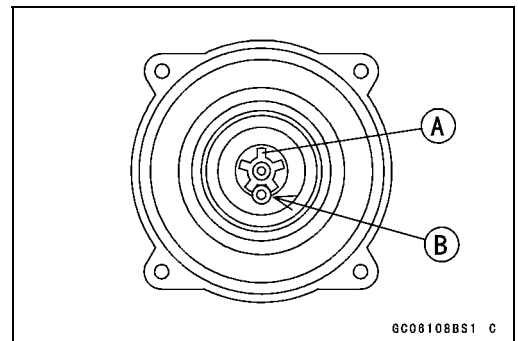
- Replace the O-ring [A] with a new one.
- Install the float bowl.



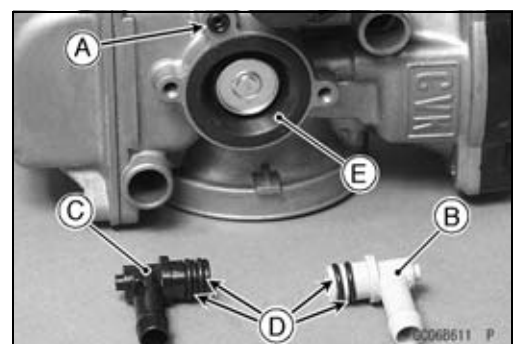
- Insert the jet needle [A] into the hole in the center of the vacuum piston [B], and put the spring seat [C] on the jet needle.



- Turn the spring seat [A] so that it does not block the hole [B] at the bottom of the vacuum piston.
- Install the spring and upper chamber cover.
- After installation, check that the vacuum piston slides up and down smoothly without binding in the carburetor bore.



- Replace the O-ring [A] with a new one.
- ★ If the air vent hose fitting [B] and fuel hose fitting [C] were removed, replace the O-rings [D] with new ones.
- Install the diaphragm [E].
- Install the spring, coasting enricher cover and plate.



## 3-26 FUEL SYSTEM

### Carburetor

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#### *Carburetor Cleaning*

##### **WARNING**

Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the carburetor in a well ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash point solvent to clean the carburetor.

##### **NOTICE**

Do not use compressed air on an assembled carburetor, or the floats may be crushed by the pressure, and the vacuum piston diaphragm may be damaged. Remove as many rubber or plastic parts from the carburetor as possible before cleaning the carburetor with a cleaning solution. This will prevent damage to or deterioration of the parts. The carburetor body has plastic parts that cannot be removed. Do not use a strong carburetor cleaning solution which could attack these parts; instead, use a mild high-flash point cleaning solution safe for plastic parts. Do not use wire or any other hard instrument to clean carburetor parts, especially jets, as they may be damaged.

- Disassemble the carburetor (see Carburetor Disassembly).
- Clean all the metal parts in a carburetor cleaning solution.
- Rinse the parts in water.
- Dry them with compressed air.
- Blow through the air and fuel passages with compressed air.
- Assemble the carburetor (see Carburetor Assembly).

#### *Carburetor Inspection*

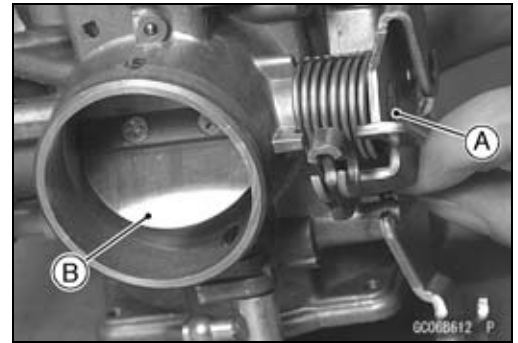
##### **WARNING**

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

- Remove the carburetor (see Carburetor Removal).
- Before disassembling the carburetor body, check the service fuel level (see Service Fuel Level Inspection).
- ★ If the fuel level is incorrect, inspect of the carburetor before correct it.

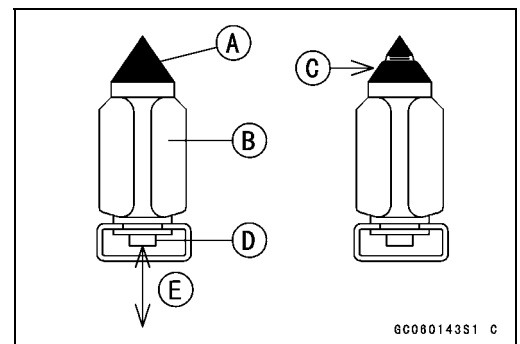
## Carburetor

- Turn the throttle cable pulley [A] to check that the throttle valve [B] moves smoothly and returns by spring force.
- ★ If the throttle valve does not move smoothly, replace the carburetor.

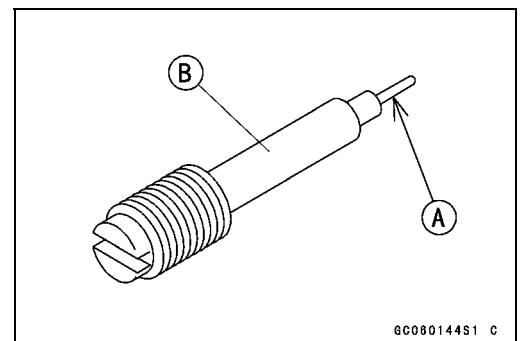


- Disassemble the carburetor (see Carburetor Disassembly).
- Clean the carburetor (see Carburetor Cleaning).
- Check that all O-rings and diaphragms of the carburetor are in good condition.
- ★ If the O-ring or the diaphragm is not in good condition, replace it.

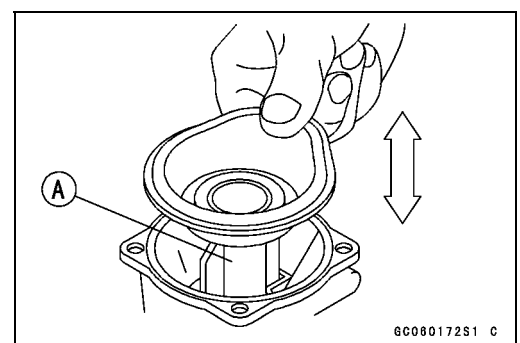
- Check the plastic tip [A] of the float valve needle [B]. It should be smooth, without any grooves, scratches, or tears.
- ★ If the plastic tip is damaged [C], replace the needle.
- Push the rod [D] into the valve needle with your finger, and then release it [E].
- ★ If the rod does not spring out, replace the float valve needle.



- Check the tapered portion [A] of the pilot screw [B] for wear or damage.
- ★ Replace the pilot screw if it is worn or damaged on the tapered portion, or it will prevent the engine from idling smoothly.



- Check that the vacuum piston [A] operates smoothly in the carburetor body.
- ★ If the vacuum piston does not operate smoothly, or if loosened in the carburetor body, replace the piston or the carburetor.



## 3-28 FUEL SYSTEM

### Air Cleaner

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

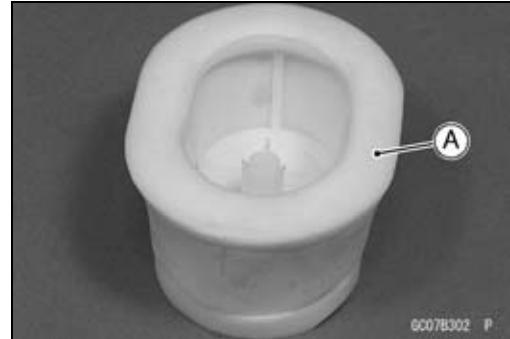
- Refer to the Air Cleaner Element Replacement in the Periodic Maintenance chapter.

#### **Air Cleaner Element Cleaning**

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

#### **Air Cleaner Element Inspection**

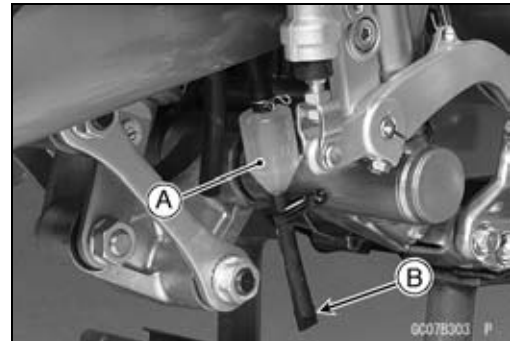
- Remove the air cleaner element (see Air Cleaner Element Replacement in the Periodic Maintenance chapter).
- Visually check the element [A] for tears or breaks.
- ★ If the element has any tears or breaks, replace the element.



#### **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 catch tank [A] of the drain hose, if the water or oil accumulates.
- ★ If any water or oil accumulates in the tank, remove the plug [B] from the drain hose and drain it.



#### **⚠ WARNING**

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

#### **Air Cleaner Housing Removal**

- Remove the rear frame (see Rear Frame Removal in the Frame chapter).
- For the California model, remove the separator.
- Remove the breather hose [A].



- Remove the drain hose [A].
- Loosen the air cleaner duct clamp screw [B].
- Pull out the duct from the carburetor and remove the air cleaner housing [C] backward.





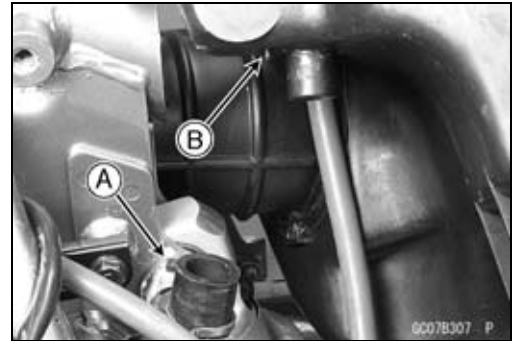
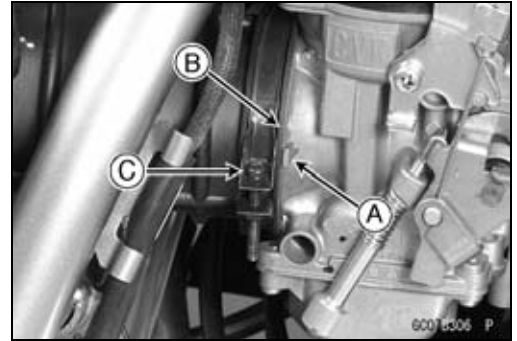
## Air Cleaner

### ***Air Cleaner Housing Installation***

- Insert the air cleaner duct into the carburetor until the stopper [A] attach to the duct end [B].
- Install the duct clamp screw [C] in the direction as shown and tighten it.

**Torque - Air Cleaner Duct Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

- Fit the projection [A] of the breather hose into the stopper [B] of the air cleaner housing.
- Install the drain hose correctly.



## 3-30 FUEL SYSTEM

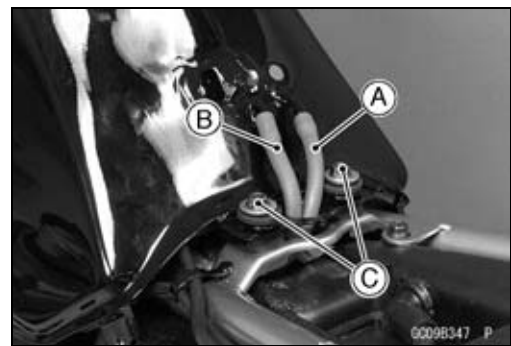
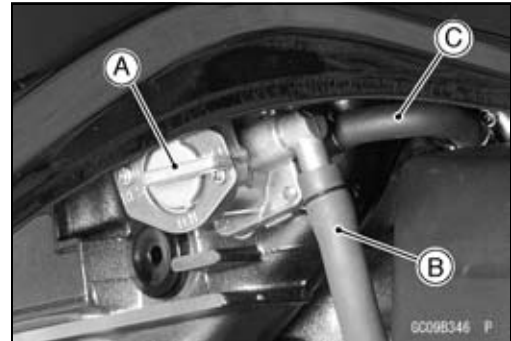
### Fuel Tank

#### Fuel Tank Removal

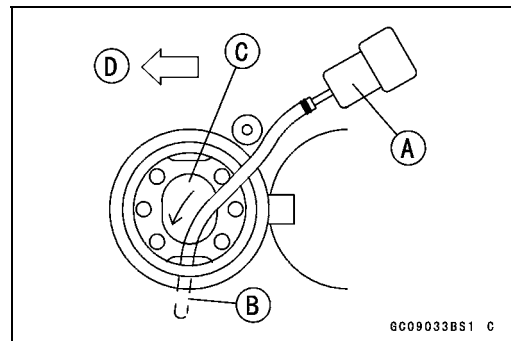
#### **⚠ WARNING**

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

- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Lower Fairings (see Lower Fairing Removal in the Frame chapter)
- Turn the fuel tap lever [A] to the OFF position.
- Remove:
  - Fuel Hose [B]
  - Vacuum Hose [C]
- For the California model, remove the following.
  - Fuel Return Hose (right side, red) [A]
  - Fuel Tank Breather Hose (left side, blue) [B]
- For the other than California model, remove the drain hose from the fitting on the fuel tank.
- Remove the fuel tank bolts [C].
- Remove the fuel tank backward.



- 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**

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

## Fuel Tank

- For the California model, note the following.

### NOTICE

**For the California model, if gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

- Be sure to plug the evaporative fuel return hose to prevent fuel spilling before fuel tank removal.

### WARNING

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

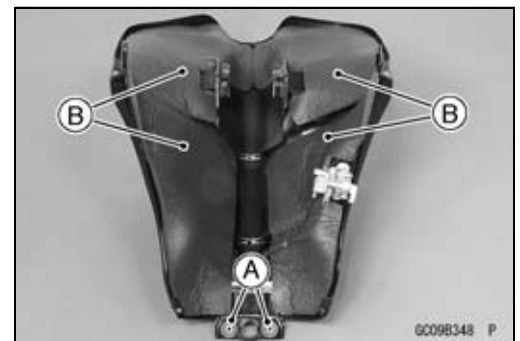
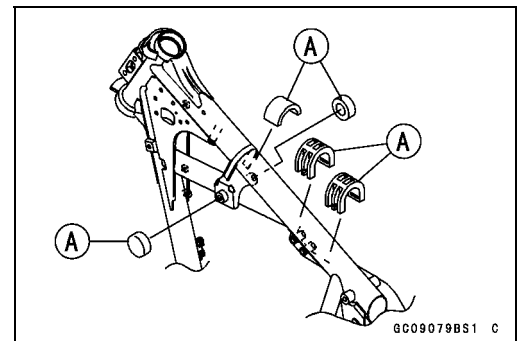
- ★ If liquid or gasoline flows into the breather hose, remove the hose and blow it clean with compressed air.
- Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump.

### WARNING

**Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Store the fuel tank in an area which is well-ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.**

### Fuel Tank Installation

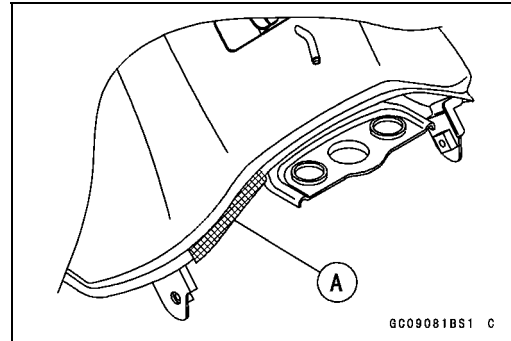
- Note the above WARNING (see Fuel Tank Removal).
- Route the hoses correctly (see Cable, Wire, and Hose Routing in the Appendix chapter).
- Check that the dampers [A] and pads [B] are in place on the frame and the fuel tank.
- ★ If the dampers are damaged or deteriorated, replace them.
- For the California model, note the following.
  - To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
  - Connect the hoses according to the Cable, Wire, and Hose Routing in the Appendix chapter. Make sure they do not get pinched or kinked.
  - Route hoses with a minimum of bending so that the air or vapor will not be obstructed.



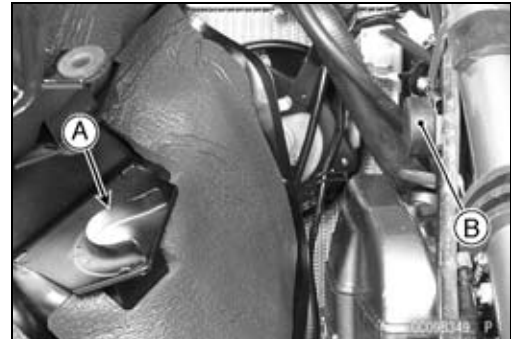
## 3-32 FUEL SYSTEM

### Fuel Tank

- Be sure that the trim [A] is on the fuel tank as shown.

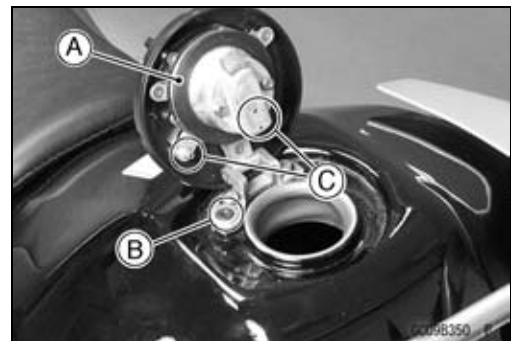


- When installing the fuel tank, fit the stoppers [A] to the dampers [B] on the frame securely.
- Be sure the hoses are clamped securely.



#### Fuel Tank Inspection

- Visually inspect the gasket [A] on the tank cap for any damage.
- ★ Replace the tank cap if gasket is damaged.
- Check to see if the water drain pipe (other than California model) and fuel breather pipe [B] (California model) in the tank are not clogged. Check the tank cap breather also.
- ★ If they are clogged, remove the tank and drain it, and then blow the breather free with compressed air.



#### NOTICE

**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

**Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the tank in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area. Do not use gasoline or low-flash point solvents to clean the tank.**

- Remove the fuel tank and drain it (see Fuel Tank Removal).
- Pour some high-flash point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Pour the solvent out of the tank.
- Remove the fuel tap (see Fuel Tap Removal).
- Clean the fuel tap filter screens in a high-flash point solvent.
- Dry the tank and the fuel tap with compressed air.
- Install the fuel tap (see Fuel Tap Installation).

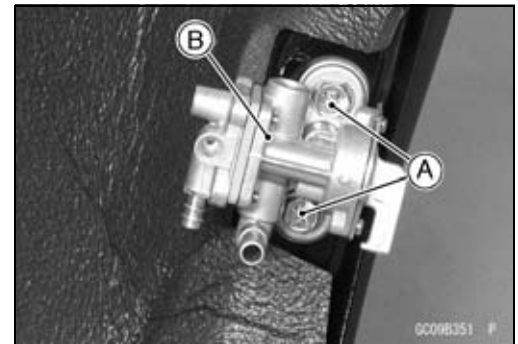
## Fuel Tank

### Fuel Tap Removal

#### WARNING

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

- Remove the fuel tank and drain it (see Fuel Tank Removal).
- Remove:
  - Bolts [A] and Nylon Washers
  - Fuel Tap [B]



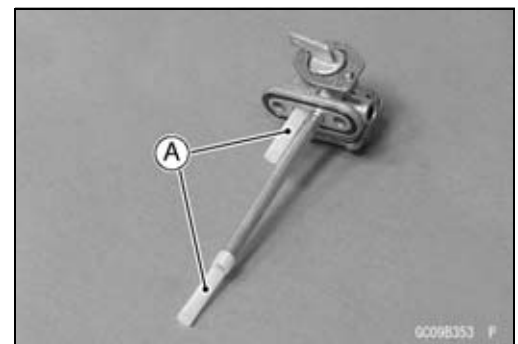
### Fuel Tap Installation

- Note the above WARNING (see Fuel Tap Removal).
- Replace the O-ring [A] with a new one.
- Check the nylon washers for damage.
- ★ If the nylon washer is damaged, replace it.
- Tighten:
  - Torque - Fuel Tap Bolts: 2.5 N·m (0.25 kgf·m, 22 in·lb)



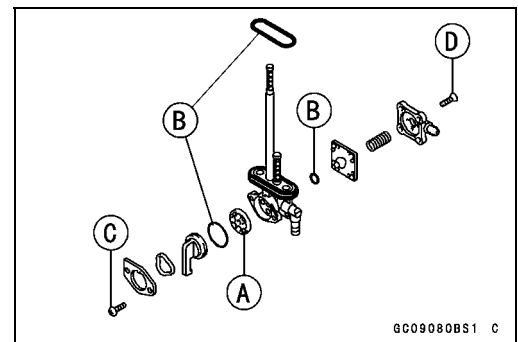
### Fuel Tap Inspection

- Remove the fuel tap (see Fuel Tap Removal).
- Check the fuel tap filter screens [A] for any breaks or deterioration.
- ★ If the fuel tap screens have any breaks or are deteriorated, they may allow dirt to reach the carburetor, causing poor running. Replace the fuel tap.



- ★ If the fuel tap leaks, or allows fuel to flow when it is at ON or RES position without engine running, replace the damaged gasket [A] or O-ring [B].

- Tighten:
  - Torque - Fuel Tap Lever Plate Screws [C]: 0.8 N·m (0.08 kgf·m, 7 in·lb)
  - Fuel Tap Diaphragm Cover Screws [D]: 1.0 N·m (0.1 kgf·m, 8.7 in·lb)



## 3-34 FUEL SYSTEM

### Evaporative Emission Control System (CAL Model)

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The Evaporative Emission Control System routes fuel vapors from the fuel system into the running engine or stores the vapors in a canister when the engine is stopped. Although no adjustments are required, a thorough visual inspection must be made at the intervals specified by the Periodic Maintenance Chart.

#### **Parts Removal/Installation**

#### **⚠ WARNING**

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

#### **NOTICE**

**If gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

- To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
- Connect the hoses according to the see Cable, Wire, and Hose Routing section in the Appendix chapter. Make sure they do not get pinched or kinked.

#### **Hose Inspection**

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

#### **Separator Inspection**

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

## Evaporative Emission Control System (CAL Model)

### Separator Operation Test

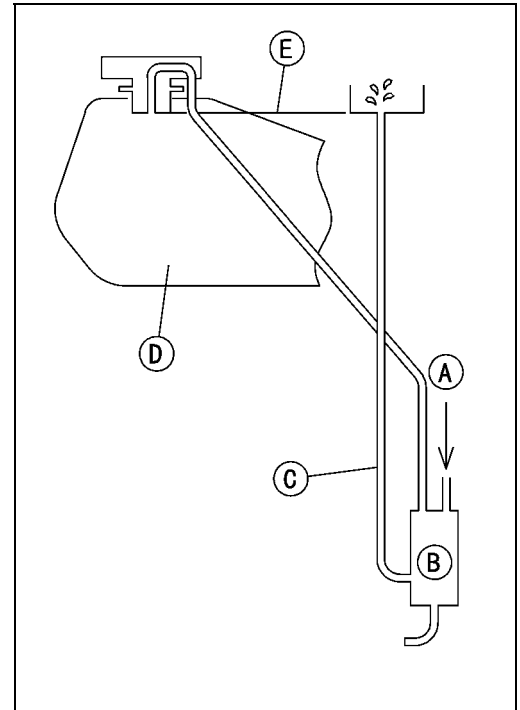
#### **⚠ WARNING**

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

- Connect the hoses to the separator, and install the separator on the motorcycle.
- Disconnect the breather hose from the separator, and inject about 20 mL (0.68 US oz.) of gasoline [A] into the separator [B] through the hose fitting.
- Disconnect the fuel return hose [C] from the fuel tank [D].
- Run the open end of the return hose into the container and hold it level with the tank top [E].
- Start the engine, and let it idle.
- ★ If the gasoline in the separator comes out of the hose, the separator works well. If it does not, replace the separator with a new one.

### Canister Inspection

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







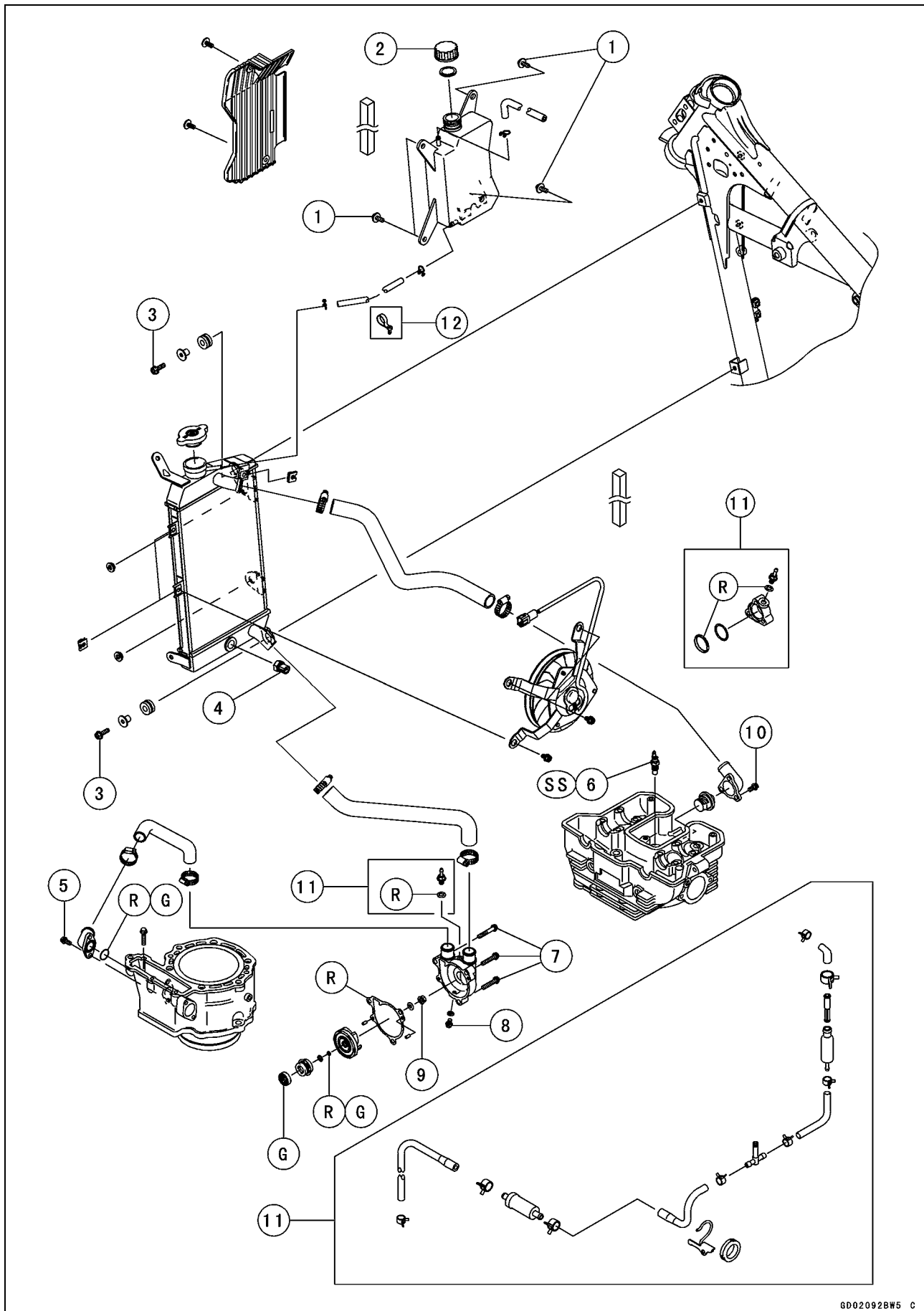
# Cooling System

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# 4-2 COOLING SYSTEM

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Reserve Tank Bolts	8.8	0.90	78 in·lb	
2	Reserve Tank Cap	–	–	–	Hand-tighten
3	Radiator Bolts	8.8	0.90	78 in·lb	
4	Radiator Fan Switch	18	1.8	13	
5	Water Hose Fitting Bolts	8.8	0.90	78 in·lb	
6	Water Temperature Sensor	15	1.5	11	SS
7	Water Pump Cover Bolts	8.8	0.90	78 in·lb	
8	Coolant Drain Bolt	8.8	0.90	78 in·lb	
9	Impeller Mounting Nut	9.8	1.0	87 in·lb	
10	Thermostat Housing Bolts	8.8	0.90	78 in·lb	

11. AU Model

12. Other than AU Model

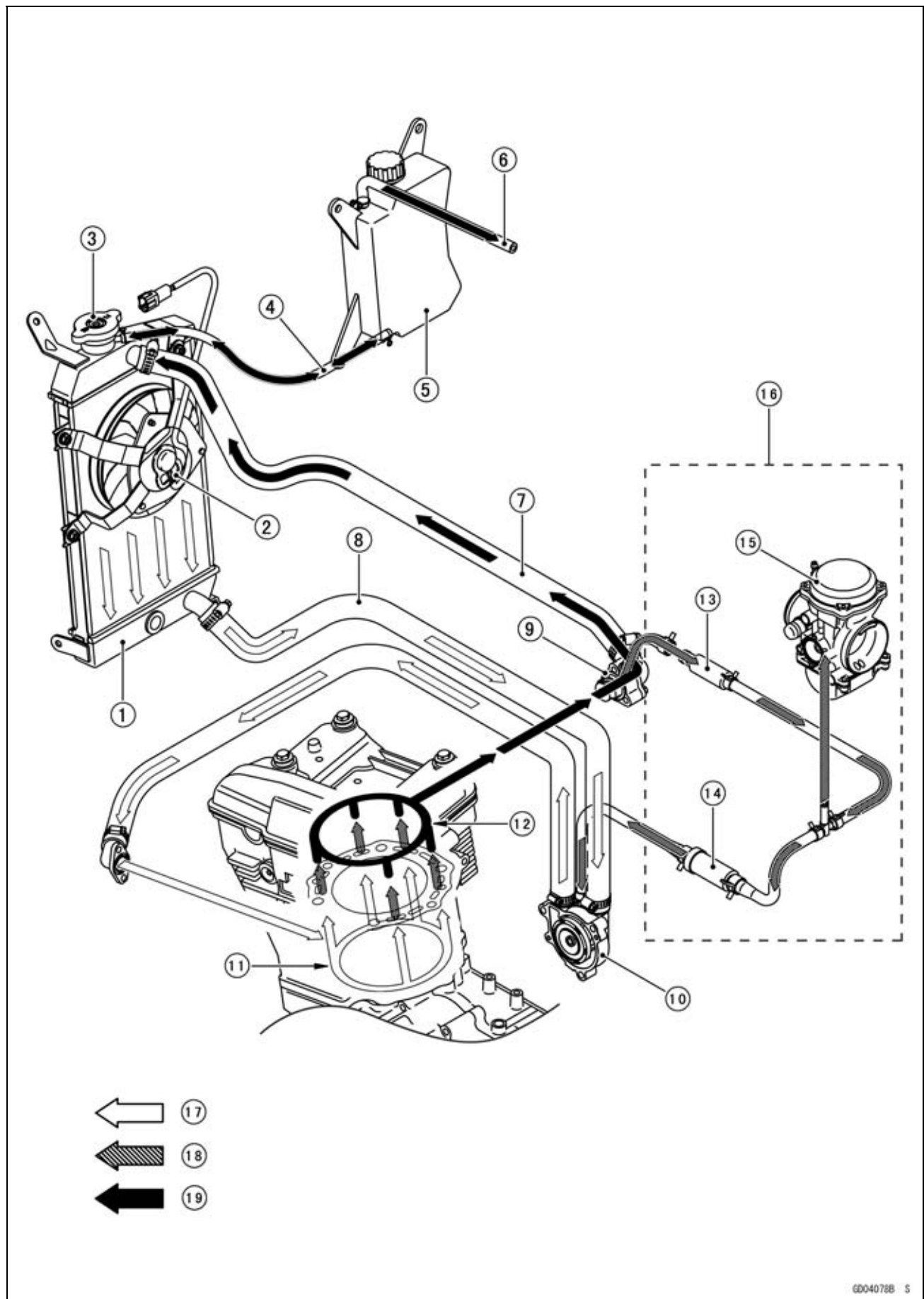
G: Apply grease.

R: Replacement Parts

SS: Apply silicone sealant.

# 4-4 COOLING SYSTEM

## Coolant Flow Chart



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**Coolant Flow Chart**

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1. Radiator
2. Radiator Fan
3. Radiator Cap
4. Radiator Overflow Hose
5. Reserve Tank
6. Reserve Tank Overflow Hose
7. Outlet Hose
8. Inlet Hose
9. Thermostat
10. Water Pump
11. Cylinder Water Jacket
12. Cylinder Head Water Jacket
13. Coolant Filter
14. Coolant valve
15. Carburetor
16. AU Model
17. Cold Coolant
18. Warm Coolant
19. Hot 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 below 69.5 ~ 72.5°C (157 ~ 163°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 69.5 ~ 72.5°C (157 ~ 163°F), the thermostat opens and the coolant flows.

When the coolant temperature goes up beyond 95 ~ 101°C (203 ~ 214°F), the radiator fan switch conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is below 87°C (189°F) ~ temperature less than ON temperature, the fan switch opens and the radiator fan stops.

In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.

The system is pressurized by the radiator cap to suppress boiling and the resultant air bubbles which can cause engine overheating. As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conversely, as the engine cools down, the coolant in the radiator and the water jacket contracts, and the stored coolant flows back to the radiator from the reserve tank.

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 14 ~ 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>, 14 ~ 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.

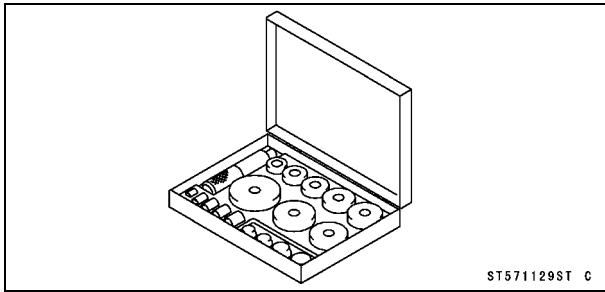
## 4-6 COOLING SYSTEM

### Specifications

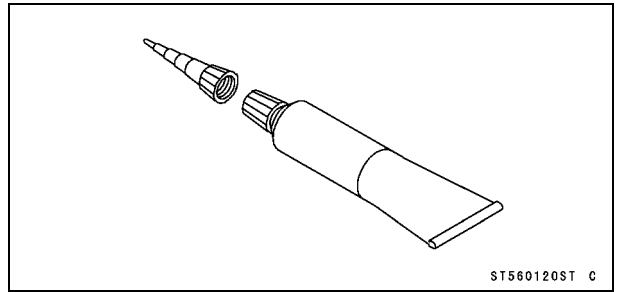
Item	Standard
<b>Coolant Provided when Shipping</b> Type (Recommended) Color Mixed Ratio Freezing Point Total Amount	Permanent type antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators) Green Soft water 50%, coolant 50% −35°C (−31°F) 1.55 L (1.64 US qt) (KL650E8) 1.5 L (1.59 US qt) (KL650E9 ~ EC) (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> , 14 ~ 18 psi)
<b>Thermostat</b> Valve Opening Temperature Valve Full Opening Lift	69.5 ~ 72.5°C (157 ~ 163°F) 3 mm (0.12 in.) or more at 85°C (185°F)

**Special Tool and Sealant**

**Bearing Driver Set:  
57001-1129**



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



## 4-8 COOLING SYSTEM

### Coolant

#### **Coolant Deterioration Inspection**

- Remove the right lower fairing (see Lower Fairing Removal in the Frame chapter).
- Visually inspect the coolant 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 radiator cap (see Coolant Change in the Periodic Maintenance chapter), and install a cooling system pressure tester [A] on the filler neck [B].

#### **NOTE**

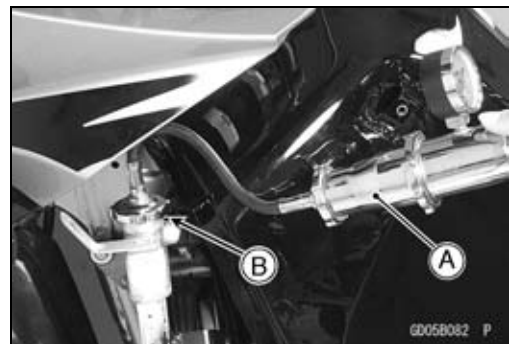
○ *Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.*

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm<sup>2</sup>, 18 psi).

#### **NOTICE**

**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.





## 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.

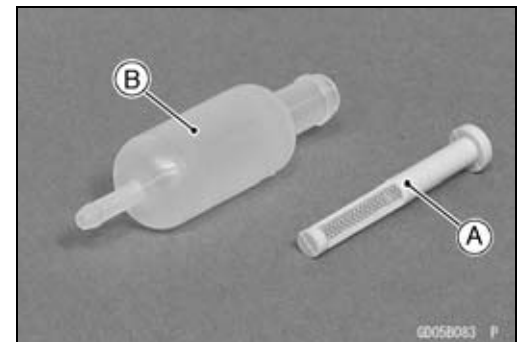
#### NOTICE

**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).

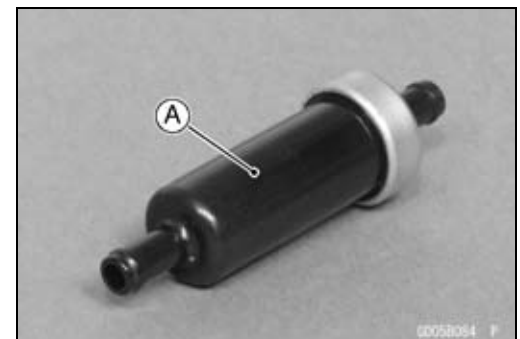
### Coolant Filter Cleaning (AU Model)

- Before winter season starts, clean the coolant filter [A] in the carburetor system.
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the coolant filter case [B] and filter from the water hoses in the carburetor system.
- Blow dirt and sediment off the filter with compressed air.



### Coolant Valve Inspection (AU Model)

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the coolant valve [A] from the water hoses in the carburetor system.
- To check the valve opening, blow the air to the one side of the valve.
- Inspect the coolant valve at room temperature.
- ★ If the valve is closed, replace the valve with a new one.



#### Valve Closing Temperature (for reference)

Standard: 70°C (158°C) or more at 25 kPa (0.25 kgf/cm<sup>2</sup>, 3.6 psi)

### Coolant Reserve Tank Removal/Installation

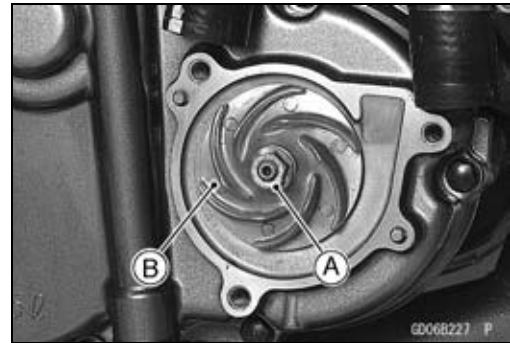
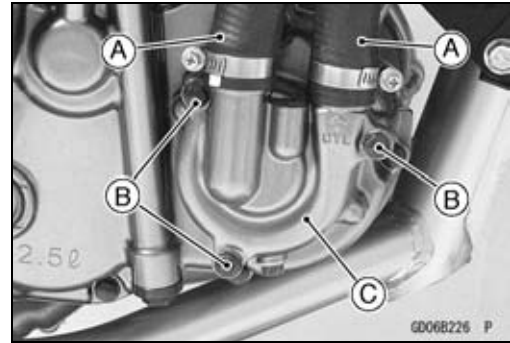
- The coolant reserve tank is removed and installed during coolant change (see Coolant Change in the Periodic Maintenance chapter).

## 4-10 COOLING SYSTEM

### Water Pump

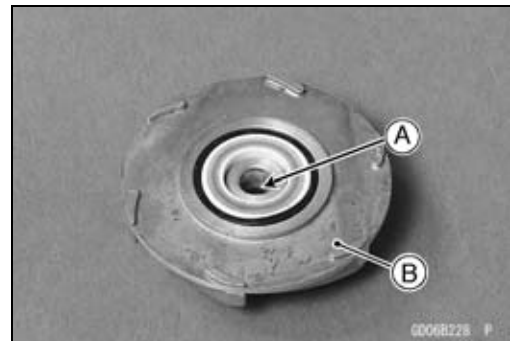
#### Water Pump Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Water Hoses [A]
  - Water Pump Cover Bolts [B]
  - Water Pump Cover [C]
- For the Australia model, remove the water hose of the carburetor system.
- Shift the transmission into 1st gear.
- While applying the rear brake, remove the impeller mounting nut [A].
- Remove the impeller [B].
- When removing the impeller, turn it counterclockwise.

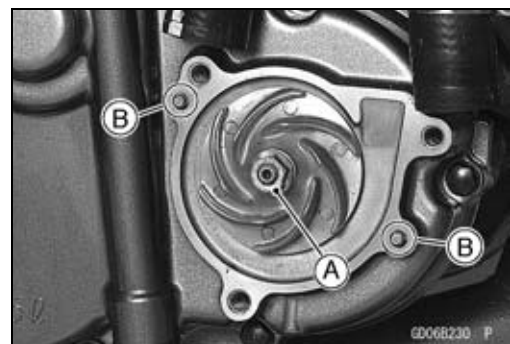


#### Water Pump Installation

- Replace the O-ring [A] of the impeller [B].
- Apply grease to the new O-ring.
- Be sure to install the washer [A] on the mechanical seal.

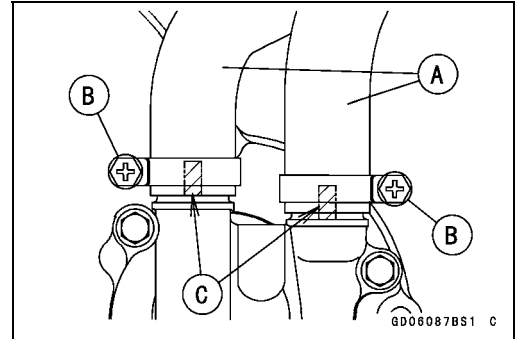


- When tightening the impeller mounting nut [A], shift the transmission into 1st gear and apply rear brake.  
**Torque - Impeller Mounting Nut: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Be sure that the dowel pins [B] are in position.
- Replace the water pump cover gasket with a new one.
- Tighten:  
**Torque - Water Pump Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



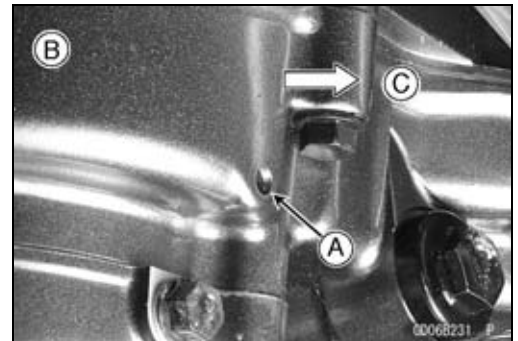
## Water Pump

- Install the water hoses [A] and clamps [B] as shown.  
White Marks [C]
- Tighten the water hose clamp screw securely.
- Fill the radiator with the coolant (see Coolant Change in the Periodic Maintenance chapter).



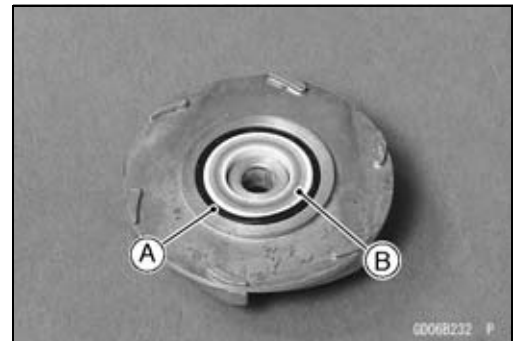
### Water Pump Inspection

- Remove the engine guard (see Engine Guard Removal in the Frame chapter).
  - Check the drainage outlet passage [A] at the bottom of the water pump body for coolant leaks.  
Bottom View [B]  
Front [C]
- ★ If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal unit.



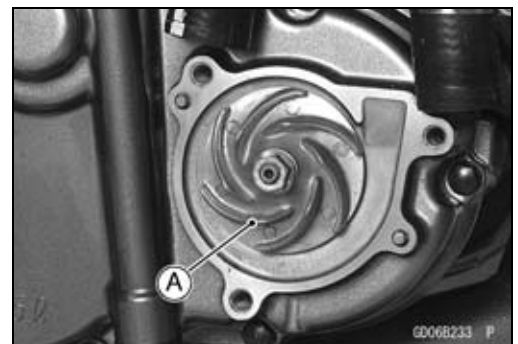
### Water Pump Impeller Disassembly/Assembly

- 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).



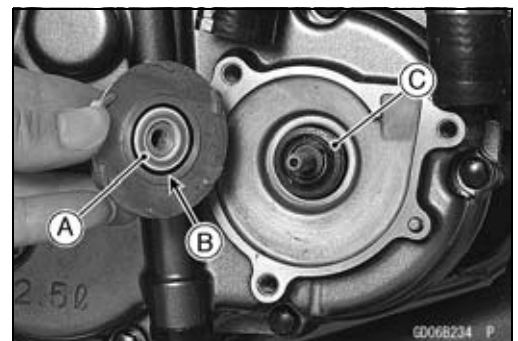
### Water Pump Impeller Inspection

- 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.



### Mechanical Seal Inspection

- Remove the 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.
- The sealing seat and rubber seal may be removed easily by hand.
- Impeller Sealing Seat Surface [A]  
Rubber Seal [B]  
Mechanical Seal Diaphragm [C]



## 4-12 COOLING SYSTEM

### Water Pump

#### Mechanical Seal Replacement

- Remove the water pump impeller (see Water Pump Removal in this section).
- Pry the mechanical seal flange off with a small chisel [A].
- Pull the mechanical seal out of the clutch cover with needle nose pliers.
- Discard the mechanical seal.

#### NOTICE

**Be careful not to damage the water pump shaft and the inner sealing surface of the clutch cover.**

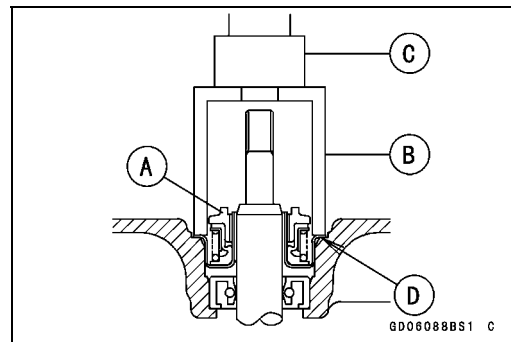
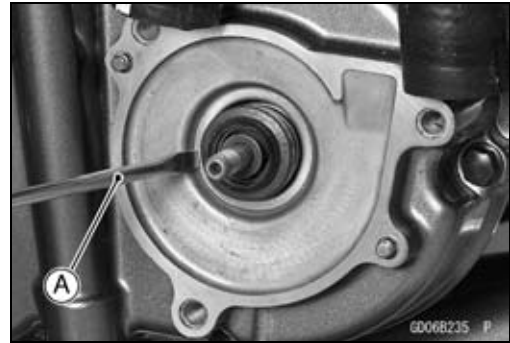
- Replace the mechanical seal with a new one.

#### NOTE

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

- Press the mechanical seal [A] with a suitable 28 mm socket [B] and the bearing driver [C] until its flange touches the surface [D] of the clutch cover.

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



#### Water Pump Oil Seal Replacement

- Remove:
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Mechanical Seal (see Mechanical Seal Replacement)
- Take the oil seal [A] out of the clutch cover [B] with a hook [C].
- Discard the oil seal.

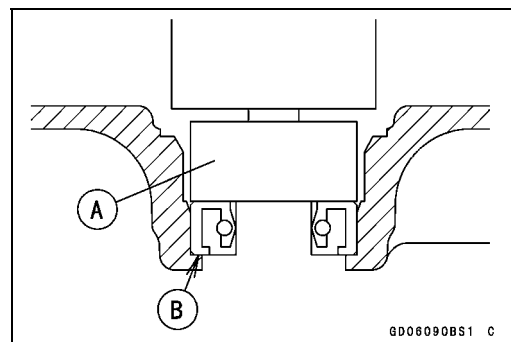
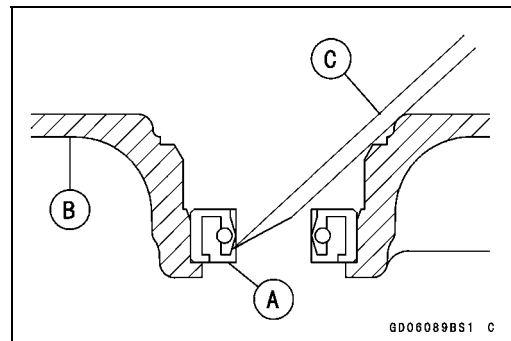
- Replace the oil seal with a new one.
- Apply grease to the lips of the oil seal.
- Install the oil seal so that the spring side of the seal lips is toward the inside of the clutch cover.
- Press the new oil seal into the clutch cover with the bearing driver [A] until it stops at the bottom surface [B] of the clutch cover.

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

- Install the new mechanical seal (see Mechanical Seal Replacement).

#### NOTICE

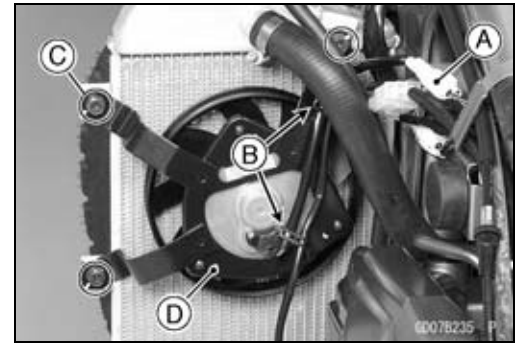
**Do not reuse the mechanical seal.**



## Radiator

### Radiator Fan Removal

- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Disconnect the radiator fan lead connector [A].
- Open the clamps [B].
- Remove:
  - Radiator Fan Mounting Bolts [C]
  - Radiator Fan [D]

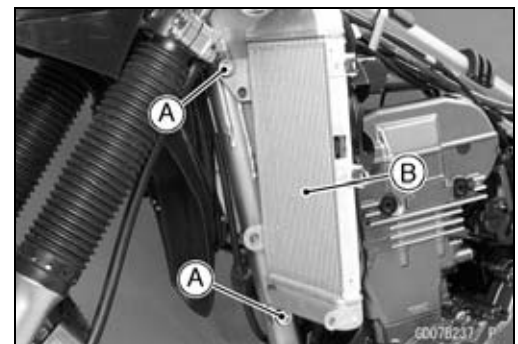
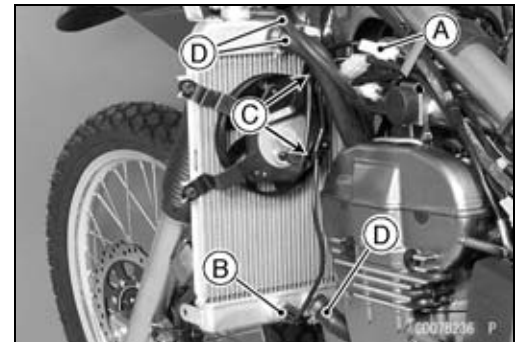


### Radiator Fan Installation

- Installation is the reverse of removal.
- Turn the ignition switch OFF while installing the radiator fan.
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

### Radiator Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Disconnect:
  - Radiator Fan Lead Connector [A]
  - Radiator Fan Switch Connector [B]
- Open the clamps [C].
- Remove the water hoses [D].
- Remove:
  - Radiator Bolts [A]
  - Radiator [B]



### NOTICE

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

- Remove the radiator fan as necessary (see Radiator Fan Removal).

### Radiator Installation

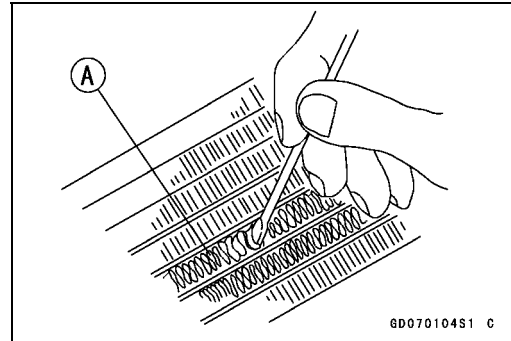
- Tighten:
  - **Torque - Radiator Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten the water hose clam screws securely.
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

## 4-14 COOLING SYSTEM

### Radiator

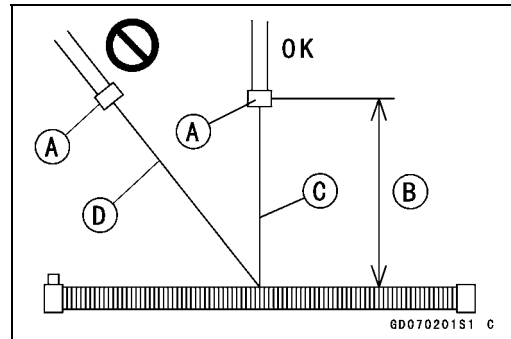
#### Radiator Inspection

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



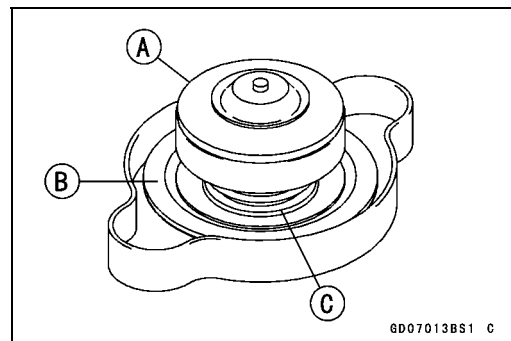
#### NOTICE

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



#### Radiator Cap Inspection

- Remove the radiator cap (see Coolant Change in the Periodic Maintenance chapter).
- Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].
- ★ If any one of them shows visible damage, replace the cap with a new one.



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

#### NOTE

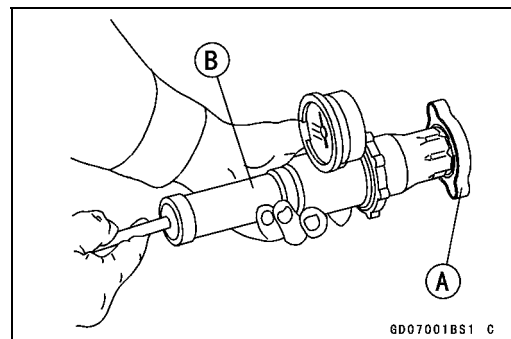
○ Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.

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

#### Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 14 ~ 18 psi)

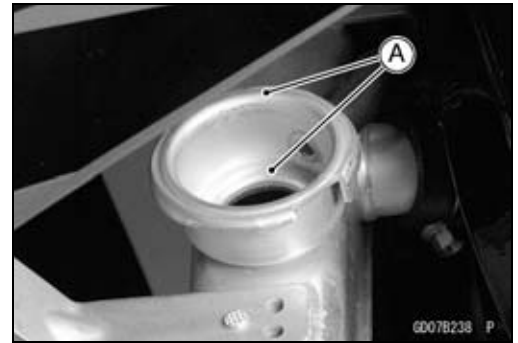
- ★ If the cap can not hold the specified pressure or if it holds too much pressure, replace it with a new one.



### Radiator

#### ***Radiator Filler Neck Inspection***

- Remove the radiator cap (see Coolant Change in the Periodic Maintenance chapter).
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



## 4-16 COOLING SYSTEM

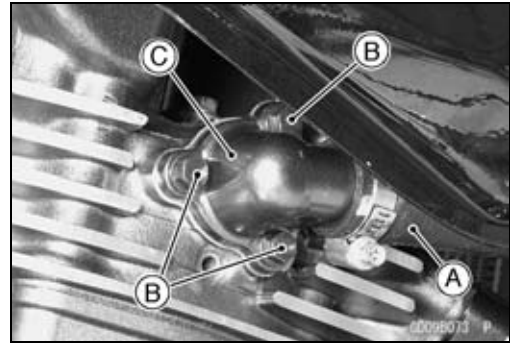
### Thermostat

#### **Thermostat Removal**

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).

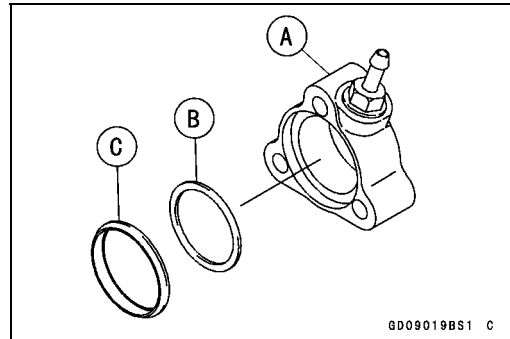
- Remove:

- Water Hose [A]
- Thermostat Housing Bolts [B]
- Thermostat Housing [C]

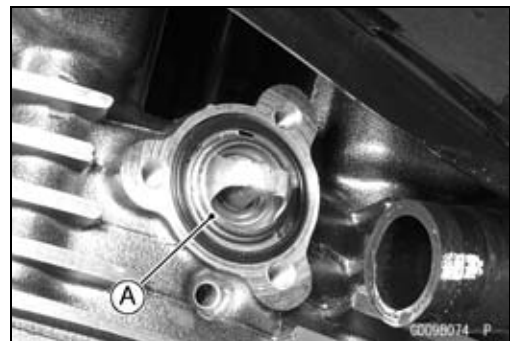


- For the Australia model, remove the following.

- Water Hose (from carburetor)
- Thermostat Housing Fitting [A]
- Washer [B]
- Gasket [C]



- Pull the thermostat [A] out of the cylinder head.

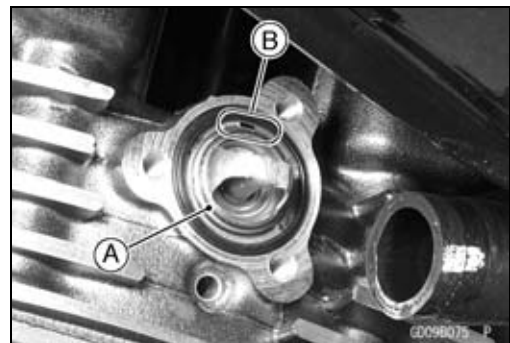


#### **Thermostat Installation**

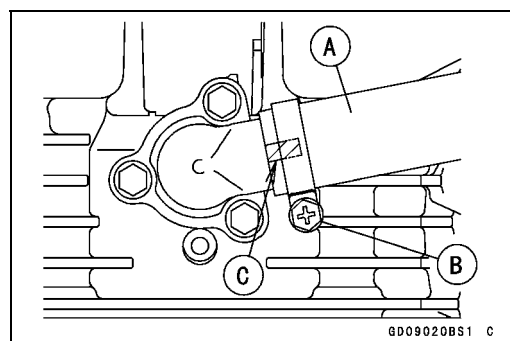
- Install the thermostat [A] in the cylinder head so that the air bleeder hole [B] is on top.

- Tighten:

**Torque - Thermostat Housing Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



- Install the water hose [A] and clamp [B] as shown. White Marks [C]
- Tighten the water hose clamp screw securely.
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

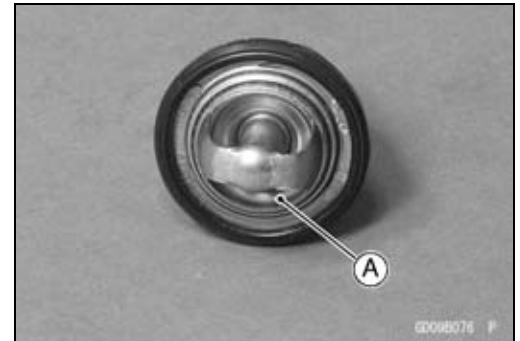




**Thermostat**

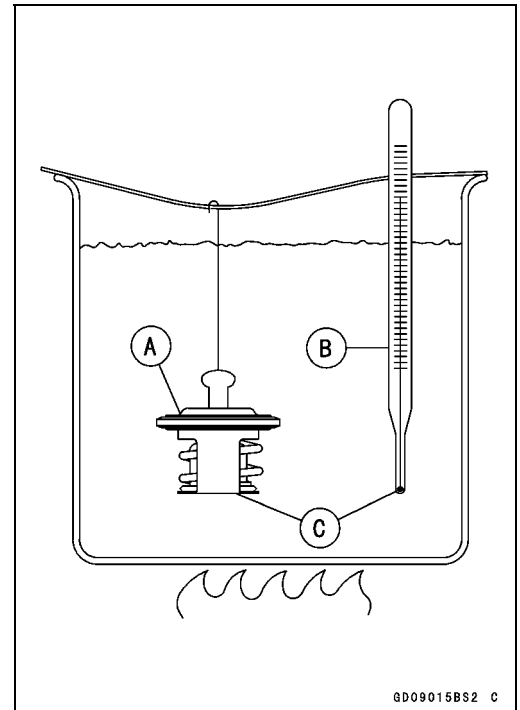
**Thermostat Inspection**

- 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.
- ★ If the measurement is out of the specified range, replace the thermostat with a new one.

**Thermostat Valve Opening Temperature**  
 69.5 ~ 72.5°C (157 ~ 163°F)



## 4-18 COOLING SYSTEM

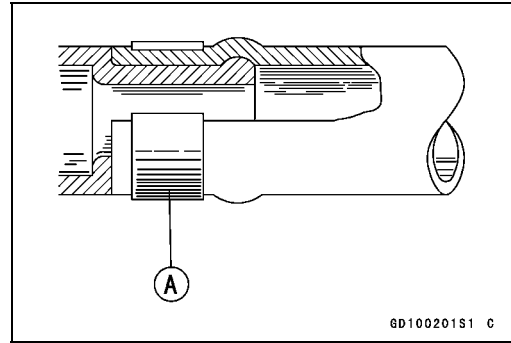
### Hose and Pipes

#### **Hose Installation**

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

#### **Hose Inspection**

- Refer to the Radiator Hose Damage and Installation Condition Inspection in the Periodic Maintenance chapter.



## Radiator Fan Switch, Water Temperature Sensor

### Radiator Fan Switch Removal/Installation

#### NOTICE

The radiator fan switch should never be allowed to fall on a hard surface. Such a shock to the switch can damage it.

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Disconnect the radiator fan switch connector [A].
- Remove the radiator fan switch [B].
- Tighten:
  - Torque - Radiator Fan Switch: 18 N·m (1.8 kgf·m, 13 ft·lb)**
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

### Radiator Fan Switch Inspection

- Refer to the Radiator Fan Switch Inspection in the Electrical System chapter.

### Water Temperature Sensor Removal/Installation

#### NOTICE

The water temperature sensor should never be allowed to fall on a hard surface. Such a shock to the sensor can damage it.

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Disconnect the water temperature sensor connector [A].
- Remove the water temperature sensor [B].
- Apply silicone sealant to the threads of the water temperature sensor and tighten it.

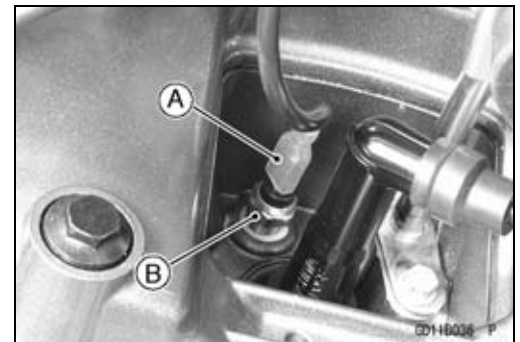
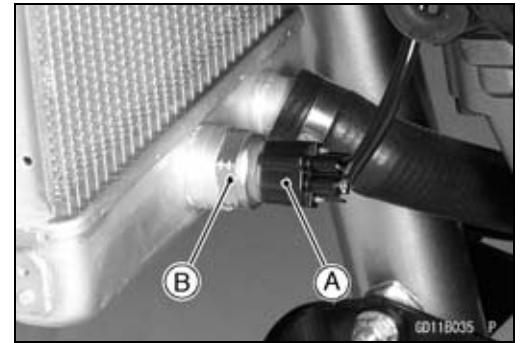
**Sealant - Liquid Gasket, TB1211: 56019-120**

**Torque - Water Temperature Sensor: 15 N·m (1.5 kgf·m, 11 ft·lb)**

- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

### Water Temperature Sensor Inspection

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





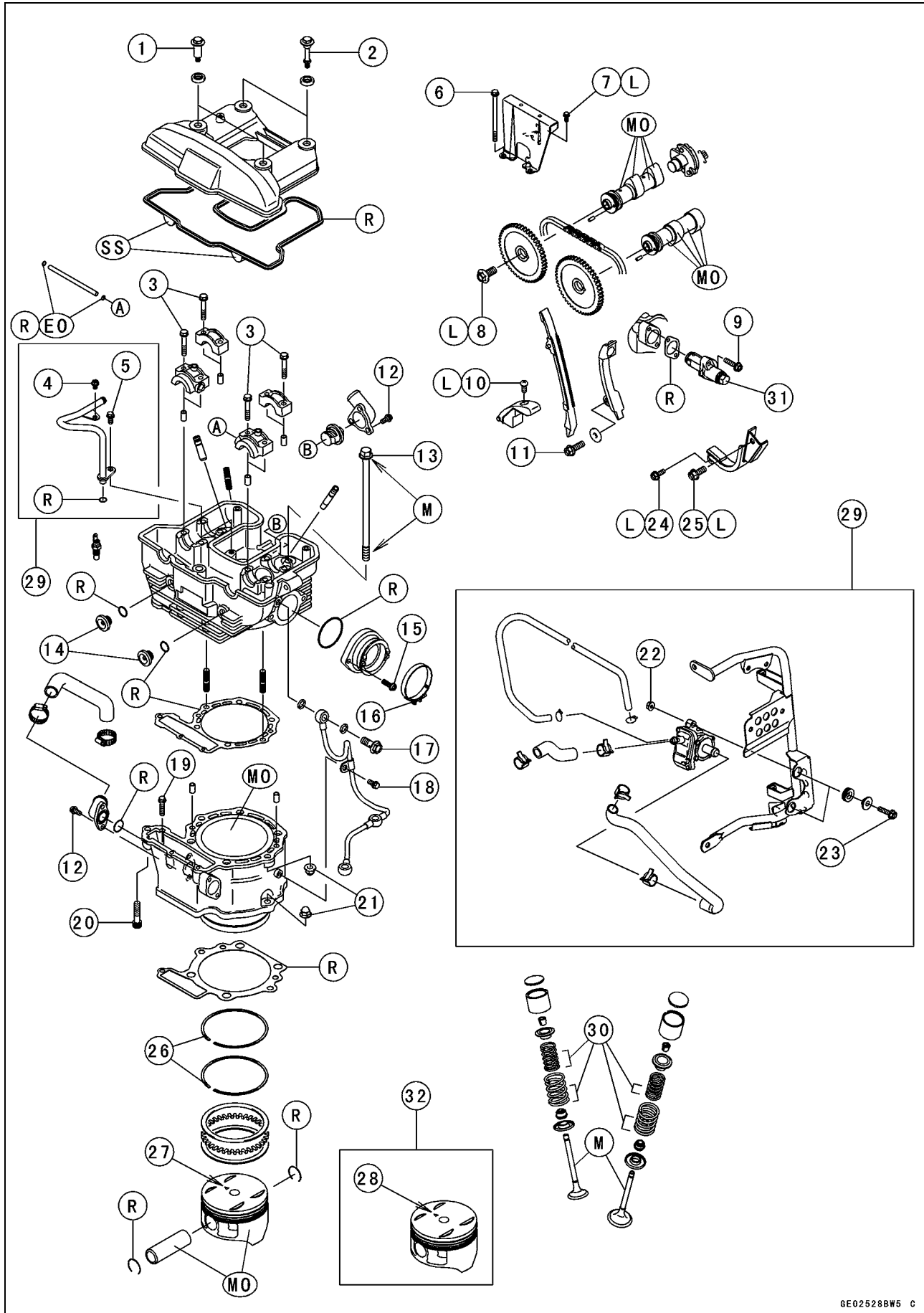
# Engine Top End

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# 5-2 ENGINE TOP END

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cylinder Head Cover Bolts (L = 34.5)	7.8	0.80	69 in·lb	
2	Cylinder Head Cover Bolts (L = 46.5)	7.8	0.80	69 in·lb	
3	Camshaft Cap Bolts	12	1.2	106 in·lb	
4	Clean Air System Pipe Bolt (M5) (Other than AU Model)	5.9	0.60	52 in·lb	
5	Clean Air System Pipe Bolt (M6) (Other than AU Model)	9.8	1.0	87 in·lb	
6	Upper Camshaft Chain Guide Bolts (L=85)	9.8	1.0	87 in·lb	
7	Upper Camshaft Chain Guide Bolt (L = 12)	8.8	0.90	78 in·lb	L
8	Camshaft Sprocket Bolts	49	5.0	36	L
9	Camshaft Chain Tensioner Bolts	8.8	0.90	78 in·lb	
10	Upper Rear Camshaft Chain Guide Screw	4.4	0.45	39 in·lb	L
11	Rear Camshaft Chain Guide Bolt	19	1.9	14	
12	Coolant Hose Fitting Bolts	8.8	0.90	78 in·lb	
13	Cylinder Head Bolts (First)	20	2.0	15	M
	Cylinder Head Bolts (Final)	65	6.6	48	
14	Plugs	2.5	0.25	22 in·lb	
15	Carburetor Holder Screws	4.4	0.45	39 in·lb	
16	Carburetor Holder Clamp Screw	2.0	0.20	18 in·lb	
17	Oil Pipe Banjo Bolts	20	2.0	15	
18	Oil Pipe Bolt	8.8	0.90	78 in·lb	
19	Cylinder Bolt (M6)	9.8	1.0	87 in·lb	
20	Cylinder Bolt (M8)	18	1.8	13	
21	Cylinder Nuts	25	2.5	18	
22	Vacuum Switch Valve Nuts (Other than AU Model)	8.8	0.90	78 in·lb	
23	Vacuum Switch Valve Bolts (Other than AU Model)	8.8	0.90	78 in·lb	
24	Lower Camshaft Chain Guide Bolt (M6)	12	1.2	106 in·lb	L
25	Lower Camshaft Chain Guide Bolt (M8)	25	2.5	18	L

26. "R" marked side faces up.

27. Install the piston so that the triangle mark on the top of the piston comes to front side of the engine.

28. Install the piston so that the marking dent on the top of the piston comes to front side of the engine.

29. Other than AU Model

30. Closed coil end faces downward.

31. For KL650EC model, install the rod into the spring.

32. KL650EC ~

EO: Apply engine oil.

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)

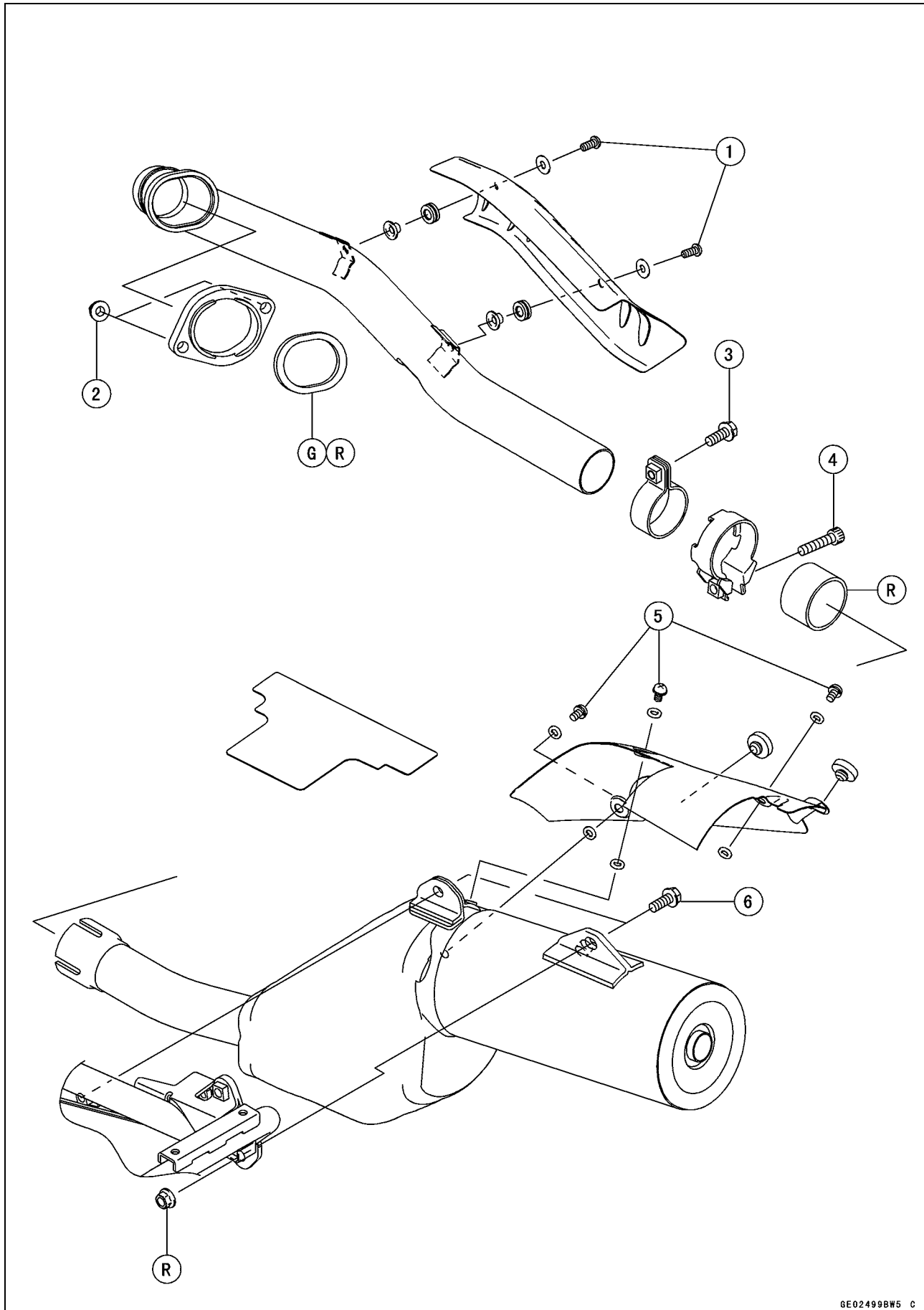
R: Replacement Parts

SS: Apply silicone sealant.

# 5-4 ENGINE TOP END

## Exploded View

KL650E8 ~ E9 Models





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Pipe Cover Bolts	4.4	0.45	39 in·lb	
2	Exhaust Pipe Holder Nuts	21	2.1	15	
3	Exhaust Pipe Holder Clamp Bolt	21	2.1	15	
4	Muffler Joint Clamp Bolt	21	2.1	15	
5	Heat Guard Plate Bolts	4.4	0.45	39 in·lb	
6	Muffler Body Mounting Bolts (KL650E8)	25	2.5	18	
	Muffler Body Mounting Bolts (KL650E9)	30	3.0	22	

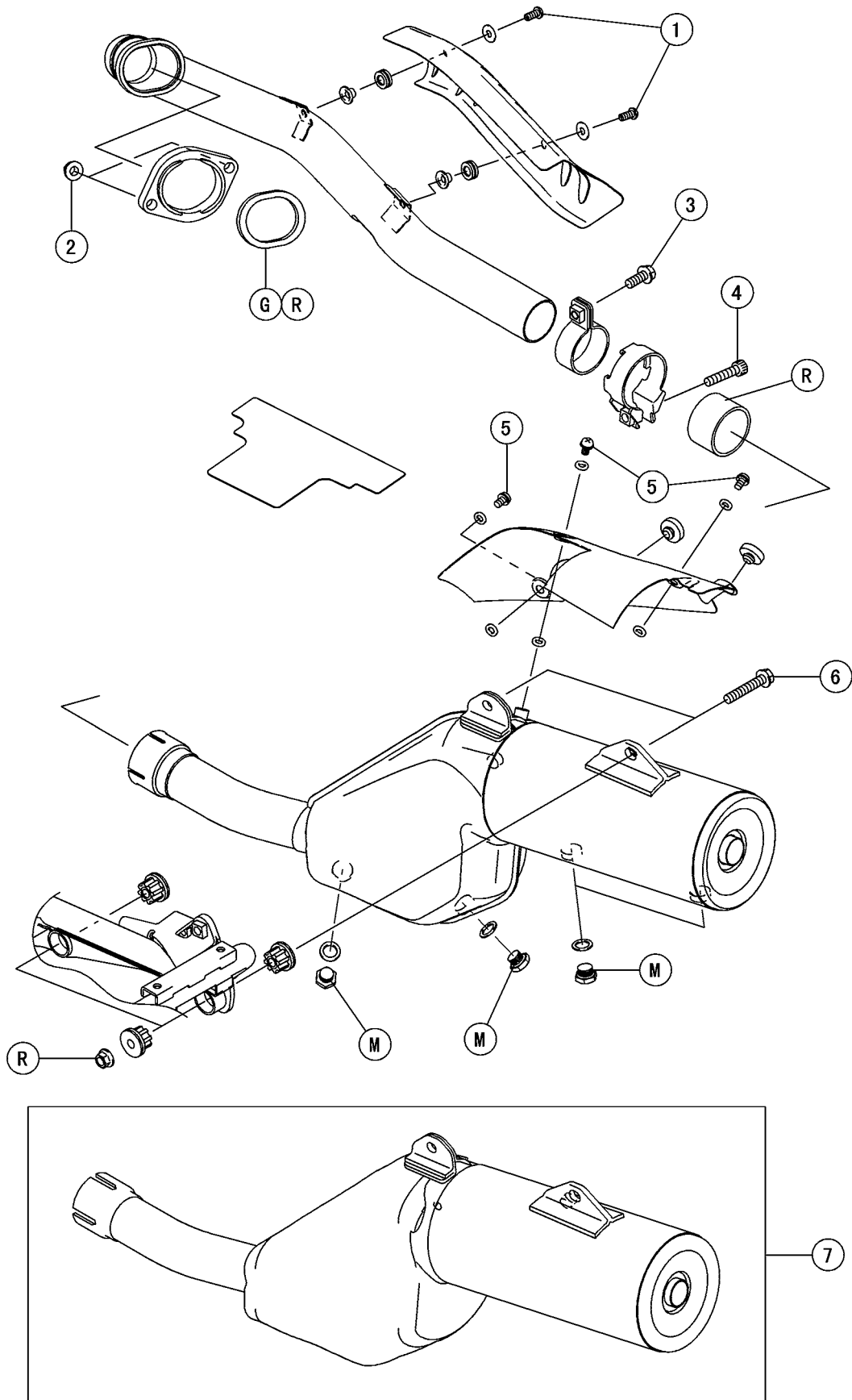
G: Apply grease.

R: Replacement Parts

# 5-6 ENGINE TOP END

## Exploded View

KL650EA ~ EC Model



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Pipe Cover Bolts	4.4	0.45	39 in·lb	
2	Exhaust Pipe Holder Nuts	21	2.1	15	
3	Exhaust Pipe Holder Clamp Bolt	21	2.1	15	
4	Muffler Joint Clamp Bolt	21	2.1	15	
5	Heat Guard Plate Bolts	4.4	0.45	39 in·lb	
6	Muffler Body Mounting Bolts	25	2.5	18	

7. Other than AU Model

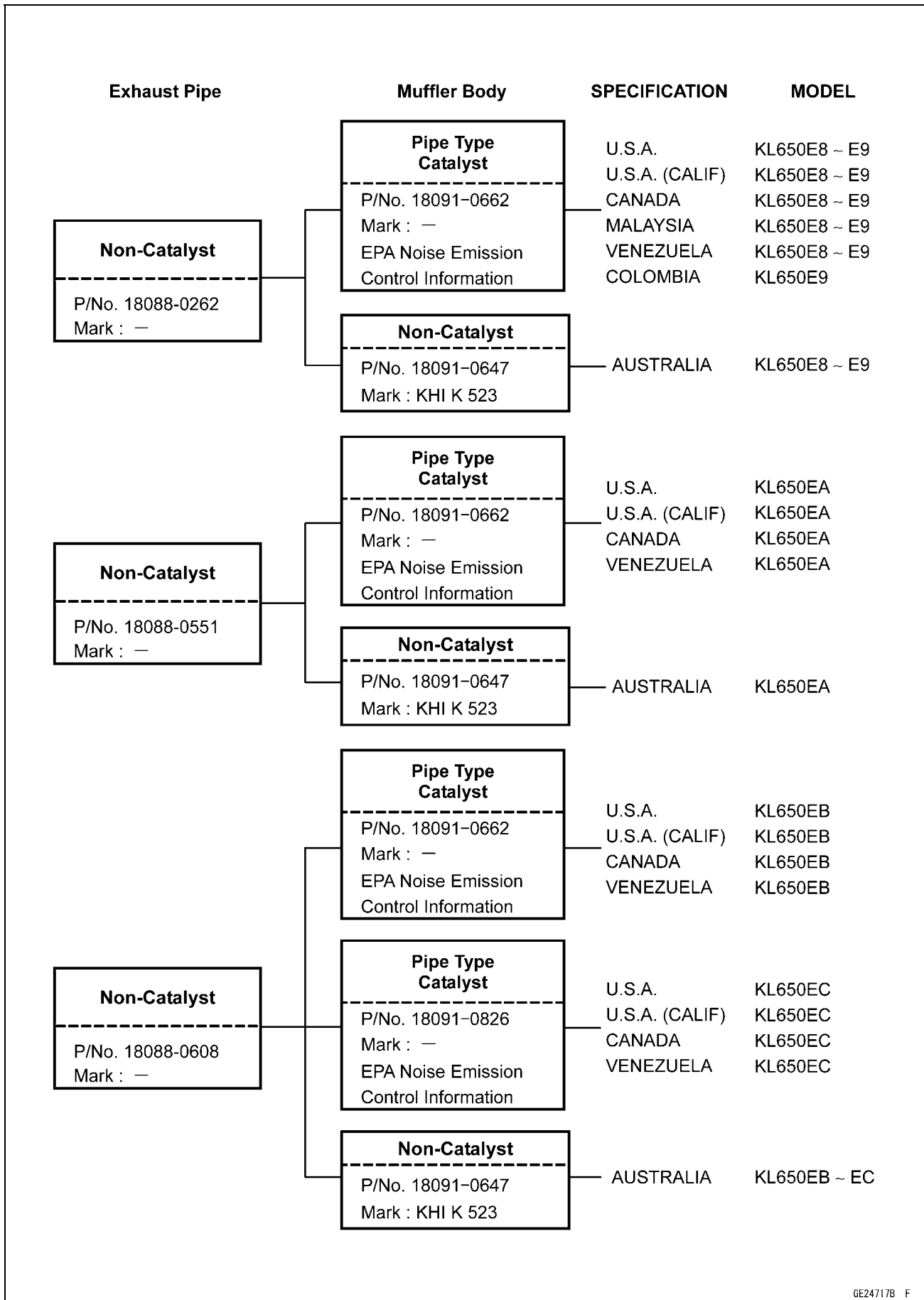
G: Apply grease.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

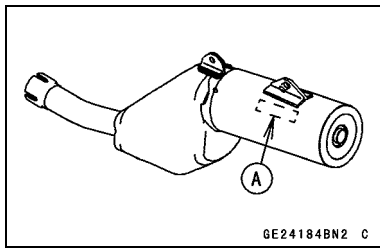
# 5-8 ENGINE TOP END

## Exhaust System Identification

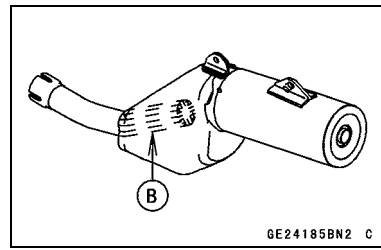


## Exhaust System Identification

Muffler Body Mark Position [A]



Pipe Type Catalyst Position [B]



## 5-10 ENGINE TOP END

### Specifications

Item	Standard	Service Limit
<b>Clean Air System</b>		
Vacuum Switch Valve Closing Pressure (Other than AU Model)	Open → Close 42.7 ~ 53.3 kPa (320 ~ 400 mmHg)	— — —
<b>Camshafts</b>		
Cam Height:		
Exhaust	36.243 ~ 36.357 mm (1.4269 ~ 1.4314 in.)	36.14 mm (1.423 in.)
Inlet	36.742 ~ 36.856 mm (1.4465 ~ 1.4510 in.)	36.64 mm (1.443 in.)
Camshaft, Camshaft Cap Clearance	0.020 ~ 0.062 mm (0.00079 ~ 0.0024 in.)	0.15 mm (0.0059 in.)
Camshaft Journal Diameter	22.959 ~ 22.980 mm (0.90390 ~ 0.90472 in.)	22.93 mm (0.9027 in.)
Camshaft Bearing Inside Diameter	23.000 ~ 23.021 mm (0.90551 ~ 0.90633 in.)	23.08 mm (0.9086 in.)
Camshaft Runout	TIR 0.03 mm (0.001 in.) or less	TIR 0.1 mm (0.004 in.)
<b>Cylinder Head</b>		
Cylinder Compression	(Usable Range) 529 ~ 853 kPa (5.4 ~ 8.7 kgf/cm <sup>2</sup> , 77 ~ 124 psi) @400 r/min (rpm)	— — —
Cylinder Head Warp	— — —	0.05 mm (0.002 in.)
<b>Valves</b>		
Valve Clearance:		
Exhaust	0.15 ~ 0.25 mm (0.0059 ~ 0.0098 in.)	— — —
Inlet	0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.)	— — —
Valve Head Thickness:		
Exhaust	1.0 mm (0.039 in.)	0.7 mm (0.028 in.)
Inlet	1.0 mm (0.039 in.)	0.5 mm (0.020 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	6.955 ~ 6.970 mm (0.2738 ~ 0.2744 in.)	6.94 mm (0.273 in.)
Inlet	6.965 ~ 6.980 mm (0.2742 ~ 0.2748 in.)	6.95 mm (0.274 in.)
Valve Guide Inside Diameter:		
Exhaust	7.000 ~ 7.015 mm (0.2756 ~ 0.2762 in.)	7.08 mm (0.279 in.)
Inlet	7.000 ~ 7.016 mm (0.2756 ~ 0.2762 in.)	7.08 mm (0.279 in.)
Valve/valve Guide Clearance (Wobble Method):		
Exhaust	0.06 ~ 0.12 mm (0.0024 ~ 0.0047 in.)	0.26 mm (0.010 in.)
Inlet	0.05 ~ 0.12 mm (0.0020 ~ 0.0047 in.)	0.26 mm (0.010 in.)
Valve Seat Cutting Angle	32°, 45°, 55°	— — —
Valve Seat Surface:		
Width:		
Exhaust	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	— — —
Inlet	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	— — —

## Specifications

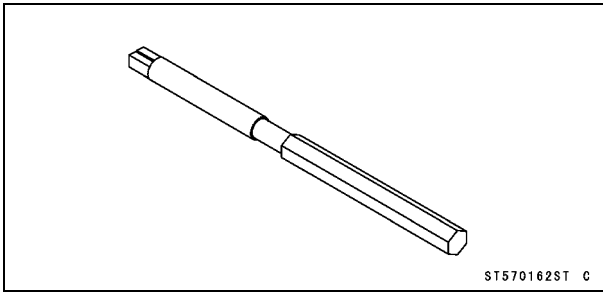
Item	Standard	Service Limit
Outside diameter:		
Exhaust	31.9 ~ 32.1 mm (1.256 ~ 1.264 in.)	— — —
Inlet	36.9 ~ 37.1 mm (1.453 ~ 1.461 in.)	— — —
Valve spring free length:		
Inner	37.6 mm (1.480 in.)	36.2 mm (1.425 in.)
Outer	40.5 mm (1.594 in.)	39.0 mm (1.535 in.)
<b>Cylinder, Piston</b>		
Cylinder Inside Diameter	100.000 ~ 100.012 mm (3.9370 ~ 3.9375 in.)	100.10 mm (3.9409 in.)
Piston Diameter	99.942 ~ 99.957 mm (3.9347 ~ 3.9353 in.)	99.79 mm (3.929 in.)
Piston/cylinder Clearance	0.043 ~ 0.070 mm (0.0017 ~ 0.0028 in.)	— — —
Oversize Piston and Rings	+0.5 mm (0.020 in.), + 1.0 mm (0.040 in.)	— — —
Piston Ring/groove Clearance:		
Top	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Second	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)	0.16 mm (0.0063 in.)
Piston Ring Groove Width:		
Top	1.22 ~ 1.24 mm (0.0480 ~ 0.0488 in.)	1.32 mm (0.0520 in.)
Second	1.21 ~ 1.23 mm (0.0476 ~ 0.0484 in.)	1.31 mm (0.0516 in.)
Piston Ring Thickness:		
Top	1.17 ~ 1.19 mm (0.0461 ~ 0.0469 in.)	1.10 mm (0.0433 in.)
Second	1.17 ~ 1.19 mm (0.0461 ~ 0.0469 in.)	1.10 mm (0.0433 in.)
Piston Ring End Gap:		
Top		
(KL650E8 Early Model)	0.20 ~ 0.35 mm (0.0079 ~ 0.0138 in.)	0.7 mm (0.03 in.)
(KL650E8 Late Model ~ KL650EC)	0.30 ~ 0.40 mm (0.0118 ~ 0.0158 in.)	0.7 mm (0.03 in.)
Second	0.40 ~ 0.55 mm (0.016 ~ 0.022 in.)	0.9 mm (0.04 in.)
Oil	0.20 ~ 0.70 mm (0.0079 ~ 0.028 in.)	1.0 mm (0.039 in.)

# 5-12 ENGINE TOP END

## Special Tools and Sealant

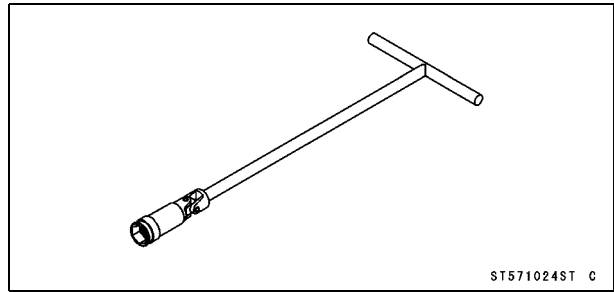
Valve Guide Reamer,  $\phi 7$ :

57001-162



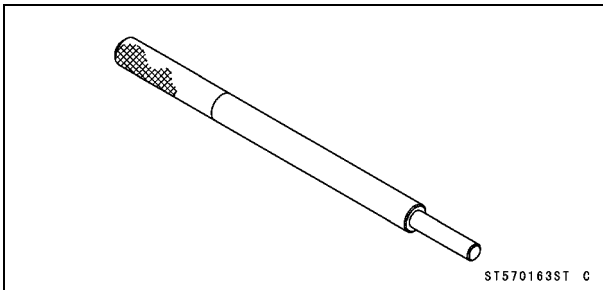
Spark Plug Wrench, Hex 18:

57001-1024



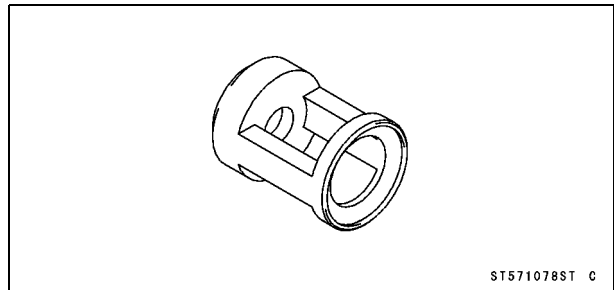
Valve Guide Arbor,  $\phi 7$ :

57001-163



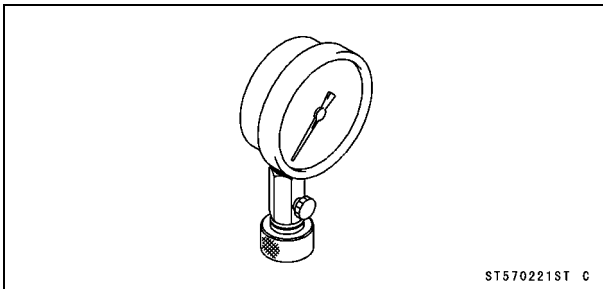
Valve Spring Compressor Adapter,  $\phi 29.5$ :

57001-1078



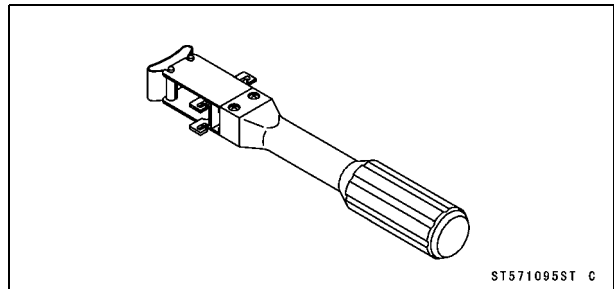
Compression Gauge, 20 kgf/cm<sup>2</sup>:

57001-221



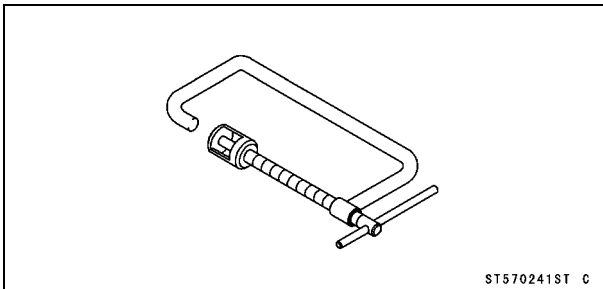
Piston Ring Compressor Grip:

57001-1095



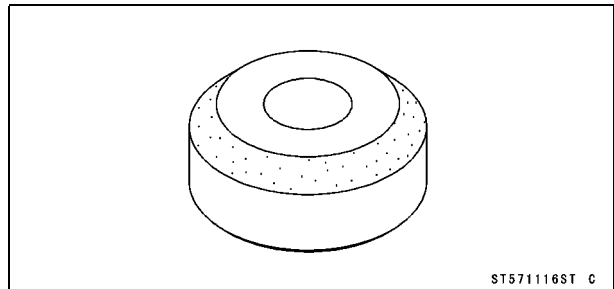
Valve Spring Compressor Assembly:

57001-241



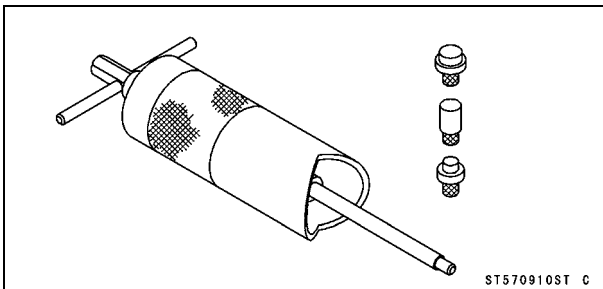
Valve Seat Cutter, 45° -  $\phi 35$ :

57001-1116



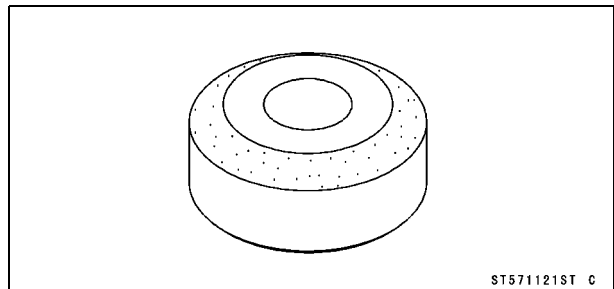
Piston Pin Puller Assembly:

57001-910



Valve Seat Cutter, 32° -  $\phi 35$ :

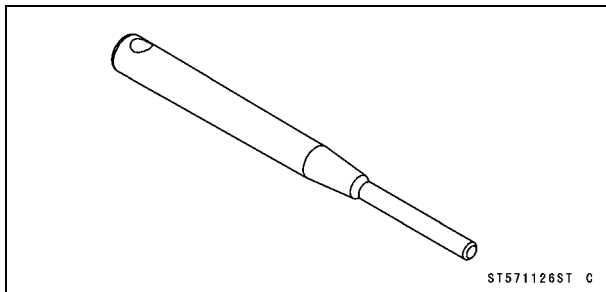
57001-1121





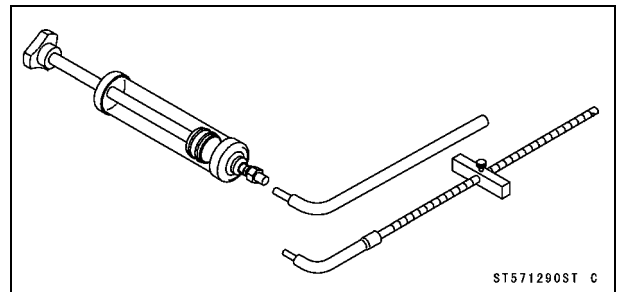
Special Tools and Sealant

Valve Seat Cutter Holder,  $\phi 7$ :  
57001-1126



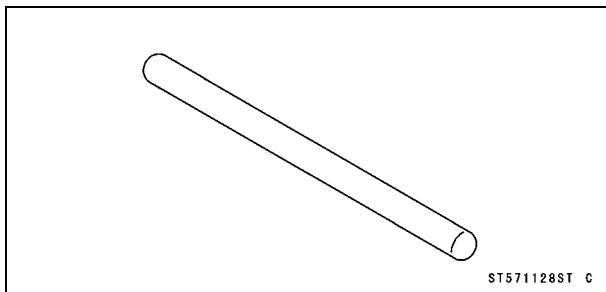
ST571126ST C

Fork Oil Level Gauge:  
57001-1290



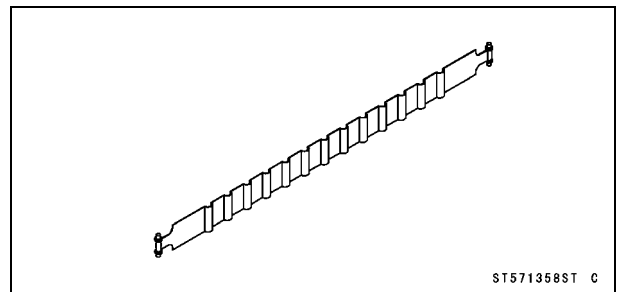
ST571290ST C

Valve Seat Cutter Holder Bar:  
57001-1128



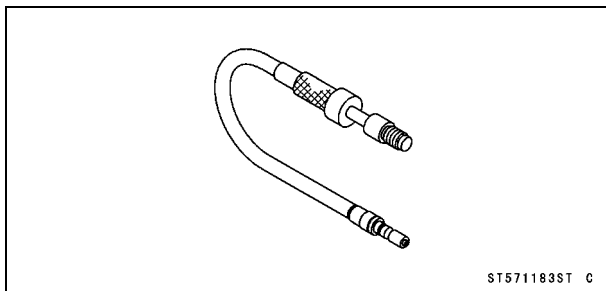
ST571128ST C

Piston Ring Compressor Belt,  $\phi 95 \sim \phi 108$ :  
57001-1358



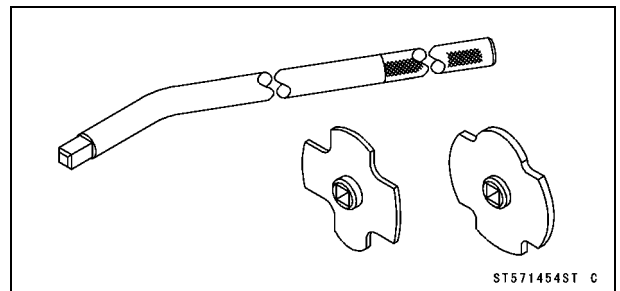
ST571358ST C

Compression Gauge Adapter, M12  $\times$  1.25:  
57001-1183



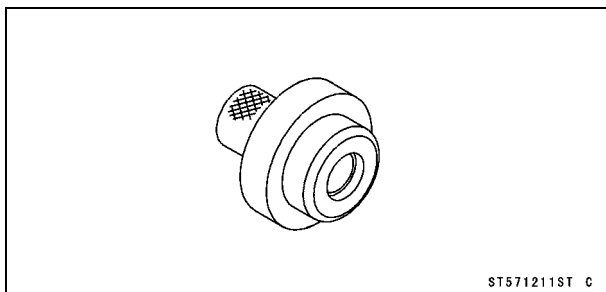
ST571183ST C

Filler Cap Driver:  
57001-1454



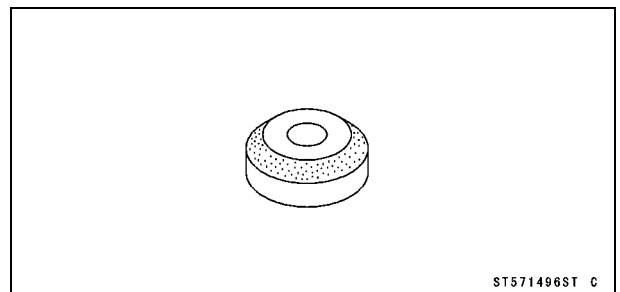
ST571454ST C

Piston Pin Puller Adapter,  $\phi 14$ :  
57001-1211



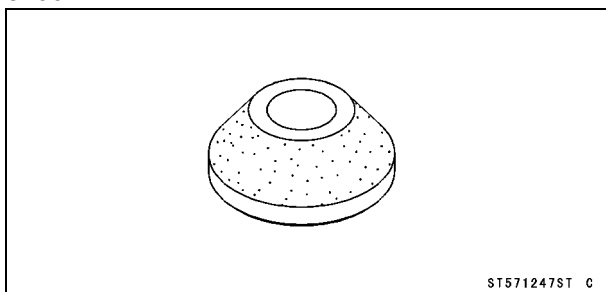
ST571211ST C

Valve Seat Cutter, 45° -  $\phi 40$ :  
57001-1496



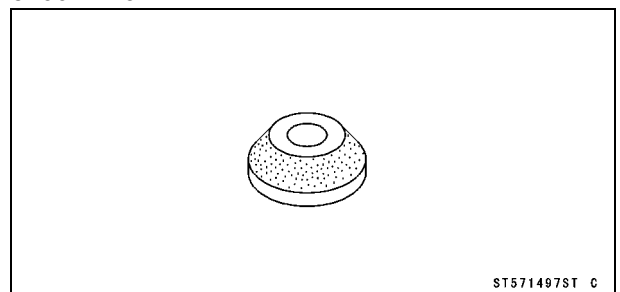
ST571496ST C

Valve Seat Cutter, 55° -  $\phi 35$ :  
57001-1247



ST571247ST C

Valve Seat Cutter, 55° -  $\phi 38.5$ :  
57001-1497



ST571497ST C

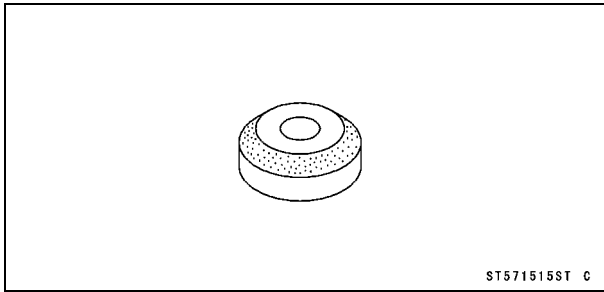
## 5-14 ENGINE TOP END

### Special Tools and Sealant

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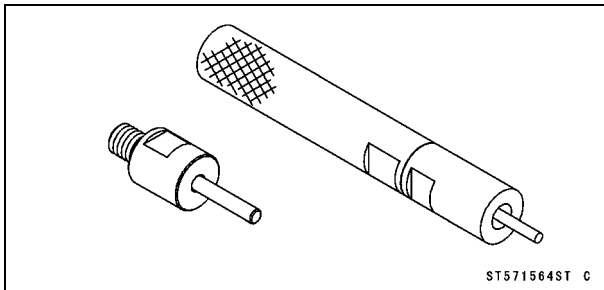
Valve Seat Cutter, 32°-  $\phi$ 44:

57001-1515



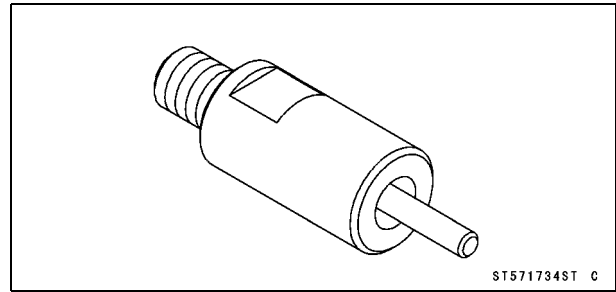
Valve Guide Driver:

57001-1564



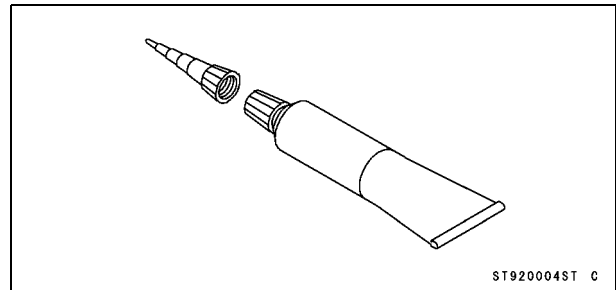
Valve Guide Driver Attachment H:

57001-1734



Liquid Gasket, TB1211F:

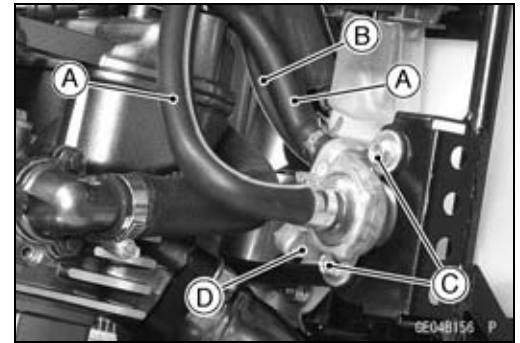
92104-0004



## Clean Air System (Other than AU Model)

### Vacuum Switch Valve Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Air Hoses [A]
  - Vacuum Hose [B]
  - Vacuum Switch Valve Bolts [C] and Nuts
  - Vacuum Switch Valve [D]



### Vacuum Switch Valve Installation

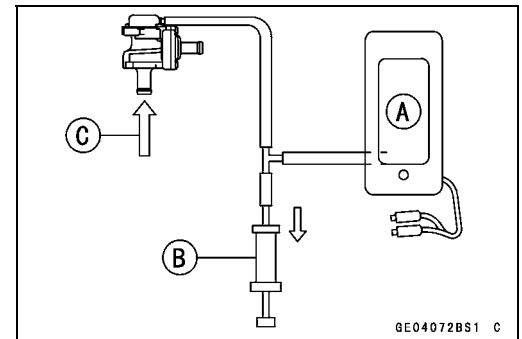
- Install the vacuum switch valve to the right lower fairing bracket.
- Tighten:
  - Torque - Vacuum Switch Valve Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
  - Vacuum Switch Valve Nuts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Install the air hoses and vacuum hose to the vacuum switch valve.
- Install the hoses correctly (see Cable, Wire, and Hose Routing section in the appendix chapter).

### Vacuum Switch Valve Test

- Remove the vacuum switch valve.
- Connect the vacuum gauge [A] and syringe [B] or fork oil level gauge to the vacuum hoses as shown.

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

Air Flow [C]



- Gradually raise the vacuum (lower the pressure) applied to the vacuum switch valve, and check the valve operation. When the vacuum is low, the vacuum switch valve should permit air to flow. When the vacuum raises to valve closing pressure, it should stop air flow.

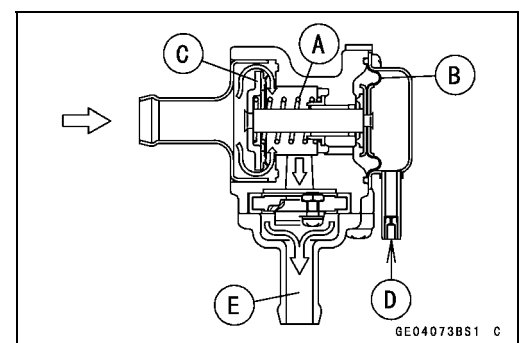
Spring [A]

Diaphragm [B]

Valve [C]

Low Vacuum [D]

Secondary Air Flow [E]



- ★ If the vacuum switch valve does not operate as described, replace it with a new one.

### NOTE

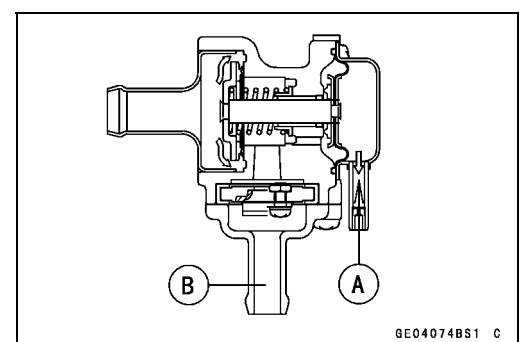
○ To check air flow through the vacuum switch valve, just blow through the air cleaner hose.

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

**Standard: 42.7 ~ 53.3 kPa (320 ~ 400 mmHg)**

High Vacuum [A]

Secondary air cannot flow [B]



## 5-16 ENGINE TOP END

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### Clean Air System (Other than AU Model)

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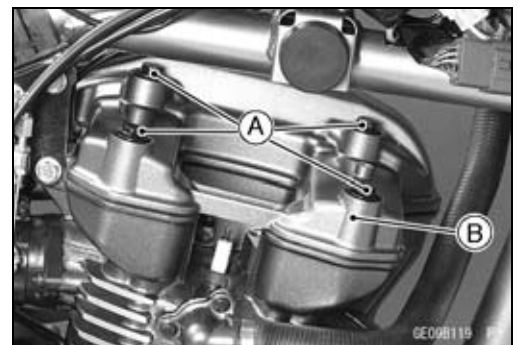
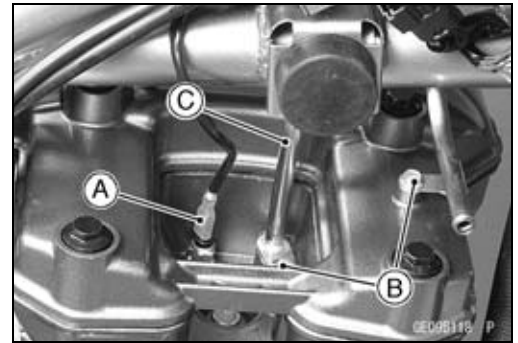
#### *Clean Air System Hose Inspection*

- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the right air cleaner housing, vacuum switch valve, carburetor holder, and air suction valve cover.
- ★ If they are not, correct them. Replace them if they are damaged.

## Cylinder Head Cover

### Cylinder Head Cover Removal

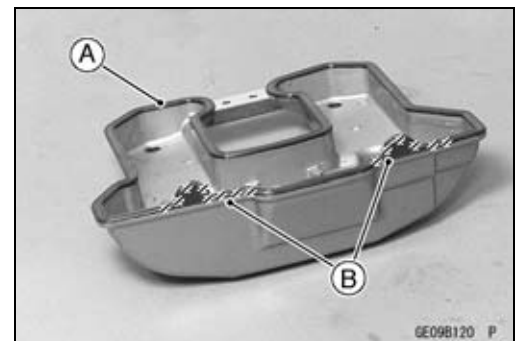
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Radiator (see Radiator Removal in the Cooling System chapter)
  - Right Lower Fairing Bracket (see Engine Removal in the Engine Removal/Installation chapter)
- Disconnect the water temperature sensor connector [A].
- Remove: (Other than AU Model)
  - Clean Air System Pipe Bolts [B]
  - Clean Air System Pipe [C]
- Remove:
  - Cylinder Head Cover Bolts [A]
  - Cylinder Head Cover [B]



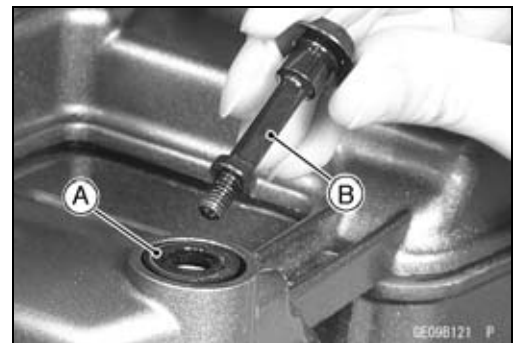
### Cylinder Head Cover Installation

- Replace the head cover gasket [A] with a new one.
- Assemble the gasket and head cover.
- Apply liquid gasket [B] to the cylinder head cover gasket as shown.

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



- Install the head cover together with the gasket.
- Install the head cover bolt washers [A] with the metal side upwards.
- Tighten:
  - Torque - Cylinder Head Cover Bolt [B]: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Install the spark plug cap.
- Pull up the spark plug cap lightly to make sure of the installation of the spark plug cap.

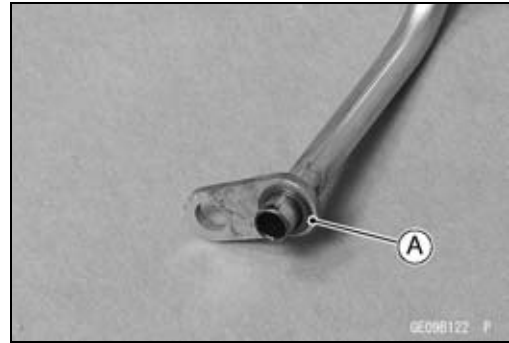


## 5-18 ENGINE TOP END

### Cylinder Head Cover

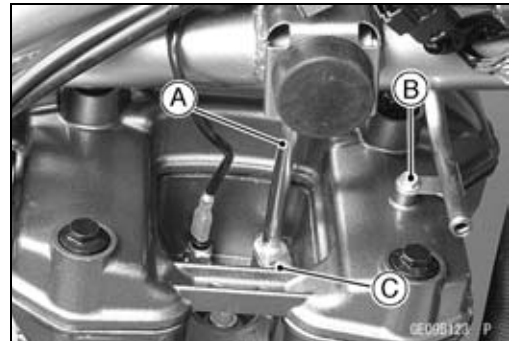
#### Other than AU Model

- Be sure to install the O-ring [A] to the clean air system pipe.



- Install the clean air system pipe [A].
- Tighten:

**Torque - Clean Air System Pipe Bolt (M5) [B]: 5.9 N·m (0.60 kgf·m, 52 in·lb)**  
**Clean Air System Pipe Bolt (M6) [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



## Camshaft Chain Tensioner

### Camshaft Chain Tensioner Removal

#### NOTICE

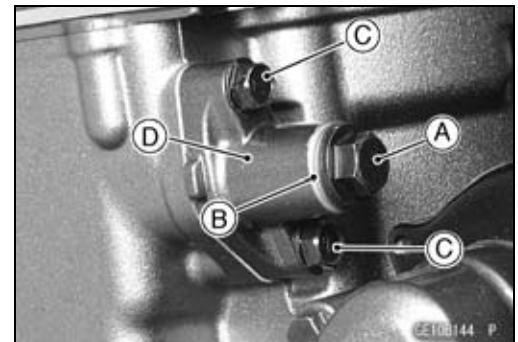
This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below:

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".

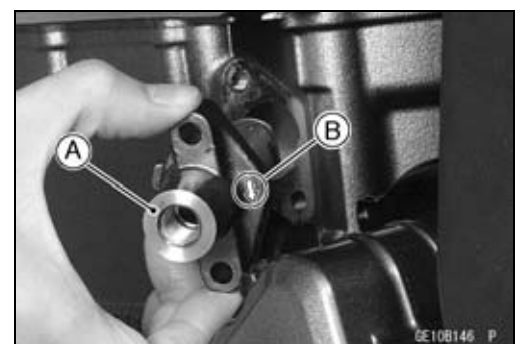
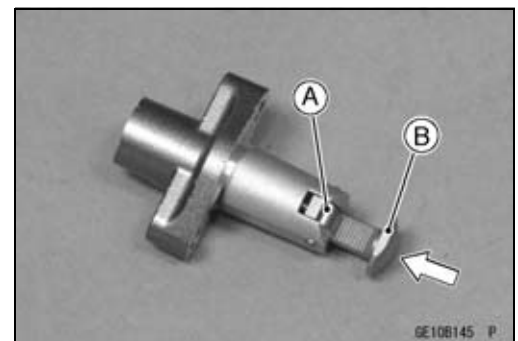
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing and damage the valves.

- Remove:
  - Cap Bolt [A]
  - Gasket [B]
  - Spring
  - Tensioner Mounting Bolts [C]
  - Camshaft Chain Tensioner Body [D]



### Camshaft Chain Tensioner Installation

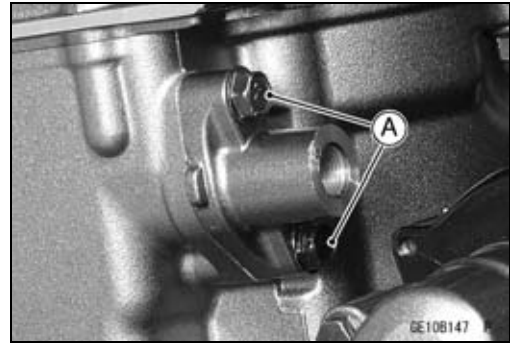
- Push the stopper [A] to release the ratchet, and push the push rod [B] into the tensioner body.
- Install the camshaft tensioner body [A] so that the arrow mark [B] faces downward.



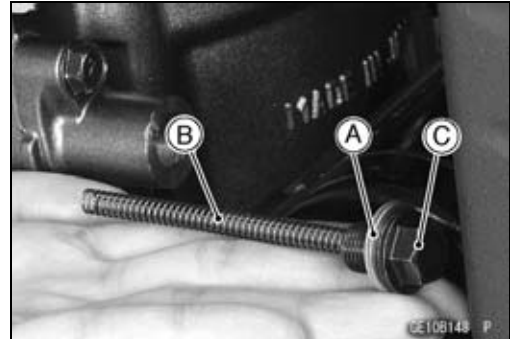
## 5-20 ENGINE TOP END

### Camshaft Chain Tensioner

- Tighten:  
Torque - Camshaft Chain Tensioner Bolts [A]: 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Replace the gasket [A] with a new one.
- Install the spring [B] together with the gasket and cap bolt [C].
- For KL650EC model, install the rod into the spring.
- Tighten the cap bolt securely.

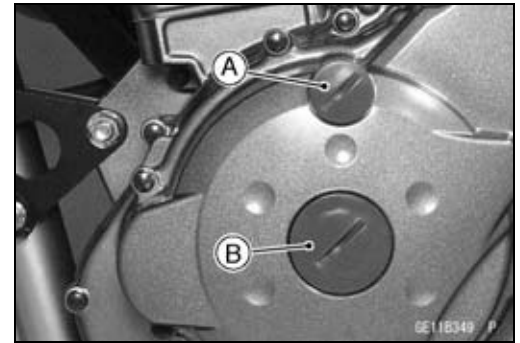




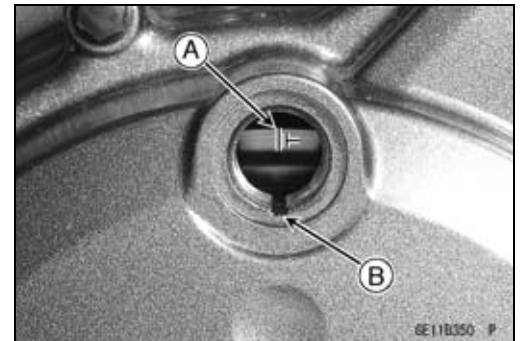
## Camshaft

### Camshaft Removal

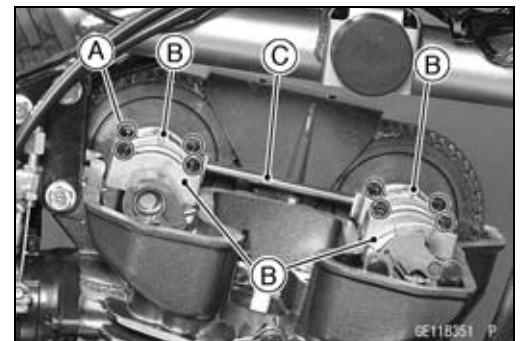
- Remove:
    - Timing Inspection Cap [A]
    - Alternator Rotor Bolt Cap [B]
- Special Tool - Filler Cap Driver: 57001-1454**



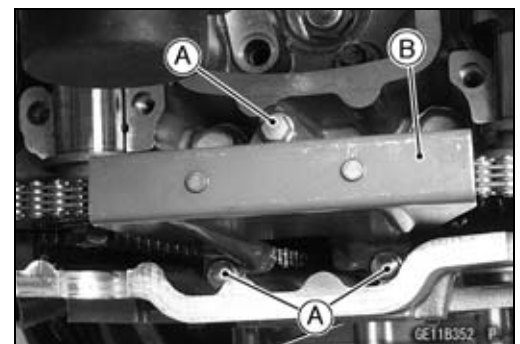
- First, bring the piston to the TDC (of either the compression or exhaust stroke).
- Place a wrench over the alternator rotor bolt and turn it counterclockwise to align the TDC mark [A] with the center of the groove [B] of the inspection hole.



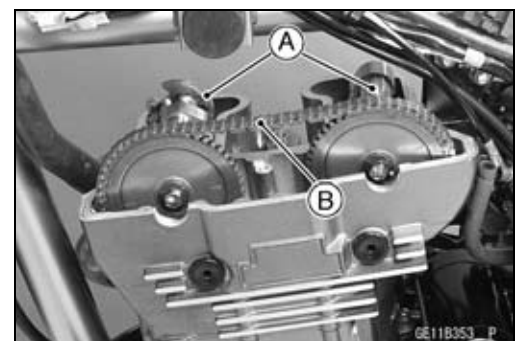
- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal).
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal).
  - Camshaft Cap Bolts [A]
  - Camshaft Caps [B]
  - Oil Pipe [C]
- Staff a clean cloth into the camshaft chain tunnel to keep any parts from dropping into the crankcase.



- Remove:
  - Upper Camshaft Chain Guide Bolts [A]
  - Upper Camshaft Chain Guide [B]



- Disengage the camshafts [A] from camshaft chain [B].



## 5-22 ENGINE TOP END

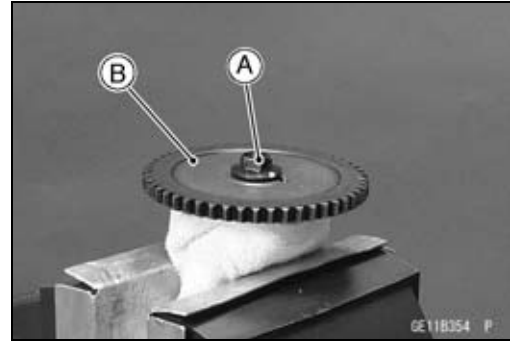
### Camshaft

#### NOTICE

The crankshaft may be turned while the camshafts are removed.

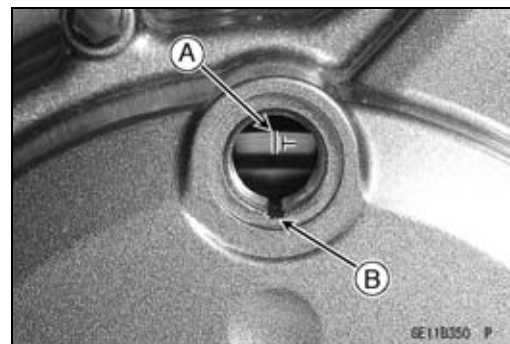
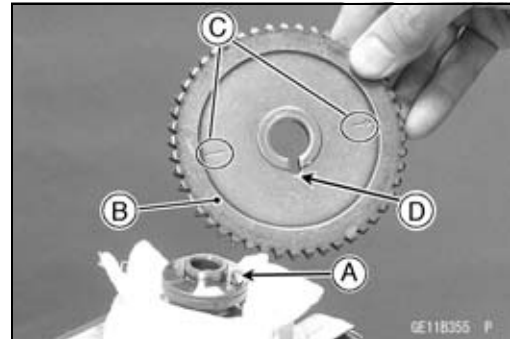
Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

- Remove:
  - Bolt [A]
  - Sprocket [B]



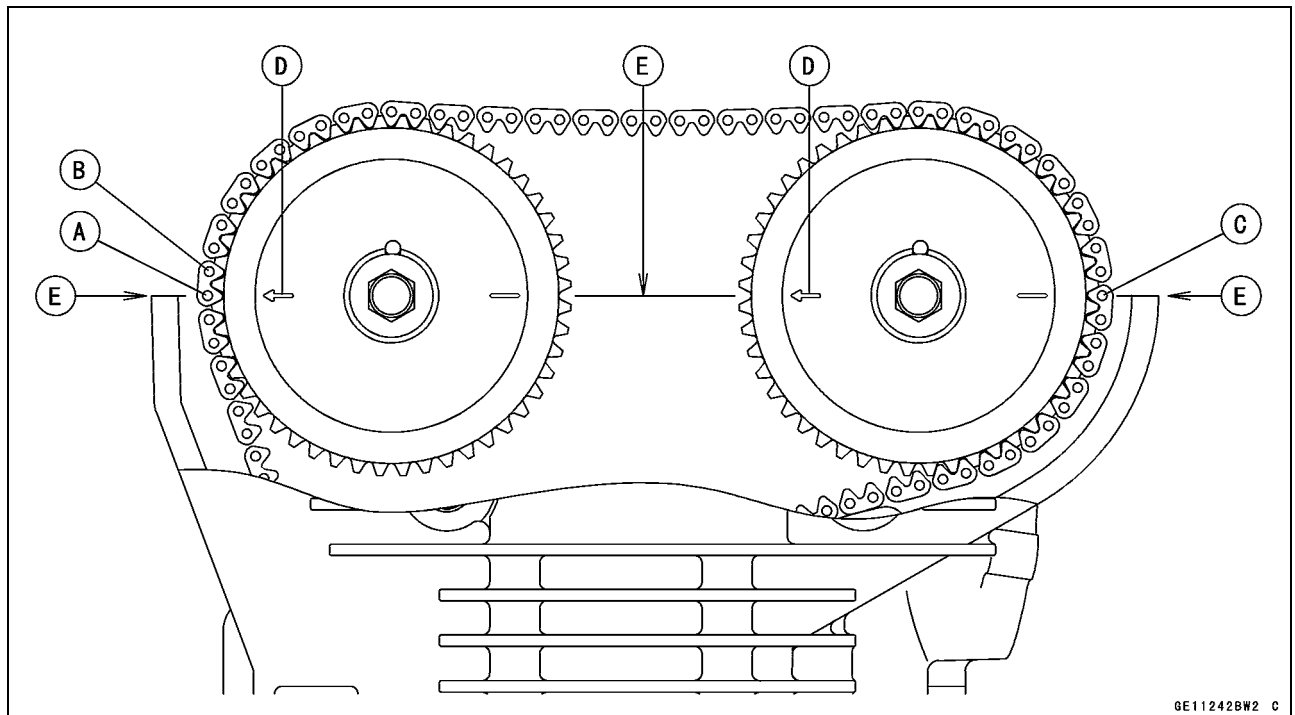
#### Camshaft Installation

- Install the pin [A] into the camshaft.
- Install the sprocket [B] so that the timing mark [C] faces outside and recess [D] on the sprocket fit to the pin.
- Apply a non-permanent locking agent to camshaft sprocket bolts.
- Tighten:
  - Torque - Camshaft Sprocket Bolts: 49 N·m (5.0 kgf·m, 36 ft·lb)
- Apply molybdenum disulfide oil to the all cam and journal surfaces of the camshaft.
- First, bring the crankshaft to the TDC (of either the compression or exhaust stroke).
- Place a wrench over the alternator rotor bolt and turn it counterclockwise to align the TDC mark [A] with the center of the groove [B] of the inspection hole.



- Engage the camshaft chain with the camshaft sprockets.
- Pull the tension side (exhaust side) of the chain taut to install the chain.
- The timing marks on the sprocket must be aligned with the cylinder head upper surface.
- Pull the chain taut and fit it onto the camshaft sprocket.
- Starting with the timing mark on the front of the exhaust sprocket, count to the 1st pin. Feed the exhaust camshaft through the chain and align the 47th pin with the cylinder head upper surface.

## Camshaft



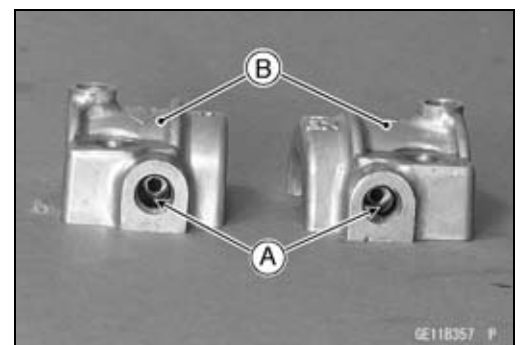
1st Pin [A]  
2nd Pin [B]  
47th Pin [C]

Arrow Mark [D]  
Cylinder Head Upper Surface [E]

- Be sure to install the dowel pins [A].
- Plug the oil passage and camshaft chain tunnel with a clean cloth for prevent the any parts from dropping in the crankcase.
- Install:  
Upper Camshaft Chain Guide (see Camshaft Chain Installation)



- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings, and install them to the camshaft caps [B].



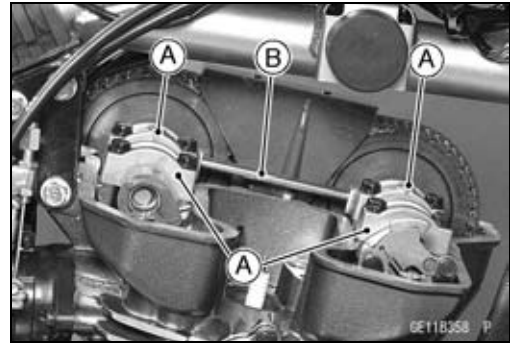
## 5-24 ENGINE TOP END

### Camshaft

- Install the camshaft caps [A] and oil pipe [B] so that note the identification mark of the “EX” and “IN”.
- Uniformly tighten all bolts and after the camshaft has settled, uniformly tighten all the bolts.

**Torque - Camshaft Cap Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)**

- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation), then, check the camshaft chain timing.



#### NOTICE

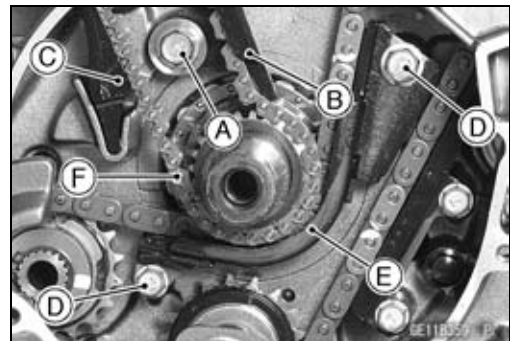
**After this procedure, if any resistance is felt while turning over the crankshaft, stop immediately, and check the camshaft chain timing. Valves will be bent if the timing is not properly set.**

- Install:
  - Cylinder Head Cover (see Cylinder Head Cover Installation)
  - Timing Inspection Cap
  - Alternator Rotor Bolt Cap

**Special Tool - Filler Cap Driver: 57001-1454**

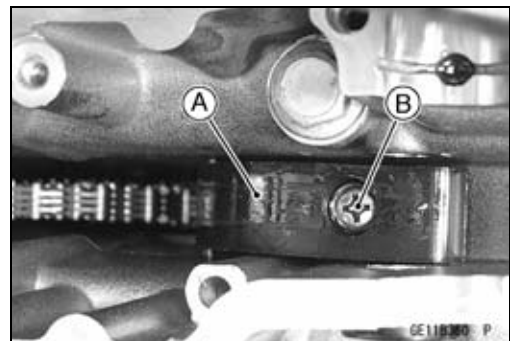
### Camshaft Chain Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Alternator Rotor (see Alternator Rotor Removal in the Electrical System)
  - Starter Motor Clutch Gear (see Alternator Rotor Removal in the Electrical System)
  - Rear Camshaft Chain Guide Bolt [A]
  - Rear Camshaft Chain Guide [B]
  - Front Camshaft Chain Guide [C]
  - Lower Camshaft Chain Guide Bolts [D]
  - Lower Camshaft Chain Guide [E]
- Remove the camshaft chain [F] from the crankshaft sprocket.



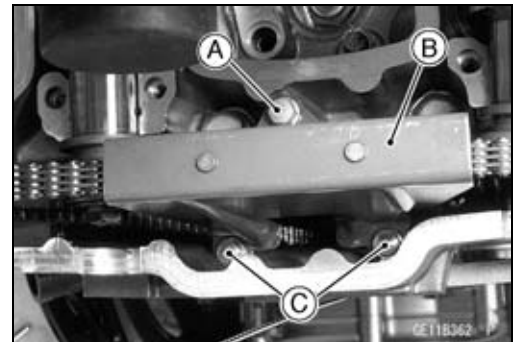
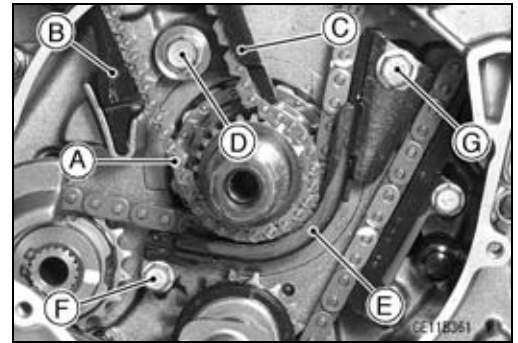
### Camshaft Chain Installation

- Apply a non-permanent locking agent to the upper rear camshaft chain guide screw.
- Install:
  - Upper Rear Camshaft Chain Guide [A]
- Tighten:
  - **Torque - Upper Rear Camshaft Chain Guide Screw [B]: 4.4 N·m (0.45 kgf·m, 39 in·lb)**



## Camshaft

- Hang the camshaft chain [A] to the crankshaft sprocket.
- Install:
  - Front Camshaft Chain Guide [B]
  - Rear Camshaft Chain Guide [C]
- Tighten:
  - Torque - Rear Camshaft Chain Guide Bolt [D]: 19 N·m (1.9 kgf·m, 14 ft·lb)**
- Install:
  - Lower Camshaft Chain Guide [E]
- Apply a non-permanent locking agent to the lower camshaft chain guide bolts, and tighten them.
  - Torque - Lower Camshaft Chain Guide Bolt (M6) [F]: 12 N·m (1.2 kgf·m, 106 in·lb)**
  - Lower Camshaft Chain Guide Bolt (M8) [G]: 25N·m (2.5 kgf·m, 18 ft·lb)**
- Install:
  - Starter Motor Clutch Gear (see Alternator Rotor Installation in the Electrical System chapter)
  - Alternator Rotor (see Alternator Rotor Installation in the Electrical System chapter)
  - Cylinder Head (see Cylinder Head Installation)
- Hang the camshaft chain to the camshaft sprocket.
- Apply a non-permanent locking agent to the upper camshaft chain guide bolt (L = 12) [A].
- Install the upper camshaft chain guide [B].
- Tighten:
  - Torque - Upper Camshaft Chain Guide Bolt (L = 12): 8.8 N·m (0.90 kgf·m, 78 in·lb)**
  - Upper Camshaft Chain Guide Bolts (L = 85) [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



### Camshaft and Camshaft Cap Wear

- Measure each clearance between the camshaft journal and camshaft cap using plastigauge (press gauge) [A].
- Install the camshaft caps (see Camshaft Installation)

#### NOTE

○Do not turn the camshaft when the plastigauge is between the journal and camshaft cap.

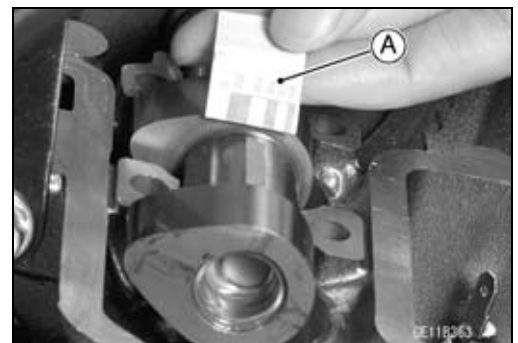
- ★If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

#### Camshaft, Camshaft Cap Clearance

**Standard: 0.020 ~ 0.062 mm (0.00079 ~ 0.0024 in.)**

**Service Limit: 0.15 mm (0.0059 in.)**

- ★If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.



## 5-26 ENGINE TOP END

### Camshaft

#### Camshaft Journal Diameter

**Standard:** 22.959 ~ 22.980 mm (0.90390 ~ 0.90472 in.)

**Service Limit:** 22.93 mm (0.9027 in.)

★ If the clearance still remains out of the service limit, replace the cylinder head unit.

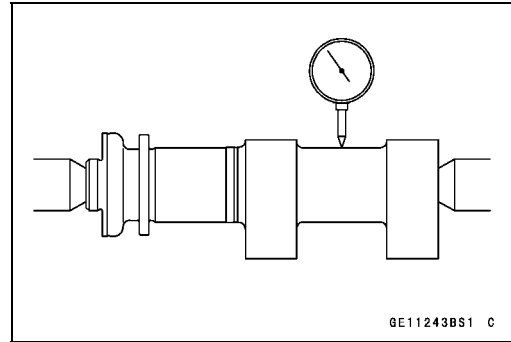
#### Camshaft Runout

- Remove the camshaft (see Camshaft Removal).
  - Set the camshaft in a camshaft alignment jig or on V blocks.
  - Measure the runout with a dial gauge at the specified place as shown.
- ★ If the runout exceeds the service limit, replace the camshaft.

#### Camshaft Runout

**Standard:** TIR 0.03 mm (0.001 in.) or less

**Service Limit:** TIR 0.1 mm (0.004 in.)



#### Cam Wear

- Remove the camshaft (see Camshaft Removal).
  - Measure the height [A] of each cam with a micrometer.
- ★ If the cams are worn down past the service limit, replace the camshaft.

#### Cam Height

##### Standard:

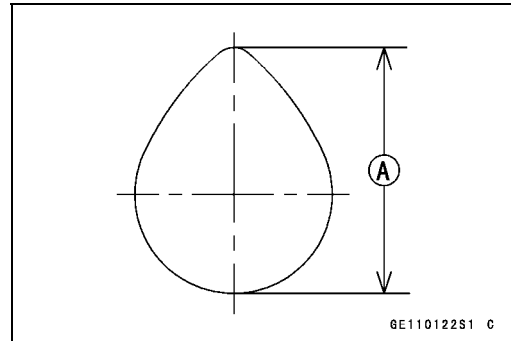
**Exhaust** 36.243 ~ 36.357 mm (1.4269 ~ 1.4314 in.)

**Inlet** 36.742 ~ 36.856 mm (1.4465 ~ 1.4510 in.)

##### Service Limit:

**Exhaust** 36.14 mm (1.423 in.)

**Inlet** 36.64 mm (1.443 in.)



## Cylinder Head

### Cylinder Compression Measurement

#### NOTE

○Use the battery which is fully charged

- Thoroughly warm up the engine so that engine oil between the piston and cylinder wall will help seal compression as it does during normal running.
- Stop the engine.
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
- Remove the spark plug [A] with spark plug wrench [B] (or owner's tool).

**Special Tool - Spark Plug Wrench, Hex 18: 57001-1024**

**Owner's Tool - Spark Plug Wrench: 92110-1111**

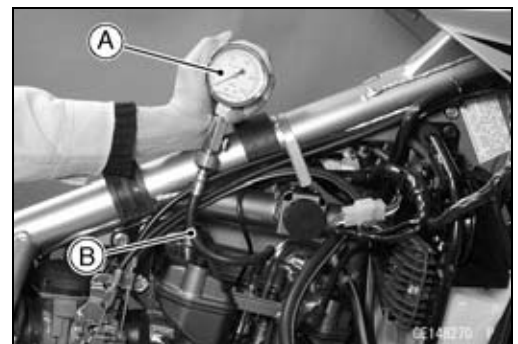
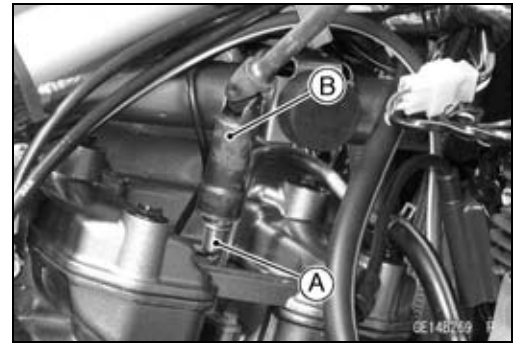
- Attach the compression gauge [A] and the adapter hose [B] firmly into the spark plug hole.
- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

**Special Tools - Compression Gauge, 20 kgf/cm<sup>2</sup>: 57001-221**  
**Compression Gauge Adapter, M12 × 1.25: 57001-1183**

#### Cylinder Compression

**Service Range: 529 ~ 853 kPa (5.4 ~ 8.7 kg/cm<sup>2</sup>, 77 ~ 124 psi) @400 r/min (rpm)**

- Install the spark plug.
  - Special Tool - Spark Plug Wrench, Hex 18: 57001-1024**
  - Owner's Tool - Spark Plug Wrench: 92110-1111**
  - Torque - Spark Plug: 14 N·m (1.4 kgf·m, 10 ft·lb)**
- Pull the spark plug cap lightly to make sure the installation of the spark plug cap.



## 5-28 ENGINE TOP END

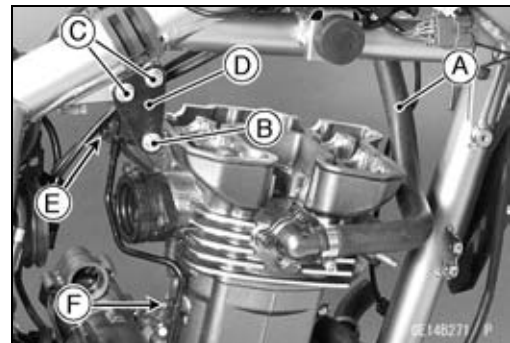
### Cylinder Head

The following table should be consulted if the obtainable compression reading is not within the usable range.

Problem	Diagnosis	Remedy (Action)
The cylinder compression is higher than the usable range	Carbon accumulation on piston and in cylinder head (combustion chamber) is suspected due to damaged valve stem or piston oil rings	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket thickness.	Replace the gasket with a standard one.
	Damaged auto-decompressor spring or decompressor do not move smoothly.	Replace the spring or exhaust camshaft.
The cylinder compression is lower than the usable range	Exhaust gas leakage around cylinder head	Replace the damaged gasket and check cylinder head warp.
	Incorrect seating surface of valve.	Repair seating surface if possible.
	Valve clearance is too narrow.	Adjust the valve clearance.
	Piston/cylinder clearance is too wide.	Replace the piston and/or cylinder
	Piston seizure.	Inspect the cylinder and piston; repair or replace them if necessary.
	Bad condition of piston ring and/or piston ring grooves	Replace the piston and/or the piston rings.
Auto-decompressor do not move smoothly.	Replace the exhaust camshaft.	

### Cylinder Head Removal

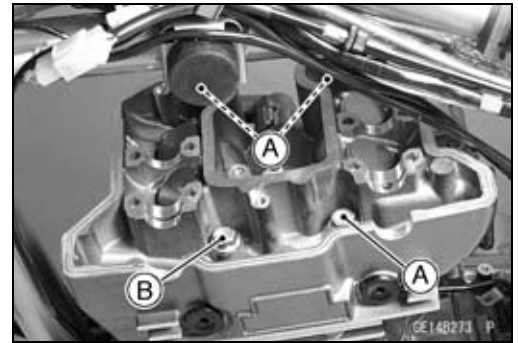
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Carburetor (see Carburetor Removal in the Fuel System chapter)
  - Exhaust Pipe (see Exhaust Pipe Removal)
  - Radiator Hose [A]
  - Upper Engine Mounting Bolt [B] and Nuts
  - Bracket Bolts [C] and Nuts
  - Upper Engine Bracket [D]
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  - Oil Pipe Banjo Bolt [E]
  - Oil Pipe Bolt [F]
  - Camshaft (see Camshaft Removal)



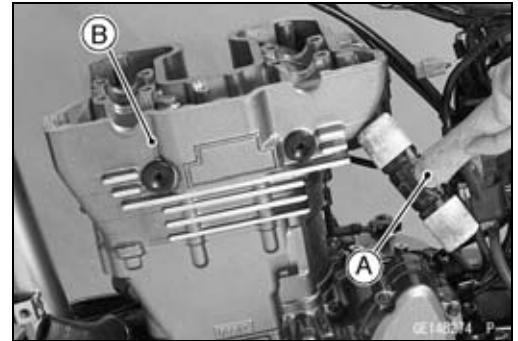


## Cylinder Head

- Remove:
  - Cylinder Head Bolts [A]
- Loosen the left side front bolt [B] fully.

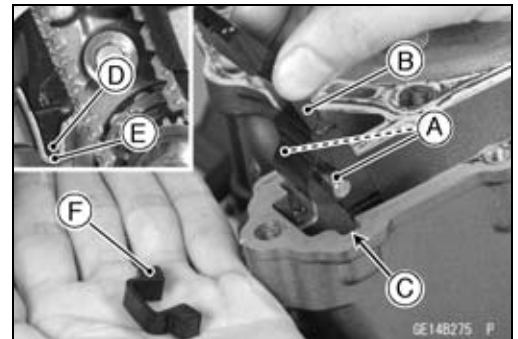


- Tap lightly up with a plastic mallet [A] to separate the cylinder head [B] from the cylinder.
- Remove the cylinder head gasket.

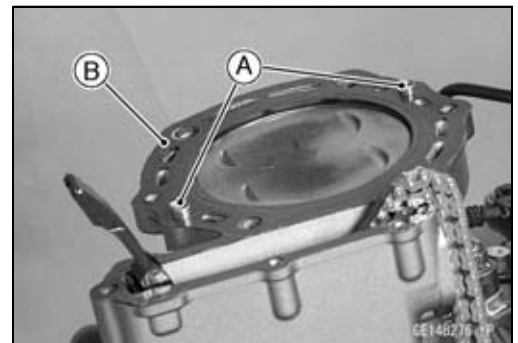


### Cylinder Head Installation

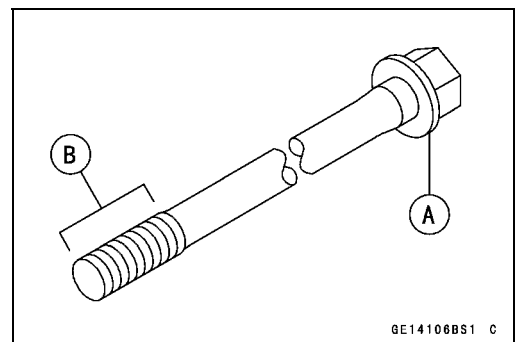
- Fit the projections [A] of the front camshaft chain guide [B] in the groove [C] of the cylinder.
- Insert the guide end [D] into the recess [E] of the left crankcase securely.
- Install the damper [F].



- Install:
  - Dowel Pins [A]
  - New Cylinder Head Gasket [B]
- Install the cylinder head.
- The camshaft caps are machined with the cylinder head; therefore, if a new cylinder head is installed, use the caps that are supplied with the new head.



- Apply molybdenum disulfide grease to the flange [A] and thread [B] of the cylinder head bolts.

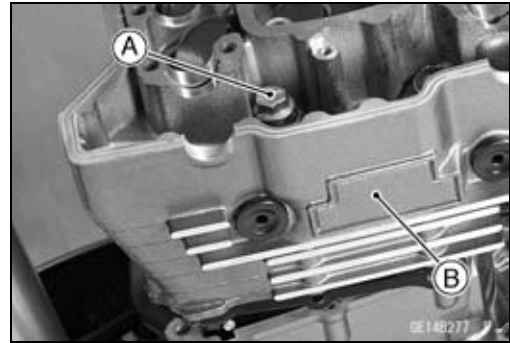


GE14106BS1 C

## 5-30 ENGINE TOP END

### Cylinder Head

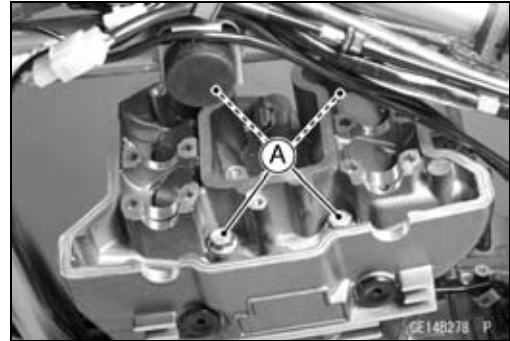
- Insert the cylinder head left side front bolt [A] to the original position.
- Insert the cylinder head [B] together with the left side front bolt.



- Tighten the cylinder head bolts [A] diagonally with the specified torque.

**Torque - Cylinder Head Bolts (First): 20 N·m (2.0 kgf·m, 15 ft·lb)**

**Cylinder Head Bolts (Final): 65 N·m (6.6 kgf·m, 48 ft·lb)**



### Cylinder Head Warp Inspection

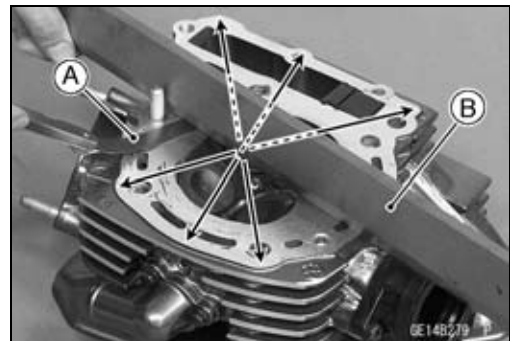
- Lay a straightedge across the mating surface of the cylinder head at the positions shown.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

#### 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 sanding the mating surface (first No. 200, then No. 400).



## Valves

### Valve Clearance Inspection

- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

### Valve Removal

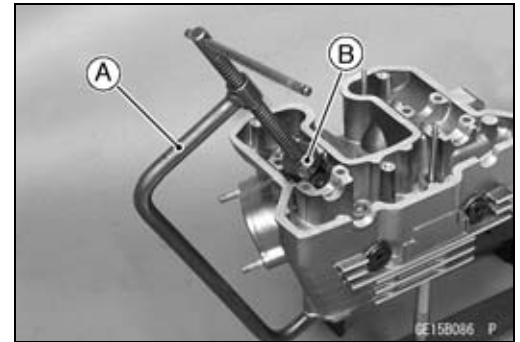
- Remove the cylinder head (see Cylinder Head Removal).
- Remove the valve lifter and the shim from the valve.

#### NOTE

- Use the valve spring compressor assembly and the adapter to press down the valve spring retainer.

**Special Tools - Valve Spring Compressor Assembly: 57001-241 [A]**

**Valve Spring Compressor Adapter,  $\phi$ 29.5: 57001-1078 [B]**



### Valve Installation

#### NOTICE

**Do not lap the valve to the valve seat, using the grinding compound. It will come off oxide film treated surface of the valve.**

- Visually inspect the valve surface.
- ★ If the surface is damaged, replace it.
- Replace the oil seal [C] with a new part.
- Apply a thin coat of molybdenum disulfide grease to the valve stem [A] before installing the valve.
- Check to make sure that the valve moves up and down smoothly.
- Check to make sure that the valve and the valve seat are making proper contact.
- Install the inner valve spring [D] and outer valve spring [E] so that the closed coil end faces the spring seat [B].
- Compress the valve spring to install the split keepers [G] in order to secure the spring retainer [F] in place.

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

**Valve Spring Compressor Adapter,  $\phi$ 29.5: 57001-1078**

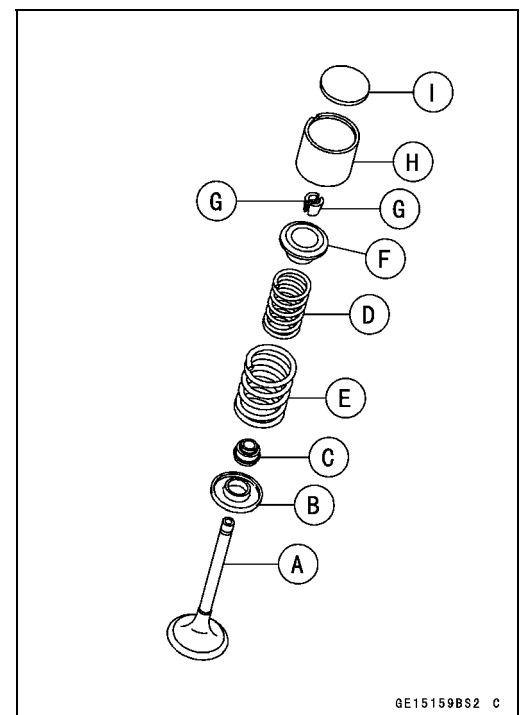
- The shim [I] must be installed with its thickness indication facing down towards the retainer.
- Apply engine oil to the valve lifter [H] surface, and install it.

### Valve Guide Removal

- Remove:
  - Valve (see Valve Removal)
  - Oil Seal
  - Spring Seat
- Heat the area around the valve guide up to 120 ~ 150°C (248 ~ 302°F).

#### NOTICE

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

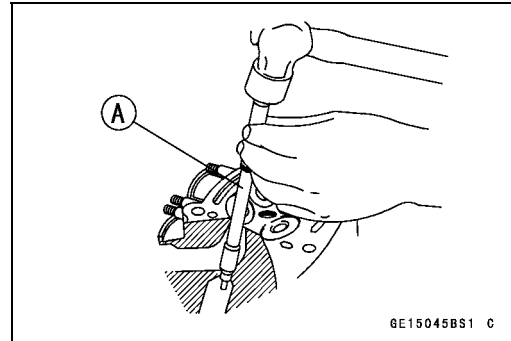


## 5-32 ENGINE TOP END

### Valves

- Hammer lightly on the valve guide arbor [A] to remove the guide.

**Special Tool - Valve Guide Arbor,  $\phi$ 7: 57001-163**



### Valve Guide Installation

- Apply a thin coat of oil to the outer surface of the valve guide.
- Heat the area around the valve guide up to 120 ~ 150°C (248 ~ 302°F).

#### NOTICE

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

- Using the valve guide arbor, press and insert the valve guide in until its snap ring touches the head surface.

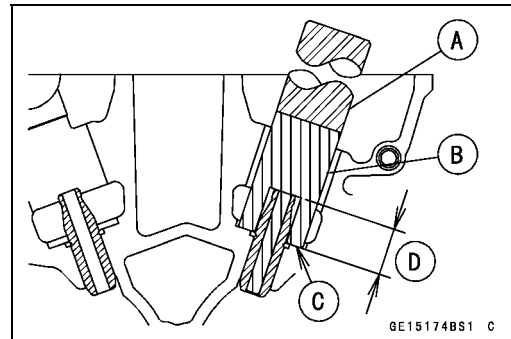
**Special Tool - Valve Guide Arbor,  $\phi$ 7: 57001-163**

- Using the valve guide driver [A] and attachment [B], press and insert the valve guide in until the attachment bottom surface touches the head surface [C].

13.8 ~ 14.0 mm (0.543 ~ 0.551 in.) [D]

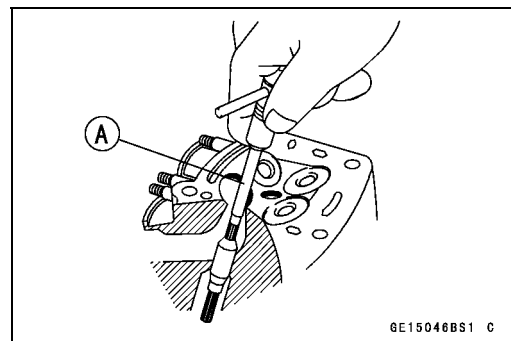
**Special Tools - Valve Guide Driver: 57001-1564**

**Valve Guide Driver Attachment H: 57001-1734**



- Ream the valve guide with valve guide reamer [A], even if the old guide is reused.

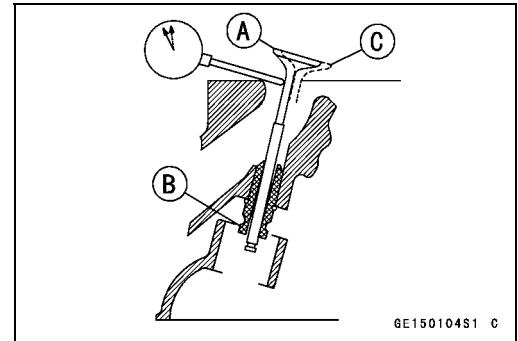
**Special Tool - Valve Guide Reamer,  $\phi$ 7: 57001-162**



## Valves

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

- If a small bore gauge is not available, inspect the valve guide wear by measuring the valve/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 the valve wobble.
- Repeat the measurement in a direction at a 90° angle to the first measurement.
- ★ If the reading exceeds the service limit, replace the guide.



### NOTE

- The reading is greater than the actual valve/valve guide clearance because the measurement is taken outside of the guide.

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

#### Standard:

Exhaust	0.06 ~ 0.12 mm (0.0024 ~ 0.0047 in.)
Inlet	0.05 ~ 0.12 mm (0.0020 ~ 0.0047 in.)

#### Service Limit:

Exhaust	0.26 mm (0.010 in.)
Inlet	0.26 mm (0.010 in.)

### Valve Seat Inspection

- Remove the valve (see Valve Removal).
- Check the valve seating surface [A] between the valve [B] and valve seat [C].
- Measure the outside diameter [D] of the seating pattern on the valve seat.
- ★ If the outside diameter is too large or too small, repair the seat. (see Seat Repair)

#### Valve Seating Surface Outside Diameter

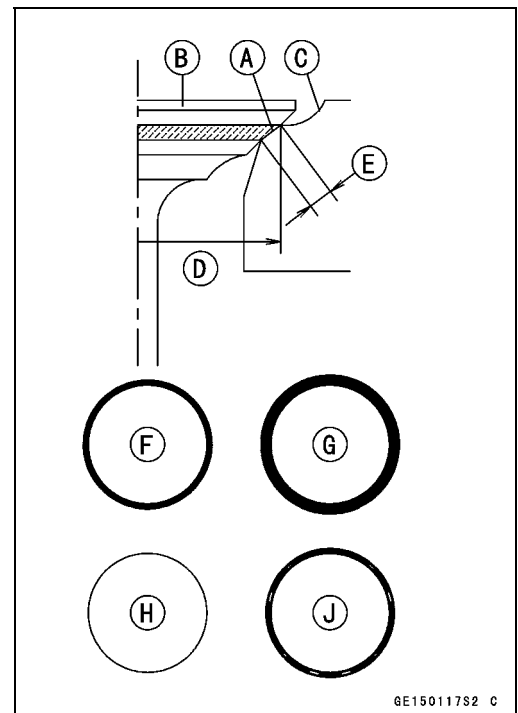
Exhaust	31.9 ~ 32.1 mm (1.256 ~ 1.264 in.)
Inlet	36.9 ~ 37.1 mm (1.453 ~ 1.461 in.)

- Check the seating surface width of the valve seat.
- 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]

#### Valve Seating Surface Width Standard

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

- ★ If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).



## 5-34 ENGINE TOP END

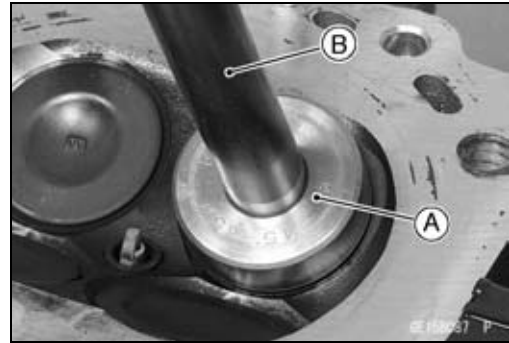
### Valves

#### Valve Seat Repair

- For the instructions on how to use the valve seat cutter [A], follow the operation manual provided by the manufacturer.

**Special Tools - Valve Seat Cutter Holder,  $\phi$ 7: 57001-1126 [B]**

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



**Exhaust: Valve Seat Cutter, 45° -  $\phi$ 35: 57001-1116**

**Valve Seat Cutter, 32° -  $\phi$ 35: 57001-1121**

**Valve Seat Cutter, 55° -  $\phi$ 35: 57001-1247**

**Inlet: Valve Seat Cutter, 45° -  $\phi$ 40: 57001-1496**

**Valve Seat Cutter, 32° -  $\phi$ 44: 57001-1515**

**Valve Seat Cutter, 55° -  $\phi$ 38.5: 57001-1497**

- ★ If the tool manufacturer's instructions are not available, operate in accordance with the following procedure.

#### 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.

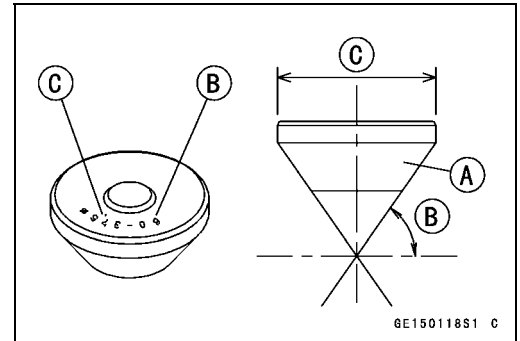
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

**Valves**

**Marks Stamped on the Cutter**

The marks stamped on the back of the cutter [A] represent the following.

- 60° ..... Cutter Angle [B]
- 37.5φ ..... Cutter Outer Diameter [C]

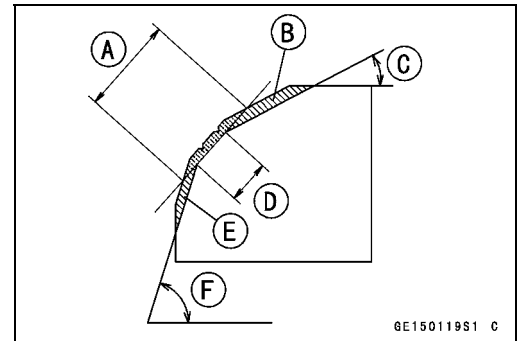


**Repair Operating Procedures**

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

**NOTICE**

**Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.**

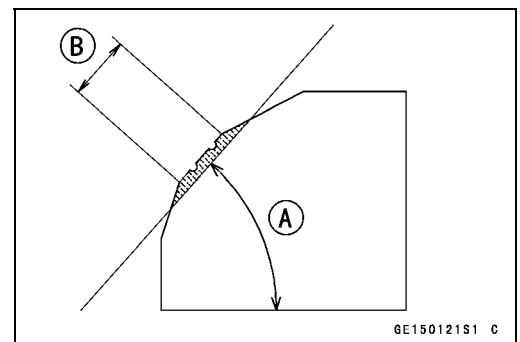


- Widened Width [A] of engagement by machining with 45° cutter
- Ground Volume [B] by 32° cutter
- 32° [C]
- Correct Width [D]
- Ground Volume [E] by 55° cutter
- 55° [F]

- 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 until the diameter is within the specified range.

Original Seating Surface [B]

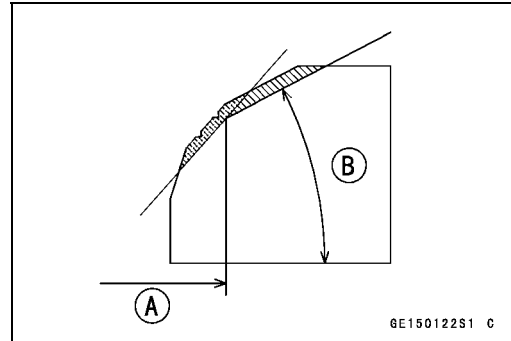
- Remove all pittings of flaws from 45° ground surface.
- Alter grinding with 45° cutter, apply thin coat of machinist's dye to 45° [A] seating surface. This makes seating surface distinct and 32° and 55° grinding operation easier.
- When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.



## 5-36 ENGINE TOP END

### Valves

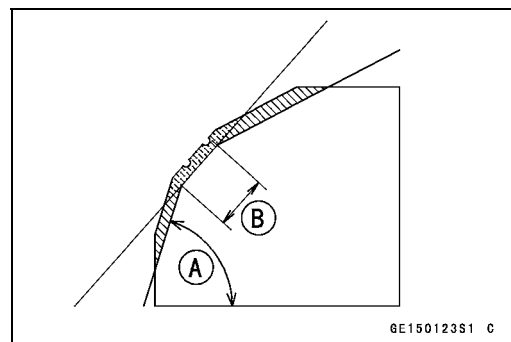
- ★ If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.
- ★ If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.
- Grind the seat at a 32° angle [B] until the seat O.D. is within the specified range.
- To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.
- Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.



#### NOTICE

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

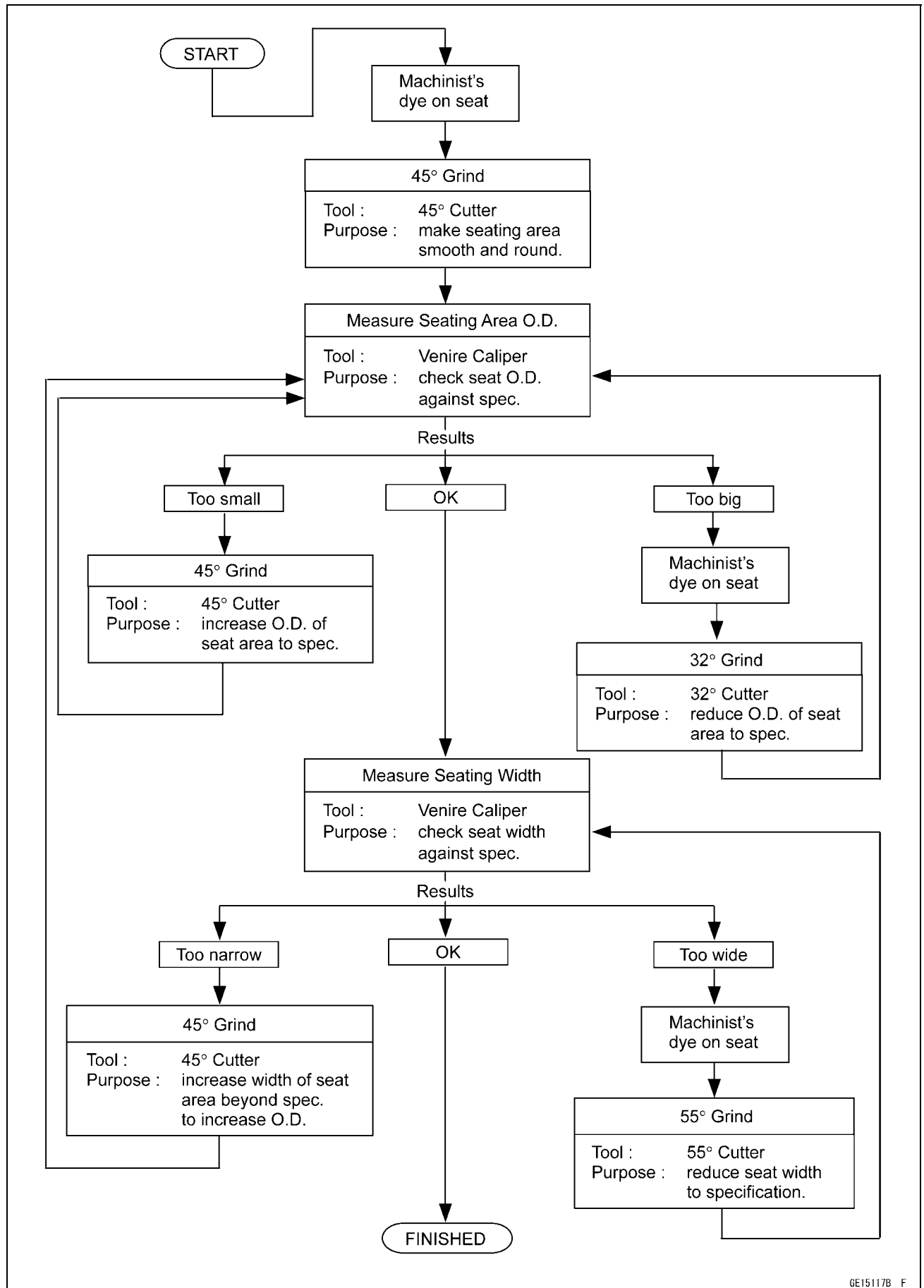
- After making the 32° grind, return to the seat O.D. measurement step above.
- To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
- ★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.
  
- ★ If the seat width is too wide, make the 55° [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 55° angle until the seat width is within the specified range.
- To make the 55° grind, fit a 55° cutter into the holder, and slide it into the valve guide.
- Turn the holder, while pressing down lightly.
- After making the 55° grind, return to the seat width measurement step above.  
Correct Width [B]
  
- 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.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment in the Periodic Maintenance chapter).





Valves

Valve Seat Repair

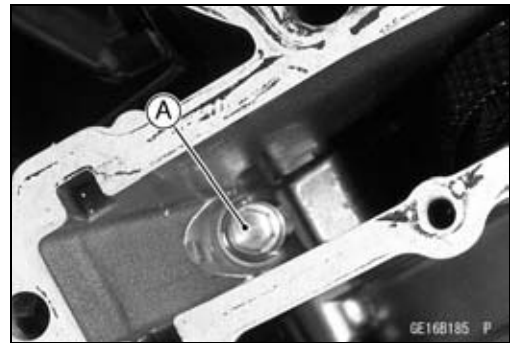
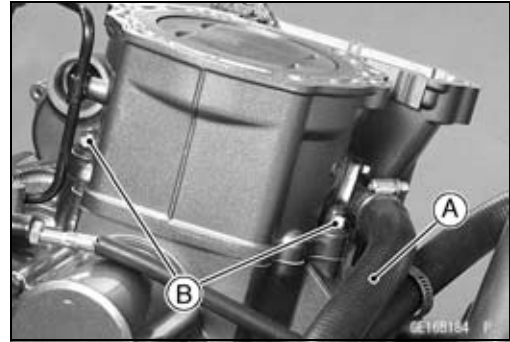


## 5-38 ENGINE TOP END

### Cylinder and Piston

#### Cylinder Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Front Camshaft Chain Guide
- Remove:
  - Radiator Hose [A]
  - Cylinder Nuts [B]
- Remove:
  - Cylinder Bolt [A]
- Tap lightly up with a plastic mallet to separate the cylinder from the crankcase.
- Remove the cylinder base gasket.

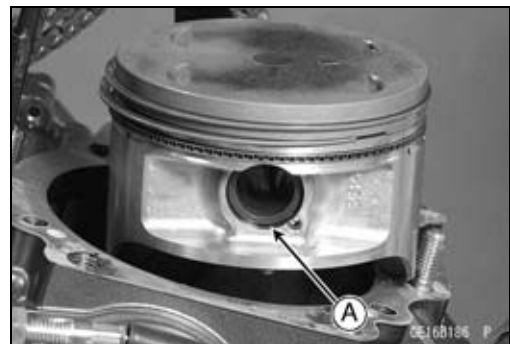


#### Piston Removal

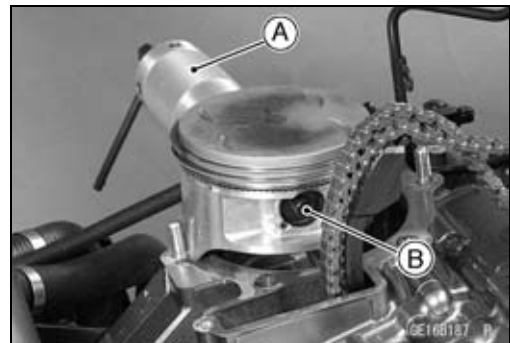
- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the piston and remove the piston snap ring [A] from one end of the piston pin.

#### NOTICE

**Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.**

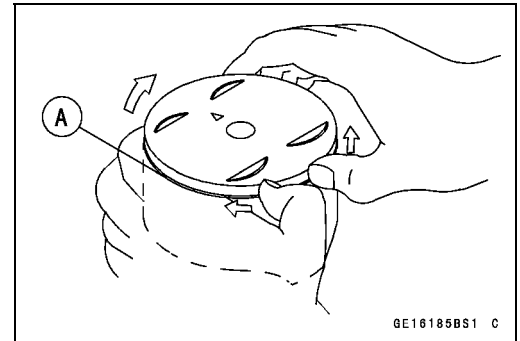


- Remove the piston pin, using a piston pin puller.
  - **Special Tools - Piston Pin Puller Assembly: 57001-910 [A]**
  - **Piston Pin Puller Adapter,  $\phi 14$ : 57001-1211 [B]**
- Remove the piston.



## Cylinder and Piston

- 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 oil ring in the same procedure.

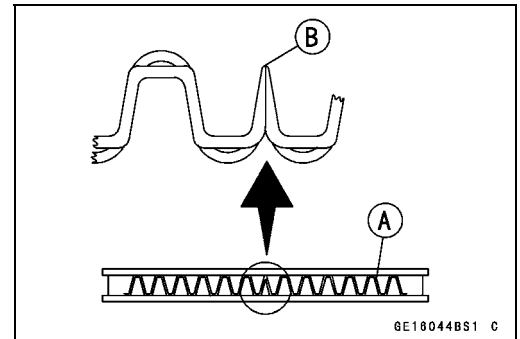


## Cylinder and Piston Installation

### NOTE

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

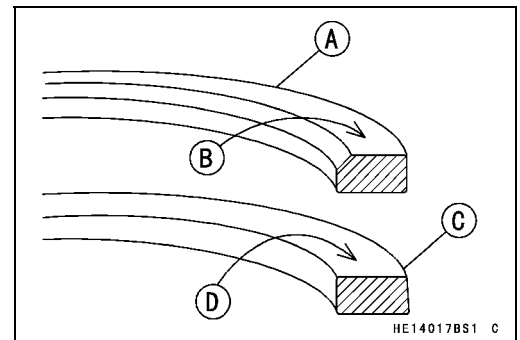
- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston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



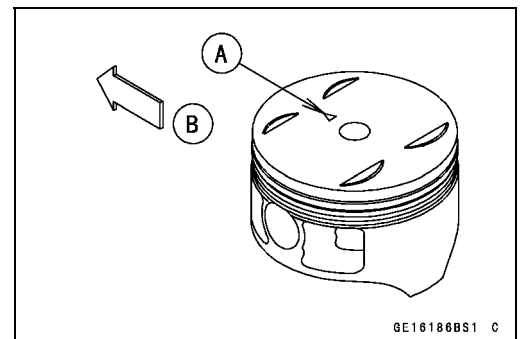
- Do not mix up the top ring and second ring.
- Install the top ring [A] so that the "R" mark [B] faces up.
- Install the second ring [C] so that the "R" mark [D] faces up.

### NOTE

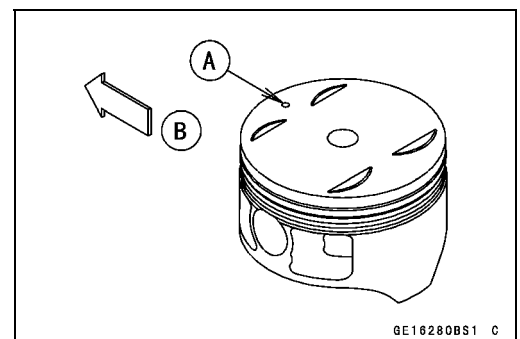
○ If a new piston or cylinder is used, check piston to cylinder clearance (see Piston/Cylinder Clearance), and use new piston rings.



- Apply engine oil to the inside wall of the small end of the connecting rod.
- For KL650E8 ~ KL650EB models, face the triangle mark [A] on the top of the piston must point toward the front [B] of the engine.



- For KL650EC model, face the marking dent [A] on the top of the piston must point toward the front [B] of the engine.



## 5-40 ENGINE TOP END

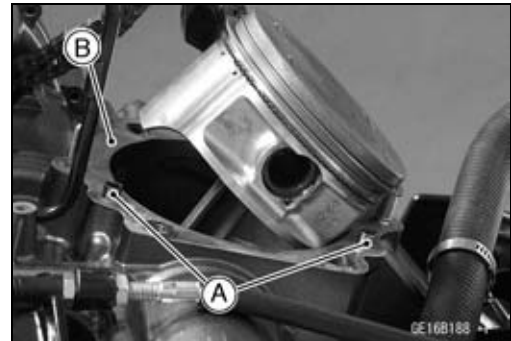
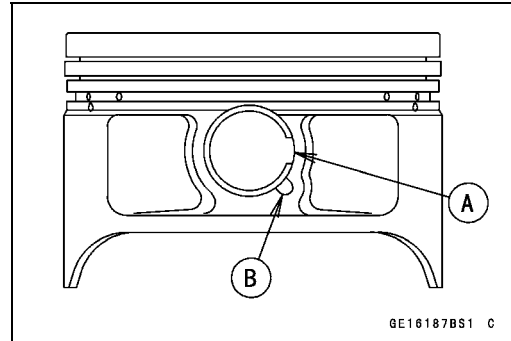
### Cylinder and Piston

- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- When installing the piston pin snap ring, compress it only enough to install it and no more.

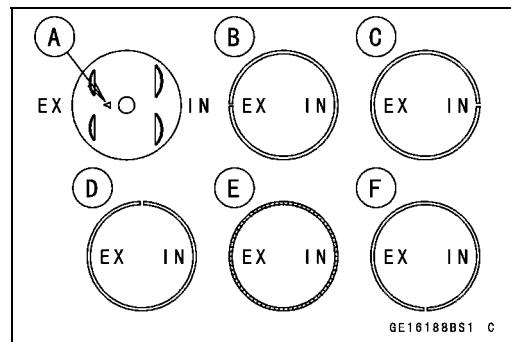
#### NOTICE

**Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.**

- Install:
  - Dowel Pins [A]
  - New Cylinder Base Gasket [B]



- The piston ring openings must be positioned as shown.
- Direction of the oil ring expander opening faces backward.
  - Triangle Mark [A]
  - Top Ring [B]
  - Second Ring [C]
  - Upper Oil Ring Steel Rails [D]
  - Oil Ring Expander [E]
  - Lower Oil Ring Steel Rail [F]



- Apply molybdenum disulfide oil to the cylinder bore.
- Determine the position of the piston ring ends.
- Install the cylinder while compressing the piston rings with your fingers or the special tools.

**Special Tools - Piston Ring Compressor Grip: 57001-1095**  
**Piston Ring Compressor Belt,  $\phi 95 \sim \phi 108$ : 57001-1358**

- Drive the front camshaft chain guide.
- Install the removed parts.

## Cylinder and Piston

### Cylinder Wear Inspection

- 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 three locations (total of six measurements) shown in the figure.

10 mm (0.39 in.) [A]

55 mm (2.2 in.) [B]

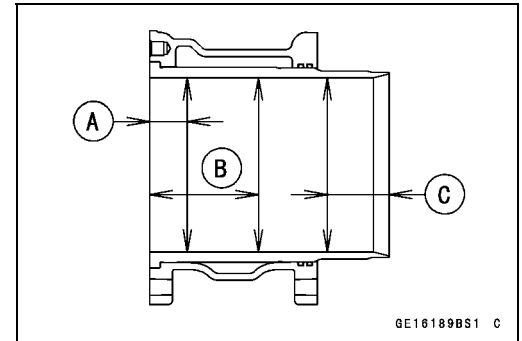
20 mm (0.79 in.) [C]

- ★ If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.

#### Cylinder Inside Diameter

**Standard:** 100.000 ~ 100.012 mm (3.9370 ~ 3.9375 in.) (less than 0.01 mm (0.0004 in.) difference between any two measurements)

**Service Limit:** 100.10 mm (3.9409 in.) (less than 0.05 mm (0.0020 in.) difference between any two measurements)



### Piston Wear Inspection

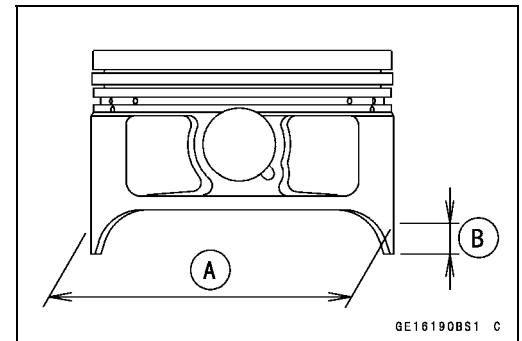
- Using a micrometer, measure the outside diameter [A] of each piston 10 mm (0.39 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

- ★ If the pistons outside diameter is smaller than the service limit, replace the piston.

#### Piston Diameter

**Standard:** 99.942 ~ 99.957 mm (3.9347 ~ 3.9353 in.)

**Service Limit:** 99.79 mm (3.929 in.)



### Piston/Cylinder Clearance Inspection

- Subtract the piston diameter from the cylinder inside diameter to get the piston/cylinder clearance.

#### Piston/Cylinder Clearance

**Standard:** 0.043 ~ 0.070 mm (0.0017 ~ 0.0028 in.)

- ★ If the piston/cylinder clearance is less than the specified range, use a smaller piston or increase the cylinder inside diameter by honing.
- ★ If the piston/cylinder clearance is greater than specified range, use a larger piston.
- ★ If only a piston is replaced, the clearance may exceed the standard slightly. But it must not be less than the minimum limit in order to prevent piston seizure.

## 5-42 ENGINE TOP END

### Cylinder and Piston

#### Cylinder Boring and Honing

○ There is an oversize piston available. The oversize piston requires oversize rings.

##### Oversize Piston and Rings

**0.5 mm Oversize**

**1.0 mm Oversize**

- Before boring a cylinder [A], first measure the exact diameter of the oversize piston, and then, according to the standard clearance in the Specifications, determine the rebore diameter. However, if the amount of boring necessary would make the inside diameter greater than **1.0 mm**, the cylinder block must be replaced.

○ Cylinder inside diameter must not vary more than **0.01 mm** at any point.

○ Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

○ In the case of rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus **0.1 mm** and the service limit for the piston is the oversize piston original diameter minus **0.15 mm**. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

#### Piston Ring/Ring Groove Clearance Inspection

- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

##### Piston Ring/Ring Groove Clearance

###### Standard:

**Top**            **0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)**

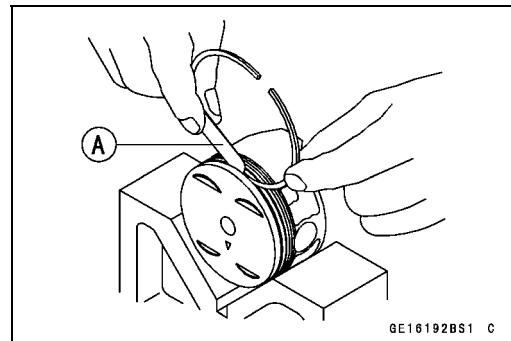
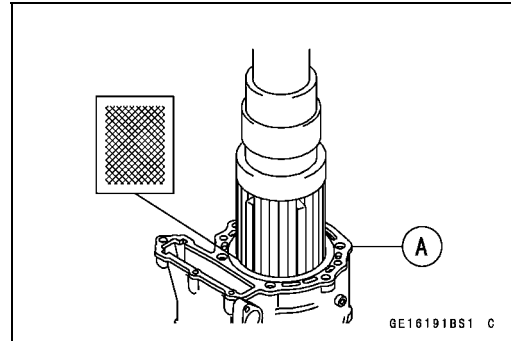
**Second**       **0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)**

###### Service Limit:

**Top**            **0.17 mm (0.0067 in.)**

**Second**       **0.16 mm (0.0063 in.)**

- ★ If the piston ring groove clearance is greater than the service limit, measure the ring thickness and groove width as follows to decide whether to replace the rings, the piston or both.



## Cylinder and Piston

### ***Piston Ring Groove Width Inspection***

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

#### **Piston Ring Groove Width**

##### **Standard:**

**Top**            **1.22 ~ 1.24 mm (0.0480 ~ 0.0488 in.)**

**Second**       **1.21 ~ 1.23 mm (0.0476 ~ 0.0484 in.)**

##### **Service Limit:**

**Top**            **1.32 mm (0.0520 in.)**

**Second**       **1.31 mm (0.0516 in.)**

- ★ If any of the groove widths exceeds the service limit, replace the piston.

### ***Piston Ring Thickness Inspection***

- Measure the thickness at several points around ring with a micrometer.

#### **Piston Ring Thickness (Top, Second)**

**Standard:**     **1.17 ~ 1.19 mm (0.0461 ~ 0.0469 in.)**

**Service Limit:** **1.10 mm (0.0433 in.)**

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

### **NOTE**

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

### ***Piston Ring End Gap Measurement***

- Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Place the piston ring close to the bottom of the cylinder, where cylinder wear is minimal
- Measure the gap [B] between the ends of the ring using a thickness gauge.
- ★ If the ring end gap exceeds the service limit, replace the ring.

#### **Piston Ring End Gap**

##### **Standard:**

**Top**            **0.20 ~ 0.35 mm (0.0079 ~ 0.0138 in.)**

**Second**       **0.40 ~ 0.55 mm (0.016 ~ 0.022 in.)**

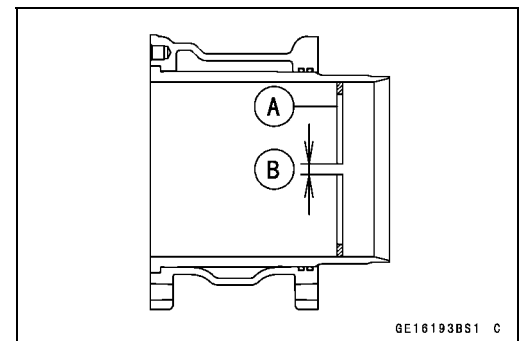
**Oil**            **0.20 ~ 0.70 mm (0.0079 ~ 0.028 in.)**

##### **Service Limit:**

**Top**            **0.7 mm (0.03 in.)**

**Second**       **0.9 mm (0.04 in.)**

**Oil**            **1.0 mm (0.039 in.)**

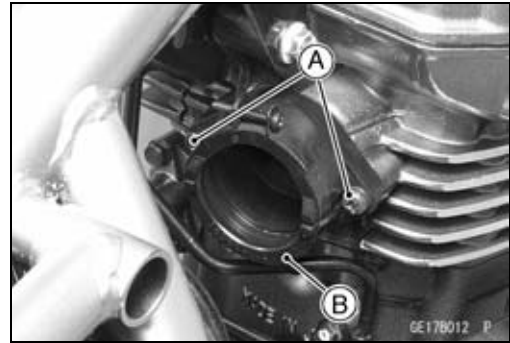


## 5-44 ENGINE TOP END

### Carburetor Holder

#### **Carburetor Holder Removal**

- Remove:
  - Carburetor (see Carburetor Removal in the Fuel System chapter)
  - Carburetor Holder Screws [A]
  - Carburetor Holder [B]



#### **Carburetor Holder Installation**

- Install the O-ring [A] to the carburetor holder [B].
- Tighten:
  - Torque - Carburetor Holder Screw: 4.4 N·m (0.45 kgf·m, 39 in·lb)





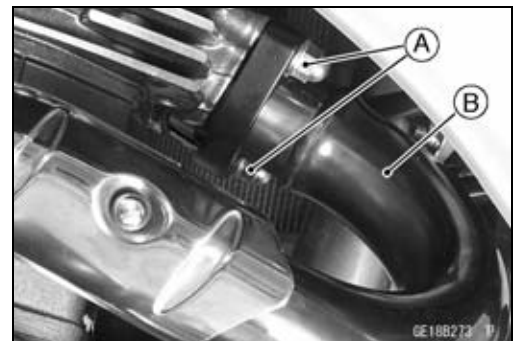
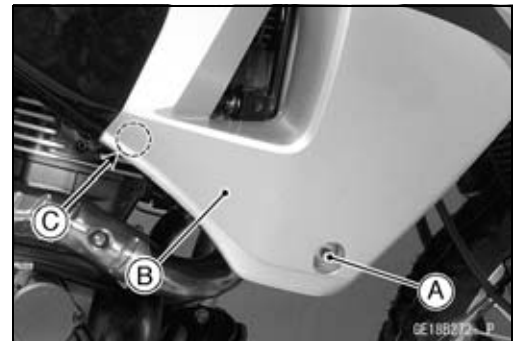
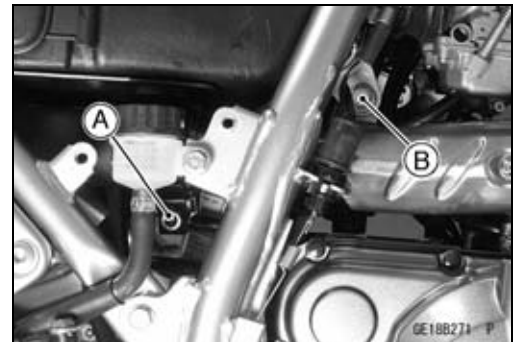
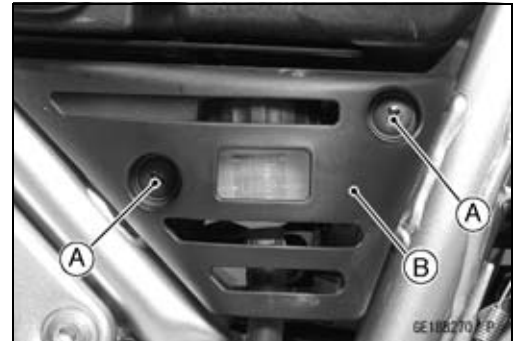
## Muffler

### **⚠ WARNING**

The exhaust pipe or muffler body can become extremely hot during normal operation and cause severe burns. Do not remove the exhaust pipe or muffler body while it is hot.

### **Exhaust Pipe Removal**

- Remove:
  - Screws [A]
  - Cover [B] and Bracket
  
- Loosen the muffler joint clamp bolt [A].
- Remove the exhaust pipe holder clamp bolt [B].
  
- Remove the lower firing mounting bolt [A], and pull the lower fairing [B] a little outward to clear the stopper [C].
  
- Remove the exhaust pipe holder nuts [A].
- Pull the exhaust pipe [B] forward and then remove it from the right side of the motorcycle.

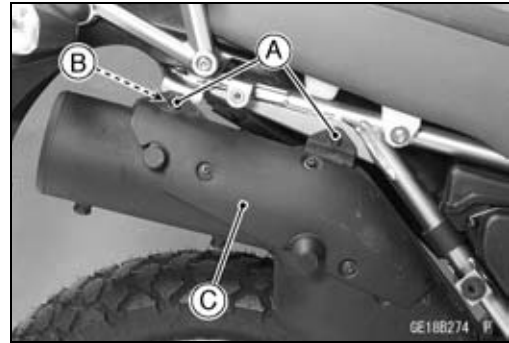


## 5-46 ENGINE TOP END

### Muffler

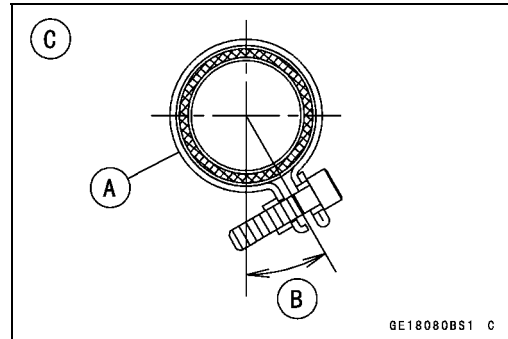
#### **Muffler Body Removal**

- Loosen the muffler joint clamp bolt (see Exhaust Pipe Removal).
- Remove:
  - Right Side Cover (see Side Cover Removal in the Frame chapter)
  - Muffler Body Mounting Bolts [A] and Nut [B]
- Remove the muffler body [C] to backward.

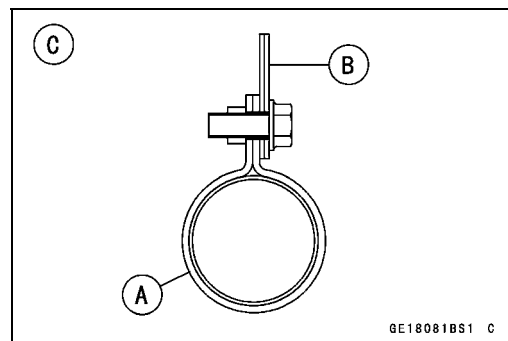


#### **Exhaust Pipe, Muffler Body Installation**

- Replace the muffler body gasket and exhaust pipe gasket with new ones.
- Apply thin coat of grease to the exhaust pipe gasket.
- Install the muffler joint clamp [A] direction as shown.
  - About 30° [B]
  - Rear View [C]



- Install the exhaust pipe holder [A] as shown.
  - Frame [B]
  - Rear View [C]



- Replace the muffler body mounting nut with a new one.
- Tighten:
  - Torque - Exhaust Pipe Holder Nuts: 21 N·m (2.1 kgf·m, 15 ft·lb)**
  - Exhaust Pipe Holder Clamp Bolt: 21 N·m (2.1 kgf·m, 15 ft·lb)**
  - Muffler Joint Clamp Bolts: 21 N·m (2.1 kgf·m, 15 ft·lb)**
  - Muffler Body Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

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

#### **Spark Arrester Cleaning (US and CA Models)**

- Refer to Spark Arrester Cleaning (US and CA Models) in the Periodic Maintenance chapter.

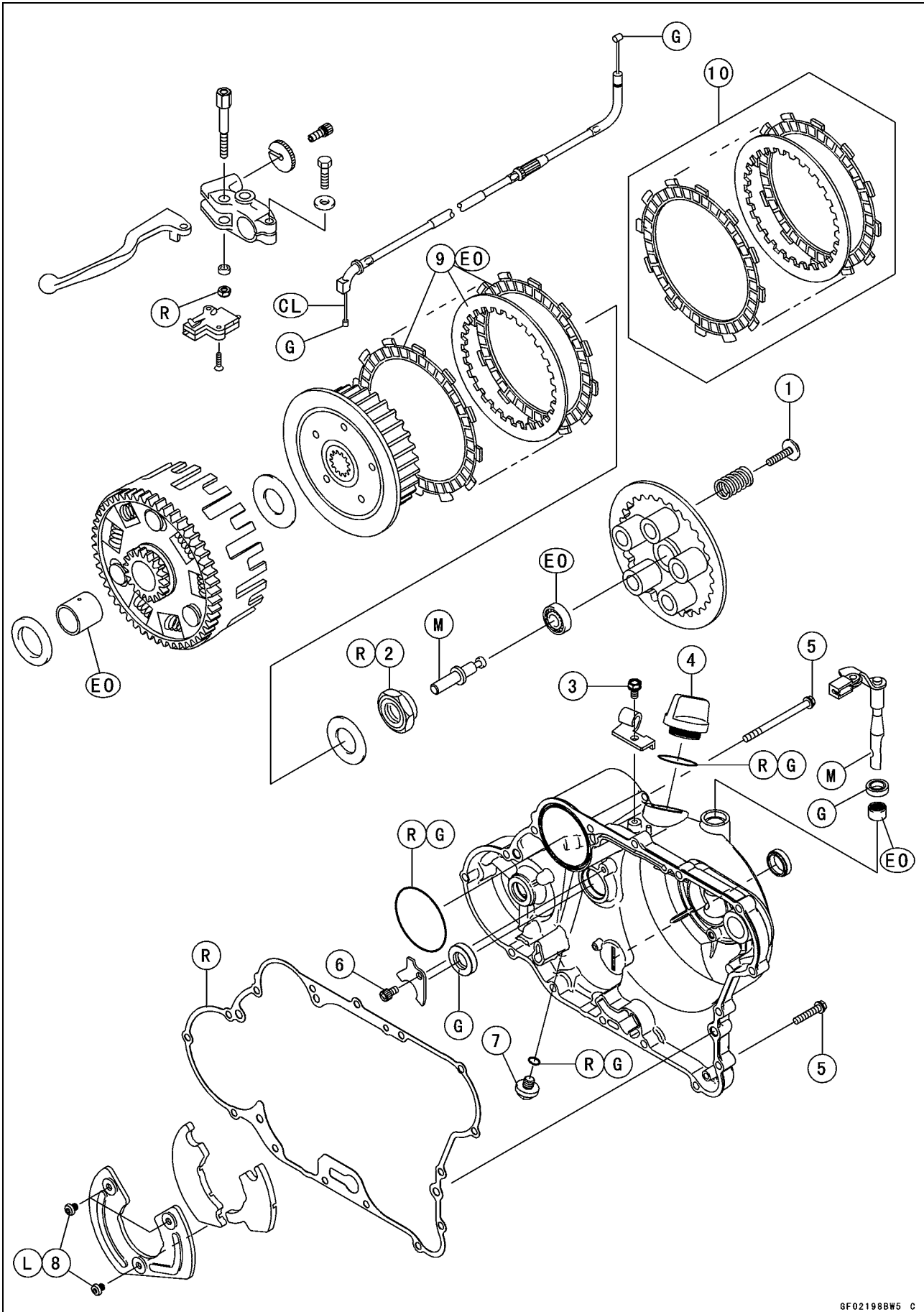
# Clutch

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# 6-2 CLUTCH

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Spring Bolts (KL650E8 ~ EA)	9.8	1.0	87 in·lb	
	Clutch Spring Bolts (KL650EB ~ EC)	9.1	0.93	81 in·lb	
2	Clutch Hub Nut	135	14	100	R
3	Clutch Cable Holder Bolt	8.8	0.90	78 in·lb	
4	Oil Filler Cap	–	–	–	Hand-tighten
5	Clutch Cover Bolts	8.8	0.90	78 in·lb	
6	Crankshaft Oil Seal Holder Plate Bolts	12.5	1.3	111 in·lb	
7	Oil Passage Plug	25	2.5	18	
8	Clutch Cover Damper Plate Bolts	8.8	0.90	78 in·lb	L

9. Engine No. ~ KL650AEA72319

10. Engine No. KL650AEA72320 ~

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

## 6-4 CLUTCH

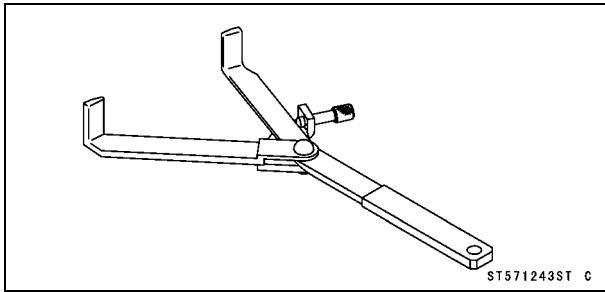
### Specifications

Item	Standard	Service Limit
<b>Clutch Lever Free Play</b>	2 ~ 3 mm (0.08 ~ 0.12 in.)	- - -
<b>Clutch</b>		
Friction Plate Thickness	2.90 ~ 3.10 mm (0.114 ~ 0.122 in.)	2.7 mm (0.106 in.)
Friction Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.012 in.)
Steel Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.012 in.)
Clutch Spring Free Length	38.7 mm (1.52 in.)	37.2 mm (1.46 in.)

**Special Tool**

---

**Clutch Holder:  
57001-1243**



## 6-6 CLUTCH

### Clutch Lever and Cable

#### **Clutch Lever Free Play Inspection**

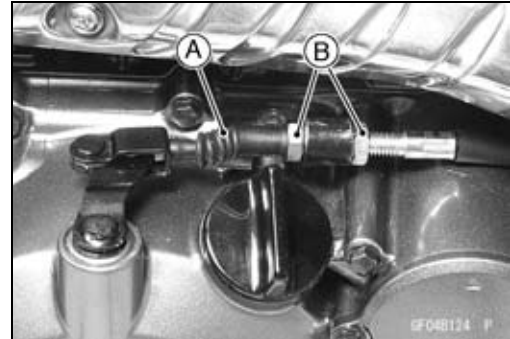
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

#### **Clutch Lever Free Play Adjustment**

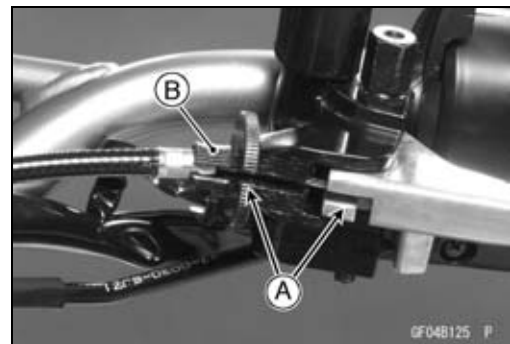
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

#### **Clutch Cable Removal**

- Remove the left handle cover (see Handle Cover Removal in the Frame chapter).
- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen the nuts [B], and slide the lower end of the clutch cable to give the cable plenty of play.



- Screw in the adjuster.
- Line up the slots [A] in the clutch lever and adjuster [B], and then free the cable from the lever.
- Free the clutch inner cable tip from the clutch release lever.
- Push the release lever toward the front of the motorcycle and tape the release lever to the clutch cover to prevent the release shaft from falling out.
- Pull the clutch cable out of the frame.



#### **Clutch Cable Installation**

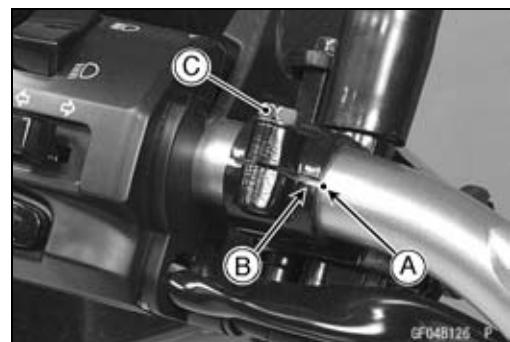
- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).

#### **Clutch Cable Lubrication**

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

#### **Clutch Lever Installation**

- Install the clutch lever so that the slit [B] of the clutch lever clamp is aligned with the punch mark [A].
- Tighten the clutch lever clamp bolt [C] securely.

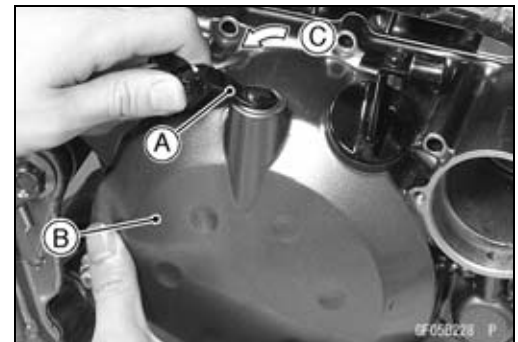
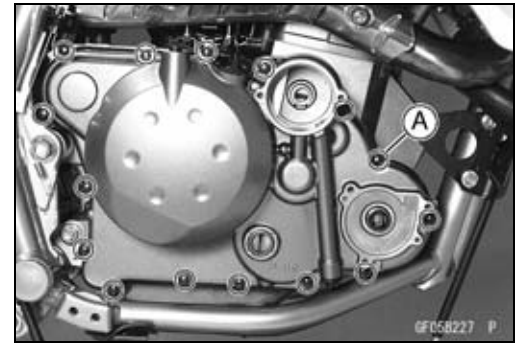




## Clutch Cover

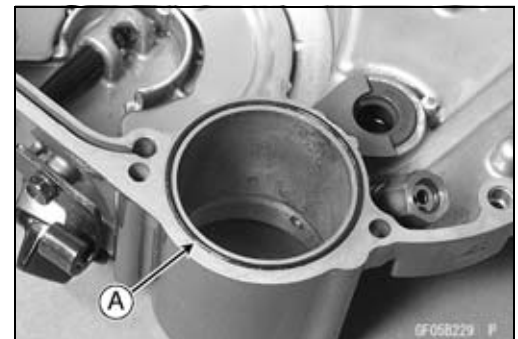
### Clutch Cover Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  - Water Pump Impeller (see Water Pump Removal in the Cooling System chapter)
  - Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)
  - Brake Pedal (see Brake Pedal Removal in the Brakes chapter)
  - Clutch Cable Lower End (see Clutch Cable Removal)
  - Right Front Footpeg
  - Clutch Cover Bolts [A]
- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B].  
About 90° [C]



### Clutch Cover Installation

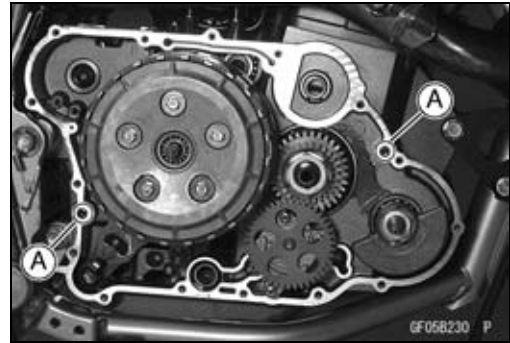
- Replace the O-ring [A] with a new one.
  - Apply grease to the new O-ring.
- 
- Apply grease to the lips of the water pump oil seal [A].



## 6-8 CLUTCH

### Clutch Cover

- Be sure that the dowel pins [A] are in position.
- Replace the clutch cover gasket with a new one.
- Tighten:  
Torque - Clutch Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

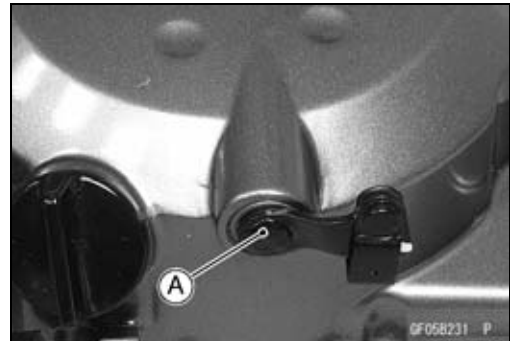


#### Release Shaft Removal

##### NOTICE

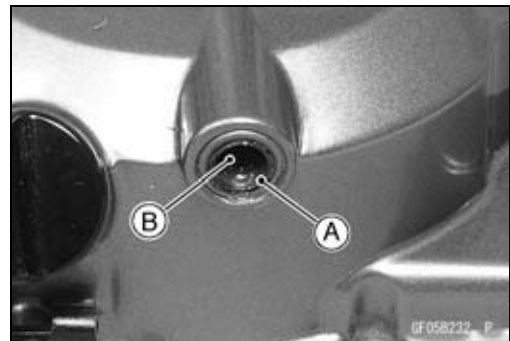
**Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.**

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



#### Release Shaft Installation

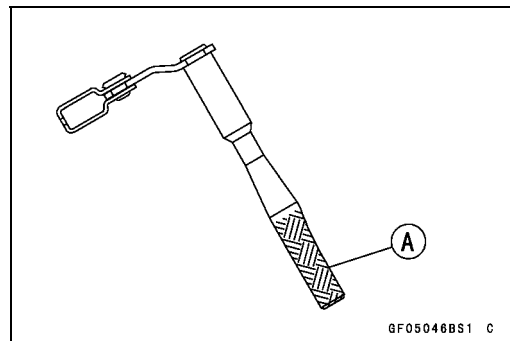
- Apply high-temperature grease to the oil seal lips [A] on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearing [B] in the hole of the clutch cover.



- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Insert the release shaft straight into the upper hole of the clutch cover.

##### NOTICE

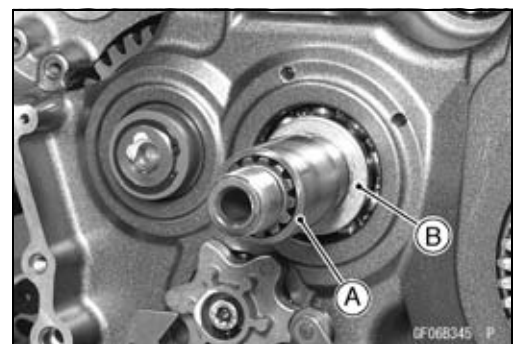
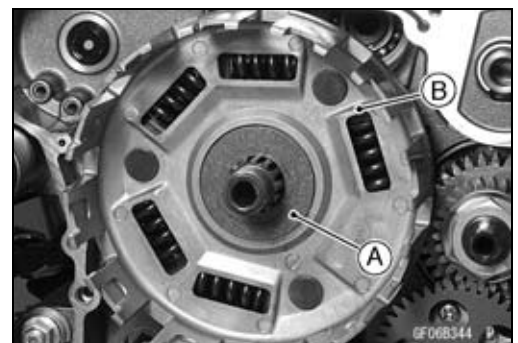
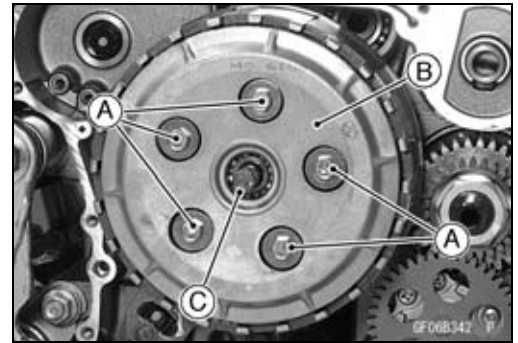
**When inserting the release shaft, be careful not to remove the spring of the oil seal.**



## Clutch

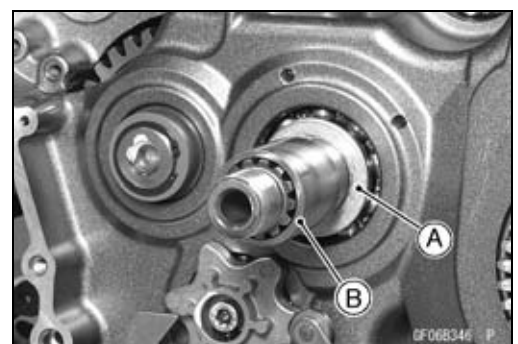
### Clutch Removal

- Remove:
  - Clutch Cover (see Clutch Cover Removal)
  - Clutch Spring Bolts [A]
  - Clutch Springs
  - Clutch Spring Plate [B] (with bearing)
  - Pusher [C]
  
- Remove:
  - Friction Plates
  - Steel Plates
- Hold the clutch hub [A] steady with the clutch holder [B], and remove the clutch hub nut [C].
  - Special Tool - Clutch Holder: 57001-1243**
- Remove:
  - Washer [D]
  - Clutch Hub
  
- Remove:
  - Spacer [A]
  - Clutch Housing [B]
  
- Remove:
  - Sleeve [A]
  - Spacer [B]



### Clutch Installation

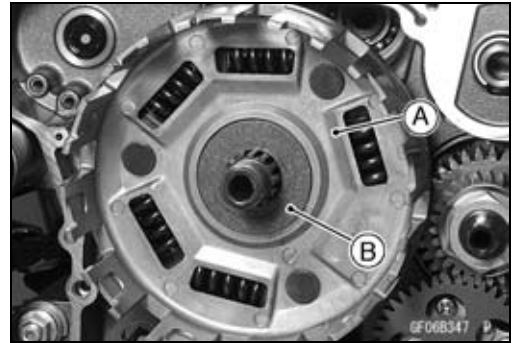
- Install the following on the drive shaft.
  - Spacer [A]
  - Sleeve [B]
- Apply engine oil to the sleeve.



## 6-10 CLUTCH

### Clutch

- Install:
  - Clutch Housing [A]
  - Spacer [B]
- Engage the clutch housing gear with primary gear on the balancer shaft.



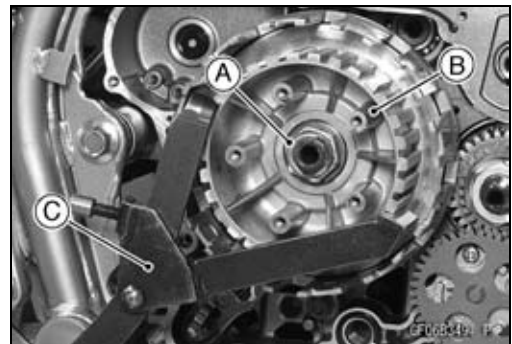
- Install the clutch hub.
- Install the washer so that the OUT SIDE mark [A] faces outward.



- Replace the clutch hub nut [A] with a new one.
- Hold the clutch hub [B] steady with the clutch holder [C], and tighten the clutch hub nut.

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

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



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

#### **NOTICE**

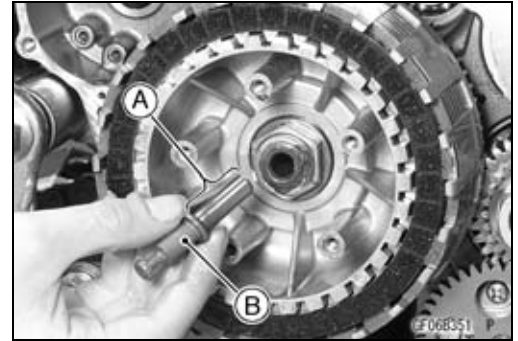
**If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

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



## Clutch

- Apply molybdenum disulfide grease to the pusher end [A].
- Install the pusher [B] to the drive shaft direction as shown.



- Apply engine oil to the sliding surfaces of the bearing [A].
- Install the bearing on the spring plate [B].
- Install the spring plate on the clutch hub [C].
- Install the clutch springs, and tighten the clutch spring bolts.

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

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



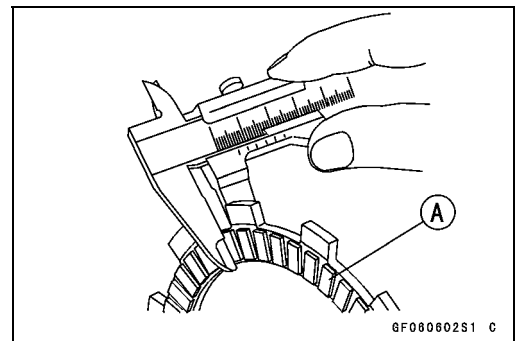
### Clutch Plate, Wear, Damage Inspection

- 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: 2.90 ~ 3.10 mm (0.114 ~ 0.122 in.)**

**Service Limit: 2.7 mm (0.106 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 Plate Warp

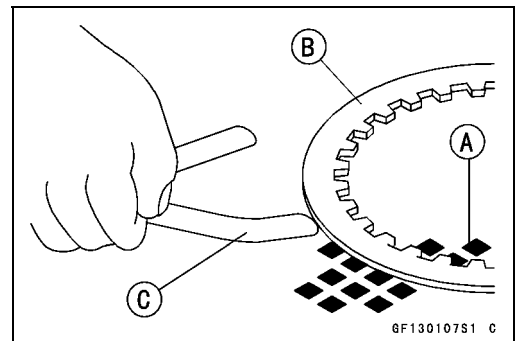
**Standard: 0.2 mm (0.008 in.) or less**

**Service Limit: 0.3 mm (0.012 in.)**

#### Steel Plate Warp

**Standard: 0.2 mm (0.008 in.) or less**

**Service Limit: 0.3 mm (0.012 in.)**



## 6-12 CLUTCH

### Clutch

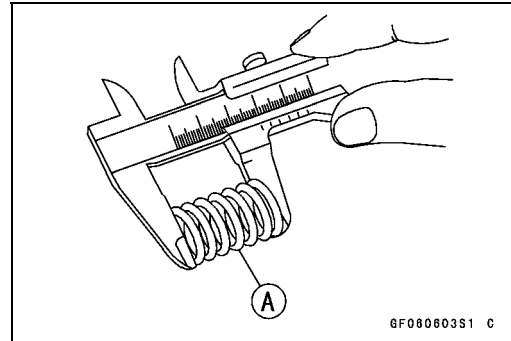
#### **Clutch Spring Free Length Measurement**

- Measure the free length of the clutch springs [A].
- ★ If any spring is shorter than the service limit, it must be replaced.

#### **Clutch Spring Free Length**

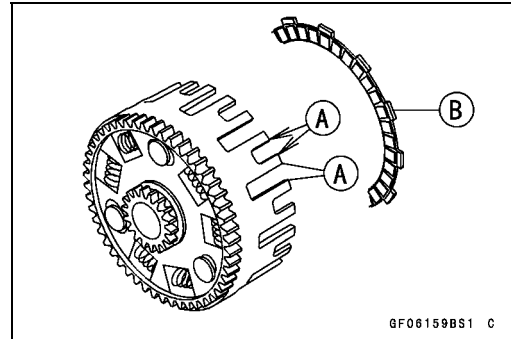
Standard: 38.7 mm (1.52 in.)

Service Limit: 37.2 mm (1.46 in.)



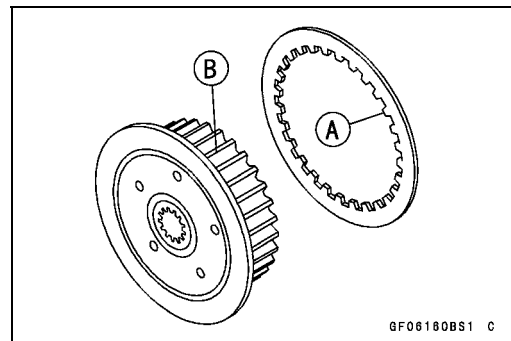
#### **Clutch Housing Finger Inspection**

- Visually inspect the clutch housing fingers [A] where the friction plate tangs [B] hit them.
- ★ If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.



#### **Clutch Housing Spline Inspection**

- Visually inspect where the teeth [A] on the steel plates wear against the clutch hub splines [B].
- ★ If there are notches worn into the splines, replace the clutch hub. Also, replace the steel plates if their teeth are damaged.



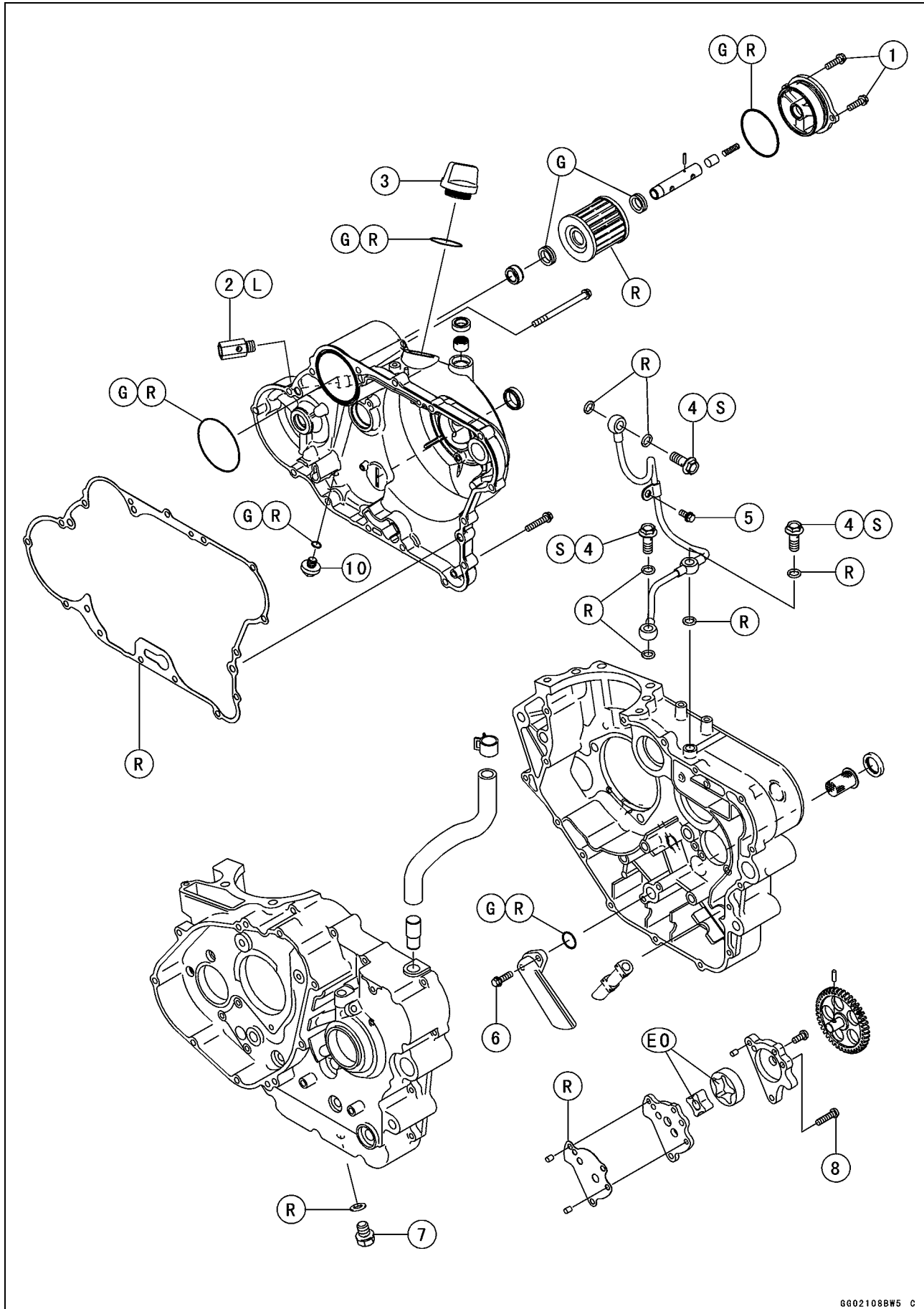
# Engine Lubrication System

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# 7-2 ENGINE LUBRICATION SYSTEM

## Exploded View





## ENGINE LUBRICATION SYSTEM 7-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Filter Cap Bolts	6.9	0.70	61 in·lb	
2	Oil Pressure Relief Valve	15	1.5	11	L
3	Oil Filler Cap	–	–	–	Hand-tighten
4	Oil Pipe Banjo Bolts	20	2.0	15	
5	Oil Pipe Bolt	8.8	0.90	78 in·lb	S
6	Engine Oil Feed Fitting Bolts	8.8	0.90	78 in·lb	
7	Engine Oil Drain Bolt	29	3.0	21	
8	Oil Pump Mounting Screws	4.4	0.45	39 in·lb	
9	Oil Pump Cover Screw	4.2	0.43	37 in·lb	L
10	Oil Passage Plug	25	2.5	18	

EO: Apply engine oil.

G: Apply grease.

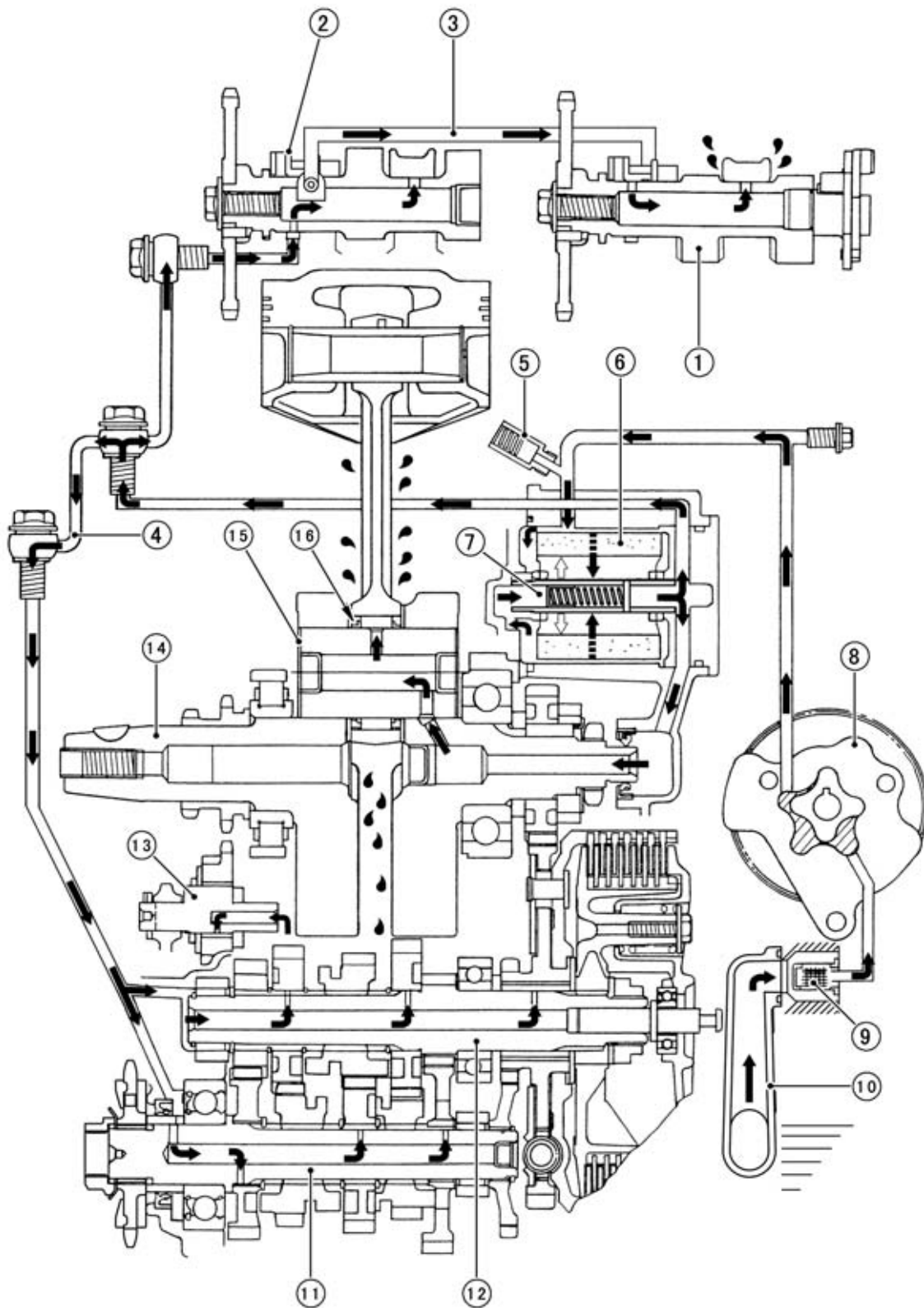
L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

# 7-4 ENGINE LUBRICATION SYSTEM

## Engine Oil Flow Chart



### Engine Oil Flow Chart

---

1. Exhaust Camshaft
2. Inlet Camshaft
3. Oil Pipe (Cylinder Head)
4. Oil Pipe (Main)
5. Oil Pressure Relief Valve
6. Oil Filter
7. Bypass Valve
8. Oil Pump
9. Oil Screen
10. Engine Oil Feed Fitting
11. Output Shaft
12. Drive Shaft
13. Idle Shaft
14. Crankshaft
15. Crankpin
16. Needle Bearing

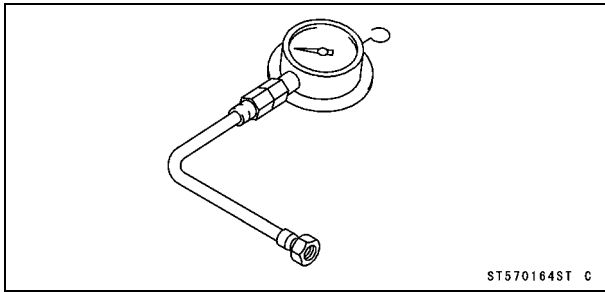
## 7-6 ENGINE LUBRICATION SYSTEM

### Specifications

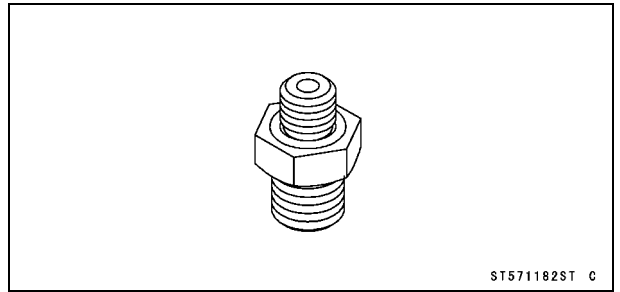
Item	Standard
<b>Engine Oil</b> Grade Viscosity Capacity  Level	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2 SAE 10W-40 1.9 L (2.0 US qt.) (when filter is not removed) 2.0 L (2.1 US qt.) (when filter is removed) 2.1 L (2.2 US qt.) (when engine is completely dry) Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)
<b>Oil Pressure Measurement</b> Oil pressure	78 ~ 147 kPa (0.8 ~ 1.5 kgf/cm <sup>2</sup> , 11 ~ 21 psi) at 4 000 r/min (rpm), oil temperature 90°C (194°F)

## Special Tools

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



Oil Pressure Gauge Adapter, M10 × 1.25:  
57001-1182



## 7-8 ENGINE LUBRICATION SYSTEM

### Engine Oil and Oil Filter

#### **⚠ WARNING**

Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine seizure, accident, and injury. Check the oil level before each use and change the oil and filter according to the periodic maintenance chart.

#### **Oil Level Inspection**

- Check that the engine oil level is between the upper [A] and lower [B] levels in the 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.

#### **NOTICE**

Racing the engine before the oil reaches every part can cause engine seizure.

- ★ If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- ★ If the oil level is too low, add the correct amount of oil through the oil filter opening. Use the same type and make of oil that is already in the engine.

#### **NOTE**

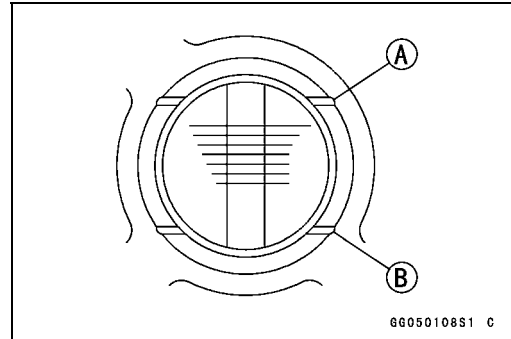
- If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

#### **Engine Oil Change**

- Refer to the Engine Oil Change in the Periodic Maintenance chapter.

#### **Oil Filter Replacement**

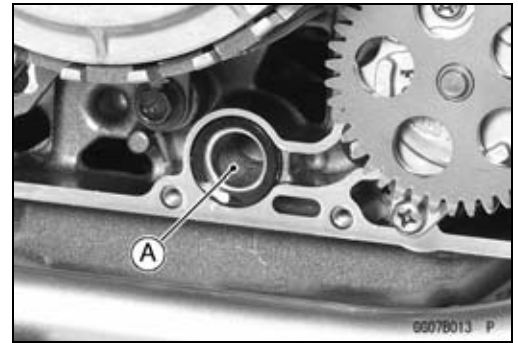
- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.



## Oil Screen

### Oil Screen Removal

- Remove:
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Oil Screen [A]



### Oil Screen Installation

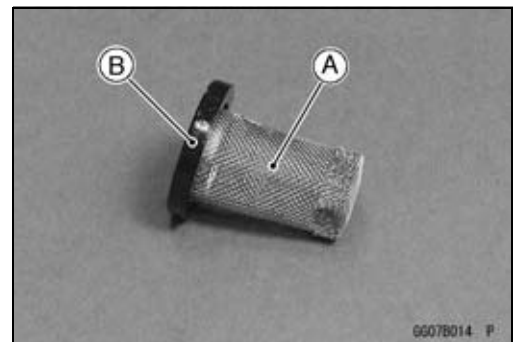
#### NOTE

- Clean the oil screen thoroughly whenever it is removed for any reason.
- While cleaning the screens, check for any metal particles that might indicate internal engine damage.
- Clean the oil screen with a high-flash point solvent and remove any particles stuck to them.

#### **⚠ WARNING**

**Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the screen in a well ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash point solvent to clean the screen.**

- Check the screen [A] carefully for any damage, holes, broken wires, gasket pulling off.
- ★ If the screen is damaged, replace it.
- Install the oil screen so that grommet side [B] faces outward.

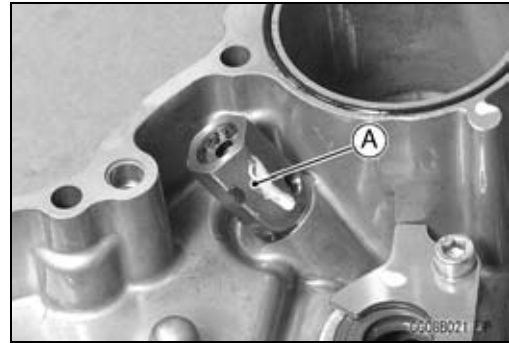


## 7-10 ENGINE LUBRICATION SYSTEM

### Oil Pressure Relief Valve

#### Oil Pressure Relief Valve Removal

- Remove:
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Oil Pressure Relief Valve [A]



#### Oil Pressure Relief Valve Installation

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

#### NOTICE

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)

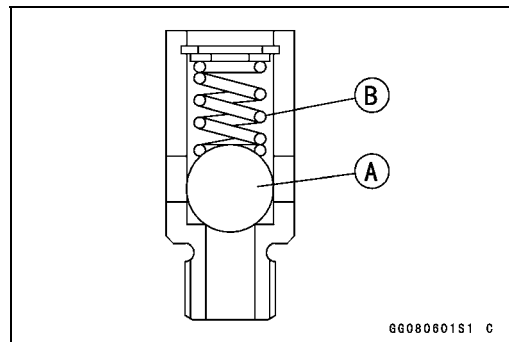
#### Oil Pressure Relief Valve Inspection

- Remove the oil pressure relief valve (see Oil Pressure Relief Valve Removal).
- Check to see if the steel ball inside 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 valve spring [B] pressure.

#### NOTE

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

- ★ If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.



#### ⚠ WARNING

Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the oil pressure relief valve in a well ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low-flash point solvent to clean the oil pressure relief valve.

- ★ If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.



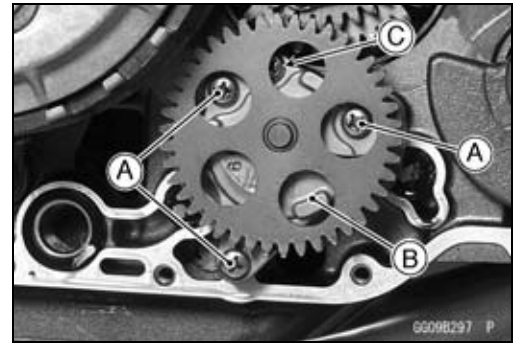
## Oil Pump

### Oil Pump Removal

- Remove:
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Oil Pump Mounting Screws [A]
  - Oil Pump [B]

#### NOTE

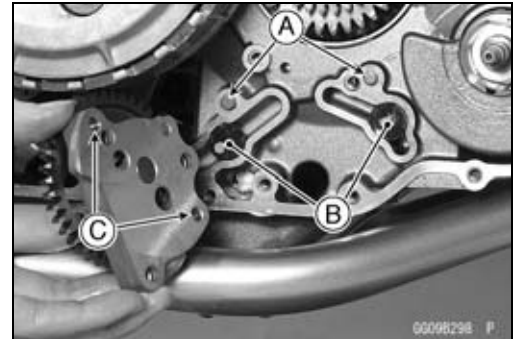
○ Do not remove the oil pump cover screw [C].



### Oil Pump Installation

- Replace the oil pump gasket with a new one.
- Be sure install the dowel pins [A] and dampers [B] in position.
- Fit the holes [C] of the oil pump onto the dowel pins, and tighten the mounting screws.

**Torque - Oil Pump Mounting Screws: 4.4 N·m (0.45 kgf·m, 39 in·lb)**

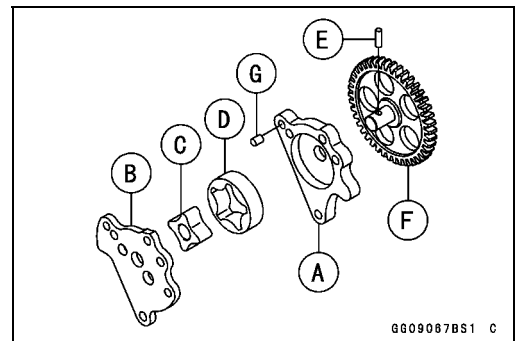


### Oil Pump Disassembly

- Remove:
  - Oil Pump (see Oil Pump Removal)
  - Oil Pump Cover Screw [A]

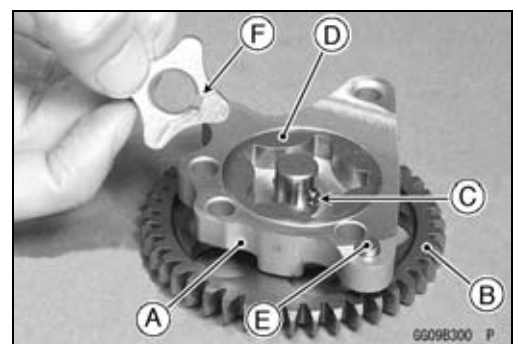


- Remove the following parts from the oil pump body [A].
  - Oil Pump Cover [B]
  - Inner Rotor [C]
  - Outer Rotor [D]
  - Pin [E]
  - Oil Pump Gear [F]
  - Dowel Pin [G]



### Oil Pump Assembly

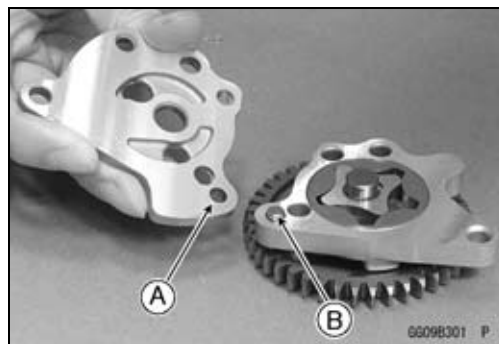
- Apply engine oil to the inner and outer rotors.
- Install the following parts to the oil pump body [A].
  - Oil Pump Gear [B]
  - Pin [C]
  - Outer Rotor [D]
  - Dowel Pin [E]
- Fit the slot [F] of the inner rotor on the pin.



## 7-12 ENGINE LUBRICATION SYSTEM

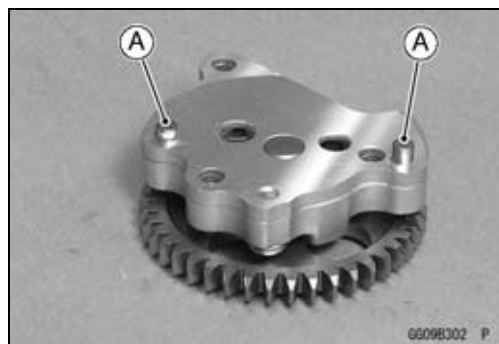
### Oil Pump

- Fit the hole [A] of the oil pump cover on the dowel pin [B].



- Install the dowel pins [A] onto the oil pump cover temporary.
- Apply a non-permanent locking agent to the threads of the oil pump cover screw, and tighten it.

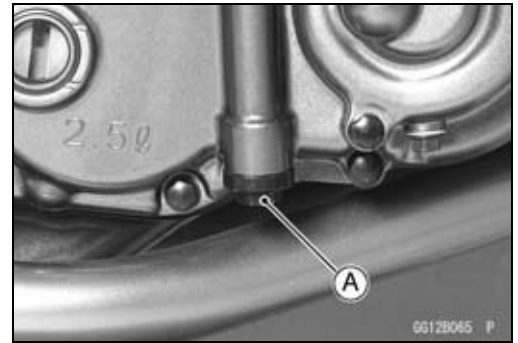
**Torque - Oil Pump Cover Screw: 4.2 N·m (0.43 kgf·m, 37 in·lb)**



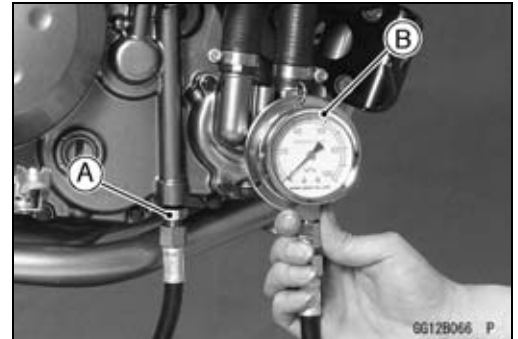
## Oil Pressure Measurement

### Oil Pressure Measurement

- Remove:
  - Engine Guard (see Engine Guard Removal in the Frame chapter)
  - Oil Passage Plug [A]



- Attach the adapter [A] and gauge [B] to the plug hole.
  - Special Tools - Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>: 57001-164**
  - Oil Pressure Gauge Adapter, M10 × 1.25: 57001-1182**



- 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 and relief valve.
- ★ If the reading is much higher than the standard, check the oil screen and oil filter first, then oil passages for clogging.

#### Oil Pressure

**Standard:** 78 ~ 147 kPa (0.8 ~ 1.5 kgf/cm<sup>2</sup>, 11 ~ 21 psi)  
at 4 000 r/min (rpm), oil temperature 90°C (194°F)

- Stop the engine.
- Remove the oil pressure gauge and adapter.

### **⚠ WARNING**

**Hot oil can cause severe burns. Beware of hot engine oil that will drain through the oil passage when the gauge adapter is removed.**

- Replace the O-ring of the oil passage plug.
- Apply grease to the new O-ring, and install the oil passage plug.

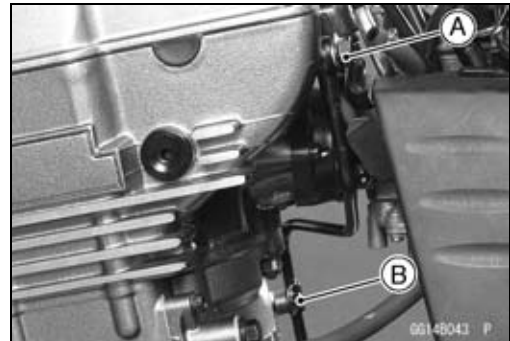
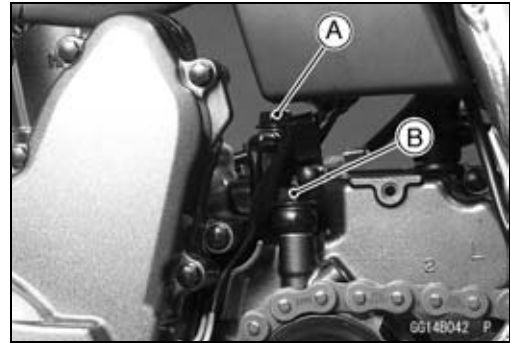
**Torque - Oil Passage Plug: 25 N·m (2.5 kgf·m, 18 ft·lb)**

## 7-14 ENGINE LUBRICATION SYSTEM

### Oil Pipe

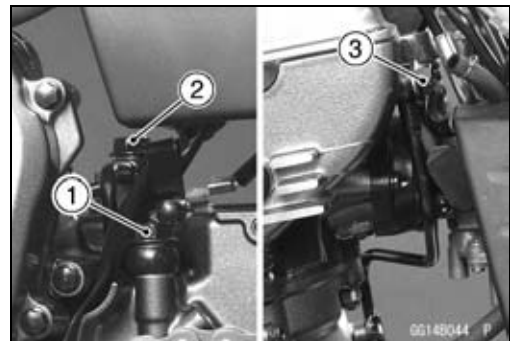
#### Oil Pipe Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  - Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  - Oil Pipe Banjo Bolt [A] (Right Crankcase Side)
  - Oil Pipe Banjo Bolt [B] (Left Crankcase Side)
- Remove:
  - Oil Pipe Banjo Bolt [A] (Cylinder Head Side)
  - Oil Pipe Bolt [B]
- Remove the oil pipe from the left side of the motorcycle.



#### Oil Pipe Installation

- Replace the washer on both sides of the oil pipe banjo bolts with new ones.
- Tighten the banjo bolts in the order as shown in the figure.  
**Torque - Oil Pipe Banjo Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**
  - Left Crankcase Side [1]
  - Right Crankcase Side [2]
  - Cylinder Head Side [3]
- Tighten:  
**Torque - Oil Pipe Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



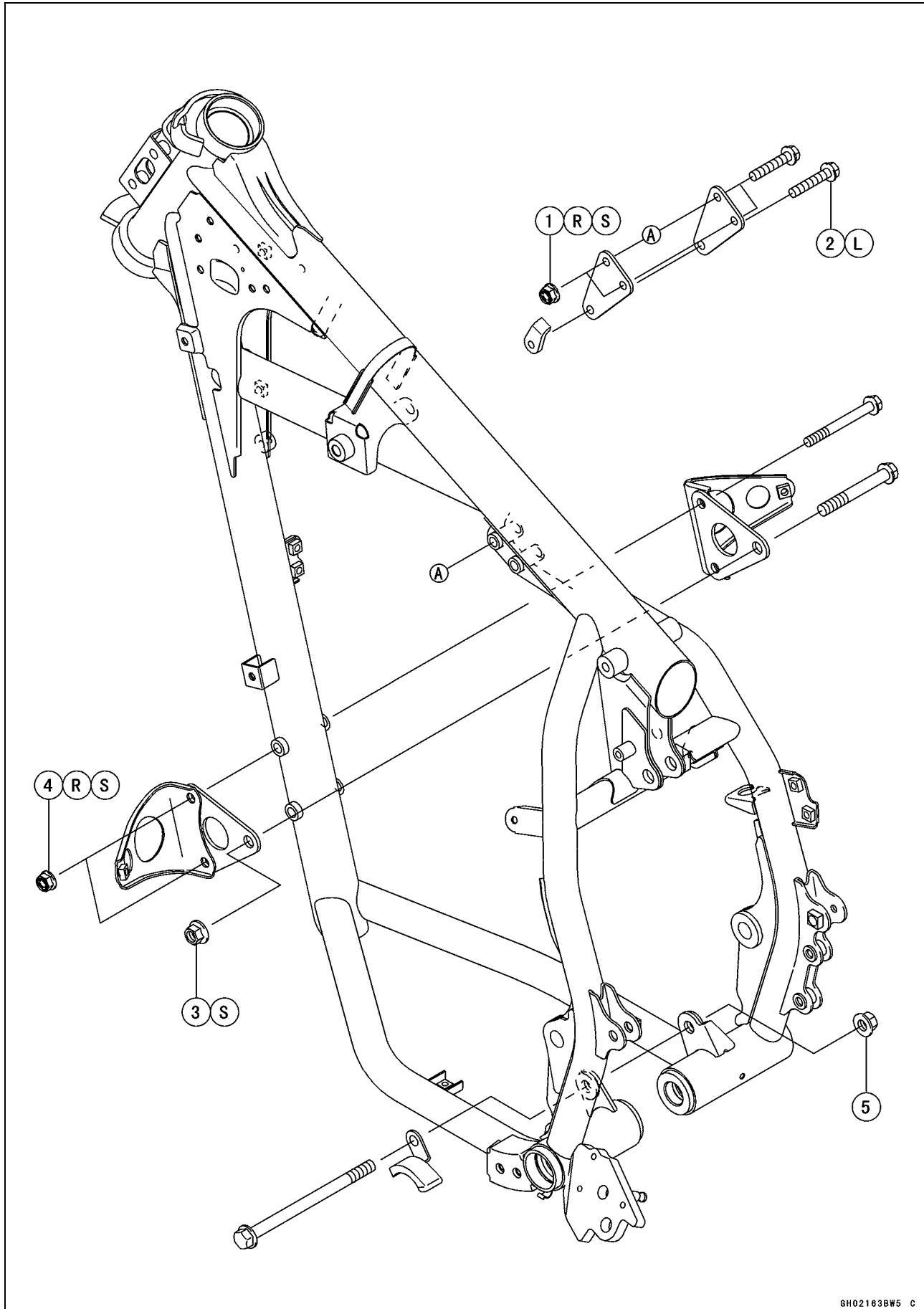
# Engine Removal/Installation

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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	Upper Engine Bracket Nuts	25	2.5	18	R, S
2	Upper Engine Mounting Bolt	25	2.5	18	L
3	Front Engine Mounting Nut	44	4.5	32	S
4	Front Engine Bracket Nuts	25	2.5	18	R, S
5	Lower Engine Mounting Nut	44	4.5	32	

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

## 8-4 ENGINE REMOVAL/INSTALLATION

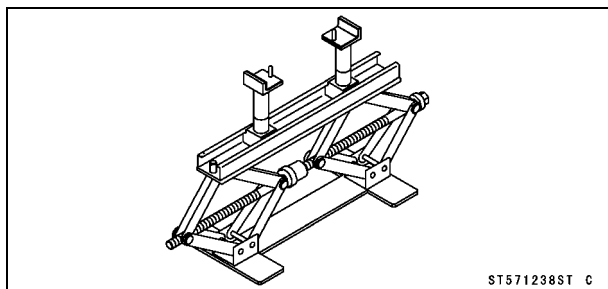
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### Special Tool

---

Jack:

57001-1238





## Engine Removal/Installation

### Engine Removal

- Place the jack under the frame to raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

#### **⚠ WARNING**

When the swingarm pivot shaft is removed the swingarm and rear wheel assembly will become detached and allow the frame to fall to the floor, creating the potential for injury. Removing the engine requires the swingarm pivot to be removed, so support the bottom of the frame with a jack or other appropriate stand.

- Squeeze the brake lever slowly and hold it with a band [A].

#### **⚠ WARNING**

Motorcycle may fall over unexpectedly resulting in an accident or injury. Be sure to hold the front brake when removing the engine.

#### **NOTICE**

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.

- Drain:
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (see Coolant Change in the Periodic Maintenance chapter)

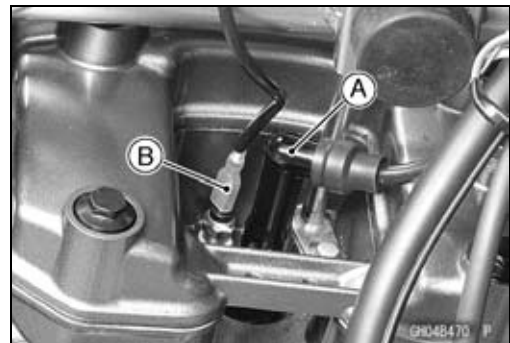


## 8-6 ENGINE REMOVAL/INSTALLATION

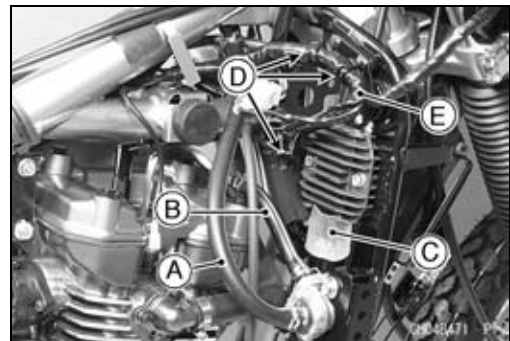
### Engine Removal/Installation

- Remove:
  - Engine Guard (see Engine Guard Removal in the Cooling System chapter)
  - Brake Pedal (see Brake Pedal Removal in the Brakes chapter)
  - Clutch Cable Lower End (see Clutch Cable Removal in the Clutch chapter)
  - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
  - Shift Pedal (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Radiator (see Radiator Removal in the Cooling System chapter)
  - Coolant Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)
  - Starter Relay (see Starter Relay Inspection in the Electrical System chapter)
  - Starter Relay Bracket (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  - Carburetor (see Carburetor Removal in the Fuel System chapter)
  - Front Footpegs

- Remove the spark plug cap [A] from the spark plug.
- Disconnect the water temperature sensor connector [B].

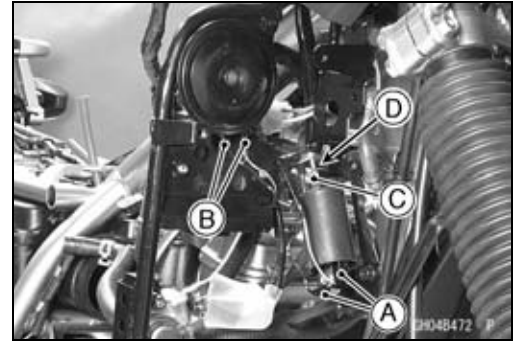


- For the other than Australia model, remove the vacuum switch valve hoses.
  - Separate the vacuum switch valve hose [A] from the frame fitting.
  - Separate the vacuum switch valve hose [B] from the pipe on the cylinder head cover.
- Disconnect the regulator/rectifier connector [C].
- Open the clamps [D], and clear the main harness [E].

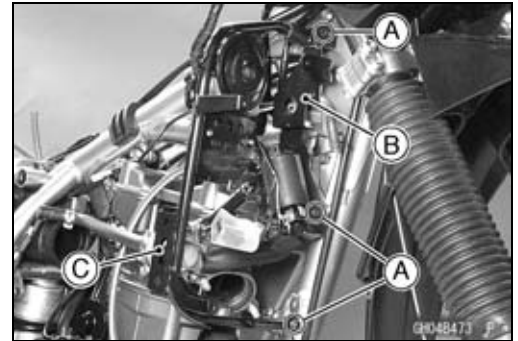


## Engine Removal/Installation

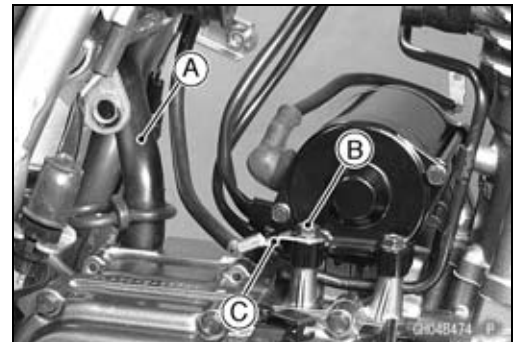
- Disconnect:
  - Ignition Coil Connectors [A]
  - Horn Connectors [B]
- Remove:
  - Ignition Coil Bolt [C]
  - Frame Ground Terminal [D]



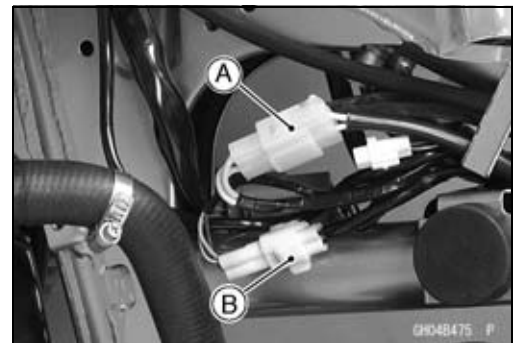
- Remove:
  - Bolts [A]
  - Ignition Coil Bracket [B]
  - Right Lower Fairing Bracket [C]



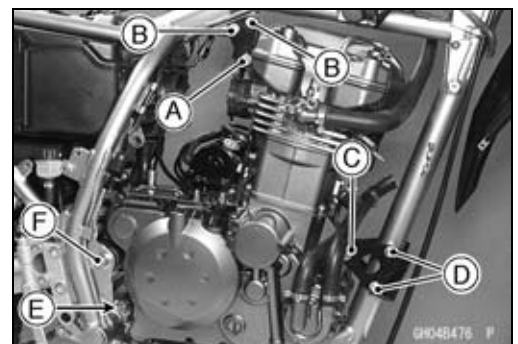
- Remove:
  - Breather Hose [A]
  - Starter Motor Mounting Bolt [B]
  - Engine Ground Terminal [C]



- Disconnect:
  - Alternator Lead Connector [A]
  - Crankshaft Sensor Lead Connector [B]



- Remove:
    - Upper Engine Mounting Bolt [A]
    - Upper Engine Bracket Bolts [B] and Nut
    - Front Engine Mounting Bolt [C] and Nut
    - Front Engine Bracket Bolts [D] and Nut
    - Lower Engine Mounting Bolt and Nut [E]
    - Swingarm Pivot Shaft [F] and Nut
- When pulling out the bolts and shaft, lift the engine a little.



## 8-8 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

- Remove the drive chain from the output shaft.
- Remove the engine [A] from the left side of the motorcycle.



### Engine Installation

- Replace:
  - Upper Engine Bracket Nuts
  - Front Engine Bracket Nuts
- Install:
  - Front Chain Guide [A]
  - Lower Engine Mounting Bolt [B]
- Tighten:

**Torque - Lower Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**

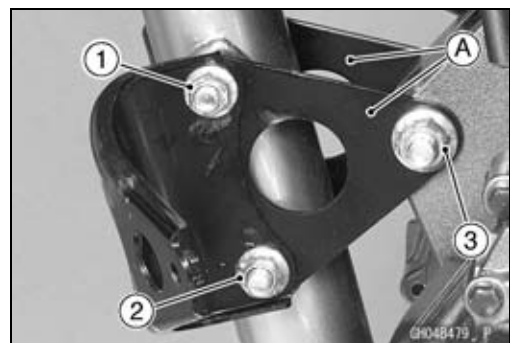
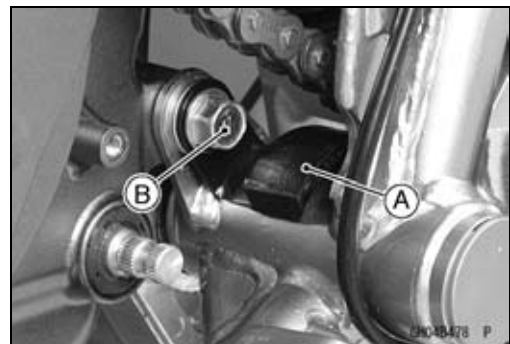
- Install the washer, and tighten the swingarm pivot shaft nut.

**Torque - Swingarm Pivot Shaft Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)**

- Install the front engine brackets [A].
- Tighten the front engine bracket nut and mounting nut in the order as shown in the figure.

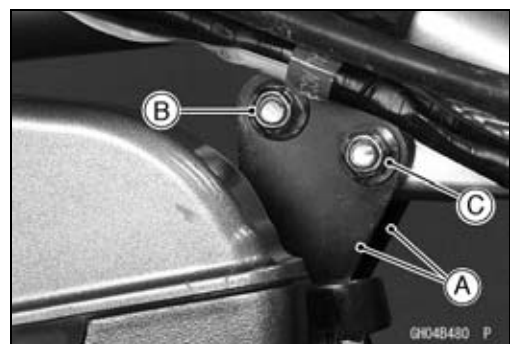
**Torque - Front Engine Bracket Nuts [1, 2]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

**Front Engine Mounting Nut [3]: 44 N·m (4.5 kgf·m, 32 ft·lb)**



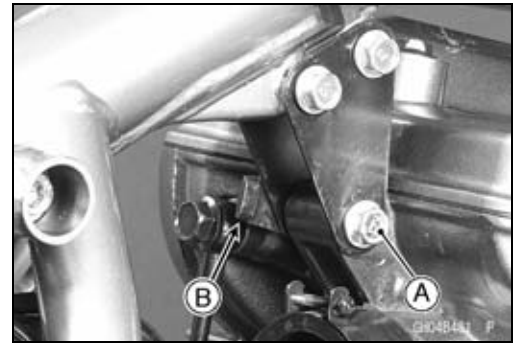
- Install the upper engine brackets [A].
- Tighten the front upper engine bracket nut [B] first, then tighten the rear bracket nut [C].

**Torque - Upper Engine Bracket Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)**



### Engine Removal/Installation

- Apply non-permanent locking agent to the threads of the upper engine mounting bolt [A].
- Install the bracket so that the hook portion [B] faces right side of the motorcycle.
- Attach the hook portion to the upper engine bracket.
- Tighten:  
**Torque - Upper Engine Mounting Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**



- Run the leads, cables, and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).
- Adjust:
  - Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  - Choke Cable (see Choke Operation Inspection in the Periodic Maintenance chapter)
  - Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)
  - Drive Chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter)
- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Adjust the idling (see Idle Speed Adjustment in the Periodic Maintenance chapter).



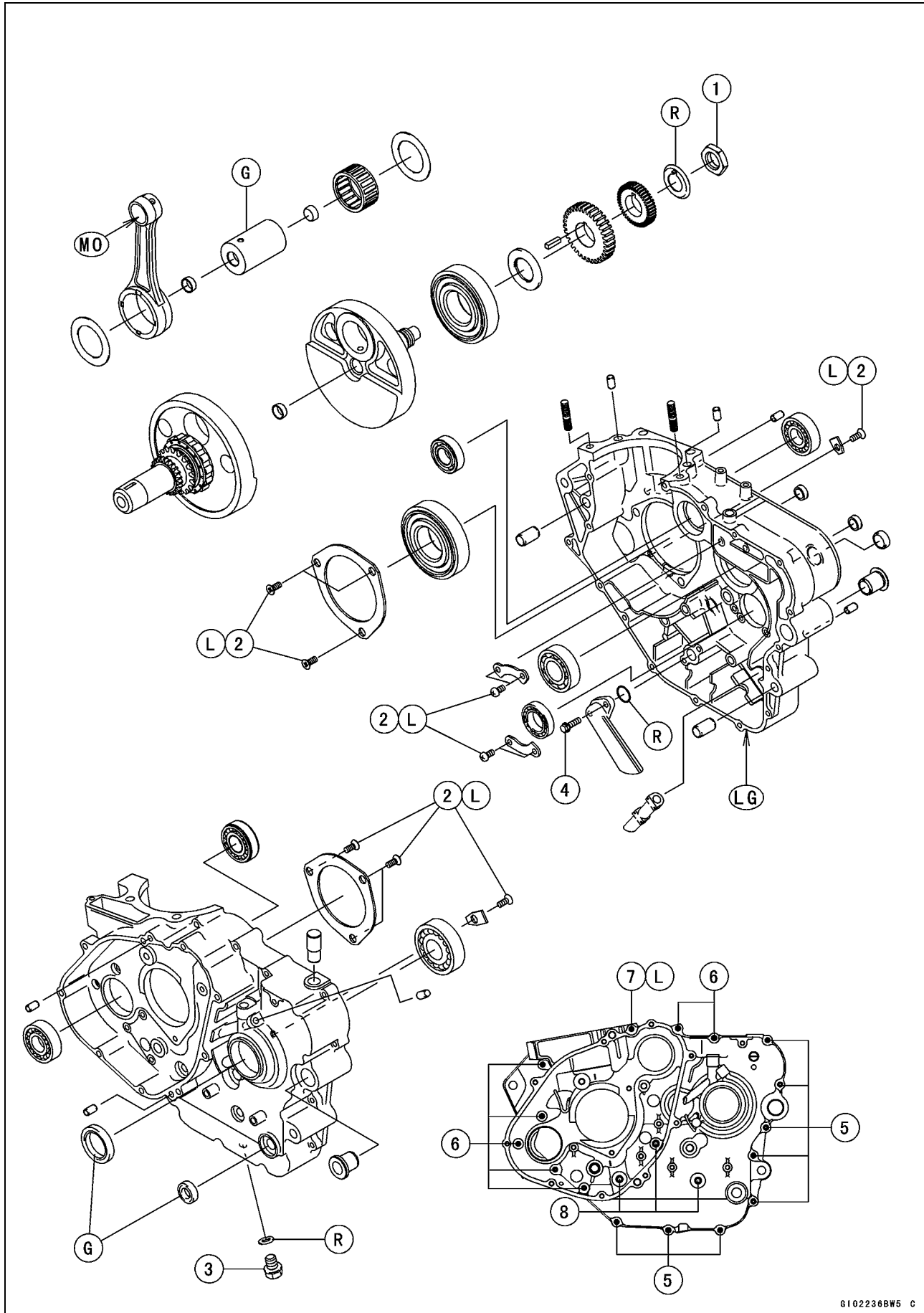
# Crankshaft/Transmission

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# 9-2 CRANKSHAFT/TRANSMISSION

## Exploded View





## CRANKSHAFT/TRANSMISSION 9-3

### Exploded View

No.	Fastener	Torque			Re- marks
		N·m	kgf·m	ft·lb	
1	Primary Gear Nut	155	16	114	
2	Bearing Retaining Screws	4.4	0.45	39 in·lb	L
3	Engine Oil Drain Bolt	29	3.0	21	
4	Engine Oil Feed Fitting Bolts	8.8	0.90	78 in·lb	
5	Crankcase Bolts (L = 30)	8.8	0.90	78 in·lb	
6	Crankcase Bolts (L = 50)	8.8	0.90	78 in·lb	
7	Crankcase Bolts (L = 60)	8.8	0.90	78 in·lb	L
8	Crankcase Bolts (L = 80)	16.5	1.7	12 in·lb	

9. KL650EB ~

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

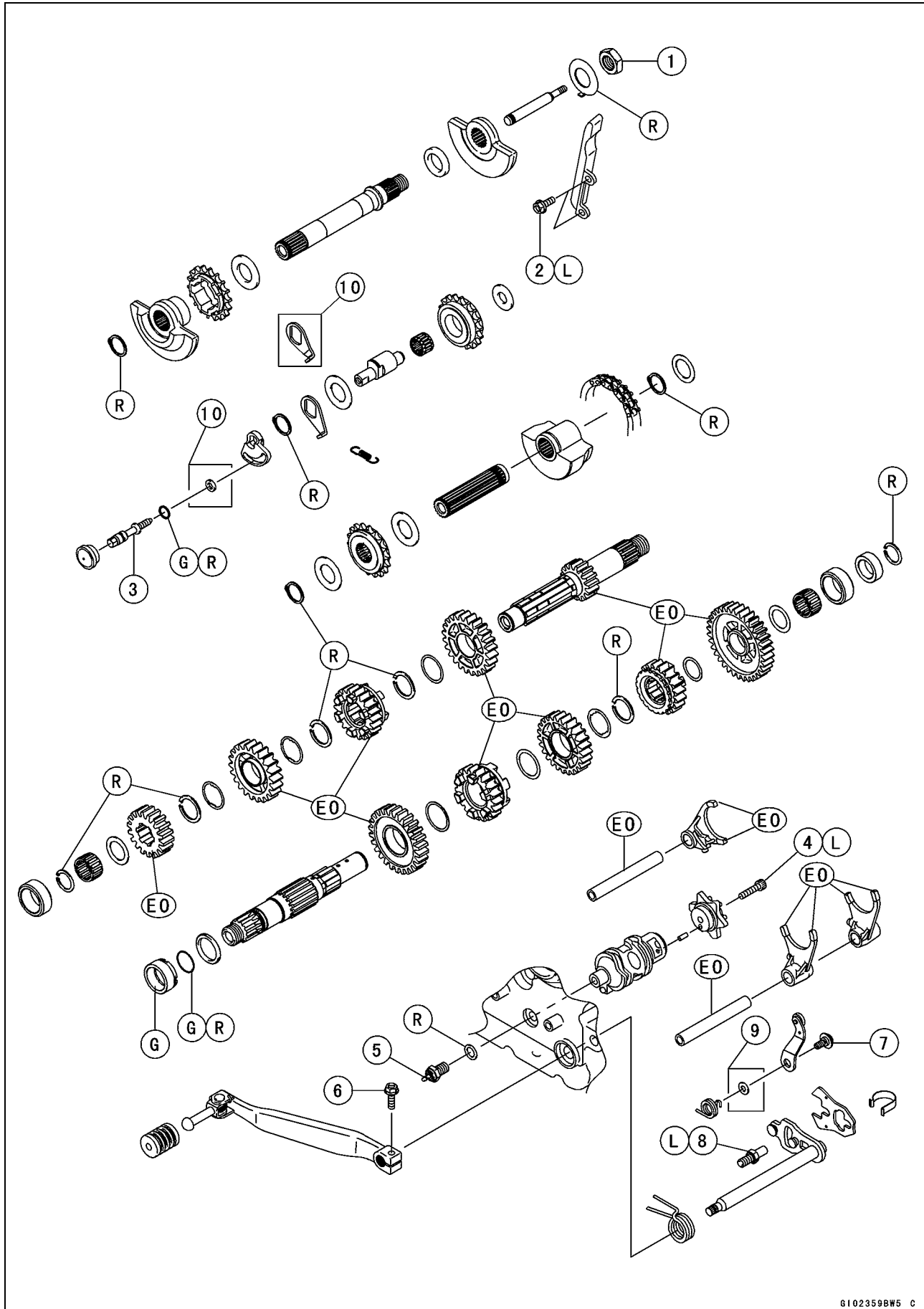
MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

# 9-4 CRANKSHAFT/TRANSMISSION

## Exploded View



## CRANKSHAFT/TRANSMISSION 9-5

### Exploded View

No.	Fastener	Torque			Re- marks
		N·m	kgf·m	ft·lb	
1	Front Right Balancer Weight Nut	44	4.5	32	
2	Rear Balancer Chain Guide Bolts	8.8	0.90	78 in·lb	L
3	Idle Shaft Lever Bolt	8.8	0.90	78 in·lb	
4	Shift Drum Cam Bolt	12	1.2	106 in·lb	L
5	Neutral Switch	15	1.5	11	
6	Shift Pedal Bolt	12.5	1.3	111 in·lb	
7	Gear Positioning Lever Bolt	8.8	0.90	78 in·lb	
8	Shift Shaft Return Spring Pin	20	2.0	15	L

9. KL650EB ~

10. KL650EC ~

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

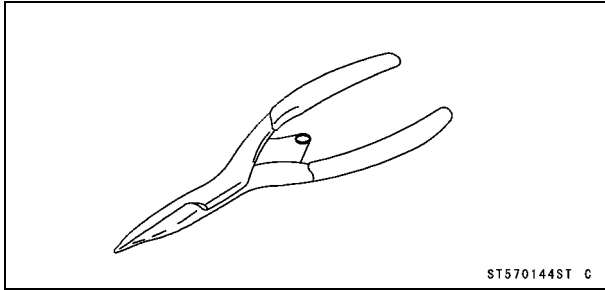
## 9-6 CRANKSHAFT/TRANSMISSION

### Specifications

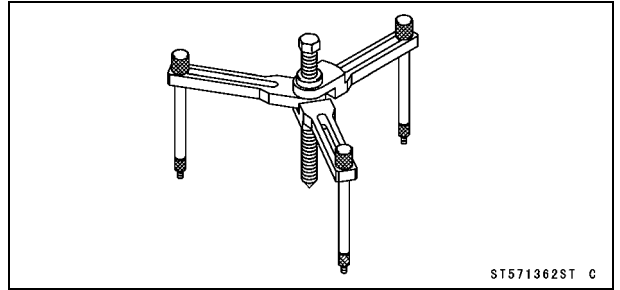
Item	Standard	Service Limit
<b>Crankshaft, Connecting Rods</b>		
Connecting Rod Bend	— — —	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Twist	— — —	TIR 0.2/100 mm 0.008/3.94 in.)
Connecting Rod Big End Side Clearance	0.25 ~ 0.35 mm (0.0098 ~ 0.014 in.)	0.6 mm (0.02 in.)
Connecting Rod Big End Radial Clearance	0.008 ~ 0.020 mm (0.0003 ~ 0.0008 in.)	0.07 mm (0.003 in.)
Crankshaft Runout:		
Left Half	TIR 0.03 mm (0.0012 in.) or less	TIR 0.08 mm (0.003 in.)
Right Half	TIR 0.04 mm (0.016 in.) or less	TIR 0.10 mm (0.004 in.)
<b>Transmission</b>		
Shift Fork Ear Thickness	4.4 ~ 4.5 mm (0.173 ~ 0.177 in.)	4.3 mm (0.169 in.)
Gear Groove Width	4.55 ~ 4.65 mm (0.179 ~ 0.183 in.)	4.8 mm (0.189 in.)
Shift Fork Guide Pin Diameter	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Shift Drum Groove Width	6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)	6.3 mm (0.248 in.)

**Special Tools and Sealant**

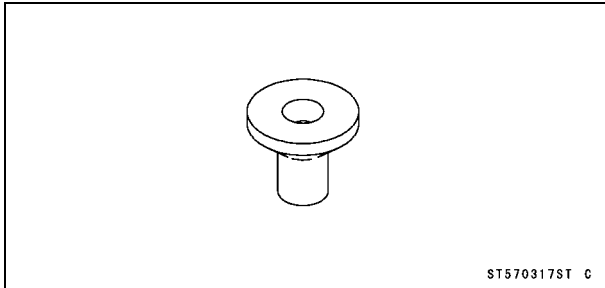
**Outside Circlip Pliers:**  
**57001-144**



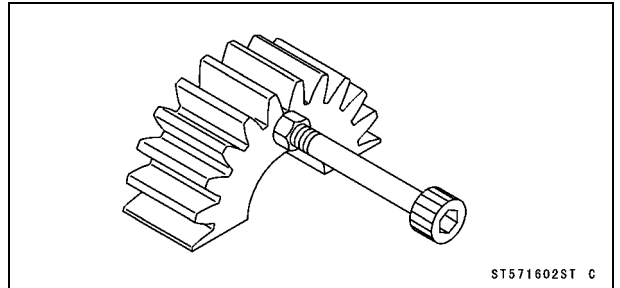
**Crankcase Splitting Tool Assembly:**  
**57001-1362**



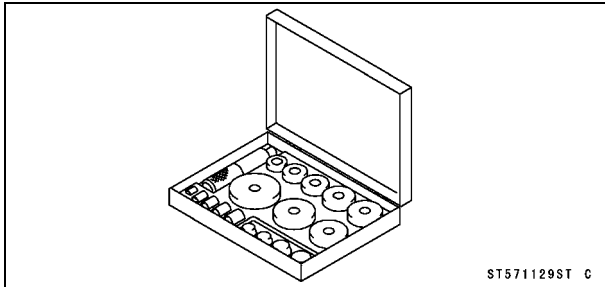
**Bearing Puller Adapter:**  
**57001-317**



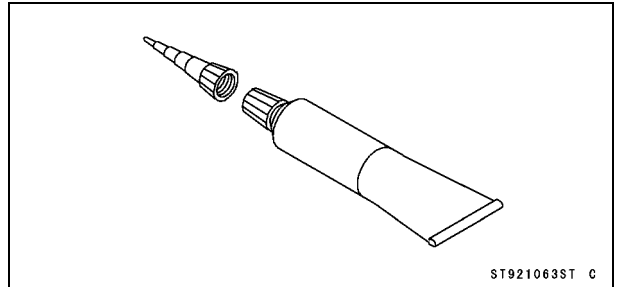
**Gear Holder:**  
**57001-1602**



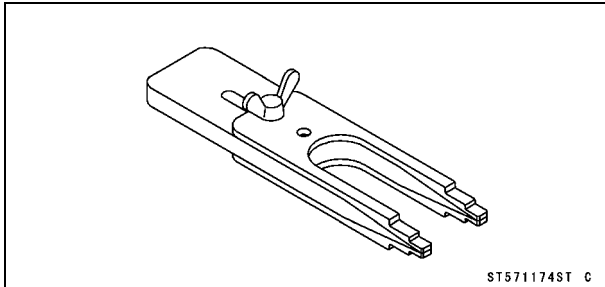
**Bearing Driver Set:**  
**57001-1129**



**Liquid Gasket, TB1216:**  
**92104-1063**



**Crankshaft Jig:**  
**57001-1174**



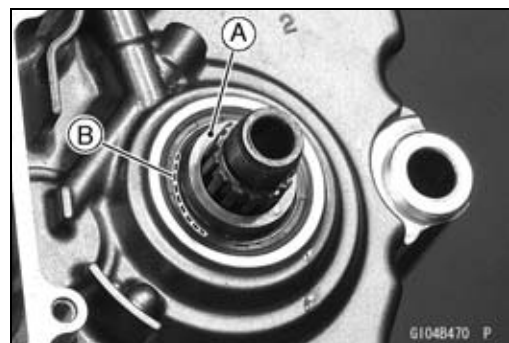
## 9-8 CRANKSHAFT/TRANSMISSION

### Crankcase

#### **Crankcase Disassembly**

- Remove the engine from the frame (see Engine Removal in the Engine Removal/Installation chapter).
- Set the engine on clean surface while parts are being removed.
- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal in the Engine Top End chapter)
  - Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
  - Cylinder (see Cylinder Removal in the Engine Top end chapter)
  - Piston (see Piston Removal in the Engine Top End chapter)
  - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  - Clutch (see Clutch Removal in the Clutch chapter)
  - Primary Gear (see Primary Gear Removal)
  - Balancer (see Balancer Removal)
  - Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
  - External Shift Mechanism (see External Shift Mechanism Removal)
  - Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  - Alternator Inner Cover (see Alternator Inner Cover Removal in the Electrical System chapter)
  - Starter Motor Clutch Gear (see Alternator Rotor Removal in the Electrical System chapter)
  - Torque Limiter (see Alternator Rotor Removal in the Electrical System chapter)
  - Starter Idle Gear (see Alternator Rotor Removal in the Electrical System chapter)

- Remove the output shaft sleeve [A] and the O-ring [B].
  - Do not reuse the O-ring.

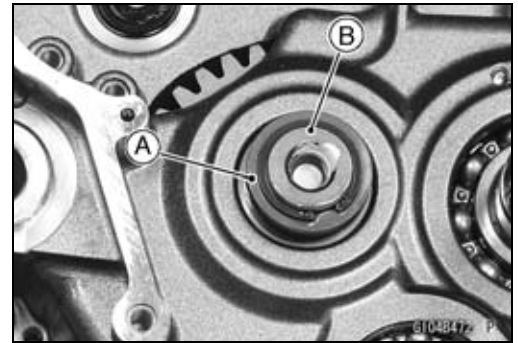


- Remove:
  - Neutral Switch [A]

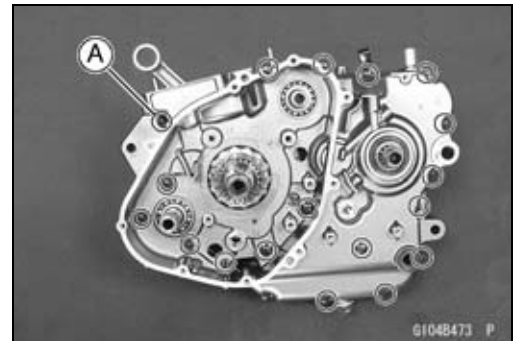


**Crankcase**

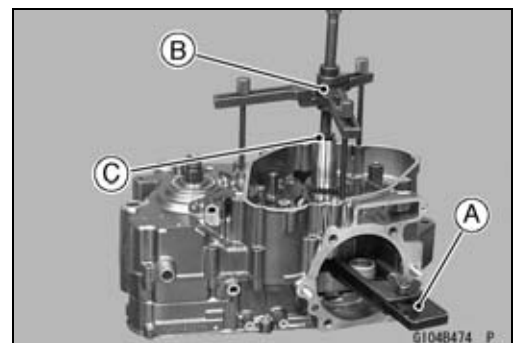
- Remove:  
 Circlip [A]  
 Collar [B]  
**Special Tool - Outside Circlip Pliers: 57001-144**



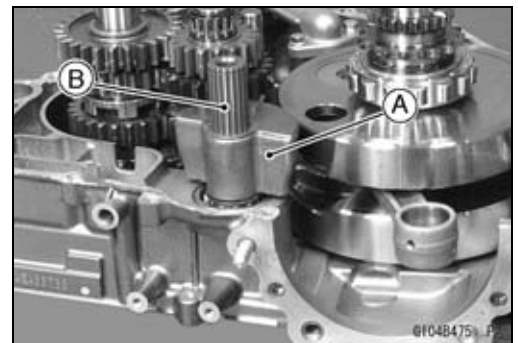
- Remove the crankcase bolts [A].



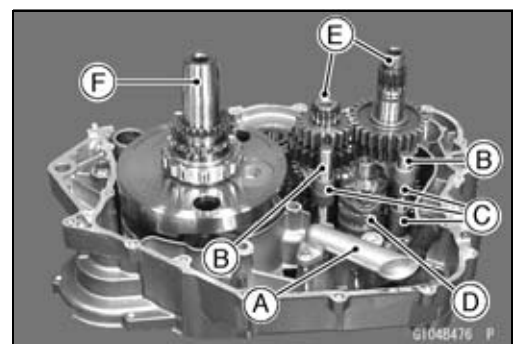
- Install the jig [A] between the crankshaft flywheels.  
**Special Tool - Crankshaft Jig: 57001-1174**
- Attach the crankcase splitting tool [B] to the left crankcase.  
**Special Tools - Bearing Puller Adapter: 57001-317**  
**Crankcase Splitting Tool Assembly: 57001-1362**
- Tighten the center bolt of the crankcase splitting tool to split the crankcase halves.  
 ○ Remove the left crankcase half.



- Remove:  
 Rear Balancer Weight [A]  
 Circlip  
 Washer  
 Rear Balancer Shaft [B]  
**Special Tool - Outside Circlip Pliers: 57001-144**



- Remove:  
 Engine Oil Feed Fitting [A]  
 Shift Rods [B] (see Transmission Shaft Removal)  
 Shift Forks [C] (see Transmission Shaft Removal)  
 Shift Drum [D] (see Transmission Shaft Removal)  
 Transmission [E] (see Transmission Shaft Removal)
- Remove the crankshaft [F] from the right crankcase half (see Crankshaft Removal).



**NOTICE**

**Do not remove the bearings and the oil seals unless it is necessary.  
 Removal may damage them.**

# 9-10 CRANKSHAFT/TRANSMISSION

## Crankcase

### Crankcase Assembly

#### NOTICE

Right and left crankcase halves are machined at the factory in the assembled state, so if replaced, they must be replaced as a set.

- Remove the old gasket from the mating surfaces of the crankcase halves and clean them off with a high-flash point solvent.
- Using compressed air, blow out the oil passages in the crankcase halves.

#### ⚠ WARNING

Gasoline and low-flash point solvents can be flammable and/or explosive and cause severe burns. Clean the engine parts in a well ventilated area, and take care that there is no spark or flame anywhere near the working areas. Do not use gasoline or low-flash point solvents to clean parts.

- Support the crankcase bearing boss with a suitable retainer [A].
- Using a press and the bearing driver set [C], install a new bearing [B] until it bottoms out.

Special Tool - Bearing Driver Set: 57001-1129

#### NOTICE

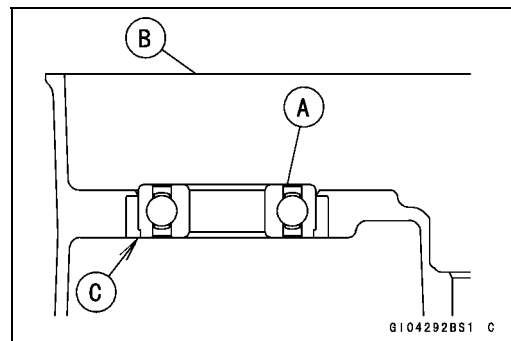
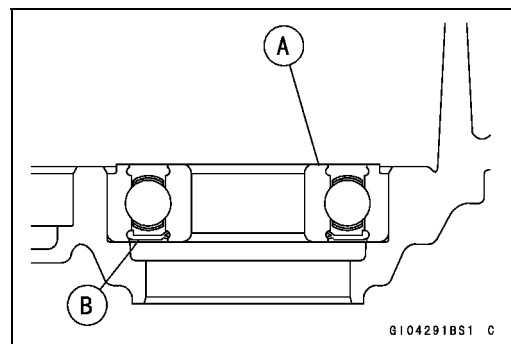
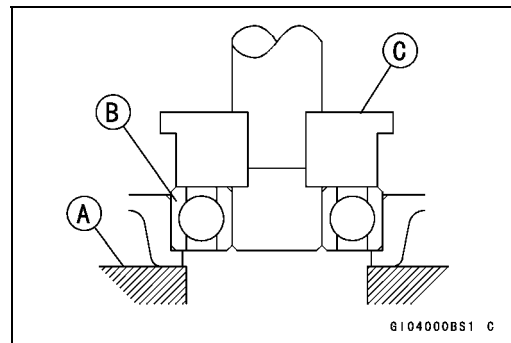
Support the crankcase bearing boss when the bearing is pressed, or the crankcase could be damaged.

- Press the new transmission shaft bearing [A] in the left crankcase half, so that the sealed side [B] faces outside of the engine.

Special Tool - Bearing Driver Set: 57001-1129

- Press the new rear balancer shaft bearing [A] in the left crankcase half [B], so that the stepped side [C] faces inside of the engine.

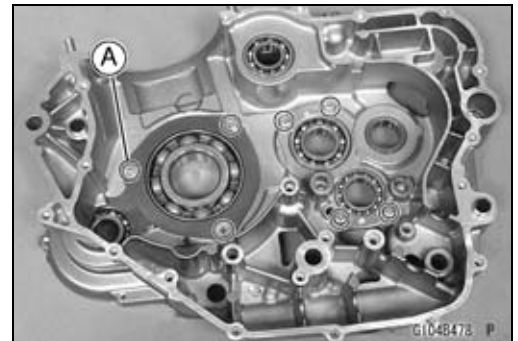
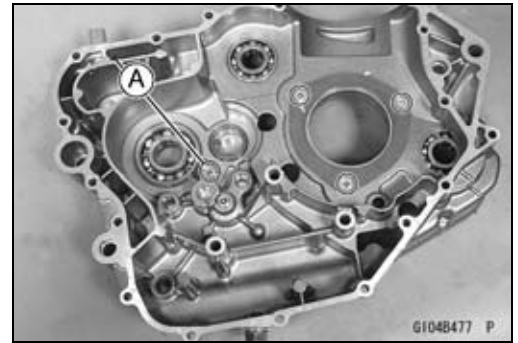
Special Tool - Bearing Driver Set: 57001-1129



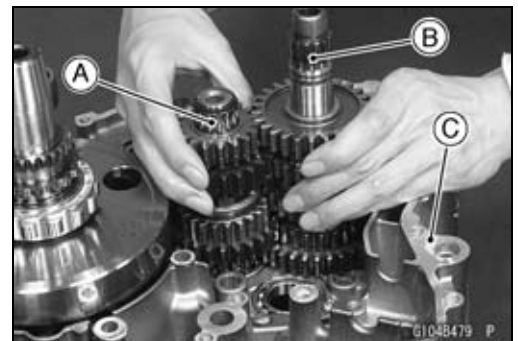


## Crankcase

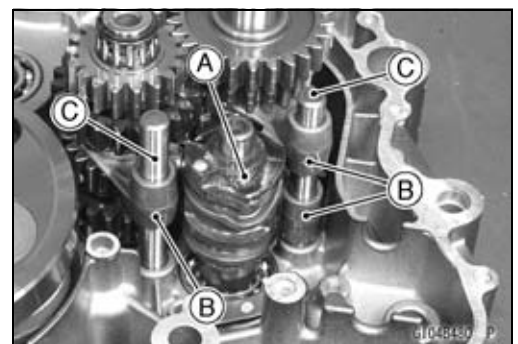
- Apply a non-permanent locking agent to the retaining screws [A].
- Tighten:  
**Torque - Bearing Retaining Screws: 4.4 N·m (0.45 kgf·m, 39 in·lb)**



- Install the crankshaft.
- Apply engine oil to the transmission gears, bearings, shift forks, shift drum and crankshaft bearing.
- Install the drive shaft [A] and output shaft [B] in the right crankcase [C] as a set.



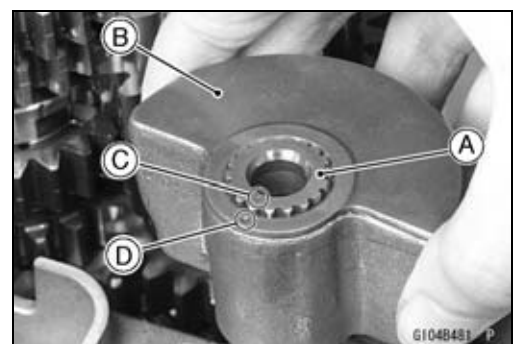
- Install:  
 Shift Drum [A] (see Transmission Installation)  
 Shift Forks [B] (see Transmission Installation)  
 Shift Rods [C] (see Transmission Installation)



- Replace the rear balancer shaft circlip with a new one.
- Install:  
 Rear Balancer Shaft [A]  
 Washer  
 Circlip

**Special Tool - Outside Circlip Pliers: 57001-144**

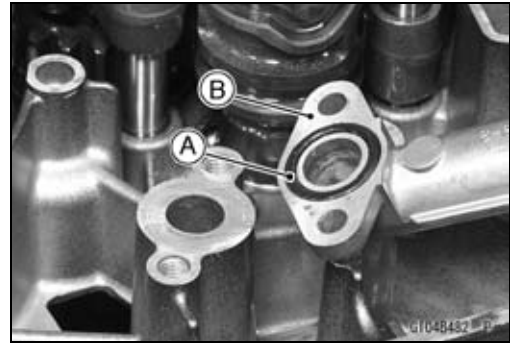
- Install the rear balancer weight [B] so that the punch mark [C] on the balancer weight and punch mark [D] on the balancer shaft.



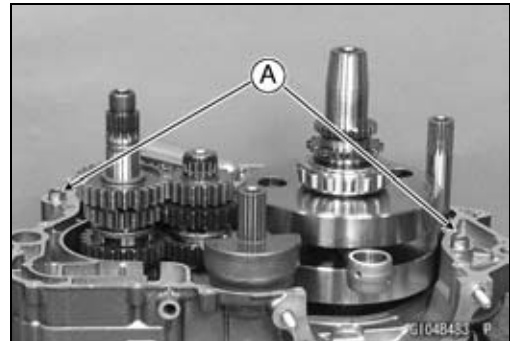
# 9-12 CRANKSHAFT/TRANSMISSION

## Crankcase

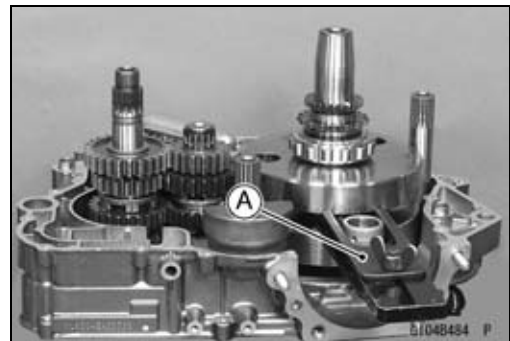
- Be sure to install the O-ring [A] on the engine oil feed fitting [B].
- Tighten:  
**Torque - Engine Oil Feed Fitting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



- Install:  
Dowel Pins [A]



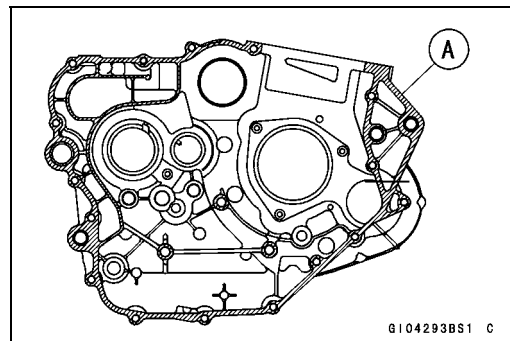
- With the connecting rod positioned at the bottom-dead-center, install the crankshaft jig [A].  
**Special Tool - Crankshaft Jig: 57001-1174**



- Apply liquid gasket to the mating surface [A] of the left crankshaft half.  
**Sealant - Liquid Gasket, TB1216: 92104-1063**

### NOTE

- Make the application finish within 30 minutes when the liquid gasket to the mating surface of the left crankcase half is applied.
- Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.

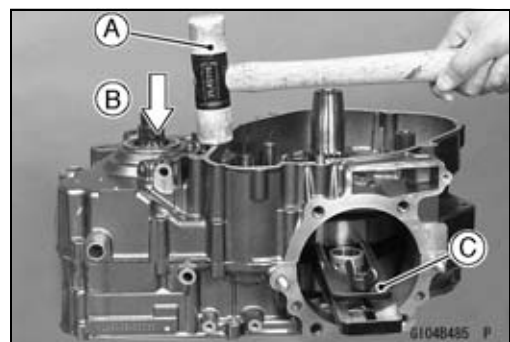


- Using a plastic hammer [A], press [B] the rear portion of the crankcase, and tap the area around the crankshaft of the left crankcase. While maintaining the mating surfaces of the right and left crankcase halves constantly parallel, mate the crankcase halves evenly.

### NOTE

- Constantly check the alignment of the two crankcase halves, and the position of the transmission shafts, and shift drum. The front and rear of the crankcase must be pushed together evenly.

- Remove the crankshaft jig [C].



## Crankcase

- Install the clamp [A].
- Apply a non-permanent locking agent to the crankcase bolt [B].
- Tighten the crankcase bolts [B] [C], starting with the periphery of the crankshaft, then outward.

**Torque - Crankcase Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

### NOTE

○After tightening the crankcase bolts, wipe up the liquid gasket seeping out around the mating surface, especially around the area.

- Instal:
  - Spring [A]
  - Gear Positioning Lever [B]
- Fit each ends [C] of the spring on the original positions.
- Tighten:

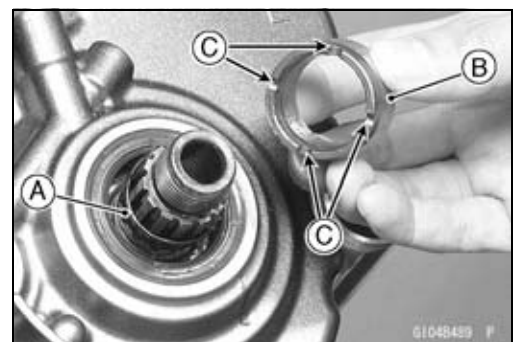
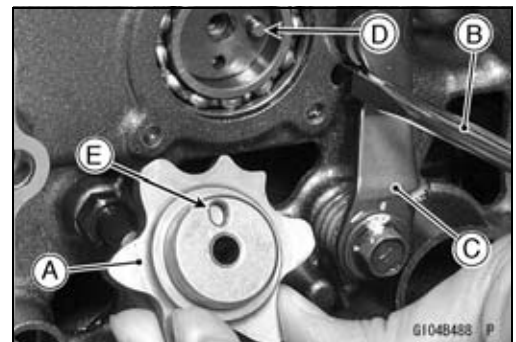
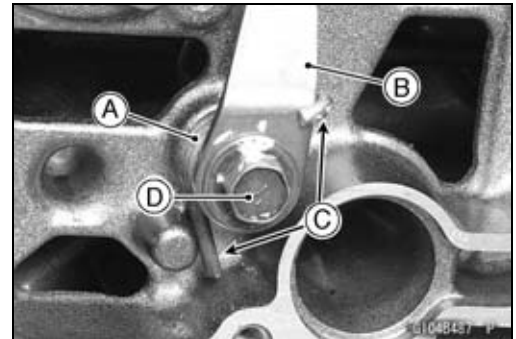
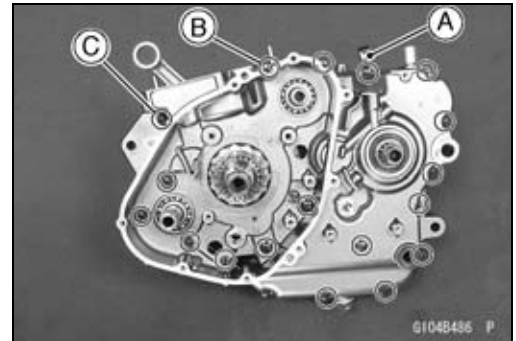
**Torque - Gear Positioning Lever Bolt [D]: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

- To install the shift drum cam [A], use the driver [B] to bring the gear positioning lever [C] to the bottom of the crankcase.
- Install the shift drum pin [D] into the shift drum hole.
- Fit the hollow [E] of the shift drum cam on the shift drum pin.
- Apply non-permanent locking agent to the shift drum cam bolts and tighten them.

**Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**

- Check to see that gears shift smoothly from 1st to 5th gear, and 5th to 1st while spinning the output shaft.
- Set the shift drum in the neutral position.

- Replace the O-ring [A] on the output shaft with a new one.
- Install the O-ring on the grinding faces of the output shaft while expanding the O-ring by the hand.
- Apply grease to the inside of the output shaft collar [B].
- Insert the collar with the oil groove end facing [C] inside.



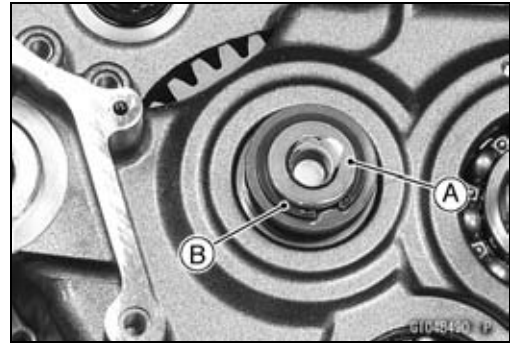
## 9-14 CRANKSHAFT/TRANSMISSION

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### Crankcase

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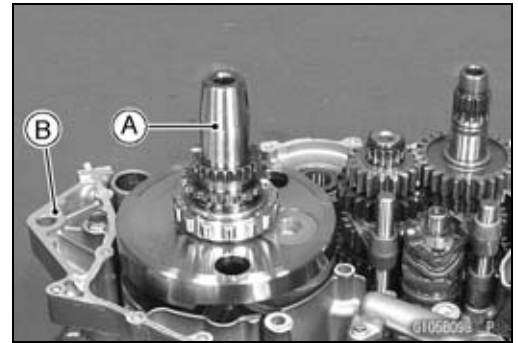
- Install the collar [A].
- Replace the circlip [B] with a new one, and install it to the output shaft.



**Crankshaft**

**Crankshaft Removal**

- Disassemble the crankcase (see Crankcase Disassembly).
- Using the hand, pull out the crankshaft [A] from the right crankcase [B].



**Crankshaft Installation**

- Install the crankshaft to the right crankcase.
- Apply engine oil to the connecting rod big end bearing.

**Crankshaft Disassembly**

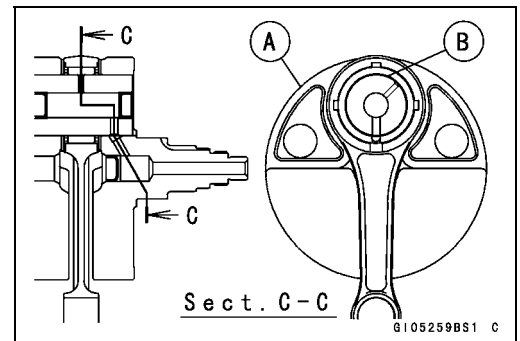
Since assembly of the crankshaft demands exacting tolerances, the disassembly and reassembly of the crankshaft can only be done by a shop having the necessary tools and equipment.

- If it should be necessary to disassemble the crankshaft, use a press to remove the crankpin.

**Crankshaft Assembly**

Since the assembly of the crankshaft demands exacting tolerances, the disassembly and reassembly of the crankshaft can only be done by a shop having the necessary tools and equipment.

- Carefully align the oil passage hole in the right flywheel [A] with the one in the crankpin [B] at rebuilding of the crankshaft as shown.



- Reassemble the crankshaft according to the standard tolerances in Specifications.
  - Connecting rod bend, twist.
  - Connecting rod big end radial clearance.
  - Cold-fitting tolerance between crankpin and flywheels.
  - Side clearance between the connecting rod big end and one of flywheels.
  - Crankshaft runout.

# 9-16 CRANKSHAFT/TRANSMISSION

## Crankshaft

### Crankshaft Inspection

#### Connecting Rod Big End Radial Clearance

- Set the crankshaft on V blocks, and place a dial gauge [A] against the connecting rod big end.
- Push [B] the connecting rod first towards the gauge and then in the opposite direction. The difference between two gauge readings is the radial clearance.

#### Connecting Rod Big End Radial Clearance

**Standard:** 0.008 mm ~ 0.020 mm (0.0003 ~ 0.0008 in.)

**Service Limit:** 0.07 mm (0.003 in.)

- ★ If the radial clearance exceeds the service limit, crankshaft should be either replaced or disassembled and crankpin, needle bearing, and connecting rod big end should be examined for wear.

#### Connecting Rod Big End Side Clearance

- Measure the connecting rod big end side clearance [A].

#### Connecting Rod Big End Side Clearance

**Standard:** 0.25 ~ 0.35 mm (0.0098 ~ 0.014 in.)

**Service Limit:** 0.6 mm (0.02 in.)

- ★ If the clearance exceeds the service limit, replace the crankshaft assembly.

#### Crankshaft Runout

- Set the crankshaft in a flywheel alignment jig or on V blocks, and place a dial gauge as shown and turn the crankshaft slowly. The maximum difference in gauge reading is the crankshaft runout.

#### Standard:

**Left Half** TIR 0.03 mm (0.0012 in.) or less

**Right Half** TIR 0.04 mm (0.0016 in.) or less

#### Service Limit:

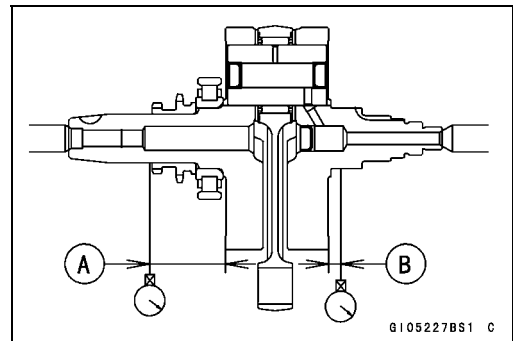
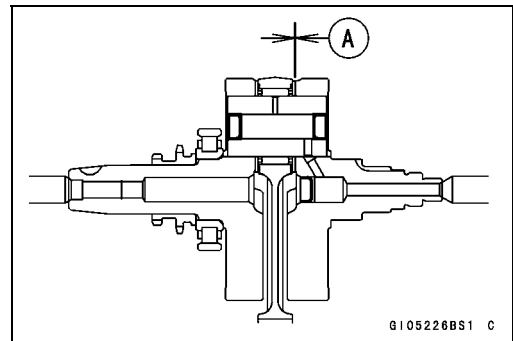
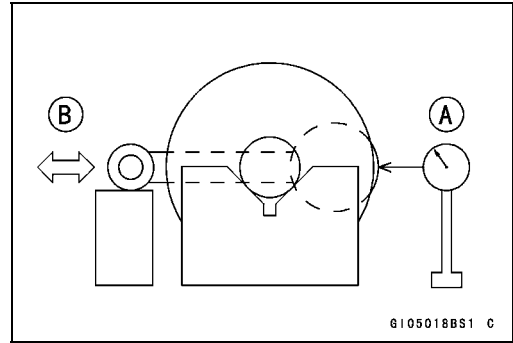
**Left Half** TIR 0.08 mm (0.003 in.)

**Right Half** TIR 0.10 mm (0.004 in.)

- ★ If the runout at either point exceeds the service limit, replace the crankshaft assembly with a new one or align the crankshaft so that the runout falls within the service limit.

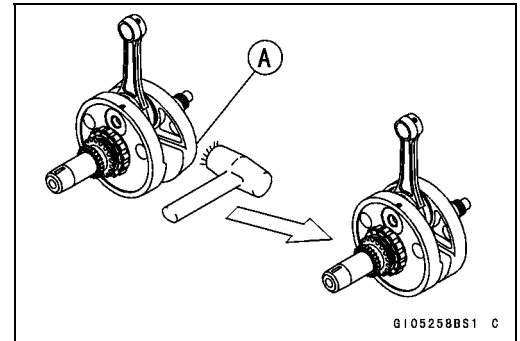
50 mm (2.0 in.) [A]

8 mm (0.31 in.) [B]



**Crankshaft**

- First correct the horizontal misalignment by striking the projecting crank half [A] with a plastic, soft lead, or brass hammer as shown.
- Recheck the runout with a dial gauge and repeat the process until the runout falls within the service limit.

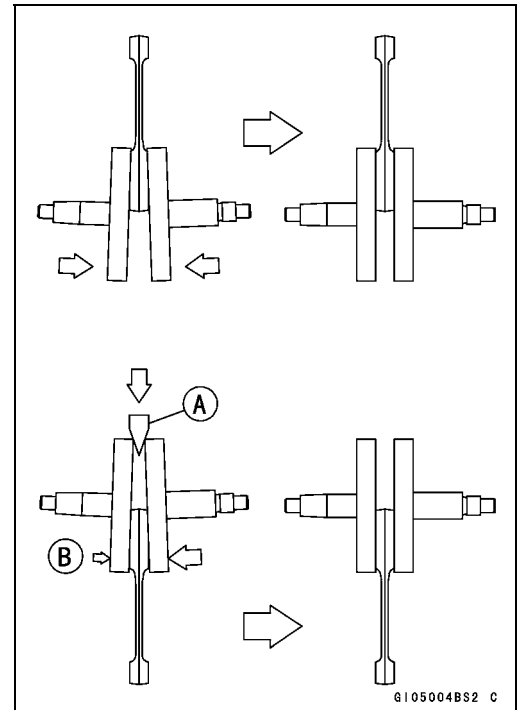


- Next, correct the vertical misalignment by either driving a wedge [A] in between the crank halves or by squeezing them in a vice, depending on the nature of the misalignment.

**NOTICE**

**Do not hammer the crank half at the point [B].**

- ★ If flywheel misalignment cannot be corrected by the above method, replace the crank pin or the crankshaft itself.

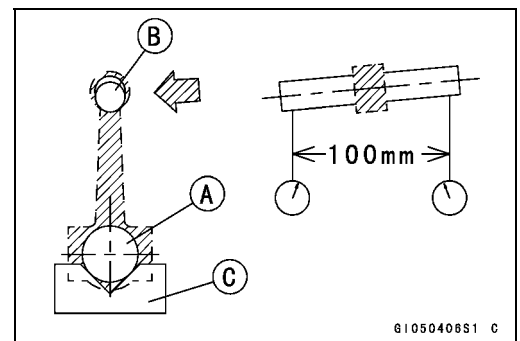


**Connecting Rod Big End Seizure**

- ★ In case of serious seizure with damaged flywheels, the crankshaft must be replaced.
- ★ In case of less serious damage, disassemble the crankshaft and replace the crankpin, needle bearing, and connecting rod.

**Connecting Rod Bend**

- Remove the connecting rod.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and more than 105 mm long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on a V block [C].



## 9-18 CRANKSHAFT/TRANSMISSION

### Crankshaft

- 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 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

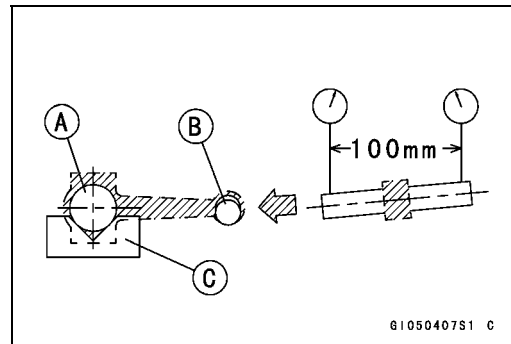
**Service Limit:** TIR 0.2/100 mm (0.008/3.94 in.)

#### Connecting Rod Twist

- With the big-end arbor [A] still on the V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being parallel with the surface plate over a 100 mm 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.)

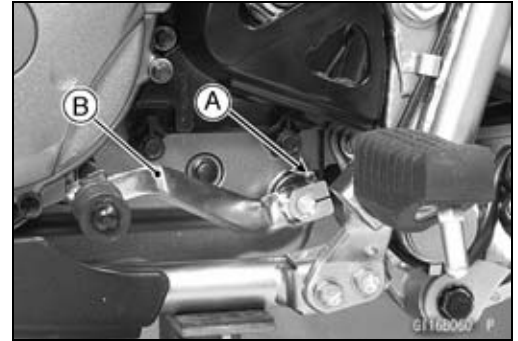




## External Shift Mechanism

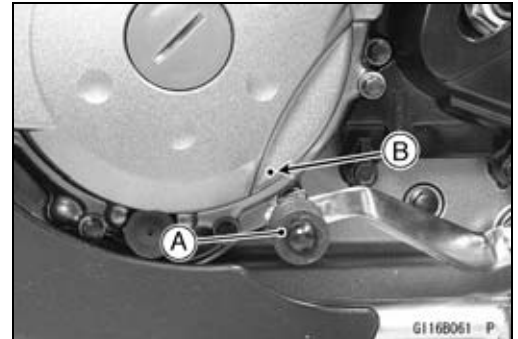
### Shift Pedal Removal

- Remove the shift pedal bolt [A].
- Pull out the shift pedal [B].



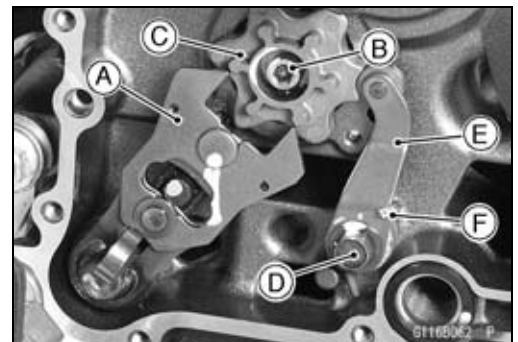
### Shift Pedal Installation

- Install the shift pedal so that the top of the shift pedal pad [A] position is lower than the punch mark [B] on the alternator outer cover.



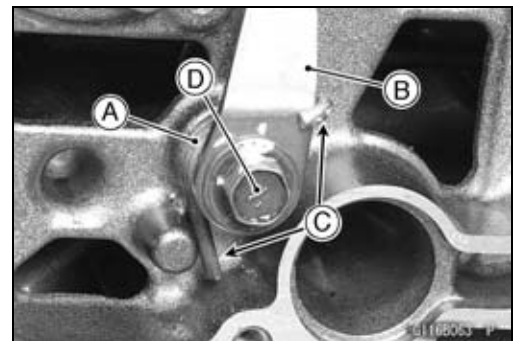
### External Shift Mechanism Removal

- Remove:
  - Shift Pedal (see Shift Pedal Removal)
  - Clutch (see Clutch Removal in the Clutch chapter)
- Pull out the shift shaft [A].
- Remove:
  - Shift Drum Cam Bolt [B]
  - Shift Drum Cam [C]
  - Gear Positioning Lever Bolt [D]
  - Gear Positioning Lever [E]
  - Spring [F]



### External Shift Mechanism Installation

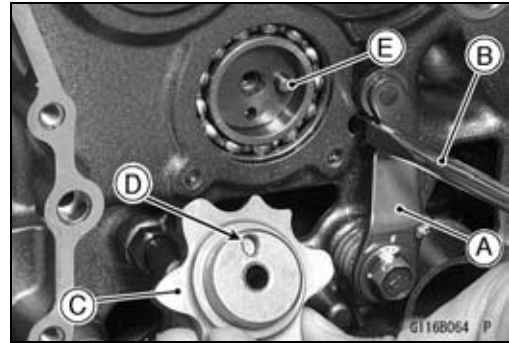
- Install:
  - Spring [A]
  - Gear Positioning Lever [B]
- Fit each ends [C] of the spring on the original positions.
- Tighten:
  - Torque - Gear Positioning Lever Bolt [D]: 8.8 N·m (0.90 kgf·m, 78 in·lb)



## 9-20 CRANKSHAFT/TRANSMISSION

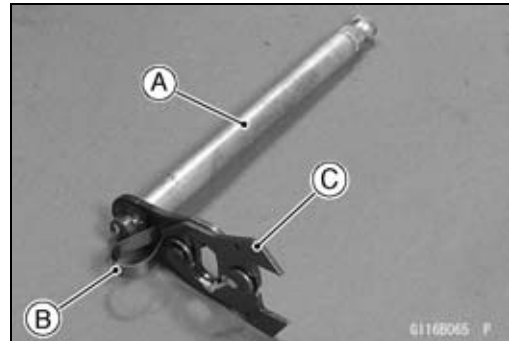
### External Shift Mechanism

- Holding the gear positioning lever [A] with the (-) driver [B] and install the shift drum cam [C] so that the hollow [D] fit to the shift drum pin [E].
- Apply a non-permanent locking agent to the shift drum cam bolt.
- Tighten:  
**Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**
- Align the roller of the gear positioning lever with the slot of the shift drum cam.

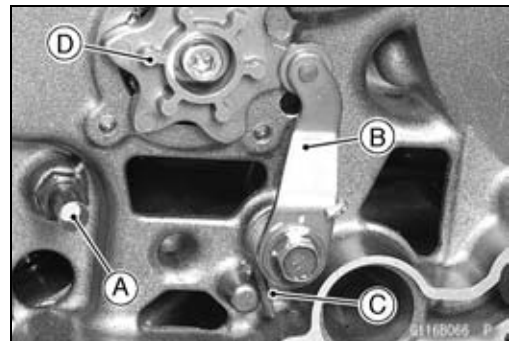


### External Shift Mechanism Inspection

- Inspect the shift shaft [A] for any damage.
- ★ If the shaft is bent, repair or replace it.
- ★ If the spring [B] or shift pedal return spring are damaged, replace the spring.
- ★ If the shift mechanism arm [C] is damaged, replace the assembly.



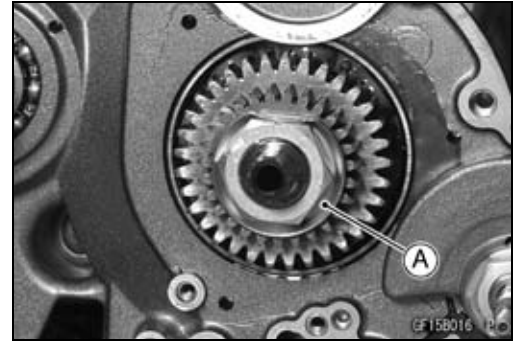
- Check the return spring pin [A] is not loose.
- ★ If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.  
**Torque - Shift Shaft Return Spring Pin: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Check the gear positioning lever [B] and spring [C] for breaks or distortion.
- ★ If the lever or spring are damaged in any way, replace them.
- Visually inspect the shift drum cam [D].
- ★ Replace it if it is seriously worn or damaged.



## Primary Gear

### Primary Gear Removal

- Remove:
  - Clutch (see Clutch Removal in the Clutch chapter)
  - Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
- Flatten out the bended washer [A].

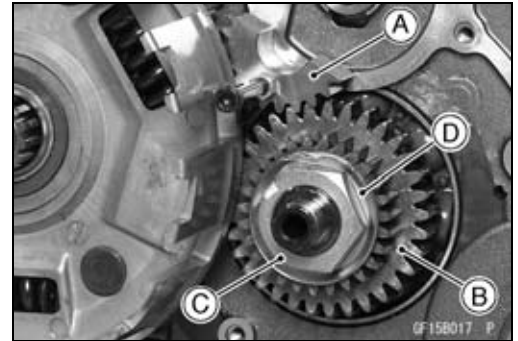


- Install the clutch housing temporary (see Clutch Installation in the Clutch chapter).
- Using the gear holder [A], secure the primary gear [B].

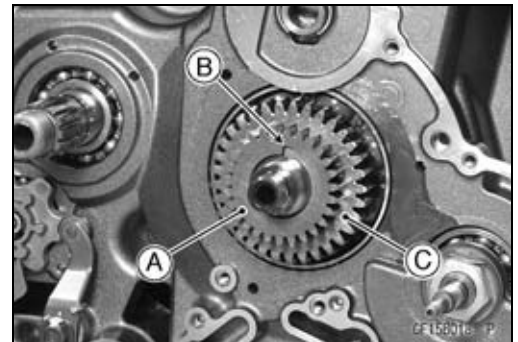
**Special Tool - Gear Holder: 57001-1602**

- Engage the gear holder to the clutch housing gear and primary gear.

- Remove:
  - Primary Gear Nut [C]
  - Washer [D]
  - Clutch Housing



- Remove:
  - Oil Pump Drive Gear [A]
  - Woodruff Key [B]
  - Primary Gear [C]



- Remove the spacer [A].



### Primary Gear Installation

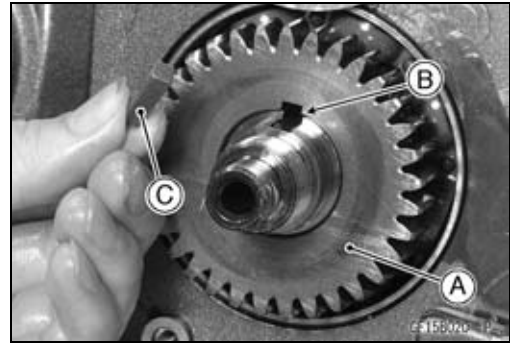
- Install the spacer [A] on the crankshaft.



## 9-22 CRANKSHAFT/TRANSMISSION

### Primary Gear

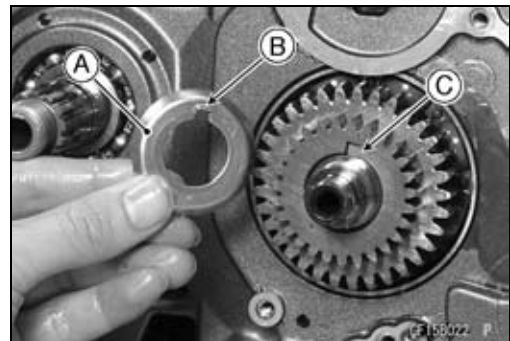
- Install the primary gear [A].
- Align the key groove [B] of the primary gear and the crankshaft.
- Insert the woodruff key [C] into the key groove.



- Install the oil pump drive gear [A] while fitting the woodruff key [B] onto the groove [C].



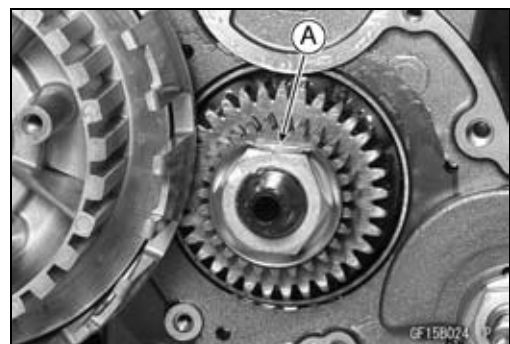
- Replace the washer [A] with a new one.
- Fit the projection [B] into the groove [C] on the oil pump drive gear.



- Install the clutch housing temporary (see Clutch Installation).
- Using the gear holder [A], secure the primary gear [B].  
**Special Tool - Gear Holder: 57001-1602**
- Tighten the primary gear nut [C].  
**Torque - Primary Gear Nut: 155 N·m (16 kgf·m, 114 ft·lb)**



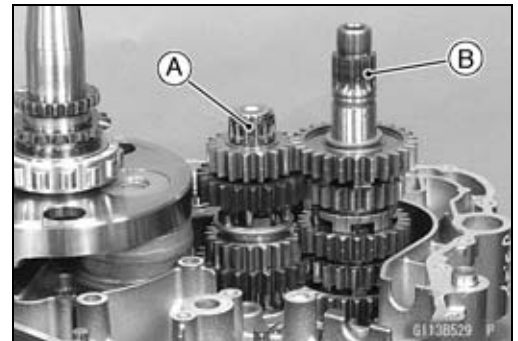
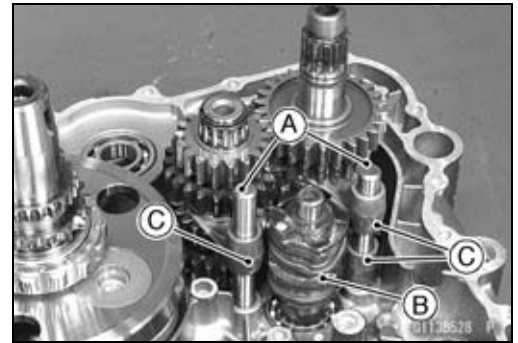
- After tightening the primary gear nut, bend [A] the one side of the washer over the nut.
- Install the removed parts (see appropriate chapters).



**Transmission**

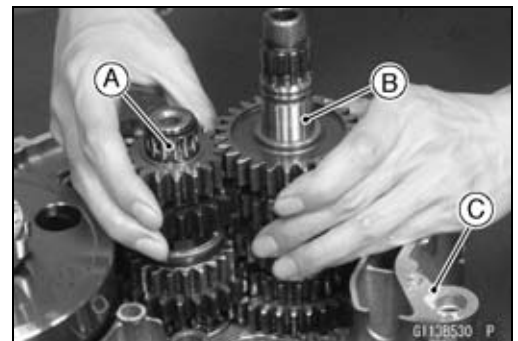
**Transmission Shaft Removal**

- Disassemble the crankcase halves (see Crankcase Disassembly).
  - Pull out the shift rods [A] allowing the shift fork guide pins to free from the shift drum [B].
  - Remove the shift forks [C].
  - Remove the shift drum.
- 
- Pull out the drive shaft [A] and output shaft [B] together with their gears meshed.



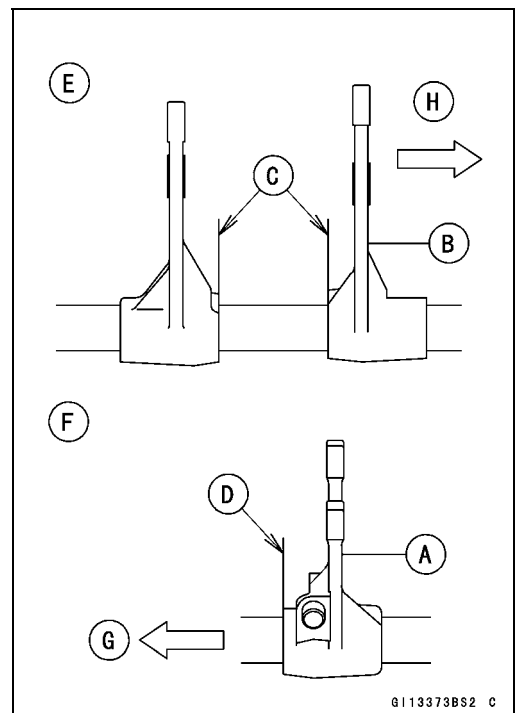
**Transmission Shaft Installation**

- Apply engine oil to the sliding portion of the transmission shaft, gears, and ball bearings.
- Install the drive shaft [A] and output shaft [B] in the right crankcase [C] with their gears meshed.
- Install the shift drum.



**NOTE**

- *The shift rods are identical.*
  - *The drive shaft shift fork [A] is shorter than other shift forks.*
  - *The right output shaft fork [B] is higher than other shift forks.*
  - *Be careful not to confuse the shift forks.*
- Install the shift forks as shown.
  - The machined surfaces [C] of the output shaft forks face to the opposite.
  - The machined surface [D] of the drive shaft fork faces to the engine left side.
  - Install the shift drum.
  - Apply a small amount of engine oil to the shift fork fingers.
  - Fit the each shift fork into the groove of the proper gear so that the shift fork guide pin is in proper groove on the shift drum.
  - Apply a small amount of engine oil to the shift rod.
  - Install the shift rods.
    - Output Shaft Forks [E]
    - Drive Shaft Fork [F]
    - Left Side [G]
    - Right Side [H]
  - Assemble the crankcase (see Crankcase Assembly).



## 9-24 CRANKSHAFT/TRANSMISSION

### Transmission

#### **Transmission Shaft Disassembly**

- Remove the transmission shafts.
- Remove the circlips, washers, then gears.

**Special Tool - Outside Circlip Pliers: 57001-144**

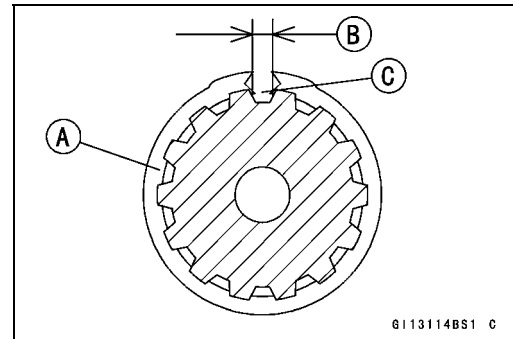
- Do not reuse the removed circlips.

#### **Transmission Shaft Assembly**

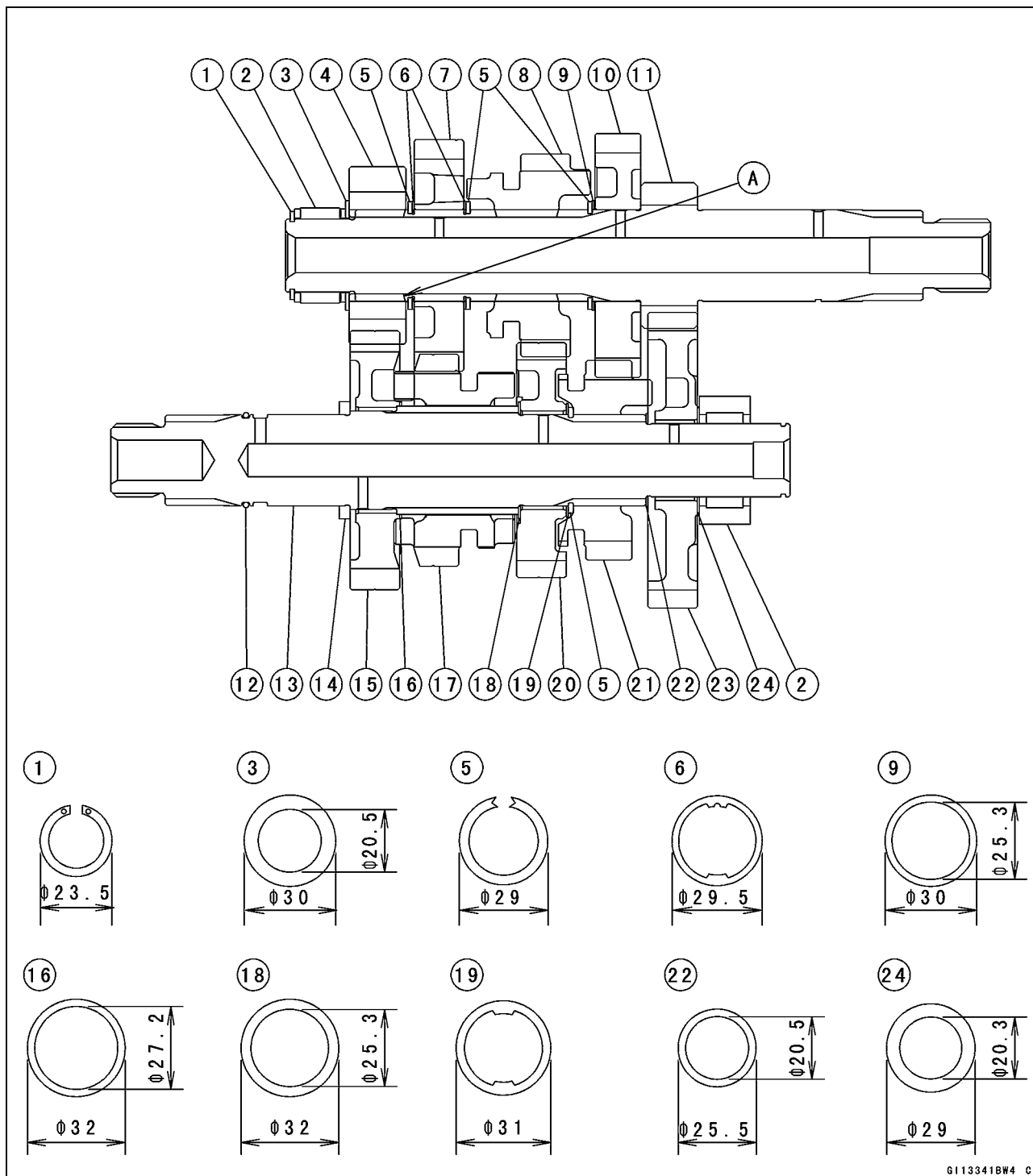
- Apply engine oil liberally to the transmission shaft, gears and bearings.
- Replace any circlips that were removed with new ones.
- Always install the circlips [A] so that the opening [B] is aligned with a spline groove [C], and install toothed washers. To install a circlip without damage, first fit the circlip onto the shaft expanding it just enough to install it, and then use a suitable gear to push the circlip into place.

**Special Tool - Outside Circlip Pliers: 57001-144**

- The drive shaft gears can be identified by size; the smallest diameter gear is 1st gear, and the largest is 5th. Be sure that all parts are put back in the correct sequence, facing the proper direction, and that all circlips and the washers are properly in place.
- The output shaft gears can be identified by size; the largest diameter gear is 1st gear, and the smallest is 5th. Be sure that all parts are put back in the correct sequence, facing the proper direction, and that all circlips and washers are properly in place.



Transmission



G113341BW4 C

- |  |   |   |
|--|---|---|
| 1. Circlip ( $\phi 23.5$ )               | 9. Washer ( $\phi 30 \times \phi 25.3$ )  | 17. 4th Gear                                |
| 2. Needle Bearing                        | 10. 5th Gear                              | 18. Washer ( $\phi 32 \times \phi 25.3$ )   |
| 3. Washer ( $\phi 30 \times \phi 20.5$ ) | 11. Drive Shaft (1st Gear)                | 19. Washer ( $\phi 31$ )                    |
| 4. 2nd Gear                              | 12. O-ring                                | 20. 3rd Gear                                |
| 5. Circlip ( $\phi 29$ )                 | 13. Output shaft                          | 21. 5th Gear                                |
| 6. Washer ( $\phi 29.5$ )                | 14. Collar                                | 22. Washer ( $\phi 25.5 \times \phi 20.5$ ) |
| 7. 4th Gear                              | 15. 2nd Gear                              | 23. 1st Gear                                |
| 8. 3rd Gear                              | 16. Washer ( $\phi 32 \times \phi 27.2$ ) | 24. Washer ( $\phi 29 \times \phi 20.3$ )   |

○The 2nd gear on the drive shaft faces taper side [A] to the 4th gear.

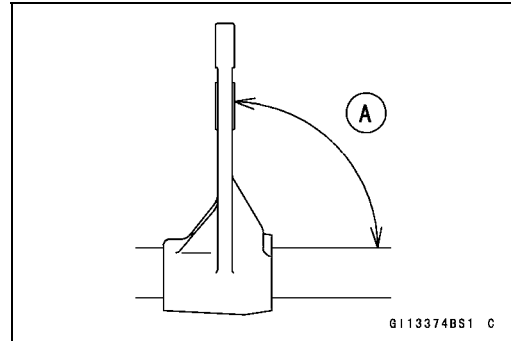
● Check each gear spins or slides freely on the transmission shaft without binding after assembly.

## 9-26 CRANKSHAFT/TRANSMISSION

### Transmission

#### Shift Fork Bending

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork may 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 [A] of the shift fork ears, and measure the width [B] of the gear grooves (with which the fork engages).

##### Shift Fork Ear Thickness

**Standard:** 4.4 ~ 4.5 mm (0.173 ~ 0.177 in.)

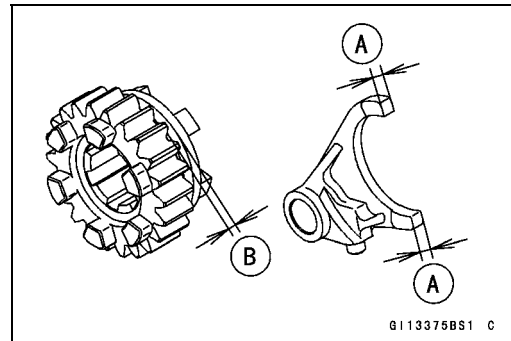
**Service Limit:** 4.3 mm (0.169 in.)

##### Gear Groove Width

**Standard:** 4.55 ~ 4.65 mm (0.179 ~ 0.183 in.)

**Service Limit:** 4.8 mm (0.189 in.)

- ★ If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.
- ★ If the gear groove is worn exceeding the service limit, the gear must be replaced.



#### Shift Fork Guide Pin/Shift Drum Groove Wear

- Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.

##### Shift Fork Guide Pin Diameter

**Standard:** 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)

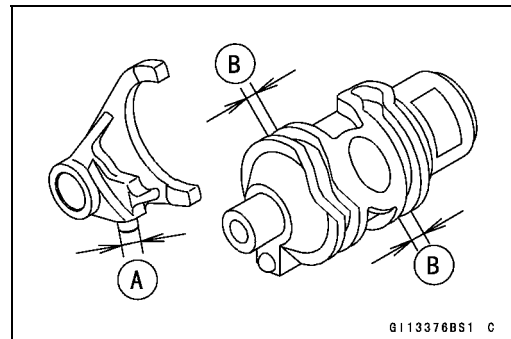
**Service Limit:** 5.8 mm (0.228 in.)

##### Shift Drum Groove Width

**Standard:** 6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)

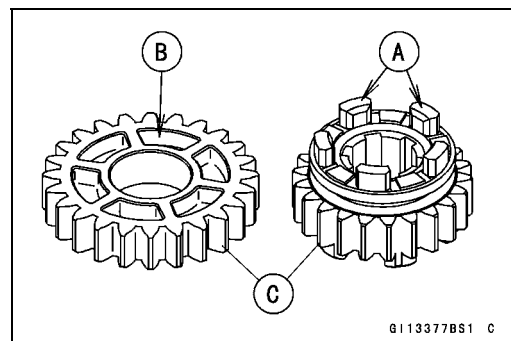
**Service Limit:** 6.3 mm (0.248 in.)

- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.
- ★ If any shift drum groove is worn exceeding the service limit, the drum must be replaced.



#### Gear 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.
- Visually inspect the gear teeth [C] on the transmission gears.
- ★ Replace lightly damaged gear teeth with an oilstone. The gear must be replaced if the teeth are badly damaged.
- ★ When gear is repaired or replaced, the driving gear should also be inspected and repaired or replaced if necessary.

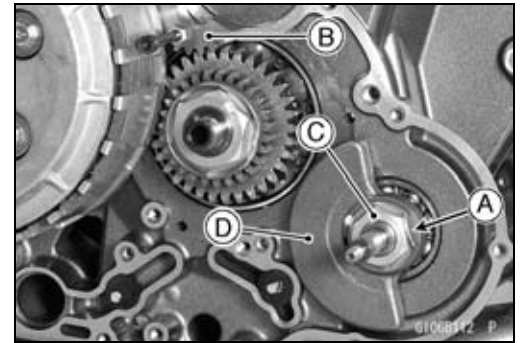




**Balancer**

**Balancer Removal**

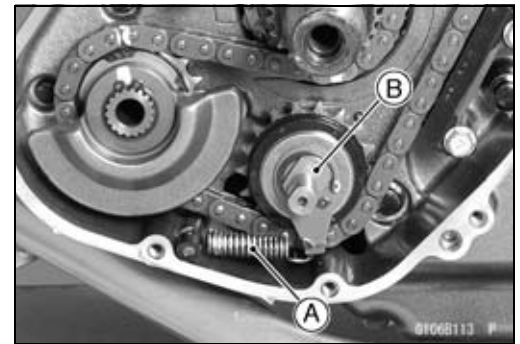
- Remove:
  - Camshaft Chain (see Camshaft Chain Removal in the Engine Top End chapter)
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
- Flatten the bended front right balancer weight washer [A].
- Using the gear holder [B], loosen the front right balancer weight nut [C].



**Special Tool - Gear Holder: 57001-1602**

- Remove:
  - Front Right Balancer Weight Nut
  - Washer
  - Front Right Balancer Weight [D]

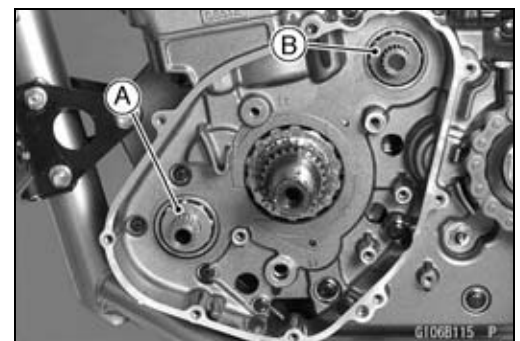
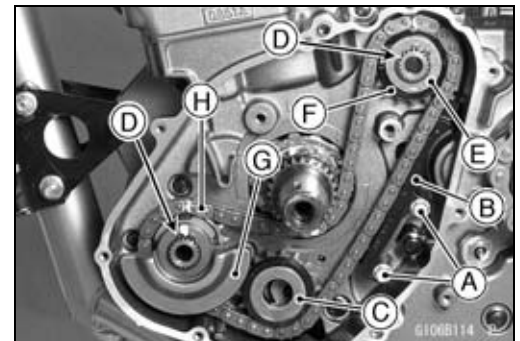
- Remove:
  - Spring [A]
  - Idle Shaft [B]



- Remove:
  - Rear Balancer Chain Guide Bolts [A]
  - Rear Balancer Chain Guide [B]
  - Idle Shaft Sprocket [C]
  - Circlips [D]
  - Washer [E]
  - Sprocket [F]
  - Sprocket (with the Left Front Balancer Weight [G])
  - Balancer Chain [H]

**Special Tool - Outside Circlip Pliers: 57001-144**

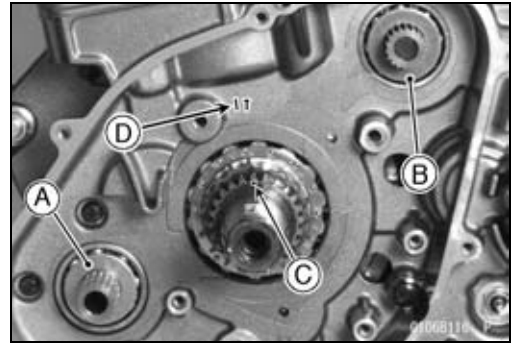
- Remove:
  - Spacer (T = 3) [A]
  - Washer (T = 2) [B]



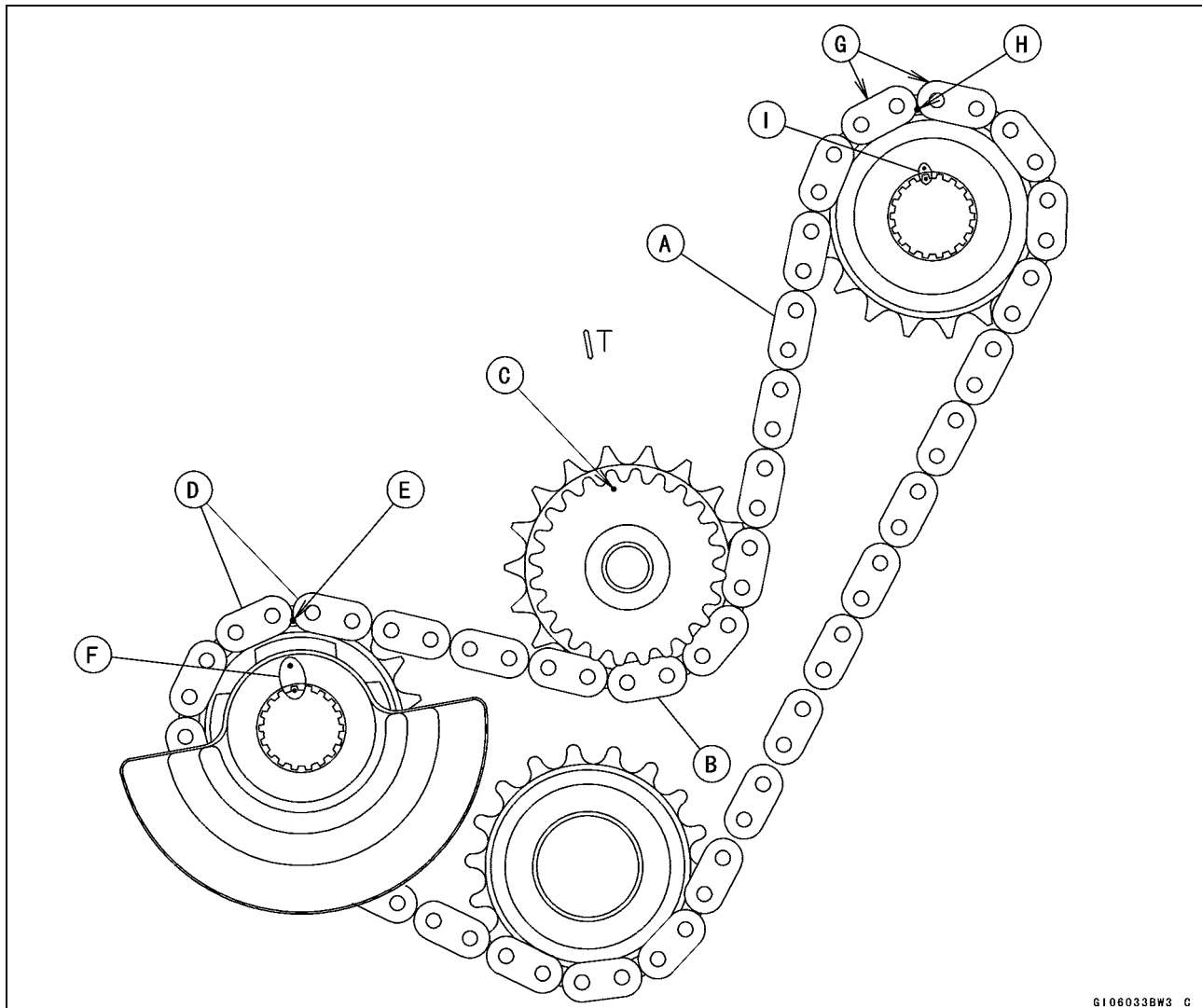
## 9-28 CRANKSHAFT/TRANSMISSION

### Balancer

- Install:
  - Spacer (T = 3) [A]
  - Washer (T = 2) [B]
- Align the punch mark [C] on the camshaft sprocket and TDC adjusting line [D].

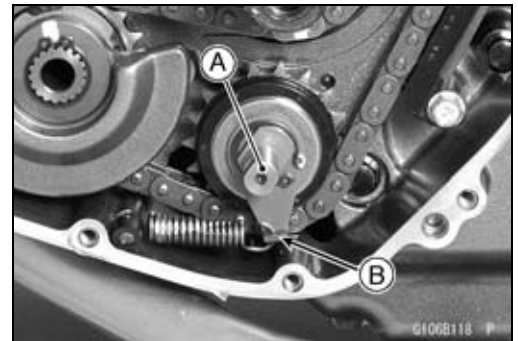
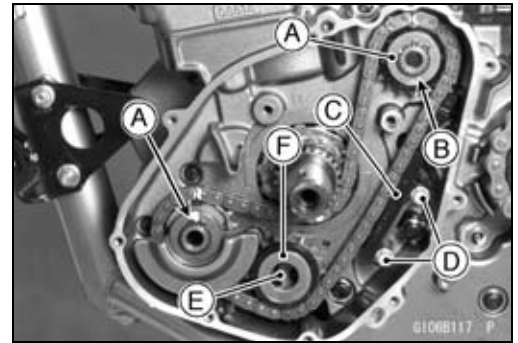


- Engage the balancer chain [A] with the sprockets as shown.
- Fit the single glossy link plate [B] to the sprocket tooth of the punch mark [C] opposite.
- Fit the between glossy plates [D] and tooth of the punch mark [E] on the sprocket.
- Install the left front balancer sprocket with the balancer chain engaged so that the align the punch marks [F] on the balancer and shaft.
- Fit the between glossy plates [G] and tooth of the punch mark [H] on the sprocket.
- Install the rear balancer sprocket so that the align the punch marks [I] on the sprocket and shaft.

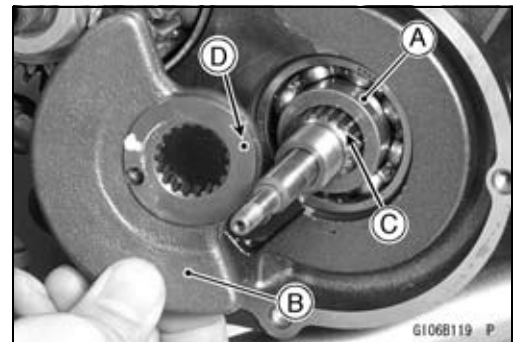


**Balancer**

- Replace the circlips [A] with new ones.
- Install:
  - Washer [B]
  - Circlips
- **Special Tool - Outside Circlip Pliers: 57001-144**
- Install the rear balancer chain guide [C].
- Apply a non-parmanent locking agent to the rear balancer chain guide bolts [D].
- Tighten:
  - Torque - Rear Balancer Chain Guide Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Put the spacer [E] and idle shaft sprocket [F].
- Install the idle shaft [A].
- Hook the spring end [B] to the lever.
- While pushing the lever, hook the other spring end to the crankcase.



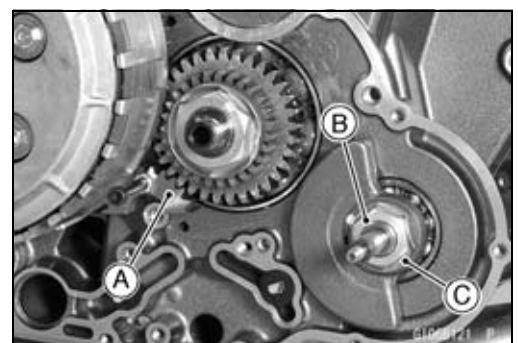
- Install the spacer [A].
- Install the front right balancer weight [B] so that the align the stepped portion [C] on the shaft and punch mark [D] on the balancer weight.



- Replace the washer [A] with a new one.
- Install the washer so that fit the claw [B] and hollow [C] on the balancer weight.



- Using the gear holder [A], tighten the front right balancer weight nut [B].
- **Special Tool - Gear Holder: 57001-1602**
- **Torque - Front Right Balancer Weight Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**
- Bend the one side of the washer [C] on the nut.



## 9-30 CRANKSHAFT/TRANSMISSION

### Bearings/Oil Seals

#### Bearing Replacement

##### NOTICE

**Do not remove the ball bearings unless it is necessary. Removal may damaged them.**

- Remove the ball bearing and/or needle bearing outer race using a press or puller.

##### NOTE

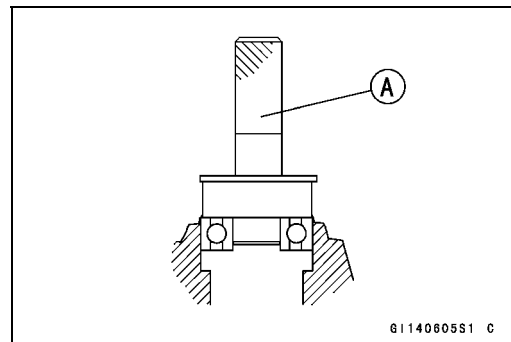
○ *In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max, and tapping the bearing in or out.*

##### NOTICE

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

- Install the new bearing until its outer race stops at the bottom of the case using a press and the bearing driver set [A].

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

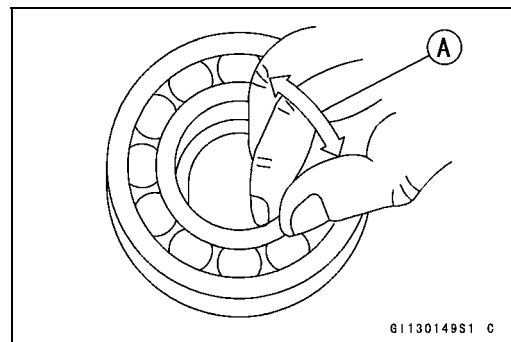


#### Bearing Inspection

##### NOTICE

**Do not remove the bearings for inspection. Removal may damage them.**

- Inspect the ball bearings.
- Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil to it.
- Spin [A] the bearing by hand to check its condition.
- ★ If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.



### Bearings/Oil Seals

---

- Check the needle bearing.
- 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 a needle bearing, replace it.

#### ***Oil Seal Inspection***

- Inspect the oil seal.
- ★ Replace the oil seal if the lips are deformed, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.



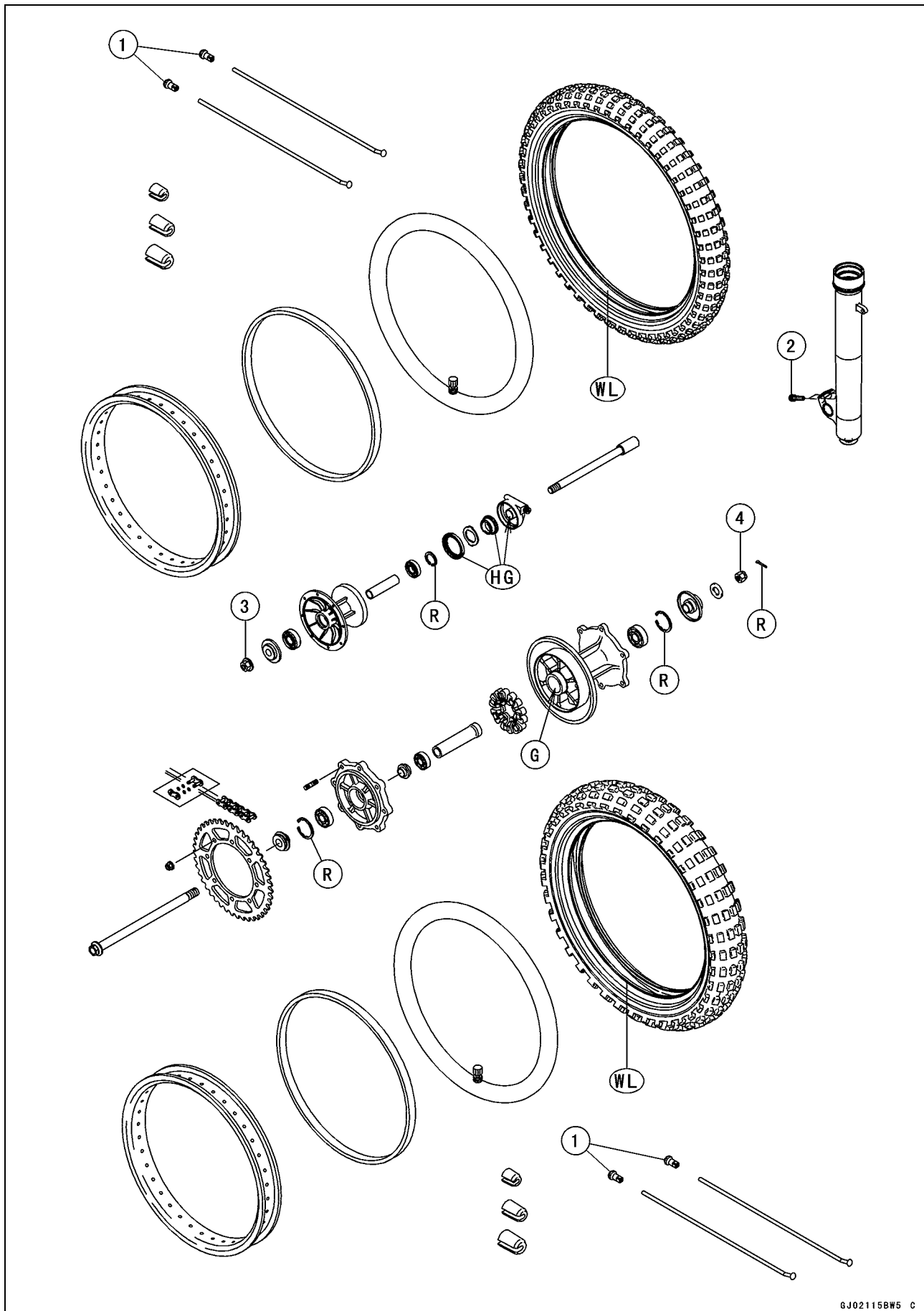
# Wheels/Tires

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# 10-2 WHEELS/TIRES

## Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Spoke Nipples	4.0	0.41	35 in·lb	
2	Front Axle Clamp Bolts	20	2.0	15	
3	Front Axle Nut	88	9.0	65	
4	Rear Axle Nut	98	10	72	

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

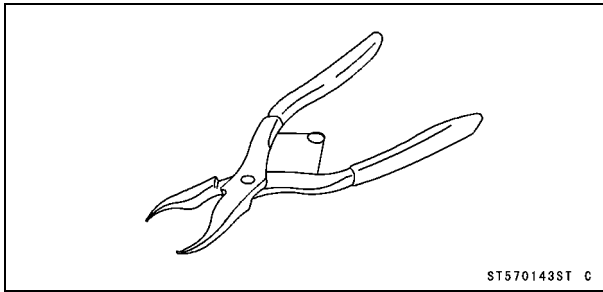
Item	Standard	Service Limit
<b>Wheels (Rims)</b>		
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 2.0 mm (0.08 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 2.0 mm (0.08 in.)
Axle Runout/100 mm (3.94 in.)	TIR 0.03 mm (0.0012 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.35 oz.) or less	— — —
Balance Weights	10 g (0.35 oz.), 20 g (0.71 oz.), 30 g (1.06 oz.)	— — —
Rim Size:		
Front	21 × 1.60	— — —
Rear	17 × 2.50	— — —
<b>Tires</b>		
Air Pressure (When Cold):		
Front	150 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi)	— — —
Rear	Up to 97.5 kg (215 lb) load: 150 kPa (1.5 kgf/cm <sup>2</sup> , 21 psi) 97.5 ~ 182.0 kg (215 ~ 401 lb) load: 200 kPa (2.0 kgf/cm <sup>2</sup> , 28 psi)	— — —
Tread Depth:		
Front	6.4 mm (0.25 in.) (AU) 6.9 mm (0.27 in.)	2 mm (0.08 in.) 2 mm (0.08 in.)
Rear	8.8 mm (0.35 in.)	2 mm (0.08 in.)
Standard Tires:	Make, Type	Size
Front	DUNLOP, K750 (AU) DUNLOP, TRAIL MAX	90/90-21 M/C 54S 90/90-21 M/C 54S
Rear	DUNLOP, K750 (AU) DUNLOP, TRAIL MAX	130/80-17 M/C 65S 130/80-17 M/C 65S

### **WARNING**

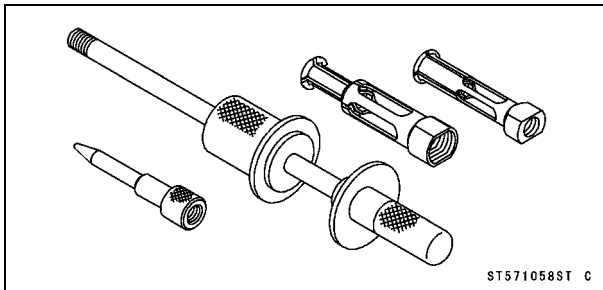
**Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.**

Special Tools

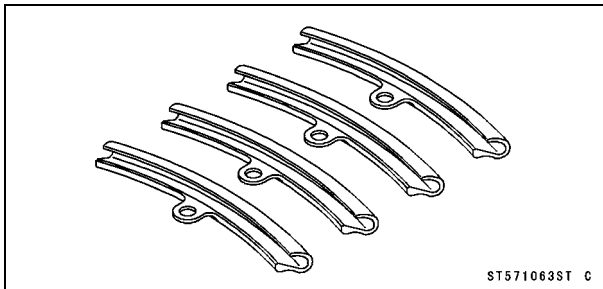
Inside Circlip Pliers:  
57001-143



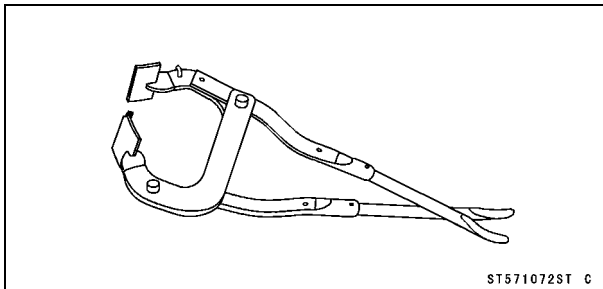
Oil Seal & Bearing Remover:  
57001-1058



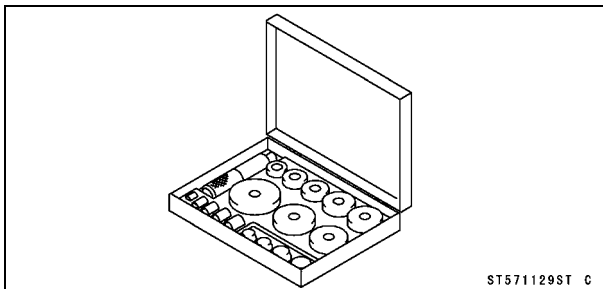
Rim Protector:  
57001-1063



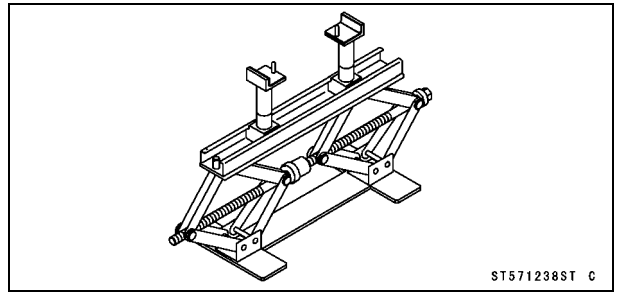
Bead Breaker Assembly:  
57001-1072



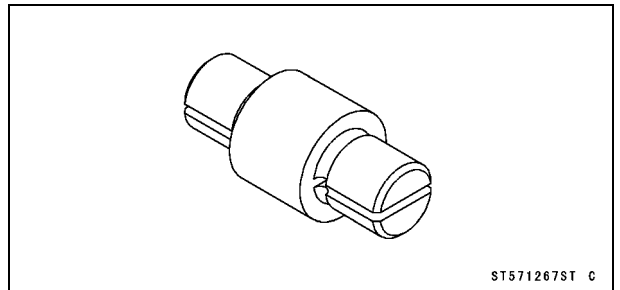
Bearing Driver Set:  
57001-1129



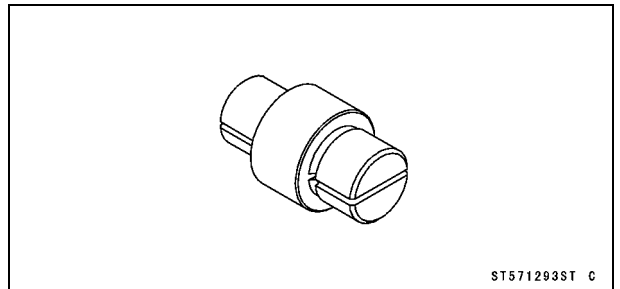
Jack:  
57001-1238



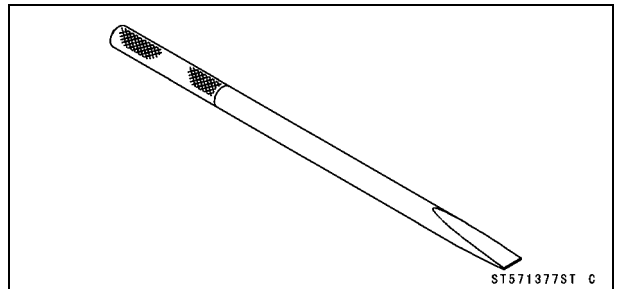
Bearing Remover Head,  $\phi 15 \times \phi 17$ :  
57001-1267



Bearing Remover Head,  $\phi 20 \times \phi 22$ :  
57001-1293



Bearing Remover Shaft,  $\phi 13$ :  
57001-1377

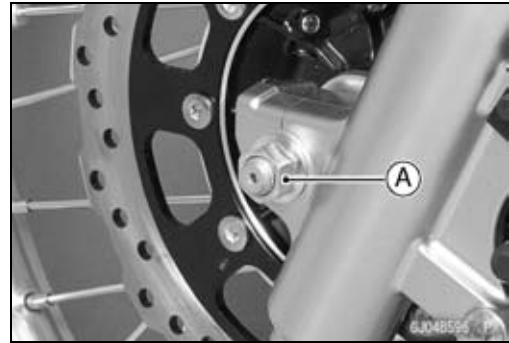


## 10-6 WHEELS/TIRES

### Wheels (Rims)

#### *Front Wheel Removal*

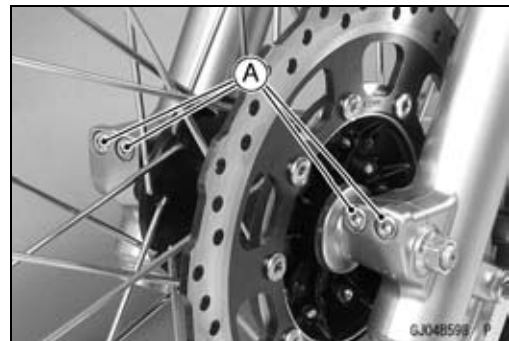
- Loosen the front axle nut [A].



- Remove the speedometer cable lower end [A].



- Loosen the front axle clamp bolts [A].
- Raise the front wheel off the ground with jack.  
**Special Tool - Jack: 57001-1238**
- Pull out the axle to the right and drop the front wheel out of the forks.



#### **NOTICE**

**Do not lay the front 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.**

#### *Front Wheel Installation*

- Install the speedometer gear housing so that its projections [A] fit into the gear drive notches [B] in the wheel hub.

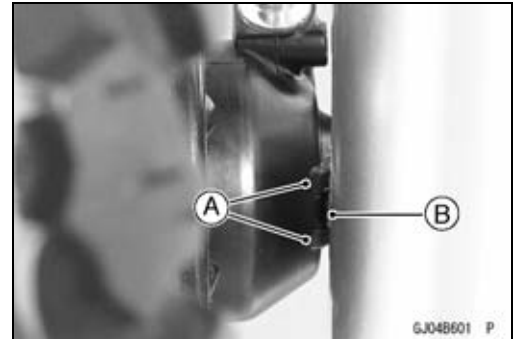


## Wheels (Rims)

- Fit the collar [A] on the wheel hub [B].



- Fit the speedometer gear housing stop [A] to the fork leg projection [B].



- Insert the front axle, and tighten the axle nut.  
**Torque - Front Axle Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)**
- Before tightening the axle clamp bolts on the right front fork leg, pump the front fork up and down 4 or 5 times to all on the right front fork leg to seat on the front axle.

### NOTE

○Put a block in front of the front wheel to stop moving.

- Tighten the axle clamp bolts on the right fork leg first. Next, tighten the left axle clamp bolts.

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

### NOTE

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

- Install the speedometer cable lower end.
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

### **⚠ WARNING**

**After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.**

## 10-8 WHEELS/TIRES

### Wheels (Rims)

#### Rear Wheel Removal

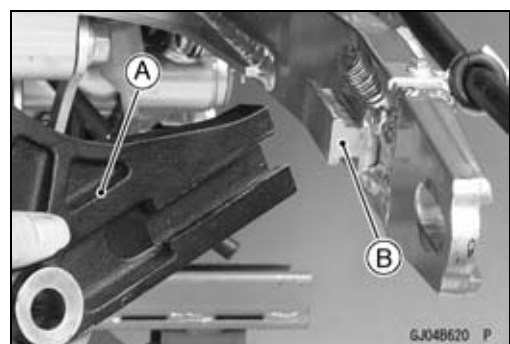
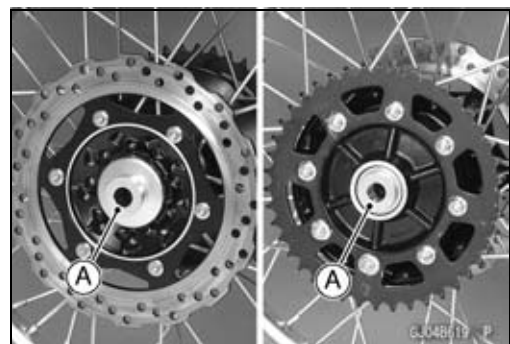
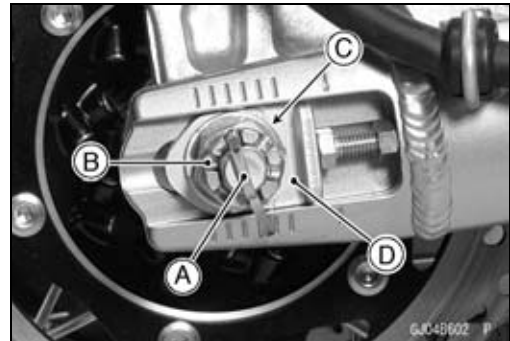
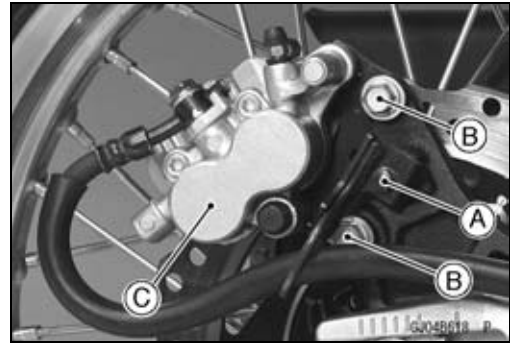
- Remove:
  - Brake Hose Clamp Bolt [A]
  - Brake Caliper Mounting Bolts [B]
  - Rear Brake Caliper [C]
- Remove the cotter pin [A] and loosen the rear axle nut [B].
- Raise the rear wheel off the ground with jack.  
**Special Tool - Jack: 57001-1238**
- Remove:
  - Rear Axle Nut and Washer [C]
  - Asjuster [D]
- Pull out the rear axle to the right and drop the rear wheel.
- Remove the drive chain [A], and hang the chain on the swingarm.
- Move the rear wheel back and remove it.

#### NOTICE

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.

#### Rear Wheel Installation

- Fit the collars [A] on the both sides of the hub.
- Install the caliper bracket [A] onto the stopper [B] of the swingarm.
- Engage the drive chain with the rear sprocket.
- Insert the axle from the right side of the wheel.
- Adjust the drive chain slack before tightening the axle nut (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
- Tighten:  
**Torque - Rear Axle Nut: 98 N·m (10 kgf·m, 72 ft·lb)**

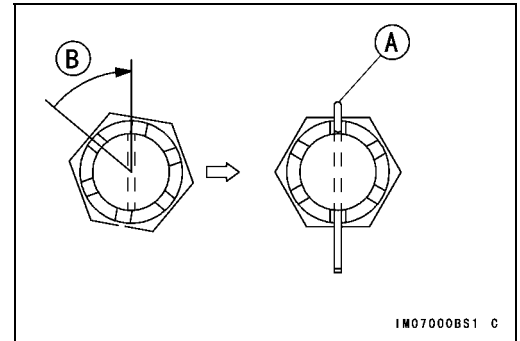


## Wheels (Rims)

- Insert a new cotter pin [A].

### NOTE

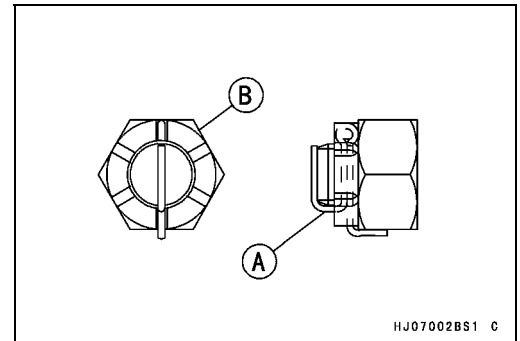
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30 degrees.
- Loosen once and tighten again when the slot goes past the nearest hole.



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

### **⚠ WARNING**

**A loose axle nut can lead to an accident resulting in serious injury or death. Tighten the axle nut to the proper torque and install a new cotter pin.**



- Install the rear brake caliper (see Caliper Installation in the Brakes chapter).
- Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

### **⚠ WARNING**

**After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.**

### **Wheel Inspection**

- Raise the front or rear wheel and turn it by hand to check that it turns smoothly without making a noise.

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

- ★ If any abnormal condition is found, replace the hub bearing.

### **Spoke Inspection**

- Refer to the Spoke Tightness and Rim Runout Inspection in the Periodic Maintenance chapter.

### **Rim Inspection**

- Refer to the Spoke Tightness and Rim Runout Inspection in the Periodic Maintenance chapter.

## 10-10 WHEELS/TIRES

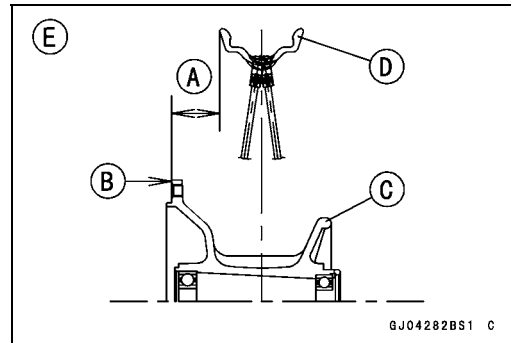
### Wheels (Rims)

#### Rim Installation Position

- When installing the rim, set the rim following position.
- The distance [A] from the brake disc seating surface [B] of the front hub [C] to left end of the front rim [D] should be as follows.

View from Rear [E]

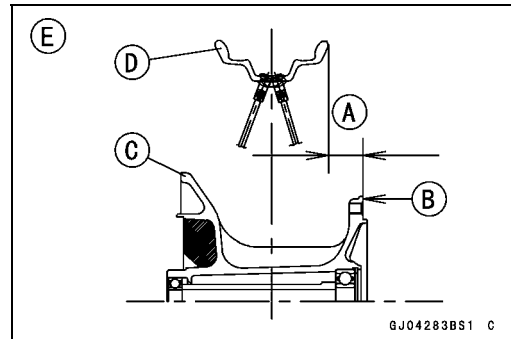
Distance:  $31.75 \pm 0.5$  mm ( $1.25 \pm 0.020$  in.)



- The distance [A] from the brake disc seating surface [B] of the rear hub [C] to right end of the rear rim [D] should be as follows.

View from Rear [E]

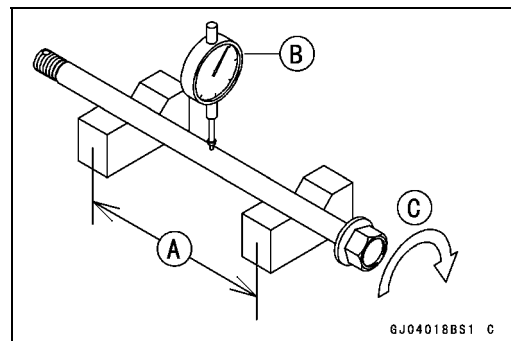
Distance:  $25.25 \pm 0.5$  mm ( $0.99 \pm 0.020$  in.)



- Check the rim runout (see Rim Runout Inspection in the Periodic Maintenance chapter).

#### Axle Inspection

- Remove the axle (see Front/Rear Wheel Removal).
- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle on the 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 gauge reading is the amount of runout.
- ★ If the axle runout exceeds the service limit, replace the axle.



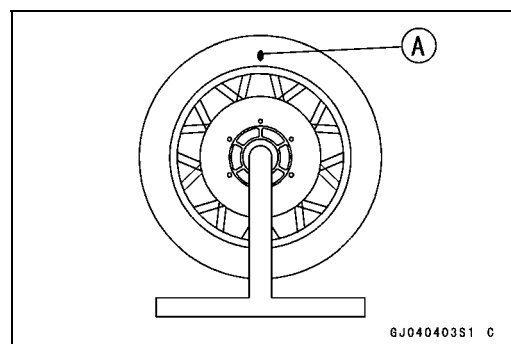
#### Axle Runout/100 mm (3.94 in.)

Standard: TIR 0.03 mm (0.0012 in.) or less

Service Limit: TIR 0.2 mm (0.008 in.)

#### Balance Inspection

- Remove the wheel (see Front/Rear Wheel Removal).
- Support the wheel on a wheel balancer 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 always stops in different position, it is balanced.
- ★ If the wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).

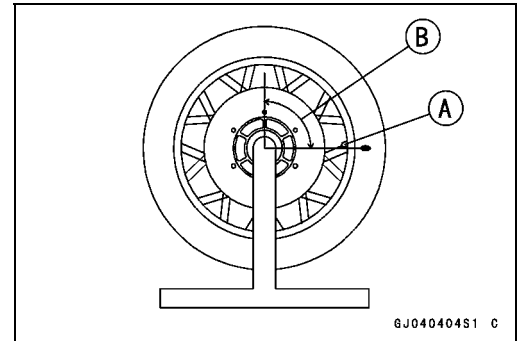




**Wheels (Rims)**

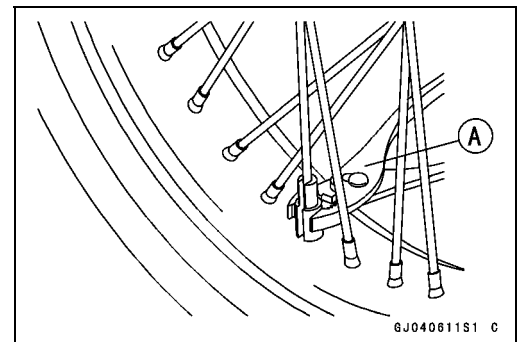
**Balance Adjustment**

- If the wheel always stops in one position, provisionally attach a balance weight [A] on the spoke at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the 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.
  
- Once proper balance has been achieved, permanently install the balance weight using a pliers [A].



**Balance Weight**

Part Number	Weight
41075-0011	10 g (0.35 US oz.)
41075-0012	20 g (0.71 US oz.)
41075-0013	30 g (1.06 US oz.)



**NOTE**

- Balance weights are available from Kawasaki dealers in 10, 20 g (0.35, 0.71 US oz.), and 30 g (1.06 US oz.) sizes. An imbalance of less than 10 grams (0.35 US oz.) will not usually affect running stability.
- Do not use four or more balance weight (more than 90 gram (3.17 US oz.)). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.

## 10-12 WHEELS/TIRES

### 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 the wheel (see Front/Rear Wheel Removal).

#### **NOTICE**

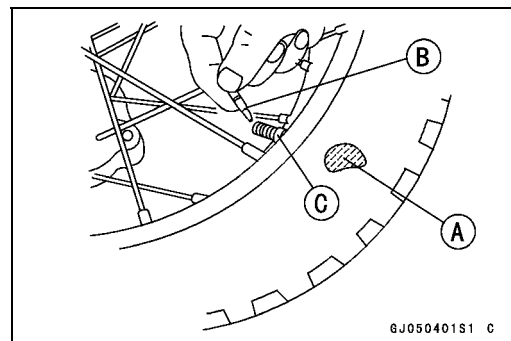
**Do not lay the front wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

- To maintain wheel balance, mark the air valve 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]



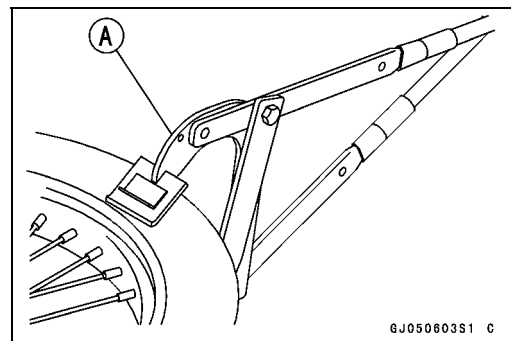
- Remove the air valve nut.
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

#### **NOTICE**

**Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.**

- Break the beads away from both sides of the rim with the bead breaker [A].

**Special Tool - Bead Breaker Assembly: 57001-1072**



**Tires**

- Step on the side of the tire opposite air valve, and pry the tire off the rim with the tire iron [B] of the bead breaker protecting the rim with rim protectors [A].

**Special Tools - Rim Protector: 57001-1063**

**Bead Breaker Assembly: 57001-1072**

**NOTICE**

**Take care not to insert the tire irons so deeply that the tube gets damaged.**

- Remove the tube when one side of the tire is pried off.
- Pry the tire off the rim.
- Remove the rim protector.

**Tire Installation**

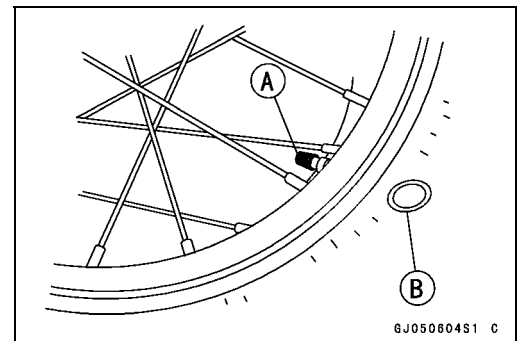
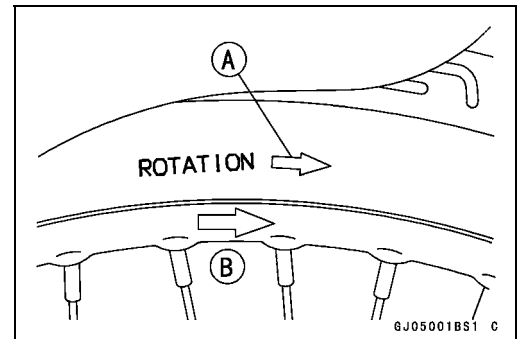
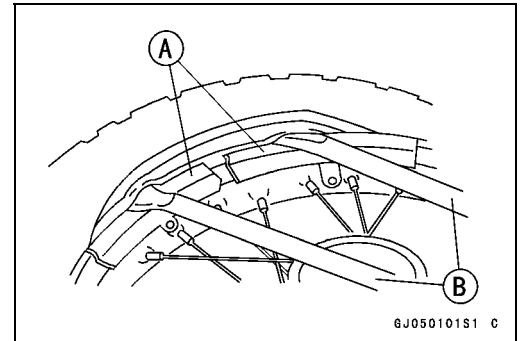
- Inspect the rim and the tire before installing the tire, and replace them if necessary.
- Apply a soap and water solution or rubber lubricant to both the tire bead and the rim flange.
- Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

Rotation Direction [A]

Tire Rotation Mark [B]

- Install the tire in the reverse order of removal.
- Position the tire on the rim so that the air valve [A] is at the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
- Adjust the air pressure to the specified pressure (see Air Pressure Inspection in the Periodic Maintenance chapter).
- Tighten the air valve nut securely.

- Install the air valve cap.
- Adjust the wheel balance.



# 10-14 WHEELS/TIRES

## Hub Bearing

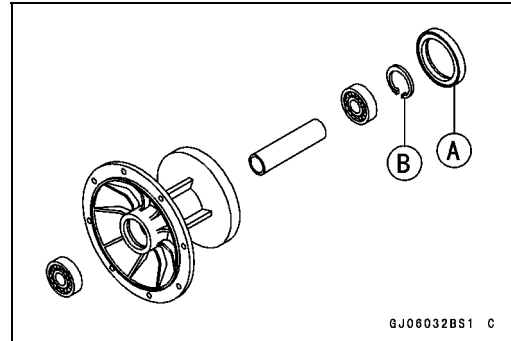
### Hub Bearing Removal

- Remove the wheel (see Front/Rear Wheel Removal), and take out the following.

#### Front

- Grease Seal [A]
- Circlip [B]

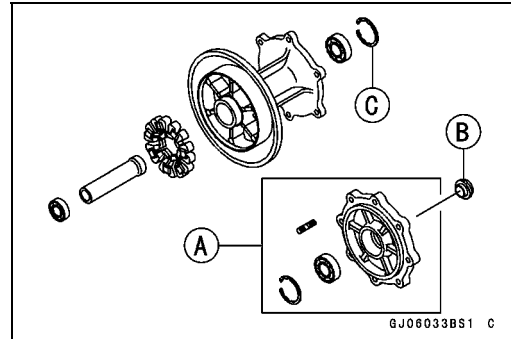
Special Tool - Inside Circlip Pliers: 57001-143



#### Rear

- Coupling [A]
- Collar [B]
- Circlip [C]

Special Tool - Inside Circlip Pliers: 57001-143

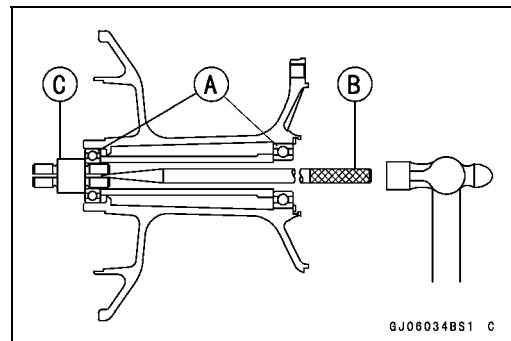


- Use the bearing remover to remove the hub bearings [A].

### NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.

- Special Tools - Bearing Remove Shaft: 57001-1377 [B]  
Bearing Remover Head,  $\phi 15 \times \phi 17$ : 57001-1267 [C]  
Bearing Remover Head,  $\phi 20 \times \phi 22$ : 57001-1293  
Oil Seal & Bearing Remover: 57001-1058



## Hub Bearing

### 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 front hub bearings in the following sequence.
  - Press in the left side bearing [A] until it is bottomed.

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

- Insert the collar [B] in the hub [C].
- Press in the right side bearing [D] until it is bottomed.

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

- Install the rear hub bearings in the following sequence.
  - Press in the right side bearing until it is bottomed.

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

- Insert the collar in the hub.
- Press in the left side bearing until it is bottomed.

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

### NOTE

- *Install the bearings so that the marked side or sealed side faces out.*

- Replace the circlips with new ones.

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

### 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.*

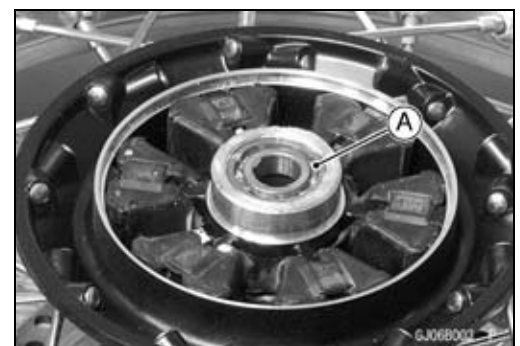
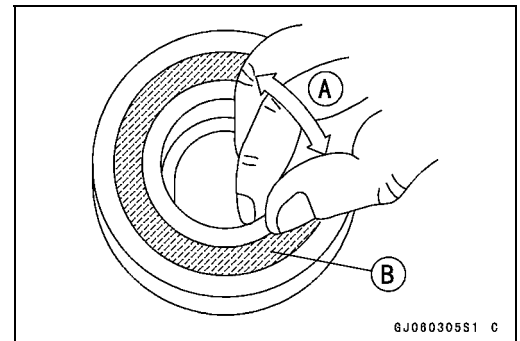
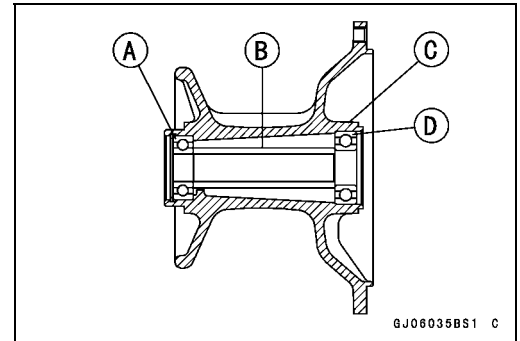
- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.

### Hub Bearing Lubrication

- Clean and grease the rear hub bearing [A] of left side.

### NOTE

- *Since the other hub bearings are packed with grease and sealed, lubrication is not required.*



## 10-16 WHEELS/TIRES

### Speedometer Gear

---

#### *Disassembly and Assembly*

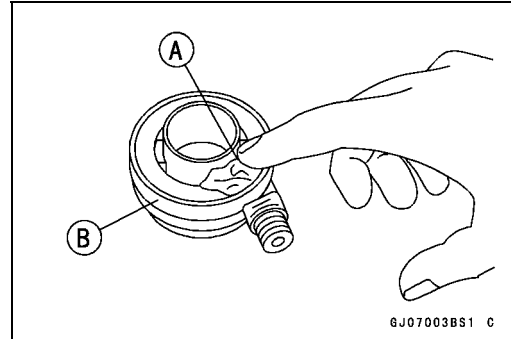
#### **NOTE**

○ *It is recommended that the assembly be replaced rather than attempting to repair the components.*

- Install the speedometer gear so that it fits in the speedometer gear drive notches (see Front Wheel Installation).

#### **Lubrication**

- Clean and grease [A] the speedometer gear housing [B] in accordance with the Periodic Maintenance chapter.



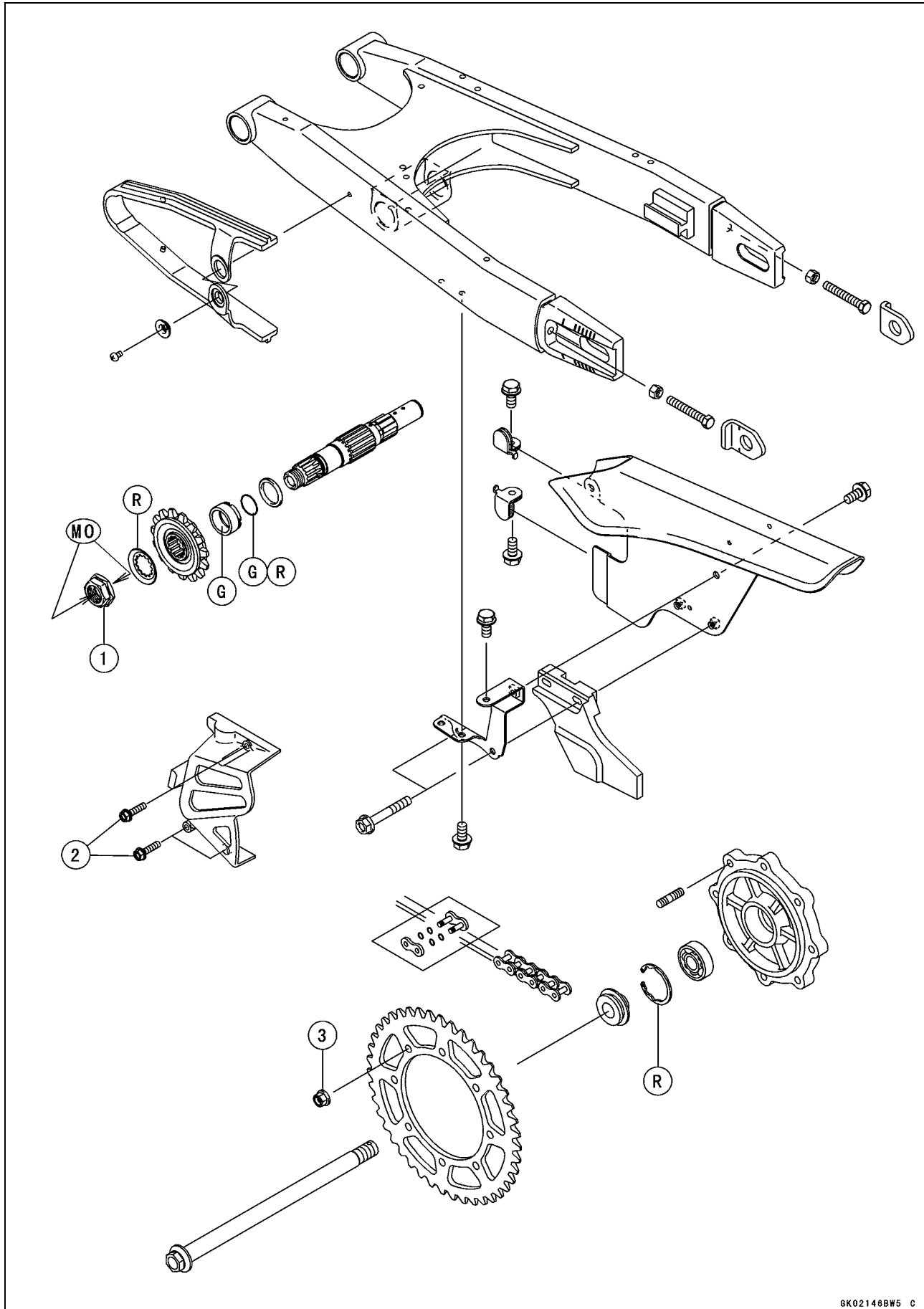
# Final Drive

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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 Nut	98	10	72	MO
2	Engine Sprocket Cover Bolts	8.8	0.90	78 in·lb	
3	Rear Sprocket Nuts	32	3.3	24	

G: Apply 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

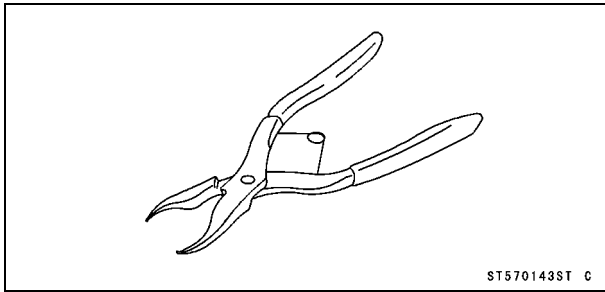
## 11-4 FINAL DRIVE

### Specifications

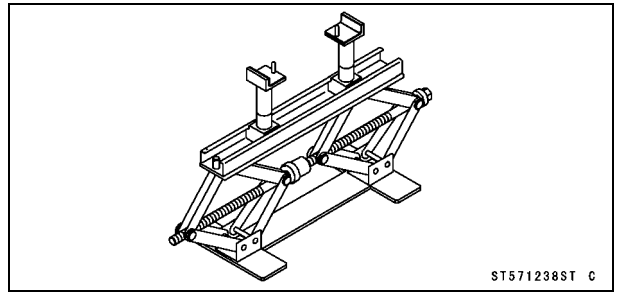
Item	Standard	Service Limit
<b>Drive Chain</b>		
Chain Slack	35 ~ 45 mm (1.4 ~ 1.8 in.)	---
20-link Length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	ENUMA (KL650E8 ~ EA) DAIDO (KL650EB ~ EC)	---
Type	EK525SR-O <sub>2</sub> (KL650E8 ~ EA) DID520VP2 (KL650EB ~ EC)	---
Link	106 links	---
<b>Sprockets</b>		
Rear Sprocket Runout	0.4 mm (0.016 in.) or less	0.5 mm (0.020 in.)

**Special Tools**

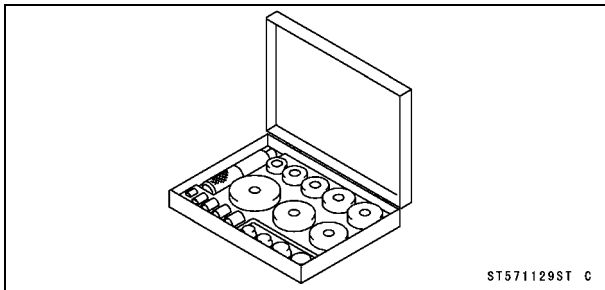
**Inside Circlip Pliers:**  
**57001-143**



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



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



## 11-6 FINAL DRIVE

### Drive Chain

#### **Drive Chain Slack Inspection**

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

#### **Drive Chain Slack Adjustment**

- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

#### **Wheel Alignment Inspection/Adjustment**

- Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

#### **Drive Chain Wear Inspection**

- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

#### **Drive Chain Lubrication**

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

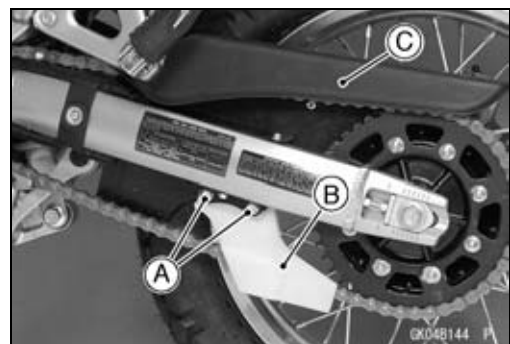
#### **Drive Chain Guide Wear Inspection**

- Refer to the Drive Chain Guide Wear Inspection in the Periodic Maintenance chapter.

#### **Drive Chain Removal**

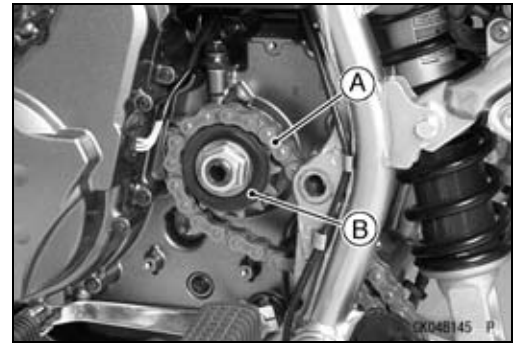
- Remove the chain cover bolt [A].

- Remove:
  - Rear Chain Guide Bolts [A]
  - Rear Chain Guide [B]
  - Chain Cover [C]



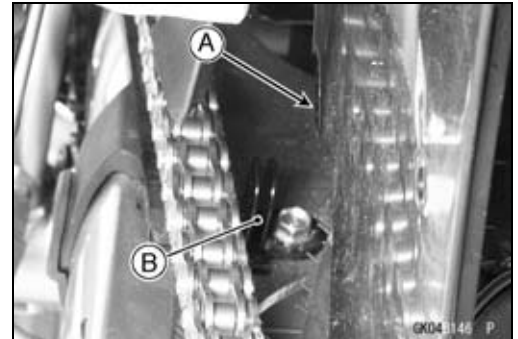
## Drive Chain

- Remove:
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  - Swingarm (see Swingarm Removal in the Suspension chapter).
  - Engine Sprocket Cover (see Engine Sprocket Removal)
- Disengage the drive chain [A] from the engine sprocket [B], and pull out the drive chain backward.



### Drive Chain Installation

- Engage the drive chain with the engine sprocket.
- Install:
  - Engine Sprocket Cover (see Engine Sprocket Installation)
  - Swingarm (see Swingarm Removal in the Suspension chapter).
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
- Insert the edge [A] of the chain cover into the chain cover stopper [B].
- Adjust the chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



### Drive Chain Replacement (KL650E8 ~ EA)

#### NOTE

○ Since the drive chain is installed through the swingarm, the chain can not be replaced other than by cutting it. Prepare the new link pin, link plate, grease seals, and tools for rejoining the chain.

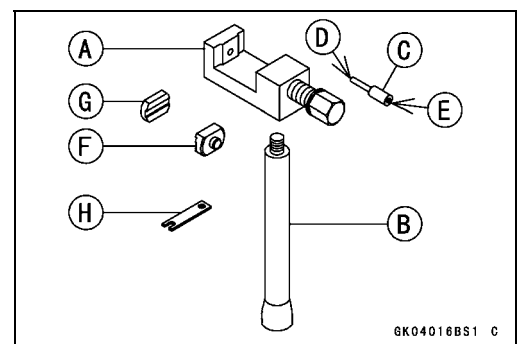
- Remove:
  - Engine Sprocket Cover (see Engine Sprocket Removal)
  - Chain Cover (see Drive Chain Removal)
- Using a suitable tool, cut the drive chain by removing the link pins.

**Recommended Tool: EK Joint Tool #50**

#### NOTICE

**Read the Tool Manual before removing.**

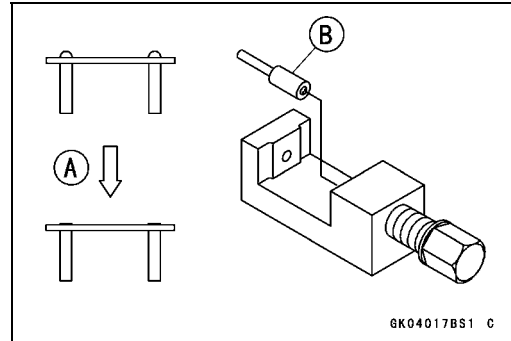
- Body [A]
- Handlebar [B]
- Cutting and Riveting Pin [C]
- For Cutting [D]
- For Riveting [E]
- Plate Holder (a) [F]
- Plate Holder (b) [G]
- Gauge [H]



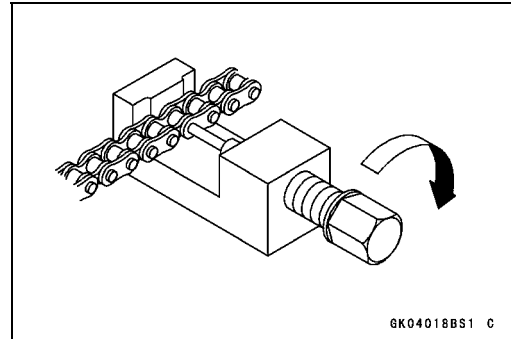
## 11-8 FINAL DRIVE

### Drive Chain

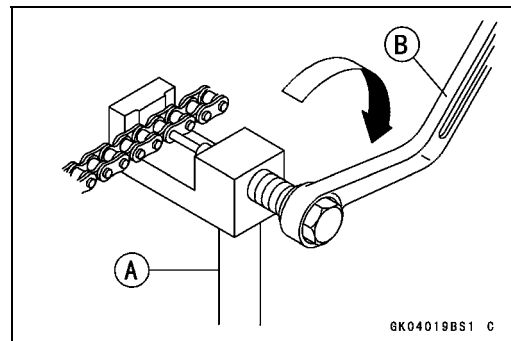
- Grind [A] the pin head to make it flat.
- Set the cutting and riveting pin [B] as shown.



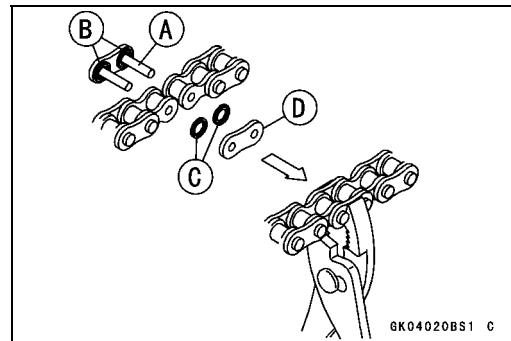
- Screw the pin holder until it touches chain pin.
- Be sure that the cutting pin hits center of chain pin.



- Screw the handlebar [A] into body.
- Turn the pin holder with wrench [B] clockwise to extract chain pin.

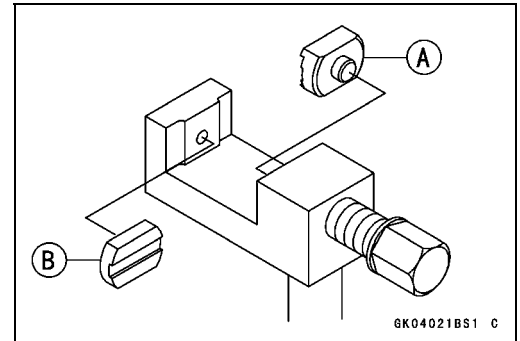


- Engage the new drive chain to the old drive chain and pull the end of the old drive chain until they are changing the position.
- Remove the old drive chain from the new drive chain.
- Apply grease to the link pins [A] and grease seals [B] [C].
- Engage the drive chain on the rear sprocket through the swingarm.
- Insert the link pins in the drive chain ends.
- Install the grease seals [C].
- Install the link plate so that the mark [D] faces out.
- Push the link plate by hand or plier to fix it.
- In case of grease seal chain, be sure to set the grease seals correctly.

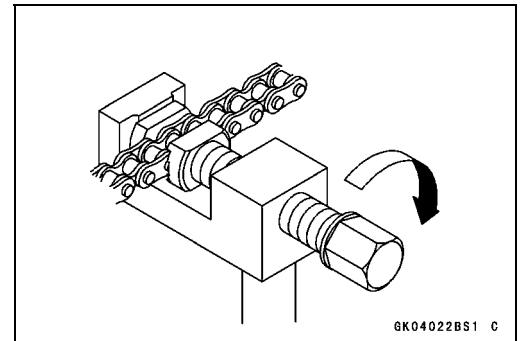


Drive Chain

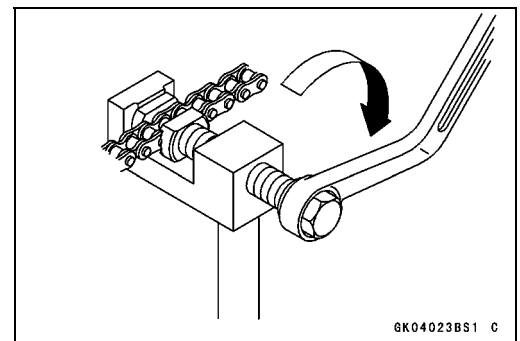
- Set the plate holder (a) [A] and plate holder (b) [B] on the body.



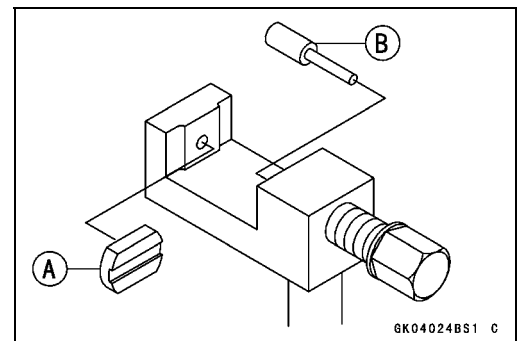
- Fit the plate holder (a) to link plate.
- Turn the pin holder by hand until plate holder (b) touches the other link plate.



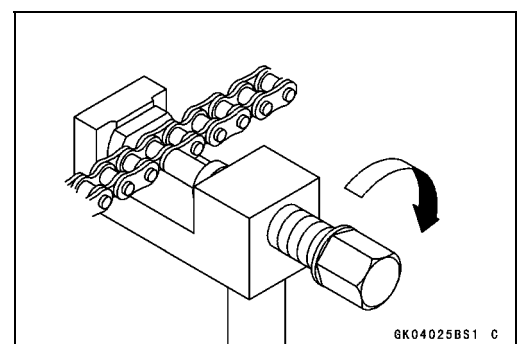
- Turn the pin holder by wrench clockwise until two pins of link come into groove of plate holder (a).
- Take off the plate holder (a).



- Set the plate holder (b) [A] and cutting and riveting pin [B] as shown.



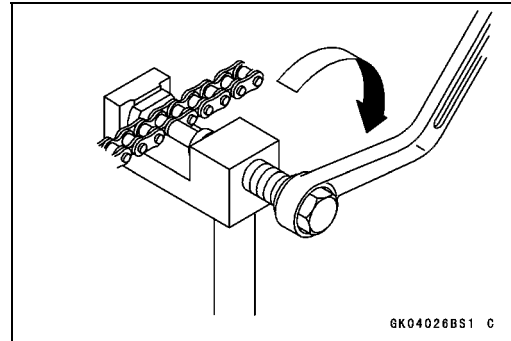
- Turn the pin holder until riveting pin touches link pin.



## 11-10 FINAL DRIVE

### Drive Chain

- 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].

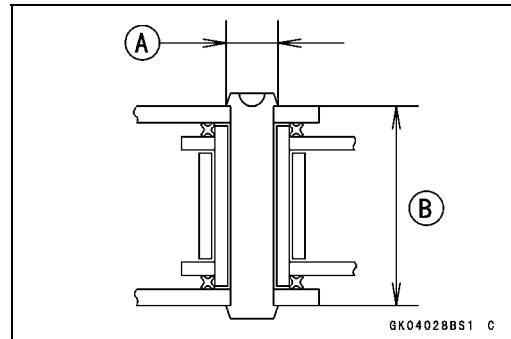
#### Link Pin Outside Diameter

Standard: 5.3 ~ 5.7 mm (0.21 ~ 0.22 in.)

#### Link Plates Outside Width

Standard: 17.35 ~ 17.50 mm (0.683 ~ 0.689 in.)

- ★ If the reading exceeds the specified length, cut and rejoin the chain again.
- Check the movement of the rollers.
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



### Drive Chain Replacement (KL650EB ~ EC)

#### NOTE

○ Since the drive chain is installed through the swingarm, the chain can not be replaced other than by cutting it. Prepare the new link pin, link plate, grease seals, and tools for rejoining the chain.

- Remove:
  - Engine Sprocket Cover (see Engine Sprocket Removal)
  - Chain Cover (see Drive Chain Removal)
- Using a suitable tool, cut the drive chain by removing the link pins.

Recommended Tool - DID Chain Joint "ZJ"  
Make DAIDO KOGYO

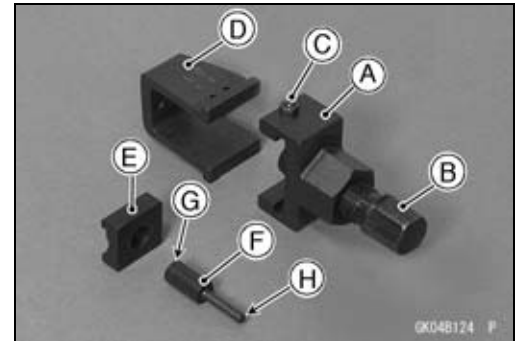
#### NOTICE

Read the Tool Manual before replacing the chain.

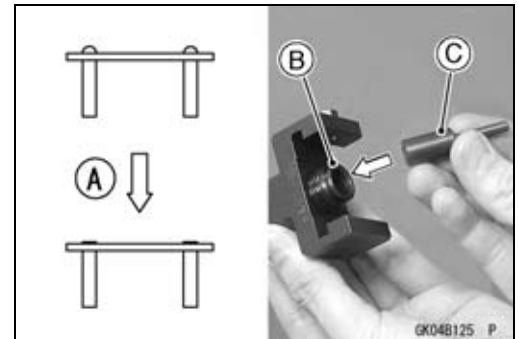


**Drive Chain**

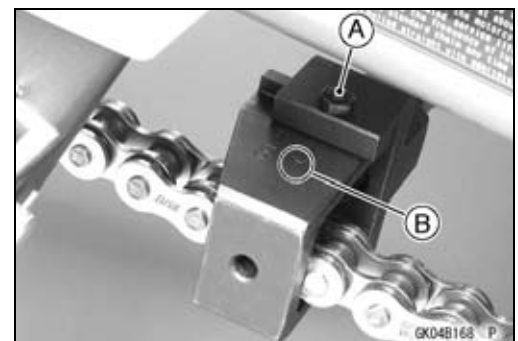
- Remove:
  - Body [A]
  - Pin Holder [B]
  - Positioning Pin [C]
  - “U” Holder [D]
  - Plate Holder [E]
  - Cutting and Riveting Pin [F]
  - Part for Riveting [G]
  - Part for Cutting [H]



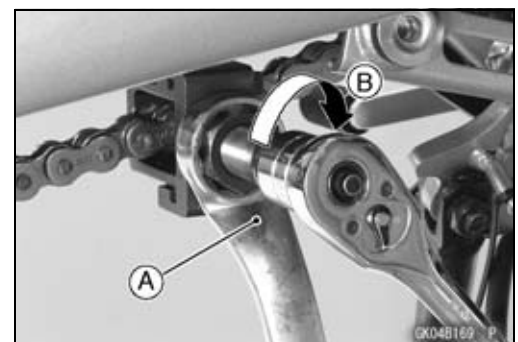
- Grind [A] the heads of the link pin to make it flat.
- Set the cutting and riveting pin [C] in the pin holder [B] as shown in the figure.



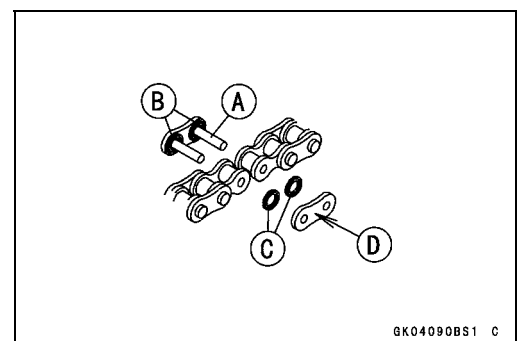
- Set the “U” holder and body, align the positioning pin [A] with the “A mark” [B].
- Tighten the pin holder by hand until the cutting and riveting pin touches the link pin.
- Be sure that the cutting and riveting pin hits center of the link pin.



- Hold the body with a wrench [A].
- Turn the pin holder clockwise [B] with another wrench, and remove the link pin.
- Do the same procedure for removal of the other link pin.



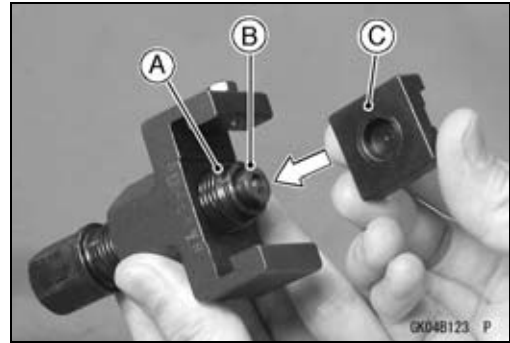
- Engage the new drive chain to the old drive chain, and change the position of the chains by pulling the old chain.
- Remove the old drive chain from the new drive chain.
- Replace the link pin [A], link plate and grease seals [B] [C] with new ones.
- Apply grease to the link pin and grease seals.
- Install the grease seals on the link pin and insert it in the ends of the drive chain.
- Install the link plate so that the mark [D] faces out.



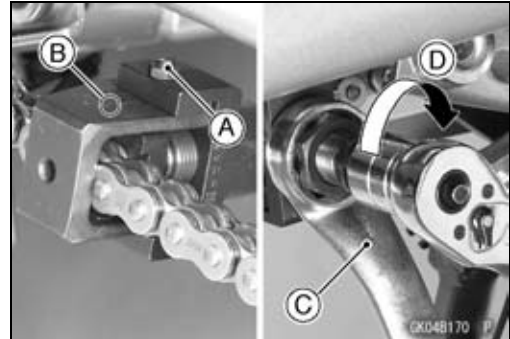
# 11-12 FINAL DRIVE

## Drive Chain

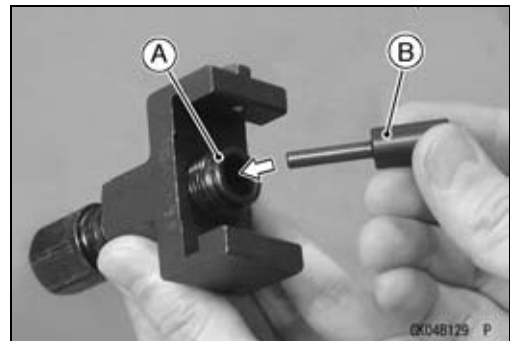
- Set the cutting and riveting pin [B] and plate holder [C] on the pin holder [A] as shown in the figure.



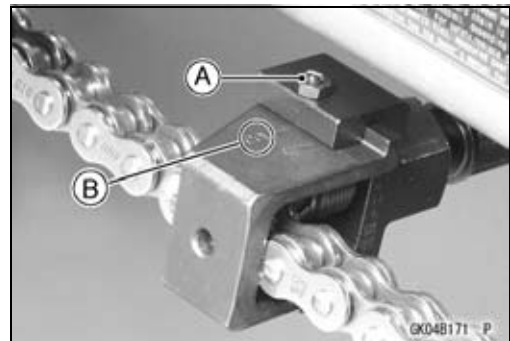
- Set the “U” holder and body, align the positioning pin [A] with the “A mark” [B].
- Hold the body with a wrench [C].
- Turn the pin holder clockwise [D] with another wrench and press in the link plate on the link pin.
- Remove the “U” holder and body.



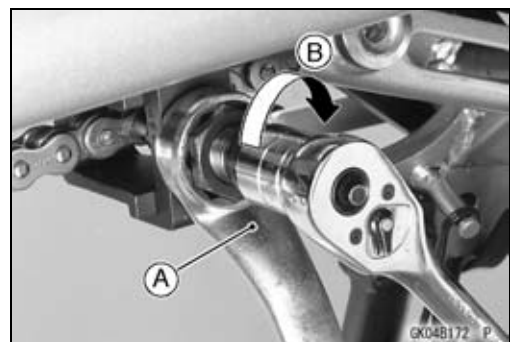
- Set the cutting and riveting pin [B] in the pin holder [A] as shown in the figure.



- Set the “U” holder and body, align the positioning pin [A] with the “B mark” [B].
- Tighten the pin holder by hand until the cutting and riveting pin touches the link pin.



- Hold the body with a wrench [A].
- Turn the pin holder clockwise [B] with another wrench until the cutting and riveting pin touches the link plate.
- Do the same procedure for removal of the other link pin.



## Drive Chain

- After riveting, check the ends of the riveted pins for cracks.
- Measure the outside diameter [A] of the link pin and width [B] of the link plates.

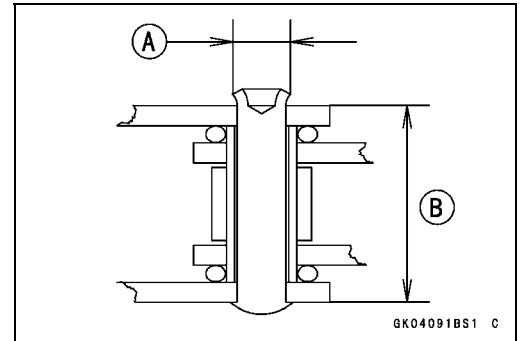
### Link Pin Outside Diameter

Standard: 5.7 ~ 6.0 mm (0.22 ~ 0.24 in.)

### Link Plate Outside Width

Standard: 17.25 ~ 17.55 mm (0.679 ~ 0.691 in.)

- ★ If the reading is not the specified length, cut and rejoin the chain again.
- Check that the rollers move smoothly.
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

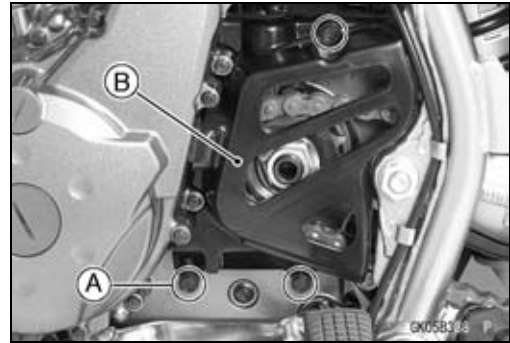


## 11-14 FINAL DRIVE

### Sprocket, Coupling

#### Engine Sprocket Removal

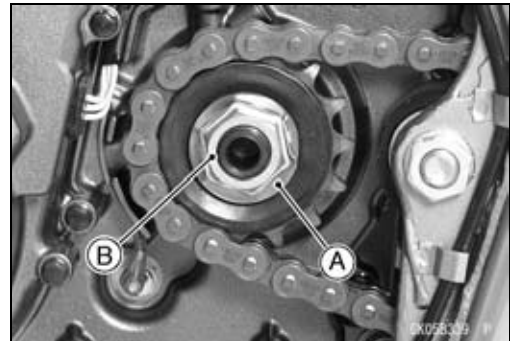
- Remove:
  - Engine Sprocket Cover Bolts [A]
  - Engine Sprocket Cover [B]



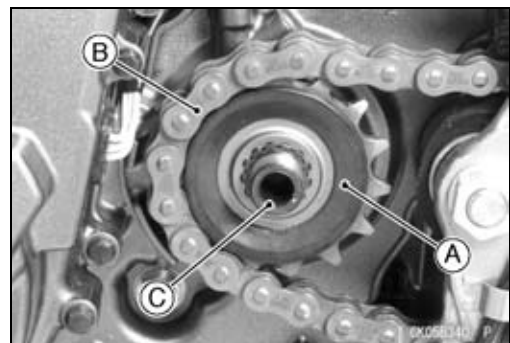
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

#### NOTE

○When loosening the engine sprocket nut, hold the rear brake on.

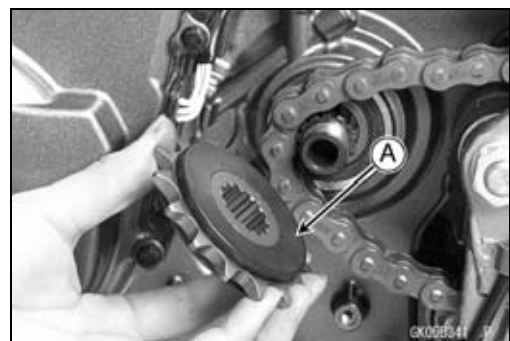


- Raise the rear wheel off the ground with jack.
  - Special Tool - Jack: 57001-1238**
- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Remove the chain cover (see Chain Removal).
- Remove the drive chain from the rear sprocket toward the right.
- Pull the engine sprocket [A] with drive chain [B] off the output shaft [C].
- Disengage the drive chain from the engine sprocket.



#### Engine Sprocket Installation

- Replace the sprocket washer with a new one.
- Install the engine sprocket so that flatten side [A] faces inside.
- Apply molybdenum disulfide oil solution to the threads of the output shaft and seating surface of the engine sprocket nut.
- Tighten:
  - Torque - Engine Sprocket Nut: 98 N·m (10 kgf·m, 72 ft·lb)**



#### NOTE

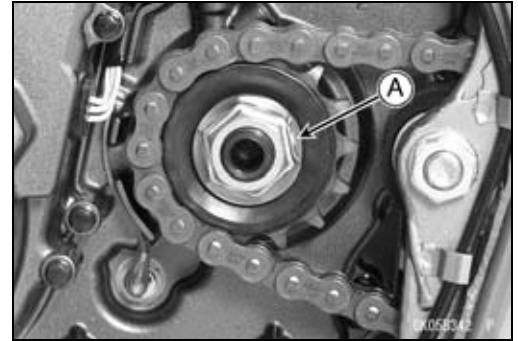
○Tighten the engine sprocket nut while applying the rear brake.

## Sprocket, Coupling

- After tightening the engine sprocket nut, bend [A] the one side of the washer over the nut.
- Install the engine sprocket cover.

**Torque - Engine Sprocket Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

- Adjust the drive chain slack after installing the sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

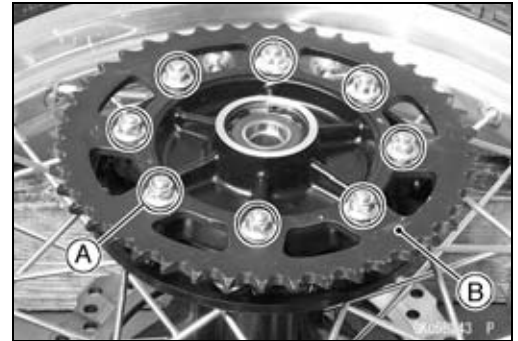


### Rear Sprocket Removal

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

#### NOTICE

**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.**



- Remove:
  - Rear Sprocket Nuts [A]
  - Rear Sprocket [B]

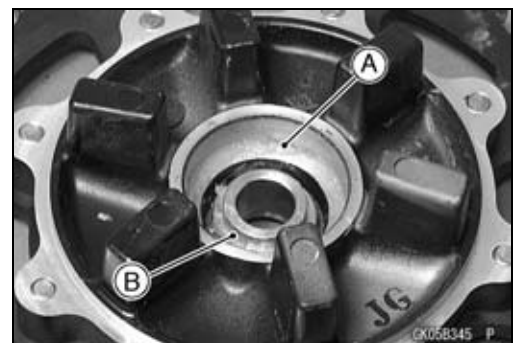
### Rear Sprocket Installation

- Install the sprocket facing the tooth number marking [A] outward.
- Tighten the rear sprocket nuts.
  - Torque - Rear Sprocket Nuts: 32 N·m (3.3 kgf·m, 24 ft·lb)**
- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).



### Coupling Installation

- Apply grease to the coupling internal surface [A].
- Install the collar [B].



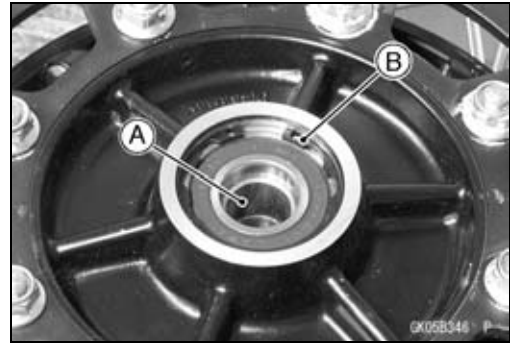
## 11-16 FINAL DRIVE

### Sprocket, Coupling

#### **Coupling Bearing Removal**

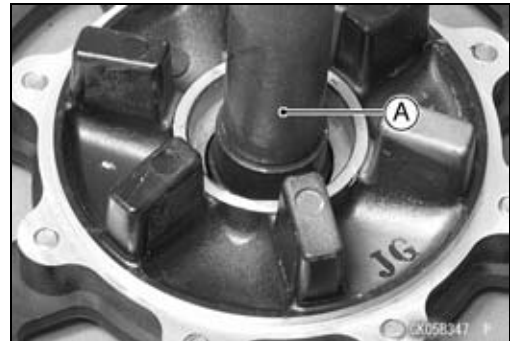
- Remove:
  - Coupling
  - Collar [A] (from inside)
  - Circlip [B]

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



- Remove the bearing by tapping from the wheel side.

**Special Tool - Bearing Driver Set [A]: 57001-1129**



#### **Coupling Bearing Installation**

- Replace the bearing with a new one.
- Press in the bearing until it is bottomed.

**Special Tool - Bearing Driver Set [A]: 57001-1129**

- Replace the circlip with a new one.

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



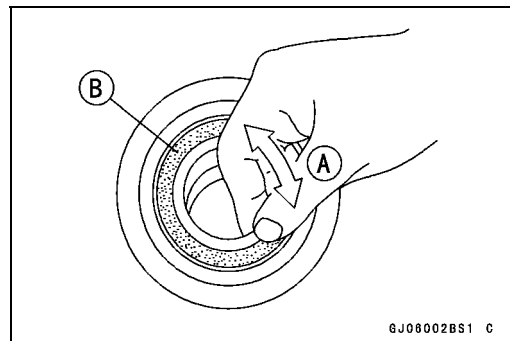
#### **Coupling Bearing Inspection**

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**

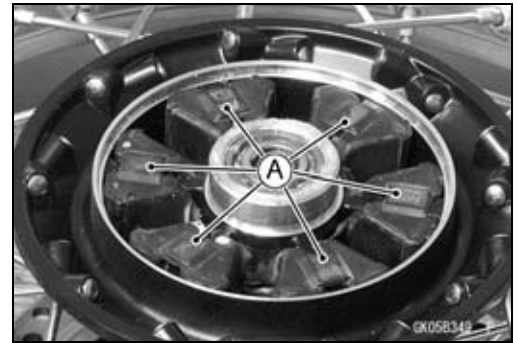
##### **NOTE**

○Since the coupling bearing is packed with grease and sealed, lubrication is not required.

## Sprocket, Coupling

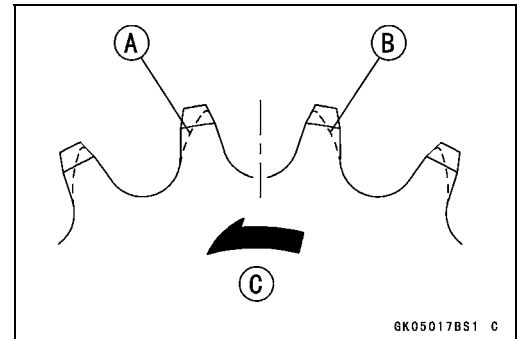
### Coupling Damper Inspection

- 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]

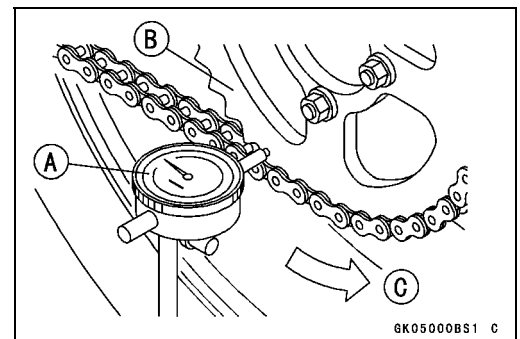


### NOTE

- If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.

### Rear Sprocket Warp Inspection

- Raise the rear wheel off the ground with jack so that it will turn freely.
  - Special Tool - Jack: 57001-1238**
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).
- ★ If the runout exceeds the service limit, replace the rear sprocket.



### Rear Sprocket Warp

**Standard: 0.4 mm (0.016 in.) or less**

**Service Limit: 0.5 mm (0.020 in.)**





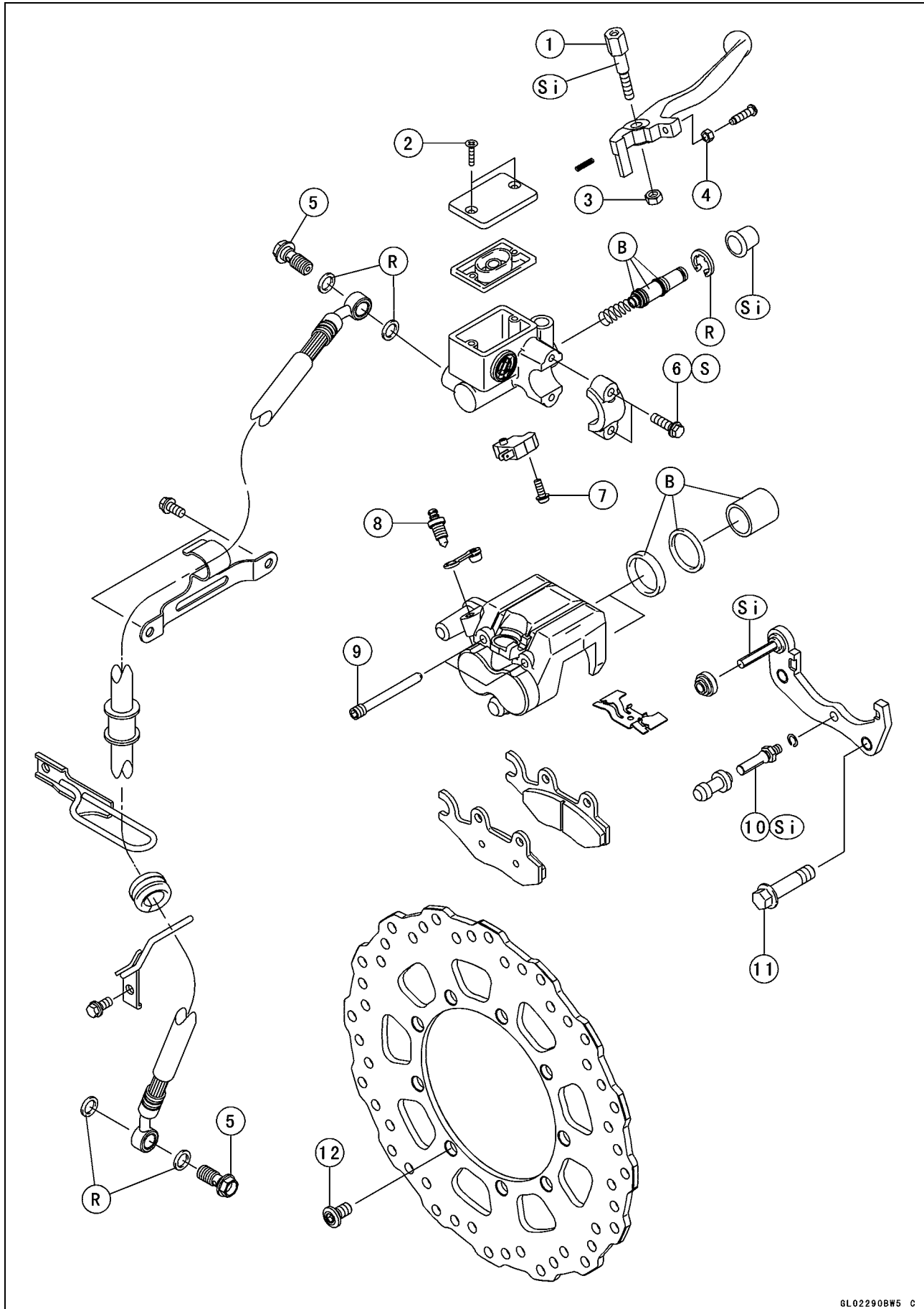
# Brakes

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# 12-2 BRAKES

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Lever Pivot Bolt	5.9	0.60	52 in·lb	Si
2	Front Master Cylinder Reservoir Cap Screws	1.5	0.15	13 in·lb	
3	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
4	Brake Lever Adjusting Bolt Locknut	5.9	0.60	52 in·lb	
5	Brake Hose Banjo Bolts	25	2.5	18	
6	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
7	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
8	Bleed Valve	7.8	0.80	69 in·lb	
9	Front Brake Pad Pins	17	1.7	12	
10	Front Caliper Holder Shaft	17	1.7	12	Si
11	Front Caliper Mounting Bolts	34	3.5	25	
12	Front Brake Disc Mounting Bolts	27	2.8	20	

B: Apply brake fluid.

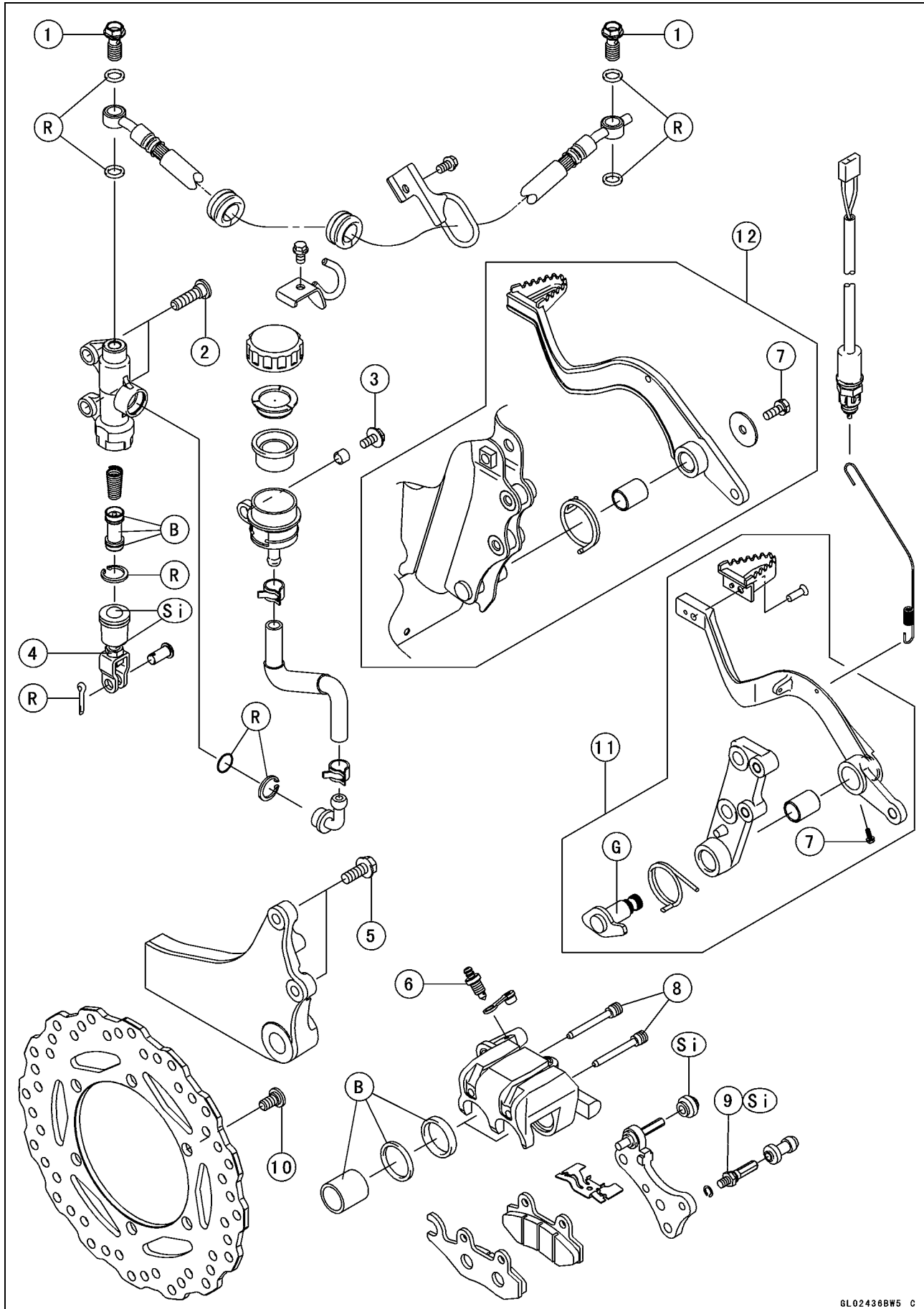
S: Follow the specified tightening sequence.

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

R: Replacement Parts

# 12-4 BRAKES

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Hose Banjo Bolts	25	2.5	18	
2	Rear Master Cylinder Mounting Bolts	25	2.5	18	
3	Rear Master Cylinder Reservoir Tank Mounting Bolt	6.9	0.70	61 in·lb	
4	Rear Master Cylinder Push Rod Locknut	17	1.7	12	
5	Rear Caliper Mounting Bolts	25	2.5	18	
6	Bleed Valve	7.8	0.80	69 in·lb	
7	Brake Pedal Bolt	8.8	0.90	78 in·lb	
8	Rear Brake Pad Pins	17	1.7	12	
9	Rear Caliper Holder Shaft	17	1.7	12	Si
10	Rear Brake Disc Mounting Bolts	27	2.8	20	

11. KL650E8 ~ EA

12. KL650EB ~ EC

B: Apply brake fluid.

G: Apply grease.

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

R: Replacement Parts

## 12-6 BRAKES

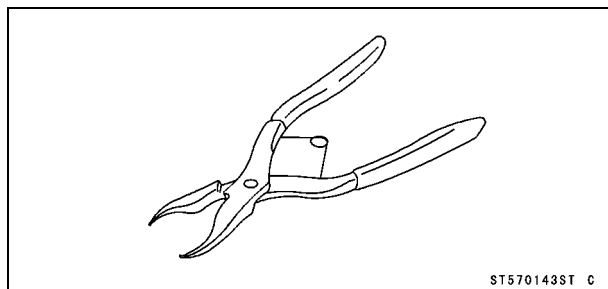
### Specifications

Item	Standard	Service Limit
<b>Brake Lever, Brake Pedal</b>		
Brake Lever Free Play	Non-adjustable	---
Lever Position	Adjust (to suit rider)	---
Brake Pedal Free Play	Non-adjustable	---
Pedal Position	About 1.1 mm (0.043 in.) below top of footpeg	---
<b>Brake Fluid</b>		
Grade	DOT4	
<b>Brake Pad</b>		
Lining Thickness:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.)
Rear	5.5 mm (0.22 in.)	1 mm (0.04 in.)
<b>Brake Discs</b>		
Thickness:		
Front	4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Rear	4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Runout	TIR 0.15 mm (0.006 in.)	TIR 0.3 mm (0.01 in.)

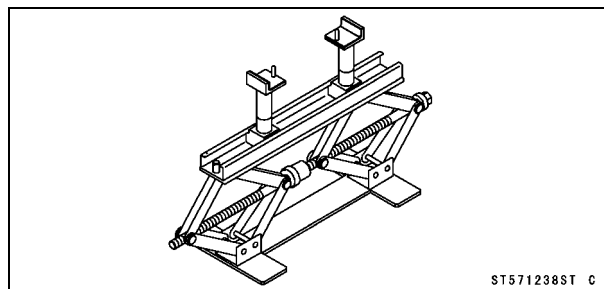
**Special Tools**

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



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



## 12-8 BRAKES

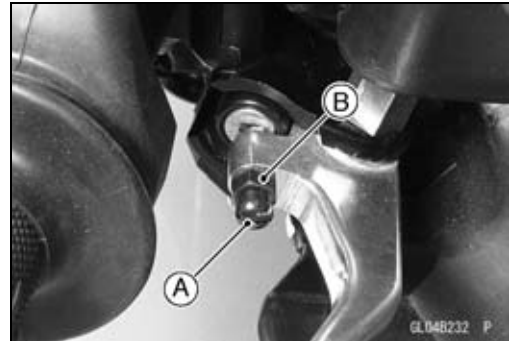
### Brake Lever, Brake Pedal

#### Brake Lever Position Adjustment

The brake lever can be adjusted to suit the operator's hand by turning the adjusting bolt [A].

- Loosen the locknut [B] and turn the bolt to either side.
- After adjustment, tighten the locknut.

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



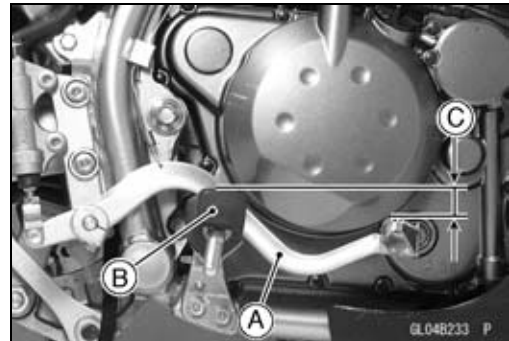
#### Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. Footpeg [B]

##### Pedal Position

**Standard: About 1.1 mm (0.043 in.) [C] below top of footpeg**

- ★ If it is incorrect, adjust the brake pedal position.



#### Brake Pedal Position Adjustment

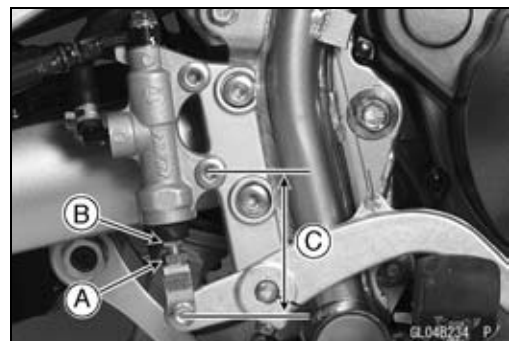
##### NOTE

○ 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:

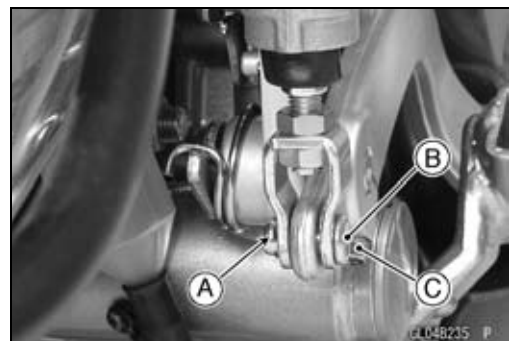
**Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 12 ft·lb)**

- Check the brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).



#### Brake Pedal Removal

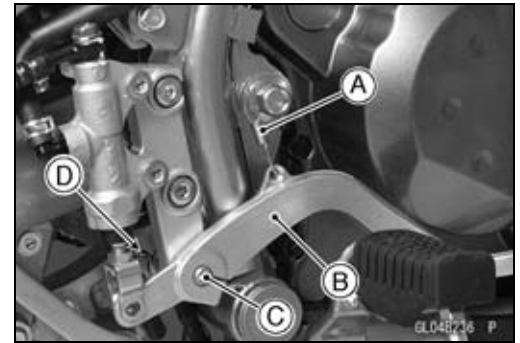
- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]
  - Brake Pedal Bolt [C]





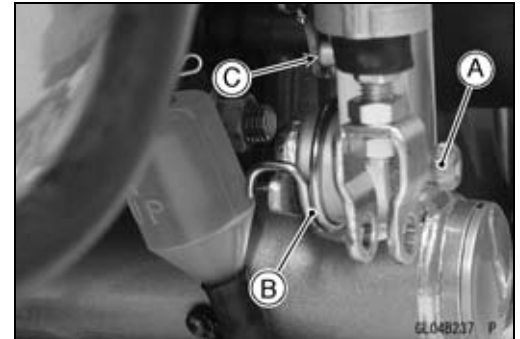
## Brake Lever, Brake Pedal

- Remove:
  - Rear Brake Light Switch Spring [A]
  - Brake Pedal [B]
  - Shaft [C]
  - Return Spring [D]

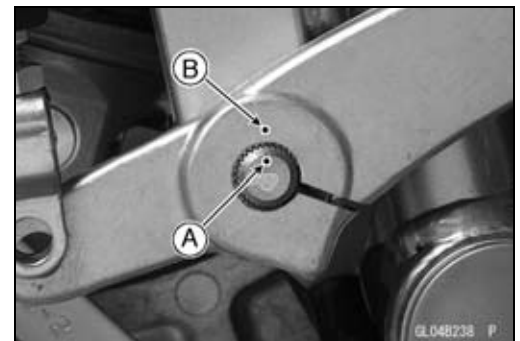


### **Brake Pedal Installation**

- Apply grease to the sliding surface of the shaft [A].
- Install the return spring [B] to the shaft as shown.
- Hook the upper end of the spring to the projection [C] of the frame backward.



- Hook the lower end of the rear brake light switch spring on the brake pedal.
- Align the punch mark [A] on the shaft with punch mark [B] on the brake pedal.
- Tighten:
  - Torque - Brake Pedal Bolt : 8.8 N·m (0.90 kgf·m, 78 in·lb)**



- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends.



## 12-10 BRAKES

### Calipers

#### Front Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the brake hose clamp bolt [B].
- Unscrew the caliper mounting bolts [C], and detach the caliper [D] from the disc.
- Unscrew the banjo bolt and remove the brake hose [E] from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

#### NOTICE

**Immediately wash away any brake fluid that spills.**

#### NOTE

○If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).

#### Rear Caliper Removal

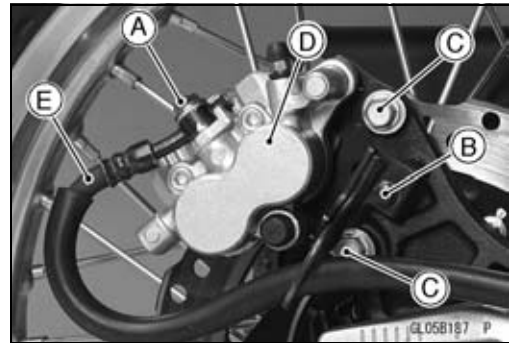
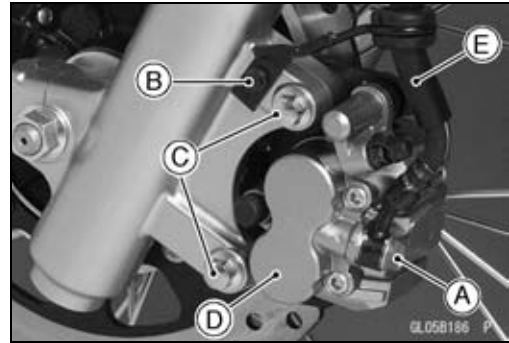
- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the brake hose clamp bolt [B].
- Unscrew the caliper mounting bolts [C], and detach the caliper [D] from the disc.
- Unscrew the banjo bolt and remove the brake hose [E] from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

#### NOTICE

**Immediately wash away any brake fluid that spills.**

#### NOTE

○If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).



---

## Calipers

---

### **Caliper Installation**

- Install the caliper and brake hose lower end.
- Replace the washers on each side of hose fitting with new ones.
- Tighten:
  - Torque - Caliper Mounting Bolts**
    - Front: 34 N·m (3.5 kgf·m, 25 ft·lb)
    - Rear: 25 N·m (2.5 kgf·m, 18 ft·lb)
  - Brake Hose Banjo Bolt: 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.

 <b>WARNING</b>
--

<p><b>After servicing, it takes several applications of the brake lever or pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever or pedal is obtained by pumping the lever or pedal until the pads are against the disc.</b></p>
---

### **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.

## 12-12 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.

Front Caliper [C]

Rear Caliper [D]

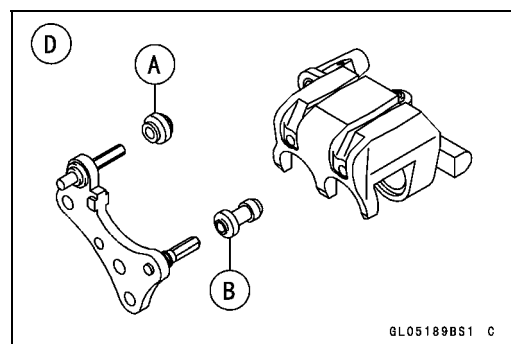
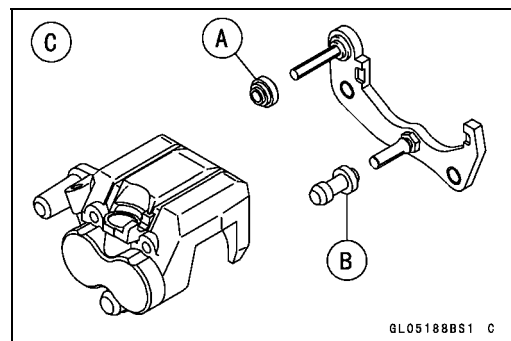
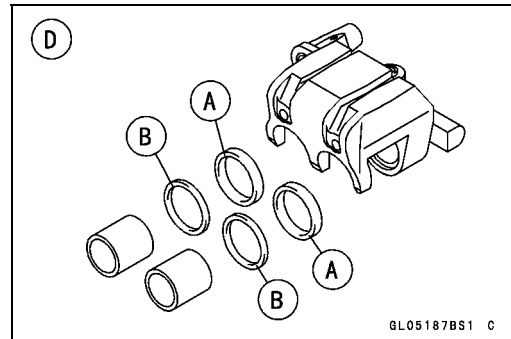
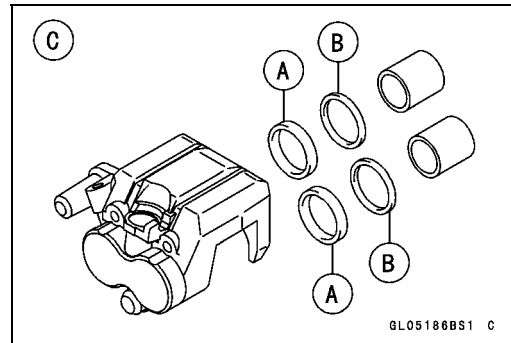
#### Caliper Dust Boot and Friction Boot Damage

- 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.

Front Caliper [C]

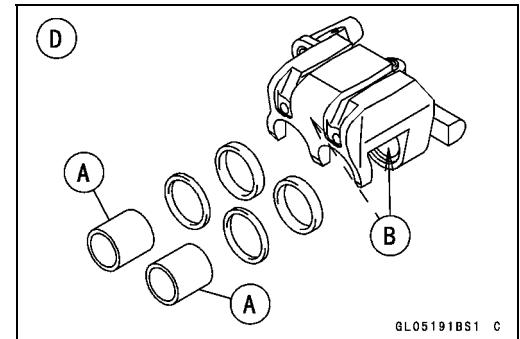
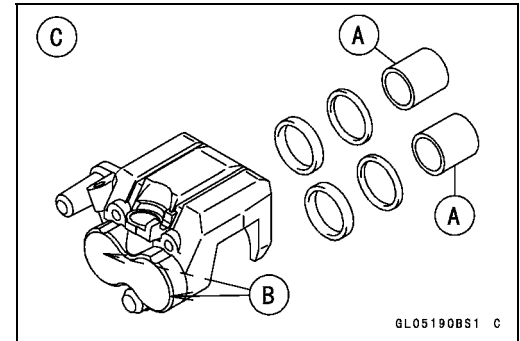
Rear Caliper [D]



## 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 [C]
  - Rear Caliper [D]



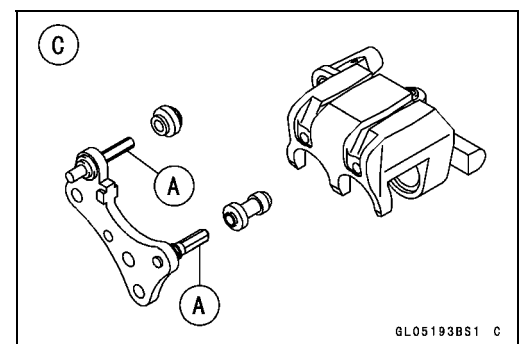
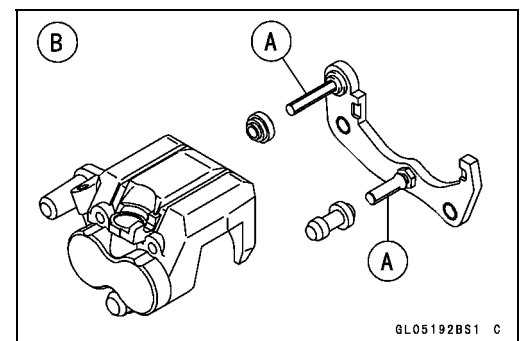
### Caliper Holder Shaft Wear

The caliper body must slide smoothly on the caliper holder shafts [A]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

- Check to see that the caliper holder shafts are not badly worn or stepped, and that the rubber friction boots are not damaged.
- ★ If the rubber friction boot is damaged, replace the rubber friction boot. To replace the friction boot, remove the pads and the caliper bracket.
- ★ If the caliper holder shaft is damaged, replace the caliper bracket and holder shaft.

**Torque - Caliper Holder Shaft: 17 N·m (1.7 kgf·m, 12 ft·lb)**

- Front Caliper [B]
- Rear Caliper [C]

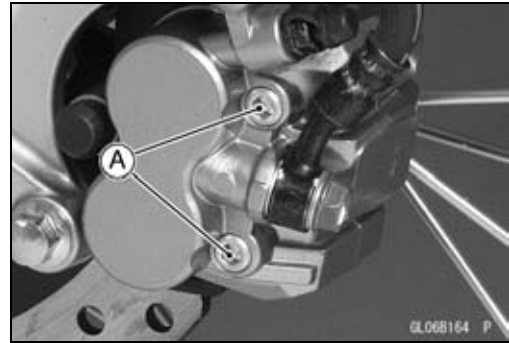


## 12-14 BRAKES

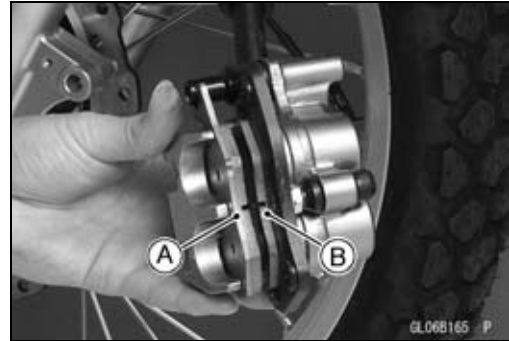
### Brake Pads

#### **Front Brake Pad Removal**

- Loosen the pad pins [A].



- Remove the front caliper with the hose installed (see Front Caliper Removal).
- Remove the pad pins.
- Remove the pad [A] of the jaw side.
- Remove the pad [B] on the piston side.



#### **Front Brake Pad Installation**

- Push the caliper pistons in by hand as far as they will go.
- Install the anti-rattle spring in its correct position.
- Install the pad on the piston side first, then install the other pad.
- Tighten the brake pad pins temporary.
- Install the front brake caliper (see Front Brake Caliper Installation).
- Tighten:

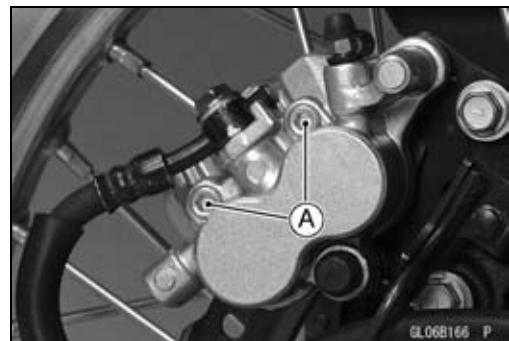
**Torque - Front Brake Pad Pins: 17 N·m (1.7 kgf·m, 12 ft·lb)**

#### **⚠ WARNING**

**After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.**

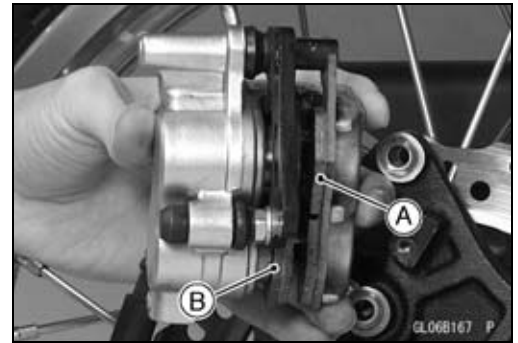
#### **Rear Brake Pad Removal**

- Loosen the pad pins [A].



## Brake Pads

- Remove the rear caliper with the hose installed (see Rear Caliper Removal).
- Remove the pad pins.
- Remove the pad [A] of the jaw side.
- Remove the pad [B] on the piston side.



### **Rear Brake Pad Installation**

- Push the caliper piston in by hand as far as it will go.
- Install the anti-rattle spring in its correct position.
- Install the pad on the piston side first, then install the other pad.
- Tighten the brake pad pins temporary.
- Install the rear brake caliper (see Rear Brake Caliper Installation).
- Tighten:

**Torque - Front Brake Pad Pins: 17 N·m (1.7 kgf·m, 12 ft·lb)**

### **⚠ WARNING**

**After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.**

### **Brake Pad Wear Inspection**

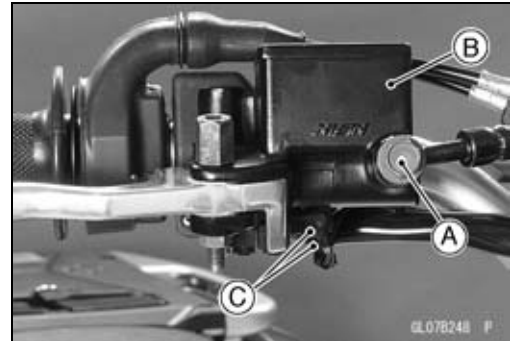
- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

## 12-16 BRAKES

### Master Cylinder

#### Front Master Cylinder Removal

- Remove the right handle cover (see Handle Cover Removal in the Frame chapter).
- Remove the banjo bolt [A] to disconnect the brake hose from the master cylinder [B] (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Disconnect the front brake light switch connectors [C].



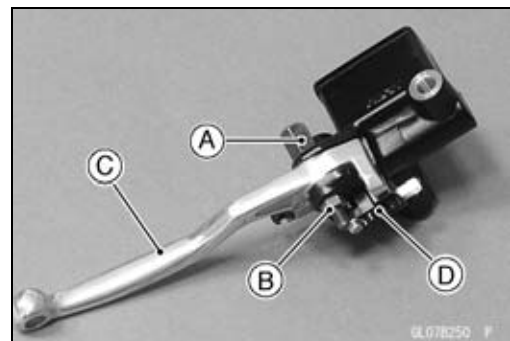
- Unscrew the clamp bolts [A], and take off the master cylinder as an assembly with the reservoir, brake lever and brake switch installed.

#### NOTICE

Immediately wash away any brake fluid that spills.



- Remove:
  - Brake Lever Pivot Bolt [A] and Locknut [B]
  - Brake Lever [C]
  - Spring
  - Front Brake Light Switch [D]



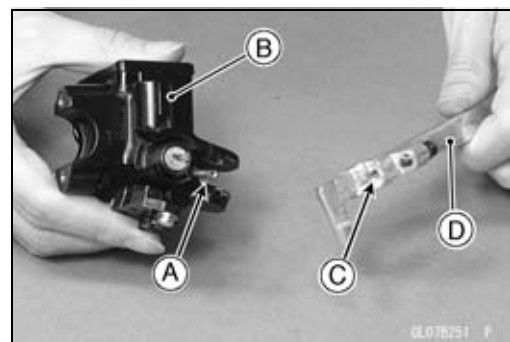
#### Front Master Cylinder Installation

- Install the spring [A] to the master cylinder [B], and insert it into the hole [C] of the brake lever [D].
- Apply silicone grease to the sliding surface of the brake lever pivot bolt.
- Tighten:

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

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

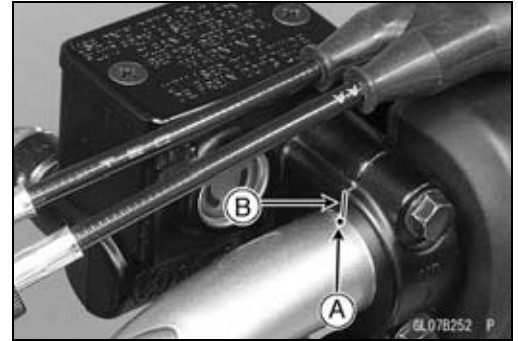
**Front Brake Light Switch Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**





## Master Cylinder

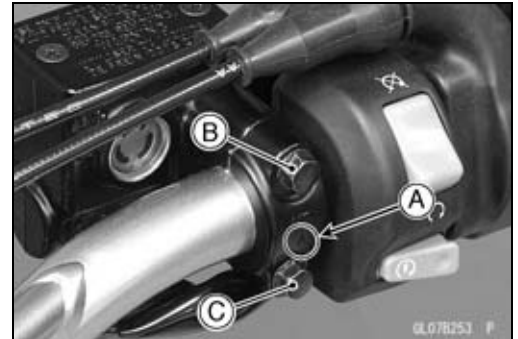
- Install the front master cylinder so that the punch mark [A] of the handlebar is aligned with the mating surface [B] of the master cylinder clamp to level the reservoir.



- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C].
- There will be a gap at the lower part of the clamp after tightening.

**Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

- Replace the washers on each side of the hose fitting with new ones.
- Tighten the brake hose banjo bolt.
- Torque - Brake Hose Banjo Bolt: 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.

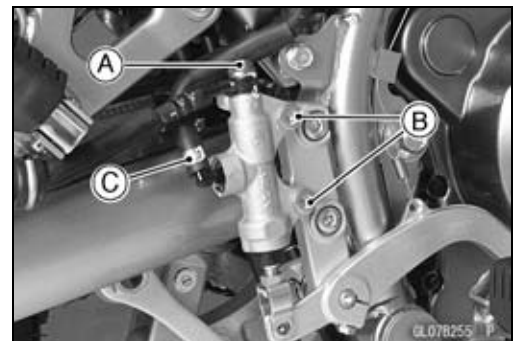


### Rear Master Cylinder Removal

- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]



- Unscrew the brake hose banjo bolt [A] on the master cylinder (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Remove the master cylinder mounting bolts [B].
- Slide the reservoir hose lower end clamp [C].
- Pull off the reservoir hose lower end, and drain the brake fluid into a container.



### Rear Master Cylinder Installation

- Replace the washers 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 Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**

## 12-18 BRAKES

### Master Cylinder

- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends.
- 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**

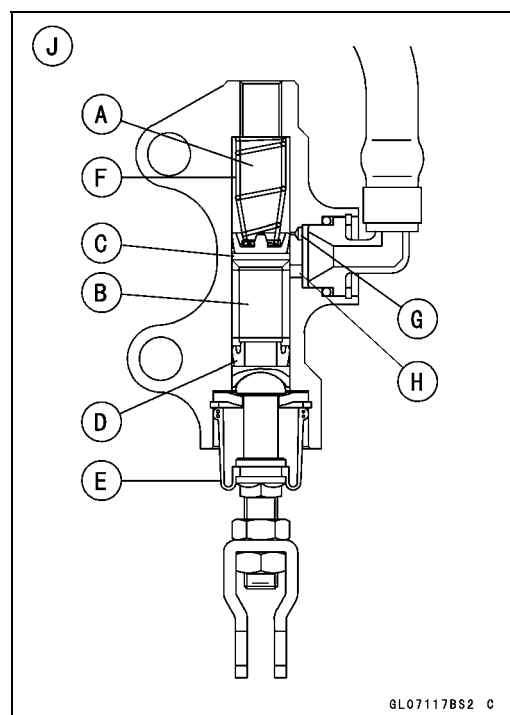
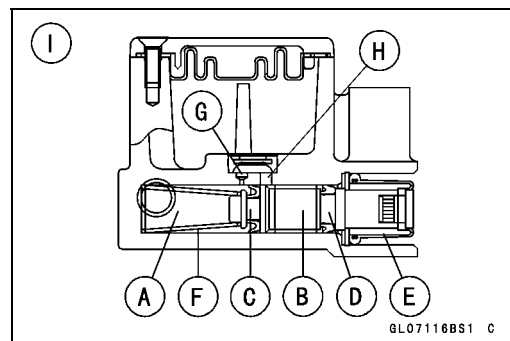
- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

#### **Master Cylinder Inspection**

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].
- ★ If a master cylinder or piston shows any damage, replace them.
- Inspect the primary cup [C] and secondary cup [D].
- ★ If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.
- ★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.
- 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]

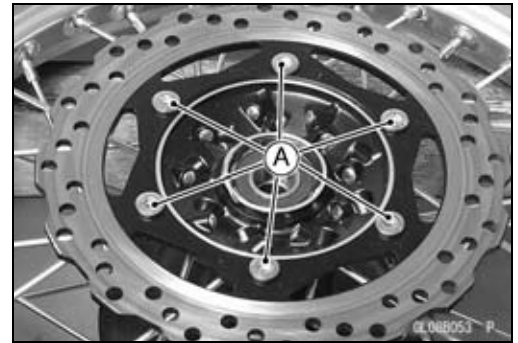
Rear Master Cylinder [J]



## Brake Disc

### Brake Disc Removal

- Remove the wheel (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc.



### Brake Disc Installation

- Install the brake disc on the wheel so that the marked side [A] faces out.
- Tighten:
  - Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)



### Brake Disc Wear

- Measure the thickness of each disc [A] at the point where it has worn the most.
  - ★ If the disc has worn past the service limit, replace it.
- Measuring Area [B]

#### Brake Discs Thickness

##### Standard:

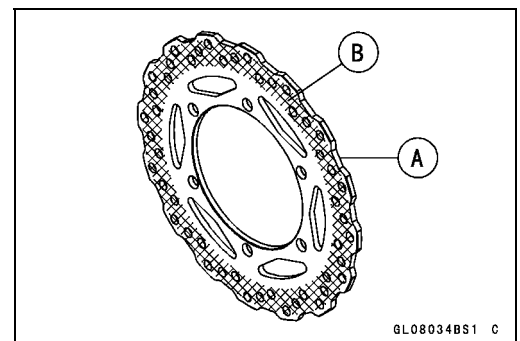
Front 4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)

Rear 4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)

##### Service Limit:

Front 4.5 mm (0.18 in.)

Rear 4.5 mm (0.18 in.)



### Brake Disc Warp

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

#### Special Tools - Jack: 57001-1238

- For front disc inspection, turn the handlebar fully to one side.

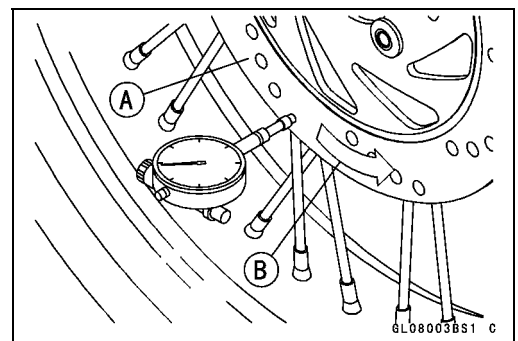
- Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.

- ★ If runout exceeds the service limit, replace the disc.

#### Disc Runout

Standard: TIR 0.15 mm (0.006 in.) or less

Service Limit: TIR 0.3 mm (0.01 in.)



## 12-20 BRAKES

### Brake Fluid

#### **Brake Fluid Level Inspection**

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

#### **Brake Fluid Change**

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

#### **Brake Line Bleeding**

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

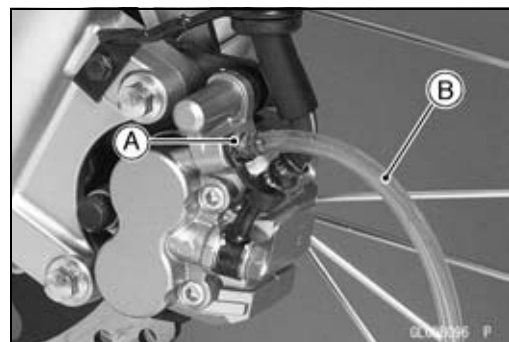
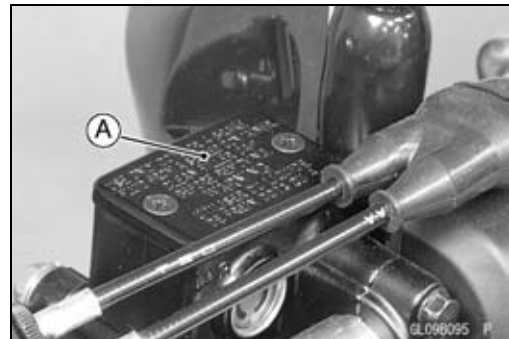
#### **⚠ WARNING**

**Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If the brake lever has a soft or "spongy" feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.**

#### **NOTE**

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

- Remove the reservoir cap [A] and 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 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.



## Brake Fluid

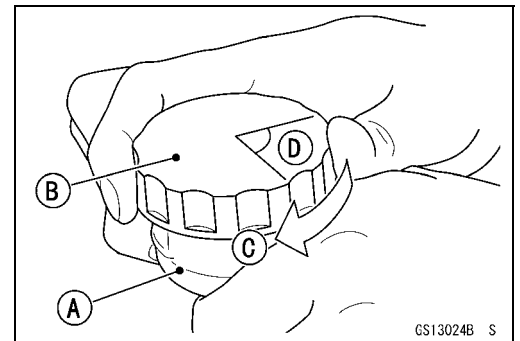
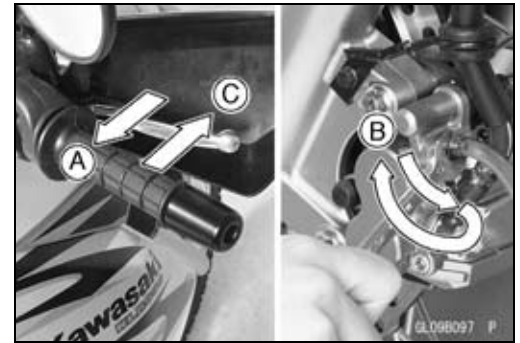
- Bleed the brake line and the caliper.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
  1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
  2. Quickly open and close [B] the bleed valve while holding the brake applied.
  3. Release 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.*
- Remove the clear plastic hose.
- Install the diaphragm and reservoir cap.
- Tighten:

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

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



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

## 12-22 BRAKES

### Brake Fluid

#### **WARNING**

**When working with the disc brake, observe the precautions listed below.**

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high-flash point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE.**

**Brake Hose**

---

***Brake Hose Removal/Installation***

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

***Brake Hose Inspection***

- Refer to the Brake Hose Damage and Installation Condition Inspection in the Periodic Maintenance chapter.





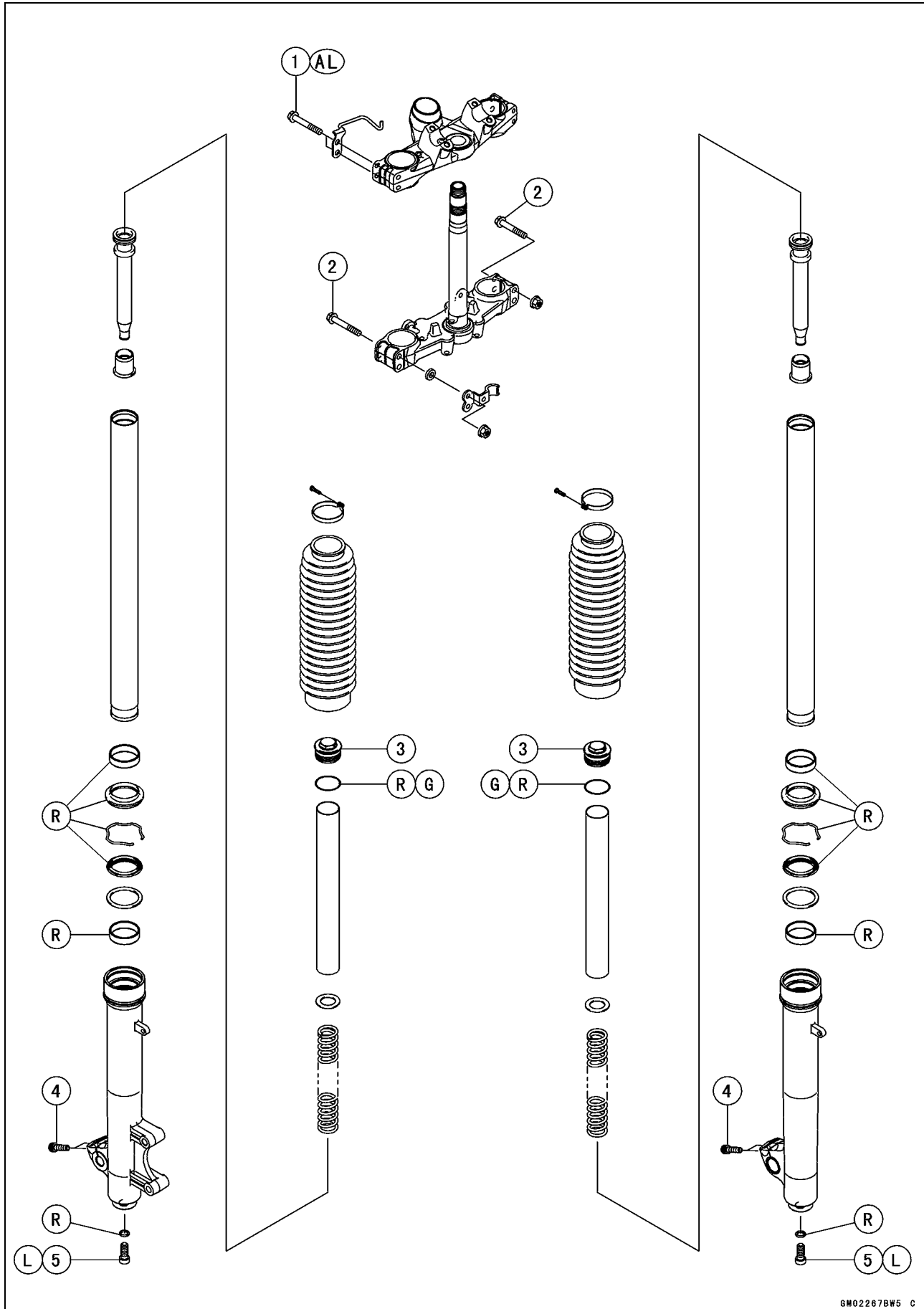
# Suspension

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# 13-2 SUSPENSION

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Upper Fork Clamp Bolts	20	2.0	15	AL
2	Lower Fork Clamp Bolts	20	2.0	15	
3	Front Fork Top Plugs	30	3.0	22	
4	Front Axle Clamp Bolts	20	2.0	15	
5	Front Fork Bottom Allen Bolts	30	3.0	22	L

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

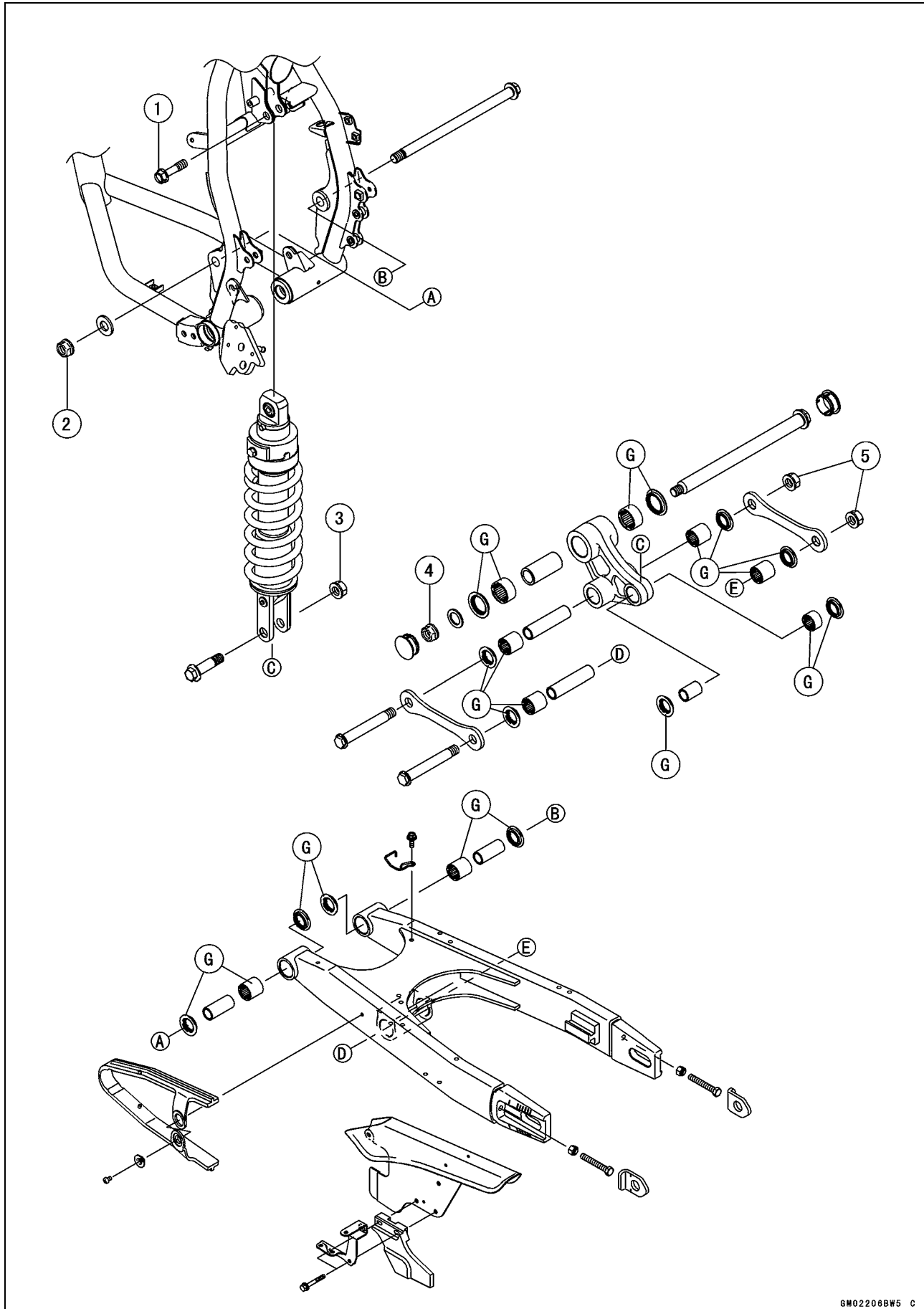
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

# 13-4 SUSPENSION

## Exploded View



**Exploded View**

<b>No.</b>	<b>Fastener</b>	<b>Torque</b>			<b>Remarks</b>
		<b>N·m</b>	<b>kgf·m</b>	<b>ft·lb</b>	
1	Upper Rear Shock Absorber Bolt	59	6.0	44	
2	Swingarm Pivot Shaft Nut	88	9.0	65	
3	Lower Rear Shock Absorber Nut	98	10	72	
4	Rocker Arm Nut	98	10	72	
5	Tie-rod Nuts	98	10	72	

G: Apply grease.

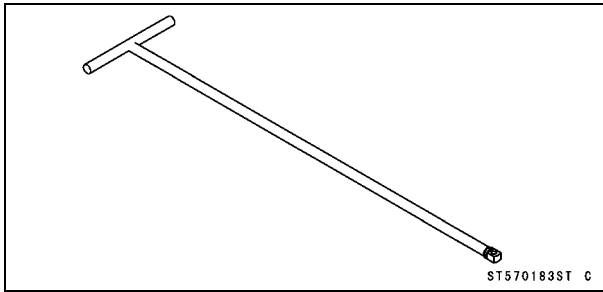
## 13-6 SUSPENSION

### Specifications

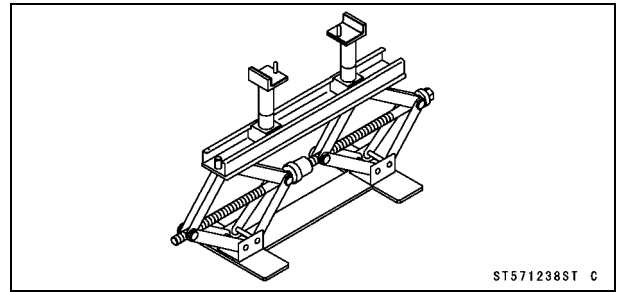
Item	Standard
<b>Front Fork (Per One Unit)</b> Fork Inner Tube Diameter Air Pressure Fork Spring Setting Damper Setting Fork Oil: Type Amount  Fork Oil Level:  Fork Spring Free Length	$\phi 41$ mm (1.6 in.) Atmospheric pressure (Non-adjustable) Non-adjustable Non-adjustable KAYABA KHL34-G10 or equivalent Approx. 500 mL (16.9 US oz.) (when changing oil) 585 $\pm$ 4 mL (19.8 $\pm$ 0.14 US oz.) (after disassembly and completely dry) 135 $\pm$ 2 mm (5.3 $\pm$ 0.08 in.) (fully compressed, without fork spring, below from the top of the inner tube) 363.9 mm (14.33 in.) (Service limit 357 mm (14.1 in.))
<b>Rear Shock Absorber</b> Rebound Damper Setting  Spring Preload Setting Gas Pressure	1 turns out from the fully clockwise position (Usable Range: 0 $\longleftrightarrow$ 3 turns out) 1st position (Adjustable Range: 1st ~ 5th position) 980 kPa (10 kgf/cm <sup>2</sup> , 142 psi, Non-adjustable)

Special Tools

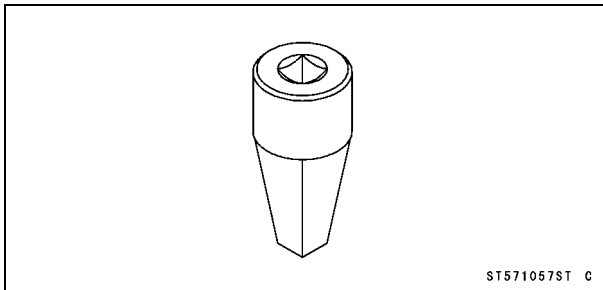
Fork Cylinder Holder Handle:  
57001-183



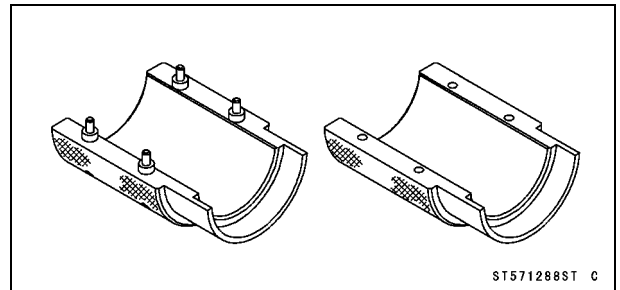
Jack:  
57001-1238



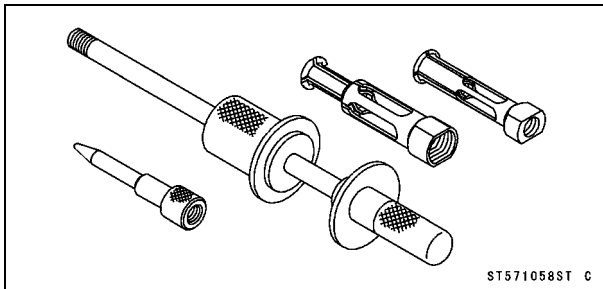
Fork Cylinder Holder Adapter:  
57001-1057



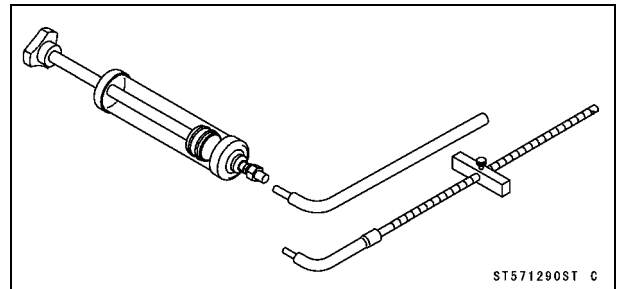
Fork Oil Seal Driver,  $\phi 41$ :  
57001-1288



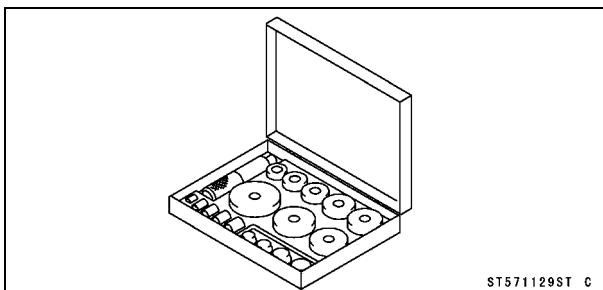
Oil Seal & Bearing Remover:  
57001-1058



Fork Oil Level Gauge:  
57001-1290



Bearing Driver Set:  
57001-1129

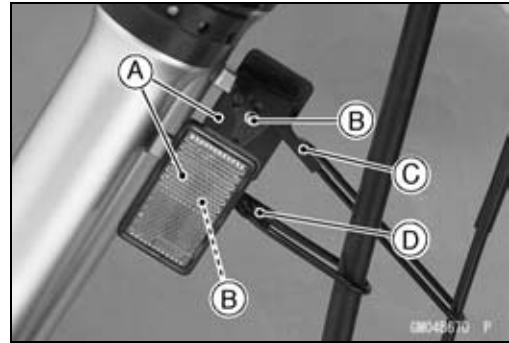


## 13-8 SUSPENSION

### Front Fork

#### Front Fork Removal

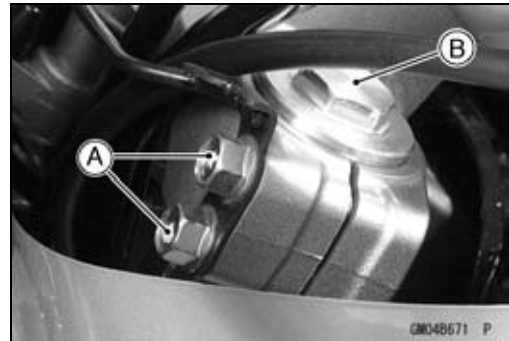
- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Front Caliper (with the hose installed, see Front Caliper Removal in the Brakes chapter)
  - Reflectors [A] (Other than AU Model)
  - Bolts [B]
  - Speedometer Cable Clamp [C]
  - Brake Hose Clamp [D]



- ★ Loosen the upper fork clamp bolts [A] and top plug [B] beforehand if the fork leg is to be disassembled.

#### NOTE

- Loosen the top plug after loosening the upper fork clamp bolts.



- Loosen the upper fork clamp bolts and lower fork clamp bolts [A].
- With a twisting motion, work the fork leg down and out.



#### Front Fork Installation

- Install the fork with the upper end of inner tube flush [A] against the top surface of the stem head [B].
- Tighten the lower fork clamp bolts and fork top plug.

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

**Front Fork Top Plug: 30 N·m (3.0 kgf·m, 22 ft·lb)**

#### NOTE

- Tighten the top plug before tightening the upper fork clamp bolts.

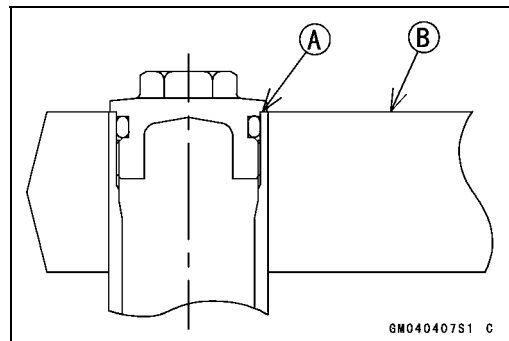
- Tighten the upper fork clamp bolts.

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

#### NOTE

- Tighten the two upper fork clamp bolts alternately two times to ensure even tightening torque.

- Install the removed parts (see appropriate chapters).

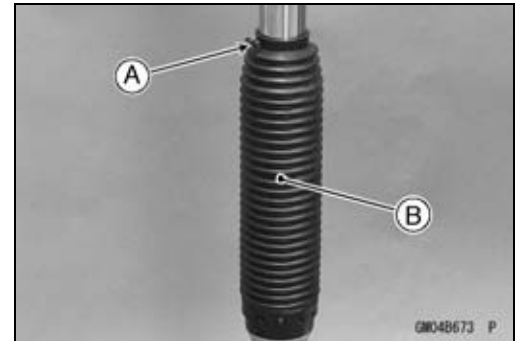




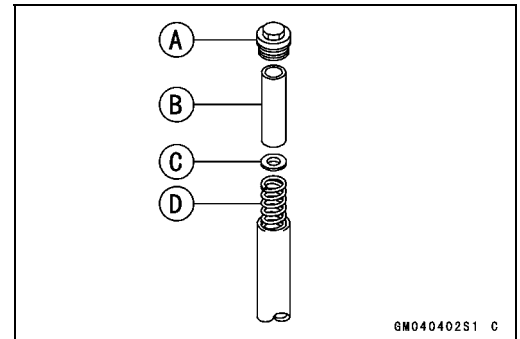
Front Fork

**Front Fork Oil Change**

- Remove the front fork (see Front Fork Removal).
- Loosen the clamp screw [A], and remove the fork boot [B].



- Remove:
  - Top Plug [A] with O-ring
  - Collar [B]
  - Fork Spring Seat [C]
  - Fork Spring [D]



- Compress [A] the fork [B] upside down to draw out the oil into the suitable container [C].
- Pour in the specified amount of oil.

**Recommended Oil**

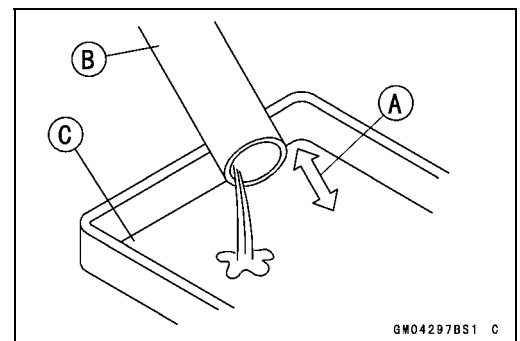
**KAYABA KHL34-G10 or equivalent**

**Amount (Per Side):**

**When changing oil: Approx. 500 mL (16.9 US oz.)**

**After disassembly and completely dry:**

**585 ±4 mL (19.8 ±0.14 US oz.)**



**NOTE**

○ Move the outer tube up and down a few times to remove the air that is trapped in the fork oil in order to stabilize the oil level.

## 13-10 SUSPENSION

### Front Fork

- Hold the outer tube vertically in a vise and compress the fork completely.
- Wait until the oil level stabilizes.
- Use the fork oil level gauge [A] to measure the distance between the top of the inner tube to the oil level.

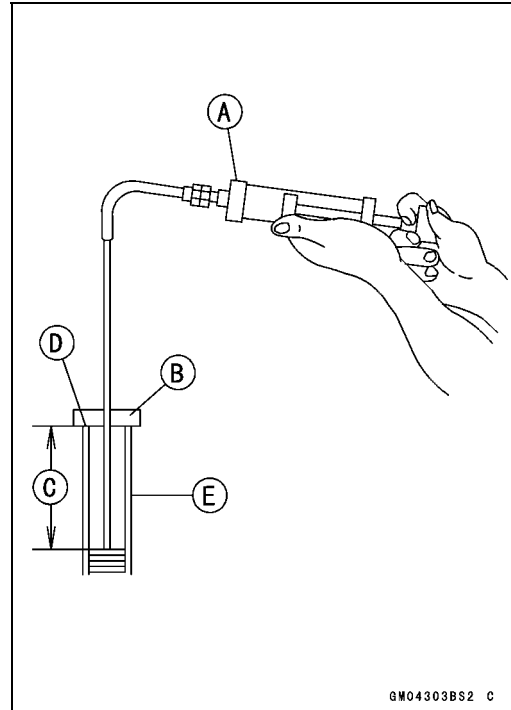
**Special Tool - Fork Oil Level Gauge: 57001-1290**

- Set the oil level gauge stopper [B] so that the distance [C] from the bottom of the stopper to the lower end of the pipe is the standard oil level distance.
- A correct measurement can not be obtained unless the level gauge pipe is placed in the center of the inner tube.

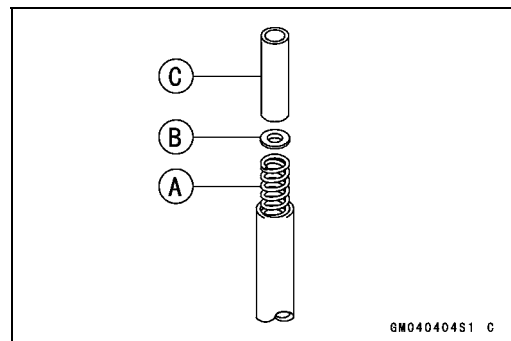
**Oil Level (fully compressed, without spring)**

**Standard: 135 ±2 mm (5.3 ±0.08 in.)**

- Place the stopper of the level gauge at the top [D] of the inner tube [E] and pull the handle slowly to draw out the excess oil from fork into the gauge, thus attaining the standard level.
- If not oil is drawn out, there is not enough oil in the fork. Pour in some more oil and measure again.



- Repeat the same procedure for adjusting the other fork.
- Install the fork spring [A], fork spring seat [B] and collar [C].
- Replace the O-ring on the top plug with new one.
- Apply grease to the new O-ring.
- Rise the inner tube and screw the top plug into it.
- Install the fork boot.
- Install the front fork (see Front Fork Installation).



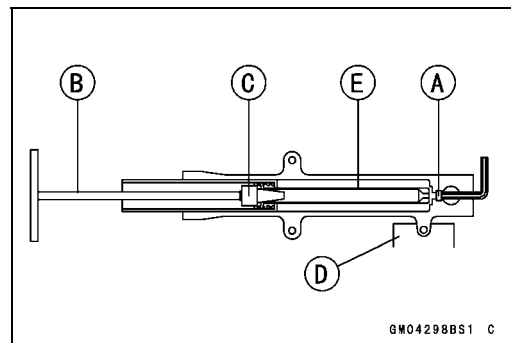
### Front Fork Disassembly

- Remove the front fork (see Front Fork Removal).
- Drain the fork oil (see Front Fork Oil Change).
- Remove the Allen bolt [A] from the bottom of the fork.

**Special Tools - Fork Cylinder Holder Handle [B]: 57001-183**  
**Fork Cylinder Holder Adapter [C]: 57001-1057**

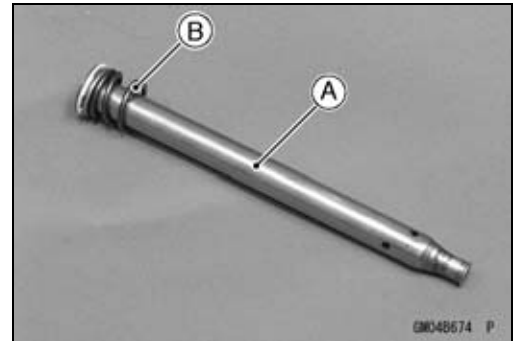
### NOTE

- Hold the outer tube in a vise [D], stop the cylinder unit [E] from turning by using the special tools, and unscrew the Allen bolt.

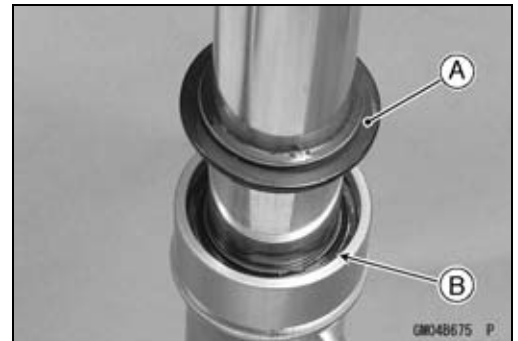


**Front Fork**

- Remove the cylinder unit [A], washer, and the spring [B] from the inner tube.



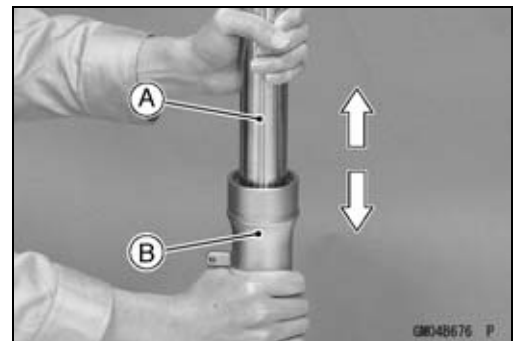
- Remove the following from the top of the outer tube.  
Dust Seal [A]  
Retaining Ring [B]



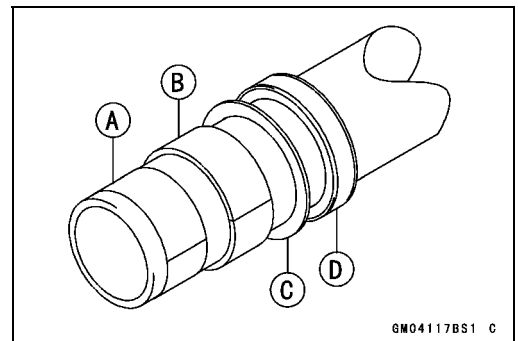
- Separate the inner tube [A] from the outer tube [B].

**NOTE**

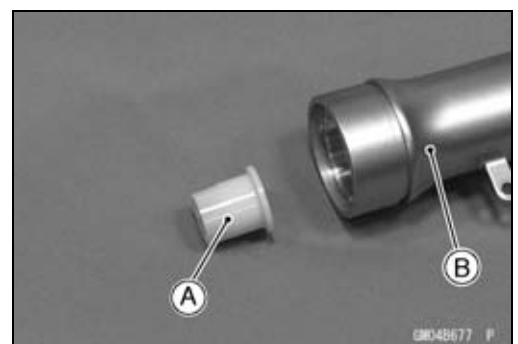
○From the compressed state, firmly pull down the outer tube a few times towards the direction of elongation.



- Remove the following from the inner tube.  
Inner Guide Bushing [A]  
Outer Guide Bushing [B]  
Washer [C]  
Oil Seal [D]



- Remove the cylinder base [A] from the bottom of the outer tube [B].

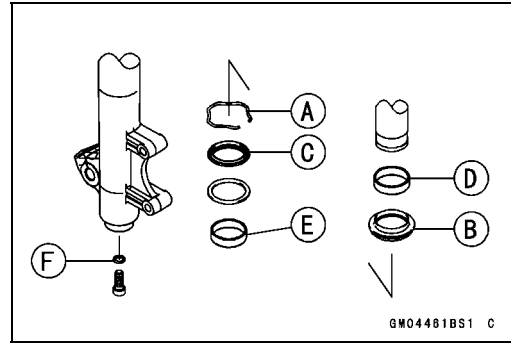


# 13-12 SUSPENSION

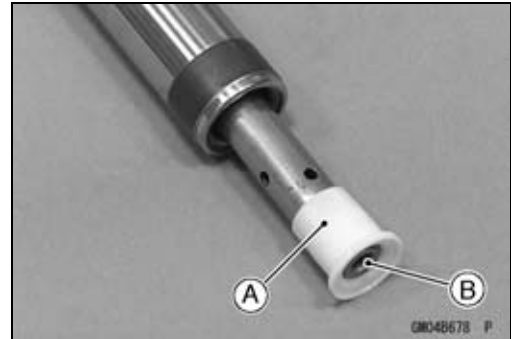
## Front Fork

### Front Fork Assembly

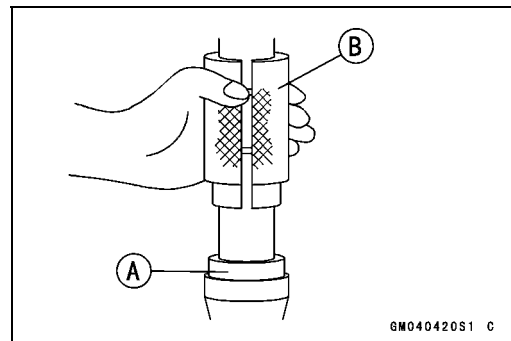
- Replace the following parts with new ones.
  - Retaining Ring [A]
  - Dust Seal [B]
  - Oil Seal [C]
  - Inner Guide Bushing [D]
  - Outer Guide Bushing [E]
  - Fork Bottom Allen Bolt Gasket [F]



- Install the guide bushing on the end of the inner tube.
- Insert the cylinder unit and the spring into the inner tube, and install the cylinder base [A] onto the cylinder end [B] that protrudes from the bottom.
- Install the cylinder base starting with its stepped end.
- Insert the inner tube, cylinder unit, washer, spring, and cylinder base as a set into the outer tube.



- Install the guide bushing into the outer tube.
  - After installing the washer, install the oil seal [A] by using the fork oil seal driver [B].
- Special Tool - Fork Oil Seal Driver,  $\phi 41$ : 57001-1288**
- Install the retaining ring into the outer tube.
  - Install the dust seal by hand.

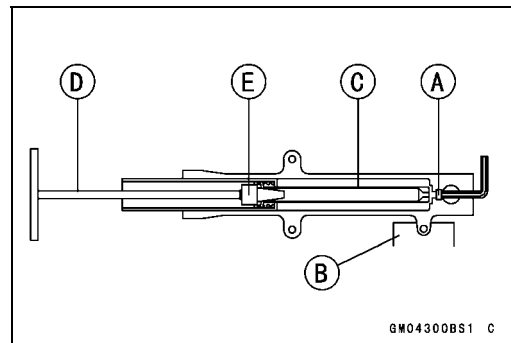


- Apply non-permanent locking agent to the threads of the bottom Allen bolt [A].
- Hold the front fork horizontally in a vise [B].
- Hold the cylinder unit [C] with the special tools and tighten the bottom Allen bolt to secure the cylinder in place.

**Torque - Front Fork Bottom Allen Bolt: 30 N·m (3.0 kgf·m, 22 ft·lb)**

**Special Tools - Fork Cylinder Holder Handle [D]: 57001-183  
Fork Cylinder Holder Adapter [E]: 57001-1057**

- 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.
- Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.
- ★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

#### NOTICE

If the inner tube is badly bent or creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.

- Temporarily assemble the inner tube [A] and outer tube [B], and pump [C] them back and forth manually to check for smooth operation.
- ★ If you feel binding or catching, the inner and outer tubes must be replaced.

#### ⚠ WARNING

A straightened inner or outer fork tube may fall in use, possibly causing an accident resulting in serious injury or death. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.

### Dust Seal Inspection

- Inspect the dust seals [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.

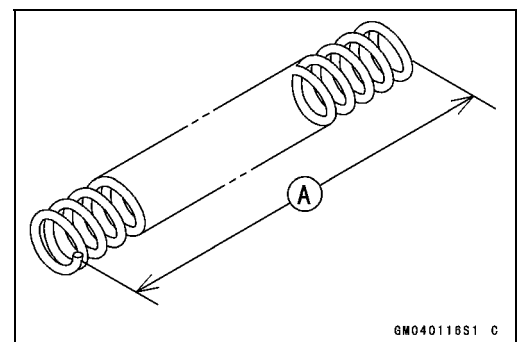
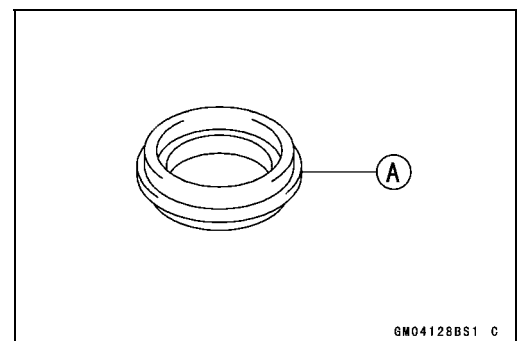
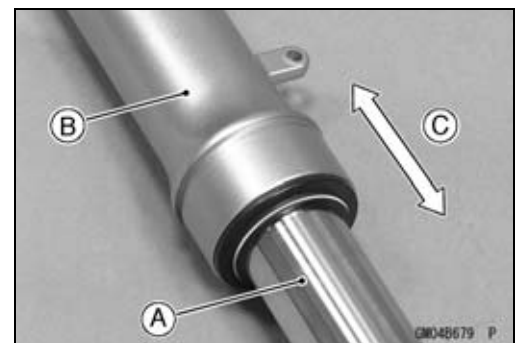
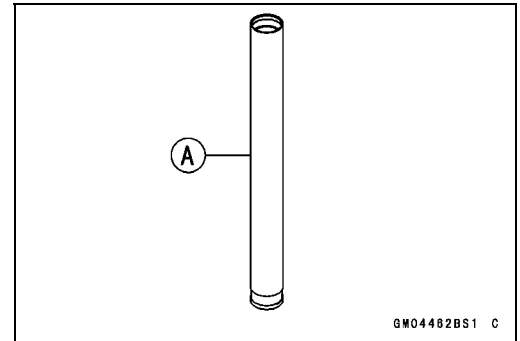
### Spring Tension Inspection

- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.
- ★ If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

#### Spring Free Length

Standard: 363.9 mm (14.33 in.)

Service Limit: 357 mm (14.1 in.)



# 13-14 SUSPENSION

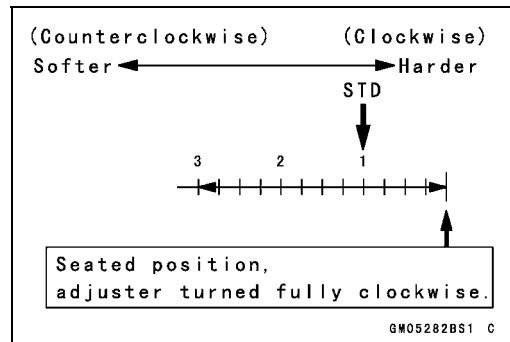
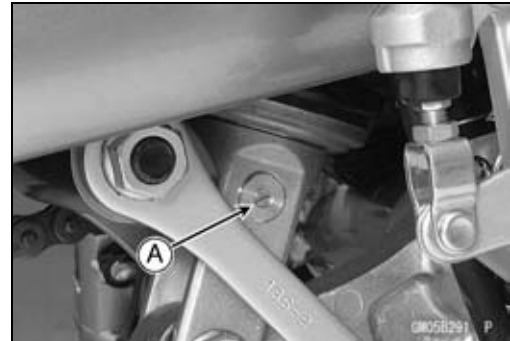
## Rear Shock Absorber

### 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 is the **1 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

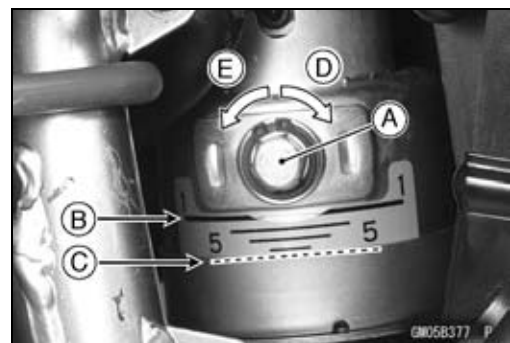


### Spring Preload Adjustment

- For the California model, remove the separator.

#### NOTE

- The spring preload adjuster has adjustable range of the 5 positions.
- Adjust the spring preload adjuster by turning the adjusting bolt [A] as follows.
- When changing the adjuster position from 1st [B] to 5th [C] in numerical order (1st→2nd→3rd→4th→5th), turn the adjusting bolt clockwise [D].
- When changing the adjuster position from 5th to 1st in numerical order (5th→4th→3rd→2nd→1st), turn the adjusting bolt counterclockwise [E].



#### NOTICE

**When the spring preload adjuster is at the position of the 1st or 5th, do not turn the adjusting bolt in opposite direction of the above procedures. The spring preload adjuster will be damaged by the shock.**

- The standard adjuster setting is **1st** position.

#### Spring Preload Setting

- Standard Position: 1st position
- Adjustable Range: 1st ~ 5th position

## Rear Shock Absorber

- 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
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
5th	Strong	Hard	Heavy	Bad	Highway

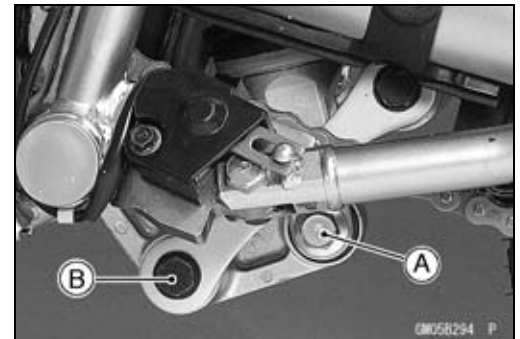
### Rear Shock Absorber Removal

- Raise the rear wheel off the ground with jack.  
**Special Tools - Jack: 57001-1238**
- Squeeze the brake lever slowly and hold it with a band [A].

#### **⚠ WARNING**

**Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.**

- Remove:
  - Lower Shock Absorber Nut and Bolt [A]
  - Lower Tie-Rod Nut and Bolt [B]
- For the California model, remove the separator.
- Remove the breather tube [A].
- Unscrew the upper rear shock absorber bolt [B], and remove the shock absorber from downside.



## 13-16 SUSPENSION

### Rear Shock Absorber

#### Rear Shock Absorber Installation

- Install the rear shock absorber so that the spring preload adjusting bolt [A] faces left side of motorcycle.
- Tighten:
  - Torque - Upper Rear Shock Absorber Bolt: 59 N·m (6.0 kgf·m, 44 ft·lb)
  - Lower Rear Shock Absorber Nut : 98 N·m (10 kgf·m, 72 ft·lb)
  - Tie-rod Nut: 98 N·m (10 kgf·m, 72 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 [A].
- ★ If it show any signs of damage, replace it.



#### Rear Shock Absorber Scrapping

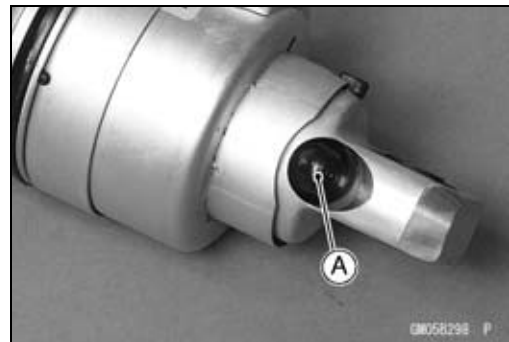
##### **⚠ WARNING**

**Pressurized nitrogen may explode when heated. The rear shock contains nitrogen gas. To avoid an explosion, do not incinerate the shock body without first releasing the nitrogen and removing the shraeder valve.**

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Remove the valve cap [A] and release the nitrogen gas completely from the gas reservoir.
- Remove the valve.

##### **⚠ WARNING**

**Pressurized gas can cause injury. Do not point the valve toward your face or body.**

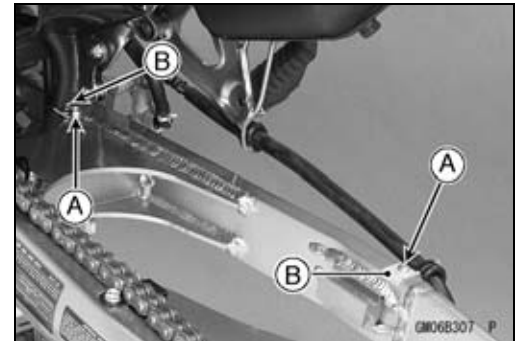




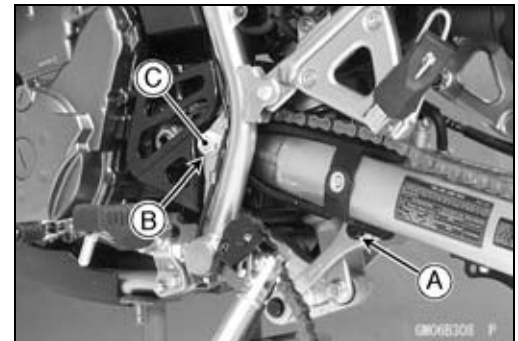
## Swingarm

### Swingarm Removal

- Remove:
  - Chain Cover (see Chain Removal in the Final Drive chapter)
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tiers chapter)
  - Bolts [A]
  - Clamps [B]

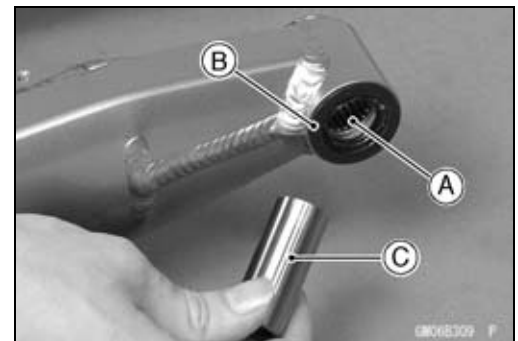


- Remove the upper tie-rod nut and bolt [A].
- Unscrew the swingarm pivot shaft nut [B].
- Pull off the pivot shaft [C], and remove the swingarm.

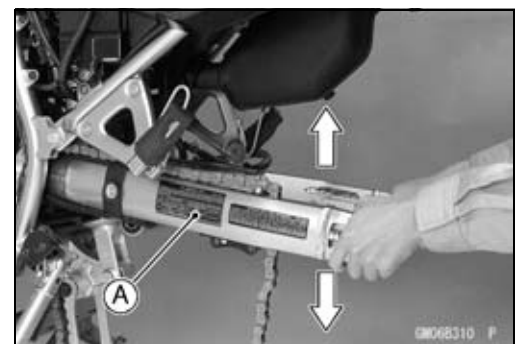


### Swingarm Installation

- Apply plenty of grease to the needle bearings [A].
- Apply grease to the lip of the oil seals [B].
- Be sure to install the oil seals and sleeves [C] to the swingarm.
- Install the washer, and tighten the pivot shaft nut.
  - Torque - Swingarm Pivot Shaft Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)**

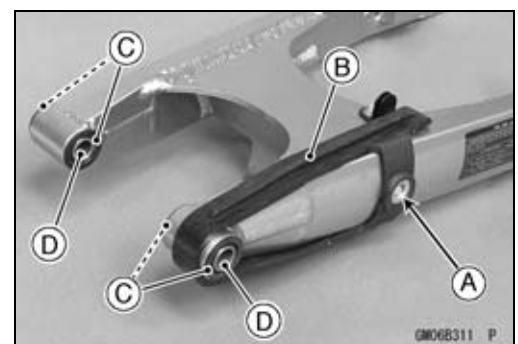


- Move the swingarm [A] up and down to check for abnormal friction.
- Install the removed parts (see appropriate chapters).



### Swingarm Bearing Removal

- Remove:
  - Swingarm (see Swingarm Removal)
  - Screw [A]
  - Chain Slipper [B]
  - Oil Seals [C]
  - Sleeves [D]

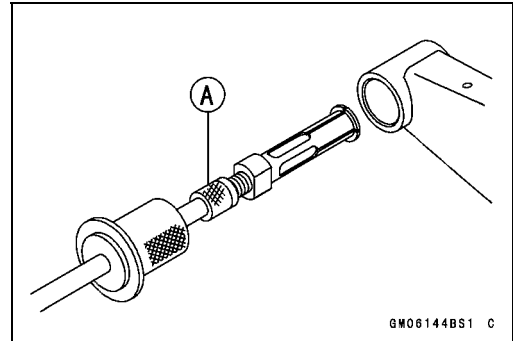


## 13-18 SUSPENSION

### Swingarm

- Remove the needle bearings using the oil seal & bearing remover [A].

**Special Tool - Oil Seal & Bearing Remover: 57001-1058**



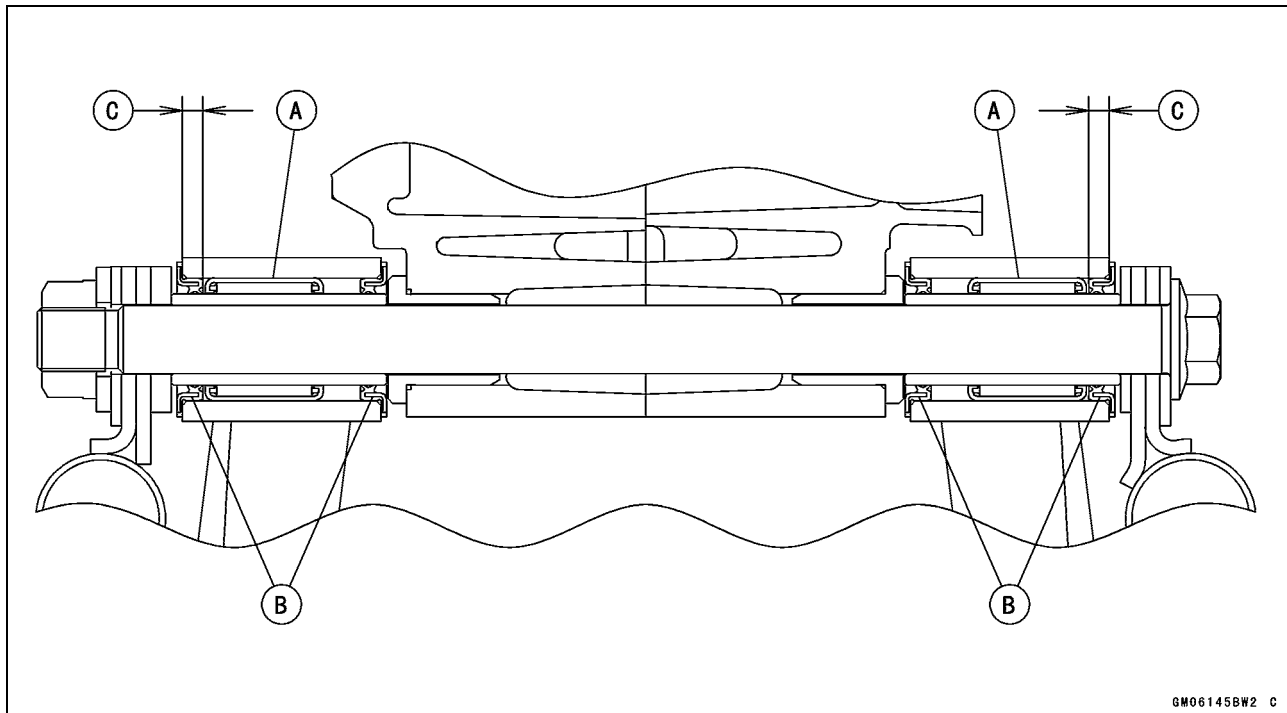
### **Swingarm Bearing Installation**

- Replace the needle bearings with new ones.
- Apply plenty of grease to the new needle bearings.
- Install the needle bearings so that the manufacturer's marks faces out.
- Install the new needle bearings [A] and oil seals [B] position as shown.

5 mm (0.20 in.) [C]

- Using a suitable bearing driver and the bearing driver set (special tool: 57001-1129).

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



## Swingarm

### Swingarm Bearing, Sleeve Inspection

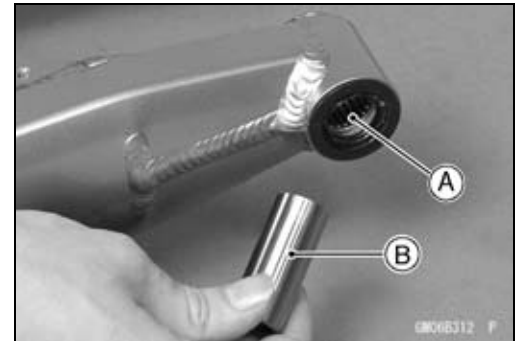
#### NOTICE

**Do not remove the bearings for inspection. Removal may damage them.**

- Inspect the needle bearings [A] installed in the swingarm.
- The rollers 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 bearings and sleeves [B] show any signs of abnormal wear, discoloration, or damage, replace them as a set.

### Swingarm Bearing Lubrication

- Refer to the Swingarm Pivot Lubrication in the Periodic Maintenance chapter.



## 13-20 SUSPENSION

### Tie-Rod, Rocker Arm

#### ***Tie-Rod Removal***

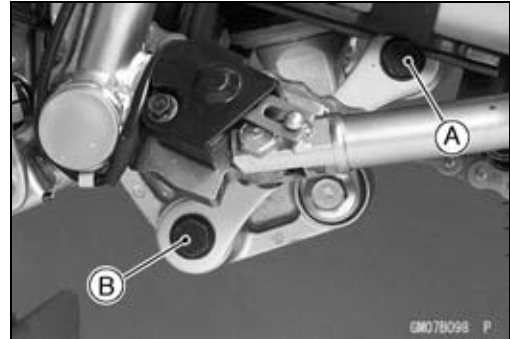
- Squeeze the brake lever slowly and hold it with a band [A].



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

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

- Remove:
  - Upper Tie-Rod Nut and Bolt [A]
  - Lower Tie-Rod Nut and Bolt [B]
  - Tie-Rods



#### ***Tie-Rod Installation***

- Install the tie-rods so that the marked side [A] faces outside.
- Tighten:
  - Torque - Tie-Rod Nuts: 98 N·m (10 kgf·m, 72 ft·lb)**

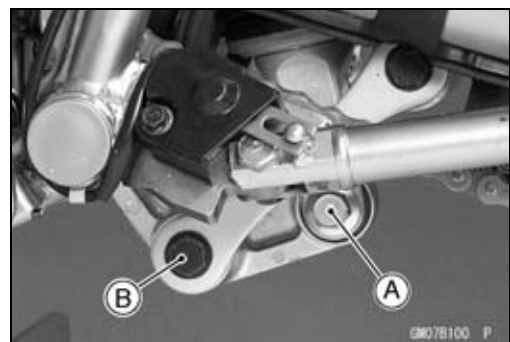


#### ***Rocker Arm Removal***

- Squeeze the brake lever slowly and hold it with a band [A].
- Raise the rear wheel off the ground with the jack.
  - Special Tool - Jack: 57001-1238**

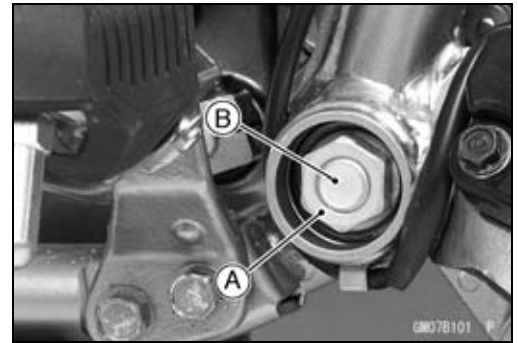


- Remove:
  - Lower Rear Shock Absorber Nut and Bolt [A]
  - Lower Tie-Rod Nut and Bolt [B]
- Loosen:
  - Swingarm Pivot Shaft Nut (see Swingarm Removal)
  - Lower Engine Mounting Nut (see Engine Removal in the Engine Removal/Installation chapter)



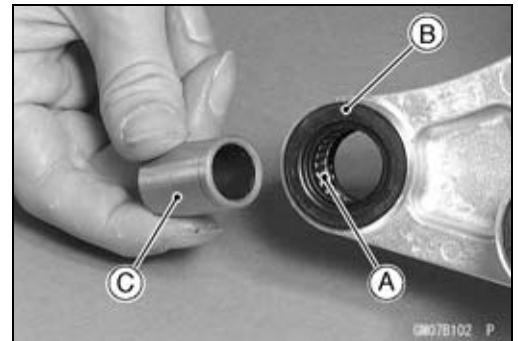
## Tie-Rod, Rocker Arm

- Remove:
  - Plug (Both Sides)
  - Rocker Arm Nut [A] and Bolt [B]
- Remove the rocker arm downward.



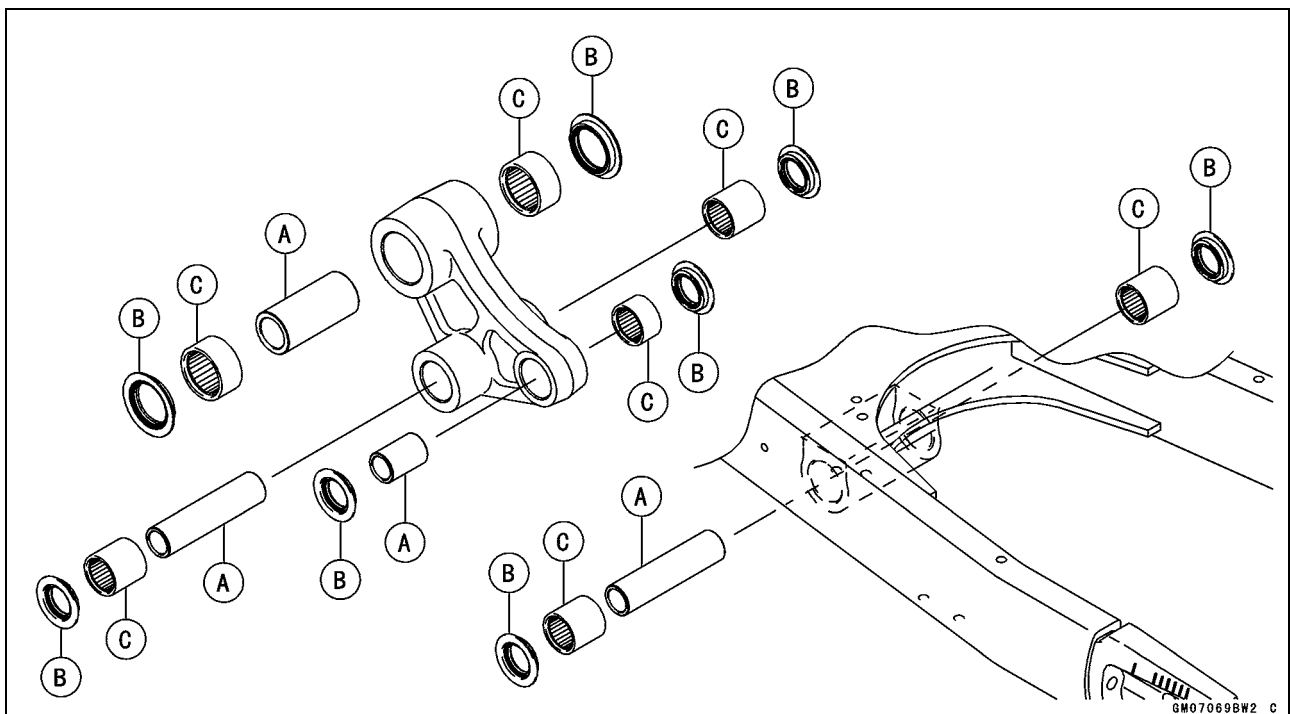
### Rocker Arm Installation

- Apply plenty of grease to the needle bearings [A].
- Apply grease to the lip of the oil seals [B].
- Be sure to install the oil seals and sleeves [C] to the rocker arm.
- Install the washer, and tighten the rocker arm nut.
  - Torque - Rocker Arm Nut: 98 N·m (10 kgf·m, 72 ft·lb)**
- Tighten:
  - Torque - Swingarm Pivot Shaft Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)**
  - Lower Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**
  - Tie-Rod Nuts: 98 N·m (10 kgf·m, 72 ft·lb)**
  - Lower Rear Shock Absorber Nut: 98 N·m (10 kgf·m, 72 ft·lb)**



### Tie-Rod and Rocker Arm Bearing Removal

- Remove:
  - Tie-Rods (see Tie-Rod Removal)
  - Rocker Arm (see Rocker Arm Removal)
  - Swingarm (see Swingarm Removal)
  - Sleeves [A]
  - Grease Seals [B]
  - Needle Bearings [C]

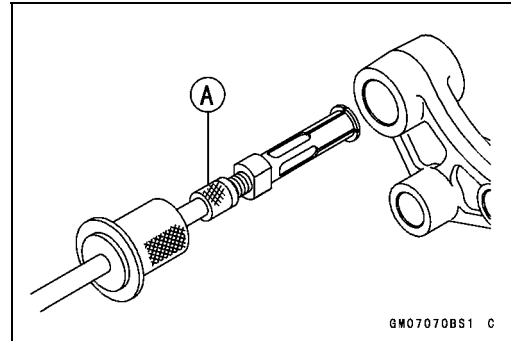


## 13-22 SUSPENSION

### Tie-Rod, Rocker Arm

○ Remove the needle bearings, using the oil seal & bearing remover [A].

**Special Tool - Oil Seal & Bearing Remover: 57001-1058**



#### ***Tie-Rod and Rocker Arm Bearing Installation***

- Replace the needle bearings with new ones.
- Apply plenty of grease to the new needle bearings.
- Install the needle bearings so that the manufacturer's marks faces out.
- Install the new needle bearings [A] and oil seals [B] position as shown

5.0 mm (0.20 in.) [C]

5.5 mm (0.22 in.) [D]

Rear Shock Absorber [E]

Tie-Rods [F]

Rocker Arm [G]

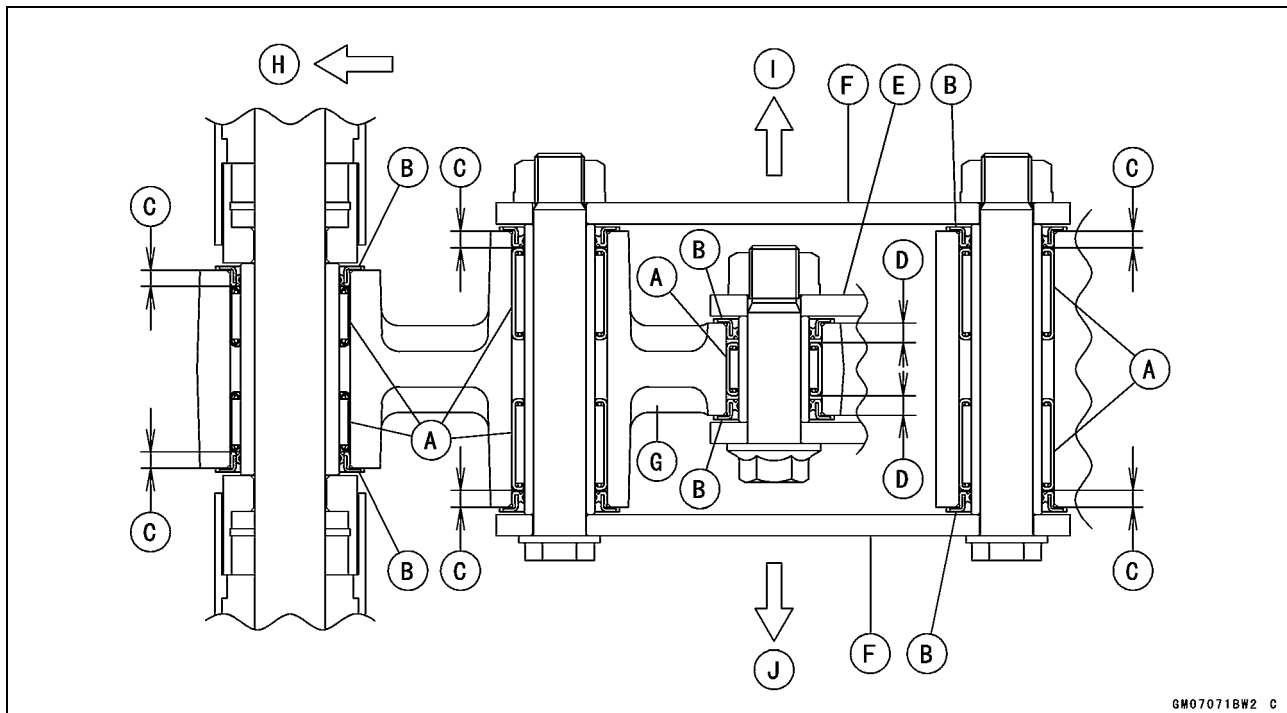
Front [H]

Right Side [I]

Left Side [J]

○ Using a suitable bearing driver and the bearing driver set (special tool: 57001-1129).

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



## Tie-Rod, Rocker Arm

### *Rocker Arm/Tie-Rod Bearing, Sleeve Inspection*

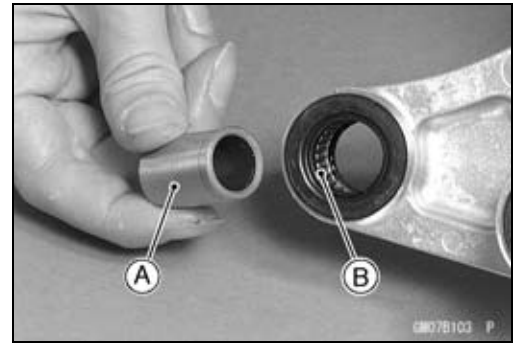
#### **NOTICE**

**Do not remove the bearings for inspection. Removal may damage them.**

- Visually inspect the rocker arm, or tie-rod sleeves [A] and needle bearings [B].
- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
- ★ If there is any doubt as to the condition of any of the needle bearings or sleeves replace the sleeve and needle bearings as a set.

### *Rocker Arm/Tie-Rod Bearing Lubrication*

- Refer to the Rocker Arm/Tie-Rod Bearing Lubrication in the Periodic Maintenance chapter.







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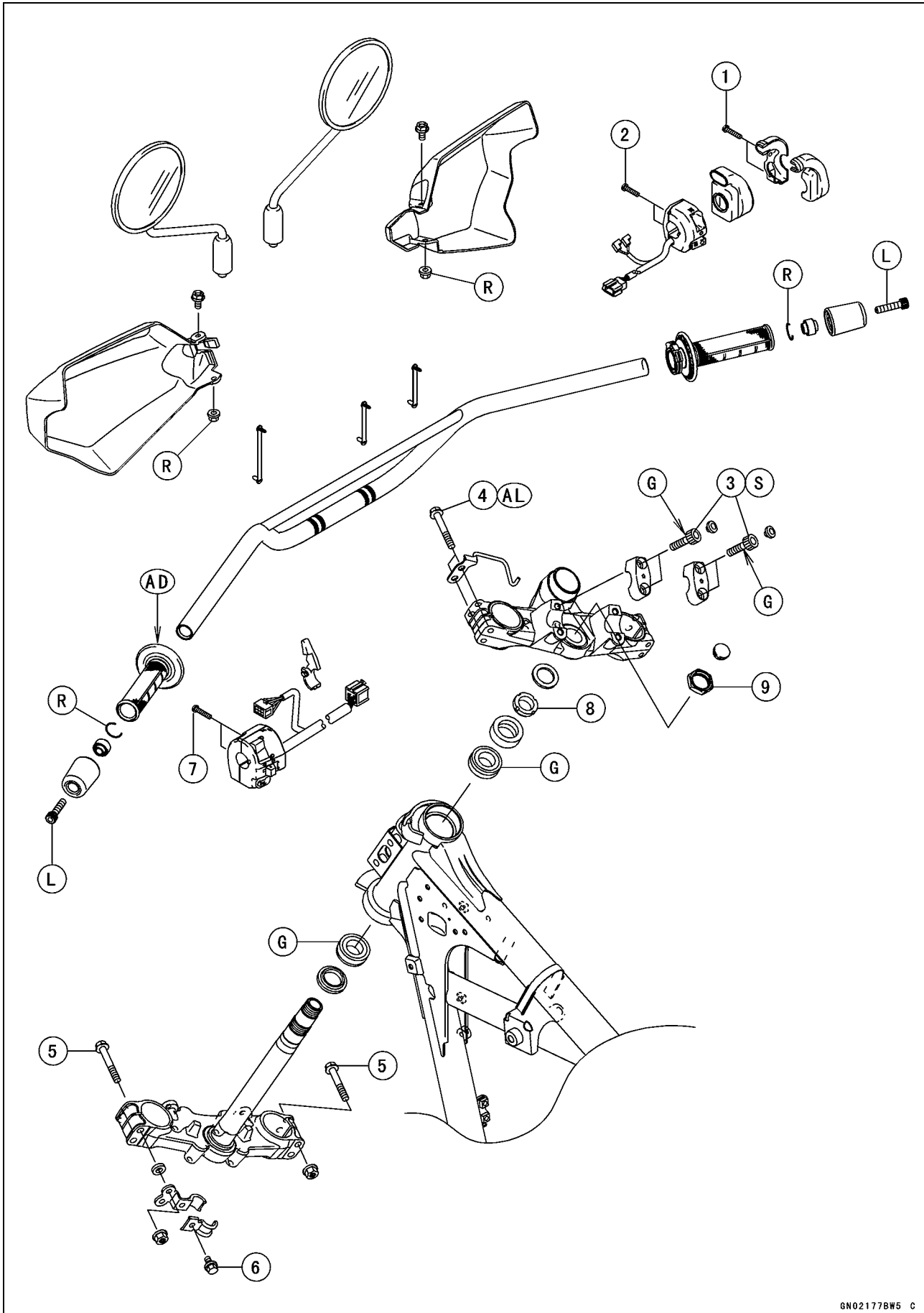
# Steering

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# 14-2 STEERING

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle Case Screws	3.8	0.39	34 in·lb	
2	Left Switch Housing Screws	3.5	0.36	31 in·lb	
3	Handlebar Clamp Bolts	25	2.5	18	S
4	Upper Fork Clamp Bolts	20	2.0	15	AL
5	Lower Fork Clamp Bolts	20	2.0	15	
6	Brake Hose Clamp Bolt	6.9	0.70	61 in·lb	
7	Right Switch Housing Screws	3.5	0.36	31 in·lb	
8	Steering Stem Nut	4.9	0.50	43 in·lb	
9	Steering Stem Head Nut	49	5.0	36	

AD: Apply adhesive.

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

G: Apply grease.

L: Apply a non-permanent locking agent.

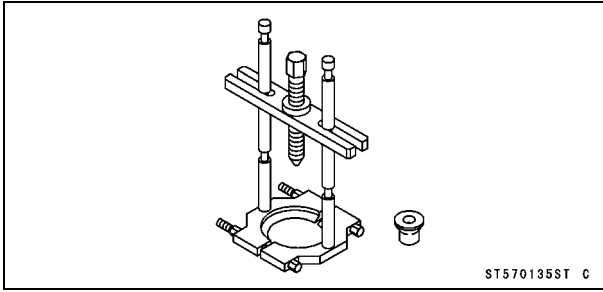
R: Replacement Parts

S: Following the specified tightening sequence.

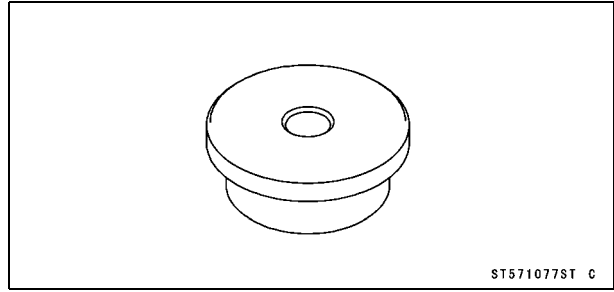
# 14-4 STEERING

## Special Tools

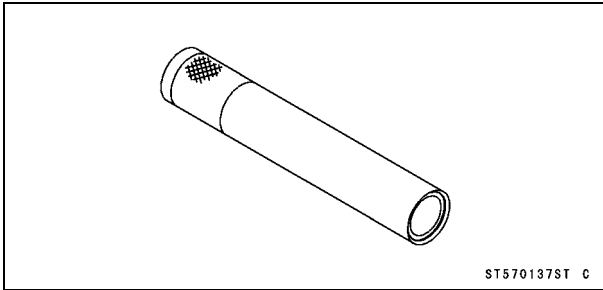
**Bearing Puller:**  
57001-135



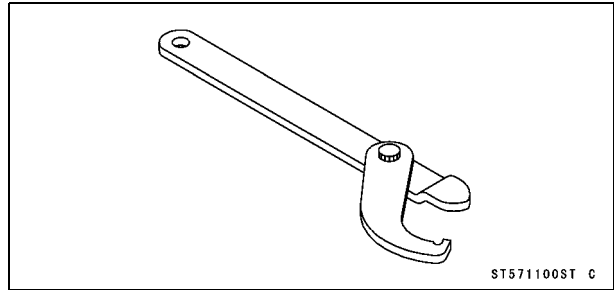
**Head Pipe Outer Race Driver,  $\phi 54.5$ :**  
57001-1077



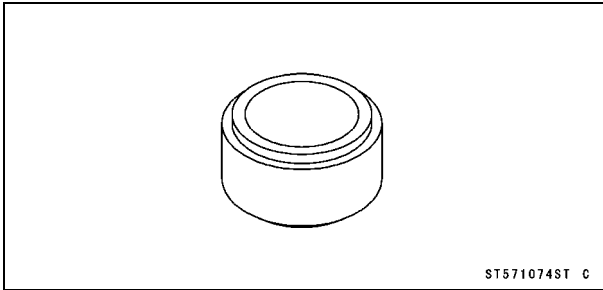
**Steering Stem Bearing Driver:**  
57001-137



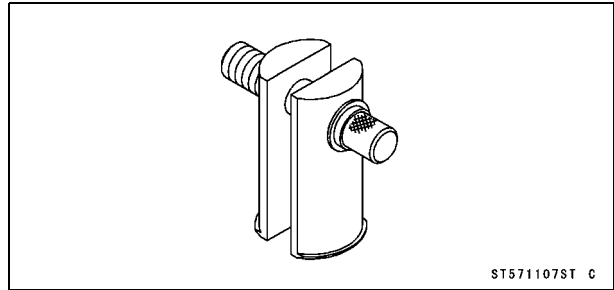
**Steering Stem Nut Wrench:**  
57001-1100



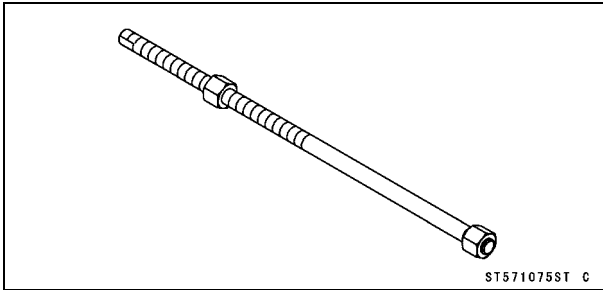
**Steering Stem Bearing Driver Adapter,  $\phi 34.5$ :**  
57001-1074



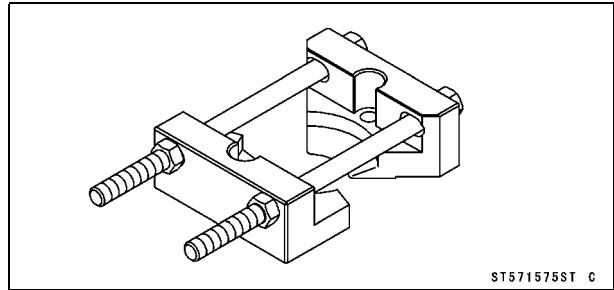
**Head Pipe Outer Race Remover ID > 37 mm:**  
57001-1107



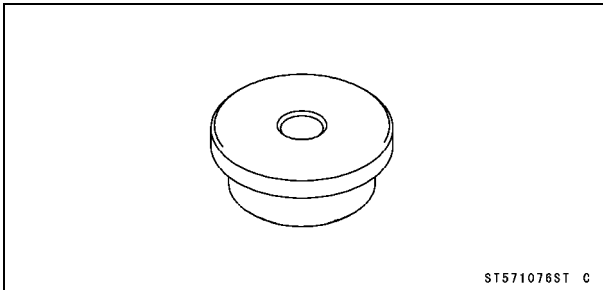
**Head Pipe Outer Race Press Shaft:**  
57001-1075



**Bearing Puller:**  
57001-1575



**Head Pipe Outer Race Driver,  $\phi 51.5$ :**  
57001-1076



## 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.

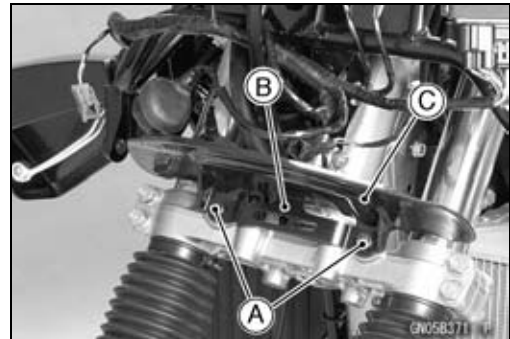
## 14-6 STEERING

### Steering Stem

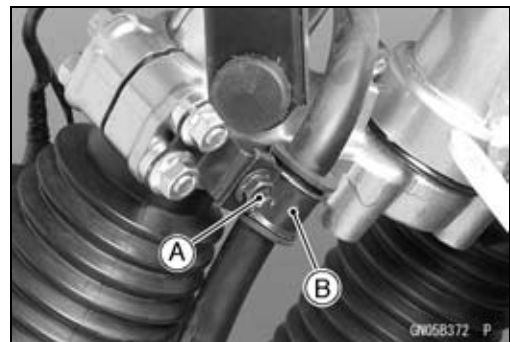
#### Stem, Stem Bearing Removal

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Lower Fairings (see Lower Fairing Removal in the Frame chapter)
  - Front Fender (see Front Fender Removal in the Frame chapter)
  - Handlebar (see Handlebar Removal)
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)

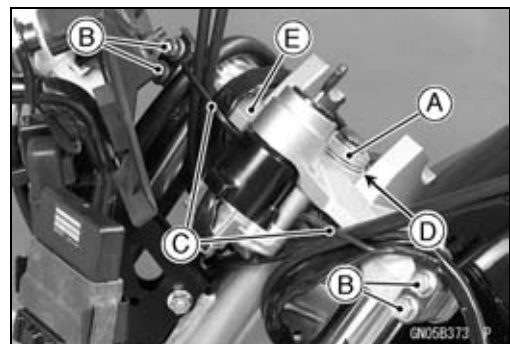
- Remove:
  - Bolt [A]
  - Brake Hose Clamp Bracket [B]
  - Upper Fairing Under Cover [C]



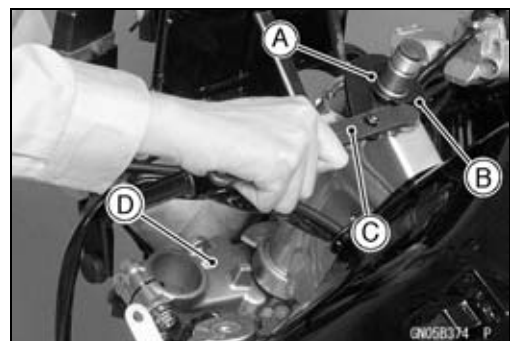
- Remove:
  - Bolt [A]
  - Brake Hose Clamp [B]



- Loosen the steering stem head nut [A].
- Remove:
  - Upper Fork Clamp Bolts [B]
  - Clamps [C]
  - Steering Stem Head Nut and Washer [D]
  - Steering Stem Head [E]
  - Front Forks (see Front Fork Removal in the Suspension chapter)

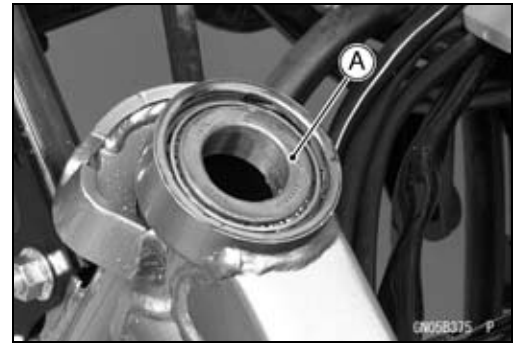


- Pushing up the stem base, and remove the steering stem nut [A] with stem cap [B].
  - Special Tool - Steering Stem Nut Wrench [C]: 57001-1100**
- Remove the steering stem [D] under side.



**Steering Stem**

- Remove the upper stem bearing inner race (tapered roller) [A].

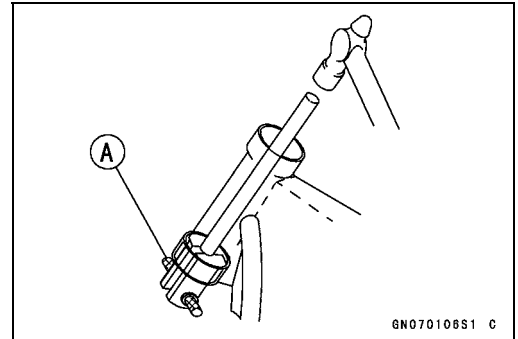


- Drive out the bearing outer races from the head pipe.
- Remove the outer races pressed into the head pipe, using the head pipe outer race remover [A], and hammer the head pipe outer race remover to drive it out.

**Special Tool - Head Pipe Outer Race Remover ID > 37 mm: 57001-1107**

**NOTE**

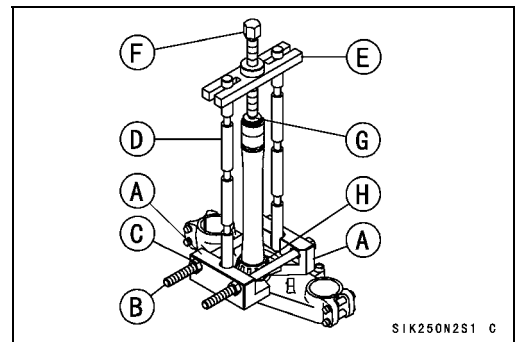
○ If either steering stem bearing is damaged, it is recommended that both the upper and lower bearing (including outer races) should be replaced with new ones.



- Remove the lower stem bearing inner race (tapered roller bearing) [A] with its grease seal from the stem using bearing pullers.

**Special Tools - Bearing Puller: 57001-135**  
**Bearing Puller: 57001-1575**

- Assemble the bearing puller (57001-1575).
- Insert the each half-split base [A] under the bottom of bearing inner race and connect the both bases by tightening the bolts [B] and nuts [C].
- Assemble the parts of the bearing puller (57001-135) as shown in the figure.
  - Stud Bolts [D]
  - Arm [E]
  - Center Bolt [F]
  - Adapter [G]
- Turn the center bolt by a wrench and pull the bearing inner race.



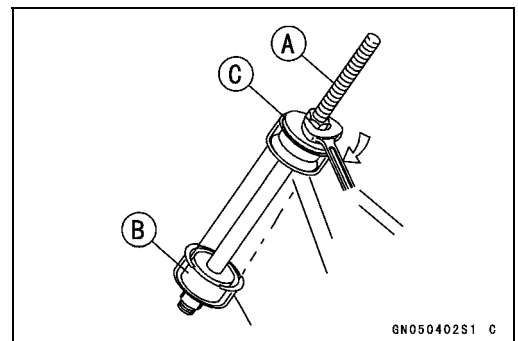
**NOTE**

○ Tighten evenly two bases by the two bolts.

**Steering Stem, Stem Bearing Installation**

- Replace the bearing outer races with new ones.
- Apply grease to the outer races, and drive them into the head pipe at the same time using the head pipe outer race press shaft [A] and the drivers.

**Special Tools - Head Pipe Outer Race Press Shaft: 57001-1075**  
**Head Pipe Outer Race Driver,  $\phi$ 51.5: 57001-1076 [B]**  
**Head Pipe Outer Race Driver,  $\phi$ 54.5: 57001-1077 [C]**

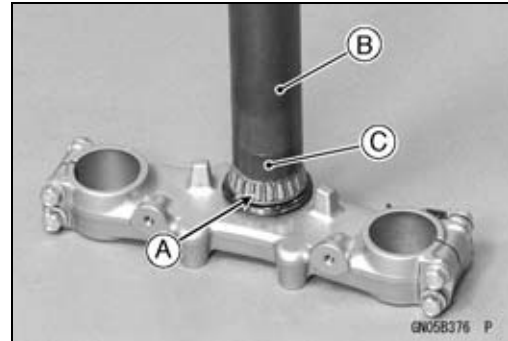


## 14-8 STEERING

### Steering Stem

- Replace the lower inner races with new ones.
- Apply grease to the lower tapered roller bearing [A], and drive it onto the stem using the steering stem bearing driver [B] and adapter [C].

**Special Tools - Steering Stem Bearing Driver: 57001-137**  
**Steering Stem Bearing Driver Adapter,**  
**φ34.5: 57001-1074**

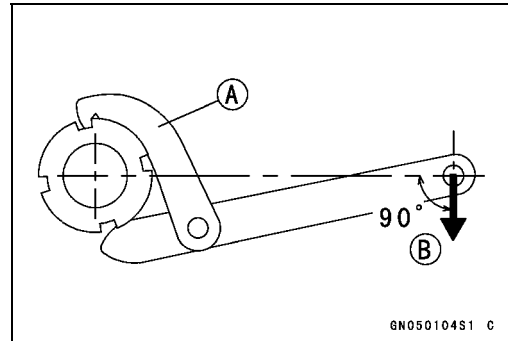


- Apply grease to the upper inner race, and install it in the head pipe.
- Install the stem through the head pipe and upper bearing, and hand-tighten the nut while pushing up on the stem base.
- Install the stem head and washer, and tighten the stem head nut lightly.
- Settle the bearing in place as follows;
- Tighten the stem nut to **39 N·m (4.0 kgf·m, 29 ft·lb)** of torque. (To tighten the steering stem nut to the specified torque, hook the wrench [A] on the stem nut, and pull the wrench at the hole by **22.2 kg** force [B] in the direction shown.)

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

- Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.
- Again back out the stem nut a fraction of a turn until it turns lightly.
- Turn the stem nut lightly clockwise until it just becomes hard to turn. Do not overtighten, or the steering will be too tight.

**Torque - Steering Stem Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)**





## Steering Stem

- Install the stem head.
- Install the washer, and tighten the stem head nut temporary.
- Install the front forks (see Front Fork Installation in the Suspension chapter).

### NOTE

- Tighten the upper fork clamp bolts first, next the stem head nut, last the lower fork clamp bolts.
- Tighten the two upper fork clamp bolts alternately two times to ensure even tightening torque.

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

**Steering Stem Head Nut:** 49 N·m (5.0 kgf·m, 36 ft·lb)

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

### **⚠ WARNING**

If the handlebar does not turn to the steering stop it may cause an accident resulting in injury or death. Be sure the cables, harnesses and hoses are routed properly and do not interfere with handlebar movement (see Cable, Wire, and Hose Routing section in the Appendix chapter).

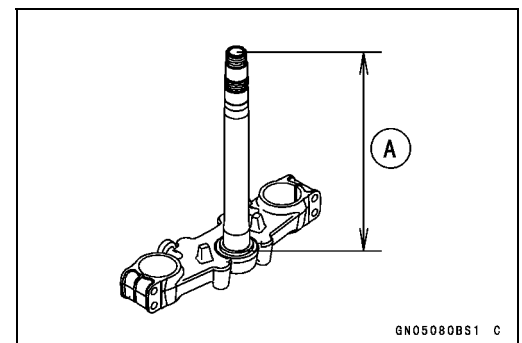
- Install the brake hose clamp.  
**Torque - Brake Hose Clamp Bolt:** 6.9 N·m (0.70 kgf·m, 61 in·lb)
- Install the removed parts (see appropriate chapters).

### **Stem Bearing Lubrication**

- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

### **Steering Stem Warp**

- Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.
- ★ If the steering stem [A] is bent, replace the steering stem.



### **Stem Cap Deterioration, Damage**

- ★ Replace the stem cap if its oil seal [A] shows damage.

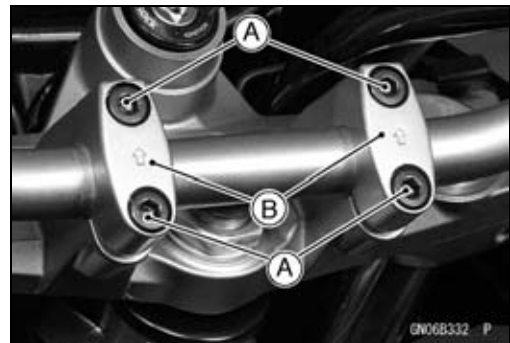
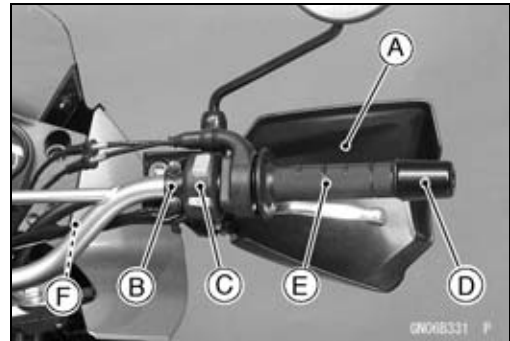
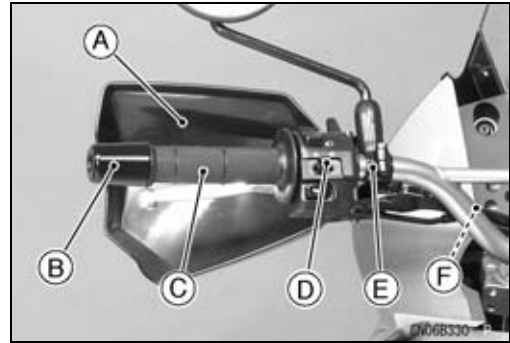


## 14-10 STEERING

### Handlebar

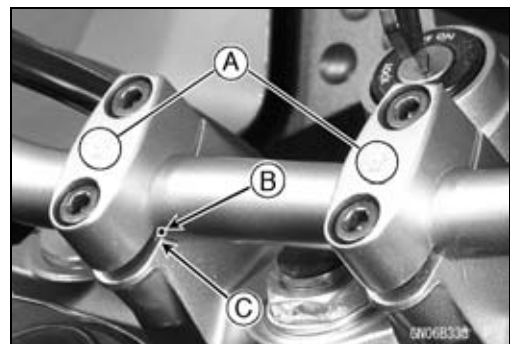
#### **Handlebar Removal**

- Remove:
  - Left Handle Cover [A] (see Handle Cover Removal in the Frame chapter)
  - Left Handlebar Weight [B]
  - Left Handlebar Grip [C]
  - Clutch Cable Upper End (see Clutch Cable Removal in the Clutch chapter)
  - Left Switch Housing [D]
  - Clutch Lever Assembly [E]
  - Clamp [F]
- Remove:
  - Right Handle Cover [A] (see Handle Cover Removal in the Frame chapter)
  - Front Brake Master Cylinder [B] (see Front Master Cylinder Removal in the Brakes chapter)
  - Right Switch Housing [C]
  - Throttle Cable Upper End (see Throttle Cable Removal in the Fuel System chapter)
  - Right Handlebar Weight [D]
  - Throttle Grip [E]
  - Clamp [F]
- Remove:
  - Handlebar Clamp Bolt Plugs and Bolts [A]
  - Handlebar Holder [B]
  - Handlebar



#### **Handlebar Installation**

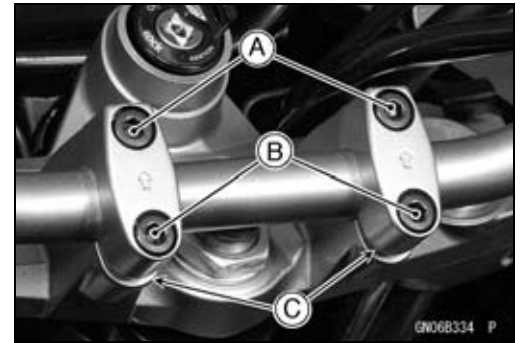
- Install the handlebar holders so that the arrow mark [A] on the holder points to the front.
- Align the punch mark [B] on the handlebar and the corner edge [C] on the stem head.



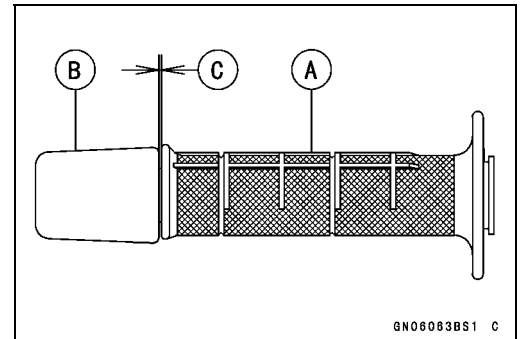
## Handlebar

- Tighten the front clamp bolts [A] first, and then the rear clamp bolts [B].
- There will be a gap [C] at the rear part of the handlebar holder after tightening.

**Torque - Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

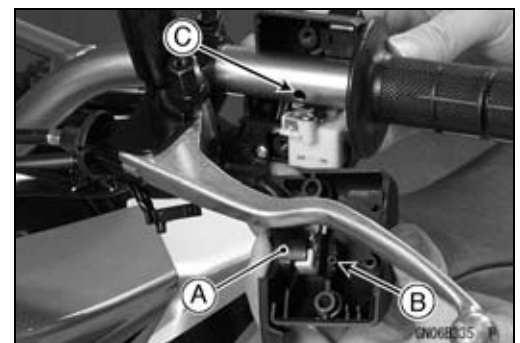


- Install the clutch lever (see Clutch Lever Installation in the Clutch chapter).
- Apply adhesive to the inside of the left handlebar grip [A].
- Install the left handlebar grip and left handlebar weight [B] so that distance [C] between the grip and weight is the 1 mm (0.04 in.).
- Apply a non-permanent locking agent to the left handlebar weight bolt, and tighten it.



- Install the left switch housing.
- Run the choke cable into the clamp of the handlebar correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the choke lever [A], and fit the projection [B] into a small hole [C] in the handlebar.

**Torque - Left Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**



- Install the right switch housing.
- Fit the projection [A] into a small hole [B] in the handlebar.

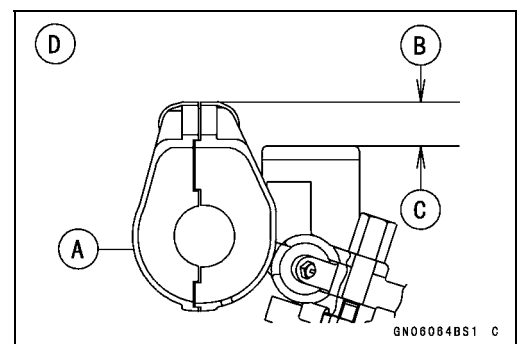
**Torque - Right Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**



- Install:
  - Front Brake Master Cylinder (see Front Brake Master Cylinder Installation in the Brakes chapter)
  - Throttle Cable Upper Ends

- Install the throttle case [A] so that the upper surface [B] of the throttle case and the upper surface [C] of the reservoir cap become parallel.

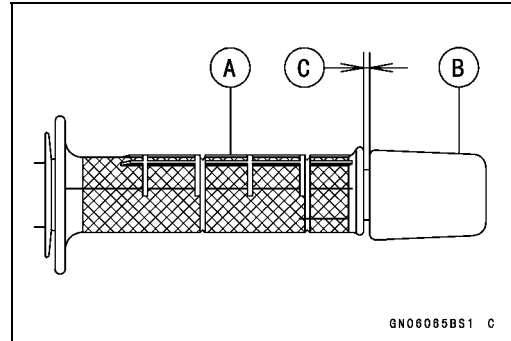
Right Side View [D]



## 14-12 STEERING

### Handlebar

- Install the throttle grip [A] and right handlebar weight [B] so that distance [C] between the grip and weight is the 2.5 mm (0.098 in.).
- Tighten:  
**Torque - Throttle Case Screws: 3.8 N·m (0.39 kgf·m, 34 in·lb)**
- Apply a non-permanent locking agent to the right handlebar weight bolt, and tighten it.



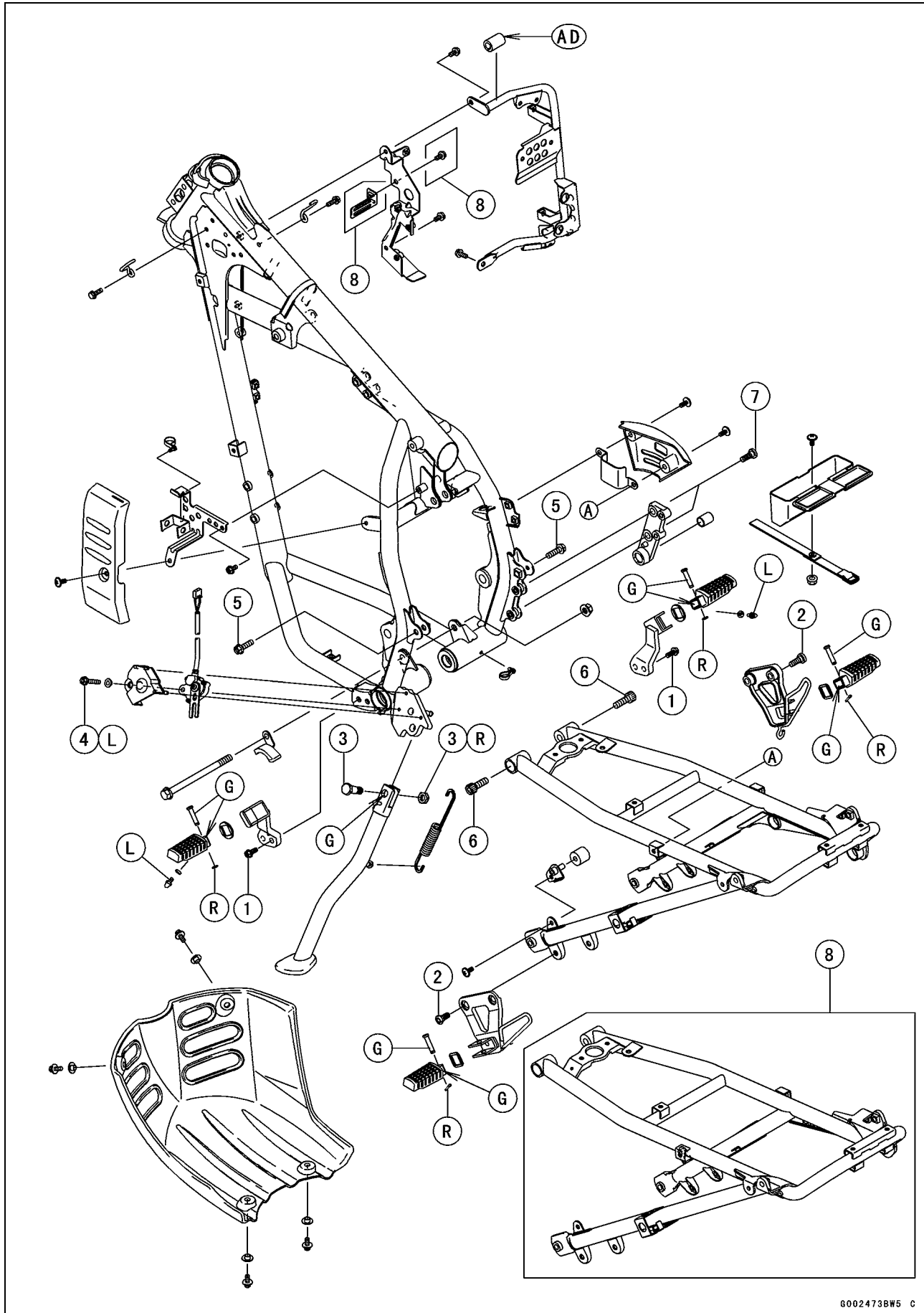
# Frame

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# 15-2 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 and Nut	44	4.5	33	R (1)
4	Sidestand Switch Mounting Bolt	8.8	0.9	78 in·lb	L
5	Lower Rear Frame Bolts	25	2.5	18	
6	Upper Rear Frame Bolts	44	4.5	33	
7	Rear Master Cylinder Bracket Bolts	25	2.5	18	

8. KL650E8 ~ E9 Models

AD: Apply adhesive.

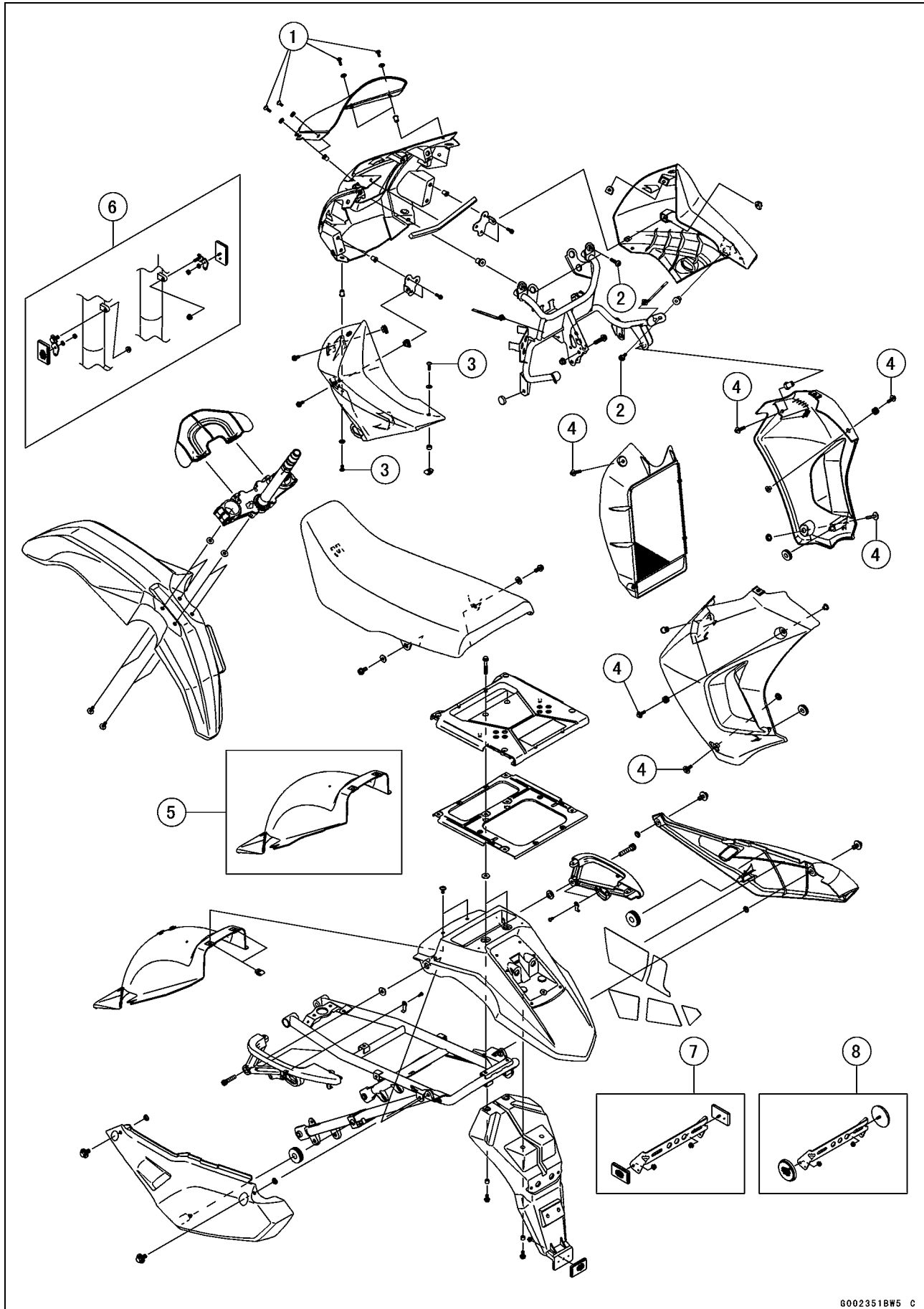
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

# 15-4 FRAME

## Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Windshieid Mounting Screws	0.4	0.04	4 in·lb	
2	Upper Fairings Mounting Bolts	0.9	0.09	8 in·lb	
3	Upper Left and Right Fairings Mounting Screws	0.4	0.04	4 in·lb	
4	Lower Fairing Mounting Bolts	8.8	0.90	78 in·lb	

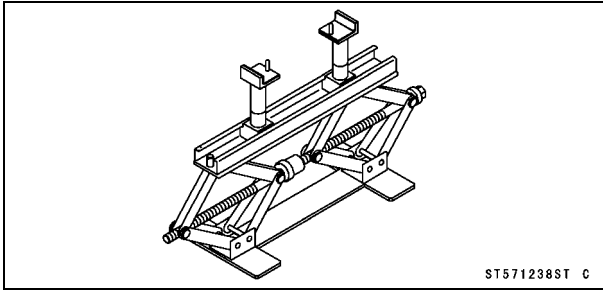
- 5. CAL Model
- 6. Other than AU and MY Models
- 7. Other than AU Model
- 8. KL650E9 ~ EC (AU Model)

## 15-6 FRAME

### Special Tool

---

Jack:  
57001-1238



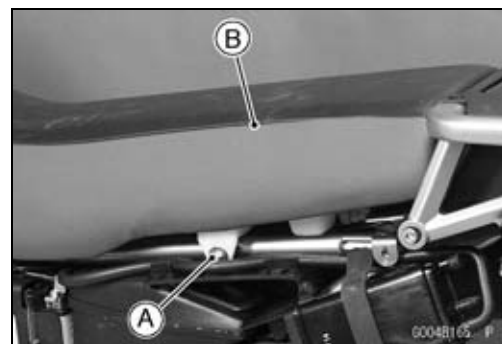
---

**Seat**

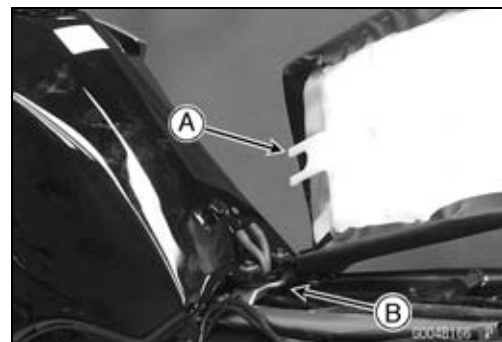
---

**Seat Removal**

- Remove the side covers (see Side Cover Removal).
- Remove the seat mounting bolts [A] on both sides.
- Pulling up on the rear of seat [B], and pulling the seat backward.

**Seat Installation**

- Insert the hook [A] of the seat under the fuel tank bracket [B].
- Take care not to damage the harness.



## 15-8 FRAME

### Fairings

#### Lower Fairing Removal

- Remove the bolt [A].



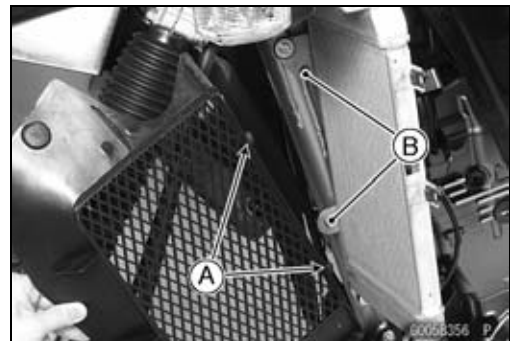
- Remove:
  - Bolts [A]
  - Screw [B]
  - Lower Fairing [C]

○ When removing the left lower fairing, remove the radiator screen together with lower fairing.



#### Lower Fairing Installation

- Before installing the left lower fairing, insert the projections [A] of the radiator screen into the grommets [B] on the radiator.



- Insert the projection [A] into the grommet [B] on the fuel tank.
- Tighten:
  - Torque - Lower Fairing Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
  - Upper Left and Right Fairings Mounting Screws: 0.4 N·m (0.04 kgf·m, 4 in·lb)**



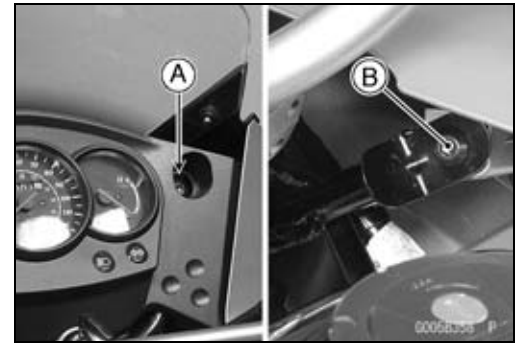
#### Upper Fairing Removal

- Remove the screws [A] on both sides.

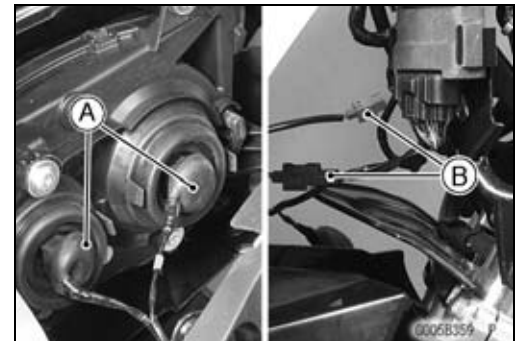


## Fairings

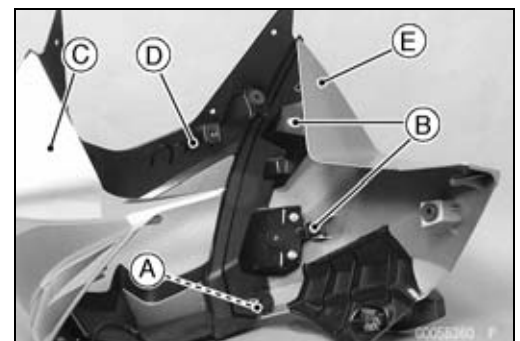
- Remove the upper fairing mounting bolts [A] [B] on both sides.
- Clear the turn signal light leads from the clamps of the upper fairing.



- Disconnect:
  - Headlight Lead Connectors [A]
  - Turn Signal Light Lead Connectors [B]
- Remove:
  - Headlight Assy (see Headlight Removal in the Electrical System chapter)
  - Windshield (see Windshield Removal)



- Remove the screw [A], and bolts [B] on both sides.
- Separate left [C], center [D] and right [E] upper fairing each other.

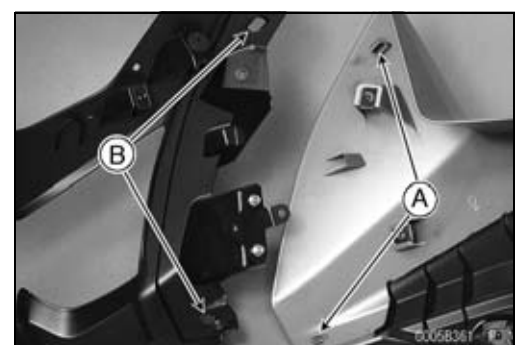


### Upper Fairings Installation

- Installation is the reverse of removal.
- When assembling the upper fairings, insert the projections [A] into the holes [B].
- Tighten:

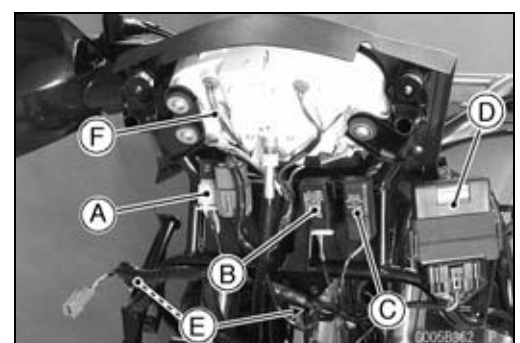
**Torque - Upper Left and Right Fairings Mounting Screws:**  
0.4 N·m (0.04 kgf·m, 4 in·lb)

**Upper Fairings Mounting Bolts:** 0.9 N·m (0.09 kgf·m, 8 in·lb)



### Upper Fairing Bracket Removal

- Remove:
  - Lower Fairings (see Lower Fairings Removal)
  - Upper Fairings (see Upper Fairings Removal)
  - Interlock Diode Unit [A]
  - Turn Signal Relay [B]
  - Starter Circuit Relay [C]
  - IC Igniter [D]
  - Clamps [E]
  - Meter Unit [F] (see Meter Unit Removal/Installation in the Electrical System chapter)

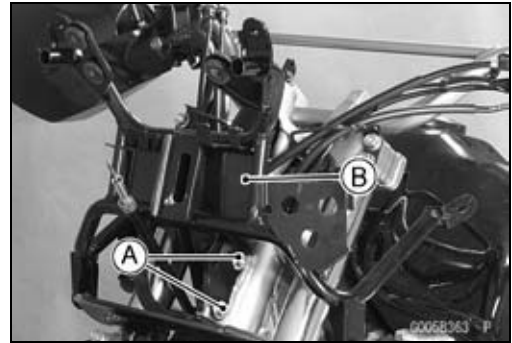


## 15-10 FRAME

### Fairings

---

- Remove:
  - Bolts and Nuts [A]
  - Upper Fairing Bracket [B]



#### ***Upper Fairing Bracket Installation***

- Installation in the reverse of removal.
- Run the harness and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

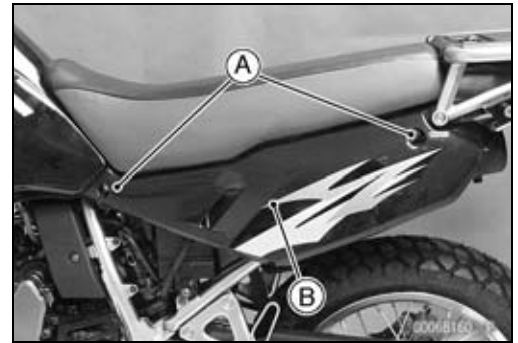
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## Side Covers

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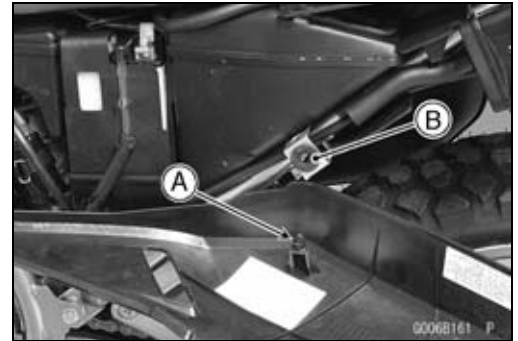
### **Side Cover Removal**

- Remove:
  - Side Cover Mounting Bolts [A]
  - Side Cover [B]



### **Side Cover Installation**

- Installation is the reverse of removal.
- Insert the projection [A] into the grommet [B] on the rear frame.



## 15-12 FRAME

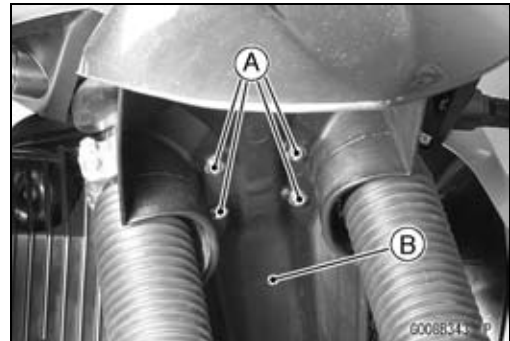
### Fenders

#### Front Fender Removal

- Remove the speedometer cable lower end [A].

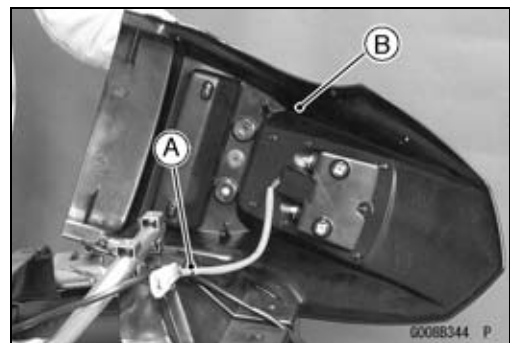


- Remove the front fender mounting bolts [A], and pull out the front fender [B].



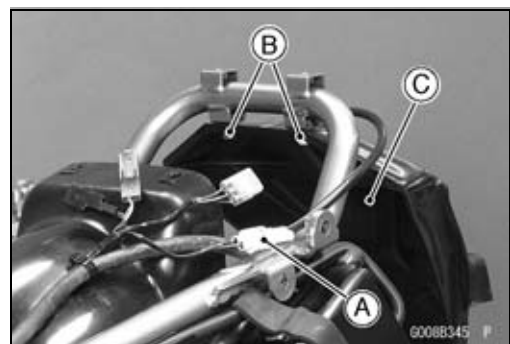
#### Rear Fender Rear Removal

- Remove:
  - Side Covers (see Side Covers Removal)
  - Seat (see Seat Removal)
  - Carrier (see Carrier Removal)
- Turn over the rear fender rear, and remove the clamp [A].
- Remove the rear fender rear [B].



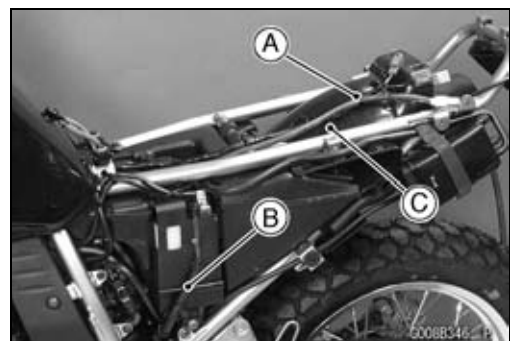
#### Flap Removal

- Remove:
  - Side Covers (see Side Covers Removal)
  - Seat (see Seat Removal)
  - Carrier (see Carrier Removal)
  - Rear Fender Rear (see Rear Fender Rear Removal)
- Disconnect the license plate light lead connector [A].
- Remove:
  - Bolts [B]
  - Flap [C]



#### Rear Fender Front Removal

- Remove:
  - Side Covers (see Side Covers Removal)
  - Seat (see Seat Removal)
  - Carrier (see Carrier Removal)
  - Rear Fender Rear (see Rear Fender Rear Removal)
- Remove the clamp [A] and battery bent hose [B] from rear fender front [C].
- Pull out the rear fender front backward.

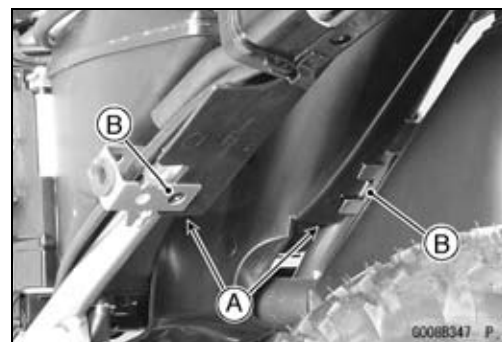




## Fenders

### ***Rear Fender Front Installation***

- Installation is the reverse of removal.
- Insert the ledges [A] of the rear fender front into the slits [B] of the rear frame securely.

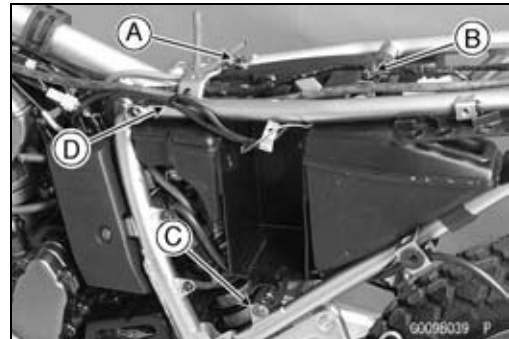


# 15-14 FRAME

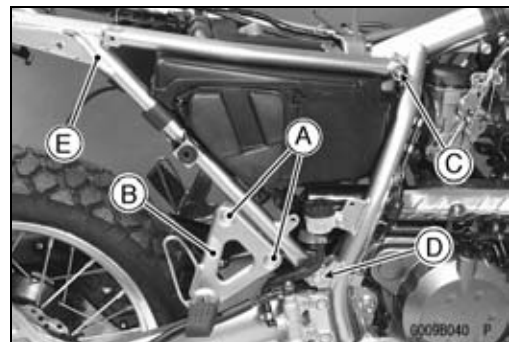
## Frame

### Rear Frame Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Battery (see Battery Removal in the Electrical System chapter)
  - Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
  - Rear Fender Front (see Rear Fender Front Removal)
  - Flap (see Flap Removal)
  - Canister (CAL Model)
- Remove:
  - Air Cleaner Housing Bolt [A]
  - Bolt [B]
  - Screw [C]
  - Clamp [D]

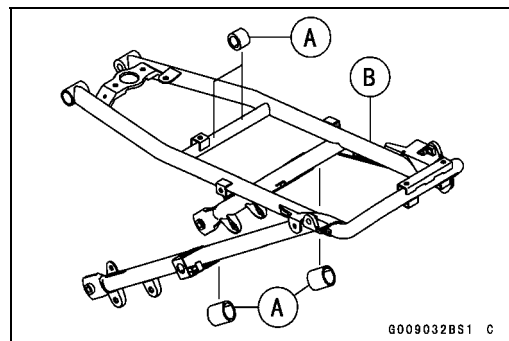


- Remove:
  - Bolts [A]
  - Rear Footpeg Bracket [B]
- Unscrew the upper [C] and lower rear frame bolts [D] on both sides, and remove the rear frame [E] backward.



### Rear Frame Installation

- Be sure that the dampers [A] are in positions on the rear frame [B].
- Run the harness, leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:
  - Torque - Upper Rear Frame Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)**
  - Lower Rear Frame Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Rear Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Air Cleaner Housing Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Install the removed parts (see appropriate chapters).



---

**Frame**

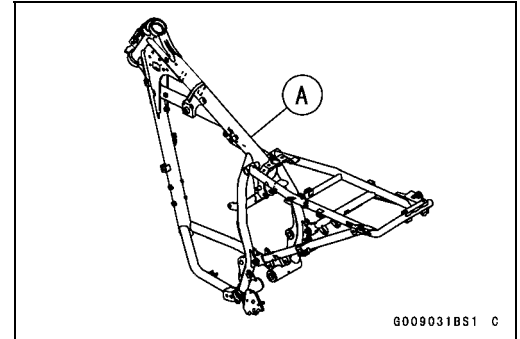
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**Frame Inspection**

- Visually inspect the frame [A] for cracks, dents, bending, or warping.
- ★ If there is any damage to the frame, replace it.

**⚠ WARNING**

A repaired frame may fail in use, possibly causing an accident resulting in injury or death. If the frame is bent, dented, cracked, or warped, replace it.



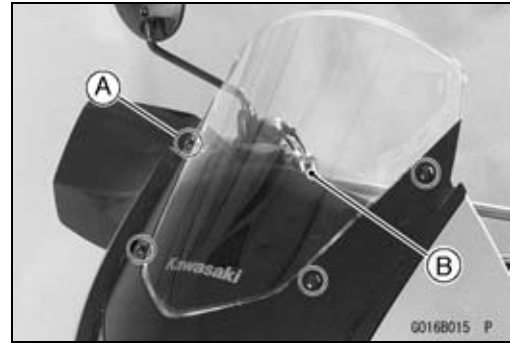
## 15-16 FRAME

### Windshield

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#### **Windshield Removal**

- Remove the windshield mounting screws [A], and the windshield [B].



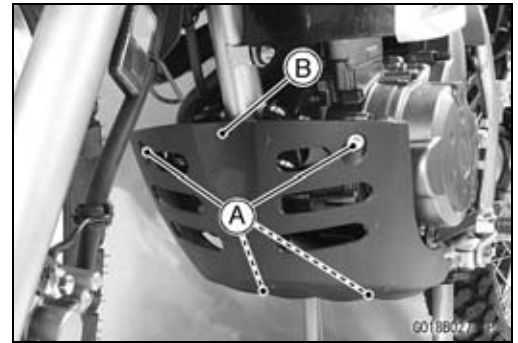
#### **Windshield Installation**

- Tighten:  
Torque - Windshield Mounting Screws: 0.4 N·m (0.04 kgf·m, 4 in·lb)

## Guard, Carrier

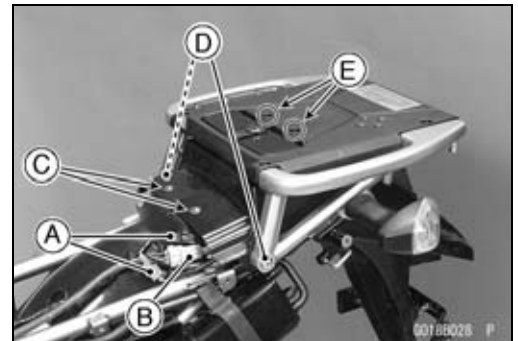
### Engine Guard Removal

- Remove:
  - Bolts [A]
  - Engine Guard [B]



### Carrier Removal

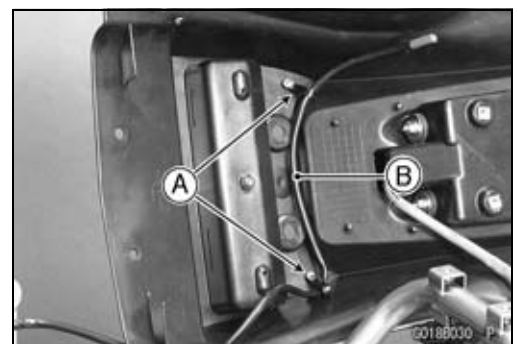
- Remove the side covers (see Side Covers Removal).
- Remove the seat (see Seat Removal).
- Disconnect the turn signal light connectors [A], and tail/brake light connector [B].
- Remove the rear fender rear mounting screws [C], the tail grip bolts [D] and carrier mounting bolts [E].



- Remove the flap mounting bolts [A].



- Turn over the carrier and the rear fender rear.
- Remove the clamps [A], and pull out the right turn signal light lead [B].
- Remove the carrier.



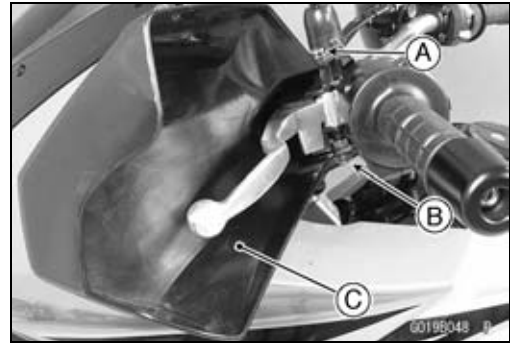
## 15-18 FRAME

### Handle Covers

---

#### *Handle Cover Removal*

- Remove:
  - Bolt [A] and Nut [B]
  - Handle Cover [C]



#### *Handle Cover Installation*

- Installation is the reverse of removal.
- Replace the handle cover nut with new one.

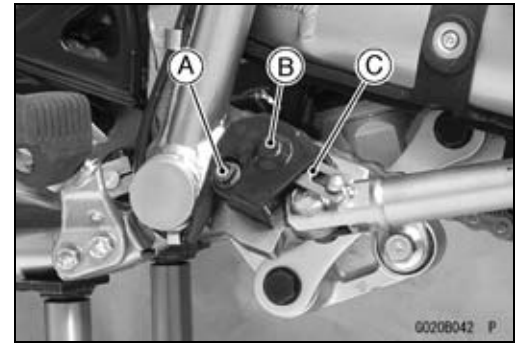
## Sidestand

### Sidestand Removal

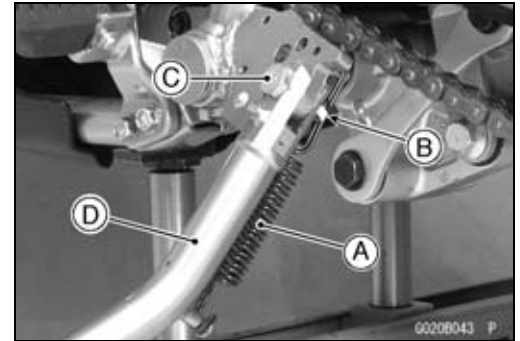
- Raise the rear wheel off the ground with the jack.

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

- Remove:
  - Sidestand Switch Mounting Bolt [A]
  - Sidestand Switch Cover [B]
  - Sidestand Switch [C]



- Remove:
  - Spring [A]
  - Sidestand Nut [B]
  - Sidestand Bolt [C]
  - Sidestand [D]

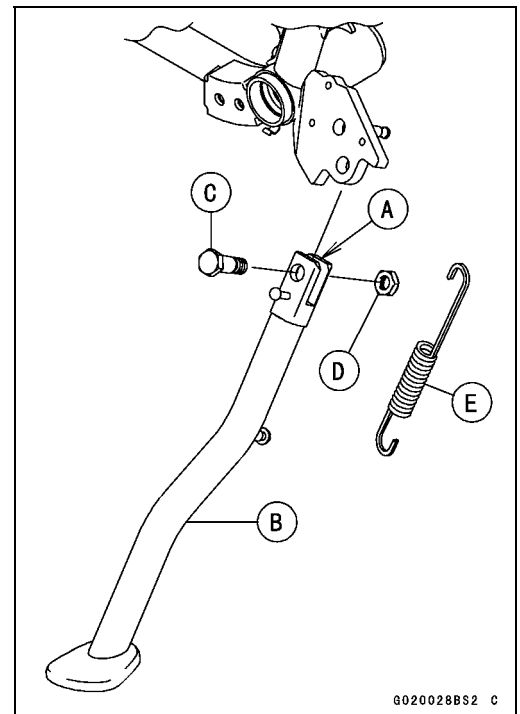


### Sidestand Installation

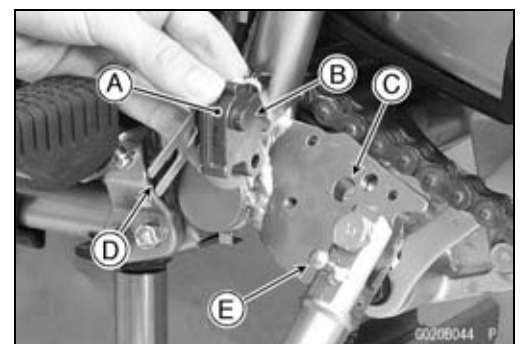
- Apply grease to the sliding area [A] of the sidestand [B].
- Replace the sidestand nut [D] with a new one.
- Tighten the bolt and lock it with the nut.

**Torque - Sidestand Bolt [C] and Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**

- Hook the spring [E] so that face the long spring end upward.



- Install the sidestand switch [A] as follows.
  - Insert the projection [B] into the hole [C].
  - Fit the slit [D] to the projection [E].

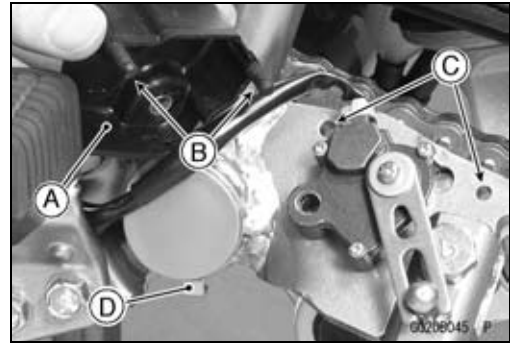


## 15-20 FRAME

### Sidestand

---

- Install the sidestand switch cover [A] as follows.
- Insert the projections [B] into the holes [C].
- Apply a non-permanent locking agent to the threads of the sidestand switch mounting bolt, and tighten it.  
**Torque - Sidestand Switch Mounting Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Hang the sidestand switch lead to the clamp [D].

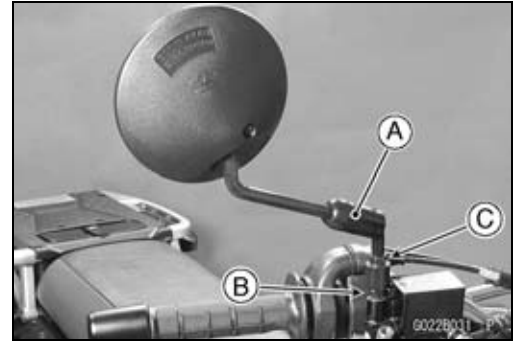




## Rear View Mirrors

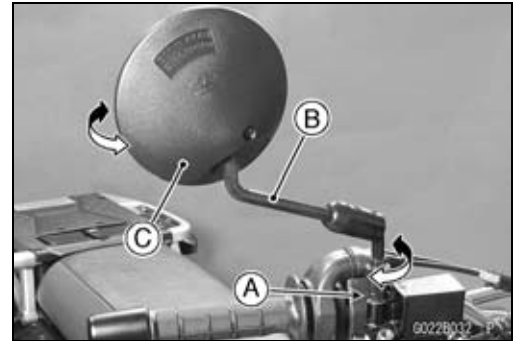
### **Rear View Mirrors Removal**

- When removing the rear view mirror of the right side, remove the handle cover (see Handle Cover Removal).
- Slide up the rubber cap [A].
- Loosen the lower adapter nut [B] for tightening to remove the rear view mirror from the holder.
- Do not loosen the upper adapter nut [C].



### **Rear View Mirrors Installation**

- Screw the rear view mirror into the holder all the way, and tighten the lower adapter nut [A] securely.
- Turn the stay [B] to assure the safe conditions of the rear with operator sat on the motorcycle.
- Adjust the rear view mirror slightly with its mirror [C].
- Installation and adjustment of the left side are common with those of the right side. Follow the procedure specified at the right side.
- Slide back the rubber cap to the original position.





# Electrical System

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## 16-2 ELECTRICAL SYSTEM

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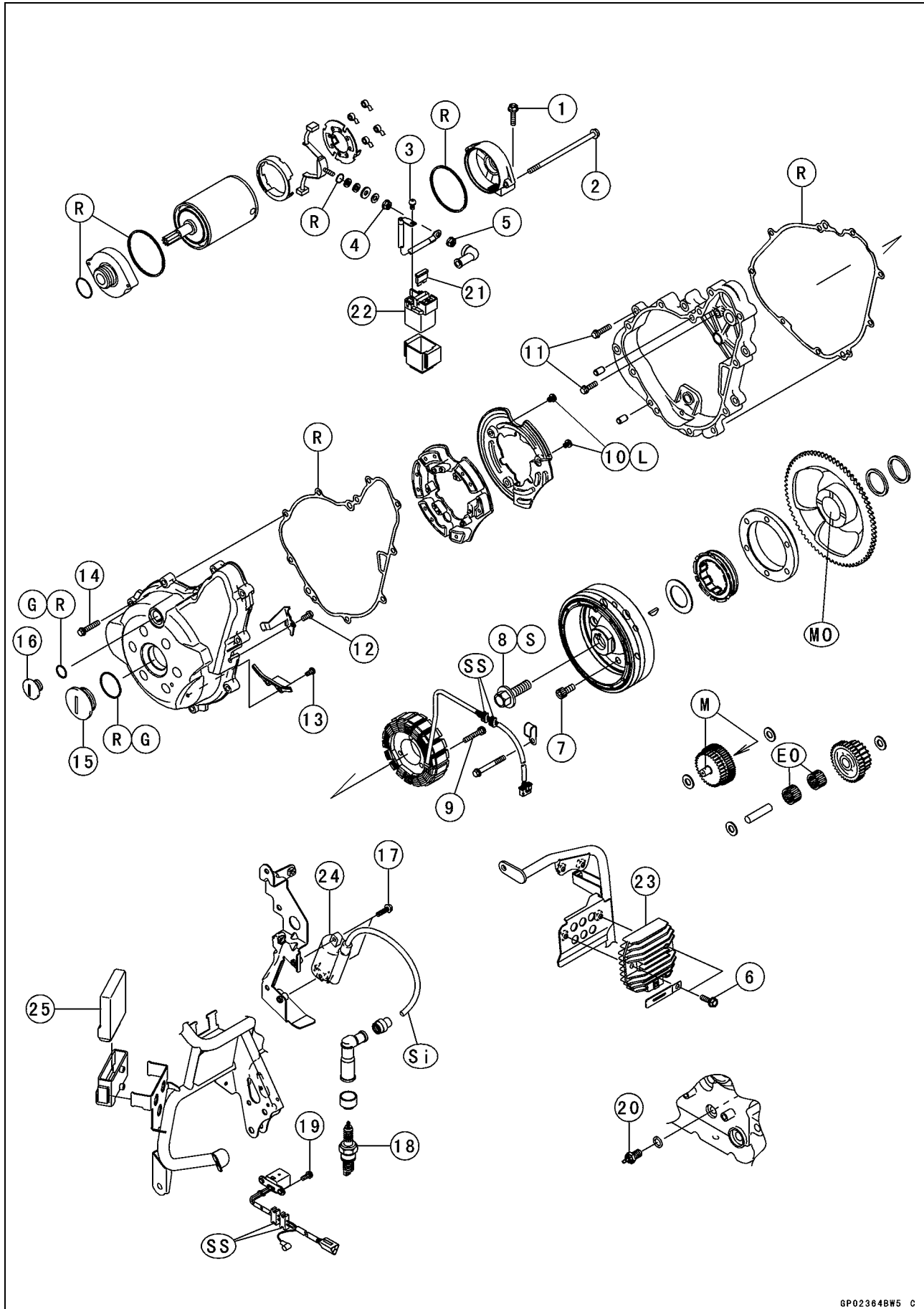
**Exploded View**

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# 16-4 ELECTRICAL SYSTEM

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Starter Motor Mounting Bolts	8.8	0.90	78 in·lb	
2	Starter Motor Through Bolts	4.9	0.50	43 in·lb	
3	Starter Relay Terminal Screws	4.4	0.45	39 in·lb	
4	Starter Motor Terminal Locknut	10.8	1.1	96 in·lb	
5	Starter Motor Cable Terminal Nut	4.9	0.50	43 in·lb	
6	Regulator/Rectifier Bolts	8.8	0.90	78 in·lb	
7	Starter Motor Clutch Bolts	34	3.5	25	
8	Alternator Rotor Bolt	195	20	144	S
9	Stator Coil Bolts	4.4	0.45	39 in·lb	
10	Alternator Outer Cover Damper Plate Bolts	8.8	0.90	78 in·lb	L
11	Alternator Inner Cover Bolts	8.8	0.90	78 in·lb	
12	Alternator and Crankshaft Sensor Lead Hold Plate Screw	4.4	0.45	39 in·lb	
13	Crankshaft Sensor Lead Hold Plate Screws	2.5	0.25	22 in·lb	
14	Alternator Outer Cover Bolts	8.8	0.90	78 in·lb	
15	Alternator Rotor Bolt Cap	2.5	0.25	22 in·lb	
16	Timing Inspection Cap	2.5	0.25	22 in·lb	
17	Ignition Coil Bolts	5.9	0.60	52 in·lb	
18	Spark Plug	14	1.4	10	
19	Crankshaft Sensor Screws	2.5	0.25	22 in·lb	
20	Neutral Switch	15	1.5	11	

21. Main Fuse 20 A

22. Starter Relay

23. Regulator/Rectifier

24. Ignition Coil

25. IC Igniter

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

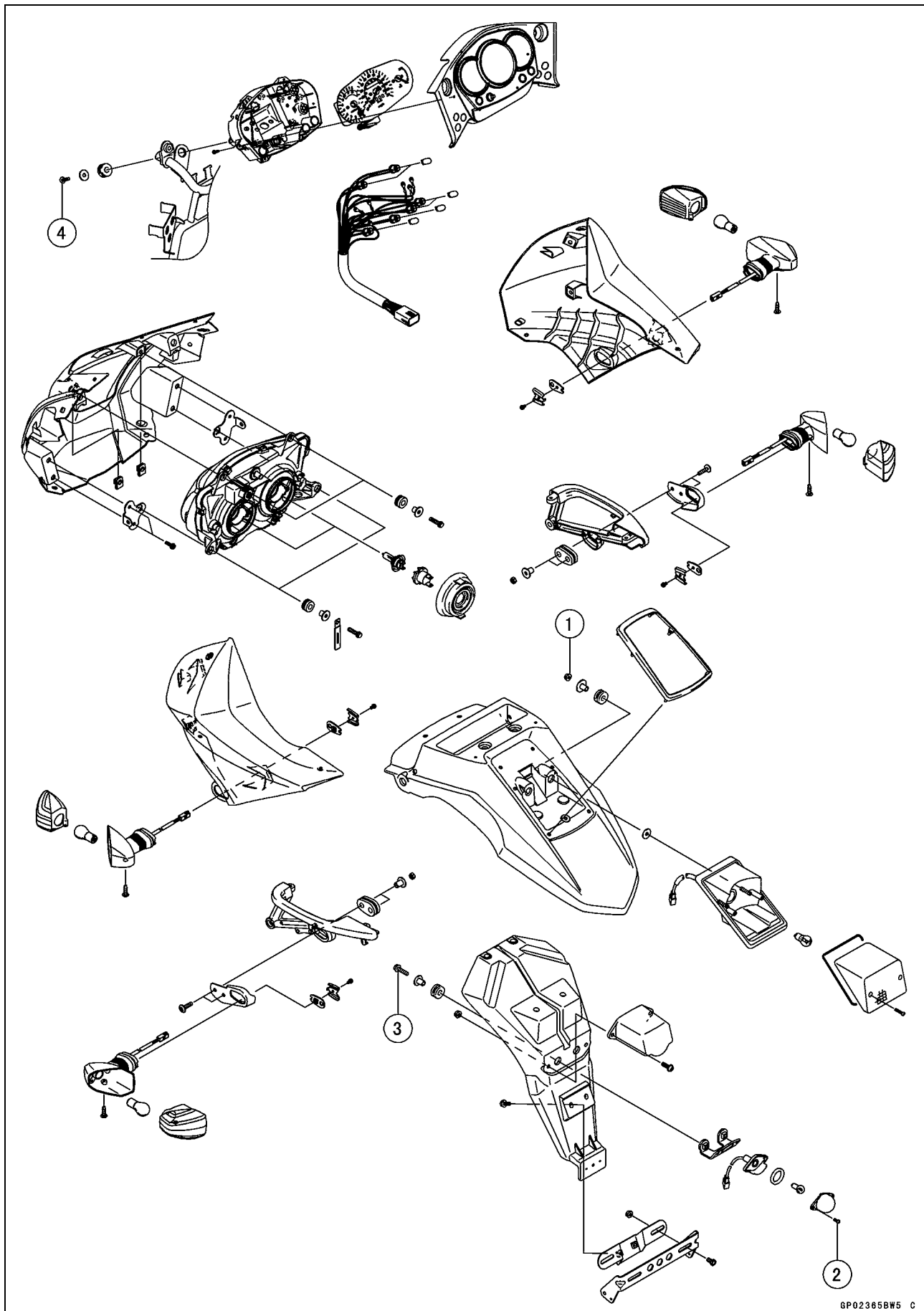
S: Follow the specified tightening sequence.

Si: Apply silicone grease (ex. PBC grease)

SS: Apply silicone sealant.

# 16-6 ELECTRICAL SYSTEM

## Exploded View



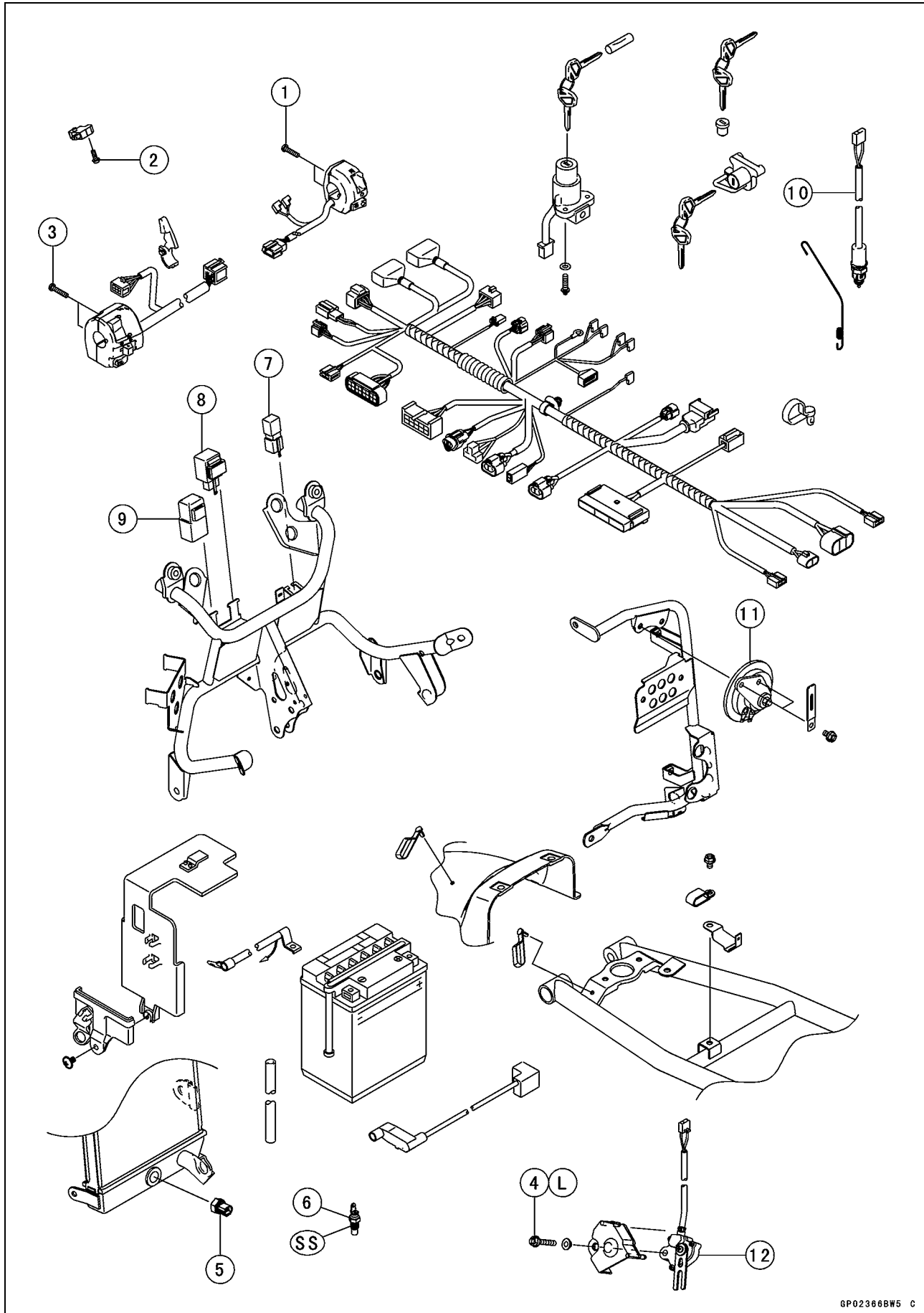


**Exploded View**

<b>No.</b>	<b>Fastener</b>	<b>Torque</b>			<b>Remarks</b>
		<b>N·m</b>	<b>kgf·m</b>	<b>ft·lb</b>	
1	Tail/Brake Light Mounting Nuts	5.9	0.60	52 in·lb	
2	License Plate Light Lens Screws	0.9	0.09	8 in·lb	
3	License Plate Light Mounting Screws	5.9	0.60	52 in·lb	
4	Meter Unit Mounting Screws	1.2	0.12	11 in·lb	

# 16-8 ELECTRICAL SYSTEM

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Right Handlebar Switch Housing Screws	3.5	0.36	31 in·lb	
2	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
3	Left Handlebar Switch Housing Screws	3.5	0.36	31 in·lb	
4	Sidestand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
5	Radiator Fan Switch	18	1.8	13	
6	Water Temperature Sensor	15	1.5	11	SS

- 7. Interlock Diode Unit
  - 8. Turn Signal Relay
  - 9. Starter Circuit Relay
  - 10. Rear Brake Light Switch
  - 11. Horn
  - 12. Sidestand Switch
- L: Apply a non-permanent locking agent.  
SS: Apply silicone sealant.

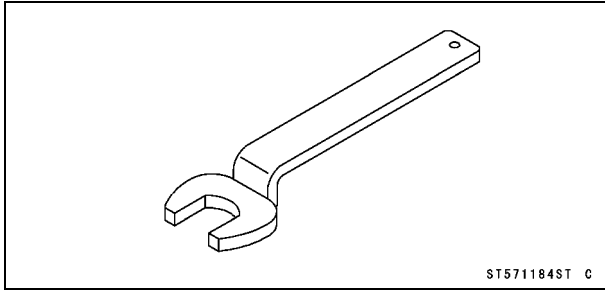
## 16-10 ELECTRICAL SYSTEM

### Specifications

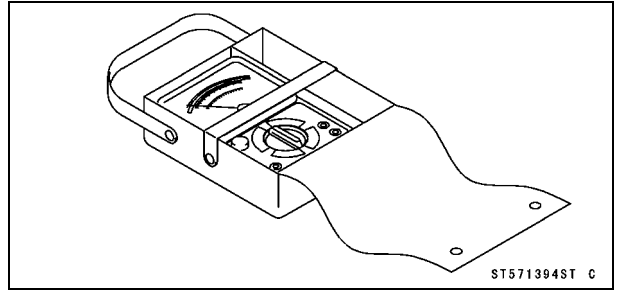
Item	Standard
<b>Battery</b> Capacity Electrolyte Level Specific Gravity	12 V 14 Ah Between upper and lower level lines 1.280 at 20°C (68°F)
<b>Charging System</b> Alternator Type Alternator Output Voltage Stator Coil Resistance Charging Voltage (Regulator/Rectifier Output Voltage)	Three-phase AC 43 V or more at 4 000 r/min (rpm) 0.1 ~ 0.8 Ω 13.8 ~ 14.8 V
<b>Ignition System</b> Crankshaft Sensor Resistance Crankshaft Sensor Peak Voltage Ignition Coil: 3 Needle Arcing Distance Primary Winding Resistance Secondary Winding Resistance Primary Peak Voltage Spark Plug: Type Spark Plug Gap Spark Plug Cap Resistance	101 ~ 151 Ω 2 V or more 6 mm (0.24 in.) or more 1.8 ~ 2.6 Ω 8.8 ~ 13.2 kΩ 240 V or more NGK DPR8EA-9 or ND X24EPR-U9 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.) 3.75 ~ 6.25 kΩ
<b>Electric Starter System</b> Starter Motor: Brush Length Commutator Diameter	12 mm (0.47 in.) (Service Limit: 6.5 mm, 0.26 in.) 28 mm (1.10 in.) (Service Limit: 27 mm, 1.06 in.)
<b>Switch and Sensor</b> Front Brake Light Switch Timing Rear Brake Light Switch Timing Water Temperature Sensor Resistance Radiator Fan Switch: Rising Temperature Falling Temperature Resistance	Pulled ON ON after about 10 mm (0.39 in.) pedal travel in the text From OFF to ON at 95 ~ 101°C (203 ~ 214°F) From ON to OFF at 87°C (189°F) or less ON: Less than 0.5 Ω OFF: More than 1 MΩ

**Special Tools and Sealant**

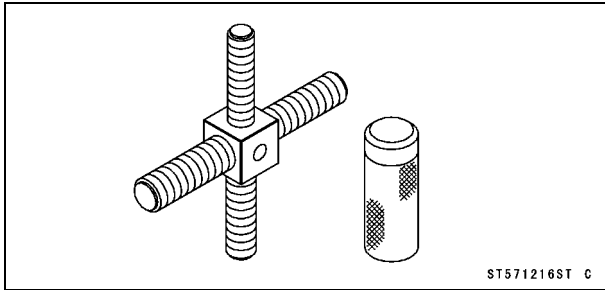
**Rotor Holder, Hex 32:  
57001-1184**



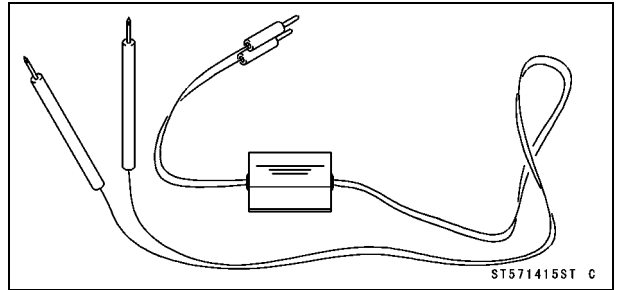
**Hand Tester:  
57001-1394**



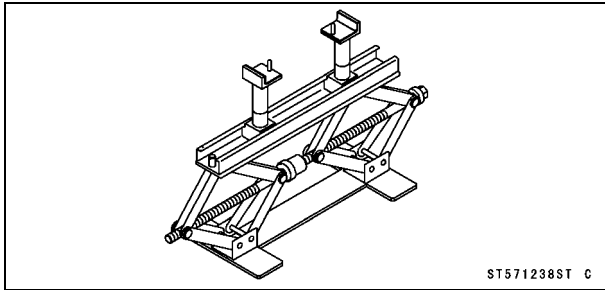
**Rotor Puller, M16/M18/M20/M22 × 1.5:  
57001-1216**



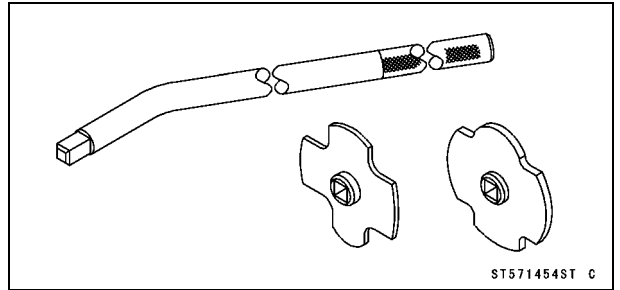
**Peak Voltage Adapter:  
57001-1415**



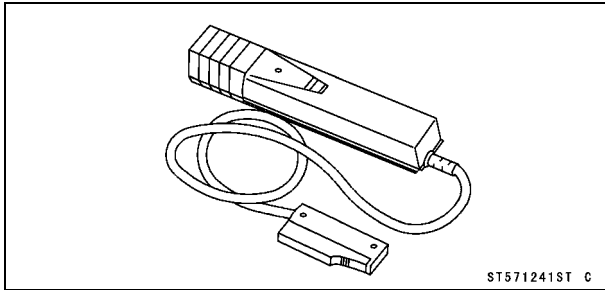
**Jack:  
57001-1238**



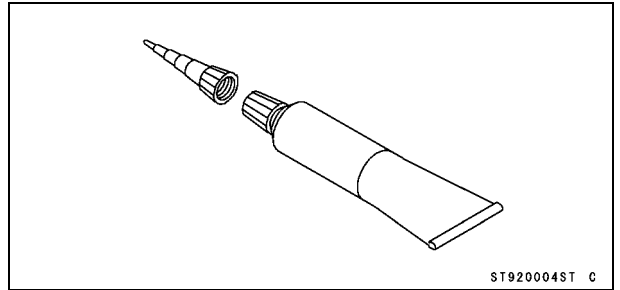
**Filler Cap Driver:  
57001-1454**



**Timing Light:  
57001-1241**

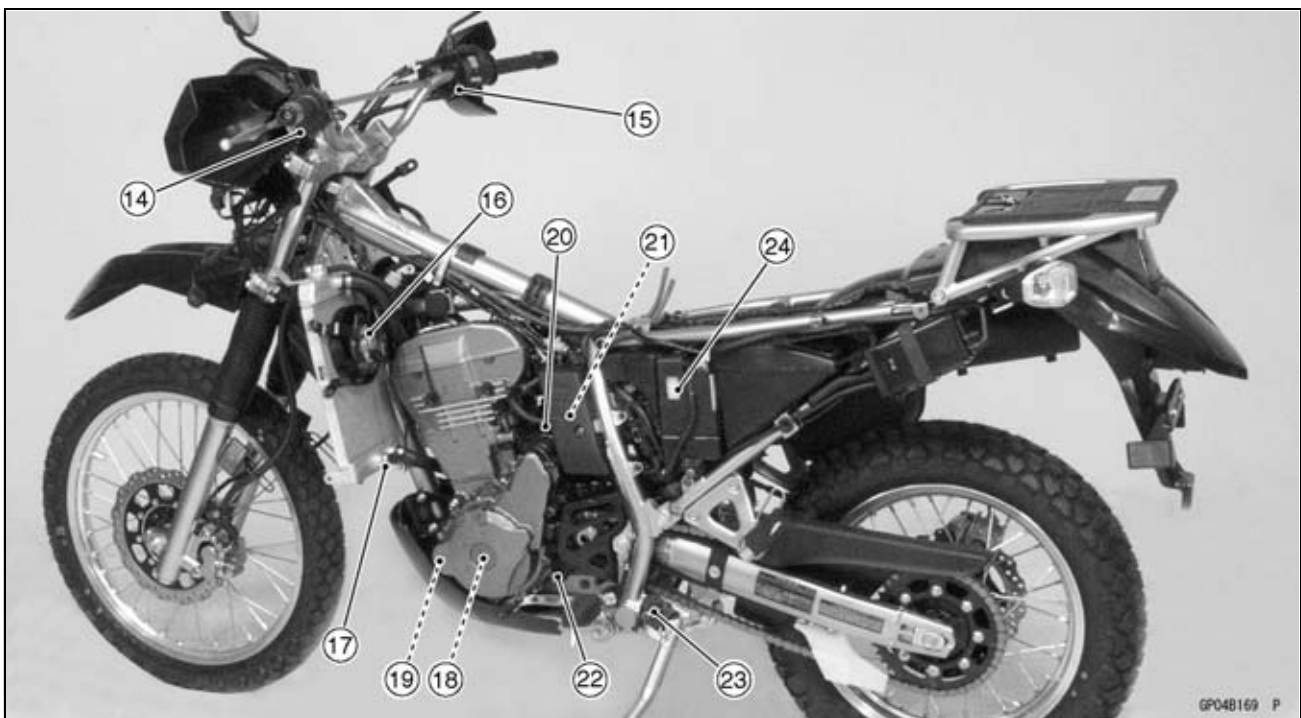
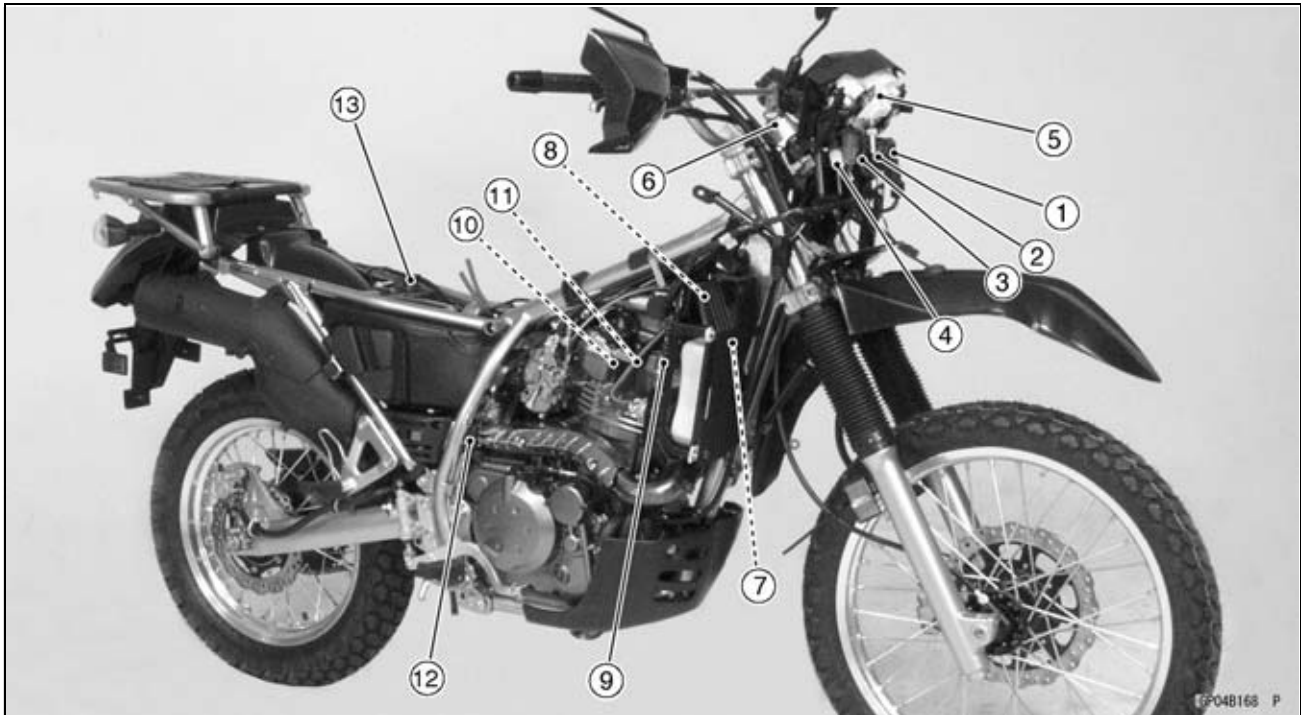


**Liquid Gasket, TB1211F:  
92104-0004**



# 16-12 ELECTRICAL SYSTEM

## Parts Location



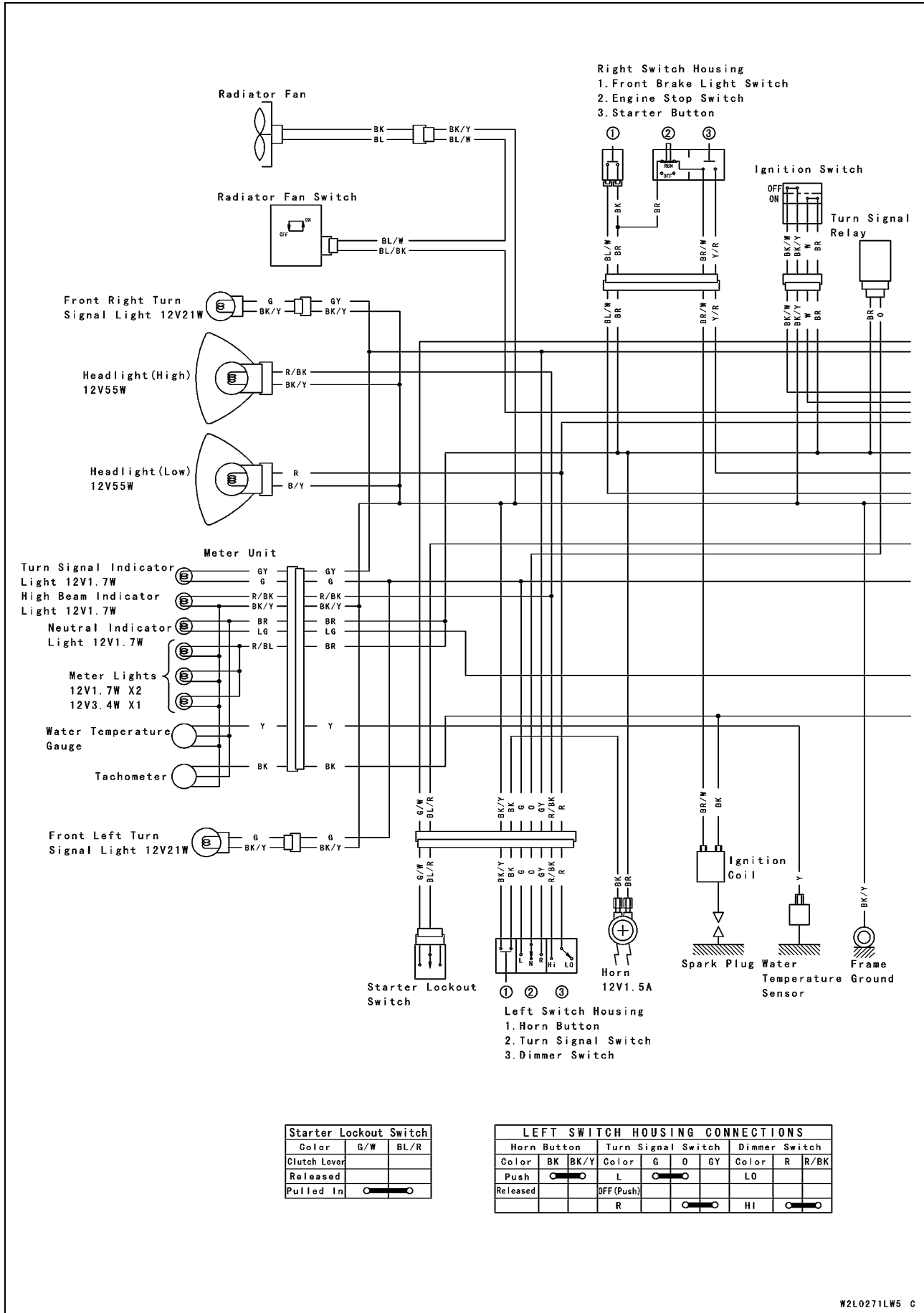
### Parts Location

---

1. IC Igniter
2. Starter Circuit Relay
3. Turn Signal Relay
4. Interlock Diode Unit
5. Meter Unit
6. Ignition Switch
7. Ignition Coil
8. Horn
9. Regulator/Rectifier
10. Water Temperature Sensor
11. Spark Plug
12. Rear Brake Light Switch
13. Fuse Box (Headlight Fuse 15 A, Fan Fuse 15 A)
14. Starter Lockout Switch
15. Front Brake Light Switch
16. Radiator Fan
17. Radiator Fan Switch
18. Alternator
19. Crankshaft Sensor
20. Starter Motor
21. Starter Relay with Main Fuse 20 A
22. Neutral Switch
23. Sidestand Switch
24. Battery 12 V 14 Ah

# 16-14 ELECTRICAL SYSTEM

## Wiring Diagram

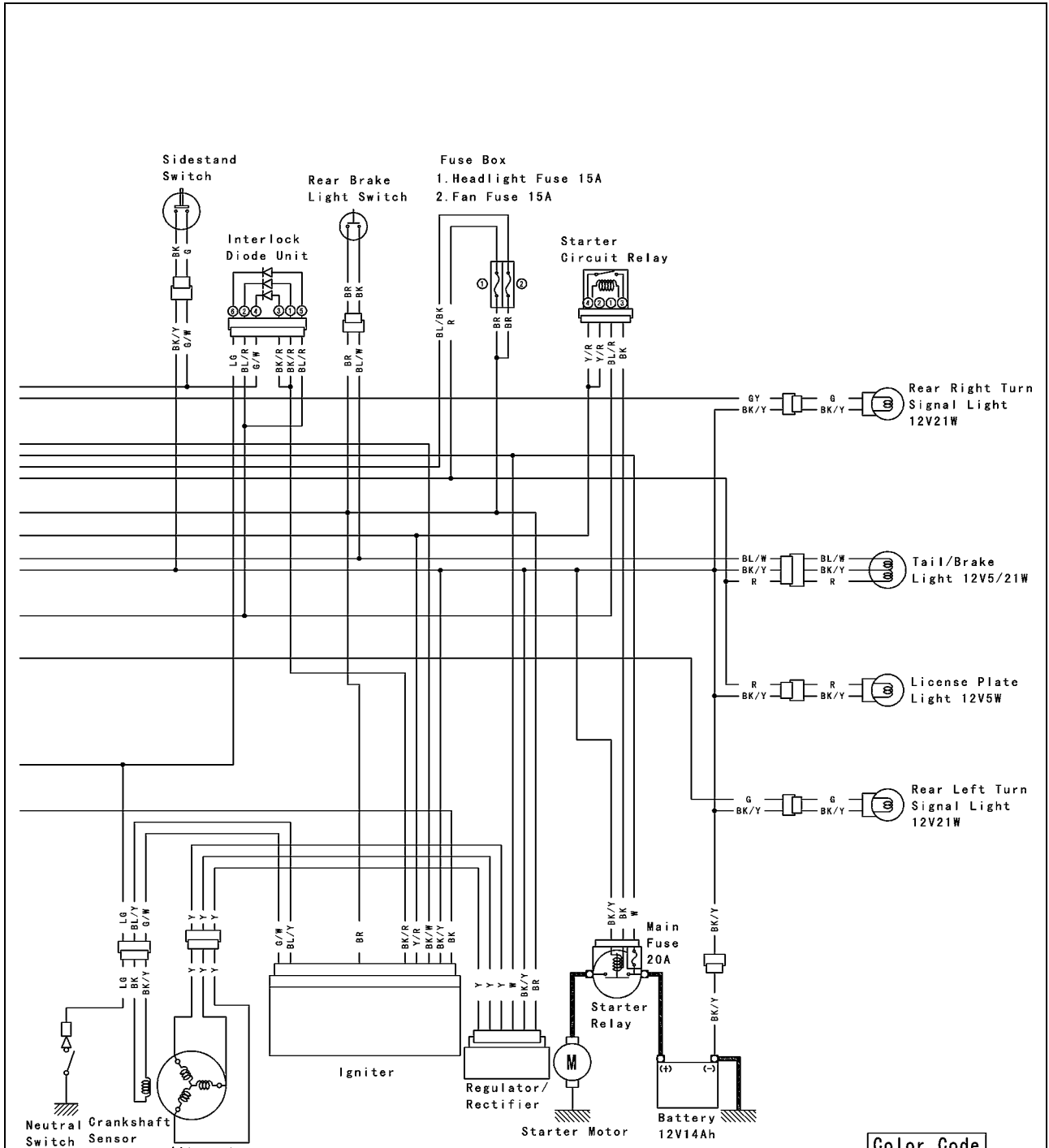


Starter Lockout Switch		
Color	G/W	BL/R
Clutch Lever		
Released		
Pulled In		

LEFT SWITCH HOUSING CONNECTIONS									
Horn Button		Turn Signal Switch		Dimmer Switch					
Color	BK	BK/Y	Color	G	O	GY	Color	R	R/BK
Push		L		LO					
Released		OFF (Push)		HI					



Wiring Diagram



IGNITION SWITCH CONNECTIONS				
Color	BK/W	BK/Y	W	BR
OFF, LOCK	○	○	○	○
ON	○	○	○	○

RIGHT SWITCH HOUSING CONNECTIONS					
Front Brake Light Switch		Engine Stop Switch		Starter Button	
Color	BL/W BK	Color	BR BR/W	Color	BR/W Y/R
Brake Lever	○	OFF	○	Push	○
Pulled In	○			Released	○
Released	○	RUN	○		○

Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

(98052-0271L)

## 16-16 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 leads for signs of burning, fraying, etc. Poor leads and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

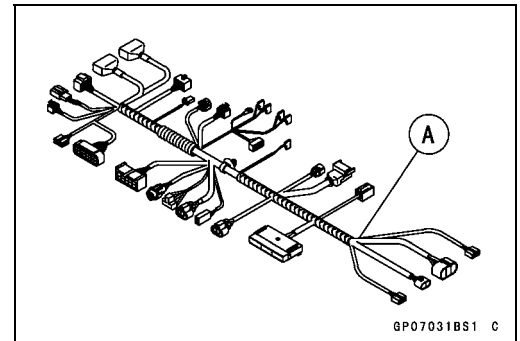
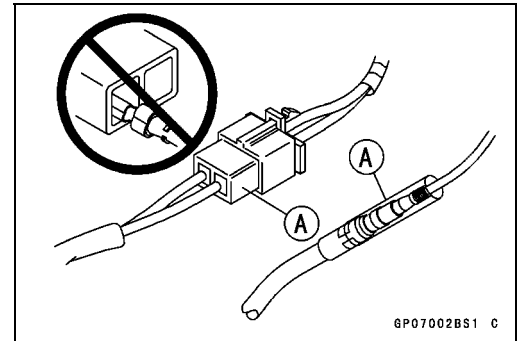
## Electrical Wiring

### Wiring Inspection

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

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

- Set the tester to the  $\times 1 \Omega$  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.



## 16-18 ELECTRICAL SYSTEM

### Battery

#### Precautions

Following a few simple rules will greatly extend the life of the battery.

- When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.
- Never add sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.
- Avoid quick-charging the battery. A quick-charge will damage the battery plates.
- Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulfate (turn white), and the battery will no longer take a charge.
- Keep the battery well-charged during cold weather so that the electrolyte does not freeze and crack open the battery. The more discharged the battery becomes, the more easily it freezes.
- Always keep the battery vent hose free of obstruction, and make sure it does not get pinched, crimped, or melted shut by contact with the hot muffler. If battery gases cannot escape through this hose, they will explode the battery.
- DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.

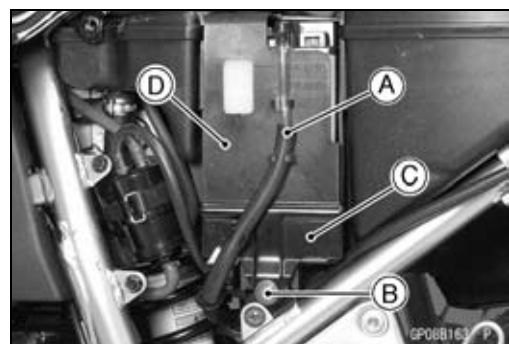
#### Battery Removal

- Remove the seat (see Seat Removal in the Frame chapter).
- Slide the red cap [A] out.
- Disconnect the negative (-) cable [B] and then positive (+) cable [C].

#### NOTICE

**Be sure to disconnect the negative (-) cable first**

- Remove:
  - Battery Vent Hose [A]
  - Screw [B]
  - Bracket [C]
  - Battery Cover [D]



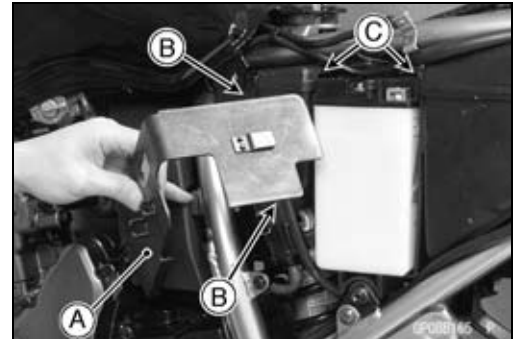
## Battery

- Pull the battery [A] out of the air cleaner housing.



### Battery Installation

- Visually inspect the surface of the battery container.
- ★ If any signs of cracking or electrolyte leakage from sides of the battery.
- Insert the battery into the air cleaner housing so that the positive terminal faces right side of the motorcycle.
- Install the battery cover [A].
- Insert the ribs [B] of the battery cover under the slots [C] of the air cleaner housing.
- Tighten the screw securely together with the bracket.
- Run the battery vent hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Connect the positive cable [A] (red cap) to the positive (+) terminal first, and then negative cable [B] to the negative (-) terminal.
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the positive (+) terminal with the red cap [C].



### NOTICE

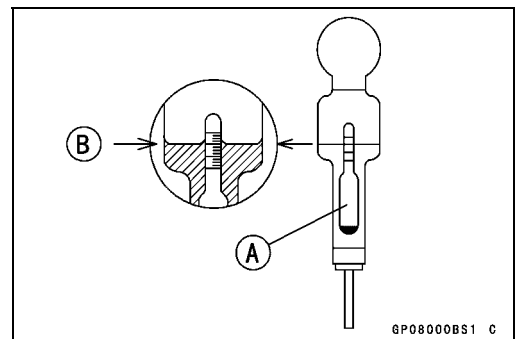
If each battery cable is not correctly disconnected or connected, sparks can arise at electrical connections, causing damage to electrical parts.

### Battery Electrolyte Level Inspection

- Refer to the Battery Electrolyte Level Inspection in the Periodic Maintenance chapter.

### Battery Condition

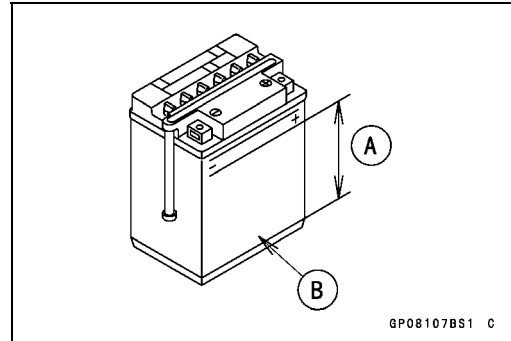
- Before charging, check the battery condition by testing the specific gravity of the electrolyte in each cell.
- Draw a little fluid from the cell with a hydrometer.
- Read the level [B] of the electrolyte on the floating scale [A]. This is the specific gravity of the electrolyte.



## 16-20 ELECTRICAL SYSTEM

### Battery

- Look for sediment and white sulfation inside the cells on the bottom of the plates.  
Sulfation Here [A]  
Sediment Here [B]
- See the Battery Troubleshooting Guide in Test Charging.
- ★ If the specific gravity is below 1.200 the battery needs to be charged.



#### NOTE

- *The specific gravity of the electrolyte varies with changes in temperature, so the specific gravity reading must be corrected for the temperature of the electrolyte.*
  - *Celsius: Add 0.007 points to reading for each 10°C above 20°C or subtract 0.007 points for each 10°C below 20°C.*
  - *Fahrenheit: Add 0.004 points to reading for each 10°F above 68°F or subtract 0.004 points for each 10°F below 68°F.*
- ★ If the specific gravity of any of the cells is more than 0.050 away from any other reading, the battery will probably not accept a charge. It is generally best to replace a battery in this condition.
  - ★ If the specific gravity of all the cells is 1.280 or more the battery is fully charged.

#### **Battery Initial Charging**

Before being placed in service, a **new battery must be given an initial charging.**

- Cut off the sealed end of the battery vent hose and remove the filler caps.
- Fill each cell to the upper level line on the battery case with fresh electrolyte at a temperature of 30°C (86°F) or less. Let the battery stand for about 30 minutes before charging.

## Battery

### NOTE

*If the electrolyte level drops, add electrolyte to the upper level line before charging.*

- Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and **charge it for 10 hours**. For example, if the battery is rated at 14 Ah, the charging rate would be 1.4 Ah.

### NOTICE

**If the battery is not given a full initial charging, it will discharge in a few weeks and will not recover fully even with supplemental charging.**

### DANGER

**Batteries produce an explosive gas mixture of hydrogen and oxygen that can cause serious injury and burns if ignited. Keep the battery away from sparks and open flames during charging. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

### NOTICE

**Do not use a high rate battery charger as is typically employed at automotive service stations, unless the charging rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than-normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

- Turn the charger off, then disconnect it from the battery.
- Check battery voltage. Battery voltage should be 12 ~ 13 V.
- Check the specific gravity of each cell with a hydrometer (see Battery Condition).
- ★ If the voltmeter or hydrometer readings are below those specified, additional charging is necessary before the battery can be installed.

## 16-22 ELECTRICAL SYSTEM

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### Battery

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#### Ordinary Charging

- Remove the battery from the motorcycle.

#### NOTICE

**Always remove the battery from the motorcycle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the motorcycle.**

- Clean off the battery using a baking soda-and-water solution.
- Mix one heaping tablespoon of baking soda in one cup of water.
- Be careful not to get any of the cleaning solution in the battery.
- The terminals must be especially clean.
- If any of the cells are low, fill them to the LOWER level line with distilled water only. The electrolyte will expand during charging, and the level will rise.
- Connect a charger to the battery BEFORE plugging it in or turning it on.

#### DANGER

**Batteries produce an explosive gas mixture of hydrogen and oxygen that can cause serious injury and burns if ignited. Keep the battery away from sparks and open flames during charging. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

#### NOTICE

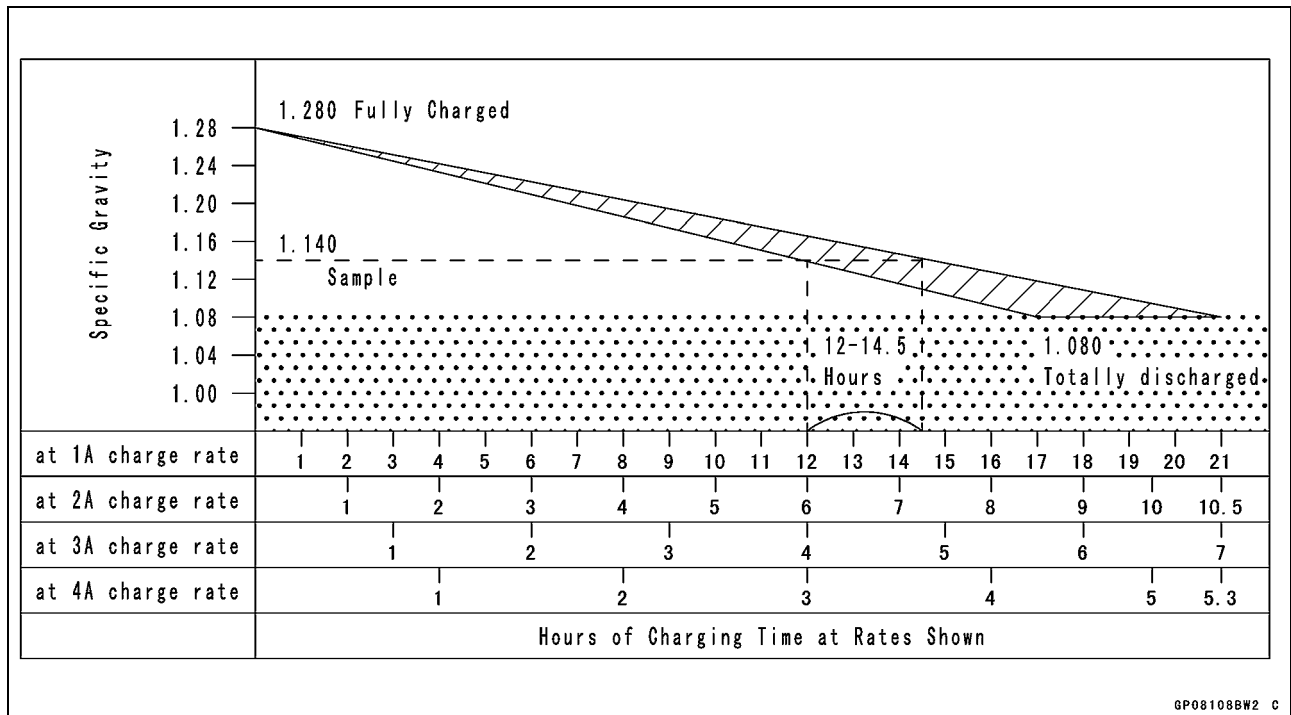
**Always remove the battery from the motorcycle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the motorcycle.**

- Set the charging rate and time according to the battery condition previously determined (see Battery Condition), using the table.



**Battery**

**Charging Rate/Time Table (12 V 14 Ah)**



**NOTICE**

Do not use a high rate battery charger as is typically employed at automotive service stations, unless the charging rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than-normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.

If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.

- Turn the charger off or unplug it, then disconnect it from the battery.
- Check battery condition (see Battery Condition).
- ★ If the battery condition indicates that it is not fully charged, additional charging time is necessary.

## 16-24 ELECTRICAL SYSTEM

### Battery

#### Test Charging

- If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the table.
- To test charge a battery, perform the ordinary charging procedure and monitor the battery voltage and other signs as mentioned below.
- ★ If the battery voltage suddenly jumps to over 13 V just after the start of charging, the plates are probably sulfated. A good battery will rise to 12 V immediately and then gradually go up to 12.5 or 13 V in about 30 minutes to an hour after the start of charging.
- ★ If one cell produces no gas bubbles or has a very low specific gravity, it is probably shorted.
- ★ If there does not appear to be enough sediment in a cell to short the plates, but that cell has a very low specific gravity after the battery is fully charged, the trouble may be that there is not enough acid in that one cell. In this case only, sulfuric acid solution may be added to correct the specific gravity.
- ★ If a fully charged battery not in use loses its charge after 2 to 7 days or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

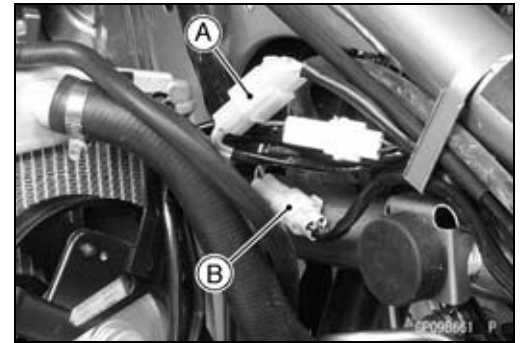
#### Battery Troubleshooting Guide

	Good Battery	Suspect Battery	Action
Plates	(+) chocolate color (–) gray	white (sulphated); + plates broken or corroded	Replace
Sediment	none, or small amount	sediment up to plates, causing short	Replace
Voltage	above 12 V	below 12 V	Test charge
Electrolyte Level	above plates	below top of plates	Fill and test charge
Specific Gravity	above 1.200 in cell; no two cells more than 0.020 different	below 1.100 of difference of more than 0.020 between two cells	Test charge

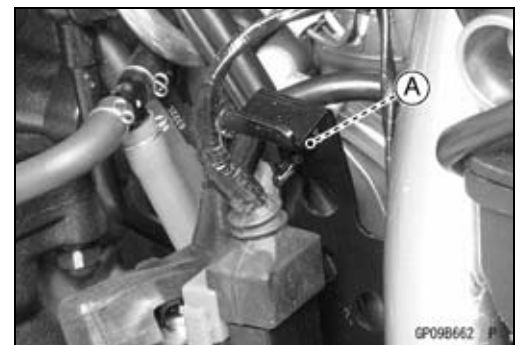
## Charging System

### Alternator Outer Cover Removal

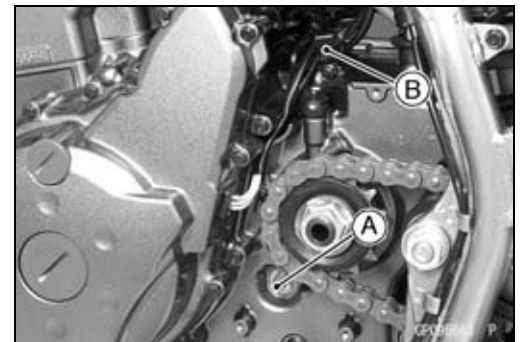
- Remove:
  - Engine Guard (see Engine Guard Removal in the Frame chapter)
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  - Starter Relay Cover (see Starter Relay Inspection)
- Disconnect:
  - Alternator Lead Connector [A]
  - Crankshaft Sensor Lead Connector [B]



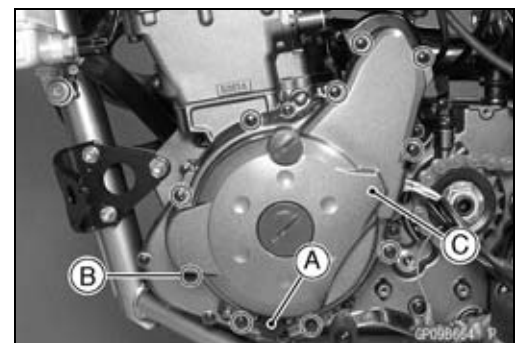
- Open the clamp [A].



- Disconnect the neutral switch connector [A].
- Open the clamp [B].



- Remove:
  - Plug [A]
  - Alternator Cover Bolts [B]
  - Alternator Cover [C]



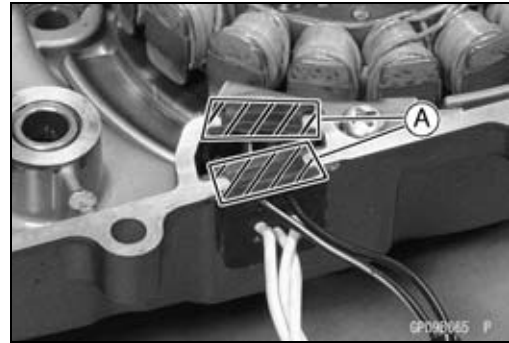
## 16-26 ELECTRICAL SYSTEM

### Charging System

#### **Alternator Outer Cover Installation**

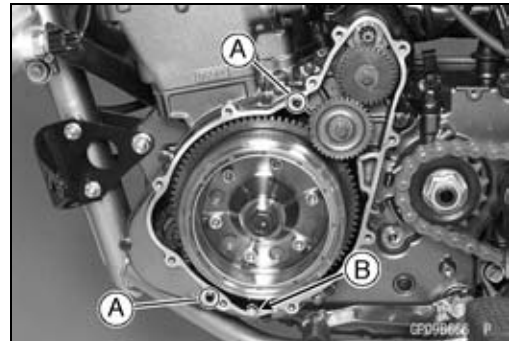
- Apply silicone sealant [A] to the crankshaft sensor lead grommets.

Sealant - Liquid Gasket, TB1211F: 92104-0004

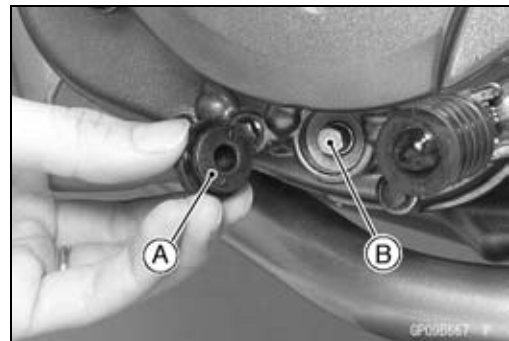


- Replace the alternator outer cover gasket with a new one.
- Be sure that the dowel pins [A] are in position.
- Apply grease to the O-ring of the idle shaft lever bolt [B].
- Tighten:

Torque - Alternator Outer Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

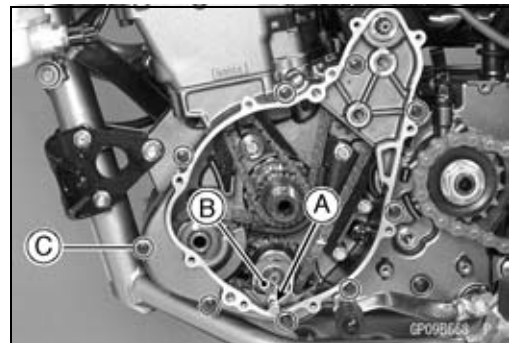


- Install the plug [A] on the idle shaft lever bolt [B] securely.



#### **Alternator Inner Cover Removal**

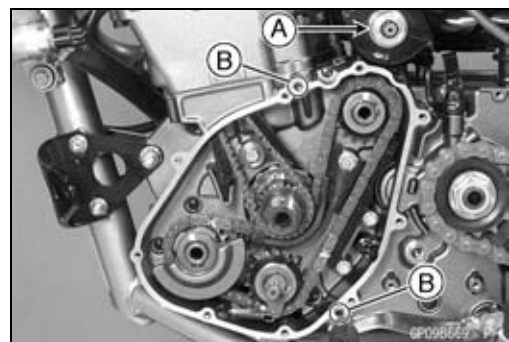
- Remove:
  - Alternator Outer Cover (see Alternator Outer Cover Removal)
  - Alternator Rotor (see Alternator Rotor Removal)
  - Idle Shaft Lever Bolt [A]
  - Idle Shaft Lever [B]
  - Alternator Inner Cover Bolts [C]
  - Alternator Inner Cover [D]



#### **Alternator Inner Cover Installation**

- Apply grease to the O-ring [A] of the starter motor.
- Replace the alternator inner cover gasket with a new one.
- Be sure that the dowel pins [B] are in position.
- Tighten:

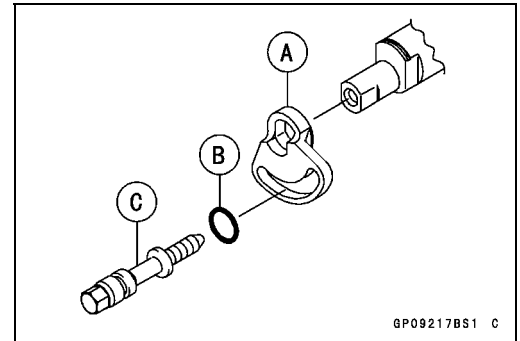
Torque - Alternator Inner Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



## Charging System

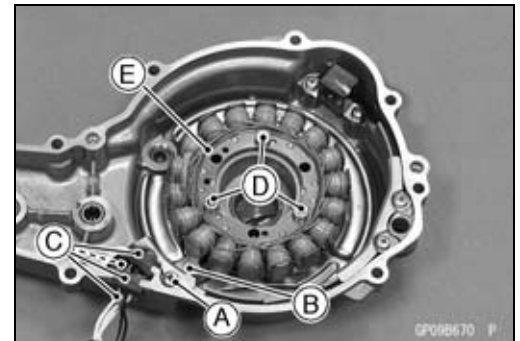
- Install the idle shaft lever [A].
- Replace the O-ring [B] of the idle shaft lever bolt [C] with a new one.
- Apply grease to the O-ring.
- Tighten:

**Torque - Idle Shaft Lever Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



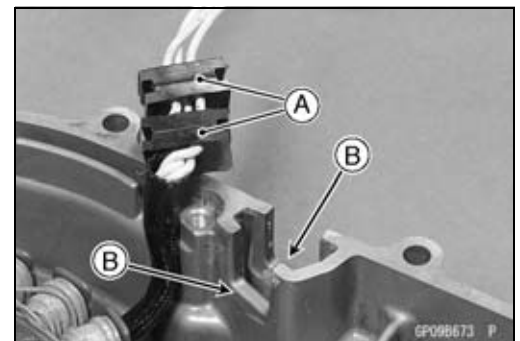
### Stator Coil Removal

- Remove:
  - Alternator Outer Cover (see Alternator Outer Cover Removal)
  - Hold Plate Screw [A]
  - Plate [B]
  - Crankshaft Sensor Lead and Alternator Lead Grommets [C]
  - Stator Coil Bolts [D]
  - Stator Coil [E]

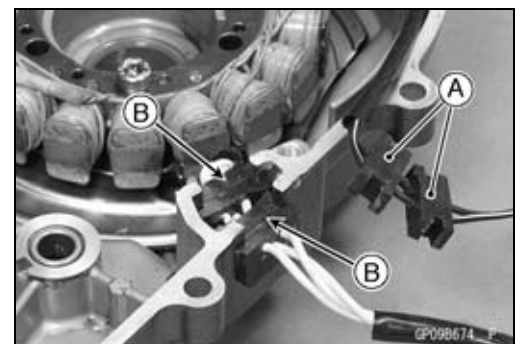


### Stator Coil Installation

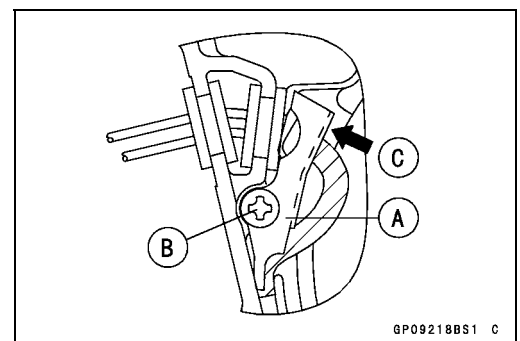
- Install the stator coil.
    - Torque - Stator Coil Bolts: 4.4 N·m (0.45 kgf·m, 39 in·lb)**
  - Apply silicone sealant to the circumference of the alternator lead grommets [A], and fit the grommet into the notch [B] of the cover securely.
- Sealant - Liquid Gasket, TB1211F: 92104-0004**



- Apply silicone sealant to the circumference of the crankshaft sensor lead grommets [A], and fit the grommet into the notch [B] of the cover securely.
- Sealant - Liquid Gasket, TB1211F: 92104-0004**



- Secure the alternator lead and crankshaft sensor lead with a hold plate [A].
  - Tighten the screw [B] while pushing [C] the hold plate.
- Torque - Alternator and Crankshaft Sensor Leads Hold Plate Screw: 4.4 N·m (0.45 kgf·m, 39 in·lb)**

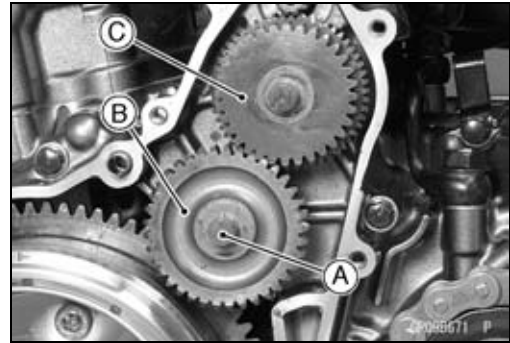


## 16-28 ELECTRICAL SYSTEM

### Charging System

#### Alternator Rotor Removal

- Remove:
  - Alternator Outer Cover (see Alternator Outer Cover Removal)
  - Shaft [A]
  - Starter Idle Gear [B] with needle bearings
  - Torque Limiter [C]
- There are washers on both sides onto the starter idle gear and torque limiter.



- Wipe oil off the outer circumference of the rotor.
  - Hold the alternator rotor steady with the rotor holder [A], and remove the rotor bolt [B].
- Special Tool - Rotor Holder, Hex 32: 57001-1184**



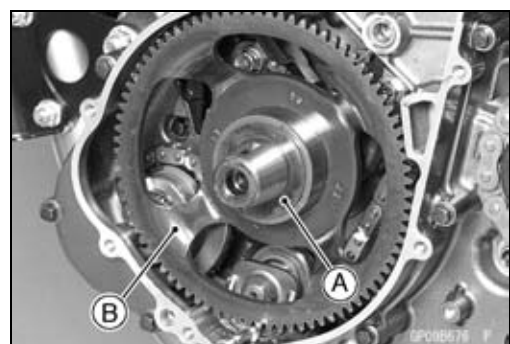
- Screw the rotor puller [A] onto the alternator rotor.
  - Remove the alternator rotor from the crankshaft by turning in the puller and tapping the head of the bolt lightly with a hammer, while holding the alternator rotor steady with the rotor holder [B].
- There is a woodruff key in the crankshaft tapered portion.
- Special Tools - Rotor Holder, Hex 32: 57001-1184**  
**Rotor Puller, M16/M18/M20/M22 x 1.5: 57001-1216**



#### NOTICE

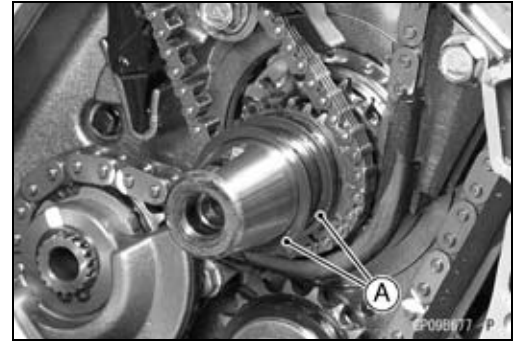
If the rotor is difficult to remove, turn the puller shaft using a wrench while tapping the head of the puller shaft with a hammer. Do not attempt to strike the grab bar or the alternator rotor itself. Striking the bar or the rotor can cause the bar to bend or the magnets to lose their magnetism.

- Remove:
  - Washer [A]
  - Starter Motor Clutch Gear [B]



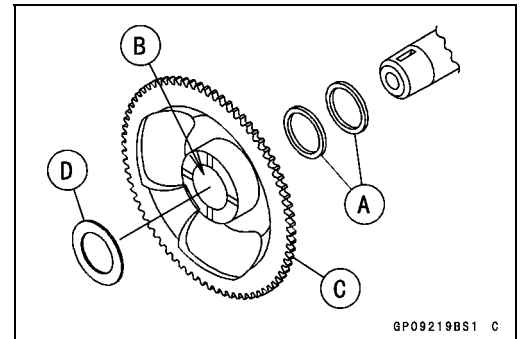
## Charging System

- Remove the spacers [A].

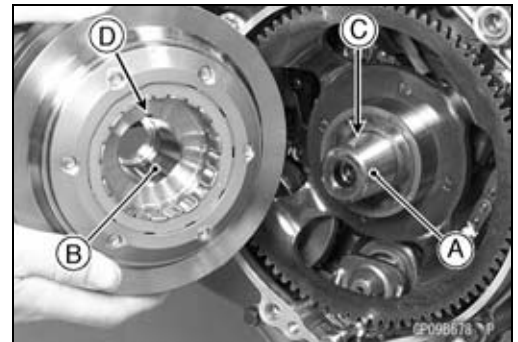


### Alternator Rotor Installation

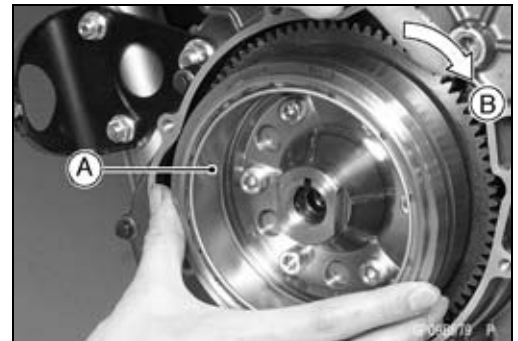
- Install the spacers [A] on the crankshaft.
- Apply molybdenum disulfide oil solution to the inner surface [B] of the starter motor clutch gear [C].
- Install the starter motor clutch gear and washer [D].



- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  - Crankshaft Tapered Portion [A]
  - Alternator Rotor Tapered Portion [B]
- Install the woodruff key [C] into the slot of the crankshaft securely.
- Fit the groove [D] on the woodruff key.



- When installing the alternator rotor [A], push it lightly while turning the starter motor clutch gear clockwise [B].



- Install the rotor bolt and tighten it with 20 N·m (2.0 kgf·m, 15 ft·lb) of torque.
- Remove the rotor bolt temporary.
- Using a cleaning fluid, clean the rotor bolt and dry it with a clean cloth.
- Install the rotor bolt again.
- Tighten the rotor bolt to the specified torque while holding the alternator rotor steady with the rotor holder.

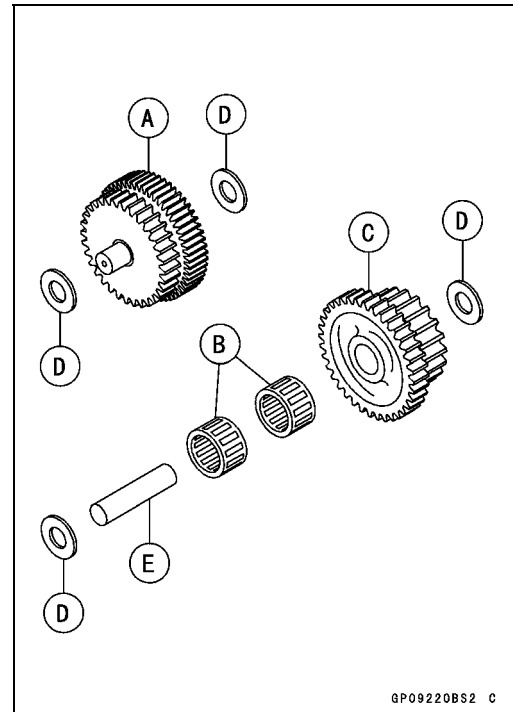
**Special Tool - Rotor Holder, Hex 32: 57001-1184**

**Torque - Alternator Rotor Bolt: 195 N·m (20 kgf·m, 144 ft·lb)**

## 16-30 ELECTRICAL SYSTEM

### Charging System

- Apply a thin coat of molybdenum disulfide grease to the shafts of the torque limiter [A].
- Apply engine oil to the needle bearings [B], and install them into the starter idle gear [C].
- Be sure install the washers [D] on both sides onto the starter idle gear and torque limiter.
- Install the starter idle gear, torque limiter and shaft [E].



### **Alternator Inspection**

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.



## Charging System

- To check the alternator output voltage, do the following procedures.
  - Turn the ignition switch OFF.
  - Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
  - Disconnect the alternator lead connector [A].
  - Connect the hand tester as shown in the table 1.
  - Install the fuel tank temporary (see Fuel Tank Installation in the Fuel System chapter).
  - Start the engine.
  - Run it at the rpm given in the table 1.
  - Note the voltage readings (total 3 measurements).



**Table 1 Alternator Output Voltage**

Tester Range	Connections		Reading at 4 000 rpm
	Tester (+) to	Tester (-) to	
AC 250 V	One Y lead	Another Y lead	43 V or more

- ★ If the output voltage shows the value in the table, the alternator operates properly.
- ★ If the output voltage shows a much higher than the value in the table, the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.
- Check the stator coil resistance as follows.
  - Stop the engine.
  - Connect the hand tester as shown in the table 2.
  - Note the readings (total 3 measurement).

**Table 2 Stator Coil Resistance**

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
× 1 Ω	One Y lead	Another Y lead	0.1 ~ 0.8 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.

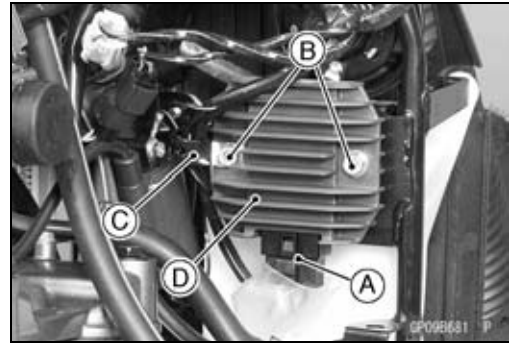
**Special Tool - Hand Tester: 57001-1394**

## 16-32 ELECTRICAL SYSTEM

### Charging System

#### Regulator/Rectifier Inspection

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Disconnect the regulator/rectifier connector [A].
- Remove:
  - Bolts [B]
  - Clamp [C]
  - Regulator/Rectifier [D]



#### Rectifier Circuit Check

- Check conductivity of the following pair of terminals.

#### Rectifier Circuit Inspection

Tester connection	W-Y1,	W-Y2,	W-Y3
	BK/Y-Y1,	BK/Y-Y2,	BK/Y-Y3,

- ★ The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and 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.

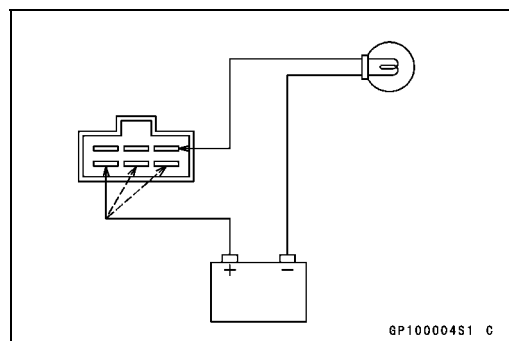
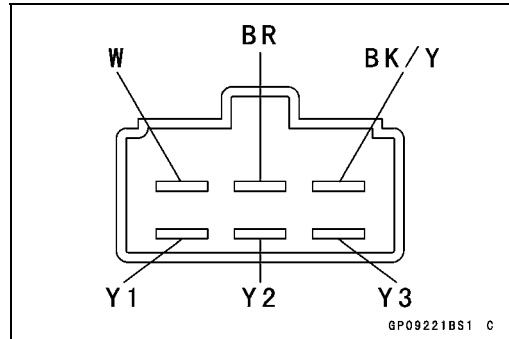
#### Regulator Circuit Check

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).

#### NOTICE

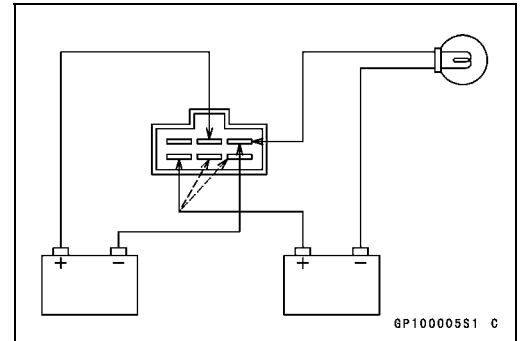
**The test light works as an indicator and also a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

- Check to be sure the rectifier circuit is normal before continuing.
- Do the 1st step regulator circuit test.
  - Connect the test light and the 12 V battery to the regulator/rectifier as shown.
  - Check the Y1, Y2 and Y3 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.



## Charging System

- Do the 2nd step regulator circuit test.
- Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test-1st Step".
- Apply 12 V to the voltage BR terminal.
- Check the Y1, Y2 and Y3 terminal respectively.
- ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
- ★ If the test light does not turn on, continue the test.

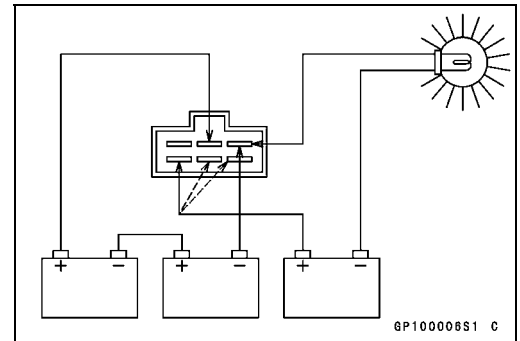


- Do the 3rd step regulator circuit test.
- Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test-1st Step".
- Momentarily apply 24 V to the voltage BR terminal by adding a 12 V battery.
- Check the Y1, Y2 and Y3 terminals respectively.

### NOTICE

**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.
- Tighten:
  - Torque - Regulator/Rectifier Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



## 16-34 ELECTRICAL SYSTEM

### Charging System

#### Charging Voltage Inspection

- Check the battery condition (see Battery Condition).
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the seat (see Seat Removal in the Frame chapter).
- Check that the ignition switch is turned off, and connect the hand tester [A] to the battery terminals [B].

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

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight, disconnect the headlight connector 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.



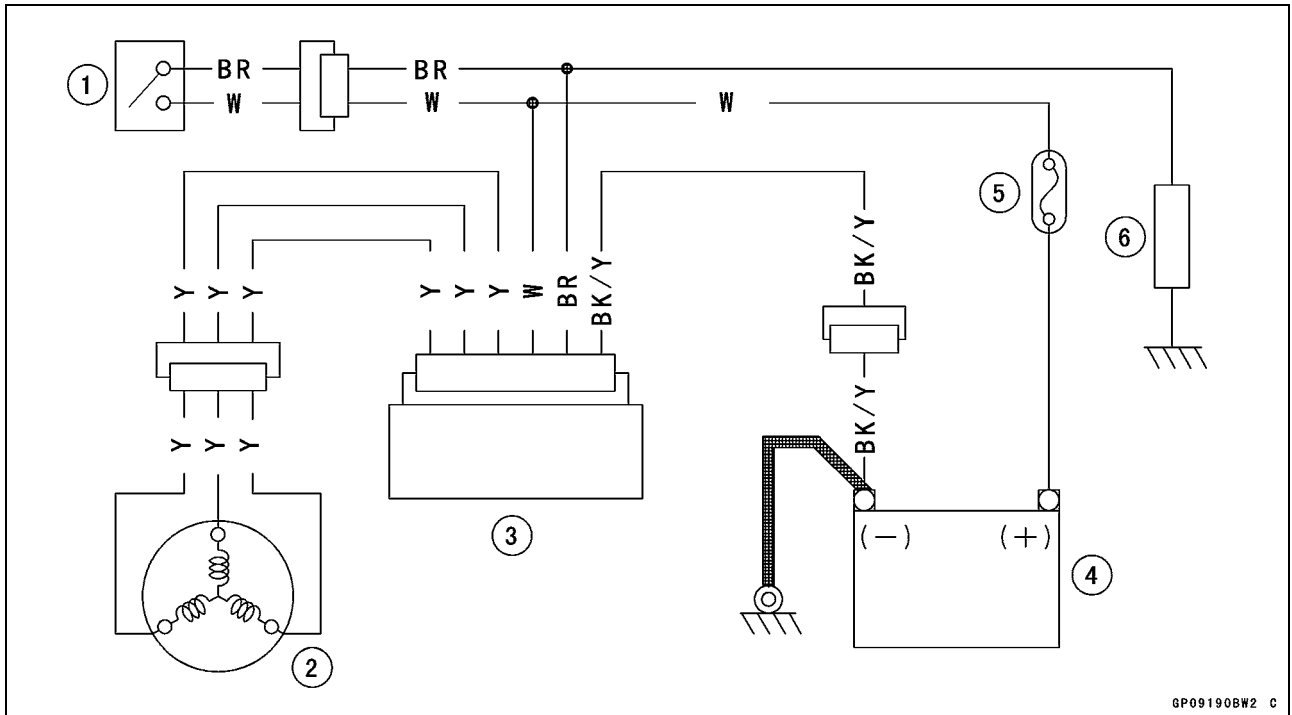
#### Charging Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
DC 25 V	Battery (+)	Battery (-)	13.8 ~ 14.8 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



GP09190BW2 C

1. Ignition Switch
2. Alternator
3. Regulator/Rectifier
4. Battery 12 V 14 Ah
5. Main Fuse 20 A
6. Load

## 16-36 ELECTRICAL SYSTEM

### Ignition System

#### **⚠ WARNING**

The ignition system produces extremely high voltage. Do not touch the spark plugs while the engine is running, or you could receive a severe electrical shock.

#### **NOTICE**

Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC igniter damage.

Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and igniter.

Use the standard regulator/rectifier, or the IC igniter will be damaged.

#### **Ignition Timing Inspection**

- Remove the timing inspection cap [A], using the filler cap driver.

**Special Tool - Filler Cap Driver: 57001-1454**



- Attach the timing light [A] in the manner prescribed by the manufacturer.

**Special Tool - Timing Light: 57001-1241**

- Start the engine and aim the timing light at the ignition timing marks on the alternator rotor.



- Run the engine at the speeds specified in the table and note the alignment of the ignition timing marks.

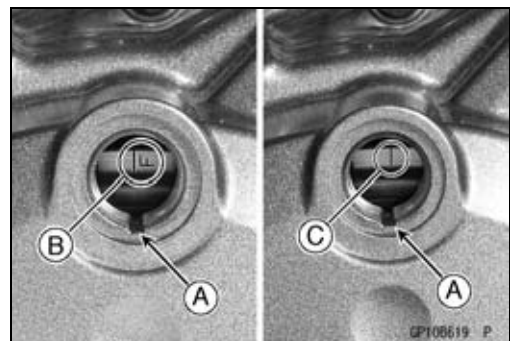
#### **Ignition Timing**

Engine Speed r/min (rpm)	Hole notch [A] aligns with:
1 300 ~ 2 100	F mark [B] on alternator rotor
4 000 ~ 6 300	Advanced mark [C] on alternator

- ★ If the ignition timing is not correct, inspect the igniter and crankshaft sensor (see Igniter Inspection).

- Replace the O-ring of the timing inspection cap with a new one.
- Apply grease to the new O-ring.
- Tighten:

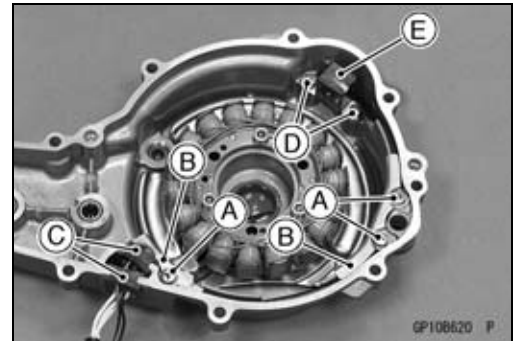
**Torque - Timing Inspection Cap: 2.5 N·m (0.25 kgf·m, 22 in·lb)**



## Ignition System

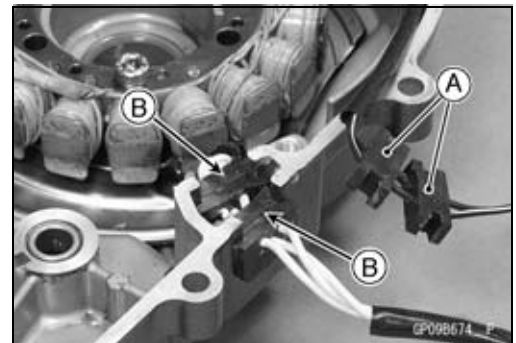
### Crankshaft Sensor Removal

- Remove:
  - Alternator Outer Cover (see Alternator Outer Cover Removal)
  - Hold Plate Screws [A]
  - Plates [B]
  - Crankshaft Sensor Lead Grommets [C]
  - Crankshaft Sensor Screws [D]
  - Crankshaft Sensor [E]

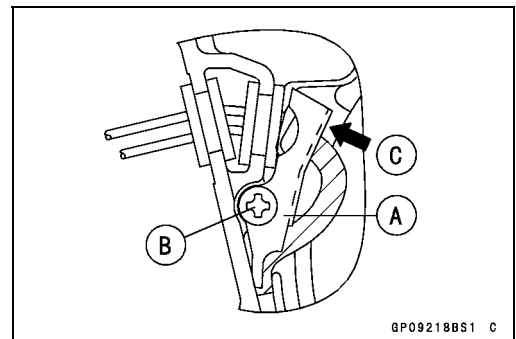


### Crankshaft Sensor Installation

- Install the crankshaft sensor.
  - Torque - Crankshaft Sensor Screws: 2.5 N·m (0.25 kgf·m, 22 in·lb)**
- Secure the crankshaft sensor lead with a hold plate and tighten the screws.
  - Torque - Crankshaft Sensor Lead Hold Plate Screws: 2.5 N·m (0.25 kgf·m, 22 in·lb)**
- Apply silicone sealant to the circumference of the crankshaft sensor lead grommets [A], and fit the grommet into the notch [B] of the cover securely.
  - sealant - Liquid Gasket, TB1211F: 92104-0004**



- Secure the alternator lead and crankshaft sensor lead with a hold plate [A].
- Tighten the screw [B] while pushing [C] the hold plate.
  - Torque - Alternator and Crankshaft Sensor Leads Hold Plate Screw: 4.4 N·m (0.45 kgf·m, 39 in·lb)**



### Crankshaft Sensor Inspection

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
  - Disconnect the crankshaft sensor lead connector [A].
  - Set the hand tester to the  $\times 100 \Omega$  range and connect it to the crankshaft sensor lead connector.
- Special Tool - Hand Tester: 57001-1394**

#### Crankshaft Sensor Resistance

**Connections:** BK Lead  $\longleftrightarrow$  BK/Y Lead

**Standard:** 101 ~ 151  $\Omega$



## 16-38 ELECTRICAL SYSTEM

### Ignition System

- ★ 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.

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

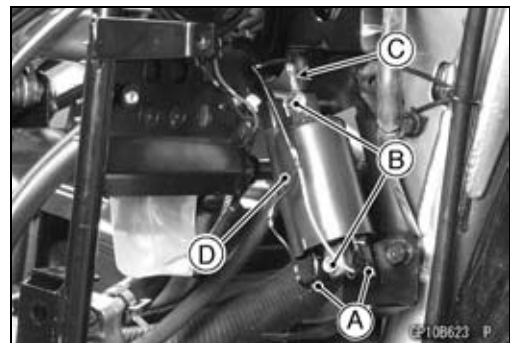
- Refer to the in the IC Igniter Inspection.

#### **Ignition Coil Removal**

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Coolant Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)
- Pull off the spark plug cap [A] from the spark plug.

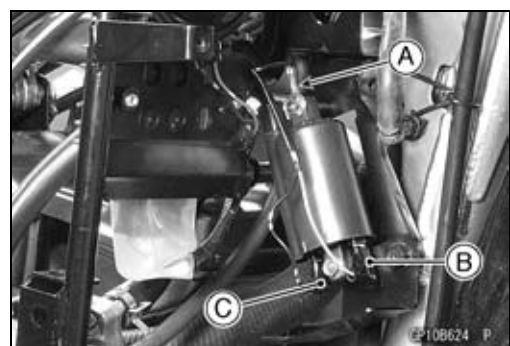


- Disconnect the ignition coil connectors [A].
- Remove:
  - Ignition Coil Bolts [B]
  - Frame Ground Terminal [C]
  - Ignition Coil [D]



#### **Ignition Coil Installation**

- Install the frame ground terminal [A] to the upper bolt of the ignition coil.
- Tighten:
  - Torque - Ignition Coil Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)**
- Connect the primary leads to the ignition coil terminals.
  - BR/W Lead [B]
  - BK Lead [C]





## Ignition System

### Ignition Coil Inspection

- Remove the ignition coil (see Ignition Coil Removal).
- Measure the arcing distance with a suitable commercially available coil tester [A] to check the condition of the ignition coil [B].
- Connect the ignition coil (with the spark plug cap left attached to each end of the spark plug lead) to the tester in the manner prescribed by the manufacturer and measure the arcing distance.

#### Ignition Coil Arcing Distance

6 mm (0.24 in.) or more

### ⚠ WARNING

To avoid extremely high voltage shocks, do not touch the coil body or leads.

- ★ If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.
- To determine which part is defective, measure the arcing distance again with the spark plug cap removed from the ignition coil.
- ★ If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug cap.
- ★ If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with the hand tester.

### NOTE

○ The hand tester can not detect layer shorts and shorts resulting from insulation breakdown under high voltage.

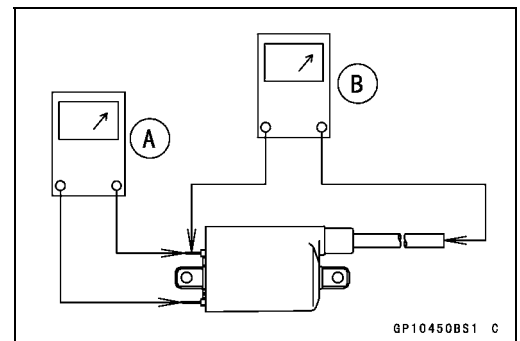
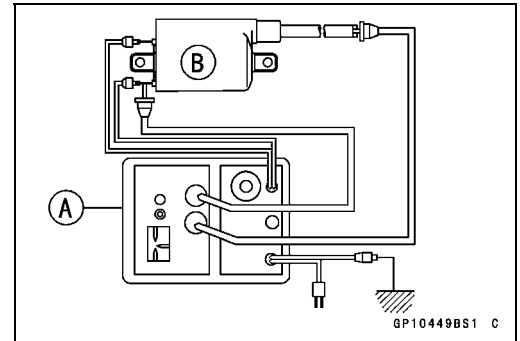
- Measure the primary winding resistance [A] as follows.
- Connect the hand tester between the coil terminals.
- Special Tool - Hand Tester: 57001-1394**
- Set the tester to the  $\times 1\Omega$  range, and read the tester.
- Measure the secondary winding resistance [B] as follows:
- Remove the spark plug cap.
- Connect the hand tester between the spark plug lead and black or green lead terminal.
- Set the tester to the  $\times 1\text{ k}\Omega$  range, and read the tester.

#### Ignition Coil Winding Resistance

Primary windings: 1.8 ~ 2.6  $\Omega$

Secondary windings: 8.8 ~ 13.2  $\text{k}\Omega$

- ★ If the tester does not read as specified, replace the coil.
- ★ If the tester reads as specified, the ignition coil windings are probably good. However, if the ignition system still does not perform as it should after all other components have been checked, replace the coil with one known to be good.
- Check the spark plug lead for visible damage.
- ★ If the spark plug lead is damaged, replace the coil.
- Before installing the spark plug cap, apply a thin coat of PBC (Poly Butyl Cuprystil) grease to the end of spark plug lead (PBC is a special high-temperature, water-resistance grease).



## 16-40 ELECTRICAL SYSTEM

### Ignition System

#### **Ignition Coil Primary Peak Voltage Inspection**

- Refer to the IC igniter inspection.

#### **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 Cleaning and Inspection**

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

**Spark Plug:**        **NGK DPR8EA-9 or**  
                              **ND X24EPR-U9**

- Measure the gap [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:**    **0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)**

#### **Interlock Operation Inspection**

- Raise the rear wheel off the ground with jack.

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

#### **1st Check**

- Start the engine to the following conditions.

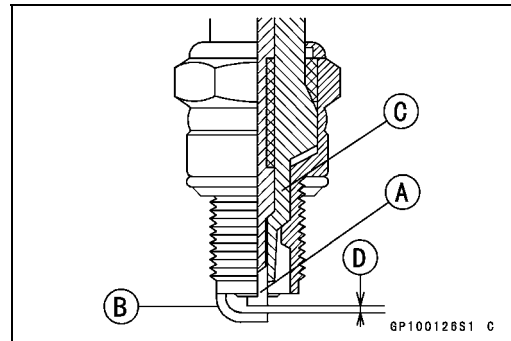
##### **Condition**

**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 interlock diode unit.
- ★ If their parts are normality replace the IC igniter.



## 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 lock-out switch, neutral switch, sidestand switch and interlock diode unit.
- ★ If their parts are normality replace the IC igniter.

### 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

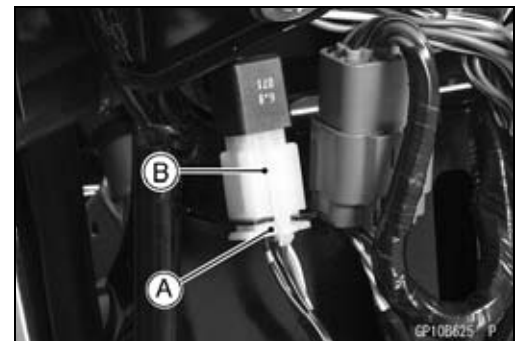
**Clutch Lever** → Pulled in

**Sidestand** → Up

- Set the sidestand on the ground, then the engine will stop.
- ★ If whichever may not be stopped, inspect the neutral switch, starter lockout switch, sidestand switch and interlock diode unit.
- ★ If their parts are normality, replace the IC igniter.

### Interlock Diode Unit Inspection

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Connector [A]
  - Interlock Diode Unit [B]



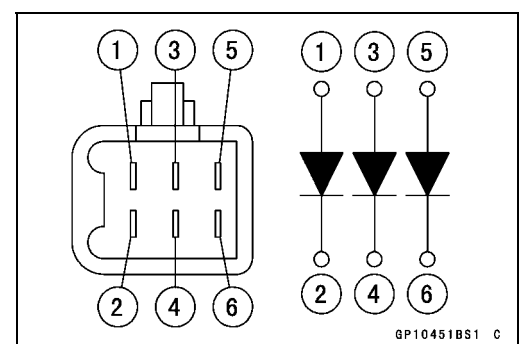
- Set the hand tester to the  $\times 1\Omega$  range and connect it to the diode unit terminals to check the resistance in both directions.

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

- ★ 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 diode unit must be replaced.

#### NOTE

- *The actual meter reading varies with the meter used and the individual diode, but, generally speaking, the lower reading should be from the zero to one half the scale.*



## 16-42 ELECTRICAL SYSTEM

### Ignition System

#### IC Igniter Removal

##### NOTICE

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

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Connector [A]
  - IC Igniter [B]



#### IC Igniter Inspection

##### NOTICE

When inspecting the IC igniter, observe the following to avoid damage to the IC igniter. Do not disconnect the battery cables or any other electrical connections when the ignition switch on, or while the engine is running. This may damage the IC igniter.

#### Check1: IC Igniter Operation Voltage Check

##### NOTE

○Be sure the battery is fully charged.

- Disconnect the IC igniter connector (see IC Igniter Removal).
- Set the hand tester [A] to the × DC 25 V range, and connect it to the main harness side connector [B].

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

##### Connections:

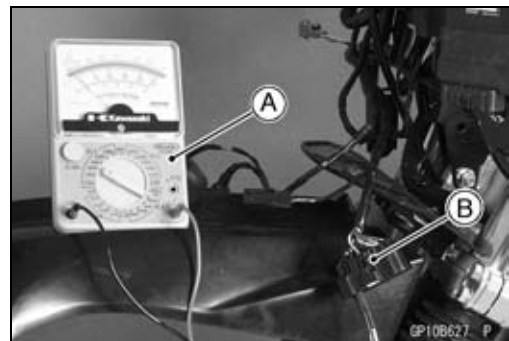
Hand Tester (+) → BR Lead  
Hand Tester (-) → BK/Y Lead

- Turn the ignition switch ON, and read the tester.

##### IC Igniter Operation Voltage

Standard: Battery Voltage

- Turn the ignition switch OFF.
- ★ If the reading is out of the specification, check the following.
  - Main Fuse 20 A (see Fuse Inspection)
  - Ignition Switch
  - Wiring (see Wiring Diagram in this section)



#### Check2: Ignition Coil Primary Peak Voltage Check

##### NOTE

○Be sure the battery is fully charged.

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System chapter)
  - Coolant Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)

## Ignition System

- Pull off the spark plug cap from the spark plug (see Ignition Coil Removal).
- Do not remove the spark plug.
- Measure the primary peak voltage as follows.
- Install the new spark plug [A] into the plug cap, and ground it onto the engine.
- Connect the peak voltage adapter [B] into the hand tester [C] which is set to the  $\times$  DC 1000 V range.

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

**Peak Voltage Adapter: 57001-1415**

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

- Connect the adapter to the primary lead terminals of the ignition coil [D].
- Do not disconnect the primary leads.

**Connections:**

- |                        |   |                               |
|------------------------|---|-------------------------------|
| <b>Adapter (R, +)</b>  | → | <b>BK Lead Terminal [E]</b>   |
| <b>Adapter (BK, -)</b> | → | <b>BR/W Lead Terminal [F]</b> |

**NOTE**

- Measure the voltage with each lead connected correctly. The correct value may not be obtained if disconnected.

**⚠ WARNING**

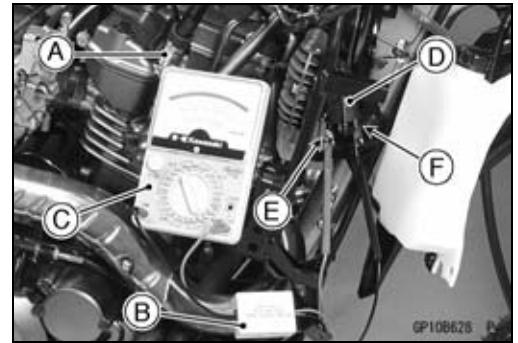
**To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.**

- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times or more times.

**Ignition Coil Primary Peak Voltage**

**Standard: 240 V or more**

- ★ If the reading is less than the standard, check the ignition coil (see Ignition Coil Inspection).
- ★ If the ignition coil is good, check the other parts (see Ignition System Troubleshooting Flow Chart in this section).
- ★ If the all parts are good, replace the IC igniter.



## 16-44 ELECTRICAL SYSTEM

### Ignition System

#### Check3: Crankshaft Sensor Primary Peak Voltage Check

##### NOTE

- Be sure the battery is fully charged.
- Using the peak voltage adapter [A] is more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.

- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Inspection).
- Set the hand tester [B] to the × DC 10 V range, and connect it peak voltage adapter.

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

**Peak Voltage Adapter: 57001-1415**

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

- Connect the adapter to the terminals of the crankshaft sensor lead connector [C].

##### Connections:

**Adapter (R, +)** → **BK Lead**

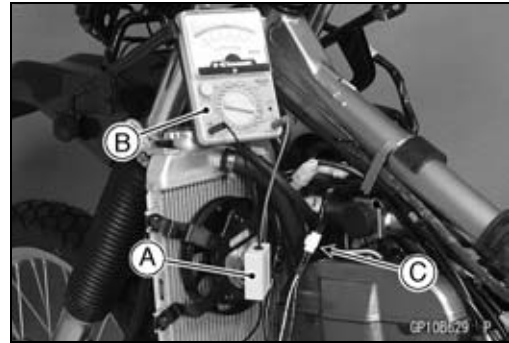
**Adapter (BK, -)** → **BK/Y Lead**

- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- Pull the clutch lever and lift the sidestand.
- 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 or more times.

##### Crankshaft Sensor Peak Voltage

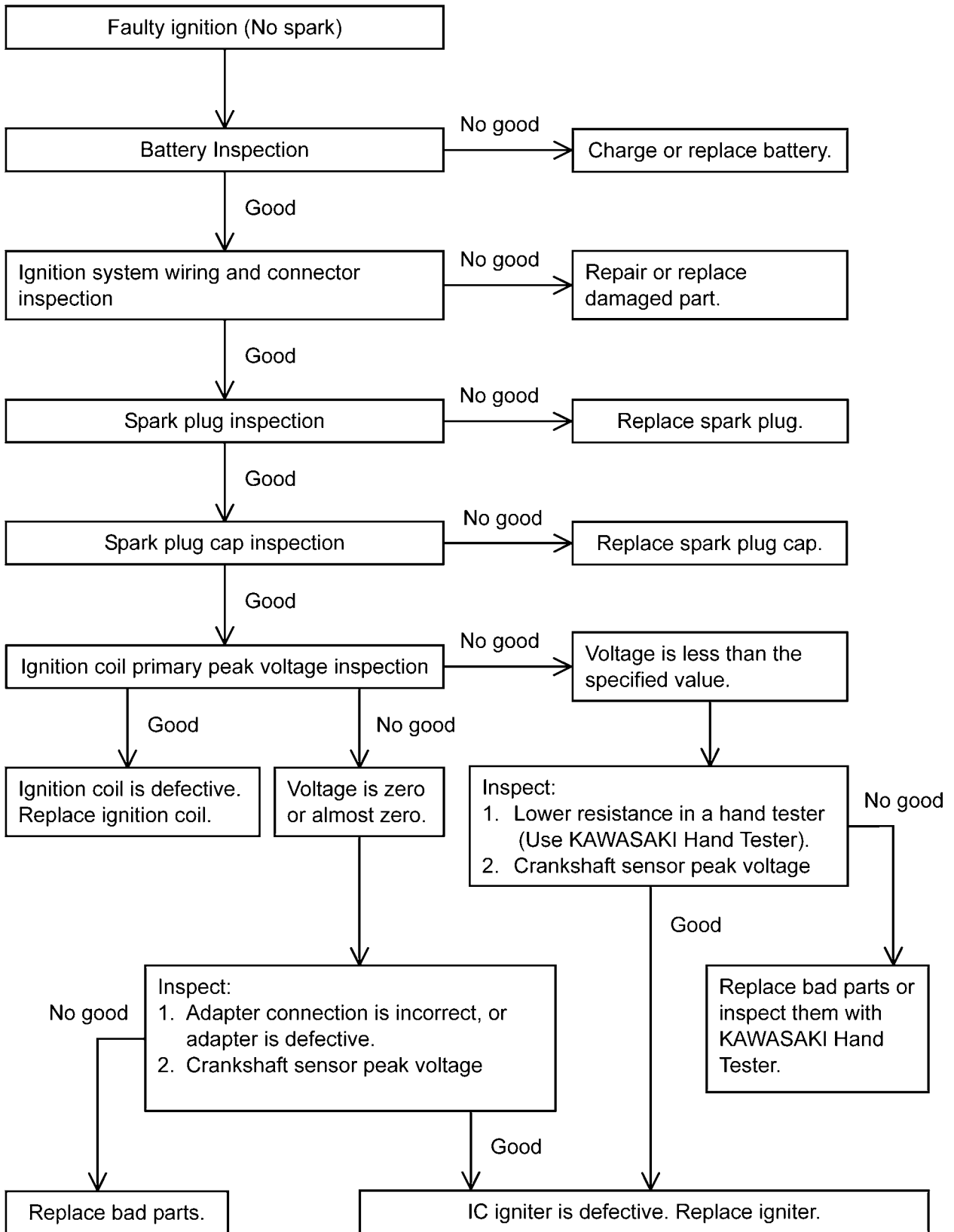
**Standard: 2.0 V or more**

- ★ If the reading is less than the standard, check the crankshaft sensor (see Crankshaft Sensor Inspection).
- ★ If the crankshaft sensor is good, check the other parts (see Ignition System Troubleshooting Flow Chart in this section).
- ★ If the all parts are good, replace the IC igniter.



Ignition System

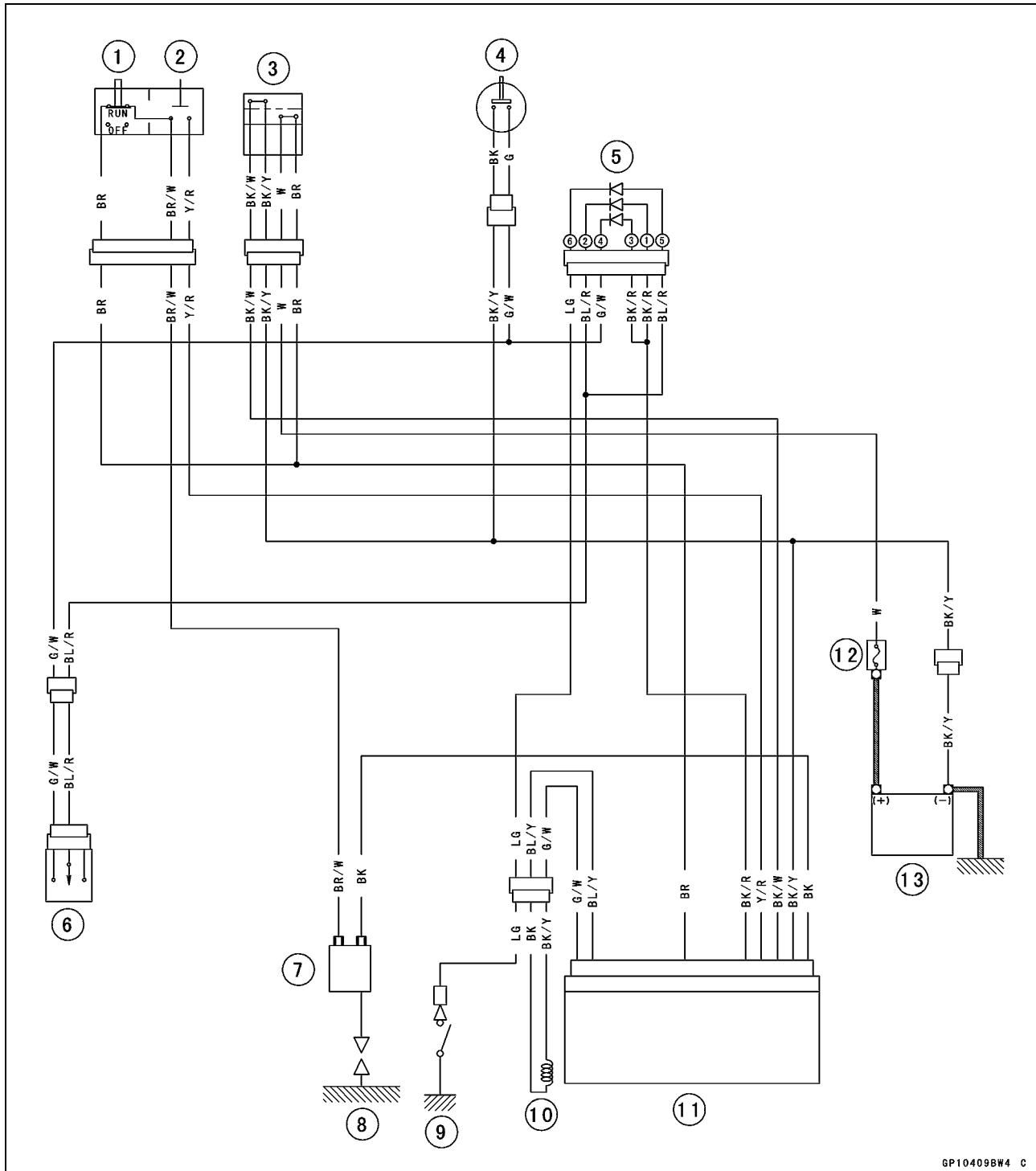
Ignition System Troubleshooting Flow Chart



# 16-46 ELECTRICAL SYSTEM

## Ignition System

### Ignition System Circuit



GP104098W4 C

1. Engine Stop Switch
2. Starter Button
3. Ignition Switch
4. Sidestand Switch
5. Interlock Diode Unit
6. Starter Lockout Switch
7. Ignition Coil
8. Spark Plug
9. Neutral Switch
10. Crankshaft Sensor
11. IC Igniter
12. Main Fuse 20 A
13. Battery 12 V 14 Ah



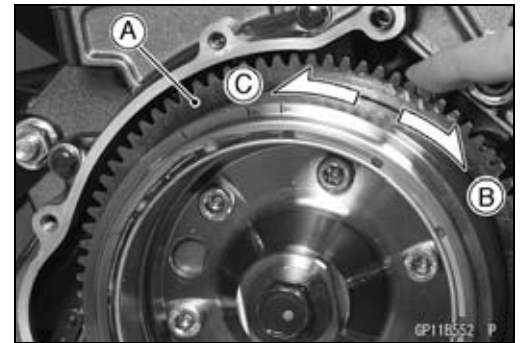
## Starter Motor Clutch

### Starter Motor Clutch Removal/Installation

- Refer to the Alternator Rotor Removal/Installation.

### Starter Motor Clutch Inspection

- Remove:
  - Alternator Outer Cover (see Alternator Outer Cover Removal)
  - Starter Idle Gear and Torque Limiter (see Alternator Removal)
- 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

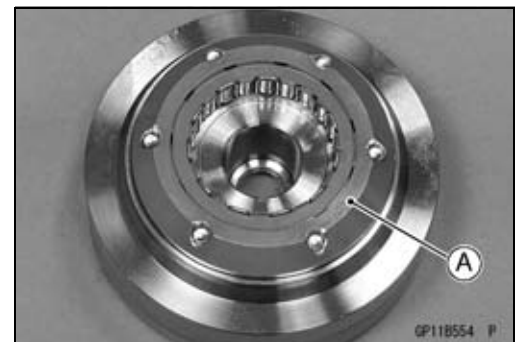
○ Examine the starter motor clutch gear as well. Replace it if it is worn or damaged.

### Starter Motor Clutch Disassembly/Assembly

- Remove:
  - Alternator Rotor (see Alternator Rotor Removal)
  - Starter Motor Clutch Bolts [A]



- Remove the starter motor clutch [A].



- Tighten:
  - Torque - Starter Motor Clutch Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

## 16-48 ELECTRICAL SYSTEM

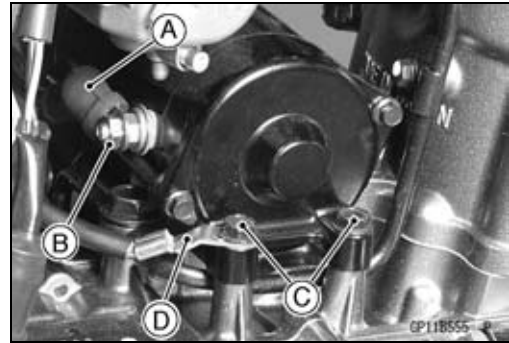
### Electric Starter System

#### Starter Motor Removal

##### NOTICE

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- Remove the exhaust pipe (see Exhaust Pipe Removal in the Engine Top End chapter).
- Slide back the rubber cap [A].
- Remove the starter motor cable terminal nut [B].
- Remove:
  - Mounting Bolts [C]
  - Engine Ground Terminal [D]
- Pull out the starter motor from the alternator inner cover.

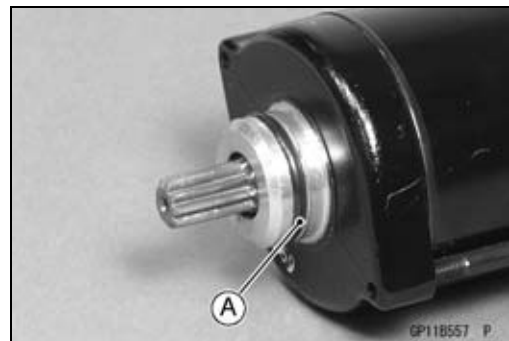
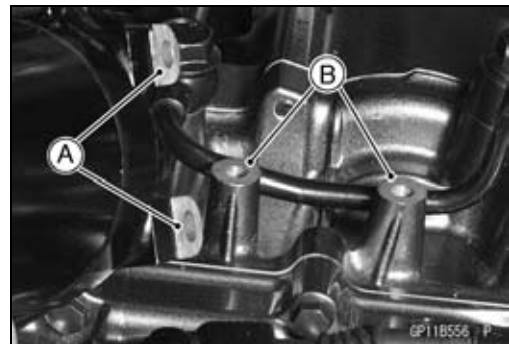


#### Starter Motor Installation

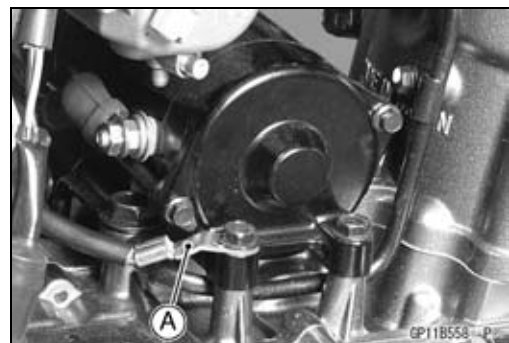
##### NOTICE

**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.



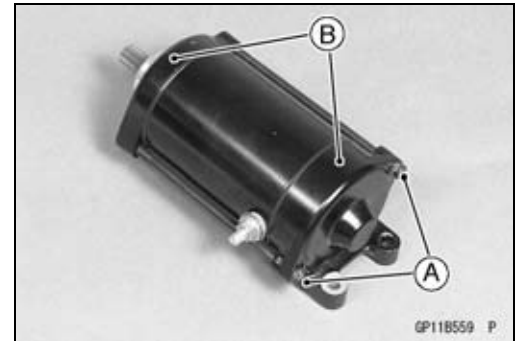
- Install the engine ground terminal [A] to the rear mounting bolt of the starter motor, and position the terminal as shown.
- Tighten:
  - Torque - Starter Motor Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Tighten the starter motor cable terminal nut securely, and slide back the rubber cap to the original position.
  - Torque - Starter Motor Cable Terminal Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)**



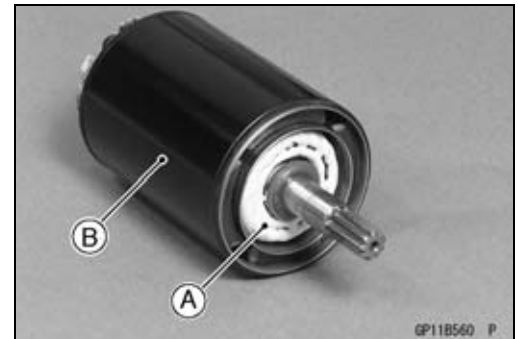
## Electric Starter System

### Starter Motor Disassembly

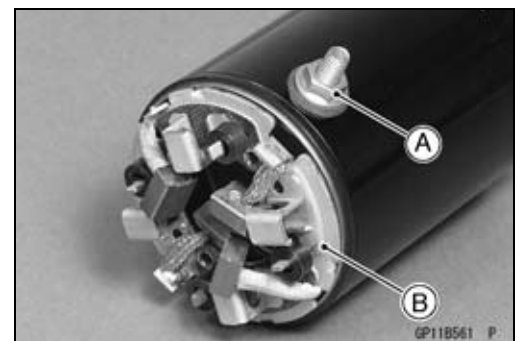
- Remove the starter motor (see Starter Motor Disassembly).
- Take off the starter motor through bolts [A] and remove the both end covers [B].



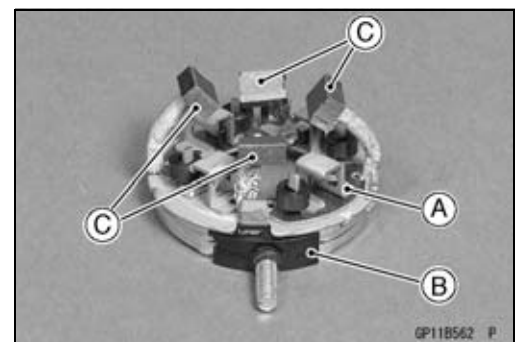
- Pull the armature [A] out of the yoke [B].



- Remove:
  - Terminal Locknut [A]
  - Washers and O-ring
  - Brush Plate Assy [B] (with Terminal Bolt Assy)

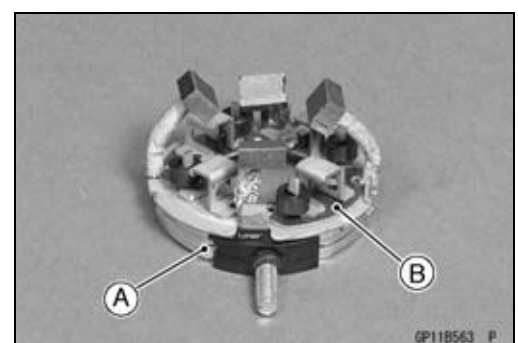


- Remove the brush plate assy [A] from the terminal bolt assy [B].
- Do not remove the carbon brushes [C] from the brush plate assy and terminal bolt assy.



### Starter Motor Assembly

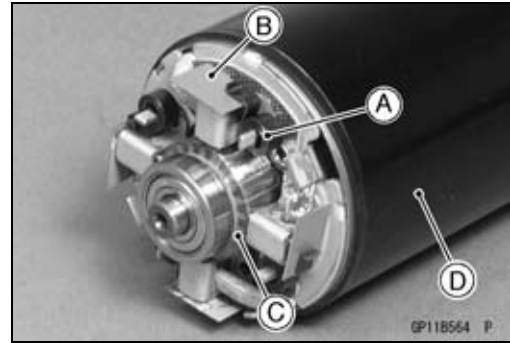
- Install the terminal bolt assy [A] to the brush plate assy [B] as shown.
- Insert the positive brush lead into the notch on the brush plate assy.
- Install the brush plate assy to the yoke.



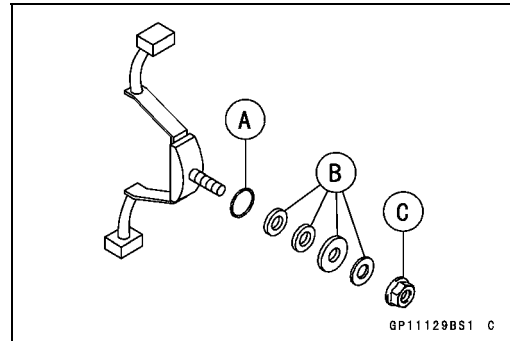
# 16-50 ELECTRICAL SYSTEM

## Electric Starter System

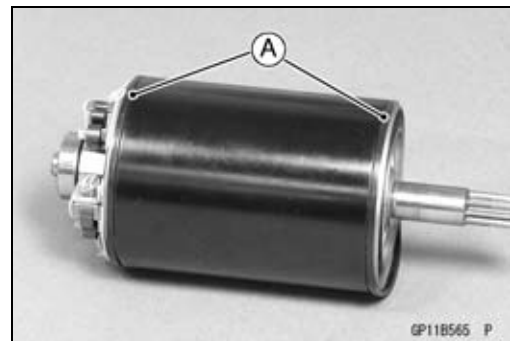
- Clamp the springs [A] with the suitable plates [B].
- Insert the armature [C] into the yoke [D].
- Remove the suitable plates.



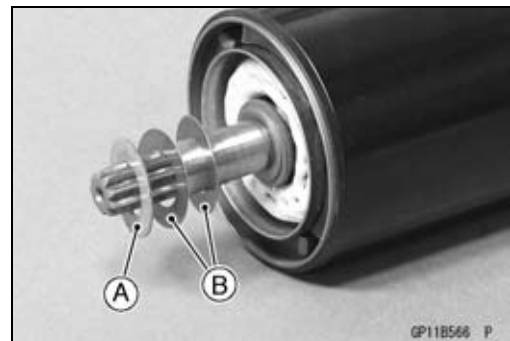
- Replace the O-ring [A] with new one and install it.
- Install:
  - Washers [B]
  - Terminal Locknut [C]
- Tighten:
  - Torque - Starter Motor Terminal Locknut: 10.8 N·m (1.1 kgf·m, 96 in·lb)**



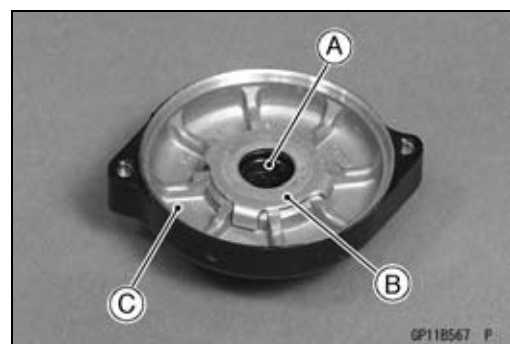
- Replace the O-rings [A] with new ones.



- Install the slip [A] and thrust washers [B] on the shaft.

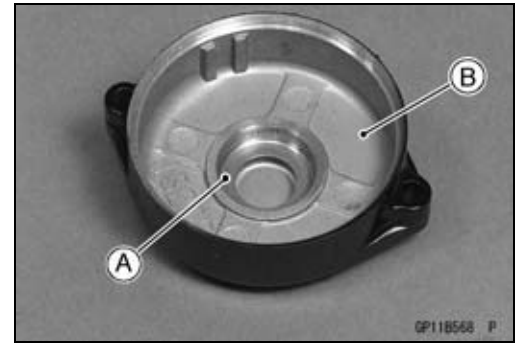


- Apply thin coat of grease to the oil seal [A].
- Fit the toothed washer [B] into the left-hand end cover [C].

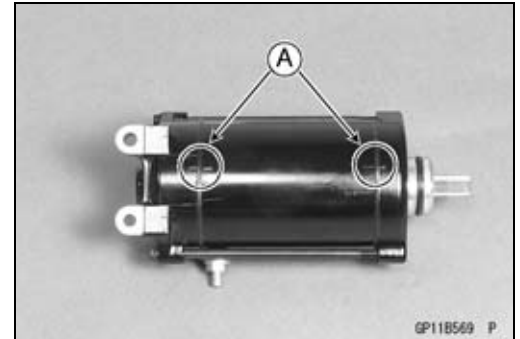


**Electric Starter System**

- Install the thrust washer(s) [A] to the right-hand end cover [B].



- Align the lines [A] of the yoke and end covers.
- Tighten:
  - Torque - Starter Motor Through Bolts: 4.9 N·m (0.50 kgf·m, 39 in·lb)**
- Install the starter motor (see Starter Motor Installation).

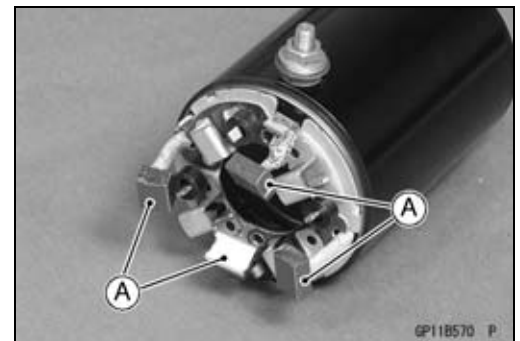


**Brush Inspection**

- Measure the length of each brush [A].
- ★ If any is worn down to the service limit, replace the brush plate assy and the terminal bolt assy as a set.

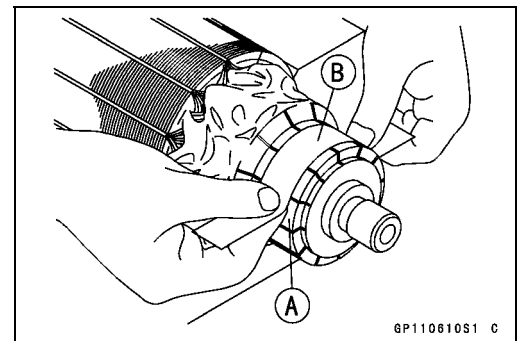
**Starter Motor Brush Length**

- Standard: 12 mm (0.47 in.)**
- Service Limit: 6.5 mm (0.26 in.)**



**Commutator Cleaning and Inspection**

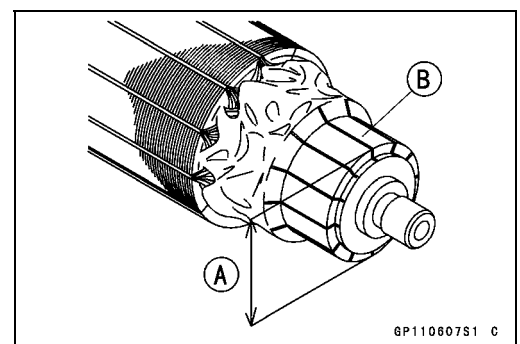
- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.



- Measure the diameter [A] of the commutator [B].
- ★ If the commutator diameter is less than the service limit, replace the starter motor with a new one .

**Commutator Diameter**

- Standard: 28 mm (1.10 in.)**
- Service Limit: 27 mm (1.06 in.)**



## 16-52 ELECTRICAL SYSTEM

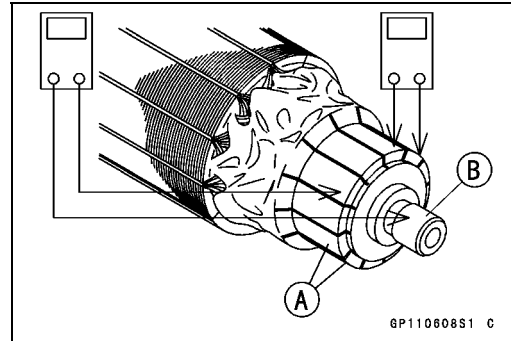
### Electric Starter System

#### 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

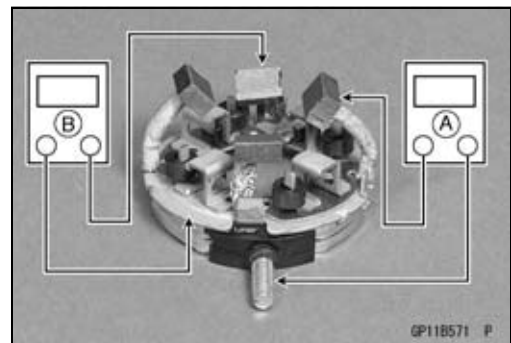
- Using the  $\times 1 \Omega$  hand tester range, measure the resistance as shown.

Terminal Bolt and Positive Brushes [A]

Brush Plate and Negative Brushes [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 assy and the brush plate assy as a set.



#### Brush Plate and Terminal Bolt Inspection

- Using the highest hand tester range, measure the resistance as shown.

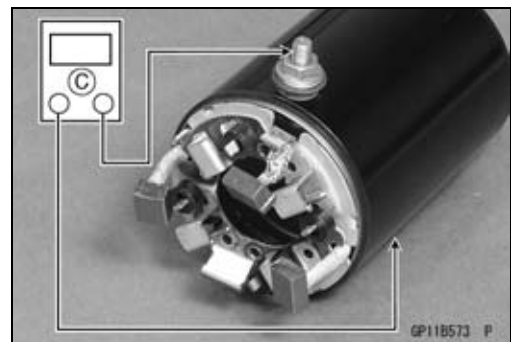
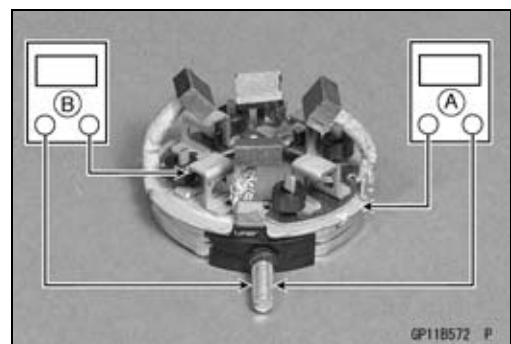
Terminal Bolt and Brush Plate [A]

Terminal Bolt and Negative Brush Holders [B]

Terminal Bolt and Yoke [C]

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

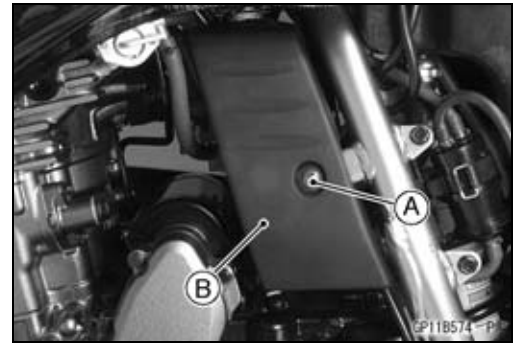
- ★ If there is any reading, the brush plate assy and terminal bolt assy have a short. Replace the brush plate assy and the terminal bolt assy as a set.



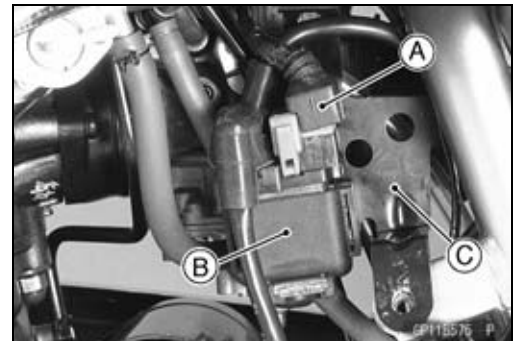
## Electric Starter System

### Starter Relay Inspection

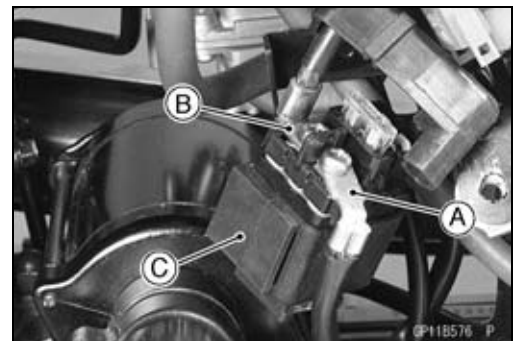
- Remove the battery negative (–) cable from the battery negative (–) terminal (see Battery Removal).
- Remove:
  - Screw [A]
  - Starter Relay Cover [B]



- Disconnect the connector [A].
- Remove the starter relay [B] from the bracket [C].



- Disconnect the starter motor cable [A] and battery positive (+) cable [B] from the starter relay [C].



- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown.

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

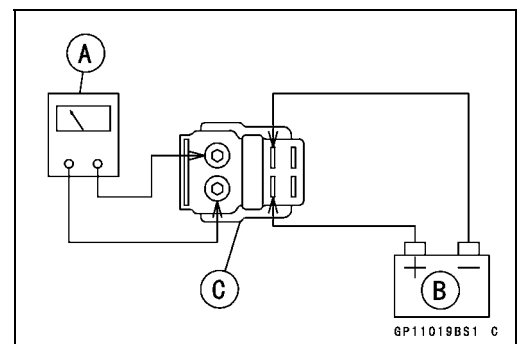
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

#### Testing Relay

**Tester Range:** × 1 Ω range

**Criteria:** When battery is connected → 0 Ω

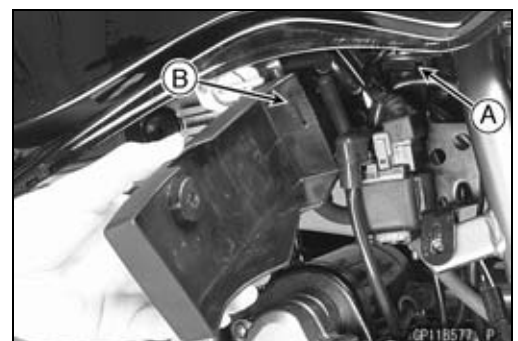
When battery is disconnected → ∞ Ω



- Run the cable and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Starter Relay Terminal Screws: 4.4 N·m (0.45 kgf·m, 39 in·lb)**

- Insert the rib [A] of the bracket into the groove [B] of the starter relay cover.
- Tighten the screw securely.

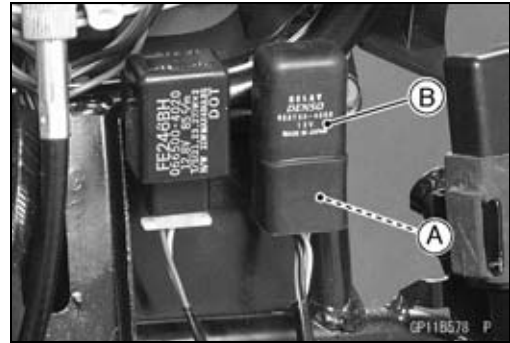


# 16-54 ELECTRICAL SYSTEM

## Electric Starter System

### Starter Circuit Relay Inspection

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Connector [A]
  - Starter Circuit Relay [B]



- Connect the hand tester [A] and a 12 V battery [B] to the starter circuit relay [C] as shown.
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

### Testing Relay

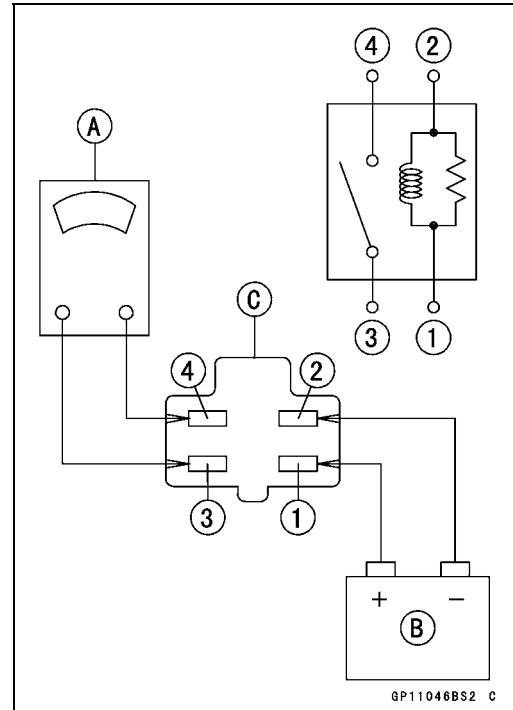
Hand Tester Range:  $\times 1 \Omega$

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

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

Relay Coil Terminals [1] and [2]

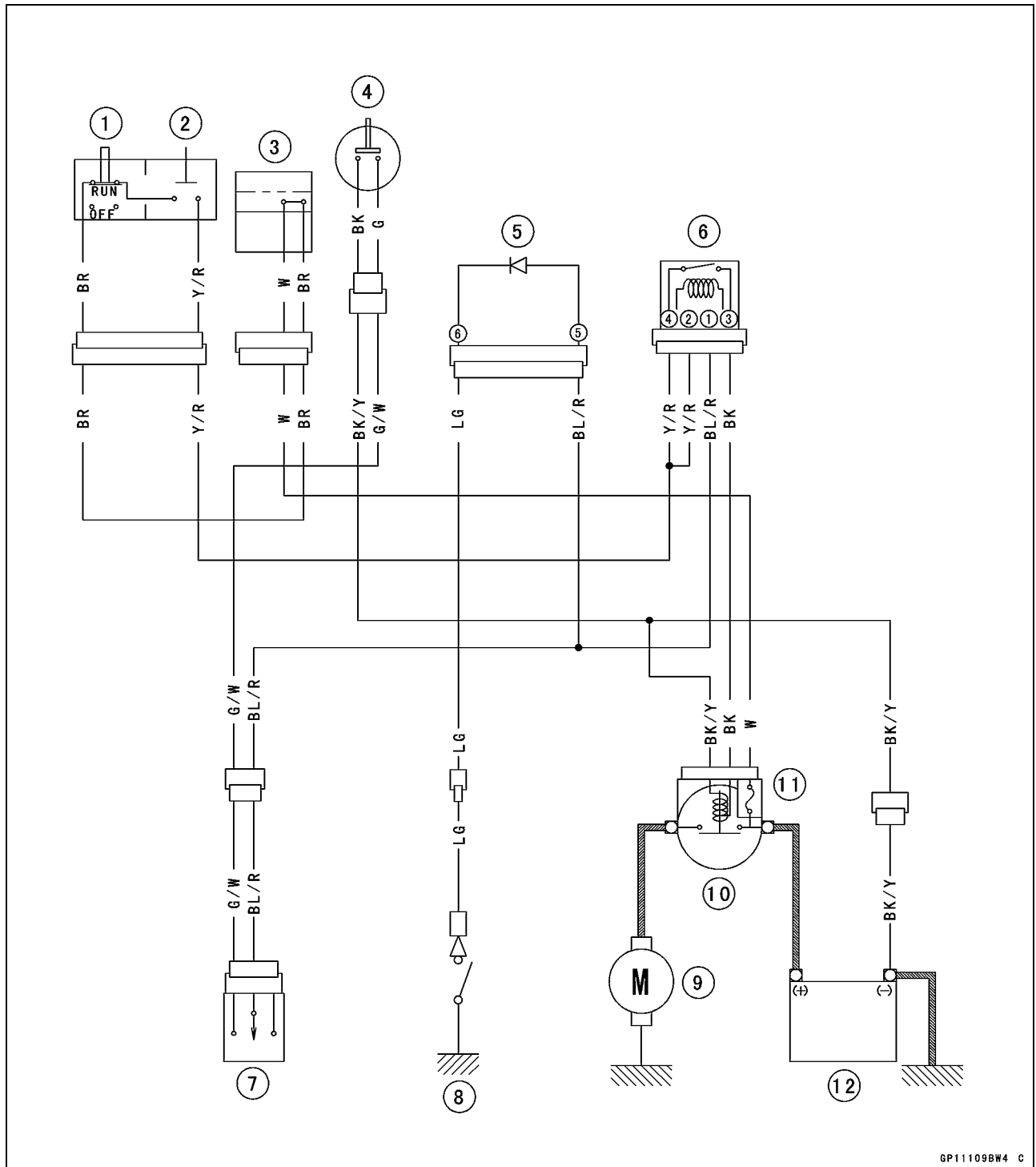
Relay Switch Terminals [3] and [4]





Electric Starter System

Electric Starter Circuit



GP11109BW4 C

1. Engine Stop Switch
2. Starter Button
3. Ignition Switch
4. Sidestand Switch
5. Interlock Diode Unit
6. Starter Circuit Relay
7. Starter Lockout Switch
8. Neutral Switch
9. Starter Motor
10. Starter Relay
11. Main Fuse 20 A
12. Battery 12 V 14 Ah

## 16-56 ELECTRICAL SYSTEM

### Lighting System

#### **Headlight Beam Horizontal Adjustment**

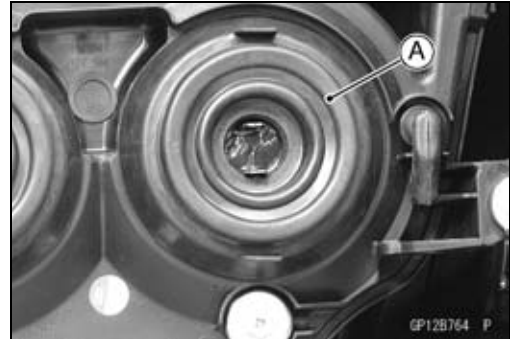
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

#### **Headlight Beam Vertical Adjustment**

- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

#### **Headlight Bulb Replacement**

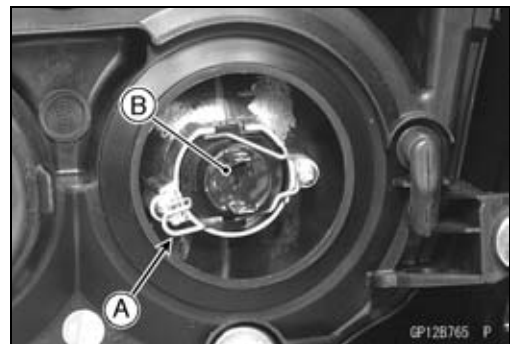
- Remove:
  - Headlight Assy (see Headlight Removal)
  - Headlight Bulb Dust Cover [A]



- Remove:
  - Hook [A]
  - Headlight Bulb [B]

#### **NOTICE**

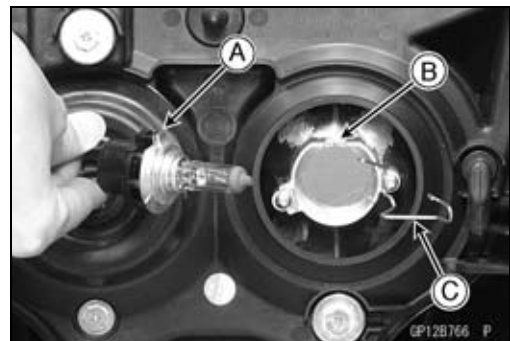
**When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.**



#### **NOTE**

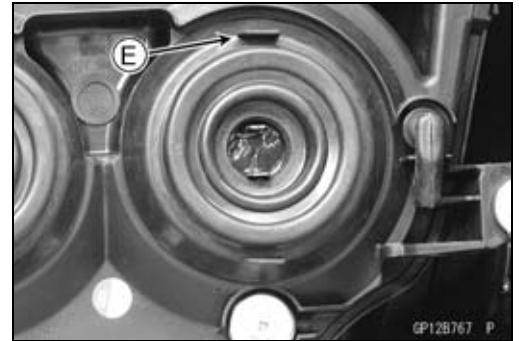
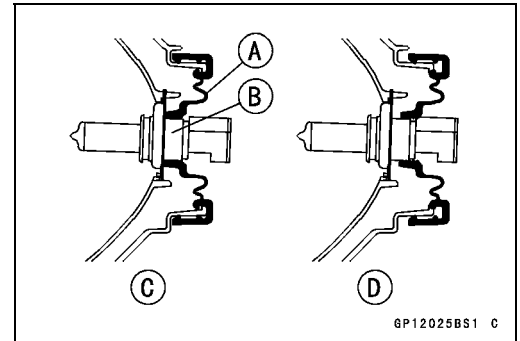
○Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.

- Replace the headlight bulb.
- Fit the projection [A] of the bulb in the hollow [B] of the headlight.
- Install the hook [C].



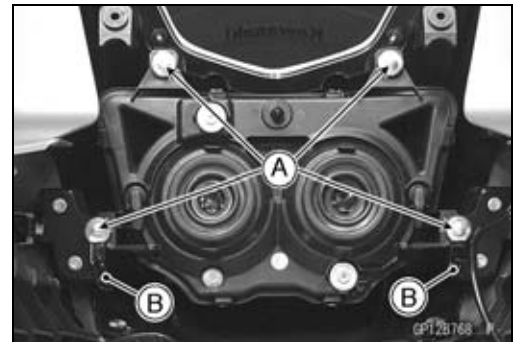
## Lighting System

- Fit the dust cover [A] with the projection upward onto the bulb [B] firmly as shown.
  - Good [C]
  - Bad [D]
  - Projection [E]
- After installation, adjust the headlight aim (see Headlight Aiming Inspection in the Periodic Maintenance chapter).
- Other Bulb: Repeat the above steps.



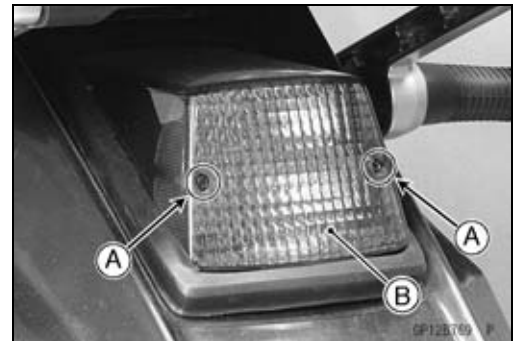
### Headlight Removal

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Mounting Bolts [A]
  - Clamps [B]
  - Headlight Assy

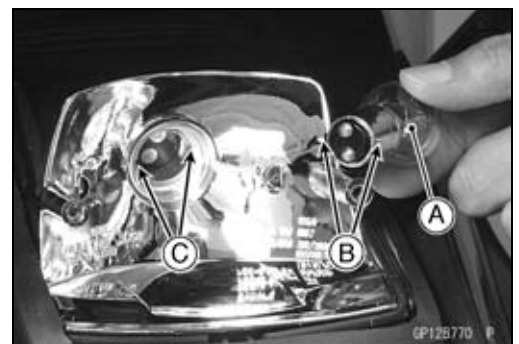


### Tail/Brake Light Bulb Replacement

- Remove:
  - Screws [A]
  - Tail/Brake Light Lens [B]
- Push and turn the bulb 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°.

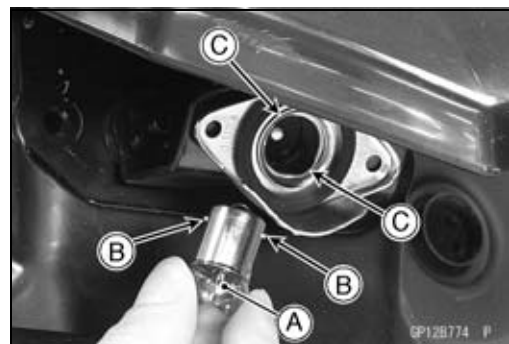
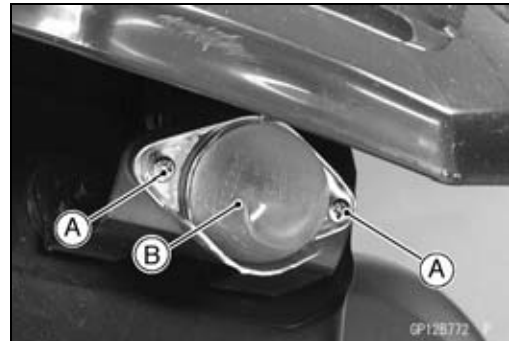
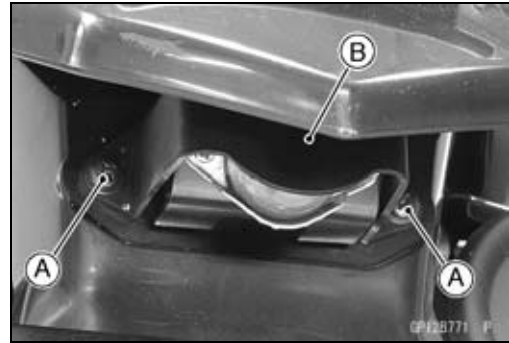


## 16-58 ELECTRICAL SYSTEM

### Lighting System

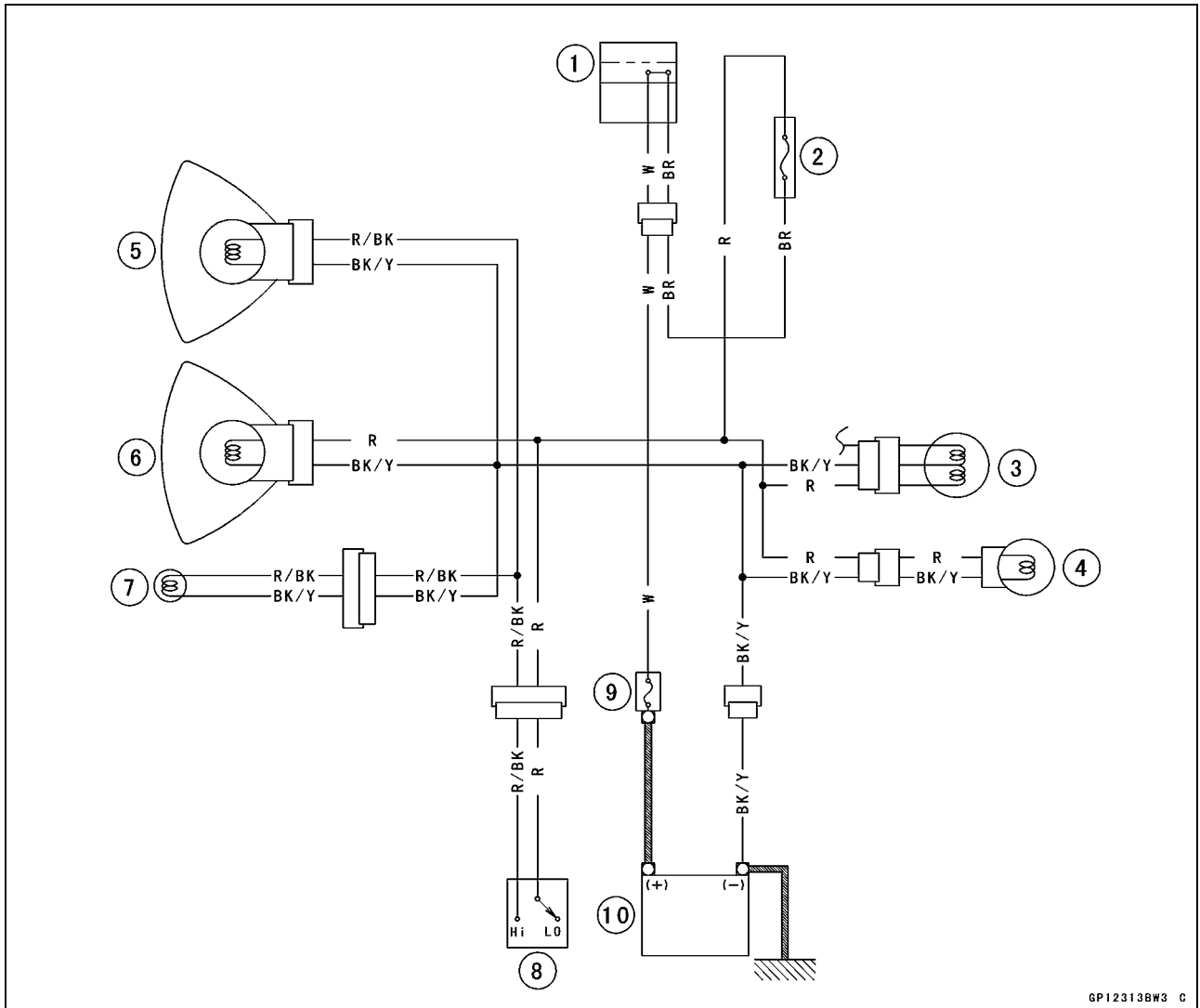
#### License Plate Light Bulb Replacement

- Remove:
  - Screws [A]
  - License Plate Light Cover [B]
  
- Remove:
  - Screws [A]
  - License Plate Light Lens [B]
  
- 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°.
  
- Fit the projection [A] of the lens in the hollow [B] of the socket.
- Tighten:
  - **Torque - License Plate Light Lens Screws: 0.9 N·m (0.09 kgf·m, 8 in·lb)**



## Lighting System

## Headlight/Tail Light Circuit



GP12313BW3 C

1. Ignition Switch
2. Headlight Fuse 15 A
3. Tail/Brake Light 12 V 5/21 W
4. License Plate Light 12 V 5 W
5. Headlight (High) 12 V 55 W
6. Headlight (Low) 12 V 55 W
7. High Beam Indicator Light 12 V 1.7 W
8. Dimmer Switch
9. Main Fuse 20 A
10. Battery 12 V 14 Ah

**Turn Signal Light Bulb Replacement**

- Remove the screw [A].



GP128776 F

## 16-60 ELECTRICAL SYSTEM

### Lighting System

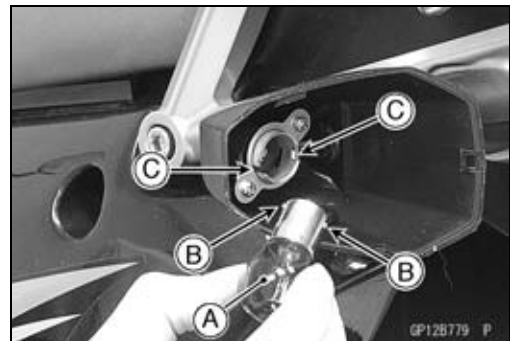
- Turn the turn signal light lens [A] counterclockwise, and remove it.



- Push and turn the bulb [A] counterclockwise and remove it.

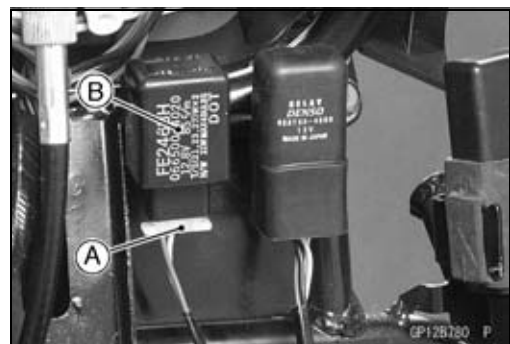


- Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.
- Turn the bulb about 15°.
- Install the projections of the lens to the dints of the turn signal light.



### Turn Signal Relay Inspection

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Connector [A]
  - Turn Signal Relay [B]

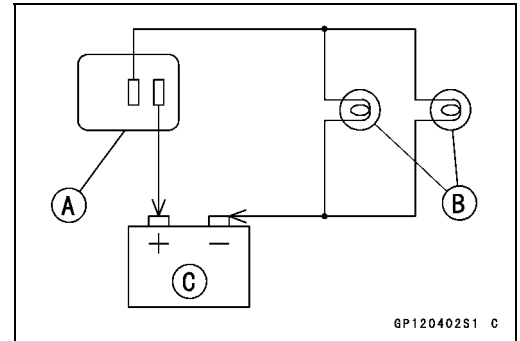


**Lighting System**

- Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights flash for one minute.

Turn Signal Relay [A]  
 Turn Signal Lights [B]  
 12 V Battery [C]

- ★ If the lights do not flash as specified, replace the turn signal relay.



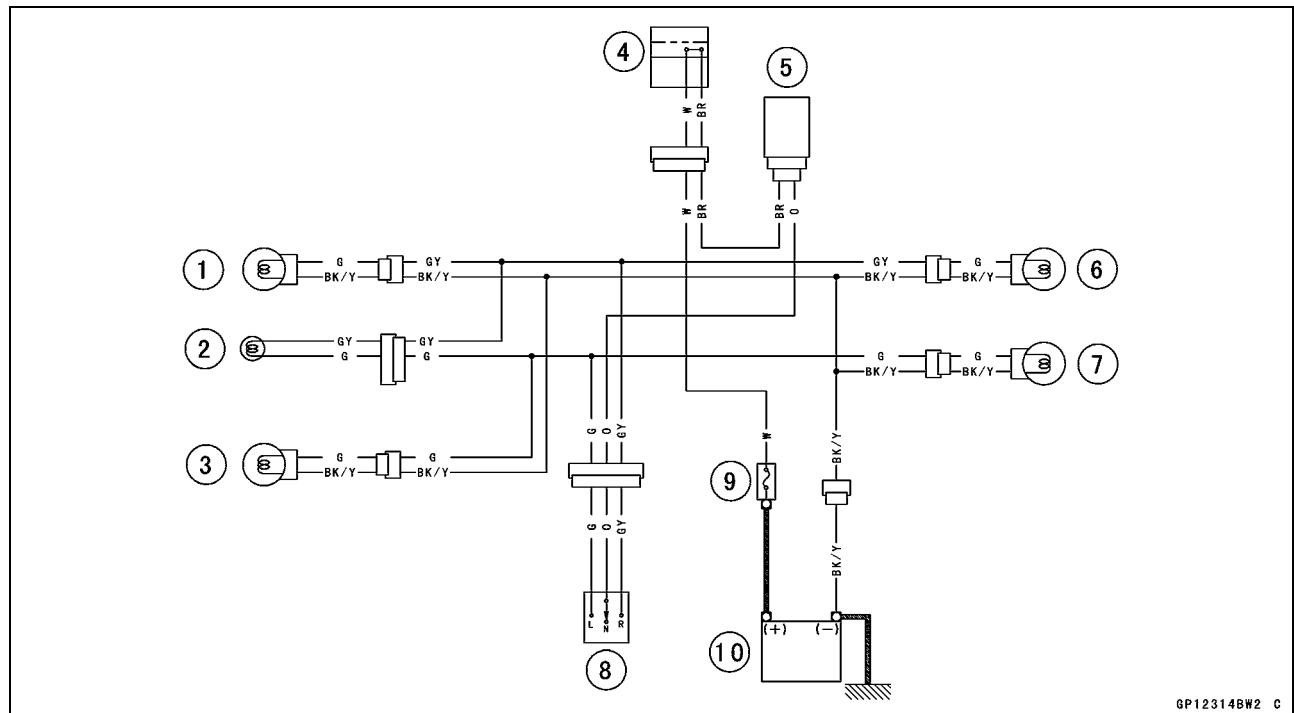
**Testing Turn Signal Relay**

Load		Flashing Times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	21 or 23	140 ~ 250
2	42 or 46	75 ~ 95

(\*): Cycle(s) per minute

(\*\*): Corrected to "one light burned out".

**Turn Signal Light Circuit**



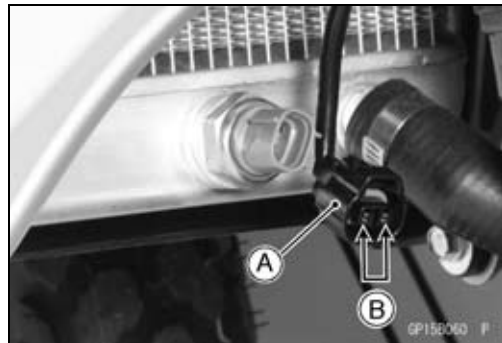
1. Front Right Turn Signal Light 12 V 21 W
2. Turn Signal Indicator Light 12 V 1.7 W
3. Front Left Turn Signal Light 12 V 21 W
4. Ignition Switch
5. Turn Signal Relay
6. Rear Right Turn Signal Light 12 V 21 W
7. Rear Left Turn Signal Light 12 V 21 W
8. Turn Signal Switch
9. Main Fuse 20 A
10. Battery 12 V 14 Ah

# 16-62 ELECTRICAL SYSTEM

## Radiator Fan System

### Fan System Circuit Inspection

- Disconnect the radiator fan switch connector [A].
- Using an auxiliary lead [B], connect the radiator fan switch leads.
- ★ If the fan rotates, inspect the fan switch (see Radiator Fan Switch Inspection).
- ★ If the fan does not rotate, inspect the following.
  - Wiring (see Wiring Diagram in this section)
  - Fan Fuse 15 A (see Fuse Inspection)
  - Fan Motor (see Fan Motor Inspection)

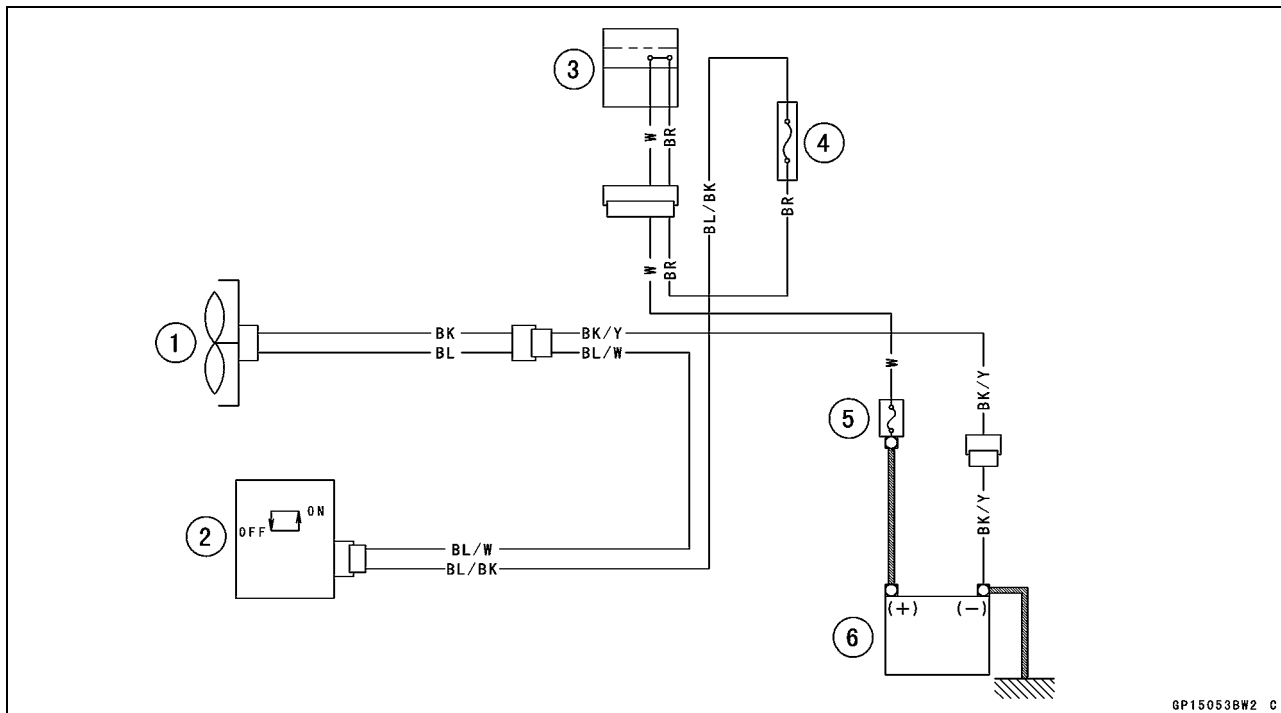


### Fan Motor Inspection

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Disconnect the radiator fan lead connector (2 pins 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
2. Radiator Fan Switch
3. Ignition Switch
4. Fan Fuse 15 A
5. Main Fuse 20 A
6. Battery 12 V 14 Ah



## Meter, Gauge, Indicator Unit

### Meter Unit Removal/Installation

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Speed Meter Cable Upper End [A]
- Disconnect the connector [B].
- Remove the meter unit by taking off the mounting screws [C] with the washers.

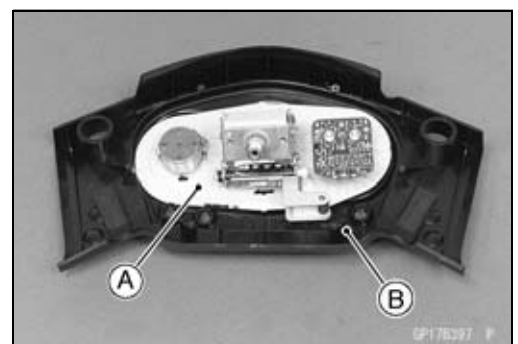
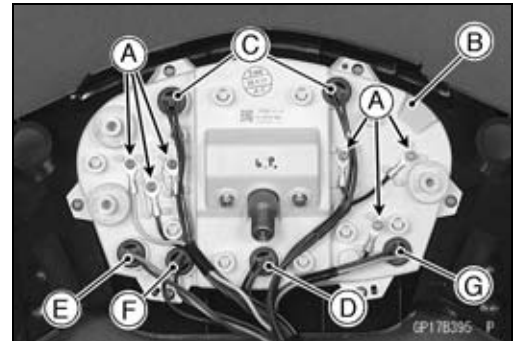
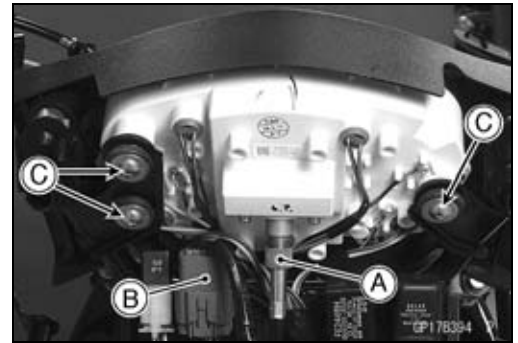
#### NOTICE

**Do not drop the meter unit. Place the meter unit so that face is up. If a meter unit is left upside down or sideways for a long time or dropped, it will malfunction.**

- Tighten:
  - Torque - Meter Unit Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)

### Meter Unit Disassembly/Assembly

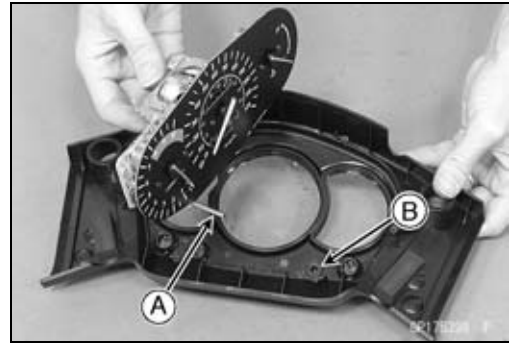
- Remove:
  - Meter Unit (see Meter Unit Removal)
  - Screws [A]
- Pull out the following socket from the lower meter cover [B].
  - Meter Lights ( 12 V 1.7 W [C], 12 V 3.4 W [D])
  - Turn Signal Indicator Light [E]
  - High Beam Indicator Light [F]
  - Neutral Indicator Light [G]
- Remove:
  - Screws [A]
  - Lower Meter Cover [B]
- Separate the meter assembly [A] and upper meter cover [B].



## 16-64 ELECTRICAL SYSTEM

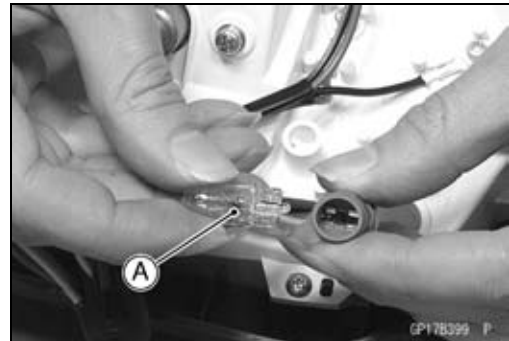
### Meter, Gauge, Indicator Unit

- Fit the rod [A] into the hole [B] of the RESET button.
- Install the sockets and terminals according to the lead color marks of the lower meter cover.



#### **Meter, Indicator Light Bulb Replacement**

- Remove the meter unit (see Meter Unit Removal/Installation).
- Pull out the socket together with the bulb (see Meter Unit Disassembly/Assembly).
- Pull the bulb [A] out of the socket.



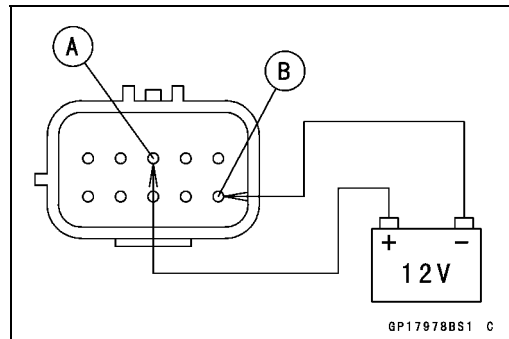
#### **NOTICE**

**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 bulb.**

- Replace the bulb with a new one.
- Other Bulb: Repeat the above steps.

#### **Tachometer Inspection**

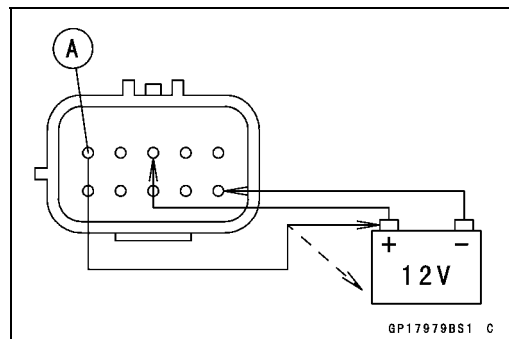
- Remove the meter unit (see Meter Unit Removal/Installation).
- Using the insulated auxiliary leads, connect the 12 V battery to the meter unit connector as follows.
- Connect the battery positive terminal to the BR lead terminal [A].
- Connect the battery negative terminal to the BK/Y lead terminal [B].



#### **NOTICE**

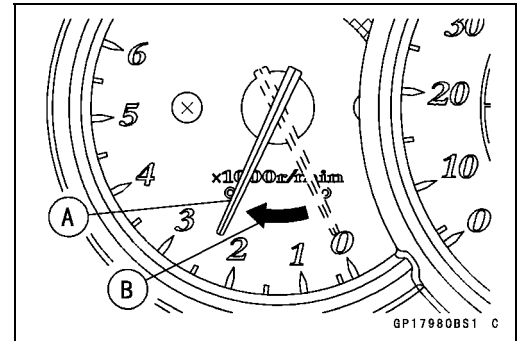
**Do not short each terminals.**

- Using the insulated auxiliary leads, open and connect the BK lead terminal [A] to the battery positive terminal repeatedly.

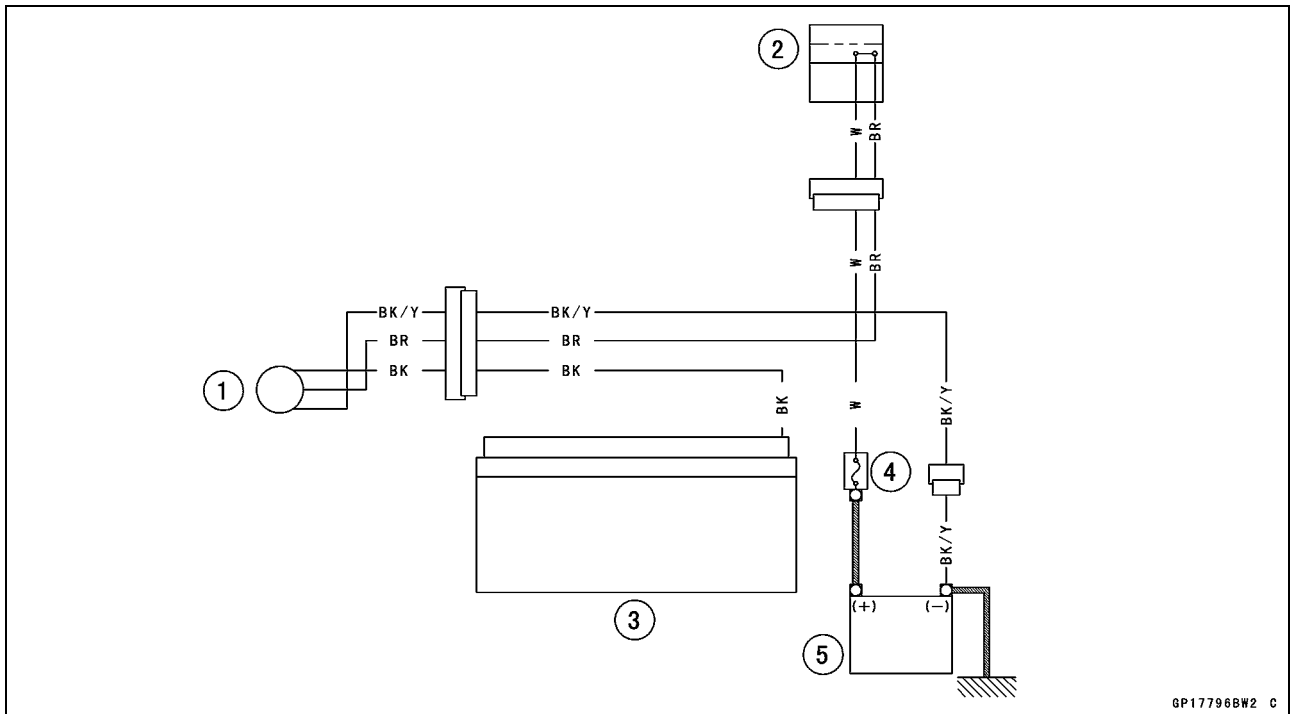


**Meter, Gauge, Indicator Unit**

- Then the tachometer needle [A] should flick [B].
- ★ If the needle does not flick, replace the meter assembly.



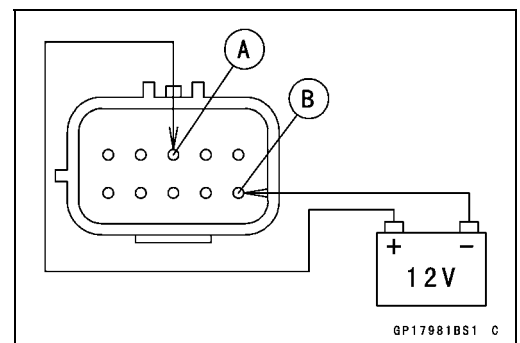
**Tachometer Circuit**



1. Tachometer
2. Ignition Switch
3. IC Igniter
4. Main Fuse 20 A
5. Battery 12 V 14 Ah

**Water Temperature Gauge Inspection**

- Remove the meter unit (see Meter Unit Removal/Installation).
- Using the insulated auxiliary leads, connect the 12 V battery to the meter unit connector as follows.
  - Connect the battery positive terminal to the BR lead terminal [A].
  - Connect the battery negative terminal to the BK/Y lead terminal [B].



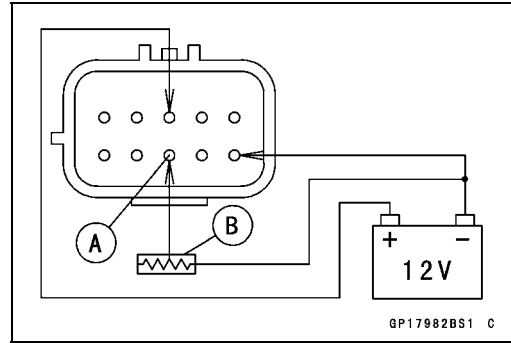
**NOTICE**

**Do not short each terminals.**

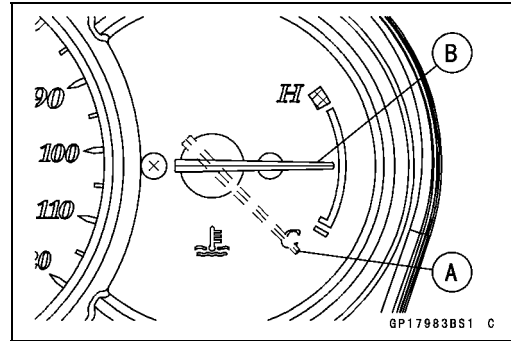
# 16-66 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

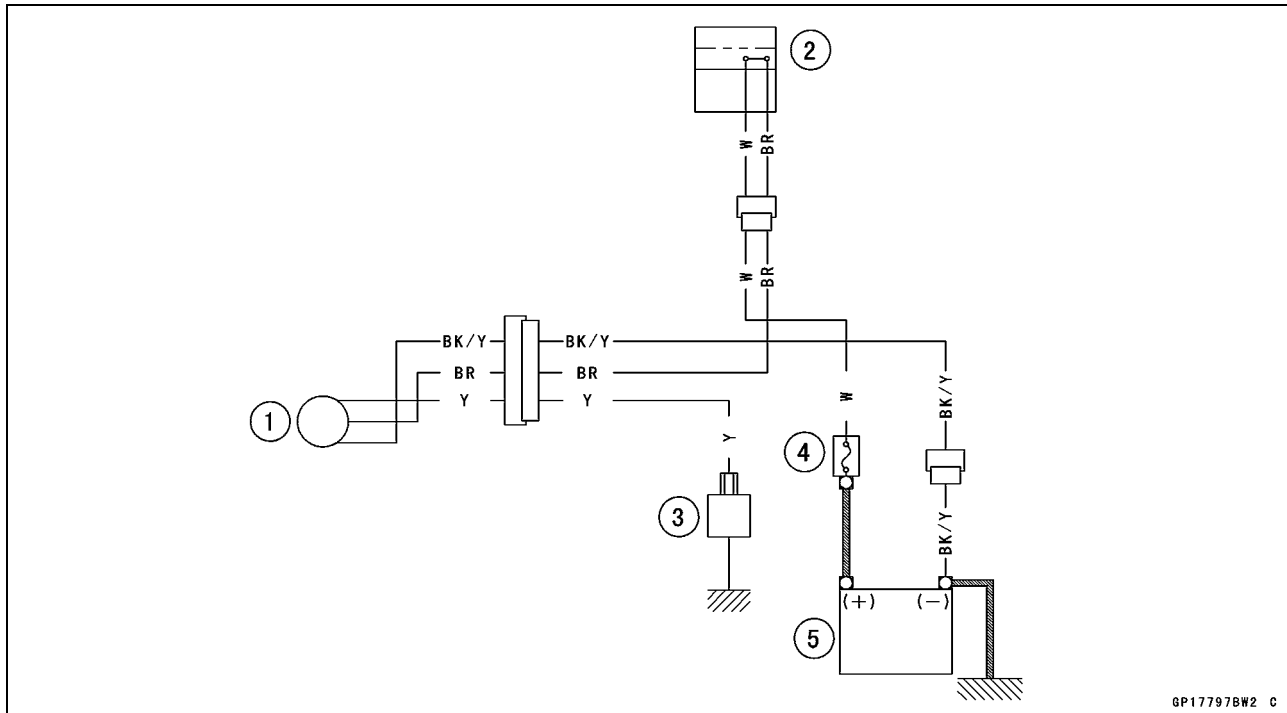
- Connect the variable rheostat [A] to the Y lead terminal [B] as shown.
- Adjust the resistance value to the approximately 30 Ω.



- The water temperature gauge [A] indicate the position [B] of the about 100 °C.
- ★ If the water temperature gauge does not work, replace the meter assembly.



## Water Temperature Gauge Circuit



1. Water Temperature Gauge
2. Ignition Switch
3. Water Temperature Sensor
4. Main Fuse 20 A
5. Battery 12 V 14 Ah

## Switches and Sensors

### **Brake Light Timing Inspection**

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

### **Brake Light Timing Adjustment**

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

### **Switch Inspection**

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).

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

- For the switch housings and the ignition switch, refer to the tables in the Wiring Diagram.
- ★ If the switch has an open or short, repair it or replace it with a new one.

#### **Rear Brake Light Switch Connections**

Rear Brake Light Switch Connections		
Color	BR	BK
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		

# 16-68 ELECTRICAL SYSTEM

## Switches and Sensors

### Radiator Fan Switch Inspection

- Remove the radiator fan switch (see Radiator Fan Switch Removal in the Cooling System chapter).
- Suspend the switch [A] in a container of coolant so that the thread portion is submerged.
- Suspend an accurate thermometer [B] with temperature sensing portions [C] located in almost the same depth.

#### NOTE

○The switch 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 switch.

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

### Radiator Fan Switch Resistance

#### Rising Temperature:

From OFF to ON at 95 ~ 101°C (203 ~ 214°F)

#### Falling Temperature:

From ON to OFF at 87°C (189°F) or less

**ON: less than 0.5Ω**

**OFF: More than 1 MΩ**

★If the hand tester does not show the specified values, replace the switch.

### Water Temperature Sensor Inspection

- Remove the water temperature sensor (see Water Temperature Sensor Removal in the Cooling System chapter).
- Suspend the sensor [A] in a container of coolant so that the thread portion is submerged.
- Suspend an accurate thermometer [B] with temperature sensing portions [C] located in almost the same depth.

#### NOTE

○The sensor and thermometer must not touch the container side or bottom.

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.

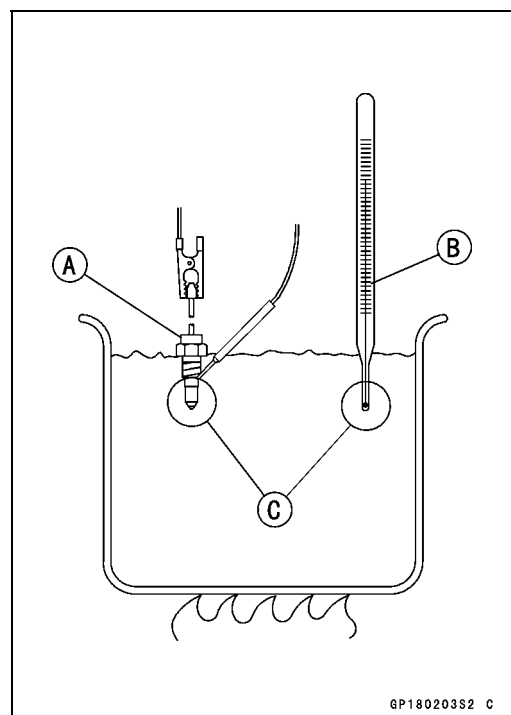
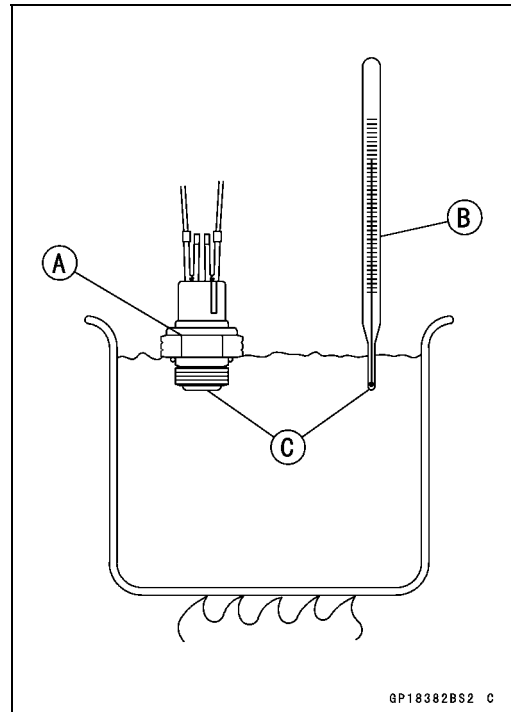
**Special Tool - Hand Tester: 57001-1394**

### Water Temperature Sensor Resistance

Temperature	Resistance (Ω)
*50 °C (122°F)	*(About 153.9)
80 °C (176°F)	47.5 ~ 56.8
100 °C (212°F)	25.7 ~ 29.3
*120°C (248 °F)	*(About 16.1)

\* Reference Information

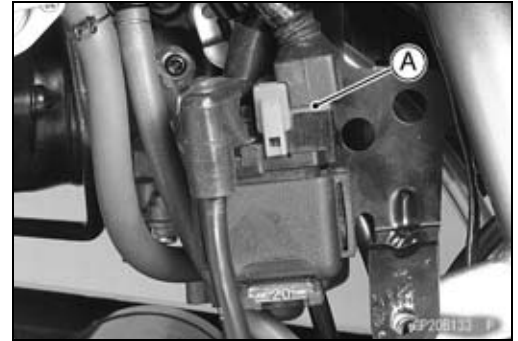
★If the hand tester does not show the specified values, replace the sensor.



## Fuse

### 20 A Main Fuse Removal

- Remove the starter relay cover (see Starter Relay Inspection).
- Disconnect the connector [A].

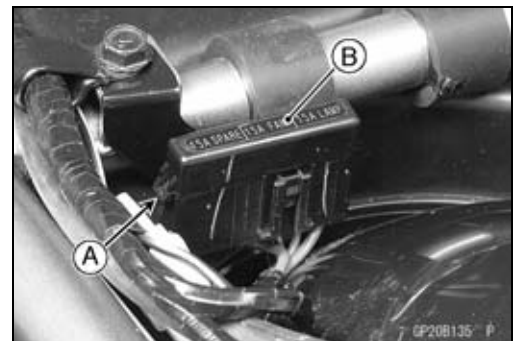


- Pull out the main fuse [A] from the starter relay with needle nose pliers.

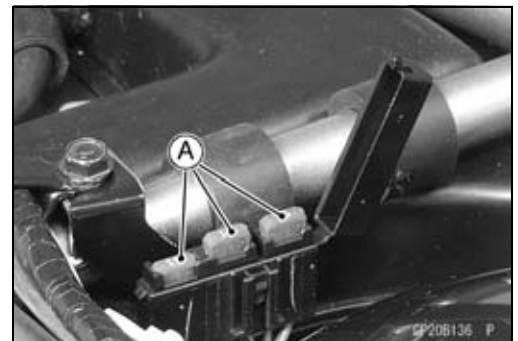


### Fuse Box Fuse Removal

- Remove the seat (see Seat Removal in the Frame chapter).
- Unlock the hook [A] to lift up the lid [B].



- Pull the fuses [A] straight out of the fuse box with needle nose pliers.



### Fuse Installation

- If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.
- Install the fuse box fuses on the original position as specified on the lid.

## 16-70 ELECTRICAL SYSTEM

### Fuse

#### **Fuse Inspection**

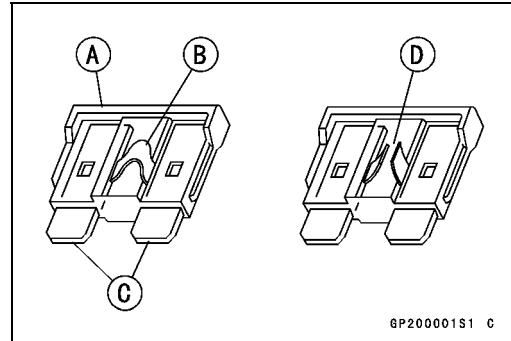
- Remove the fuse (see 20 A Main/Fuse Box Fuse Removal).
- Inspect the fuse element.
- ★ If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

Housing [A]

Fuse Element [B]

Terminals [C]

Blown Element [D]



#### **NOTICE**

**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**



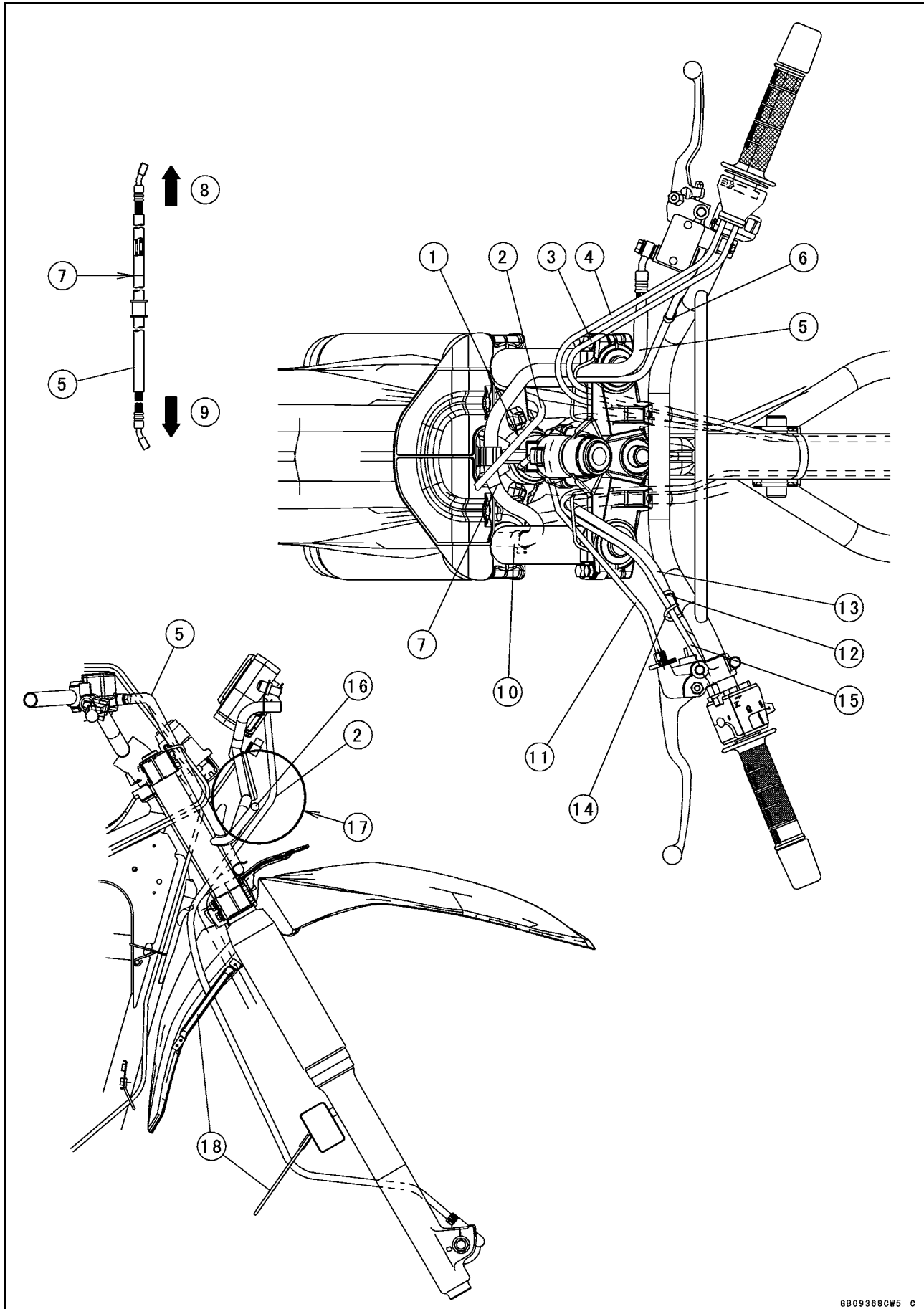
# Appendix

## Table of Contents

Cable, Wire, and Hose Routing .....	17-2
Troubleshooting Guide .....	17-34

# 17-2 APPENDIX

## Cable, Wire, and Hose Routing



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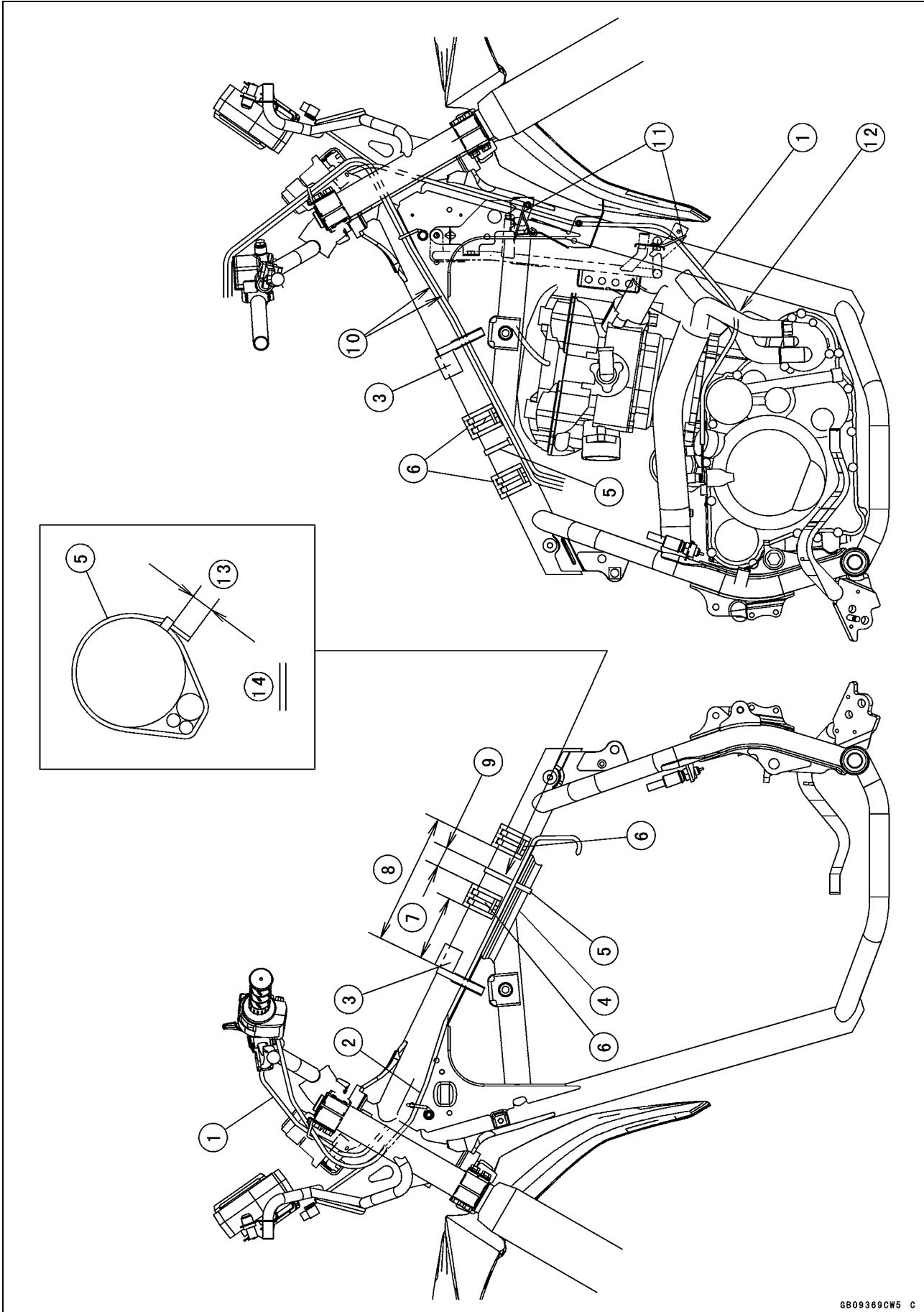
**Cable, Wire, and Hose Routing**

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1. Run the speedometer cable to the inside of the brake hose.
2. Speedometer Cable
3. Throttle Cable (Decelerator)
4. Throttle Cable (Accelerator)
5. Brake Hose
6. Clamp (Run the right switch housing lead in the clamp, and insert the clamp in the handlebar.)
7. Slit
8. To Front Brake Master Cylinder
9. To Front Brake Caliper
10. Clamp
11. Clutch Cable
12. Clamp (Run the left switch housing lead in the clamp, and insert the clamp in the handlebar.)
13. Left Switch Housing Lead
14. Clamp (Run the choke cable in the clamp.)
15. Choke Cable
16. Main Harness
17. Run the speedometer cable to the inside of the main harness.
18. Clamps (Run the speedometer cable in the clamps.)

# 17-4 APPENDIX

## Cable, Wire, and Hose Routing



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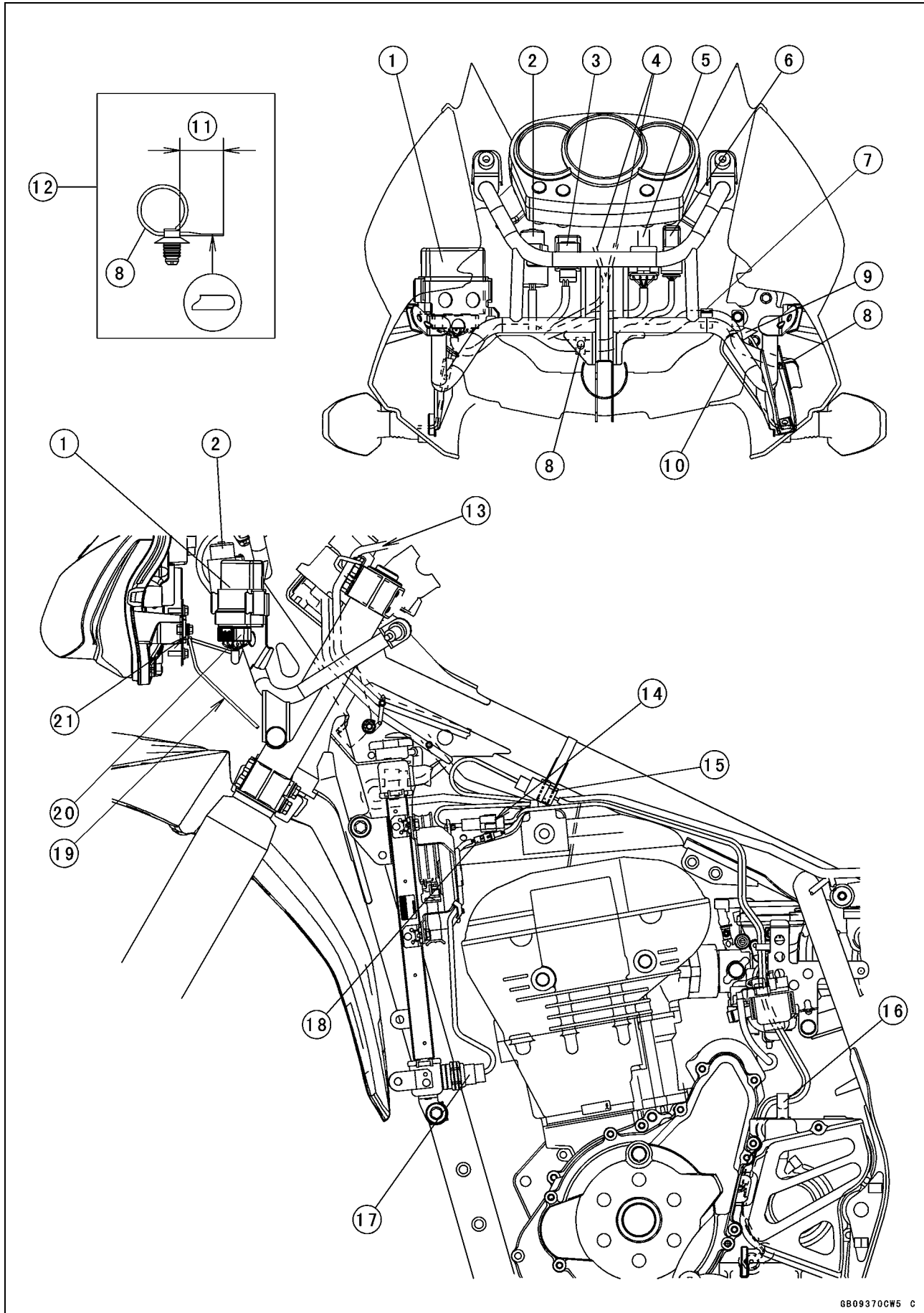
**Cable, Wire, and Hose Routing**

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1. Clutch Cable
2. Choke Cable
3. Damper
4. Main Harness
5. Band (Fix the main harness, alternator lead and crankshaft sensor lead at the frame pipe.)
6. Dampers
7. 97 mm (3.82 in.)
8. 195 mm (7.68 in.)
9. 0 ~ 30 mm (1.18 in.)
10. Throttle Cables
11. Clamps (Run the clutch cable in the clamps.)
12. Run the clutch cable between water hoses.
13. 5 ~ 10 mm (0.20 ~ 0.40 in.)
14. Rear View

# 17-6 APPENDIX

## Cable, Wire, and Hose Routing



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**Cable, Wire, and Hose Routing**

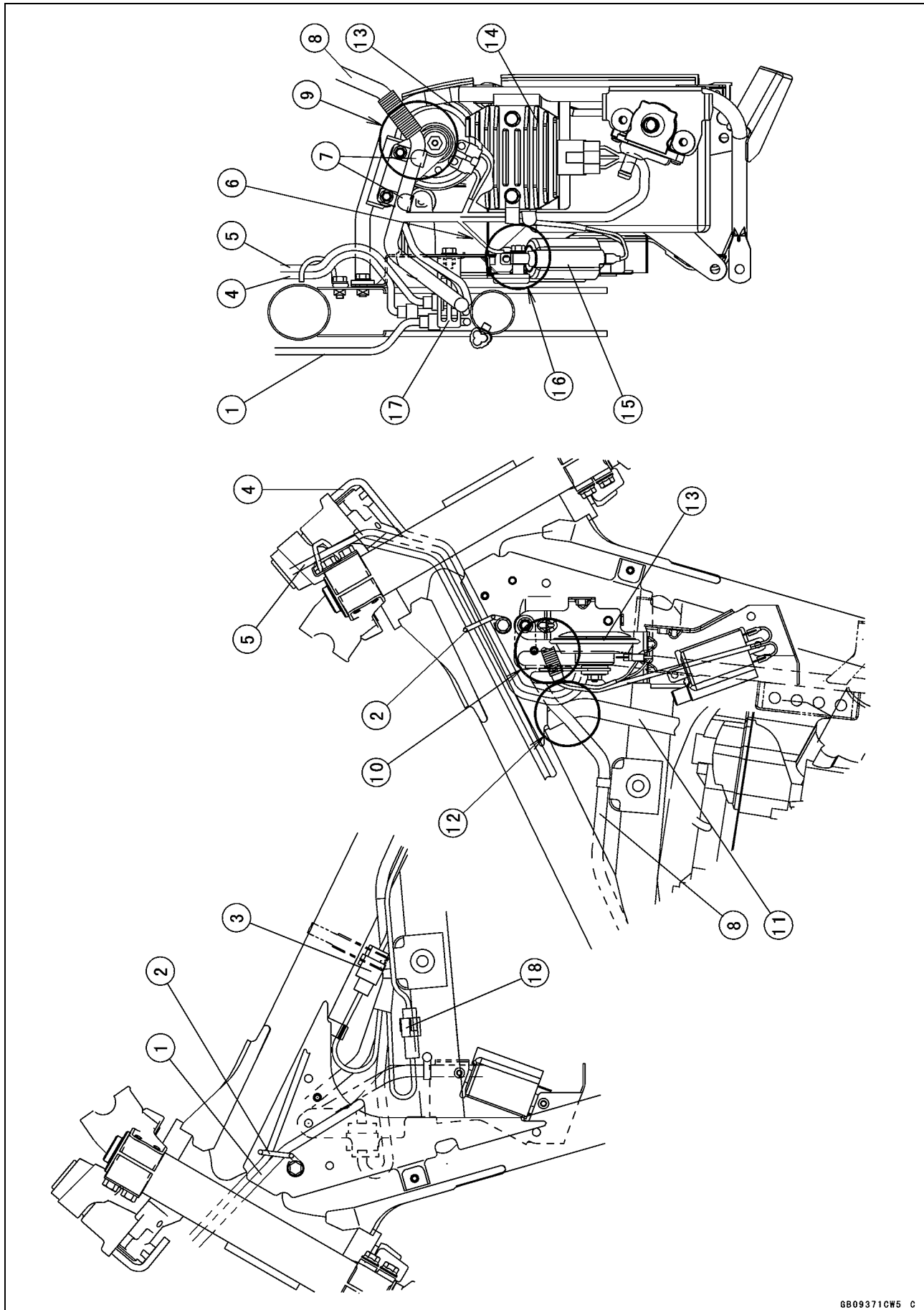
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1. IC Igniter
2. Starter Circuit Relay
3. Turn Signal Relay
4. Headlight Leads
5. Meter Unit Lead
6. Interlock Diode Unit
7. Fix the main harness at the upper fairing bracket.
8. Bands (Insert the band in the upper fairing bracket and fix the main harness.)
9. Clamp (Clamp the front right turn signal lead.)
10. Front Right Turn Signal Lead
11. About 20 mm (0.79 in.)
12. Cut the end of the band as shown.
13. Left Switch Housing Lead
14. Crankshaft Sensor Lead Connector
15. Alternator Lead Connector
16. Clamp (Run the crankshaft sensor lead and alternator lead in the clamp.)
17. Radiator Fan Switch
18. Radiator Fan Lead Connector
19. Front Left Switch Housing Lead
20. IC Igniter Connector
21. Clamp (Clamp the front left turn signal lead.)

# 17-8 APPENDIX

## Cable, Wire, and Hose Routing

### KL650E8 ~ E9 Models





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**Cable, Wire, and Hose Routing**

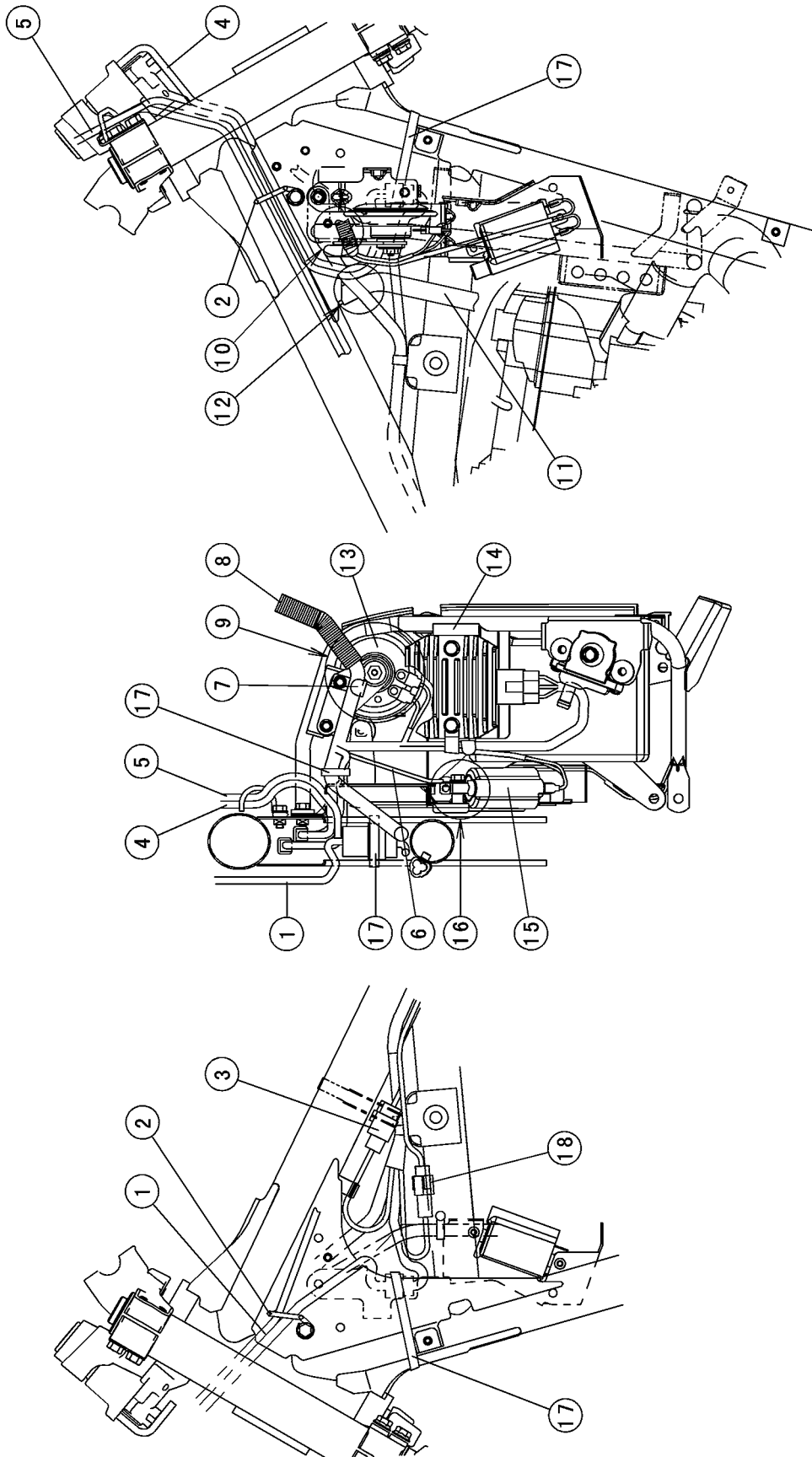
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1. Left Switch Housing Lead
2. Clamps
3. Alternator Lead Connector
4. Ignition Switch Lead
5. Right Switch Housing Lead
6. Frame Ground Lead
7. Clamps (Clamp the main harness.)
8. Main Harness
9. Run the main harness between the clamp bolt and horn nut.
10. Run the main harness so that it does not touch the horn.
11. Vacuum Switch Valve Hose (Other than AU Model)
12. Run the main harness to the right side of the vacuum switch valve hose.
13. Horn
14. Regulator/Rectifier
15. Ignition Coil
16. Install the frame ground terminal together with the upper ignition coil bolt.
17. Clamp (Clamp the left switch housing lead connector, right switch housing lead connector and ignition switch lead connector.)
18. Crankshaft Sensor Lead Connector

# 17-10 APPENDIX

## Cable, Wire, and Hose Routing

### KL650EA ~ EC Models



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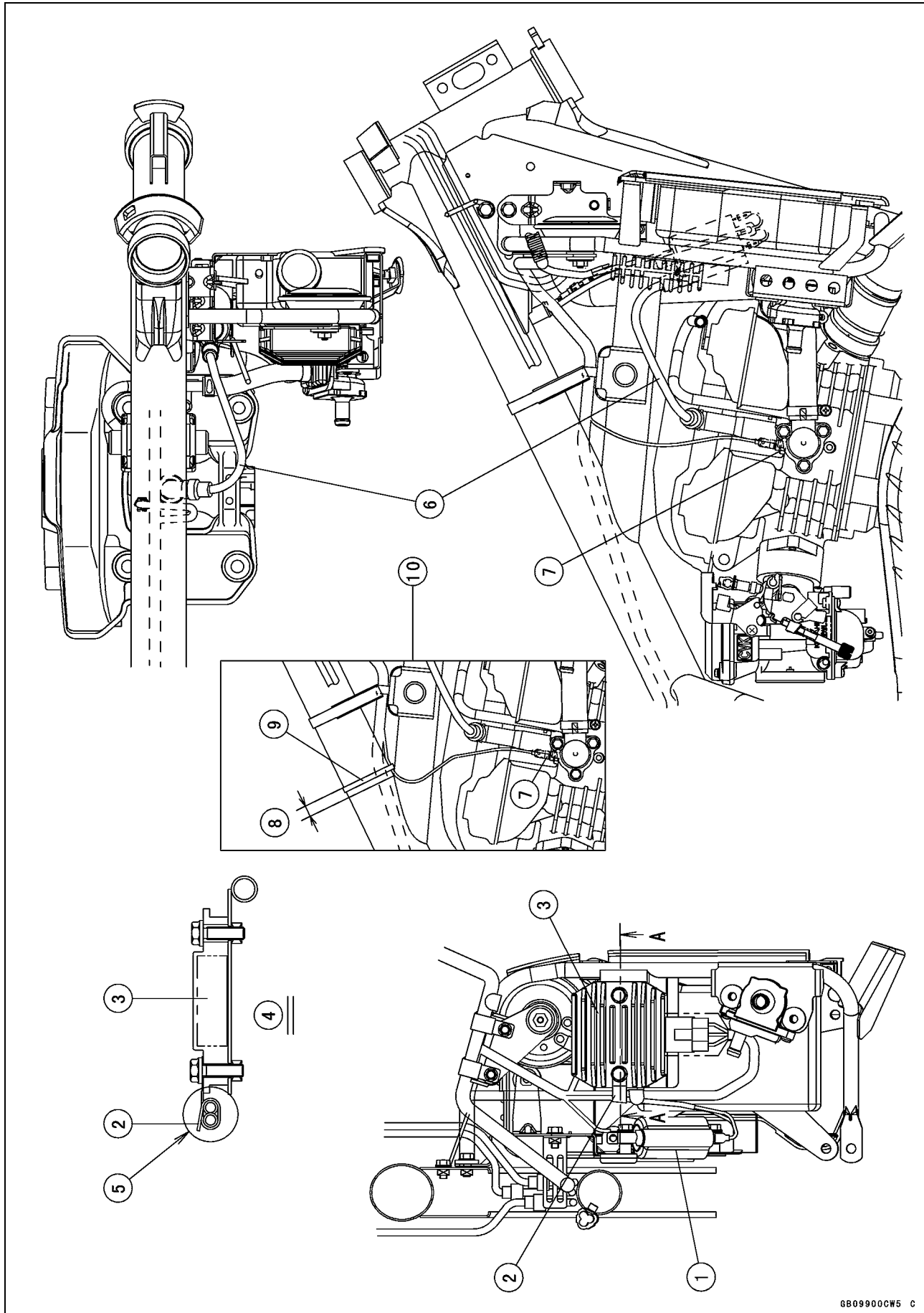
**Cable, Wire, and Hose Routing**

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1. Left Switch Housing Lead
2. Clamps
3. Alternator Lead Connector
4. Ignition Switch Lead
5. Right Switch Housing Lead
6. Frame Ground Lead
7. Clamps (Clamp the main harness.)
8. Main Harness
9. Run the main harness between the clamp bolt and horn nut.
10. Run the main harness so that it does not touch the horn.
11. Vacuum Switch Valve Hose (Other than AU Model)
12. Run the main harness to the right side of the vacuum switch valve hose.
13. Horn
14. Regulator/Rectifier
15. Ignition Coil
16. Install the frame ground terminal together with the upper ignition coil bolt.
17. Band
18. Crankshaft Sensor Lead Connector

# 17-12 APPENDIX

## Cable, Wire, and Hose Routing



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**Cable, Wire, and Hose Routing**

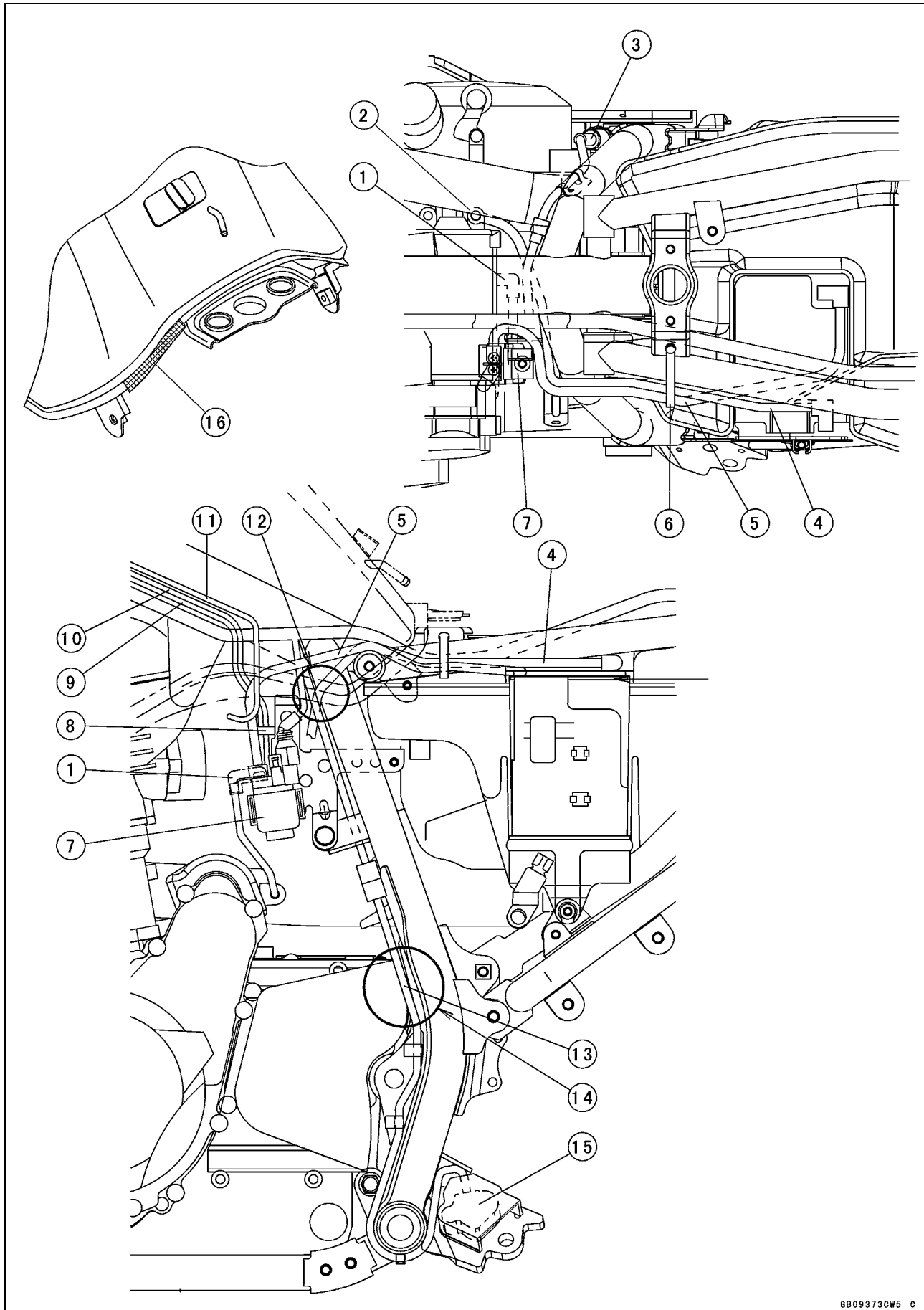
---

1. Ignition Coil
2. Clamp
3. Reguretor/Rectifier
4. Viewed from A - A
5. Clamp the ignition coil lead and reguretor/rectifier lead so that they do not touch the reguretor/rectifier.
6. Spark Plug Lead
7. Water Temperature Sensor
8. 0 ~ 15 mm (0 ~ 0.6 in.)
9. Clamp (clamp the water temperature sensor lead as shown.)
10. KL650E9 ~ EC Models

# 17-14 APPENDIX

## Cable, Wire, and Hose Routing

### KL650E8 ~ E9 Models



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**Cable, Wire, and Hose Routing**

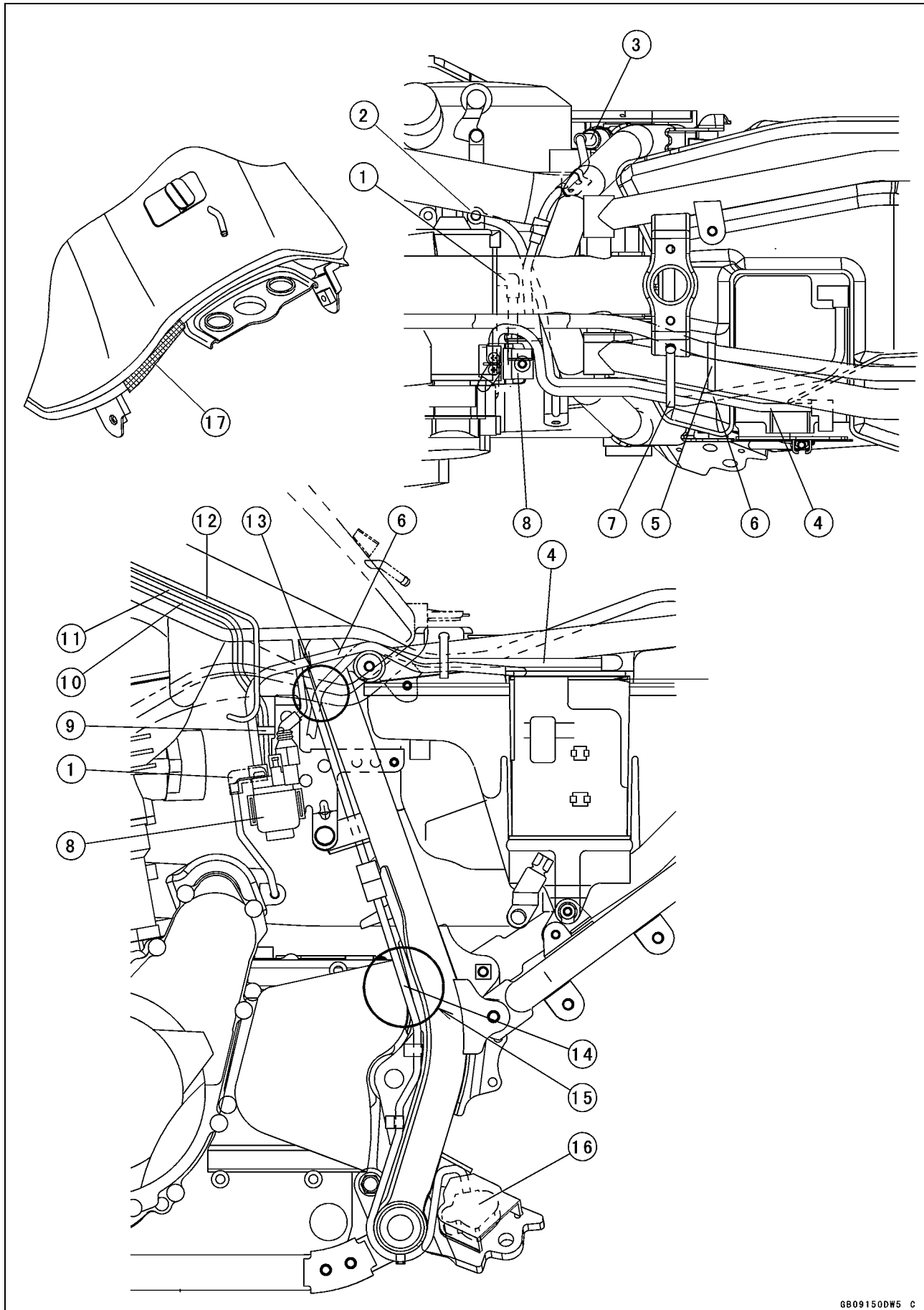
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1. Starter Motor Cable
2. Engine Ground Terminal
3. Rear Brake Light Switch
4. Battery Negative Cable
5. Battery Positive Cable
6. Clamp (Clamp the battery cables.)
7. Starter Relay
8. Clamp (Insert the clamp in the starter relay bracket from inside of motorcycle and clamp the alternator lead and crankshaft sensor lead.)
9. Alternator Lead
10. Crankshaft Sensor Lead
11. Choke Cable
12. Run the battery negative cable to the inside of the starter relay lead and sidestand switch lead.
13. Sidestand Switch Lead
14. Run the sidestand switch lead so that it does not pinch with the engine sprocket cover.
15. Sidestand Switch
16. Trim

# 17-16 APPENDIX

## Cable, Wire, and Hose Routing

### KL650EA ~ EC Models





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**Cable, Wire, and Hose Routing**

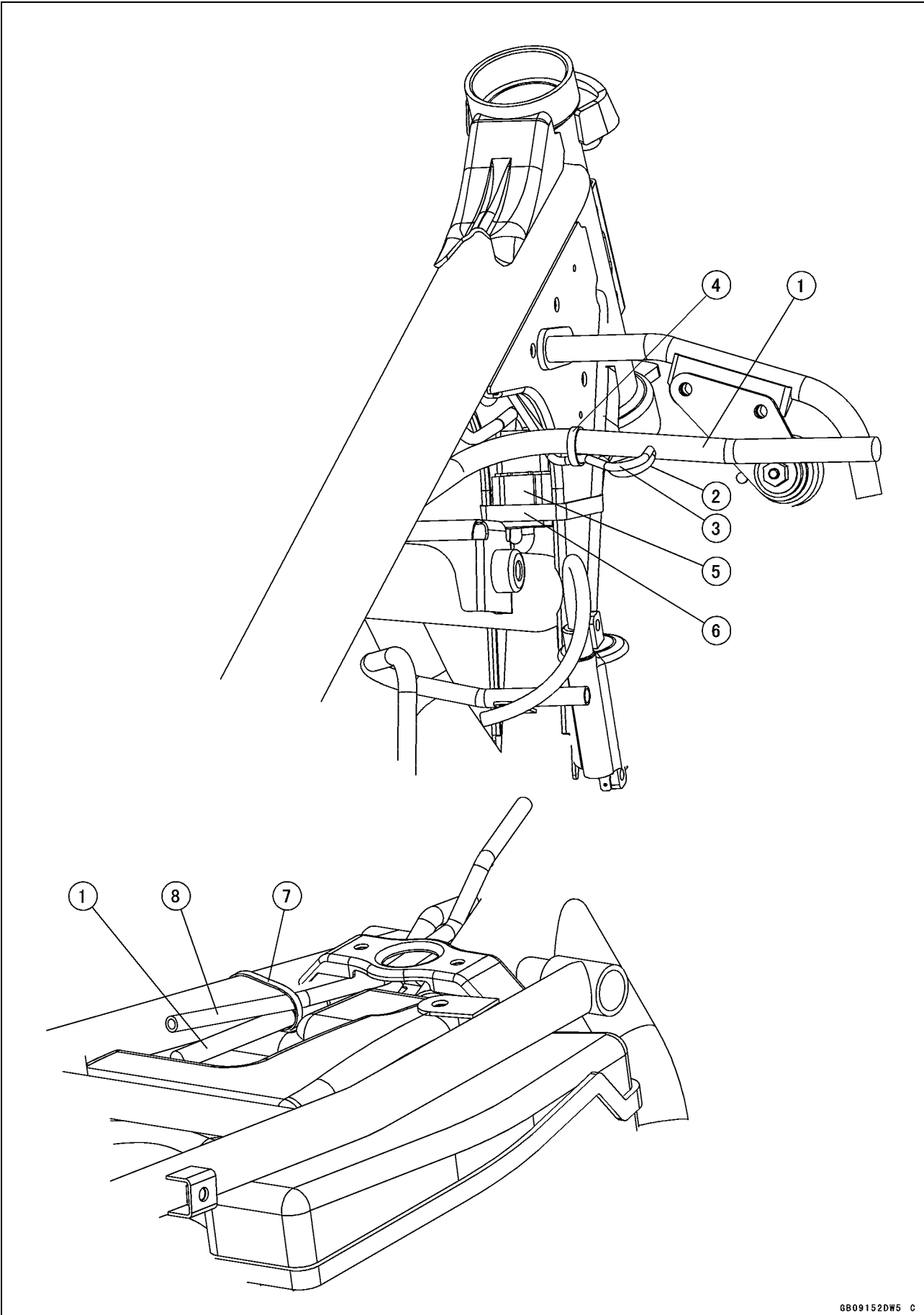
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1. Starter Motor Cable
2. Engine Ground Terminal
3. Rear Brake Light Switch
4. Battery Negative Cable
5. Band
6. Battery Positive Cable
7. Clamp (Clamp the battery cables.)
8. Starter Relay
9. Clamp (Insert the clamp in the starter relay bracket from inside of motorcycle and clamp the alternator lead and crankshaft sensor lead.)
10. Alternator Lead
11. Crankshaft Sensor Lead
12. Choke Cable
13. Run the battery negative cable to the inside of the starter relay lead and sidestand switch lead.
14. Sidestand Switch Lead
15. Run the sidestand switch lead so that it does not pinch with the engine sprocket cover.
16. Sidestand Switch
17. Trim

# 17-18 APPENDIX

## Cable, Wire, and Hose Routing

### KL650EA ~ EC Models



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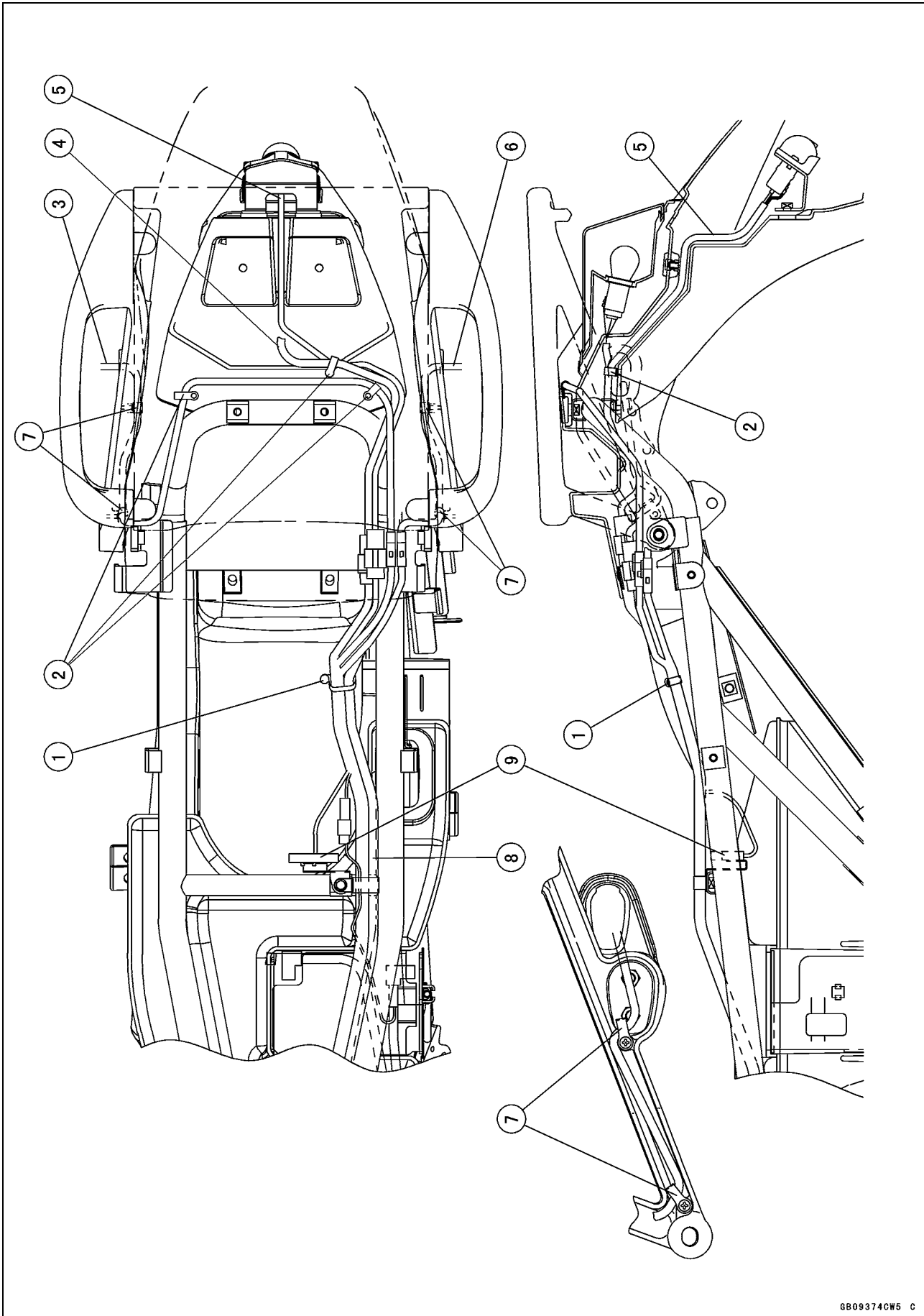
**Cable, Wire, and Hose Routing**

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1. Main Harness
2. Ignition Switch Lead
3. Right Switch Housing Lead
4. Band (Clamp the right switch housing lead, ignition switch lead and main harness.)
5. Left Switch Housing Lead Connector
6. Band (Clamp the right switch housing lead connector and ignition switch lead connector.)
7. Band (Fix the main harness to take through under the breather hose.)
8. Breathe hose

# 17-20 APPENDIX

## Cable, Wire, and Hose Routing



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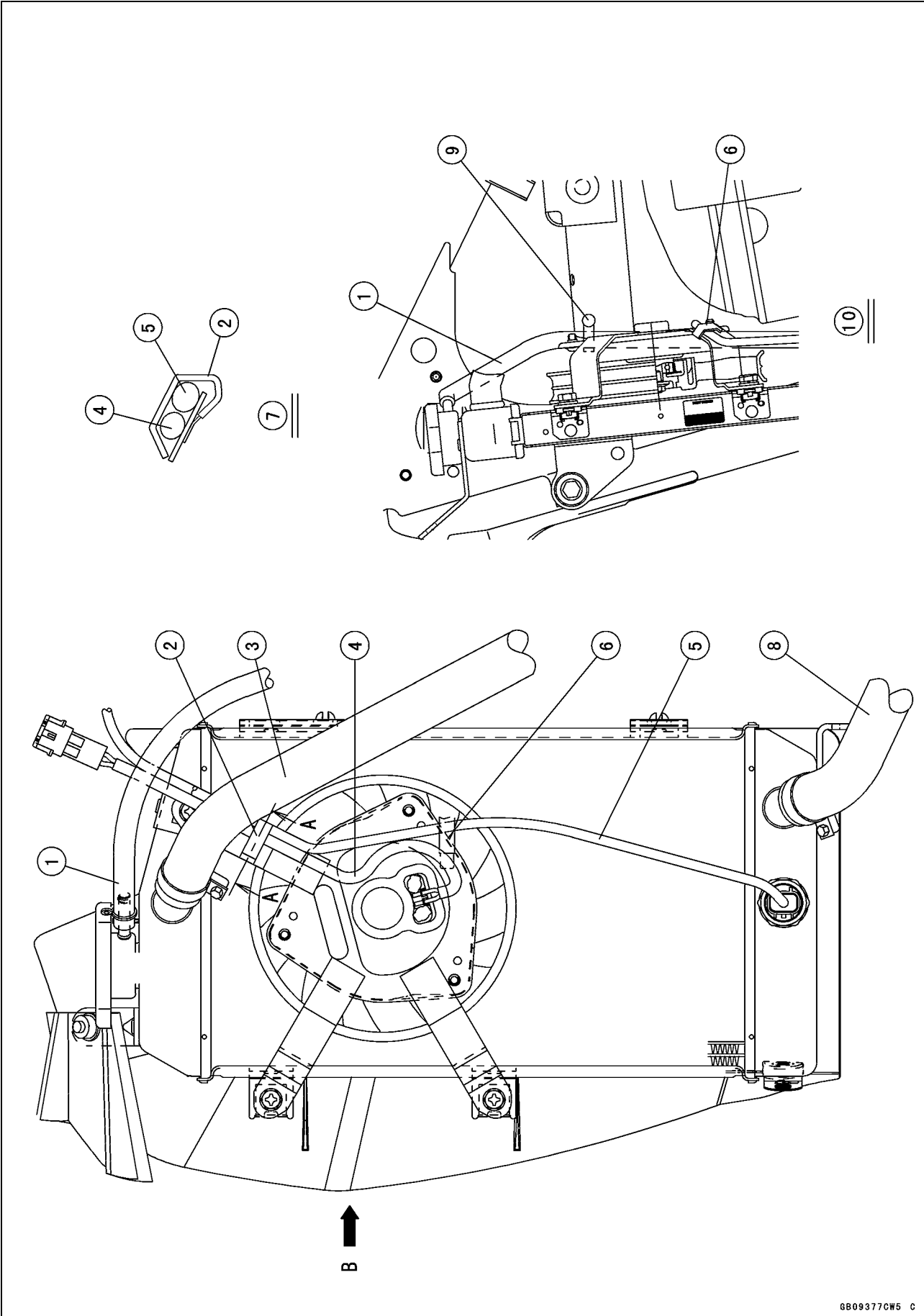
**Cable, Wire, and Hose Routing**

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1. Clamp (Clamp the coolant reserve tank overflow hose and main harness.)
2. Clamps
3. Rear Right Turn Signal Lead
4. Tail/Brake Light Lead
5. License Plate Light Lead
6. Rear Left Turn Signal Lead
7. Clamps (Clamp the rear turn signal leads as shown.)
8. Coolant Reserve Tank Overflow Hose
9. Fuse Box

# 17-22 APPENDIX

## Cable, Wire, and Hose Routing



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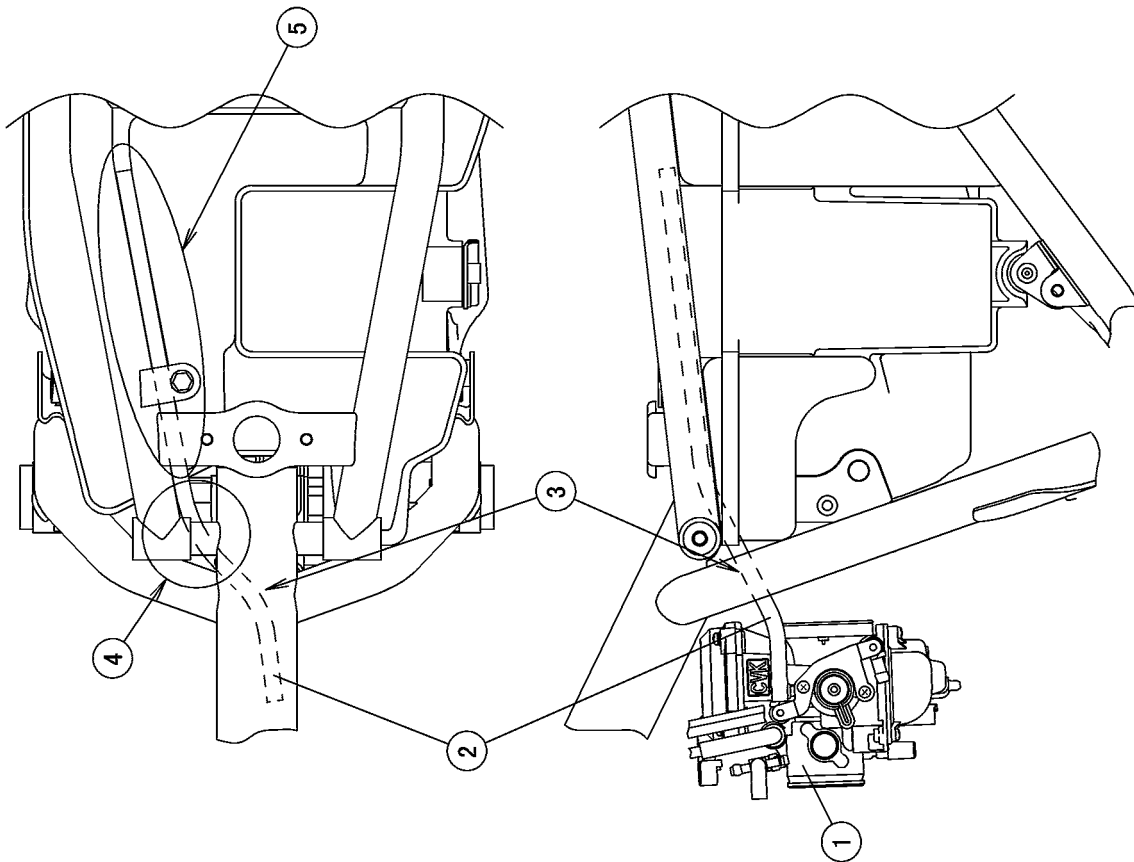
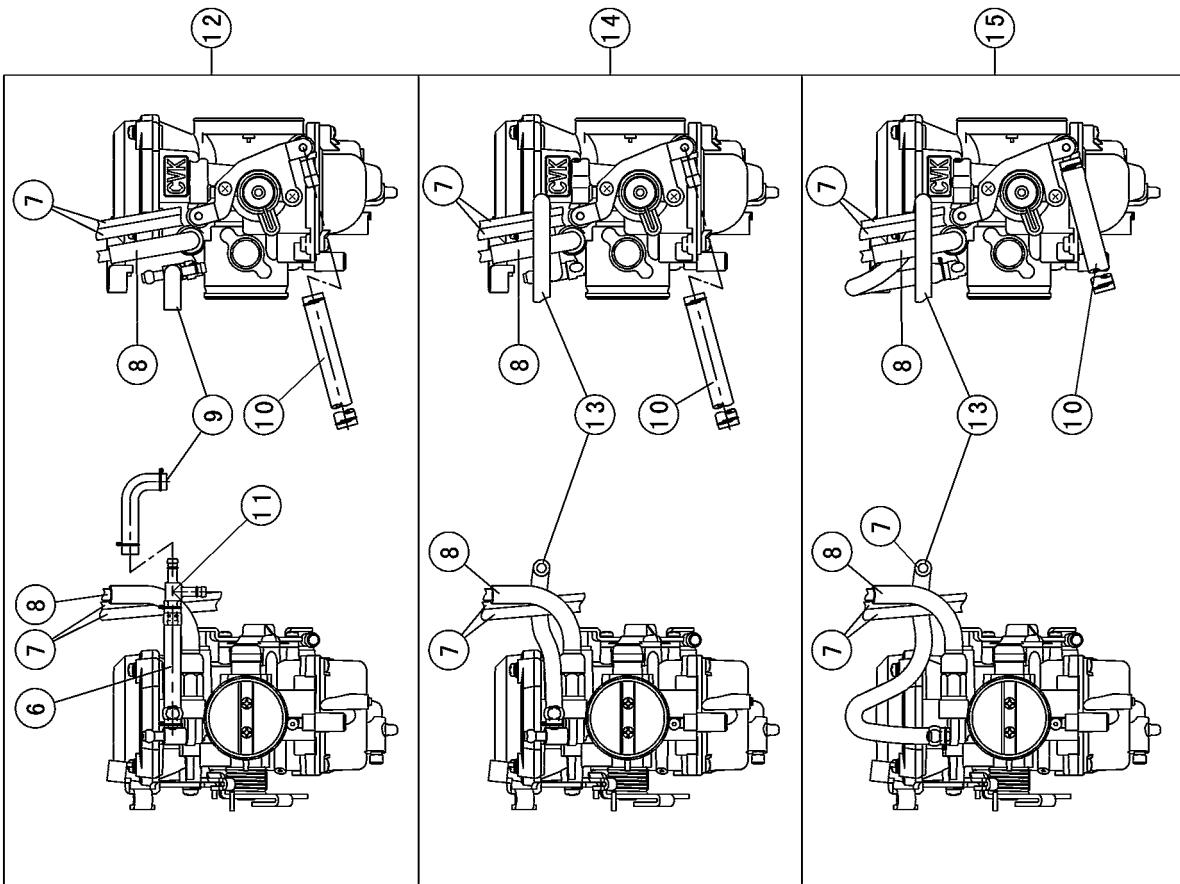
**Cable, Wire, and Hose Routing**

---

1. Radiator Overflow Hose
2. Clamp (Clamp the radiator fan lead and radiator fan switch lead.)
3. Water Hose (To Thermostat Housing)
4. Radiator Fan Lead
5. Radiator Fan Switch Lead
6. Clamp (Clamp the radiator fan switch lead.)
7. Viewed from A - A
8. Water Hose (To Water Pump)
9. Clamp (Insert the clamp in the frame pipe and fix the radiator overflow hose.)
10. Viewed from B

# 17-24 APPENDIX

## Cable, Wire, and Hose Routing





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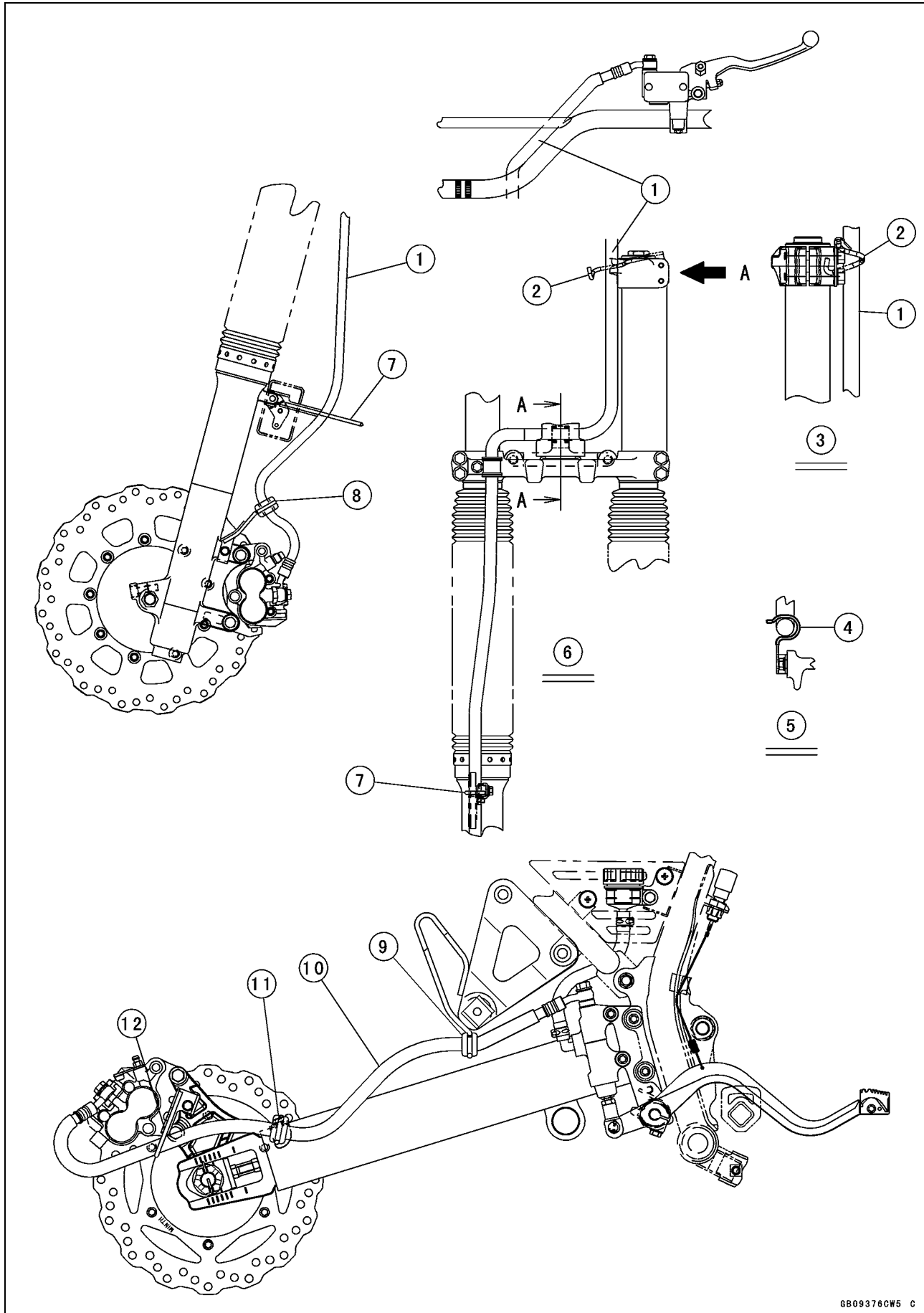
**Cable, Wire, and Hose Routing**

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1. Carburetor
2. Air Vent Hose
3. Run the air vent hose to the right side of motorcycle.
4. Run the air vent hose under the rear frame fitting.
5. Run the air vent hose between rear frame and air cleaner housing.
6. Vacuum Hose (Carburetor ~ Fitting)
7. Alternator Lead and Crankshaft Sensor Lead
8. Choke Cable
9. Vacuum Hose (Fitting ~ Fuel Tap)
10. Fuel Hose
11. Fitting
12. CAL Model
13. Vacuum Hose (Carburetor ~ Fuel Tap)
14. Other than CAL and AU Models
15. AU Model

# 17-26 APPENDIX

## Cable, Wire, and Hose Routing



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**Cable, Wire, and Hose Routing**

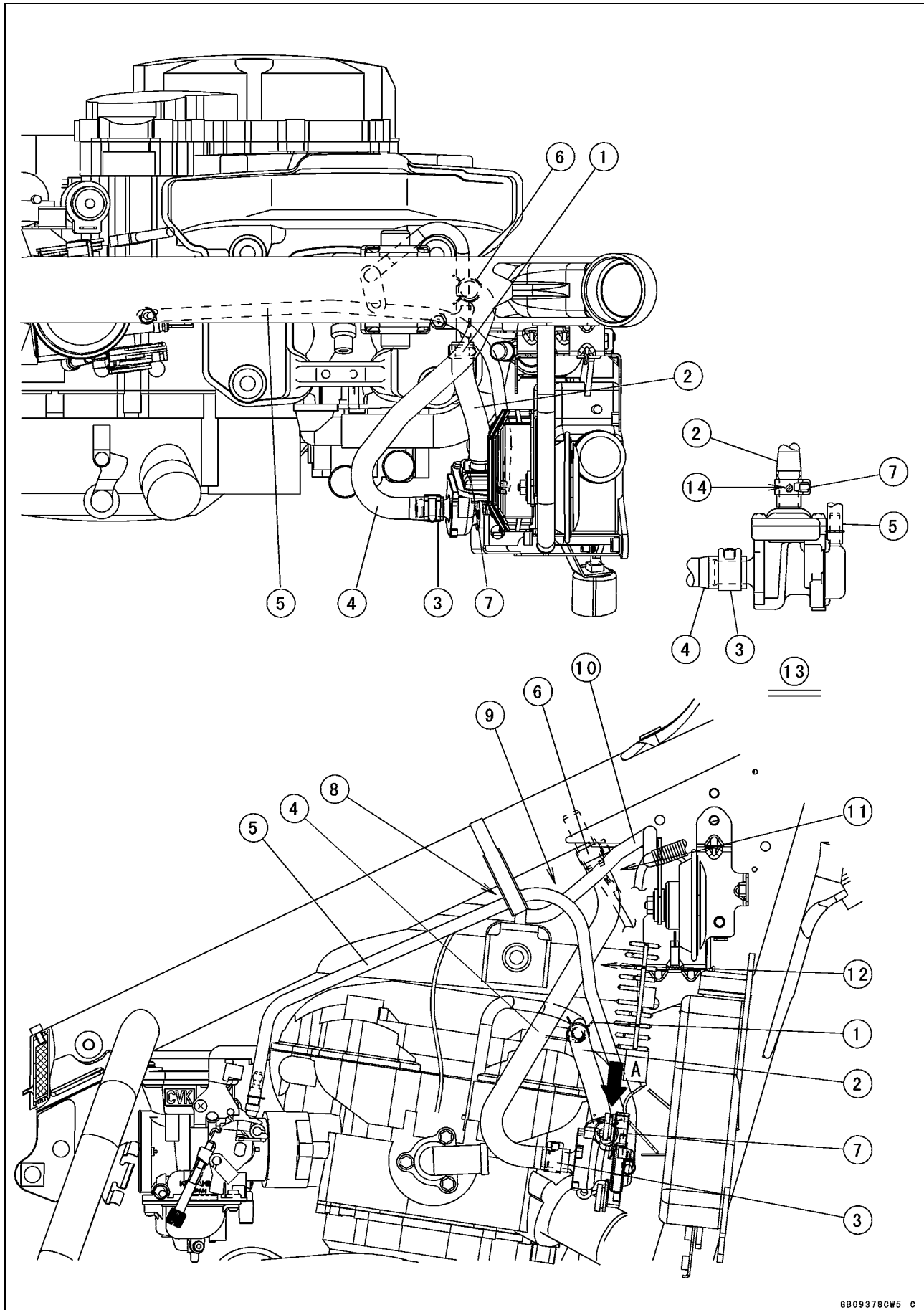
---

1. Front Brake Hose
2. Clamp
3. Viewed from A
4. Clamp Bracket
5. Viewed from A - A
6. Rear View
7. Clamp
8. Clamp
9. Clamp
10. Rear Brake Hose
11. Clamp
12. Clamp

# 17-28 APPENDIX

## Cable, Wire, and Hose Routing

### Other than AU Model



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**Cable, Wire, and Hose Routing**

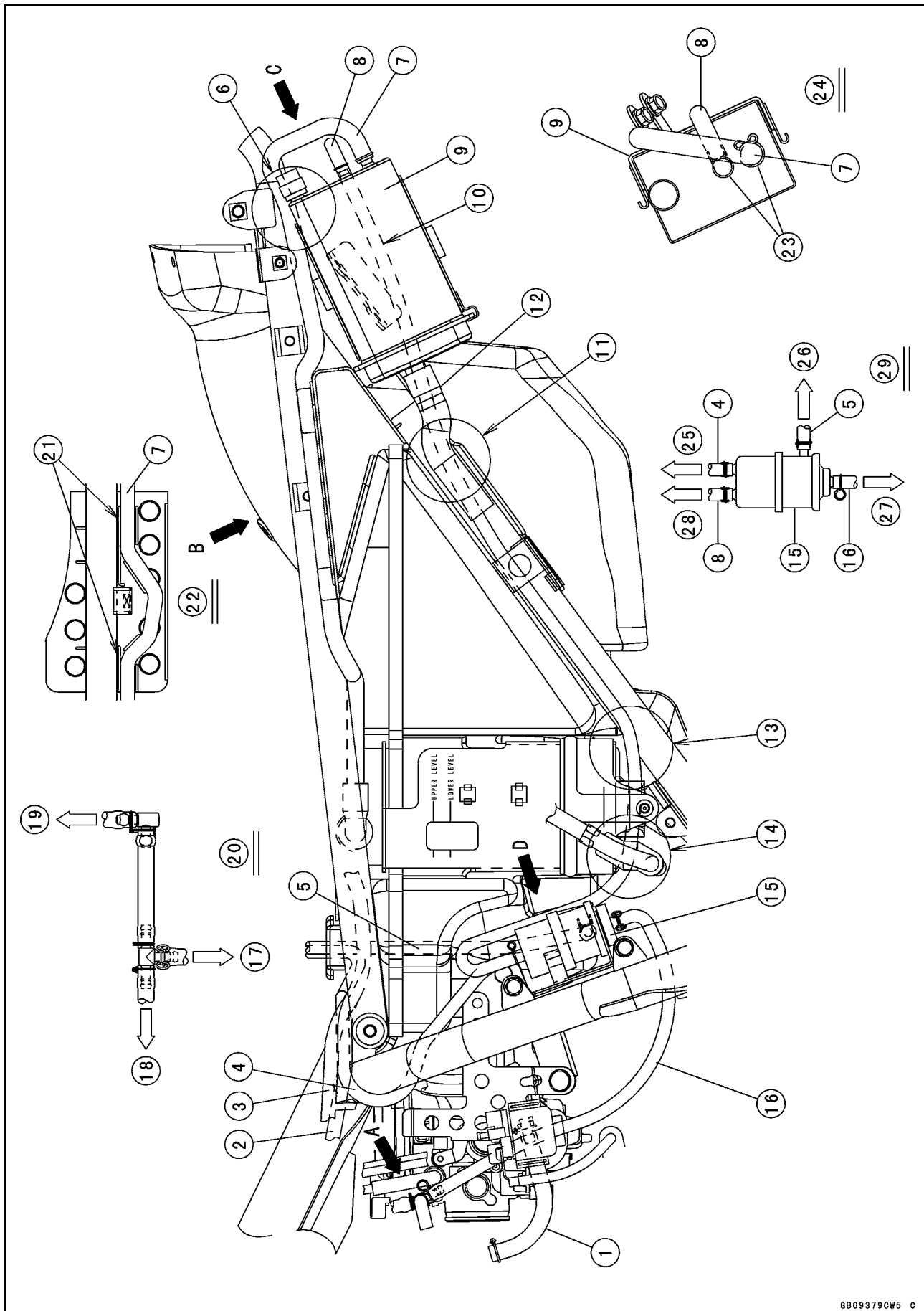
---

1. Clamp (Position the pinch head between upper and front (within the range of 90°).)
2. Vacuum Switch Valve Hose (To Clean Air System Pipe)
3. Clamp (Position the pinch head upward.)
4. Vacuum Switch Valve Hose (To Frame Fitting)
5. Vacuum Switch Valve Hose (To Carburetor)
6. Clamp (Position the pinch head forward.)
7. Clamp (Position the pinch head between upper and front (within the range of 90°).)
8. Run the vacuum switch valve hose to the inside of the frame bracket.
9. Run the vacuum switch valve hose to the outside of the main harness.
10. Main Harness
11. Run the vacuum switch valve hose to the inside of the main harness.
12. Run the vacuum switch valve hose [5] to the outside of the vacuum switch valve hose [4].
13. Viewed from A
14. White Paint

# 17-30 APPENDIX

## Cable, Wire, and Hose Routing

### CAL Model (KL650E8)



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**Cable, Wire, and Hose Routing**

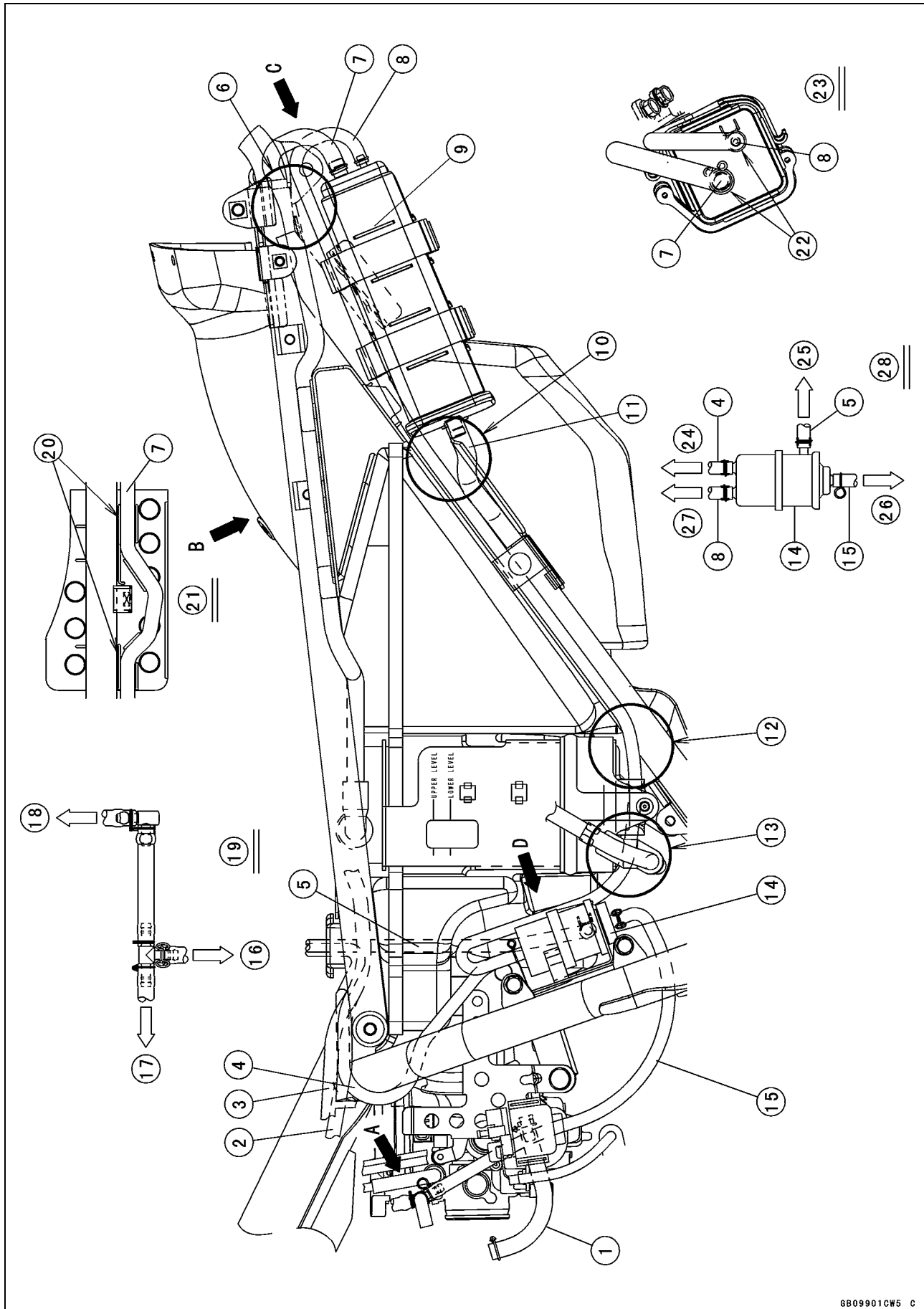
---

1. Fuel Hose
2. Coolant Reserve Tank Overflow Hose
3. Main Harness
4. Blue Hose
5. Red Hose
6. Run the green hose between rear frame and canister bracket.
7. Green Hose
8. Blue Hose
9. Canister
10. Run the blue hose so that it does not slack.
11. Run the blue hose between rear frame and breather hose.
12. Breather Hose
13. Run the blue hose between rear frame and air cleaner housing.
14. Run the blue hose between battery vent hose and air cleaner housing.
15. Separator
16. White Hose
17. To Separator
18. To Fuel Tap
19. To Vacuum Switch Valve
20. Viewed from A
21. Run the green hose between ribs of the hose holder bracket.
22. Viewed from B
23. Clamps (Position the pinch head inside.)
24. Viewed from C
25. To Fuel Tank (Left Side of Tank Fitting)
26. To Fuel Tank (Right Side of Tank Fitting)
27. To Carburetor
28. To Canister
29. Viewed from D

# 17-32 APPENDIX

## Cable, Wire, and Hose Routing

CAL Model (KL650E9 ~ EC)





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**Cable, Wire, and Hose Routing**

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1. Fuel Hose
2. Coolant Reserve Tank Overflow Hose
3. Main Harness
4. Blue Hose
5. Red Hose
6. Run the green hose between rear frame and canister bracket.
7. Green Hose
8. Blue Hose
9. Canister
10. Run the blue hose between rear frame and breather hose.
11. Breather Hose
12. Run the blue hose between rear frame and air cleaner housing.
13. Run the blue hose between battery vent hose and air cleaner housing.
14. Separator
15. White Hose
16. To Separator
17. To Fuel Tap
18. To Vacuum Switch Valve
19. Viewed from A
20. Run the green hose between ribs of the hose holder bracket.
21. Viewed from B
22. Clamps (Position the pinch head inside.)
23. Viewed from C
24. To Fuel Tank (Left Side of Tank Fitting)
25. To Fuel Tank (Right Side of Tank Fitting)
26. To Carburetor
27. To Canister
28. Viewed from D

## Troubleshooting Guide

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### 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.*

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

#### Starter motor not rotating:

- Starter lockout or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relays not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Main 20 A Fuse blown

#### Starter motor rotating but engine doesn't turn over:

- Starter clutch trouble

#### Engine won't turn over:

- Valve seizure
- Valve lifer seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Balancer bearing seizure
- Compression release cam (K.A.C.R) spring broken
- Compression release cam (K.A.C.R) sticks close

#### No fuel flow:

- No fuel in tank
- Fuel tap vacuum hose clogged
- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

#### Engine flooded:

- Fuel level in carburetor float bowl too high
- Float valve worn or stuck open
- Starting technique faulty  
(When flooded, crank the engine with the throttle fully opened to allow more air to reach the engine.)

#### No spark; spark weak:

- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or spark plug lead trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect

- IC igniter trouble
- Neutral, starter lockout, sidestand switch or interlock diodes trouble
- Crankshaft sensor trouble
- Ignition coil trouble
- Ignition or engine stop switch shorted
- Wiring shorted or open
- Main 20 A Fuse blown

#### Fuel/air mixture incorrect:

- Pilot screw and/or idle adjusting screw maladjusted
- Pilot jet, or air passage clogged
- Starter jet clogged
- Air cleaner clogged, poorly sealed, or missing

#### Compression low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
- Compression release cam (K.A.C.R) sticks close (engine stalls when moving off)

### Poor Running at Low Speed:

#### Spark weak:

- Spark plug dirty, broken, or maladjusted
- Spark plug cap or spark plug lead trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter trouble
- Crankshaft sensor trouble
- Ignition coil trouble

#### Fuel/air mixture incorrect:

- Pilot screw maladjusted
- Pilot jet, or air passage clogged
- Air bleed pipe bleed holes clogged
- Air cleaner clogged, poorly sealed, or missing
- Choke plunger stuck open
- Fuel level in carburetor float bowl too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Air cleaner duct loose
- Air cleaner O-ring damaged

## 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 warped  
 Cylinder head gasket damaged  
 Valve spring broken or weak  
 Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)  
 Compression release cam (K.A.C.R) sticks close (engine stalls when moving off)

### Other:

IC igniter trouble  
 Carburetor vacuum piston doesn't slide smoothly  
 Carburetor vacuum piston diaphragm damage  
 Engine oil viscosity too high  
 Drive train trouble  
 Brake dragging  
 Vacuum switch valve trouble  
 Coasting enricher trouble  
 Clutch slipping

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

#### Firing incorrect:

Spark plug dirty, broken, or maladjusted  
 Spark plug cap or high tension lead trouble  
 Spark plug cap shorted or not in good contact  
 Spark plug incorrect  
 IC igniter trouble  
 Crankshaft sensor trouble  
 Ignition coil trouble

#### Fuel/air mixture incorrect:

Choke plunger stuck open  
 Main jet clogged or wrong size  
 Jet needle or needle jet worn  
 Air jet clogged  
 Fuel level in carburetor float bowl too high or too low  
 Bleed holes of needle jet holder or needle jet clogged  
 Air cleaner clogged, poorly sealed, or missing  
 Air cleaner duct loose  
 Water or foreign matter in fuel  
 Carburetor holder loose  
 Fuel tank air vent obstructed  
 Fuel tap clogged

Fuel line clogged

### 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.)  
 Compression release cam (K.A.C.R) sticks close (engine stalls when moving off)

### Knocking:

Carbon built up in combustion chamber  
 Fuel poor quality or incorrect  
 Spark plug incorrect  
 IC igniter trouble

### Miscellaneous:

Throttle valve won't fully open  
 Carburetor vacuum piston doesn't slide smoothly  
 Carburetor vacuum piston diaphragm damaged  
 Brake dragging  
 Clutch slipping  
 Overheating  
 Engine oil level too high  
 Engine oil viscosity too high  
 Drive train trouble  
 Vacuum switch valve trouble  
 Coasting enricher trouble  
 Balancer mechanism malfunctioning

### Overheating:

#### Firing incorrect:

Spark plug dirty, broken, or maladjusted  
 Spark plug incorrect  
 IC igniter trouble

#### Fuel/air mixture incorrect:

Main jet clogged or wrong size  
 Fuel level in carburetor float bowl too low  
 Carburetor holder loose  
 Air cleaner duct loose  
 Air cleaner poorly sealed, or missing  
 Air cleaner clogged

#### Compression high:

Carbon built up in combustion chamber  
 Compression release cam (K.A.C.R) sticks close (engine stalls when moving off)

#### Engine load faulty:

Clutch slipping

## 17-36 APPENDIX

### Troubleshooting Guide

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- 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

#### **Cooling system component incorrect:**

- Radiator fin damaged
- Radiator clogged
- Thermostat trouble
- Radiator cap trouble
- Radiator fan switch trouble
- Fan motor broken
- Fan blade damaged
- Water pump not turning
- Water pump impeller damaged

#### **Over Cooling:**

##### **Gauge incorrect:**

- Water temperature gauge broken
- Water temperature sensor broken

##### **Cooling system component incorrect:**

- Radiator fan switch trouble
- Thermostat trouble

#### **Clutch Operation Faulty:**

##### **Clutch slipping:**

- Friction plate worn or warped
- Steel plate worn or warped
- Clutch spring broken or weak
- Clutch hub or housing unevenly worn
- No clutch lever play
- Clutch inner cable trouble
- Clutch release mechanism trouble

##### **Clutch not disengaging properly:**

- Clutch plate warped or too rough
- Clutch spring compression uneven
- Engine oil deteriorated
- Engine oil viscosity too high
- Engine oil level too high
- Clutch housing frozen on drive shaft
- Clutch hub nut loose
- Clutch hub spline damaged
- Clutch friction plate installed wrong
- Clutch lever play excessive
- Clutch release mechanism trouble

#### **Gear Shifting Faulty:**

##### **Doesn't go into gear; shift pedal doesn't return:**

- Clutch not disengaging
- Shift fork bent or seized
- Gear stuck on the shaft
- Gear positioning lever binding
- Shift return spring weak or broken
- Shift return spring pin loose
- Shift mechanism arm spring broken
- Shift mechanism arm broken

##### **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 pin worn
- Drive shaft, output shaft, and/or gear splines worn

##### **Overshifts:**

- Gear positioning lever spring weak or broken
- Shift mechanism arm spring broken

#### **Abnormal Engine Noise:**

##### **Knocking:**

- IC igniter 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 worn, broken, or stuck
- Piston seizure, damage
- Cylinder head gasket leaking
- Exhaust pipe leaking at cylinder head connection
- Crankshaft runout excessive
- Engine mounts loose
- Crankshaft bearing worn
- Primary gear worn

## Troubleshooting Guide

Camshaft chain tensioner trouble  
 Camshaft chain, sprocket, guide worn  
 Vacuum switch valve damaged  
 Alternator rotor loose  
 Balancer gear worn or chipped  
 Balancer shaft position maladjusted  
 Balancer bearing worn  
 Balancer chain, sprocket, guide worn

### Abnormal Drive Train Noise:

#### Clutch noise:

Clutch housing/friction plate clearance excessive  
 Clutch housing gear worn

#### Transmission noise:

Bearings worn  
 Transmission gears 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 sprockets 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

### Exhaust Smokes Excessively:

#### White smoke:

Piston oil ring worn  
 Cylinder worn  
 Valve oil seal damaged  
 Valve guide worn  
 Cylinder head gasket damaged  
 Engine oil level too high

#### Black smoke:

Air cleaner clogged  
 Main jet too large or fallen off  
 Choke plunger stuck open  
 Fuel level in carburetor float bowl too high

#### Brown smoke:

Main jet too small

Fuel level in carburetor float bowl too low  
 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 locknut 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 bearings worn  
 Rim warped, or not balanced  
 Wheel bearing worn  
 Handlebar holder loose  
 Steering stem head nut loose

#### Handlebar pulls to one side:

Frame bent  
 Wheel misalignment  
 Swingarm bent or twisted  
 Steering maladjusted  
 Front fork bent  
 Right and left front fork oil level uneven

#### Shock absorption unsatisfactory:

(Too hard)  
 Front fork oil excessive  
 Front fork oil viscosity too high  
 Rear shock absorber adjustment too hard  
 Tire air pressure too high  
 Front fork bent  
 (Too soft)  
 Tire air pressure too low  
 Front fork oil insufficient and/or leaking  
 Front fork oil viscosity too low  
 Rear shock absorber adjustment too soft  
 Front fork, rear shock absorber spring weak  
 Rear shock absorber oil leaking

### Brake Doesn't Hold:

#### Disc brake:

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

## 17-38 APPENDIX

### Troubleshooting Guide

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#### **Battery Trouble:**

##### **Battery discharged:**

Battery faulty (e.g., plates sulphated, shorted through sedimentation, electrolyte insufficient)

Battery leads making poor contact

Load excessive (e.g., bulb of excessive wattage)

Ignition switch trouble

Alternator trouble

Wiring faulty

Regulator/rectifier trouble

##### **Battery overcharged:**

Regulator/rectifier trouble

Battery faulty

## MODEL APPLICATION

Year	Model	Beginning Frame No.
2008	KL650E8	JKAKLEE1□8DA00101, JKAKLEE1□8DA00701
2009	KL650E9	JKAKLEE1□9DA15801, JKAKLEE1□9DA16243
2010	KL650EA	JKAKLEE1□ADA29521, JKAKLEE1□ADA29561
2011	KL650EB	JKAKLEE1□BDA34207
2012	KL650EC	JKAKLEE1□CDA40279

□:This digit in the frame number changes from one machine to another.



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Motorcycle & Engine Company

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