

**Kawasaki**

**KX450F**



# **Motorcycle Service Manual**



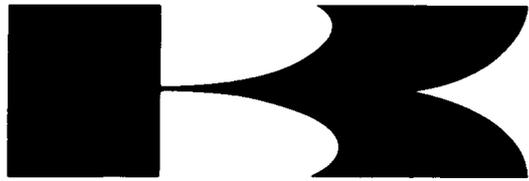
# Quick Reference Guide

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

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





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# **Motorcycle Service Manual**

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

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

## 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	r/min, 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) (mass)	W	watt(s)
h	hour(s)	Ω	ohm(s)
kg	(mass)		
kgf	(force)		
L	liter(s)		

# Foreword

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

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

To get the longest life out of your vehicle:

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

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

### **▲ WARNING**

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

### **CAUTION**

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

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

### **NOTE**

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

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

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



# General Information

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## 1-2 GENERAL INFORMATION

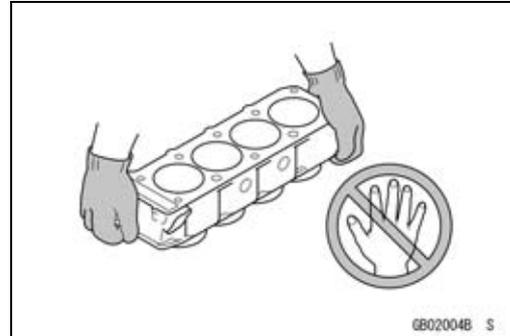
### Before Servicing

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

Especially note the following:

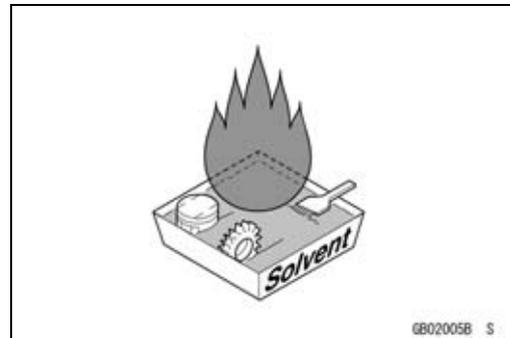
#### **Edges of Parts**

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



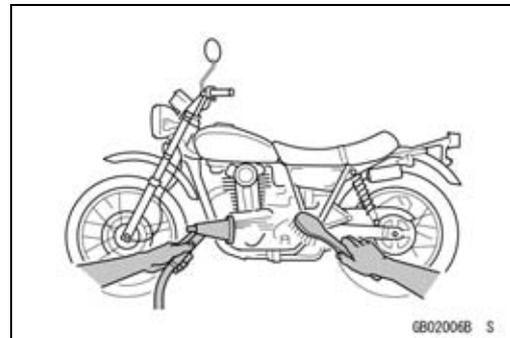
#### **Solvent**

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



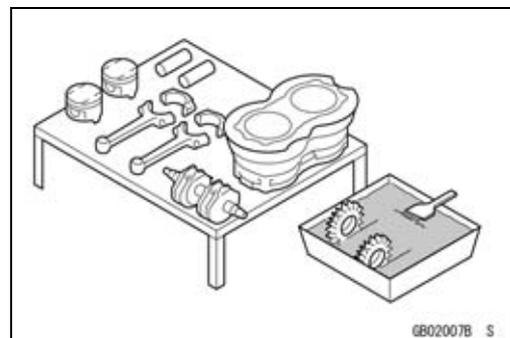
#### **Cleaning vehicle before disassembly**

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.



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

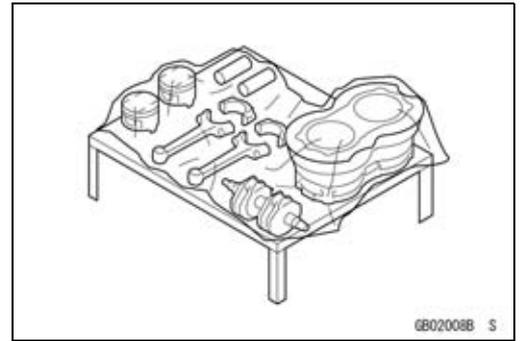
Disassembled parts are easy to confuse. Arrange the parts according to the order the parts were disassembled and clean the parts in order prior to assembly.



**Before Servicing**

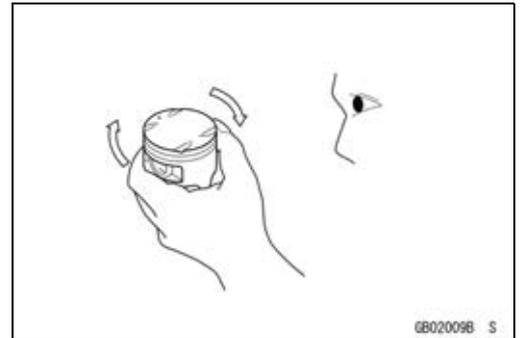
**Storage of Removed Parts**

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



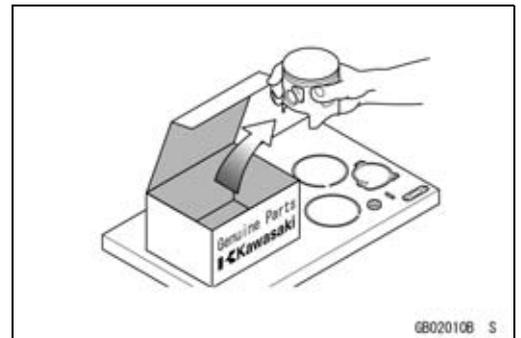
**Inspection**

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



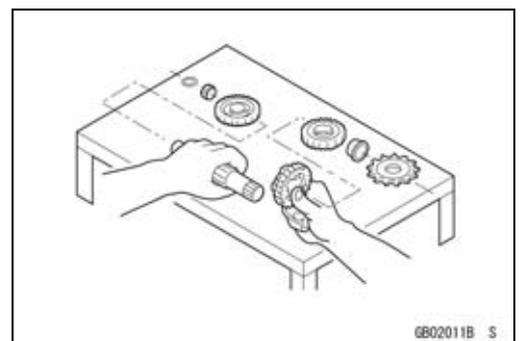
**Replacement Parts**

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



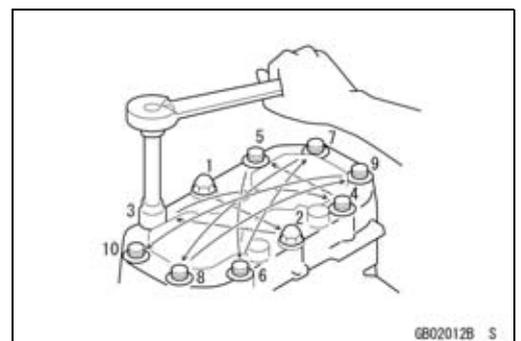
**Assembly Order**

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



**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.



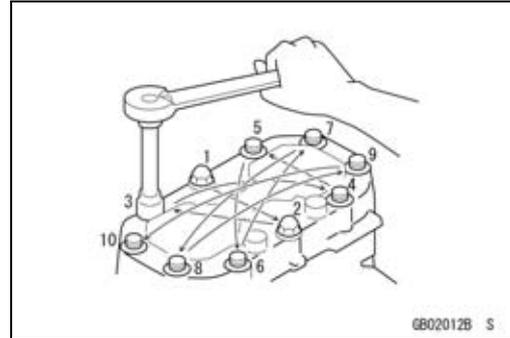
## 1-4 GENERAL INFORMATION

### Before Servicing

#### **Tightening Torque**

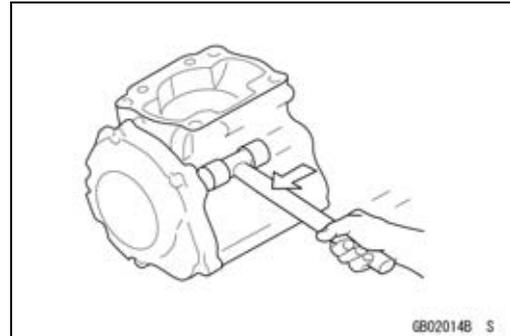
Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.

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



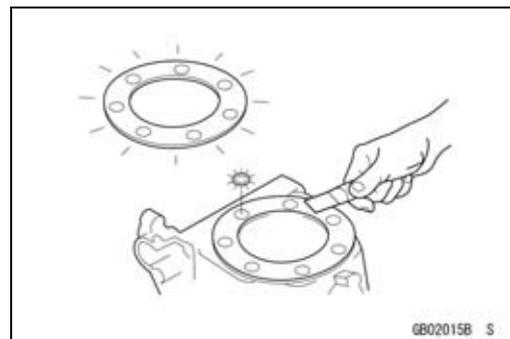
#### **Force**

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



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

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



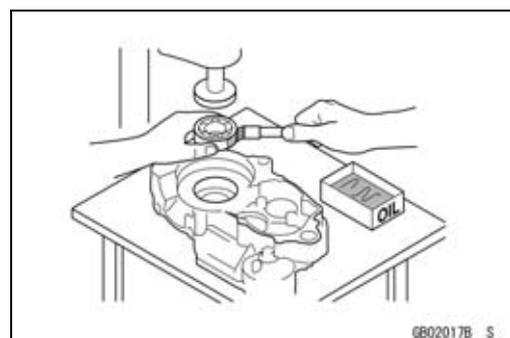
#### **Liquid Gasket, Non-permanent Locking Agent**

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



#### **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.

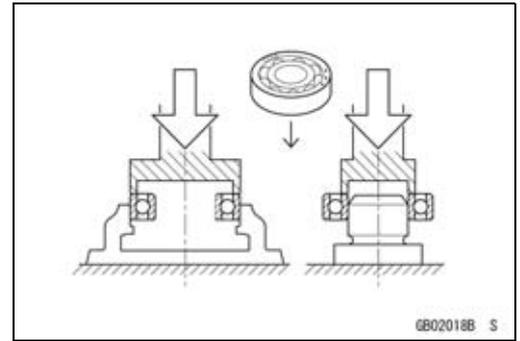


**Before Servicing**

**Ball Bearing and Needle Bearing**

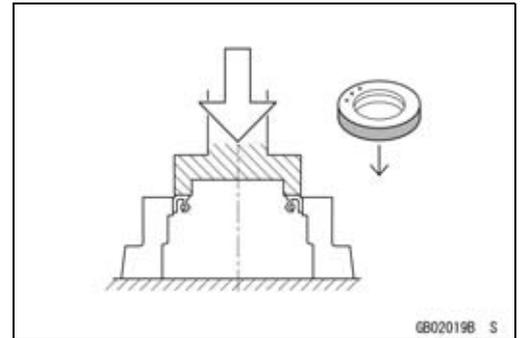
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

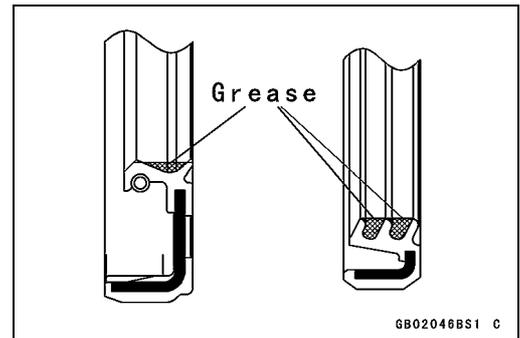


**Oil Seal, Grease Seal**

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

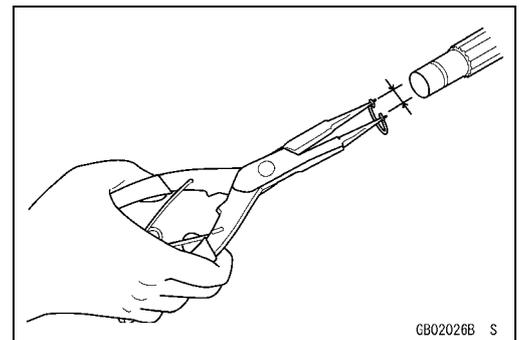


Apply specified grease to the lip of seal before installing the seal.



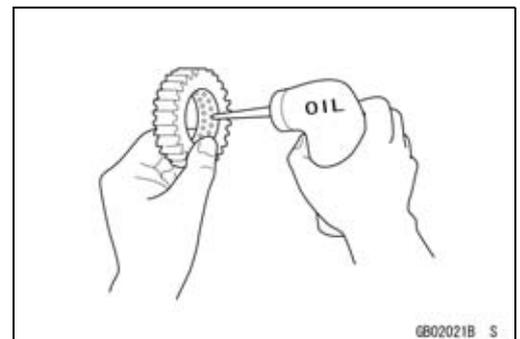
**Circlips, Cotter Pins**

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



**Lubrication**

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

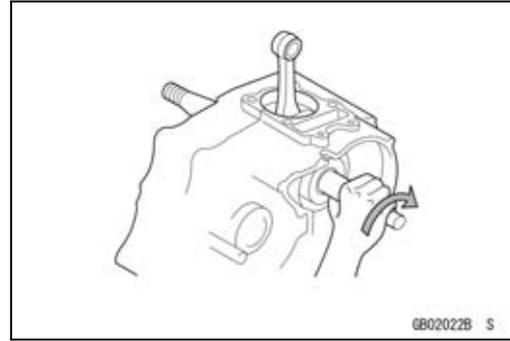


## 1-6 GENERAL INFORMATION

### Before Servicing

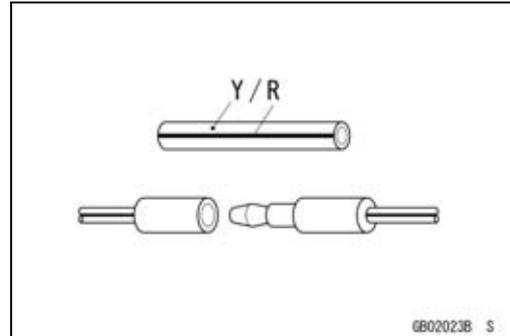
#### ***Direction of Engine Rotation***

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



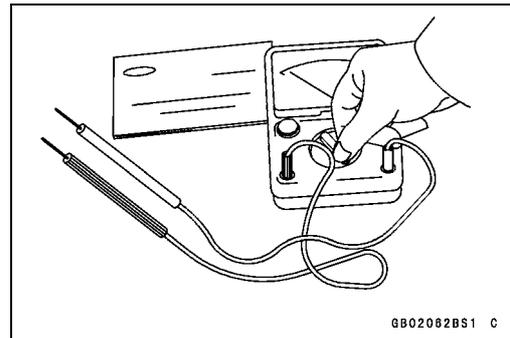
#### ***Electrical Leads***

A two-color lead is identified first by the primary color and then the stripe color. Unless instructed otherwise, electrical leads 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

KX450E9F Left Side View



KX450E9F Right Side View



Frame Number



Engine Number



# 1-8 GENERAL INFORMATION

## General Specifications

Items	KX450E9F
<b>Dimensions</b> Overall Length Overall Width Overall Height Wheelbase Road Clearance Seat Height Curb Mass: Front Rear Fuel Tank Capacity	2 185 mm (86.02 in.) 820 mm (32.3 in.) 1 280 mm (50.39 in.) 1 480 mm (58.27 in.) 340 mm (13.4 in.) 965 mm (38.0 in.) 112.1 kg (247.1 lb) 54.4 kg (120 lb) 57.7 kg (127 lb) 7.0 L (1.8 US gal)
<b>Engine</b> Type Cooling System Bore and Stroke Displacement Compression Ratio Carburetion System Starting System Ignition System Timing Advance Ignition Timing Spark Plug Valve Timing: Inlet: Open Close Duration Exhaust: Open Close Duration Lubrication System Engine Oil: Grade Viscosity Capacity	4-stroke, single cylinder, DOHC 4 valve Liquid-cooled 96.0 × 62.1 mm (3.78 × 2.44 in.) 449 cm <sup>3</sup> (27.4 cu in.) 12.5 : 1 DFI (Digital Fuel Injection) System, KEIHIN $\phi$ 43 Primary kick Digital DC-CDI BTDC 10° @2 000 r/min (rpm) NGK CPR8EB-9 BTDC 34° ABDC 70° 284° BBDC 66° ATDC 38° 284° Forced lubrication (semi-dry sump) API SG API SH, SJ or SL with JASO MA, MA1 or MA2 SAE 10W-40 1.2 L (1.3 US qt)
<b>Drive Train</b> Primary Reduction System: Type Reduction Ratio Clutch Type	Gear 2.727 (60/22) Wet, multi disc

**General Specifications**

Items	KX450E9F
Transmission: Type Gear ratios: 1st 2nd 3rd 4th 5th Final Drive System: Type Reduction Ratio Overall Drive Ratio	5-speed, constant mesh, return shift  1.750 (28/16) 1.412 (24/17) 1.188 (19/16) 1.000 (19/19) 0.875 (21/24)  Chain drive 3.846 (50/13) 9.178 @Top gear
<b>Frame</b> Type Steering Angle Caster (rake angle) Trail Front tire: Size Make/Type Rear tire: Size Make/Type Rim size: Front Rear Front suspension: Type Wheel travel Rear suspension: Type Wheel travel Brake type: Front and Rear Effective disc diameter: Front (effect. dia.) Rear (effect. dia.)	Tubular, semi-double cradle 42° to either side 26.7° 116 mm (4.57 in.) 90/100-21 57M DUNLOP D742F, Tube type 120/80-19 63M DUNLOP D756, Tube type 21 × 1.60 19 × 2.15 Telescopic fork (up side down) 315 mm (12.4 in.) Swingarm (New Uni-trak) 315 mm (12.4 in.) Single disc 225 mm (8.86 in.) 215 mm (8.46 in.)

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

# 1-10 GENERAL INFORMATION

## Unit Conversion Table

### Prefixes for Units:

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

### Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

### Units of Volume:

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

### Units of Force:

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

### Units of Length:

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

### Units of Torque:

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

### Units of Pressure:

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

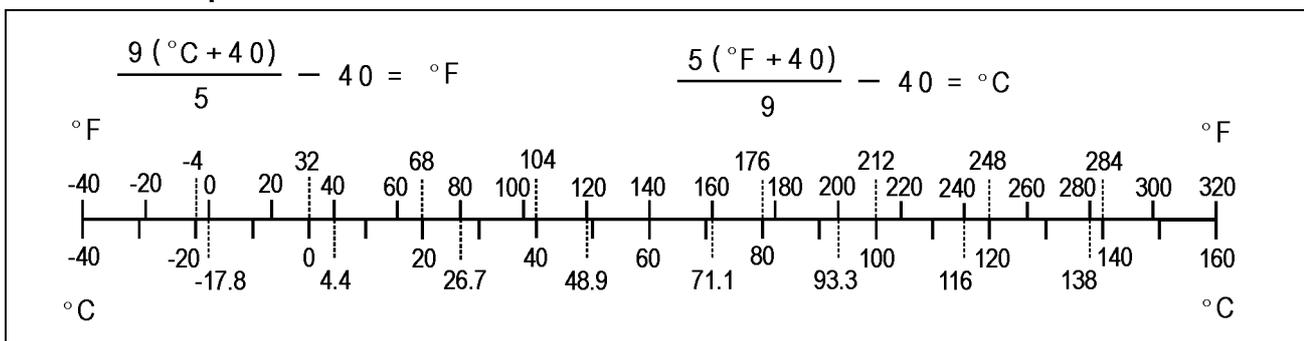
### Units of Speed:

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

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

### Units of Temperature:



# Periodic Maintenance

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## PERIODIC MAINTENANCE 2-3

### Periodic Maintenance Chart

The maintenance must be done in accordance with this chart to keep the motorcycle in good running condition.

OPERATION		FREQUENCY				See Page
		Each race or 2.5 hr	Every 3 races or 7.5 hr	Every 6 races or 15 hr	Every 12 races or 30 hr	
ENGINE	Spark plug-clean, inspect †	●				2-64
	Clutch cable-inspect and adjust	●				2-25
	Clutch plates-inspect †	●				2-26
	Throttle cable-inspect and adjust	●				2-12
	Idle speed-inspect and adjust	●				2-14
	Air cleaner element-clean †	●				2-15
	Air cleaner element-replace	If damaged				2-15
	Throttle body-inspect and clean	●				2-13
	Engine oil-change			●		2-26
	Piston and piston ring-replace	Every 6 races				2-23
	Cylinder head, cylinder-inspect			●		2-22
	Piston pin-replace				●	2-23
	Valve clearance-inspect †			●		2-19
	Oil filter-replace			●		2-27
	Muffler-inspect †	●				2-23
	Muffler baffle-replace		●			2-23
	Kick pedal and shift pedal-clean	●				-
	Engine sprocket-inspect †	●				2-34
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	Water hoses and connections-inspect †	●				2-19
Crankshaft-inspect			●		2-28	
Breather hose-inspect	●				2-28	
CHASSIS	Brake adjustment-inspect †	●				2-34
	Brake-pad wear-inspect	●				2-39
	Brake fluid level-inspect †	●				2-36
	Brake fluid-change	Every 2 years				2-37
	Brake master cylinder cup and dust cover-replace	Every 2 years				2-39
	Brake caliper fluid seal and dust seal-replace	Every 2 years				2-40
	Brake hoses and pipe-replace	Every 4 years				2-44
	Brake hoses, connections-inspect †	●				2-44
	Spoke tightness and rim runout-inspect †	●				2-30
	Wheel bearing-inspect †	●				2-31
	Frame-inspect and clean	●				2-64
	Drive chain wear-inspect †	●				2-33
Drive chain-inspect and adjust	●				2-31	
Drive chain-lubricate	●				2-33	

## 2-4 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

OPERATION	FREQUENCY				See Page
	Each race or 2.5 hr	Every 3 races or 7.5 hr	Every 6 races or 15 hr	Every 12 races or 30 hr	
Wheels/tires-inspect	●				2-29
Rear sprocket-inspect †	●				2-34
Front fork-inspect and clean	●				2-46
Front fork oil-change			●		2-46
Rear shock absorber oil-change			●		2-55
Cable-inspect	●				2-65
Fuel hose-replace	Every 4 years				2-13
Fuel hose, connections-inspect †	●				2-12
Fuel system-clean		●			2-17
Steering play-inspect †	●				2-61
Steering stem bearing-lubricate			●		2-63
Rear shock absorber-inspect	●				2-55
Swingarm and Uni-Trak linkage pivots-lubricate		●			2-60
Swingarm and Uni-Trak linkage pivots-inspect †		●			2-60
Nuts, bolts, fasteners-inspect †	●				2-66
General Lubrication-perform	●				2-65

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

**Torque and Locking Agent**

Tighten all bolts and nuts to the proper torque using an accurate torque wrench. If insufficiently tightened, a bolt or nut may become damaged, strip an internal thread, or break and then fall out. The following table lists the tightening torque for the major bolts and nuts, and the parts requiring use of a non-permanent locking agent or liquid gasket.

When checking the tightening torque of the bolts and nuts, first loosen the bolt or nut by half a turn and then tighten to specified torque.

Letters used in the "Remarks" column mean:

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

G: Apply grease.

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

MO: Apply molybdenum disulfide oil (mixture of engine oil and molybdenum disulfide grease with a weight ratio 10 : 1).

Lh: Left-hand Threads

S: Tighten the fasteners following the specified sequence.

2T: Apply 2-stroke oil.

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
<b>Fuel System</b>				
Throttle Pulley Cover Bolts	7.0	0.71	62 in-lb	
Throttle Cable Mounting Bolts	7.0	0.71	62 in-lb	
Air Cleaner Duct Clamp Screw	2.0	0.20	18 in-lb	
Air Cleaner Duct Mounting Nuts	3.0	0.30	26 in-lb	
Air Cleaner Duct Mounting Bolt	3.0	0.30	26 in-lb	
Air Cleaner Housing Bolts	9.8	1.0	87 in-lb	
Inlet Air Temperature Sensor Bolts	7.0	0.71	62 in-lb	L
Fuel Pump Bolts	9.8	1.0	87 in-lb	L, S
Water Temperature Sensor	12	1.2	106 in-lb	
<b>Cooling System</b>				
Water Pump Cover Bolts	9.8	1.0	87 in-lb	
Water Pump Impeller Bolt	9.8	1.0	87 in-lb	
Water Hose Clamp Screws	1.5	0.15	13 in-lb	
Coolant Drain Bolt	6.9	0.70	61 in-lb	
Radiator Mounting Bolts	9.8	1.0	87 in-lb	
Radiator Screen Bolts	9.8	1.0	87 in-lb	
<b>Engine Top End</b>				
Cylinder Head Cover Bolts	9.8	1.0	87 in-lb	
Cylinder Head Bolts (M10)	59	6.0	44	S, MO
Cylinder Head Bolts (M6)	12	1.2	106 in-lb	S
Camshaft Cap Bolts	9.8	1.0	87 in-lb	S, MO
Camshaft Sprocket Bolts	12	1.2	106 in-lb	L
Water Hose Fitting Bolts	9.8	1.0	87 in-lb	
Oil Line Plug	3.0	0.31	27 in-lb	L
Throttle Body Assy Holder Bolts	9.8	1.0	87 in-lb	L
Plug	20	2.0	15	L
Lower Camshaft Chain Guide Bolts	9.8	1.0	87 in-lb	
Rear Camshaft Chain Guide Bolt	15	1.5	11	
Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in-lb	

## 2-6 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
Camshaft Chain Tensioner Cap Bolt	5.0	0.51	44 in-lb	
Cylinder Bolt	12	1.2	106 in-lb	S
Exhaust Pipe Cover Bolts	12	1.2	106 in-lb	
Exhaust Pipe Holder Nuts	20	2.0	15	S
Muffler Mounting Bolts	20	2.0	15	S
Muffler Clamp Bolt	16	1.6	12	
<b>Clutch</b>				
Clutch Spring Bolts	8.8	0.90	78 in-lb	
Clutch Hub Nut	98	10	72	
Clutch Cover Bolts	9.8	1.0	87 in-lb	
Right Engine Cover Bolts	9.8	1.0	87 in-lb	
<b>Engine Lubrication System</b>				
Engine Oil Drain Bolt (M10)	20	2.0	15	
Engine Oil Drain Bolt (M6)	7.0	0.71	62 in-lb	
Oil Pump (Scavenge) Cover Bolts	9.8	1.0	87 in-lb	
Oil Pump (Feed) Cover Bolts	9.8	1.0	87 in-lb	
Oil Filter Cover (Right Engine Cover) Bolt	9.8	1.0	87 in-lb	
Oil Filter Cover Bolt	9.8	1.0	87 in-lb	
Oil Screen (Feed) Mounting Bolts	9.8	1.0	87 in-lb	
Oil Pressure Relief Valve	15	1.5	11	L
Piston Oil Nozzle	3.0	0.31	26 in-lb	
Piston Oil Nozzle Bolt	7.0	0.71	62 in-lb	L
Breather Fitting	15	1.5	11	L
<b>Engine Removal/Installation</b>				
Middle Engine Mounting Nut	49	5.0	36	S
Middle Engine Bracket Nuts	29	3.0	21	S
Upper Engine Mounting Bolts	49	5.0	36	S
Upper Engine Bracket Bolts	29	3.0	21	S
Lower Engine Mounting Nut	49	5.0	36	S
Swingarm Pivot Shaft Nut	98	10	72	S
<b>Crankshaft/Transmission</b>				
Piston Oil Nozzle	3.0	0.30	26 in-lb	
Piston Oil Nozzle Bolt	7.0	0.71	62 in-lb	
Crankcase Bolts (M6)	12	1.2	106 in-lb	S
Crankcase Bolts (M7)	15	1.5	11	S
Engine Oil Drain Bolt (M10)	20	2.0	15	
Engine Oil Drain Bolt (M6)	7.0	0.71	62 in-lb	
Bearing Retaining Screw	15	1.5	11	L
Ratchet Guide Bolt	8.8	0.90	78 in-lb	
Kick Pedal Bolt	25	2.5	18	L
Shift Pedal Bolt	9.8	1.0	87 in-lb	
Upper Ratchet Plate Mounting Bolt	9.8	1.0	87 in-lb	S
Lower Ratchet Plate Mounting Bolt	15	1.5	11	L, S



## 2-8 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
<b>Steering</b>				
Steering Stem Head Nut	98	10	72	2T, AL
Steering Stem Nut	4.9	0.50	43 in-lb	
Handlebar Clamp Bolts	25	2.5	18	
<b>Frame</b>				
Rear Frame Mounting Bolts	34	3.5	25	L
Upper Footpeg Bracket Bolts	54	5.5	40	
Radiator Shroud Bolts	9.8	1.0	87 in-lb	
<b>Electrical System</b>				
Gear Position Switch Screws	2.9	0.30	26 in-lb	L
Flywheel Nut	78	8.0	58	L
Stator Coil Bolts	9.8	1.0	87 in-lb	
Crankshaft Sensor Bolts	7.0	0.71	62 in-lb	
Spark Plug	13	1.3	115 in-lb	L
Magneto Cover Bolts	9.8	1.0	87 in-lb	
Breather Fitting	15	1.5	11	
Ignition Coil Bolts	9.8	1.0	87 in-lb	

### Basic Torque for General Fasteners

Threads dia. (mm)	Torque		
	N-m	kgf-m	ft-lb
5	3.4 ~ 4.9	0.35 ~ 0.50	30 ~ 43 in-lb
6	5.9 ~ 7.8	0.60 ~ 0.80	52 ~ 69 in-lb
8	14 ~ 19	1.4 ~ 1.9	10.0 ~ 13.5
10	25 ~ 34	2.6 ~ 3.5	19.0 ~ 25
12	44 ~ 61	4.5 ~ 6.2	33 ~ 45
14	73 ~ 98	7.4 ~ 10.0	54 ~ 72
16	115 ~ 155	11.5 ~ 16.0	83 ~ 115
18	165 ~ 225	17.0 ~ 23.0	125 ~ 165
20	225 ~ 325	23 ~ 33	165 ~ 240

**Specifications**

Item	Standard	Service Limit
<b>Fuel System</b>		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	---
Idle Speed	2 000± 50 r/min (rpm)	---
Air Cleaner Element Oil	High quality foam air filter oil	---
<b>Cooling System</b>		
Coolant:		
Type (recommended)	Permanent type antifreeze	
Color	Green	
Mixed Ratio	Soft water 50% and coolant 50%	
Freezing Point	-35 °C (-31 °F)	
Total Amount	1.1 L (1.2 US qt.)	
<b>Engine Top End</b>		
Valve Clearance:		
Exhaust	0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)	---
Inlet	0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)	---
Cylinder Head Warp	---	0.05 mm (0.002 in.)
Cylinder Inside Diameter (see text)	96.000 ~ 96.012 mm (3.7795 ~ 3.7800 in.)	96.10 mm (3.783 in.)
Piston/Cylinder Clearance	0.020 ~ 0.042 mm (0.00079 ~ 0.0016 in.)	---
<b>Clutch</b>		
Clutch Lever Free Play	8 ~ 13 mm (0.3 ~ 0.5 in.)	---
Friction Plate Thickness	2.92 ~ 3.08 mm (0.115 ~ 0.121 in.)	2.6 mm (0.10 in.)
Friction Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.01 in.)
Steel Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.01 in.)
<b>Engine Lubrication System</b>		
Engine oil:		
Grade	Castrol "POWER1 R4 Racing" 5W-40 or API SG API SH, SJ or SL with JASO MA, MA1 or MA2	
Viscosity	SAE 10W-30, 10W-40, or 10W-50	
Capacity	0.96 L (1.01 US qt.) (when filter is not removed) 0.98 L (10.3 US qt.) (when filter is remove) 1.2 L (1.3 US qt.) (when engine is completely dry)	
<b>Crankshaft/Transmission</b>		
Connecting Rod Big End Side Clearance	0.25 ~ 0.35 mm (0.0098 ~ 0.014 in.)	0.6 mm (0.02 in.)
<b>Wheels/Tires</b>		
Rim Runout (with tire installed):		
Axial	TIR 1.0 mm (0.039 in.) or less	TIR 2 mm (0.08 in.)
Radial	TIR 1.0 mm (0.039 in.) or less	TIR 2 mm (0.08 in.)
Front and Rear Tires Air Pressure	100 kPa (1.0 kgf/cm <sup>2</sup> , 14 psi)	---

## 2-10 PERIODIC MAINTENANCE

### Specifications

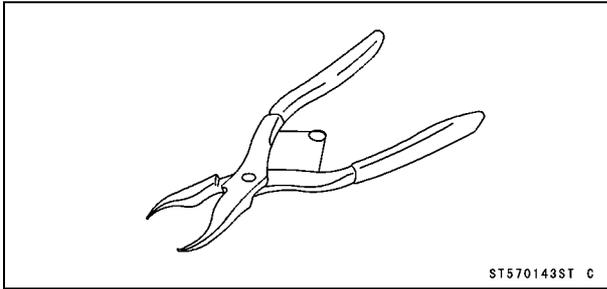
Item	Standard	Service Limit
Standard Tire:		
Front:		
Size	90/100-21 57M	---
Make	DUNLOP	
Type	D742F, Tube	
Rear:		
Size	120/80-19 63M	---
Make	DUNLOP	
Type	D756, Tube	
<b>Final Drive</b>		
Drive Chain Slack	52 ~ 58 mm (2.0 ~ 2.3 in.)	---
Drive Chain 20 Link Length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Rear Sprocket Warp (Runout)	TIR 0.4 mm (0.016 in.) or less	TIR 0.5 mm (0.020 in.)
<b>Brakes</b>		
Brake Lever Free Play	(to suit rider)	---
Brake Fluid:		
Type:		
Front	DOT3 or DOT4	---
Rear	DOT4	---
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	6.4 mm (0.25 in.)	1 mm (0.04 in.)
<b>Suspension</b>		
Fork Oil:		
Oil Viscosity	KHL15-10 (KAYABA 01) or equivalent	---
Oil Quantity:		(Adjustable range)
Outer (Outer/Inner Tubes)	350 mL (11.8 US oz.) (EUR) 355mL (12.0 US oz.)	330 ~ 380 mL (11.2 ~ 12.8 US oz.)
Inner (Subtank)	191 mL (6.46 US oz.)	---
Rear Shock Absorber Oil:		
Oil Viscosity	K2-C (KAYABA) or equivalent	---
<b>Electrical System</b>		
Spark Plug Gap	0.8 ~ 0.9 mm (0.03 ~ 0.04 in.)	---

TIR: Total Indicator Readings

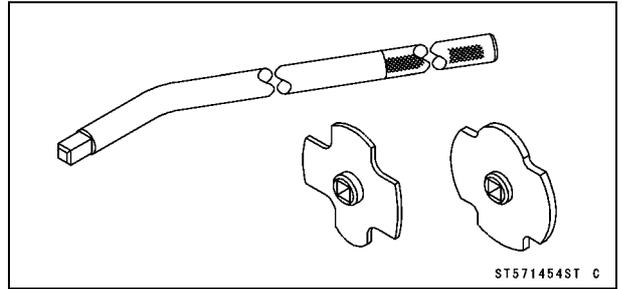
EUR: Europe Model

Special Tools

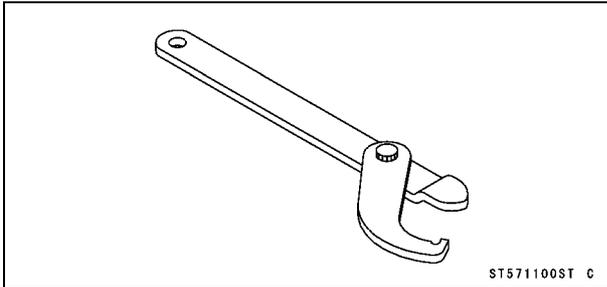
Inside Circlip Pliers:  
57001-143



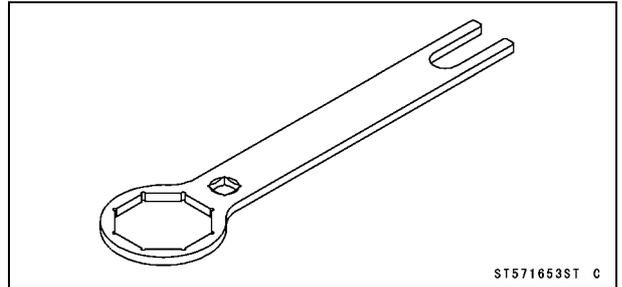
Filler Cap Driver:  
57001-1454



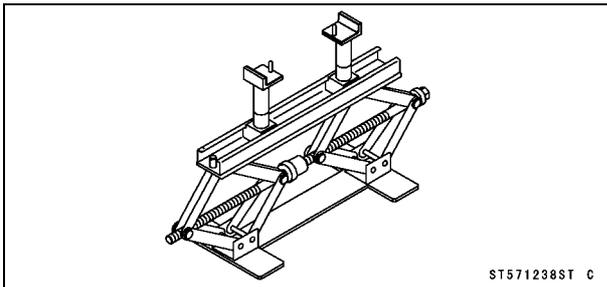
Steering Stem Nut Wrench:  
57001-1100



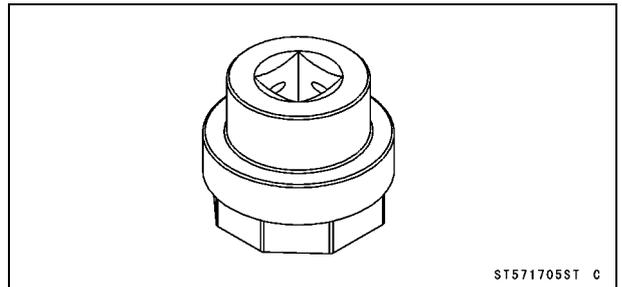
Top Plug Wrench, 49 mm:  
57001-1653



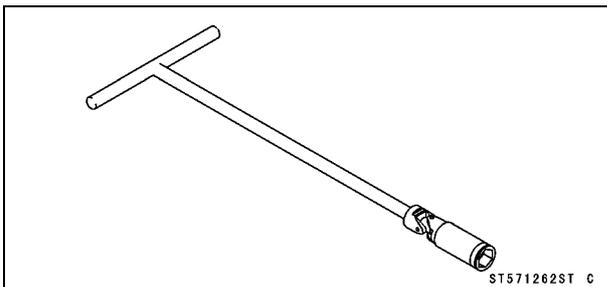
Jack:  
57001-1238



Top Plug Wrench, 36 mm:  
57001-1705



Spark Plug Wrench, Hex 16:  
57001-1262



## 2-12 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Fuel System

##### **Fuel Hose and Connections Inspection**

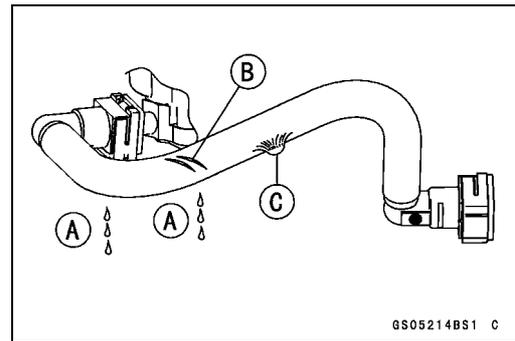
○ If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose burst.

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

● 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.



##### **Throttle Grip (Throttle Cable) Free Play Inspection**

● Check throttle grip free play [B] by lightly turning the throttle grip [A] back and forth.

★ If the free play is improper, adjust the throttle cable.

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

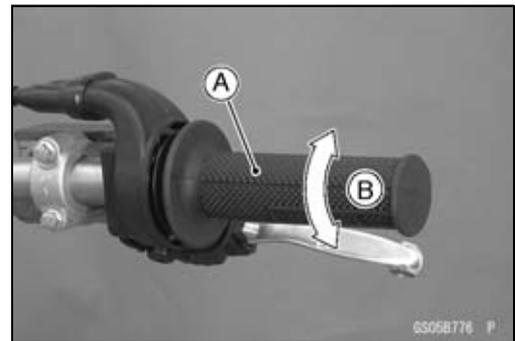
**Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)**

● Check that the throttle grip moves smoothly from full open to close, and the throttle closes quickly and completely in all steering positions by the return spring.

★ If the throttle grip does not return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.

● Run the engine at the idle speed, and turn the handlebar all the way to the right and left to ensure that the idle speed does not change.

★ If the idle speed increase, check the throttle cable free play and the cable routing.



##### **Throttle Grip (Throttle Cable) Free Play Adjustment**

● Loosen the locknuts [A] [B] at the upper end of the throttle cable.

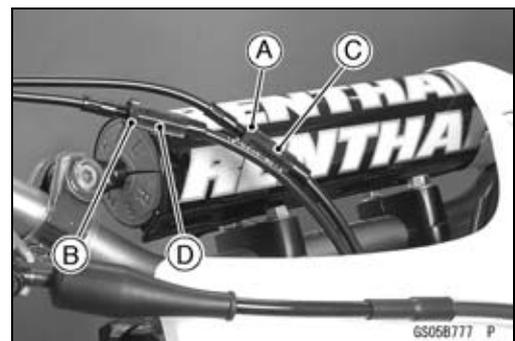
● Screw both throttle cable adjusters [C] [D] to give the throttle grip plenty of play.

● Turn out the decelerator adjuster [C] until there is no play when the throttle grip is completely closed.

● Tighten the locknut [A].

● Turn the accelerator cable adjuster [D] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.

● Tighten the locknut [B].



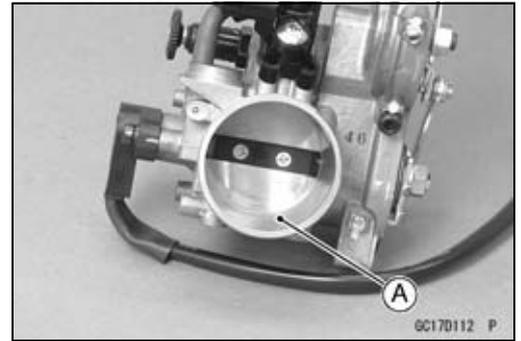
#### **⚠ WARNING**

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

**Periodic Maintenance Procedures**

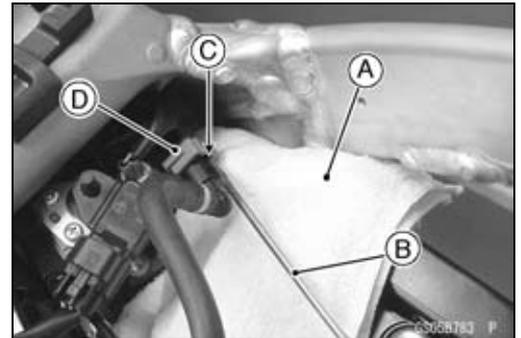
**Throttle Body Cleaning**

- Check the throttle bore for cleanliness as follows.
- Remove the throttle body assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter).
- Check the throttle bore [A] at the throttle valve for carbon deposits by opening the throttle valve.
- ★ If any carbon accumulates, wipe the carbon off the throttle bore and the throttle valve, using a lint-free cloth penetrated with a high-flash point solvent.

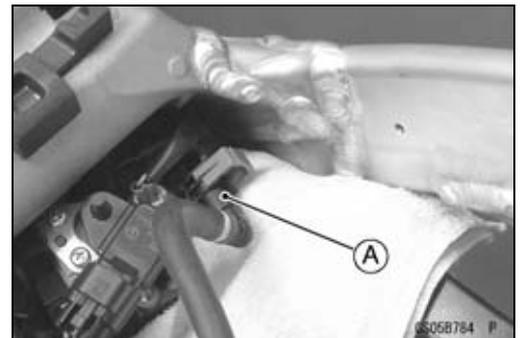


**Fuel Hose Replacement**

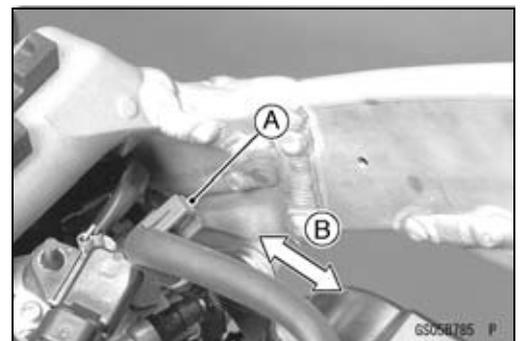
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert the screw driver [B] to the joint lock slit [C].
- Turn the driver to disconnect the joint lock [D].



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



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



**⚠ WARNING**

**Slide the joint, and confirm the joint is correctly installed. There is a possibility that the fuel leaks when the installation is mistaken.**

- ★ If it comes off, reinstall the hose joint.

## 2-14 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Idle Speed Inspection

##### CAUTION

This motorcycle is designed for competition use only. Therefore, the radiator does not incorporate a coolant reserve tank or cooling fan. Prolonged idling of the engine with no airflow through the radiator can cause coolant loss and engine overheating resulting in possible engine damage. Any riding conditions that increase engine temperature will further reduce idling time before coolant loss occurs. These conditions include high ambient temperature, sandy or muddy terrain, or other conditions causing high engine loads at low speeds. Furthermore, warming the engine up excessively before operation, or leaving idling with the hot engine temperature after operation results in the engine overheating, too.

- 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 cable may be improperly adjusted or incorrectly routed, or it may be damaged. Be sure to correct any of these conditions before riding (see Cable, Wire, and Hose Routing section in the Appendix chapter).

##### ⚠ WARNING

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

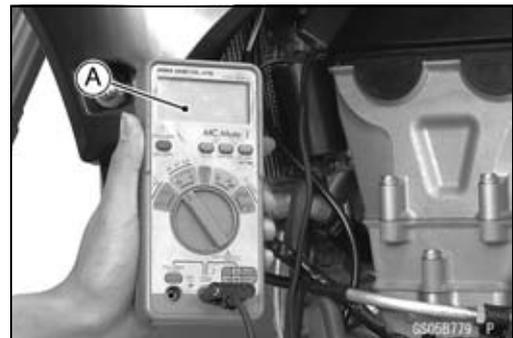
- Check the idle speed, using the engine revolution tester [A] for high accuracy.
- ★ If the idle speed is out of specified range, adjust it.

Idle Speed:

Standard: 2 000 ±50 r/min (rpm)

#### Idle Speed Adjustment

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



**Periodic Maintenance Procedures**

**Air Cleaner Element Cleaning and Inspection**

**NOTE**

- In dusty areas, the element should be cleaned more frequently than recommended interval.
- After riding through rain or on muddy roads, the element should be cleaned immediately.
- Since repeated cleaning opens the pores of the element, replace it with a new one in accordance with the Periodic Maintenance Chart. Also, if there is a break in the element material or any other damage to the element, replace the element with a new one.

**⚠ WARNING**

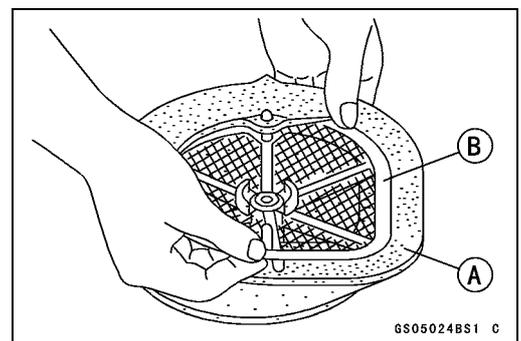
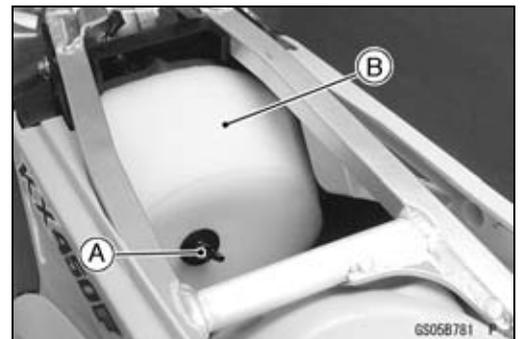
Clean the element in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or a low flash-point solvent to clean the element.

- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Wing Bolt [A]
  - Air Cleaner Element [B]
- Stuff a clean, lint-free towel into the carburetor so no dirt is allowed to enter the carburetor.
- Wipe out the inside of the air cleaner housing with a clean damp towel.

**CAUTION**

Check inside of the inlet tract for dirt. If dirt is present, clean the intake tract and carburetor thoroughly. You may also need to replace the element and seal the housing and inlet tract.

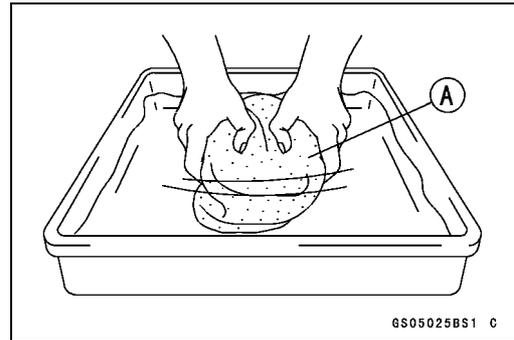
- Separate the element [A] from the frame [B].



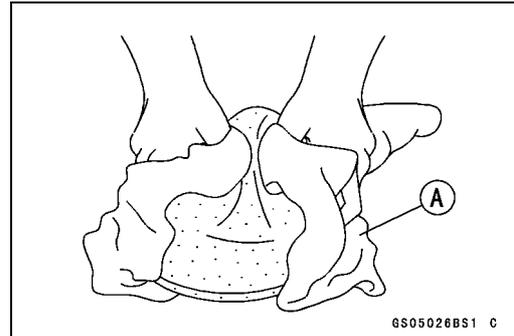
## 2-16 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

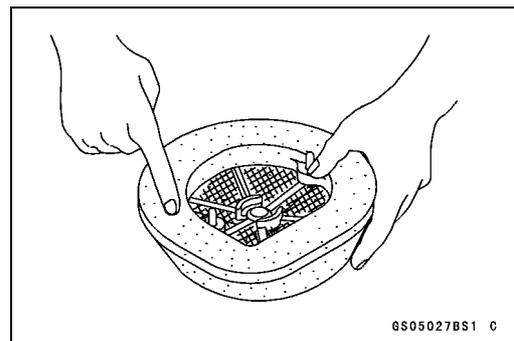
- Clean the element [A] in a bath of a high-flash point solvent using a soft bristle brush.



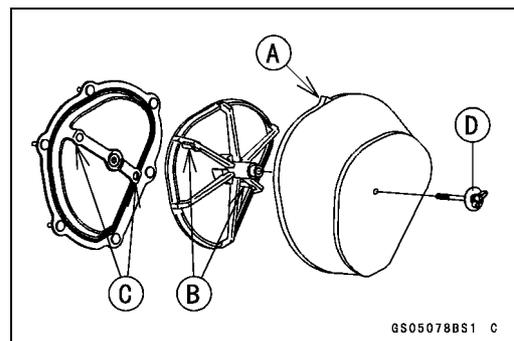
- Squeeze it dry in a clean towel [A]. Do not wring the element or blow it dry; the element can be damaged.
- Check all the parts of the element for visible damage.
- ★ If any of the parts of the element are damaged, replace them.
- After cleaning, saturate the element with a high-quality foam-air-filter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



- Apply grease to all connections and screw holes in the air cleaner housing and intake tract.
- Install the element onto its frame, and coat the element lip and lip seat with a thick layer of all-purpose grease to assure a complete seal.



- Install the air cleaner element so that its tab faces [A] upward and its projections [B] align with the holes [C] in the housing.
- Tighten the wing bolt [D]
- Install the seat (see Seat Installation in the Frame chapter).



## Periodic Maintenance Procedures

### Fuel Tank Cleaning

#### ⚠ WARNING

Clean the fuel tank in a well-ventilated area, and take care that there is no sparks or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvent to clean the tank.

- Remove the fuel tank and drain it (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Remove the fuel pump (see Fuel Pump Removal in the Fuel System (DFI) chapter).
- Pour some high-flash point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Drain the solvent out of the tank.
- Dry the tank with compressed air.

### Cooling System

#### ⚠ WARNING

To avoid burns, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down.

Coolant on tires will make them slippery and can cause an accident and injury. Immediately wash away any coolant that spills on the wheels.

Since coolant is harmful to the human body, do not use for drinking.

#### CAUTION

The coolant should be changed periodically to ensure long engine life.

### Coolant Level Inspection

#### NOTE

- Check the level when the engine is cold (room or ambient temperature).
- Lean the motorcycle slightly until the radiator cap is level to the ground so that the radiator cap is located uppermost in order to exhaust the air accumulated in the radiator.
- Remove the radiator cap [A].

#### NOTE

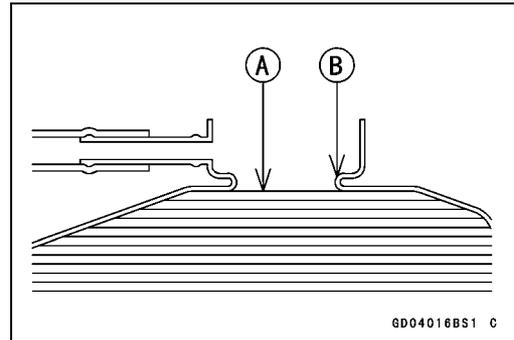
- Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop and wait there for a few seconds. Then push down and turn it further in the same direction and remove the cap.



## 2-18 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Check the coolant level. The coolant level [A] should be at the bottom of the filler neck [B].
- ★ If the coolant level is low, add coolant through the filler opening to the bottom of the filler neck. Install the cap.



#### Recommended coolant:

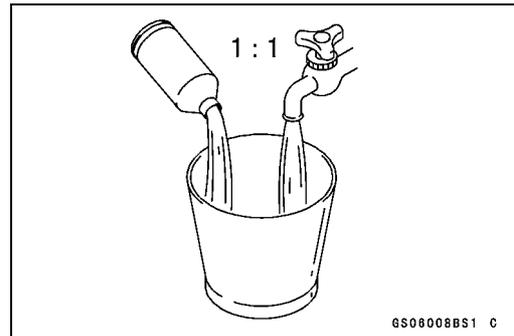
Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)

#### Water and coolant mixture ratio:

1 : 1 (water 50%, Coolant 50%)

#### Total amount:

1.1 L (1.2 US qt.)



### CAUTION

For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water alone can be added. But the diluted coolant must be returned to the correct mixture ratio within a few days.

If coolant must be added often or the reserve tank has run completely dry, there is probably leakage in the cooling system. Check the system for leaks. Coolant ruins painted surfaces. Immediately wash away any coolant that spills on the frame, engine, wheels or other painted parts.

#### **Coolant Deterioration Inspection**

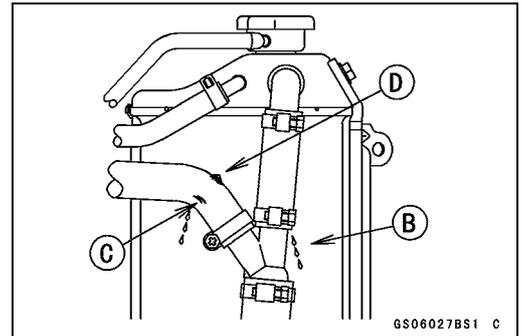
- Visually inspect the coolant.
- ★ If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.
- ★ If the coolant gives off an abnormal smell, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.

**Periodic Maintenance Procedures**

**Water Hoses and Connections Inspection**

- The high pressure inside the water hoses [A] can cause coolant to leak [B] 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 [C] or bulges [D] are noticed.
- Check that the hoses are securely connected and clamps are tightened correctly.

**Torque - Water Hose Clamp Screws: 1.5 N-m (0.15 kgf-m, 13 in-lb)**



**Engine Top End**

**Valve Clearance Inspection**

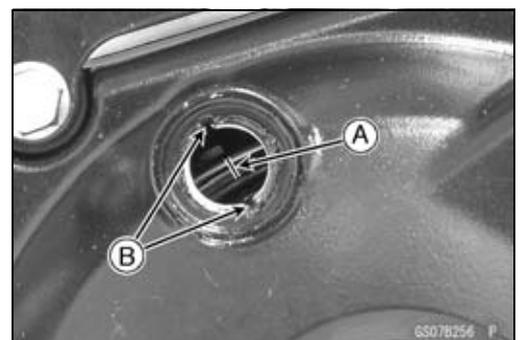
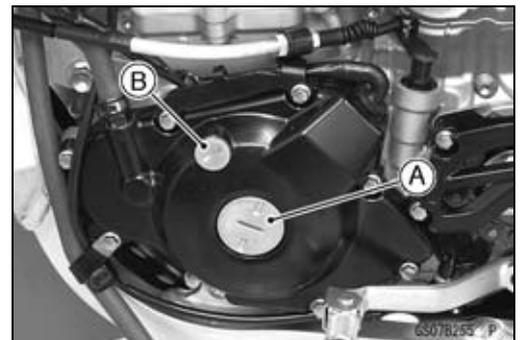
**NOTE**

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

- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal in the Engine Top End chapter)
  - Flywheel Nut Cap [A]
  - Timing Inspection Cap [B]

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

- First, bring the piston to the top-dead-center of its compression stroke to inspect the valve clearance (the position at the end of the compression stroke), when the cam lobe faces outside of the camshaft.
- Place a wrench over the flywheel nut and turn it counterclockwise to align the TDC mark [A] with the center of the groove [B] of the inspection hole.



## 2-20 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Using a thickness gauge [A], measure the clearance between each cam lobe and valve lifter for all four valves.
- For the purpose of adjusting the valve clearances, record the measured values.

**Valve clearance: between cam and valve lifter**

**Standard:**

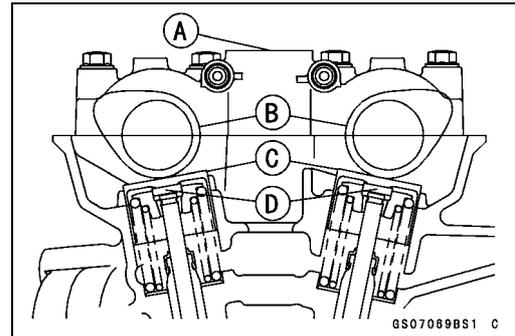
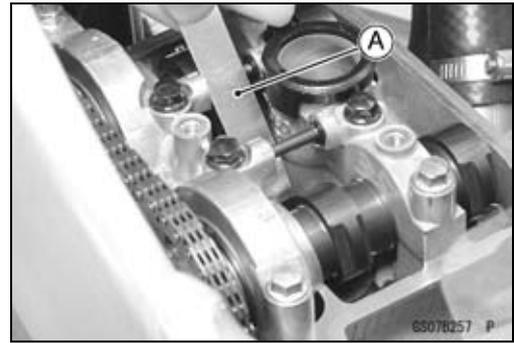
**Exhaust 0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)**

**Inlet 0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)**

- ★ If the valve clearance is not within the specified range, adjust it.

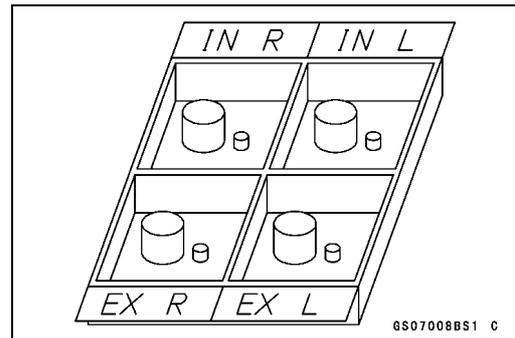
#### Valve Clearance Adjustment

- Remove the camshaft caps [A] (see Camshaft Removal in the Engine Top End chapter).
- Remove the camshafts [B] (see Camshaft Removal in the Engine Top End chapter).
- Remove the valve lifters [C] of the applicable valve.
- Remove the shims [D] from the top of the spring retainer.



#### NOTE

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



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

$$A = (B - C) + D$$

[A] Replace Shim Thickness

[B] Measured Valve Clearance

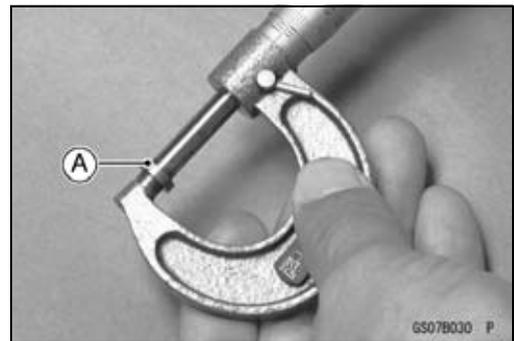
[C] Specified Valve Clearance

[D] Present Shim Thickness

#### Example

$$(0.31 \text{ mm} - 0.10 \sim 0.15 \text{ mm}) + 2.60 \text{ mm} = 2.81 \sim 2.76 \text{ mm}$$

- Exchange the shims for the 2.775 or 2.800 size shim.



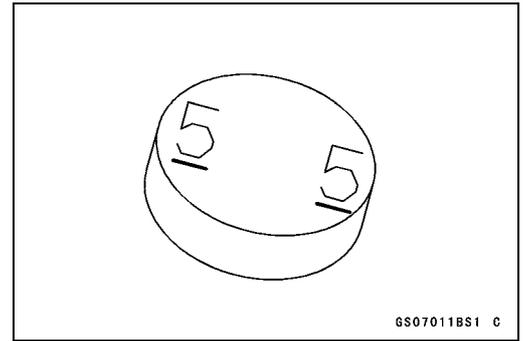
#### CAUTION

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

Periodic Maintenance Procedures

Adjustment shims

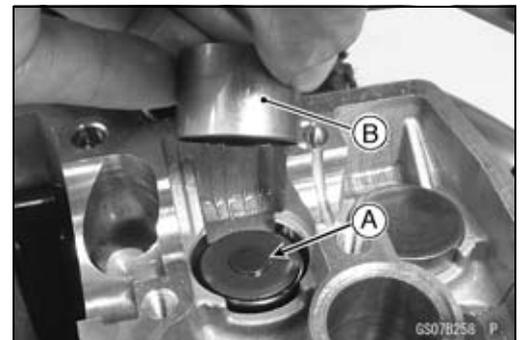
Thick-ness	P/No.	Mark	Thick-ness	P/No.	Mark
2.00	92025-1870	0	2.55	92025-1881	55
2.05	92025-1871	5	2.575	92025-1985	58
2.10	92025-1872	10	2.60	92025-1882	60
2.15	92025-1873	15	2.625	92180-1059	63
2.20	92025-1874	20	2.625	92025-1883	65
2.25	92025-1875	25	2.675	92180-1194	68
2.30	92025-1876	30	2.70	92025-1884	70
2.35	92025-1877	35	2.725	92180-1195	73
2.375	92180-1058	38	2.75	92025-1885	75
2.40	92025-1878	40	2.775	92180-1196	78
2.425	92025-1982	43	2.80	92025-1886	80
2.45	92025-1879	45	2.85	92025-1887	85
2.475	92025-1983	48	2.90	92025-1888	90
2.50	92025-1880	50	2.95	92025-1889	95
2.525	92025-1984	53	3.00	92025-1890	00



**NOTE**

- 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 [A] toward the valve lifter [B]. At this time, apply engine oil to the shim or the valve lifter to keep the shim in place during camshaft installation.



**CAUTION**

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

- Apply engine oil to the valve lifter surface and install the lifter.
- Install the camshaft (see Camshaft Installation in the Engine Top End chapter).
- Recheck the valve clearance and readjust if necessary.
- Install the cylinder head cover (see Engine Top End chapter), timing inspection cap, and the flywheel nut cap.

## 2-22 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

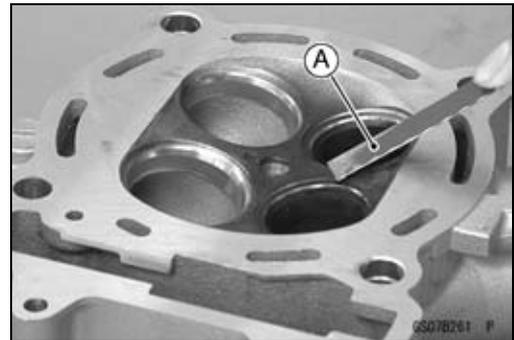
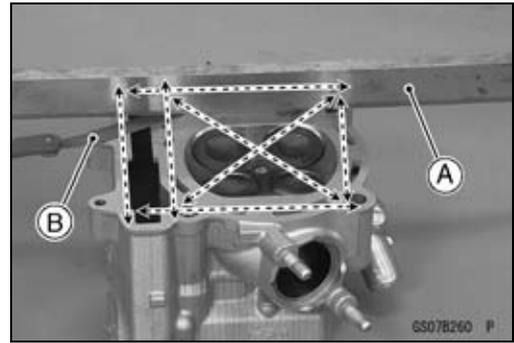
#### Cylinder Head Warp Inspection

- Remove the cylinder head (see Cylinder Head Removal in the Engine Top End chapter).
- Lay a straightedge [A] across the lower surface of the head at several different points, and measure warp by inserting a thickness gauge [B] between the straightedge and the head.
- ★ If warp exceeds the service limit, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.

#### Cylinder Head Warp

**Service Limit: 0.05 mm (0.002 in.)**

- Remove the valves (see Valve Removal in the Engine Top End chapter).
- Scrape the carbon out of the combustion chamber and exhaust port with a scraper [A] or a suitable tool.
- Clean the cylinder head, using high-flash point solvent.
- Blow out any particles which may obstruct the oil passage in the cylinder head using compressed air.
- Install the valves (see Valve Installation in the Engine Top End chapter).



#### Cylinder Wear Inspection

##### NOTE

○ Measure the cylinder inside diameter when the cylinder is cold (room or ambient temperature).

- Visually inspect the inside of the cylinder for scratches and abnormal wear.
- ★ If the cylinder is damaged or badly worn, replace it with a new one.
- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement shown in the figure.

[A] 10 mm (0.39 in.)

[B] 30 mm (1.2 in.)

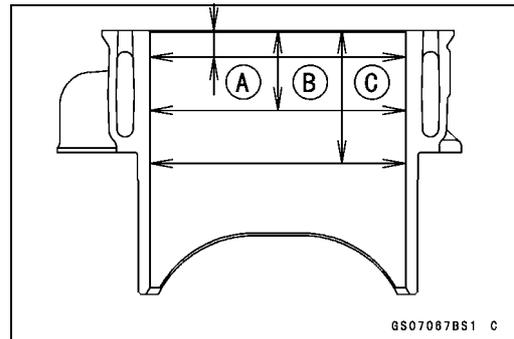
[C] 50 mm (2.0 in.)

- ★ If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder must be replaced with a new one since the PLATING cylinder cannot be bored or honed.

#### Cylinder Inside Diameter

**Standard: 96.000 ~ 96.012 mm (3.7795 ~ 3.7800 in.), and less than 0.01 mm (0.0004 in.) difference between any two measurements.**

**Service Limit: 96.10 mm (3.783 in.), or more than 0.05 mm (0.020 in.) difference between any two measurements.**



## Periodic Maintenance Procedures

### ***Piston/Cylinder Clearance Inspection***

The piston-to-cylinder clearance is measured whenever a piston or cylinder is replaced with a new one. The standard piston-to-cylinder clearance must be adhered to whenever the cylinder is replaced.

If only a piston is replaced, the clearance may exceed the standard slightly. But it must not be less than the minimum, in order to avoid piston seizure.

The most accurate way to find the piston clearance is by making separate piston and cylinder diameter measurements and then computing the difference between the two values. Measure the piston diameter as just described, and measure the cylinder diameter at the very bottom of the cylinder.

#### **Piston/Cylinder Clearance**

**Standard: 0.020 ~ 0.042 mm (0.00079 ~ 0.0016 in.)**

### ***Piston, Piston Ring and Piston Pin Replacement***

- Refer to the Cylinder and Piston Section in Engine Top End chapter.

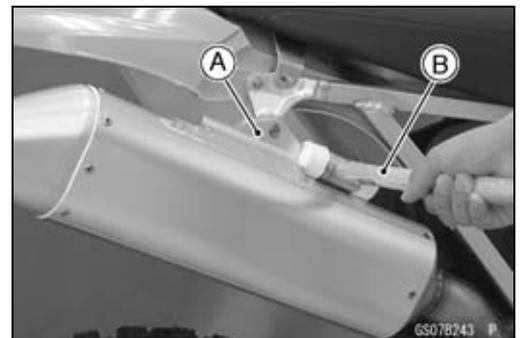
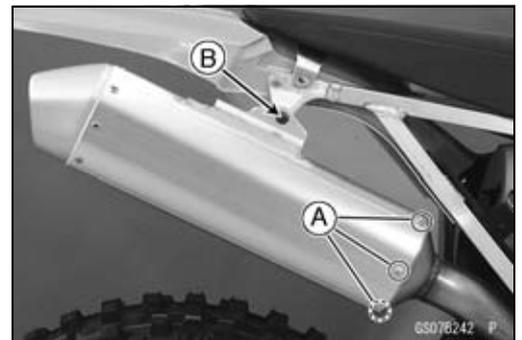
### ***Exhaust System Inspection***

- The exhaust system, in particular the muffler body, is designed to reduce exhaust noise and conduct the exhaust gases away from the rider while minimizing power loss. If carbon has built up inside the muffler body, exhaust efficiency is reduced, causing engine performance to drop.
- ★ If the muffler body is badly damaged, dented, cracked or rusted, replace it. Replace the muffler baffle if the exhaust noise becomes too loud or engine performance drops.

### ***Muffler Baffle Change***

- Remove:
  - Right Side Cover (see Side Cover Removal in the Frame chapter)
  - Muffler Pipe Mounting Bolts [A]
  - Muffler Mounting Bolt (Rear) [B]

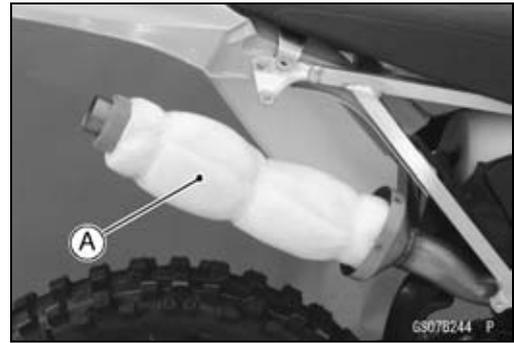
- Tap the bracket [A] of the muffler body with a plastic mallet [B] to separate from the inner pipe.



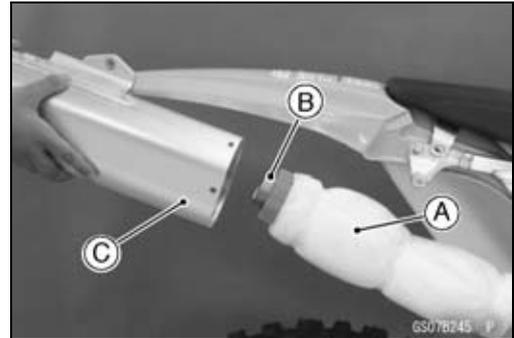
## 2-24 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Pull off the old muffler baffle assembly [A].

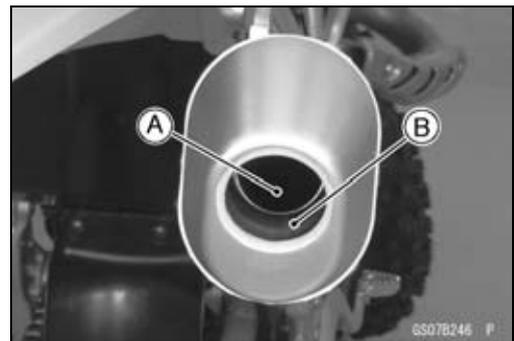


- Clean the adhered silicone sealant.
- Install the new muffler baffle assembly [A] into the inner pipe [B].
- While suppressing the muffler baffle for shrink, install the muffler body [C].

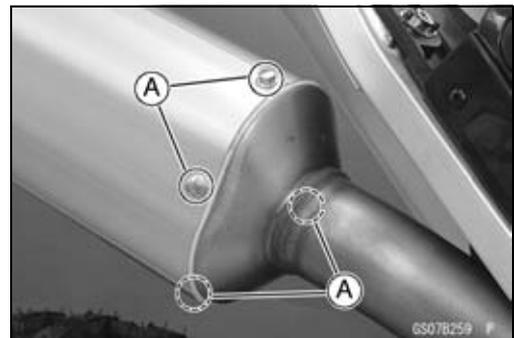


#### NOTE

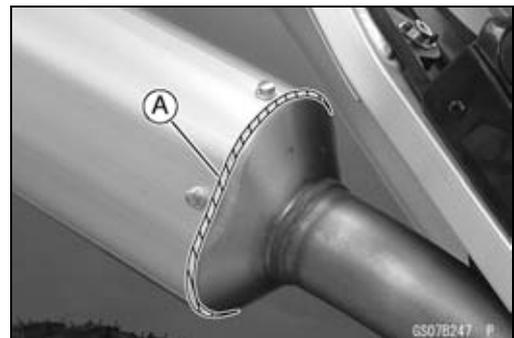
○ When replacing the muffler baffle assembly, insert the inner pipe [A] into the hole [B] of the muffler body end. When the muffler pipe mounting bolt holes are not suitable, remove the muffler from the chassis, and then assemble the muffler body and inner pipe.



- Apply a non-permanent locking agent to the muffler pipe mounting bolts [A], and tighten them.
- Install the muffler, if removed (see Muffler Installation in the Engine Top End chapter).



- Apply silicone sealant to the circumference [A] of the inner pipe.

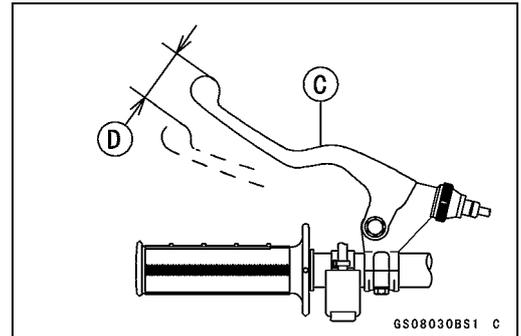
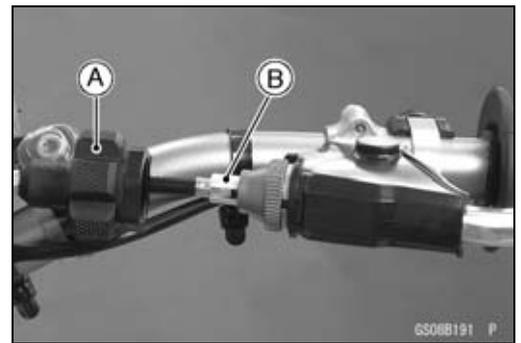


Periodic Maintenance Procedures

Clutch

**Clutch Lever (Clutch Cable) Free Play Inspection**

- Slide the clutch lever dust cover [A] out of place.
- Check that the clutch cable upper end is fully seated in the adjusting bolt [B].
- Check that the clutch lever [C] has 8 ~ 13 mm (0.3 ~ 0.5 in.) of play [D].
- ★ If it does not, adjust the lever play.



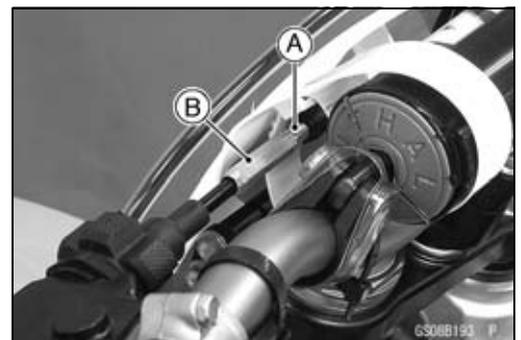
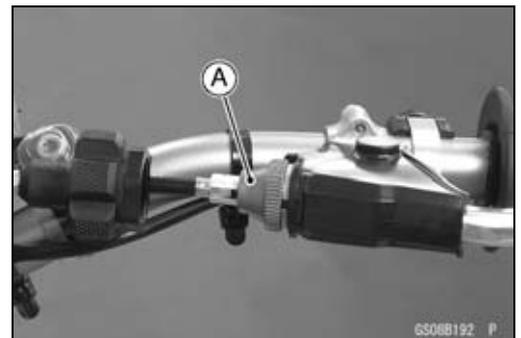
**Clutch Lever (Clutch Cable) Free Play Adjustment**

- Slide the clutch lever dust cover out of place.
- Turn the adjuster [A] so that the clutch lever will have 8 ~ 13 mm (0.3 ~ 0.5 in.) of play.

**NOTE**

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

- If it cannot be done, loosen the locknut [A] at the middle of the clutch cable, and turn the adjusting nut [B] so that the clutch lever has 8 ~ 13 mm (0.3 ~ 0.5 in.) of play.
- After the adjustment is made, tighten the locknut, and start the engine and check that the clutch does not slip and that it release properly.



## 2-26 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Clutch Plates Inspection

- Remove the clutch plates (see Clutch Removal in the Clutch chapter).
- Visually inspect the friction and steel plates to see if they show any signs of seizure, or uneven wear.
- ★ If any plates show signs of damage, replace the friction plates and steel plates as a set.
- Measure the thickness [A] of the friction plates with vernier calipers.

#### Friction Plate Thickness

**Standard:** 2.92 ~ 3.08 mm (0.115 ~ 0.121 in.)

**Service Limit:** 2.6 mm (0.10 in.)

- ★ If they have worn past the service limit, replace them with new ones.

- 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.

#### Friction and Steel Plates Warp

##### Standard:

**Friction Plate** 0.15 mm (0.0059 in.) or less

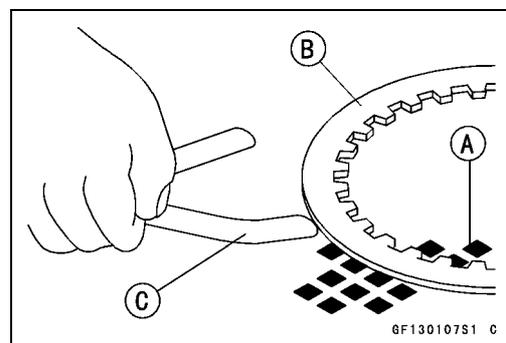
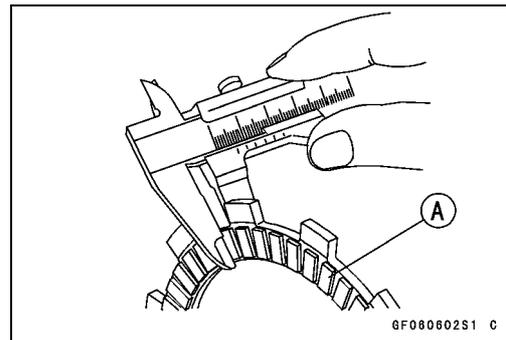
**Steel Plate** 0.2 mm (0.008 in.) or less

##### Service Limit:

**Friction Plate** 0.3 mm (0.01 in.)

**Steel Plate** 0.3 mm (0.01 in.)

- ★ If any plate is warped over the service limit, replace it with a new one.



## Engine Lubrication System

### Engine Oil Change

- Warm up the engine thoroughly so that the oil will pick up any sediment and drain easily. Then stop the engine.
- Remove the engine oil drain bolts on the bottom of the engine, and let the oil drain completely.
  - Drain Bolt (M6) [A]
  - Drain Bolt (M10) [B]

#### NOTE

○ Hold the motorcycle upright so that the oil may drain completely.

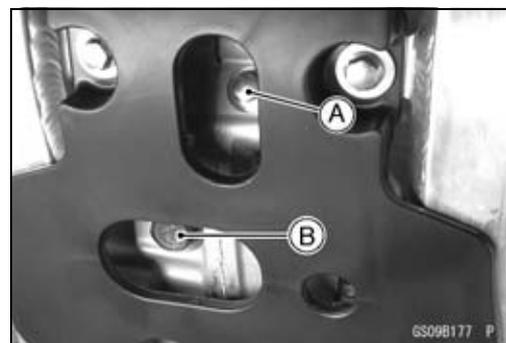
- Replace the gaskets at the drain bolts with a new one.
- After the oil has completely drained out, install the drain bolts with the gaskets, and tighten them.

#### Torque - Engine Oil Drain Bolts

**Transmission Room Oil Sump:** 20 N-m (2.0 kgf-m, 15 ft-lb)

**Crank Room Oil Sump:** 7.0 N-m (0.71 kgf-m, 62 in-lb)

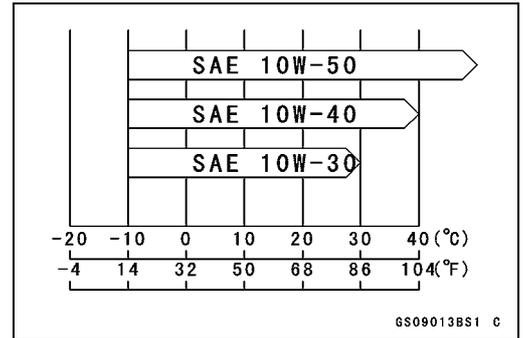
- Fill the engine with a good quality engine oil specified below.



Periodic Maintenance Procedures

Recommended Engine

- Type **Castrol "POWER1 R4 Racing" 5W-40 or API SG API SH, SJ or SL with JASO MA, MA1 or MA2**
- Viscosity **SAE 10W-30, 10W-40, 10W-50**
- Capacity **0.96 L (1.01 US qt.) (when filter is not removed)**  
**0.98 L (1.03 US qt.) (when filter is remove)**  
**1.2 L (1.3 US qt.) (when engine is completely dry)**



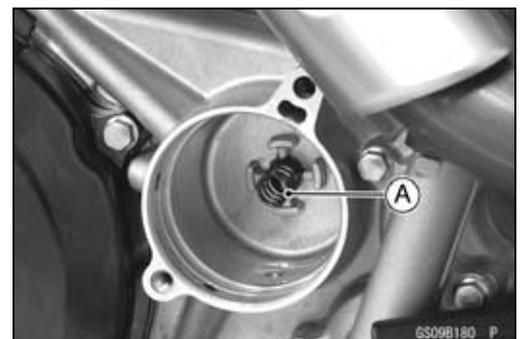
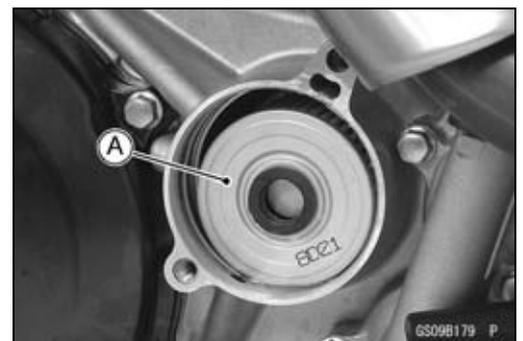
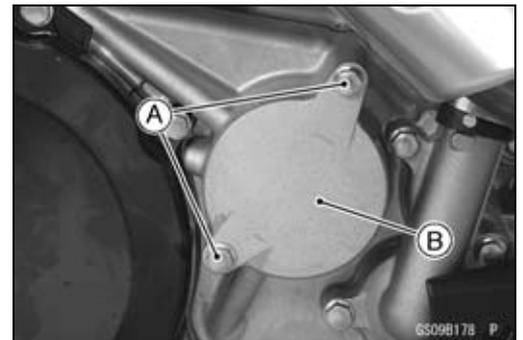
**NOTE**

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

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

**Oil Filter Change**

- Drain: Engine Oil (see Engine Oil Change)
- Remove: Oil Filter Cover Bolts [A]  
Oil Filter Cover [B]
  
- Remove the Oil Filter [A].
  
- Replace the oil filter with a new one.
- Install the spring [A] to the right engine cover.



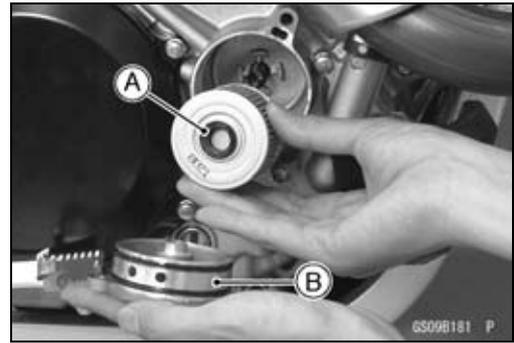
## 2-28 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Apply grease to the grommet [A].
- Install the filter to the filter cover [B] so that the grommet faces outside.

#### CAUTION

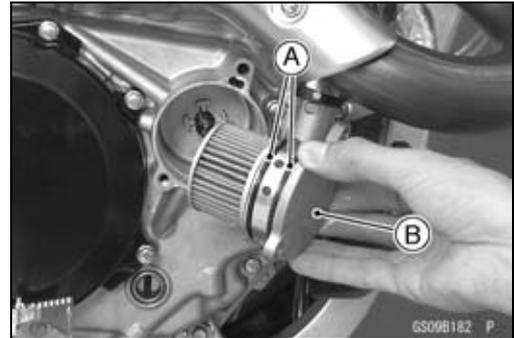
Inside out installation stop oil flow, causing engine seizure.



- Replace the oil filter cover O-rings [A] with new ones.
- Apply grease to the O-rings.
- Install the oil filter cover [B].

**Torque - Oil Filter Cover Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

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



#### **Breather Hose Inspection**

- Be certain that the breather hose are routed without being flattened or kinked and is connected correctly.
- ★ If it is not, correct it.
- Inspect the breather hose [A] for damage or signs of deterioration.
- This hose should not be hard and brittle, nor should be soft swollen.
- ★ Replace it if any cracks or swelling is noticed.



### Crankshaft/Transmission

#### **Crankshaft Inspection**

##### **Connecting Rod Big End Side Clearance**

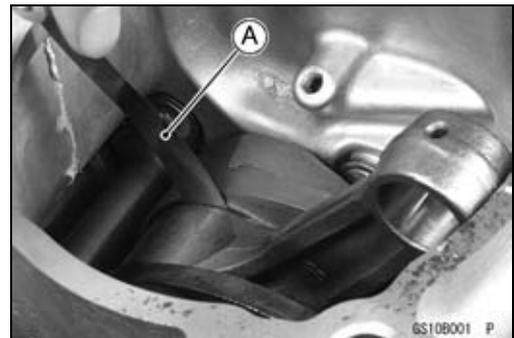
- Remove the piston (see Piston Removal in the Engine Top End chapter).
- Measure the connecting rod big end side clearance at right side of big end using a thickness gauge [A].

##### **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.
- Make sure that the crankshaft rotates smoothly after assembling the engine.

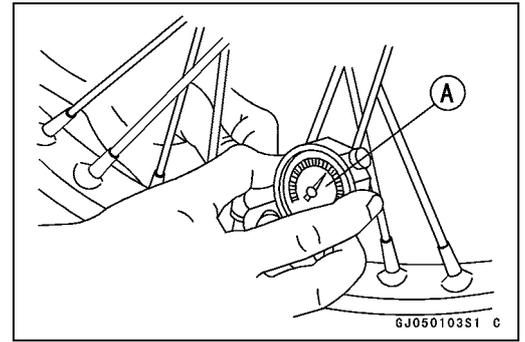


**Periodic Maintenance Procedures**

**Wheel/Tires**

**Air Pressure Inspection/Adjustment**

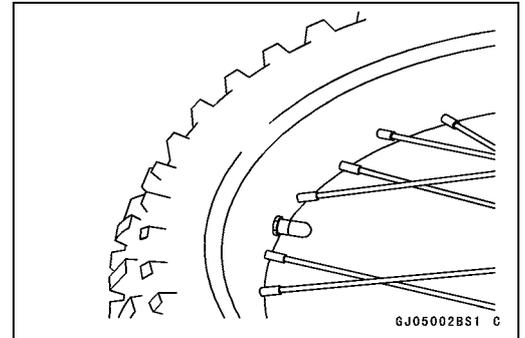
- Using tire air pressure gauge [A], measure the tire pressure when the tires are cold.
- ★ Adjust the tire air pressure to suit track conditions and rider preference, but do not stray too far from the recommended pressure.



Track Condition	Tire Pressure
○ When the track is wet, muddy, sandy or slippery, reduce the tire pressure to increase the tire tread surface on the ground.	80 kPa (0.8 kgf/cm <sup>2</sup> , 11 psi) ↑
○ When the track is pebbly or hard, increase the tire pressure to prevent damage or punctures, though the tires will skid more easily.	↓ 100 kPa (1.0 kgf/cm <sup>2</sup> , 14 psi)

**Tires Inspection**

- Inspect the side wall and tread of the tire for any damage or small cracks.
- ★ Replace the tire with new one if there is any damage.
- Remove any imbedded stones or other foreign particles from the tread.
- Visually inspect the tire for cracks and cuts, replacing the tire in case of bad damage. Swelling or high spots indicate internal damage, requiring tire replacement.
- ★ Repair the tire or replace the tire with new one if there is any damage.



**⚠ WARNING**

**To ensure safe 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.

**Standard Tire**

**Front:**

- Size:** 90/100-21 57M
- Make:** DUNLOP
- Type:** D742F, Tube

**Rear:**

- Size:** 120/80-19 63M
- Make:** DUNLOP
- Type:** D756, Tube

## 2-30 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Spoke Tightness Inspection

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

**Torque - Spoke Nipples: 2.2 N·m (0.22 kgf·m, 19 in·lb)**

#### **⚠ WARNING**

**If any spoke breaks, it should be replaced immediately. A missing spoke places an additional load on the other spokes, which will eventually cause other spokes to break.**

- Check the rim runout (see Rim Runout Inspection).

#### Rim Runout Inspection

- Place the jack under the frame so that the front/rear wheel off the ground.

**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:

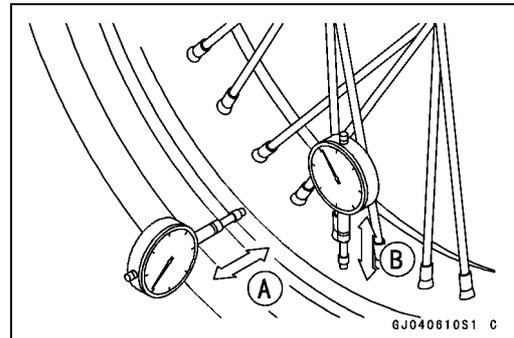
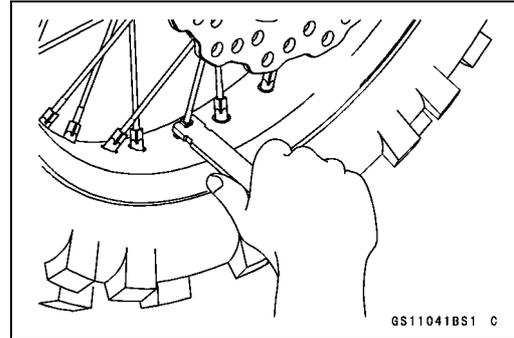
**Axial TIR 1.0 mm (0.039 in.) or less**

**Radial TIR 1.0 mm (0.039 in.) or less**

##### Service Limit:

**Axial TIR 2 mm (0.08 in.)**

**Radial TIR 2 mm (0.08 in.)**



**Periodic Maintenance Procedures**

**Wheel Bearing Inspection**

- Raise the front/rear wheel off the ground.
- Special Tool - Jack: 57001-1238**
- Spin the wheel lightly, and check for roughness, binding or noise.
- ★ If roughness, binding, abnormal noise is found, replace the hub bearing.



- Turn the handlebar until the handlebar doesn't move to either side.
- The wheel edge is moved to one direction gripping the edge of the wheel by both hands and the play of the wheel bearing is checked.
- ★ If the play is found, replace the bearing.



**Final Drive**

**Drive Chain Slack Inspection**

- Raise the rear wheel off the ground, rotate the rear wheel to find the place where the chain is tightest (because it wears unevenly).
- Check the wheel alignment (see Wheel Alignment Inspection in the Final Drive chapter), and adjust it if necessary (see Drive Chain Slack Adjustment).

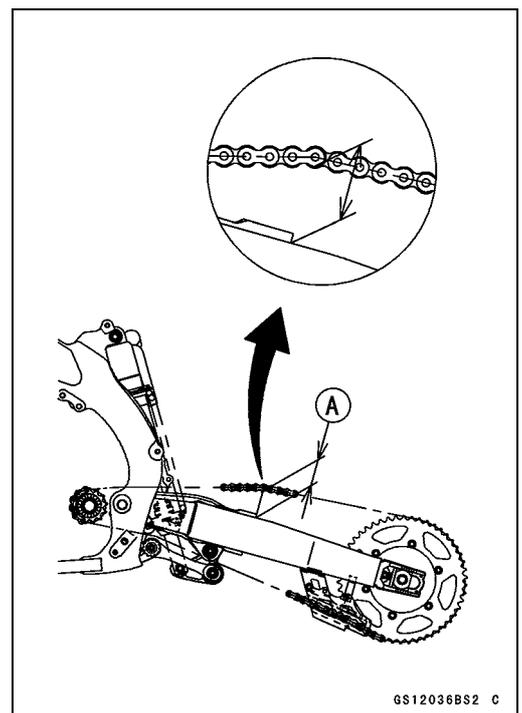
**NOTE**

○ Clean the drive chain if it is dirty, and lubricate it if it appears dry.

- Rotate the rear wheel to find the position where the chain is tightest.
- Measure the space (chain slack) between the chain and the swingarm at the rear of the chain slipper as shown.
- ★ If the drive chain slack [A] exceeds the standard, adjust it.

**Chain Slack**

Standard: 52 ~ 58 mm (2.0 ~ 2.3 in.)

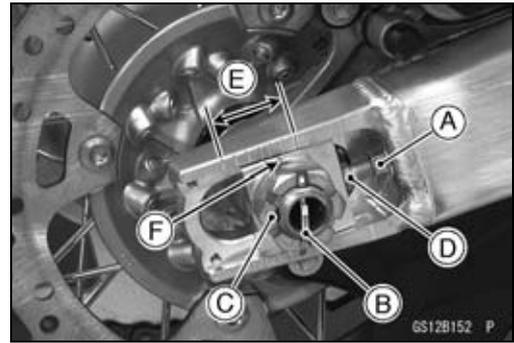


## 2-32 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Drive Chain Slack Adjustment

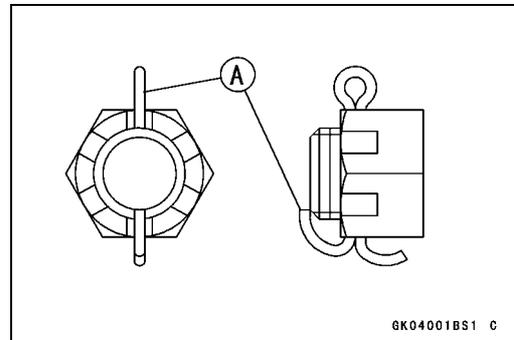
- Loosen the left and right chain adjuster locknuts [A].
- Remove the cotter pin [B] and loosen the axle nut [C].
- ★ If the chain is too tight, back out the left and right chain adjusting bolts [D] evenly, and push the wheel forward until the chain is too loose.
- ★ If the chain is too loose, turn both chain adjusting bolts evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the notch on the left chain adjuster should align with the same swingarm mark [E] as the right chain adjuster notch [F].
- ★ Check the wheel alignment.



#### **⚠ WARNING**

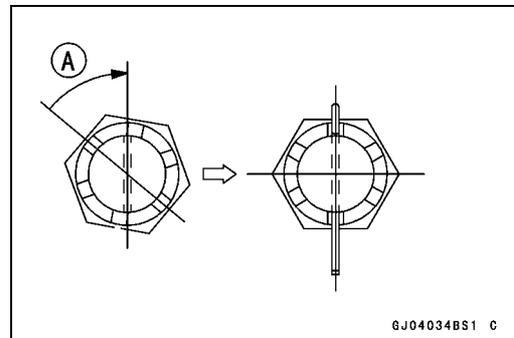
**Misalignment of the wheel result in abnormal wear and may result in an unsafe riding condition.**

- Tighten both chain adjuster locknuts securely.
- Tighten:  
**Torque - Rear Axle Nut: 110 N·m (11.2 kgf·m, 81.1 ft·lb)**
- Rotate the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Install a new cotter pin [A] through the axle nut and axle, and spread its ends.



#### **NOTE**

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



#### **⚠ WARNING**

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

- Check the rear brake.

#### **NOTE**

- In wet and muddy conditions, mud sticks to the chain and sprockets resulting in an overly tight chain, and the chain may break. To prevent this, adjust the chain to 58 ~ 68 mm (2.28 ~ 2.68 in.) of slack whenever necessary.

**Periodic Maintenance Procedures**

**Drive Chain Wear Inspection**

- 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.

- [A] Bushing
- [B] Roller
- [C] Pin
- [D] Pin Link
- [E] Roller Link

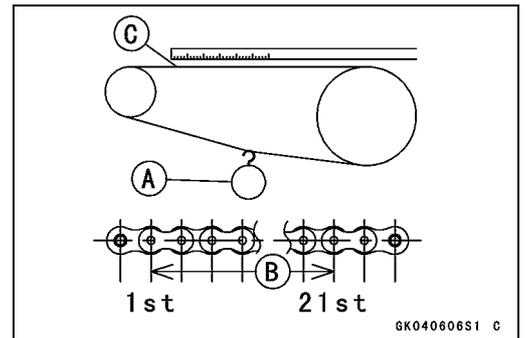
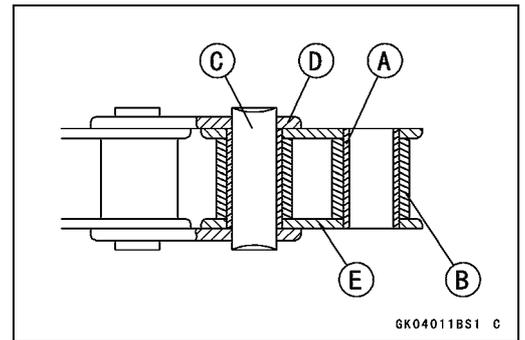
- Stretch the chain taut by hanging a 98 N (10 kgf, 20 lb) weight [A] on the chain.
- Measure the length of 20 links [B] on the straight part [C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.

**Chain 20-link Length**

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

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

- ★ If any measurements exceed the service limit, replace the chain. Also, replace the front and rear sprockets when the drive chain is replaced.



**⚠ WARNING**

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

**Standard Chain**

- Make:** DAIDO
- Type:** D.I.D 520DMA2
- Link:** 114 Links

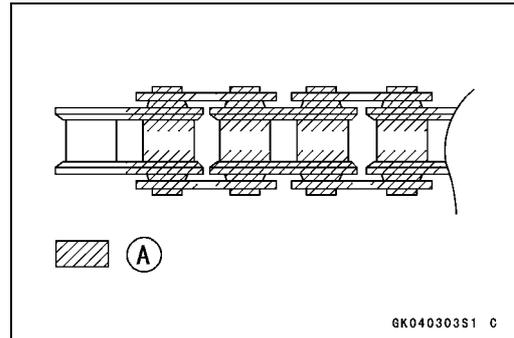
**Drive Chain Lubrication**

- The chain should be lubricated with a lubricant which will both prevent the exterior from rusting and also absorb shock and reduce friction in the interior of the chain.
- ★ If the chain is especially dirty, it should be washed in diesel oil or kerosene, and afterward soaked in a heavy oil. Shake the chain while it is in the oil so that oil will penetrate to the inside of each roller.
- An effective, good quality lubricant specially formulated for chains is best for regular chain lubrication.

## 2-34 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- If a special lubricant is not available, a heavy oil such as SAE90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.
- Apply oil to the sides of the rollers so that oil will penetrate into the rollers and bushings.
- Wipe off any excess oil.  
Oil applied area [A]

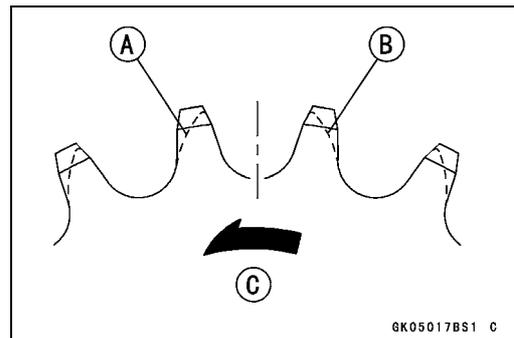


### Sprocket Wear Inspection

- Visually inspect the front and rear sprocket teeth for wear and damage.
- ★ If they are worn as illustrated or damaged, replace the sprocket.  
[A] Worn Tooth (Engine Sprocket)  
[B] Worn Tooth (Rear Sprocket)  
[C] Direction of Rotation

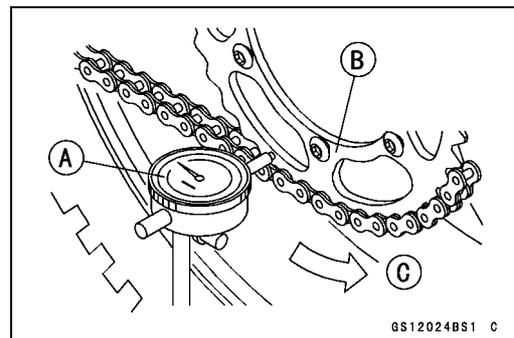
#### NOTE

○ If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.



### Rear Sprocket Warp (Runout) Inspection

- Using the jack, raise the rear wheel off the ground (see Wheels/Tires chapter).
- **Special Tool - Jack: 57001-1238**
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown.
- 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 (Runout)

Standard: TIR 0.4 mm (0.016 in.) or less  
Service Limit: TIR 0.5 mm (0.020 in.)

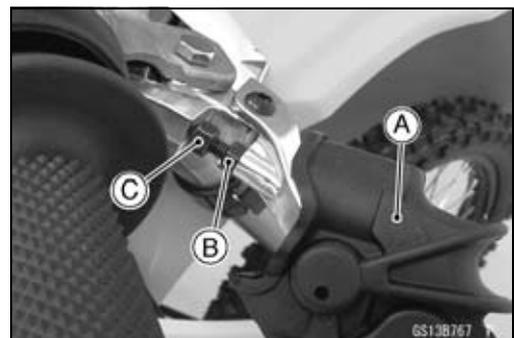
## Brakes

### Brake Lever and Pedal Position Adjustment

- Adjust the front brake lever to suit you.
- Slide the brake lever dust cover [A] out of place.
- Loosen the adjuster locknut [B] and turn the adjuster [C] to either side.
- After adjustment, tighten the locknut.

#### ⚠ WARNING

Always maintain proper brake adjustment. If adjustment is improper, the brake could drag and overheat. This could damage the brake assembly and possibly lock the wheel resulting in loss of control.



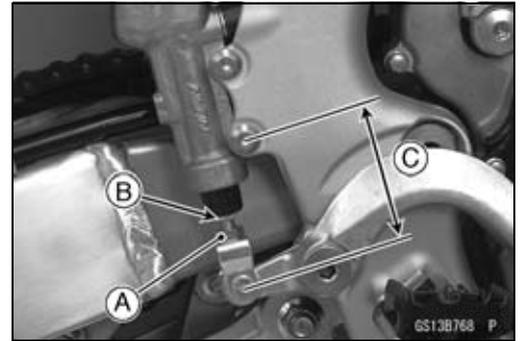
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**Periodic Maintenance Procedures**

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**NOTE**

- Usually it is not necessary to adjust the pedal position, but always adjust it when the master cylinder is disassembled or pedal position is incorrect.
- Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.
- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.
- ★ If the length [C] shown is **68.5 ±1 mm (2.70 ±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)**



## 2-36 PERIODIC MAINTENANCE

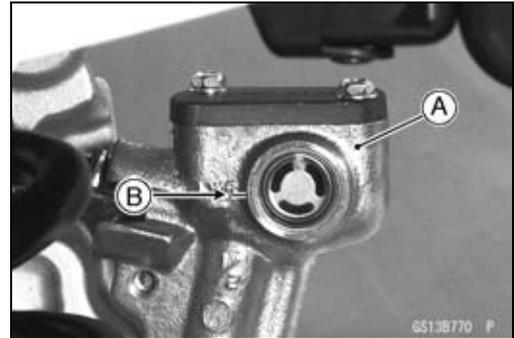
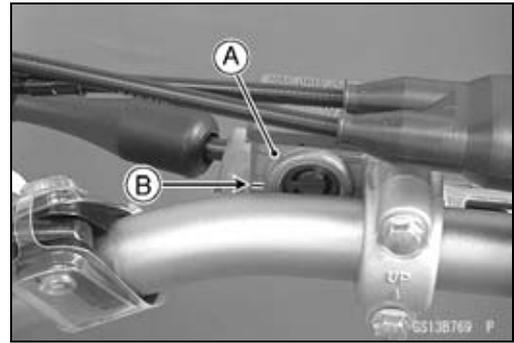
### Periodic Maintenance Procedures

#### **Brake Fluid Level Inspection**

- Check the brake fluid level in the front or rear brake reservoir [A] and the front or rear reservoir must be kept above the lower level line [B].
- ★ If the fluid level in front or rear reservoir is lower than the lower level line, fill the reservoir to the upper level line.

#### **NOTE**

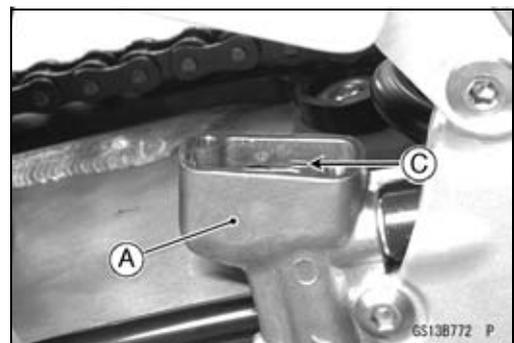
○ Hold the reservoir horizontal when checking brake fluid level.



- Inside the reservoir is stopped end showing the upper level line [C].

#### **⚠ WARNING**

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



## Periodic Maintenance Procedures

### Brake Fluid Change

#### ⚠ 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 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.**

#### Recommended Disc Brake Fluid

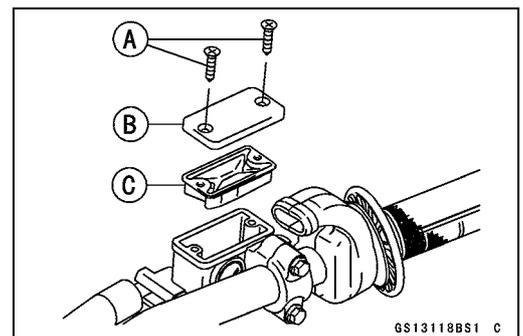
##### Type:

- |       |              |
|-------|--------------|
| Front | DOT3 or DOT4 |
| Rear  | DOT4         |

#### NOTE

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

- Level the brake fluid reservoir.
- Remove the screws [A], reservoir cap [B] and diaphragm [C].

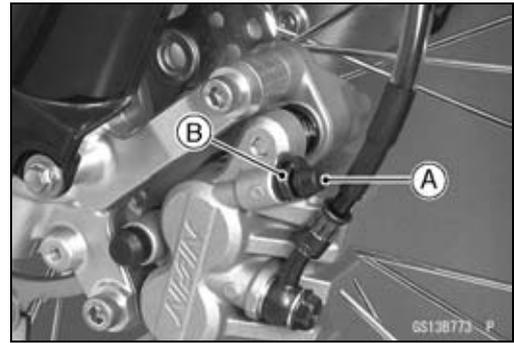


GS13118BS1 C

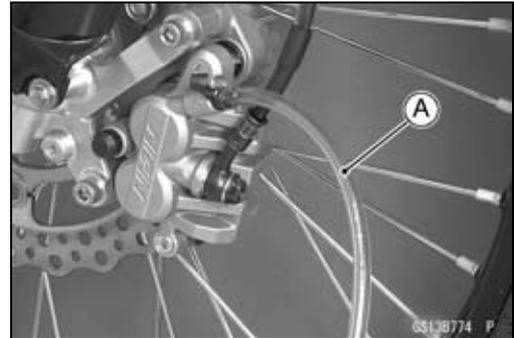
## 2-38 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Remove the rubber cap [A] on the bleed valve [B].



- Attach a clear plastic hose [A] to the bleed valve on the caliper, and run the other end of the hose into a container.



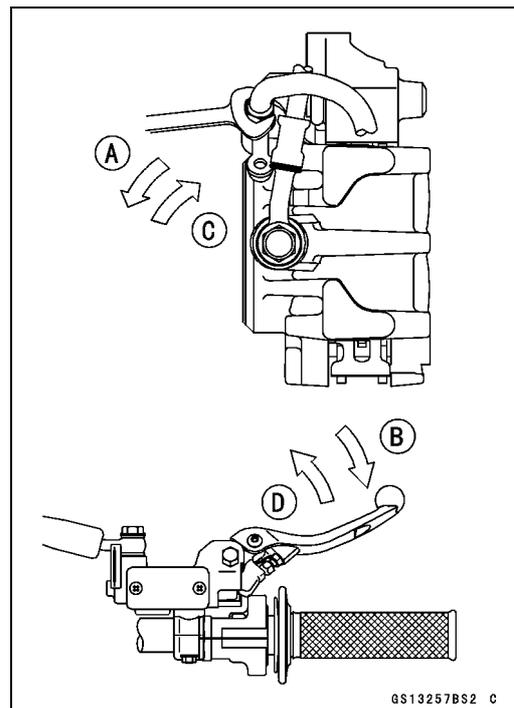
- Change the brake fluid as follows:
  - Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
  - 1. Open the bleed valve [A]
  - 2. Apply the brake and hold it [B]
  - 3. Close the bleed valve [C]
  - 4. Release the brake [D]

#### **WARNING**

**Do not mix two brands of fluid. Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that is already in the reservoir are unidentified.**

#### **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.

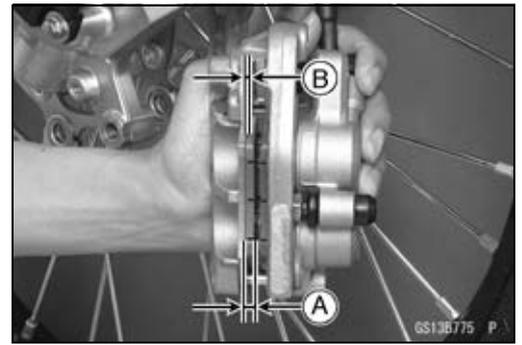


- Remove the clear plastic hose.
- Tighten the bleed valves, and install the rubber caps.
  - Torque - Caliper Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
  - Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)**
- After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.
- ★ If necessary, bleed the air from the lines (see Bleeding the Brake Line in the Brakes chapter).

**Periodic Maintenance Procedures**

**Brake Pad Wear Inspection**

- Remove the front brake caliper (see Caliper Removal in the Brakes chapter).
- Check the lining thickness and condition of the pads in each caliper.
- ★ If either pad is damaged, replace both pads in the caliper as a set.
- ★ If the lining thickness [A] of either pad is less than the service limit [B], replace both pads in the caliper as a set.



**Lining Thickness**

**Standard:**

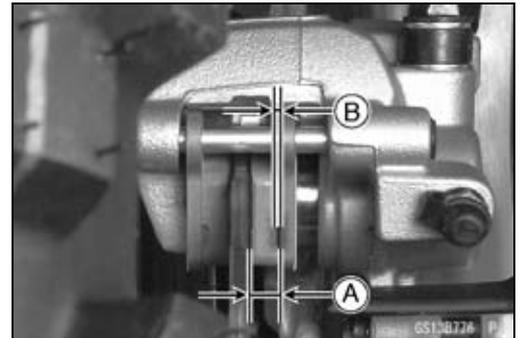
Front 4.0 mm (0.16 in.)

Rear 6.4 mm (0.25 in.)

**Service Limit:**

Front 1 mm (0.04 in.)

Rear 1 mm (0.04 in.)

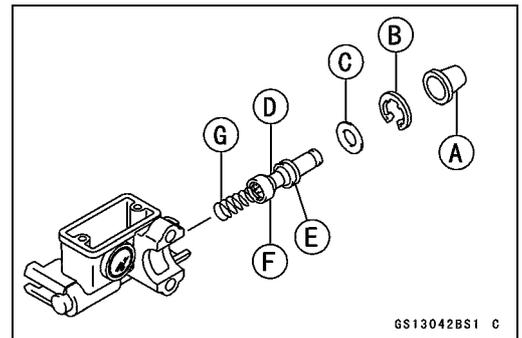


**Brake Master Cylinder Cup and Dust Cover Replacement**

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

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

- Remove the washer [C] and then pull out the piston [D], secondary cup [E], primary cup [F], and return spring [G].



**CAUTION**

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

- Remove the rear master cylinder (see Rear Master Cylinder Removal in the Brakes chapter).

**NOTE**

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

## 2-40 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Remove the reservoir cap and diaphragm, and pour the brake fluid into a container.
- Slide the dust cover [A] on the push rod [B] out of place, and remove the circlip [C].

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

- Pull out the push rod with the piston stop [D].
- Take off the piston [E], secondary cup [F], primary cup [G], and return spring [H].

#### CAUTION

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

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

#### CAUTION

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

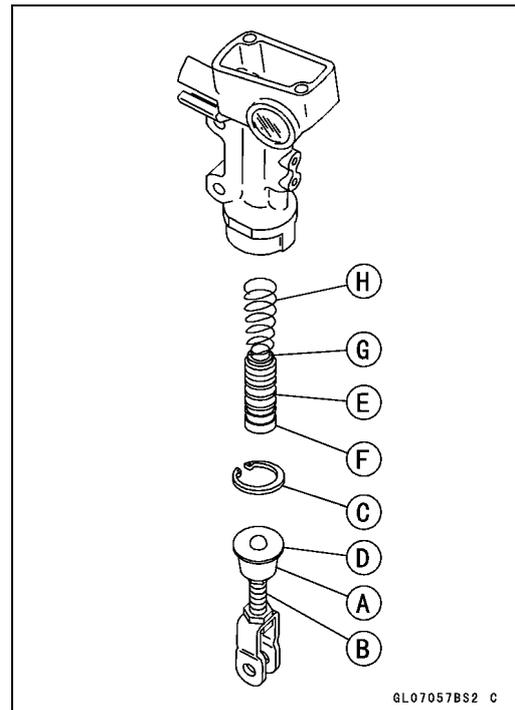
- Apply brake fluid to the removed parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Apply silicone grease (ex. PBC grease).
  - Brake Lever Pivot Bolt
  - Brake Lever Pivot Contact
  - Push Rod Contact (Rear)
  - Dust Covers
- Tighten:

**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)**

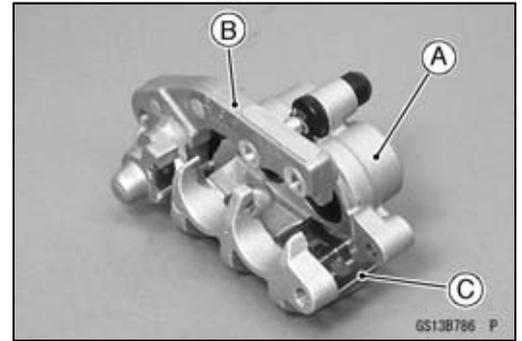
### ***Brake Caliper Fluid Seal and Dust Seal Replacement***

- Remove:
  - Front Caliper (see Front Caliper Removal in the Brakes chapter)
  - Brake Pads (see Brake Pad Removal in the Brakes chapter)

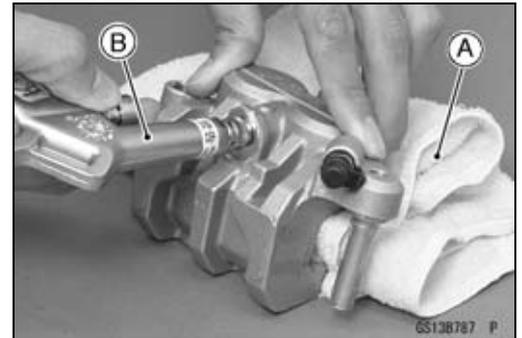


Periodic Maintenance Procedures

- Remove the caliper holder [A] from the caliper [B] and remove the anti-rattle spring [C].



- Using compressed air, remove the pistons. One way to remove the pistons is as follows.
  - Cover the caliper opening with a clean, heavy cloth [A].
  - Remove the pistons by lightly applying compressed air [B] to the hose joint opening.



**NOTE**

○ The front caliper is built into the two pistons. When remove one piston using compressed air, the another piston comes off previously. To come off the remaining piston, the edge of the piston that came off previously is pushed into the cylinder a little, and repeat the same work.

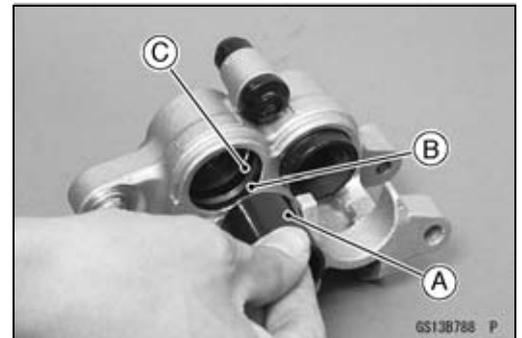
**⚠ WARNING**

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

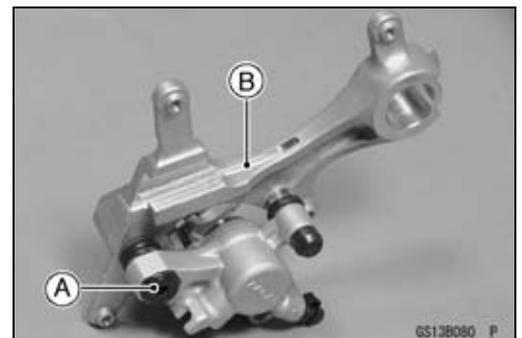
- Pull out the pistons [A] by hand.
- Remove the dust seals [B] and fluid seals [C].

**NOTE**

○ If compressed air is not available, do as follows for both calipers coincidentally, with the brake hose connected to the caliper.  
 ○ Prepare a container for brake fluid, and perform the work above it.  
 ○ Remove the spring and pads (see Brake Pad Removal in the Brakes chapter).  
 ○ Pump the brake lever until the pistons come out of the cylinders, and then disassemble the caliper.



- Remove the rear caliper (see Caliper Removal in the Brakes chapter).
- Remove the pads (see Brake Pad Removal in the Brakes chapter).
- Separate the caliper holder [B] from the caliper [A].



## 2-42 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Using compressed air, remove the piston.
- Cover the caliper opening with a clean, heavy cloth [A].
- Remove the piston by lightly applying compressed air [B] to where the brake line fits into the caliper.

#### **⚠ WARNING**

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

- Pull out the piston [A] by hand.
- Remove the dust seal [B] and fluid seal [C].
- Clean the caliper parts except for the pads.

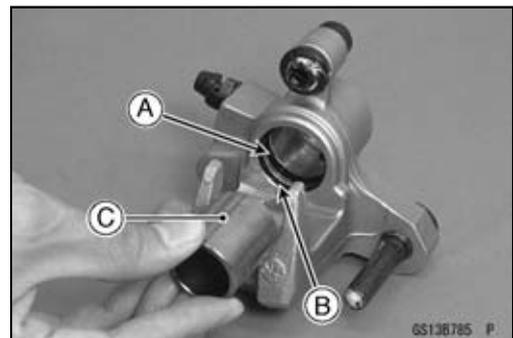
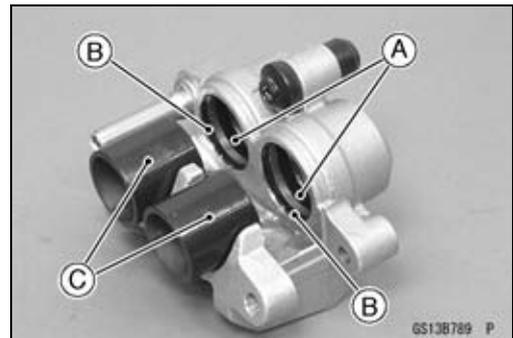
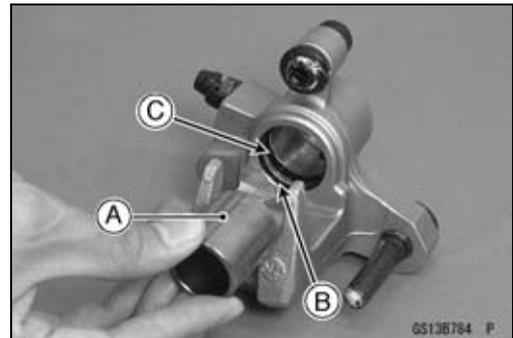
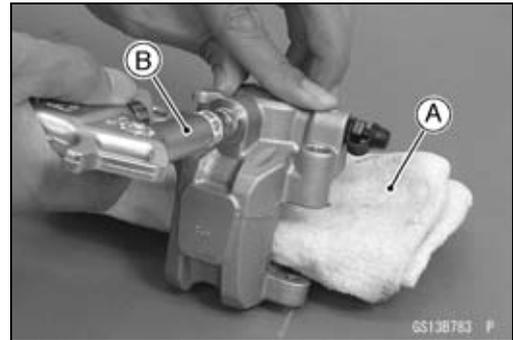
#### **CAUTION**

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

- The bleed valve was removed, install the bleed valve and rubber cap.

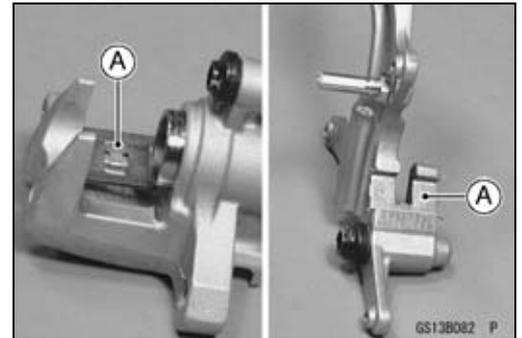
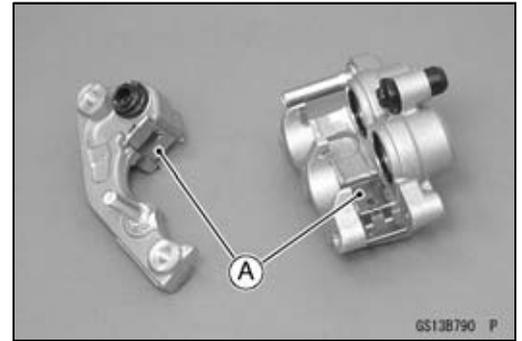
**Torque - Caliper Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

- Replace the fluid seal(s) [A] with new ones.
- Replace the dust seal(s) [B] with new ones.
- Assemble the front and rear caliper as follows.
  - Apply brake fluid to the fluid seal(s), and install them into the cylinders by hand.
  - Apply brake fluid to the dust seal(s), and install them into the cylinder by hand.
  - Apply brake fluid to the outside of the piston(s) [C], and push them into each cylinder by hand.

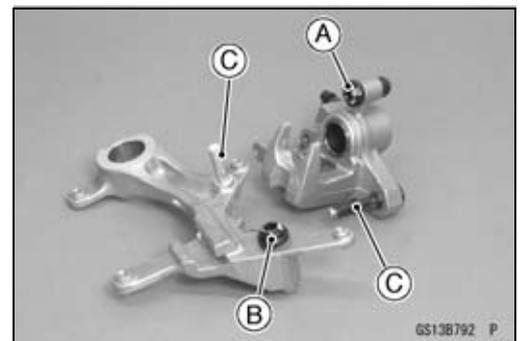
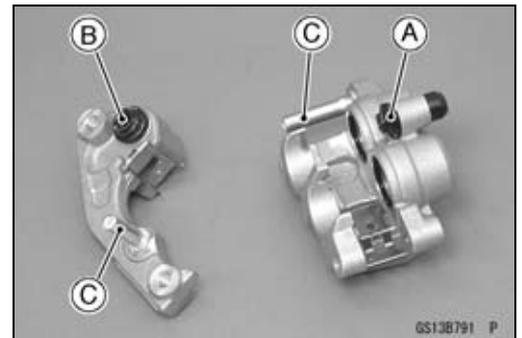


Periodic Maintenance Procedures

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



- Replace the shaft rubber 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 (PBC is a special high temperature, water-resistance grease).



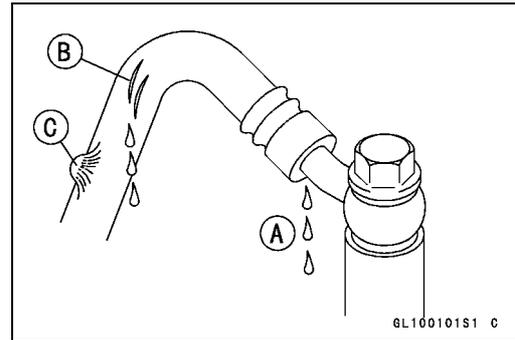
- Install the pads (see Brake Pad Installation in the Brakes chapter).
- Install the caliper (see Caliper Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.

## 2-44 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **Brake Hoses and Connections Inspection**

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



#### **Brake Hose Replacement**

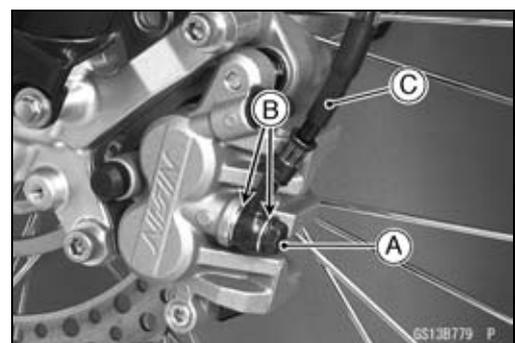
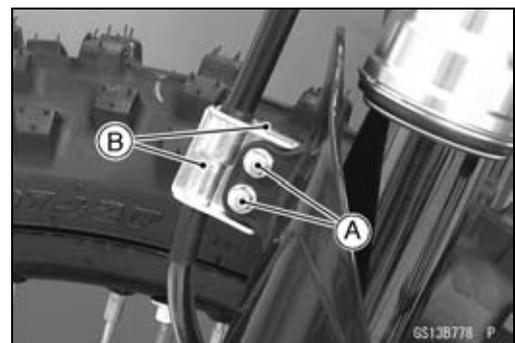
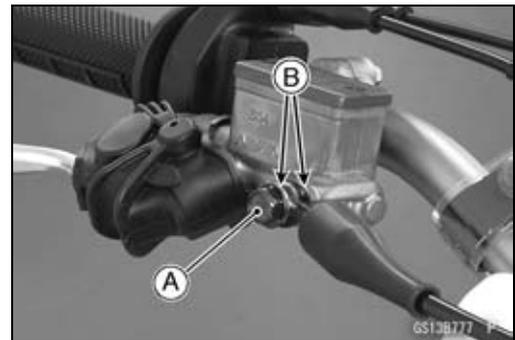
##### **CAUTION**

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

- 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.

#### **Front Brake**

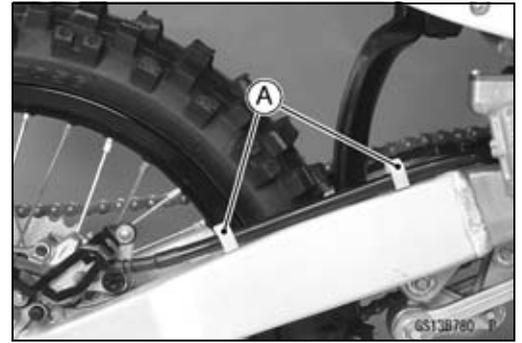
- Remove:
  - Banjo Bolt [A]
  - Washers [B]
  
- Remove:
  - Bolts [A]
  - Brake Hose Clamps [B]
  
- Remove:
  - Banjo Bolt [A]
  - Washers [B]
  - Brake Hose Clamp [C]



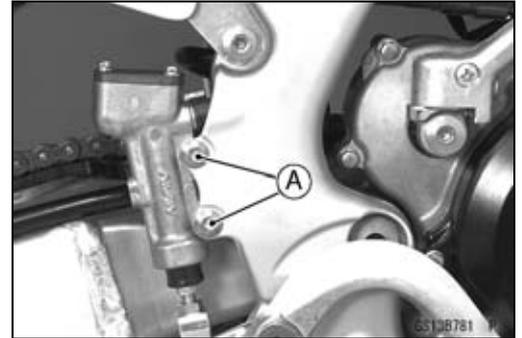
Periodic Maintenance Procedures

Rear Brake

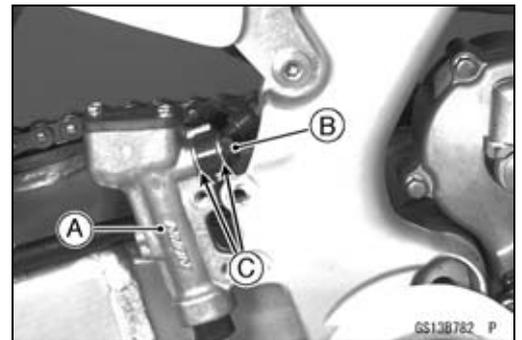
- Remove:  
Brake Hose Clamps [A]



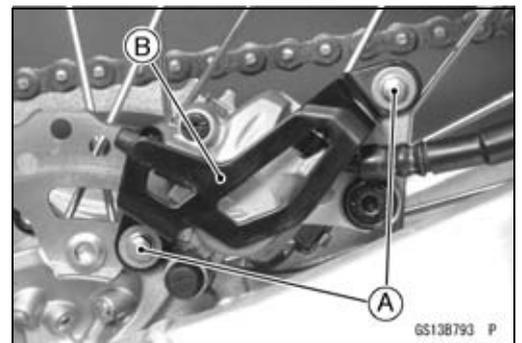
- Remove:  
Rear Master Cylinder Mounting Bolts [A]



- Slide the rear master cylinder [A] backward.
- Remove:  
Banjo Bolt [B]  
Washers [C]



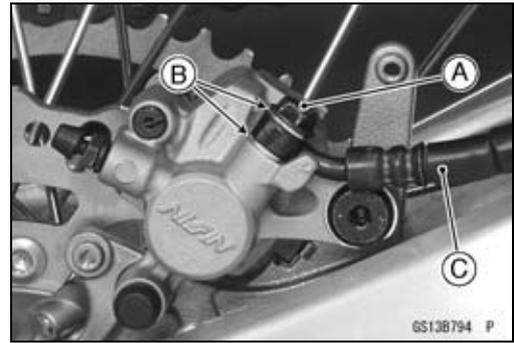
- Remove:  
Bolts [A]  
Rear Caliper Guard [B]



## 2-46 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Remove:
  - Banjo Bolt [A]
  - Washers [B]
  - Brake Hose [C]
- There are washers on each side of the brake hose fitting. Replace them with new ones when installing.
- When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Tighten:
  - Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the rear master cylinder.
- Fill the brake line after installing the brake hose (see Brake Fluid Change).



## Suspension

### Front Fork Inspection

- Visually inspect the front fork for oil leakage, scoring or scratches on the outer surface of the inner tubes [A].
- Holding the brake lever, pump the front fork back and forth manually to check for smooth operation.
- ★ If necessary, repair any damage. If roughness, binding, or noise is found, check the tightness of the fork oil level and fork mount.
- Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.
- ★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

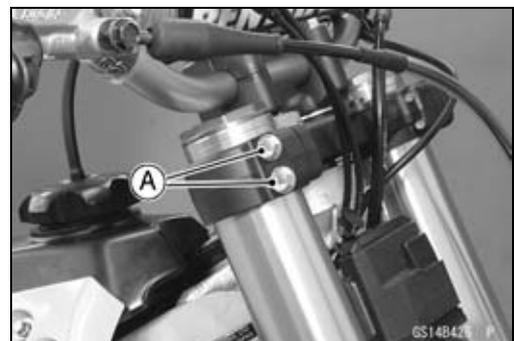


### CAUTION

If the inner tube is badly bent or creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.

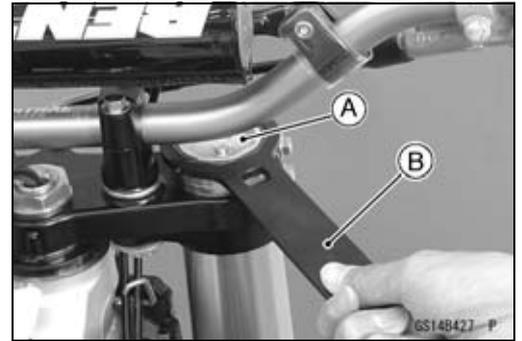
### Front Fork Oil Change (each fork leg)

- Remove:
  - Number Plate
- Loosen the upper front fork clamp bolts [A].



**Periodic Maintenance Procedures**

- Turn the handlebar to one side, and loosen the fork top plug [A].  
**Special Tool - Top Plug Wrench, 49 mm: 57001-1653 [B]**
- Remove:  
 Front Fork (see Front Fork Removal in the Suspension chapter)



**NOTE**

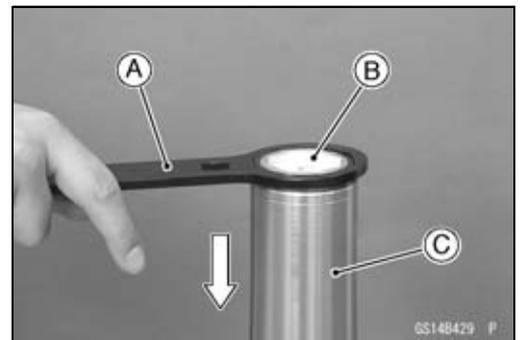
○ Set rebound and compression damping setting to the softest settings before disassembling to prevent the needle of adjusters from damaging. Record the setting before turning the adjuster.

- Thoroughly clean the fork before disassembly.

**CAUTION**

**Be careful not scratch the inner tube and not to damage the dust seal.  
 Avoid scratching or damaging the inner tube or the dust seal. Use a mild detergent and sponge out dirt with plenty of water.**

- Using the top plug wrench [A], remove the fork top plug [B] (subtank) from the outer tube and slowly slide down the outer tube [C].  
**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**



- Place an oil pan under the front fork and drain fork oil [A].

**NOTE**

○ Pump the fork tube several times to discharge the fork oil.

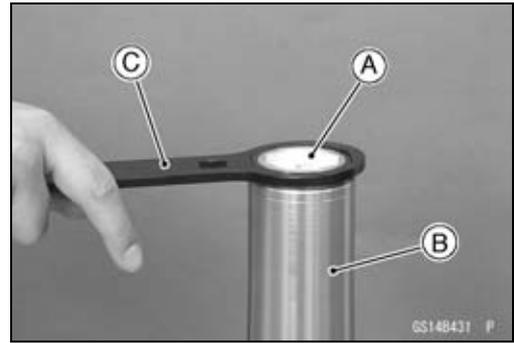


## 2-48 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Raise the outer tube and temporarily install the fork top plug [A] (subtank) to the outer tube [B] with the top plug wrench [C].

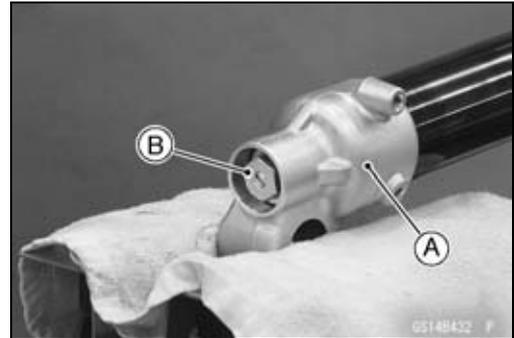
Special Tool - Top Plug Wrench, 49 mm: 57001-1653



- Hold the axle holder [A] with a vise.
- Protect the axle holder with a rag when using a vise.
- Loosen the adjuster assembly [B] completely.

#### **⚠ WARNING**

**Clamping the axle holder too tight can damage it which will affect riding stability. Do not clamp the axle holder too tight.**

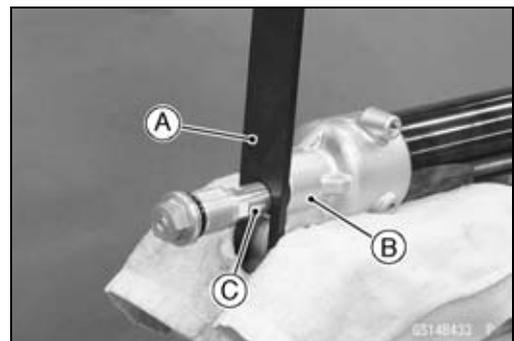


- Compress the outer tube by hands and install the top plug wrench [A] between the axle holder bottom [B] and locknut [C].

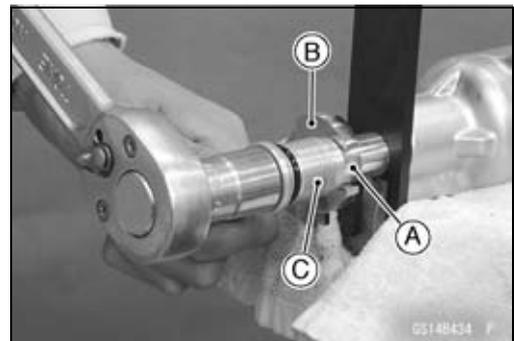
Special Tool - Top Plug Wrench, 49 mm: 57001-1653

#### **⚠ WARNING**

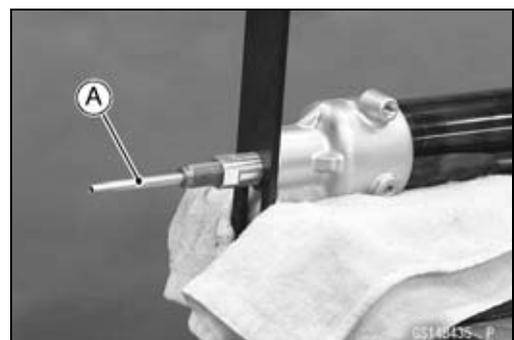
**Be careful of reaction force in spring and fix surely so that the special tool should not come off. Do not place the finger etc. while servicing.**



- Hold the locknut [A] with a wrench [B] and remove the adjuster assembly [C].



- Remove the push rod [A].



**Periodic Maintenance Procedures**

- With the outer tube compressed by hands, remove the top plug wrench [A].

**CAUTION**

**Removing the locknut and pushing the piston rod thread into the cylinder unit will damage the oil seal. Do not remove the locknut from the piston rod.**

- Remove the fork leg from the vise.
- Loosen the fork top plug (subtank) [A] with the top plug wrench [B].

**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**

- Remove:  
Cylinder Unit [A]  
Spacer [B]  
Fork Spring [C]

**CAUTION**

**Disassembling the cylinder unit can lead to trouble. Do not disassemble the cylinder unit.**

- Holding the top plug wrench (57001-1653) [A] with a vise, loosen the base valve assembly [B] using the top plug wrench (57001-1705) [C].

**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**  
**Top Plug Wrench, 36 mm: 57001-1705**

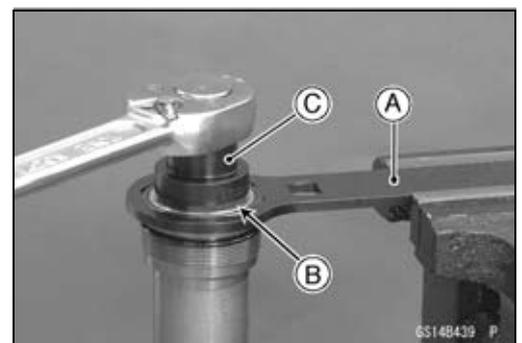
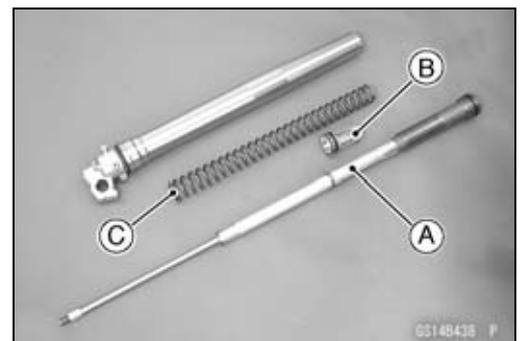
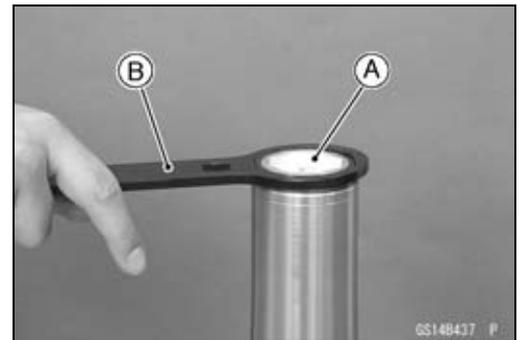
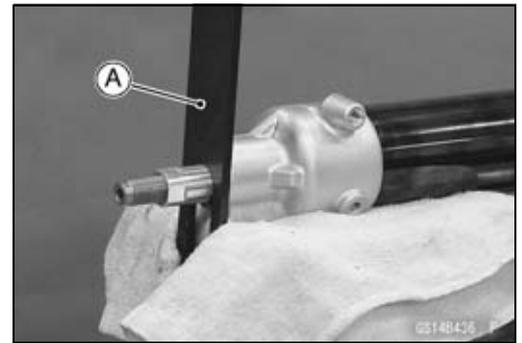
- Remove the base valve assembly [A] from the subtank [B].

**NOTE**

○ *Slowly compress the piston rod until it stops so that the base valve assembly can be removed easily.*

**CAUTION**

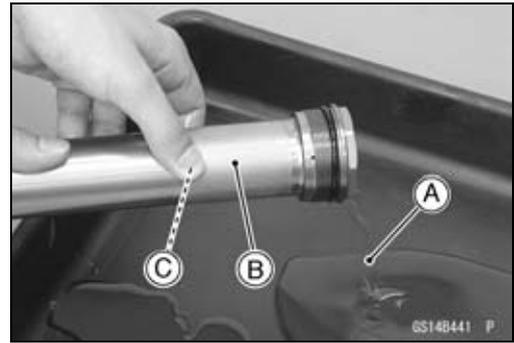
**Disassembling the base valve assembly can lead to trouble. Do not disassemble the base valve assembly.**



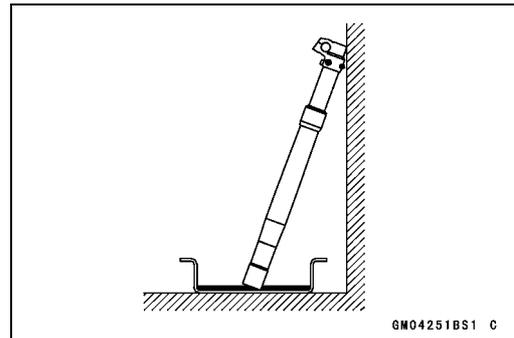
## 2-50 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

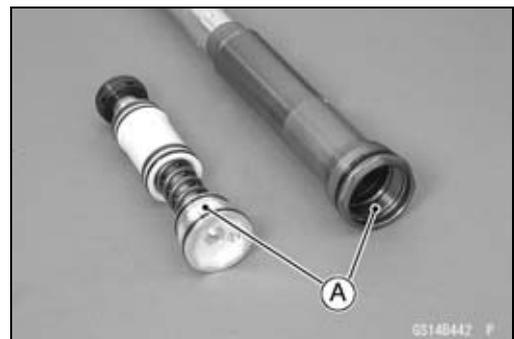
- Drain the fork oil [A] from the cylinder unit [B] by pumping the piston rod several times.
- Plug the two oil holes on the subtank [C] with fingers.



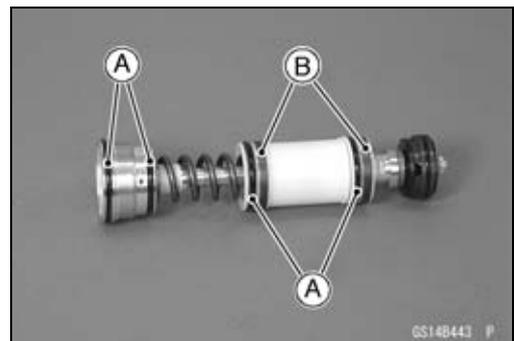
- Hold the front fork inverted position for more than 20 minutes to allow the fork oil to fully drain.



- Clean the threads [A] of subtank and base valve assembly.



- Replace the O-rings [A] on the base valve assembly with new ones.
- Apply specified fork oil to the O-rings and bushings [B] on the base valve assembly.



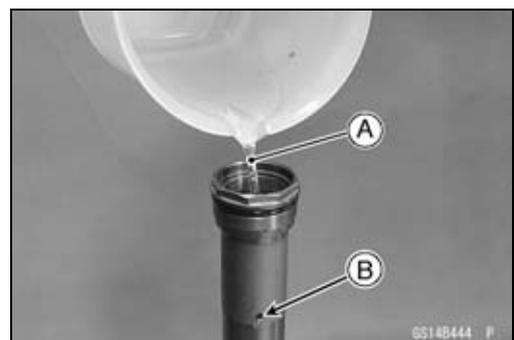
- With the piston rod in fully compressed position, pour the specified amount of fork oil [A].

**Recommended Oil:** KHL15-10 (KAYABA 01) or equivalent

**Recommended Quantity:** 191 ml (6.46 US oz.)

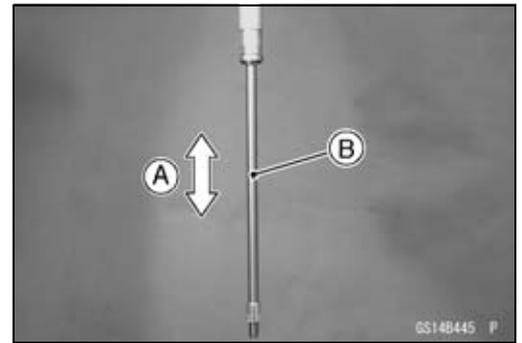
#### NOTE

- Plug the two oil holes on the subtank [B] with fingers until the base valve assembly is installed.

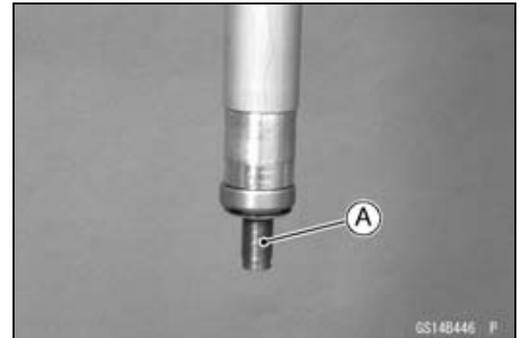


**Periodic Maintenance Procedures**

- Pump [A] the piston rod [B] slowly several times to expel air.



- With the piston rod held immovable in fully compressed position [A], gently install the base valve assembly [B] to the subtank.
- Screw in the base valve assembly in the subtank when the piston rod extends.

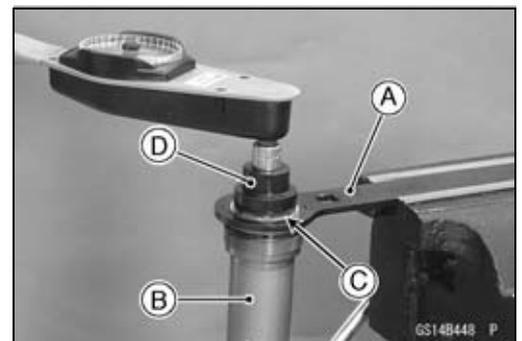


**NOTE**

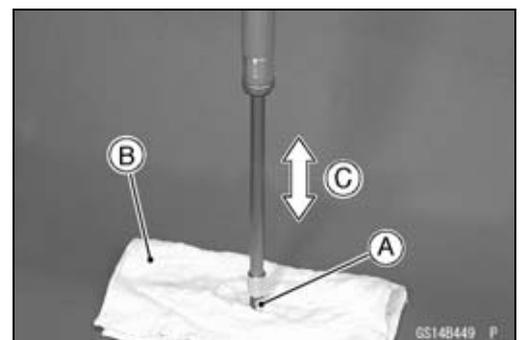
○When it is hard to screw in the base valve assembly, pull down the piston rod a little.



- Holding the top plug wrench (57001-1653) [A] with a vise.  
**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**  
**Top Plug Wrench, 36 mm: 57001-1705**
- Holding the subtank [B] with the top plug wrench (57001-1653), torque the base valve assembly [C] using the top plug wrench (57001-1705) [D].  
**Torque - Base Valve Assembly: 28 N·m (2.9 kgf·m, 21 ft·lb)**



- Protect the piston rod end [A] with a rag [B] to prevent fork damage.
- Discharge the extra oil off the cylinder unit by pumping [C] the piston rod to full stroke.



**CAUTION**

**Be careful not to bend or damage the piston rod when the piston rod is stroked. Service carefully because oil files out from the oil hole of the cylinder unit.**

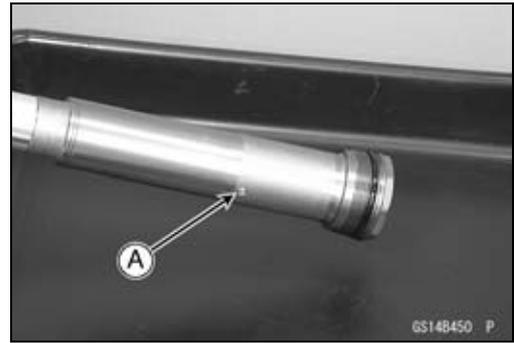
**NOTE**

- Set the compression damper setting to the softest.
- Check the piston rod sliding surface for damage.
- Apply fork oil to the piston rod sliding surface.

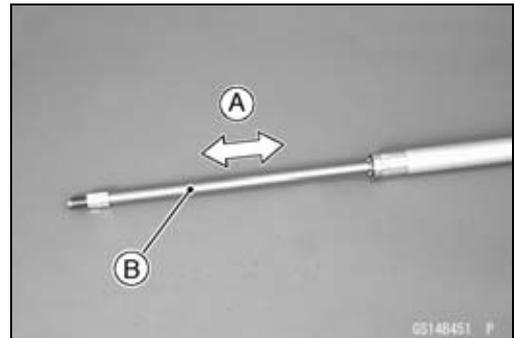
## 2-52 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

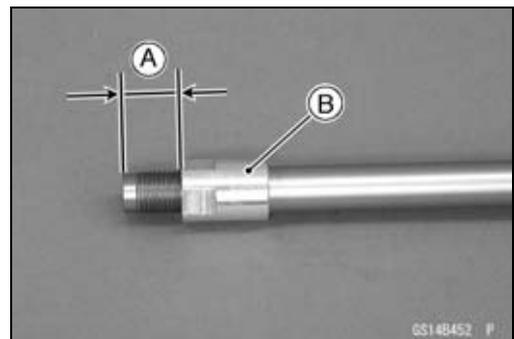
- Drain the extra oil from the subtank oil hole [A].



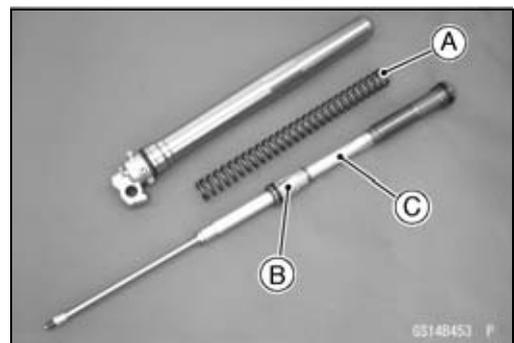
- With the cylinder unit in horizontal position, move [A] the piston rod [B] by hand to inspect it if operating smoothly.
- If the piston rod is not extend, remove the base valve assembly and perform the air bleeding (pour the specified amount fork oil and discharge an excess of oil).



- Make sure about 16 mm (0.63 in.) [A] of push rod thread is exposed from the locknut [B].



- Completely wipe of the fork oil from the spring [A], spacer [B] and cylinder unit [C].
- Insert above-mentioned parts into the fork.



- Clamp the axle holder with a vise.
- Protect the axle holder with a rag when using a vise.

#### **▲ WARNING**

**Clamping the axle holder too tight can damage it which will affect riding stability.  
Do not clamp the axle holder too tight.**

**Periodic Maintenance Procedures**

- Compress the outer tube by hands and install the top plug wrench [A] between the axle holder bottom and locknut.  
**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**

**⚠ WARNING**

**Be careful of reaction force in spring and fix surely so that special tool should not come off.  
 Do not place the fingers etc. while serving.**

- Insert the push rod [A] into the piston rod.

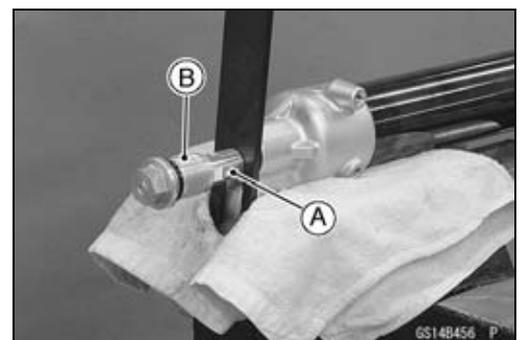
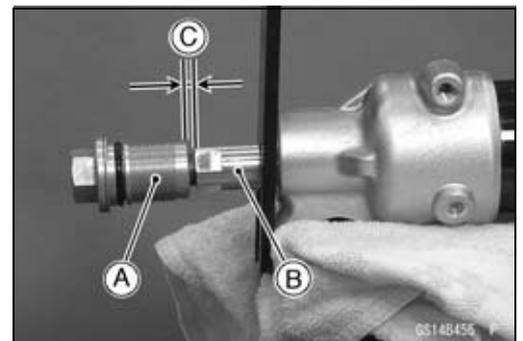
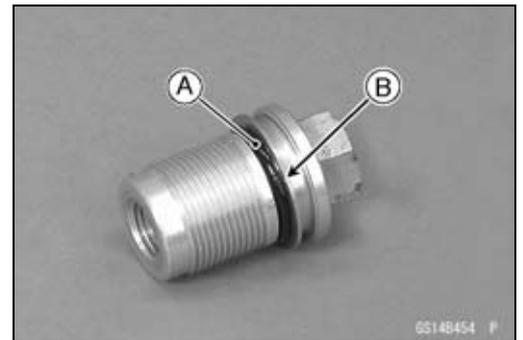
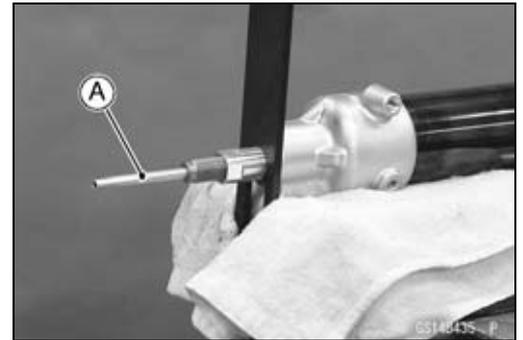
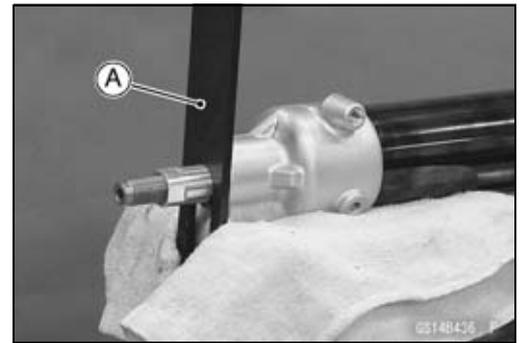
- Replace the O-ring [A] and gasket [B] on the adjuster assembly with new ones and apply specified fork oil to the O-ring.

- Slowly turn the adjuster assembly [A] clockwise until resistance is felt and check the clearance between the locknut [B] and adjuster assembly to provide more than 1 mm (0.04 in.) [C].

- Turn the locknut [A] counterclockwise until it contacts with the adjuster assembly [B].
- With the locknut held immovable using a wrench, tighten the adjuster assembly to the specified torque.

**Torque - Adjuster Assembly Locknut: 28 N·m (2.9 kgf·m, 22 ft·lb)**

- With the outer tube compressed by hands, remove the top plug wrench.

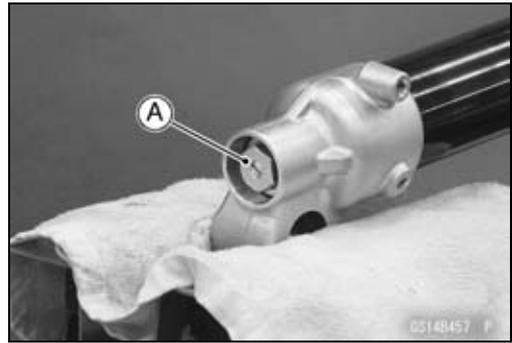


## 2-54 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Apply a non-permanent locking agent to the threads of a adjuster assembly.
- Torque the adjuster assembly [A].

**Torque - Adjuster Assembly: 55 N·m (5.6 kgf·m, 40 ft·lb)**



- Loosen and remove the fork top plug (subtank) from the outer tube and slowly slide down the outer tube.

**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**

- Pour the specified amount of fork oil into the outer tube.

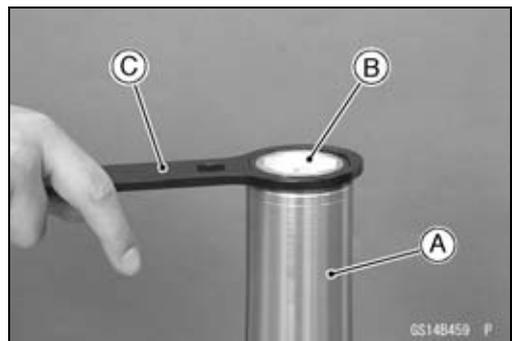
**Recommended Oil: KHL15-10 (KAYABA01) or equivalent**

**Recommended Quantity: 350 mL (11.8 US oz.)  
355 mL (12.0 US oz.) (EUR)**



- Raise the outer tube [A] and temporarily tighten the fork top plug (subtank) [B].

**Special Tool - Top Plug Wrench, 49 mm: 57001-1653 [C]**



- Install the front fork to the frame (see Front Fork Installation in the Suspension chapter).

○ Loosen the upper front fork mounting bolts.

- After installing the front fork, torque the top plug [A].

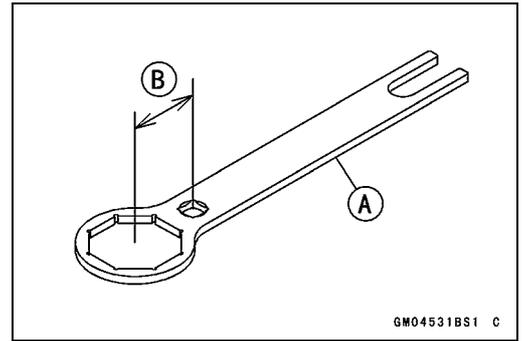
**Special Tool - Top Plug Wrench, 49 mm: 57001-1653**



**Periodic Maintenance Procedures**

The torque of fork top plug is specified to **30 N·m (3.0 kgf·m, 22 ft·lb)** however, when you use the top plug wrench (special tool) [A], reduce the torque to 90% of the specified value [**27 N·m (2.8 kgf·m, 20 ft·lb)**] due to the distance [B] between the center of the square hole, where the torque wrench is fitted, and that of the octagonal hole of the wrench.

This torque value [**27 N·m (2.8 kgf·m, 20 ft·lb)**] is applicable when you use a torque wrench whose length gives leverage of approximately 310 mm between the grip point to the center of the coupling square.

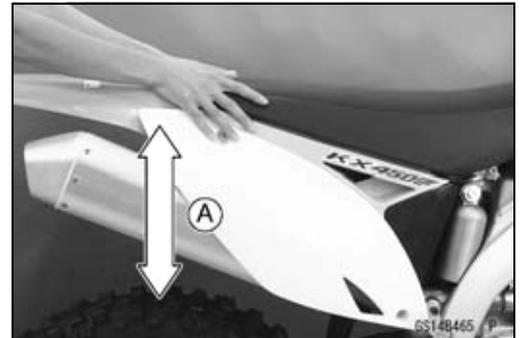


**Torque - Front Fork Top Plug: 30 N·m (3.1 kgf·m, 22 ft·lb)**

- Install:
  - Front Wheel (see Front Wheel Installation in the Wheels/Tires chapter)
  - Front Brake (see Caliper Installation in the Brakes chapter)
  - Brake Hose Clamps (see Brake Hose Replacement)

**Rear Shock Absorber Inspection**

- Bounce [A] the rear of the motorcycle up and down and check for smooth suspension stroke.
- Remove the rear frame (see Rear Frame Removal in the Frame chapter).
- Check for a broken or collapsed spring.
- Check the shock for a bent shaft or oil leaks.
- ★ If the shock does not smoothly or damaged, replace or repair defective parts.



**Rear Shock Absorber Oil Change**

The oil should be changed in the rear shock absorber at least once per racing season. The frequency for best performance must be based upon riding conditions and rider ability.

- Remove the rear shock absorber from the frame (see Rear Shock Absorber Removal in the Suspension chapter).
- Remove the shock absorber spring (see Spring Replacement in the Suspension chapter).
- Insert a suitable jig to center of the reservoir cap, and release nitrogen gas completely (keep the dedicated jig inserted).
- For instructions on how to use the jig, follow the operation manual provided by the manufacturer.

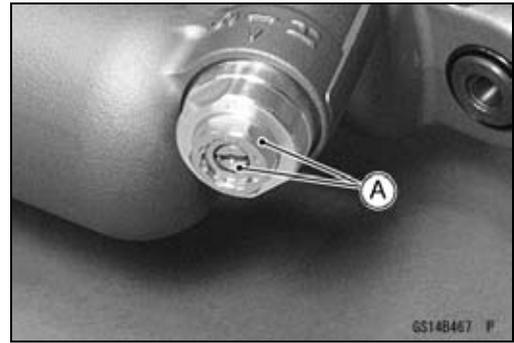
**⚠ WARNING**

**Do not point the reservoir valve toward your face or body when releasing nitrogen gas pressure. An oil mist is often released with the nitrogen. Always release nitrogen gas pressure before disassembling the rear shock absorber to prevent explosive separation of parts.**

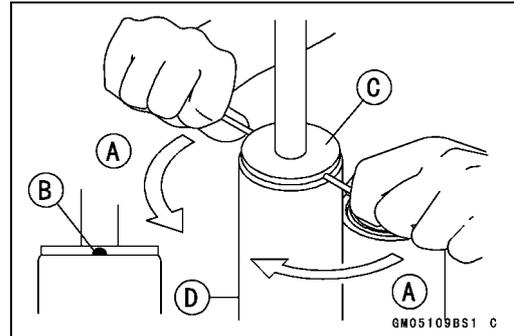
## 2-56 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

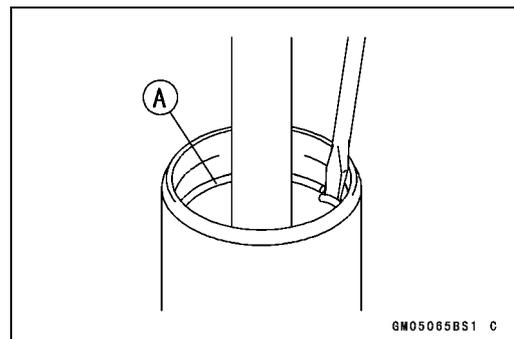
- Adjust the gas reservoir damping adjusters [A] to the softest position.



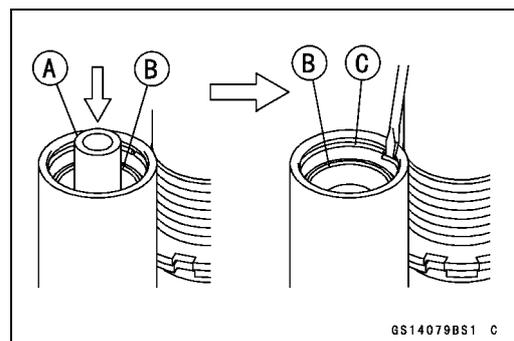
- Pry or tap [A] at the gaps [B] in the stop [C] with suitable tools to free the stop from the rear shock body [D].



- Slide the stop up the top of the piston rod then lightly tap around the seal with a suitable rod and mallet, and push the seal assembly 10 mm (0.39 in.) down.
- Remove the circlip [A].
- Lightly move the piston rod back and forth, and pull out the piston rod assembly.
- Pour the oil out of the rear shock body into the suitable container.



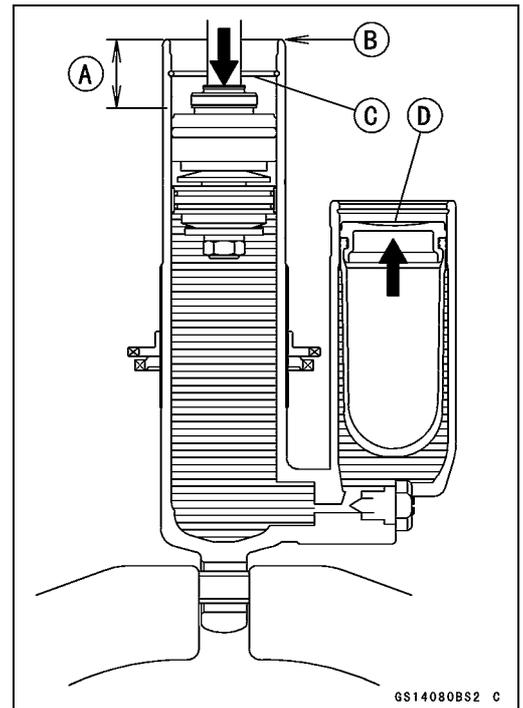
- Remove the jig.
- Using the suitable tool [A] and press, push the reservoir cap [B] in 10 mm (0.39 in.).
- Remove the circlip [C] from the gas reservoir.



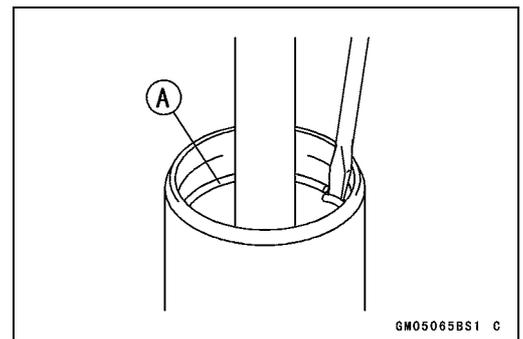
Periodic Maintenance Procedures

- Pour KYB K2-C oil into the gas reservoir to 30 mm (1.2 in.) [A] from the rear shock body upper end [B]. Push the piston rod assembly and seal downward again into the place where circlip is installed, and then fit the circlip [C] into the rear shock groove securely.
- Press the piston rod assembly downward, and press out the reservoir cap [D] from the rear shock by the oil pressure.

<b>CAUTION</b>
<b>Be careful that if the piston rod assembly is pressed downward mightily, the reservoir cap may crush.</b>

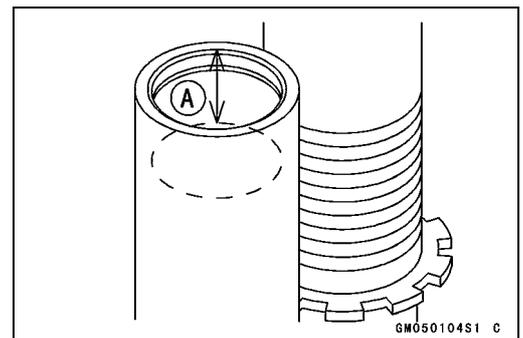


- Slide the stop up the top of the piston rod then lightly tap around the seal with a suitable rod and mallet, and push the seal assembly 10 mm (0.39 in.) down.
- Remove the circlip [A].
- Lightly move the piston rod back and forth, and pull out the piston rod assembly.
- Pour the oil out of the rear shock body into the suitable container.



- Pour KYB K2-C (SAE 5W or Bel-Ray SE2 #40) oil into the gas reservoir to 50 ~ 60 mm (2.0 ~ 2.4 in.) [A] from the gas reservoir upper end.

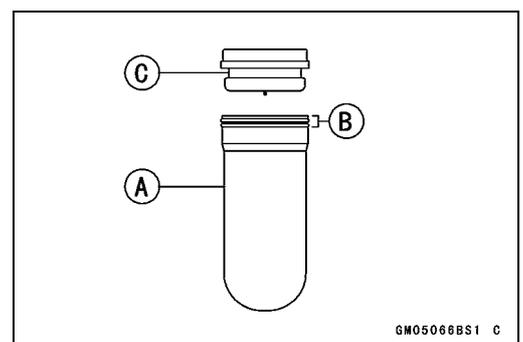
**Recommended Oil: K2-C (KAYABA) or equivalent**



- Replace the bladder [A] with a new one.

<b>CAUTION</b>
<b>The bladder is damaged and its performance is reduced noticeably if the bladder is damaged or deformed during reuse.</b>

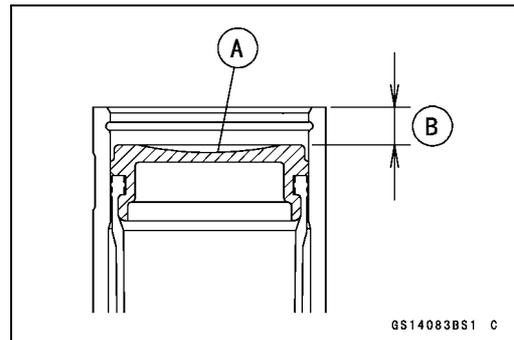
- Apply grease to the lip [B] of the bladder and install the reservoir cap [C].



## 2-58 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Press the reservoir cap [A] assembly downward slowly into the gas reservoir to 10 mm (0.4 in.) [B] from the gas reservoir upper end.



#### CAUTION

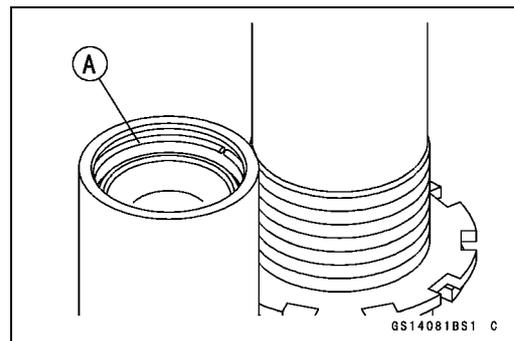
Ensure that no air remains in the system.

- Replace the circlip with a new one.

#### WARNING

If weakened, deformed or flawed circlip is used, the gas reservoir cap may not hold when injecting the nitrogen gas. This would allow oil and internal parts to explode out of the reservoir.

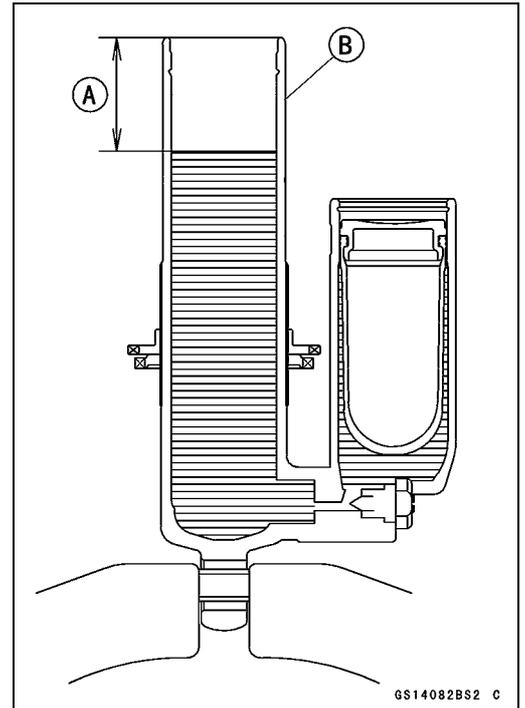
- Mount the circlip [A] in the groove in the gas reservoir.



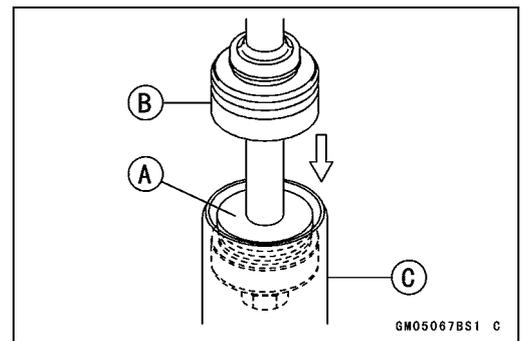
Periodic Maintenance Procedures

- Pour KYB K2-C oil into the rear shock body to 50 mm (2.0 in.) [A] from the lower end of the rear shock body [B].

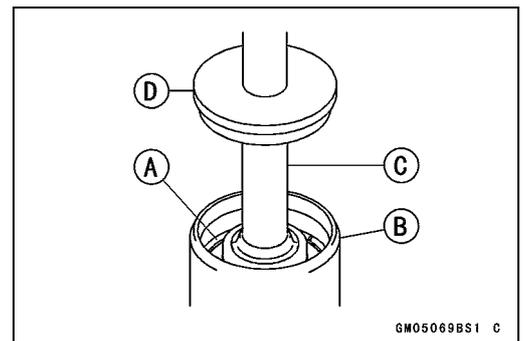
**Recommended Oil: K2-C (KAYABA) or equivalent**



- Insert the piston end [A] of the piston rod assembly into the rear shock body [C] slowly. (Do not insert the seal assembly [B] yet. ) Pump the piston rod until all the air is forced out of the rear shock body.



- Push the seal assembly into the rear shock body until it just clears the circlip groove.
- Check the circlip.
- ★ If it is deformed or damaged, replace it with a new one.
- Fit the circlip [A] into the groove in the rear shock body [B].



**CAUTION**

**If the circlip is not a certain fit in the groove in the rear shock body, the piston rod assembly may come out of the shock absorber when injecting the nitrogen gas or riding the motorcycle.**

- Pull up the piston rod assembly [C] against the circlip.
- Force the stop [D] into the rear shock body by lightly tapping around the edge of the stop with a mallet.

## 2-60 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Insert a suitable jig to center of the reservoir cap, and operate the piston rod assembly after poor 98kPa (1.0 kgf/cm<sup>2</sup>, 14 psi) nitrogen gas, and then push out to the place where the reservoir cap hits the circlip. Now, check that the edge of the reservoir cap is pushed out to 2 mm (0.08 in.) deeper than the edge of the gas reservoir.

#### **⚠ WARNING**

**If the reservoir cap is not pushed out to specified position, oil may be spouted out during the gas enclosing or the driving.**

- Check the rear shock body and gas reservoir for oil and gas leaks.
- ★ If there are no leaks, inject the nitrogen gas up to the 980 kPa (10 kgf/cm<sup>2</sup>, 142 psi) pressure.

#### **⚠ WARNING**

**Pressurize the gas reservoir with nitrogen gas only. Do not use air or other gases, since they may cause premature wear, rust, fire hazard or substandard performance.**  
**High pressure gas is dangerous. Have a qualified mechanic perform this procedure.**

- Install the spring and spring guide.
- Install the rear shock to the frame.
- Adjust spring preload.
- Install the parts removed (see appropriate chapters).

#### ***Swingarm and Uni-Trak Linkage Inspection***

Check the uni-trak component parts for wear periodically, or whenever excessive play is suspected.

- Using the jack under the frame, raise the rear wheel off the ground.

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

- Push and pull on the swingarm [A], up and down, to check for wear.
- ★ A small amount of play on the swingarm is normal and no corrective action is needed. However, if excessive play is felt, remove the uni-trak parts from the frame and check for wear.

#### ***Swingarm and Uni-Track Linkage Pivot Lubrication***

- Refer to the Swingarm Bearing Installation and Rocker Arm Bearing Installation in Suspension chapter.



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## Periodic Maintenance Procedures

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### Steering

#### *Steering Inspection*

- Using the jack, raise the front wheel off the ground.
  - **Special Tool - Jack: 57001-1238**
- With the front wheel pointing straight ahead, alternately nudge 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 steering binds or catches before the stop, check the routing of the cables, hoses, and harnesses.
- ★ If the steering feels tight, adjust or lubricate the steering.
- Feel for steering looseness by pushing and pulling the forks.
- ★ If you feel looseness, adjust the steering.



## 2-62 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Steering Adjustment

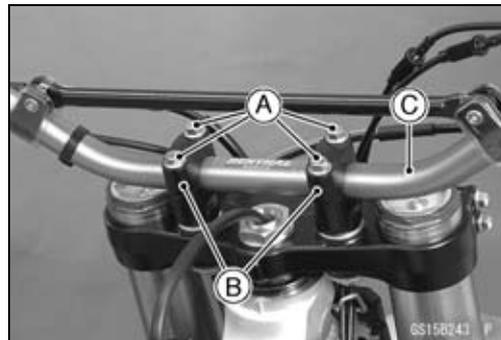
- Using the jack, raise the front wheel off the ground.

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

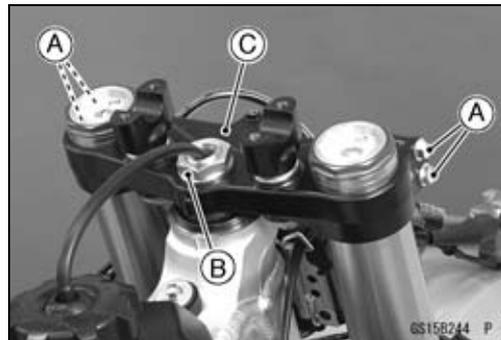
- Remove number plate (see Number Plate Removal in the Frame chapter).
- Remove the handlebar pad [A].



- Remove:
  - Handlebar Clamp Bolts [A]
  - Handlebar Holders [B] (upper)
  - Handlebar [C]



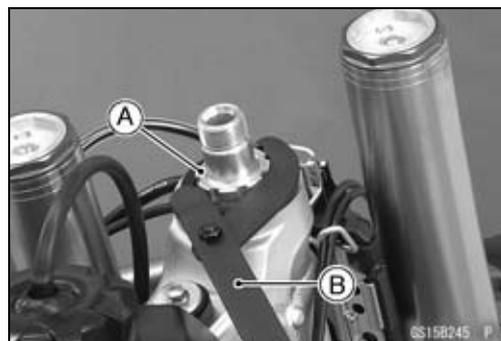
- Loosen the front fork upper clamp bolts [A], and remove the steering stem head nut [B] and steering stem head [C].



- Turn the steering stem nut [A] with the steering stem nut wrench [B] to obtain the proper adjustment.

**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 nut a fraction of a turn.



#### NOTE

○ Turn the stem nut 1/8 turn at a time maximum.

**Periodic Maintenance Procedures**

- Install the steering stem head to the front fork.
- Tighten the steering stem head nut.
  - Torque - Steering Stem Head Nut: 98 N·m (10 kgf·m, 72 ft·lb)**
- Tighten the loosened front fork clamp bolts.
  - Torque - Upper Front Fork 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.

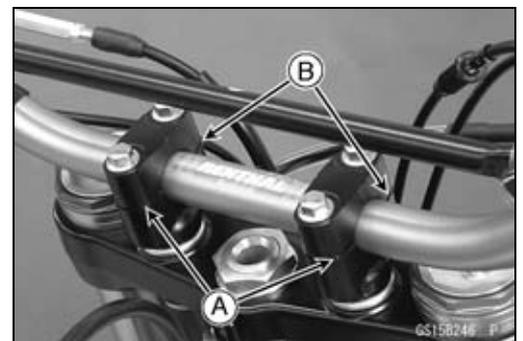
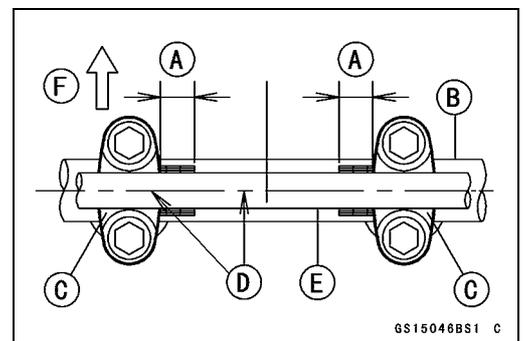
- Check the steering again.
- ★ If the steering is too tight or too loose, repeat the adjustment as mentioned above.

- Install the handlebar [B] on the handlebar holder (lower) so that the protruded scales of the both side adjust to the same width [A].
- Apply 2-stroke oil to the threads of the handlebar clamp bolts.
- Install the handlebar holders (upper) [C] so that center [D] of the handlebar holders (upper) and handlebar bridge [E] align.

**Torque - Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

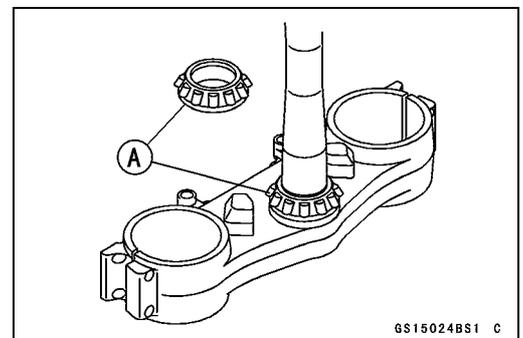
[F] Front

- After tighten, make sure space [A] [B] of the ahead and back are same width.
- Install the handlebar pad and number plate.



**Steering Stem Bearing Lubrication**

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



## 2-64 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

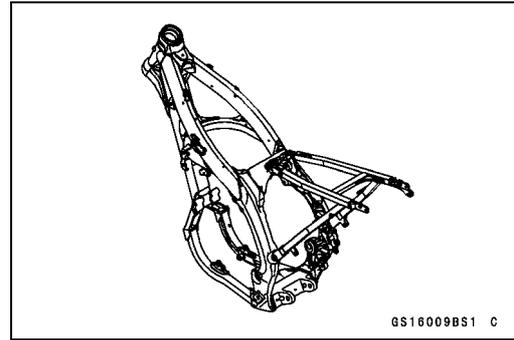
#### Frame

##### **Frame Inspection**

- Clean the frame with steam cleaner.
- Visually inspect the frame and rear frame for cracks, dents, bending, or warp.
- ★ If there is any damage to the frame, replace it.

#### **⚠ WARNING**

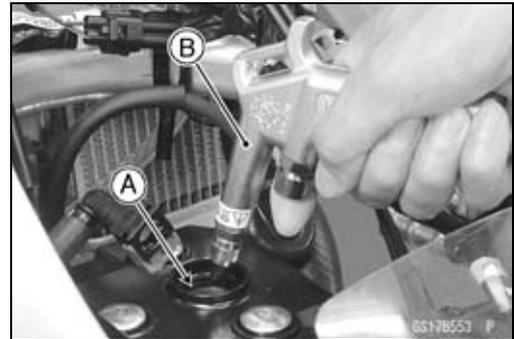
**A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.**



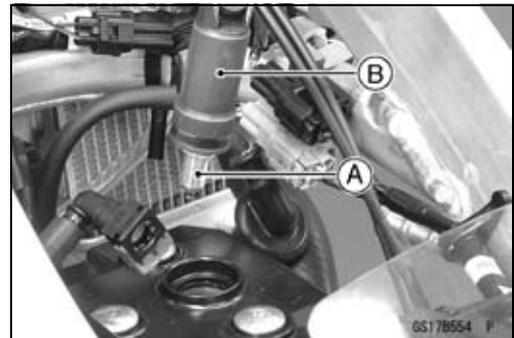
#### Electrical System

##### **Spark Plug Cleaning and Inspection**

- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Spark Plug Cap
- Clean the plug hole [A], using the compressed air [B].



- Remove the spark plug [A], and visually inspect it.
  - Special Tool - Spark Plug Wrench, Hex 16 [B]: 57001-1262**
- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high-flash point solvent and a wire brush or other suitable tool.
- ★ If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug.

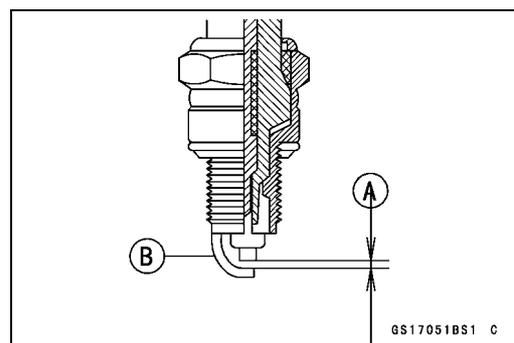


- Measure the gap [A] with a wire-type thickness gauge.
- ★ If the gap is incorrect, carefully bend the side electrode [B] with a suitable tool to obtain the correct gap.

##### **Spark Plug Gap**

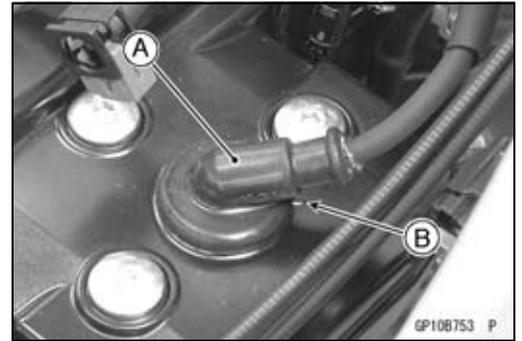
**Standard: 0.8 ~ 0.9 mm (0.03 ~ 0.04 in.)**

- Install the spark plug.
  - Torque - Spark Plug: 13 N·m (1.3 kgf·m, 115 in·lb)**



**Periodic Maintenance Procedures**

- Fit the spark plug cap [A] so that align it to the rised line [B] on the head cover.
- Pull the plug cap to make sure the installation of the spark plug cap.



**Spark Plug Replacement**

- Refer to the Spark Plug Cleaning and Inspection.

**General Lubrication and Cable Inspection**

**General Lubrication**

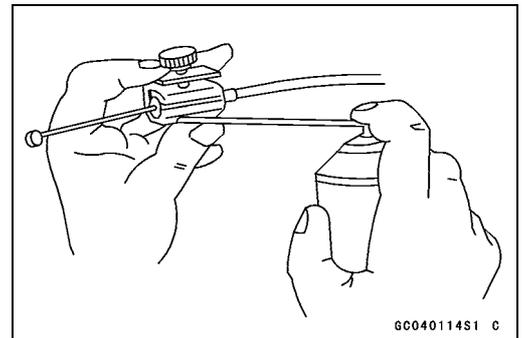
- Lubricate the points listed below with indicated lubricant. Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.

**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.

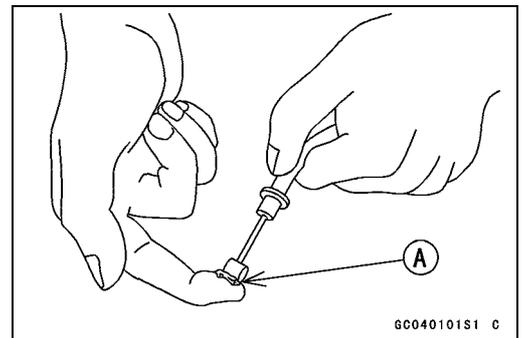
**Cables: Lubricate with Rust Inhibitor.**

- Throttle Inner Cables
- Clutch Inner Cable



**Points: Lubricate with Grease.**

- Clutch Inner Cable Upper and Lower Ends [A]
- Throttle Inner Cable Upper End
- Brake Lever Pivot Bolt
- Clutch Lever Pivot Bolt
- Brake Pedal Mounting Bolt



**Pivot: Lubricate with Engine Oil.**

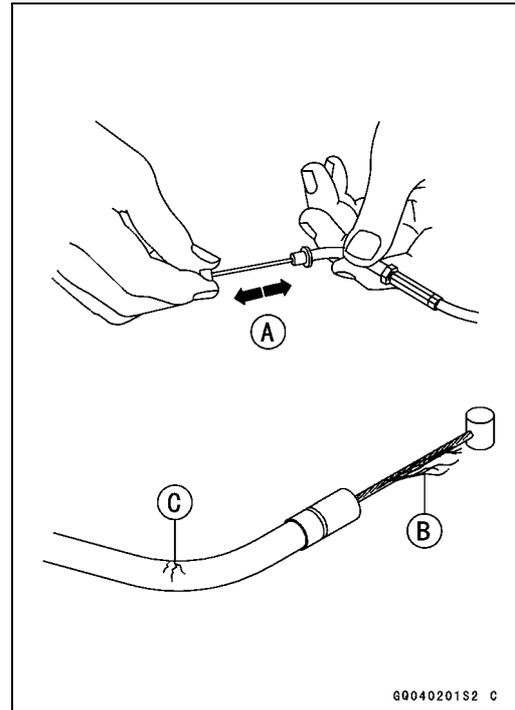
- Rear Master Cylinder Joint Pin

## 2-66 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **Cable Inspection**

- With the cable disconnected at the 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.



#### **Nut, Bolt, and Fastener Tightness Inspection**

##### **Tightness Inspection**

- Check the tightness of the bolts and nuts listed here in accordance with the Periodic Maintenance Chart. 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, retorque them to the specified torque following the specified tightening sequence. Refer to the Torque and Locking Agent section of the General Information chapter for torque specifications. For each fastener, first loosen it by 1/2 turn, then tighten it.
- ★ If cotter pins are damaged, replace them with new ones.

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

Wheels:

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

Final Drive:

- Chain Adjuster Locknut
- Rear Sprocket Nuts

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**Periodic Maintenance Procedures**

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Brakes:

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

Suspension:

- Front Fork Clamp Bolts
- Rear Shock Absorber Mounting Bolts, Nuts
- Swingarm Pivot Shaft Nut
- Uni-Trak Link Nuts

Steering:

- Steering Stem Head Nut
- Handlebar Holder Bolts

Engine:

- Throttle Cable Adjuster Locknuts
- Engine Mounting Bolts, Nuts
- Engine Bracket Nuts
- Shift Pedal Bolt
- Muffler Mounting Bolts
- Exhaust Pipe Holder Nuts
- Muffler Pipe Clamp Bolt
- Clutch Cable Adjuster Locknut
- Clutch Lever Pivot Nut
- Kick Pedal Bolts

Others:

- Footpeg Cotter Pins
- Rear Frame Mounting Bolts
- Front Fender Mounting Bolts



# Fuel System (DFI)

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## 3-2 FUEL SYSTEM (DFI)

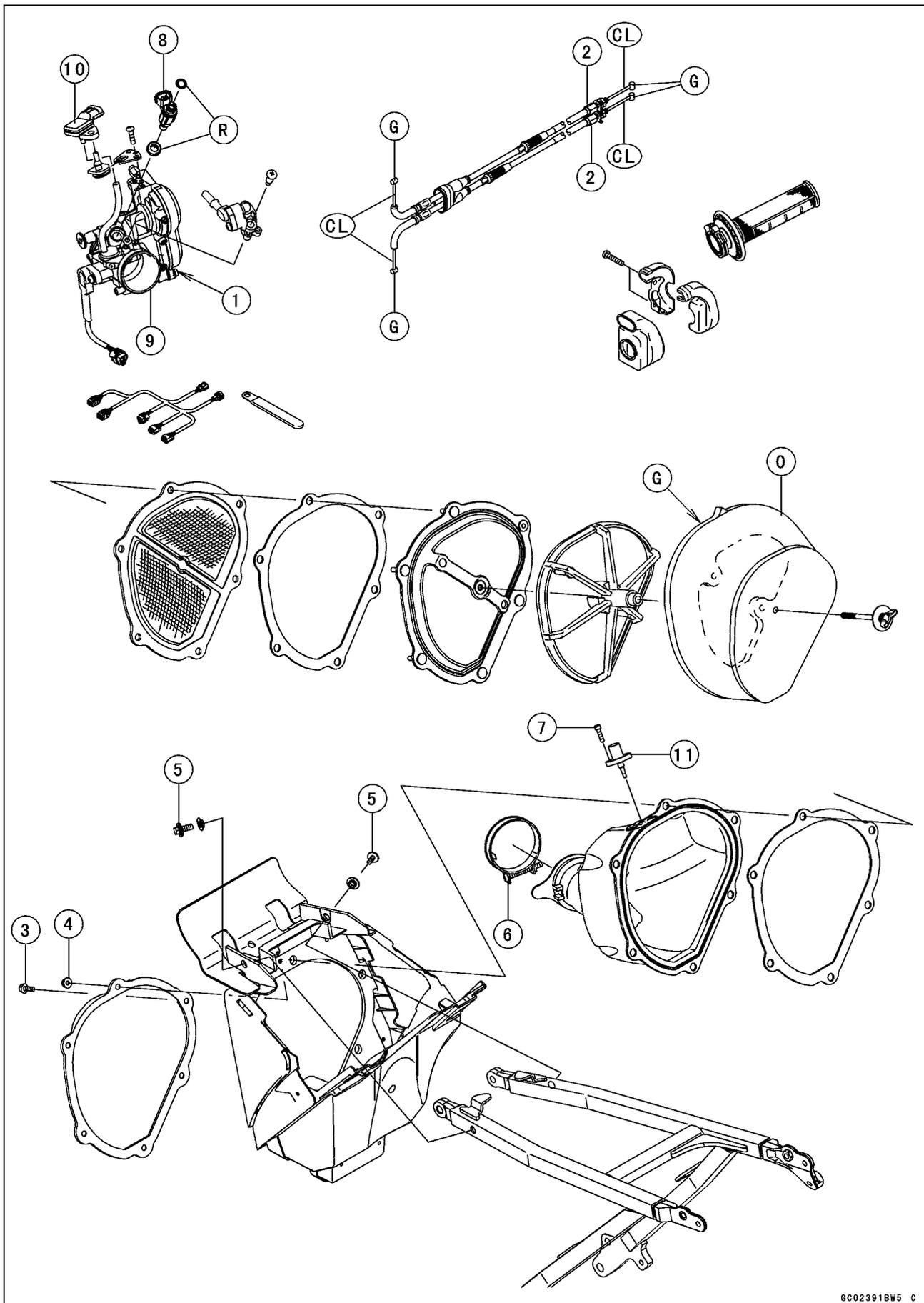
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Fuel Tank Cleaning .....	3-89

Dummy Page

# 3-4 FUEL SYSTEM (DFI)

## Exploded View



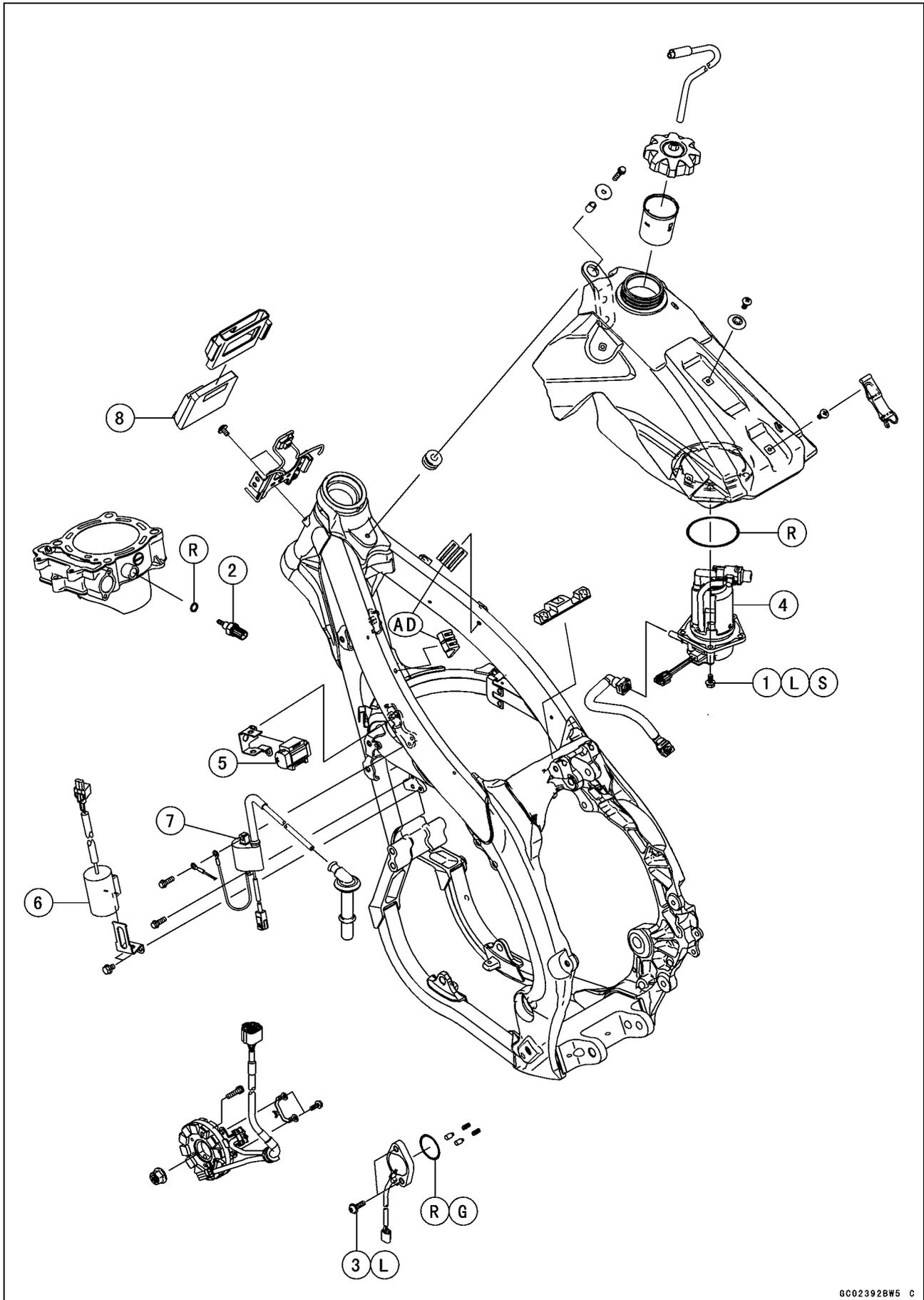
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle Pulley Cover Bolts	7.0	0.71	62 in·lb	
2	Throttle Cable Mounting Bolts	7.0	0.71	62 in·lb	
3	Air Cleaner Duct Mounting Bolt	2.0	0.20	18 in·lb	
4	Air Cleaner Duct Mounting Nuts	3.0	0.30	26 in·lb	
5	Air Cleaner Housing Bolts	9.8	1.0	87 in·lb	
6	Air Cleaner Duct Clamp Screw	2.0	0.20	18 in·lb	
7	Inlet Air Temperature Sensor Bolts	7.0	0.71	62 in·lb	L

- 8. Fuel Injector
- 9. Throttle Body Assy
- 10. Inlet Air Pressure Sensor
- 11. Inlet Air Temperature Sensor
- CL: Apply cable lubricant.
- G: Apply grease.
- O: Apply high-quality foam air filter oil.
- R: Replacement Parts

# 3-6 FUEL SYSTEM (DFI)

## Exploded View



**Exploded View**

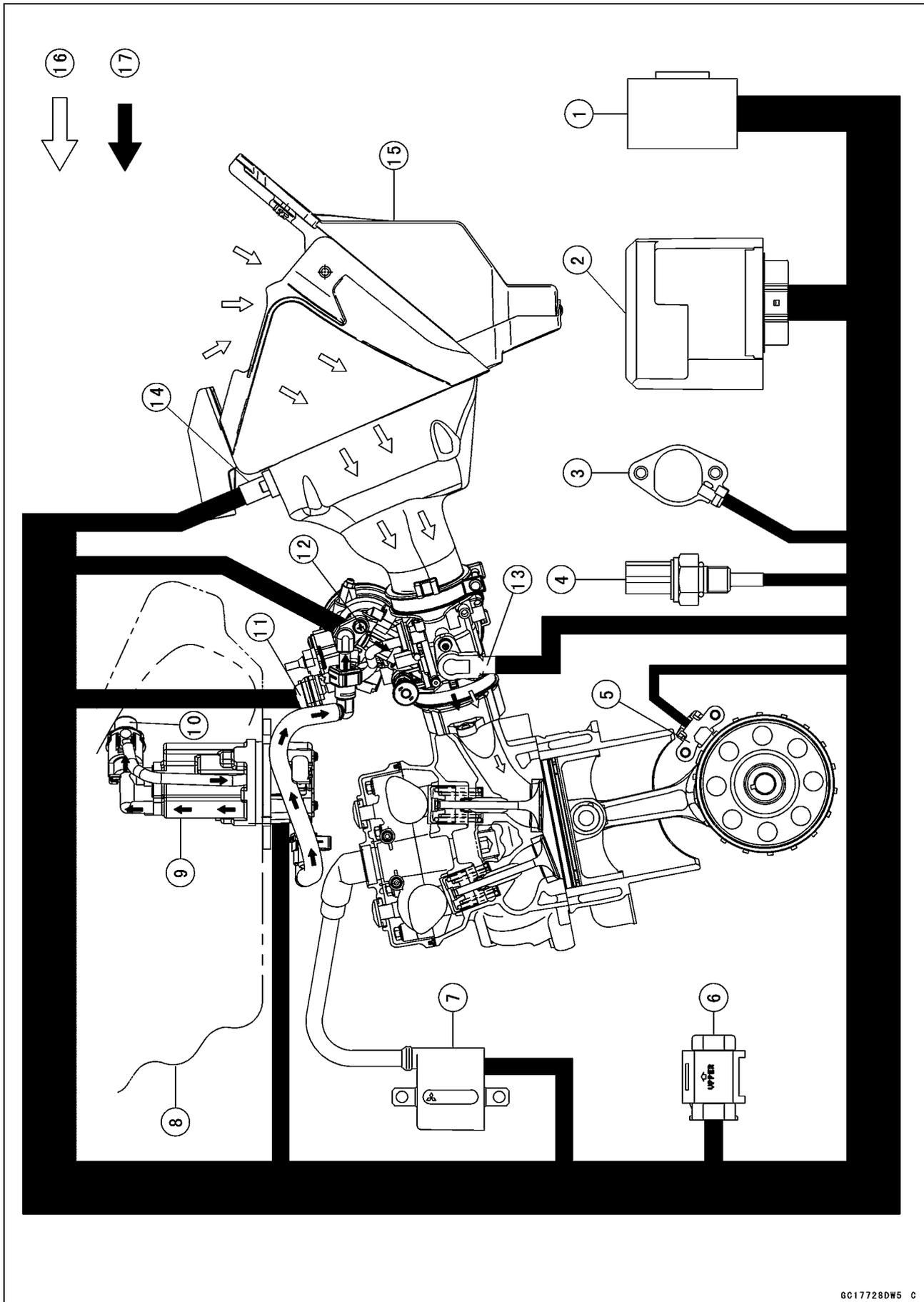
No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
2	Water Temperature Sensor	12	1.2	106 in·lb	
3	Gear Position Switch Screws	2.9	0.30	26 in·lb	L

- 4. Fuel Pump
  - 5. Vehicle-down Sensor
  - 6. Capacitor
  - 7. Ignition Coil
  - 8. ECU
- AD: Apply adhesive.  
 G: Apply grease  
 S: Follow the specific tightening sequence.  
 L: Apply a non-permanent locking agent.  
 R: Replacement Parts

# 3-8 FUEL SYSTEM (DFI)

## DFI System

### DFI System



### DFI System

---

1. Capacitor
2. ECU
3. Gear Position Switch
4. Water Temperature Sensor
5. Crankshaft Sensor
6. Vehicle-down Sensor
7. Ignition Coil
8. Fuel Tank
9. Fuel Pump
10. Pressure Regulator
11. Inlet Air Pressure Sensor
12. Fuel Injector
13. Throttle Sensor
14. Inlet Air Temperature Sensor
15. Air Cleaner Housing
16. Air Flow
17. Fuel Flow



---

**DFI System**

---

**Part Names**

1. ECU
2. FI Indicator Light Harness Connector
3. Fuel Injector
4. Inlet Air Pressure Sensor
5. Inlet Air Temperature Sensor
6. Throttle Sensor
7. Water Temperature Sensor
8. Spark Plug
9. Ignition Coil
10. Frame Ground
11. Fuel Pump
12. Vehicle-down Sensor
13. Capacitor
14. Crankshaft Sensor
15. Gear Position Switch
16. Engine Stop Switch
17. Kawasaki Diagnostic System Connector

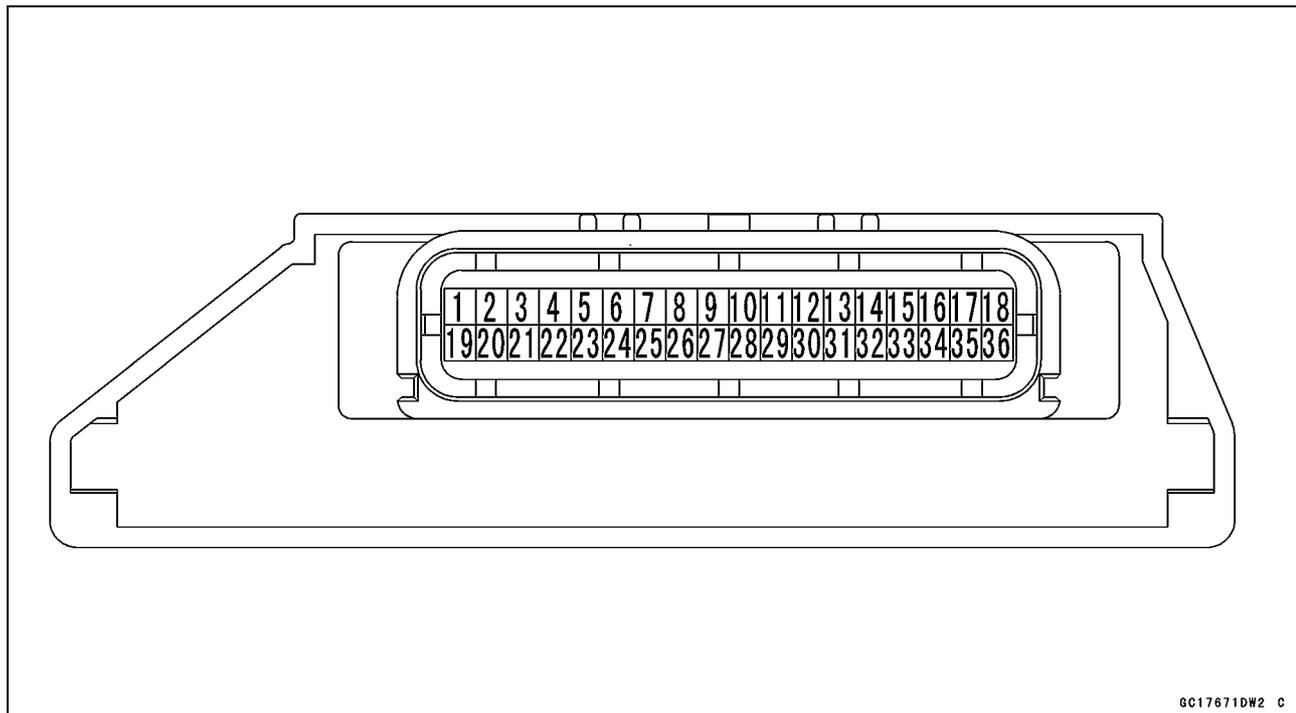
## ○Color Codes:

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

## 3-12 FUEL SYSTEM (DFI)

### DFI System

#### Terminal Numbers of ECU Connectors



GC17671DW2 C

#### Terminal Names

1. Power Supply to ECU
2. Vehicle-down Sensor
3. Crankshaft Sensor (+)
4. Gear Position Switch
5. Main Throttle Sensor
6. Inlet Air Pressure Sensor
7. Unused
8. Ground for Control System
9. Crankshaft Sensor
10. External Communication Line (\*KDS)
11. Unused
12. Unused
13. Power Supply to Sensors
14. Fuel Pump Power Supply Voltage
15. Fuel Pump
16. Injector
17. Unused
18. Ignition Coil
19. Unused
20. Unused
21. FI Indicator Light
22. Water Temperature Sensor
23. Unused
24. Ground for Sensors
25. Inlet Air Temperature Sensor
26. Unused
27. Unused
28. Unused
29. Self-Diagnosis
30. Unused
31. External Communication Line
32. External Communication Line
33. Unused
34. Engine Stop Switch

**DFI System**

---

35. Ground for ECU

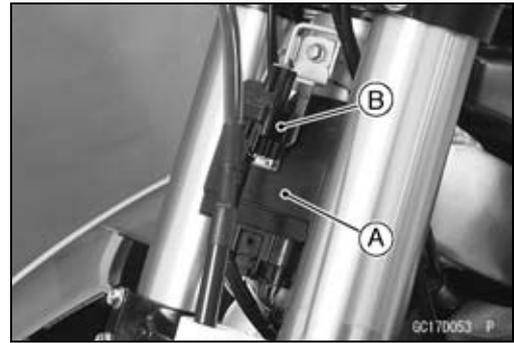
36. Ground for ECU

\*: KDS (Kawasaki Diagnostic System)

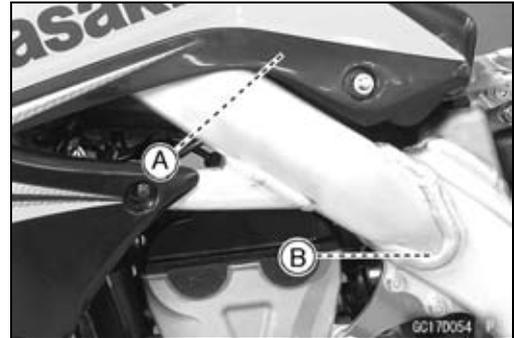
## 3-14 FUEL SYSTEM (DFI)

### DFI Parts Location

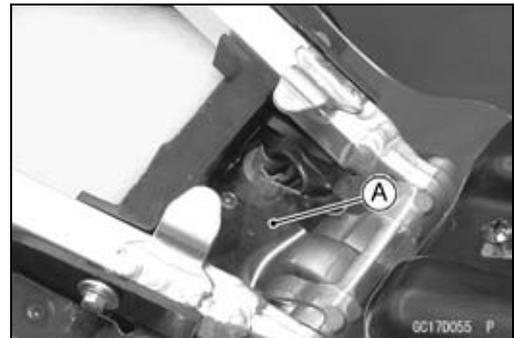
ECU [A]  
Kawasaki Diagnostic System Connector [B]



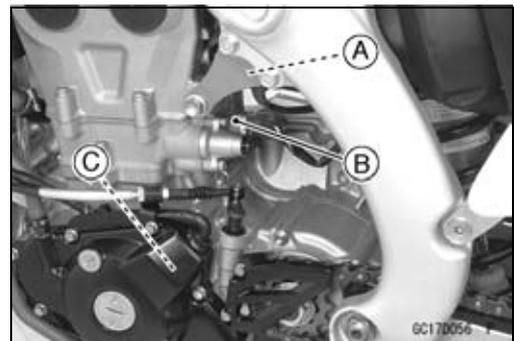
Fuel Pump [A]  
Throttle Body Assy [B]



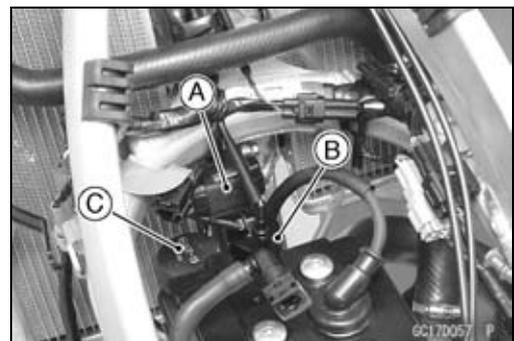
Inlet Air Temperature Sensor [A]



Throttle Sensor [A]  
Water Temperature Sensor [B]  
Crankshaft Sensor [C]

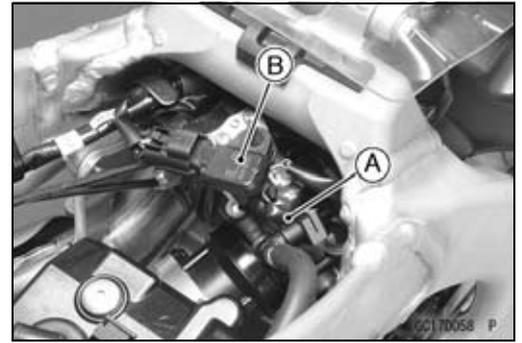


Vehicle-down Sensor [A]  
Ignition Coil [B]  
Capacitor [C]



**DFI Parts Location**

- Fuel Injector [A]
- Inlet Air Pressure Sensor [B]



- FI Indicator Light Harness Connector [A]



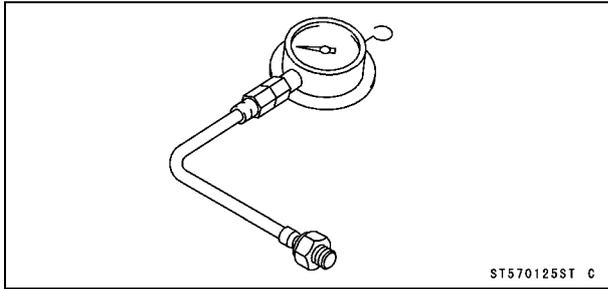
## 3-16 FUEL SYSTEM (DFI)

### Specifications

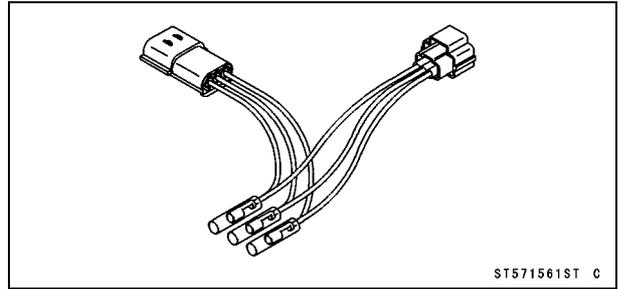
Item	Standard
<b>Digital Fuel Injection System</b>	
Idle Speed	2 000 ±50 r/min (rpm)
Throttle Body Assy:	
Type	Single barrel
Bore	φ43 (1.69 in.)
ECU:	
Make	KEIHIN
Type	Digital memory type, with built in IC igniter, sealed with resin
Fuel Pressure (High Pressure Line)	294 kPa (3.0 kgf/cm <sup>2</sup> , 43 psi) with engine idling
Fuel Pump:	
Type	Wesco pump
Discharge	26 mL (0.88 US oz.) or more for 3 seconds
Fuel Injectors:	
Type	INP-286
Nozzle Type	One spray type with 10 holes
Resistance	About 11.7 ~ 12.3 Ω at 20°C (68°F)
Throttle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 0.525 ~ 0.675 V at idle throttle opening DC 3.74 ~ 3.94 V at full throttle opening
Resistance	4 ~ 6 kΩ
Inlet Air Pressure Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.80 ~ 4.20V at standard atmospheric pressure (see this text for details)
Inlet Air Temperature Sensor:	
Output Voltage	About DC 2.28 ~ 3.43 V at inlet air temperature 20°C (68°F)
Resistance	910 ~ 1363 Ω at 40°C (104°F) 120 ~ 190 Ω at 100°C (212°F) (for reference)
Water Temperature Sensor:	
Resistance	see text
Output Voltage	About DC 2.80 ~ 2.97 V at 20°C (68°F)
Vehicle-down Sensor:	
Detection Angle	More than 55 ~ 75° for each bank
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	With sensor tilted 55 ~ 75° or more right or left: DC 3.7 ~ 4.4 V With sensor arrow mark pointed up: DC 0.4 ~ 1.4 V
<b>Throttle Grip and Cables</b>	
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)

Special Tools and Sealant

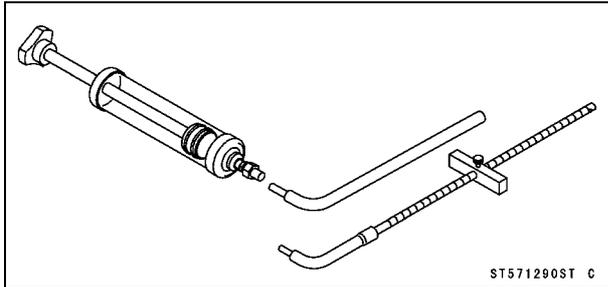
Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>:  
57001-125



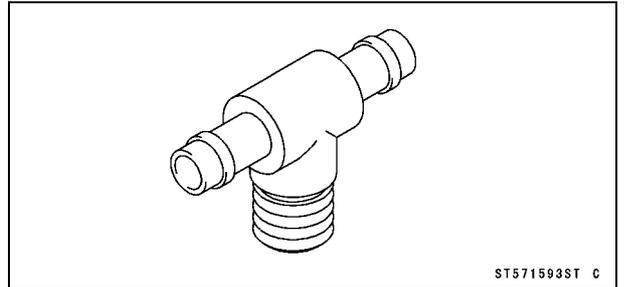
Sensor Harness Adapter:  
57001-1561



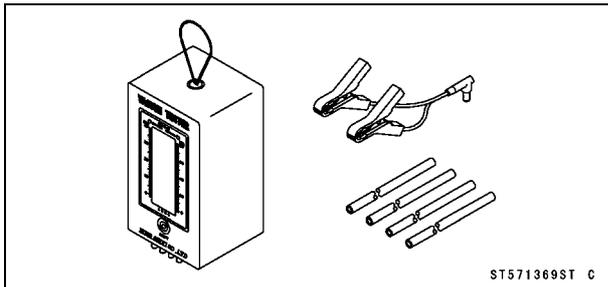
Fork Oil Level Gauge:  
57001-1290



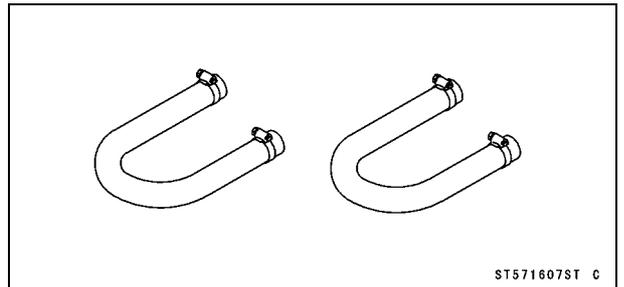
Fuel Pressure Gauge Adapter:  
57001-1593



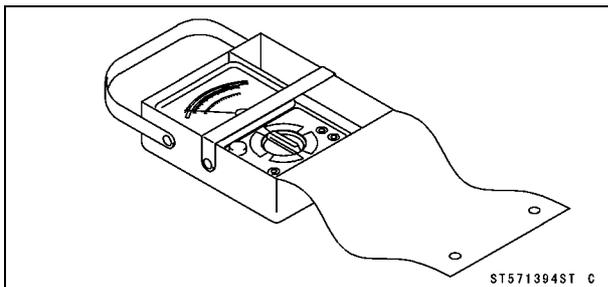
Vacuum Gauge:  
57001-1369



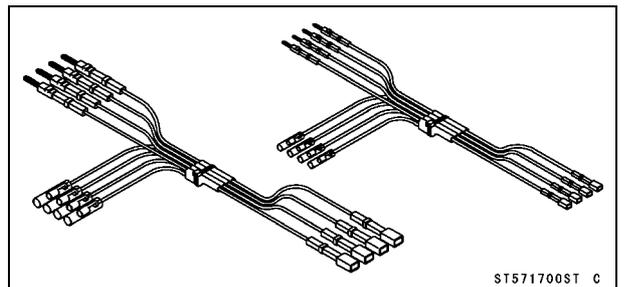
Fuel Hose:  
57001-1607



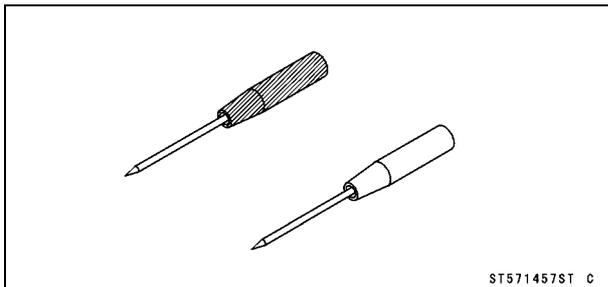
Hand Tester:  
57001-1394



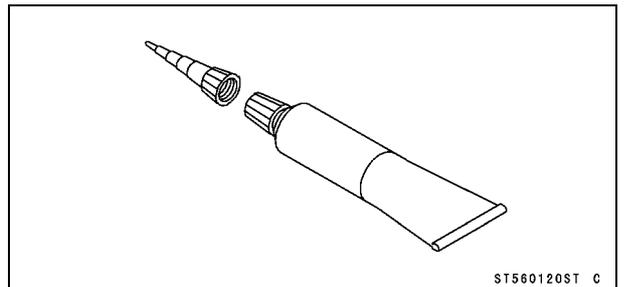
Measuring Adapter:  
57001-1700



Needle Adapter Set:  
57001-1457



Kawasaki Bond (Silicone Sealant):  
56019-120



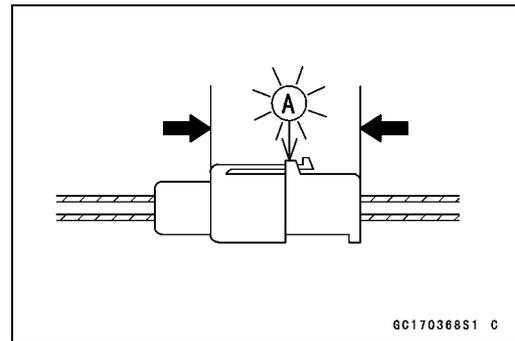
## 3-18 FUEL SYSTEM (DFI)

### DFI Servicing Precautions

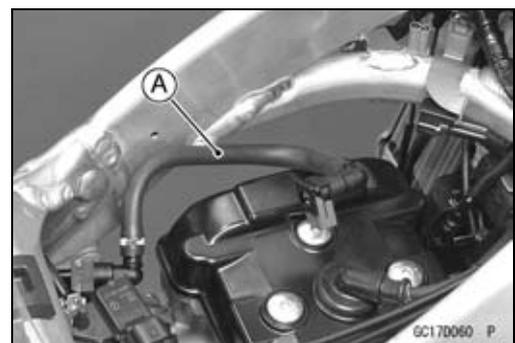
#### DFI Servicing Precautions

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

○Connect these connectors until they click [A].



- Never any of the DFI electrical connectors are disconnected. The ECU memorizes service codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads and wiring.
- When any fuel hose is disconnected, do not start the engine. The fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if the pump is completely dry. This is to prevent pump seizure.
- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- When any fuel hose is disconnected, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.
- Route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.
- If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak or the hose to burst. Remove the fuel tank (see Fuel Tank Removal) and check the fuel hose [A].
- ★Replace the fuel hose if any fraying, cracks or bulges are noticed.



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

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



## Troubleshooting the DFI System

### Outline

When an abnormality in the system occurs, the condition of the problem is stored in the memory of the ECU (Electronic Control Unit). With the engine stopped and conduct a self-diagnosis inspection, the service code [A] is indicated by the number of times the FI indicator light blinks.

Ask the rider about the conditions [A] under which the problem occurred and try to determine the cause [B].

- First, conduct a self-diagnosis inspection and then a non-self-diagnosis inspection. The non-self-diagnosis items are not indicated by the FI indicator light. Don't rely solely on the DFI self-diagnosis function, use common sense.
- When the ignition coil or crankshaft sensor are trouble, the FI indicator light does not go on.
- If the FI indicator light goes on by kicking the kick pedal about ten times, these parts are broken.

Even when the DFI system is operating normally, the FI indicator light may light up under strong electrical interference. No repair needed.

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

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

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

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

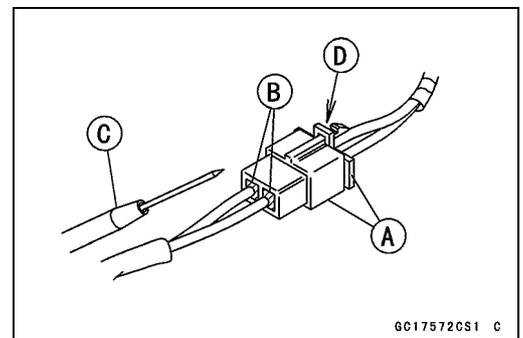
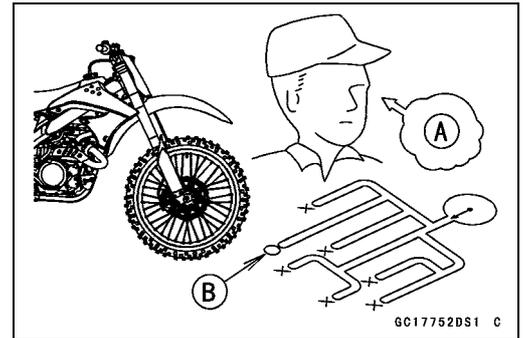
### CAUTION

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

- Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of a digital meter.
- Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.
- Connect the power supply harness (option P/No. 26011-0246) and the battery to the capacitor lead connector, and measure the voltage with the connector joined.

### CAUTION

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

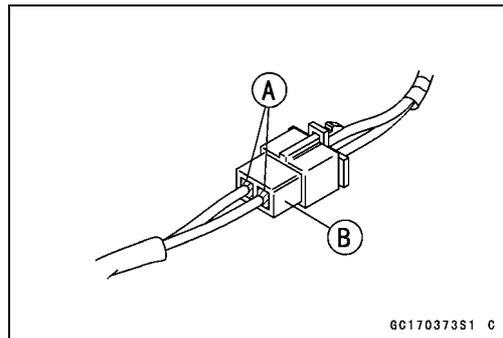


## 3-20 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

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

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



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

★ If any wiring is deteriorated, replace the wiring.

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

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

- Check the wiring for continuity.

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

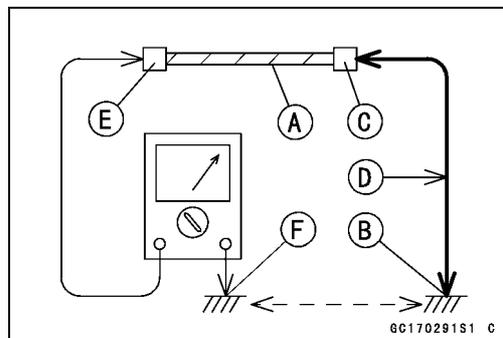
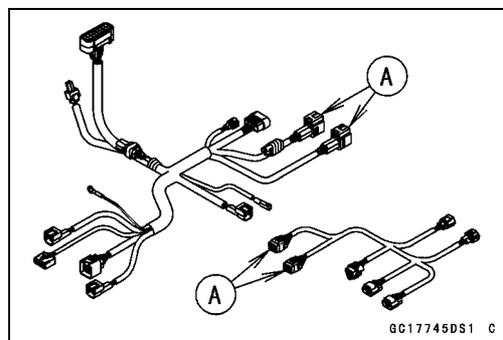
○ Connect the hand tester between the ends of the leads.

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

○ Set the tester to the  $\times 1 \Omega$  range, and read the tester.

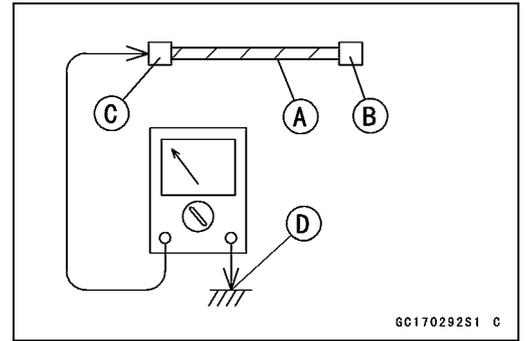
★ If the tester does not read  $0 \Omega$ , the lead is defective. Replace the lead or the main harness or the subharness.

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



### Troubleshooting the DFI System

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

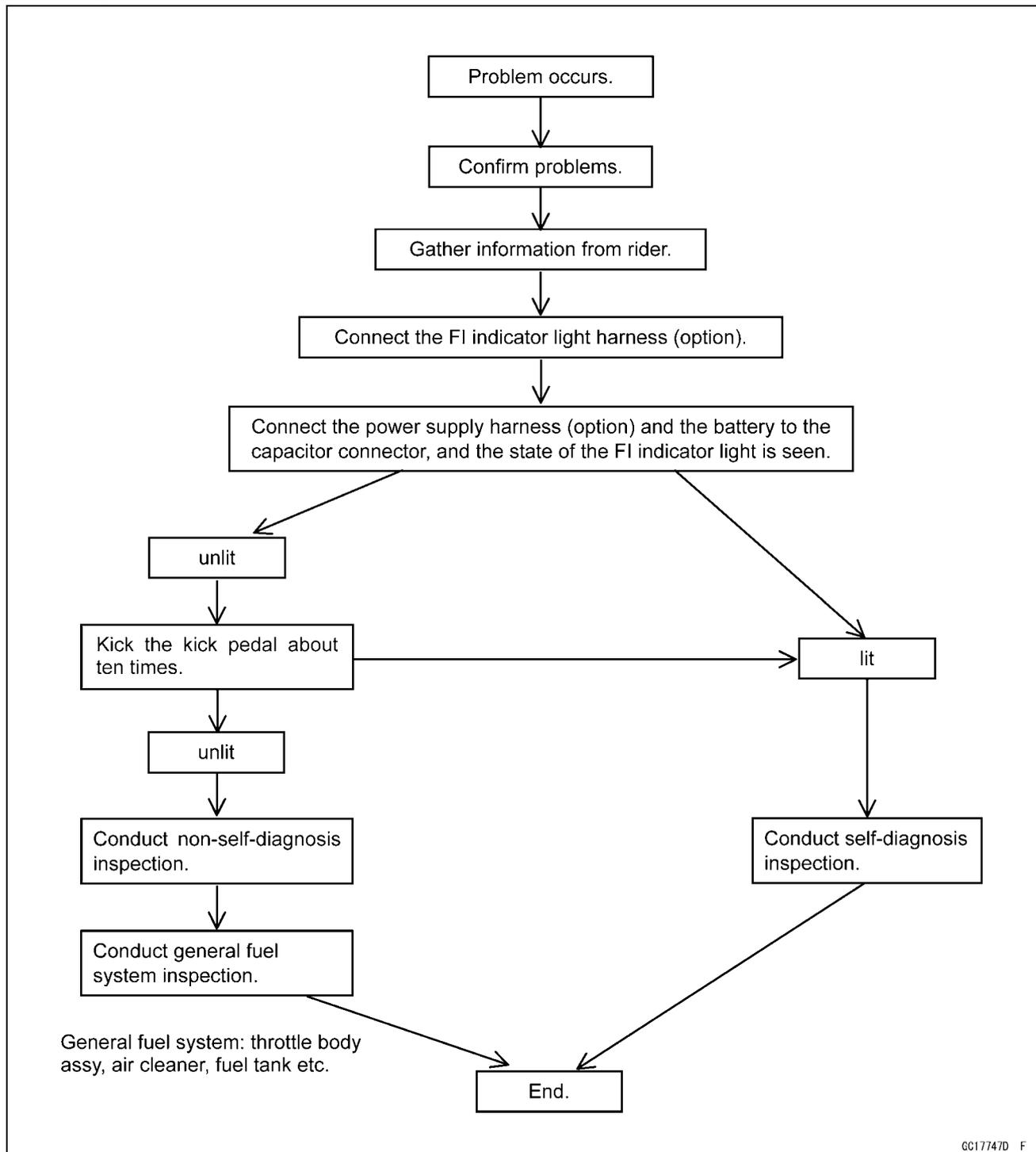


- Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.
- ★ If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.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

## 3-22 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

#### DFI Diagnosis Flow Chart



#### Inquiries to Rider

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



## 3-24 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

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

**DFI System Troubleshooting Guide**

**NOTE**

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

**Engine Won't Turn Over**

<b>Symptoms or possible Causes</b>	<b>Actions (chapter)</b>
Gear position switch trouble	Inspect gear position switch (see chapter 16).
Vehicle-down sensor OFF	Reinstall (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 16).
Ignition coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU ground and power supply trouble	Inspect (see chapter 3).
ECU trouble	Inspect (see chapter 3).
No or little fuel in tank	Supply fuel (see Owner's Manual).
Fuel Injector trouble	Inspect and replace (see chapter 3).
Fuel pump not operating	Inspect (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 16).
Fuel line clogged	Inspect and repair (see chapter 3).

**Poor Running at Low Speed**

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

## 3-26 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
<b>Unstable (rough) idling:</b>	
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
<b>Engine stalls easily:</b>	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Throttle sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 16).
Fuel line clogged	Inspect and repair (see chapter 3).
<b>Poor acceleration:</b>	
Fuel pressure too low	Inspect (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
<b>Stumble:</b>	
Fuel pressure too low	Inspect (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).

**DFI System Troubleshooting Guide**

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
<b>Surge:</b>	
Unstable fuel pressure	Fuel pressure regulator trouble (Inspect and replace fuel pump) or kinked fuel line (Inspect and replace fuel pump) (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
<b>Backfiring when deceleration:</b>	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Fuel pressure too low	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
<b>After fire:</b>	
Spark plug burned or gap maladjusted	Replace (see chapter 16).
Fuel Injector trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
<b>Other:</b>	
Intermittent any DFI fault and its recovery	Check that DFI connectors are clean and tight, and examine leads for signs of burning or fraying (see chapter 3).

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

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
<b>Firing incorrect:</b>	
Ignition coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU trouble	Inspect (see chapter 3).
<b>Fuel/air mixture incorrect:</b>	
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 3).
Air cleaner housing loose	Reinstall (see chapter 3).
Throttle body assy holder loose	Reinstall (see chapter 3).
Fuel injector dust seal damage	Replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel Injector O-ring damage	Replace (see chapter 3).
Fuel Injector clogged	Inspect and repair (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).

## 3-28 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
<b>Knocking:</b>	
Fuel poor quality or incorrect	Fuel charge (Use the gasoline recommended in the Owner's Manual).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
Ignition coil trouble	Inspect (see chapter 16).
ECU trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
<b>Miscellaneous:</b>	
Throttle valve will not fully open	Inspect throttle cables and lever linkage (see chapter 3).
Engine overheating - Water temperature sensor or crankshaft sensor trouble	(see Overheating of Troubleshooting Guide in chapter 17)
<b>Exhaust Smokes Excessively:</b>	
<b>(Black smokes)</b>	
Air cleaner element clogged	Clean element (see chapter 3).
Fuel pressure too high	Inspect (see chapter 3).
Fuel Injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
<b>(Brown smoke)</b>	
Air cleaner housing loose	Reinstall (see chapter 3).
Fuel pressure too low	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).

## Self-Diagnosis

### Self-diagnosis Outline

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

### User Mode

The ECU connected FI indicator light goes on when DFI system and ignition system parts are faulty. In case of serious troubles, the ECU stops the injection/ignition operation.

### Dealer Mode

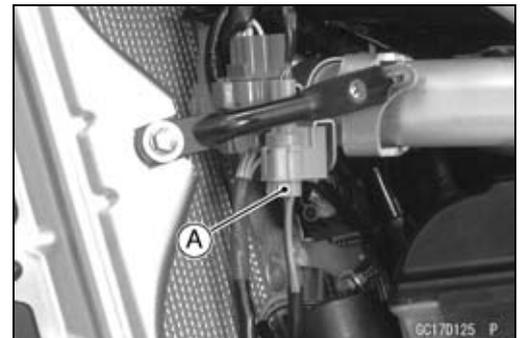
The FI indicator light emits service code(s) to show the problem(s) which the DFI system, and ignition system has at the moment of diagnosis.

### Self-diagnosis Procedures

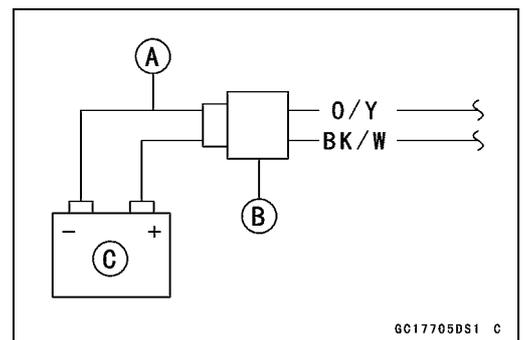
- Remove the FI indicator light harness cap [A], and connect the FI indicator light assy (option P/No. 23016-0034).



- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



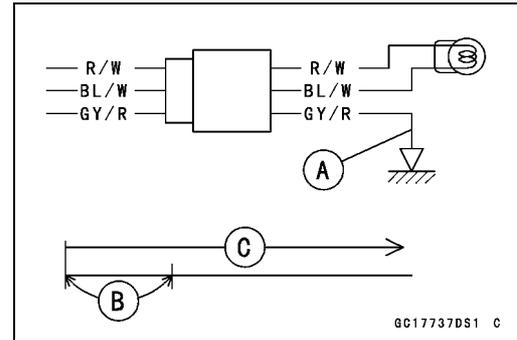
### NOTE

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

## 3-30 FUEL SYSTEM (DFI)

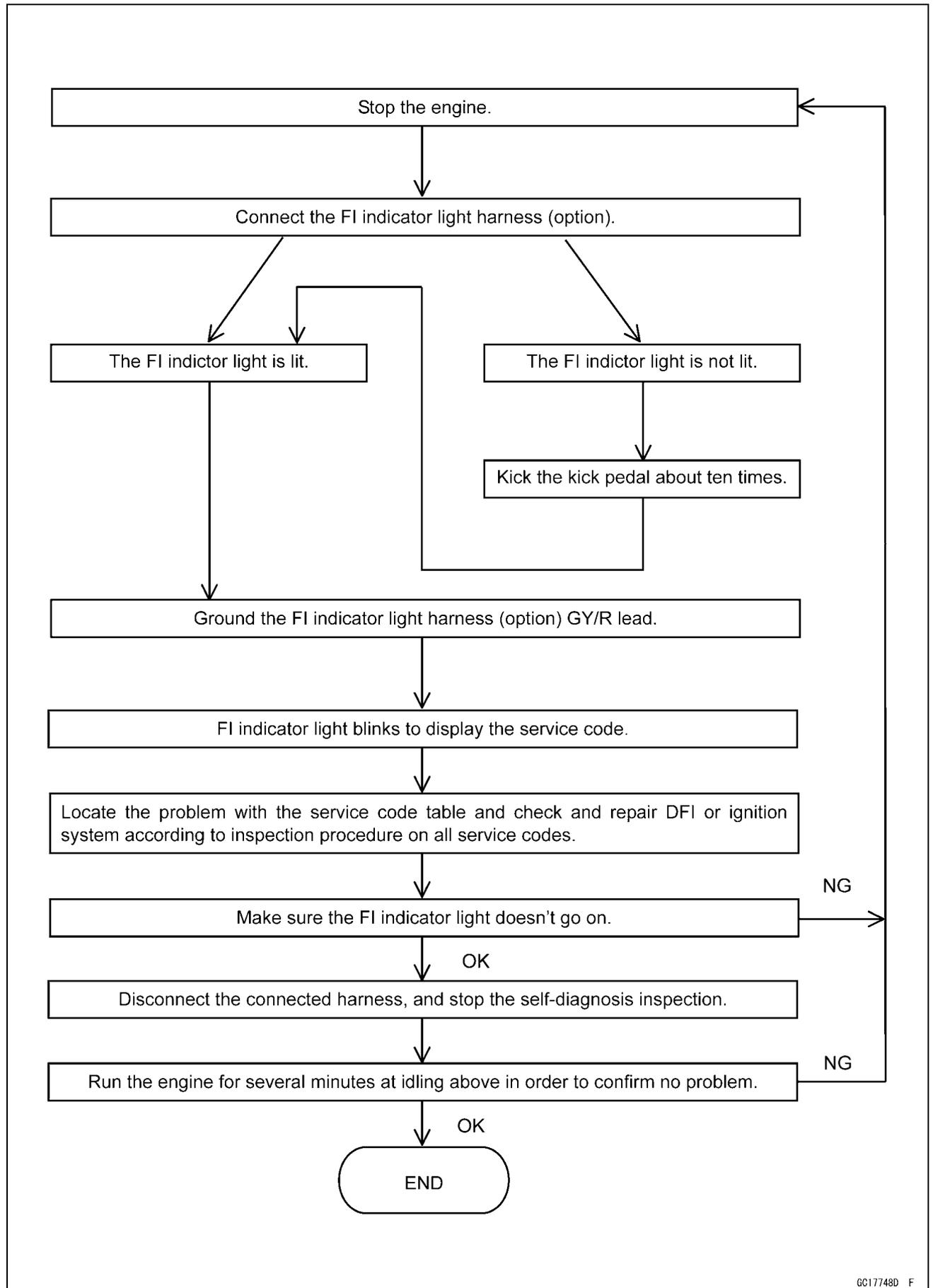
### Self-Diagnosis

- Keep the FI indicator light assy (option P/No. 23016-0034) GY/R lead [A] ground.
- Count the blinks of the light to read the service code. Keep the lead ground until you finish reading the service code.
- To enter the self-diagnosis dealer mode, ground the self-diagnosis indicator terminal for more than 2 seconds [B], and then keep it grounded continuously [C].



Self-Diagnosis

Self-Diagnosis Flow Chart

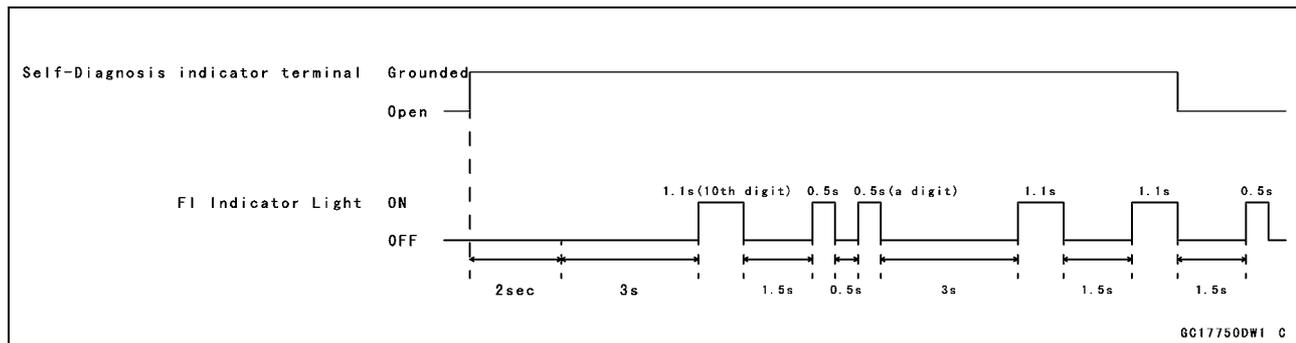


## 3-32 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### How to Read Service Codes

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



- If the problem is with the following parts, the ECU cannot memorize these problems, the FI indicator light doesn't go on, and no service codes can be displayed.

ECU Power Source Wiring and Ground Wiring (see ECU Power Supply Inspection)

#### How to Erase Service Codes

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

Self-Diagnosis

Service Code Table

Service Code	FI Indicator Light	Problems
11	 ON OFF	Throttle sensor malfunction, wiring open or short
12		Inlet air pressure sensor malfunction, wiring open or short
13		Inlet air temperature sensor malfunction, wiring open or short
14		Water temperature sensor malfunction, wiring open or short
21		Crankshaft sensor malfunction, wiring open or short
25		Gear position switch malfunction, wiring open or short
31		Vehicle-down sensor, malfunction, wiring open or short
41		Injector malfunction, wiring open or short
46		Fuel pump malfunction, wiring open or short
51		Ignition coil malfunction, wiring open or short

Notes:

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

## 3-34 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### Backups

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Throttle Sensor	Throttle Sensor Output Voltage 0.391 ~ 4.512 V	If the throttle sensor system fails (the signal is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method. Also, the throttle sensor system and inlet air pressure fails, the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the $\alpha$ -N method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure Output Voltage 0.352 ~ 4.824 V	If the inlet air pressure sensor system fails (the signal Pv is out of the usable range, wiring short or open), the ECU sets the DFI in the $\alpha$ - N method. Conduct ignition and injection operations whenever crank rotates by 360 degrees.
13	Inlet Air Temperature Sensor	Inlet Air Temperature Output Voltage 0.117 ~ 4.922 V	ECU sets Ta at 26°C.
14	Water Temperature Sensor	Water Temperature Output Voltage 0.195 ~ 4.902 V	ECU sets Tw at 80°C.
21	Crankshaft Sensor	Crankshaft sensor must send 18 signals (output signal) to the ECU at the one cranking.	If crankshaft sensor generates other than 18 signals, the engine stops by itself.
25	Gear Position Switch	Gear Position Sensor Output Voltage 0.469 ~ 4.727 V	If the gear position switch fails, set the low (1) gear position.
31	Vehicle-down Sensor	Vehicle-down Sensor Output Voltage 0.176 ~ 4.727 V	If the vehicle-down sensor system has failures, the ECU shuts off the fuel system and the ignition system. ECU does not backup.
41	Fuel Injector	In succession pulse is input to ECU.	If the injector break down, wiring short or open, the ECU stops the signal input to injector and the fuel delivery to cylinder is stopped.
46	Fuel Pump	Supply Voltage 6 ~ 15 V	If the pump fails, wiring short or open, the ECU stops the pump operations.
51	Ignition Coil	Send signals (output voltage) continuously to the ECU.	If the ignition coil fails, the ECU shuts off the signal to the ignition coil.

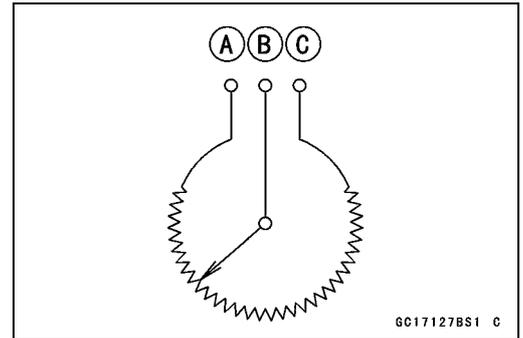
#### Note:

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

**Throttle Sensor (Service Code 11)**

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

- Input Terminal [A]
- Output Terminal [B]
- Ground Terminal [C]



**Throttle Sensor Removal/Adjustment**

**CAUTION**

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

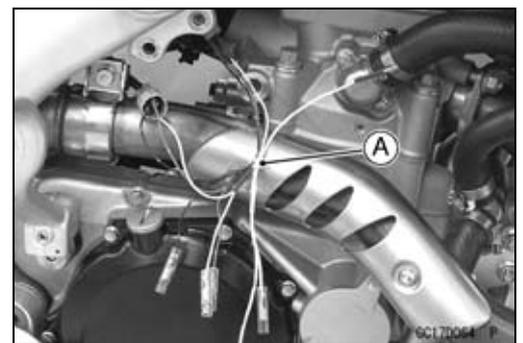
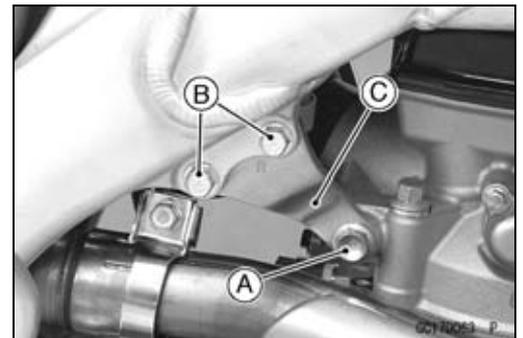


**Throttle Sensor Input Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

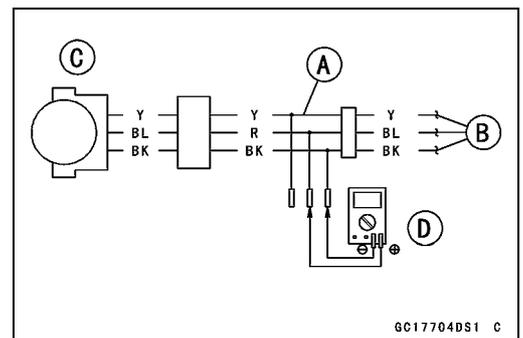
- Remove:
  - Upper Engine Mounting Bolt [A]
  - Upper Engine Bracket Bolts [B]
  - Upper Engine Bracket [C]
- Disconnect the throttle sensor connector and connect the measuring adapter [A] between these connectors.
  - Main Harness [B]
  - Throttle Sensor [C]
- Connect a digital meter [D] to the harness adapter leads.



**Throttle Sensor Input Voltage**

**Connections to Adapter:**

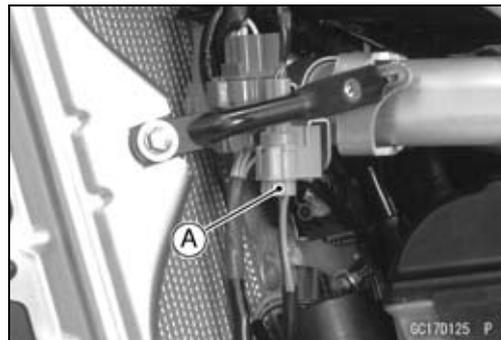
- Digital Meter (+) → R (sensor BL) lead
- Digital Meter (-) → BK (sensor BK) lead



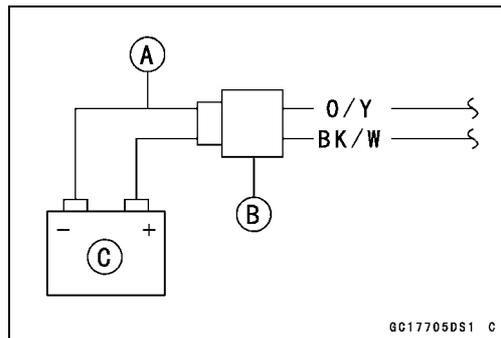
## 3-36 FUEL SYSTEM (DFI)

### Throttle Sensor (Service Code 11)

- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Measure the input voltage with the engine stopped and with the connector joined.

#### Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

#### Wiring Inspection

ECU Connector [A] ↔

Throttle Sensor Connector [B] ↔

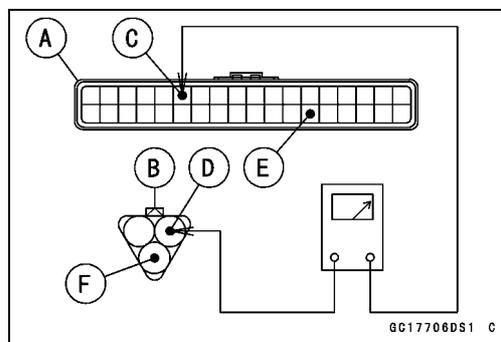
R/Y lead (ECU terminal 13) [C]

BL lead [D]

GY lead (ECU terminal 24) [E] ↔

BK lead [F]

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



## Throttle Sensor (Service Code 11)

### Throttle Sensor Output Voltage Inspection

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

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

#### Throttle Sensor Output Voltage

##### Connections to Adapter:

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

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

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

#### Idle Speed

**Standard: 2 000 ±50 r/min (rpm)**

- ★ If the idle speed is out of the specified range, adjust it (see Idle Speed Inspection in the Periodic Maintenance chapter).
- Connect the power supply harness (option P/No. 26011-0246) and 12 V battery to the capacitor lead connector (see Throttle Sensor Input Voltage Inspection).
- Measure the output voltage with the engine stopped, and with the connector joined.

#### Output Voltage

**Standard: DC 0.525 ~ 0.675 V at idle throttle opening**

**DC 3.74 ~ 3.94 V at full throttle opening (for reference)**

### NOTE

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

*Example:*

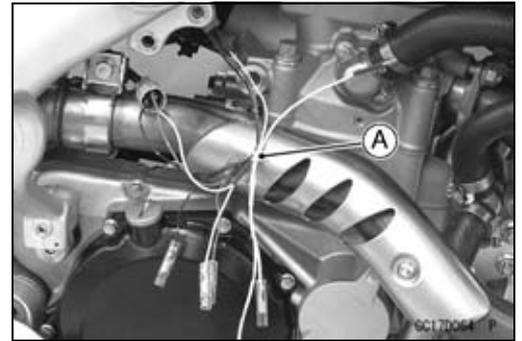
*In the case of a input voltage of 4.75 V.*

$$0.525 \times 4.75 \div 5.00 = 0.499 \text{ V}$$

$$0.675 \times 4.75 \div 5.00 = 0.641 \text{ V}$$

*Thus, the valid range is 0.499 ~ 0.641 V*

- ★ If the reading is out of the standard, check the throttle sensor resistance (see Throttle Sensor Resistance Inspection).



## 3-38 FUEL SYSTEM (DFI)

### Throttle Sensor (Service Code 11)

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Inspection

ECU Connector [A] ↔

Throttle Sensor Connector [B]

Y lead (ECU terminal 5) [C]

GY lead (ECU terminal 24) [D] ↔

BK lead [E]

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

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

#### Throttle Sensor Resistance Inspection

● Disconnect the throttle sensor connector.

● Connect a measuring adapter [A] to the throttle sensor.

Special Tool - Measuring Adapter: 57001-1700

#### Throttle Sensor Resistance

Connections to Adapter:

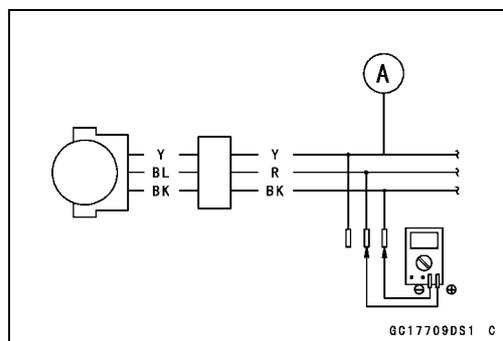
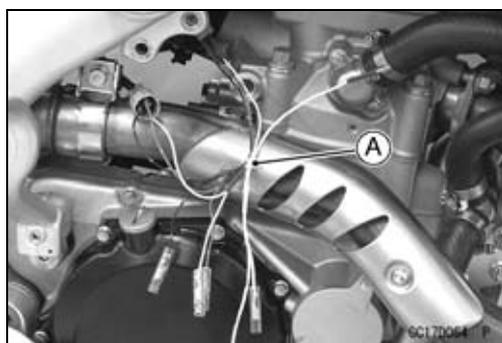
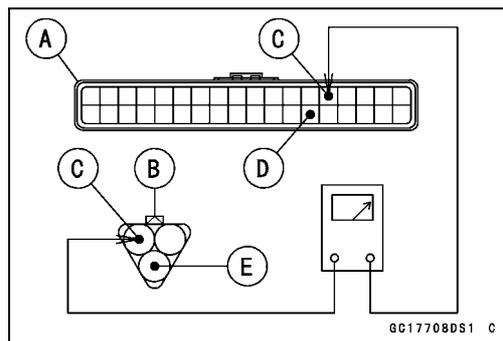
Digital Meter (+) → R (sensor BL) lead

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

Standard: 4 ~ 6 kΩ

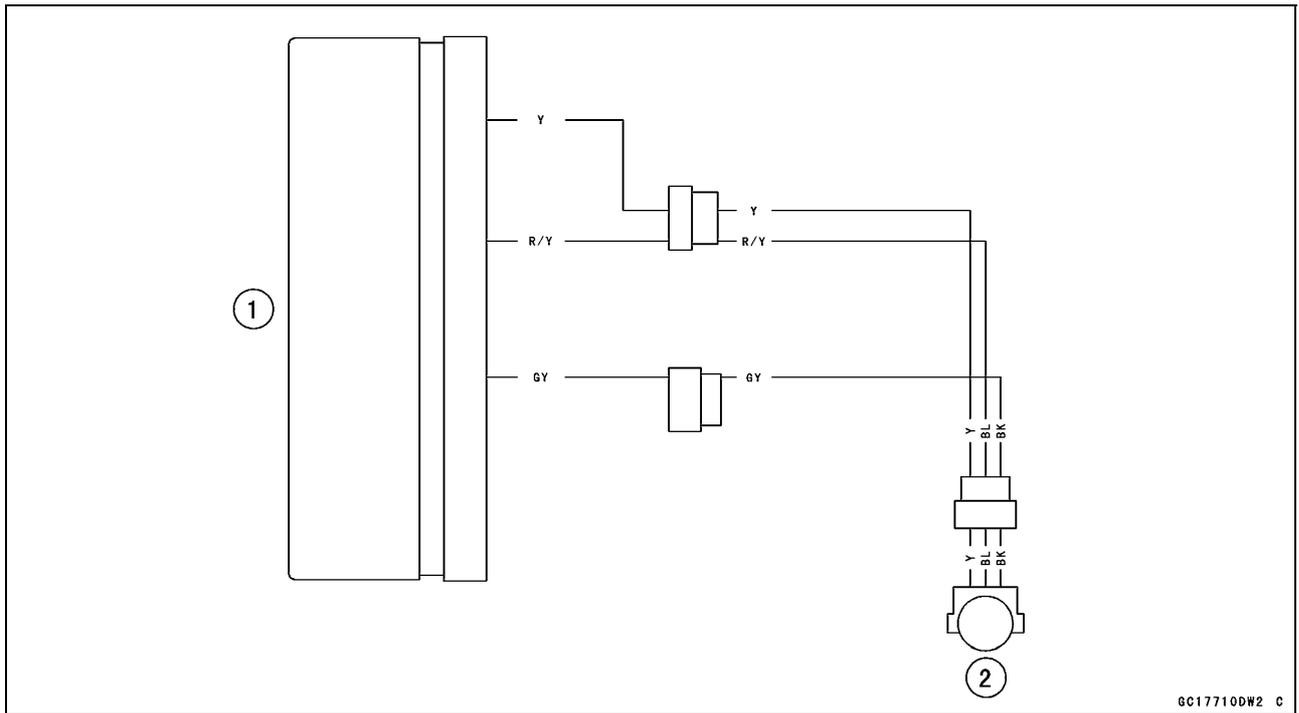
★ If the reading is out of the standard, replace the throttle body assy.

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



Throttle Sensor (Service Code 11)

Throttle Sensor Circuit



GC17710DW2 C

- 1. ECU
- 2. Throttle Sensor

## 3-40 FUEL SYSTEM (DFI)

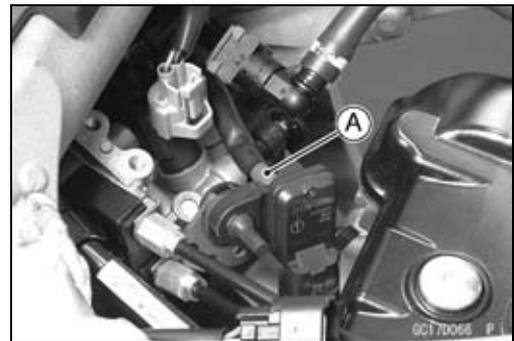
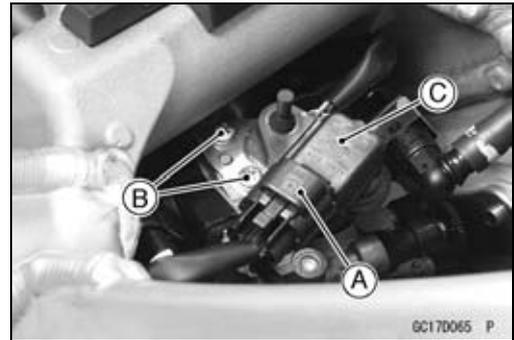
### Inlet Air Pressure Sensor (Service Code 12)

#### *Inlet Air Pressure Sensor Removal*

#### CAUTION

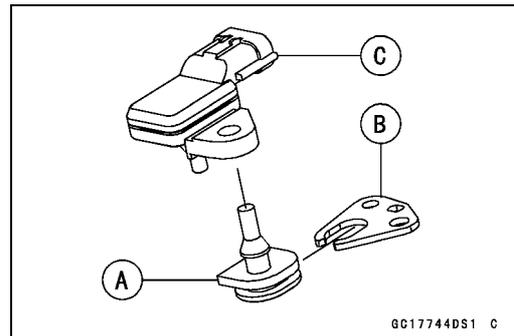
Never drop the inlet air pressure sensor, especially on a hard surface. Such a shock to the sensor can damage it.

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Inlet Air Pressure Sensor Connector [A]
  - Screws [B]
  - Inlet Air Pressure Sensor (with the plate and rubber damper) [C]
- Remove the vacuum hose [A] from the inlet air pressure sensor.

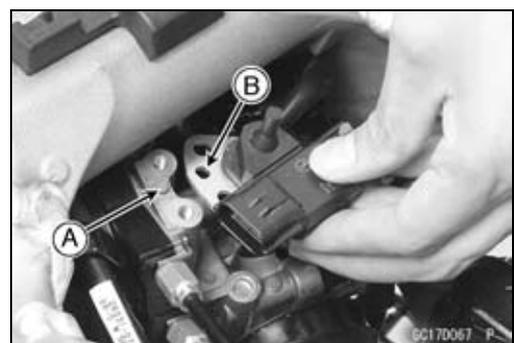


#### *Inlet Air Pressure Sensor Installation*

- Assemble the rubber damper [A], plate [B] and inlet air pressure sensor [C].

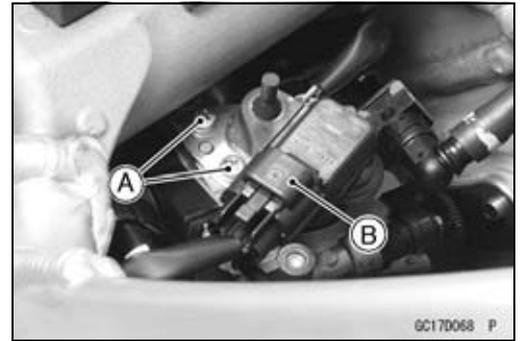


- Connect the vacuum hose.
- Install the inlet air pressure sensor so that fit the projection [A] on the throttle body assy and hole [B] of the plate.



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

- Tighten the screws [A] securely.
- Connect the inlet air pressure sensor connector [B].



**Inlet Air Pressure Sensor Input Voltage Inspection**

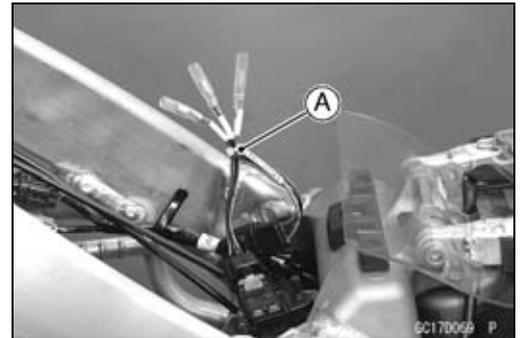
**NOTE**

○ Be sure the battery is fully charged.

- Disconnect the inlet air pressure sensor connector and connect the sensor harness adapter [A] between these connectors.

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

- Connect a digital meter to the harness adapter leads.

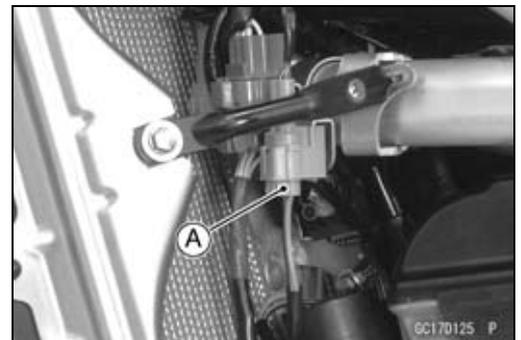


**Inlet Air Pressure Sensor Input Voltage Connections to Adapter:**

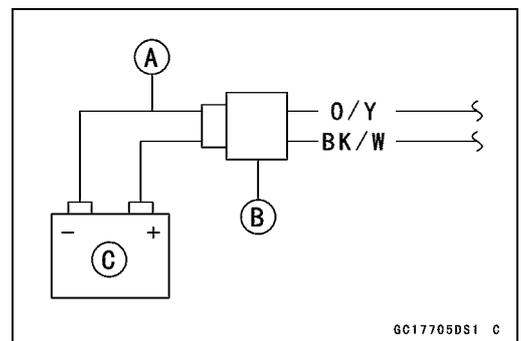
**Digital Meter (+) → G/W (sensor R/Y) lead**

**Digital Meter (-) → BK (sensor GY) lead**

- Remove:  
Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)  
Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Measure the input voltage with the engine stopped and with the connector joined.

**Input Voltage**

**Standard: DC 4.75 ~ 5.25 V**

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

## 3-42 FUEL SYSTEM (DFI)

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

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Inspection

ECU Connector [A] ←→

Inlet Air Pressure Sensor Connector [B]

R/Y lead (ECU terminal 13) [C]

GY lead (ECU terminal 24) [D]

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

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

#### Inlet Air Pressure Sensor Output Voltage Inspection

● Measure the output voltage at the inlet air pressure sensor in the same way as input voltage inspection, note the following.

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

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

#### Inlet Air Pressure Sensor Output Voltage

Connections to Adapter:

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

Digital Meter (-) → BK (sensor GY) lead

● Connect the power supply harness (option P/No. 26011-0246) and 12 V battery to the capacitor lead connector (see Inlet Air Pressure Sensor Input Voltage Inspection).

● Measure the output voltage with the engine stopped, and with the connector joined.

#### Output Voltage

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

#### NOTE

○ The output voltage changes according to local atmospheric pressure.

★ If the reading is out of the usable range, replace the sensor.

★ If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness and sub harness connectors.

○ Disconnect the ECU and sensor connectors.

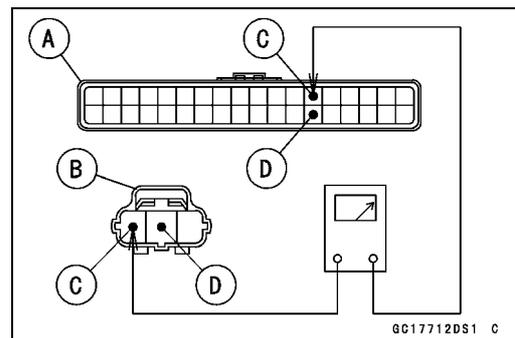
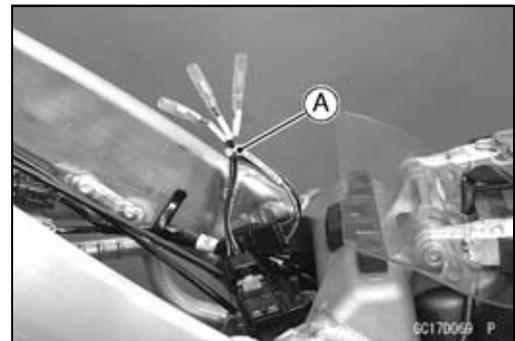
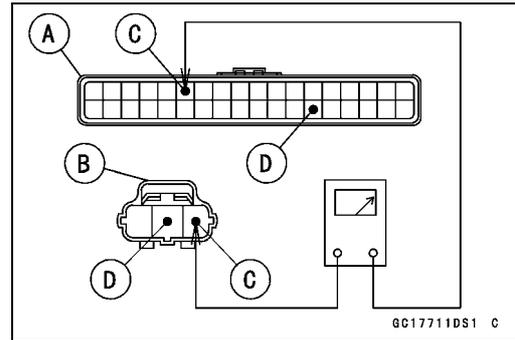
#### Wiring Inspection

ECU Connector [A] ←→

Inlet Air Pressure Sensor Connector [B]

BL lead (ECU terminal 6) [C]

GY lead (ECU terminal 24) [D]



## Inlet Air Pressure Sensor (Service Code 12)

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

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

### Inlet Air Pressure Sensor Output Voltage

#### Connections to Adapter:

- Digital Meter (+) → G (sensor BL) lead
- Digital Meter (-) → BK (sensor GY) lead

- Connect the power supply harness (option P/No. 26011-0246) and 12 V battery to the capacitor lead connector (see Inlet Air Pressure Sensor Input Voltage Inspection).
- Measure the inlet air pressure sensor output voltage from various vacuum readings, while pulling the handle of the fork oil level gauge.
- Check the inlet air pressure sensor output voltage, using the following formula and chart.

Suppose:

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

then

$$Pv = Pl - Pg$$

For example, suppose the following data is obtained:

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

then

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

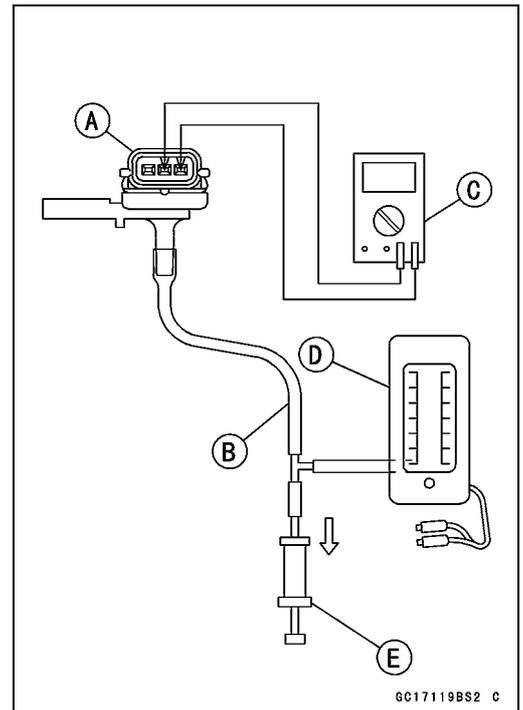
Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.

$$\text{Usable range} = 3.08 \sim 3.48 \text{ V}$$

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

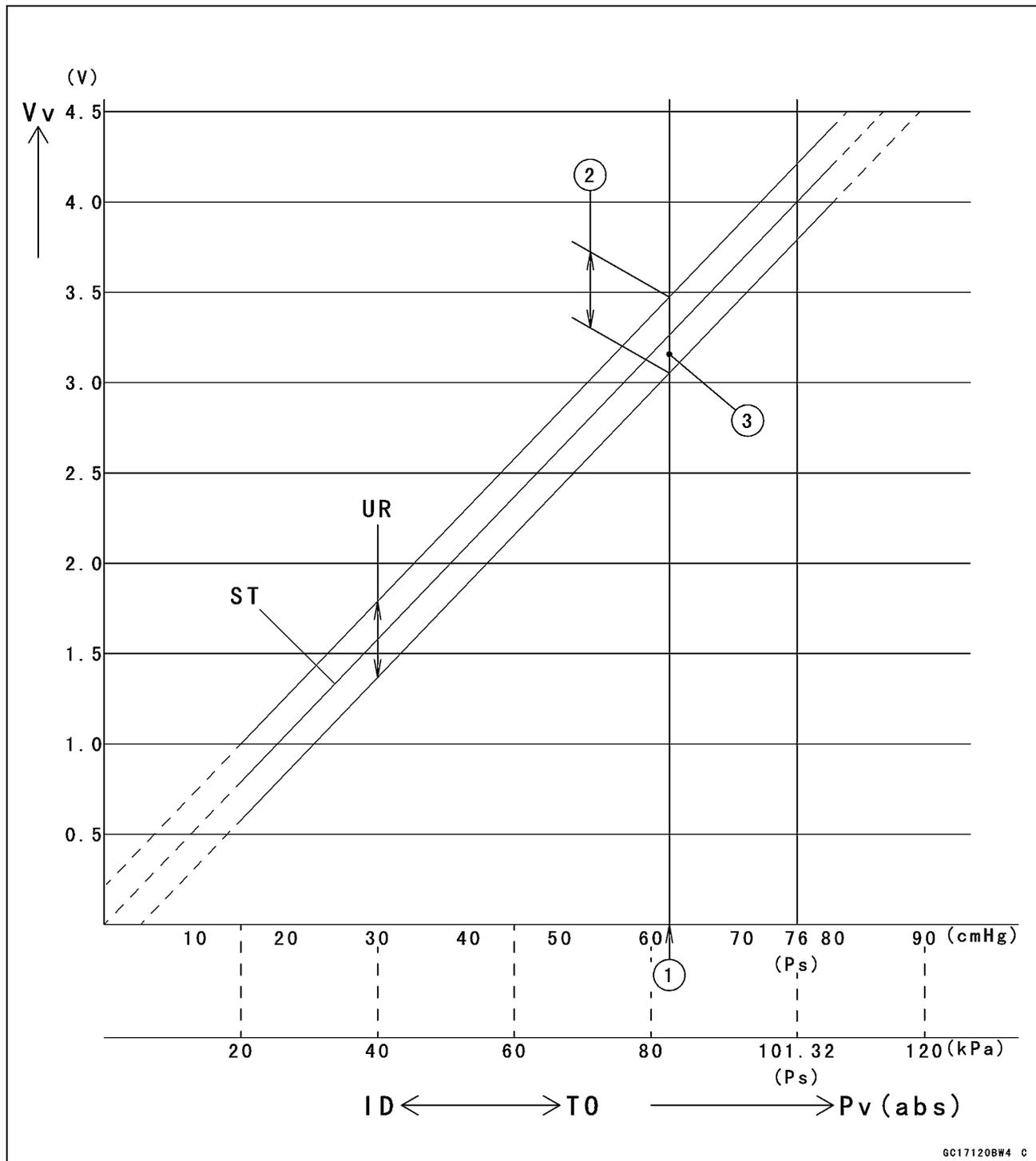
**Results: In the chart, Vv is within the usable range and the sensor is normal.**

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



### 3-44 FUEL SYSTEM (DFI)

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



GC171208W4 C

ID: Idling

Ps: Standard Atmospheric Pressure (Absolute)

Pv: Throttle Vacuum Pressure (Absolute)

ST: Standard of Sensor Output Voltage (V)

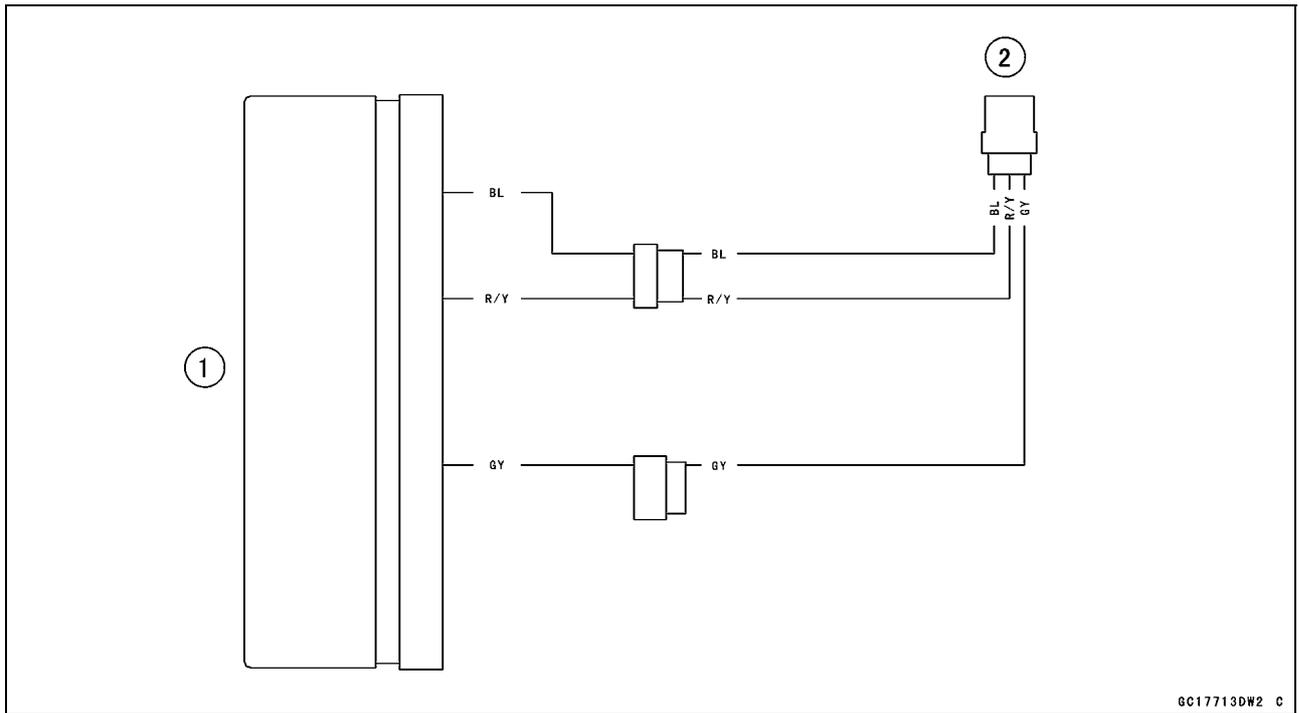
TO: Throttle Full Open

UR: Usable Range of Sensor Output Voltage (V)

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

Inlet Air Pressure Sensor (Service Code 12)

Inlet Air Pressure Sensor Circuit



- 1. ECU
- 2. Inlet Air Pressure Sensor

## 3-46 FUEL SYSTEM (DFI)

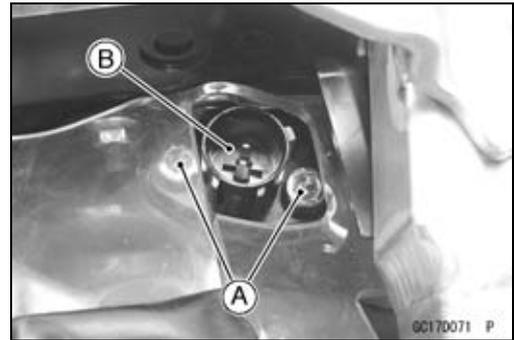
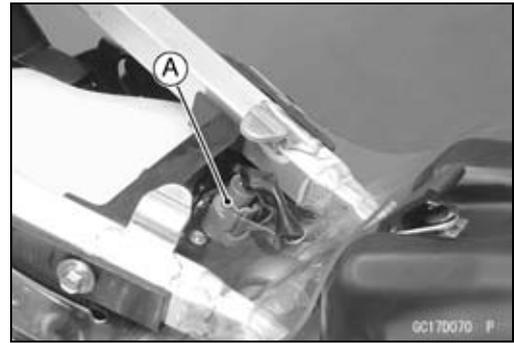
### Inlet Air Temperature Sensor (Service Code 13)

#### Inlet Air Temperature Sensor Removal/Installation

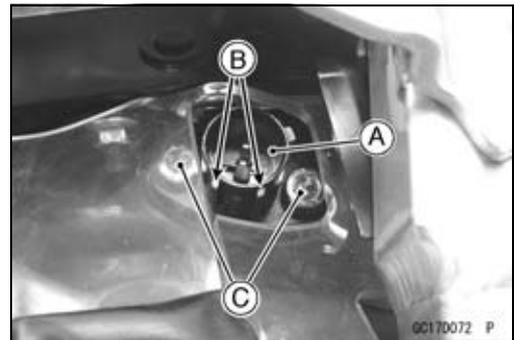
##### CAUTION

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

- Remove the seat (see Seat Removal in the Frame chapter).
- Disconnect the connector [A] from the inlet air temperature sensor.
- Remove the bolts [A].
- Pull out the inlet air temperature sensor [B].



- Put the inlet air temperature sensor [A] into the air cleaner housing.
- Face the locks [B] front side.
- Apply a non-permanent locking agent to the inlet air temperature sensor bolts [C].
- Tighten:
  - Torque - Inlet Air Temperature Sensor Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**
- Connect the sensor connector.



#### Inlet Air Temperature Sensor Output Voltage Inspection

##### NOTE

○ Be sure the battery is fully charged.

- Remove the seat (see Seat Removal in the Frame chapter).
- Disconnect the inlet air temperature sensor connector and connect the harness adapter [A] between these connectors as shown.

Main Harness [B]

Inlet Air Temperature Sensor [C]

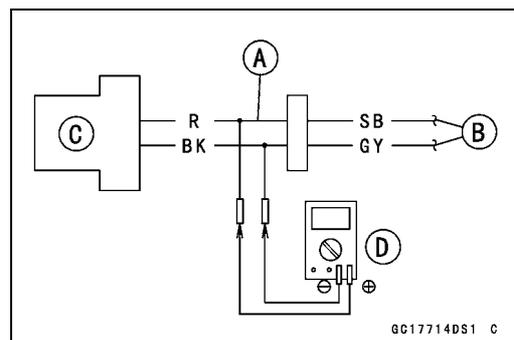
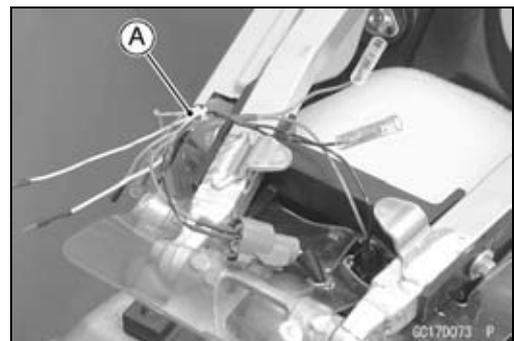
**Special Tool - Measuring Adapter: 57001-1700**

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

**Inlet Air Temperature Sensor Output Voltage Connections to Adapter:**

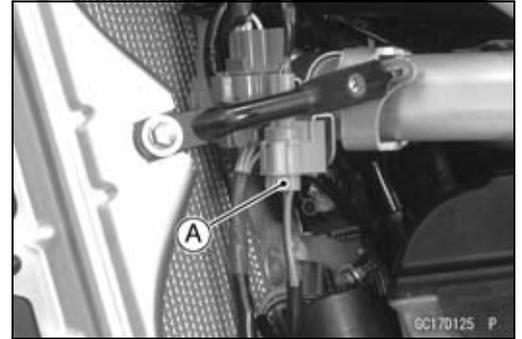
**Digital Meter (+) → R (sensor LB) lead**

**Digital Meter (-) → BK (sensor GY) lead**

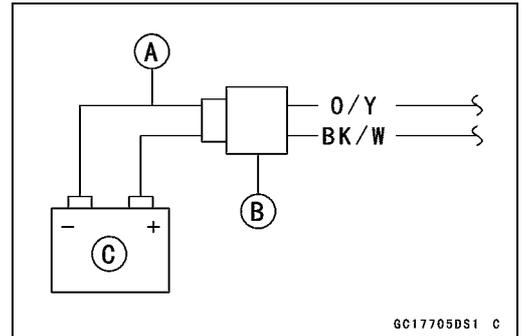


**Inlet Air Temperature Sensor (Service Code 13)**

- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Measure the output voltage with the engine stopped and the connector joined.

**Output Voltage**

**Standard: About DC 2.28 ~ 3.43 V at inlet air temperature 20°C (68°F)**

**NOTE**

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

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

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

○ Disconnect the ECU and sensor connectors.

**Wiring Inspection**

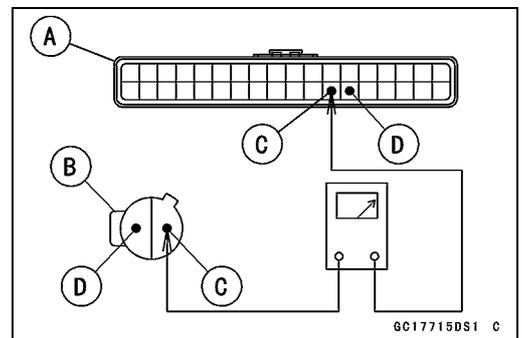
**ECU Connector [A] ↔**

**Inlet Air Temperature Sensor Connector [B]**

**LB lead (ECU terminal 25) [C]**

**GY lead (ECU terminal 24) [D]**

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



## 3-48 FUEL SYSTEM (DFI)

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

#### Inlet Air Temperature Sensor Resistance Inspection

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

#### NOTE

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

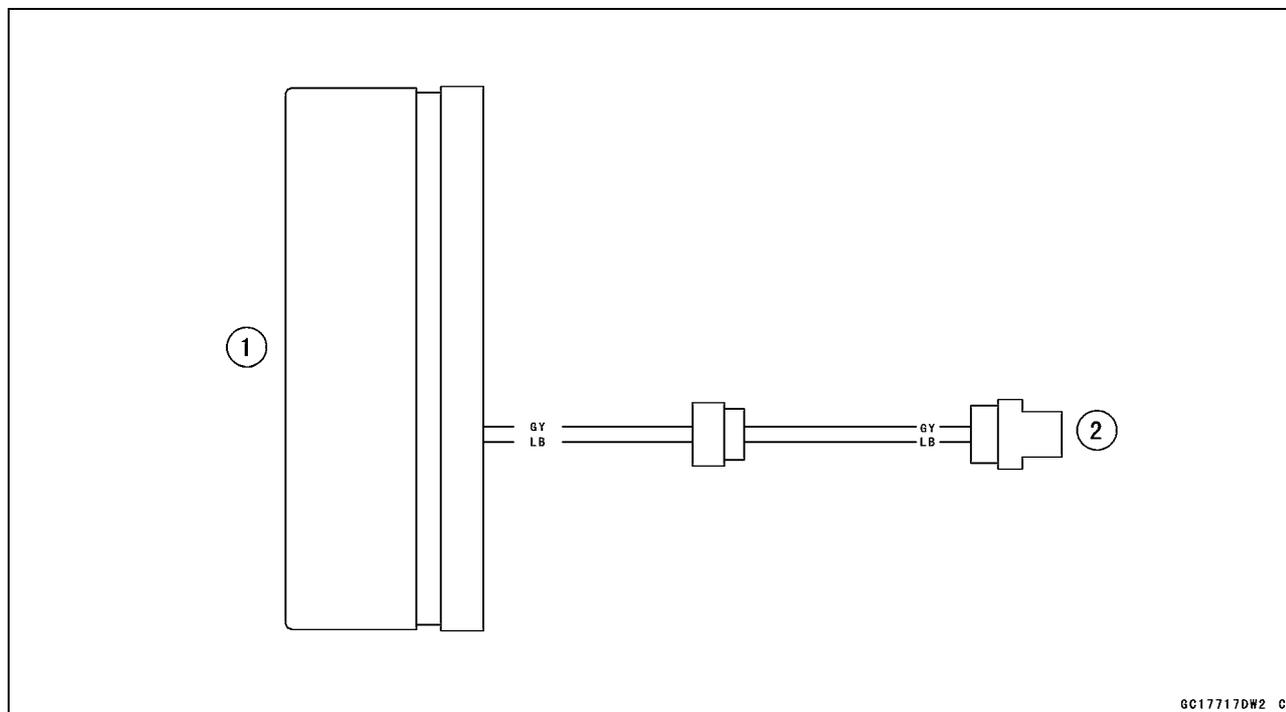
#### Inlet Air Temperature Sensor Resistance

Standard: 910 ~ 1363  $\Omega$  at 40°C (104°F)

120 ~ 190  $\Omega$  at 100°C (212°F)

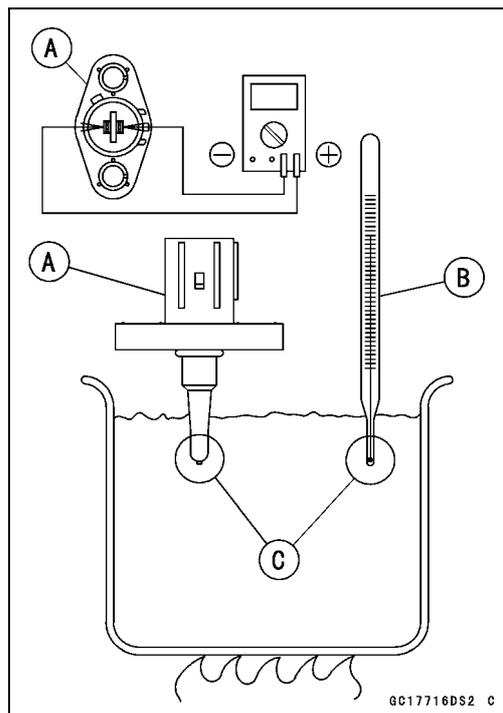
- ★ If the reading is out of the standard, replace the sensor.
- ★ If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

#### Inlet Air Temperature Sensor Circuit



1. ECU

2. Inlet Air Temperature Sensor



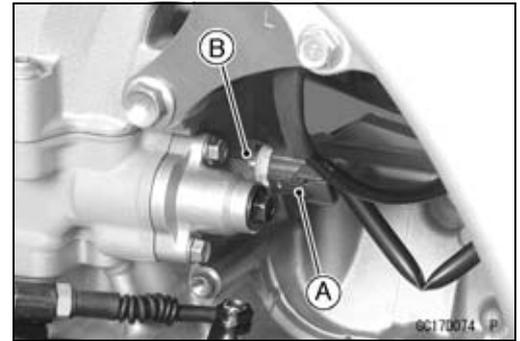
**Water Temperature Sensor (Service Code 14)**

**Water Temperature Sensor Removal/Installation**

**CAUTION**

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

- Drain the coolant (see Coolant Draining in the Cooling System chapter).
  - Remove:
    - Connector [A]
    - Water Temperature Sensor [B]
  - Replace the O-ring with a new one, and tighten the water temperature sensor.
- Torque - Water Temperature Sensor: 12 N·m (1.2 kgf·m, 106 in·lb)**
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Filling in the Cooling System chapter).

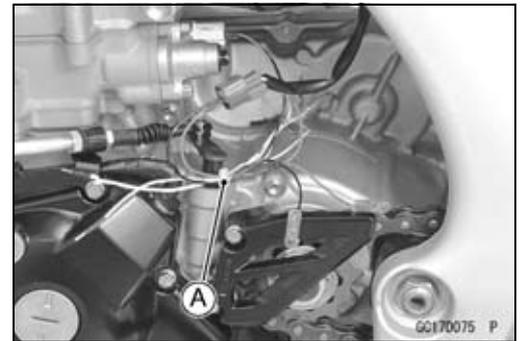


**Water Temperature Sensor Output Voltage Inspection**

**NOTE**

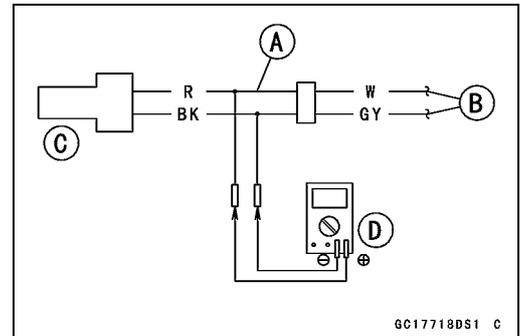
○ Be sure the battery is fully charged.

- Disconnect the water temperature sensor connector and connect the harness adapter [A] between these connectors as shown.
    - Main Harness [B]
    - Water Temperature Sensor [C]
- Special Tool - Measuring Adapter: 57001-1700**
- Connect a digital meter [D] to the harness adapter leads.

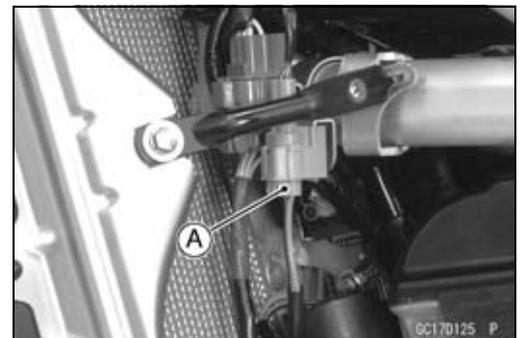


**Water Temperature Sensor Output Voltage Connections to Adapter:**

- Digital Meter (+) → R (sensor W) lead**
- Digital Meter (-) → BK (sensor GY) lead**



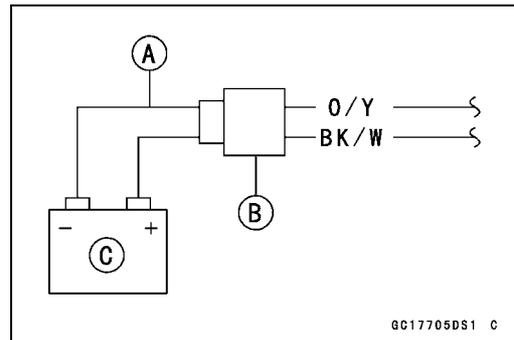
- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



## 3-50 FUEL SYSTEM (DFI)

### Water Temperature Sensor (Service Code 14)

- Connect the power supply harness (option P/No. 26011 -0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011 -0246) to the 12 V battery [C] as shown.



- Measure the output voltage with the engine stopped and the connector joined.

#### Output Voltage

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

#### NOTE

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

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

#### Wiring Inspection

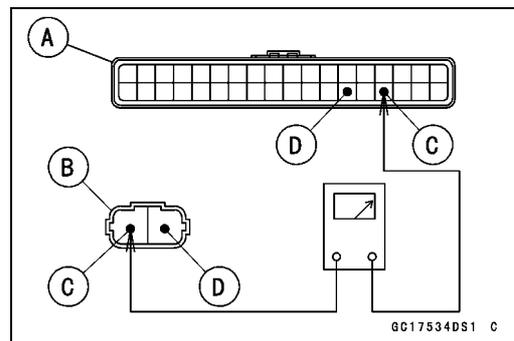
**ECU Connector [A] ←→**

**Subthrottle Sensor Connector [B]**

**W lead (ECU terminal 22) [C]**

**GY lead (ECU terminal 24) [D]**

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



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

**Water Temperature Sensor Inspection**

- Remove the water temperature sensor (see Water Temperature Sensor Removal/Installation).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion and threaded portion are submerged.
- Suspend an accurate thermometer [B] with heat-sensitive 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 oil while stirring the oil gently for even temperature.
- Using the hand tester, measure the internal resistance of the sensor.
- ★ If the measurement is out of the range, replace the sensor.

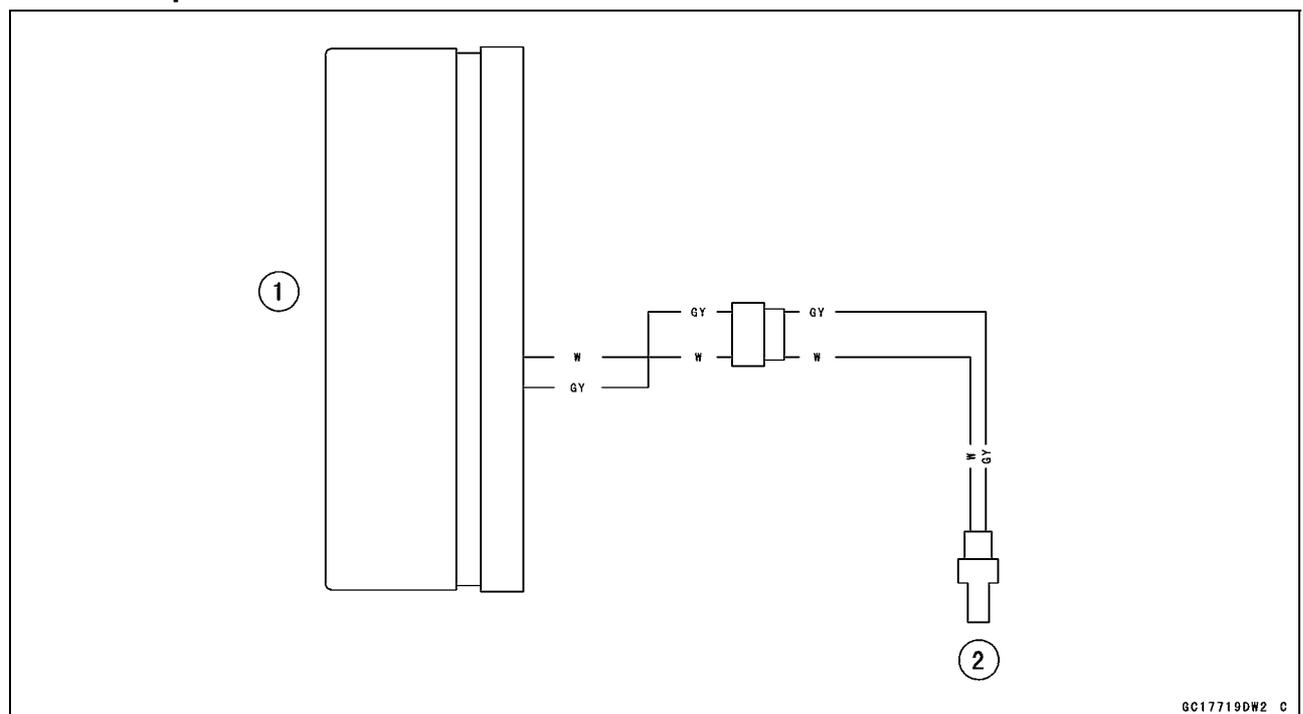
**Water Temperature Sensor Resistance**

Temperature	Resistance (kΩ)
-20°C (-4°F)	*18.80 ±2.37
0°C (32°F)	*(About 6.544)
40°C (104°F)	1.136 ±0.095
100°C (212°F)	0.1553 ±0.0070

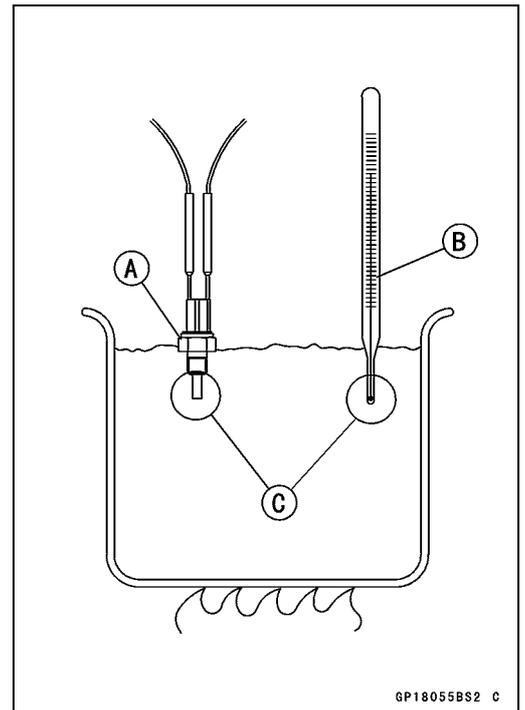
\*: Reference Information

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

**Water Temperature Sensor Circuit**



1. ECU
2. Water Temperature Sensor



GP18055BS2 C

GC17719DW2 C

## 3-52 FUEL SYSTEM (DFI)

### Crankshaft Sensor (Service Code 21)

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

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

- Refer to the Starter Coil Removal/Installation in the Electrical System chapter.

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

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

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

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

#### **Wiring Inspection**

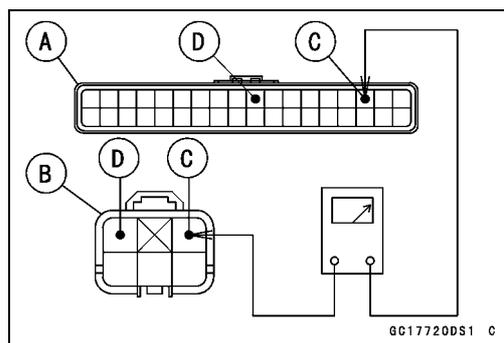
ECU Connector [A] ←→

Crankshaft Sensor Connector [B]

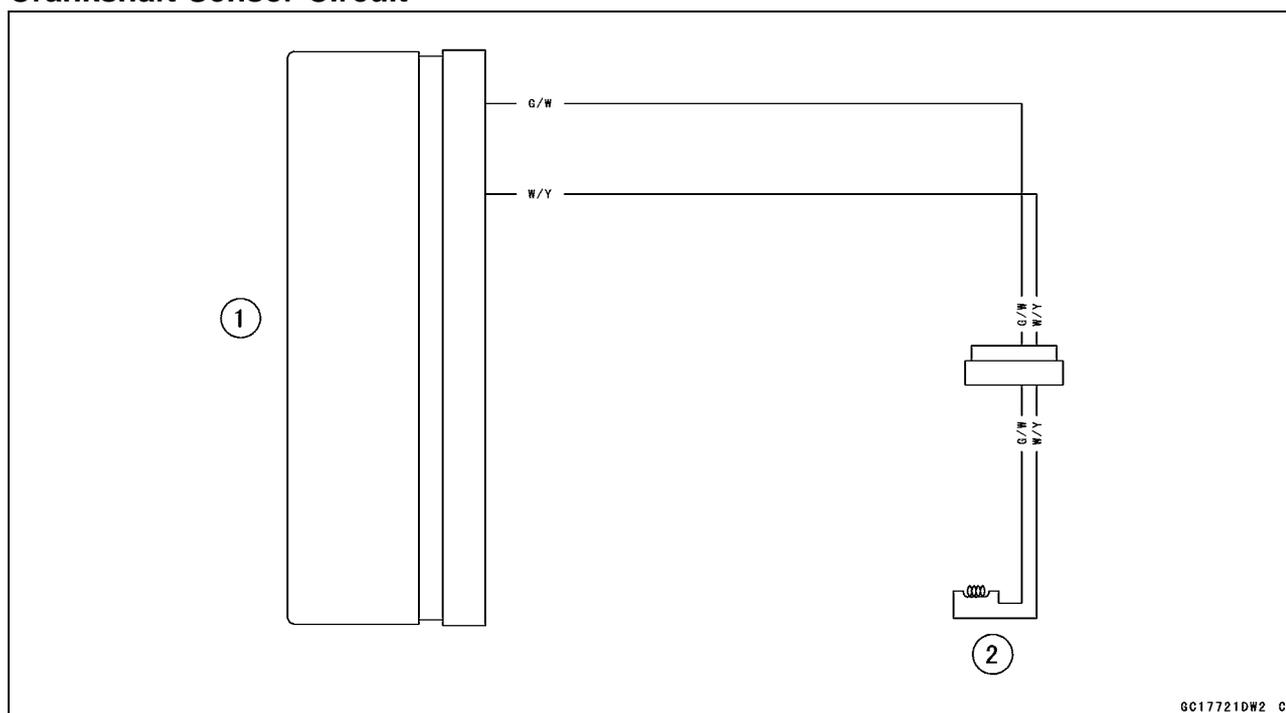
G/W lead (ECU terminal 3) [C]

W/Y lead (ECU terminal 9) [D]

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



#### **Crankshaft Sensor Circuit**

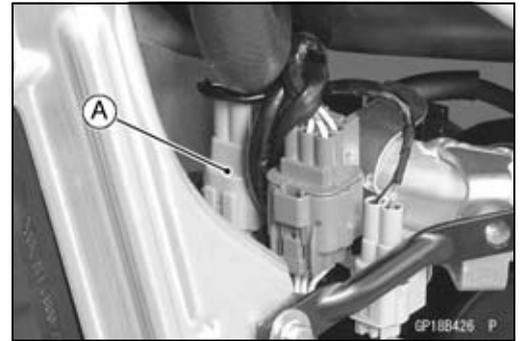


1. ECU
2. Crankshaft Sensor

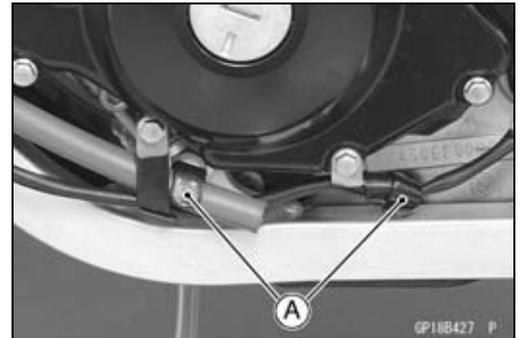
**Gear Position Switch (Service Code 25)**

**Gear position Switch Removal**

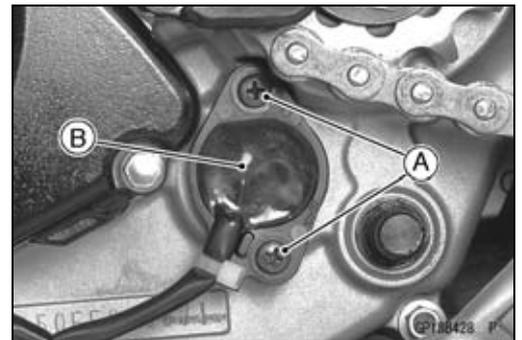
- Remove:
  - Shift Pedal (External Shift Mechanism Removal in the Crankshaft/Transmission chapter)
- Remove the gear position switch connector [A].



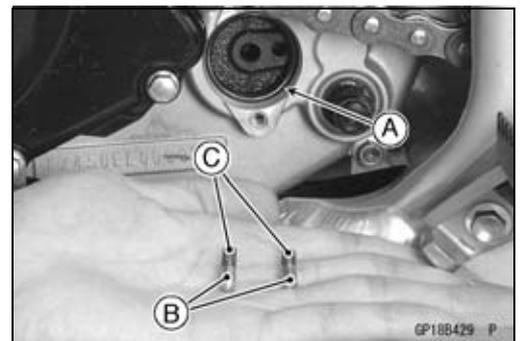
- Open the clamps [A].



- Remove:
  - Screws [A]
  - Gear Position Switch [B]



- Remove:
  - O-ring [A]
  - Gear Position Switch Fingers [B]
  - Springs [C]



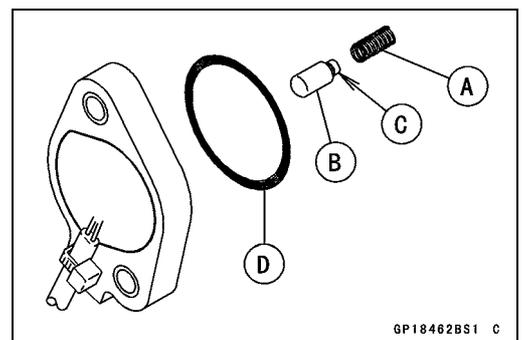
**Gear Position Switch Inspection**

- Insert the spring [A] into the hole in the shift drum.
- Insert the switch finger [B] so that the small diameter [C] is toward hplc side.
- Apply grease to the O-ring [D].
- Clean the contact points on the position switch.
- Apply a non-permanent locking agent to the gear position switch screws.

- Tighten:

**Torque - Gear Position Switch Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)**

- Install the removed parts (see appropriate chapters).



GP18462BS1 C

## 3-54 FUEL SYSTEM (DFI)

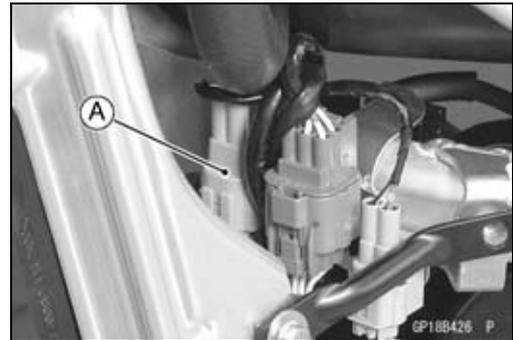
### Gear Position Switch (Service Code 25)

#### Gear Position Switch Inspection

##### NOTE

○ Be sure the transmission mechanism is good condition.

- Remove the left radiator shroud (see Radiator shroud Removal in the Frame chapter).
- Disconnect the gear position switch lead connector [A].



- Set the hand tester [A] to the  $\times 1$  k $\Omega$  or  $\times 100$   $\Omega$  range and connect it to the terminals in the gear position switch lead connector [B] and ground.

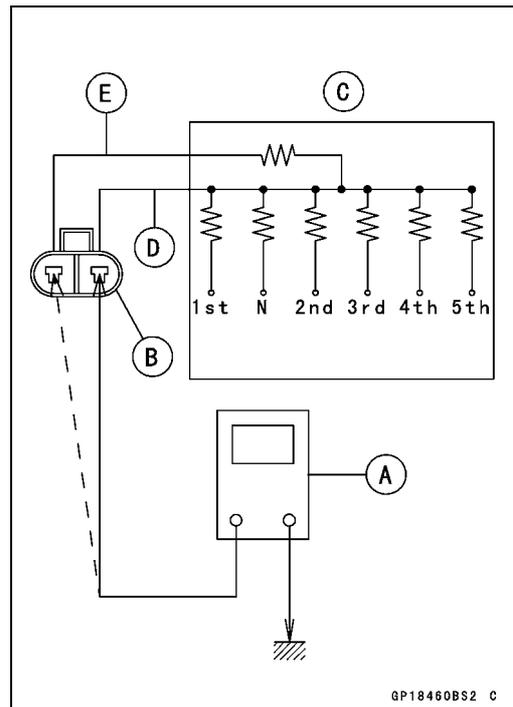
[C] Internal Circuit  
[D] Green/Red Lead  
[E] Black Lead

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

#### Gear Position Switch Resistance

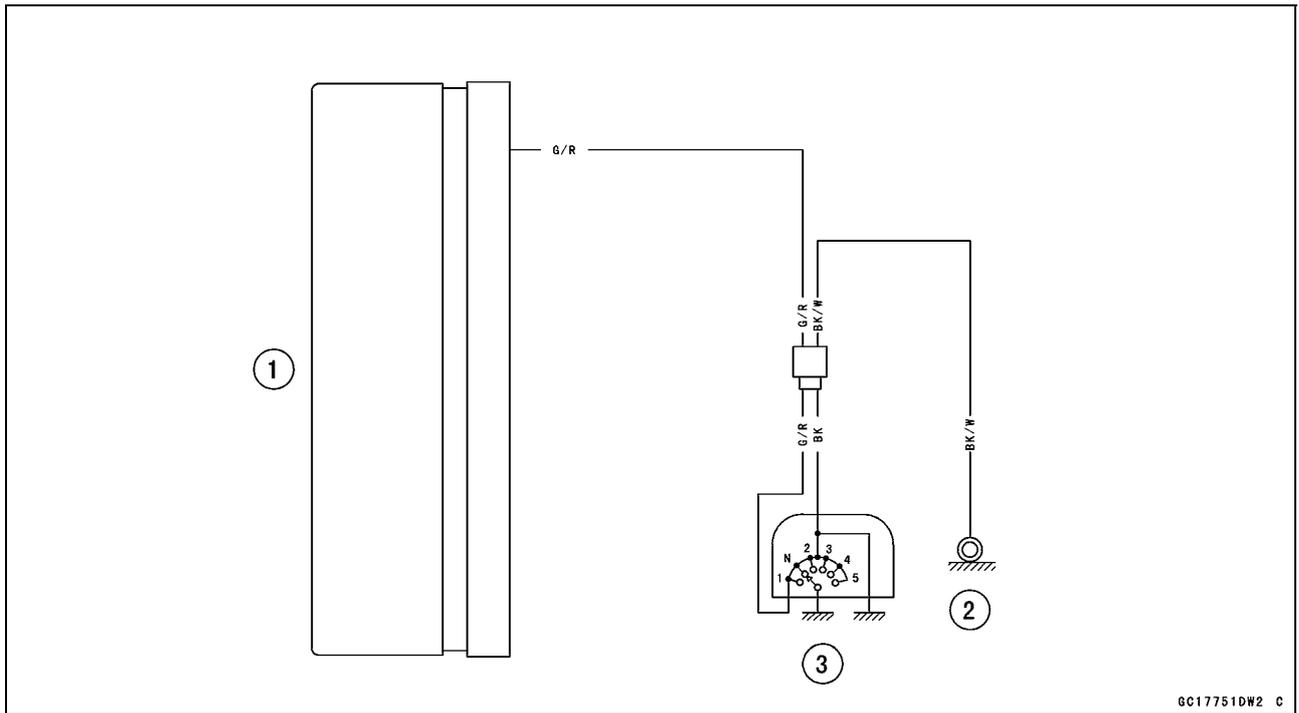
Gear Position	Connections	
	[D] Terminal - Ground	[E] Terminal - Ground
Neutral	1.71 ~ 1.89 k $\Omega$	10.35 ~ 11.43 k $\Omega$
1st	3.00 ~ 3.32 k $\Omega$	11.64 ~ 12.86 k $\Omega$
2nd	1.07 ~ 1.19 k $\Omega$	9.71 ~ 10.73 k $\Omega$
3rd	695 ~ 769 $\Omega$	9.34 ~ 10.31 k $\Omega$
4th	430 ~ 476 $\Omega$	9.07 ~ 10.02 k $\Omega$
5th	248 ~ 274 $\Omega$	8.89 ~ 9.8k $\Omega$

- ★ If the tester reading is not as specified, replace the gear position switch with a new one.



Gear Position Switch (Service Code 25)

Gear Position Switch Circuit



GC17751DW2 C

- 1. ECU
- 2. Frame Ground
- 3. Gear Position Switch

## 3-56 FUEL SYSTEM (DFI)

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

When motorcycle is down, if opening of the throttle valve is 3/8 or more, stop the engine after 3 seconds. If throttle valve opening is 3/8 or less, hold the engine speed at 3000rpm for 3 seconds after the motorcycle fell over the 3 seconds, then stop the engine.

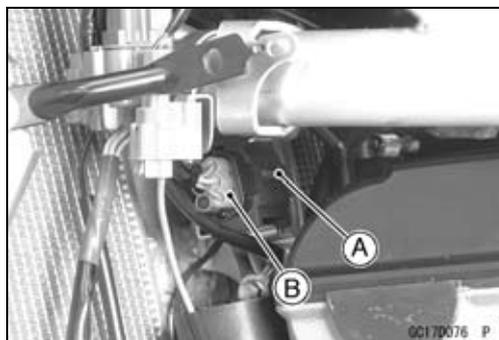
When the vehicle-down sensor is broken, the engine will start though stop it at 3 seconds.

#### Vehicle-down Sensor Removal

##### CAUTION

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

- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
- Pull the vehicle-down sensor [A] from the frame bracket.
- Disconnect the connector [B].

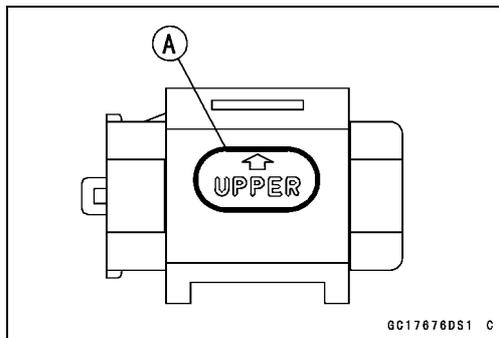


#### Vehicle-down Sensor Installation

- The UPPER mark [A] of the sensor should face upward and install the sensor.
- Connect the connector.

##### WARNING

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



#### Vehicle-down Sensor Input Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Remove the left radiator shroud (see Radiator Shroud Removal in the Frame chapter).
- Disconnect the vehicle-down sensor connector and connect the harness adapter [A] between these connectors as shown.

Main Harness [B]

Vehicle-down Sensor [C]

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

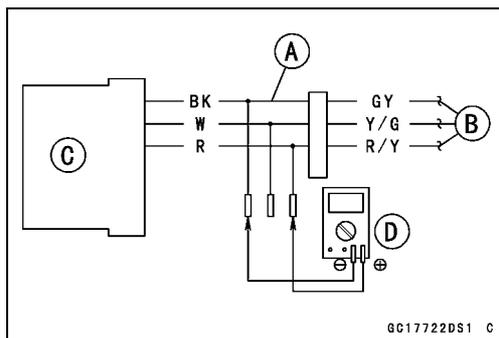
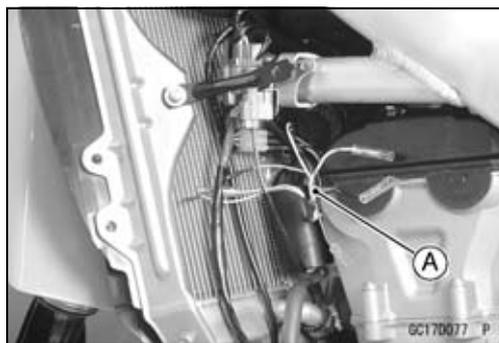
- Connect a digital meter [D] to the harness adapter leads.

#### Vehicle-down Sensor Input Voltage

##### Connections to Adapter:

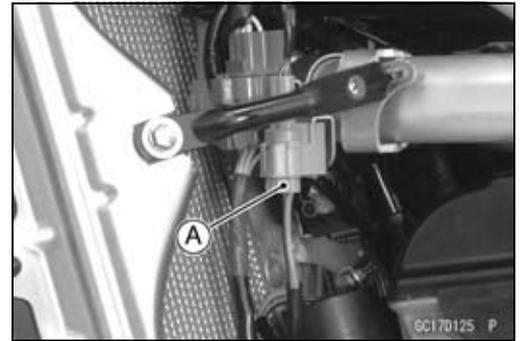
Digital Meter (+) → R (sensor R/Y) lead

Digital Meter (-) → BK (sensor GY) lead

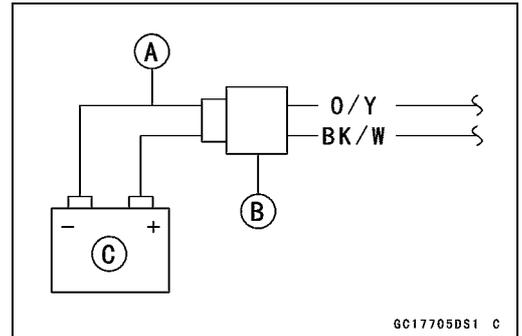


**Vehicle-down Sensor (Service Code 31)**

- Remove:  
Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Measure the input voltage with the engine stopped and with the connector joined.

**Input Voltage**

**Standard: DC 4.75 ~ 5.25 V**

- ★ If the reading is within the standard, check the output voltage (see Vehicle-down Sensor Output Voltage Inspection).

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

**Wiring Inspection**

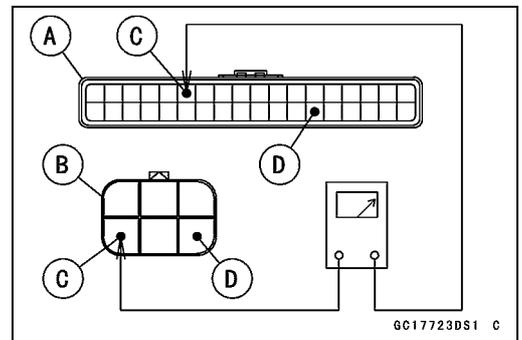
**ECU Connector [A] ↔**

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

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

**GY lead (ECU terminal 24) [D]**

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



## 3-58 FUEL SYSTEM (DFI)

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

#### Vehicle-down Sensor Output Voltage Inspection

- Remove the vehicle-down sensor.
- Remove the vehicle-down sensor, and connect the measuring adapter [A].

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

Main Harness [B]

Vehicle-down Sensor [C]

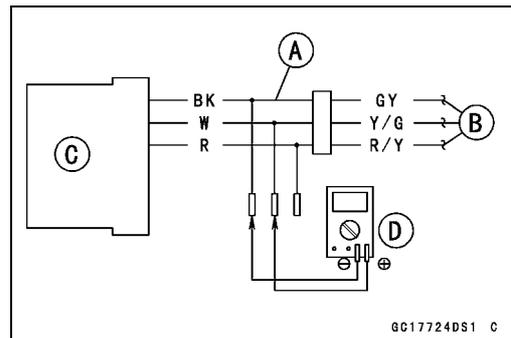
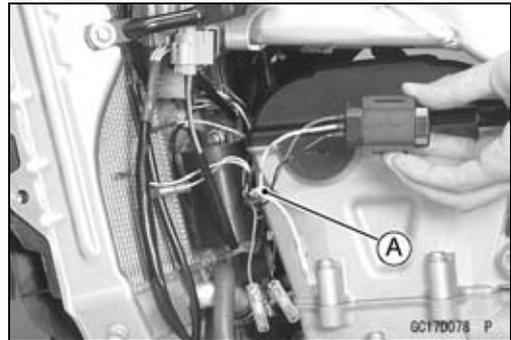
- Connect a digital meter [D] to the harness adapter leads.

#### Vehicle-down Sensor Output Voltage

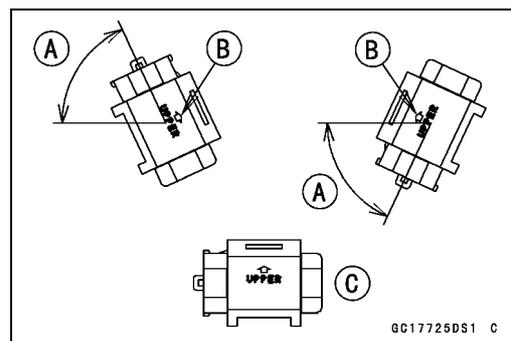
##### Connections to Adapter:

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

Digital Meter (-) → BK (sensor GY) lead



- Hold the sensor vertically.
- Connect the power supply harness (option P/No. 26011-0246) and 12 V battery to the capacitor lead connector (see Vehicle-down Sensor Input Voltage Inspection).
- Measure the output voltage with the engine stopped, and with the connector joined.
- Tilt the sensor 55 ~ 75° or more [A] right or left, then hold the sensor almost vertical with the arrow mark [B] pointed up [C], and measure the output voltage.



#### Output Voltage

Standard: With sensor tilted 55 ~ 75° or more right or left: DC 3.7 ~ 4.4 V

With sensor arrow mark pointed up: DC 0.4 ~ 1.4 V

#### NOTE

○ If you need to test again, disconnect the battery connection.

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

#### Wiring Inspection

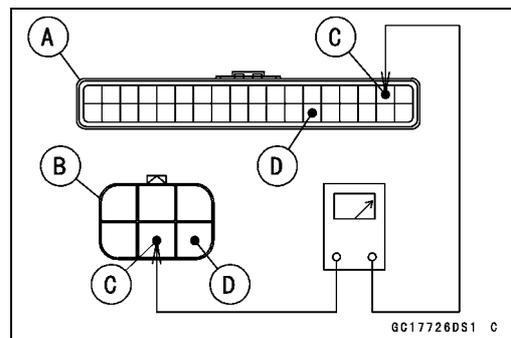
ECU Connector [A] ↔

Vehicle-down Sensor Connector [B]

Y/G lead (ECU terminal 2) [C]

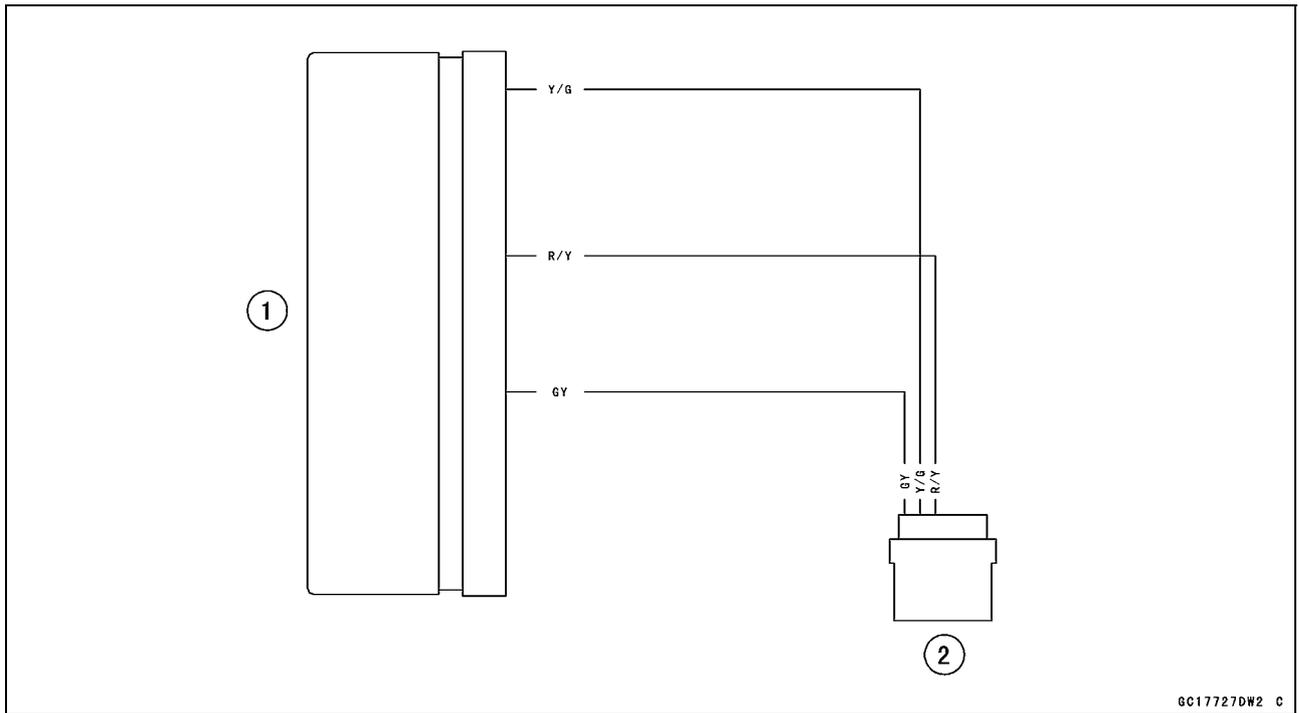
GY lead (ECU terminal 24) [D]

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



Vehicle-down Sensor (Service Code 31)

Vehicle-down Sensor Circuit



GC17727DW2 C

- 1. ECU
- 2. Vehicle-down Sensor

## 3-60 FUEL SYSTEM (DFI)

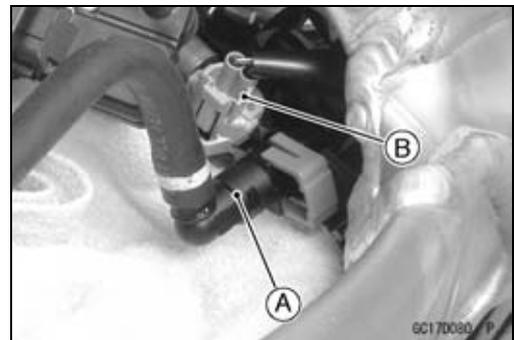
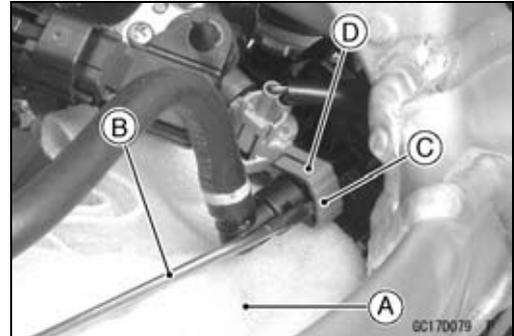
### Fuel Injector (Service Code 41)

#### CAUTION

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

#### Fuel Injector Removal

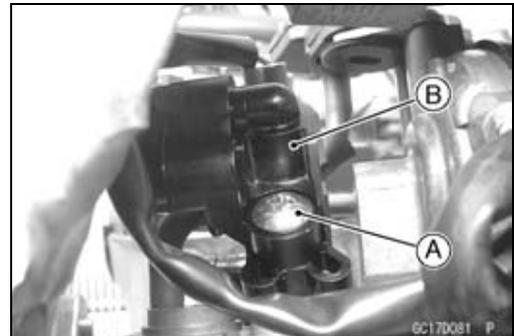
- Remove:
    - Rear Frame (see Rear Frame Removal in the Frame chapter)
    - Fuel Tank (see Fuel Tank Removal)
  - Be sure to place a piece of cloth [A] around the fuel hose joint.
  - Insert the screw driver [B] to the joint lock slit [C].
  - Turn the driver to disconnect the joint lock [D].
- 
- Pull the fuel hose joint [A] out of the delivery pipe.
  - Disconnect the injector connector [B].



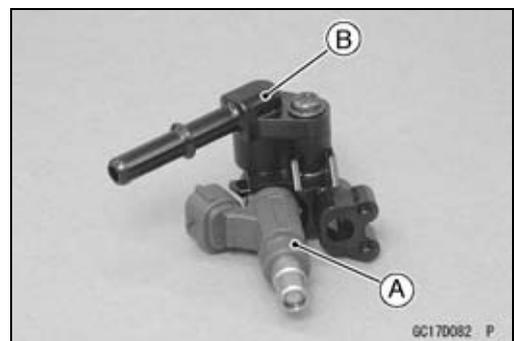
- Remove the delivery pipe mounting screw [A].
- Remove the delivery pipe [B] together with the injector.

#### NOTE

○Do not damage the insertion portions of the injector when they are pulled out from the throttle body.



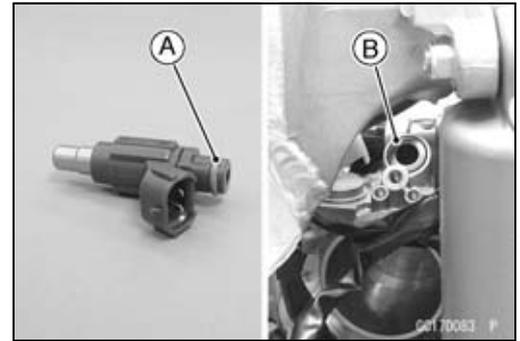
- Separate the injector [A] from the delivery pipe [B].



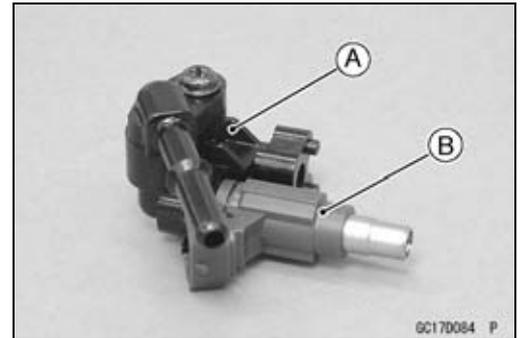
Fuel Injector (Service Code 41)

**Fuel Injector Installation**

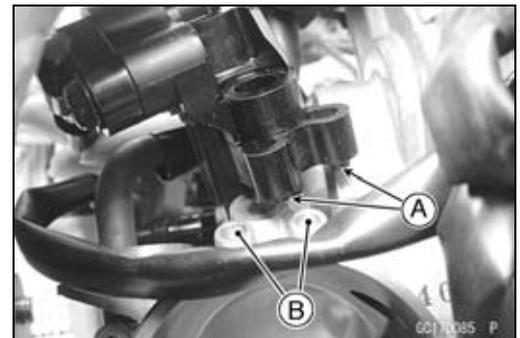
- Replace the O-ring [A] and dust seal [B] with a new one.



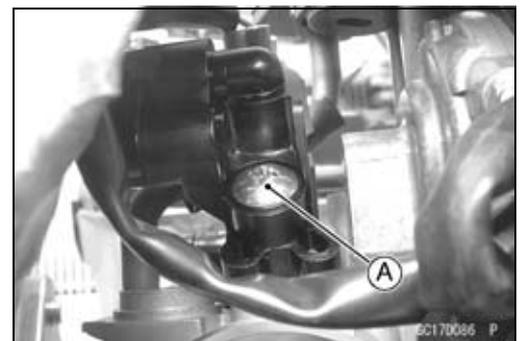
- Assemble the delivery pipe [A] and the fuel injector [B].



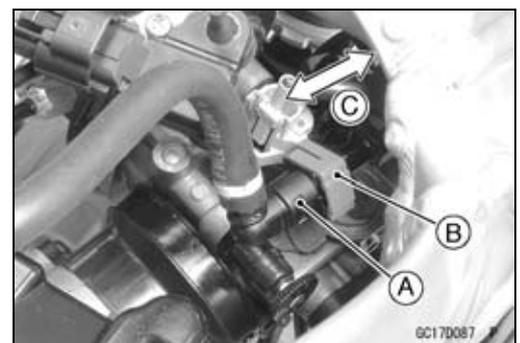
- Fit the projections [A] on the delivery pipe to the hollows [B] of the throttle body assy.



- Tighten the delivery pipe mounting screw [A]
- Connect the fuel injector connector.



- Insert the fuel hose joint [A] straight into the delivery pipe.
- Push the joint lock [B].
- Push and pull [C] the fuel hose joint back and forth more than two times and make sure it is locked and does not come off.



**⚠ WARNING**

**Slide the joint, and confirm the joint is correctly installed. There is a possibility that the fuel leaks when the installation is mistaken.**

★ If it comes off, reinstall the hose joint.

● Install:

Rear Frame (see Rear Frame Installation in the Frame chapter)

Fuel Tank (see Fuel Tank Installation)

## 3-62 FUEL SYSTEM (DFI)

### Fuel Injector (Service Code 41)

#### *Fuel Injector Audible Inspection*

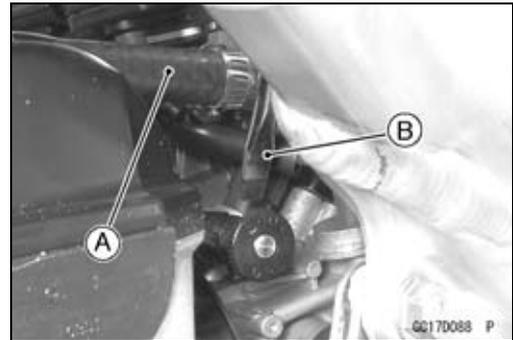
##### NOTE

○Be sure the battery is fully charged.

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Hose (see Fuel Injector Removal)
- Connect the following parts.
  - Fuel Pump Lead Connector
  - Fuel Hose [A]

##### Special Tool - Fuel Hose: 57001-1607

- Start the engine, and let it idle.
- Apply the tip of a screwdriver [B] to the fuel injector. Put the grip end into your ear, and listen whether the fuel injector is clicking or not.
- A sound scope can also be used.
- The click interval becomes shorter as the engine speed rises.
- ★ If the injector click at a regular intervals, the injector is normal
- Stop the engine.
- ★ If fuel injector dose not click, check the fuel injector resistance (see Fuel Injector Resistance Inspection).



#### *Fuel Injector Resistance Inspection*

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Injector Connector [A]



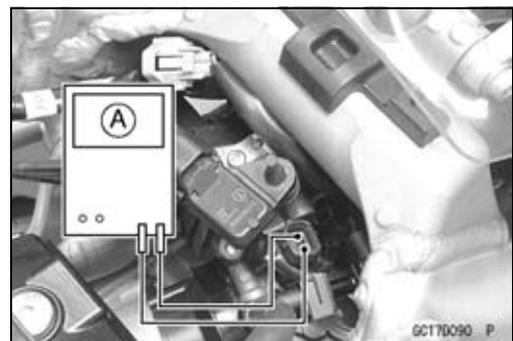
- Connect a digital meter [A] to the injector terminal.
- Measure the fuel injector resistance.

##### Fuel Injector Resistance

Connections: R/W terminal ↔ BL/R terminal

Standard: 11.7 ~ 12.3 Ω @20°C (68 °F)

- ★ If the reading is out of the standard, replace the injector.
- ★ If the reading is within the standard, check the power supply voltage (see Fuel Injector Power Supply Voltage Inspection)



**Fuel Injector (Service Code 41)**

**Fuel Injector Power Supply Voltage Inspection**

**NOTE**

○ Be sure the battery is fully charged.

- Disconnect the injector connector and connect the measuring adapter [A] between these connector.  
Main Harness [B]  
Fuel Injector [C]

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

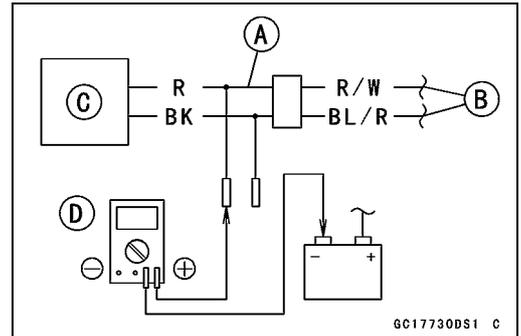
- Connect a digital meter [D] to the measure adapter lead.

**Fuel Injector Power Supply Voltage**

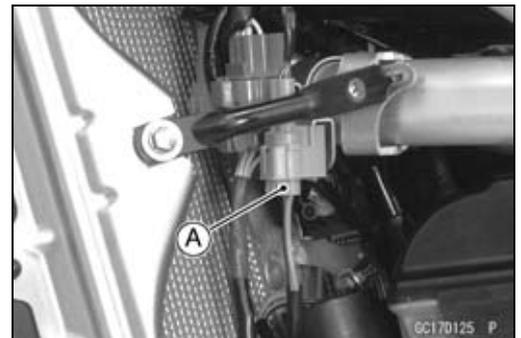
**Connect the Adapter:**

Digital Meter (+) → R (Injector R/W) lead

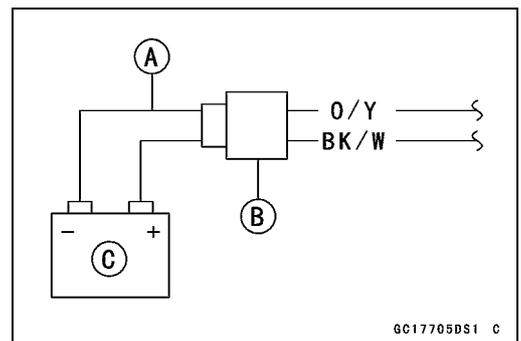
Digital Meter (-) → Battery (-) Terminal



- Remove:  
Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)  
Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Measure the power supply voltage with the engine stopped.

**Power Supply Voltage**

**Standard: Battery Voltage**

- ★ If the voltage is out of the standard, check the power supply wiring (see Fuel Injector Circuit).
- ★ If the reading is within the standard, check the output voltage (see Fuel Injector Power Supply Voltage Inspection).

## 3-64 FUEL SYSTEM (DFI)

### Fuel Injector (Service Code 41)

#### Fuel Injector Output Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Remove the ECU (see ECU Removal).
- Do not disconnect the ECU connector.
- Connect the power supply harness (option P/No. 26011-0246) and 12 V battery to the capacitor lead connector (see Fuel Injector Power Supply Voltage Inspection).
- Using the needle adapter set and connect a digital meter [A] to the connector [B].

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

#### Fuel Injector Output Voltage

**Connect the ECU Connector:**

**Digital Meter (+) → O/W lead (ECU Terminal 16)**

**Digital Meter (-) → Battery (-) Terminal**

- Measure the power supply voltage with the engine stopped with the connector jointed.

#### Output Voltage

**Standard: Battery Voltage**

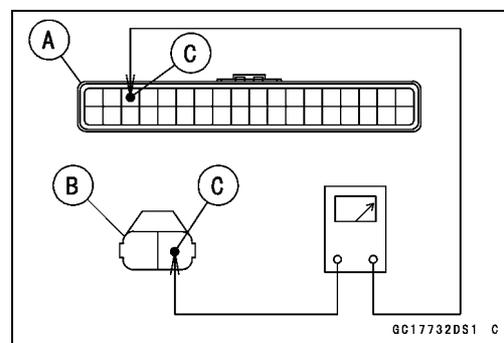
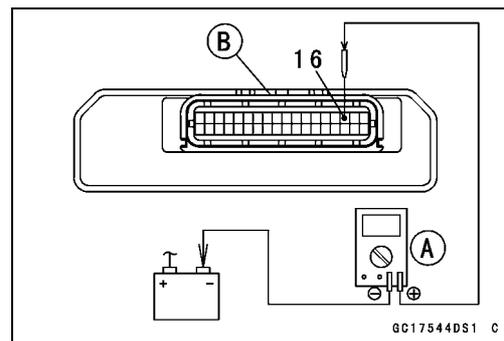
- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection)
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is out of the standard, remove the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

#### Wiring Inspection

**ECU Connector [A] ← → Fuel Injector connector [B]**

**BL/R lead (ECU terminal 16) [C]**

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



**Fuel Injector (Service Code 41)**

**Injector Fuel Line Inspection**

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Hose (see Fuel Injector Removal)
- Be sure to place a piece of cloth around the fuel outlet pipe of fuel pump and delivery pipe of throttle body assy.
- Check the injector fuel line for leakage as follows:
  - Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamp [D]) as shown in the figure.
  - Apply a soap and water solution to the areas [E] as shown.
  - Watching the pressure gauge, squeeze the pump lever [G], and build up the pressure until the pressure reaches the maximum pressure.

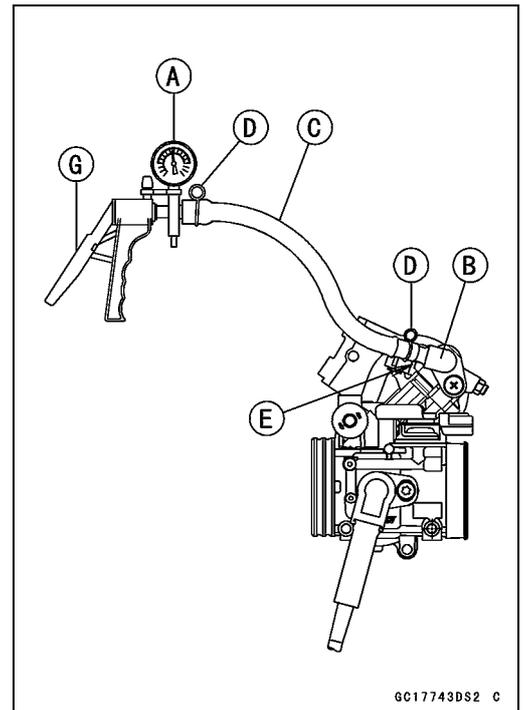
**Fuel Line Maximum Pressure**

**Standard: 300 kPa (3.06 kgf/cm<sup>2</sup>, 44 psi)**

**CAUTION**

**During pressure testing, do not exceed the maximum pressure for which the system is designed.**

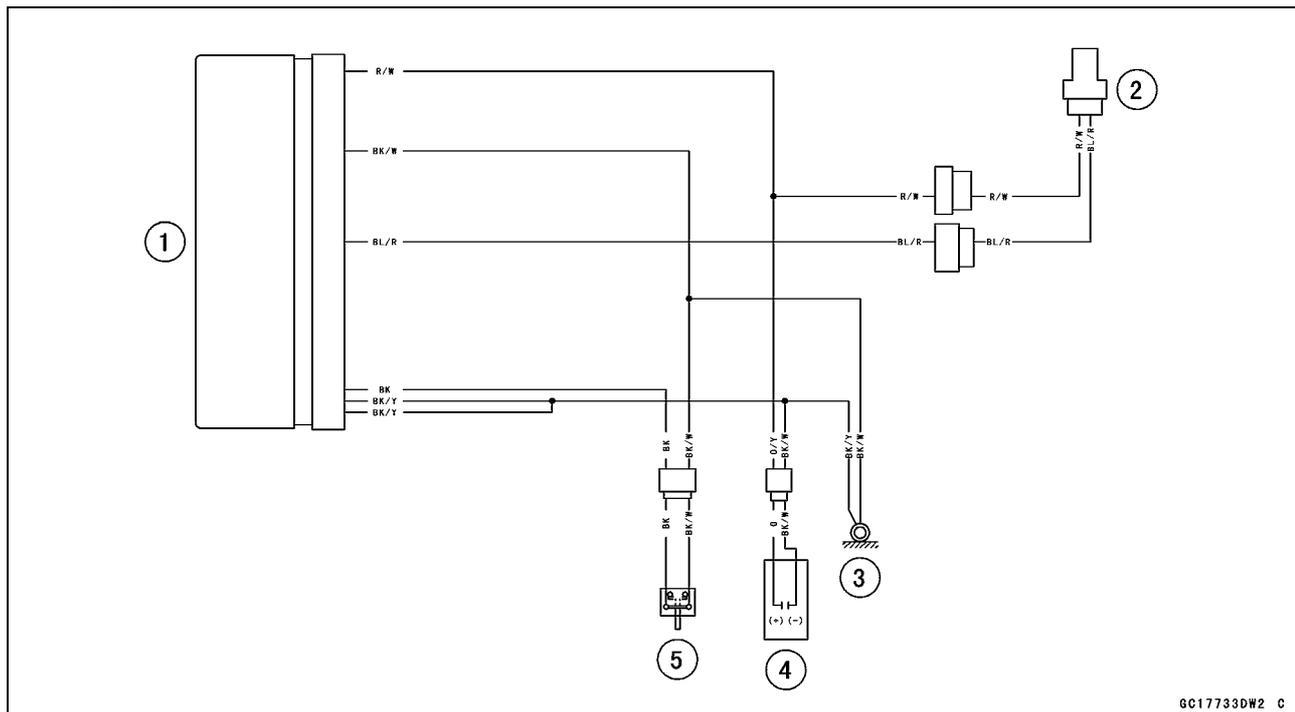
- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the fuel line is good.
- ★ If the pressure drops at once, or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, injector and related parts.
- Repeat the leak test, and check the fuel line for no leakage.
- Install:
  - Fuel Hose (see Fuel Injector Installation)
  - Fuel Tank (see Fuel Tank Installation)
- Start the engine, check the fuel leakage.



## 3-66 FUEL SYSTEM (DFI)

### Fuel Injector (Service Code 41)

#### Fuel Injector Circuit



1. ECU
2. Fuel Injector
3. Frame Ground
4. Capacitor
5. Engine Stop Switch

Fuel Pump (Service Code 46)

Fuel Pump Removal

**⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke.  
To make fuel spillage minimum, draw the fuel out from the fuel tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

**CAUTION**

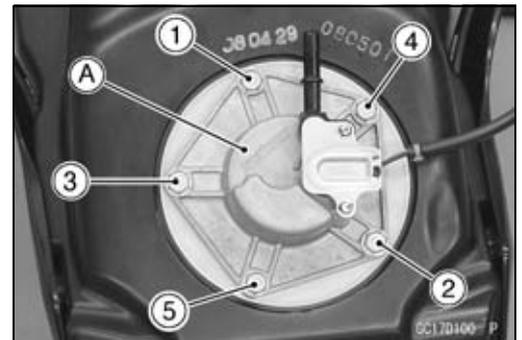
Never drop the fuel pump, especially on a hard surface. Such a shock to the pump can damage it.

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see Fuel Tank Removal).
- Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump. Plug the fuel pipe of the fuel tank.
- Turn the fuel tank upside down.
- Loosen the fuel pump bolts evenly following the specified tightening sequence [1 ~ 5], and take out the fuel pump [A].

**CAUTION**

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

- Discard the fuel pump gasket [A].

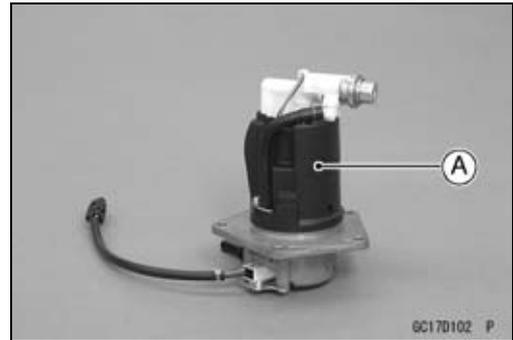


## 3-68 FUEL SYSTEM (DFI)

### Fuel Pump (Service Code 46)

#### Fuel Pump Installation

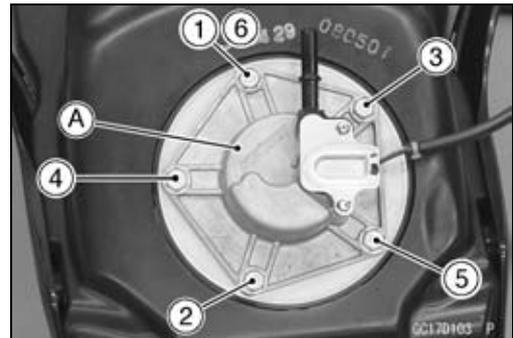
- Remove the dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.



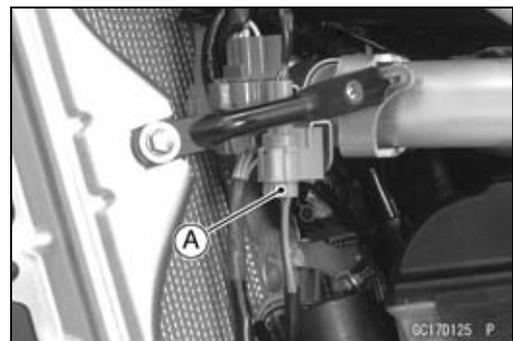
- Install the fuel pump [A] to the fuel tank.
- Gradually tighten the fuel pump bolts evenly following the specified tightening sequence [1 ~ 6].

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

- Install the removed parts (see appropriate chapters)



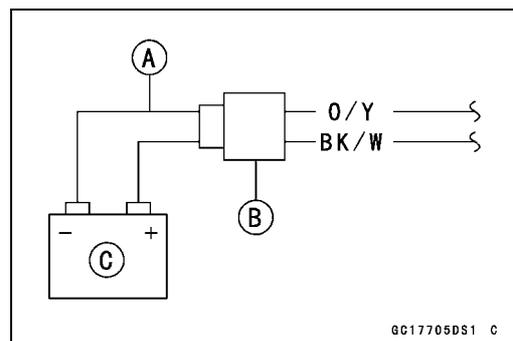
- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.

#### NOTE

- When battery is connected, drive the fuel pump, and apply fuel pressure to the fuel line for engine start easily



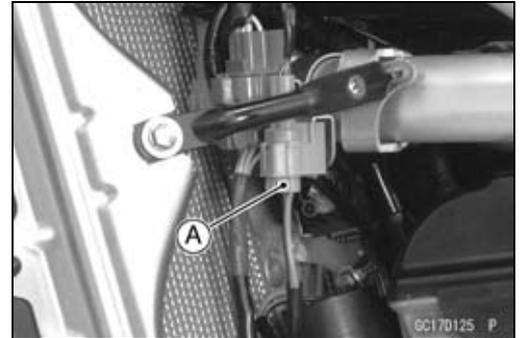
**Fuel Pump (Service Code 46)**

**Fuel Pump Operation Inspection**

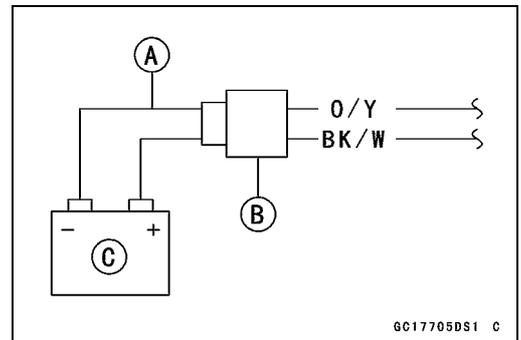
**NOTE**

○Be sure the battery is fully charged.

- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Make sure that the fuel pump operates (make light sounds), and keep the pump operation.
- Disconnect the battery and make sure that the fuel pump operation stops.
- ★ If the pump does not operate as described above, check the operating voltage (see Fuel Pump Operating Voltage Inspection).

## 3-70 FUEL SYSTEM (DFI)

### Fuel Pump (Service Code 46)

#### Fuel Pump Operating Voltage Inspection

##### NOTE

○ Be sure the battery is fully charged.

- Remove the left radiator shroud (see Radiator Shroud Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the harness adapter [A] between these connectors as shown.  
Main Harness [B]  
Fuel Pump [C]

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

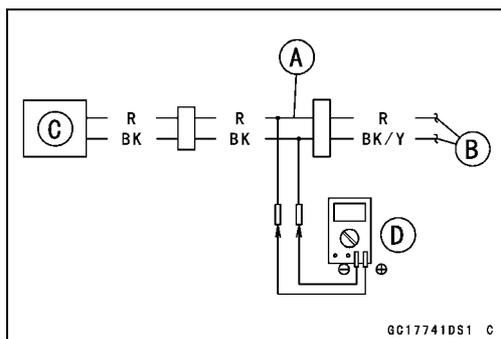
- Connect a digital meter [D] to the harness adapter leads.

#### Fuel Pump Operating Voltage

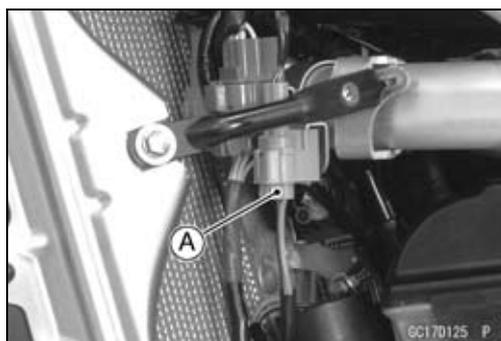
##### Connections to Adapter:

Digital Meter (+) → R (pump R) lead

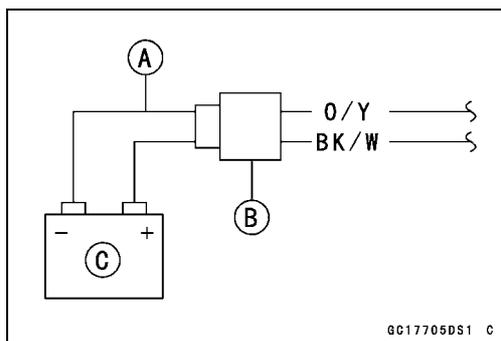
Digital Meter (-) → BK (pump BK) lead



- Disconnect:  
Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Measure the operating voltage with engine stopped and with the connector joined.

#### Operating Voltage

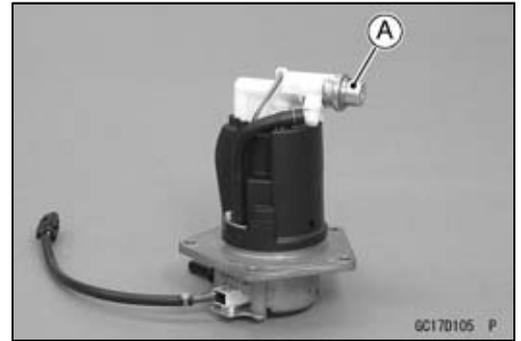
**Standard: Battery Voltage**

- ★ If the reading is not battery voltage, check the wiring for continuity (see Fuel Pump Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is in specification, but the fuel pump does not operate, replace the fuel pump (see Fuel Pump Removal/Installation).

## Fuel Pump (Service Code 46)

### Pressure Regulator Removal

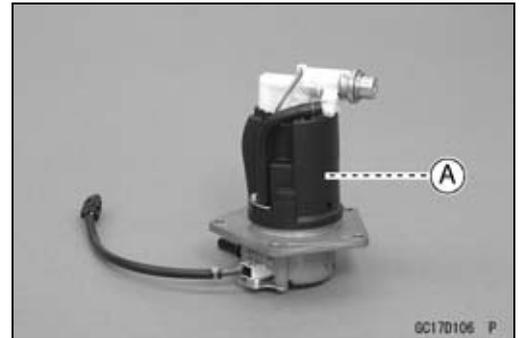
○The pressure regulator [A] is built into the fuel pump and can not be removed.



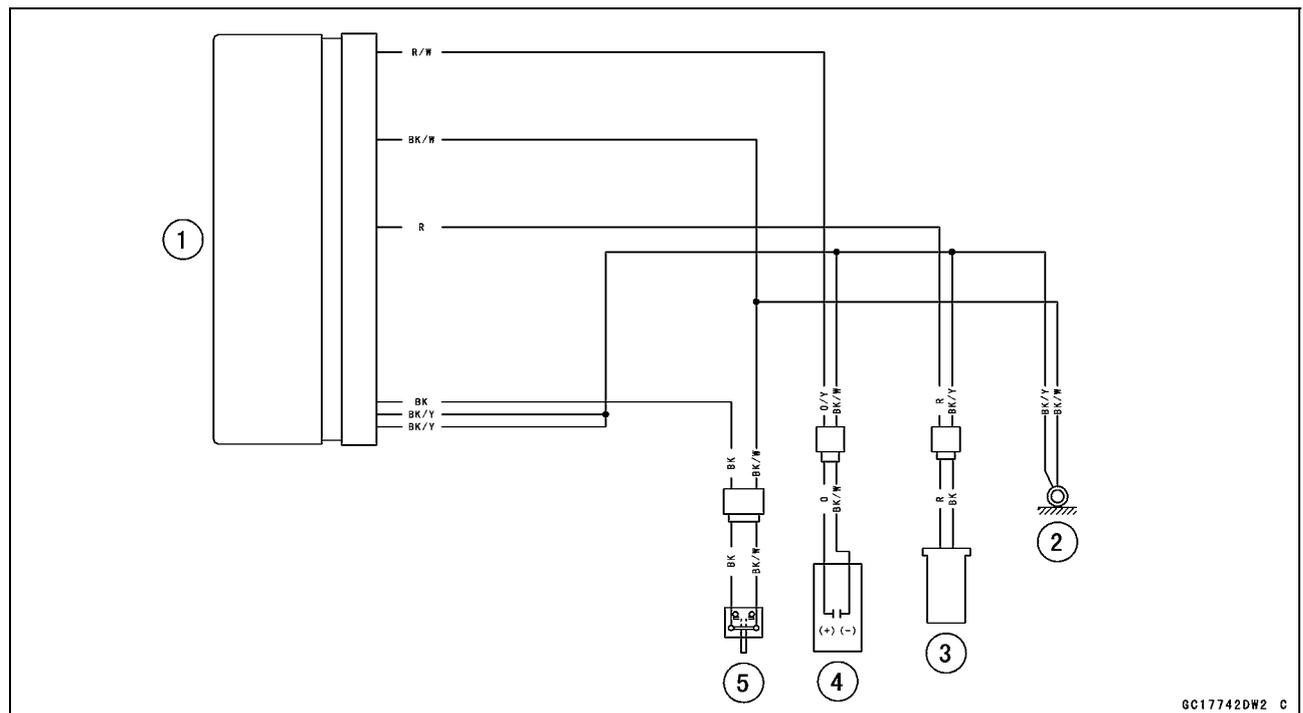
### Fuel Filter Cleaning

○The fuel filter [A] is built into the pump and can not be cleaned or checked.

★If the fuel filter is suspected of clogging or being damaged, replace it with the fuel pump as a set.



## Fuel Pump Circuit



1. ECU
2. Frame Ground
3. Fuel Pump
4. Capacitor
5. Engine Stop Switch

## 3-72 FUEL SYSTEM (DFI)

### Ignition Coil (Service Code 51)

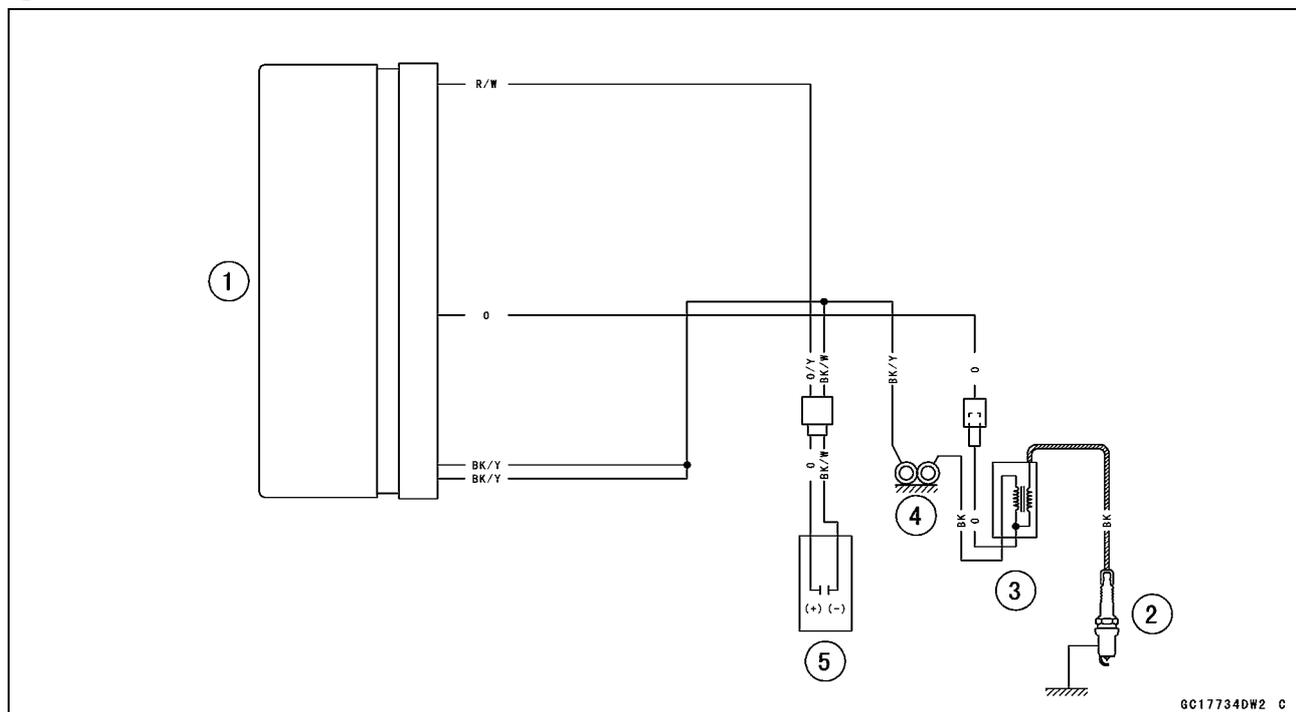
#### Ignition Coil Removal/Installation

- Refer to the Ignition Coil Removal/Installation in the Electrical System chapter.

#### Ignition Coil Input Voltage Inspection

- Refer to the Ignition Coil Peak Voltage Inspection in the Electrical System chapter.
- ★ If the peak voltage is much lower than standard, check the wiring for continuity (see Ignition Coil Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

#### Ignition Coil Circuit



1. ECU
2. Spark Plug
3. Ignition Coil
4. Frame Ground
5. Capacitor

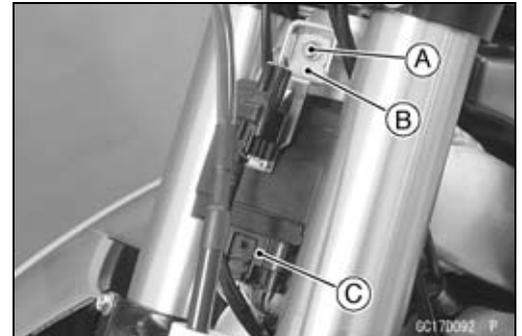
**ECU**

**CAUTION**

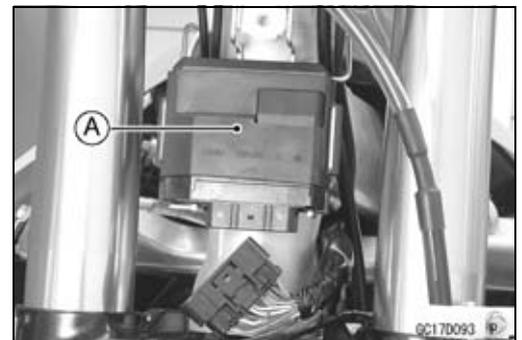
Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.

**ECU Removal**

- Remove:
  - Number Plate (see Number Plate Removal in the Frame chapter)
  - Bolt [A]
  - Connector Bracket [B]
  - ECU Connector [C]

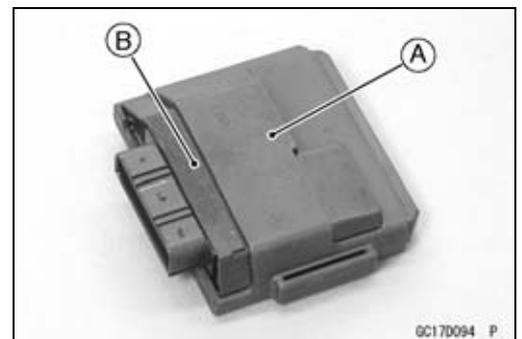


- Pull the ECU [A] together with rubber protector.

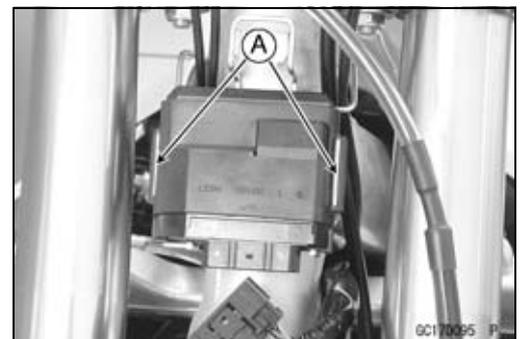


**ECU Installation**

- Install the ECU [B] to the rubber protector [A].



- Insert the slits [A] of the rubber protector to the air cleaner housing bracket.
- Connect the ECU connector.

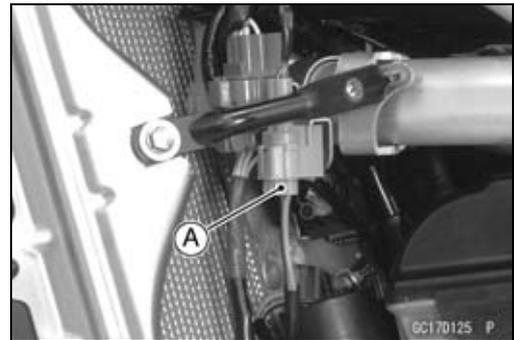
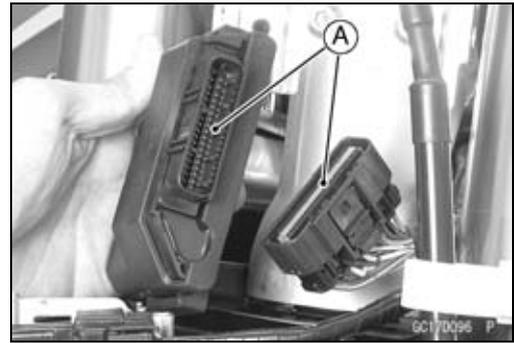


## 3-74 FUEL SYSTEM (DFI)

### ECU

#### ECU Power Supply Inspection

- Remove the number plate (see Number Plate Removal in the Frame chapter).
  - Visually inspect the ECU connectors.
  - ★ If the connector is clogged with mud or dust, blow it off with compressed air.
  - Remove the ECU (see ECU Removal).
  - Visually inspect the terminals [A] of the ECU connectors.
  - ★ If the terminals of the main harness connector are damaged, replace the main harness.
  - ★ If the terminals of the ECU connector are damaged, replace the ECU.
- Remove:
- Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Disconnect the ECU connectors [A].
- Set the hand tester [B] to the  $\times 1 \Omega$  range and check the following wiring for continuity.

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

#### ECU Grounding Inspection

ECU Connector  $\longleftrightarrow$

Capacitor Connector [C]

R/W lead (ECU Terminal 8) [D]

BK/Y lead (ECU Terminal 35) [E]

BK/Y lead (ECU Terminal 36) [F]

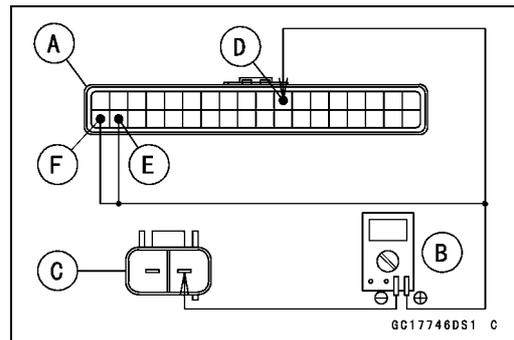
**Criteria: 0  $\Omega$**

- ★ If no continuity, check the connector or main harness, and repair or replace them if necessary.
- ★ If the wiring is good, check the power supply voltage of the ECU.

#### NOTE

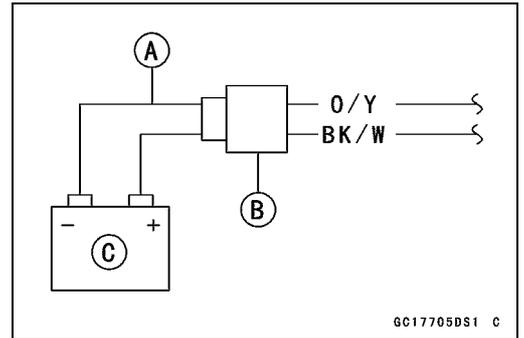
○ Be sure the battery is fully charged.

- Connect the ECU connector.



## ECU

- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



- Connect a digital meter [A] to the connector [B] with the needle adapter set.

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

### ECU Power Supply Inspection

#### Connections:

**Digital Meter (+) → Terminal 1 (R/W lead)**

**Digital Meter (-) → Battery (-) terminal**

#### Standard:

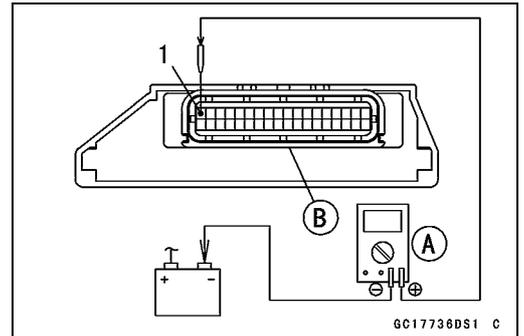
**When battery is not connected: DC 0 V**

**When battery is connected: Battery Voltage**

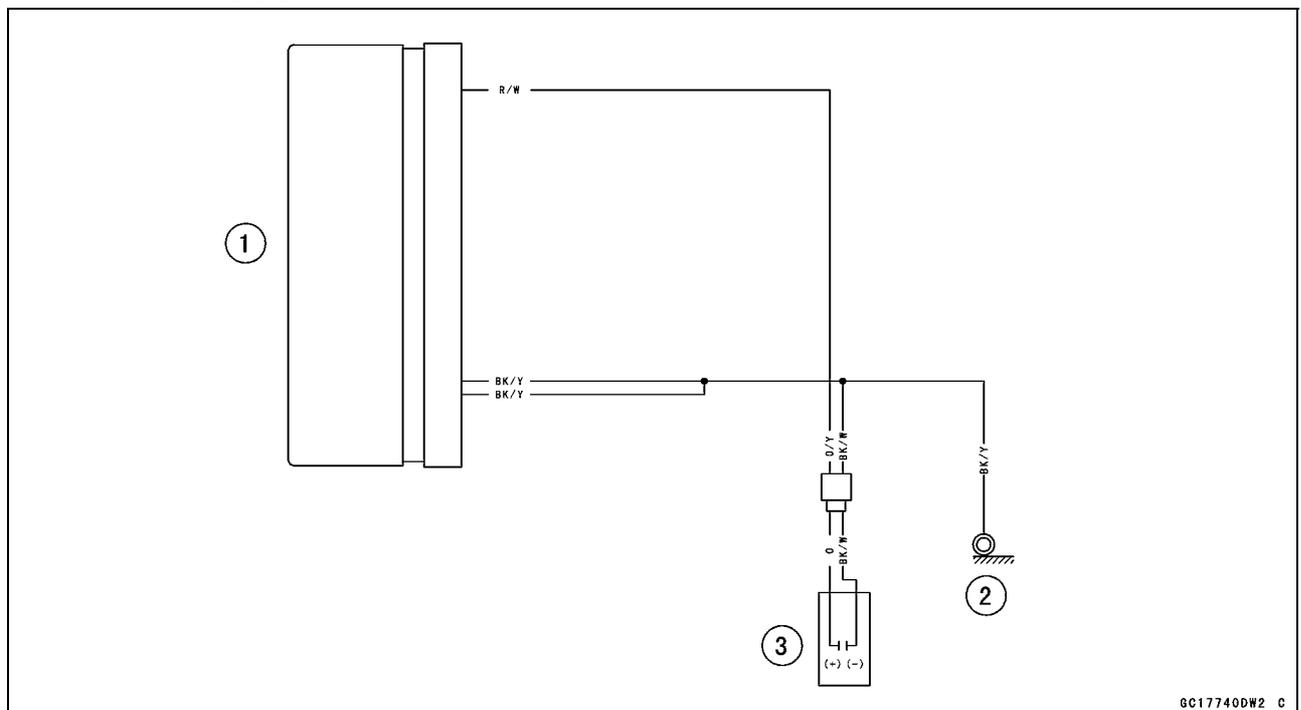
- ★ If the reading is out of the specification, check the following.

Power Supply Wiring (see ECU Power Supply Circuit )

- ★ If the wiring is good, replace the ECU (see ECU Removal/Installation).



### ECU Power Supply Circuit



1. ECU
2. Frame Ground
3. Capacitor

## 3-76 FUEL SYSTEM (DFI)

### Fuel Line

#### Fuel Pressure Inspection

##### NOTE

○Be sure the battery is fully charged.

- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Hose (see Fuel Injector Removal)
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

##### **⚠ WARNING**

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

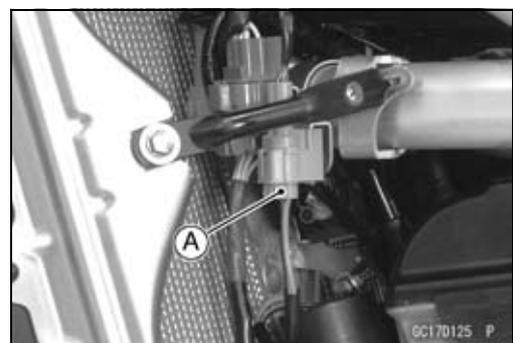
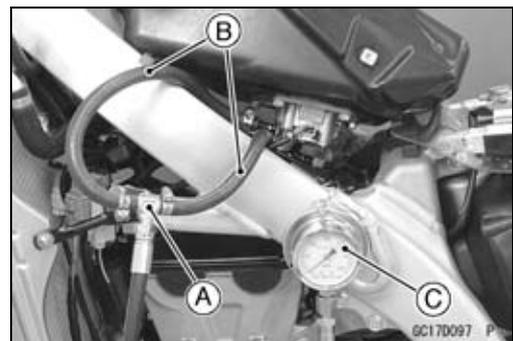
- Install the fuel pressure gauge adapter [A] and fuel hoses (Special Tool: 57001-1607) [B] between the fuel outlet pipe and delivery pipe.
- Secure the fuel hoses with the clamps.
- Connect the pressure gauge [C] to the fuel pressure gauge adapter.

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

##### **⚠ WARNING**

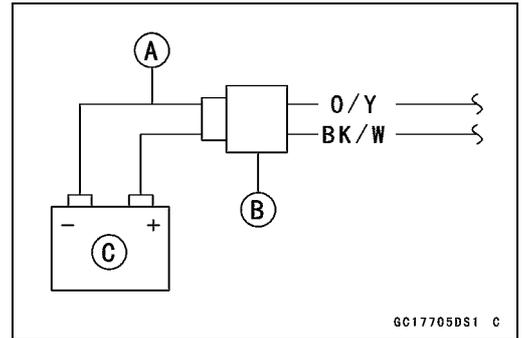
**Do not try to start the engine with the fuel hoses disconnected.**

- Connect:
  - Fuel Pump Lead Connector
- Disconnect:
  - Capacitor Lead Connector [A]



## Fuel Line

- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



### NOTE

○ Inspect the fuel leakage from the connected portion of the special tools.

### CAUTION

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

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

#### Fuel Pressure (with Engine Idling)

**Standard: 294 kPa (3.0 kgf/cm<sup>2</sup>, 43 psi)**

### NOTE

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

- Stop the engine.
- ★ If the fuel pressure is much higher than specified, replace the fuel pump because the fuel pressure regulator in the fuel pump have been clogged or stuck.
- ★ If the fuel pressure is much lower than specified, check the following.
  - Fuel Line Leakage (see Injector Fuel Line Inspection)
  - Amount of Fuel Flow (see Fuel Flow Rate Inspection)
- After above checks, measure the fuel pressure again.
- Remove the fuel pressure gauge, hoses and adapter.
- Install:
  - Fuel Hose (see Fuel Injector Installation)
  - Fuel Tank (see Fuel Tank Installation)
- Start the engine and check for fuel leakage.

## 3-78 FUEL SYSTEM (DFI)

### Fuel Line

#### Fuel Flow Rate Inspection

#### **⚠ WARNING**

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

#### **NOTE**

○ Be sure the battery is fully charged.

- Wait until the engine cools down.
- Prepare a fuel hose (Special Tool: 57001-1607) and a measuring cylinder.

#### **Special Tool - Fuel Hose: 57001-1607**

- Remove the fuel tank bolt and tank mounting band (see Fuel Tank Removal).
- Remove the left radiator shroud (see Radiator Shroud Removal in the Frame chapter).
- Open the fuel tank cap [A] to lower the pressure in the tank.
- Remove the fuel hose from the fuel pump (see Fuel Tank Removal).
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.

#### **⚠ WARNING**

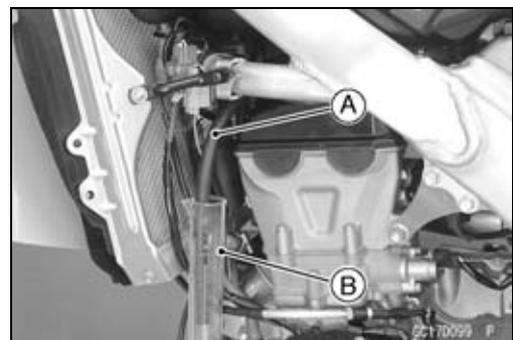
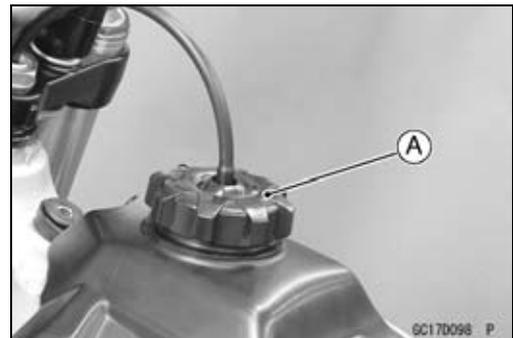
Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.

- Connect the prepared fuel hose [A] to the fuel outlet pipe.
- Secure the fuel hose with a clamp.
- Insert the fuel hose into the measuring cylinder [B].

#### **⚠ WARNING**

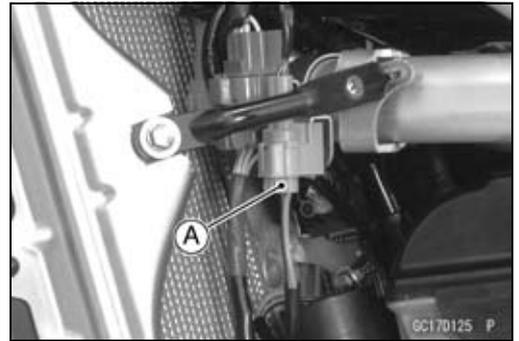
Wipe off spilled out fuel immediately. Be sure to hold the measuring cylinder vertical.

- Close the fuel tank cap.

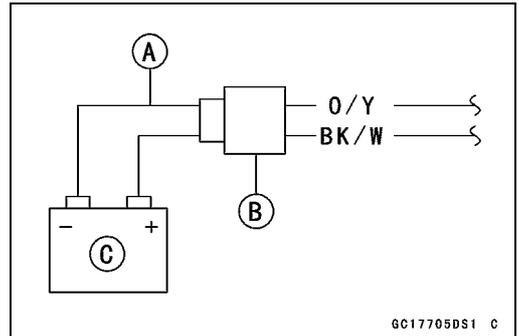


**Fuel Line**

- Disconnect:  
Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown then, drive the fuel pump and fuel goes out.



**CAUTION**

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

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

**Amount of Fuel Flow**

**Standard: 26 mL (0.88 US oz.) or more for 3 seconds**

- ★ If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).
- Install the fuel tank (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

## 3-80 FUEL SYSTEM (DFI)

### Throttle Grip and Cable

If the throttle grip has excessive free play due to cable stretch or misadjustment, there will be a delay in throttle response. Also, the throttle valve may not open fully at full throttle. On the other hand, if the throttle grip has no play, the throttle will be hard to control, and the idle speed will be erratic. Check the throttle grip play periodically in accordance with the Periodic Maintenance Chart, and adjust the play if necessary.

The throttle cable routing is shown in Cable, Wire, and Hose Routing Section in the Appendix chapter.

#### **Throttle Grip (Throttle Cable) Free Play Inspection**

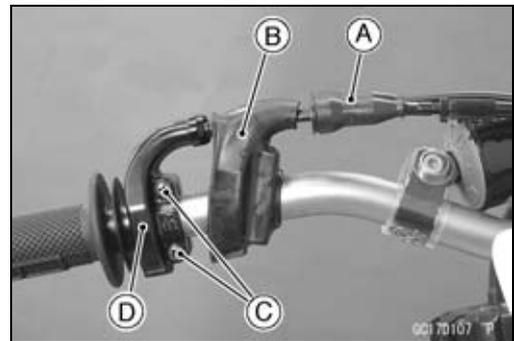
- Refer to the Throttle Grip Free Play Inspection in the Periodic Maintenance chapter.

#### **Throttle Grip (Throttle Cable) Free Play Adjustment**

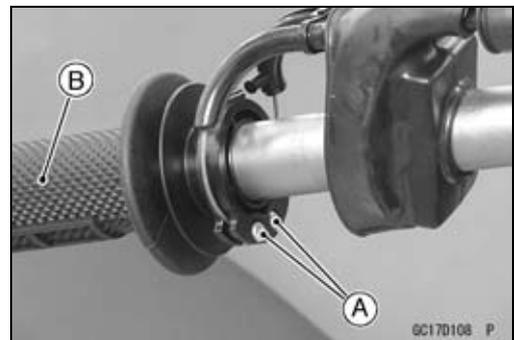
- Refer to the Throttle Grip Free Play Adjustment in the Periodic Maintenance chapter.

#### **Throttle Cable Replacement**

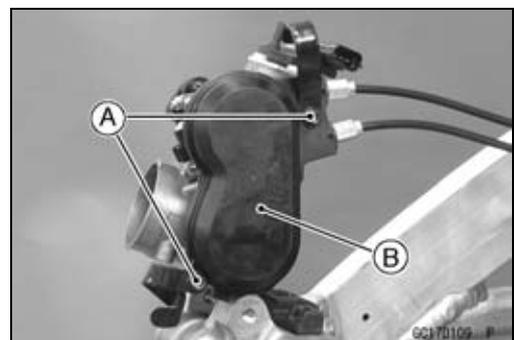
- Remove the front master cylinder (see Front Master Cylinder Removal in the Brakes chapter).
- Slide out the dust cover [A] and cable housing dust cover [B].
- Unscrew the screws [C].
- Separate the throttle cable housing [D].



- Free the tips [A] from the grip [B].

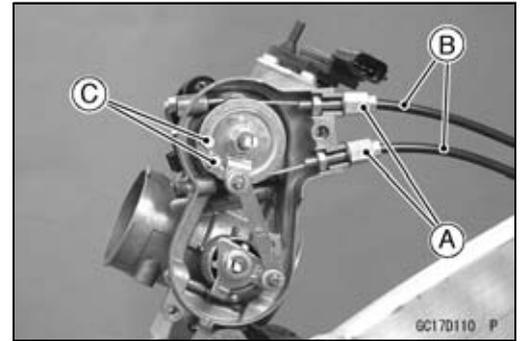


- Remove:
  - Throttle Body Assy (see Throttle Body Assy Removal)
  - Bolts [A]
  - Throttle pulley Cover [B]



## Throttle Grip and Cable

- Loosen the mounting bolts [A].
- Remove the cables [B] from the throttle body assy.
- Free the tips [C] from the pulley.
- Pull out the cables from the frame.

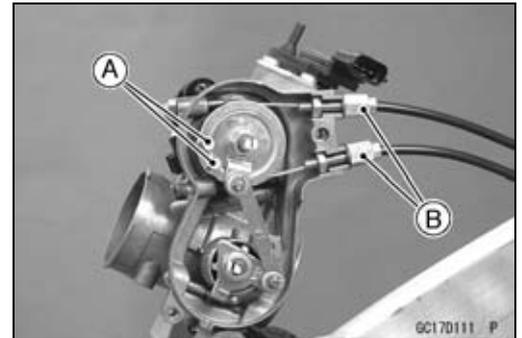


- Lubricate the cable.
- Apply grease to the tips of the cables.
- Install the throttle cable tips [A].
- Install the mounting bolts [B] to the holder as shown.
- Install the throttle pulley cover.

**Torque - Throttle Cable Mounting Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

**Throttle Pulley Cover Bolt: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Install the removed parts (see appropriate chapters).
- Install the throttle cable in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- After the installation, adjust each cable properly.



### **⚠ WARNING**

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

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

- Whenever the throttle cable is removed or in accordance with the Periodic Maintenance Chart, lubricate these cables (see Lubrication in the Periodic Maintenance chapter).
  - Apply a thin coating of grease to the cable upper end.
  - Use a commercially available pressure cable lubricator to lubricate these cables.

### ***Throttle Cable Inspection***

- Refer to the Cable Inspection in the Periodic Maintenance chapter.

## 3-82 FUEL SYSTEM (DFI)

### Throttle Body Assy

#### *Idle Speed Inspection*

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

#### *Throttle Bore Cleaning*

- Refer to the Throttle Body Cleaning in the Periodic Maintenance chapter.

#### *Throttle Body Assy Removal*

#### **⚠ WARNING**

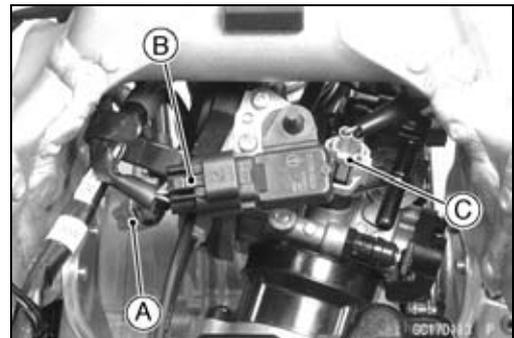
Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke.

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

#### **CAUTION**

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

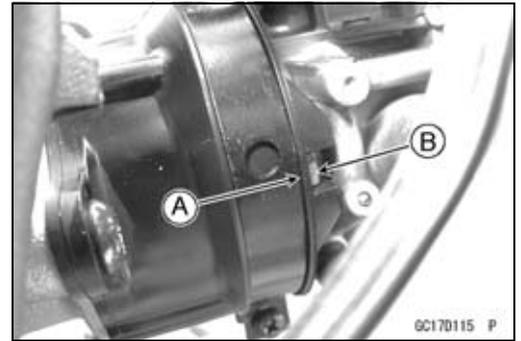
- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Fuel Hose (see Fuel Injector Removal)
- Disconnect:
  - Throttle Sensor Connector [A]
  - Inlet Air Pressure Sensor Connector [B]
  - Fuel Injector Connector [C]
- Loosen the clamp screw [A].
- Pull the throttle body assy backward.
- Remove the throttle cable lower ends (see Throttle Cable Replacement).



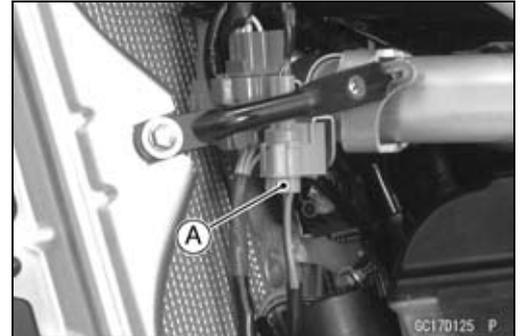
## Throttle Body Assy

### Throttle Body Assy Installation

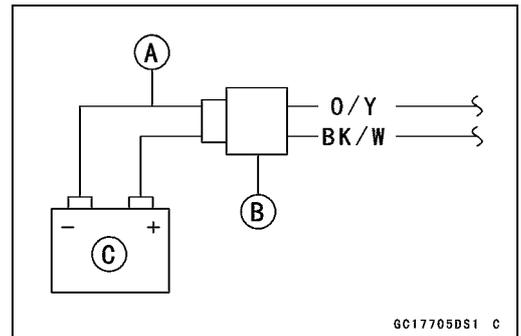
- Install the throttle body assy so that fit the projection [B] on throttle body assy and groove [A] of the throttle body holder.
- Install the removed parts (see appropriate chapters).



- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.



### NOTE

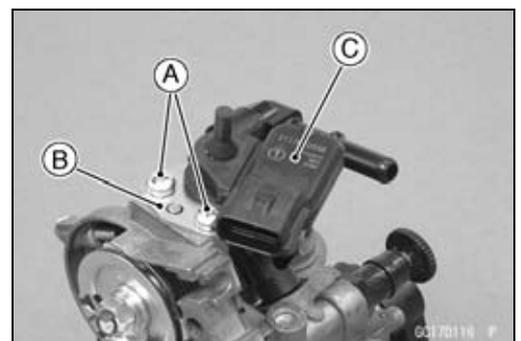
- When the battery is connected, drive the fuel pump, and apply fuel pressure to the fuel line for engine start easily.

### Throttle Body Assy Disassembly

#### CAUTION

Do not remove, disassemble or adjust the throttle sensor, throttle link mechanism and throttle body assy, because they are adjust or set surely at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Remove:
  - Screws [A]
  - Plate [B]
  - Inlet Air Pressure Sensor [C]



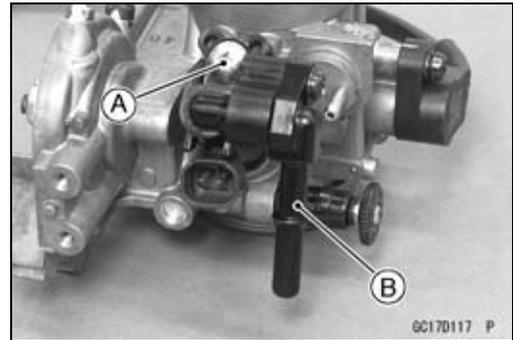
## 3-84 FUEL SYSTEM (DFI)

### Throttle Body Assy

- Remove the screw [A] to pull out the injector from the throttle body assy together with the delivery pipe assy [B].

#### NOTE

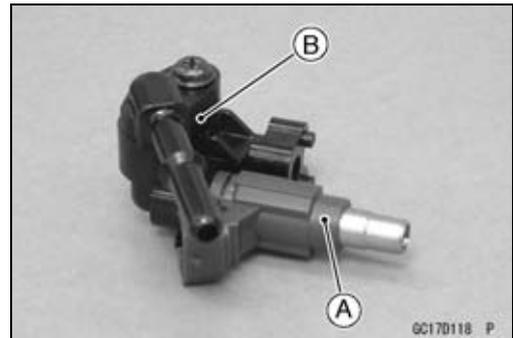
○ Do not damage the insertion portions of the injector when they are pulled out from the throttle body.



- Pull out the injector [A] from the delivery pipe [B].

#### NOTE

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

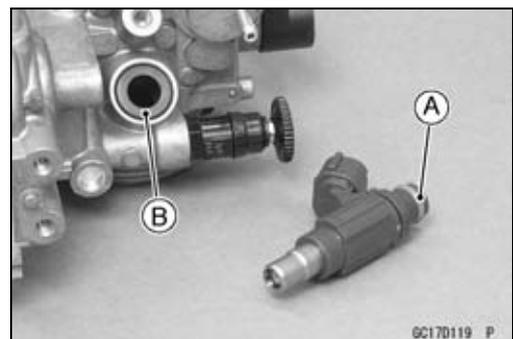


#### CAUTION

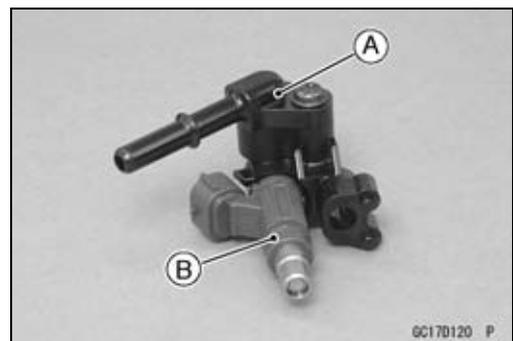
Never drop the fuel injector, especially on a hard surface. Such a shock to the injector can damage it.

#### Throttle Body Assy Assembly

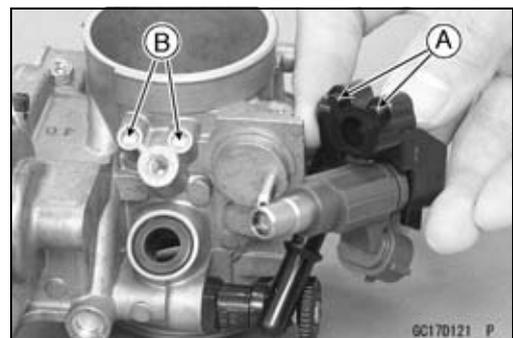
- Replace the O-ring [A] of fuel injector and dust seal [B] with a new one.



- Install the fuel injector [B] to the delivery pipe [A].

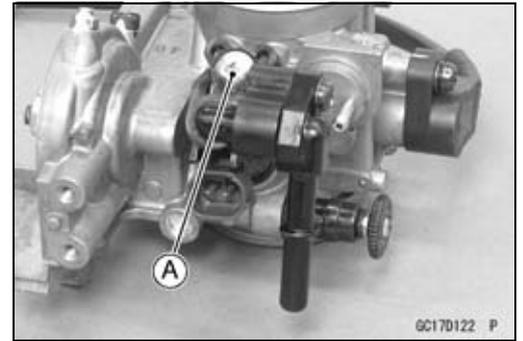


- Fit the projections [A] on the delivery pipe to the hollows [B] of the throttle body.

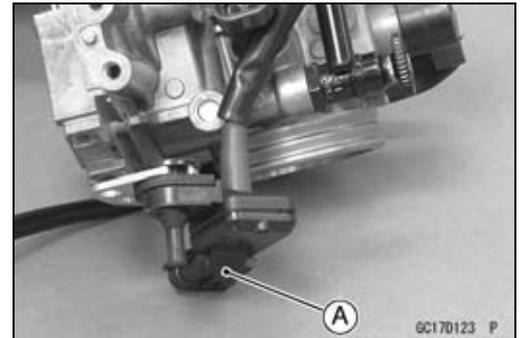


### Throttle Body Assy

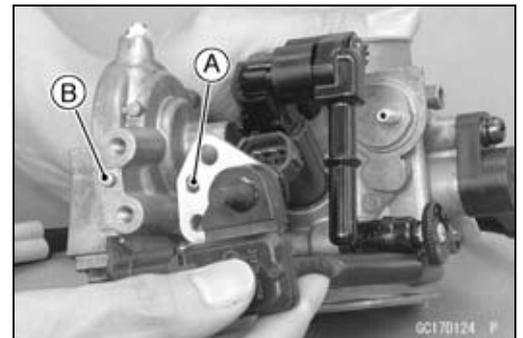
- Tighten the delivery pipe mounting screw [A] securely.



- Install the inlet air pressure sensor [A] to the vacuum hose.



- Install the plate so that fit the hollow [A] on the plate and projection [B] on the throttle body assy.
- Tighten the plate mounting screw securely.

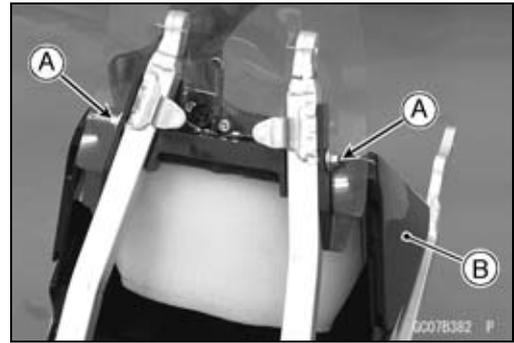


## 3-86 FUEL SYSTEM (DFI)

### Air Cleaner

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

- Remove the rear frame (see Rear Frame Removal in the Frame chapter).
- Unscrew the bolts [A].
- Remove the air cleaner housing [B] from the rear frame.



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

- Install the air cleaner housing to the rear frame.
- Tighten:
  - Torque - Air Cleaner Housing Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Install the rear frame (see Rear Frame Installation in the Frame chapter).

#### ***Element Removal/Installation***

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

#### ***Element Cleaning and Inspection***

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

Fuel Tank

Fuel Tank Removal

**⚠ WARNING**

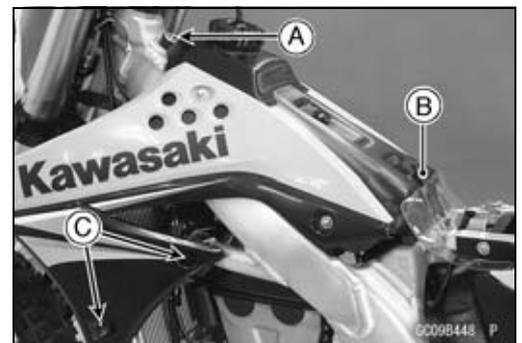
Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke.

To avoid fire, do not remove the fuel tank when the engine is still hot. Wait until it cools down.

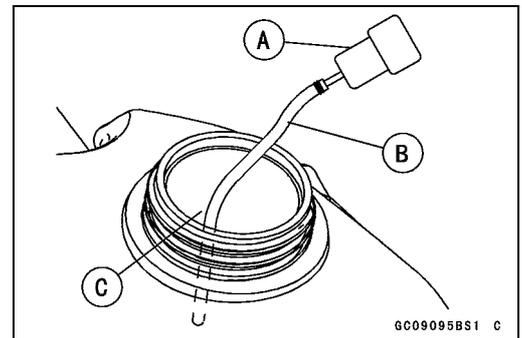
To make fuel spillage minimum, draw the fuel out from the fuel tank when the engine is cold.

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

- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Fuel Tank Bolt [A]
  - Band [B]
  - Radiator Shroud Bolts [C]



- 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.



**⚠ WARNING**

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

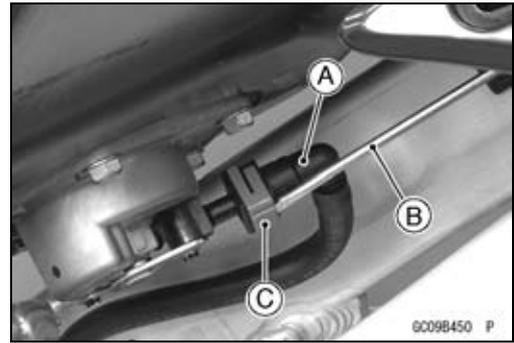
- Lift up the fuel tank, and remove the fuel pump lead connector [A].



## 3-88 FUEL SYSTEM (DFI)

### Fuel Tank

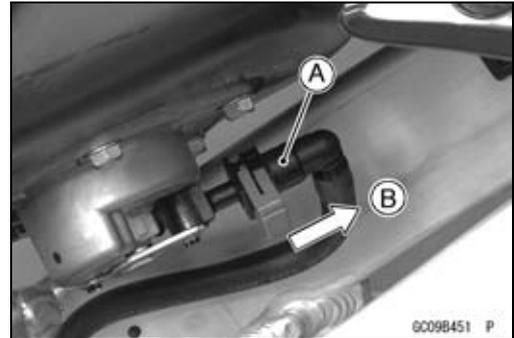
- Be sure to place a piece of cloth around the fuel hose joint [A].
- Insert a minus screw driver [B] into the slit on the joint lock [C].
- Turn the driver to disconnect the joint lock.



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

#### **⚠ WARNING**

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



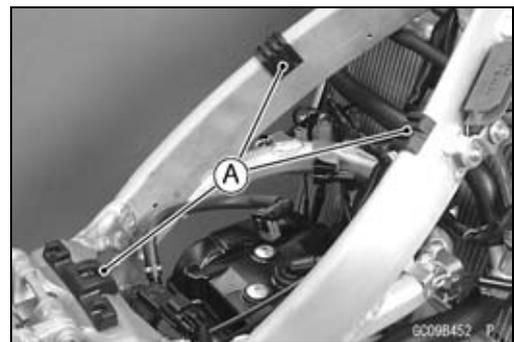
- Close the fuel tank cap.
- Remove the fuel tank with the radiator shroud, and place it on a flat surface.
- Do not apply the load to the fuel outlet pipe of the fuel pump.

#### **⚠ WARNING**

**Store the fuel tank in an area which is well-ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.**

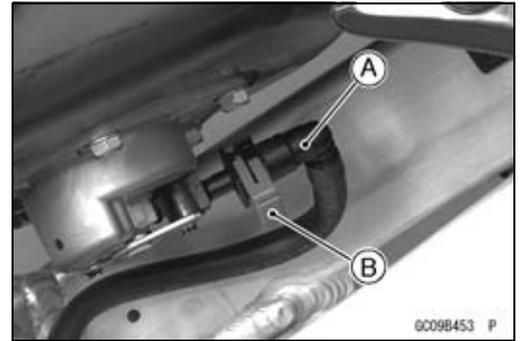
### **Fuel Tank Installation**

- 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] are in place on the frame.
- ★ If the dampers are damaged or deteriorated, replace it.



## Fuel Tank

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

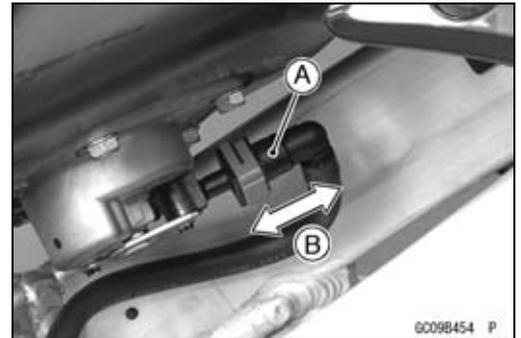


- Push and pull [B] the hose joint [A] back and forth more than two times, and make sure it is locked and does not come off.

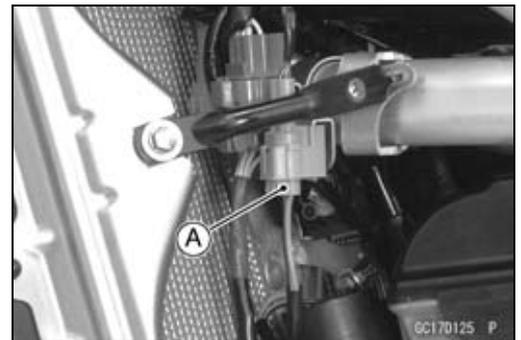
**⚠ WARNING**

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

- ★ If it comes off, reinstall the hose joint.
- Connect the fuel pump lead connector.



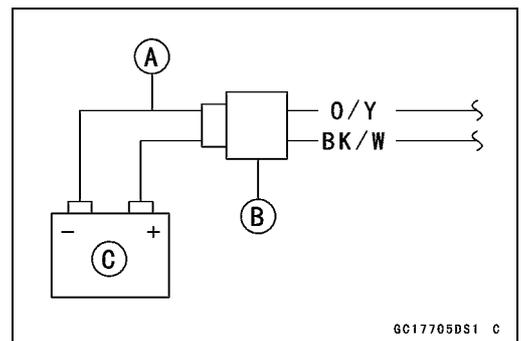
- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Capacitor Lead Connector [A]



- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C] as shown.

**NOTE**

○ When the battery is connected, drive the fuel pump, and apply fuel pressure to the fuel line for engine start easily.



### Fuel Tank Cleaning

- Refer to the Fuel Tank Cleaning in the Periodic Maintenance chapter.



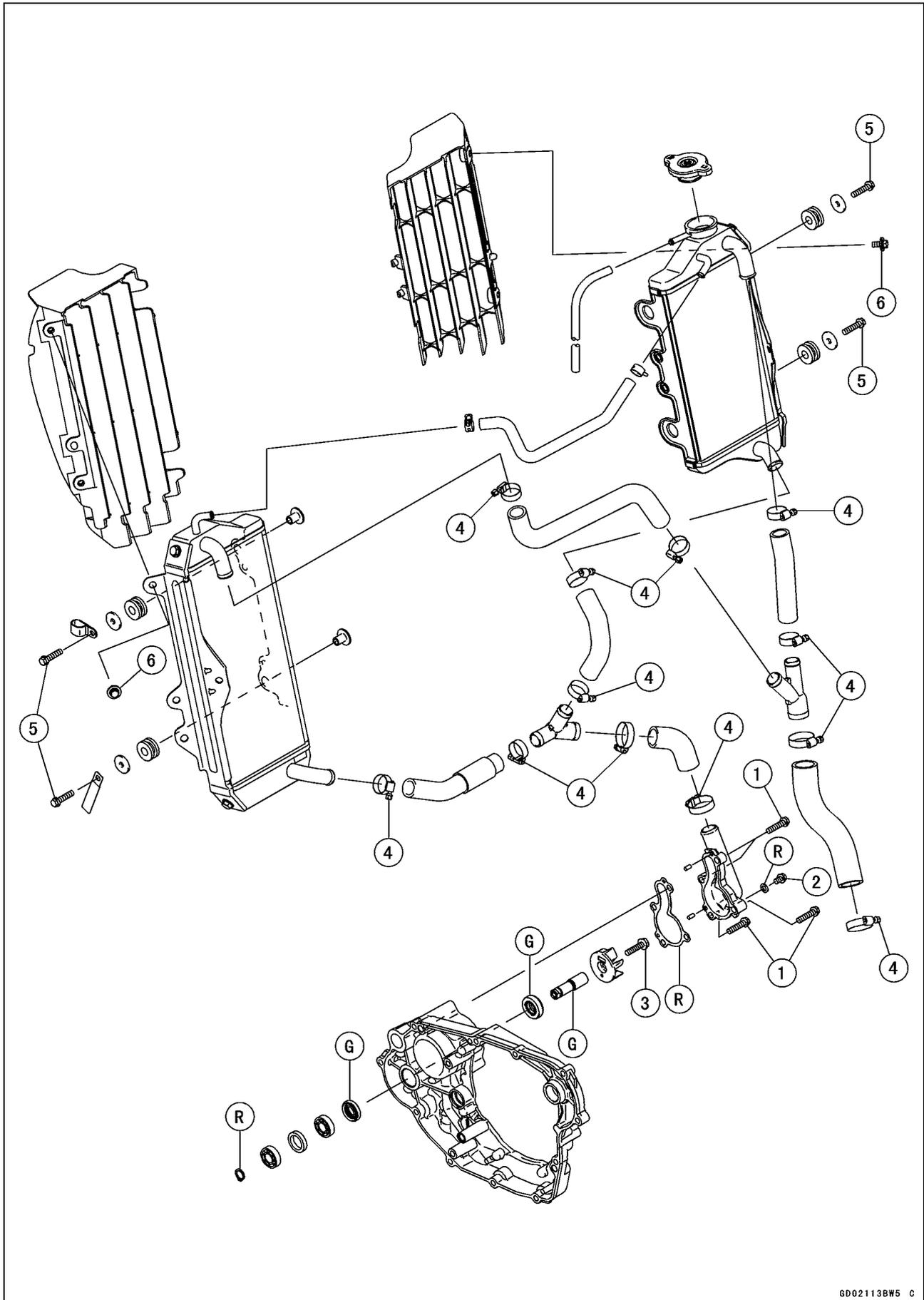
# Cooling System

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# 4-2 COOLING SYSTEM

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Pump Cover Bolts	9.8	1.0	87 in·lb	
2	Coolant Drain Bolt	6.9	0.70	61 in·lb	
3	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
4	Water Hose Clamp Screws	1.5	0.15	13 in·lb	
5	Radiator Mounting Bolts	9.8	1.0	87 in·lb	
6	Radiator Screen Bolts	9.8	1.0	87 in·lb	

G: Apply grease.

R: Replacement Parts

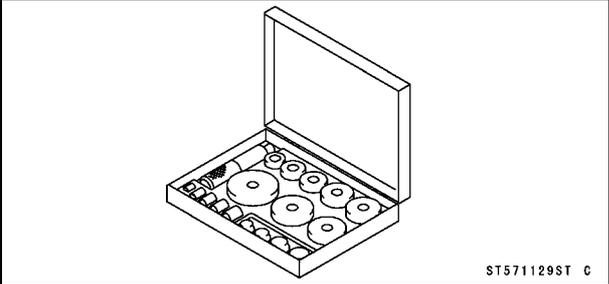
## 4-4 COOLING SYSTEM

### Specifications

Item	Service Limit
<b>Coolant</b> Type Color Mixed Ratio Freezing Point Total Amount	Permanent type antifreeze for aluminum engines and radiators Green Soft water 50%, antifreeze 50% -35°C (-31°F) 1.1 L (1.2 US qt.)
<b>Radiator</b> Cap Relief Pressure	112 ~ 142 kPa (1.14 ~ 1.45 kgf/cm <sup>2</sup> , 16.2 ~ 20.6 psi)

Special Tool

Bearing Driver Set:  
57001-1129



## 4-6 COOLING SYSTEM

### Coolant

#### **Coolant Level Inspection**

- Refer to the Coolant Level Inspection in the Periodic Maintenance chapter.

#### **Coolant Deterioration Inspection**

- Refer to the Coolant Deterioration Inspection in the Periodic Maintenance chapter.

#### **Coolant Draining**

##### **⚠ WARNING**

To avoid burns, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down.

Coolant on tires will make them slippery and can cause an accident and injury. Immediately wipe up or wash away any coolant that spills on the frame, engine or other painted parts. Since coolant is harmful to the human body, do not use for drinking.

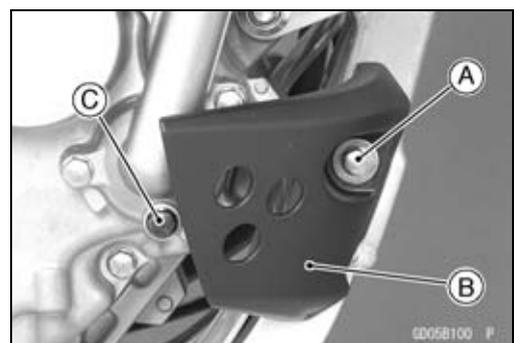
##### **CAUTION**

The coolant should be changed periodically to ensure long engine life.

- Remove the radiator cap [A].
- Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop and wait there for a few seconds. Then push down and turn it further in the same direction and remove the cap.



- Remove:
  - Bolt [A]
  - Right Engine Guard [B]
- Place a container under the coolant drain bolt [C], and drain the coolant from the radiator and engine by removing the drain bolt on the water pump cover. Immediately wipe or wash out any coolant that spills on the frame, or engine.
- Inspect the old coolant for visual evidence of corrosion and abnormal smell (see Coolant Deterioration Inspection in the Periodic Maintenance chapter).



**Coolant**

**Coolant Filling**

**CAUTION**

Use coolant containing corrosion inhibitors made specifically for aluminum engines and radiators in accordance with the instruction of the manufacturer's. Soft or distilled water must be used with the antifreeze (see below for antifreeze) in the cooling system. If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system.

**Recommended Coolant**

- Type: Permanent type antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
- Color: Green
- Mixed ratio: Soft water 50%, Coolant 50%
- Freezing point: -35°C (-31°F)
- Total amount 1.1 L (1.2 US qt.)

- Replace the gasket with a new one.
- Tighten:  
Torque - Coolant Drain Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Fill the radiator up to the bottom of the radiator filler neck [B] with coolant [A], and install the cap, turning it clockwise about 1/4 turn.
- Lean the motorcycle slightly to the right until the radiator filler neck is level to the ground so that the filler neck is located uppermost in order to exhaust the air accumulated in the radiator.

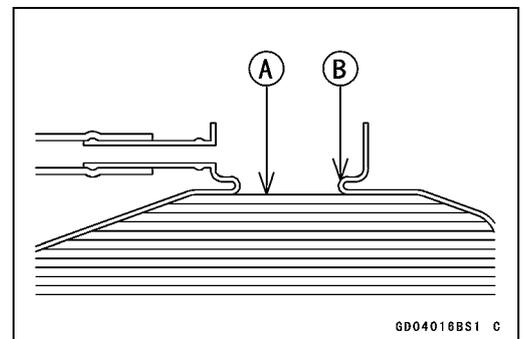
**NOTE**

○ Pour in the coolant slowly so that it can expel the air from the engine and radiator. The radiator cap must be installed in two steps. First turn the cap clockwise to the first stop. Then push down on it and turn it the rest of the way.

- Check the cooling system for leaks.

**Air Bleeding**

- Start the engine, warm up the engine thoroughly, and then stop the engine. Wait until the engine cools down.
- Remove the radiator cap.
- Check the coolant level (see Coolant Level Inspection in the Periodic Maintenance chapter).
- ★ If the coolant level is low, add coolant up to the bottom of the filler neck.
- Install the radiator cap.
- Check the cooling system for leaks.



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## 4-8 COOLING SYSTEM

### Coolant

#### Cooling System Pressure Testing

##### CAUTION

**During pressure testing, do not exceed the pressure for which the system is designed to work. The maximum pressure is 123 kPa (1.25 kgf/cm<sup>2</sup>, 18 psi).**

- Remove the radiator cap, and install a cooling system pressure tester [A] and adapter [B] on the radiator filler neck [C].

##### NOTE

○ *Wet the adapter 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).
- Watch the gauge for at least 6 seconds. If the pressure holds steady, the cooling system is all right.
- Remove the pressure tester, replenish the coolant, and install the radiator cap.
- ★ If the pressure drops and no external source is found, check for internal leaks. Check the cylinder head gasket for leaks.

#### Cooling System Flushing

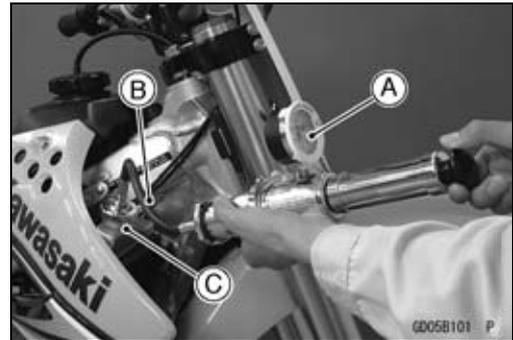
Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passages and considerably reduce the efficiency of the cooling system.

- Drain the cooling system.
- Fill the cooling system with fresh water mixed with a flushing compound.

##### CAUTION

**Avoid the use of a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacture of the cleaning product.**

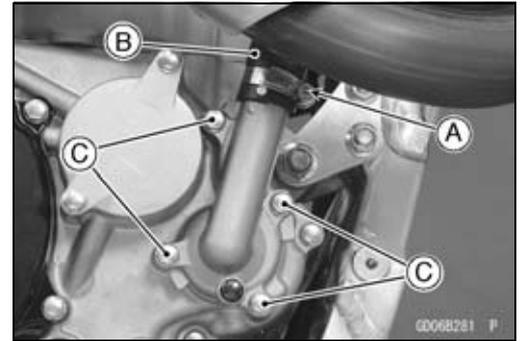
- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system after the coolant cools down.
- Fill the system with fresh water.
- Warm up the engine and drain the system after the coolant cools down.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant, and bleed the air from the system (see Air Bleeding).



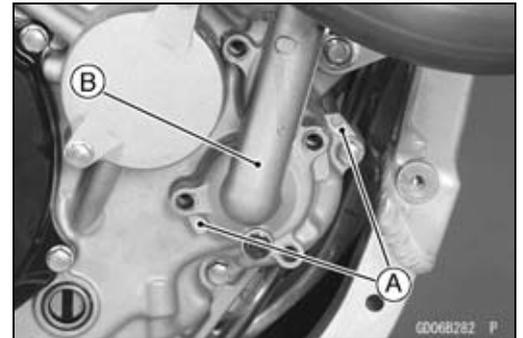
## Water Pump

### Water Pump Cover Removal

- Drain the coolant (see Coolant Draining).
- Loosen the clamp screw [A], and remove the water hose [B] from the water pump cover.
- Unscrew the cover bolts [C].

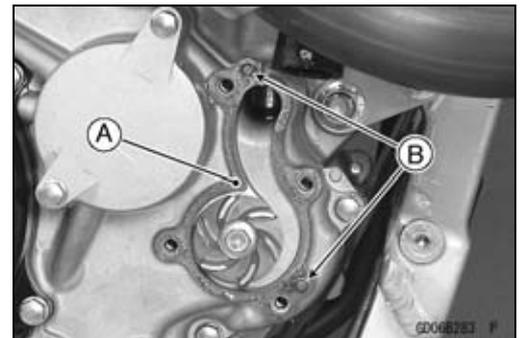


- Using the pry points [A], remove the pump cover [B].

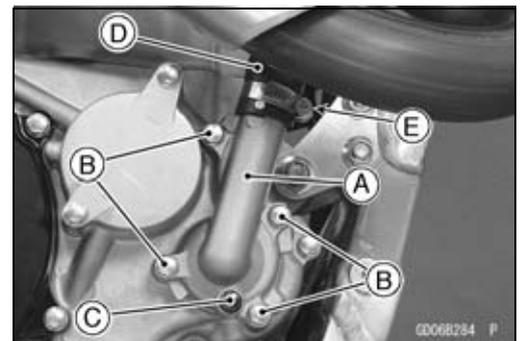


### Water Pump Cover Installation

- Replace the pump cover gasket [A] with a new one.
- Check to see that dowel pins [B] are in place in the mating surfaces of the right engine cover.



- Install the water pump cover [A].
- Replace the drain bolt washer with a new ones.
- Tighten:
  - Torque - Water Pump Cover Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
  - Coolant Drain Bolt [C]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**



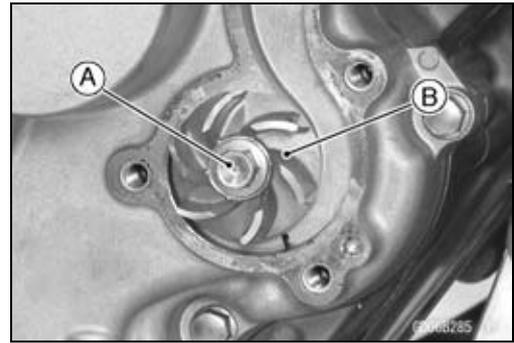
- Insert the water hose [D] into the water pump cover.
- Tighten:
  - Torque - Water Hose Clamp Screw [E]: 1.5 N·m (0.15 kgf·m, 13 in·lb)**
- Fill the cooling system (see Coolant Filling).
- Bleed the air from the cooling system (see Air Bleeding).

## 4-10 COOLING SYSTEM

### Water Pump

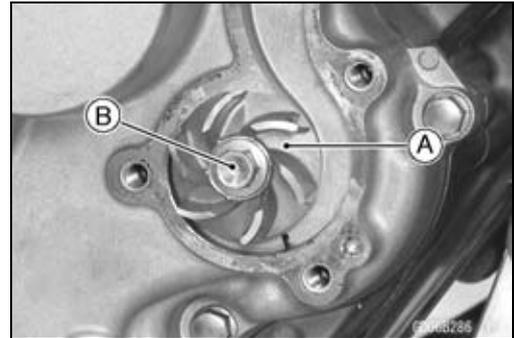
#### **Impeller Removal**

- Drain:  
Coolant (see Coolant Draining)
- Remove:  
Water Pump Cover (see Water Pump Cover Removal)  
Impeller Bolt [A]  
Impeller [B]



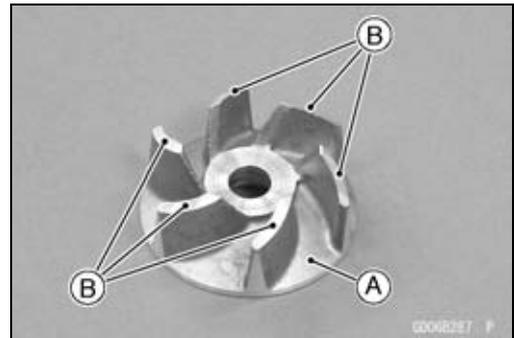
#### **Impeller Installation**

- Install:  
Impeller [A]
- Tighten:  
Torque - Water Pump Impeller Bolt [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Install:  
Water Pump Cover (see Water Pump Cover Installation)



#### **Water Pump Inspection**

- Visually check the impeller [A].
- ★ If the surface is corroded, or if the blades [B] are damaged, replace the impeller.

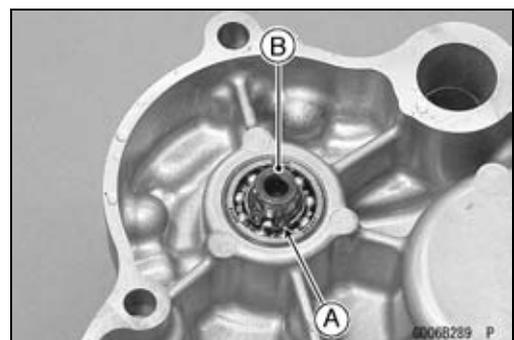


- Check the drainage outlet passage [A] at the bottom of the right engine cover for coolant leaks.
- ★ If the oil seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the oil seals.



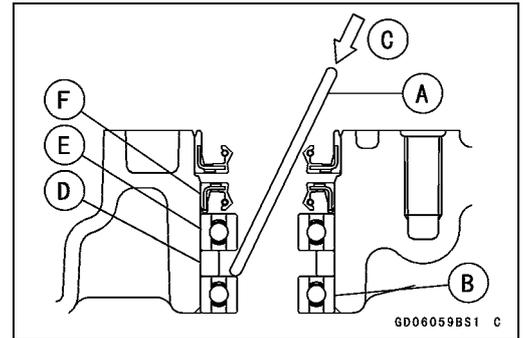
#### **Oil Seal and Bearing Removal**

- Remove:  
Impeller (see Impeller Removal)  
Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)  
Circlip [A]  
Water Pump Shaft [B]

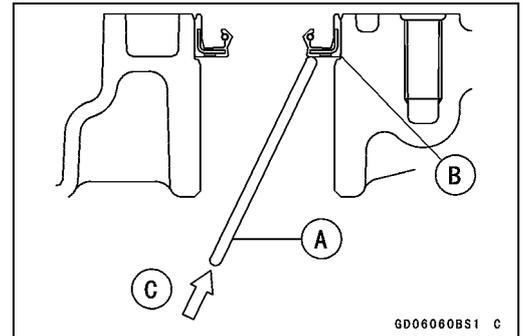


**Water Pump**

- Insert a bar [A] into the water pump shaft hole from the outside of the right engine cover, and remove the ball bearing [B] by tapping [C] evenly around the bearing inner race.
- Remove the spacer [D].
- Remove the ball bearing [E] and oil seal [F] from the right engine cover in the same way as ball bearing removal.



- Insert a bar [A] into the water pump shaft hole from the inside of the right engine cover, and remove the oil seal [B] by tapping [C] evenly around the seal lips.



**Oil Seal and Bearing Installation**

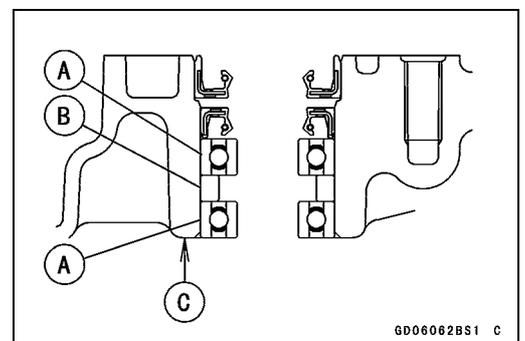
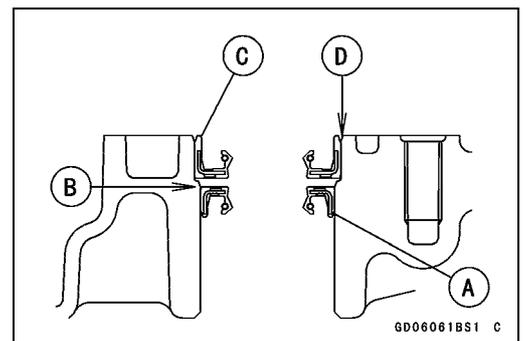
<b>CAUTION</b>
<b>If the oil seal or ball bearing is removed, replace all of them with new ones at the same time</b>

- Be sure to replace the oil seals.
- Apply plenty of grease to the oil seal lips.
- Press in the new oil seal [A] using a bearing driver set from the outside of the right engine cover so that the seal bottom surface is flush with the end face [B] of the right engine cover.
- Press in the new oil seal [C] using a bearing driver set from the outside of the right engine cover so that the oil seal surface is flush [D] with the surface of the right engine cover.

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

- Press the ball bearing [A] together with the spacer [B] into the hole until the face of the bearing is even [C] with the end of the hole.

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

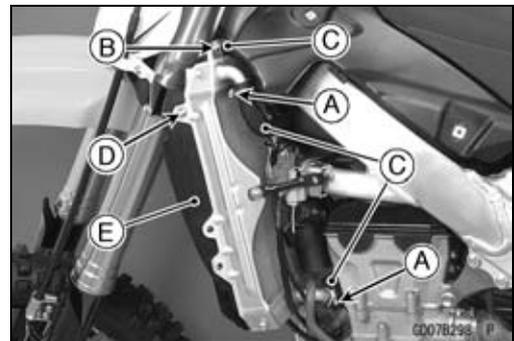


## 4-12 COOLING SYSTEM

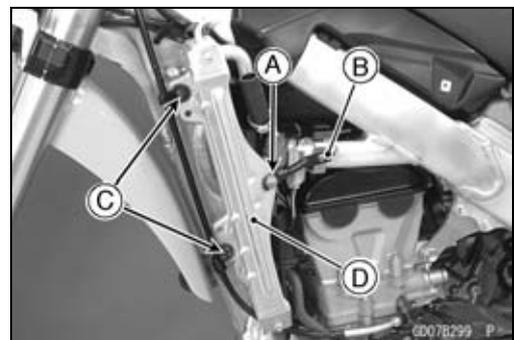
### Radiator

#### **Radiator Removal**

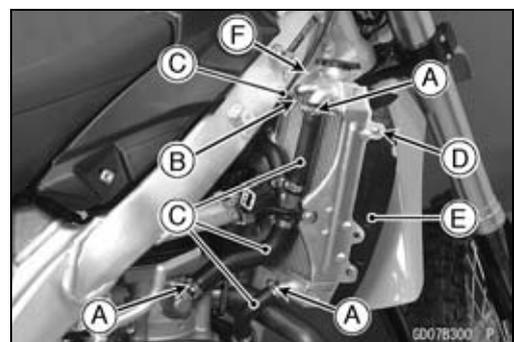
- Drain the coolant (see Coolant Draining).
- Remove:
  - Radiator Shrouds (see Radiator Shroud Removal in the Frame chapter)
  - Regulator/Rectifier (see Regulator/Rectifier Removal in the Electrical System chapter)
- Loosen:
  - Clamp Screws [A]
- Remove:
  - Clamp [B]
  - Water Hoses [C]
  - Bolt [D]
  - Left Radiator Screen [E]



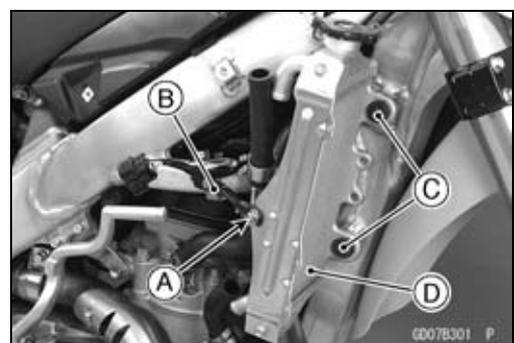
- Remove the bolt [A] and bracket [B], if necessary.
- Remove:
  - Radiator Mounting Bolts [C]
  - Left Radiator [D]



- Loosen:
  - Clamp Screws [A]
- Remove:
  - Clamp [B]
  - Radiator Hoses [C]
  - Bolt [D]
  - Right Radiator Screen [E]
  - Overflow Hose [F]



- Remove the bolt [A] and bracket [B], if necessary.
- Remove:
  - Radiator Mounting Bolts [C]
  - Right Radiator [D]



## Radiator

### Radiator Installation

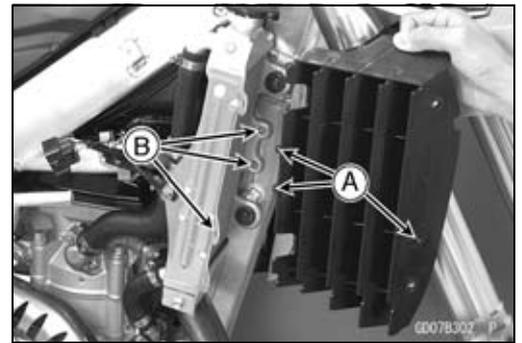
- Fit the projections [A] of the screen in the holes [B] of the radiator.

**Torque - Water Hose Clamp Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)**

**Radiator Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

**Radiator Screen Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

- Route the water and overflow hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Fill the cooling system with a permanent type coolant.
- Install the removed parts (see appropriate chapter).



### Radiator Inspection

- Check the radiator core.
- ★ If there are obstructions to air flow, remove them.
- ★ If the corrugated fins are deformed, carefully straighten them with the thin blade of a screwdriver [A].

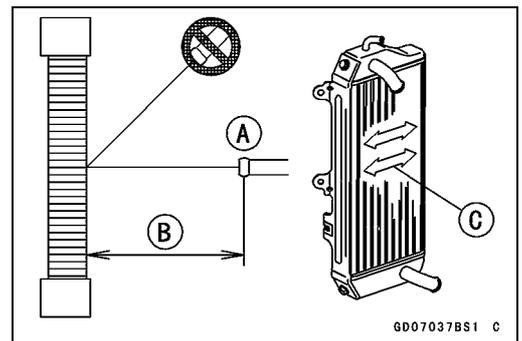
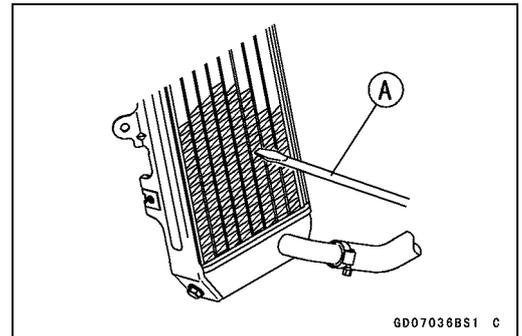
#### CAUTION

**Do not tear the radiator tubes while straightening the fins.**

- ★ If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.

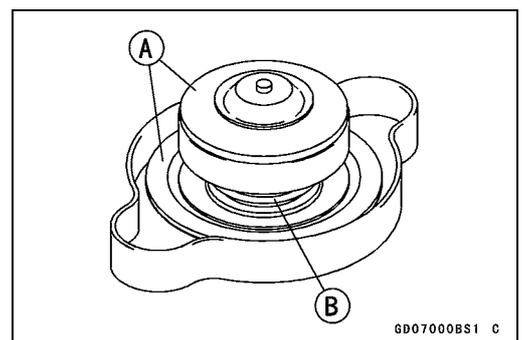
#### CAUTION

**When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage. Keep the steam gun [A] away more than 0.5 m (1.64 ft) [B] from the radiator core. Hold the steam gun perpendicular to the core surface. Run the steam gun following the core fin direction [C].**



### Radiator Cap Inspection

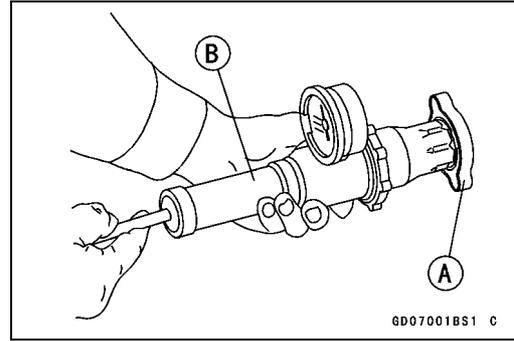
- Check the condition of the valve spring [B], and the top and bottom valve seals [A] of the radiator cap.
- ★ If any one of them shows visible damage, replace the cap.



## 4-14 COOLING SYSTEM

### Radiator

- Wet the top and bottom valve seals with water or coolant to prevent pressure leaks.
- Install the cap [A] on a cooling system pressure tester [B].
- Watching the pressure gauge, slowly pump the pressure tester to build up the pressure. The gauge hand must remain within the relief pressure range in the table below at least 6 seconds. Continue to pump the tester until the relief valve opens, indicated by the gauge hand flicking downward. The relief valve must open within the specified range.



#### Radiator Cap Relief Pressure

**Standard: 112 ~ 142 kPa (1.14 ~ 1.45 kgf/cm<sup>2</sup>, 16.2 ~ 20.6 psi)**

- ★ If the cap cannot hold the pressure, or if the relief pressure is too high or too low, replace the cap with a new one.

#### Filler Neck Inspection

- 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.



#### Water Hoses, Overflow Hose Inspection

- Refer to the Water Hoses and Connections Inspection in the Periodic Maintenance chapter.

#### Water Hoses, Overflow Hose Installation

- Install the water hoses or overflow hose being careful to follow the performed bends (see Cable, Wire, and Hose Routing section in the Appendix chapter). Avoid sharp bending, kinking, flattening, or twisting.
- Tighten the hose clamps securely.

**Torque - Water Hose Clamp Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)**

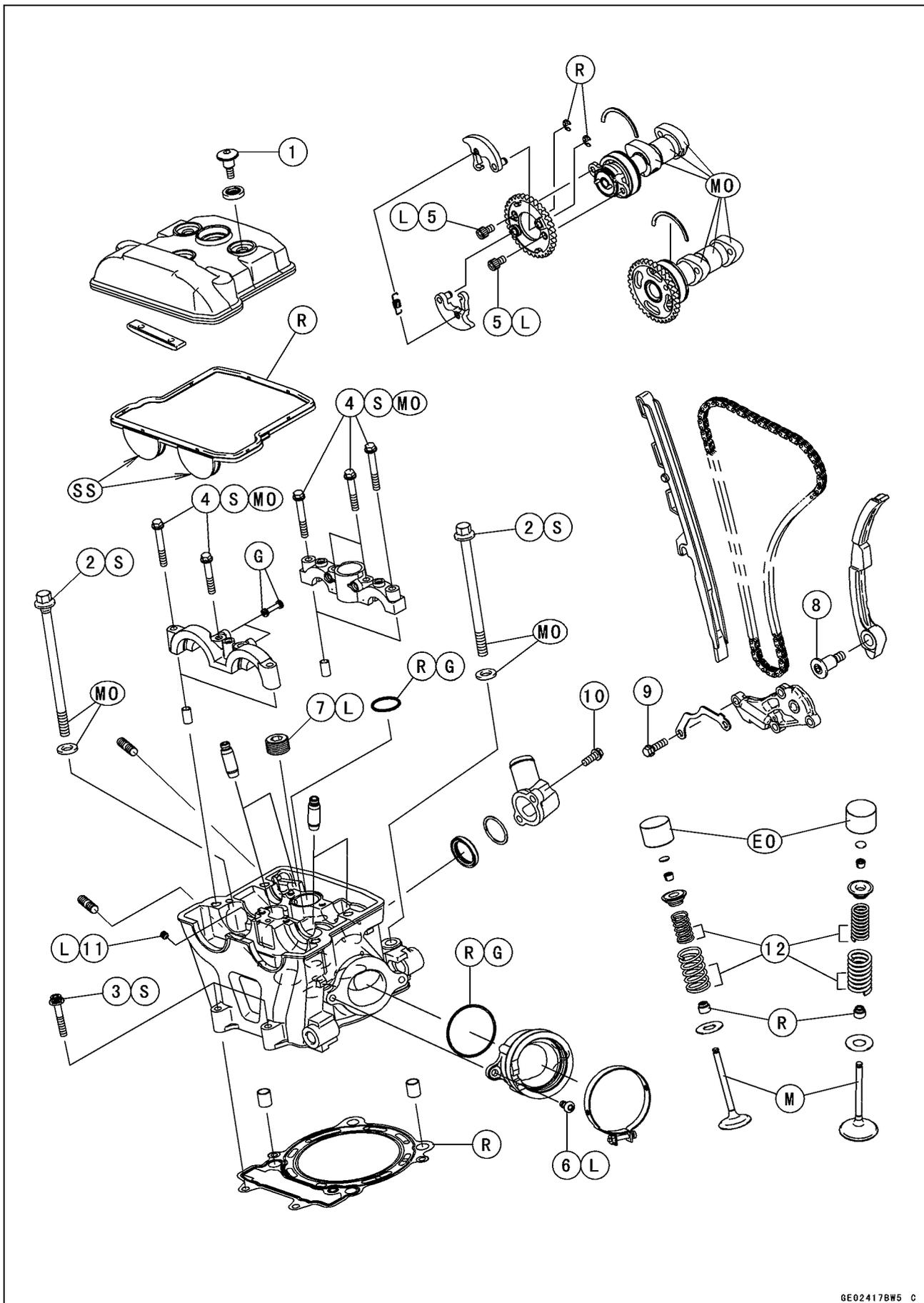
# Engine Top End

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Cylinder Head Cleaning.....	5-23	Muffler Installation.....	5-37
Cylinder Head Warp Inspection ...	5-23	Muffler Baffle Replacement.....	5-38
Valves .....	5-24		
Valve Clearance Inspection .....	5-24		
Valve Removal .....	5-24		
Valve Installation .....	5-24		
Valve Guide Removal .....	5-24		

# 5-2 ENGINE TOP END

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	
2	Cylinder Head Bolts (M10)	59	6.0	44	S, MO
3	Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
4	Camshaft Cap Bolts	9.8	1.0	87 in·lb	S, MO
5	Camshaft Sprocket Bolts	12	1.2	106 in·lb	L
6	Throttle Body Assy Holder Bolts	9.8	1.0	87 in·lb	L
7	Plug	20	2.0	15	L
8	Rear Camshaft Chain Guide Bolt	15	1.5	11	
9	Lower Camshaft Chain Guide Bolts (Oil Pump (Scavenge) Cover Bolts)	9.8	1.0	87 in·lb	
10	Water Hose Fitting Bolts	9.8	1.0	87 in·lb	
11	Oil Line Plug	3.0	0.31	27 in·lb	L

12. Closed coil end faces down.

EO: Apply engine oil.

G: Apply grease.

L: Apply non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil.

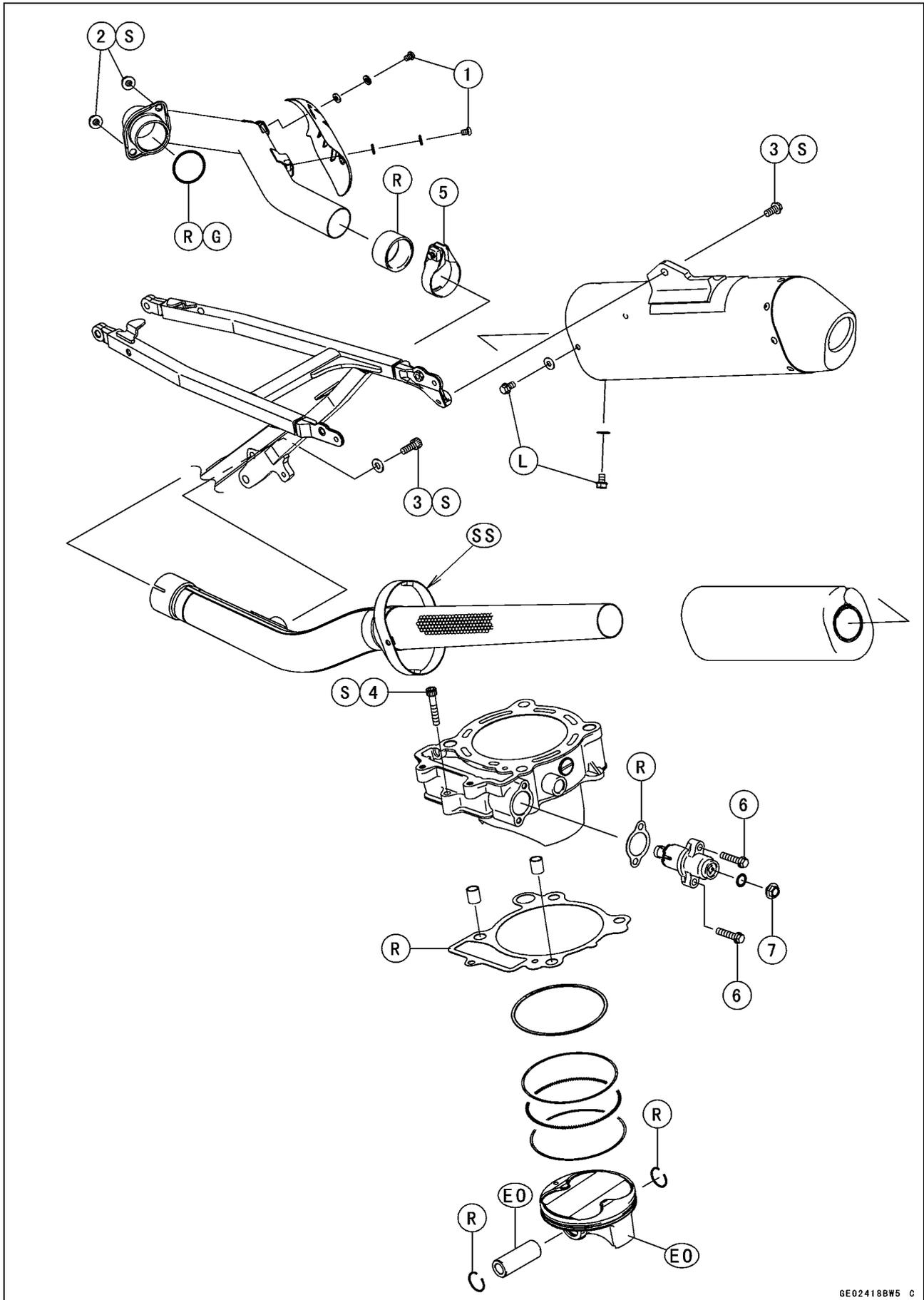
R: Replacement Parts

S: Follow the specific tightening sequence.

SS: Apply silicon sealant.

# 5-4 ENGINE TOP END

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Pipe Cover Bolts	12	1.2	106 in·lb	
2	Exhaust Pipe Holder Nuts	20	2.0	15	S
3	Muffler Mounting Bolts	20	2.0	15	S
4	Cylinder Bolt	12	1.2	106 in·lb	S
5	Muffler Clamp Bolt	16	1.6	12	
6	Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in·lb	
7	Camshaft Chain Tensioner Cap Bolt	5.0	0.51	44 in·lb	

EO: Apply engine oil.

G: Apply grease.

L: Apply non-permanent locking agent.

R: Replacement Parts

S: Follow the specific tightening sequence.

SS: Apply silicone sealant.

## 5-6 ENGINE TOP END

### Specifications

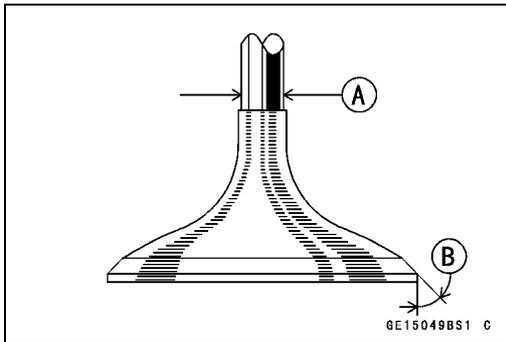
Item	Standard	Service Limit
<b>Camshafts</b>		
Cam Height:		
Exhaust	36.943 ~ 37.057 mm (1.4544 ~ 1.4589 in.)	36.84 mm (1.450 in.)
Inlet	37.743 ~ 37.857 mm (1.4859 ~ 1.4904 in.)	37.64 mm (1.482 in.)
Camshaft Journal/Camshaft Cap Clearance	0.020 ~ 0.062 mm (0.00079 ~ 0.0024 in.)	0.15 mm (0.0059 in.)
Camshaft Journal Diameter	22.959 ~ 22.980 mm (0.90390 ~ 0.90472 in.)	22.93 mm (0.9028 in.)
Camshaft Journal Inside Diameter	23.000 ~ 23.021 mm (0.90551 ~ 0.90634 in.)	23.08 mm (0.9087 in.)
Camshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
<b>Cylinder Head</b>		
Cylinder Compression	(Usable range) 420 ~ 700 kPa (4.28 ~ 7.14 kg/cm <sup>2</sup> , 60.9 ~ 102 psi) @ 5 kicks.	— — —
Cylinder Head Warp	— — —	0.05 mm (0.0020 in.)
<b>Valve</b>		
Valve Clearance:		
Exhaust	0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)	— — —
Inlet	0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)	— — —
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	5.455 ~ 5.470 mm (0.2148 ~ 0.2154 in.)	5.44 mm (0.214 in.)
Inlet	5.465 ~ 5.480 mm (0.2152 ~ 0.2158 in.)	5.45 mm (0.214 in.)
Valve Guide Inside Diameter:		
Exhaust	5.500 ~ 5.512 mm (0.2165 ~ 0.2170 in.)	5.58 mm (0.220 in.)
Inlet	5.500 ~ 5.512 mm (0.2165 ~ 0.2170 in.)	5.58 mm (0.220 in.)
Valve/Valve Guide Clearance (wobble method):		
Exhaust	0.14 ~ 0.26 mm (0.0055 ~ 0.0102 in.)	0.57 mm (0.022 in.)
Inlet	0.09 ~ 0.22 mm (0.0035 ~ 0.0087 in.)	0.53 mm (0.021 in.)
Valve Seat Cutting Angle	45°, 32°, 55°	— — —
Valve Seat Surface Outside Diameter:		
Exhaust	30.4 ~ 30.6 mm (1.197 ~ 1.205 in.)	— — —
Inlet	35.4 ~ 35.6 mm (1.39 ~ 1.40 in.)	— — —
Valve Seat Surface Width:		
Exhaust	0.8 ~ 1.2 mm (0.032 ~ 0.047 in.)	— — —
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	— — —
Valve Spring Free Length:		
Exhaust		
Outer	38.92 mm (1.532 in.)	37.4 mm (1.47 in.)
Inner	35.66 mm (1.404 in.)	34.2 mm (1.35 in.)

**Specifications**

Item	Standard	Service Limit
Inlet		
Outer	39.28 mm (1.546 in.)	37.8 mm (1.49 in.)
Inner	36.05 mm (1.419 in.)	34.5 mm (1.36 in.)
<b>Cylinder and Pistons</b>		
Cylinder Inside Diameter	96.000 ~ 96.012 mm (3.7795 ~ 3.7800 in.)	96.10 mm (3.783 in.)
Piston Diameter	95.970 ~ 95.980 mm (3.7783 ~ 3.7787 in.)	95.82 mm (3.772 in.)
Piston/Cylinder Clearance	0.020 ~ 0.042 mm (0.00079 ~ 0.0016 in.)	---
Piston Ring/Ring Groove Clearance:		
Top	0.04 ~ 0.08 mm (0.002 ~ 0.003 in.)	0.18 mm (0.0071 in.)
Piston Ring Groove Width:		
Top	1.03 ~ 1.05 mm (0.0406 ~ 0.0413 in.)	1.13 mm (0.0445 in.)
Piston Ring Thickness:		
Top	0.970 ~ 0.990 mm (0.0382 ~ 0.0390 in.)	0.90 mm (0.035 in.)
Piston Ring End Gap:		
Top	0.25 ~ 0.35 mm (0.0098 ~ 0.014 in.)	0.6 mm (0.02 in.)
Oil	0.15 ~ 0.50 mm (0.0059 ~ 0.020 in.)	0.8 mm (0.03 in.)
Piston Pin Diameter	18.991 ~ 19.000 mm (0.74768 ~ 0.74803 in.)	18.96 mm (0.7465 in.)
Piston Pin Hole Diameter	19.004 ~ 19.010 mm (0.74819 ~ 0.74842 in.)	19.08 mm (0.7512 in.)
Connecting Rod Small End Inside Diameter	19.019 ~ 19.030 mm (0.74878 ~ 0.74921 in.)	19.07 mm (0.7508 in.)

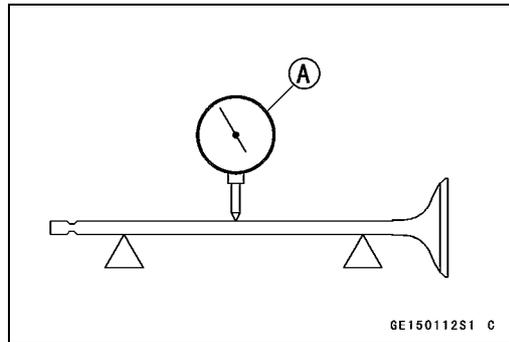
TIR: Total Indicator Readings.

**Valve Stem Diameter**



Valve Stem Diameter [A]  
45° [B]

**Valve Stem Bend**



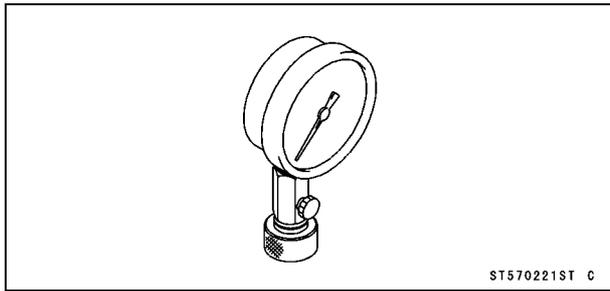
Dial Gauge [A]

# 5-8 ENGINE TOP END

## Special Tools and Sealant

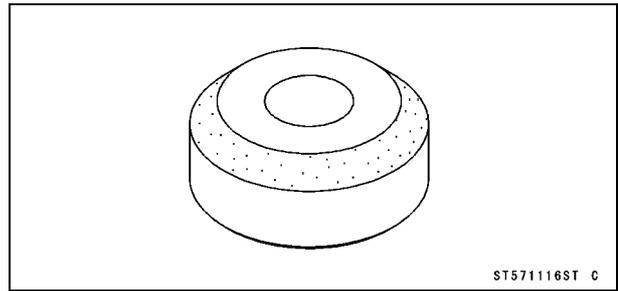
Compression Gauge, 20 kgf/cm<sup>2</sup>:

57001-221



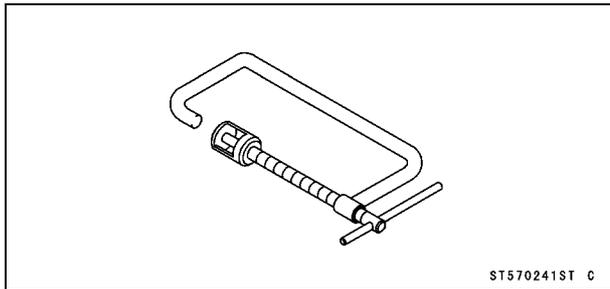
Valve Seat Cutter, 45° -  $\phi$ 35:

57001-1116



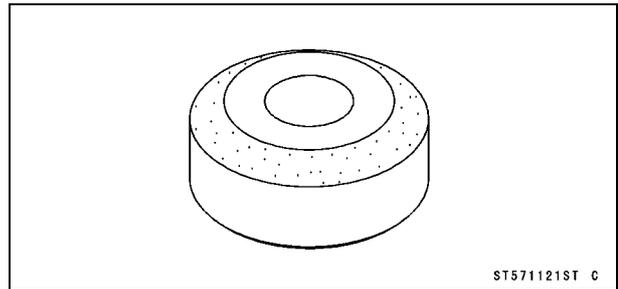
Valve Spring Compressor Assembly:

57001-241



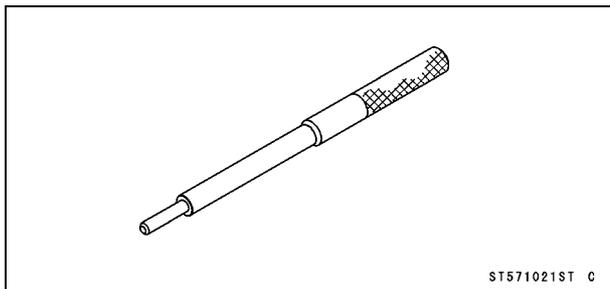
Valve Seat Cutter, 32° -  $\phi$ 35:

57001-1121



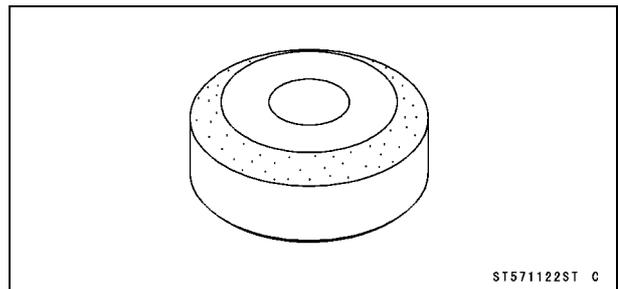
Valve Guide Arbor,  $\phi$ 5.5:

57001-1021



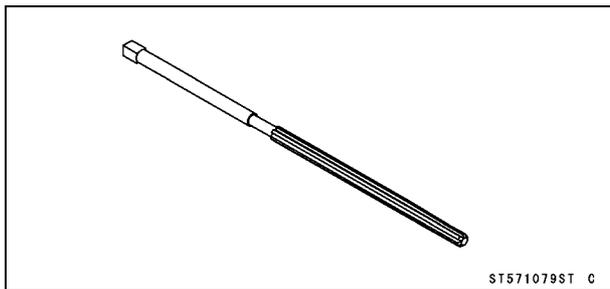
Valve Seat Cutter, 32° -  $\phi$ 38.5:

57001-1122



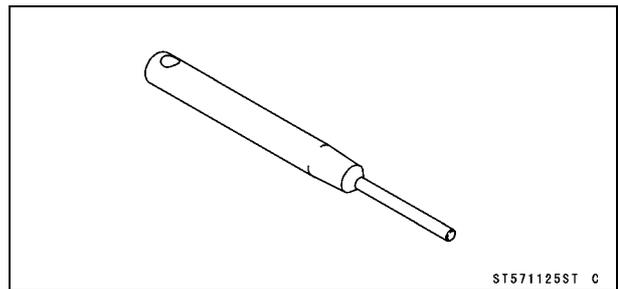
Valve Guide Reamer,  $\phi$ 5.5:

57001-1079



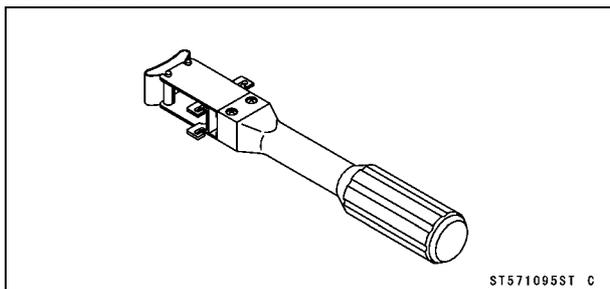
Valve Seat Cutter Holder,  $\phi$ 5.5:

57001-1125



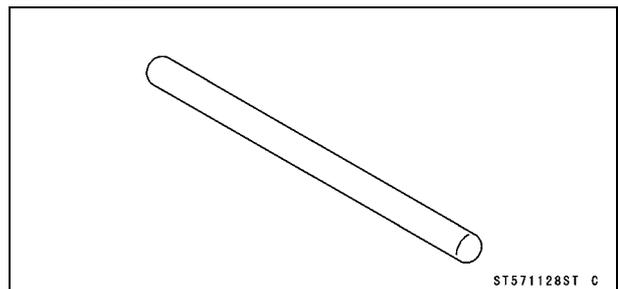
Piston Ring Compressor Grip:

57001-1095



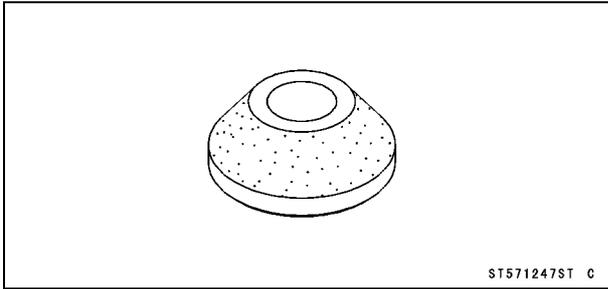
Valve Seat Cutter Holder Bar:

57001-1128



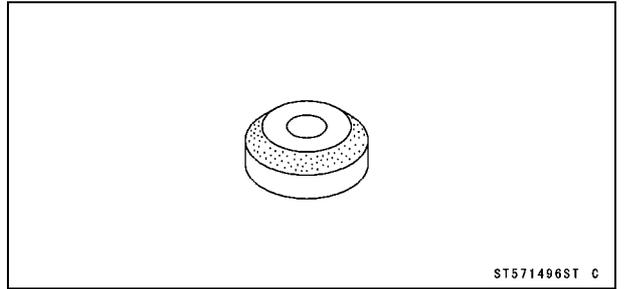
Special Tools and Sealant

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



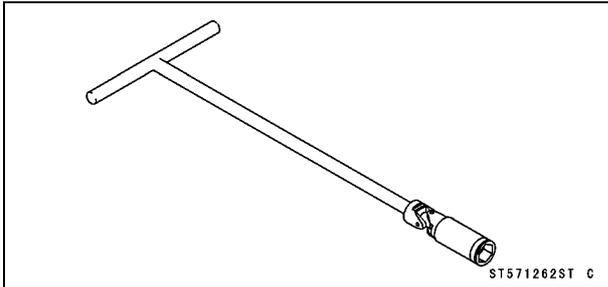
ST571247ST C

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



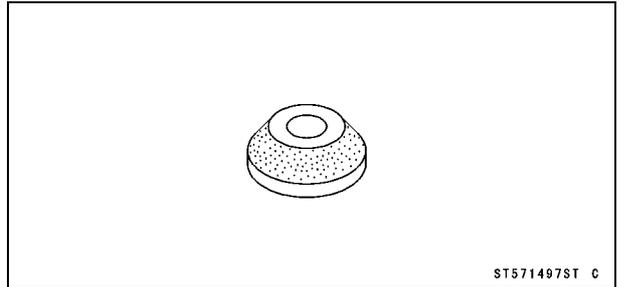
ST571496ST C

Spark Plug Wrench, Hex 16:  
57001-1262



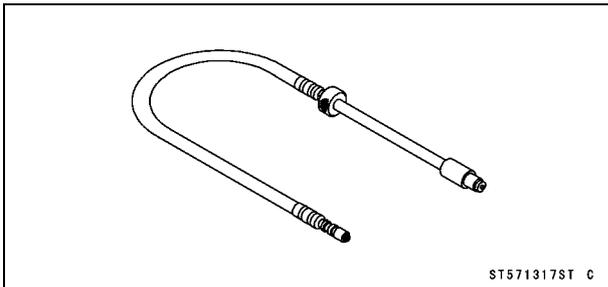
ST571262ST C

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



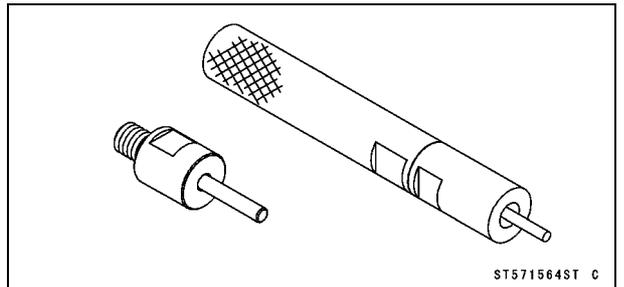
ST571497ST C

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



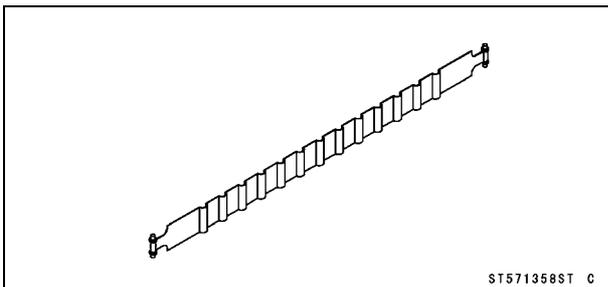
ST571317ST C

Valve Guide Driver:  
57001-1564



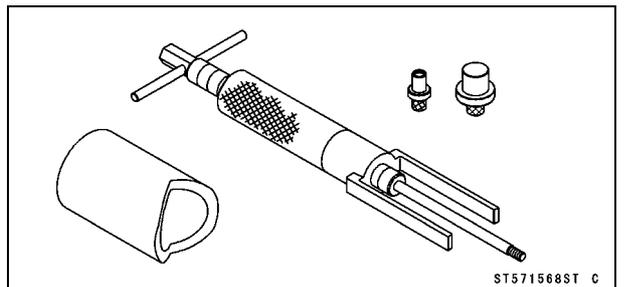
ST571564ST C

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



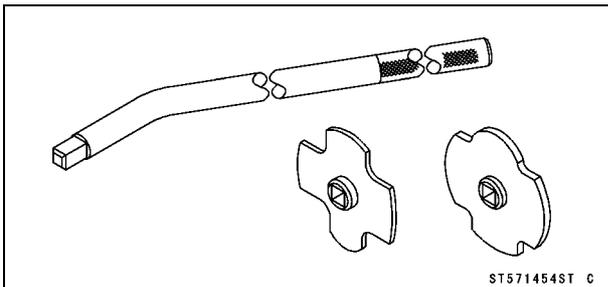
ST571358ST C

Piston Pin Puller:  
57001-1568



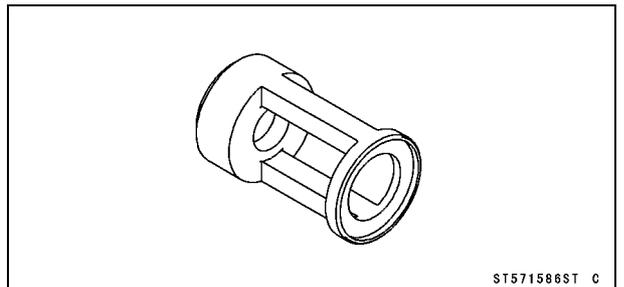
ST571568ST C

Filler Cap Driver:  
57001-1454



ST571454ST C

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



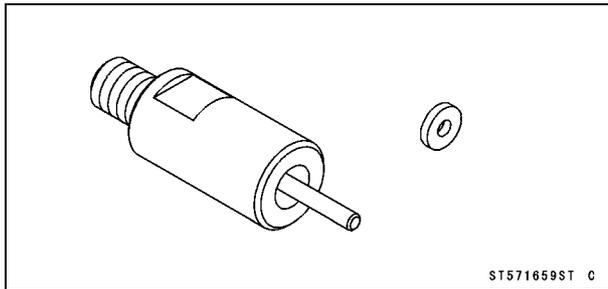
ST571586ST C

## 5-10 ENGINE TOP END

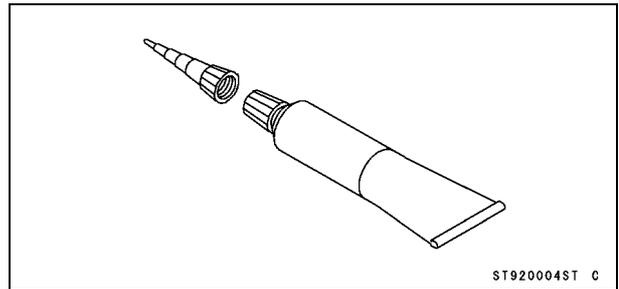
### Special Tools and Sealant

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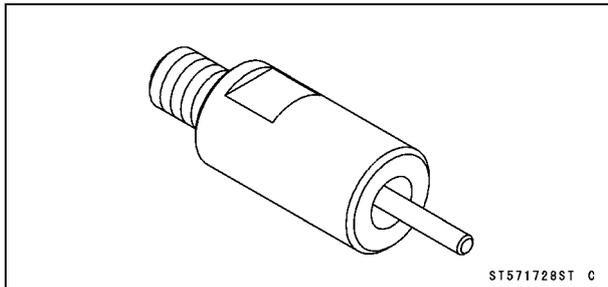
**Valve Guide Driver Attachment D:  
57001-1659**



**Kawasaki Bond (Silicone Sealant):  
92104-0004**



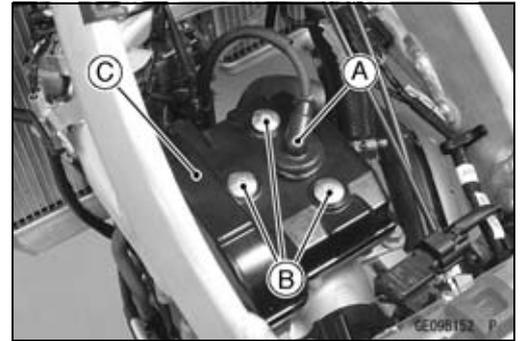
**Valve Guide Driver Attachment G:  
57001-1728**



## Cylinder Head Cover

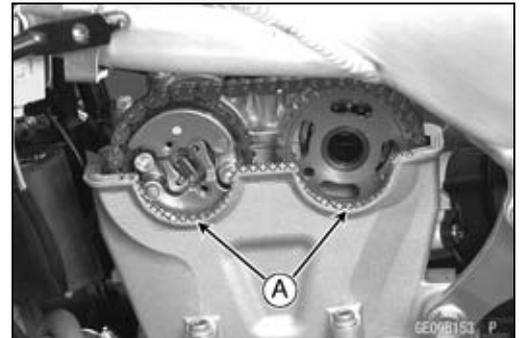
### Cylinder Head Cover Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Fuel Hose
  - Spark Plug Cap [A]
  - Cylinder Head Cover Bolts [B]
  - Cylinder Head Cover [C]

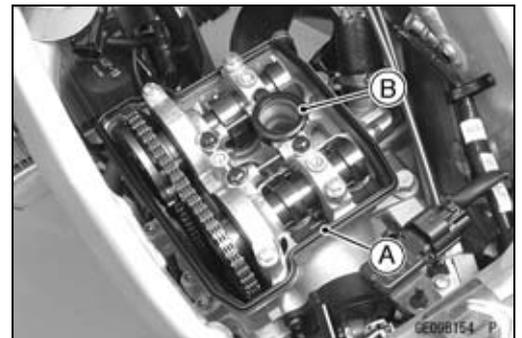


### Cylinder Head Cover Installation

- Apply silicon sealant [A] to the cylinder head as shown.  
**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**



- Replace the head cover gasket [A] with a new one.
- Install the head cover gasket on the cylinder head.
- Replace the spark plug hole gasket [B] with a new one, and install it.

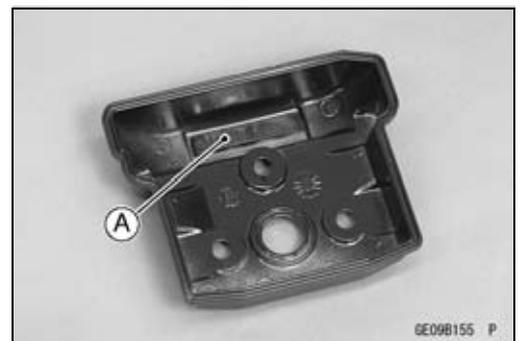


- Make sure that the upper chain guide [A] is bottomed.

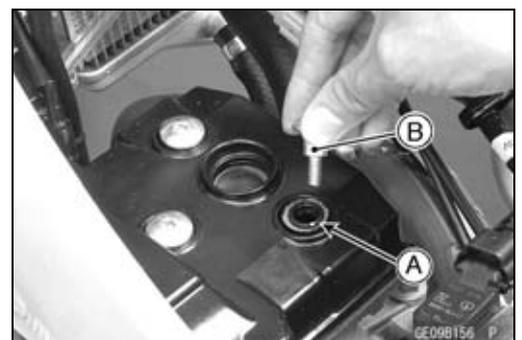
#### CAUTION

Unless the upper chain guide is bottomed, the camshaft chain could push the cylinder head cover upward, leading to an oil leak.

- Install the head cover from the motorcycle left side.



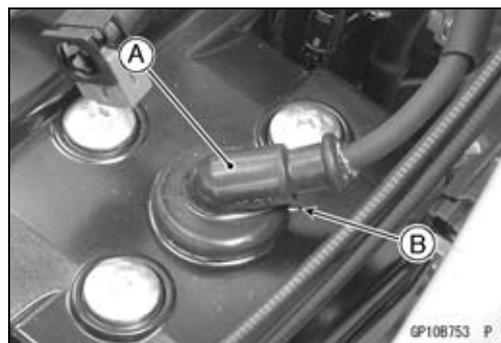
- Install the head cover bolt washers with the metal side [A] upwards.
- Tighten:
  - Torque - Cylinder Head Cover Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



## 5-12 ENGINE TOP END

### Cylinder Head Cover

- Install the spark plug cap [A] so that align it to the raised line [B] on the head cover.
- Pull up the spark plug cap lightly to make sure of the installation of the spark plug cap.



## Camshaft Chain Tensioner

### Camshaft Chain Tensioner Removal

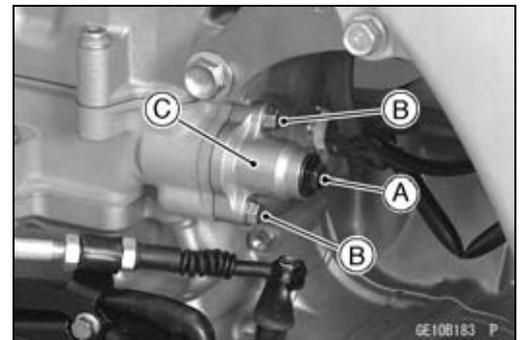
#### CAUTION

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

When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation".

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

- Loosen the cap bolt [A]
- Remove the tensioner mounting bolts [B], and remove the chain tensioner body [C].

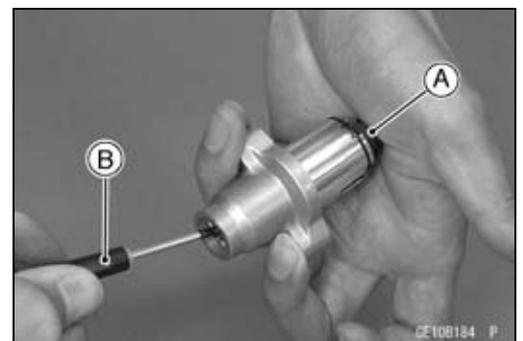


### Camshaft Chain Tensioner Installation

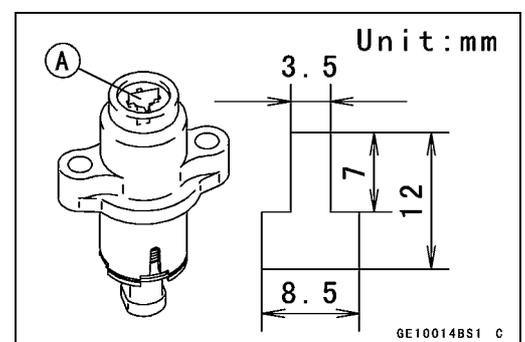
- Remove the tensioner cap bolt and O-ring.
- While compressing the push rod [A], turn it clockwise with a suitable screwdriver [B] until the rod stopped.

#### CAUTION

Do not turn the rod counterclockwise at installation. This could detach the rod and the tensioner cannot be reinstalled.



- While holding the rod in position with a suitable push rod holder plate [A] install the tensioner on the cylinder block.

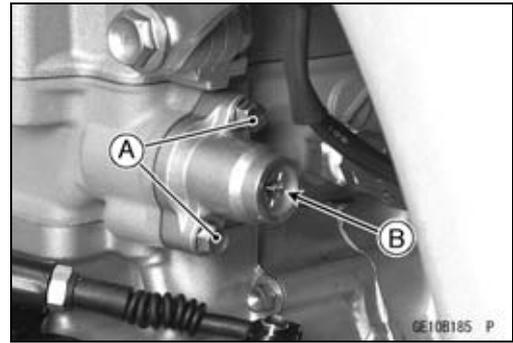


## 5-14 ENGINE TOP END

### Camshaft Chain Tensioner

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- Replace the chain tensioner gasket with a new one.
- Tighten:
  - Torque - Camshaft Chain Tensioner Mounting Bolts [A]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Take out the holder plate [B].
- Install the O-ring and tighten the cap bolt.
  - Torque - Camshaft Chain Tensioner Cap Bolt: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

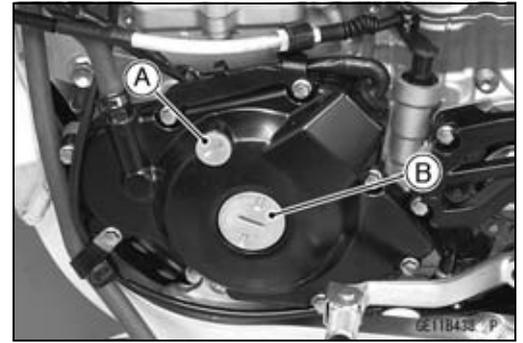


## Camshaft

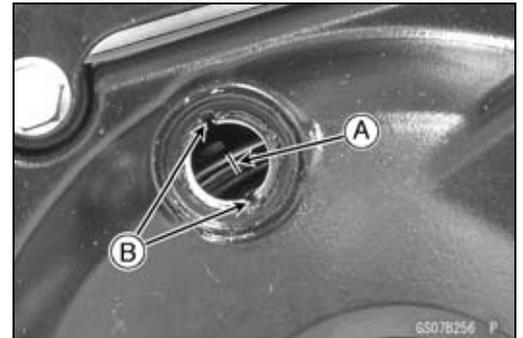
### Camshaft Removal

- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Timing Inspection Cap [A]
  - Flywheel Nut Cap [B]

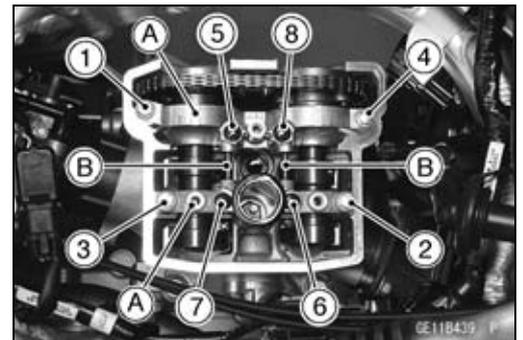
**Special Tool - Filler Cap Driver: 57001-1454**



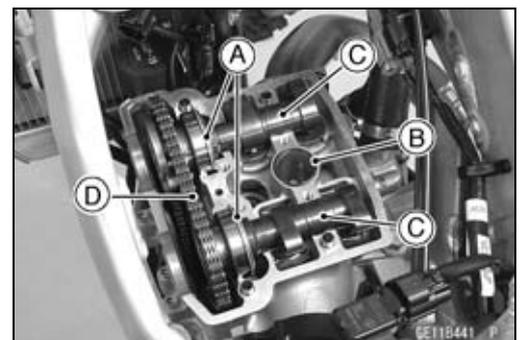
- First, bring the piston to the TDC (of either the compression or exhaust stroke).
- Place a wrench over the flywheel nut and turn it counter-clockwise to align the TDC mark [A] with the center of the groove [B] of the inspection hole.



- Remove:
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal).
  - Camshaft Cap Bolts [1 ~ 8] (sequence numbers)
  - Camshaft Caps [A] (together with the oil pipes [B])
- Plug the oil passage and camshaft chain tunnel with a clean cloth for prevent the oil pipe from dropping into the crankcase.
- While keeping parallel, remove the camshaft caps and oil pipes.



- Remove:
  - Positioning Rings [A]
  - O-ring [B]
- Disengage the Camshafts [C] from camshaft chain [D].
- Staff a clean cloth into the camshaft chain tunnel to keep any parts from dropping into the crankcase.



### CAUTION

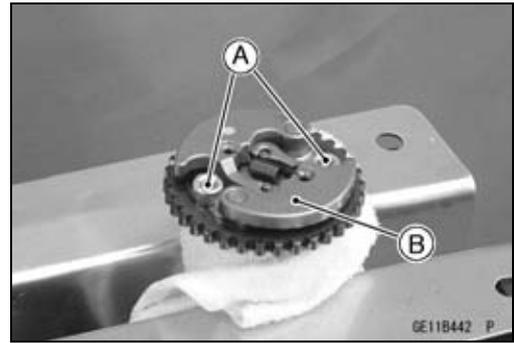
**The crankshaft may be turned while the camshafts are removed.**

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

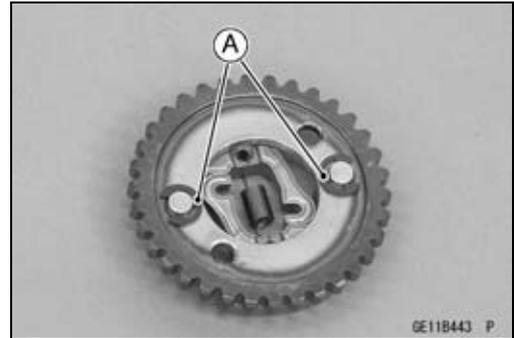
## 5-16 ENGINE TOP END

### Camshaft

- Remove:
  - Bolts [A]
  - Auto-Decompressor [B] (with the sprocket)

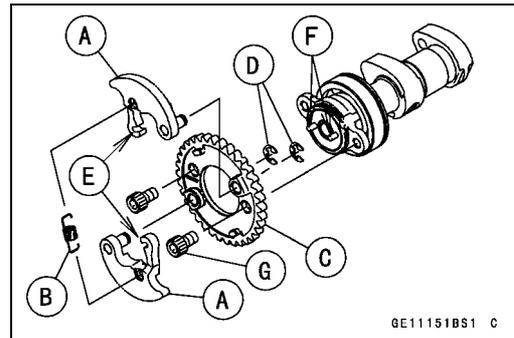


- Remove:
  - Circlips [A]



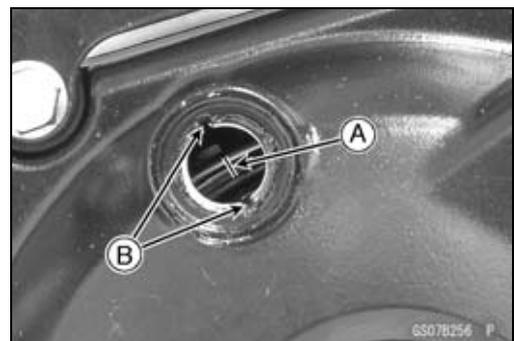
### Camshaft Installation

- Assemble the auto-decompressor weights [A] and spring [B] to install it to the sprocket [C].
- Replace the circlips [D] with new ones, and install them.
- Fit the recess [E] of the weight and projections [F] of the camshaft, and install it.
- Apply a non-permanent locking agent to camshaft sprocket bolts.
- Tighten:



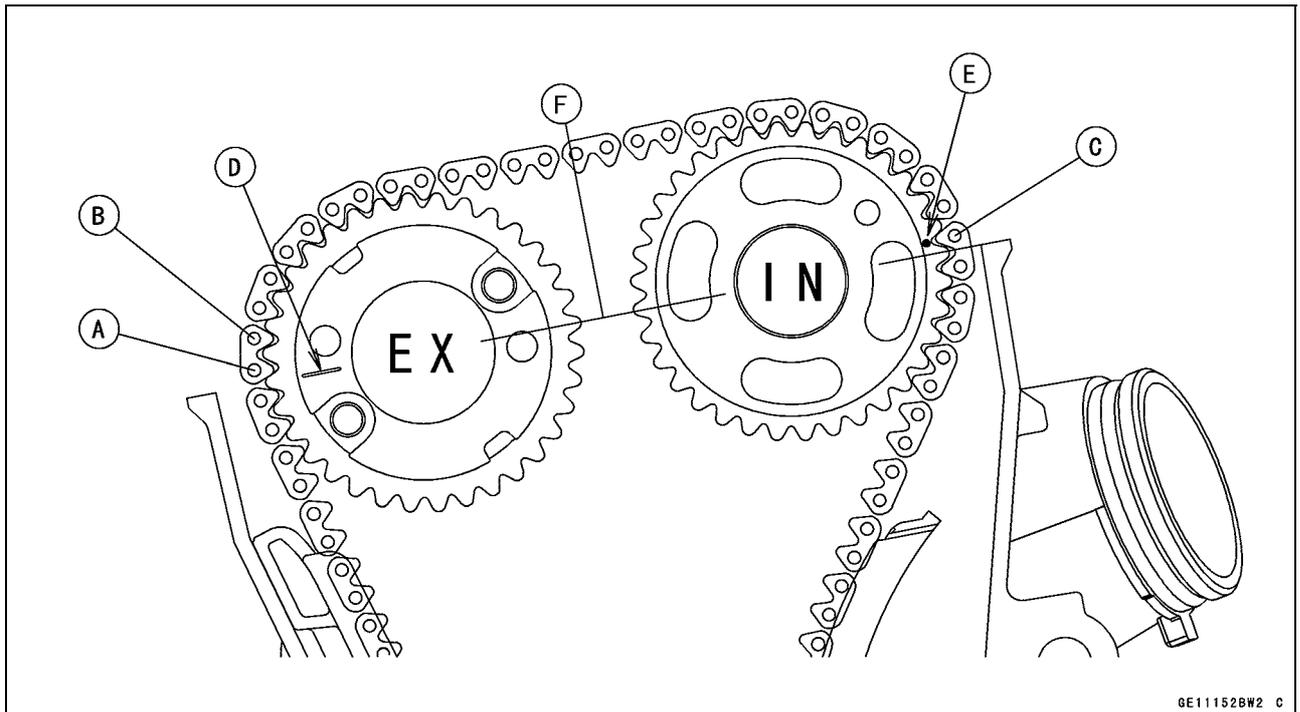
**Torque - Camshaft Sprocket Bolts [G]: 12 N·m (1.2 kgf·m, 106 in·lb)**

- Apply molybdenum disulfide oil to the ball bearing, 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 flywheel nut 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 29th pin with the timing mark on the inlet camshaft sprocket.

Camshaft

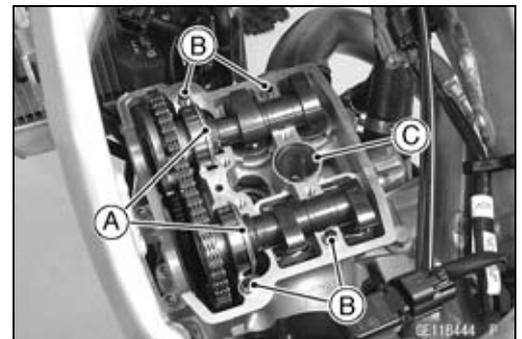


GE11152BW2 C

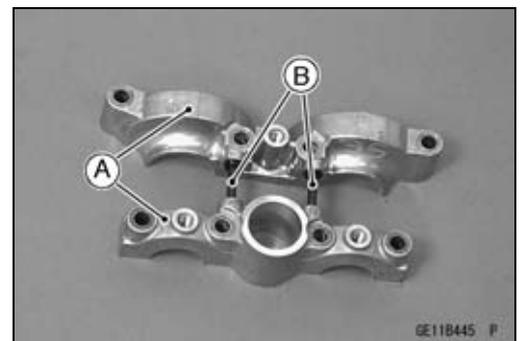
1st Pin [A]  
2nd Pin [B]  
29th Pin [C]

Mark (exhaust) [D]  
Punch Mark (inlet) [E]  
Cylinder Head Upper Surface [F]

- Plug the oil passage and camshaft chain tunnel with a clean cloth for prevent the any parts from dropping in the crankcase.
- Be sure to install the positioning rings [A] and dowel pins [B].
- Apply grease to the O-ring [C], and install it.



- Apply grease to the rubber portions of the oil pipes.
- Assemble:  
Camshaft Caps [A]  
Oil Pipes [B]
- While keeping the camshaft caps in parallel, install them to the cylinder head.



GE11B445 P

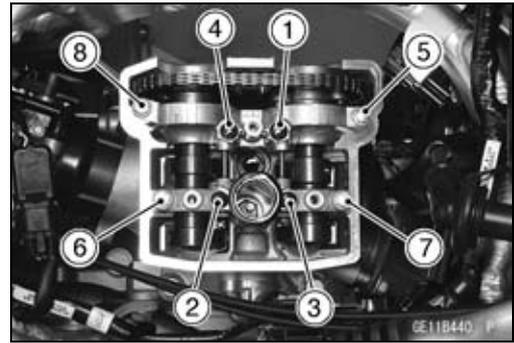
## 5-18 ENGINE TOP END

### Camshaft

- Uniformly tighten all bolts and after the camshaft has settled, uniformly tighten all the bolts.
- Following the sequence numbers on the camshaft caps. Tighten the cap bolts [1 ~ 8] after applying molybdenum disulfide oil to the thread of them.

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

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



#### CAUTION

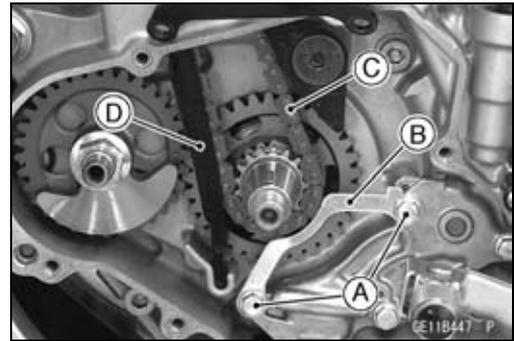
**After this procedure, if any resistance is felt while turning over the crankshaft, stop immediately, and check the camshaft chain timing. Valves will be bent if the timing is not properly set.**

- Install the cylinder head cover (see Cylinder Head Cover Installation), timing inspection cap, and the flywheel nut cap.

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

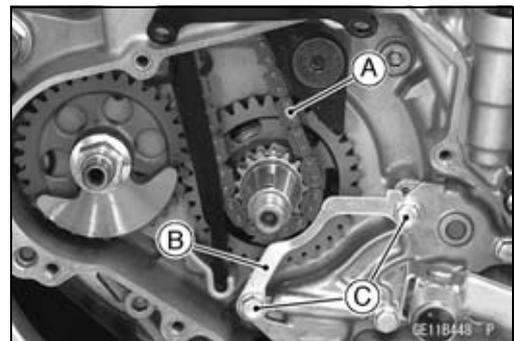
### Camshaft Chain Removal

- Remove:
  - Camshaft (see Camshaft Removal)
  - Flywheel (see Flywheel Removal in the Electrical System)
  - Lower Camshaft Chain Guide Bolts [A]
  - Lower Chain Guide [B]
- Remove the camshaft chain [C] from the crankshaft sprocket.
- While pushing the front chain guide [D], remove the camshaft chain.



### Camshaft Chain Installation

- Hang the camshaft chain [A] to the crankshaft sprocket.
- Install:
  - Lower Chain Guide [B]
- Tighten:
  - Torque - Lower Camshaft Chain Guide Bolts [C] (Oil Pump (Scavenge) Cover Bolts): 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install:
  - Flywheel (see Flywheel Installation in the Electrical System chapter)
  - Camshaft (see Camshaft Installation)



## Camshaft

### Camshaft and Camshaft Cap Wear Inspection

- 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.

#### Camshaft Journal/Camshaft Cap Clearance

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

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

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

#### Camshaft Journal Diameter

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

**Service Limit:** 22.93 mm (0.9028 in.)

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

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

### Camshaft Runout Inspection

- Remove the 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 0.02 mm (0.0008 in.) or less

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

### Cam Wear Inspection

- 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:**

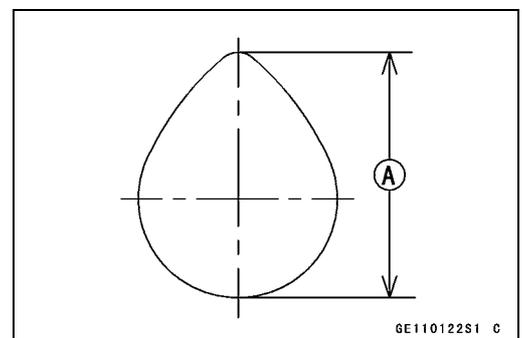
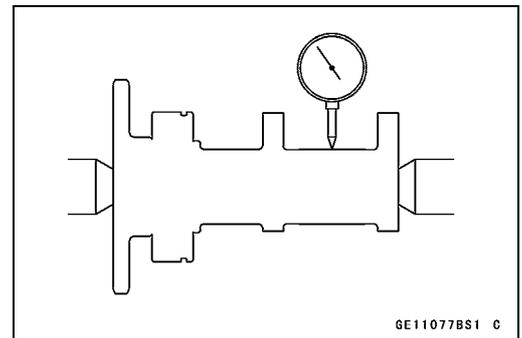
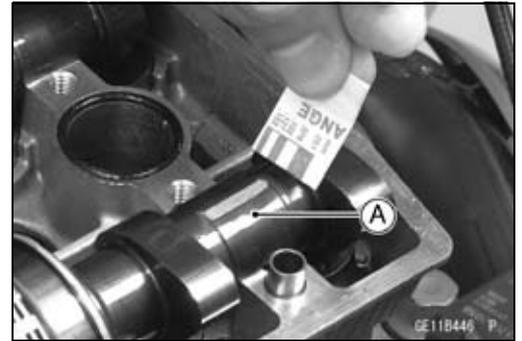
**Exhaust** 36.943 ~ 37.057 mm (1.4544 ~ 1.4589 in.)

**Inlet** 37.743 ~ 37.857 mm (1.4859 ~ 1.4904 in.)

**Service Limit:**

**Exhaust** 36.84 mm (1.450 in.)

**Inlet** 37.64 mm (1.482 in.)



## 5-20 ENGINE TOP END

### Cylinder Head

#### **Cylinder Compression Measurement**

- Start the engine.
- Thoroughly warm up the engine so that the 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 (DFI) chapter)
- Remove the spark plug [A] with spark plug wrench [B].

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

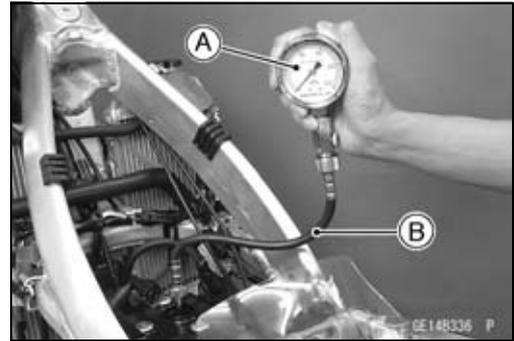
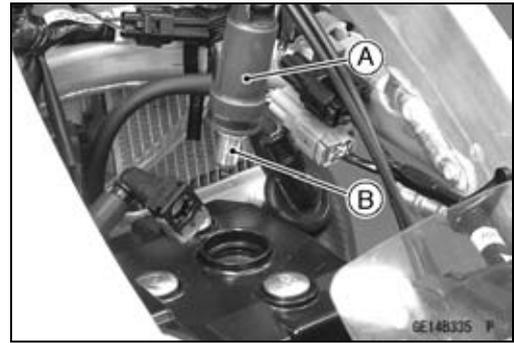
- Attach the compression gauge [A] and the adapter hose [B] firmly into the spark plug hole.
- With the throttle fully open, turn the engine over sharply with the kickstarter several times until the compression gauge stops rising; the compression is the highest reading obtainable.

**Special Tools - Compression Gauge, 20 kgf/cm<sup>2</sup>: 57001-221**  
**Compression Gauge Adapter, M10 x 1.0: 57001-1317**

#### **Cylinder Compression**

**Service Range: 420 ~ 700 kPa (4.28 ~ 7.14 kg/cm<sup>2</sup>, 60.9 ~ 102 psi) @ 5 kicks**

- Install the spark plug.
  - Torque - Spark Plug: 13 N·m (1.3 kgf·m, 115 in·lb)**
- Pull the spark plug cap lightly to make sure the installation of the spark plug cap.

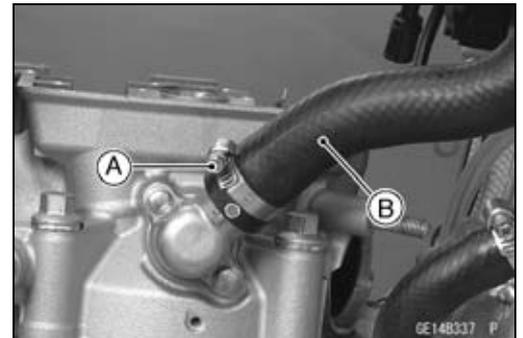


**Cylinder Head**

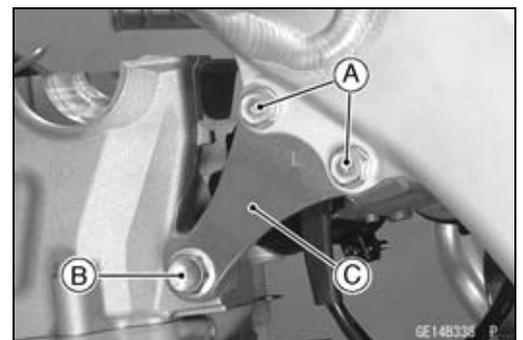
Problem	Diagnosis	Remedy (Action)
The cylinder compression is higher than the usable range	Carbon accumulation on piston and in cylinder head (combustion chamber) is suspected due to damaged valve stem or piston oil rings.	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect 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 auto-decompressor.
The cylinder compression is lower than the usable range	Exhaust gas leakage around cylinder head.	Replace the damaged gasket and inspect 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 auto-decompressor.

**Cylinder Head Removal**

- Remove:
  - Ignition Coil (see Ignition Coil Removal in the Electrical System chapter)
  - Camshaft (see Camshaft Removal)
  - Exhaust Pipe (see Muffler Removal)
  - Clamp Screw [A]
  - Water Hose [B]



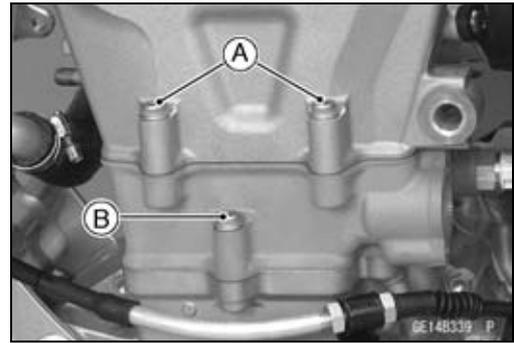
- Remove:
  - Upper Engine Bracket Bolts [A]
  - Upper Engine Mounting Bolts [B]
  - Upper Engine Brackets [C]



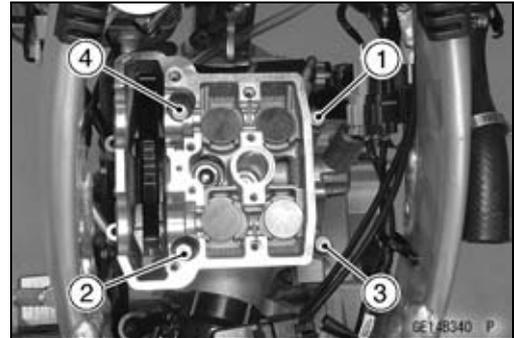
## 5-22 ENGINE TOP END

### Cylinder Head

- Remove the cylinder head bolts (M6) [A] and loosen the cylinder bolt [B] for prevent damage.



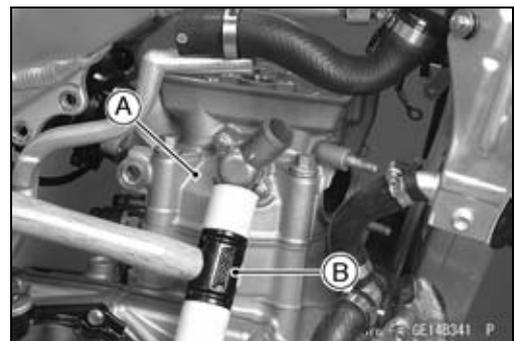
- Remove the cylinder head bolts (M10) following the loosening sequence as shown.



- Remove the cylinder head [A].

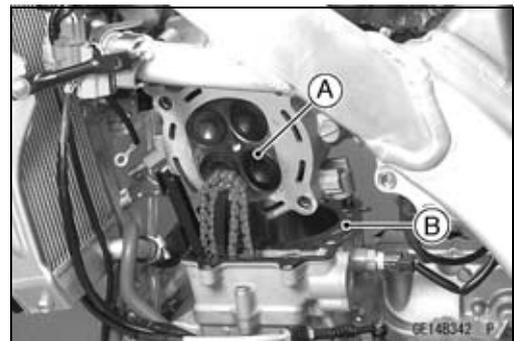
#### NOTE

○ When do not remove the cylinder head easily, tap lightly up with a plastic mallet [B] to separate the cylinder head from the cylinder.



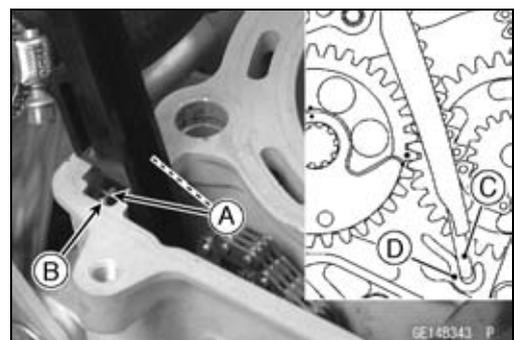
○ Face the combustion chamber [A] to the left, remove the cylinder head.

- Remove the cylinder head gasket [B].



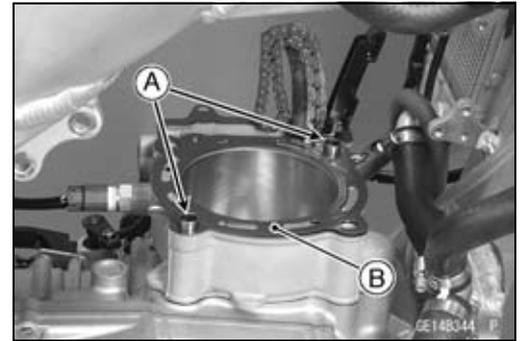
#### Cylinder Head Installation

- Fit the projection [A] of the front camshaft chain guide in the groove [B] of the cylinder.
- Insert the guide end [C] into the recess [D] of the crankcase securely.

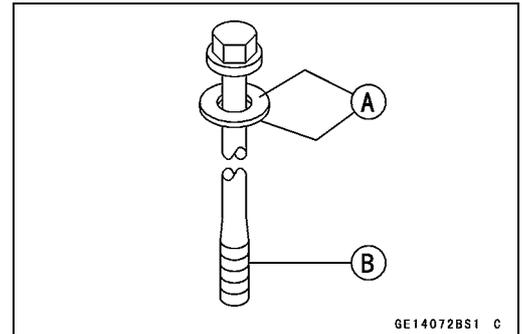


## Cylinder Head

- 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.

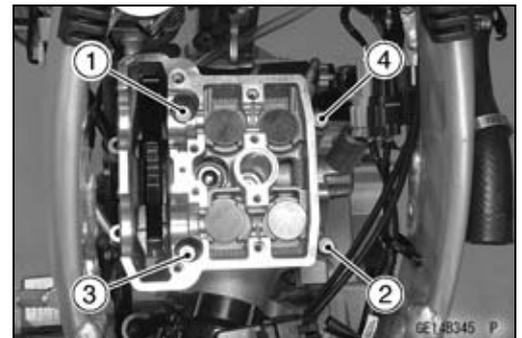


- Replace all the cylinder head bolt washers with new ones.
  - The cylinder head bolt washers could leak oil if reused.
- Apply molybdenum disulfide oil to the both sides [A] of the cylinder head bolt washer and thread [B] of the cylinder head bolts (M10).

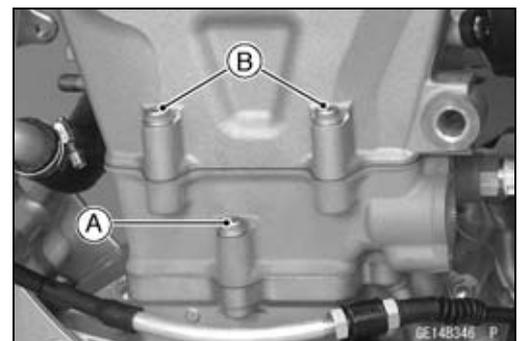


- Tighten the cylinder head bolts (M10) in the numbered sequence [1 ~ 4].

**Torque - Cylinder Head Bolts (M10): 59 N·m (6.0 kgf·m, 44 ft·lb)**



- Tighten:
  - Torque - Cylinder Bolt [A]: 12 N·m (1.2 kgf·m, 106 in·lb)**
  - Cylinder Head Bolts (M6) [B]: 12 N·m (1.2 kgf·m, 106 in·lb)**
- Install the removed parts (see appropriate chapters).



### **Cylinder Head Cleaning**

- Refer to the Cylinder Head Warp Inspection in the Periodic Maintenance chapter.

### **Cylinder Head Warp Inspection**

- Refer to the Cylinder Head Warp Inspection in the Periodic Maintenance chapter.

## 5-24 ENGINE TOP END

### Valves

#### Valve Clearance Inspection

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

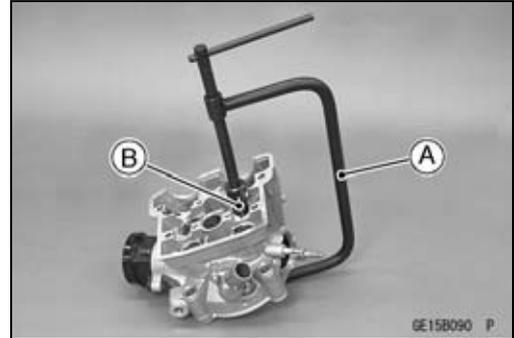
#### Valve Removal

- 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,  $\phi$ 24: 57001-1586 [B]**



#### Valve Installation

#### CAUTION

**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.

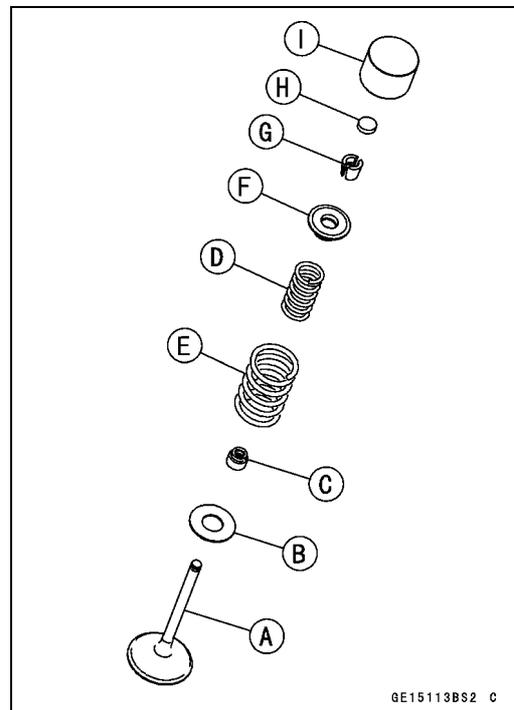
**Special Tools - Valve Spring Compressor Assembly: 57001-241**

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

- The shim [H] must be installed with its thickness indication facing up towards the retainer.
- Apply engine oil to the valve lifter [I] surface; then install the lifter.

#### 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).



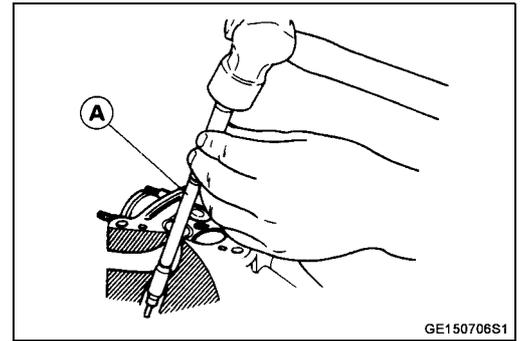
#### CAUTION

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

**Valves**

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

**Special Tool - Valve Guide Arbor,  $\phi$ 5.5: 57001-1021**



**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).

**CAUTION**

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

- Assemble the valve guide driver [A] and valve guide driver attachment G [B].
- When install the exhaust valve guide, using the attached washer (t = 2.0) [C] of the attachment D.

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

**Valve Guide Driver Attachment D: 57001-1659**

**Valve Guide Driver Attachment G: 57001-1728**

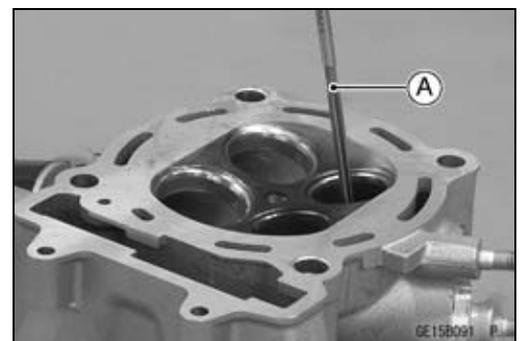
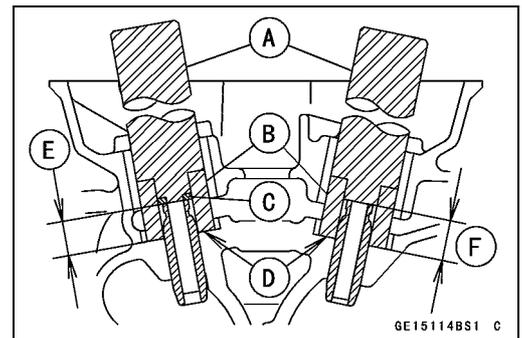
- Using the valve guide driver, press and insert the valve guide in until the valve guide driver surface [D] touches the head surface.

[E] Exhaust 11.35 ~ 11.55 mm (0.437 ~ 0.445 in.)

[F] Inlet 13.35 ~ 13.55 mm (0.516 ~ 0.524 in.)

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

**Special Tool - Valve Guide Reamer,  $\phi$ 5.5: 57001-1079**

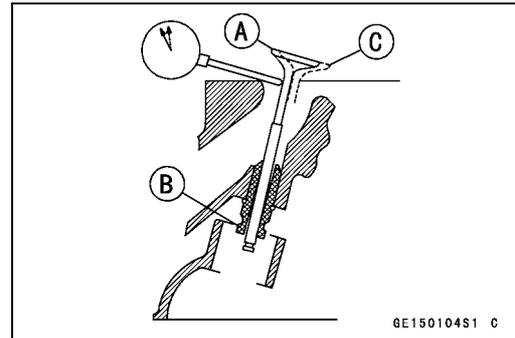


## 5-26 ENGINE TOP END

### 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	0.14 ~ 0.26 mm (0.0055 ~ 0.0102 in.)
Inlet	0.09 ~ 0.22 mm (0.0035 ~ 0.0087 in.)

##### Service Limit:

Exhaust	0.57 mm (0.022 in.)
Inlet	0.53 mm (0.021 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

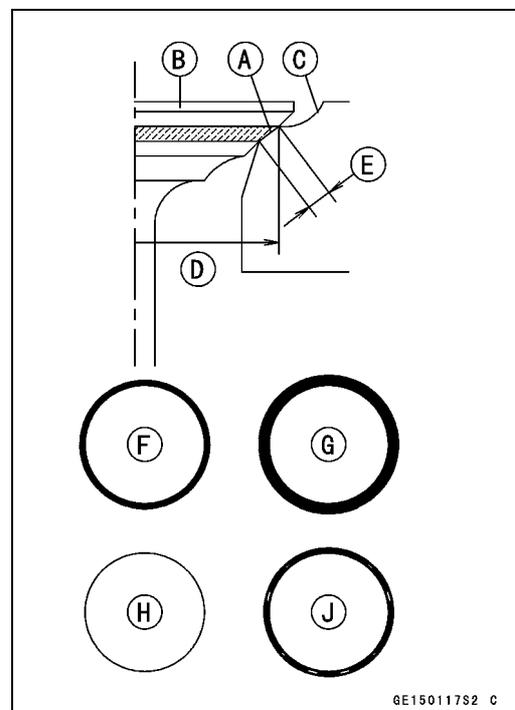
Exhaust	30.4 ~ 30.6 mm (1.197 ~ 1.205 in.)
Inlet	35.4 ~ 35.6 mm (1.39 ~ 1.40 in.)

- 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 (0.032 ~ 0.047 in.)
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)

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



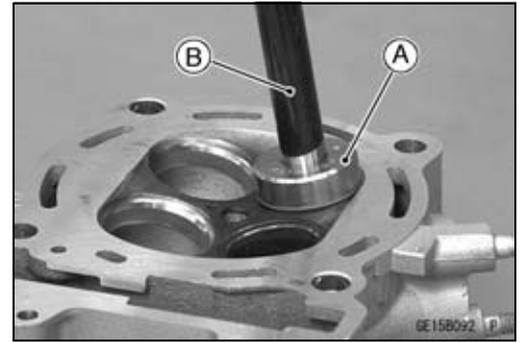
## Valves

### 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,  $\phi$ 5.5: 57001-1125 [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° -  $\phi$ 38.5: 57001-1122**

**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.

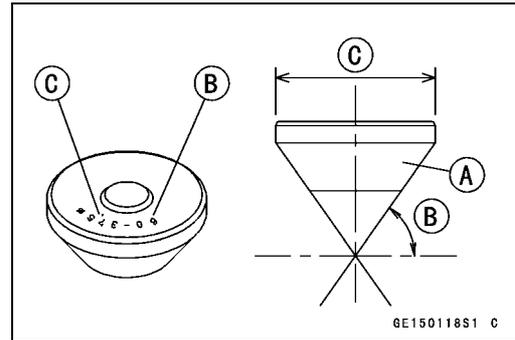
# 5-28 ENGINE TOP END

## 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]

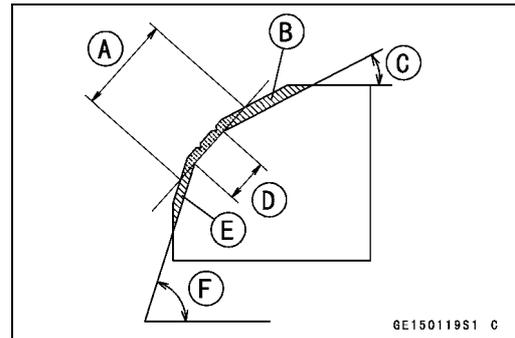


### Repair Operating Procedures

- 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.

### CAUTION

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

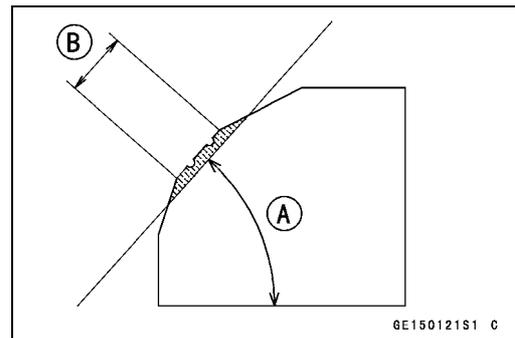


- Widened Width [A] of engagement by machining with 45° cutter
- Ground Volume [B] by 32° cutter
- 32° [C]
- Correct Width [D]
- Ground Volume [E] by 55° cutter
- 55° [F]

- Measure the outside diameter [O.D.] 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.

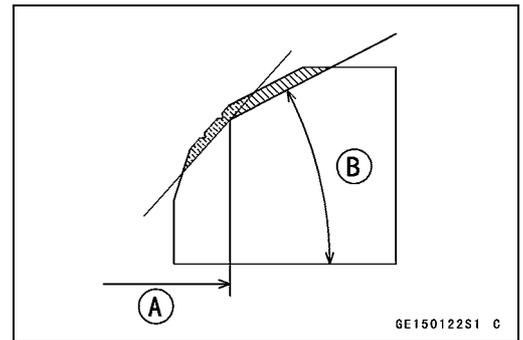
Original Seating Surface [B]

- 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.



## 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.

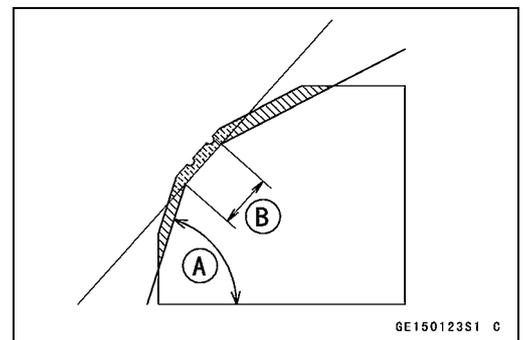


### CAUTION

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

- After making the 32° grind, return to the seat O.D. measurement step above.
- To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
- ★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.

- ★ 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]

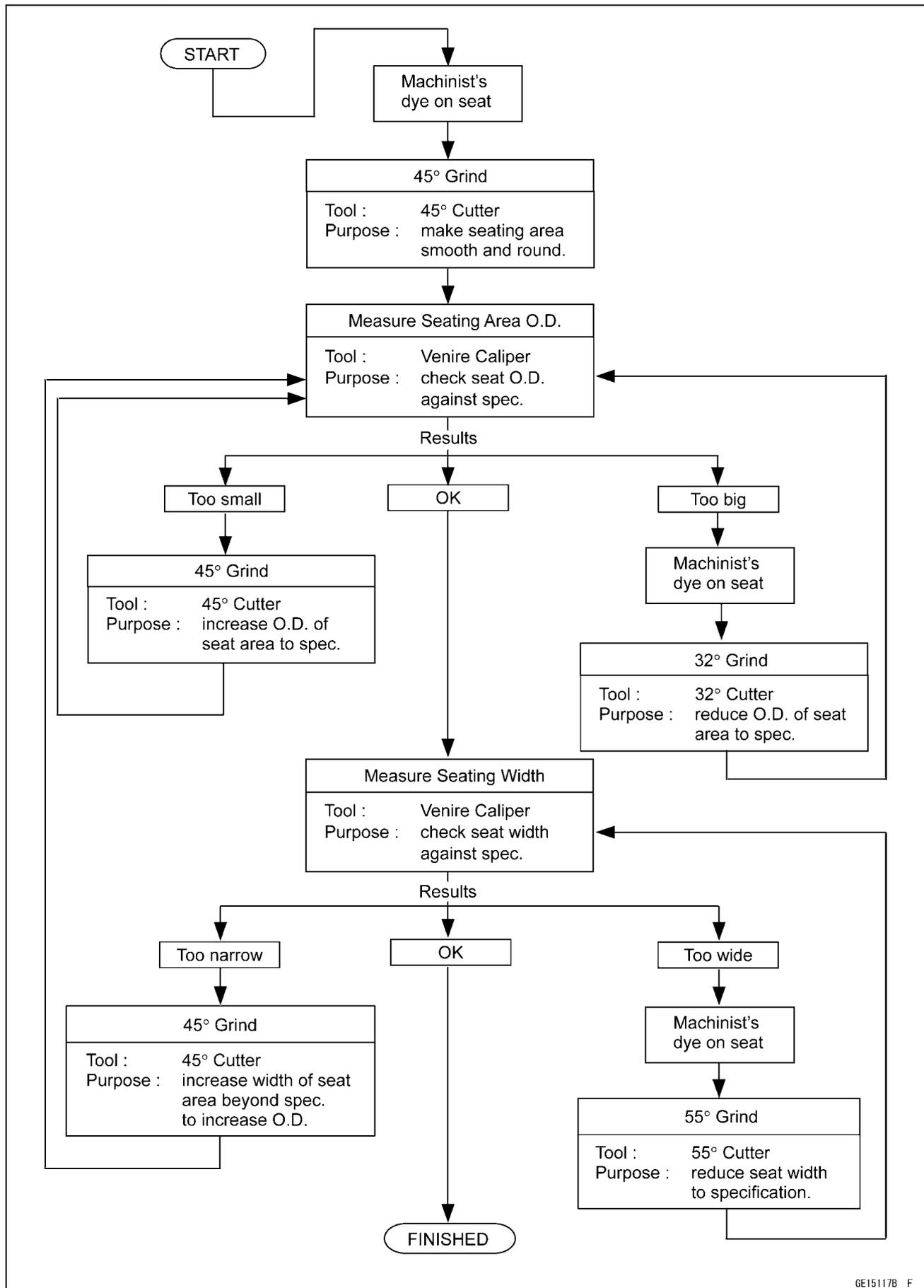


- The seating area should be marked about in the middle of the valve face.
- ★ If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment in the Periodic Maintenance chapter).

# 5-30 ENGINE TOP END

## Valves

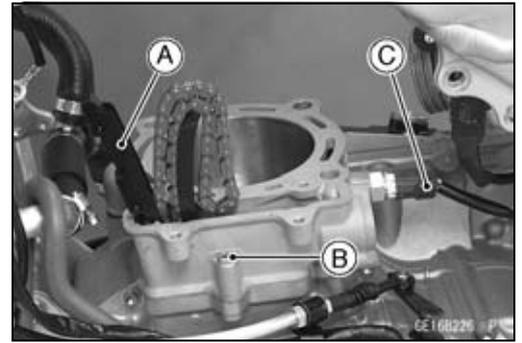
### Valve Seat Repair



## Cylinder and Piston

### Cylinder Removal

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



### Piston Removal

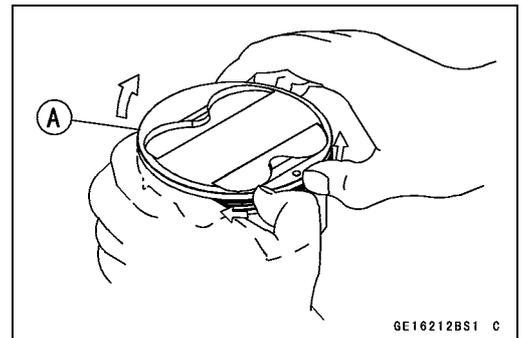
- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the piston and remove the piston snap ring [A] from one end of the piston pin.



- Remove the piston pin with the piston pin puller [A].  
**Special Tool - Piston Pin Puller: 57001-1568**
- Remove the piston.



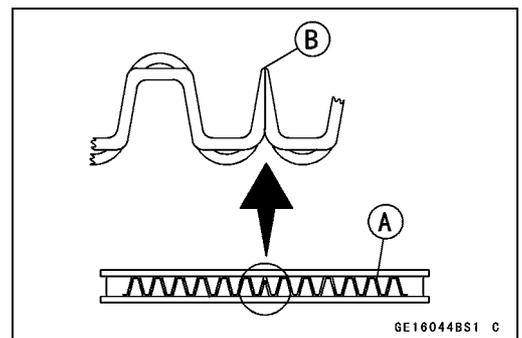
- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the oil ring in the same procedure.



### 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.



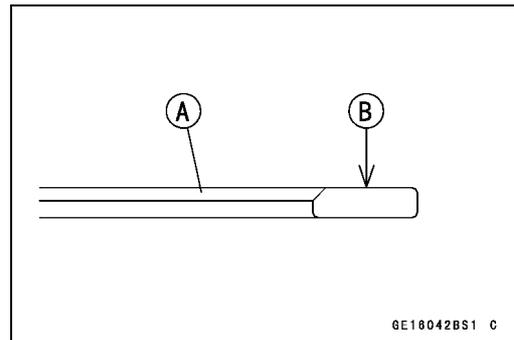
## 5-32 ENGINE TOP END

### Cylinder and Piston

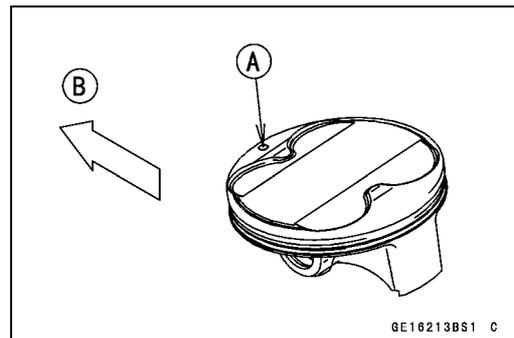
- Install the top ring [A] so that the "R" mark [B] faces up.

#### NOTE

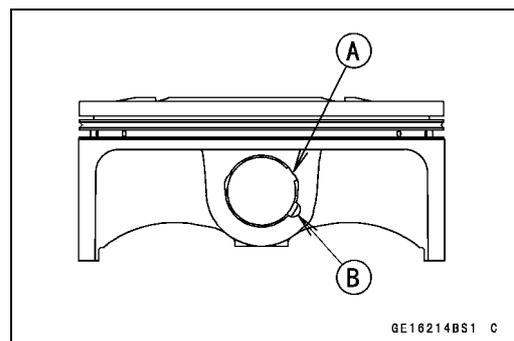
○ If a new piston or cylinder is used, check piston to cylinder clearance (see *Piston/Cylinder Clearance*), and use new piston rings.



- Apply engine oil to the inside wall of the small end of the connecting rod.
- Face the circle mark [A] on the top of the piston must point toward the front [B] of the engine.



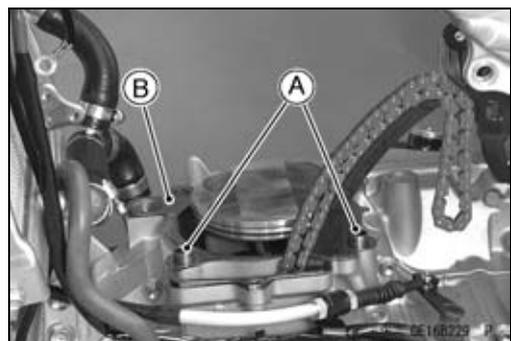
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- When installing the piston pin snap ring, compress it only enough to install it and no more.



#### CAUTION

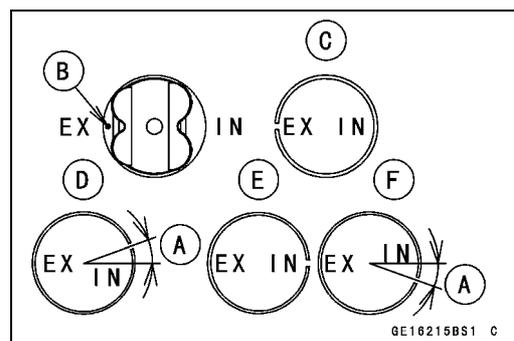
**Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.**

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



- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 20° [A] of angle from the opening of the oil ring expander.

Circle Mark [B]  
Top Ring [C]  
Upper Oil Ring Steel Rail [D]  
Oil Ring Expander [E]  
Lower Oil Ring Steel Rail [F]

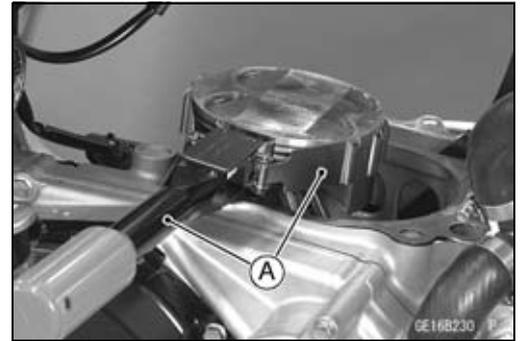


## Cylinder and Piston

- Apply engine 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 tool [A].

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

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



### Cylinder Wear Inspection

- Refer to the Cylinder Wear Inspection in the Periodic Maintenance chapter.

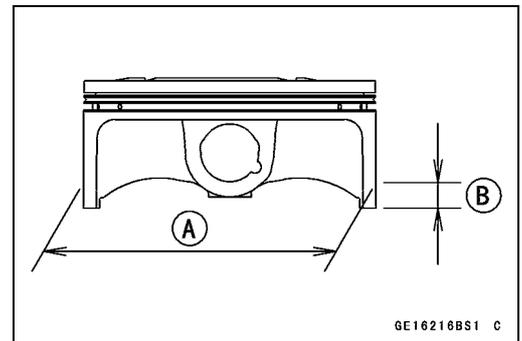
### Piston Wear Inspection

- Using a micrometer, measure the outside diameter [A] of each piston 8.5 mm (0.33 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.
- ★ If the piston's outside diameter is smaller than the service limit, replace the piston.

#### Piston Diameter

**Standard: 95.970 ~ 95.980 mm (3.7783 ~ 3.7787 in.)**

**Service Limit: 95.82 mm (3.772 in.)**



### Piston/Cylinder Clearance Inspection

- Refer to the Piston/Cylinder Clearance Inspection in the Periodic Maintenance chapter.

### 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

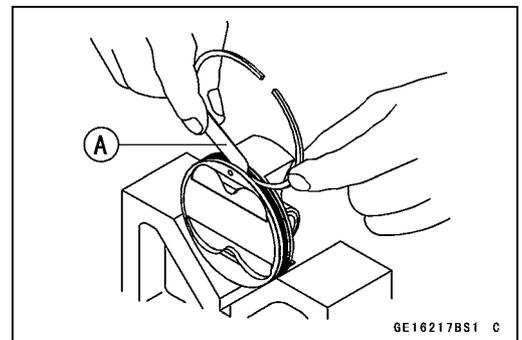
##### Standard:

**Top 0.04 ~ 0.08 mm (0.002 ~ 0.003 in.)**

##### Service Limit:

**Top 0.18 mm (0.0071 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.



## 5-34 ENGINE TOP END

### 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**                    **1.03 ~ 1.05 mm (0.0406 ~ 0.0413 in.)**

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

**Top**                    **1.13 mm (0.0445 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**

###### **Standard:**

**Top**                    **0.970 ~ 0.990 mm (0.0382 ~ 0.0390 in.)**

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

**Top**                    **0.90 mm (0.035 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:**

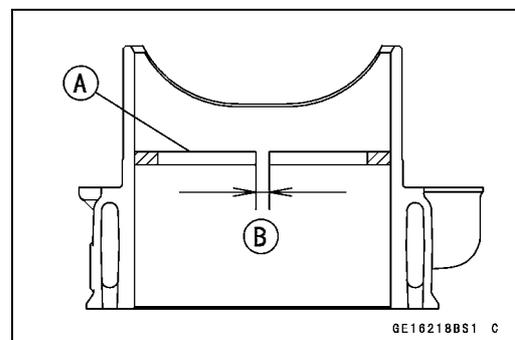
**Top**                    **0.25 ~ 0.35 mm (0.0098 ~ 0.014 in.)**

**Oil**                    **0.15 ~ 0.50 mm (0.0059 ~ 0.020 in.)**

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

**Top**                    **0.6 mm (0.02 in.)**

**Oil**                    **0.8 mm (0.03 in.)**



## Cylinder and Piston

### ***Piston, Piston Pin, Connecting Rod Wear Inspection***

- Visually inspect the snap rings [A] still fitted in place.
- ★ If the ring shows weakness or deformation, replace the ring. Also if the pin hole groove shows excessive wear, replace the piston.
- Measure the diameter of the piston pin [B] with a micrometer.

#### **Piston Pin Diameter**

**Standard:** 18.991 ~19.000 mm (0.74768 ~ 0.74803 in.)

**Service Limit:** 18.96 mm (0.7465 in.)

- ★ If the piston pin diameter is less than the service limit at any point, replace the piston pin.
- Using a cylinder gauge, measure the diameter of both of piston pin holes [C] in the piston and the inside diameter of the connecting rod small end [D].

#### **Piston Pin Hole Diameter**

**Standard:** 19.004 ~ 19.010 mm (0.74819 ~ 0.74842 in.)

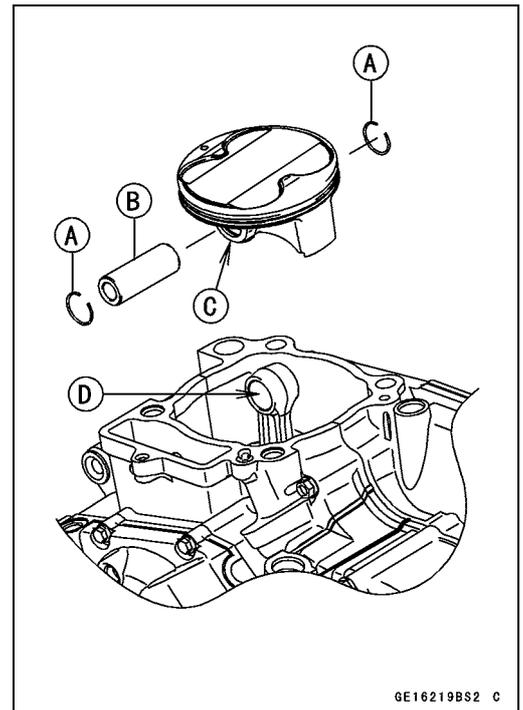
**Service Limit:** 19.08 mm (0.7512 in.)

#### **Connecting Rod Small End Inside Diameter**

**Standard:** 19.019 ~ 19.030 mm (0.74878 ~ 0.74921 in.)

**Service Limit:** 19.07 mm (0.7508 in.)

- ★ If either piston pin hole diameter exceeds the service limit, replace the piston.
- ★ If the connecting rod small end inside diameter exceeds the service limit, replace the connecting rod.



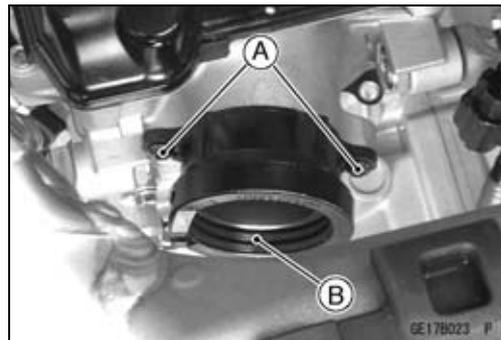
GE16219BS2 C

## 5-36 ENGINE TOP END

### Throttle Body Assy Holder

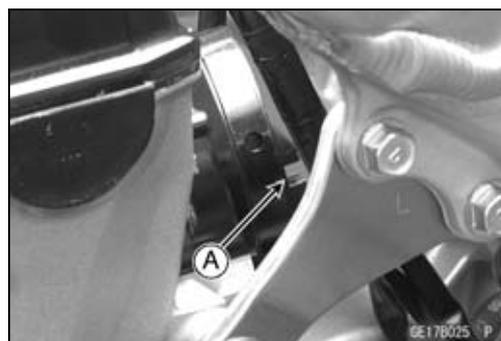
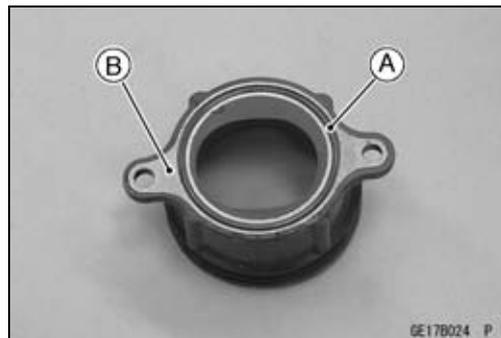
#### ***Throttle Body Assy Holder Removal***

- Remove:
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Throttle Body Assy Holder Bolts [A]
  - Throttle Body Assy Holder [B]



#### ***Throttle Body Assy Holder Installation***

- Replace the O-ring [A] with a new one.
  - Apply grease to the O-ring.
  - Install the O-ring to the throttle body assy holder [B].
- 
- Install the throttle body assy holder so that the groove [A] faces left side.
  - Apply a non-permanent locking agent to the throttle body assy holder bolts.
  - Tighten:
    - Torque - Throttle Body Assy Holder Bolts : 9.8 N-m (1.0 kgf-m, 87 in-lb)**



## Muffler

### ⚠ WARNING

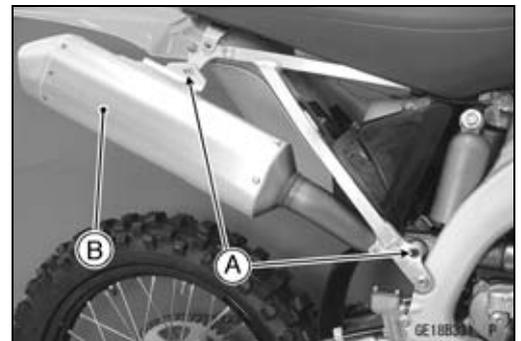
To avoid a serious burn, do not remove the muffler when the engine is still hot. Wait until the muffler cools down.

### Muffler Removal

- Loosen the muffler clamp bolt [A].
- Remove the exhaust pipe holder nuts [B].
- Remove the exhaust pipe [C].

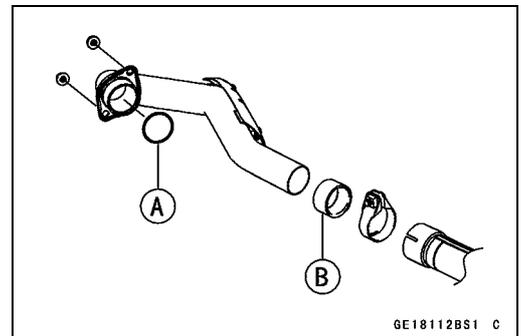


- Remove  
Seat (see Seat Removal in the Frame chapter)  
Right Side Cover (see Side Cover Removal in the Frame chapter)
- Remove the muffler mounting bolts [A].
- Remove the muffler [B] backward.



### Muffler Installation

- Replace the exhaust pipe holder gasket [A] with a new one.
- Replace the muffler pipe gasket [B] with a new one. Make sure that the gasket is placed securely outside the exhaust pipe.
- Apply grease to the exhaust pipe gasket.



- Tighten the following bolts and nut according to the specific tightening sequence.
- Temporary tighten the exhaust pipe holder nuts [A] first, and then the muffler mounting bolt (rear) [B].
- Tighten:

**Torque - Muffler Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

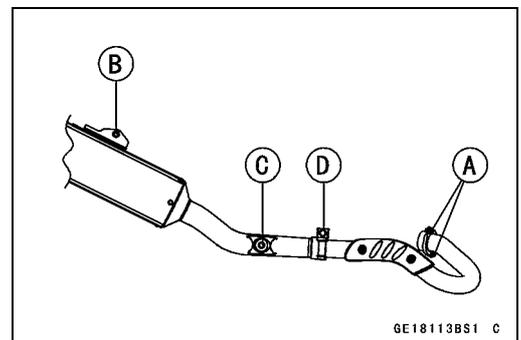
- Tighten the front bolt [C] first, and then the rear bolt.

- Tighten:

**Torque - Exhaust Pipe Holder Nuts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

**Muffler Clamp Bolt [D]: 16 N·m (1.6 kgf·m, 12 ft·lb)**

- Face the muffler clamp bolt upward.
- Tighten the holder nuts first, and then the clamp bolt.
- Thoroughly warm up the engine, wait until the engine cools down, and then retighten the exhaust pipe holder nuts, and the clamp bolt securely.



## 5-38 ENGINE TOP END

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### Muffler

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#### ***Muffler Baffle Replacement***

- Refer to the Muffler Baffle Change in the Periodic Maintenance chapter.

# Clutch

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## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Cover Bolts	9.8	1.0	87 in·lb	
2	Right Engine Cover Bolts	9.8	1.0	87 in·lb	
3	Clutch Spring Bolts	8.8	0.90	78 in·lb	
4	Clutch Hub Nut	98	10	72	

5. Friction Plates (The lining blocks are many.)

6. Friction Plates (The lining blocks are little.)

7. Steel Plates

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil.

R: Replacement Parts

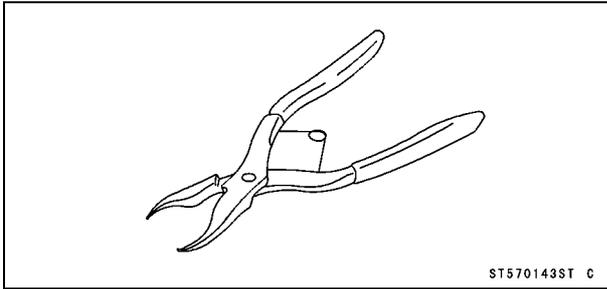
## 6-4 CLUTCH

### Specifications

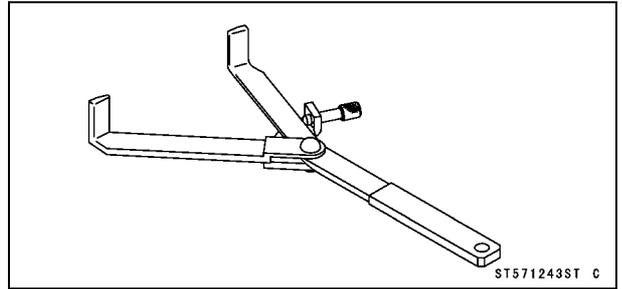
Item	Standard	Service Limit
<b>Clutch Lever</b>		
Clutch Lever Free Play	8 ~ 13 mm (0.3 ~ 0.5 in.)	— — —
<b>Clutch</b>		
Friction Plate Thickness	2.92 ~ 3.08 mm (0.115 ~ 0.121 in.)	2.6 mm (0.10 in.)
Friction Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.01 in.)
Steel Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.01 in.)
Clutch Spring Free Length	49.2 mm (1.94 in.)	46.7 mm (1.84 in.)
Friction Plate/Clutch Housing Clearance	0.20 ~ 0.60 mm (0.0079 ~ 0.024 in.)	0.8 mm (0.03 in.)
Clutch Plate Assembly Length	34.9 ~ 35.5 mm (1.37 ~ 1.40 in.)	— — —

**Special Tools**

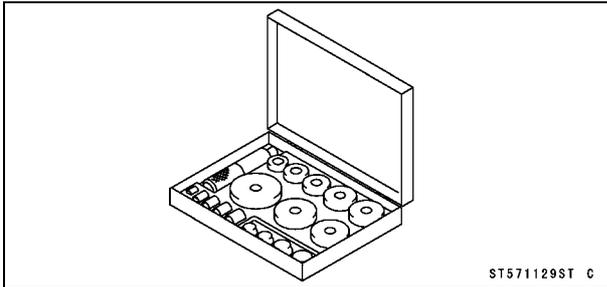
**Inside Circlip Pliers:**  
**57001-143**



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



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



## 6-6 CLUTCH

### Clutch Lever and Clutch Cable

Due to friction plate wear and clutch cable stretch over a long period of use, the clutch must be adjusted in accordance with the Periodic Maintenance Chart.

#### **⚠ WARNING**

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

#### **Clutch Lever (Clutch Cable) Free Play Inspection**

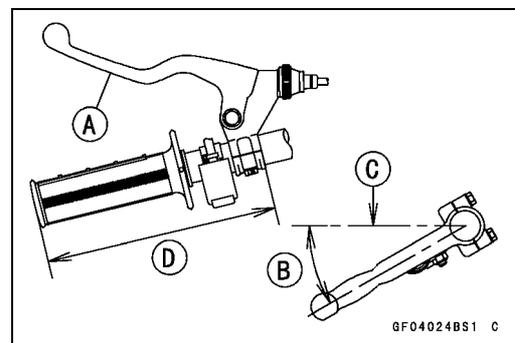
- Refer to the Clutch Lever Free Play Inspection in the Periodic Maintenance chapter.

#### **Clutch Lever (Clutch Cable) Free Play Adjustment**

- Refer to the Clutch Lever Free Play Adjustment in the Periodic Maintenance chapter.

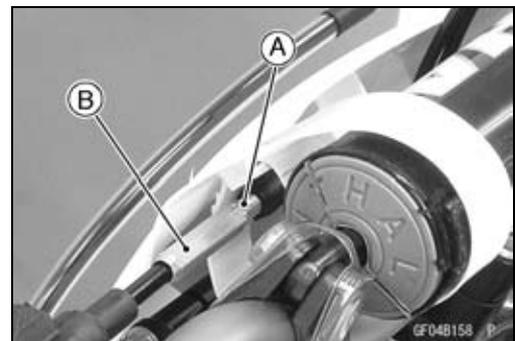
#### **Clutch Lever Installation**

- Install the clutch lever [A] so that it incline  $20^{\circ} \pm 5^{\circ}$  [B] more than the horizontal line [C], and position it from the edge of the grip to 170 mm (6.69 in.) [D].

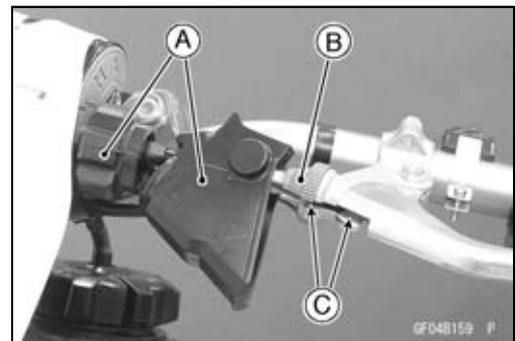


#### **Clutch Cable Removal**

- Loosen the locknut [A] fully, and turn in the adjuster [B] fully.



- Slide the dust cover [A] out of place.
- Screw the adjuster [B] at the clutch lever fully.
- Line up the slots [C] in the clutch lever and adjuster and then free the cable from the lever.



## Clutch Lever and Clutch Cable

- Loosen the adjusting nuts [A] fully.
- Free the clutch inner cable tip [B] from the clutch release lever [C].

### CAUTION

**Do not remove the clutch release shaft unless it is absolutely necessary. If removed, release shaft oil seal must be replaced with a new one.**

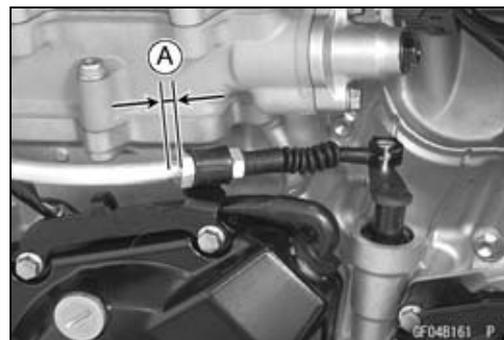
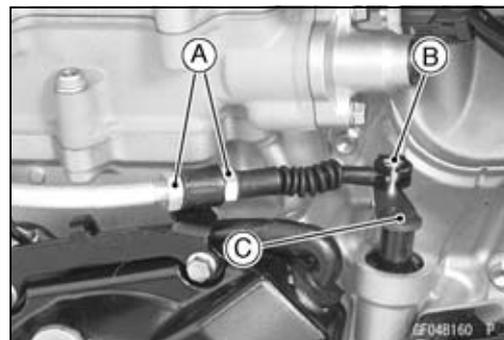
- Pull the clutch cable out of the frame.

### **Clutch Cable Installation**

- Install the clutch cable with the threads width as shown.  
[A]  $5 \pm 2$  mm ( $0.2 \pm 0.08$  in.)
- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Lever Free Play Adjustment in the Periodic Maintenance chapter).

### **Clutch Cable Inspection and Lubrication**

- During a periodic inspection or when the cable has been removed, inspect and lubricate the cable (see General Lubrication and Cable Inspection in the Periodic Maintenance chapter).

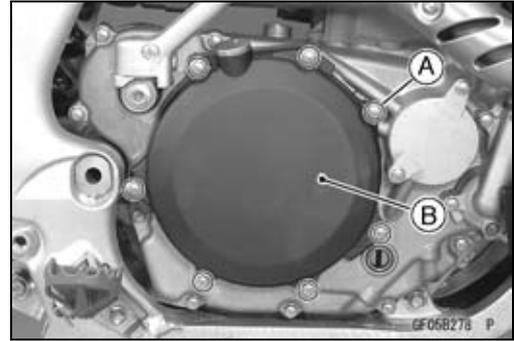


## 6-8 CLUTCH

### Clutch Cover and Right Engine Cover

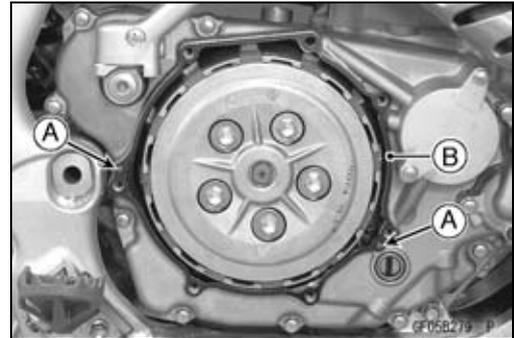
#### Clutch Cover Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove the brake pedal (see Brake Pedal Removal in the Brakes chapter).
- Remove:
  - Clutch Cover Bolts [A]
  - Clutch Cover [B]

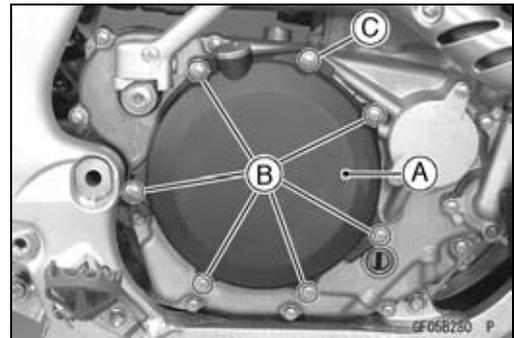


#### Clutch Cover Installation

- Be sure to install the dowel pins [A].
- Replace the clutch cover gasket [B] with a new one and install it.

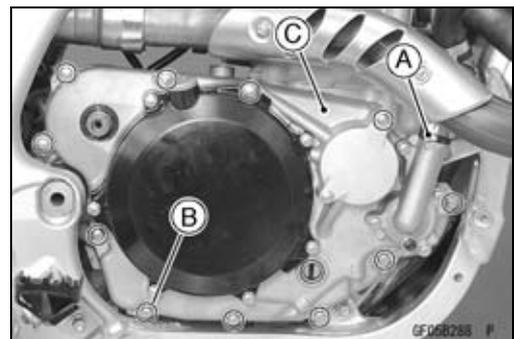


- Install the clutch cover [A].
- Tighten:
  - Torque - Clutch Cover Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 ft·lb)**
  - Right Engine Cover Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the brake pedal (see Brake Pedal in the Brakes chapter).



#### Right Engine Cover Removal

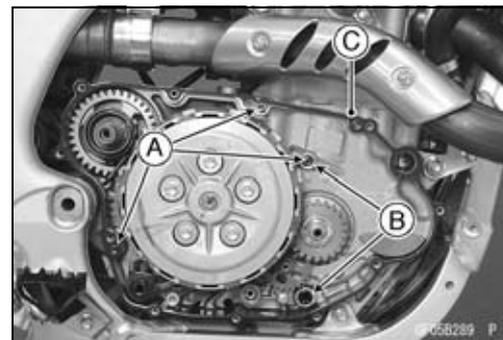
- Drain:
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (see Coolant Draining in the Cooling System chapter)
- Remove:
  - Kick Pedal (see Kick Pedal Removal in the Crankshaft/Transmission chapter)
  - Brake Pedal (see Brake Pedal Removal in the Brakes chapter)
- Remove:
  - Right Engine Guard
  - Water Hose [A]
  - Right Engine Cover Bolts [B]
  - Right Engine Cover [C]



## Clutch Cover and Right Engine Cover

### Right Engine Cover Installation

- Three dowel pins [A] are installed at the mating surface between the crankcase and the right engine cover.
- Apply grease to the O-rings [B], and install them to the crankcase.
- Install the lower O-ring so that the tapered side facing outside.
- Replace the engine cover gasket [C] with a new one.
- Apply grease to the kick shaft oil seal lips and kick shaft spline.



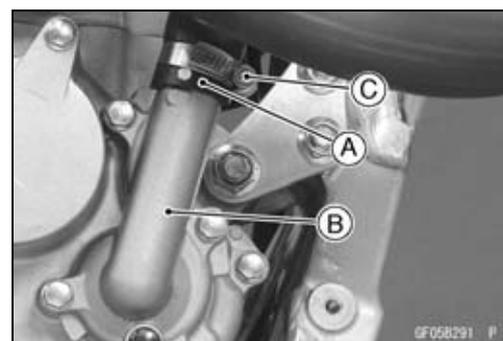
- When installing the cover doesn't go well, the cover is installed according to the following procedures.
- Fit the water pump shaft [A] and groove [B] of the balancer shaft while turning the water pump shaft.
- Tighten:



**Torque - Right Engine Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

- Insert the water hose [A] into the water pump cover [B], and tighten it with the clamp [C].

**Torque - Water Hose Clamp Screw: 1.5 N·m (0.15 kgf·m, 13 in·lb)**



- Install the brake Pedal (see Brake Pedal Installation in the Brakes chapter).
- Install the kick pedal (see Kick Pedal Installation in the Crankshaft/Transmission chapter).
- Pour in the specified type and amount of oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Pour in the specified type and amount of coolant (see Coolant Filling in the Cooling System chapter).
- Check the rear brake for good braking power and no brake drag.

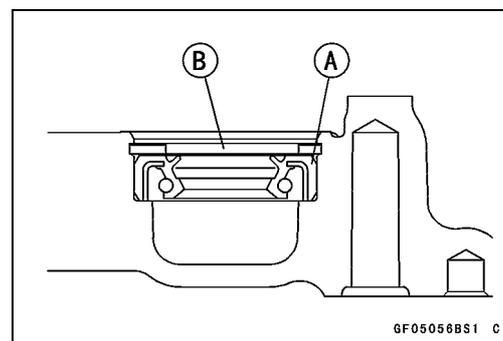
### Right Engine Cover Assembly

- Refer to Oil Seal and Bearing Installation in the Cooling System chapter for water pump oil seal and bearing installation.
- Replace the removed oil seal and circlip with a new one.
- Press the crankshaft oil [A] seal until it bottoms out as shown.

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

- Install the circlip [B]

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



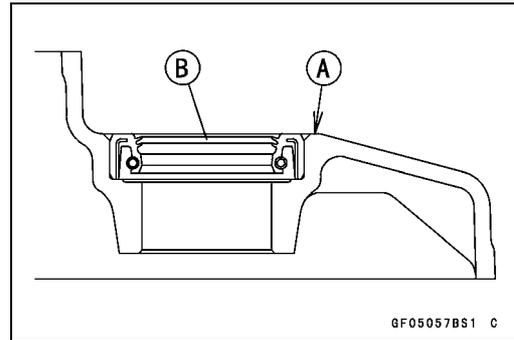
## 6-10 CLUTCH

### Clutch Cover and Right Engine Cover

- Press the kick shaft oil seal [B] so that the bearing surface flush with the right engine cover surface [A].

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

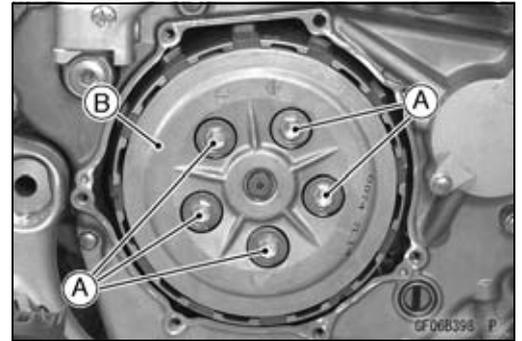
- Apply grease to the oil seal lip.



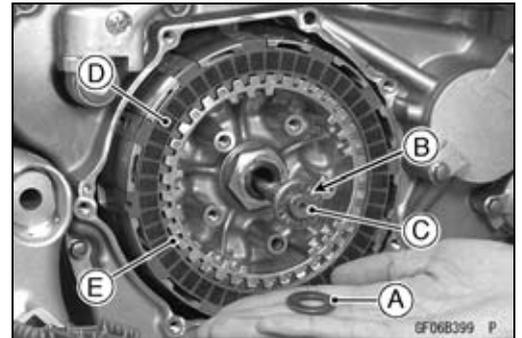
## Clutch

### Clutch Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove the clutch cover (see Clutch Cover Removal).
- Remove:
  - Clutch Spring Bolts [A]
  - Clutch Spring
  - Clutch Spring Plate [B]



- Remove:
  - Washer [A]
  - Needle Bearing [B]
  - Push Rod Holder [C]
  - Push Rod
  - Friction Plates [D]
  - Steel Plates [E]



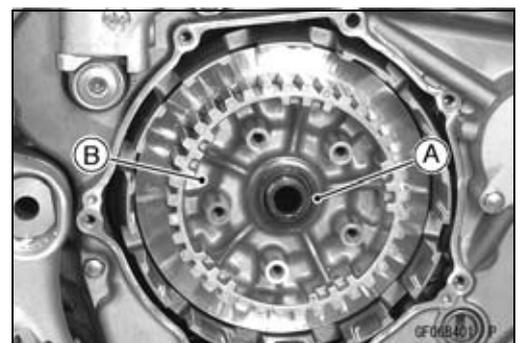
- Hold the clutch hub [A] with the clutch holder [B].

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

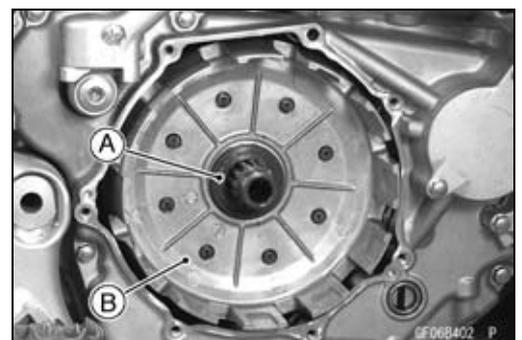
- Remove the clutch hub nut [C].



- Remove:
  - Washer [A]
  - Clutch Hub [B]



- Remove:
  - Toothed Washer [A]
  - Clutch Housing [B]

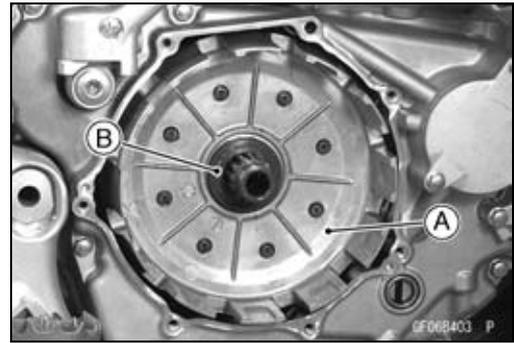


## 6-12 CLUTCH

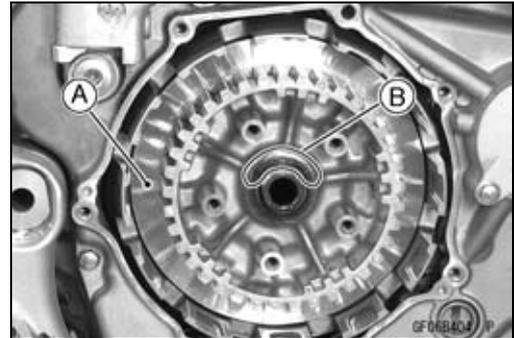
### Clutch

#### Clutch Installation

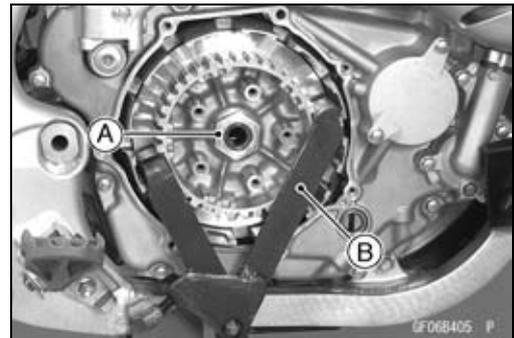
- Check the clutch plate assembly free play (see Clutch Plate Assembly Free Play Inspection/Adjustment).
- Apply molybdenum disulfide oil to the inside of the clutch housing.
- Install:
  - Clutch Housing [A]
  - Toothed Washer [B]



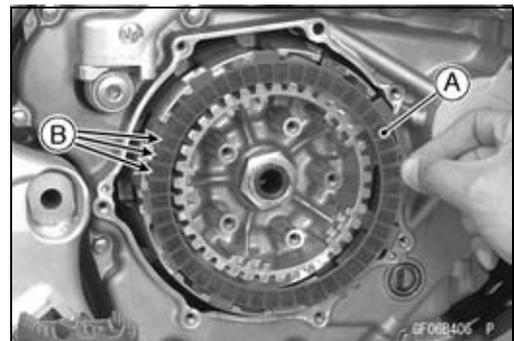
- Install the clutch hub [A].
- Install the washer so that stamp mark [B] facing the outside.



- Tighten the clutch hub nut [A] using the clutch holder [B].  
**Special Tool - Clutch Holder: 57001-1243**  
**Torque - Clutch Hub Nut: 98 N·m (10 kgf·m, 72 ft·lb)**



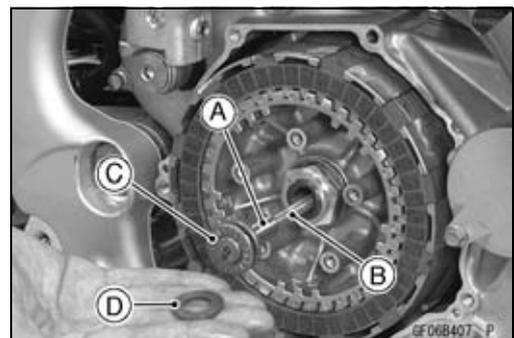
- Install the friction plates and steel plates, starting with a friction plate [A] and alternating them. Finishing with a friction plate.
- Install the friction plates which the lining blocks [B] on the plates installed to both end are more than the one of the other plates.



#### CAUTION

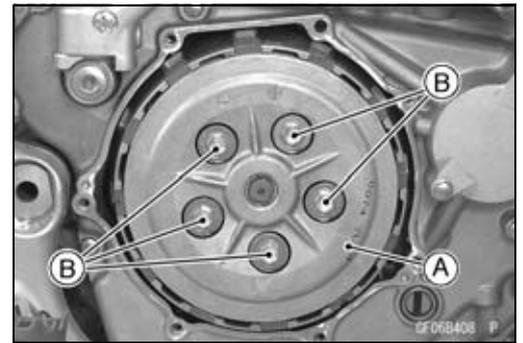
**If dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

- Apply molybdenum disulfide grease to the sliding portion [A] of the push rod holder.
- Install the push rod [B] and push rod holder.
- Apply molybdenum disulfide grease to the needle bearing [C] and washer [D], and install them.

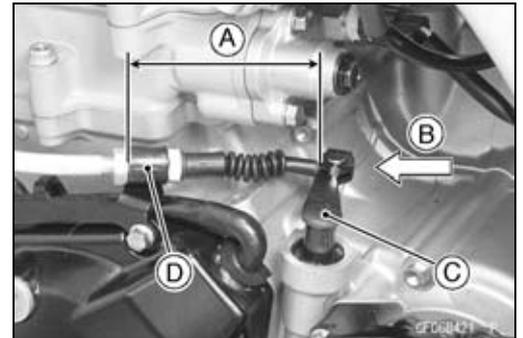


**Clutch**

- Install the clutch spring plate [A].
- Tighten:
  - Torque - Clutch Spring Bolts [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Install the clutch cover (see Clutch Cover Installation).



- Check the release shaft lever positions.
  - Pushing [B] the release shaft lever [C] lightly forward, measure the distance [A] between the lever and cable bracket [D].



**Release Shaft Lever Position**

**Standard: 68.6 ~ 76.4 mm (2.70 ~ 3.01 in.)**

- ★ If the lever position is not within the standard, select the correct thickness of adjusting washer(s) according to the tables shown.

**Adjusting Washers**

Thickness	Part Number
1.5 mm	92200-1548
1.0 mm	92200-0045

**Release Shaft Lever Position and Adjusting Washer Selection**

Position Distance	Judgment	Washers Thickness	Qty
68.6 mm to 76.4 mm	Standard	1.5 mm	1
More than 76.4 mm	Too big	1.0 mm	1
Less than 68.6 mm	Too small	1.0 mm	2

- ★ If the replacement of the adjusting washer is necessary, remove the clutch spring plate again and install the selected washer [A]



## 6-14 CLUTCH

### Clutch

#### **Clutch Plate Assembly Free Play Inspection/Adjustment**

- Assemble the following parts.

- Clutch Hub [A]
- Friction Plates [B]
- Steel Plates [C]
- Friction Plates [D]
- Spring Plates [E]
- Spring [F]
- Bolts [G]

- The friction plates [B] have many lining blocks than other plates [D]. These plates are installed to both end of the all plates.

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

- Measure the clutch plate assembly [H].

#### **Clutch Plate Length**

**Standard: 34.9 ~ 35.5 mm (1.37 ~ 1.40 in.)**

- ★ If clutch plate length is not within the standard, select the correct length of steel plates according to the table shown.

Thickness	Part Number
1.2 mm (0.047 in.)	13089-1010
1.6 mm (0.063 in.) (STD)	13089-1095
2.0 mm (0.079 in.)	13089-1005

- Do not use the steel plate of 1.2 mm (0.047 in.) and 2.0 mm (0.079 in.) thickness at the same time.

#### **Friction and Steel Plates Wear, Damage Inspection**

- Refer to the Friction and Steel Plates Inspection in the Periodic Maintenance chapter.

#### **Friction and Steel Plate Warp Inspection**

- Refer to the Friction and Steel Plate Inspection in the Periodic Maintenance chapter.

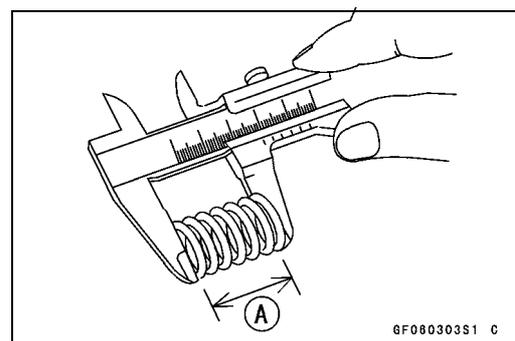
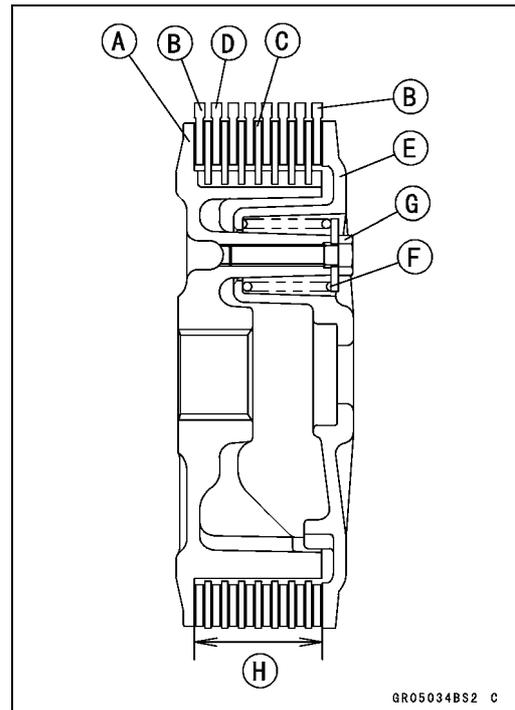
#### **Clutch Spring Free Length Inspection**

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

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

**Standard: 49.2 mm (1.94 in.)**

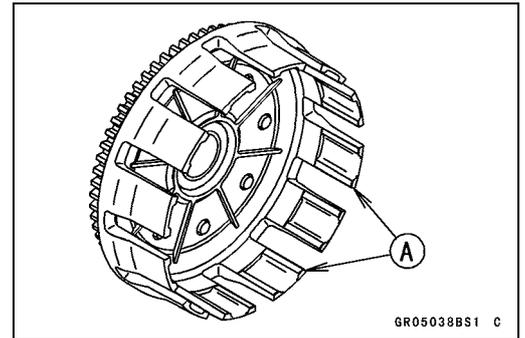
**Service Limit: 46.7 mm (1.84 in.)**



## Clutch

### Clutch Housing Finger Damage Inspection

- Visually inspect the clutch housing fingers [A] that come in contact with the friction plate tangs.
- ★ If they are damaged or if there are groove cuts in the areas that come in contact with the tangs, replace the housing. Replace the friction plates if their tangs are damaged as well.

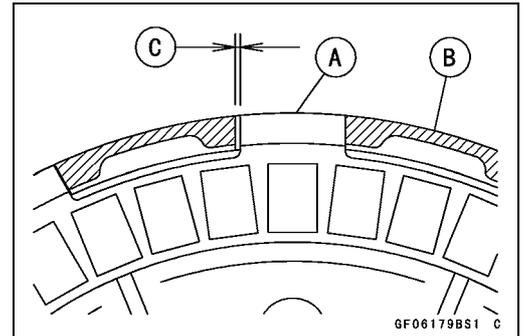


### Friction Plate/Clutch Housing Clearance Inspection

- Measure the clearance [C] between the tangs [A] on the friction plate and the fingers [B] of the clutch housing.
- ★ If this clearance is excessive, the clutch will be noisy.
- ★ If the clearance exceeds the service limit, replace the friction plates.

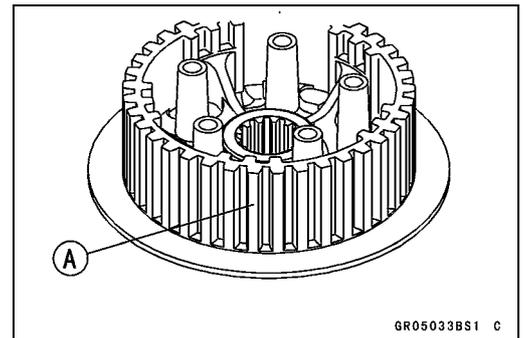
#### Friction Plate/Clutch Housing Clearance

- Standard:** 0.20 ~ 0.60 mm (0.0079 ~ 0.024 in.)
- Service Limit:** 0.8 mm (0.03 in.)



### Clutch Hub Spline Damage Inspection

- Visually inspect the areas of the clutch hub splines that come in contact with the teeth of the steel plates.
- ★ If there are notches worn into the clutch hub splines [A], replace the clutch hub. Replace the steel plates if their teeth are damaged as well.

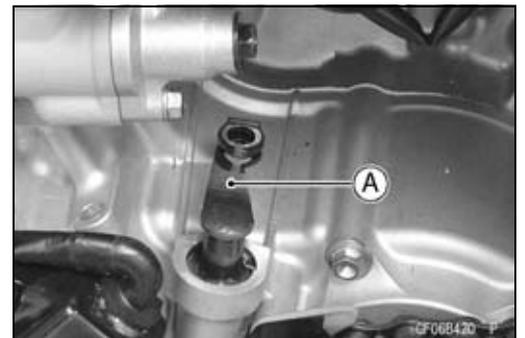


### Release Shaft Removal

#### CAUTION

**Do not remove the clutch release shaft unless it is absolutely necessary. If removed, release shaft oil seal must be replaced with a new one.**

- Remove the clutch (see Clutch Removal).
- Remove the tips of the clutch cable (see Clutch Cable Removal).
- Pull the release shaft lever [A] out of the crankcase.



## 6-16 CLUTCH

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### Clutch

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#### ***Release Shaft Installation***

- Replace the oil seal with a new one.
- Apply grease to the oil seal lip.
- Apply engine oil to the bearing in the hole of the crankcase.
- Apply grease to the part where the push rod comes in contact.
- Insert the release shaft straight into the hole of the crankcase.

<b>CAUTION</b>
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<b>When inserting the release shaft, be careful not to remove the spring of the oil seal.</b>
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- Install the clutch cable (see Clutch Cable Installation).

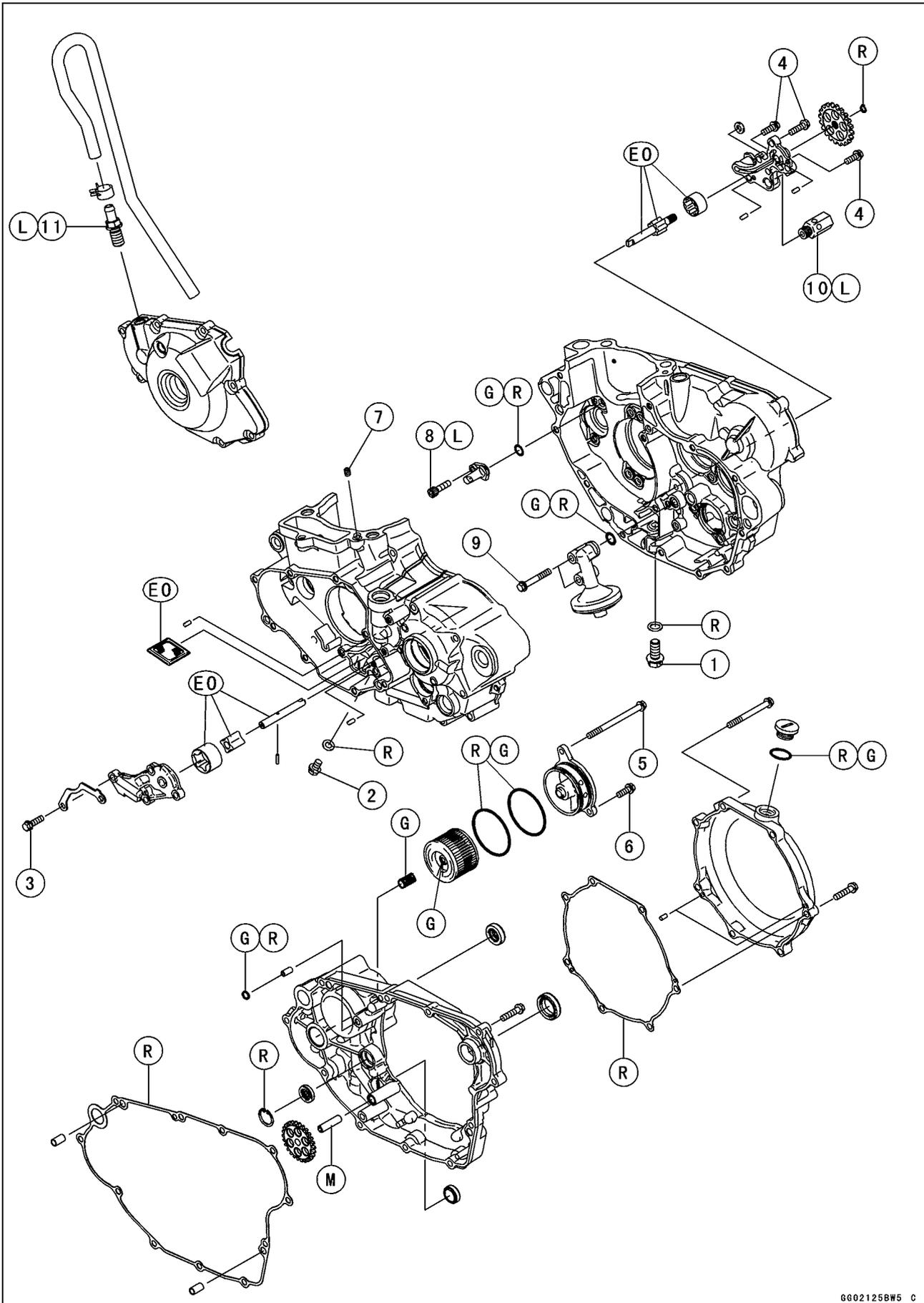
# Engine Lubrication System

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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	Engine Oil Drain Bolt (M10)	20	2.0	15	
2	Engine Oil Drain Bolt (M6)	7.0	0.71	62 in-lb	
3	Oil Pump (Scavenge) Cover Bolts	9.8	1.0	87 in-lb	
4	Oil Pump (Feed) Cover Bolts	9.8	1.0	87 in-lb	
5	Oil Filter Cover (Right Engine Cover) Bolt	9.8	1.0	87 in-lb	
6	Oil Filter Cover Bolt	9.8	1.0	87 in-lb	
7	Piston Oil Nozzle	3.0	0.31	26 in-lb	
8	Piston Oil Nozzle Bolt	7.0	0.71	62 in-lb	L
9	Oil Screen (Feed) Mounting Bolts	9.8	1.0	87 in-lb	
10	Oil Pressure Relief Valve	15	1.5	11	L
11	Breather Fitting	15	1.5	11	L

EO: Apply engine oil.

G: Apply grease.

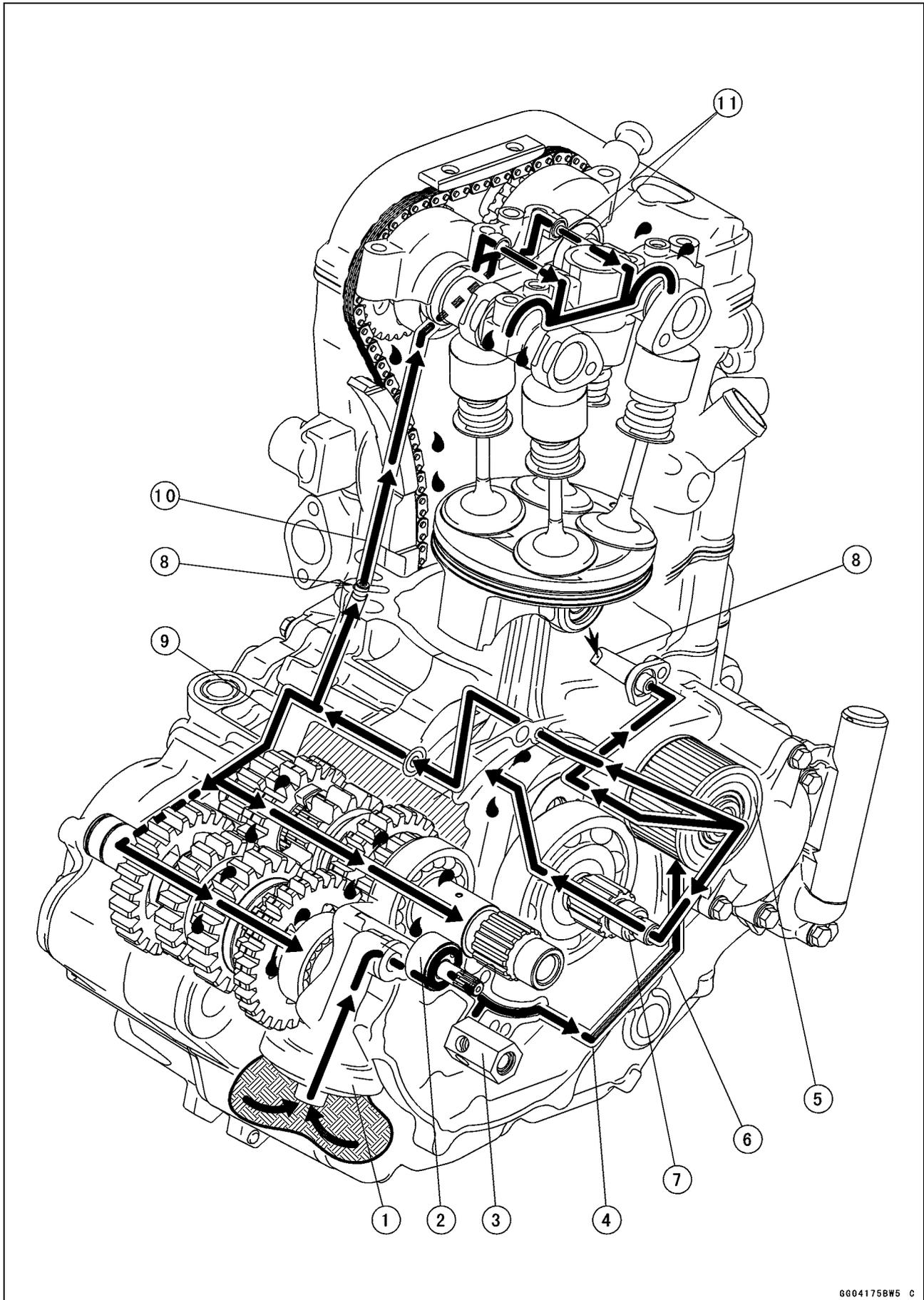
L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

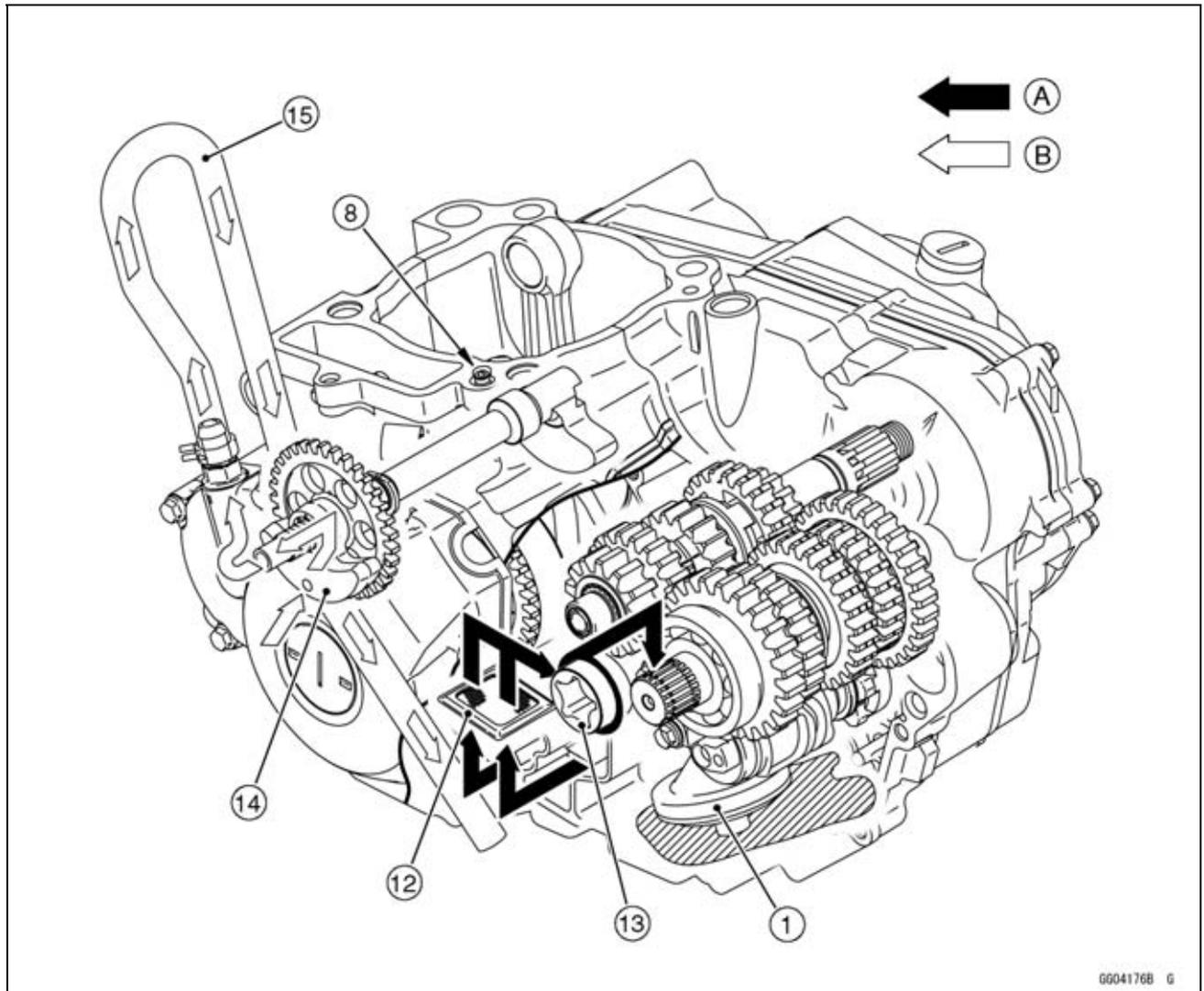
R: Replacement Parts

# 7-4 ENGINE LUBRICATION SYSTEM

## Lubrication System Chart



## Lubrication System Chart



1. Oil Screen (feed)
  2. Oil Pump (feed)
  3. Oil Pressure Relief Valve
  4. Right Engine Cover Oil Passage (from Feed Oil Pump to Oil filter)
  5. Oil Filter
  6. Right Engine Cover Oil Passage (from Oil filter to Crankshaft)
  7. Crankshaft
  8. Piston Oil Nozzles
  9. Left Crankcase Oil Passage (from Oil filter to Transmission Oil Passage)
  10. Cylinder Oil Passage (from Crankcase Oil Passage to Cylinder Head Oil Passage)
  11. Oil Pipes
  12. Oil Screen (scavenge)
  13. Oil Pump (scavenge)
  14. Balancer Weight
  15. Breather Hose
- A: Engine Oil  
B: Blowby Gas

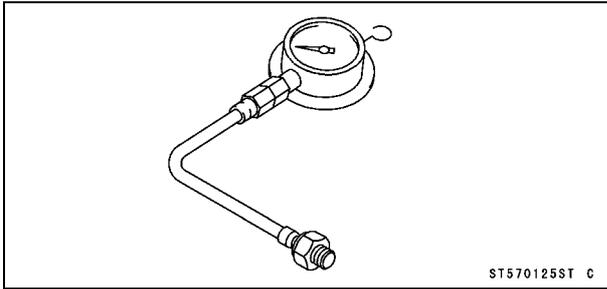
## 7-6 ENGINE LUBRICATION SYSTEM

### Specifications

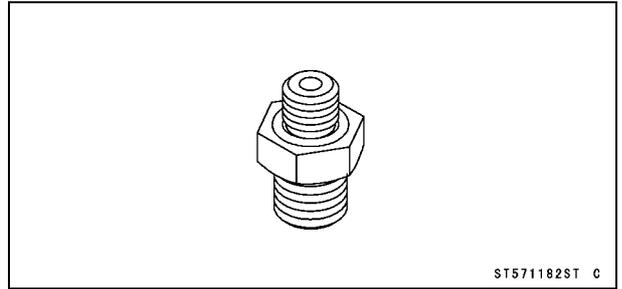
Item	Standard
<b>Engine Oil</b> Grade Viscosity Capacity Oil Change - when filter is not removed Oil Change - when filter is removed when engine is completely dry Oil Level (after warm-up or driving)	Castrol "POWER1 R4 Racing" 5W-40 or API SG API SH, SJ or SL with JASO MA, MA1 or MA2 SAE 10W-30, 10W-40, or 10W-50  0.96 L (1.01 US qt) 0.98 L (1.03 US qt) 1.2 L (1.3 US qt) Upper level
<b>Oil Pressure Measurement</b> (oil temperature 40°C, engine speed 4 000 rpm)	20 ~ 70 kPa (0.20 ~ 0.71 kgf/cm <sup>2</sup> , 2.9 ~ 10 psi)

## Special Tools

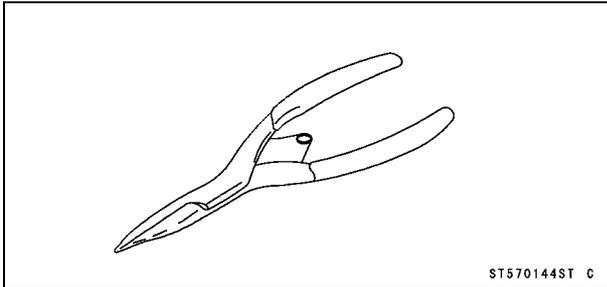
**Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>:**  
**57001-125**



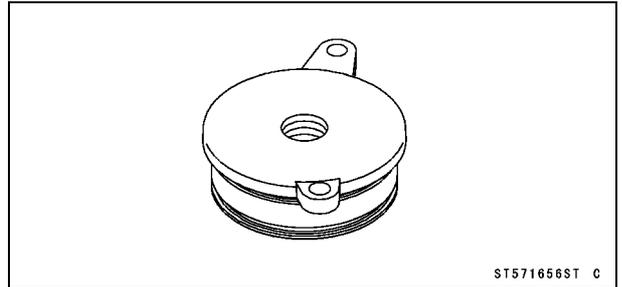
**Oil Pressure Gauge Adapter, M10 × 1.25:**  
**57001-1182**



**Outside Circlip Pliers:**  
**57001-144**



**Oil Pressure Cap:**  
**57001-1656**



## 7-8 ENGINE LUBRICATION SYSTEM

### Engine Oil and Oil Filter

#### **⚠ WARNING**

**Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.**

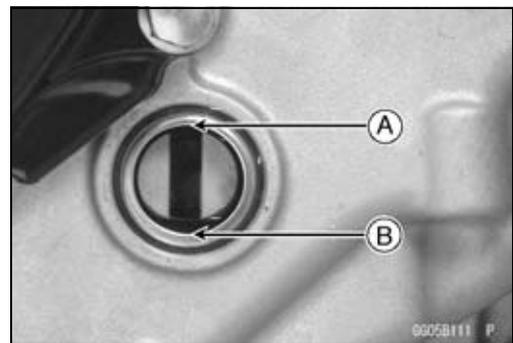
The engine oil level indicated in the right engine cover oil level gauge is very sensitive to the motorcycle's position and engine rpm at time of shut down. Because of the semi-dry sump lubrication system with separate oil chambers in the crank room and transmission room, under certain conditions oil can accumulate in the crank room and give a false low reading at the oil level gauge, which indicates oil volume in the transmission room.

#### **Engine Oil Level Inspection**

- Situate the motorcycle so that it is vertical.
- Check that the engine oil level is between the upper [A] and lower levels [B] in the gauge.

#### **NOTE**

- Situate the motorcycle so that it is perpendicular to the ground.
- If no oil appears in the gauge, tip the motorcycle slightly to the right until oil is visible then return to an upright position. If no oil appears even when tipped at an extreme angle, remove both drain bolts to empty any oil that may be in the transmission and crankcase, reinstall the drain bolts and refill with the specified amount of oil.
- 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.
- **Do not run the engine at high engine speed.** Stop the engine, then wait several minutes until the oil settles.



#### **CAUTION**

**Racing the engine before the oil reaches every part can cause engine seizure.**

- ★ If the oil level is too high, remove the excess oil through the filler opening, using a syringe or some other suitable device.
- ★ If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.

#### **NOTE**

- If the engine oil type and make are unknown, use any brand of the specified oil to top off the level rather than 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.

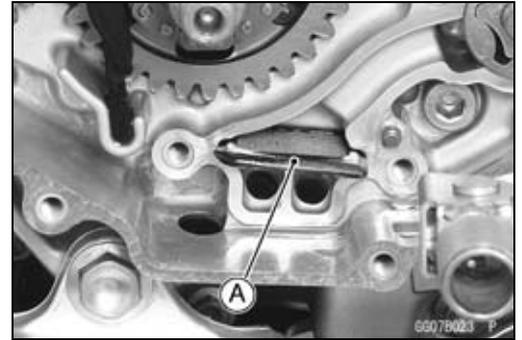
## Engine Oil and Oil Filter

### **Oil Filter Change**

- Refer to the Oil Filter Change in the Periodic Maintenance chapter.

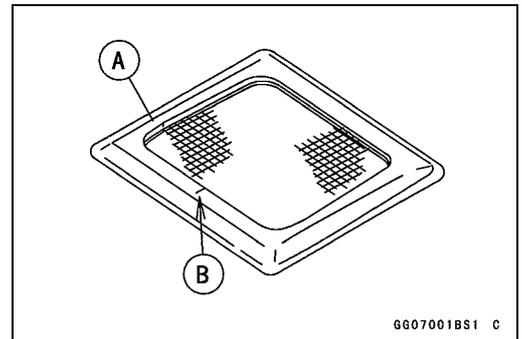
### **Oil Screen (Scavenge) Removal**

- Remove the oil pump (scavenge) cover (see Oil Pump (Scavenge) Cover Removal).
- Pull out the oil screen [A] from the crankcase.



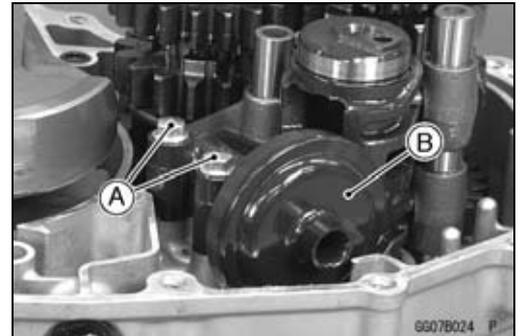
### **Oil Screen (Scavenge) Installation**

- Clean the oil screens thoroughly whenever it is removed for any reason (see Oil Screen (Scavenge) Cleaning).
- Apply engine oil to the rubber portion [A] on the oil screen.
- Install the oil screen facing the carved line [B] to the outside.
- Install the oil pump (scavenge) cover.



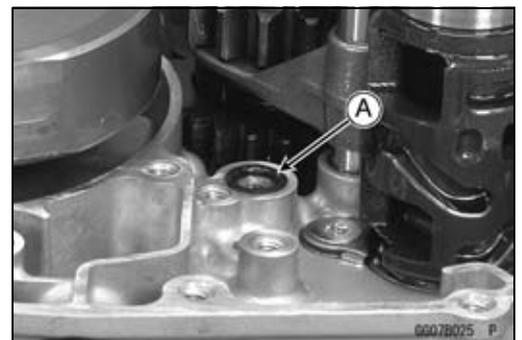
### **Oil Screen (Feed) Removal**

- Split the crankcase (see Crankcase Disassembly in the Crankshaft/Transmission chapter).
- Remove:
  - Bolts [A]
  - Oil Screen [B]



### **Oil Screen (Feed) Installation**

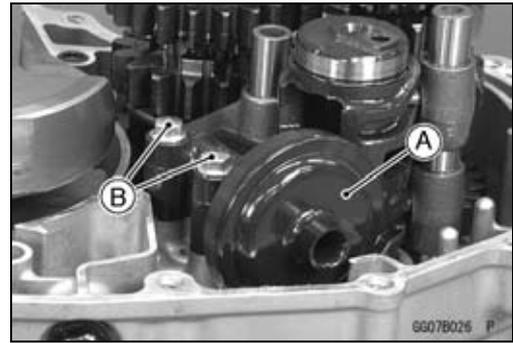
- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring, and install it.



## 7-10 ENGINE LUBRICATION SYSTEM

### Engine Oil and Oil Filter

- Install the oil screen [A], and tighten the bolts [B].  
Torque - Oil Screen (Feed) Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



#### **Oil Screen (Scavenge) Cleaning**

- Remove the oil screen (see Oil Screen (Scavenge) Removal).
- Clean the oil screen with a high-flash point solvent and remove any particles stuck to them.

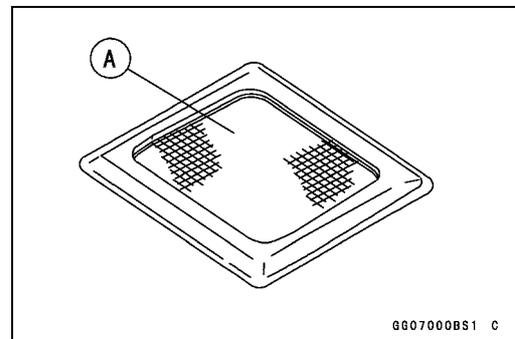
#### **⚠ WARNING**

Clean the screen in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.

#### **NOTE**

○ While cleaning the screen, check for any metal particles that might indicate internal engine damage.

- Check the screen [A] carefully for any damage.
- ★ If the screen is damaged, replace it.
- Install the oil screen (see Oil Screen (Scavenge) Installation).



## Engine Oil and Oil Filter

### Oil Screen (Feed) Cleaning

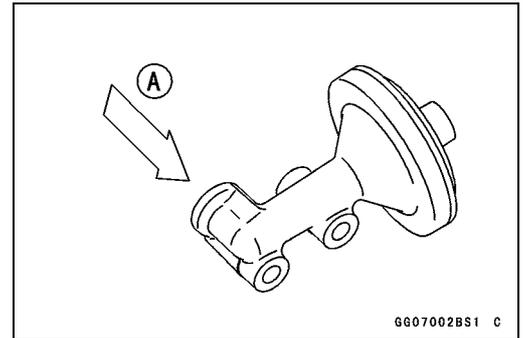
- Remove the oil screen (see Oil Screen (Feed) Removal)
- Clean the oil screen with a high-flash point solvent and remove the particles stuck.
- Blow away the particles by applying compressed air [A] from the inside to the outside (from the clean side to the dirty side).

### **⚠ WARNING**

**Clean the screen in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents.**

### **NOTE**

- *While cleaning the screen, check for any metal particles that might indicate internal engine damage.*
- Check the screens carefully for any damage.
- ★ If the screen is damaged, replace the oil screen.

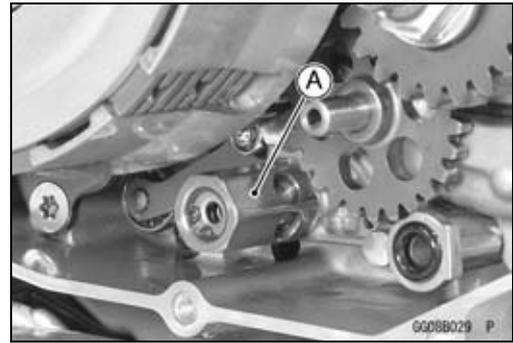


## 7-12 ENGINE LUBRICATION SYSTEM

### Oil Pressure Relief Valve

#### Oil Pressure Relief Valve Removal

- Remove:
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
- Remove the oil pressure relief valve [A].



#### Oil Pressure Relief Valve Installation

- Apply a non-permanent locking agent to the threads of oil pressure relief valve, and tighten it.
- Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)**

#### Oil Pressure Relief Valve Inspection

- Remove the relief valve (see Oil Pressure Relief Valve Removal).
- Using a wooden stick, push the inner valve to make sure that the valve [A] moves smoothly and that it returns to its original position by the force of the spring [B].

#### NOTE

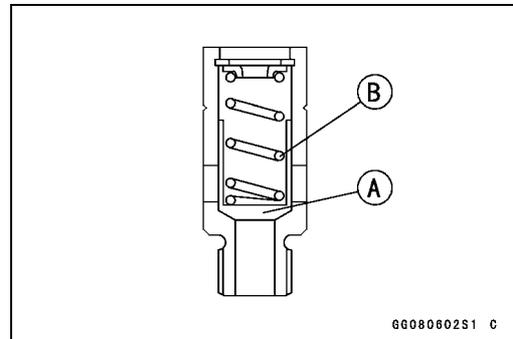
- The relief valve cannot be disassembled and it must be inspected in the assembled state.

- ★ If the valve movement is not smooth, wash the relief valve with high-flash point solvent, and use compressed air to remove any foreign particles from it.

#### **⚠ WARNING**

**Clean the oil pressure relief valve in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents.**

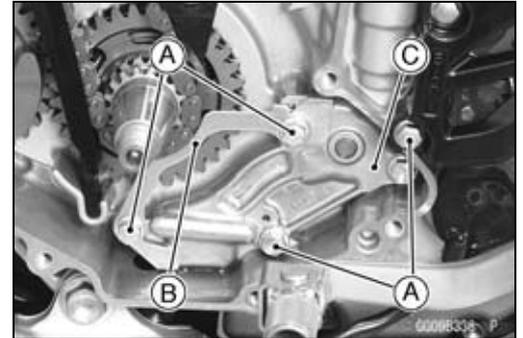
- ★ If the valve does not move smoothly even after washing it, replace the relief valve. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.



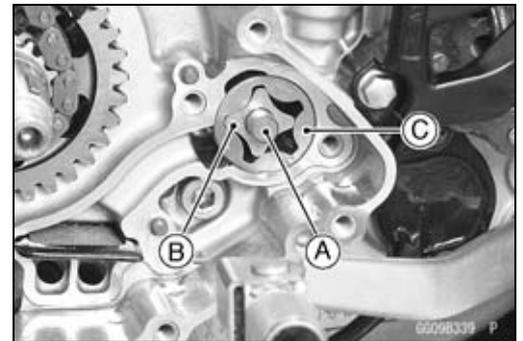
## Oil Pump

### Oil Pump (Scavenge) Removal

- Drain:  
Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:  
Flywheel (see Flywheel Removal in the Electrical System chapter)
- Remove:  
Oil Pump Cover Bolts [A]  
Lower Camshaft Chain Guide [B]  
Oil Pump Cover [C]

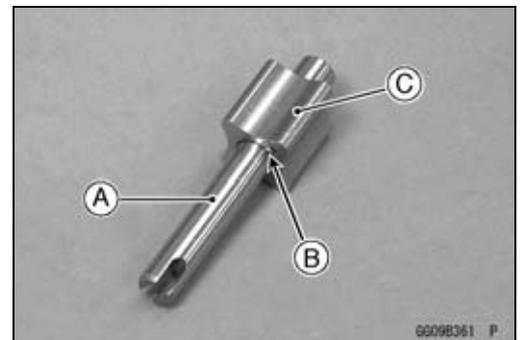


- Pull out the oil pump shaft [A] to remove the inner rotor [B].
- Remove:  
Outer Rotor [C]

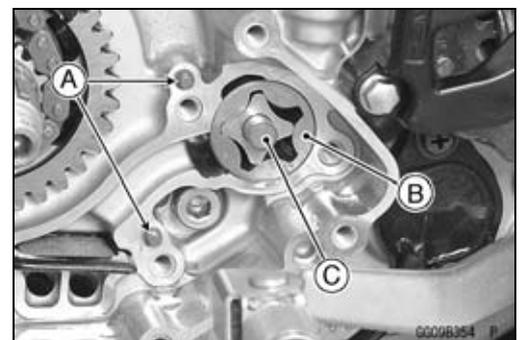


### Oil Pump (Scavenge) Installation

- Install the oil screen (see Oil Screen (Scavenge) Installation).
- Assemble the following parts as shown.  
Oil Pump Shaft [A]  
Pin [B]  
Inner Rotor [C]
- Fit the pin into the groove on the inner rotor.



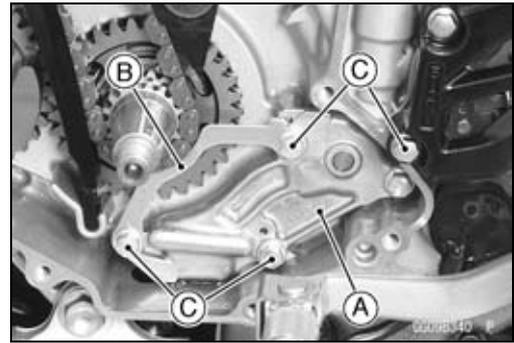
- Install the dowel pins [A] to the crankcase.
- Apply engine oil to the each oil pump rotor and sliding surface of the oil pump shaft.
- Install:  
Outer Rotor [B]  
Inner Rotor Assy [C]
- While turn the oil pump shaft, install the oil pump so that the left and right oil pump shaft may mesh in the crankcase.



## 7-14 ENGINE LUBRICATION SYSTEM

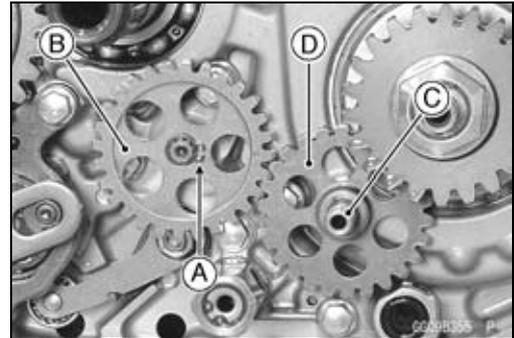
### Oil Pump

- Install:
  - Oil Pump Cover [A]
  - Lower Camshaft Chain Guide [B]
- While pushing the oil pump cover, tighten the oil pump cover bolts [C].  
**Torque - Oil Pump (Scavenge) Cover Bolts: 9.8 N-m (1.0 kgf-m, 87 in-lb)**

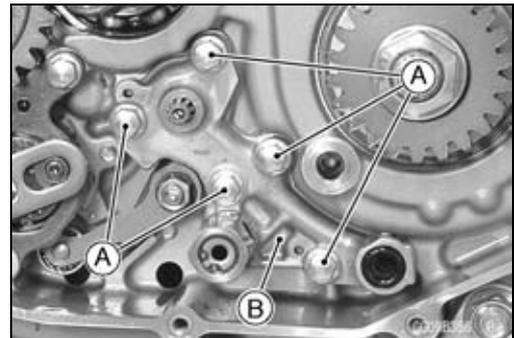


### Oil Pump (Feed) Removal

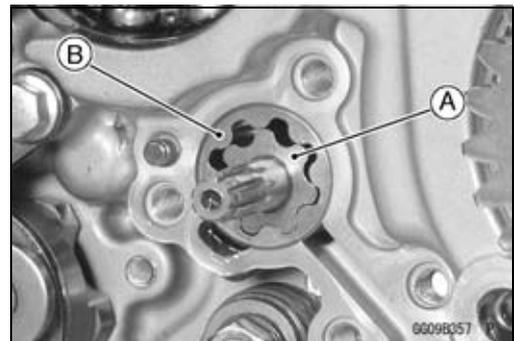
- Remove:
  - Clutch (Clutch Removal in the Clutch chapter)
  - Circlip [A]
  - Oil Pump Driven Gear [B]
  - Shaft [C]
  - Oil Pump Idle Gear [D]
- **Special Tool - Outside Circlip Pliers: 57001-144**



- Remove:
  - Oil Pump Cover Bolts [A]
  - Oil Pump Cover [B]

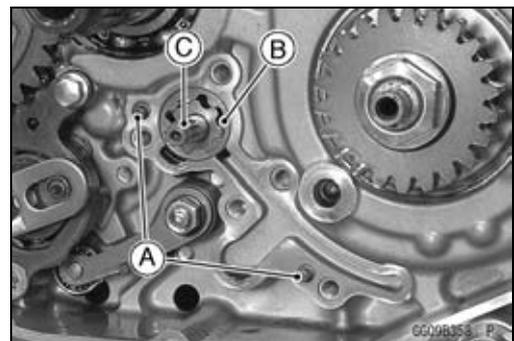


- Remove:
  - Inner Rotor [A]
  - Outer Rotor [B]



### Oil Pump (Feed) Installation

- Install the dowel pins [A] to the crankcase.
- Apply engine oil to the each oil pump rotor and sliding surface of the oil pump shaft.
- Install:
  - Outer Rotor [B]
  - Inner Rotor [C]
- While turn the oil pump shaft, install the oil pump so that the left and right oil pump shaft may mesh in the crankcase.



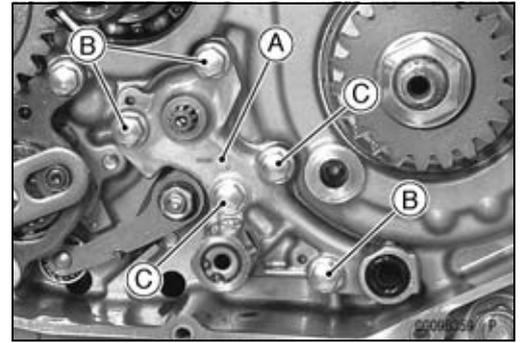
## Oil Pump

- While pushing the oil pump cover [A], tighten the oil pump cover bolts.

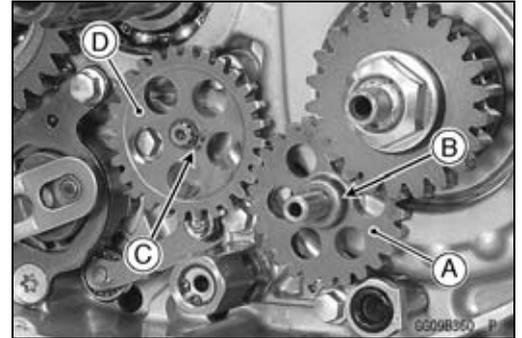
[B] L = 20mm

[C] L = 16mm

**Torque - Oil Pump (Feed) Cover Bolts: 9.8 N-m (1.0 kgf-m, 87 in-lb)**



- Install the oil pump idle gear [A] facing the stepped side [B] to the outside.
- Replace the circlip [C] with a new one.
- Install the oil pump driven gear [D] and circlip.



### ***Oil Pump Inspection***

- Remove the each oil pump.
- Visually inspect the oil pump body, outer rotors and the inner rotors.
- ★ If the oil pump is any damaged or unevenly worn, replace the rotors, cover, or body.

## 7-16 ENGINE LUBRICATION SYSTEM

### Oil Pressure

#### Oil Pressure Measurement

- Remove:
  - Oil Filter Cover Bolts [A]
  - Oil Filter Cover [B]
- Install the O-rings to the oil pressure cap.  
**Special Tool - Oil Pressure Cap: 57001-1656**
- Install the oil pressure cap.
  
- Attach the oil pressure gauge adapter [A] and oil pressure gauge [B].  
**Special Tools - Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>: 57001-125**  
**Oil Pressure Gauge Adapter, M10 × 1.25: 57001-1182**

#### **⚠ WARNING**

**Take care against burns from hot engine oil that will drain through the oil passage when the oil pressure gauge adapter is removed.**

- Start the engine and warm up the engine thoroughly.
- 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 feed oil pump.
- ★ If the reading is much higher than the standard, check the oil filter first, and oil passages for dirt or clogging.

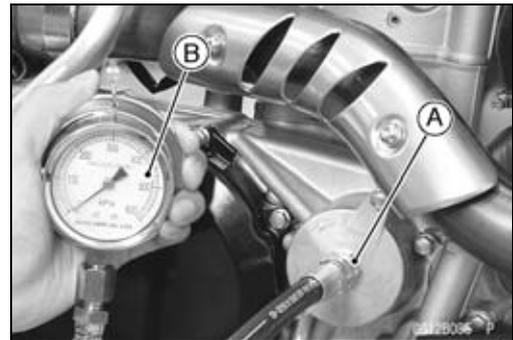
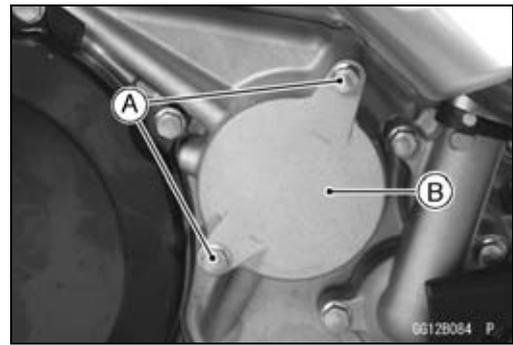
**Oil Pump Pressure (oil temperature 40°C, @4 000 rpm)**  
**Standard: 20~ 70 kPa (0.20 ~ 0.71 kgf/cm<sup>2</sup>, 2.9 ~ 10 psi)**

#### **NOTE**

○ Warm up the engine thoroughly before measuring the oil pressure.

- Stop the engine and remove the oil pressure cap, oil pressure gauge adapter and gauge.
- Install the oil filter cover.

**Torque - Oil Filter Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



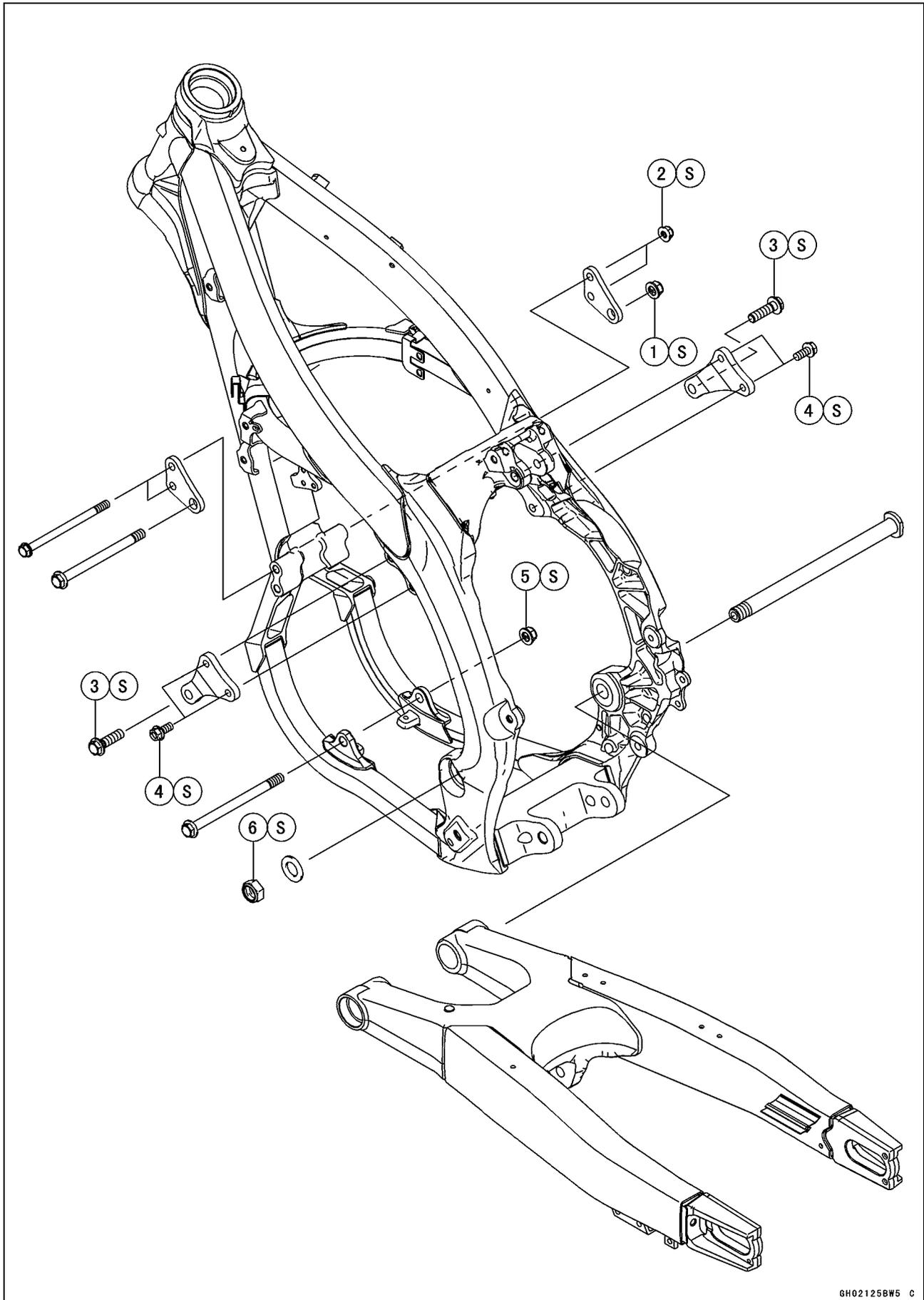
# Engine Removal/Installation

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Engine Removal/Installation .....	8-5
Engine Removal.....	8-5
Engine Installation.....	8-7

# 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	Middle Engine Mounting Nut	49	5.0	36	S
2	Middle Engine Bracket Nuts	29	3.0	21	S
3	Upper Engine Mounting Bolts	49	5.0	36	S
4	Upper Engine Bracket Bolts	29	3.0	21	S
5	Lower Engine Mounting Nut	49	5.0	36	S
6	Swingarm Pivot Shaft Nut	98	10	72	S

S: Follow the specified tightening sequence.

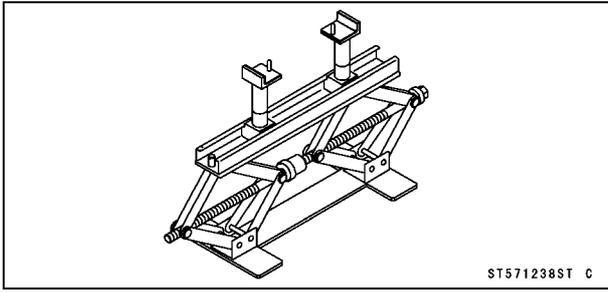
## 8-4 ENGINE REMOVAL/INSTALLATION

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### Special Tool

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Jack:  
57001-1238



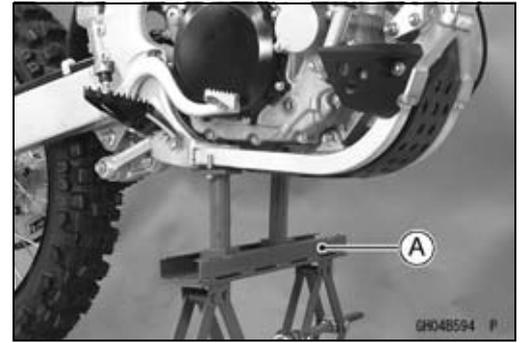
## Engine Removal/Installation

### Engine Removal

- Raise the rear wheel off the ground with the jack [A].  
Special Tool - Jack: 57001-1238

#### **⚠ WARNING**

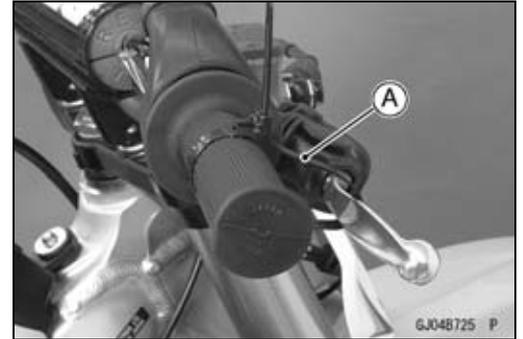
For engine removal, the swingarm pivot shaft must be pulled out, causing the swingarm and rear wheel assembly to become detached. To prevent the motorcycle from falling, make sure to support the frame with a jack.



- Squeeze the brake lever slowly and hold it with a band [A].

#### **⚠ WARNING**

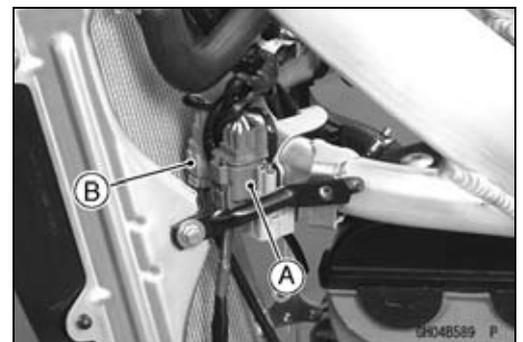
Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.



#### **CAUTION**

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.

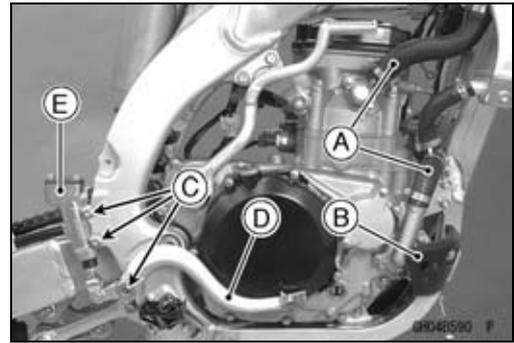
- Drain:
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (see Coolant Draining in the Cooling System chapter)
- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (FDI) chapter)
  - Ignition Coil (see Ignition Coil Removal in the Electrical System chapter)
  - Clutch Cable Lower End (see Clutch Cable Removal in the Clutch chapter)
- Disconnect:
  - Magnet Lead Connector [A]
  - Gear Position Switch Connector [B]



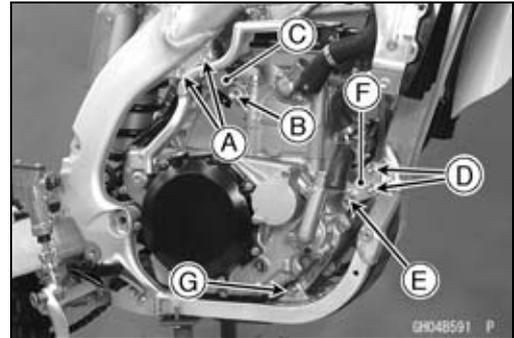
## 8-6 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

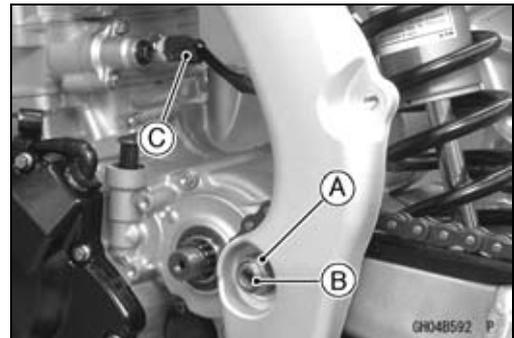
- Remove:
  - Water Hoses [A]
  - Right Engine Guard [B]
- Remove the bolts [C], and remove the brake pedal [D] and rear master cylinder [E] as a set.



- Remove:
  - Upper Engine Bracket Bolts (Left and Right) [A]
  - Upper Engine Mounting Bolts and Nuts (Left and Right) [B]
  - Upper Engine Brackets (Left and Right) [C]
  - Middle Engine Bracket Bolts and Nuts [D]
  - Middle Engine Mounting Bolt and Nut [E]
  - Middle Engine Brackets (Left and Right) [F]
  - Lower Engine Mounting Bolt and Nut [G]



- Remove the swingarm pivot shaft nut [A] to pull out the swingarm pivot shaft [B].
- Pull out the swingarm pivot shaft half way from right side to free the engine.
- Disconnect the water temperature sensor connector [C].



- Remove the engine from the vehicle to right side.
- Clear the engine rear portion from the swingarm and then remove the engine.



### Engine Removal/Installation

---

#### **Engine Installation**

- Install the engine.
- First, insert the front portion of the engine, and then install the rear portion.
- Install the swingarm pivot shaft, all engine bracket and mounting bolts temporarily.
- Insert the swingarm pivot shaft from the right side.
- Insert the middle and lower engine mounting bolts from the left side.
- Tighten the engine bracket bolts, nut and engine mounting bolts, nuts following sequence.
- First, tighten the swingarm pivot shaft nut.
- Secondly, tighten the lower engine mounting bolt and nut.
- Thirdly, tighten the middle engine mounting bolt and nut.
- Fourthly, tighten the middle engine bracket bolts and nuts.
- Fifthly, tighten the upper engine mounting bolts and nuts.
- Lastly, tighten the upper engine mounting bolts.

**Torque - Swingarm Pivot Shaft Nut: 98 N·m (10 kgf·m, 72 ft·lb)**

**Engine Mounting Bolts: 49 N·m (5.0 kgf·m, 36 ft·lb)**

**Engine Bracket Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)**

- Install the removed parts (see appropriate chapters).
- Run the cables, hoses, and leads according to the Cable, Wire and Hose Routing section in the Appendix chapter.
- Fill:
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (see Coolant Filling in the Cooling System chapter)
- Adjust:
  - Throttle Cable (see Throttle Grip Free Play Adjustment in the Periodic Maintenance chapter)
  - Clutch Cable (see Clutch Lever Free Play Adjustment in the Periodic Maintenance chapter)
  - Drive Chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter)
- Check the operation of the clutch lever.
- Check the brake effectiveness.

#### **⚠ WARNING**

**Do no attempt to drive the motorcycle until you pump the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**



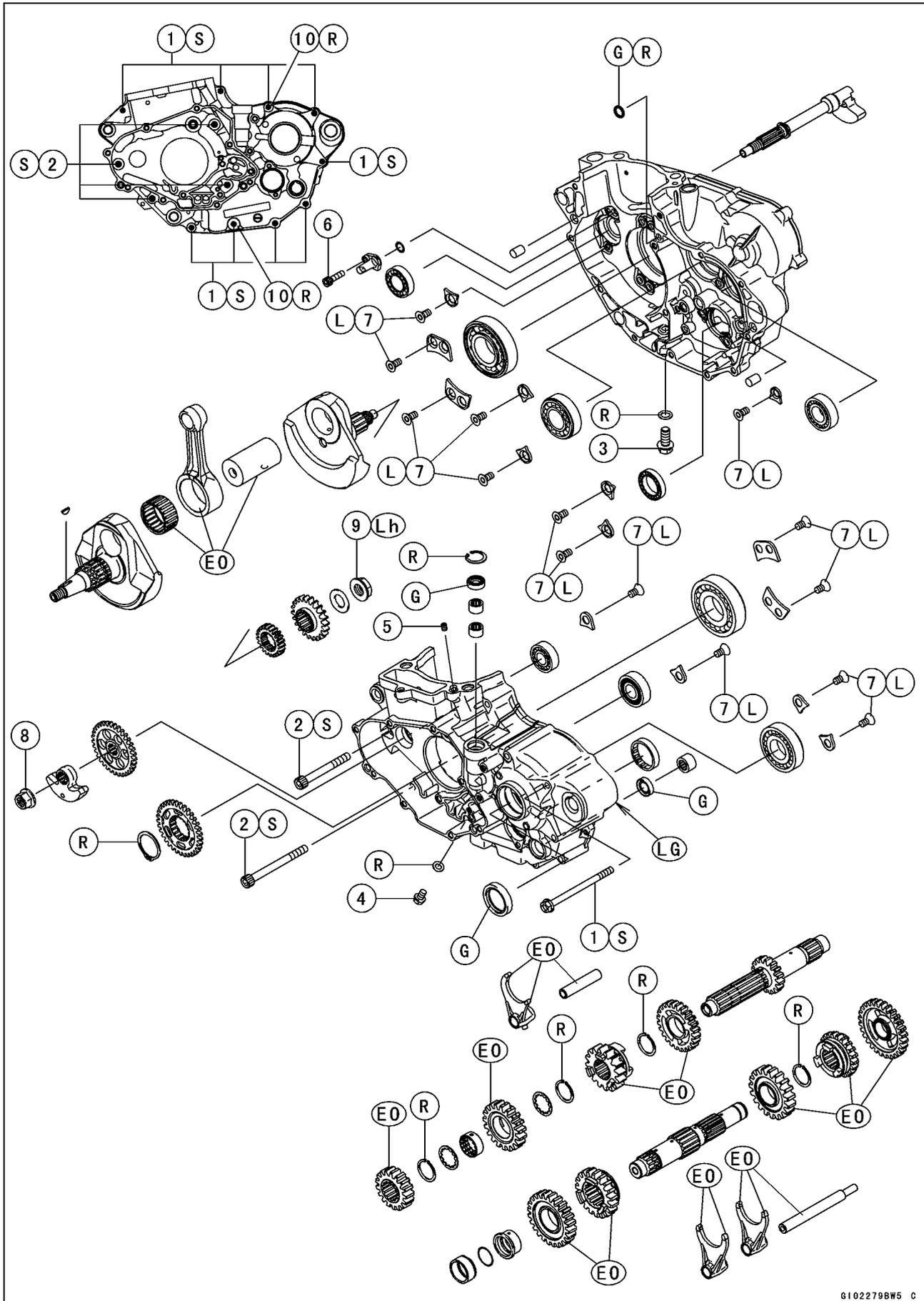
# Crankshaft/Transmission

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# 9-2 CRANKSHAFT/TRANSMISSION

## Exploded View



## CRANKSHAFT/TRANSMISSION 9-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Crankcase Bolts (M6)	12	1.2	106 in·lb	S
2	Crankcase Bolts (M7)	15	1.5	11	S
3	Engine Oil Drain Bolt (M10)	20	2.0	15	
4	Engine Oil Drain Bolt (M6)	7.0	0.71	62 in·lb	
5	Piston Oil Nozzle	3.0	0.30	26 in·lb	
6	Piston Oil Nozzle Bolt	7.0	0.71	62 in·lb	
7	Bearing Retaining Screws	15	1.5	11	L
8	Balancer Weight Mounting Nut	52	5.3	38	
9	Primary Gear Nut	98	10	72	Lh

10. Washers

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

Lh: Left-hand Threads

LG: Apply liquid gasket.

R: Replacement parts

S: Tighten the fasteners following the specified sequence.



## CRANKSHAFT/TRANSMISSION 9-5

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Ratchet Guide Bolt	8.8	0.90	78 in·lb	
2	Kick Pedal Bolt	25	2.5	18	L
3	Shift Pedal Bolt	9.8	1.0	87 in·lb	
4	Upper Ratchet Plate Mounting Bolt	9.8	1.0	87 in·lb	S
5	Lower Ratchet Plate Mounting Bolt	15	1.5	11	L, S
6	Gear Positioning Lever Nut	8.8	0.90	78 in·lb	
7	Shift Drum Cam Bolt	24	2.4	18	L

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil.

R: Replacement Parts

S: Follow the specific tightening sequence.

St: Stake the fasteners.

## 9-6 CRANKSHAFT/TRANSMISSION

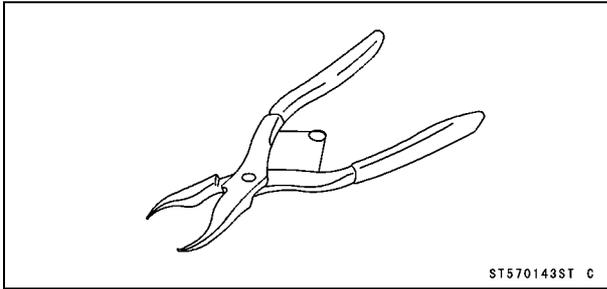
### Specifications

Item	Standard	Service Limit
<b>Crankshaft</b>		
Connecting Rod Big End Radial Clearance	0.002 ~ 0.014 mm (0.00008 ~ 0.00055 in.)	0.06 mm (0.002 in.)
Connecting Rod Big End Side Clearance	0.25 ~ 0.35 mm (0.0098 ~ 0.014 in.)	0.6 mm (0.02 in.)
Crankshaft Runout	TIR 0.03 mm (0.0012 in.) or less	TIR 0.08 mm (0.003 in.)
Connecting Rod Bend	— — —	TIR 0.2 mm (0.008 in.)/100 mm (3.94 in.)
Connecting Rod Twist	— — —	TIR 0.2 mm (0.008 in.)/100 mm (3.94 in.)
<b>Transmission</b>		
Shift Fork Ear Thickness	4.9 ~ 5.0 mm (0.193 ~ 0.197 in.)	4.8 mm (0.19 in.)
Gear Shift Fork Groove Width	5.05 ~ 5.15 mm (0.199 ~ 0.203 in.)	5.2 mm (0.20 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 (0.25 in.)

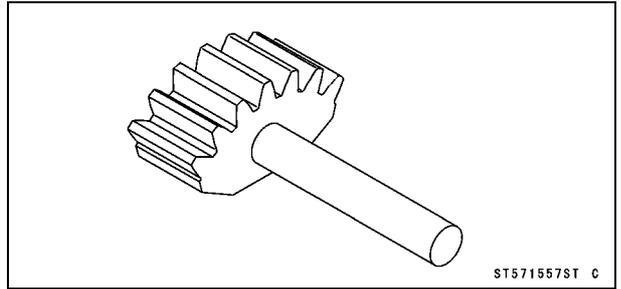
TIR: Total Indicator Readings

**Special Tools and Sealant**

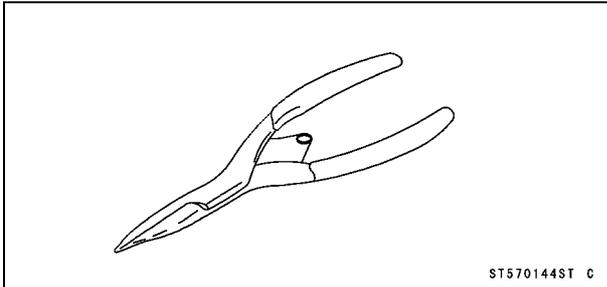
**Inside Circlip Pliers:**  
**57001-143**



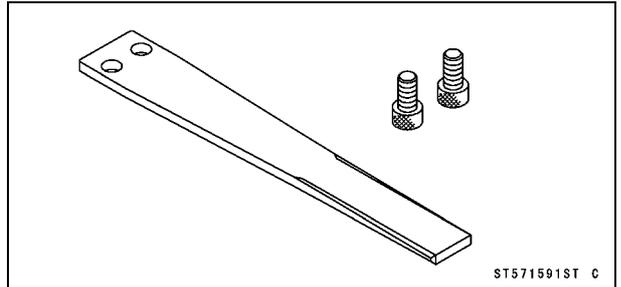
**Gear Holder, m2.0:**  
**57001-1557**



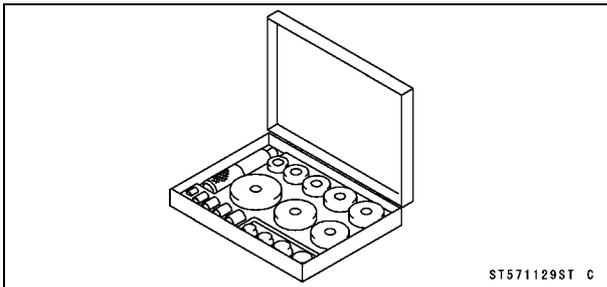
**Outside Circlip Pliers:**  
**57001-144**



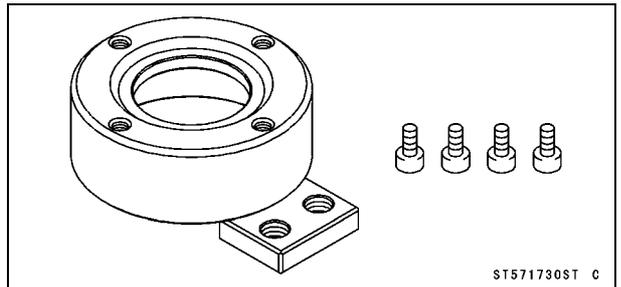
**Grip:**  
**57001-1591**



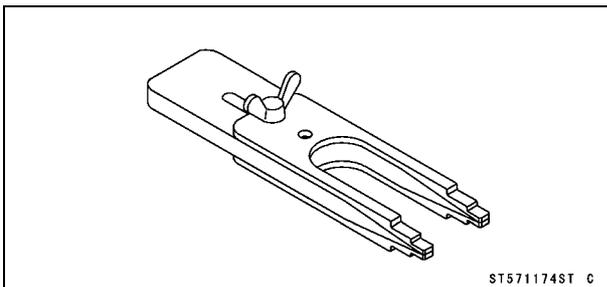
**Bearing Driver Set:**  
**57001-1129**



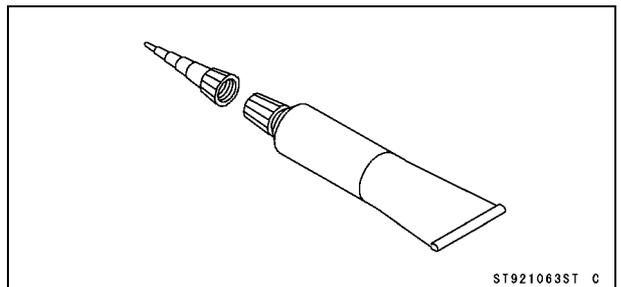
**Rotor Holder:**  
**57001-1730**



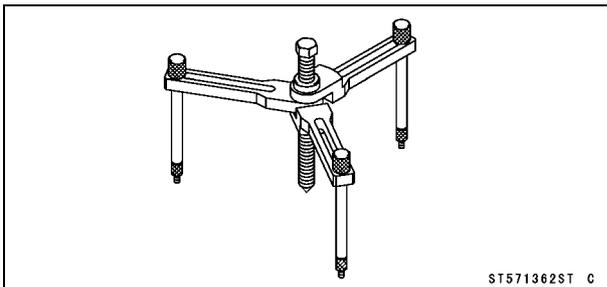
**Crankshaft Jig:**  
**57001-1174**



**Kawasaki Bond (Liquid Gasket - Gray):**  
**92104-1063**



**Crankcase Splitting Tool Assembly:**  
**57001-1362**

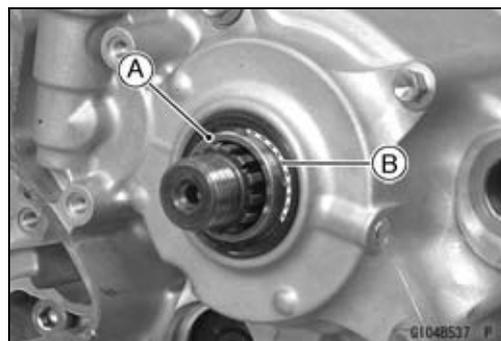


## 9-8 CRANKSHAFT/TRANSMISSION

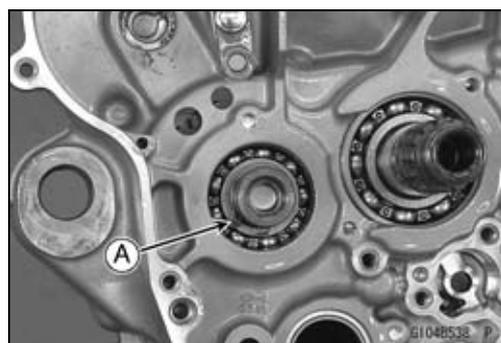
### Crankcase

#### **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:
  - Piston (see Piston Removal in the Engine Top End chapter)
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
  - Clutch (see Clutch Removal in the Clutch chapter)
  - Primary Gear (see Primary Gear Removal)
  - Balancer (see Balancer Removal)
  - Oil Pumps (see Oil Pump (Scavenge) (Feed) Removal in the Engine Lubrication System chapter)
  - Kick Shaft Assembly (see Kick Shaft Removal)
  - Kick Shaft Idle Gear (see Idle Gear Removal)
  - External Shift Mechanism (see External Shift Mechanism Removal)
  - Flywheel (see Flywheel Removal in the Electrical System chapter)
  - Gear Position Switch (see Gear Position Switch Removal in the Fuel System (DFI) chapter)
- Remove the output shaft collar [A] and the O-ring [B].
- Do not reuse the O-ring.

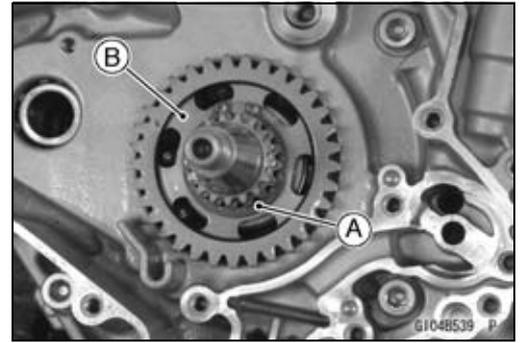


- Remove:
    - Circlip [A]
- Special Tool - Outside Circlip Pliers: 57001-144**

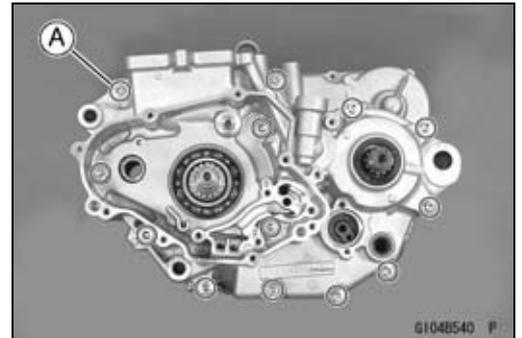


## Crankcase

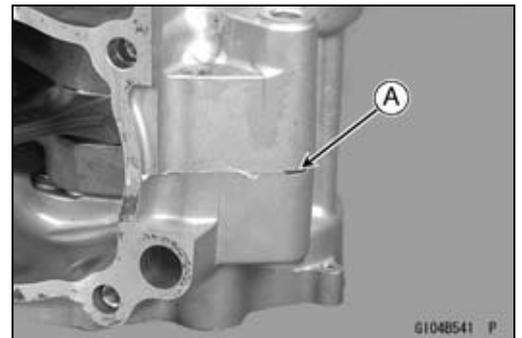
- Remove:
  - Circlip [A]
  - Balancer Drive Gear [B]



- Remove the crankcase bolts [A].



- Pry a pry point [A] at the crankcase mating surface, and split the crankcase.



- ★ If crankcase splitting can not easily, split the crankcase according to the following procedures.

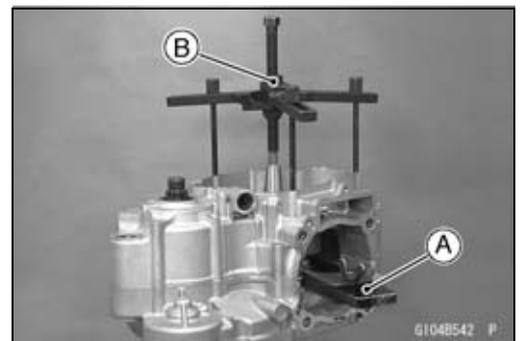
- Install the jig [A] between the crankshaft flywheels.

**Special Tool - Crankshaft Jig: 57001-1174**

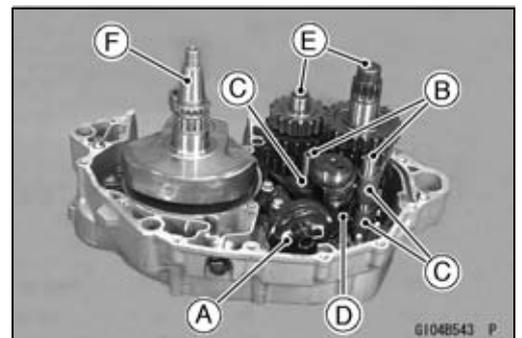
- Attach the crankcase splitting tool [B] to the left crankcase half.

**Special Tool - Crankcase Splitting Tool Assembly: 57001-1362**

- Tighten the center bolt of the crankcase splitting tool to split the crankcase halves.



- Remove:
  - Oil Screen (Feed) [A] (see Oil Screen (Feed) Removal in the Engine Lubrication System chapter)
  - 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).



## 9-10 CRANKSHAFT/TRANSMISSION

### Crankcase

#### CAUTION

Do not remove the bearings and the oil seals unless it is necessary.  
Removal may damage them.

### Crankcase Assembly

#### CAUTION

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

Clean the engine parts 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 parts. A fire or explosions could result.

- 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.

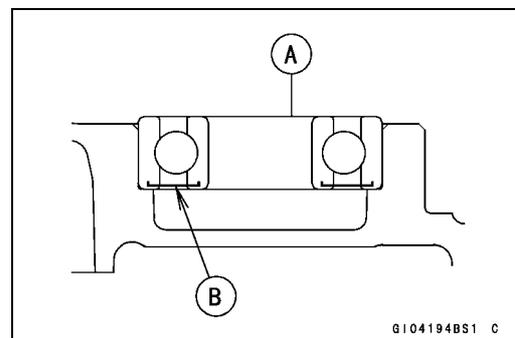
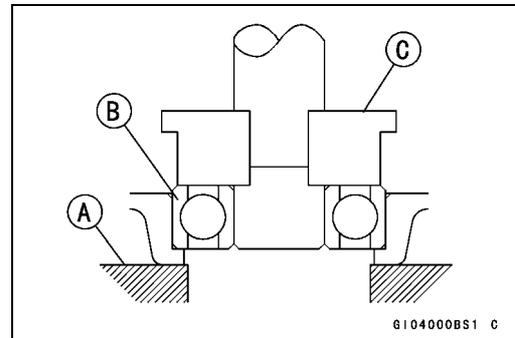
Special Tool - Bearing Driver Set: 57001-1129

#### CAUTION

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.

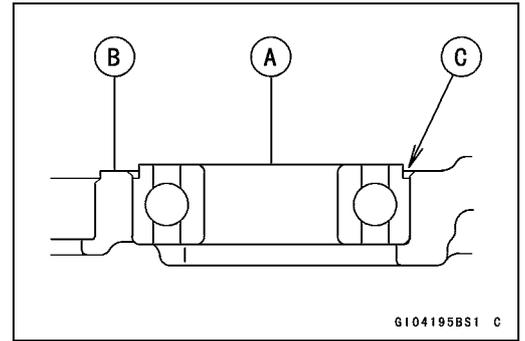
Special Tool - Bearing Driver Set: 57001-1129



## Crankcase

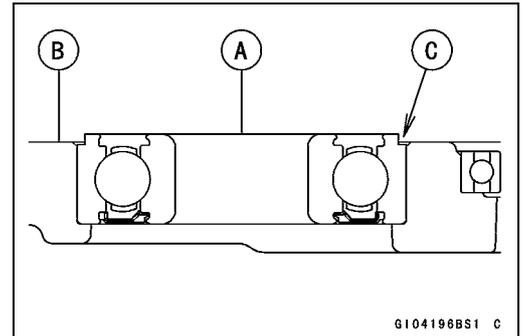
- Press the new drive shaft bearing [A] in the right crankcase [B] half so that the stepped side [C] faces inside of the engine.

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



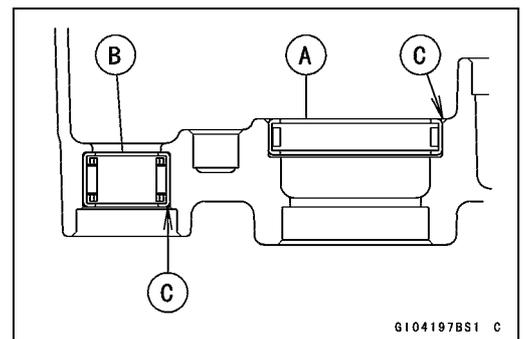
- Press the new crankshaft bearings [A] in the left and right crankcase halves [B] so that the stepped side [C] faces inside of the engine.

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



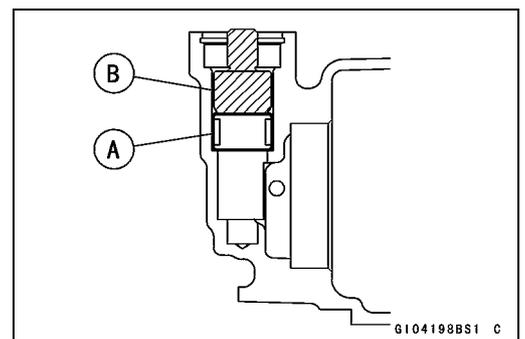
- Press the shift drum needle bearing [A] and shift shaft needle [B] bearing in the left crankcase half so that bearing surface flush with the crankcase surface [C].

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



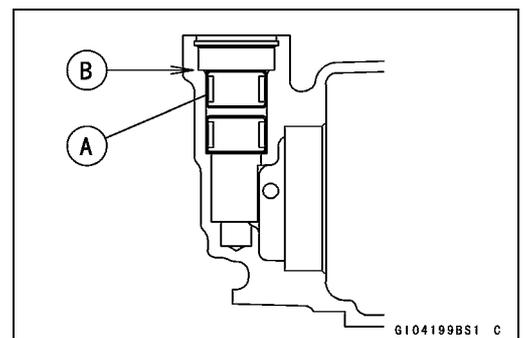
- First, press the inside release shaft needle bearing [A] until it bottom out with the bearing driver set [B].

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



- Next, press the outside release shaft needle bearing [A] until the surface of the bearing is even with the crankcase surface [B].

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



## 9-12 CRANKSHAFT/TRANSMISSION

### Crankcase

- Replace the oil seals, if removed.
- Press the output shaft, shift shaft and release shaft oil seals [C] so that oil seal lip [A] face to the engine outside and oil seal surface flush with the left crankcase surface [B].

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

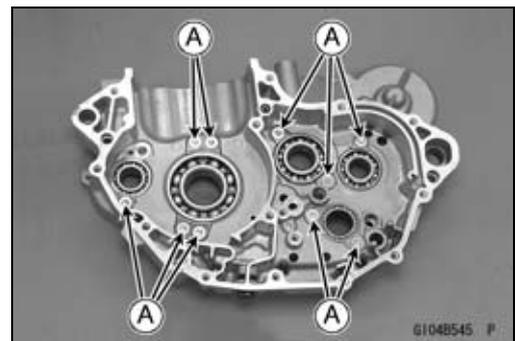
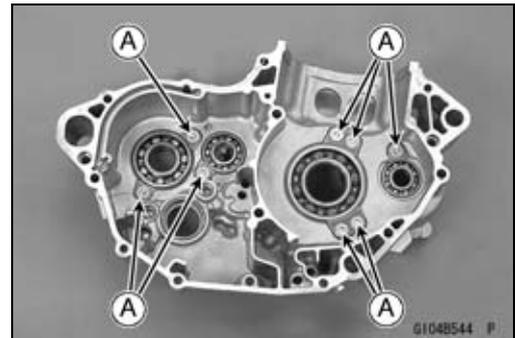
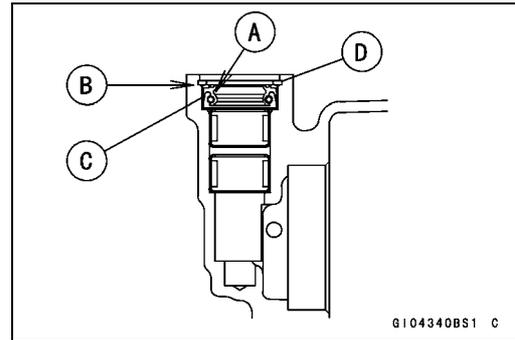
- Apply grease to the oil seal lip.
- Install the new circlip [D] to the release shaft oil seal.

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

- Apply a non-permanent locking agent to the bearing retaining screws [A].

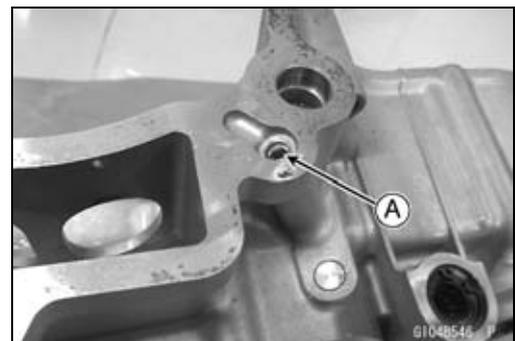
- Tighten:

**Torque - Bearing Retaining Screws: 15 N·m (1.5 kgf·m, 11 ft·lb)**

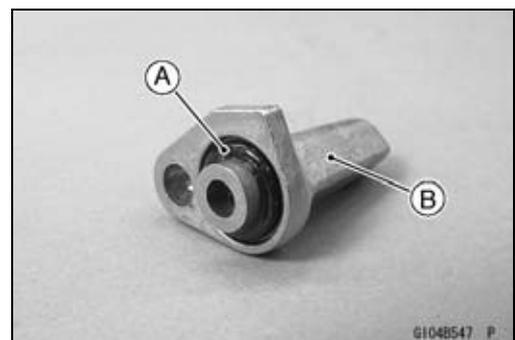


- Tighten:

**Torque - Piston Oil Nozzle [A]: 3.0 N·m (0.30 kgf·m, 26 in·lb)**

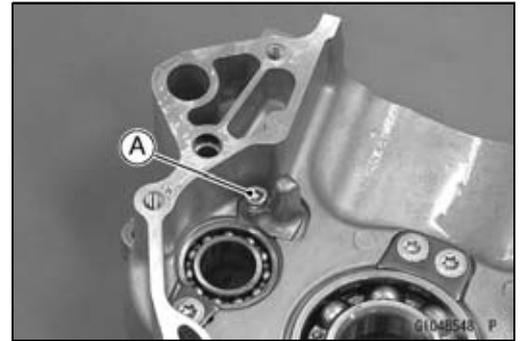


- Replace the O-ring [A] with a new one.
- Install the O-ring to the piston oil nozzle [B].

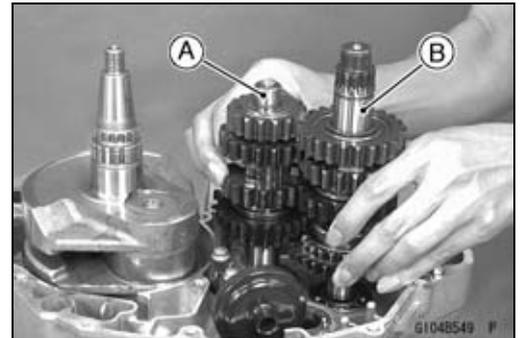


**Crankcase**

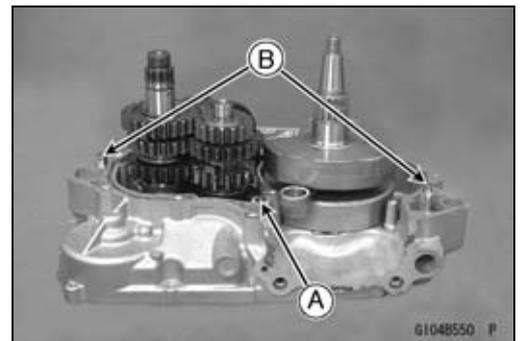
- Apply a non-permanent locking agent to the piston oil nozzle bolt [A].
- Tighten:  
**Torque - Piston Oil Nozzle Bolt: 7.0 N-m (0.71 kgf-m, 62 in-lb)**



- Install:  
 Crankshaft (see Crankshaft Installation)  
 Oil Screen (Feed) (see Oil Screen (Feed) Installation in the Engine Lubrication System chapter)
- 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 half as a set.
- Install the shift drum and shift forks (see Transmission Shaft Installation).



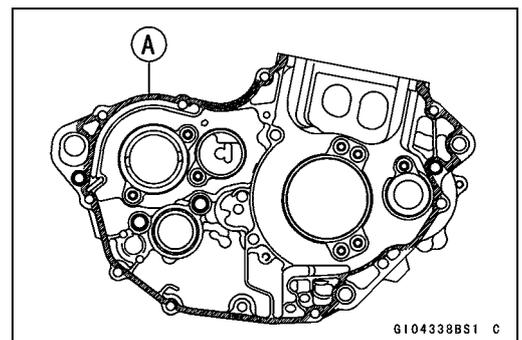
- Replace the O-ring [A] with a new one, and apply grease.
- Install:  
 Dowel Pins [B]  
 O-ring



- Apply liquid gasket to the mating surface [A] of the left crankshaft half.  
**Sealant - Kawasaki Bond (Liquid Gasket - Gray): 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.



## 9-14 CRANKSHAFT/TRANSMISSION

### Crankcase

- Using a plastic hammer, press the rear portion of the crankcase, and tap the area around the crankshaft of the left crankcase half. While maintaining the mating surfaces of the right and left crankcase halves constantly parallel, mate the crankcase halves evenly.
- When the left crankcase half can not install easily, position the connecting rod at the bottom-dead-center, and install the crankshaft jig [A].

**Special Tool - Crankshaft Jig: 57001-1174**

#### 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.*

- Tighten the crankcase bolts, starting with the periphery of the crankshaft, then outward.
- Replace the washers [A] with a new one.
- Tighten:

**Torque - Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**

**Crankcase Bolts (M7): 15 N·m (1.5 kgf·m, 11 ft·lb)**

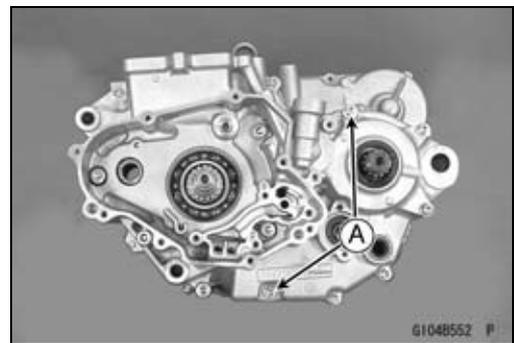
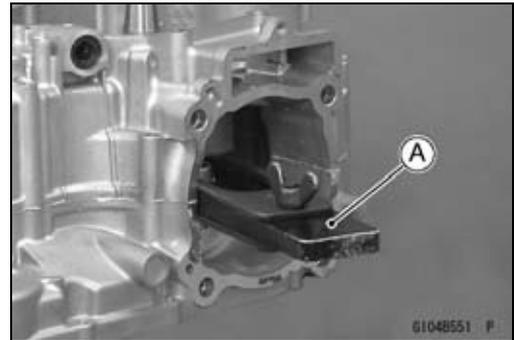
#### NOTE

- *After tightening the crankcase bolts, wipe up the liquid gasket seeping out around the mating surface, especially around the area.*

- Make sure that the crankshaft, driveshaft, and the output shaft, rotate smoothly (in the neutral position).
- ★ If the crankshaft will not turn, probably the crankshaft is not centered; install the crankshaft jig at the bottom-dead-center, and tap the appropriate end of the crankshaft with a mallet to reposition it.

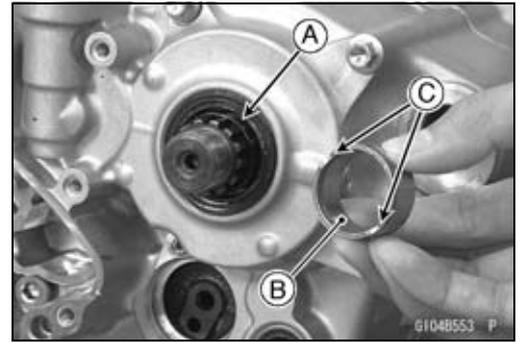
**Special Tool - Crankshaft Jig: 57001-1174**

- Install:
  - Gear Positioning Lever (see External Shift Mechanism Installation)
  - Shift Drum Cam (see External Shift Mechanism Installation)
- 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.

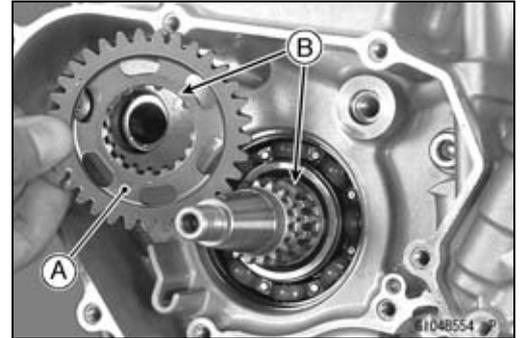


### Crankcase

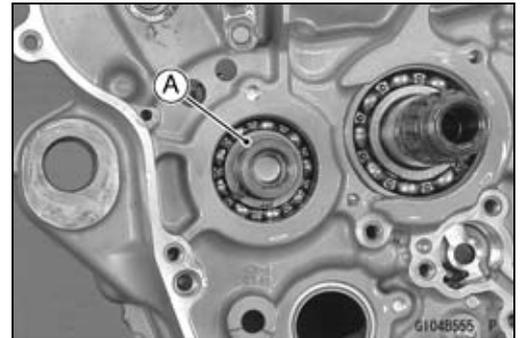
- Replace the O-ring [A] on the output shaft with new ones.
- Install O-ring on the grinding faces of the output shaft while expanding the O-ring by the hand.
- Apply grease to the inside of the output shaft collar [B].
- Insert the collar with the groove [C] faces inside.



- Replace the circlip with a new one, and install it.
- Install the balancer drive gear [A] to the crankshaft so that it fits the low tooth [B] on the drive gear and crankshaft.



- Replace the circlip [A] with a new one, and install it to the output shaft.

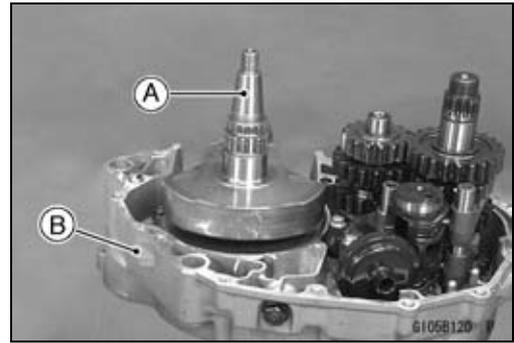


## 9-16 CRANKSHAFT/TRANSMISSION

### Crankshaft

#### **Crankshaft Removal**

- Disassemble the crankcase (see Crankcase Disassembly).
- Using the hand pull out the crankshaft [A] from the right crankcase half [B].

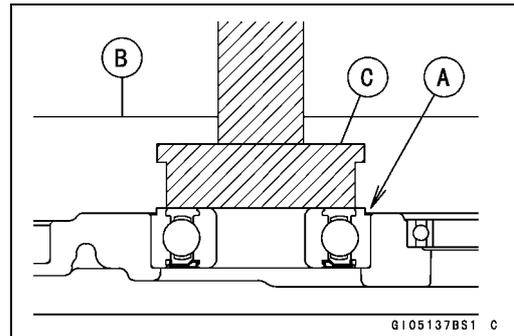


#### **Crankshaft Installation**

- Apply grease to the outer side of the crankshaft bearings and use the bearing driver set [C] to face the stepped side [A] to the engine inside and drive the bearing to the bottom of the crankcase [B]. While driving the bearing in, make sure to use a holder to support the boss area.

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

- Install the crankshaft to the right crankcase half.
- 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.

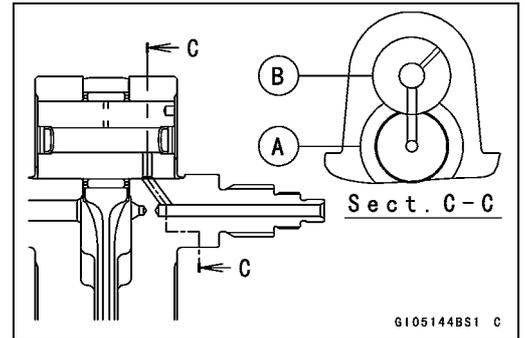
#### **Crankshaft Assembly**

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.

- 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

**Crankshaft**

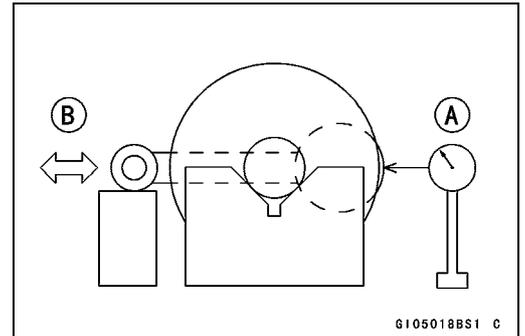
- Carefully align the oil passage hole in the right flywheel [A] with the one in the crankpin [B] at rebuilding of the crankshaft as shown.



**Crankshaft Inspection**

**Connecting Rod Big End Radial Clearance Inspection**

- 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:** 0.002 mm ~ 0.014 mm (0.00008 ~ 0.00055 in.)

**Service Limit:** 0.06 mm (0.002 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 Inspection**

- Refer to the Crankshaft Inspection in the Periodic Maintenance chapter.

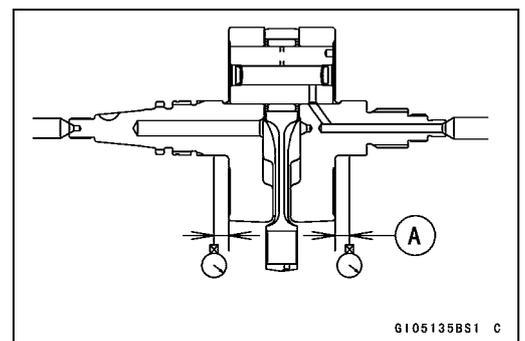
**Crankshaft Runout Inspection**

- 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.

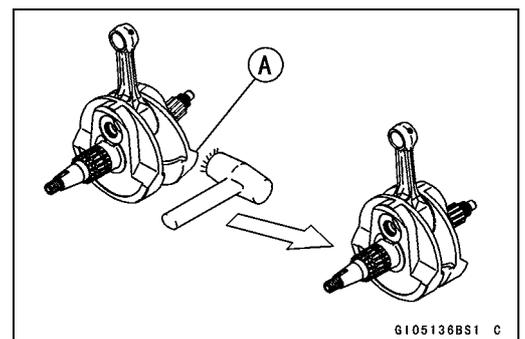
**Standard:** TIR 0.03 mm (0.0012 in.) or less

**Service Limit:** TIR 0.08 mm (0.003 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. 8.5 mm (0.33 in.) [A]



- 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.



## 9-18 CRANKSHAFT/TRANSMISSION

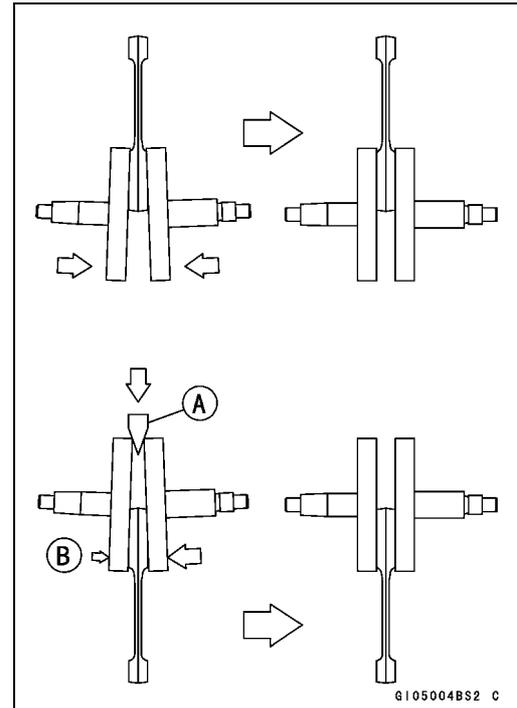
### Crankshaft

- 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.

#### CAUTION

**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.

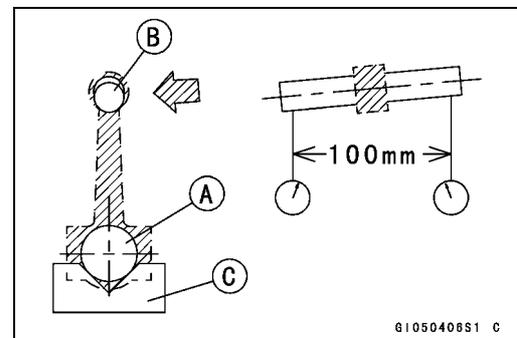


#### Connecting Rod Big End Seizure Inspection

- ★ 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 Inspection

- 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].



- 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.)**

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**Crankshaft**

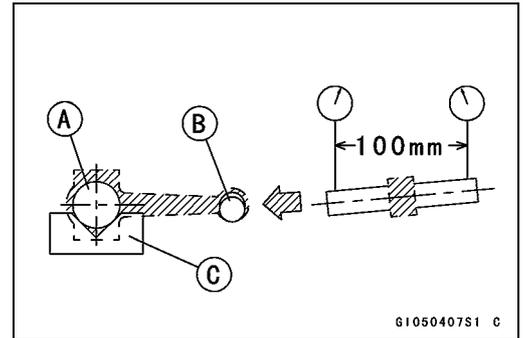
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**Connecting Rod Twist Inspection**

- 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.)**

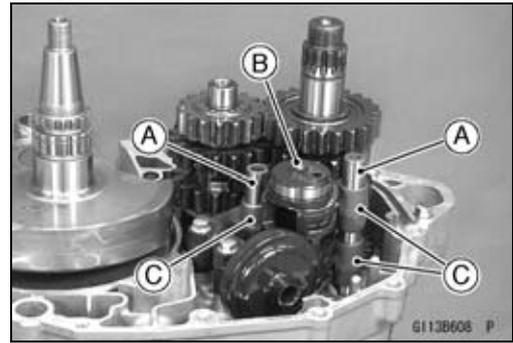


## 9-20 CRANKSHAFT/TRANSMISSION

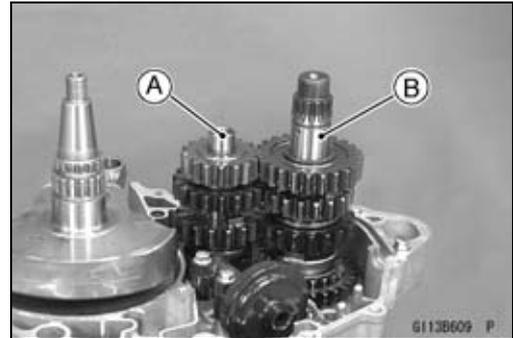
### Transmission

#### **Transmission Shaft Removal**

- Disassemble the crankcase (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.

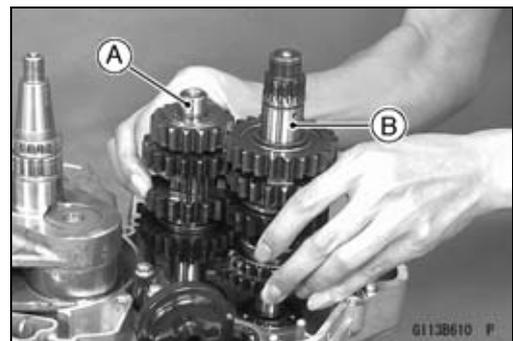


- Pull out the drive shaft [A] and output shaft [B] together with their gears meshed.



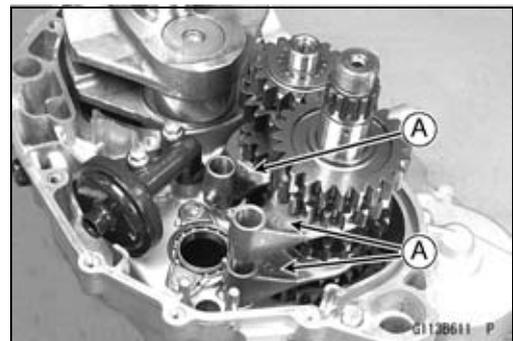
#### **Transmission Shaft Installation**

- 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 half with their gears meshed.
- Install the shift drum.

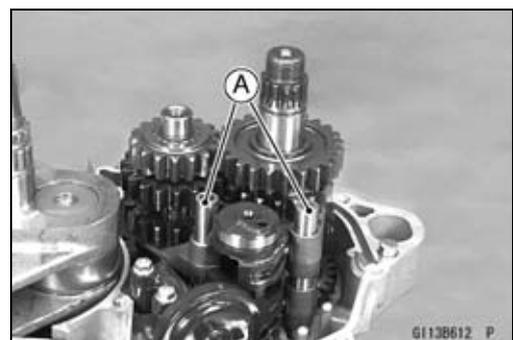


- Apply a small amount of engine oil to the shift fork fingers and fit each shift fork into the groove of the proper gear.
- The shift forks can be identified by their shape or mark. Install them noting the direction shown.
- Install each shift forks with its marks [A] facing the engine left side.

Marks:           043 (Drive shaft)  
                      044 (Output shaft)



- Fit each shift fork guide pin into the corresponding groove in the shift drum.
- Apply a small amount of engine oil to the shift rods [A] and slide them into the shift forks.
- Assemble the crankcase (see Crankcase Assembly).



**Transmission**

**Transmission Shaft Disassembly**

- Remove the transmission shafts.
- Remove the circlips, washers, then gears.

**Special Tool - Outside Circlip Pliers: 57001-144**

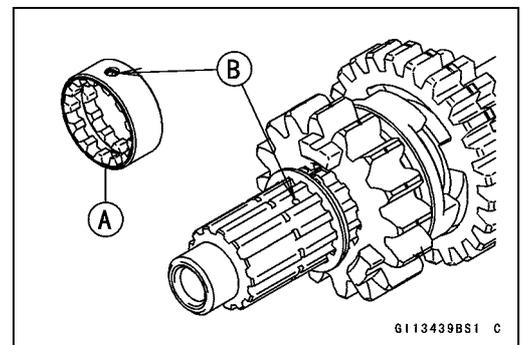
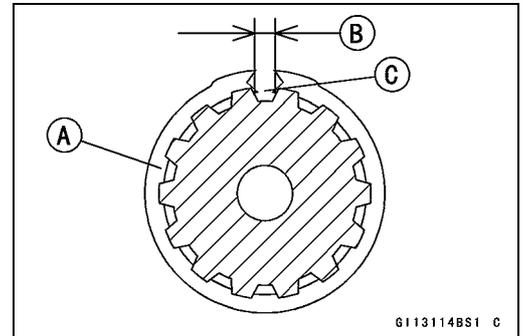
- Do not reuse the removed circlips.

**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**

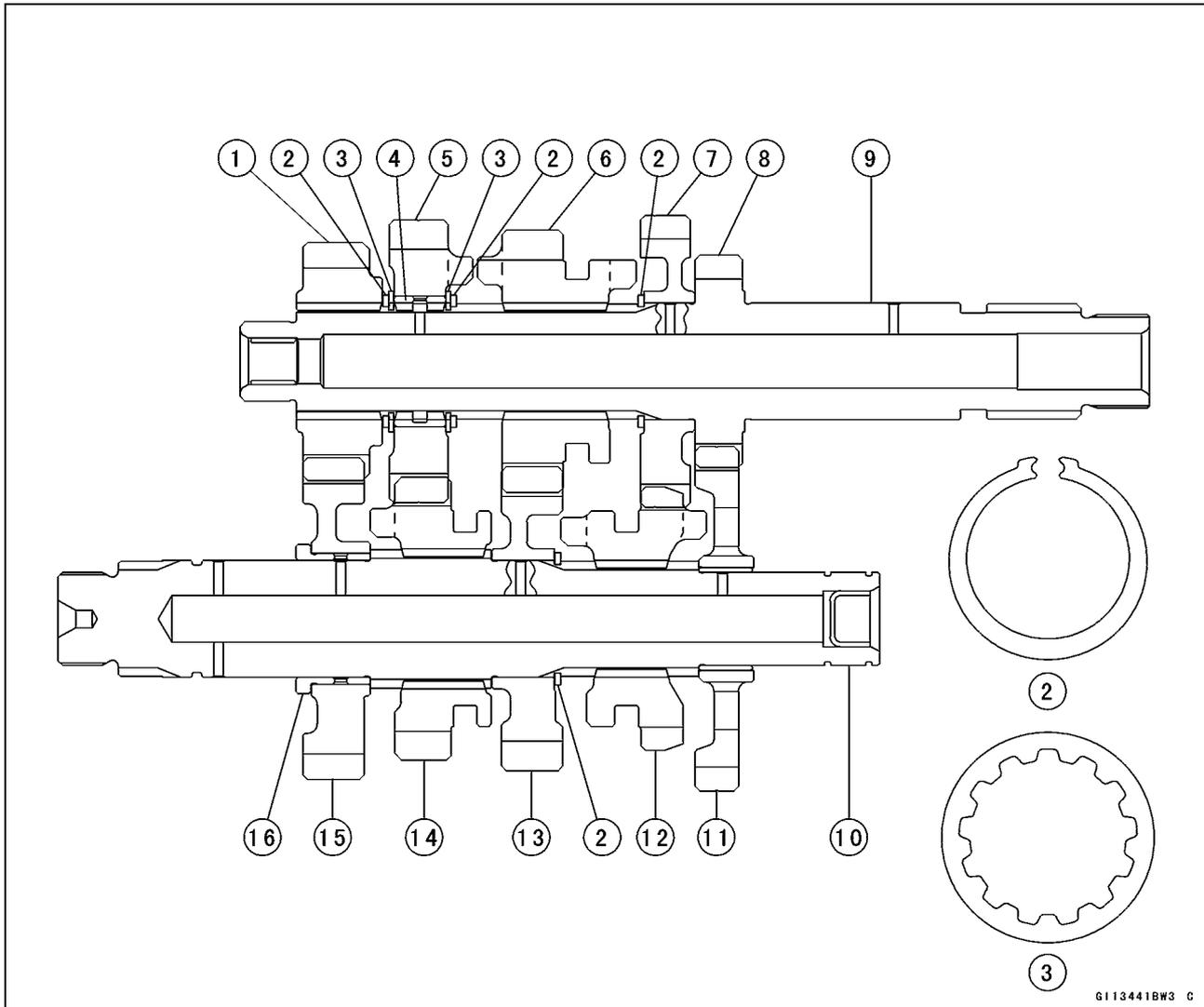
- When install the bushing (for 4th) [A] to the drive shaft, align the oil passage holes [B] each other.



- 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.

## 9-22 CRANKSHAFT/TRANSMISSION

### Transmission



6113441B#3 C

1. 2nd Gear (17T)
2. Circlip
3. Toothed Washer
4. Bushing
5. 4th Gear (19T)
6. 3rd Gear (16T)
7. 5th Gear (24T)
8. 1st Gear (16T)

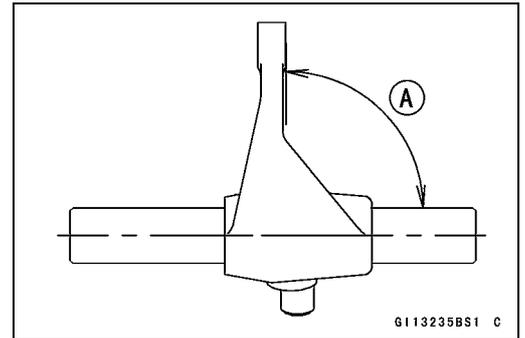
9. Drive Shaft
10. Output Shaft
11. 1st Gear (28T)
12. 5th Gear (21T)
13. 3rd Gear (19T)
14. 4th Gear (19T)
15. 2nd Gear (24T)
16. Collar

- Check each gear spins or slides freely on the transmission shaft without binding after assembly.

**Transmission**

**Shift Fork Bending Inspection**

- 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 Inspection**

- 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:** 4.9 ~ 5.0 mm (0.193 ~ 0.197 in.)

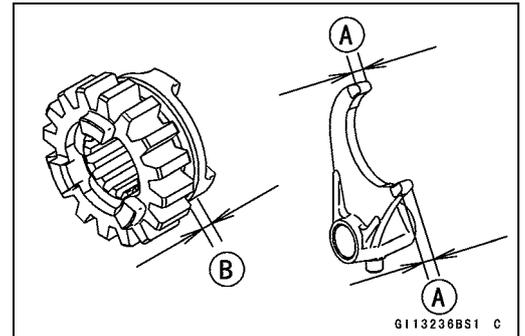
**Service Limit:** 4.8 mm (0.19 in.)

**Gear Groove Width**

**Standard:** 5.05 ~ 5.15 mm (0.199 ~ 0.203 in.)

**Service Limit:** 5.2 mm (0.20 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 Inspection**

- 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.)

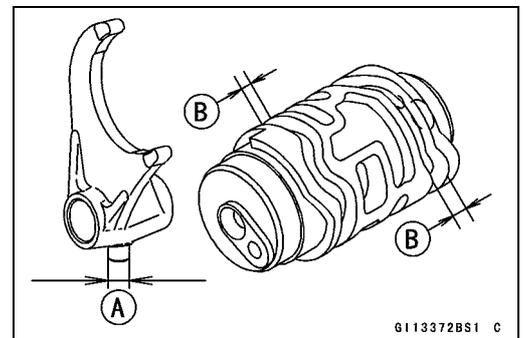
**Service Limit:** 5.8 mm (0.228 in.)

**Shift Drum Groove Width**

**Standard:** 6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)

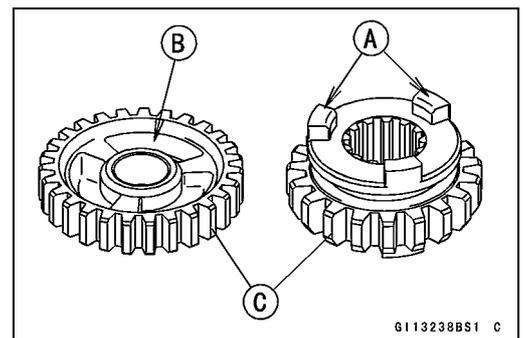
**Service Limit:** 6.3 mm (0.25 in.)

- ★ 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 Inspection**

- 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.



## 9-24 CRANKSHAFT/TRANSMISSION

### Balancer

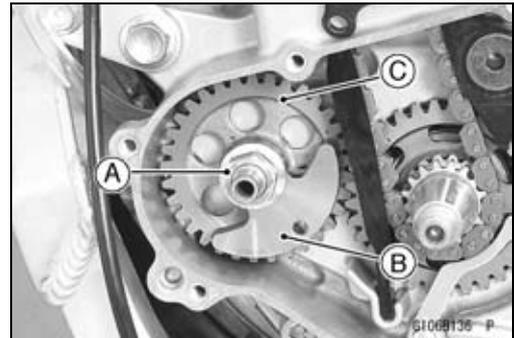
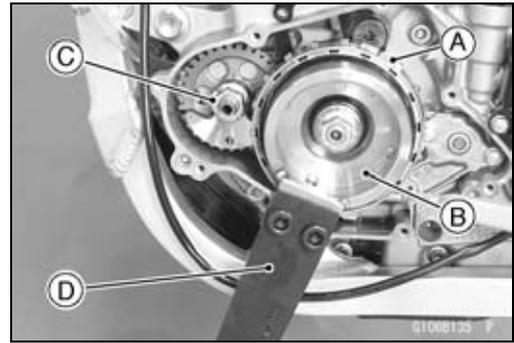
#### **Balancer Removal**

- Hold the flywheel [A] with the rotor holder [B] to loosen the balancer weight mounting nut [C]

**Special Tools - Grip [D]: 57001-1591**

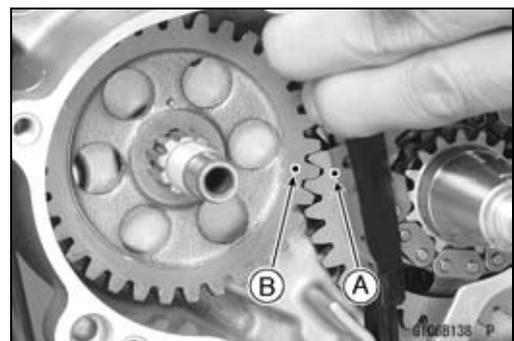
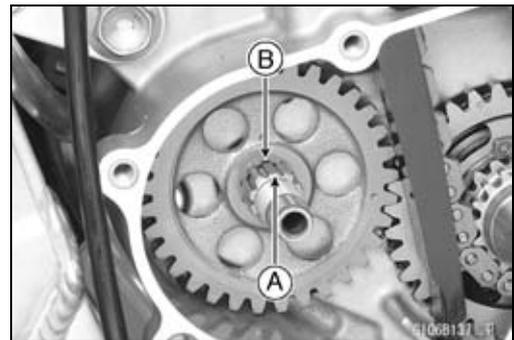
**Rotor Holder: 57001-1730**

- Remove:
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
  - Magneto Cover (see Magneto Cover Removal in the Electrical System chapter)
- Remove:
  - Flywheel (see Flywheel Removal in the Electrical System chapter)
  - Balancer Weight Mounting Nut [A]
  - Balancer Weight [B]
  - Balancer Gear [C]
- Pull out the balancer shaft from the right crankcase half.

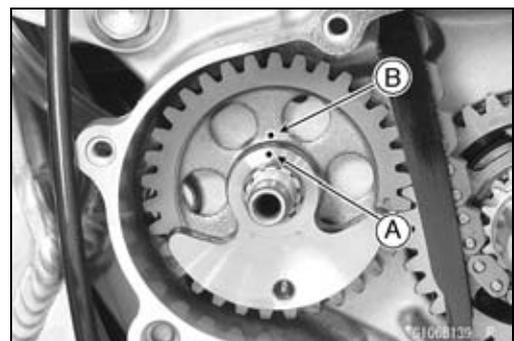


#### **Balancer Installation**

- Insert the balancer shaft from the right crankcase half.
- Install the balancer gear so that align the stepped portion [A] on the balancer shaft and low tooth [B] on the balancer gear.
- Align the punch mark [A] on the balancer drive gear and punch mark [B] on the balancer gear.
- While pushing the front camshaft chain guide, align the punch marks each other.



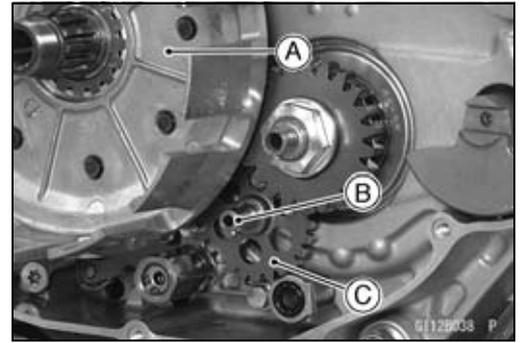
- Install the balancer weight so that align the punch mark [A] on the balancer and punch mark [B] on the balancer gear.
- Tighten:
  - Torque - Balancer Weight Mounting Nut: 52 N-m (5.3 kgf-m, 38 ft-lb)**



**Primary Gear**

**Primary Gear Removal**

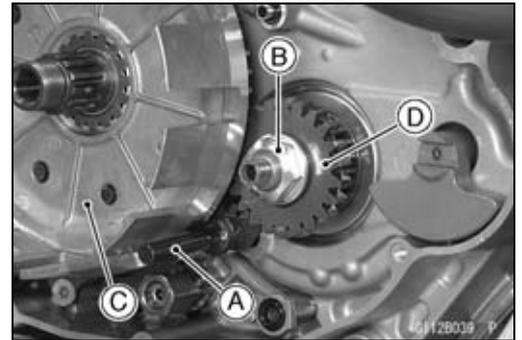
- Remove:
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
  - Clutch (see Clutch Removal in the Clutch chapter)
- Temporarily install the clutch housing [A].
- Remove:
  - Oil Pump Drive Shaft [B]
  - Oil Pump Gear [C]



- Using the gear holder [A], secure the primary gear.

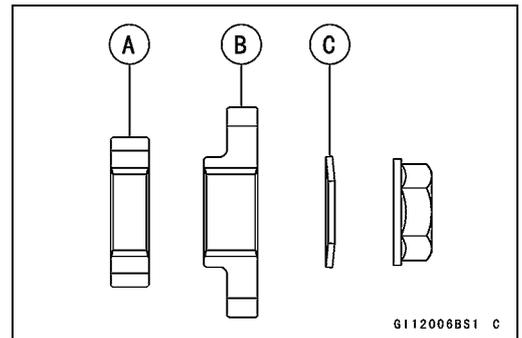
**Special Tool - Gear Holder, m2.0: 57001-1557**

- Remove:
  - Primary Gear Nut [B]
  - Washer
  - Clutch Housing [C]
  - Primary Gear [D]
- Primary gear nut is left-hand threads.



**Primary Gear Installation**

- Insert the oil pump drive gear [A] and primary gear [B] to the crankshaft.
- Install the washer [C] as shown.



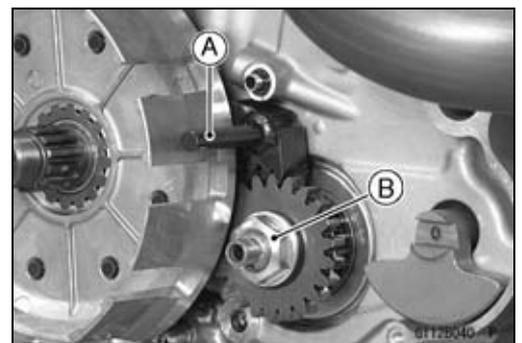
- Temporarily install the clutch housing.
- Using the gear holder [A], secure the clutch gear and the bottom of the primary gear; then, tighten the primary gear nut [B].

- Primary gear nut is left-hand threads.

**Torque - Primary Gear Nut: 98 N·m (10 kgf·m, 72 ft·lb)**

**Special Tool - Gear Holder, m2.0: 57001-1557**

- Install the removed parts (see appropriate chapter).

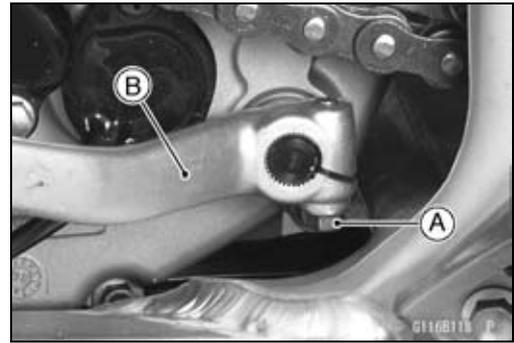


## 9-26 CRANKSHAFT/TRANSMISSION

### External Shift Mechanism

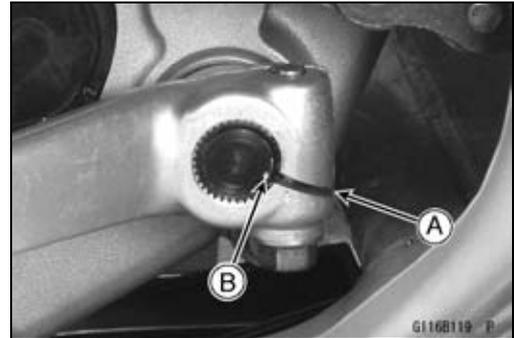
#### Shift Pedal Removal

- Remove:
  - Shift Pedal Bolt [A]
  - Shift Pedal [B]



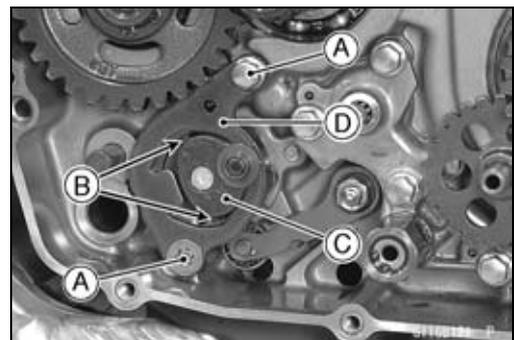
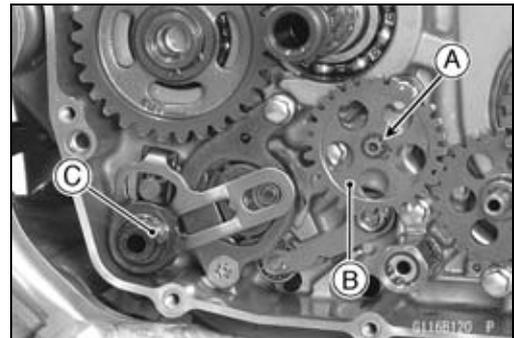
#### Shift Pedal Installation

- Install the shift pedal so that the split portion [A] on the pedal align with the punch mark [B] on the shift shaft.
- Tighten:
  - Torque - Shift Pedal Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

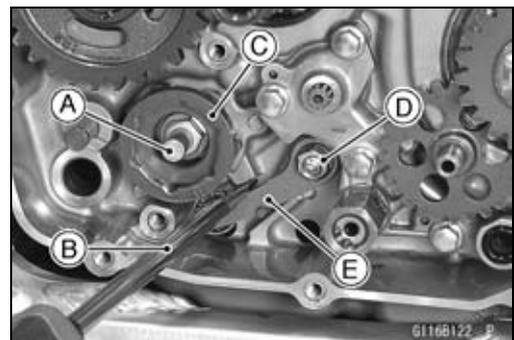


#### External Shift Mechanism Removal

- Remove:
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
  - Clutch Housing (see Clutch Removal in the Clutch chapter)
  - Shift Pedal (see Shift Pedal Removal)
  - Circlip [A]
  - Oil Pump Driven Gear [B]
- Pull out the shift shaft [C].
- Remove the bolts [A]
- While compressing the pawls [B], take off the shift ratchet assembly [C] with ratchet plate [D].



- Remove the shift drum cam bolt [A].
- Push down the gear positioning lever with the screw driver [B] to remove the shift drum cam [C].
- Remove the nut [D], and take off the gear positioning lever [E].



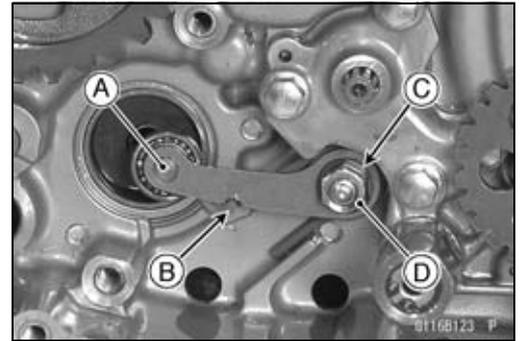
**External Shift Mechanism**

**External Shift Mechanism Installation**

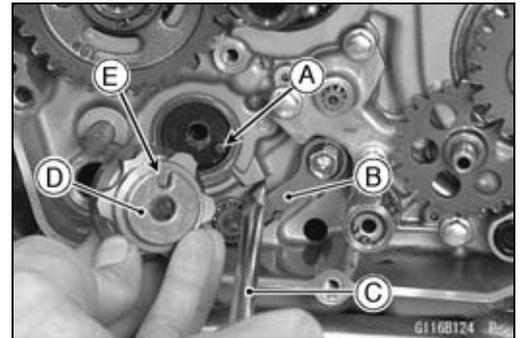
- Install the gear positioning lever [A].
- Fit each end of the spring [B] or original positions.
- Install the color and washer [C].

● Tighten:

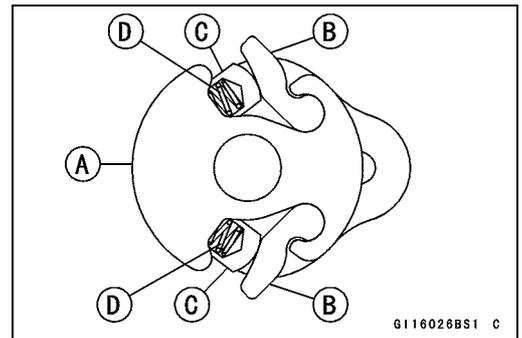
**Torque - Gear Positioning Lever Nut [D]: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



- Install the pin [A] to the shift drum.
- Apply a non-permanent locking agent to the shift drum cam bolt.
- Push down the gear positioning lever [B] with the screw driver [C] and install the shift drum cam [D].
- Fit the groove [E] on the pin.
- Align the roller of the gear positioning lever with the slot of the shift drum cam.



- Set up the shift ratchet assembly as shown in the figure.
  - Ratchet [A]
  - Pawls [B]
  - Pins [C]
  - Springs [D]

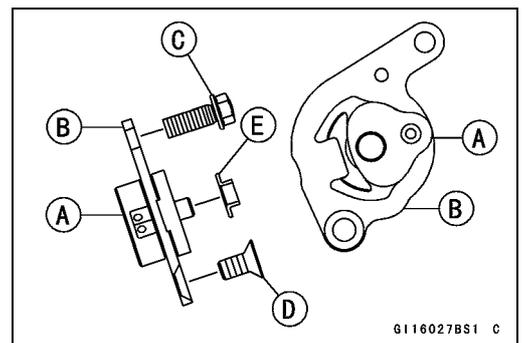


- Then install the ratchet assembly [A] to the ratchet plate [B] as shown in the figure.
- Install the ratchet assembly to the shift drum cam.
- Apply a non-permanent locking agent to the lower ratchet plate mounting bolt.
- Tighten the lower bolt first, and tighten the upper bolt.

**Torque - Lower Ratchet Plate Mounting Bolt [D]: 15 N·m (1.5 kgf·m, 11 ft·lb)**

**Upper Ratchet Plate Mounting Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

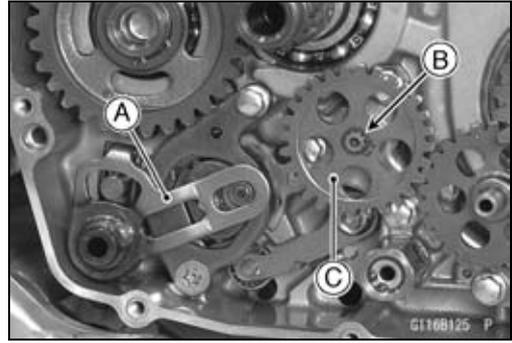
- Install the collar [E].



## 9-28 CRANKSHAFT/TRANSMISSION

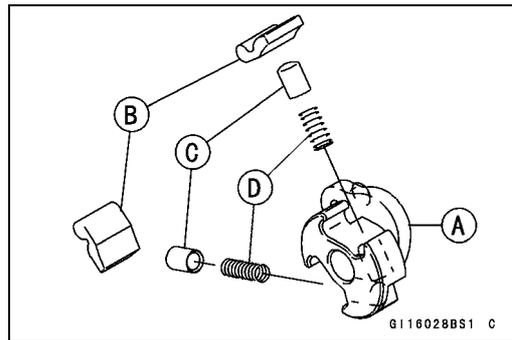
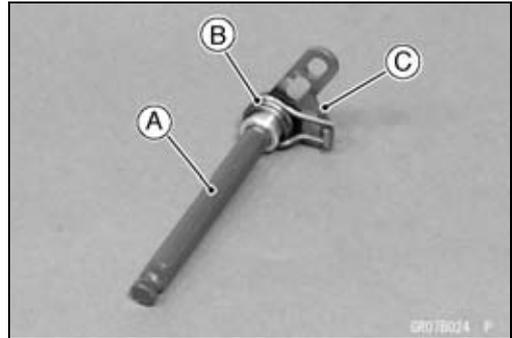
### External Shift Mechanism

- Before installing the shift shaft, apply grease to the oil seal lips and shift shaft splines.
- Insert the shift shaft [A].
- Replace the circlip [B] with a new one.
- Install the oil pump driver gear [C].
- Install the removed parts (see appropriate chapters).

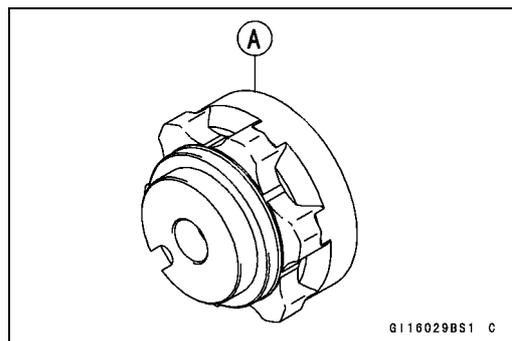


### External Shift Mechanism Inspection

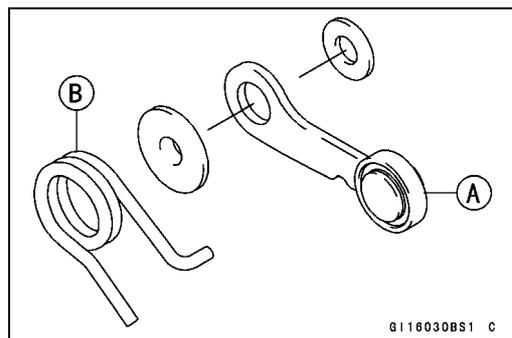
- Remove the external shift mechanism (see External Shift Mechanism Removal).
- Check the shift shaft [A] for bending or damage to the splines.
- ★ If the shaft is bent, straighten or replace it. If the splines are damaged, replace the shift mechanism.
- Check the return spring [B] for cracks or distortion.
- ★ If the spring is damaged in any way, replace it.
- Check the shift lever [C] for distortion.
- ★ If the shift lever is damaged in any way, replace the shift shaft.
- Check the ratchet assembly for damage.
- ★ If ratchet [A], pawls [B], pins [C] or springs [D] are damaged in any way, replace them.



- Visually inspect the shift drum cam [A].
- ★ If it is badly worn or if it shows any damage, replace it.



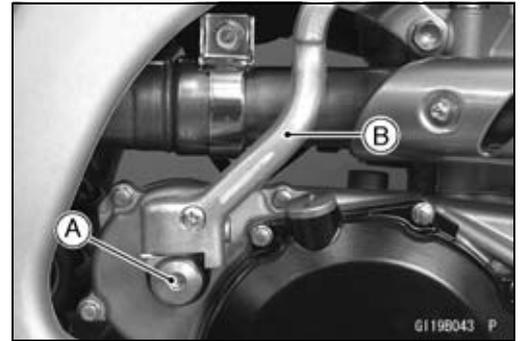
- Check the gear positioning lever [A] and its spring [B] for cracks or distortion.
- ★ If the lever or spring is damaged in any way, replace them.



**Kickstarter**

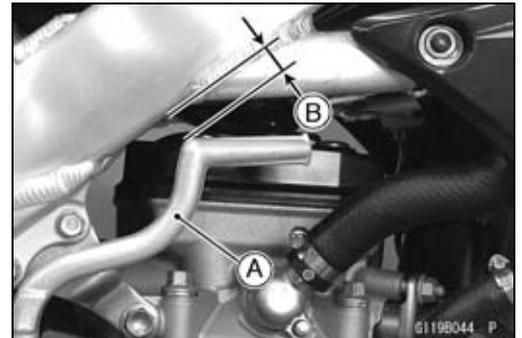
**Kick Pedal Assy Removal**

- Remove:
  - Mounting Bolt [A]
  - Kick Pedal Assy [B]



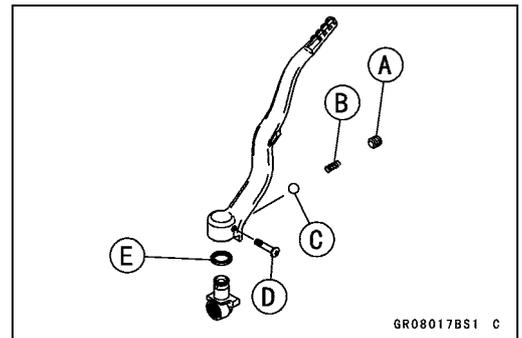
**Kick Pedal Assy Installation**

- Install the kick pedal assy [A] as shown.
  - 15.6 ~ 25.6mm (0.614 ~ 1.00 in.) [B]
- Apply a non-permanent locking agent to the kick pedal bolt.
- Tighten:
  - Torque - Kick Pedal Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)



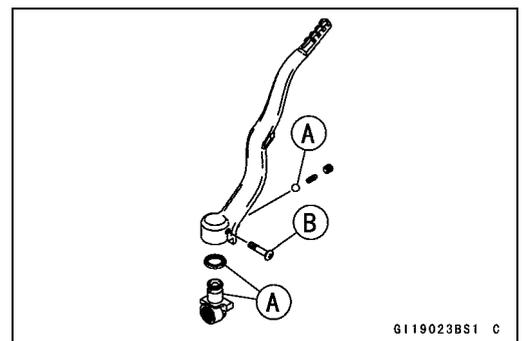
**Kick Pedal Assy Disassembly**

- Remove the kick pedal assy (see Kick Pedal Assy Removal).
- Remove:
  - Plug Screw [A]
  - Spring [B]
  - Steel Ball [C]
  - Detent Screw [D]
  - Oil Seal [E]



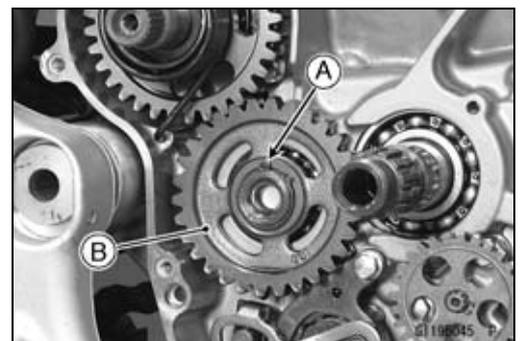
**Kick Pedal Assy Assembly**

- Apply grease [A] to the steel ball, oil seal lip, spring, and the sliding portion of the lever.
- After tightening the screw [B] stake it with a punch.



**Idle Gear Removal**

- Remove:
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
  - Clutch Housing (see Clutch Removal in the Clutch chapter)
  - Circlip [A]
  - Idle Gear [B]

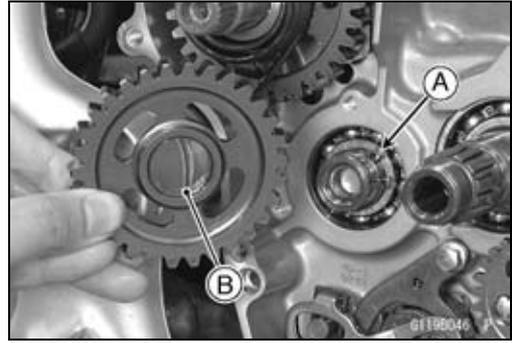


## 9-30 CRANKSHAFT/TRANSMISSION

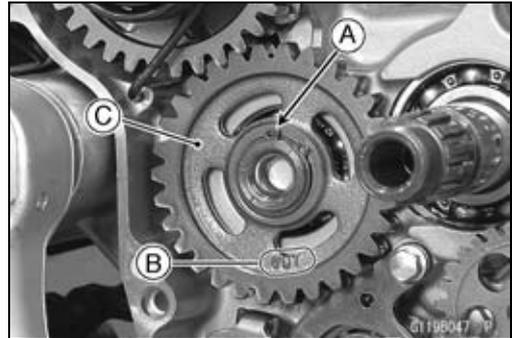
### Kickstarter

#### **Idle Gear Installation**

- Make sure to position the circlip [A] in original position. Replace it, if removed.
- Apply molybdenum disulfide oil to the inside [B] of the idle gear.

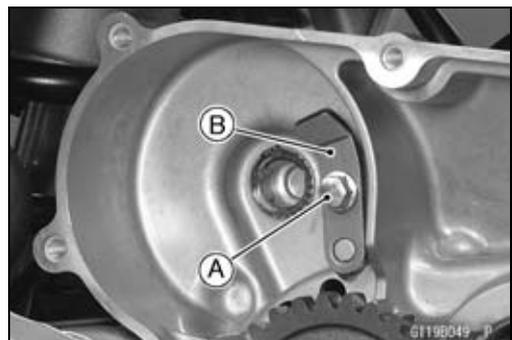
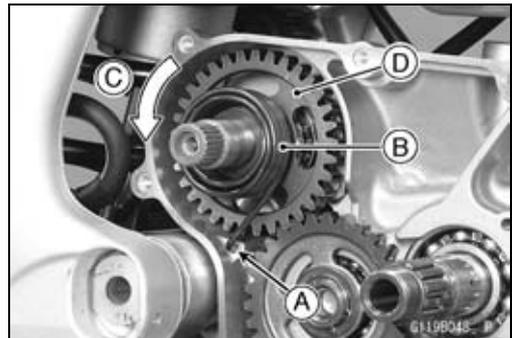


- Replace the circlip [A] with a new one.
- Install the idle gear [C] facing embossed letter [B] to the outside.
- Install the circlip.



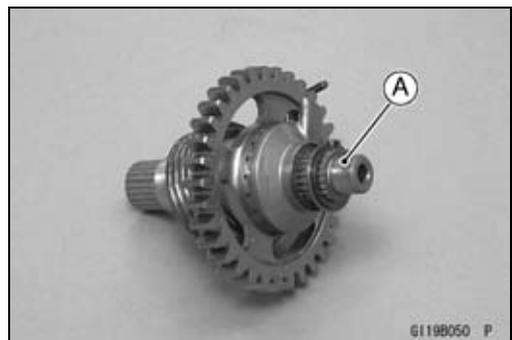
#### **Kickshaft Removal**

- Remove:
  - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
  - Clutch Housing (see Clutch Removal in the Clutch chapter)
- Pull the end [A] of the kick spring [B] out of the hole in the crankcase.
- Turn the kickshaft counterclockwise [C] and pull out the kickstarter assembly [D].
- Remove the bolt [A], and take off the ratchet guide [B].



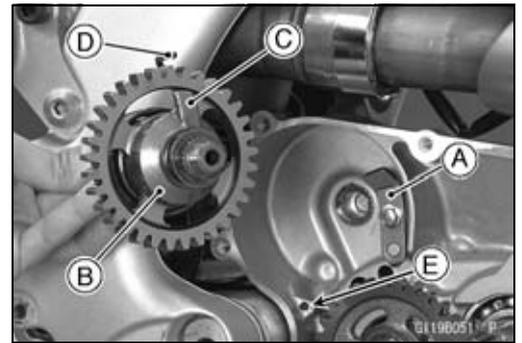
#### **Kickshaft Installation**

- Apply molybdenum disulfide grease to the end [A] of the kickshaft.



**Kickstarter**

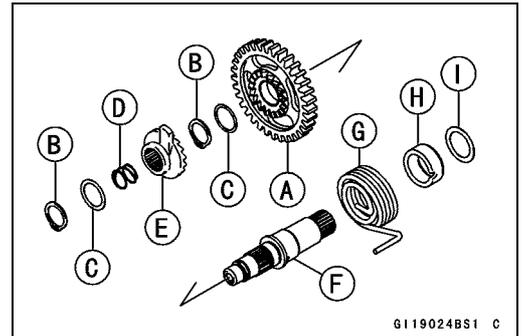
- Install the ratchet guide [A].
- Tighten:
  - Torque - Ratchet Guide Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Insert the kick shaft assembly [B] into the crankcase.
- Securely engage the stopper portion [C] of the ratchet gear with the guide.
- Insert the spring end [D] into the hole [E].
- Install the removed parts (see appropriate chapter).



**Kick Shaft Assembly Disassembly/Assembly**

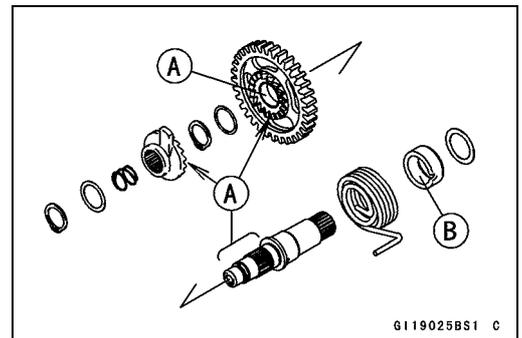
- The kick shaft assembly consists of the following parts.

- [A] Kick Gear
- [B] Circlips
- [C] Washers ( $\phi 24 \times \phi 18.3$ )
- [D] Spring
- [E] Ratchet Gear
- [F] Kick Shaft
- [G] Kick Spring
- [H] Spring Guide
- [I] Washer ( $\phi 28 \times \phi 20.3$ )



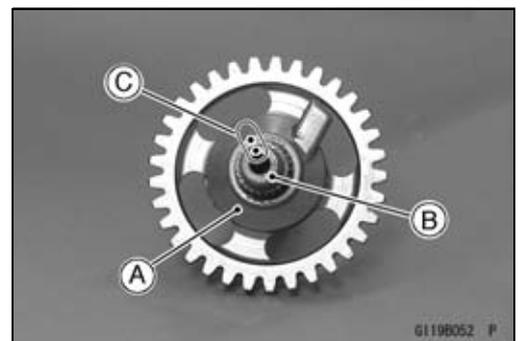
- Check the kick shaft assembly parts for damage.
- ★ Any damaged parts should be replaced with new ones.
- Apply molybdenum disulfide grease [A] to the inside of the kick gear and ratchet gear, kick shaft and ratchet gear.
- Apply grease to the inside [B] of the spring guide.
- Replace the circlips that were removed with new ones.

**Special Tool - Outside Circlip Pliers: 57001-144**



**NOTE**

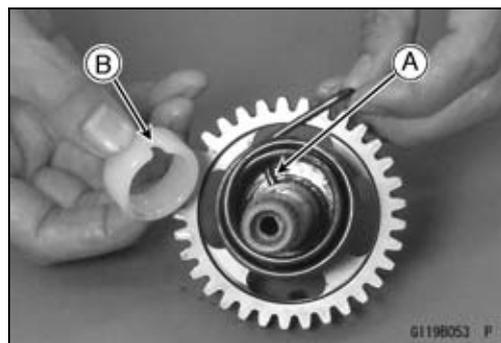
- When assembling the ratchet gear [A] onto the kick shaft [B], align the punch mark [C] on the ratchet gear with the punch mark [C] on the kick shaft.



## 9-32 CRANKSHAFT/TRANSMISSION

### Kickstarter

- Fit the spring end [A] and hollow [B] on the spring guide.



**Bearings/Oil Seals**

**Bearing Replacement**

<b>CAUTION</b>
<b>Do not remove the ball bearings unless it is necessary. Removal may damaged them.</b>

- Remove the ball bearing and/or needle bearing outer race using a press or puller.

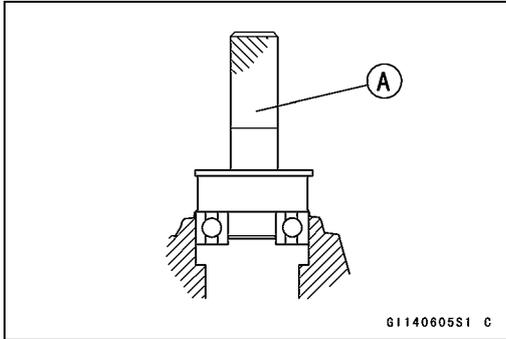
**NOTE**

○ *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.*

<b>CAUTION</b>
<b>Do not heat the case with a torch. This will warp the case. Soak the case in oil and heat the oil.</b>

- Install the new bearing until its outer race stops at the bottom of the case using a press and the bearing driver set [A].

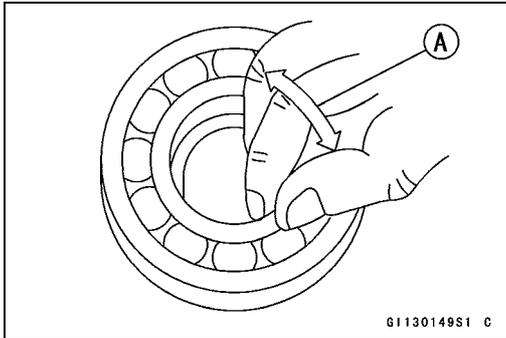
**Special Tool - Bearing Driver Set: 57001-1129**



**Bearing Inspection**

<b>CAUTION</b>
<b>Do not remove the bearings for inspection. Removal may damage them.</b>

- 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.



## 9-34 CRANKSHAFT/TRANSMISSION

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### Bearings/Oil Seals

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- 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.

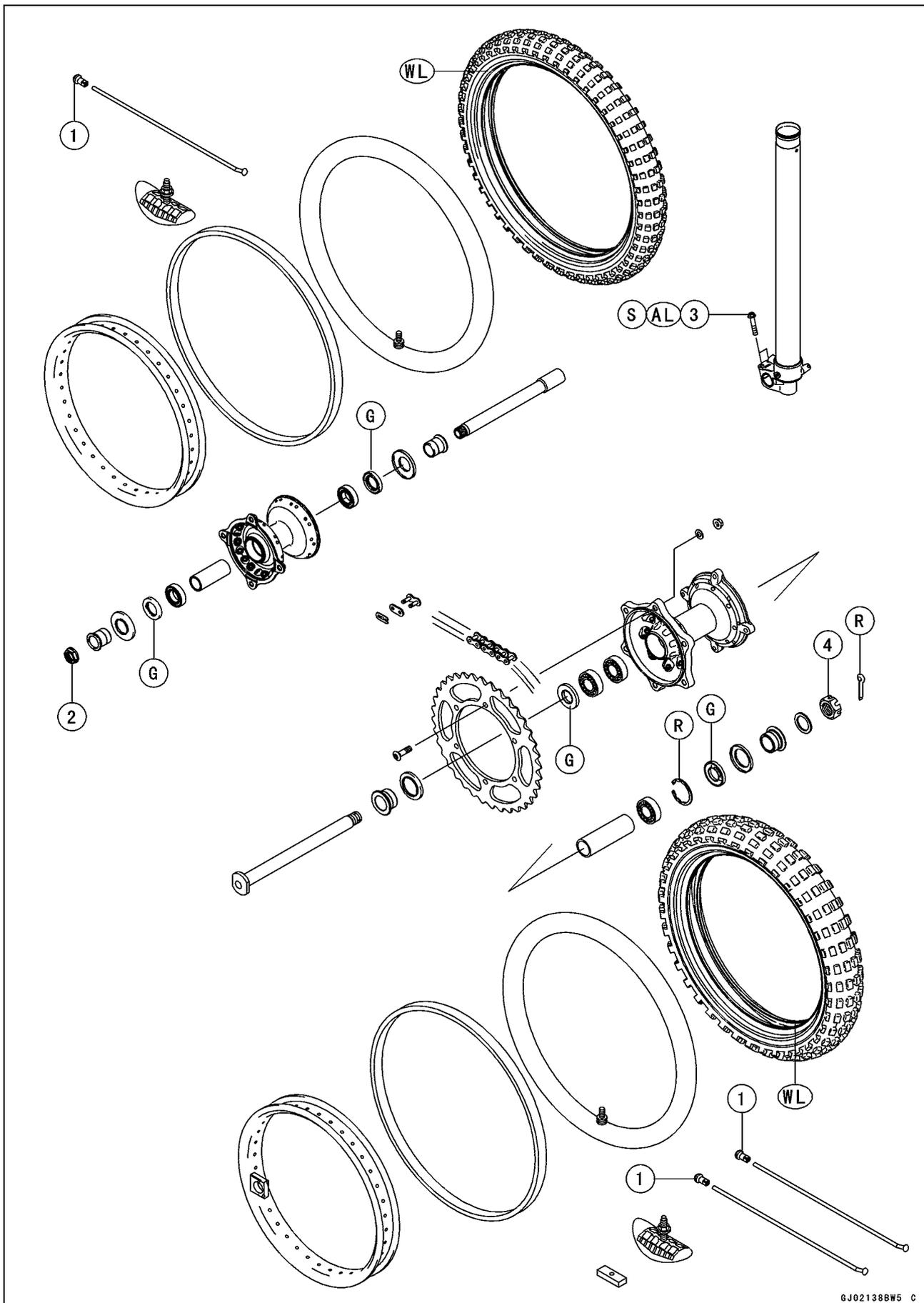
# Wheels/Tires

## Table of Contents

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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	Not less than 2.2	Not less than 0.22	Not less than 19 in·lb	
2	Front Axle Nut	79	8.0	58	
3	Front Axle Clamp Bolts	20	2.0	15	AL, S
4	Rear Axle Nut	110	11.2	81.1	

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

G: Apply grease.

R: Replacement Parts

S: Follow the specific tightening sequence.

WL: Apply soap and water solution, or rubber lubricant.

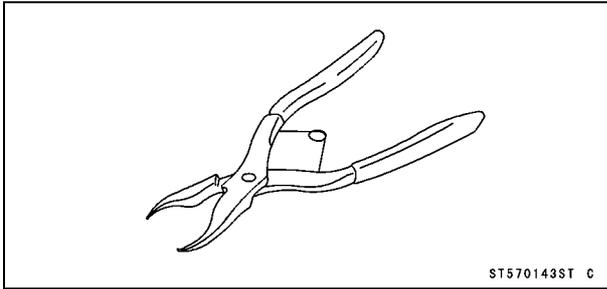
## 10-4 WHEELS/TIRES

### Specifications

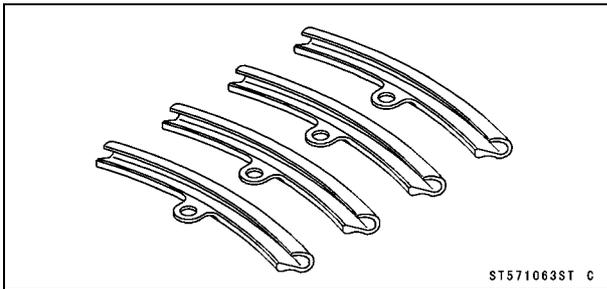
Item	Standard	Service Limit
<b>Wheels (Rims)</b>		
Rim Runout (with tire installed):		
Axial	TIR 1.0 mm (0.039 in.) or less	TIR 2 mm (0.08 in.)
Radial	TIR 1.0 mm (0.039 in.) or less	TIR 2 mm (0.08 in.)
Axle Runout/100 mm (3.94 in.)	TIR 0.1 mm (0.004 in.) or less	TIR 0.2 mm (0.008 in.)
Rim Size:		
Front	21 × 1.60	— — —
Rear	19 × 2.15	— — —
<b>Tires Air Pressure</b>		
Front and Rear	100 kPa (1.0 kgf/cm <sup>2</sup> , 14 psi)	— — —
<b>Tires</b>		
Standard Tire:		
Front:		
Size	90/100-21 57M	— — —
Make	DUNLOP	
Type	D742F, Tube	
Rear:		
Size	120/80-19 63M	— — —
Make	DUNLOP	
Type	D756, Tube	

Special Tools

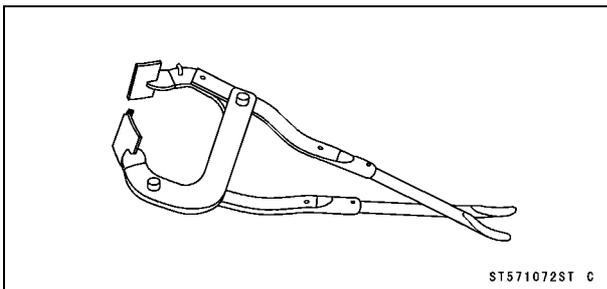
Inside Circlip Pliers:  
57001-143



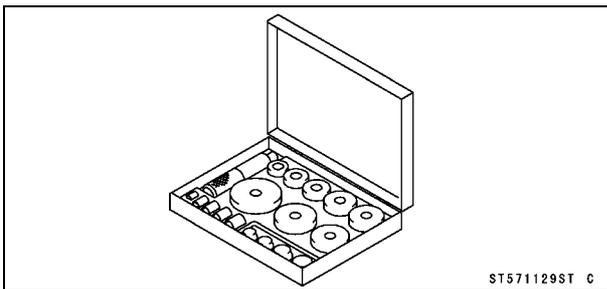
Rim Protector:  
57001-1063



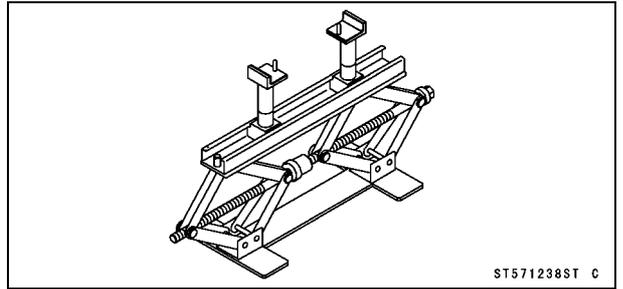
Bead Breaker Assembly:  
57001-1072



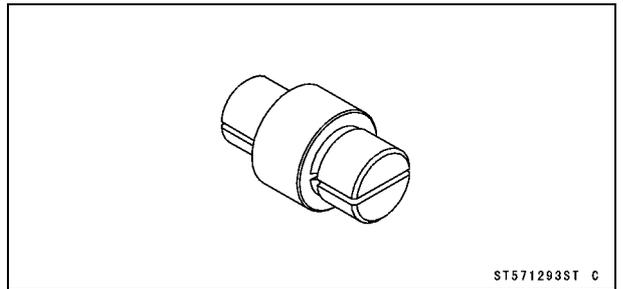
Bearing Driver Set:  
57001-1129



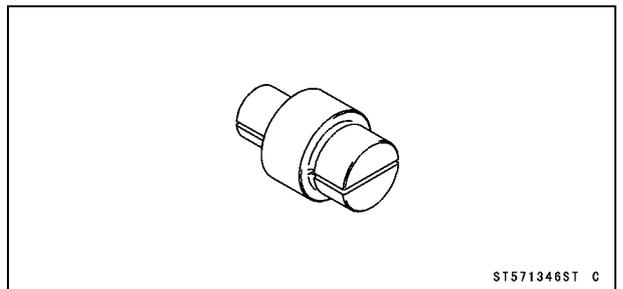
Jack:  
57001-1238



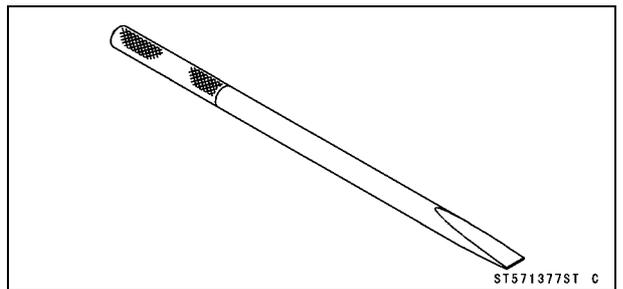
Bearing Remover Head,  $\phi 20 \times \phi 22$ :  
57001-1293



Bearing Remover Head,  $\phi 25 \times \phi 28$ :  
57001-1346



Bearing Remover Shaft,  $\phi 13$ :  
57001-1377



## 10-6 WHEELS/TIRES

### Wheels (Rims)

#### Front Wheel Removal

- Unscrew the axle nut [A].
- Loosen the left and right axle clamp bolts [B].
- Using the jack under the frame, and raise the front wheel off the ground.
- **Special Tool - Jack: 57001-1238**
- Apply the rear brake to rear wheel so that it does not turn.
- Remove the axle [C], and pull out the wheel. Take off the collars and caps [D] from both side of the front hub.

#### CAUTION

**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

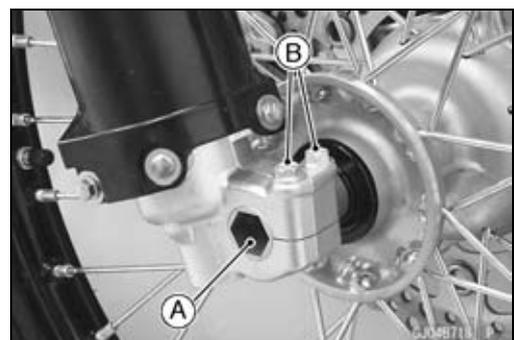
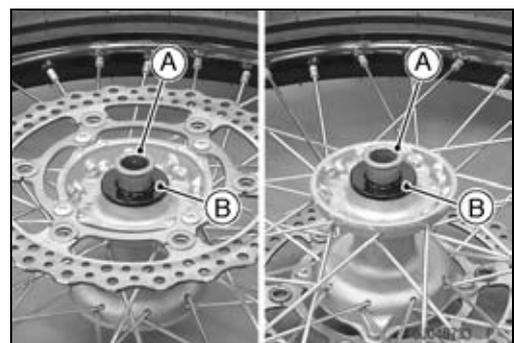
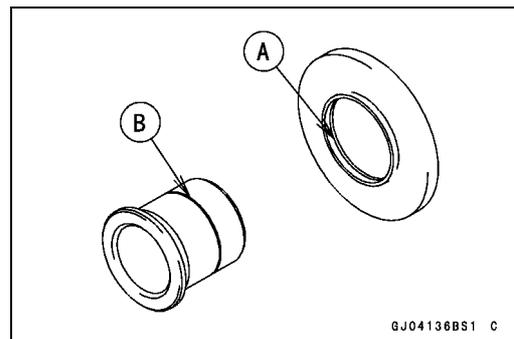
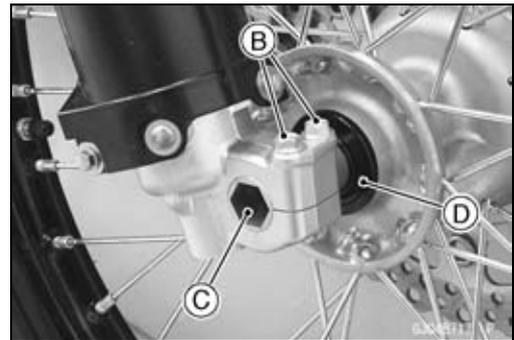
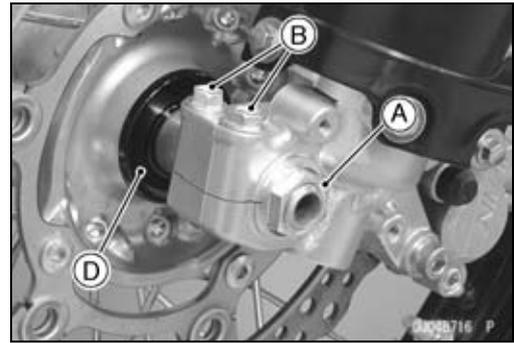
- Insert a wood wedge between the disc brake pads this prevents them from being moved out of their proper position, should the brake lever be squeezed accidentally.

#### Front Wheel Installation

- Fit the projection [A] on the cap to the groove [B] on the collar.

- Apply grease to the grease seal lips of the front hub.
- Install the collars [A] and caps [B] on the left and right side of the hub.

- Insert the axle [A] from right side until it stops at the bottom.
- Tighten the right axle clamp bolts [B] temporarily.



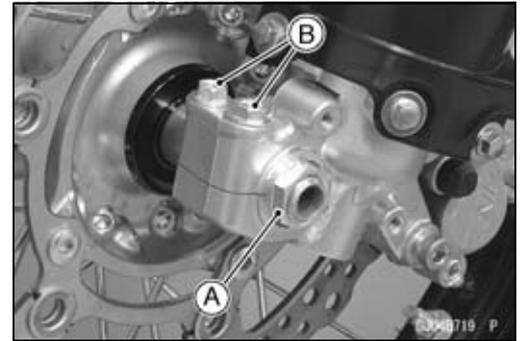
## Wheels (Rims)

- Tighten the axle nut [A].
- Tighten the left axle clamp bolts [B].

**Torque - Front Axle Nut: 79 N·m (8.0 kgf·m, 58 ft·lb)**  
**Left Front Axle Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

### NOTE

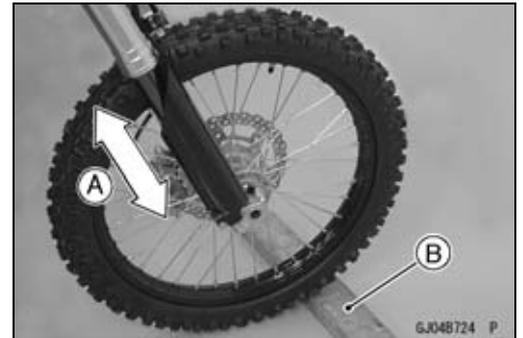
○ Tighten the two clamp bolts alternately two times to ensure even tightening torque.



- Loosen the right front axle clamp bolts.
- Remove the jack.
- Before tightening the right clamp bolts on the right fork leg, pump the forks up and down [A] 4 or 5 times to allow the right fork leg to find a neutral position on the front axle.

### NOTE

○ Do not apply the front brake during this process to stop the motorcycle from rolling forward. Put a block [B] in front of the wheel to stop it from moving.



- Check the right and left front forks are parallel.

**Torque - Right 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.

- Check the front brake for good braking power and no brake drag.

### **⚠ WARNING**

Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

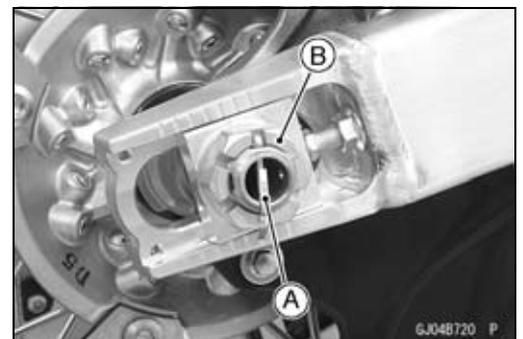
### **Rear Wheel Removal**

- Remove the cotter pin [A] and loosen the rear axle nut [B].
- Raise the rear wheel off the ground with jack.

### **⚠ WARNING**

Be sure to put the front wheel on the ground when removing the rear wheel the motorcycle may fall over. It cause an accident and injury.

Special Tool - Jack: 57001-1238



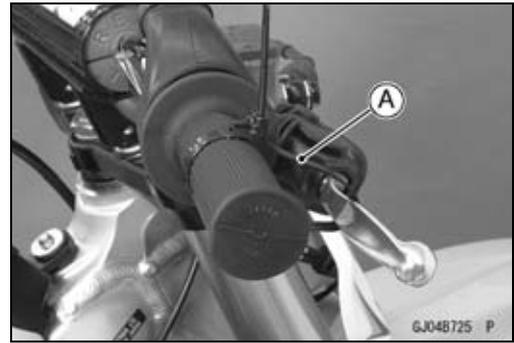
## 10-8 WHEELS/TIRES

### Wheels (Rims)

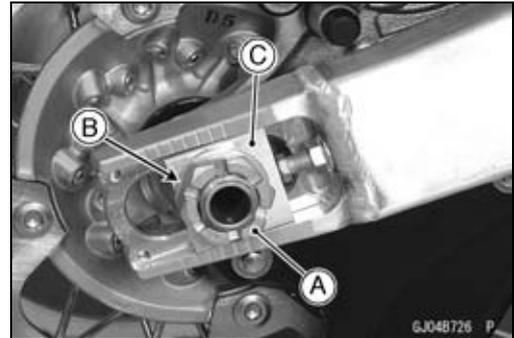
- Squeeze the front brake lever, and hold it with a band [A] to prevent the motorcycle from running forward.

#### **⚠ WARNING**

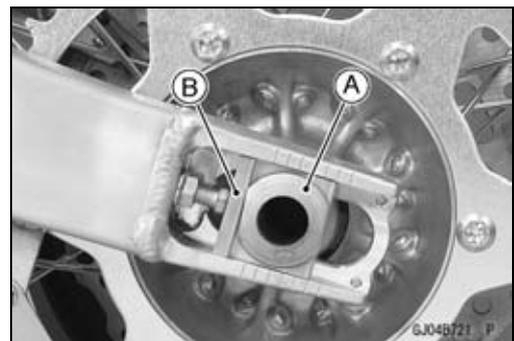
**Be sure to hold the front brake when removing the rear wheel, or the motorcycle may fall over. It could cause an accident and injury.**



- Remove:
  - Rear Axle Nut [A]
  - Washer [B]
  - Adjuster [C]



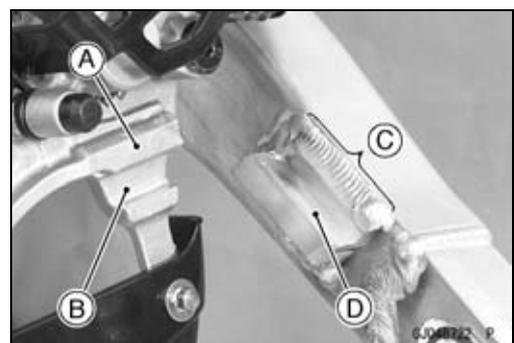
- Pull out the rear axle [A] from the left, and remove the adjuster [B] from the swingarm.
- Disengage the drive chain from the sprocket while lifting up the rear wheel.
- Pull out the rear axle and drop the rear wheel.



- Insert a wood wedge between the brake pads. This prevents them from being moved out of their proper position, should the brake pedal be squeezed accidentally.

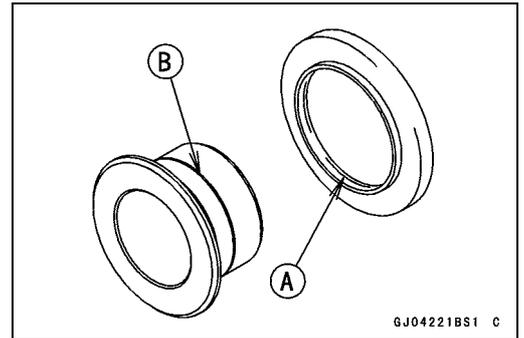
#### **Rear Wheel Installation**

- Fit the brake holder stopper [A] with the stop groove [B] against the swingarm stopper space [C] with the stopper rail [D].

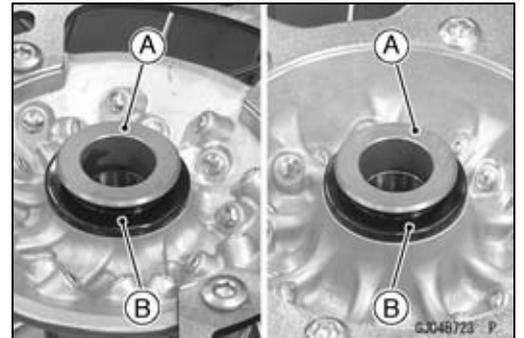


**Wheels (Rims)**

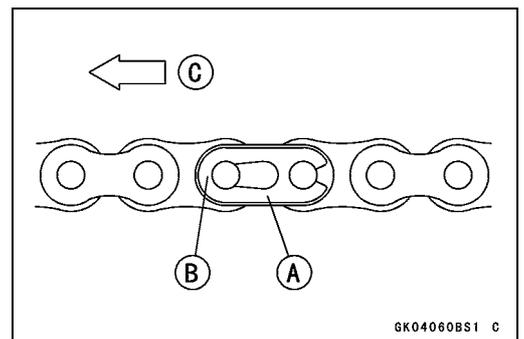
- Fit the projection [A] on the cap to the groove [B] on the collar.
- The collars are identical.



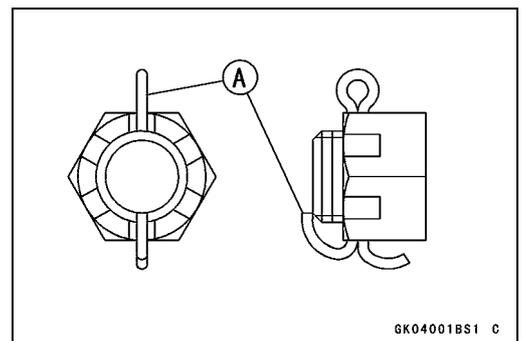
- Apply grease to the grease seal lips of the rear hub.
- Fit the collars [A] and caps [B] on the both sides of the rear hub.



- Engage the joint of the drive chain, and install the master link from the inside.
- Install the master link clip [A] so that the closed end [B] of the "U" points in the direction of chain rotation [C].
- Check the drive chain slack (see Drive Chain Slack in-pection the Periodic Maintenance chapter).



- Tighten:  
**Torque - Rear Axle Nut: 110 N·m (11.2 kg·m, 81.1 ft·lb)**
- Install the new cotter pin [A] and spread its end.



# 10-10 WHEELS/TIRES

## Wheels (Rims)

### NOTE

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

### ⚠ WARNING

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

- Check the rear brake for good braking power and no brake drag.

### ⚠ WARNING

Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.

### Wheels Inspection

- Refer to the Wheel Bearing Inspection in the Periodic Maintenance chapter.

### Spoke Tightness Inspection

- Refer to the Spoke Tightness Inspection in the Periodic Maintenance chapter.

### Rim Runout Inspection

- Refer to the Rim Runout Inspection in the Periodic Maintenance chapter.

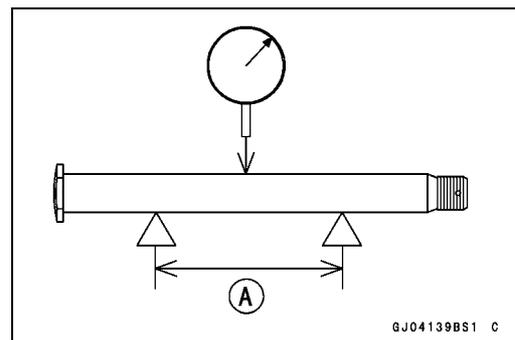
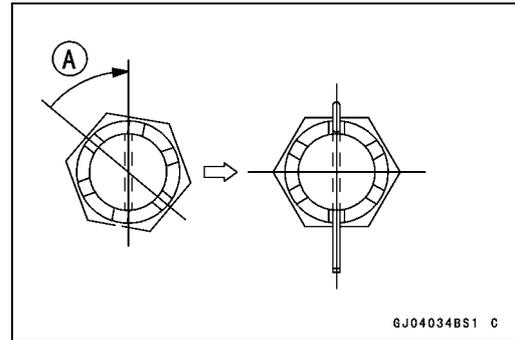
### Axle Inspection

- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle in V blocks that are 100 mm (3.937 in.) [A] apart, and set a dial gauge on the axle at a point halfway between the blocks. Turn the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.
- ★ If the runout exceeds the service limit, replace the axle.

#### Axle Runout/100 mm (3.94 in.)

Standard: TIR 0.1 mm (0.004 in.) or less

Service Limit: TIR 0.2 mm (0.008 in.)



Tires

**Air Pressure Inspection/Adjustment**

- Refer to the Air Pressure Inspection/Adjustment in the Periodic Maintenance chapter.

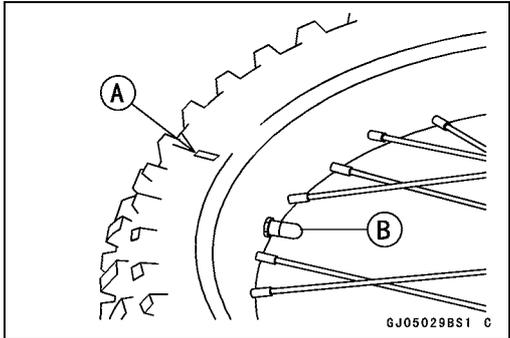
**Tire Removal**

- Remove the wheel from the motorcycle.

**CAUTION**

**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

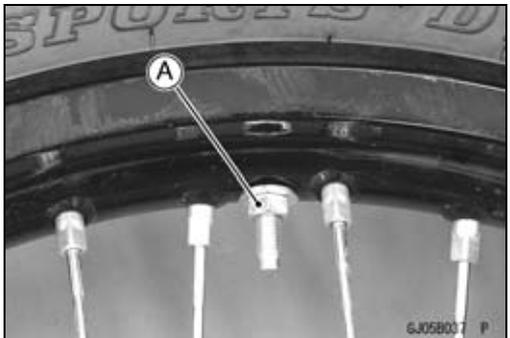
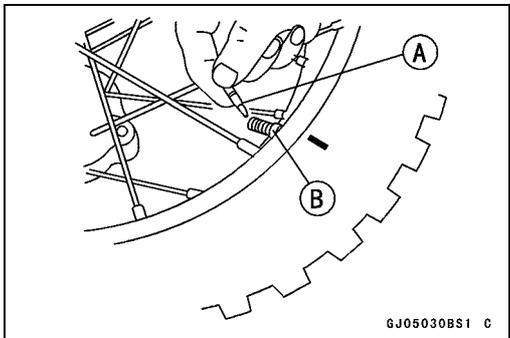
- To maintain front wheel balance, mark [A] the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
- Remove the valve cap [B].
- Take out the valve core [A] to let out the air.
- Remove the valve stem nut [B].



- Remove the bead protector nut [A].
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

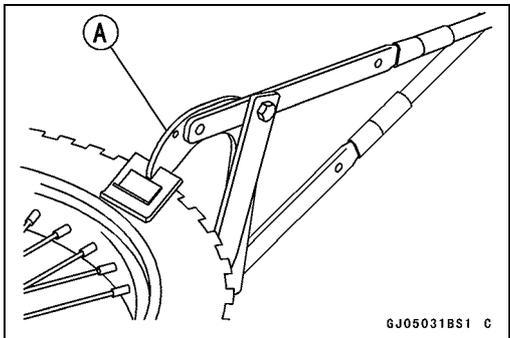
**CAUTION**

**Never lubricate with mineral oil (engine oil) or gasoline because they will cause deterioration of the tire.**



- Break the beads away from both sides of the rim with the bead breaker [A].

**Special Tool - Bead Breaker Assembly: 57001-1072**



## 10-12 WHEELS/TIRES

### Tires

- Step on the side of the tire opposite valve stem, pry the tire off the rim with the tire irons [A] of the bead breaker protecting the rim with rim protectors [B].
- Begin to remove the tire beads from the rim, and completely remove the tire beads that are valve stem of the opposite side, and then remove the tire beads slowly.

#### CAUTION

Take care not to inset the tire irons so deeply that the tube gets damaged.

Special Tools - Rim Protector: 57001-1063

Bead Breaker Assembly: 57001-1072

- Remove the tube.
- Separate the beat stopper.
- Remove the tire beads of the opposite side, and separate the rim from the tire.
- Remove the rim protectors.

### Tire Installation

#### NOTE

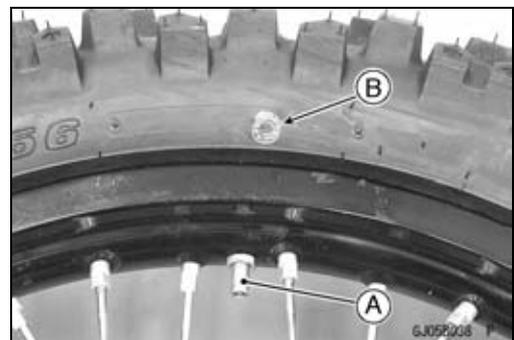
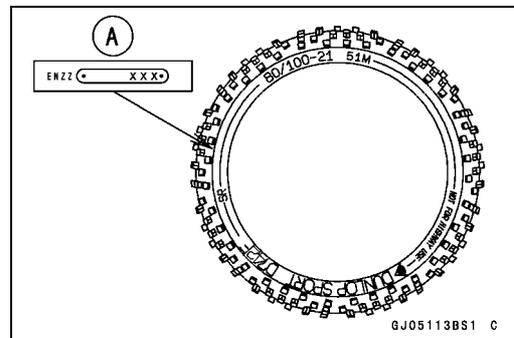
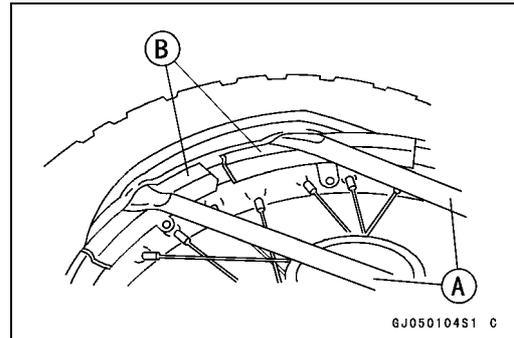
○ The Tires should be installed so that the ID serial NO. [A] faces to left side.

- Inspect the rim and tire, and replace them if necessary.
  - Install the tube band and tube.
  - Apply a soap and water solution, or rubber lubricant to the rim flange and tire beads.
- 
- When the tire is installed, position the tire on the rim so that the valve stem [A] is at the tire balance mark [B] (marked on the tire with chalk the yellow paint mark on a new tire).
  - Insert the valve stem into the rim, and screw the nut on loosely.
  - Fit the rim protectors and use tire irons to install the tire bead.

#### NOTE

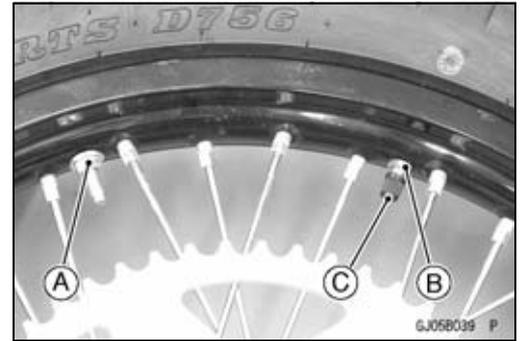
○ To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.

- Pry one side of the tire back onto the rim. Fit the bead protector into the tire.
- Pry the other side of the tire onto the rim, starting at the side opposite the valve.
- Take care not to insert the tire irons so deeply that the tube is damaged.
- Install the other side of the tire bead onto the rim in the same manner.
- Check that the tube is not pinched between the tire and rim.



### Tires

- Tighten the bead protector nut [A] and valve stem nut [B], and put on the valve cap [C].
- Check and adjust the air pressure after installing.

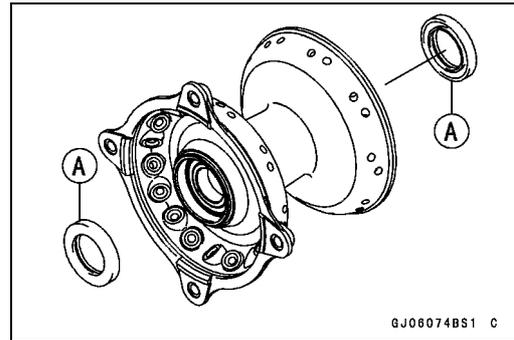


# 10-14 WHEELS/TIRES

## Hub Bearing

### Front Hub Bearing Removal

- Remove  
Front Wheel (see Front Wheel Removal)  
Grease Seals [A]

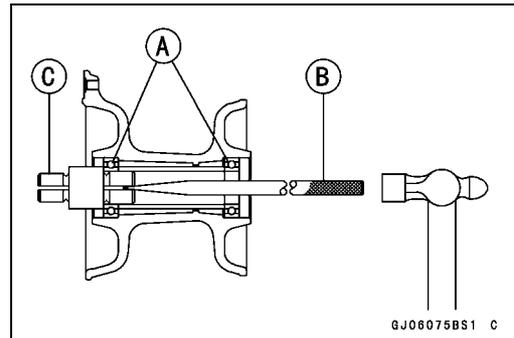


- Use the bearing remover to remove the hub bearings [A].

### CAUTION

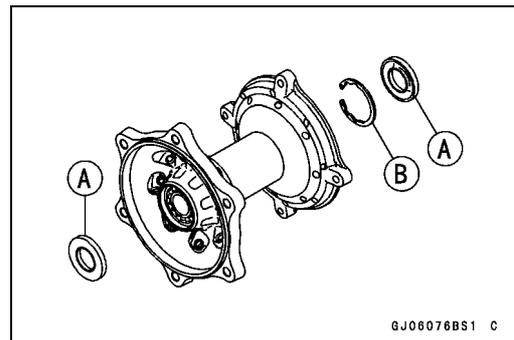
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.

- Special Tools - Bearing Remover Shaft,  $\phi 13$ : 57001-1377 [B]  
Bearing Remover Head,  $\phi 20 \times \phi 22$  [C]: 57001-1293



### Rear Hub Bearing Removal

- Remove  
Rear Wheel (see Rear Wheel Removal)  
Grease Seals [A]  
Circlip [B]
- Special Tool - Inside Circlip Pliers: 57001-143



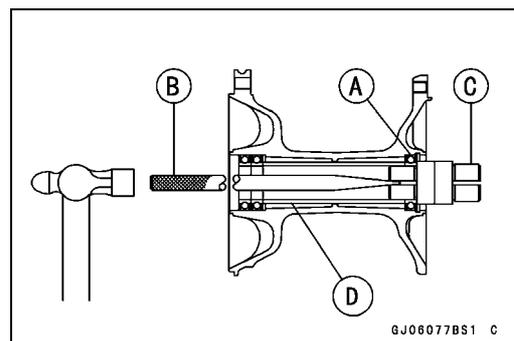
- Use the bearing remover to remove the right hub bearing [A].

### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.

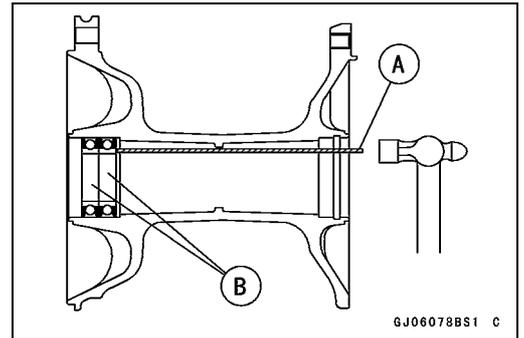
- Special Tools - Bearing Remover Shaft,  $\phi 13$ : 57001-1377 [B]  
Bearing Remover Head,  $\phi 25 \times \phi 28$ : 57001-1346 [C]

- Remove the collar [D].



## Hub Bearing

- Using a suitable bar [A], tap the around of the bearing inner race evenly to remove the bearings [B].



### 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.

#### NOTE

○ Install the bearings so that the marked side or sealed side faces out.

- 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 front 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.

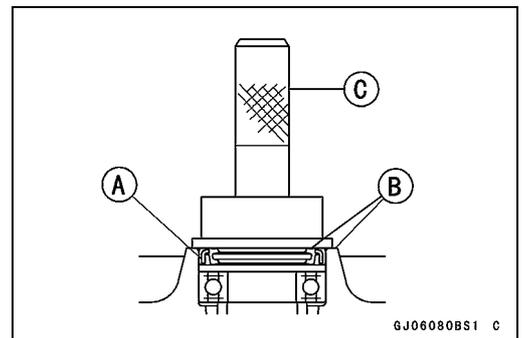
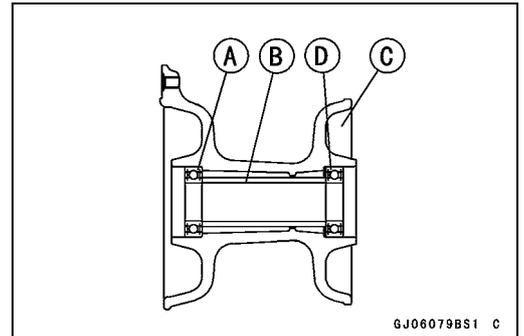
**Special Tool - Bearing Driver Set: 57001-1129**

- Replace the circlips with a new one.

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

- Replace the grease seal [A] with a new one.
- Press in the grease seal so that the seal surface is flush [B] with the end of the hole.
- Apply grease to the grease seal lip.

**Special Tool - Bearing Driver set: 57001-1129 [C]**



## 10-16 WHEELS/TIRES

### Hub Bearing

#### **Hub Bearing Inspection**

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

#### **NOTE**

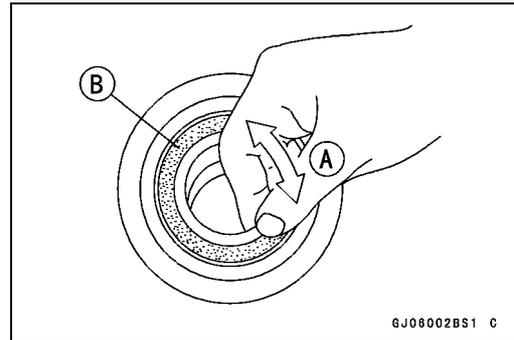
○Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.

- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.

#### **Hub Bearing Lubrication**

#### **NOTE**

○Since the hub bearings are packed with grease and sealed, lubrication is not required.



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# Final Drive

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**Exploded View**


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No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Rear Sprocket Nuts	34	3.5	25	
2	Engine Sprocket Nut	70	7.1	52	
3	Engine Sprocket Cover Bolts	9.8	1.0	87 in-lb	

G: Apply grease.

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 11-4 FINAL DRIVE

### Specifications

Item	Standard	Service Limit
<b>Drive Chain</b>		
Chain Slack	52 ~ 58 mm (2.0 ~ 2.3 in.)	— — —
Chain 20-link Length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	DAIDO	— — —
Type	DID 520DMA2	— — —
Length	114 Links	— — —
<b>Sprocket</b>		
Rear Sprocket Warp	0.4 mm (0.016 in.) or less	0.5 mm (0.020 in.)

## Drive Chain

### **Drive Chain Slack Inspection**

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

### **Drive Chain Slack Adjustment**

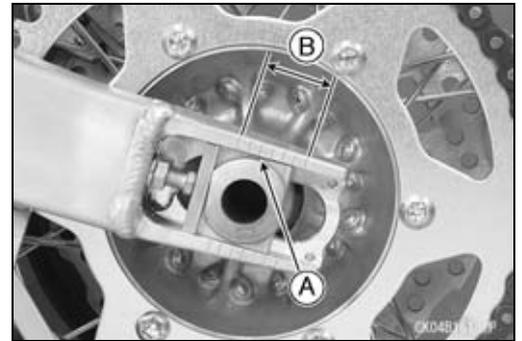
- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

### **Wheel Alignment Inspection**

- Check that the rear end [A] of the left chain adjuster aligns with the same swing arm mark [B] as the right chain adjuster.

### **⚠ WARNING**

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



### **Wheel Alignment Adjustment**

- This procedure is the same as Drive Chain Slack Adjustment (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

### **Drive Chain Wear Inspection**

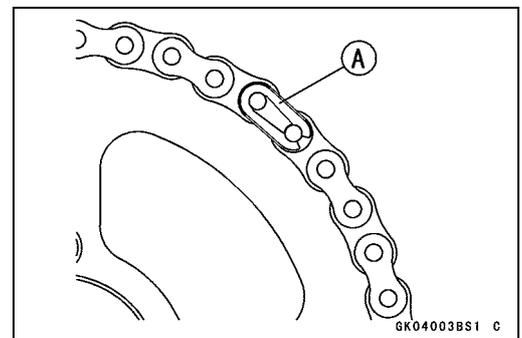
- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

### **Drive Chain Lubrication**

- Refer to the Drive Chain Lubrication in the Periodic Maintenance chapter.

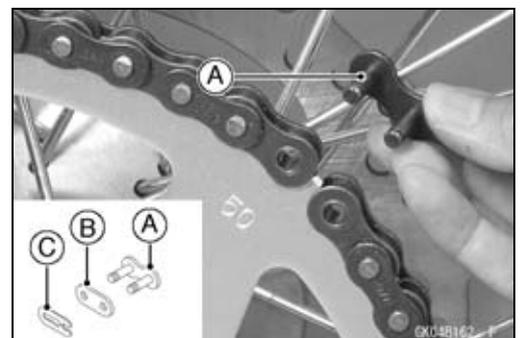
### **Drive Chain Removal**

- Remove the engine sprocket cover (see Engine Sprocket Removal).
- Remove the clip [A] from the master link using pliers, and free the drive chain from the rear sprocket.
- Remove the drive chain from the chassis.



### **Drive Chain Installation**

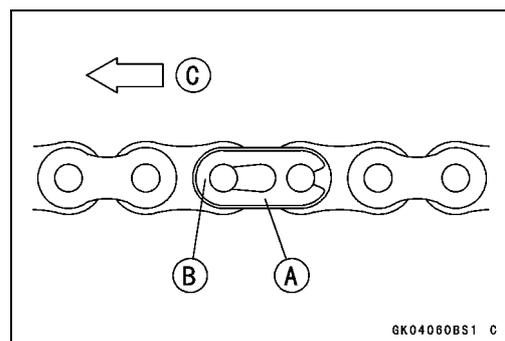
- Fit the drive chain back onto the sprockets with the ends at the rear sprocket.
- Install the master link [A] from the frame side.
- Install the link plate [B] so that the mark faces out.  
Clip [C]



## 11-6 FINAL DRIVE

### Drive Chain

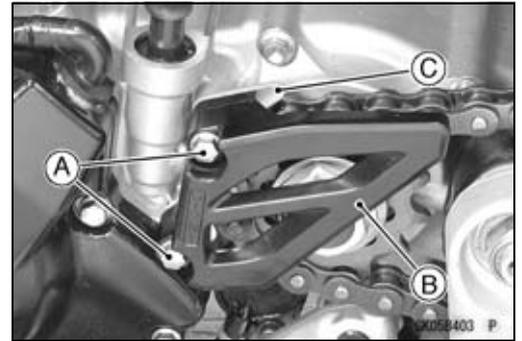
- Install the clip [A] so that the closed end [B] of the "U" pointed in the direction of chain rotation [C].
- Adjust the drive chain slack (see Drive Chain Slack Adjustment).
- Check the rear brake effectiveness.



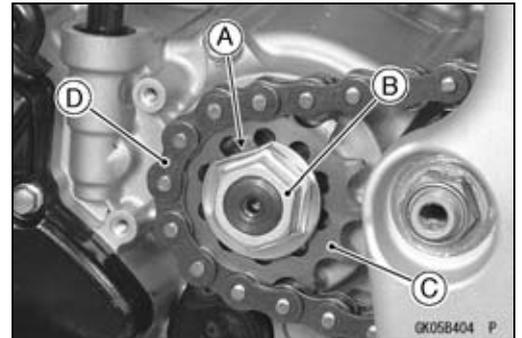
## Sprockets

### Engine Sprocket Removal

- Remove:
  - Engine Sprocket Cover Bolts [A]
  - Engine Sprocket Cover [B]
  - Drive Chain Guide [C]

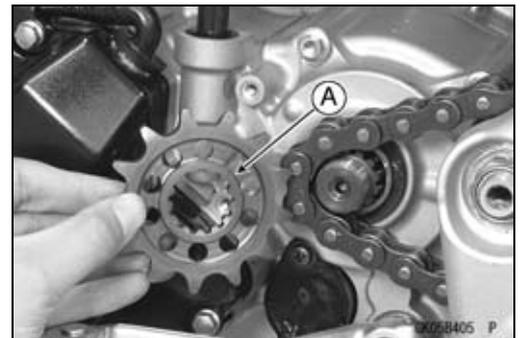


- Flatten the bended sprocket washer [A].
- Remove:
  - Engine Sprocket Nut [B]
  - Washer
- Remove the drive chain [D] from the engine sprocket [C].



### Engine Sprocket Installation

- Install the engine sprocket so that the stepped side faces [A] inside.
- Replace the sprocket washer with a new one.
- Install the sprocket washer and sprocket nut.
  - Torque - Engine Sprocket Nut: 70 N·m (7.1 kgf·m, 52ft·lb)**
- Bend the one side of the sprocket washer on the nut.
- Install the engine sprocket cover.
  - Torque - Engine Sprocket Cover Bolts : 9.8 N·m (1.0 kgf·m, 87 in·lb)**



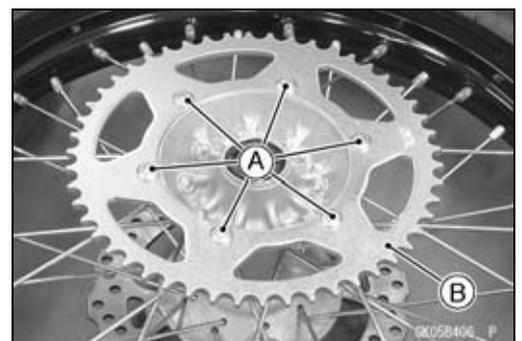
### Rear Sprocket Removal

- Remove the rear wheel (see Rear wheel Removal in the Wheels/Tires chapter).

#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

- Unscrew the rear sprocket bolts [A], and remove the rear sprocket [B].

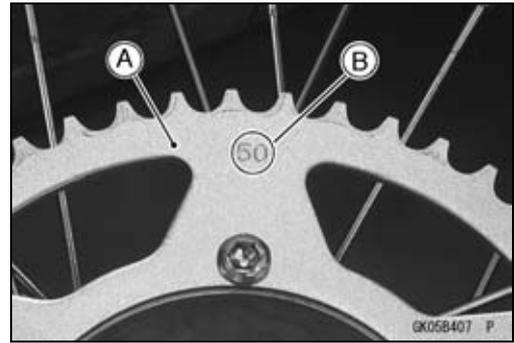


## 11-8 FINAL DRIVE

### Sprockets

#### ***Rear Sprocket Installation***

- Install the rear sprocket [A] so that the marked side [B] faces out.
- Tighten:  
Torque - Rear Sprocket Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)



#### ***Sprocket Wear Inspection***

- Refer to the Sprocket Wear Inspection in the Periodic Maintenance chapter.

#### ***Rear Sprocket Warp Inspection***

- Refer to the Rear Sprocket Warp Inspection in the Periodic Maintenance chapter.

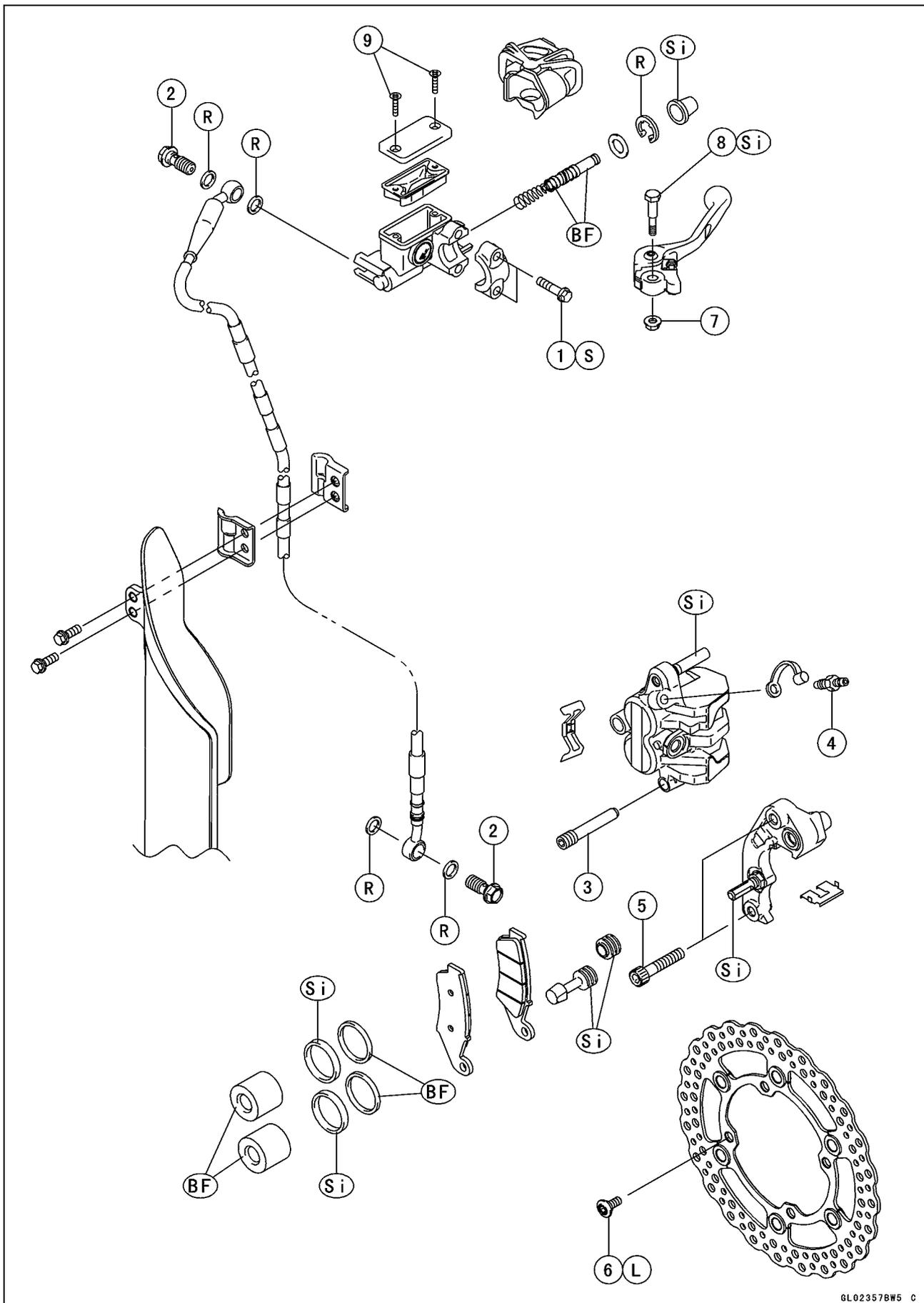
# Brakes

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# 12-2 BRAKES

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Pad Pin	17	1.7	12	
4	Caliper Bleed Valve	7.8	0.80	69 in·lb	
5	Front Caliper Mounting Bolts	25	2.5	18	
6	Front Brake Disc Mounting Bolts	10	1.0	88 in·lb	L
7	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
8	Brake Lever Pivot Bolt	5.9	0.60	52 in·lb	Si
9	Brake Reservoir Cap Screws	1.5	0.15	13 in·lb	

BF: Apply brake fluid.

L: Apply a non-permanent locking agent.

R: Replacement Parts.

S: Follow the specific tightening sequence.

Si: Apply Silicone grease.



## Exploded View

No.	Fastener	Torque			Re- marks
		N-m	kgf-m	ft-lb	
1	Brake Hose Banjo Bolts	25	2.5	18	
2	Rear Master Cylinder Mounting Bolts	10	1.0	88 in-lb	
3	Rear Master Cylinder Push Rod Locknut	17	1.7	12	
4	Caliper Bleed Valve	7.8	0.80	69 in-lb	
5	Brake Pad Pin	17	1.7	12	
6	Rear Brake Pad Pin Plug	2.5	0.25	22 in-lb	
7	Rear Caliper Holder Shaft	27	2.8	20	
8	Brake Pedal Bolt	25	2.5	18	L,G
9	Rear Brake Disc Mounting Bolts	23	2.3	17	L
10	Brake Reservoir Cap Bolts	1.5	0.15	13 in-lb	

BF: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

Si: Apply Silicone grease.

## 12-6 BRAKES

### Specifications

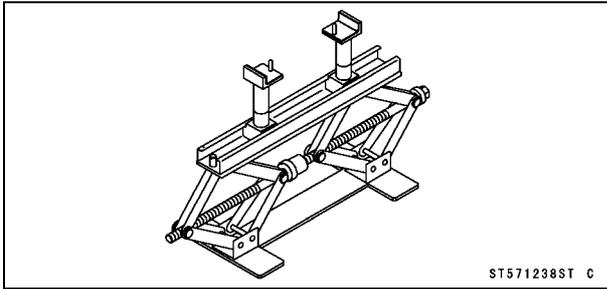
Item	Standard	Service Limit
<b>Brake adjustment</b> Lever Play	Adjustable (to suit rider)	— — —
<b>Brake Fluid</b> Recommended Disc Brake Fluid: Type		— — —
Front	DOT3 or DOT4	— — —
Rear	DOT4	
<b>Brake Pads</b> Lining thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	6.4 mm (0.25 in.)	1 mm (0.04 in.)
<b>Brake Disc</b> Thickness:		
Front	2.85 ~ 3.15 mm (0.112 ~ 0.124 in.)	2.5 mm (0.098 in.)
Rear	3.85 ~ 4.15 mm (0.152 ~ 0.163 in.)	3.5 mm (0.14 in.)
Runout	TIR 0.25 mm (0.0098 in.) or less	TIR 0.3 mm (0.01 in.)

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**Special Tool**

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**Jack:**  
**57001-1238**



## 12-8 BRAKES

### Brake Lever, Brake Pedal

#### **Brake Lever Adjustment**

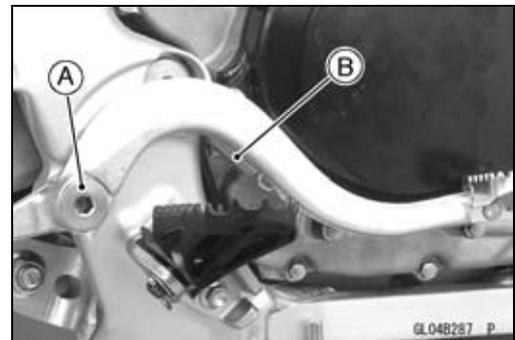
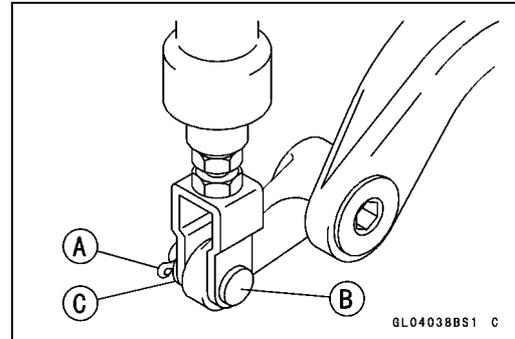
- Refer to the Brake Lever and Pedal Position Adjustment in the Periodic Maintenance chapter.

#### **Brake Pedal Position Adjustment**

- Refer to the Brake Lever and Pedal Position Adjustment in the Periodic Maintenance chapter.

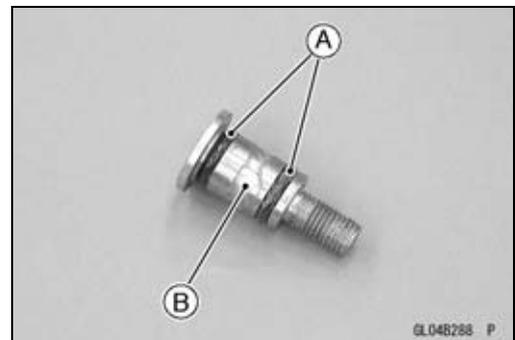
#### **Brake Pedal Removal**

- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]
  - Washer [C]
- Remove the mounting bolt [A] and take off the brake pedal [B] and return spring.



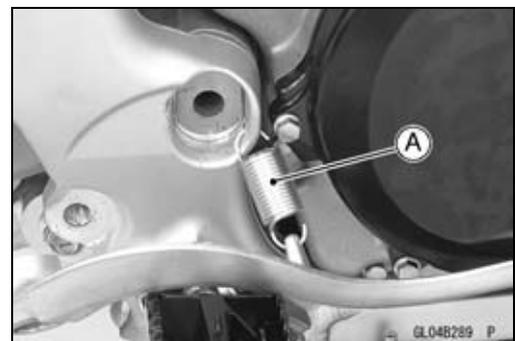
#### **Brake Pedal Installation**

- Replace the O-rings [A] with new one and apply grease to the O-rings.
- Apply grease to the shaft portion [B] and a non-permanent locking agent to the thread of the brake pedal bolt, and install the pedal with return spring onto the frame.



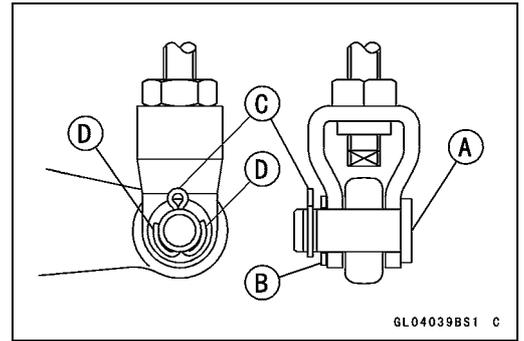
○ Install the return spring direction [A] as shown.

**Torque - Brake Pedal Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**



**Brake Lever, Brake Pedal**

- Install the joint pin [A], washer [B] and a new cotter pin [C].
- Bend the ends [D] of the cotter pin.
- Adjust the brake pedal position (see Brake Lever and Pedal Position Adjustment in the Periodic Maintenance chapter).



## 12-10 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.**

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

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

#### ***Fluid Change***

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

## Brake Fluid

### ***Bleeding the Brake Line***

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

#### **⚠ WARNING**

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

#### **NOTE**

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

- Remove the reservoir cap and diaphragm, and then fill the reservoir with brake fluid to the upper level line [A] in the reservoir.

#### **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 almost out any time during bleeding operation, the bleeding operation must be done over again from the beginning since air will have entered the line.*

- With the reservoir cap off, slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. Bleed the air completely from the master cylinder by this operation.

#### **NOTE**

○ *Tap the brake hose lightly from the caliper to the reservoir for easier bleeding.*

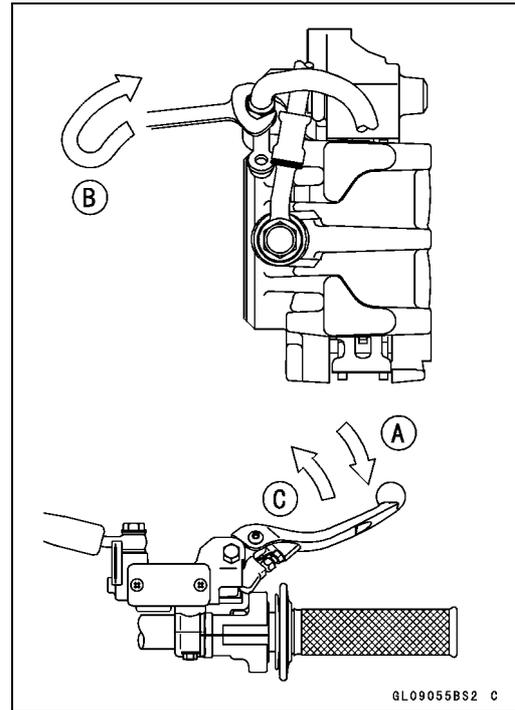
- Install the reservoir cap.
- Attach a clear plastic hose [A] to the bleed valve on the caliper, and run the other end of the hose into a container.



## 12-12 BRAKES

### Brake Fluid

- 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 the bleed valve while holding the brake applied [B].
  - 3. Release the brake [C].
  - Remove the clear plastic hose.
  - Tighten the bleed valves, and install the rubber caps.
- Torque - Caliper Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**



- Hold the master cylinder horizontally, and check the fluid level in the reservoir.
- After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.

#### **⚠ WARNING**

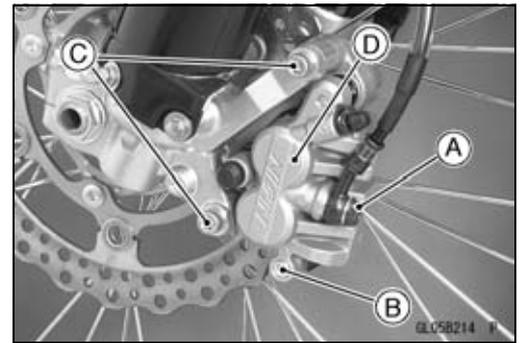
**Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brake will not function on the first application of the lever or pedal if this is not done.**

## Calipers

### Caliper Removal

#### Front Brake

- Loosen the banjo bolt [A] on the caliper side once, and tighten again lightly.
- Loosen the brake pad pin [B] before the caliper removal if the caliper is to be disassembled.
- Remove the caliper mounting bolts [C] and remove the caliper [D] from the disc.
- Remove the banjo bolt and take off the brake hose from the caliper.

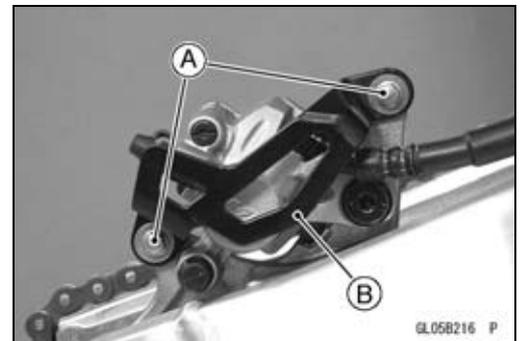


#### NOTE

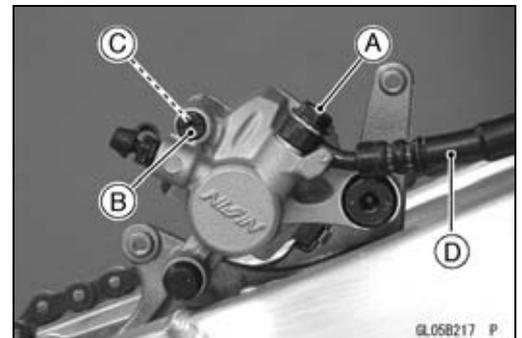
○ If the caliper is to be disassembled after removal and compressed air is not available, disassemble the caliper before brake hose removal (see Brake Caliper Fluid Seal and Dust Seal Replacement in the Periodic Maintenance chapter).

#### Rear Brake

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).
- Remove:
  - Caliper Guard Bolts [A]
  - Caliper Guard [B]



- Loosen the banjo bolt [A] on the caliper side once, and tighten again lightly.
- Remove the brake pad pin plug [B], and loosen the pad pin [C] before the caliper removal if the caliper is to be disassembled.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper.



#### CAUTION

Immediately wipe up any brake fluid that is spilled.

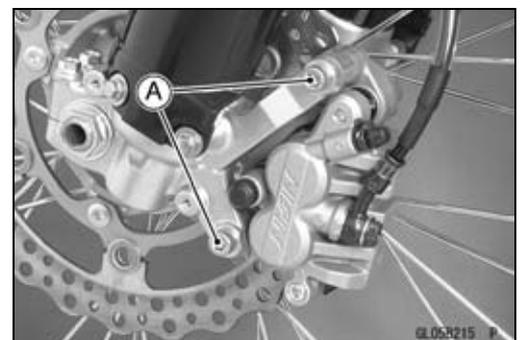
### Caliper Installation

#### Front Brake

- Tighten:
  - Torque - Front Caliper Mounting Bolts [A]: 25 N·m (2.5 kgf·m, 18 ft·lb)

#### Rear Brake

- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).



- Install the brake hose lower end.
- Replace the washers that are on each side of hose fitting with new ones.

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

- Install removed parts (see appropriate chapter).

## 12-14 BRAKES

### Calipers

- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

#### **⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brakes will not function on the first application of the lever or pedal if this is not done.**

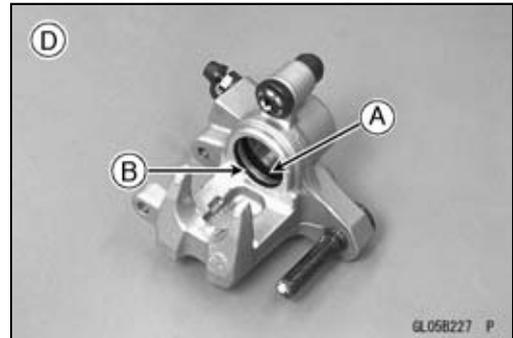
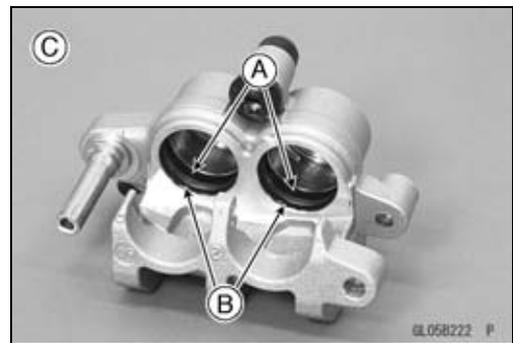
#### **Caliper Disassembly**

- Refer to the Caliper Piston Seal and Dust Seal Replacement in the Periodic Maintenance chapter.

#### **Fluid Seal Damage Inspection**

The fluid seals [A] around the piston maintains the proper pad/disc clearance. If this seal is not in good condition, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

- Replace the fluid seals under any of the following conditions.
    - Fluid leakage around the pad
    - Brakes overheat
    - There is a large difference in left and right pad wear.
    - The seal is stuck to the piston.
  - ★ If the fluid seal is replaced, replace the dust seals [B] as well. Also, replace all seals every other time the pads are changed.
- [C] Front Caliper  
[D] Rear Caliper



#### **Dust Seal Damage Inspection**

- Check that the dust seals are not cracked, worn, swollen, or otherwise damaged.
- ★ If they show any damage, replace them.

## Calipers

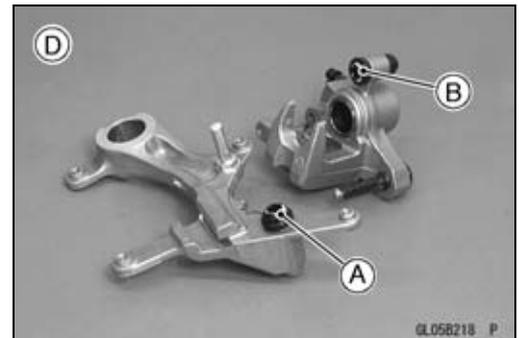
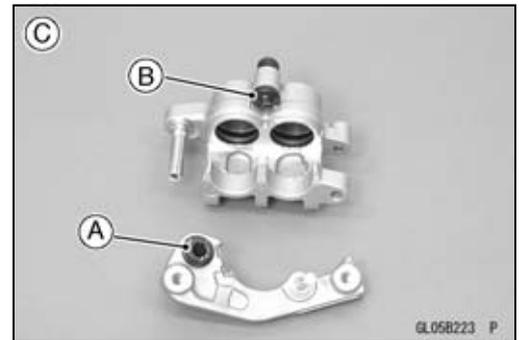
### **Caliper Dust Boot and Friction Boot Damage**

● 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.

[C] Front Caliper

[D] Rear Caliper



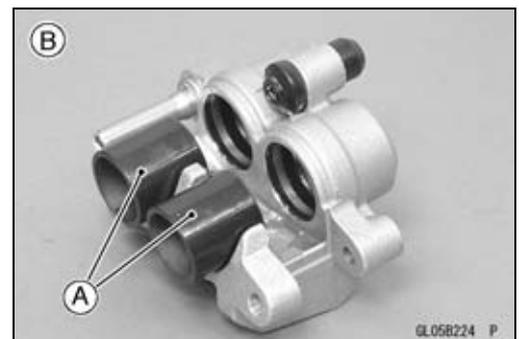
### **Caliper Piston and Cylinder Damage**

● Visually inspect the pistons [A] and cylinder surfaces.

★ Replace the caliper if the cylinder and piston are badly scored or rusty.

[B] Front Caliper

[C] Rear Caliper



## 12-16 BRAKES

### Calipers

#### **Caliper Holder Shaft Wear**

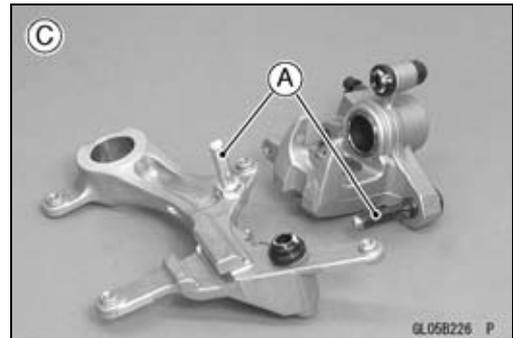
The caliper body must slide smoothly on the caliper holder shafts [A]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

- 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 damage, replace the caliper assembly (front caliper), caliper bracket or holder shaft (rear caliper).

**Torque - Rear Caliper Holder Shaft: 27 N·m (2.8 kgf·m, 20 ft·lb)**

[B] Front Caliper

[C] Rear Caliper

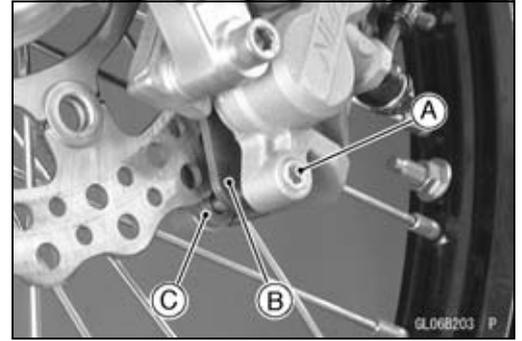


## Brake Pad

### Brake Pad Removal

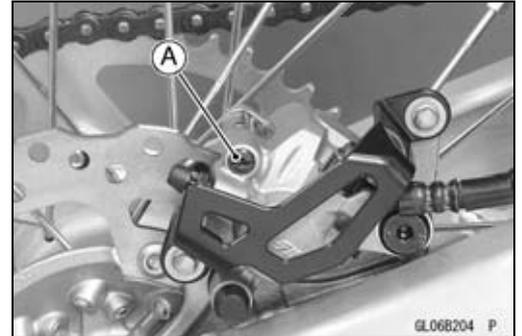
#### Front Brake

- Unscrew the pad pin [A].
- Take the piston side pad [B].
- Remove another pad [C] from the caliper holder.

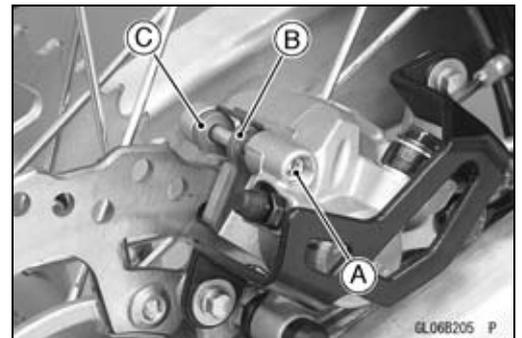


#### Rear Brake

- Remove:  
Pad Pin Plug [A]

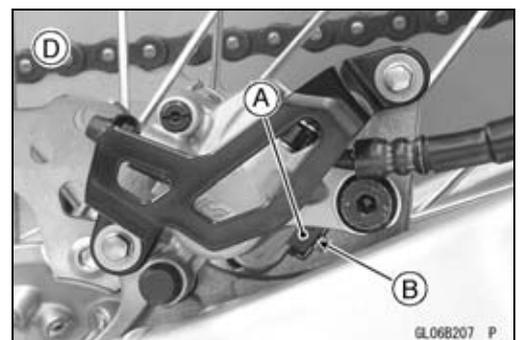
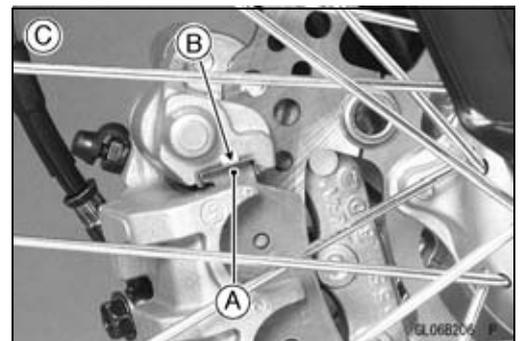


- Unscrew the pad pin [A].
- Take the piston side pad [B].
- Remove another pad [C] from the caliper holder.



### Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install the piston side pad first, and then another pad.
- Fit the pad end [A] into the groove [B] of the anti-rattle spring securely.
  - [C] Front Brake
  - [D] Rear Brake
- Tighten:
  - Torque - Brake Pad Pin: 17 N·m (1.7 kgf·m, 12 ft·lb)
  - Rear Brake Pad Pin Plug: 2.5 N·m (0.25 kgf·m, 22 in·lb)
- Check the brake for good braking power, no brake drag, and no fluid leakage.



### ⚠ WARNING

Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brake will not function on the first application of the lever or pedal if this is not done.

### Brake Pad Inspection

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

## 12-18 BRAKES

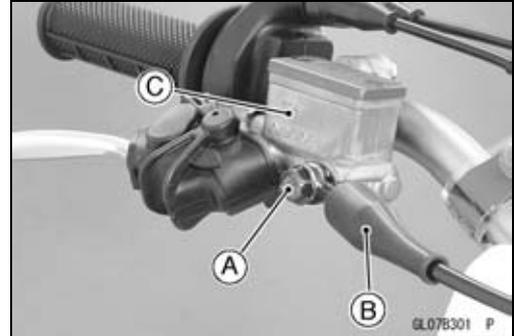
### Master Cylinder

#### CAUTION

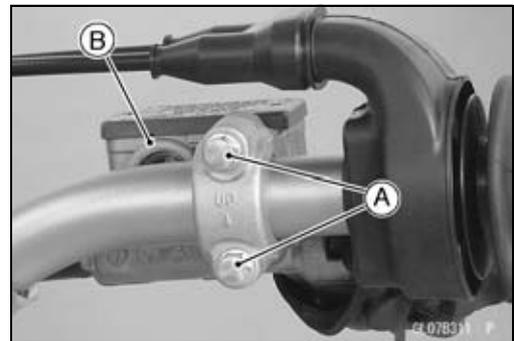
Brake fluid quickly ruins painted or plastic surfaces; any spilled fluid should be completely wiped up immediately.

#### Front Master Cylinder Removal

- Remove the banjo bolt [A] to disconnect the upper brake hose [B] from the master cylinder [C].
- When removing the brake hose, temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.

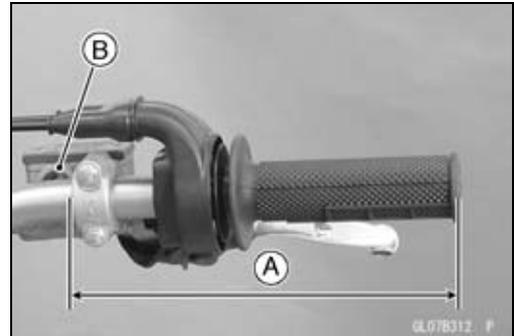


- Unscrew the clamp bolts [A], and take off the master cylinder [B] as an assembly with the brake lever.



#### Front Master Cylinder Installation

- Install the master cylinder so that the reservoir cap [B] is horizontally and position it from edge of the grip to 185 mm (7.28 in.) [A].



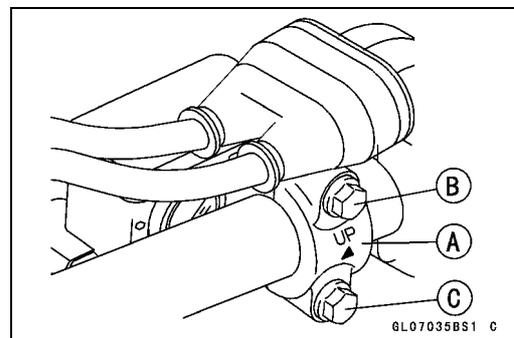
- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C]. There will be a gap at the lower part of the clamp after tightening.

**Torque - Front Master Cylinder Clamp Bolts: 8.8 N-m (0.90 kgf-m, 78 in-lb)**

- Replace the washers that are on each side of hose fitting with new ones.
- Tighten:

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

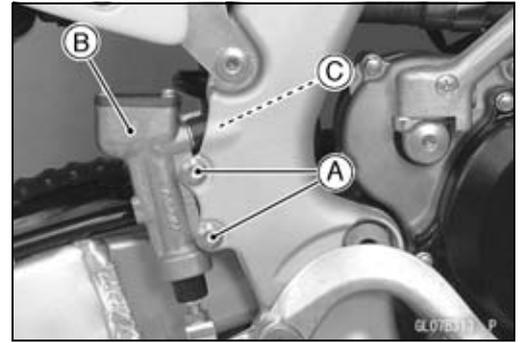
- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.



## Master Cylinder

### **Rear Master Cylinder Removal**

- Remove the brake pedal joint pin (see Brake Pedal Removal).
- Unscrew the master cylinder mounting bolts [A], and remove the master cylinder [B] backward.
- Unscrew the brake hose banjo bolt [C].
- When removing the brake hose, temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.



### **Rear Master Cylinder Installation**

- Replace the cotter pin with a new one.
- Replace the washers on each side of hose fitting with new ones.
- Tighten:
  - Torque - Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Rear Master Cylinder Mounting Bolts: 10 N·m (1.0 kgf·m, 88 in·lb)**
- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.
- Check the brake pedal position (see Brake Lever and Pedal Position Adjustment in the Periodic Maintenance chapter).

### **Front Master Cylinder Disassembly**

- Refer to the Brake Master Cylinder Cup and Dust Cover Replacement in the Periodic Maintenance chapter.

### **Rear Master Cylinder Disassembly**

- Refer to the Brake Master Cylinder Cup and Dust Cover Replacement in the Periodic Maintenance chapter.

### **Master Cylinder Assembly**

- Refer to the Brake Master Cylinder Cup and Dust Cover Replacement in the Periodic Maintenance chapter.

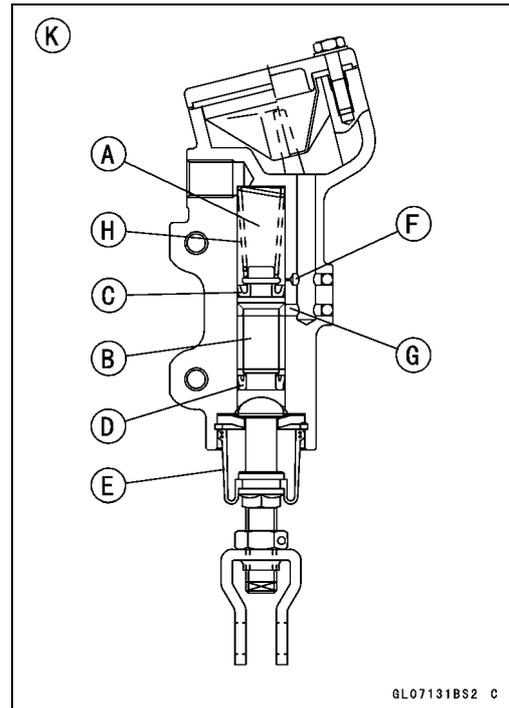
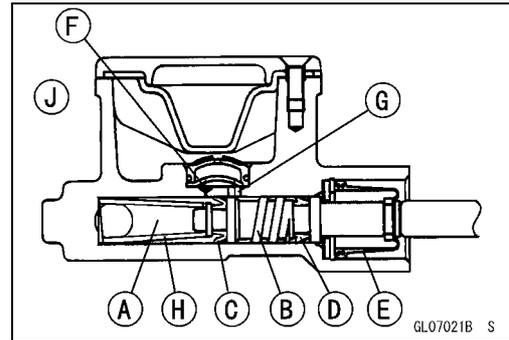
## 12-20 BRAKES

### Master Cylinder

#### **Master Cylinder Inspection (Visual Inspection)**

- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall of each master cylinder [A] and on the outside of each piston [B].
- ★ If a master cylinder or piston shows any damage, replace them.
- Inspect the primary [C] and secondary [D] cups.
- ★ 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 cup.
- Check the dust covers [E] for damage.
- ★ If they are damaged, replace them.
- Check that the relief [F] and supply [G] ports are not plugged.
- ★ If the small relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.
- Check the piston return springs [H] for any damage.
- ★ If a spring is damaged, replace it.

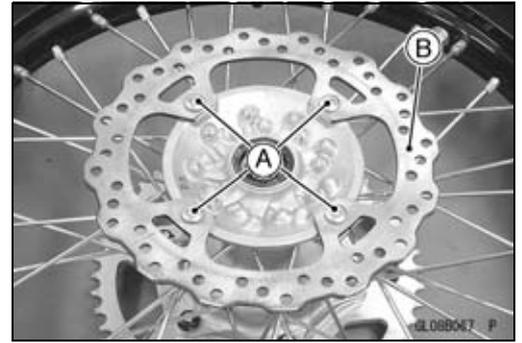
[J] Front Master Cylinder  
[K] Rear Master Cylinder



## 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 [B].

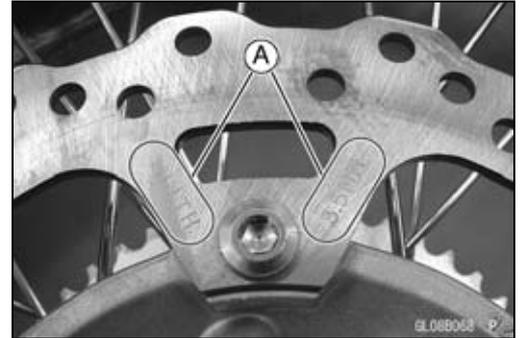


### Brake Disc Installation

- Install the brake disc on the wheel so that the marked side [A] faces out.
- Apply a non-permanent locking agent to the brake disc mounting bolts.
- Tighten:

**Torque - Front Brake Disc Mounting Bolts:** 10 N·m (1.0 kgf·m, 88 in·lb)

**Rear Brake Disc Mounting Bolts:** 23 N·m (2.3 kgf·m, 17 ft·lb)



### Brake Disc Inspection

- Visually inspect the disc [A].
- ★ If it is scratched or damaged, replace the disc.
- Measure the thickness of each disc at the point [B] where it has worn the most.
- ★ Replace the disc if it has worn past the service limit.

#### Thickness

##### Standard:

**Front** 2.85 ~ 3.15 mm (0.112 ~ 0.124 in.)

**Rear** 3.85 ~ 4.15 mm (0.152 ~ 0.163 in.)

##### Service Limit:

**Front** 2.5 mm (0.098 in.)

**Rear** 3.5 mm (0.14 in.)

**Torque - Front Brake Disc Mounting Bolts:** 10 N·m (1.0 kgf·m, 88 in·lb)

**Rear Brake Disc Mounting Bolts:** 23 N·m (2.3 kgf·m, 17 ft·lb)

- Place a jack under the motorcycle so that the front/rear wheel is raised off the ground.

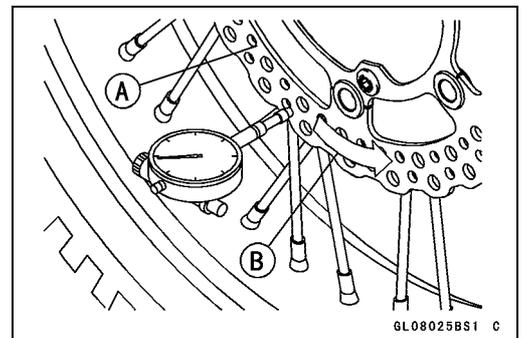
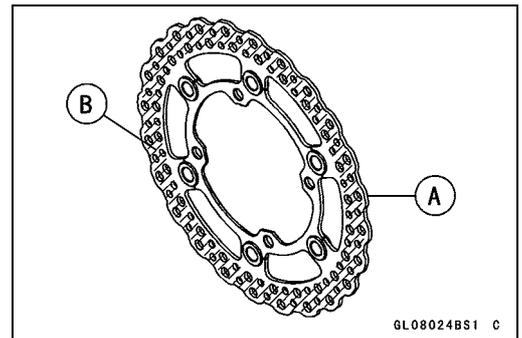
#### Special Tool - Jack: 57001-1238

- Set up a dial gauge against the disc [A] as illustrated.
- For the front disc, turn the handlebar fully to one side.
- Measure the disc runout while rotating the wheel slowly [B].
- ★ If the runout exceeds the service limit, replace the disc.

#### Runout

**Standard:** TIR 0.25 mm (0.0098 in.) or less

**Service Limit:** TIR 0.3 mm (0.01 in.)



## 12-22 BRAKES

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### Brake Hose

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#### ***Brake Hose Removal/Installation***

- Refer to the Brake Hose Replacement in the Periodic Maintenance chapter.

#### ***Brake Hose Inspection***

- Refer to the Brake Hoses and Connections Inspection in the Periodic Maintenance chapter.

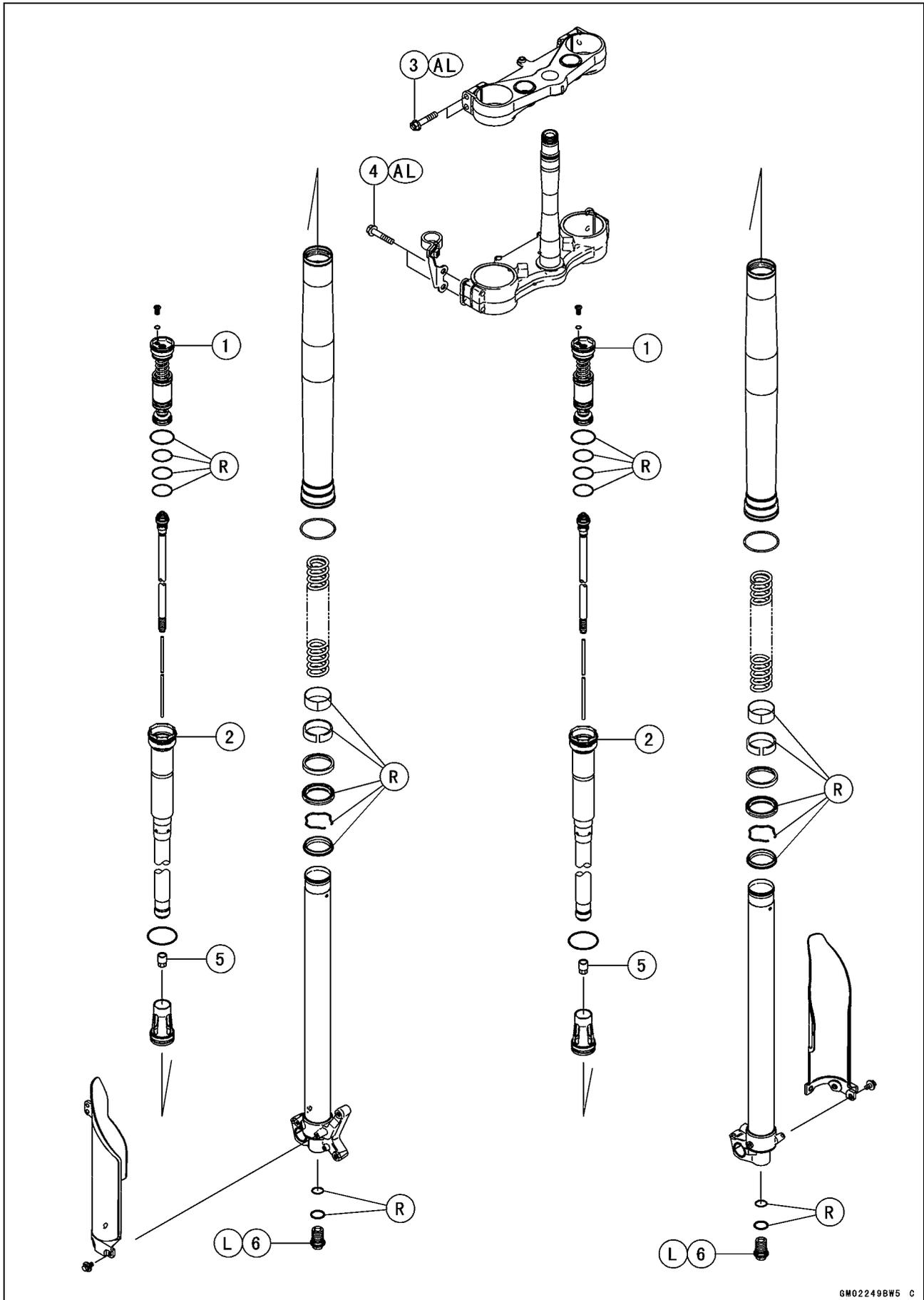
# Suspension

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# 13-2 SUSPENSION

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Base Valve Assembly	28	2.9	21	
2	Front Fork Top Plugs	30	3.1	22	
3	Upper Front Fork Clamp Bolts	20	2.0	15	AL
4	Lower Front Fork Clamp Bolts	20	2.0	15	AL
5	Adjuster Assembly Locknut	28	2.9	22	
6	Adjuster Assembly	55	5.6	40	L

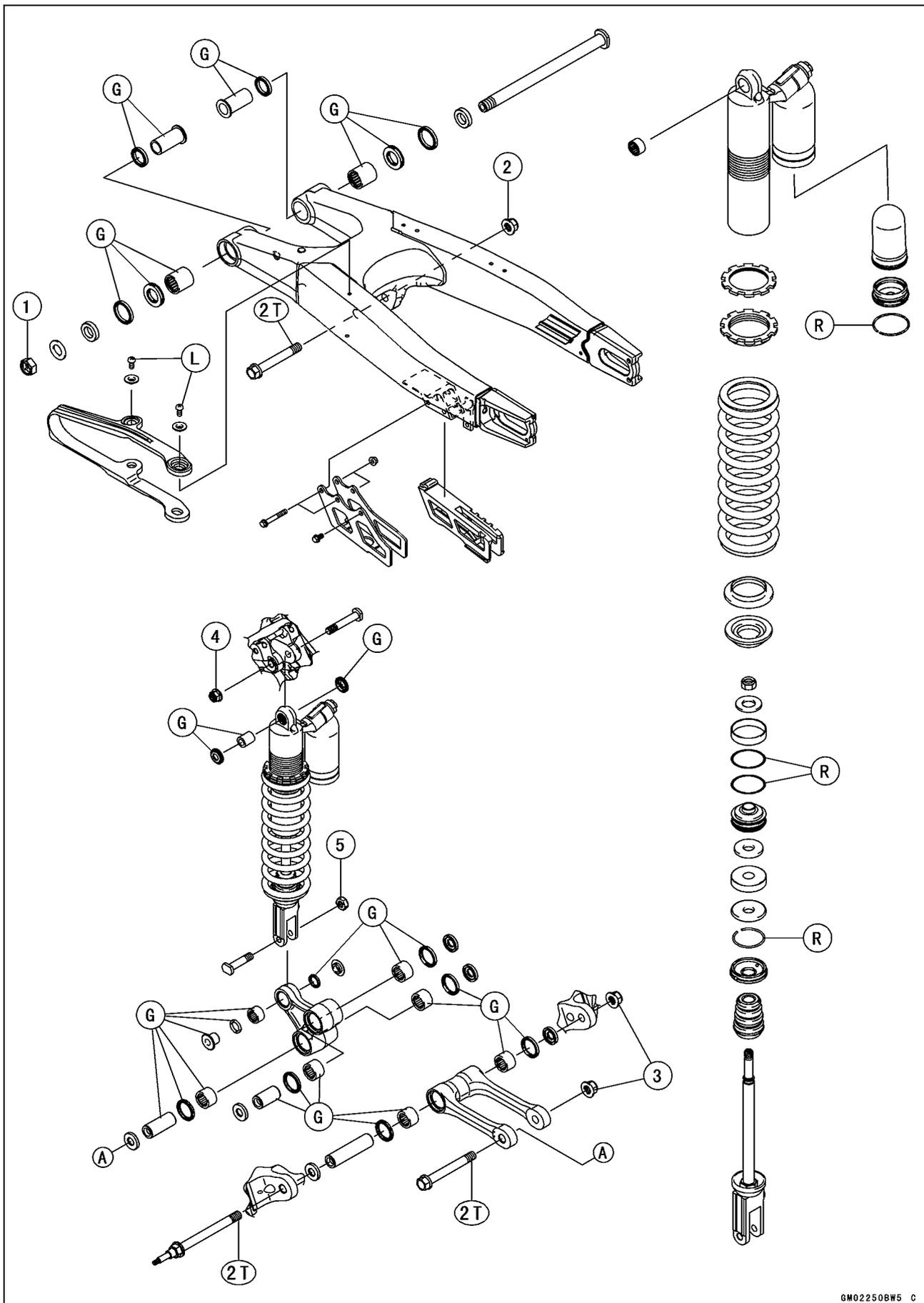
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.

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

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	Swingarm Pivot Shaft Nut	98	10	72	
2	Rocker Arm Pivot Nut	59	6.0	44	
3	Tie-rod Mounting Nuts	59	6.0	44	
4	Upper Rear Shock Absorber Mounting Nut	39	4.0	29	
5	Lower Rear Shock Absorber Mounting Nut	34	3.5	25	

2T: Apply 2-stroke oil.

G: Apply grease

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 13-6 SUSPENSION

### Specifications

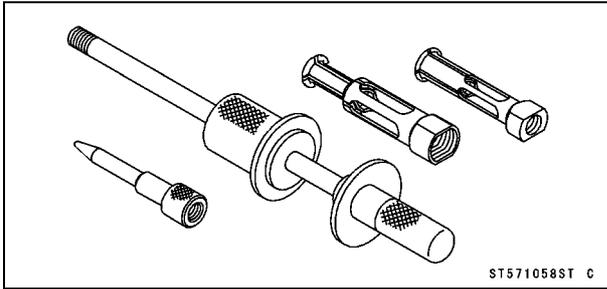
Item	Standard	Service Limit
<b>Front Fork</b>		
Air Pressure	Atmospheric pressure	— — — (Adjustable Range)
Rebound Damping Adjustment (from the seated position adjuster turned fully clockwise)	13 clicks counterclockwise	20 clicks  (Adjustable Range)
Compression Damping Adjustment (from the seated position adjuster turned fully clockwise)	11 clicks counterclockwise (EUR) 12 clicks conterclockwise	22 clicks
Oil Viscosity	KHL15-10 (KAYABA 01) or equivalent	— — —
Oil Quantity:		— — — (Adjustable Range)
Outer (Outer/Inner Tubes)	350 mL (11.7 US oz) (EUR) 355 mL (12.0 US oz)	330 ~ 380 mL (11.2 ~ 12.8 US oz)
Inner (subtank)	191 mL (6.46 US oz)	— — —
Fork Spring Free Length	470 mm (18.5 in.)	461 mm (18.1 in.)
<b>Rear Shock Absorber</b>		
Rebound Damping Adjustment (from the seated position adjuster turned fully clockwise)	10 clicks counterclockwise (EUR) 11 clicks counterclockwise	22 clicks  (Adjustable Range)
Spring Preload Adjustment (Adjusting nut position from the center of the mounting hole upper)	132.5 mm (5.216 in.)	126.5 ~ 139.5 mm (4.980 ~ 5.492 in.)
Rear Shock Spring Free Length	255 mm (10.0 in.)	250 mm (9.84 in.) (Adjustable Range)
High Speed Compression Damping Adjustment	1-1/2 turns out	2 ±0.5 turns out  (Adjustable Range)
Low Compression Damping Adjustment (from the seated position adjuster turned fully clockwise)	12 clicks counterclockwise (EUR) 11 clicks counterclockwise )	22 clicks
Gas Pressure	980 kPa (10 kgf/cm <sup>2</sup> , 142 psi)	— — —
<b>Tie-Rod, Rocker Arm</b>		
Sleeve Outside Diameter:		
Tie-rod	19.987 ~ 20.000 mm (0.78689 ~ 0.78740 in.)	19.85 mm (0.781 in.)
Rocker Arm		
Large	19.987 ~ 20.000 mm (0.78688 ~ 0.78740 in.)	19.85 mm (0.781 in.)
Small	15.950 ~ 16.000 mm (0.62795 ~ 0.62992 in.)	15.92 mm (0.627 in.)
Rocker Arm Mounting Bolt Runout	TIR 0.1 mm (0.004 in.) or less	TIR 0.2 mm (0.008 in.)

EUR: Europe Model

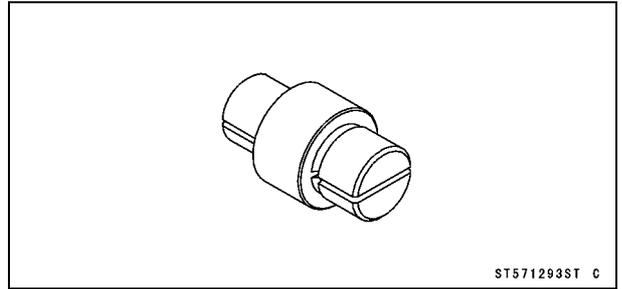
TIR : Total Indicator Reading

Special Tools

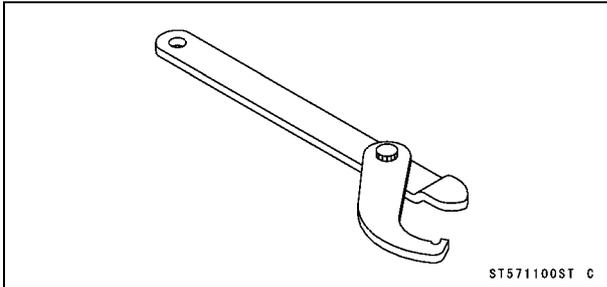
Oil Seal & Bearing Remover:  
57001-1058



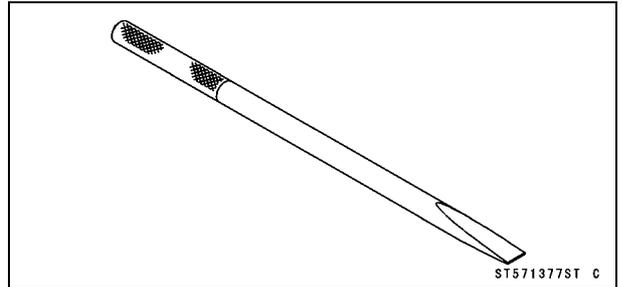
Bearing Remover Head,  $\phi 20 \times \phi 22$ :  
57001-1293



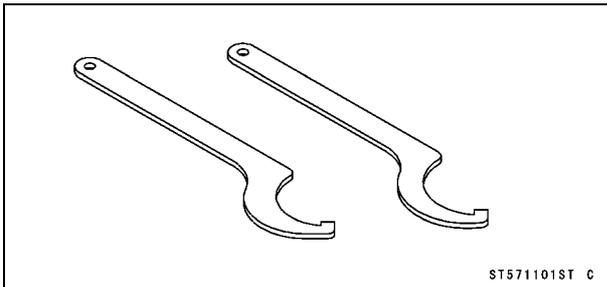
Steering Stem Nut Wrench:  
57001-1100



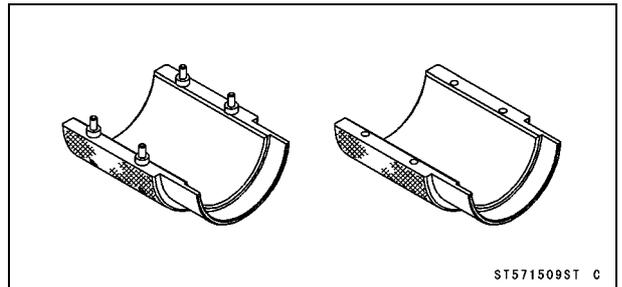
Bearing Remover Shaft,  $\phi 13$ :  
57001-1377



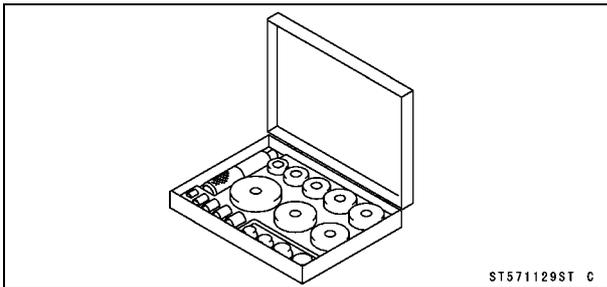
Hook Wrench R37.5, R42:  
57001-1101



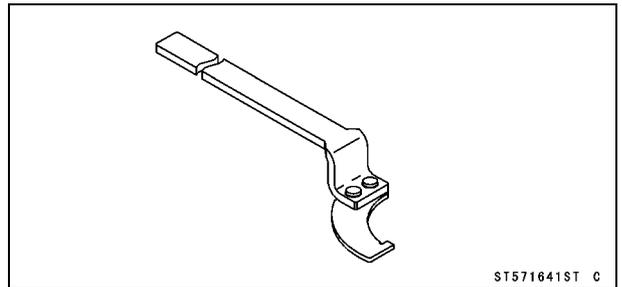
Fork Oil Seal Driver,  $\phi 48$ :  
57001-1509



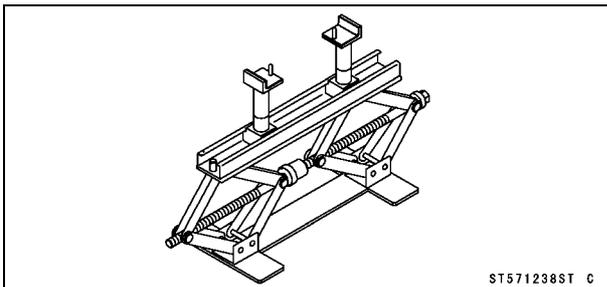
Bearing Driver Set:  
57001-1129



Hook Wrench:  
57001-1641



Jack:  
57001-1238



## 13-8 SUSPENSION

### Front Fork

#### Air Pressure

If you felt that a front fork is strong during a driving, place the jack under the frame so that the front wheel off the ground, and remove the screw [A] at the top of the front fork top plugs to let the air pressure equalize.

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

#### NOTE

○ Do not use the sidestand when adjusting the air pressure.

○ Adjust the air pressure when the front forks are cold.

- Replace the O-ring with a new one.
- Install the screw.

#### Compression Damping Adjustment

- Place the jack under the frame so that the front wheel off the ground.

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

- To adjust compression damping, turn the adjuster [A] on the front fork top plugs with the blade of a screwdriver until you feel a click. Adjust the compression damping to suit your preference under special condition.

#### NOTE

○ The left and right fork legs must have the same shock damping.

Seated positions: adjuster turned fully clockwise [A].

#### Compression Damping Adjuster Setting

**Standard: 11 clicks [B]**  
**(EUR) 12 clicks [C]**  
**Softer (Counterclockwise) [D]**  
**Harder (Clockwise) [E]**

\*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.

#### Rebound Damping Adjustment

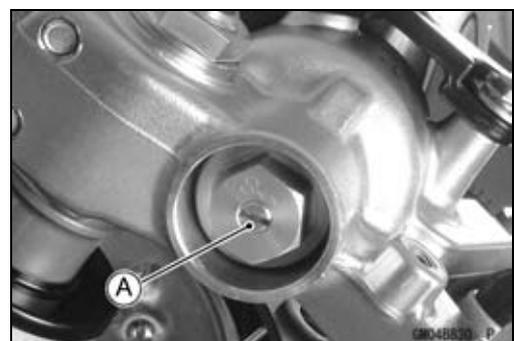
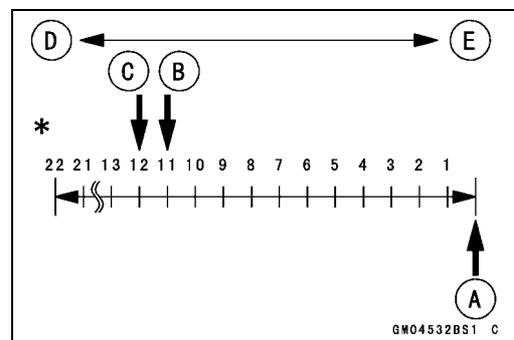
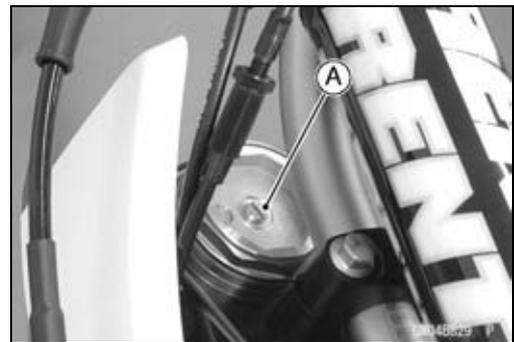
- Place the jack under the frame so that the front wheel off the ground.

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

- To adjust rebound damping, turn the adjuster [A] on the front fork cylinder valve with the blade of a screwdriver until you feel a click. Adjust the rebound damping to suit your preference under special condition.

#### NOTE

○ The left and right fork legs must have the same shock damping.



## Front Fork

Seated positions adjuster turned fully clockwise [A].

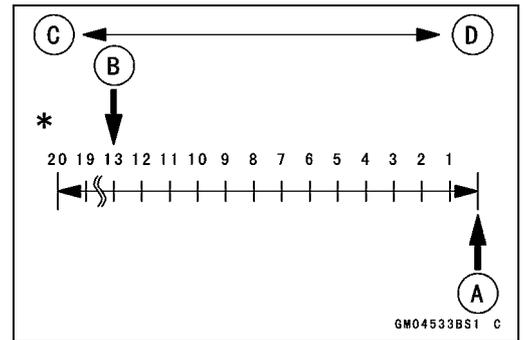
### Rebound Damping Adjuster Setting

**Standard: 13 clicks [B]**

**Softer (Counterclockwise) [C]**

**Harder (Clockwise) [D]**

\*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.

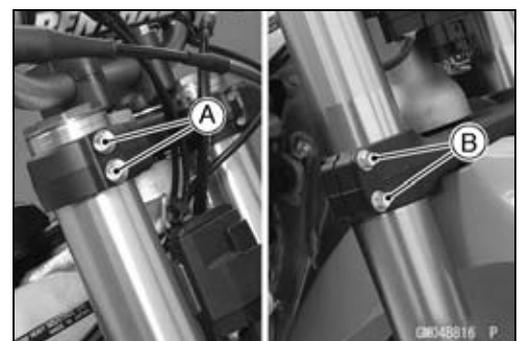
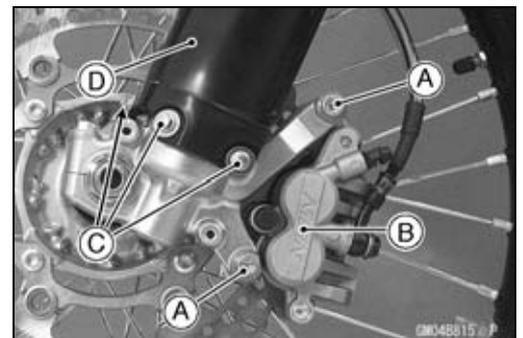
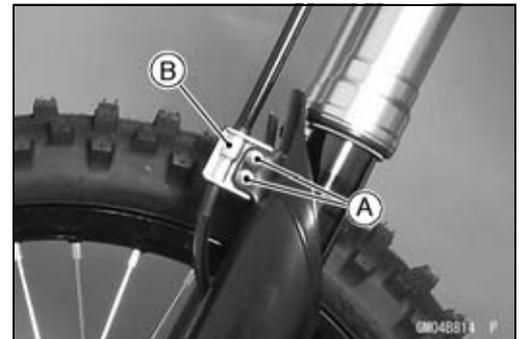


### Oil Change (each fork leg)

- Refer to Front Fork Oil Change in the Periodic Maintenance chapter.

### Front Fork Removal

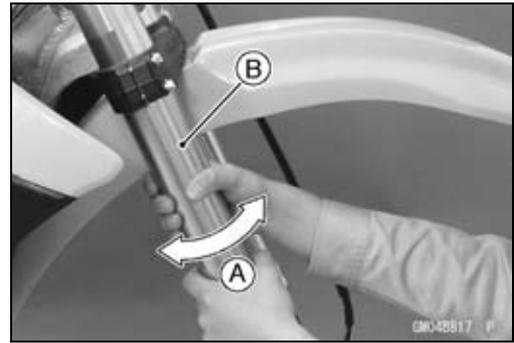
- Remove:
  - Number Plate
- Unscrew the bolts [A], and remove the front brake hose clamps [B].
- Remove:
  - Bolts [A]
- Remove the caliper [B] from the fork leg to be removed, and rest the caliper on some kind of stand so that it doesn't dangle.
- Remove:
  - Bolts [C]
  - Fork Protector [D]
  - Front wheel (see Front Wheel Removal in the Wheels/Tires chapter)
- Loosen the upper [A] and lower [B] front fork clamp bolts.



## 13-10 SUSPENSION

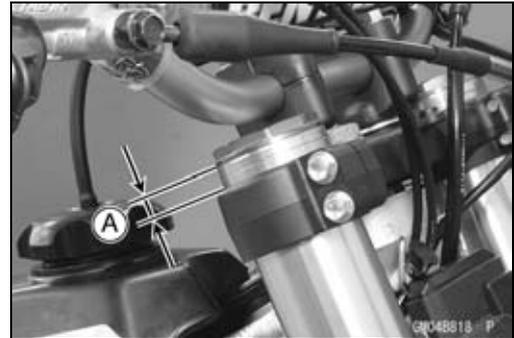
### Front Fork

- Remove the front fork.
- With a twisting motion [A], work the fork leg [B] down and out.



#### Front Fork Installation

- Install the fork so that the distance between the top end of the outer tube and the upper surface of the steering stem head is specified dimension.  
[A] 10 mm (0.39 in.), (EUR) 5 mm (0.2 in.)
- Tighten:
  - Torque - Upper Front Fork Clamp Bolts: 20 N-m (2.0 kgf-m, 15 ft-lb)**
  - Lower Front Fork Clamp Bolts: 20 N-m (2.0 kgf-m, 15 ft-lb)**



#### NOTE

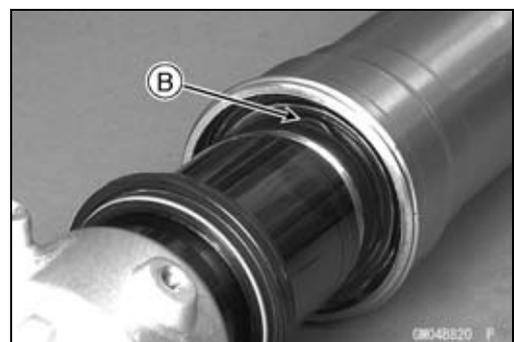
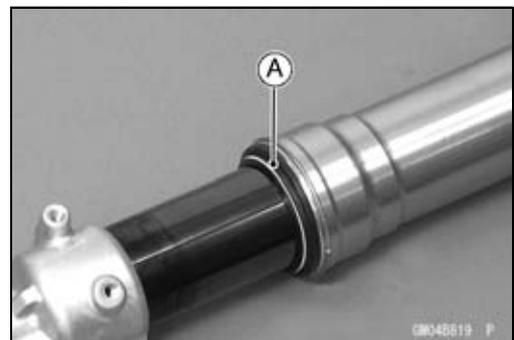
○ Tighten the two clamp bolts alternately two times to ensure even tightening torque.

- Route the cables and hose according to the Cable, Wire, and , Hose Routing section in the Appendix chapter.
- Install the removed parts (see appropriate chapters).

#### Front Fork Disassembly

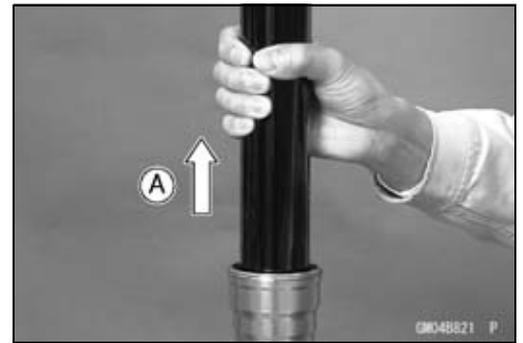
- Drain the fork oil (see Front Fork Oil Change in the Periodic Maintenance chapter).
- Remove the dust seal [A] and the retaining ring [B].

<b>CAUTION</b>
<b>Be careful not to scratch the inner tube.</b>



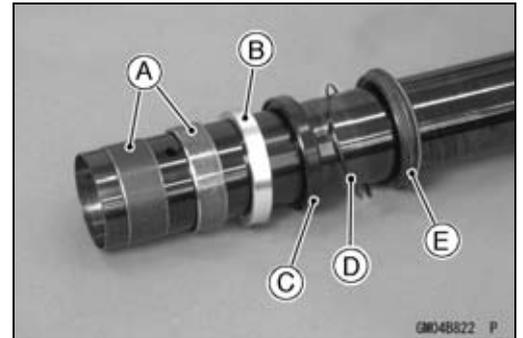
## Front Fork

- Grasp the outer tube and stroke [A] the inner tube several times. The shock to fork seal separates the inner tube from the outer tube.



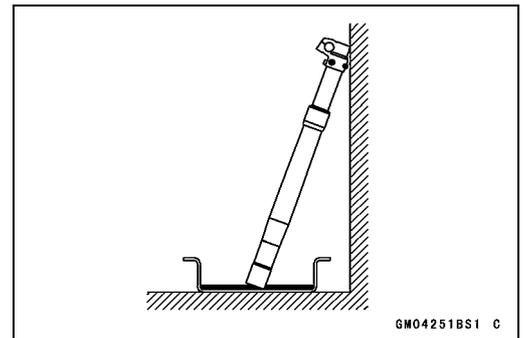
- Remove the following parts from the inner tube.

- [A] Guide Bushes
- [B] Washer
- [C] Oil Seal
- [D] Retaining Ring
- [E] Dust Seal



### Front Fork Assembly

- When the fork tubes are not disassembled, hold the fork inverted position for more than 20 minutes to allow the fork oil to fully drain.



- Replace the following with new ones:

- Dust Seal [A]
- Retaining Ring [B]
- Oil Seal [C]
- Guide Bushes [D]

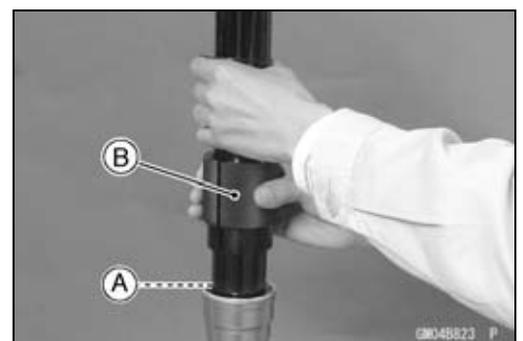
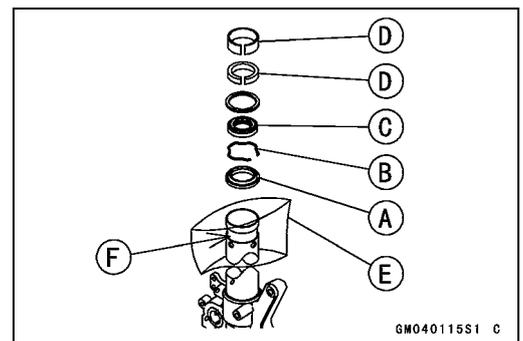
- Place an oil coated plastic bag [E] over the end of the inner tube to protect the oil seals.

- The inner tube guide bush groove has a sharp edge [F] that cut out the sealing lip of the seals as they are pushed down over the inner tube.

- Install in order these parts on the inner tube.

- Tap the washer [A] with the oil seal driver [B] to install the outer guide bush.

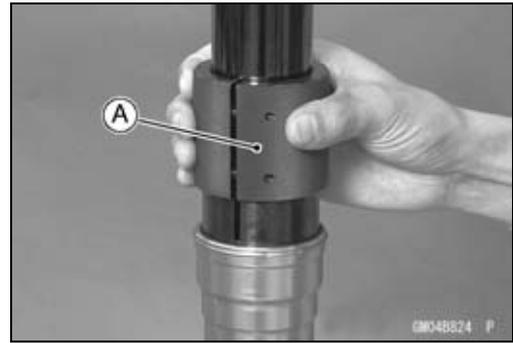
**Special Tool - Fork Oil Seal Driver,  $\phi$ 48: 57001-1509**



## 13-12 SUSPENSION

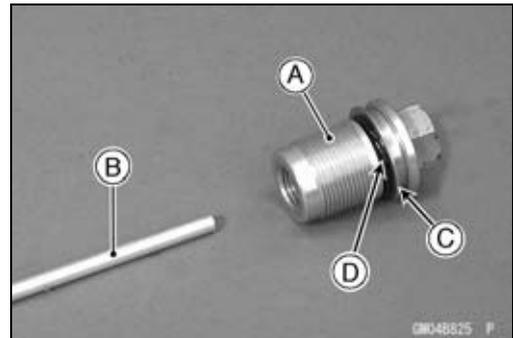
### Front Fork

- Install the oil seal by using the fork oil seal driver [A].  
**Special Tool - Fork Oil Seal Driver,  $\phi$ 48: 57001-1509**
- Install the retaining ring to the outer tube.
- Push the dust seal into the outer tube, and put the spring band on the dust seal.
- Pour the fork oil (see Front Fork Oil Change in the Periodic Maintenance chapter).



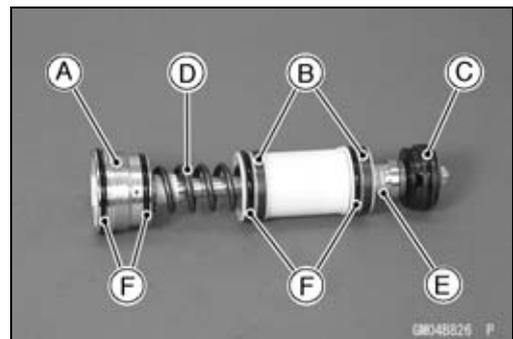
#### **Adjuster Assembly Inspection**

- Inspect the adjuster assembly [A] and push rod [B] for damage.
- ★ If they are damaged, replace them with new ones.
- Replace the gasket [C] and O-ring [D] on the adjuster assembly with new ones.



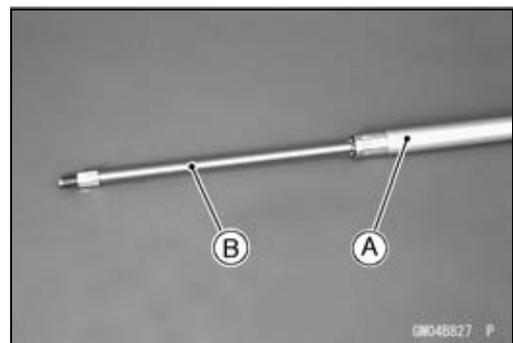
#### **Base Valve Assembly Inspection**

- Inspect the threads portion [A], bushing [B], O-ring [C] and spring [D] of base valve assembly [E] for damage.
- ★ If they are damaged, replace base valve assembly with new one.
- Replace the O-rings [F] with new ones.



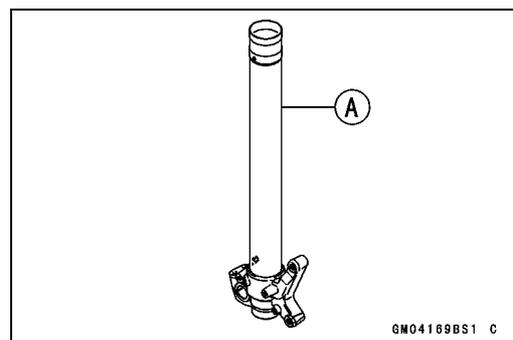
#### **Cylinder Unit Inspection**

- Inspect the piston rod [B] of cylinder unit [A] for scratches or bending.
- ★ If it has scratches or is bent, replace cylinder unit with a new one.



#### **Inner Tube Inspection**

- Visually inspect the inner tube [A], 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.

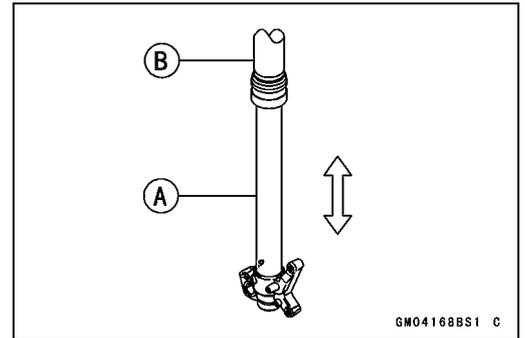


**Front Fork**

- Temporarily assemble the inner [A] and outer tubes [B], and pump them back and forth manually to check for smooth operation.

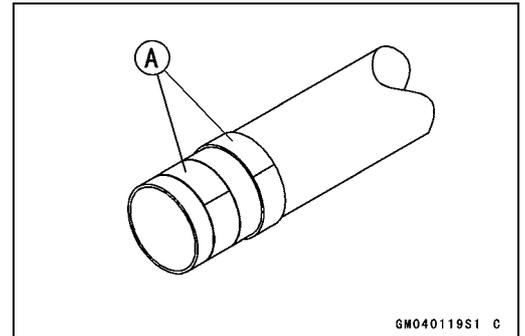
**CAUTION**

**If the inner tube is badly bent or creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.**



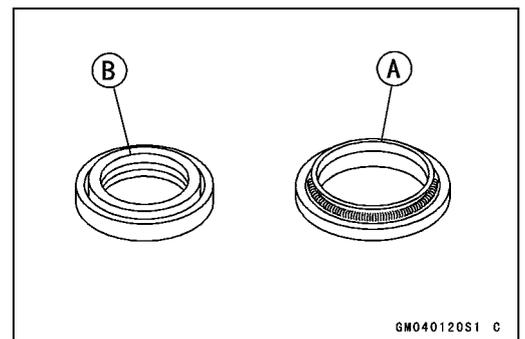
**Guide Bush Inspection**

- Visually inspect the guide bushes [A], and replace them if necessary.



**Dust Seal/Oil Seal Inspection**

- Inspect the dust seal [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.
- Replace the oil seal [B] with a new one whenever it has been removed.

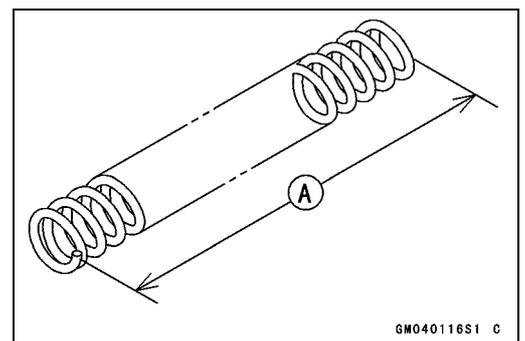


**Spring Tension Inspection**

- 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 from motorcycle stability.

**Fork Spring Free Length**

- Standard: 470 mm (18.5 in.)**
- Service Limit: 461 mm (18.1 in.)**



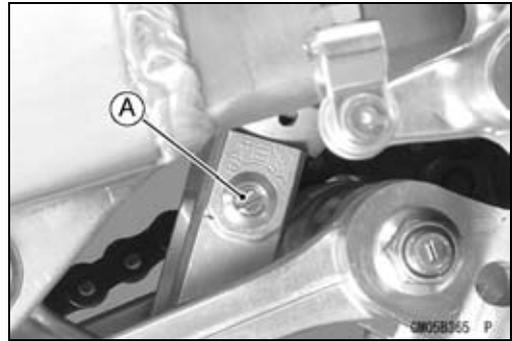
# 13-14 SUSPENSION

## Rear Shock Absorber

To suit to various riding conditions, the spring preload of the shock absorber can be adjusted or the spring can be replaced with an optional one. Also the damping force can be adjusted easily so changing oil viscosity unnecessary.

### Rebound Damping Adjustment

- Turn the rebound damping adjuster [A] on the rear shock absorber lower end with the blade of a screwdriver until you feel a click.
- ★ If the damper setting feels too soft or too stiff, adjust it in accordance with the following table:

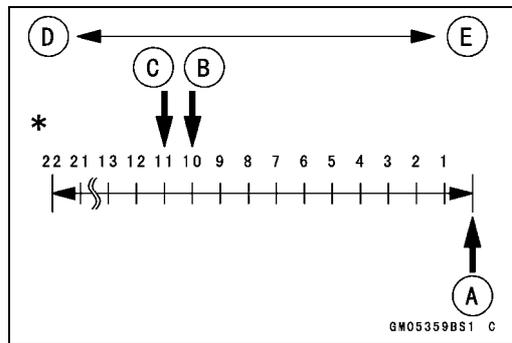


Seated position: adjuster turned fully clockwise [A].

#### Rebound Damping Adjuster Setting

- Standard: 10 clicks [B]
- (EUR) 11 clicks [C]
- Softer (Counterclockwise) [D]
- Harder (Clockwise) [E]

\*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.



### NOTE

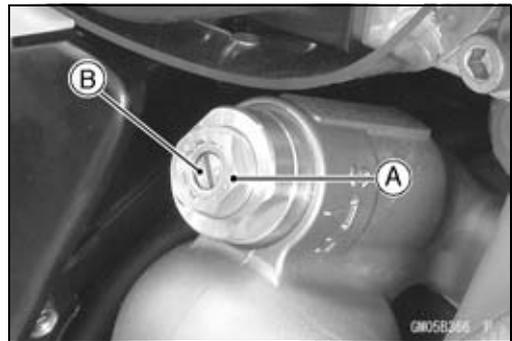
○ Adjustment of the rebound damping adjuster for the rear suspension will slightly affect the compression damping force. Always make any damping adjustments in small steps and test their effects before using them in competition.

### Compression Damping Adjustment

There are two adjustments you can make to the rear shock absorber gas reservoir.

- High Speed Compression Damping Adjuster [A]
- Low Speed Compression Damping Adjuster [B]

- ★ If the damper setting feels too soft or too stiff, adjust it in accordance with the following table:

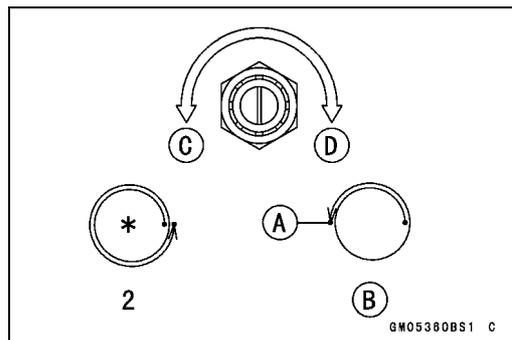


Seated position: adjuster turned fully clockwise [A].

#### High Speed Compression Damping

- Standard: 1 1/2 turns out [B]
- Softer (counterclockwise) [C]
- Harder (clockwise) [D]

\*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.



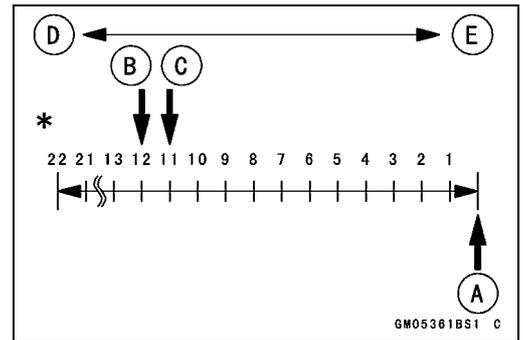
## Rear Shock Absorber

Seated position: adjuster turned fully clockwise [A].

### Low Speed Compression Damping

- Standard: 12 clicks [B]
- (EUR) 11 clicks [C]
- Softer (counterclockwise) [D]
- Harder (clockwise) [E]

\* : Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.

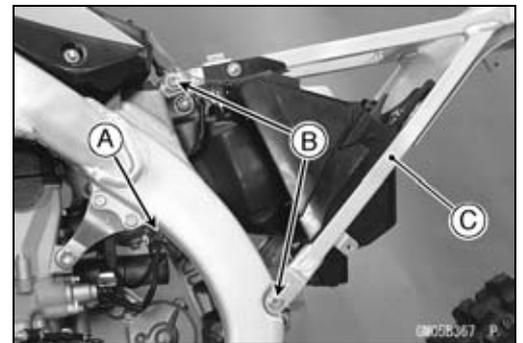


### NOTE

○ Adjustment of the rebound damping adjuster for the rear suspension will slightly affect the compression damping force. Always make any damping adjustments in small steps and test their effects before using them in competition.

### Spring Preload Adjustment

- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Side Covers (see Side Cover Removal in the Frame chapter)
  - Inlet Air Temperature Sensor Connector
  - Air Cleaner Duct Clamp Screw [A] (loosen)
  - Rear Flap
  - Muffler (see Muffler Removal in the Engine Top End chapter)
  - Rear Frame Mounting Bolts [B]
  - Rear Frame [C] with Air Cleaner Housing
- Using the jack under the frame, raise the rear wheel off the ground.
  - Special Tool - Jack: 57001-1238**
- Using the hook wrenches, loosen the locknut [A] on the rear shock absorber.
  - Special Tools - Hook Wrench R37.5, R42 [B]: 57001-1101**
  - Hook Wrench [C]: 57001-1641**

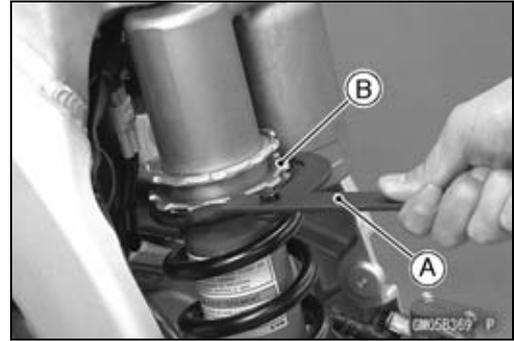


## 13-16 SUSPENSION

### Rear Shock Absorber

- Using the stem nut wrench [A], turn the adjusting nut [B] as required. Turning the adjusting nut downward marks the spring action harder and upward softer.

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



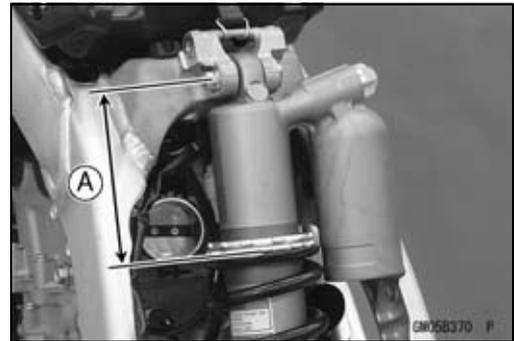
#### Spring Preload Adjustment

(Adjusting nut position at the lower surface [A] from the center of the mounting hole)

**Standard:** 132.5 mm (5.216 in.)

**Adjustable Range** 126.5 ~ 139.5 mm (4.980 ~ 5.492 in.)

- Tighten the locknut securely.
- After adjusting, move the spring up and down to make sure that the spring is seated.
- Install the parts removed (see appropriate chapters).



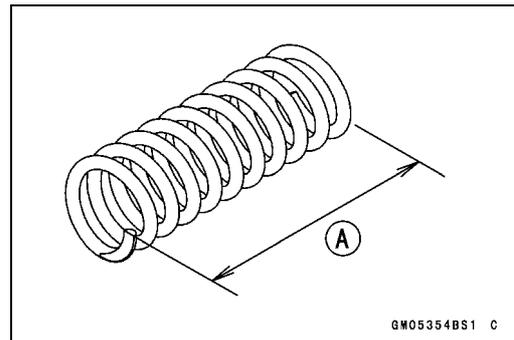
#### Spring Tension Inspection

- Since the spring becomes shorter as it weakens, check its free length [A] to determine its condition.

#### Shock Absorber Spring Free Length

**Standard:** 255 mm (10.0 in.)

**Service Limit:** 250 mm (9.84 in.)



#### Rear Shock Absorber Removal

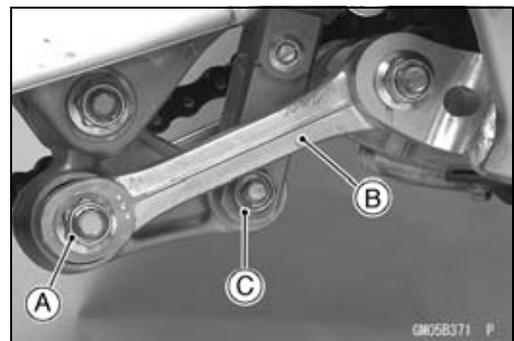
- Remove:
  - Rear Frame with Air Cleaner Housing (see Rear Frame Removal in the Frame chapter)
- Using the jack under the frame, raise the rear wheel off the ground.

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

#### CAUTION

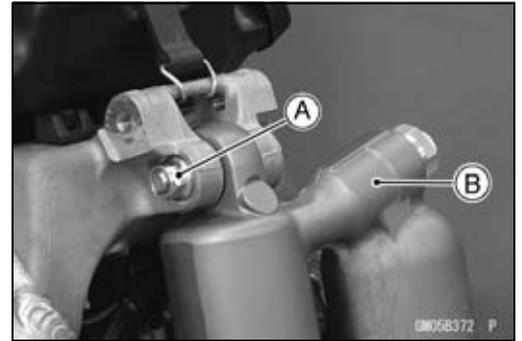
**When pulling out the mounting bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing**

- Remove the tie-rod mounting bolt and nut [A] (Rear), and turn the tie-rod [B] downward.
- Remove the rear shock absorber lower mounting bolt and nut [C].



## Rear Shock Absorber

Remove the rear shock absorber upper mounting bolt [A], nut, and pull out the rear shock absorber [B] down and out.



### Rear Shock Absorber Installation

- Pack the rocker arm needle bearings with grease.
- Apply the tie-rod mounting bolts (rear) to the 2-stroke oil.
- Tighten:

**Torque - Upper Rear Shock Absorber Mounting Nut: 39 N·m (4.0 kgf·m, 29 ft·lb)**

**Lower Rear Shock Absorber Mounting Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**

**Tie-rod Mounting Nut (Rear): 59 N·m (6.0 kgf·m, 44 ft·lb)**

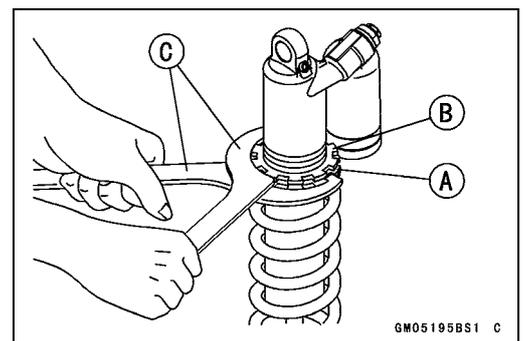
- Install removed parts (see appropriate chapters).

### Spring Replacement

In addition to the standard spring, heavy and light springs are available. If the standard spring is improper for your purpose, select a proper one according to the rider's weight or course conditions.

- Remove:
  - Rear Shock Absorber (see Rear Shock Absorber Removal)
- Clean the threaded portion on the upper of the rear shock absorber.
- Hold the lower of the rear shock absorber with a vise.
- Using the hook wrenches [C], loosen the locknut [B] and turn the adjusting nut [A] all way up.

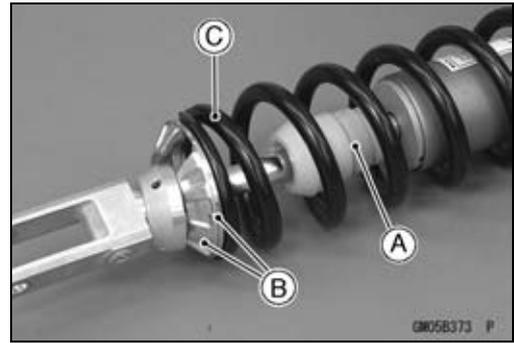
**Special Tools - Hook Wrench R37.5, R42: 57001-1101**  
**Hook Wrench: 57001-1641**



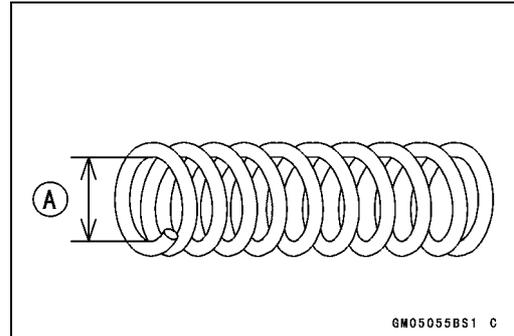
## 13-18 SUSPENSION

### Rear Shock Absorber

- Remove the rear shock absorber from the vise.
- Slide up the rubber bumper [A].
- Remove the spring guides [B] from the shock absorber and lift off the spring [C].



- Exchange the spring for an optional part.
- Install the spring so that closed coil large diameter end [A] faces upward.
- Install the spring guide.
- Adjust the spring preload (see Spring Preload Adjustment).
- Install the rear shock absorber (see Rear Shock Absorber Installation).



#### **Rear Shock Absorber Disassembly (Oil Change)**

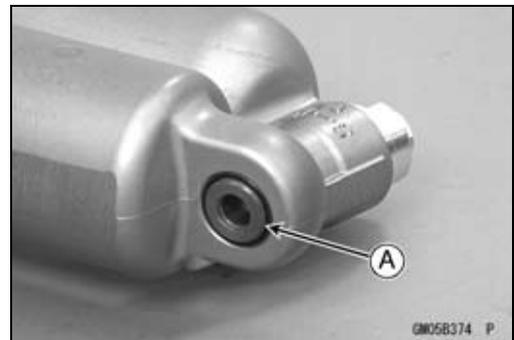
- Refer to the Rear Shock Absorber Oil Change in the Periodic Maintenance chapter.

#### **Rear Shock Absorber Assembly**

- Refer to the Rear Shock Absorber Oil Change in the Periodic Maintenance chapter.

#### **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.

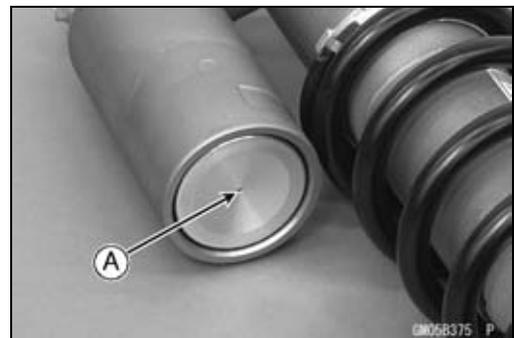


#### **Rear Shock Absorber Scrapping**

##### **⚠ WARNING**

Since the reservoir tank of the rear shock absorber contains nitrogen gas, do not incinerate the reservoir tank without first releasing the gas or it may explode.

- Remove the rear shock absorber. (see Rear Shock Absorber Removal).
- Drill the hole [A] of the reservoir tank using about 2 mm (0.08 in.) drillbit.



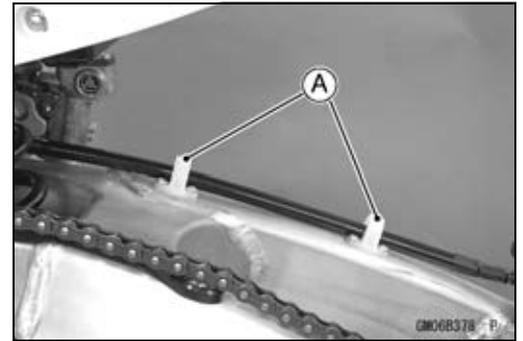
##### **⚠ WARNING**

Wear safety glasses when drilling the hole, as the high pressure gas may blow out bits or drilled metal when the hole opens.

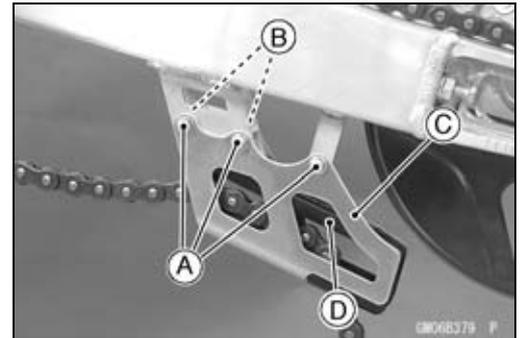
## Swingarm

### Swingarm Removal

- Remove:
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  - Rear Flap (see Rear Fender Flap Removal in the Frame chapter)
  - Brake Hose Clamps [A]



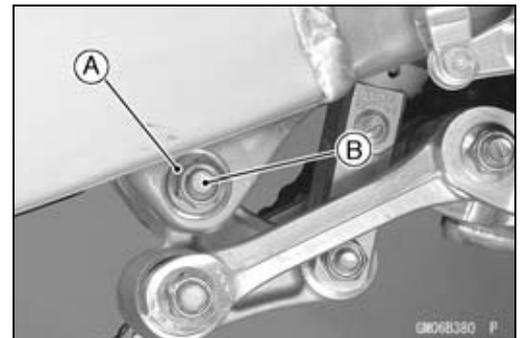
- Remove:
  - Bolts [A] and Nuts [B]
  - Chain Guide Plate [C]
  - Chain Guide [D]



- Unscrew the rocker arm pivot nut [A] and pull out the rocker arm pivot bolt [B].

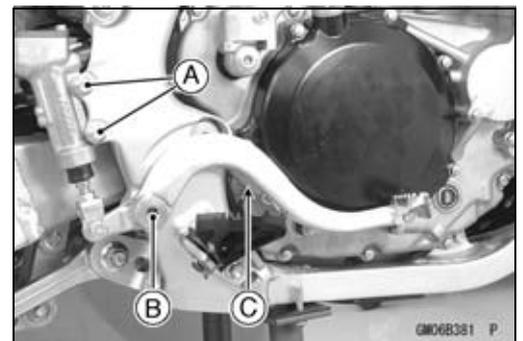
**CAUTION**

**When pulling out the mounting bolts, lift the swingarm slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing.**

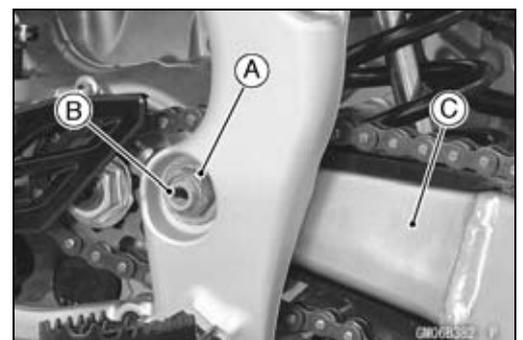


- Remove:
  - Rear Master Cylinder Mounting Bolts [A]
  - Brake Pedal Bolt [B]
  - Brake Pedal Return Spring [C]

- Remove the following parts as a set.
  - Brake pedal
  - Rear Brake Master Cylinder
  - Brake Hose
  - Rear Brake Caliper



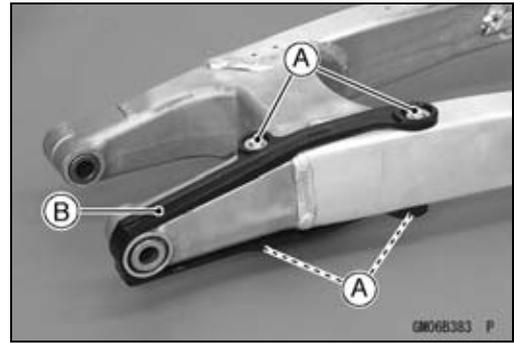
- Remove the swingarm pivot shaft nut [A].
- Pull out the swingarm pivot shaft [B], and remove the swingarm [C].



## 13-20 SUSPENSION

### Swingarm

- Remove the screws [A]
- Remove the chain slipper [B] from the swingarm.



#### **Swingarm Installation**

- Apply plenty of grease to the inside of the needle bearings, sleeves, and grease seals.
- Install the collars to the both sides of the swingarm.
- Tighten:

**Torque - Swingarm Pivot Shaft Nut: 98 N-m (10 kgf-m, 72 ft-lb)**

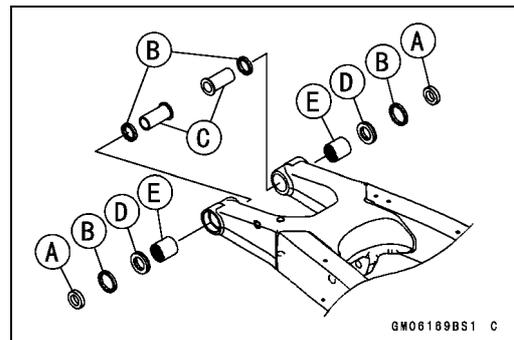
**Rocker Arm Pivot Nut: 59 N-m (6.0 kgf-m, 44 ft-lb)**

- Install removed parts (see appropriate chapters).

#### **Swingarm Bearing Removal**

- Remove:
  - Swingarm (see Swingarm Removal)
  - Collars [A]
  - Grease Seals [B]
  - Sleeves [C]
  - Needle Bearings [D]
- Remove the needle bearings [E] using the oil seal & bearing remover.

**Special Tool - Oil Seal & Bearing Remover: 57001-1058**



#### **Swingarm Bearing Installation**

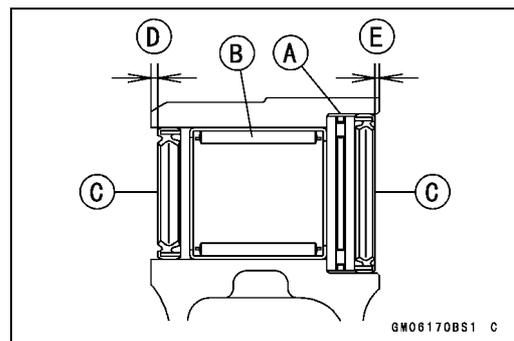
- Replace the needle bearings and, grease seals with new ones.
- Install the needle bearings [A] [B] and grease seals [C] position as shown.

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

- Install the needle bearings so that the manufacturer's marks face out.
- Install the grease seals so that the deep groove side of the rip in-ward.
- The installation procedure is the same as the counter side.

[D] 1.5 mm (0.059 in.)

[E] 1 mm (0.039 in.)



## Swingarm

### Swingarm Bearing, Sleeve Inspection

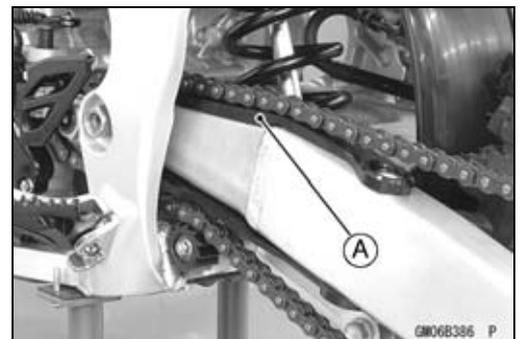
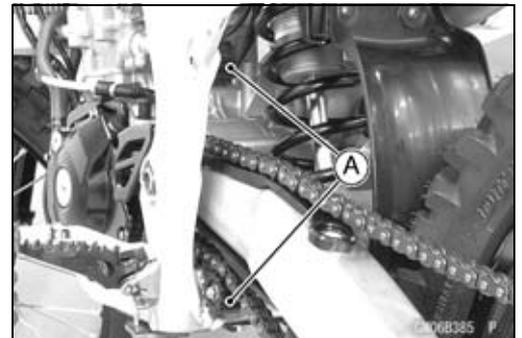
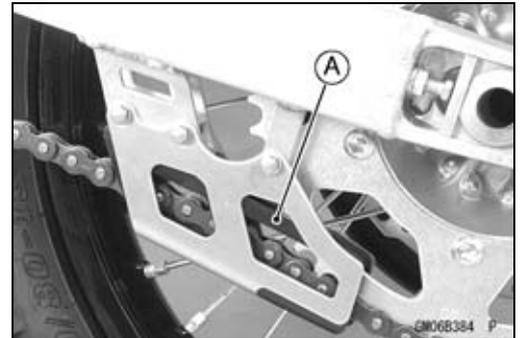
#### CAUTION

**Do not remove the bearings for inspection. Removal may damage them.**

- Inspect the needle bearings 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 bearing, and sleeve show any signs of abnormal wear, discoloration, or damage, replace them as a set.

### Drive Chain Guide, Guide Roller, Chain Slipper Wear Inspection

- Visually inspect the drive chain guide [A] and replace it if excessively worn or damaged.
- Visually inspect the upper and lower chain guide rollers [A] and replace them if excessively worn or damaged.
- Visually inspect the chain slipper [A] on the swingarm and replace it if worn or damaged.



## 13-22 SUSPENSION

### Tie-Rod, Rocker Arm

#### *Tie-Rod Removal*

- Using the jack under the frame, raise the rear wheel off the ground.

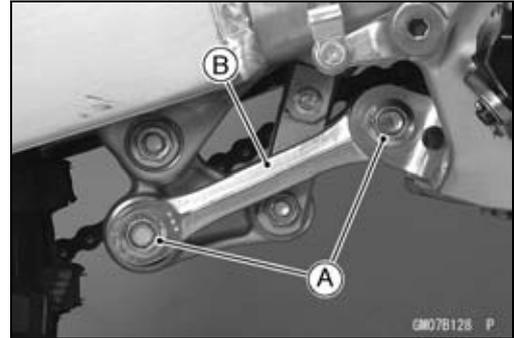
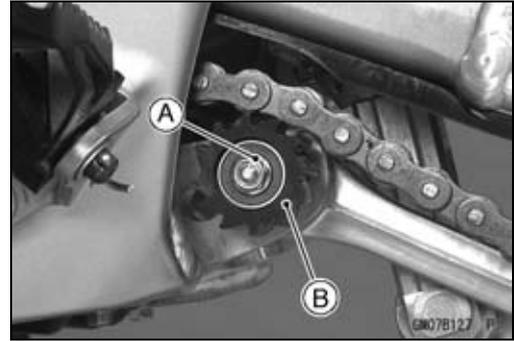
Special Tool - Jack: 57001-1238

- Unscrew the nut [A] and remove the chain guide roller [B].

#### CAUTION

When pulling out the mounting bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing.

- Remove the tie-rod mounting nuts [A].
- Remove the tie-rod front mounting bolt, and then take off the tie-rod [B].



#### *Tie-Rod Installation*

- Apply plenty of grease to the inside of the grease seals.
- Apply the 2-stroke oil to the threads of the tie-rod mounting bolts.
- Tighten:

Torque - Tie-rod Mounting Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

#### *Rocker Arm Removal*

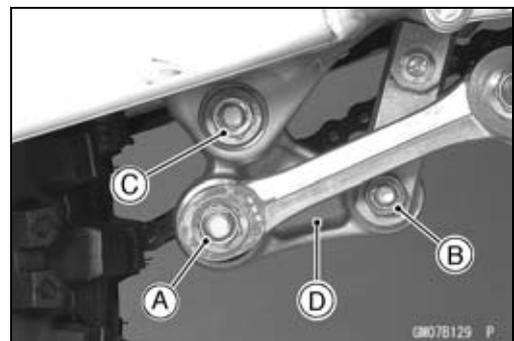
- Using the jack under the frame, raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

#### CAUTION

When pulling out the mounting bolts, lift the rear wheel slightly. Forcing or tapping on bolt could damage the bolt, sleeve, and bearing.

- Remove:
  - Tie-rod Mounting Nut (Rear) [A] and Bolt
  - Rear Shock Absorber Mounting Nut (Lower) [B] and Bolt
  - Rocker Arm Pivot Nut [C] and Bolt
  - Rocker Arm [D]



## Tie-Rod, Rocker Arm

### Rocker Arm Installation

- Apply plenty of grease to the inside of the rocker arm, needle bearings, grease seals and outside of the sleeve.
- Tighten:

**Torque - Rocker Arm Pivot Nut: 59 N·m (6.0 kgf·m, 44 ft·lb)**

**Lower Rear Shock Absorber Mounting Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**

**Tie-rod Mounting Nut (Rear): 59 N·m (6.0 kgf·m, 44 ft·lb)**

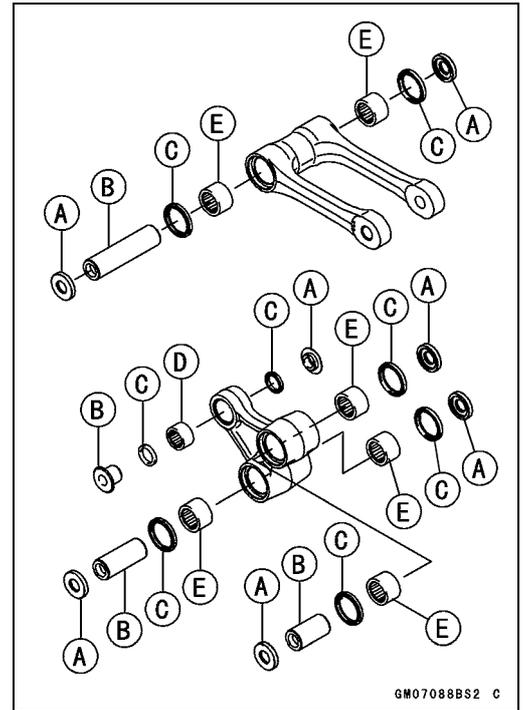
### Tie-Rod and Rocker Arm Bearing Removal

- Remove:
  - Tie-Rod (see Tie-Rod Removal)
  - Rocker Arm (see Rocker Arm Removal)
  - Collars [A]
  - Sleeves [B]
  - Grease Seals [C]
- Remove the needle bearing [D], using the oil seal & bearing remover.
- Remove the needle bearings [E], using the bearing remover head and bearing remover shaft.

**Special Tools - Bearing Remover Head,  $\phi$  20 x  $\phi$ 22: 57001-1293**

**Bearing Remover Shaft,  $\phi$  13: 57001-1377**

**Oil Seal & Bearing Remover: 57001-1058**



## 13-24 SUSPENSION

### Tie-Rod, Rocker Arm

#### ***Tie-Rod and Rocker Arm Bearing Installation***

- Replace the needle bearing and grease seals with new ones.
- Apply plenty of grease to the grease seal and needle bearings [A].

#### **NOTE**

○ Install the grease seals so that the deep groove side of the rip out-ward.

- Install the needle bearings [A], [B] and grease seals [C] position as shown.
- The installation procedure is the same as the counter side.

[D] 1 mm (0.04 in.)

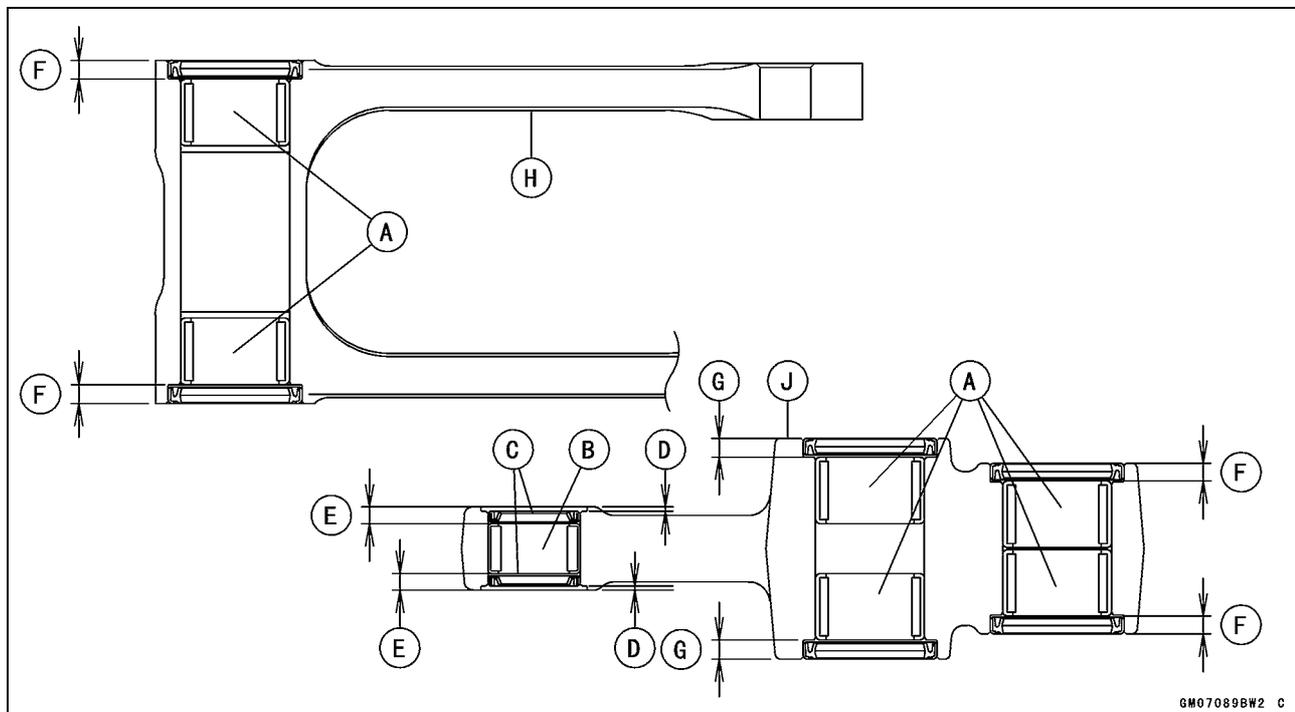
[G] 4.5 mm (0.18 in.)

[E] 2.5 mm (0.098 in.)

Tie-rod [H]

[F] 4.25 mm (0.167 in.)

Rocker Arm [J]



#### ***Needle Bearing Inspection***

##### **CAUTION**

**Do not remove the bearings for inspection. Removal may damage them.**

- Inspect the needle bearings installed in the rocker arm.
- The needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearings for abrasion, discoloration, or other damage.
- ★ If there is any doubt as to the condition of either needle bearing, replace the bearing and sleeve as a set.

**Uni-Trak Maintenance**

**Uni-Trak Linkage Inspection**

- Refer to the Uni-Trak Linkage Inspection in the Periodic Maintenance chapter.

**Tie-Rod and Rocker Arm Sleeve Wear Inspection**

- Pull out the sleeves [A] of the tie-rod and rocker arm and measure the outside diameter of the sleeve.
- ★ If the sleeve is worn past the service limit, replace the sleeve.

**Sleeve Outside Diameter**

**Standard:**

**Rocker Arm:**

[Large] 19.987 ~ 20.000 mm (0.78688 ~ 0.78740 in.)

[Small] 15.950 ~ 16.000 mm (0.62795 ~ 0.62992 in.)

**Tie-rod** 19.987 ~ 20.000 mm (0.78689 ~ 0.78740 in.)

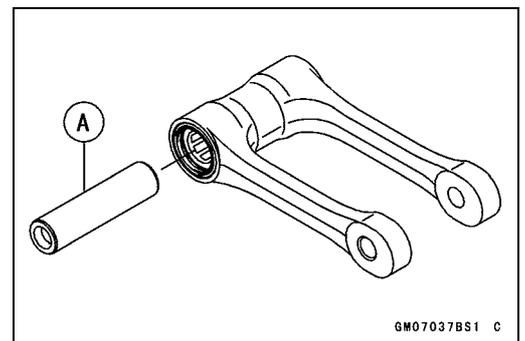
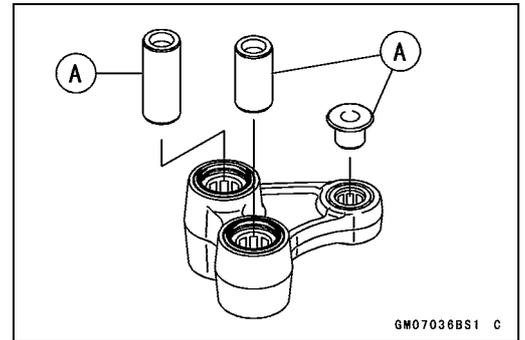
**Service Limit:**

**Rocker Arm:**

[Large] 19.85 mm (0.781 in.)

[Small] 15.92 mm (0.627 in.)

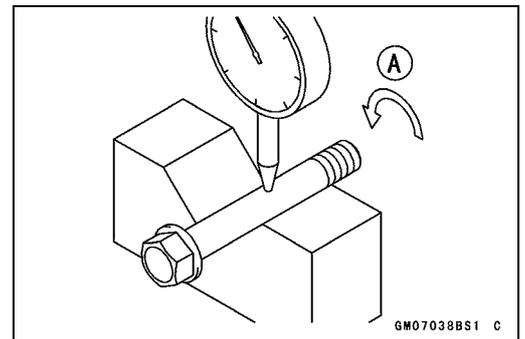
**Tie-rod** 19.85 mm (0.781 in.)



**Tie-Rod and Rocker Arm Mounting Bolt Bend Inspection**

A bent bolt causes vibration, poor handling, and instability.

- To measure the bolt runout, remove the bolt, place it in V blocks, and set a dial gauge to the bolt at a point halfway between the blocks. Turn [A] the bolt to measure the runout. The amount of dial variation is the amount of runout.
- ★ If runout exceeds the service limit, replace the bolt.



**Bolt Runout**

**Standard:** TIR 0.1 mm (0.004 in.) or less

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



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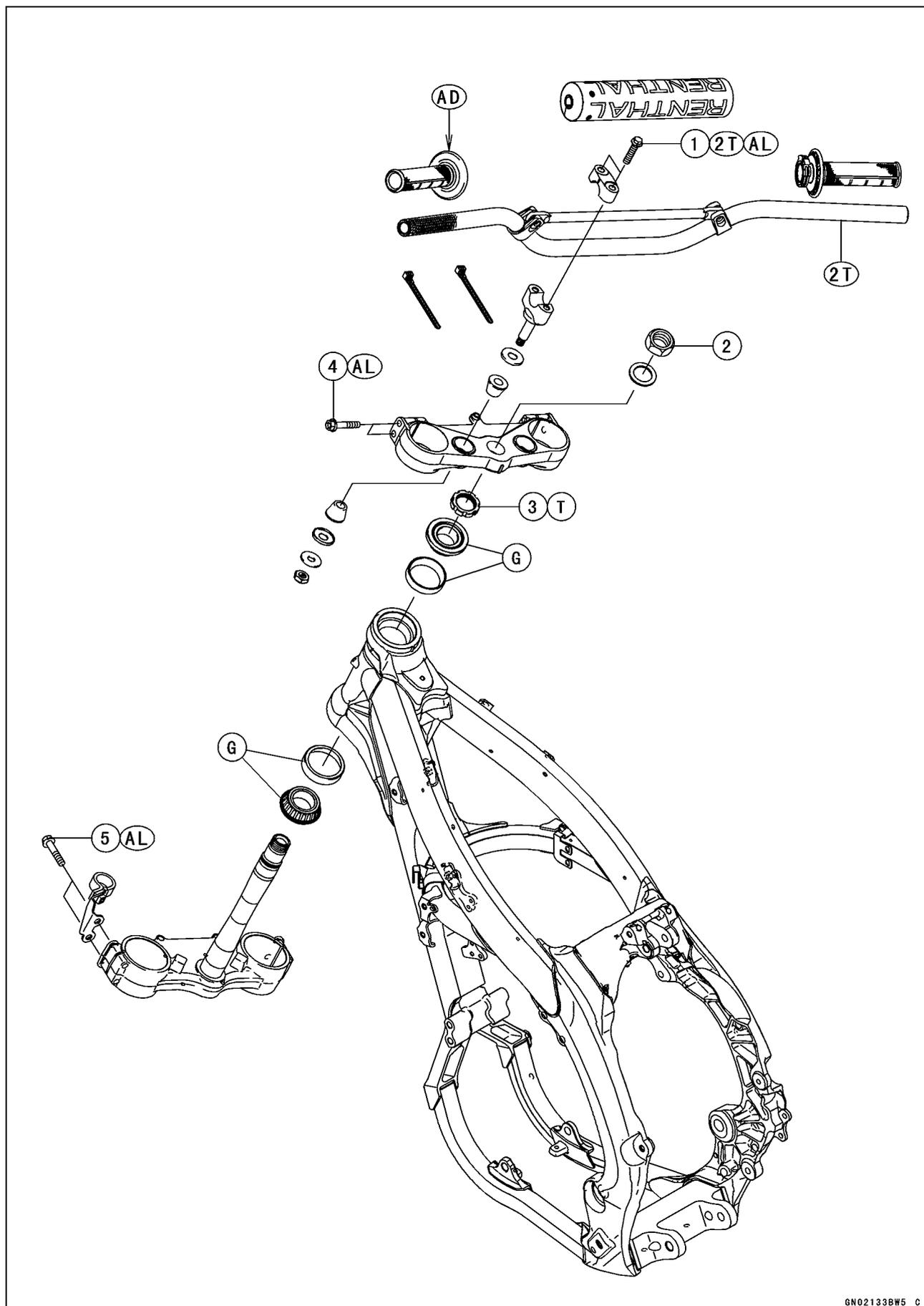
# Steering

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# 14-2 STEERING

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Clamp Bolts	25	2.5	18	2T, AL
2	Steering Stem Head Nut	98	10	72	
3	Steering Stem Nut	4.9	0.50	43 in·lb	T
4	Upper Front Fork Clamp Bolts	20	2.0	15	AL
5	Lower Front Fork Clamp Bolts	20	2.0	15	AL

AD: Apply adhesive cement.

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

G: Apply grease.

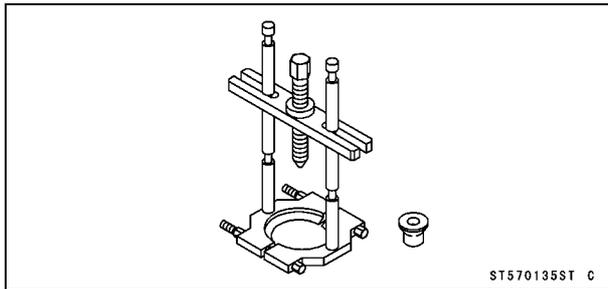
2T: Apply 2-stroke oil.

T: First, tighten the stem locknut with 39 N·m (4.0 kgf·m, 29 ft·lb) of torque, then loosen it and retighten it with 4.9 N·m (0.50 kgf·m, 43 in·lb) of torque.

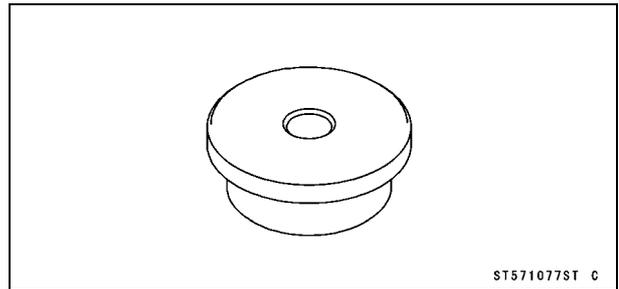
# 14-4 STEERING

## Special Tools

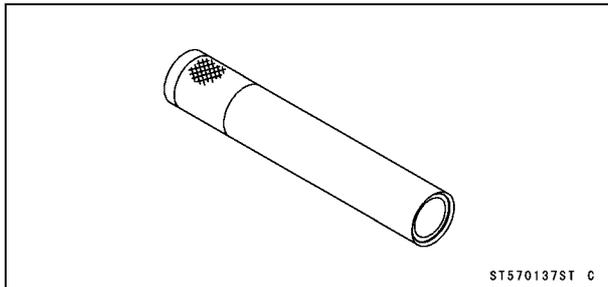
**Bearing Puller:**  
57001-135



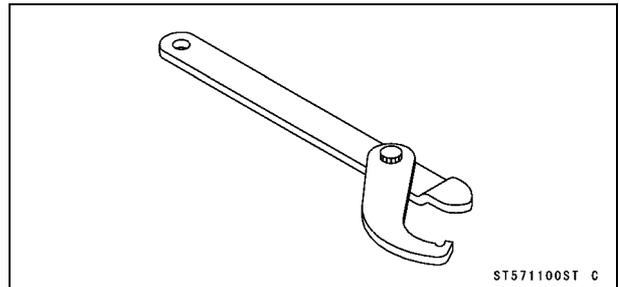
**Head Pipe Outer Race Driver,  $\phi 54.5$ :**  
57001-1077



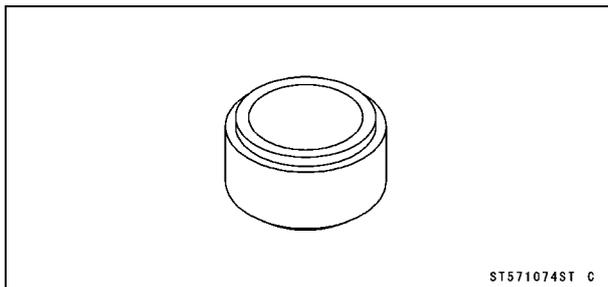
**Steering Stem Bearing Driver:**  
57001-137



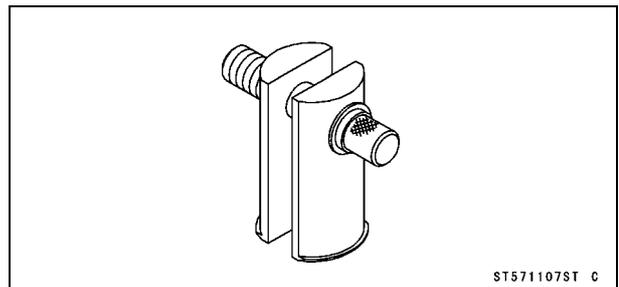
**Steering Stem Nut Wrench:**  
57001-1100



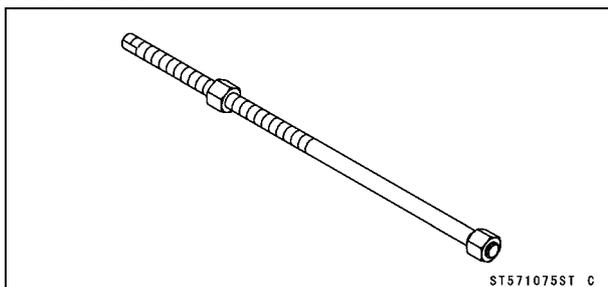
**Steering Stem Bearing Driver Adapter,  $\phi 34.5$ :**  
57001-1074



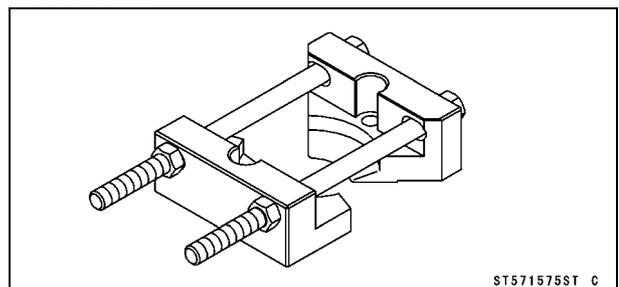
**Head Pipe Outer Race Remover ID > 37 mm:**  
57001-1107



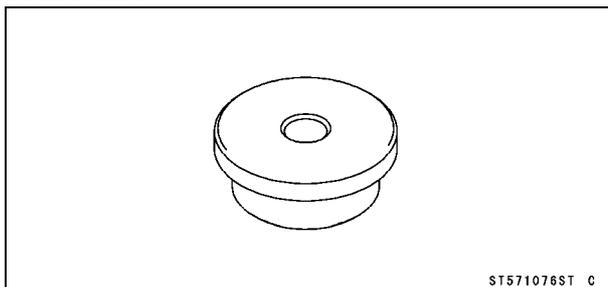
**Head Pipe Outer Race Press Shaft:**  
57001-1075



**Bearing Puller:**  
57001-1575



**Head Pipe Outer Race Driver,  $\phi 51.5$ :**  
57001-1076



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## Steering

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### ***Steering Inspection***

- Refer to the Steering Inspection in the Periodic Maintenance chapter.

### ***Steering Adjustment***

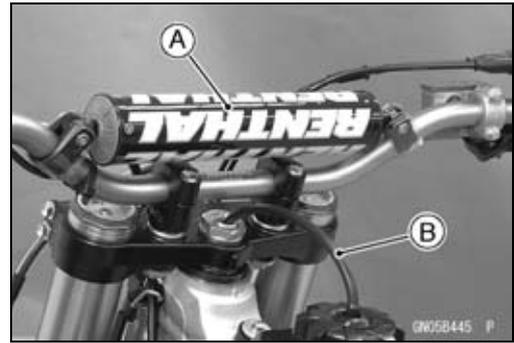
- Refer to the Steering Adjustment in the Periodic Maintenance chapter.

## 14-6 STEERING

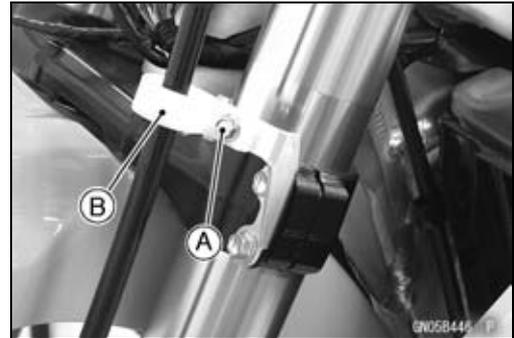
### Steering Stem

#### **Steering Stem, Stem Bearing Removal**

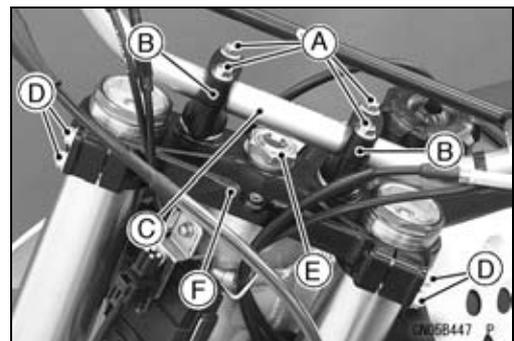
- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Front Fender (see Front Fender Removal in the Frame chapter)
  - Number Plate (see Number Plate Removal in the Frame chapter)
  - Handlebar Pad [A]
  - Breather Hose [B] (Pull out)



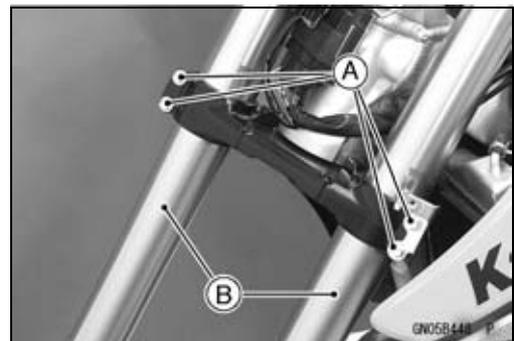
- Remove:
  - Bolt [A]
  - Brake Hose Holder [B]



- Remove:
  - Handlebar Clamp Bolts [A]
  - Handlebar Clamps (Upper) [B]
  - Handlebar [C]
- Remove the upper front fork clamp bolts [D]
- Remove the steering stem head nut [E] and washer.
- Remove the steering stem head [F].

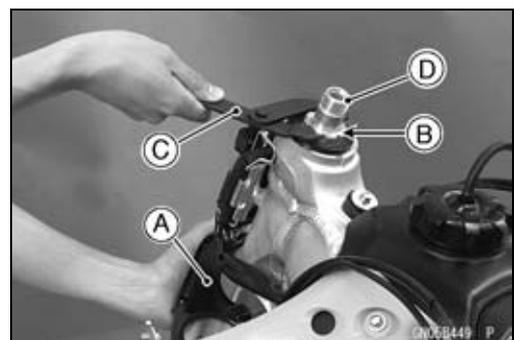


- Remove:
  - Front Fork Lower Clamp Bolts [A]
  - Front Forks [B]



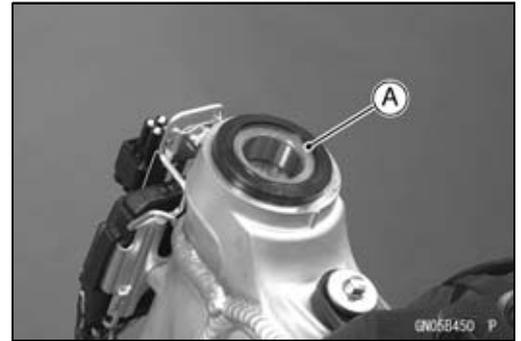
- Pushing up on the stem base [A], and remove the steering stem nut [B], with the steering stem nut wrench [C], then remove the steering stem [D] and stem base.

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



## Steering Stem

- Take off the upper stem bearing inner race (tapered roller bearing) [A].

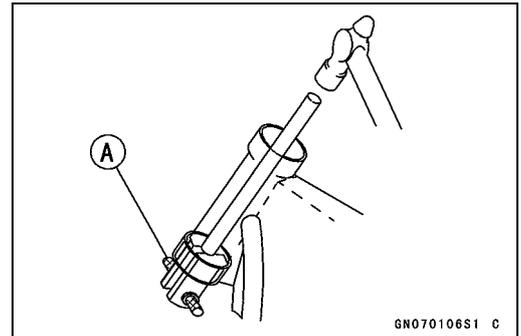


- Drive out the bearing outer races from the head pipe.
  - Remove the outer races pressed into the head pipe, using the head pipe outer race remover [A], and hammer the head pipe outer race remover to drive it out.

**Special Tool - Head Pipe Outer Race Remover ID > 37 mm: 57001-1107**

### NOTE

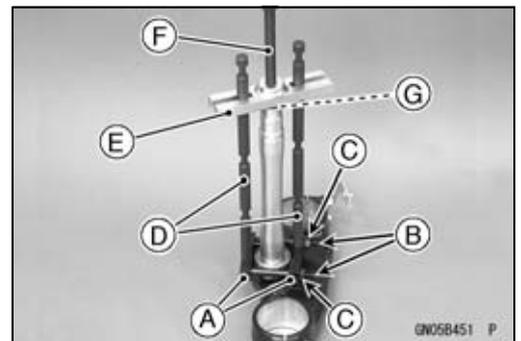
○ If either steering stem bearing is damaged, it is recommended that both the upper and lower bearing (including outer races) should be replaced with new ones.



- Remove the lower stem bearing inner race (tapered roller bearing) with its grease seal from the stem using bearing pullers.

**Special Tools - Bearing Puller: 57001-135**  
**Bearing Puller: 57001-1575**

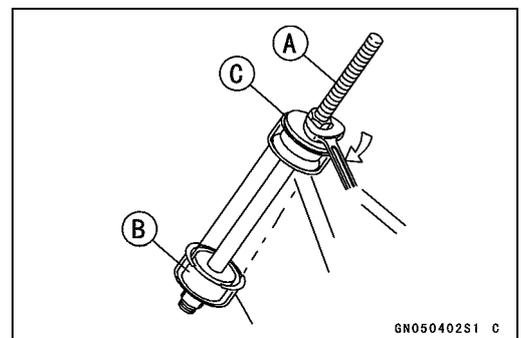
- Assemble the bearing puller (57001-1575).
- Insert the each half-split base [A] under the bottom of bearing inner race and connect the both bases by tightening the bolts [B] and nuts [C].
- Assemble the parts of the bearing puller (57001-135) as shown in the figure.
  - Stud Bolts [D]
  - Arm [E]
  - Center Bolt [F]
  - Adapter [G]
- Turn the center bolt by a wrench and pull the bearing inner race.



### Steering Stem, Stem Bearing Installation

- Replace the bearing outer race 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 head pipe outer race drivers.

**Special Tools - Head Pipe Outer Race Press Shaft: 57001-1075**  
**Head Pipe Outer Race Driver,  $\phi$ 54.5: 57001-1077 [B]**  
**Head Pipe Outer Race Driver,  $\phi$ 51.5: 57001-1076 [C]**

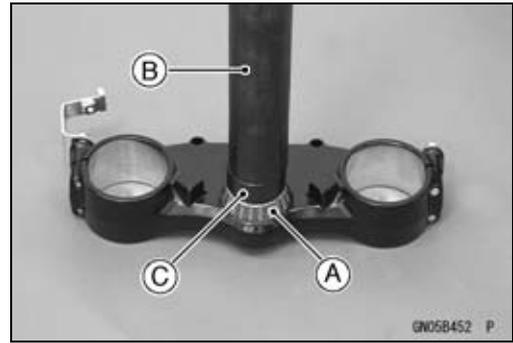


## 14-8 STEERING

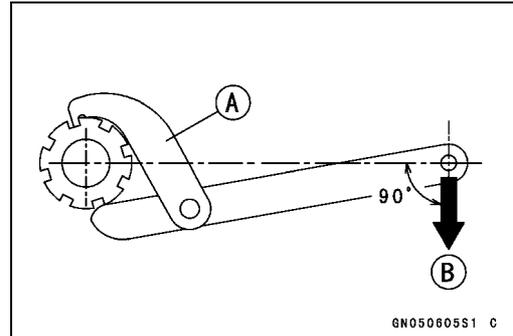
### Steering Stem

- 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, install the stem cap and hand-tighten the stem 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)**

- Install the front fork (see Front Fork Installation in the Suspension chapter).

#### NOTE

- Tighten the upper fork clamp bolts first, next the stem head nut, last the fork lower clamp bolts.

- Tighten:

**Torque - Steering Stem Head Nut: 98 N·m (10 kgf·m, 72 ft·lb)**

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

**Lower Front Fork 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.

## Steering Stem

- Install the parts removed (see the appropriate chapter).

### **⚠ WARNING**

**Do not impede the handlebar turning by routing the cables, wires, and hoses improperly (see Cable, Wire, and Hose Routing in the Appendix chapter).**

- Check and Adjust:
  - Steering
  - Front Brake
  - Clutch Cable
  - Throttle Cable

### **Stem Bearing Lubrication**

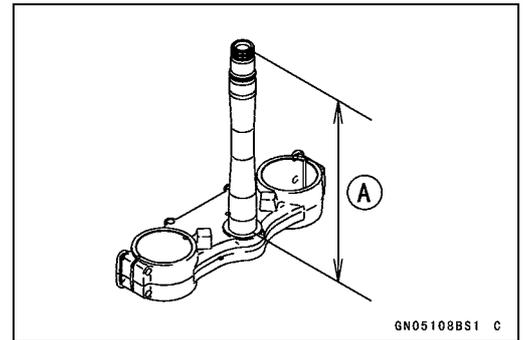
- Refer to the Stem Bearing Lubrication in the Periodic Maintenance chapter.

### **Stem Bearing Wear, Damage Inspection**

- Using a high-flash point solvent, wash the upper and lower tapered rollers in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean off grease and dirt.
- Visually check the outer race and the rollers.
- ★ Replace the bearing assembly if it show damage.

### **Stem Warp Inspection**

- 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 shaft is bent [A], replace the steering stem.

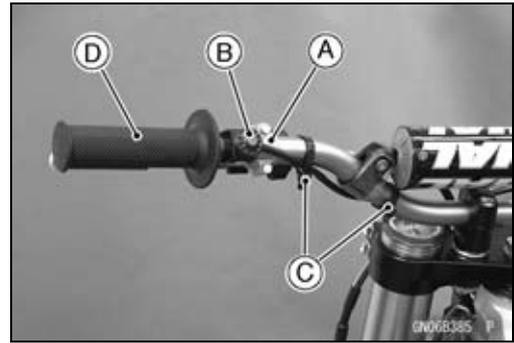


## 14-10 STEERING

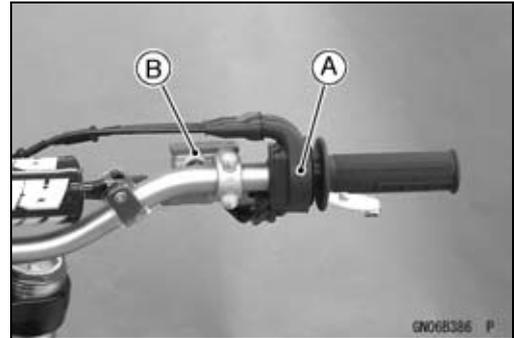
### Handlebar

#### **Handlebar Removal**

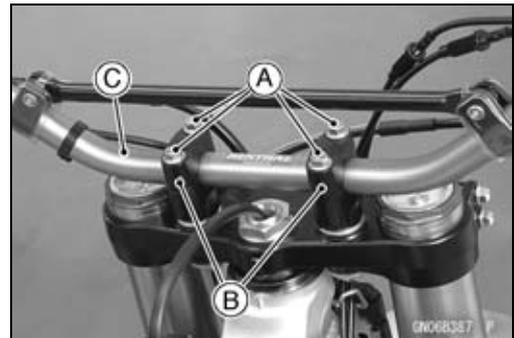
- Remove:
  - Number Plate (see Number Plate Removal in the Frame chapter)
  - Clutch Holder [A]
  - Engine Stop Switch [B]
  - Clamps [C]
  - Left Handlebar Grip [D]



- Remove:
  - Throttle Grip Assy [A] (see Throttle Cable Replacement in the Fuel System (DFI) chapter)
  - Master Cylinder [B] (see Front Master Cylinder Removal in the Brakes chapter)

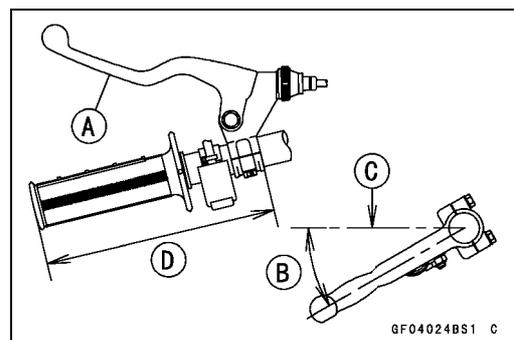
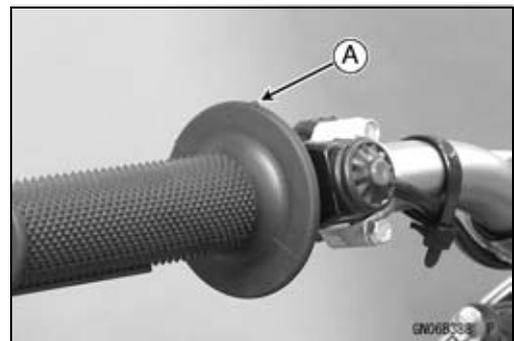


- Remove:
  - Handlebar Clamp Bolts [A]
  - Handlebar Clamps (Upper)[B]
  - Handlebar [C]



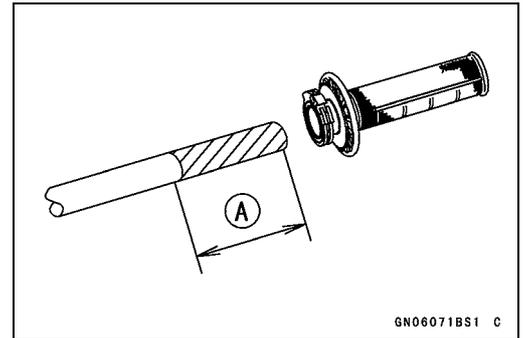
#### **Handlebar Installation**

- Apply adhesive cement to the inside of the left handlebar grip.
- Install the left handlebar grip so that the projection [A] on the grip faces upward.
- Install the clutch lever [A] so that it incline  $20^{\circ} \pm 5^{\circ}$  [B] more than the horizontal line [C] and position it from the edge of the grip to 170 mm (6.69 in.) [D].

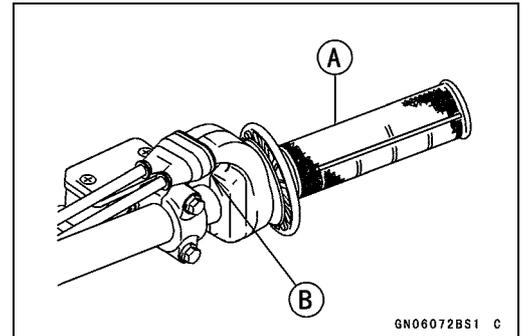


**Handlebar**

- Apply grease to the throttle cable upper end and clutch cable upper end.
- Apply a 2-stroke oil to the edge (slash area) of the handlebar.
  - [A] 120mm (4.72in.)



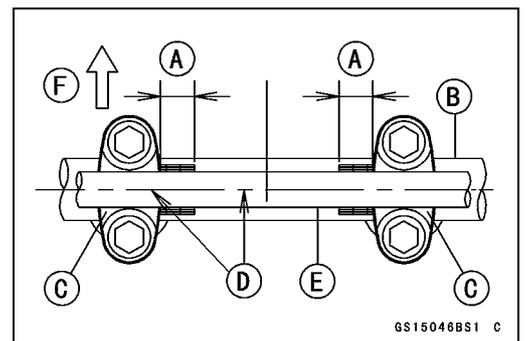
- Install the throttle grip assy so that the grip [A] is in as far as it will go.
- Position the throttle grip assy so that the parting line [B] of the throttle case vertically, and tighten the screws.
- Install the front master cylinder (see Front Master Cylinder Installation in the Brakes chapter).



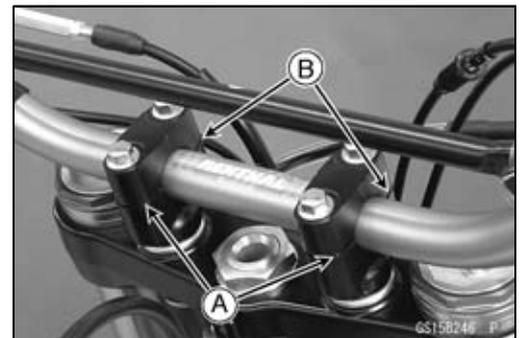
- Install the handlebar [B] on the handlebar clamp (lower) so that the protruded scales of the both side adjust to the same width [A].
- Apply 2-stroke oil to the thread of the handlebar holder bolts.
- Install the handlebar clamps [C] so that center [D] of the handlebar clamp and handlebar bridge [E] align.

**Torque - Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

[F] Front



- After tighten, make sure the gap [A] [B] of the front and rear are same width.





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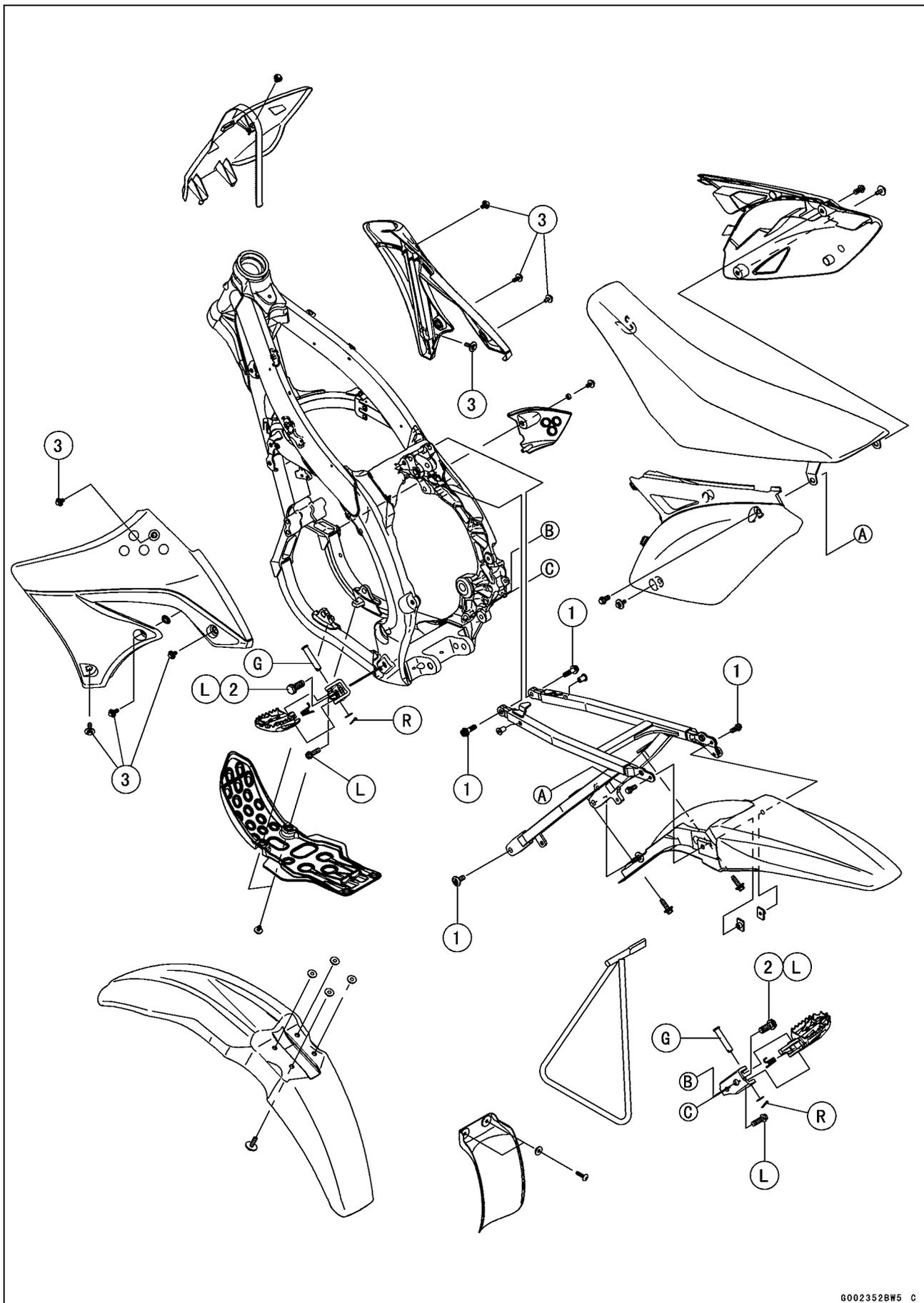
# Frame

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# 15-2 FRAME

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Frame Mounting Bolts	34	3.5	25	
2	Upper Footpeg Bracket Bolts	54	5.5	40	L
3	Radiator Shroud Bolts	9.8	1.0	87 in·lb	

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 15-4 FRAME

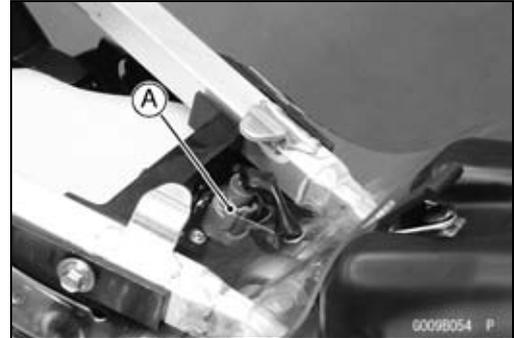
### Frame

#### **Frame Inspection**

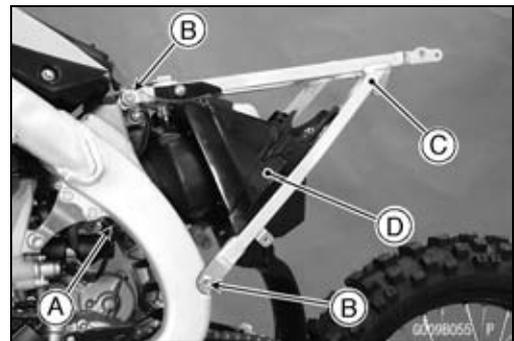
- Refer to the Frame Inspection in the Periodic Maintenance chapter.

#### **Rear Frame Removal**

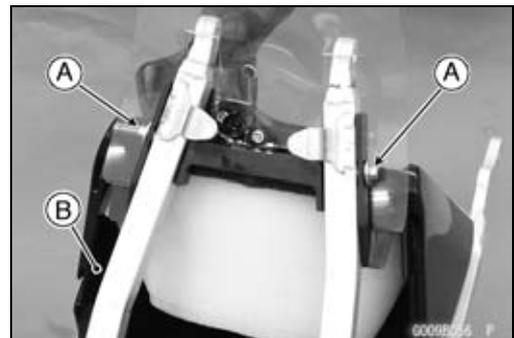
- Remove:
  - Seat (see Seat Removal)
  - Right and Left Side Cover (see Side Cover Removal)
  - Muffler (see Muffler Removal in the Engine Top End chapter)
  - Rear Fender (see Rear Fender Removal)
  - Inlet Air Temperature Sensor Connector [A]



- Loosen the air cleaner duct clamp screw [A].
- Unscrew the rear frame mounting bolts [B].
- Remove the rear frame [C] with the air cleaner housing [D].



- Remove:
  - Bolts [A]
  - Air Cleaner Housing [B]



#### **Rear Frame Installation**

- Install the air cleaner housing to the rear frame (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter).
- Tighten:
  - Torque - Rear Frame Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)**
- Install the removed parts (see appropriate chapters).

---

**Frame**

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**Engine Guard Installation**

- Install the engine guard as shown.

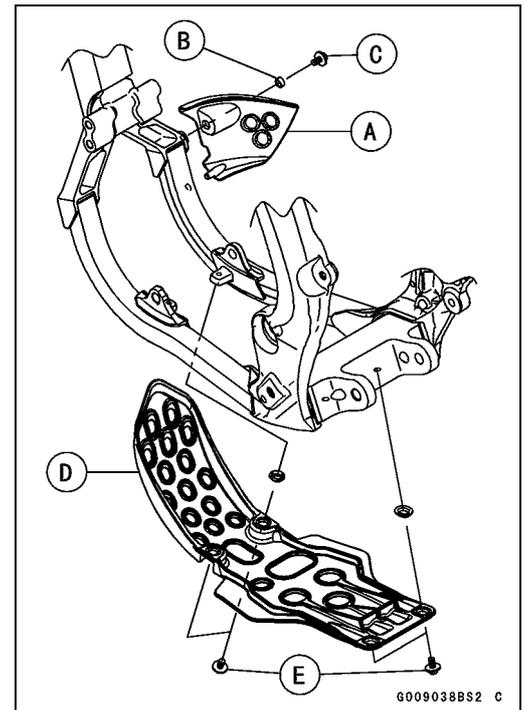
Right Engine Guard [A]

Collar [B]

Bolt [C]

Engine Guard [D]

Bolts [E]

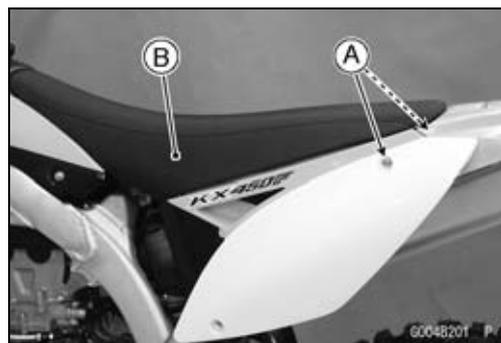


## 15-6 FRAME

### Seat

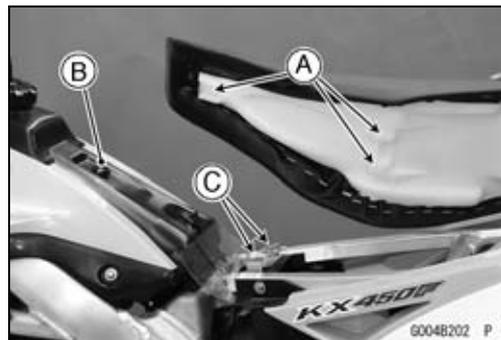
#### **Seat Removal**

- Remove the bolts [A].
- Pull the seat [B] out from the back.



#### **Seat Installation**

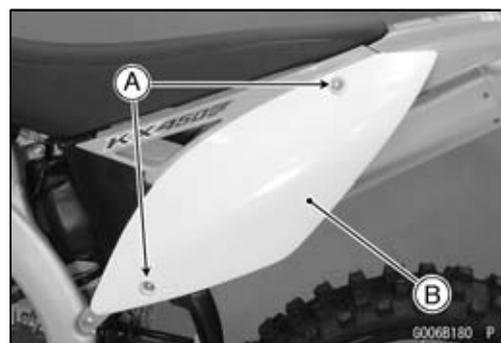
- Insert the hooks [A] of the seat under the flange collar [B] and brackets [C].
- Tighten the seat mounting bolts.



## Side Cover

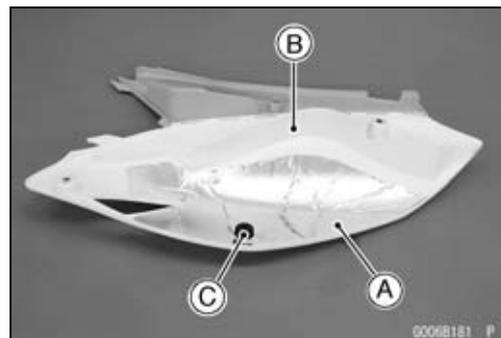
### *Side Cover Removal*

- Remove:
  - Bolts [A]
  - Side Cover [B]
- Remove the other side according to similar procedure.

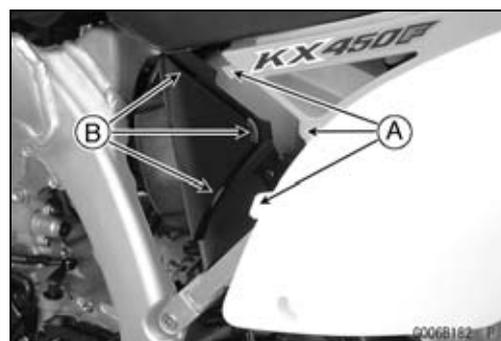


### *Side Cover Installation*

- Stick the pad [A] on the inside of the right side cover [B].
- Install the damper [C].



- Insert the tabs [A] of the side cover into slits [B] of the air cleaner housing.

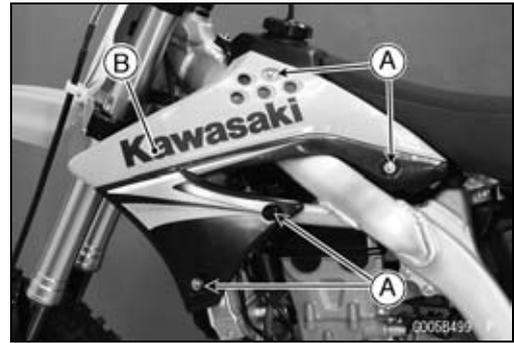


## 15-8 FRAME

### Radiator Shroud

#### *Radiator Shroud Removal*

- Remove:
  - Bolts [A]
  - Radiator Shroud [B]



#### *Radiator Shroud Installation*

- Install:
  - Radiator shroud [A]
  - Bolts (L = 12) [B]
  - Bolt (L = 16) [C]



## Number Plate

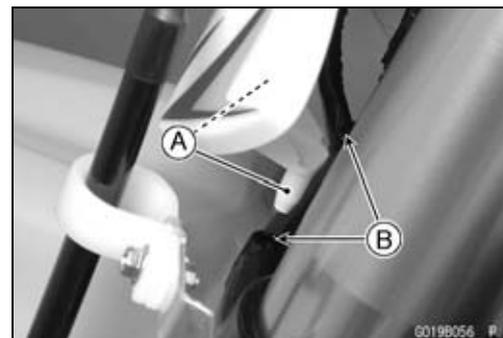
### ***Number Plate Removal***

- Remove the bolt [A].
- Remove the band [B] from the handlebar.
- Remove the number plate [C] upward.



### ***Number Plate Installation***

- Insert the projections [A] of the number plate into the holes [B] of the steering stem.
- Run the clutch cable through front of the number plate.
- Install the band to the handlebar, and tighten the mounting bolt.

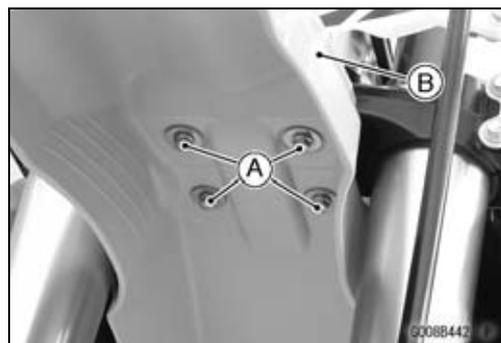


## 15-10 FRAME

### Fender

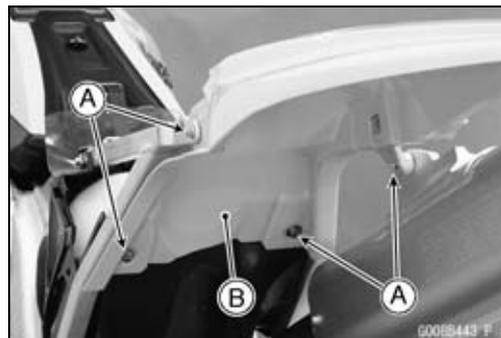
#### ***Front Fender Removal***

- Unscrew the bolts [A] and remove the front fender [B].



#### ***Rear Fender Removal***

- Remove:
  - Seat (see Seat Removal)
  - Sidecover (see Side Cover Removal)
- Unscrew the bolts [A] and remove the rear fender [B].



#### ***Rear Flap Removal***

- Unscrew the screws [A] and remove the rear flap [B].



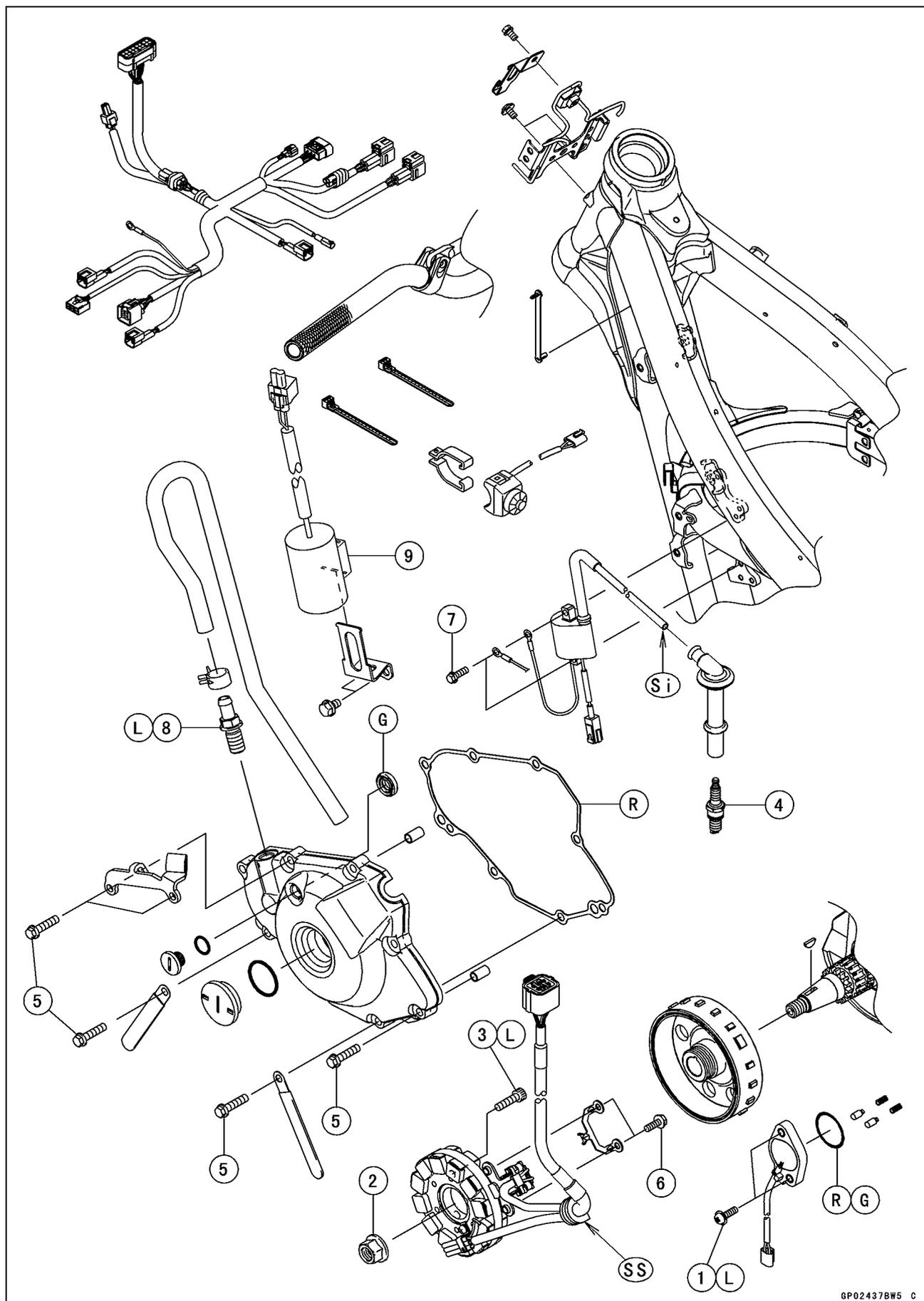
# Electrical System

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# 16-2 ELECTRICAL SYSTEM

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Gear Position Switch Screws	2.9	0.30	26 in-lb	L
2	Flywheel Nut	78	8.0	58	
3	Stator Coil Bolts	9.8	1.0	87 in-lb	L
4	Spark Plug	13	1.3	115 in-lb	
5	Magneto Cover Bolts	9.8	1.0	87 in-lb	
6	Crankshaft Sensor Bolts	7.0	0.71	62 in-lb	
7	Ignition Coil Bolts	9.8	1.0	87 in-lb	
8	Breather Fitting	15	1.5	11	L

9: Capacitor

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

Si: Apply silicon grease.

SS: Apply silicon sealant.

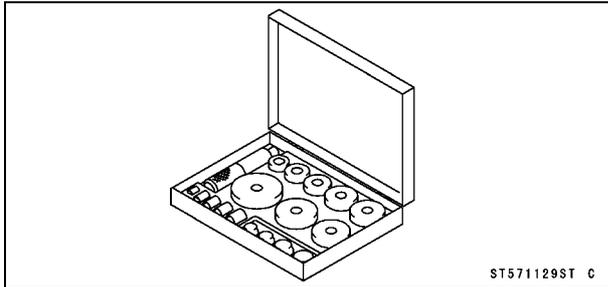
## 16-4 ELECTRICAL SYSTEM

### Specifications

Item	Standard
<b>Magneto</b> Magneto Output Voltage Stator Coil Resistance	37 V or more at 4 000 r/min (rpm) 0.4 ~ 1.1 $\Omega$ (at 20°C (68°F))
<b>Ignition System</b> Ignition Timing Ignition Coil: 3 Needle Arcing Distance Primary Winding Resistance Secondary Winding Resistance Primary Peak Voltage Crankshaft Sensor Resistance Crankshaft Sensor Peak Voltage Spark Plug: Type Gap	10° BTDC @2 000 r/min (rpm) 7 mm (0.26 in.) or more 0.28 ~ 0.38 $\Omega$ (at 20°C (68°F)) 7.65 ~ 10.35 k $\Omega$ (at 20°C (68°F)) 152 V or more 180 ~ 280 $\Omega$ (at 20°C (68°F)) 4 V or more NGK CPR8EB-9 0.8 ~ 0.9 mm (0.03 ~ 0.04 in.)

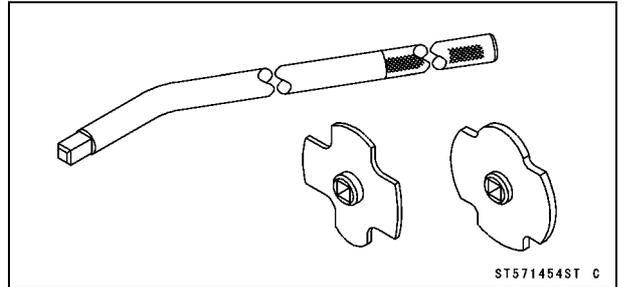
Special Tools and Sealant

Bearing Driver Set:  
57001-1129



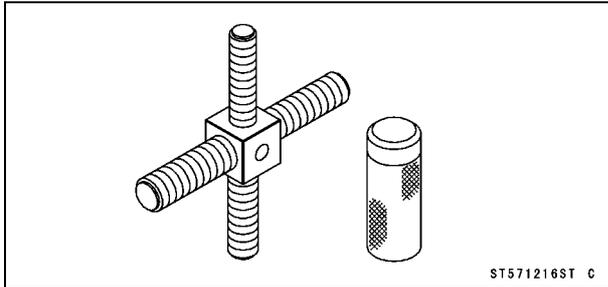
ST571129ST C

Filler Cap Driver:  
57001-1454



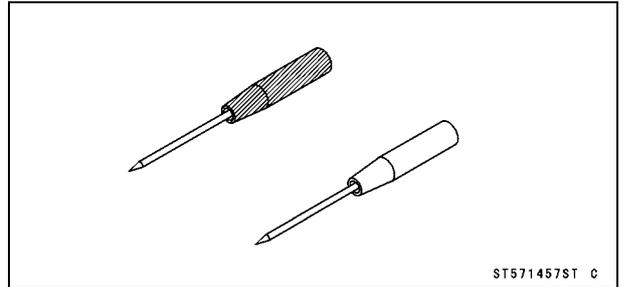
ST571454ST C

Rotor Puller, M16/M18/M20/M22 x 1.5:  
57001-1216



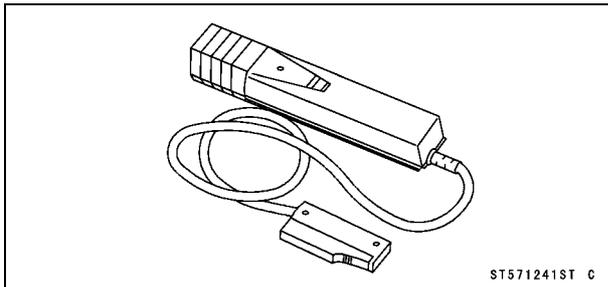
ST571216ST C

Needle Adapter Set:  
57001-1457



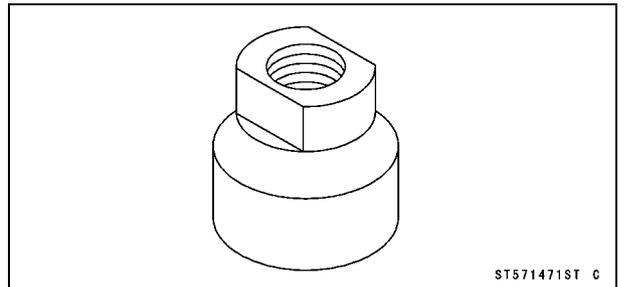
ST571457ST C

Timing Light:  
57001-1241



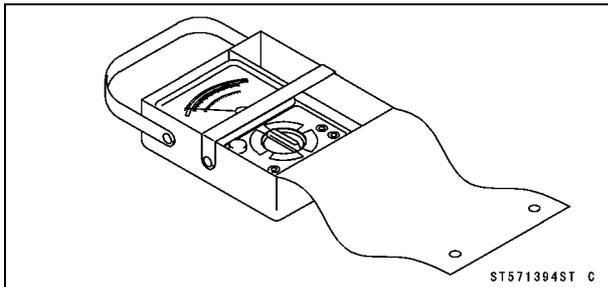
ST571241ST C

Flywheel Puller, M28 x 1.0:  
57001-1471



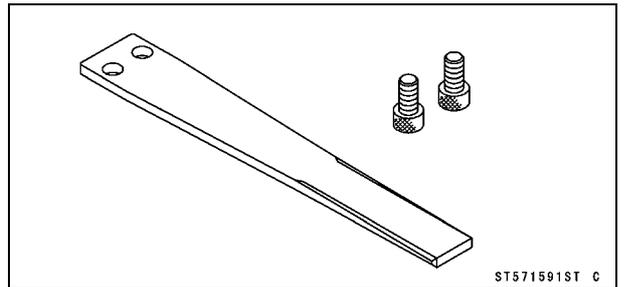
ST571471ST C

Hand Tester:  
57001-1394



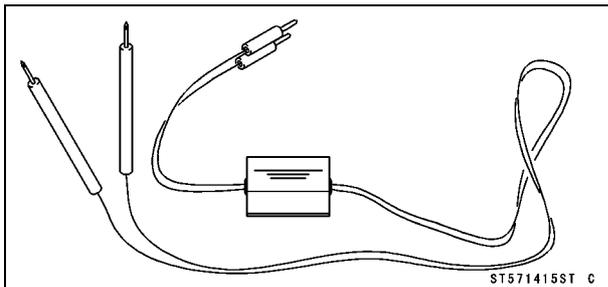
ST571394ST C

Grip:  
57001-1591



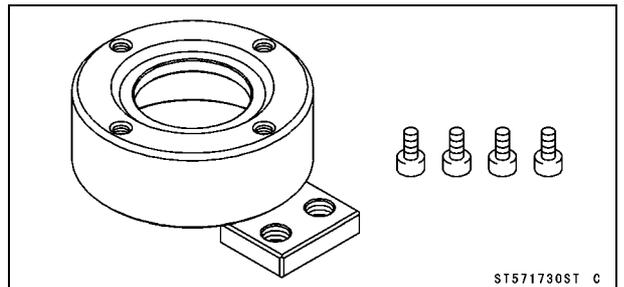
ST571591ST C

Peak Voltage Adapter:  
57001-1415



ST571415ST C

Rotor Holder:  
57001-1730



ST571730ST C

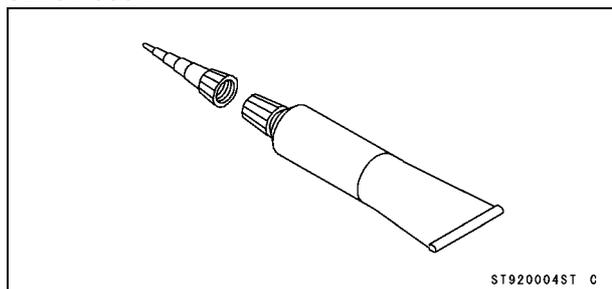
## 16-6 ELECTRICAL SYSTEM

### Special Tools and Sealant

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Kawasaki Bond (Silicone Sealant):

92104-0004



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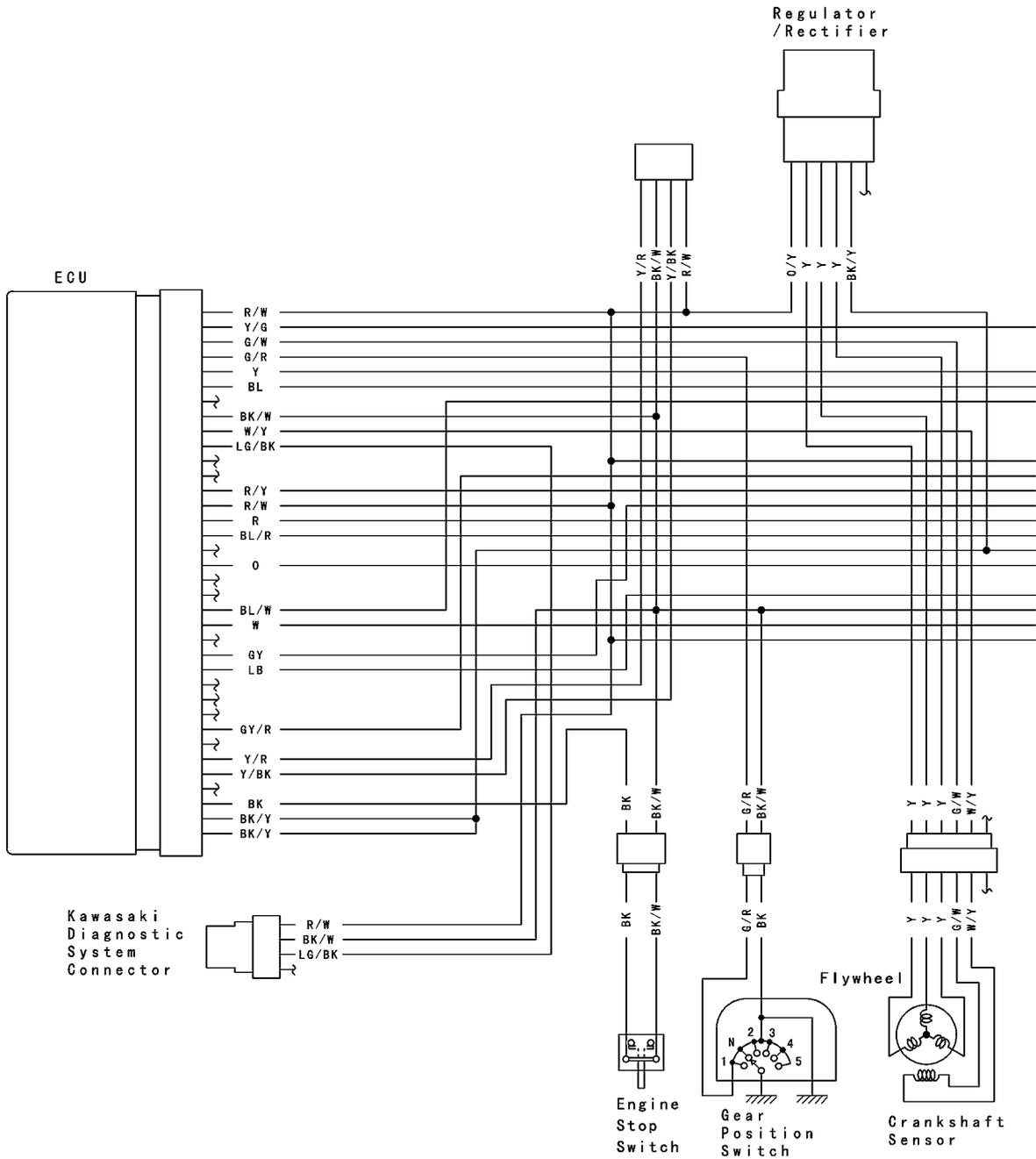
**Special Tools and Sealant**

---

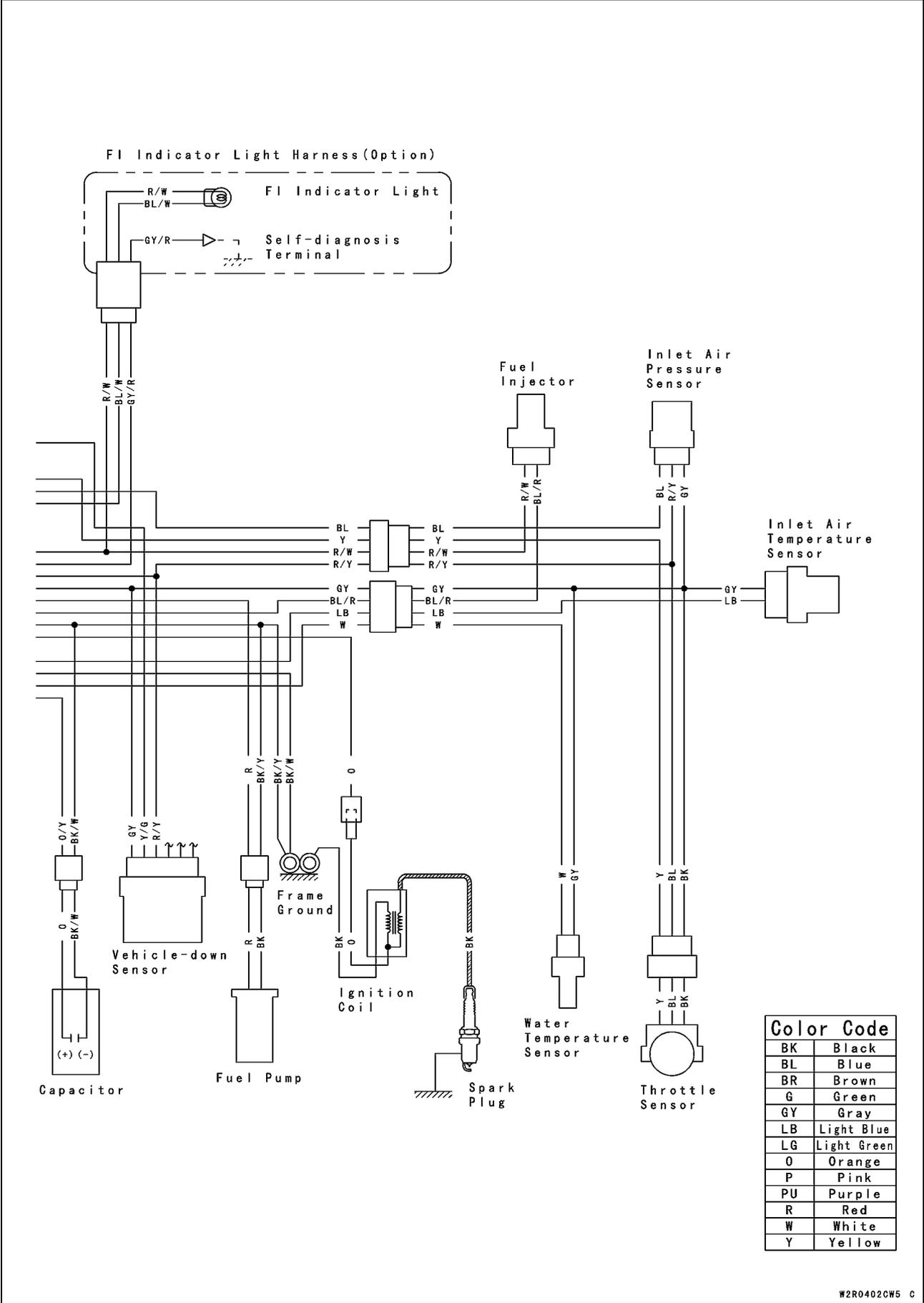
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# 16-8 ELECTRICAL SYSTEM

## Wiring Diagram



Wiring Diagram



## 16-10 ELECTRICAL SYSTEM

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### Precautions

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There are numbers of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- 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 any electrical connections while the engine is running.
- 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 too 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

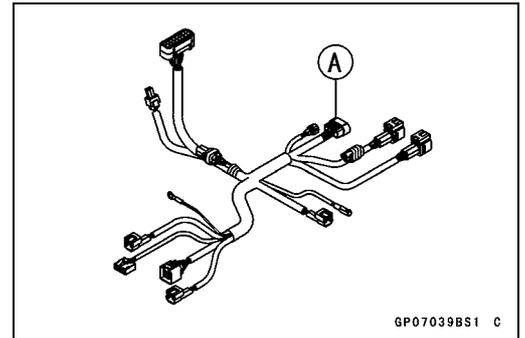
### **Wiring Inspection**

- 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 an ohmmeter between the ends of the leads.

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

Set the meter to the x 1  $\Omega$  range, and read the meter.

- ★ If the meter does not read 0  $\Omega$ , the lead is defective. Replace the lead or the wiring harness if necessary.

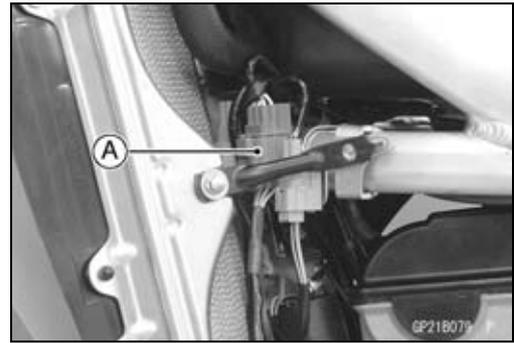


## 16-12 ELECTRICAL SYSTEM

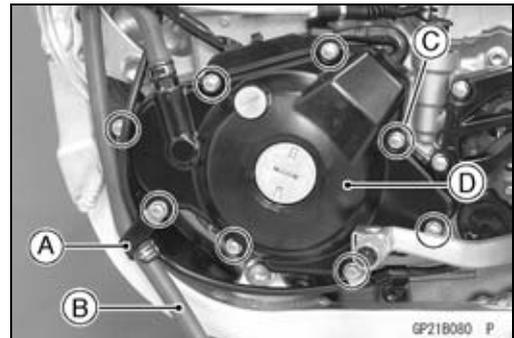
### Flywheel Magneto

#### **Magneto Cover Removal**

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove the left radiator shroud (see Radiator Shroud Removal in the Frame chapter).
- Disconnect the magneto lead connector [A] from the main harness.

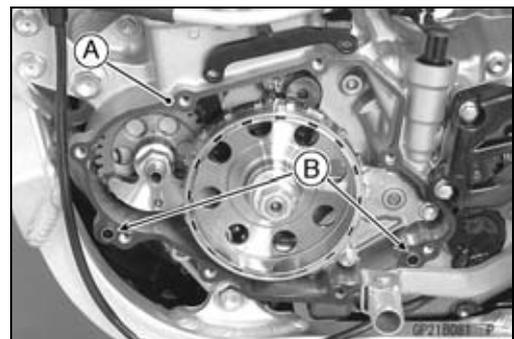


- Open the clamp [A] then free the breather hose [B].
- Remove:
  - Magneto Cover Mounting Bolts [C].
  - Magneto Cover [D]



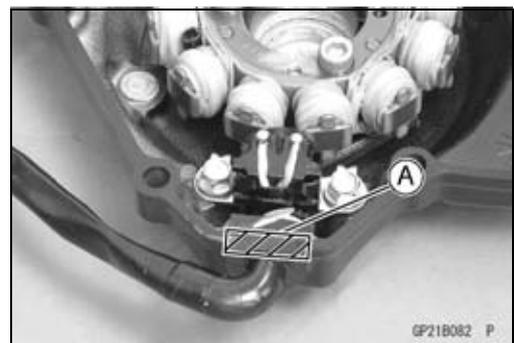
#### **Magneto Cover Installation**

- Replace the gasket [A] with a new one.
- Be sure to install the dowel pins [B].



- Apply silicone sealant to the area [A] to the magneto lead grommet.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**



- Put in the magneto lead to the lead holder [A].
- Tighten:
  - **Torque - Magneto Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Run the breather hose [B] and magneto lead according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Connect the magneto connector.



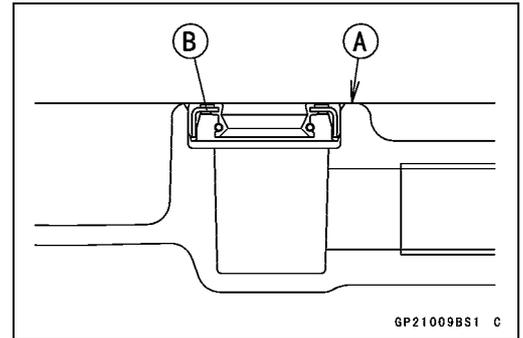
## Flywheel Magneto

### Magneto Cover Assembly

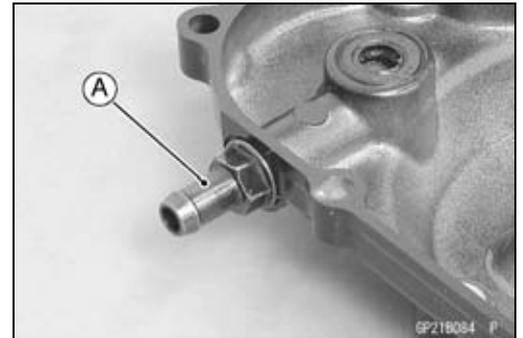
- If removed, the oil seal replacement may be required.
- Press the balancer shaft oil seal [B] so that the magneto cover end [A] is flushed as shown.

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

- Apply grease to the oil seal lips.



- Apply a non-permanent locking agent to the threads of the breather fitting [A].
- Tighten:
  - Torque - Breather Fitting: 15 N·m (1.5 kgf·m, 11 ft·lb)**
- Install the stator coil and crankshaft sensor (see Stator Coil Installation in the Electrical System chapter).



### Flywheel Removal

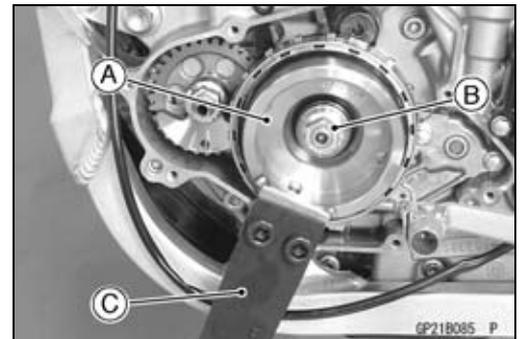
- Remove the magneto cover (see Magneto Cover Removal).

- Hold the flywheel steady with the rotor holder [A], and remove the flywheel nut [B].

**Special Tools - Grip [C]: 57001-1591**

**Rotor Holder: 57001-1730**

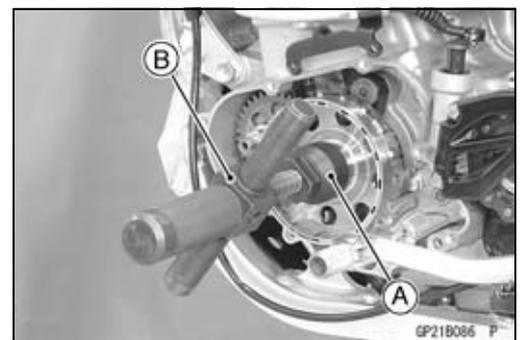
- Remove the flywheel holder.



- Screw the flywheel puller [A] into the flywheel.
- Screw the rotor puller [B] to the flywheel puller.
- Remove the flywheel from the crankshaft by turning in the puller rotor puller and tapping the head of the puller lightly with a hammer, while holding the puller body steady. There is a woodruff key in the crankshaft tapered portion.

**Special Tools - Rotor Puller, M16/M18/M20/M22 x 1.5: 57001-1216**

**Flywheel Puller, M28 x 1.0: 57001-1471**



### CAUTION

**Never strike the grab bar or the flywheel itself. Striking the bar can bond it. If the flywheel is struck, the magnets may lose their magnetism.**

## 16-14 ELECTRICAL SYSTEM

### Flywheel Magneto

#### **Flywheel Installation**

- Using a high-flash point solvent, clean off any oil or dirt that may be on the crankshaft taper [A] or in the hole [B] of the flywheel. Dry them with a clean cloth.
- Fit the woodruff key [C] securely in the slot of the crankshaft.
- Install the flywheel according to the following procedures.

#### **NOTE**

○ Confirm the flywheel fit or not to the crankshaft before tightening it with specified torque.

- Install the flywheel and tighten the flywheel nut with 54 N·m (5.5 kgf·m, 40 ft·lb) of torque.
- Remove the flywheel nut.
- Check the tightening torque with rotor puller.
- ★ If the flywheel is not pulled out with 20 N·m (2 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
- ★ If the flywheel is pulled out with under 20 N·m (2 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and flywheel tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.

- Hold the flywheel steady with the rotor holder, and tighten the flywheel nut.

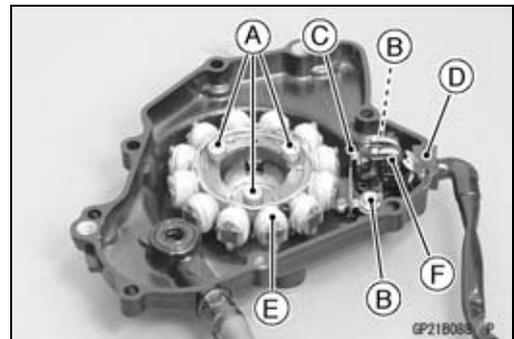
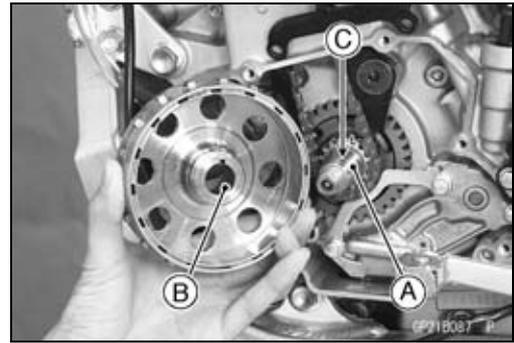
**Special Tool - Rotor Holder: 57001-1730**

**Torque - Flywheel Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)**

- Install the magneto cover (see Magneto Cover Installation)

#### **Stator Coil Removal**

- Remove:
  - Magneto Cover (see Magneto Cover Removal)
  - Stator Coil Bolts [A]
  - Crankshaft Sensor Bolts [B]
  - Wiring Holder [C]
  - Wiring Grommet [D]
- Remove the stator coil [E] and crankshaft sensor [F] as a set.



## Flywheel Magneto

### Stator Coil Installation

- Route the leads according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Apply a non-permanent locking agent to the stator coil bolts.
- Install the stator and tighten the stator coil bolts.

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

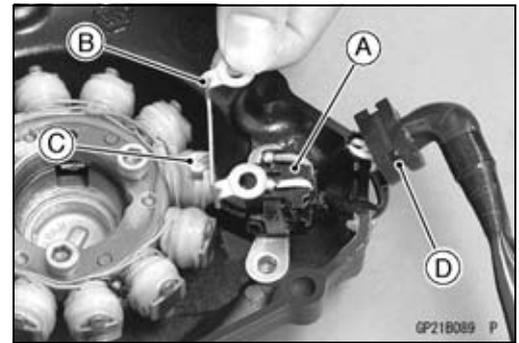
- Install the crankshaft sensor [A] and wiring holder [B].
- Run the magneto leads under the sensor, and hold the guide [C] of the holder.

**Torque - Crankshaft Sensor Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Apply silicone sealant around the circumference of the wiring grommet [D].

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Set the stator wiring grommet securely in the notch.
- Install the magneto cover (see Magneto Cover Installation).



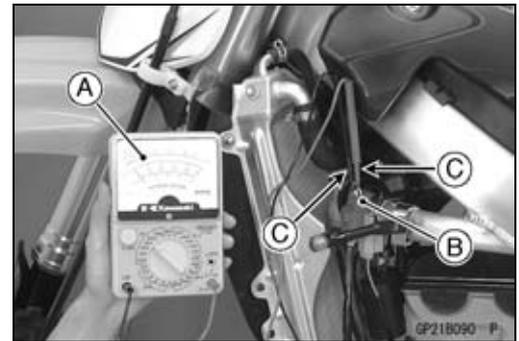
### Flywheel Inspection

There are three types of magneto problems: short, open (lead burned out), or loss in flywheel. A short or open in one of the coil leads will result in either a low output, or no output at all. A loss in flywheel, which may be caused by dropping or hitting the flywheel by leaving it near an electromagnetic field, or just by aging, will result in low output.

- Check the magneto output voltage, do the following procedures.
  - Remove the left radiator shroud.
  - Connect the hand tester [A] to the connector [B] as shown in the table 1, using the needle adapter set [C].
  - Start the engine.
  - Run it at the rpm given in the table 1.
  - Note the voltage readings (total 2 measurements).

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

**Needle Adapter Set: 57001-1457**



**Table 1 Magneto Output Voltage**

Tester Range	Connections		Reading @ 4 000 rpm
	Tester (+) to	Tester (-) to	
50 V AC	One yellow lead	Another yellow lead	37 V or more

- ★ If the output voltage shows the value in the table, the magneto operates properly.
- ★ If the output voltage shows a much lower reading than that given in the table it indicates that the magneto is defective.
- To check the stator coil resistance as follows.
  - Stop the engine.
  - Disconnect the connector.
  - Connect the hand tester as shown in the table 2.
  - Note the readings (total 2 measurement).

## 16-16 ELECTRICAL SYSTEM

### Flywheel Magneto

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Table 2 Stator Coil Resistance

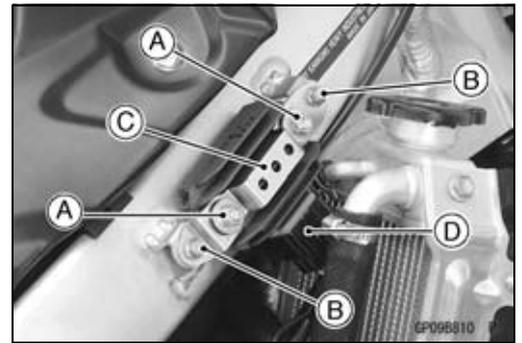
Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
$\times 1 \Omega$	One yellow lead	Another yellow lead	$0.4 \sim 1.1\Omega$

- ★ If there is more resistance than shown in the table, or no hand tester reading (infinity), 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 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 magneto to be defective; then the flywheel have probably weakened, and the flywheel must be replaced.

**Charging System**

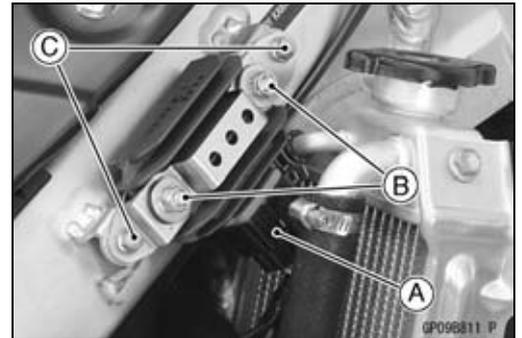
**Regulator/Rectifier Removal**

- Remove:
  - Right Radiator shroud (see Radiator Shroud Removal in the Frame chapter)
  - Nuts [A]
  - Bolts [B]
  - Bracket [C]
- Remove the regulator/rectifier connector [D].



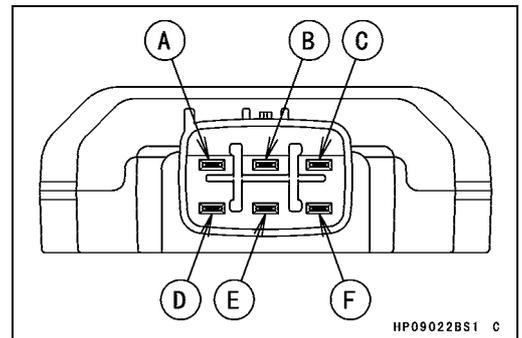
**Regulator/Rectifier Installation**

- Install the regulator/rectifier connector [A].
- Assemble the upper and lower bracket, and tighten the nuts [B].
- Tighten the regulator/rectifier bracket bolts [C].



**Regulator/Rectifier Inspection**

- Remove:
  - Regulator/Rectifier (see Regulator/Rectifier Removal)
- Set the hand tester to the  $\times 1 \text{ k}\Omega$  range and make the measurements shown in the table.
- Special Tool - Hand Tester: 57001-1394**
- Connect the hand tester to the regulator rectifier.
- ★ If the tester readings are not as specified, replace the regulator/rectifier.



**CAUTION**

**Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings. If a megger or a meter with a large capacity battery is used, the regulator/rectifier will be damaged.**

**Regulator/Rectifier Resistance (Unit:  $\text{k}\Omega$ )**

		Tester (+) Lead Connection					
Terminal		A	B	C	D	E	F
(-)*	A	-	0	0	0	0	0
	B	0	-	0	0	0	0
	C	5 ~ 15	0	-	5 ~ 15	5 ~ 15	5 ~ 15
	D	5 ~ 15	0	0	-	0	0
	E	5 ~ 15	0	0	0	-	0
	F	5 ~ 15	0	0	0	0	-

(-)\*: Tester (-) Lead Connection

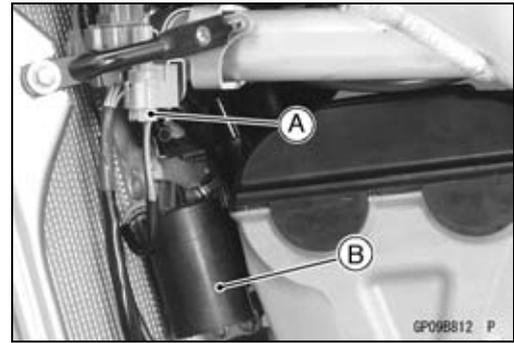
- Install the regulator/rectifier.

# 16-18 ELECTRICAL SYSTEM

## Charging System

### Capacitor Removal

- Remove:
  - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
- Remove the connector [A], and pull the capacitor [B] upward.



### Capacitor Installation

- Face the lead of the capacitor upward, and insert to the bracket.
- Connect the connector.

### Capacitor Inspection

- Remove:
  - Capacitor (see Capacitor Removal)
- Set the hand tester to the  $\times 1 \text{ k}\Omega$  range, connect the tester to the leads of the capacitor, and check the internal resistance following the table.

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

### CAUTION

**Use only Hand Tester 57001-1394 for this test. An ohmmeter other than the Hand Tester may show different readings.**

- ★ If the readings do not correspond to the table, replace the capacitor unit.

### Capacitor Internal Resistance

		Tester Positive (+) Lead Connection	
Tester Negative (-) Lead Connection	Color	○	BK/W
	○	—	more than 5 kΩ *1
	BK/W	Should not be inspected *2	—

\*1: Check the capacitor after 2 minutes.

\*2: Do not check the resistance because of opposite of the polarity.

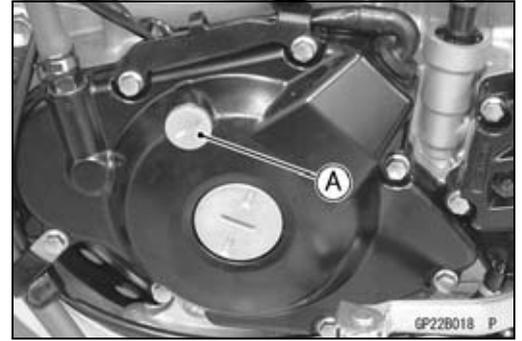
### Capacitor Capacity

**10 000  $\mu\text{F}$ /50V**

## Ignition Timing

### Ignition Timing Inspection

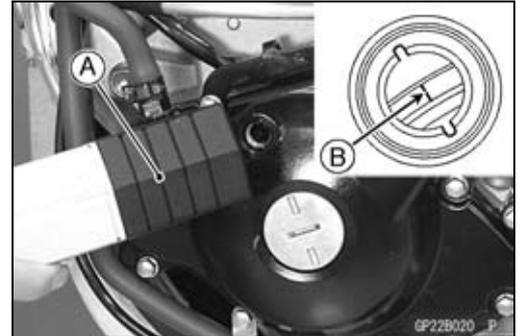
- Remove the timing inspection cap[A].  
**Special Tool - Filler Cap Driver: 57001-1454**



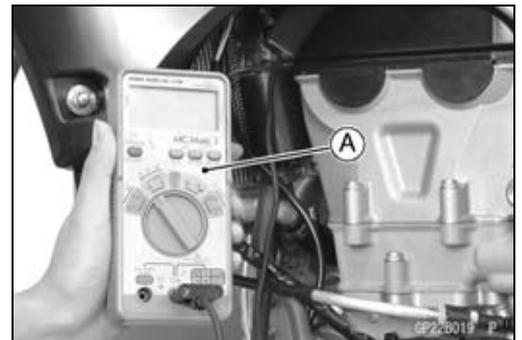
- Attach the timing light [A] to the ignition coil lead in the manner prescribed by the manufacturer.

**Special Tool - Timing Light: 57001-1241**

- Start the engine and aim the timing light at the ignition timing mark [B] on the flywheel.
- Run the engine at the speeds specified and note the alignment of the ignition timing marks.



- Check the engine speed, using the engine revolution tester [A] for high accuracy.



### Ignition Timing

Engine speed [r/min (rpm)]	Hole groove aligns with:
2 000	Line mark on flywheel

- ★ If the ignition timing is incorrect, check the crankshaft sensor (see Crankshaft Sensor Inspection).
- ★ If the crankshaft sensor is normal, replace the ECU.
- Install the timing inspection cap.

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

## 16-20 ELECTRICAL SYSTEM

### Ignition System

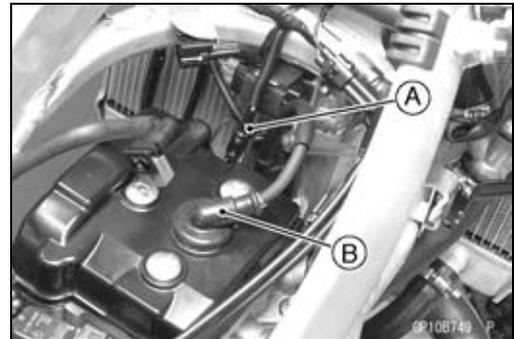
#### Safety Instructions

#### **⚠ WARNING**

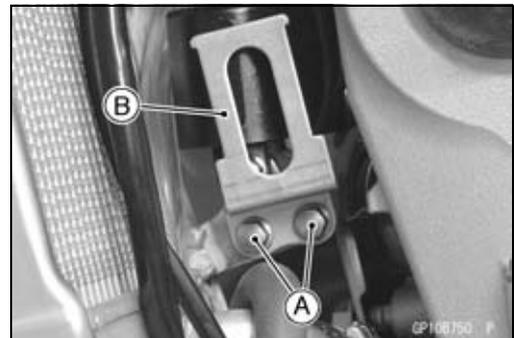
The ignition system produces extremely high voltage. Do not touch the spark plug, ignition coil, or high tension lead while the engine is running, or you could receive a severe electrical shock.

#### **Ignition Coil Removal**

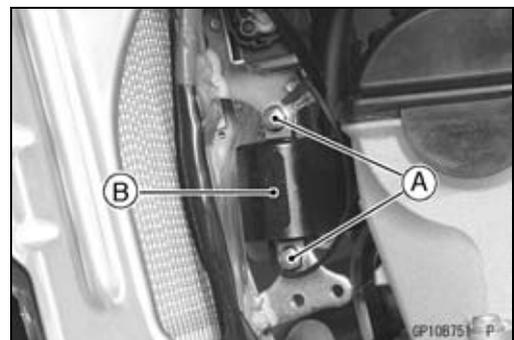
- Remove:
  - Fuel Tank (Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Capacitor (see Capacitor Removal)
- Disconnect the primary lead connector [A].
- Pull off the plug cap [B] .



- Remove:
  - Bolts [A]
  - Capacitor Bracket [B]

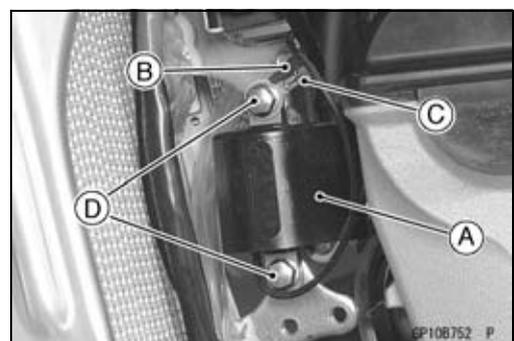


- Remove the mounting bolts [A], and remove the ignition coil [B].



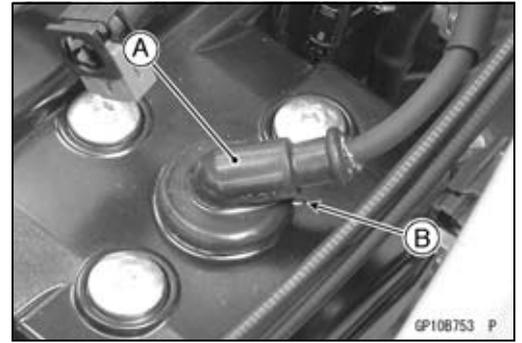
#### **Ignition Coil Installation**

- Install:
  - Ignition Coil [A]
  - Ignition Coil Ground Lead [B]
  - Main Harness Ground Lead [C]
- Tighten:
  - Torque - Ignition Coil Bolts [D]: 9.8 N·m (1.0 kgf·m, 87in·lb)**
- Connect the primary lead connector.



## Ignition System

- Install the spark plug cap [A] aligned with the line [B] of the cylinder head cover.

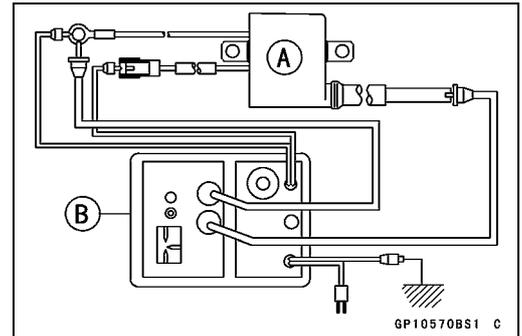


### Ignition Coil Inspection

#### Measuring arcing distance

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance using the coil tester for the 3-needle method.

- Measure the arcing distance using the coil tester [B].
- Remove the ignition coil (see Ignition Coil Removal).
- Connect the ignition coil (with the spark plug cap left installed on the spark plug lead) [A] to the tester and measure the arcing distance.



### **⚠ WARNING**

**To avoid extremely high voltage shocks, do not touch the coil or lead.**

- ★ If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.

#### 3 Needle Arcing Distance

**Standard: 7 mm (0.26 in.) or more**

- To determine which part is defective, measure the arcing distance again with the spark plug cap removed from the ignition coil lead.
- ★ 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.

## 16-22 ELECTRICAL SYSTEM

### Ignition System

#### Measuring Coil Resistance

If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

- Remove the ignition coil (see Ignition Coil Removal).
- Measure the primary winding resistance [A].
  - Connect an ohmmeter between the coil terminals.
  - Set the meter to the x 1  $\Omega$  range, and read the meter.
- Measure the secondary winding resistance [B].
  - Pull the spark plug cap off the lead.
  - Connect an ohmmeter between the high tension lead and the ground lead terminal.
  - Set the meter to the x 1 k $\Omega$  range, and read the meter.

#### Ignition Coil Winding Resistance

**Primary windings: 0.28 ~ 0.38  $\Omega$  (at 20°C (68°F))**

**Secondary windings: 7.65 ~ 10.35 k $\Omega$  (at 20°C (68°F))**

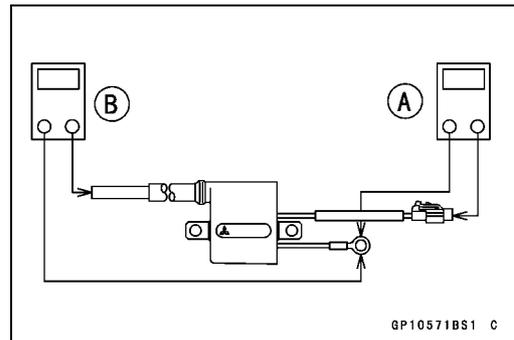
- ★ If the meter does not read as specified, replace the coil.
- ★ If the meter reads as specified, the ignition coil windings are probably good. However, if the ignition system still does not perform as it should after all other components have been checked, test replace the coil with one known to be good.
- Check the high tension lead for visible damage.
- ★ If the high tension lead is damaged, replace the ignition coil.

#### Spark Plug Cleaning and Inspection

- Refer to the Spark Plug Cleaning and Inspection in the Periodic Maintenance chapter.

#### Spark Plug Gap Inspection

- Refer to the Spark Plug Cleaning and Inspection in the Periodic Maintenance chapter.



## Ignition System

### Ignition Coil Primary Peak Voltage Check

- Disconnect the spark plug cap from the spark plug, but do not remove the spark plug.
- Connect the good spark plug [A] to the spark plug cap, then touch the engine with it.

#### NOTE

- Measure the voltage with each lead connected correctly. The correct value may not be obtained if disconnected.
- Maintain the correct value of compression pressure for the cylinder (Be sure to measure the voltage with the spark plug installed to the cylinder head).
- Connect the peak voltage adapter [B] to the hand tester, and connect the black lead of adapter to the terminal of primary lead (orange), red lead of it to the ground connection of the ignition coil [C].
- Set the tester to DC 250 V range.

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

**Peak Voltage Adapter: 57001-1415**

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

**Needle Adapter Set: 57001-1457**

**Connection: Adapter Positive → Ground Lead [D]**

**Adapter Negative → Orange Lead [E]**

ECU [F]

Needle Adapter [G]

- Shift the gear to the neutral position, then free the engine stop switch.
- Crank the engine by kicking the pedal several times to measure the peak voltage of the primary ignition coil.

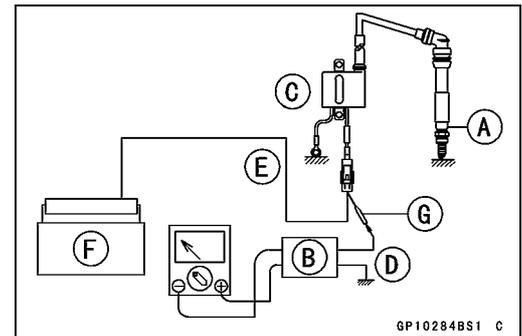
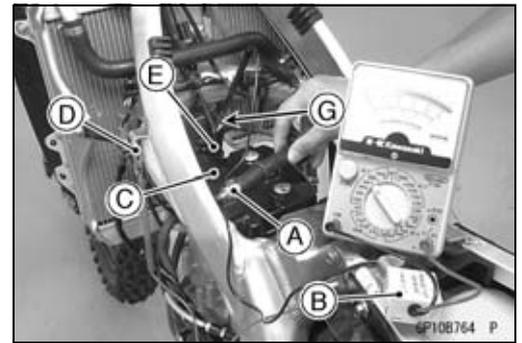
### Ignition Coil Primary Peak Voltage

**Standard : 152 V or more**

#### **⚠ WARNING**

**Do not touch the metal portion of the probe in case of measuring the voltage, or you may receive a serious electric shock.**

- ★ If the voltage is less than the specified value, see the next page.



# 16-24 ELECTRICAL SYSTEM

## Ignition System

### Troubleshooting

Faulty ignition (Malfunctioned engine)

Wiring and connect portion of the ignition system inspection

No good

Repair

Good

Spark plug inspection

No good

Replace

Good

Spark plug cap inspection

No good

Replace

Good

Ignition coil primary peak voltage inspection

Good

Voltage is specified but faulty ignition

Defective ignition coil

Replace

Replace the malfunctioned-no good parts

No good. Voltage is none or almost

Inspect  
1. Adapter connection is incorrect or adapter is directive.  
2. Engine stop switch  
3. Crankshaft sensor peak voltage

All good

ECU is defective

No good. Voltage is less than the specified value.

Inspection  
1. Speed of cranking engine is slow. (Increase force of kicking engine.)  
2. Lower resistance in the tester. (Use KAWASAKI Hand Tester)  
3. Lacking of sampling (Sampling few times)  
4. Crankshaft sensor peak voltage

All good

No good

Replace the malfunctioned parts or inspect in proper way

## Ignition System

### Crankshaft Sensor Peak Voltage Check

- To check the peak voltage, do the following procedures.
- Disconnect the connector of the magneto lead connector from the main harness.

#### NOTE

- Measure the voltage with each lead connected correctly. The correct value may not be obtained if disconnected.
- Maintain the correct value of compression pressure for the cylinder (Be sure to measure the voltage with the spark plug installed to the cylinder head).

#### **⚠ WARNING**

**Do not touch the metal portion of the probe in case of measuring the voltage, or you may receive a serious electric shock.**

- Set the hand tester to DC 25 V range.
- Connect the peak voltage adapter [A] to the tester and the terminals of the magneto lead connector [B].

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

**Peak Voltage Adapter: 57001-1415**

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

**Connection: Adapter Positive → Green/White Lead [C]**  
**Adapter Negative → White/Yellow Lead [D]**

- Crank the engine by kicking the pedal several times to measure the peak voltage of the crankshaft sensor.

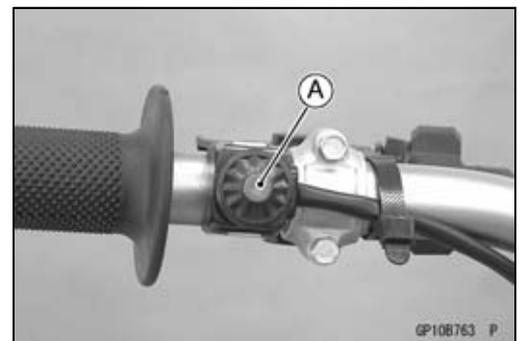
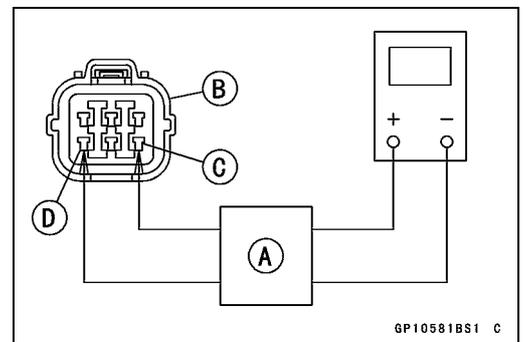
#### Crankshaft Sensor Peak Voltage

**Standard: 4 V or more**

- ★ If the voltage is less than the specified, check the crankshaft sensor.

### Engine Stop Switch System Check

- Start the engine.
- Push the engine stop switch [A], stop the engine.
- ★ If the engine does not stop, check the engine stop switch for continuity.
- ★ If the engine stop switch is good, replace the ECU.



## 16-26 ELECTRICAL SYSTEM

### Ignition System

#### **Crankshaft Sensor Inspection**

- Remove:
  - Magneto Lead Connector (see Magneto Cover Removal).
- Set the hand tester [A] to the  $\times 100 \Omega$  range and connect it to the Green/White [B] and White/Yellow [C] Leads in the connector.

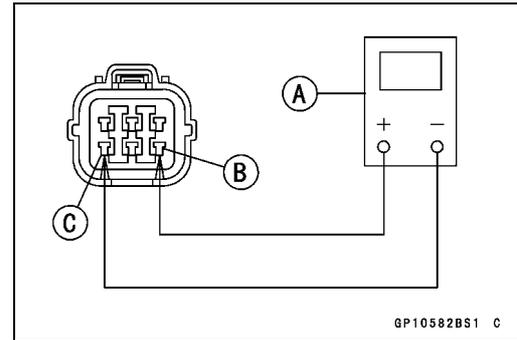
**Special Tool - Hand Tester: 57001-1394**

- ★ If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

#### **Crankshaft Sensor Resistance**

**Standard:  $180 \sim 280 \Omega$  (at  $20 \text{ }^\circ\text{C}$  ( $68 \text{ }^\circ\text{F}$ ))**

- 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, necessitates replacement of the crankshaft sensor assembly.



## Switches

---

### ***Engine Stop Switch Inspection***

- Using the hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).

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

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

### **Engine Stop Switch Connection**

	Y	R
Stop		
Run	○—	—○

### ***Gear Position Switch Removal***

- Refer to the Gear Position Switch Removal in the Fuel System (DFI) chapter.

### ***Gear Position Switch Installation***

- Refer to the Gear Position Switch Installation in the Fuel System (DFI) chapter.

### ***Gear Position Switch Inspection***

- Refer to the Gear Position Switch Resistance Inspection in the Fuel System (DFI) chapter.



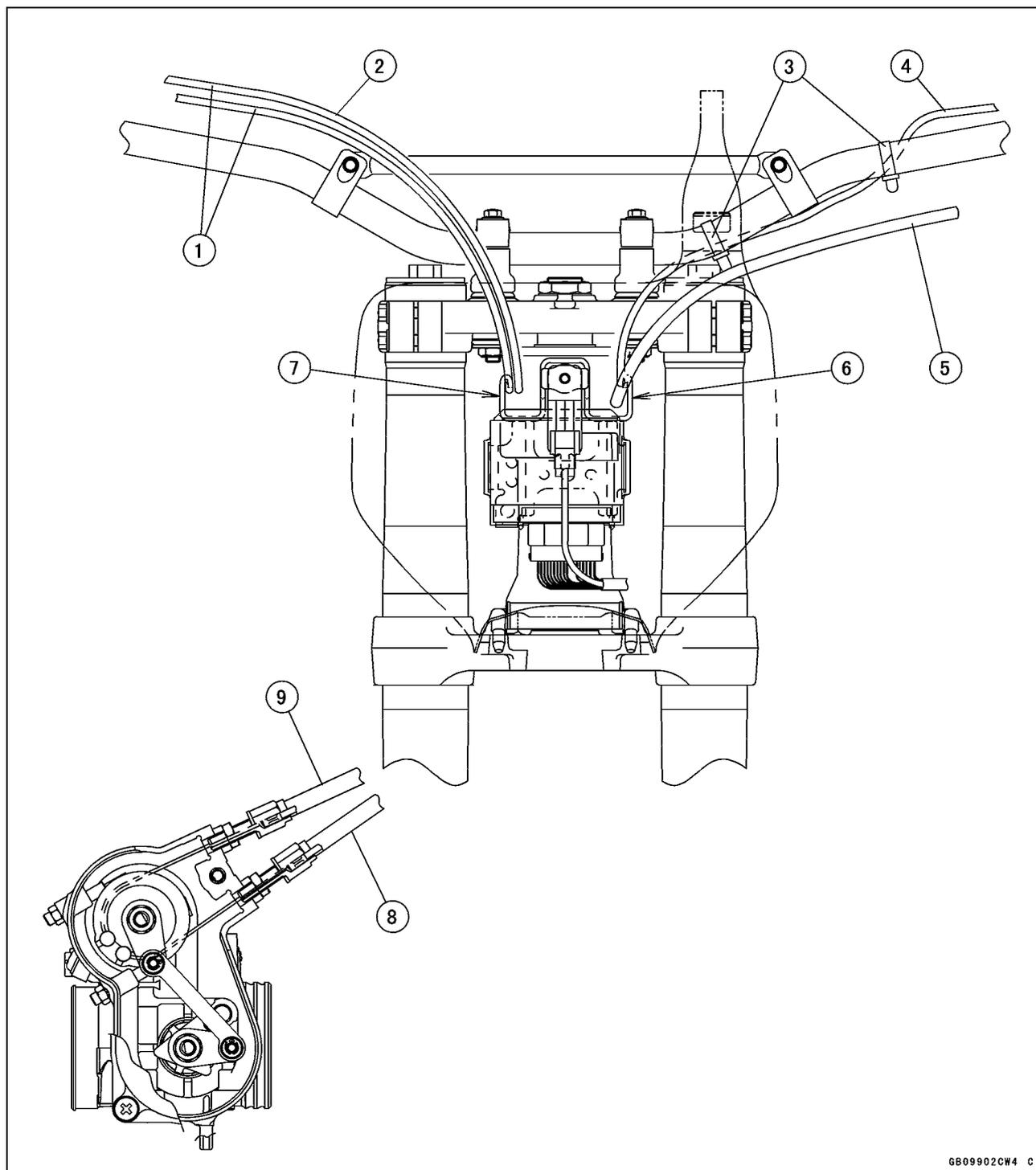
# Appendix

## Table of Contents

Cable, Wire, and Hose Routing.....	17-2
Troubleshooting Guide .....	17-12

## 17-2 APPENDIX

### Cable, Wire, and Hose Routing



1. Throttle Cables

2. Marked (AAA) cable is accelerator side.

3. Bands (Hold the engine stop switch lead.)

4. Engine Stop Switch Lead

5. Clutch Cable

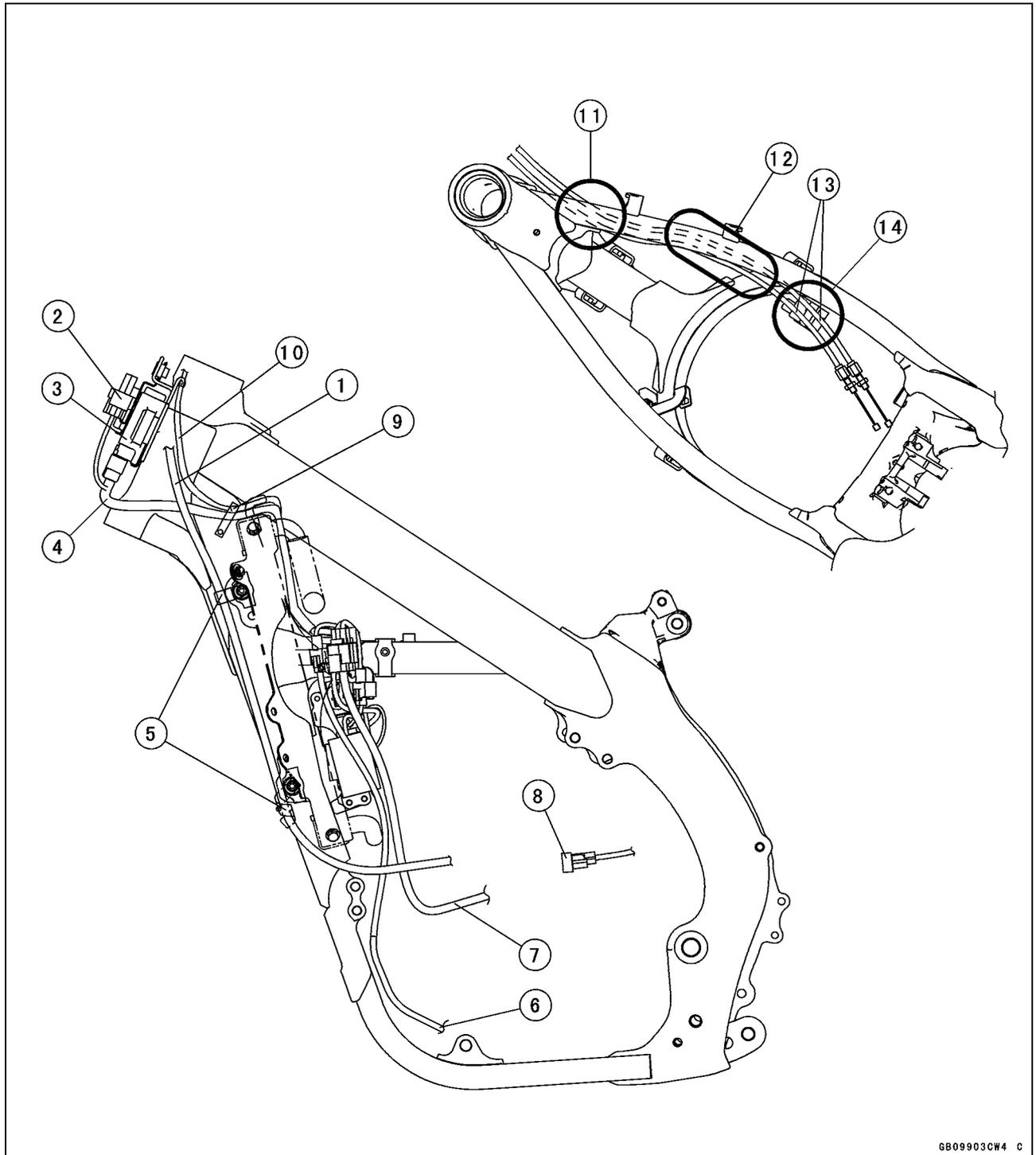
6. Clamp (Clamp the clutch cable and engine stop switch lead.)

7. Clamp (Clamp the throttle cables.)

8. Throttle Cable (Accelerator side)

9. Throttle Cable (Decelerator side)

## Cable, Wire, and Hose Routing

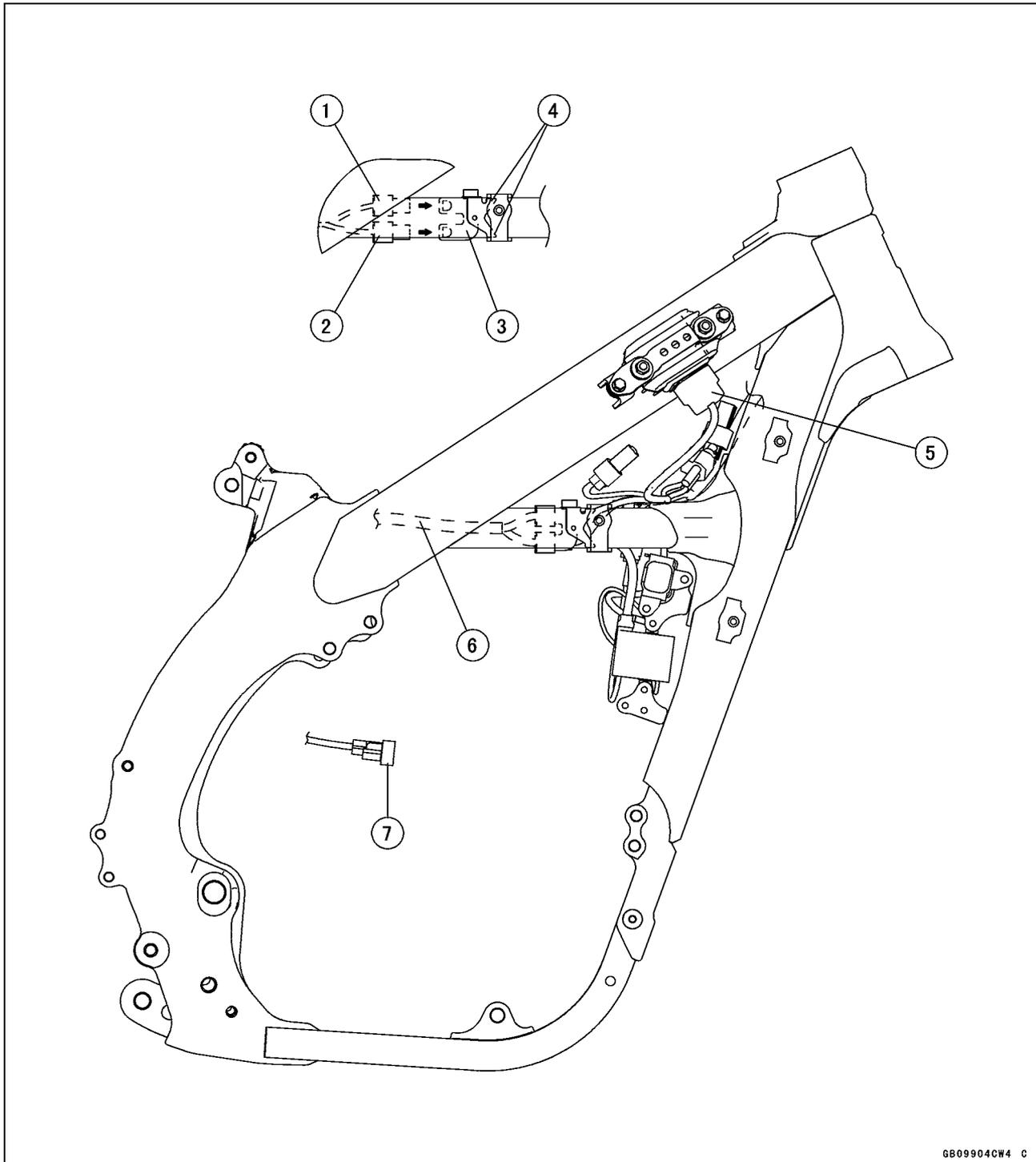


GB09903CW4 C

- |  |  |
|--|--|
| 1. Clutch Cable  | 10. Engine Stop Switch Lead                                    |
| 2. Kawasaki Diagnostic System Connector                | 11. Run the throttle cables over the radiator hose.            |
| 3. ECU   | 12. Run the throttle cables through the side of the fuel tank. |
| 4. Main Harness  | 13. Throttle Cables  |
| 5. Clamp the clutch cable.                             | 14. Run the throttle cables over the main harness connectors.  |
| 6. Gear Position Switch Lead                           |  |
| 7. Magneto Lead  |  |
| 8. Water Temperature Sensor Connector                  |  |
| 9. Clamp the main harness and engine stop switch lead. |  |

## 17-4 APPENDIX

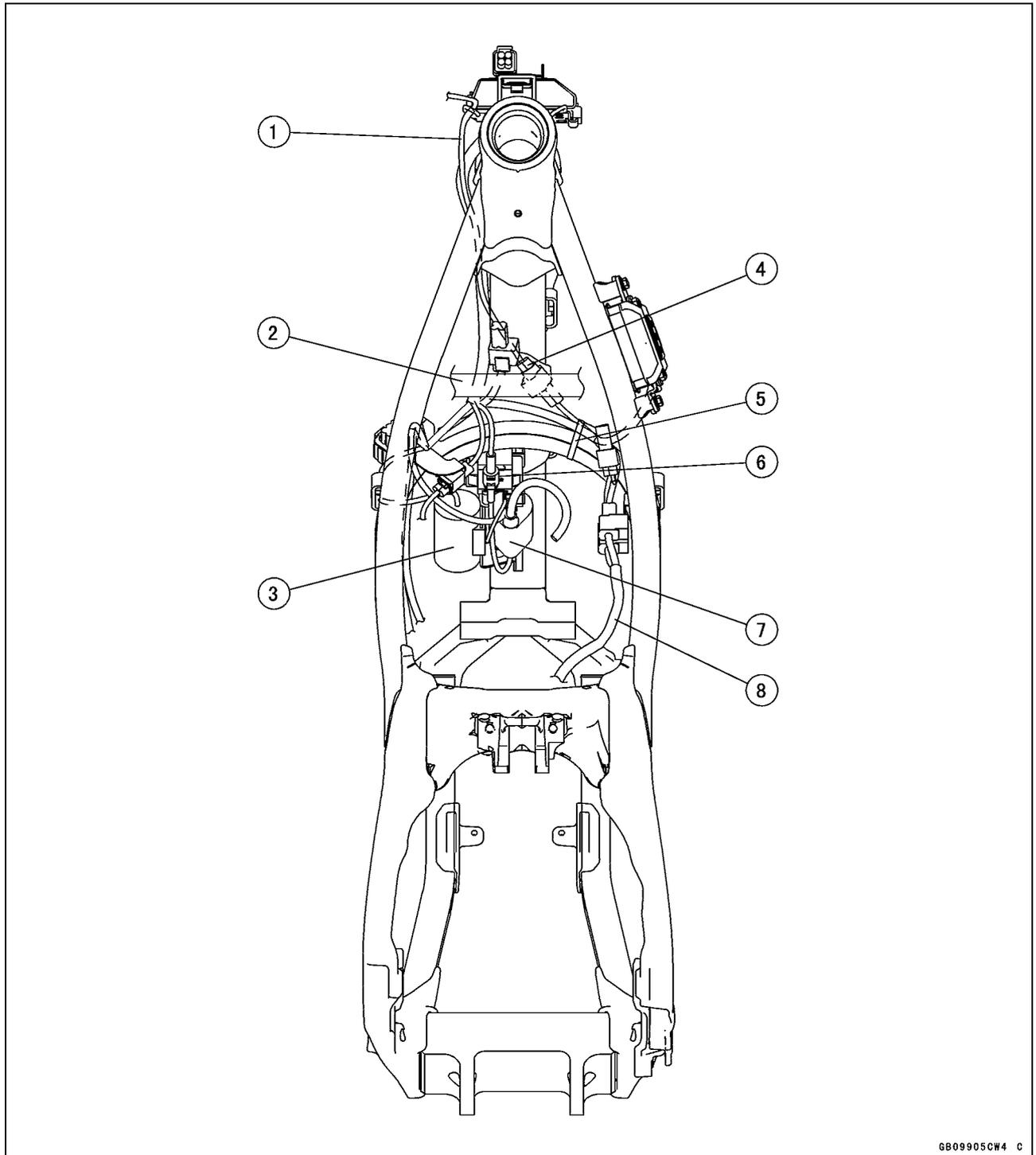
### Cable, Wire, and Hose Routing



6B09904CW4 C

1. Sub-harness connector (Black)
2. Sub-harness connector (Gray)
3. Bracket
4. Insert the sub-harness connectors into the bracket.
5. Regulator/Rectifier Connector
6. Sub-harness
7. Water Temperature Sensor Connector

## Cable, Wire, and Hose Routing

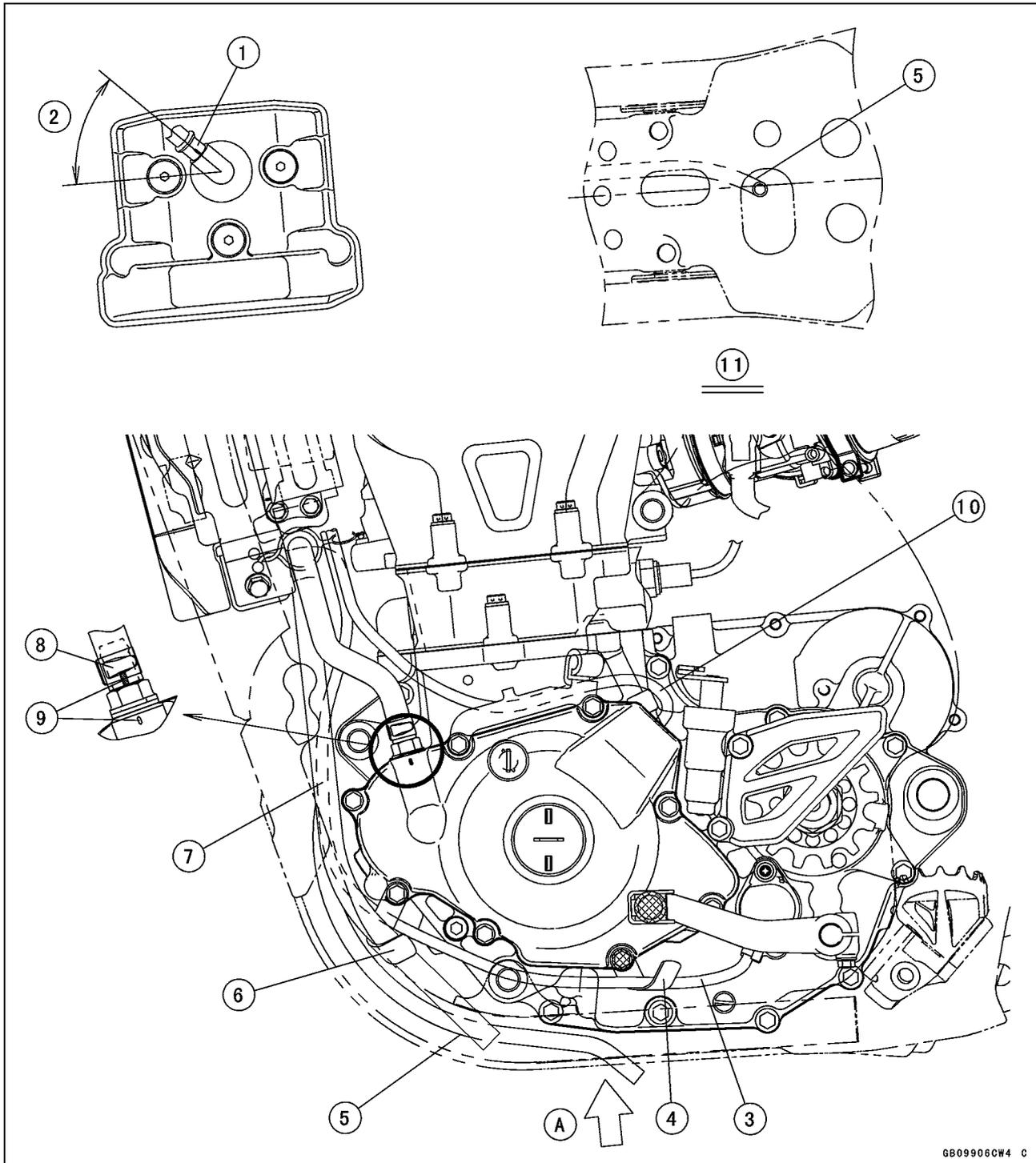


GB09905CW4 C

1. Engine Stop Switch Lead
2. Radiator Hose
3. Capacitor
4. Engine Stop Switch Lead Connector
5. Clamp the engine stop switch lead and regulator/rectifier lead with the frame pipe at the blue tape portion.
6. Ignition Coil Connector
7. Ignition Coil
8. Sub-harness

# 17-6 APPENDIX

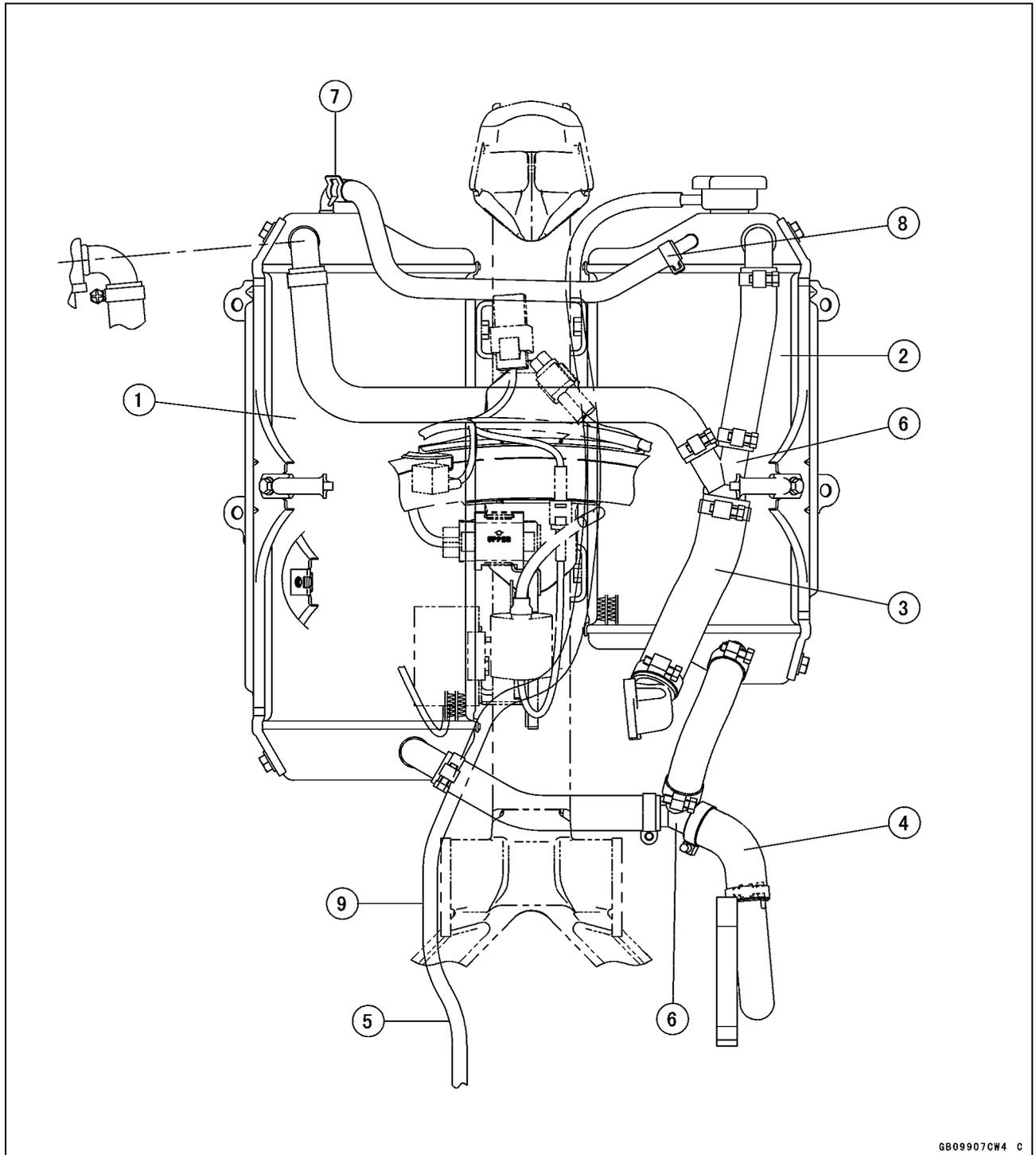
## Cable, Wire, and Hose Routing



GB09906CW4 C

- 1. Spark Plug Cap
- 2. 45°
- 3. Gear Position Switch Lead
- 4. Clamp the gear position switch lead.
- 5. Radiator Overflow Hose
- 6. Clamp (Clamp the breather hose and radiator overflow hose.)
- 7. Breather Hose
- 8. Install the clamp as shown.
- 9. Align the white mark on the breather hose and embossed mark.
- 10. Magneto Lead
- 11. Viewed A

## Cable, Wire, and Hose Routing

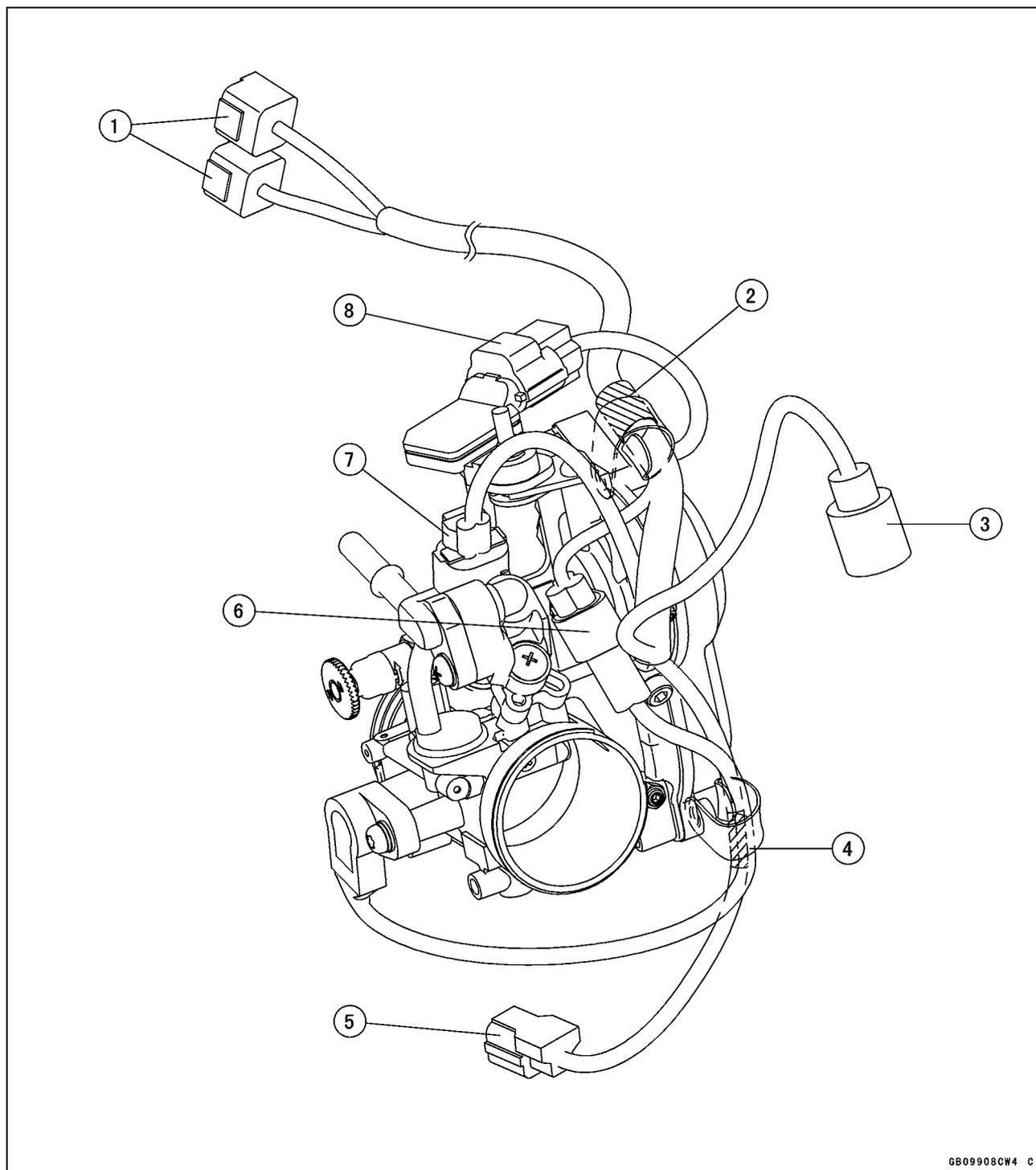


1. Left Radiator
2. Right Radiator
3. Radiator Hose (to cylinder head)
4. Radiator Hose (to water pump)
5. Radiator Overflow Hose
6. Joint Pipe

7. Clamp (Position the clamp claw left side.)
8. Clamp (Position the clamp claw downward.)
9. Run the radiator overflow hose outside the middle engine bracket.

## 17-8 APPENDIX

### Cable, Wire, and Hose Routing



1. To Main Harness

2. Clamp the sub-harness at the blue tape portion.

3. To Intake Air Temperature Sensor

4. Clamp the water temperature sensor lead and throttle sensor lead at the blue tape portion.

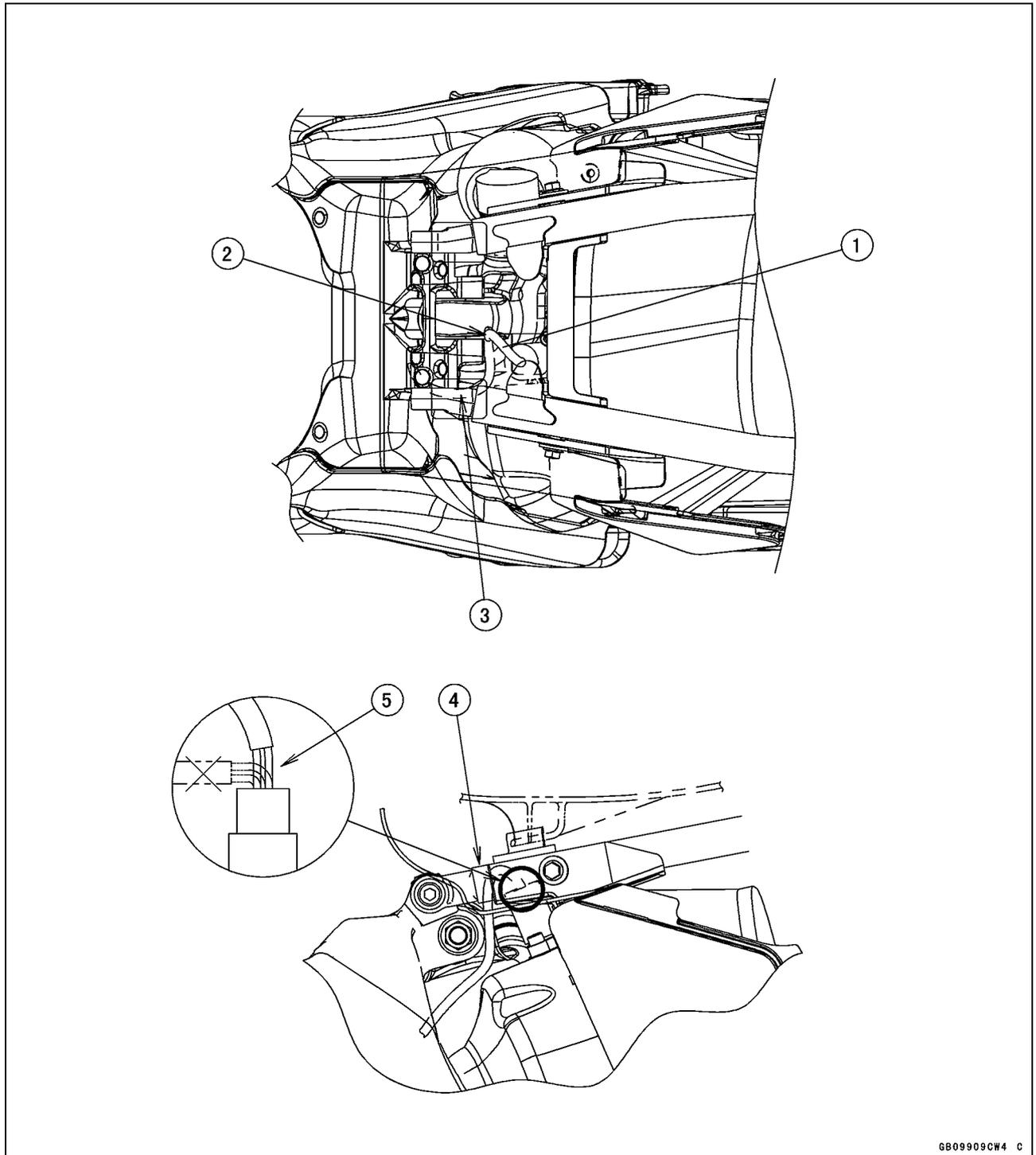
5. To Water Temperature Sensor

6. Throttle Sensor Connector

7. Injector Connector

8. Inlet Air Pressure Sensor Connector

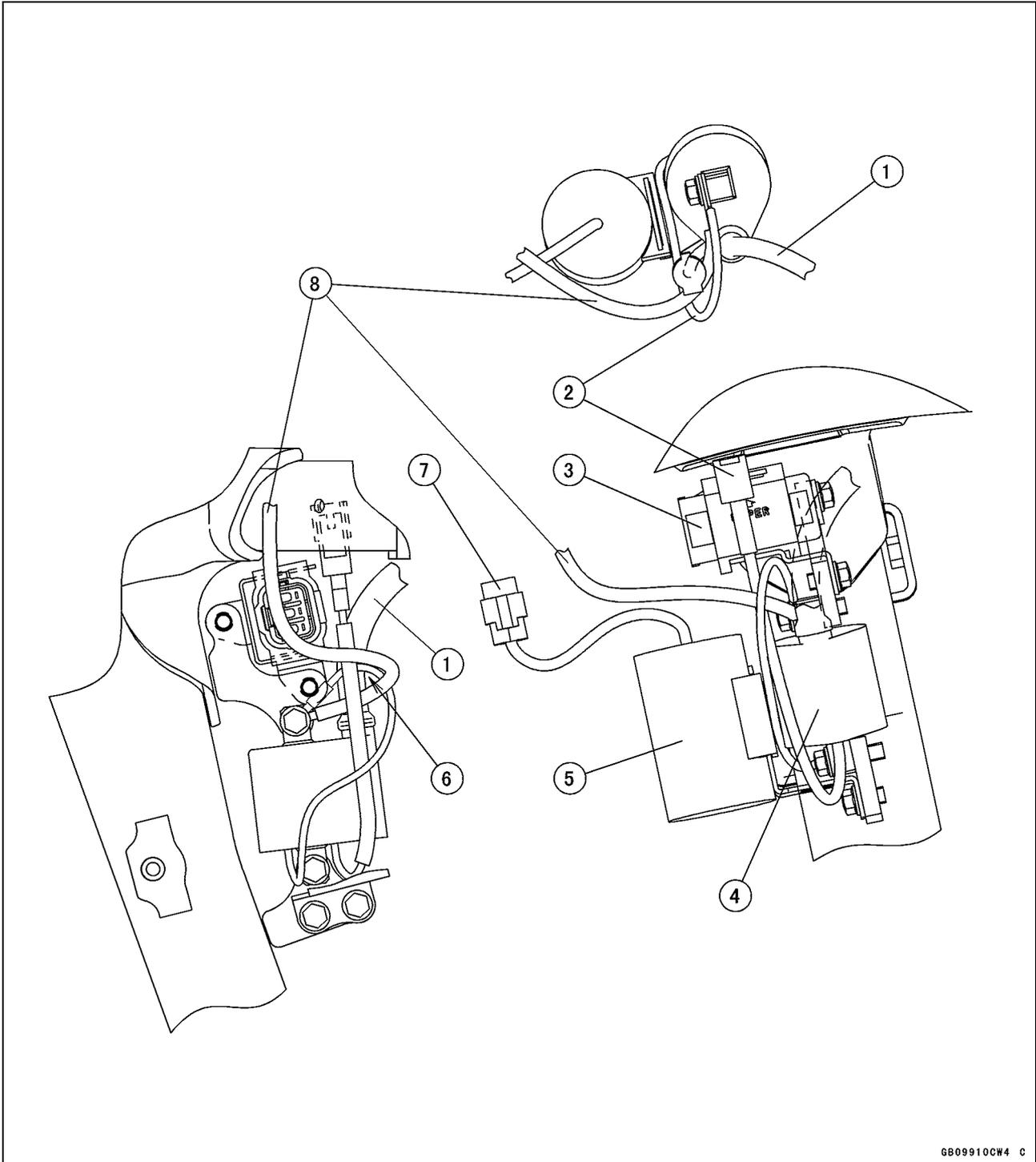
## Cable, Wire, and Hose Routing



1. Intake Air Temperature Sensor Lead
2. Run the intake air temperature sensor lead through the hole of the guide as shown.
3. Do not touch the intake air temperature sensor lead and rear shock absorber.
4. Do not show up the intake air temperature sensor lead above the pipe as shown.
5. Do not bend the intake air temperature sensor lead end as shown.

## 17-10 APPENDIX

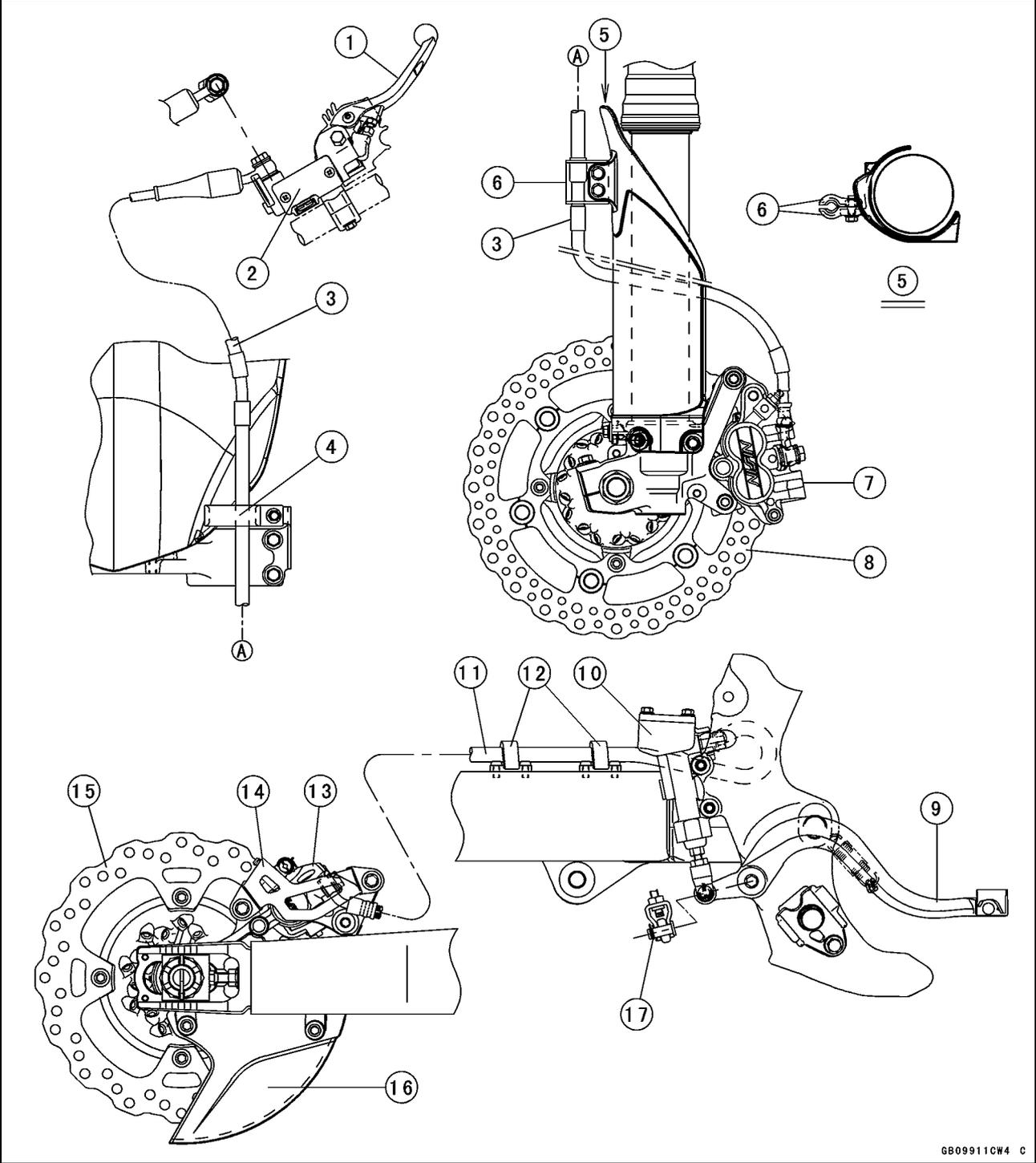
### Cable, Wire, and Hose Routing



GB09910CW4 C

1. To Spark Plug Cap
2. To Main Harness (Black)
3. Vehicle-down Sensor
4. Ignition Coil
5. Capacitor
6. Do not touch the high tension lead and engine ground lead.
7. To Main Harness (Green)
8. To Main Harness

Cable, Wire, and Hose Routing



GB09911CW4 C

- 1. Brake Lever
- 2. Front Brake Master Cylinder
- 3. Front Brake Hose
- 4. Clamp
- 5. Viewed
- 6. Clamps
- 7. Front Brake Caliper
- 8. Front Brake Disc
- 9. Brake Pedal
- 10. Rear Brake Master Cylinder
- 11. Rear Brake Hose
- 12. Clamps
- 13. Rear Brake Caliper
- 14. Rear Brake Caliper Guard
- 15. Rear Brake Disc
- 16. Rear Brake Disc Guard
- 17. Cotter Pin

## 17-12 APPENDIX

### Troubleshooting Guide

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#### NOTE

- Refer to the *Fuel System (DFI)* chapter for most of DFI trouble shooting guide.
- This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.

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

##### Engine won't turn over:

- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end, big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Kick shaft return spring broken
- Kick ratchet gear not engaging
- Balancer Bearing seizure

##### No fuel flow:

- No fuel in Fuel tank
- Fuel tank cap air vent obstructed
- Fuel line clogged
- Fuel filter clogged

##### Engine flooded:

- Clean spark plug and adjust plug gap
- Starting technique faulty  
(When flooded, do not crank the engine with the throttle fully opened. This promotes engine flood because more fuel is supplied automatically by DFI.)

##### No spark; spark weak:

- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect heat value
- ECU trouble
- Crankshaft sensor trouble
- Ignition coil trouble
- Engine stop switch shorted
- Neutral switch trouble.
- Wiring shorted or open
- Flywheel damage

##### 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, deformed, worn, or carbon accumulation on the seating surface)
- Decompression trouble

#### Poor Running at Low Speed:

##### Spark weak:

- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect heat value
- ECU trouble
- Crankshaft sensor trouble
- Flywheel damaged
- Ignition coil trouble
- Wiring connector not in good contact

##### Fuel/air mixture incorrect:

- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Throttle body assy holder loose
- Air cleaner duct loose

##### Compression low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, deformed, worn, or carbon accumulation on the seating surface)
- Decompression trouble

##### Other:

- ECU trouble
- Engine oil level too high
- Engine oil viscosity too high
- Brake dragging
- Drive train trouble
- Engine overheating
- Clutch slipping

## Troubleshooting Guide

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

#### Firing incorrect:

- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect heat value
- ECU trouble
- Crankshaft sensor trouble
- Flywheel damage
- Ignition coil trouble
- Wiring connector not in good contact

#### Fuel/air mixture incorrect:

- Air cleaner clogged, poorly sealed, or missing
- Air cleaner duct loose
- Water or foreign matter in fuel
- Throttle body assy holder loose
- Fuel to injector insufficient (DFI)
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble

#### Compression low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, deformed, worn, carbon accumulation on the seating surface.)
- Decompression trouble

#### Knocking:

- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect heat valve
- ECU trouble

#### Other:

- Throttle valve won't fully open
- Brake dragging
- Air cleaner clogged
- Water or foreign matter in fuel
- Clutch slipping
- Overheating
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Crankshaft bearing worn or damage

### Engine Overheating:

#### Firing incorrect:

- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble

#### Fuel/air mixture incorrect:

- Throttle body holder loose
- Air cleaner duct loose
- Air cleaner poorly sealed, or missing
- Air cleaner clogged

#### Compression high:

- Carbon built up in combustion chamber

#### Engine load faulty:

- Clutch slipping
- Engine oil level too high
- Engine oil viscosity too high
- Brake dragging
- Drive train trouble

#### Lubrication inadequate:

- Engine oil level too low
- Engine oil poor quality or incorrect

#### Coolant incorrect:

- Coolant level too low
- Coolant deteriorated

#### Cooling system component incorrect:

- Radiator clogged
- Radiator cap trouble
- Water pump not rotating

### Clutch Operation Faulty:

#### Clutch slipping:

- No clutch lever play
- Clutch cable maladjusted
- Clutch inner cable sticking
- Friction plate worn or warped
- Steel plate worn or warped
- Clutch spring broken or weak
- Clutch release function trouble
- Clutch hub or housing unevenly worn

#### Clutch not disengaging properly:

- Clutch lever play excessive
- Clutch spring compression uneven
- Engine oil deteriorated
- Engine oil viscosity too high
- Engine oil level too high
- Clutch housing seized
- Clutch release function trouble
- Clutch hub nut loose
- Clutch plate warped or rough
- Clutch hub spline damaged

### Gear Shifting Faulty:

#### Doesn't go into gear; shift pedal doesn't return:

- Clutch not disengaging
- Shift fork bent, worn, or seized
- Shift return spring pin loose

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### Troubleshooting Guide

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- Shift return spring weak or broken
- Shift shaft lever broken
- Pawl guide plate broken
- Shift pawl broken
- Shift pawl spring tension lose
- Gear seized
- Gear positioning lever operation trouble
- Shift drum broken

#### **Jumps out of gear:**

- Shift fork ear worn, bent
- Gear groove worn
- Gear dogs and/or dog holes worn
- Shift drum groove worn
- Gear positioning lever spring weak or broken
- Shift fork guide pin worn
- Drive shaft, output shaft, and/or gear splines worn

#### **Overshifts:**

- Gear positioning lever spring weak or broken
- Pawl guide plate worn

#### **Abnormal Engine Noise:**

##### **Knocking:**

- ECU trouble
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect heat value
- 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 or cam face worn
- Valve lifter worn

##### **Other noise:**

- Connecting rod big end, small 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
- Camshaft chain tensioner trouble
- Camshaft chain, sprocket, chain guide worn
- Primary gear worn or damaged
- Decompressor spring broken
- Magneto flywheel loose

#### **Abnormal Drive Train Noise:**

##### **Clutch noise:**

- Clutch housing finger and friction plate tang worn
- Clutch housing gear worn
- Metal chips jammed in clutch housing gear teeth

##### **Transmission noise:**

- Bearings worn
- Transmission gears worn or chipped
- Metal chips jammed in gear teeth
- Engine oil insufficient, low viscosity
- Kick ratchet gear not properly disengaging from kick gear
- Kick shaft idle gear worn or chipped

##### **Drive chain noise:**

- Drive chain maladjusted
- Drive chain worn
- Rear and/or engine sprocket worn
- Drive chain lubrication insufficient
- Rear wheel misaligned

#### **Abnormal Frame Noise:**

##### **Front fork noise:**

- Oil insufficient or too thin
- Spring weak or broken
- Front fork air pressure high

##### **Rear shock absorber noise:**

- Shock absorber trouble
- Spring weak or broken

##### **Disc brake noise:**

- Pad surface glazed
- Disc warped
- Caliper trouble
- Pad installed incorrectly
- Master cylinder damaged

##### **Other noise:**

- Bracket, nut, bolt, etc., not properly mounted or tightened

#### **Abnormal Exhaust Color:**

##### **White smoke:**

- Piston oil ring worn
- Cylinder worn
- Valve oil seal damaged
- Valve guide worn
- Engine oil level too high

##### **Black smoke:**

- Air cleaner element clogged

##### **Brown smoke:**

- Air cleaner duct loose
- Air cleaner clogged
- Air cleaner poorly sealed or missing

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**Troubleshooting Guide**


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**Handling and/or Stability****Unsatisfactory:****Handlebar hard to turn:**

- Cable, hose, wire routing incorrect
- Steering stem nut too tight
- Steering stem bearing damaged
- Steering stem bearing lubrication inadequate
- Steering stem bent
- Tire air pressure too low

**Handlebar shakes or excessively vibrates:**

- Tire worn
- Swingarm pivot bearings worn
- Rim warped, or not balanced
- Spokes loose
- Wheel bearing worn
- Handlebar clamp bolt loose
- Steering stem head bolt loose
- Front, rear axle runout excessive

**Handlebar pulls to one side:**

- Frame bent
- Rear wheel misalignment
- Swingarm bent or twisted
- Swingarm pivot shaft bent
- Steering maladjusted
- Steering stem bent
- Front fork bent

Right and left front fork oil level uneven

**Suspension operation trouble:****(Too hard)**

- Tire air pressure too high
- Front fork oil excessive
- Front fork oil viscosity too high
- Rear shock absorber adjustment too hard
- Front fork bent
- Front fork air pressure too high

**(Too soft)**

- Front fork oil insufficient or leaking
- Front fork oil viscosity too low
- Rear shock absorber adjusted too soft
- Front fork, rear shock absorber spring weak
- Rear shock absorber oil or gas leaking
- Tire air pressure too low

**Brake Doesn't Hold:**

- Air in brake system
- Pad, disc worn
- Brake fluid leakage
- Contaminated pad
- Brake fluid deteriorated
- Brake master cylinder cups damaged
- Master cylinder scratched inside
- Disc warped

## MODEL APPLICATION

Year	Model	Beginning Frame No.
2009	KX450E9F	JKAKXGEC□9A000001 or JKAKX450EEA000001

□:This digit in the frame number changes from one machine to another.



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