

Kawasaki

Ninja ZX-6R



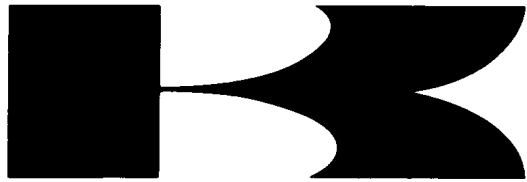
Motorcycle Service Manual

Quick Reference Guide

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

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

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

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

LIST OF ABBREVIATIONS

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

COUNTRY AND AREA CODES

AT	Austria	GB	United Kingdom
AU	Australia	MY	Malaysia
BR	Brazil	SEA	Southeast Asia
CA	Canada	TH	Thailand
CAL	California	US	United States
CH	Switzerland	WVTA (FULL H)	WVTA Model with Honeycomb Catalytic Converter (Full Power)
DE	Germany	GB WVTA (FULL H)	WVTA Model with Honeycomb Catalytic Converter (Left Side Traffic Full Power)
EUR	Europe	WVTA (78.2 H)	WVTA Model with Honeycomb Catalytic Converter (Restricted Power)

EMISSION CONTROL INFORMATION

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

1. Crankcase Emission Control System

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

2. Exhaust Emission Control System

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

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

3. Evaporative Emission Control System

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

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

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

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

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

NOTE

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

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

2. Tampering could include.

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

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

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

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

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

TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

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

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

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

Foreword

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

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

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

To get the longest life out of your vehicle.

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

How to Use This Manual

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

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

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

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

WARNING

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

CAUTION

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

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

NOTE

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

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

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

General Information

Table of Contents

Before Servicing	1-2
Model Identification.....	1-7
General Specifications.....	1-9
Unit Conversion Table	1-12

1-2 GENERAL INFORMATION

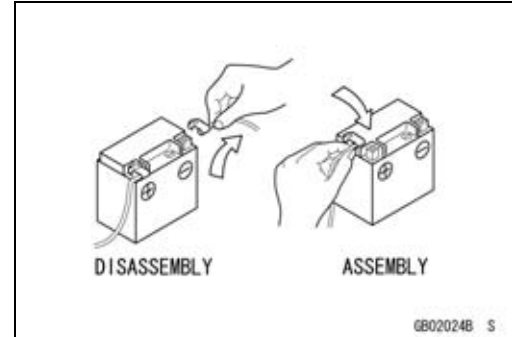
Before Servicing

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

Especially note the following.

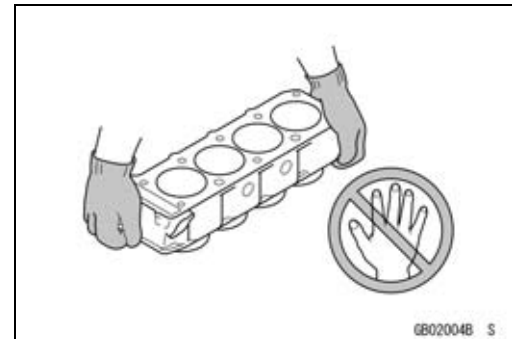
Battery Ground

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



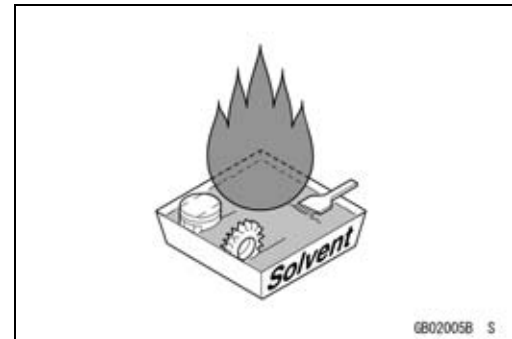
Edges of Parts

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



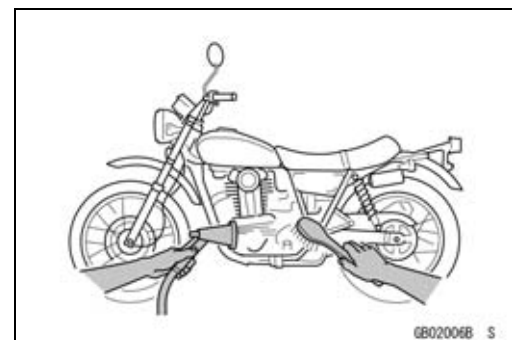
Solvent

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



Cleaning Vehicle before Disassembly

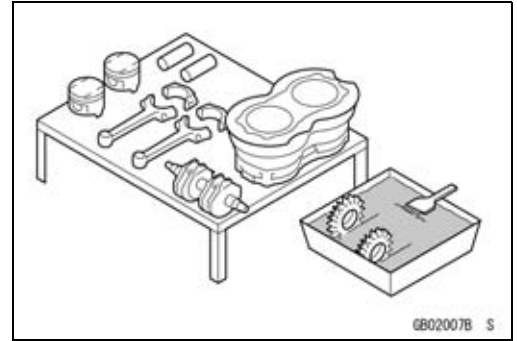
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



Before Servicing

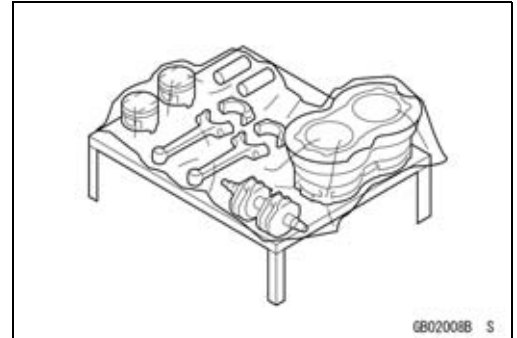
Arrangement and Cleaning of Removed Parts

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



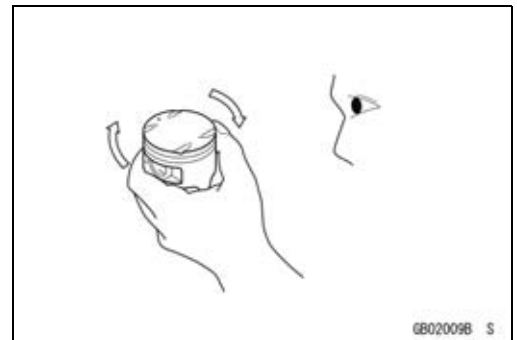
Storage of Removed Parts

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



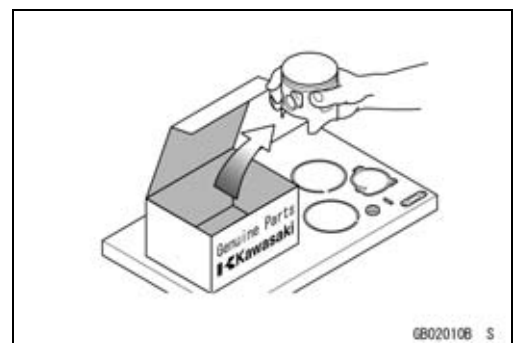
Inspection

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



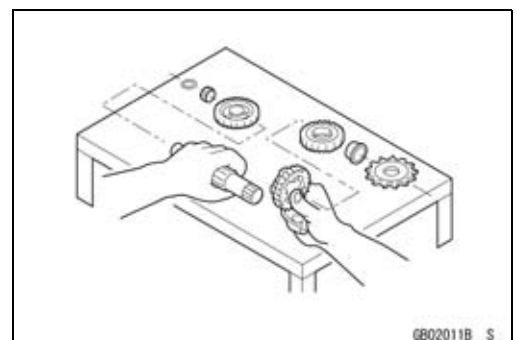
Replacement Parts

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



Assembly Order

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

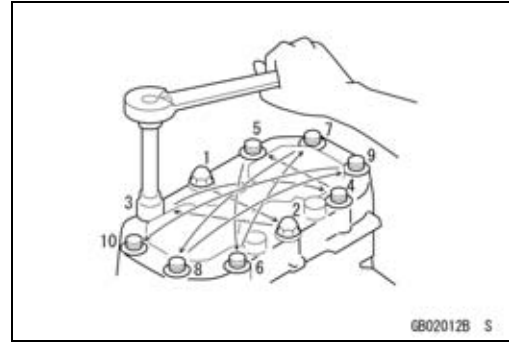


1-4 GENERAL INFORMATION

Before Servicing

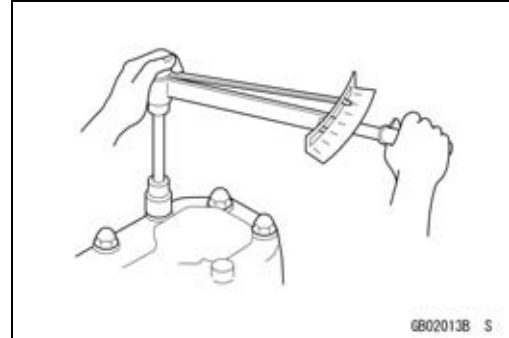
Tightening Sequence

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



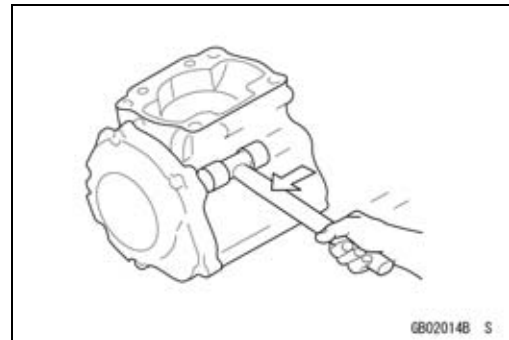
Tightening Torque

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



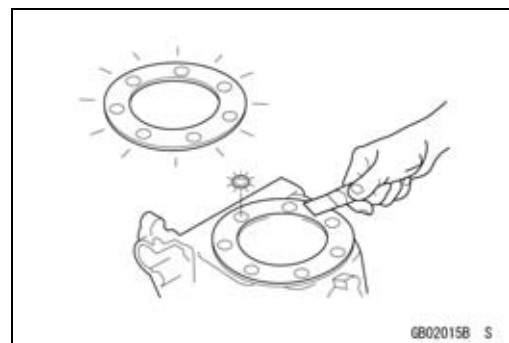
Force

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



Gasket, O-ring

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



Liquid Gasket, Non-permanent Locking Agent

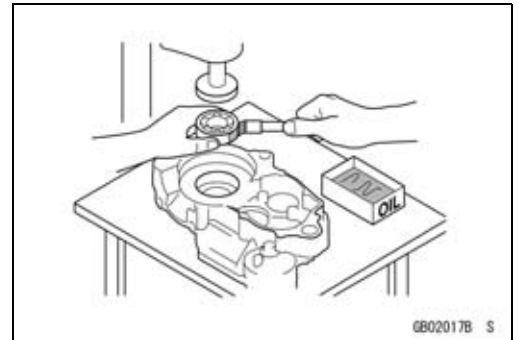
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



Before Servicing

Press

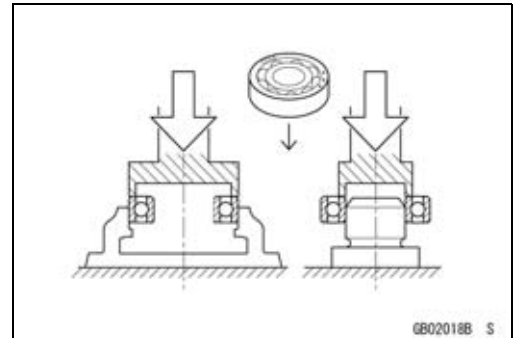
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing and Needle Bearing

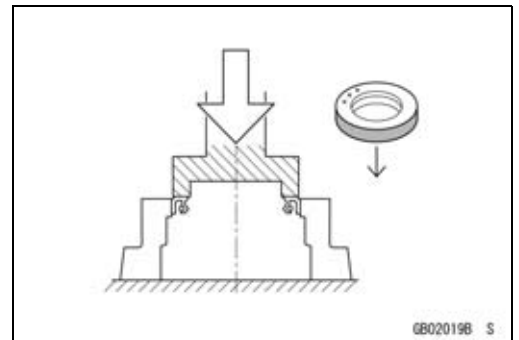
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

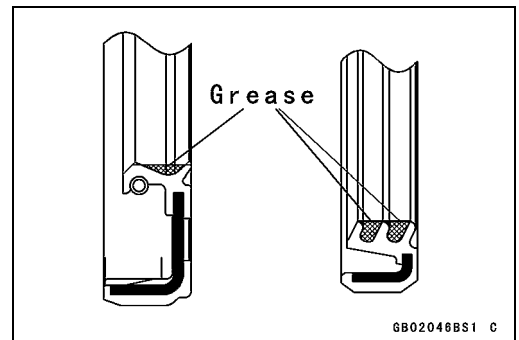


Oil Seal, Grease Seal

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

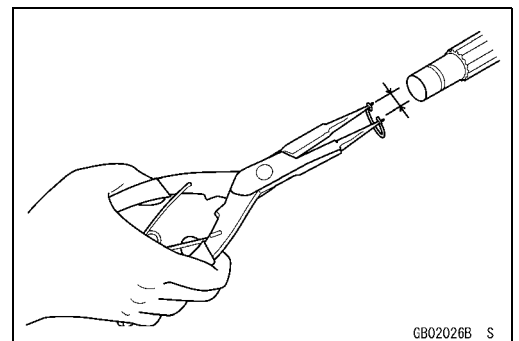


Apply specified grease to the lip of seal before installing the seal.



Circlips, Cotter Pins

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

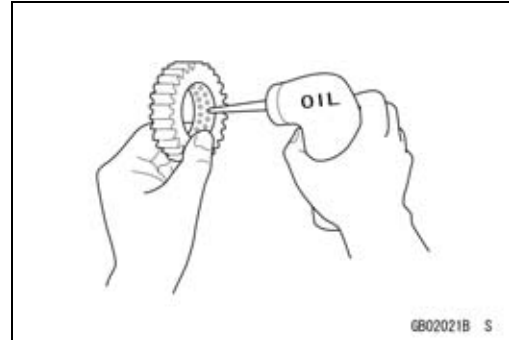


1-6 GENERAL INFORMATION

Before Servicing

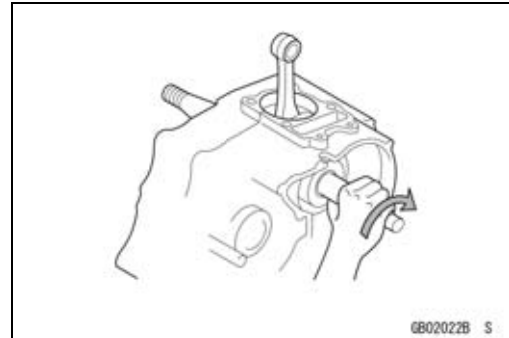
Lubrication

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



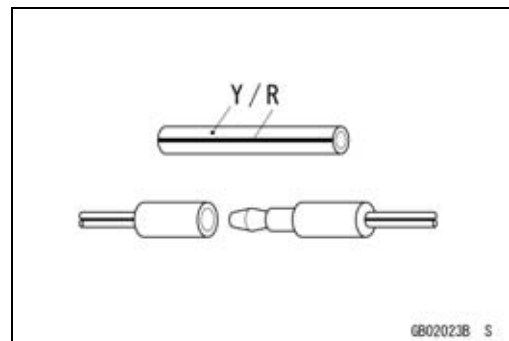
Direction of Engine Rotation

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



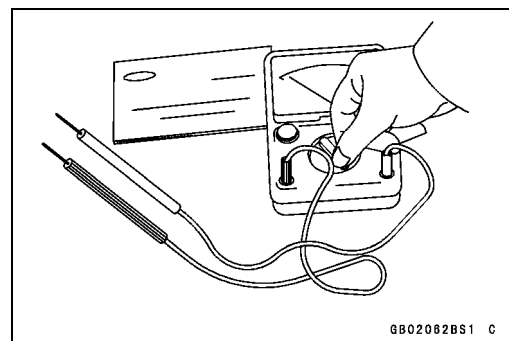
Electrical Wires

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



Instrument

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



Model Identification

ZX600R9F (US and CA Models) Left Side View



ZX600R9F (US and CA Models) Right Side View



General Specifications

Items	ZX600R9F
<p>Dimensions</p> <p>Overall Length Overall Width Overall Height Wheelbase Road Clearance Seat Height Curb Mass: Front Rear Fuel Tank Capacity</p>	<p>2 090 mm (82.3 in.) 710 mm (28.0 in.) 1 115 mm (43.9 in.) 1 400 mm (55.1 in.) 120 mm (4.72 in.) 815 mm (32.1 in.) 191 kg (421 lb) 97 kg (214 lb) 94 kg (207 lb) 17 L (4.5 US gal)</p>
<p>Performance</p> <p>Minimum Turning Radius</p>	<p>3.4 m (11.2 ft)</p>
<p>Engine</p> <p>Type Cooling System Bore and Stroke Displacement Compression Ratio Maximum Horsepower Maximum Torque Carburetion System Starting System Ignition System Timing Advance Ignition Timing Spark Plug Cylinder Numbering Method Firing Order Valve Timing: Inlet: Open Close Duration Exhaust: Open Close Duration</p>	<p>4-stroke, DOHC, 4-cylinder Liquid-cooled 67.0 × 42.5 mm (2.64 × 1.67 in.) 599 cm³ (36.6 cu in.) 13.3:1 94.1 kW (128 PS) @14 000 r/min (rpm), (WVTA (78.2 H)) 78.2 kW (106 PS) @14 000 r/min (rpm), (SEA), (TH) 87.5 kW (119 PS) @12 500 r/min (rpm), (CA), (CAL), (US) – – – 66.7 N·m (6.8 kgf·m, 49.2 ft·lb) @11 800 r/min (rpm), (WVTA (78.2 H)) 60 N·m (6.1 kgf·m, 44.3 ft·lb) @11 000 r/min (rpm), (CA), (CAL), (US) – – – FI (Fuel Injection), KEIHIN TTK38 × 4 Electric starter Battery and coil (transistorized) Electronically advanced (IC igniter in ECU) From 12.5° BTDC @1 300 r/min (rpm) NGK CR9E Left to right, 1-2-3-4 1-2-4-3 41° (BTDC) 67° (ABDC) 288° 58° (BBDC) 20° (ATDC) 258°</p>

1-10 GENERAL INFORMATION

General Specifications

Items	ZX600R9F
Lubrication System Engine Oil: Type Viscosity Capacity	Forced lubrication (wet sump with oil cooler) API SE, SF or SG API SH, SJ, SL or SM with JASO MA, MA1 or MA2 SAE 10W-40 3.6 L (3.8 US qt)
Drive Train Primary Reduction System: Type Reduction Ratio Clutch Type Transmission: Type Gear Ratios: 1st 2nd 3rd 4th 5th 6th Final Drive System: Type Reduction Ratio Overall Drive Ratio	Gear 1.900 (76/40) Wet multi disc 6-speed, constant mesh, return shift 2.714 (38/14) 2.200 (33/15) 1.850 (37/20) 1.600 (32/20) 1.421 (27/19) 1.300 (26/20) Chain drive 2.688 (43/16) 6.638 @Top gear
Frame Type Caster (Rake Angle) Trail Front Tire: Type Size Rim Size Rear Tire: Type Size Rim Size Front Suspension: Type Wheel Travel Rear Suspension: Type Wheel Travel	Tubular, diamond 24° 103 mm (4.06 in.) Tubeless 120/70 ZR17 M/C (58 W) 17 x 3.50 Tubeless 180/55 ZR17 M/C (73 W) 17 x 5.50 Telescopic fork (upside-down) 120 mm (4.72 in.) Swingarm (uni-trak) 134 mm (5.28 in.)

General Specifications

Items	ZX600R9F
Brake Type: Front Rear	Dual discs Single disc
Electrical Equipment Battery Headlight: Type Bulb: High Low Tail/Brake Light Alternator: Type Rated Output	12 V 8 Ah Semi-sealed beam 12 V 55 W + 65 W (quartz-halogen) 12 V 55 W (quartz-halogen) LED Three-phase AC 30 A/14 V @5 000 r/min (rpm)

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

1-12 GENERAL INFORMATION

Unit Conversion Table

Prefixes for Units:

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

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

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

Units of Force:

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

Units of Length:

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

Units of Torque:

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

Units of Pressure:

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

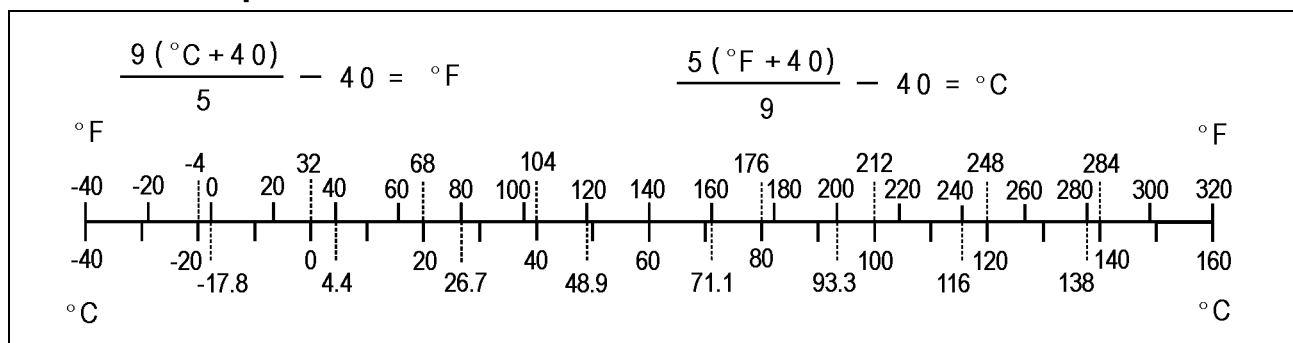
Units of Speed:

km/h	×	0.6214	=	mph
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Units of Power:

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

Units of Temperature:



Periodic Maintenance

Table of Contents

Periodic Maintenance Chart	2-3
Torque and Locking Agent.....	2-6
Specifications	2-13
Special Tools	2-15
Periodic Maintenance Procedures.....	2-16
Fuel System (DFI).....	2-16
Throttle Control System Inspection.....	2-16
Engine Vacuum Synchronization Inspection.....	2-16
Idle Speed Inspection	2-20
Idle Speed Adjustment.....	2-20
Fuel Hose Inspection (fuel leak, damage, installation condition)	2-20
Evaporative Emission Control System Inspection (CAL, SEA and TH Models)	2-21
Cooling System.....	2-22
Coolant Level Inspection.....	2-22
Radiator Hose and Pipe Inspection (coolant leak, damage, installation condition)	2-23
Engine Top End	2-23
Valve Clearance Inspection	2-23
Valve Clearance Adjustment.....	2-24
Air Suction System Damage Inspection.....	2-27
Clutch.....	2-28
Clutch Operation Inspection	2-28
Wheels/Tires.....	2-29
Air Pressure Inspection.....	2-29
Wheel/Tire Damage Inspection.....	2-29
Tire Tread Wear Inspection	2-29
Wheel Bearing Damage Inspection	2-30
Final Drive.....	2-31
Drive Chain Lubrication Condition Inspection	2-31
Drive Chain Slack Inspection.....	2-31
Drive Chain Slack Adjustment	2-32
Wheel Alignment Inspection	2-33
Drive Chain Wear Inspection	2-33
Chain Guide Wear Inspection	2-34
Brakes.....	2-34
Brake Fluid Leak (Brake Hose and Pipe) Inspection	2-34
Brake Hose and Pipe Damage and Installation Condition Inspection.....	2-34
Brake Fluid Level Inspection.....	2-35
Brake Pad Wear Inspection	2-36
Brake Operation Inspection	2-36
Brake Light Switch Operation Inspection	2-36
Suspension	2-37
Front Forks/Rear Shock Absorber Operation Inspection	2-37
Front Fork Oil Leak Inspection.....	2-37
Rear Shock Absorber Oil Leak Inspection	2-38
Rocker Arm Operation Inspection.....	2-38
Tie-Rod Operation Inspection	2-38
Steering	2-38
Steering Play Inspection	2-38
Steering Play Adjustment.....	2-39
Steering Stem Bearing Lubrication	2-40

2-2 PERIODIC MAINTENANCE

Steering Damper Oil Leak Inspection	2-40
Electrical System	2-41
Lights and Switches Operation Inspection.....	2-41
Headlight Aiming Inspection	2-43
Sidestand Switch Operation Inspection	2-44
Engine Stop Switch Operation Inspection.....	2-45
Others	2-46
Chassis Parts Lubrication	2-46
Bolts, Nuts and Fasteners Tightness Inspection.....	2-47
Replacement Parts	2-48
Air Cleaner Element Replacement.....	2-48
Fuel Hose Replacement	2-48
Coolant Change	2-51
Radiator Hose and O-ring Replacement.....	2-54
Engine Oil Change.....	2-55
Oil Filter Replacement	2-56
Brake Hose and Pipe Replacement.....	2-57
Brake Fluid Change	2-57
Master Cylinder Rubber Parts Replacement	2-59
Caliper Rubber Parts Replacement	2-60
Spark Plug Replacement	2-63

PERIODIC MAINTENANCE 2-3

Periodic Maintenance Chart

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

Periodic Inspection

ITEM	FREQUENCY	* ODOMETER READING							See Page
		Whichever comes first ↓ Every	1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	
Fuel System									
Throttle control system (play, smooth return, no drag) - inspect	year	●		●		●		●	2-16
Engine vacuum synchronization - inspect				●		●		●	2-16
Idle speed - inspect		●		●		●		●	2-20
Fuel leak (fuel hose and pipe) - inspect	year	●		●		●		●	2-20
Fuel hose and pipe damage - inspect	year	●		●		●		●	2-20
Fuel hose and pipe installation condition - inspect	year	●		●		●		●	2-20
Evaporative emission control system function - inspect (CAL, SEA and TH Models)		●	●	●	●	●	●	●	2-21
Cooling System									
Coolant level - inspect		●		●		●		●	2-22
Coolant leak (water hose and pipe) - inspect	year	●		●		●		●	2-23
Water hose damage - inspect	year	●		●		●		●	2-23
Water hose installation condition - inspect	year	●		●		●		●	2-23
Engine Top End									
Valve clearance - inspect	CA, CAL and US Models					●			2-23
	Other than CA, CAL and US Models	Every 42 000 km (26 250 mile)							
Air suction system damage - inspect				●		●		●	2-27
Clutch									
Clutch operation (play, disengagement, engagement) - inspect		●		●		●		●	2-28
Wheels and Tires									
Tire air pressure - inspect	year			●		●		●	2-29
Wheel/tire damage - inspect				●		●		●	2-29
Tire tread wear, abnormal wear - inspect				●		●		●	2-29

2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

ITEM	FREQUENCY	* ODOMETER READING × 1 000 km (× 1 000 mile)							See Page
		Whichever comes first ↓	1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	
Wheel bearing damage - inspect	year			●		●		●	2-30
Final Drive									
Drive chain lubrication condition - inspect #		Every 600 km (400 mile)							2-31
Drive chain slack - inspect #		Every 1 000 km (600 mile)							2-31
Drive chain wear - inspect #				●		●		●	2-33
Chain guide wear - inspect				●		●		●	2-34
Brakes									
Brake fluid leak (brake hose and pipe) - inspect	year	●	●	●	●	●	●	●	2-34
Brake hose and pipe damage - inspect	year	●	●	●	●	●	●	●	2-34
Brake hose installation condition - inspect	year	●	●	●	●	●	●	●	2-34
Brake fluid level - inspect	6 months	●	●	●	●	●	●	●	2-35
Brake pad wear - inspect #			●	●	●	●	●	●	2-36
Brake operation (effectiveness, play, no drag) - inspect	year	●	●	●	●	●	●	●	2-36
Brake light switch operation - inspect		●	●	●	●	●	●	●	2-36
Suspension									
Front forks/rear shock absorber operation (damping and smooth stroke) - inspect				●		●		●	2-37
Front forks/rear shock absorber oil leak - inspect	year			●		●		●	2-37, 2-38
Rocker arm operation - inspect				●		●		●	2-38
Tie-rods operation - inspect				●		●		●	2-38
Steering									
Steering play - inspect	year	●		●		●		●	2-38
Steering stem bearings - lubricate	2 years					●			2-40
Steering damper oil leak - inspect			●	●	●	●	●	●	2-40
Electrical System									
Lights and switches operation - inspect	year			●		●		●	2-41
Headlight aiming - inspect	year			●		●		●	2-43
Sidestand switch operation - inspect	year			●		●		●	2-44

PERIODIC MAINTENANCE 2-5

Periodic Maintenance Chart

ITEM	FREQUENCY	Whichever comes first ↓	* ODOMETER READING × 1 000 km (× 1 000 mile)						See Page
			1 (0.6)	6 (3.75)	12 (7.5)	18 (11.25)	24 (15)	30 (18.75)	
Engine stop switch operation - inspect	year			●		●		●	2-45
Others									
Chassis parts - lubricate	year			●		●		●	2-46
Bolts and nuts tightness - inspect			●	●		●		●	2-47

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

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

Periodic Replacement Parts

ITEM	FREQUENCY	Whichever comes first ↓	* ODOMETER READING × 1 000 km (× 1 000 mile)					See Page
			1 (0.6)	12 (7.5)	24 (15)	36 (22.5)	48 (30)	
Air cleaner element # - replace	Every 18 000 km (12 000 mile)						2-48	
Fuel hose - replace	4 years					●	2-48	
Coolant - change	3 years				●		2-51	
Radiator hose and O-ring - replace	3 years				●		2-54	
Engine oil # - change	year	●	●	●	●	●	2-55	
Oil filter - replace	year	●	●	●	●	●	2-56	
Brake hose and pipe - replace	4 years					●	2-57	
Brake fluid - change	2 years			●		●	2-57	
Rubber parts of master cylinder and caliper - replace	4 years					●	2-59, 2-60	
Spark plug - replace			●	●	●	●	2-63	

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

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

2-6 PERIODIC MAINTENANCE

Torque and Locking Agent

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

Letters used in the "Remarks" column mean:

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

G: Apply grease.

L: Apply a non-permanent locking agent.

Lh: Left-hand Threads

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

S: Follow the specified tightening sequence.

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

SS: Apply silicone sealant.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System (DFI)				
Air Cleaner Housing Assembly Screws	1.2	0.12	11 in·lb	
Air Cleaner Housing Clamp Bolts	2.0	0.20	18 in·lb	
Air Cleaner Housing Mounting Bolt	6.9	0.70	61 in·lb	
Air Inlet Duct Mounting Bolts	9.8	1.0	87 in·lb	L
Canister Bracket Screws	1.2	0.12	11 in·lb	
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Delivery Pipe Assy Mounting Screws (Nozzle Assy)	3.43	0.35	30 in·lb	
Delivery Pipe Assy Mounting Screws (Throttle Body Assy)	3.43	0.35	30 in·lb	
Exhaust Butterfly Valve Actuator Mounting Screws	4.3	0.44	38 in·lb	
Exhaust Butterfly Valve Actuator Pulley Bolt	4.9	0.50	43 in·lb	
Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
Gear Position Switch Screws	2.9	0.30	26 in·lb	L
Inlet Air Temperature Sensor Screw	0.80	0.081	7.1 in·lb	
Nozzle Assy Mounting Screws	1.2	0.12	11 in·lb	S
Oxygen Sensor (Equipped Models)	25	2.5	18	
Separator Bracket Mounting Bolt	6.9	0.70	61 in·lb	
Speed Sensor Bolt	6.9	0.70	61 in·lb	L
Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
Throttle Cable Holder Plate Bolt	3.9	0.40	35 in·lb	L
Water Temperature Sensor	25	2.5	18	
Cooling System				
Coolant By-pass Fitting Bolt	8.8	0.90	78 in·lb	L
Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
Coolant Drain Bolt (Water Pump)	8.8	0.90	78 in·lb	
Coolant Reserve Tank Mounting Bolts	6.9	0.70	61 in·lb	
Heat Insulation Plate Bolt	3.9	0.40	35 in·lb	L
Impeller Bolt	9.8	1.0	87 in·lb	
Oil Cooler Mounting Bolts	20	2.0	15	

PERIODIC MAINTENANCE 2-7

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Radiator Bracket Mounting Bolt	9.8	1.0	87 in·lb	
Radiator Lower Bolt	6.9	0.70	61 in·lb	
Radiator Upper Bolts	9.8	1.0	87 in·lb	
Thermostat Housing Cover Bolts	5.9	0.60	52 in·lb	
Water Hose Clamp Screws	2.0	0.20	18 in·lb	
Water Hose Fitting Bolts	9.8	1.0	87 in·lb	
Water Pump Cover Bolts	12	1.2	106 in·lb	L
Water Temperature Sensor	25	2.5	18	
Engine Top End				
Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	L
Breather Hose Fitting	15	1.5	11	L
Camshaft Cap Bolts	12	1.2	106 in·lb	S
Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
Camshaft Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	
Camshaft Sprocket Bolts	15	1.5	11	L
Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
Cylinder Head Bolts (M9)	39	4.0	29	MO, S
Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
Exhaust Butterfly Valve Cable Adjuster Locknuts	6.9	0.70	61 in·lb	
Exhaust Butterfly Valve Cable Locknuts	7.0	0.71	62 in·lb	
Exhaust Pipe Clamp Bolt	17	1.7	13	
Exhaust Pipe Guard Bolts	6.9	0.70	61 in·lb	
Exhaust Pipe Holder Nuts	17	1.7	13	
Front Camshaft Chain Guide Bolt (Lower)	12	1.2	106 in·lb	
Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
Muffler Body Clamp Bolt	17	1.7	13	
Muffler Body Cover Bolts	7.0	0.71	62 in·lb	
Muffler Body Mounting Bolt	25	2.5	18	
Muffler Body Rear Cover Bolts	7.0	0.71	62 in·lb	
Premuffler Chamber Bracket Bolt	35	3.6	26	
Premuffler Chamber Guard Bolts	6.9	0.70	61 in·lb	
Premuffler Chamber Mounting Bolt	35	3.6	26	
Spark Plugs	13	1.3	115 in·lb	
Starter Clutch Bolt Cap	–	–	–	Hand-tighten
Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
Timing Inspection Cap	–	–	–	Hand-tighten
Upper Camshaft Chain Guide Bolts	12	1.2	106 in·lb	S
Water Passage Plugs	19.6	2.0	14	L
Clutch				
Clutch Cover Bolts (M6, L = 40 mm)	9.8	1.0	87 in·lb	
Clutch Cover Bolts (M6, L = 25 mm)	9.8	1.0	87 in·lb	

2-8 PERIODIC MAINTENANCE

Torque and Locking Agent

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
Clutch Cover Plate Bolts	9.8	1.0	87 in-lb	L
Clutch Hub Nut	135	13.8	99.6	R
Clutch Lever Clamp Bolts	7.8	0.80	69 in-lb	S
Clutch Spring Bolts	8.8	0.90	78 in-lb	
Oil Filler Plug	–	–	–	Hand-tighten
Sub Clutch Hub Bolts	25	2.5	18	L
Engine Lubrication System				
Air Bleed Bolt	9.8	1.0	87 in-lb	
Engine Oil Drain Bolt	29	3.0	21	
Impeller Bolt	9.8	1.0	87 in-lb	
Oil Cooler Mounting Bolts	20	2.0	15	
Oil Cooler/Oil Filter Case Mounting Bolts	20	2.0	15	L
Oil Filter	17	1.7	13	G, R
Oil Filter Guard Bolts	4.0	0.41	35 in-lb	L
Oil Filter Holder Bolt	25	2.5	18	L
Oil Jet Nozzles	2.9	0.30	26 in-lb	
Oil Pan Bolts	9.8	1.0	87 in-lb	S
Oil Passage Plug	17	1.7	13	
Oil Passage Plugs (Taper)	20	2.0	15	L
Oil Pressure Relief Valve	15	1.5	11	L
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in-lb	G
Oil Pump Drive Gear Bolt	9.8	1.0	87 in-lb	L
Water Pump Cover Bolts	12	1.2	106 in-lb	L
Engine Removal/Installation				
Adjusting Collar Locknuts	49	5.0	36	S
Adjusting Collars	9.8	1.0	87 in-lb	S
Left Front Engine Mounting Bolt	44	4.5	32	S
Lower Engine Mounting Nut	44	4.5	32	S
Middle Engine Mounting Nut	44	4.5	32	S
Right Front Engine Mounting Bolt	44	4.5	32	S
Crankshaft/Transmission				
Bearing Holder Screws	4.9	0.50	43 in-lb	L
Breather Hose Fitting	15	1.5	11	L
Breather Plate Bolts	9.8	1.0	87 in-lb	L
Connecting Rod Big End Nuts	see the text	←	←	MO
Crankcase Bolt (M8, L = 90 mm)	27	2.8	20	S
Crankcase Bolts (M8, L = 95 mm)	31	3.2	23	MO, S
Crankcase Bolts (M8, L = 75 mm)	27	2.8	20	S
Crankcase Bolts (M6, L = 65 mm)	12	1.2	106 in-lb	S
Crankcase Bolts (M6, L = 50 mm)	12	1.2	106 in-lb	
Gear Position Switch Screws	2.9	0.30	26 in-lb	L

PERIODIC MAINTENANCE 2-9

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Gear Positioning Lever Bolt	12	1.2	106 in·lb	
Idle Gear Cover Bolts	9.8	1.0	87 in·lb	
Oil Jet Nozzles	2.9	0.30	26 in·lb	
Oil Passage Nozzle	4.9	0.50	43 in·lb	
Oil Passage Plug	17	1.7	13	
Oil Passage Plugs (Taper)	20	2.0	15	L
Race Holder Screws	4.9	0.50	43 in·lb	L
Shift Drum Cam Holder Bolt	12	1.2	106 in·lb	L
Shift Lever Bolt	6.9	0.70	61 in·lb	
Shift Pedal Mounting Bolt	25	2.5	18	L
Shift Shaft Return Spring Pin	28	2.9	21	L
Starter Clutch Bolt	49	5.0	36	
Starter Clutch Cover Bolt (L = 40 mm)	9.8	1.0	87 in·lb	
Starter Clutch Cover Bolt (L = 20 mm)	9.8	1.0	87 in·lb	
Starter Clutch Cover Bolts (L = 30 mm)	9.8	1.0	87 in·lb	
Tie-Rod Locknut (Front)	6.9	0.70	61 in·lb	Lh
Tie-Rod Locknut (Rear)	6.9	0.70	61 in·lb	
Transmission Case Bolt (M6)	9.8	1.0	87 in·lb	
Transmission Case Bolts (M8)	20	2.0	15	
Wheels/Tires				
Front Axle Clamp Bolts	20	2.0	15	AL
Front Axle Nut	127	13.0	93.7	
Rear Axle Nut	127	13.0	93.7	
Final Drive				
Chain Guide Bolts	9.8	1.0	87 in·lb	L
Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
Engine Sprocket Cover Plate Mounting Bolts	9.8	1.0	87 in·lb	L
Engine Sprocket Nut	125	13.0	92.2	MO
Rear Axle Nut	127	13.0	93.7	
Rear Sprocket Nuts	59	6.0	44	
Speed Sensor Bolt	6.9	0.70	61 in·lb	L
Brakes				
Bleed Valves	7.8	0.80	69 in·lb	
Brake Hose Banjo Bolts	25	2.5	18	
Brake Lever Pivot Bolt	1.0	0.10	8.9 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Brake Pedal Mounting Bolt	34	3.5	25	L
Front Brake Disc Mounting Bolts	27	2.8	20	L
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Front Brake Pad Pins	17	1.7	13	
Front Brake Reservoir Cap Stopper Screw	1.2	0.12	11 in·lb	
Front Caliper Assembly Bolts	27	2.8	20	L
Front Caliper Mounting Bolts	34	3.5	25	

2-10 PERIODIC MAINTENANCE

Torque and Locking Agent

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
Front Master Cylinder Bleed Valve	5.4	0.55	48 in-lb	
Front Master Cylinder Clamp Bolts	11	1.1	97 in-lb	S
Rear Brake Disc Mounting Bolts	27	2.8	20	L
Rear Caliper Mounting Bolts	25	2.5	18	
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	17	1.7	13	
Suspension				
Front Axle Clamp Bolts	20	2.0	15	AL
Front Fork Top Plugs	35	3.6	26	
Lower Front Fork Clamp Bolts	23	2.3	17	AL
Lower Rear Shock Absorber Nut	34	3.5	25	
Piston Rod Guide Case	90	9.2	66	
Rear Shock Absorber Bracket Nut	59	6.0	44	
Swingarm Pivot Adjusting Collar Locknut	98	10.0	72.3	
Swingarm Pivot Shaft	20	2.0	15	
Swingarm Pivot Shaft Nut	108	11.0	79.7	
Tie-Rod Nuts	59	6.0	44	
Uni-Trak Rocker Arm Bolt	34	3.5	25	
Upper Front Fork Clamp Bolts	20	2.0	15	
Upper Rear Shock Absorber Nut	34	3.5	25	
Steering				
Handlebar Clamp Bolts	25	2.5	18	
Handlebar Positioning Bolts	9.8	1.0	87 in-lb	L
Left Switch Housing Screws	3.5	0.36	31 in-lb	
Lower Front Fork Clamp Bolts	23	2.3	17	AL
Right Switch Housing Screws	3.5	0.36	31 in-lb	
Steering Damper Mounting Bolts	11	1.1	97 in-lb	L
Steering Stem Head Nut	78	8.0	58	
Steering Stem Nut	20	2.0	15	
Throttle Case Screws	3.5	0.36	31 in-lb	
Upper Front Fork Clamp Bolts	20	2.0	15	
Frame				
Front Fender Mounting Bolts	3.9	0.40	35 in-lb	
Front Footpeg Bracket Bolts	25	2.5	18	
Rear Footpeg Bracket Bolts	25	2.5	18	
Rear Frame Bolts (M10)	44	4.5	32	L
Rear Frame Bolts (M8)	25	2.5	18	L
Sidestand Bolt	44	4.5	32	G
Sidestand Bracket Bolts	49	5.0	36	L
Sidestand Switch Bolt	8.8	0.90	78 in-lb	L
Windshield Mounting Bolts	0.42	0.043	3.7 in-lb	
Electrical System				
Alternator Cover Bolts	9.8	1.0	87 in-lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Alternator Lead Holding Plate Bolt	9.8	1.0	87 in·lb	L
Alternator Rotor Bolt	155	15.8	114	S
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Front Turn Signal Light Mounting Screw	1.2	0.12	11 in·lb	
Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
Gear Position Switch Screws	2.9	0.30	26 in·lb	L
Left Switch Housing Screws	3.5	0.36	31 in·lb	
License Plate Light Cover Screws	1.0	0.10	8.9 in·lb	
License Plate Light Mounting Nuts	3.5	0.36	31 in·lb	
Meter Unit Mounting Screws	1.2	0.12	11 in·lb	
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	G
Oxygen Sensor (Equipped Models)	25	2.5	18	
Rear Turn Signal Light Lens Screws	1.0	0.10	8.9 in·lb	
Regulator/Rectifier Bracket Screws	1.2	0.12	11 in·lb	
Right Switch Housing Screws	3.5	0.36	31 in·lb	
Sidestand Switch Bolt	8.8	0.90	78 in·lb	L
Spark Plugs	13	1.3	115 in·lb	
Speed Sensor Bolt	6.9	0.70	61 in·lb	L
Starter Clutch Bolt Cap	–	–	–	Hand-tighten
Starter Clutch Cover Bolt (L = 40 mm)	9.8	1.0	87 in·lb	
Starter Clutch Cover Bolt (L = 20 mm)	9.8	1.0	87 in·lb	
Starter Clutch Cover Bolts (L = 30 mm)	9.8	1.0	87 in·lb	
Starter Motor Cable Terminal Bolt	2.9	0.30	26 in·lb	
Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	
Stator Coil Bolts	12	1.2	106 in·lb	L
Water Temperature Sensor	25	2.5	18	

2-12 PERIODIC MAINTENANCE

Torque and Locking Agent

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

Basic Torque for General Fasteners

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

Specifications

Item	Standard	Service Limit
Fuel System (DFI)		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	- - -
Idle Speed	1 300 ±50 r/min (rpm)	- - -
Throttle Body Vacuum	30.6 ±1.3 kPa (230 ±10 mmHg) at idle speed	- - -
Bypass Screws (Turn Out)	0 ~ 2 1/2 (for reference)	- - -
Air Cleaner Element	Viscous paper element	- - -
Cooling System		
Coolant:		
Type (Recommended)	Permanent type of antifreeze	- - -
Color	Green	- - -
Mixed Ratio	Soft water 50%, coolant 50%	- - -
Freezing Point	-35°C (-31°F)	- - -
Total Amount	2.5 L (2.6 US qt)	- - -
Engine Top End		
Valve Clearance:		
Exhaust	0.24 ~ 0.31 mm (0.0094 ~ 0.0122 in.)	- - -
Inlet	0.13 ~ 0.19 mm (0.0051 ~ 0.0075 in.)	- - -
Clutch		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	- - -
Engine Lubrication System		
Engine Oil:		
Type	API SE, SF or SG API SH, SJ, SL or SM with JASO MA, MA1 or MA2	- - -
Viscosity	SAE 10W-40	- - -
Capacity	2.8 L (3.0 US qt) (when filter is not removed)	- - -
	3.1 L (3.3 US qt) (when filter is removed)	- - -
	3.6 L (3.8 US qt) (when engine is completely dry)	- - -
Level	Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)	- - -
Wheels/Tires		
Tread Depth:		
Front	3.6 mm (0.14 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	5.3 mm (0.21 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.)
		Over 130 km/h (80 mph): 3 mm (0.12 in.)
Air Pressure (when Cold):		
Front	Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm ² , 36 psi)	- - -
Rear	Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm ² , 42 psi)	- - -

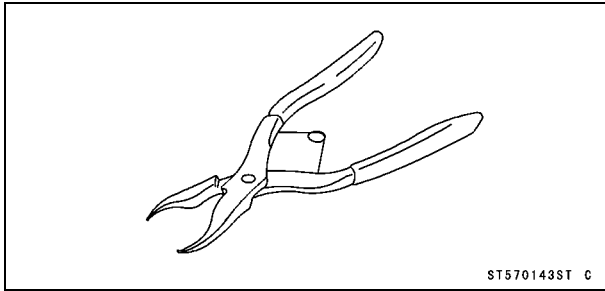
2-14 PERIODIC MAINTENANCE

Specifications

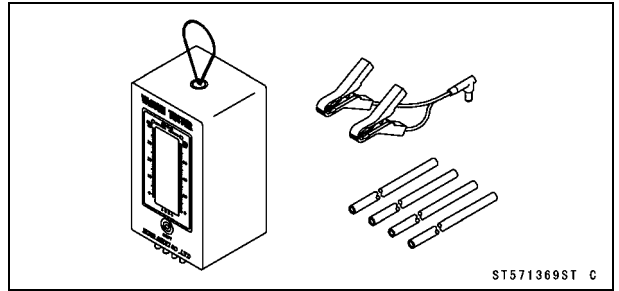
Item	Standard	Service Limit
Final Drive		
Drive Chain Slack	30 ~ 40 mm (1.2 ~ 1.6 in.)	---
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	ENUMA	---
Type	EK 520MVXL2	---
Link	112 links	---
Brakes		
Brake Fluid:		
Grade	DOT4	---
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Light Timing:		
Front	Pulled ON	---
Rear	On after about 10 mm (0.39 in.) of pedal travel	---
Electrical System		
Spark Plug:		
Type	NGK CR9E	---
Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	---

Special Tools

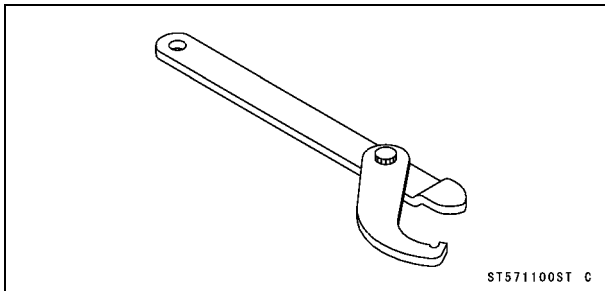
Inside Circlip Pliers:
57001-143



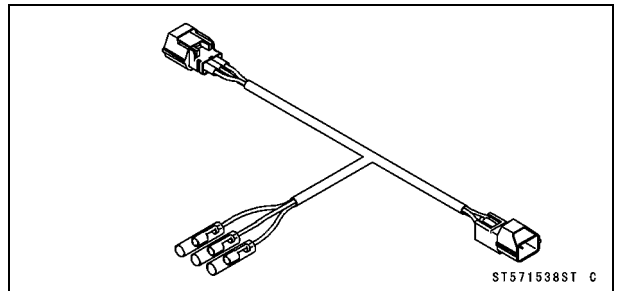
Vacuum Gauge:
57001-1369



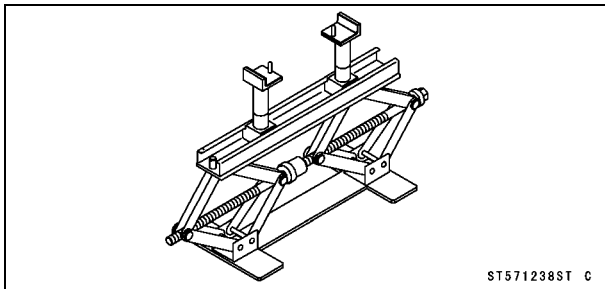
Steering Stem Nut Wrench:
57001-1100



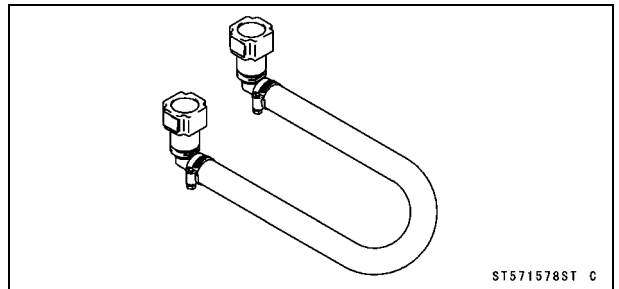
Throttle Sensor Setting Adapter:
57001-1538



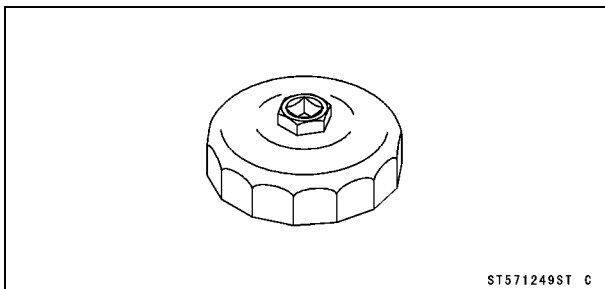
Jack:
57001-1238



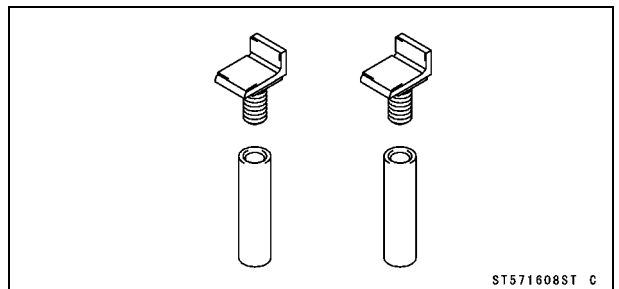
Extension Tube:
57001-1578



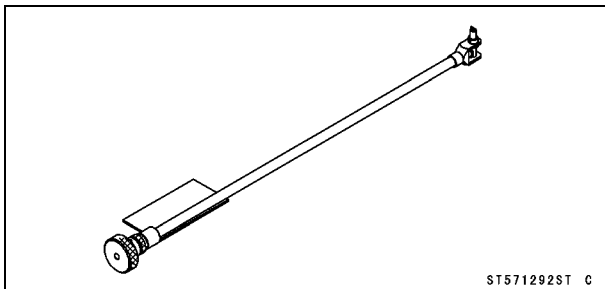
Oil Filter Wrench:
57001-1249



Jack Attachment:
57001-1608



Pilot Screw Adjuster, C:
57001-1292



2-16 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Fuel System (DFI)

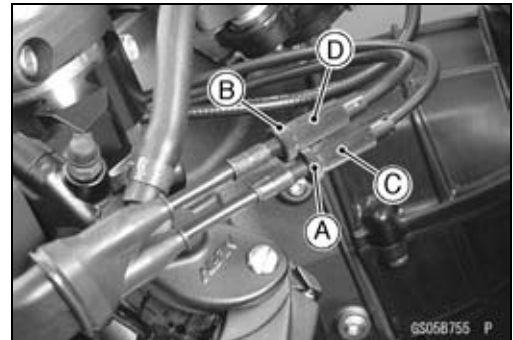
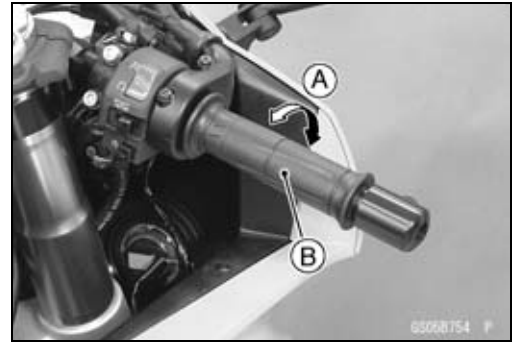
Throttle Control System Inspection

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

Throttle Grip Free Play

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

- Check that the throttle grip [B] moves smoothly from full open to close, and the throttle closes quickly and completely by the return spring in all steering positions.
- ★ If the throttle grip does not return properly, check the throttle cables 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 increases, check the throttle cable free play and the cable routing.
- ★ If necessary, adjust the throttle cable as follows.
- Loosen the locknuts [A] [B].
- Screw both throttle cable adjusters [C] [D] to give the throttle grip plenty of play.
- Turn the decelerator cable adjuster [C] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [A].
- Turn the accelerator cable adjuster [D] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [B].
- ★ If the free play can not be adjusted with the adjusters, replace the cable.



Engine Vacuum Synchronization Inspection

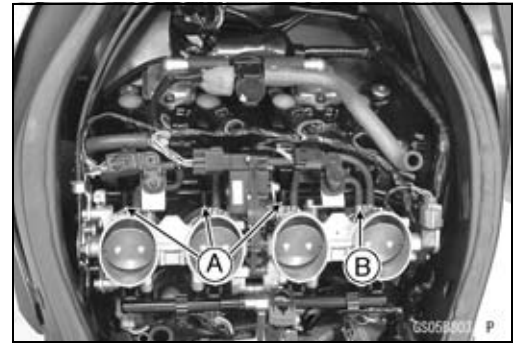
NOTE

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

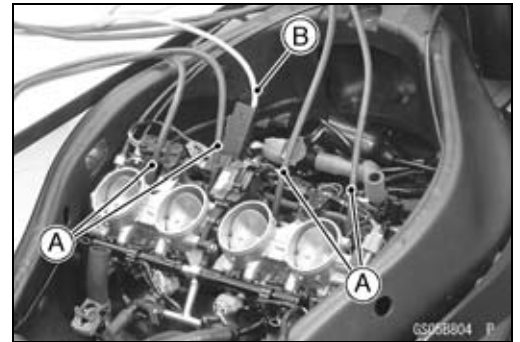
- Situate the motorcycle so that it is vertical.
- Remove:
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
 - Primary Fuel Hose (see Fuel Hose Replacement)

Periodic Maintenance Procedures

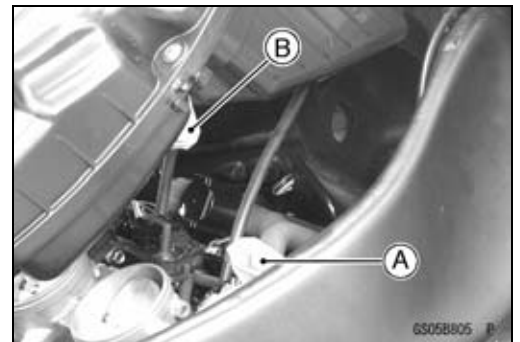
- Pull off the rubber caps [A] and vacuum hose [B] from the fittings of each throttle body.
- For the California, Southeast Asia and Thailand Models, pull off the vacuum hose.



- Connect a vacuum gauge (special tool) and hoses [A] to the fittings on the throttle body.
Special Tool - Vacuum Gauge: 57001-1369
- Connect a highly accurate tachometer lead [B] to one of the stick coil primary lead.

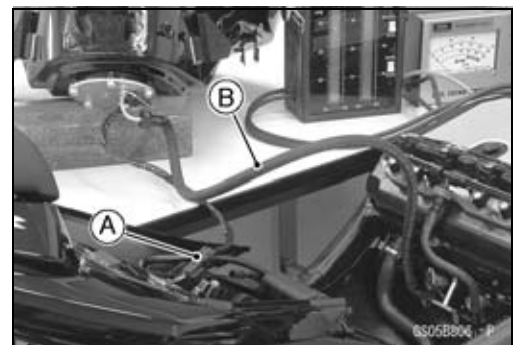


- Plug the air switching valve hose end [A] and air cleaner housing fitting [B].



- Install the air cleaner housing (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter).
- Connect the following parts temporarily.
Fuel Pump Lead Connector [A]
Extension Tube [B]

Special Tool - Extension Tube: 57001-1578



2-18 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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

Idle Speed

Standard: 1 300 ±50 r/min (rpm)

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

CAUTION

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

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

Throttle Body Vacuum

Standard: 30.6 ±1.3 kPa (230 ±10 mmHg) at idle speed

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

Example:

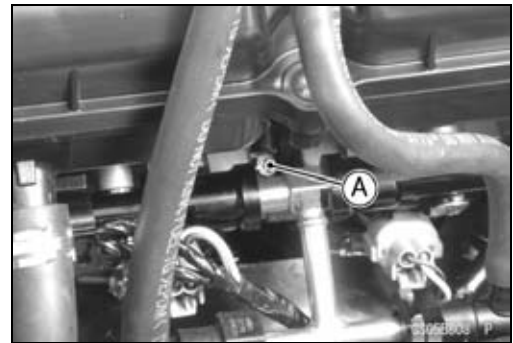
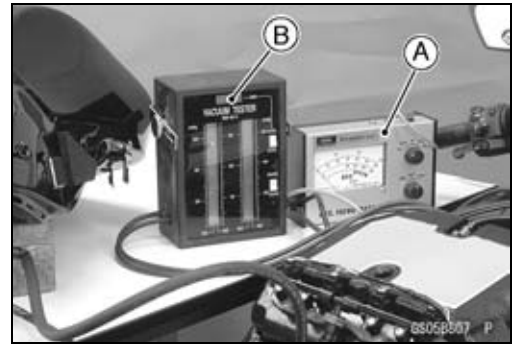
- #1: 165 mmHg
- #2: 190 mmHg
- #3: 170 mmHg
- #4: 200 mmHg

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

NOTE

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

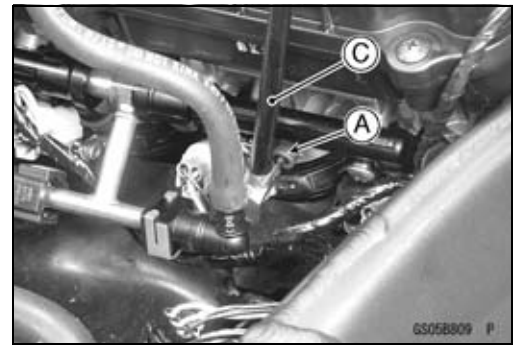
- Open and close the throttle after each measurement and adjust the idle speed as necessary.
- Once the throttle valves have been synchronized, inspect the main throttle sensor output voltage to ensure proper operation (procedure is explained at the end of this section).



Periodic Maintenance Procedures

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

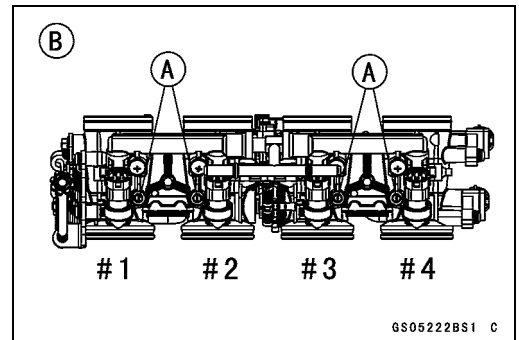
Special Tool - Pilot Screw Adjuster, C [C]: 57001-1292



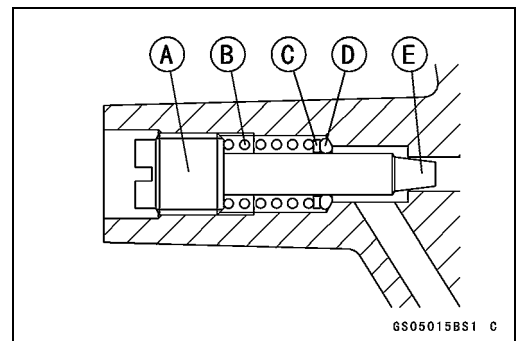
CAUTION

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

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



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



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

Special Tool - Throttle Sensor Setting Adapter: 57001-1538

Main Throttle Sensor Output Voltage

Connections to Adapter:

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

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

Standard: DC 1.02 ~ 1.06 V at idle throttle opening

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

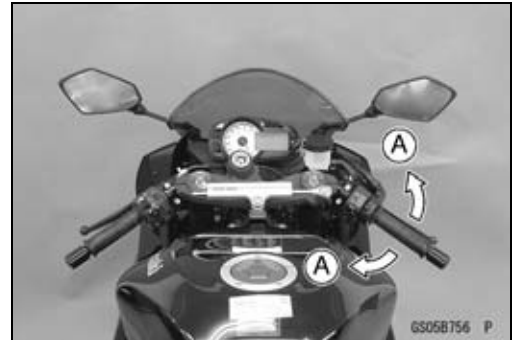
2-20 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Remove the vacuum gauge hoses and install the rubber caps and vacuum hose on the original position.
- For the California, Southeast Asia and Thailand Models, install the vacuum hose.
- Run the vacuum hose according to Cable, Wire, and Hose Routing section in the Appendix chapter.

Idle Speed Inspection

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



⚠ WARNING

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

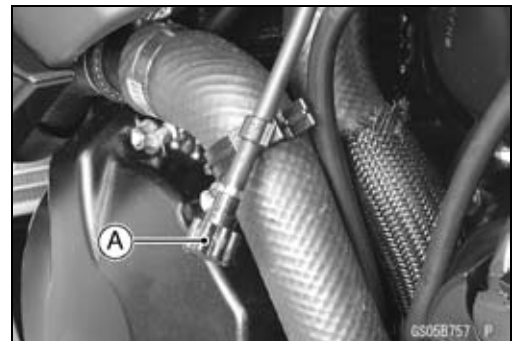
- Check the idle speed.
- ★ If the idle speed is out of specified range, adjust it.

Idle Speed

Standard: 1 300 ±50 r/min (rpm)

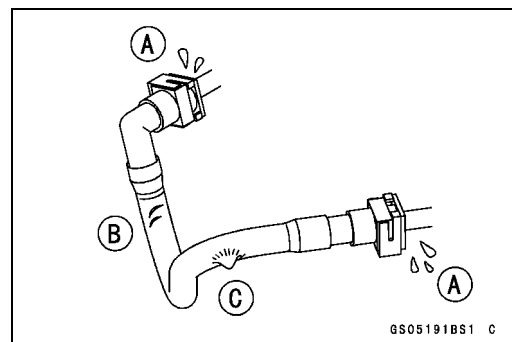
Idle Speed Adjustment

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



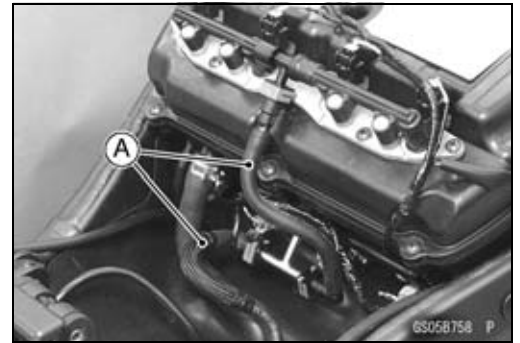
Fuel Hose Inspection (fuel leak, damage, installation condition)

- If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose to burst. Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter) and check the fuel hoses.
- ★ Replace the fuel hose if any fraying, cracks [B] or bulges [C] are noticed.

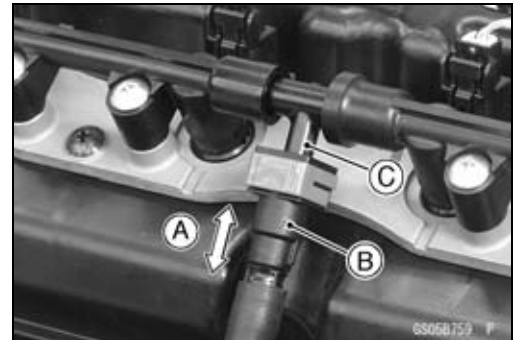


Periodic Maintenance Procedures

- Check that the fuel hoses [A] are routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- ★ Replace the hose if it has been sharply bent or kinked.



- Check that the fuel hose joints are securely connected.
- Push and pull [A] the fuel hose joint [B] back and forth more than two times, and make sure it is locked.
- Check the other hose joint in the same way.



CAUTION

When pushing and pulling the fuel hose joint, do not apply strong force to the delivery pipe [C] on the nozzle assy. The pipe made from resin could be damaged.

⚠ WARNING

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

- ★ If it does not locked, reinstall the hose joint.

Evaporative Emission Control System Inspection (CAL, SEA and TH Models)

- Inspect the canister as follows.
- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Remove the canister [A], and disconnect the hoses from the canister.
- Visually inspect the canister for cracks or other damage.
- ★ If the canister has any cracks or bad damage, replace it with a new one.



NOTE

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

2-22 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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

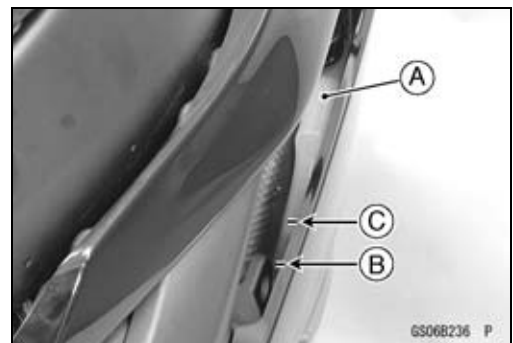


Cooling System

Coolant Level Inspection

NOTE

- Check the level when the engine is cold (room or ambient temperature).
- Check the coolant level in the reserve tank [A] with the motorcycle held perpendicular (Do not use the sidestand).
- ★ If the coolant level is lower than the “L” level line [B], remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter), and then unscrew the reserve tank cap and add coolant to the “F” level line [C].
 - “L”: Low
 - “F”: Full



CAUTION

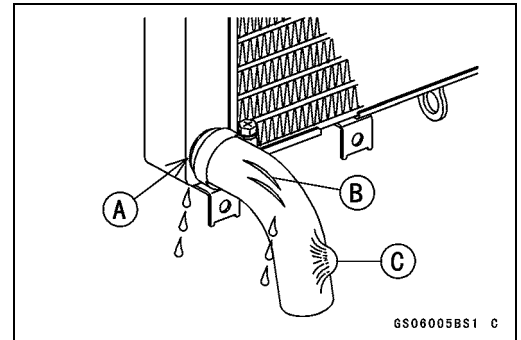
For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water alone can be added. But the diluted coolant must be returned to the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

Periodic Maintenance Procedures

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

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

Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)



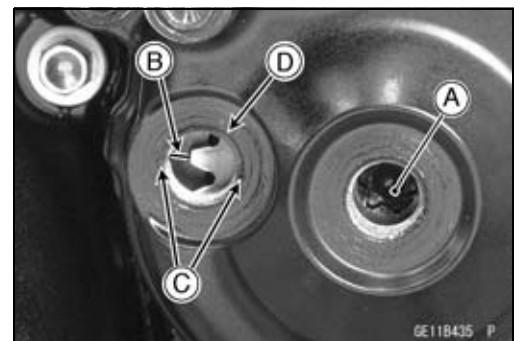
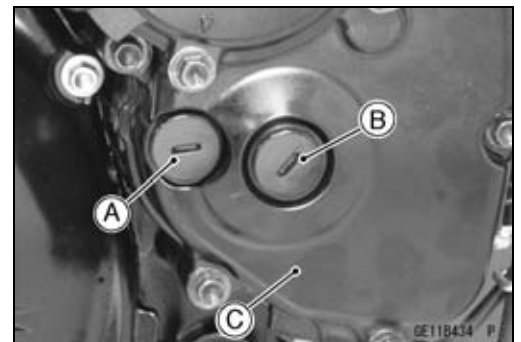
Engine Top End

Valve Clearance Inspection

NOTE

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

- Remove the cylinder head cover (see Cylinder Head Cover Removal in the Engine Top End chapter).
- Remove the timing inspection cap [A] and starter clutch bolt cap [B] on the starter clutch cover [C].
- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch is aligned with the notches [C] in the edge of the timing inspection hole [D] in the starter clutch cover.



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

Valve Clearance

Standard:

- Exhaust** 0.24 ~ 0.31 mm (0.0094 ~ 0.0122 in.)
- Inlet** 0.13 ~ 0.19 mm (0.0051 ~ 0.0075 in.)



2-24 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

NOTE

○ Thickness gauge is horizontally inserted on the valve lifter.

Appropriateness [A]

Inadequacy [B]

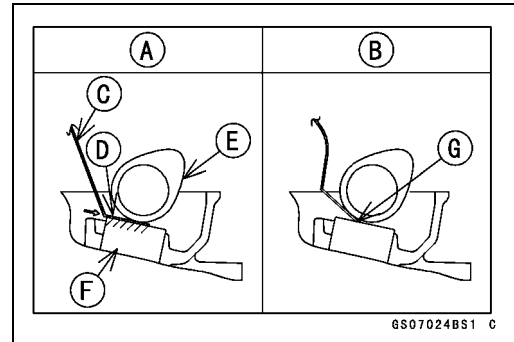
Thickness Gauge [C]

Horizontally Inserts [D]

Cam [E]

Valve Lifter [F]

Hits the Valve Lifter Ahead [G]

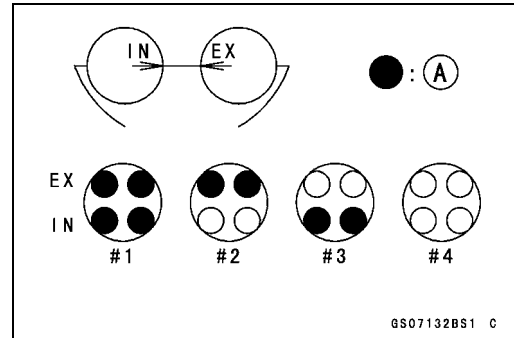


○ When positioning #1 piston TDC at the end of the compression stroke:

Inlet Valve Clearance of #1 and #3 Cylinders

Exhaust Valve Clearance of #1 and #2 Cylinders

Measuring Valve [A]

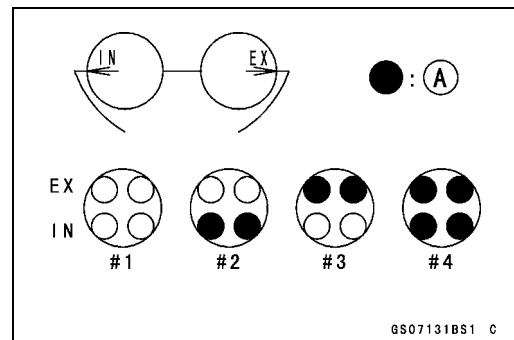


○ When positioning #4 piston TDC at the end of the compression stroke:

Inlet Valve Clearance of #2 and #4 Cylinders

Exhaust Valve Clearance of #3 and #4 Cylinders

Measuring Valve [A]



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

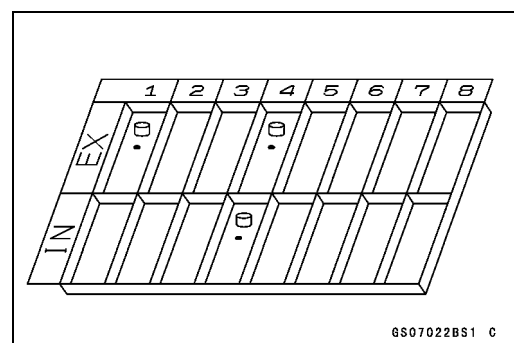
Valve Clearance Adjustment

● To change the valve clearance, remove the camshafts (see Camshaft Removal in the Engine Top End chapter) and valve lifters.

● Replace the shim with one of a different thickness.

NOTE

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



Periodic Maintenance Procedures

- 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] Present Shim Thickness

[b] Measured Valve Clearance

[c] Specified Valve Clearance (Mean Value = 0.275 mm
(Exhaust), 0.160 mm (Inlet))

[d] Replace Shim Thickness

Example (Exhaust):

$$1.600 + 0.33 - 0.275 = 1.655 \text{ mm}$$

- Exchange the shim for the 1.675 size shim.

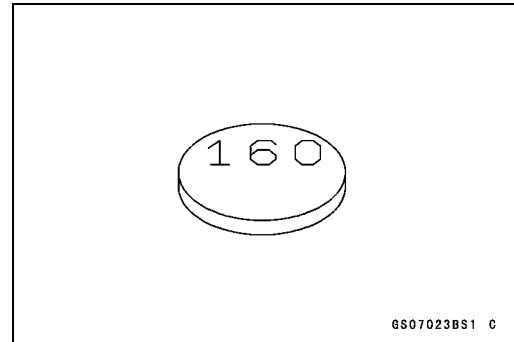


2-26 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Adjustment Shims

Thickness	Part Number	Mark
1.300	92180-0108	130
1.325	92180-0109	132
1.350	92180-0110	135
1.375	92180-0111	138
1.400	92180-0112	140
1.425	92180-0113	142
1.450	92180-0114	145
1.475	92180-0115	148
1.500	92180-0116	150
1.525	92180-0117	152
1.550	92180-0118	155
1.575	92180-0119	158
1.600	92180-0120	160
1.625	92180-0121	162
1.650	92180-0122	165
1.675	92180-0123	168
1.700	92180-0124	170
1.725	92180-0125	172
1.750	92180-0126	175
1.775	92180-0127	178
1.800	92180-0128	180
1.825	92180-0129	182
1.850	92180-0130	185
1.875	92180-0131	188
1.900	92180-0132	190
1.925	92180-0133	192
1.950	92180-0134	195
1.975	92180-0135	198
2.000	92180-0136	200
2.025	92180-0137	202
2.050	92180-0138	205
2.075	92180-0139	208
2.100	92180-0140	210
2.125	92180-0141	212
2.150	92180-0142	215
2.175	92180-0143	218
2.200	92180-0144	220
2.225	92180-0145	222
2.250	92180-0146	225
2.275	92180-0147	228
2.300	92180-0148	230



Periodic Maintenance Procedures

CAUTION

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

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

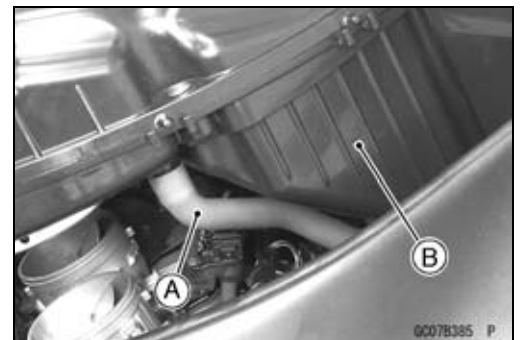
CAUTION

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

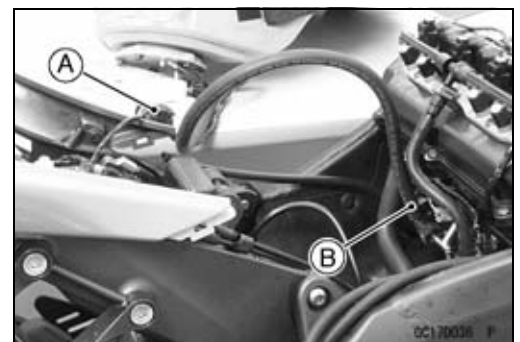
Air Suction System Damage Inspection

- Separate the air switching valve hose [A] from the lower air cleaner housing [B] (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).



- Connect the following parts temporarily.
 - Fuel Pump Lead Connector [A]
 - Extension Tube [B]
 - Air Cleaner Housing (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter)

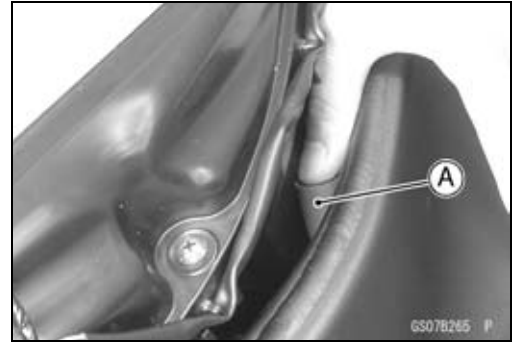
Special Tool - Extension Tube: 57001-1578



2-28 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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



Clutch

Clutch Operation Inspection

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

Clutch Lever Free Play

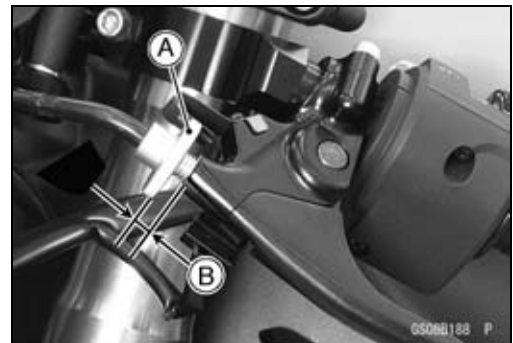
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)



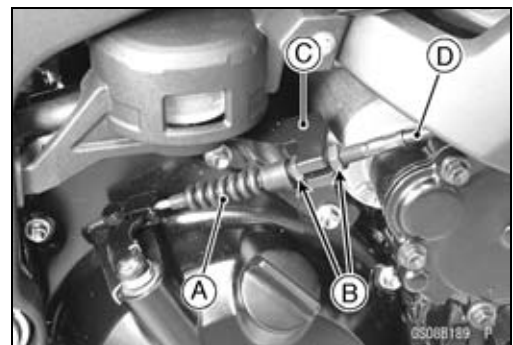
⚠ WARNING

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

- Turn the adjuster [A] so that 4 ~ 6 mm (0.16 ~ 0.24 in.) [B] of threads is visible.

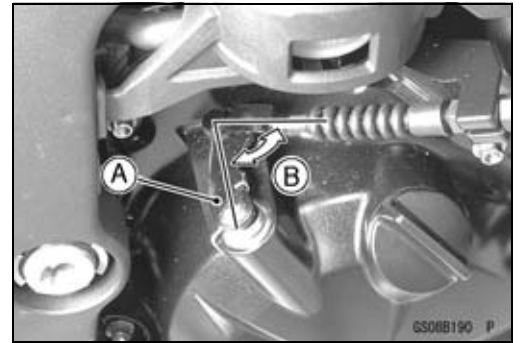


- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen both adjusting nuts [B] at the bracket [C] on the clutch cover as far as they will go.
- Pull the clutch outer cable [D] tight and tighten the adjusting nuts against the bracket.
- Slip the dust cover back onto place.
- Turn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



Periodic Maintenance Procedures

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



⚠ WARNING

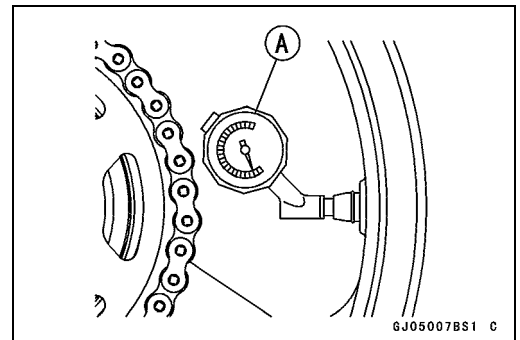
Be sure that the outer cable end at the clutch lever is fully seated in the adjuster at the clutch lever, or it could slip into place later, creating enough cable play to prevent clutch disengagement.

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

Wheels/Tires

Air Pressure Inspection

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

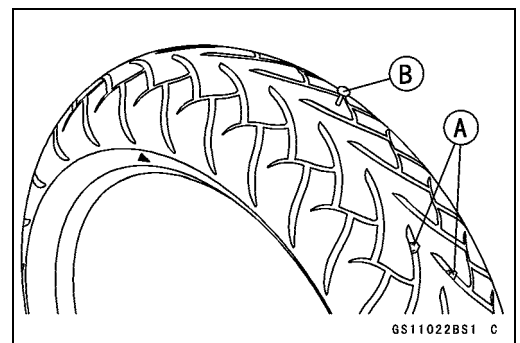


Air Pressure (when Cold)

- Front: Up to 180 kg (397 lb) load:**
250 kPa (2.5 kgf/cm², 36 psi)
- Rear: Up to 180 kg (397 lb) load:**
290 kPa (2.9 kgf/cm², 42 psi)

Wheel/Tire Damage Inspection

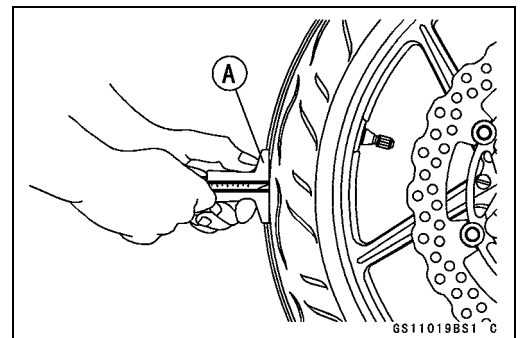
- Remove any imbedded stones [A] or other foreign particles [B] from tread.
- Visually inspect the tire for cracks and cuts, and replace the tire if necessary. Swelling or high spots indicate internal damage, requiring tire replacement.
- Visually inspect the wheel for cracks, cuts and dents damage.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



Tire Tread Wear Inspection

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

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



2-30 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Tread Depth

Standard:

Front 3.6 mm (0.14 in.)

Rear 5.3 mm (0.21 in.)

Service

Limit:

Front 1 mm (0.04 in.)

(AT, CH, DE) 1.6 mm (0.06 in.)

Rear 2 mm (0.08 in.) (Up to 130 km/h (80 mph))

3 mm (0.12 in.) (Over 130 km/h (80 mph))

WARNING

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

NOTE

○ Most countries may have their own regulations a minimum tire tread depth: be sure to follow them.

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

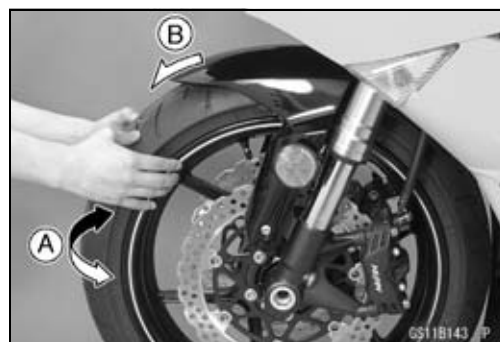
Wheel Bearing Damage Inspection

- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheels/Tires chapter).

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

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



Periodic Maintenance Procedures

Final Drive

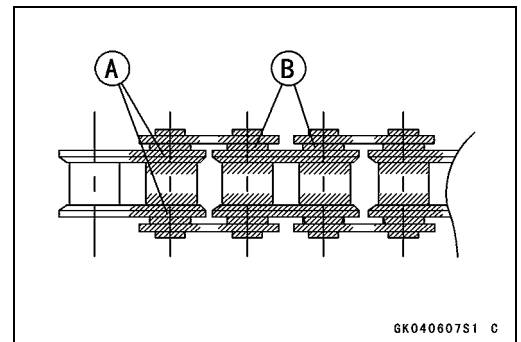
Drive Chain Lubrication Condition Inspection

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

CAUTION

The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-rings and resultant loss of lubricant, observe the following rules.
 Use only kerosene or diesel oil for cleaning of the O-ring of the drive chain. Any other cleaning solution such as gasoline will cause deterioration and swelling of the O-ring. Immediately blow the chain dry with compressed air after cleaning. Complete cleaning and drying the chain within 10 minutes.

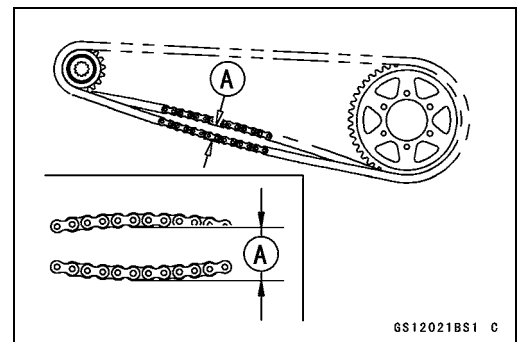
- Apply oil to the sides of the rollers so that oil will penetrate to the rollers and bushings. Apply the oil to the O-rings so that the O-rings will be coated with oil.
- Wipe off any excess oil.
 - Oil Applied Areas [A]
 - O-rings [B]



Drive Chain Slack Inspection

NOTE

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



Chain Slack

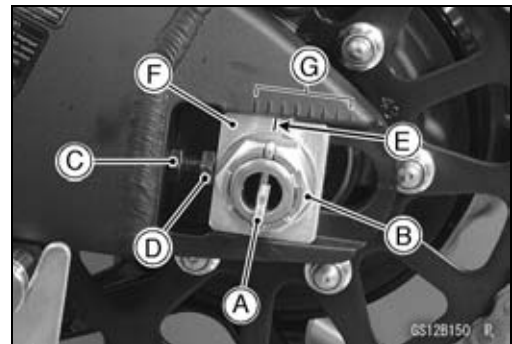
Standard: 30 ~ 40 mm (1.2 ~ 1.6 in.)

2-32 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Drive Chain Slack Adjustment

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



⚠ WARNING

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

- Tighten the both chain adjuster locknuts securely.
- Tighten the rear axle nut.
Torque - Rear Axle Nut: 127 N·m (13.0 kgf·m, 93.7 ft·lb)
- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin [A].

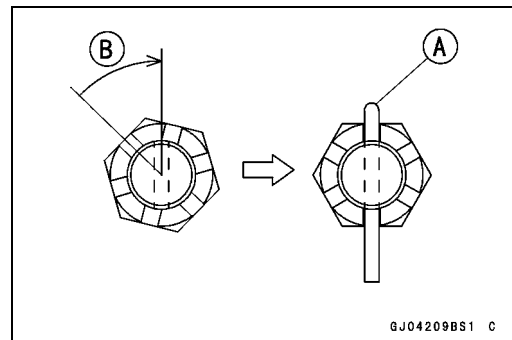
NOTE

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

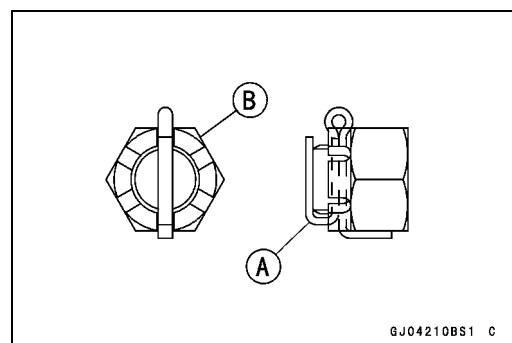
- Bend the cotter pin [A] over the nut [B].

⚠ WARNING

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



GJ04209BS1 C



GJ04210BS1 C

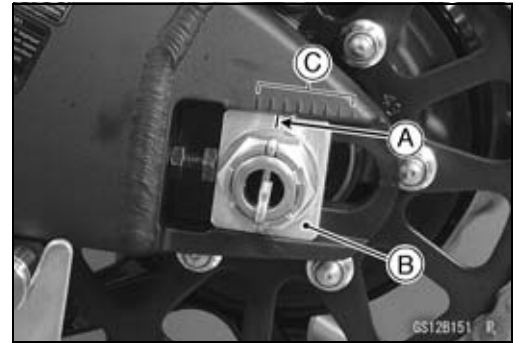
Periodic Maintenance Procedures

Wheel Alignment Inspection

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

NOTE

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

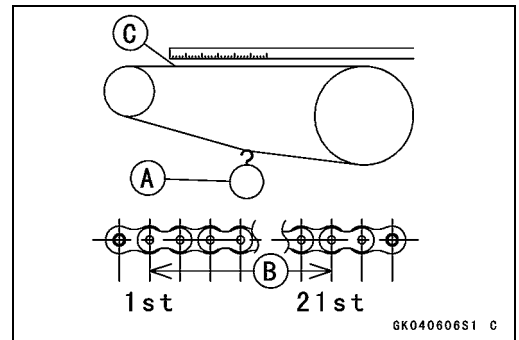


⚠ WARNING

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

Drive Chain Wear Inspection

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



Drive Chain 20-link Length

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

Service Limit: 323 mm (12.7 in.)

⚠ WARNING

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

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

Standard Chain

Make: ENUMA

Type: EK 520MVXL2

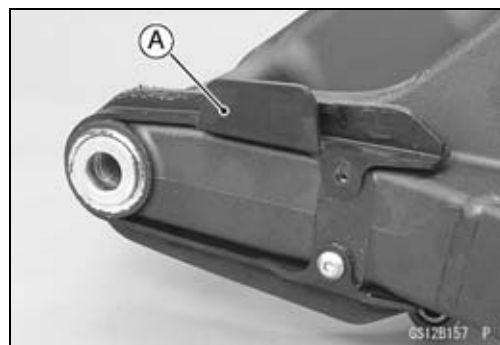
Link: 112 links

2-34 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Chain Guide Wear Inspection

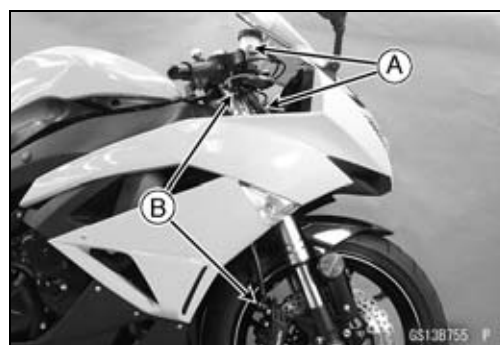
- Remove the swingarm (see Swingarm Removal in the Suspension chapter).
- Visually inspect the chain guide [A].
- ★ Replace the chain guide if it shows any signs of abnormal wear or damage.



Brakes

Brake Fluid Leak (Brake Hose and Pipe) Inspection

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

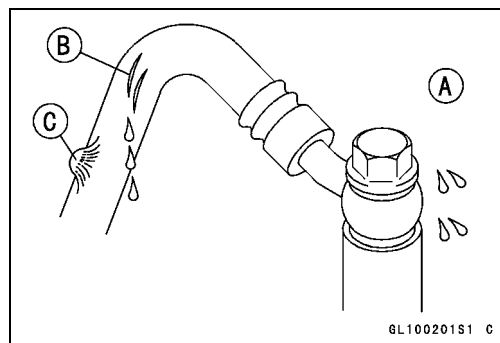


Brake Hose and Pipe Damage and Installation Condition Inspection

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

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

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



Periodic Maintenance Procedures

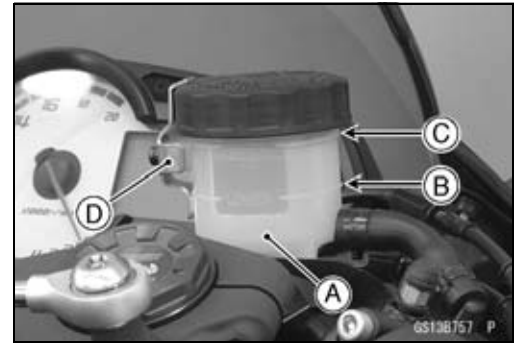
Brake Fluid Level Inspection

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

NOTE

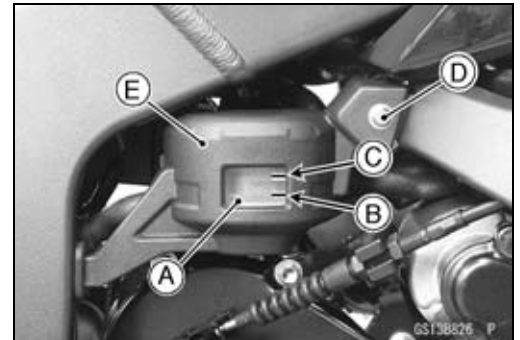
○ Hold the reservoir horizontal by turning the handlebar when checking brake fluid level.

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



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

- ★ If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C].
- Remove the bolt [D] and cover [E].



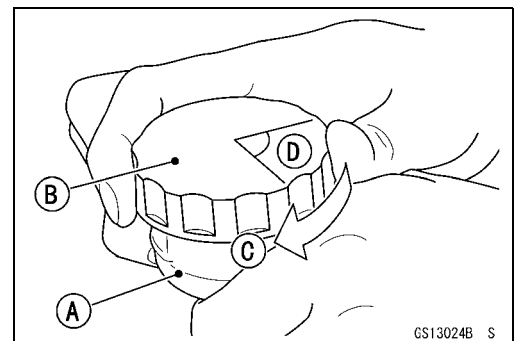
⚠ WARNING

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

Recommended Disc Brake Fluid

Grade: DOT4

- Follow the procedure below to install the front/rear brake fluid reservoir cap correctly.
- First, tighten the brake fluid reservoir cap [B] clockwise [C] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body, then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body [A].
- Install the stopper and cover (see Brake Line Bleeding in the Brakes chapter).



2-36 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Brake Pad Wear Inspection

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

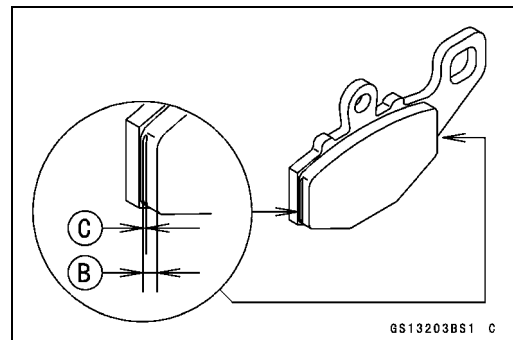
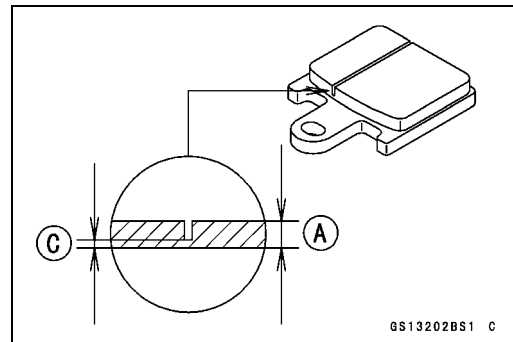
Pad Lining Thickness

Standard:

Front [A] 4.0 mm (0.16 in.)

Rear [B] 5.0 mm (0.20 in.)

Service Limit [C]: 1 mm (0.04 in.)



Brake Operation Inspection

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

⚠ WARNING

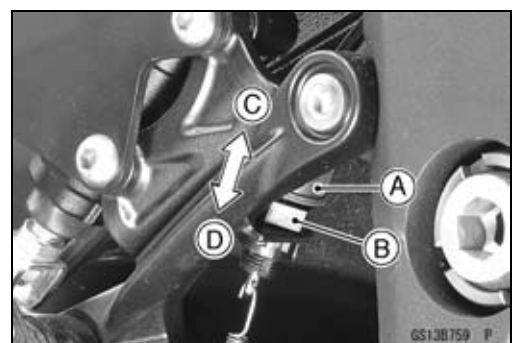
When inspecting by running the vehicle, note a surrounding traffic situation enough in the place of safety.

Brake Light Switch Operation Inspection

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



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

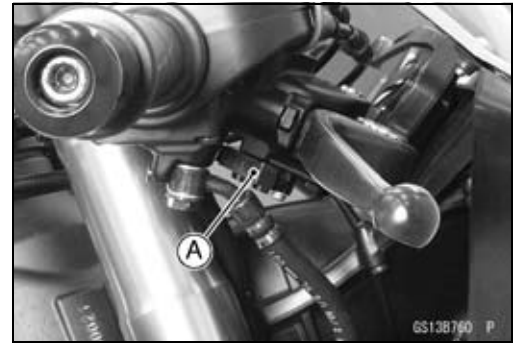


CAUTION

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

Periodic Maintenance Procedures

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



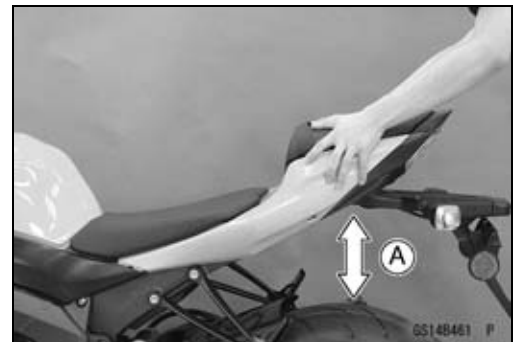
Suspension

Front Forks/Rear Shock Absorber Operation Inspection

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



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



Front Fork Oil Leak Inspection

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

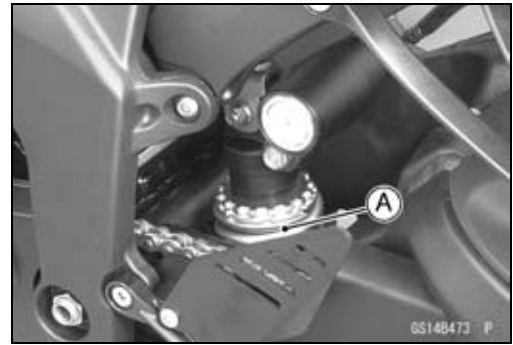


2-38 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

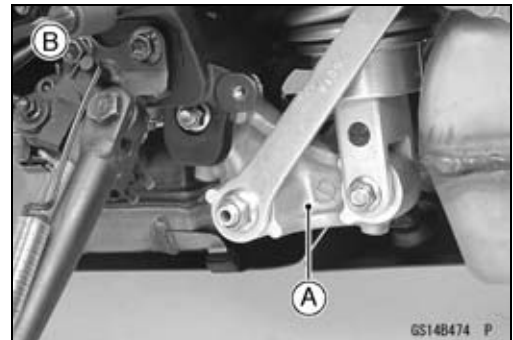
Rear Shock Absorber Oil Leak Inspection

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



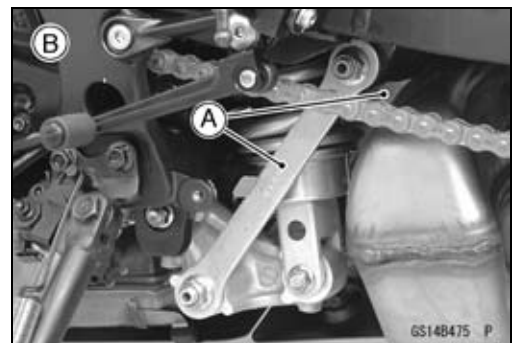
Rocker Arm Operation Inspection

- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.
- ★ If the rocker arm [A] does not smoothly stroke or noise is found, inspect the fasteners and bearings (see Tie-Rod/Rocker Arm Bearing, Sleeve Inspection in the Suspension chapter).
- In this photo [B], the left lower fairing has been removed for clarity.



Tie-Rod Operation Inspection

- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.
- ★ If the tie-rod [A] do not smoothly stroke or noise is found, inspect the fasteners and tie-rod bearings (see Tie-Rod/Rocker Arm Bearing, Sleeve Inspection in the Suspension chapter).
- In this photo [B], the left lower fairing has been removed for clarity.



Steering

Steering Play Inspection

- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheels/Tires chapter).

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

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



NOTE

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

Periodic Maintenance Procedures

Steering Play Adjustment

- Remove:
 - Steering Stem Head with Handlebars (see Handlebar Removal in the Steering chapter).
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Bend the claws [A] of the claw washer [B] straighten.
- Remove:
 - Steering Stem Locknut [C]
 - Claw Washer
- Adjust the steering using the steering stem nut wrench [A].
 - ★ If the steering is too tight, loosen the stem nut [B] a fraction of a turn.
 - ★ If the steering is too loose, tighten the stem nut a fraction of a turn.

NOTE

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

- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until it touches the claw washer.
- Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].
- Install the stem head.
- Install the washer, and temporary tighten the stem head nut.

NOTE

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

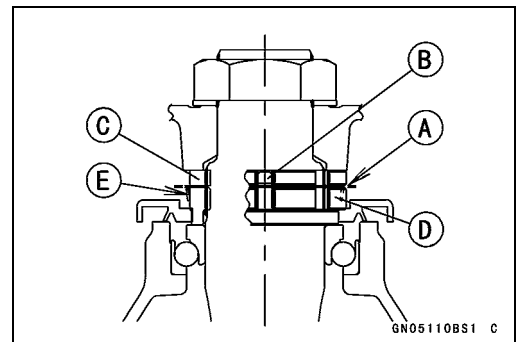
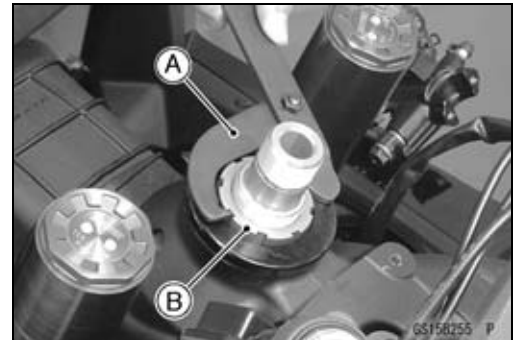
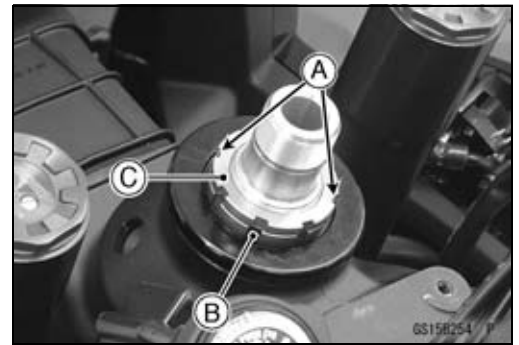
Torque - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

Steering Stem Head Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)

⚠ WARNING

Do not impede the handlebar turning by routing the cables, harness and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

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

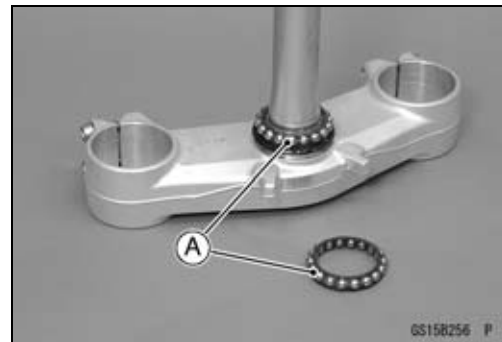


2-40 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Steering Stem Bearing Lubrication

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



Steering Damper Oil Leak Inspection

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



Periodic Maintenance Procedures

Electrical System

Lights and Switches Operation Inspection

First Step

- Set the gear position in the neutral position.
- Turn the ignition switch ON.
- The following lights should go on according to below table.

City Lights [A]	Go on
Taillight (LED) [B]	Goes on
License Plate Light [C]	Goes on
Meter Panel Illumination Light (LED) [D]	Goes on
Meter Panel LCD [E]	Goes on after *blinks
Neutral Indicator Light (LED) [F]	Goes on
Fuel Level Warning Indicator Light (LED) [G]	Goes on (for 3 seconds)
Oil Pressure Warning Symbol [H] and Warning Indicator Light (LED) [I]	Blinks (about 2 seconds after)

*: The LCD goes on for 0.27 seconds and goes off for 0.27 seconds twice.

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

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

City Light Bulb (see City Light Bulb Replacement in the Electrical System chapter)

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

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

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

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

Meter Panel Illumination Light (LED) (see Meter Unit Inspection in the Electrical System chapter)

Fuel Level Warning Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)

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

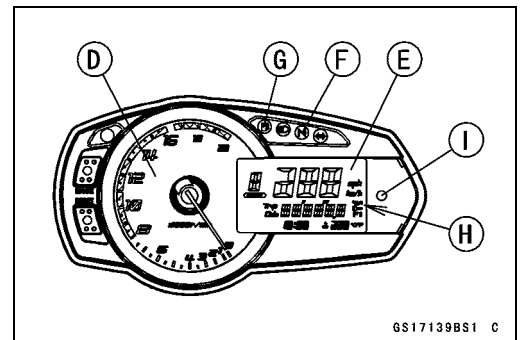
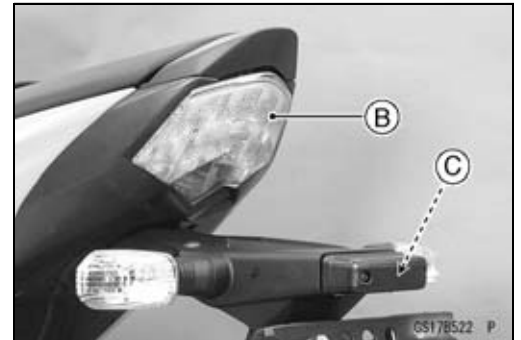
Main Fuse 30 A and Taillight Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

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

Oil Pressure Switch (see Switch Inspection in the Electrical System chapter)

Gear Position Switch (see Gear Position Switch Inspection in the Electrical System chapter)

Harness (see Wiring Inspection in the Electrical System chapter)



2-42 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Turn the ignition switch OFF.
- The all lights should go off (for models equipped with an immobilizer system, warning indicator light (LED) will blink. Refer to the Immobilizer System (Equipped Models) section in the Electrical System chapter).
- ★ If the light does not go off, replace the ignition switch.

Second Step

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

Third Step

- Turn the ignition switch ON.
- Turn the turn signal switch [A] ON (left or right position).
- The left or right turn signal lights [B] (front and rear) according to the switch position should flash.
- The turn signal indicator light (LED) [C] in the meter unit should flash.
- ★ If the each light does not flash, inspect or replace the following parts.

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

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

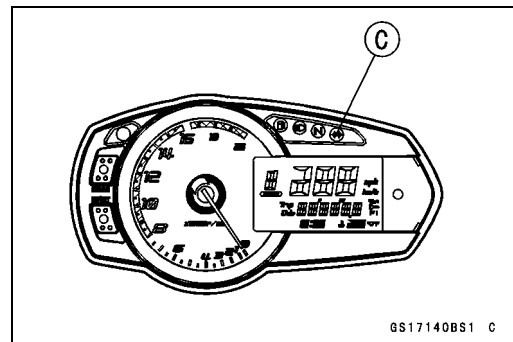
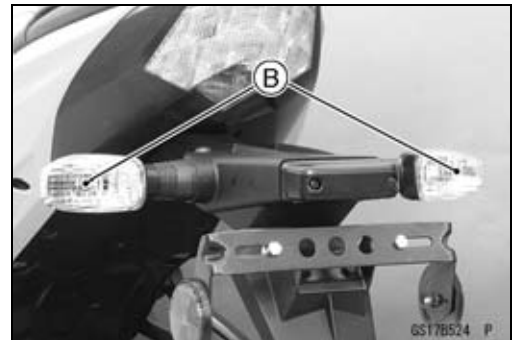
Turn Signal Relay Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

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

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

Harness (see Wiring Inspection in the Electrical System chapter)

- Push the turn signal switch.
- The turn signal lights and indicator light (LED) should go off.
- ★ If the light does not go off, inspect or replace the following parts.
 - Turn Signal Switch (see Switch Inspection in the Electrical System chapter)
 - Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)



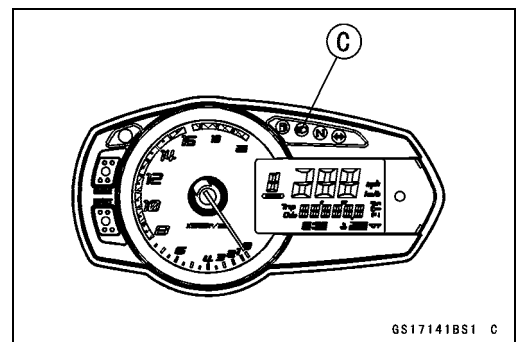
Periodic Maintenance Procedures

Fourth Step

- Set the dimmer switch [A] to low beam position.
- Start the engine.
- The low beam headlight should go on.
- ★ If the low beam headlight does not go on, inspect or replace the following parts.
 - Headlight Low Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
 - Headlight Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
 - Dimmer Switch (see Switch Inspection in the Electrical System chapter)
 - Headlight Relay (see Relay Circuit Inspection in the Electrical System chapter)
 - Harness (see Wiring Inspection in the Electrical System chapter)



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



Headlight Aiming Inspection

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

Headlight Beam Horizontal Adjustment

- Remove the upper inner fairings (see Upper Inner Fairing Removal in the Frame chapter.)
- Turn the horizontal adjuster [A] in both headlights with the screwdriver in or out until the beam points straight ahead.
- ★ If the headlight beam points too low or high, adjust the vertical beam.

Headlight Beam Vertical Adjustment

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



2-44 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

NOTE

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

NOTE

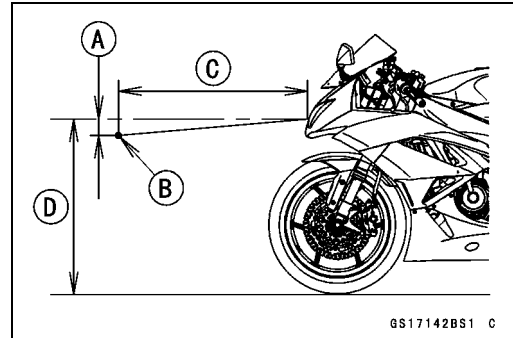
- For the United States model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2.0 in.) drop at 7.6 m (25 ft) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.

50 mm (2.0 in.) [A]

Center of Brightest Spot [B]

7.6 m (25 ft) [C]

Height of Headlight Center [D]



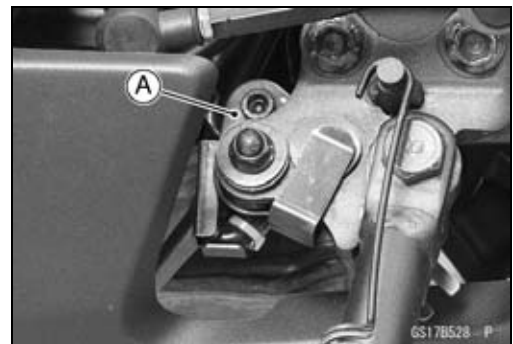
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Sidestand Switch Operation Inspection

- Raise the rear wheel off the ground with the stand (see Rear Wheel Removal in the Wheels/Tires chapter).
- Inspect the sidestand switch [A] operation accordance to below table.

Sidestand Switch Operation

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



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Periodic Maintenance Procedures

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

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

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

Ignition Fuse 15 A (see Fuse Inspection in the Electrical System chapter)

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

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

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

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

Gear Position Switch (see Gear Position Switch Inspection in the Electrical System chapter)

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

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

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

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

Harness (see Wiring Inspection in the Electrical System chapter)

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

Engine Stop Switch Operation Inspection

First Step

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

Second Step

- Set the gear position in the neutral position.
 - Turn the ignition switch ON.
 - Turn the engine stop switch to run position [A].
 - Push the starter button and start the engine.
 - Turn the engine stop switch to stop position.
 - Immediately the engine should be stop.
- ★If the engine does not stop, inspect or replace the engine stop switch (see Switch Inspection in the Electrical System chapter).
- ★If the engine stop switch is good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



2-46 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Others

Chassis Parts Lubrication

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

NOTE

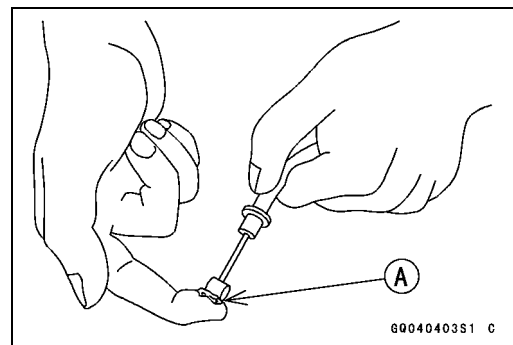
○ *Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

Pivots: Lubricate with Grease.

Brake Lever
Brake Pedal
Clutch Lever
Rear Master Cylinder Push Rod Joint Pin
Sidestand

Points: Lubricate with Grease.

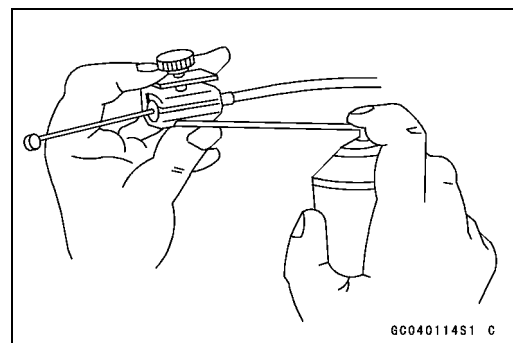
Clutch Inner Cable Upper and Lower Ends [A]
Throttle Inner Cable Upper and Lower Ends



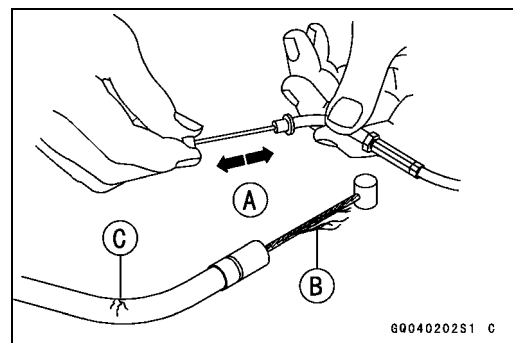
Cables: Lubricate with Rust Inhibitor.

Clutch Cable
Throttle Cables

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



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



Periodic Maintenance Procedures

Bolts, Nuts and Fasteners Tightness Inspection

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

NOTE

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

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

Bolt, Nut and Fastener to be checked

Engine:

Clutch Lever Pivot Bolt Locknut
 Engine Mounting Bolts and Nuts
 Exhaust Pipe Clamp Bolt
 Exhaust Pipe Holder Nuts
 Muffler Body Clamp Bolt
 Muffler Body Mounting Bolt
 Premuffler Chamber Bracket Bolt
 Premuffler Chamber Mounting Bolt
 Radiator Bolts

Wheels:

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

Brakes:

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

Suspension:

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

Steering:

Handlebar Clamp Bolts
 Steering Stem Head Nut

Others:

Footpeg Bracket Bolts
 Front Fender Mounting Bolts
 Rear Frame Bolts
 Sidestand Bolt
 Sidestand Bracket Bolts

2-48 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Replacement Parts

Air Cleaner Element Replacement

NOTE

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

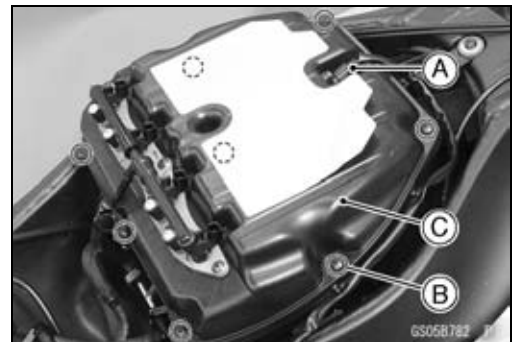
⚠ WARNING

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

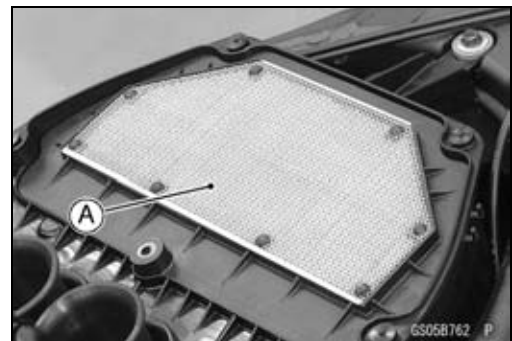
CAUTION

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

- Remove:
 - Secondary Fuel Hose (see Fuel Hose Replacement)
 - Secondary Fuel Injector Connectors (see Nozzle Assy Removal in the Fuel System (DFI) chapter)
 - Connector [A]
 - Screws [B]
 - Upper Air Cleaner Housing [C]



- Discard the air cleaner element [A].

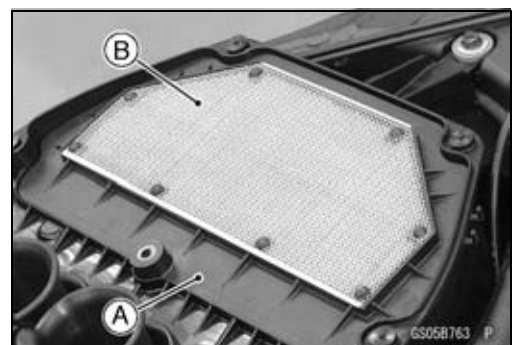


- Install a new element [A] so that the screen side [B] faces upward.

CAUTION

Use only the recommended air cleaner element (Kawasaki part number 11013-0036). Using another air cleaner element will wear the engine prematurely or lower the engine performance.

- Install the upper air cleaner housing (see Air Cleaner Housing Assembly in the Fuel System (DFI) chapter).



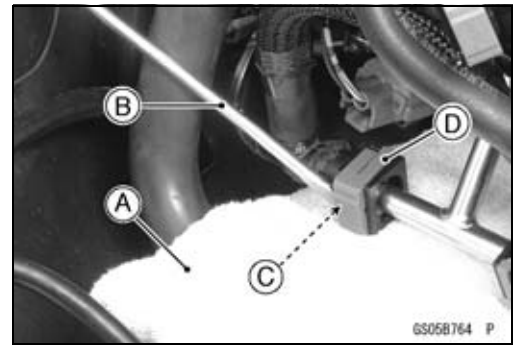
Fuel Hose Replacement

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).

Periodic Maintenance Procedures

For Primary Fuel Hose (Fuel Tank ~ Throttle Body Assy)

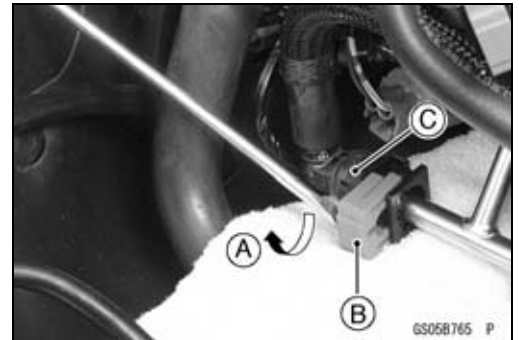
- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert a thin blade screwdriver [B] into the slit [C] on the joint lock [D].



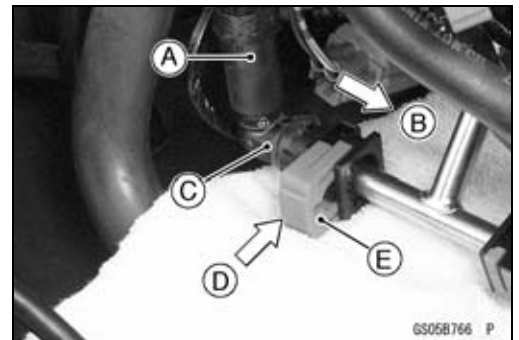
- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the delivery pipe.

⚠ WARNING

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



- Replace the fuel hose [A] with a new one.
- Run the fuel hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Insert [B] the fuel hose joint [C] straight onto the delivery pipe until the hose joint clicks.
- Push [D] the joint lock [E].

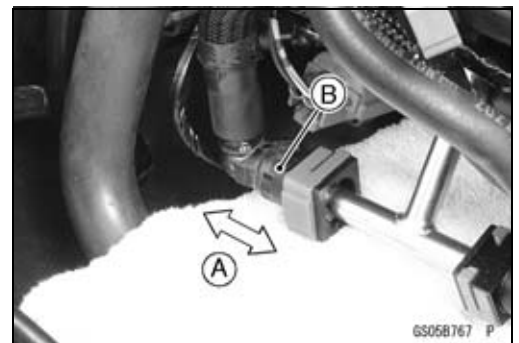


- Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and does not come off.

⚠ WARNING

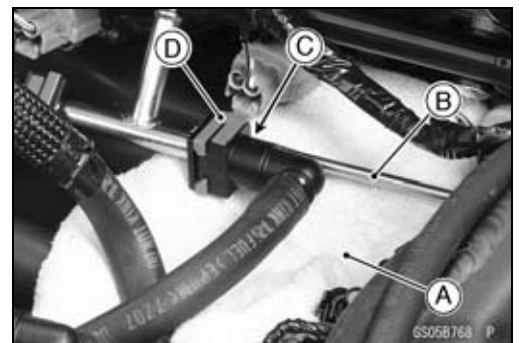
Make sure the fuel hose joint is installed correctly on the delivery pipe or the fuel could leak.

★ If it comes off, reinstall the hose joint.



For Secondary Fuel Hose (Throttle Body Assy ~ Nozzle Assy)

- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert a thin blade screwdriver [B] into the slit [C] on the joint lock [D].



2-50 PERIODIC MAINTENANCE

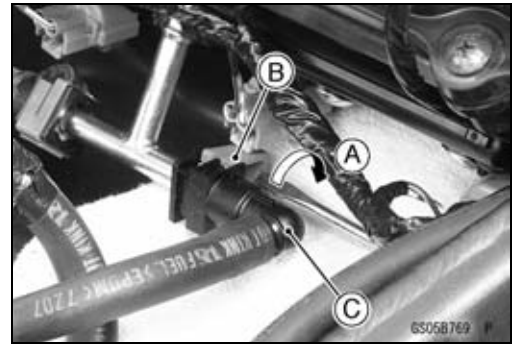
Periodic Maintenance Procedures

- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the delivery pipe.

⚠ WARNING

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

- Insert a thin blade screwdriver [A] into the slit [B] on the joint lock [C].

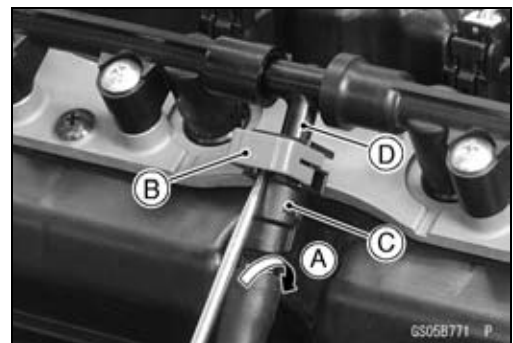
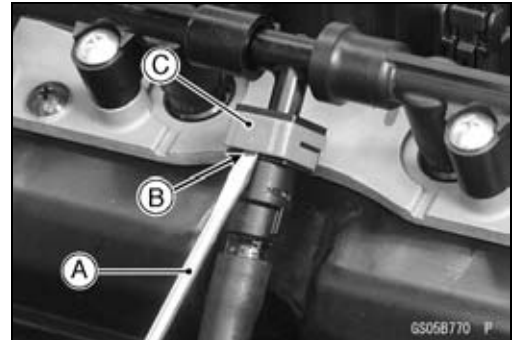


- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the delivery pipe.

CAUTION

When pulling out the fuel hose joint, do not apply strong force to the delivery pipe [D] on the nozzle assy. The pipe made from resin could be damaged.

- Replace the fuel hose [A] with a new one.
- Insert [B] the fuel hose joint [C] straight onto the delivery pipe until the hose joint clicks.
- Push [D] the joint lock [E].

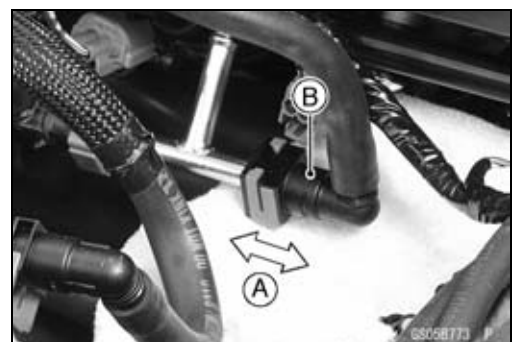
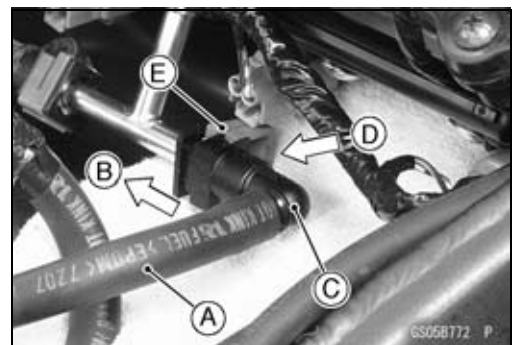


- Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and does not come off.

⚠ WARNING

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

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

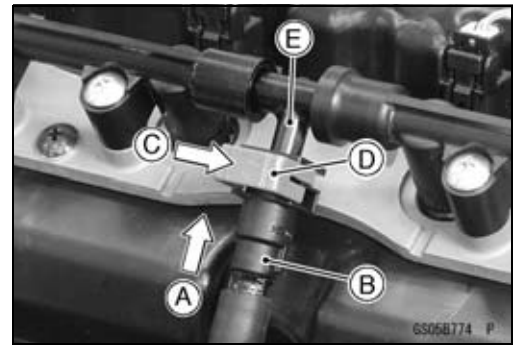


Periodic Maintenance Procedures

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

CAUTION

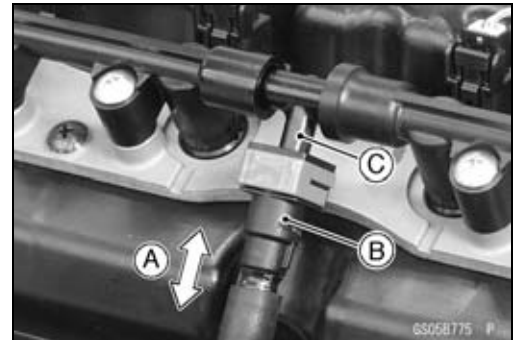
When inserting the fuel hose joint, do not apply strong force to the delivery pipe [E] on the nozzle assy. The pipe made from resin could be damaged.



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

CAUTION

When pushing and pulling the fuel hose joint, do not apply strong force to the delivery pipe [C] on the nozzle assy. The pipe made from resin could be damaged.



⚠ WARNING

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

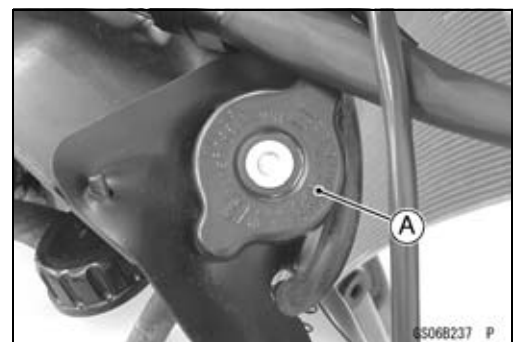
- ★ If it comes off, reinstall the hose joint.
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
- Start the engine and check the fuel hose for leaks.

Coolant Change

⚠ WARNING

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

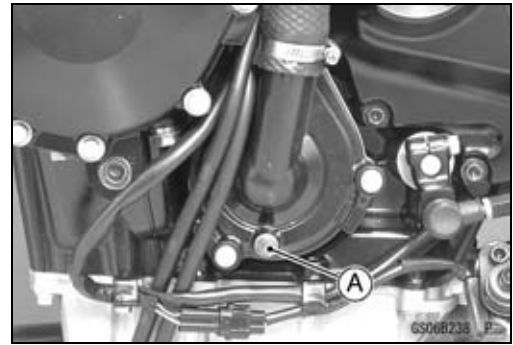
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Radiator Cap [A]
- Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.



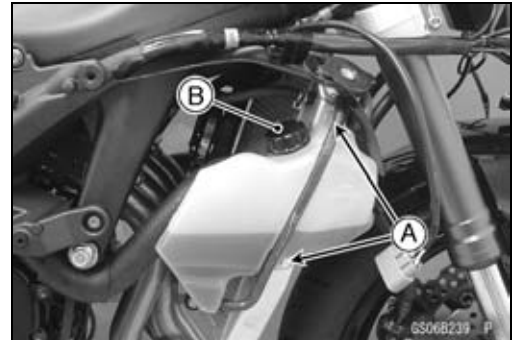
2-52 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Place a container under the drain bolt [A] of the water pump cover.
- Drain the coolant from the radiator by removing the drain bolt.



- Remove:
 - Coolant Reserve Tank Mounting Bolts [A]
 - Cap [B]
- Pour the coolant into a container.
- Tighten:
 - Torque - Coolant Reserve Tank Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)
- Tighten the drain bolt with gasket.
 - Torque - Coolant Drain Bolt (Water Pump): 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Fill the radiator up to the radiator filler neck [A] with coolant, and install the radiator cap.

NOTE

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

- Fill the reserve tank up to the "F" level line with coolant, and install the cap (see Coolant Level Inspection).



CAUTION

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 scales accumulation in the water passages, and considerably reduces the efficiency of the cooling system.

Water and Coolant Mixture Ratio (Recommended)

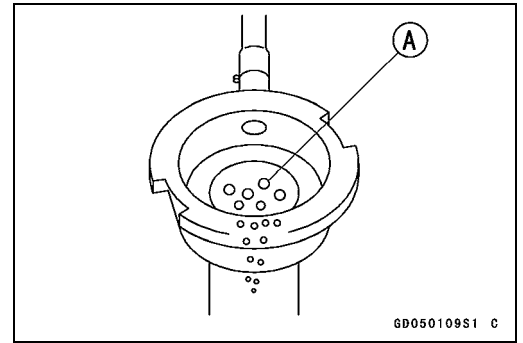
Soft Water:	50%
Coolant:	50%
Freezing Point:	-35°C (-31°F)
Total Amount:	2.5 L (2.6 US qt)

NOTE

○ Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.

Periodic Maintenance Procedures

- Bleed the air from the cooling system as follows.
- Start the engine with the radiator cap removed and run it until no more air bubbles [A] can be seen in the coolant.
- Tap the radiator hoses to force any air bubbles caught inside.
- Stop the engine and add coolant up to the radiator filler neck.
- Install the radiator cap.
- Start the engine, warm it up thoroughly until the radiator fan turns on and then stop the engine.
- Check the coolant level in the reserve tank after the engine cools down.
- ★ If the coolant level is lower than the “L” level line, add coolant to the “F” level line (see Coolant Level Inspection).



CAUTION

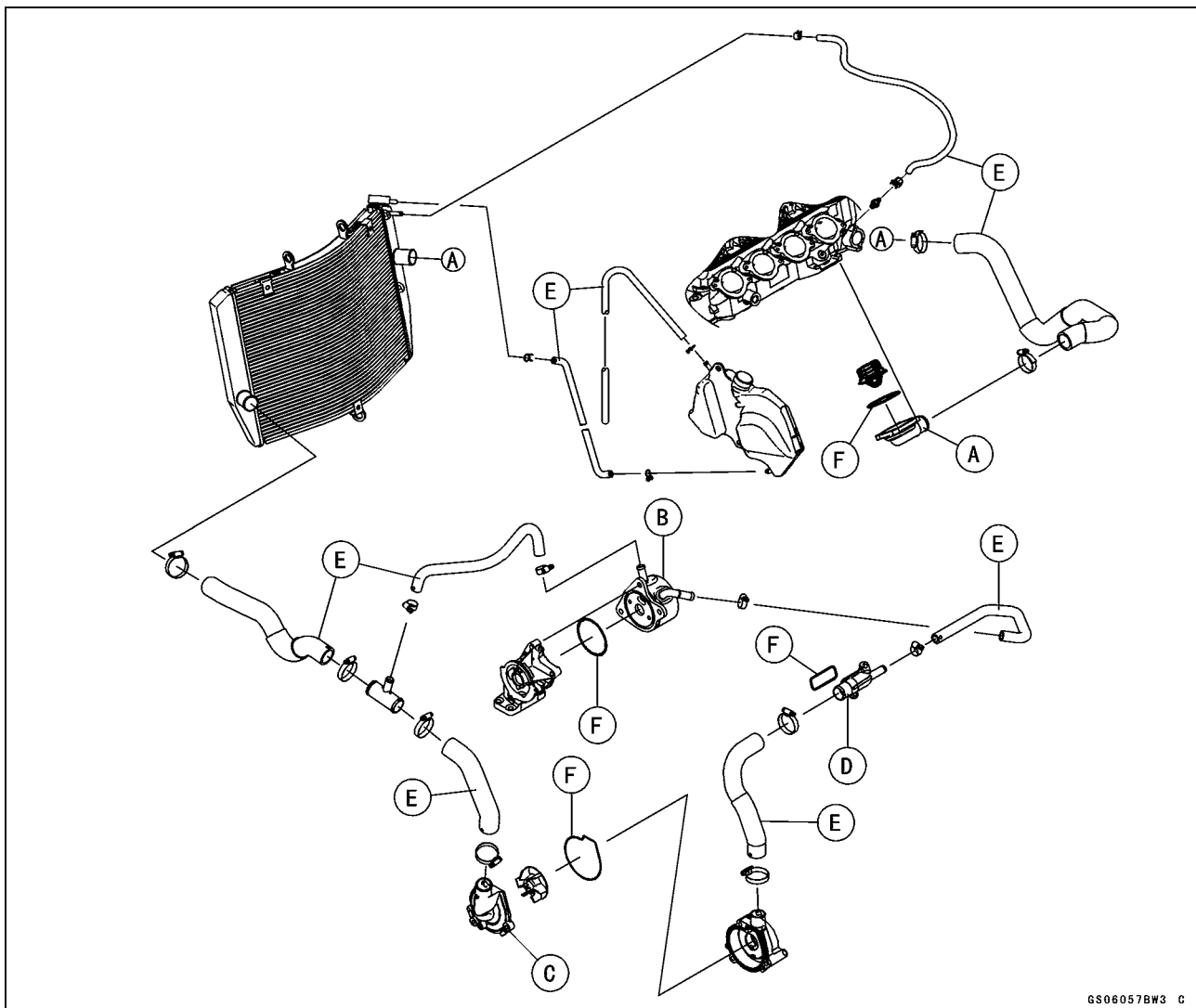
Do not add more coolant above the “F” level line.

2-54 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Radiator Hose and O-ring Replacement

- Drain the coolant (see Coolant Change).
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Thermostat Housing Cover [A] (see Thermostat Housing Removal in the Cooling System chapter)
 - Oil Cooler [B] (see Oil Cooler Removal in the Engine Lubrication System chapter)
 - Water Pump Cover [C] (see Water Pump Removal in the Cooling System chapter)
 - Fitting [D]
- Replace the hoses [E] and O-rings [F] with new ones.
- Apply grease to the new O-rings.
- Run the new hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Tighten:
 - Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**
- Install the removed parts (see appropriate chapters).
- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.

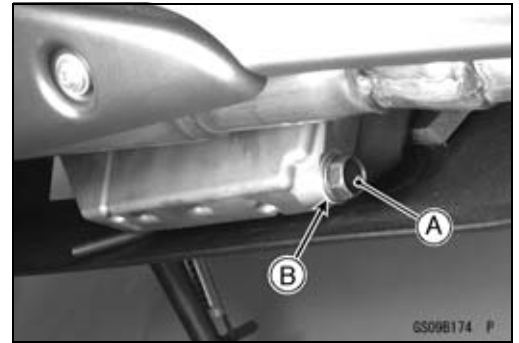


Periodic Maintenance Procedures

Engine Oil Change

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

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



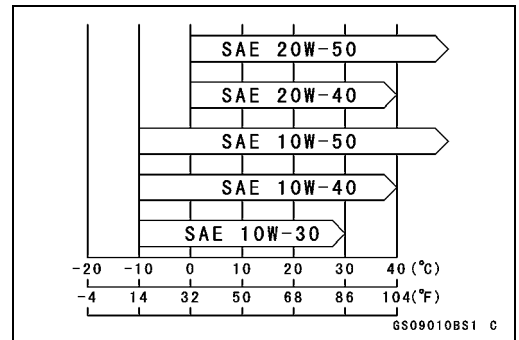
- Remove the oil filler plug [A].



- Pour in the specified type and amount of oil.

Recommended Engine Oil

- Type:** API SE, SF or SG
 API SH, SJ, SL or SM with JASO MA, MA1 or MA2
- Viscosity:** SAE 10W-40
- Capacity:** 2.8 L (3.0 US qt) (when filter is not removed)
 3.1 L (3.3 US qt) (when filter is removed)
 3.6 L (3.8 US qt) (when engine is completely dry)



NOTE

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

- Replace the O-ring of the oil filler plug with a new one.
- Apply engine oil to the new O-ring.
- Install the oil filler plug.

Torque - Oil Filler Plug: Hand-tighten

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

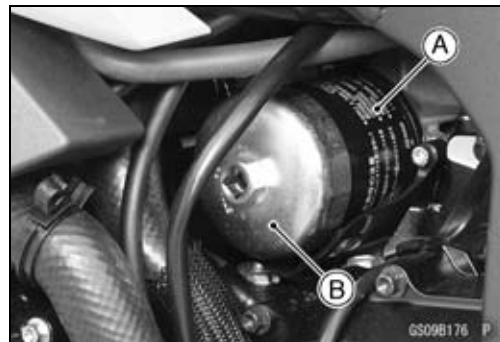
2-56 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Oil Filter Replacement

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

Special Tool - Oil Filter Wrench: 57001-1249



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

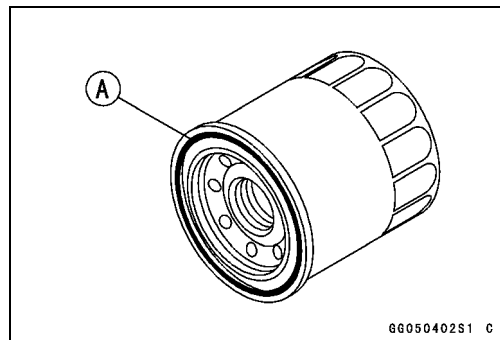
Special Tool - Oil Filter Wrench: 57001-1249

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

NOTE

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

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



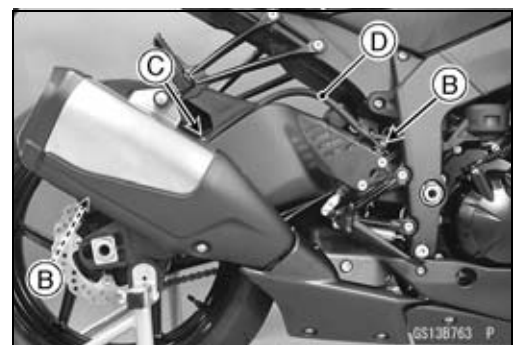
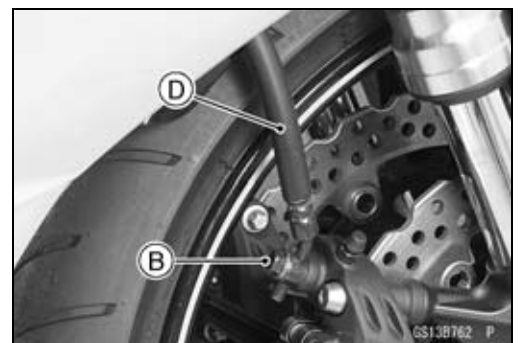
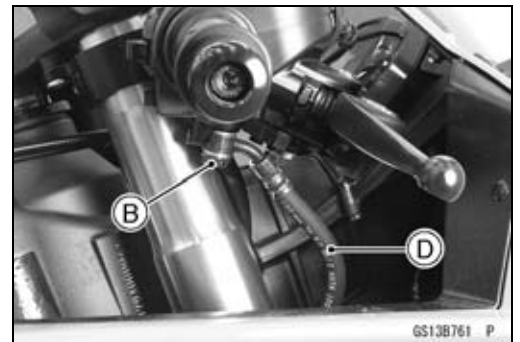
Periodic Maintenance Procedures

Brake Hose and Pipe Replacement

CAUTION

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

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Brake Hose Fitting Bolt [A]
 - Brake Hose Banjo Bolts [B]
 - Bolt [C]
- When removing the brake hoses [D], note the following.
 - Take care not to spill the brake fluid on the painted or plastic parts.
 - Temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
 - Immediately wash away any brake fluid that spills.
- When installing the brake hoses, note the following.
 - Avoid sharp bending, kinking, flattening or twisting, and run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
 - There are washers on each side of the brake hose fitting. Replace them with new ones.
 - Tighten:
 - Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
- Fill the brake line after installing the brake hose (see Brake Fluid Change).



Brake Fluid Change

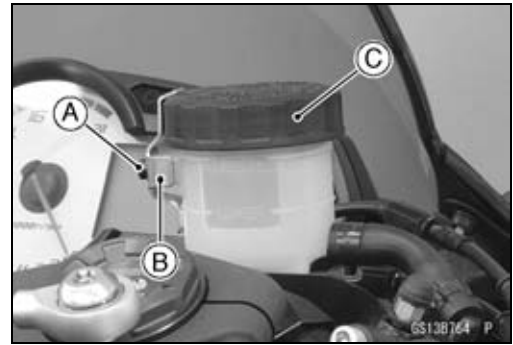
NOTE

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

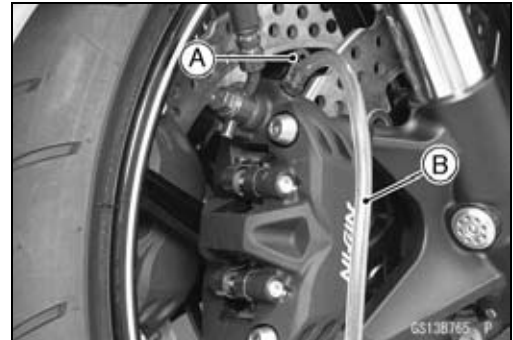
2-58 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Level the brake fluid reservoir.
- Remove:
 - Screw [A]
 - Stopper [B]
 - Front Brake Reservoir Cap [C]
 - Diaphragm Plate
 - Diaphragm



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



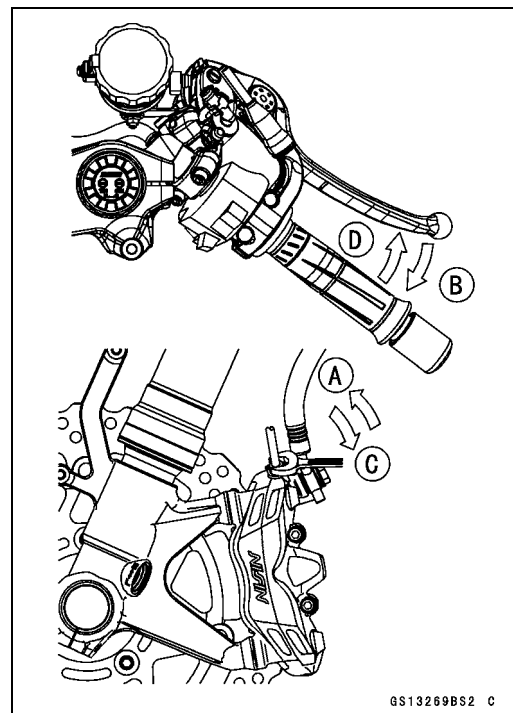
- Change the brake fluid.
- Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
 1. Open the bleed valve [A].
 2. Apply the brake and hold it [B].
 3. Close the bleed valve [C].
 4. Release the brake [D].

NOTE

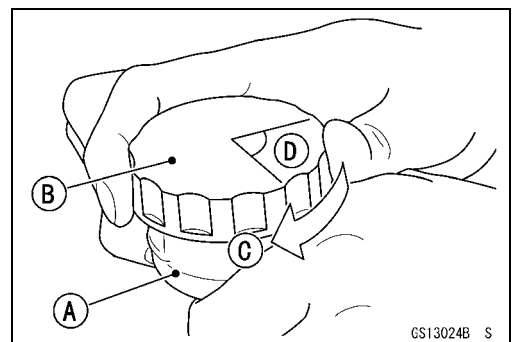
○ The fluid level must be checked often during the changing operation and replenished with fresh brake fluid. If the fluid in the reservoir runs out any time during the changing operation, the brakes will need to be bled since air will have entered the brake line.

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

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



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



Periodic Maintenance Procedures

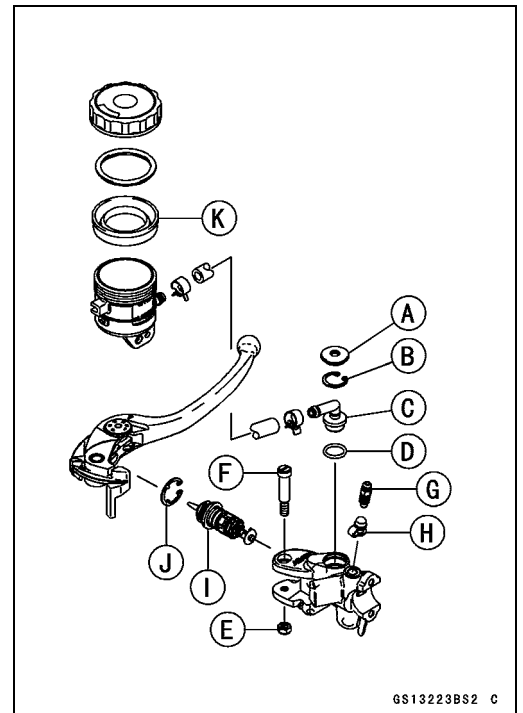
- Install the stopper on the reservoir.
- Tighten:
 - Torque - Front Brake Reservoir Cap Stopper Screw: 1.2 N-m (0.12 kgf-m, 11 in-lb)**
- Tighten the bleed valve, and install the rubber cap.
- Torque - Bleed Valves: 7.8 N-m (0.80 kgf-m, 69 in-lb)**
- After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.
- ★ If necessary, bleed the air from the lines.

**Master Cylinder Rubber Parts Replacement
Front Master Cylinder Disassembly**

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

Special Tool - Inside Circlip Pliers: 57001-143

- Unscrew the locknut [E] and pivot bolt [F], and remove the brake lever.
- Remove the bleed valve [G] and rubber cap [H].
- Remove the piston assembly [I] as follows.
 - Remove the dust cover and push rod.
 - Remove the circlip [J].
 - Pull out the piston (with primary cup and secondary cup).
 - Remove the return spring and spring guide.
- Replace:
 - Seal Cover [A]
 - Circlip [B]
 - O-ring [D]
 - Rubber Cap [H]
 - Piston Assembly [I]
 - Circlip [J]
 - Diaphragm [K]



GS13223BS2 C

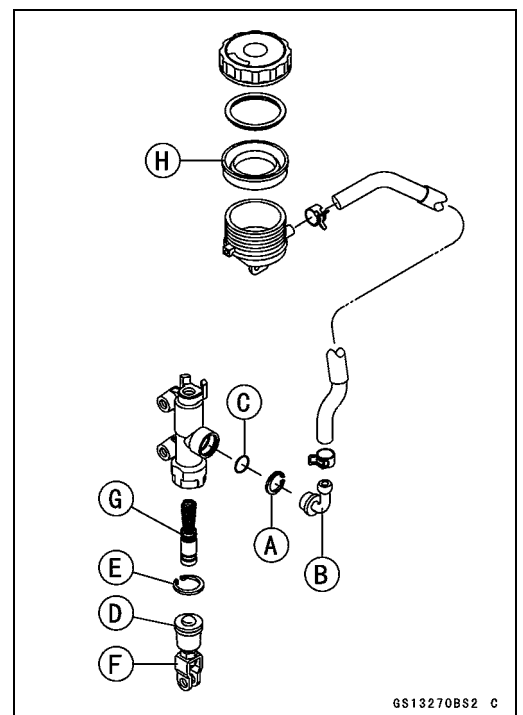
Rear Master Cylinder Disassembly

- Remove the rear master cylinder (see Rear Master Cylinder Removal in the Brakes chapter).
- Remove the circlip [A], connector [B] and O-ring [C].
- Special Tool - Inside Circlip Pliers: 57001-143**
- Slide the dust cover [D] out of place, and remove the circlip [E].
- Pull out the push rod assembly [F].
- Remove the piston assembly [G] and return spring.

CAUTION

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

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



GS13270BS2 C

2-60 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Master Cylinder Assembly

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

CAUTION

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

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

Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)

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

- For the front master cylinder, install the bleed valve and rubber cap.

Torque - Front Master Cylinder Bleed Valve: 5.4 N·m (0.55 kgf·m, 48 in·lb)

Caliper Rubber Parts Replacement

Front Caliper Disassembly

- Loosen the front caliper pad pins [A] and banjo bolt [B] and tighten them loosely.
- Remove:
 - Front Caliper [C] (see Front Caliper Removal in the Brakes chapter)
 - Brake Pads (see Front Brake Pad Removal in the Brakes chapter)
 - Front Caliper Assembly Bolts
 - O-ring

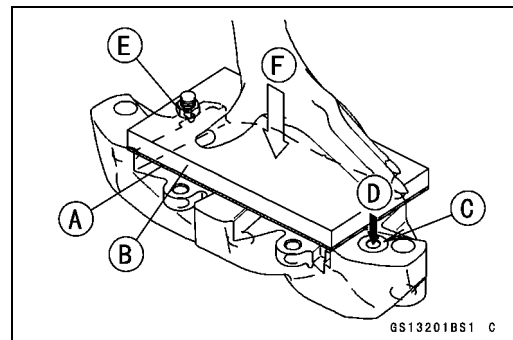
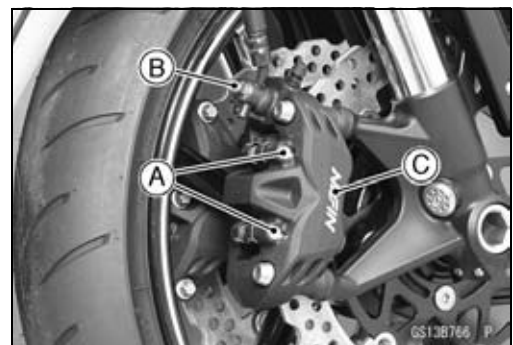
- Using compressed air, remove the pistons. One way to remove the pistons is as follows.

- Install a rubber gasket [A] and a wooden board [B] more than 10 mm (0.4 in.) thick on the caliper half, and fasten them together with a suitable bolt and nut as shown. Leave one of the oil passages [C] open.

- Lightly apply compressed air [D] to the oil passage until the pistons hit the rubber gasket. Block the hose joint opening during this operation if the caliper half has the opening.

Bolt and Nut [E]

Push down [F].

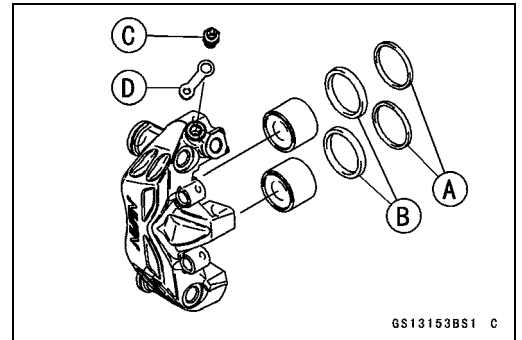


Periodic Maintenance Procedures

⚠ WARNING

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

- Pull out the pistons by hand.
- Remove the dust seals [A] and fluid seals [B].
- Remove the bleed valve [C] and rubber cap [D].
- Repeat the previous step to remove the pistons from the other side of the caliper body.



NOTE

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

Front Caliper Assembly

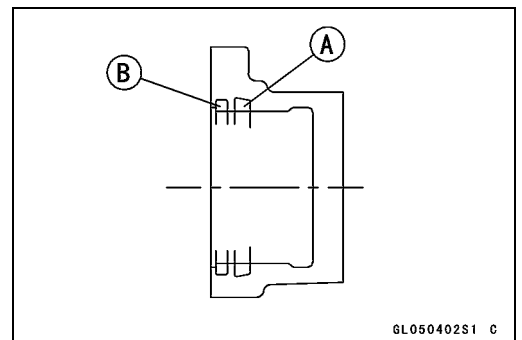
- Clean the caliper parts except for the pads.

CAUTION

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

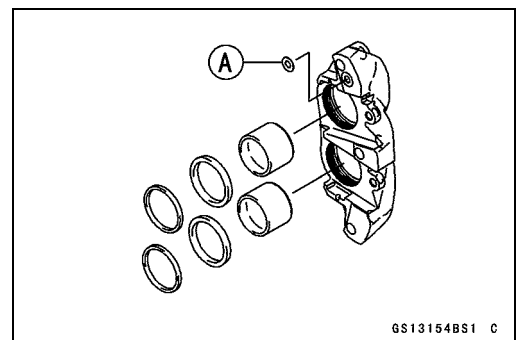
- Install the bleed valve and rubber cap.
- Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

- Replace the fluid seals [A] with new ones.
- Apply silicone grease to the fluid seals, and install them into the cylinders by hand.
- Replace the dust seals [B] with new ones if they are damaged.
- Apply silicone grease to the dust seals, and install them into the cylinders by hand.



- Replace the O-ring [A].
- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
- Be sure to install the O-ring.
- Apply a non-permanent locking agent to the threads of the front caliper assembly bolts, and tighten them.

Torque - Front Caliper Assembly Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)



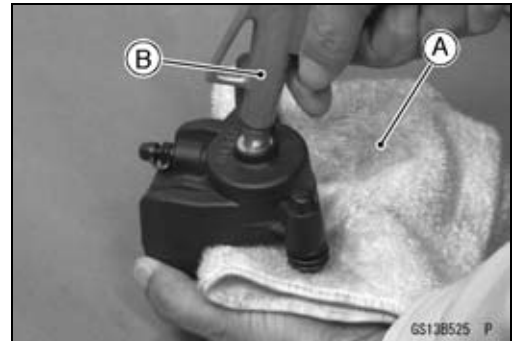
2-62 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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

Rear Caliper Disassembly

- Remove the rear caliper (see Rear Caliper Removal in the Brakes chapter).
- Remove the pads and pad spring (see Rear Brake Pad Removal in the Brakes chapter).
- 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, the piston may crush your hand or fingers.

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

NOTE

- If compressed air is not available, do as follows with the brake hose connected to the caliper.
- Prepare a container for brake fluid, and perform the work above it.
- Remove the pads and pad spring (see Rear Brake Pad Removal in the Brakes chapter).
- Pump the brake pedal to remove the caliper piston.

Rear Caliper Assembly

- Clean the caliper parts except for the pads.

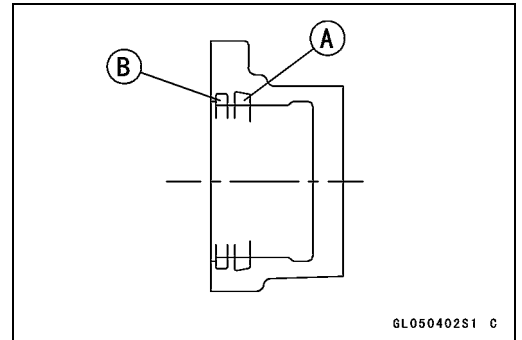
CAUTION

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

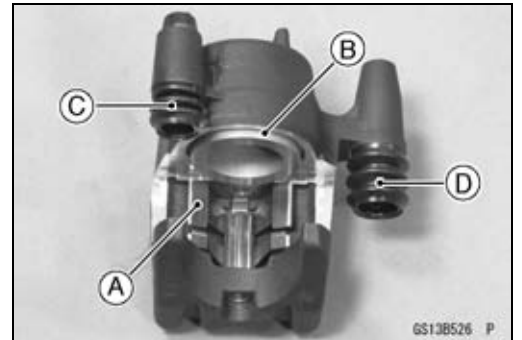
- Install the bleed valve and rubber cap.
Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)

Periodic Maintenance Procedures

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



- Install the pad spring [A] in the caliper as shown in the figure.
- Apply brake fluid to the outside of the piston [B], and push it into the cylinder by hand.
- Replace the shaft rubber friction boot [C] and dust boot [D].



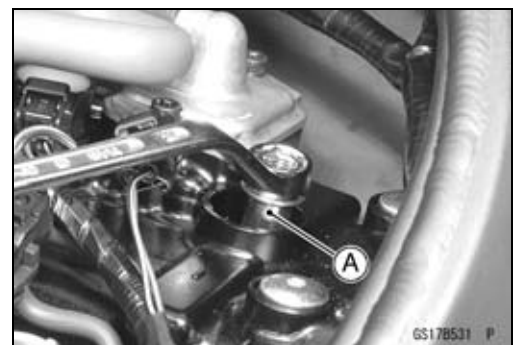
- Install the pad spring [A] on the caliper holder as shown in the figure.
- Apply a silicone grease to the caliper holder shafts [B].
- Install the pads (see Rear Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.



Spark Plug Replacement

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

Standard Spark Plug
Type: NGK CR9E



- Insert the spark plug vertically into the spark plug hole with the spark plug installed in the plug wrench [A], and finger-tighten it first.

CAUTION

If tightening the spark plug with the wrench inclined, the insulator of the spark plug may break.

- Tighten:
 - Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 115 in·lb)**
- Install the stick coils (see Stick Coil Installation in the Electrical System chapter).
- After installation, be sure the stick coils are installed securely by pulling up them lightly.



Fuel System (DFI)

Table of Contents

Exploded View.....	3-4	Water Temperature Sensor Output Voltage Inspection.....	3-58
DFI System.....	3-10	Water Temperature Sensor Resistance Inspection.....	3-59
DFI Parts Location.....	3-16	Atmospheric Pressure Sensor (Service Code 16).....	3-60
Specifications.....	3-19	Atmospheric Pressure Sensor Removal.....	3-60
Special Tools and Sealant.....	3-21	Atmospheric Pressure Sensor Installation.....	3-60
DFI Servicing Precautions.....	3-23	Atmospheric Pressure Sensor Input Voltage Inspection.....	3-60
DFI Servicing Precautions.....	3-23	Atmospheric Pressure Sensor Output Voltage Inspection.....	3-61
Troubleshooting the DFI System.....	3-25	Crankshaft Sensor (Service Code 21).....	3-65
Outline.....	3-25	Crankshaft Sensor Removal/Installation.....	3-65
Inquiries to Rider.....	3-29	Crankshaft Sensor Resistance Inspection.....	3-65
DFI System Troubleshooting Guide ..	3-32	Crankshaft Sensor Peak Voltage Inspection.....	3-65
Self-Diagnosis.....	3-37	Speed Sensor (Service Code 24).....	3-67
Self-diagnosis Outline.....	3-37	Speed Sensor Removal/Installa- tion.....	3-67
Self-diagnosis Procedures.....	3-38	Speed Sensor Inspection.....	3-67
Service Code Reading.....	3-41	Speed Sensor Input Voltage Inspection.....	3-67
Service Code Erasing.....	3-41	Speed Sensor Output Voltage Inspection.....	3-68
Backups.....	3-43	Gear Position Switch (Service Code 25).....	3-70
Main Throttle Sensor (Service Code 11).....	3-46	Gear Position Switch Removal/Installation.....	3-70
Main Throttle Sensor Removal/Adjustment.....	3-46	Gear Position Switch Resistance Inspection.....	3-70
Main Throttle Sensor Input Voltage Inspection.....	3-46	Gear Position Switch Output Voltage Inspection.....	3-70
Main Throttle Sensor Output Voltage Inspection.....	3-47	Vehicle-down Sensor (Service Code 31).....	3-72
Main Throttle Sensor Resistance Inspection.....	3-48	Vehicle-down Sensor Removal....	3-72
Inlet Air Pressure Sensor (Service Code 12).....	3-49	Vehicle-down Sensor Installation..	3-72
Inlet Air Pressure Sensor Removal.....	3-49	Vehicle-down Sensor Input Voltage Inspection.....	3-73
Inlet Air Pressure Sensor Installation.....	3-49	Vehicle-down Sensor Output Voltage Inspection.....	3-74
Inlet Air Pressure Sensor Input Voltage Inspection.....	3-49	Subthrottle Sensor (Service Code 32).....	3-76
Inlet Air Pressure Sensor Output Voltage Inspection.....	3-50	Subthrottle Sensor Removal/Adjustment.....	3-76
Inlet Air Temperature Sensor (Service Code 13).....	3-55		
Inlet Air Temperature Sensor Removal/Installation.....	3-55		
Inlet Air Temperature Sensor Output Voltage Inspection.....	3-55		
Inlet Air Temperature Sensor Resistance Inspection.....	3-56		
Water Temperature Sensor (Service Code 14).....	3-58		
Water Temperature Sensor Removal/Installation.....	3-58		

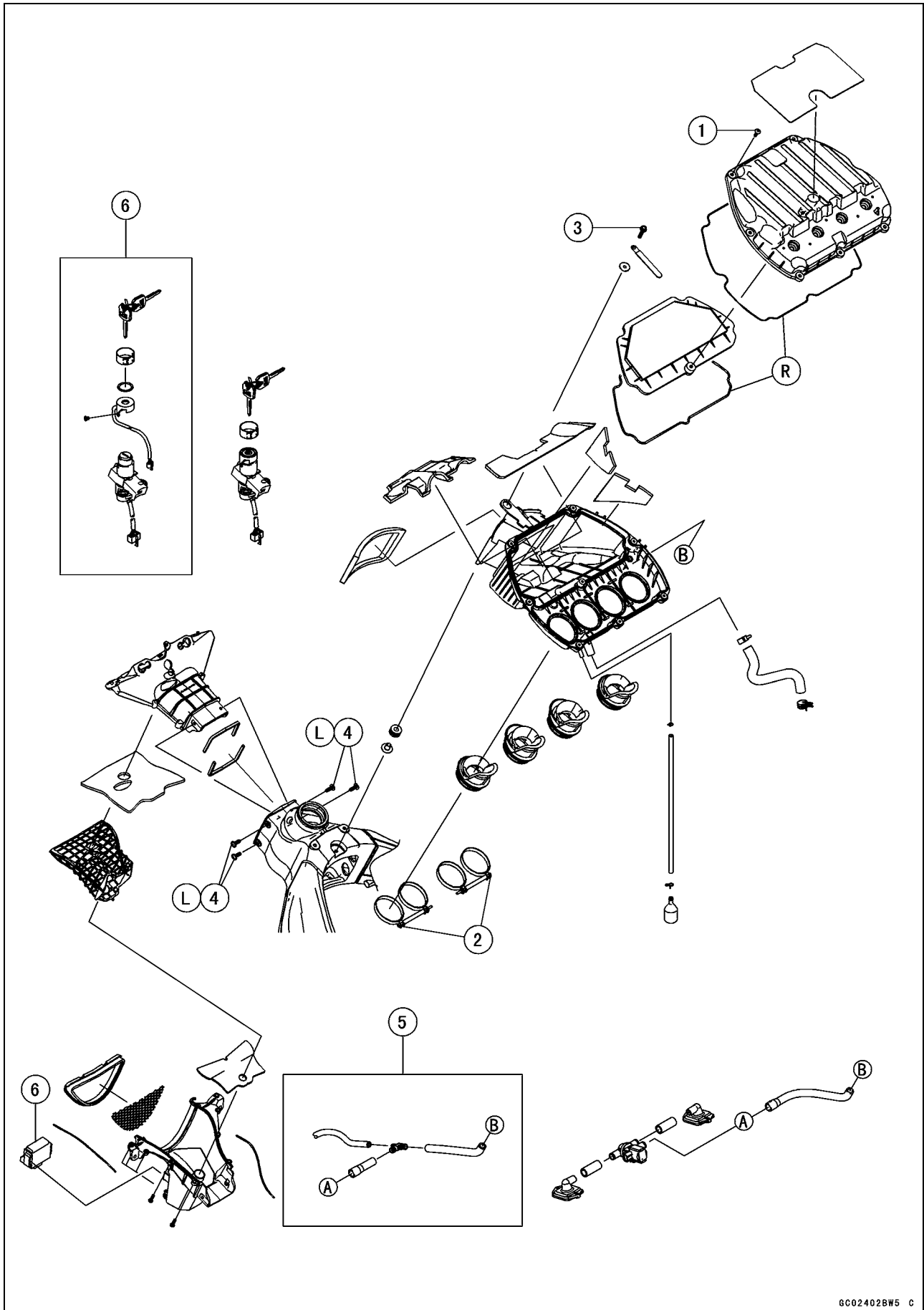
3-2 FUEL SYSTEM (DFI)

Subthrottle Sensor Input Voltage Inspection.....	3-76	Exhaust Butterfly Valve Actuator (Service Code 63).....	3-96
Subthrottle Sensor Output Voltage Inspection.....	3-77	Exhaust Butterfly Valve Actuator Removal.....	3-96
Subthrottle Sensor Resistance Inspection.....	3-78	Exhaust Butterfly Valve Actuator Installation.....	3-96
Oxygen Sensor - not activated (Service Code 33 (Equipped Models)).....	3-79	Exhaust Butterfly Valve Actuator Inspection.....	3-98
Oxygen Sensor Removal/Installation	3-79	Exhaust Butterfly Valve Actuator Resistance Inspection	3-98
Oxygen Sensor Inspection.....	3-79	Air Switching Valve (Service Code 64).....	3-100
Exhaust Butterfly Valve Actuator Sensor (Service Code 34)	3-82	Air Switching Valve Removal/Installation.....	3-100
Exhaust Butterfly Valve Actuator Sensor Removal/Installation	3-82	Air Switching Valve Inspection	3-100
Exhaust Butterfly Valve Actuator Sensor Input Voltage Inspection	3-82	Oxygen Sensor Heater (Service Code 67 (Equipped Models)).....	3-101
Exhaust Butterfly Valve Actuator Sensor Output Voltage Inspection.....	3-83	Oxygen Sensor Heater Removal/Installation.....	3-101
Exhaust Butterfly Valve Actuator Sensor Resistance Inspection...	3-84	Oxygen Sensor Heater Resistance Inspection	3-101
Immobilizer Amplifier (Service Code 35 (Equipped Models))	3-85	Oxygen Sensor Heater Power Source Voltage Inspection	3-102
Antenna Resistance Inspection ...	3-85	Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))	3-104
Amplifier Input Voltage Inspection	3-85	Oxygen Sensor Removal/Installation	3-104
Blank Key Detection (Service Code 36 (Equipped Models))	3-86	Oxygen Sensor Inspection.....	3-104
User Key Inspection.....	3-86	Warning Indicator Light (LED)	3-107
ECU Communication Error (Service Code 39).....	3-88	Light (LED) Inspection	3-107
ECU Communication Line Inspection.....	3-88	ECU.....	3-108
Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54).....	3-89	ECU Identification	3-108
Stick Coil Removal/Installation.....	3-89	ECU Removal	3-108
Stick Coil Primary Winding Resistance Inspection	3-89	ECU Installation	3-109
Stick Coil Input Voltage Inspection.....	3-89	ECU Power Supply Inspection....	3-109
Radiator Fan Relay (Service Code 56).....	3-91	DFI Power Source	3-112
Radiator Fan Relay Removal/Installation.....	3-91	ECU Fuse Removal	3-112
Radiator Fan Relay Inspection.....	3-91	ECU Fuse Installation	3-112
Subthrottle Valve Actuator (Service Code 62).....	3-93	ECU Fuse Inspection	3-112
Subthrottle Valve Actuator Removal.....	3-93	ECU Main Relay Removal/Installation.....	3-112
Subthrottle Valve Actuator Inspection.....	3-93	ECU Main Relay Inspection	3-112
Subthrottle Valve Actuator Resistance Inspection	3-93	Fuel Line.....	3-113
Subthrottle Valve Actuator Input Voltage Inspection.....	3-94	Fuel Pressure Inspection	3-113
		Fuel Flow Rate Inspection	3-114
		Fuel Pump	3-116
		Fuel Pump Removal	3-116
		Fuel Pump Installation	3-117
		Fuel Pump Operation Inspection .	3-117
		Fuel Pump Operating Voltage Inspection.....	3-118
		Pressure Regulator Removal.....	3-119
		Fuel Filter Cleaning.....	3-119
		Fuel Injectors	3-120
		Primary Fuel Injector Removal/Installation.....	3-120

<p>Secondary Fuel Injector Removal/Installation..... 3-120</p> <p>Fuel Injector Audible Inspection... 3-120</p> <p>Fuel Injector Resistance Inspection..... 3-121</p> <p>Fuel Injector Power Source Voltage Inspection..... 3-122</p> <p>Fuel Injector Output Voltage Inspection..... 3-124</p> <p>Fuel Injector Fuel Line Inspection 3-126</p> <p>Throttle Grip and Cables 3-128</p> <p>Free Play Inspection 3-128</p> <p>Free Play Adjustment..... 3-128</p> <p>Cable Installation 3-128</p> <p>Cable Lubrication 3-128</p> <p>Throttle Body Assy 3-129</p> <p>Idle Speed Inspection/Adjustment 3-129</p> <p>Synchronization Inspection/Ad- justment..... 3-129</p> <p>Throttle Body Assy Removal..... 3-129</p> <p>Throttle Body Assy Installation.... 3-130</p> <p>Throttle Body Assy Disassembly . 3-131</p> <p>Throttle Body Assy Assembly 3-132</p> <p>Nozzle Assy..... 3-133</p> <p>Nozzle Assy Removal..... 3-133</p> <p>Nozzle Assy Installation..... 3-133</p>	<p>Nozzle Assy Disassembly..... 3-134</p> <p>Nozzle Assy Assembly..... 3-134</p> <p>Air Cleaner..... 3-136</p> <p>Air Cleaner Element Removal/Installation..... 3-136</p> <p>Air Cleaner Element Inspection ... 3-136</p> <p>Air Cleaner Oil Draining 3-136</p> <p>Air Cleaner Housing Removal..... 3-136</p> <p>Air Cleaner Housing Installation... 3-138</p> <p>Air Cleaner Housing Disassembly 3-138</p> <p>Air Cleaner Housing Assembly 3-139</p> <p>Air Line 3-140</p> <p>Air Inlet Duct Removal 3-140</p> <p>Air Inlet Duct Installation 3-140</p> <p>Fuel Tank..... 3-141</p> <p>Fuel Tank Removal 3-141</p> <p>Fuel Tank Installation 3-143</p> <p>Fuel Tank Inspection..... 3-145</p> <p>Fuel Tank Cleaning 3-145</p> <p>Evaporative Emission Control System (CAL, SEA and TH Models)..... 3-146</p> <p>Parts Removal/Installation 3-146</p> <p>Hose Inspection 3-146</p> <p>Separator Inspection..... 3-146</p> <p>Separator Operation Test..... 3-147</p> <p>Canister Inspection 3-147</p>
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3-4 FUEL SYSTEM (DFI)

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Air Cleaner Housing Assembly Screws	1.2	0.12	11 in-lb	
2	Air Cleaner Housing Clamp Bolts	2.0	0.20	18 in-lb	
3	Air Cleaner Housing Mounting Bolt	6.9	0.70	61 in-lb	
4	Air Inlet Duct Mounting Bolts	9.8	1.0	87 in-lb	L

5. CAL, SEA and TH Models

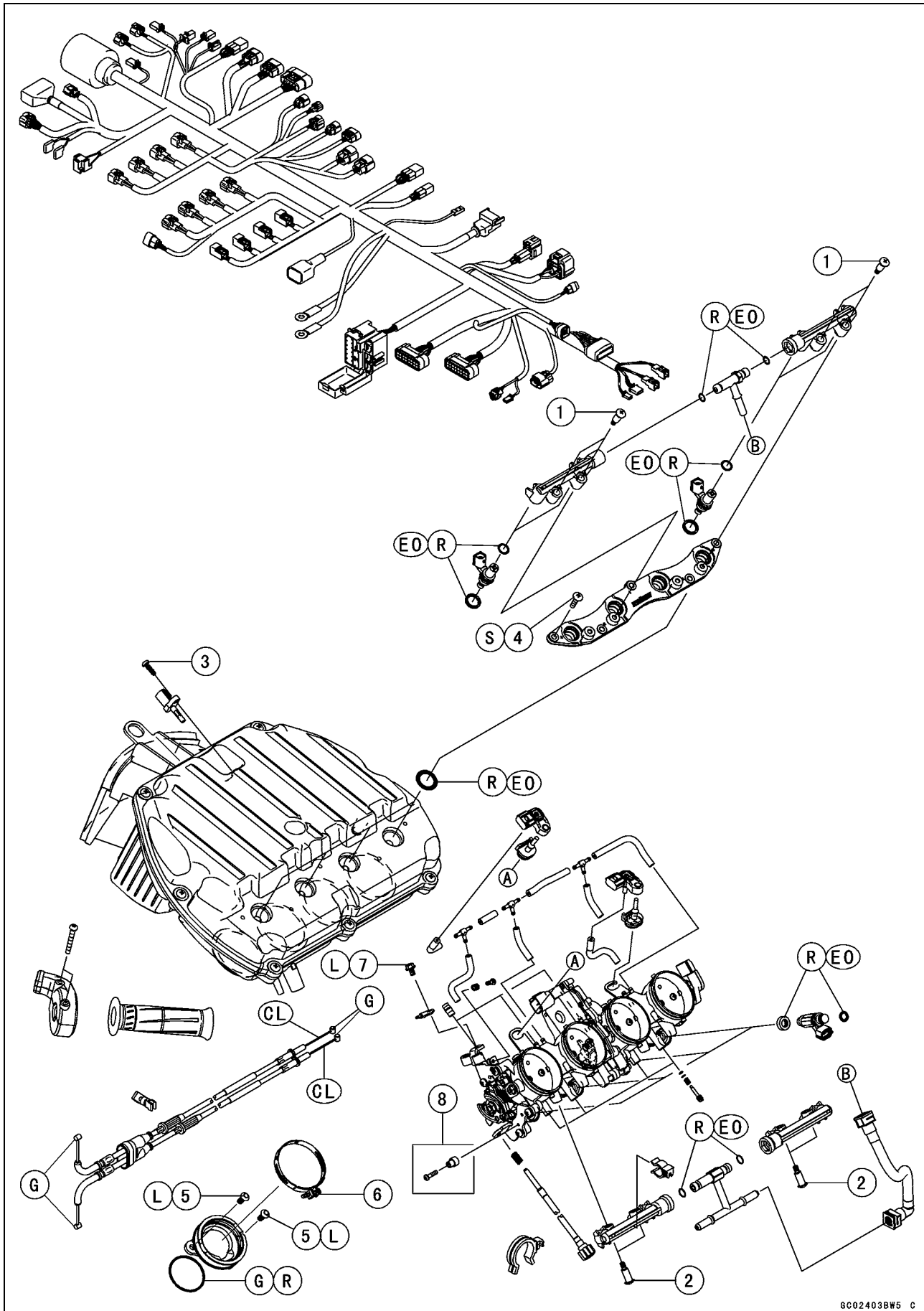
6. Immobilizer System Equipped Models

L: Apply a non-permanent locking agent.

R: Replacement Parts

3-6 FUEL SYSTEM (DFI)

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Delivery Pipe Assy Mounting Screws (Nozzle Assy)	3.43	0.35	30 in-lb	
2	Delivery Pipe Assy Mounting Screws (Throttle Body Assy)	3.43	0.35	30 in-lb	
3	Inlet Air Temperature Sensor Screw	0.80	0.081	7.1 in-lb	
4	Nozzle Assy Mounting Screws	1.2	0.12	11 in-lb	S
5	Throttle Body Assy Holder Bolts	12	1.2	106 in-lb	L
6	Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in-lb	
7	Throttle Cable Holder Plate Bolt	3.9	0.40	35 in-lb	L

8. WVTA (78.2 H) Model

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

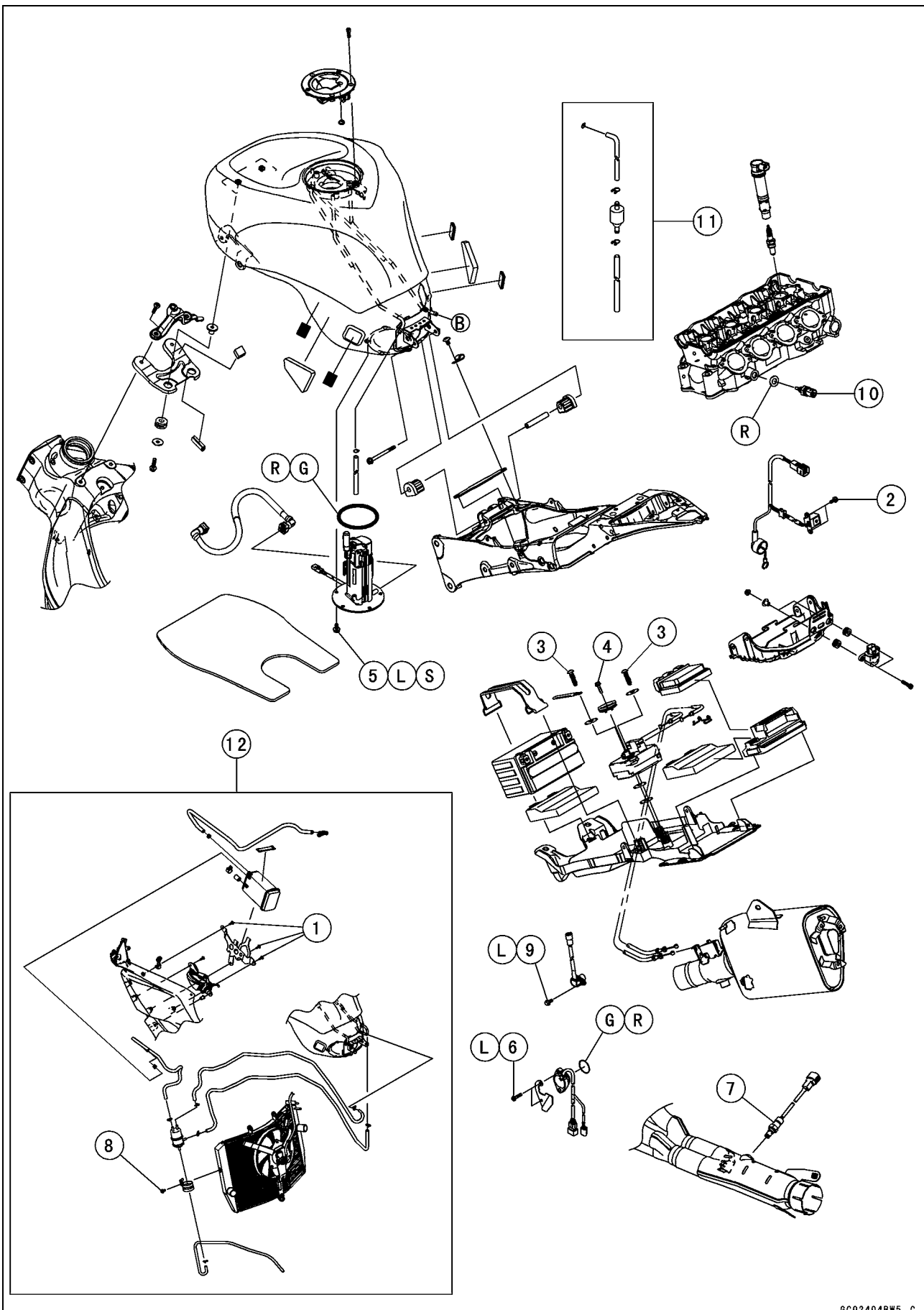
L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

3-8 FUEL SYSTEM (DFI)

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Canister Bracket Screws	1.2	0.12	11 in·lb	
2	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
3	Exhaust Butterfly Valve Actuator Mounting Screws	4.3	0.44	38 in·lb	
4	Exhaust Butterfly Valve Actuator Pulley Bolt	4.9	0.50	43 in·lb	
5	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
6	Gear Position Switch Screws	2.9	0.30	26 in·lb	L
7	Oxygen Sensor (Equipped Models)	25	2.5	18	
8	Separator Bracket Mounting Bolt	6.9	0.70	61 in·lb	
9	Speed Sensor Bolt	6.9	0.70	61 in·lb	L
10	Water Temperature Sensor	25	2.5	18	

11. Other than CAL, SEA and TH Models

12. CAL, SEA and TH Models

G: Apply grease.

L: Apply a non-permanent locking agent.

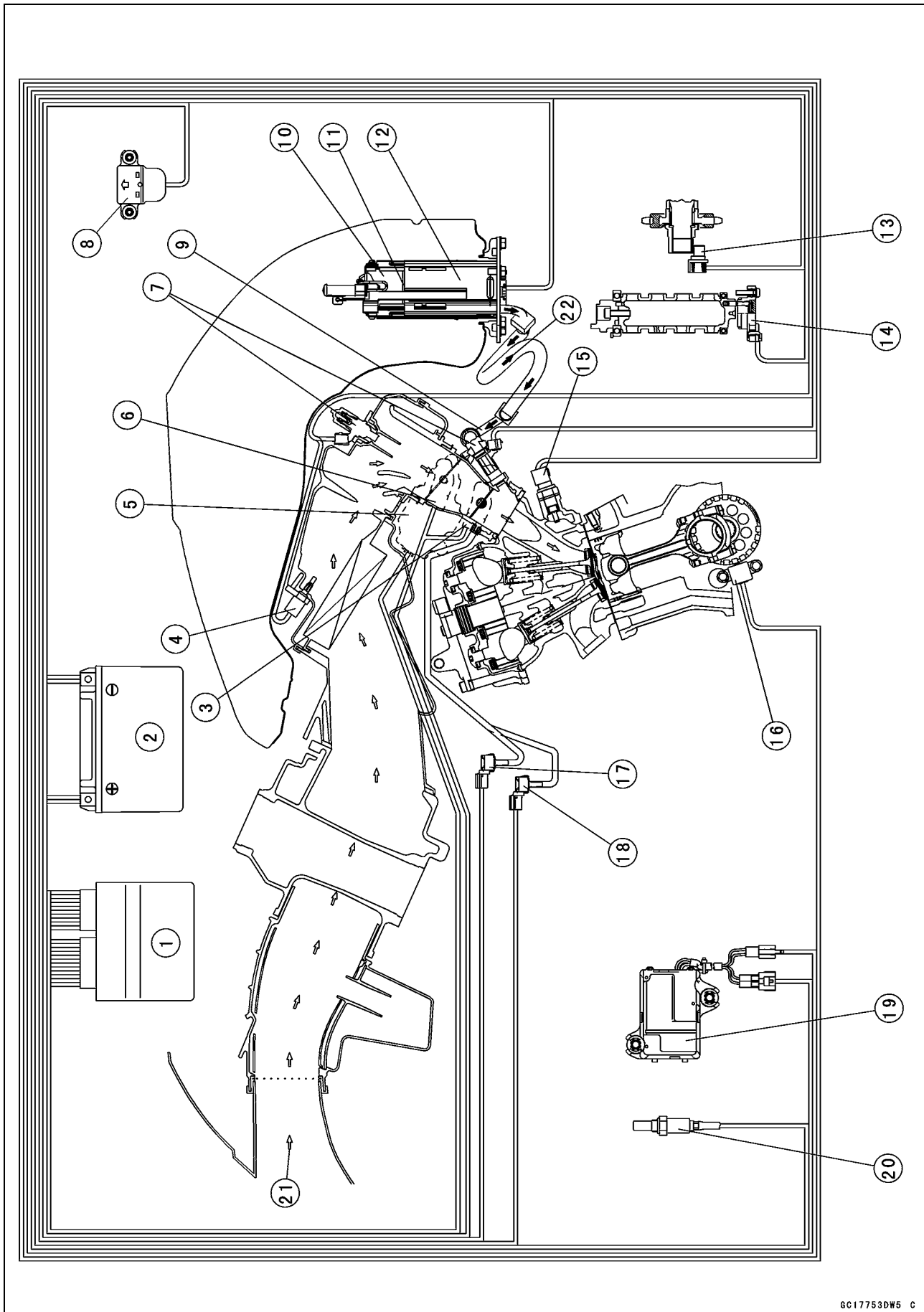
R: Replacement Parts

S: Follow the specified tightening sequence.

3-10 FUEL SYSTEM (DFI)

DFI System

DFI System



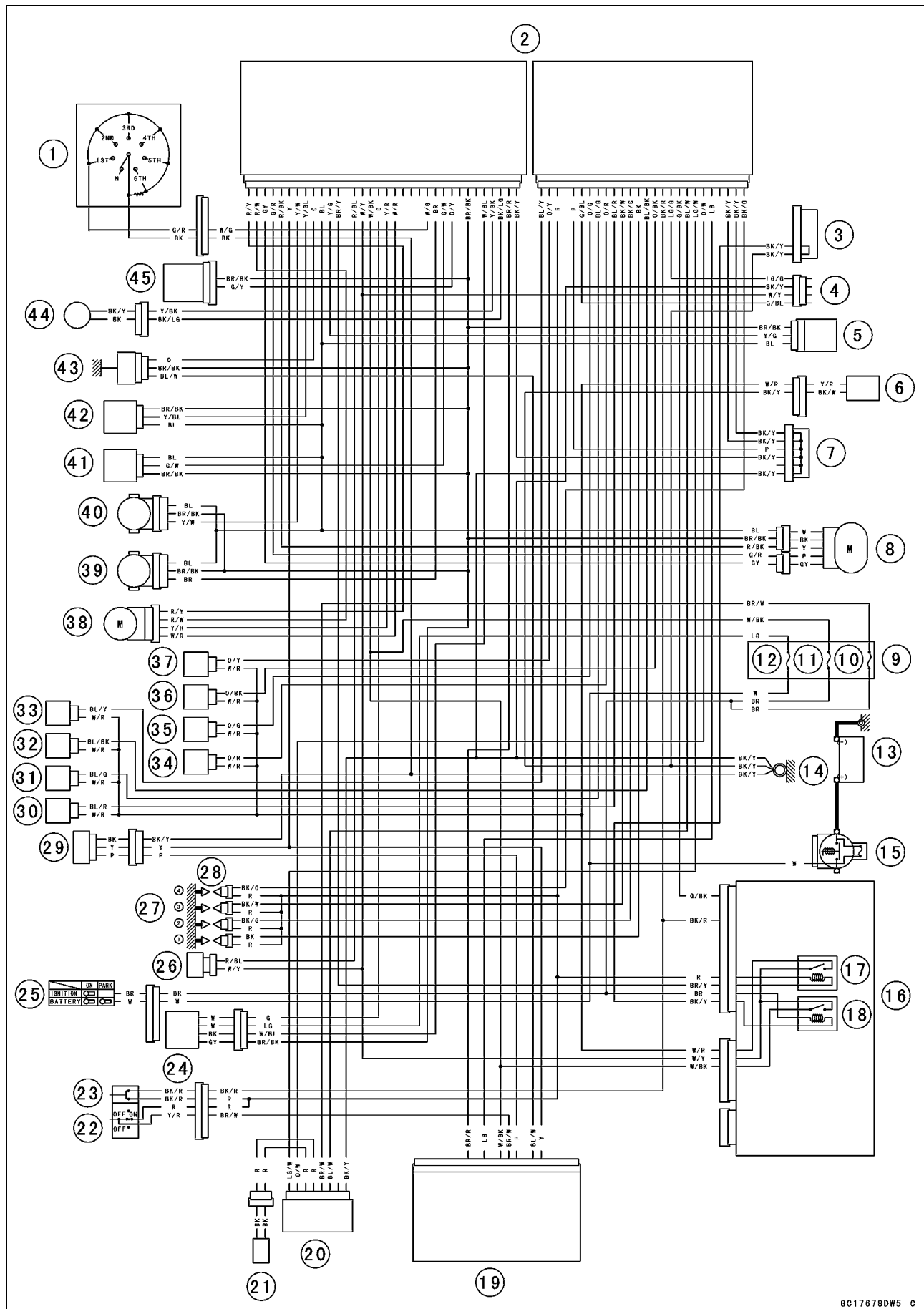
DFI System

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

3-12 FUEL SYSTEM (DFI)

DFI System

DFI System Wiring Diagram



DFI System

Part Names

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

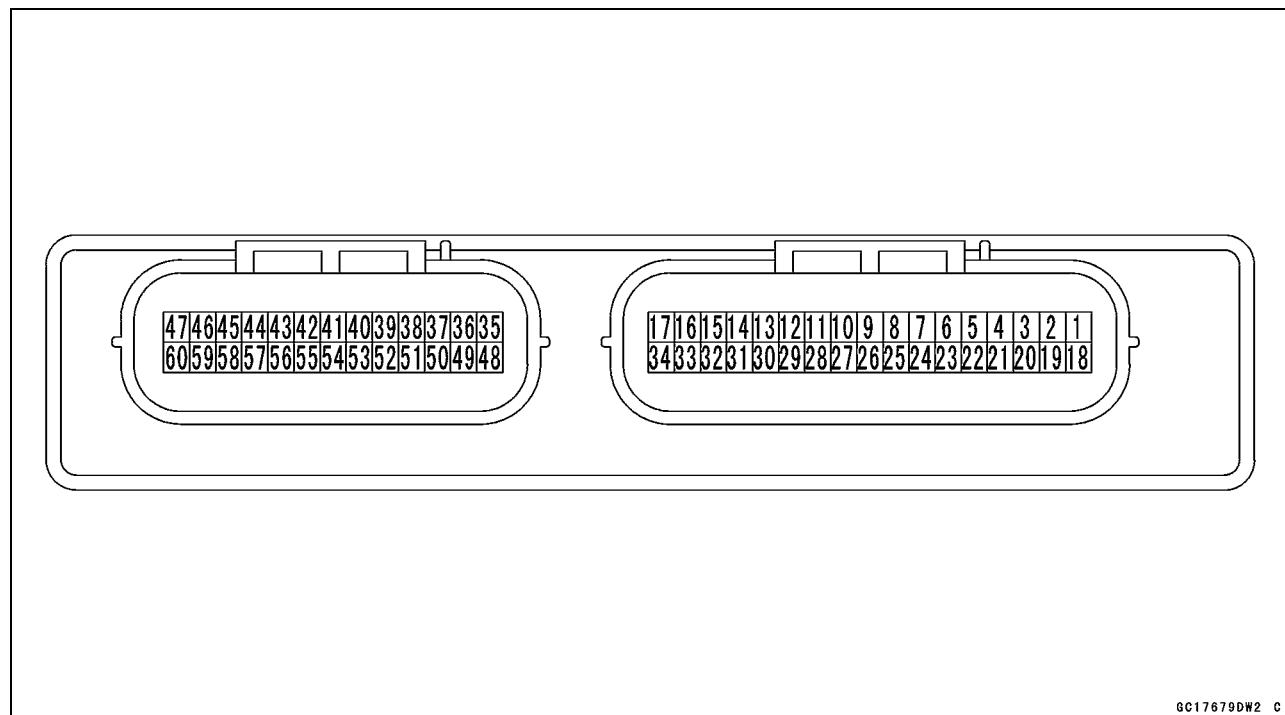
○Color Codes:

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

3-14 FUEL SYSTEM (DFI)

DFI System

Terminal Numbers of ECU Connectors



GC17679DW2 C

Terminal Names

1. Subthrottle Valve Actuator: R/Y
2. Subthrottle Valve Actuator: R/W
3. Exhaust Battery Valve Actuator (-): GY
4. Exhaust Butterfly Valve Actuator (+): G/R
5. Exhaust Butterfly Valve Actuator Sensor: R/BK
6. Speed Sensor: Y
7. Main Throttle Sensor: Y/W
8. Inlet Air Pressure Sensor: Y/BL
9. Water Temperature Sensor: O
10. Power Supply to Sensors: BL
11. Vehicle-down Sensor: Y/G
12. Fuel Pump Relay: BR/Y
13. Radiator Fan Relay: BK/BL
14. Air Switching Valve: R/BL
15. Power Supply to ECU (from Battery): W/Y
16. Power Supply to ECU (from Battery): W/BK
17. Oxygen Sensor Heater (Equipped Models): G
18. Subthrottle Valve Actuator: Y/R
19. Subthrottle Valve Actuator: W/R
20. Unused
21. Unused
22. Unused
23. Gear Position Switch: W/G
24. Subthrottle Sensor: BR
25. Atmospheric Pressure Sensor: G/W
26. Inlet Air Temperature Sensor: G/Y
27. Unused
28. Ground for Sensors: BR/BK
29. Unused
30. Oxygen Sensor (Equipped Models): W/BL
31. Crankshaft Sensor (+): Y/BK
32. Crankshaft Sensor (-): BK/LG
33. ECU Communication Line (to Meter Unit): BR/R
34. Ground for ECU: BK/Y

DFI System

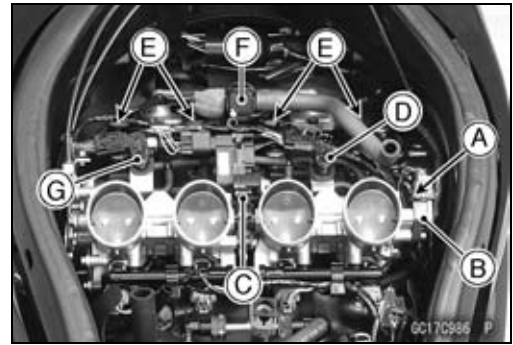
- 35. Primary Fuel Injector #4: BL/Y
- 36. Secondary Fuel Injector #4: O/Y
- 37. Engine Stop Switch: R
- 38. Starter Lockout Switch: R/G
- 39. Ground: P
- 40. Unused
- 41. Secondary Fuel Injector #2: O/G
- 42. Primary Fuel Injector #2: BL/G
- 43. Secondary Fuel Injector #1: O/R
- 44. Primary Fuel Injector #1: BL/R
- 45. Stick Coil #3: BK/W
- 46. Stick Coil #2: BK/G
- 47. Stick Coil #1: BK
- 48. Primary Fuel Injector #3: BL/BK
- 49. Secondary Fuel Injector #3: O/BK
- 50. Starter Button: BK/R
- 51. External Communication Line (Immobilizer System (Equipped Models)/*KDS): LG/G
- 52. Sidestand Switch: G/BK
- 53. Immobilizer Amplifier (Equipped Models): BL/W
- 54. Immobilizer Amplifier (Equipped Models): LG/W
- 55. Immobilizer Amplifier (Equipped Models): O/W
- 56. Meter Unit (Tachometer): LB
- 57. Unused
- 58. Ground for Fuel System: BK/Y
- 59. Ground For Ignition System: BK/Y
- 60. Stick Coil #4: BK/O

*: KDS (Kawasaki Diagnostic System)

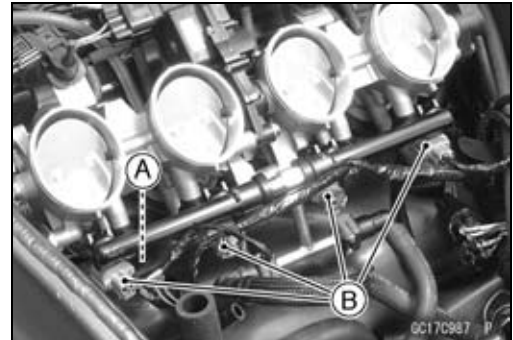
3-16 FUEL SYSTEM (DFI)

DFI Parts Location

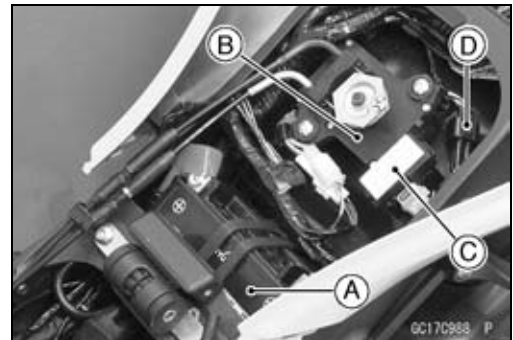
Main Throttle Sensor [A]
Subthrottle Sensor [B]
Subthrottle Valve Actuator [C]
Inlet Air Pressure Sensor [D]
Stick Coils #1, #2, #3, #4 [E]
Air Switching Valve [F]
Atmospheric Pressure Sensor [G]



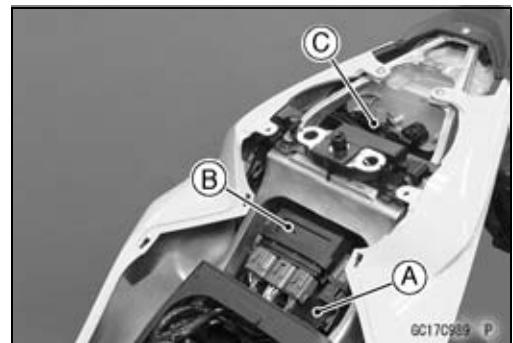
Water Temperature Sensor [A]
Primary Fuel Injectors #1, #2, #3, #4 [B]



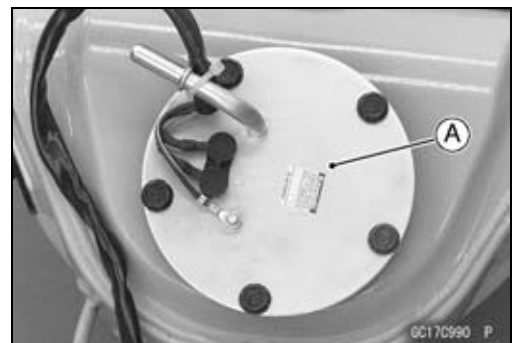
Battery 12 V 8 Ah [A]
Exhaust Butterfly Valve Actuator [B]
Fuse Box [C] (Ignition Fuse 15 A, ECU Fuse 10 A, Oxygen Sensor Heater Fuse 10 A (Equipped Models))
Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector [D]



ECU [A]
Relay Box [B] (Fuel Pump Relay, Radiator Fan Relay)
Vehicle-down Sensor [C]

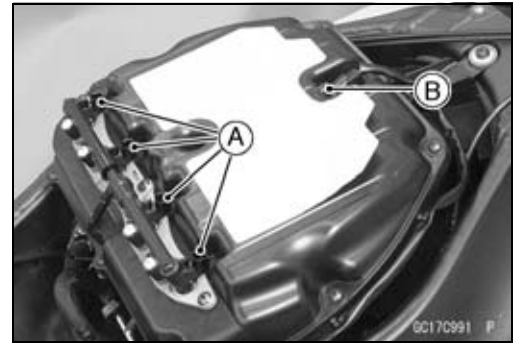


Fuel Pump [A]

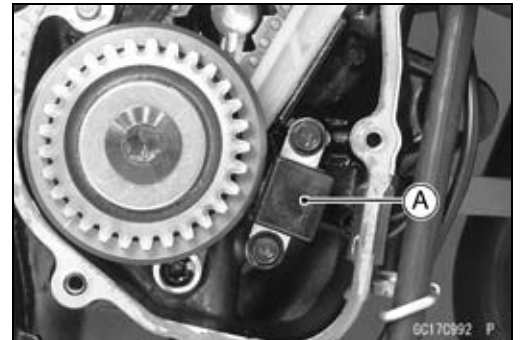


DFI Parts Location

Secondary Fuel Injectors #1, #2, #3, #4 [A]
Inlet Air Temperature Sensor [B]



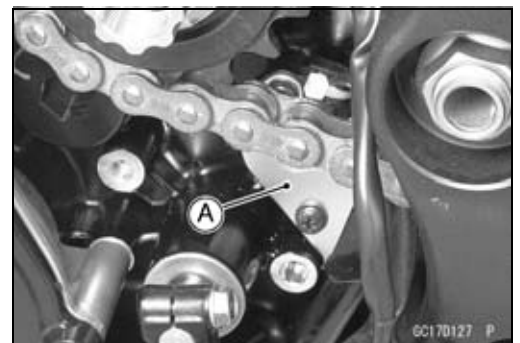
Crankshaft Sensor [A]



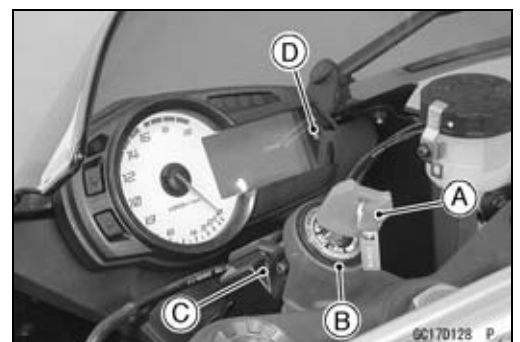
Speed Sensor [A]



Gear Position Switch [A]



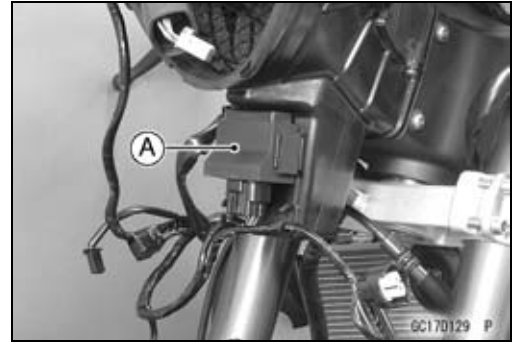
Ignition Key [A] (Transponder, Immobilizer System Equipped Models)
Immobilizer Antenna [B] (Equipped Models)
Ignition Switch [C]
Warning Indicator Light (LED) [D]



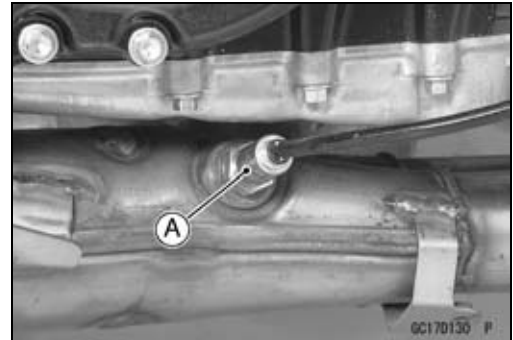
3-18 FUEL SYSTEM (DFI)

DFI Parts Location

Immobilizer Amplifier [A] (Equipped Models)



Oxygen Sensor [A] (Equipped Models)



Specifications

Item	Standard
Digital Fuel Injection System	
Idle Speed	1 300 ±50 r/min (rpm)
Throttle Body Assy:	
Type	Four oval type
Bore	φ38 mm (1.5 in.)
Throttle Body Vacuum	30.6 ±1.3 kPa (230 ±10 mmHg)
Bypass Screws (Turn Out)	0 ~ 2 1/2 (for reference)
ECU:	
Make	DENSO
Type	Digital memory type, with built in IC igniter, sealed with resin
Fuel Pressure (High Pressure Line)	294 kPa (3.0 kgf/cm ² , 43 psi) with engine idling
Fuel Pump:	
Type	Wesco pump
Discharge	50 mL (1.7 US oz.) or more for 3 seconds
Primary Fuel Injectors:	
Type	INP-288
Nozzle Type	Fine atomizing type with 8 holes
Resistance	About 11.7 ~ 12.3 Ω at 20°C (68°F)
Secondary Fuel Injectors:	
Type	KN-7
Nozzle Type	Fine atomizing type with 8 holes
Resistance	About 10.5 Ω at 20°C (68°F)
Main Throttle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 1.02 ~ 1.06 V at idle throttle opening DC 4.30 ~ 4.34 V at full throttle opening (for reference)
Resistance	4 ~ 6 kΩ
Inlet Air Pressure Sensor/Atmospheric Pressure Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.80 ~ 4.20 V at standard atmospheric pressure (see this text for details)
Inlet Air Temperature Sensor:	
Output Voltage	About DC 2.25 ~ 2.50 V at inlet air temperature 20°C (68°F)
Resistance	5.4 ~ 6.6 kΩ at 0°C (32°F) 0.29 ~ 0.39 kΩ at 80°C (176°F)
Water Temperature Sensor:	
Output Voltage	About DC 2.80 ~ 2.97 V at 20°C (68°F)
Speed Sensor:	
Input Voltage	DC 9 ~ 11 V
Output Voltage	About DC 0.05 ~ 0.09 V or DC 4.5 ~ 4.9 V at ignition switch ON and 0 km/h

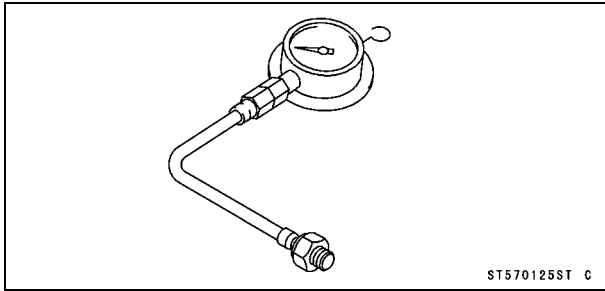
3-20 FUEL SYSTEM (DFI)

Specifications

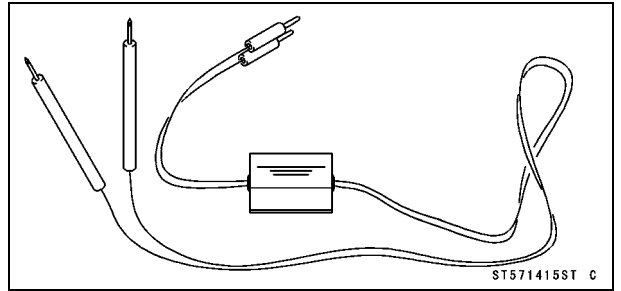
Item	Standard
Vehicle-down Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V
Subthrottle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 1.08 ~ 1.12 V at subthrottle valve full close position DC 4.48 ~ 4.52 V at subthrottle valve full open position (for reference)
Resistance	4 ~ 6 k Ω
Exhaust Butterfly Valve Actuator Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.46 ~ 3.76 V at pulley original position
Resistance	4 ~ 6 k Ω
Immobilizer Antenna (Equipped Models):	
Resistance	About 0.6 ~ 0.9 Ω
Exhaust Butterfly Valve Actuator:	
Resistance	5 ~ 200 Ω (for reference)
Subthrottle Valve Actuator:	
Resistance	About 5.2 ~ 7.8 Ω
Input Voltage	About DC 8.5 ~ 10.5 V
Oxygen Sensor (Equipped Models):	
Output Voltage (Rich)	DC 0.8 V or more
Output Voltage (Lean)	DC 0.24 V or less
Heater Resistance	6.7 ~ 10.5 Ω at 20°C (68°F)
Throttle Grip and Cables	
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
Air Cleaner	
Element	Viscous paper element

Special Tools and Sealant

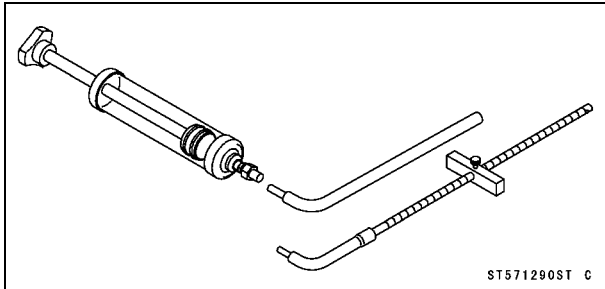
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



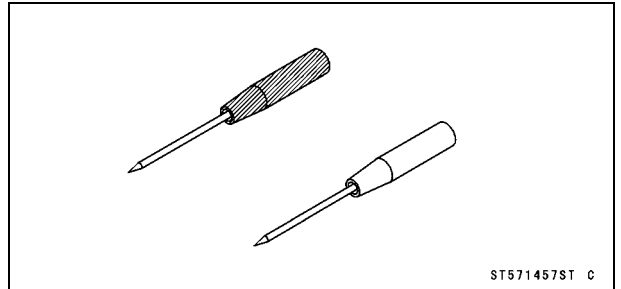
Peak Voltage Adapter:
57001-1415



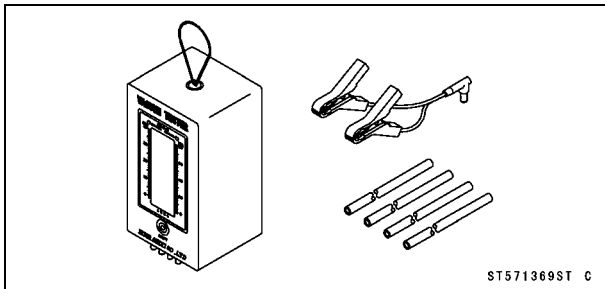
Fork Oil Level Gauge:
57001-1290



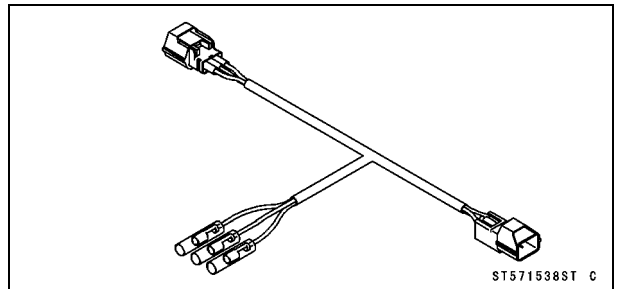
Needle Adapter Set:
57001-1457



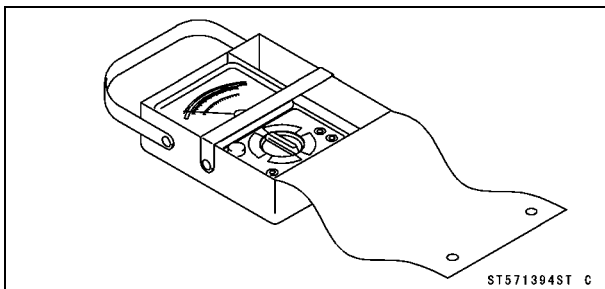
Vacuum Gauge:
57001-1369



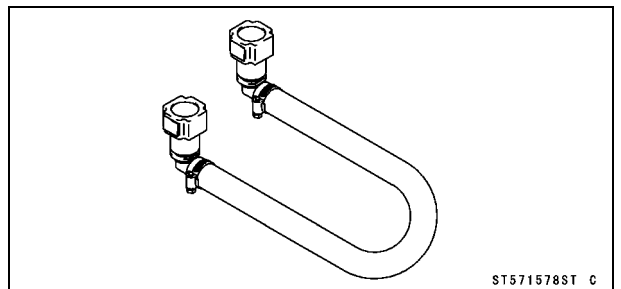
Throttle Sensor Setting Adapter:
57001-1538



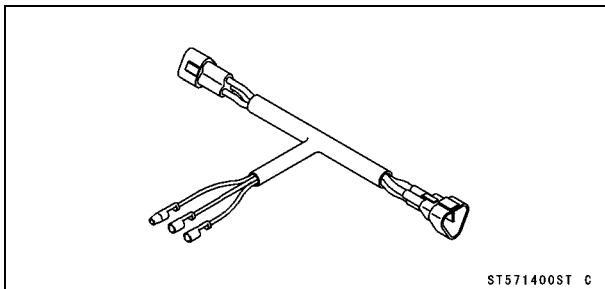
Hand Tester:
57001-1394



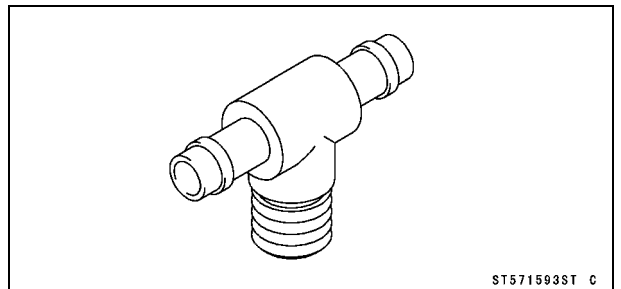
Extension Tube:
57001-1578



Throttle Sensor Setting Adapter #1:
57001-1400



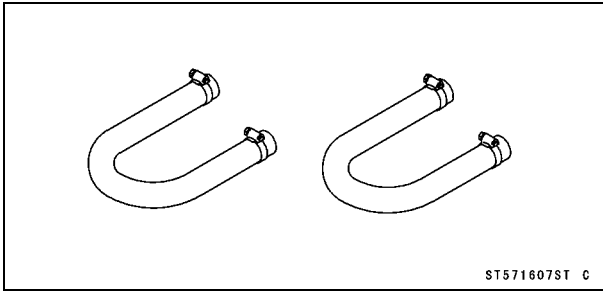
Fuel Pressure Gauge Adapter:
57001-1593



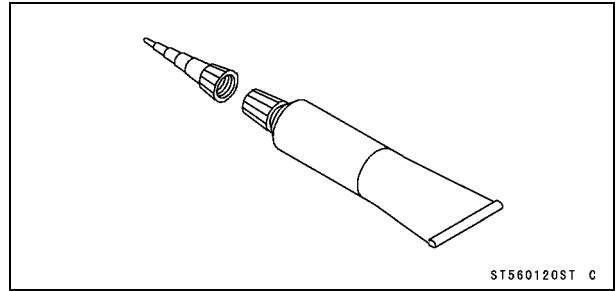
3-22 FUEL SYSTEM (DFI)

Special Tools and Sealant

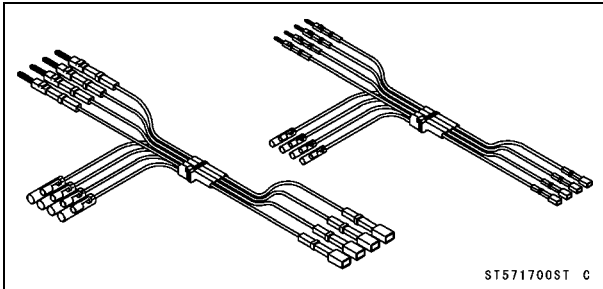
Fuel Hose:
57001-1607



Kawasaki Bond (Silicone Sealant):
56019-120



Measuring Adapter:
57001-1700

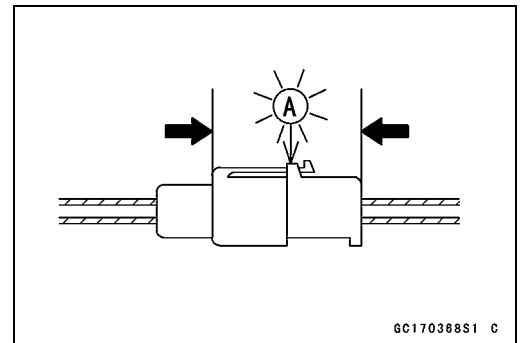


DFI Servicing Precautions

DFI Servicing Precautions

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

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



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

3-24 FUEL SYSTEM (DFI)

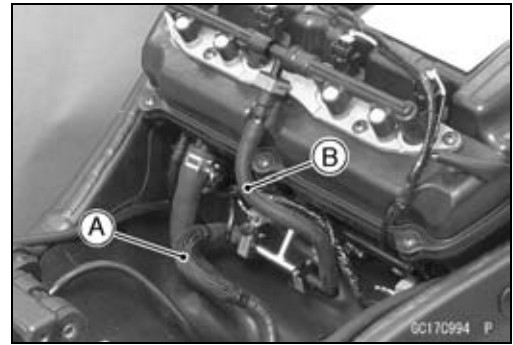
DFI Servicing Precautions

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

Primary Fuel Hose [A]

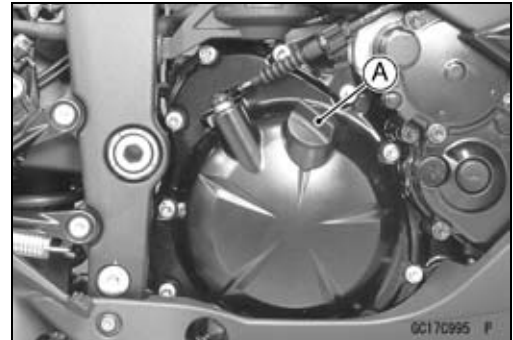
Secondary Fuel Hose [B]

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



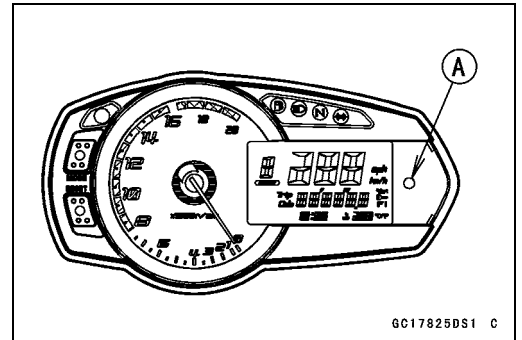
○To maintain the correct fuel/air mixture (F/A), there must be no inlet air leaks in the DFI system. Be sure to install the oil filler plug [A] after filling the engine oil.

Torque - Oil Filler Plug: Hand-tighten



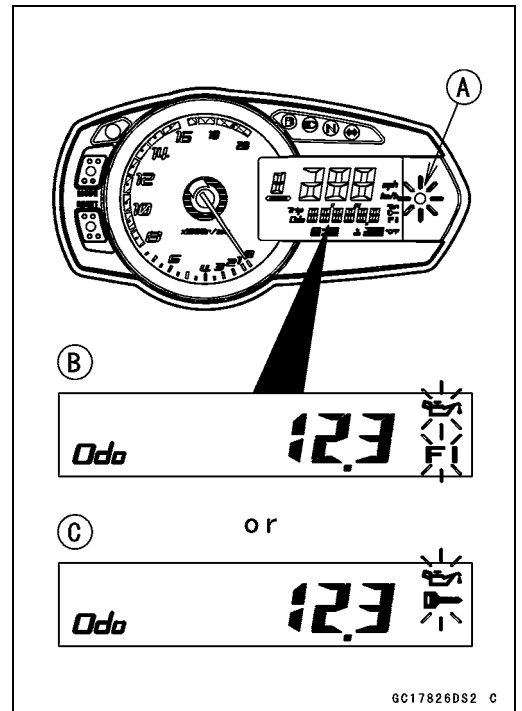
Troubleshooting the DFI System

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



Outline

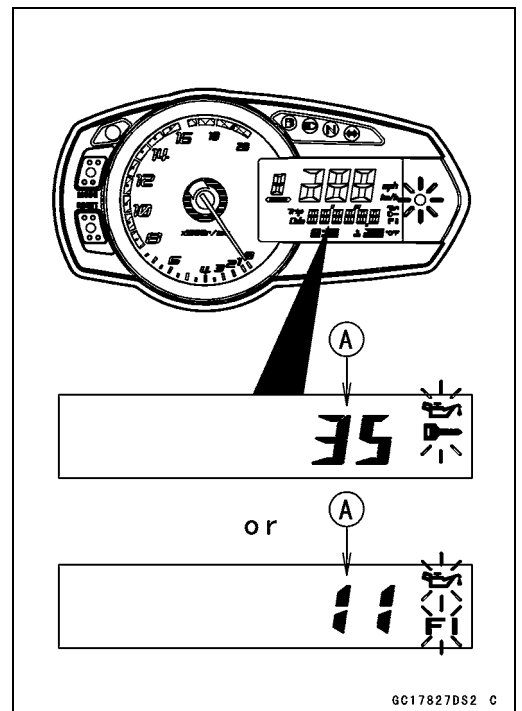
When a problem occurs with DFI system, the warning indicator light (LED) [A] and FI warning symbol [B] blinks to alert the rider. In addition, the condition of the problem is stored in the memory of the ECU. For models equipped with an immobilizer system, the warning indicator light (LED) and immobilizer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



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

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

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



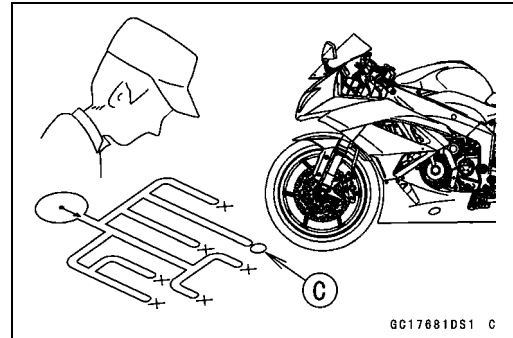
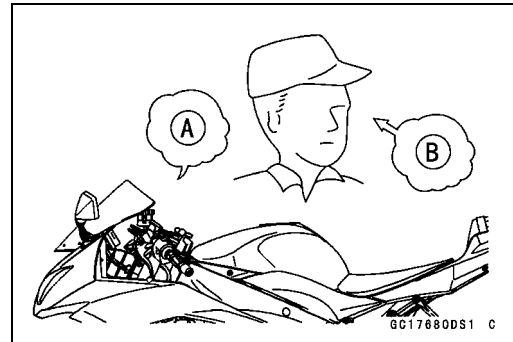
3-26 FUEL SYSTEM (DFI)

Troubleshooting the DFI System

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

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

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



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

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

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

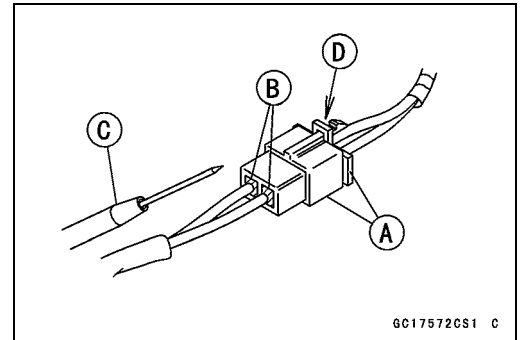
When the motorcycle is down, the vehicle-down sensor operates and the ECU shuts off the fuel pump relay, fuel injectors (primary and secondary) and ignition system. The ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. When the starter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

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

Troubleshooting the DFI System

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

Special Tool - Needle Adapter Set: 57001-1457



CAUTION

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

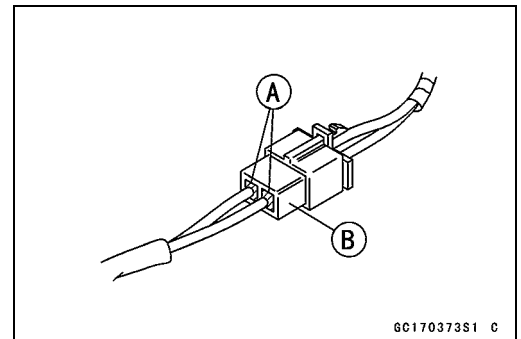
- Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of a digital meter.
- Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.
- Turn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

CAUTION

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

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

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



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

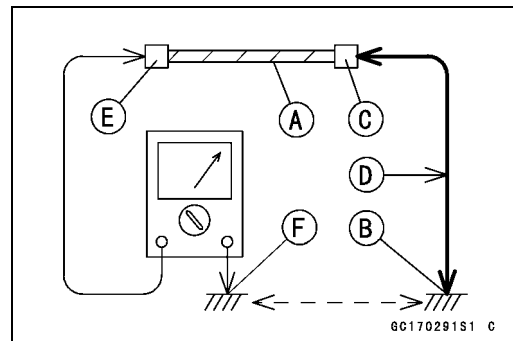
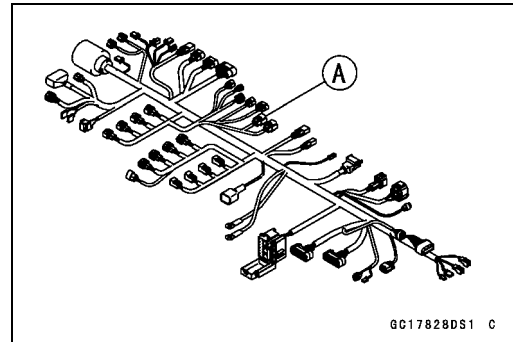
3-28 FUEL SYSTEM (DFI)

Troubleshooting the DFI System

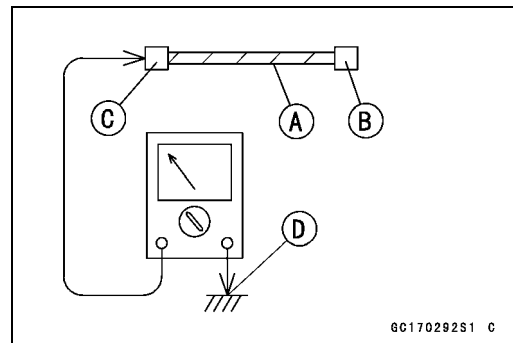
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which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

Special Tool - Hand Tester: 57001-1394

- Set the tester to the $\times 1 \Omega$ range, and read the tester.
- ★ If the tester does not read 0Ω , the lead is defective. Replace the lead or the main harness.
- If both ends of a harness [A] are far apart, ground [B] the one end [C], using a jumper lead [D] and check the continuity between the end [E] and the ground [F]. This enables to check a long harness for continuity. If the harness is open, repair or replace the harness.



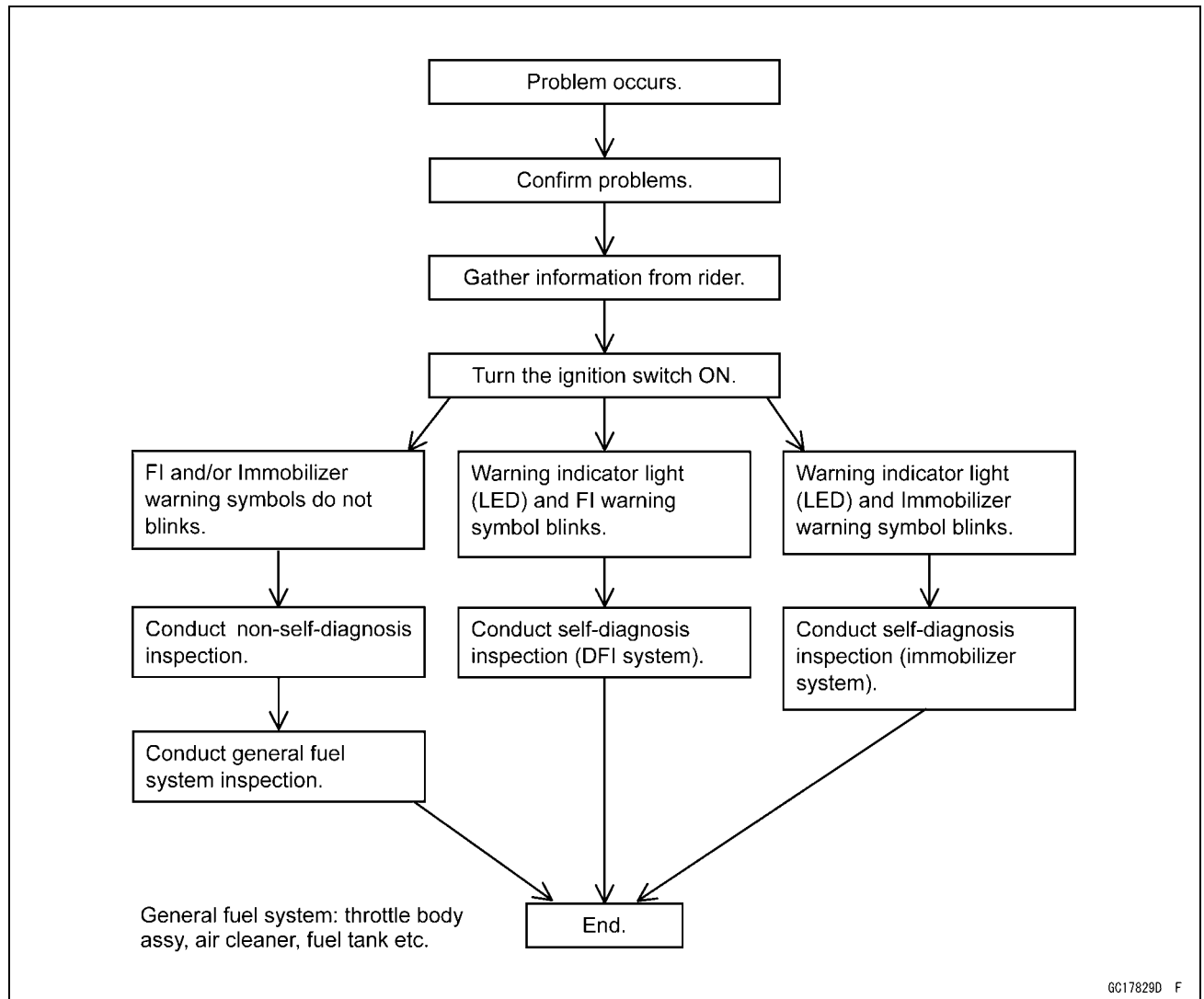
- When checking a harness [A] for short circuit, open one end [B] and check the continuity between the other end [C] and ground [D]. If there is continuity, the harness has a short circuit to ground, and it must be repaired or replaced.



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

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.

3-30 FUEL SYSTEM (DFI)

Troubleshooting the DFI System

Sample Diagnosis Sheet

Rider name:	Registration No. (license plate No.):	Year of initial registration:
Model:	Engine No.:	Frame No.:
Date problem occurred:	Mileage:	
Environment when problem occurred.		
Weather	<input type="checkbox"/> fine, <input type="checkbox"/> cloudy, <input type="checkbox"/> rain, <input type="checkbox"/> snow, <input type="checkbox"/> always, <input type="checkbox"/> other:	
Temperature	<input type="checkbox"/> hot, <input type="checkbox"/> warm, <input type="checkbox"/> cold, <input type="checkbox"/> very cold, <input type="checkbox"/> always, <input type="checkbox"/> other:	
Problem frequency	<input type="checkbox"/> chronic, <input type="checkbox"/> often, <input type="checkbox"/> once	
Road	<input type="checkbox"/> street, <input type="checkbox"/> highway, <input type="checkbox"/> mountain road (<input type="checkbox"/> uphill, <input type="checkbox"/> downhill), <input type="checkbox"/> bumpy, <input type="checkbox"/> pebble	
Altitude	<input type="checkbox"/> normal, <input type="checkbox"/> high (about 1 000 m or more)	
Motorcycle conditions when problem occurred.		
Warning indicator light (LED)	<input type="checkbox"/> Start blinks immediately after ignition switch ON, and goes off after 1 ~ 2 seconds (normal).	
	<input type="checkbox"/> Start blinks immediately after ignition switch ON, and the FI warning symbol on the LCD starts blinking (DFI system problem).	
	<input type="checkbox"/> Start blinks immediately after ignition switch ON, and the immobilizer warning symbol on the LCD starts blinking (immobilizer system problem).	
	<input type="checkbox"/> Does not blink after ignition switch ON.	
	<input type="checkbox"/> light up (ECU or meter unit replace).	
Starting difficulty	<input type="checkbox"/> starter motor not rotating.	
	<input type="checkbox"/> starter motor rotating but engine do not turn over.	
	<input type="checkbox"/> starter motor and engine do not turn over.	
	<input type="checkbox"/> no fuel flow (<input type="checkbox"/> no fuel in tank, <input type="checkbox"/> no fuel pump sound).	
	<input type="checkbox"/> no spark.	
	<input type="checkbox"/> other:	
Engine stalls	<input type="checkbox"/> right after starting.	
	<input type="checkbox"/> when opening throttle grip.	
	<input type="checkbox"/> when closing throttle grip.	
	<input type="checkbox"/> when moving off.	
	<input type="checkbox"/> when stopping the motorcycle.	
	<input type="checkbox"/> when cruising.	
	<input type="checkbox"/> other:	
Poor running at low speed	<input type="checkbox"/> very low idle speed, <input type="checkbox"/> very high idle speed, <input type="checkbox"/> rough idle speed.	
	<input type="checkbox"/> battery voltage is low (charge the battery).	
	<input type="checkbox"/> spark plug loose (tighten it).	
	<input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (remedy it).	
	<input type="checkbox"/> backfiring.	
	<input type="checkbox"/> afterfiring.	
	<input type="checkbox"/> hesitation when acceleration.	
	<input type="checkbox"/> engine oil viscosity too high.	
	<input type="checkbox"/> brake dragging.	
	<input type="checkbox"/> engine overheating.	
	<input type="checkbox"/> clutch slipping.	
	<input type="checkbox"/> other:	

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, → use high-octane gasoline).
	<input type="checkbox"/> brake dragging.
	<input type="checkbox"/> clutch slipping.
	<input type="checkbox"/> engine overheating.
	<input type="checkbox"/> engine oil level too high.
	<input type="checkbox"/> engine oil viscosity too high.
	<input type="checkbox"/> other:

3-32 FUEL SYSTEM (DFI)

DFI System Troubleshooting Guide

NOTE

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

Engine Won't Turn Over

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

Poor Running at Low Speed

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

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Unstable (rough) idling:	
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Engine vacuum not synchronizing	Inspect and adjust (see chapter 2).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Engine stalls easily:	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Stick coil trouble	Inspect (see chapter 16).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Poor acceleration:	
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).
Main throttle sensor trouble	Inspect (see chapter 3).

3-34 FUEL SYSTEM (DFI)

DFI System Troubleshooting Guide

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

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions
Other:	
Intermittent any DFI fault and its recovery	Check that DFI connectors are clean and tight, and examine leads for signs of burning or fraying (see chapter 3).

Poor Running or No Power at High Speed

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

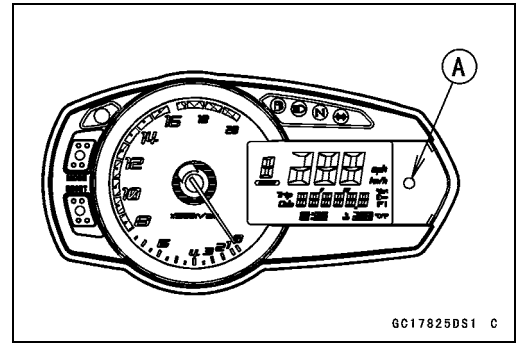
3-36 FUEL SYSTEM (DFI)

DFI System Troubleshooting Guide

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

Self-Diagnosis

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

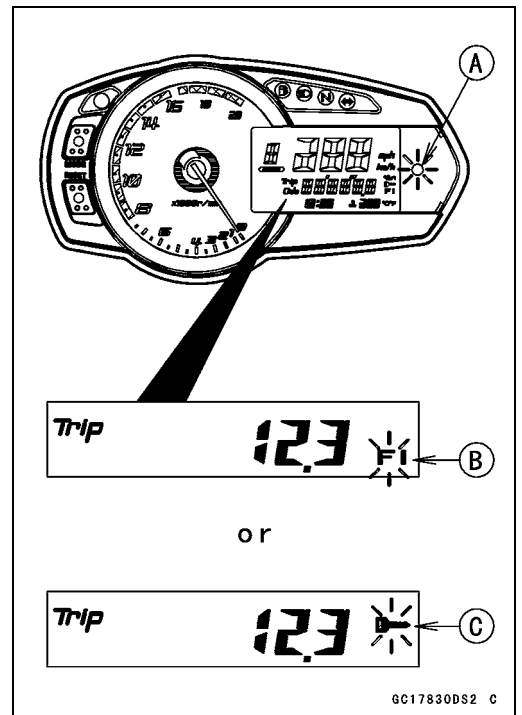


Self-diagnosis Outline

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

User Mode

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



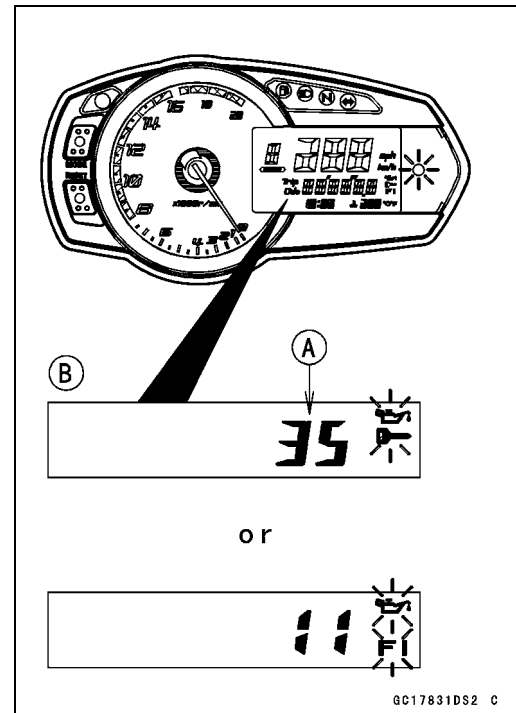
3-38 FUEL SYSTEM (DFI)

Self-Diagnosis

Dealer Mode

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

Immobilizer Models [B]

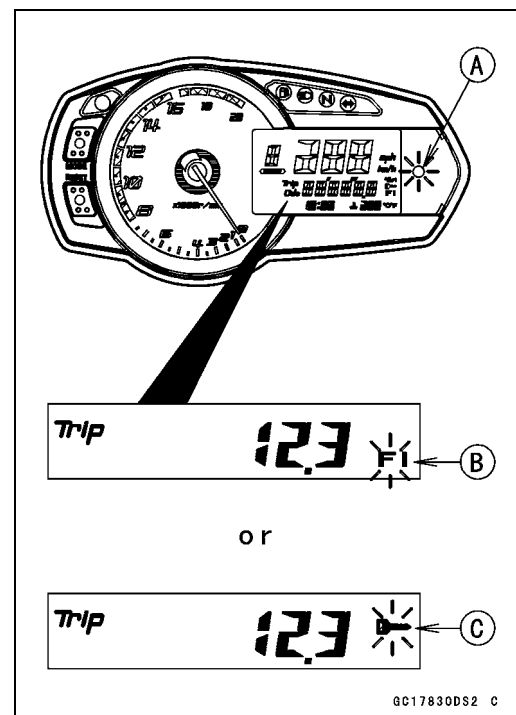


Self-diagnosis Procedures

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

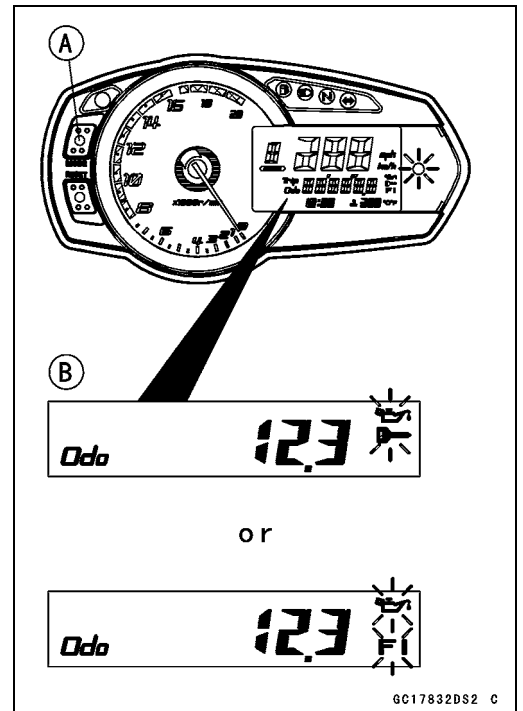
NOTE

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

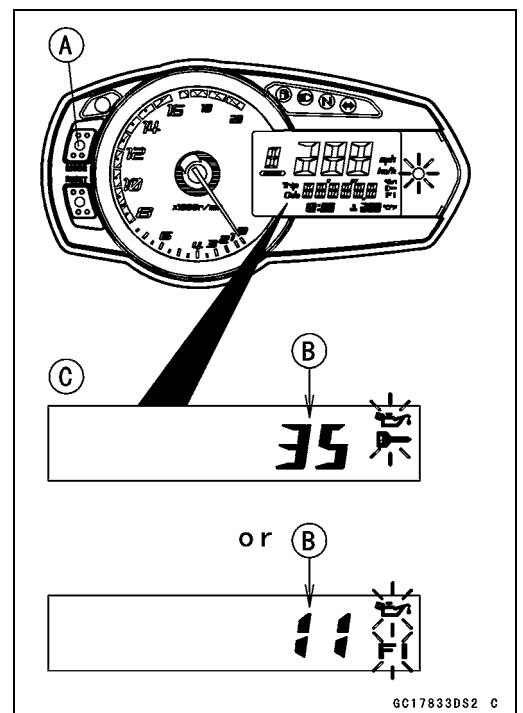


Self-Diagnosis

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



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

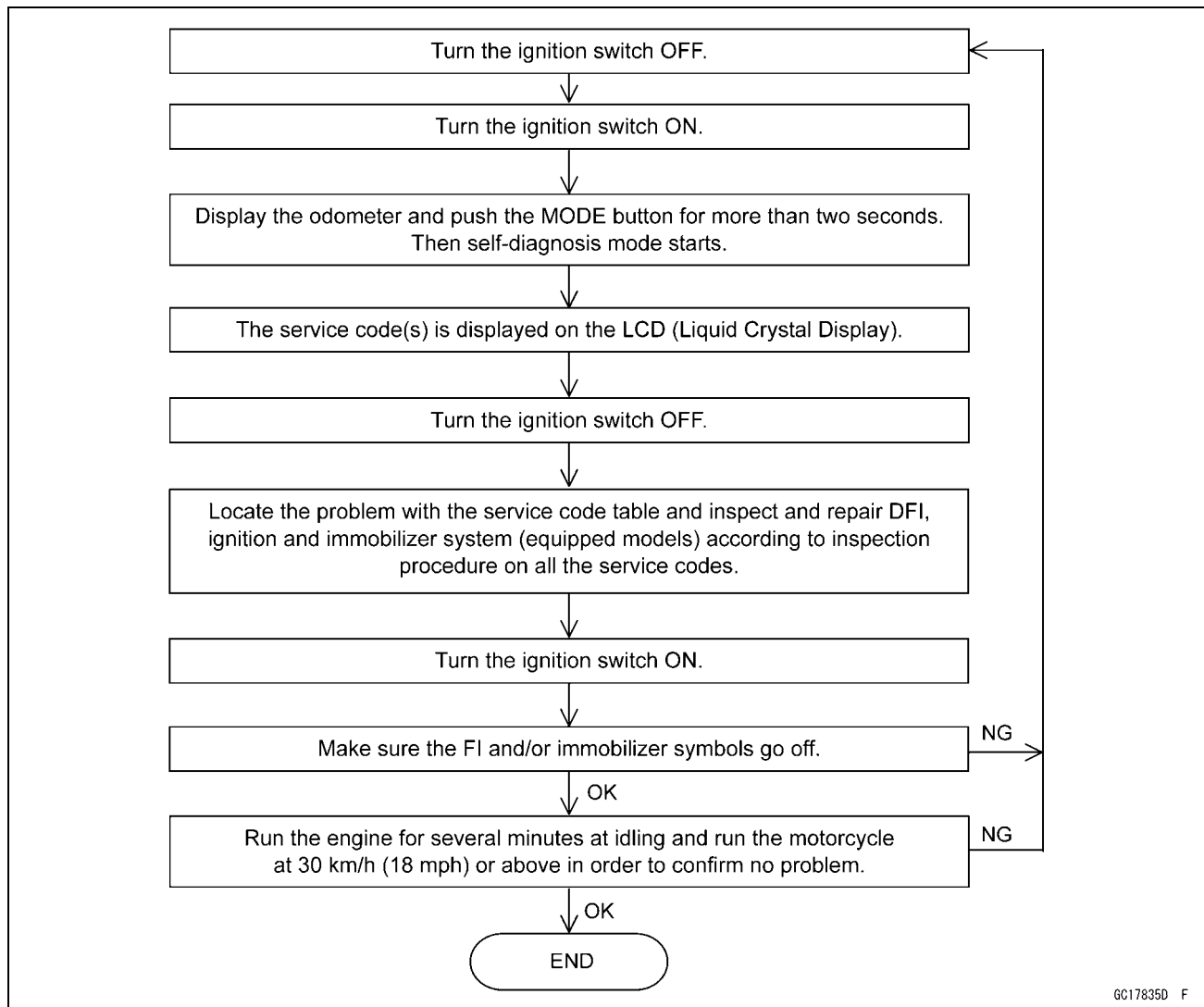


- Any of the following procedures ends self-diagnosis.
 - When the service code is displayed on the LCD, push the MODE button for more than two seconds.
 - When the ignition switch is turned OFF.

3-40 FUEL SYSTEM (DFI)

Self-Diagnosis

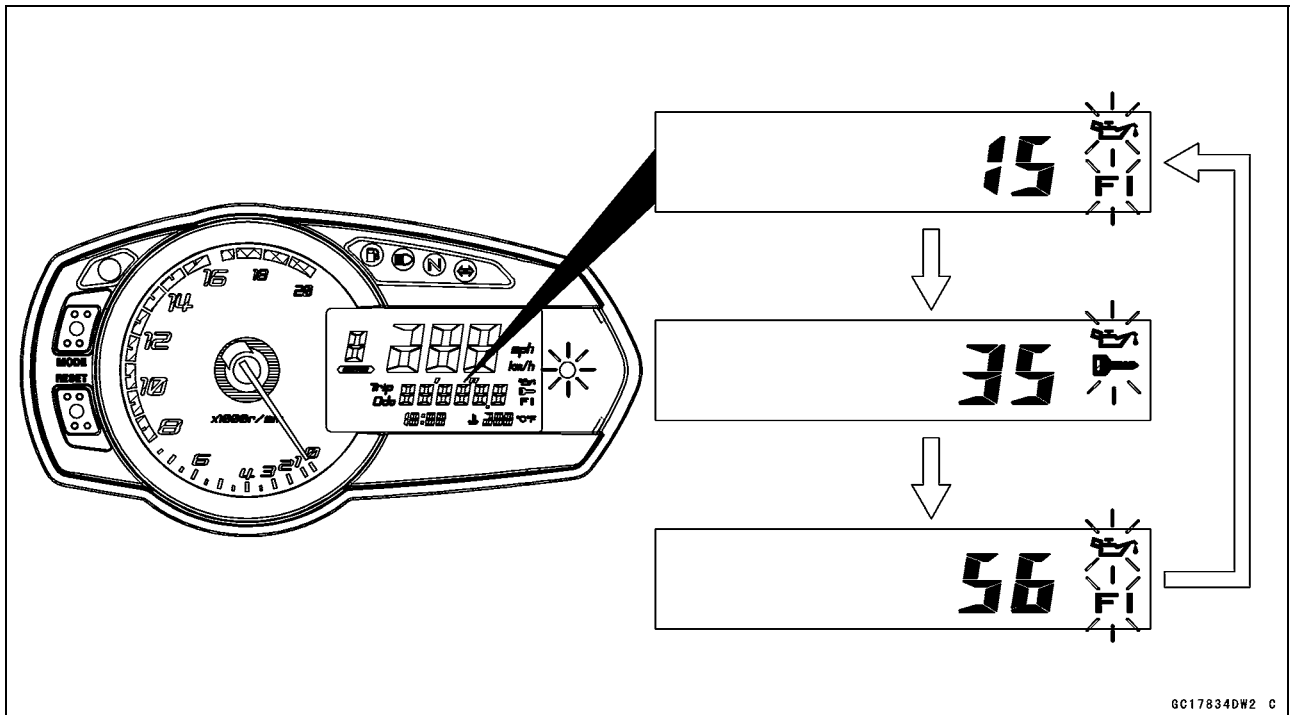
Self-Diagnosis Flow Chart



Self-Diagnosis

Service Code Reading

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



GC17834DW2 C

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

Service Code Erasing

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

3-42 FUEL SYSTEM (DFI)

Self-Diagnosis

Service Code Table

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

Notes:

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

Self-Diagnosis

Backups

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Main Throttle Sensor	Output Voltage 0.2 ~ 4.8 V	If the main throttle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure (Absolute) Pv = 100 ~ 900 mmHg	If the inlet air pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets the DFI in the α-N method (1).
13	Inlet Air Temperature Sensor	Inlet Air Temperature Ta = - 47 ~ + 178°C	If the inlet air temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 40°C.
14	Water Temperature Sensor	Water Temperature Tw = - 30 ~ + 120°C	If the water temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Tw at 80°C and the radiator fan operates.
16	Atmospheric Pressure Sensor	Atmospheric Pressure (Absolute) Pa = 100 ~ 900 mmHg	If the atmospheric pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pa at 760 mmHg (the standard atmospheric pressure).
21	Crankshaft Sensor	Crankshaft sensor must send 22 signals to the ECU at the 1 cranking.	If the crankshaft sensor fails, the engine stops by itself.
24	Speed Sensor	Speed sensor must send 8 signals to the ECU at the 1 rotation of the output shaft.	If the speed sensor system fails (no signal, wiring short or open), the speedometer shows 0.
25	Gear Position Switch	Output Voltage 0.2 ~ 4.8 V	If the gear position switch system fails (no signal, wiring short or open), the ECU set the top (6th) gear position.
31	Vehicle -down Sensor	Output Voltage 0.10 ~ 4.84 V	If the vehicle-down sensor system has failures (the output voltage is out of the usable range, wiring short or open), the ECU shuts off the fuel pump relay, the fuel injectors (primary and secondary) and the ignition system.
32	Subthrottle Sensor	Output Voltage 0.15 ~ 4.84 V	If the subthrottle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU drive the subthrottle valve to the full closed position, and it stops the current to the subthrottle valve actuator.
33	Oxygen Sensor (Equipped Models)	The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU.	If the oxygen sensor is not activated, the ECU stops the feedback mode of the oxygen sensor.

3-44 FUEL SYSTEM (DFI)

Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
34	Exhaust Butterfly Valve Actuator Sensor	Output Voltage 0.1 ~ 4.8 V	If the exhaust butterfly valve actuator sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU drive the exhaust butterfly valve at full open position near, and it stops the current to the exhaust butterfly valve actuator.
35	Immobilizer Amplifier (Equipped Models)	—	If the immobilizer system fails (no signal, wiring short or open), the vehicle is no start and run.
36	Master or User Key (Equipped Models)	The user or master key must use register key.	If the blank key or broken key is used, the vehicle is no start and run.
39	ECU	The ECU send the data (for gear position, service code and key registration) to the meter unit.	—
51	Stick Coil #1*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #1 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running.
52	Stick Coil #2*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #2 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running.
53	Stick Coil #3*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #3 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #3 to stop fuel to the cylinder #3, though the engine keeps running.
54	Stick Coil #4*	The stick coil primary winding must send signals 20 or more times continuously to the ECU.	If the stick coil #4 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #4 to stop fuel to the cylinder #4, though the engine keeps running.
56	Radiator Fan Relay	When the relay OFF condition, the fan relay is open.	—
62	Subthrottle Valve Actuator	The actuator operates open and close of the subthrottle valve by the pulse signal from the ECU.	If the subthrottle valve actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator.
63	Exhaust Butterfly Valve Actuator	The actuator operates open and close of the exhaust butterfly valve by the pulse signal from the ECU.	If the exhaust butterfly valve actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator.
64	Air Switching Valve	The air switching valve controls the flow of the secondary air by opening and shutting the solenoid valve.	—

Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
67	Oxygen Sensor Heater (Equipped Models)	The oxygen sensor heater raise temperature of the sensor for its earlier activation.	If the oxygen sensor heater fails (wiring short or open), the ECU stops the current to the heater, and it stops the feedback mode of the oxygen sensor.
94	Oxygen Sensor (Equipped Models)	The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU.	If the oxygen sensor is not activated, the ECU stops feedback mode of the oxygen sensor.

Note:

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

*: This depends on the number of stopped cylinders.

3-46 FUEL SYSTEM (DFI)

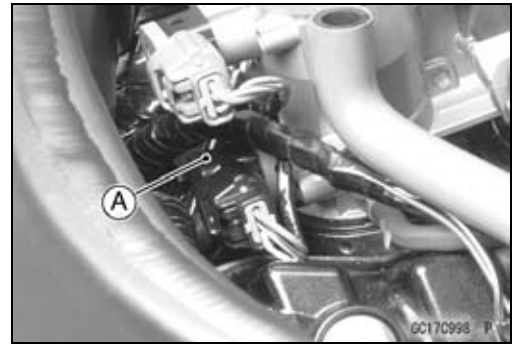
Main Throttle Sensor (Service Code 11)

Main Throttle Sensor Removal/Adjustment

CAUTION

Do not remove or adjust the main throttle sensor [A] since it has been adjusted and set with precision at the factory.

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



Main Throttle Sensor Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the main throttle sensor connector.
- Connect the harness adapter [A] between the main harness connector and main throttle sensor connector.

Special Tool - Throttle Sensor Setting Adapter: 57001-1538

- Connect a digital meter to the harness adapter leads.

Main Throttle Sensor Input Voltage

Connections to Adapter:

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

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

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the output voltage (see Main 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 connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

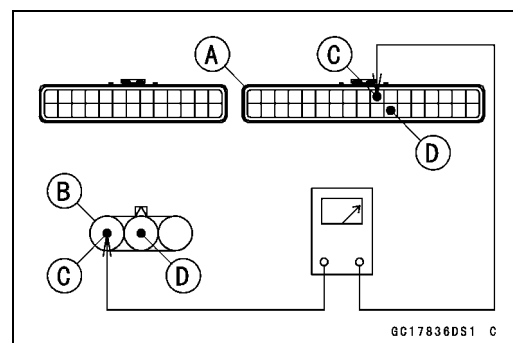
ECU Connector [A] ↔

Main Throttle Sensor Connector [B]

BL lead (ECU terminal 10) [C]

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

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



Main Throttle Sensor (Service Code 11)

Main Throttle Sensor Output Voltage Inspection

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

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

Special Tool - Throttle Sensor Setting Adapter: 57001-1538

Main Throttle Sensor Output Voltage

Connections to Adapter:

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

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

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

Idle Speed

Standard: 1 300 ±50 r/min (rpm)

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

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

Output Voltage

Standard: DC 1.02 ~ 1.06 V at idle throttle opening

DC 4.30 ~ 4.34 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.

$$1.02 \times 4.75 \div 5.00 = 0.969 \text{ V}$$

$$1.06 \times 4.75 \div 5.00 = 1.007 \text{ V}$$

Thus, the valid range is 0.969 ~ 1.007 V

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the main throttle sensor resistance (see Main Throttle Sensor Resistance Inspection).



3-48 FUEL SYSTEM (DFI)

Main Throttle Sensor (Service Code 11)

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

Special Tool - Hand Tester: 57001-1394

○ Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ↔

Main Throttle Sensor Connector [B]

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

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

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

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

Main Throttle Sensor Resistance Inspection

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

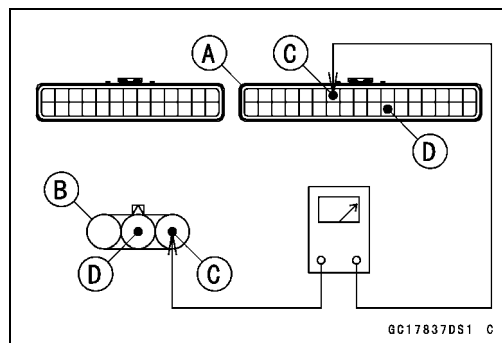
Main Throttle Sensor Resistance

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

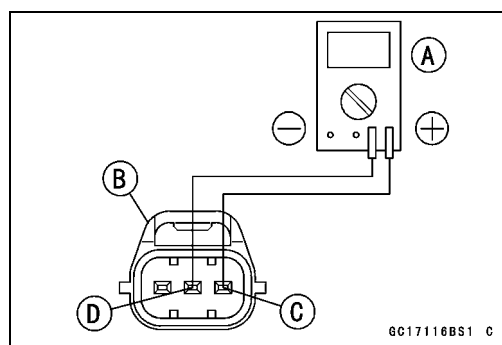
Standard: 4 ~ 6 kΩ

★ If the reading is out of the standard, replace the throttle body assy (see Throttle Body Assy Removal/Installation).

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

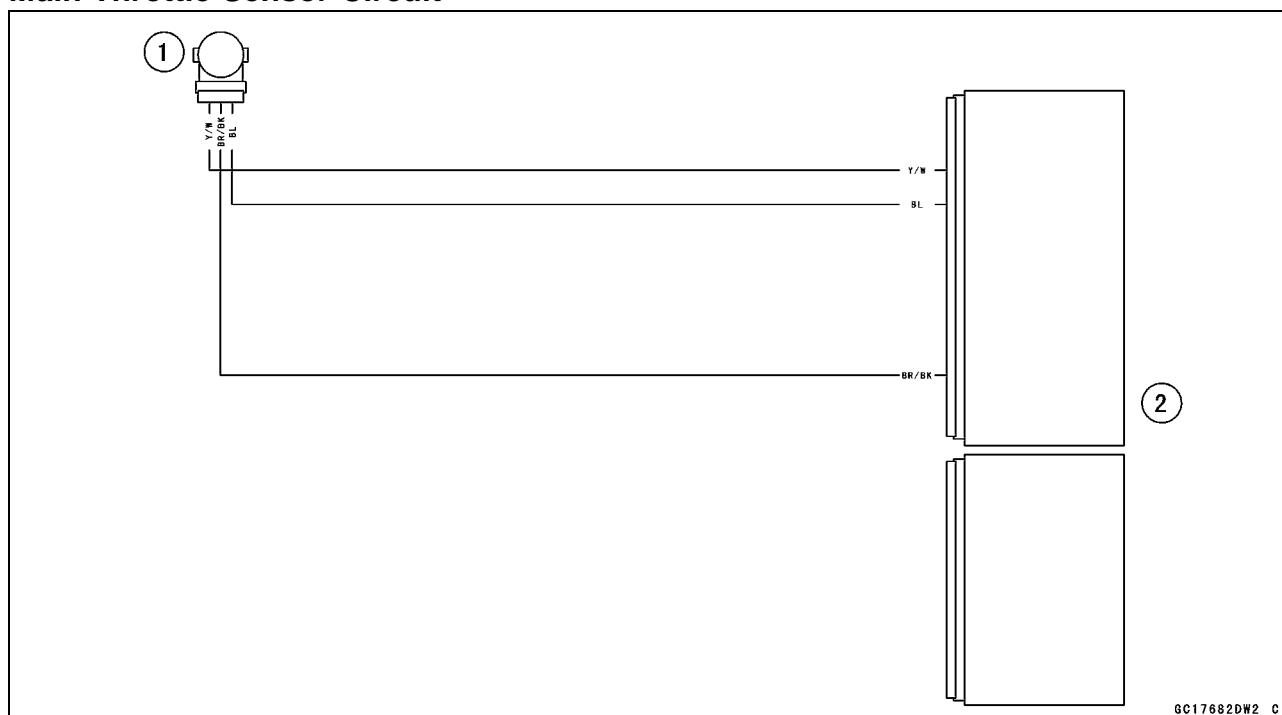


GC17837DS1 C



GC17116BS1 C

Main Throttle Sensor Circuit



GC17682DW2 C

1. Main Throttle Sensor

2. ECU

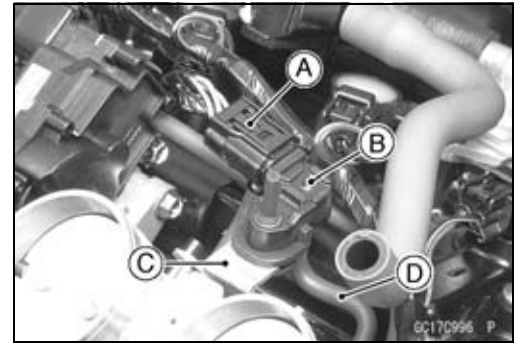
Inlet Air Pressure Sensor (Service Code 12)

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:
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Inlet Air Pressure Sensor Connector [A]
- Remove the inlet air pressure sensor [B] from the rubber damper in the bracket [C] and separate the vacuum hose [D].



Inlet Air Pressure Sensor Installation

NOTE

○ The inlet air pressure sensor is the same part as the atmospheric pressure sensor.

- Installation is the reverse of removal.

Inlet Air Pressure Sensor Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the inlet air pressure sensor connector and connect the harness adapter [A] between these connectors.

Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter to the harness adapter leads.

Inlet Air Pressure Sensor Input Voltage

Connections to Adapter:

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

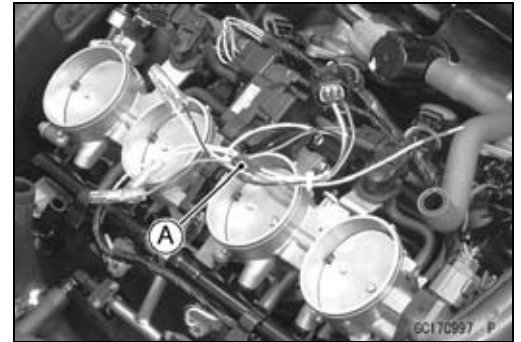
Digital Meter (-) → BK (sensor BR/BK) lead

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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



3-50 FUEL SYSTEM (DFI)

Inlet Air Pressure Sensor (Service Code 12)

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

Special Tool - Hand Tester: 57001-1394

○ Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ←→

Inlet Air Pressure Sensor Connector [B]

BL lead (ECU terminal 10) [C]

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

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

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

Inlet Air Pressure Sensor Output Voltage Inspection

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

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

Special Tool - Measuring Adapter: 57001-1700

Inlet Air Pressure Sensor Output Voltage

Connections to Adapter:

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

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

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

● Turn the ignition switch ON.

Output Voltage

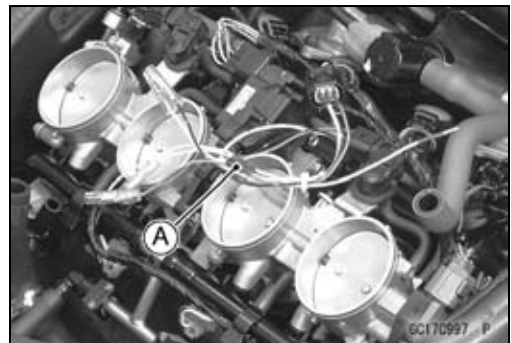
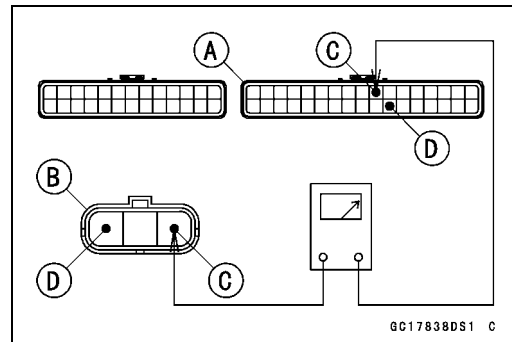
Usable Range: DC 3.80 ~ 4.20 V at standard atmospheric pressure (101.32 kPa, 76 cmHg)

NOTE

○ The output voltage changes according to local atmospheric pressure.

● Turn the ignition switch OFF.

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



Inlet Air Pressure Sensor (Service Code 12)

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

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.

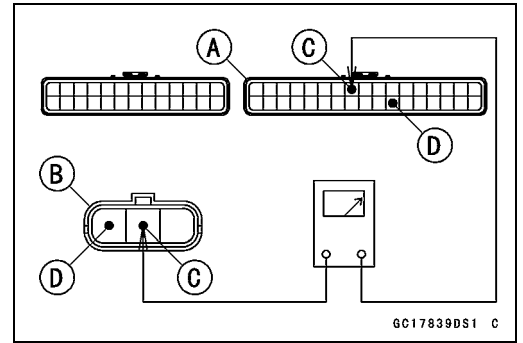
Wiring Continuity Inspection

ECU Connector [A] ↔

Inlet Air Pressure Sensor Connector [B]

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

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



★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

Measuring Adapter: 57001-1700

Inlet Air Pressure Sensor Output Voltage

Connections to Adapter:

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

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

○ Turn the ignition switch ON.

○ Measure the inlet air pressure sensor output voltage from various vacuum readings, while pulling the handle of the fork oil level gauge.

○ Check the inlet air pressure sensor output voltage, using the following formula and chart.

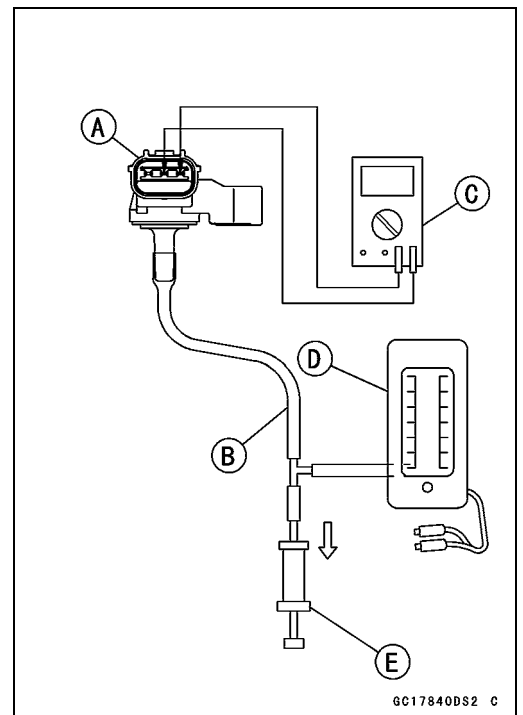
Suppose:

Pg: Vacuum Pressure (Gauge) of Throttle Body

Pl: Local Atmospheric Pressure (Absolute) measured by a barometer

Pv: Vacuum Pressure (Absolute) of Throttle Body

Vv: Sensor Output Voltage (V)



3-52 FUEL SYSTEM (DFI)

Inlet Air Pressure Sensor (Service Code 12)

then

$$P_v = P_i - P_g$$

For example, suppose the following data is obtained:

$P_g = 8$ cmHg (Vacuum Gauge Reading)

$P_i = 70$ cmHg (Barometer Reading)

$V_v = 3.2$ V (Digital Meter Reading)

then

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

Plot this P_v (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.

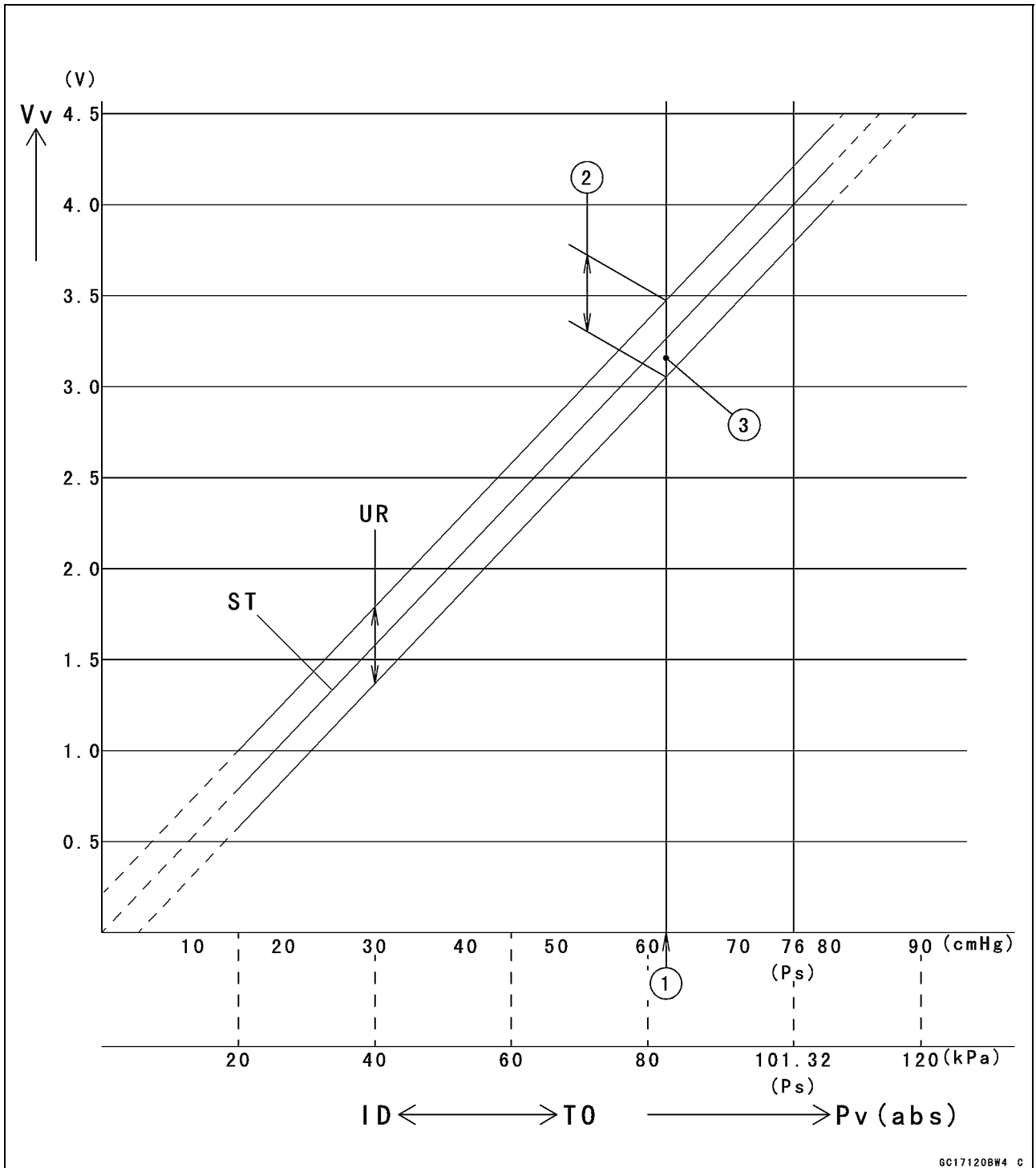
$$\text{Usable range} = 3.08 \sim 3.48 \text{ V}$$

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

Results: In the chart, V_v 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).

Inlet Air Pressure Sensor (Service Code 12)



ID: Idling

Ps: Standard Atmospheric Pressure (Absolute)

P_v : Throttle Vacuum Pressure (Absolute)

ST: Standard of Sensor Output Voltage (V)

TO: Throttle Full Open

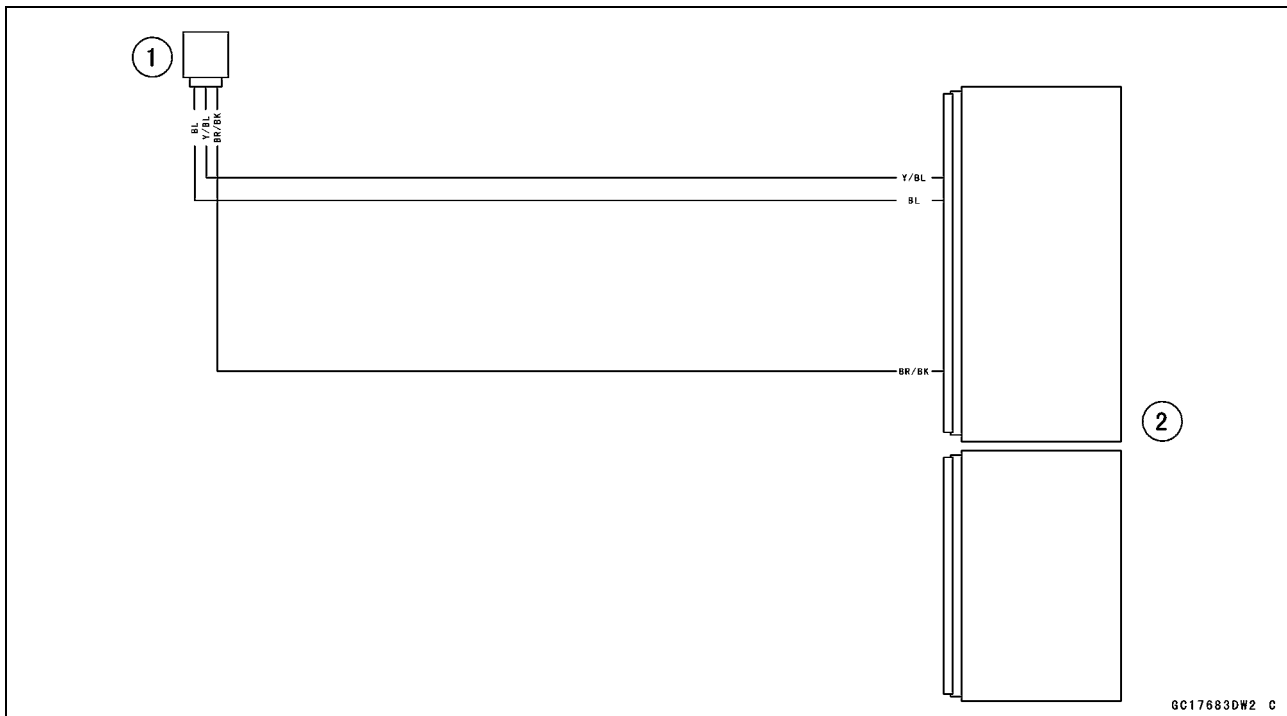
UR: Usable Range of Sensor Output Voltage (V)

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

3-54 FUEL SYSTEM (DFI)

Inlet Air Pressure Sensor (Service Code 12)

Inlet Air Pressure Sensor Circuit



1. Inlet Air Pressure Sensor
2. ECU

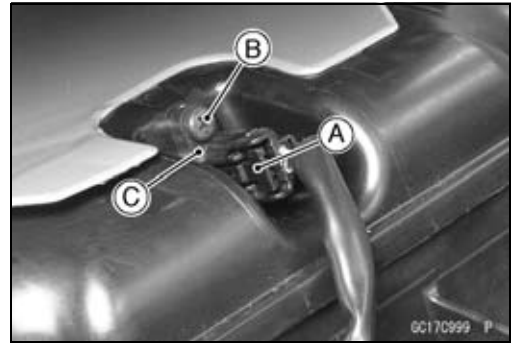
Inlet Air Temperature Sensor (Service Code 13)

Inlet Air Temperature Sensor Removal/Installation

CAUTION

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

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the connector [A].
- Remove the screw [B].
- Pull out the inlet air temperature sensor [C].
- Put the inlet air temperature sensor into the air cleaner housing.
- Tighten:
 - Torque - Inlet Air Temperature Sensor Screw: 0.80 N·m (0.081 kgf·m, 7.1 in·lb)

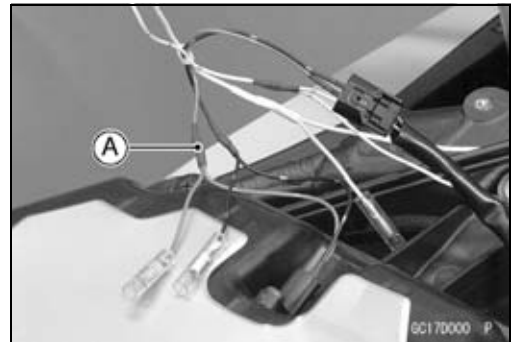


Inlet Air Temperature Sensor Output Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

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



Special Tool - Measuring Adapter: 57001-1700

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

Inlet Air Temperature Sensor Output Voltage

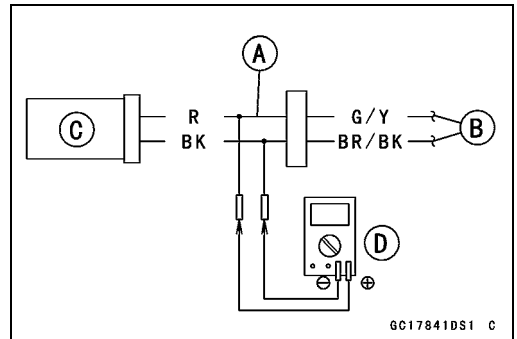
Connections to Adapter:

- Digital Meter (+) → R (sensor G/Y) lead
- Digital Meter (-) → BK (sensor BR/BK) lead

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

Output Voltage

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



NOTE

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

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

3-56 FUEL SYSTEM (DFI)

Inlet Air Temperature Sensor (Service Code 13)

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

Special Tool - Hand Tester: 57001-1394

○ Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ←→

Inlet Air Temperature Sensor Connector [B]

G/Y lead (ECU terminal 26) [C]

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

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

Inlet Air Temperature Sensor Resistance Inspection

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

NOTE

○ The sensor and thermometer must not touch the container side or bottom.

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the following.

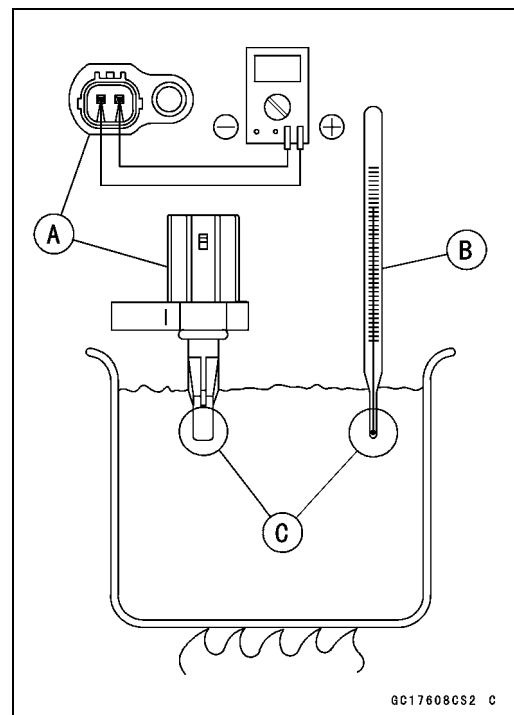
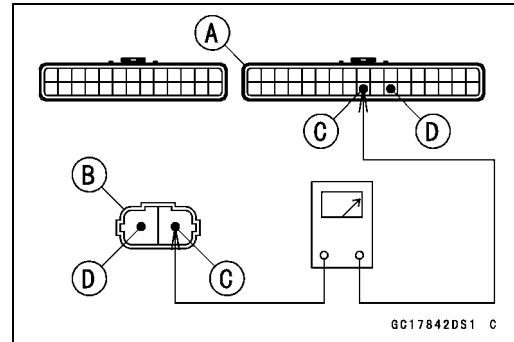
Inlet Air Temperature Sensor Resistance

Standard: 5.4 ~ 6.6 kΩ at 0°C (32°F)

0.29 ~ 0.39 kΩ at 80°C (176°F)

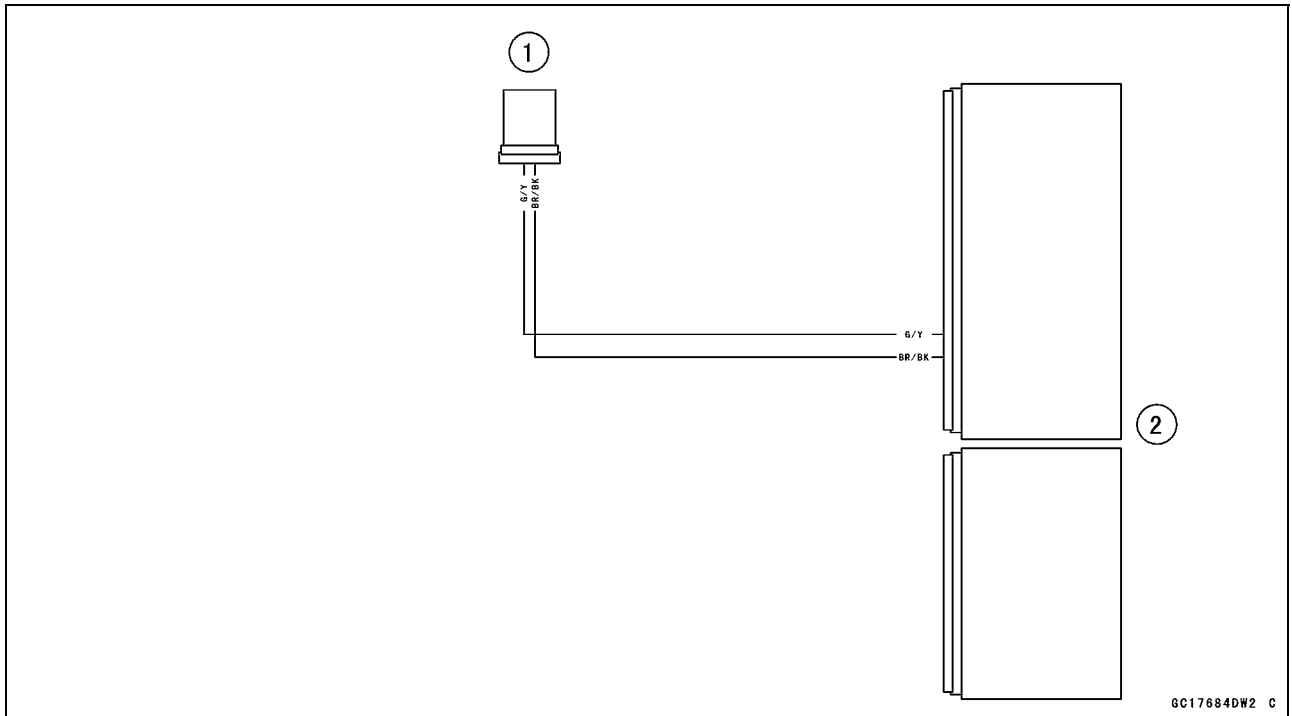
★ If the reading is out of the standard, replace the sensor.

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



Inlet Air Temperature Sensor (Service Code 13)

Inlet Air Temperature Sensor Circuit



GC17684DW2 C

- 1. Inlet Air Temperature Sensor
- 2. ECU

3-58 FUEL SYSTEM (DFI)

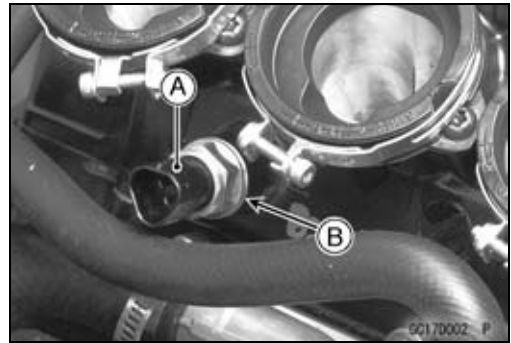
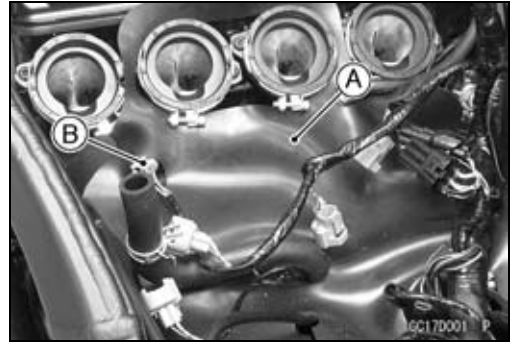
Water Temperature Sensor (Service Code 14)

Water Temperature Sensor Removal/Installation

CAUTION

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

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Free the heat insulation rubber plate [A].
- Disconnect the connector [B].
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the water temperature sensor [A] with gasket [B].
- Replace the gasket with a new one.
- Tighten:
Torque - Water Temperature Sensor: 25 N·m (2.5 kgf·m, 18 ft·lb)
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).



Water Temperature Sensor Output Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the throttle body assy (see Throttle Body Assy Removal).
- Disconnect the water temperature sensor connector and connect the harness adapter [A] between these connectors as shown in the figure.

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 O) lead

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

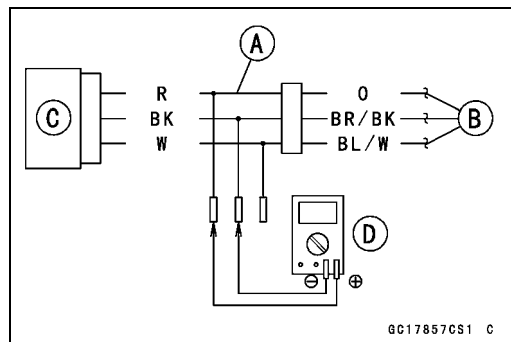
- Measure the output voltage with the engine stopped and the connector joined.
- Turn the ignition switch ON.

Output Voltage

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

NOTE

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



Water Temperature Sensor (Service Code 14)

- 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 connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ←→

Water Temperature Sensor Connector [B]

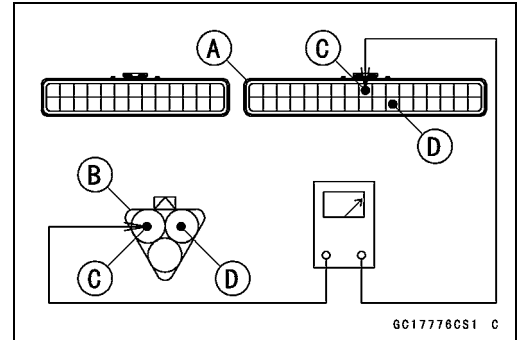
O lead (ECU terminal 9) [C]

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

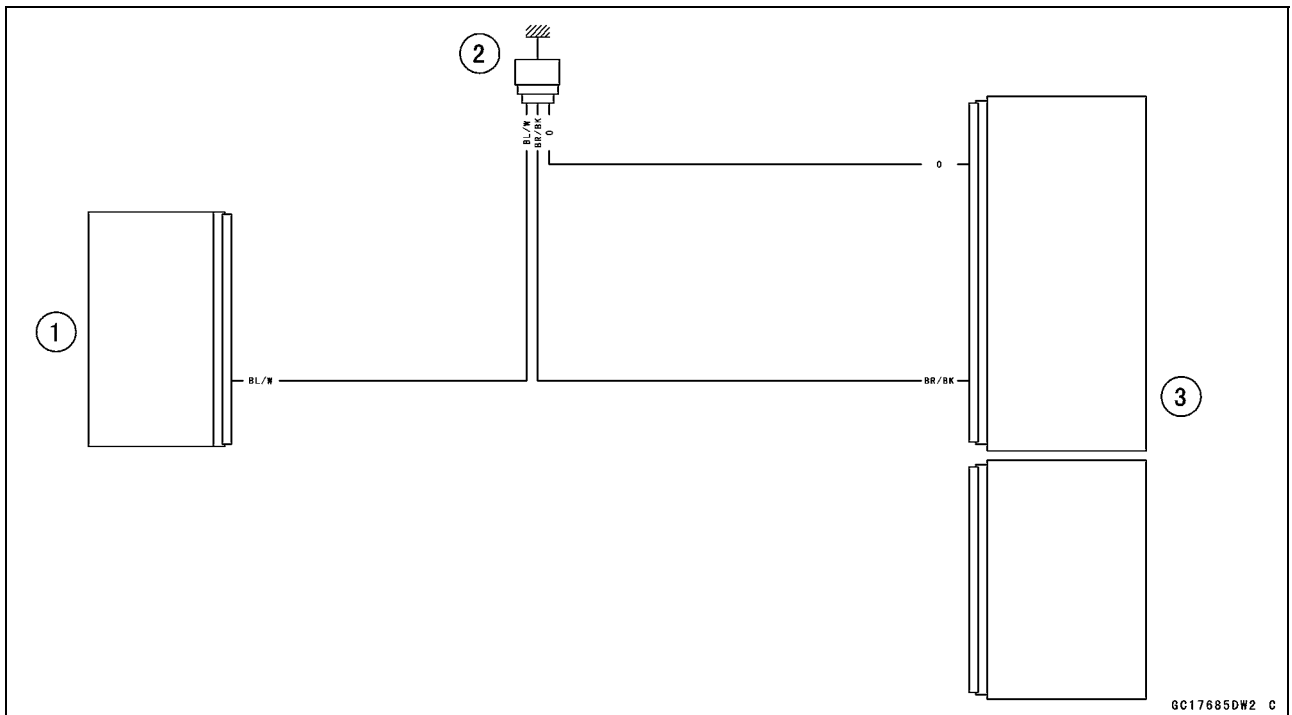
- ★ If the wiring is good, check the water temperature sensor resistance (see Water Temperature Sensor Resistance Inspection).

Water Temperature Sensor Resistance Inspection

- Refer to the Water Temperature Sensor Inspection in the Electrical System chapter.
- ★ If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).



Water Temperature Sensor Circuit



1. Meter Unit
2. Water Temperature Sensor
3. ECU

3-60 FUEL SYSTEM (DFI)

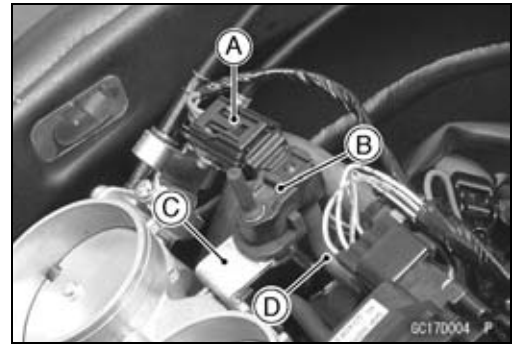
Atmospheric Pressure Sensor (Service Code 16)

Atmospheric Pressure Sensor Removal

CAUTION

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

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the sensor connector [A].
- Remove the atmospheric pressure sensor [B] from the rubber damper in the bracket [C] and separate the vacuum hose [D].



Atmospheric Pressure Sensor Installation

NOTE

○The atmospheric pressure sensor is the same part as the inlet air pressure sensor.

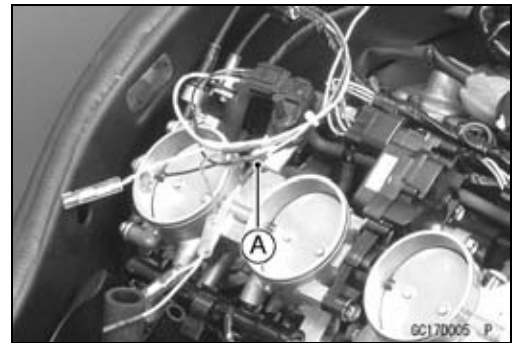
- Installation is the reverse of removal.

Atmospheric Pressure Sensor Input Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the atmospheric pressure sensor connector and connect the harness adapter [A] between these connectors.



Special Tool - Measuring Adapter: 57001-1700

- Connect a digital meter to the harness adapter leads.

Atmospheric Pressure Sensor Input Voltage

Connections to Adapter:

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

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

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

Atmospheric Pressure Sensor (Service Code 16)

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

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ↔

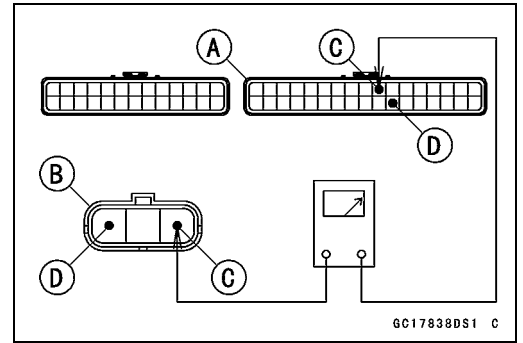
Atmospheric Pressure Sensor Connector [B]

BL lead (ECU terminal 10) [C]

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

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

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



Atmospheric Pressure Sensor Output Voltage Inspection

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

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

Special Tool - Measuring Adapter: 57001-1700

Atmospheric Pressure Sensor Output Voltage

Connections to Adapter:

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

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

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

● Turn the ignition switch ON.

Output Voltage

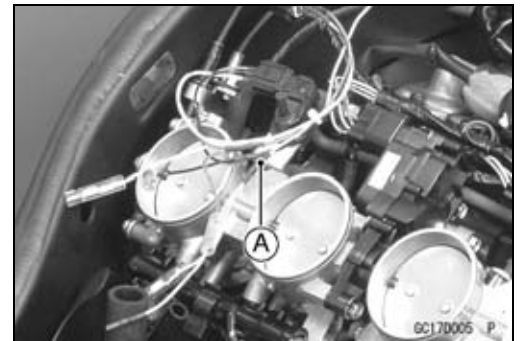
Usable Range: DC 3.80 ~ 4.20 V at standard atmospheric pressure (101.32 kPa, 76 cmHg absolute)

NOTE

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

● Turn the ignition switch OFF.

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



3-62 FUEL SYSTEM (DFI)

Atmospheric Pressure Sensor (Service Code 16)

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

Special Tool - Hand Tester: 57001-1394

○ Disconnect the ECU and sensor connectors.

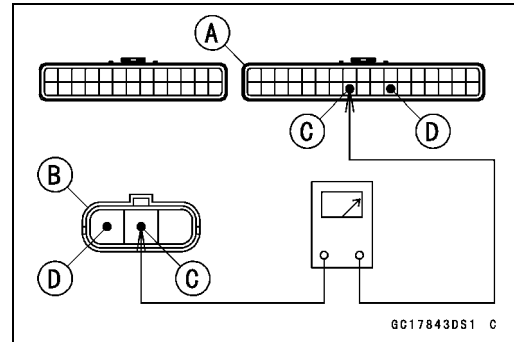
Wiring Continuity Inspection

ECU Connector [A] ←→

Atmospheric Pressure Sensor Connector [B]

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

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



★ If the wiring is good, check the sensor for various vacuum.

○ Determine the local altitude (elevation).

★ If you know the local altitude, use the chart in this section.

★ If you know the local atmospheric pressure using a barometer, substitute the atmospheric pressure for P_v (vacuum pressure) in the inlet air pressure sensor chart (see Inlet Air Pressure Sensor Output Voltage Inspection).

○ Get the usable range of the atmospheric pressure sensor output voltage in the same way as Output Voltage Inspection of the inlet air pressure sensor and check if V_a (output voltage) is within the usable range or not.

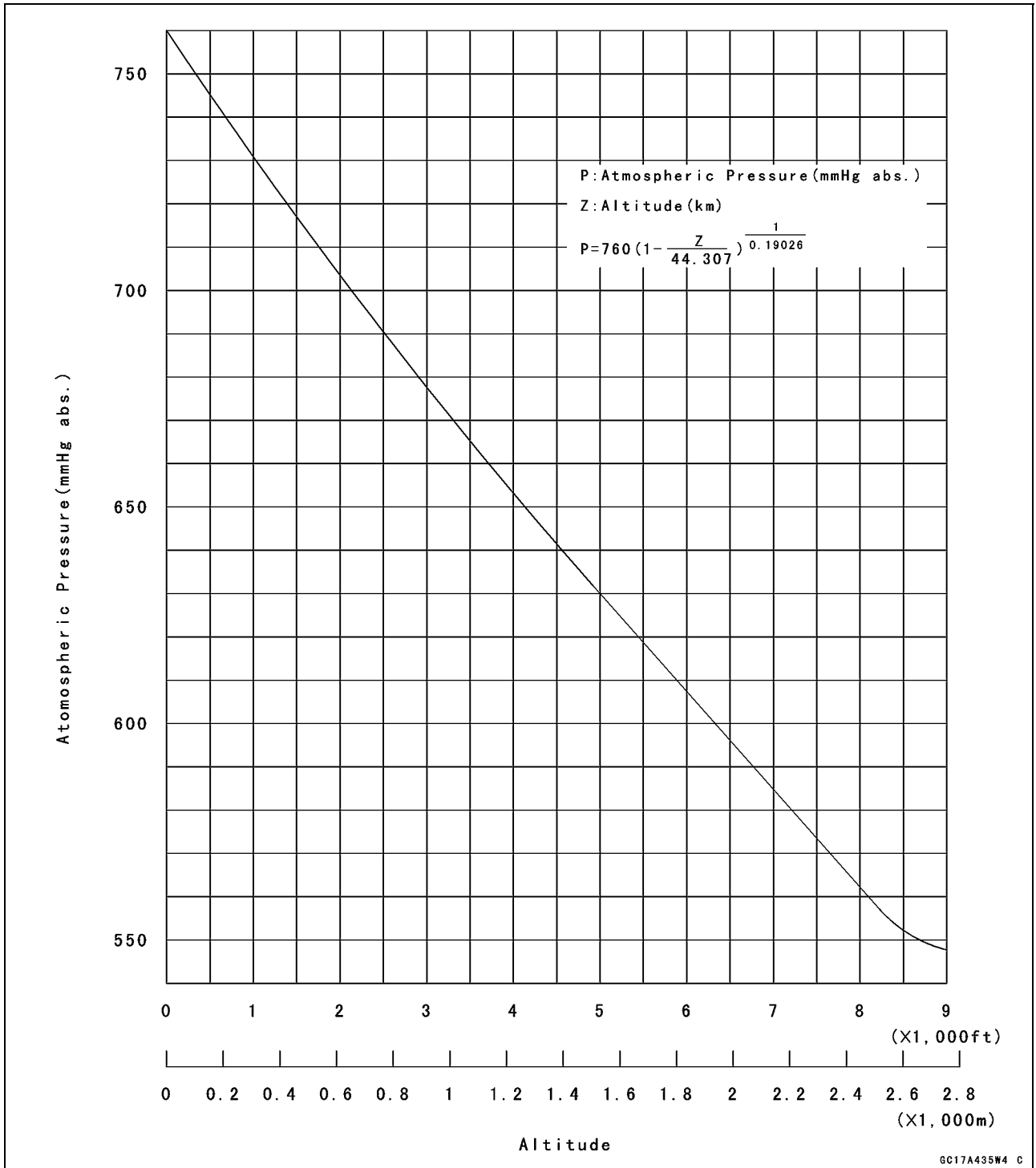
★ If the reading is out of the usable range, replace the sensor.

★ If the reading is within the usable range, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).

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

Atmospheric Pressure Sensor (Service Code 16)

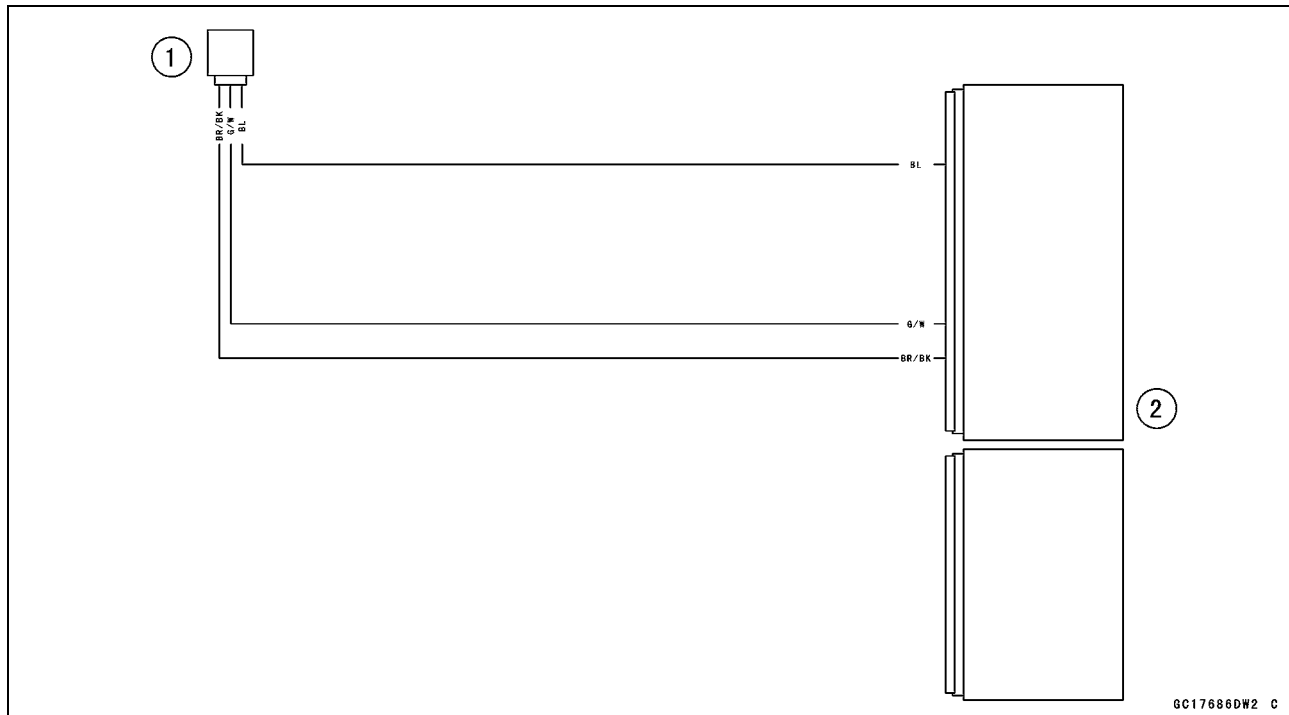
Atmospheric Pressure/Altitude Relationship



3-64 FUEL SYSTEM (DFI)

Atmospheric Pressure Sensor (Service Code 16)

Atmospheric Pressure Sensor Circuit



1. Atmospheric Pressure Sensor
2. ECU

Crankshaft Sensor (Service Code 21)

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

Crankshaft Sensor Removal/Installation

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

Crankshaft Sensor Resistance Inspection

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

Crankshaft Sensor Peak Voltage Inspection

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

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

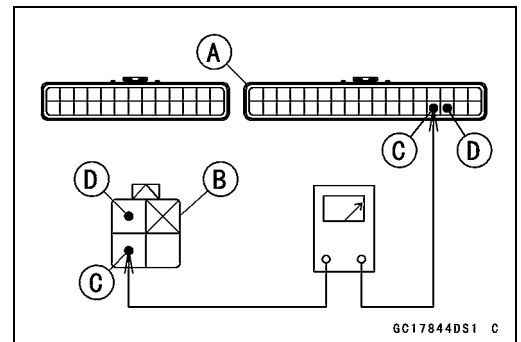
ECU Connector [A] ←→

Crankshaft Sensor Connector [B]

Y/BK lead (ECU terminal 31) [C]

BK/LG lead (ECU terminal 32) [D]

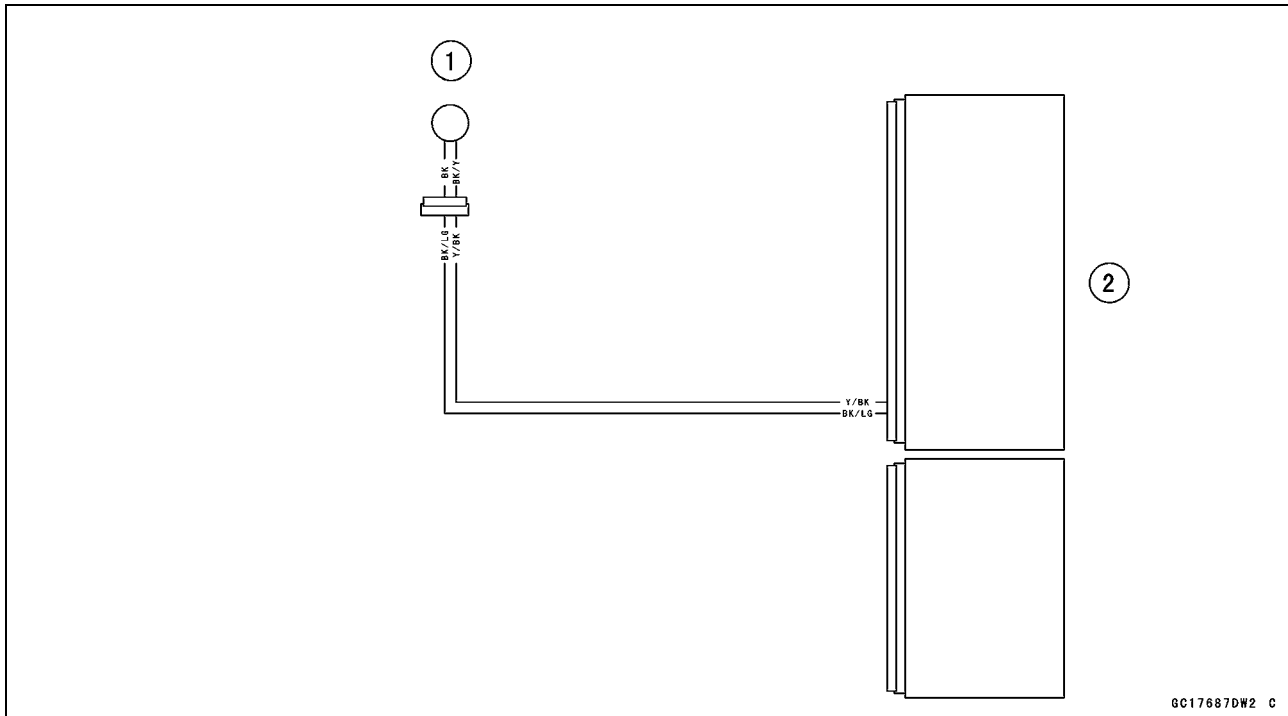
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



3-66 FUEL SYSTEM (DFI)

Crankshaft Sensor (Service Code 21)

Crankshaft Sensor Circuit



1. Crankshaft Sensor
2. ECU

Speed Sensor (Service Code 24)

Speed Sensor Removal/Installation

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

Speed Sensor Inspection

- Refer to the Speed Sensor Inspection in the Electrical System chapter.

Speed Sensor Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the speed sensor connector [A].

- Connect the harness adapter [A] between the main harness connector and speed sensor connector.

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

- Connect a digital meter to the harness adapter leads.

Speed Sensor Input Voltage

Connections to Adapter:

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

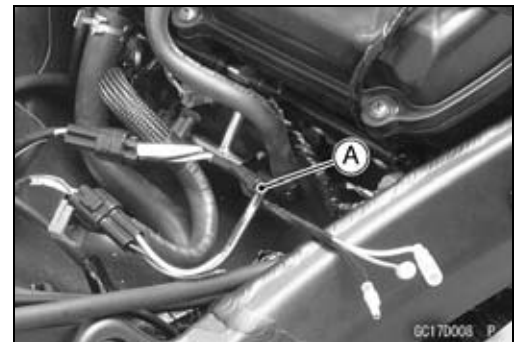
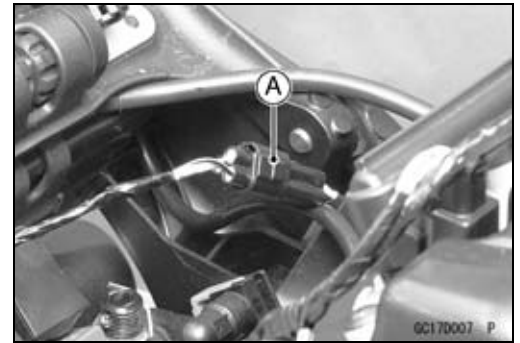
Digital Meter (-) → BK/BL (sensor BK) lead

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

Input Voltage

Standard: DC 9 ~ 11 V

- Turn the ignition switch OFF.
- ★ If the reading is within the standard, check the output voltage (see Speed Sensor Output Voltage Inspection).
- ★ If the reading is out of the range, check the wiring (see wiring diagram in this section) and meter unit (see Meter Unit Inspection in the Electrical System chapter).
- ★ If the wiring and meter unit are good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



3-68 FUEL SYSTEM (DFI)

Speed Sensor (Service Code 24)

Speed Sensor Output Voltage Inspection

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

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

Speed Sensor Output Voltage

Connections to Adapter:

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

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

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

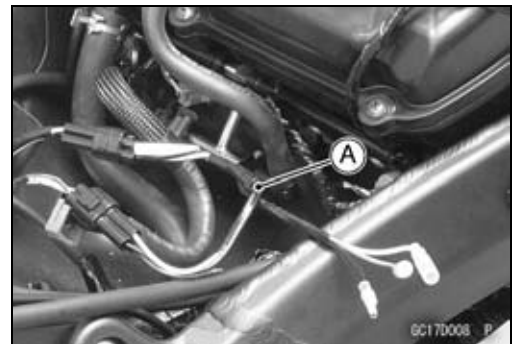
Output Voltage

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

NOTE

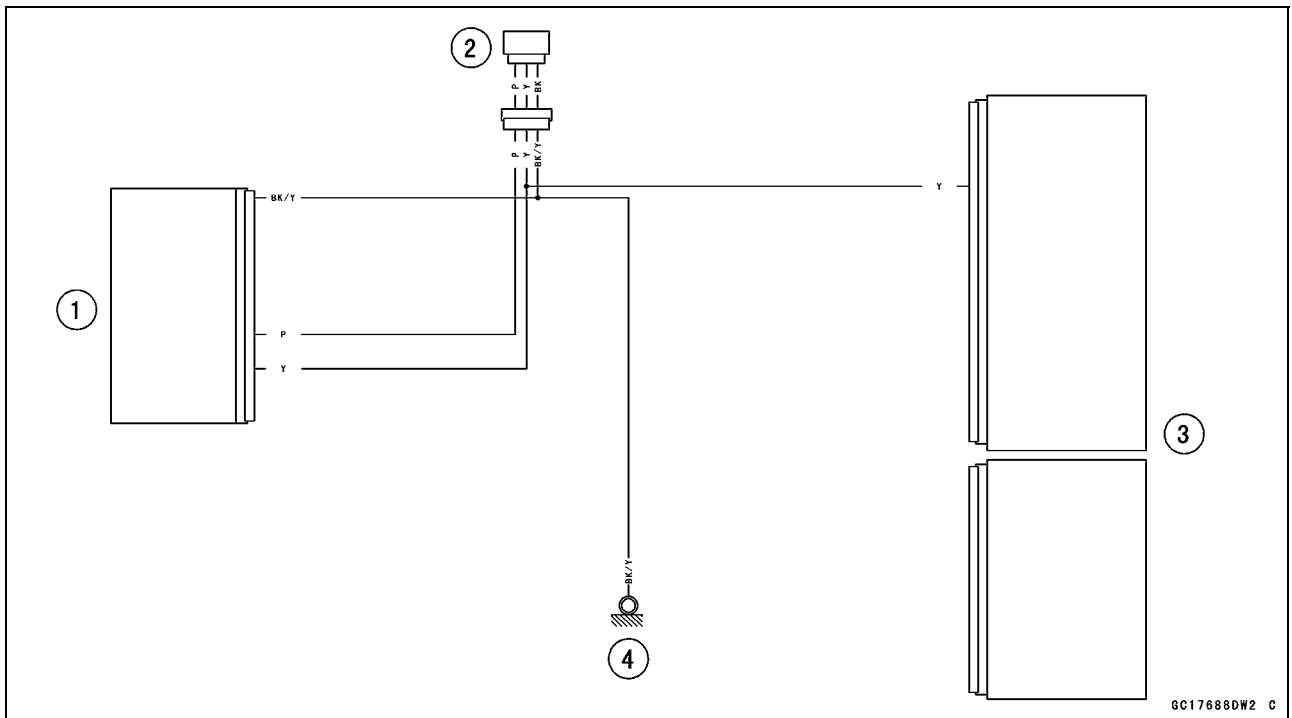
○ Rotate the rear wheel by hand, confirm the output voltage will be raise or lower.

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the wiring (see wiring diagram in this section) and speed sensor (see Speed Sensor Inspection in the Electrical System chapter).
- ★ If the wiring and speed sensor are good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



Speed Sensor (Service Code 24)

Speed Sensor Circuit



- 1. Meter Unit
- 2. Speed Sensor
- 3. ECU
- 4. Frame Ground

3-70 FUEL SYSTEM (DFI)

Gear Position Switch (Service Code 25)

Gear Position Switch Removal/Installation

- Refer to the Gear Position Switch Removal/Installation in the Electrical System chapter.

Gear Position Switch Resistance Inspection

- Refer to the Gear Position Switch Inspection in the Electrical System chapter.
- ★ If the reading is as the specified, check the output voltage (see Gear Position Switch Output Voltage Inspection).

Gear Position Switch Output Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

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

Special Tool - Needle Adapter Set: 57001-1457

Gear Position Switch Output Voltage

Connections to ECU Connector:

Digital Meter (+) → W/G lead (terminal 23)

Digital Meter (-) → Battery (-) terminal

- Measure the switch output voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.
- When changing the gear position from lower gear to higher gear, raise the rear wheel off the ground with the stand and rotate the rear wheel by hand.

Output Voltage at 1 ~ 6 Gear Positions

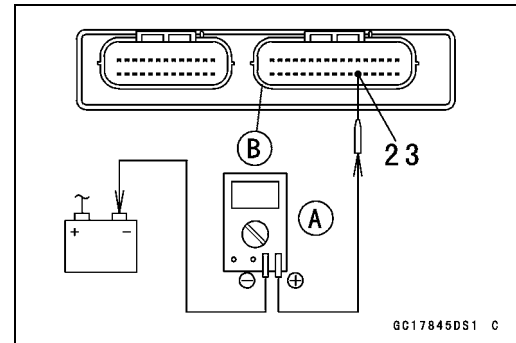
Standard:

1st	About 3.0 V
2nd	About 2.5 V
3rd	About 2.0 V
4th	About 1.5 V
5th	About 1.1 V
6th	About 0.7 V

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the wiring for continuity, using the wiring diagram in this section.

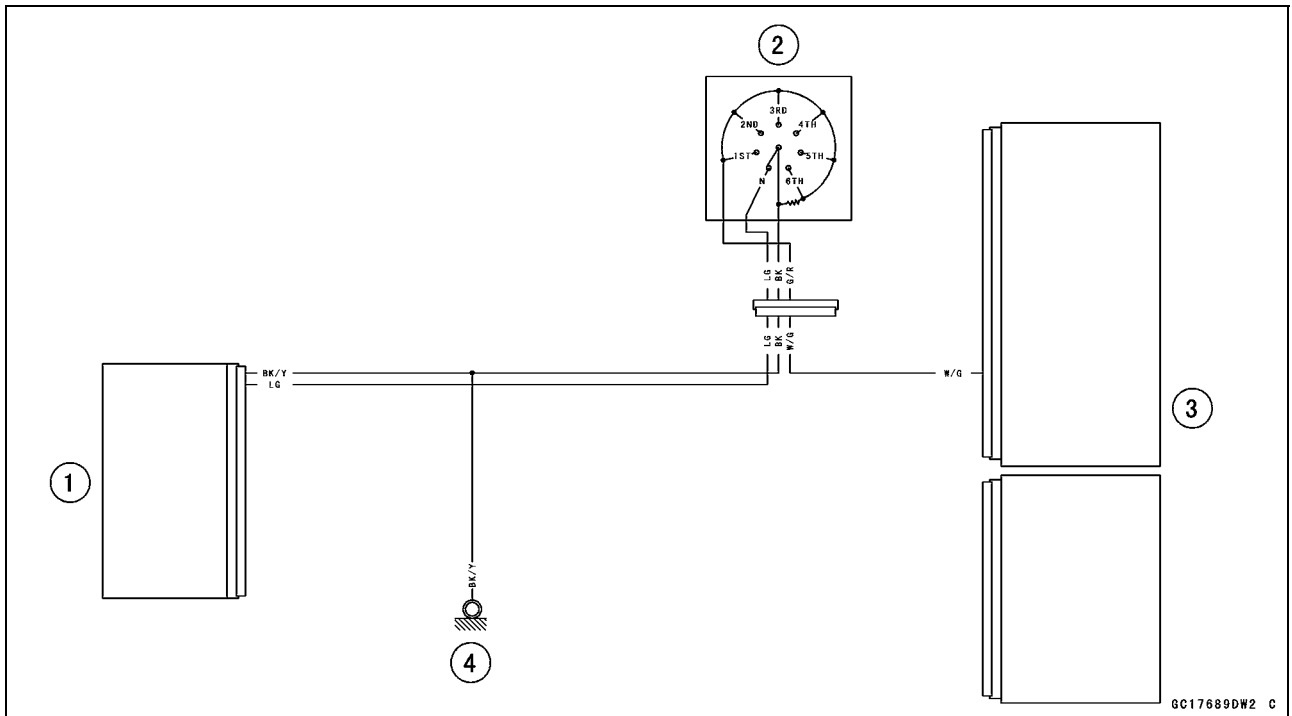
Special Tool - Hand Tester: 57001-1394

- ★ 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).



Gear Position Switch (Service Code 25)

Gear Position Switch Circuit



- 1. Meter Unit
- 2. Gear Position Switch
- 3. ECU
- 4. Frame Ground

GC17689DW2 C

3-72 FUEL SYSTEM (DFI)

Vehicle-down Sensor (Service Code 31)

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

Hall IC [B]

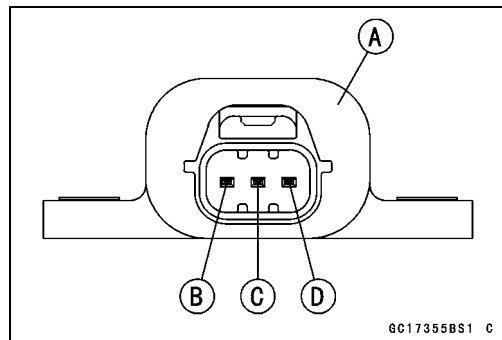
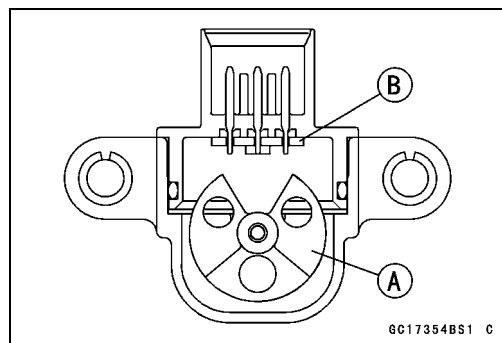
When the motorcycle is down, the ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON.

Vehicle-down Sensor [A]

Ground Terminal [B]: BR/BK

Output Terminal [C]: Y/G

Power Source Terminal [D]: BL

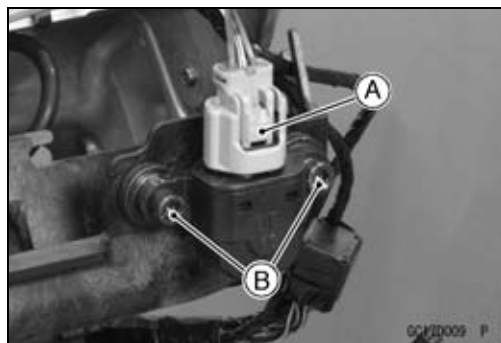


Vehicle-down Sensor Removal

CAUTION

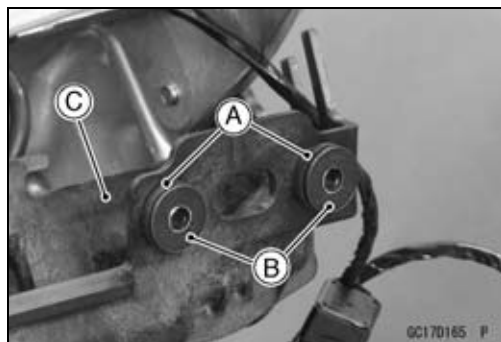
Never drop the vehicle-down sensor especially on a hard surface. Such a shock to the sensor can damage it.

- Remove:
 - Rear Seat Cover (see Seat Cover Removal in the Frame chapter)
 - Connector [A]
 - Bolts [B]
 - Vehicle-down Sensor



Vehicle-down Sensor Installation

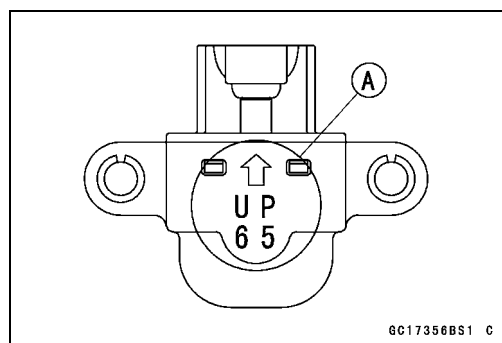
- Be sure to install the rubber dampers [A] and collars [B] on the tool kit case [C].



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

▲ 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 tool kit case.



Vehicle-down Sensor (Service Code 31)

Vehicle-down Sensor Input Voltage Inspection

NOTE

○Be sure the battery is fully charged.

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

Special Tool - Measuring Adapter: 57001-1700

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

Vehicle-down Sensor Input Voltage

Connections to Adapter:

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

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

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

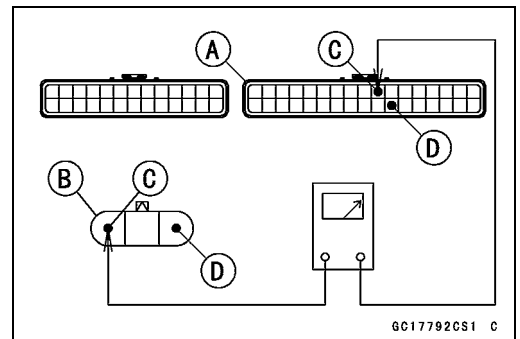
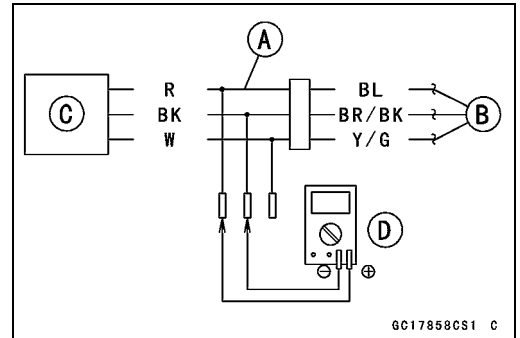
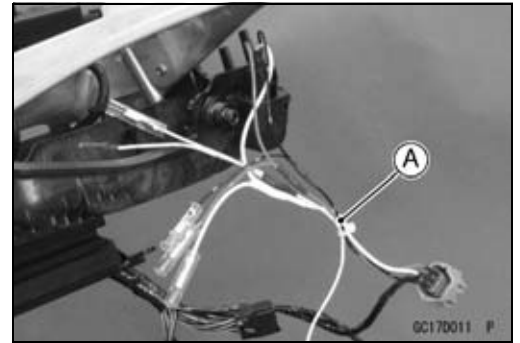
ECU Connector [A] ↔

Vehicle-down Sensor Connector [B]

BL lead (ECU terminal 10) [C]

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

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



3-74 FUEL SYSTEM (DFI)

Vehicle-down Sensor (Service Code 31)

Vehicle-down Sensor Output Voltage Inspection

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

Special Tool - Measuring Adapter: 57001-1700

Main Harness [B]

Vehicle-down Sensor [C]

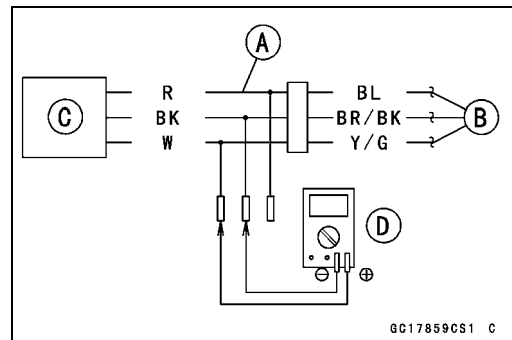
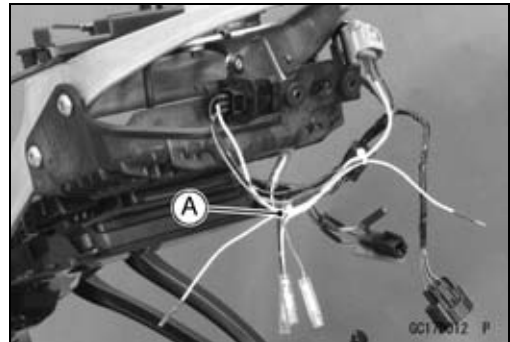
- Connect a digital meter [D] to the harness adapter leads.

Vehicle-down Sensor Output Voltage

Connections to Adapter:

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

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



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

Output Voltage

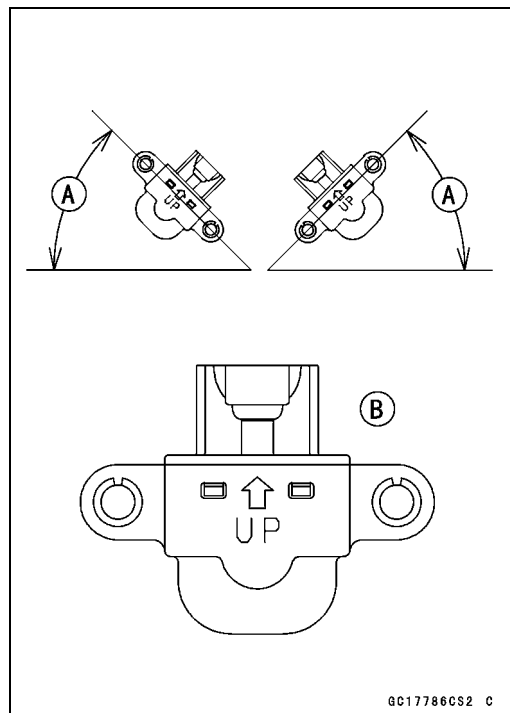
Standard: With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V

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

NOTE

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

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



Vehicle-down Sensor (Service Code 31)

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

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and sensor connectors.

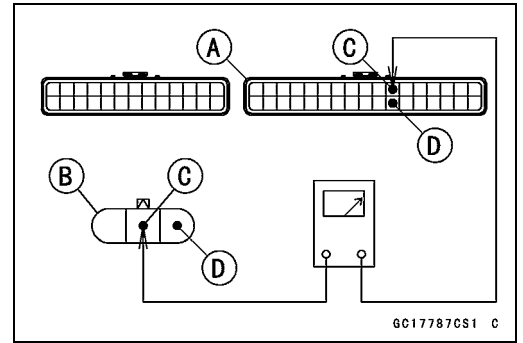
Wiring Continuity Inspection

ECU Connector [A] ↔

Vehicle-down Sensor Connector [B]

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

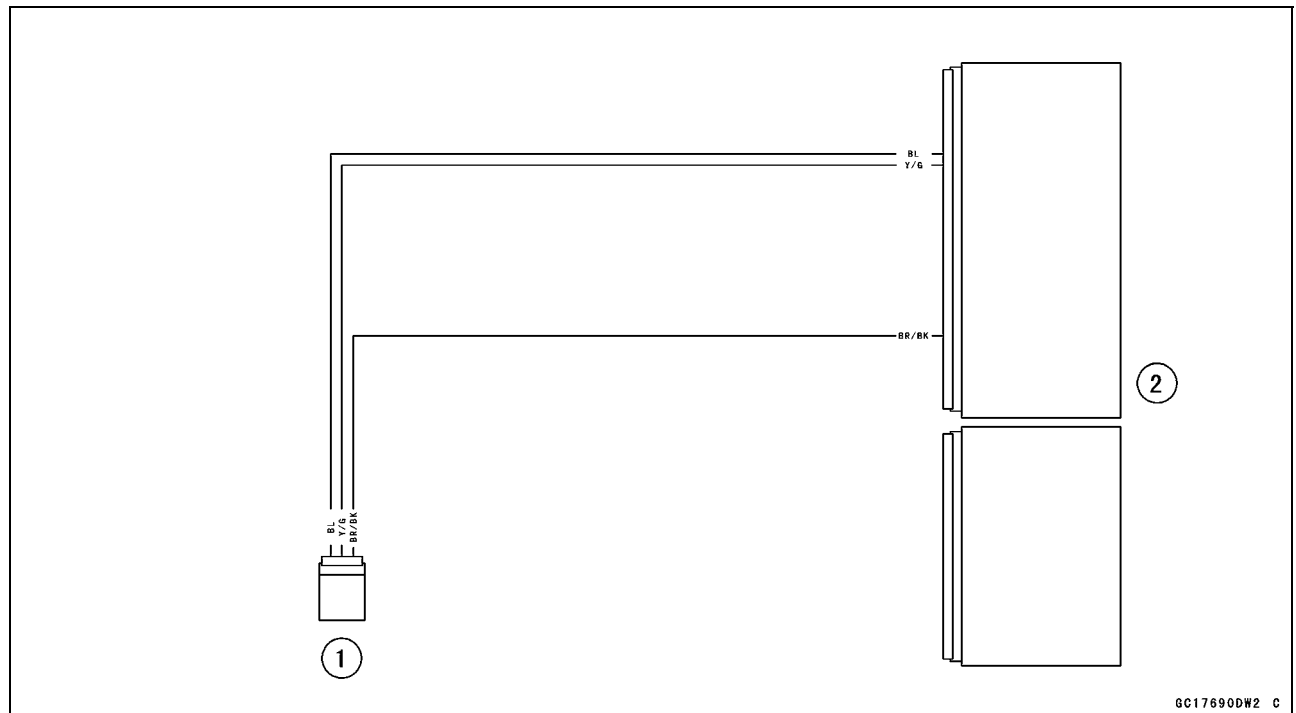
BR/BK lead (ECU terminal 28) [D]



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

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

Vehicle-down Sensor Circuit



- 1. Vehicle-down Sensor
- 2. ECU

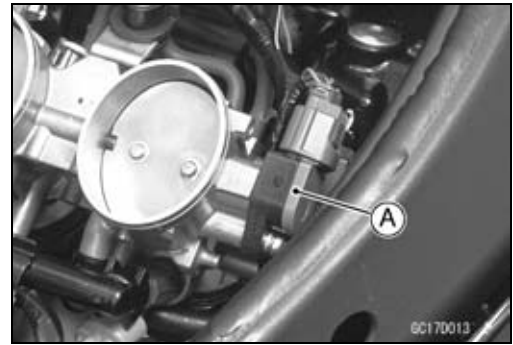
3-76 FUEL SYSTEM (DFI)

Subthrottle Sensor (Service Code 32)

Subthrottle Sensor Removal/Adjustment

CAUTION

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



Subthrottle Sensor Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the subthrottle sensor connector and connect the harness adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001-1538

- Connect a digital meter to the harness adapter leads.

Subthrottle Sensor Input Voltage

Connections to Adapter:

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

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

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

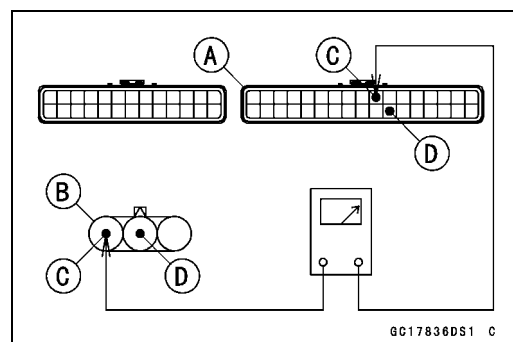
ECU Connector [A] ↔

Subthrottle Sensor Connector [B]

BL lead (ECU terminal 10) [C]

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

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



Subthrottle Sensor (Service Code 32)

Subthrottle Sensor Output Voltage Inspection

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

Special Tool - Throttle Sensor Setting Adapter: 57001-1538

Subthrottle Sensor Output Voltage Connections to Adapter:

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

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

- Disconnect the subthrottle valve actuator connector [A].



- Measure the output voltage with the engine stopped with the connector joined.
- Turn the ignition switch ON.
- Measure the output voltage when the subthrottle valves are fully opened by hand.

Output Voltage

Standard: DC 1.08 ~ 1.12 V at subthrottle valve full close position

DC 4.48 ~ 4.52 V at subthrottle valve full open position (for reference)

NOTE

- Close the subthrottle valves, confirm the output voltage will be lower.
- 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.

$$1.08 \times 4.75 \div 5.00 = 1.026 \text{ V}$$

$$1.12 \times 4.75 \div 5.00 = 1.064 \text{ V}$$

Thus, the valid range is 1.026 ~ 1.064 V

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the subthrottle sensor resistance (see Subthrottle Sensor Resistance Inspection).

3-78 FUEL SYSTEM (DFI)

Subthrottle Sensor (Service Code 32)

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

Special Tool - Hand Tester: 57001-1394

○ Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ←→

Subthrottle Sensor Connector [B]

BR lead (ECU terminal 24) [C]

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

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

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

Subthrottle Sensor Resistance Inspection

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

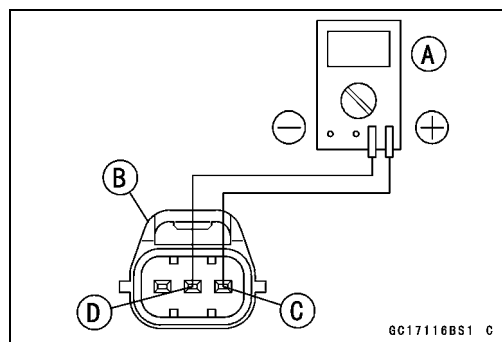
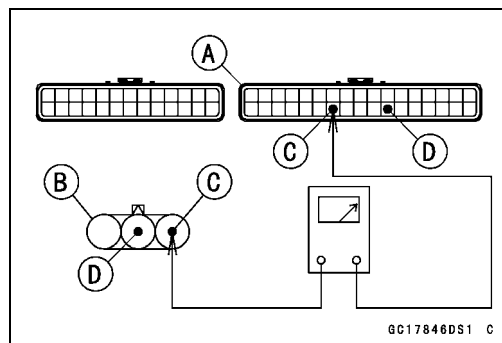
Subthrottle Sensor Resistance

Connections: BL lead [C] ←→ BR/BK lead [D]

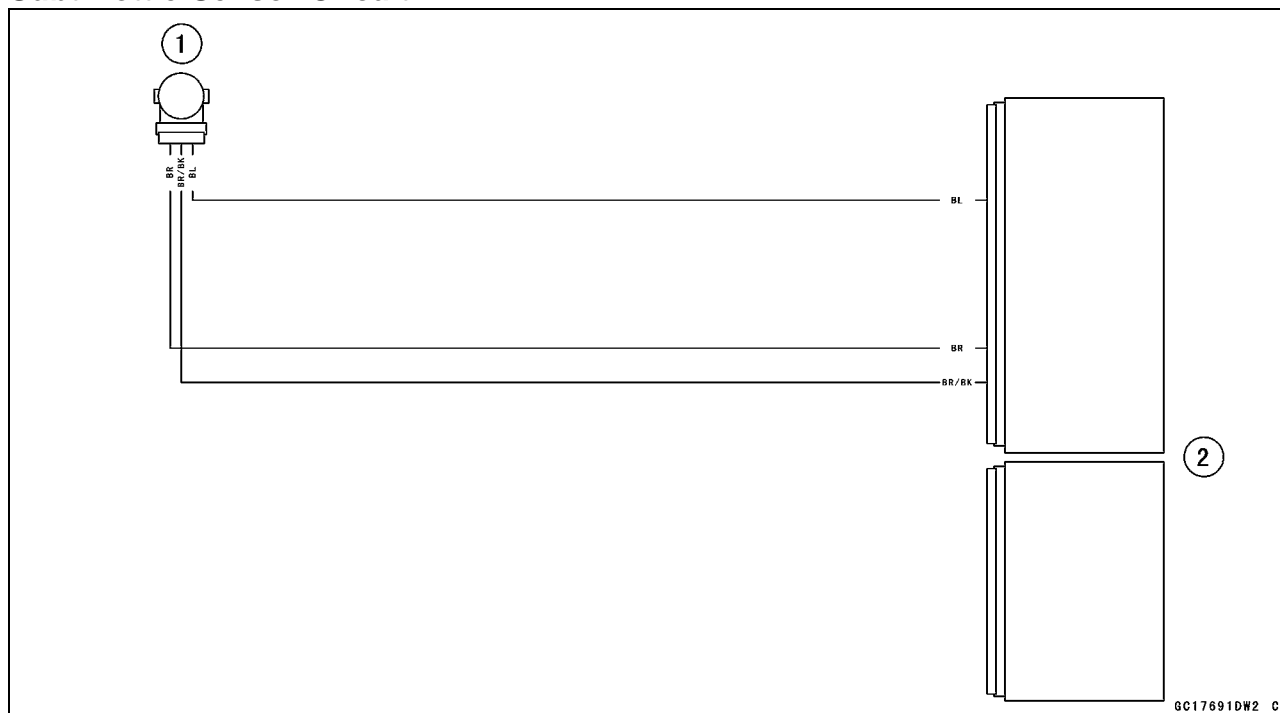
Standard: 4 ~ 6 kΩ

★ If the reading is out of the standard, replace the throttle body assy (see Throttle Body Assy Removal/Installation).

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



Subthrottle Sensor Circuit



1. Subthrottle Sensor
2. ECU

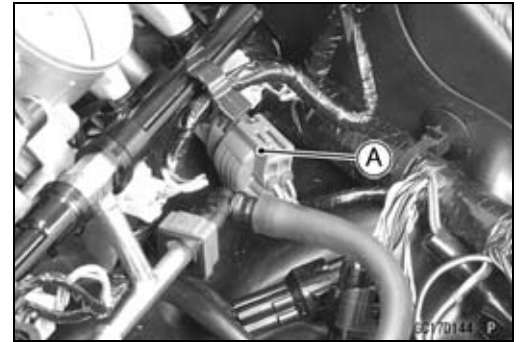
Oxygen Sensor - not activated (Service Code 33 (Equipped Models))

Oxygen Sensor Removal/Installation

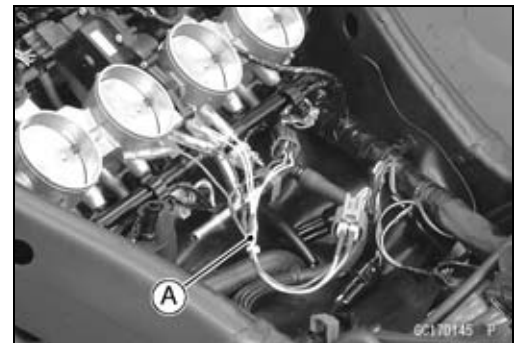
- Refer to the Oxygen Sensor Removal/Installation (Equipped Models) in the Electrical System chapter.

Oxygen Sensor Inspection

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch OFF.
- Remove:
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
 - Oxygen Sensor Lead Connector [A]



- Connect the harness adapter [A] between the main harness connector and oxygen sensor lead connector as shown in the figure.
 - Main Harness [B]
 - Oxygen Sensor [C]



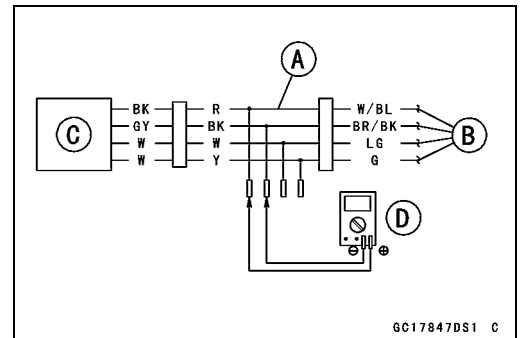
Special Tool - Measuring Adapter: 57001-1700

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

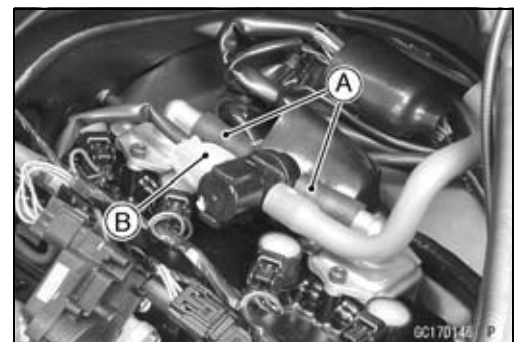
Oxygen Sensor Output Voltage

Connections to Adapter:

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



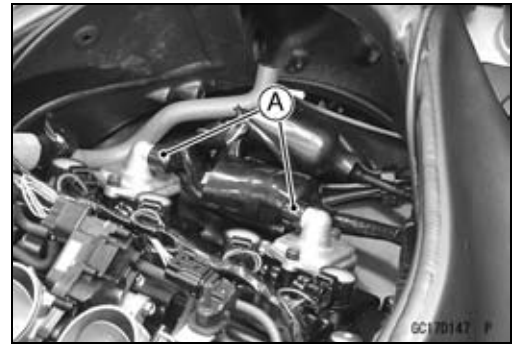
- Separate the air switching valve hoses [A] from the air suction valve covers.
- Do not disconnect the air switching valve connector [B].



3-80 FUEL SYSTEM (DFI)

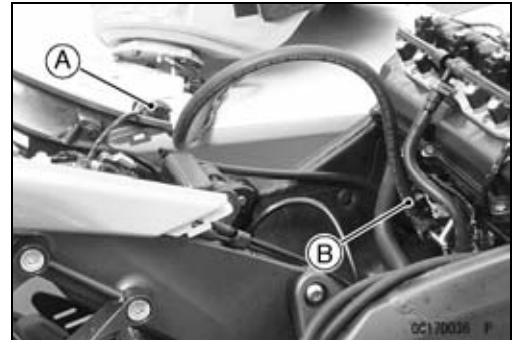
Oxygen Sensor - not activated (Service Code 33 (Equipped Models))

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



- Connect the following parts temporarily.
 - Fuel Pump Lead Connector [A]
 - Extension Tube [B]
 - Air Cleaner Housing (see Air Cleaner Housing Installation)

Special Tool - Extension Tube: 57001-1578



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

Output Voltage (with Plugs)

Standard: DC 0.8 V or more

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

Output Voltage (without Plugs)

Standard: DC 0.24 V or less

- Turn the ignition switch OFF.



- ★ If the reading is out of the standard (with plugs: DC 0.8 V or more, without plugs: DC 0.24 V or less), remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

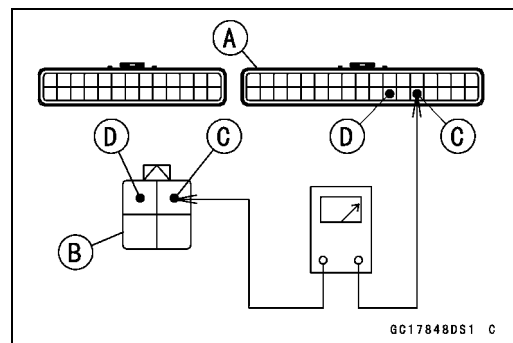
ECU Connector [A] ←→

Oxygen Sensor Connector [B]

W/BL lead (ECU terminal 30) [C]

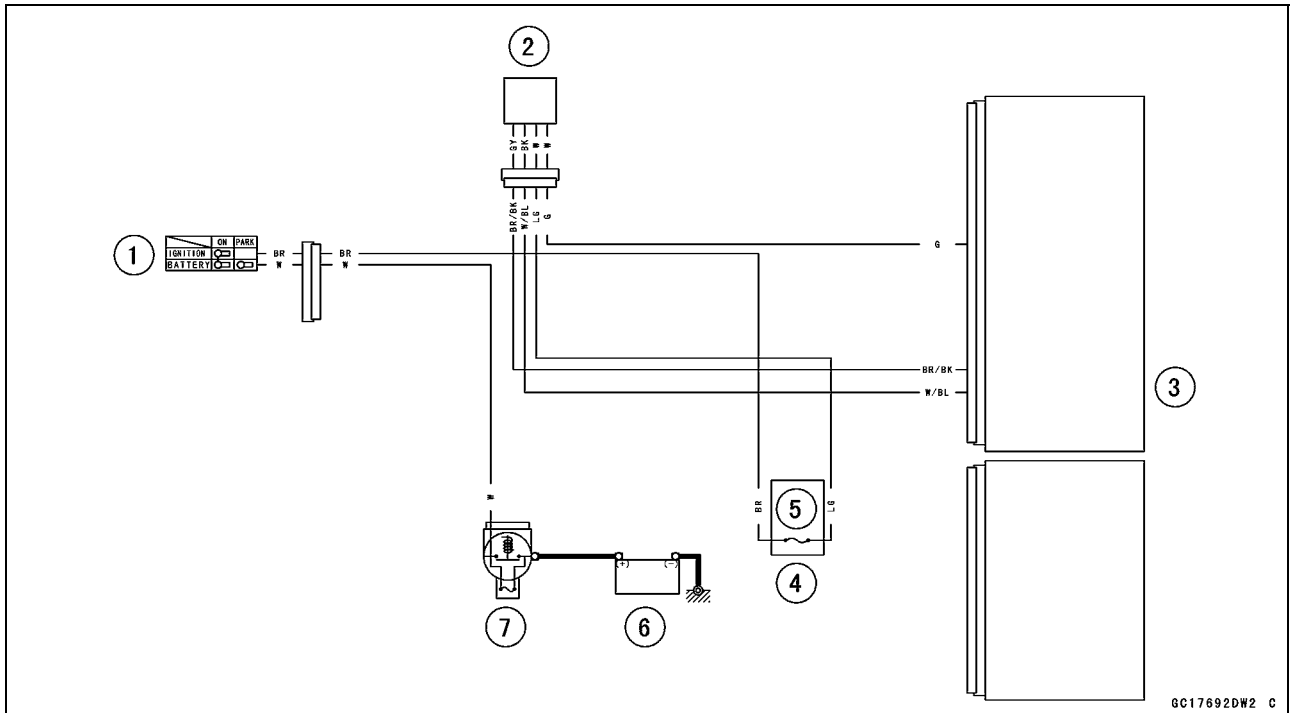
BR/BK lead (ECU terminal 28) [D]

- ★ If the wiring is good, replace the sensor.
- ★ If the reading is within the standard (with plugs: DC 0.8 V or more, without plugs: DC 0.24 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



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

Oxygen Sensor Circuit



GC17692DW2 C

1. Ignition Switch
2. Oxygen Sensor
3. ECU
4. Fuse Box
5. Oxygen Sensor Heater Fuse 10 A
6. Battery 12 V 8 Ah
7. Main Fuse 30 A

3-82 FUEL SYSTEM (DFI)

Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

Exhaust Butterfly Valve Actuator Sensor Removal/Installation

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

Exhaust Butterfly Valve Actuator Sensor Input Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect the exhaust butterfly valve actuator sensor lead connector (3 pins connector) [A] and connect the harness adapter [B] between these connector.

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

- Connect a digital meter to the harness adapter leads.

Exhaust Butterfly Valve Actuator Sensor Input Voltage Connections to Adapter:

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

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

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

Special Tool - Hand Tester: 57001-1394

Wiring Continuity Inspection

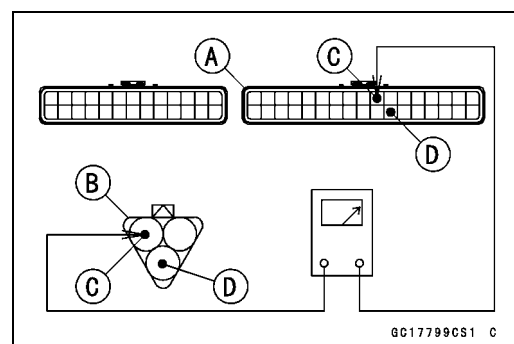
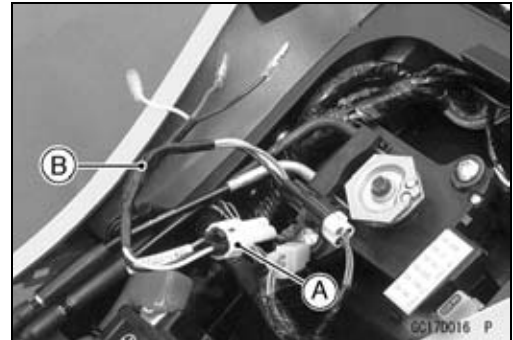
ECU Connector [A] ↔

Exhaust Butterfly Valve Actuator Sensor Connector [B]

BL lead (ECU terminal 10) [C]

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

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



Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

Exhaust Butterfly Valve Actuator Sensor Output Voltage Inspection

NOTE

○ Before this inspection, confirm the pulley [A] is original position (see Exhaust Butterfly Valve Actuator Installation).

- Disconnect:
 - 2 pins Connector [B]
 - 3 pins Connector [C]
- Connect the harness adapter [A] between the 3 pins connectors.

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

- Connect a digital meter to the harness adapter leads.

Exhaust Butterfly Valve Actuator Sensor Output Voltage Connections to Adapter:

- Digital Meter (+) → BL (actuator Y) lead
- Digital Meter (-) → BK/BL (actuator BK) lead

- Measure the output voltage at the 3 pins connector of the exhaust butterfly valve actuator when the pulley is original position.
- Turn the ignition switch ON.

Output Voltage

Standard: DC 3.46 ~ 3.76 V at pulley original position

- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the exhaust butterfly valve actuator sensor resistance (see Exhaust Butterfly Valve Actuator Sensor Resistance Inspection).
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

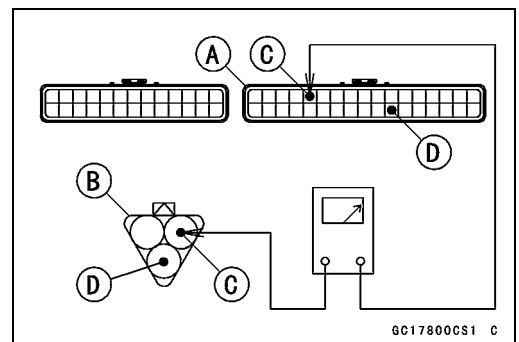
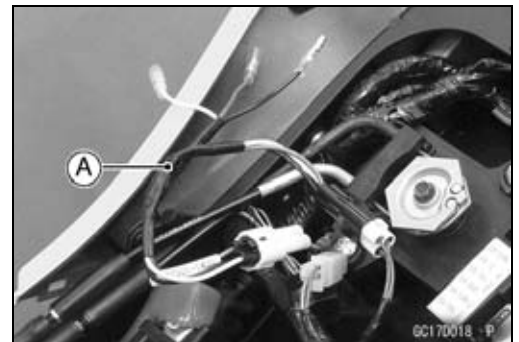
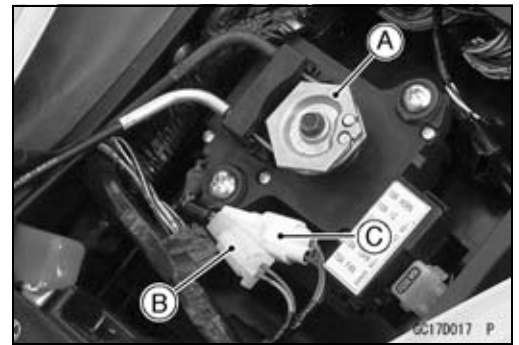
ECU Connector [A] ↔

Exhaust Butterfly Valve Actuator Sensor Connector [B]

R/BK lead (ECU terminal 5) [C]

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

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



3-84 FUEL SYSTEM (DFI)

Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

Exhaust Butterfly Valve Actuator Sensor Resistance Inspection

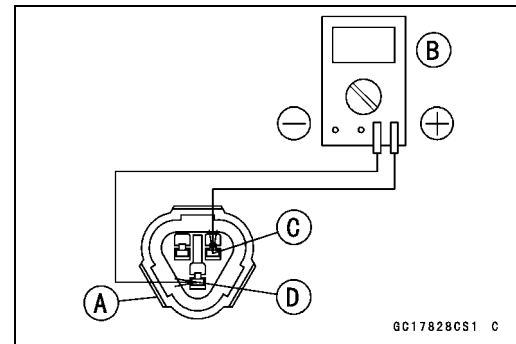
- Turn the ignition switch OFF.
- Disconnect the exhaust butterfly valve actuator sensor connector (3 pins connector) [A].
- Connect a digital meter [B] to the exhaust butterfly valve actuator sensor connector.
- Measure the exhaust butterfly valve actuator sensor resistance.

Exhaust Butterfly Valve Actuator Sensor Resistance

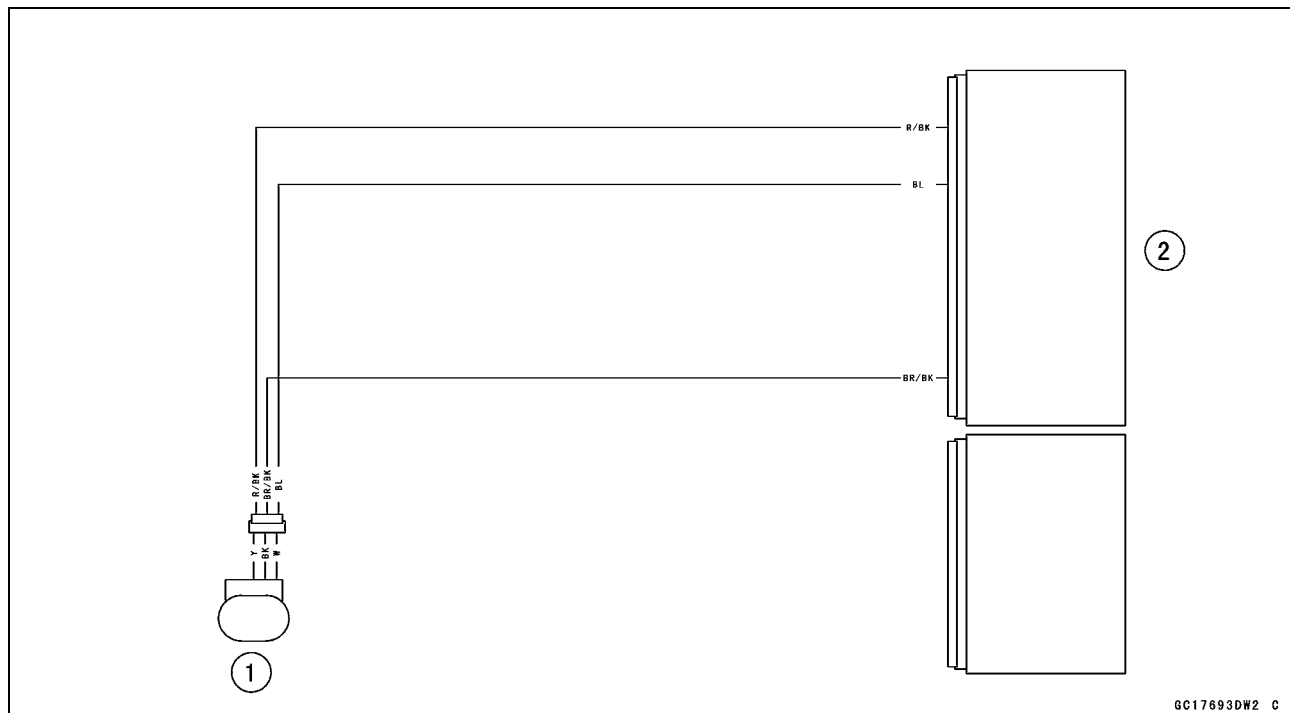
Connections: W lead [C] ↔ BK lead [D]

Standard: 4 ~ 6 kΩ

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



Exhaust Butterfly Valve Actuator Sensor Circuit



1. Exhaust Butterfly Valve Actuator
2. ECU

Immobilizer Amplifier (Service Code 35 (Equipped Models))

Antenna Resistance Inspection

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the antenna lead connector [A].
- Measure the antenna resistance.

Antenna Resistance

Connections: BK lead ↔ BK lead

Standard: About 0.6 ~ 0.9 Ω

- ★ If the reading is out of the standard, replace the antenna (see Immobilizer System Parts Replacement in the Electrical System chapter).
- ★ If the reading is within the standard, check the wiring to the amplifier (see wiring diagram in next section).
- ★ If the wiring is good, check the input voltage of the amplifier (see Amplifier Input Voltage Inspection).



Amplifier Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Pull out the immobilizer amplifier [A] with the rubber protector [B] from the projections [C].
- Connect a digital meter to the amplifier connector [D] with needle adapter set.

Special Tool - Needle Adapter Set: 57001-1457

Amplifier Input Voltage

Connections to Amplifier Connector:

Digital Meter (+) → BR/W lead

Digital Meter (-) → BK/Y lead

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

Input Voltage

Standard: Battery Voltage

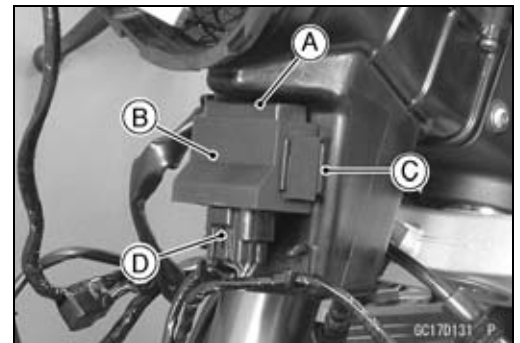
- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, check the wiring (see wiring diagram in next section).

Special Tool - Hand Tester: 57001-1394

- ★ If the reading is within the standard, check the wiring to ECU (see wiring diagram in next section).

Special Tool - Hand Tester: 57001-1394

- ★ If the wiring is good, replace the amplifier (see Immobilizer System Parts Replacement in the Electrical System chapter).



3-86 FUEL SYSTEM (DFI)

Blank Key Detection (Service Code 36 (Equipped Models))

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

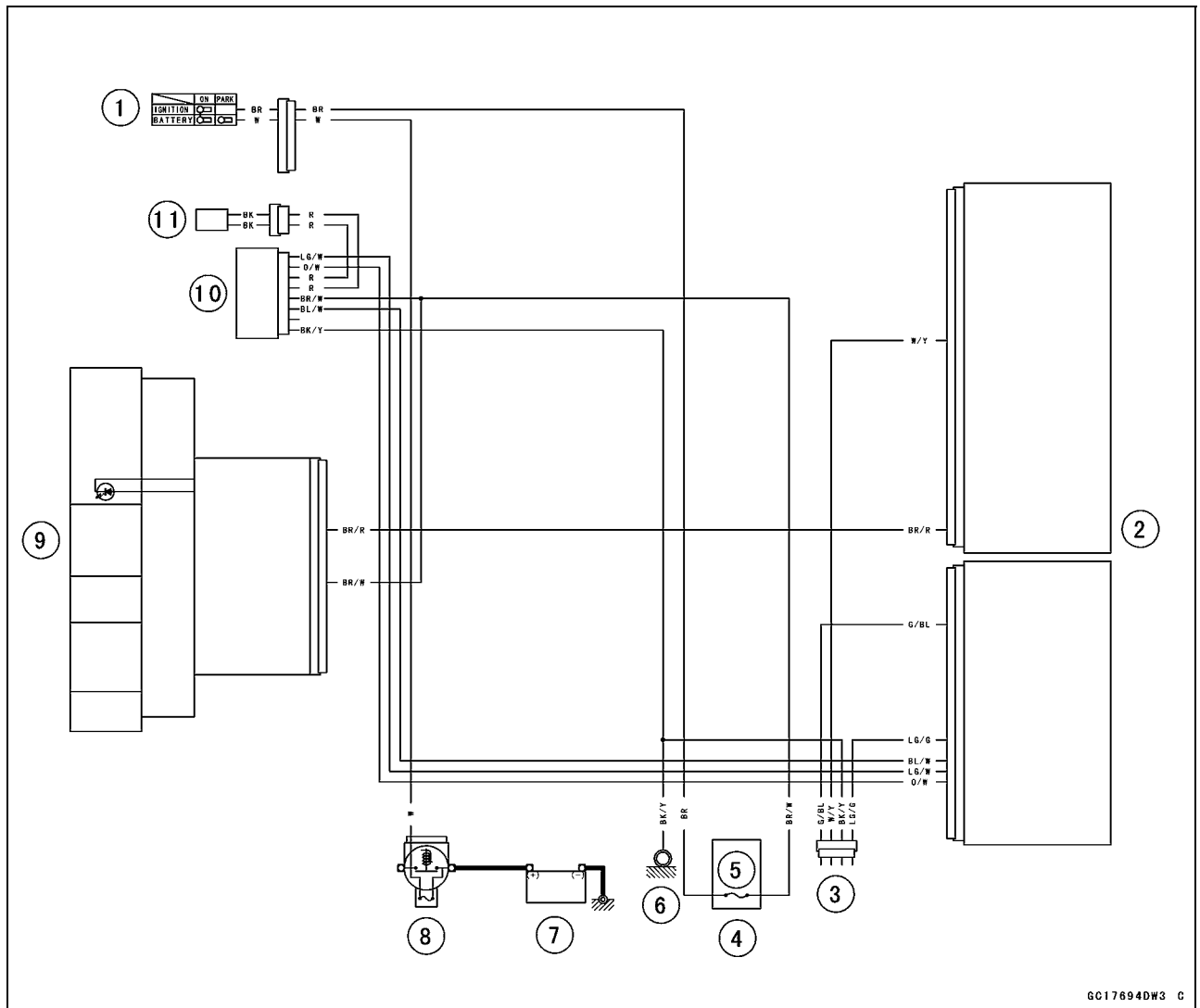


User Key Inspection

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

Blank Key Detection (Service Code 36 (Equipped Models))

Immobilizer System Circuit



GC17694DW3 C

1. Ignition Switch
2. ECU
3. Immobilizer/Kawasaki Diagnostic System Connector
4. Fuse Box
5. Ignition Fuse 15 A
6. Frame Ground
7. Battery 12 V 8 Ah
8. Main Fuse 30 A
9. Meter Unit
10. Immobilizer Amplifier
11. Immobilizer Antenna

3-88 FUEL SYSTEM (DFI)

ECU Communication Error (Service Code 39)

ECU Communication Line Inspection

○When the data is not sent from the ECU to the meter unit for more than about 10 seconds, the service code 39 is displayed.

○The service code 39 is detected with meter unit.

●Remove the ECU and meter unit, check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and meter unit connectors.

Wiring Continuity Inspection

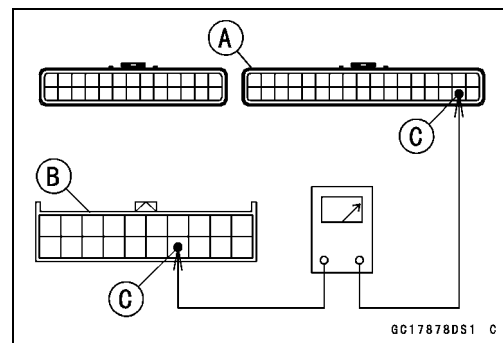
ECU Connector [A] ←→

Meter Unit Connector [B]

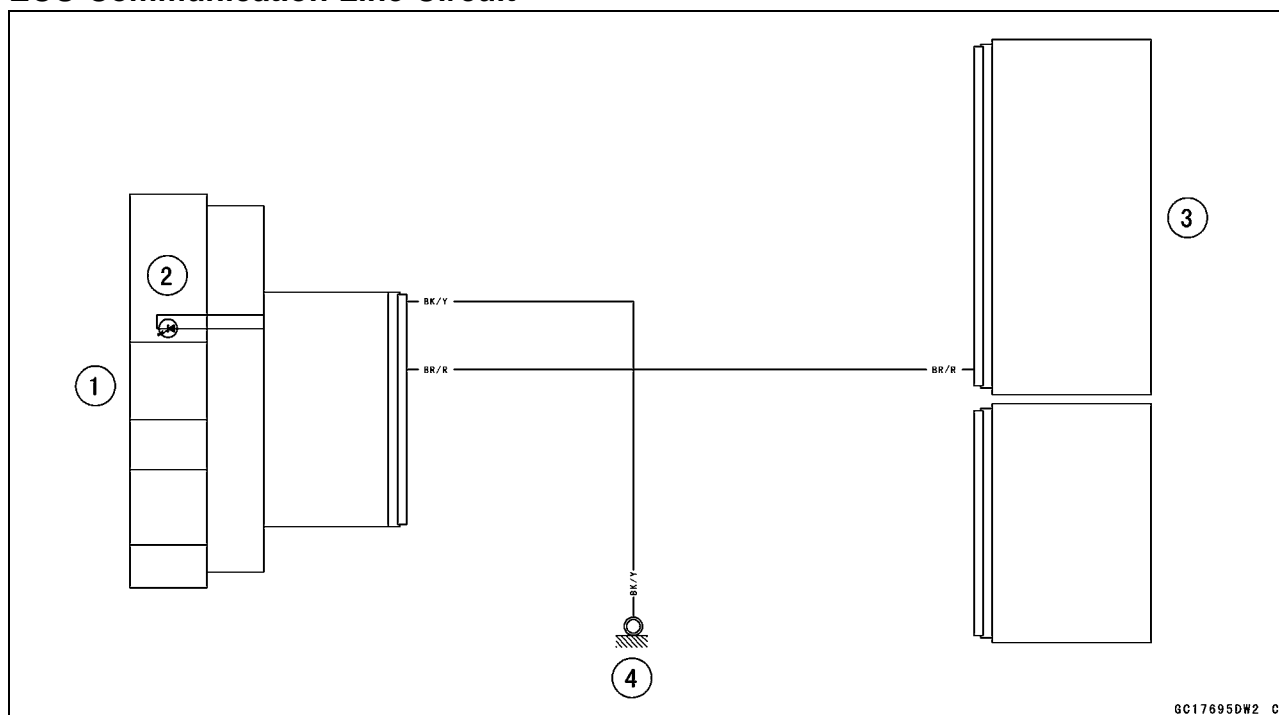
BR/R lead (ECU terminal 33) [C]

★If the wiring is good, check the meter unit (see Meter Unit Inspection in the Electrical System chapter).

★If the meter unit is normal, replace the ECU (see ECU Removal/Installation).



ECU Communication Line Circuit



1. Meter Unit
2. Warning Indicator Light (LED)
3. ECU
4. Frame Ground

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

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

Stick Coil Removal/Installation

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

Stick Coil Primary Winding Resistance Inspection

- Refer to the Stick Coil Inspection in the Electrical System chapter.
- ★ If the reading is within the standard, check the input voltage (see Stick Coil Input Voltage Inspection).

Stick Coil Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

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

Special Tool - Needle Adapter Set: 57001-1457

Stick Coil Input Voltage

Connections to ECU Connector:

For Stick Coil #1

- Digital Meter (+) → BK lead (terminal 47)
- Digital Meter (-) → BK/Y lead (terminal 59)

For Stick Coil #2

- Digital Meter (+) → BK/G lead (terminal 46)
- Digital Meter (-) → BK/Y lead (terminal 59)

For Stick Coil #3

- Digital Meter (+) → BK/W lead (terminal 45)
- Digital Meter (-) → BK/Y lead (terminal 59)

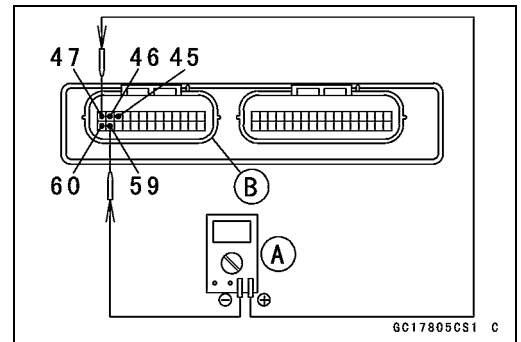
For Stick Coil #4

- Digital Meter (+) → BK/O lead (terminal 60)
- Digital Meter (-) → BK/Y lead (terminal 59)

- Measure the input voltage to each primary winding of the stick coils with the engine stopped and with the connectors joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

Input Voltage

Standard: Battery Voltage



3-90 FUEL SYSTEM (DFI)

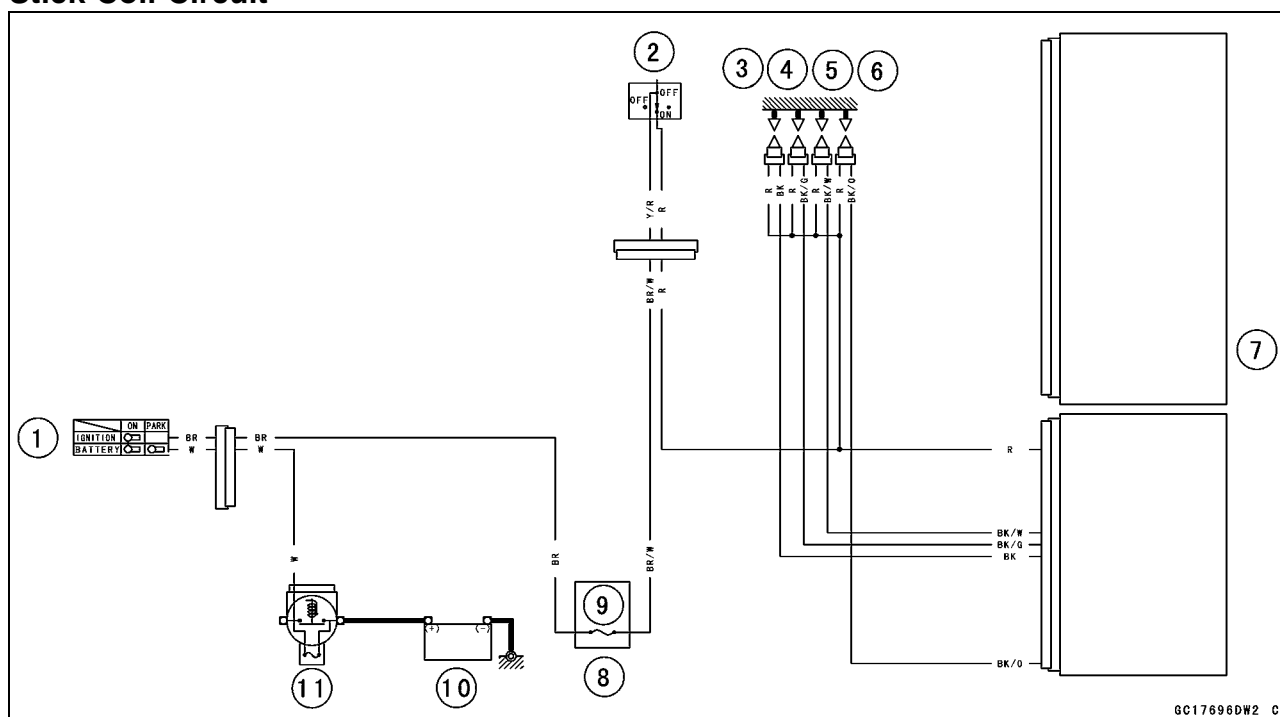
Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54)

- Turn the ignition switch OFF.
- ★ If the input voltage is out of the standard, check the wiring for continuity (see wiring diagram in this section).

Special Tool - Hand Tester: 57001-1394

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

Stick Coil Circuit

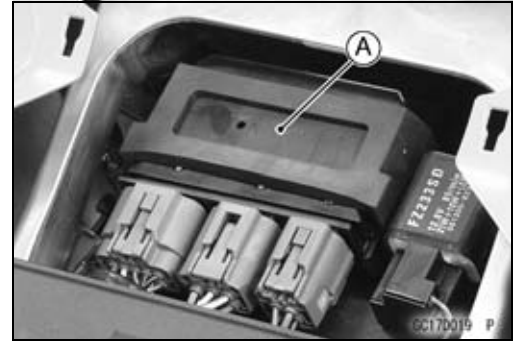


1. Ignition Switch
2. Engine Stop Switch
3. Stick Coil #1
4. Stick Coil #2
5. Stick Coil #3
6. Stick Coil #4
7. ECU
8. Fuse Box
9. Ignition Fuse 15 A
10. Battery 12 V 8 Ah
11. Main Fuse 30 A

Radiator Fan Relay (Service Code 56)

Radiator Fan Relay Removal/Installation

- The radiator fan relay is built in the relay box [A].
- Refer to the Relay Box Removal in the Electrical System chapter.



Radiator Fan Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.
 - ★If the radiator fan relay is normal, check the wiring for continuity (see wiring diagram in this section).
- Special Tool - Hand Tester: 57001-1394**
- ★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
 - ★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Removal

CAUTION

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

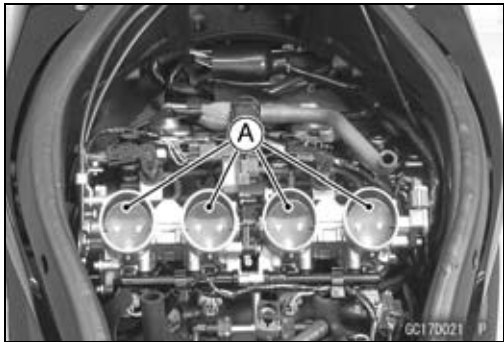


Subthrottle Valve Actuator Inspection

NOTE

○ Be sure the battery is fully charged.

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Turn the ignition switch ON.
- Check to see that all the subthrottle valves [A] open and close smoothly.
- Turn the ignition switch OFF.
- ★ If the subthrottle valves do not operate, check the subthrottle valve actuator resistance (see Subthrottle Valve Actuator Resistance Inspection).



Subthrottle Valve Actuator Resistance Inspection

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the subthrottle valve actuator connector [A].



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

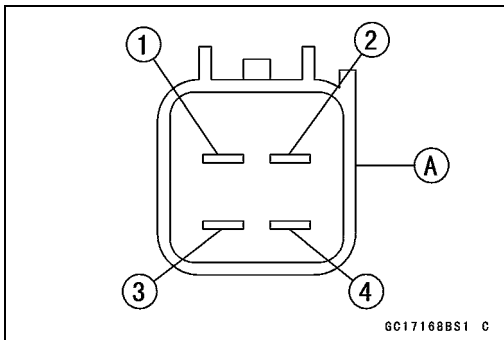
Subthrottle Valve Actuator Resistance

Connections: Y/R lead [1] ↔ R/Y lead [2]

W/R lead [3] ↔ R/W lead [4]

Standard: About 5.2 ~ 7.8 Ω

- ★ If the reading is out of the standard, replace the throttle body assy (see Throttle Body Assy Removal/Installation).
- ★ If the reading is within the standard, check the input voltage (see Subthrottle Valve Actuator Input Voltage Inspection).



3-94 FUEL SYSTEM (DFI)

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Input Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the subthrottle valve actuator connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]

Subthrottle Valve Actuator [C]

Special Tool - Measuring Adapter: 57001-1700

- Connect the peak voltage adapter [D] and a digital meter [E] to the harness adapter leads.

Special Tool - Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B

Subthrottle Valve Actuator Input Voltage Connections to Adapter:

- (I) Digital Meter (+) → R (actuator Y/R) lead
Digital Meter (-) → BK (actuator R/Y) lead
- (II) Digital Meter (+) → W (actuator W/R) lead
Digital Meter (-) → Y (actuator R/W) lead

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

Input Voltage

Standard: About DC 8.5 ~ 10.5 V

- Turn the ignition switch OFF.
- ★ If the reading is in specification, but the actuator does not operate, replace the throttle body assy (see Throttle Body Assy Removal/Installation).
- ★ If the reading is out of the specification, remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and actuator connectors.

Wiring Continuity Inspection

ECU Connector [A] ↔

Subthrottle Valve Actuator Connector [B]

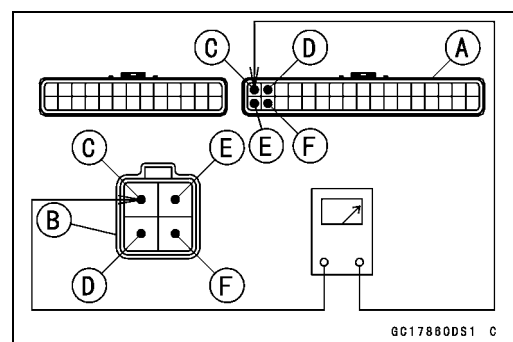
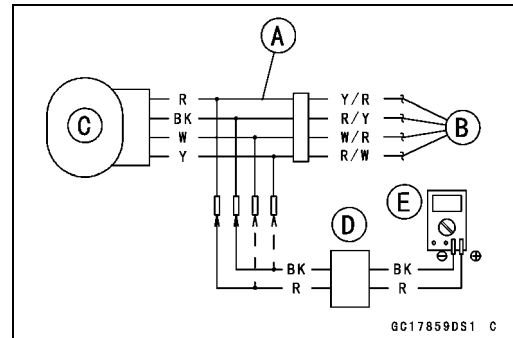
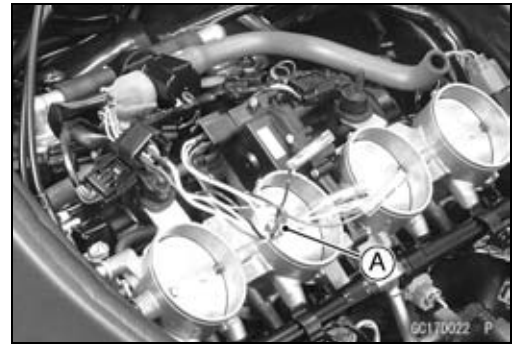
R/Y lead (ECU terminal 1) [C]

R/W lead (ECU terminal 2) [D]

Y/R lead (ECU terminal 18) [E]

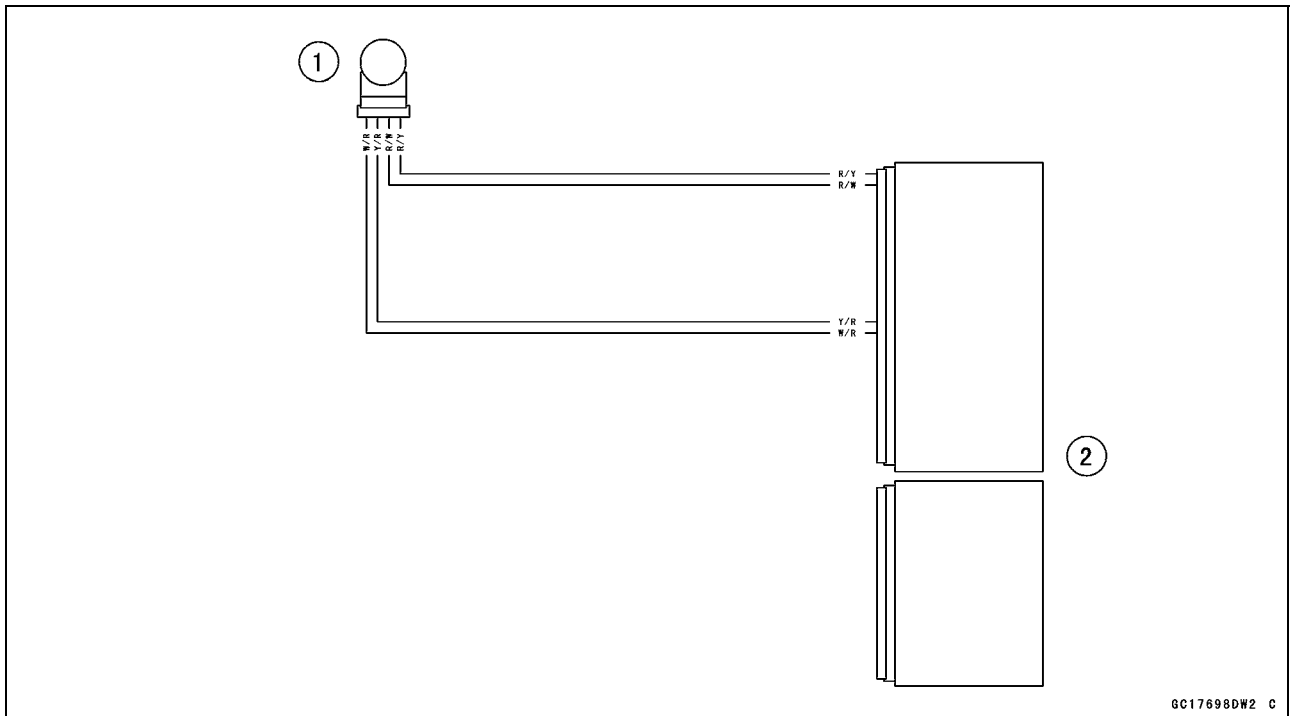
W/R lead (ECU terminal 19) [F]

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



Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Circuit



- 1. Subthrottle Valve Actuator
- 2. ECU

3-96 FUEL SYSTEM (DFI)

Exhaust Butterfly Valve Actuator (Service Code 63)

Exhaust Butterfly Valve Actuator Removal

CAUTION

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

- Remove:
 - Exhaust Butterfly Valve Cable Upper Ends (see Exhaust Butterfly Valve Cable Removal in the Engine Top End chapter)
 - Connectors [A]
 - Screws [B]
 - Exhaust Butterfly Valve Actuator [C]
- Remove the pulley bolt while holding the pulley [A] with the suitable tool [B].

CAUTION

If the pulley bolt is removed without holding, the actuator damage will occur.

- Remove the pulley from the actuator.

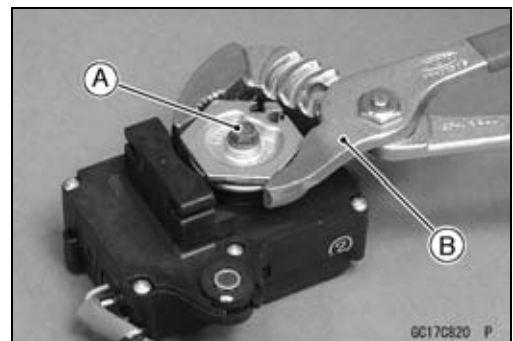
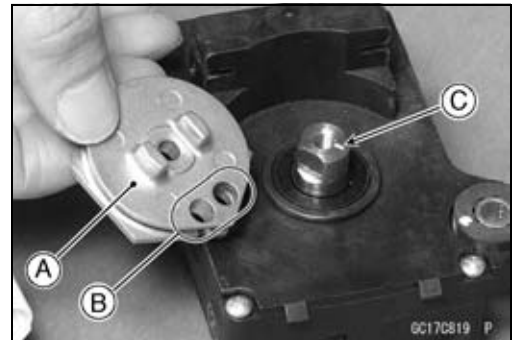
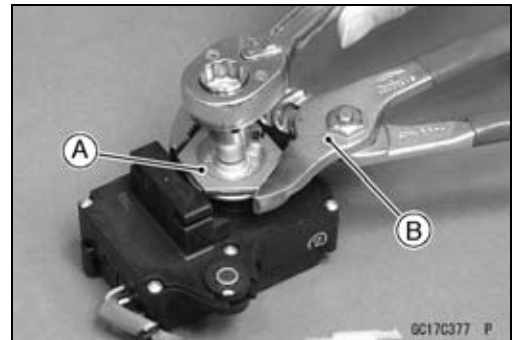
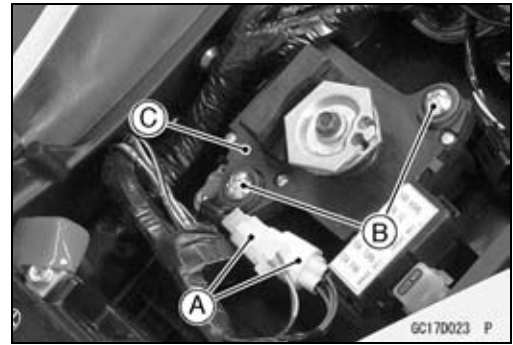
Exhaust Butterfly Valve Actuator Installation

- Install the pulley [A] on the actuator so that the hole side [B] align with the groove [C] on the shaft.
- Tighten the pulley bolt [A] while holding the pulley with the suitable tool [B].

Torque - Exhaust Butterfly Valve Actuator Pulley Bolt: 4.9 N-m (0.50 kgf-m, 43 in-lb)

CAUTION

If the pulley bolt is tightened without holding, the actuator damage will occur.

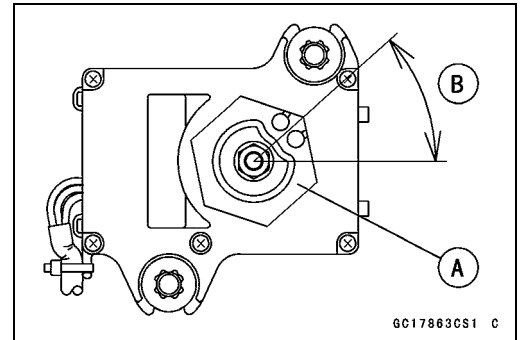


Exhaust Butterfly Valve Actuator (Service Code 63)

- After tightening the pulley bolt, confirm whether pulley [A] is an angle shown in the figure.
41.7° ±0.7° [B]
- This position is original position of the pulley.

NOTE

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



CAUTION

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

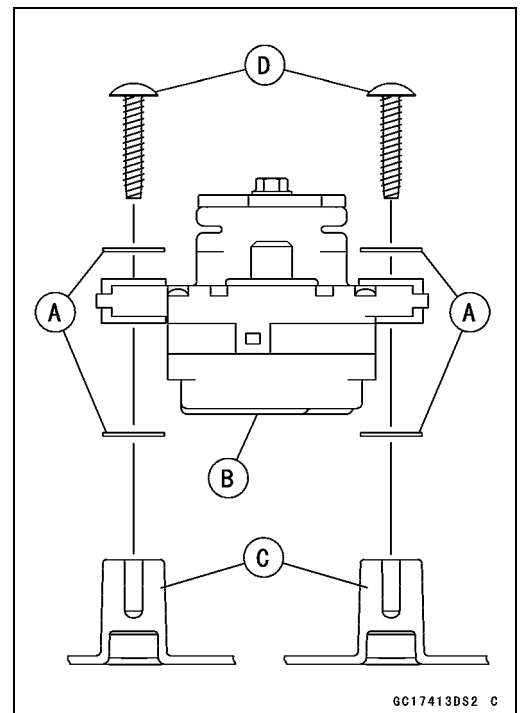
- ★ If the pulley angle is wrong, adjust the angle as follows.
- Connect:
 - 2 pins Connector
 - 3 pins Connector
- Turn the ignition switch ON.
- The pulley turns clockwise and then counterclockwise, and clockwise again.
- Turn the ignition switch OFF.
- Confirm that the pulley turns counterclockwise and the pulley returns to the original position.
- ★ If the position is not within the specified angle above, replace the exhaust butterfly valve actuator.

- Be sure to install the washers [A] on the exhaust butterfly valve actuator [B] and rear fender [C].

- Tighten:

Torque - Exhaust Butterfly Valve Actuator Mounting Screws [D]: 4.3 N·m (0.44 kgf·m, 38 in·lb)

- Install the upper ends of the exhaust butterfly valve cables and adjust them (see Exhaust Butterfly Valve Cable Installation in the Engine Top End chapter).



3-98 FUEL SYSTEM (DFI)

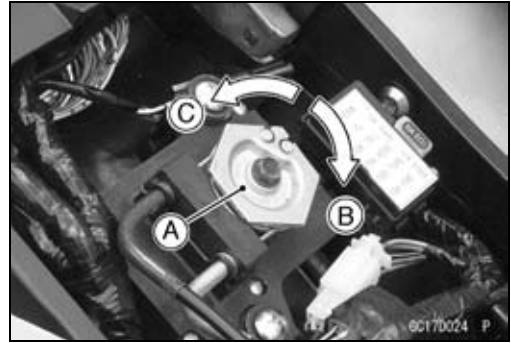
Exhaust Butterfly Valve Actuator (Service Code 63)

Exhaust Butterfly Valve Actuator Inspection

NOTE

○Be sure the battery is fully charged.

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Turn the ignition switch ON.
- Check to see the pulley [A] turns clockwise [B] and counterclockwise [C] smoothly.
- The pulley turns clockwise and then counterclockwise, and clockwise again.
- Turn the ignition switch OFF.
- The pulley turns counterclockwise.
- ★ If the pulley does not operate, check the exhaust butterfly valve actuator resistance (see Exhaust Butterfly Valve Actuator Resistance Inspection).



Exhaust Butterfly Valve Actuator Resistance Inspection

- Turn the ignition switch OFF.
- Disconnect the exhaust butterfly valve actuator lead connector (2 pins connector) [A].
- Set the hand tester to the $\times 1 \Omega$ range and connect it to the exhaust butterfly valve actuator connector.

Special Tool - Hand Tester: 57001-1394

- Measure the exhaust butterfly valve actuator resistance.

Exhaust Butterfly Valve Actuator Resistance

Connections: P lead \longleftrightarrow GY lead

Standard: Any Reading Resistance (reference 5 ~ 200 Ω)

- ★ If the reading is 0 or infinity (∞) Ω , replace the exhaust butterfly valve actuator.
- ★ If the reading is in specification, remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and actuator connectors.

Wiring Continuity Inspection

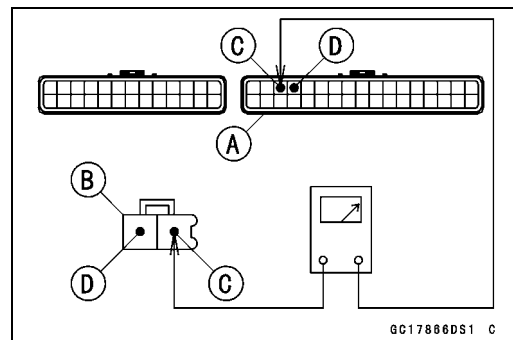
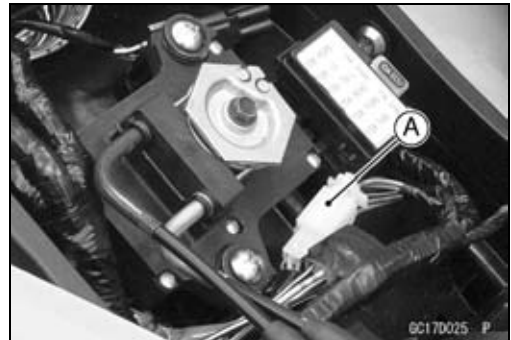
ECU Connector [A] \longleftrightarrow

Exhaust Butterfly Valve Actuator Connector [B]

GY lead (ECU terminal 3) [C]

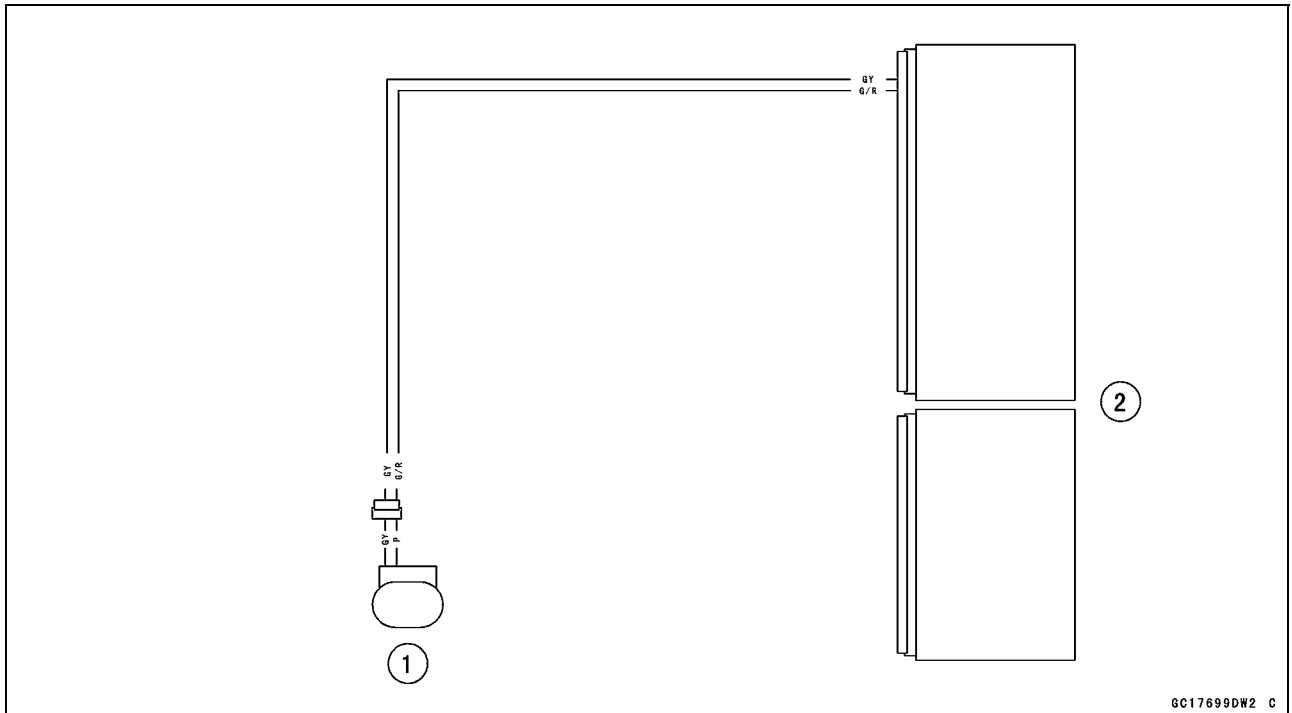
G/R lead (ECU terminal 4) [D]

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



Exhaust Butterfly Valve Actuator (Service Code 63)

Exhaust Butterfly Valve Actuator Circuit



- 1. Exhaust Butterfly Valve Actuator
- 2. ECU

3-100 FUEL SYSTEM (DFI)

Air Switching Valve (Service Code 64)

Air Switching Valve Removal/Installation

- Refer to the Air Switching Valve Removal/Installation in the Engine Top End chapter.

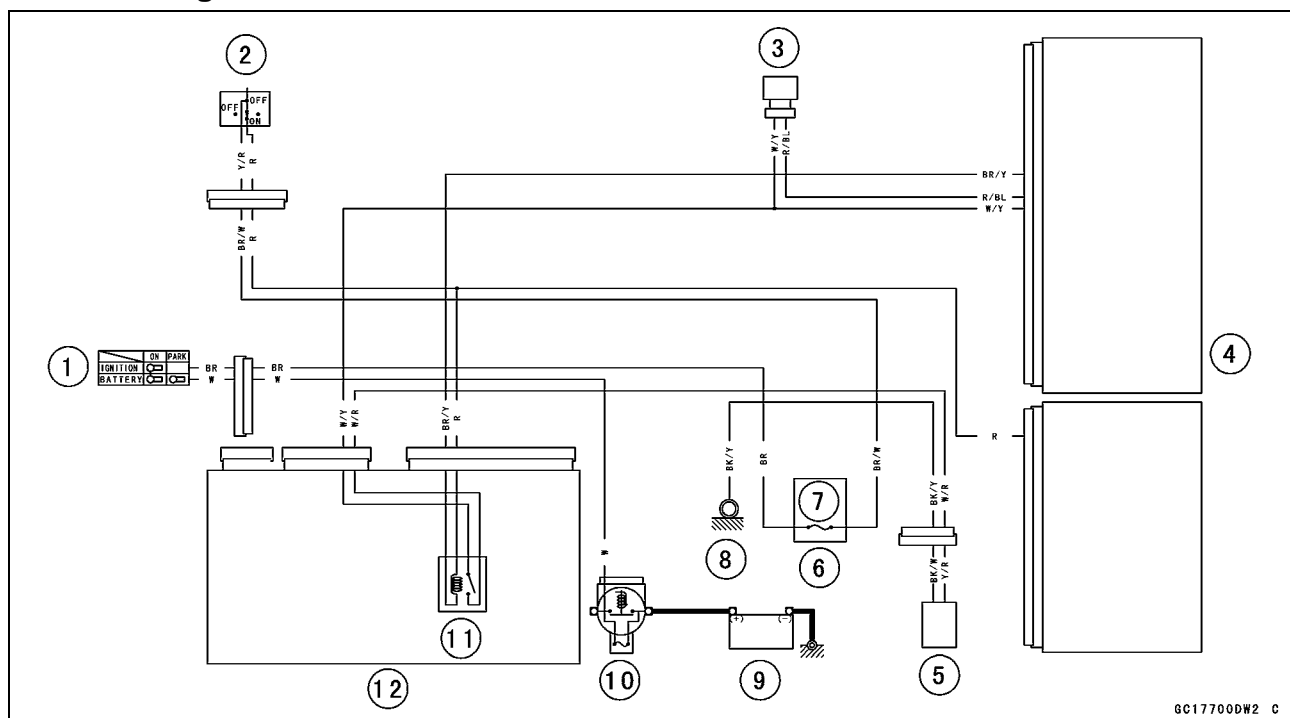
Air Switching Valve Inspection

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.
- ★ If the air switching valve is normal, check the wiring for continuity, using the wiring diagram in this section.

Special Tool - Hand Tester: 57001-1394

- ★ 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).

Air Switching Valve Circuit



1. Ignition Switch
2. Engine Stop Switch
3. Air Switching Valve
4. ECU
5. Fuel Pump
6. Fuse Box
7. Ignition Fuse 15 A
8. Frame Ground
9. Battery 12 V 8 Ah
10. Main Fuse 30 A
11. Fuel Pump Relay
12. Relay Box

Oxygen Sensor Heater (Service Code 67 (Equipped Models))

Oxygen Sensor Heater Removal/Installation

The oxygen sensor heater is built in the oxygen sensor. So, the heater itself can not be removed. Remove the oxygen sensor (see Oxygen Sensor Removal (Equipped Models) in the Electrical System chapter).

Oxygen Sensor Heater Resistance Inspection

- Turn the ignition switch OFF.
- Remove:
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Oxygen Sensor Lead Connector [A]



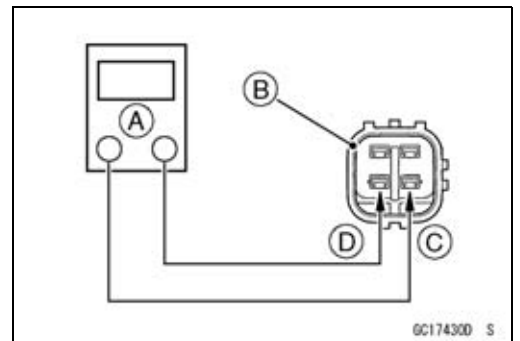
- Connect a digital meter [A] to the oxygen sensor lead connector [B].
- Measure the oxygen sensor heater resistance.

Oxygen Sensor Heater Resistance

Connections: W lead [C] ↔ W lead [D]

Standard: 6.7 ~ 10.5 Ω at 20° (68°F)

- ★ If the reading is out of the standard, replace the sensor.
- ★ If the reading is within the standard, check the power source voltage (see Oxygen Sensor Heater Power Source Voltage Inspection).



3-102 FUEL SYSTEM (DFI)

Oxygen Sensor Heater (Service Code 67 (Equipped Models))

Oxygen Sensor Heater Power Source Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the oxygen sensor lead connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]
Oxygen Sensor [C]

Special Tool - Measuring Adapter: 57001-1700

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

Oxygen Sensor Heater Power Source Voltage Connections to Adapter:

Digital Meter (+) → R (main harness LG) lead

Digital Meter (-) → Battery (-) terminal

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

Power Source Voltage

Standard: Battery Voltage

- Turn the ignition switch OFF.
- ★ If the reading is in specification, but the problem still exists, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is out of the standard, check the following.
 - Oxygen Sensor Heater Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
 - Power Source Wiring (see wiring diagram in this section)
- ★ If the fuse and wiring are good, remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

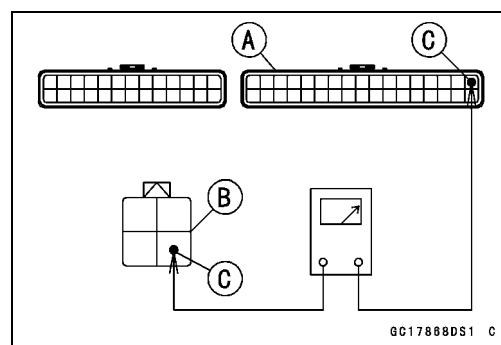
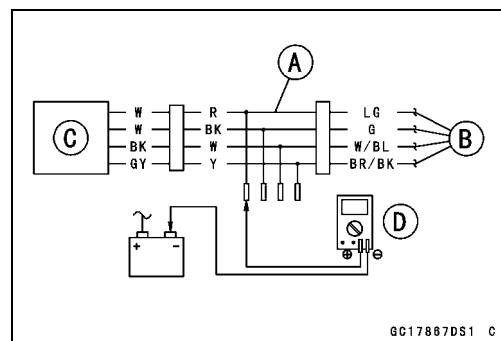
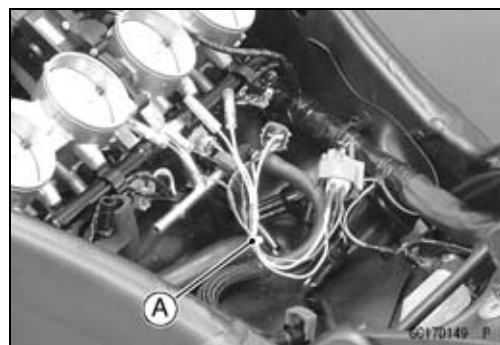
Wiring Continuity Inspection

ECU Connector [A] ↔

Oxygen Sensor Connector [B]

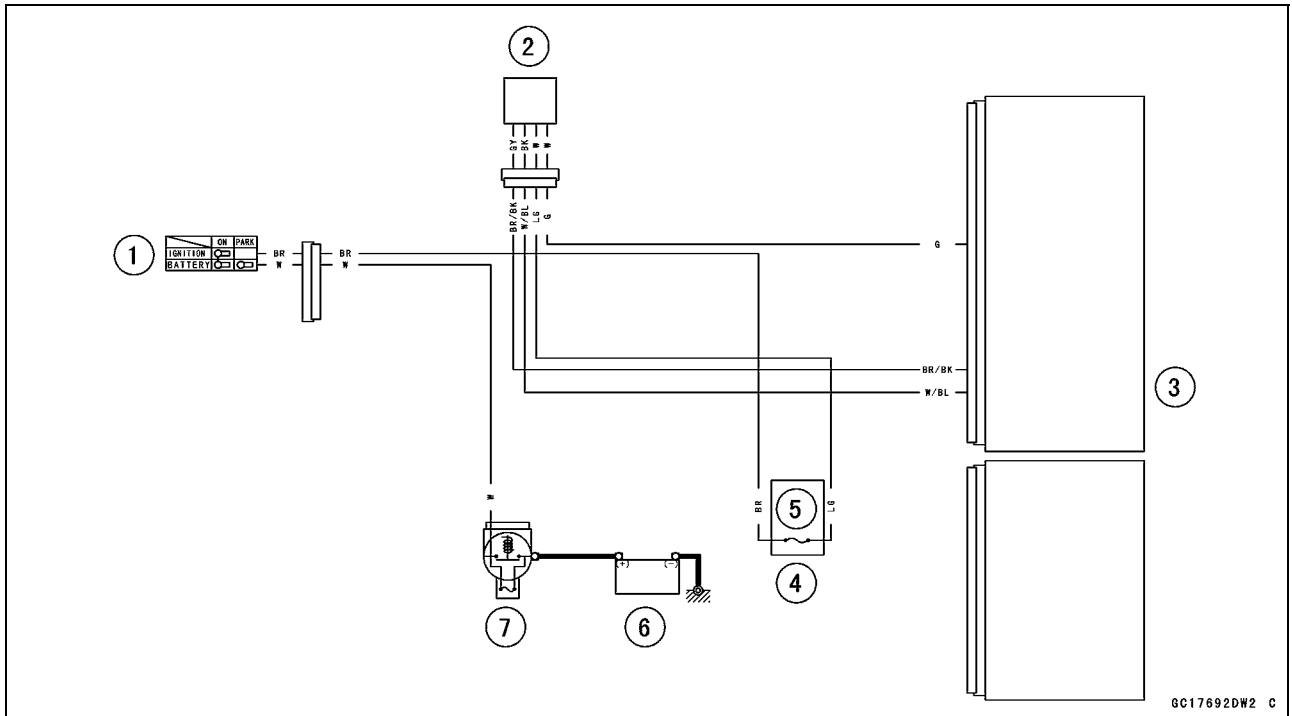
G lead (ECU terminal 17) [C]

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



Oxygen Sensor Heater (Service Code 67 (Equipped Models))

Oxygen Sensor Circuit



1. Ignition Switch
2. Oxygen Sensor
3. ECU
4. Fuse Box
5. Oxygen Sensor Heater Fuse 10 A
6. Battery 12 V 8 Ah
7. Main Fuse 30 A

3-104 FUEL SYSTEM (DFI)

Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))

Oxygen Sensor Removal/Installation

- Refer to the Oxygen Sensor Removal/Installation (Equipped Models) in the Electrical System chapter.

Oxygen Sensor Inspection

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch OFF.
- Remove:
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
 - Oxygen Sensor Lead Connector [A]



- Connect the harness adapter [A] between the main harness connector and oxygen sensor lead connector as shown in the figure.
 - Main Harness [B]
 - Oxygen Sensor [C]

Special Tool - Measuring Adapter: 57001-1700

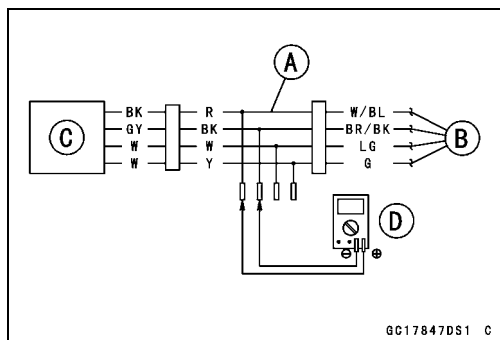
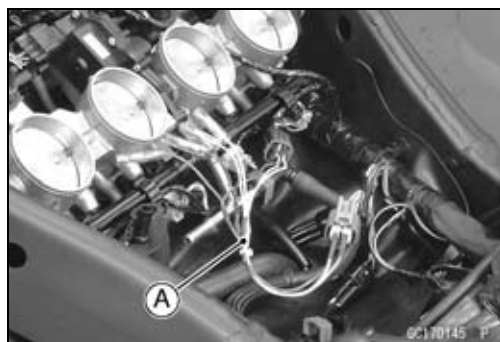
- Connect a digital meter [D] to the harness adapter leads.

Oxygen Sensor Output Voltage

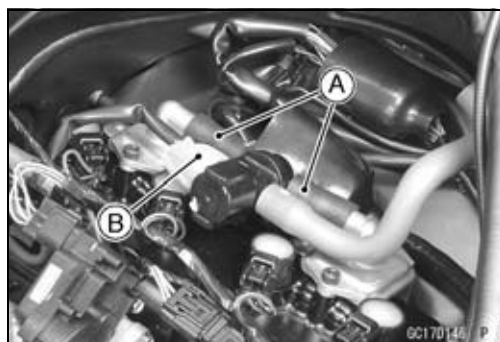
Connections to Adapter:

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

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



- Separate the air switching valve hoses [A] from the air suction valve covers.
- Do not disconnect the air switching valve connector [B].



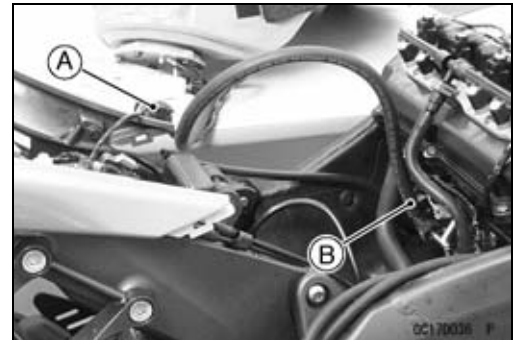
Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))

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



- Connect the following parts temporarily.
 - Fuel Pump Lead Connector [A]
 - Extension Tube [B]
 - Air Cleaner Housing (see Air Cleaner Housing Installation)

Special Tool - Extension Tube: 57001-1578



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

Output Voltage (with Plugs)
Standard: DC 0.8 V or more

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

Output Voltage (without Plugs)
Standard: DC 0.24 V or less

- Turn the ignition switch OFF.



- ★ If the reading is out of the standard (with plugs: DC 0.8 V or more, without plugs: DC 0.24 V or less), remove the ECU and check the wiring for continuity between main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

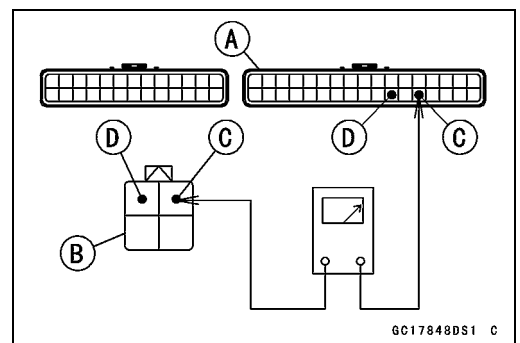
ECU Connector [A] ←→

Oxygen Sensor Connector [B]

W/BL lead (ECU terminal 30) [C]

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

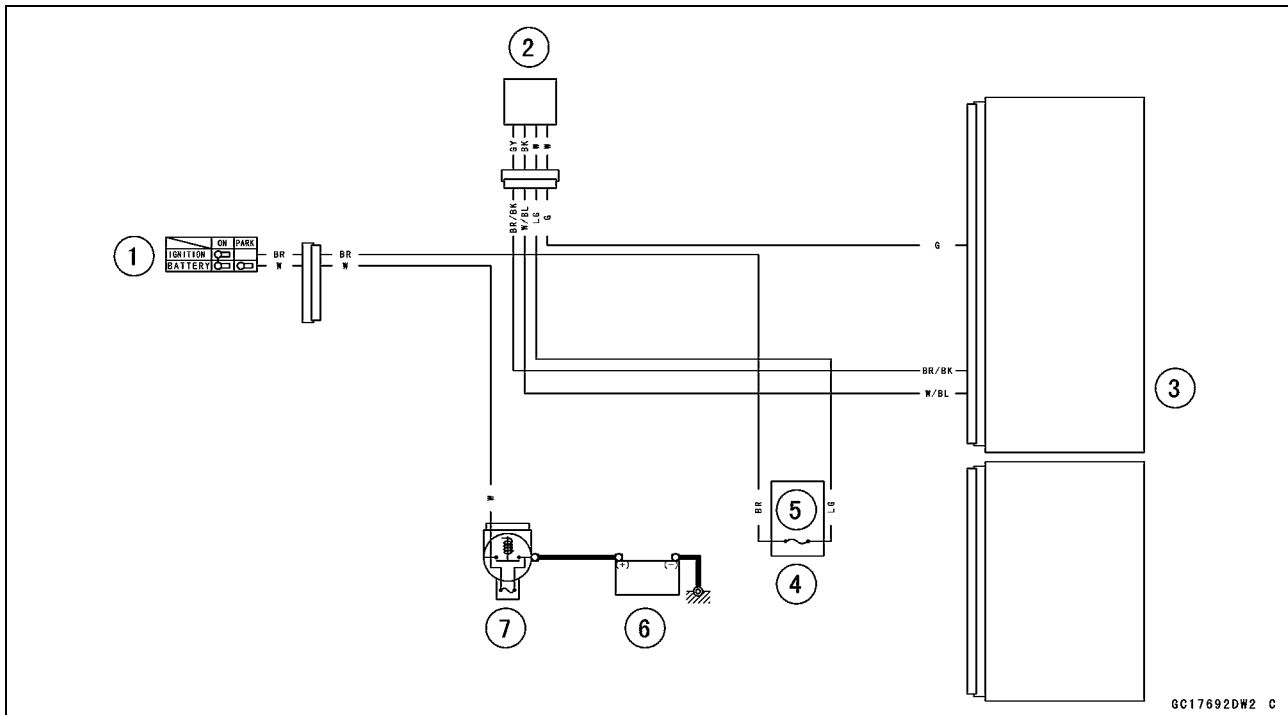
- ★ If the wiring is good, replace the sensor.
- ★ If the reading is within the standard (with plugs: DC 0.8 V or more, without plugs: DC 0.24 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



3-106 FUEL SYSTEM (DFI)

Oxygen Sensor - Incorrect Output Voltage (Service Code 94 (Equipped Models))

Oxygen Sensor Circuit

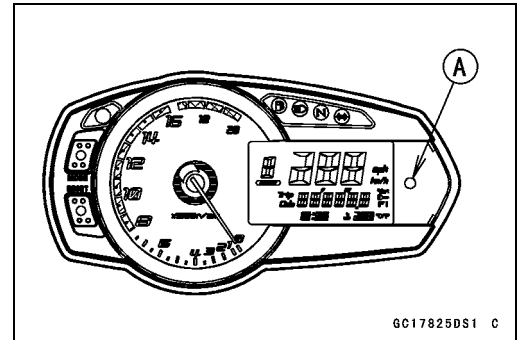


1. Ignition Switch
2. Oxygen Sensor
3. ECU
4. Fuse Box
5. Oxygen Sensor Heater Fuse 10 A
6. Battery 12 V 8 Ah
7. Main Fuse 30 A

Warning Indicator Light (LED)

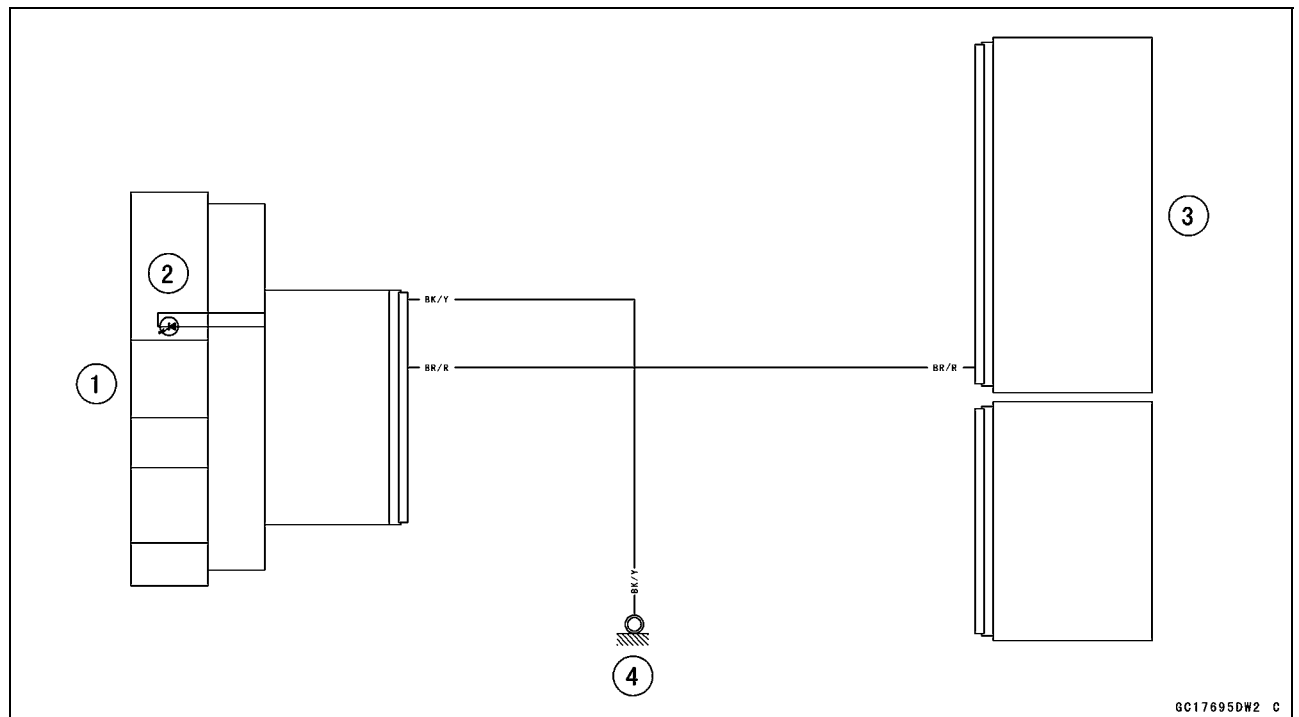
Light (LED) Inspection

- The warning indicator light (LED) [A] is used for the FI indicator, immobilizer indicator (equipped models) and oil pressure warning indicator.
- In this model, the warning indicator light (LED) (FI/immobilizer) blinks by the data sent from the ECU.
- Refer to the Meter Unit Inspection in the Electrical System chapter.



GC17825DS1 C

Warning Indicator Light (LED) (FI/Immobilizer) Circuit



GC17695DW2 C

1. Meter Unit
2. Warning Indicator Light (LED)
3. ECU
4. Frame Ground

3-108 FUEL SYSTEM (DFI)

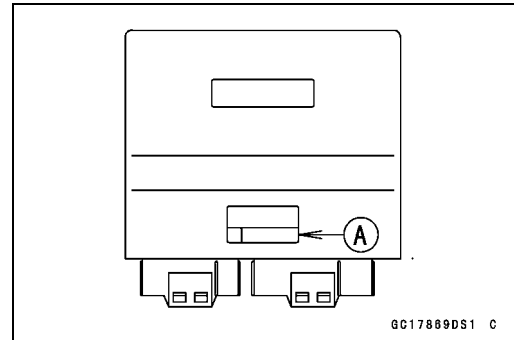
ECU

ECU Identification

○Most countries have their own regulations, so each ECU has different characteristics. So, do not confuse ECU with each other and use only the ECU for your model. Otherwise, the motorcycle can not clear the regulation.

ECU Identification

Part Number [A]	Specification
21175-0220	WVTA (FULL H), with Immobilizer
	GB WVTA (FULL H), with Immobilizer
	WVTA (78.2 H), with Immobilizer
	AU, with Immobilizer
21175-0221	US, without Immobilizer
	CA, without Immobilizer
	CAL, without Immobilizer
21175-0247	SEA, with Immobilizer
	TH, with Immobilizer
21175-0250	BR, with Immobilizer

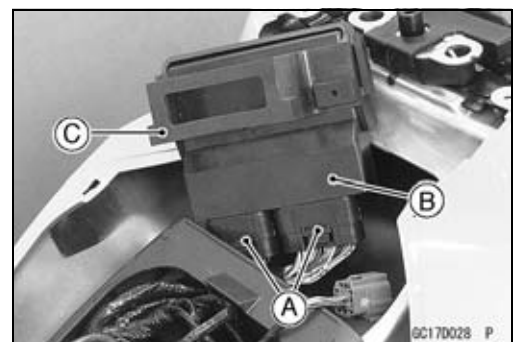
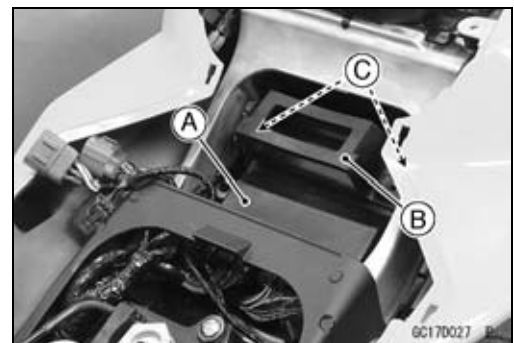
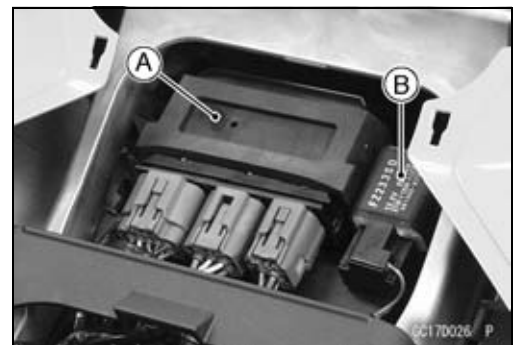


ECU Removal

CAUTION

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

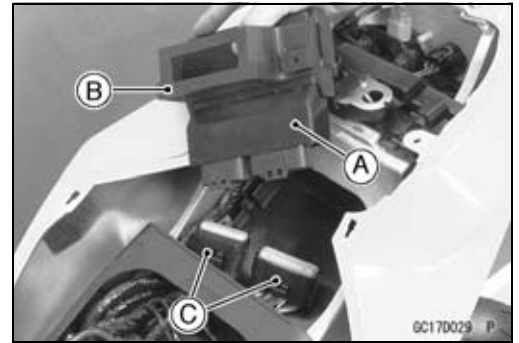
- Remove the front seat cover (see Seat Cover Removal in the Frame chapter).
- Pull out the relay box [A] and turn signal relay [B] from the rubber protector.
- Lift up the ECU [A] with rubber protector [B] to clear the projections [C].
- Remove:
 - ECU Connectors [A]
 - ECU [B] (with Rubber Protector [C])



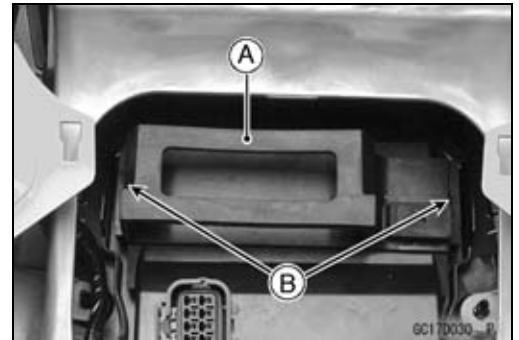
ECU

ECU Installation

- Install:
 - ECU [A] (in Rubber Protector [B])
 - ECU Connectors [C]

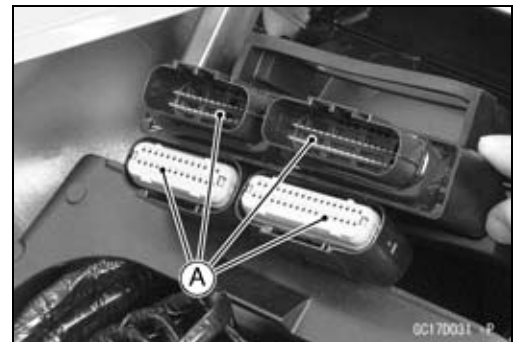


- Insert the slits of the rubber protector [A] to the projections [B] of the rear fender.



ECU Power Supply Inspection

- Remove the front seat cover (see Seat Cover 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 connectors are damaged, replace the main harness.
- ★ If the terminals of the ECU connectors are damaged, replace the ECU.
- Turn the ignition switch OFF.
- Disconnect the ECU connectors [A].
- Set the hand tester [B] to the $\times 1 \Omega$ range and check the following wiring for continuity.



Special Tool - Hand Tester: 57001-1394

ECU Grounding Inspection

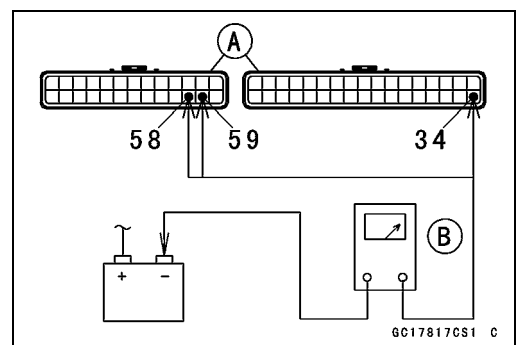
Connections:

- (I) BK/Y leads (ECU terminal 34, 58 or 59) \longleftrightarrow Battery (-) Terminal
- (II) Engine Ground \longleftrightarrow Battery (-) Terminal

Criteria:

Both: 0 Ω

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



3-110 FUEL SYSTEM (DFI)

ECU

★ If the wiring is good, check the power source voltage of the ECU.

NOTE

○ Be sure the battery is fully charged.

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

Special Tool - Needle Adapter Set: 57001-1457

ECU Power Supply Inspection

Connections:

- (I) Digital Meter (+) → Terminal 15 (W/Y)
Digital Meter (-) → Battery (-) terminal
- (II) Digital Meter (+) → Terminal 16 (W/BK)
Digital Meter (-) → Battery (-) terminal

Ignition Switch OFF:

Terminal 15 (W/Y): 0 V

Terminal 16 (W/BK): Battery Voltage

Ignition Switch ON:

All: Battery Voltage

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

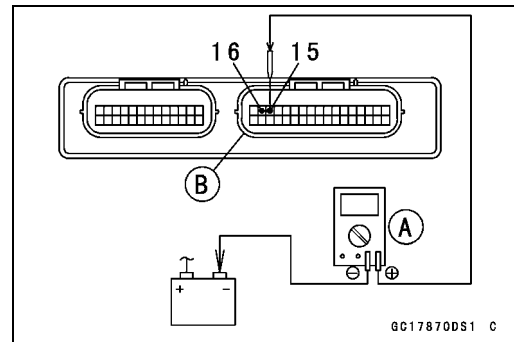
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)

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

ECU Main Relay (see Relay Circuit Inspection in the Electrical System chapter)

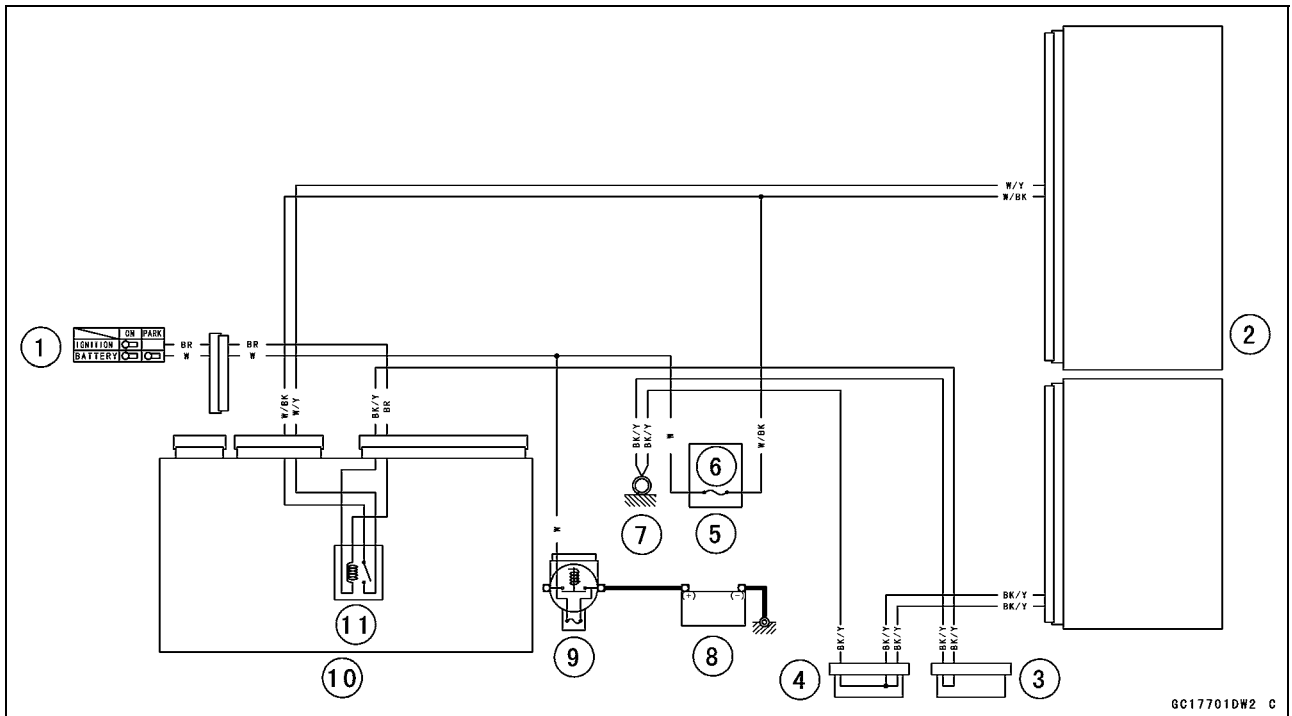
Power Source Wiring (see wiring diagram in this section)

★ If the fuse, wiring and relay are good, replace the ECU (see ECU Removal/Installation).



ECU

ECU Power Source Circuit



1. Ignition Switch
2. ECU
3. Joint Connector C
4. Joint Connector D
5. Fuse Box
6. ECU Fuse 10 A
7. Frame Ground
8. Battery 12 V 8 Ah
9. Main Fuse 30 A
10. Relay Box
11. ECU Main Relay

3-112 FUEL SYSTEM (DFI)

DFI Power Source

ECU Fuse Removal

- Refer to the 10 A ECU Fuse Removal in the Electrical System chapter.

ECU Fuse Installation

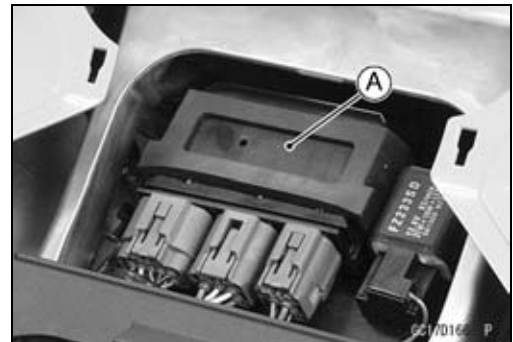
- ★ If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.
- Refer to the Fuse Installation in the Electrical System chapter.

ECU Fuse Inspection

- Refer to the Fuse Inspection in the Electrical System chapter.

ECU Main Relay Removal/Installation

- The ECU main relay is built in the relay box [A].
- Refer to the Relay Box Removal in the Electrical System chapter.



ECU Main Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.

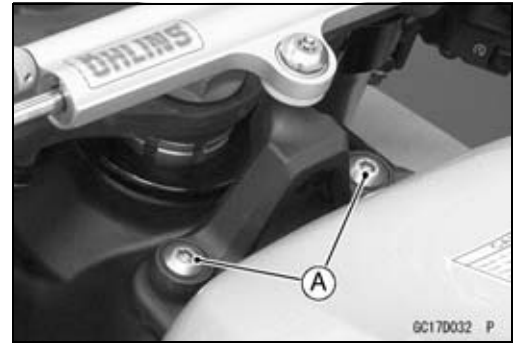
Fuel Line

Fuel Pressure Inspection

NOTE

○Be sure the battery is fully charged.

- Remove:
 - Fuel Tank Bolts [A]
 - Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

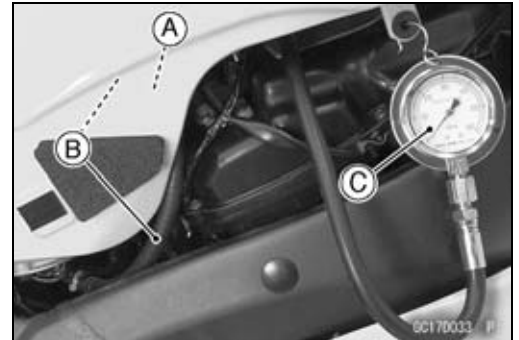


⚠ WARNING

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

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

Special Tools - Oil Pressure Gauge, 5 kgf/cm²: 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.

- Turn the engine stop switch run position.
- Turn the ignition switch ON.
- The fuel pump should operate for 3 seconds, and then should stop.

NOTE

○After turning on the engine stop switch and ignition switch, inspect the fuel leakage from the connected portion of the special tools.

CAUTION

Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.

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

Fuel Pressure (with Engine Idling)

Standard: 294 kPa (3.0 kgf/cm², 43 psi)

3-114 FUEL SYSTEM (DFI)

Fuel Line

NOTE

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

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

Fuel Flow Rate Inspection

⚠ WARNING

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

NOTE

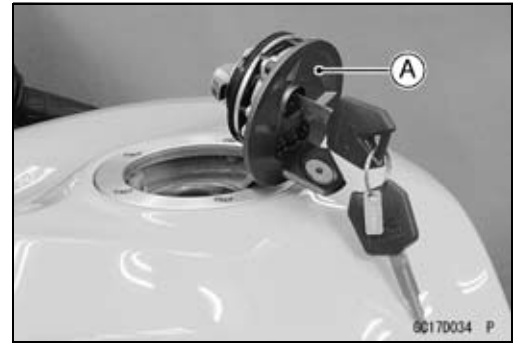
○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Wait until the engine cools down.
- Prepare a fuel hose (Special Tool: 57001-1607) and a measuring cylinder.
 - Special Tool - Fuel Hose: 57001-1607**
- Remove the fuel tank bolts [A].



Fuel Line

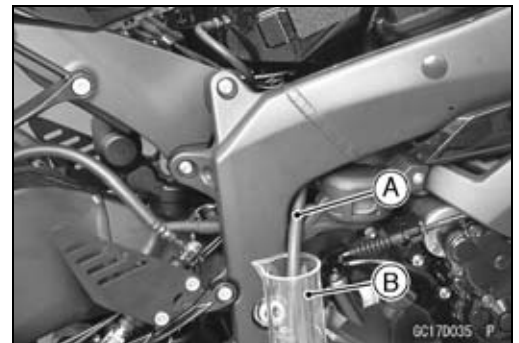
- Open the fuel tank cap [A] to lower the pressure in the tank.
- Remove the primary fuel hose from the fuel pump (see Fuel Tank Removal).
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.



⚠ 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 fuel immediately. Be sure to hold the measuring cylinder vertical.

- Close the fuel tank cap.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- The fuel pump should operate for 3 seconds, and then should stop.

CAUTION

Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.

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

Amount of Fuel Flow

Standard: 50 mL (1.7 US oz.) or more for 3 seconds

- Turn the ignition switch OFF.
- ★ If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).
- Install the fuel tank (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

3-116 FUEL SYSTEM (DFI)

Fuel Pump

Fuel Pump Removal

⚠ WARNING

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

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

CAUTION

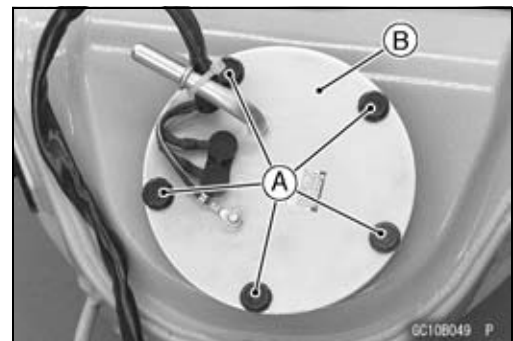
Never drop the fuel pump especially on a hard surface. Such a shock to the pump can damage it.

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

CAUTION

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

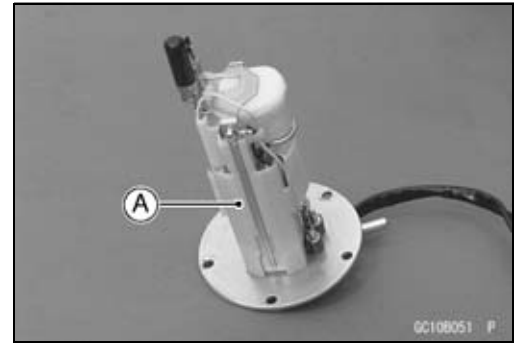
- Discard the fuel pump gasket [A].



Fuel Pump

Fuel Pump Installation

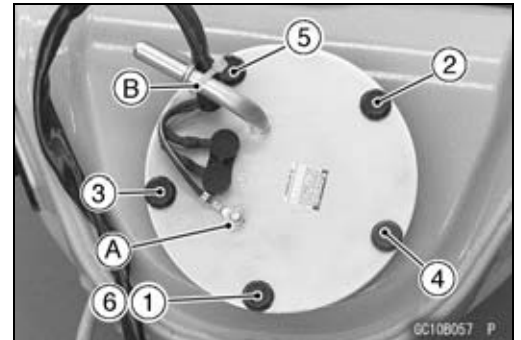
- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.



- Check that the fuel pump terminal [A] and band [B] are in place.
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts to a snug fit, following the tightening sequence as shown in the figure.
- Following the tightening sequence, tighten the fuel pump bolts to the specified torque.

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

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



Fuel Pump Operation Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the engine stop switch to run position.
- Turn the ignition switch ON and make sure that the fuel pump operates (make light sounds) for 3 seconds, and then stops.
- Turn the ignition switch OFF.
- ★ If the pump does not operate as described above, check the operating voltage (see Fuel Pump Operating Voltage Inspection).

3-118 FUEL SYSTEM (DFI)

Fuel Pump

Fuel Pump Operating Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]
Fuel Pump [C]

Special Tool - Measuring Adapter: 57001-1700

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

Fuel Pump Operating Voltage

Connections to Adapter:

Digital Meter (+) → R (pump Y/R) lead

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

- Measure the operating voltage with engine stopped and with the connector joined.
- Turn the engine stop switch run position.
- Turn the ignition switch ON.

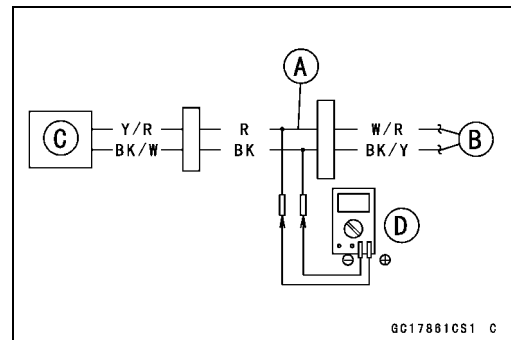
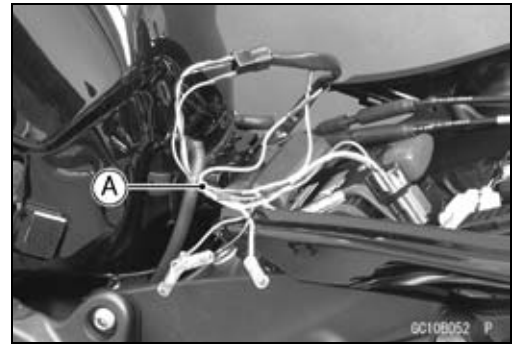
Operating Voltage

Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch OFF.
- ★ If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the fuel pump relay is normal, check the wiring for continuity (see wiring diagram in this section).

Special Tool - Hand Tester: 57001-1394

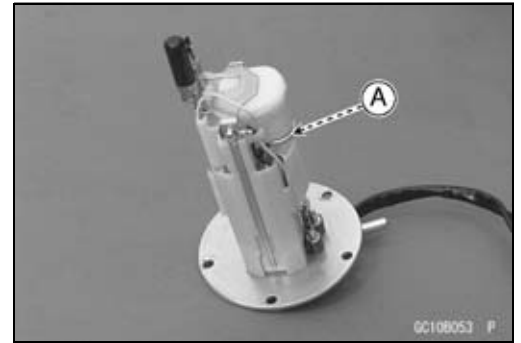
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is in specification, but the pump does not operate, replace the fuel pump (see Fuel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



Fuel Pump

Pressure Regulator Removal

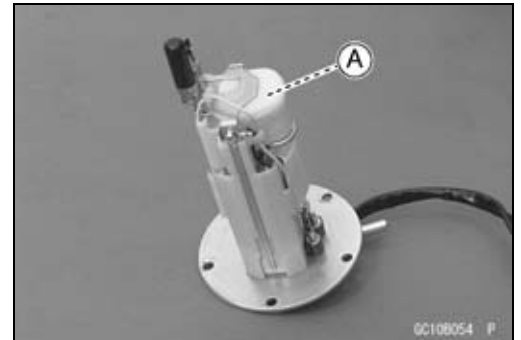
○The pressure regulator [A] is built into the fuel pump and can not be removed.



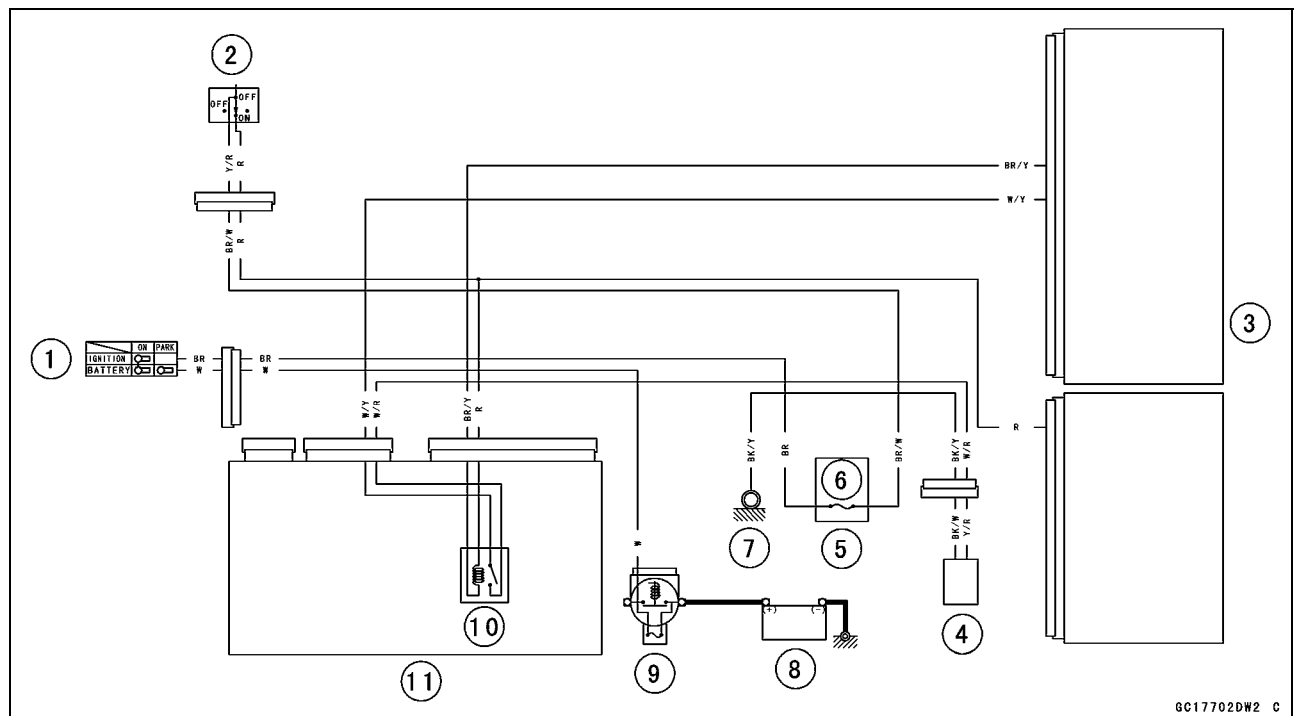
Fuel Filter Cleaning

○The fuel filter [A] is built into the fuel 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. Ignition Switch
2. Engine Stop Switch
3. ECU
4. Fuel Pump
5. Fuse Box
6. Ignition Fuse 15 A
7. Frame Ground
8. Battery 12 V 8 Ah
9. Main Fuse 30 A
10. Fuel Pump Relay
11. Relay Box

3-120 FUEL SYSTEM (DFI)

Fuel Injectors

Primary Fuel Injector Removal/Installation

- Refer to the Throttle Body Assy Disassembly/Assembly.

Secondary Fuel Injector Removal/Installation

- Refer to the Nozzle Assy Disassembly/Assembly.

Fuel Injector Audible Inspection

NOTE

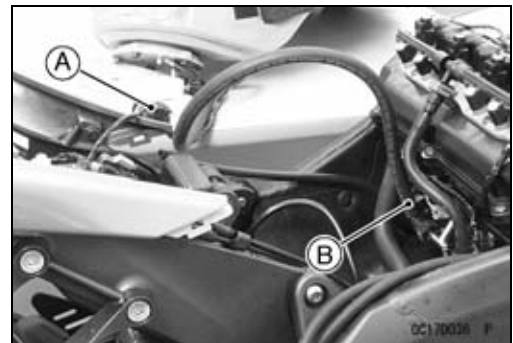
- Be sure the battery is fully charged.
- The secondary fuel injectors are operating with following conditions.

1. The engine speed is more than 7 000 r/min (rpm).
2. The throttle opening is more than 15°.

- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Connect the following parts temporarily.
 - Fuel Pump Lead Connector [A]
 - Extension Tube [B]

Special Tool - Extension Tube: 57001-1578

- Start the engine, and let it idle.
- Apply the tip of a screwdriver [A] to the fuel injector. Put the grip end onto your ear, and listen whether the fuel injector is clicking or not.
 - Primary Fuel Injector [B]
 - Secondary Fuel Injector [C]
- A sound scope can also be used.
- The click interval becomes shorter as the engine speed rises.
- Do the same for the other fuel injectors.
- ★ If all the fuel injectors click at a regular intervals, the fuel injectors are normal.
- Turn the ignition switch OFF.
- ★ If any fuel injector does not click, check the fuel injector resistance (see Fuel Injector Resistance Inspection).

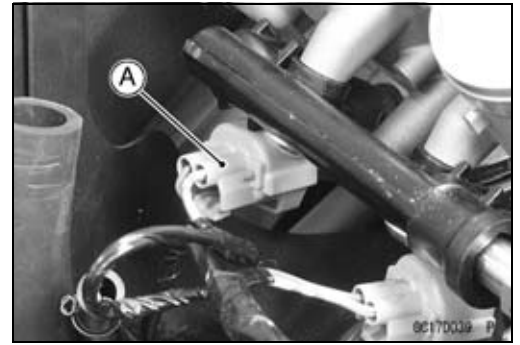


Fuel Injectors

Fuel Injector Resistance Inspection

For Primary Fuel Injectors

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the primary fuel injector connector [A].



- Connect a digital meter to the terminals in each primary fuel injector [A].
- Measure the primary fuel injector resistance.

Primary Fuel Injector Resistance

Standard: About 11.7 ~ 12.3 Ω at 20°C (68°F)

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



For Secondary Fuel Injectors

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel injector connector [A].



- Connect a digital meter to the terminals in each secondary fuel injector [A].
- Measure the secondary fuel injector resistance.

Secondary Fuel Injector Resistance

Standard: About 10.5 Ω at 20°C (68°F)

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



3-122 FUEL SYSTEM (DFI)

Fuel Injectors

Fuel Injector Power Source Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.

For Primary Fuel Injectors

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the injector connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]

Primary Fuel Injector #1 [C]

Special Tool - Measuring Adapter: 57001-1700

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

Primary Fuel Injector Power Source Voltage Connections to Adapter:

For Primary Fuel Injector #1, #2, #3, #4

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

Digital Meter (-) → Battery (-) terminal

- Measure the power source voltage with the engine stopped.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

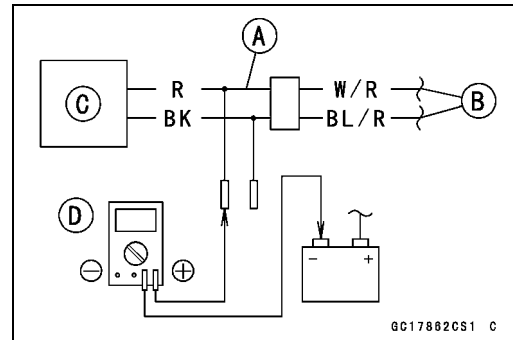
Power Source Voltage

Standard: **Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.
- ★ If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the fuel pump relay is normal, check the power source wiring (see wiring diagram in this section).

Special Tool - Hand Tester: 57001-1394

- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is in specification, check the output voltage (see Fuel Injector Output Voltage Inspection).



Fuel Injectors

For Secondary Fuel Injectors

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the injector connector and connect the harness adapter [A] between these connectors as shown in the figure.

Main Harness [B]

Secondary Fuel Injector #1 [C]

Special Tool - Measuring Adapter: 57001-1700

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

Secondary Fuel Injector Power Source Voltage Connections to Adapter:

For Secondary Fuel Injector #1, #2, #3, #4

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

Digital Meter (-) → Battery (-) terminal

- Measure the power source voltage with the engine stopped.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

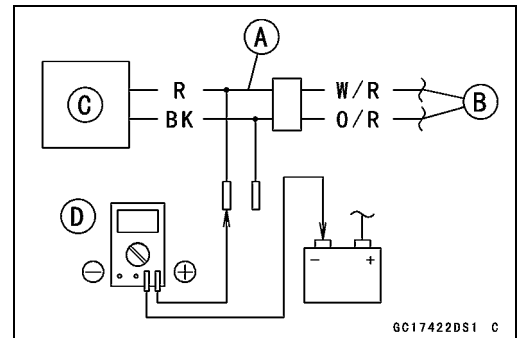
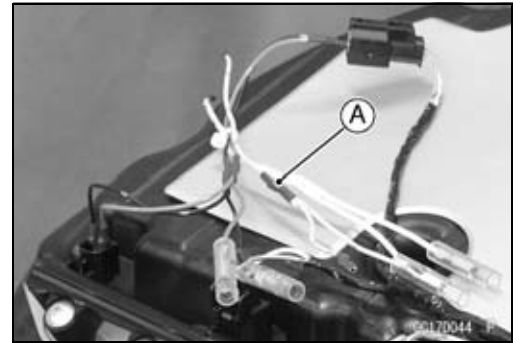
Power Source Voltage

Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch OFF.
- ★ If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the fuel pump relay is normal, check the power source wiring (see wiring diagram in this section).

Special Tool - Hand Tester: 57001-1394

- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
- ★ If the reading is in specification, check the output voltage (see Fuel Injector Output Voltage Inspection).



GC17422DS1 C

3-124 FUEL SYSTEM (DFI)

Fuel Injectors

Fuel Injector Output Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

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

Special Tool - Needle Adapter Set: 57001-1457

Primary Fuel Injector Output Voltage [C]

Connections to ECU Connector:

For Primary Fuel Injector #1

Digital Meter (+) → BL/R lead (ECU terminal 44)

Digital Meter (-) → Battery (-) terminal

For Primary Fuel Injector #2

Digital Meter (+) → BL/G lead (ECU terminal 42)

Digital Meter (-) → Battery (-) terminal

For Primary Fuel Injector #3

Digital Meter (+) → BL/BK lead (ECU terminal 48)

Digital Meter (-) → Battery (-) terminal

For Primary Fuel Injector #4

Digital Meter (+) → BL/Y lead (ECU terminal 35)

Digital Meter (-) → Battery (-) terminal

Secondary Fuel Injector Output Voltage [D]

Connections to ECU Connector:

For Secondary Fuel Injector #1

Digital Meter (+) → O/R lead (ECU terminal 43)

Digital Meter (-) → Battery (-) terminal

For Secondary Fuel Injector #2

Digital Meter (+) → O/G lead (ECU terminal 41)

Digital Meter (-) → Battery (-) terminal

For Secondary Fuel Injector #3

Digital Meter (+) → O/BK lead (ECU terminal 49)

Digital Meter (-) → Battery (-) terminal

For Secondary Fuel Injector #4

Digital Meter (+) → O/Y lead (ECU terminal 36)

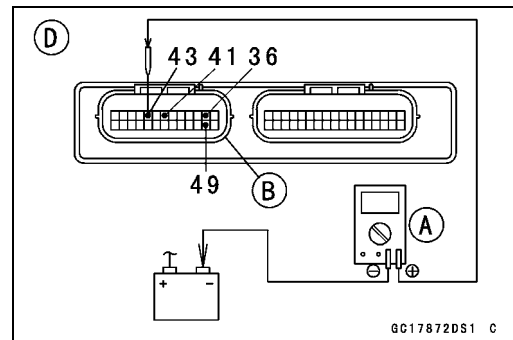
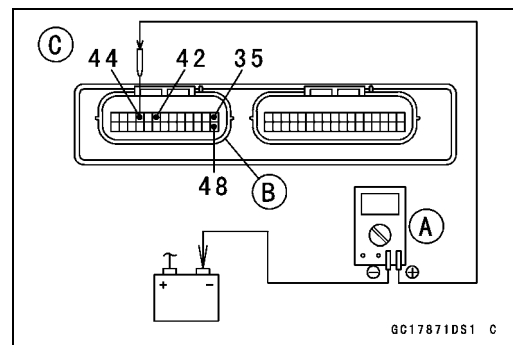
Digital Meter (-) → Battery (-) terminal

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

Output Voltage

Standard: Battery Voltage for 3 seconds, and then 0 V

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



Fuel Injectors

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

Special Tool - Hand Tester: 57001-1394

○Disconnect the ECU and injector connector.

Wiring Continuity Inspection (Primary Fuel Injectors)

ECU Connector [A] ↔ Primary Fuel Injector Connector [B]

For Primary Fuel Injector #1 [C]

BL/R lead (ECU terminal 44) [D]

For Primary Fuel Injector #2

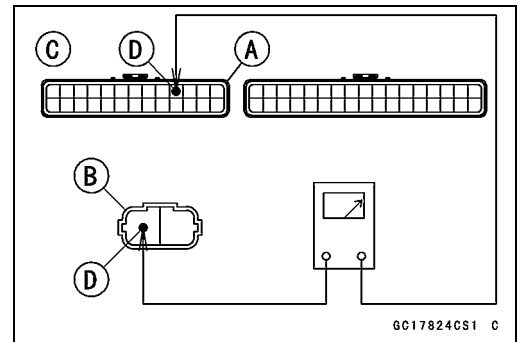
BL/G lead (ECU terminal 42)

For Primary Fuel Injector #3

BL/BK lead (ECU terminal 48)

For Primary Fuel Injector #4

BL/Y lead (ECU terminal 35)



Wiring Continuity Inspection (Secondary Fuel Injectors)

ECU Connector [A] ↔ Secondary Fuel Injector Connector [E]

For Secondary Fuel Injector #1 [F]

O/R lead (ECU terminal 43) [G]

For Secondary Fuel Injector #2

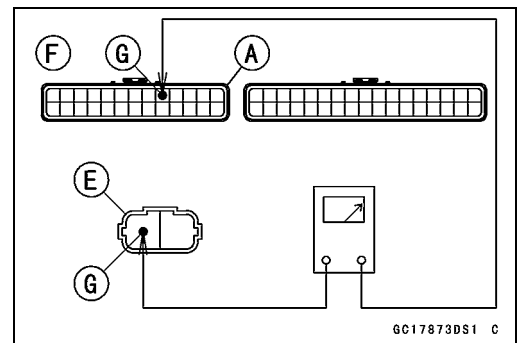
O/G lead (ECU terminal 41)

For Secondary Fuel Injector #3

O/BK lead (ECU terminal 49)

For Secondary Fuel Injector #4

O/Y lead (ECU terminal 36)



★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).

3-126 FUEL SYSTEM (DFI)

Fuel Injectors

Fuel Injector Fuel Line Inspection

- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Primary and Secondary Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Do not remove the nozzle assy from the air cleaner housing.
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

▲ WARNING

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

- Check the injector fuel line for leakage as follows.
 - Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamps [D]) as shown in the figure.
 - Rear View [E]
 - Connect the fuel hose [F] (both ends with the clamps [G]) between the delivery pipes [H] of the throttle body assy and nozzle assy [I] as shown in the figure.
 - Apply soap and water solution to the areas [J] as shown in the figure.
 - Watching the pressure gauge, squeeze the pump lever, and build up the pressure until the pressure reaches the maximum pressure.

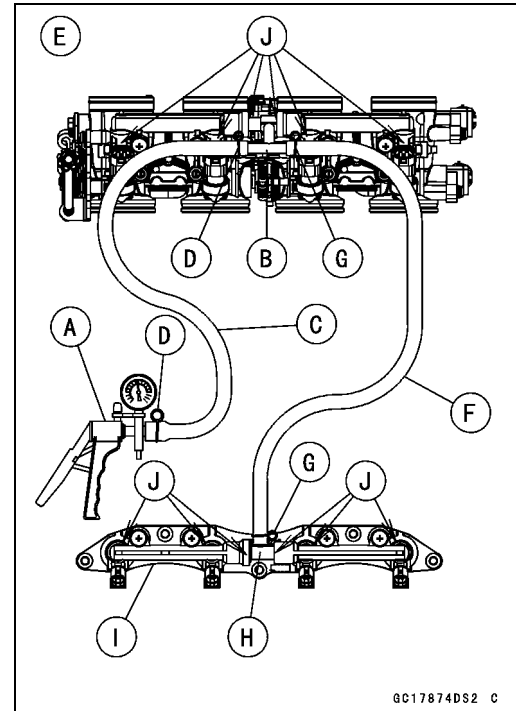
Injector Fuel Line Maximum Pressure

Standard: 300 kPa (3.06 kgf/cm², 43 psi)

CAUTION

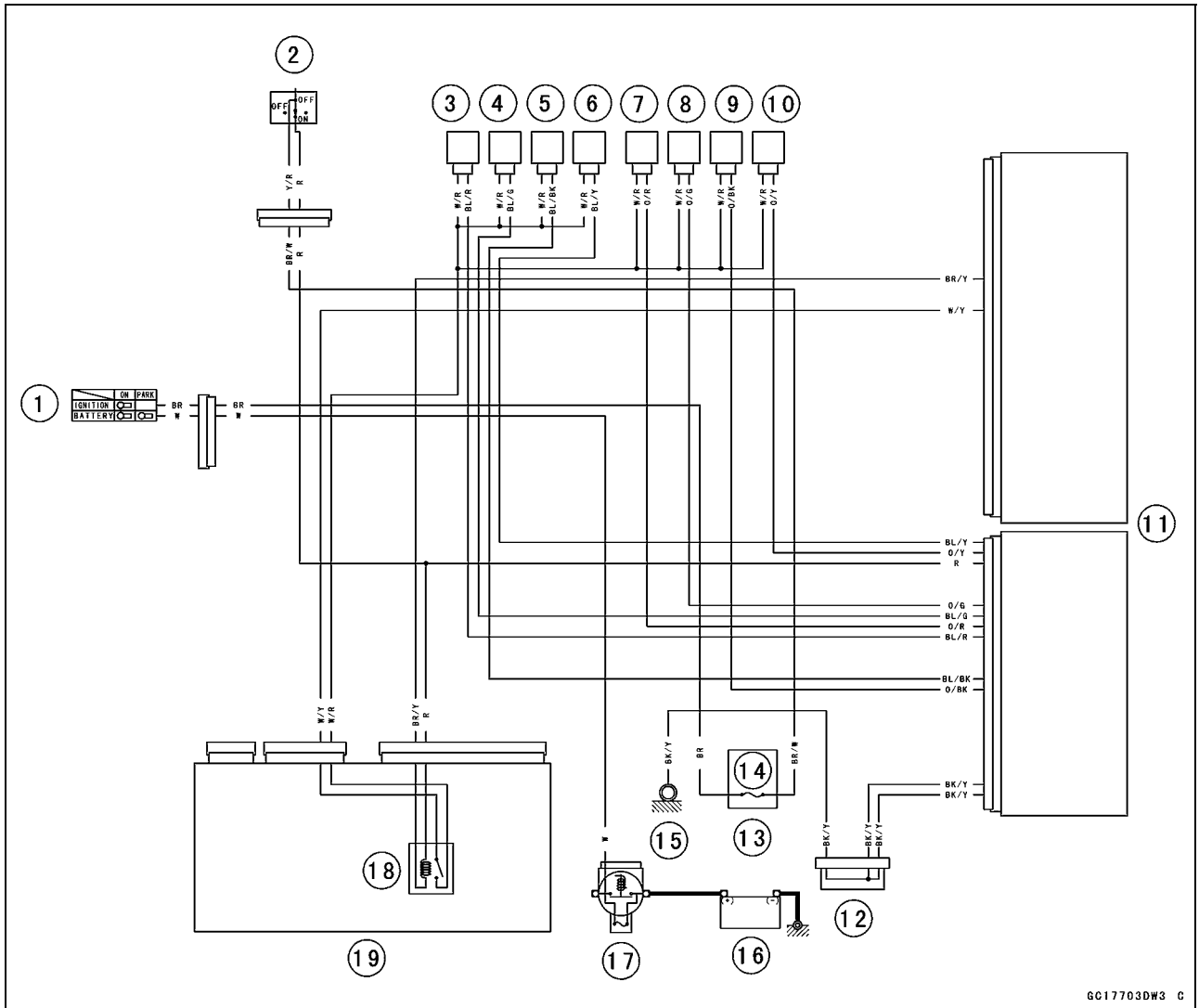
During pressure testing, do not exceed the maximum pressure for which the system is designed.

- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the fuel line is good.
- ★ If the pressure drops at once or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, injectors and related parts.
- Repeat the leak test, and check the fuel line for no leakage.
- Install:
 - Primary and Secondary Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Fuel Tank (see Fuel Tank Removal)
- Start the engine and check for fuel leakage.



Fuel Injectors

Fuel Injector Circuit



GC17703DW3 C

1. Ignition Switch
2. Engine Stop Switch
3. Primary Fuel Injector #1
4. Primary Fuel Injector #2
5. Primary Fuel Injector #3
6. Primary Fuel Injector #4
7. Secondary Fuel Injector #1
8. Secondary Fuel Injector #2
9. Secondary Fuel Injector #3
10. Secondary Fuel Injector #4
11. ECU
12. Joint Connector D
13. Fuse Box
14. Ignition Fuse 15 A
15. Frame Ground
16. Battery 12 V 8 Ah
17. Main Fuse 30 A
18. Fuel Pump Relay
19. Relay Box

3-128 FUEL SYSTEM (DFI)

Throttle Grip and Cables

Free Play Inspection

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

Free Play Adjustment

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

Cable Installation

- Install the throttle cables in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the lower ends of the throttle cables in the throttle pulley on the throttle body assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly (see Throttle Control System Inspection in the Periodic Maintenance chapter).

⚠ WARNING

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

Cable Lubrication

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

Throttle Body Assy

Idle Speed Inspection/Adjustment

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

Synchronization Inspection/Adjustment

- Refer to the Engine Vacuum Synchronization Inspection in the Periodic Maintenance chapter.

Throttle Body Assy Removal

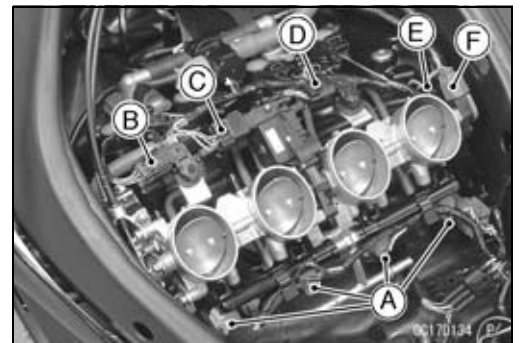
⚠ WARNING

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

CAUTION

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

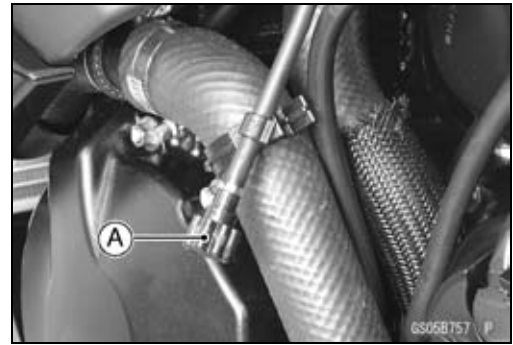
- Remove:
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Primary and Secondary Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Disconnect:
 - Primary Fuel Injector Connectors [A]
 - Atmospheric Pressure Sensor Connector [B]
 - Subthrottle Valve Actuator Connector [C]
 - Inlet Air Pressure Sensor Connector [D]
 - Main Throttle Sensor Connector [E]
 - Subthrottle Sensor Connector [F]
- For the California, Southeast Asia and Thailand models, pull off the vacuum hose.
- Loosen the throttle body assy holder clamp bolts [A].



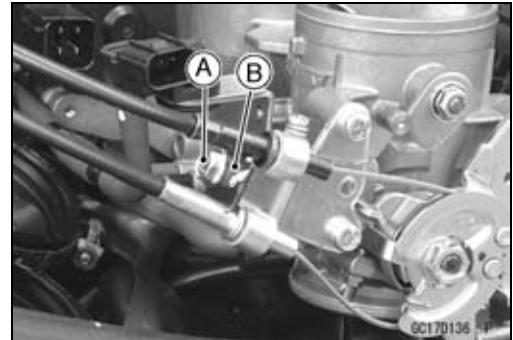
3-130 FUEL SYSTEM (DFI)

Throttle Body Assy

- Remove the adjusting screw [A] from the clamp.



- Remove the throttle body assy from the throttle body assy holders.
- Remove:
 - Bolt [A]
 - Holder Plate [B]
 - Throttle Cable Lower Ends
- After removing the throttle body assy, stuff pieces of lint-free, clean cloth into the throttle body assy holders.



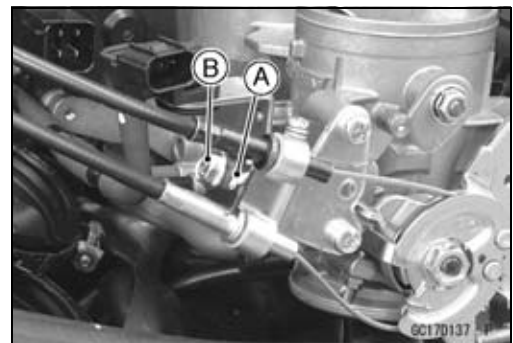
CAUTION

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

Throttle Body Assy Installation

- Apply a thin coat of grease to the throttle cable lower ends.
- Fit the accelerator cable end and the decelerator cable end into the throttle pulley.
- Install the holder plate [A] securely.
- Apply a non-permanent locking agent to the threads of the holder plate bolt [B], and tighten it.

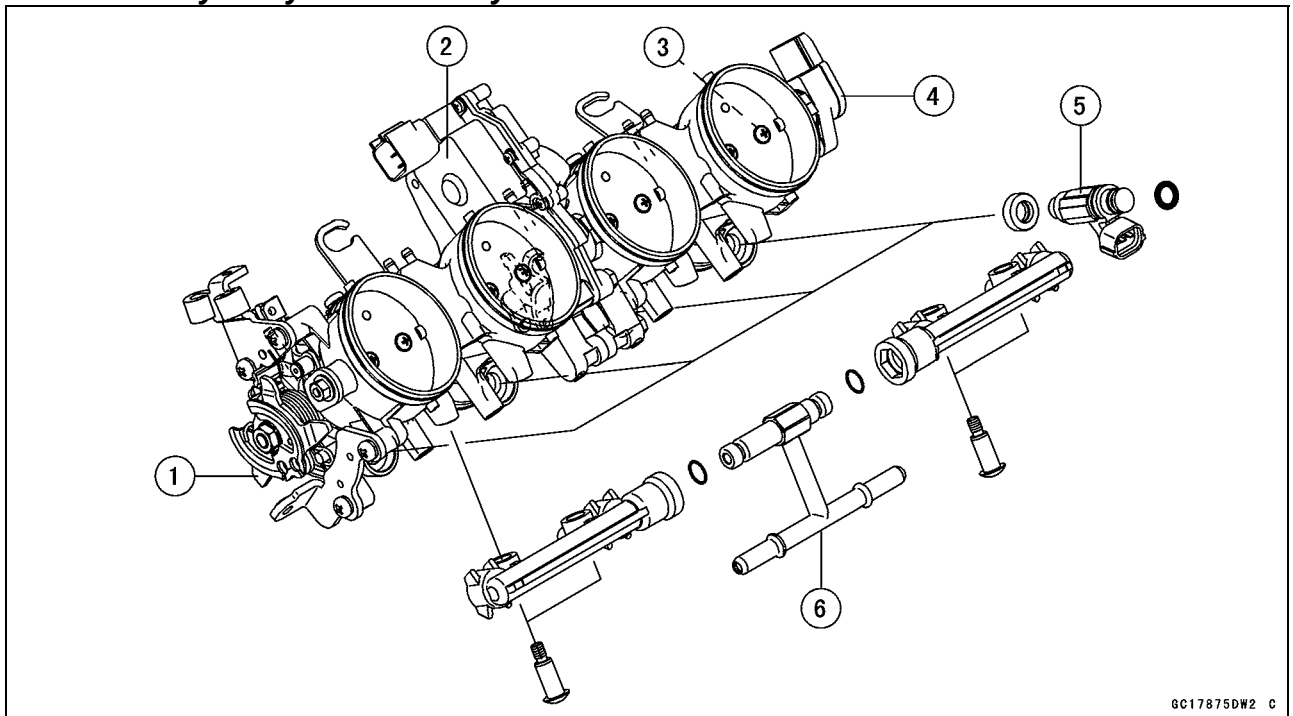
Torque - Throttle Cable Holder Plate Bolt: 3.9 N·m (0.40 kgf·m, 35 in·lb)



- Install the throttle body assy holder clamp bolts, and tighten them (see Throttle Body Assy Holder Installation in the Engine Top End chapter).
- Turn the throttle grip and make sure that the throttle pulley moves smoothly and return by spring force.
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust:
 - Throttle Grip Free Play (see Throttle Control System Inspection in the Periodic Maintenance chapter)
 - Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)

Throttle Body Assy

Throttle Body Assy Disassembly



1. Throttle Body Assy
2. Subthrottle Valve Actuator
3. Main Throttle Sensor
4. Subthrottle Sensor
5. Primary Fuel Injectors
6. Delivery Pipe Assy

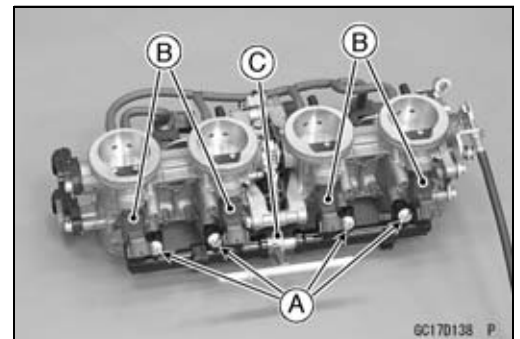
CAUTION

Do not remove, disassemble or adjust the main throttle sensor, subthrottle sensor, subthrottle valve actuator, throttle link mechanism and throttle body assy, because they are adjust or set surely at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Remove the screws [A] to pull out the primary fuel injectors [B] from the throttle body assy together with the delivery pipe assy [C].

NOTE

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



3-132 FUEL SYSTEM (DFI)

Throttle Body Assy

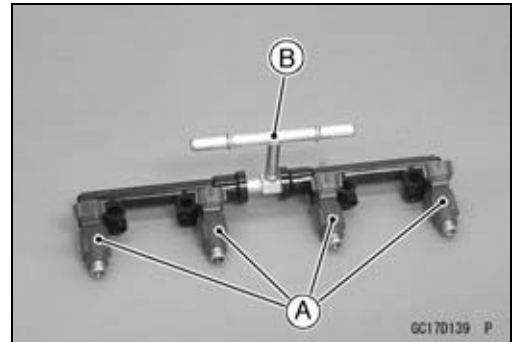
- Pull out the primary fuel injectors [A] from the delivery pipe Assy [B].

NOTE

○ Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe Assy.

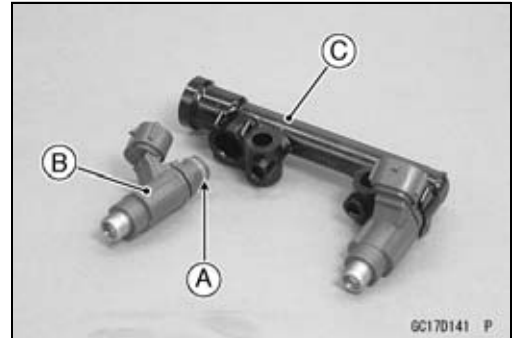
CAUTION

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

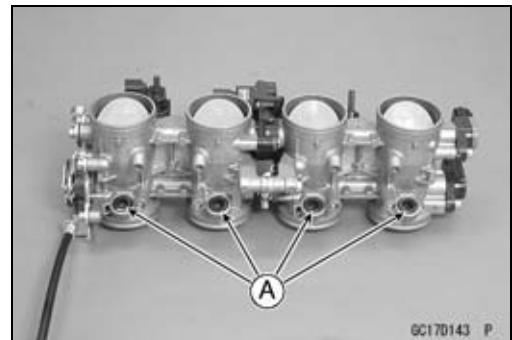


Throttle Body Assy Assembly

- Before assembling, blow away dirt or dust from the throttle body and delivery pipe Assy by applying compressed air.
- Replace the O-rings [A] of each primary fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, insert them to the delivery pipe Assy [C] and confirm whether the injectors turn smoothly or not.



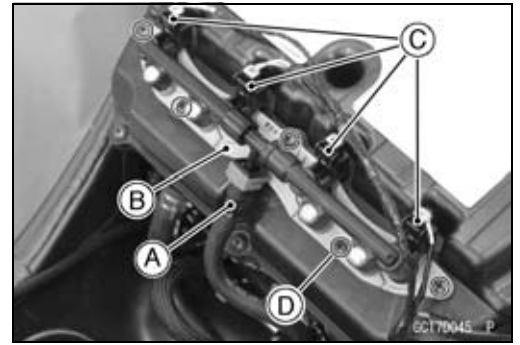
- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the primary fuel injectors along with the delivery pipe Assy to the throttle body.
- Tighten:
Torque - Delivery Pipe Assy Mounting Screws (Throttle Body Assy): 3.43 N·m (0.35 kgf·m, 30 in·lb)
- Install the throttle body Assy (see Throttle Body Assy Installation).



Nozzle Assy

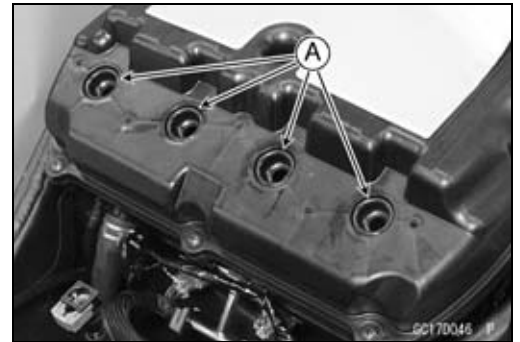
Nozzle Assy Removal

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel hose [A] from the delivery pipe of the nozzle assy [B] (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Disconnect the secondary fuel injector connectors [C].
- Remove:
 - Nozzle Assy Mounting Screws [D]
 - Nozzle Assy



Nozzle Assy Installation

- Replace the O-rings [A] with new ones.
- Apply engine oil to the new O-rings.
- Install the nozzle assy securely.



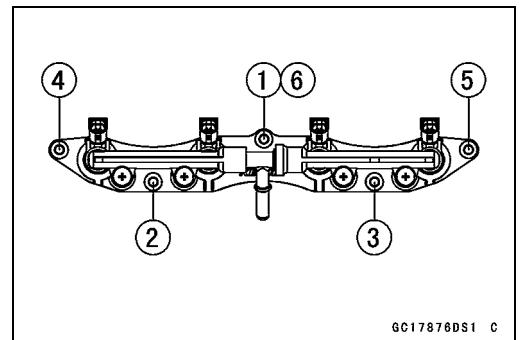
CAUTION

**When installing the nozzle assy, apply force equally to the stay plate.
Pushing the fuel pipe strongly could damage it as it is made from resin.**

- Tighten the mounting bolts as shown sequence [1 ~ 6] in the figure.

Torque - Nozzle Assy Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)

- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Connect the secondary fuel hose to the delivery pipe of the nozzle assy (see Fuel Hose Replacement in the Periodic Maintenance chapter).



GC17876DS1 C

3-134 FUEL SYSTEM (DFI)

Nozzle Assy

Nozzle Assy Disassembly

- Remove the nozzle assy (see Nozzle Assy Removal).
- Remove the screws [A] to pull out the secondary fuel injectors [B] from the stay plate [C] together with the delivery pipe assy [D].

NOTE

○ Do not damage the insertion portions of the injectors when they are pulled out from the stay plate.

- Pull out the secondary fuel injectors from the delivery pipe assy.

NOTE

○ Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.

CAUTION

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

- Separate the delivery pipe assy.

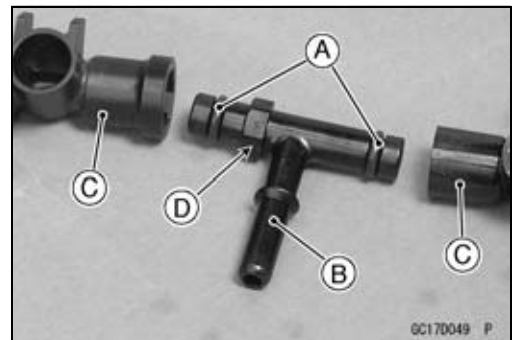
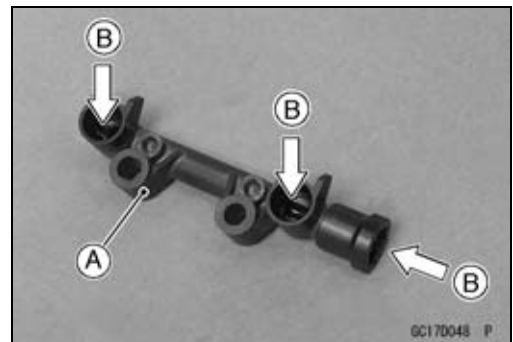
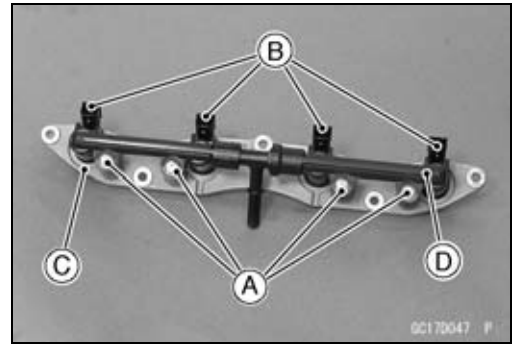
NOTE

○ Mark and record the location of the delivery pipes and the joint pipe so that the delivery pipe assy can be re-assembled in the original position.

Nozzle Assy Assembly

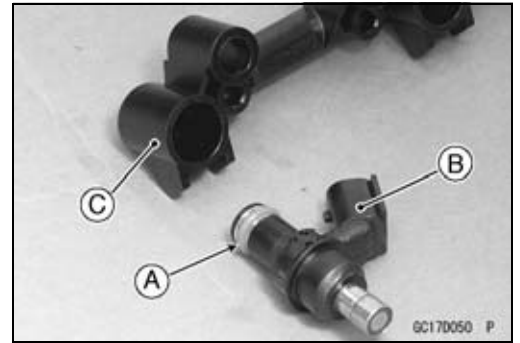
- Before assembling, blow away dirt or dust from the delivery pipes [A] by applying compressed air [B].

- Replace the O-rings [A] of the joint pipe [B] with new ones.
- Apply engine oil to the new O-rings, and insert it to the delivery pipes [C].
- Insert the joint pipe so that the stepped side [D] faces right side.

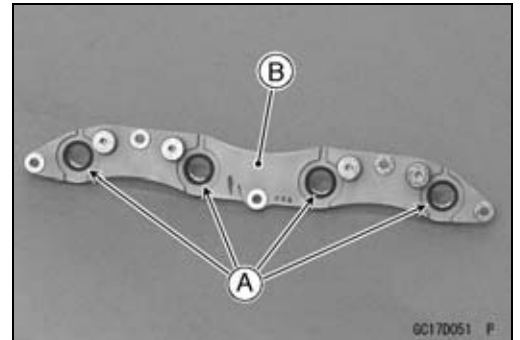


Nozzle Assy

- Replace the O-rings [A] of each secondary fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, and insert them to the delivery pipe assy [C] and confirm whether the injectors turn smoothly or not.



- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the secondary fuel injectors along with the delivery pipe assy to the stay plate [B].
- Tighten:
 - Torque - Delivery Pipe Assy Mounting Screws (Nozzle Assy): 3.43 N·m (0.35 kgf·m, 30 in·lb)**
- Install the nozzle assy (see Nozzle Assy Installation).



3-136 FUEL SYSTEM (DFI)

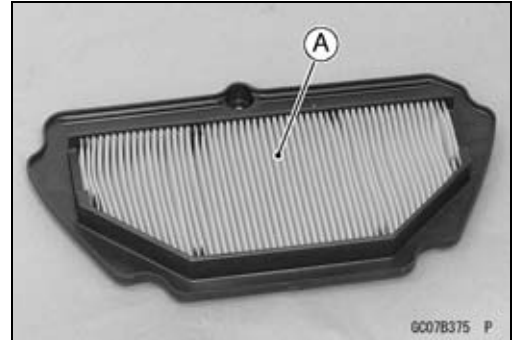
Air Cleaner

Air Cleaner Element Removal/Installation

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

Air Cleaner Element Inspection

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



Air Cleaner Oil Draining

A drain hose is connected to the bottom of the air cleaner to drain water or oil accumulated in the cleaner part.

- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Visually check the catch tank [A] of the drain hose, if the water or oil accumulates in the tank.
- ★ If any water or oil accumulates in the catch tank, remove the catch tank from the drain hose and drain it.

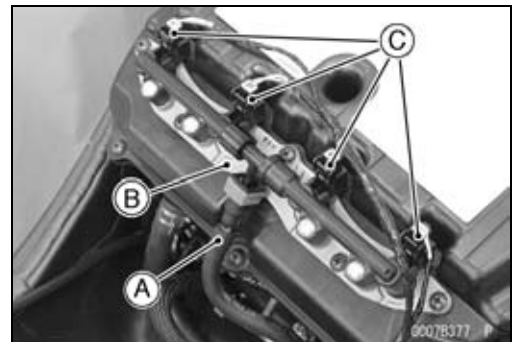


⚠ WARNING

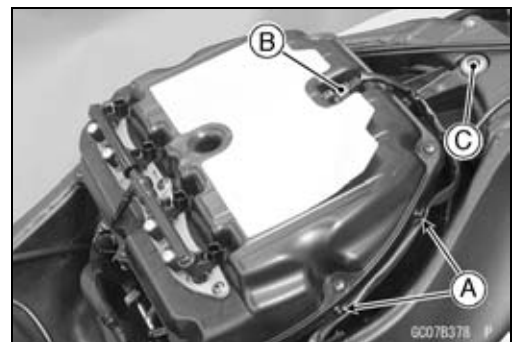
Be sure to reinstall the catch tank after draining. Oil on tires will make them slippery and can cause an accident and injury.

Air Cleaner Housing Removal

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel hose [A] from the delivery pipe of the nozzle assy [B] (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Disconnect the secondary fuel injector connectors [C].

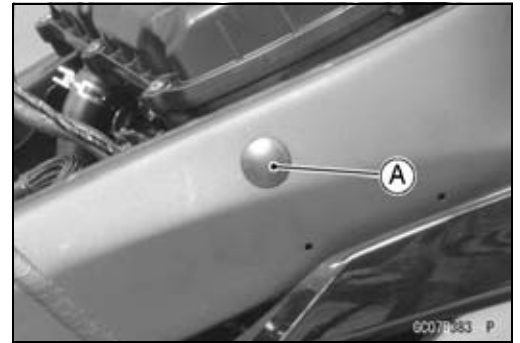


- Free the lead from the clamps [A].
- Disconnect the connector [B].
- Remove the bolt [C].



Air Cleaner

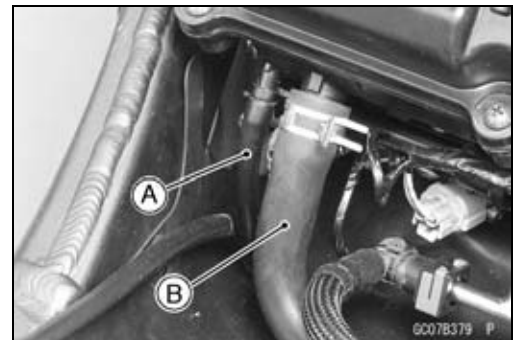
- Remove the caps [A].



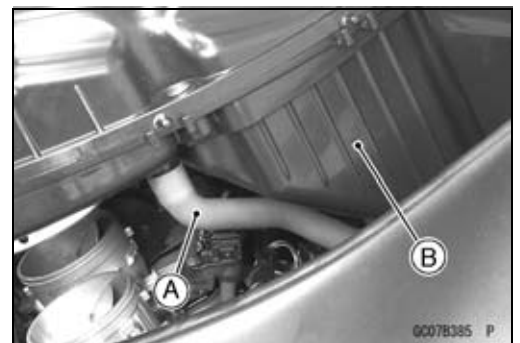
- Loosen the air cleaner housing clamp bolts [A].



- Remove:
Air Cleaner Drain Hose [A]
Breather Hose [B]



- Separate the air switching valve hose [A] from the air cleaner housing [B].

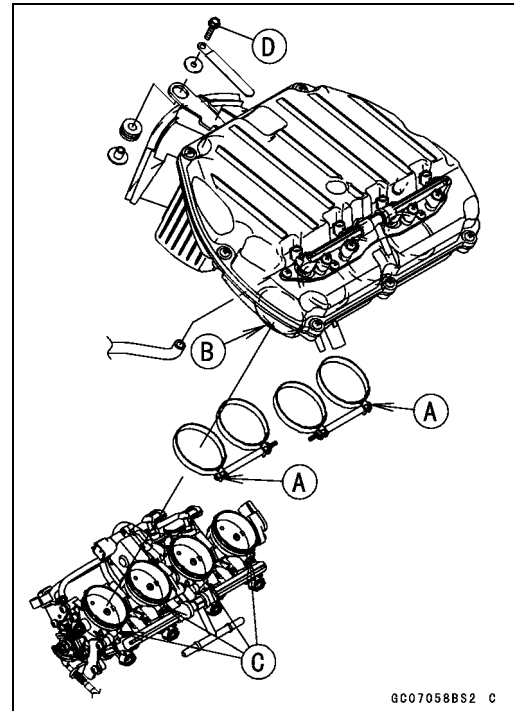


3-138 FUEL SYSTEM (DFI)

Air Cleaner

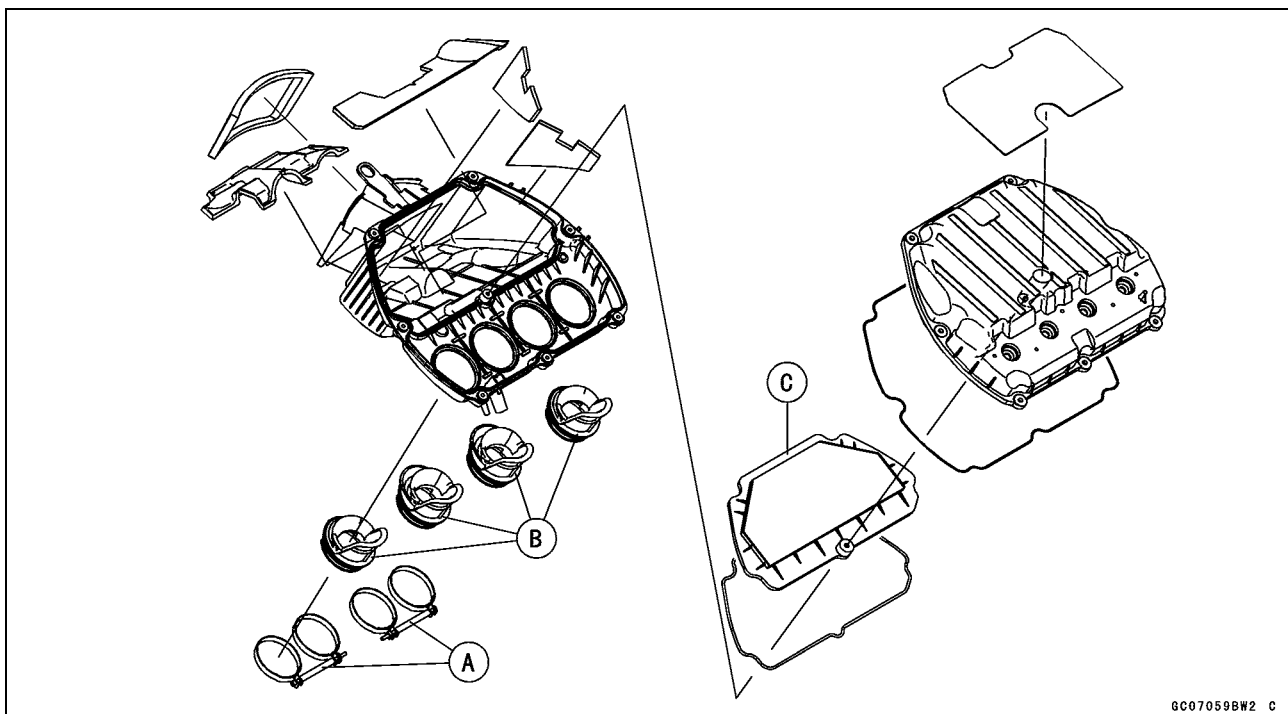
Air Cleaner Housing Installation

- Install the air switching valve hose to the air cleaner housing.
- Install the air cleaner housing on the throttle body assy.
- Install the clamp bolt heads [A] outside as shown in the figure.
- Push in the ducts [B] touch the stopper [C] of the throttle body.
- Tighten:
 - Torque - Air Cleaner Housing Clamp Bolts: 2.0 N·m (0.20 kgf·m, 18 in·lb)**
 - Air Cleaner Housing Mounting Bolt [D]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



Air Cleaner Housing Disassembly

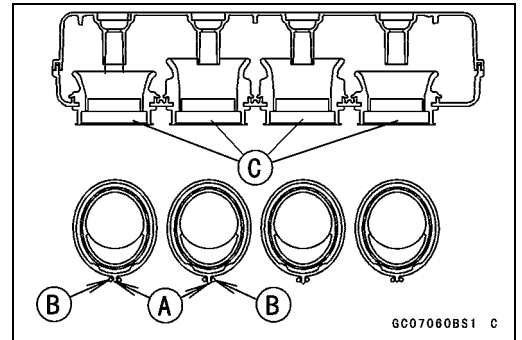
- Remove:
 - Air Cleaner Housing (see Air Cleaner Housing Removal)
 - Inlet Air Temperature Sensor (see Inlet Air Temperature Sensor Removal/Installation)
 - Nozzle Assy (see Nozzle Assy Removal)
 - Clamps [A]
 - Ducts [B]
 - Air Cleaner Element [C] (see Air Cleaner Element Replacement in the Periodic Maintenance chapter)



Air Cleaner

Air Cleaner Housing Assembly

- Fit the projections [A] of the duct into the slits [B] on the air cleaner housing.
- Do not twist the ducts [C].

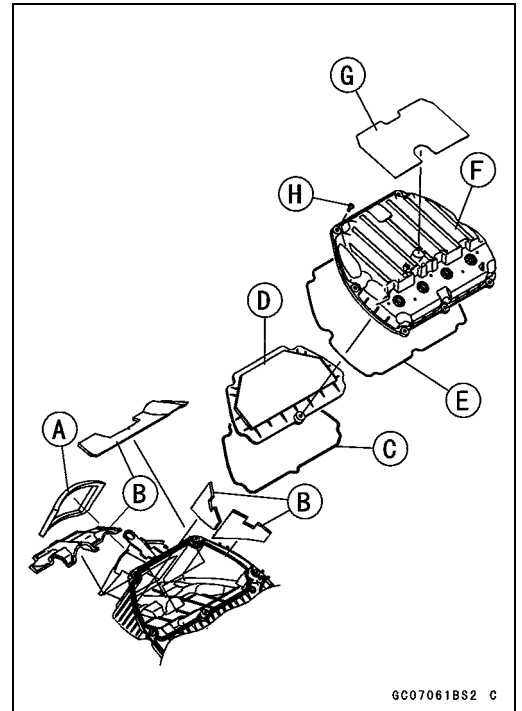


- Install:
 - Air Cleaner Frame Gasket [A]
 - Pads [B]
 - Air Cleaner Element Gasket [C]
 - Air Cleaner Element [D]
 - Air Cleaner Case Gasket [E]
 - Upper Air Cleaner Housing [F]
 - Damper [G]
 - Screws [H]

- Tighten:

**Torque - Air Cleaner Housing Assembly Screws: 1.2 N·m
(0.12 kgf·m, 11 in·lb)**

- Install the air cleaner housing (see Air Cleaner Housing Installation).

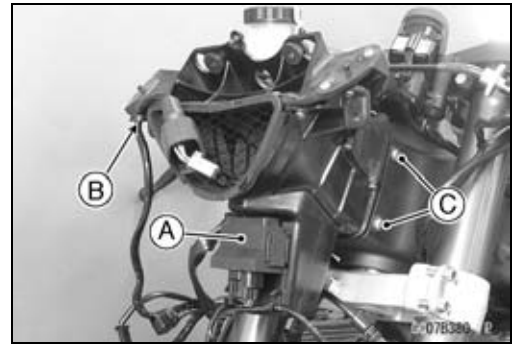


3-140 FUEL SYSTEM (DFI)

Air Line

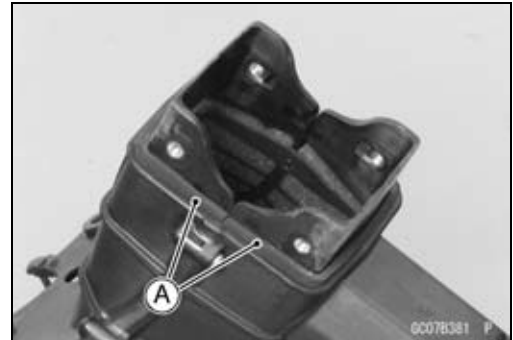
Air Inlet Duct Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Immobilizer Amplifier [A] (Equipped Models) (see Immobilizer System Parts Replacement in the Electrical System chapter)
 - Lead [B] (Free)
 - Air Inlet Duct Mounting Bolts [C] (Both Sides)
 - Air Inlet Duct



Air Inlet Duct Installation

- Check that the pads [A] are in place on the air inlet duct.
- Apply a non-permanent locking agent to the threads of the air inlet duct mounting bolts, and tighten them.
 - Torque - Air Inlet Duct Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix 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. Turn the ignition switch OFF and disconnect the battery (-) terminal. To avoid fire, do not remove the fuel tank when the engine is still hot. Wait until it cools down. To make fuel spillage minimum, draw the fuel out from the fuel tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

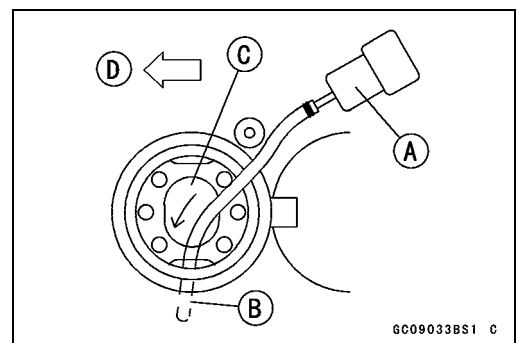
- Turn the ignition switch OFF.
- Wait until the engine cools down.
- Remove:
 - Front Seat (see Front Seat Removal in the Frame chapter)
 - Fuel Tank Bolts [A]



- Open the fuel tank cap [A] to lower the pressure in the tank.
- During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.



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



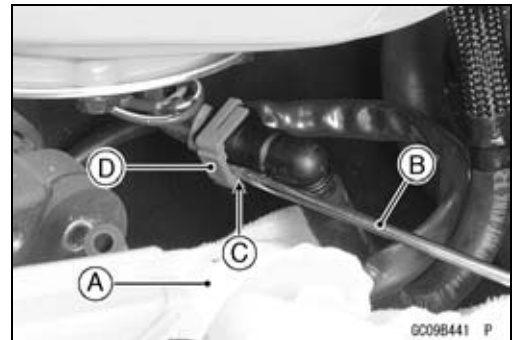
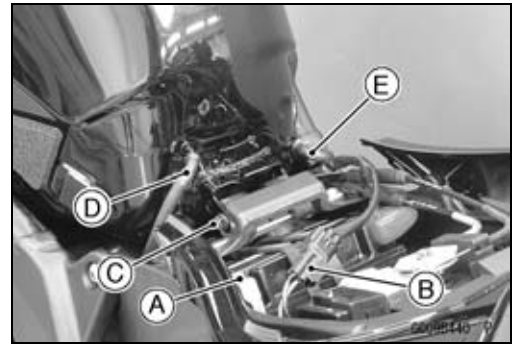
⚠ WARNING

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

3-142 FUEL SYSTEM (DFI)

Fuel Tank

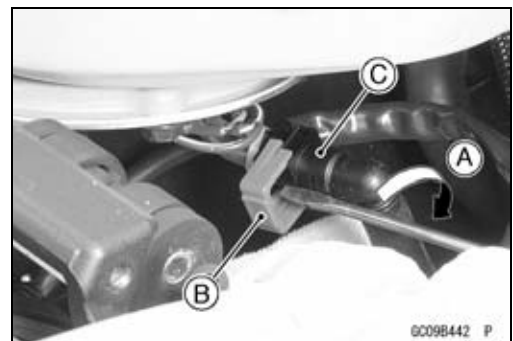
- Disconnect:
 - Battery (-) Terminal [A]
 - Fuel Pump Lead Connector [B]
- Remove:
 - Fuel Tank Bolt [C]
 - Fuel Tank Drain Hose [D]
 - Fuel Tank Breather Hose [E]
- For the California, Southeast Asia and Thailand models, remove the following.
 - Fuel Return Hose
- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert a thin blade screwdriver [B] into the slit [C] on the joint lock [D].



- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the 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. Cover the hose connection with a clean shop towel to prevent fuel spillage.



- Close the fuel tank cap.
- Remove the fuel tank, and place it on a flat surface.

Fuel Tank

- For the California, Southeast Asia and Thailand models, note the following.

CAUTION

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

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

⚠ WARNING

For the California, Southeast Asia and Thailand models, be careful not to spill the gasoline through the return hose. Spilled fuel is hazardous.

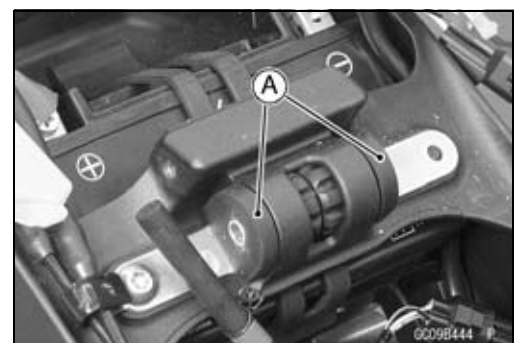
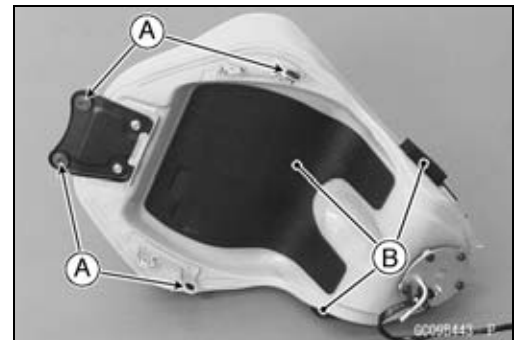
- ★ If liquid or gasoline flows into the breather hose, remove the hose and blow it clean with compressed air.
- Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump.

⚠ WARNING

Store the fuel tank in an area which is well-ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.

Fuel Tank Installation

- Note the above WARNING (see Fuel Tank Removal).
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Check that the dampers [A] and pads [B] are in place on the frame and the fuel tank.
- ★ If the dampers and pads are damaged or deteriorated, replace them.



3-144 FUEL SYSTEM (DFI)

Fuel Tank

- Install the pads [A] and trim [B] as shown in the figure.

Hook [C]

8 mm (0.31 in.) [D]

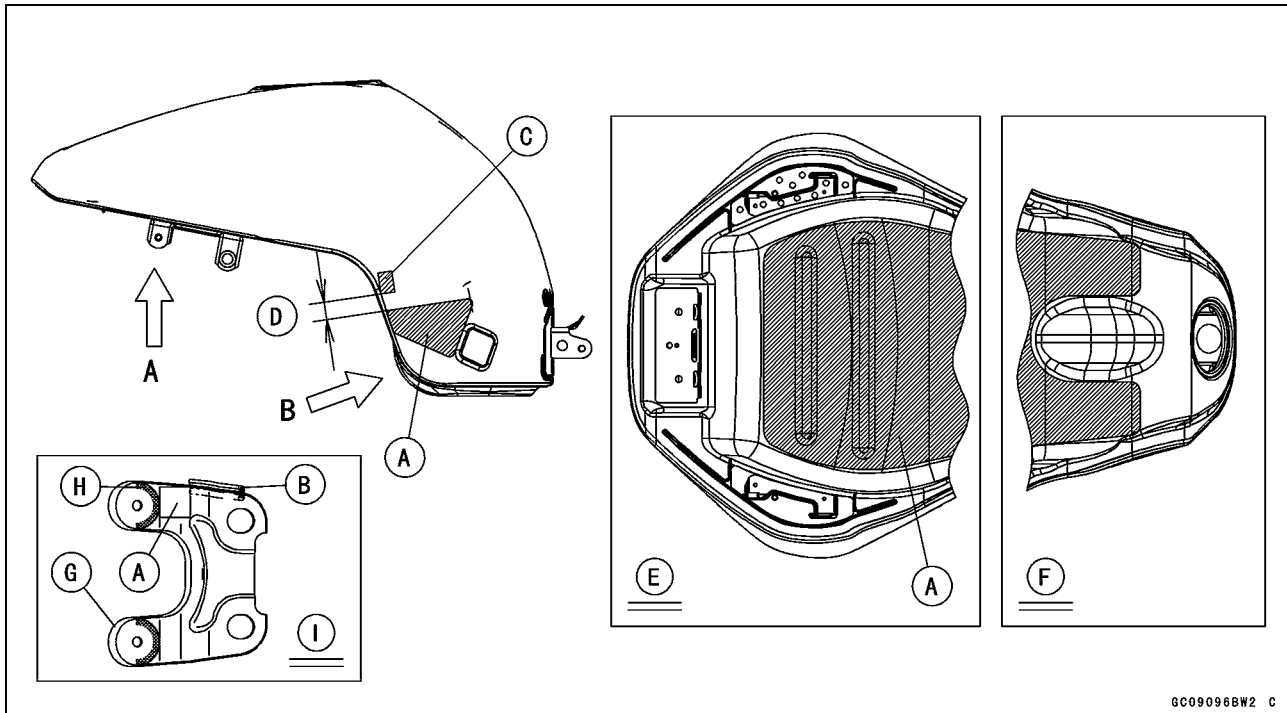
View A [E]

View B [F]

Fuel Tank Bracket [G]

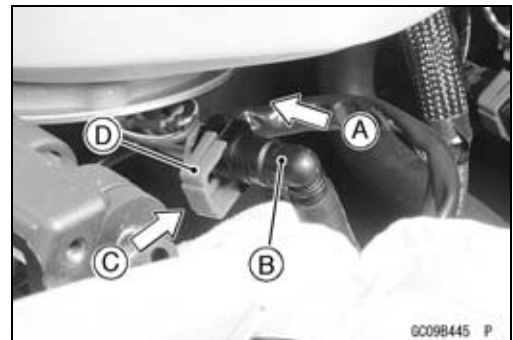
Weld [H]

View Upper Side [I]



GC090966W2 C

- For the California, Southeast Asia and Thailand models, note the following.
 - To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
 - Connect the hoses according to the diagram of the evaporative emission control system. Make sure they do not get pinched or kinked.
 - Run the hoses with a minimum of bending so that the air or vapor will not be obstructed.
- Insert [A] the fuel hose joint [B] straight onto the fuel outlet pipe until the hose joint clicks.
- Push [C] the joint lock [D] until the hose joint clicks.



GC09B445 P

Fuel Tank

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

⚠ WARNING

Make sure the 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 and the battery (-) terminal (see Battery Installation in the Electrical System chapter).

Fuel Tank Inspection

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

CAUTION

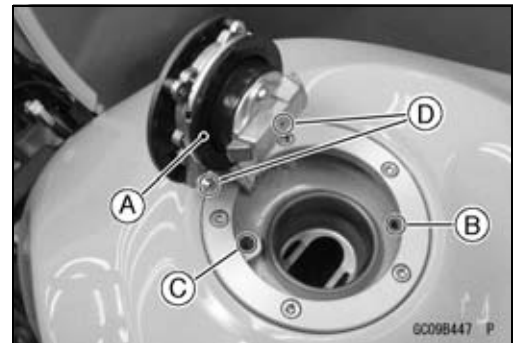
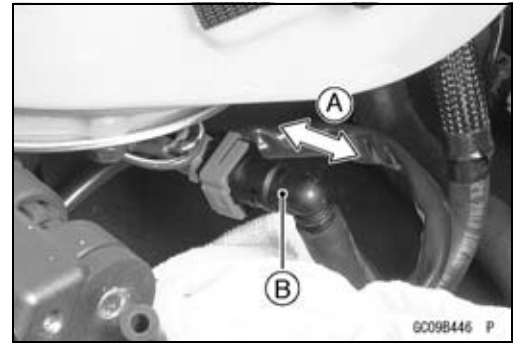
Do not apply compressed air to the air vent holes [D] in the tank cap. This could cause damage and clogging of the labyrinth in the cap.

Fuel Tank Cleaning

⚠ WARNING

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

- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Fuel Pump (see Fuel Pump Removal)
- Pour some high-flash point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Draw the solvent out of the fuel tank.
- Dry the tank with compressed air.
- Install:
 - Fuel Pump (see Fuel Pump Installation)
 - Fuel Tank (see Fuel Tank Installation)



3-146 FUEL SYSTEM (DFI)

Evaporative Emission Control System (CAL, SEA and TH Models)

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

Parts Removal/Installation

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. 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.

CAUTION

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

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

Hose Inspection

- Refer to the Evaporative Emission Control System Inspection (CAL, SEA and TH Models) in the Periodic Maintenance chapter.

Separator Inspection

- Refer to the Evaporative Emission Control System Inspection (CAL, SEA and TH Models) in the Periodic Maintenance chapter.

Evaporative Emission Control System (CAL, SEA and TH Models)

Separator Operation Test

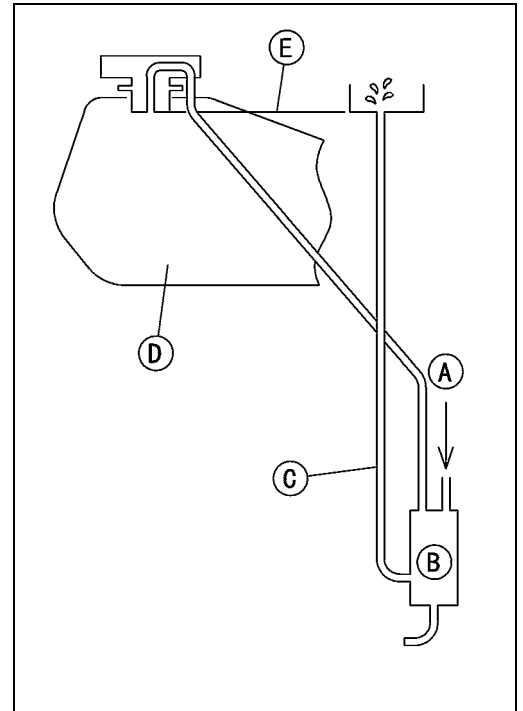
⚠ WARNING

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

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

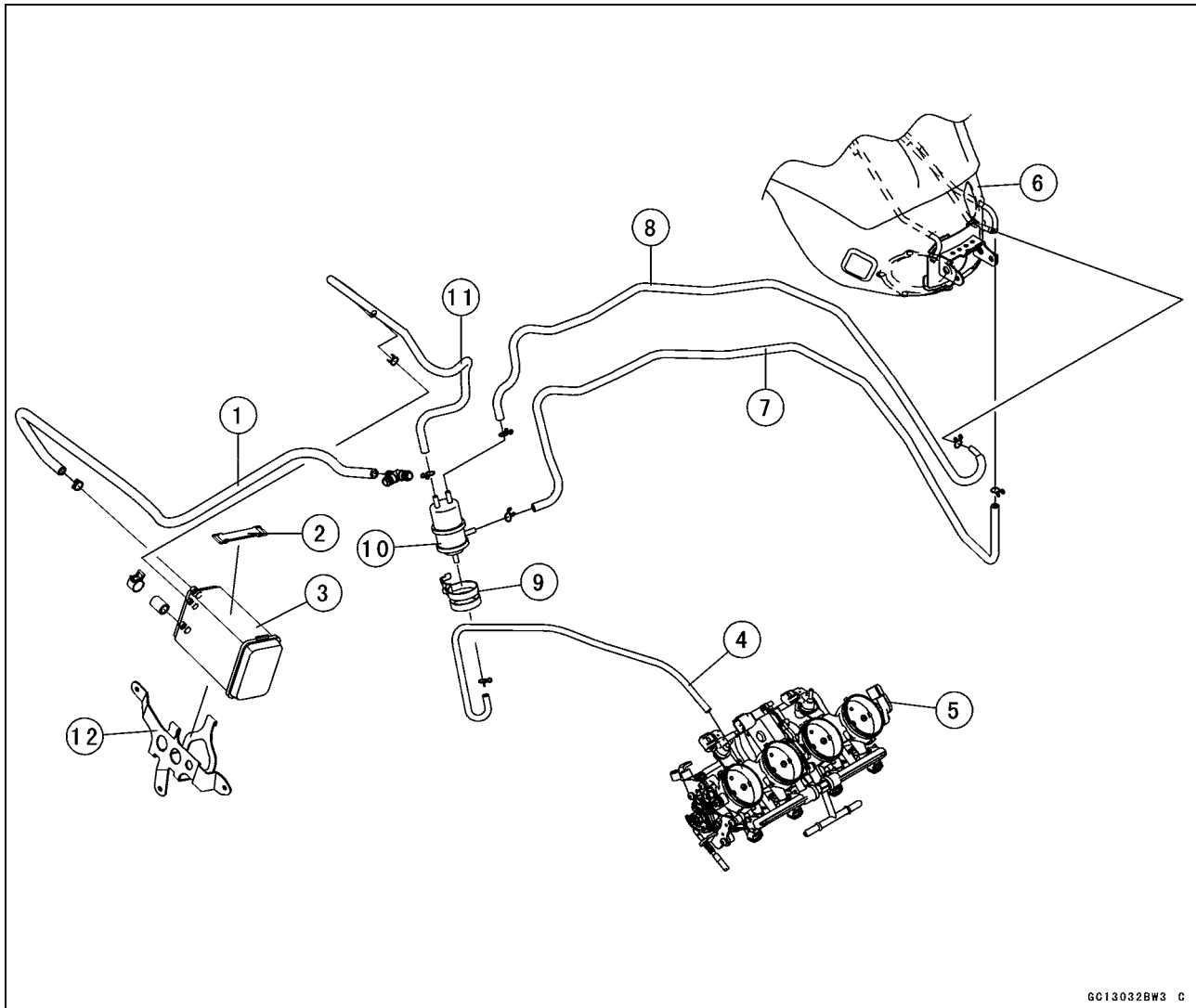
Canister Inspection

- Refer to the Evaporative Emission Control System Inspection (CAL, SEA and TH Models) in the Periodic Maintenance chapter.



3-148 FUEL SYSTEM (DFI)

Evaporative Emission Control System (CAL, SEA and TH Models)



1. Green Hose (Purge)
2. Band (for Canister)
3. Canister
4. White Hose (Vacuum)
5. Throttle Body Assy
6. Fuel Tank
7. Red Hose (Return)
8. Blue Hose (Breather)
9. Bracket (for Separator)
10. Separator
11. Blue Hose (Breather)
12. Bracket (for Canister)

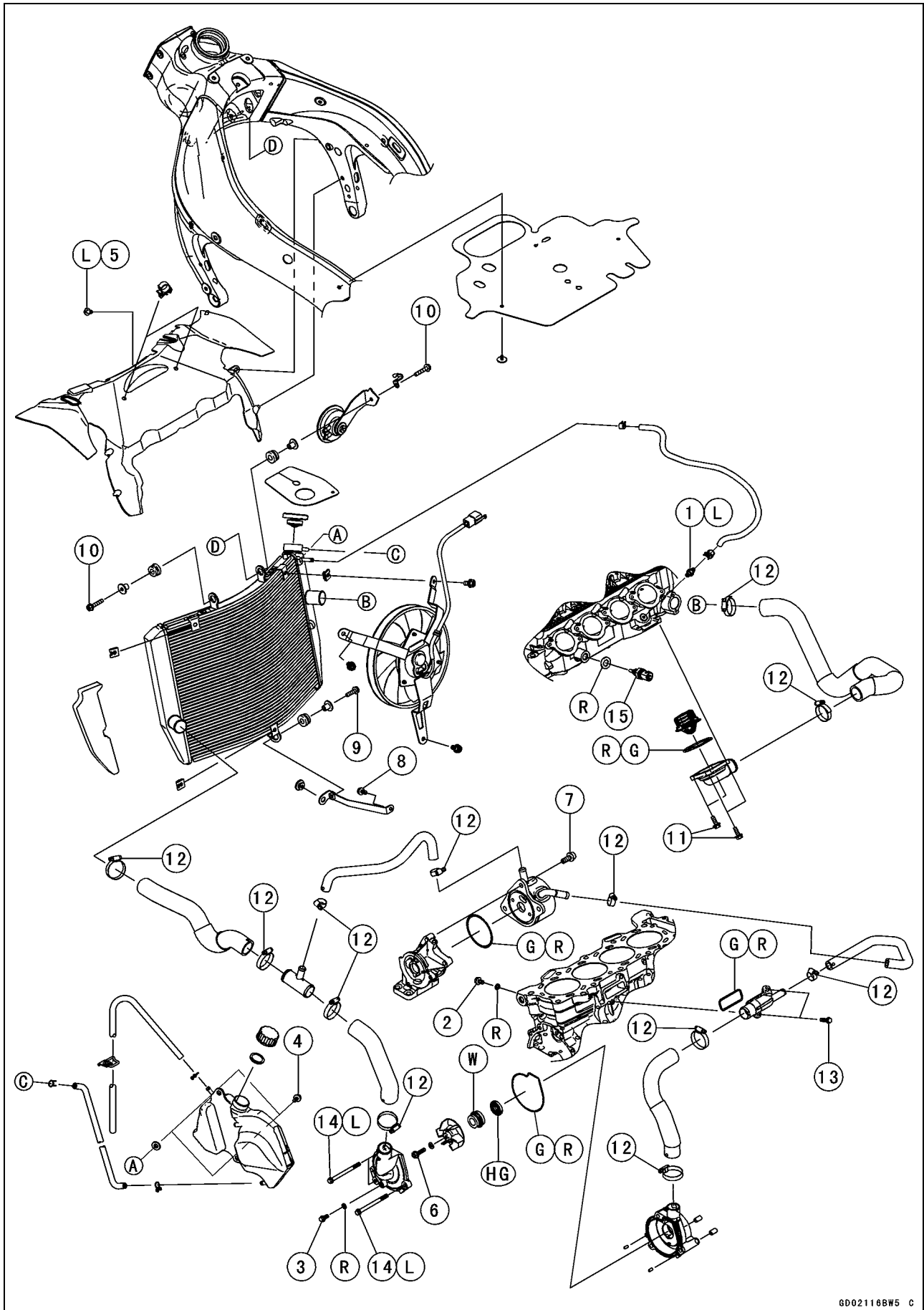
Cooling System

Table of Contents

Exploded View	4-2
Coolant Flow Chart	4-4
Specifications	4-6
Special Tools	4-7
Coolant	4-8
Coolant Deterioration Inspection	4-8
Coolant Level Inspection	4-8
Coolant Draining	4-8
Coolant Filling	4-8
Pressure Testing	4-8
Cooling System Flushing	4-9
Coolant Reserve Tank Removal	4-9
Coolant Reserve Tank Installation	4-9
Water Pump	4-10
Water Pump Removal	4-10
Water Pump Installation	4-10
Water Pump Inspection	4-10
Water Pump Impeller Disassembly/Assembly	4-10
Water Pump Impeller Inspection	4-10
Water Pump Housing Disassembly	4-10
Water Pump Housing Assembly	4-11
Mechanical Seal Inspection	4-11
Radiator	4-12
Radiator and Radiator Fan Removal	4-12
Radiator and Radiator Fan Installation	4-13
Radiator Inspection	4-13
Radiator Cap Inspection	4-14
Radiator Filler Neck Inspection	4-14
Thermostat	4-15
Thermostat Removal	4-15
Thermostat Installation	4-15
Thermostat Inspection	4-15
Hoses and Pipes	4-17
Hose Installation	4-17
Hose Inspection	4-17
Water Temperature Sensor	4-18
Water Temperature Sensor Removal/Installation	4-18
Water Temperature Sensor Inspection	4-18

4-2 COOLING SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coolant By-pass Fitting Bolt	8.8	0.90	78 in·lb	L
2	Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
3	Coolant Drain Bolt (Water Pump)	8.8	0.90	78 in·lb	
4	Coolant Reserve Tank Mounting Bolts	6.9	0.70	61 in·lb	
5	Heat Insulation Plate Bolt	3.9	0.40	35 in·lb	L
6	Impeller Bolt	9.8	1.0	87 in·lb	
7	Oil Cooler Mounting Bolts	20	2.0	15	
8	Radiator Bracket Mounting Bolt	9.8	1.0	87 in·lb	
9	Radiator Lower Bolt	6.9	0.70	61 in·lb	
10	Radiator Upper Bolts	9.8	1.0	87 in·lb	
11	Thermostat Housing Cover Bolts	5.9	0.60	52 in·lb	
12	Water Hose Clamp Screws	2.0	0.20	18 in·lb	
13	Water Hose Fitting Bolts	9.8	1.0	87 in·lb	
14	Water Pump Cover Bolts	12	1.2	106 in·lb	L
15	Water Temperature Sensor	25	2.5	18	

G: Apply grease.

HG: Apply high-temperature grease.

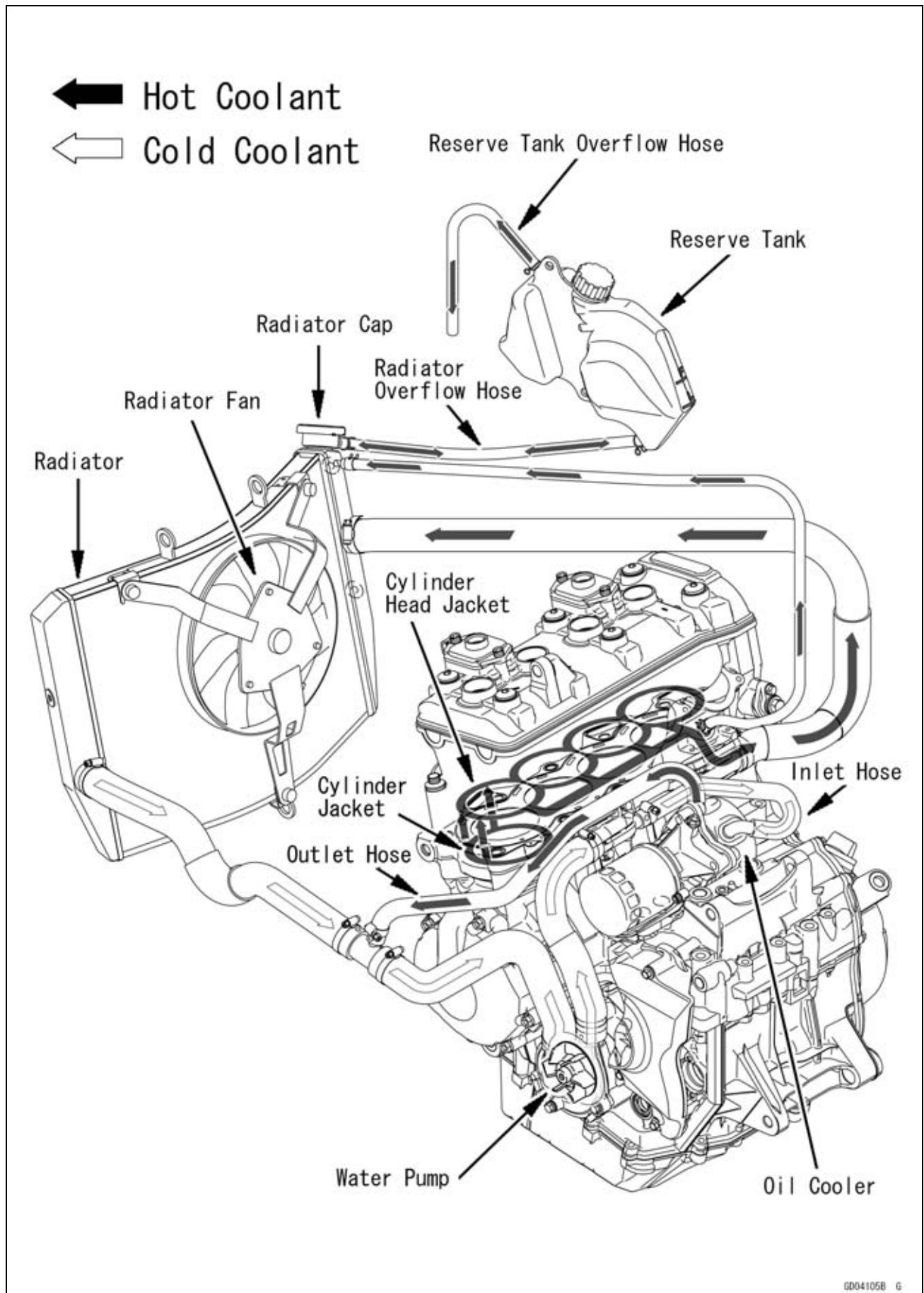
L: Apply a non-permanent locking agent.

R: Replacement Parts

W: Apply water.

4-4 COOLING SYSTEM

Coolant Flow Chart



Coolant Flow Chart

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

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

When the coolant temperature goes up beyond 100°C (212°F), the radiator fan relay conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the coolant temperature is below 97°C (207°F), the fan relay opens and the radiator fan stops.

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

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

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

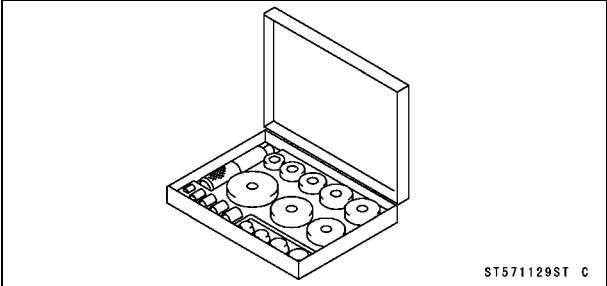
4-6 COOLING SYSTEM

Specifications

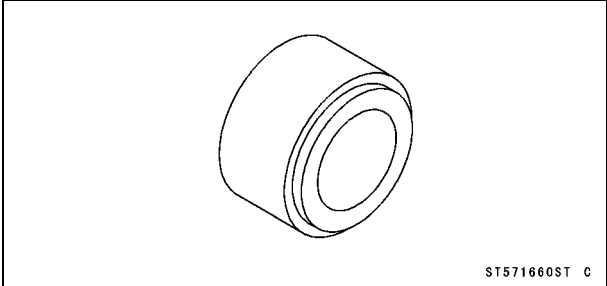
Item	Standard
Coolant Provided when Shipping Type (Recommended) Color Mixed Ratio Freezing Point Total Amount	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators) Green Soft water 50%, coolant 50% -35°C (-31°F) 2.5 L (2.6 US qt) (Reserve tank full level, including radiator and engine)
Radiator Cap Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm ² , 13 ~ 18 psi)
Thermostat Valve Opening Temperature Valve Full Opening Lift	58 ~ 62°C (136 ~ 144°F) 8 mm (0.31 in.) or more at 75°C (167°F)

Special Tools

**Bearing Driver Set:
57001-1129**



**Oil Seal Driver:
57001-1660**

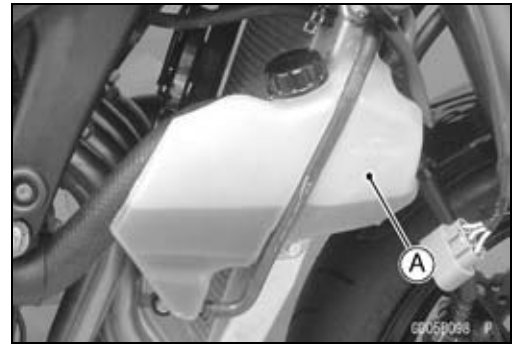


4-8 COOLING SYSTEM

Coolant

Coolant Deterioration Inspection

- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Visually inspect the coolant in the reserve tank [A].
- ★ If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.
- ★ If the coolant gives off an abnormal smell, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.



Coolant Level Inspection

- Refer to the Coolant Level Inspection in the Periodic Maintenance chapter.

Coolant Draining

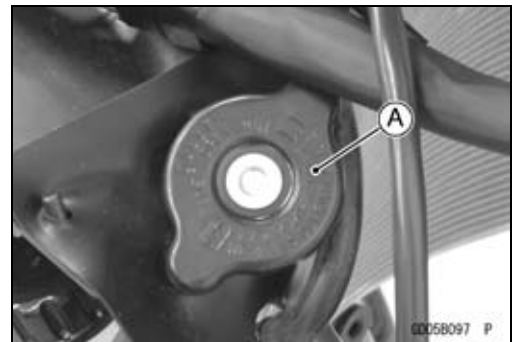
- Refer to the Coolant Change in the Periodic Maintenance chapter.

Coolant Filling

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

Pressure Testing

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Radiator Cap [A]
- Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.



- Install the cooling system pressure tester [A] on the filler neck.

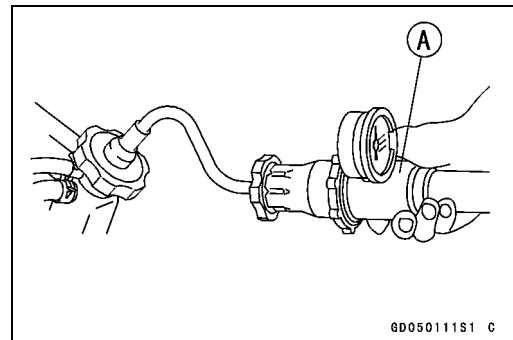
NOTE

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

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm², 18 psi).

CAUTION

During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm², 18 psi).



- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the system is all right.
- ★ If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the water pump.
- Remove the pressure tester, replenish the coolant, and install the radiator cap.

Coolant

Cooling System Flushing

Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passage and considerably reduce the efficiency of the cooling system.

- Drain the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Fill the cooling system with fresh water mixed with a flushing compound.

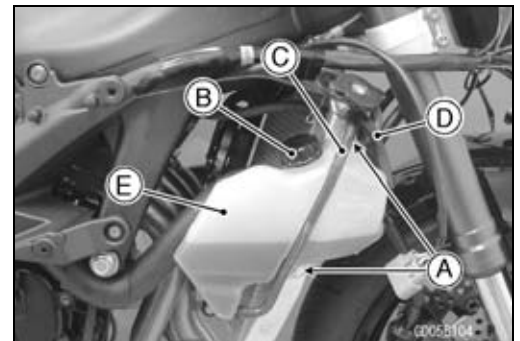
CAUTION

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

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

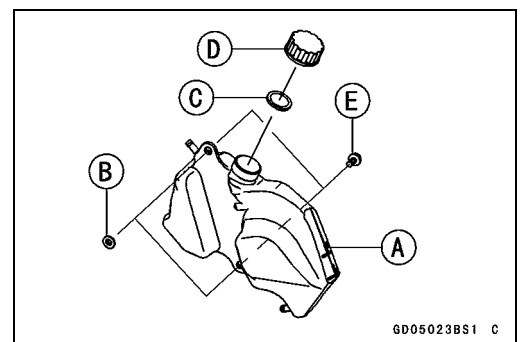
Coolant Reserve Tank Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Coolant Reserve Tank Mounting Bolts [A]
- Remove the cap [B] and pour the coolant into a container.
- Remove:
 - Radiator Overflow Hose [C]
 - Reserve Tank Overflow Hose [D]
 - Coolant Reserve Tank [E]



Coolant Reserve Tank Installation

- Install the following to the coolant reserve tank [A].
 - Collars [B]
 - Gasket [C]
 - Cap [D]
- Tighten:
 - Torque - Coolant Reserve Tank Mounting Bolts [E]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Fill the coolant reserve tank with coolant (see Coolant Change in the Periodic Maintenance chapter).



4-10 COOLING SYSTEM

Water Pump

Water Pump Removal

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

Water Pump Installation

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

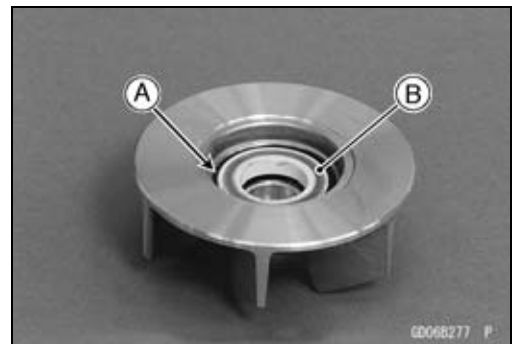
Water Pump Inspection

- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Check the drainage outlet passage [A] at the bottom of the water pump body for coolant leaks.
- ★ If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal unit (see Water Pump Housing Disassembly/Assembly).



Water Pump Impeller Disassembly/Assembly

- Remove the water pump impeller (see Oil Pump Removal in the Engine Lubrication System chapter).
- The sealing seat and rubber seal may be removed easily by hand.
- Apply coolant around the surfaces of the rubber seal and sealing seat.
- Install the rubber seal [A] and sealing seat [B] into the impeller by pressing them by hand until the seat stops at the bottom of the hole.
- Install the water pump impeller (see Oil Pump Installation in the Engine Lubrication System chapter).



Water Pump Impeller Inspection

- Remove the water pump cover (see Oil Pump Removal in the Engine Lubrication System chapter).
- Visually inspect the impeller [A].
- ★ If the surface is corroded or if the blades are damaged, replace the impeller.

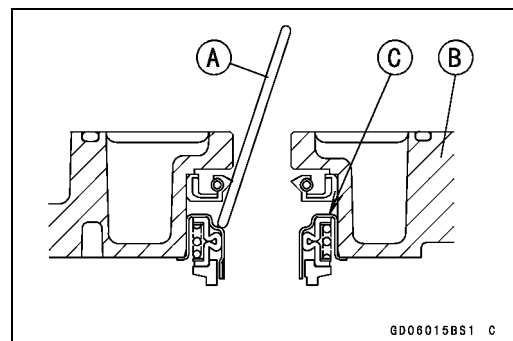


Water Pump Housing Disassembly

CAUTION

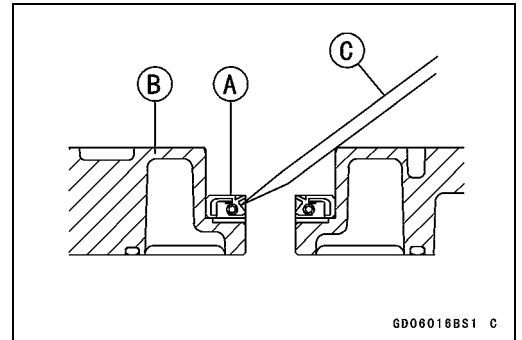
Do not damage the hole wall of the water pump housing.

- Insert a bar [A] into the pump housing [B], and hammer evenly around the circumference of the mechanical seal bottom [C].



Water Pump

- Take the oil seal [A] out of the housing [B] with a hook [C].



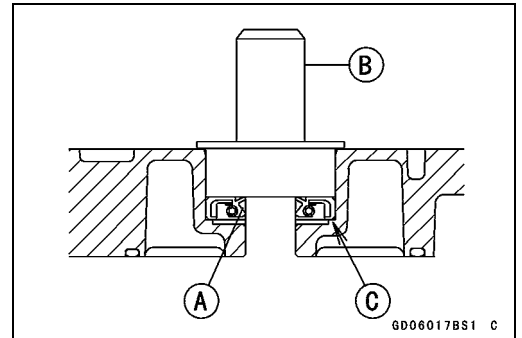
Water Pump Housing Assembly

CAUTION

Do not reuse the mechanical seal and oil seal.

- Apply high-temperature grease to the oil seal lips [A].
- Press the new oil seal into the housing with a bearing driver [B] until it stops at the bottom surface [C] of the housing.

Special Tool - Bearing Driver Set: 57001-1129

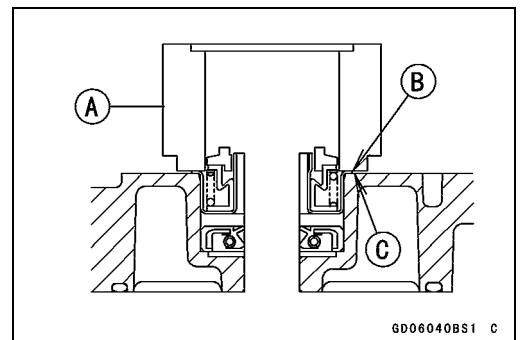


CAUTION

Be careful not to damage the sealing surface of the mechanical seal.

- Press the new mechanical seal into the housing with the oil seal driver [A] until its flange [B] touches the surface [C] of the housing.

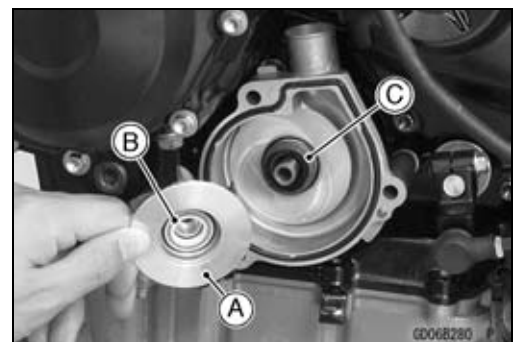
Special Tool - Oil Seal Driver: 57001-1660



Mechanical Seal Inspection

- Remove the impeller (see Oil Pump Removal in the Engine Lubrication System chapter).
- Visually inspect the mechanical seal.
- ★ If any one of the parts is damaged, replace the mechanical seal as a unit.

- Impeller Sealing Seat Surface [A]
- Rubber Seal [B]
- Mechanical Seal [C]



4-12 COOLING SYSTEM

Radiator

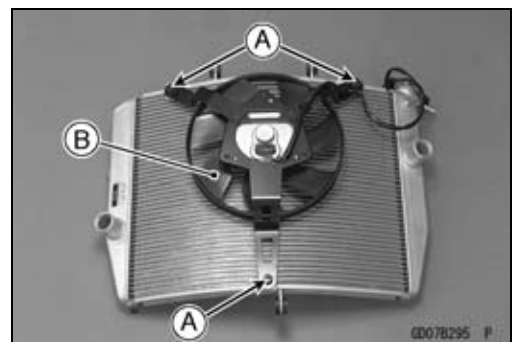
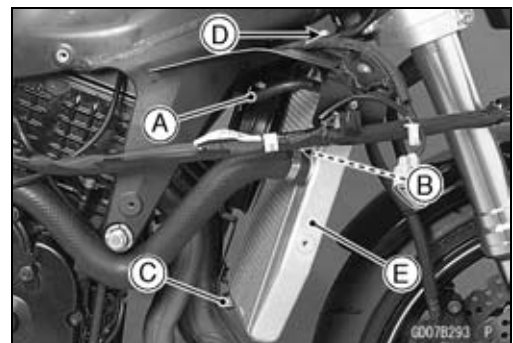
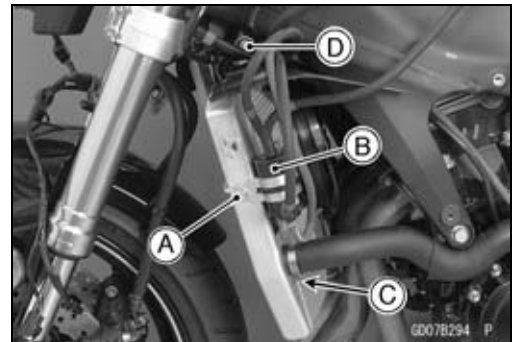
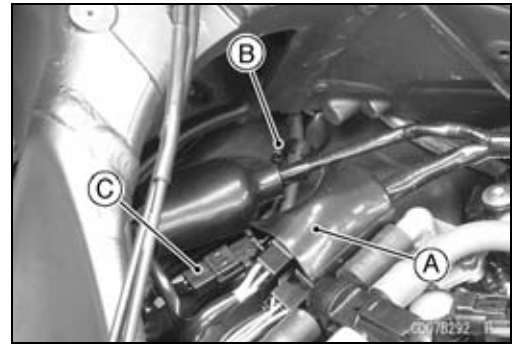
Radiator and Radiator Fan Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
 - Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
 - Coolant Reserve Tank (see Coolant Reserve Tank Removal)
 - Dust Cover [A] (Slide)
 - Clamp [B]
 - Radiator Fan Motor Lead Connector [C] (Disconnect)
- For the California, Southeast Asia and Thailand models, remove the following.
 - Separator Bracket Mounting Bolt [A]
 - Separator [B]
- Remove:
 - Pad
 - Radiator Hose Clamp Screw [C] (Loosen)
 - Radiator Upper Bolt (Left) [D]
- Remove:
 - Radiator Hose [A]
 - Radiator Hose Clamp Screw [B] (loosen)
 - Radiator Lower Bolt [C]
 - Radiator Upper Bolt (Right) [D]
 - Radiator [E]

CAUTION

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

- Remove:
 - Radiator Fan Mounting Bolts [A]
 - Radiator Fan [B]



Radiator

Radiator and Radiator Fan Installation

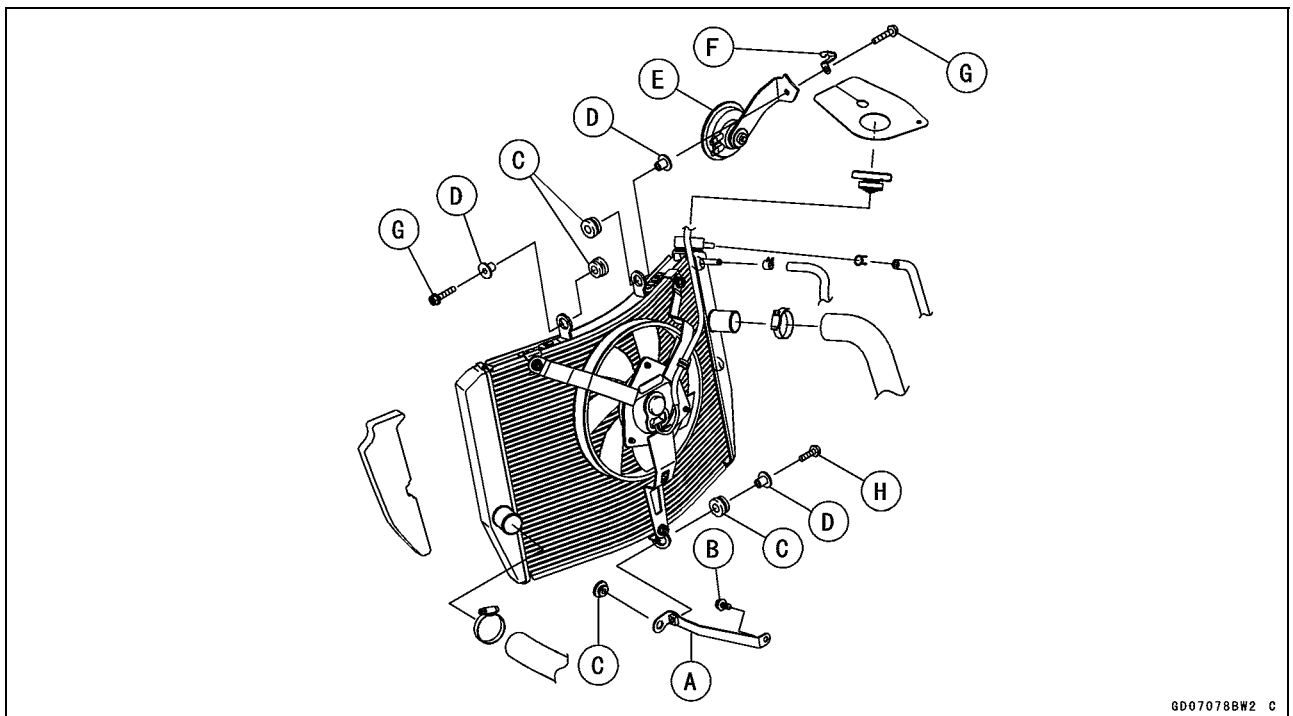
★If the radiator bracket [A] was removed, install it.

Torque - Radiator Bracket Mounting Bolt [B]: 9.8 N-m (1.0 kgf-m, 87 in-lb)

- Run the radiator fan motor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the rubber dampers [C] and collars [D] as shown in the figure.
- Install the horn [E] and clamp [F].
- Tighten:

Torque - Radiator Upper Bolts [G]: 9.8 N-m (1.0 kgf-m, 87 in-lb)

Radiator Lower Bolt [H]: 6.9 N-m (0.70 kgf-m, 61 in-lb)



GD07078BW2 C

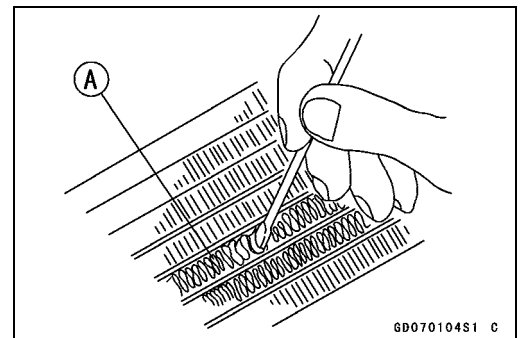
- Install the water hoses and clamps (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

Torque - Water Hose Clamp Screws: 2.0 N-m (0.20 kgf-m, 18 in-lb)

- Install the removed parts (see appropriate chapters).

Radiator Inspection

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



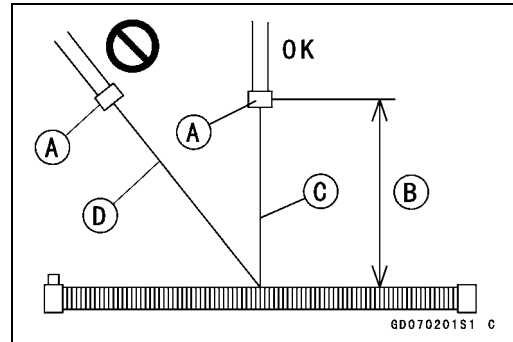
GD070104S1 C

4-14 COOLING SYSTEM

Radiator

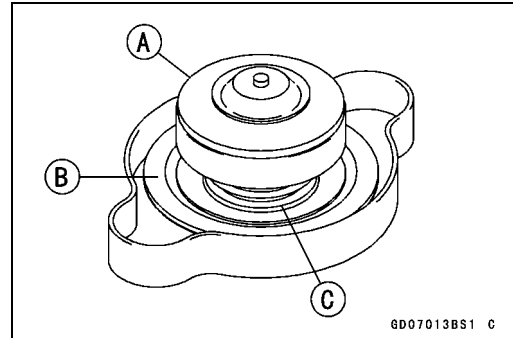
CAUTION

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



Radiator Cap Inspection

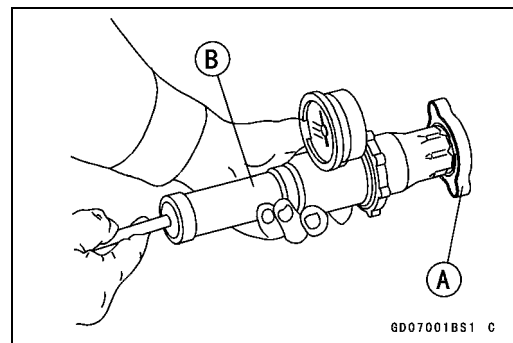
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Radiator Cap
- Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].
- ★ If any one of them shows visible damage, replace the cap with a new one.
- Install the cap [A] on a cooling system pressure tester [B].



NOTE

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

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



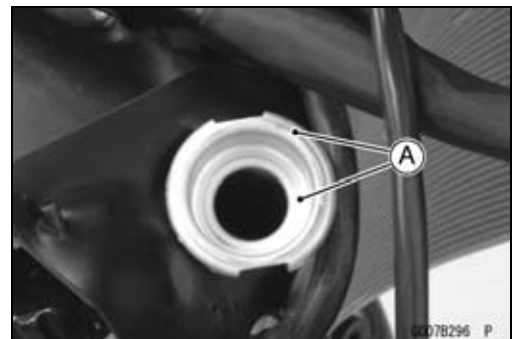
Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi)

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

Radiator Filler Neck Inspection

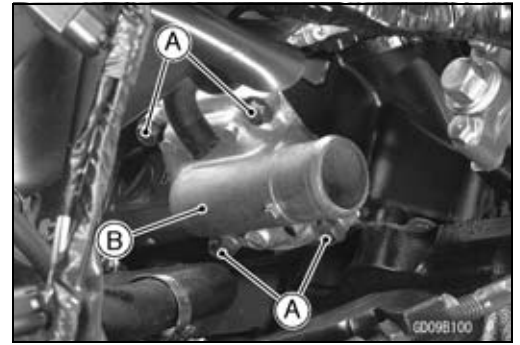
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Radiator Cap
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



Thermostat

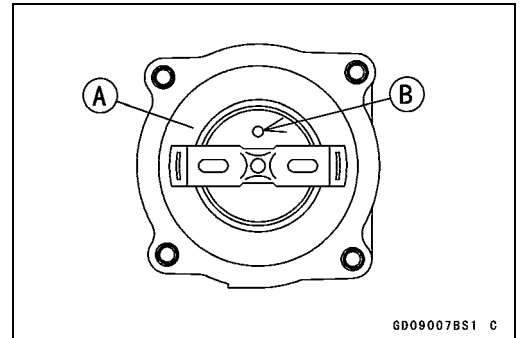
Thermostat Removal

- Remove:
 - Oil Cooler (see Oil Cooler Removal in the Engine Lubrication System chapter)
 - Thermostat Housing Cover Bolts [A]
 - Thermostat Housing Cover [B]
 - Thermostat

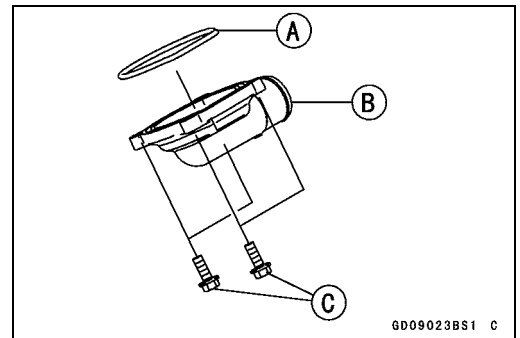


Thermostat Installation

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

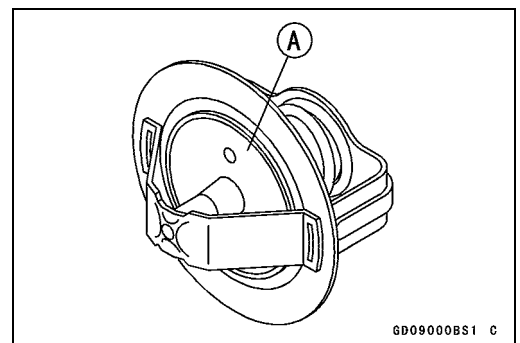


- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Install a new O-ring into the thermostat housing cover [B].
- Tighten:
 - Torque - Thermostat Housing Cover Bolts [C]: 5.9 N-m (0.60 kgf-m, 52 in-lb)**
- Install the removed parts (see appropriate chapters).



Thermostat Inspection

- Remove the thermostat (see Thermostat Removal).
- Inspect the thermostat valve [A] at room temperature.
- ★ If the valve is open, replace the thermostat with a new one.



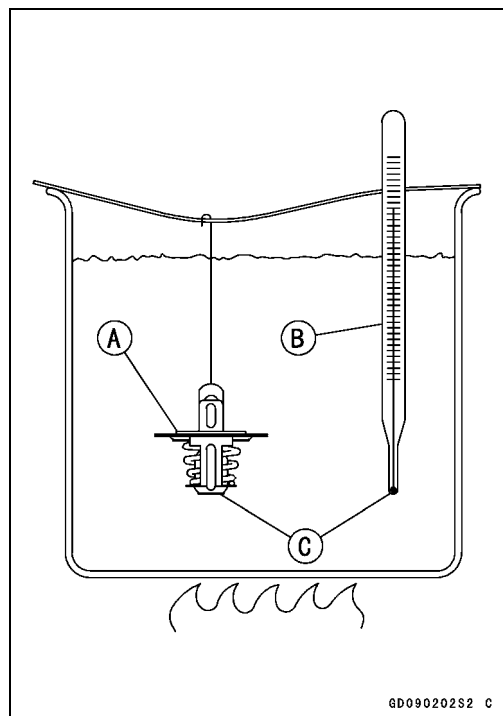
4-16 COOLING SYSTEM

Thermostat

- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.
- The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth.
- ★ If the measurement is out of the specified range, replace the thermostat with a new one.

Thermostat Valve Opening Temperature

58 ~ 62°C (136 ~ 144°F)



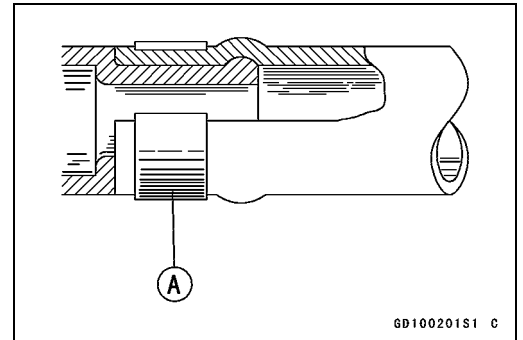
Hoses and Pipes

Hose Installation

- Install the hoses and pipes, being careful to follow bending direction. Avoid sharp bending, kinking, flattening or twisting.
- Run the hoses (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the clamp [A] as near as possible to the hose end to clear the raised rib of the fitting. This will prevent the hoses from working loose.
- The clamp screws should be positioned correctly to prevent the clamps from contacting the other parts.
- Tighten:
Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)

Hose Inspection

- Refer to the Radiator Hose and Pipe Inspection in the Periodic Maintenance chapter.



4-18 COOLING SYSTEM

Water Temperature Sensor

Water Temperature Sensor Removal/Installation

- Refer to the Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter.

Water Temperature Sensor Inspection

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

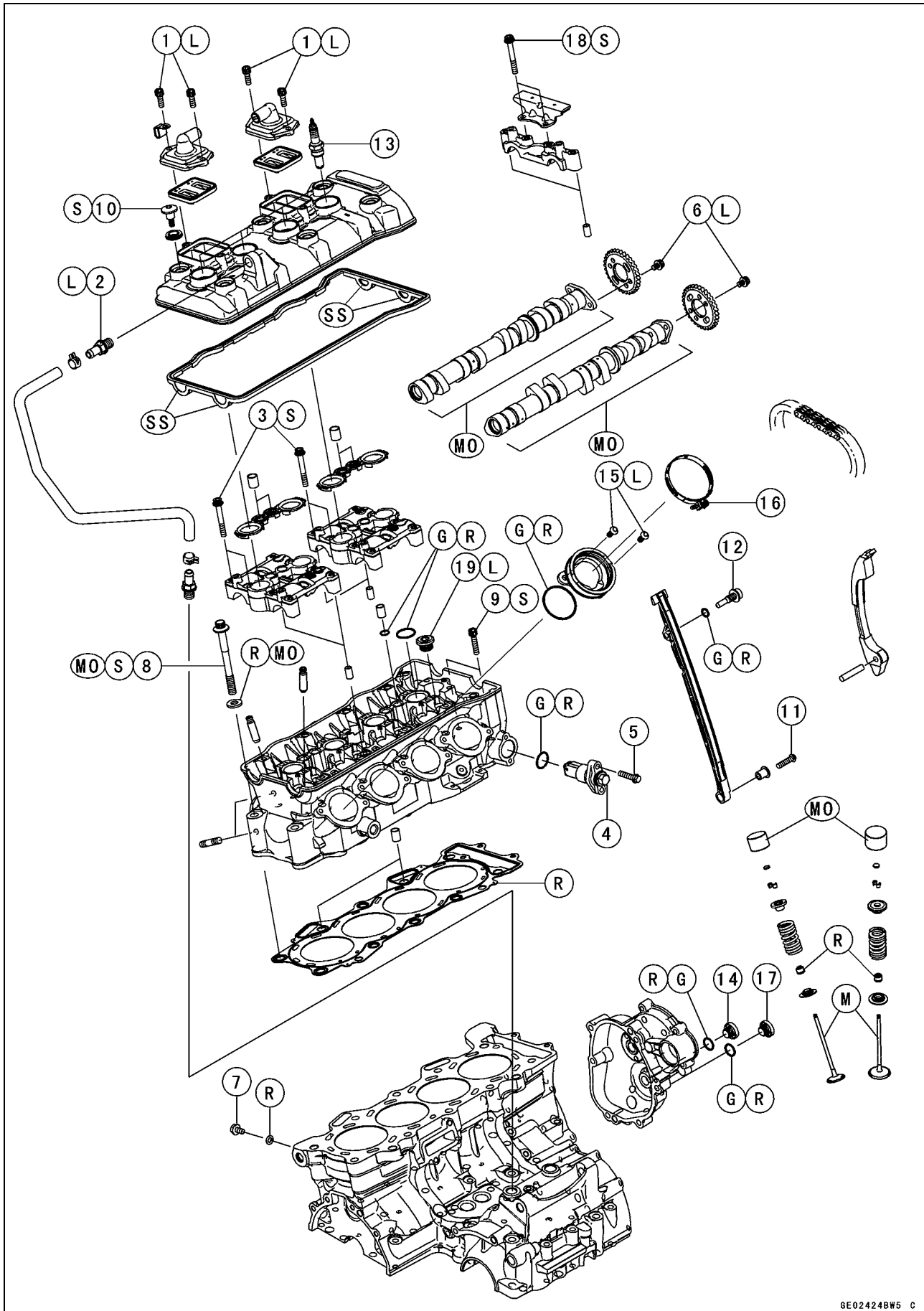
Engine Top End

Table of Contents

Exploded View.....	5-2	Cylinder Compression	
Exhaust System Identification	5-6	Measurement	5-25
Specifications	5-8	Cylinder Head Removal	5-26
Special Tools and Sealant	5-9	Cylinder Head Installation	5-27
Clean Air System.....	5-11	Cylinder Head Warp Inspection ...	5-28
Air Suction Valve Removal.....	5-11	Valves	5-29
Air Suction Valve Installation.....	5-11	Valve Clearance Inspection	5-29
Air Suction Valve Inspection	5-12	Valve Removal	5-29
Air Switching Valve Removal	5-12	Valve Installation	5-29
Air Switching Valve Installation ...	5-12	Valve Guide Removal	5-29
Air Switching Valve Operation		Valve Guide Installation	5-29
Test.....	5-13	Valve-to-Guide Clearance	
Air Switching Valve Unit Test	5-13	Measurement (Wobble	
Clean Air System Hose		Method).....	5-30
Inspection.....	5-13	Valve Seat Inspection	5-31
Cylinder Head Cover	5-14	Valve Seat Repair	5-31
Cylinder Head Cover Removal	5-14	Throttle Body Assy Holder.....	5-36
Cylinder Head Cover Installation .	5-14	Throttle Body Assy Holder	
Camshaft Chain Tensioner	5-16	Removal	5-36
Camshaft Chain Tensioner		Installation	5-36
Removal	5-16	Muffler.....	5-37
Camshaft Chain Tensioner		Muffler Body Removal.....	5-37
Installation	5-17	Muffler Body Installation.....	5-38
Camshaft, Camshaft Chain	5-18	Premuffler Chamber Removal	5-39
Camshaft Removal	5-18	Premuffler Chamber Installation ..	5-40
Camshaft Installation	5-19	Exhaust Pipe Removal.....	5-41
Camshaft, Camshaft Cap Wear		Exhaust Pipe Installation.....	5-42
Inspection.....	5-23	Exhaust Butterfly Valve Cable	
Camshaft Runout Inspection.....	5-24	Removal	5-43
Cam Wear Inspection	5-24	Exhaust Butterfly Valve Cable	
Camshaft Chain Removal	5-24	Installation	5-44
Cylinder Head.....	5-25		

5-2 ENGINE TOP END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	L
2	Breather Hose Fitting	15	1.5	11	L
3	Camshaft Cap Bolts	12	1.2	106 in·lb	S
4	Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
5	Camshaft Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	
6	Camshaft Sprocket Bolts	15	1.5	11	L
7	Coolant Drain Bolt (Cylinder)	9.8	1.0	87 in·lb	
8	Cylinder Head Bolts (M9)	39	4.0	29	MO, S
9	Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
10	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
11	Front Camshaft Chain Guide Bolt (Lower)	12	1.2	106 in·lb	
12	Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
13	Spark Plugs	13	1.3	115 in·lb	
14	Starter Clutch Bolt Cap	–	–	–	Hand-tighten
15	Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	L
16	Throttle Body Assy Holder Clamp Bolts	2.9	0.30	26 in·lb	
17	Timing Inspection Cap	–	–	–	Hand-tighten
18	Upper Camshaft Chain Guide Bolts	12	1.2	106 in·lb	S
19	Water Passage Plugs	19.6	2.0	14	L

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

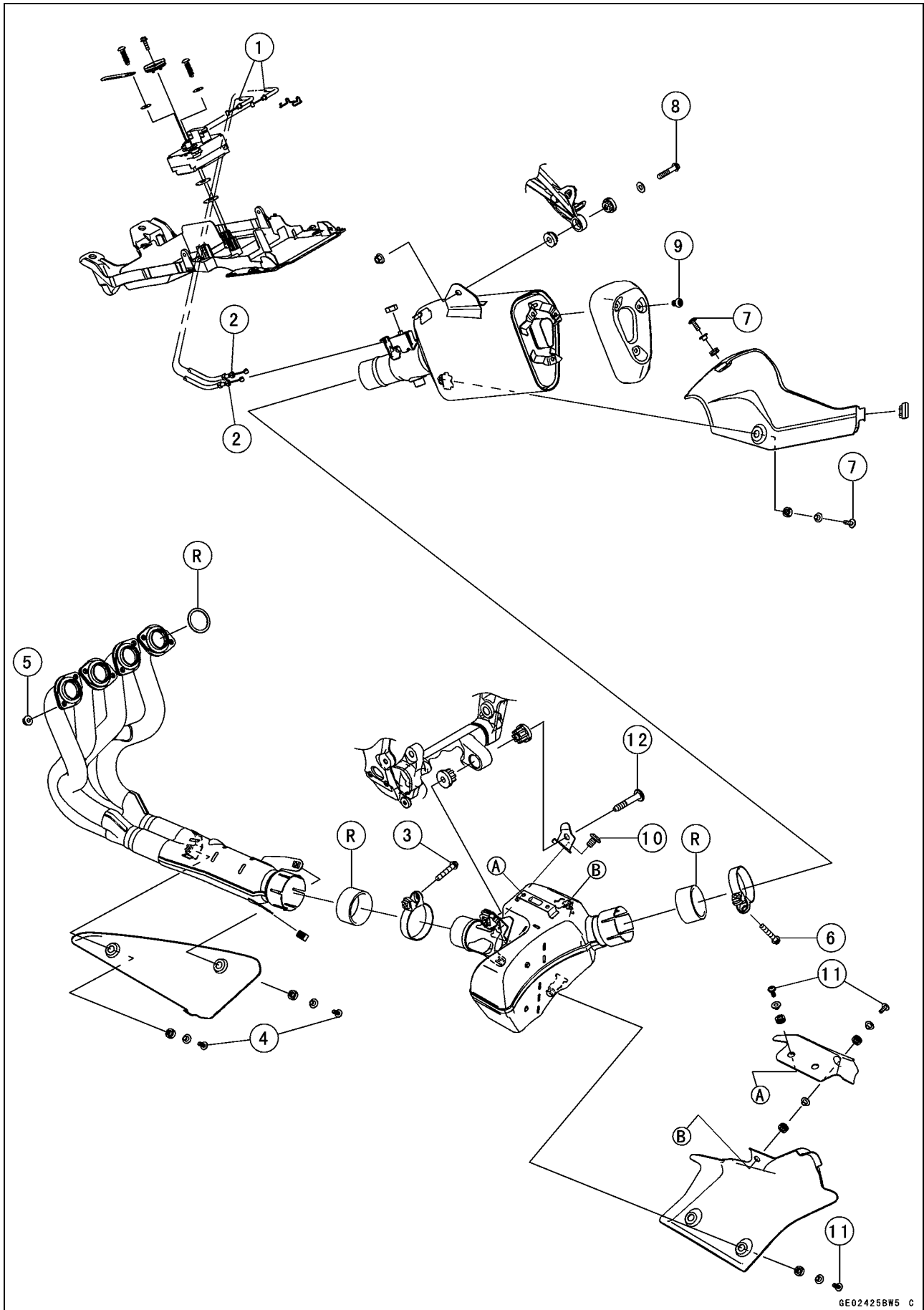
R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

5-4 ENGINE TOP END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Butterfly Valve Cable Adjuster Locknuts	6.9	0.70	61 in·lb	
2	Exhaust Butterfly Valve Cable Locknuts	7.0	0.71	62 in·lb	
3	Exhaust Pipe Clamp Bolt	17	1.7	13	
4	Exhaust Pipe Guard Bolts	6.9	0.70	61 in·lb	
5	Exhaust Pipe Holder Nuts	17	1.7	13	
6	Muffler Body Clamp Bolt	17	1.7	13	
7	Muffler Body Cover Bolts	7.0	0.71	62 in·lb	
8	Muffler Body Mounting Bolt	25	2.5	18	
9	Muffler Body Rear Cover Bolts	7.0	0.71	62 in·lb	
10	Premuffler Chamber Bracket Bolt	35	3.6	26	
11	Premuffler Chamber Guard Bolts	6.9	0.70	61 in·lb	
12	Premuffler Chamber Mounting Bolt	35	3.6	26	

R: Replacement Parts

5-6 ENGINE TOP END

Exhaust System Identification

MANIFOLD		MUFFLER BODY	SPECIFICATION	MODEL
Honeycomb Type Catalyst with Oxygen Sensor Exhaust Pipe P/No. 39178-0146 Mark: KHI M 126	Non-Catalyst Premuffler Chamber P/No. 49062-0043 Mark: KHI M 125	Non-Catalyst P/No. 18091-0543 Mark: KHI K 599	WVTA (FULL H)	ZX600R9F
			GB WVTA (FULL H) WVTA (78.2 H) AU SEA TH BR	ZX600R9F ZX600R9F ZX600R9F ZX600R9F ZX600R9F ZX600R9F
Honeycomb Type Catalyst without Oxygen Sensor Exhaust Pipe P/No. 39178-0148 Mark: None	Non-Catalyst Premuffler Chamber P/No. 49062-0042 Mark: None	Non-Catalyst P/No. 18091-0594 Mark: None EPA Noise Emission Control Information	US	ZX600R9F
			CAL CA	ZX600R9FL ZX600R9F

GE24340B F

Exhaust Pipe Mark Position [A]



GE248029 P

Premuffler Chamber Mark Position [A]



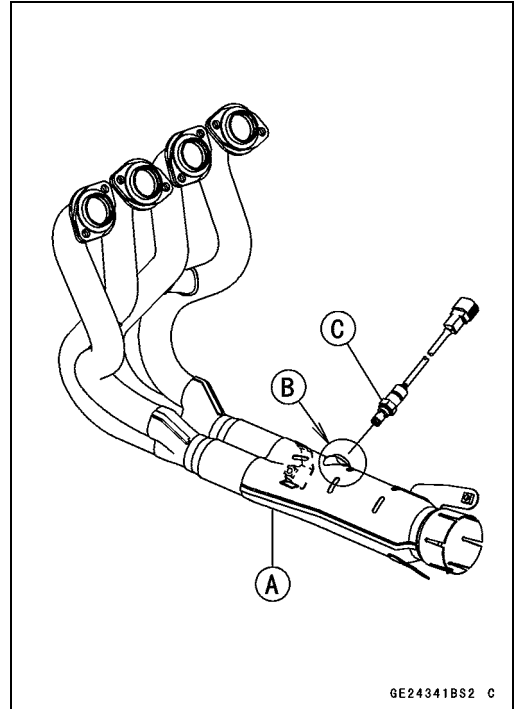
GE248030 P

Exhaust System Identification

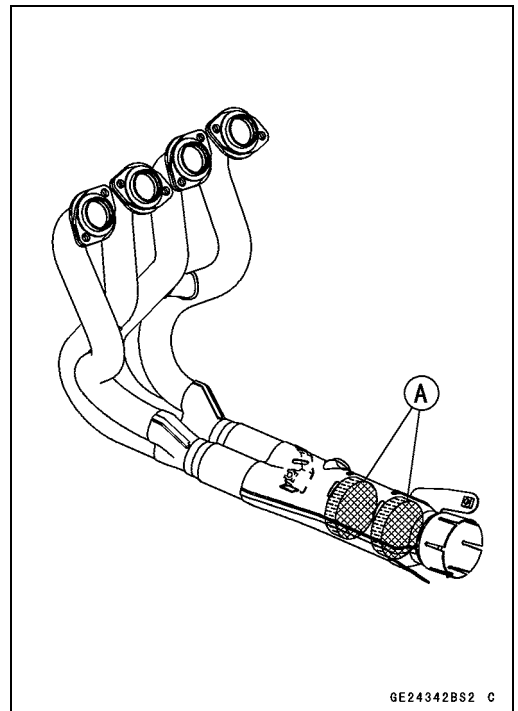
Muffler Body Mark Position [A]



Exhaust Pipe [A] with Hole [B] for Oxygen Sensor [C]



Honeycomb Type Catalyst Positions [A]



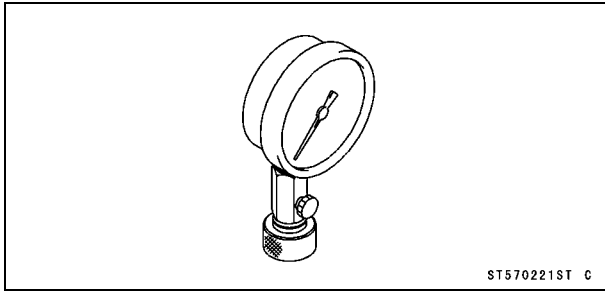
5-8 ENGINE TOP END

Specifications

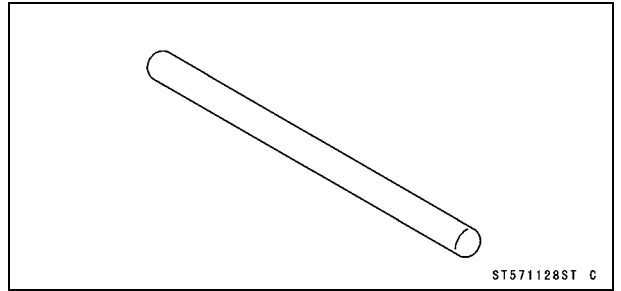
Item	Standard	Service Limit
Camshafts		
Cam Height:		
Exhaust	33.143 ~ 33.257 mm (1.3048 ~ 1.3093 in.)	33.04 mm (1.301 in.)
Inlet	34.543 ~ 34.657 mm (1.3600 ~ 1.3644 in.)	34.44 mm (1.356 in.)
Camshaft Journal/Camshaft Cap Clearance	0.038 ~ 0.081 mm (0.0015 ~ 0.0032 in.)	0.17 mm (0.0067 in.)
Camshaft Journal Diameter	23.940 ~ 23.962 mm (0.9425 ~ 0.9434 in.)	23.91 mm (0.941 in.)
Camshaft Bearing Inside Diameter	24.000 ~ 24.021 mm (0.9449 ~ 0.9457 in.)	24.08 mm (0.948 in.)
Camshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
Cylinder Head		
Cylinder Compression	(Usable Range) 980 ~ 1 498 kPa (10.0 ~ 15.3 kgf/cm ² , 142 ~ 217 psi) at 240 r/min (rpm)	— — —
Cylinder Head Warp	— — —	0.05 mm (0.002 in.)
Valves		
Valve Clearance:		
Exhaust	0.24 ~ 0.31 mm (0.0094 ~ 0.0122 in.)	— — —
Inlet	0.13 ~ 0.19 mm (0.0051 ~ 0.0075 in.)	— — —
Valve Head Thickness:		
Exhaust	1.0 mm (0.039 in.)	0.5 mm (0.020 in.)
Inlet	0.5 mm (0.020 in.)	0.3 mm (0.012 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	3.955 ~ 3.970 mm (0.1557 ~ 0.1563 in.)	3.94 mm (0.155 in.)
Inlet	3.975 ~ 3.990 mm (0.1565 ~ 0.1571 in.)	3.96 mm (0.156 in.)
Valve Guide Inside Diameter:		
Exhaust	4.000 ~ 4.012 mm (0.1575 ~ 0.1580 in.)	4.08 mm (0.161 in.)
Inlet	4.000 ~ 4.012 mm (0.1575 ~ 0.1580 in.)	4.08 mm (0.161 in.)
Valve/Valve Guide Clearance (Wobble Method):		
Exhaust	0.08 ~ 0.16 mm (0.0031 ~ 0.0063 in.)	0.40 mm (0.016 in.)
Inlet	0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)	0.34 mm (0.013 in.)
Valve Seat Cutting Angle	32°, 45°, 60°	— — —
Valve Seating Surface:		
Width:		
Exhaust	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	— — —
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	— — —
Outside Diameter:		
Exhaust	22.8 ~ 23.0 mm (0.898 ~ 0.906 in.)	— — —
Inlet	26.93 ~ 27.13 mm (1.060 ~ 1.068 in.)	— — —
Valve Spring Free Length:		
Exhaust	40.81 mm (1.607 in.)	39.5 mm (1.555 in.)
Inlet	38.46 mm (1.514 in.)	37.1 mm (1.461 in.)

Special Tools and Sealant

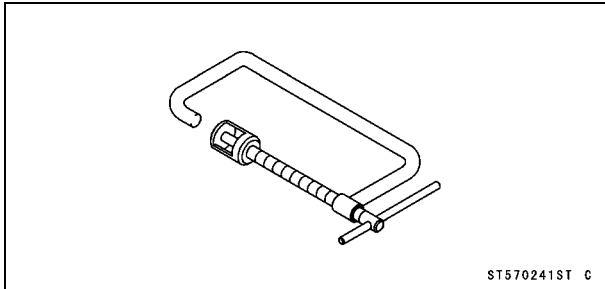
Compression Gauge, 20 kgf/cm²:
57001-221



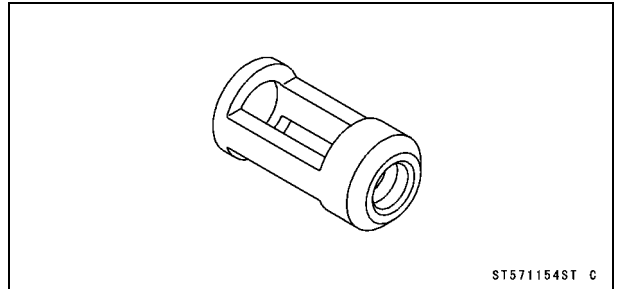
Valve Seat Cutter Holder Bar:
57001-1128



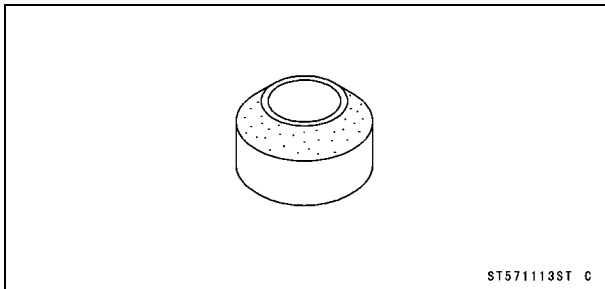
Valve Spring Compressor Assembly:
57001-241



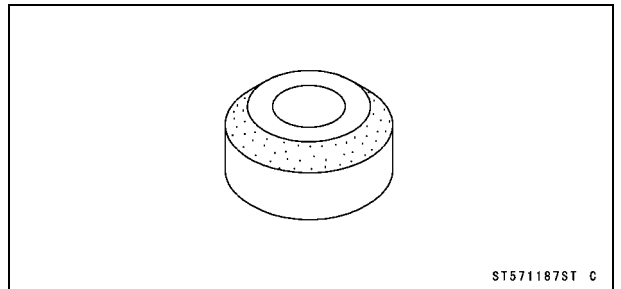
Valve Spring Compressor Adapter, $\phi 20$:
57001-1154



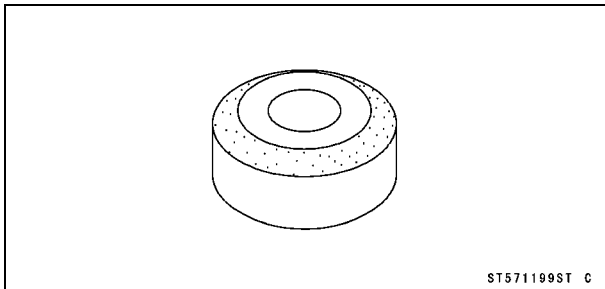
Valve Seat Cutter, 45° - $\phi 24.5$:
57001-1113



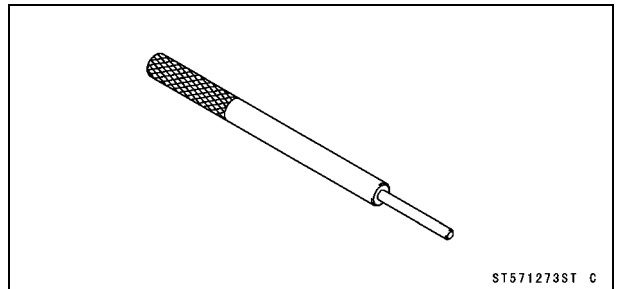
Valve Seat Cutter, 45° - $\phi 30$:
57001-1187



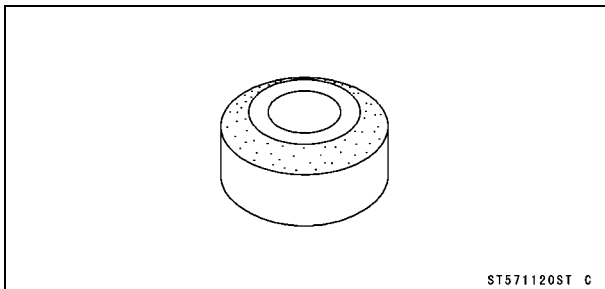
Valve Seat Cutter, 32° - $\phi 25$:
57001-1118



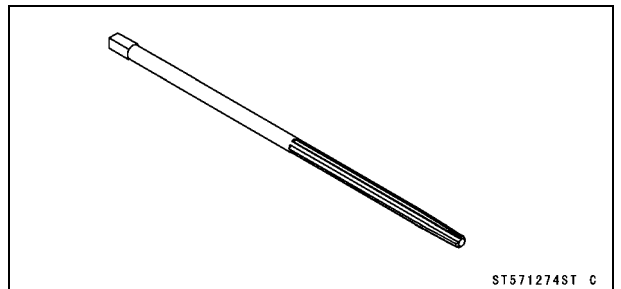
Valve Guide Arbor, $\phi 4$:
57001-1273



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



Valve Guide Reamer, $\phi 4$:
57001-1274

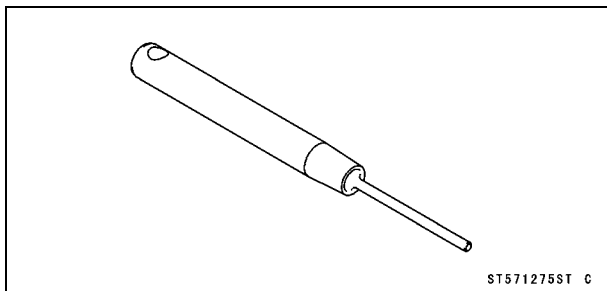


5-10 ENGINE TOP END

Special Tools and Sealant

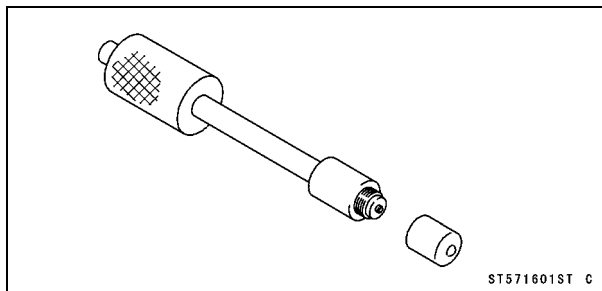
Valve Seat Cutter Holder, $\phi 4$:

57001-1275



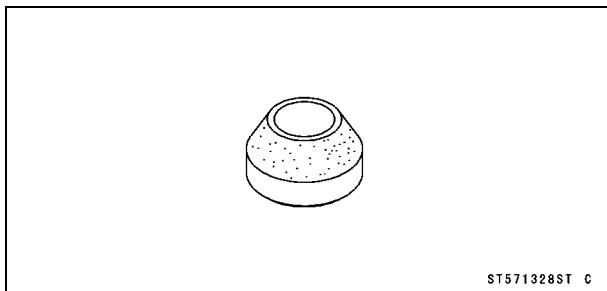
Compression Gauge Adapter, M10 x 1.0:

57001-1601



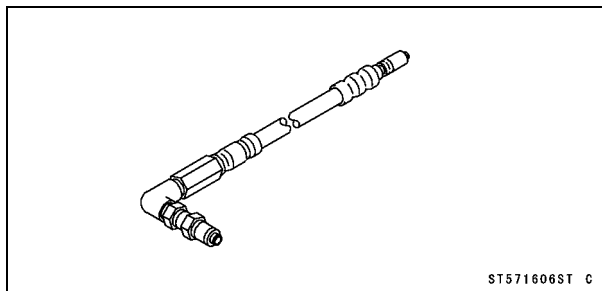
Valve Seat Cutter, 60° - $\phi 25$:

57001-1328



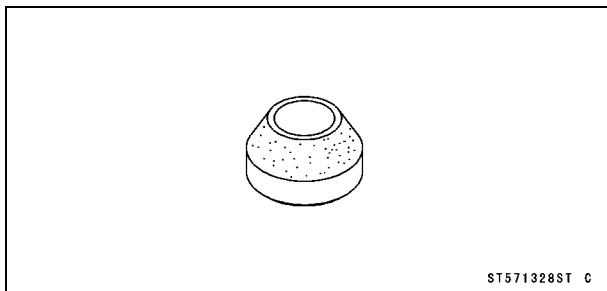
L-Shape Hose:

57001-1606



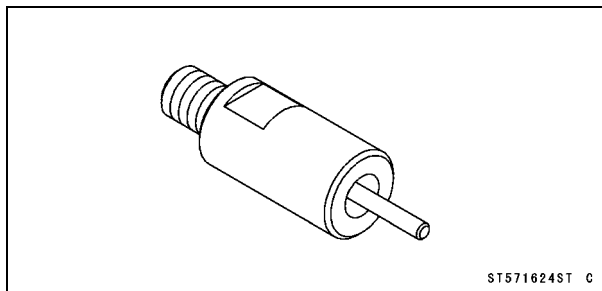
Valve Seat Cutter, 60° - $\phi 27$:

57001-1409



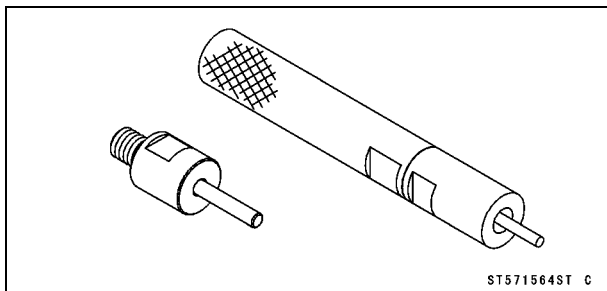
Attachment C:

57001-1624



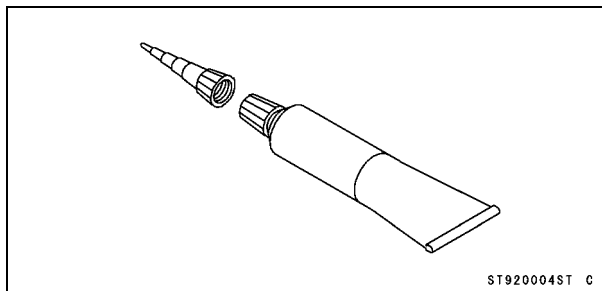
Valve Guide Driver:

57001-1564



Kawasaki Bond (Silicone Sealant):

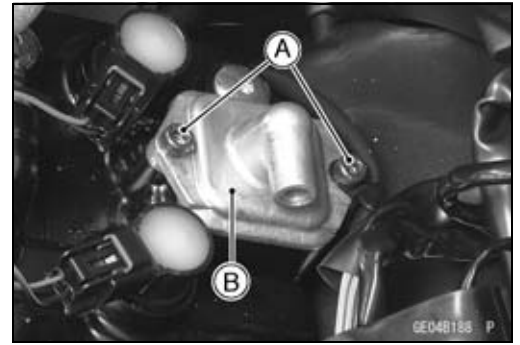
92104-0004



Clean Air System

Air Suction Valve Removal

- Remove:
 - Air Switching Valve (see Air Switching Valve Removal)
 - Air Suction Valve Cover Bolts [A] (Both Sides)
 - Air Suction Valve Covers [B] (Both Sides)

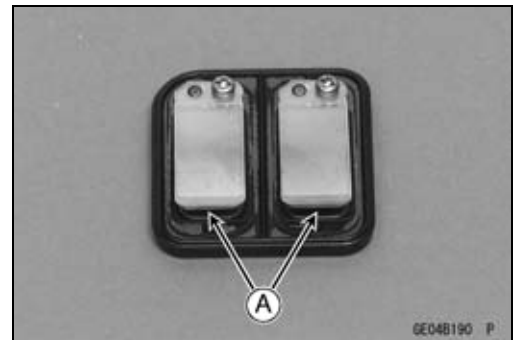


- Remove the air suction valves [A] on both sides.



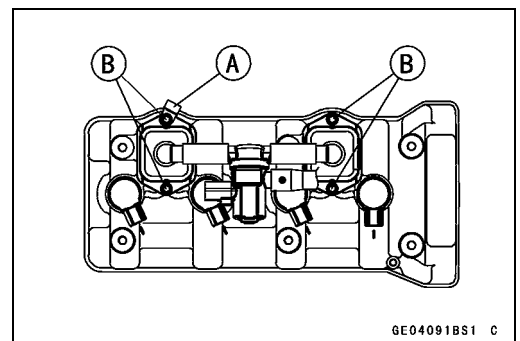
Air Suction Valve Installation

- Install the air suction valve so that opening [A] of the reed faces the rear and downward.



- Install the clamp [A] as shown in the figure.
- Apply a non-permanent locking agent to the threads of the air suction valve cover bolts [B], and tighten them.

Torque - Air Suction Valve Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



5-12 ENGINE TOP END

Clean Air System

Air Suction Valve Inspection

- Remove the air suction valve (see Air Suction Valve Removal).
- Visually inspect the reeds [A] for cracks, folds, warps, heat damage or other damage.
- ★ If there is any doubt as to the condition of the reeds, replace the air suction valve as an assembly.
- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.
- If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high-flash point solvent.

CAUTION

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

Air Switching Valve Removal

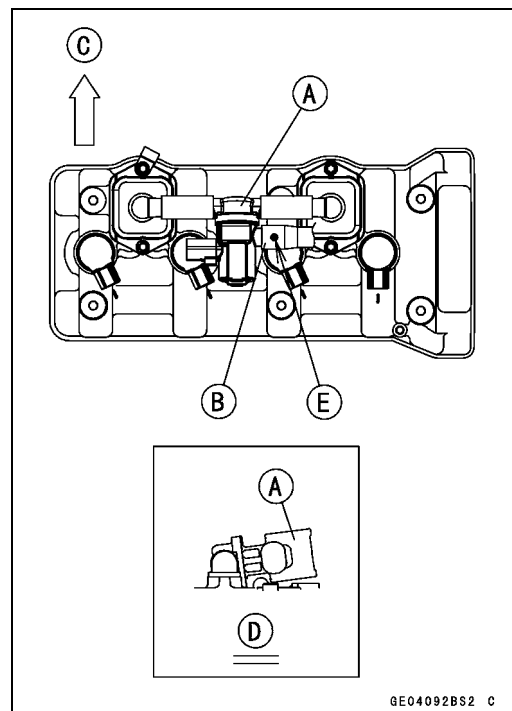
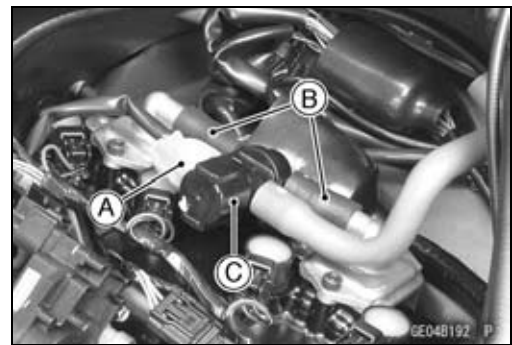
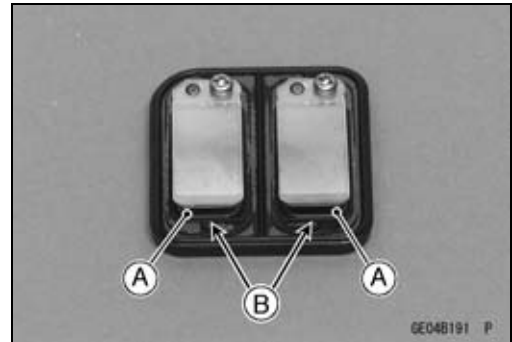
CAUTION

Never drop the air switching valve especially on a hard surface. Such a shock to the air switching valve can damaged it.

- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Disconnect the connector [A].
- Separate the hoses [B] from the air suction valve covers, and remove the air switching valve [C].

Air Switching Valve Installation

- Install the air switching valve [A] with hose [B] as shown in the figure.
 - Front [C]
 - Left Side View [D]
 - White Paint [E]



Clean Air System

Air Switching Valve Operation Test

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Air Switching Valve Unit Test

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

Clean Air System Hose Inspection

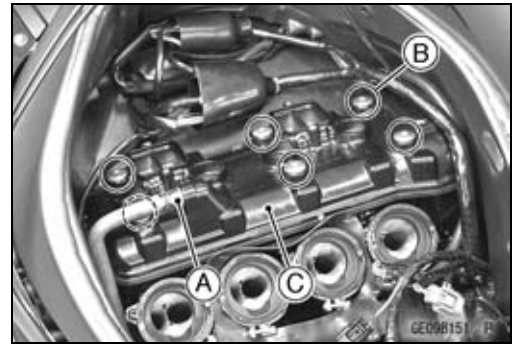
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, air switching valve and air suction valve covers.
- ★ If they are not, correct them. Replace them if they are damaged.

5-14 ENGINE TOP END

Cylinder Head Cover

Cylinder Head Cover Removal

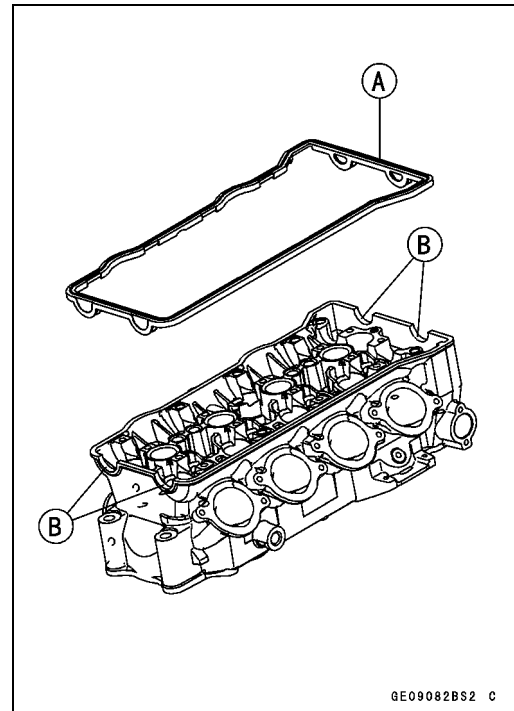
- Remove:
 - Air Suction Valves (see Air Suction Valve Removal)
 - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
 - Stick Coils (see Stick Coil Removal in the Electrical System chapter)
 - Breather Hose [A]
 - Cylinder Head Cover Bolts [B] with Rubber Washers
 - Cylinder Head Cover [C]



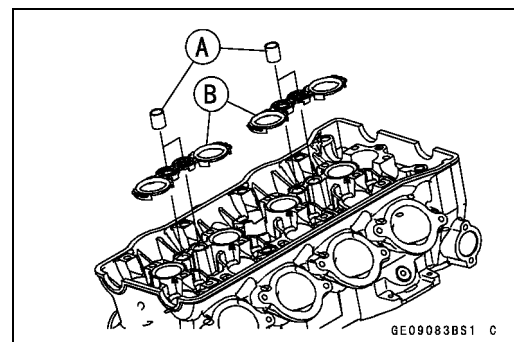
Cylinder Head Cover Installation

- Replace the cylinder head cover gasket [A] with a new one.
- Apply silicone sealant [B] to the cylinder head as shown in the figure.

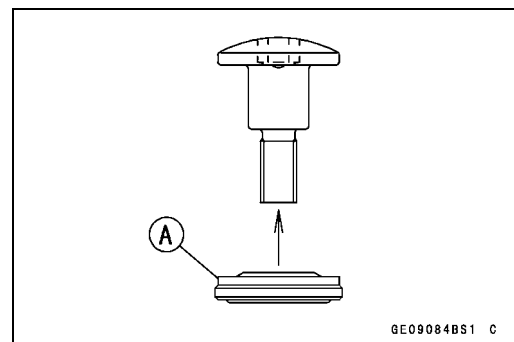
Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004



- Be sure to install the following parts.
 - Dowel Pins [A]
 - Plug Hole Gaskets [B]

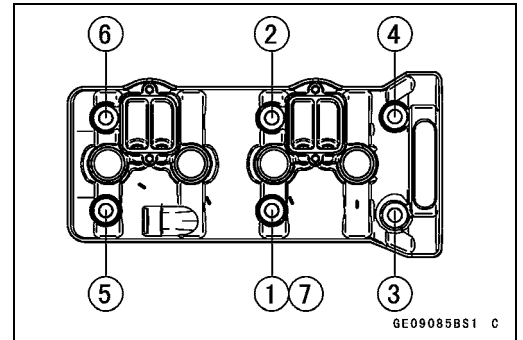


- Install the cylinder head cover.
- Install the rubber washers [A] with the metal side faces upward.



Cylinder Head Cover

- Tighten the cover bolts following the specified tightening sequence.
Torque - Cylinder Head Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Install the removed parts (see appropriate chapters).



5-16 ENGINE TOP END

Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

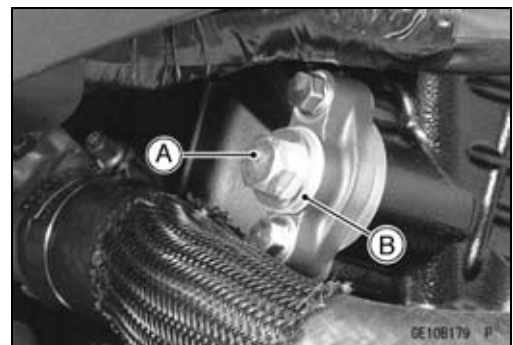
CAUTION

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

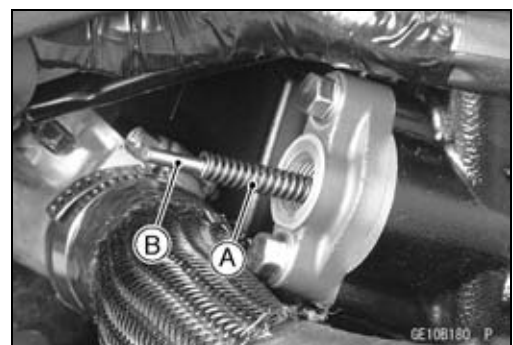
When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation".

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

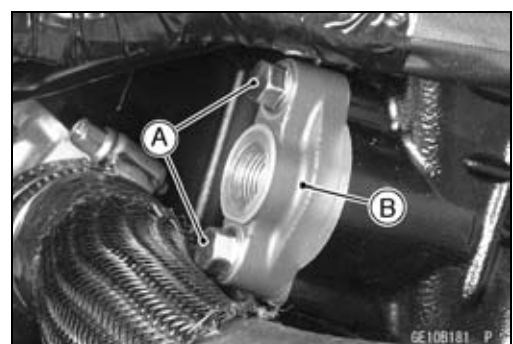
- Remove:
 - Upper Fairing Assembly (See Upper Fairing Assembly Removal in the Frame chapter)
 - Cap Bolt [A]
 - Washer [B]



- Remove:
 - Spring [A]
 - Rod [B]



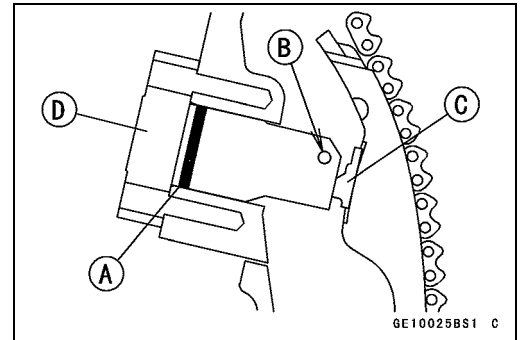
- Remove the mounting bolts [A] and take off the camshaft chain tensioner body [B].



Camshaft Chain Tensioner

Camshaft Chain Tensioner Installation

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Release the stopper [B] and push the push rod [C] into the interior of the tensioner body [D].
- Install the tensioner body so that the stopper faces upward.



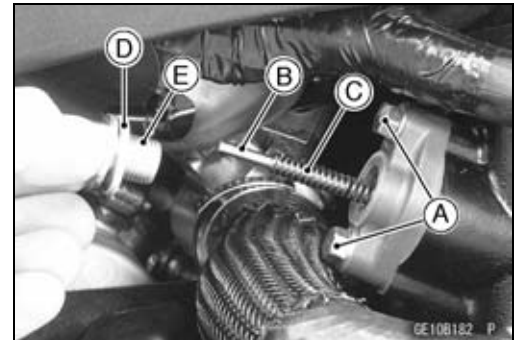
- Tighten the tensioner mounting bolts [A].

Torque - Camshaft Chain Tensioner Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Install:
 - Rod [B]
 - Spring [C]
 - Washer [D]

- Tighten the cap bolt [E].

Torque - Camshaft Chain Tensioner Cap Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)

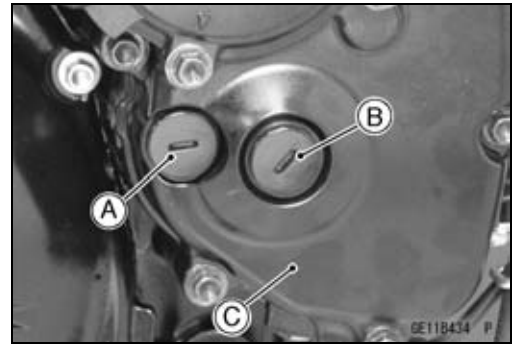


5-18 ENGINE TOP END

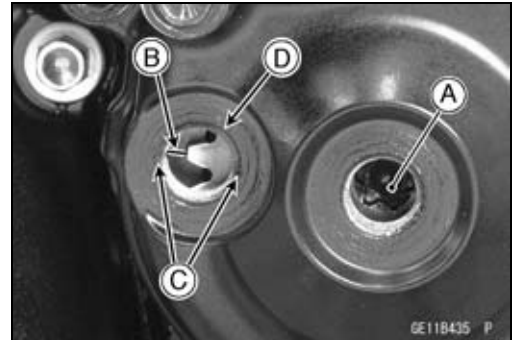
Camshaft, Camshaft Chain

Camshaft Removal

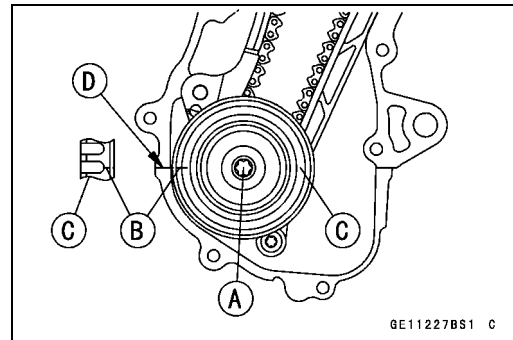
- Remove the cylinder head cover (see Cylinder Head Cover Removal).
- Remove the timing inspection cap [A] and starter clutch bolt cap [B] on the starter clutch cover [C].



- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch is aligned with the notches [C] in the edge of the timing inspection hole [D] in the starter clutch cover.

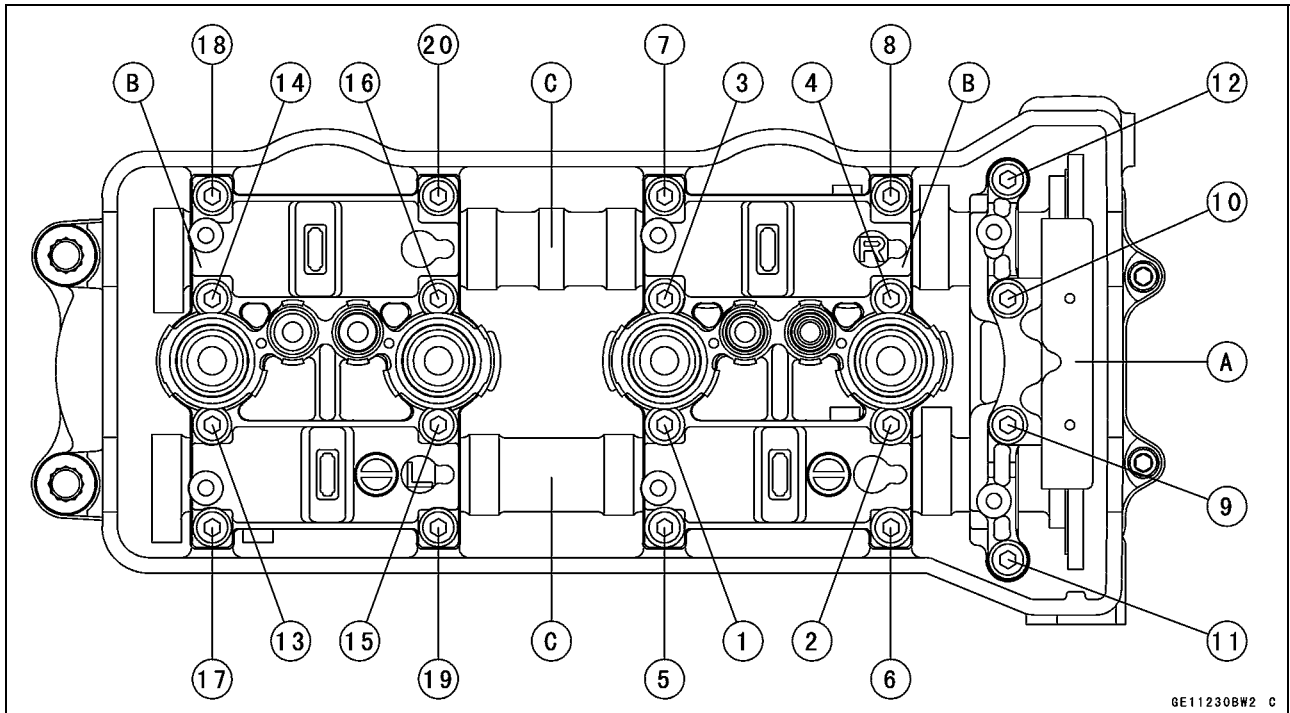


- ★ If the starter clutch cover was removed, perform the next procedure.
- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch [C] is aligned with the mating surface [D] of the crankcase.



Camshaft, Camshaft Chain

- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
- Loosen the upper camshaft chain guide bolts and camshaft cap bolts as shown sequence [1 ~ 20] in the figure, and remove them.
- Remove:
 - Upper Camshaft Chain Guide [A]
 - Camshaft Caps [B]
 - Camshafts [C]
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.

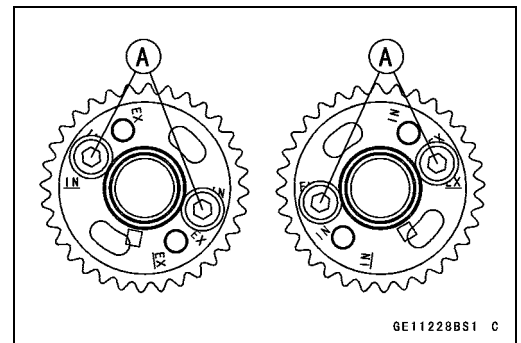


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- Remove:
 - Camshaft Sprocket Bolts [A]
 - Camshaft Sprockets

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.

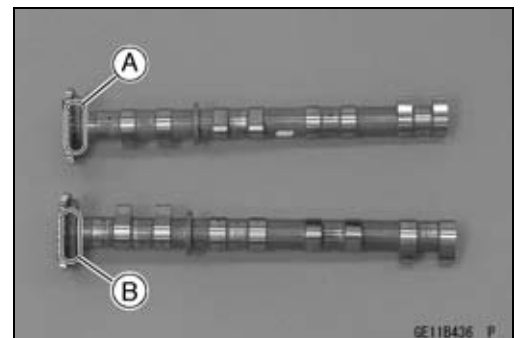


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Camshaft Installation

NOTE

- The exhaust camshaft has a 2716 EX mark [A] and the inlet camshaft has a 2716 IN mark [B]. Be careful not to mix up these shafts.

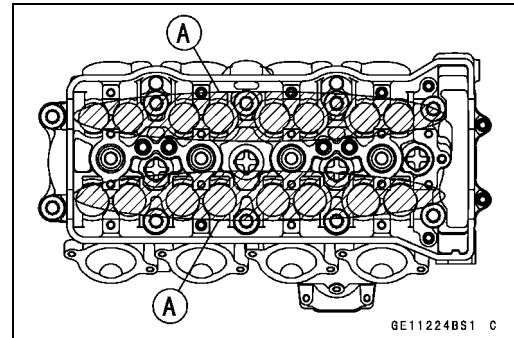
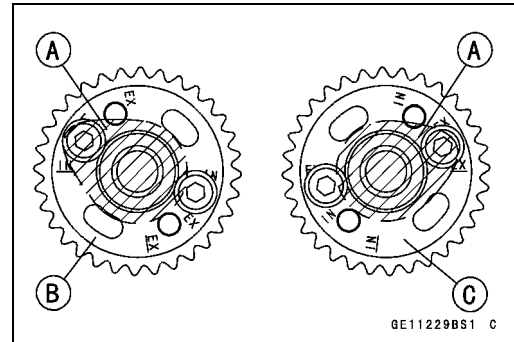


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5-20 ENGINE TOP END

Camshaft, Camshaft Chain

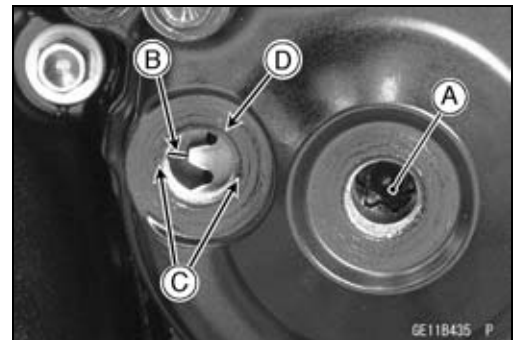
- Install the camshaft sprockets as shown in the figure.
 - #4 Cam Positions [A]
 - Inlet Camshaft Sprocket [B]
 - Exhaust Camshaft Sprocket [C]
- The inlet camshaft sprocket and exhaust camshaft sprocket are identical.
- Apply a non-permanent locking agent to the threads of the camshaft sprocket bolts and tighten them.
- Torque - Camshaft Sprocket Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**
- Apply molybdenum disulfide oil solution [A] to all cam parts, journals and tappets.
- ★ If a new camshaft is to be used, apply a thin coat of molybdenum disulfide grease to the cam surfaces.



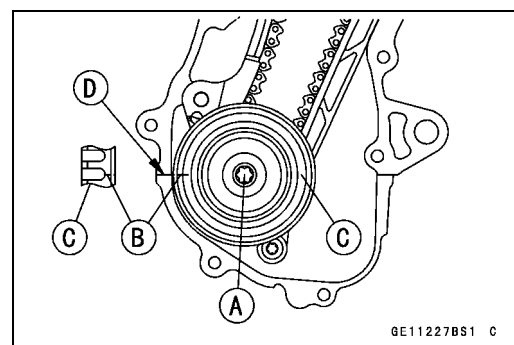
- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch is aligned with the notches [C] in the edge of the timing inspection hole [D] in the starter clutch cover.

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.

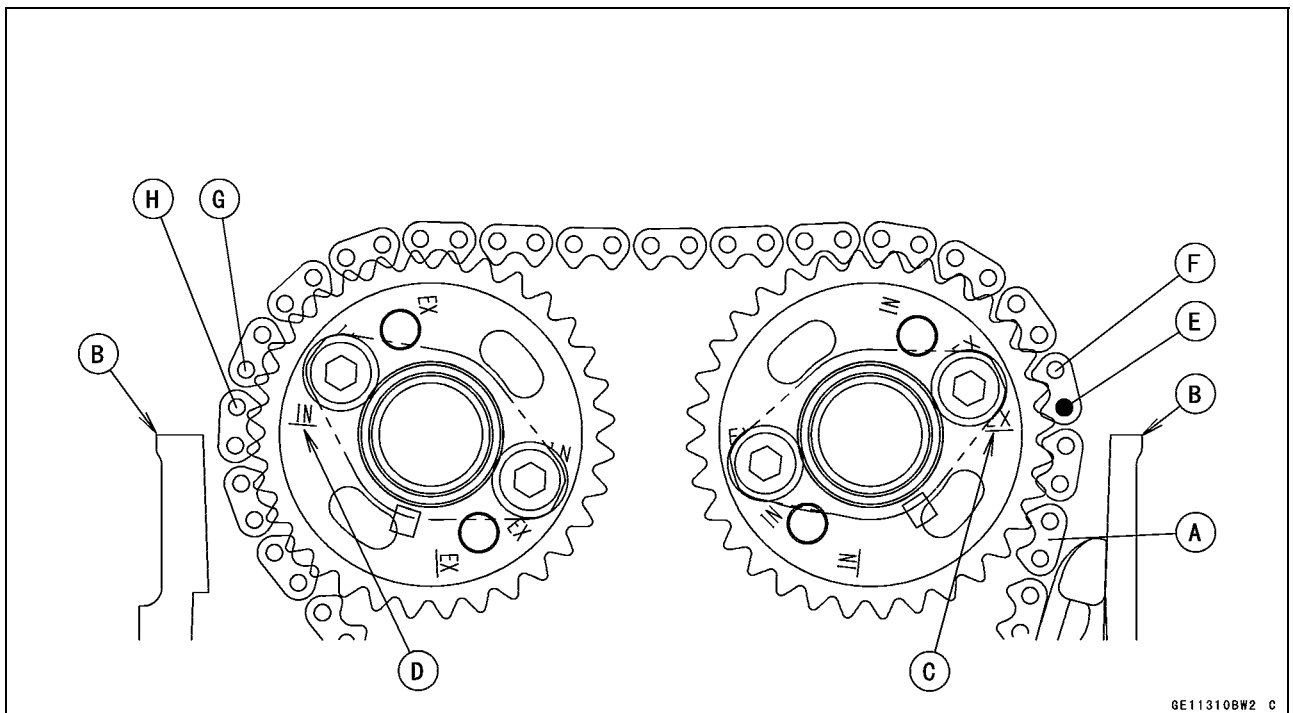


- ★ If the starter clutch cover was removed, perform the next procedure.
- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch [C] is aligned with the mating surface [D] of the crankcase.

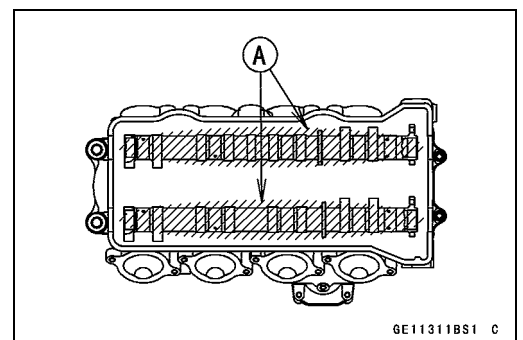


Camshaft, Camshaft Chain

- Pull the tension side (exhaust side) [A] of the chain taut to install the chain.
- Engage the camshaft chain with the sprockets so that timing marks on the sprockets are positioned as shown in the figure.
- The timing marks must be aligned with the cylinder head upper surface [B].
 - EX Mark [C]
 - IN Mark [D]
 - #1 Pin [E]
 - #2 Pin [F]
 - #26 Pin [G]
 - #27 Pin [H]



- Apply molybdenum disulfide oil solution [A] to all cam lobes, journals and thrust journals.

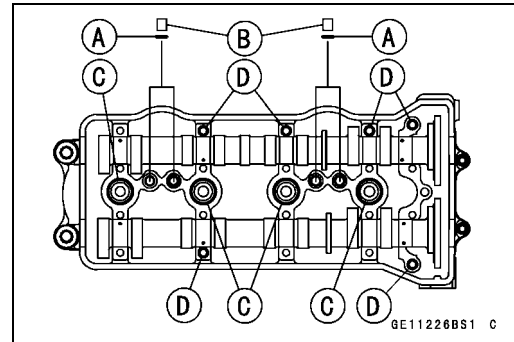


5-22 ENGINE TOP END

Camshaft, Camshaft Chain

● Install:

- O-rings [A]
- Dowel Pins [B]
- O-rings [C]
- Dowel Pins [D]



● Install the camshaft caps and upper camshaft chain guide [A] as shown in the figure.

- “R” Mark [B]
- “L” Mark [C]

● First tighten the all camshaft cap bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

Torque - Camshaft Camshaft Cap Bolts (1 ~ 10, 13 ~ 20):

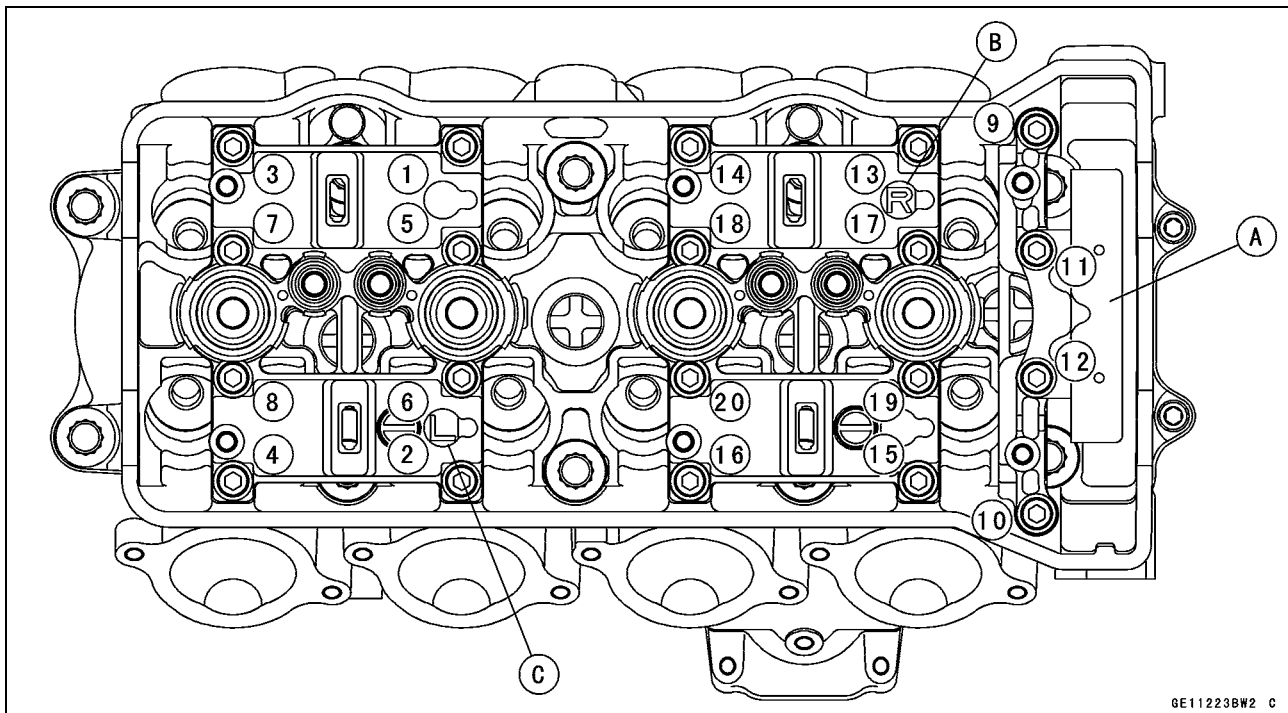
First: 5.9 N·m (0.60 kgf·m, 52 in·lb)

Final: 12 N·m (1.2 kgf·m, 106 in·lb)

Upper Camshaft Chain Guide Bolts (11, 12):

First: 5.9 N·m (0.60 kgf·m, 52 in·lb)

Final: 12 N·m (1.2 kgf·m, 106 in·lb)



Camshaft, Camshaft Chain

- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.
- Replace the O-ring of the timing inspection cap and starter clutch bolt cap with new ones.
- Apply grease to the new O-rings.
- Install the timing inspection cap and starter clutch bolt cap.
- Tighten:
 - Torque - Timing Inspection Cap: Hand-tighten**
 - Starter Clutch Bolt Cap: Hand-tighten**
- Install the cylinder head cover (see Cylinder Head Cover Installation).

Camshaft, Camshaft Cap Wear Inspection

- Remove the camshaft caps (see Camshaft Removal).
- Cut the strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Tighten the camshaft cap bolts and upper camshaft chain guide bolts to the specified torque (see Camshaft Installation).

NOTE

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

- Remove the camshaft cap again, measure each clearance between the camshaft journal and the camshaft cap using plastigage (press gauge) [A].

Camshaft Journal/Camshaft Cap Clearance

Standard: 0.038 ~ 0.081 mm (0.0015 ~ 0.0032 in.)

Service Limit: 0.17 mm (0.0067 in.)

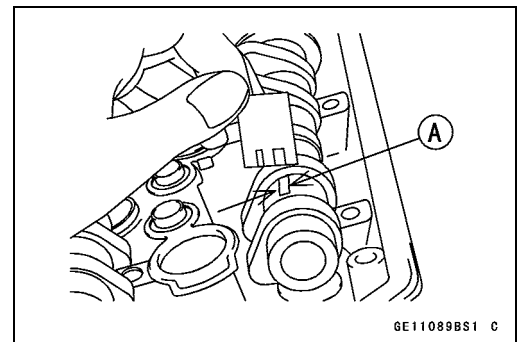
- ★ If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

Camshaft Journal Diameter

Standard: 23.940 ~ 23.962 mm (0.9425 ~ 0.9434 in.)

Service Limit: 23.91 mm (0.941 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.



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5-24 ENGINE TOP END

Camshaft, Camshaft Chain

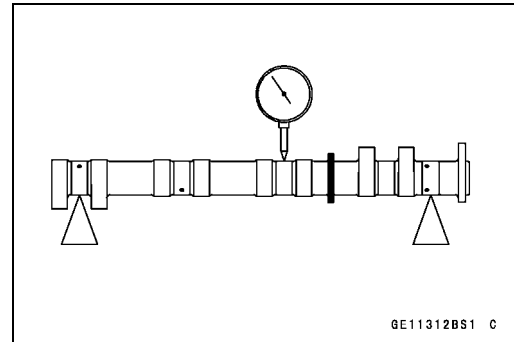
Camshaft Runout Inspection

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

Cam Height

Standard:

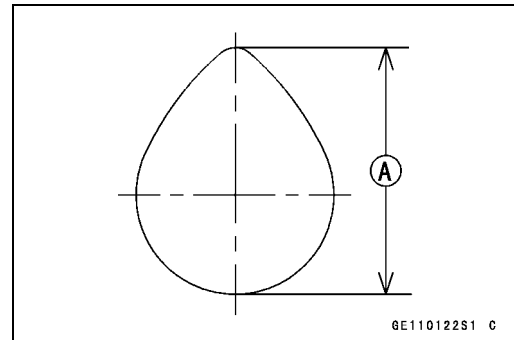
Exhaust 33.143 ~ 33.257 mm (1.3048 ~ 1.3093 in.)

Inlet 34.543 ~ 34.657 mm (1.3600 ~ 1.3644 in.)

Service Limit:

Exhaust 33.04 mm (1.301 in.)

Inlet 34.44 mm (1.356 in.)



Camshaft Chain Removal

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



Cylinder Head

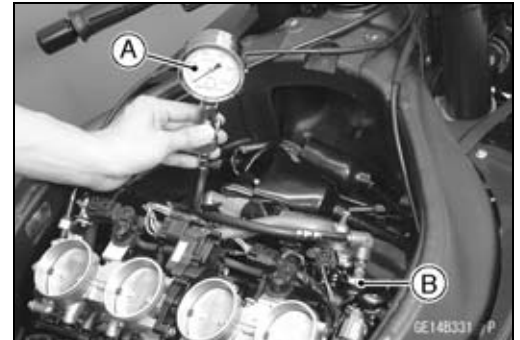
Cylinder Compression Measurement

NOTE

○ Use the battery which is fully charged.

- Warm up the engine thoroughly.
- Stop the engine.
- Remove the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).
- Attach the compression gauge [A] and adapter [B] firmly into the spark plug hole.
- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

Special Tools - Compression Gauge, 20 kgf/cm²: 57001-221
Compression Gauge Adapter, M10 × 1.0: 57001-1601
L-Shape Hose: 57001-1606



Cylinder Compression

Usable Range: 980 ~ 1 498 kPa (10.0 ~ 15.3 kgf/cm², 142 ~ 217 psi) at 240 r/min (rpm)

- Repeat the measurement for the other cylinders.
- Install the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).

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

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

5-26 ENGINE TOP END

Cylinder Head

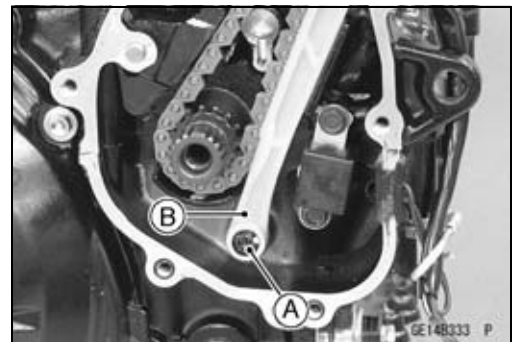
Cylinder Head Removal

- Drain:
 - Coolant (see Coolant Change in the Periodic Maintenance chapter)
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
 - Engine (see Engine Removal in the Engine Removal/Installation chapter)
 - Cylinder Head Cover (see Cylinder Head Cover Removal)
 - Camshafts (see Camshaft Removal)

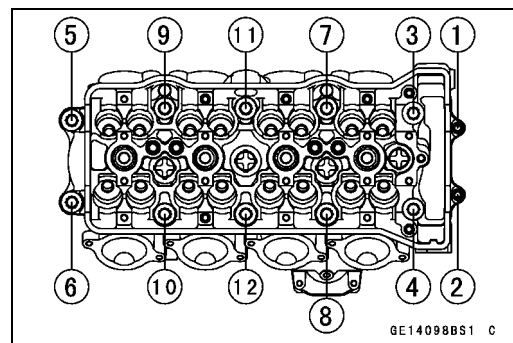
- Remove the front camshaft chain guide bolt (upper) [A].



- Remove:
 - Front Camshaft Chain Guide Bolt (Lower) [A]
 - Collar
 - Front Camshaft Chain Guide [B]



- Loosen the M6 and M9 cylinder head bolts as shown sequence [1 ~ 12] in the figure, and remove them with washers.
- Remove the cylinder head.



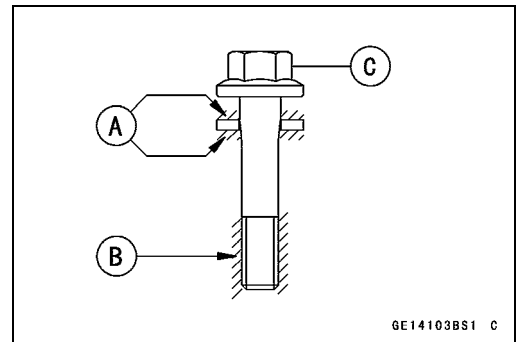
Cylinder Head

Cylinder Head Installation

NOTE

○ The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.

- Install the dowel pins.
- Replace the cylinder head gasket with a new one.
- Replace the cylinder head bolt washers with new ones.
- Apply molybdenum disulfide oil solution to both sides [A] of the cylinder head bolt washers and the threads [B] of the head bolts [C].



- Tighten the M9 cylinder head bolts as shown sequence [1 ~ 10] in the figure.

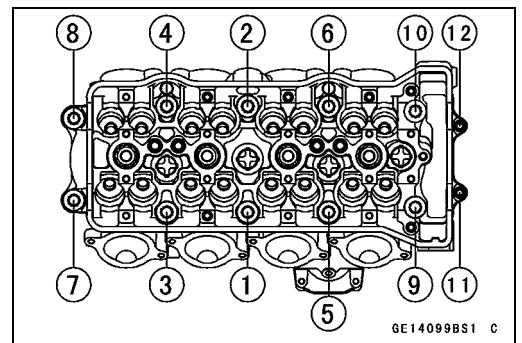
Torque - Cylinder Head Bolts (M9):

First: 15 N·m (1.5 kgf·m, 11 ft·lb)

Final: 39 N·m (4.0 kgf·m, 29 ft·lb)

- Tighten the M6 cylinder head bolts as shown sequence [11, 12] in the figure.

Torque - Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)



- Install:
 - Front Camshaft Chain Guide [A]
 - New O-ring [B]
 - Collar [C]

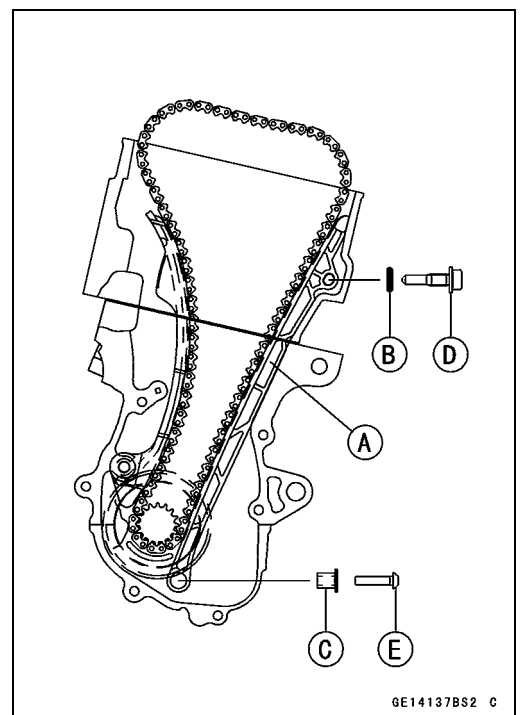
○ Apply grease to the new O-ring.

- Tighten:

Torque - Front Camshaft Chain Guide Bolt (Upper) [D]: 25 N·m (2.5 kgf·m, 18 ft·lb)

Front Camshaft Chain Guide Bolt (Lower) [E]: 12 N·m (1.2 kgf·m, 106 in·lb)

- Install the removed parts (see appropriate chapters).



5-28 ENGINE TOP END

Cylinder Head

Cylinder Head Warp Inspection

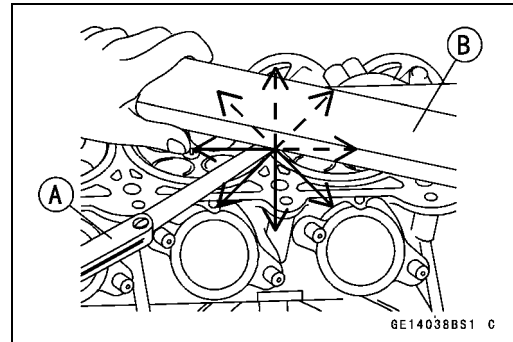
- Clean the cylinder head.
- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

Cylinder Head Warp

Standard: ---

Service Limit: 0.05 mm (0.002 in.)

- ★ If the cylinder head is warped more than the service limit, replace it.
- ★ If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).



Valves

Valve Clearance Inspection

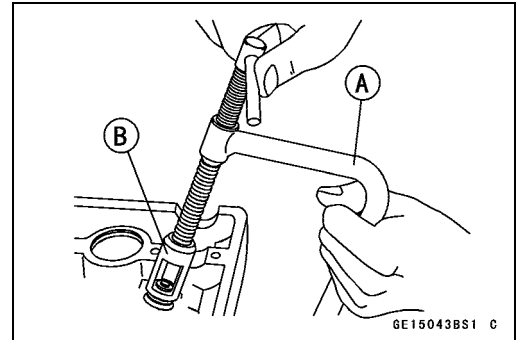
- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

Valve Removal

- Remove the cylinder head (see Cylinder Head Removal).
- Remove the valve lifter and shim.
- Mark and record the valve lifter and shim locations so they can be installed in their original positions.
- Using the valve spring compressor assembly, remove the valve.

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

Valve Spring Compressor Adapter, ϕ 20 [B]:
57001-1154



Valve Installation

- Replace the oil seal with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
- Install the springs so that the closed coil end faces downwards.

Valve Stem [A]

Oil Seal [B]

Spring Seat [C]

Closed Coil End [D]

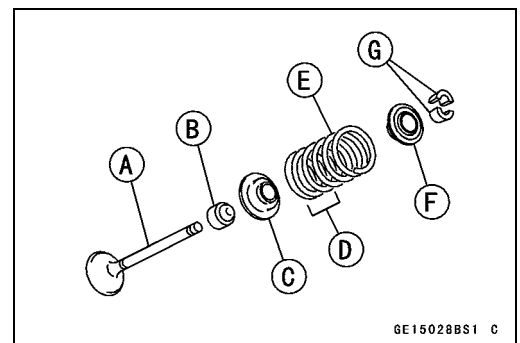
Valve Spring [E]:

EX - Brown Paint

IN - Light Green Paint

Retainer [F]

Split Keepers [G]



Valve Guide Removal

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

CAUTION

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

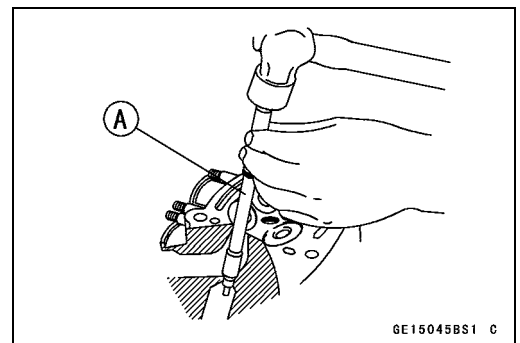
Special Tool - Valve Guide Arbor, ϕ 4: 57001-1273

Valve Guide Installation

- Apply engine oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).

CAUTION

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



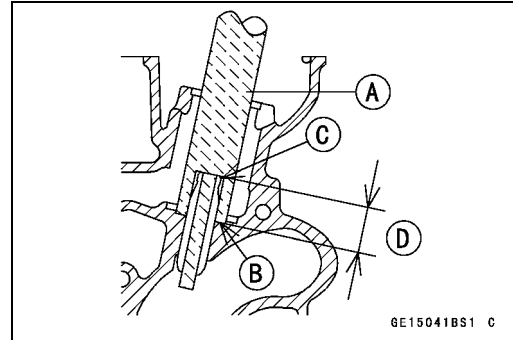
5-30 ENGINE TOP END

Valves

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

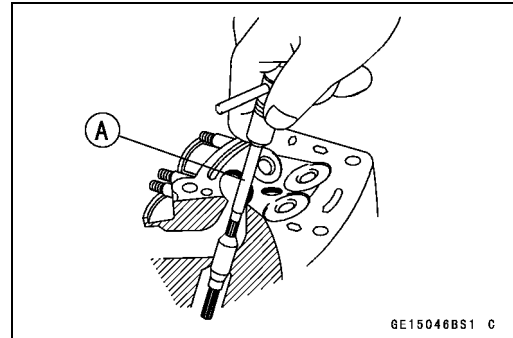
13.3 ~ 13.5 mm (0.52 ~ 0.53 in.) [D]

Special Tools - Valve Guide Driver: 57001-1564
Attachment C: 57001-1624



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

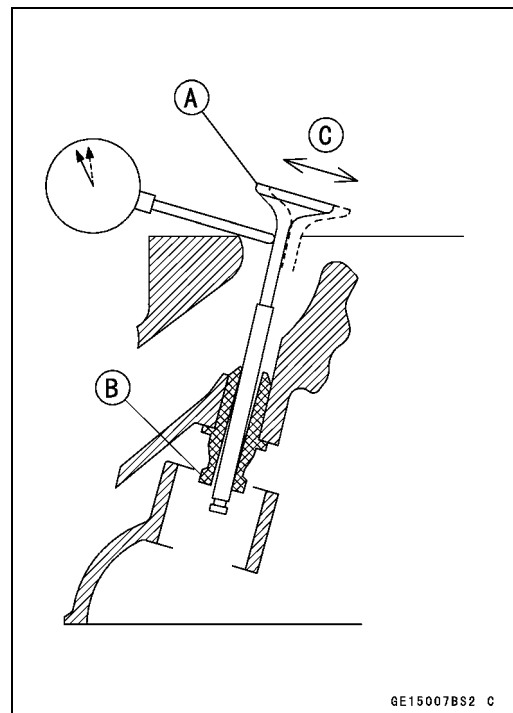
Special Tool - Valve Guide Reamer, $\phi 4$: 57001-1274



Valve-to-Guide Clearance Measurement (Wobble Method)

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

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



NOTE

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

Valve/Valve Guide Clearance (Wobble Method)

Standard:

Exhaust 0.08 ~ 0.16 mm (0.0031 ~ 0.0063 in.)
Inlet 0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)

Service Limit:

Exhaust 0.40 mm (0.016 in.)
Inlet 0.34 mm (0.013 in.)

Valves

Valve Seat Inspection

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

Valve Seating Surface Outside Diameter

Standard:

Exhaust 22.8 ~ 23.0 mm (0.898 ~ 0.906 in.)

Inlet 26.93 ~ 27.13 mm (1.060 ~ 1.068 in.)

- Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

Good [F]

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

Valve Seating Surface Width

Standard:

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

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

Valve Seat Repair

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

Special Tools - Valve Seat Cutter Holder Bar [B]: 57001-1128

Valve Seat Cutter Holder, ϕ 4 [C]: 57001-1275

[For Exhaust Valve Seat]

Valve Seat Cutter, 45° - ϕ 24.5: 57001-1113

Valve Seat Cutter, 32° - ϕ 25: 57001-1118

Valve Seat Cutter, 60° - ϕ 25: 57001-1328

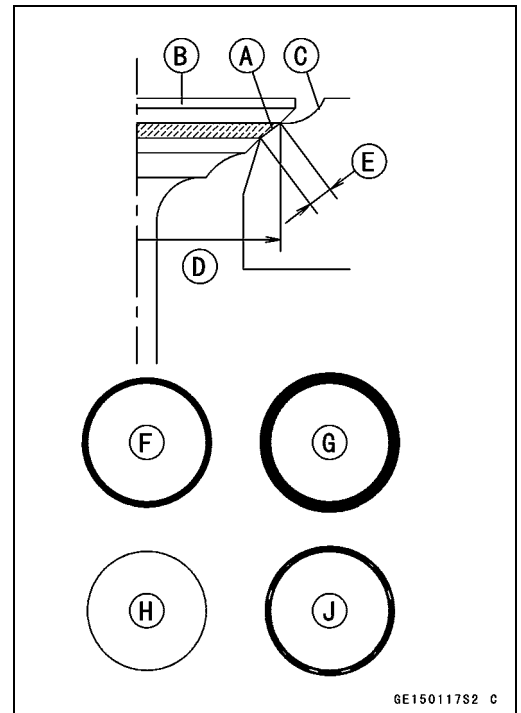
[For Inlet Valve Seat]

Valve Seat Cutter, 45° - ϕ 30: 57001-1187

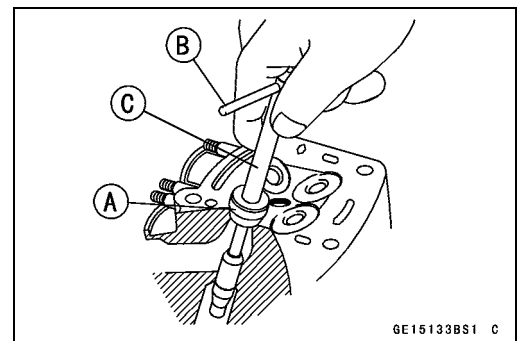
Valve Seat Cutter, 32° - ϕ 30: 57001-1120

Valve Seat Cutter, 60° - ϕ 27: 57001-1409

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



GE150117S2 C



GE15133BS1 C

5-32 ENGINE TOP END

Valves

Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

NOTE

○Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

NOTE

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

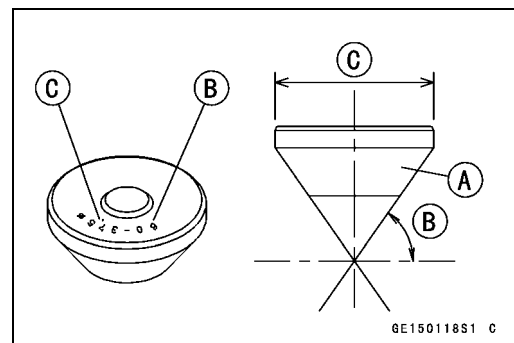
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter

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

60° Cutter angle [B]

37.5φ Outer diameter of cutter [C]



Operating Procedures

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

CAUTION

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

Valves

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

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

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

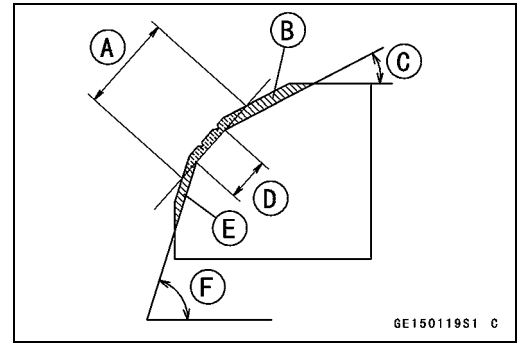
Ground Volume [B] by 32° cutter

32° [C]

Correct Width [D]

Ground Volume [E] by 60° cutter

60° [F]



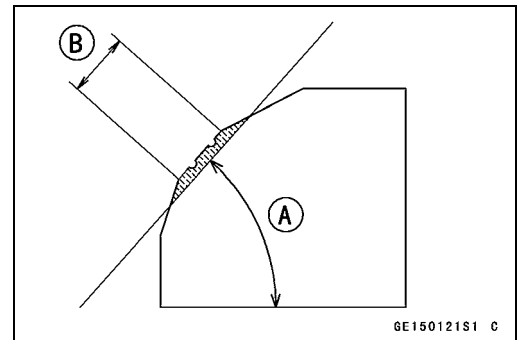
- Measure the outside diameter of the seating surface with a vernier caliper.

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

Original Seating Surface [B]

NOTE

- Remove all pittings or flaws from 45° ground surface.
- After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.
- When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.



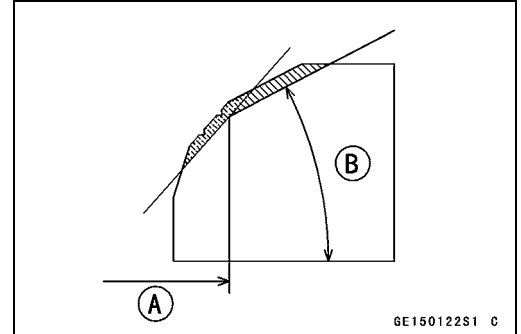
- ★ If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.

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

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

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

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



CAUTION

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

- After making the 32° grind, return to the seat outside diameter measurement step above.

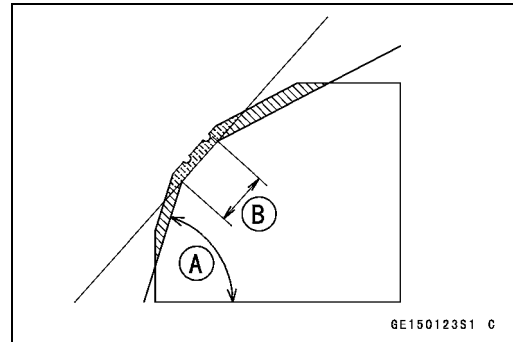
- To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.

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

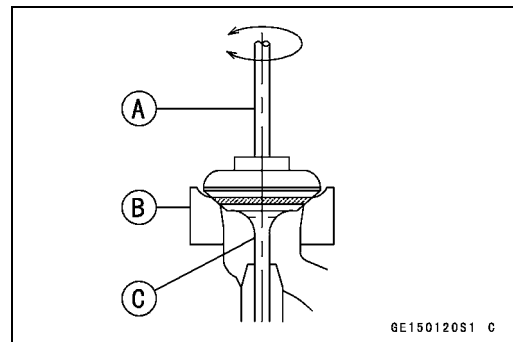
5-34 ENGINE TOP END

Valves

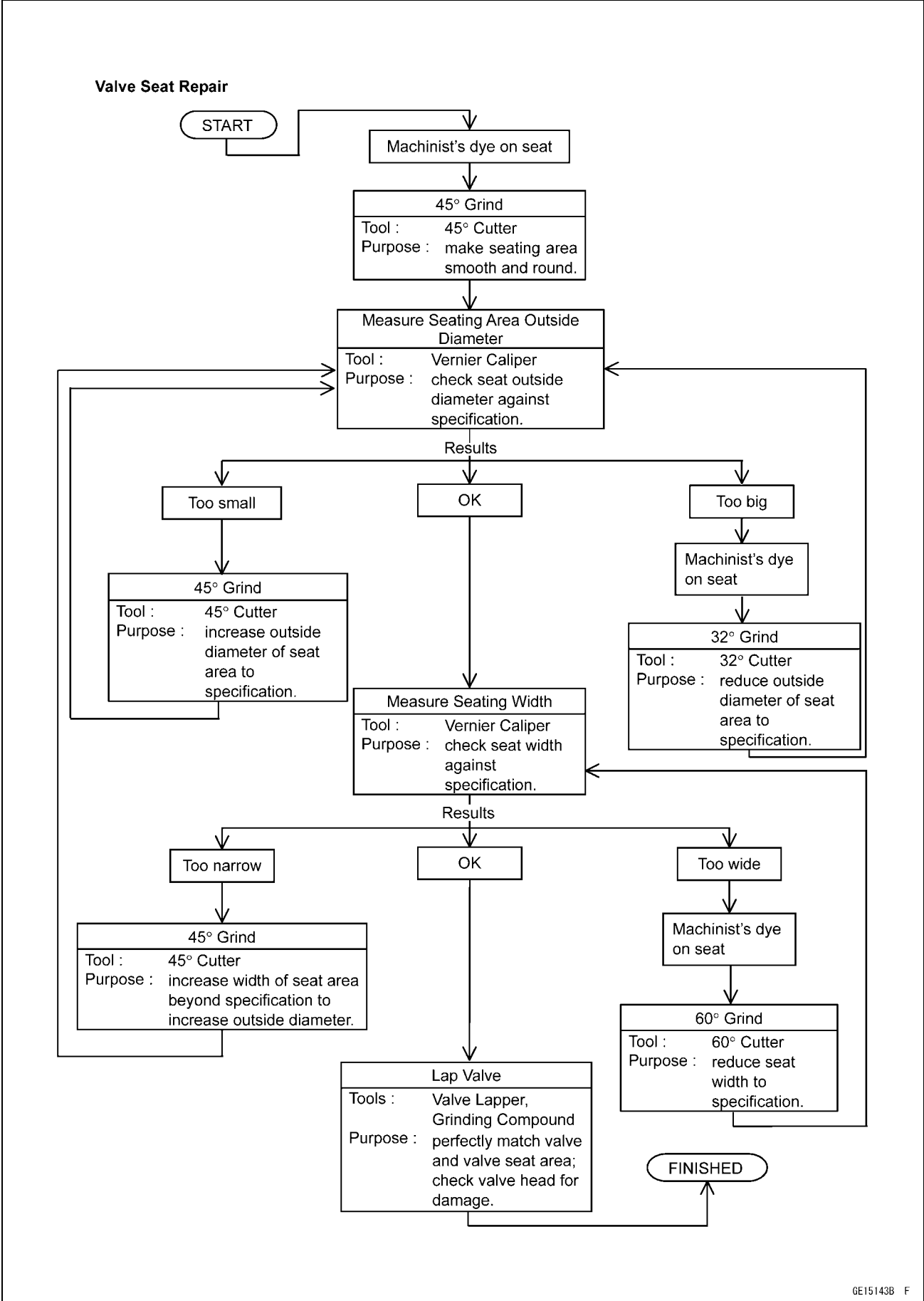
- ★ If the seat width is too wide, make the 60° [A] grind described below.
- ★ If the seat width is within the specified range, lap the valve to the seat as described below.
- Grind the seat at a 60° angle until the seat width is within the specified range.
- To make the 60° grind, fit 60° cutter into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



- Lap the valve to the valve seat, once the seat width and outside diameter are within the ranges specified above.
- Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
- Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
- Repeat the process with a fine grinding compound.
Lapper [A]
Valve Seat [B]
Valve [C]
- The seating area should be marked about in the middle of the valve face.
- ★ If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).



Valves

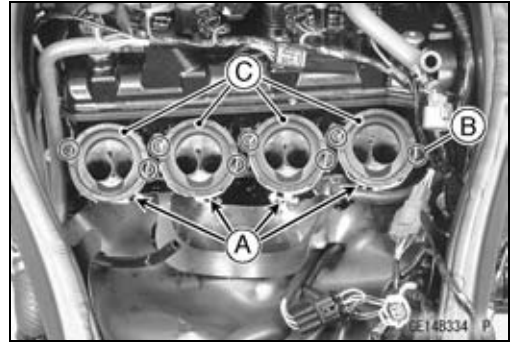


5-36 ENGINE TOP END

Throttle Body Assy Holder

Throttle Body Assy Holder Removal

- Remove:
 - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
 - Clamps [A]
 - Throttle Body Assy Holder Bolts [B]
 - Throttle Body Assy Holders [C]



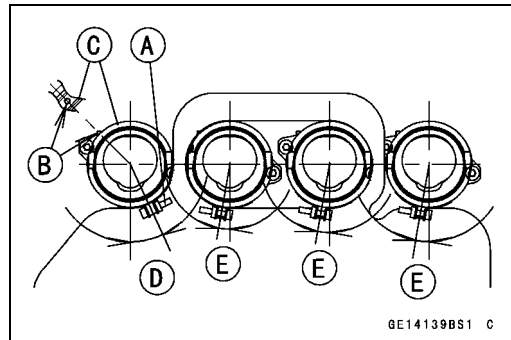
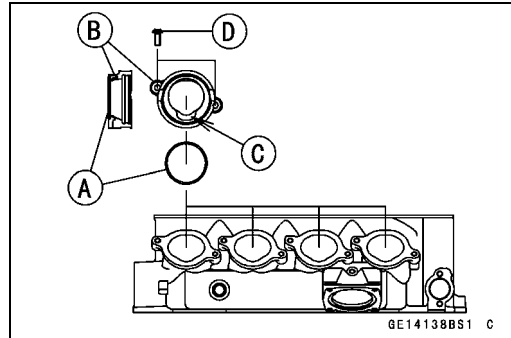
Throttle Body Assy Holder Installation

- Be sure to install the new O-rings [A].
- Apply grease to the new O-rings.
- Install the holders [B] as shown in the figure.
 - Recession [C]
- Apply a non-permanent locking agent to the threads of the throttle body assy holder bolts [D], and tighten them.

Torque - Throttle Body Assy Holder Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Fix the hole of the clamp [A] to the projection [B] of the holder [C].
 - 25° [D]
 - 10° [E]

- Tighten:
 - Torque - Throttle Body Assy Holder Clamp Bolts: 2.9 N·m (0.30 kgf·m, 26 in·lb)**



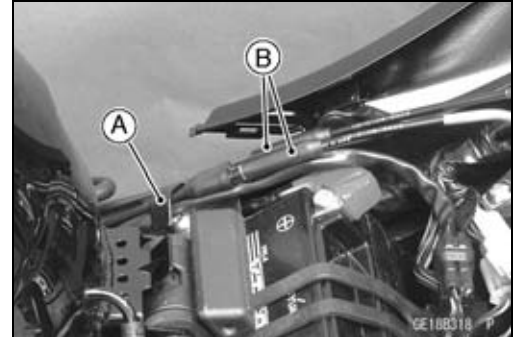
Muffler

⚠ WARNING

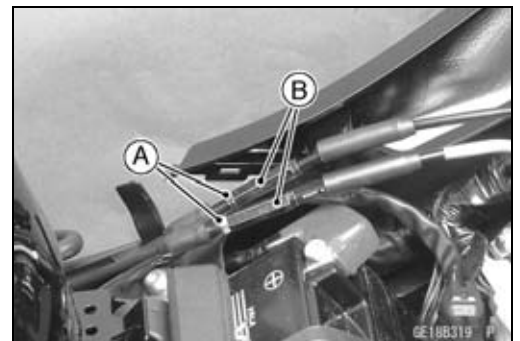
To avoid a serious burn, do not remove the muffler when the engine is still hot. Wait until the muffler cool down.

Muffler Body Removal

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Open the clamp [A] and free the cables.
- Slide the dust covers [B].



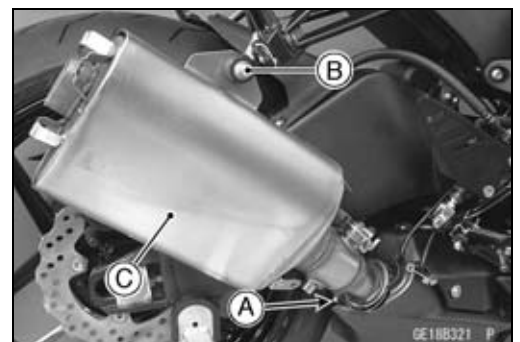
- Loosen the locknuts [A], and turn the adjusters [B] to give the cable plenty of play.



- Remove:
 - Bolts [A]
 - Muffler Body Rear Cover [B]
 - Bolts [C]
 - Muffler Body Cover [D]



- Remove the lower ends of the exhaust butterfly valve cables from the pulley of the muffler body (see Exhaust Butterfly Valve Cable Removal).
- Loosen the muffler body clamp bolt [A].
- Remove the muffler body mounting bolt [B], and pull out the muffler body [C] backward from the premuffler chamber.



5-38 ENGINE TOP END

Muffler

Muffler Body Installation

- Replace the muffler body gasket [A] with a new one.
- Install the muffler body gasket to the premuffler chamber [B] until it is bottomed so that the chamfer side [C] faces muffler body [D].

About 4.0 mm (0.16 in.) [E]

- Install the muffler body clamp [F] as shown in the figure.

- Insert the projection [G] into the slot [H].

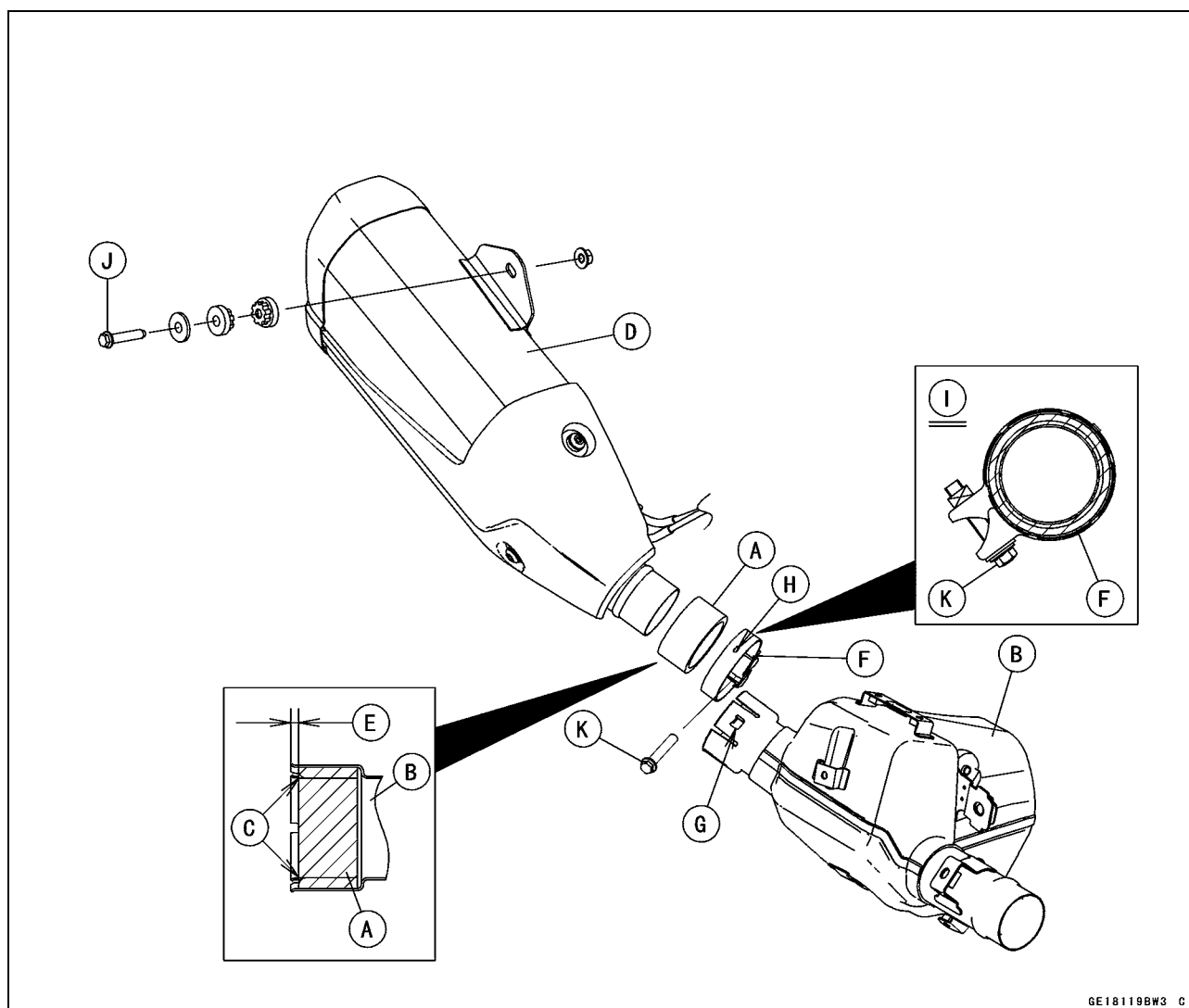
Rear View [I]

- Install the muffler body.

- Tighten:

Torque - Muffler Body Mounting Bolt [J]: 25 N·m (2.5 kgf·m, 18 ft·lb)

Muffler Body Clamp Bolt [K]: 17 N·m (1.7 kgf·m, 13 ft·lb)

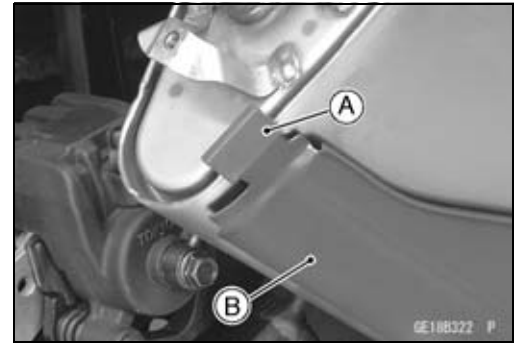


- Install the lower ends of the exhaust butterfly valve cables, and adjust the cables correctly (see Exhaust Butterfly Valve Cable Installation).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts.

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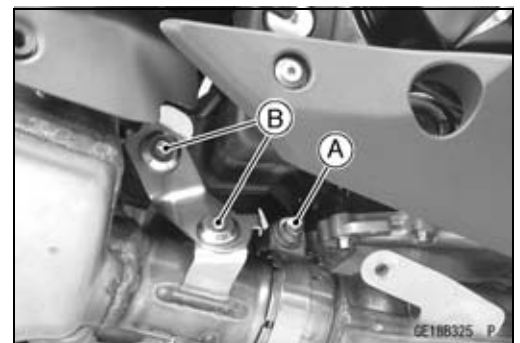
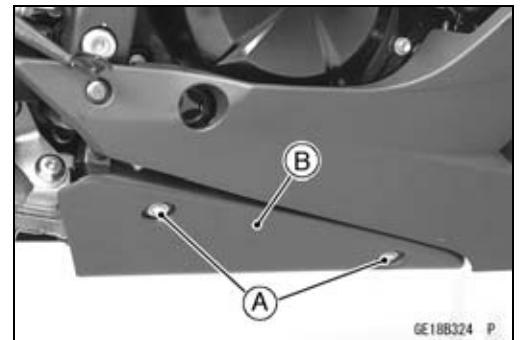
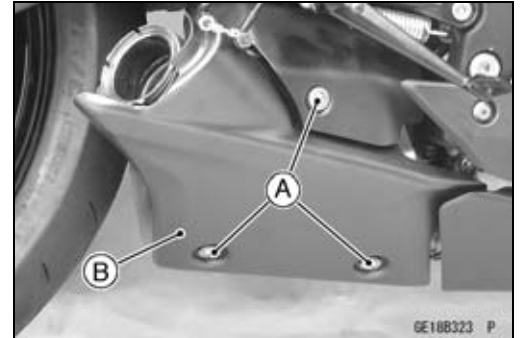
Muffler

- Install the muffler body cover, and tighten the bolts.
Torque - Muffler Body Cover Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)
- Install the damper [A] on the muffler body cover [B].
- Install the muffler body rear cover, and tighten the bolts.
Torque - Muffler Body Rear Cover Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)
- Install the removed parts (see appropriate chapters).



Premuffler Chamber Removal

- Remove:
 - Muffler Body (see Muffler Body Removal)
 - Guard Bolts [A]
 - Premuffler Chamber Guard [B]
- Remove:
 - Guard Bolts [A]
 - Exhaust Pipe Guard [B]
- Loosen the exhaust pipe clamp bolt [A].
- Remove the bolts [B].
- Pull out the premuffler chamber backward from the exhaust pipe.



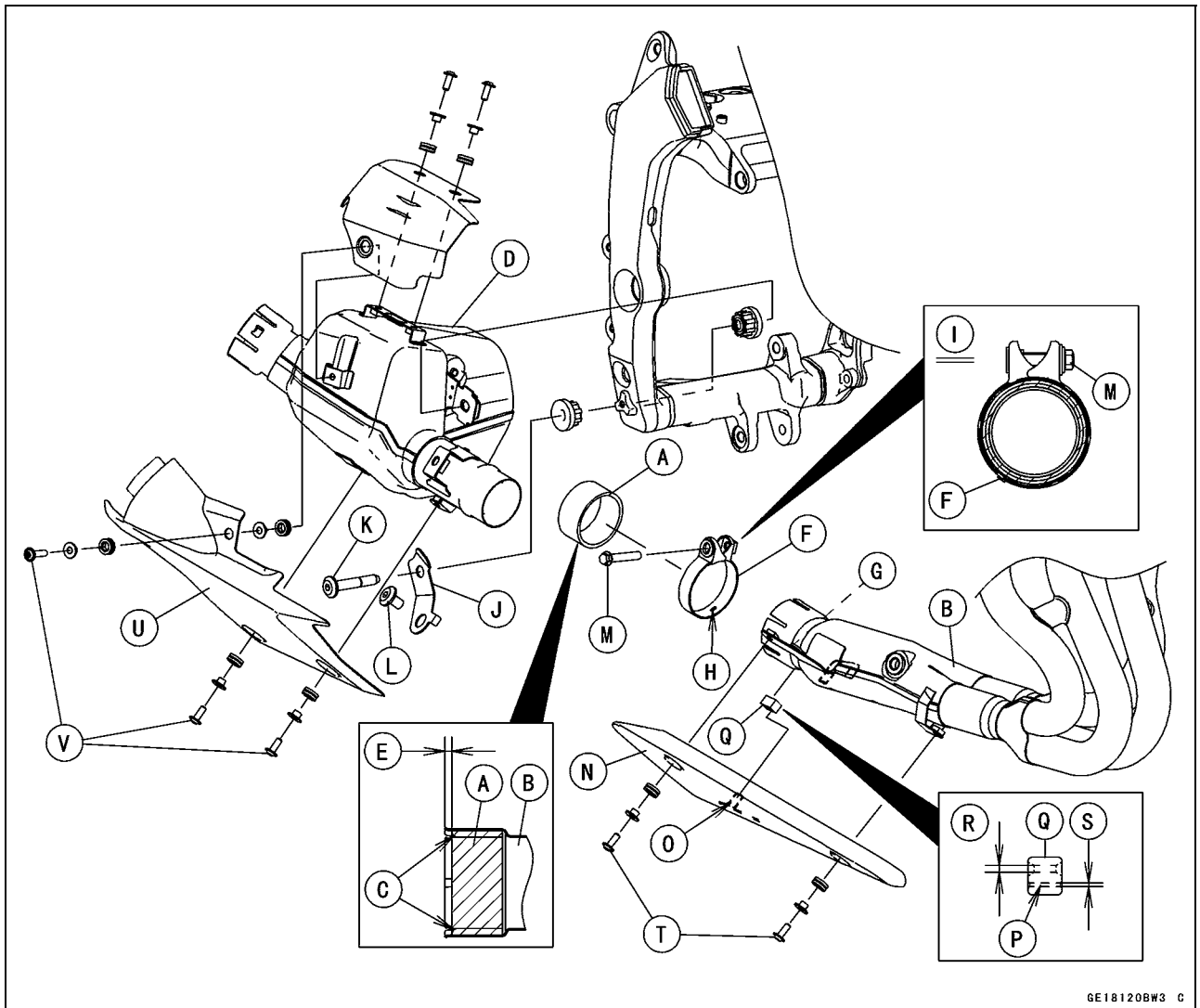
5-40 ENGINE TOP END

Muffler

Premuffler Chamber Installation

- Replace the exhaust pipe gasket [A] with a new one.
- Install the exhaust pipe gasket to the exhaust pipe [B] until it is bottomed so that the chamfer side [C] faces premuffler chamber [D].
 - About 4.0 mm (0.16 in.) [E]
- Install the exhaust pipe clamp [F] as shown in the figure.
- Insert the projection [G] into the slot [H].
 - Rear View [I]
- Install the premuffler chamber and bracket [J].
- Tighten:
 - Torque - Premuffler Chamber Mounting Bolt [K]: 35 N·m (3.6 kgf·m, 26 ft·lb)**
 - Premuffler Chamber Bracket Bolt [L]: 35 N·m (3.6 kgf·m, 26 ft·lb)**
 - Exhaust Pipe Clamp Bolt [M]: 17 N·m (1.7 kgf·m, 13 ft·lb)**
- Install the exhaust pipe guard [N].
- Insert the projection [O] of the guard into the hole [P] of the damper [Q].
 - 2 mm (0.08 in.) [R]
 - 1 mm (0.04 in.) [S]
- Tighten:
 - Torque - Exhaust Pipe Guard Bolts [T]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Install the premuffler chamber guard [U].
- Tighten:
 - Torque - Premuffler Chamber Guard Bolts [V]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

Muffler

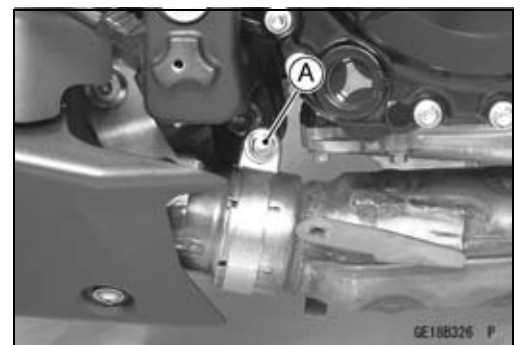


GE18120BW3 C

- Install the muffler body (see Muffler Body Installation).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts.

Exhaust Pipe Removal

- Remove:
 - Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
 - Oxygen Sensor (Equipped Models) (see Oxygen Sensor Removal (Equipped Models) in the Electrical System chapter)
 - Exhaust Pipe Guard (see Premuffler Chamber Removal)
 - Exhaust Pipe Clamp Bolt [A]

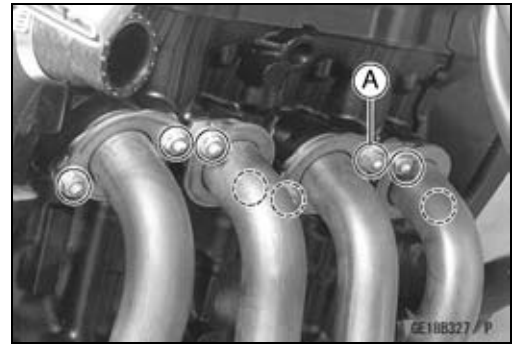


GE188326 P

5-42 ENGINE TOP END

Muffler

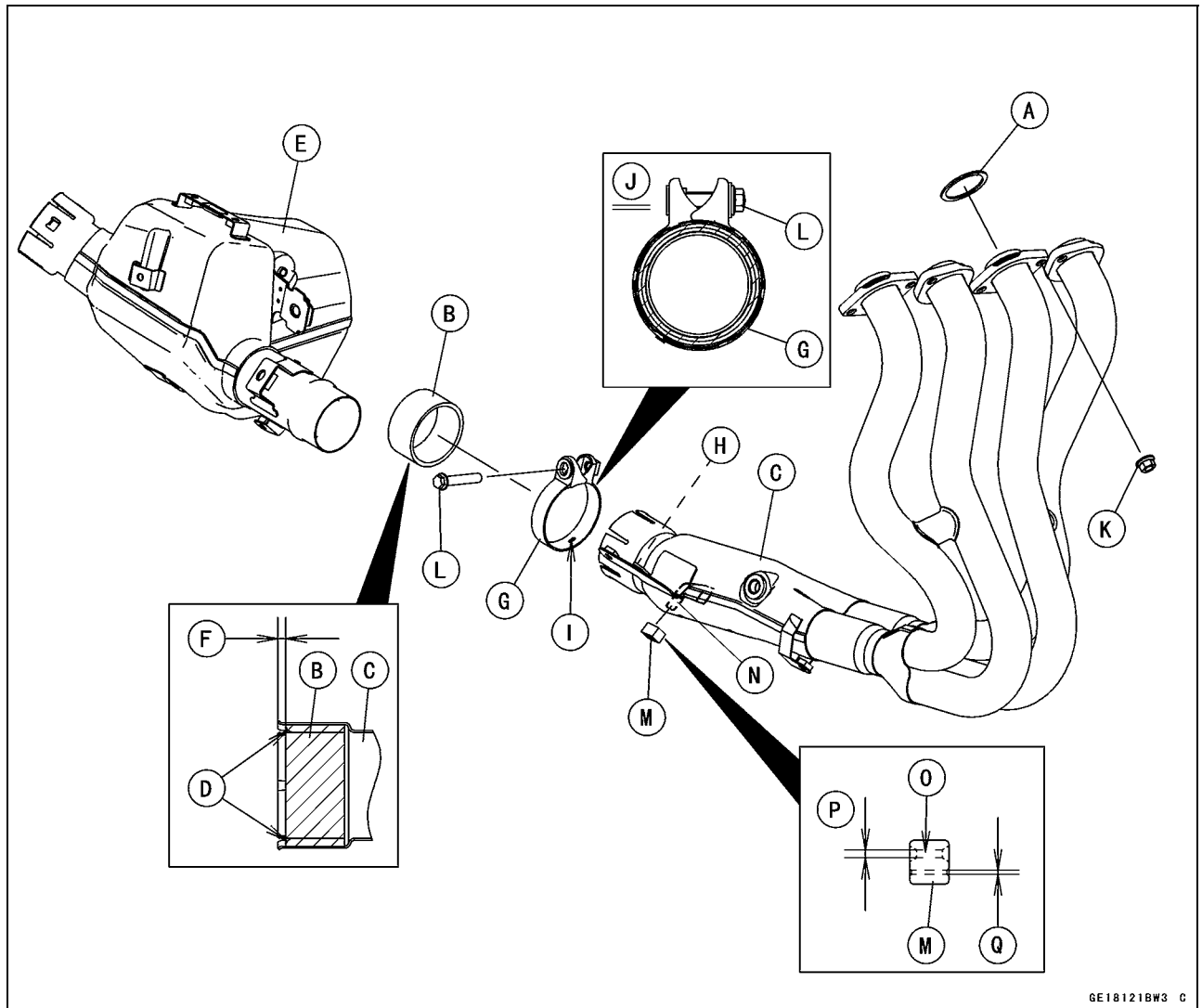
- Remove the exhaust pipe holder nuts [A], and pull out the exhaust pipe forward from the premuffler chamber.



Exhaust Pipe Installation

- Replace the exhaust pipe gaskets [A] [B] with new ones.
- Install the exhaust pipe gasket [B] to the exhaust pipe [C] until it is bottomed so that the chamfer side [D] faces premuffler chamber [E].
 - About 4.0 mm (0.16 in.) [F]
- Install the exhaust pipe clamp [G] as shown in the figure.
- Insert the projection [H] into the slot [I].
 - Rear View [J]
- Install the exhaust pipe.
- Tighten:
 - Torque - Exhaust Pipe Holder Nuts [K]: 17 N·m (1.7 kgf·m, 13 ft·lb)**
 - Exhaust Pipe Clamp Bolt [L]: 17 N·m (1.7 kgf·m, 13 ft·lb)**
- Install the damper [M] to the exhaust pipe.
- Insert the projection [N] of the exhaust pipe into the hole [O] of the damper.
 - 2 mm (0.08 in.) [P]
 - 1 mm (0.04 in.) [Q]

Muffler

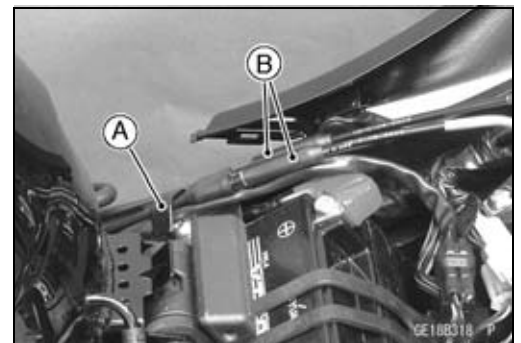


GE18121BW3 C

- Install the removed parts (see appropriate chapters).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.

Exhaust Butterfly Valve Cable Removal

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Open the clamp [A] and free the cables.
- Slide the dust covers [B].

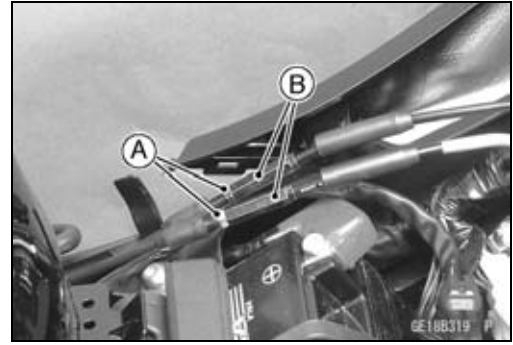


GE18B318 P

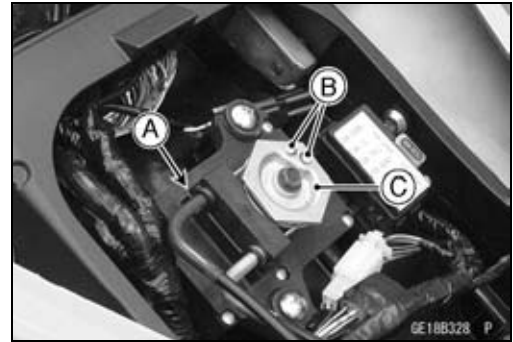
5-44 ENGINE TOP END

Muffler

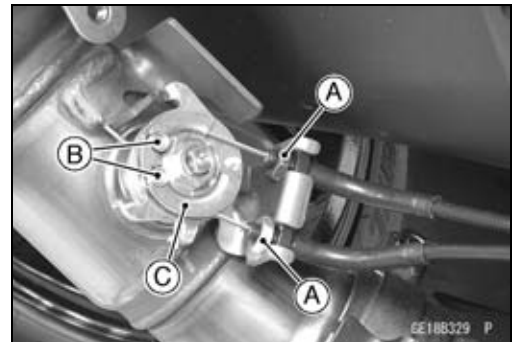
- Loosen the locknuts [A], and turn the adjusters [B] to give the cable plenty of play.



- Remove the clamp [A].
- Remove the upper ends [B] of the exhaust butterfly valve cables from the pulley [C].



- Remove the muffler body cover (see Muffler Body Removal).
- Loosen the locknuts [A].
- Remove the lower ends [B] of the exhaust butterfly valve cables from the pulley [C].
- Pull the exhaust butterfly valve cables out of the frame.



Exhaust Butterfly Valve Cable Installation

- Confirm whether pulley [A] is an angle shown in the figure. $41.7^\circ \pm 0.7^\circ$ [B]
- This position is original position of the pulley.

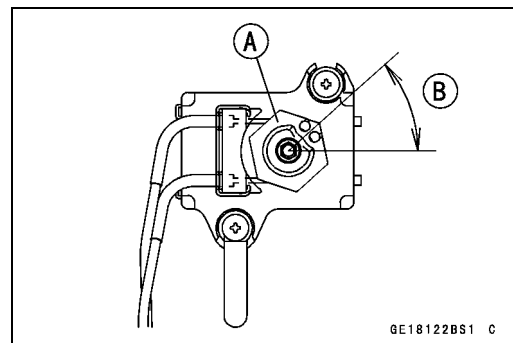
NOTE

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

CAUTION

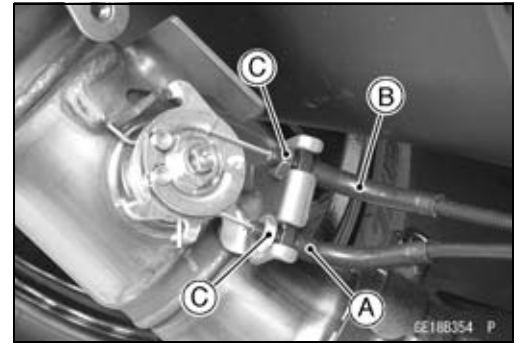
Do not correct the pulley position with the tool, forcibly. The actuator damage will occur.

- ★ If the angle is wrong, adjust the pulley (see Exhaust Butterfly Valve Actuator Installation in the Fuel System (DFI) chapter).



Muffler

- Run the exhaust butterfly valve cables correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the lower ends of the exhaust butterfly valve cables to the pulley of the muffler body as shown in the figure.
 - Open Cable (White) [A]
 - Close Cable (Black) [B]
- Tighten:
 - Torque - Exhaust Butterfly Valve Cable Locknuts [C]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**



5-46 ENGINE TOP END

Muffler

- Install the upper ends of the exhaust butterfly valve cables to the pulley of the exhaust butterfly valve actuator, following the specified installing sequence.
 - First, install the close cable (black) [A].
 - Second, install the open cable (white) [B].
 - Third, stretch the open cable (white) by using the adjuster [C].
 - Turn the adjuster counterclockwise until the play of the open cable becomes no play.

CAUTION

To keep the correct exhaust butterfly valve position, be sure to adjust the open cable first. Do not overstretch the cable.

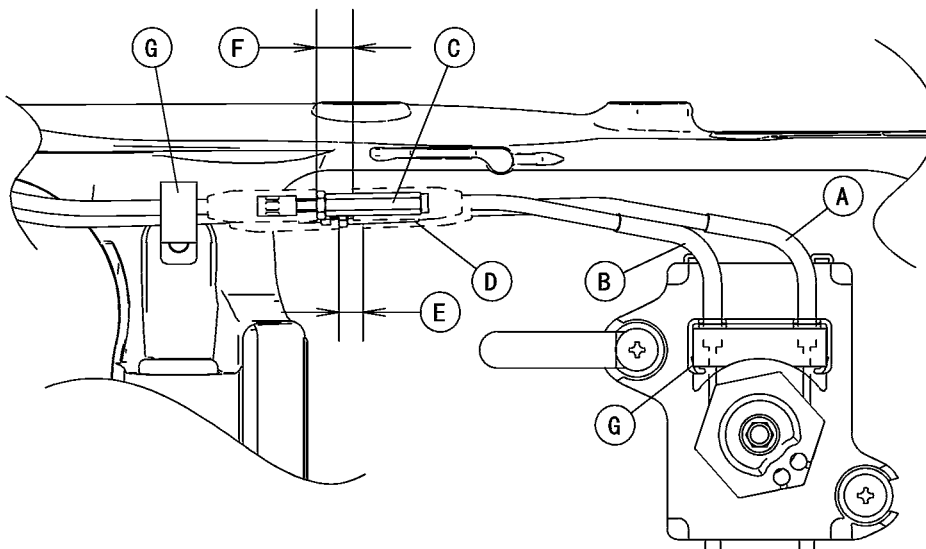
- Fourth, tighten the adjuster locknut (white) of the open cable securely.

**Torque - Exhaust Butterfly Valve Cable Adjuster Locknuts:
6.9 N·m (0.70 kgf·m, 61 in·lb)**

- Fifth, stretch the close cable (black) by using the adjuster [D].
- Turn the adjuster counterclockwise until the play of the close cable becomes no play.
- Sixth, turn the adjuster of the close cable (black) clockwise by 1/2 to 1 rotation.
- Seventh, tighten the adjuster locknut (black) of the close cable securely.

**Torque - Exhaust Butterfly Valve Cable Adjuster Locknuts:
6.9 N·m (0.70 kgf·m, 61 in·lb)**

- After installation, cover the dust covers on the adjusters as shown in the figure.
 - 10 mm (0.39 in.) or less [E]
 - 15 mm (0.59 in.) or less [F]
- Fix the exhaust butterfly valve cables with the clamps [G].



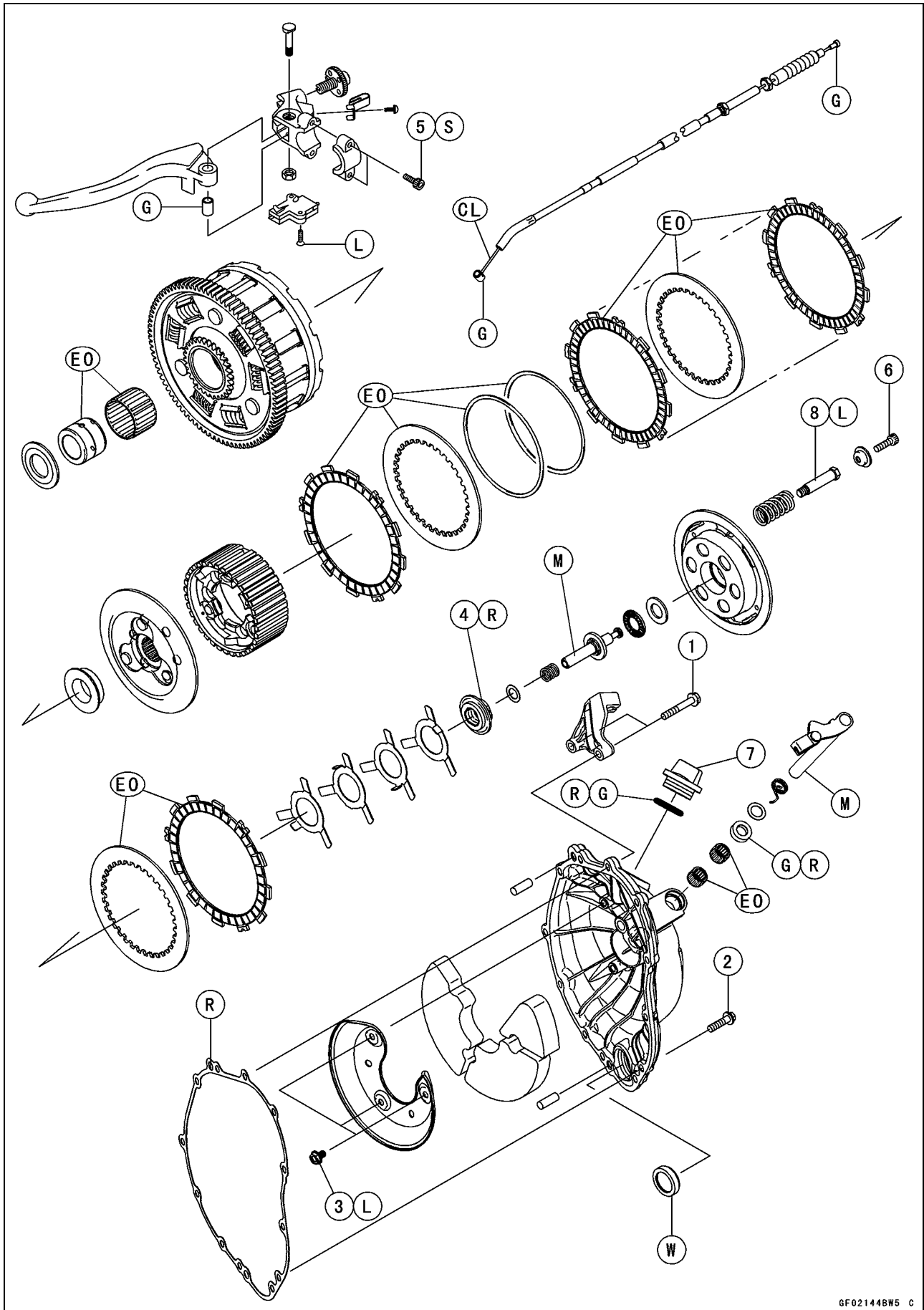
Clutch

Table of Contents

Exploded View	6-2
Specifications	6-4
Special Tool and Sealant	6-5
Clutch Lever and Cable	6-6
Clutch Lever Free Play Inspection	6-6
Clutch Lever Free Play Adjustment	6-6
Cable Removal	6-6
Cable Installation	6-6
Cable Lubrication	6-6
Clutch Lever Installation	6-6
Clutch Cover	6-7
Clutch Cover Removal	6-7
Clutch Cover Installation	6-7
Release Shaft Removal	6-8
Release Shaft Installation	6-8
Clutch Cover Disassembly	6-8
Clutch Cover Assembly	6-9
Clutch	6-11
Clutch Removal	6-11
Clutch Installation	6-12
Spring Plate Free Play Measurement	6-15
Spring Plate Free Play Adjustment	6-16
Clutch Plate, Wear, Damage Inspection	6-17
Clutch Plate Warp Inspection	6-17
Clutch Spring Free Length Measurement	6-18
Clutch Housing Finger Inspection	6-18
Clutch Housing Spline Inspection	6-18
Damper Cam Inspection	6-18

6-2 CLUTCH

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Clutch Cover Bolts (M6, L = 40 mm)	9.8	1.0	87 in·lb	
2	Clutch Cover Bolts (M6, L = 25 mm)	9.8	1.0	87 in·lb	
3	Clutch Cover Plate Bolts	9.8	1.0	87 in·lb	L
4	Clutch Hub Nut	135	13.8	99.6	R
5	Clutch Lever Clamp Bolts	7.8	0.80	69 in·lb	S
6	Clutch Spring Bolts	8.8	0.90	78 in·lb	
7	Oil Filler Plug	–	–	–	Hand-tighten
8	Sub Clutch Hub Bolts	25	2.5	18	L

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

S: Follow the specified tightening sequence.

W: Apply water.

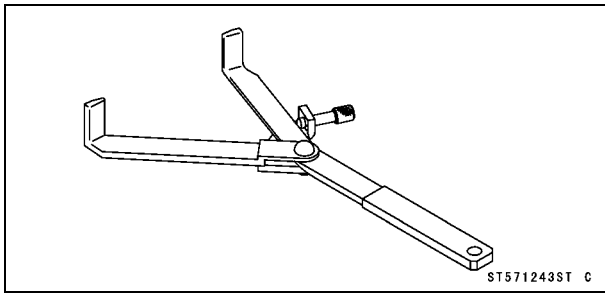
6-4 CLUTCH

Specifications

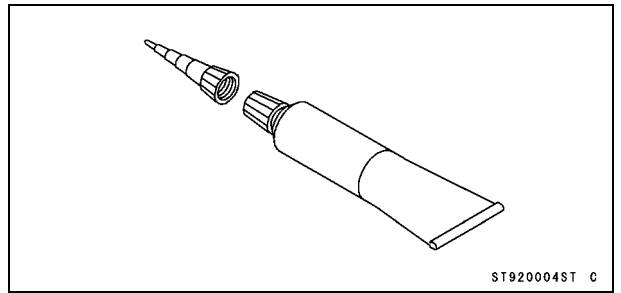
Item	Standard	Service Limit
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
Clutch		
Spring Plate Free Play	(Usable Range) 0.05 ~ 0.70 mm (0.002 ~ 0.028 in.)	— — —
Clutch Plate Assembly Length	(Reference) 40.6 mm (1.60 in.)	— — —
Friction Plate Thickness: 13088-0003/0025	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)	2.5 mm (0.098 in.)
Friction and Steel Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.012 in.)
Clutch Spring Free Length	41.6 mm (1.64 in.)	40.1 mm (1.58 in.)

Special Tool and Sealant

**Clutch Holder:
57001-1243**



**Kawasaki Bond (Silicone Sealant):
92104-0004**



6-6 CLUTCH

Clutch Lever and Cable

Clutch Lever Free Play Inspection

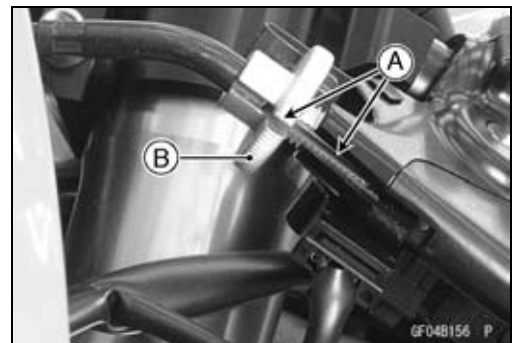
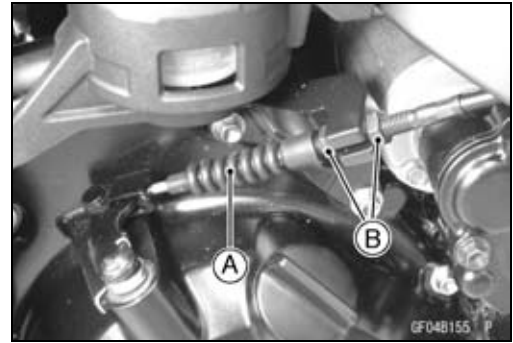
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

Clutch Lever Free Play Adjustment

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

Cable Removal

- Remove:
 - Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
 - Right Fairing Cover (see Fairing Cover Removal in the Frame chapter)
- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen the nuts [B], and slide the lower end of the clutch cable to give the cable plenty of play.
- Screw in the adjuster.
- Line up the slots [A] in the clutch lever and adjuster [B], and then free the cable from the lever.
- Free the clutch inner cable tip from the clutch release lever.
- Push the release lever toward the front of the motorcycle and tape the release lever to the clutch cover to prevent the release shaft from falling out.
- Pull the clutch cable out of the frame.



Cable Installation

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

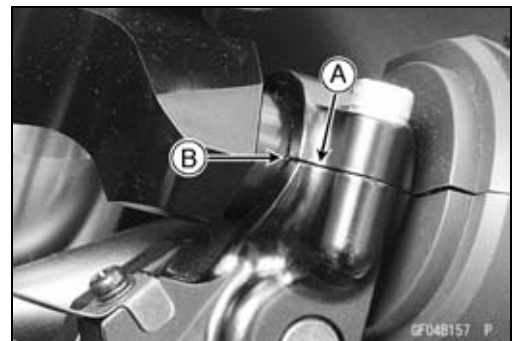
Cable Lubrication

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

Clutch Lever Installation

- Install the clutch lever so that the mating surface [A] of the clutch lever clamp is aligned with the punch mark [B] of the handlebar.
- Tighten the upper clamp bolt first, and then the lower clamp bolt.
- There will be a gap at the lower part of the clamp after tightening.

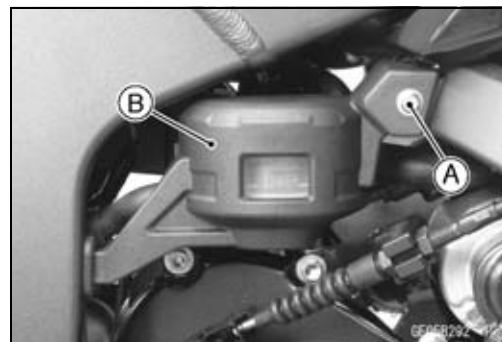
Torque - Clutch Lever Clamp Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)



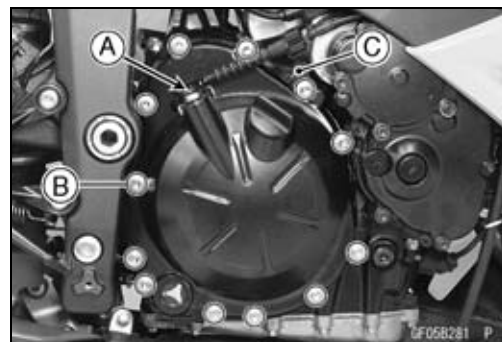
Clutch Cover

Clutch Cover Removal

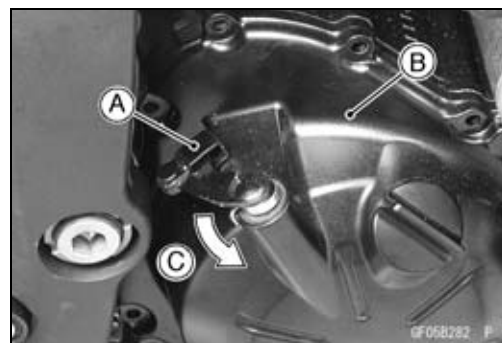
- Remove the bolt [A].
- Remove the cover [B] from the frame.



- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
 - Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
 - Clutch Cable Lower End [A] (see Cable Removal)
 - Clutch Cover Bolts [B]
 - Bracket [C]

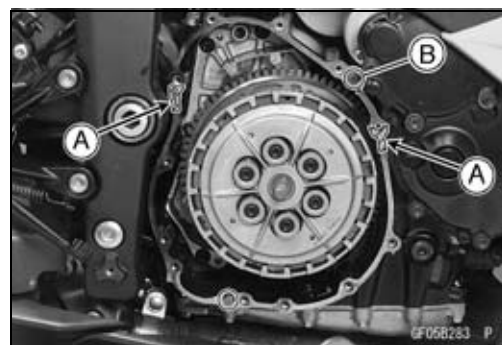


- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B].
About 90° [C]

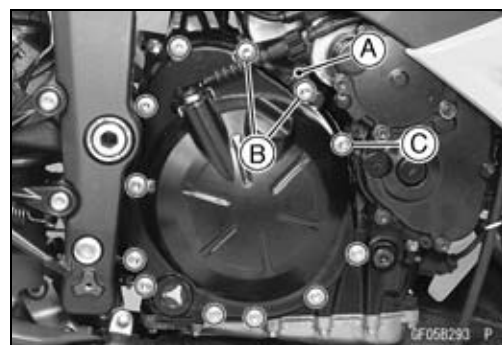


Clutch Cover Installation

- Apply silicone sealant to the area [A] where the mating surface of the crankcase touches the clutch cover gasket.
- Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**
- Be sure that the dowel pins [B] are in position.
- Replace the clutch cover gasket with a new one.



- Install the bracket [A].
- Tighten:
 - Torque - Clutch Cover Bolts: 9.8 N-m (1.0 kgf-m, 87 in-lb)**
 - L = 40 mm (1.57 in.) [B]
 - L = 25 mm (0.98 in.) [C]



6-8 CLUTCH

Clutch Cover

Release Shaft Removal

CAUTION

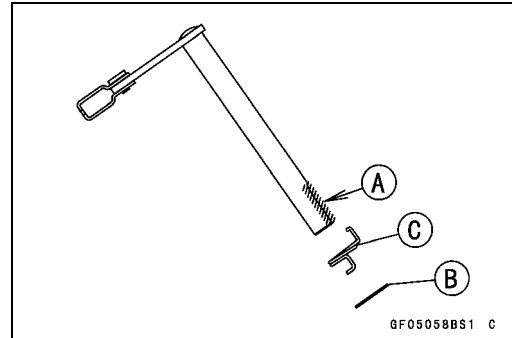
Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.

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



Release Shaft Installation

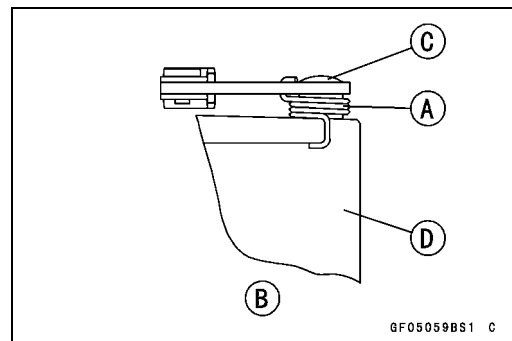
- Apply grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearings in the hole of the clutch cover.
- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Install the washer [B] and spring [C].
- Insert the release shaft straight into the upper hole of the clutch cover.



CAUTION

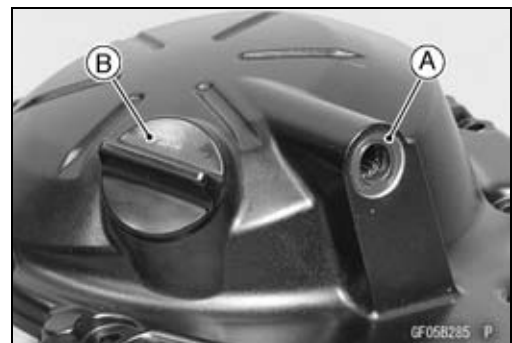
When inserting the release shaft, be careful not to remove the spring of the oil seal.

- Fit the spring [A] as shown in the figure.
Rear View [B]
Release Shaft [C]
Clutch Cover [D]



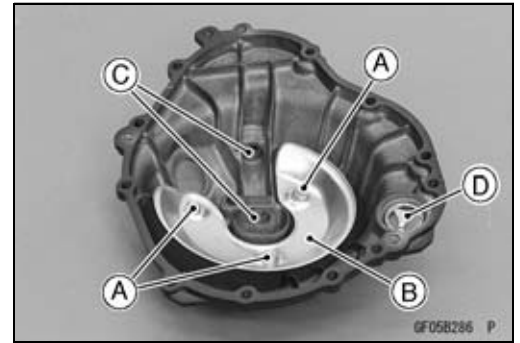
Clutch Cover Disassembly

- Remove:
Clutch Cover (see Clutch Cover Removal)
Release Lever and Shaft Assembly (see Release Shaft Removal)
Oil Seal [A]
Oil Filler Plug [B]



Clutch Cover

- Remove:
 - Bolts [A]
 - Plate [B]
 - Pads
 - Needle Bearings [C]
 - Oil Level Gauge [D]



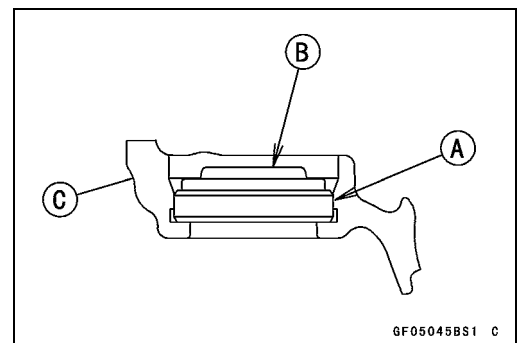
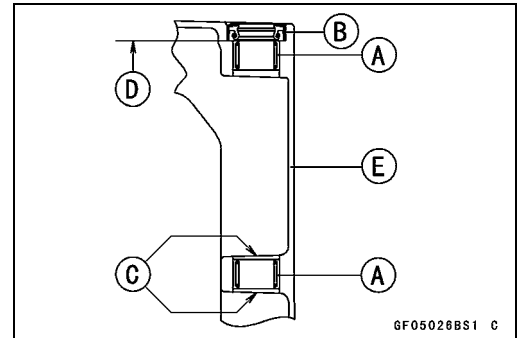
Clutch Cover Assembly

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

NOTE

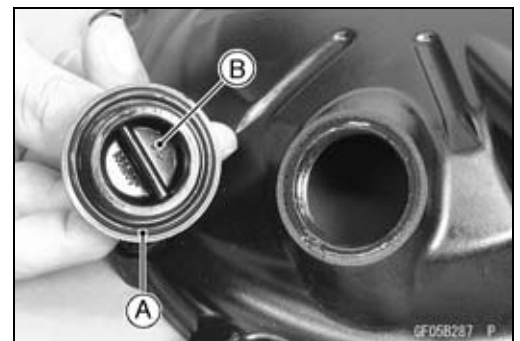
○ Install the needle bearings so that the manufacture's mark face out.

- Install the needle bearings [A] and oil seal [B] position as shown in the figure.
- Apply grease to the oil seal lips.
- Press the lower bearing, do not protrude from the boss [C] of the clutch cover.
- Press the upper bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].
- Press the oil seal until the bottom.
- Apply water to the rubber portion [A] of the oil level gauge.
- Press the gauge so that its projection [B] faces inside of the clutch cover [C].



- Replace the O-ring [A] of the oil filler plug [B] with a new one.
- Apply grease to the new O-ring.
- Tighten:

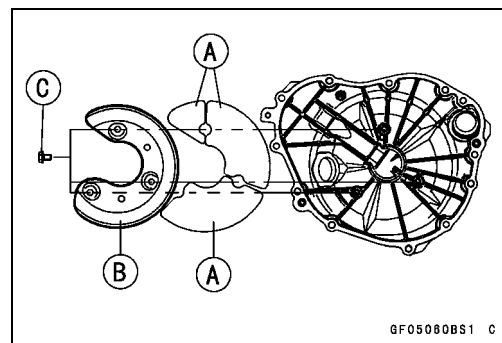
Torque - Oil Filler Plug: Hand-tighten



6-10 CLUTCH

Clutch Cover

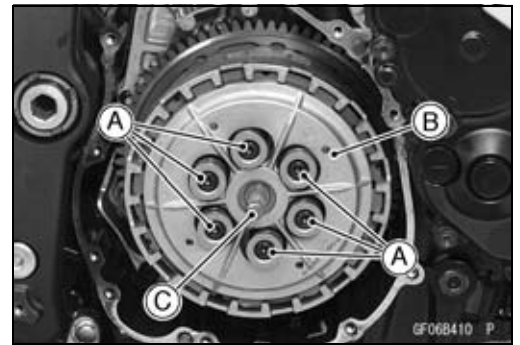
- Install:
 - Pads [A]
 - Plate [B]
 - Apply a non-permanent locking agent to the threads of the clutch cover plate bolts [C], and tighten them.
- Torque - Clutch Cover Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



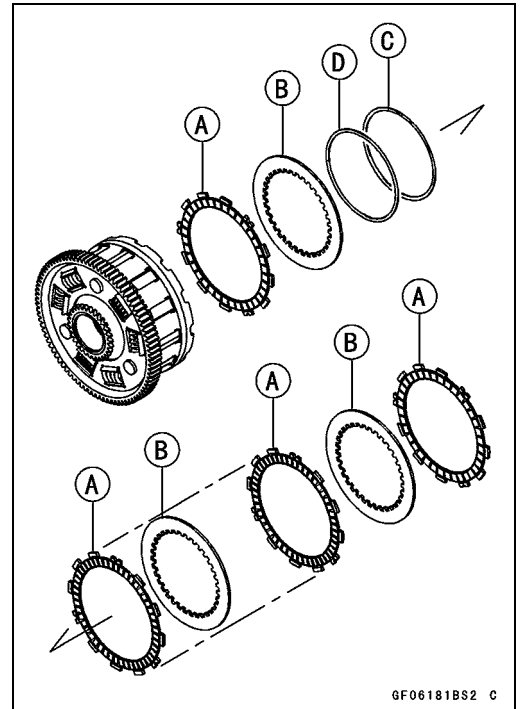
Clutch

Clutch Removal

- Remove:
 - Clutch Cover (see Clutch Cover Removal)
 - Clutch Spring Bolts [A]
 - Clutch Springs (with Clutch Spring Holders)
 - Clutch Spring Plate [B] (with Shim, Bearing, Pusher [C], Spring and Washer)



- Remove:
 - Friction Plates (8) [A]
 - Steel Plates (7) [B]
 - Spring [C]
 - Spring Seat [D]



- Hold the sub clutch hub [A] steady with the clutch holder [B], and remove the nut [C].

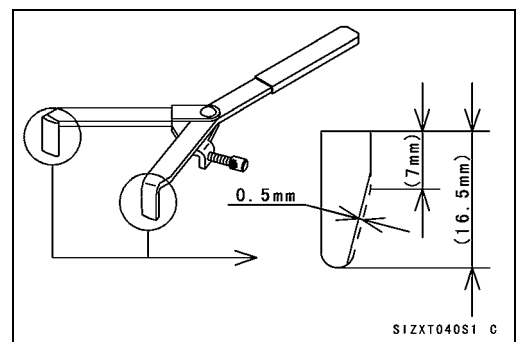
Special Tool - Clutch Holder: 57001-1243



- Use the clutch holder with sharpened hook nose by grinding.

Special Tool - Clutch Holder: 57001-1243

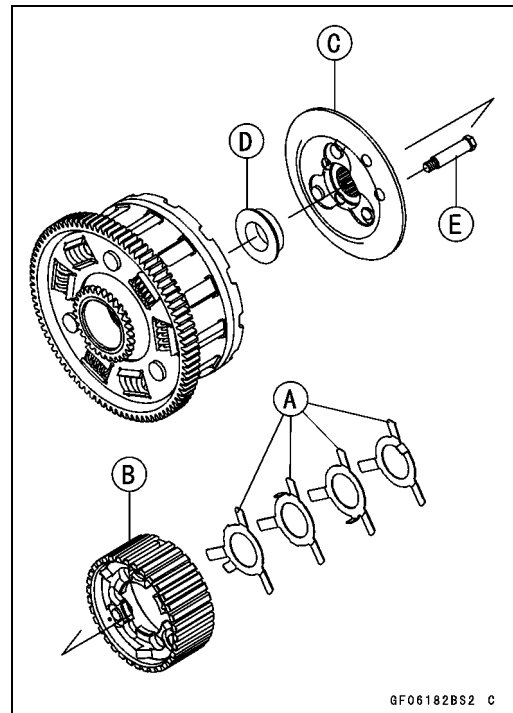
- Grind the hook nose by 0.5 mm (0.02 in.) as shown in the figure.



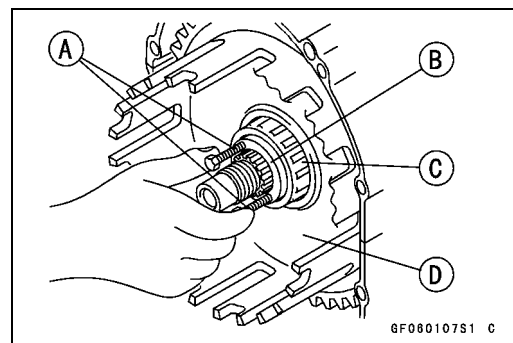
6-12 CLUTCH

Clutch

- Remove:
 - Torque Limiter Springs [A]
 - Sub Clutch Hub [B]
 - Clutch Hub [C]
 - Spacer [D]
- Remove the sub clutch hub bolts [E] as necessary.

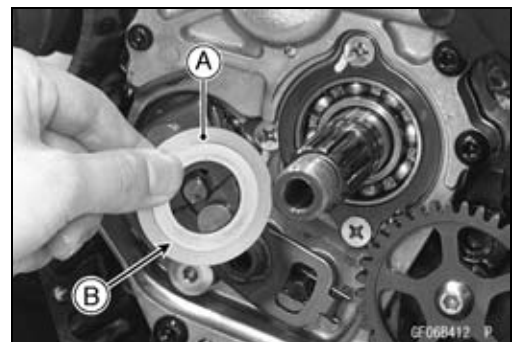


- Using the two 4 mm (0.16 in.) screws [A], pull out the sleeve [B], needle bearing [C] and clutch housing [D].
- Remove the spacer.



Clutch Installation

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

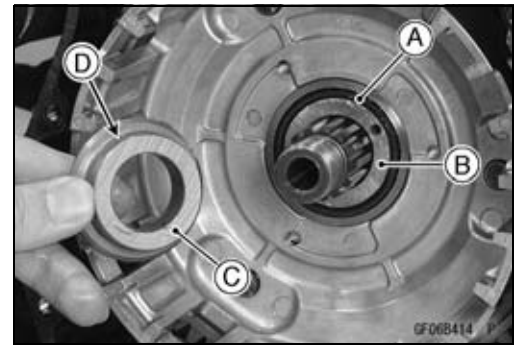


- Engage the clutch housing gear [A] and oil pump drive gear [B] with the crankshaft primary gear [C] and oil pump drive gear [D].



Clutch

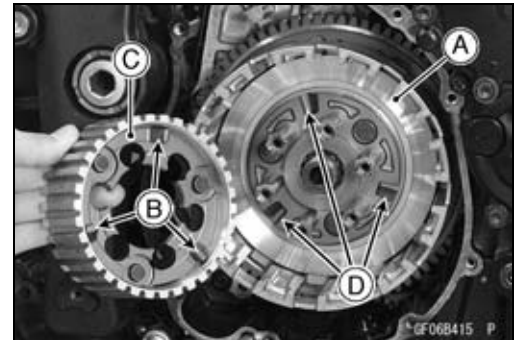
- Install:
 - Needle Bearing [A]
 - Sleeve [B]
- Apply engine oil to the sleeve and needle bearing.
- Install the spacer [C] so that the stepped side [D] faces outward.



- ★ If the sub clutch hub bolts were removed, install them as follows.
- Apply a non-permanent locking agent to the threads of the sub clutch hub bolts, and tighten them.

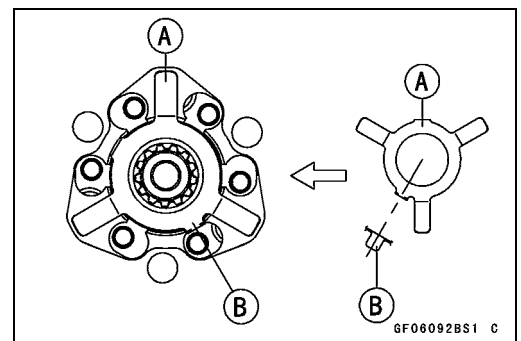
Torque - Sub Clutch Hub Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Install the clutch hub [A] on the drive shaft.
- Align the damper cams [B] of the sub clutch hub [C] to the cam followers [D] of the clutch hub.

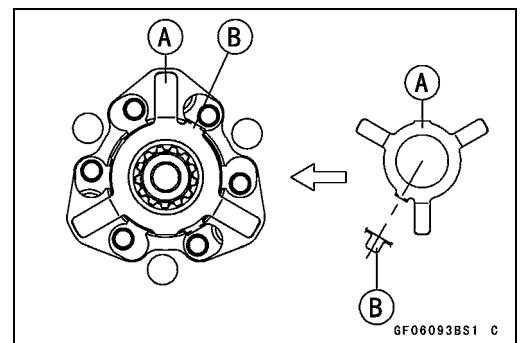


- Install the four torque limiter springs as shown in the figure.

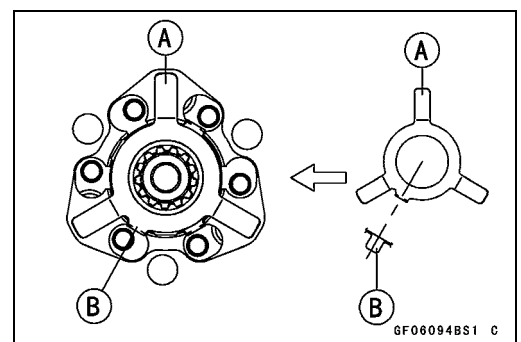
- First Torque Limiter Spring [A]
- Tang [B]



- Second Torque Limiter Spring [A]
- Tang [B]



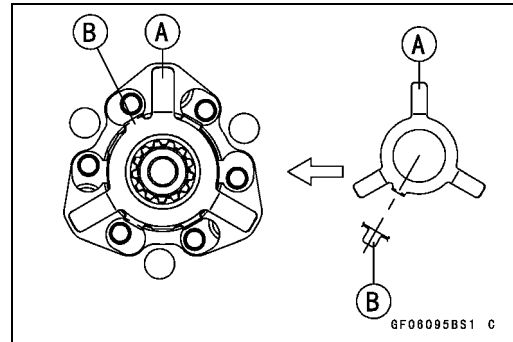
- Third Torque Limiter Spring [A]
- Tang [B]



6-14 CLUTCH

Clutch

- Fourth Torque Limiter Spring [A]
Tang [B]



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

Special Tool - Clutch Holder: 57001-1243

Torque - Clutch Hub Nut: 135 N·m (13.8 kgf·m, 99.6 ft·lb)



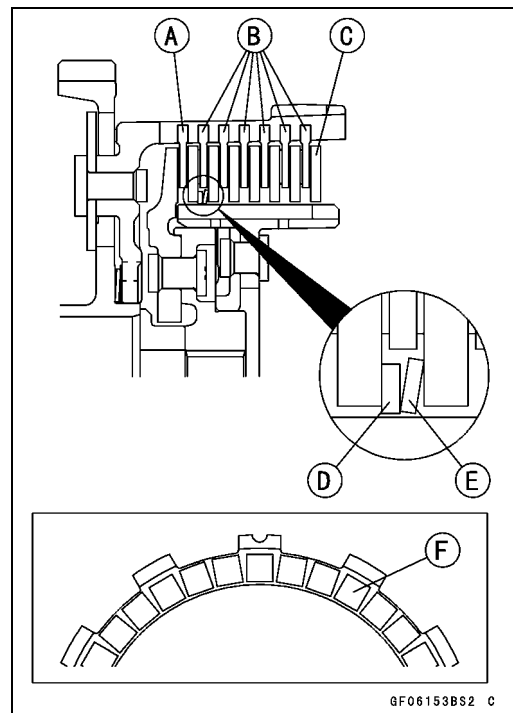
- Install the following as shown in the figure.
 - Friction Plate (36 Lining Blocks) [A]
 - Friction Plates (48 Lining Blocks) [B]
 - Steel Plates [C]
 - Spring Seat [D]
 - Spring [E]

NOTE

- The lining blocks [F] of the friction plate [A] are larger than them of the friction plates [B].
- Install the spring seat and spring between first steel plate and second steel plate.

CAUTION

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

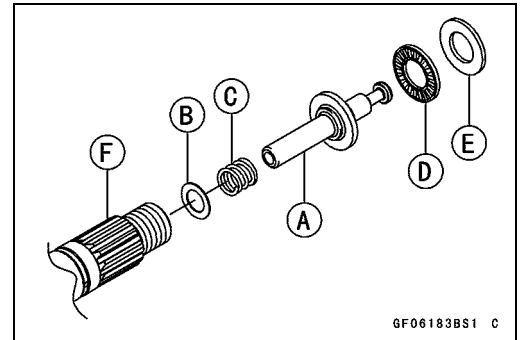


- Install the last friction plate (36 lining blocks) [A] fitting the tangs in the grooves in the housing as shown in the figure.



Clutch

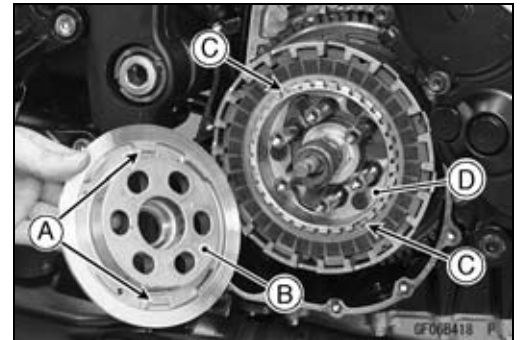
- Apply molybdenum disulfide grease to the pusher end [A].
- Install the washer [B], spring [C], bearing [D] and shim [E] to the pusher.
- Install the pusher to the drive shaft [F] direction as shown in the figure.



- Align the projections [A] of the spring plate [B] to the grooves [C] of the sub clutch hub [D] to install the spring plate on the sub clutch hub.
- Install the clutch springs and spring holders, and tighten the clutch spring bolts.

Torque - Clutch Spring Bolts: 8.8 N-m (0.90 kgf-m, 78 in-lb)

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

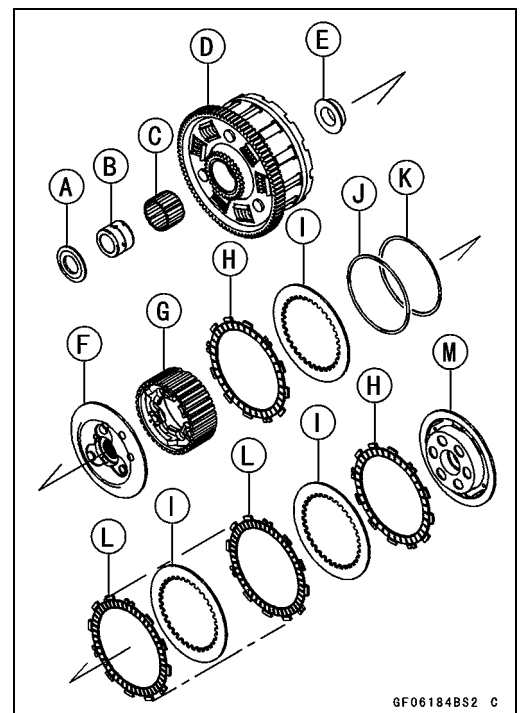


Spring Plate Free Play Measurement

Insufficient clutch free play will cause the engine braking effect to be more sudden, resulting in rear wheel hop. On the other hand, if the free play is excessive, the clutch lever may feel “spongy” or pulsate when pulled.

- Hold an extra drive shaft in a vise and install the following clutch parts on the shaft (see Clutch Installation).

- Spacer [A]
- Sleeve [B]
- Needle Bearing [C]
- Clutch Housing [D]
- Spacer [E]
- Clutch Hub [F]
- Sub Clutch Hub [G]
- Friction Plates (36 Lining Blocks) [H]
- Steel Plates [I]
- Spring Seat [J]
- Spring [K]
- Friction Plates (48 Lining Blocks) [L]
- Clutch Spring Plate [M]



6-16 CLUTCH

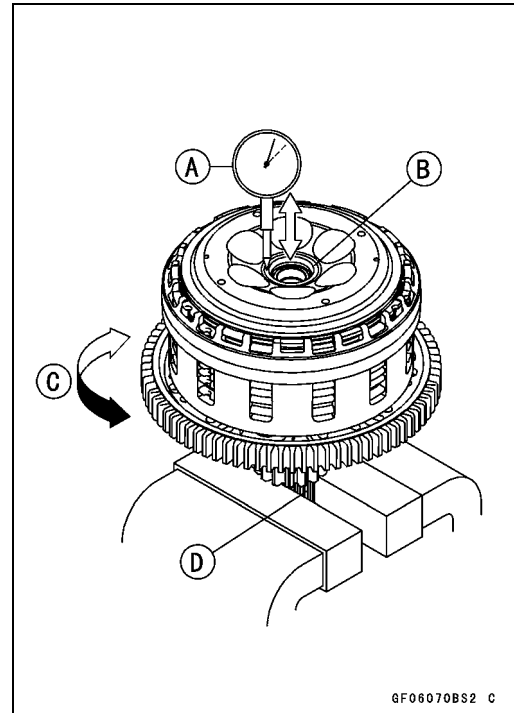
Clutch

- Engage the clutch hub with the sub clutch hub.
- To measure the free play, set a dial gauge [A] against the raised center [B] of the clutch spring plate.
- Move the clutch housing gear back and forth [C]. The difference between the highest and lowest gauge readings is the amount of free play.
Drive Shaft [D]
- Measure the spring plate free play.

Spring Plate Free Play

Usable Range: 0.05 ~ 0.70 mm (0.002 ~ 0.028 in.)

- ★ If the free play is not within the usable range, change all of the friction plate and measure the free play again.
- ★ If the free play is not within the usable range, adjust the free play (see Spring Plate Free Play Adjustment).



Spring Plate Free Play Adjustment

NOTE

- The free play adjustment is performed by replacing the steel plate(s).
- Measure the clutch spring plate free play (see Clutch Spring Plate Free Play Measurement), and then replace the steel plate(s) which brings the free play within the usable range.

Spring Plate Free Play

Usable Range: 0.05 ~ 0.70 mm (0.002 ~ 0.028 in.)

- Replace the following steel plate(s).

Thickness	Part Number
2.3 mm (0.090 in.)	13089-0008
2.6 mm (0.102 in.) (STD)	13089-0009
2.9 mm (0.114 in.)	13089-1093

NOTE

- Do not use the steel plate of 2.3 mm (0.090 in.) and 2.9 mm (0.114 in.) thickness at the same time.

Clutch

Clutch Plate Assembly Length (Reference Information)

- Assemble the following parts.

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

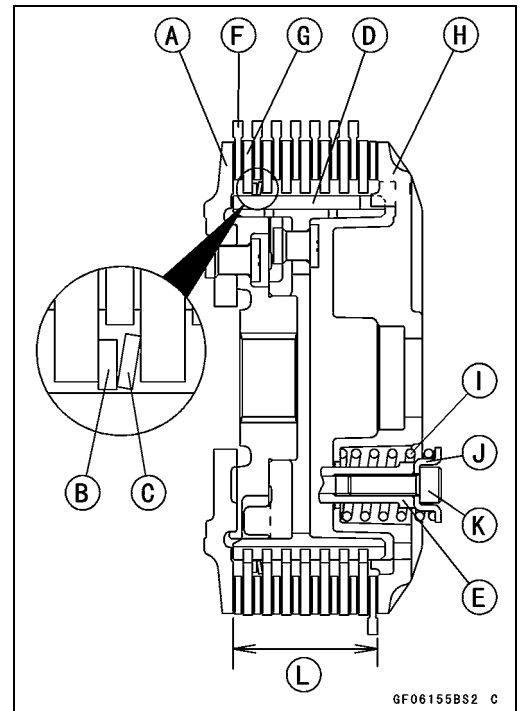
Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Measure the clutch plate assembly length [L].

Clutch Plate Assembly Length (Reference)
40.6 mm (1.60 in.)

NOTE

- The length of the clutch plate assembly changes by the steel plate thickness.

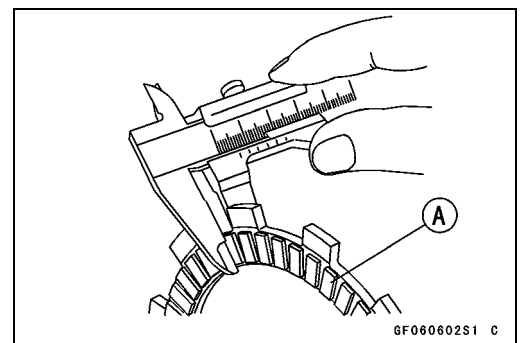


Clutch Plate, Wear, Damage Inspection

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.
- ★ If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

Friction Plate Thickness

Standard: 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)
Service Limit: 2.5 mm (0.098 in.)

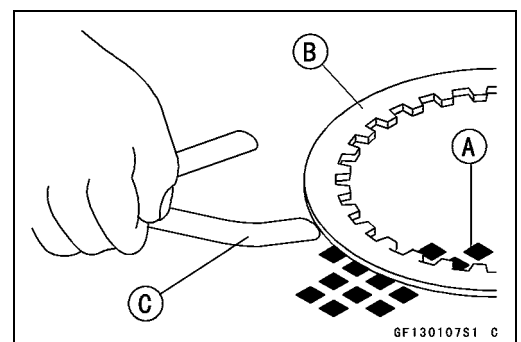


Clutch Plate Warp Inspection

- Place each friction plate or steel plate on a surface plate and measure the gap between the surface plate [A] and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp.
- ★ If any plate is warped over the service limit, replace it with a new one.

Friction and Steel Plate Warp

Standard: 0.15 mm (0.0059 in.) or less
Service Limit: 0.3 mm (0.012 in.)



6-18 CLUTCH

Clutch

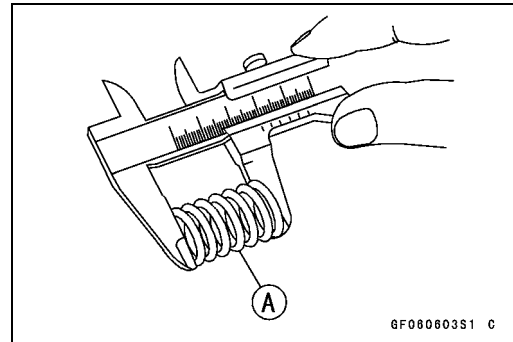
Clutch Spring Free Length Measurement

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

Clutch Spring Free Length

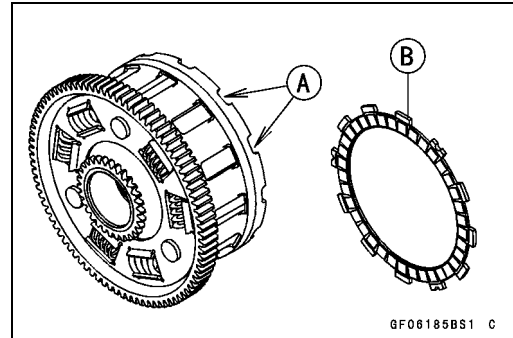
Standard: 41.6 mm (1.64 in.)

Service Limit: 40.1 mm (1.58 in.)



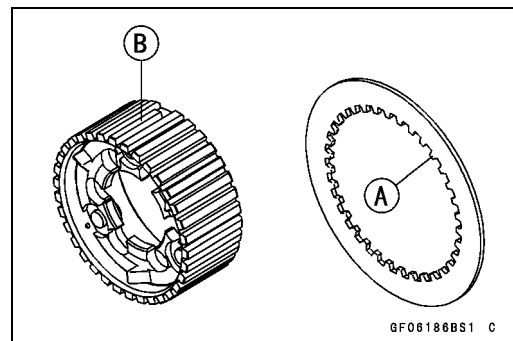
Clutch Housing Finger Inspection

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



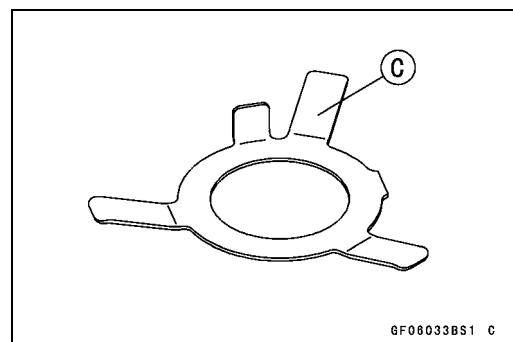
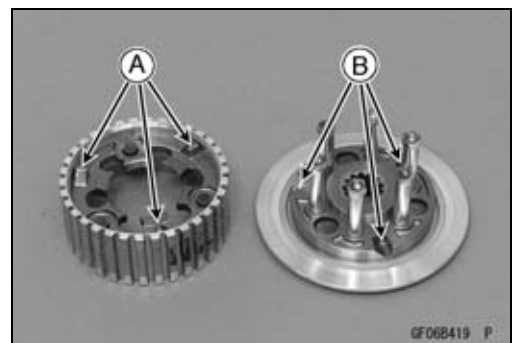
Clutch Housing Spline Inspection

- Visually inspect where the teeth [A] on the steel plates wear against the sub clutch hub splines [B].
- ★ If there are notches worn into the splines, replace the sub clutch hub. Also, replace the steel plates if their teeth are damaged.



Damper Cam Inspection

- Remove the clutch (see Clutch Removal).
- Visually inspect the damper cam [A], cam follower [B], and the torque limiter spring [C].
- Replace the part if it appears damaged.



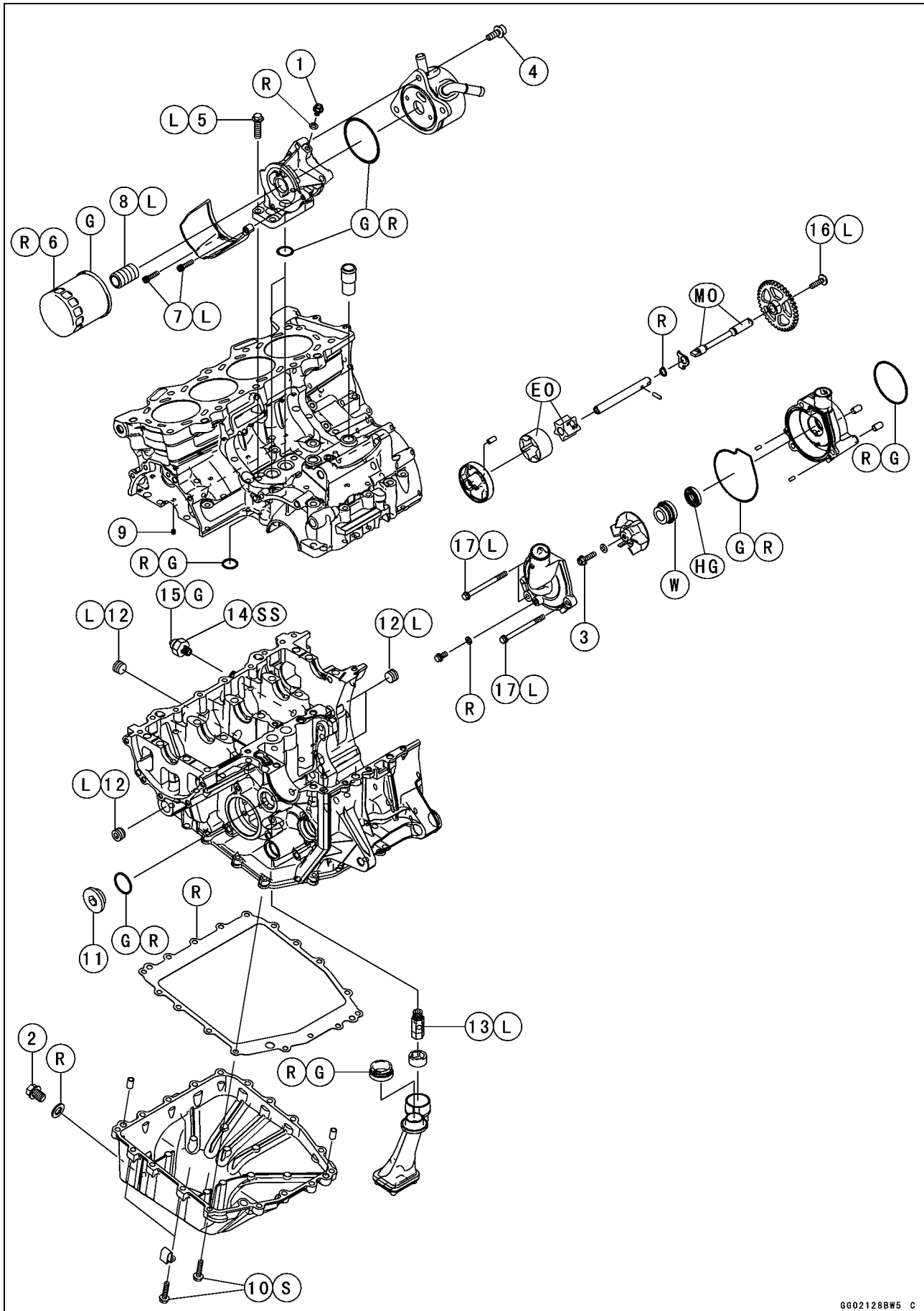
Engine Lubrication System

Table of Contents

Exploded View	7-2
Engine Oil Flow Chart.....	7-4
Specifications	7-6
Special Tools and Sealant	7-7
Engine Oil and Oil Filter.....	7-8
Oil Level Inspection.....	7-8
Engine Oil Change.....	7-8
Oil Filter Replacement	7-8
Oil Pan.....	7-9
Oil Pan Removal	7-9
Oil Pan Installation.....	7-9
Oil Pressure Relief Valve.....	7-10
Oil Pressure Relief Valve Removal	7-10
Oil Pressure Relief Valve Installation	7-10
Oil Pressure Relief Valve Inspection.....	7-11
Oil Pump.....	7-12
Oil Pump Removal	7-12
Oil Pump Installation	7-13
Oil Pump Drive Gear Removal.....	7-14
Oil Pump Drive Gear Installation.....	7-14
Oil Pump Drive Gear Shaft Removal	7-14
Oil Pump Drive Gear Shaft Installation	7-15
Oil Cooler.....	7-16
Oil Cooler Removal.....	7-16
Oil Cooler Installation.....	7-16
Oil Cooler/Oil Filter Case Removal	7-16
Oil Cooler/Oil Filter Case Installation	7-17
Oil Pressure Measurement.....	7-19
Oil Pressure Measurement	7-19
Oil Pressure Switch	7-20
Oil Pressure Switch Removal	7-20
Oil Pressure Switch Installation	7-20

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	Air Bleed Bolt	9.8	1.0	87 in-lb	
2	Engine Oil Drain Bolt	29	3.0	21	
3	Impeller Bolt	9.8	1.0	87 in-lb	
4	Oil Cooler Mounting Bolts	20	2.0	15	
5	Oil Cooler/Oil Filter Case Mounting Bolts	20	2.0	15	L
6	Oil Filter	17	1.7	13	G, R
7	Oil Filter Guard Bolts	4.0	0.41	35 in-lb	L
8	Oil Filter Holder Bolt	25	2.5	18	L
9	Oil Jet Nozzles	2.9	0.30	26 in-lb	
10	Oil Pan Bolts	9.8	1.0	87 in-lb	S
11	Oil Passage Plug	17	1.7	13	
12	Oil Passage Plugs (Taper)	20	2.0	15	L
13	Oil Pressure Relief Valve	15	1.5	11	L
14	Oil Pressure Switch	15	1.5	11	SS
15	Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in-lb	G
16	Oil Pump Drive Gear Bolt	9.8	1.0	87 in-lb	L
17	Water Pump Cover Bolts	12	1.2	106 in-lb	L

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

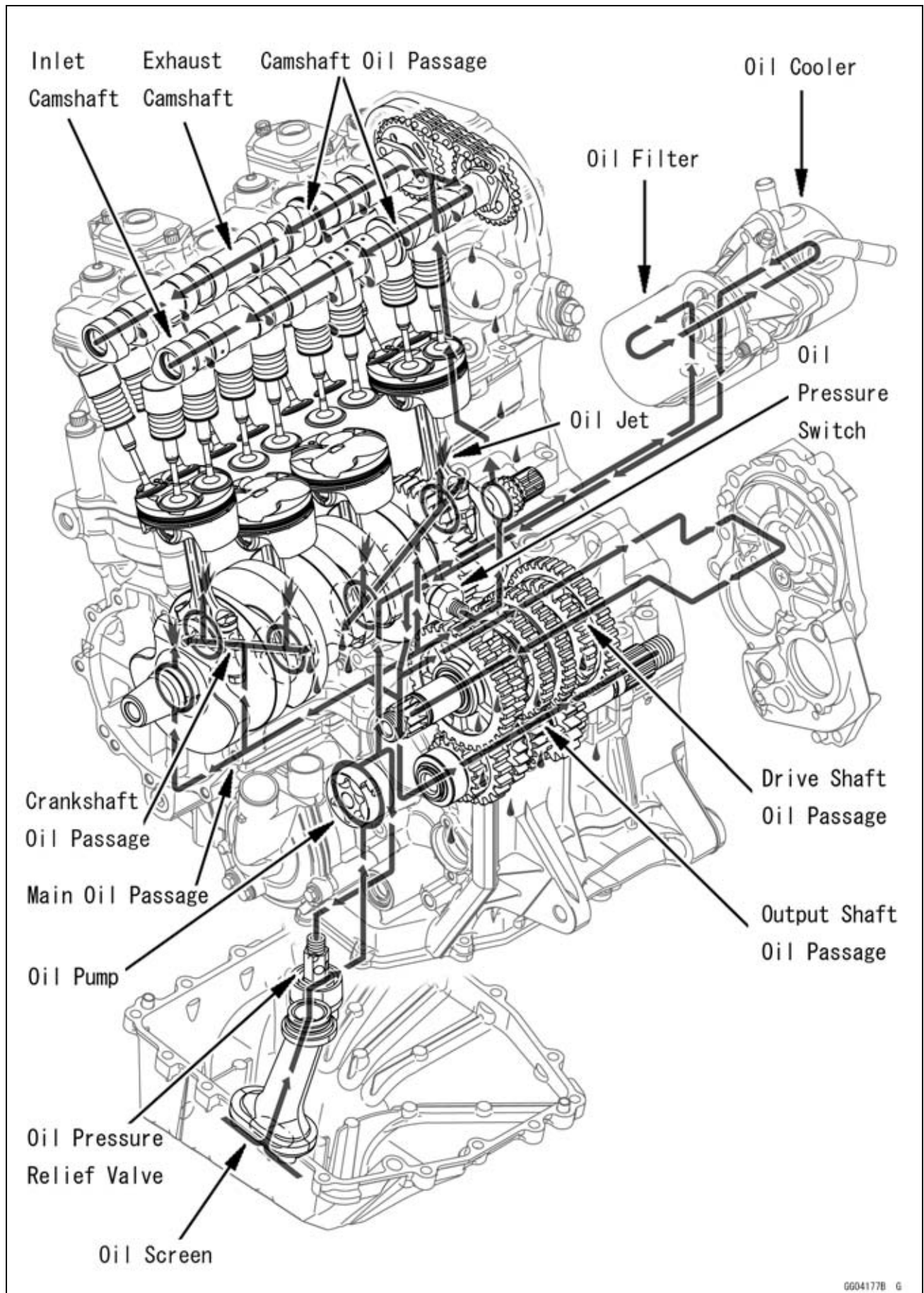
S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

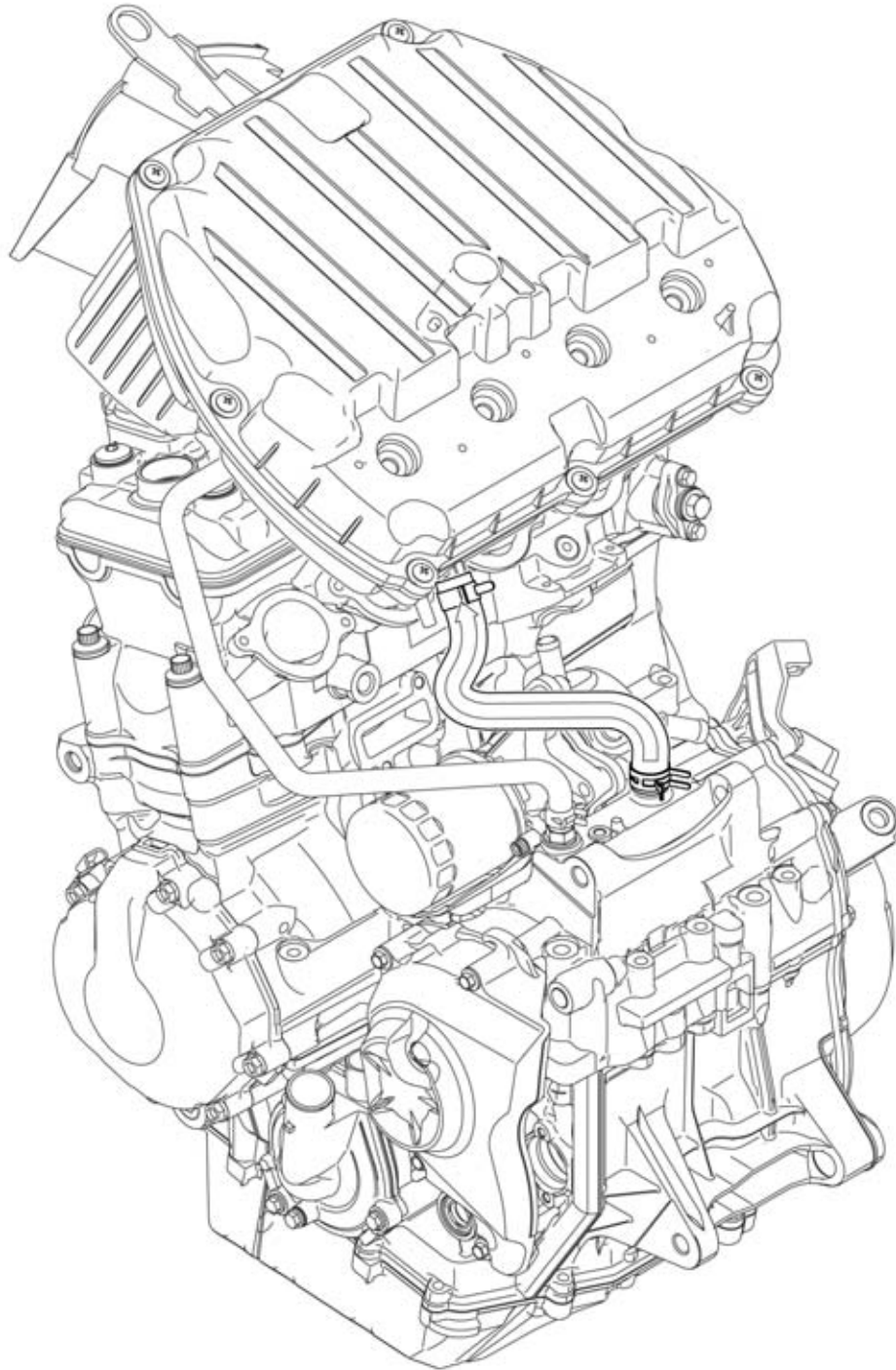
W: Apply water.

7-4 ENGINE LUBRICATION SYSTEM

Engine Oil Flow Chart



Engine Oil Flow Chart



← Blowby Gas

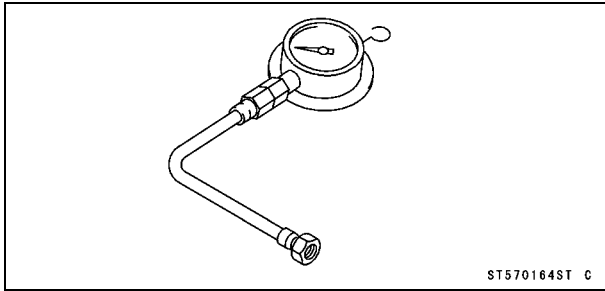
7-6 ENGINE LUBRICATION SYSTEM

Specifications

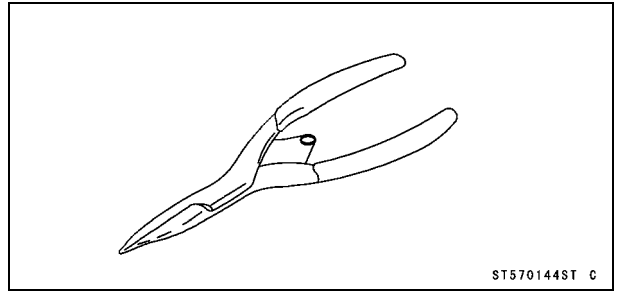
Item	Standard
Engine Oil Type Viscosity Capacity Level	API SE, SF or SG API SH, SJ, SL or SM with JASO MA, MA1 or MA2 SAE 10W-40 2.8 L (3.0 US qt) (when filter is not removed) 3.1 L (3.3 US qt) (when filter is removed) 3.6 L (3.8 US qt) (when engine is completely dry) Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)
Oil Pressure Measurement Oil Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm ² , 14 ~ 18 psi) at 4 000 r/min (rpm), Oil Temperature 90°C (194°F)

Special Tools and Sealant

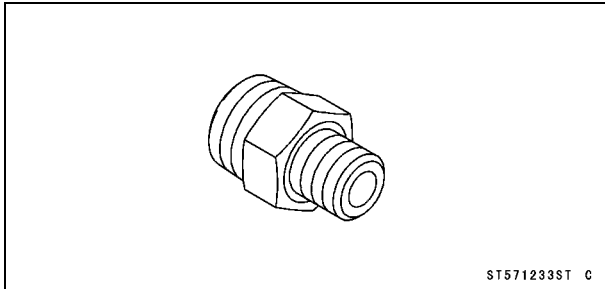
Oil Pressure Gauge, 10 kgf/cm²:
57001-164



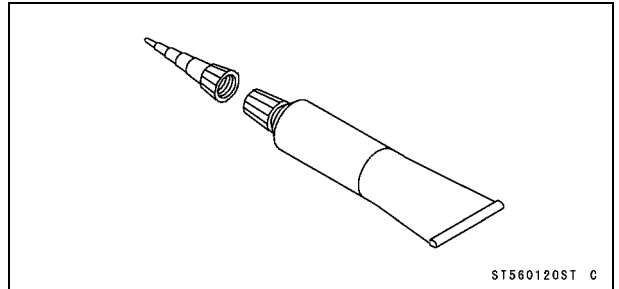
Outside Circlip Pliers:
57001-144



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



Kawasaki Bond (Silicone Sealant):
56019-120



7-8 ENGINE LUBRICATION SYSTEM

Engine Oil and Oil Filter

⚠ WARNING

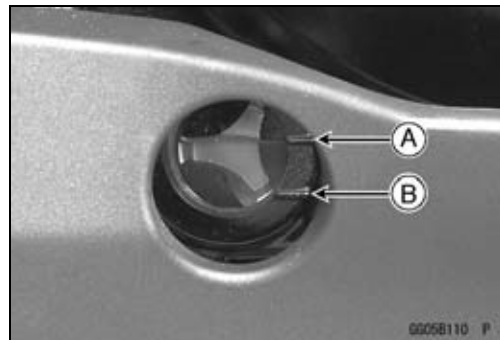
Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

Oil Level Inspection

- Check that the engine oil level is between the upper [A] and lower [B] levels in the gauge.

NOTE

- Situate the motorcycle so that it is perpendicular to the ground.
- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.



CAUTION

Racing the engine before the oil reaches every part can cause engine seizure.

If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the warning indicator light (LED) and oil pressure warning symbol will blink. If this blink stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

- ★ If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- ★ If the oil level is too low, add the correct amount of oil through the oil 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 in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

Engine Oil Change

- Refer to the Engine Oil Change in the Periodic Maintenance chapter.

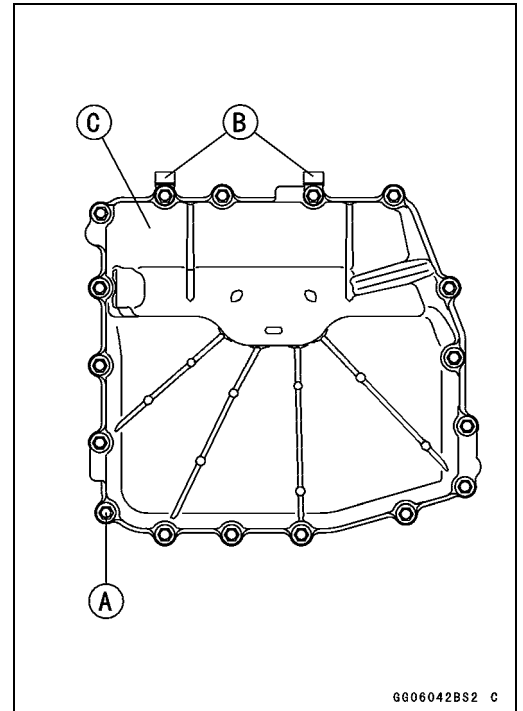
Oil Filter Replacement

- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

Oil Pan

Oil Pan Removal

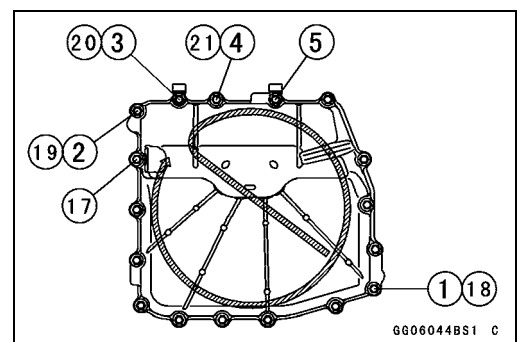
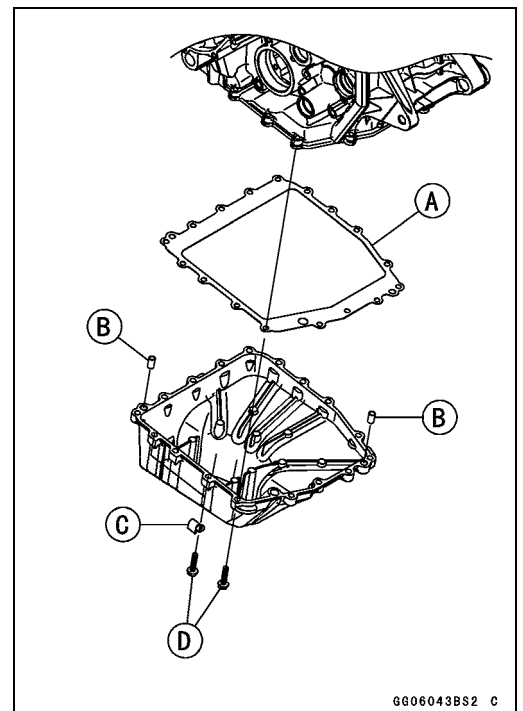
- Remove:
 - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
 - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
 - Oil Pan Bolts [A]
 - Clamps [B]
 - Oil Pan [C]



Oil Pan Installation

- Replace the oil pan gasket [A] with a new one.
- Install the dowel pins [B] and clamps [C] as shown in the figure.
- Tighten the oil pan bolts [D] as shown sequence [1 ~ 21] in the figure.

Torque - Oil Pan Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

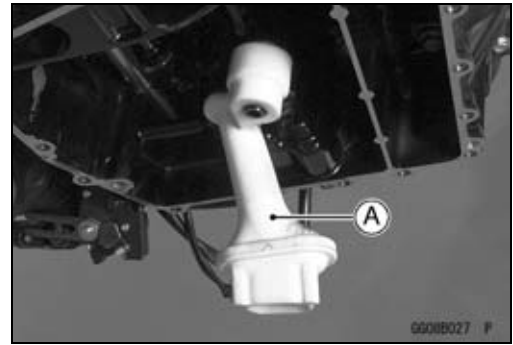


7-10 ENGINE LUBRICATION SYSTEM

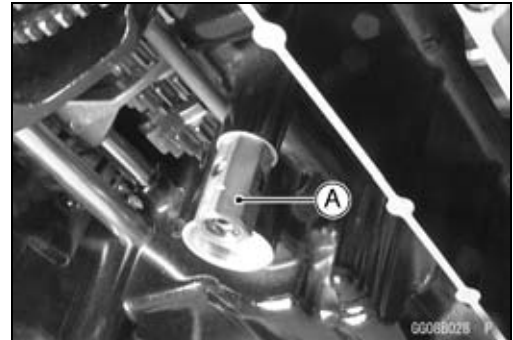
Oil Pressure Relief Valve

Oil Pressure Relief Valve Removal

- Remove:
 - Oil Pan (see Oil Pan Removal)
 - Oil Screen [A]



- Remove the oil pressure relief valve [A].



Oil Pressure Relief Valve Installation

- Apply a non-permanent locking agent to the threads of the oil pressure relief valve [A], and tighten it.

CAUTION

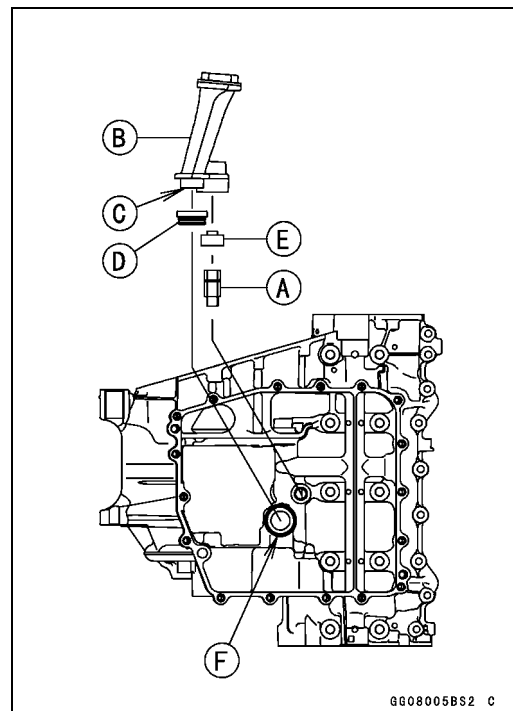
Do not apply too much non-permanent locking agent to the threads. This may block the oil passage.

Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Clean the oil screen [B] with a high-flash point solvent and remove any particles stuck to them.
- Blow away the particles by applying compressed air [C] 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 solvent.



NOTE

○ While cleaning the oil screen, check for any metal particles that might indicate internal engine damage.

- Check the screen carefully for any damage, holes, broken wires.
- ★ If the screen is damaged, replace it.
- Apply grease to the O-ring [D].
- Install the O-ring and damper [E] to the oil screen.
- Install the oil screen so that the crankcase rib [F] and relief valve fits the oil screen.
- Install the oil pan (see Oil Pan Installation).

Oil Pressure Relief Valve

Oil Pressure Relief Valve Inspection

- Remove the oil pressure relief valve (see Oil Pressure Relief Valve Removal).
- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

NOTE

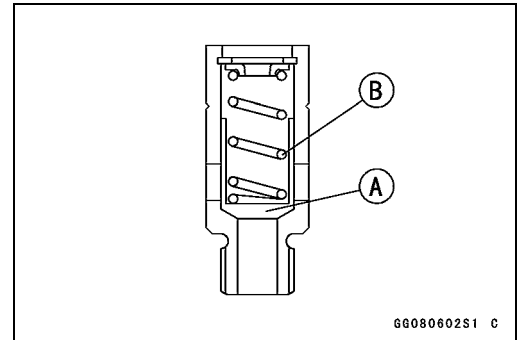
Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.

- ★ If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.

⚠ WARNING

Clean the oil pressure relief valve in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.

- ★ If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

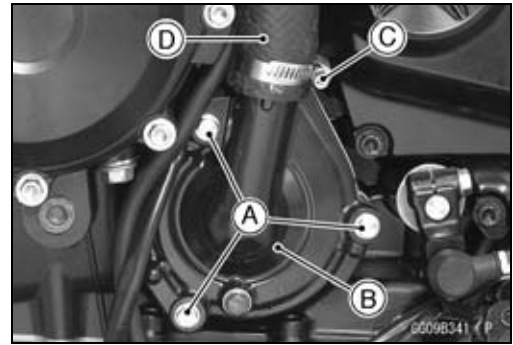


7-12 ENGINE LUBRICATION SYSTEM

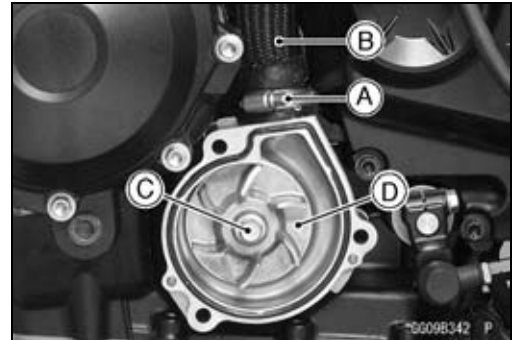
Oil Pump

Oil Pump Removal

- Remove:
 - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
 - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
 - Water Pump Cover Bolts [A]
 - Water Pump Cover [B]
 - Water Hose Clamp Screw [C] (Loosen)
 - Water Hose [D]



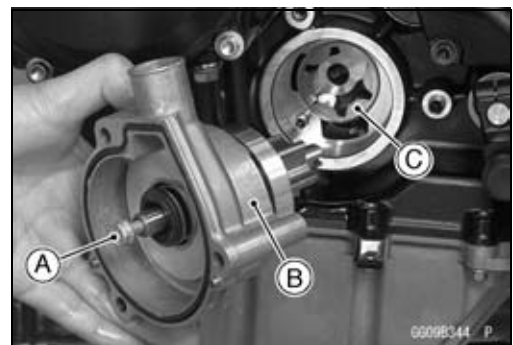
- Remove:
 - Water Hose Clamp Screw [A] (Loosen)
 - Water Hose [B]
 - Impeller Bolt [C] and Washer
 - Impeller [D]



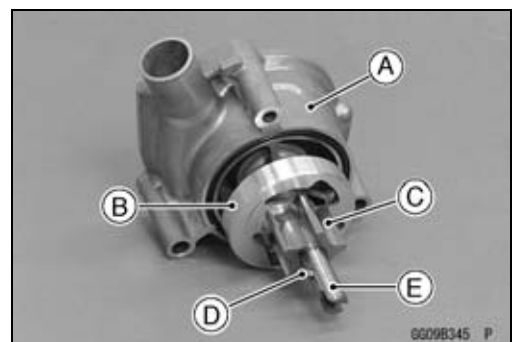
- Install the impeller bolt [A] temporary.



- Using the impeller bolt [A], pull out the oil (water) pump [B] as a assembly.
- Remove the outer rotor [C].



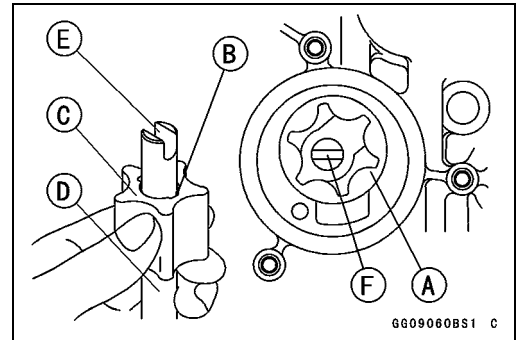
- Remove:
 - Water Pump Body [A]
 - Oil Pump Cover [B]
 - Inner Rotor [C]
 - Pin [D]
 - Oil (Water) Pump Shaft [E]



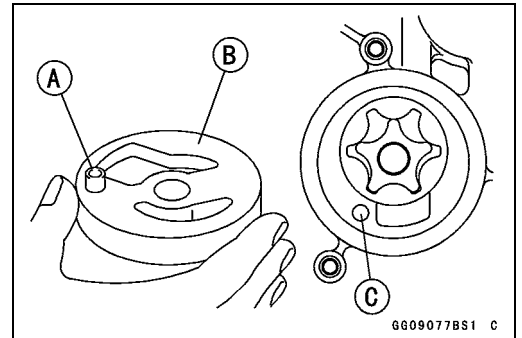
Oil Pump

Oil Pump Installation

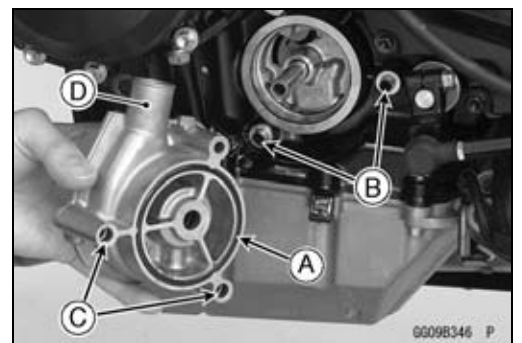
- Install the outer rotor [A] into the crankcase.
- Install the pin [B] and inner rotor [C] to the oil (water) pump shaft [D], and install the assy.
- Turn the pump shaft so that the slot [E] in its shaft fits onto the projection [F] of the pump drive gear shaft.



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



- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Install the dowel pins [B].
- Fit the pin of the crankcase into the holes [C] in the water pump body [D].



- Apply coolant to the surface of the rubber seal [A] on the impeller.
- Install the impeller, washer and bolt.
- Tighten:

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

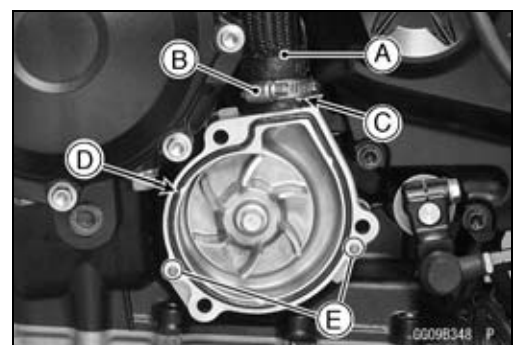


- Install the water hose [A] and hose clamp [B] as shown in the figure.
- White Mark [C]

- Tighten:
- Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

- Replace the O-ring [D] with a new one.
- Apply grease to the new O-ring.
- Install the dowel pins [E] and water pump cover.
- Apply a non-permanent locking agent to the threads of the water pump cover bolts, and tighten them.

Torque - Water Pump Cover Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

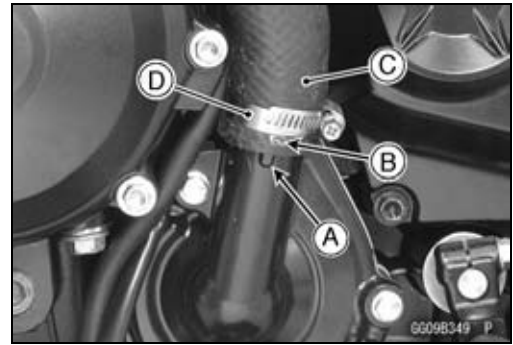


7-14 ENGINE LUBRICATION SYSTEM

Oil Pump

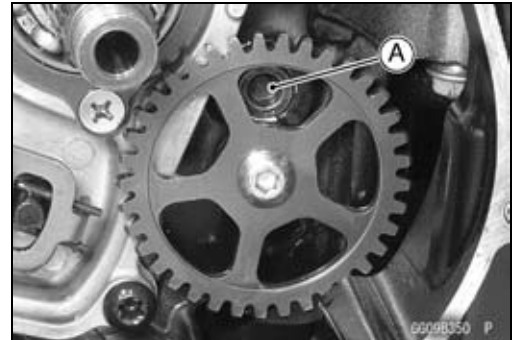
- Align the line [A] of the water pump cover and the white mark [B] of the water hose [C].
- Install the water hose clamp [D] as shown in the figure.
- Tighten:

Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)

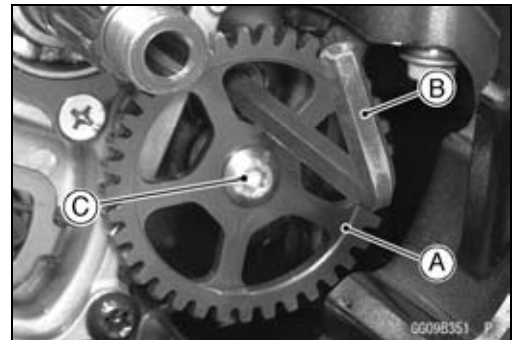


Oil Pump Drive Gear Removal

- Remove the clutch (see Clutch Removal in the Clutch chapter).
- Fit the suitable tool into the hole of the oil passage plug [A].



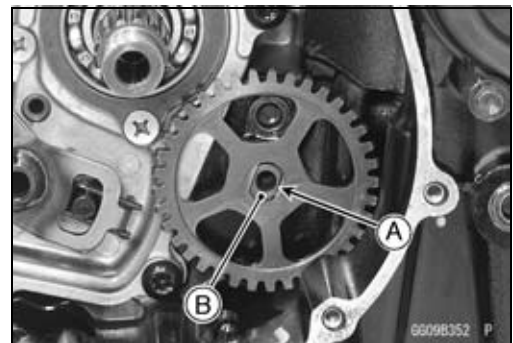
- Hold the oil pump drive gear [A] steady with the suitable tool [B], and remove the bolt [C].
- Remove the oil pump drive gear.



Oil Pump Drive Gear Installation

- Align the groove [A] of the oil pump drive gear to the oil pump drive gear shaft [B] to install the oil pump drive gear.
- Apply a non-permanent locking agent to the threads of the oil pump drive gear bolt.
- Hold the oil pump drive gear steady with the suitable tool, and tighten the bolt.

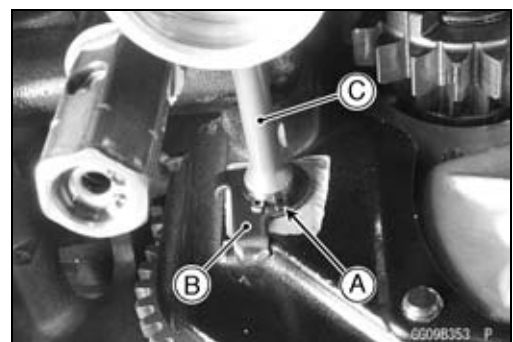
Torque - Oil Pump Drive Gear Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Oil Pump Drive Gear Shaft Removal

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

Special Tool - Outside Circlip Pliers: 57001-144

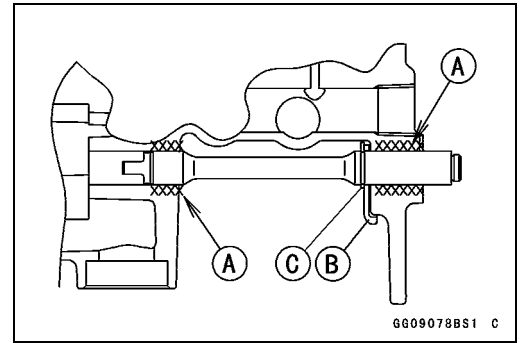


Oil Pump

Oil Pump Drive Gear Shaft Installation

- Apply molybdenum disulfide oil solution to the journal portions [A] on the oil pump drive gear shaft.
- Install the oil pump drive gear shaft and washer [B] as shown in the figure.
- Install the new circlip [C] into the groove of the oil pump drive gear shaft.

Special Tool - Outside Circlip Pliers: 57001-144

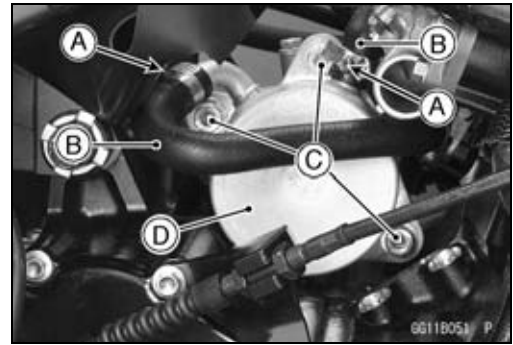


7-16 ENGINE LUBRICATION SYSTEM

Oil Cooler

Oil Cooler Removal

- Remove:
 - Coolant (Drain, see Coolant Change in the Periodic Maintenance chapter)
 - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
 - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
 - Water Hose Clamp Screws [A] (Loosen)
 - Water Hoses [B]
 - Oil Cooler Mounting Bolts [C]
 - Oil Cooler [D]

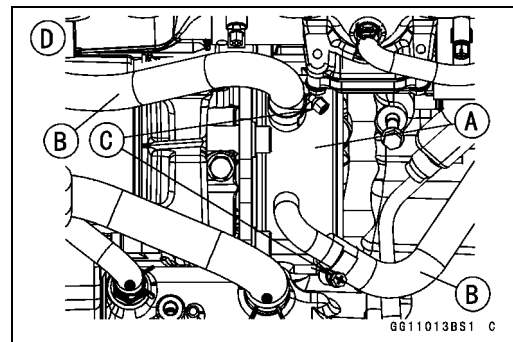


Oil Cooler Installation

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.



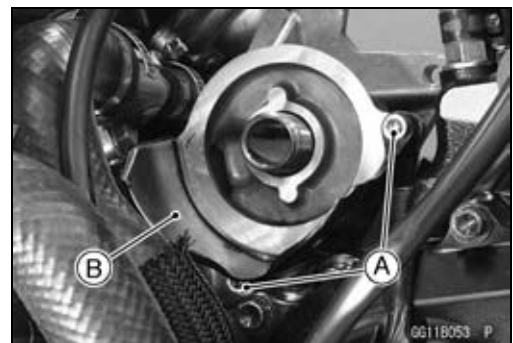
- Install the oil cooler [A].
- Tighten:
 - Torque - Oil Cooler Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Install the water hoses [B] and hose clamps [C] as shown in the figure.
 - Upside View [D]
- Tighten:
 - Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**



- Install the removed parts (see appropriate chapters).
- Pour:
 - Coolant (see Coolant Change in the Periodic Maintenance chapter)
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)

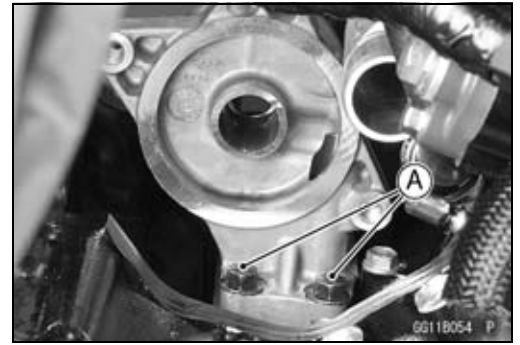
Oil Cooler/Oil Filter Case Removal

- Remove:
 - Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)
 - Oil Cooler (see Oil Cooler Removal)
 - Bolts [A]
 - Oil Filter Guard [B]

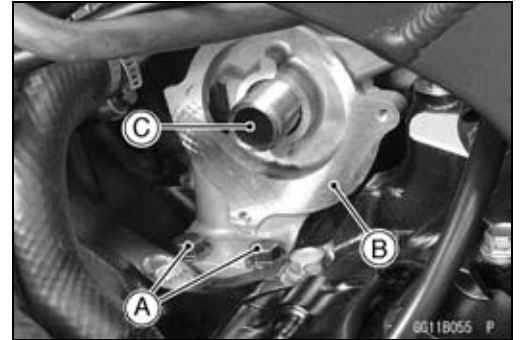


Oil Cooler

- Remove the bolts [A].

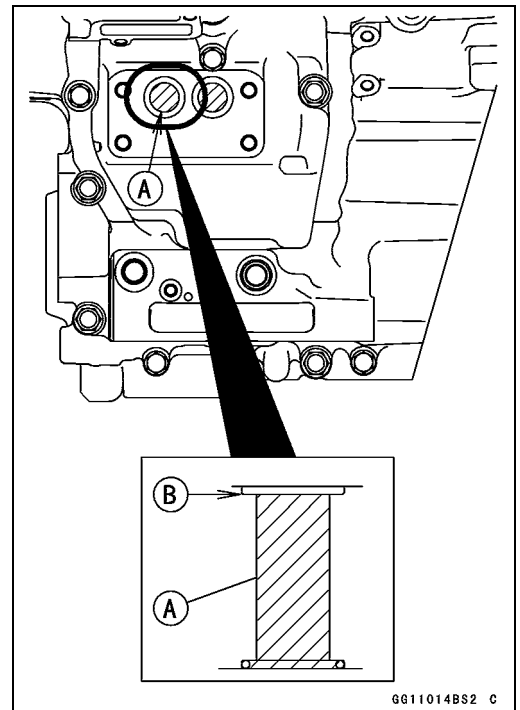


- Remove:
 - Bolts [A]
 - Oil Cooler/Oil Filter Case [B]
- Remove the oil filter holder bolt [C] as necessary.



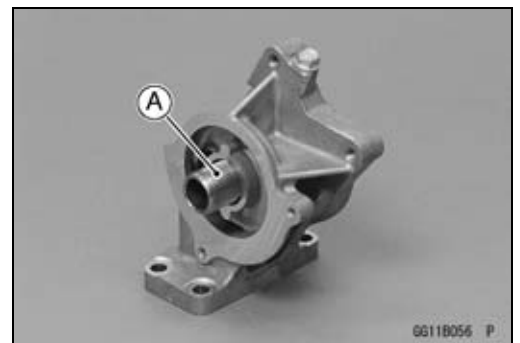
Oil Cooler/Oil Filter Case Installation

- ★ If the crankcase was disassembled, pour the engine oil into the oil passage [A] until O-ring insert portion [B] of the upper crankcase.



- ★ If the oil filter holder bolt [A] was removed, install it.
- Apply a non-permanent locking agent to the threads of the oil filter holder bolt, and tighten it.

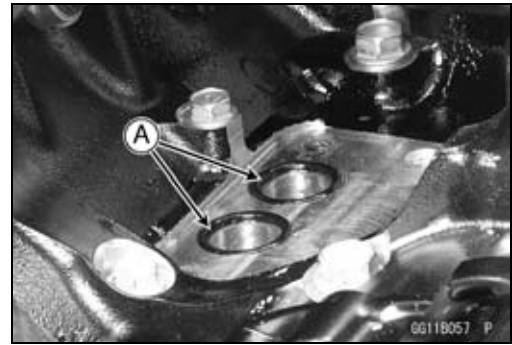
Torque - Oil Filter Holder Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)



7-18 ENGINE LUBRICATION SYSTEM

Oil Cooler

- Replace the O-rings [A] with new ones.
- Apply grease to the new O-rings.

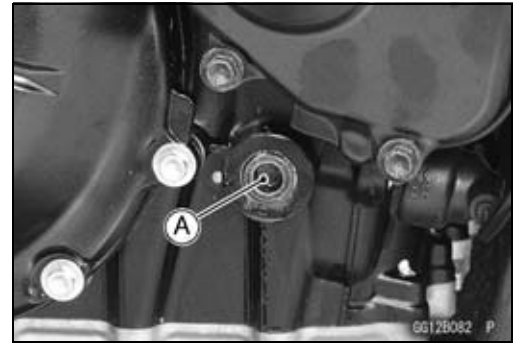


- Install the oil cooler/oil filter case.
- Apply a non-permanent locking agent to the threads of the oil cooler/oil filter case mounting bolts, and tighten them.
Torque - Oil Cooler/Oil Filter Case Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
- Install the oil filter guard.
- Apply a non-permanent locking agent to the threads of the oil filter guard bolts, and tighten them.
Torque - Oil Filter Guard Bolts: 4.0 N·m (0.41 kgf·m, 35 in·lb)
- Install:
 - Oil Cooler (see Oil Cooler Installation)
 - Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)

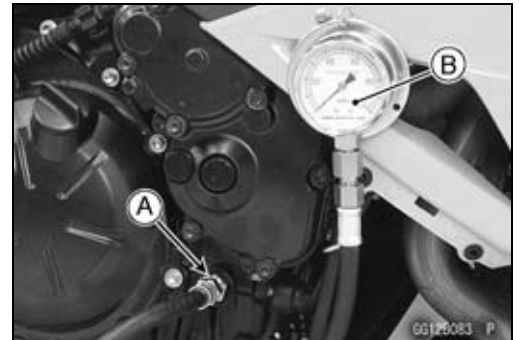
Oil Pressure Measurement

Oil Pressure Measurement

- Remove:
 - Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
 - Oil Passage Plug [A]



- Attach the adapter [A] and gauge [B] to the plug hole.
 - Special Tools - Oil Pressure Gauge, 10 kgf/cm²: 57001-164**
 - Oil Pressure Gauge Adapter, PT3/8: 57001-1233**



- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

Oil Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi) at 4 000 r/min (rpm), Oil Temperature 90°C (194°F)

- ★ If the reading is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert wear immediately.
- ★ If the reading is much higher than the standard, check the oil passages for clogging.
- Stop the engine.
- Remove the oil pressure gauge and adapter.

⚠ WARNING

Take care against burns from hot engine oil that will drain through the oil passage when the gauge adapter is removed.

- Apply a non-permanent locking agent to the oil passage plug, and install it.

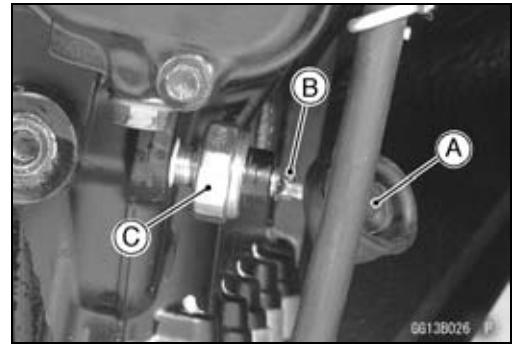
Torque - Oil Passage Plugs (Taper): 20 N·m (2.0 kgf·m, 15 ft·lb)

7-20 ENGINE LUBRICATION SYSTEM

Oil Pressure Switch

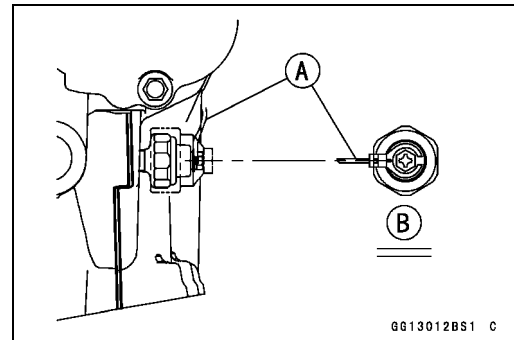
Oil Pressure Switch Removal

- Remove:
 - Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
 - Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
 - Switch Cover [A]
 - Switch Terminal Bolt [B]
 - Oil Pressure Switch [C]



Oil Pressure Switch Installation

- Apply silicone sealant to the threads of the oil pressure switch, and tighten it.
 - Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**
 - Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)**
- Install the switch lead [A] as shown in the figure.
 - Front View [B]
- Apply grease to the terminal.
- Tighten the terminal bolt.
 - Torque - Oil Pressure Switch Terminal Bolt: 1.5 N·m (0.15 kgf·m, 13 in·lb)**
- Cover the switch.
- Install the right lower fairing (see Lower Fairing Installation in the Frame chapter).



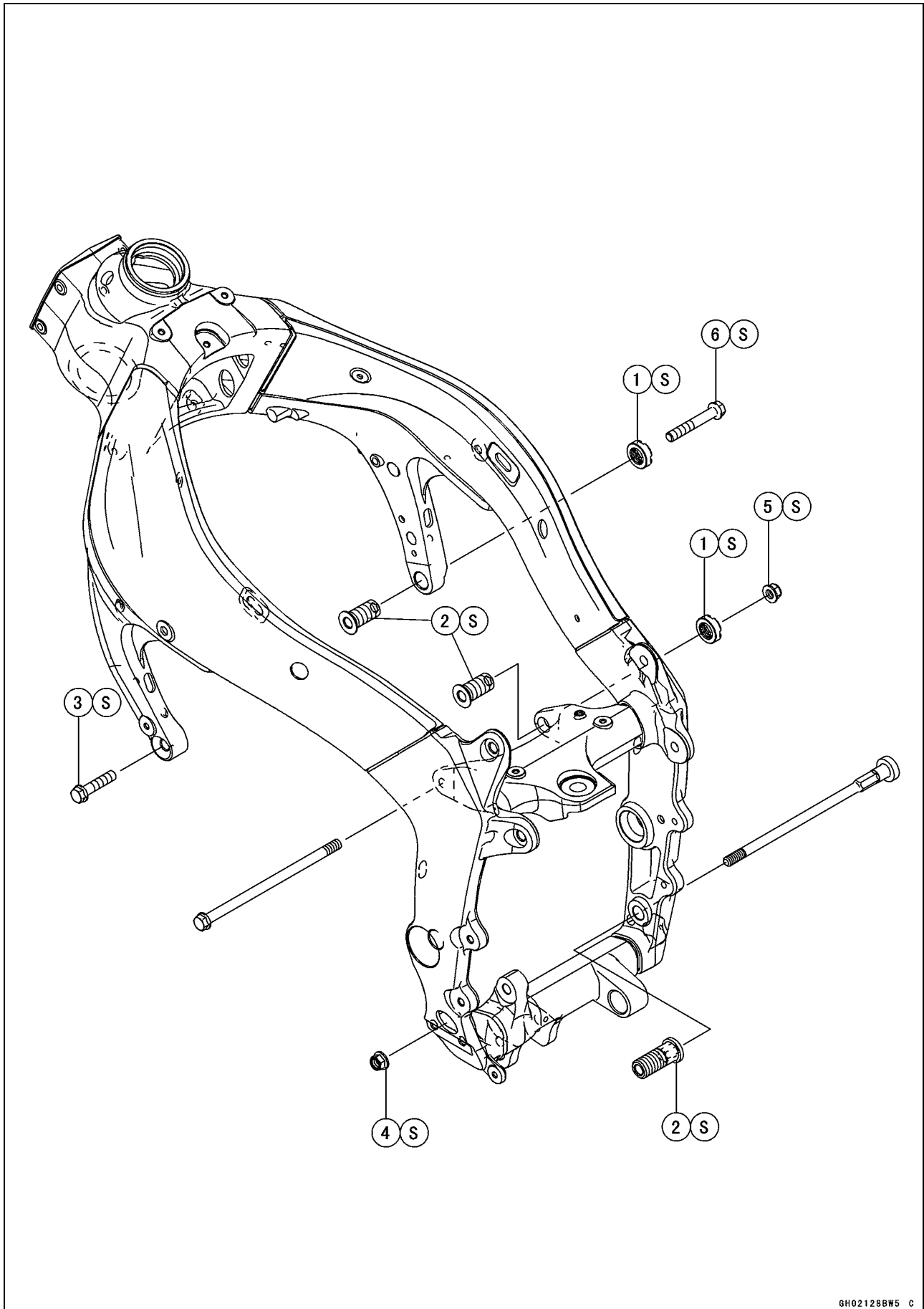
Engine Removal/Installation

Table of Contents

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

8-2 ENGINE REMOVAL/INSTALLATION

Exploded View



ENGINE REMOVAL/INSTALLATION 8-3

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Adjusting Collar Locknuts	49	5.0	36	S
2	Adjusting Collars	9.8	1.0	87 in·lb	S
3	Left Front Engine Mounting Bolt	44	4.5	32	S
4	Lower Engine Mounting Nut	44	4.5	32	S
5	Middle Engine Mounting Nut	44	4.5	32	S
6	Right Front Engine Mounting Bolt	44	4.5	32	S

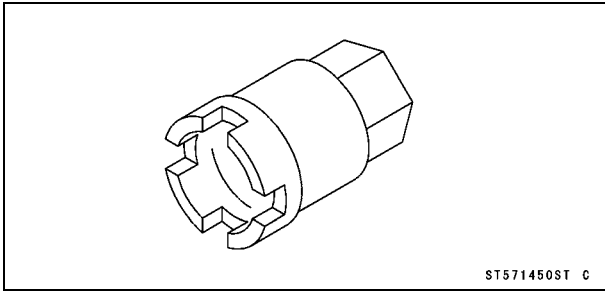
S: Follow the specified tightening sequence.

8-4 ENGINE REMOVAL/INSTALLATION

Special Tool

Engine Mount Nut Wrench:

57001-1450



Engine Removal/Installation

Engine Removal

- Support the rear part of the swingarm with a stand.
- Squeeze the brake lever slowly and hold it with a band [A].

⚠ WARNING

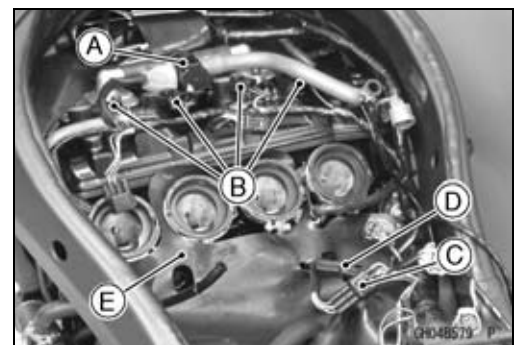
Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.

CAUTION

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.



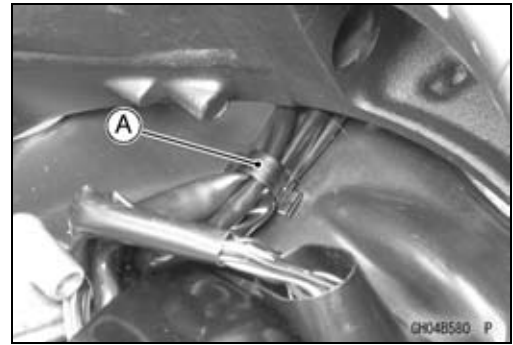
- Drain:
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
 - Coolant (see Coolant Change in the Periodic Maintenance chapter)
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Coolant Reserve Tank (see Coolant Reserve Tank Removal in the Cooling System chapter)
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
 - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
 - Clutch Cable Lower End (see Cable Removal in the Clutch chapter)
 - Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
 - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
 - Shift Lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
 - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
- Remove the air switching valve [A] (see Air Switching Valve Removal in the Engine Top End chapter).
- Disconnect:
 - Stick Coil Connectors [B]
 - Water Temperature Sensor Connector (see Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter)
 - Starter Motor Cable (see Starter Motor Removal in the Electrical System chapter)
 - Gear Position Switch/Sidestand Switch Lead Connector [C]
 - Crankshaft Sensor/Oil Pressure Switch Lead Connector [D]
- Turn up the front side of the heat insulation rubber plate [E].



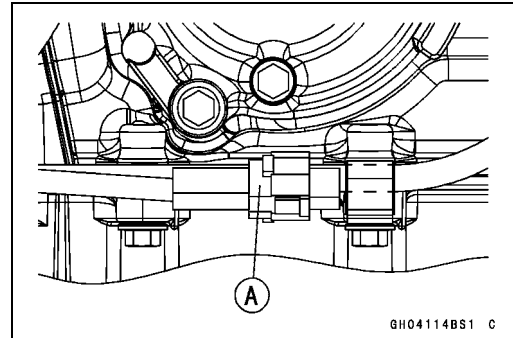
8-6 ENGINE REMOVAL/INSTALLATION

Engine Removal/Installation

- Remove the clamp [A].



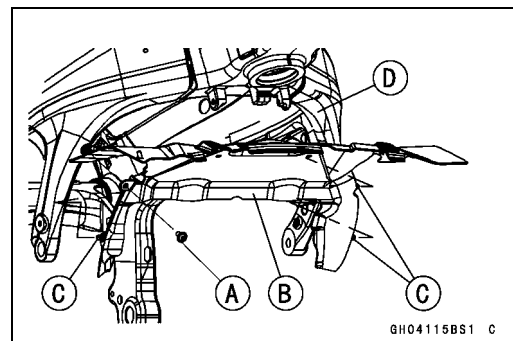
- Disconnect the sidestand switch lead connector [A].



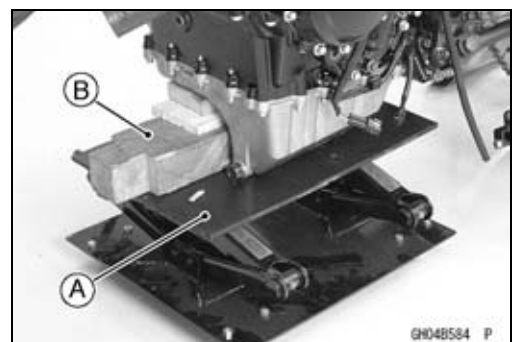
- Remove the engine ground cable terminal bolt [A].



- Remove:
 - Bolt [A]
 - Heat Insulation Plate [B]
- Clear the projections [C] from the frame [D].

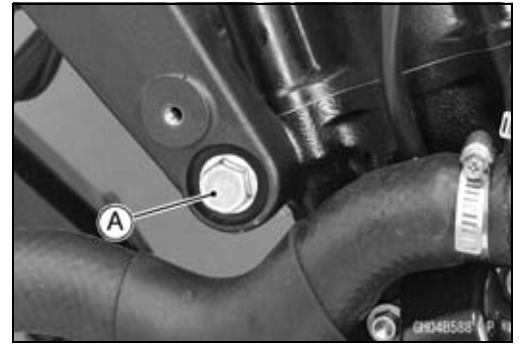


- Support the engine with a suitable stand [A].
- Put a plank [B] onto the suitable stand for engine balance.

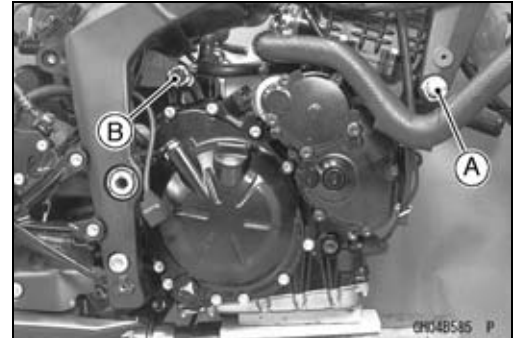


Engine Removal/Installation

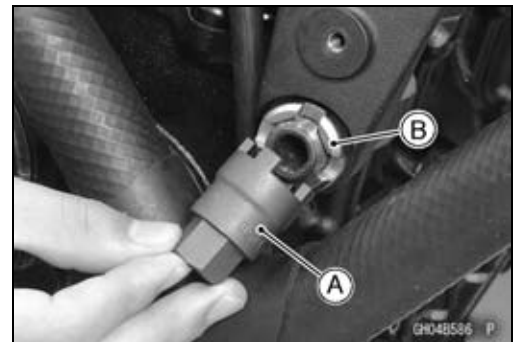
- Remove the left front engine mounting bolt [A].



- Remove:
 - Right Front Engine Mounting Bolt [A]
 - Middle Engine Mounting Nut [B]
 - Lower Engine Mounting Nut



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



- Using the Hexagon Wrench, turn the adjusting collars [A] counterclockwise to make the gap between the engine and adjusting collar.



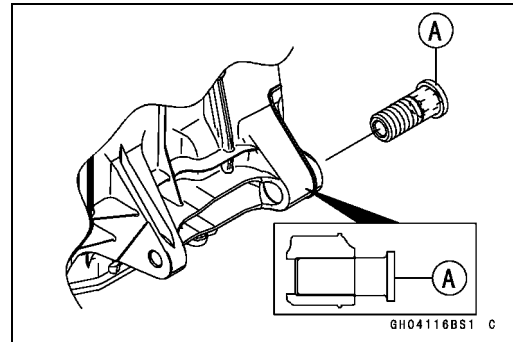
- Turn the lower engine mounting bolt clockwise to make the gap between the adjusting collar and frame.
- Pull out the engine mounting bolts.
- Using the stand, take out the engine.

8-8 ENGINE REMOVAL/INSTALLATION

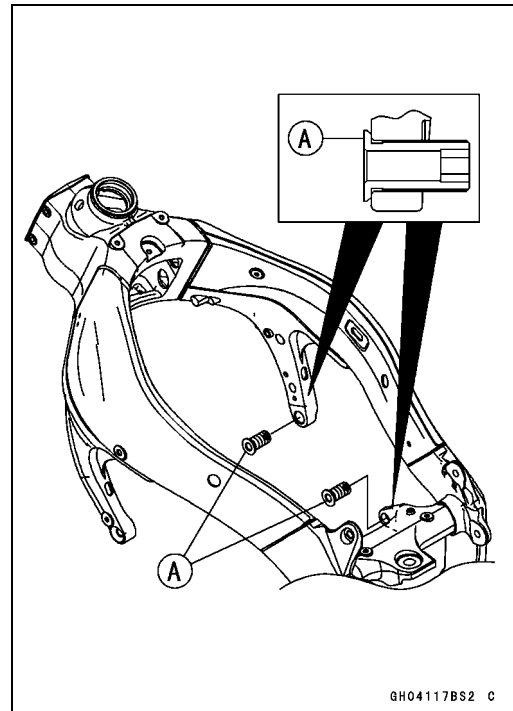
Engine Removal/Installation

Engine Installation

- Install the adjusting collar [A] to crankcase backside until end of the threads.



- Install the adjusting collar [A] to the frame until end of the threads.



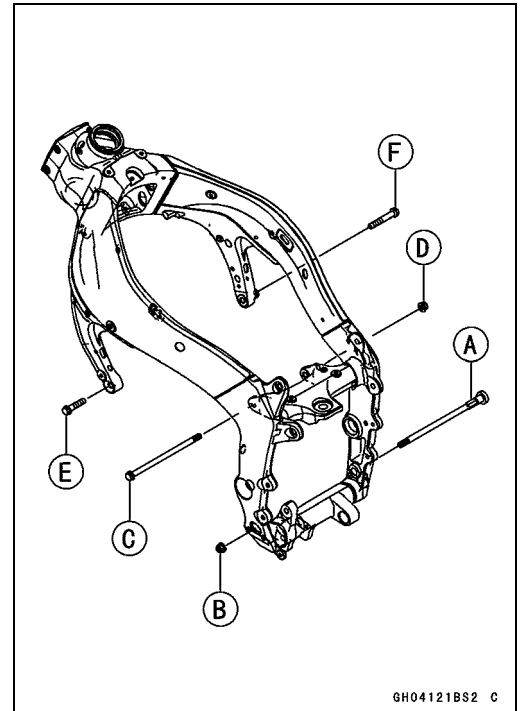
- Support the engine with a suitable stand.
- Put a plank onto the suitable stand for engine balance.

Engine Removal/Installation

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

○ First, tighten the following bolts and nuts temporarily.

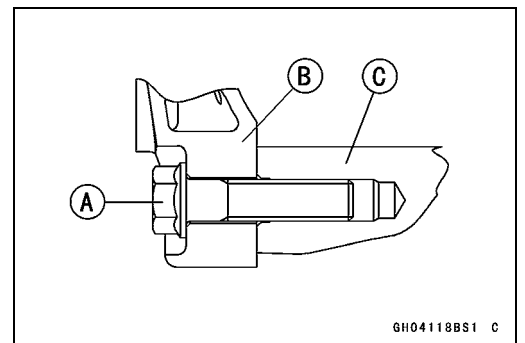
- Lower Engine Mounting Bolt [A] and Nut [B]
- Middle Engine Mounting Bolt [C] and Nut [D]
- Left Front Engine Mounting Bolt [E]
- Right Front Engine Mounting Bolt [F]



○ Second, tighten the left front engine mounting bolt [A].

- Frame [B]
- Engine [C]

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



8-10 ENGINE REMOVAL/INSTALLATION

Engine Removal/Installation

- Third, tighten the adjusting collar [A] with the lower engine mounting bolt [B] counterclockwise until the adjusting collar touches [C] the frame [D].

Torque - Adjusting Collars: 9.8 N-m (1.0 kgf-m, 87 in-lb)

- Fourth, tighten the adjusting collar [E] counterclockwise until the adjusting collar touches [C] the frame [D].

Torque - Adjusting Collars: 9.8 N-m (1.0 kgf-m, 87 in-lb)

- Fifth, tighten the adjusting collar locknut [F].

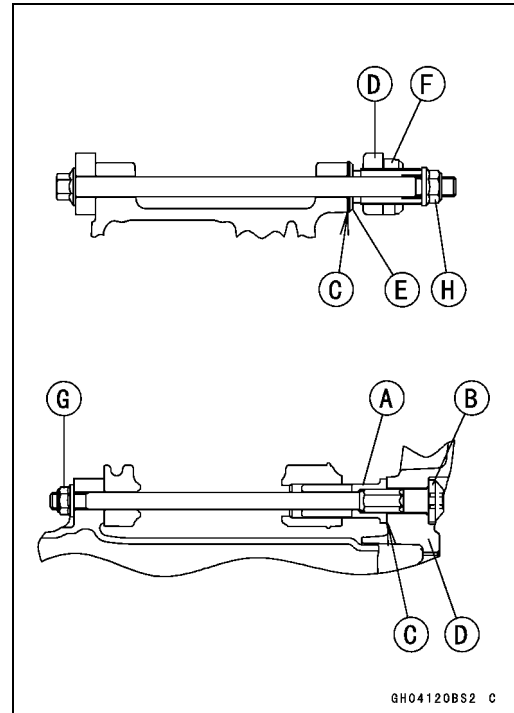
Special Tool - Engine Mount Nut Wrench: 57001-1450

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

- Sixth, tighten the lower and middle engine mounting nuts.

Torque - Lower Engine Mounting Nut [G]: 44 N-m (4.5 kgf-m, 32 ft-lb)

Middle Engine Mounting Nut [H]: 44 N-m (4.5 kgf-m, 32 ft-lb)



- Seventh, remove the right front engine mounting bolt [A], and tighten the adjusting collar [B] counterclockwise until the clearance [C] between the engine [D] and collar come to 0 mm (0 in.).

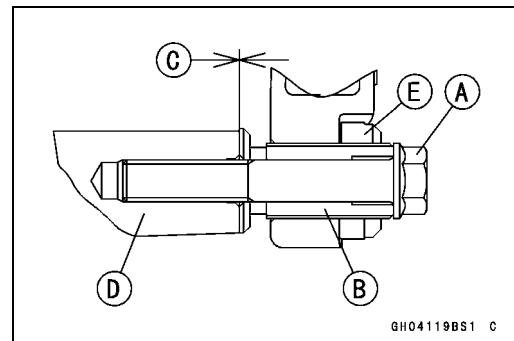
- Eighth, tighten the adjusting collar locknut [E].

Special Tool - Engine Mount Nut Wrench: 57001-1450

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

- Lastly, tighten the right front engine mounting bolt.

Torque - Right Front Engine Mounting Bolt: 44 N-m (4.5 kgf-m, 32 ft-lb)



- Run the leads, cables and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).
- Insert the projections [A] into the holes [B].
- Apply a non-permanent locking agent to the threads of the heat insulation plate bolt [C] and tighten it.

Torque - Heat Insulation Plate Bolt: 3.9 N-m (0.40 kgf-m, 35 in-lb)

- Adjust:

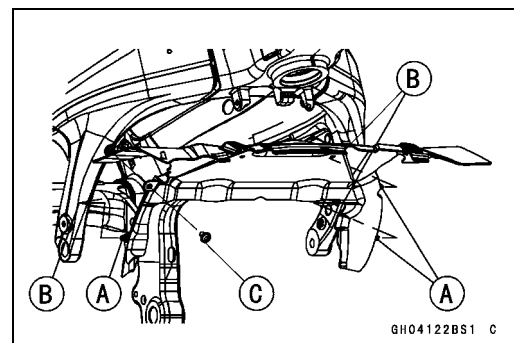
Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)

Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)

Drive Chain (see Drive Chain Slack Inspection in the Periodic Maintenance chapter)

- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).

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



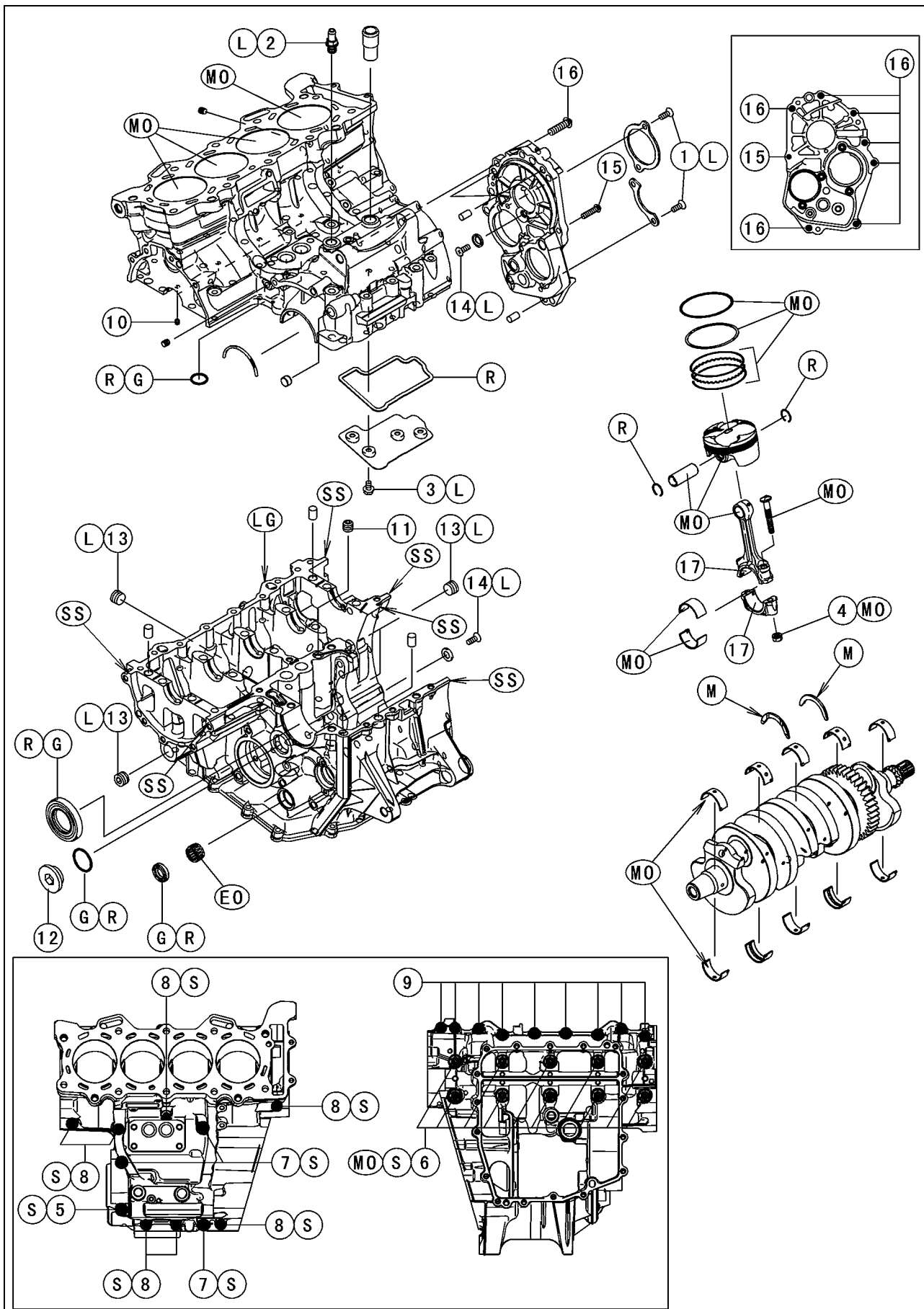
Crankshaft/Transmission

Table of Contents

Exploded View	9-2	Starter Idle Gear and Starter Clutch ..	9-32
Specifications	9-6	Starter Idle Gear Removal	9-32
Special Tools and Sealants	9-9	Starter Idle Gear Installation	9-32
Crankcase	9-11	Starter Clutch Removal.....	9-34
Crankcase Splitting.....	9-11	Starter Clutch Installation	9-34
Crankcase Assembly	9-12	Starter Clutch Disassembly.....	9-34
Crankshaft and Connecting Rods.....	9-17	Starter Clutch Assembly	9-35
Crankshaft Removal	9-17	Starter Clutch Inspection.....	9-35
Crankshaft Installation	9-17	Transmission	9-37
Connecting Rod Removal.....	9-18	Transmission Assy Removal.....	9-37
Connecting Rod Installation.....	9-19	Transmission Assy Disassembly .	9-37
Crankshaft/Connecting Rod		Transmission Assy Assembly	9-37
Cleaning	9-22	Transmission Assy Installation.....	9-39
Connecting Rod Bend Inspection	9-22	Transmission Shaft Removal.....	9-40
Connecting Rod Twist Inspection.	9-23	Transmission Shaft Installation	9-40
Connecting Rod Big End Side		Transmission Shaft Disassembly .	9-40
Clearance Inspection	9-23	Transmission Shaft Assembly.....	9-40
Connecting Rod Big End		Shift Drum and Fork Removal.....	9-44
Bearing Insert/Crankpin Wear		Shift Drum and Fork Installation...	9-44
Inspection.....	9-23	Shift Drum Disassembly.....	9-44
Crankshaft Side Clearance		Shift Drum Assembly	9-44
Inspection.....	9-25	Shift Fork Bending Inspection.....	9-44
Crankshaft Runout Inspection.....	9-25	Shift Fork/Gear Groove Wear	
Crankshaft Main Bearing		Inspection.....	9-44
Insert/Journal Wear Inspection .	9-26	Shift Fork Guide Pin/Drum	
Pistons.....	9-28	Groove Wear Inspection	9-45
Piston Removal.....	9-28	Gear Dog and Gear Dog Hole	
Piston Installation.....	9-29	Damage Inspection	9-45
Cylinder (Upper Crankcase) Wear		External Shift Mechanism.....	9-46
Inspection.....	9-30	Shift Pedal Removal	9-46
Piston Wear Inspection	9-30	Shift Pedal Installation	9-46
Piston Ring, Piston Ring Groove		External Shift Mechanism	
Wear Inspection	9-30	Removal	9-47
Piston Ring Groove Width		External Shift Mechanism	
Inspection.....	9-31	Installation	9-47
Piston Ring Thickness Inspection	9-31	External Shift Mechanism	
Piston Ring End Gap Inspection..	9-31	Inspection.....	9-48

9-2 CRANKSHAFT/TRANSMISSION

Exploded View



CRANKSHAFT/TRANSMISSION 9-3

Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Bearing Holder Screws	4.9	0.50	43 in-lb	L
2	Breather Hose Fitting	15	1.5	11	L
3	Breather Plate Bolts	9.8	1.0	87 in-lb	L
4	Connecting Rod Big End Nuts	see the text	←	←	MO
5	Crankcase Bolt (M8, L = 90 mm)	27	2.8	20	S
6	Crankcase Bolts (M8, L = 95 mm)	31	3.2	23	MO, S
7	Crankcase Bolts (M8, L = 75 mm)	27	2.8	20	S
8	Crankcase Bolts (M6, L = 65 mm)	12	1.2	106 in-lb	S
9	Crankcase Bolts (M6, L = 50 mm)	12	1.2	106 in-lb	
10	Oil Jet Nozzles	2.9	0.30	26 in-lb	
11	Oil Passage Nozzle	4.9	0.50	43 in-lb	
12	Oil Passage Plug	17	1.7	13	
13	Oil Passage Plugs (Taper)	20	2.0	15	L
14	Race Holder Screws	4.9	0.50	43 in-lb	L
15	Transmission Case Bolt (M6)	9.8	1.0	87 in-lb	
16	Transmission Case Bolts (M8)	20	2.0	15	

17. Do not apply any grease or oil.

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

CRANKSHAFT/TRANSMISSION 9-5

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	Gear Positioning Lever Bolt	12	1.2	106 in-lb	
3	Idle Gear Cover Bolts	9.8	1.0	87 in-lb	
4	Shift Drum Cam Holder Bolt	12	1.2	106 in-lb	L
5	Shift Lever Bolt	6.9	0.70	61 in-lb	
6	Shift Pedal Mounting Bolt	25	2.5	18	L
7	Shift Shaft Return Spring Pin	28	2.9	21	L
8	Starter Clutch Bolt	49	5.0	36	
9	Starter Clutch Cover Bolt (L = 40 mm)	9.8	1.0	87 in-lb	
10	Starter Clutch Cover Bolt (L = 20 mm)	9.8	1.0	87 in-lb	
11	Starter Clutch Cover Bolts (L = 30 mm)	9.8	1.0	87 in-lb	
12	Tie-Rod Locknut (Front)	6.9	0.70	61 in-lb	Lh
13	Tie-Rod Locknut (Rear)	6.9	0.70	61 in-lb	

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

Lh: Left-hand Threads

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

9-6 CRANKSHAFT/TRANSMISSION

Specifications

Item	Standard	Service Limit
Crankcase, Crankshaft, Connecting Rods		
Connecting Rod Bend	— — —	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Twist	— — —	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Big End Side Clearance	0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)	0.58 mm (0.023 in.)
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.044 ~ 0.081 mm (0.0017 ~ 0.0032 in.)	0.11 mm (0.0043 in.)
Crankpin Diameter:	29.987 ~ 30.000 mm (1.1806 ~ 1.1811 in.)	29.98 mm (1.1803 in.)
Marking:		
None	29.984 ~ 29.992 mm (1.1805 ~ 1.1808 in.)	— — —
○	29.993 ~ 30.000 mm (1.1808 ~ 1.1811 in.)	— — —
Connecting Rod Big End Inside Diameter:	33.000 ~ 33.016 mm (1.2992 ~ 1.2998 in.)	— — —
Marking:		
None	33.000 ~ 33.008 mm (1.2992 ~ 1.2995 in.)	— — —
○	33.009 ~ 33.016 mm (1.2996 ~ 1.2998 in.)	— — —
Connecting Rod Big End Bearing Insert Thickness:		
Brown	1.475 ~ 1.480 mm (0.05807 ~ 0.05827 in.)	— — —
Black	1.480 ~ 1.485 mm (0.05827 ~ 0.05846 in.)	— — —
Blue	1.485 ~ 1.490 mm (0.05846 ~ 0.05866 in.)	— — —
Connecting Rod Bolt Stretch	(Usable Range) 0.28 ~ 0.38 mm (0.0110 ~ 0.0150 in.)	— — —
Crankshaft Side Clearance	0.05 ~ 0.25 mm (0.0020 ~ 0.0098 in.)	0.45 mm (0.0177 in.)
Crankshaft #3 Main Journal Width	21.09 ~ 21.14 mm (0.8303 ~ 0.8323 in.)	— — —
Crankshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.0020 in.)
Crankshaft Main Bearing Insert/Journal Clearance	0.028 ~ 0.060 mm (0.0011 ~ 0.0024 in.)	0.09 mm (0.0035 in.)
Crankshaft Main Journal Diameter:	30.984 ~ 31.000 mm (1.2198 ~ 1.2205 in.)	30.96 mm (1.2189 in.)
Marking:		
None	30.984 ~ 30.992 mm (1.2198 ~ 1.2202 in.)	— — —
1	30.993 ~ 31.000 mm (1.2202 ~ 1.2205 in.)	— — —
Crankcase Main Bearing Inside Diameter:	34.000 ~ 34.016 mm (1.3386 ~ 1.3392 in.)	— — —
Marking		
○	34.000 ~ 34.008 mm (1.3386 ~ 1.3389 in.)	— — —
None	34.009 ~ 34.016 mm (1.3389 ~ 1.3392 in.)	— — —

CRANKSHAFT/TRANSMISSION 9-7

Specifications

Item	Standard	Service Limit
Crankshaft Main Bearing Insert Thickness:		
Brown, Yellow	1.491 ~ 1.495 mm (0.0587 ~ 0.0589 in.)	— — —
Black, Green	1.495 ~ 1.499 mm (0.0589 ~ 0.0590 in.)	— — —
Blue, Purple	1.499 ~ 1.503 mm (0.0590 ~ 0.0592 in.)	— — —
Cylinder , Pistons		
Cylinder (Upper Crankcase) Inside Diameter	67.000 ~ 67.012 mm (2.6378 ~ 2.6383 in.)	67.09 mm (2.6413 in.)
Piston Diameter	66.960 ~ 66.975 mm (2.6362 ~ 2.6368 in.)	66.81 mm (2.6303 in.)
Piston/Cylinder Clearance	0.020 ~ 0.047 mm (0.0008 ~ 0.0019 in.)	— — —
Piston Ring/Groove Clearance:		
Top	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Second	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Piston Ring Groove Width:		
Top	0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)	0.92 mm (0.036 in.)
Second	0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)	0.92 mm (0.036 in.)
Piston Ring Thickness:		
Top	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Second	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Piston Ring End Gap:		
Top	0.12 ~ 0.22 mm (0.0047 ~ 0.0087 in.)	0.5 mm (0.020 in.)
Second	0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)	0.8 mm (0.031 in.)
Oil	0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)	1.0 mm (0.039 in.)
Transmission		
Shift Fork Ear Thickness	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Gear Groove Width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.25 mm (0.246 in.)
Shift Fork Guide Pin Diameter	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Shift Drum Groove Width	6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)	6.3 mm (0.248 in.)

9-8 CRANKSHAFT/TRANSMISSION

Specifications

Connecting Rod Big End Bearing Insert Selection

Con-rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-0167
None	None	Black	92139-0166
○	○		
○	None	Blue	92139-0165

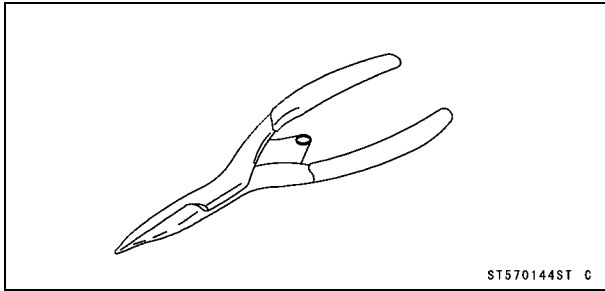
Crankshaft Main Bearing Insert Selection

Crankcase Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92139-0247	1, 5
			92139-0250	2, 4
		Yellow	92139-0253	3
None	1	Black	92139-0246	1, 5
			92139-0249	2, 4
		Green	92139-0252	3
○	None	Black	92139-0246	1, 5
			92139-0249	2, 4
		Green	92139-0252	3
None	None	Blue	92139-0245	1, 5
			92139-0248	2, 4
		Purple	92139-0251	3

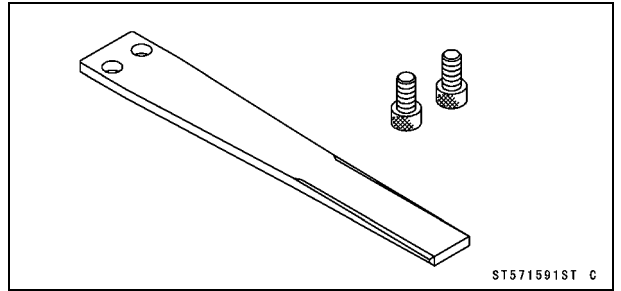
*: The bearing inserts for Nos. 2 and 4 journals have an oil groove, respectively.

Special Tools and Sealants

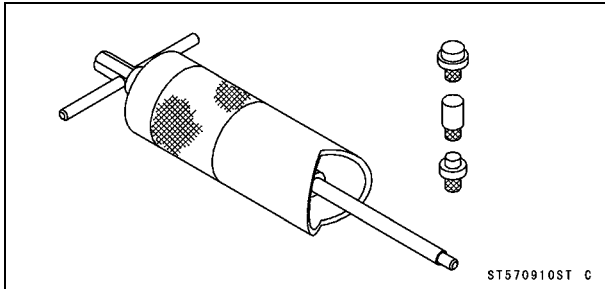
Outside Circlip Pliers:
57001-144



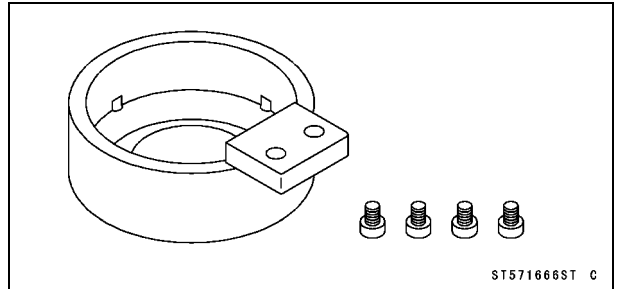
Grip:
57001-1591



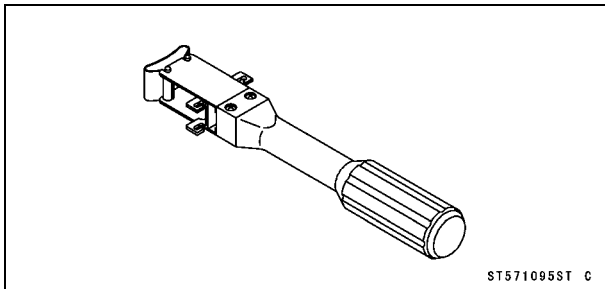
Piston Pin Puller Assembly:
57001-910



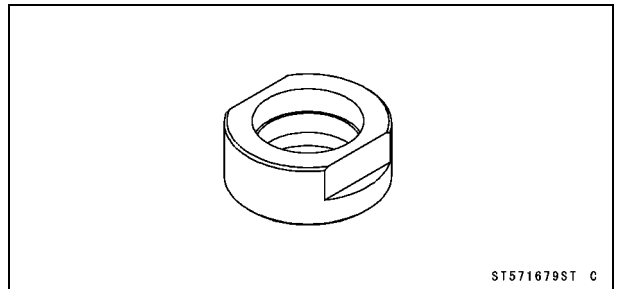
Rotor Holder:
57001-1666



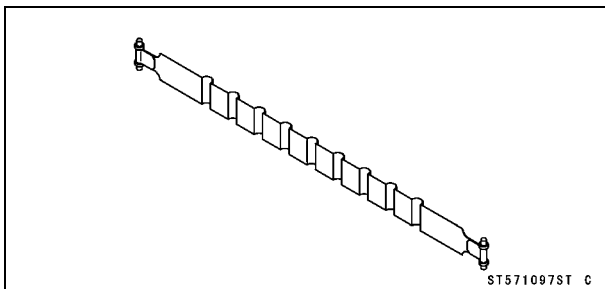
Piston Ring Compressor Grip:
57001-1095



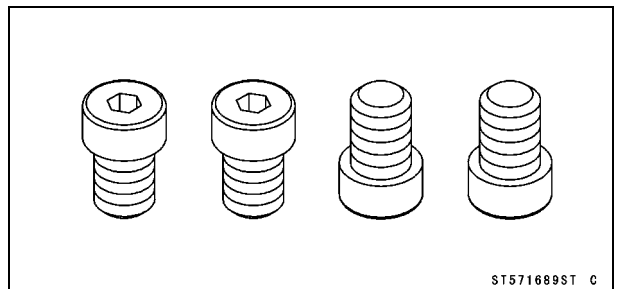
Stopper:
57001-1679



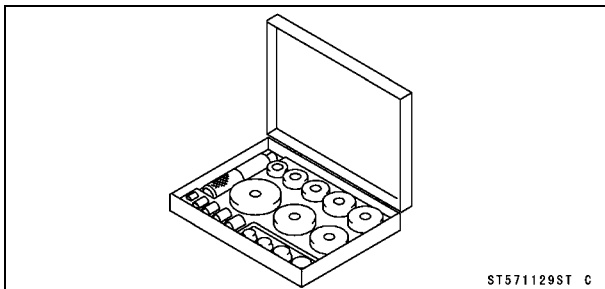
Piston Ring Compressor Belt, $\phi 67 \sim \phi 79$:
57001-1097



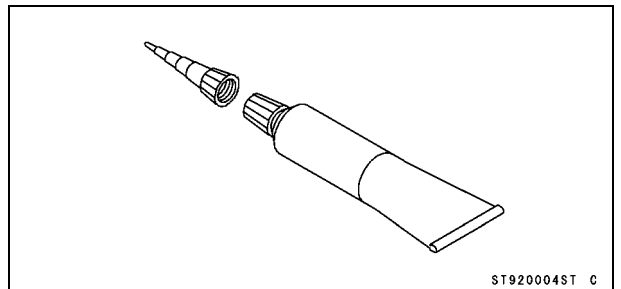
Rotor Holder Attachment:
57001-1689



Bearing Driver Set:
57001-1129



Kawasaki Bond (Silicone Sealant):
92104-0004

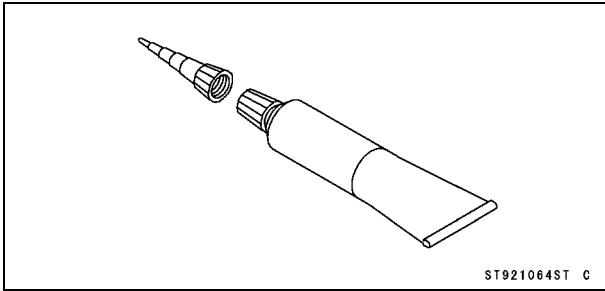


9-10 CRANKSHAFT/TRANSMISSION

Special Tools and Sealants

Kawasaki Bond (Liquid Gasket - Black):

92104-1064

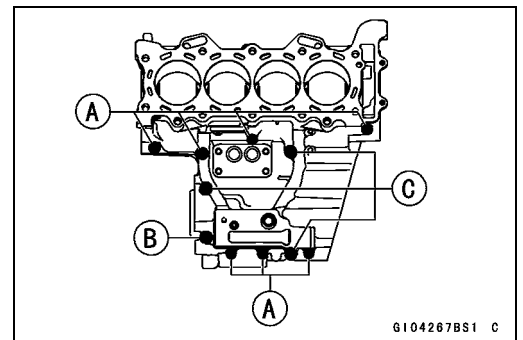


Crankcase

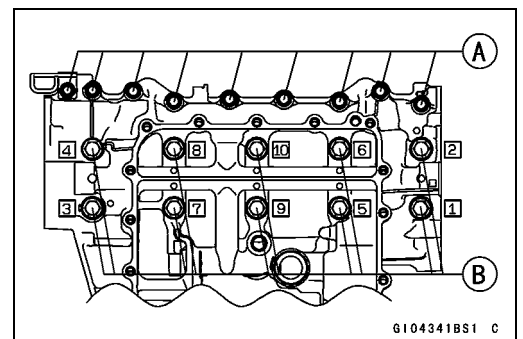
Crankcase Splitting

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:
 - Crankshaft Sensor (see Crankshaft Sensor Removal in the Electrical System chapter)
 - Starter Clutch (see Starter Clutch Removal)
 - Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
 - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
 - Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
 - Oil Cooler/Oil Filter Case (see Oil Cooler/Oil Filter Case Removal in the Engine Lubrication System chapter)
 - Oil Pan (see Oil Pan Removal in the Engine Lubrication System chapter)
 - Oil Screen (see Oil Pressure Relief Valve Removal in the Engine Lubrication System chapter)
 - External Shift Mechanism (see External Shift Mechanism Removal)
 - Transmission Assy (see Transmission Assy Removal)

- Remove the upper crankcase bolts, following the specified sequence.
 - Firstly, loosen the M6 bolts [A].
 - Secondly, loosen the M8 bolt (L = 90 mm) [B].
 - Lastly, loosen the M8 bolts (L = 75 mm) [C].



- Remove the lower crankcase bolts, following the specified sequence.
 - Firstly, loosen the M6 bolts [A].
 - Lastly, loosen the M8 bolts [B] as shown sequence [1 ~ 10] in the figure.
- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase.
 - Take care not to damage the crankcase.



9-12 CRANKSHAFT/TRANSMISSION

Crankcase

Crankcase Assembly

CAUTION

The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

- With a high-flash point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.

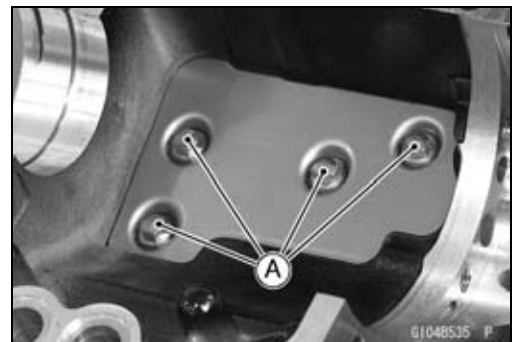
⚠ WARNING

Clean the crankcase 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.

- Using compressed air, blow out the oil passages in the crankcase halves.
- When installing the breather plate to upper crankcase, replace the gasket [A] with a new one.

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

Torque - Breather Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Crankcase

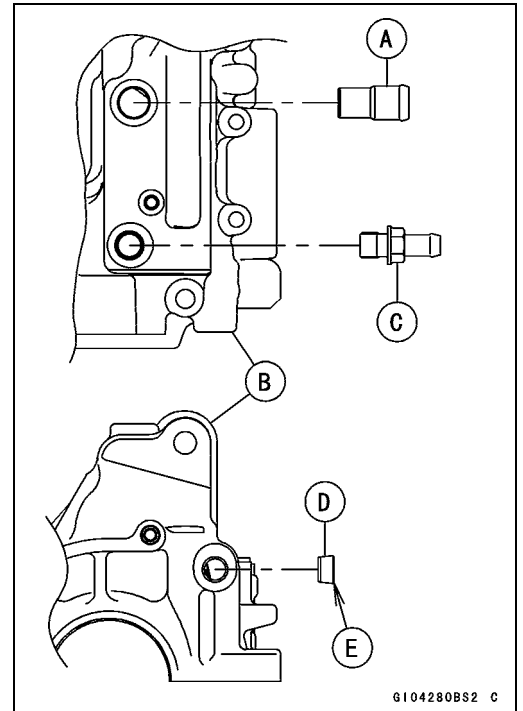
- Press and insert the fitting [A] in the upper crankcase [B] until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

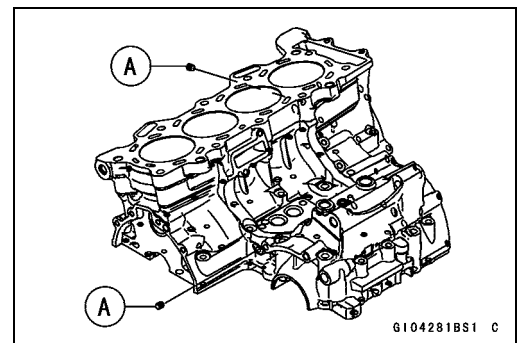
- Apply a non-permanent locking agent to the threads of the breather hose fitting [C] and tighten it.

Torque - Breather Hose Fitting: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Press and insert the plug [D] in the upper crankcase so that the plug surface [E] is flush with the end of the hole.



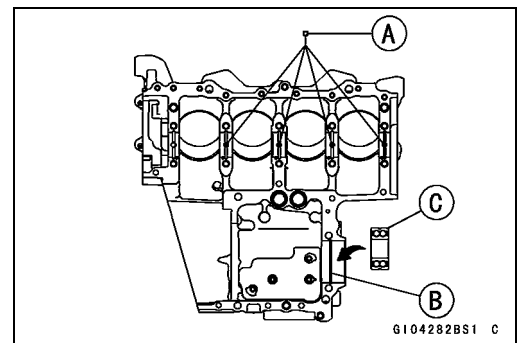
- Install the oil plugs [A] so that its surface is flush with the end of the hole.



- Install the oil jet nozzles [A] in the upper crankcase, and tighten them.

Torque - Oil Jet Nozzles: 2.9 N·m (0.30 kgf·m, 26 in·lb)

- Install:
Position Ring [B]
Ball Bearing [C]

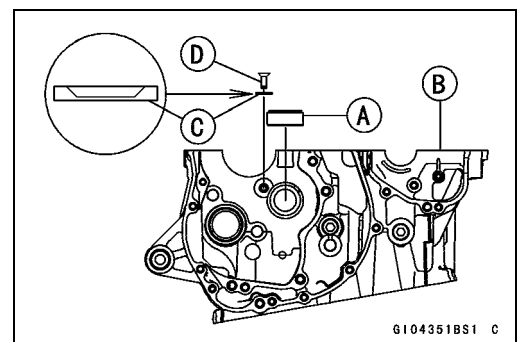


- Press and insert the race [A] in the lower crankcase [B] so that the big stepped side faces to inside of the crankcase until it is bottomed.

- Install the race holder [C] as shown in the figure.
- Apply a non-permanent locking agent to the threads of the race holder screw [D].

- Tighten:

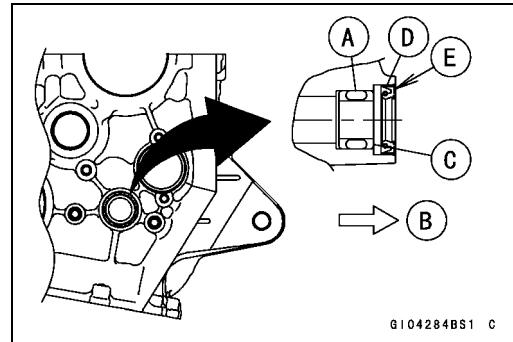
Torque - Race Holder Screws: 4.9 N·m (0.50 kgf·m, 43 in·lb)



9-14 CRANKSHAFT/TRANSMISSION

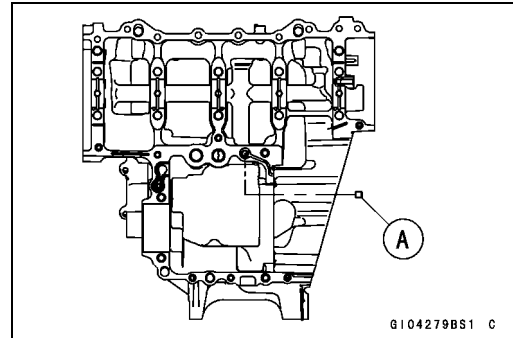
Crankcase

- Press and insert the new needle bearing [A] for the shift shaft so that its marked side faces outside [B] and its surface [C] is flush with the end of the hole.
- Install the new oil seal [D] so that its surface [E] is flush with the end of the hole.
- Apply grease to the oil seal lips.

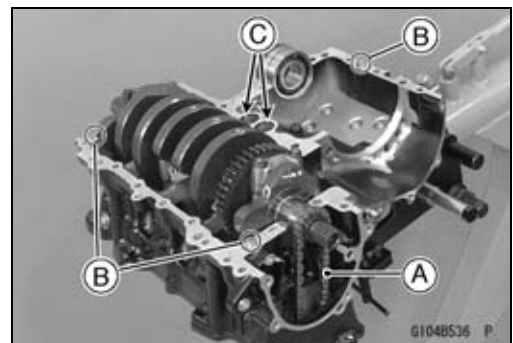


- Install the oil passage nozzle [A] in the lower crankcase, and tighten it.

Torque - Oil Passage Nozzle: 4.9 N·m (0.50 kgf·m, 43 in·lb)



- Install:
 - Crankshaft and Connecting Rods
 - Camshaft Chain [A]
 - Dowel Pins [B]
 - O-rings [C]
- Before fitting the lower case on the upper case, check the following.
 - Be sure to hang the camshaft chain on the crankshaft.



Crankcase

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

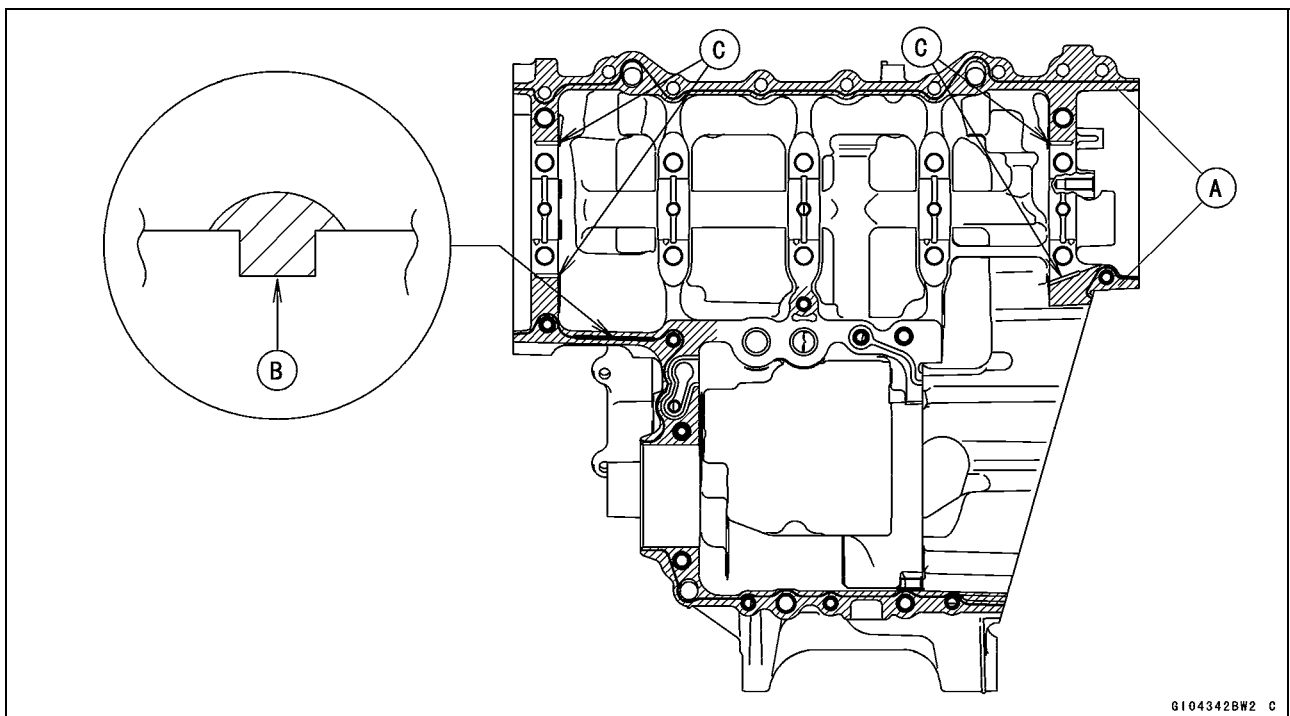
**Sealant - Kawasaki Bond (Liquid Gasket - Black): 92104
-1064**

NOTE

- Especially, apply a sealant so that it shall be filled up on the groove [B].
- Do not apply liquid gasket to the inside of the groove [C].

CAUTION

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



G104342BW2 C

- Fit the lower crankcase half to the upper crankcase half.

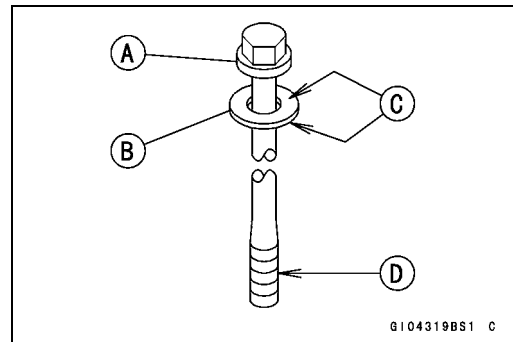
NOTE

- Make the application finish within 20 minutes when the liquid gasket to the mating surface of the lower crankcase half is applied.
- Moreover fit the case and tighten the bolts just after application of the liquid gasket.

9-16 CRANKSHAFT/TRANSMISSION

Crankcase

- The M8 bolts [A] has a copper plated washer [B], replace it with a new one.
- Apply molybdenum disulfide oil solution to both sides [C] of the washers and threads [D] of M8 bolts.



- Tighten the lower crankcase bolts using the following steps.
- Following the sequence numbers on the lower crankcase half, tighten M8 bolts [1 ~ 10] with copper plated washers.

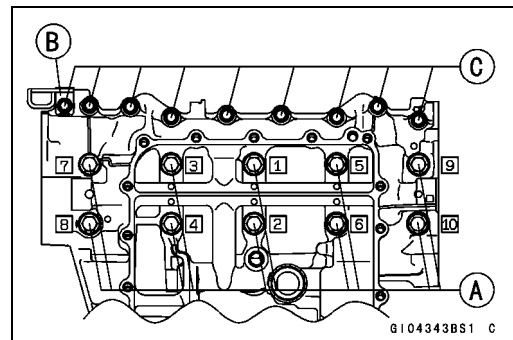
Torque - Crankcase Bolts (M8) [A]:

First: 15 N·m (1.5 kgf·m, 11 ft·lb)

Final: 31 N·m (3.2 kgf·m, 23 ft·lb)

- Install the clamp [B], and tighten the M6 bolts [C].

Torque - Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)



- Tighten the upper crankcase bolts using the following steps.
- The M8 bolts has a washer [A], replace it with a new one.
- Tighten the M8 bolts with washers.

Torque - Crankcase Bolts (M8): 27 N·m (2.8 kgf·m, 20 ft·lb)

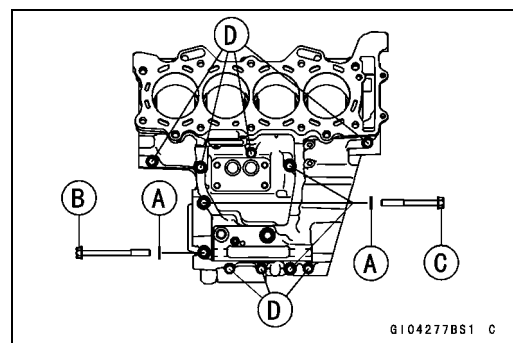
L = 90 mm (3.54 in.) [B]

L = 75 mm (2.95 in.) [C]

- Tighten the M6 bolts [D].

Torque - Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)

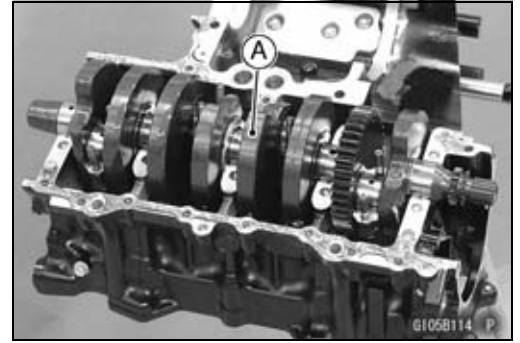
- After tightening all crankcase bolts, check the following items.
- Wipe up the liquid gasket that seeps out around the crankcase mating surface.
- Crankshaft turns freely.
- Install the removed parts (see appropriate chapters).



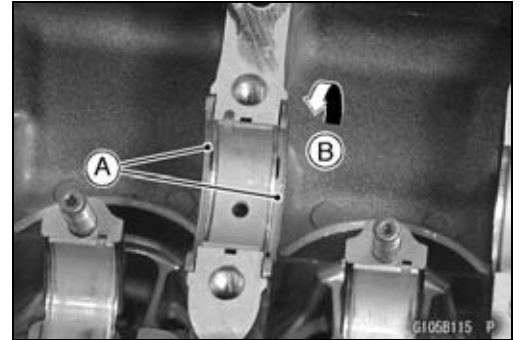
Crankshaft and Connecting Rods

Crankshaft Removal

- Split the crankcase (see Crankcase Splitting).
- Remove:
 - Camshaft Chain (see Camshaft Chain Removal in the Engine Top End chapter)
 - Connecting Rod Big End Caps (see Connecting Rod Removal)
 - Crankshaft [A]



- Remove the thrust washers [A] from the #3 main journal of the upper crankcase half as follows.
 - Slide [B] the thrust washers upward and remove them.



Crankshaft Installation

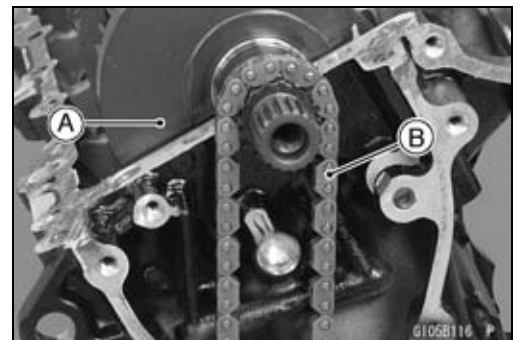
NOTE

○ If the crankshaft is replaced with a new one, refer to the Connecting Rod Big End Bearing/Crankshaft Main Bearing Insert Selection in the Specifications.

CAUTION

If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

- Apply molybdenum disulfide oil solution to the crankshaft main bearing inserts.
- Install the crankshaft [A] with the camshaft chain [B] hanging on it.
- Install the connecting rod big end caps (see Connecting Rod Installation).

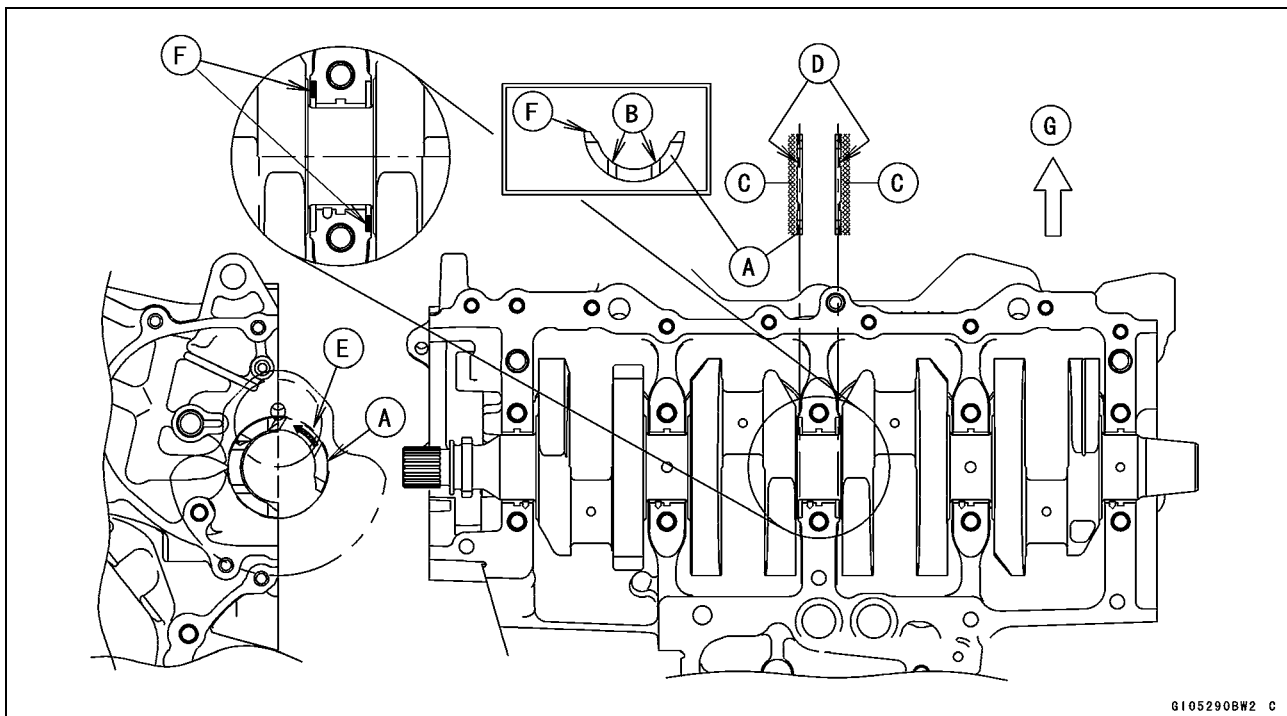


9-18 CRANKSHAFT/TRANSMISSION

Crankshaft and Connecting Rods

NOTE

- The thrust washer [A] has oil grooves [B] on the one side.
 - The thrust washers are identical.
 - Apply molybdenum disulfide grease [C] to the oil groove side [D] of the thrust washers.
 - Slide [E] the thrust washer of the one side into the groove of the #3 main journal so that the oil grooves face outward.
 - Move the crankshaft to the left or right, and then slide the thrust washer of the other side into the groove of the #3 main journal in the same way.
 - After installation, confirm that the blue-painted edges [F] of the thrust washers are positioned as shown in the figure.
- Front [G]

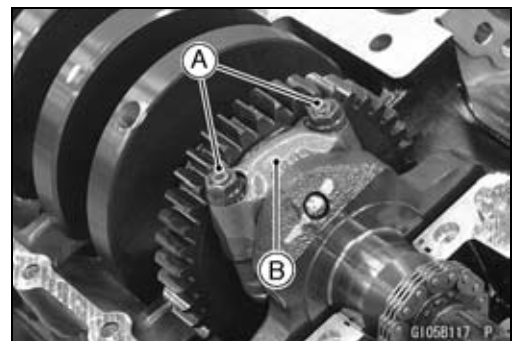


Connecting Rod Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod big end nuts [A] and caps [B].

NOTE

- Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.

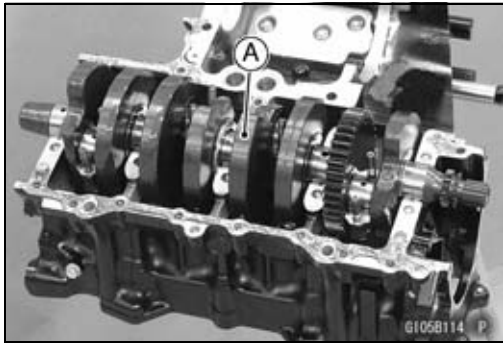


Crankshaft and Connecting Rods

- Remove:
 - Camshaft Chain (see Camshaft Chain Removal in the Engine Top End chapter)
 - Crankshaft [A]
 - Pistons (see Piston Removal)

CAUTION

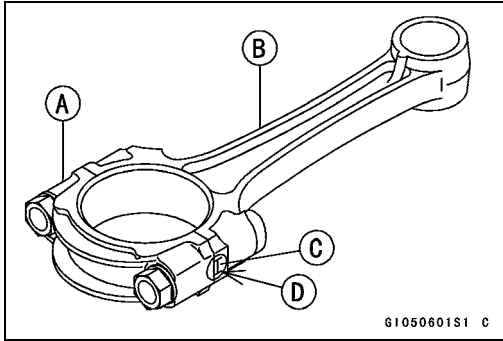
Discard the connecting rod bolts and nuts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.



Connecting Rod Installation

CAUTION

To minimize vibration, the connecting rods should have the same weight mark.

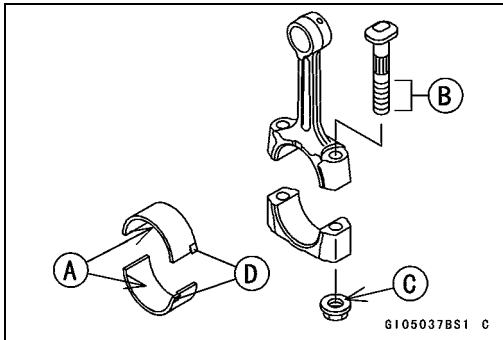


- Big End Cap [A]
- Connecting Rod [B]
- Weight Mark, Alphabet [C]
- Diameter Mark [D]: "O" or no mark

CAUTION

If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plasti-gage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

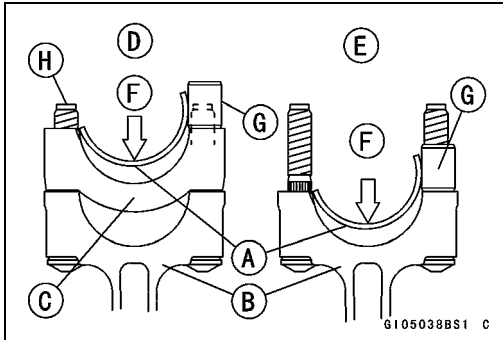
- Apply molybdenum disulfide oil solution to the inner surface of the upper and lower bearing inserts [A].
- Apply molybdenum disulfide oil solution to the threads [B] and seating surface [C] of the connecting rod nuts.
- Install the inserts so that their nails [D] are on the same side and fit them into the recess of the connecting rod and cap.



CAUTION

Wrong application of oil and grease could cause bearing damage.

- When installing the inserts [A], be careful not to damage the insert surface with the edge of the connecting rod [B] or the cap [C]. One way to install inserts is as follows.
 - Installation [D] to Cap
 - Installation [E] to Connecting Rod
 - Push [F]
 - Spare Dowel Pin [G]
 - Connecting Rod Bolts [H]
- Remove debris and clean the surface of inserts.
- Install the cap on the connecting rod, aligning the weight and diameter marks.



9-20 CRANKSHAFT/TRANSMISSION

Crankshaft and Connecting Rods

- Install each connecting rod on its original crankpin.
- The connecting rod big end is bolted using the “plastic region fastening method”.
- This method precisely achieves the needed clamping force without exceeding it unnecessarily, allowing the use of thinner, lighter bolts further decreasing connecting rod weight.
- There are two types of the plastic region fastening. One is a bolt length measurement method and other is a rotation angle method. Observe one of the following two, but the bolt length measurement method is preferable because this is a more reliable way to tighten the big end nuts.

CAUTION
The connecting rod bolts are designed to stretch when tightened. Never reuse the connecting rod bolts. See the table below for correct bolt and nut usage.

CAUTION
Be careful not to overtighten the nuts. The bolts must be positioned on the seating surface correctly to prevent the bolt heads from hitting the crankcase.

(1) Bolt Length Measurement Method

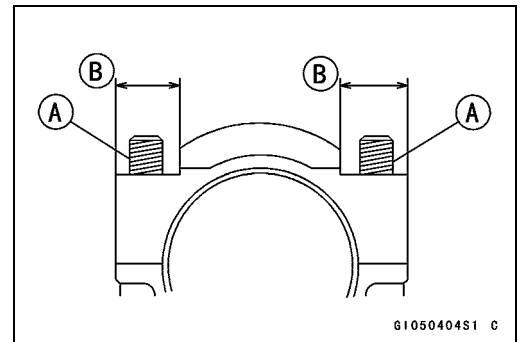
- Be sure to clean the bolts, nuts, and connecting rods thoroughly with a high-flash point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

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

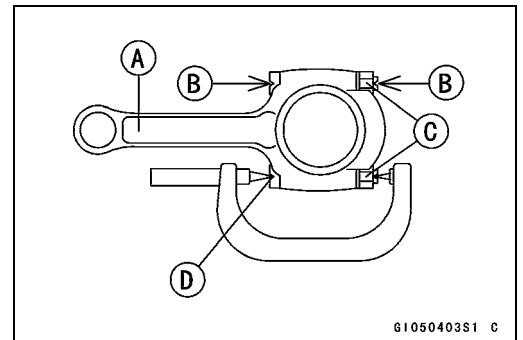
CAUTION
Immediately dry the bolts and nuts with compressed air after cleaning. Clean and dry the bolts and nuts completely.

Crankshaft and Connecting Rods

- Install new bolts and nuts in reused connecting rod.
- ★ If the connecting rod assy was replaced, use the bolts and nuts attached to the new connecting rod assy.
- Apply a small amount of molybdenum disulfide oil solution to the following portions.
 - Threads [A] of Nuts and Bolts
 - Seating Surfaces [B] of Nuts and Connecting Rods



- Dent both bolt head and bolt tip with a punch as shown in the figure.
- Before tightening, use a point micrometer to measure the length of new connecting rod bolts and record the values to find the bolt stretch.
 - Connecting Rod [A]
 - Dent here with a punch [B].
 - Nuts [C]
 - Fit micrometer pins into dents [D].
- Tighten the big end nuts until the bolt elongation reaches the length specified as follows.



$$\text{Bolt Length after tightening} - \text{Bolt Length before tightening} = \text{Bolt Stretch}$$

Connecting Rod Bolt Stretch

Usable Range: 0.28 ~ 0.38 mm (0.0110 ~ 0.0150 in.)

- Check the length of the connecting rod bolts.
- ★ If the stretch is more than the usable range, the bolt has stretched too much. An overelongated bolt may break in use.

(2) Rotation Angle Method

- ★ If you do not have a point micrometer, you may tighten the nuts using the "Rotation Angle Method".
- Be sure to clean the bolts, nuts and connecting rods thoroughly with a high-flash point solvent, because the new connecting rods, bolts and nuts are treated with an anti-rust solution.

⚠ WARNING

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

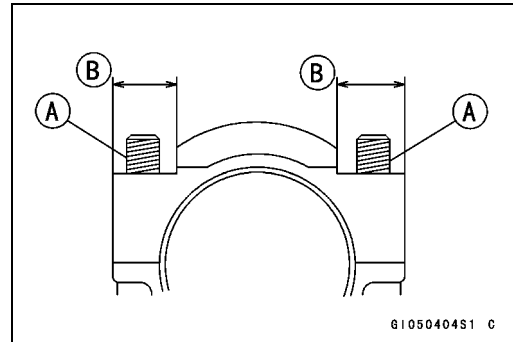
CAUTION

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

9-22 CRANKSHAFT/TRANSMISSION

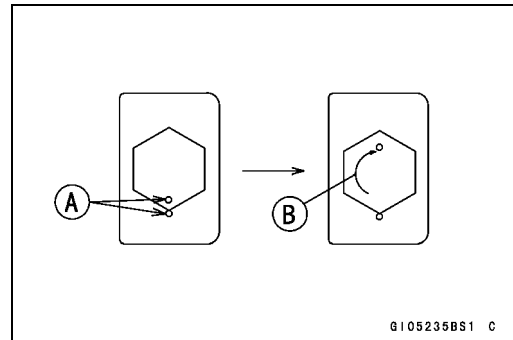
Crankshaft and Connecting Rods

- Install new bolts and nuts in reused connecting rod.
- ★ If the connecting rod assy was replaced, use the bolts and nuts attached to the new connecting rod assy.
- Apply a small amount of molybdenum disulfide oil solution to the following portions.
 - Threads [A] of Nuts and Bolts
 - Seating Surfaces [B] of Nuts and Connecting Rods



- First, tighten the nuts with **11.8 N·m (1.2 kgf·m, 104 in·lb)** of torque.
- Next, tighten the nuts **180°**.
- Mark [A] the connecting rod big end caps and nuts so that nuts can be turned 180° [B] properly.

Connecting Rod Assy	Bolt	Nut	Torque + Angle N·m (kgf·m, in·lb)
New	Attached to new con-rod	Attached to new con-rod	11.8 (1.2, 104) + 180°
	New	New	
Used	Replace the bolts with new ones	Replace the nuts with new ones	11.8 (1.2, 104) + 180°

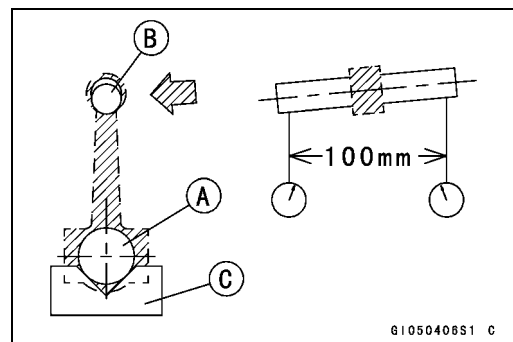


Crankshaft/Connecting Rod Cleaning

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

Connecting Rod Bend Inspection

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



Connecting Rod Bend

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

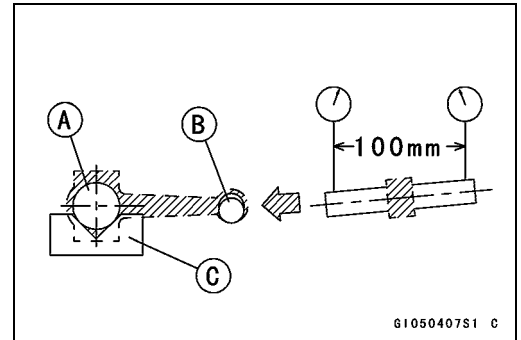
Crankshaft and Connecting Rods

Connecting Rod Twist Inspection

- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.
- ★ If the connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist

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



Connecting Rod Big End Side Clearance Inspection

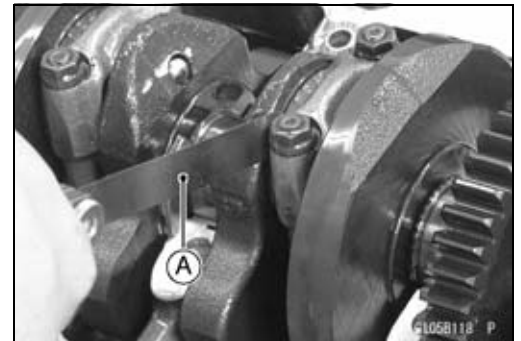
- Measure connecting rod big end side clearance.
- Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

Connecting Rod Big End Side Clearance

Standard: 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)

Service Limit: 0.58 mm (0.023 in.)

- ★ If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If the clearance is too large after connecting rod replacement, the crankshaft also must be replaced.



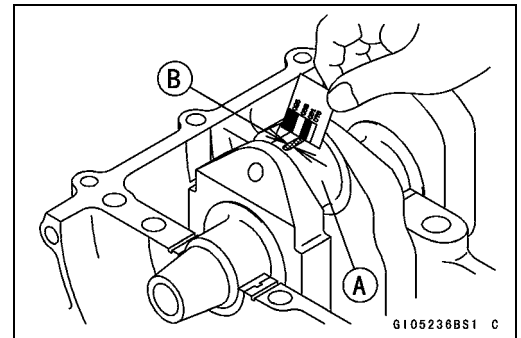
Connecting Rod Big End Bearing Insert/Crankpin Wear Inspection

- Remove the connecting rod big end (see Connecting Rod Removal).
- Cut strips of plastigage to crankpin width. Place a strip on the crankpin parallel to the crankshaft installed in the correct position.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

NOTE

○ Do not move the connecting rod and crankshaft during clearance measurement.

- Remove the connecting rod big end again, measure each clearance between the bearing insert and crankpin [A] using plastigage (press gauge) [B].



CAUTION

After measurement, replace the connecting rod bolts and nuts.

Connecting Rod Big End Bearing Insert/Crankpin Clearance

Standard: 0.044 ~ 0.081 mm (0.0017 ~ 0.0032 in.)

Service Limit: 0.11 mm (0.0043 in.)

9-24 CRANKSHAFT/TRANSMISSION

Crankshaft and Connecting Rods

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.082 mm (0.0032 in.) and the service limit (0.11 mm, 0.0043 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit, measure the diameter of the crankpins.

Crankpin Diameter

Standard: 29.987 ~ 30.000 mm (1.1806 ~ 1.1811 in.)

Service Limit: 29.98 mm (1.1803 in.)

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

Crankpin Diameter Marks

None 29.984 ~ 29.992 mm (1.1805 ~ 1.1808 in.)

○ 29.993 ~ 30.000 mm (1.1808 ~ 1.1811 in.)

△: Crankpin Diameter Marks, "○" or no mark.

- Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

NOTE

○ The mark already on the big end should almost coincide with the measurement.

Connecting Rod Big End Inside Diameter Marks

None 33.000 ~ 33.008 mm (1.2992 ~ 1.2995 in.)

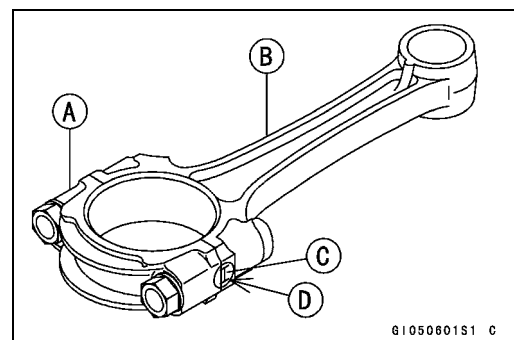
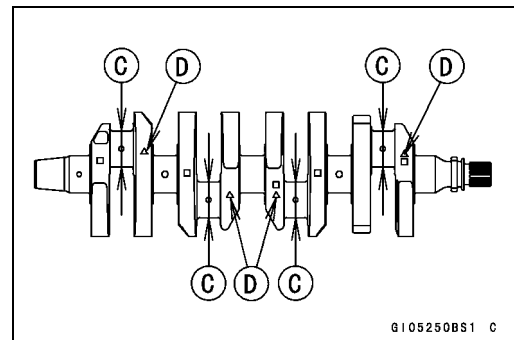
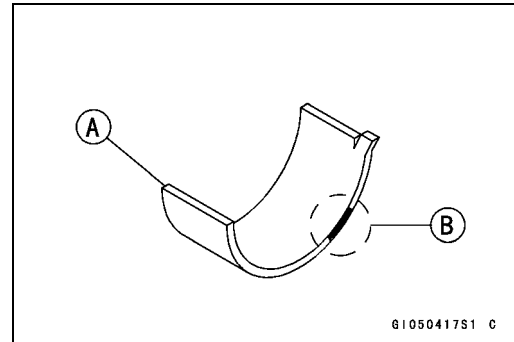
○ 33.009 ~ 33.016 mm (1.2996 ~ 1.2998 in.)

Big End Cap [A]

Connecting Rod [B]

Weight Mark, Alphabet [C]

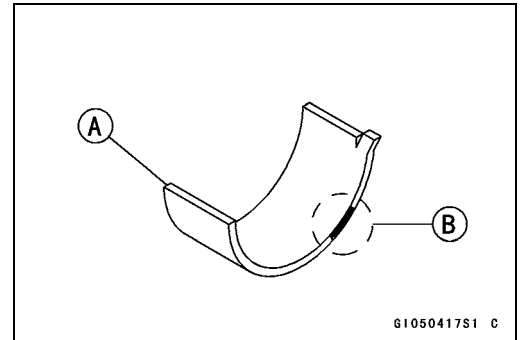
Diameter Mark (Around Weight Mark) [D]: "○" or no mark



Crankshaft and Connecting Rods

- Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding. Size Color [B]

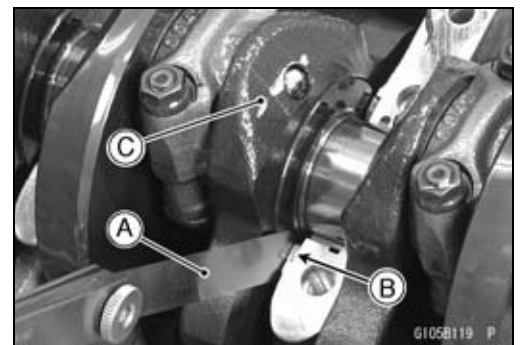
Con-rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-0167
None	None	Black	92139-0166
○	○		
○	None	Blue	92139-0165



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

Crankshaft Side Clearance Inspection

- Insert a thickness gauge [A] between the thrust washer [B] on the crankcase and the crank web [C] at the #3 main journal to determine clearance.
- ★ If the clearance exceeds the service limit, replace the thrust washers as a set and check the width of the crankshaft #3 main journal.



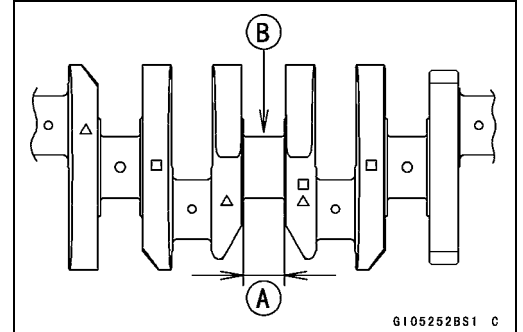
Crankshaft Side Clearance

Standard: 0.05 ~ 0.25 mm (0.0020 ~ 0.0098 in.)
Service Limit: 0.45 mm (0.0177 in.)

- Measure the width [A] of the crankshaft #3 main journal [B].
- ★ If the measurement exceeds the standard, replace the crankshaft.

Crankshaft #3 Main Journal Width

Standard: 21.09 ~ 21.14 mm (0.8303 ~ 0.8323 in.)

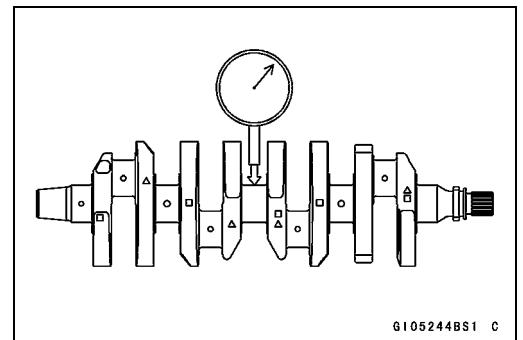


Crankshaft Runout Inspection

- Measure the crankshaft runout.
- ★ If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

Standard: TIR 0.02 mm (0.0008 in.) or less
Service Limit: TIR 0.05 mm (0.0020 in.)



9-26 CRANKSHAFT/TRANSMISSION

Crankshaft and Connecting Rods

Crankshaft Main Bearing Insert/Journal Wear Inspection

- Split the crankcase (see Crankcase Splitting).
- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the crankshaft installed in the correct position.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

NOTE

- Do not turn the crankshaft during clearance measurement.
- Journal clearance less than 0.025 mm (0.00098 in.) can not be measured by plastigage [A], however, using genuine parts maintains the minimum standard clearance.
- Split the crankcase again, measure each clearance between the bearing insert and journal [B] using plastigage (press gauge).

Crankshaft Main Bearing Insert/Journal Clearance

Standard: 0.028 ~ 0.060 mm (0.0011 ~ 0.0024 in.)

Service Limit: 0.09 mm (0.0035 in.)

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.061 mm (0.0024 in.) and the service limit (0.09 mm, 0.0035 in.), replace the bearing inserts [A] with inserts painted blue and purple [B]. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

Crankshaft Main Journal Diameter

Standard: 30.984 ~ 31.000 mm (1.2198 ~ 1.2205 in.)

Service Limit: 30.96 mm (1.2189 in.)

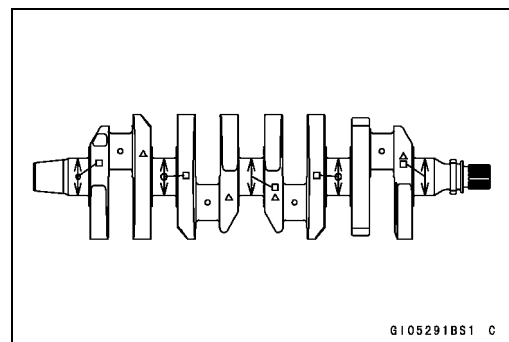
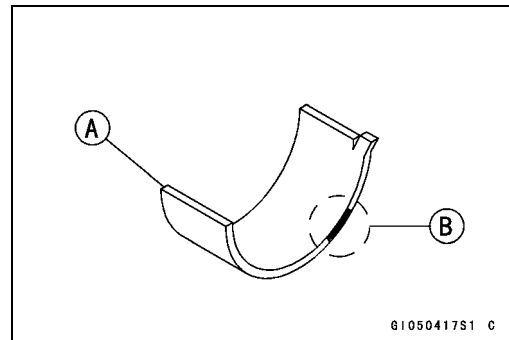
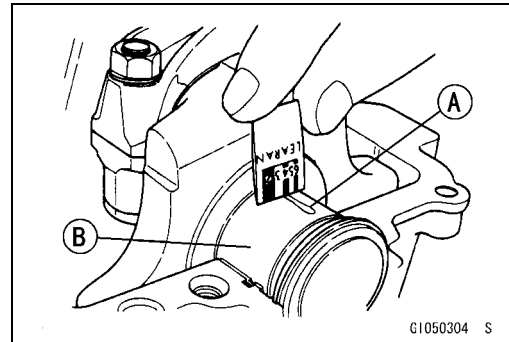
- ★ If any journal has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankshaft Main Journal Diameter Marks

None 30.984 ~ 30.992 mm (1.2198 ~ 1.2202 in.)

1 30.993 ~ 31.000 mm (1.2202 ~ 1.2205 in.)

- : Crankshaft Main Journal Diameter Marks, "1" or no mark.



Crankshaft and Connecting Rods

- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.

[A]: Crankcase Main Bearing Inside Diameter Marks, “○” or no mark.

- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

NOTE

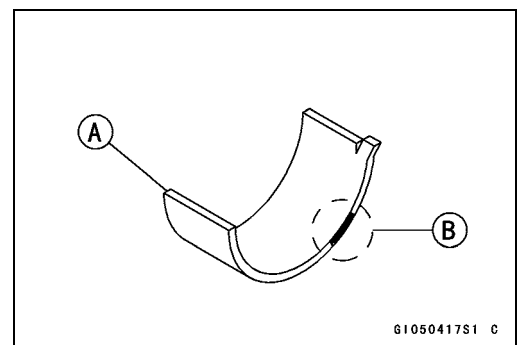
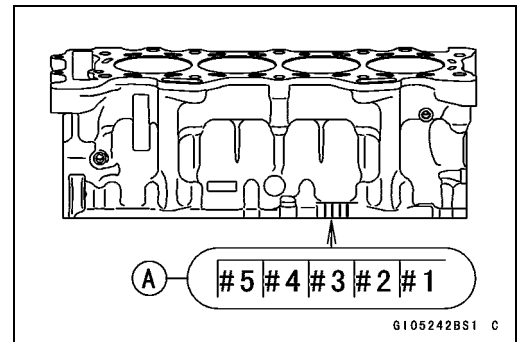
○ The mark already on the upper crankcase half should almost coincide with the measurement.

Crankcase Main Bearing Inside Diameter Marks

○ 34.000 ~ 34.008 mm (1.3386 ~ 1.3389 in.)

None 34.009 ~ 34.016 mm (1.3389 ~ 1.3392 in.)

- Select the proper bearing insert [A] in accordance with the combination of the crankcase and crankshaft coding. Size Color [B]



Crankcase Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92139-0247	1, 5
			92139-0250	2, 4
		Yellow	92139-0253	3
None	1	Black	92139-0246	1, 5
			92139-0249	2, 4
		Green	92139-0252	3
○	None	Black	92139-0246	1, 5
			92139-0249	2, 4
		Green	92139-0252	3
None	None	Blue	92139-0245	1, 5
			92139-0248	2, 4
		Purple	92139-0251	3

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

- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage.

9-28 CRANKSHAFT/TRANSMISSION

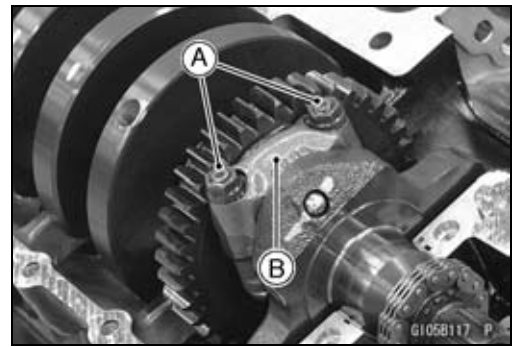
Pistons

Piston Removal

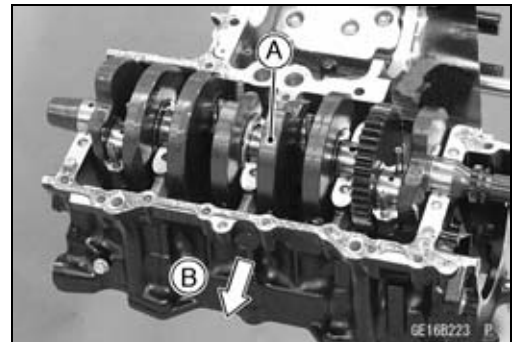
- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod big end nuts [A] and caps [B].

NOTE

○ Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.



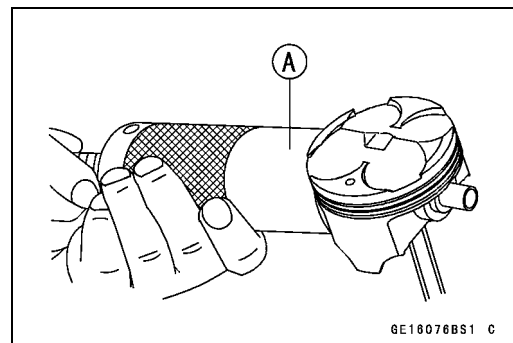
- Remove:
 - Camshaft Chain (see Camshaft Chain Removal in the Engine Top End chapter)
 - Crankshaft [A]
- Remove the connecting rods with pistons to the cylinder head side [B].



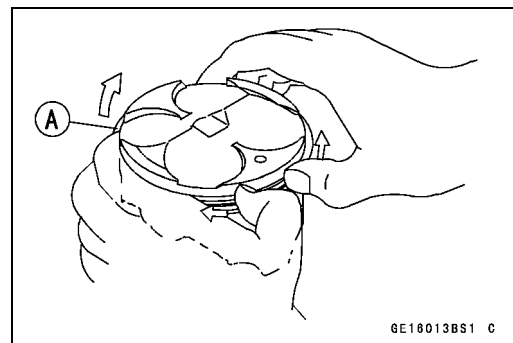
- Remove the piston pin snap rings [A].



- Using the piston pin puller assembly [A], remove the piston pins.
Special Tool - Piston Pin Puller Assembly: 57001-910
- Remove the pistons from the connecting rods.



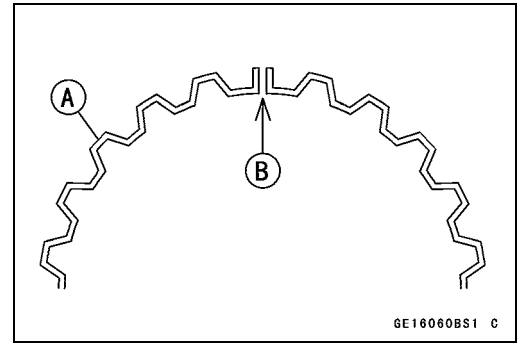
- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



Pistons

Piston Installation

- Apply molybdenum disulfide oil solution to the oil ring expander, and install the oil ring expander [A] in the bottom piston ring groove so the ends [B] not butt together.
- Apply molybdenum disulfide oil solution to the oil ring steel rails, and install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston ring groove.



NOTE

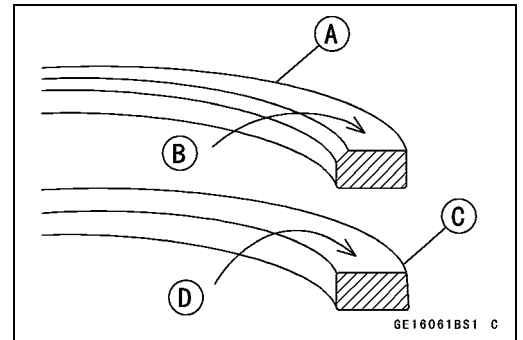
- The oil ring rails have no “top” or “bottom”.

- Apply molybdenum disulfide oil solution to the piston rings.

NOTE

- Do not mix up the top and second ring.

- Install the top ring [A] so that the “R” mark [B] faces up.
- Install the second ring [C] so that the “RN” mark [D] faces up.

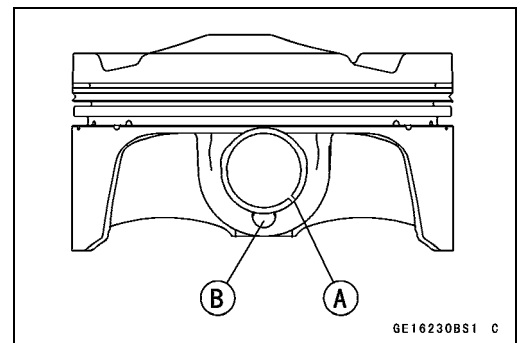


- Apply molybdenum disulfide oil solution to the piston pins and piston journals.

NOTE

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

- 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.

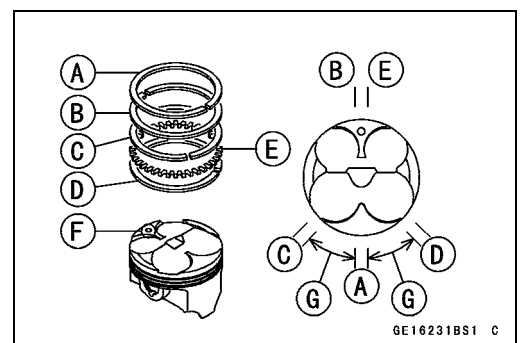


CAUTION

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

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

- Top Ring [A]
- Second Ring [B]
- Upper Oil Ring Steel Rail [C]
- Lower Oil Ring Steel Rail [D]
- Oil Ring Expander [E]
- Hollow [F]
- 30 ~ 40° [G]



9-30 CRANKSHAFT/TRANSMISSION

Pistons

- Apply molybdenum disulfide oil solution to the cylinder bore and piston skirt.
- Install the piston with its marking hollow [A] facing exhaust side.
- Using the piston ring compressor assembly [B] to install the piston from the cylinder head side.

Special Tools - Piston Ring Compressor Grip: 57001-1095
Piston Ring Compressor Belt, $\phi 67 \sim \phi 79$: 57001-1097

- Install:
Crankshaft (see Crankshaft Installation)
Connecting Rod Big End Caps (see Connecting Rod Installation)

Cylinder (Upper Crankcase) Wear Inspection

- Since there is a difference in cylinder wear (upper crankcase) in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) as shown in the figure.
- ★ If any of the cylinder inside diameter measurements exceeds the service limit, replace the crankcase.
10 mm (0.39 in.) [A]
60 mm (2.36 in.) [B]

Cylinder (Upper Crankcase) Inside Diameter

Standard: 67.000 ~ 67.012 mm (2.6378 ~ 2.6383 in.)
Service Limit: 67.09 mm (2.6413 in.)

Piston Wear Inspection

- Measure the outside diameter [A] of each piston 5 mm (0.20 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.
- ★ If the measurement is under service limit, replace the piston.

Piston Diameter

Standard: 66.960 ~ 66.975 mm (2.6362 ~ 2.6368 in.)
Service Limit: 66.81 mm (2.6303 in.)

Piston Ring, Piston Ring Groove Wear 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.

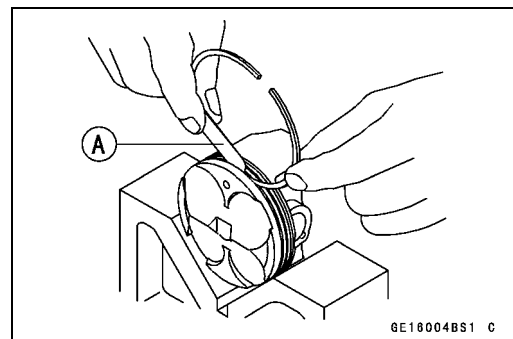
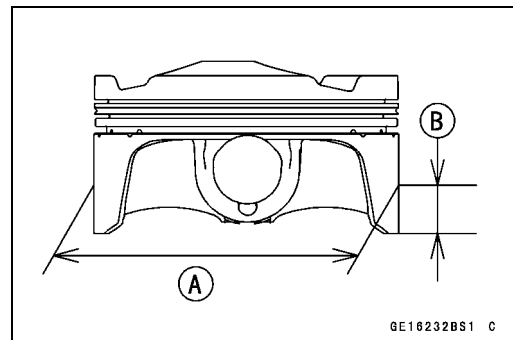
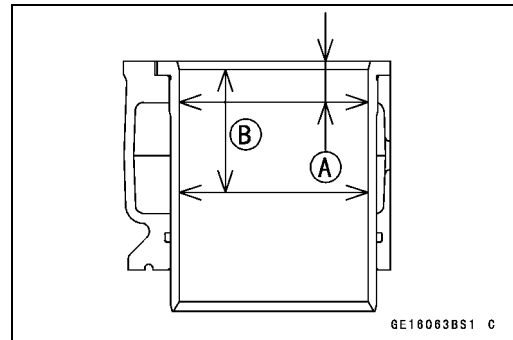
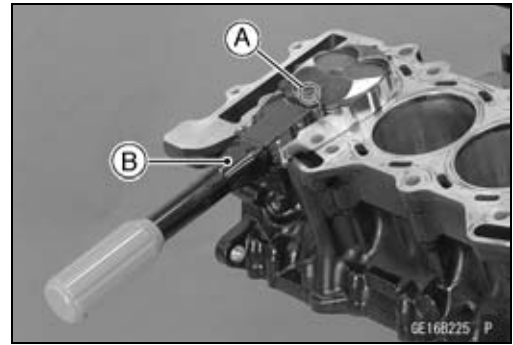
Piston Ring/Groove Clearance

Standard:

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

Service Limit:

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



Pistons

Piston Ring Groove Width Inspection

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

Piston Ring Groove Width

Standard:

Top [A] 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)

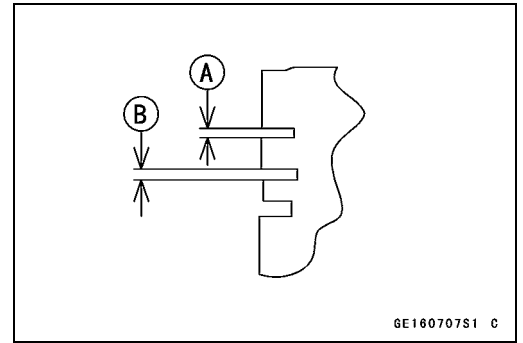
Second [B] 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)

Service Limit:

Top 0.92 mm (0.036 in.)

Second 0.92 mm (0.036 in.)

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



Piston Ring Thickness Inspection

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

Piston Ring Thickness

Standard:

Top [A] 0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)

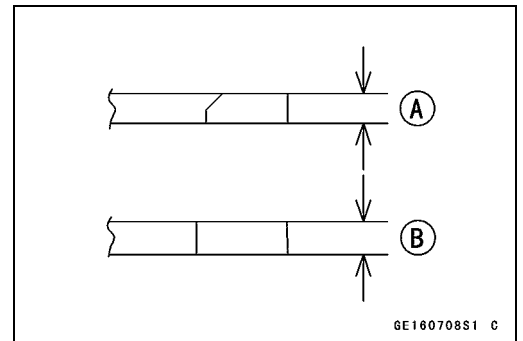
Second [B] 0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)

Service Limit:

Top 0.70 mm (0.028 in.)

Second 0.70 mm (0.028 in.)

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



NOTE

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

Piston Ring End Gap Inspection

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

Piston Ring End Gap

Standard:

Top 0.12 ~ 0.22 mm (0.0047 ~ 0.0087 in.)

Second 0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)

Oil 0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)

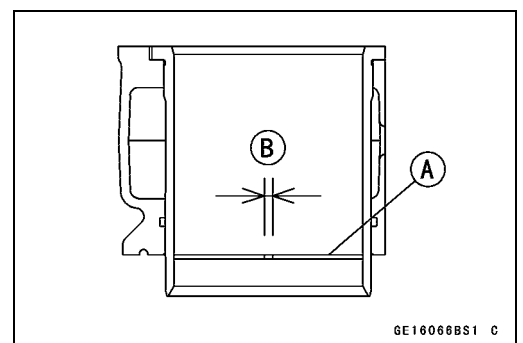
Service Limit:

Top 0.5 mm (0.020 in.)

Second 0.8 mm (0.031 in.)

Oil 1.0 mm (0.039 in.)

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

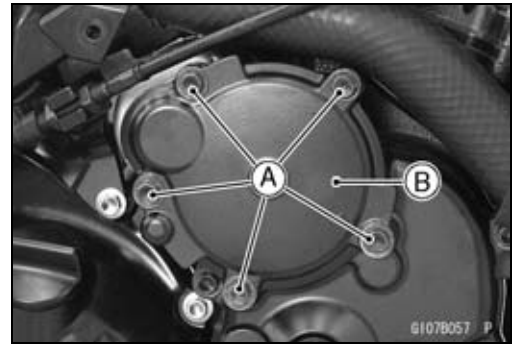


9-32 CRANKSHAFT/TRANSMISSION

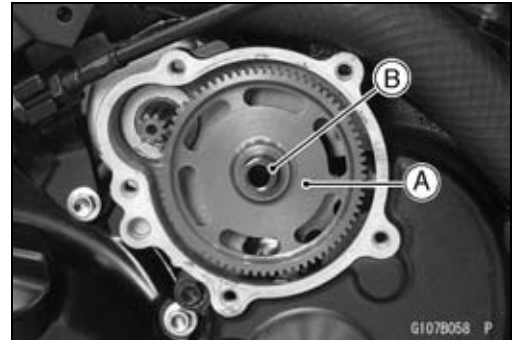
Starter Idle Gear and Starter Clutch

Starter Idle Gear Removal

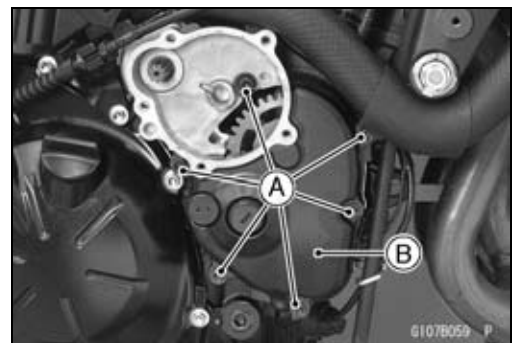
- Remove:
 - Right Fairing Cover (see Fairing Cover Removal in the Frame chapter)
 - Bolts [A]
 - Idle Gear Cover [B]



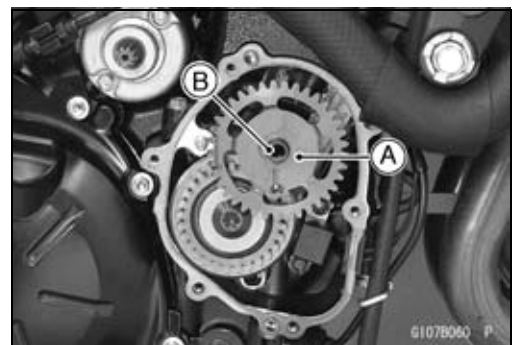
- Pull out the idle gear (starter motor side) [A] with the shaft [B].



- Remove:
 - Bolts [A]
 - Starter Clutch Cover [B]

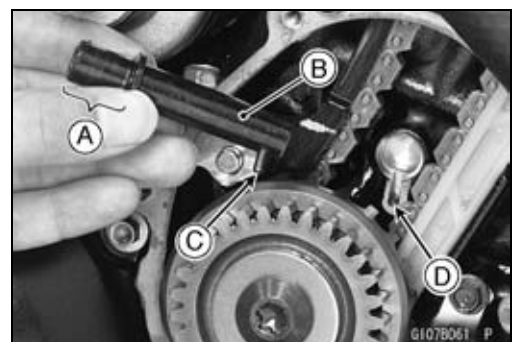


- Pull out the idle gear (starter clutch side) [A] with the shaft [B].



Starter Idle Gear Installation

- Apply molybdenum disulfide grease [A] to the idle gear shaft (starter clutch side) [B].
- Fit the pin [C] into the groove [D] of the crankcase.

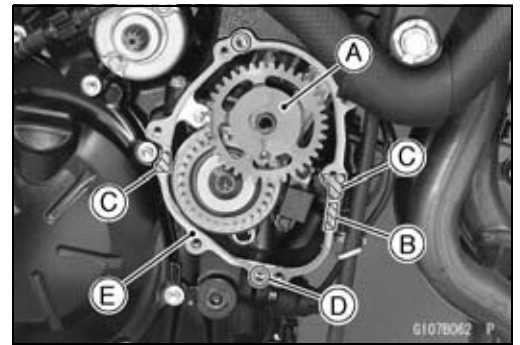


Starter Idle Gear and Starter Clutch

- Install the idle gear (starter clutch side) [A] on the shaft.
- Engage the idle gear with the starter clutch gear.
- Apply silicone sealant to the following portion.
 - Crankshaft Sensor Lead Grommet [B]
 - Crankcase Halves Mating Surfaces [C]

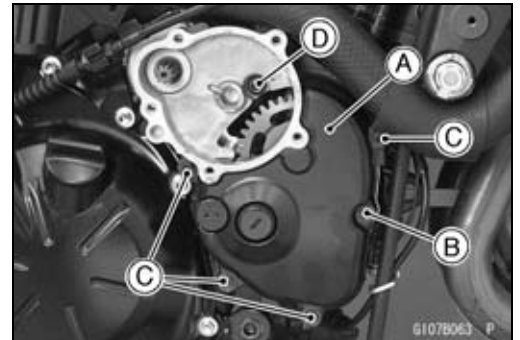
Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

- Install the dowel pins [D] and new gasket [E].



- Apply grease to the O-ring of the starter motor.
- Install the starter clutch cover [A].
- Tighten:
 - Torque - Starter Clutch Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

- L = 40 mm (1.57 in.) [B]
- L = 30 mm (1.18 in.) [C]
- L = 20 mm (0.79 in.) [D]



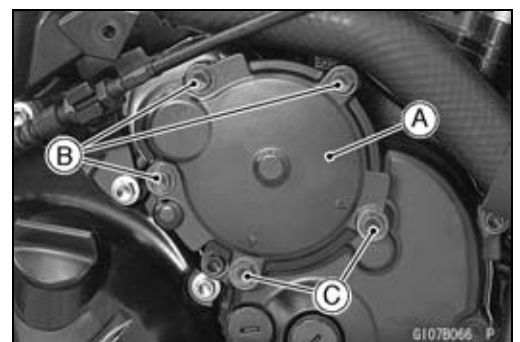
- Apply molybdenum disulfide grease to the idle gear shaft (starter motor side) [A].
- Install the idle gear (starter motor side) [B] on the shaft.
- Engage the idle gear with the starter motor gear and idle gear (starter clutch side).
- Fit the pin [C] into the groove [D] of the starter clutch cover.
- Install the dowel pin [E] and new gasket.



- Position the idle gear [A] to inside of the mating surface [B] of the cover.



- Install:
 - Idle Gear Cover [A]
 - Idle Gear Cover Bolts [B]
 - Idle Gear Cover Bolts [C] with New Gaskets
- Tighten:
 - Torque - Idle Gear Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the removed parts (see appropriate chapters).



9-34 CRANKSHAFT/TRANSMISSION

Starter Idle Gear and Starter Clutch

Starter Clutch Removal

- Remove:
 - Alternator Cover (see Alternator Cover Removal in the Electrical System chapter)
 - Starter Clutch Cover (see Starter Idle Gear Removal)
 - Idle Gear (Starter Clutch Side) (see Starter Idle Gear Removal)
- Unscrew the starter clutch bolt [A], while holding the alternator rotor steady with the rotor holder (see Alternator Rotor Removal in the Electrical System chapter).

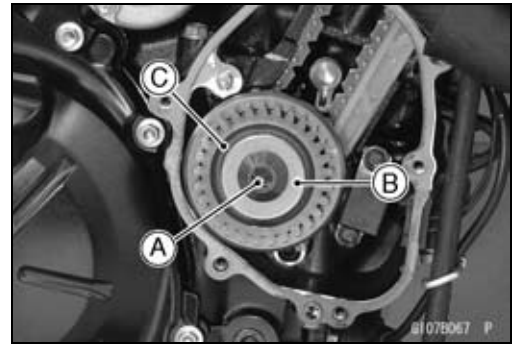
Special Tools - Grip: 57001-1591

Rotor Holder: 57001-1666

Stopper: 57001-1679

Rotor Holder Attachment: 57001-1689

- Remove:
 - Washer [B]
 - Starter Clutch [C]



Starter Clutch Installation

- Install the starter clutch [A] while fitting the alignment notch [B] of the splines onto the alignment tooth [C].
- Install the washer.
- Tighten the starter clutch bolt, while holding the alternator rotor steady with the rotor holder (see Alternator Rotor Installation in the Electrical System chapter).

Special Tools - Grip: 57001-1591

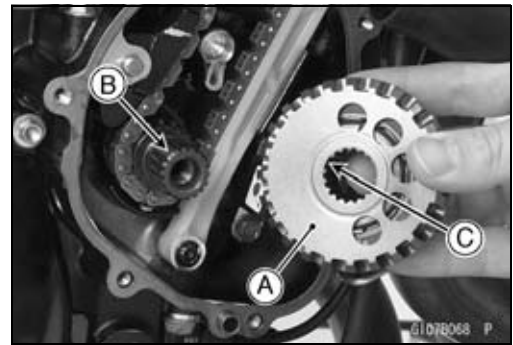
Rotor Holder: 57001-1666

Stopper: 57001-1679

Rotor Holder Attachment: 57001-1689

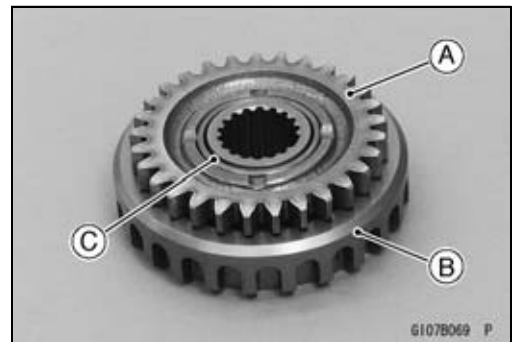
Torque - Starter Clutch Bolt: 49 N·m (5.0 kgf·m, 36 ft·lb)

- Install the removed parts (see appropriate chapters).

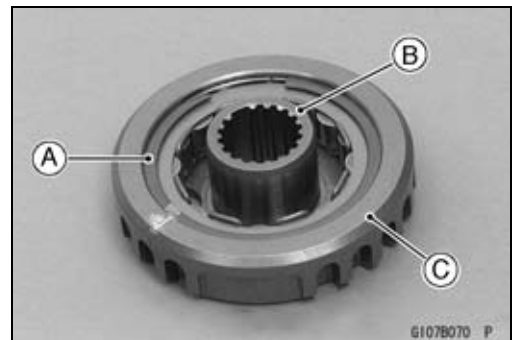


Starter Clutch Disassembly

- Remove the starter clutch (see Starter Clutch Removal).
- Pull the starter clutch gear [A] out of the starter clutch [B].
- Remove the needle bearing [C].



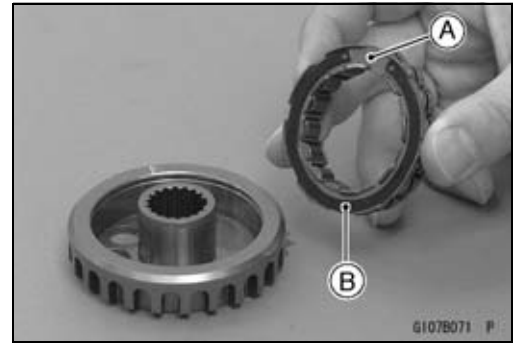
- Remove the snap ring [A].
- Pull the one-way clutch [B] out of the starter clutch case [C].



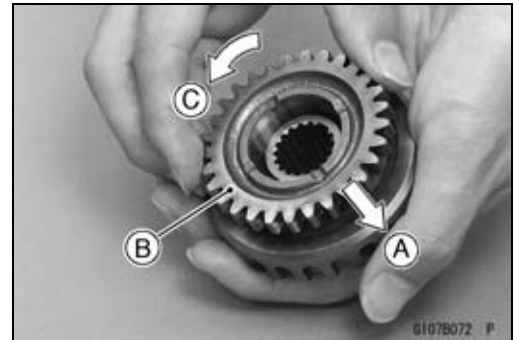
Starter Idle Gear and Starter Clutch

Starter Clutch Assembly

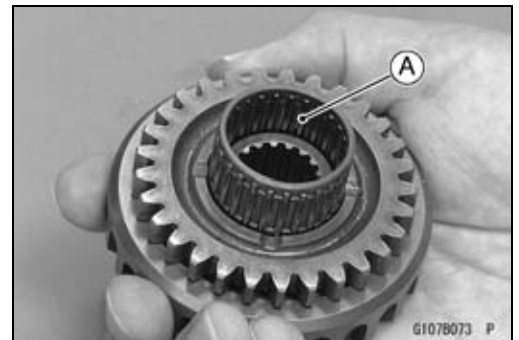
- Install the one-way clutch [A] so that its circlip side [B] faces in.
- Install the new snap ring.



- Push [A] the starter clutch gear [B] in and turn it counterclockwise [C] and install it.

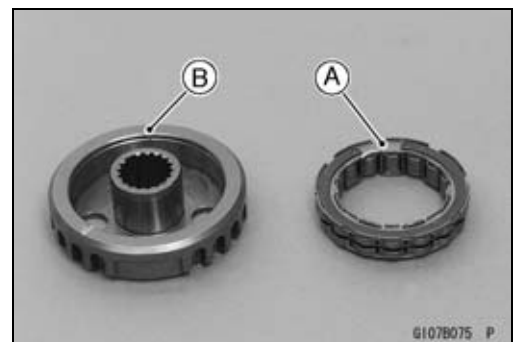
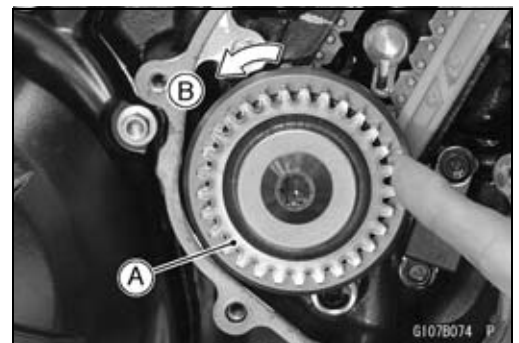


- Apply molybdenum disulfide oil solution to the needle bearing [A], and install it.



Starter Clutch Inspection

- Remove:
 - Starter Clutch Cover (see Starter Idle Gear Removal)
 - Idle Gear (Starter Clutch Side) (see Starter Idle Gear Removal)
- Turn the starter clutch gear [A] by hand. The starter clutch gear should turn counterclockwise freely [B], but should not turn clockwise.
- ★ If the starter clutch does not operate as it should or if it makes noise, go to the next step.
- Disassemble the starter clutch, and visually inspect the clutch parts.
 - One-way Clutch [A]
 - Starter Clutch Case [B]
- ★ If there is any worn or damaged part, replace it.



9-36 CRANKSHAFT/TRANSMISSION

Starter Idle Gear and Starter Clutch

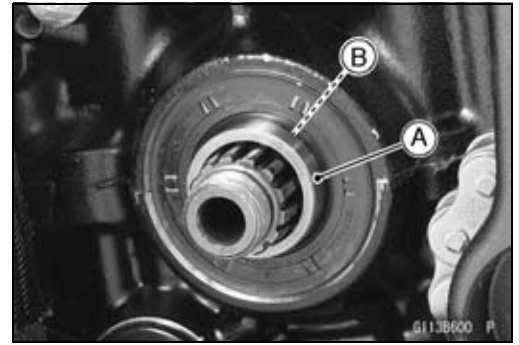
○Examine the starter clutch gear [A] as well. Replace the clutch gear if it is worn or damaged.



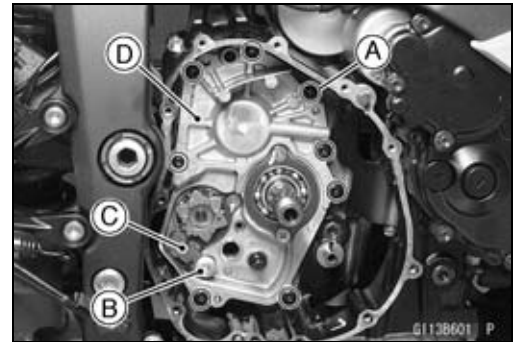
Transmission

Transmission Assy Removal

- Remove:
 - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
 - Gear Position Switch (see Gear Position Switch Removal in the Electrical System chapter)
 - Collar [A]
 - O-ring [B]

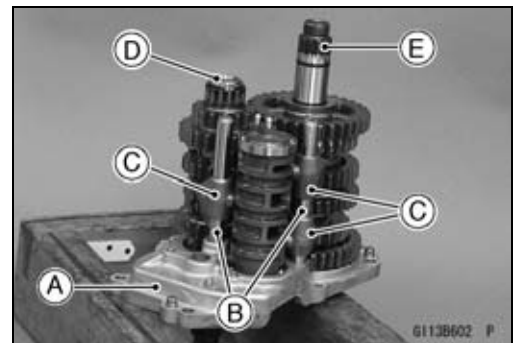


- Remove:
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Shift Shaft Assembly (see External Shift Mechanism Removal)
 - Transmission Case Bolts [A]
- ★ If the transmission assy is to be disassembled, remove the following.
 - Gear Positioning Lever Bolt [B]
 - Gear Positioning Lever [C], Spring and Collar
- Pull the transmission assy [D] out of the crankcase.

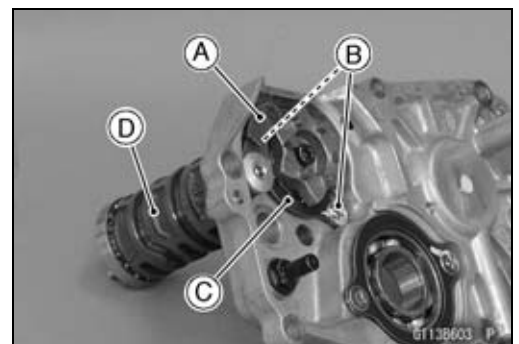


Transmission Assy Disassembly

- Remove the transmission assy (see Transmission Assy Removal).
- Remove the following from the transmission case [A].
 - Shift Rods [B]
 - Shift Forks [C]
 - Drive Shaft [D]
 - Output Shaft [E]



- Remove:
 - Gear Positioning Lever [A]
 - Bearing Holder Screws [B]
 - Bearing Holder [C]
 - Shift Drum Assembly [D]



Transmission Assy Assembly

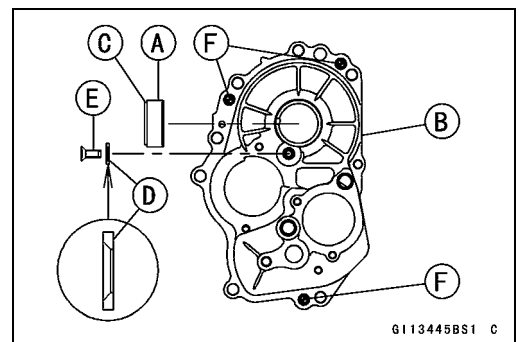
- Press and insert the race [A] in the transmission case [B] so that the big stepped side [C] faces to transmission gears side until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

- Install the race holder [D] as shown in the figure.
- Apply a non-permanent locking agent to the threads of the race holder screw [E].
- Tighten:

Torque - Race Holder Screws: 4.9 N·m (0.50 kgf·m, 43 in·lb)

- Press and insert the dowel pins [F] in the transmission case until they are bottomed.

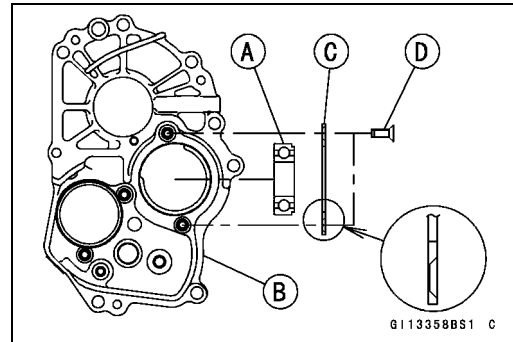


9-38 CRANKSHAFT/TRANSMISSION

Transmission

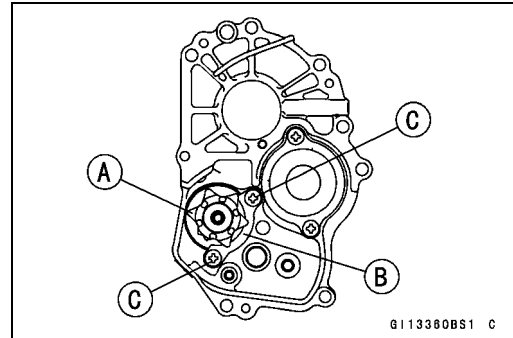
- Press and insert the ball bearing [A] in the transmission case [B] so that the stepped side faces outside until it is bottomed.
- Install the bearing holder [C] as shown in the figure.
- Apply a non-permanent locking agent to the threads of the bearing holder screws [D].
- Tighten:

Torque - Bearing Holder Screws: 4.9 N·m (0.50 kgf·m, 43 in·lb)



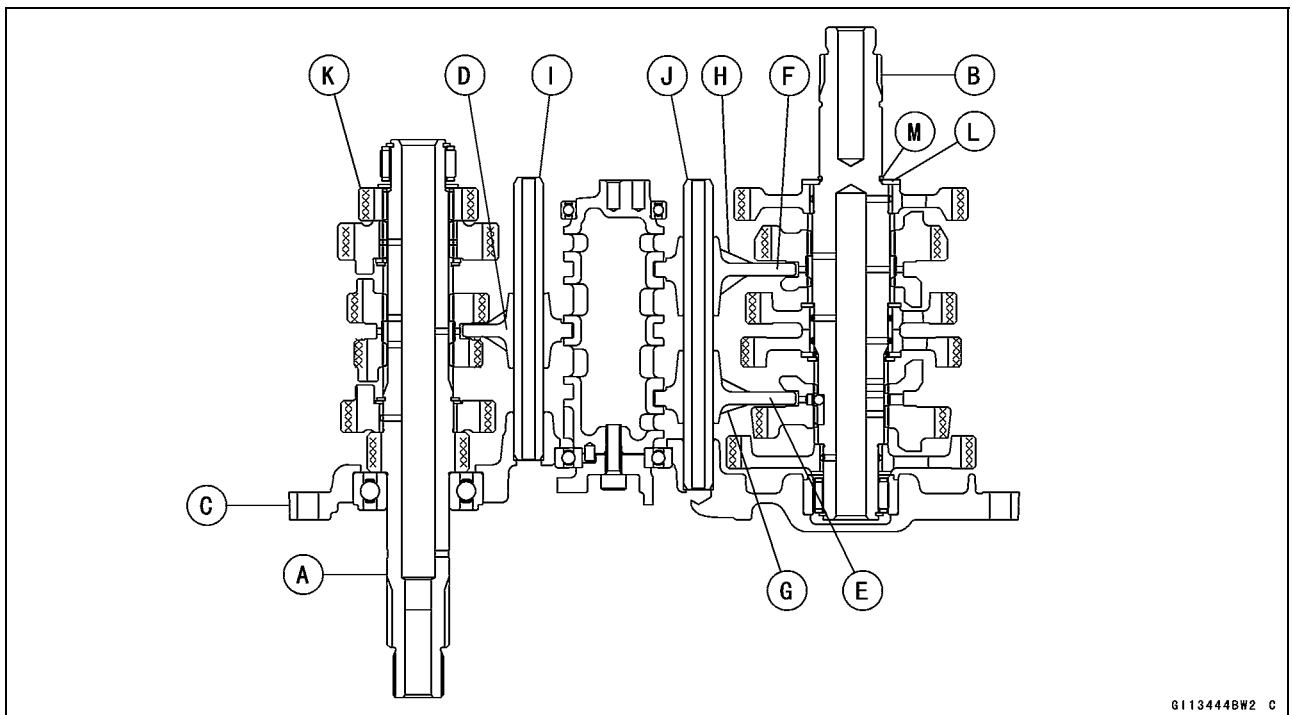
- Install:
 - Shift Drum Assembly [A]
 - Bearing Holder [B]
- Install the bearing holder so that the taper side faces outside.
- Apply a non-permanent locking agent to the threads of the bearing holder screws [C].
- Tighten:

Torque - Bearing Holder Screws: 4.9 N·m (0.50 kgf·m, 43 in·lb)



Transmission

- Install the drive shaft [A] and output shaft [B] as a set in the transmission case [C].
- Install the shift forks as shown in the figure.
 - The shift fork [D] for drive shaft gears has the short ears.
 - The shift forks [E] [F] for output shaft gears have the long ears.
 - The shift fork [E] has R mark [G].
 - The shift fork [F] has L mark [H].
- Install the shift rods so that the ends of the rods are same height.
 - The shift rod [I] of the drive shaft side is shorter than the shift rod [J] of the output shaft side.
- Apply molybdenum disulfide oil solution to the transmission gears (x marks) [K].
- Install the spacer [L] on the output shaft.
- Apply grease to the O-ring [M] and install it to its position on the output shaft.



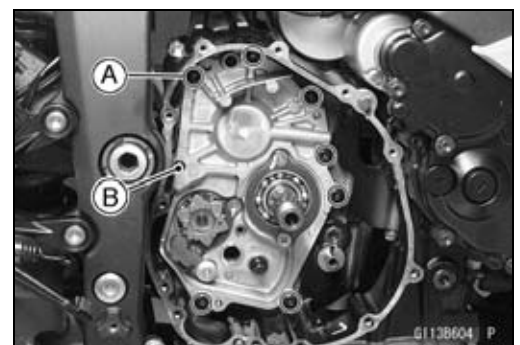
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Transmission Assy Installation

- Assemble the transmission assy (see Transmission Assy Assembly).
- Be sure that the dowel pins are in position.
- Install the transmission assy on the crankcase.
- Tighten:

Torque - Transmission Case Bolts (M8) [A]: 20 N·m (2.0 kgf·m, 15 ft·lb)

Transmission Case Bolts (M6) [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

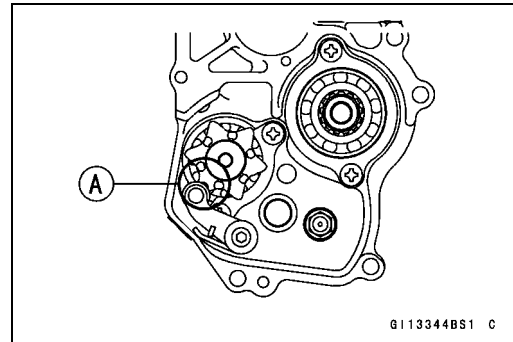


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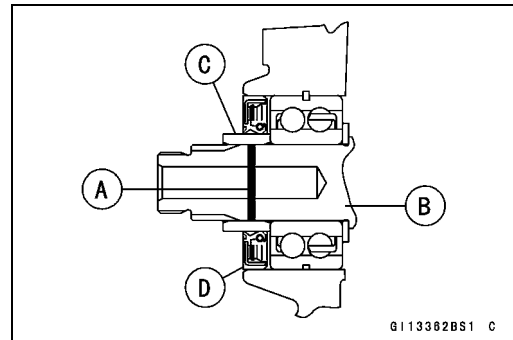
9-40 CRANKSHAFT/TRANSMISSION

Transmission

- Install the gear positioning lever (see External Shift Mechanism Installation).
- Set the gear positioning lever to the neutral position [A].
- Check that the drive and output shaft turn freely.



- Apply grease to the O-ring [A] and install it to its position on the output shaft [B].
- Install the collar [C].
- When installing the oil seal [D], install it as follows.
 - Apply grease to the oil seal lips.
 - Apply to the outer circumference of the oil seal so that it will go into place smoothly.
 - Press and insert the oil seal in the crankcase so that the surface of the oil seal is flush with the surface of the crankcase as shown in the figure.
- Install the removed parts (see appropriate chapters).



Transmission Shaft Removal

- Refer to the Transmission Assy Disassembly.

Transmission Shaft Installation

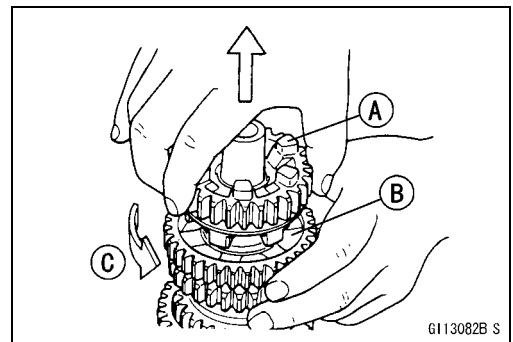
- Refer to the Transmission Assy Assembly.

Transmission Shaft Disassembly

- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, and then disassemble the transmission shafts.

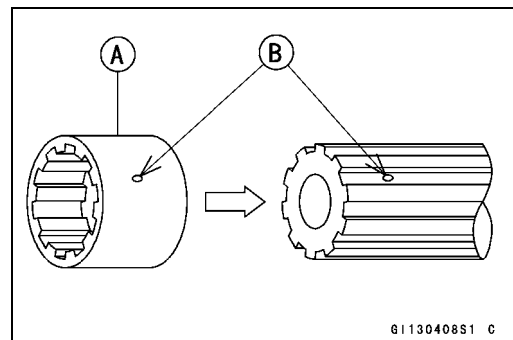
Special Tool - Outside Circlip Pliers: 57001-144

- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.
- Set the output shaft in a vertical position holding the 3rd gear [B].
- Spin the 5th gear quickly [C] and pull it off upward.



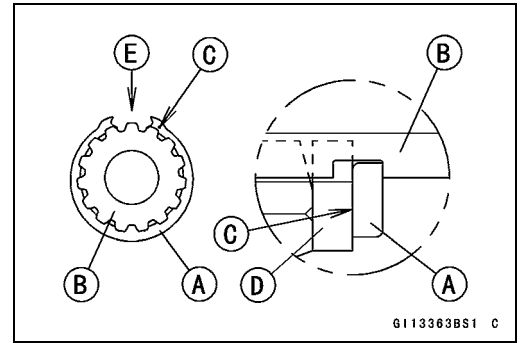
Transmission Shaft Assembly

- Apply molybdenum disulfide oil solution to the sliding surfaces of the gears and shafts.
- Install the gear bushings [A] on the shaft with their holes [B] aligned.

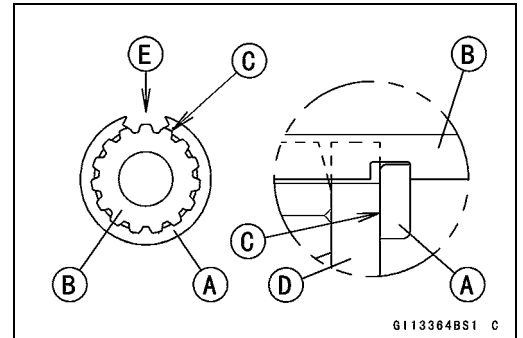


Transmission

- Replace any circlips removed with new ones.
- Install the circlip [A] on the drive shaft [B] so that the punch mark [C] faces the washer [D] and position the opening [E] as shown in the figure.



- Install the circlip [A] on the output shaft [B] so that the punch mark [C] faces the washer [D] and position the opening [E] as shown in the figure.



- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 3rd/4th gear onto the drive shaft with their oil holes aligned.
- Install the 5th and 6th gear bushings onto the drive shaft with their oil holes aligned.
- The output shaft gears can be recognized by size: the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 5th and 6th gears onto the output shaft with their oil holes aligned.
- Install the 1st, 2nd and 3rd/4th gear bushings onto the output shaft with their oil holes aligned.

9-42 CRANKSHAFT/TRANSMISSION

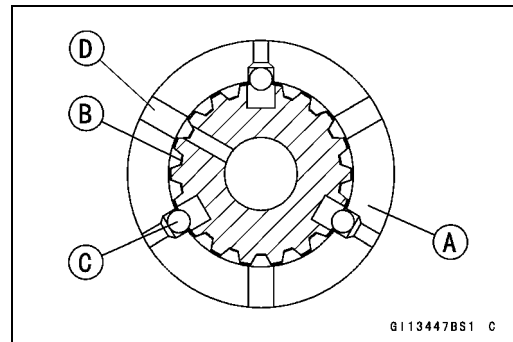
Transmission

- Fit the steel balls into the 5th gear holes in the output shaft, aligning oil hole as shown in the figure.
 - 5th Gear [A]
 - Output Shaft [B]
 - Steel Balls [C]
 - Oil Holes [D]

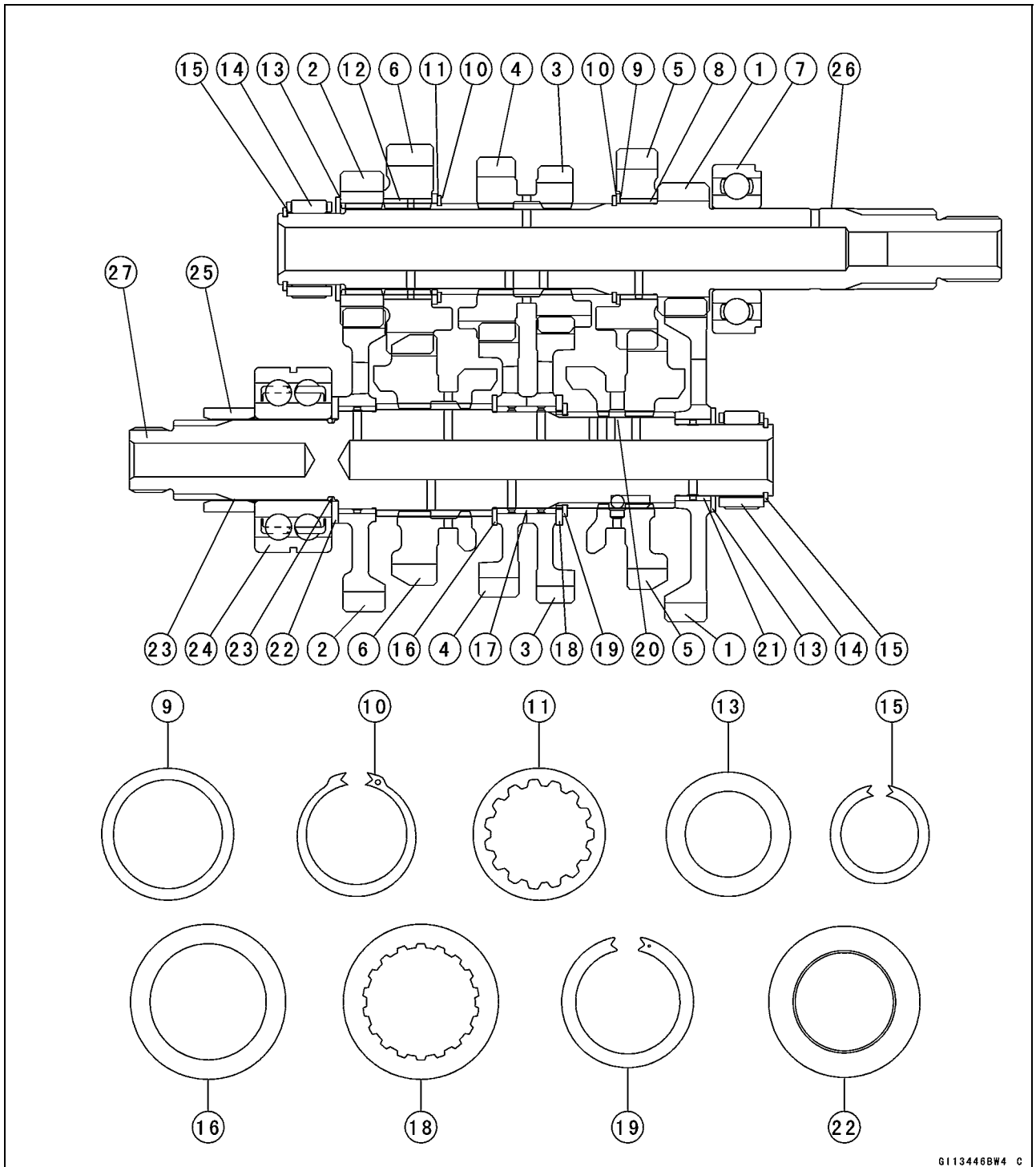
CAUTION

Do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.

- After assembling the 5th gear with steel balls in place on the output shaft, check the ball-locking effect that the 5th gear does not come out of the output shaft when moving it up and down by hand.
- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.



Transmission



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- | | |
|---|---|
| 1. 1st Gear | 15. Circlip |
| 2. 2nd Gear | 16. Washer, ϕ 40 mm (1.57 in.) |
| 3. 3rd Gear | 17. Bushing |
| 4. 4th Gear | 18. Toothed Washer, ϕ 40 mm (1.57 in.) |
| 5. 5th Gear | 19. Circlip |
| 6. 6th (Top) Gear | 20. Steel Ball |
| 7. Ball Bearing | 21. Bushing |
| 8. Bushing | 22. Spacer |
| 9. Washer, ϕ 34 mm (1.34 in.) | 23. O-ring |
| 10. Circlip | 24. Ball Bearing |
| 11. Toothed Washer, ϕ 34 mm (1.34 in.) | 25. Collar |
| 12. Bushing | 26. Drive Shaft |
| 13. Washer, ϕ 32 mm (1.26 in.) | 27. Output Shaft |
| 14. Needle Bearing | |

9-44 CRANKSHAFT/TRANSMISSION

Transmission

Shift Drum and Fork Removal

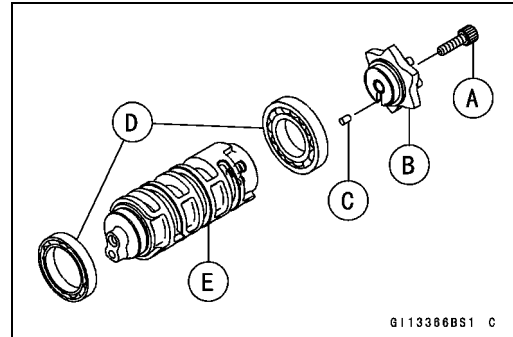
- Refer to the Transmission Assy Disassembly.

Shift Drum and Fork Installation

- Refer to the Transmission Assy Assembly.

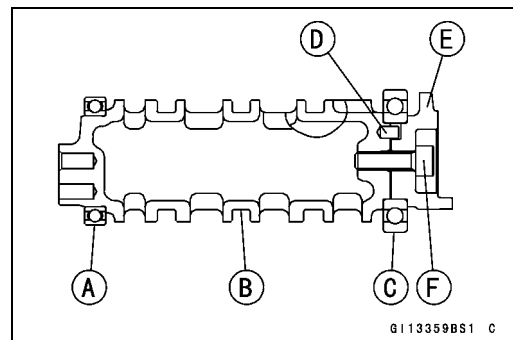
Shift Drum Disassembly

- Remove the shift drum (see Transmission Assy Disassembly).
- While holding the shift drum with a vise, remove the shift drum cam holder bolt [A].
- Remove:
 - Shift Drum Cam [B]
 - Dowel Pin [C]
 - Ball Bearings [D]
 - Shift Drum [E]



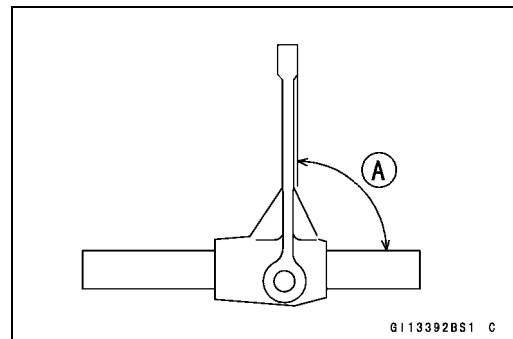
Shift Drum Assembly

- Press and insert the ball bearing [A] on the shift drum [B] until it is bottomed.
 - Install:
 - Ball Bearing [C]
 - Dowel Pin [D] and Shift Drum Cam [E]
 - Align the pin with the groove in the shift drum cam.
 - Apply a non-permanent locking agent to the threads of the shift drum cam holder bolt [F] and tighten it.
- Torque - Shift Drum Cam Holder Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**



Shift Fork Bending Inspection

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power. 90° [A]



Shift Fork/Gear Groove Wear Inspection

- Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves.
- ★ If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

Shift Fork Ear Thickness

Standard: 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)

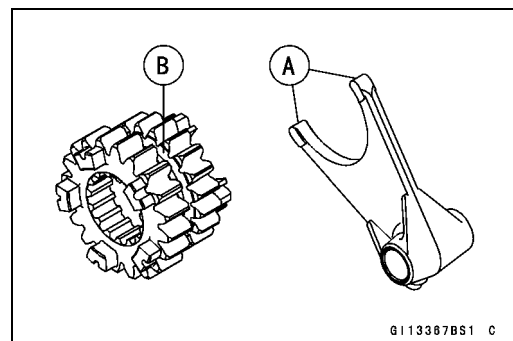
Service Limit: 5.8 mm (0.228 in.)

- ★ If the gear groove is worn over the service limit, the gear must be replaced.

Gear Groove Width

Standard: 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)

Service Limit: 6.25 mm (0.246 in.)



Transmission

Shift Fork Guide Pin/Drum Groove Wear Inspection

- Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.
- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

Shift Fork Guide Pin Diameter

Standard: 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)

Service Limit: 5.8 mm (0.228 in.)

- ★ If any shift drum groove is worn over the service limit, the drum must be replaced.

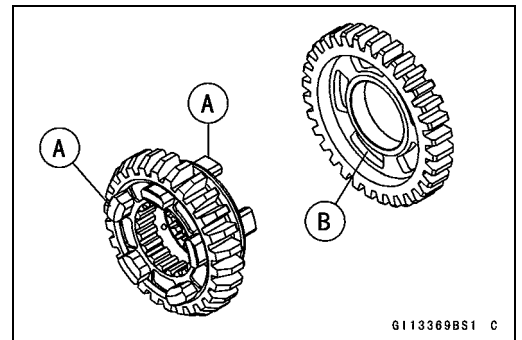
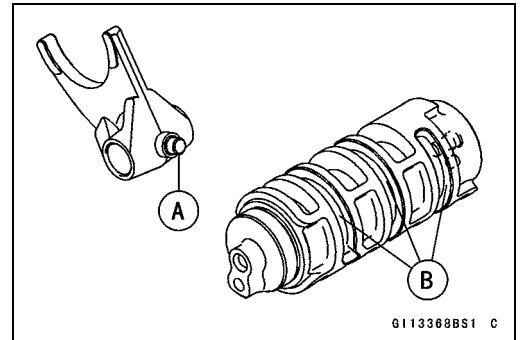
Shift Drum Groove Width

Standard: 6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)

Service Limit: 6.3 mm (0.248 in.)

Gear Dog and Gear Dog Hole 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.

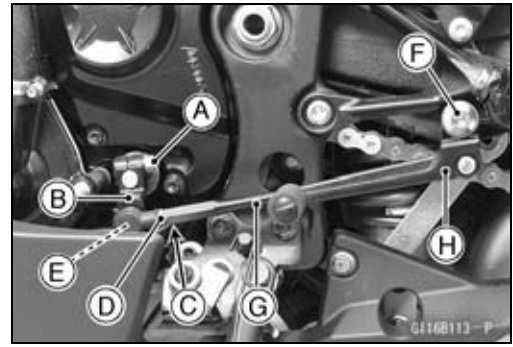


9-46 CRANKSHAFT/TRANSMISSION

External Shift Mechanism

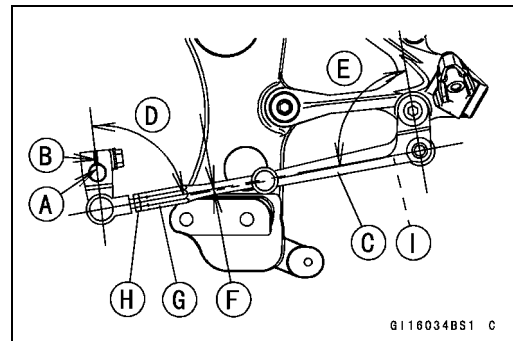
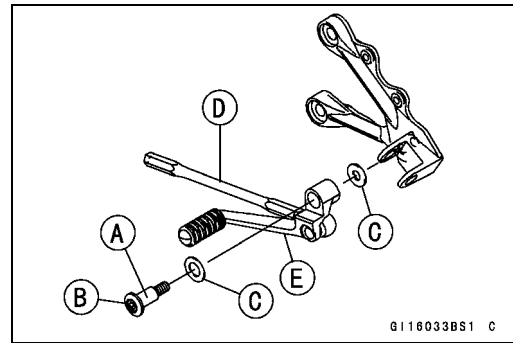
Shift Pedal Removal

- Remove:
 - Shift Lever Bolt [A]
 - Shift Lever [B]
- ★ If the tie-rod is removed from the shift pedal and shift lever, note the following.
 - The following portions have left-hand threads.
 - Shift Lever Side of Tie-Rod (The shift lever side of the tie-rod has the grooves [C].)
 - Locknut [D] of Shift Lever Side
 - Ball Joint [E] of Shift Lever
- Remove:
 - Shift Pedal Mounting Bolt [F]
 - Tie-Rod [G] and Shift Pedal [H]



Shift Pedal Installation

- Apply grease to the sliding surface [A] on the shift pedal mounting bolt [B].
- Apply a non-permanent locking agent to the threads of the shift pedal mounting bolt.
- Install:
 - Washers [C]
 - Tie-Rod [D] and Shift Pedal [E]
- Tighten:
 - Torque - Shift Pedal Mounting Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Align the punch mark [A] on the shift shaft with the slit [B] of the shift lever.
- Tighten:
 - Torque - Shift Lever Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- After installation, confirm that the shift pedal [C] is positioned as shown in the figure.
 - About 86° [D]
 - About 91° [E]
 - 0 ~ 2 mm (0 ~ 0.08 in.) [F] (The length is distance between the center line of the tie-rod [G] and center in the shift pedal end.)
- ★ If the pedal position is different, adjust it as follows.
 - To adjust the pedal position, loosen the front locknut [H] (left-hand threads) and rear locknut [I], and then turn the tie-rod.
 - Tighten:
 - Torque - Tie-Rod Locknuts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

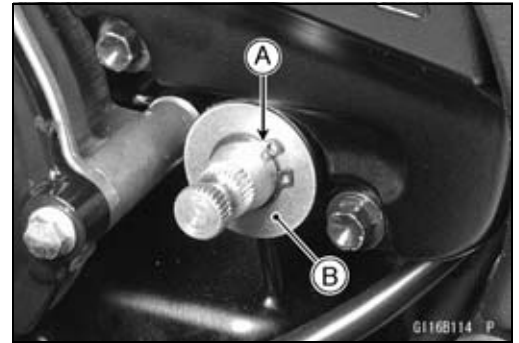


External Shift Mechanism

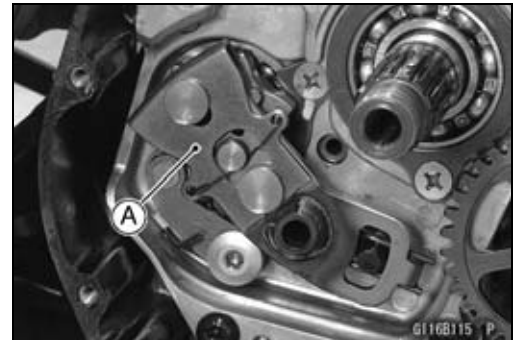
External Shift Mechanism Removal

- Remove:
 - Shift Lever (see Shift Pedal Removal)
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Circlip [A]
 - Washer [B]

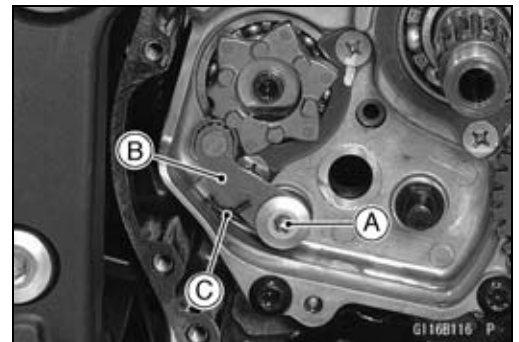
Special Tool - Outside Circlip Pliers: 57001-144



- Remove the shift shaft assembly [A] while pulling out the shift mechanism arm.



- Remove:
 - Gear Positioning Lever Bolt [A]
 - Gear Positioning Lever [B]
 - Collar and Spring [C]

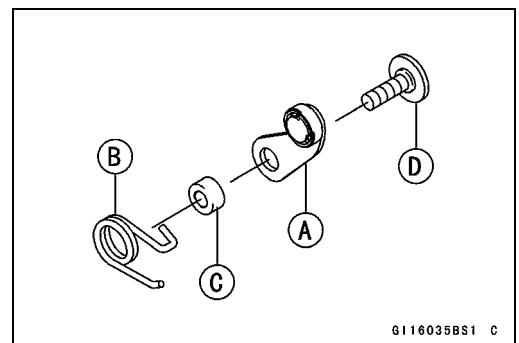


External Shift Mechanism Installation

- Install the gear positioning lever [A] as shown in the figure.

- Install:
 - Spring [B]
 - Collar [C]

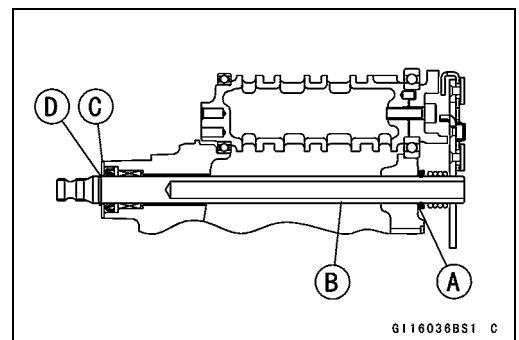
- Tighten:
 - Torque - Gear Positioning Lever Bolt [D]: 12 N·m (1.2 kgf·m, 106 in·lb)**



- Install:
 - Washer [A]
 - Shift Shaft Assembly [B]
 - Washer [C]
 - New Circlip [D]

Special Tool - Outside Circlip Pliers: 57001-144

- Fit the circlip into the groove of the shift shaft securely.

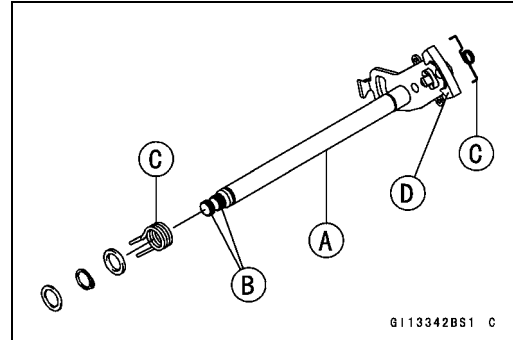


9-48 CRANKSHAFT/TRANSMISSION

External Shift Mechanism

External Shift Mechanism Inspection

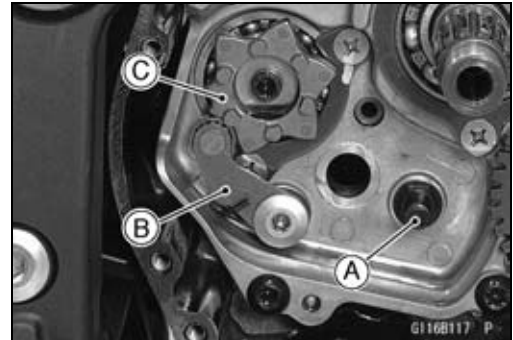
- Examine the shift shaft [A] for any damage.
- ★ If the shaft is bent, replace it.
- ★ If the serration [B] are damaged, replace the shaft.
- ★ If the springs [C] are damaged in any way, replace them.
- ★ If the shift mechanism arm [D] is damaged in any way, replace the shaft.



- Check the return spring pin [A] is not loose.
- ★ If it is loose, unscrew it, apply a non-permanent locking agent to the threads of the return spring pin, and tighten it.

Torque - Shift Shaft Return Spring Pin: 28 N·m (2.9 kgf·m, 21 ft·lb)

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



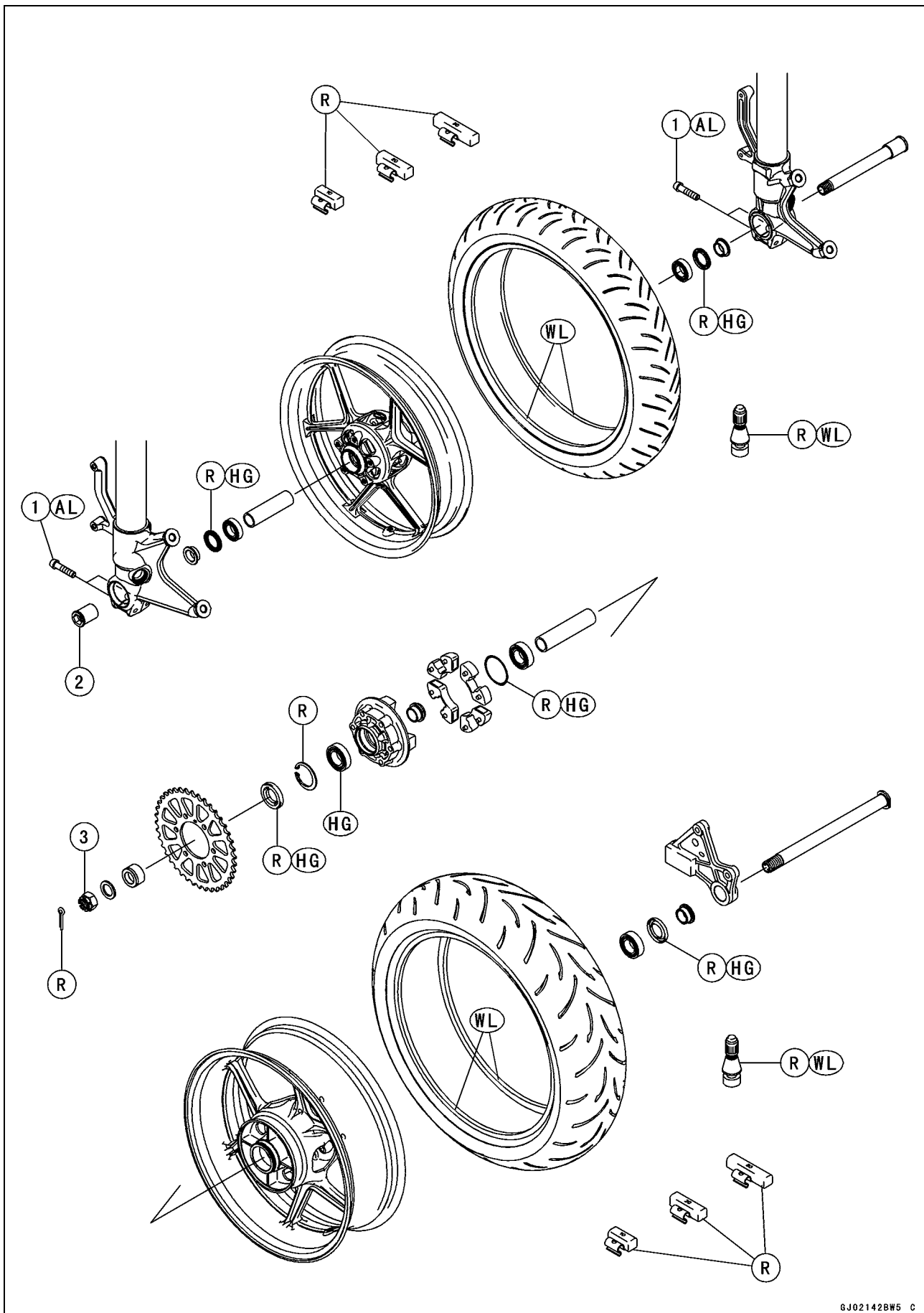
Wheels/Tires

Table of Contents

Exploded View	10-2
Specifications	10-4
Special Tools	10-5
Wheels (Rims)	10-6
Front Wheel Removal	10-6
Front Wheel Installation	10-7
Rear Wheel Removal	10-8
Rear Wheel Installation	10-8
Wheel Inspection	10-10
Axle Inspection	10-10
Balance Inspection	10-11
Balance Adjustment	10-11
Balance Weight Removal	10-11
Balance Weight Installation	10-11
Tires	10-13
Air Pressure Inspection/Adjustment	10-13
Tire Inspection	10-13
Tire Removal	10-13
Tire Installation	10-13
Tire Repair	10-15
Hub Bearing	10-16
Hub Bearing Removal	10-16
Hub Bearing Installation	10-16
Hub Bearing Inspection	10-16
Hub Bearing Lubrication	10-17

10-2 WHEELS/TIRES

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Front Axle Clamp Bolts	20	2.0	15	AL
2	Front Axle Nut	127	13.0	93.7	
3	Rear Axle Nut	127	13.0	93.7	

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

HG: Apply high-temperature grease.

R: Replacement Parts

WL: Apply soap and water solution or rubber lubricant.

10-4 WHEELS/TIRES

Specifications

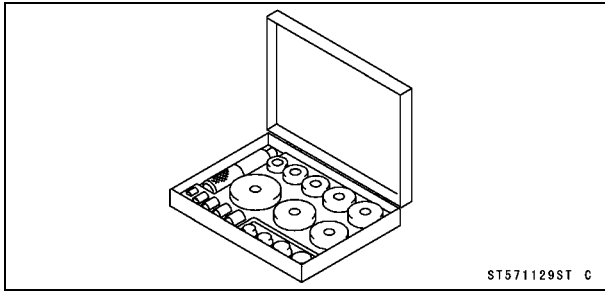
Item	Standard	Service Limit
Wheels (Rims)		
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 1.0 mm (0.04 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 1.0 mm (0.04 in.)
Axle Runout/100 mm (3.94 in.)	TIR 0.03 mm (0.0012 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.35 oz.) or less	— — —
Balance Weights	10 g (0.35 oz.), 20 g (0.71 oz.), 30 g (1.06 oz.)	— — —
Rim Size:		
Front	17 × 3.50	— — —
Rear	17 × 5.50	— — —
Tires		
Air Pressure (when Cold):		
Front	Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm ² , 36 psi)	— — —
Rear	Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm ² , 42 psi)	— — —
Tread Depth:		
Front	3.6 mm (0.14 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	5.3 mm (0.21 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Standard Tires:	Make, Type	Size
Front	BRIDGESTONE, BATTLEAX BT016F L	120/70 ZR17 M/C (58 W)
Rear	BRIDGESTONE, BATTLEAX BT016R L	180/55 ZR17 M/C (73 W)

WARNING

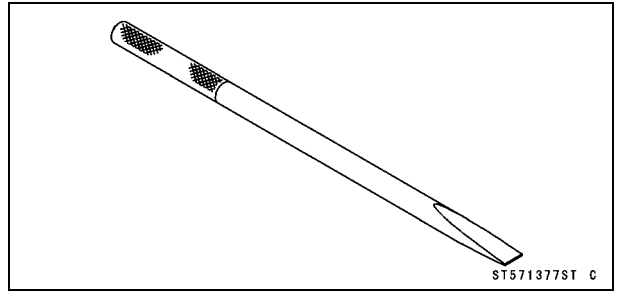
Use the same manufacturer's tires on both front and rear wheels.

Special Tools

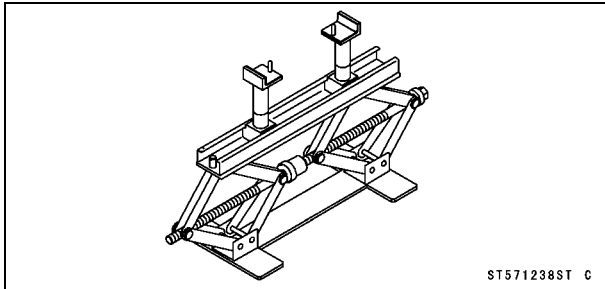
Bearing Driver Set:
57001-1129



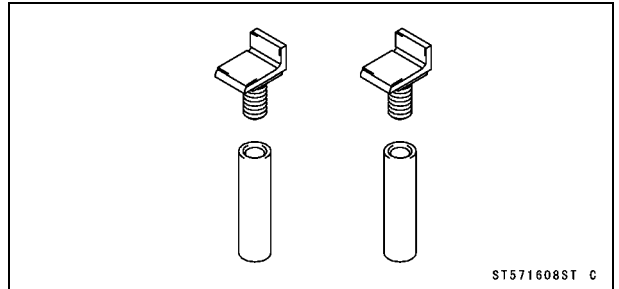
Bearing Remover Shaft, $\phi 13$:
57001-1377



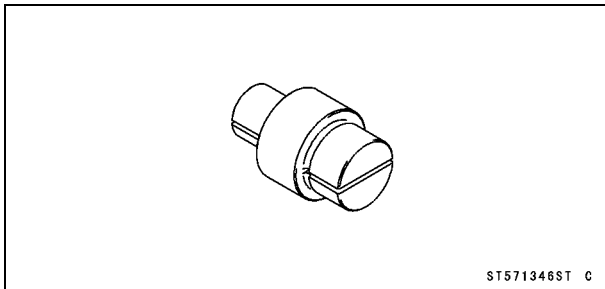
Jack:
57001-1238



Jack Attachment:
57001-1608



Bearing Remover Head, $\phi 25 \times \phi 28$:
57001-1346



10-6 WHEELS/TIRES

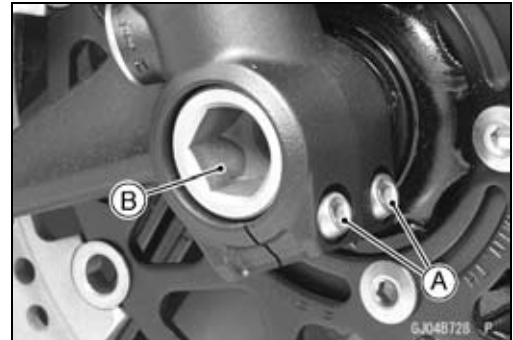
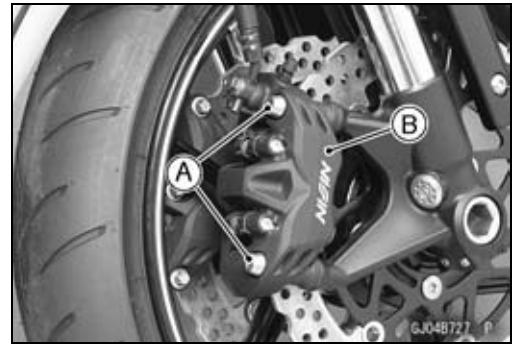
Wheels (Rims)

Front Wheel Removal

- Remove:
 - Front Caliper Mounting Bolts [A] (Both Sides)
 - Front Caliper [B] (Both Sides)

- Loosen:
 - Front Axle Clamp Bolts [A] (Right Side)
 - Front Axle [B]

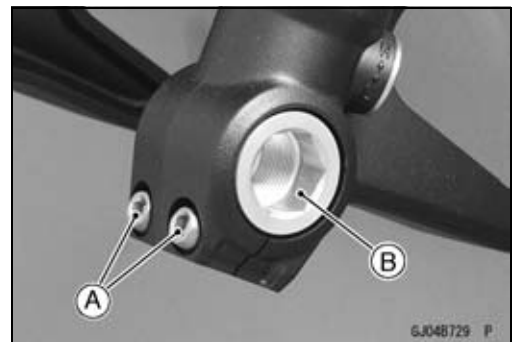
- Remove the lower fairings (see Lower Fairing Removal in the Frame chapter).
- Raise the front wheel off the ground.
 - Special Tools - Jack: 57001-1238**
 - Jack Attachment: 57001-1608**
- Pull out the axle to the right side and drop the front wheel out of the front forks.



CAUTION

Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

- Loosen the axle clamp bolts (left side) [A] and remove the axle nut [B].



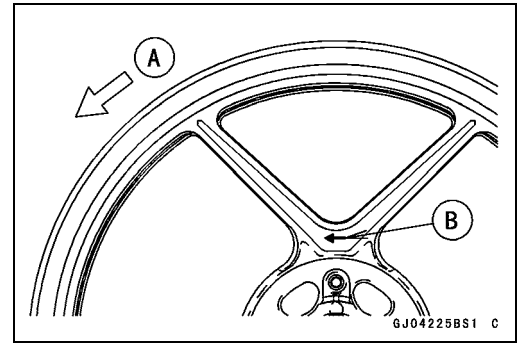
Wheels (Rims)

Front Wheel Installation

NOTE

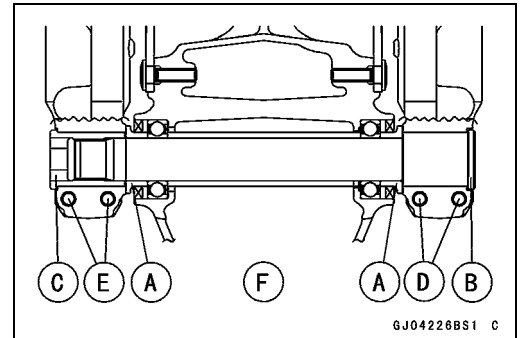
○ The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel spoke.

- Check the wheel rotation mark on the front wheel and install it.



- Apply high-temperature grease to the grease seal lips.
- Fit the collars [A] on the both sides of the hub.
- The collars are identical.
- Insert the axle [B] from the right side.
- Tighten the axle nut [C].
 - Right Axle Clamp Bolts [D]
 - Left Axle Clamp Bolts [E]
 - Viewed from Rear [F]

Torque - Front Axle Nut: 127 N·m (13.0 kgf·m, 93.7 ft·lb)



- Before tightening the axle clamp bolts on the right front fork leg, pump the front fork up and down 4 or 5 times to all on the right front fork leg to seat on the front axle.

NOTE

○ Put a block in front of the front wheel to stop moving.

- Tighten the axle clamp bolts on the right fork leg first. Next, tighten the left axle clamp bolts.

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

NOTE

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

- Install the removed parts (see appropriate chapters).
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

⚠ WARNING

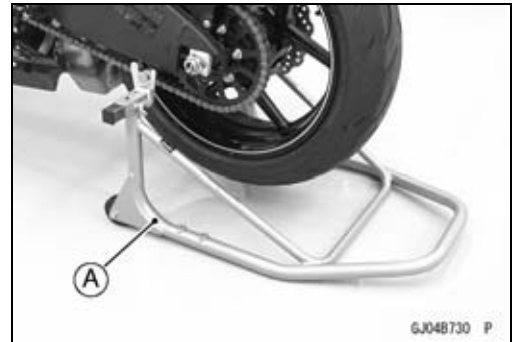
Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

10-8 WHEELS/TIRES

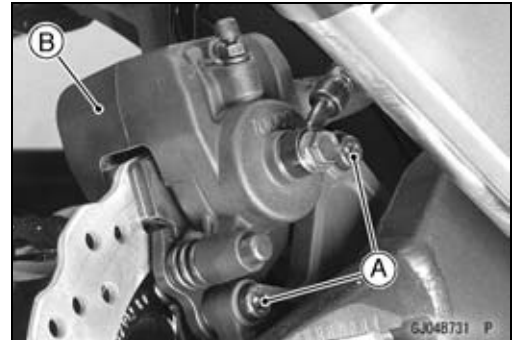
Wheels (Rims)

Rear Wheel Removal

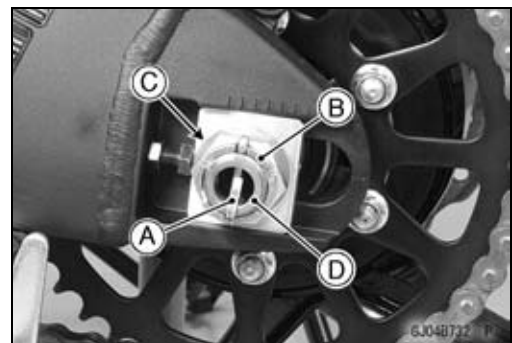
- Raise the rear wheel off the ground with the stand [A].



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



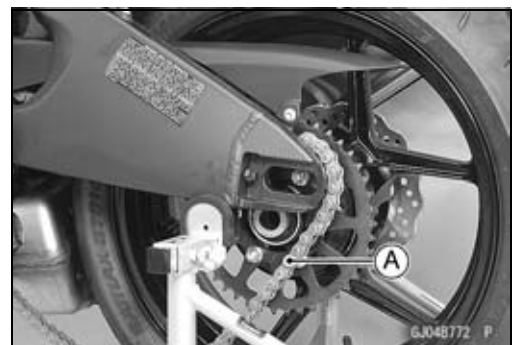
- Remove:
 - Cotter Pin [A]
 - Axle Nut [B]
 - Washer [C]
 - Axle [D] (from Right Side)



- Remove the drive chain [A] from the rear sprocket toward the left.
- Move the rear wheel back and remove it.

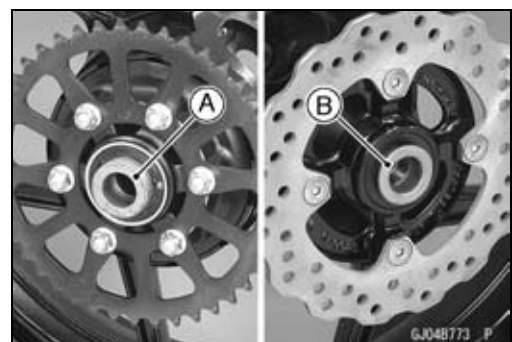
CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.



Rear Wheel Installation

- Apply high-temperature grease to the grease seal lips.
- Fit the collars on the both sides of the hub.
 - Left Side Collar [A]
 - Right Side Collar [B] (with Flange)



Wheels (Rims)

- Engage the drive chain with the rear sprocket.
- Install the caliper bracket [A] onto the stopper [B] of the swingarm.
- Insert the axle from the right side of the wheel.
- Install the washer and axle nut.
- Adjust the drive chain slack before tightening the axle nut (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
- Tighten:
 - Torque - Rear Axle Nut: 127 N·m (13.0 kgf·m, 93.7 ft·lb)**
- Insert a new cotter pin [A].

NOTE

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

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

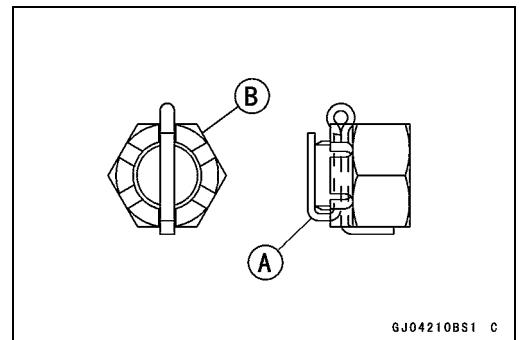
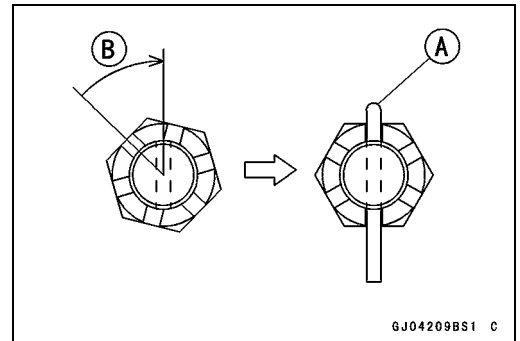
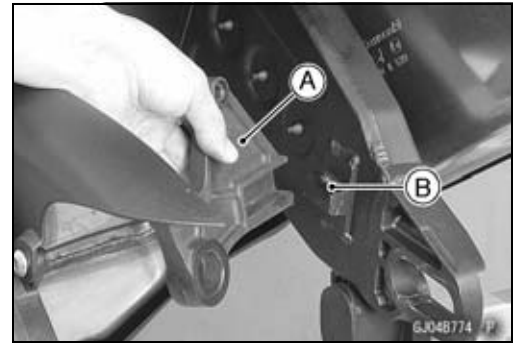
⚠ WARNING

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

- Install the rear caliper (see Caliper Installation in the Brakes chapter).
- Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

⚠ WARNING

Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.



10-10 WHEELS/TIRES

Wheels (Rims)

Wheel Inspection

- Raise the front/rear wheel off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Spin the wheel lightly, and check for roughness or binding.
- ★ If roughness or binding is found, replace the hub bearings (see Hub Bearing Removal/Installation).
- Inspect the wheel for small cracks, dents, bending, or warp.
- ★ If there is any damage to the wheel, replace the wheel.
- Remove the wheel, and support it with the tire by the axle.
- Measure the rim runout, axial [A] and radial [B], with a dial gauge.
- ★ If rim runout exceeds the service limit, check the hub bearings (see Hub Bearing Inspection).
- ★ If the problem is not due to the bearings, replace the wheel.

Rim Runout (with tire installed)

Standard:

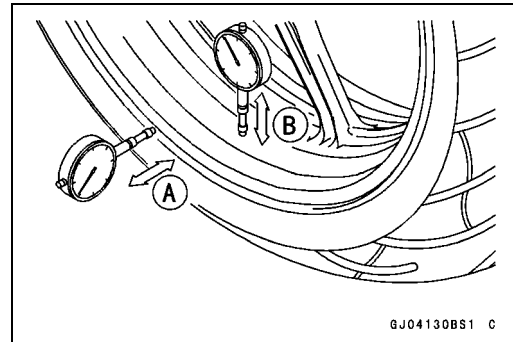
Axial TIR 0.5 mm (0.02 in.) or less

Radial TIR 0.8 mm (0.03 in.) or less

Service Limit:

Axial TIR 1.0 mm (0.04 in.)

Radial TIR 1.0 mm (0.04 in.)



⚠ WARNING

Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.

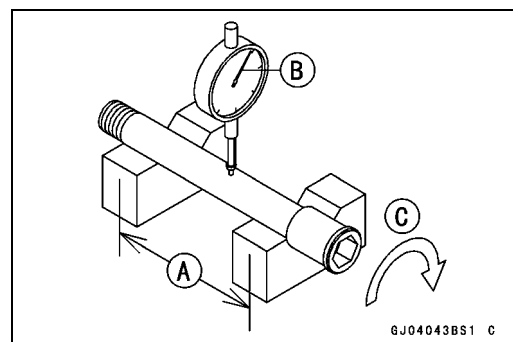
Axle Inspection

- Remove the front and rear axles (see Front/Rear Wheel Removal).
- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the axle at a point halfway between the blocks. Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.
- ★ If axle runout exceeds the service limit, replace the axle.

Axle Runout/100 mm (3.94 in.)

Standard: TIR 0.03 mm (0.0012 in.) or less

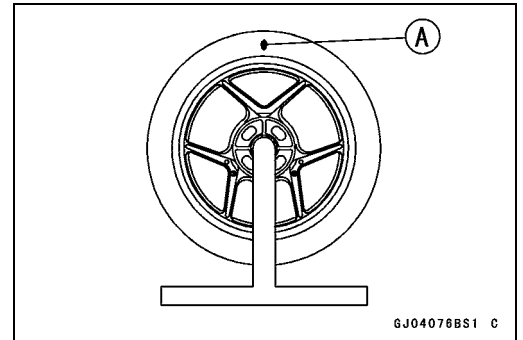
Service Limit: TIR 0.2 mm (0.008 in.)



Wheels (Rims)

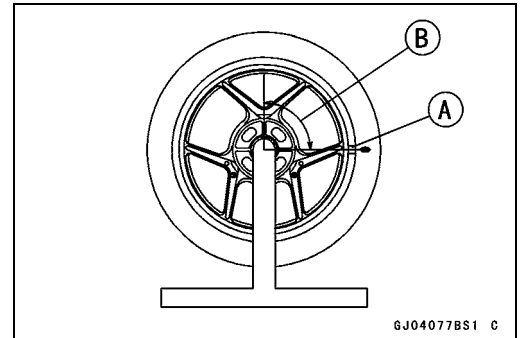
Balance Inspection

- Remove the front and rear wheels (see Front/Rear Wheel Removal).
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.
- ★ If the wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).



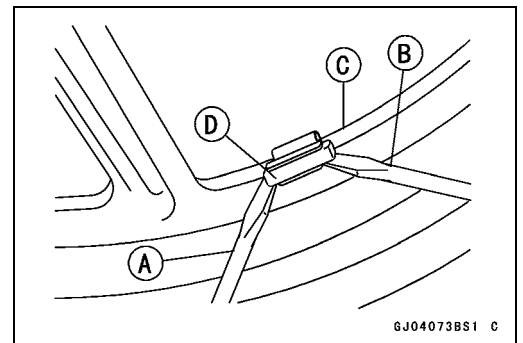
Balance Adjustment

- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.
- ★ If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.
- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.



Balance Weight Removal

- Insert a regular tip screwdrivers [A] [B] between the rib [C] and weight [D] as shown in the figure.
- Pry the balance weight with two screwdrivers and remove the balance weight.
- Discard the used balance weight.



CAUTION

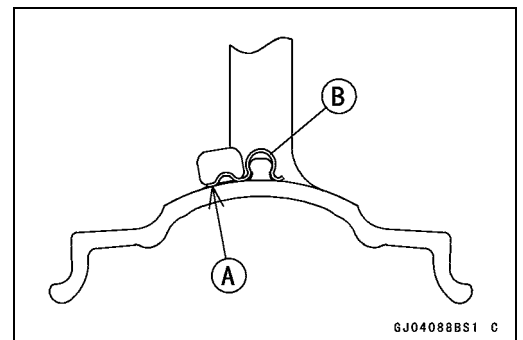
Do not tap the screwdrivers. The rim could be damaged.

Balance Weight Installation

- Check if the weight portion has any play on the blade [A] and clip [B].
- ★ If it does, discard it.

⚠ WARNING

If the balance weight has any play on the rib of the rim, the blade and/or clip have been stretched. Replace the loose balance weight. Do not reuse used balance weight. Unbalanced wheels can create an unsafe riding condition.



10-12 WHEELS/TIRES

Wheels (Rims)

Balance Weight

Part Number	Weight
41075-0007	10 g (0.35 oz.)
41075-0008	20 g (0.71 oz.)
41075-0009	30 g (1.06 oz.)

NOTE

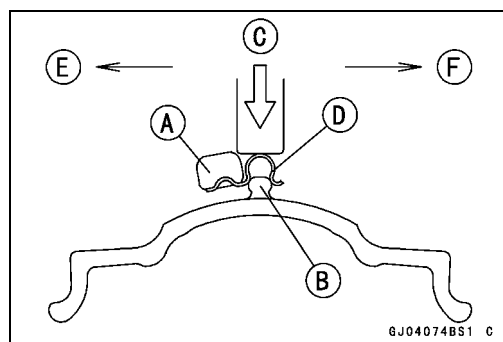
○Balance weights are available from Kawasaki dealers in 10, 20 and 30 grams (0.35, 0.71 and 1.06 oz.) sizes. An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.

○Do not use four or more balance weight (more than 90 gram, 3.2 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.

- Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].

Left Side [E]

Right Side [F]

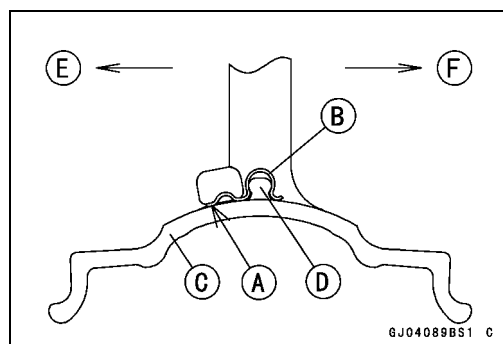


- Be sure to install the balance weight.

○Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].

Left Side [E]

Right Side [F]



Tires

Air Pressure Inspection/Adjustment

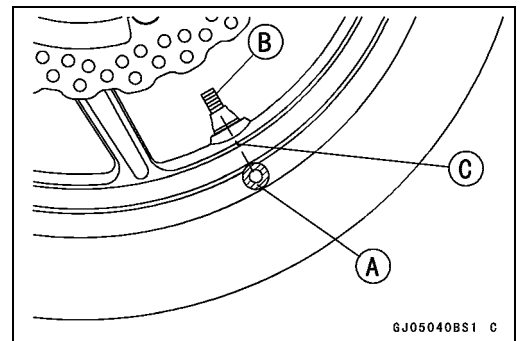
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

Tire Inspection

- Refer to the Wheel/Tire Damage Inspection in the Periodic Maintenance chapter.

Tire Removal

- Remove:
 - Wheels (see Front/Rear Wheel Removal)
 - Valve Core (Let out the air)
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
 - Chalk Mark or Yellow Mark [A]
 - Valve Stem [B]
 - Align [C]



- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

CAUTION

Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.

- Remove the tire from the rim using a suitable commercially available tire changer.

NOTE

○ *The tires cannot be removed with hand tools because they fit the rims too tightly.*

Tire Installation

▲ WARNING

Use the same manufacturer's on both front and rear wheels.

- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

CAUTION

Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

10-14 WHEELS/TIRES

Tires

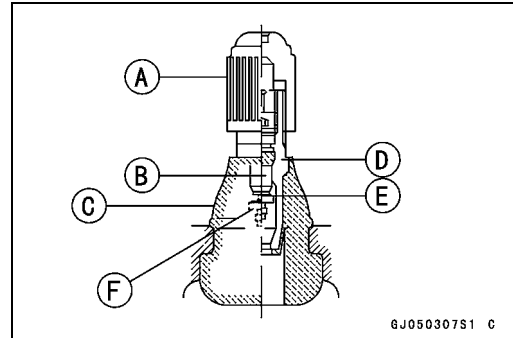
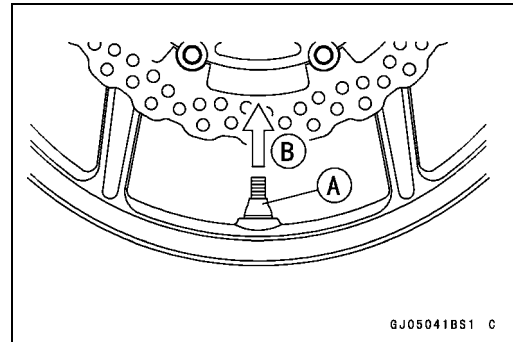
- Install a new valve in the rim.
- Remove the valve cap, lubricate the stem seal [A] with a soap and water solution or rubber lubricant, and pull [B] the valve stem through the rim from the inside out until it snaps into place.

CAUTION

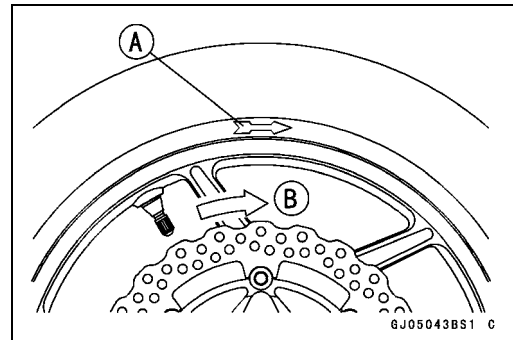
Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.

- The air valve is shown in the figure.

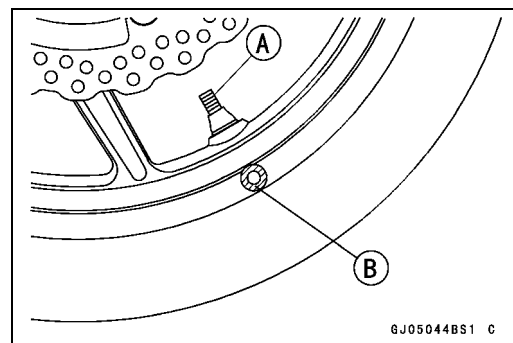
Valve Cap [A]
Valve Core [B]
Stem Seal [C]
Valve Stem [D]
Valve Seat [E]
Valve Opened [F]



- Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.
Tire Rotation Mark [A]
Rotating Direction [B]



- Position the tire on the rim so that the valve [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
- Install the tire bead over the rim flange using a suitable commercially available tire changer.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.

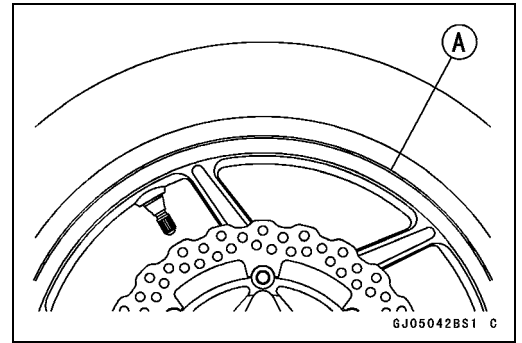


⚠ WARNING

Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/cm², 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.

Tires

- Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.
- ★ If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.
- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leakage.
- Inflate the tire slightly above standard inflation.
- Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.
- Adjust the air pressure to the specified pressure (see Air Pressure Inspection in the Periodic Maintenance chapter).
- Install the air valve cap.
- Adjust the wheel balance (see Balance Adjustment).



Tire Repair

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

10-16 WHEELS/TIRES

Hub Bearing

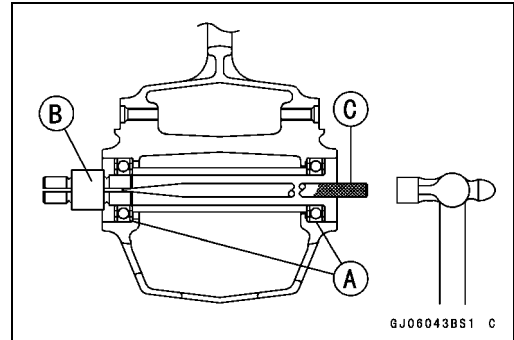
Hub Bearing Removal

- Remove the wheels (see Front/Rear Wheel Removal), and take out the following.
 - Collars
 - Coupling (Out of rear hub)
 - Grease Seals
- Use the bearing remover to remove the hub bearings [A].

CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

- Special Tools - Bearing Remover Head, $\phi 25 \times \phi 28$ [B]: 57001-1346
Bearing Remover Shaft, $\phi 13$ [C]: 57001-1377



Hub Bearing Installation

- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.

NOTE

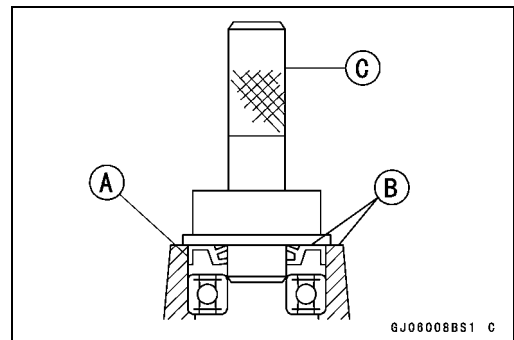
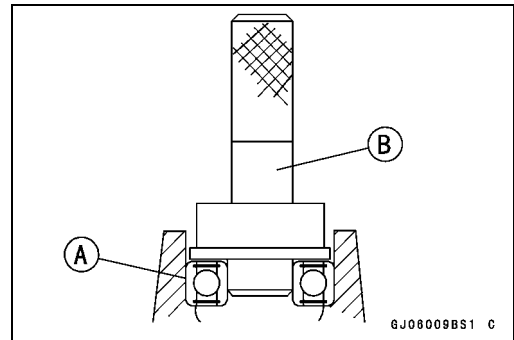
○ Install the bearings so that the marked side faces out.

- Install the bearings by using the bearing driver set which does not contact the bearing inner race.
- Press in each right the bearing [A] until they are bottomed.

Special Tool - Bearing Driver Set [B]: 57001-1129

- Replace the grease seals with new ones.
- Press in the grease seals [A] so that the seal surface is flush [B] with the end of the hole.
- Apply high-temperature grease to the grease seal lips.

Special Tool - Bearing Driver Set [C]: 57001-1129



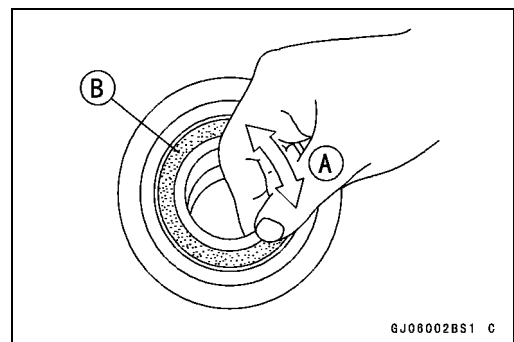
Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

NOTE

○ Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.

- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



Hub Bearing

Hub Bearing Lubrication

NOTE

- *Since the hub bearings are packed with grease and sealed, lubrication is not required.*

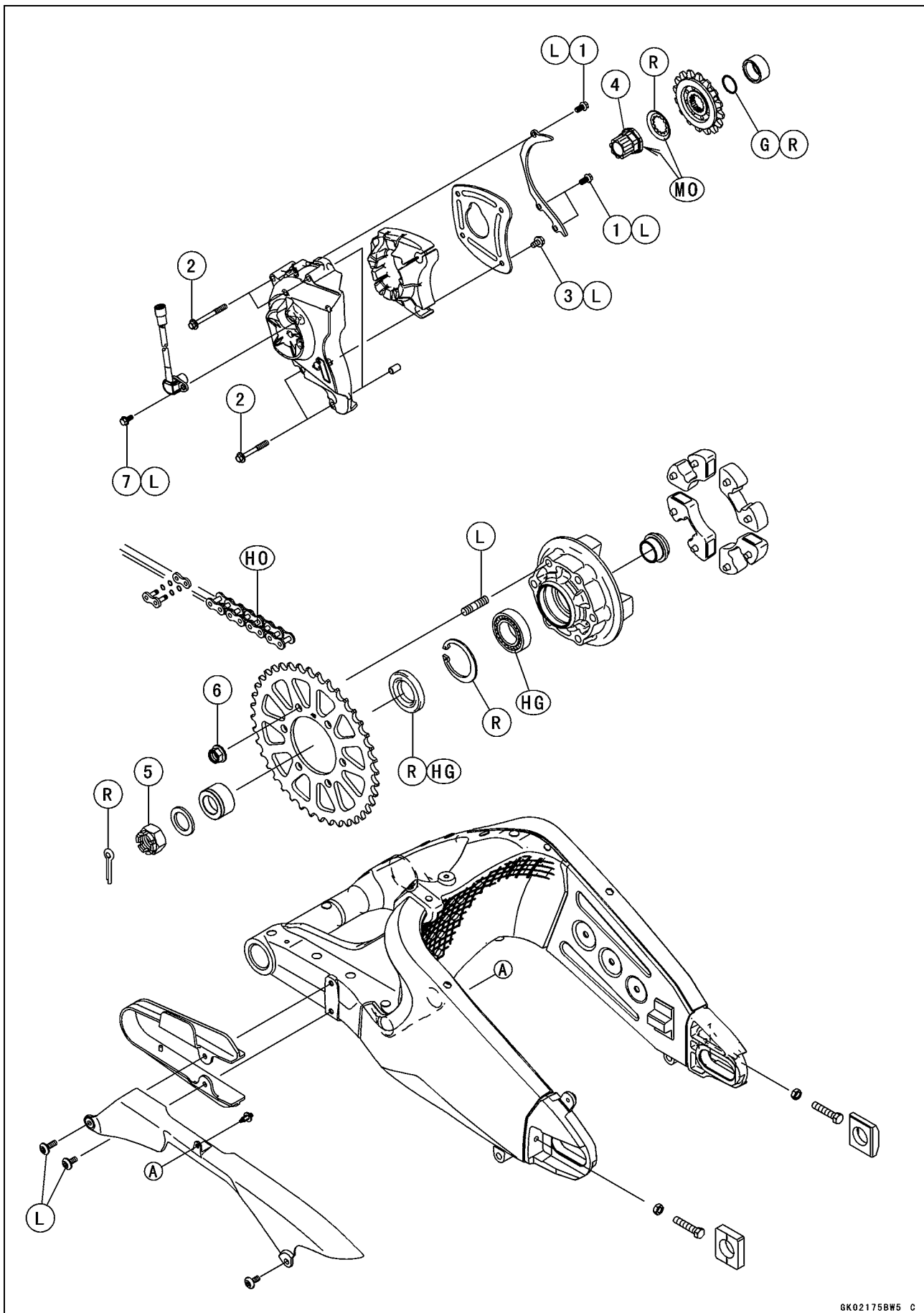
Final Drive

Table of Contents

Exploded View	11-2
Specifications	11-4
Special Tools	11-5
Drive Chain.....	11-6
Drive Chain Slack Inspection.....	11-6
Drive Chain Slack Adjustment	11-6
Wheel Alignment Inspection/Adjustment	11-6
Drive Chain Wear Inspection	11-6
Drive Chain Lubrication.....	11-6
Drive Chain Guide Wear Inspection.....	11-6
Drive Chain Removal.....	11-6
Sprocket, Coupling	11-10
Engine Sprocket Removal	11-10
Engine Sprocket Installation	11-10
Rear Sprocket Removal.....	11-11
Rear Sprocket Installation.....	11-12
Coupling Installation.....	11-12
Coupling Bearing Removal	11-12
Coupling Bearing Installation	11-13
Coupling Bearing Inspection.....	11-13
Coupling Bearing Lubrication.....	11-13
Coupling Damper Inspection.....	11-13
Sprocket Wear Inspection.....	11-14
Rear Sprocket Warp Inspection	11-14

11-2 FINAL DRIVE

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Chain Guide Bolts	9.8	1.0	87 in·lb	L
2	Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
3	Engine Sprocket Cover Plate Mounting Bolts	9.8	1.0	87 in·lb	L
4	Engine Sprocket Nut	125	13.0	92.2	MO
5	Rear Axle Nut	127	13.0	93.7	
6	Rear Sprocket Nuts	59	6.0	44	
7	Speed Sensor Bolt	6.9	0.70	61 in·lb	L

G: Apply grease.

HG: Apply high-temperature grease.

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

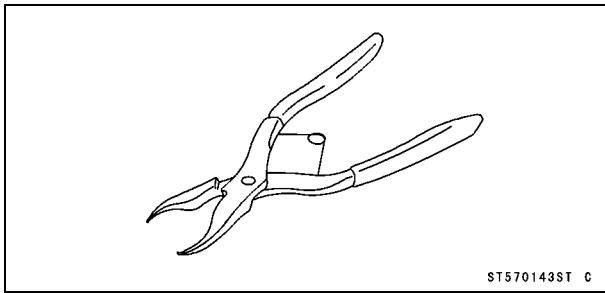
11-4 FINAL DRIVE

Specifications

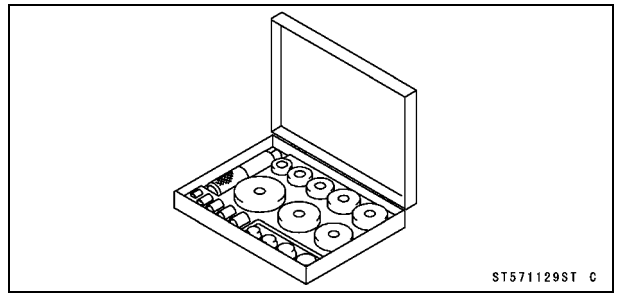
Item	Standard	Service Limit
Drive Chain		
Drive Chain Slack	30 ~ 40 mm (1.2 ~ 1.6 in.)	---
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	ENUMA	---
Type	EX520MVXL2	---
Link	112 links	---
Sprockets		
Rear Sprocket Warp	TIR 0.4 mm (0.016 in.) or less	TIR 0.5 mm (0.020 in.)

Special Tools

Inside Circlip Pliers:
57001-143



Bearing Driver Set:
57001-1129



11-6 FINAL DRIVE

Drive Chain

Drive Chain Slack Inspection

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

Drive Chain Slack Adjustment

- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

Wheel Alignment Inspection/Adjustment

- Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

Drive Chain Wear Inspection

- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

Drive Chain Lubrication

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

Drive Chain Guide Wear Inspection

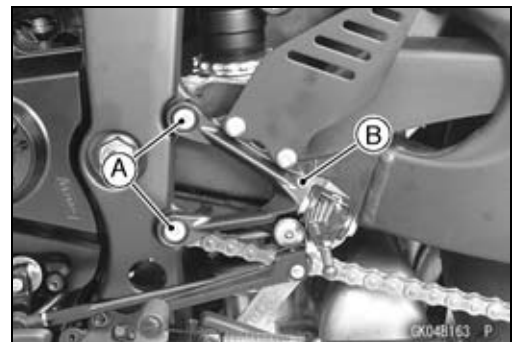
- Refer to the Chain Guide Wear Inspection in the Periodic Maintenance chapter.

Drive Chain Removal

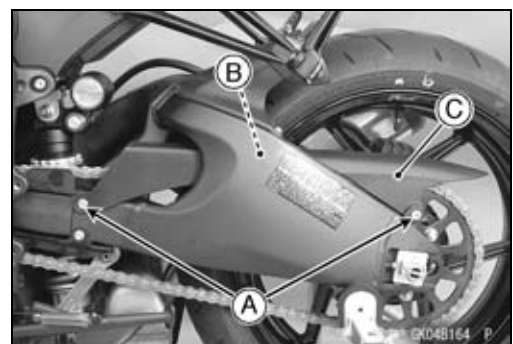
NOTE

- Since the drive chain is installed through the swingarm, The chain can not be removed other than by cutting it. Prepare the new link pin, link plate, grease seals, and tools for rejoining the chain.

- Remove:
 - Bolts [A]
 - Front Footpeg Bracket [B]



- Remove:
 - Bolts [A]
 - Quick Rivet [B]
 - Chain Cover [C]
- Push the central pin, and then remove the quick rivet.



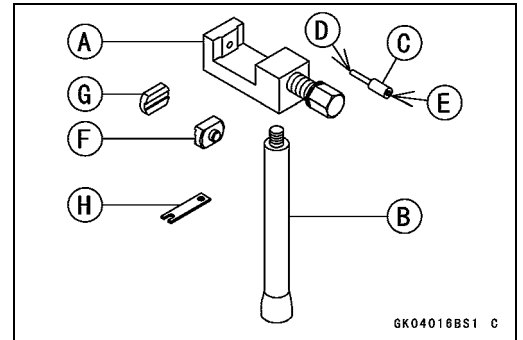
CAUTION

For safety, if the drive chain shall be replaced, replace it using a recommended tool.

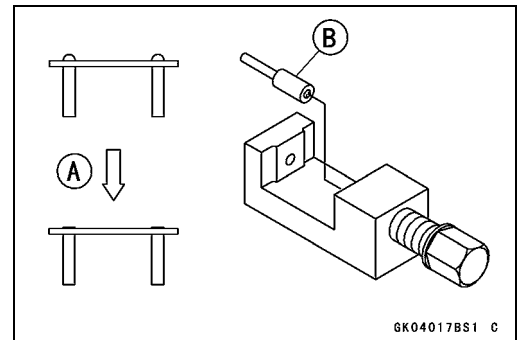
**Recommended Tool - Type: EK Joint Tool #50
Brand: ENUMA**

Drive Chain

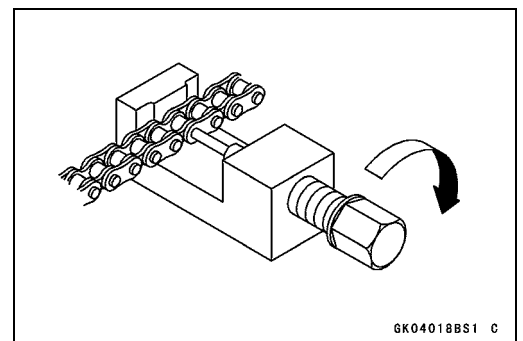
- Body [A]
- Handlebar [B]
- Cutting and Riveting Pin [C]
- For Cutting [D]
- For Riveting [E]
- Plate Holder (A) [F]
- Plate Holder (B) [G]
- Gauge [H]



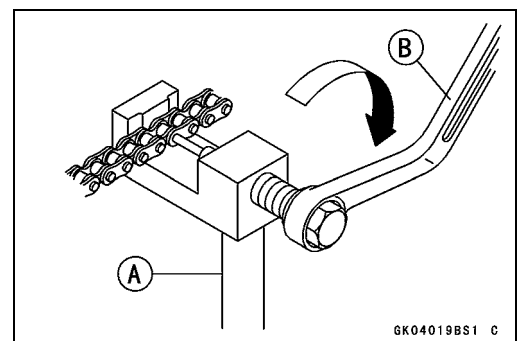
- Grind [A] the pin head to make it flat.
- Set the cutting and riveting pin [B] as shown in the figure.



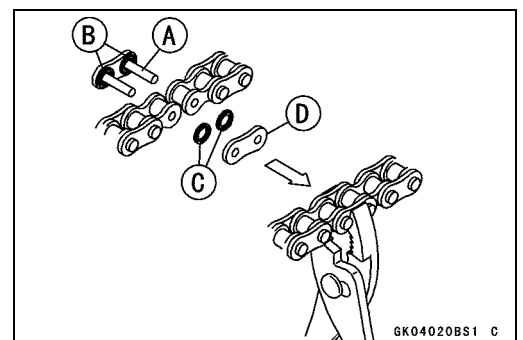
- Screw the pin holder until it touches the link pin.
- Be sure that the cutting pin hits center of the link pin.



- Screw the handlebar [A] into the body.
- Turn the pin holder with the wrench [B] clockwise to extract the link pin.



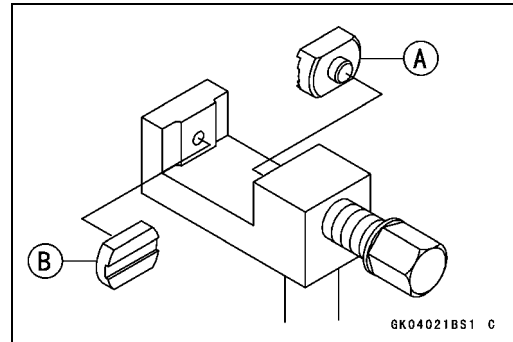
- Replace the link pin, link plate and grease seals.
- Apply grease to the link pins [A] and grease seals [B] [C].
- Engage the drive chain on the engine and rear sprockets.
- Insert the link pins in the drive chain ends.
- Install the grease seals.
- Install the link plate so that the mark [D] faces out.
- Push the link plate by hand or plier to fix it.
- In case of grease seals chain, be sure to set the grease seals correctly.



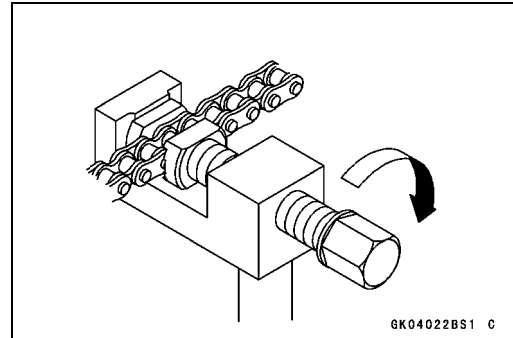
11-8 FINAL DRIVE

Drive Chain

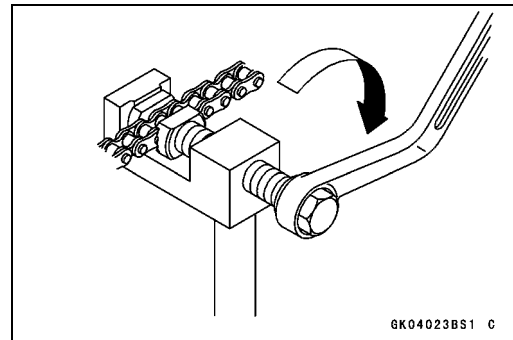
- Set the plate holder (A) [A] and plate holder (B) [B] on the body.



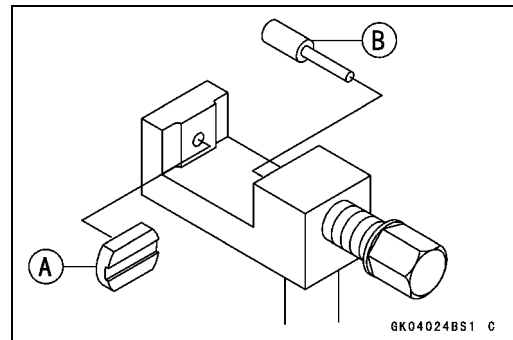
- Fit the plate holder (A) to the link plate.
- Turn the pin holder by hand until the plate holder (B) touches the other link plate.



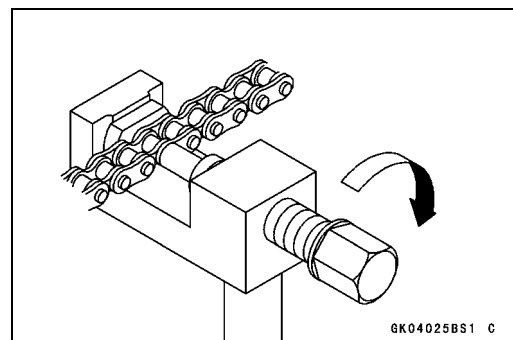
- Turn the pin holder by a wrench clockwise until two pins of link come into groove of the plate holder (A).
- Take off the plate holder.



- Set the plate holder (B) [A] and cutting and riveting pin [B] as shown in the figure.

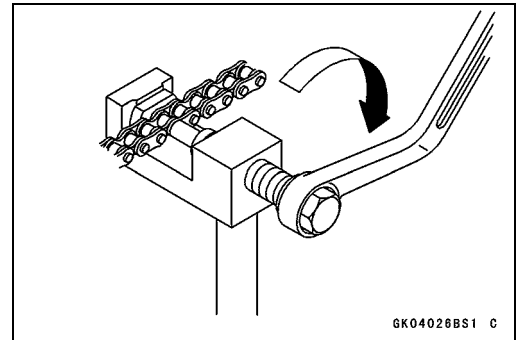


- Turn the pin holder until the riveting pin touches the link pin.



Drive Chain

- Turn the wrench clockwise until the tip of riveting pin hits of the link pin.
- Rivet it.
- Same work for the other link pin.



- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates width [B].

Link Pin Outside Diameter

Standard: 5.7 ~ 6.0 mm (0.22 ~ 0.24 in.)

Link Plates Outside Width

Standard: 17.25 ~ 17.45 mm (0.679 ~ 0.687 in.)

- ★ If the reading exceeds the specified length, cut and rejoin the chain again.

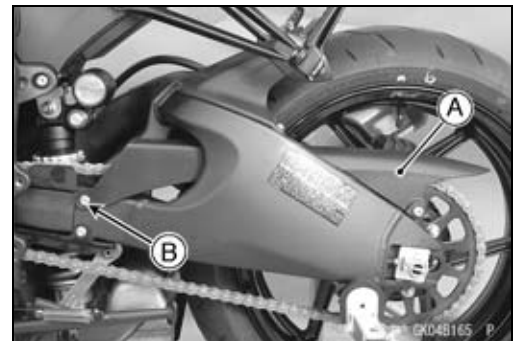
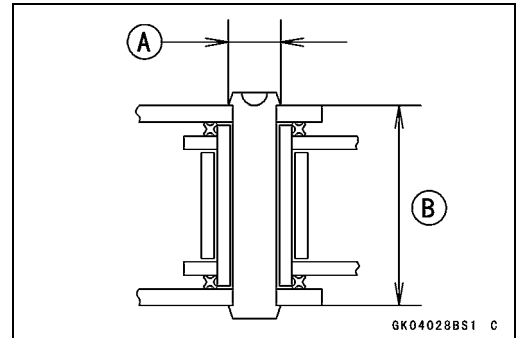
- Check:

Movement of the Rollers

- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

- When installing the chain cover [A], note the following.
 - Apply a non-permanent locking agent to the bolt [B] only.
- Install the front footpeg bracket.
- Tighten:

Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

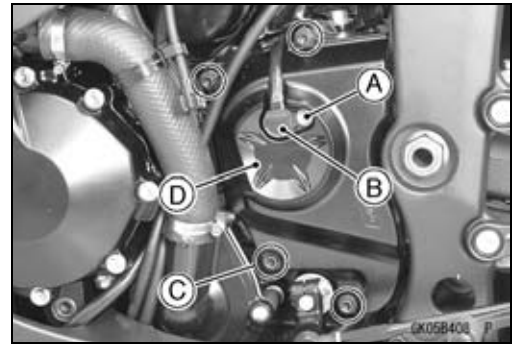


11-10 FINAL DRIVE

Sprocket, Coupling

Engine Sprocket Removal

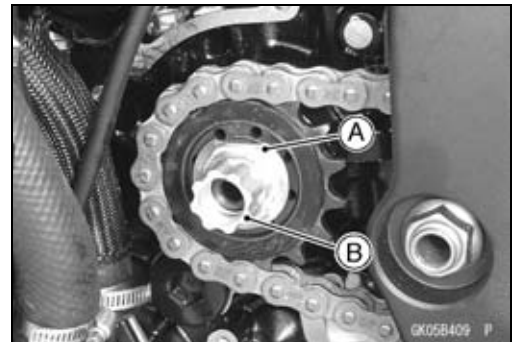
- Remove:
 - Speed Sensor Bolt [A]
 - Speed Sensor [B]
 - Engine Sprocket Cover Bolts [C]
 - Engine Sprocket Cover [D]



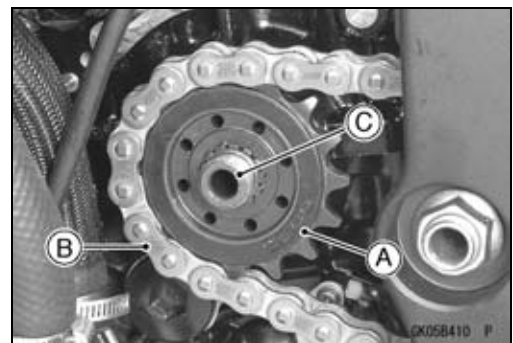
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

NOTE

○ When loosening the engine sprocket nut, hold the rear brake on.



- Raise the rear wheel off the ground with the stand.
- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Pull the engine sprocket [A] with drive chain [B] off the output shaft [C].
- Disengage the drive chain from the engine sprocket.



Engine Sprocket Installation

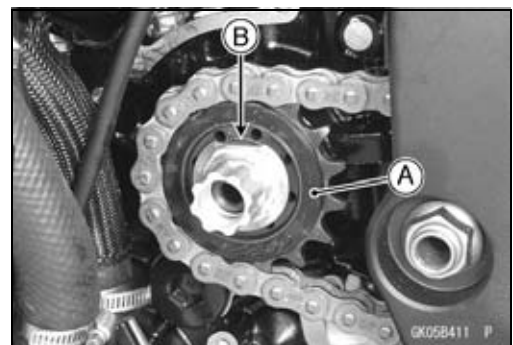
- Replace the sprocket washer and axle cotter pin.
- Install the engine sprocket [A] onto the output shaft.
- Apply molybdenum disulfide oil solution to the threads of the output shaft and the seating surface of the engine sprocket nut.
- Tighten:

Torque - Engine Sprocket Nut: 125 N·m (13.0 kgf·m, 92.2 ft·lb)

NOTE

○ Tighten the engine sprocket nut while applying the rear brake.

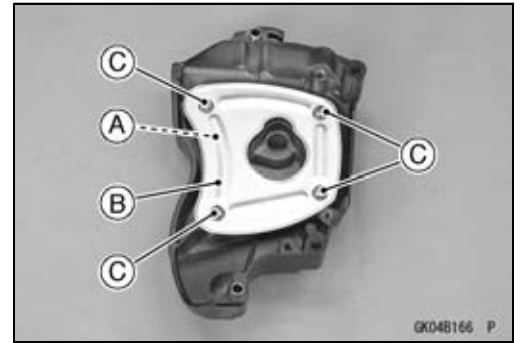
- After torquing the engine sprocket nut, bend [B] the one side of the washer over the nut.
- Adjust the drive chain slack after installing the engine sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



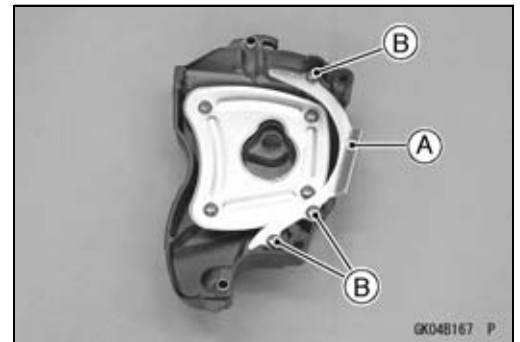
Sprocket, Coupling

★If the chain guide and engine sprocket cover plate removed, install the as follows.

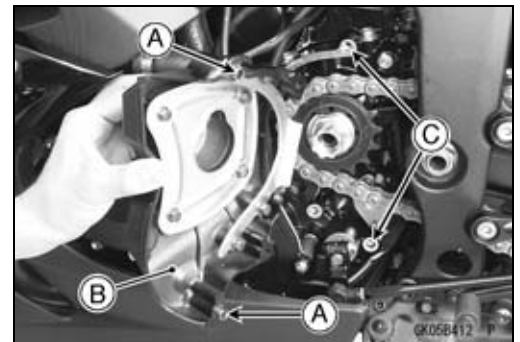
- Install:
 - Pad [A]
 - Engine Sprocket Cover Plate [B]
- Insert the groove of the pad into the rib of the engine sprocket cover.
- Apply a non-permanent locking agent to the threads of the engine sprocket cover plate mounting bolts [C].
- Tighten:
 - Torque - Engine Sprocket Cover Plate Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



- Install the chain guide [A].
- Apply a non-permanent locking agent to the threads of the chain guide bolts [B].
- Tighten:
 - Torque - Chain Guide Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



- Fit the pins [A] of the engine sprocket cover [B] into the holes [C] of the crankcase.
- Tighten:
 - 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.

- Remove:
 - Rear Sprocket Nuts [A]
 - Rear Sprocket [B]

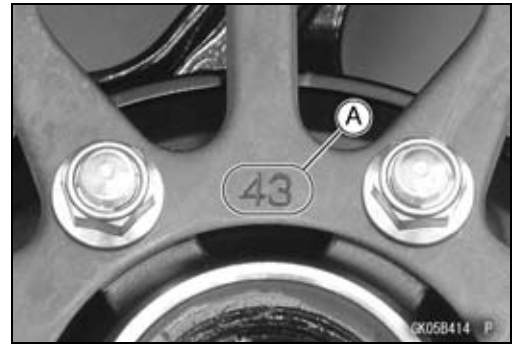


11-12 FINAL DRIVE

Sprocket, Coupling

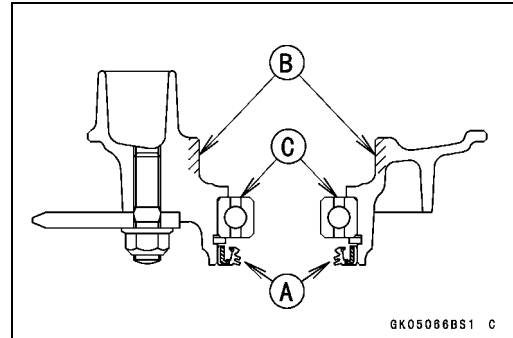
Rear Sprocket Installation

- Install the sprocket facing the tooth number marking [A] outward.
- Tighten:
Torque - Rear Sprocket Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)
- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).



Coupling Installation

- Apply high-temperature grease to the following.
 - Coupling Grease Seal Lips [A]
 - Coupling Internal Surface [B]
 - Ball Bearing [C]



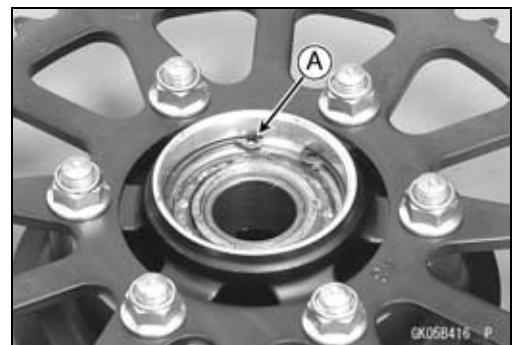
- Install:
 - Collar [A]
 - Coupling



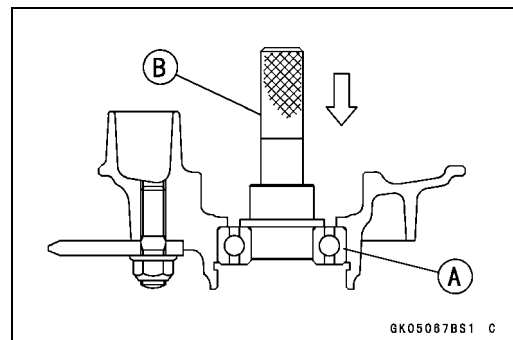
Coupling Bearing Removal

- Remove:
 - Coupling
 - Grease Seal
 - Circlip [A]

Special Tool - Inside Circlip Pliers: 57001-143



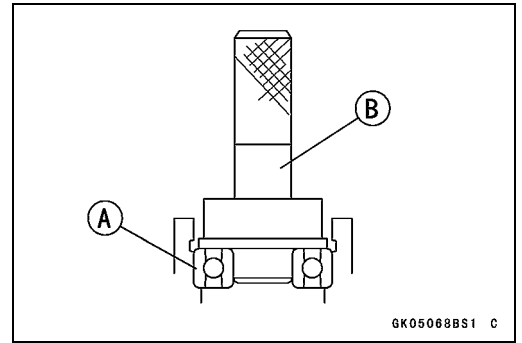
- Remove the bearing [A] by tapping from the wheel side.
Special Tool - Bearing Driver Set [B]: 57001-1129



Sprocket, Coupling

Coupling Bearing Installation

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.
 - Special Tool - Bearing Driver Set [B]: 57001-1129
- Pack the bearing with high-temperature grease.
- Replace the circlip with a new one.
 - Special Tool - Inside Circlip Pliers: 57001-143



- Replace the grease seal with a new one.
- Press in the grease seal so that the seal surface is flush with the end of the hole.
- Apply high-temperature grease to the grease seal lips.
 - Special Tool - Bearing Driver Set: 57001-1129

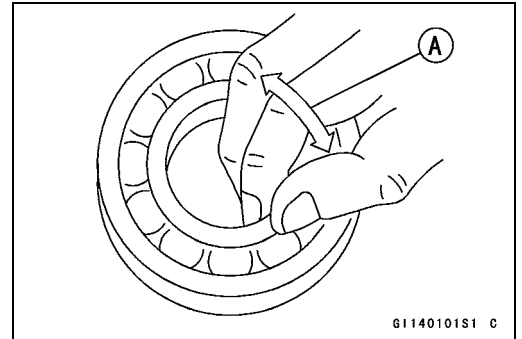
Coupling Bearing Inspection

Since the coupling bearing is made to extremely close tolerances, the clearance can NOT normally be measured.

NOTE

○ It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.

- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness or binding.
- ★ If the bearing play, roughness or binding is found, replace the bearing.

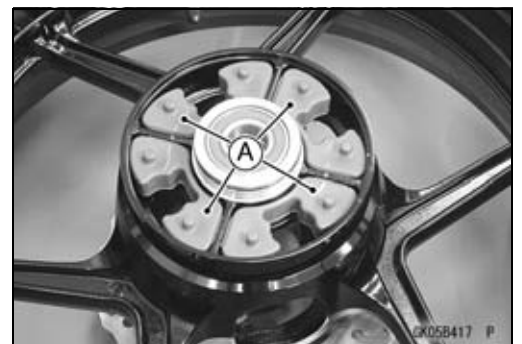


Coupling Bearing Lubrication

- Pack the bearing with high-temperature grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.

Coupling Damper Inspection

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.



11-14 FINAL DRIVE

Sprocket, Coupling

Sprocket Wear Inspection

- Visually inspect the engine and rear sprocket teeth for wear and damage.
- ★ If the teeth are worn as illustrated, replace the sprocket, and inspect the drive chain wear (see Drive Chain Wear Inspection in the Periodic Maintenance chapter).
 - Worn Tooth (Engine Sprocket) [A]
 - Worn Tooth (Rear Sprocket) [B]
 - Direction of Rotation [C]

NOTE

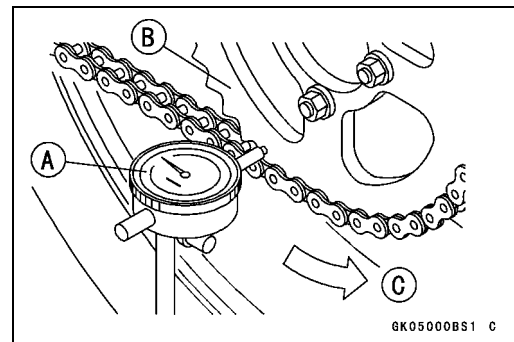
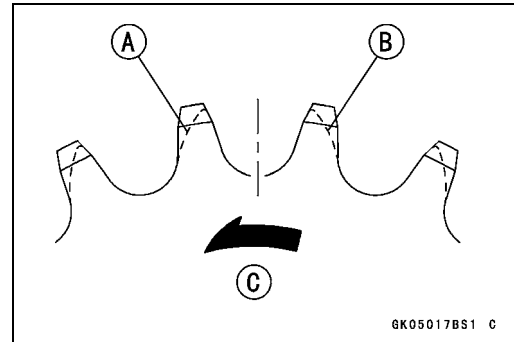
○ If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.

Rear Sprocket Warp Inspection

- Raise the rear wheel off the ground with the stand so that it will turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown in the figure, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).
- ★ If the runout exceeds the service limit, replace the rear sprocket.

Rear Sprocket Warp

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



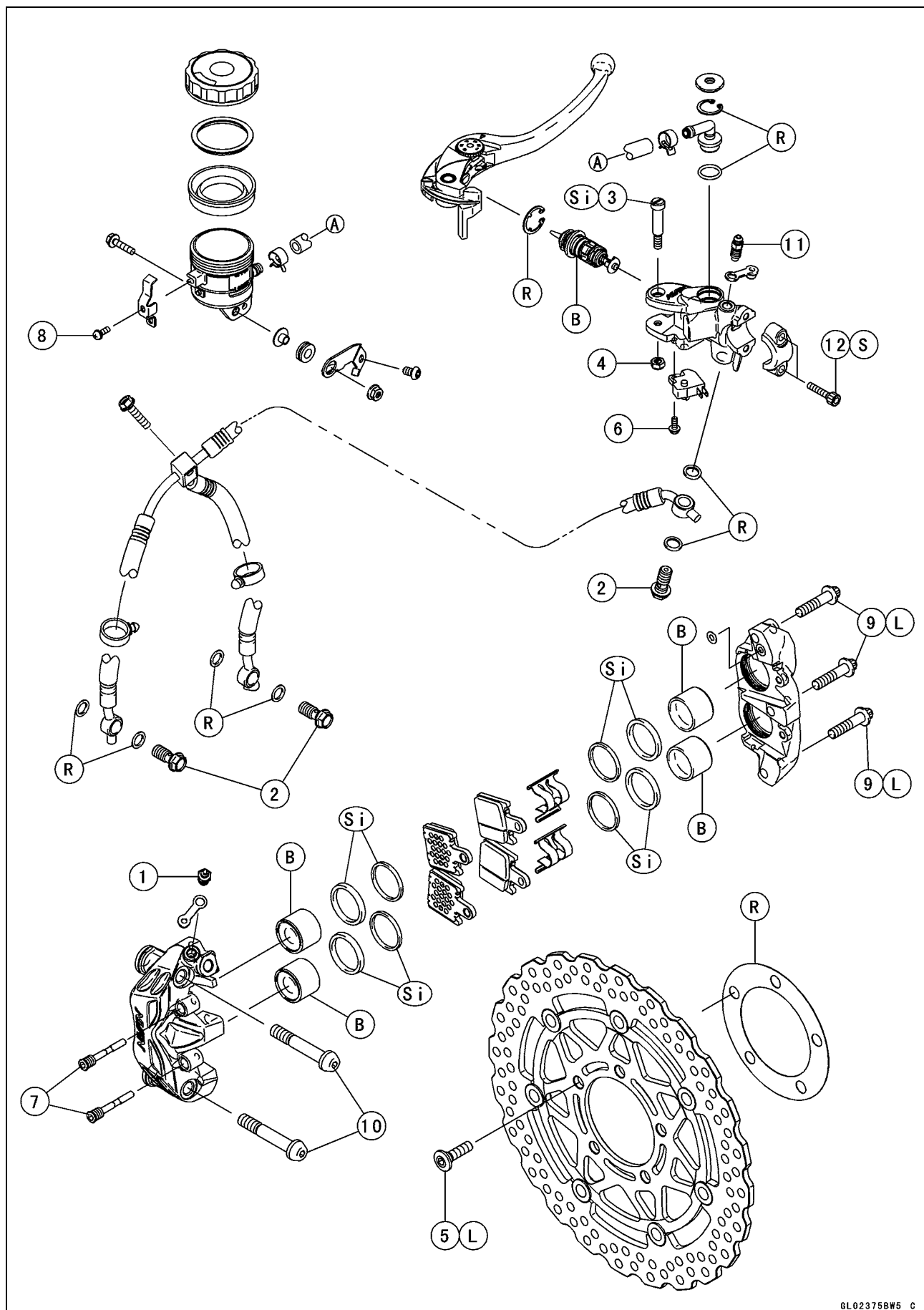
Brakes

Table of Contents

Exploded View	12-2
Specifications	12-6
Special Tools	12-7
Brake Lever, Brake Pedal.....	12-8
Brake Lever Position Adjustment.....	12-8
Brake Pedal Position Inspection	12-8
Brake Pedal Position Adjustment	12-8
Brake Pedal Removal	12-8
Brake Pedal Installation	12-9
Calipers	12-11
Front Caliper Removal.....	12-11
Rear Caliper Removal.....	12-11
Caliper Installation	12-12
Front Caliper Disassembly.....	12-12
Front Caliper Assembly.....	12-12
Rear Caliper Disassembly	12-12
Rear Caliper Assembly	12-12
Caliper Fluid Seal Damage Inspection.....	12-13
Caliper Dust Seal Damage Inspection	12-13
Rear Caliper Dust Boot and Friction Boot Damage Inspection.....	12-13
Caliper Piston and Cylinder Damage Inspection	12-14
Rear Caliper Holder Shaft Wear Inspection.....	12-14
Brake Pads.....	12-15
Front Brake Pad Removal.....	12-15
Front Brake Pad Installation.....	12-15
Rear Brake Pad Removal	12-16
Rear Brake Pad Installation	12-16
Brake Pad Wear Inspection	12-16
Master Cylinder	12-17
Front Master Cylinder Removal	12-17
Front Master Cylinder Installation	12-17
Rear Master Cylinder Removal.....	12-18
Rear Master Cylinder Installation.....	12-19
Front Master Cylinder Disassembly	12-19
Rear Master Cylinder Disassembly.....	12-20
Master Cylinder Assembly	12-20
Master Cylinder Inspection (Visual Inspection).....	12-20
Brake Disc	12-21
Brake Disc Removal	12-21
Brake Disc Installation	12-21
Brake Disc Wear Inspection.....	12-21
Brake Disc Warp Inspection.....	12-22
Brake Fluid	12-23
Brake Fluid Level Inspection.....	12-23
Brake Fluid Change	12-23
Brake Line Bleeding.....	12-23
Brake Hose.....	12-28
Brake Hose Removal/Installation.....	12-28
Brake Hose Inspection.....	12-28

12-2 BRAKES

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Bleed Valves	7.8	0.80	69 in-lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Lever Pivot Bolt	1.0	0.10	8.9 in-lb	Si
4	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in-lb	
5	Front Brake Disc Mounting Bolts	27	2.8	20	L
6	Front Brake Light Switch Screw	1.2	0.12	11 in-lb	
7	Front Brake Pad Pins	17	1.7	13	
8	Front Brake Reservoir Cap Stopper Screw	1.2	0.12	11 in-lb	
9	Front Caliper Assembly Bolts	27	2.8	20	L
10	Front Caliper Mounting Bolts	34	3.5	25	
11	Front Master Cylinder Bleed Valve	5.4	0.55	48 in-lb	
12	Front Master Cylinder Clamp Bolts	11	1.1	97 in-lb	S

B: Apply brake fluid.

L: Apply a non-permanent locking agent.

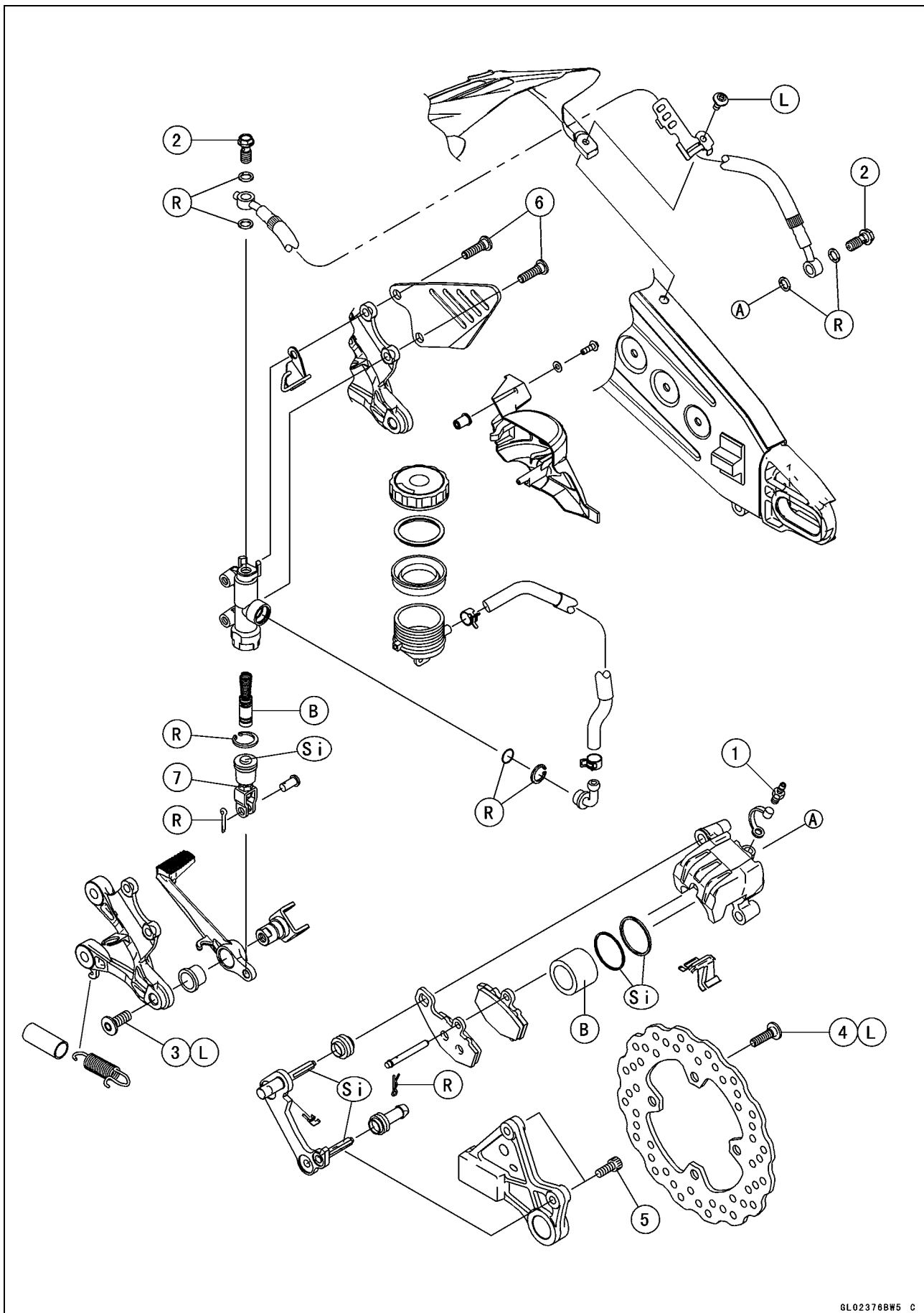
R: Replacement Parts

S: Follow the specified tightening sequence.

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

12-4 BRAKES

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Bleed Valve	7.8	0.80	69 in-lb	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Pedal Mounting Bolt	34	3.5	25	L
4	Rear Brake Disc Mounting Bolts	27	2.8	20	L
5	Rear Caliper Mounting Bolts	25	2.5	18	
6	Rear Master Cylinder Mounting Bolts	25	2.5	18	
7	Rear Master Cylinder Push Rod Locknut	17	1.7	13	

B: Apply brake fluid.

L: Apply a non-permanent locking agent.

R: Replacement Parts

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

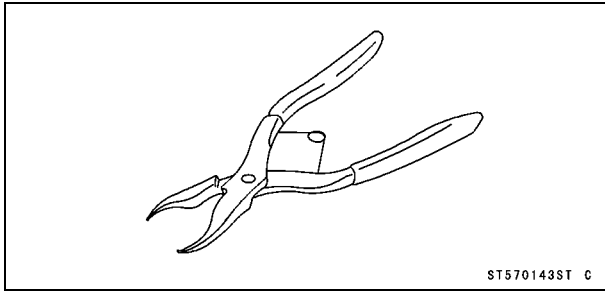
12-6 BRAKES

Specifications

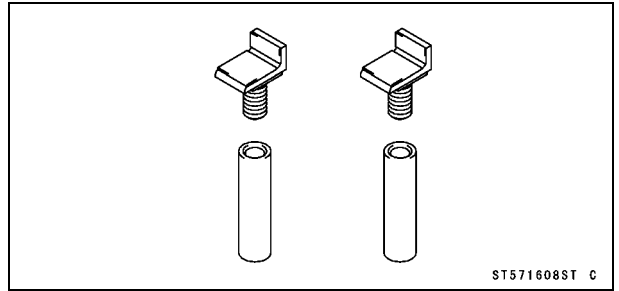
Item	Standard	Service Limit
Brake Lever, Brake Pedal		
Brake Lever Position	6-way adjustable (to suit rider)	— — —
Brake Lever Free Play	Non-adjustable	— — —
Pedal Free Play	Non-adjustable	— — —
Pedal Position	About 75 mm (2.95 in.) below top of footpeg	— — —
Brake Pads		
Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Discs		
Thickness:		
Front	5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)	5.5 mm (0.22 in.)
Rear	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Runout	TIR 0.15 mm (0.006 in.) or less	TIR 0.3 mm (0.01 in.)
Brake Fluid		
Grade	DOT4	— — —

Special Tools

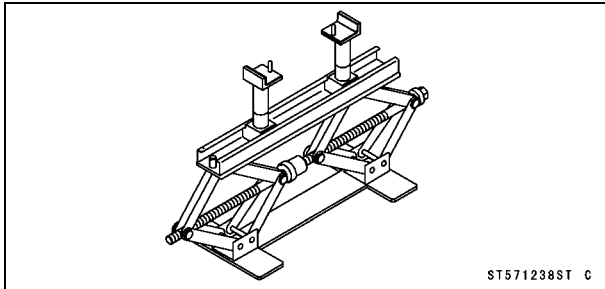
Inside Circlip Pliers:
57001-143



Jack Attachment:
57001-1608



Jack:
57001-1238



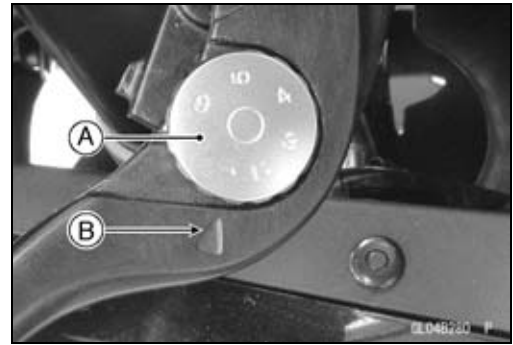
12-8 BRAKES

Brake Lever, Brake Pedal

Brake Lever Position Adjustment

The brake lever adjuster has 6 positions so that the brake lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.
- The distance from the grip to the lever is minimum at number 6 and maximum at number 1.



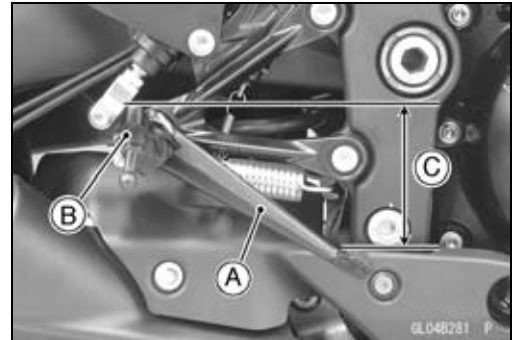
Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. Footpeg [B]

Pedal Position

Standard: About 75 mm (2.95 in.) [C] below top of footpeg

- ★ If it is incorrect, adjust the brake pedal position.



Brake Pedal Position Adjustment

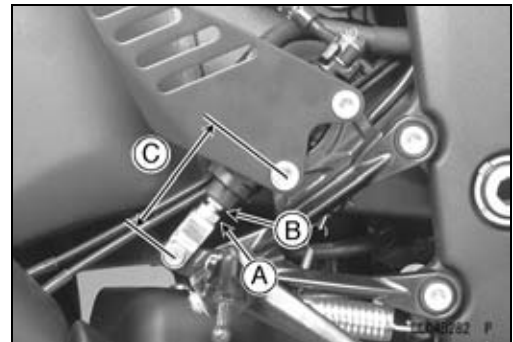
NOTE

○ Usually it is not necessary to adjust the pedal position, but always adjust it when push rod locknut has been loosened.

- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.
- ★ If the length [C] shown is **70 ±1 mm (2.8 ±0.04 in.)**, the pedal position will be within the standard range.
- Tighten:

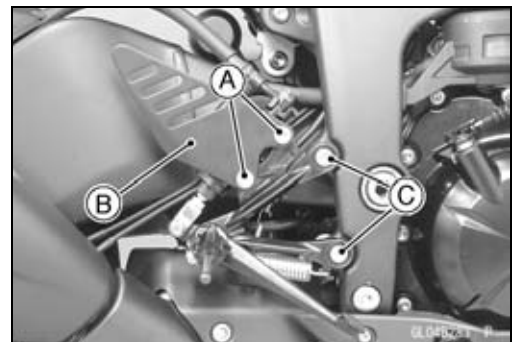
Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 13 ft·lb)

- Check the brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).



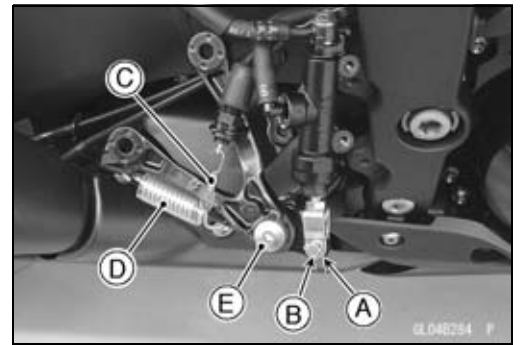
Brake Pedal Removal

- Remove:
 - Rear Master Cylinder Mounting Bolts [A]
 - Foot Guard [B]
 - Front Footpeg Bracket Bolts [C]



Brake Lever, Brake Pedal

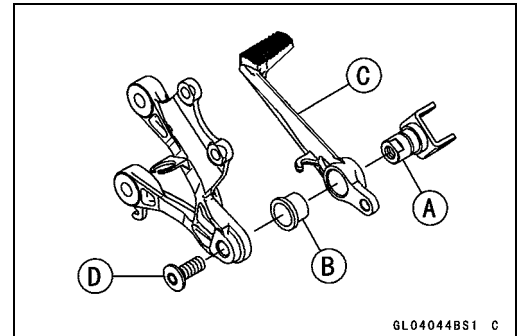
- Remove:
 - Cotter Pin [A]
 - Joint Pin [B]
 - Rear Brake Light Switch Spring [C]
 - Return Spring [D]
- Remove the brake pedal mounting bolt [E] and take out the brake pedal.



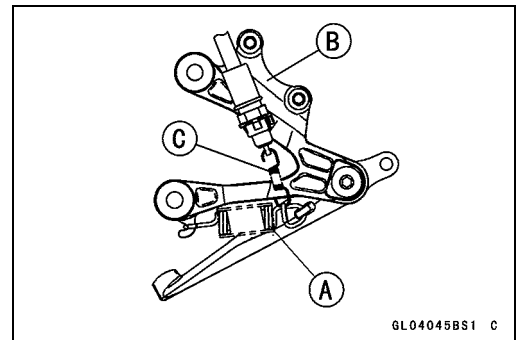
Brake Pedal Installation

- Apply grease to the footpeg pivot shaft [A].
- Install:
 - Bushing [B]
 - Brake Pedal [C]
- Apply a non-permanent locking agent to the threads of the brake pedal mounting bolt [D], and tighten it.

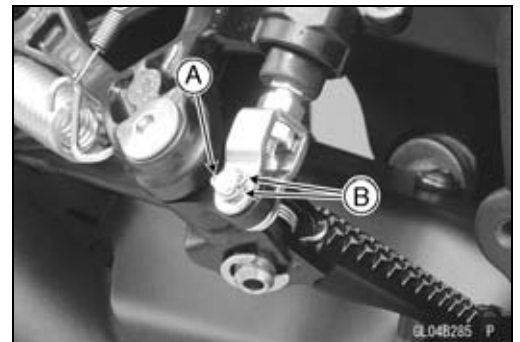
Torque - Brake Pedal Mounting Bolt: 34 N-m (3.5 kgf-m, 25 ft-lb)



- Hook the return spring [A] on the brake pedal and front footpeg bracket [B] as shown in the figure.
- Hook the rear brake light switch spring [C] on the switch and return spring as shown in the figure.



- Replace the cotter pin with a new one.
- Insert the cotter pin [A] and bend the pin ends [B].



12-10 BRAKES

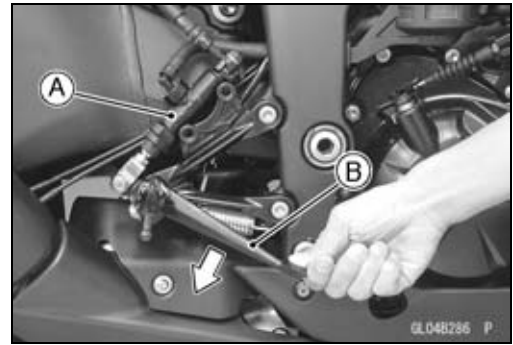
Brake Lever, Brake Pedal

- Install the front footpeg bracket.
- Tighten:
 - Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the rear master cylinder [A] and foot guard.

NOTE

- *Depress the brake pedal [B] and then align the holes of the master cylinder.*
- *After installation, check that the rear brake light switch spring is hooked on the return spring.*

- Tighten:
 - Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Check the brake pedal position (see Brake Pedal Position Inspection).



Calipers

Front Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.

CAUTION

Do not loosen the caliper assembly bolts. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leakage.

- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

CAUTION

Immediately wash away any brake fluid that spills.

NOTE

○ If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).

Rear Caliper Removal

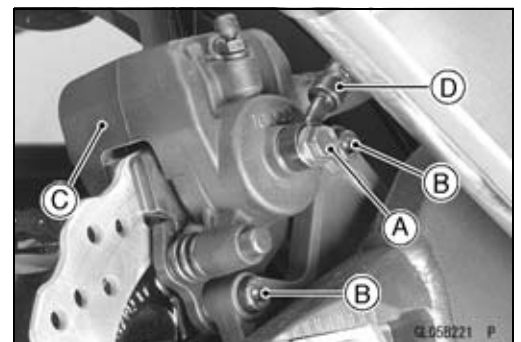
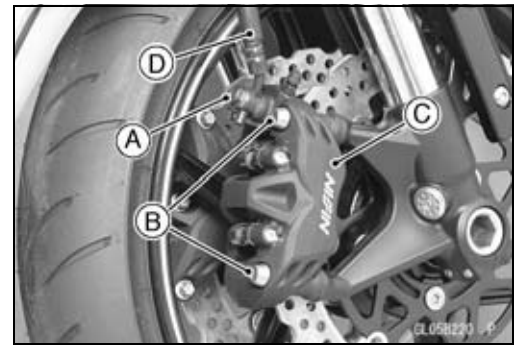
- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

CAUTION

Immediately wash away any brake fluid that spills.

NOTE

○ If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).



12-12 BRAKES

Calipers

Caliper Installation

- Install the caliper and brake hose lower end.
- Replace the washers on each side of hose fitting with new ones.
- Tighten:
 - Torque - Caliper Mounting Bolts:**
 - Front: 34 N·m (3.5 kgf·m, 25 ft·lb)
 - Rear: 25 N·m (2.5 kgf·m, 18 ft·lb)
 - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brakes will not function on the first application of the lever or pedal if this is not done.

Front Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Front Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Caliper Assembly

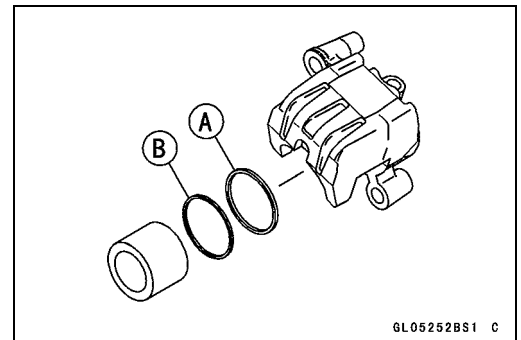
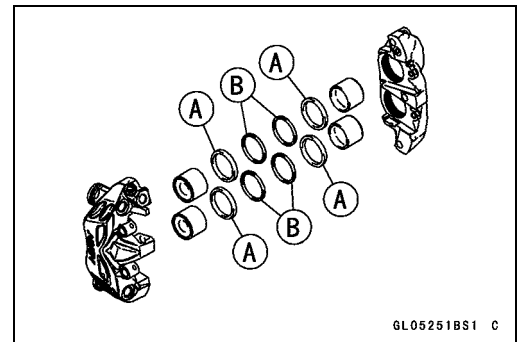
- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Calipers

Caliper Fluid Seal Damage Inspection

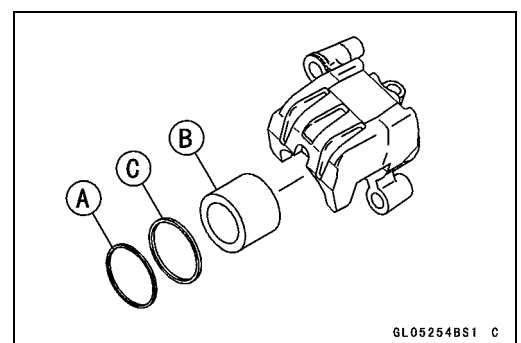
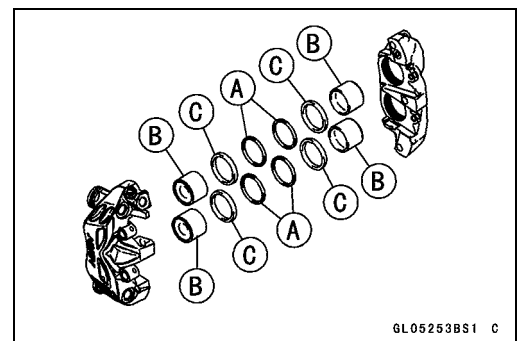
The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

- Replace the fluid seal if it exhibits any of the conditions listed below.
 - Brake fluid leakage around the pad.
 - Brakes overheat.
 - Considerable difference in inner and outer pad wear.
 - Seal and piston are stuck together.
- ★ If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.



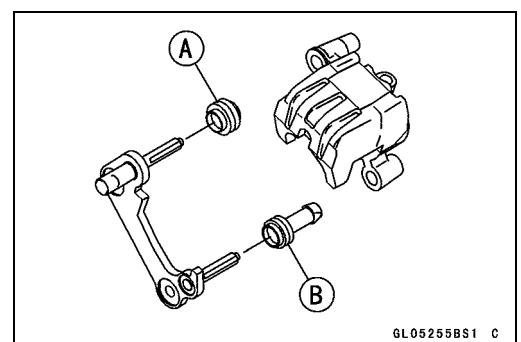
Caliper Dust Seal Damage Inspection

- Check that the dust seals [A] are not cracked, worn, swollen, or otherwise damaged.
- ★ If they show any damage, replace the dust seals with new ones.
 - Pistons [B]
 - Fluid Seals [C]



Rear Caliper Dust Boot and Friction Boot Damage Inspection

- 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.

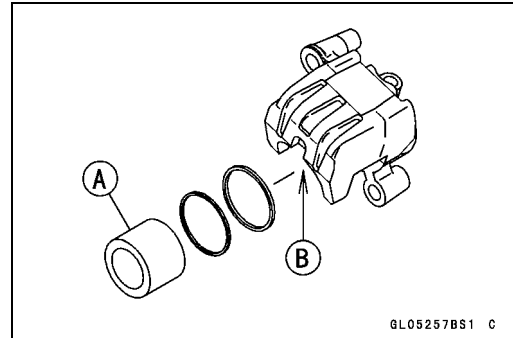
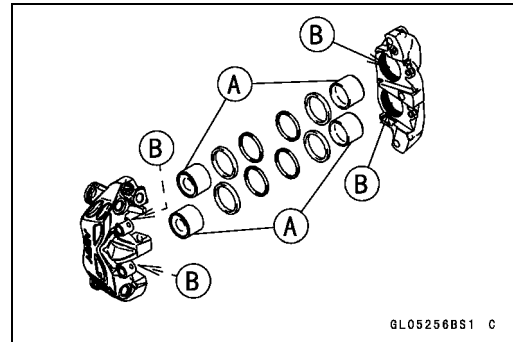


12-14 BRAKES

Calipers

Caliper Piston and Cylinder Damage Inspection

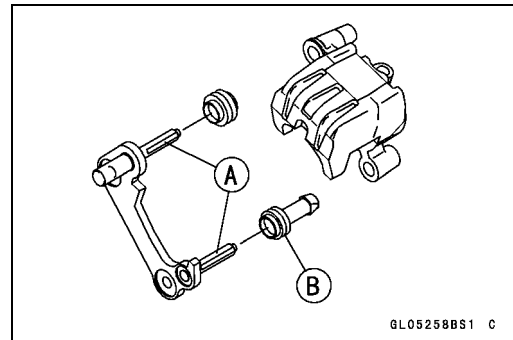
- Visually inspect the pistons [A] and cylinder surfaces [B].
- ★ Replace the caliper if the cylinder and piston are badly scored or rusty.



Rear Caliper Holder Shaft Wear Inspection

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 friction boot [B] is not damaged.
- ★ If the friction boot is damaged, replace the friction boot. To replace the friction boot, remove the pads and the caliper holder.
- ★ If the caliper holder shaft is damaged, replace the caliper holder.



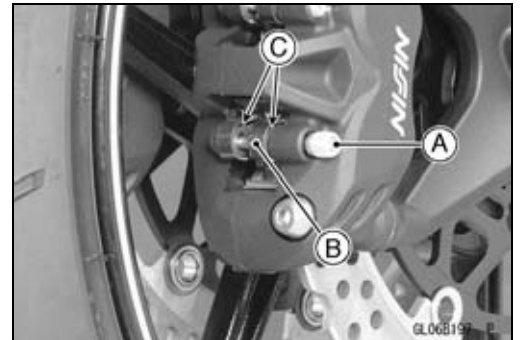
Brake Pads

Front Brake Pad Removal

- Loosen the pad pins [A].

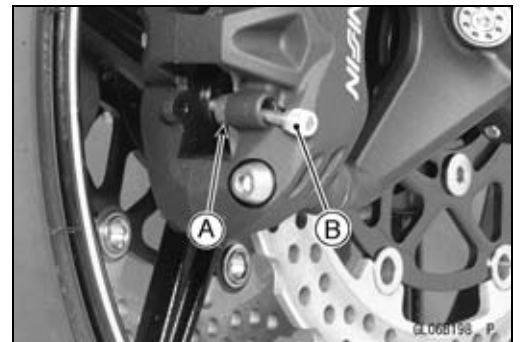


- Remove:
 - Pad Pins [A]
 - Pad Springs [B]
 - Brake Pads [C]



Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install the outside pad [A] and insert the pad pin [B] as shown in the figure.

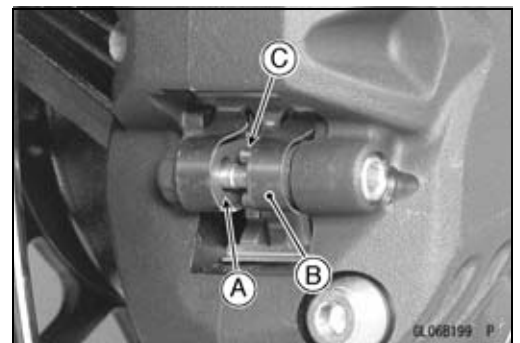


- Set:
 - Inside Pad [A]
 - Pad Spring [B]
- Pushing the pin holder [C] to hole of the pad and insert the pad pin.

Torque - Front Brake Pad Pins: 17 N·m (1.7 kgf·m, 13 ft·lb)

⚠ WARNING

Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever and the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

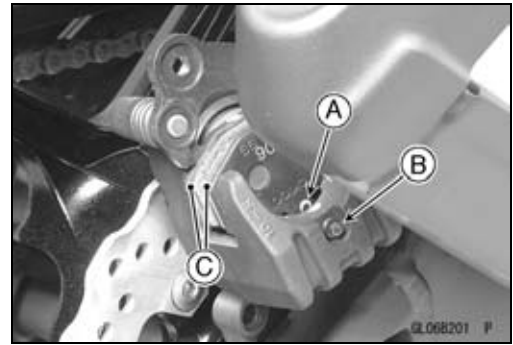


12-16 BRAKES

Brake Pads

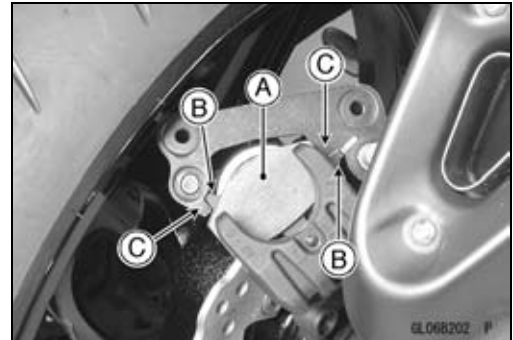
Rear Brake Pad Removal

- Remove the rear caliper with the hose installed (see Rear Caliper Removal).
- Remove:
 - Clip [A]
 - Pad Pin [B]
 - Brake Pads [C]



Rear Brake Pad Installation

- Push the caliper piston in by hand as far as it will go.
- Install the pad spring in place.
- Install the piston side pad [A] first, and then another pad.
- Fit the projections [B] of the pad into the recess [C] of the caliper holder.
- Install the pad pin and clip. The clip must be “outside” of the pads.
- Install the caliper (see Caliper Installation).



⚠ WARNING

Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.

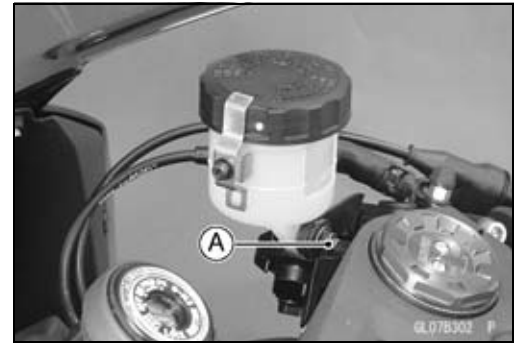
Brake Pad Wear Inspection

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

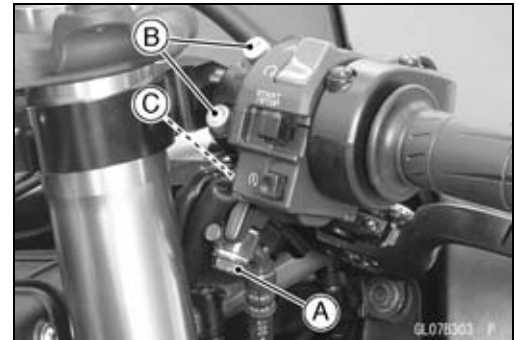
Master Cylinder

Front Master Cylinder Removal

- Remove the reservoir mounting bolt and nut [A].



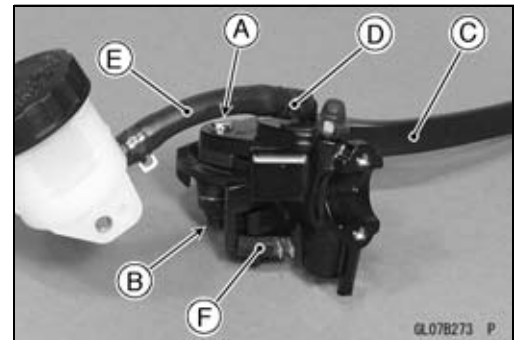
- Unscrew the banjo bolt [A] and remove the brake hose from the master cylinder (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Unscrew the clamp bolts [B], and take off the master cylinder as an assembly with the reservoir, brake lever, and front brake light switch installed.
- Disconnect the front brake light switch connector [C].



CAUTION

Immediately wash away any brake fluid that spills.

- Remove:
 - Brake Lever Pivot Bolt [A] and Nut [B]
 - Brake Lever [C]
 - Clamp [D] (Slide Out)
 - Brake Hose [E]
 - Front Brake Light Switch [F]



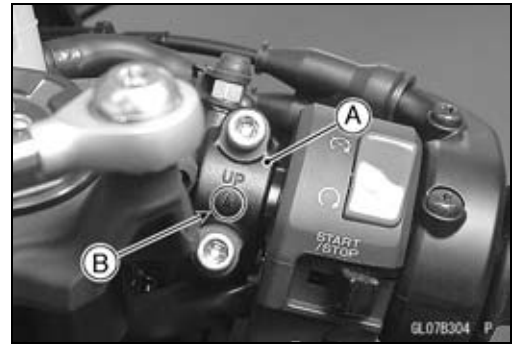
Front Master Cylinder Installation

- Apply silicone grease to the sliding surface of the brake lever pivot bolt.
- Tighten:
 - Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)**
 - Brake Lever Pivot Bolt Nut: 5.9 N·m (0.60 kgf·m, 52 in·lb)**
- Install the front brake light switch.
- Tighten:
 - Torque - Front Brake Light Switch Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

12-18 BRAKES

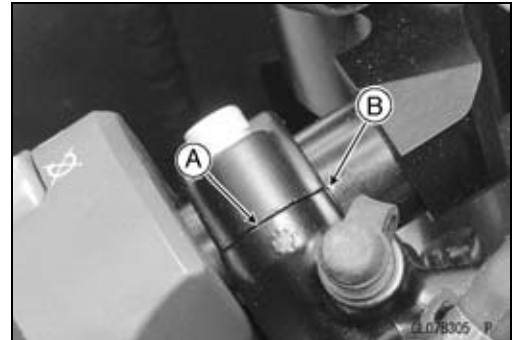
Master Cylinder

- Install the master cylinder clamp [A] so that the arrow mark [B] faces upward.



- Set the front master cylinder to match its mating surface [A] to the punch mark [B] of the handlebar.
- Tighten the upper clamp bolt first, and then the lower clamp bolt.

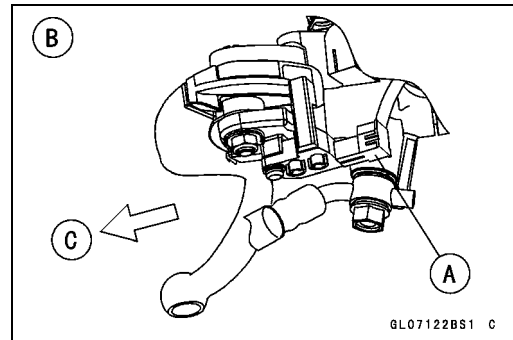
Torque - Front Master Cylinder Clamp Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



- Connect the front brake light switch connector [A] as shown in the figure.
Left Side View [B]
Front [C]
- Replace the washers that are on each side of the hose fitting with new ones.
- Tighten:

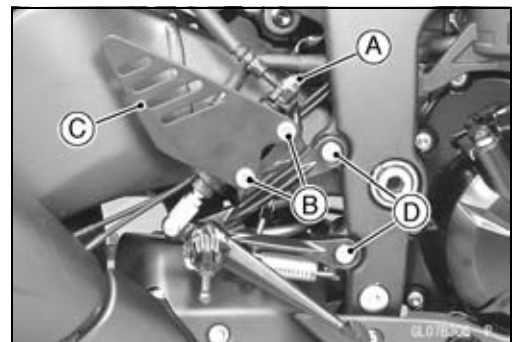
Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 in·lb)

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.



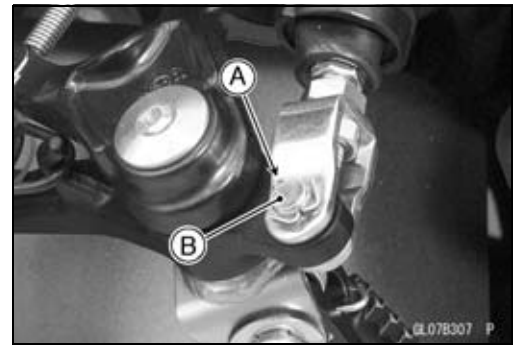
Rear Master Cylinder Removal

- Unscrew the brake hose banjo bolt [A] and remove the brake hose (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Remove:
Rear Master Cylinder Mounting Bolts [B]
Foot Guard [C]
Front Footpeg Bracket Bolts [D]

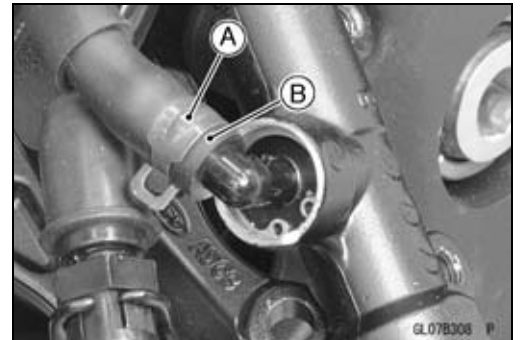


Master Cylinder

- Remove:
 - Cotter Pin [A]
 - Joint Pin [B]

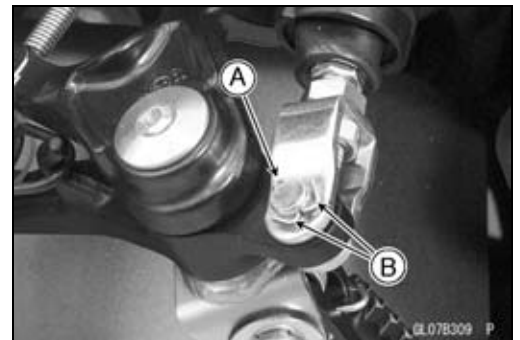


- Slide the reservoir hose lower end clamp [A].
- Pull off the reservoir hose lower end [B], and drain the brake fluid into a container.



Rear Master Cylinder Installation

- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends [B].

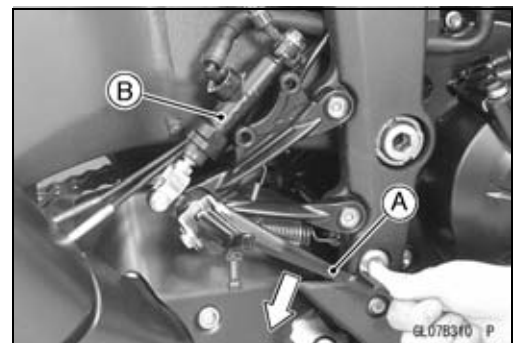


- Replace the washers that are on each side of hose fitting with new ones.
- Tighten:

Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

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



NOTE

○ Depress the brake pedal [A] and then align the holes of the master cylinder [B].

○ After installation, check that the rear brake light switch spring is hooked on the return spring.

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

Front Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

12-20 BRAKES

Master Cylinder

Rear Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Assembly

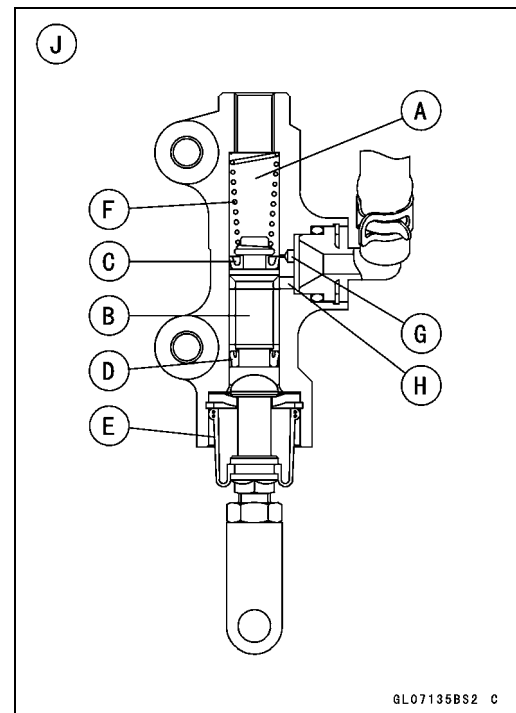
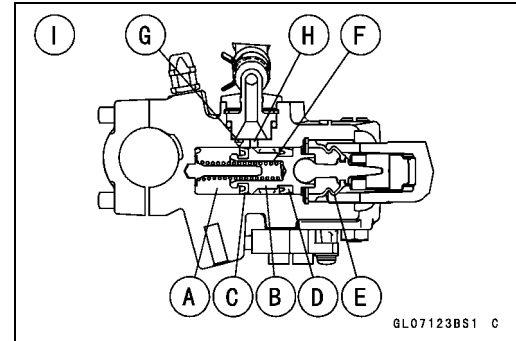
- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Inspection (Visual Inspection)

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders (see Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].
- ★ If a master cylinder or piston shows any damage, replace them.
- Inspect the primary cup [C] and secondary cup [D].
- ★ If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.
- ★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.
- Check the dust covers [E] for damage.
- ★ If they are damaged, replace them.
- Check the piston return springs [F] for any damage.
- ★ If the springs are damaged, replace them.
- Check that relief port [G] and supply port [H] are not plugged.
- ★ If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

Front Master Cylinder [I]

Rear Master Cylinder [J]



Brake Disc

Brake Disc Removal

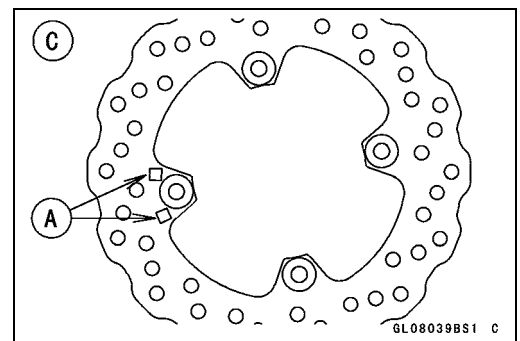
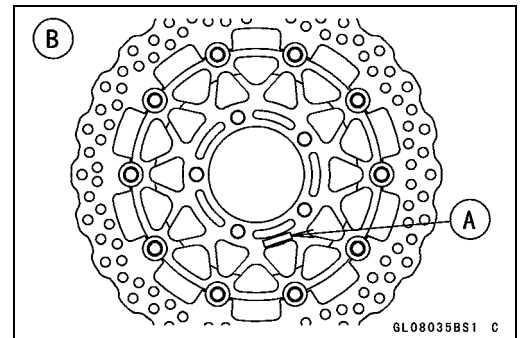
- Remove the wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc [B].



Brake Disc Installation

- Replace the gaskets with new ones.
- Install the brake disc on the wheel so that the marked side [A] faces out.
 - Front Brake Discs [B]
 - Rear Brake Disc [C]
- Apply a non-permanent locking agent to the threads of the brake disc mounting bolts.
- Tighten:

Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)



Brake Disc Wear Inspection

- Measure the thickness of each disc [A] at the point where it has worn the most.
- ★ If the disc has worn past the service limit, replace it.
 - Measuring Area [B]

Brake Discs Thickness

Standard:

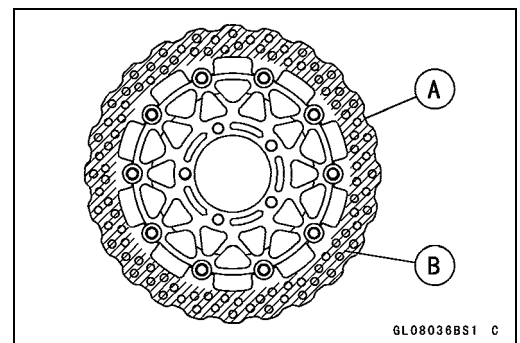
Front 5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)

Rear 4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)

Service Limit:

Front 5.5 mm (0.22 in.)

Rear 4.5 mm (0.18 in.)



12-22 BRAKES

Brake Disc

Brake Disc Warp Inspection

- Raise the wheel off the ground with jack.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- For front disc inspection, turn the handlebar fully to one side.

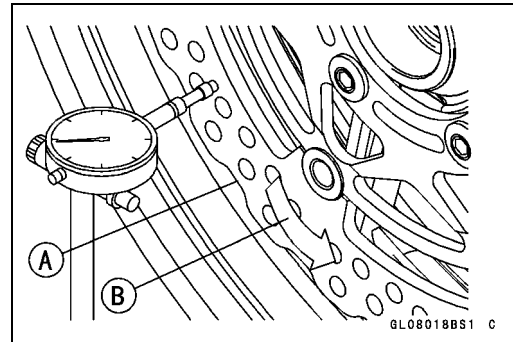
- Set up a dial gauge against the disc [A] as shown in the figure and measure disc runout, while turning [B] the wheel by hand.

- ★ If runout exceeds the service limit, replace the disc.

Disc Runout

Standard: TIR 0.15 mm (0.006 in.) or less

Service Limit: TIR 0.3 mm (0.01 in.)



Brake Fluid

Brake Fluid Level Inspection

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

Brake Fluid Change

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

Brake Line Bleeding

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

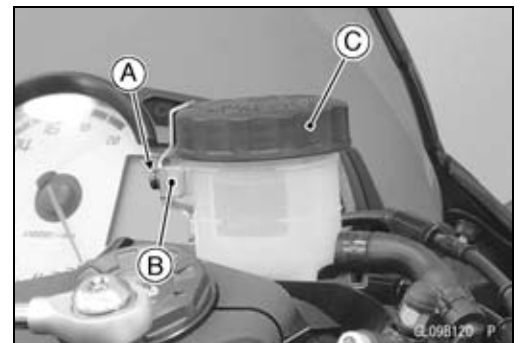
⚠ WARNING

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

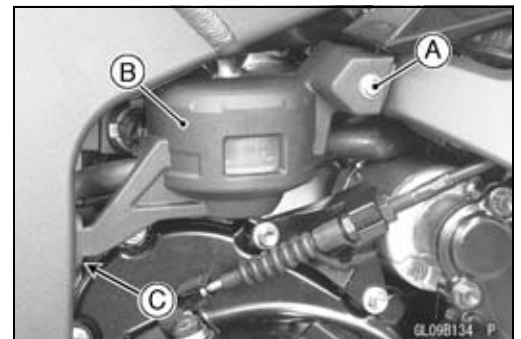
NOTE

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

- Remove:
 - Screw [A]
 - Stopper [B]
 - Front Brake Reservoir Cap [C]



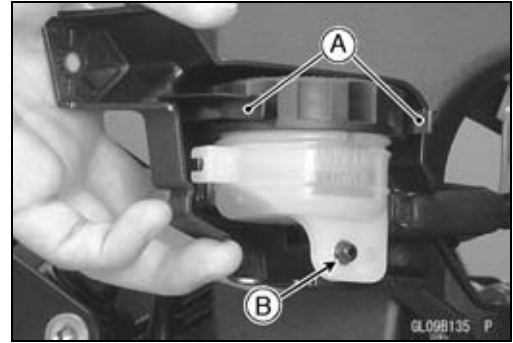
- Remove:
 - Bolt [A]
 - Cover [B]
- Pull out the cover from the grommet [C].



12-24 BRAKES

Brake Fluid

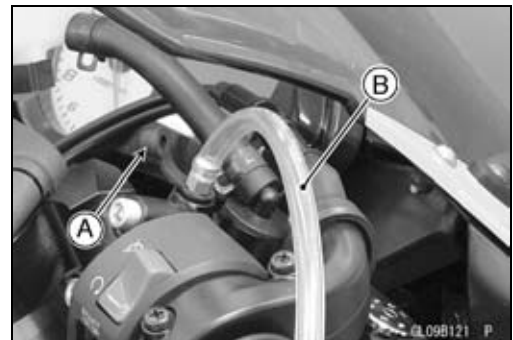
- Release the clamps [A] and projection [B] of the cover from the rear brake reservoir.



- Remove the rear brake reservoir cap [A].



- Remove:
 - Diaphragm Plate
 - Diaphragm
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.
- Remove the rubber cap [A] from the bleed valve on the front master cylinder.
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.



Brake Fluid

- Bleed the brake line and the master cylinder.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
 1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
 2. Quickly open and close [B] the bleed valve while holding the brake applied.
 3. Release the brake [C].

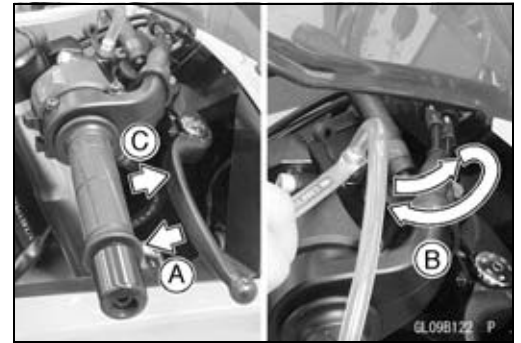
NOTE

- *The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

- Remove the clear plastic hose.
- Tighten the bleed valve, and install the rubber cap.

Torque - Front Master Cylinder Bleed Valve: 5.4 N·m (0.55 kgf·m, 48 in·lb)

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



- Bleed the brake line and the caliper.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
 1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
 2. Quickly open and close [B] the bleed valve while holding the brake applied.
 3. Release the brake [C].

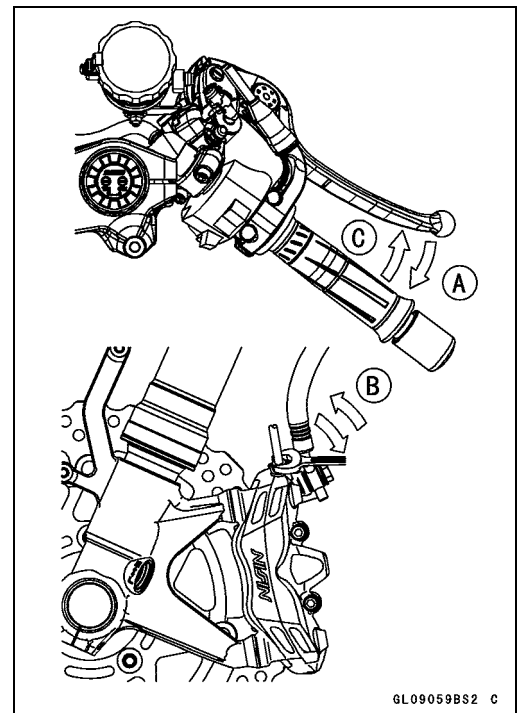
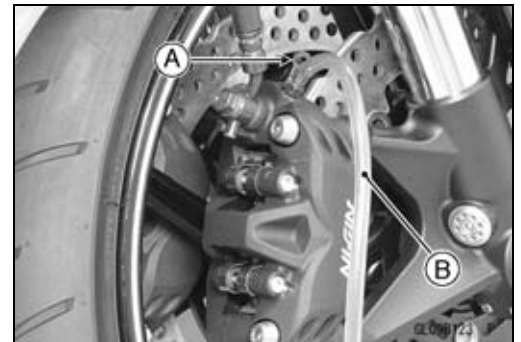
NOTE

- *The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

○ *Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.*

○ *Front Brake: First bleeding the right caliper then repeat the above steps for the left caliper.*

- Remove the clear plastic hose.
- Install:
 - Diaphragm
 - Diaphragm Plate
 - Front Brake Reservoir Cap

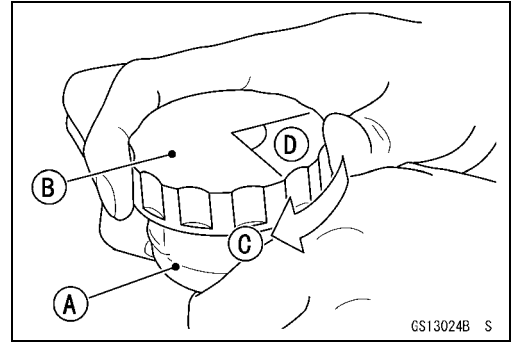


GL09059BS2 C

12-26 BRAKES

Brake Fluid

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



- Install the stopper and screw.
- Tighten:
 - Torque - Front Brake Reservoir Cap Stopper Screw: 1.2 N-m (0.12 kgf-m, 11 in-lb)**
- Install the rear brake reservoir to the projection and clamps of the cover.
- Insert the cover into the grommet, and install the bolt.
- Tighten the bleed valve, and install the rubber cap.
 - Torque - Bleed Valves: 7.8 N-m (0.80 kgf-m, 69 in-lb)**
- Check the fluid level (see Brake Fluid Level Inspection in the Periodic Maintenance chapter).
- After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.

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.**

12-28 BRAKES

Brake Hose

Brake Hose Removal/Installation

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

Brake Hose Inspection

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

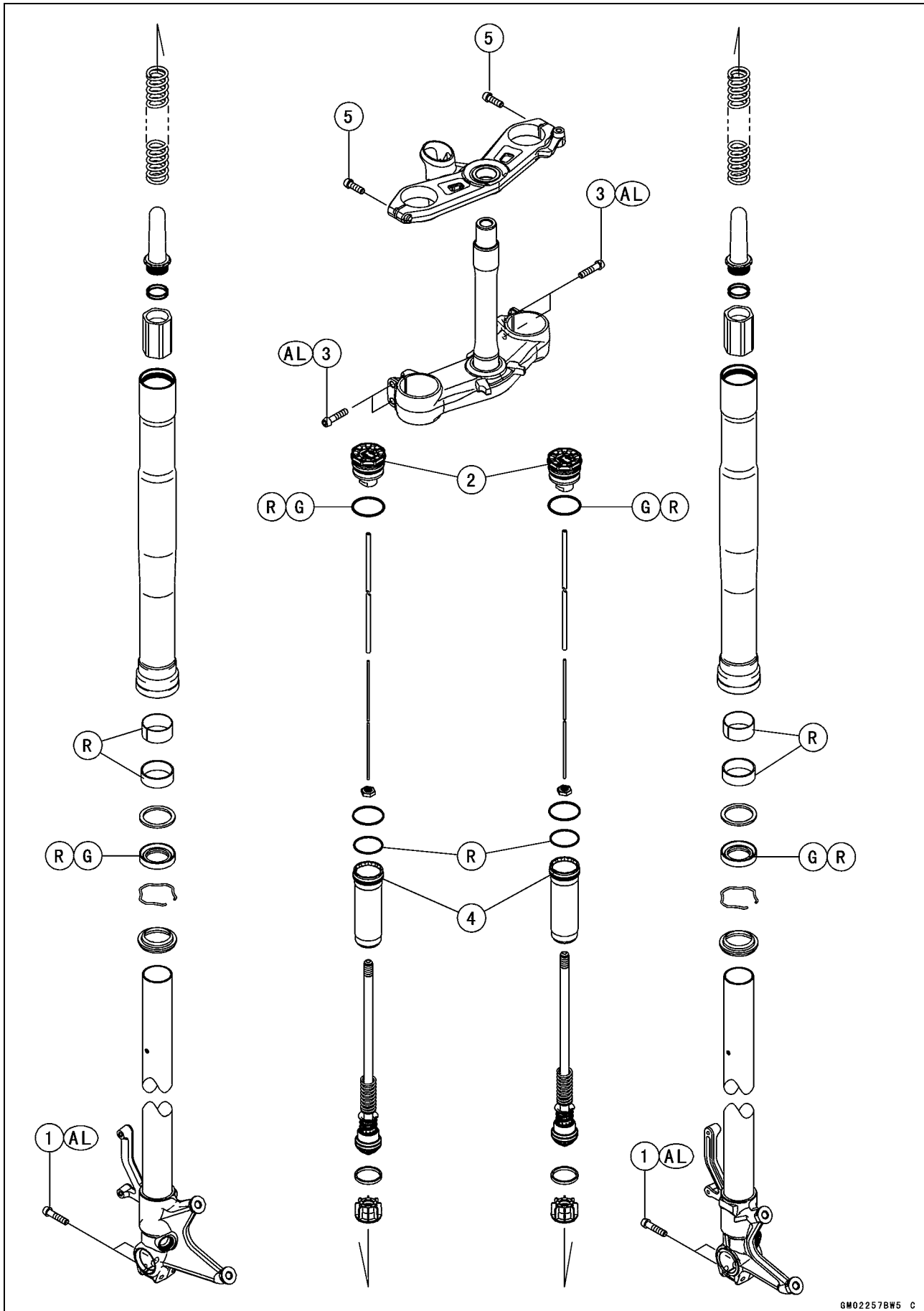
Suspension

Table of Contents

Exploded View	13-2
Specifications	13-6
Special Tools	13-7
Front Fork	13-9
Rebound Damping Force Adjustment	13-9
Compression Damping Force Adjustment	13-9
Spring Preload Adjustment	13-10
Front Fork Removal (Each Fork Leg)	13-10
Front Fork Installation (Each Fork Leg)	13-11
Front Fork Oil Change	13-11
Front Fork Disassembly	13-14
Front Fork Assembly	13-15
Inner Tube Inspection	13-16
Dust Seal Inspection	13-16
Spring Tension Inspection	13-16
Rear Shock Absorber	13-17
Rebound Damping Force Adjustment	13-17
Compression Damping Force Adjustment	13-17
Spring Preload Adjustment	13-18
Rear Shock Absorber Removal	13-19
Rear Shock Absorber Installation	13-20
Rear Shock Absorber Inspection	13-20
Rear Shock Absorber Scrapping	13-20
Swingarm	13-21
Swingarm Removal	13-21
Swingarm Installation	13-21
Swingarm Bearing Removal	13-22
Swingarm Bearing Installation	13-23
Swingarm Bearing, Sleeve Inspection	13-24
Swingarm Bearing Lubrication	13-24
Tie-Rod, Rocker Arm	13-25
Tie-Rod Removal	13-25
Tie-Rod Installation	13-25
Rocker Arm Removal	13-25
Rocker Arm Installation	13-26
Tie-Rod and Rocker Arm Bearing Removal	13-26
Tie-Rod and Rocker Arm Bearing Installation	13-27
Tie-Rod/Rocker Arm Bearing, Sleeve Inspection	13-28
Tie-Rod/Rocker Arm Bearing Lubrication	13-28

13-2 SUSPENSION

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Front Axle Clamp Bolts	20	2.0	15	AL
2	Front Fork Top Plugs	35	3.6	26	
3	Lower Front Fork Clamp Bolts	23	2.3	17	AL
4	Piston Rod Guide Case	90	9.2	66	
5	Upper Front Fork Clamp Bolts	20	2.0	15	

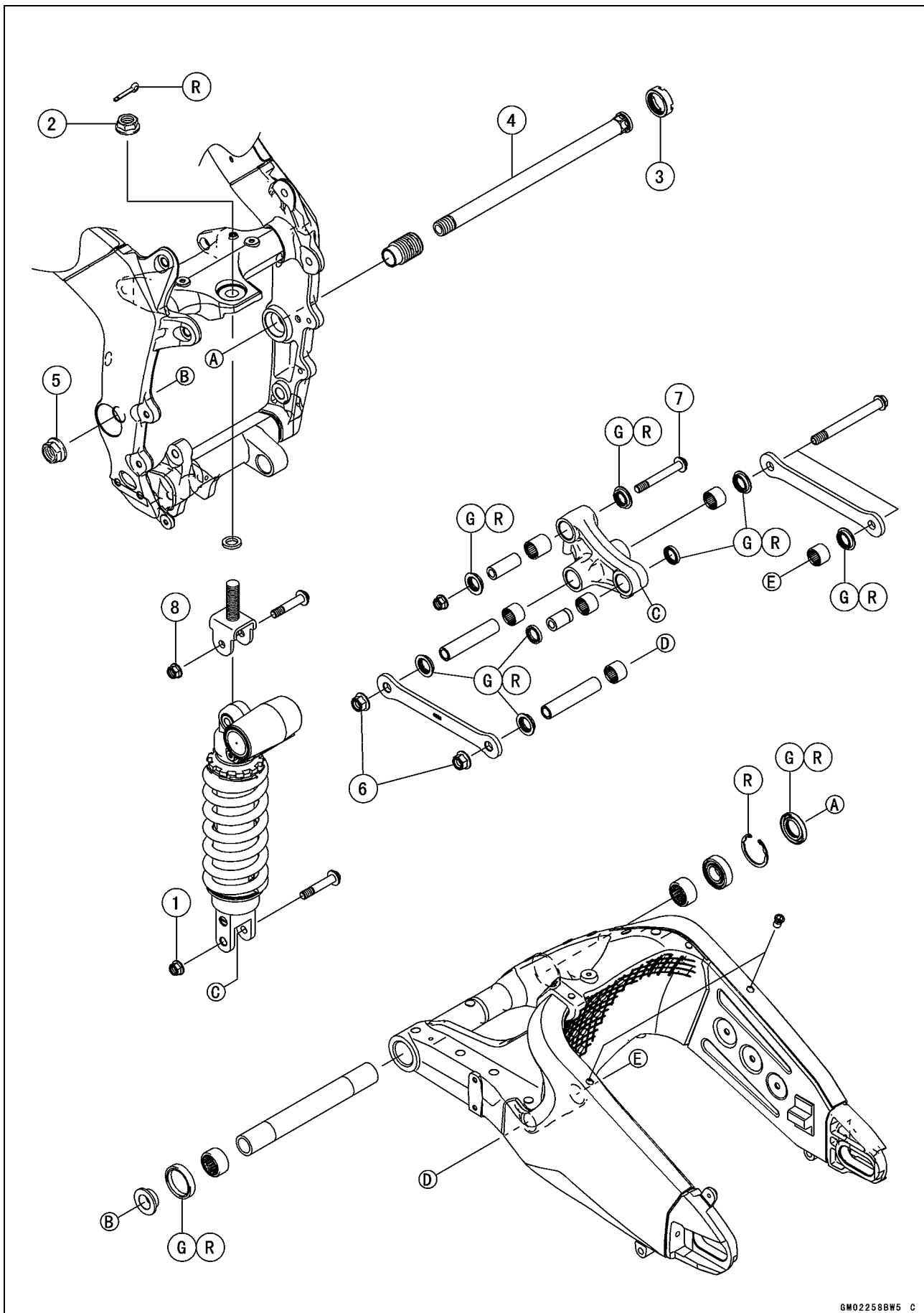
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.

G: Apply grease.

R: Replacement Parts

13-4 SUSPENSION

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Lower Rear Shock Absorber Nut	34	3.5	25	
2	Rear Shock Absorber Bracket Nut	59	6.0	44	
3	Swingarm Pivot Adjusting Collar Locknut	98	10.0	72.3	
4	Swingarm Pivot Shaft	20	2.0	15	
5	Swingarm Pivot Shaft Nut	108	11.0	79.7	
6	Tie-Rod Nuts	59	6.0	44	
7	Uni-Trak Rocker Arm Bolt	34	3.5	25	
8	Upper Rear Shock Absorber Nut	34	3.5	25	

G: Apply grease.

R: Replacement Parts

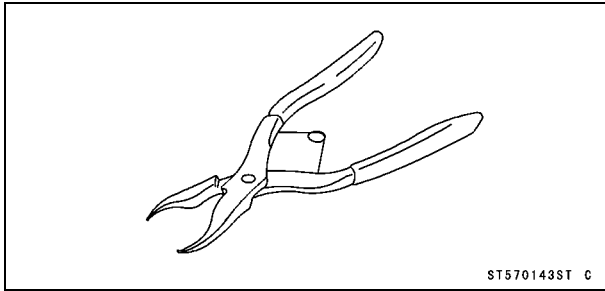
13-6 SUSPENSION

Specifications

Item	Standard
Front Fork (Per One Unit)	
Fork Inner Tube Diameter	φ41 mm (1.6 in.)
Air Pressure	Atmospheric pressure (Non-adjustable)
Rebound Damper Setting	4 turns out from the fully clockwise position (Usable Range: 0 ←→ 5 1/2 turns out)
Compression Damper Setting	5 1/2 turns out from the fully clockwise position (Usable Range: 0 ←→ 7 turns out)
Fork Spring Preload Setting	4 turns in from the fully counterclockwise position (Usable Range: 0 ←→ 15 turns in)
Fork Oil:	
Viscosity	SHOWA SS05 or equivalent SAE 5W
Amount	Approx. 370 mL (12.5 US oz.) (when changing oil) 433 ±2.5 mL (14.6 ±0.085 US oz.) (after disassembly and completely dry)
Fork Oil Level	80 ±2 mm (3.15 ±0.08 in.) (fully compressed, below from the top of outer tube)
Fork Spring Free Length	235 mm (9.25 in.) (Service Limit: 230 mm (9.06 in.))
Rear Shock Absorber	
Rebound Damper Setting	15th click from the first click of the fully clockwise position (Usable Range: 0 ←→ 21 clicks)
Compression Damper Setting:	
High Speed	3 turns out from the fully clockwise position (Usable Range: 0 ←→ 4 turns out)
Low Speed	3 turns out from the fully clockwise position (Usable Range: 0 ←→ 5 turns out)
Spring Preload Setting Position:	
Standard	Spring length: 179 mm (7.05 in.)
Usable Range	Spring length: 179 ~ 190 mm (7.05 ~ 7.48 in.) (stronger to weaker)
Gas Pressure	980 kPa (10.0 kgf/cm ² , 142 psi, Non-adjustable)

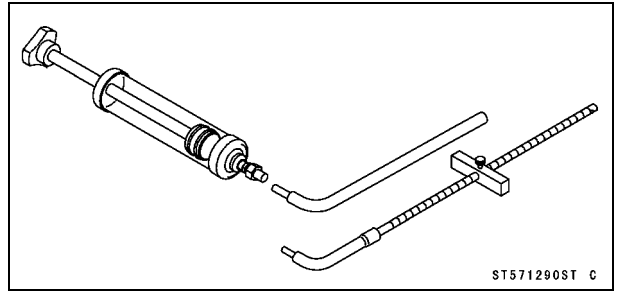
Special Tools

Inside Circlip Pliers:
57001-143



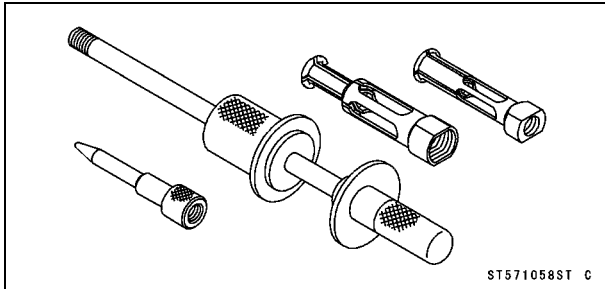
ST570143ST C

Fork Oil Level Gauge:
57001-1290



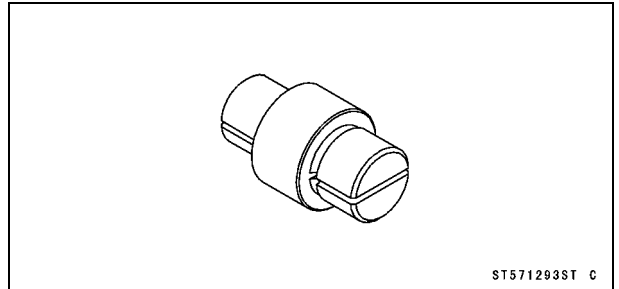
ST571290ST C

Oil Seal & Bearing Remover:
57001-1058



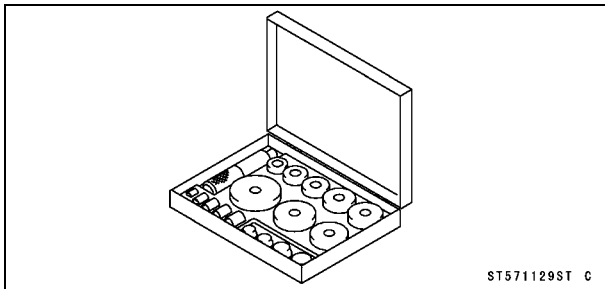
ST571058ST C

Bearing Remover Head, $\phi 20 \times \phi 22$:
57001-1293



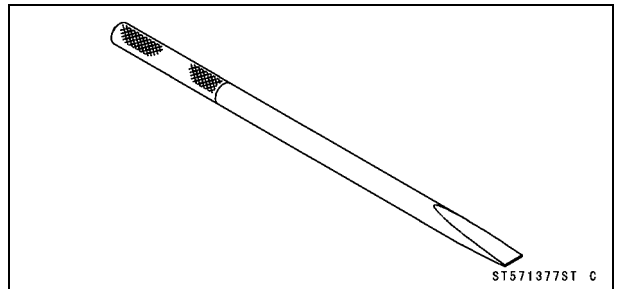
ST571293ST C

Bearing Driver Set:
57001-1129



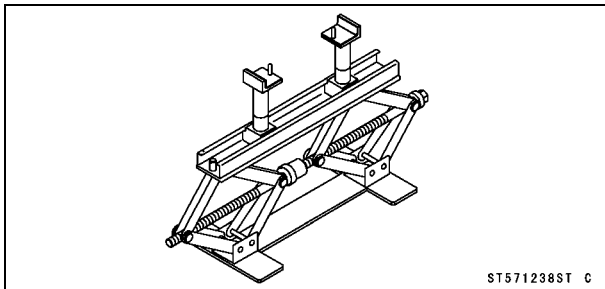
ST571129ST C

Bearing Remover Shaft, $\phi 13$:
57001-1377



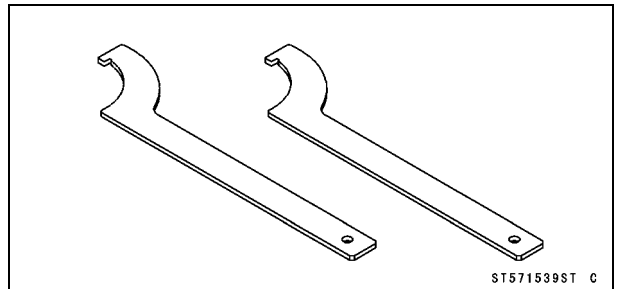
ST571377ST C

Jack:
57001-1238



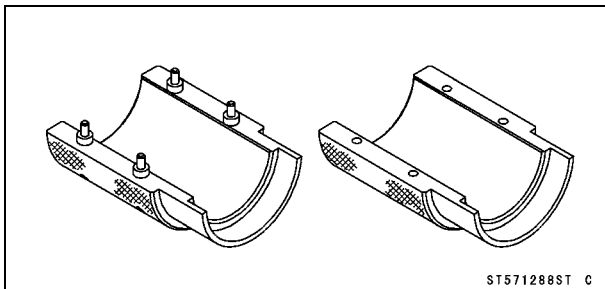
ST571238ST C

Hook Wrench T=3.2 R37:
57001-1539



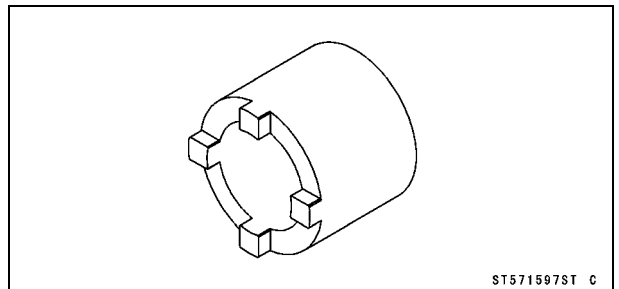
ST571539ST C

Fork Oil Seal Driver, $\phi 41$:
57001-1288



ST571288ST C

Swingarm Pivot Nut Wrench:
57001-1597

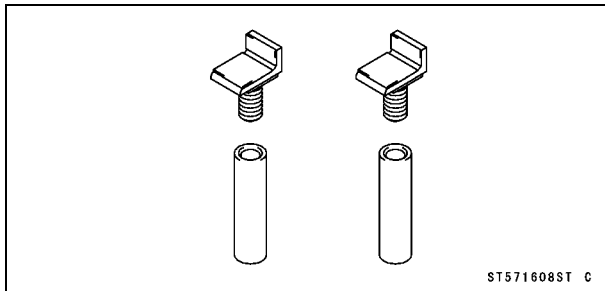


ST571597ST C

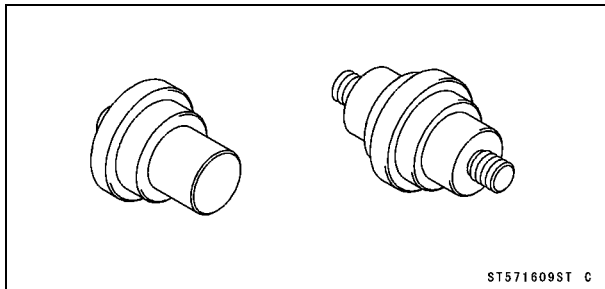
13-8 SUSPENSION

Special Tools

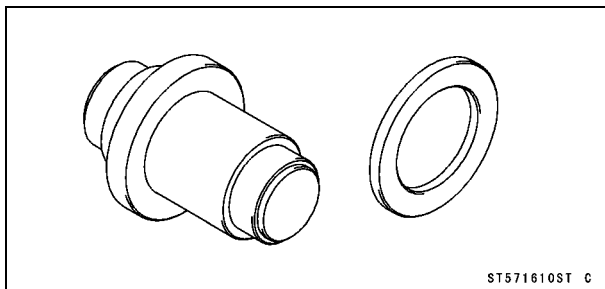
**Jack Attachment:
57001-1608**



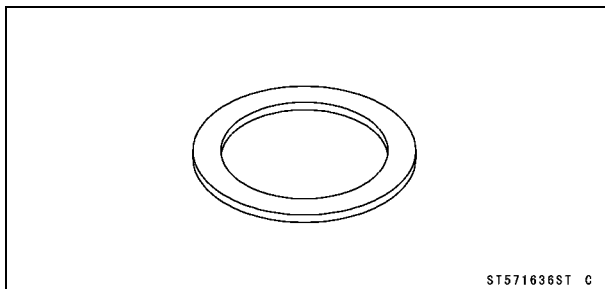
**Needle Bearing Driver, $\phi 17/\phi 18$:
57001-1609**



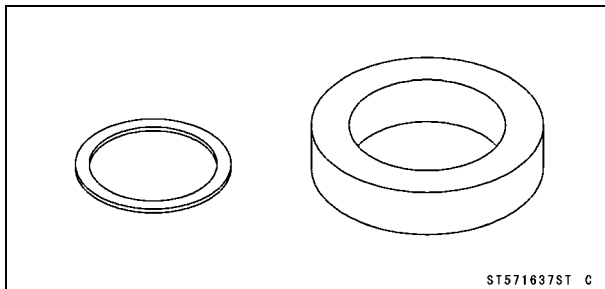
**Needle Bearing Driver, $\phi 28$:
57001-1610**



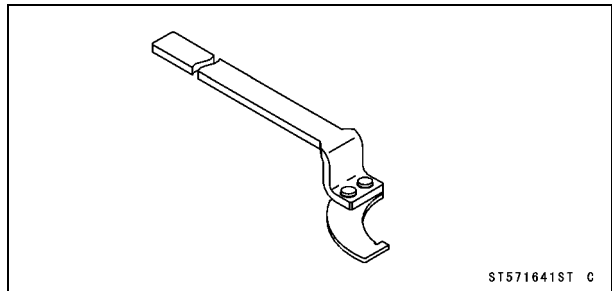
**Spacer, $\phi 18$:
57001-1636**



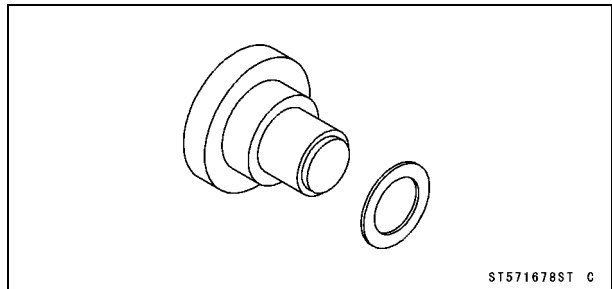
**Spacer, $\phi 28$:
57001-1637**



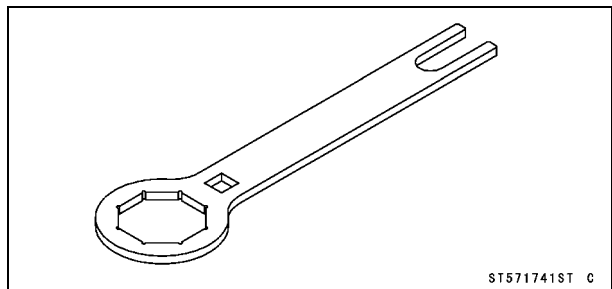
**Hook Wrench:
57001-1641**



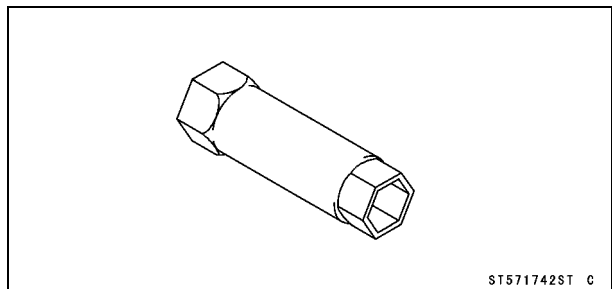
**Needle Bearing Driver, $\phi 20$ & Spacer, $\phi 28$:
57001-1678**



**Top Plug Wrench (45 mm):
57001-1741**



**Box Wrench (27 mm):
57001-1742**



Front Fork

Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the rebound damping adjuster [A] until you feel a click.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **4 turns out** from the fully clockwise position.

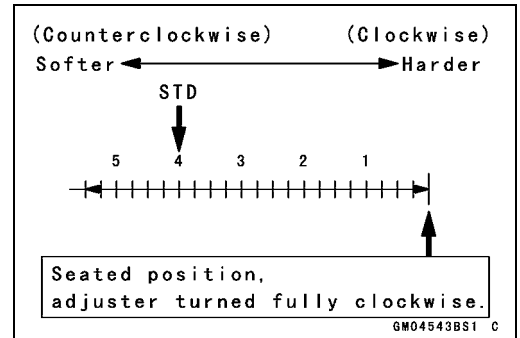
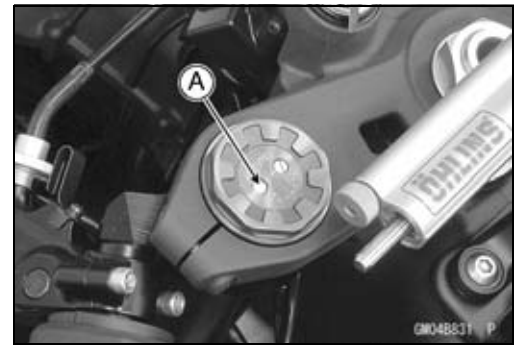
⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

- The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
5 1/2 turns out	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High



Compression Damping Force Adjustment

- To adjust the compression damping force, turn the compression damping adjuster [A] until you feel a click.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **5 1/2 turns out** from the fully clockwise position.

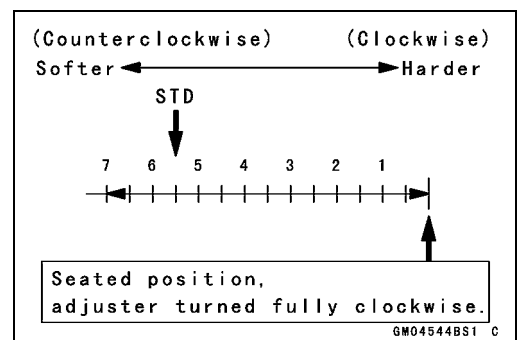
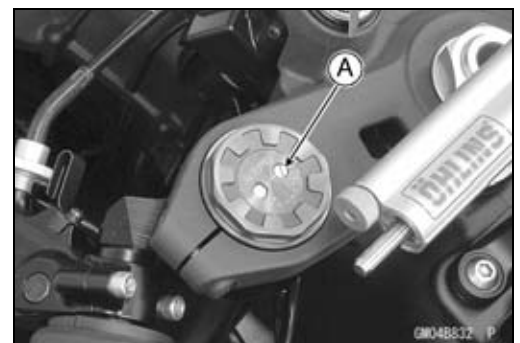
⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

- The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

Compression Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
7 turns out	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High



13-10 SUSPENSION

Front Fork

Spring Preload Adjustment

- To adjust the spring preload, turn the spring preload adjuster [A] until you feel a click.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **4 turns in** from the fully counterclockwise position.

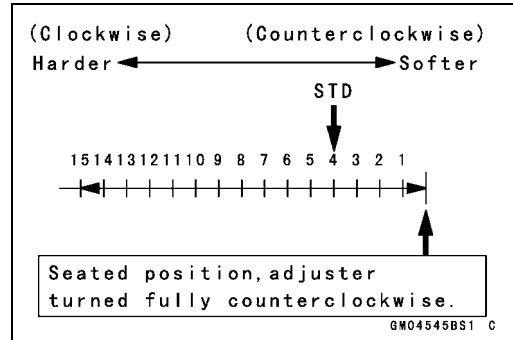
⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

- The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

Spring Action

Adjuster Position	Damping Force	Setting	Load	Road	Speed
0	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
15 turns in	Strong	Hard	Heavy	Bad	High



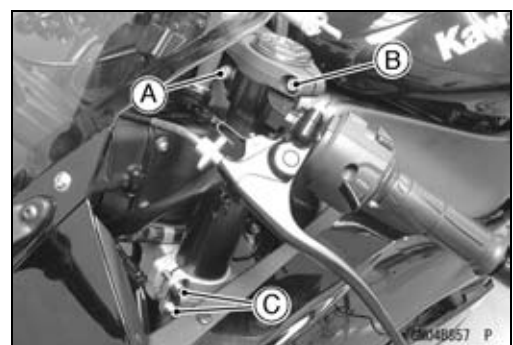
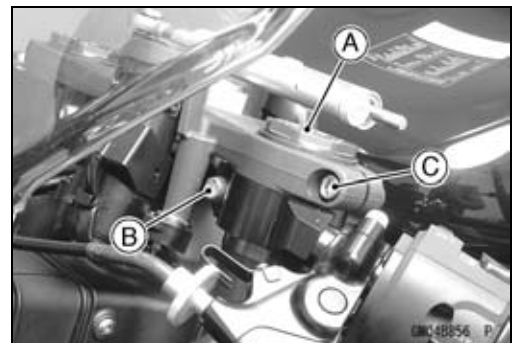
Front Fork Removal (Each Fork Leg)

- Remove:
 - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
 - Front Fender (see Front Fender Removal in the Frame chapter)
- ★ Loosen the front fork top plug [A] beforehand if the fork leg is to be disassembled.

NOTE

○ Loosen the top plug after loosening the handlebar clamp bolt [B] and upper front fork clamp bolt [C].

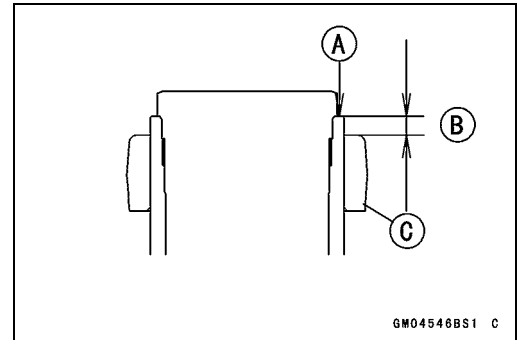
- Loosen:
 - Handlebar Clamp Bolt [A]
 - Upper Front Fork Clamp Bolt [B]
 - Lower Front Fork Clamp Bolts [C]
- With a twisting motion, work the fork leg down and out.



Front Fork

Front Fork Installation (Each Fork Leg)

- Install the fork so that the top end [A] of the outer tube as shown in the figure.
 - 5 mm (0.20 in.) [B]
 - Steering Stem Head [C]
- Tighten:
 - Torque - Lower Front Fork Clamp Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)**
 - Front Fork Top Plugs: 35 N·m (3.6 kgf·m, 26 ft·lb)**

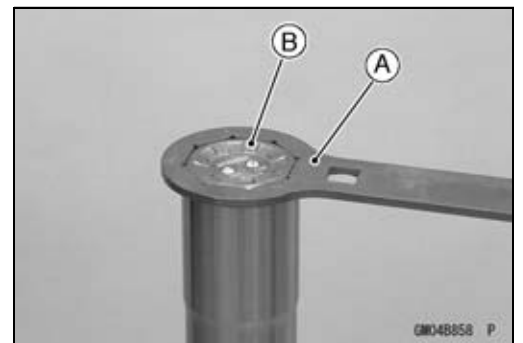


NOTE

- Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.
- Tighten the front fork top plug before tightening the handlebar clamp bolt and upper front fork clamp bolt.
- Tighten:
 - Torque - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**
 - Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the removed parts (see appropriate chapters).
- Adjust:
 - Spring Preload (see Spring Preload Adjustment)
 - Rebound Damping Force (see Rebound Damping Force Adjustment)
 - Compression Damping Force (see Compression Damping Force Adjustment)

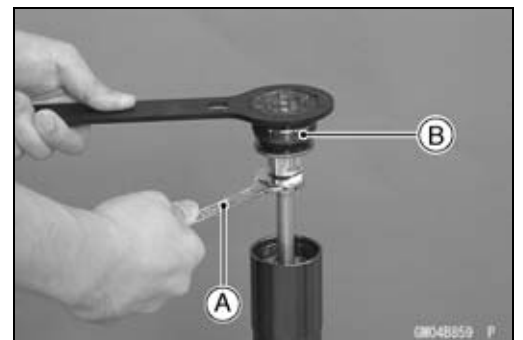
Front Fork Oil Change

- Remove the front fork (see Front Fork Removal (Each Fork Leg)).
- Turn the spring preload adjuster fully counterclockwise for removing the piston rod assy easily.
- Hold the inner tube lower end in a vise.
- Using the wrench [A], unscrew the top plug [B] out of the outer tube.
 - Special Tool - Top Plug Wrench (45 mm): 57001-1741**



- Holding the piston rod nut with a wrench [A], remove the top plug [B] from the piston rod.
 - Special Tool - Top Plug Wrench (45 mm): 57001-1741**

- Remove:
 - Rebound Damping Adjuster Rod
 - Compression Damping Adjuster Rod
 - Piston Rod Nut

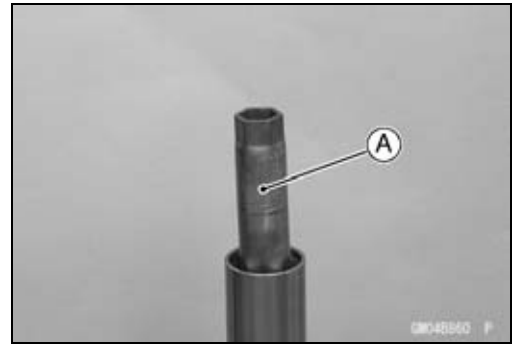


13-12 SUSPENSION

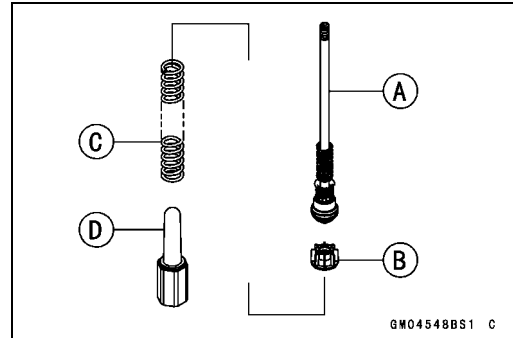
Front Fork

- Using the wrench [A], unscrew the piston rod guide case out of the inner tube.

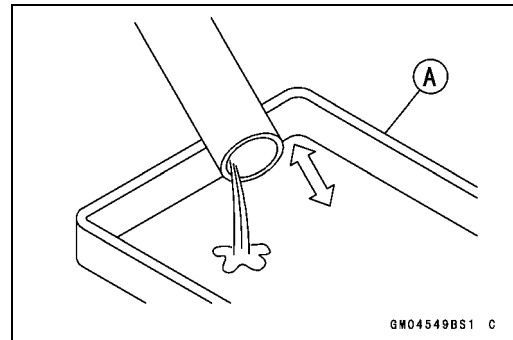
Special Tool - Box Wrench (27 mm): 57001-1742



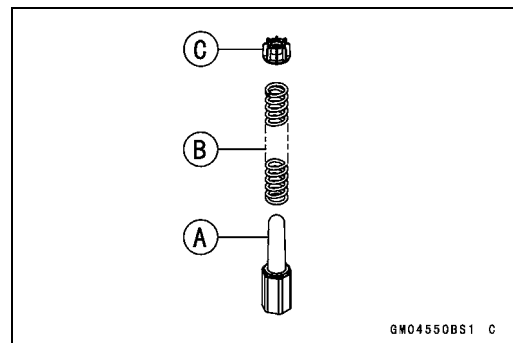
- Remove:
 - Piston Rod Assy [A]
 - Collar [B]
 - Fork Spring [C]
 - Collar [D]



- Drain the fork oil into a suitable container [A].
- Pump the inner tube up and down at least ten times to expel the oil from the fork.



- Install:
 - Collar [A]
 - Fork Spring [B]
 - Collar [C]



- Hold the fork tube upright, press the outer tube.
- Pour in the type and amount of fork oil specified.
- Pour the fork oil until the upper of the inner tube hole [A].

Fork Oil

Viscosity:

SHOWA SS05 or equivalent SAE 5W

Amount (Per Side):

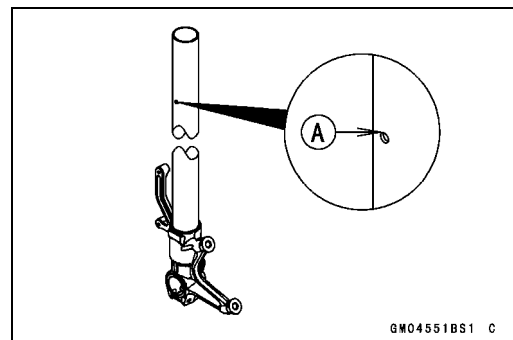
When changing oil:

Approx. 370 mL (12.5 US oz.)

After disassembly and completely dry:

433 ±2.5 mL (14.6 ±0.085 US oz.)

- Move the inner tube up and down more than ten times in order to expel the air from the fork oil.



Front Fork

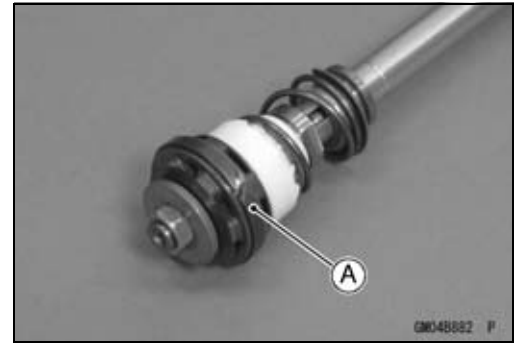
- Insert the piston rod assy into the inner tube.

NOTE

○ *Lifting the outer tube, and insert the piston rod assy.*

CAUTION

When inserting, be careful not to damage the piston ring [A].



- Using the wrench [A], tighten the piston rod guide case to the inner tube.

Special Tool - Box Wrench (27 mm): 57001-1742

Torque - Piston Rod Guide Case: 90 N·m (9.2 kgf·m, 66 ft·lb)



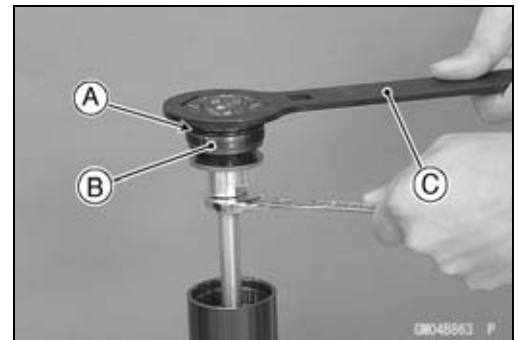
- Install:
 - Piston Rod Nut
 - Compression Damping Adjuster Rod
 - Rebound Damping Adjuster Rod

- Check the O-ring [A] on the top plug [B] and replace it with a new one if damaged.

○ Apply grease to the new O-ring.

- Holding the top plug with a wrench [C], tighten the piston rod nut against the top plug.

Special Tool - Top Plug Wrench (45 mm): 57001-1741

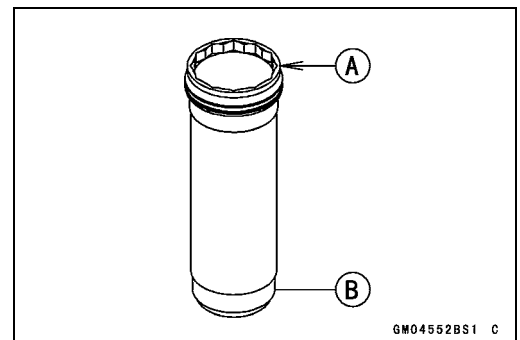


- Pour the fork oil of the remainder.

○ Pour the fork oil until the upper [A] of the piston rod guide case [B].

- Move the piston rod assy up and down more than ten times in order to expel all the air from the fork oil.

- Move the outer tube up and down more than ten times in order to expel all the air from the fork oil.



13-14 SUSPENSION

Front Fork

- Measure the oil level as follows.
- Hold the inner tube vertically in a vise.
- Wait until the oil level settles.
- With the fork fully compressed, insert a tape measure or rod into the piston rod guide case [A], and measure the distance [B] from the top [C] of the outer tube [D] to the oil.

Oil Level (fully compressed)

Standard: 80 ±2 mm (3.15 ±0.08 in.)

NOTE

- After more than ten minutes, oil level is 74 ±2 mm (2.91 ±0.08 in.).
- Fork oil level may also be measured using the fork oil level gauge [E].

Special Tool - Fork Oil Level Gauge: 57001-1290

- Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
- ★ If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.

- Raise the outer tube.
- Using the wrench [A], tighten the top plug [B] to the outer tube.

Special Tool - Top Plug Wrench (45 mm): 57001-1741

Torque - Front Fork Top Plugs: 35 N·m (3.6 kgf·m, 26 ft·lb)

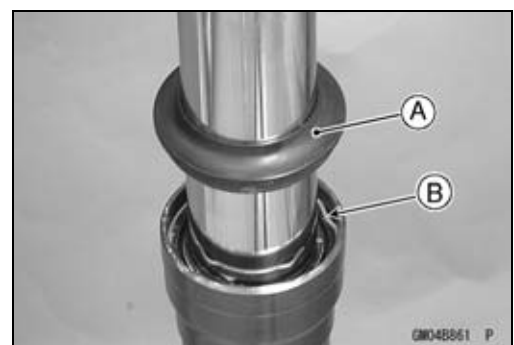
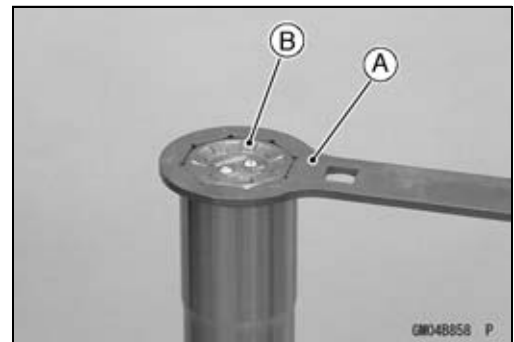
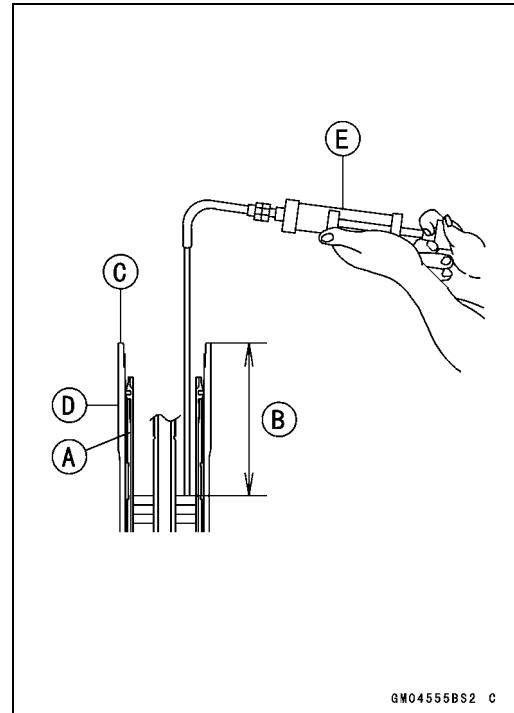
- Install the front fork (see Front Fork Installation (Each Fork Leg)).

NOTE

- After installing the front fork, adjust the spring preload and damping force correctly.

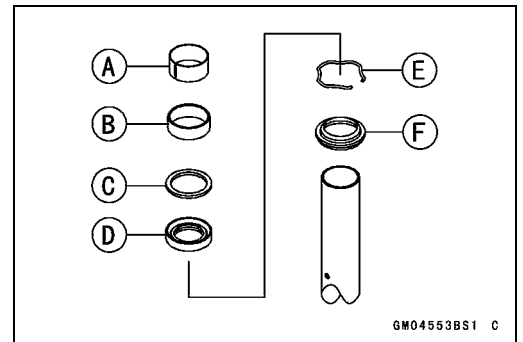
Front Fork Disassembly

- Remove the front fork (see Front Fork Removal (Each Fork Leg)).
- Drain the fork oil (see Front Fork Oil Change).
- Pull out the dust seal [A] from the outer tube.
- Remove the retaining ring [B].
- Separate the outer tube from the inner tube.



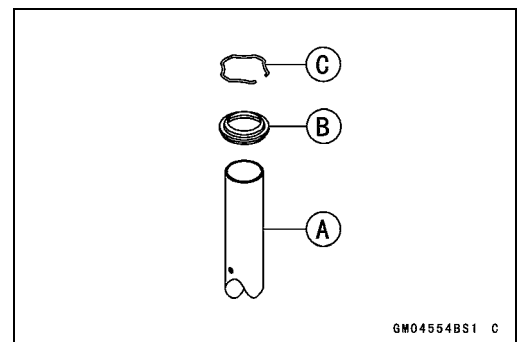
Front Fork

- Remove the following parts from the inner tube.
 - Slide Bushing [A]
 - Guide Bushing [B]
 - Washer [C]
 - Oil Seal [D]
 - Retaining Ring [E]
 - Dust Seal [F]

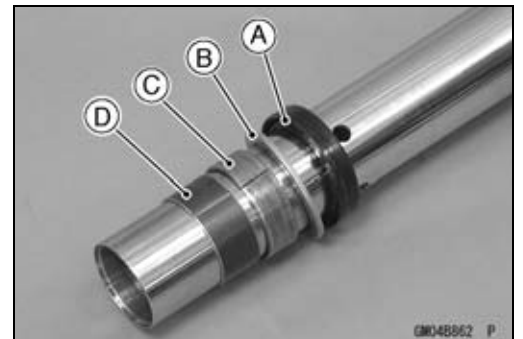


Front Fork Assembly

- Replace the following parts with new ones.
 - Slide Bushing
 - Guide Bushing
 - Oil Seal
- Install the following parts to the inner tube [A].
 - Dust Seal [B]
 - Retaining Ring [C]



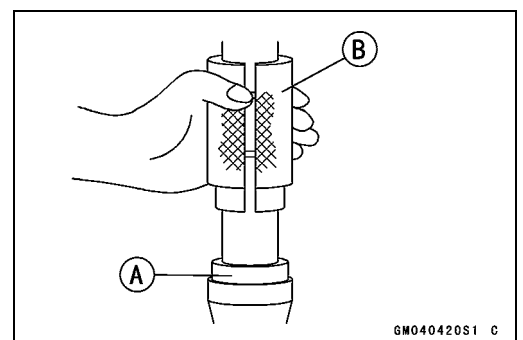
- Apply grease to the oil seal lips.
- Install the oil seal [A] so that the stamp side faces lower side.
- Install the washer [B] so that the chamfer side faces upper side.
- Install the guide bushing [C] so that the slit of it is positioned perpendicular to the traveling direction.
- Install the slide bushing [D] so that the slit of it is positioned perpendicular to the traveling direction.
- Apply grease to the slide and guide bushings and oil seal.



- Insert the inner tube to the outer tube.
- After installing the washer, install the oil seal [A] by using the fork oil seal driver [B].

Special Tool - Fork Oil Seal Driver, $\phi 41$: 57001-1288

- Install the retaining ring and dust seal.
- Pour in the specified type of oil (see Front Fork Oil Change).



13-16 SUSPENSION

Front Fork

Inner Tube Inspection

- Visually inspect the inner tube [A], and repair any damage.
- Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.
- ★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

CAUTION

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

- Temporarily assemble the inner tube [A] and outer tube [B], and pump [C] them back and forth manually to check for smooth operation.
- ★ If you feel binding or catching, the inner and outer tubes must be replaced.

⚠ WARNING

A straightened inner or outer fork tube may fall in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.

Dust Seal Inspection

- Inspect the dust seals [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.

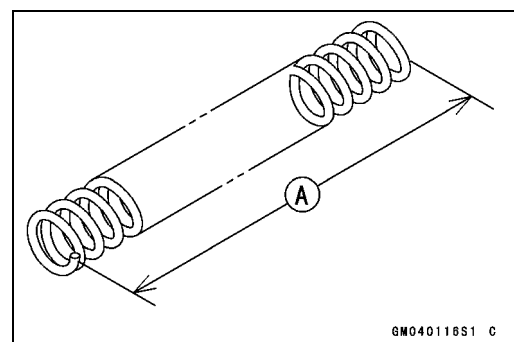
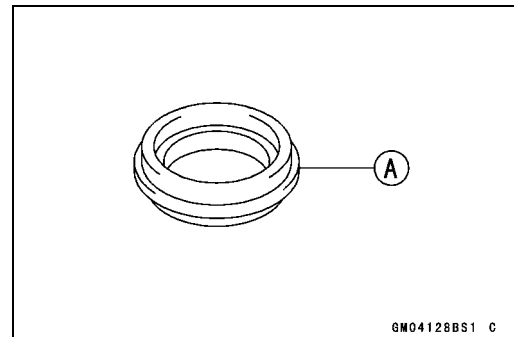
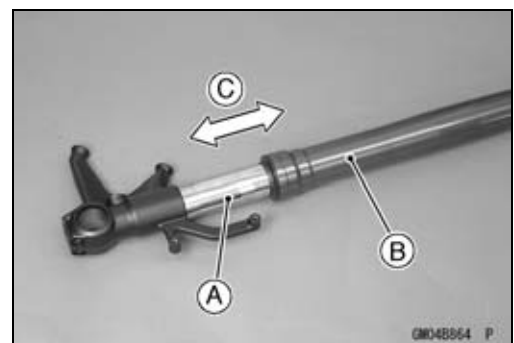
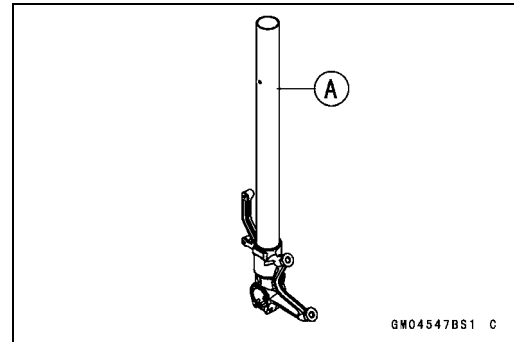
Spring Tension Inspection

- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.
- ★ If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

Spring Free Length

Standard: 235 mm (9.25 in.)

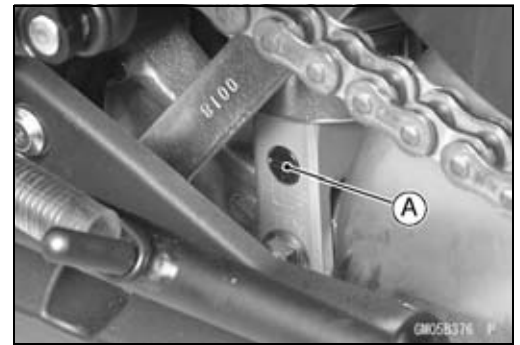
Service Limit: 230 mm (9.06 in.)



Rear Shock Absorber

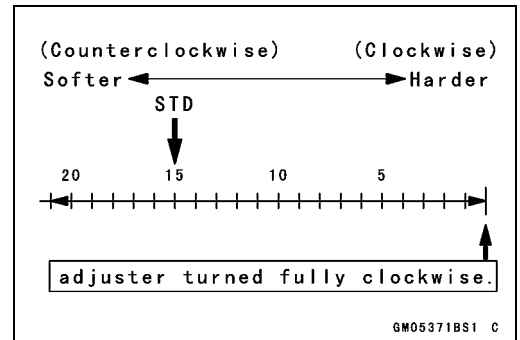
Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the rebound damping adjuster [A] to the desired position, until you feel a click.
- The standard adjuster setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **15th click** from the first click of the fully clockwise position.



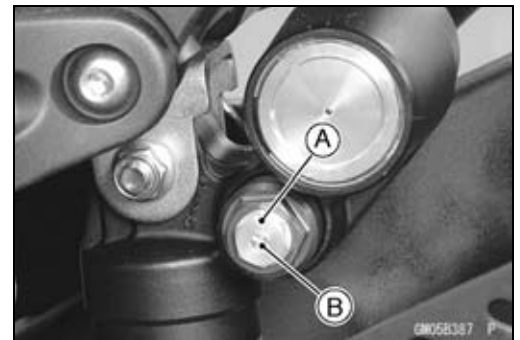
Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
21 clicks	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High

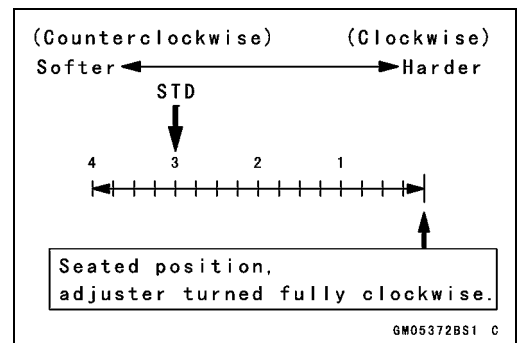


Compression Damping Force Adjustment

- There are two adjustments you can make to the compression damping force.
 - High Speed Compression Damping Adjuster [A]
 - Low Speed Compression Damping Adjuster [B]



- To adjust the high speed compression damping force, turn the outside damping adjuster with a wrench to the desired position.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **3 turns out** from the fully clockwise position.



High Speed Compression Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road
4 turns out	Weak	Soft	Light	Good
↑	↑	↑	↑	↑
↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad

NOTE

- When turning the high speed compression damping force adjuster (outside), turn the low speed compression damping force adjuster (inside) too. But, the low speed compression damping force (setting position) dose not change.

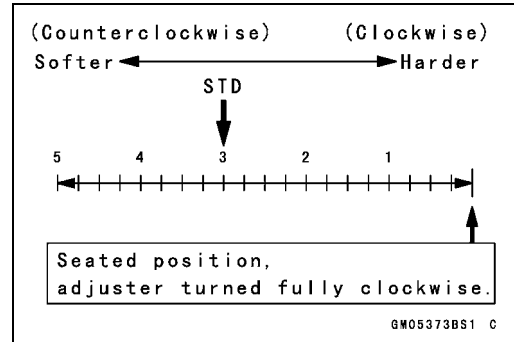
13-18 SUSPENSION

Rear Shock Absorber

- To adjust the low speed compression damping force, turn the inside damping adjuster with a flat-head screwdriver to the desired position.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **3 turns out** from the fully clockwise position.

Low Speed Compression Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road
5 turns out	Weak	Soft	Light	Good
↑	↑	↑	↑	↑
↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad



Spring Preload Adjustment

- Remove the rear shock absorber from the frame (see Rear Shock Absorber Removal).
- Loosen the locknut and turn out the adjusting nut to free the spring.

Special Tool - Hook Wrench T=3.2 R37: 57001-1539

- To adjust the spring preload, turn in the adjusting nut [A] to the desired position and tighten the locknut [B].
Spring Length [C]

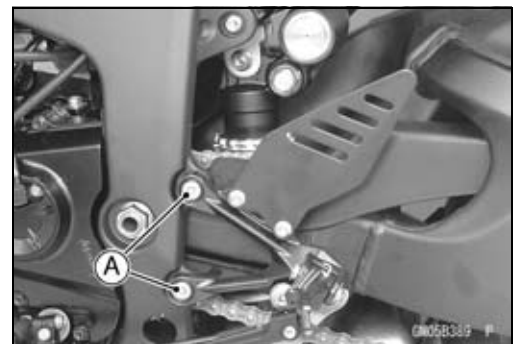
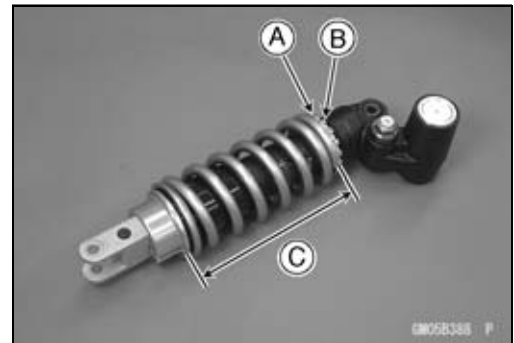
Spring Preload Setting

Standard: Spring length 179 mm (7.05 in.)

Usable Range: Spring length 179 ~ 190 mm (7.05 ~ 7.48 in.)

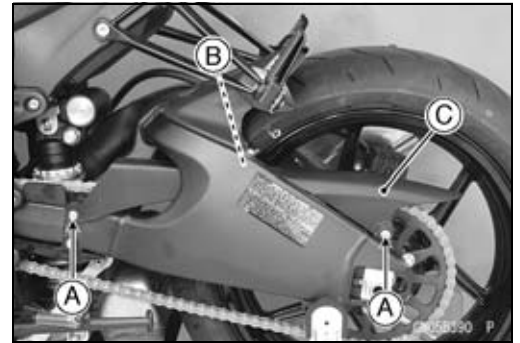
- The standard adjusting nut setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is **179 mm (7.05 in.)** spring length.

- Remove the bolts [A].



Rear Shock Absorber

- Remove:
 - Bolts [A]
 - Quick Rivet [B]
 - Chain Cover [C]
- Push the central pin, and then remove the quick rivet.



- To adjust the spring preload, turn in the adjusting nut to the desired position and tighten the locknut by using hook wrenches [A] with the rear shock absorber attached the frame.

Special Tools - Hook Wrench T=3.2 R37: 57001-1539

Hook Wrench: 57001-1641

- ★ If the spring action feels too soft or too stiff, adjust it.

Spring Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
190 mm (7.48 in.)	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
179 mm (7.05 in.)	Strong	Hard	Heavy	Bad	High



Rear Shock Absorber Removal

- Remove:
 - Lower Fairings (see Lower Fairing Removal in the Frame chapter)
 - Premuffler Chamber (see Premuffler Chamber Removal in the Engine Top End chapter)
- Squeeze the brake lever slowly and hold it with a band [A].



⚠ WARNING

Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.

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

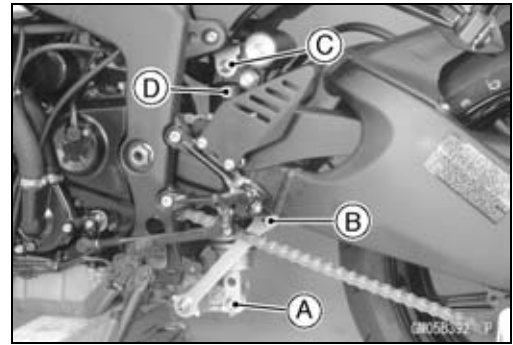
Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

13-20 SUSPENSION

Rear Shock Absorber

- Remove:
 - Lower Rear Shock Absorber Nut and Bolt [A]
 - Upper Tie-Rod Nut and Bolt [B]
 - Upper Rear Shock Absorber Nut and Bolt [C]
- Remove the rear shock absorber [D] downward.

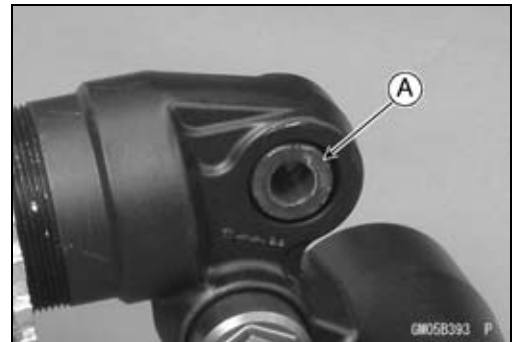


Rear Shock Absorber Installation

- Tighten:
 - Torque - Rear Shock Absorber Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)
 - Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

Rear Shock Absorber Inspection

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.
 - Smooth Stroke
 - Oil Leakage
 - Crack or Dent
- ★ If there is any damage to the rear shock absorber, replace it.
- Visually inspect the rubber bushing [A].
- ★ If it show any signs of damage, replace it.

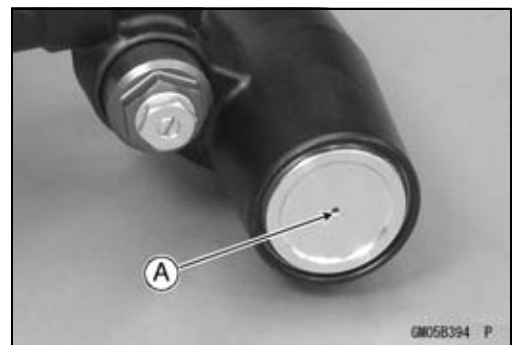


Rear Shock Absorber Scrapping

⚠ 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.



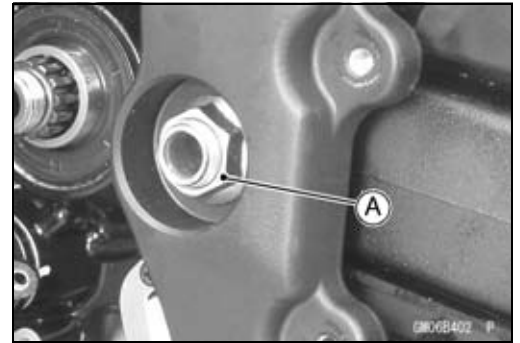
⚠ WARNING

Since the high pressure gas is dangerous, do not point the drill toward your face or body.

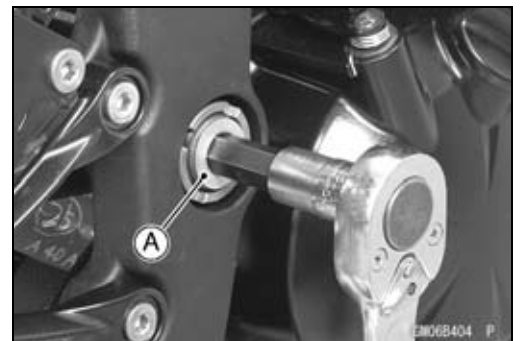
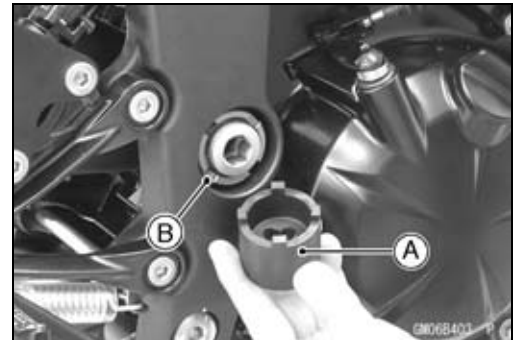
Swingarm

Swingarm Removal

- Remove:
 - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
 - Chain Cover (see Drive Chain Removal in the Final Drive chapter)
 - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
 - Mud Guard (see Mud Guard Removal in the Frame chapter)
 - Rear Shock Absorber (see Rear Shock Absorber Removal)
- Unscrew the swingarm pivot shaft nut [A].
- Using the swingarm pivot nut wrench [A], loosen the swingarm pivot adjusting collar locknut [B].
 - Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**

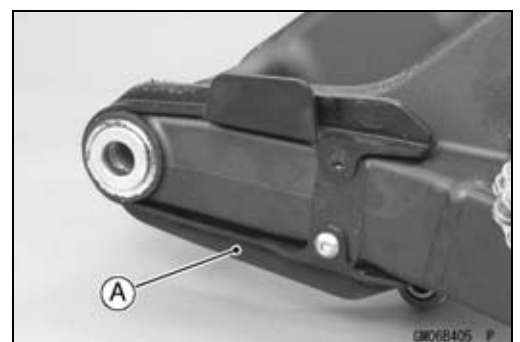


- Turn the swingarm pivot shaft [A] counterclockwise to free the adjusting collar from the swingarm.
- Make the gap between the adjusting collar and swingarm.
- Pull out the pivot shaft to the right side and remove the swingarm.



Swingarm Installation

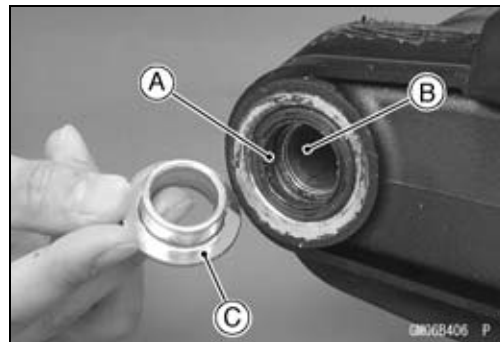
- Visually inspect the chain guide [A].
- ★ Replace the chain guide if it shows any signs of abnormal wear or damage.
- Apply a non-permanent locking agent to the threads of the chain guide bolt.



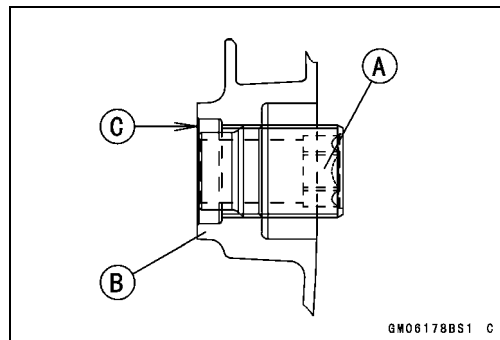
13-22 SUSPENSION

Swingarm

- Apply plenty of grease to the lip of the oil seals [A].
- Be sure to install the oil seals and sleeve [B] to the swingarm.
- Fit the collar [C] on the oil seal of the left side.



- Screw the adjusting collar [A] into the frame [B] so that the collar does not project the swingarm mating surface [C].



- Insert the swingarm pivot shaft [A] into the adjusting collar [B] from the right side, and tighten the pivot shaft.

NOTE

○ Tighten the swingarm pivot shaft until the clearance [C] between the ball bearing [D] and collar come to 0 mm (0 in.).

Torque - Swingarm Pivot Shaft: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Using the swingarm pivot nut wrench, tighten the swingarm pivot adjusting collar locknut [E].

Special Tool - Swingarm Pivot Nut Wrench: 57001-1597

Torque - Swingarm Pivot Adjusting Collar Locknut: 98 N·m (10.0 kgf·m, 72.3 ft·lb)

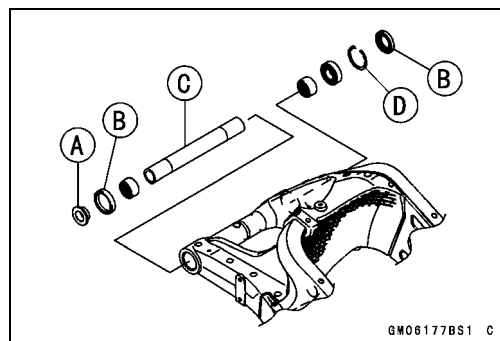
- Tighten the swingarm pivot shaft nut.
Torque - Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

- Install the removed parts (see appropriate chapters).

Swingarm Bearing Removal

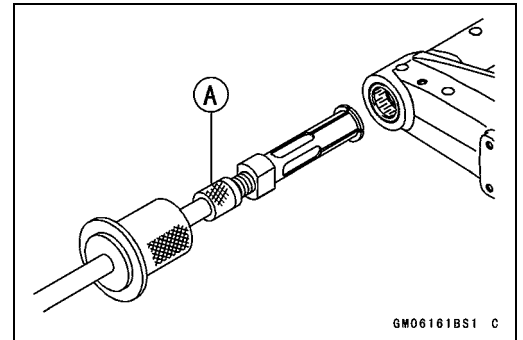
- Remove:
 - Swingarm (see Swingarm Removal)
 - Collar [A]
 - Oil Seals [B]
 - Sleeve [C]
 - Circlip [D] (Right Side)

Special Tool - Inside Circlip Pliers: 57001-143



Swingarm

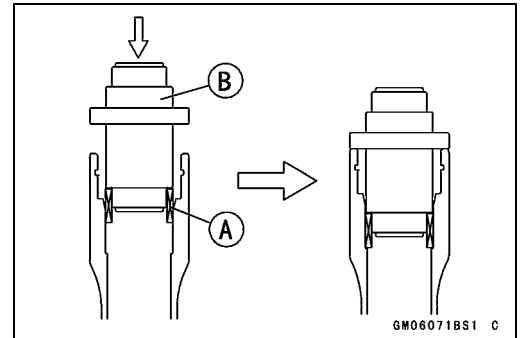
- Remove the ball bearing and needle bearings.
Special Tool - Oil Seal & Bearing Remover [A]: 57001-1058



Swingarm Bearing Installation

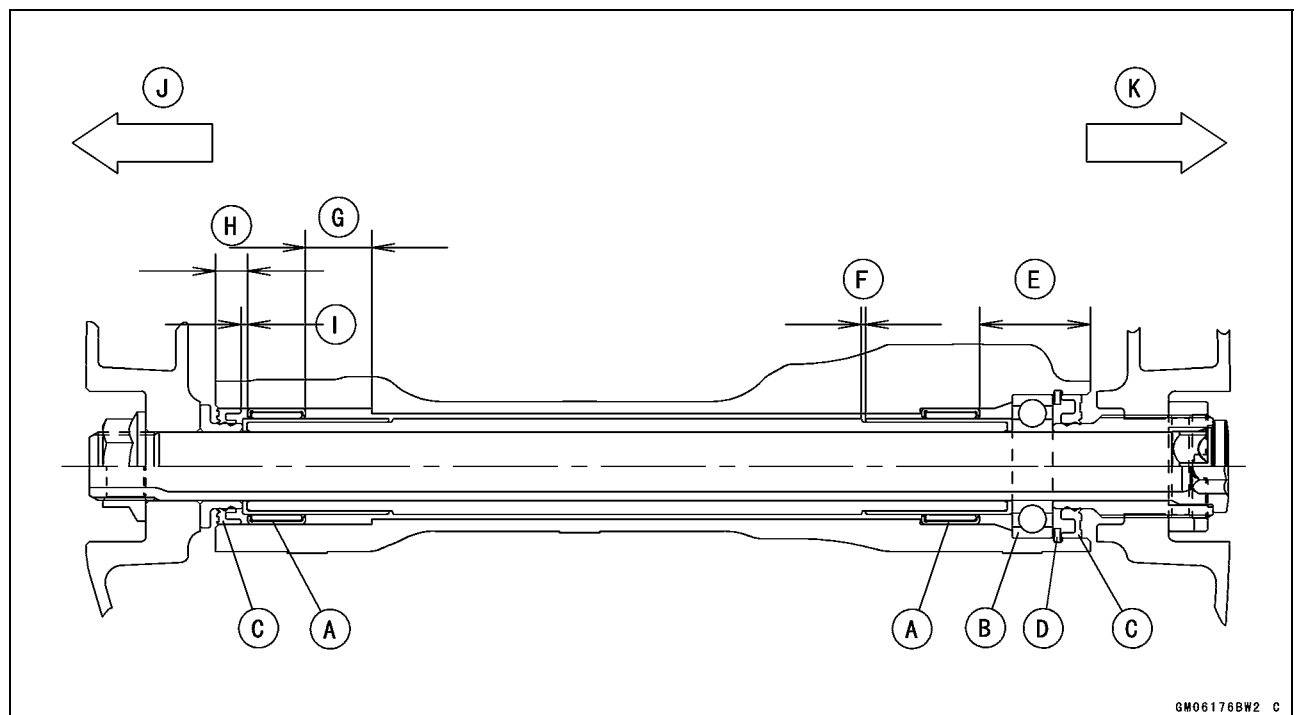
- Replace the ball and needle bearings [A] with new ones.
- Install the ball and needle bearings so that the manufacturer's marks face out.

- Special Tools - Bearing Driver Set: 57001-1129**
Needle Bearing Driver, ϕ 28 [B]: 57001-1610
Spacer, ϕ 28: 57001-1637
Needle Bearing Driver, ϕ 20 & Spacer, ϕ 28: 57001-1678



- Install the needle bearings [A], ball bearing [B] and oil seals [C] position as shown in the figure.

- Circlip [D]
- 32.5 mm (1.28 in.) [E]
- 0.5 mm (0.02 in.) [F]
- 19.5 mm (0.77 in.) [G]
- 9.5 mm (0.37 in.) [H]
- 2 mm (0.08 in.) [I]
- Left Side [J]
- Right Side [K]



13-24 SUSPENSION

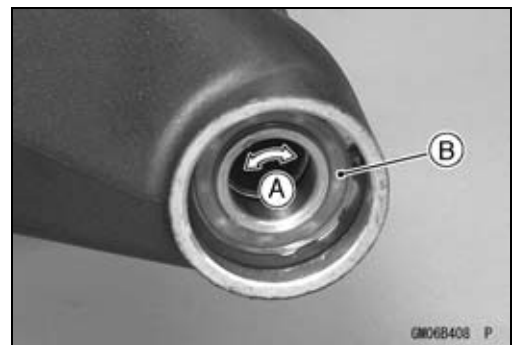
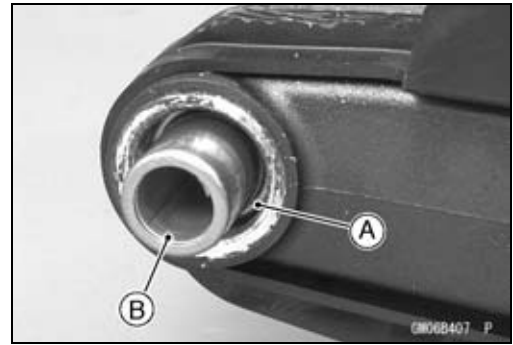
Swingarm

Swingarm Bearing, Sleeve Inspection

CAUTION

Do not remove the bearings for inspection. Removal may damage them.

- Inspect the needle bearings [A] and ball bearing installed in the swingarm.
- The rollers and ball in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.
- ★ If the needle bearing, and sleeve [B] show any signs of abnormal wear, discoloration, or damage, replace them as a set.
- Turn the bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



Swingarm Bearing Lubrication

NOTE

- Since the bearing are packed with grease and sealed, lubrication is not required.

Tie-Rod, Rocker Arm

Tie-Rod Removal

- Remove:
 - Lower Fairings (see Lower Fairing Removal in the Frame chapter)
 - Premuffler Chamber (see Premuffler Chamber Removal in the Engine Top End chapter)
- Squeeze the brake lever slowly and hold it with a band [A].

⚠ WARNING

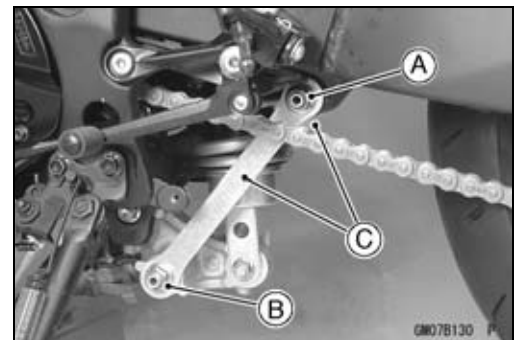
Be sure to hold the brake lever when removing the tie-rod, or the motorcycle may fall over. If could cause an accident and injury.

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

Special Tools - Jack: 57001-1238

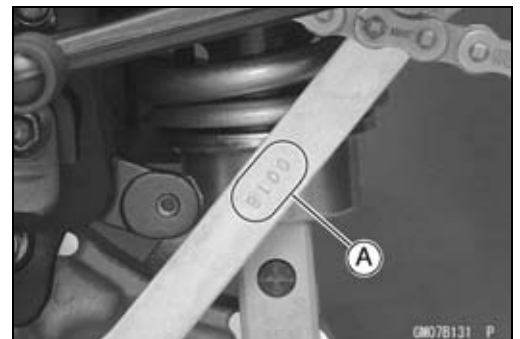
Jack Attachment: 57001-1608

- Remove:
 - Upper Tie-Rod Nut and Bolt [A]
 - Lower Tie-Rod Nut and Bolt [B]
 - Tie-Rods [C]



Tie-Rod Installation

- Apply grease to the inside of the oil seals.
- Install the tie-rods so that the marked side faces [A] outside.
- Tighten:
 - Torque - Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**



Rocker Arm Removal

- Remove:
 - Lower Fairings (see Lower Fairing Removal in the Frame chapter)
 - Premuffler Chamber (see Premuffler Chamber Removal in the Engine Top End chapter)
- Squeeze the brake lever slowly and hold it with a band [A].

⚠ WARNING

Be sure to hold the brake lever when removing the rocker arm, or the motorcycle may fall over. If could cause an accident and injury.

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

Special Tools - Jack: 57001-1238

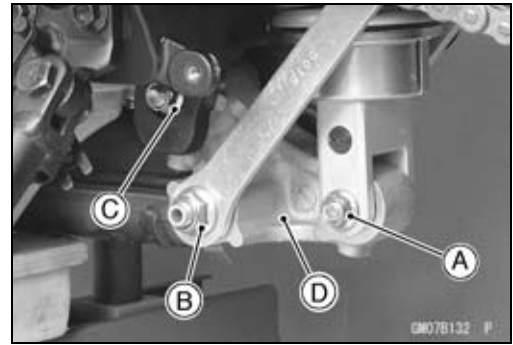
Jack Attachment: 57001-1608



13-26 SUSPENSION

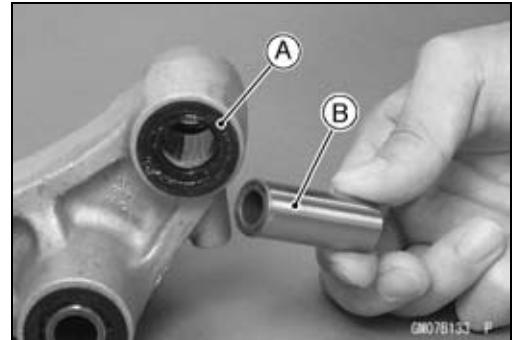
Tie-Rod, Rocker Arm

- Remove:
 - Lower Rear Shock Absorber Nut and Bolt [A]
 - Lower Tie-Rod Nut and Bolt [B]
 - Rocker Arm Nut and Bolt [C]
 - Rocker Arm [D]



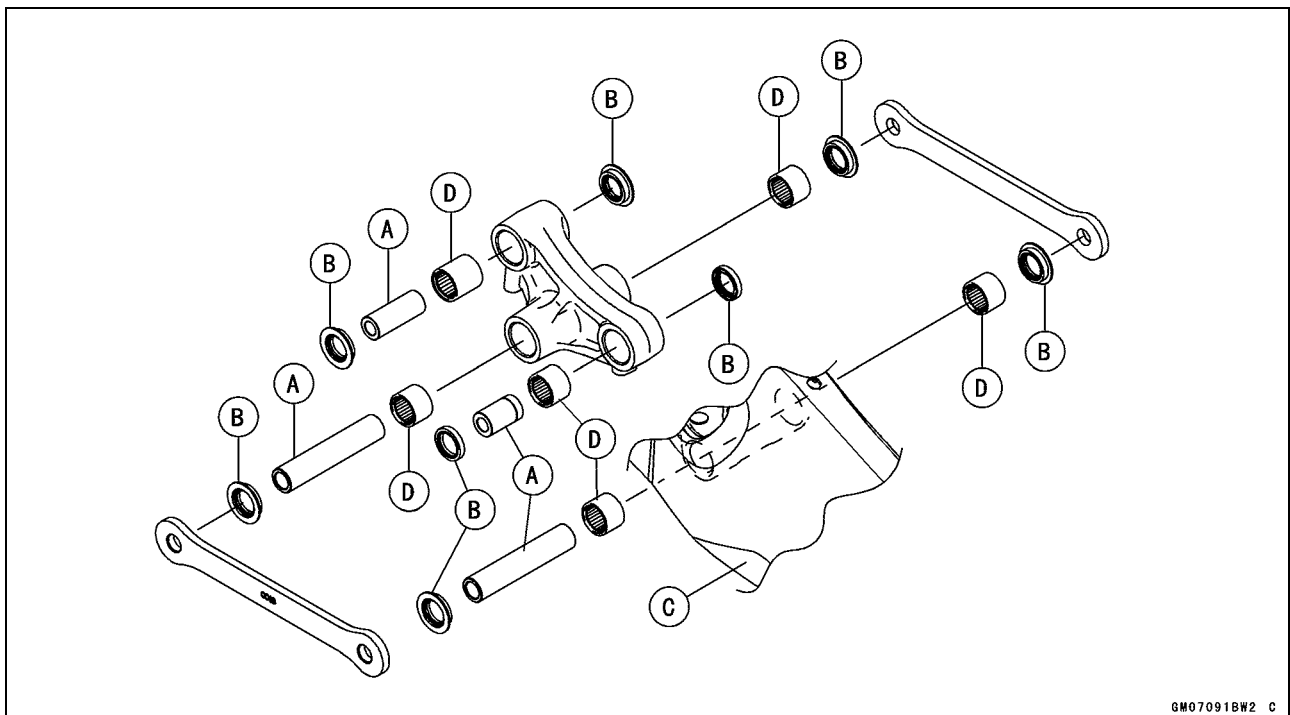
Rocker Arm Installation

- Apply grease to the inside of the oil seals [A].
- Be sure to install the oil seals and sleeves [B] to the rocker arm.
- Tighten:
 - Torque - Uni-Trak Rocker Arm Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)
 - Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)
 - Lower Rear Shock Absorber Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)



Tie-Rod and Rocker Arm Bearing Removal

- Remove:
 - Tie-Rods (see Tie-Rod Removal)
 - Rocker Arm (see Rocker Arm Removal)
 - Sleeves [A]
 - Oil Seals [B]
 - Swingarm [C] (see Swingarm Removal)
 - Remove the needle bearings [D], using the bearing remover head and bearing remover shaft.
- Special Tools - Bearing Remover Head, $\phi 20 \times \phi 22$: 57001-1293**
- Bearing Remover Shaft, $\phi 13$: 57001-1377**



Tie-Rod, Rocker Arm

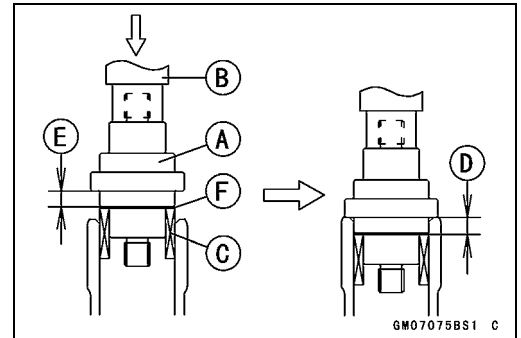
Tie-Rod and Rocker Arm Bearing Installation

- Replace the needle bearings and oil seals with new ones.
 - Install the needle bearings and oil seals position as shown in the figure.
- Screw the needle bearing driver [A] into the driver holder [B].
 - Insert the needle bearing driver into the needle bearing [C] and press the needle bearing into the housing until the driver contacts the end surface of the housing.
 Bearing Pressing Depth: 5.5 mm (0.22 in.) [D]
 5.0 mm (0.20 in.) [E]

NOTE

- For a bearing of inside diameter $\phi 18$, select the pressing side of the needle bearing driver according to its pressing depth.
- When pressing in the needle bearings to the 5.5 mm (0.22 in.) depth, adjust the pressing depth with the spacer [F].
- Install the needle bearings so that the marked side faces out.

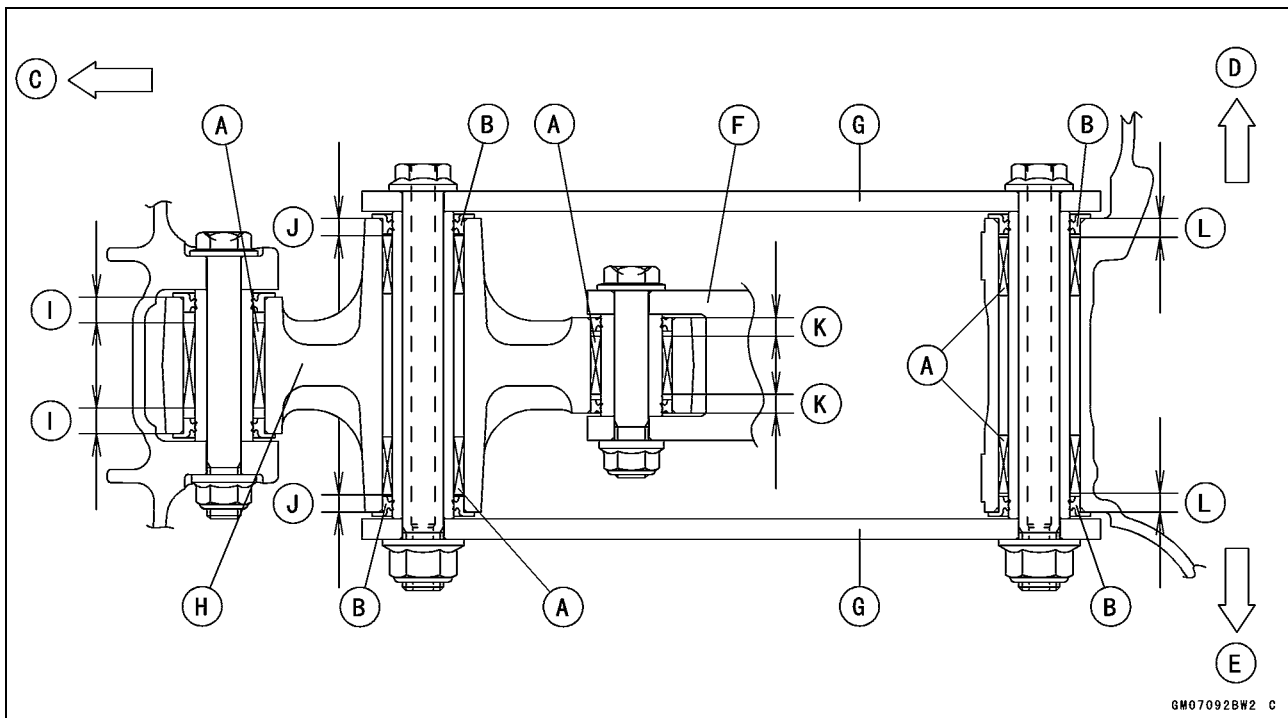
Special Tools - Bearing Driver Set: 57001-1129
Needle Bearing Driver, $\phi 17/\phi 18$: 57001-1609
Spacer, $\phi 18$: 57001-1636



13-28 SUSPENSION

Tie-Rod, Rocker Arm

- Needle Bearings [A]
- Oil Seals [B]
- Front [C]
- Right Side [D]
- Left Side [E]
- Rear Shock Absorber [F]
- Tie-Rods [G]
- Rocker Arm [H]
- 7.5 mm (0.30 in.) [I]
- 5.0 mm (0.20 in.) [J]
- 5.5 mm (0.22 in.) [K]
- 5.5 mm (0.22 in.) [L]

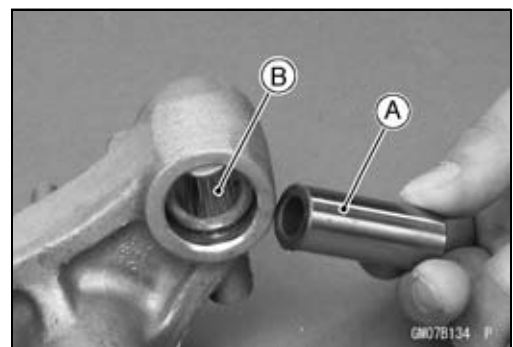


Tie-Rod/Rocker Arm Bearing, Sleeve Inspection

CAUTION

Do not remove the bearings for inspection. Removal may damage them.

- Visually inspect the rocker arm, or tie-rod sleeves [A] and needle bearings [B].
- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
- ★ If there is any doubt as to the condition of any of the needle bearings or sleeve, replace the sleeve and needle bearings as a set.



Tie-Rod/Rocker Arm Bearing Lubrication

NOTE

○ Since the bearings are packed with grease, lubrication is not required.

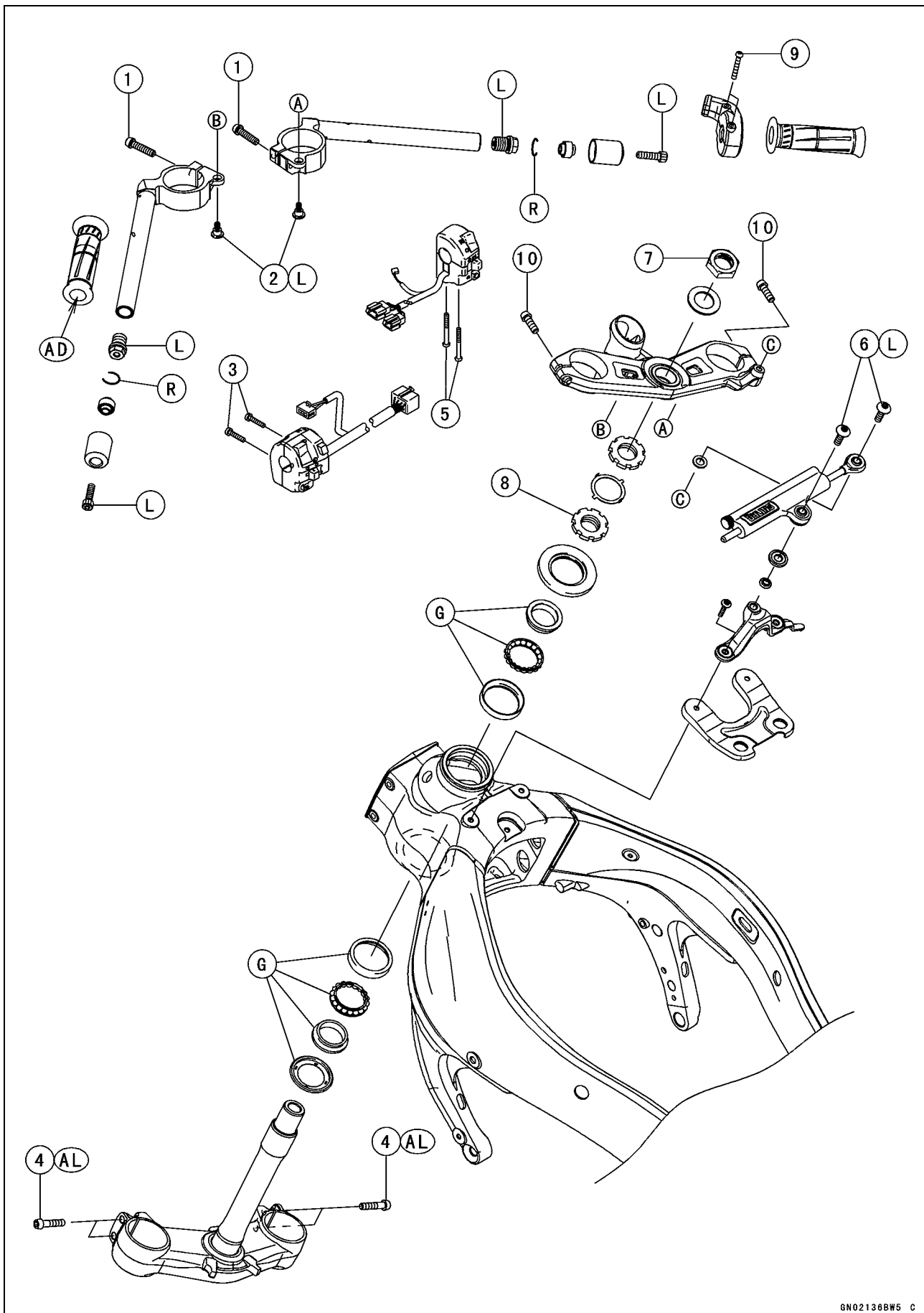
Steering

Table of Contents

Exploded View	14-2
Specifications	14-4
Special Tools	14-5
Steering	14-6
Steering Inspection	14-6
Steering Adjustment.....	14-6
Steering Damper	14-7
Damping Force Adjustment	14-7
Steering Damper Removal.....	14-7
Steering Damper Installation.....	14-7
Steering Damper Oil Leak Inspection	14-7
Steering Stem.....	14-8
Stem, Stem Bearing Removal.....	14-8
Stem, Stem Bearing Installation.....	14-9
Steering Stem Bearing Lubrication	14-11
Steering Stem Warp Inspection	14-11
Stem Cap Deterioration, Damage Inspection	14-11
Handlebar	14-12
Handlebar Removal	14-12
Handlebar Installation	14-13

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	
2	Handlebar Positioning Bolts	9.8	1.0	87 in·lb	L
3	Left Switch Housing Screws	3.5	0.36	31 in·lb	
4	Lower Front Fork Clamp Bolts	23	2.3	17	AL
5	Right Switch Housing Screws	3.5	0.36	31 in·lb	
6	Steering Damper Mounting Bolts	11	1.1	97 in·lb	L
7	Steering Stem Head Nut	78	8.0	58	
8	Steering Stem Nut	20	2.0	15	
9	Throttle Case Screws	3.5	0.36	31 in·lb	
10	Upper Front Fork Clamp Bolts	20	2.0	15	

AD: Apply adhesive.

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

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

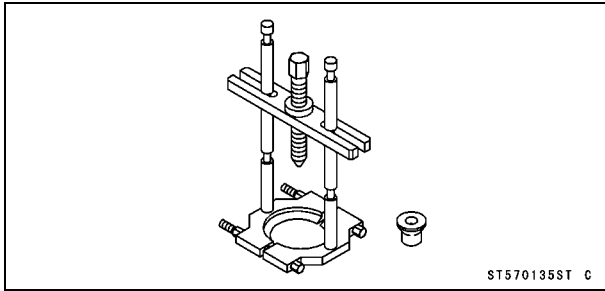
14-4 STEERING

Specifications

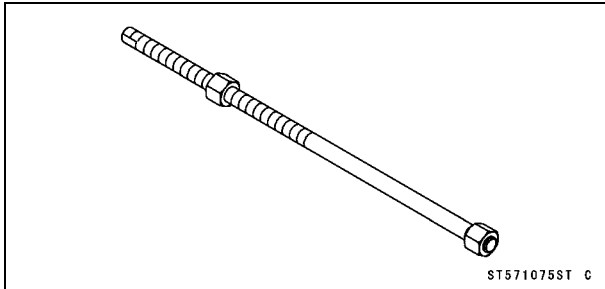
Item	Standard
Steering Damper Damper Setting	18th click from the first click of the fully clockwise position (Usable Range: 0 ↔ 18 Clicks)

Special Tools

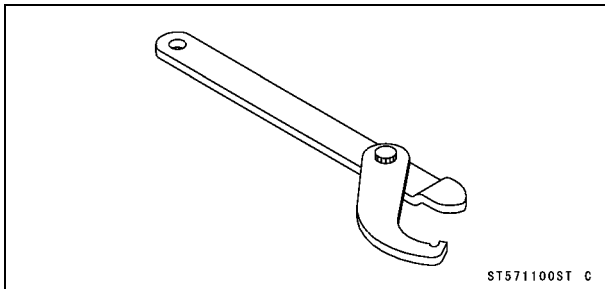
Bearing Puller:
57001-135



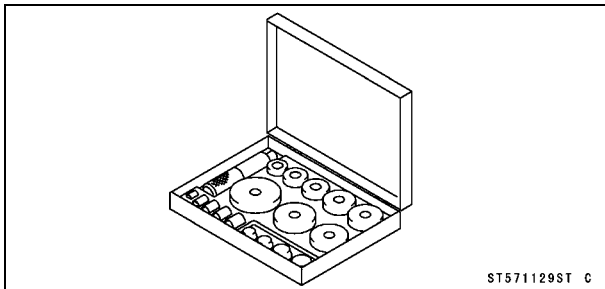
Head Pipe Outer Race Press Shaft:
57001-1075



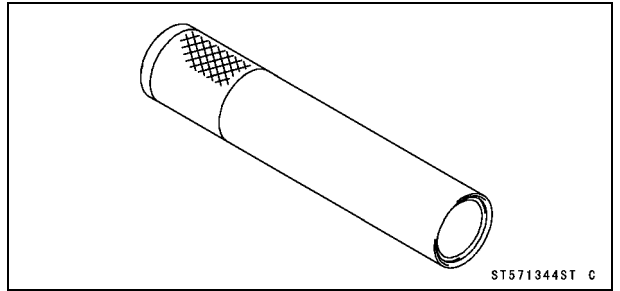
Steering Stem Nut Wrench:
57001-1100



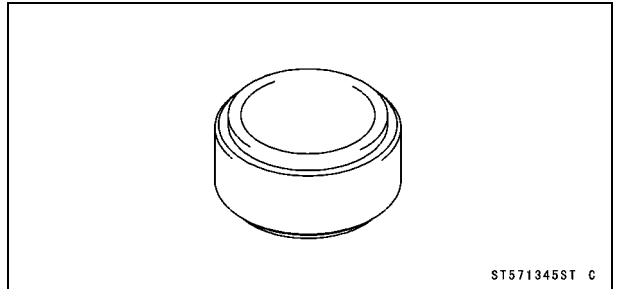
Bearing Driver Set:
57001-1129



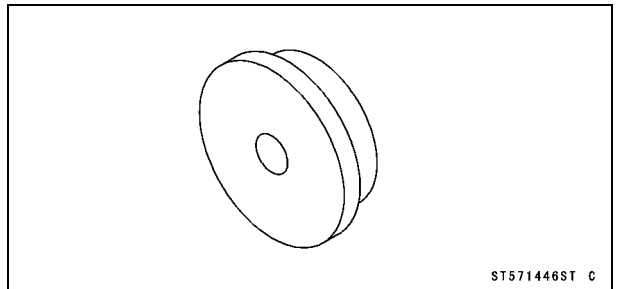
Steering Stem Bearing Driver, $\phi 42.5$:
57001-1344



Steering Stem Bearing Driver Adapter, $\phi 41.5$:
57001-1345



Head Pipe Outer Race Driver, $\phi 55$:
57001-1446



14-6 STEERING

Steering

Steering Inspection

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

Steering Adjustment

- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

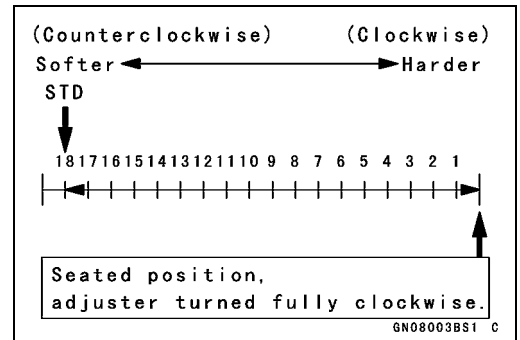
Steering Damper

Damping Force Adjustment

- To adjust the damping force, turn the damping adjuster [A] until you feel a click.
- The standard adjuster setting is the **18th click** from the 1st of the fully clockwise position. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

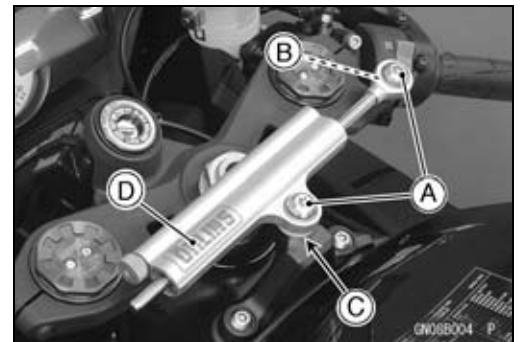
Damping Force Adjustment

Adjuster Position	Damping Force	Setting
18	Weak	Soft
↑	↑	↑
↓	↓	↓
0	Strong	Hard



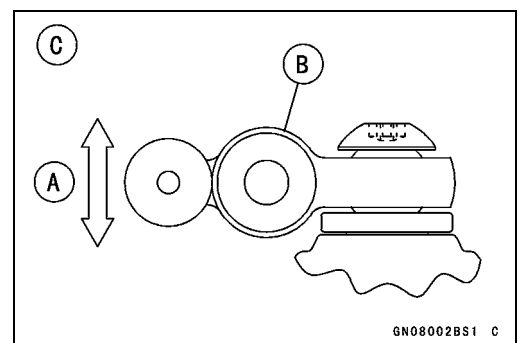
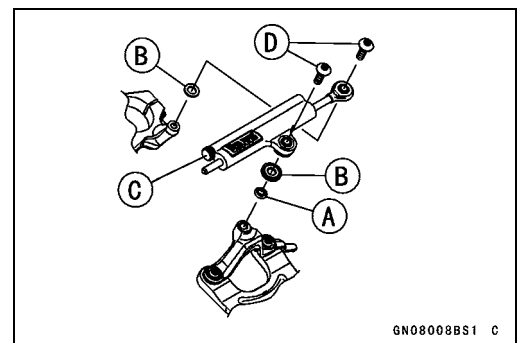
Steering Damper Removal

- Remove:
 - Steering Damper Mounting Bolts (TORX Bolts) [A]
 - Washer [B]
 - Washer and Collar [C]
 - Steering Damper [D]



Steering Damper Installation

- Install the following parts as shown in the figure.
 - Collar [A]
 - Washers [B]
 - Steering Damper [C]
- Apply a non-permanent locking agent to the threads of the steering damper mounting bolts (TORX bolts) [D].
- Tighten:
 - Torque - Steering Damper Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**
- After tightening the steering damper mounting bolts, confirm that there is play [A] in the steering damper [B].
 - Left Side View [C]



Steering Damper Oil Leak Inspection

- Refer to the Steering Damper Oil Leak Inspection in the Periodic Maintenance chapter.

14-8 STEERING

Steering Stem

Stem, Stem Bearing Removal

- Remove:

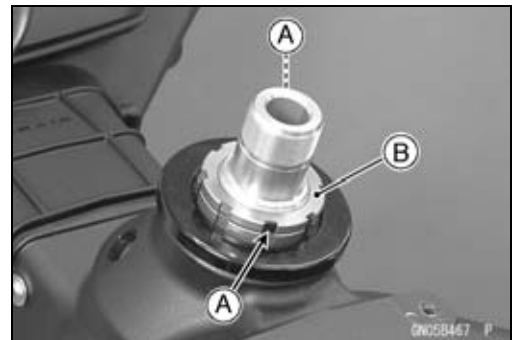
- Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Steering Damper (see Steering Damper Removal)
- Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
- Front Fender (see Front Fender Removal in the Frame chapter)
- Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
- Handlebar (see Handlebar Removal)
- Front Forks (see Front Fork Removal in the Suspension chapter)
- Steering Stem Head (see Steering Play Adjustment in the Periodic Maintenance chapter)
- Brake Hose Fitting Bolt (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter)

- Bend the claws [A] of the claw washer straighten.

- Remove the steering stem locknut [B].

Special Tool - Steering Stem Nut Wrench: 57001-1100

- Remove the claw washer.

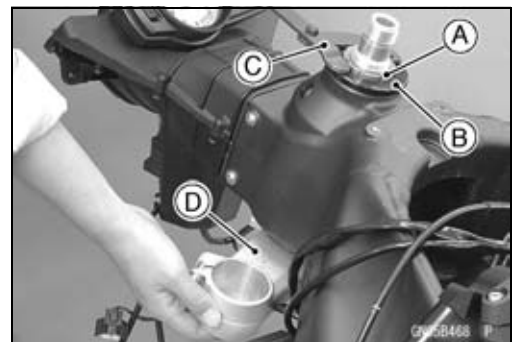


- Pushing up the stem base, and remove the steering stem nut [A] with stem cap [B].

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

- Remove:

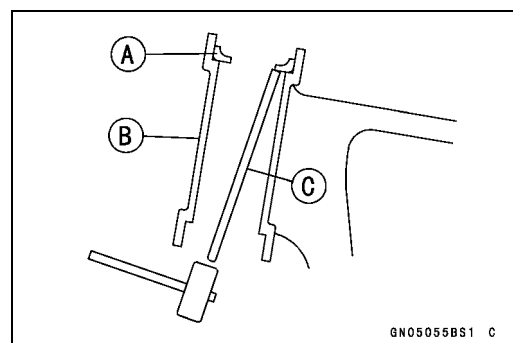
- Steering Stem [D]
- Upper Ball Bearing Inner Race and Ball Bearing



- To remove the ball bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses of head pipe, and applying it to both recess alternately hammer it to drive the race out.

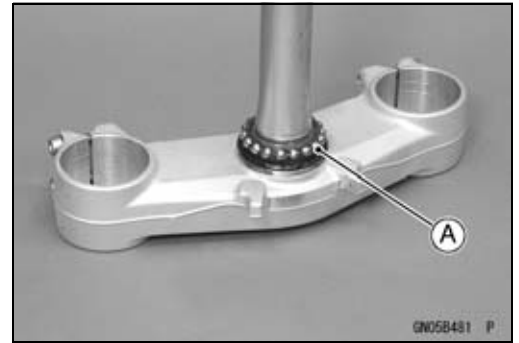
NOTE

- If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.



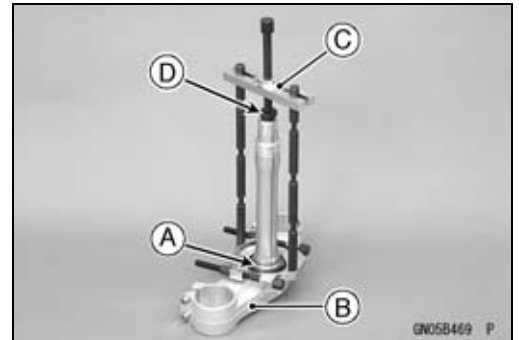
Steering Stem

- Remove the lower ball bearing [A] from the steering stem.



- Remove the lower bearing inner race (with its grease seal) [A] which is pressed onto the steering stem [B] with the bearing puller [C] and adapter [D].

Special Tool - Bearing Puller: 57001-135



Stem, Stem Bearing Installation

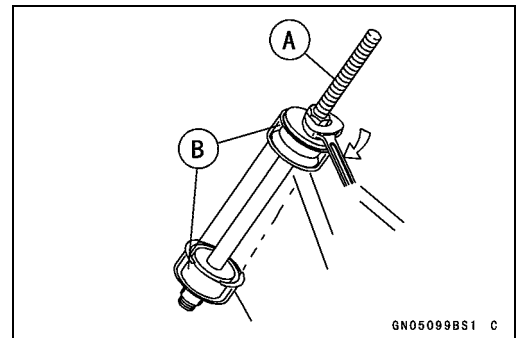
- Replace the bearing outer races with new ones.
- Drive them into the head pipe at the same time.

Special Tools - Head Pipe Outer Race Press Shaft [A]: 57001-1075

Bearing Driver Set: 57001-1129

Head Pipe Outer Race Driver, $\phi 55$ [B]: 57001-1446

- Apply grease to the outer races.



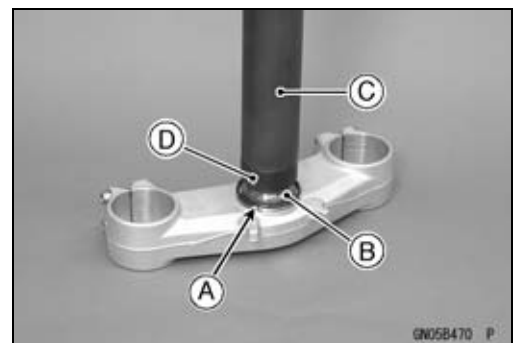
- Replace the bearing inner races and oil seal with new ones.

- Apply grease to the oil seal.

- Install the oil seal [A] on the steering stem, and drive the lower ball bearing inner race [B] applied the grease onto the stem.

Special Tools - Steering Stem Bearing Driver, $\phi 42.5$ [C]: 57001-1344

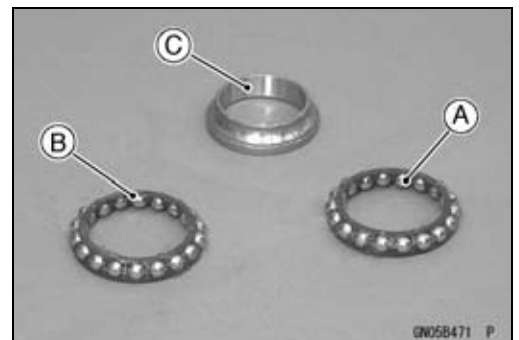
Steering Stem Bearing Driver Adapter, $\phi 41.5$ [D]: 57001-1345



- Apply grease to the lower ball bearing [A], and install it onto the steering stem.

○ The lower and upper ball bearings are identical.

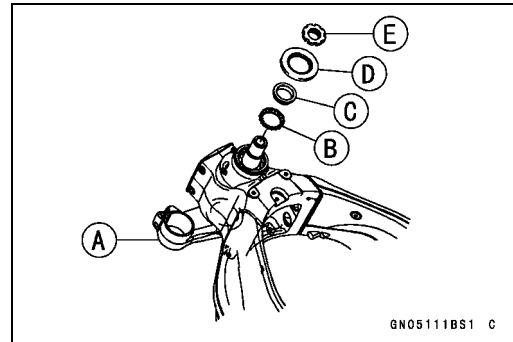
- Apply grease to the upper ball bearing [B] and inner race [C].



14-10 STEERING

Steering Stem

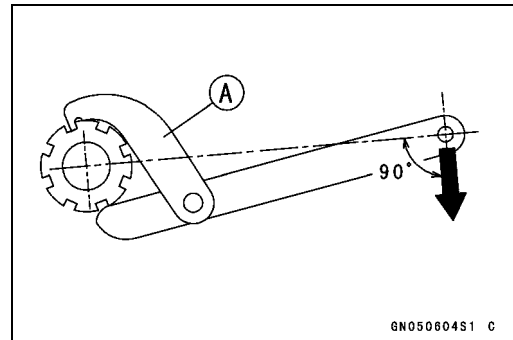
- Install the steering stem [A] through the head pipe and install the upper bearing [B] and inner race [C] on it.
- Install:
 - Stem Cap [D]
 - Steering Stem Nut [E]



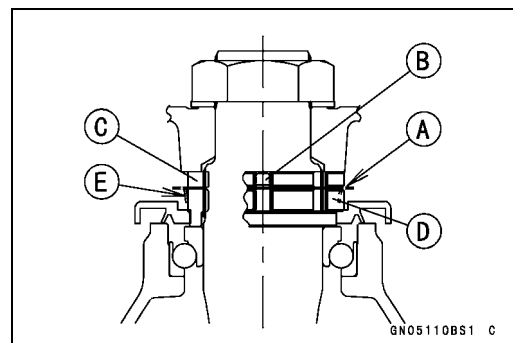
- Settle the bearings in place as follows.
 - Tighten the steering stem nut with **55 N·m (5.6 kgf-m, 41 ft·lb)** of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using a steering stem nut wrench [A].
 - Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.

Special Tool - Steering Stem Nut Wrench: 57001-1100

Torque - Steering Stem Nut: 20 N·m (2.0 kgf-m, 15 ft·lb)



- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until it touches the claw washer.
- Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].
- Install the stem head.
- Install the washer, and temporary tighten the stem head nut.
- Install the front forks (see Front Fork Installation in the Suspension chapter).



NOTE

- Tighten the upper front fork clamp bolts first, next the stem head nut, last the lower front fork clamp bolts.
- Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.

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

Steering Stem Head Nut: 78 N·m (8.0 kgf-m, 58 ft·lb)

Lower Front Fork Clamp Bolts: 23 N·m (2.3 kgf-m, 17 ft·lb)

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

⚠ WARNING

Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Install the removed parts (see appropriate chapters).

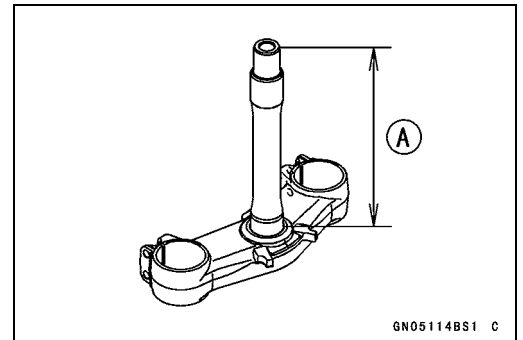
Steering Stem

Steering Stem Bearing Lubrication

- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

Steering Stem Warp Inspection

- Whenever the steering stem is removed, or if the steering can not be adjusted for smooth action, check the steering stem for straightness.
- ★ If the steering stem [A] is bent, replace the steering stem.



Stem Cap Deterioration, Damage Inspection

- ★ Replace the stem cap if its oil seal [A] shows damage.



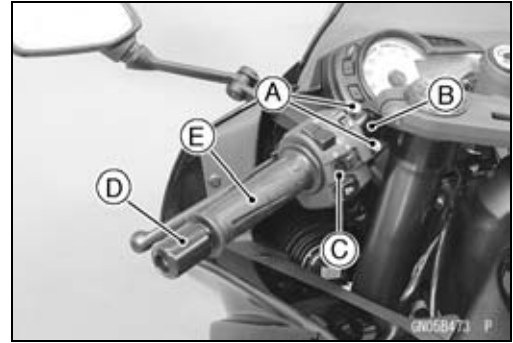
14-12 STEERING

Handlebar

Handlebar Removal

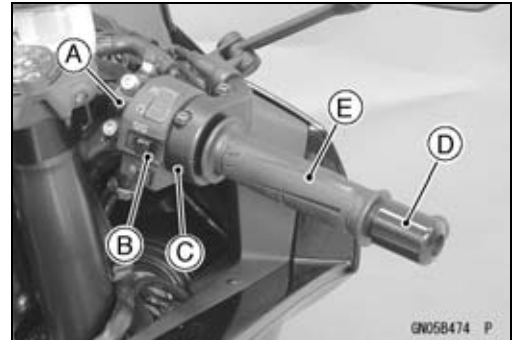
● Remove:

- Steering Damper (see Steering Damper Removal)
- Clutch Lever Clamp Bolts [A]
- Clutch Lever Assembly [B]
- Left Switch Housing [C]
- Handlebar Weight [D]
- Left Handlebar Grip [E]



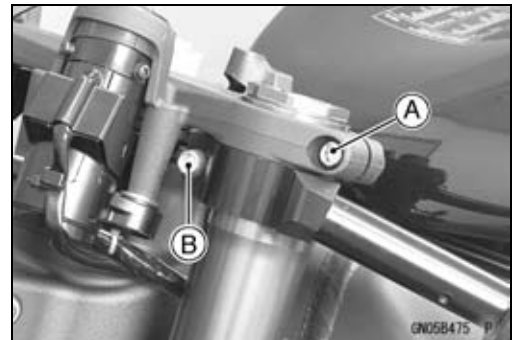
● Remove:

- Front Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
- Right Switch Housing [B]
- Throttle Case [C]
- Handlebar Weight [D]
- Throttle Grip [E]



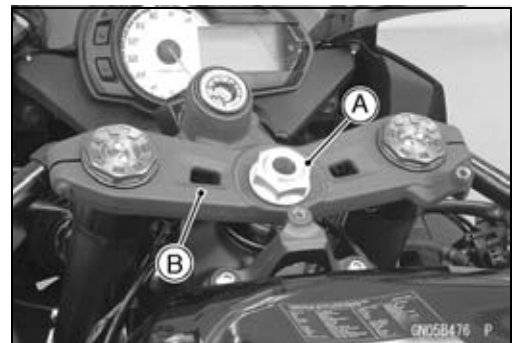
● Loosen:

- Upper Front Fork Clamp Bolt [A] (Both Sides)
- Handlebar Clamp Bolt [B] (Both Sides)



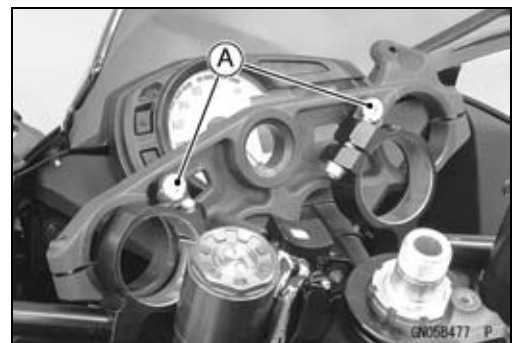
● Remove:

- Steering Stem Head Nut [A] and Washer
- Steering Stem Head [B] with Handlebars



● Remove:

- Handlebar Positioning Bolts [A]
- Handlebars



Handlebar

Handlebar Installation

- Apply a non-permanent locking agent to the threads of the handlebar positioning bolts and tighten them.

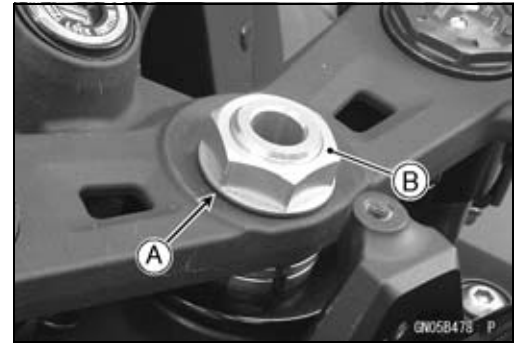
Torque - Handlebar Positioning Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the steering stem head with handlebars.
- Install the washer [A] and steering stem head nut [B].
- Tighten:

Torque - Steering Stem Head Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)

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

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



NOTE

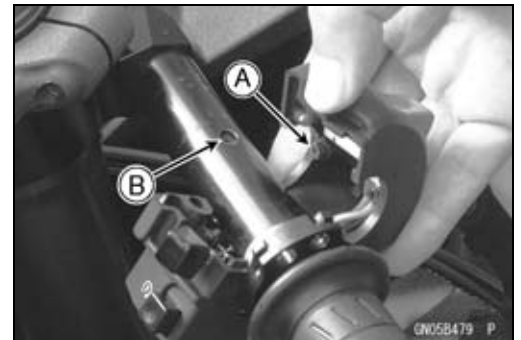
- Tighten the steering stem head bolt before tightening the upper front fork clamp bolts and handlebar clamp bolts.

⚠ WARNING

Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

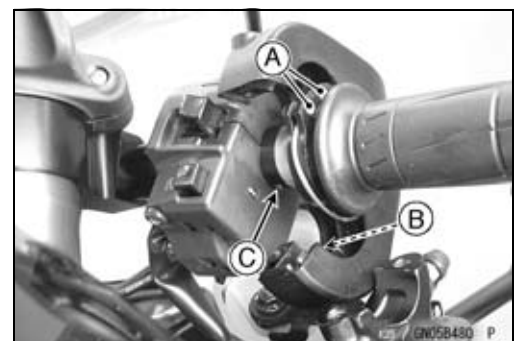
- Apply adhesive cement to the inside of the left handlebar grip.
- Install the left handlebar grip, throttle grip and left/right handlebar weight.
- Apply a non-permanent locking agent to the threads of the handlebar weight bolts, and tighten them.
- Install the left and right switch housings.
- Fit the projection [A] into a hole [B] in the handlebar.

Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)



- Install the throttle cable tips [A].
- Install the throttle case.
- Fit the projection [B] into a hole [C] in the handlebar.
- Tighten:

Torque - Throttle Case Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)



14-14 STEERING

Handlebar

- Install:
 - Clutch Lever Assembly (see Clutch Lever Installation in the Clutch chapter)
 - Front Master Cylinder (see Front Master Cylinder Installation in the Brakes chapter)
 - Steering Damper (see Steering Damper Installation)

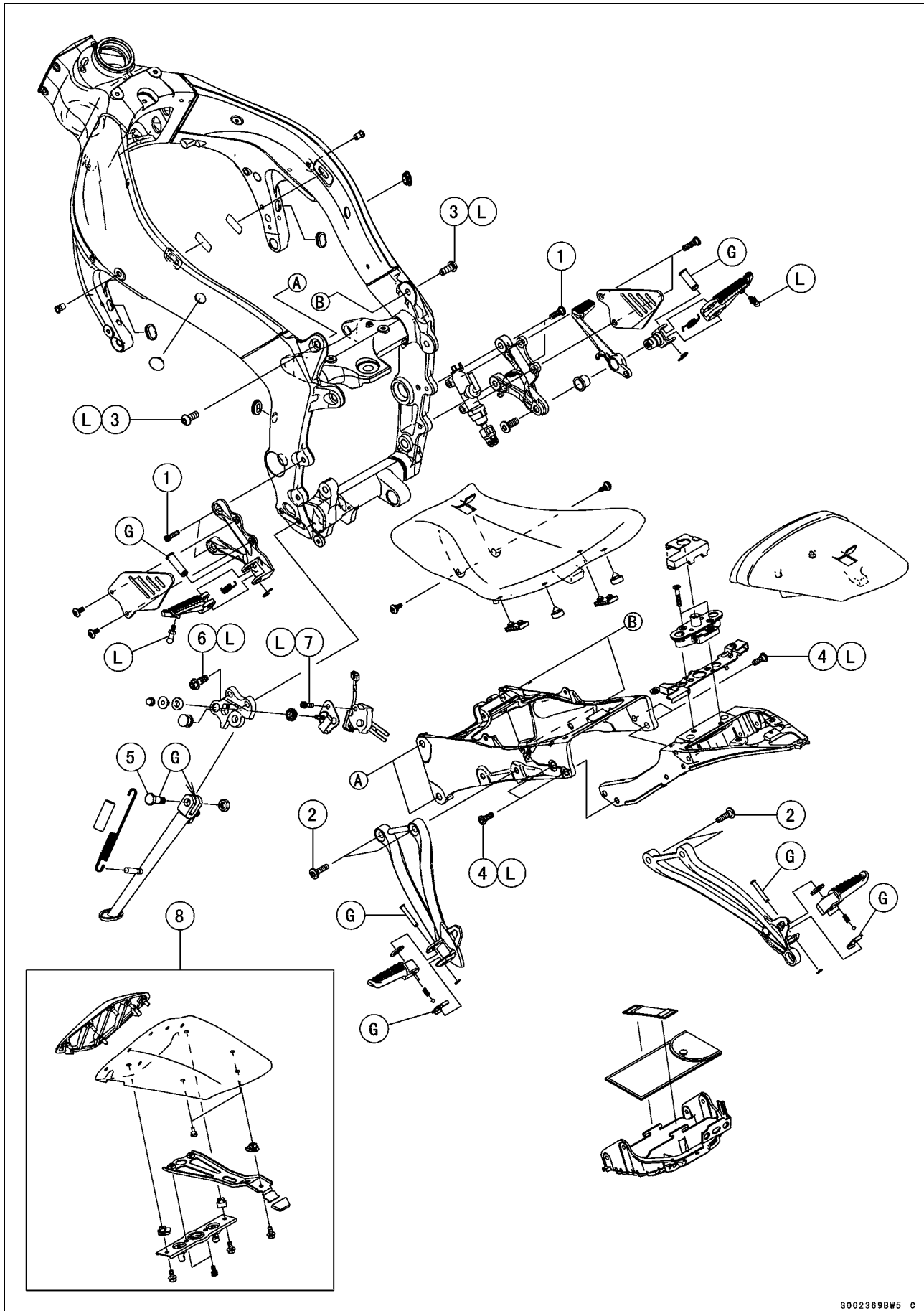
Frame

Table of Contents

Exploded View	15-2	Side Cover Installation	15-16
Seats	15-8	Seat Covers	15-17
Front Seat Removal	15-8	Seat Cover Removal	15-17
Front Seat Installation	15-8	Seat Cover Installation	15-18
Rear Seat Removal	15-8	Upper Seat Cover Removal (Only	
Rear Seat Installation	15-8	on Ninja ZX-6R MONSTER	
Fairings	15-9	ENERGY® Model)	15-19
Lower Fairing Removal	15-9	Upper Seat Cover Installation	
Lower Fairing Installation	15-9	(Only on Ninja ZX-6R	
Lower Inner Fairing Removal	15-9	MONSTER ENERGY® Model) .	15-19
Lower Inner Fairing Installation	15-10	Fenders	15-20
Upper Fairing Assembly Removal	15-10	Front Fender Removal	15-20
Upper Fairing Assembly		Front Fender Installation	15-20
Installation	15-11	Flap and Rear Fender Removal...	15-20
Center Fairing Removal	15-11	Flap and Rear Fender Installation	15-21
Center Fairing Installation	15-12	Frame	15-22
Upper Fairing Removal	15-12	Rear Frame Rear Removal	15-22
Upper Fairing Installation	15-12	Rear Frame Rear Installation	15-22
Upper Center Fairing Removal	15-12	Rear Frame Front Removal	15-22
Upper Center Fairing Installation .	15-13	Rear Frame Front Installation	15-22
Upper Inner Fairing Removal	15-13	Frame Inspection	15-22
Upper Inner Fairing Installation	15-13	Windshield	15-23
Center Inner Fairing Removal	15-14	Windshield Removal	15-23
Center Inner Fairing Installation	15-14	Windshield Installation	15-23
Inner Fairing Removal	15-14	Guard	15-24
Inner Fairing Installation	15-14	Mud Guard Removal	15-24
Fairing Cover Removal	15-15	Mud Guard Installation	15-24
Fairing Cover Installation	15-15	Sidestand	15-25
Side Covers	15-16	Sidestand Removal	15-25
Side Cover Removal	15-16	Sidestand Installation	15-25

15-2 FRAME

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Footpeg Bracket Bolts	25	2.5	18	
2	Rear Footpeg Bracket Bolts	25	2.5	18	
3	Rear Frame Bolts (M10)	44	4.5	32	L
4	Rear Frame Bolts (M8)	25	2.5	18	L
5	Sidestand Bolt	44	4.5	32	G
6	Sidestand Bracket Bolts	49	5.0	36	L
7	Sidestand Switch Bolt	8.8	0.90	78 in·lb	L

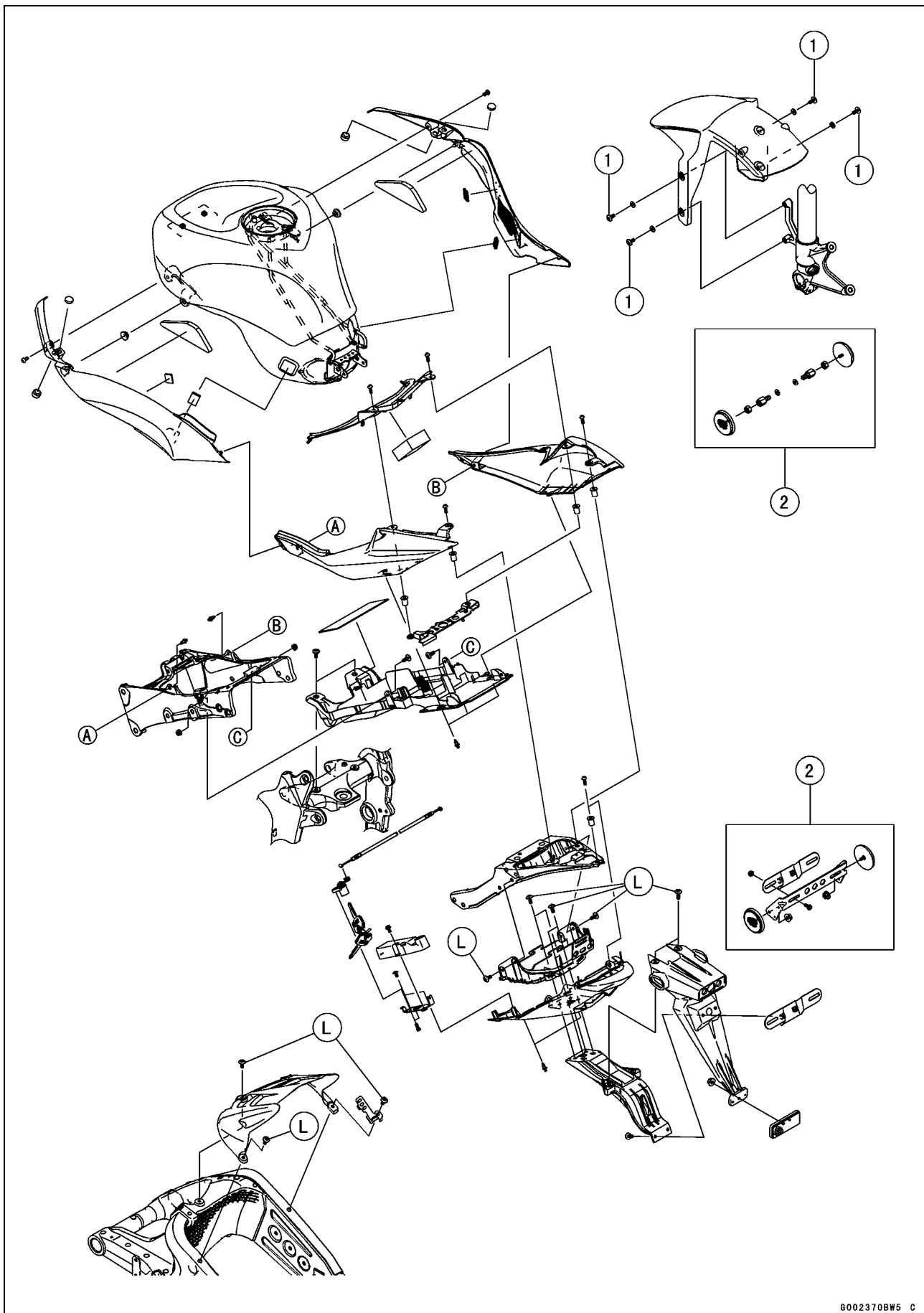
8. Only on Ninja ZX-6R MONSTER ENERGY® Model

G: Apply grease.

L: Apply a non-permanent locking agent.

15-4 FRAME

Exploded View



Exploded View

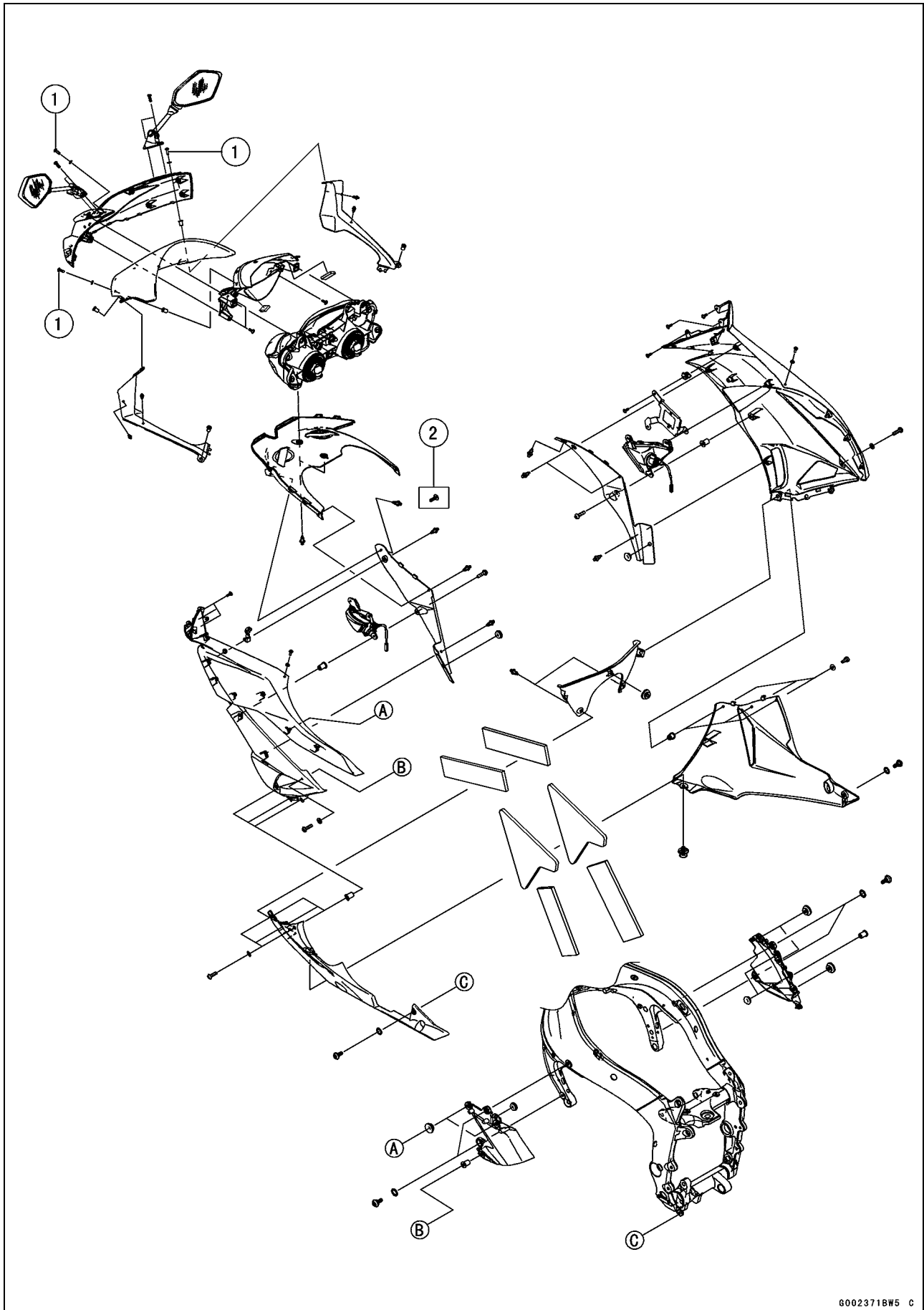
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fender Mounting Bolts	3.9	0.40	35 in·lb	

2. US, CA, CAL and SEA Models

L: Apply a non-permanent locking agent.

15-6 FRAME

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Windshield Mounting Bolts	0.42	0.043	3.7 in·lb	

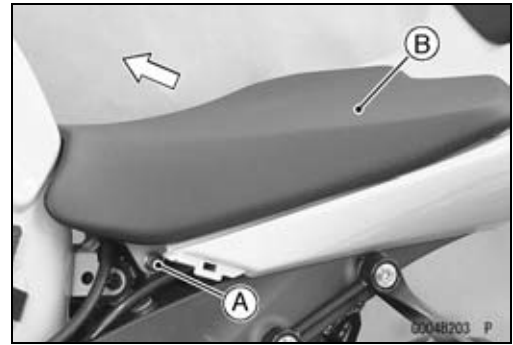
2. Other than CAL, SEA and TH Models

15-8 FRAME

Seats

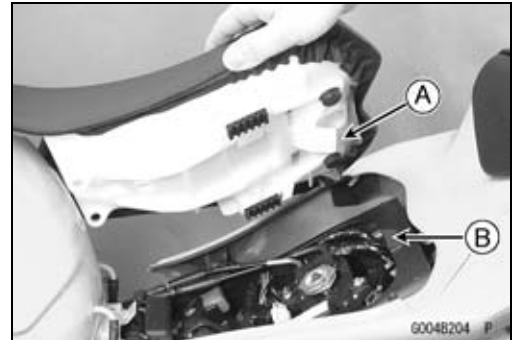
Front Seat Removal

- Remove:
 - Side Covers (see Side Cover Removal)
 - Bolts [A] (Both Sides)
- Remove the seat [B] forward while lifting up the front part of the seat.



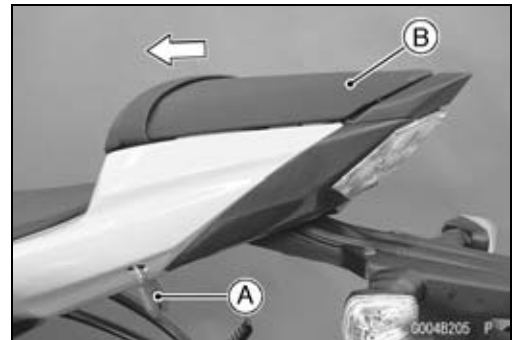
Front Seat Installation

- Installation is the reverse of removal, note the following.
- Slip the seat hook [A] under the rib [B] on the rear frame front.



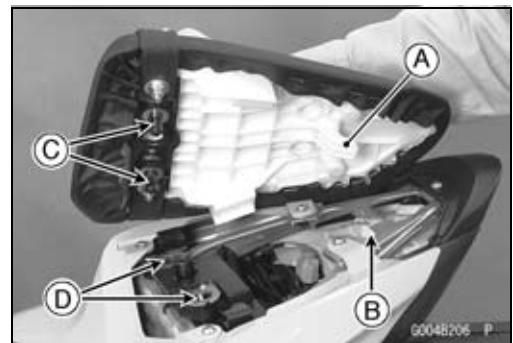
Rear Seat Removal

- Insert the ignition switch key [A] into the seat lock.
- Pull up the seat [B] upward while turning the key clockwise, and remove it forward.



Rear Seat Installation

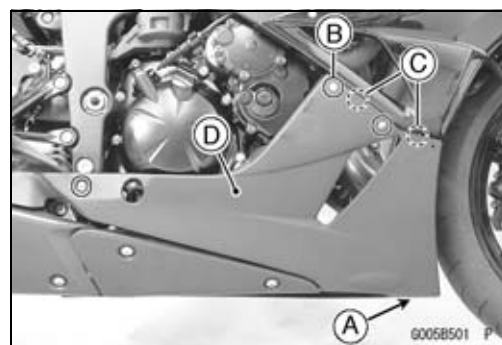
- Slip the seat hook [A] under the rib [B] on the rear frame rear.
- Insert the seat latches [C] into the latch holes [D].
- Push down the seat until the lock clicks.



Fairings

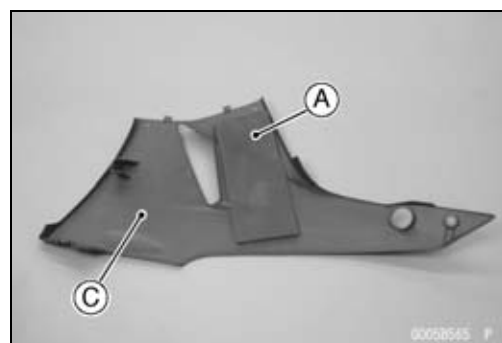
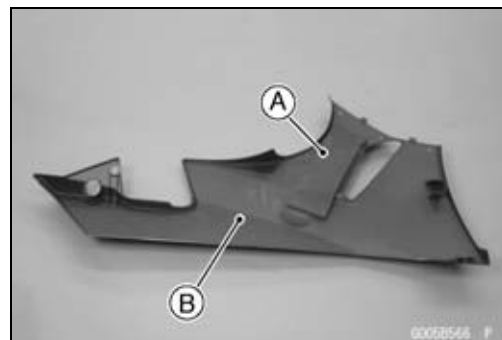
Lower Fairing Removal

- Remove:
 - Lower Inner Fairing (see Lower Inner Fairing Removal)
 - Quick Rivet [A]
 - Bolts [B]
- Pull up the core by the flat-head screwdriver, and then remove the quick rivet.
- Clear the hook portions [C] from the slots and remove the lower fairing [D].
- Remove the right lower fairing in the same way.

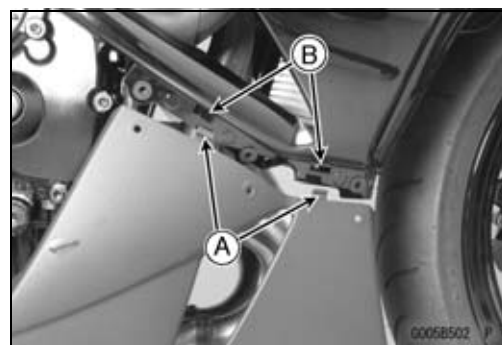


Lower Fairing Installation

- Installation is the reverse of removal, note the following.
- Check that the pads [A] are in place on the lower fairing.
 - Left Lower Fairing [B]
 - Right Lower Fairing [C]

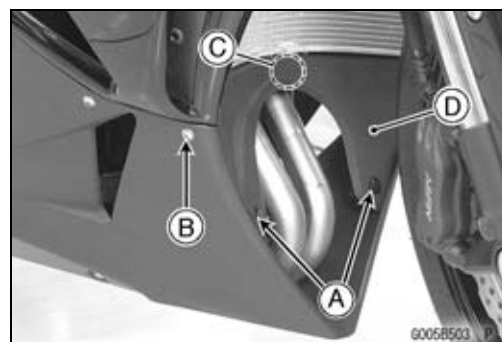


- Insert the hook portions [A] into the slots [B].



Lower Inner Fairing Removal

- Remove:
 - Quick Rivets [A]
 - Bolts [B]
- Clear the projection [C] from the hole and remove the lower inner fairing [D].

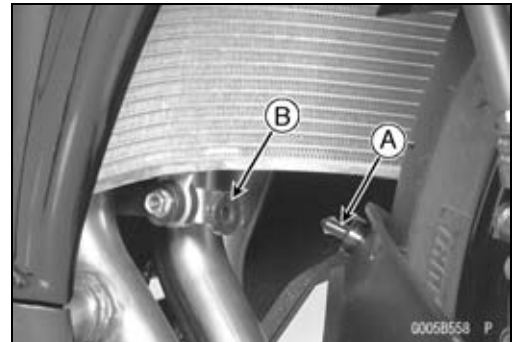


15-10 FRAME

Fairings

Lower Inner Fairing Installation

- Installation is the reverse of removal, note the following.
- Insert the projection [A] into the hole [B].

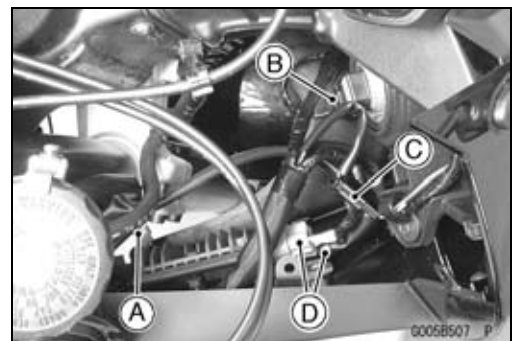


Upper Fairing Assembly Removal

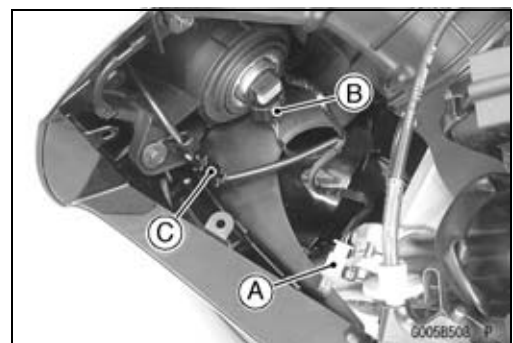
- Remove:
 - Lower Fairings (see Lower Fairing Removal)
 - Upper Inner Fairings (see Upper Inner Fairing Removal)
 - Windshield (see Windshield Removal)
 - Quick Rivet [A]



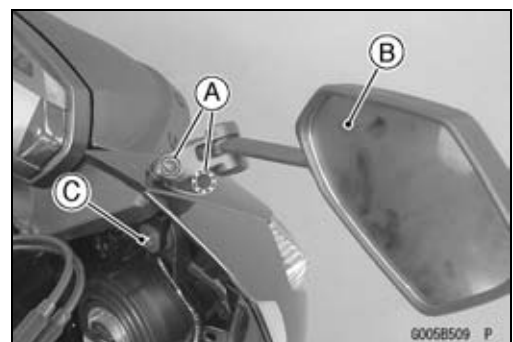
- Disconnect:
 - Front Turn Signal Light Lead Connector [A]
 - Headlight Connector [B]
 - City Light Lead Connector [C]
 - Alternator and Regulator/Rectifier Lead Connectors [D]



- Remove:
 - Front Right Turn Signal Light Lead Connector [A]
 - Headlight Connector [B]
 - City Light Lead Connector [C]
 - Canister (CAL, SEA and TH Models)

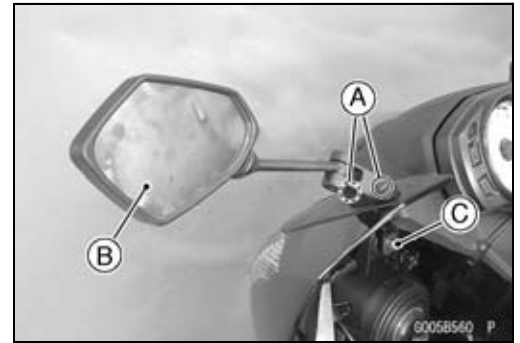


- Remove:
 - Bolts [A]
 - Rear View Mirror [B]
 - Bolt [C]

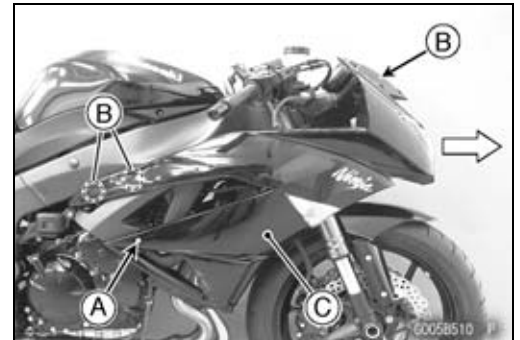


Fairings

- Remove:
 - Bolts [A]
 - Rear View Mirror [B]
 - Bolt [C]



- Remove the bolts [A].
- Clear the projections [B] from the holes and remove the upper fairing assembly [C].

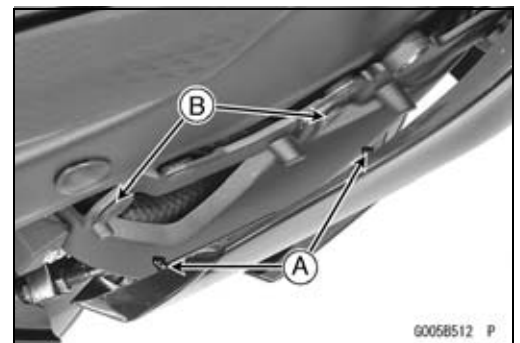


Upper Fairing Assembly Installation

- Installation is the reverse of removal, note the following.
 - Run the hoses, leads and harness correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
 - Insert the hole [A] onto the projection [B].

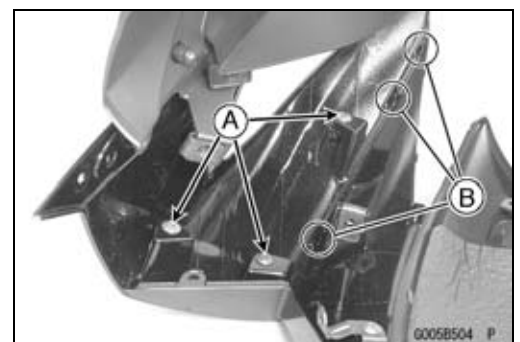


- Insert the projections [A] into the holes [B].



Center Fairing Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal)
 - Center Inner Fairing (see Center Inner Fairing Removal)
 - Headlight (see Headlight Removal/Installation in the Electrical System chapter)
 - Screws [A]
- Clear the hook portions [B] from the slots and remove the center fairing.
- Remove the right center fairing in the same way.

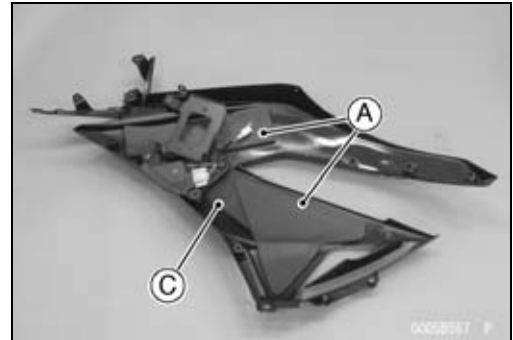
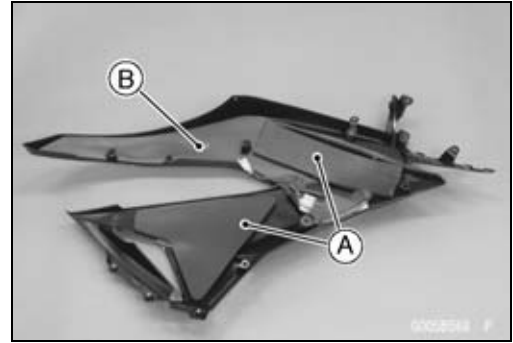


15-12 FRAME

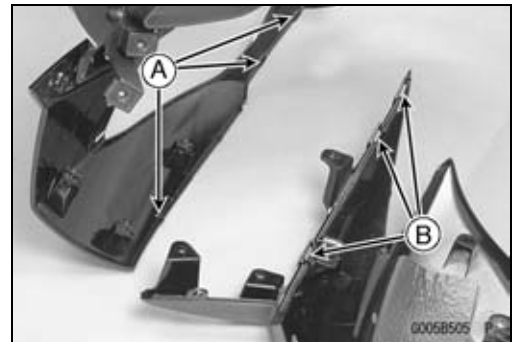
Fairings

Center Fairing Installation

- Installation is the reverse of removal, note the following.
- Check that the pads [A] are in place on the center fairing.
 - Left Center Fairing [B]
 - Right Center Fairing [C]



- Insert the hook portions [A] into the slots [B].



Upper Fairing Removal

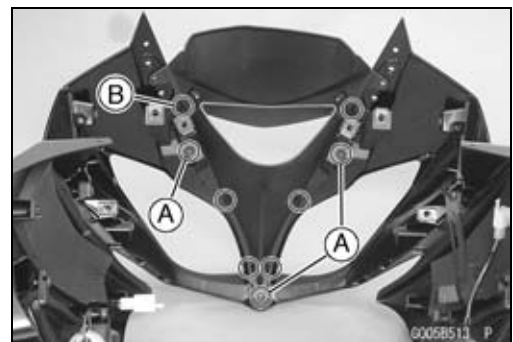
- Remove:
 - Center Fairings (see Center Fairing Removal)
 - Upper Center Fairing (see Upper Center Fairing Removal)

Upper Fairing Installation

- Installation is the reverse of removal.

Upper Center Fairing Removal

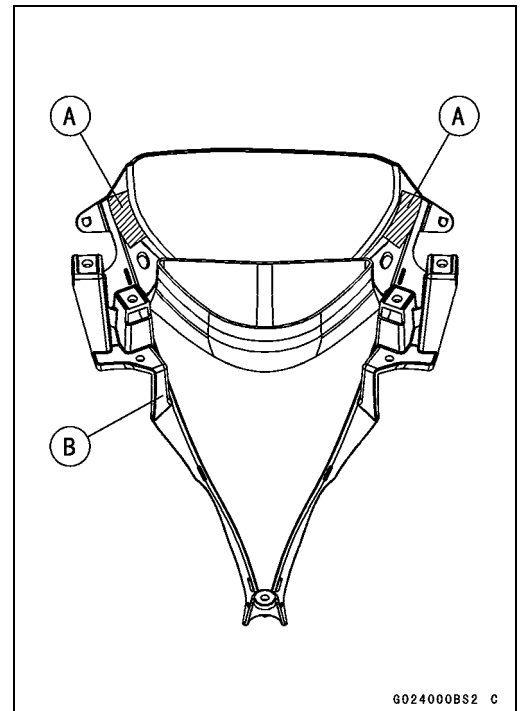
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal)
 - Center Inner Fairing (see Center Inner Fairing Removal)
 - Headlight (see Headlight Removal/Installation in the Electrical System chapter)
 - Screws [A]
- Clear the slots [B] from the hook portions and remove the upper center fairing.



Fairings

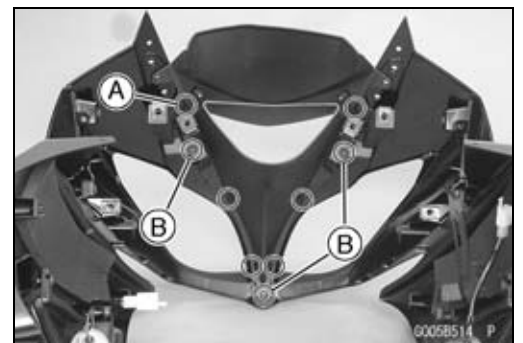
Upper Center Fairing Installation

- Installation is the reverse of removal, note the following.
- Check that the pads [A] are in place on the upper center fairing [B].



G02400BS2 C

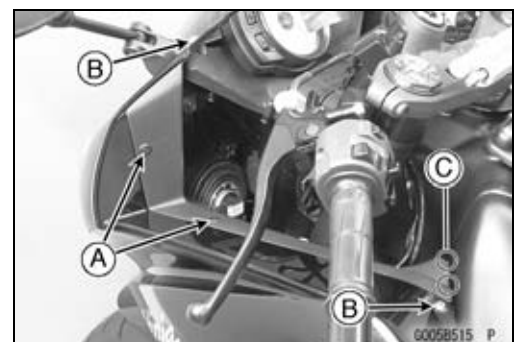
- Insert the slots [A] onto the hook portions.
- Tighten the screws [B].



G005B514 P

Upper Inner Fairing Removal

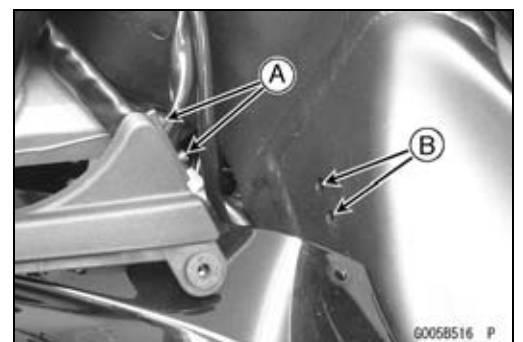
- Remove:
 - Quick Rivets [A]
 - Bolts [B]
- Clear the projections [C] from the holes and remove the upper inner fairing.



G005B515 P

Upper Inner Fairing Installation

- Installation is the reverse of removal, note the following.
- Insert the projections [A] into the holes [B].



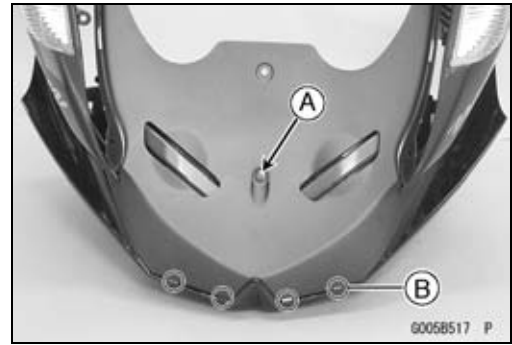
G005B516 P

15-14 FRAME

Fairings

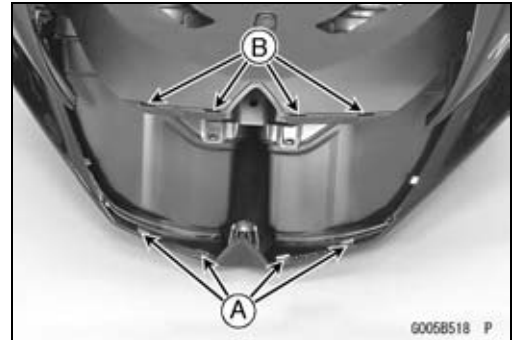
Center Inner Fairing Removal

- Remove the bolt [A].
- Clear the slots [B] from the hook portions and remove the center inner fairing.



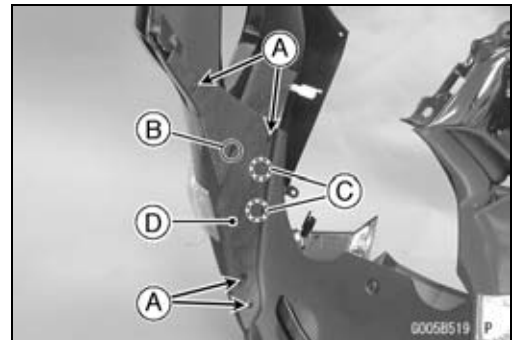
Center Inner Fairing Installation

- Installation is the reverse of removal, note the following.
- Insert the hook portions [A] into the slots [B].



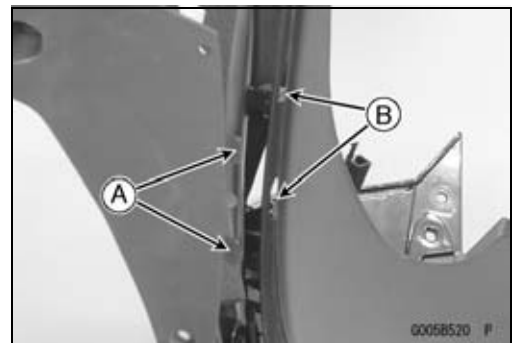
Inner Fairing Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal)
 - Quick Rivets [A]
 - Bolt [B]
- Clear the hook portions [C] from the slots and remove the inner fairing [D].



Inner Fairing Installation

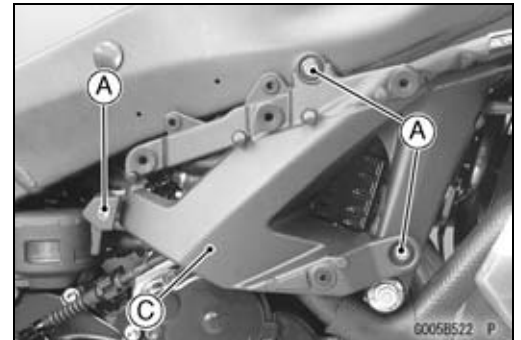
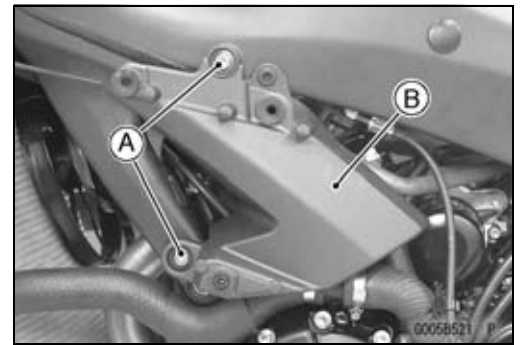
- Installation is the reverse of removal, note the following.
- Insert the hook portions [A] into the slots [B].



Fairings

Fairing Cover Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal)
 - Bolts [A]
 - Left Fairing Cover [B]
 - Right Fairing Cover [C]



Fairing Cover Installation

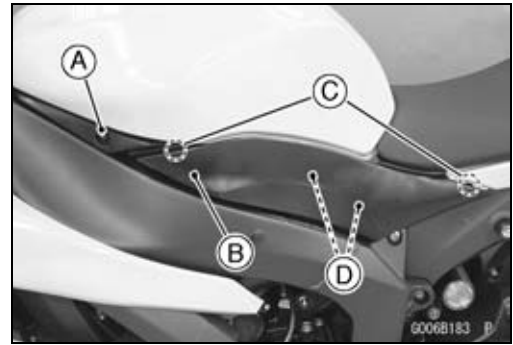
- Installation is the reverse of removal.

15-16 FRAME

Side Covers

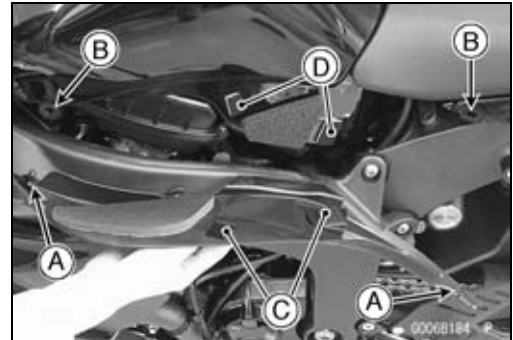
Side Cover Removal

- Remove the bolt [A].
- Pull the side cover [B] evenly outward to clear the projection [C] and hook fasteners [D], and remove it.



Side Cover Installation

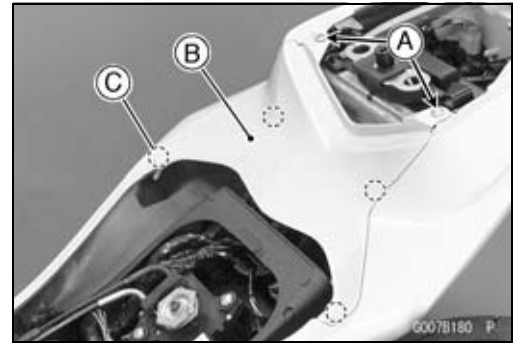
- Installation is the reverse of removal, note the following.
- Insert the projections [A] into the holes [B] on the seat cover, and then attach the hook fasteners [C] to the hook fasteners [D] on the fuel tank.



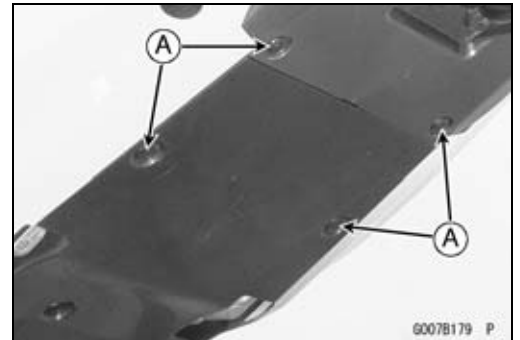
Seat Covers

Seat Cover Removal

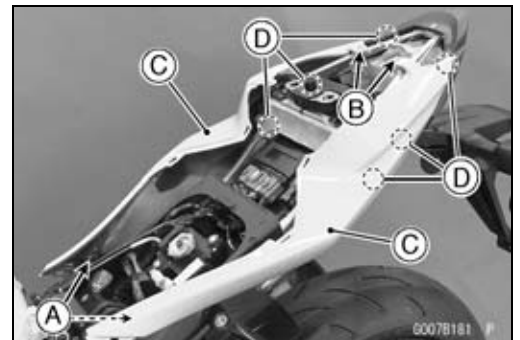
- Remove:
 - Seats (see Front/Rear Seat Removal)
 - Bolts [A]
- Pull the front seat cover [B] backward to clear the hook portions [C], and remove it upward.



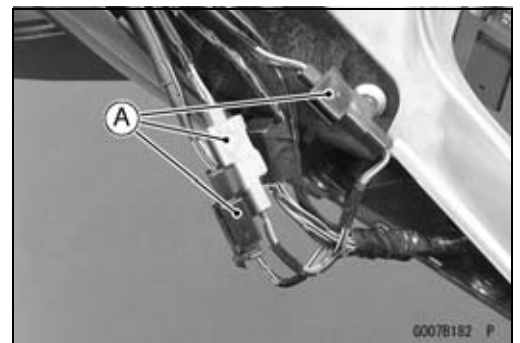
- Remove the quick rivets [A].
- Push the central pin, and then remove the quick rivet.



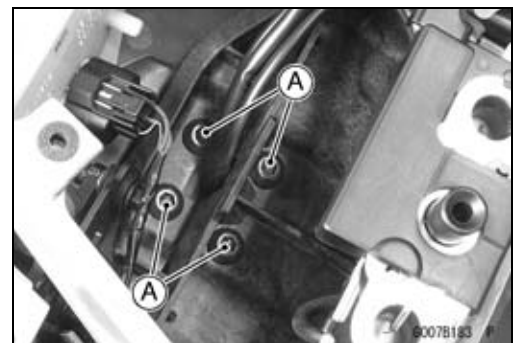
- Remove the quick rivets [A] and bolts [B].
- Pull the seat covers [C] evenly outward to clear the hook portions [D], and remove them.



- Disconnect the connectors [A].



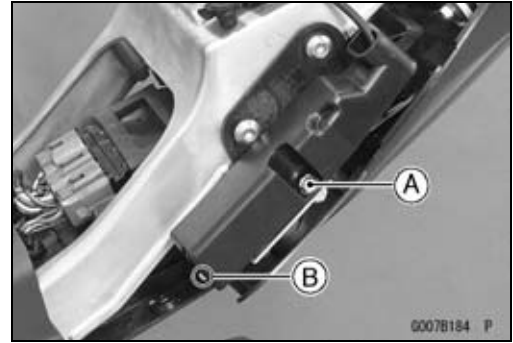
- Remove:
 - Bolts [A]
 - Flap (with Turn Signal and License Plate Lights)



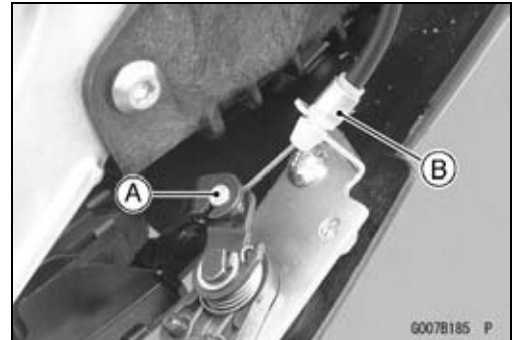
15-18 FRAME

Seat Covers

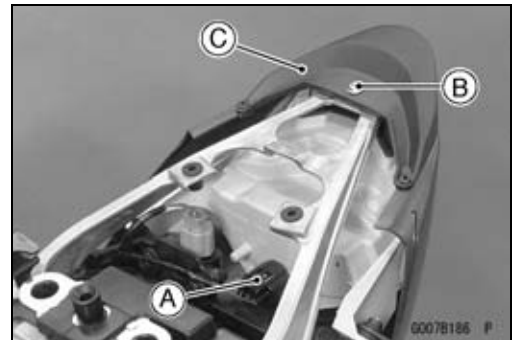
- Remove the bolt [A].
- Clear the hook portion [B] from the slot.



- Remove the lower end [A] of the seat lock cable [B].

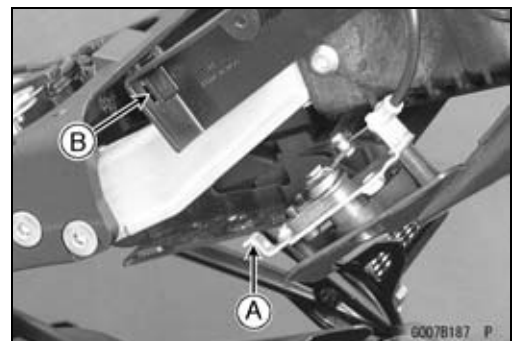


- Remove:
 - Connector [A]
 - Bolt [B]
 - Rear Seat Cover [C]
 - Tail/Brake Light (LED) (see Tail/Brake Light (LED) Removal/Installation in the Electrical System chapter)



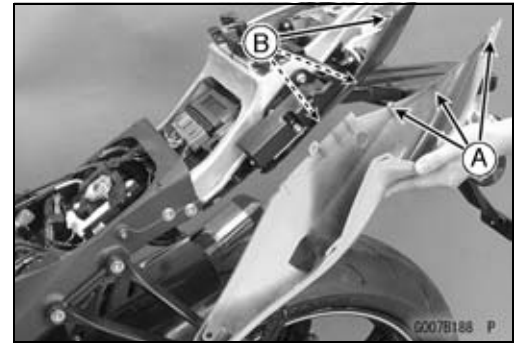
Seat Cover Installation

- Installation is the reverse of removal, note the following.
 - Run the harness, cables and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
 - Apply a non-permanent locking agent to the threads of the flap mounting bolts.
- Insert the hook portion [A] into the slot [B].

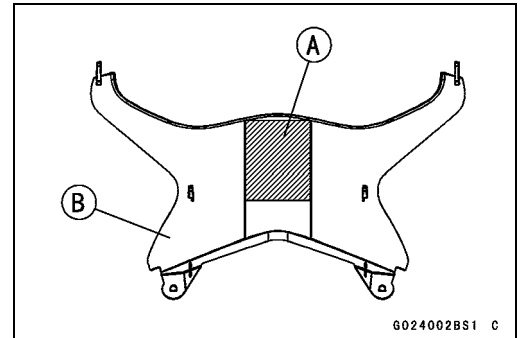


Seat Covers

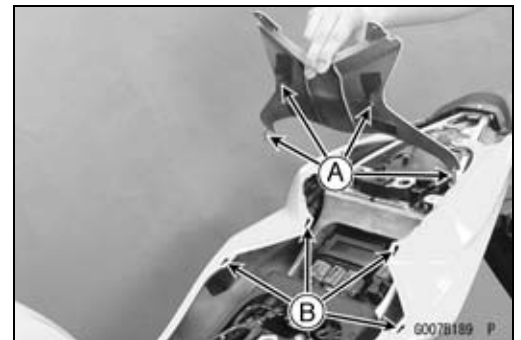
○ Insert the hook portions [A] into the slots [B].



○ Check that the pad [A] is in place on the front seat cover [B].

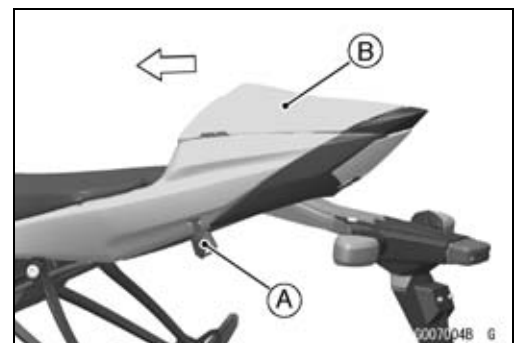


○ Insert the hook portions [A] into the slots [B].



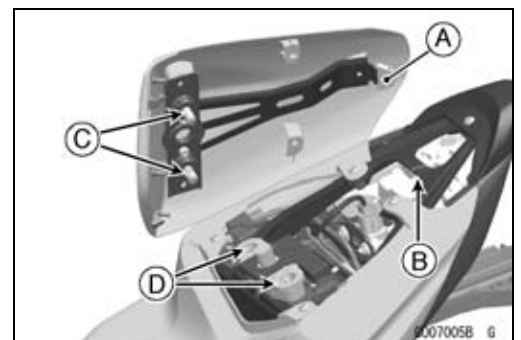
Upper Seat Cover Removal (Only on Ninja ZX-6R MONSTER ENERGY® Model)

- Insert the ignition switch key [A] into the seat lock.
- Pull up the upper seat cover [B] upward while turning the key clockwise, and remove it forward.



Upper Seat Cover Installation (Only on Ninja ZX-6R MONSTER ENERGY® Model)

- Slip the upper seat cover hook [A] under the rib [B] on the rear frame rear.
- Insert the latches [C] into the latch holes [D].
- Push down the upper seat cover until the lock clicks.

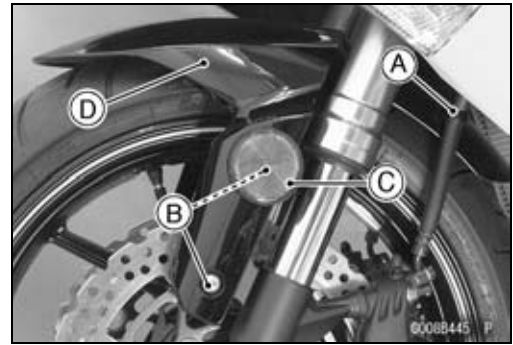


15-20 FRAME

Fenders

Front Fender Removal

- Remove:
 - Clamps [A] (Both Sides)
 - Bolts [B] with Washers (Both Sides)
 - Reflectors [C] (Both Sides, US, CA, CAL and SEA Models)
 - Front Fender [D]

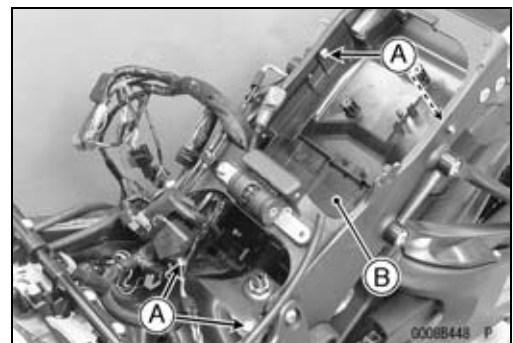
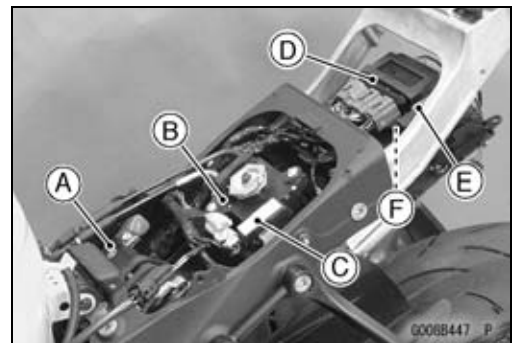
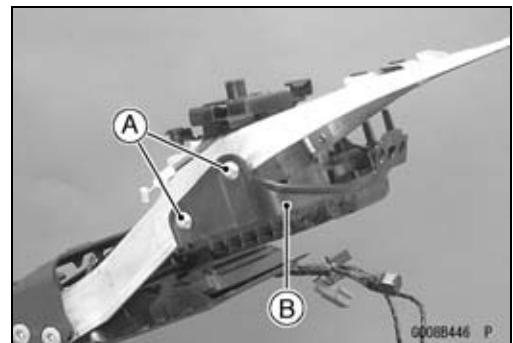


Front Fender Installation

- Tighten:
 - Torque - Front Fender Mounting Bolts: 3.9 N·m (0.40 kgf·m, 35 in·lb)

Flap and Rear Fender Removal

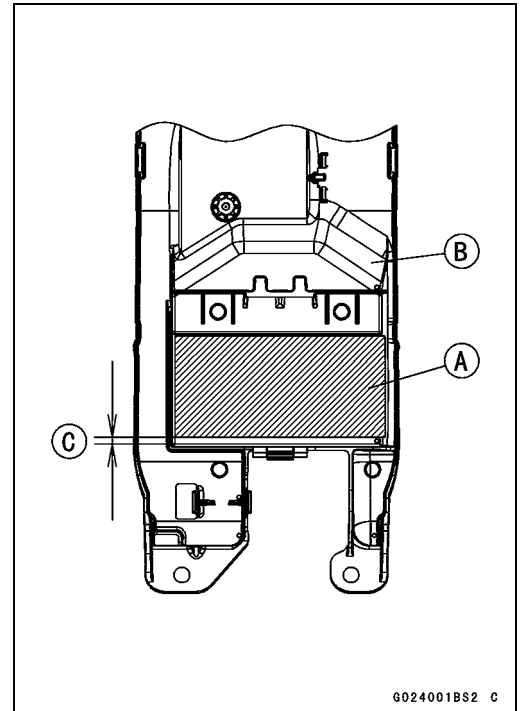
- Remove:
 - Flap (see Seat Cover Removal)
 - Rear Seat Cover (see Seat Cover Removal)
 - Owner's Tool
 - Bolts [A]
 - Tool Kit Case [B]
- Remove:
 - Battery [A] (see Battery Removal in the Electrical System chapter)
 - Exhaust Butterfly Valve Actuator [B] (see Exhaust Butterfly Valve Actuator Removal in the Fuel System (DFI) chapter)
 - Fuse Box [C]
 - Relay Box [D] (see Relay Box Removal in the Electrical System chapter)
 - Turn Signal Relay [E] (see Turn Signal Relay Inspection in the Electrical System chapter)
 - ECU [F] (see ECU Removal in the Fuel System (DFI) chapter)
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Remove:
 - Bolts [A]
 - Rear Fender [B]



Fenders

Flap and Rear Fender Installation

- Installation is the reverse of removal, note the following.
- Check that the pad [A] is in place on the rear fender [B].
5 mm (0.20 in.) [C]



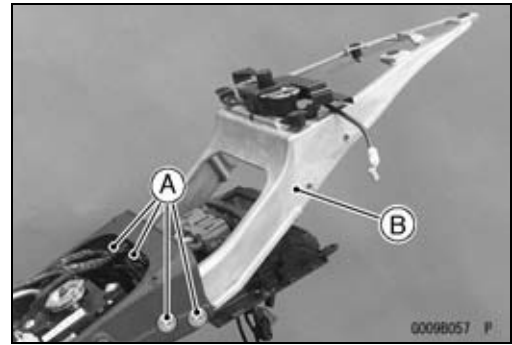
- Run the harness, cables and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Apply a non-permanent locking agent to the threads of the tool kit case bolts.

15-22 FRAME

Frame

Rear Frame Rear Removal

- Remove:
 - Rear Seat Cover (see Seat Cover Removal)
 - Tool Kit Case (see Flap and Rear Fender Removal)
 - Bolts [A] (Both Sides)
 - Rear Frame Rear [B]

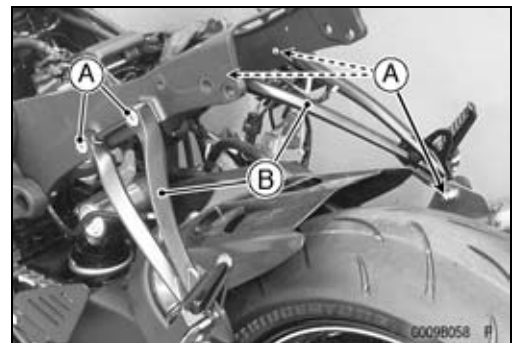


Rear Frame Rear Installation

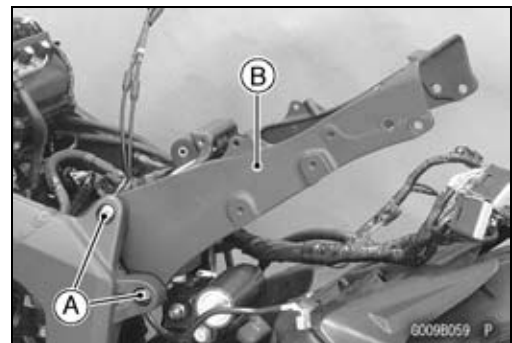
- Apply a non-permanent locking agent to the threads of the rear frame bolts (M8) and tighten them.
 - Torque - Rear Frame Bolts (M8): 25 N·m (2.5 kgf·m, 18 ft·lb)

Rear Frame Front Removal

- Remove:
 - Rear Frame Rear (see Rear Frame Rear Removal)
 - Rear Fender (see Flap and Rear Fender Removal)
 - Bolts [A]
 - Rear Footpeg Brackets [B]



- Remove:
 - Bolts [A] (Both Sides)
 - Rear Frame Front [B]



Rear Frame Front Installation

- Apply a non-permanent locking agent to the threads of the rear frame bolts (M10) and tighten them.
 - Torque - Rear Frame Bolts (M10): 44 N·m (4.5 kgf·m, 32 ft·lb)
 - Rear Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
 - Muffler Body Mounting Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)

Frame Inspection

- Visually inspect the frame for cracks, dents, bending, or warp.
- ★ If there is any damage to the frame, replace it.

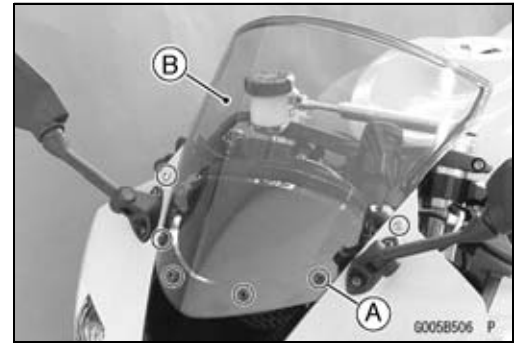
⚠ WARNING

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

Windshield

Windshield Removal

- Remove:
 - Bolts with Washers [A]
 - Windshield [B]



Windshield Installation

- Be sure that the wellnuts [A] are in position as shown in the figure.
- Tighten:
 - Torque - Windshield Mounting Bolts: 0.42 N·m (0.043 kgf·m, 3.7 in·lb)

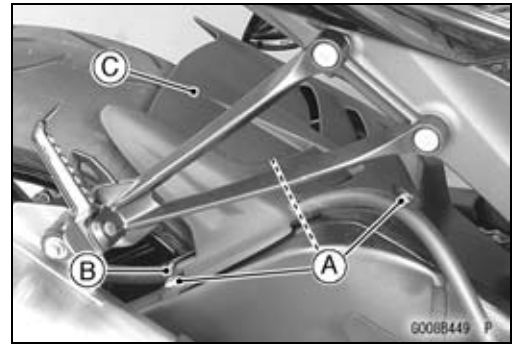


15-24 FRAME

Guard

Mud Guard Removal

- Remove:
 - Bolts [A] and Brake Hose Clamp [B]
 - Mud Guard [C]



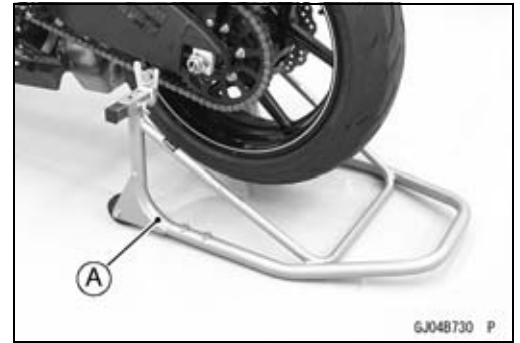
Mud Guard Installation

- Installation is the reverse of removal, note the following.
- Apply a non-permanent locking agent to the threads of the mud guard mounting bolts, and tighten them securely.

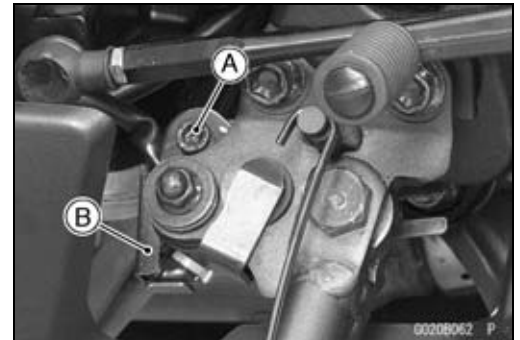
Sidestand

Sidestand Removal

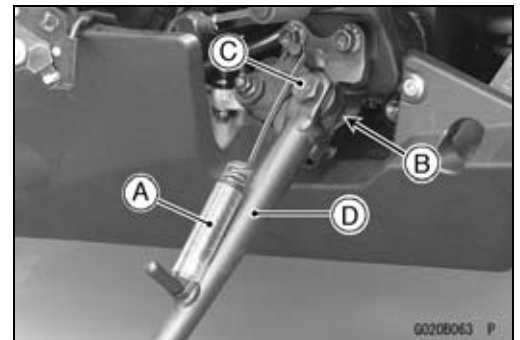
- Raise the rear wheel off the ground with the stand [A].



- Remove:
Sidestand Switch Bolt [A]
Sidestand Switch [B]



- Remove:
Spring [A]
Sidestand Nut [B]
Sidestand Bolt [C]
Sidestand [D]



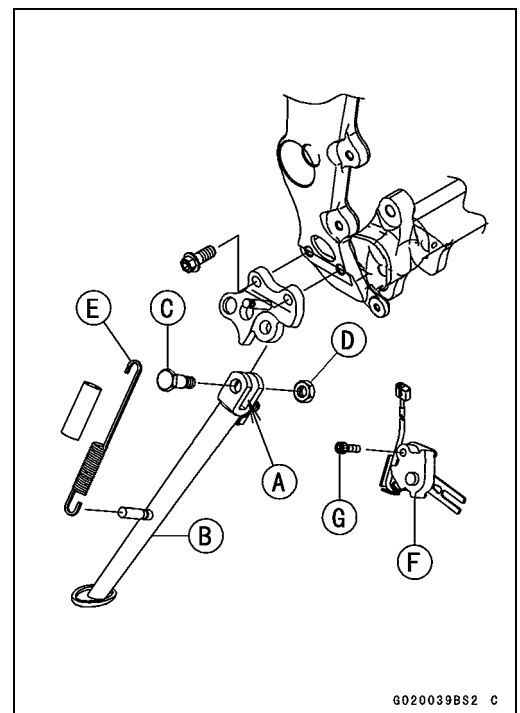
Sidestand Installation

- Apply grease to the sliding area [A] of the sidestand [B].
- Tighten the sidestand bolt [C], and then lock it with the nut [D].

Torque - Sidestand Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Hook the spring [E] so that the long spring end faces upward.
- Install the spring hook direction as shown in the figure.
- Install the sidestand switch [F].
- Apply a non-permanent locking agent to the threads of the sidestand switch bolt [G], and tighten it.

Torque - Sidestand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)



Electrical System

Table of Contents

Exploded View	16-4
Specifications	16-10
Special Tools and Sealant	16-11
Parts Location.....	16-12
Wiring Diagram (US, CAL and CA Models).....	16-14
Wiring Diagram (Other than US, CAL and CA Models).....	16-16
Precautions.....	16-18
Electrical Wiring.....	16-19
Wiring Inspection	16-19
Battery	16-20
Battery Removal	16-20
Battery Installation	16-20
Battery Activation	16-20
Precautions	16-24
Interchange	16-24
Charging Condition Inspection.....	16-24
Refreshing Charge.....	16-25
Charging System	16-26
Alternator Cover Removal.....	16-26
Alternator Cover Installation.....	16-26
Stator Coil Removal	16-26
Stator Coil Installation	16-27
Alternator Rotor Removal	16-27
Alternator Rotor Installation	16-27
Charging Voltage Inspection.....	16-29
Alternator Inspection	16-29
Regulator/Rectifier Inspection.....	16-31
Ignition System	16-33
Crankshaft Sensor Removal.....	16-33
Crankshaft Sensor Installation.....	16-33
Crankshaft Sensor Inspection.....	16-34
Crankshaft Sensor Peak Voltage Inspection.....	16-34
Stick Coil Removal.....	16-35
Stick Coil Installation.....	16-35
Stick Coil Inspection.....	16-35
Stick Coil Primary Peak Voltage Inspection	16-36
Spark Plug Removal	16-36
Spark Plug Installation	16-36
Spark Plug Condition Inspection.....	16-37
Interlock Operation Inspection	16-37
IC Igniter Inspection	16-38
Electric Starter System	16-41
Starter Motor Removal.....	16-41
Starter Motor Installation.....	16-41
Starter Motor Disassembly.....	16-42
Starter Motor Assembly	16-42
Brush Inspection	16-43
Commutator Cleaning and Inspection.....	16-44
Armature Inspection.....	16-44
Brush Lead Inspection	16-44

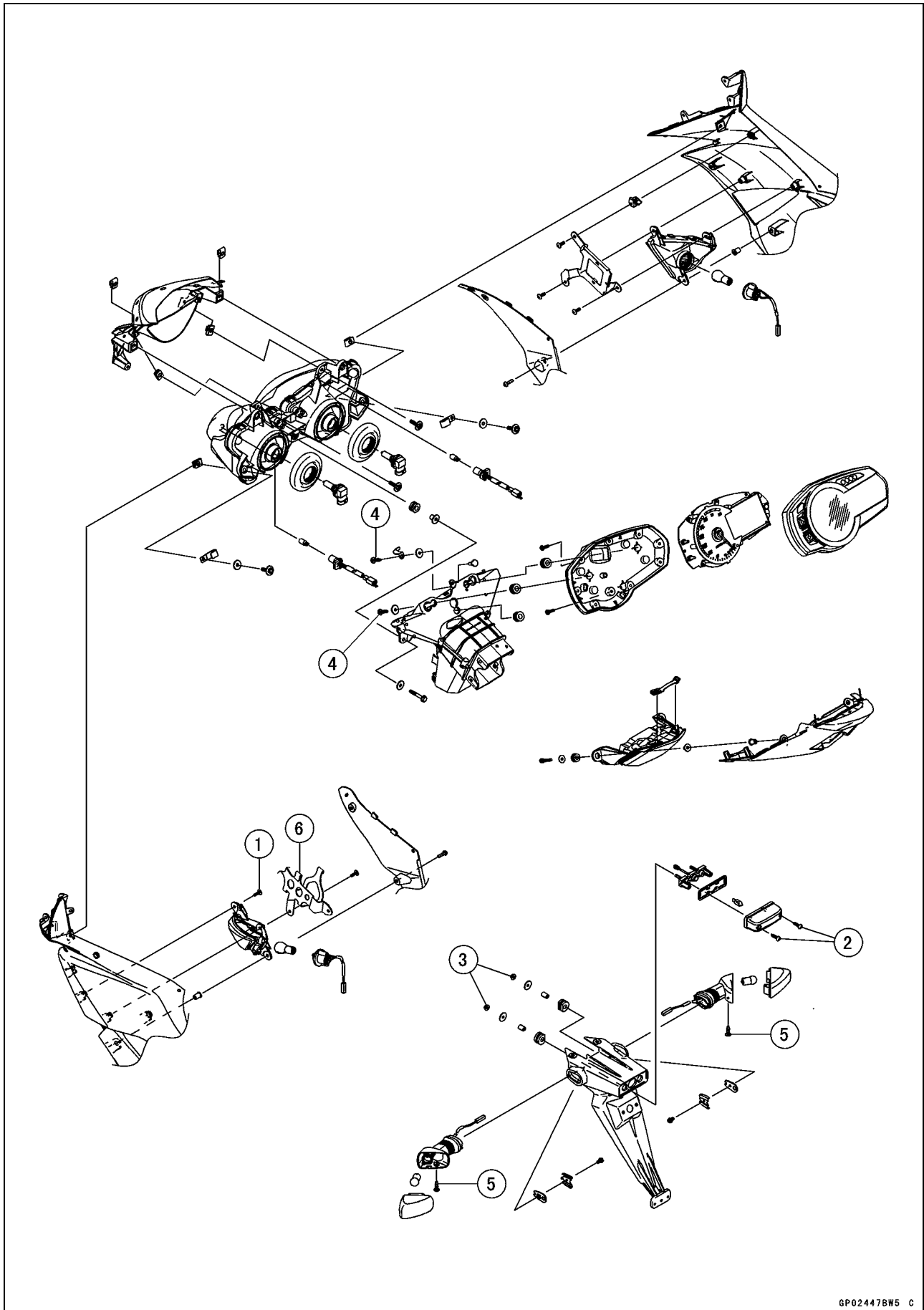
16-2 ELECTRICAL SYSTEM

Right-hand End Cover Assembly Inspection	16-45
Starter Relay Inspection.....	16-45
Lighting System.....	16-47
Headlight Beam Horizontal Adjustment	16-47
Headlight Beam Vertical Adjustment.....	16-47
Headlight Bulb Replacement	16-47
City Light Bulb Replacement.....	16-48
Headlight Removal/Installation	16-48
Tail/Brake Light (LED) Removal/Installation.....	16-49
License Plate Light Bulb Replacement	16-49
Turn Signal Light Bulb Replacement	16-51
Turn Signal Relay Inspection	16-52
Air Switching Valve	16-55
Air Switching Valve Operation Test	16-55
Air Switching Valve Unit Test	16-55
Radiator Fan System.....	16-57
Fan Motor Inspection	16-57
Meter, Gauge, Indicator Unit.....	16-58
Meter Unit Removal/Installation	16-58
Meter Unit Disassembly	16-58
Electronic Unit (Combination Meter) Inspection.....	16-59
Immobilizer System (Equipped Models)	16-70
Operational Cautions	16-70
Key Registration.....	16-70
Immobilizer System Parts Replacement.....	16-86
Immobilizer System Inspection	16-87
Switches and Sensors	16-89
Brake Light Timing Inspection.....	16-89
Brake Light Timing Adjustment	16-89
Switch Inspection	16-89
Water Temperature Sensor Inspection	16-90
Speed Sensor Removal	16-90
Speed Sensor Installation	16-91
Speed Sensor Inspection	16-91
Fuel Reserve Switch Inspection.....	16-91
Oxygen Sensor Removal (Equipped Models).....	16-92
Oxygen Sensor Installation (Equipped Models).....	16-93
Oxygen Sensor Inspection (Equipped Models).....	16-93
Oxygen Sensor Heater Inspection (Equipped Models).....	16-93
Gear Position Switch Removal	16-93
Gear Position Switch Installation	16-94
Gear Position Switch Inspection	16-94
Relay Box	16-96
Relay Box Removal	16-96
Relay Circuit Inspection	16-96
Diode Circuit Inspection	16-97
Fuse.....	16-98
30 A Main Fuse Removal.....	16-98
Fuse Box Fuse Removal.....	16-98
10 A ECU Fuse Removal.....	16-98
Fuse Installation.....	16-99
Fuse Inspection.....	16-99

Dummy Page

16-4 ELECTRICAL SYSTEM

Exploded View



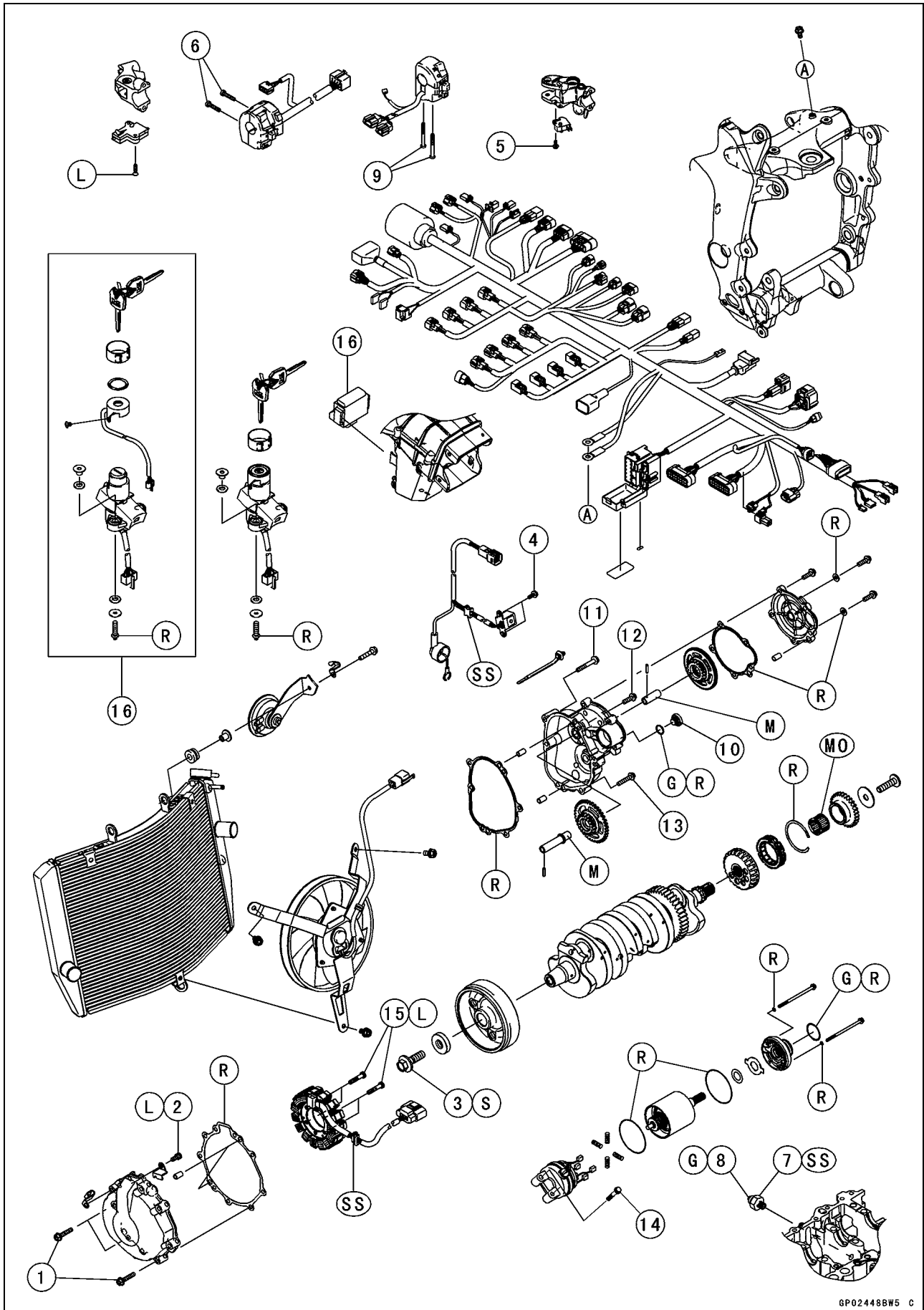
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Turn Signal Light Mounting Screw	1.2	0.12	11 in·lb	
2	License Plate Light Cover Screws	1.0	0.10	8.9 in·lb	
3	License Plate Light Mounting Nuts	3.5	0.36	31 in·lb	
4	Meter Unit Mounting Screws	1.2	0.12	11 in·lb	
5	Rear Turn Signal Light Lens Screws	1.0	0.10	8.9 in·lb	

6. CAL, SEA and TH Models

16-6 ELECTRICAL SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Alternator Cover Bolts	9.8	1.0	87 in·lb	
2	Alternator Lead Holding Plate Bolt	9.8	1.0	87 in·lb	L
3	Alternator Rotor Bolt	155	15.8	114	S
4	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
5	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
6	Left Switch Housing Screws	3.5	0.36	31 in·lb	
7	Oil Pressure Switch	15	1.5	11	SS
8	Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	G
9	Right Switch Housing Screws	3.5	0.36	31 in·lb	
10	Starter Clutch Bolt Cap	–	–	–	Hand-tighten
11	Starter Clutch Cover Bolt (L = 40 mm)	9.8	1.0	87 in·lb	
12	Starter Clutch Cover Bolt (L = 20 mm)	9.8	1.0	87 in·lb	
13	Starter Clutch Cover Bolts (L = 30 mm)	9.8	1.0	87 in·lb	
14	Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	
15	Stator Coil Bolts	12	1.2	106 in·lb	L

16. Immobilizer System Equipped Models

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

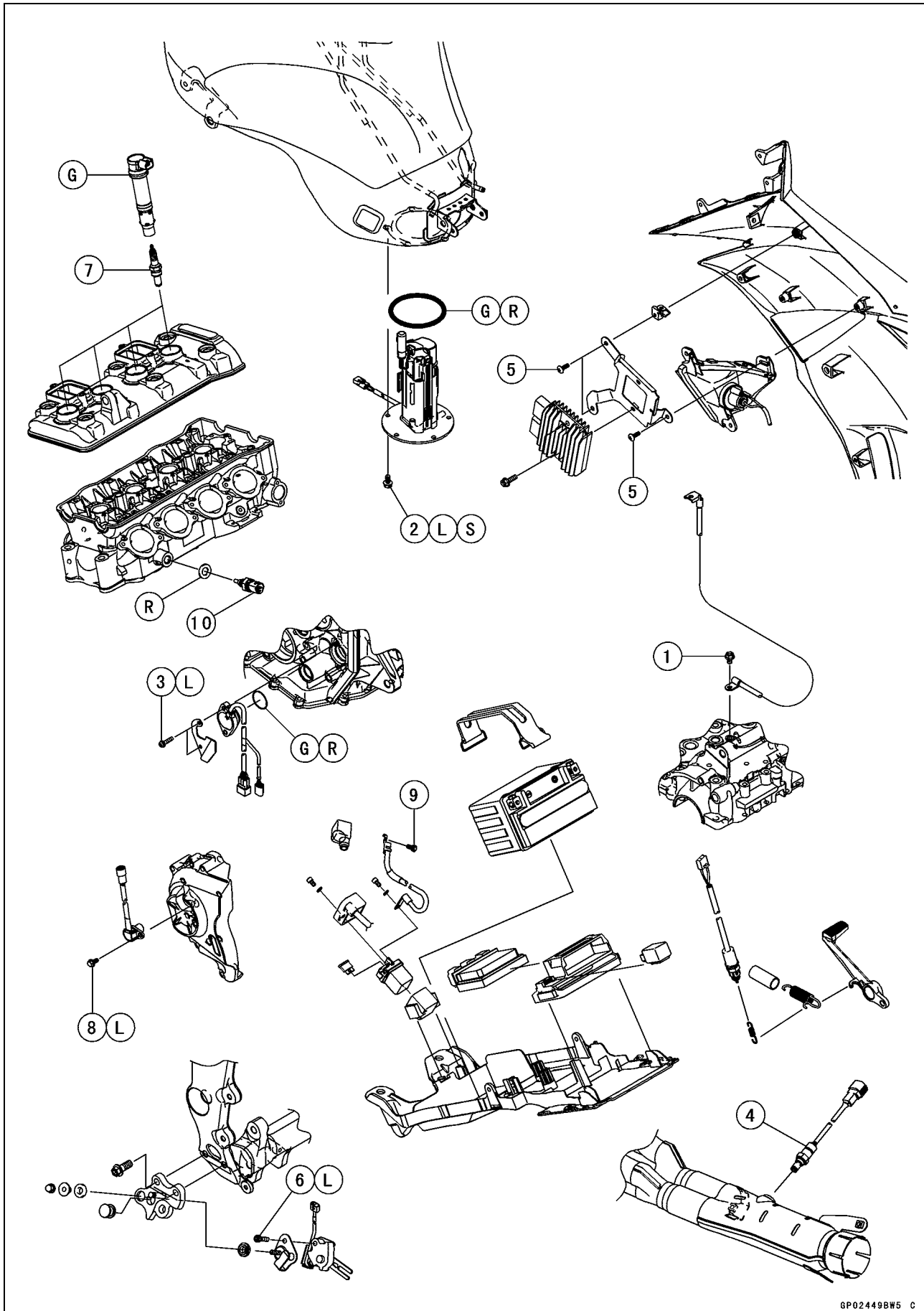
R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

16-8 ELECTRICAL SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
2	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
3	Gear Position Switch Screws	2.9	0.30	26 in·lb	L
4	Oxygen Sensor (Equipped Models)	25	2.5	18	
5	Regulator/Rectifier Bracket Screws	1.2	0.12	11 in·lb	
6	Sidestand Switch Bolt	8.8	0.90	78 in·lb	L
7	Spark Plugs	13	1.3	115 in·lb	
8	Speed Sensor Bolt	6.9	0.70	61 in·lb	L
9	Starter Motor Cable Terminal Bolt	2.9	0.30	26 in·lb	
10	Water Temperature Sensor	25	2.5	18	

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

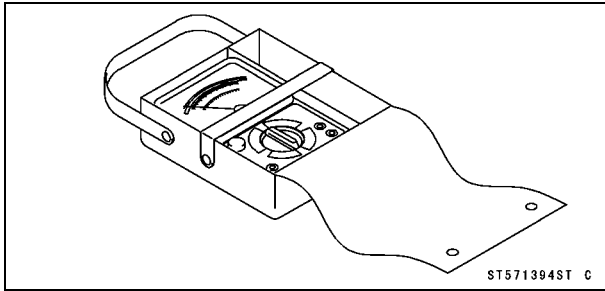
16-10 ELECTRICAL SYSTEM

Specifications

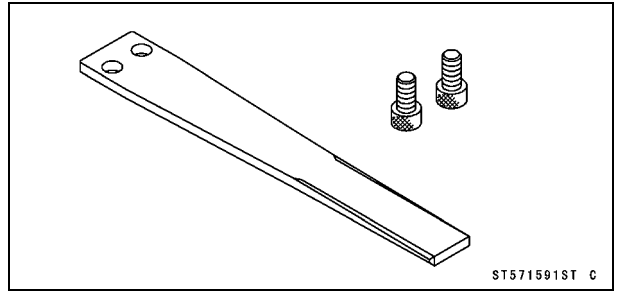
Item	Standard
Battery Type Model Name Capacity Voltage	Sealed Battery YTX9-BS 12 V 8 Ah 12.8 V or more
Charging System Type Alternator Output Voltage Stator Coil Resistance Charging Voltage (Regulator/Rectifier Output Voltage)	Three-phase AC 54 V or more at 4 000 r/min (rpm) 0.11 ~ 0.17 Ω at 20°C (68°F) 14.2 ~ 15.2 V
Ignition System Crankshaft Sensor: Resistance Peak Voltage Stick Coil: Primary Winding Resistance Secondary Winding Resistance Primary Peak Voltage Spark Plug: Type Gap	368 ~ 552 Ω 5.6 V or more 0.8 ~ 1.2 Ω 5.0 ~ 6.8 k Ω 72 V or more NGK CR9E 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)
Electric Starter System Starter Motor: Brush Length Commutator Diameter	7 mm (0.28 in.) (Service Limit: 3.5 mm (0.14 in.)) 24 mm (0.94 in.) (Service Limit: 23 mm (0.91 in.))
Air Switching Valve Resistance	20 ~ 24 Ω at 20°C (68°F)
Switches and Sensors Rear Brake Light Switch Timing Oil Pressure Switch Connections Water Temperature Sensor Resistance Gear Position Switch Resistance	ON after about 10 mm (0.39 in.) of pedal travel When engine is stopped: ON When engine is running: OFF in the text in the text

Special Tools and Sealant

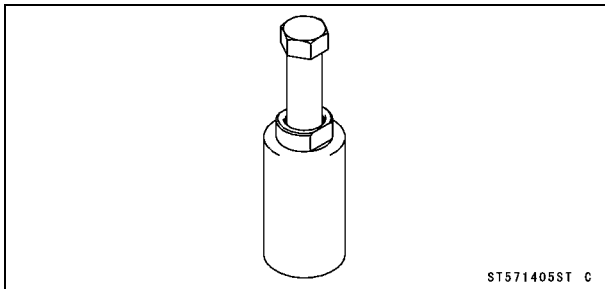
**Hand Tester:
57001-1394**



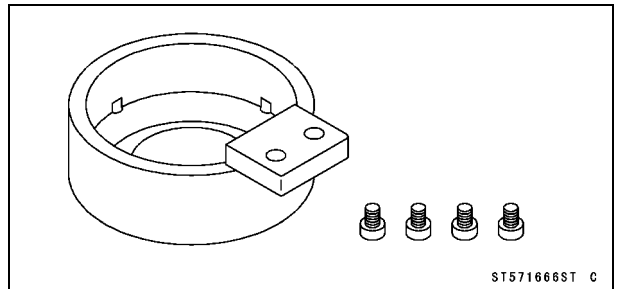
**Grip:
57001-1591**



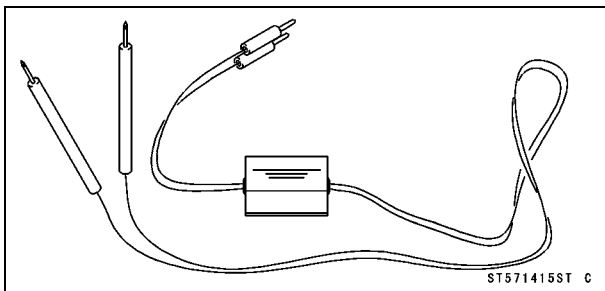
**Flywheel Puller Assembly, M38 x 1.5/M35 x 1.5:
57001-1405**



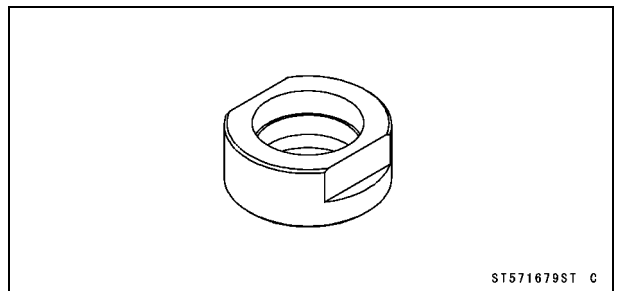
**Rotor Holder:
57001-1666**



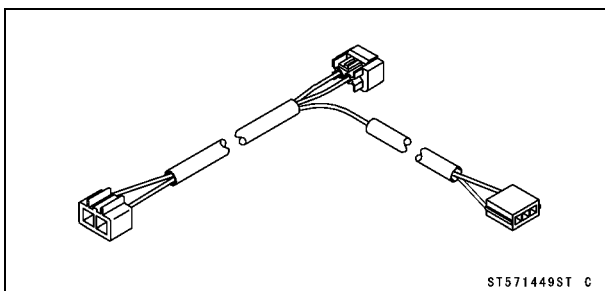
**Peak Voltage Adapter:
57001-1415**



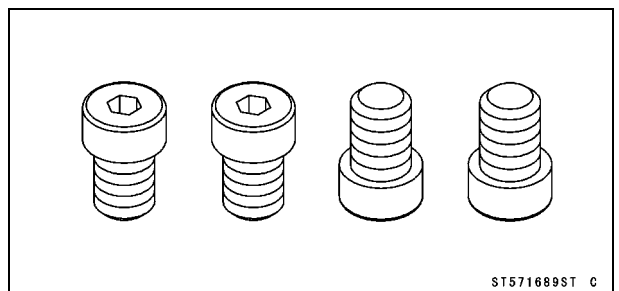
**Stopper:
57001-1679**



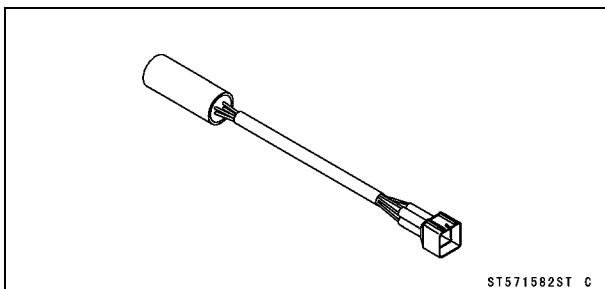
**Lead Wire - Peak Voltage Adapter:
57001-1449**



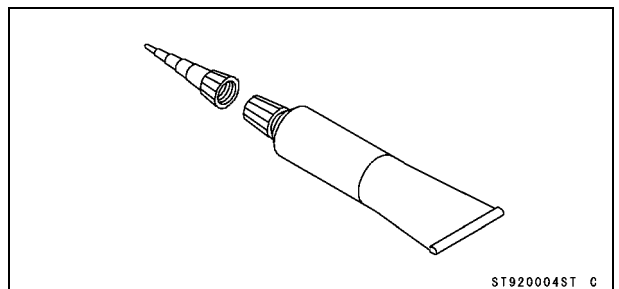
**Rotor Holder Attachment:
57001-1689**



**Key Registration Unit:
57001-1582**

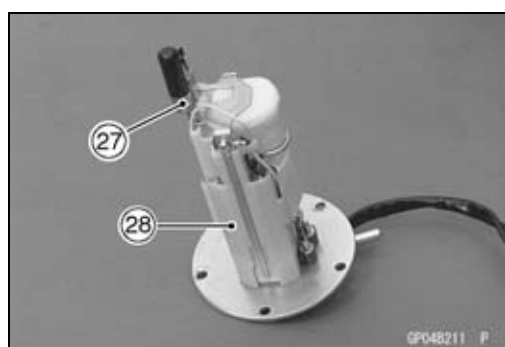
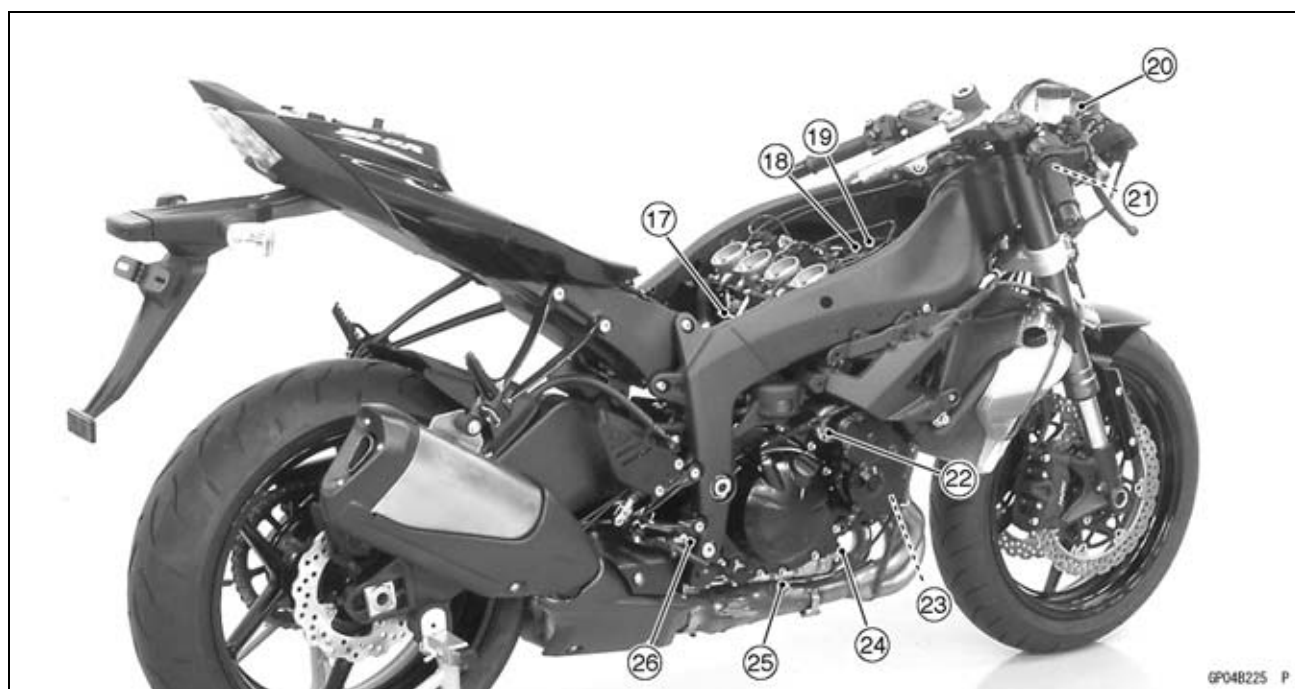
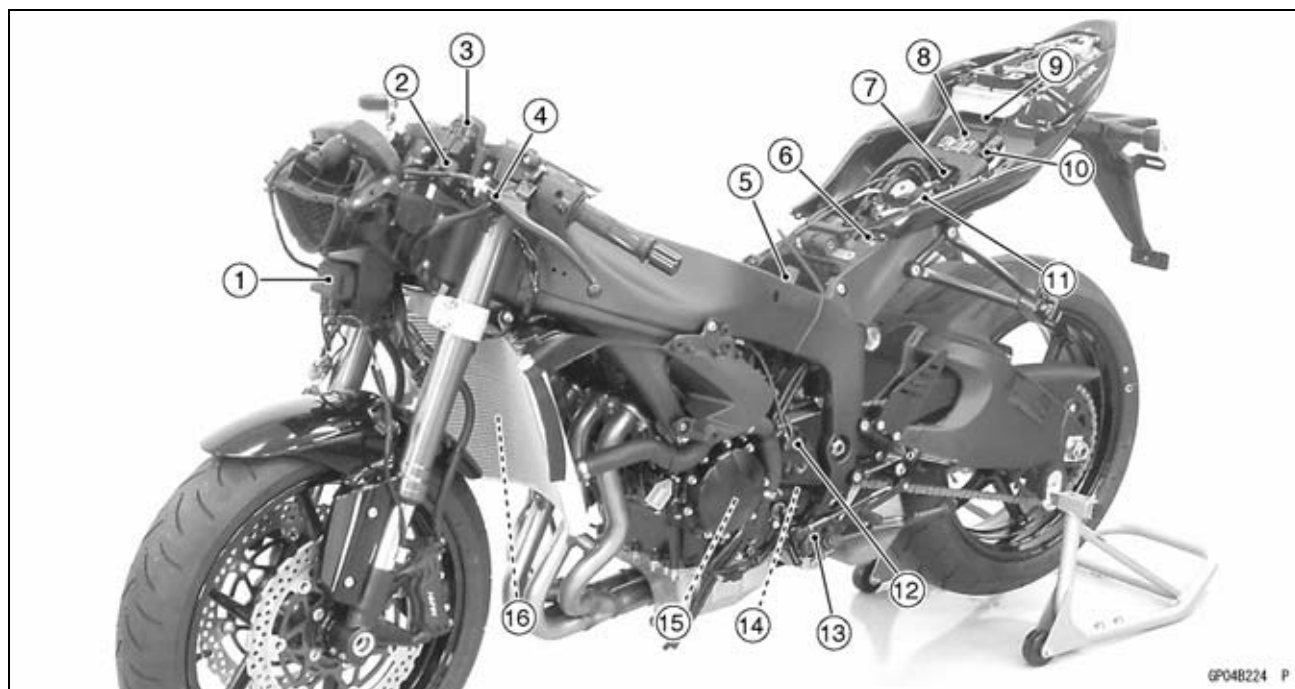


**Kawasaki Bond (Silicone Sealant):
92104-0004**



16-12 ELECTRICAL SYSTEM

Parts Location

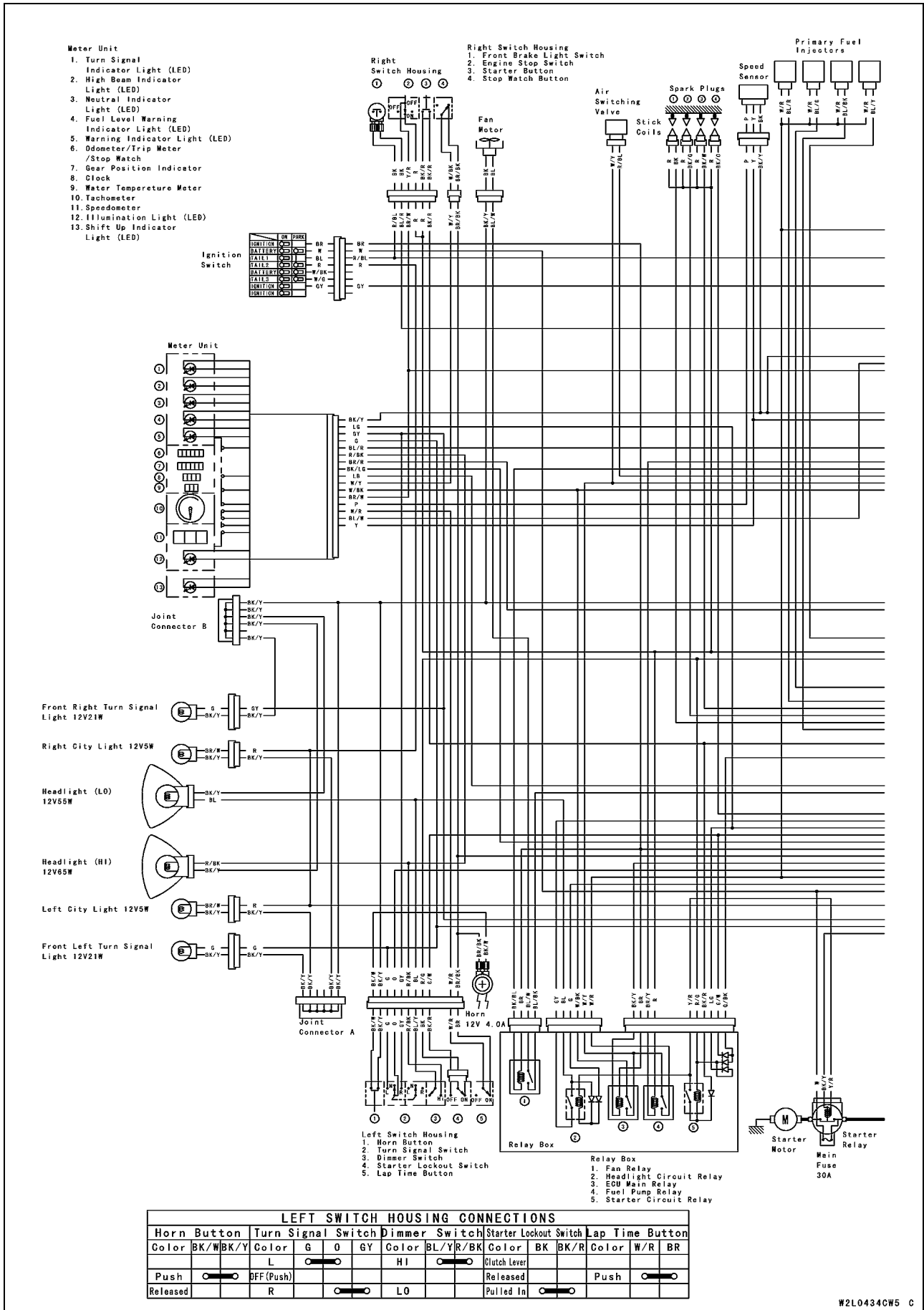


Parts Location

1. Immobilizer Amplifier (Equipped Models)
2. Ignition Switch
3. Immobilizer Antenna (Equipped Models)
4. Starter Lockout Switch
5. Starter Relay
6. Battery 12 V 8 Ah
7. Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector
8. Relay Box
9. ECU
10. Turn Signal Relay
11. Fuse Box
12. Speed Sensor
13. Sidestand Switch
14. Gear Position Switch
15. Alternator
16. Fan Motor
17. Water Temperature Sensor
18. Stick Coils
19. Air Switching Valve
20. Meter Unit
21. Front Brake Light Switch
22. Starter Motor
23. Crankshaft Sensor
24. Oil Pressure Switch
25. Oxygen Sensor (Equipped Models)
26. Rear Brake Light Switch
27. Fuel Reserve Switch
28. Fuel Pump
29. Regulator/Rectifier

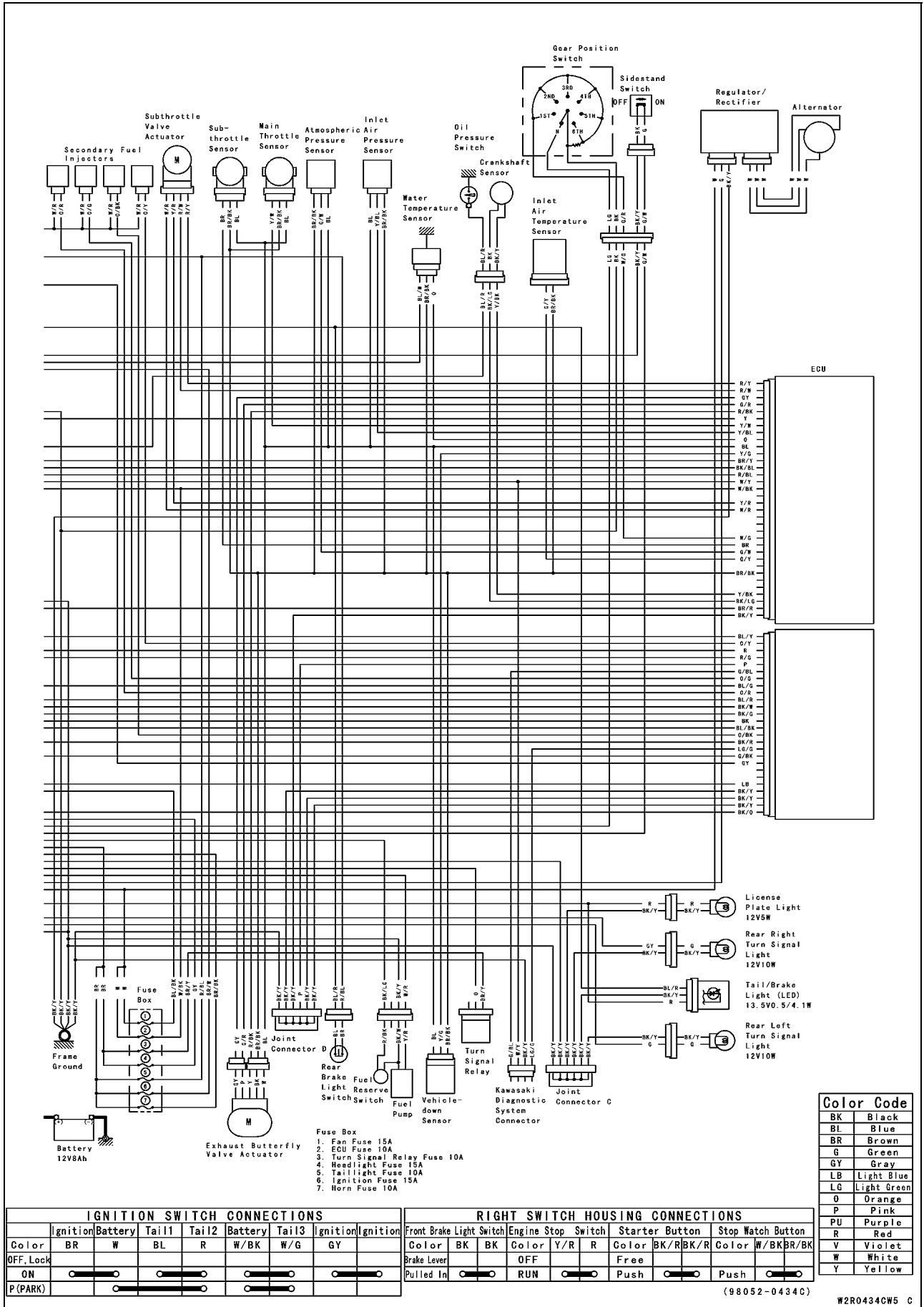
16-14 ELECTRICAL SYSTEM

Wiring Diagram (US, CAL and CA Models)



ELECTRICAL SYSTEM 16-15

Wiring Diagram (US, CAL and CA Models)



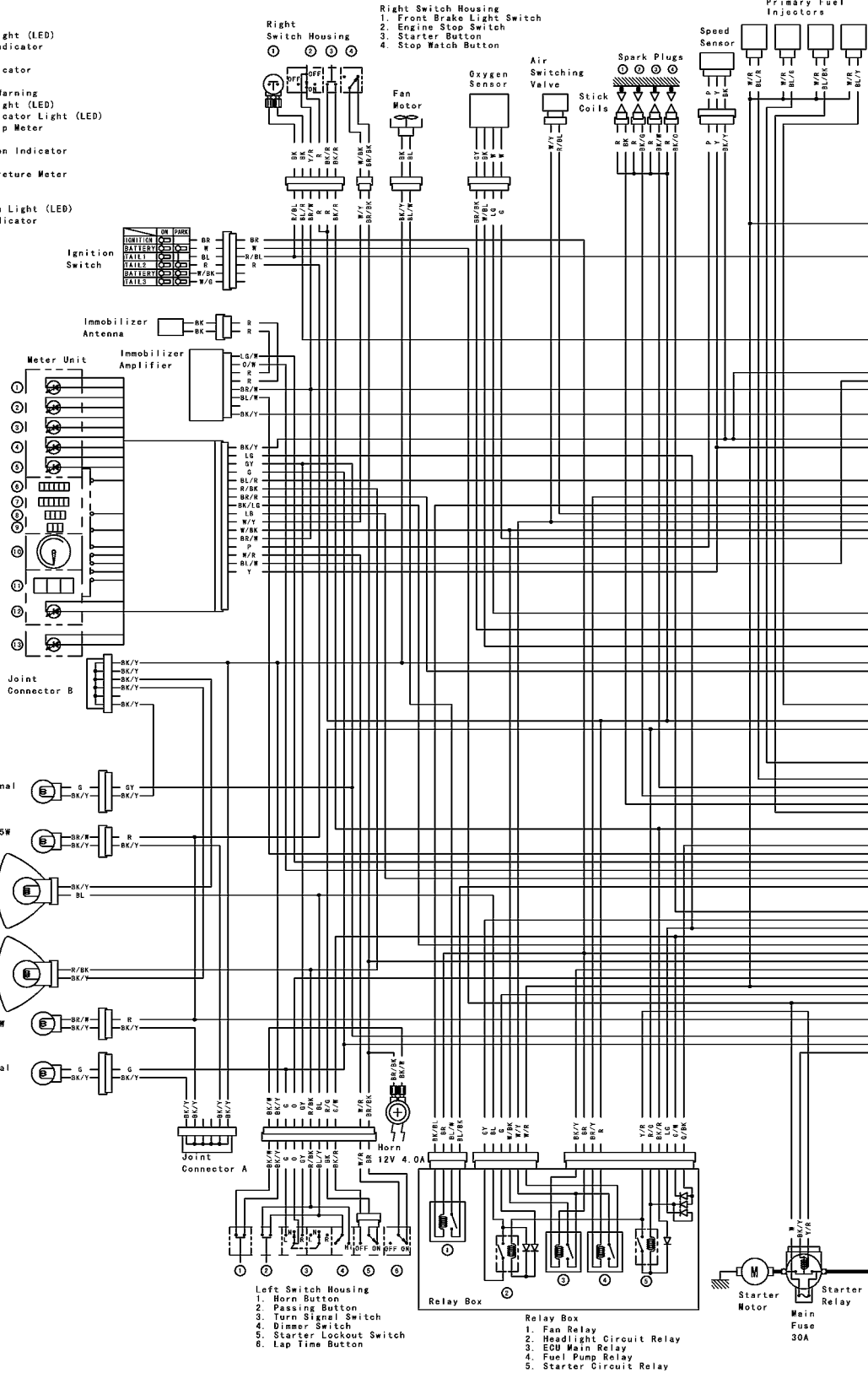
16-16 ELECTRICAL SYSTEM

Wiring Diagram (Other than US, CAL and CA Models)

- Meter Unit**
1. Turn Signal Indicator Light (LED)
 2. High Beam Indicator Light (LED)
 3. Neutral Indicator Light (LED)
 4. Fuel Level Warning Indicator Light (LED)
 5. Warning Indicator Light (LED)
 6. Odometer/Trip Meter /Stop Watch
 7. Gear Position Indicator
 8. Clock
 9. Water Temperature Meter
 10. Tachometer
 11. Speedometer
 12. Illumination Light (LED)
 13. Shift Up Indicator Light (LED)

- Right Switch Housing**
1. Front Brake Light Switch
 2. Engine Stop Switch
 3. Starter Button
 4. Stop Watch Button

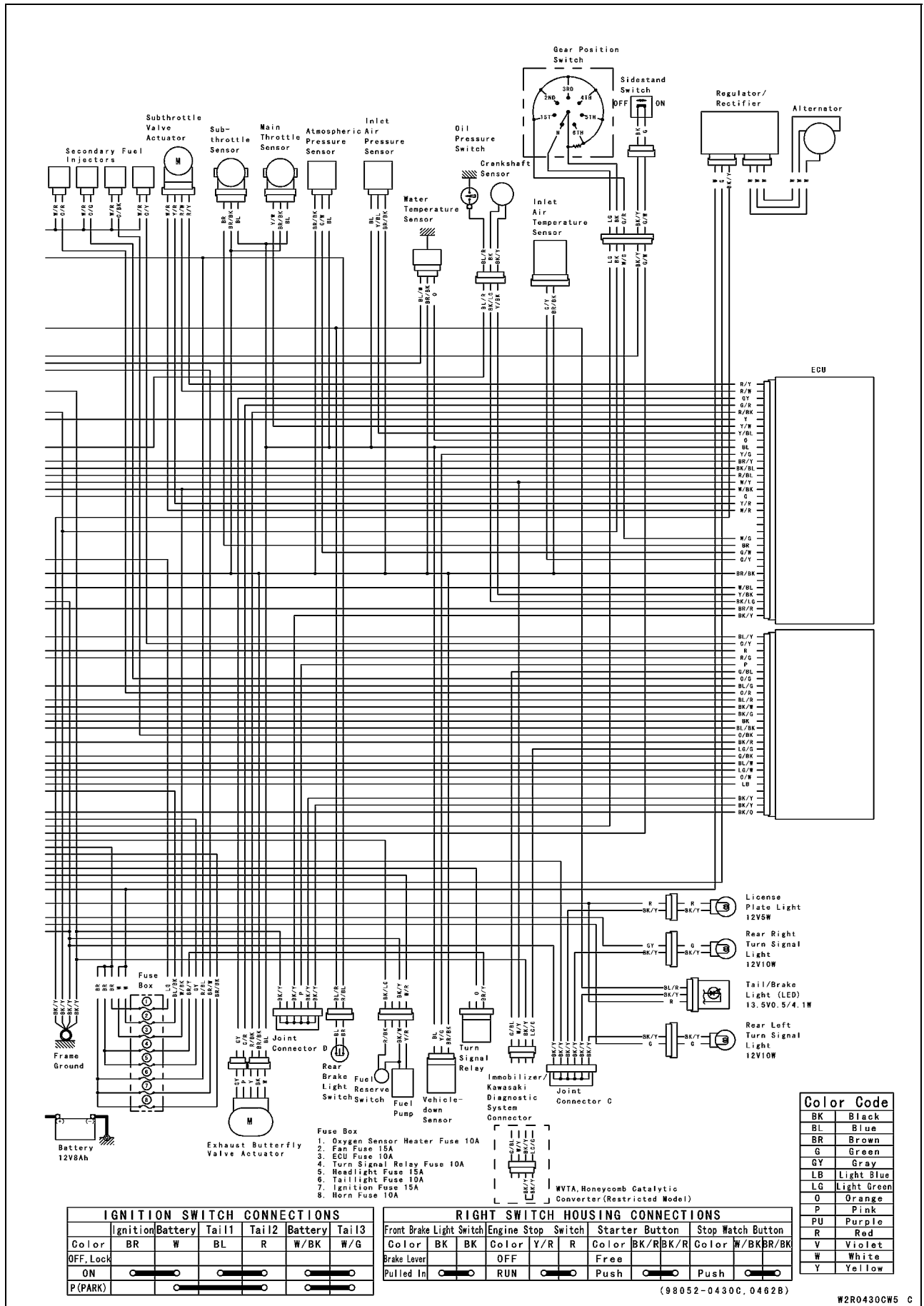
Primary Fuel Injectors



LEFT SWITCH HOUSING CONNECTIONS									
Horn Button	Passing Button	Turn Signal Switch	Dimmer Switch	Starter Lockout Switch	Lap Time Button				
Color BK/WBK/Y	Color BL/YR/BK	Color G 0 GY	Color BL/YR/BK	Color BK BK/R	Color W/R BR				
Push	Push	OFF (Push)	HI	Clutch Lever	Push				
Released		R	LO	Released	Push				
				Pulled In					

ELECTRICAL SYSTEM 16-17

Wiring Diagram (Other than US, CAL and CA Models)



16-18 ELECTRICAL SYSTEM

Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Take care not to short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine leads for signs of burning, fraying, etc. Poor leads and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

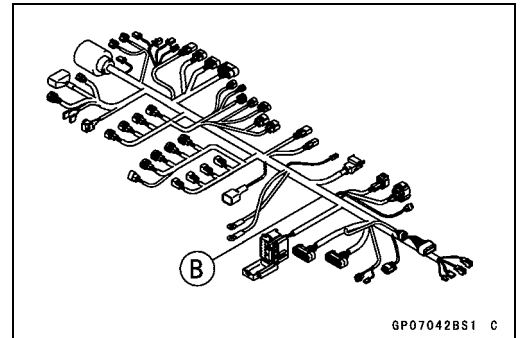
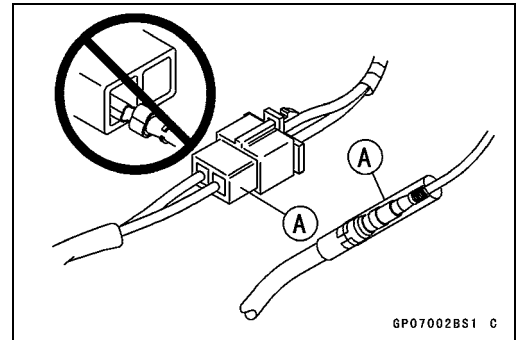
Electrical Wiring

Wiring Inspection

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

Special Tool - Hand Tester: 57001-1394

- Set the tester to the $\times 1 \Omega$ range, and read the tester.
- ★ If the tester does not read 0Ω , the lead is defective. Replace the lead or the wiring harness [B] if necessary.



16-20 ELECTRICAL SYSTEM

Battery

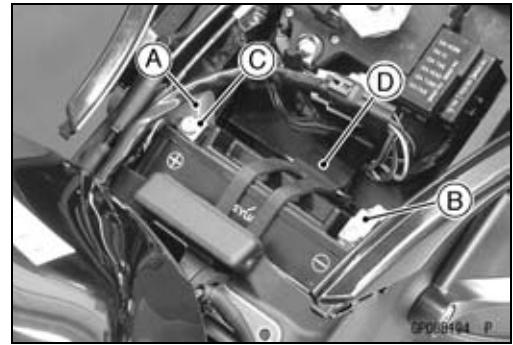
Battery Removal

- Turn off the ignition switch.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Slide the red cap [A].
- Disconnect the negative (-) cable [B] and then positive (+) cable [C].

CAUTION

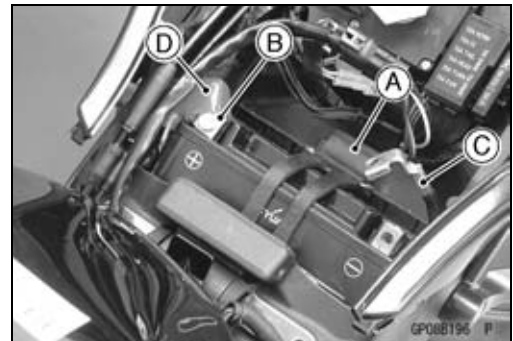
Be sure to disconnect the negative (-) cable first.

- Remove the band [D].
- Pull the battery [A] out of the rear fender.



Battery Installation

- Visually inspect the surface of the battery container.
- ★ If any signs of cracking or electrolyte leakage from the sides of the battery.
- Put the battery into the rear fender so that the positive (+) terminal faces right side of the motorcycle.
- Install the band [A].
- Connect the positive (+) cable [B] (red cap) to the positive (+) terminal first, and then the negative (-) cable [C] to the negative (-) terminal.
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the positive (+) terminal with the red cap [D].



CAUTION

If each battery cable is not correctly disconnected or connected, sparks can arise at electrical connections, causing damage to electrical and DFI parts.

Battery Activation

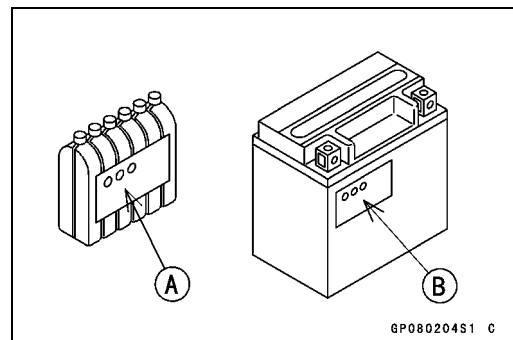
Electrolyte Filling

- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

Battery Model Name for ZX600R: YTX9-BS

CAUTION

Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.



Battery

CAUTION

Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.

- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

NOTE

○ *The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*

- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.

NOTE

○ *Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*

- Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

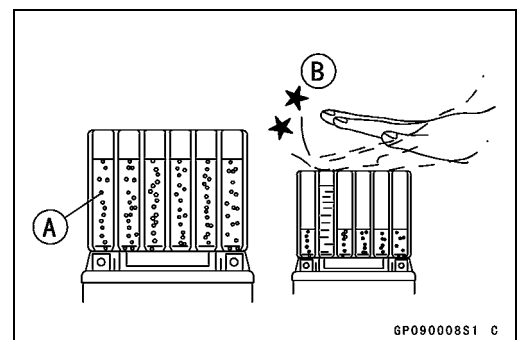
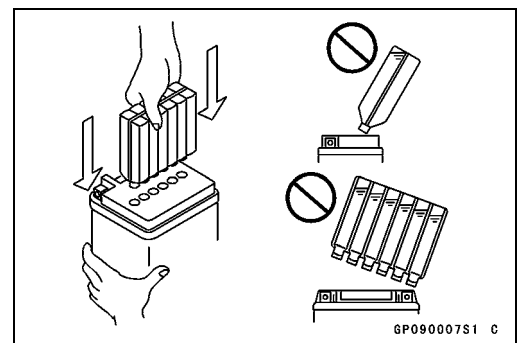
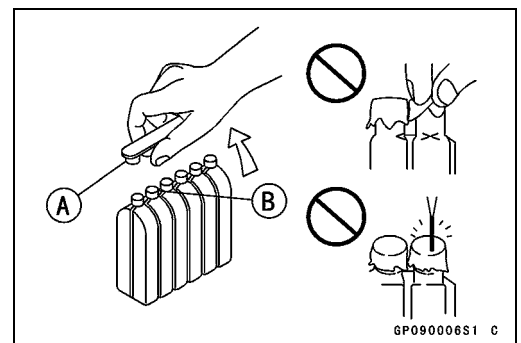
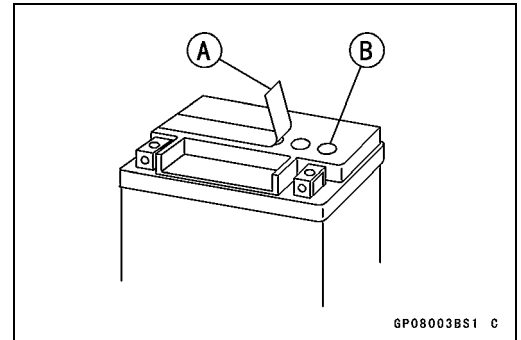
NOTE

○ *Do not tilt the electrolyte container.*

- Check the electrolyte flow.
- ★ If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.
- Keep the container in place for **20 minutes** or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.

CAUTION

Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.



16-22 ELECTRICAL SYSTEM

Battery

- Gently remove the container from the battery.
- Let the battery sit for **30** minutes prior to charging to allow the electrolyte to permeate into the plates for optimum performance.

NOTE

○ *Charging the battery immediately after filling can shorten service life. Let the battery sit for at least **30** minutes after filling.*

Initial Charge

- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

Standard Charge: 0.9 A × 5 ~ 10 hours

- ★ If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

Kawasaki-recommended chargers:

Optimate III

Yuasa 1.5 Amp Automatic Charger

Battery Mate 150-9

- ★ If the above chargers are not available, use equivalent one.

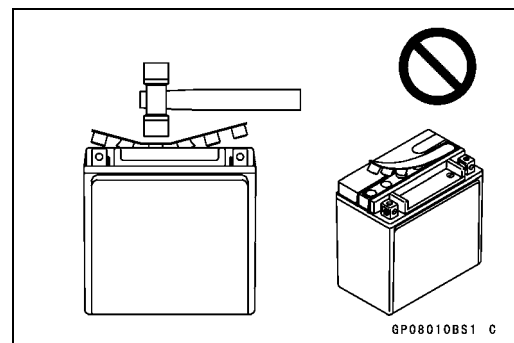
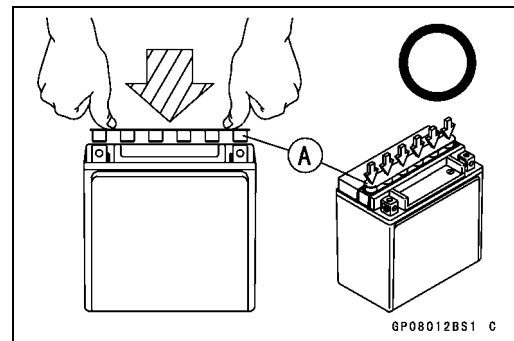
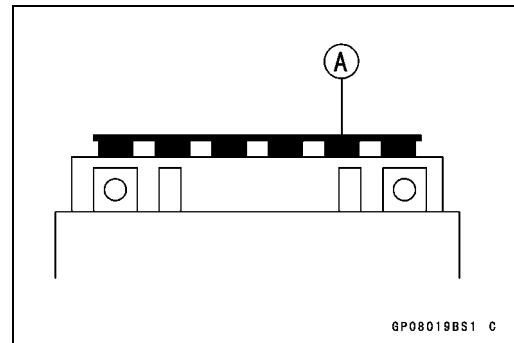
NOTE

○ *Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.8 V, repeat charging cycle.*

- After charging is completed, press down firmly with both hands to seat the strip of caps [A] into the battery (don't pound or hammer). When properly installed, the strip of the caps will be level with the top of the battery.

CAUTION

Once the strip of the caps is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.



Battery

NOTE

○ *To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds.*

Re-check voltage and if less than 12.8 V repeat the charging cycle and load test. If still below 12.8 V the battery is defective.

16-24 ELECTRICAL SYSTEM

Battery

Precautions

- 1) No need of topping-up

No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.

- 2) Refreshing charge

If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see Refreshing Charge).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

CAUTION

This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge.

If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.

- 3) When you do not use the motorcycle for months.

Give a refresh charge before you store the motorcycle and store it with the negative cable removed. Give a refresh charge **once a month** during storage.

- 4) Battery life

If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

⚠ WARNING

Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.

This procedure prevents sparks at the battery terminals which could ignite any battery gases.

No fire should be drawn near the battery, or no terminals should have the tightening loosened.

The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medical attention if severe.

Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

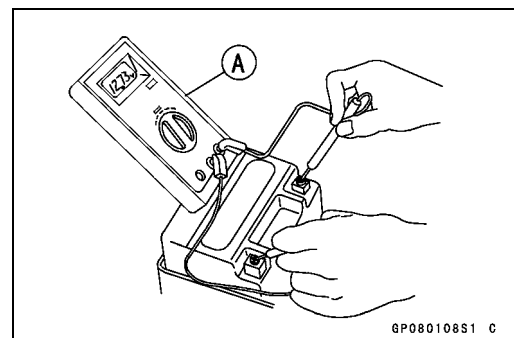
Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

Charging Condition Inspection

- Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].
- Remove the battery (see Battery Removal).
- Measure the battery terminal voltage.

NOTE

- Measure with a digital voltmeter which can be read one decimal place voltage.



Battery

★If the reading is 12.8 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

Battery Terminal Voltage

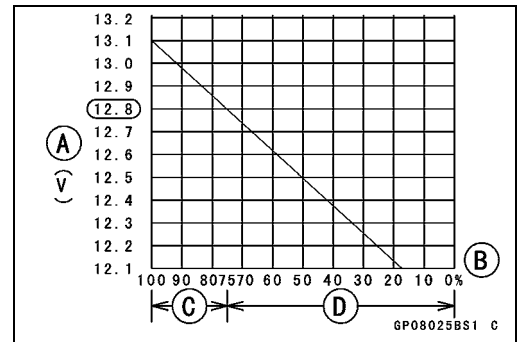
Standard: 12.8 V or more

Terminal Voltage (V) [A]

Battery Charge Rate (%) [B]

Good [C]

Refresh charge is required [D]

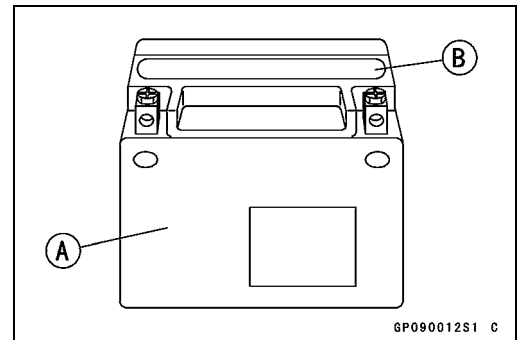


Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

⚠ WARNING

This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.



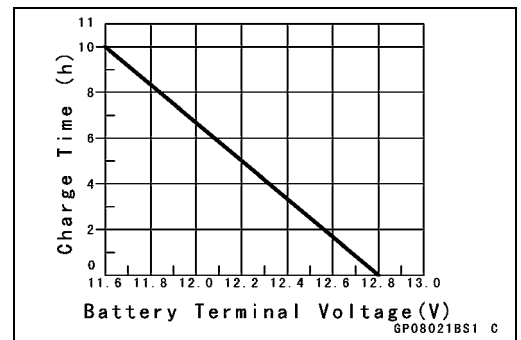
Terminal Voltage: 11.5 ~ less than 12.8 V

Standard Charge 0.9 A x 5 ~ 10 h (see following chart)

Quick Charge 4 A x 1 h

CAUTION

If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.

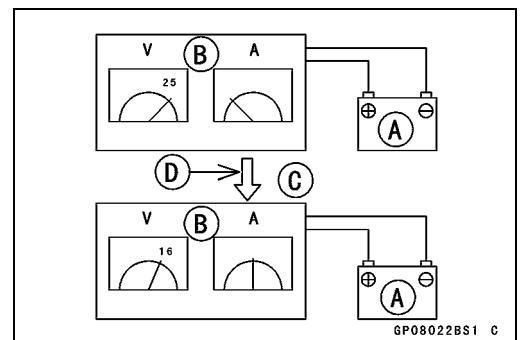


Terminal Voltage: less than 11.5 V

Charging Method: 0.9 A x 20 h

NOTE

○ Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.



Battery [A]

Battery Charger [B]

Standard Value [C]

Current starts to flow [D]

- Determine the battery condition after refresh charge.
- Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

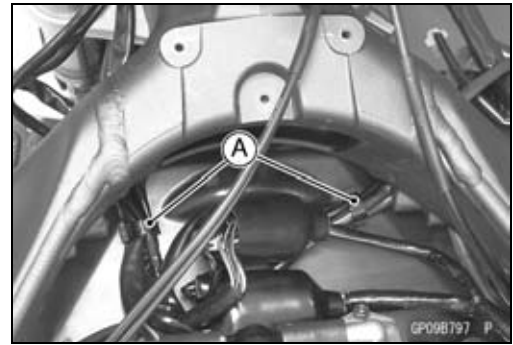
Criteria	Judgement
12.8 V or higher	Good
12.0 ~ lower than 12.8 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace

16-26 ELECTRICAL SYSTEM

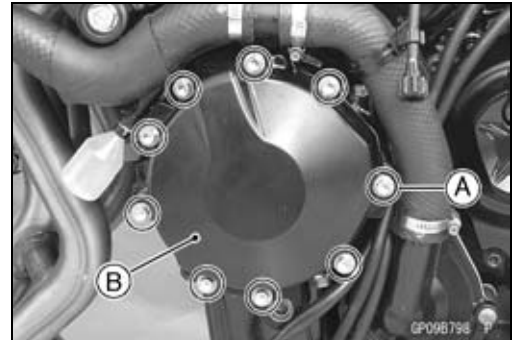
Charging System

Alternator Cover Removal

- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
 - Clamps [A]



- Remove:
 - Bolts [A]
 - Alternator Cover [B]



Alternator Cover Installation

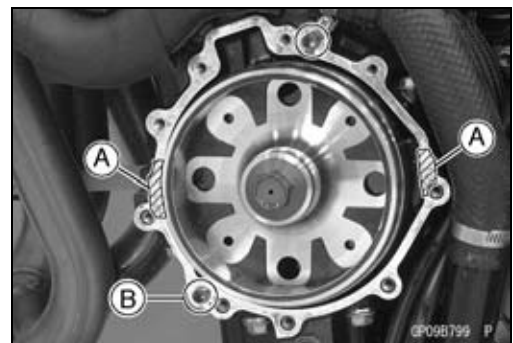
- Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

- Check that dowel pins [B] are in place on the crankcase.
- Replace the alternator cover gasket with a new one.
- Tighten:

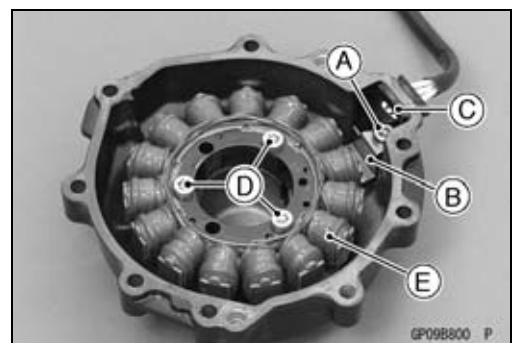
Torque - Alternator Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



Stator Coil Removal

- Remove:
 - Alternator Cover (see Alternator Cover Removal)
 - Holding Plate Bolt [A] and Plate [B]
 - Alternator Lead Grommet [C]
 - Stator Coil Bolts [D]
- Remove the stator coil [E] from the alternator cover.



Charging System

Stator Coil Installation

- Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.

Torque - Stator Coil Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

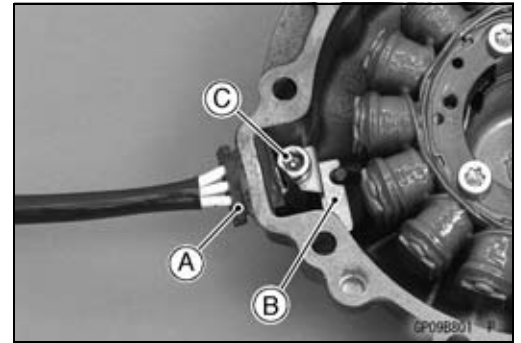
- Apply silicone sealant to the circumference of the alternator lead grommet [A], and fit the grommet into the notch of the cover securely.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

- Secure the alternator lead with a holding plate [B], and apply a non-permanent locking agent to the threads of the plate bolt [C] and tighten it.

Torque - Alternator Lead Holding Plate Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the alternator cover (see Alternator Cover Installation).



Alternator Rotor Removal

- Remove the alternator cover (see Alternator Cover Removal).
- Clean off the oil from the outer circumference of the rotor.
- Hold the alternator rotor steady with the rotor holder [A], and remove the rotor bolt [B] and washer.

Special Tools - Grip [C]: 57001-1591

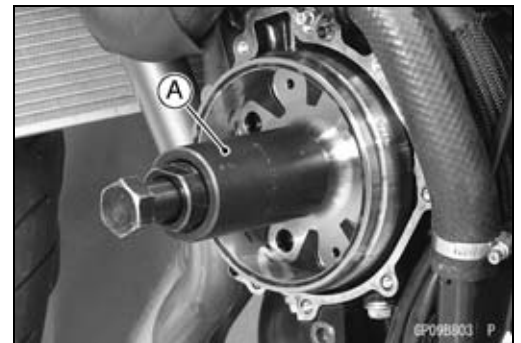
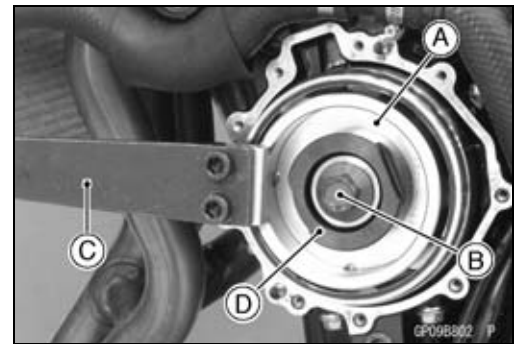
Rotor Holder: 57001-1666

Stopper [D]: 57001-1679

Rotor Holder Attachment: 57001-1689

- Using the flywheel puller [A], remove the alternator rotor from the crankshaft.

Special Tool - Flywheel Puller Assembly, M38 x 1.5/M35 x 1.5: 57001-1405

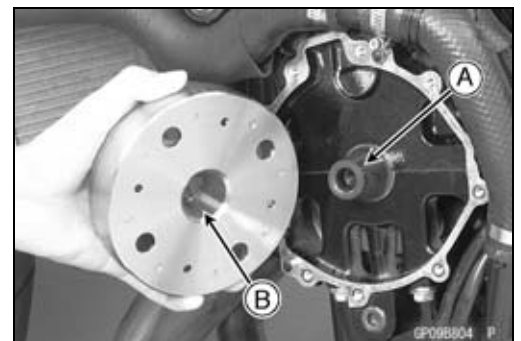


CAUTION

Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.

Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
 - Crankshaft Tapered Portion [A]
 - Alternator Rotor Tapered Portion [B]
- Install the alternator rotor.



16-28 ELECTRICAL SYSTEM

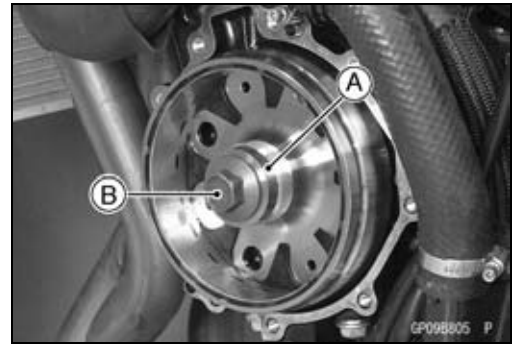
Charging System

- Using a cleaning fluid, clean off any oil or dirt on the washer [A] and dry it with a clean cloth.
- Install the washer.

NOTE

○ Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.

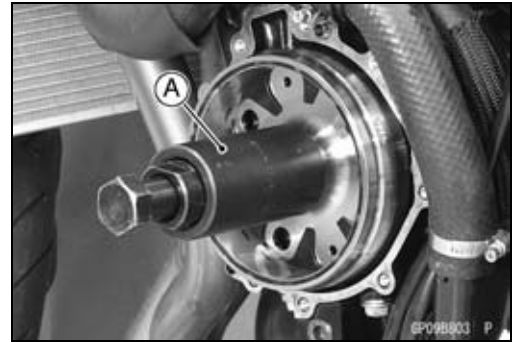
- Install the rotor bolt [B] and tighten it with 70 N·m (7.0 kgf·m, 52 ft·lb) of torque.



- Remove the rotor bolt and washer.
- Check the tightening torque with flywheel puller [A].

Special Tool - Flywheel Puller Assembly, M38 x 1.5/M35 x 1.5: 57001-1405

- ★ If the rotor is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
- ★ If the rotor is pulled out with under 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.

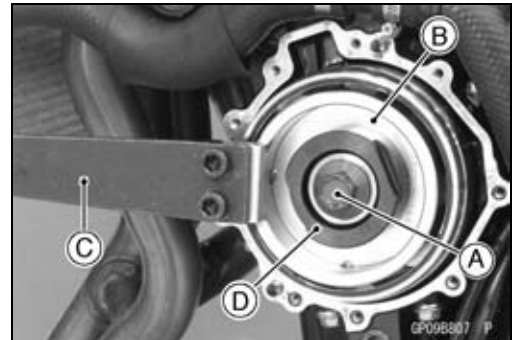


- Install the washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B].

Special Tools - Grip [C]: 57001-1591
Rotor Holder: 57001-1666
Stopper [D]: 57001-1679
Rotor Holder Attachment: 57001-1689

Torque - Alternator Rotor Bolt: 155 N·m (15.8 kgf·m, 114 ft·lb)

- Install the alternator cover (see Alternator Cover Installation).



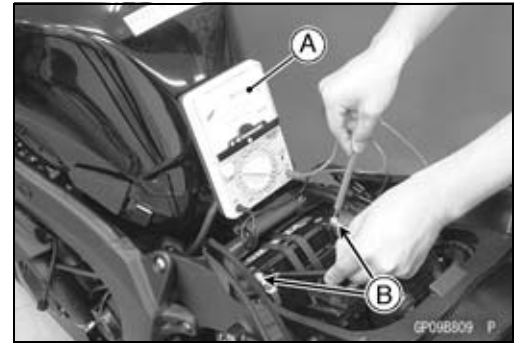
Charging System

Charging Voltage Inspection

- Check the battery condition (see Charging Condition Inspection).
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Check that the ignition switch is turned off, and connect the hand tester [A] to the battery terminals [B].

Special Tool - Hand Tester: 57001-1394

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight, disconnect the headlight connector.). The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.



Charging Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
DC 25 V	Battery (+)	Battery (-)	14.2 ~ 15.2 V

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.
- ★ If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.
- ★ If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.
- ★ If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

Alternator Inspection

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.

16-30 ELECTRICAL SYSTEM

Charging System

- To check the alternator output voltage, do the following procedures.
- Turn the ignition switch OFF.
- Remove the right upper inner fairing (see Upper Inner Fairing Removal in the Frame chapter).
- Disconnect the alternator lead connector [A].
- Connect the hand tester as shown in the table 1.

Special Tool - Hand Tester: 57001-1394

- Start the engine.
- Run it at the rpm given in the table 1.
- Note the voltage readings (total 3 measurements).



Table 1 Alternator Output Voltage at 4 000 r/min (rpm)

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
AC 250 V	One W lead	Another W lead	54 V or more

- ★ If the output voltage shows the value in the table, the alternator operates properly. The regulator/rectifier is damaged.
- ★ If the output voltage shows a much lower reading than that given in the table, stop the engine and inspect the stator coil resistance.
- Check the stator coil resistance as follows.
- Stop the engine.
- Connect the hand tester as shown in the table 2.

Special Tool - Hand Tester: 57001-1394

- Note the readings (total 3 measurements).

Table 2 Stator Coil Resistance at 20°C (68°F)

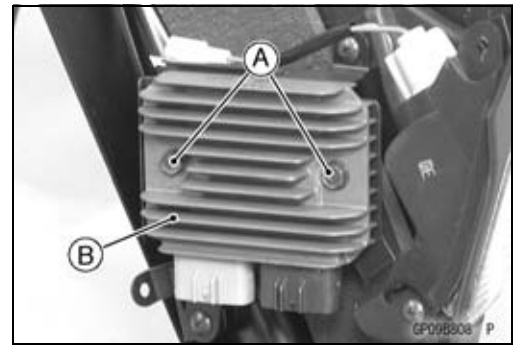
Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
$\times 1 \Omega$	One W lead	Another W lead	0.11 ~ 0.17 Ω

- ★ If there is more resistance than shown in the table, or no hand tester reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
- Using the highest resistance range of the hand tester, measure the resistance between each of the white leads and chassis ground.
- ★ Any hand tester reading less than infinity (∞) indicates a short, necessitating stator replacement.
- ★ If the stator coil has normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Charging System

Regulator/Rectifier Inspection

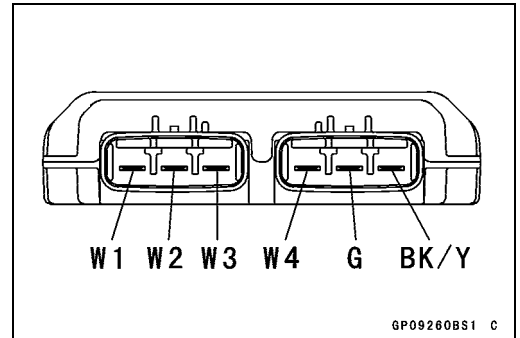
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Right Inner Fairing (see Inner Fairing Removal in the Frame chapter)
 - Bolts [A]
 - Regulator/Rectifier [B]



- 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: $\text{k}\Omega$)

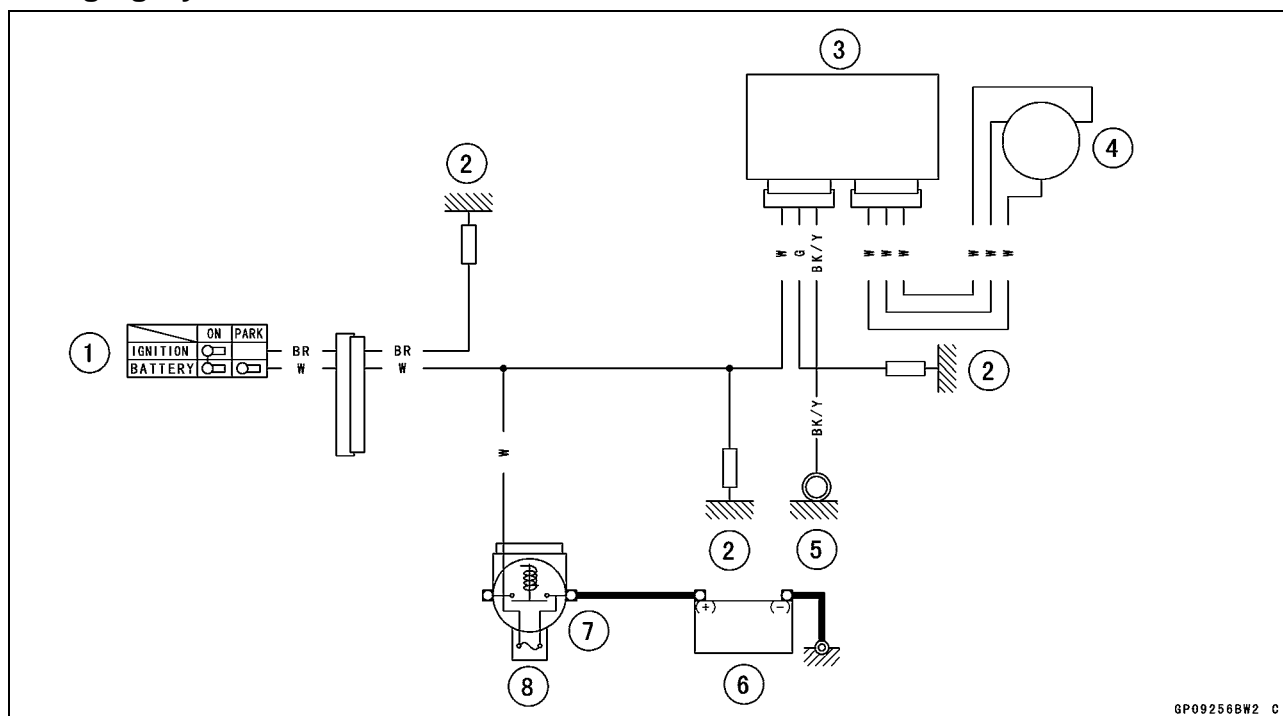
		Tester (+) Lead Connection					
Terminal		W1	W2	W3	W4	G	BK/Y
(-)*	W1	—	0	0	3 ~ 11	0	0
	W2	0	—	0	3 ~ 11	0	0
	W3	0	0	—	3 ~ 11	0	0
	W4	0	0	0	—	0	0
	G	0	0	0	3 ~ 11	—	0
	BK/Y	3 ~ 11	3 ~ 11	3 ~ 11	6 ~ 18	3 ~ 11	—

(-)*: Tester (-) Lead Connection

16-32 ELECTRICAL SYSTEM

Charging System

Charging System Circuit



1. Ignition Switch
2. Load
3. Regulator/Rectifier
4. Alternator
5. Frame Ground
6. Battery 12 V 8 Ah
7. Starter Relay
8. Main Fuse 30 A

Ignition System

⚠ WARNING

The ignition system produces extremely high voltage. Do not touch the spark plugs or stick coils while the engine is running, or you could receive a severe electrical shock.

CAUTION

Do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, or while the engine is running. This is to prevent ECU damage.

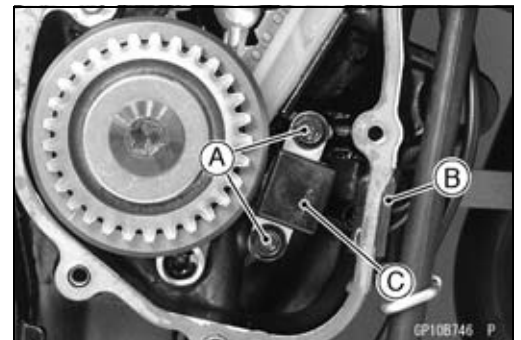
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.

Crankshaft Sensor Removal

- Remove:
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Crankshaft Sensor Lead Connector [A]



- Remove:
 - Idle Gear (Starter Clutch Side) (see Starter Idle Gear Removal in the Crankshaft/Transmission chapter)
 - Bolts [A]
 - Crankshaft Sensor Lead Grommet [B]
 - Crankshaft Sensor [C]



Crankshaft Sensor Installation

- Tighten:
 - Torque - Crankshaft Sensor Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)**
- Apply silicone sealant to the circumference of the crankshaft sensor lead grommet [B], and fit the grommet into the notch of the crankcase securely.
- Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**
- Run the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



16-34 ELECTRICAL SYSTEM

Ignition System

Crankshaft Sensor Inspection

- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Removal).
- Set the hand tester [A] to the $\times 10 \Omega$ range and connect it to the crankshaft sensor lead connector [B].

Special Tool - Hand Tester: 57001-1394

Crankshaft Sensor Resistance

Connections:

Meter (+) → BK lead

Meter (-) → BK/Y lead

Standard: 368 ~ 552 Ω

- ★ If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.
- ★ Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the crankshaft sensor.

Crankshaft Sensor Peak Voltage Inspection

NOTE

- Be sure the battery is fully charged.
- Using the peak voltage adapter [A] is more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.

- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Removal).
- Set the hand tester [B] to the DC 10 V range, and connect it peak voltage adapter.

Special Tools - Hand Tester: 57001-1394

Peak Voltage Adapter: 57001-1415

Type: KEK-54-9-B

- Connect the adapter to the terminals of the crankshaft sensor lead connector [C].

Connections:

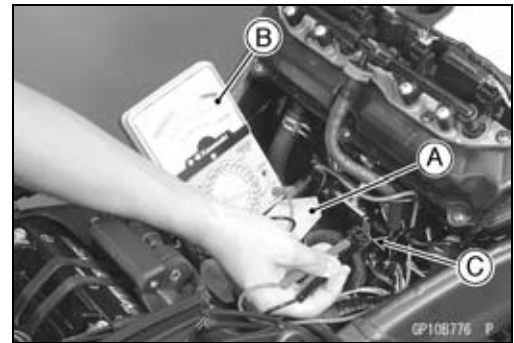
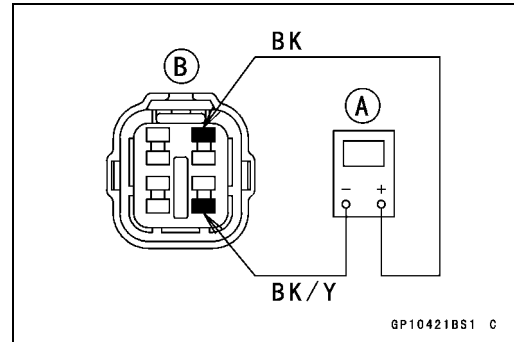
Crankshaft Sensor Lead Connector	Peak Voltage Adapter	Hand Tester
BK lead	← R lead →	(+)
BK/Y lead	← BK lead →	(-)

- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the peak voltage.
- Repeat the measurements 5 times or more times.

Crankshaft Sensor Peak Voltage

Standard: 5.6 V or more

- ★ If the reading is less than the standard, inspect the crankshaft sensor (see Crankshaft Sensor Inspection).



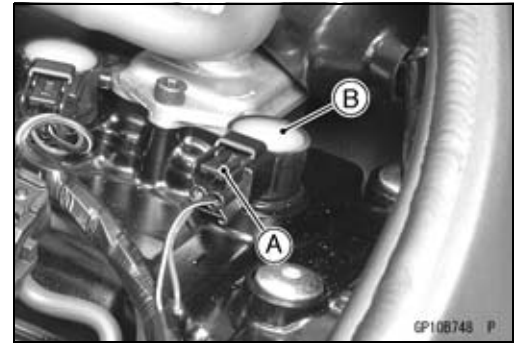
Ignition System

Stick Coil Removal

- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Disconnect the stick coil connectors [A].
- Pull out the stick coils [B] upward.
- First, turn the stick coil by 90 degrees, and then pull it out by twisting the coil head to the left and right while holding it securely by hand.

CAUTION

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

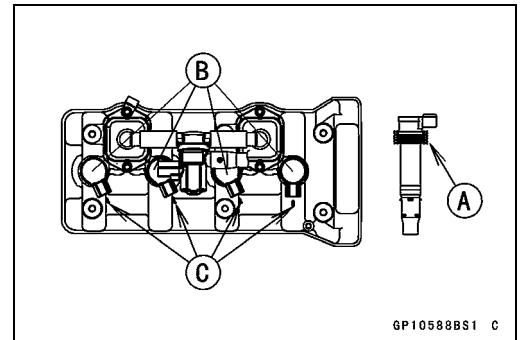


Stick Coil Installation

- Apply a thin coat of grease [A] to the stick coils for easy installation.
- Insert the stick coils [B] so that the coil heads align with the lines [C] on the cylinder head cover.

CAUTION

Do not tap the coil head while installing the coil.



- After installation, be sure the stick coils are installed securely by pulling up them lightly.
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

Stick Coil Inspection

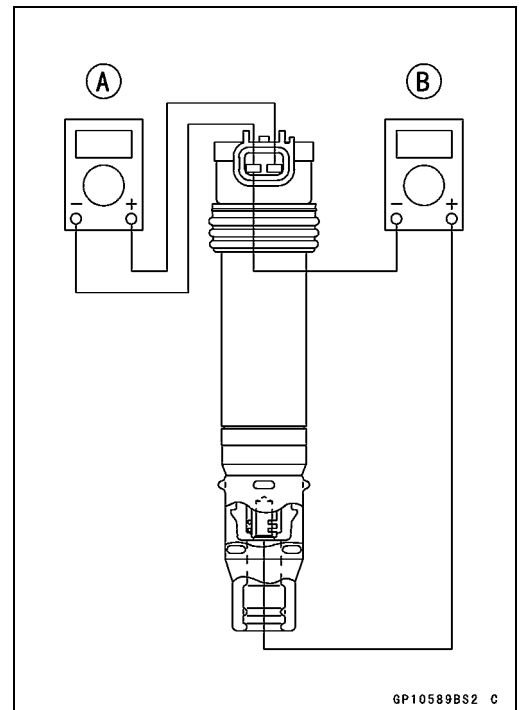
- Remove the stick coils (see Stick Coil Removal).
- Measure the primary winding resistance [A] as follows.
 - Connect the hand tester between the coil terminals.
 - Set the tester to the $\times 1 \Omega$ range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
 - Connect the tester between the plug terminal and (–) coil terminal.
 - Set the tester to the $\times 1 \text{ k}\Omega$ range and read the tester.

Stick Coil Winding Resistance

Primary Windings: 0.8 ~ 1.2 Ω

Secondary Windings: 5.0 ~ 6.8 $\text{k}\Omega$

- ★ If the tester does not read as specified, replace the coil.



16-36 ELECTRICAL SYSTEM

Ignition System

Stick Coil Primary Peak Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Remove the stick coils (see Stick Coil Removal).
- Do not remove the spark plugs.
- Measure the primary peak voltage as follows.
- Install the new spark plug [A] into each stick coil [B], and ground them onto the engine.
- Connect the peak voltage adapter [C] into the hand tester [D] which is set to the DC 250 V range.
- Connect the adapter to the lead wire-peak voltage adapter [E] which is connected between the stick coil connector and stick coil.

ECU [F]

Battery [G]

Special Tools - Hand Tester: 57001-1394

Peak Voltage Adapter: 57001-1415

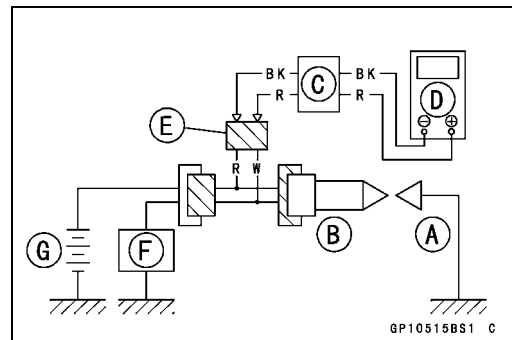
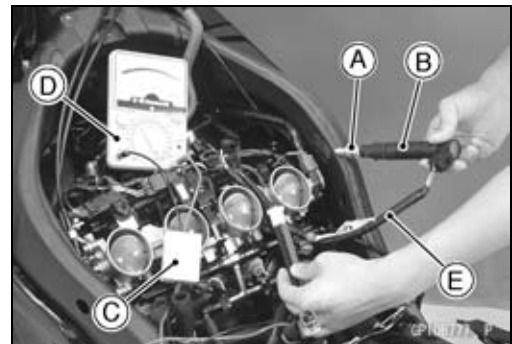
Type: KEK-54-9-B

Lead Wire-Peak Voltage Adapter: 57001-1449

Connections:

Adapter (R, +) → Lead Wire-Peak Voltage Adapter (W)

Adapter (BK, -) → Lead Wire-Peak Voltage Adapter (R)



⚠ WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one stick coil.

Stick Coil Primary Peak Voltage

Standard: 72 V or more

- Repeat the test for the other stick coils.
- ★ If the reading is less than the specified value, check the following.
 - Stick Coils (see Stick Coil Inspection)
 - Crankshaft Sensor (see Crankshaft Sensor Inspection)
 - ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)

Spark Plug Removal

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

Spark Plug Installation

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

Ignition System

Spark Plug Condition Inspection

- Remove the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).
- Visually inspect the spark plugs.
- ★ If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug.
- ★ If the spark plug is dirtied or the carbon is accumulated, replace the spark plug.
- Measure the gap [D] with a wire-type thickness gauge.
- ★ If the gap is incorrect, replace the spark plug.

Spark Plug Gap: 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)

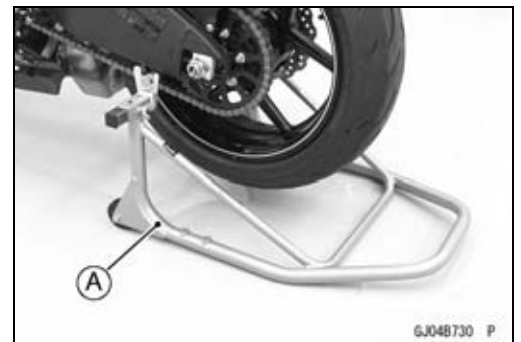
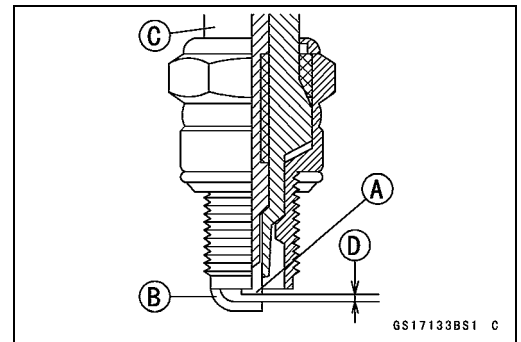
- Use the standard spark plug or its equivalent.

Standard Spark Plug

Type: **NGK CR9E**

Interlock Operation Inspection

- Raise the rear wheel off the ground with the stand [A].



1st Check

- Start the engine to the following conditions.

Condition:

Transmission Gear → 1st Position

Clutch Lever → Release

Sidestand → Down or Up

- Turn the ignition switch ON and push the starter button.
- Then the starter motor should not turn when the starter system circuit is normality.
- ★ If the engine is start, inspect the starter lockout switch, gear position switch and relay box.
- ★ If their parts are normality, replace the ECU.

2nd Check

- Start the engine to the following conditions.

Condition:

Transmission Gear → 1st Position

Clutch Lever → Pulled in

Sidestand → Up

- Turn the ignition switch ON and push the starter button.
- Then the starter motor should turn when the starter system circuit is normality.
- ★ If the starter motor is not turn, inspect the starter lockout switch, gear position switch, sidestand switch and relay box.
- ★ If their parts are normality, replace the ECU.

16-38 ELECTRICAL SYSTEM

Ignition System

3rd Check

- Inspect the engine for its secure stop after the following operations are completed.
- Run the engine to the following conditions.

Condition:

Transmission Gear → 1st Position

Clutch Lever → Release

Sidestand → Up

- Set the sidestand on the ground, then the engine will stop.
- ★ If whichever may not be stopped, inspect the gear position switch, starter lockout switch, sidestand switch and relay box.
- ★ If their parts are normality, replace the ECU.

IC Igniter Inspection

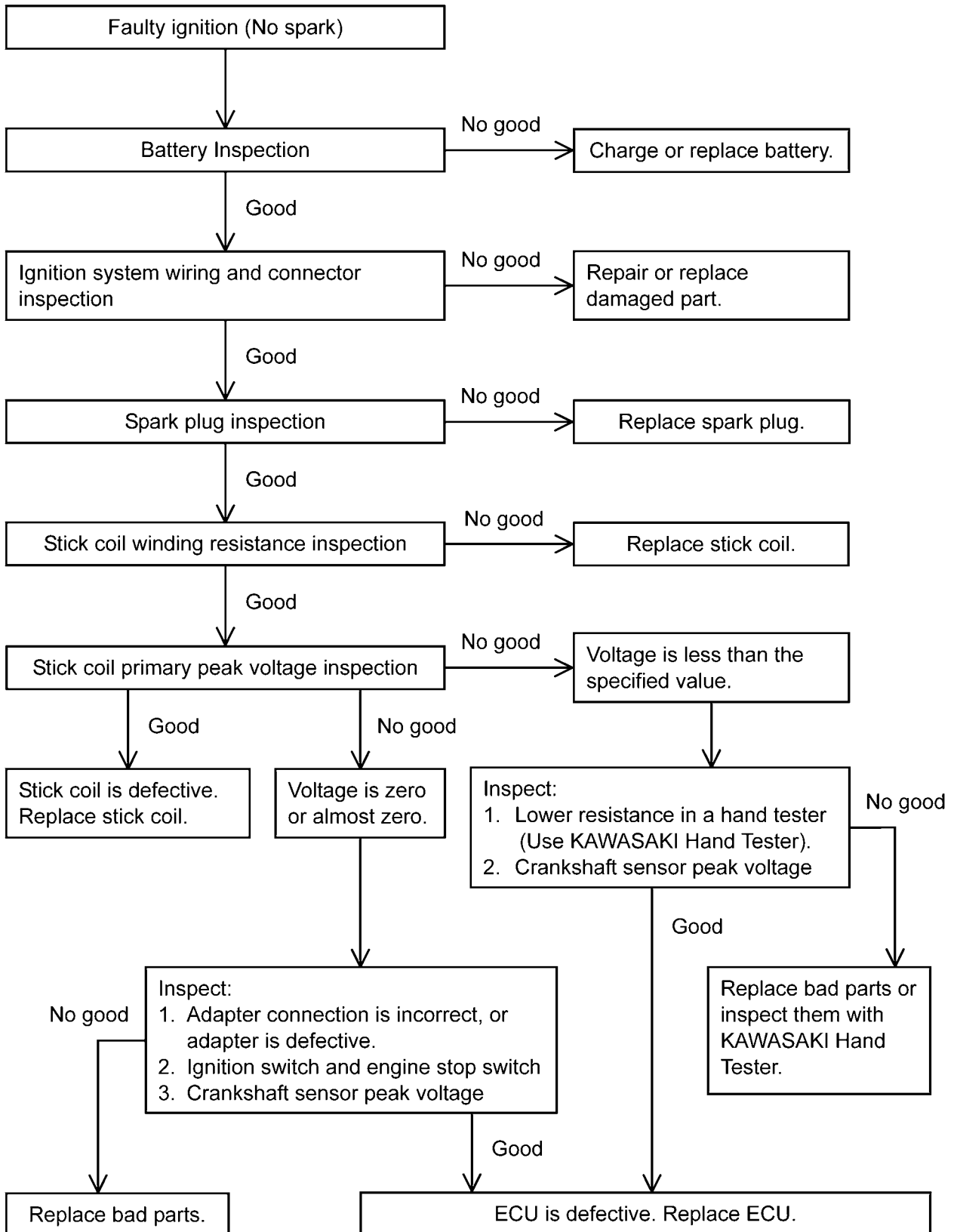
○ The IC igniter is built in the ECU [A].

- Refer to the following items.
 - Interlock Operation Inspection (see Interlock Operation Inspection)
 - Ignition System Troubleshooting (see Ignition System section)
 - ECU Power Supply Inspection (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)



Ignition System

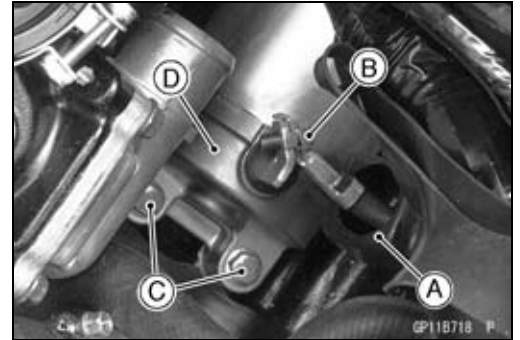
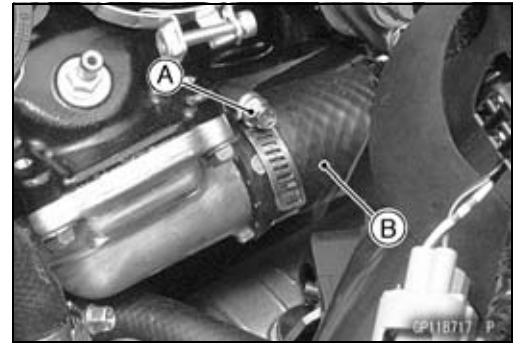
Ignition System Troubleshooting



Electric Starter System

Starter Motor Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
 - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
 - Starter Clutch Cover (see Starter Idle Gear Removal in the Crankshaft/Transmission chapter)
 - Clamp Screw [A] (Loosen)
 - Water Hose [B]
- Slide out the rubber cap [A].
- Remove the starter motor cable terminal bolt [B].
- Remove the starter motor mounting bolts [C].
- Take out the starter motor [D] from the right side of the motorcycle.

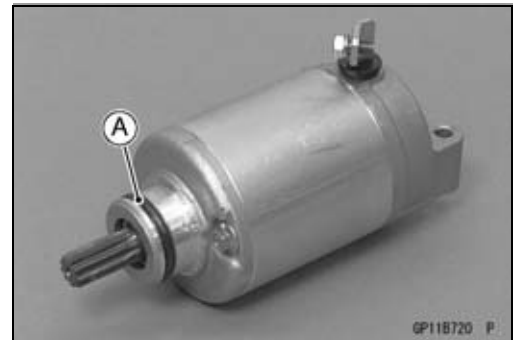
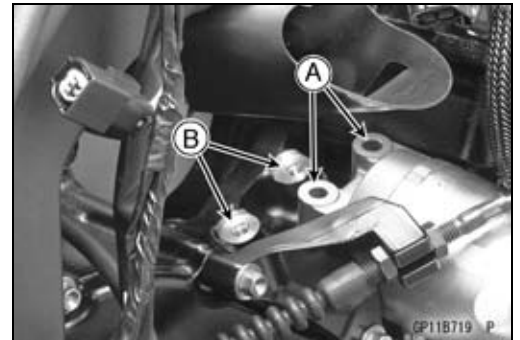


Starter Motor Installation

CAUTION

Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

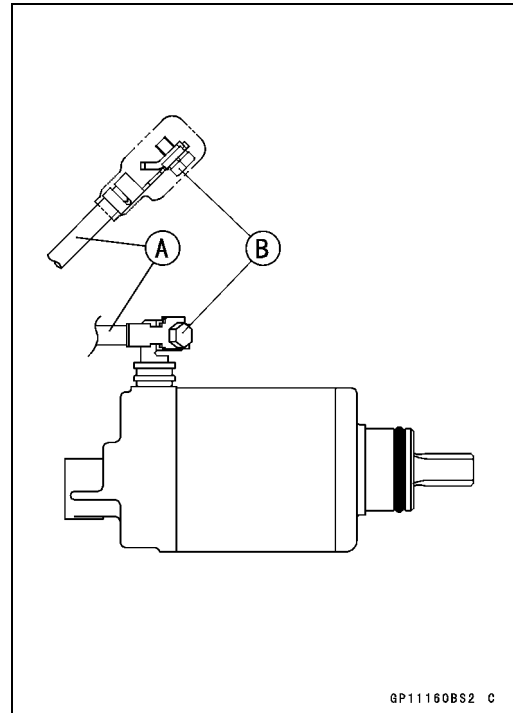
- Clean the starter motor legs [A] and crankcase [B] where the starter motor is ground.
- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Tighten the starter motor mounting bolts temporarily.
- Install the starter clutch cover (see Starter Idle Gear Installation in the Crankshaft/Transmission chapter).
- Tighten:
 - Torque - Starter Motor Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



16-42 ELECTRICAL SYSTEM

Electric Starter System

- Install the starter motor cable [A] as shown in the figure.
- Tighten:
 Torque - Starter Motor Cable Terminal Bolt [B]: 2.9 N·m
 (0.30 kgf·m, 26 in·lb)
- Slide back the rubber cap to the original position.

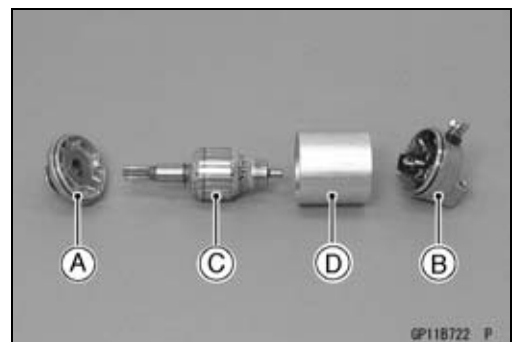


Starter Motor Disassembly

- Take off the starter motor through bolts [A].

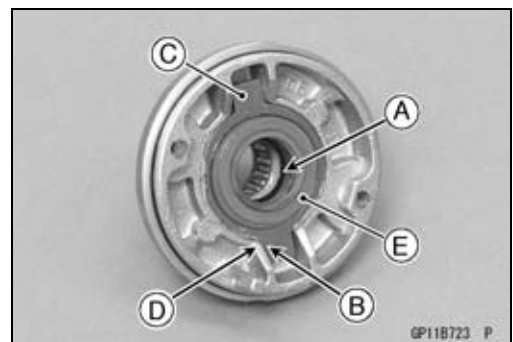


- Remove:
 Left-hand End Cover [A]
 Right-hand End Cover [B]
 Armature [C]
 Yoke [D]



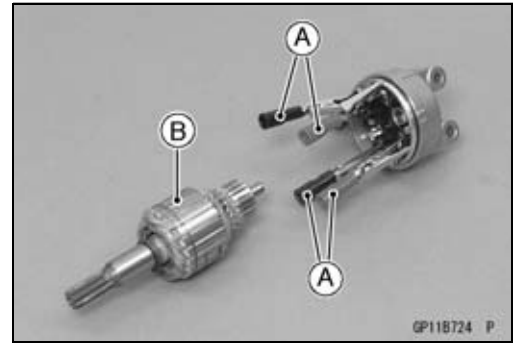
Starter Motor Assembly

- Apply a thin coat of grease to the oil seal [A].
- Fit the groove [B] of the toothed washer [C] on the projection [D] left-hand end cover.
- Install the washer [E].

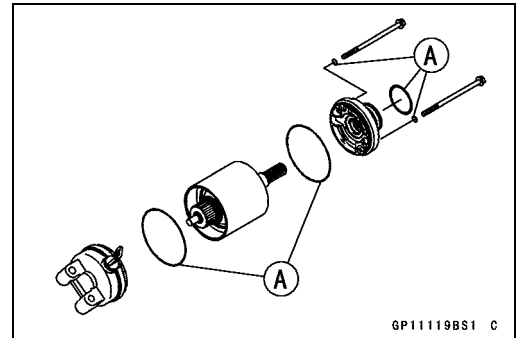


Electric Starter System

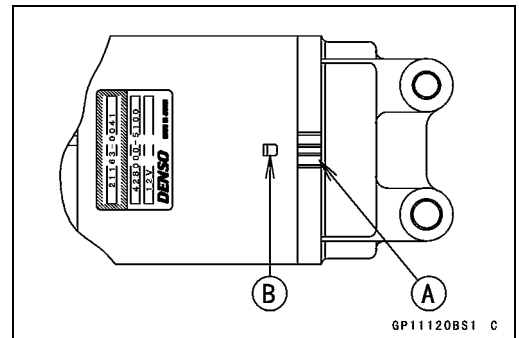
- Press the springs holding the brush leads with suitable clips [A] as shown in the figure.
- Put the armature [B] among the brushes.



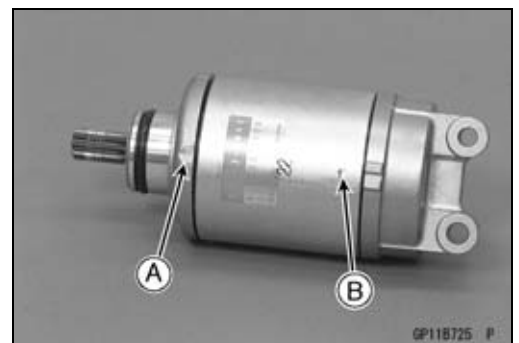
- Install the new O-rings [A] as shown in the figure.



- Align the groove [A] in the right-hand end cover and the hollow mark [B] on the yoke.



- Align the hollow mark [A] on the left-hand end cover and the hollow mark [B] on the yoke.



Brush Inspection

- Measure the length [A] of each brush.
- ★ If any is worn down to the service limit, replace the brush holder assembly.

Starter Motor Brush Length

Standard: 7 mm (0.28 in.)

Service Limit: 3.5 mm (0.14 in.)

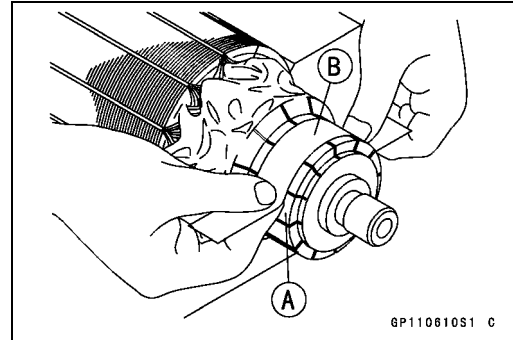


16-44 ELECTRICAL SYSTEM

Electric Starter System

Commutator Cleaning and Inspection

- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.

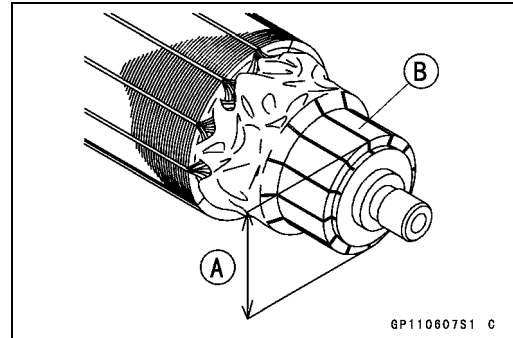


- Measure the diameter [A] of the commutator [B].
- ★ If the commutator diameter is less than the service limit, replace the starter motor with a new one .

Commutator Diameter

Standard: 24 mm (0.94 in.)

Service Limit: 23 mm (0.91 in.)

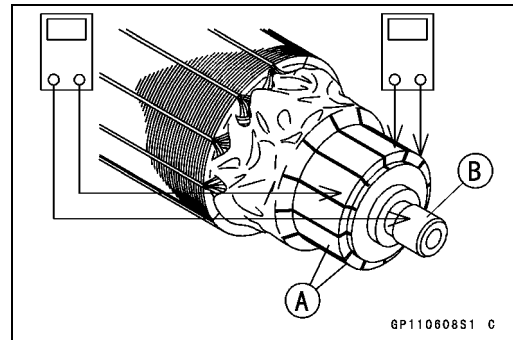


Armature Inspection

- Using the $\times 1 \Omega$ hand tester range, measure the resistance between any two commutator segments [A].

Special Tool - Hand Tester: 57001-1394

- ★ If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.
- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].
- ★ If there is any reading at all, the armature has a short and the starter motor must be replaced.



NOTE

○ Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.

Brush Lead Inspection

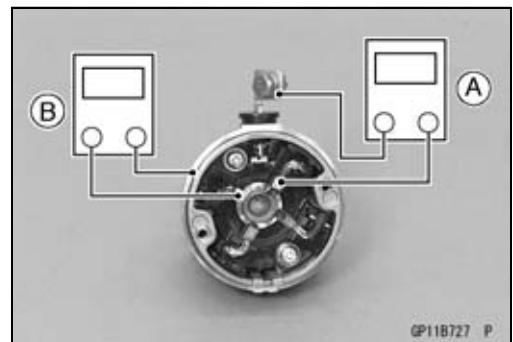
- Using the $\times 1 \Omega$ hand tester range, measure the resistance as shown in the figure.

Terminal Bolt and Positive Brush [A]

Right-hand End Cover and Negative Brush [B]

Special Tool - Hand Tester: 57001-1394

- ★ If there is not close to zero ohms, the brush lead has an open. Replace the right-hand end cover assembly.



Electric Starter System

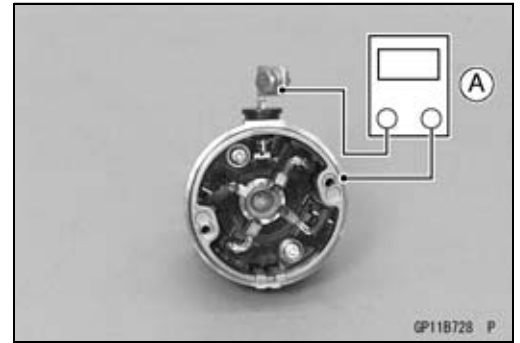
Right-hand End Cover Assembly Inspection

- Using the highest hand tester range, measure the resistance as shown in the figure.

Terminal and Right-hand End Cover [A]

Special Tool - Hand Tester: 57001-1394

- ★ If there is any reading, the right-hand end cover assembly have a short. Replace the right-hand end cover assembly.

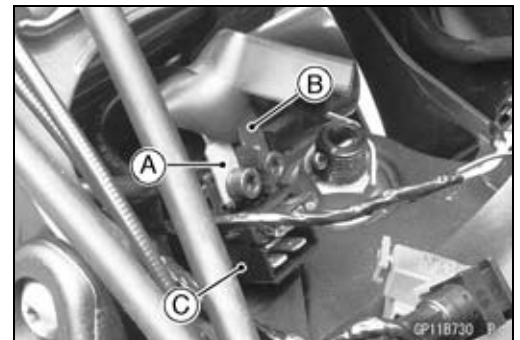


Starter Relay Inspection

- Remove the battery negative (-) cable from the battery negative (-) terminal (see Battery Removal).
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the connector [A].



- Remove the starter motor cable [A] and battery positive (+) cable [B].
- Pull out the starter relay [C] from the rear fender.



- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown in the figure.

Special Tool - Hand Tester: 57001-1394

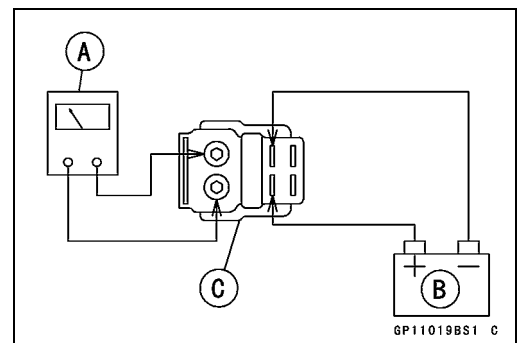
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

Tester Range: × 1 Ω range

Criteria: When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω



Lighting System

This motorcycle adopt the daylight system and have a headlight relay in the relay box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

Headlight Beam Horizontal Adjustment

- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Beam Vertical Adjustment

- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Bulb Replacement

- Disconnect the headlight connector [A].



- Turn the headlight bulb [A] counterclockwise and pull out the bulb from the headlight.

CAUTION

When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.



NOTE

○ Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.

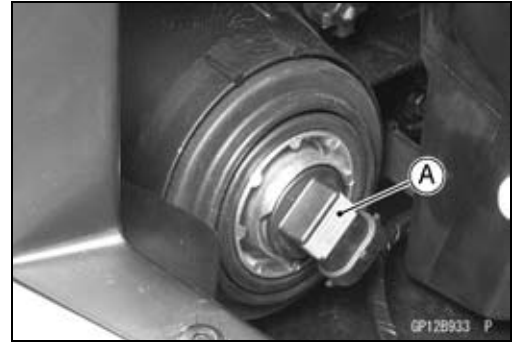
- Replace the headlight bulb.
- Fit the projections [A] of the bulb in the hollows [B] of the headlight.



16-48 ELECTRICAL SYSTEM

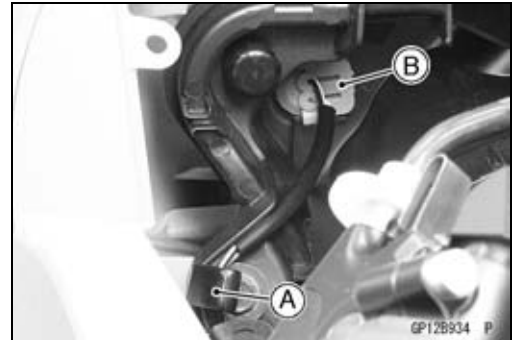
Lighting System

- Turn the headlight bulb [A] clockwise.
- Connect the headlight connector.
- After installation, adjust the headlight aim (see Headlight Aiming Inspection in the Periodic Maintenance chapter).
- Other Bulb: Repeat the above steps.



City Light Bulb Replacement

- Remove the upper inner fairings (see Upper Inner Fairing Removal in the Frame chapter).
- Open the clamp [A].
- Pull out the socket [B] together with the bulb.

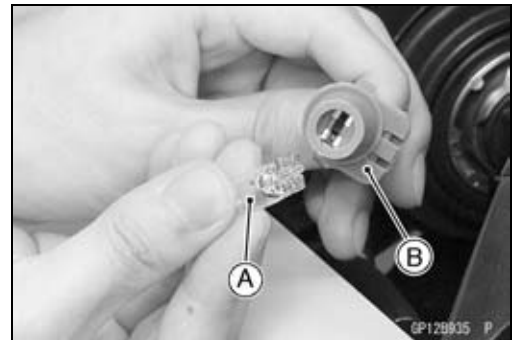


- Pull the bulb [A] out of the socket [B].

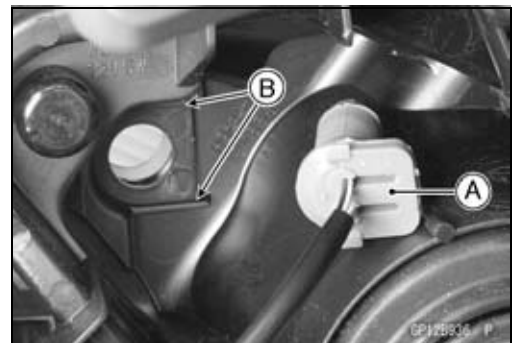
CAUTION

Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.

- Replace the bulb with a new one.

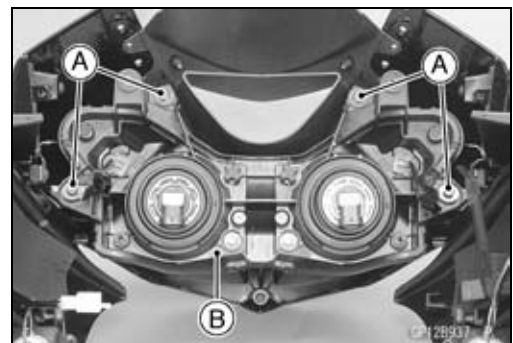


- Insert the socket [A] to the headlight.
- Fit the socket into the grooves [B] of the headlight.
- Other Bulb: Repeat the above steps.



Headlight Removal/Installation

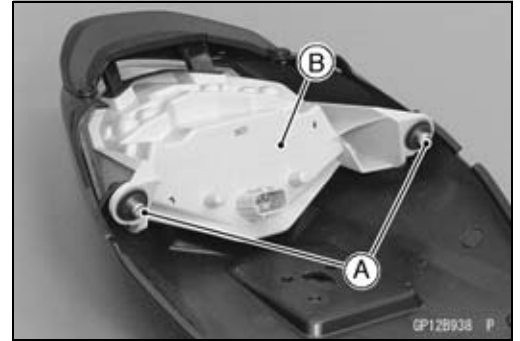
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Bolts [A] and Clamps
 - Headlight [B]
- Installation is the reverse of removal.



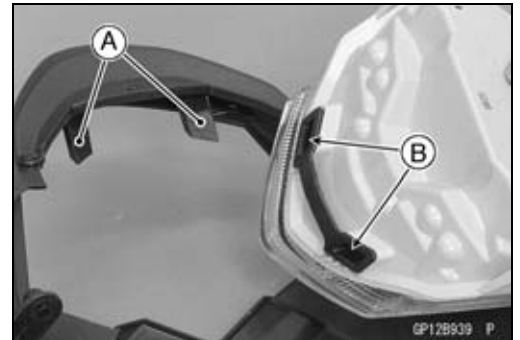
Lighting System

Tail/Brake Light (LED) Removal/Installation

- Remove:
 - Rear Seat Cover (see Seat Cover Removal in the Frame chapter)
 - Bolts [A]
 - Tail/Brake Light (LED) [B]

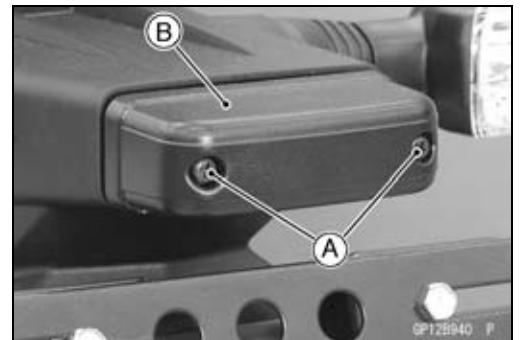


- Installation is the reverse of removal, note the following.
 - Fit the projections [A] of the rear seat cover into the slots [B] of the tail/brake light (LED).



License Plate Light Bulb Replacement

- Remove:
 - Screws [A]
 - License Plate Light Cover [B]

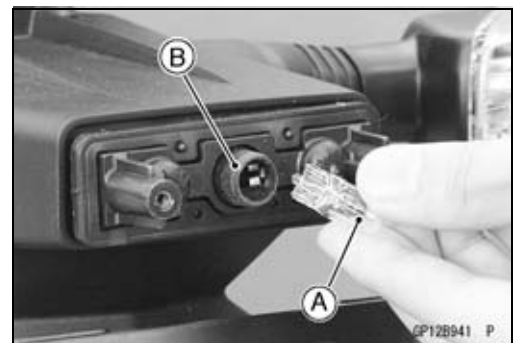


- Pull the bulb [A] out of the socket [B].

CAUTION

Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.

- Replace the bulb with a new one.
- Tighten:
 - Torque - License Plate Light Cover Screws: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)

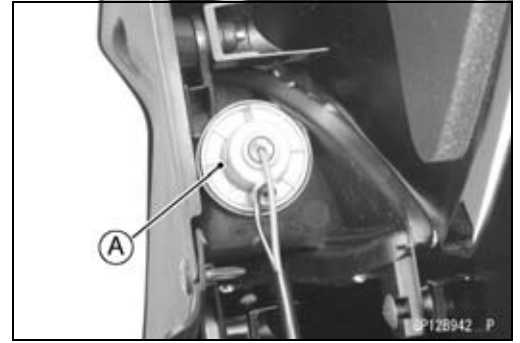


Lighting System

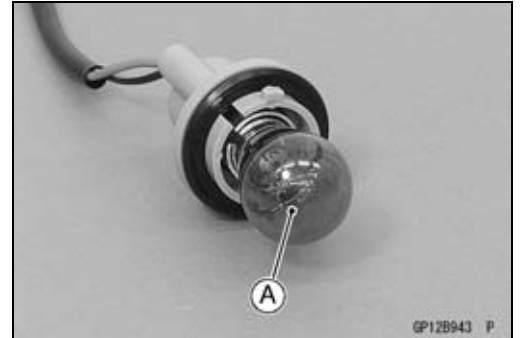
Turn Signal Light Bulb Replacement

Front Turn Signal Light

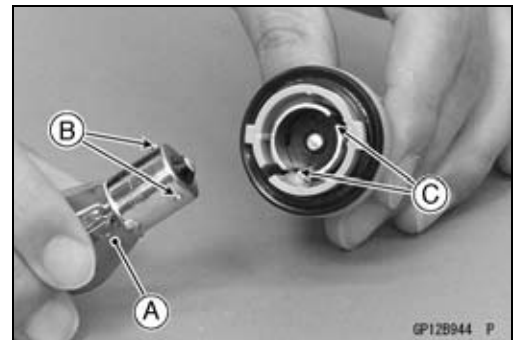
- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Turn the socket [A] counterclockwise and pull out the socket together with the bulb.



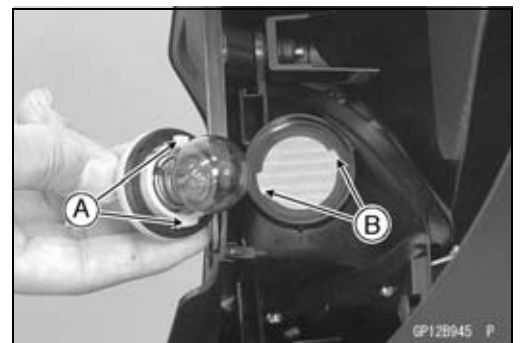
- Push and turn the front turn signal light bulb [A] counterclockwise and remove it.
- Replace the bulb with a new one.



- Insert the new bulb [A] by aligning its left and right pins [B] with the left and right grooves [C] in the socket, and turn the bulb clockwise.
- Turn the bulb about 15°.

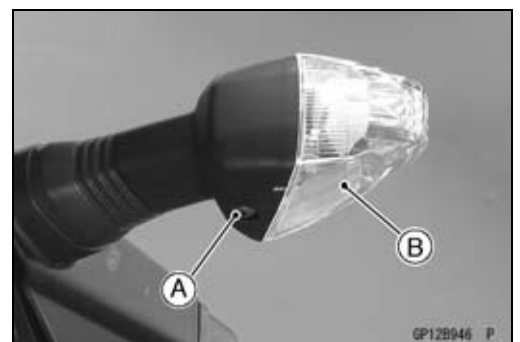


- Fit the projections [A] of the socket into the grooves [B] of the turn signal light.
- Turn the front turn signal light bulb clockwise.
- Other Bulb: Repeat the above steps.



Rear Turn Signal Light

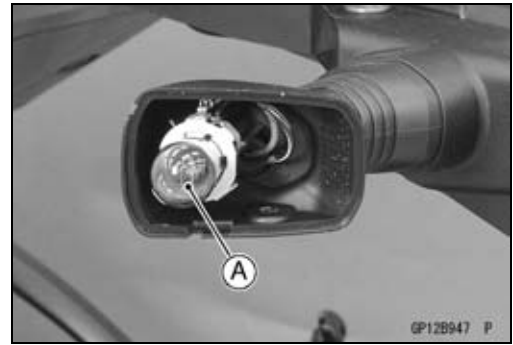
- Remove:
 - Screw [A]
 - Rear Turn Signal Light Lens [B]



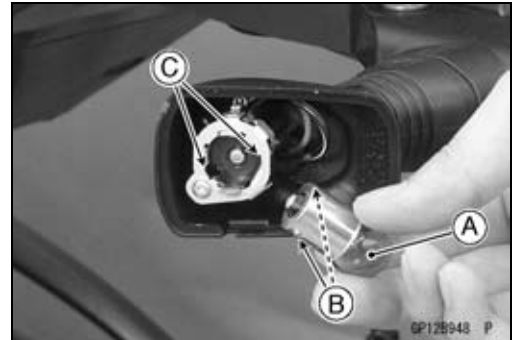
16-52 ELECTRICAL SYSTEM

Lighting System

- Push and turn the rear turn signal light bulb [A] counter-clockwise and remove it.



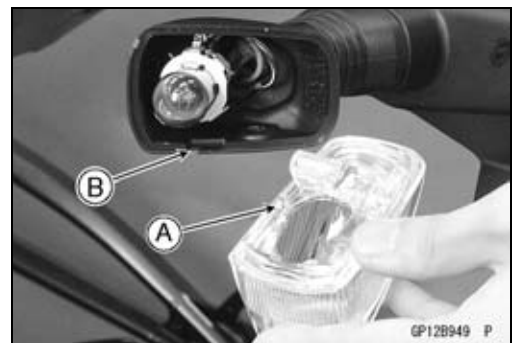
- Insert the new bulb [A] by aligning its left and right pins [B] with the left and right grooves [C] in the socket, and turn the bulb clockwise.
- Turn the bulb about 15°.



- Fit the projection [A] of the lens into the groove [B] of the turn signal light.
- Tighten:

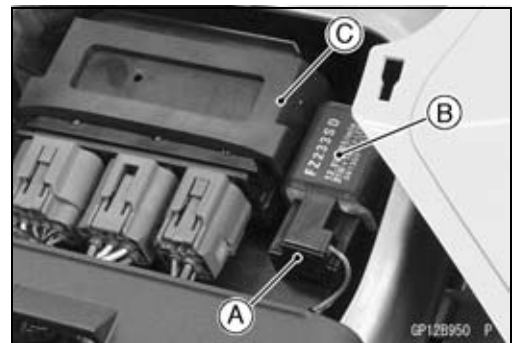
Torque - Rear Turn Signal Light Lens Screws: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)

- Other Bulb: Repeat the above steps.



Turn Signal Relay Inspection

- Remove the front seat cover (see Seat Cover Removal in the Frame chapter).
- Disconnect the connector [A].
- Pull out the turn signal relay [B] backward, and remove it from the rubber protector [C].

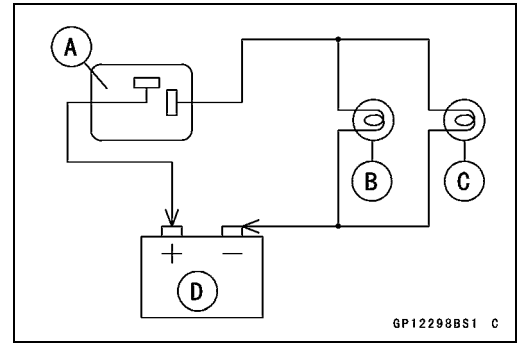


Lighting System

- Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights flash for one minute.

- Turn Signal Relay [A]
- Turn Signal Light 21 W [B]
- Turn Signal Light 10 W [C]
- 12 V Battery [D]

★ If the lights do not flash as specified, replace the turn signal relay.



Testing Turn Signal Relay

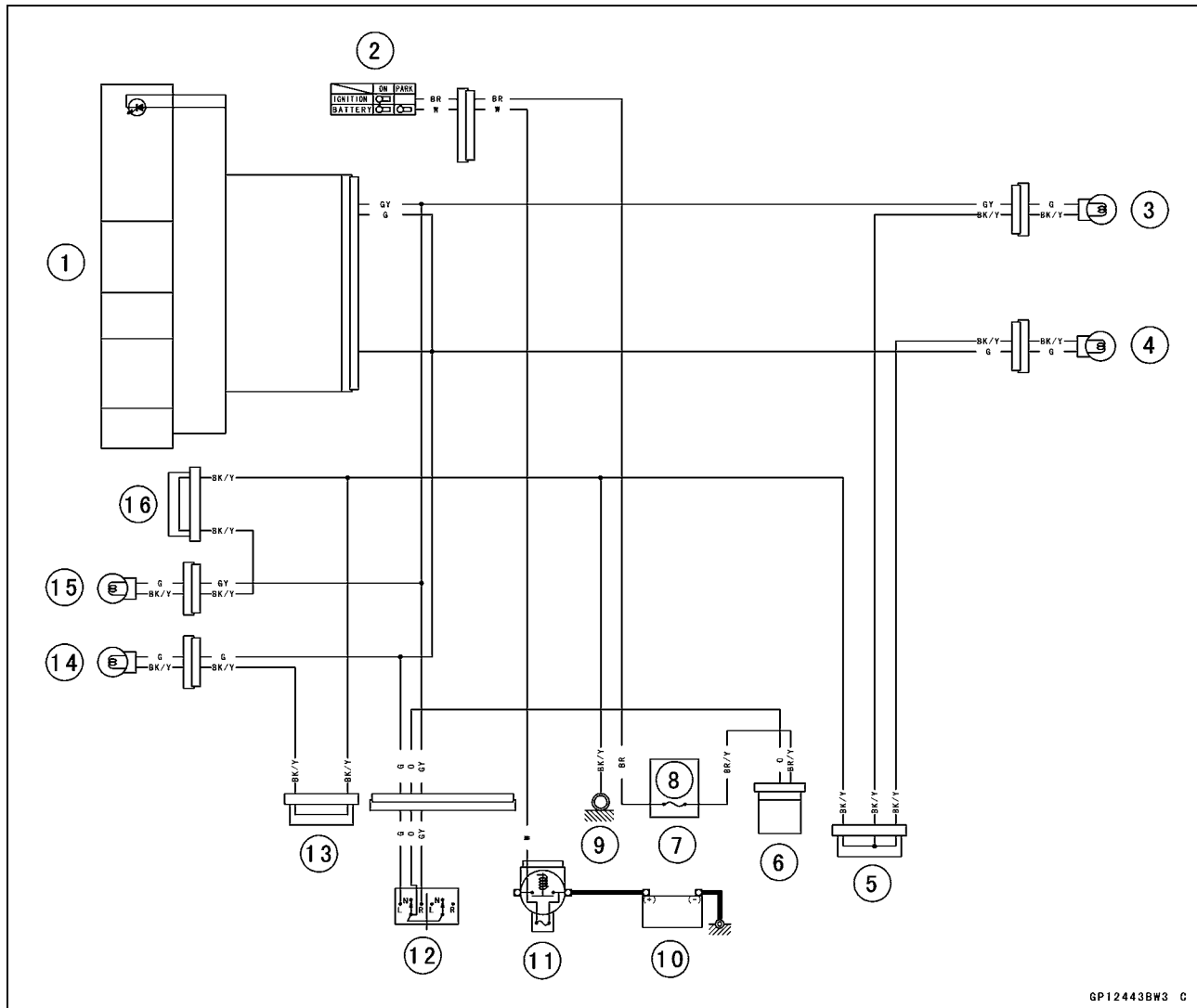
Connections of Turn Signal Lights	Flashing Times (c/m)*
[B] (21 W) and [C] (10 W)	75 ~ 95
[B] (21 W)	[B] (21 W) Light Stays on or flashing times decrease more than 15.
[C] (10 W)	[C] (10 W) Light Stays on.

*: Cycle(s) per minute

16-54 ELECTRICAL SYSTEM

Lighting System

Turn Signal Light Circuit



GP12443BW3 G

1. Turn Signal Indicator Light (LED)
2. Ignition Switch
3. Rear Right Turn Signal Light 12 V 10 W
4. Rear Left Turn Signal Light 12 V 10 W
5. Joint Connector C
6. Turn Signal Relay
7. Fuse Box
8. Turn Signal Relay Fuse 10 A
9. Frame Ground
10. Battery 12 V 8 Ah
11. Main Fuse 30 A
12. Turn Signal Switch
13. Joint Connector A
14. Front Left Turn Signal Light 12 V 21 W
15. Front Right Turn Signal Light 12 V 21 W
16. Joint Connector B

Air Switching Valve

Air Switching Valve Operation Test

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Air Switching Valve Unit Test

- Remove the air switching valve (see Air Switching Valve Removal in the Engine Top End chapter).
- Set the hand tester [A] to the $\times 1 \Omega$ range and connect it to the air switching valve terminals as shown in the figure.

Special Tool - Hand Tester: 57001-1394

Air Switching Valve Resistance

Standard: 20 ~ 24 Ω at 20°C (68°F)

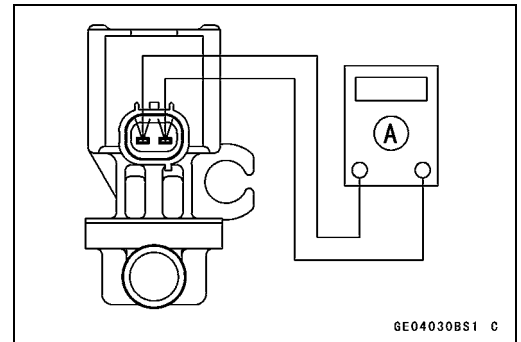
- ★ If the resistance reading is out of the specified value, replace it with a new one.
- Connect the 12 V battery [A] to the air switching valve terminals as shown in the figure.

- Blow the air to the inlet air duct [A], and make sure does not flow the blown air from the outlet air ducts [B].

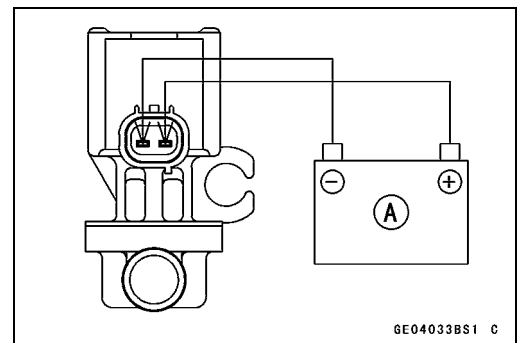
- Disconnect the 12 V battery.
- Blow the air to the inlet air duct [A] again, and make sure flow the blown air from the outlet air ducts [B].
- ★ If the air switching valve does not operate as described, replace it with a new one.

NOTE

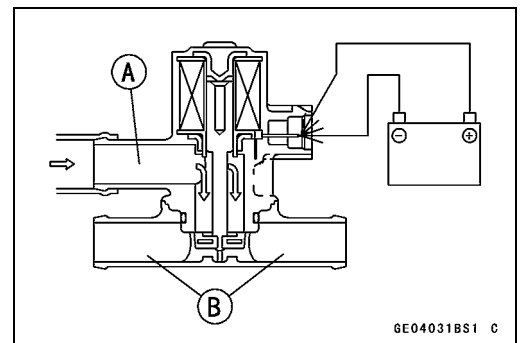
- To check air flow through the air switching valve, just blow through the air switching valve hose (inlet side) [C].



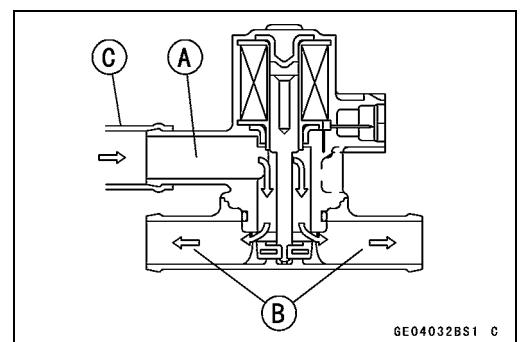
GE04030BS1 C



GE04033BS1 C



GE04031BS1 C

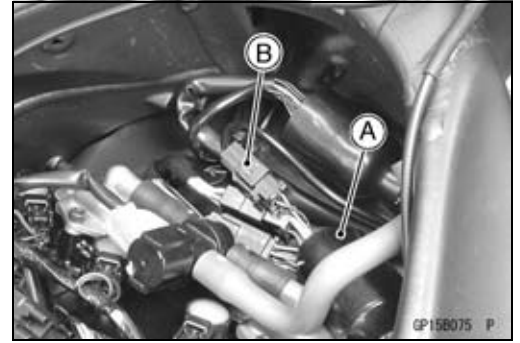


GE04032BS1 C

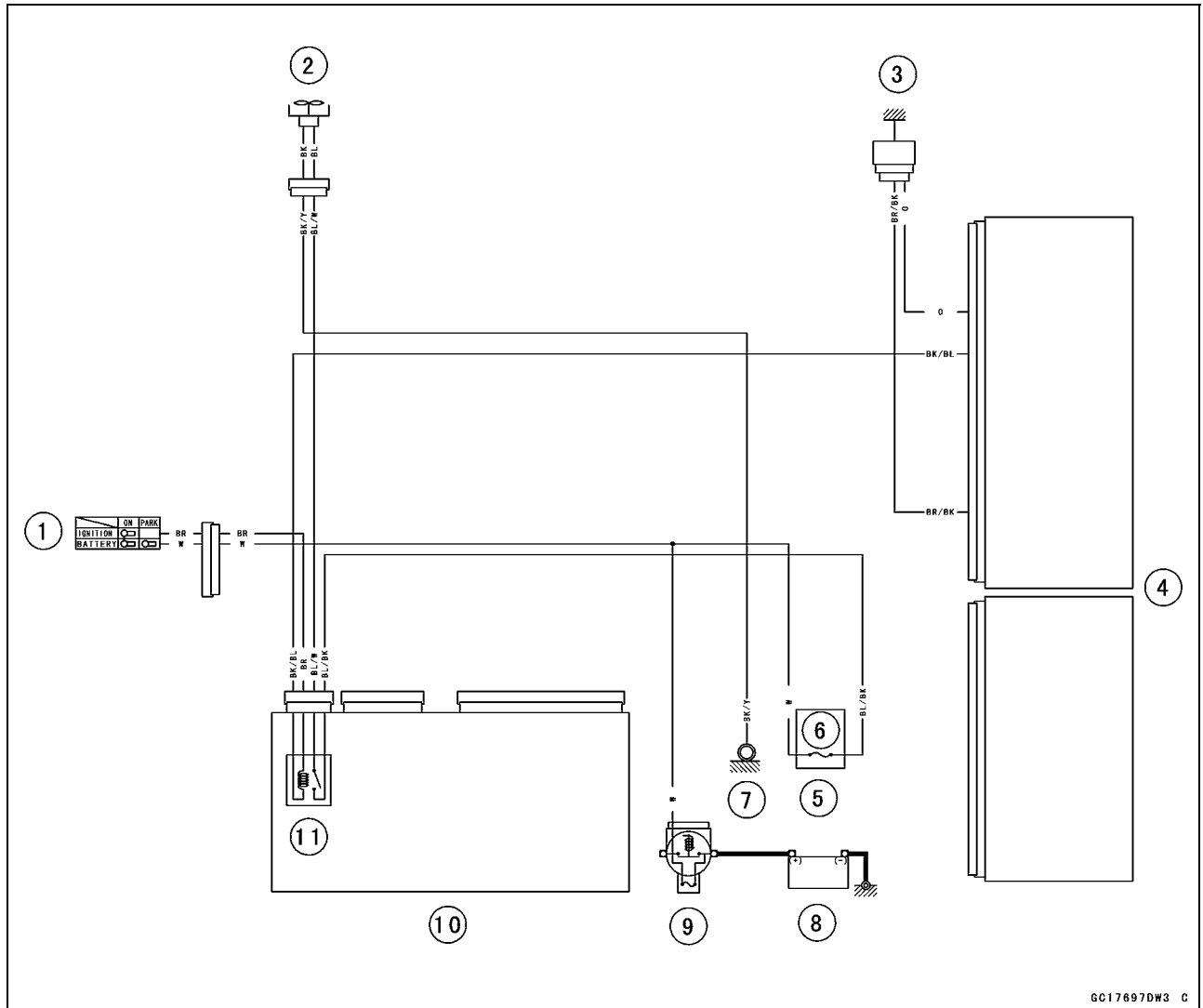
Radiator Fan System

Fan Motor Inspection

- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Slide the dust cover [A].
- Disconnect the connector [B].
- Using an auxiliary leads, supply battery power to the fan motor.
- ★ If the fan does not rotate, the fan motor is defective and must be replaced.



Radiator Fan Circuit



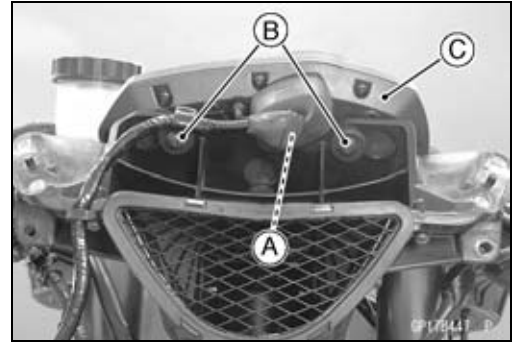
1. Ignition Switch
2. Fan Motor
3. Water Temperature Sensor
4. ECU
5. Fuse Box
6. Fan Fuse 15 A
7. Frame Ground
8. Battery 12 V 8 Ah
9. Main Fuse 30 A
10. Relay Box
11. Fan Relay

16-58 ELECTRICAL SYSTEM

Meter, Gauge, Indicator Unit

Meter Unit Removal/Installation

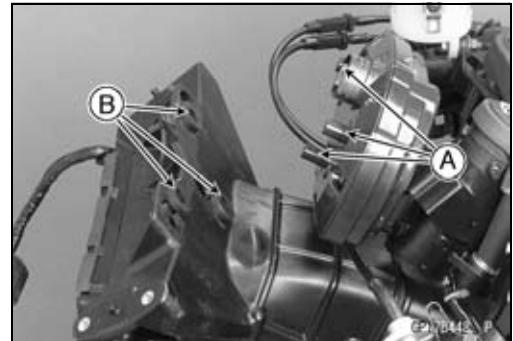
- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Slide back the dust cover and disconnect the meter unit connector [A].
- Remove:
 - Screws [B]
 - Meter Unit [C]



CAUTION

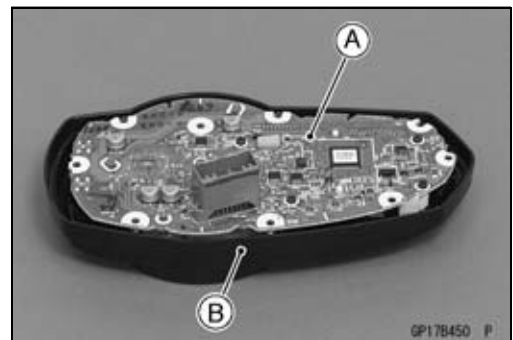
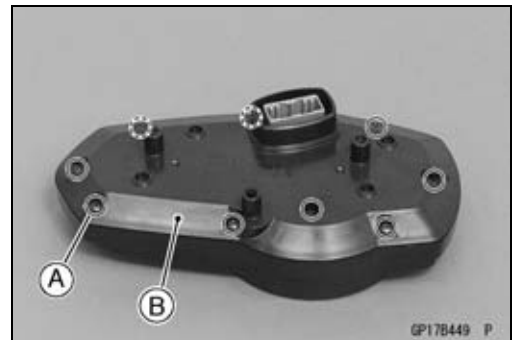
Place the meter unit so that the face is up. If a meter unit is left upside down or sideways for any length of time, it will malfunction.

- Fit the projections [A] into the grommets [B].
- Tighten:
 - Torque - Meter Unit Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



Meter Unit Disassembly

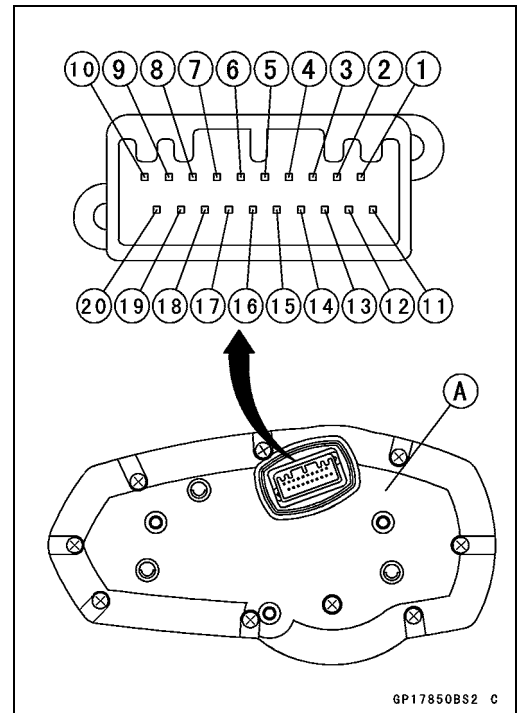
- Remove:
 - Meter Unit (see Meter Unit Removal/Installation)
 - Screws [A]
 - Lower Meter Cover [B]
- Separate the meter assembly [A] and upper meter cover [B].



Meter, Gauge, Indicator Unit

Electronic Unit (Combination Meter) Inspection

- Remove the meter unit [A] (see Meter Unit Removal/Installation).
- [1] Left Turn Signal Indicator Light (LED) (+)
- [2] Unused
- [3] Unused
- [4] Unused
- [5] Stop Watch (+)
- [6] Lap Time (+)
- [7] Water Temperature Sensor
- [8] High Beam Indicator Light (LED) (+)
- [9] Right Turn Signal Indicator Light (LED) (+)
- [10] Neutral Indicator Light (LED) Ground (-)
- [11] Unused
- [12] Ground (-)
- [13] Speed Sensor Supply Voltage
- [14] Battery (+)
- [15] Ignition
- [16] Fuel Reserve Switch
- [17] ECU Communication Pulse
- [18] Speed Sensor Pulse
- [19] Tachometer Pulse
- [20] Warning Indicator Light (LED) Ground (-)



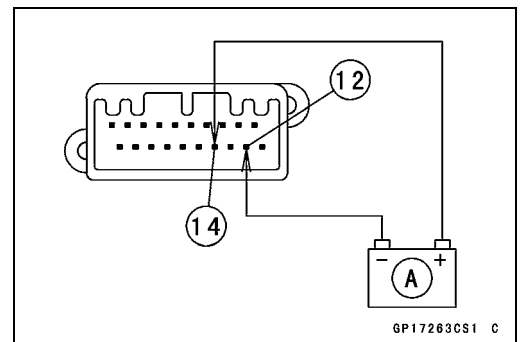
CAUTION

Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter unit is left upside down or sideways for a long time or dropped, it will malfunction.

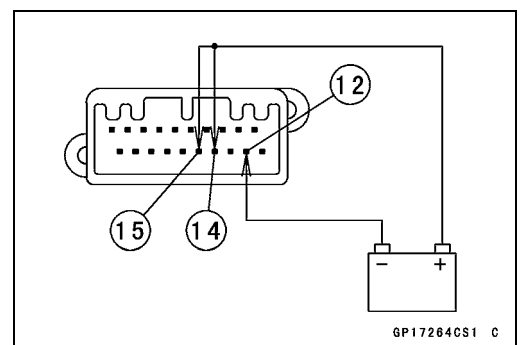
Do not short each terminals.

Liquid Crystal Display (LCD) Segments Check

- Using the insulated auxiliary leads, connect the 12 V battery [A] to the meter unit connector as follows.
- Connect the battery positive terminal to the terminal [14].
- Connect the battery negative terminal to the terminal [12].



- Connect the terminal [15] to the terminal [14].



16-60 ELECTRICAL SYSTEM

Meter, Gauge, Indicator Unit

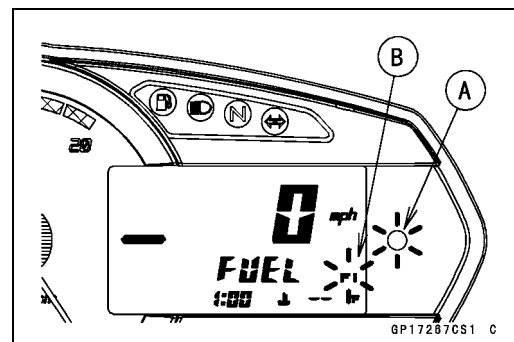
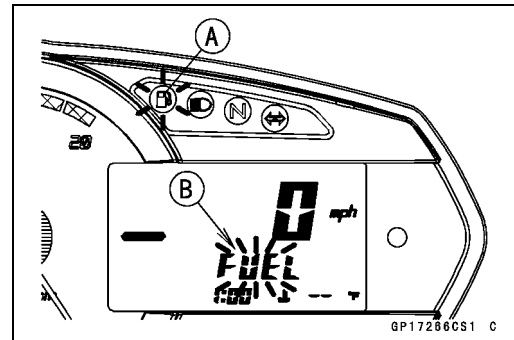
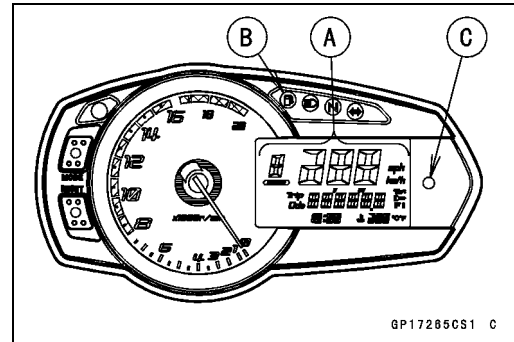
- When the terminals are connected, all the LCD segments [A] blinks 2 times, then appear for 1 seconds.
- The fuel level warning indicator light (LED) [B] goes on for 3 seconds.
- ★If the LCD segments do not appear, replace the meter unit.
- Disconnect the terminal [15].
- All the LCD segments disappear.
- For models equipped with an immobilizer system, the warning indicator light (LED) [C] starts flashing (see Abstract in the Immobilizer System (Equipped Models) section).
- ★If the segments do not disappear, replace the meter unit.
- Connect the terminal [15] to the terminal [14] again.
- About 5 seconds after, the fuel level warning indicator light (LED) blinks [A] and the FUEL segments [B] appears in the display.
- The FUEL segments is flashing.
- ★If the fuel level warning indicator light (LED) does not blink and/or the FUEL segments does not appear, replace the meter unit.

NOTE

- This meter unit has a failure detection function (for open or short) of the fuel reserve switch. When the fuel reserve switch is open or short, the meter unit alerts the rider by the fuel level warning indicator light (LED) blinks and the FUEL segments appears in the display.
- If the failure detection function operates with the meter unit installed on the motorcycle, inspect the fuel reserve switch (see Fuel Reserve Switch Inspection in the Electrical System chapter) and wiring.
- About 10 seconds after, the warning indicator light (LED) [A] blinks and the FI warning symbol [B] appears in the display.
- The FI warning symbol is blinking.
- ★If the warning indicator light (LED) does not blink and/or the FI warning symbol does not appear, replace the meter unit.

NOTE

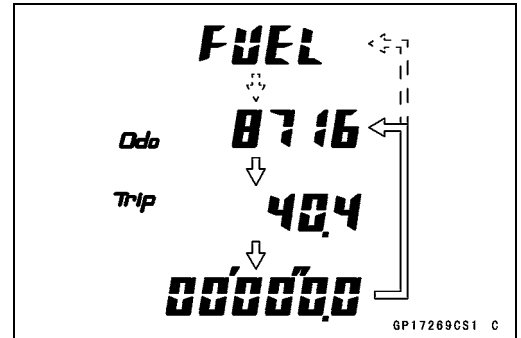
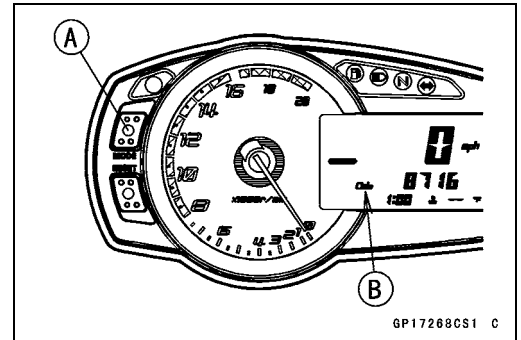
- This meter unit has a failure detection function of the ECU communication. When the ECU communication error was detected, the meter unit alerts the rider by the warning indicator light (LED) blinks and the FI warning symbol appears in the display (see ECU Communication Line Inspection in the Fuel System (DFI) chapter).



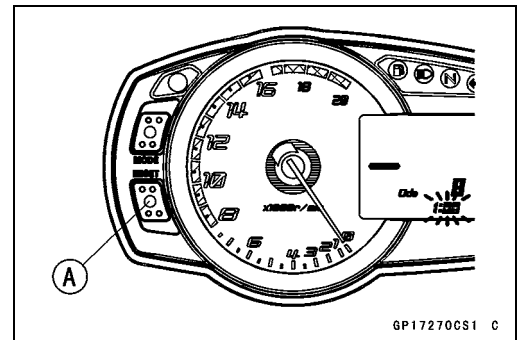
Meter, Gauge, Indicator Unit

MODE and RESET BUTTON Operation Check

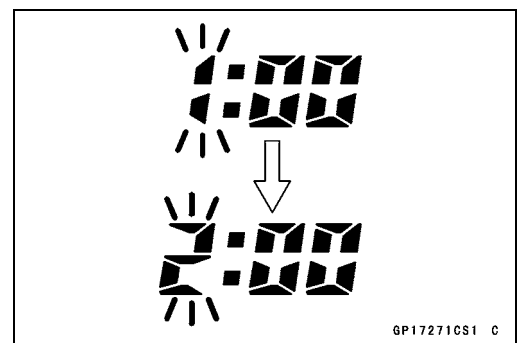
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Check that the display [B] change to the ODO, TRIP, and STOP WATCH displays each time the MODE button [A] is pressed.
- When the fuel level warning indicator light (LED) blinked, display change to FUEL, ODO, TRIP, STOP WATCH and FUEL.
- ★ If the display function does not work, replace the meter unit.



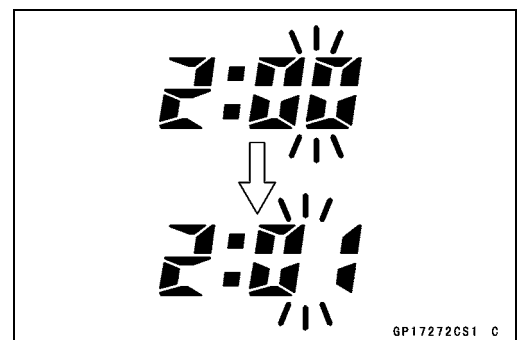
- Indicate the ODO mode.
- Check that when the RESET button [A] in ODO mode is pushed for more than two seconds, the meter display turns to the clock set mode.
- Both the hour and minute display start flashing.



- In the HOUR/MINUTE setting mode, press the reset button again to effect the HOUR setting mode.
- The hour display flashes on the display.
- Press the MODE button to set the hour.



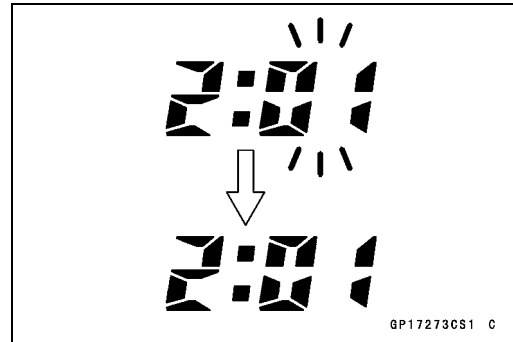
- In the HOUR setting mode, press the RESET button to effect the MINUTE setting mode.
- The minute display flashes on the display.
- Press the MODE button to set the minute.



16-62 ELECTRICAL SYSTEM

Meter, Gauge, Indicator Unit

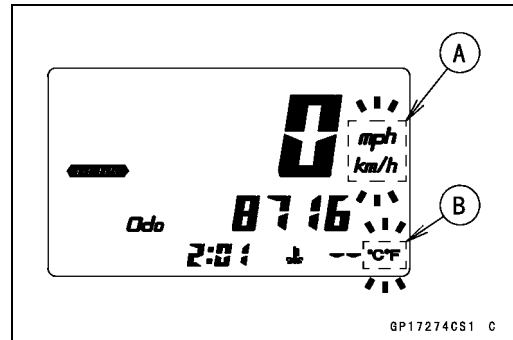
- In the MINUTE setting mode, press the RESET button to return to the HOUR/MINUTE setting mode.
- Press the MODE button to complete the time setting process.



- Indicate the ODO mode.
- Check that the display [A] [B] change to the mile and °F, Mile and °C, km and °F, km and °C display each time by pushing the RESET button while MODE button pushed in.

NOTE

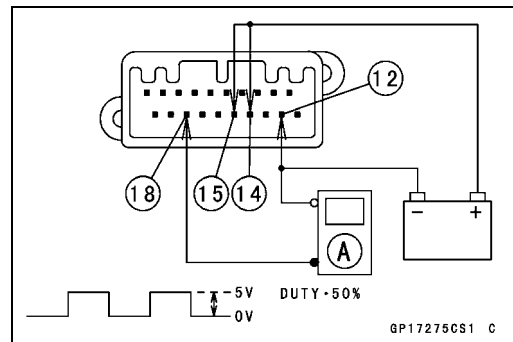
○Mile/Km Display can alternate between English and metric modes (mile and km) in the digital meter. Make sure that km or mile according to local regulations is correctly displayed before riding.



- ★If the display function does not work and adjust, replace the meter unit.

Speedometer Check

- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave (illustrated as shown in the figure) would be input into the terminal [18].
- Indicates approximately 60 km/h in case the input frequency would be approximately 184 Hz.
- Indicates approximately 60 mph in case the input frequency would be approximately 294 Hz.
- ★If the speedometer does not work, replace the meter unit.



- ★If the oscillator is not available, the speedometer can be checked as follows.
- Connect the meter unit connector temporarily.
- Raise the rear wheel off the ground with the stand.
- Turn the ignition switch ON.
- Rotate the rear wheel by hand.
- Check that the speedometer shows the speed.
- ★If the speedometer does not work, inspect the speed sensor and wiring (see Speed Sensor Output Voltage Inspection in the Fuel System (DFI) chapter).
- ★If the speed sensor and wiring are normal, replace the meter unit.

Meter, Gauge, Indicator Unit

Odometer Check

- Check the odometer with the speedometer check in the same way.
- ★ If value indicated in the odometer is not added, replace the meter unit.

NOTE

- The data is maintained even if the battery is disconnected.
- When the figures come to 999999, they are stopped and locked.

Trip Meter Check

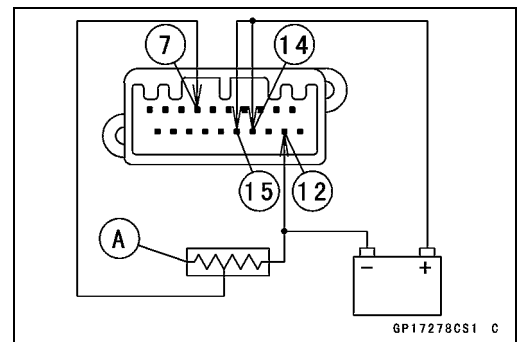
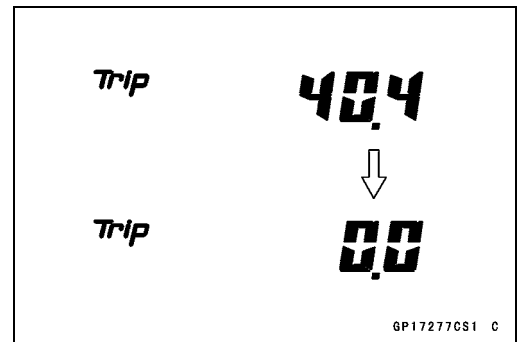
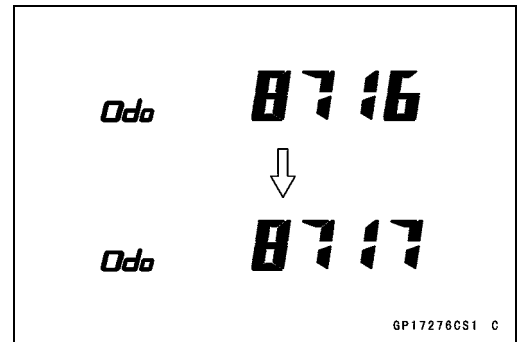
- Check the trip meter with the speedometer in the same way.
- ★ If value indicated in the trip meter is not added, replace the meter unit.
- Check that when the RESET button is pushed for more than two seconds, the figure display turns to 0.0.
- ★ If the figure display does not indicate 0.0, replace the meter unit.

Water Temperature Meter Check

- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Connect the variable rheostat [A] to the terminal [7] as shown in the figure.
- Check that the number of segments matches the resistance value of the variable rheostat.

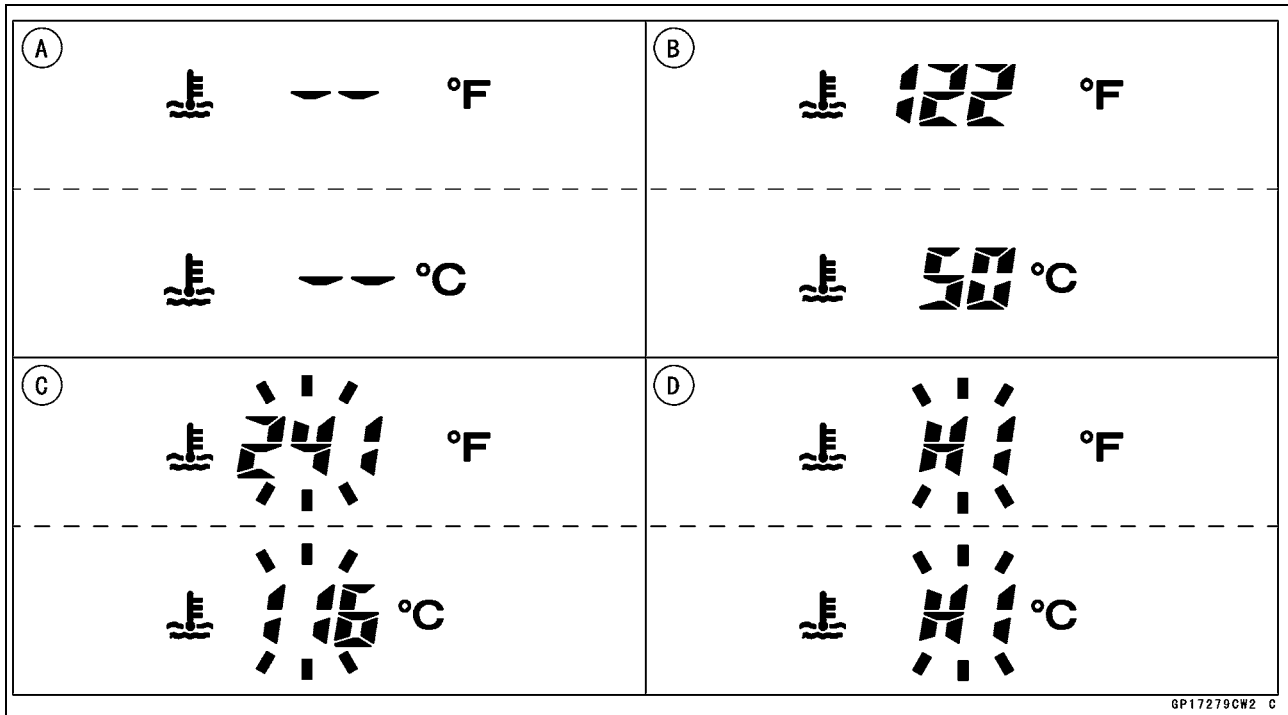
Resistance Value (Ω)	Temperature Meter	Warning Indicate
	--	- [A]
209.8	50°C (122°F)	- [B]
69.1	80°C (176°F)	- [B]
25	116°C (241°F)	Flash [C]
17	HI	Flash [D]

- ★ If any display function does not work, replace the meter unit.



16-64 ELECTRICAL SYSTEM

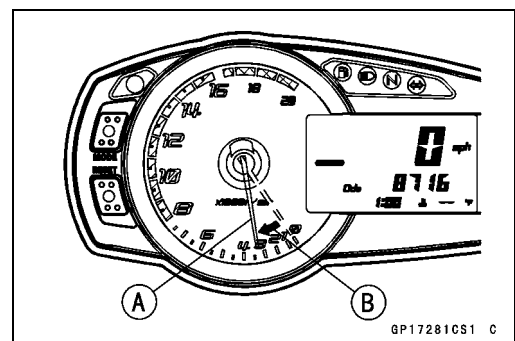
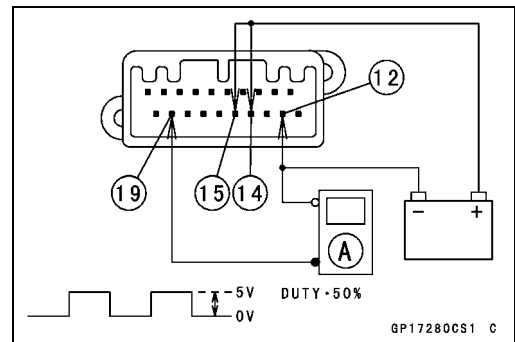
Meter, Gauge, Indicator Unit



GP17279CW2 C

Tachometer Check

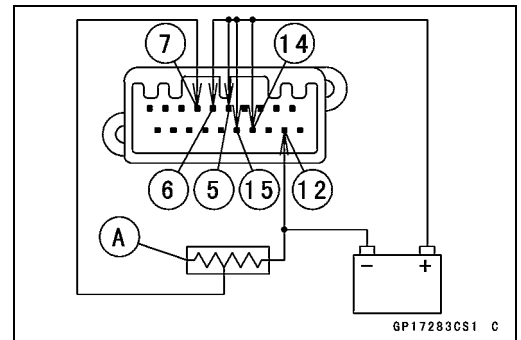
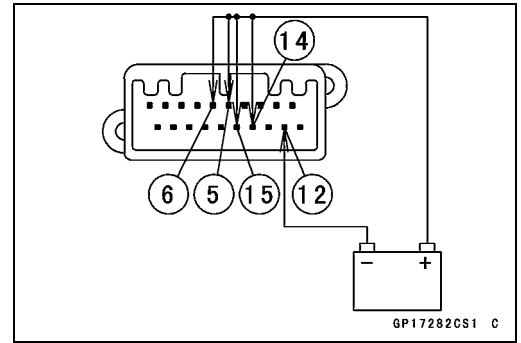
- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- When the terminals are connected, the tachometer needle momentarily points to the last reading, and then return to the 0 position.
- ★ If the needle function does not work, replace the meter unit.
- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown in the figure) would be input into the terminal [19].
- Indicates approximately 4 000 rpm in case the input frequency would be approximately 133.3 Hz.
- ★ If the oscillator is not available, the tachometer can be checked as follows.
- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- When the terminals are connected, the tachometer needle momentarily points to the last reading, and then return to the 0 position.
- ★ If the needle function does not work, replace the meter unit.
- Using the insulated auxiliary lead, quickly open and connect the terminal [15] to the terminal [19] repeatedly.
- Then the tachometer needle [A] should flick [B].
- ★ If the needle does not flick, replace the meter unit.



Meter, Gauge, Indicator Unit

Stop Watch Check

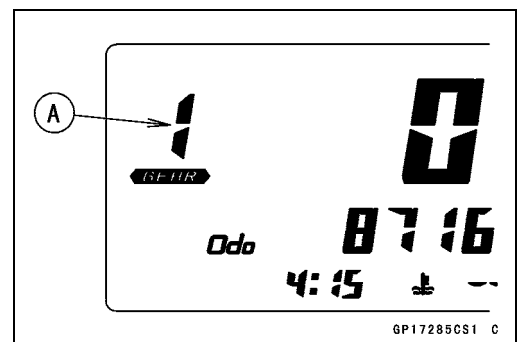
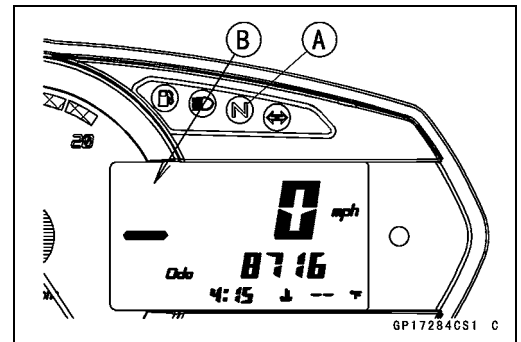
- Connect the 12 V battery and terminal in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- Press the MODE button each time to set the stop watch mode.
- Connect the insulated auxiliary lead processed insulation to the terminal [5] as shown in the figure, then stop watch start to count.
- While count the stop watch, connect the auxiliary lead to the terminal [6] as shown in the figure, then indicate the counted lap time during 10 seconds.
- Connect the variable rheostat [A] to the terminal [7] as shown in the figure.
- When adjusting the resistance to less than 21.1Ω , lap display segment indicate the water temperature (HI segments).
- The HI segment is flashing.
- ★ If the display function does not work, replace the meter unit.



Gear Position Indication Inspection

NOTE

- The gear position is indicated by the data sent from the ECU.
- Be sure the ECU communication line is normal (see ECU Communication Line Inspection in the Fuel System (DFI) chapter).
- Inspect with the meter unit installed on the motorcycle.
- Set the gear position in the neutral position.
 - Turn the ignition switch ON.
 - The neutral indicator light (LED) [A] should go on.
 - The gear position [B] does not appear in the display.
- Set the gear position in the 1st position.
 - The 1 segments [A] should appear in the display.
 - The neutral indicator light (LED) goes off.
- Raise the rear wheel off the ground with the stand.
- Start the engine and change the gear position from 2nd to 6th in numerical order (2nd → 3rd → 4th → 5th → 6th).
- Check that the display corresponding to each gear position appears.
- Turn the ignition switch OFF
- ★ If the display function does not work, inspect the gear position switch (see Gear Position Switch Inspection) and wiring.
- ★ If the gear position switch and wiring are normal, replace the meter unit.

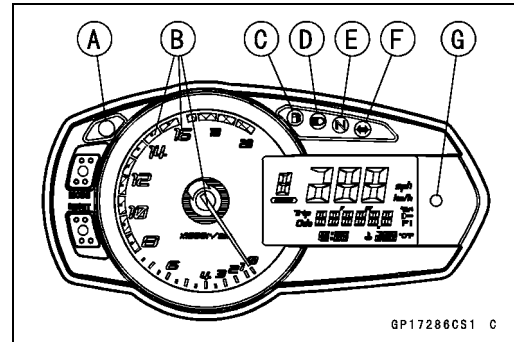


16-66 ELECTRICAL SYSTEM

Meter, Gauge, Indicator Unit

Lights (LED) Inspection

- Shift Up Indicator Light (LED) [A]
- Illumination Light (LED) [B]
- Fuel Level Warning Indicator Light (LED) [C]
- High Beam Indicator Light (LED) [D]
- Neutral Indicator Light (LED) [E]
- Turn Signal Indicator Light (LED) [F]
- Warning Indicator Light (LED) [G]

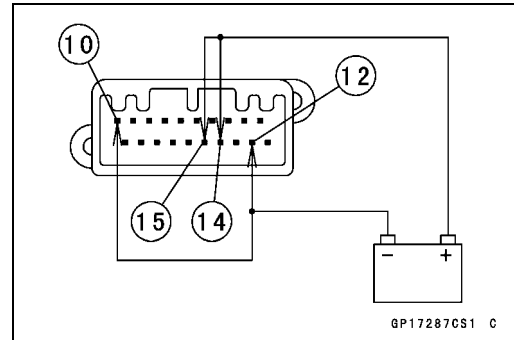


Illumination Light (LED) Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
- When the terminals are connected, the illumination light (LED) should go on.
- ★ If the illumination light (LED) does not go on, replace the meter unit.

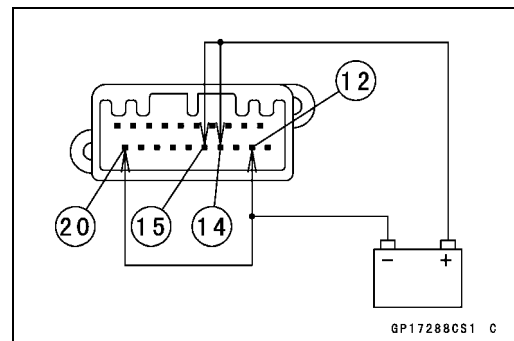
Neutral Indicator Light (LED) Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
- Using the insulated auxiliary lead, 12 V battery to the meter unit connector as follows.
- Connect the battery negative (-) terminal to the terminal [10].
- When the terminals are connected, the neutral indicator light (LED) should go on.
- ★ If the neutral indicator light (LED) does not go on, replace the meter unit.

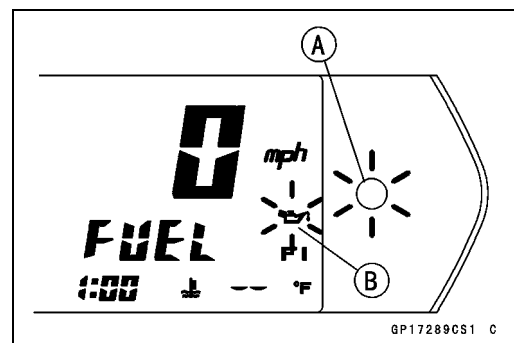


Warning Indicator Light (LED) (Oil Pressure Warning) Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
- Using the insulated auxiliary lead, 12 V battery to the meter unit connector as follows.
- Connect the battery negative (-) terminal to the terminal [20].



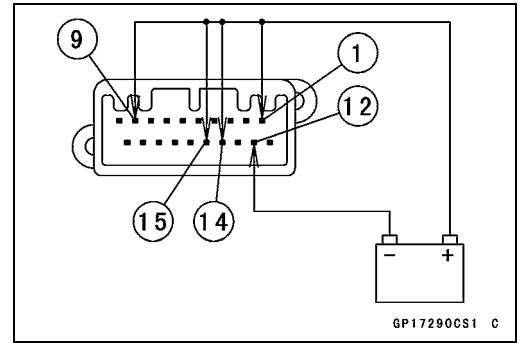
- When the terminals are connected, the warning indicator light (LED) [A] blinks and the oil pressure warning symbol [B] appears in the display.
- The oil pressure warning symbol is blinking.
- ★ If the warning indicator light (LED) does not blink and/or oil pressure warning symbol does not appear, replace the meter unit.



Meter, Gauge, Indicator Unit

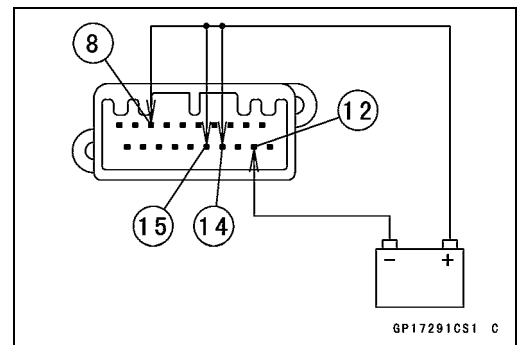
Left and Right Turn Signal Indicator Light (LED)

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
- Using the insulated auxiliary leads, 12 V battery to the meter unit connector as follows.
 - Connect the battery positive (+) terminal to the terminal [9].
 - Connect the battery positive (+) terminal to the terminal [1].
- When the terminals are connected, the turn signal indicator light (LED) should go on.
- ★ If the turn signal indicator light (LED) does not go on, replace the meter unit.



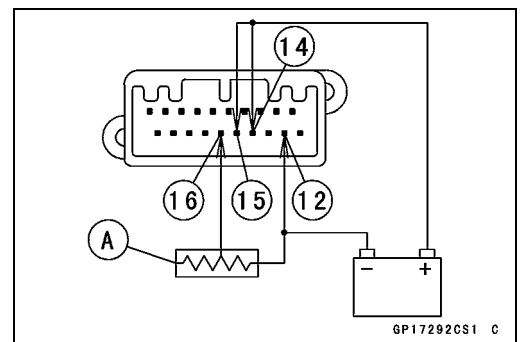
High Beam Indicator Light (LED)

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
- Using the insulated auxiliary lead, 12 V battery to the meter unit connector as follows.
 - Connect the battery positive (+) terminal to the terminal [8].
- When the terminals are connected, the high beam indicator light (LED) should go on.
- ★ If the turn signal high beam indicator light (LED) does not go on, replace the meter unit.



Fuel Level Warning Indicator Light (LED)

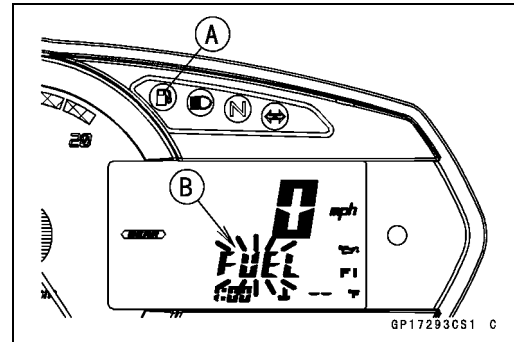
- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
- When the terminals are connected, the fuel level warning indicator light (LED) should go on for 3 seconds.
- ★ If the fuel level warning indicator light (LED) does not go on, replace the meter unit.
- Connect the variable rheostat [A] to the terminal [16] as shown in the figure.
- Adjust the resistance value to the approximately 20 Ω .



16-68 ELECTRICAL SYSTEM

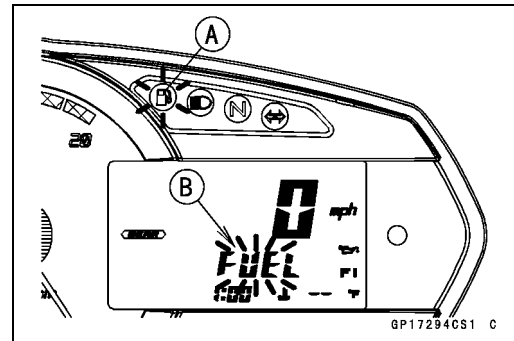
Meter, Gauge, Indicator Unit

- When the terminals are connected, the fuel level warning indicator light (LED) [A] should go on and the FUEL segments [B] appears in the display.
- The FUEL segments is flashing.
- ★If the fuel level warning indicator light (LED) does not go on and/or the FUEL segments does not appear, replace the meter unit.

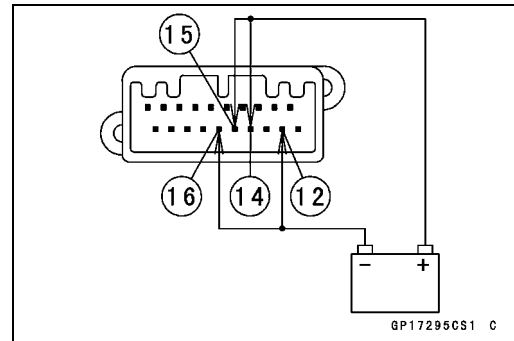


- Adjust the resistance value to the approximately 100 Ω.
- The fuel level warning indicator light (LED) goes off and the FUEL segments disappears from the display.
- ★If the fuel level warning indicator light (LED) does not go off and/or the FUEL segments does not disappear, replace the meter unit.

- Disconnect the terminal [16].
- About 5 seconds after, the fuel level warning indicator light (LED) [A] blinks and the FUEL segments [B] appears in the display.
- The FUEL segments is flashing.
- ★If the fuel level warning indicator light (LED) does not blink and/or the FUEL segments does not appear, replace the meter unit.

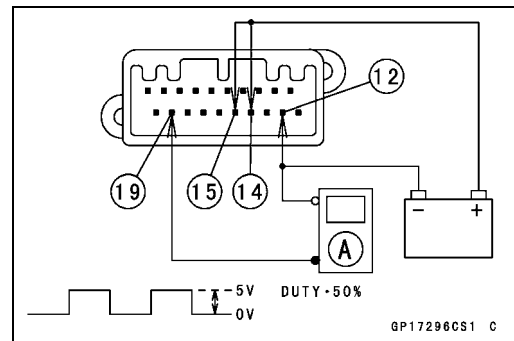


- Connect the battery negative (-) terminal to the terminal [16].
- When the terminal is connected, the fuel level warning indicator light (LED) blinks and the FUEL segments flashes on the display.
- ★If the fuel level warning indicator light (LED) does not blink and/or the FUEL segments does not displayed, replace the meter unit.



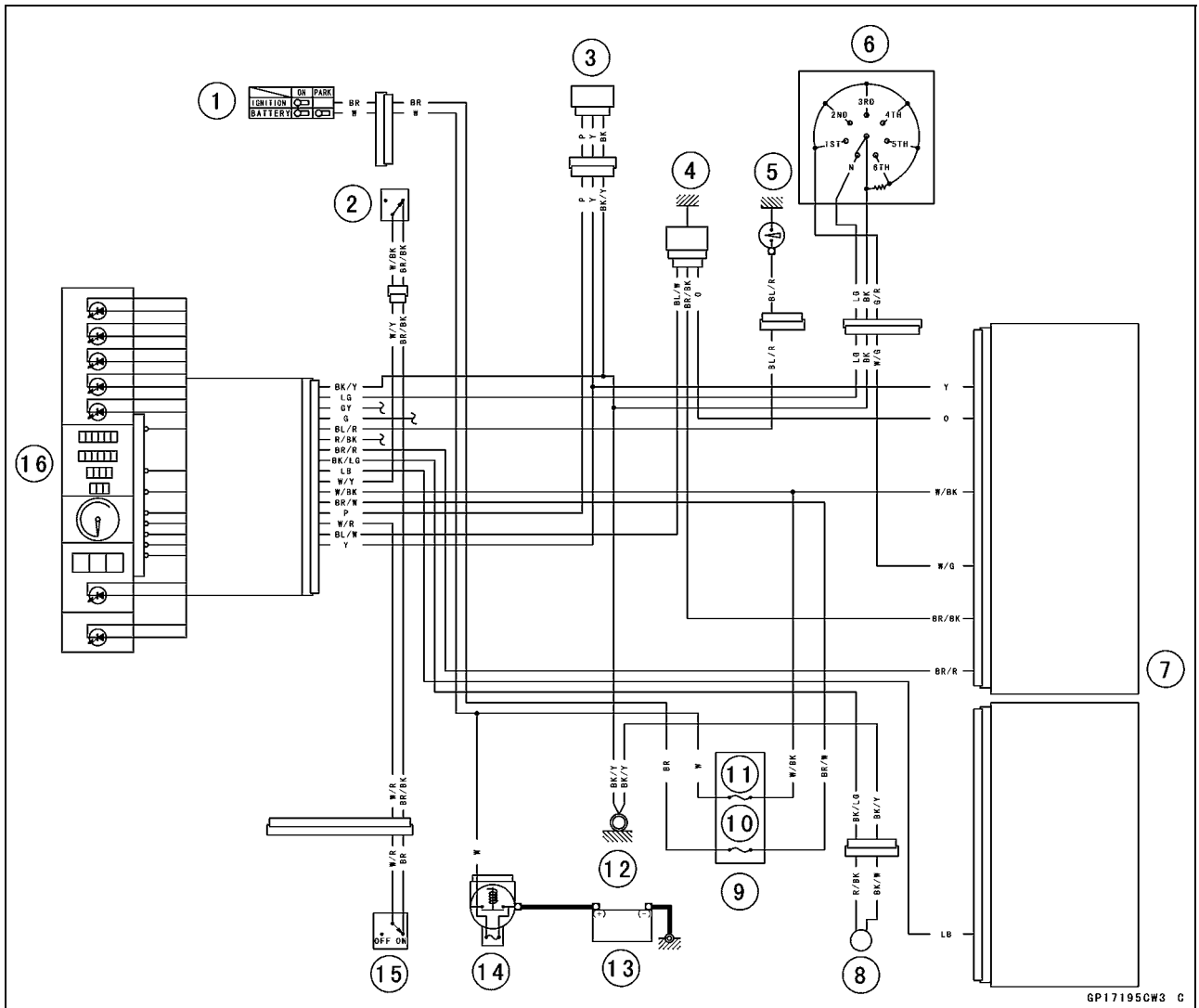
Shift Up Indicator Light (LED)

- Connect the 12 V battery and terminal in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown in the figure) would be input into the terminal [19].
- When set the oscillator more than 550 Hz, shift up indicator light (LED) go on.
- ★If the shift up indicator light (LED) does not go on, replace the meter unit.



Meter, Gauge, Indicator Unit

Meter Unit Circuit



GP17195CW3 C

1. Ignition Switch
2. Stop Watch Button
3. Speed Sensor
4. Water Temperature Sensor
5. Oil Pressure Switch
6. Gear Position Switch
7. ECU
8. Fuel Reserve Switch
9. Fuse Box
10. Ignition Fuse 15 A
11. ECU Fuse 10 A
12. Frame Ground
13. Battery 12 V 8 Ah
14. Main Fuse 30 A
15. Lap Time Button
16. Meter Unit

16-70 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

This motorcycle is equipped with an immobilizer system to protect the motorcycle from theft. This system provides a theft proof device by means of matching a code between the inbuilt key transponder and ECU. If the code does not match, ignition system, injectors, subthrottle valve actuator and exhaust butterfly valve actuator will not operate and the engine will not start.

Abstract

- Do not keep more than one immobilizer key of any system on a key ring. Jamming of the key code signal may occur and the operation of the system may be affected.
- The warning indicator light (LED) will flash for a period of 24 hours once the ignition switch has been switched off and the key removed. This flashing can be set to on or off as desired by holding the MODE and RESET buttons down for 2 seconds within 20 seconds of switching the ignition off.
- If all coded keys (master key and user keys) are lost the ECU and ignition switch will have to be replaced.
- The immobilizer system can not function until the master key code is registered in the ECU.
- A total of six keys can be registered in the ECU at any one time (one master key and five user keys).
- If the master key is lost it is not possible to register new user keys.

Operational Cautions

1. Do not put two keys of any immobilizer system on the same key ring.
2. Do not submerge any key in water.
3. Do not expose any key to excessively high temperature.
4. Do not place any key close to magnet.
5. Do not place a heavy item on any key.
6. Do not grind any key or alter its shape.
7. Do not disassemble the plastic part of any key.
8. Do not drop the key and/or apply any shocks to the key.
9. When a user key is lost, the user should go to his dealer to invalidate the lost key registration in the ECU.
10. When the master key is lost, the user should go to his dealer and have a new ECU installed and register a new master key and user keys.

NOTE

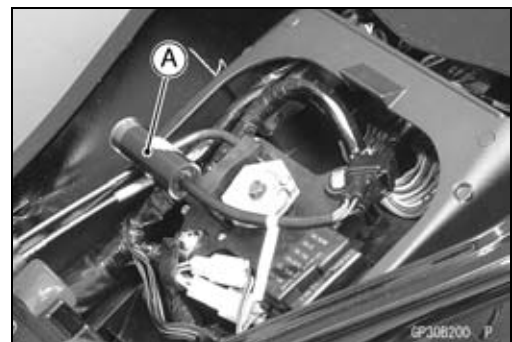
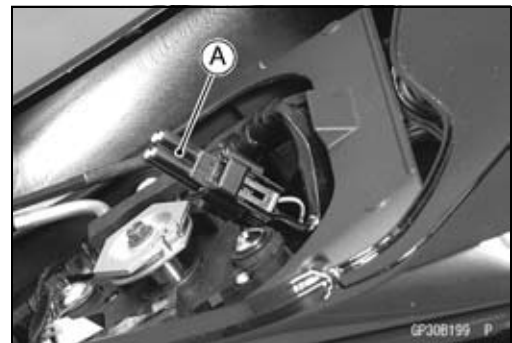
○No.9 and 10 are strongly recommended to the customer to ensure security of the motorcycle.

Key Registration

Case 1: When the user key has been lost or additional spare user key is required.

- Prepare a new spare user key.
- Cut the key in accordance with the shape of the current user key.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect the immobilizer/Kawasaki diagnostic system connector [A].
- Connect the key registration unit [A].

Special Tool - Key Registration Unit: 57001-1582

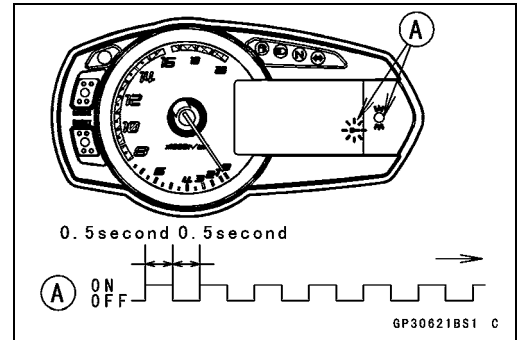


Immobilizer System (Equipped Models)

- Insert the master key to the ignition switch and turn it ON.

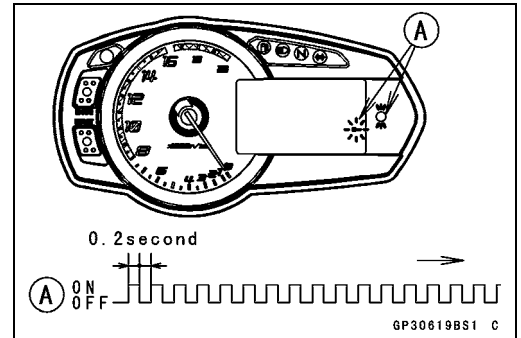
Verified

- The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the registration mode (go to the next step).

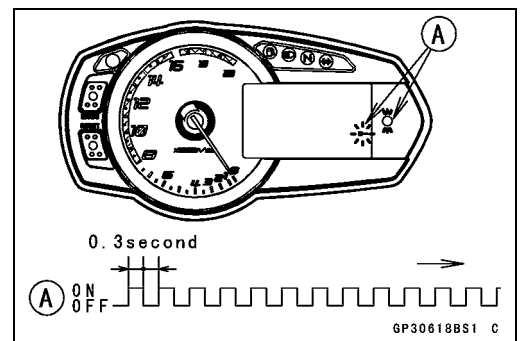


Not Verified

- The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error (refer to the following failure illustrations).
Immobilizer Amplifier Failure



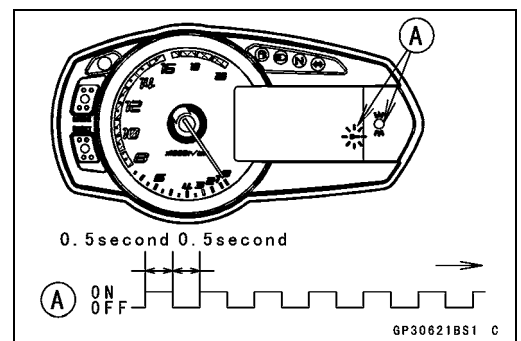
Master Key Collation Error



- Turn the master key OFF and remove the master key.
- The warning indicator light (LED) [A] blinks continuously to display that the ECU is in the registration mode for 15 seconds.

NOTE

- Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light (LED) stops flashing.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.



- Insert the user key 1 to the ignition switch and turn it ON.

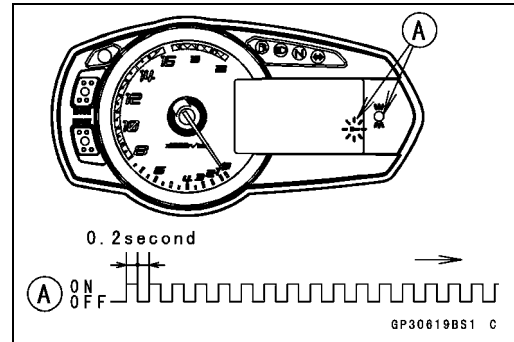
NOTE

- Keep the other user key away from the immobilizer antenna.

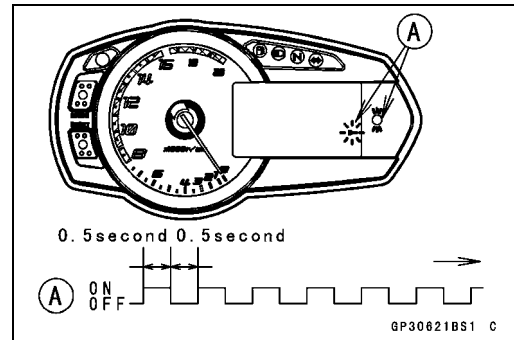
16-72 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

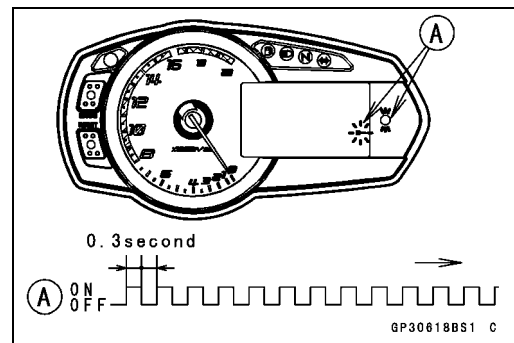
- If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.
Immobilizer Amplifier Failure



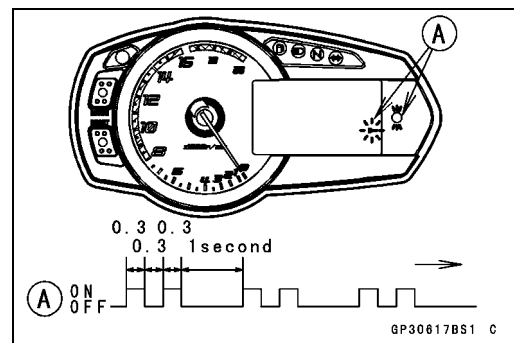
When Registered User Key is Inserted.



User Key Collation Error



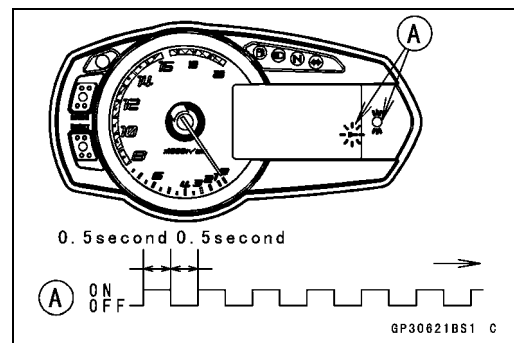
- The user key 1 is successfully registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 2 times and stops for 1 second and then repeats this cycle.



- Turn the user key 1 OFF and remove the user key 1.
- The warning indicator light (LED) [A] blinks to display the registration mode.

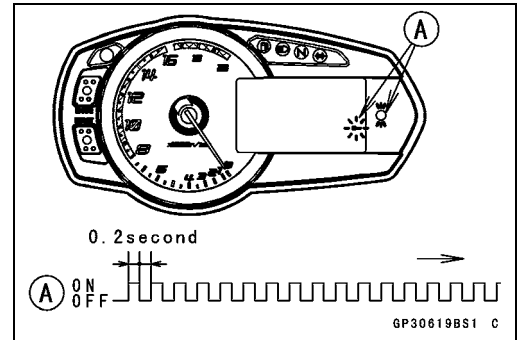
NOTE

- Turn off the ignition switch and wait for the period of 15 seconds or more. The registration mode automatically finishes and the warning indicator light (LED) will switch off.
- This procedure registered the master key and one user key.
- Continue with the procedure to register the second and later keys before the 15 seconds period has elapsed.
- Insert the user key 2 to the ignition switch and turn it ON.

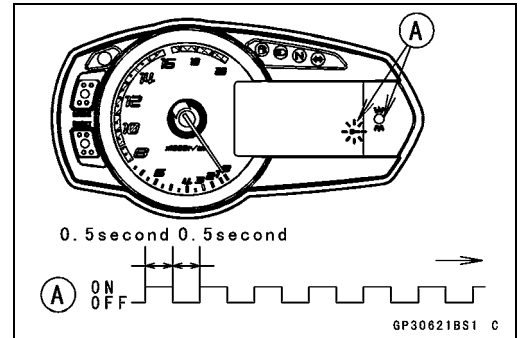


Immobilizer System (Equipped Models)

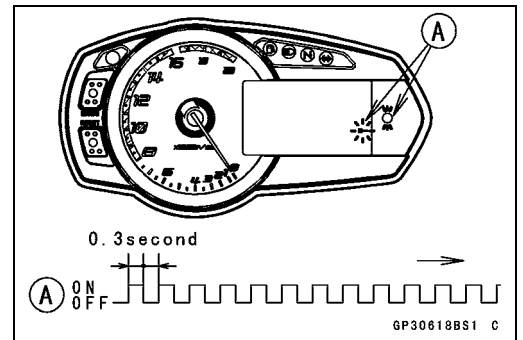
○If there is any problem in the registration, the warning indicator light and immobilizer warning symbol [A] blinks to display the collation error.
 Immobilizer Amplifier Failure



When Registered User Key is Inserted.



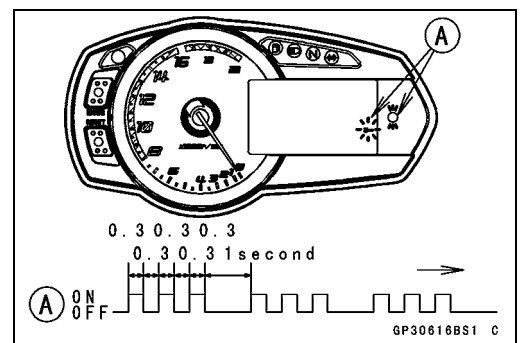
User Key Collation Error



- The user key 2 is registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 3 times and stops for 1 second and then repeats this cycle.
- This procedure has registered the master key and 2 user keys.
- Continue with the procedure to register an additional 3 user keys.

NOTE

○The ECU can store up the six key codes (master key x 1 and user key x 5).



User Key Indicator Light and Symbol Flashes

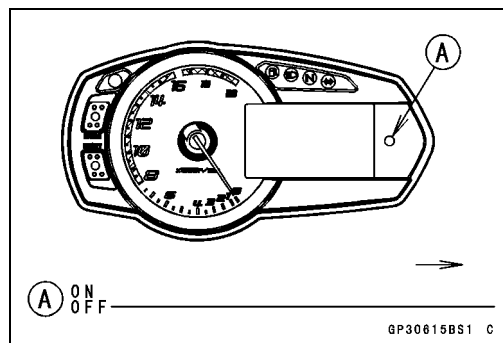
	Indicator Light and Symbol Blinks	Indicator Light and Symbol Stop	Remarks
User Key 3	4 times	1 seconds	Repeat
User Key 4	5 times	1 seconds	Repeat
User Key 5	6 times	1 seconds	Repeat

- Turn OFF the ignition switch and wait for period of more than 15 seconds.
- The registration mode automatically ends.

16-74 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

- The warning indicator light (LED) goes off [A].



- Remove the key registration unit and connect the immobilizer/Kawasaki diagnostic system connector.

NOTE

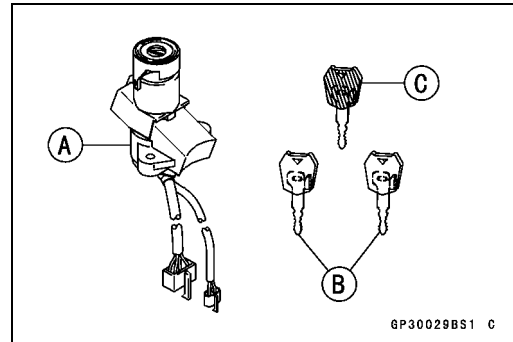
- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

16-76 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

Case 2: When the ignition switch is faulty and to be replaced.

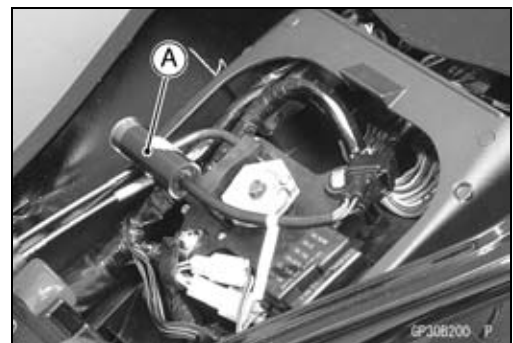
- Prepare a new ignition switch [A] and two new user keys [B].
- These parts are available as a set. Prepare the current master key [C].



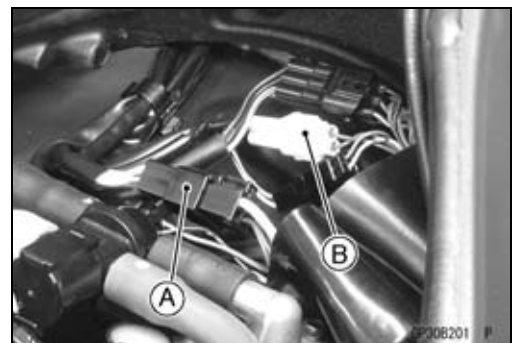
- Remove:
 - Ignition Switch and Immobilizer Antenna (see Immobilizer System Parts Replacement)
 - Front Seat (see Front Seat Removal in the Frame chapter)
- Disconnect the immobilizer/Kawasaki diagnostic system connector [A].



- Connect the key registration unit [A].
Special Tool - Key Registration Unit: 57001-1582



- Connect:
 - New Ignition Switch Lead Connector [A]
 - Immobilizer Antenna Lead Connector [B]

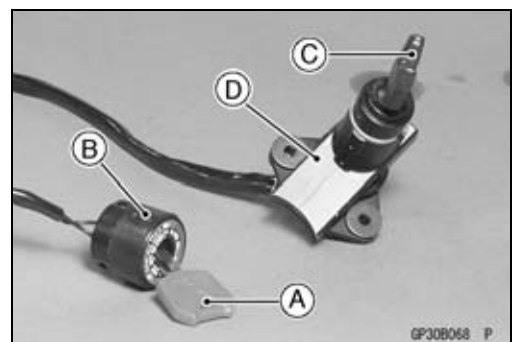


- Put the current master key [A] at the antenna [B].

NOTE

○ Keep the antenna more than 15 cm (5.9 in.) from the ignition switch.

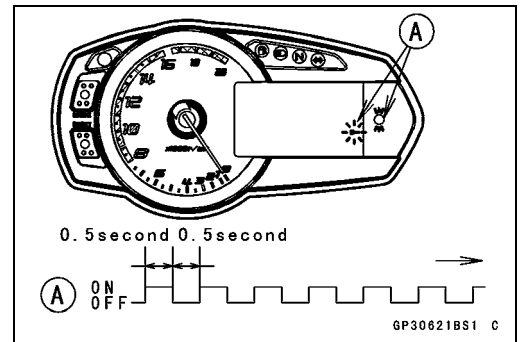
- Insert the new user key 1 [C] to the new ignition switch [D] and turn it ON.



Immobilizer System (Equipped Models)

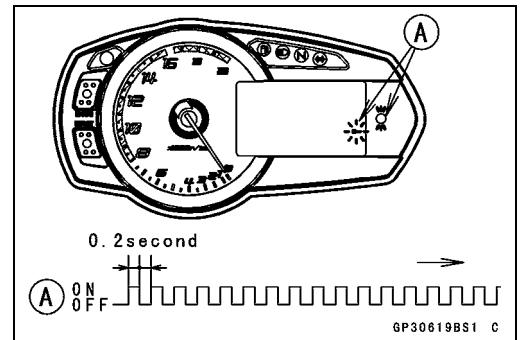
Verified

- The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the ECU is in the registration mode (go to the next step).

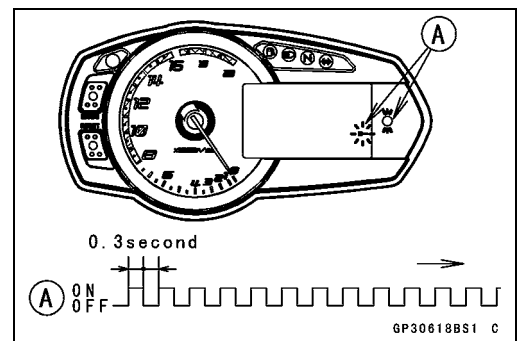


Not Verified

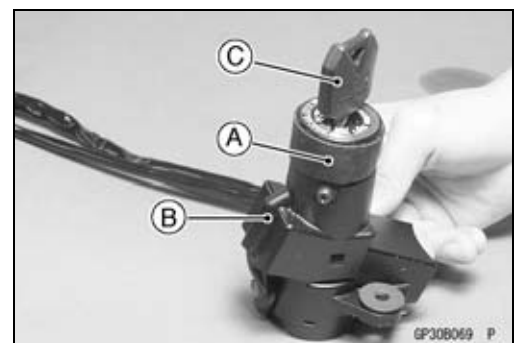
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.
Immobilizer Amplifier Failure



Master Key Collation Error



- Turn OFF and remove the new user key 1.
- Temporarily place the antenna [A] on the new ignition switch [B].
- Insert the user key 1 [C] again into the new ignition switch and turn it ON.



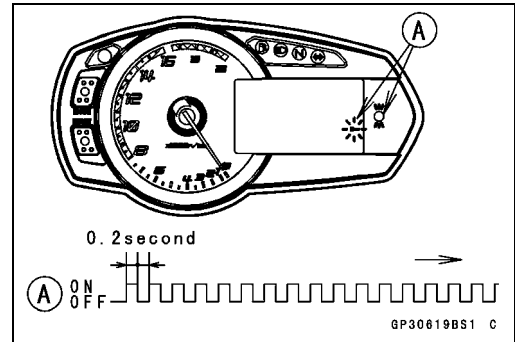
NOTE

- Place the antenna on the ignition switch, insert the next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light (LED) stops flashing.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.
- Keep other user keys away from the immobilizer antenna.

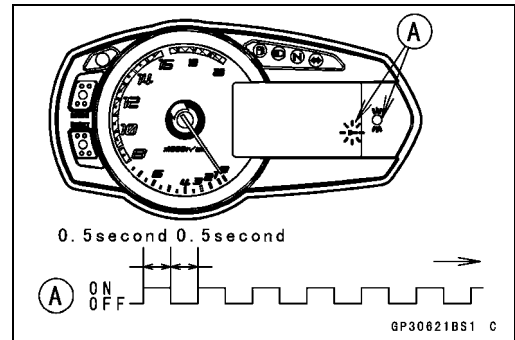
16-78 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

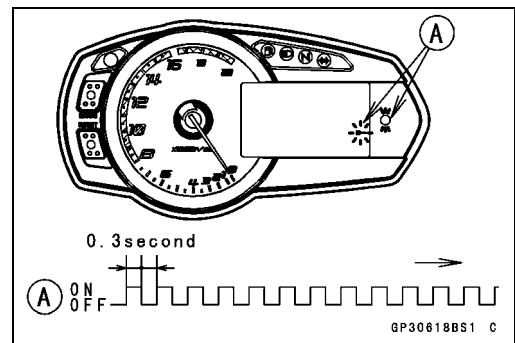
- If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.
Immobilizer Amplifier Failure



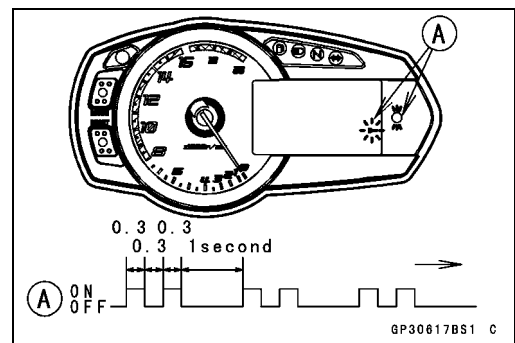
When Registered User Key is Inserted.



User Key Collation Error



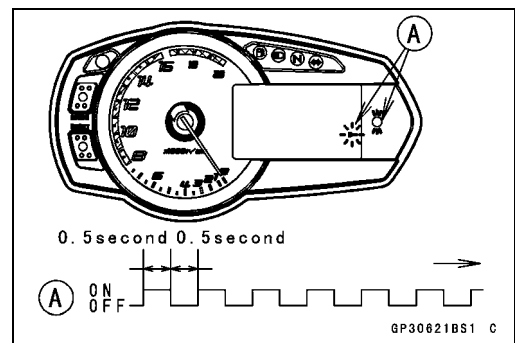
- The user key 1 is successfully registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registering of user key 1.



- Turn OFF and remove user key 1.
- The warning indicator light (LED) [A] blinks to display the registration mode.

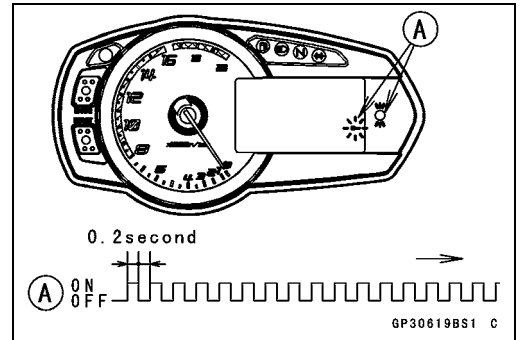
NOTE

- Turn off the ignition switch and wait for the period more than 15 seconds. The registration mode automatically ends and warning indicator light (LED) goes off.
- This procedure has , registered the master key and one user key.
- Continue the procedure to program the second and later keys.
- Insert the user key 2 to the ignition switch and turn it ON.

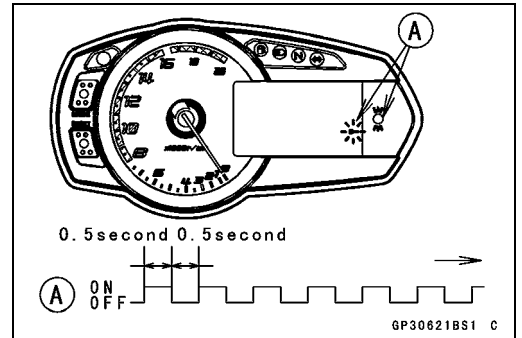


Immobilizer System (Equipped Models)

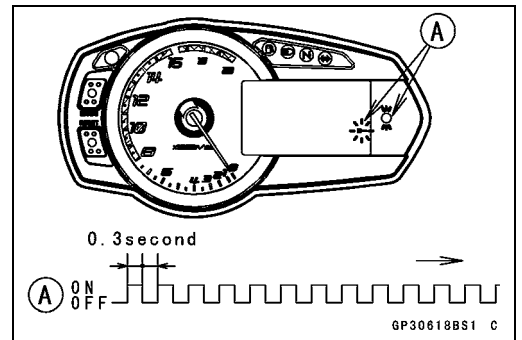
○ If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.
 Immobilizer Amplifier Failure



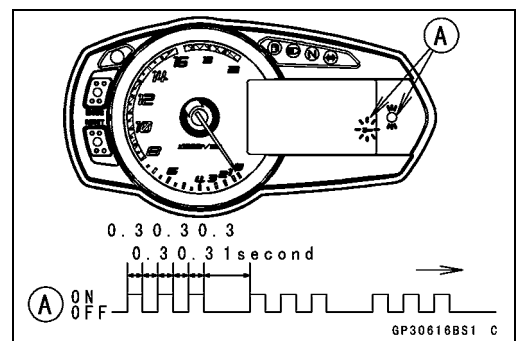
When Registered User Key is Inserted.



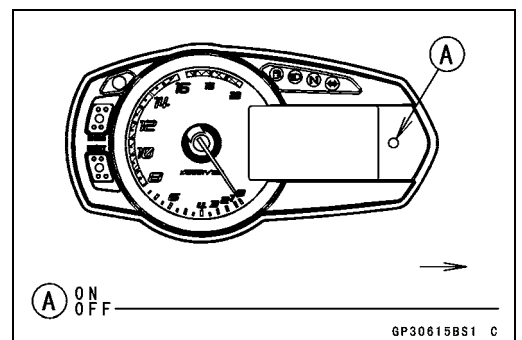
User Key Collation Error



- The user key 2 is successfully registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 3 times and stops for 1 second and then repeat this cycle to indicate successful programming of user key 2.
- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- The warning indicator light (LED) goes off [A].



16-80 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

- Remove the key registration unit and connect the immobilizer/Kawasaki diagnostic system connector.

NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

- Install the new ignition switch and antenna (see Immobilizer System Parts Replacement).

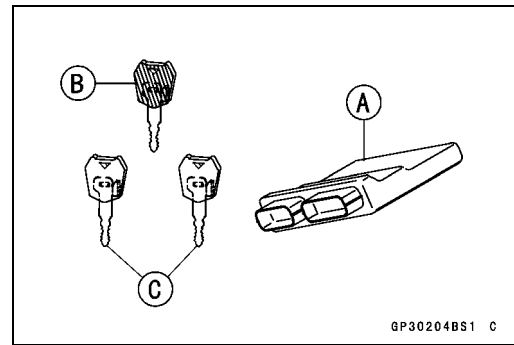
Case 3: When the ECU is faulty and has to be replaced.

- Prepare a new ECU [A], current master key [B] and current user keys [C].

NOTE

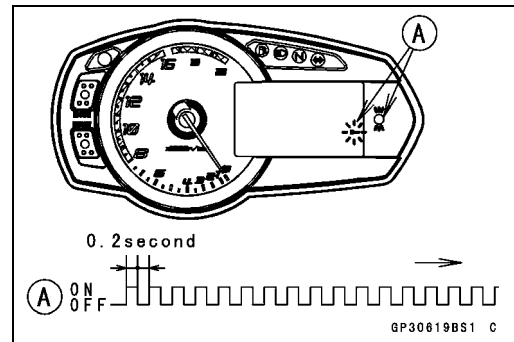
- The key registration unit is not required.
- After replacing the ECU, be sure to register the master key and 2 user keys. If the 3 keys (master key x 1 and user key x 2) are not registered, the engine can not be started.

- Replace the ECU [A] (see ECU Removal/Installation in the Fuel System (DFI) chapter).



- Insert the current master key into the ignition switch and turn it ON.

- If there is any problem in the registration, the warning indicator light and immobilizer warning symbol [A] blinks to display the collation error.
Immobilizer Amplifier Failure



Immobilizer System (Equipped Models)

Master Key Collation Error

- The master key is registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 1 time and stops for 1 second and the repeats this cycle to indicate successful registration of the master key.

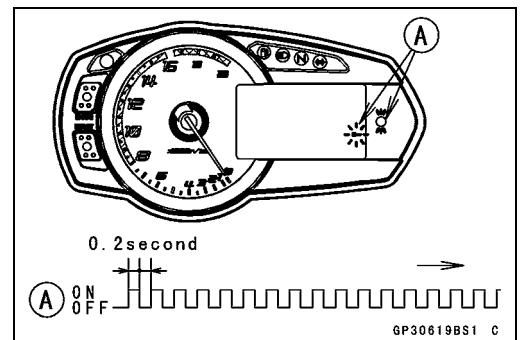
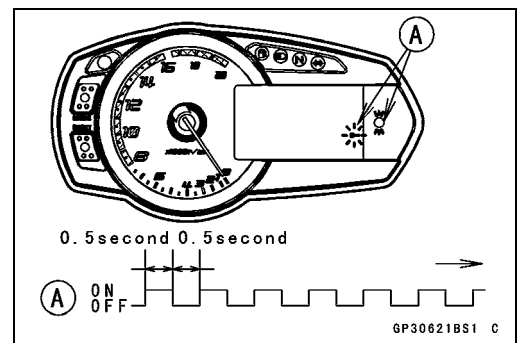
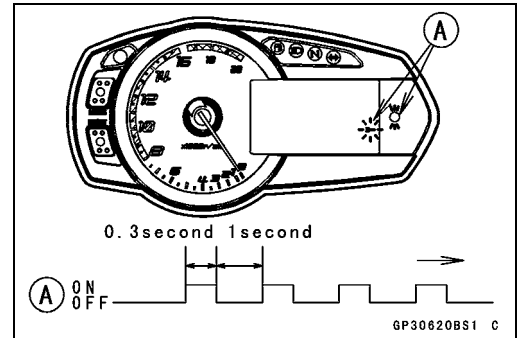
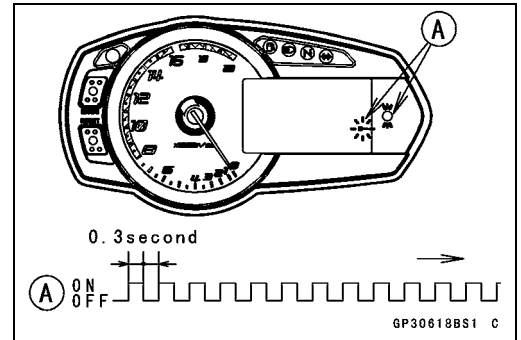
- Turn OFF the master key and remove it.
- The warning indicator light (LED) [A] blinks to display the registration mode.

NOTE

- Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light (LED) goes off.
 - To return to the registration mode start the master key verification procedure. This applies to all user key registration.
- Insert the user key 1 to the ignition switch and turn it ON.

NOTE

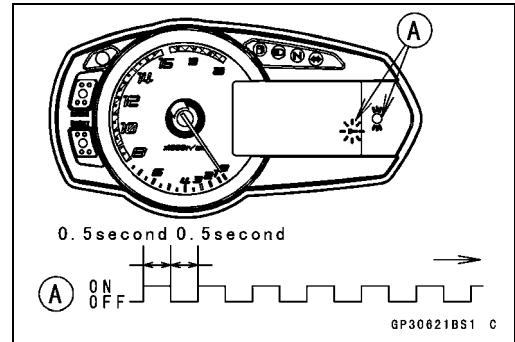
- Keep the other user keys away from the immobilizer antenna.
- If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.
Immobilizer Amplifier Failure



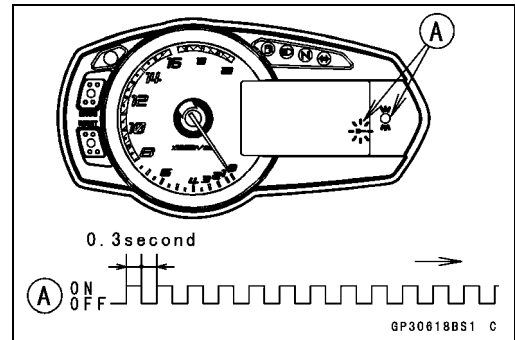
16-82 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

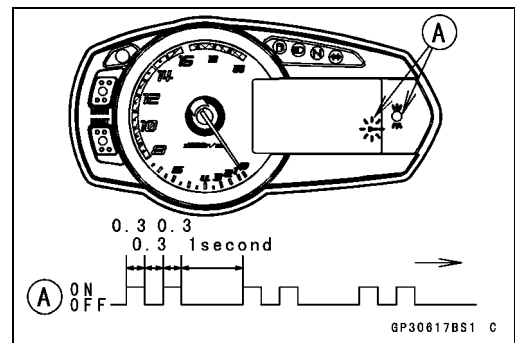
When Registered User Key is Inserted.



User Key Collation Error



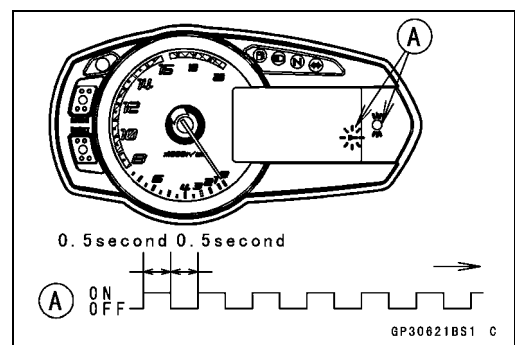
- The user key 1 is registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key.



- Turn OFF and remove the user key 1.
- The warning indicator light (LED) [A] blinks to display the registration mode codes.

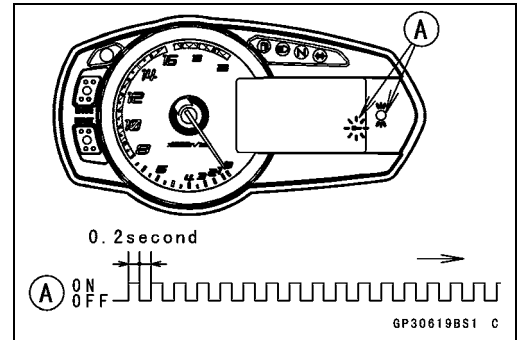
NOTE

- Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light goes off.
 - To return to the registration mode start the master key verification procedure. This applies to all user key registration.
- Insert the user key 2 to the ignition switch and turn it ON.

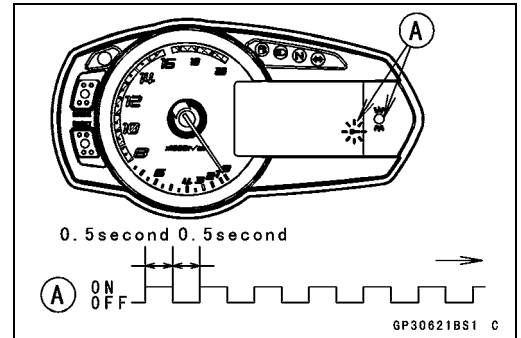


Immobilizer System (Equipped Models)

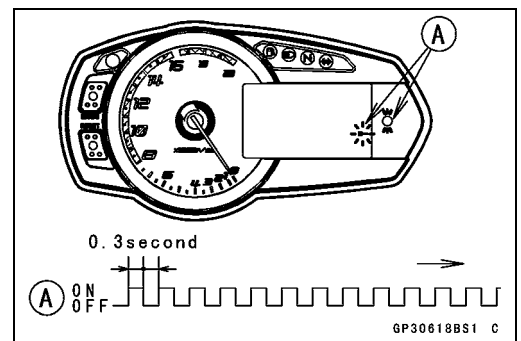
- If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error code.
 Immobilizer Amplifier Failure



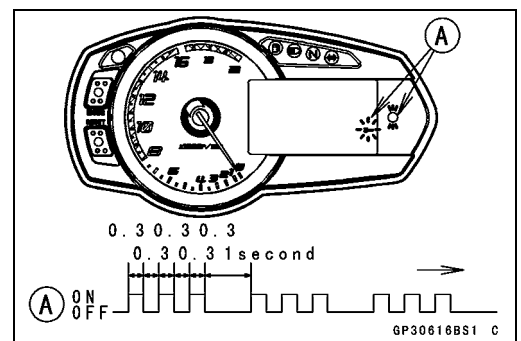
When Registered User Key is Inserted.



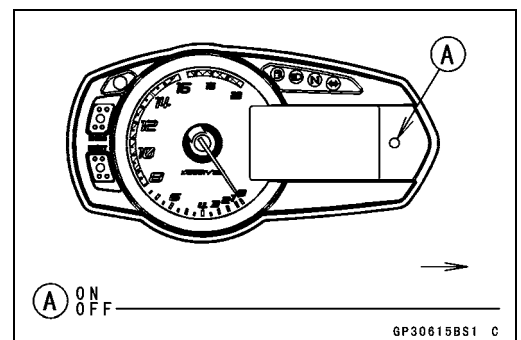
User Key Collation Error



- The user key 2 is registered in the ECU.
- The warning indicator light (LED) and immobilizer warning symbol [A] blinks 3 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key 2.
- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- The warning indicator light (LED) goes off [A].



NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

16-84 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

Case 4: When master key is faulty or lost.

The master key replacement is considered very rare case. However if it is required, the following is necessary.

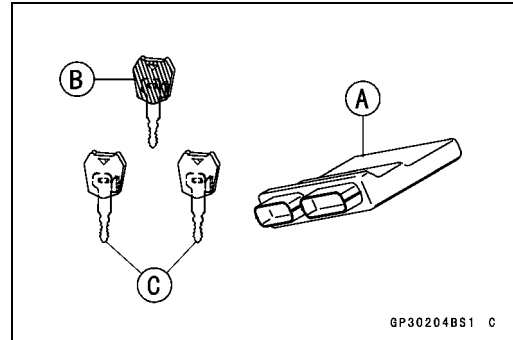
NOTE

○ *The ECU must be replaced with a new one because the master key code that is registered in the current ECU can not be rewritten.*

- Prepare a new ECU [A], new master key [B] and current user keys [C].

NOTE

○ *The key registration unit is not required.*
○ *The key registration process is same as the electric control unit replacement.*



Case 5: When replacing the antenna.

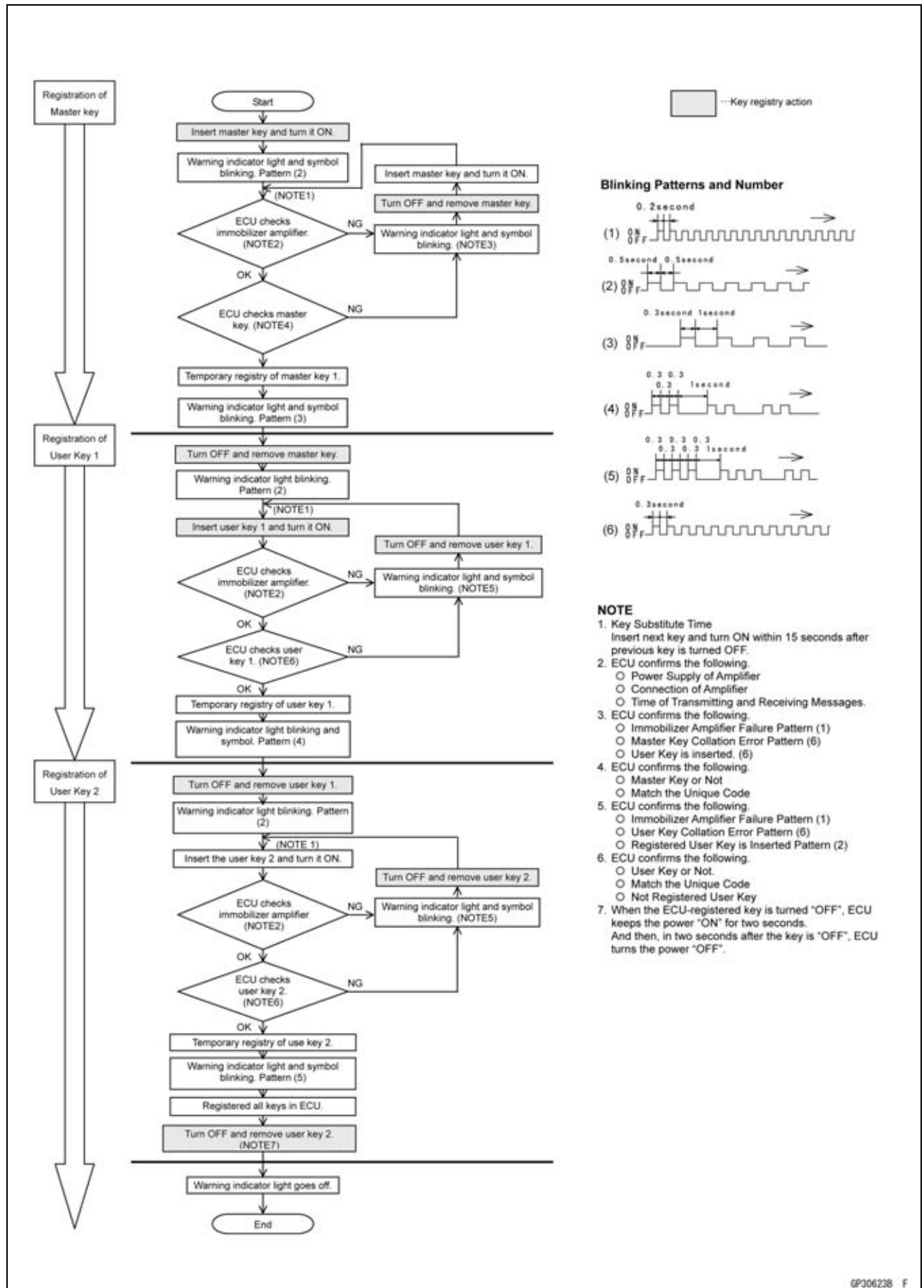
- Prepare a new antenna.
- Refer to the Immobilizer System Parts Replacement.

NOTE

○ *The key registration is not required.*

Immobilizer System (Equipped Models)

All Keys Initial Registration Flow Chart



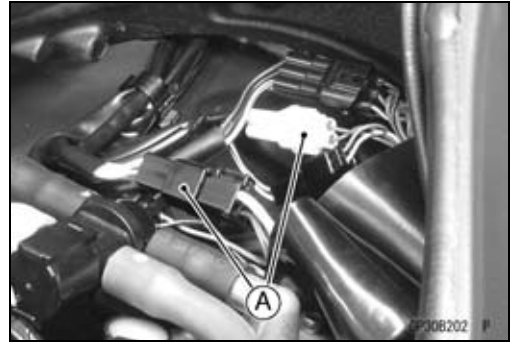
16-86 ELECTRICAL SYSTEM

Immobilizer System (Equipped Models)

Immobilizer System Parts Replacement

Immobilizer Antenna

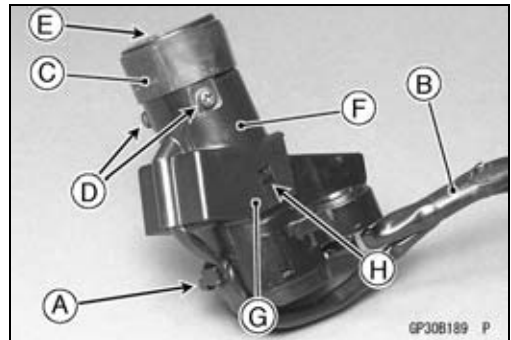
- Remove:
 - Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
 - Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
- Disconnect the lead connectors [A].



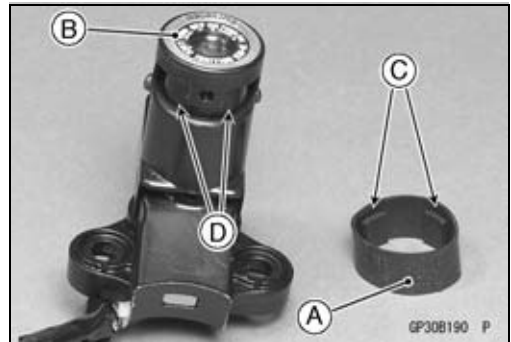
- Remove:
 - Steering Stem Head (see Stem, Stem Bearing Removal in the Steering chapter)
 - Handlebars (see Handlebar Removal in the Steering chapter)
- Using a small chisel or punch, turn out the Torx bolts [A].
- Pull out the ignition switch together with the immobilizer antenna from the steering stem head.



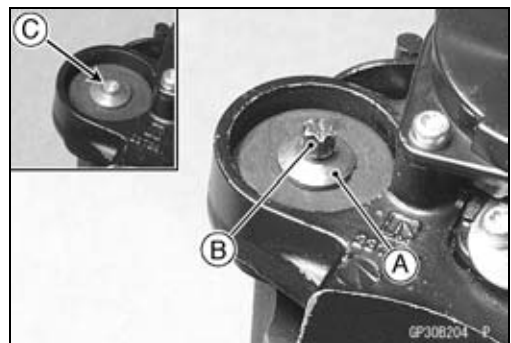
- Cut the band [A] and tape [B].
- Remove:
 - Rubber Damper [C]
 - Screws [D]
- Remove the antenna [E] together with the cover [F].
- Pull the lower parts [G] of the cover outside to clear the projections [H] of the ignition switch.



- Install the rubber damper [A] on the immobilizer antenna [B] so that the stepped side [C] of the projections faces upward.
- Fit the projections into the grooves [D].



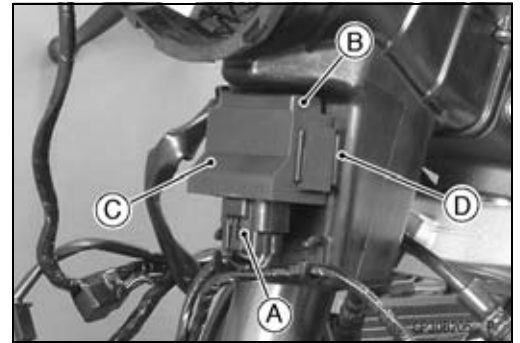
- Tighten a new Torx bolt [A] until the bolt head [B] is broken [C].
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



Immobilizer System (Equipped Models)

Immobilizer Amplifier Replacement

- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Disconnect the connector [A].
- Pull out the immobilizer amplifier [B] together with the rubber protector [C] from the air inlet duct [D].



ECU Replacement

- Refer to the ECU Removal/Installation in the Fuel System (DFI) chapter.

Immobilizer Relational Parts Replacement Chart

		Failed or Lost Part					
		Master Key (Red)	User Key (Black)	Ignition Switch	Antenna	Amplifier	ECU
*	Master Key (Red)	●					
	User Key (Black)		●	○			
	Ignition Switch			●			
	Antenna				●		
	Amplifier					●	
	ECU	○					●
*	Replacement Part						
●	Main Replacement Part						
○	Additional Replacement Part						

Immobilizer System Inspection

- Refer to the Immobilizer Amplifier and Blank Key Detection section in the Fuel System (DFI) chapter.

Switches and Sensors

Brake Light Timing Inspection

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

Brake Light Timing Adjustment

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity.

Special Tool - Hand Tester: 57001-1394

- For the switch housings and the ignition switch, refer to the tables in the Wiring Diagram.

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

Rear Brake Light Switch Connections

Rear Brake Light Switch Connections		
Color	BR	BL
When brake pedal is pushed down	○ ——— ○	
When brake pedal is released		

Sidestand Switch Connections

Sidestand Switch Connections		
Color	BK	G
When sidestand is down		
When sidestand is up	○ ——— ○	

Oil Pressure Switch Connections*

Oil Pressure Switch Connections *		
Color	SW. Terminal	Ground
When engine is stopped	○ ——— ○	
When engine is running		

*: Engine lubrication system is in good condition.

16-90 ELECTRICAL SYSTEM

Switches and Sensors

Water Temperature Sensor Inspection

- Remove the water temperature sensor (see Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter).
- Suspend the sensor [A] in a container of coolant so that the threaded portion is submerged.
- Suspend an accurate thermometer [B] with temperature sensing portions [C] located in almost the same depth.

NOTE

○ The sensor and thermometer must not touch the container side or bottom.

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.

Special Tool - Hand Tester: 57001-1394

- The sensor sends electric signals to the ECU and water temperature meter in the meter unit.
- Measure the resistance across the terminals and the body (for the gauge) at the temperatures shown in the table.
- ★ If the hand tester does not show the specified values, replace the sensor.

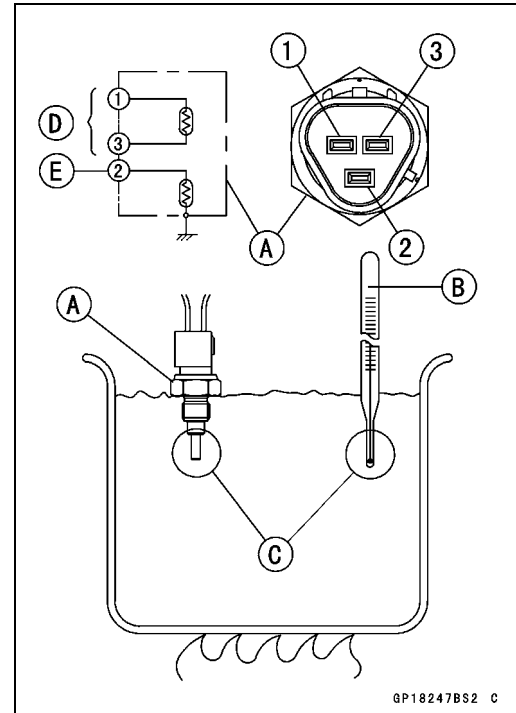
Water Temperature Sensor

Resistance for ECU [D]	
Temperature	Resistance (kΩ) (Terminal [1]-[3])
20°C (68°F)	2.46 +0.155 -0.143
80°C (176°F)	0.32 ±0.011
110°C (230°F)	0.1426 ±0.0041

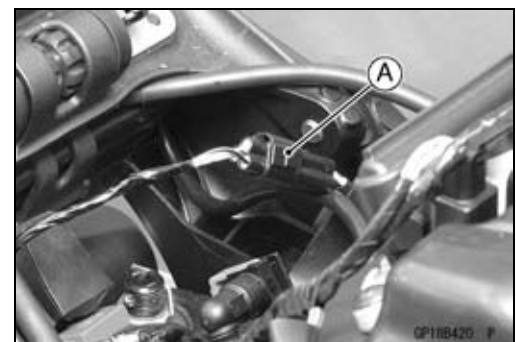
Resistance for Water Temperature Gauge [E]	
Temperature	Resistance (Ω) (Terminal [2]-Body)
50°C (122°F)	210 ±40
120°C (248°F)	21.2 ±1.5

Speed Sensor Removal

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the connector [A].



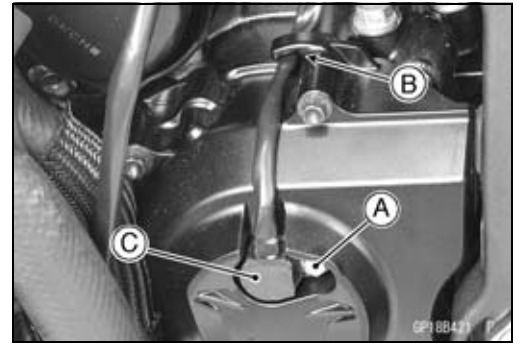
GP18247BS2 C



GP118420 F

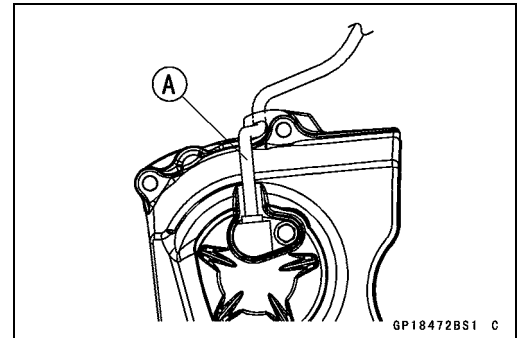
Switches and Sensors

- Remove:
 - Bolt [A]
 - Lead [B] (Free)
 - Speed Sensor [C]



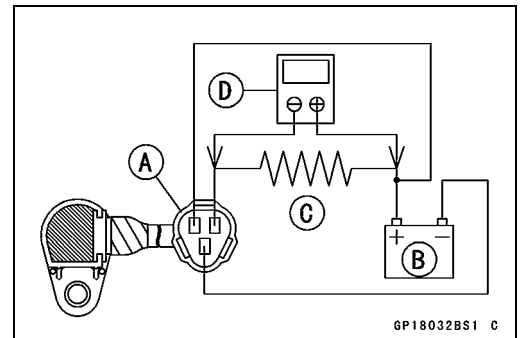
Speed Sensor Installation

- Run the lead [A] as shown in the figure.
- Apply a non-permanent locking agent to the threads of the speed sensor bolt, and tighten it.
- Torque - Speed Sensor Bolt: 6.9 N-m (0.70 kgf-m, 61 in-lb)**
- Install the removed parts (see appropriate chapters).

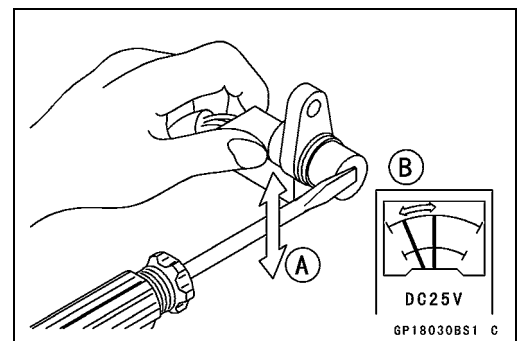


Speed Sensor Inspection

- Remove the speed sensor (see Speed Sensor Removal).
- Connect the speed sensor connector [A] with the battery [B], 10 kΩ resistor [C] and hand tester [D] as shown in the figure.
- Set the tester to the DC 25 V range.
- Special Tool - Hand Tester: 57001-1394**



- Trace [A] each side of the speed sensor surface with the screwdriver.
- Then the tester indicator should flick [B].
- ★ If the tester indicator does not flick, replace the speed sensor.



Fuel Reserve Switch Inspection

- Fill the fuel tank with fuel and close the fuel tank cap.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect the fuel pump lead connector [A].



16-92 ELECTRICAL SYSTEM

Switches and Sensors

- Connect the test light [A] (12 V 3.4 W bulb in a socket with leads) and the 12 V battery [B] to the fuel pump lead connector [C].

Connections:

Battery (+) → 12 V 3.4 W Bulb (One Side)

12 V 3.4 W Bulb (Other Side) → R/BK lead [D]

Battery (-) → BK/W lead [E]

- ★ If the test light turn on, the reserve switch is defective. Replace the fuel pump.

- Draw the fuel out from the fuel tank with a commercially available pump (see Fuel Tank Removal in the Fuel System (DFI) chapter).

- Connect the test light (12 V 3.4 W bulb in a socket with leads) and the 12 V battery to the fuel pump lead connector in the same way again.

Connections:

Battery (+) → 12 V 3.4 W Bulb (One Side)

12 V 3.4 W Bulb (Other Side) → R/BK lead

Battery (-) → BK/W lead

- ★ If the test light does not light, replace the fuel pump.

NOTE

○ It may take a long time to turn on the test light in case that the fuel reserve switch is inspected just after the fuel is drawn. Leave the fuel pump lead connector with leads for inspection connected for few minutes.

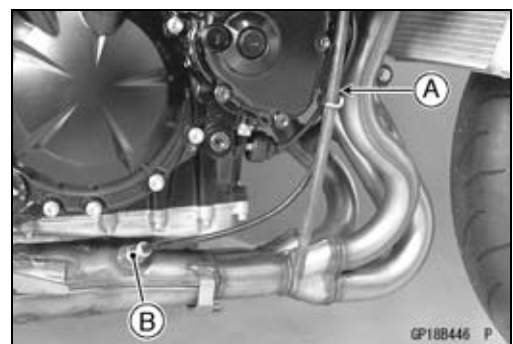
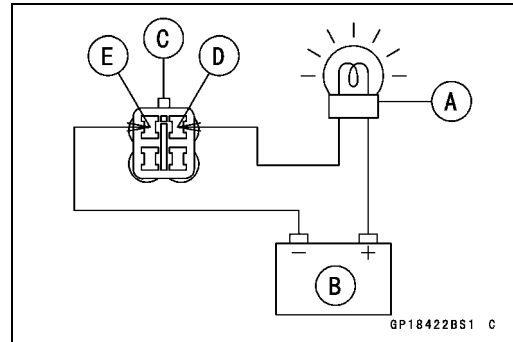
Oxygen Sensor Removal (Equipped Models)

- Disconnect the oxygen sensor lead connector [A].

CAUTION

Do not pull strongly, twist, or bend the oxygen sensor lead. This may cause the wiring open.

- Free the lead [A] from the clamp.
- Remove the oxygen sensor [B].

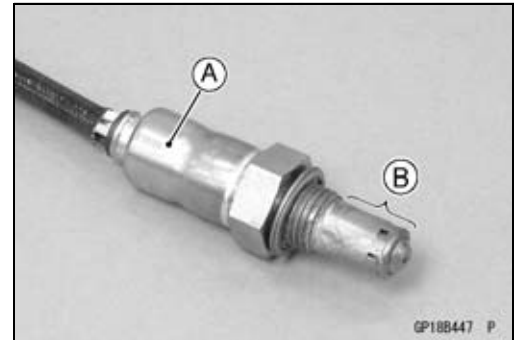


Switches and Sensors

Oxygen Sensor Installation (Equipped Models)

CAUTION

Never drop the oxygen sensor [A] especially on a hard surface. Such a shock to the unit can damage it. Do not touch the sensing part [B] to prevent oil contact. Oil contamination from hands can reduce sensor performance.



- Tighten:
Torque - Oxygen Sensor: 25 N·m (2.5 kgf·m, 18 ft·lb)
- Run the oxygen sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Oxygen Sensor Inspection (Equipped Models)

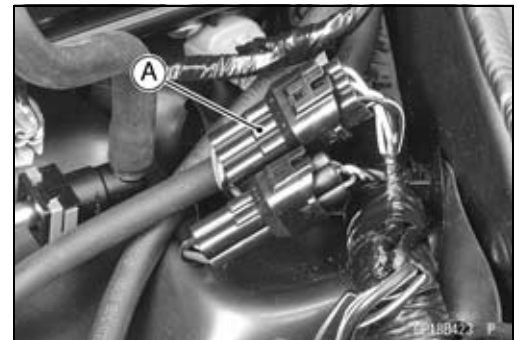
- Refer to the Oxygen Sensor Inspection in the Fuel System (DFI) chapter.

Oxygen Sensor Heater Inspection (Equipped Models)

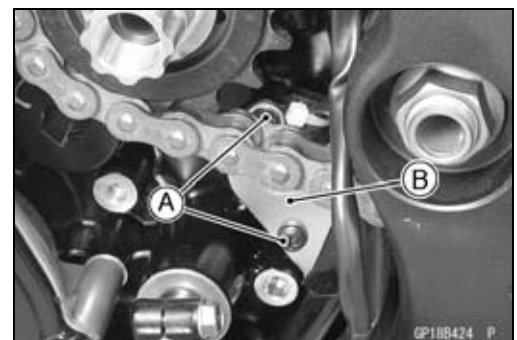
- Refer to the Oxygen Sensor Heater Inspection in the Fuel System (DFI) chapter.

Gear Position Switch Removal

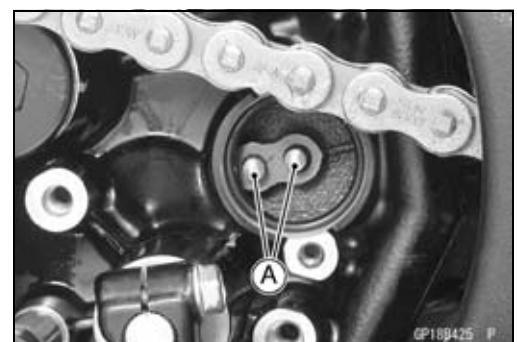
- Remove:
Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Disconnect the connector [A].



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



- Remove the pins [A] and springs from the shift drum.

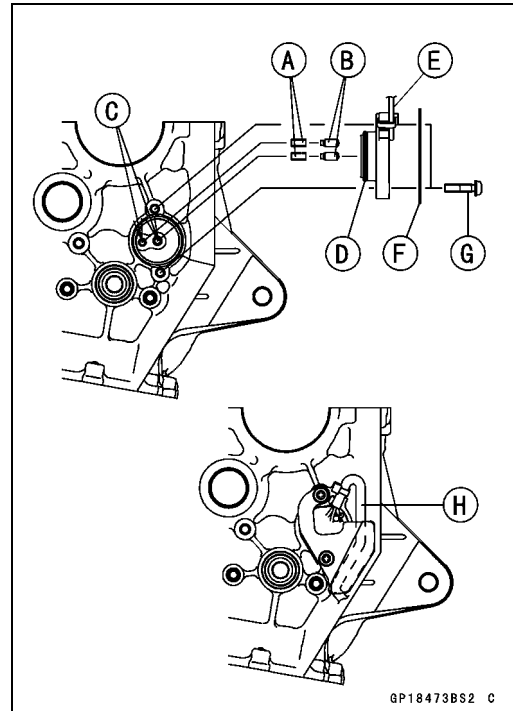


16-94 ELECTRICAL SYSTEM

Switches and Sensors

Gear Position Switch Installation

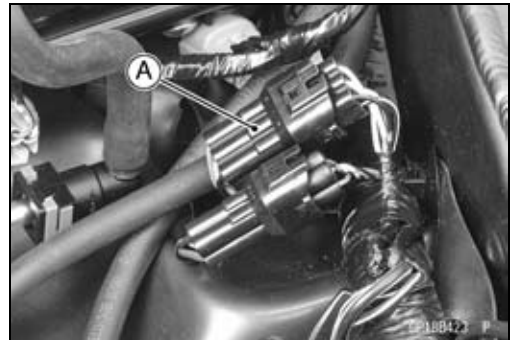
- Securely place the springs [A] and pins [B] into the holes [C] of the shift drum.
- Apply grease to the new O-ring [D].
- Install the gear position switch [E] and holding plate [F].
- Apply a non-permanent locking agent to the threads of the gear position switch screws [G].
- Tighten:
 - Torque - Gear Position Switch Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)**
- Run the lead [H] correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



Gear Position Switch Inspection

NOTE

- *Be sure the transmission and external shift mechanism are good condition.*
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the connector [A].



Switches and Sensors

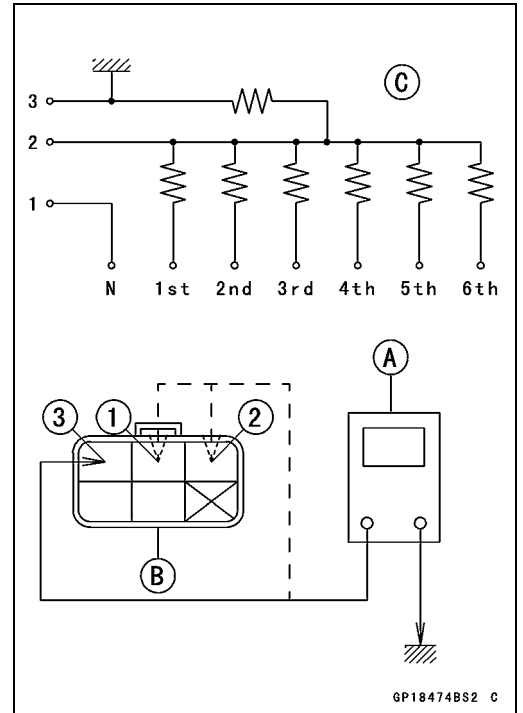
- Set the hand tester [A] to the $\times 1\text{ k}\Omega$ or $\times 100\ \Omega$ range and connect it to the terminals in the connector [B] and ground.
- When changing the gear position from lower gear to higher gear, raise the rear wheel off the ground with the stand and rotate the rear wheel by hand.
 - Internal Circuit [C]
 - [1] LG Lead
 - [2] G/R Lead
 - [3] BK Lead

Special Tool - Hand Tester: 57001-1394

Gear Position Switch Resistance (Unit: $\text{k}\Omega$)

Gear Position	Connections		
	[1]-Ground	[2]-Ground	[3]-Ground
Neutral	about 0	8.64 ~ 9.54	about 0
1st	–	2.22 ~ 2.46	about 0
2nd	–	1.42 ~ 1.58	about 0
3rd	–	0.955 ~ 1.055	about 0
4th	–	0.644 ~ 0.711	about 0
5th	–	0.410 ~ 0.453	about 0
6th	–	0.241 ~ 0.266	about 0

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



16-96 ELECTRICAL SYSTEM

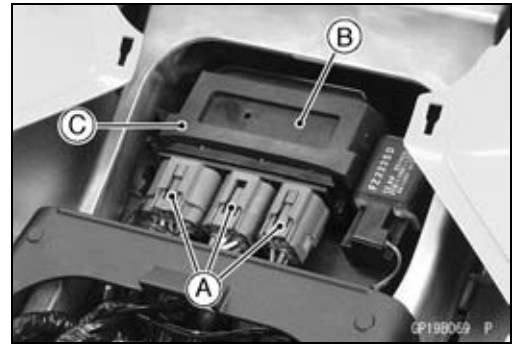
Relay Box

Relay Box Removal

- Remove the front seat cover (see Seat Cover Removal in the Frame chapter).
- Disconnect the connectors [A].
- Pull out the relay box [B] from the rubber protector [C].

NOTE

○ The relay box has relays and diodes. The relays and diodes can not be removed.



Relay Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the relay box as shown in the figure (see Relay Box Internal Circuit in this section).
- ★ If the tester does not read as specified, replace the relay box.

Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading (Ω)
Headlight Circuit Relay	1-3	∞
ECU Main Relay	7-6	∞
	4-5	Not ∞^*
Fuel Pump Relay	7-8	∞
	9-10	Not ∞^*
Starter Circuit Relay	11-16	∞
	11-12	∞
Fan Relay	17-20	∞
	18-19	Not ∞^*

*: The actual reading varies with the hand tester used.

Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (-)	Tester Connection	Tester Reading (Ω)
ECU Main Relay	2-11	1-3	0
	4-5	7-6	0
Fuel Pump Relay	9-10	7-8	0
Fan Relay	18-19	17-20	0

	Battery Connection (+) (-)	Tester Connection DC 25 V Range (+) (-)	Tester Reading (V)
Starter Circuit Relay	16-12	11-12	Battery Voltage

- (+): Apply positive lead.
- (-): Apply negative lead.

Relay Box

Diode Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit in this section).

Diode Circuit Inspection

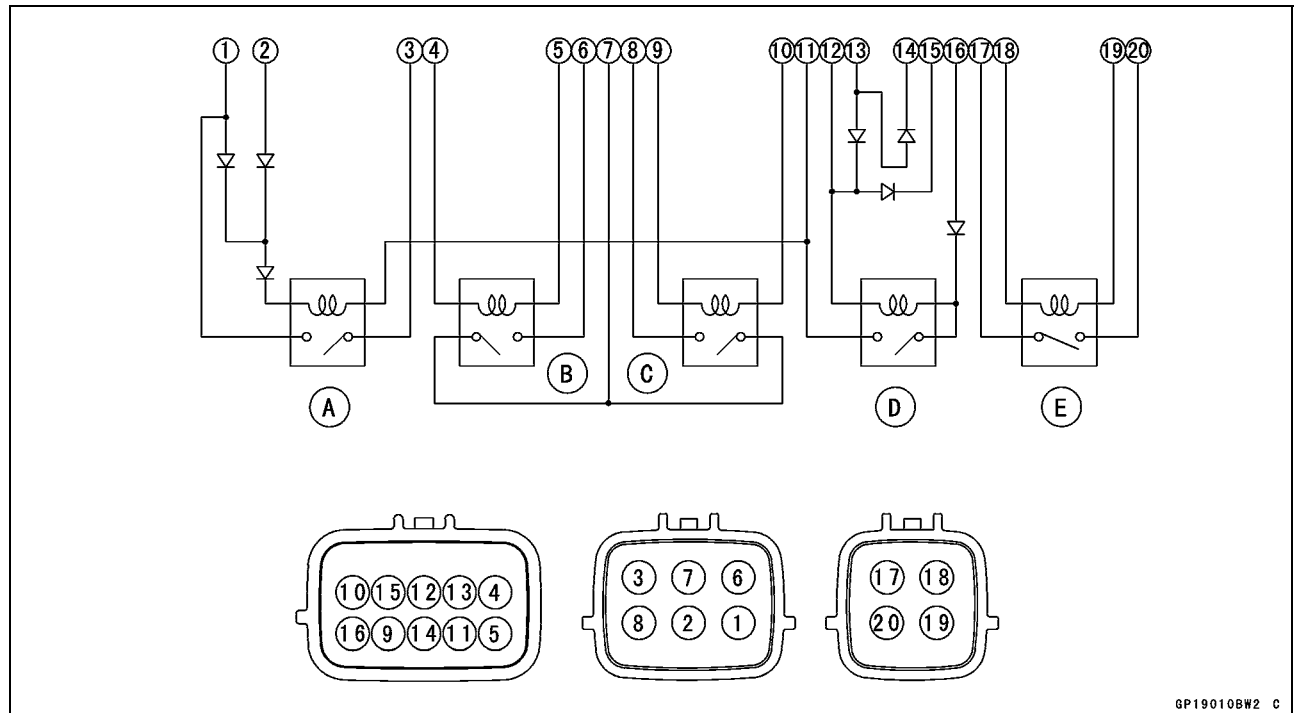
Tester Connection	1-11, 2-11, 12-13, 12-15, 12-16, 13-14, 13-15
-------------------	---

- ★ The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

NOTE

- The actual meter reading varies with the meter or tester used and the individual diodes, but generally speaking, the lower reading should be from zero to one half the scale.

Relay Box Internal Circuit



GP19010BW2 C

- A: Headlight Circuit Relay
- B: ECU Main Relay
- C: Fuel Pump Relay
- D: Starter Circuit Relay
- E: Fan Relay

16-98 ELECTRICAL SYSTEM

Fuse

30 A Main Fuse Removal

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the connector [A].

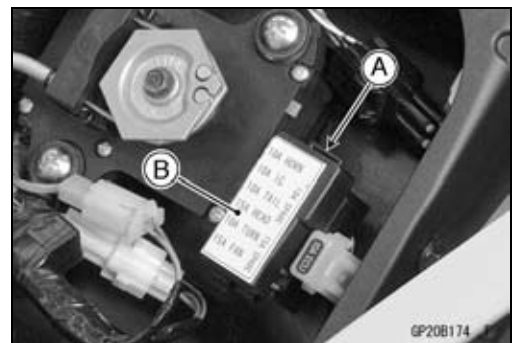


- Pull out the main fuse [A] from the starter relay with needle nose pliers.

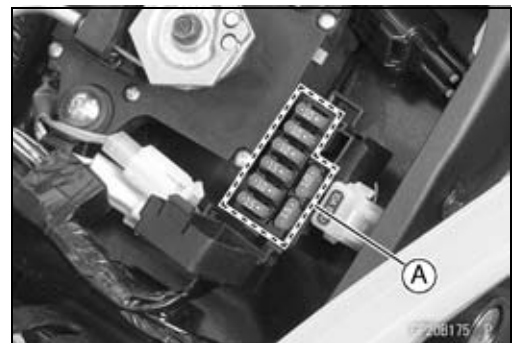


Fuse Box Fuse Removal

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Unlock the hook [A] to lift up the lid [B].

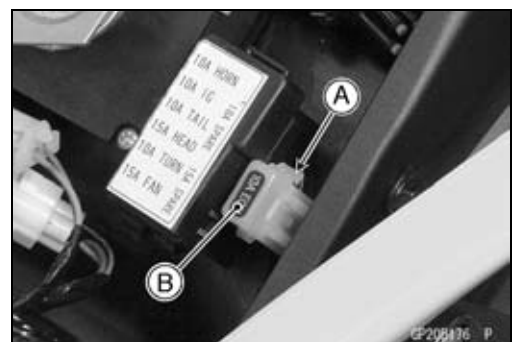


- Pull the fuses [A] straight out of the fuse box with needle nose pliers.



10 A ECU Fuse Removal

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Unlock the hook [A] to lift up the lid [B].



Fuse

- Pull the ECU fuse [A] straight out of the fuse box with needle nose pliers.

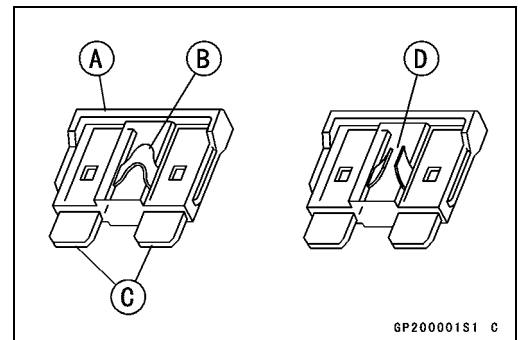


Fuse Installation

- ★ If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.
- Install the fuse box fuses on the original position as specified on the lid.

Fuse Inspection

- Remove the fuse (see 30 A Main/Fuse Box/10 A ECU Fuse Removal).
- Inspect the fuse element.
- ★ If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.
 - Housing [A]
 - Fuse Element [B]
 - Terminals [C]
 - Blown Element [D]



CAUTION

When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.

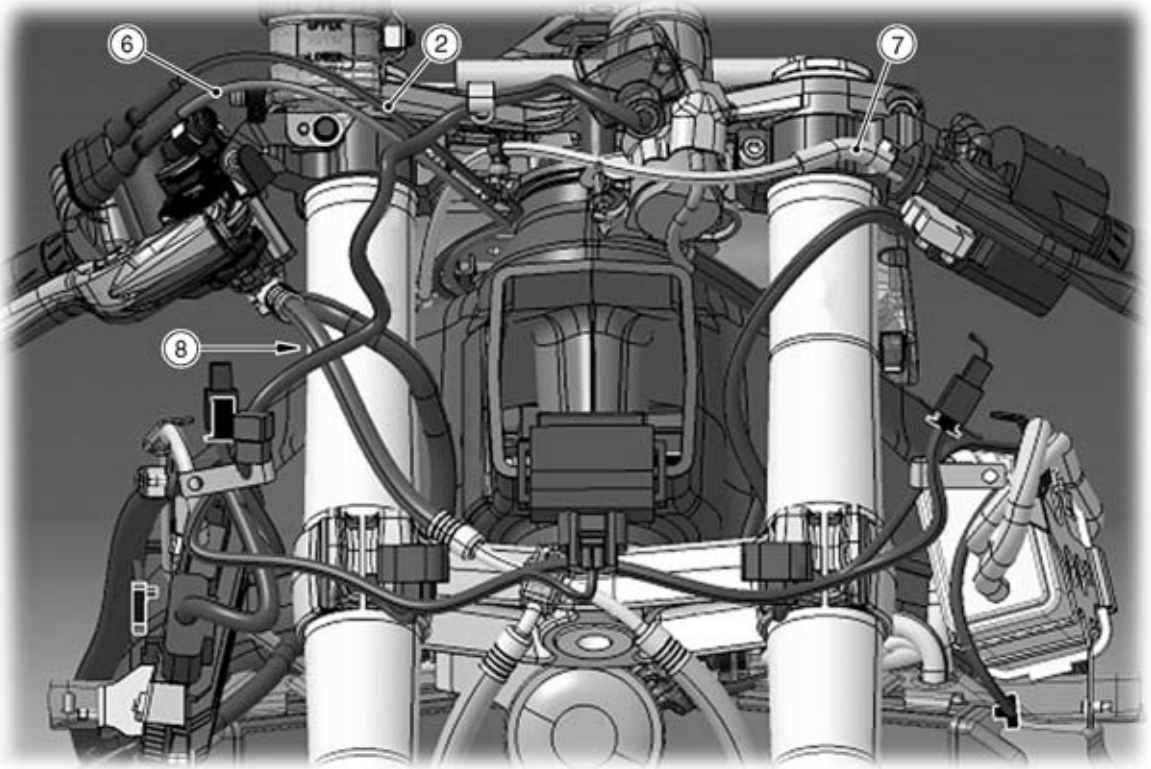
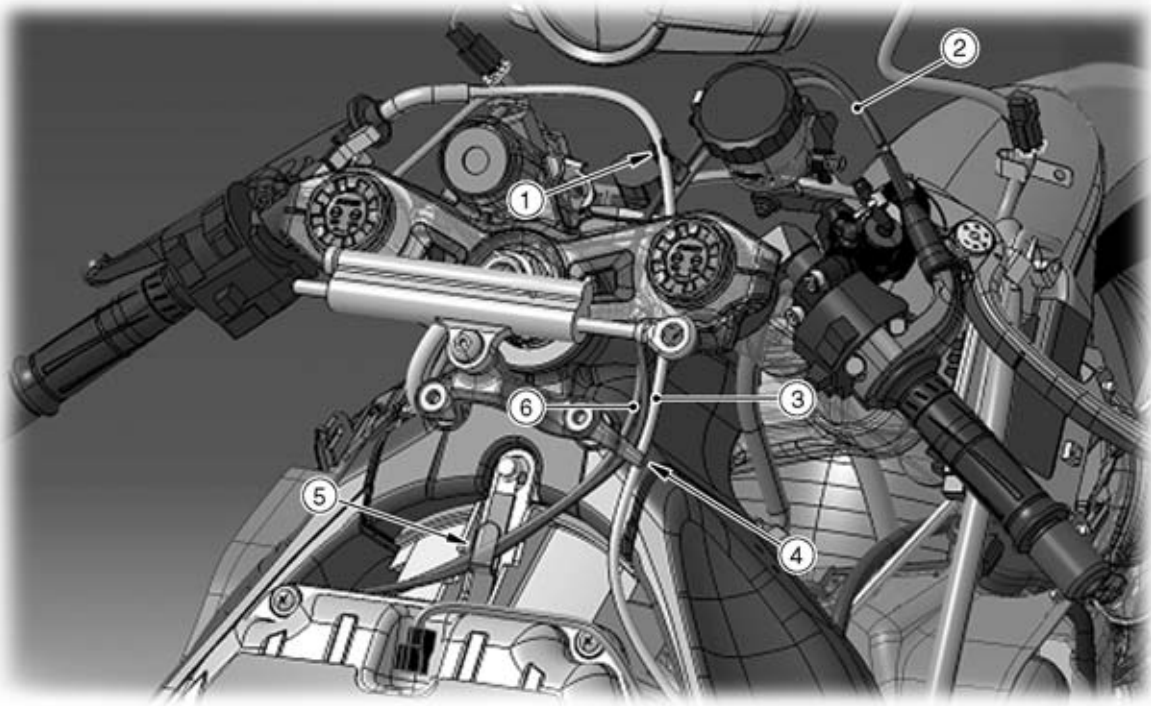
Appendix

Table of Contents

Cable, Wire, and Hose Routing.....	17-2
Troubleshooting Guide	17-48

17-2 APPENDIX

Cable, Wire, and Hose Routing

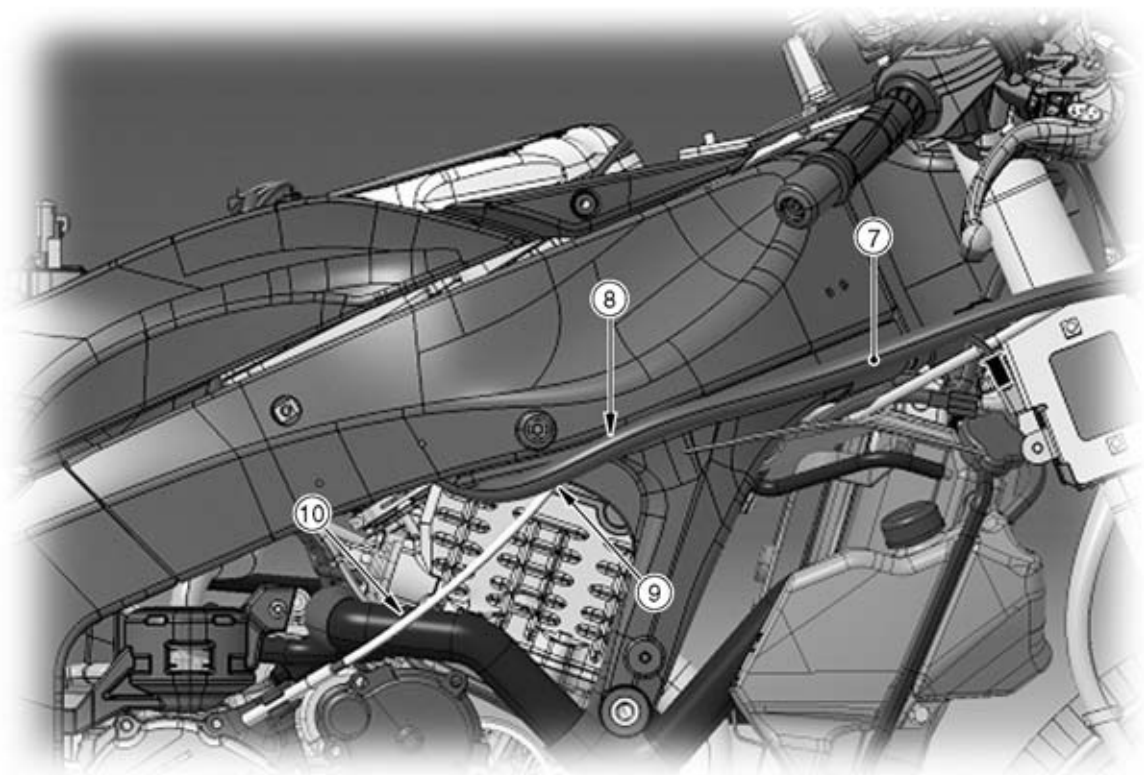
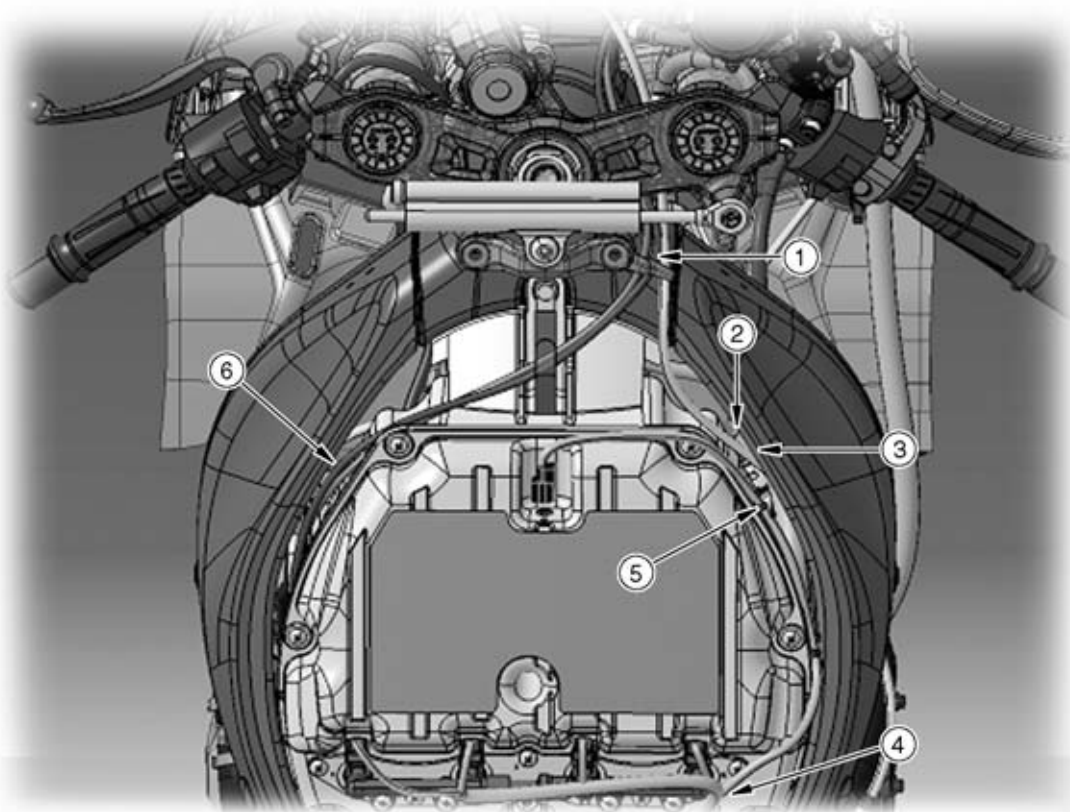


Cable, Wire, and Hose Routing

1. Attach the clamp on each marking of the clutch cable and throttle cable (accelerator) with the clutch cable positioned on the upper side.
 - Clamp (Larger Diameter) → Clutch Cable
 - Clamp (Smaller Diameter) → Throttle Cable (Accelerator)
2. Throttle Cable (Accelerator)
3. Clutch Cable
4. Run the throttle cable (accelerator, left), throttle cable (decelerator, middle) and clutch cable (right) to the inside of the bracket.
5. Hold the throttle cables.
6. Throttle Cable (Decelerator)
7. Run the clutch cable to the outside of the left front fork.
8. Run the brake hose to the inside of the meter unit lead.

17-4 APPENDIX

Cable, Wire, and Hose Routing

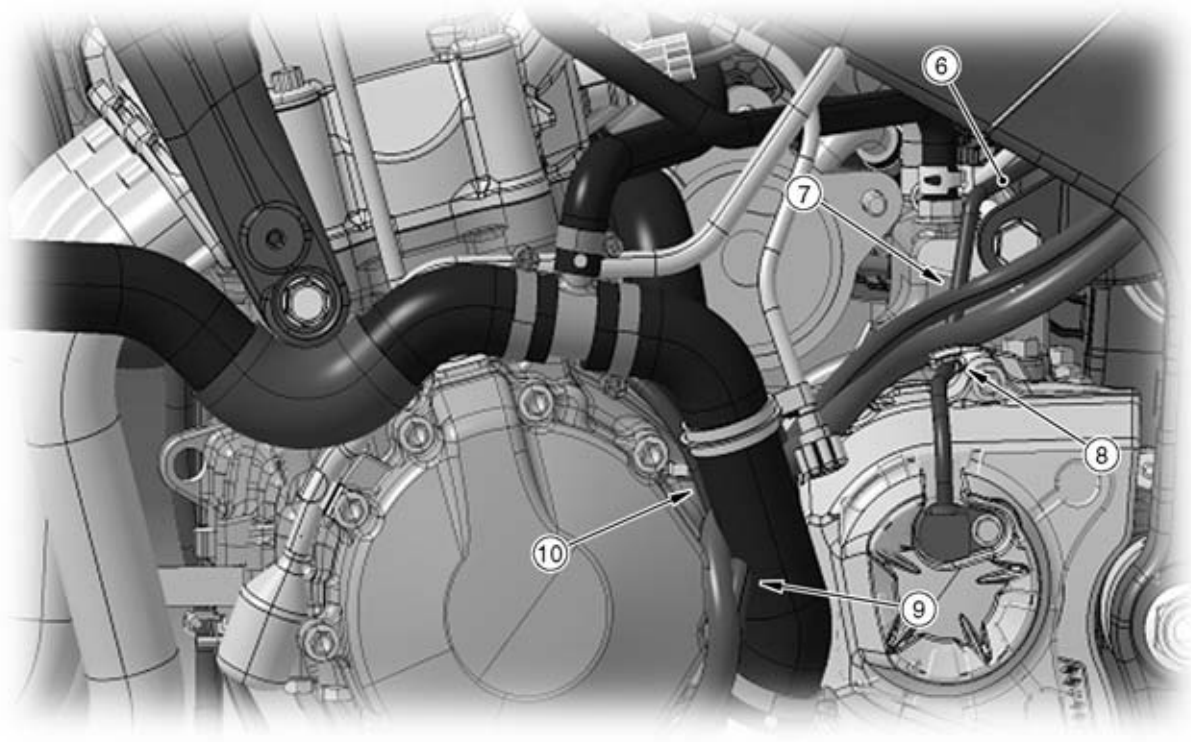
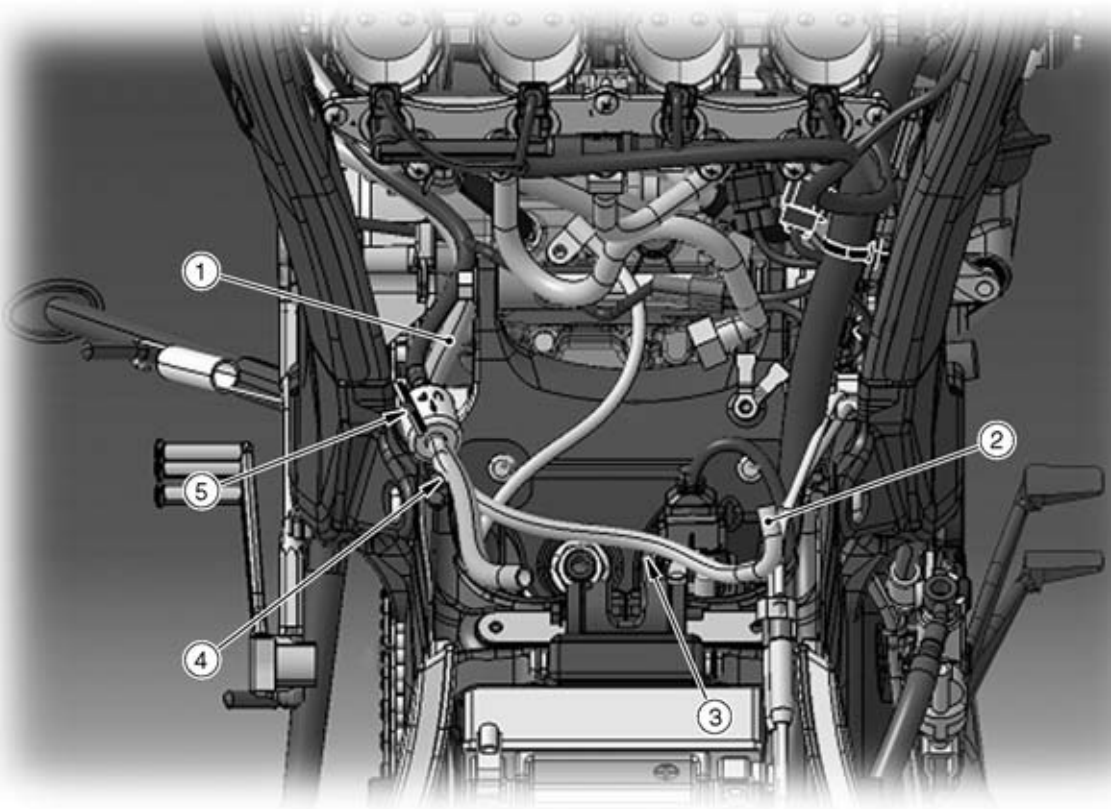


Cable, Wire, and Hose Routing

1. Be careful not to press the throttle cables by the fuel tank.
2. Run the clutch cable near the engine side.
3. Run the clutch cable under the inlet air temperature sensor lead.
4. Run the secondary injector lead to the inside of the air cleaner housing guide.
5. Hold the inlet air temperature sensor lead.
6. Run the throttle cables between the frame and air cleaner housing.
7. Main Harness
8. Run the main harness as shown in the figure.
9. Run the clutch cable to the inside of the main harness.
10. Run the clutch cable to the outside of the water hose.

17-6 APPENDIX

Cable, Wire, and Hose Routing

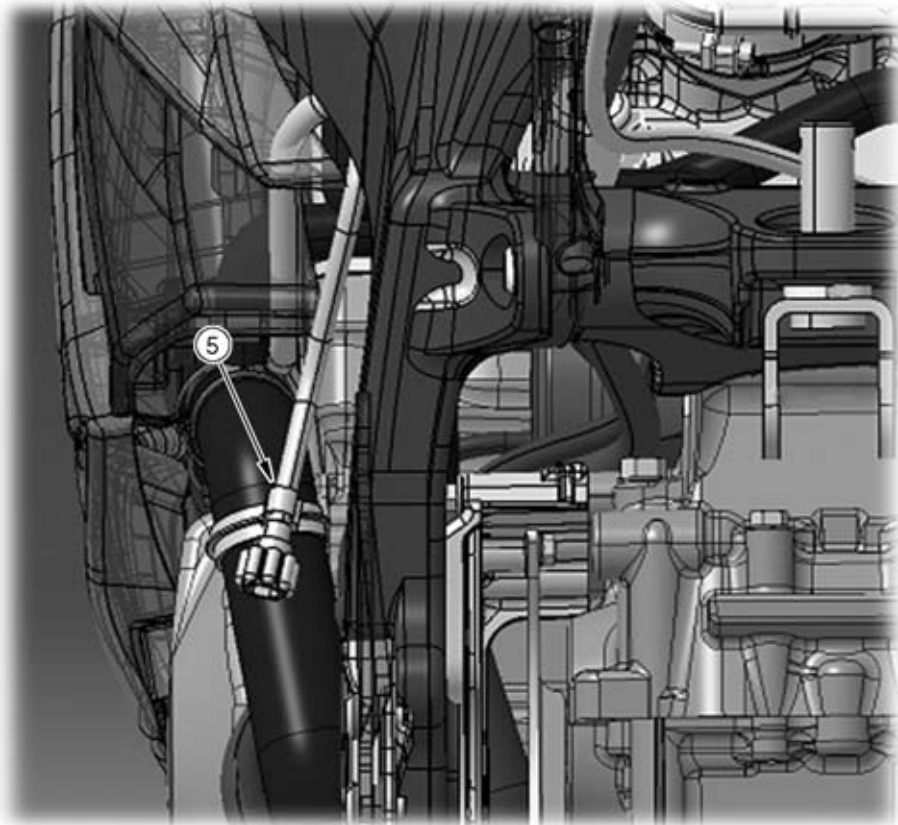
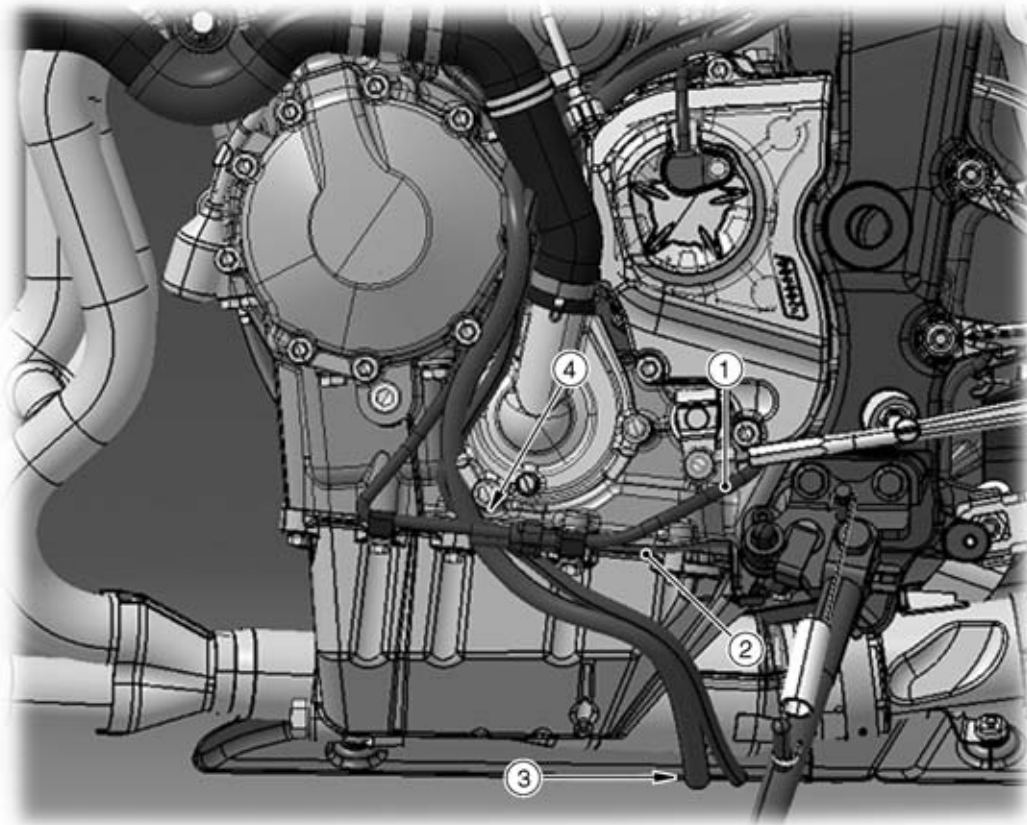


Cable, Wire, and Hose Routing

1. Fuel Tank Drain Hose
2. Run the fuel tank breather hose as shown in the figure.
3. Run the fuel tank breather hose over the gear position switch lead and fuel pump lead.
4. Run the fuel tank drain hose and fuel tank breather hose over the battery negative (-) cable.
5. Put the breather tank as shown in the figure.
6. Speed Sensor Lead
7. Run the fuel tank drain hose and fuel tank breather hose over the speed sensor lead.
8. Run the speed sensor lead to the hook of the engine sprocket cover.
9. Run the fuel tank drain hose and fuel tank breather hose to the inside of the water hose.
10. Run the gear position switch lead to the inside of the fuel tank drain hose and fuel tank breather hose.

17-8 APPENDIX

Cable, Wire, and Hose Routing

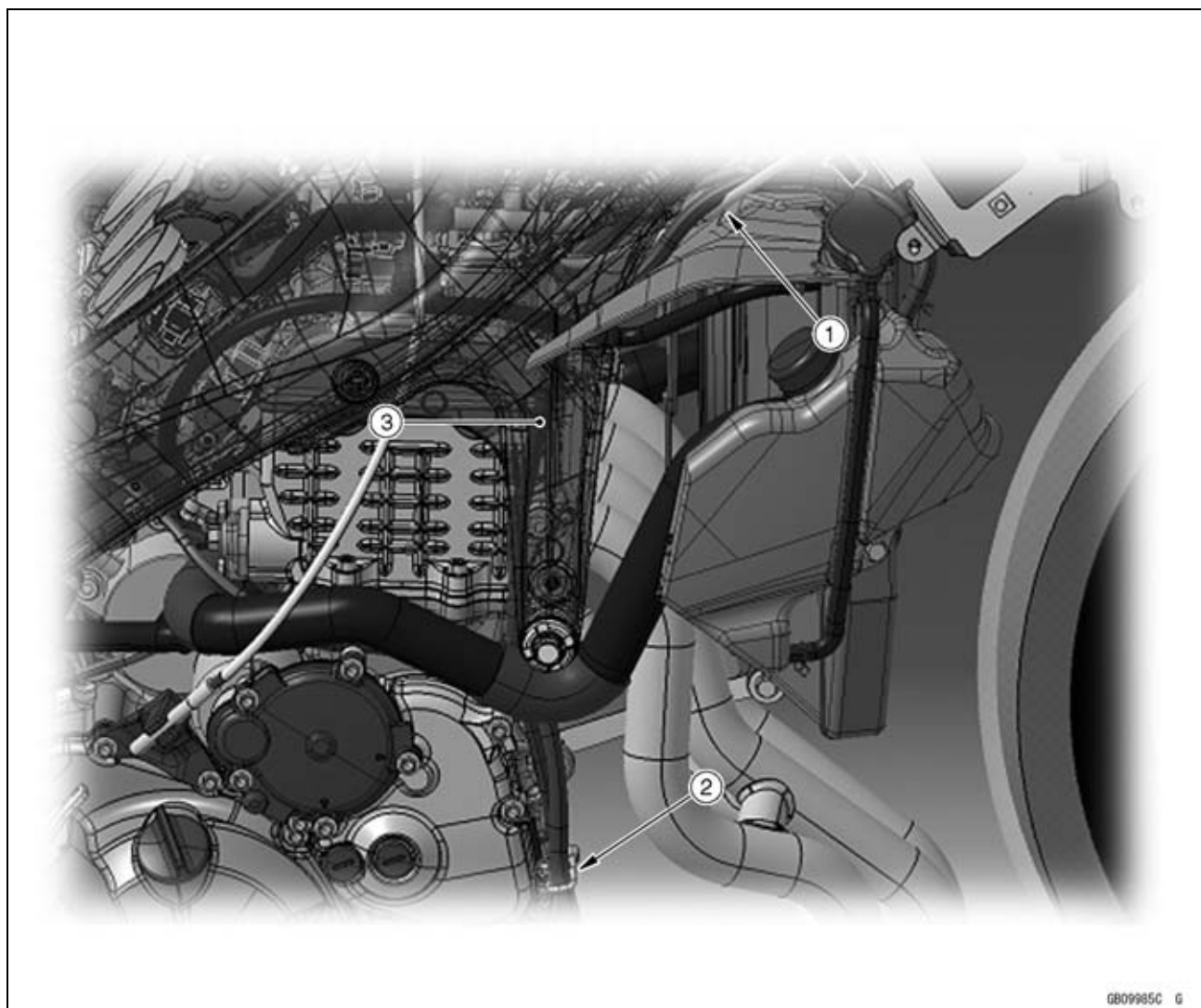


Cable, Wire, and Hose Routing

1. Gear Position Switch Lead
2. Sidestand Switch Lead
3. Make sure that each end of the fuel tank drain hose and fuel tank breather hose is out of the lower fairing. Keep each hose end away from the exhaust pipe.
4. Run the fuel tank drain hose and fuel tank breather hose to the inside of the gear position switch lead.
5. Hold the idle adjusting screw cable on the water hose.

17-10 APPENDIX

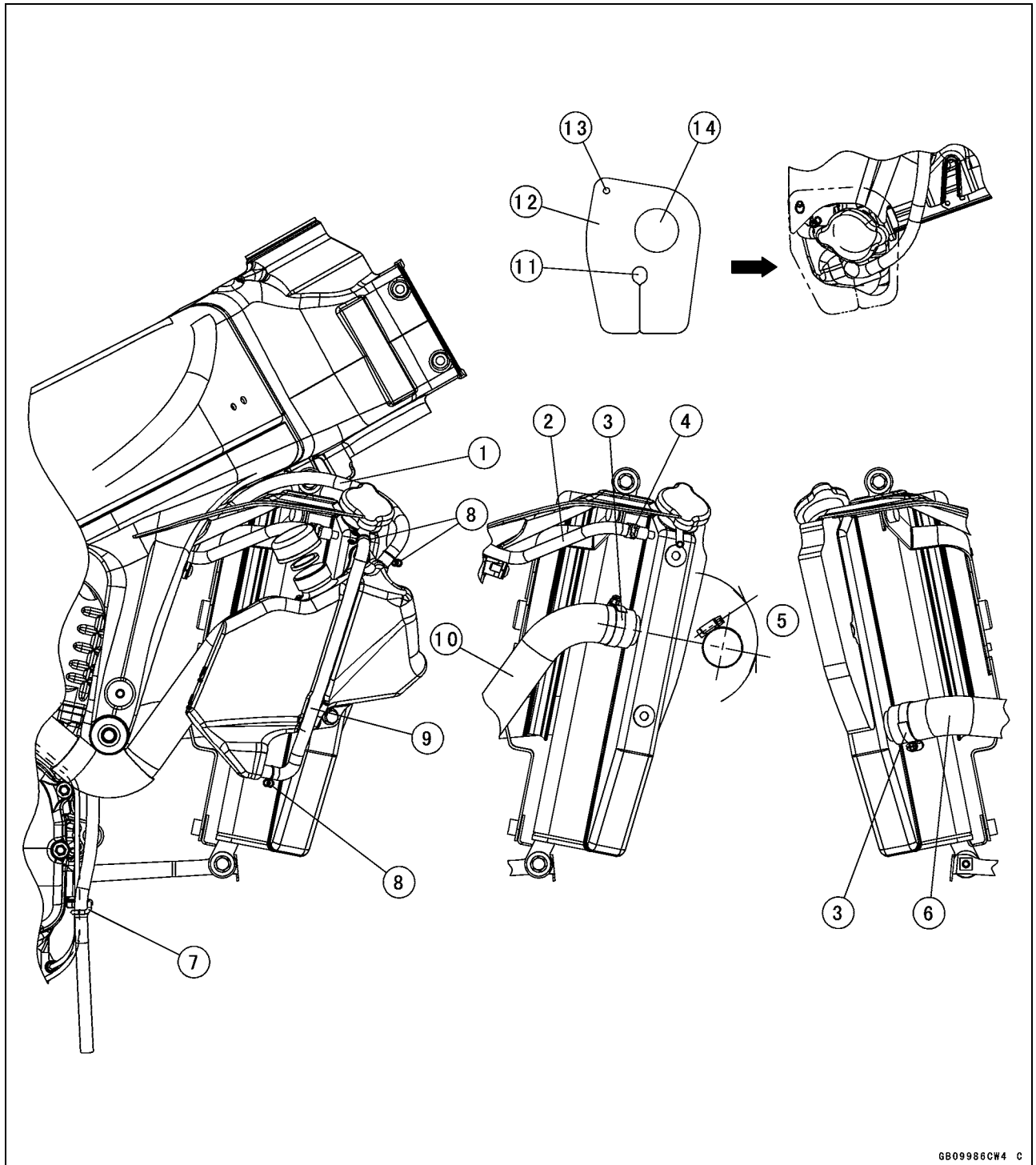
Cable, Wire, and Hose Routing



GB09985C G

1. Run the reserve tank overflow hose under the alternator lead.
2. Run the reserve tank overflow hose into the clamp.
3. Run the reserve tank overflow hose to the inside of the frame.

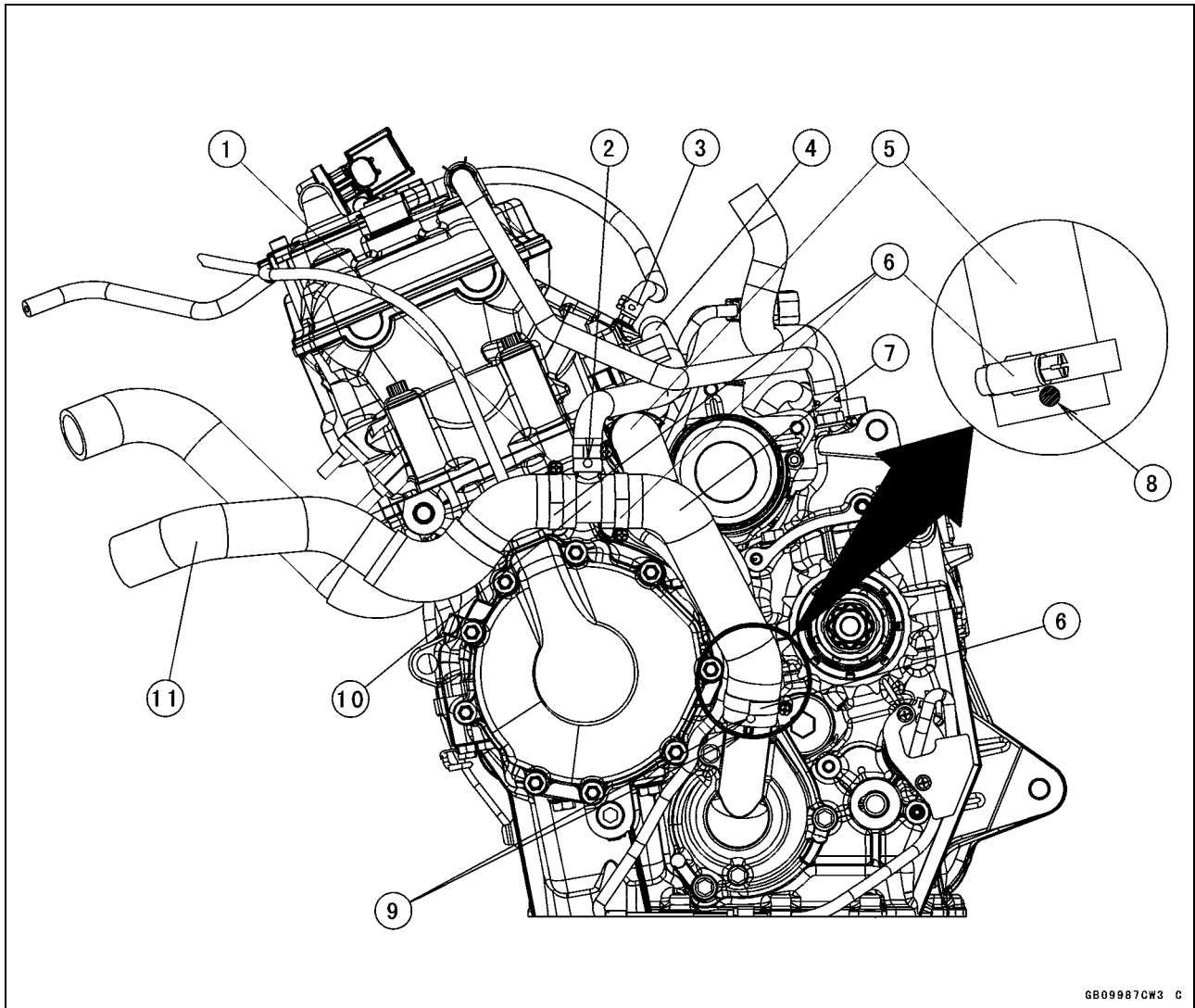
Cable, Wire, and Hose Routing



1. Reserve Tank Overflow Hose
2. Air Bleeder Hose
3. Clamp
4. Clamp
5. 40° or more
6. Water Hose
7. Run the reserve tank overflow hose, oxygen sensor lead (equipped models) and oil pressure switch lead into the clamp.
8. Clamp
9. Radiator Overflow Hose
10. Water Hose
11. Run the reserve tank overflow hose into the cover.
12. Cover
13. Install the hole of the cover on the projection of the heat insulation plate.
14. Install the cover onto the radiator cap.

17-12 APPENDIX

Cable, Wire, and Hose Routing

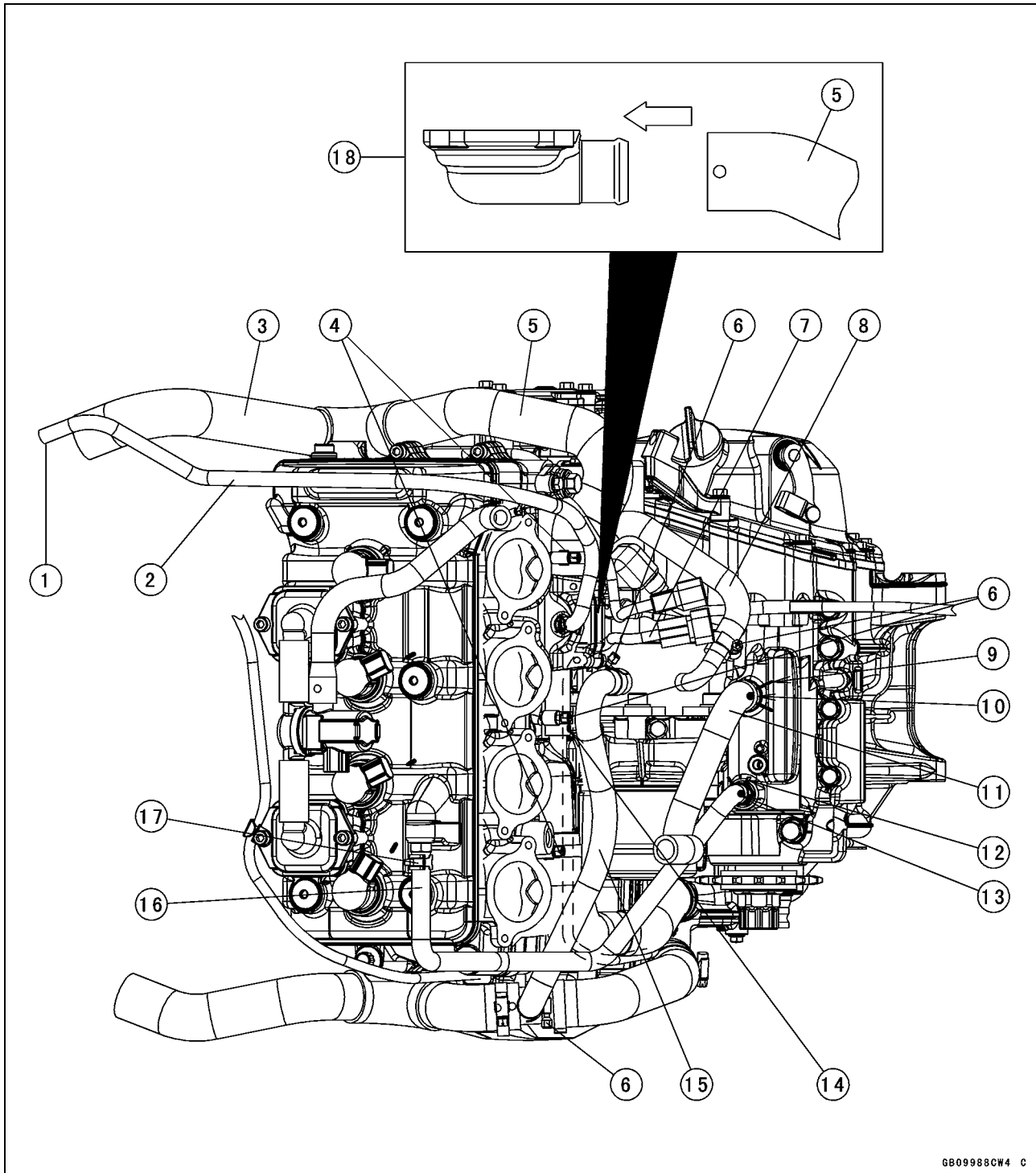


Cable, Wire, and Hose Routing

1. Install the water hose so that white paint mark faces left side.
2. Install the water hose so that white paint mark faces left side.
3. Install the clamp as shown in the figure.
4. Install the outlet hose as shown in the figure.
5. Water Hose
6. Install the clamp as shown in the figure.
7. Install the water hose as shown in the figure.
8. Install the water hose so that white paint mark faces left side.
9. Align the white paint mark of the water hose with the projection on the water pump cover.
10. Install the water pipe as shown in the figure.
11. Install the water hose as shown in the figure.

17-14 APPENDIX

Cable, Wire, and Hose Routing

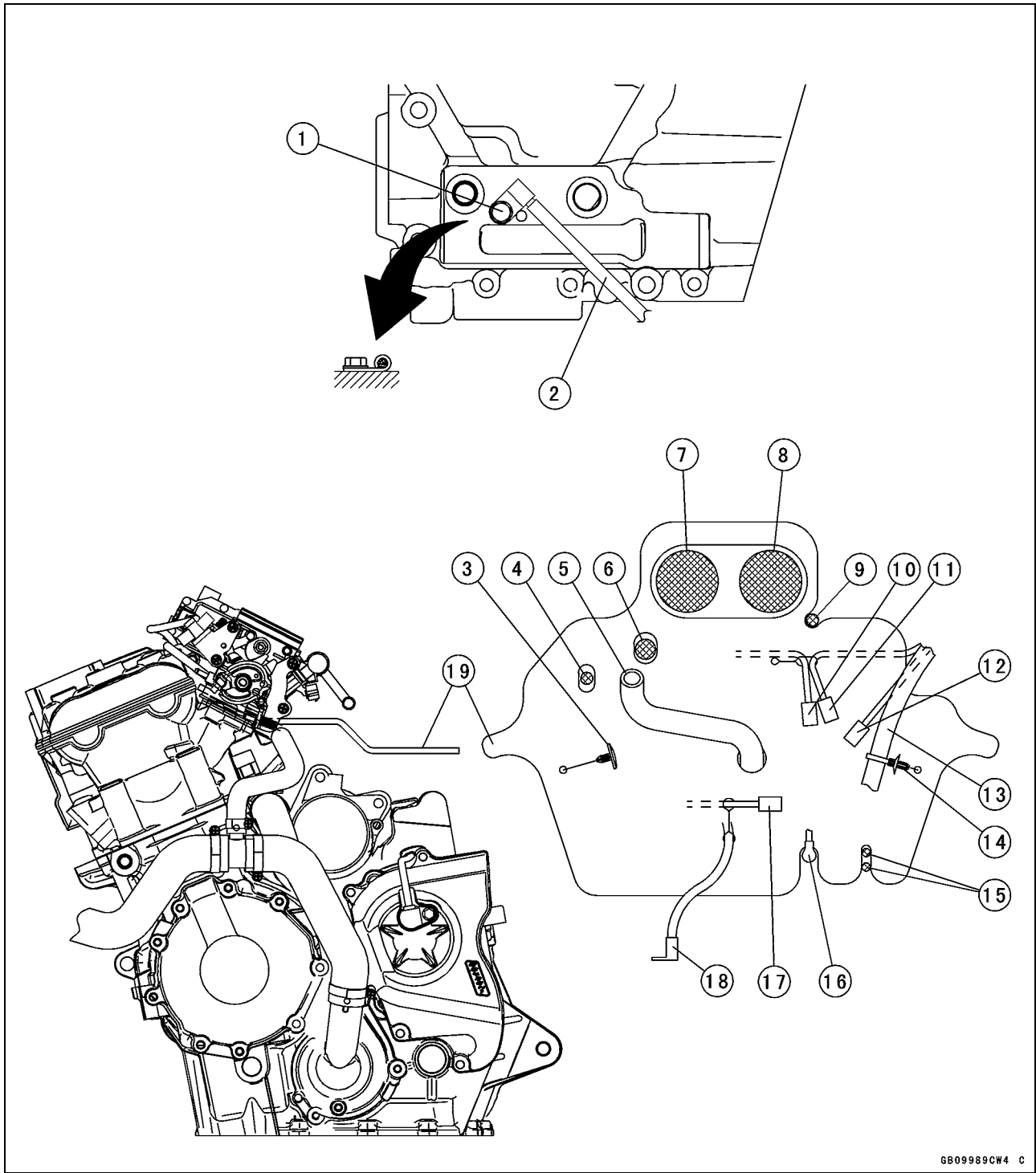


Cable, Wire, and Hose Routing

1. Air Bleeder Hose (Straight Side)
2. Install the air bleeder hose as shown in the figure.
3. Install the water hose as shown in the figure.
4. Install the clamp as shown in the figure.
5. Water Hose
6. Install the clamp as shown in the figure.
7. Run the gear position switch lead to the right side of the outlet hose.
8. Install the inlet hose as shown in the figure.
9. Install the clamp as shown in the figure.
10. Install the breather hose so that white paint mark on the hose faces the rear side of the engine.
11. Install the breather hose as shown in the figure.
12. Install the clamp as shown in the figure.
13. Install the breather hose so that white paint mark on the hose faces the rear side of the engine.
14. Install the water hose to the fitting so that the white paint mark on the hose aligns with the center of the fitting matching surface.
15. Outlet Hose
16. Install the breather hose as shown in the figure.
17. Install the clamp as shown in the figure.
18. Install the water hose to the fitting so that the white paint mark on the hose aligns with the center of the fitting matching surface.

17-16 APPENDIX

Cable, Wire, and Hose Routing

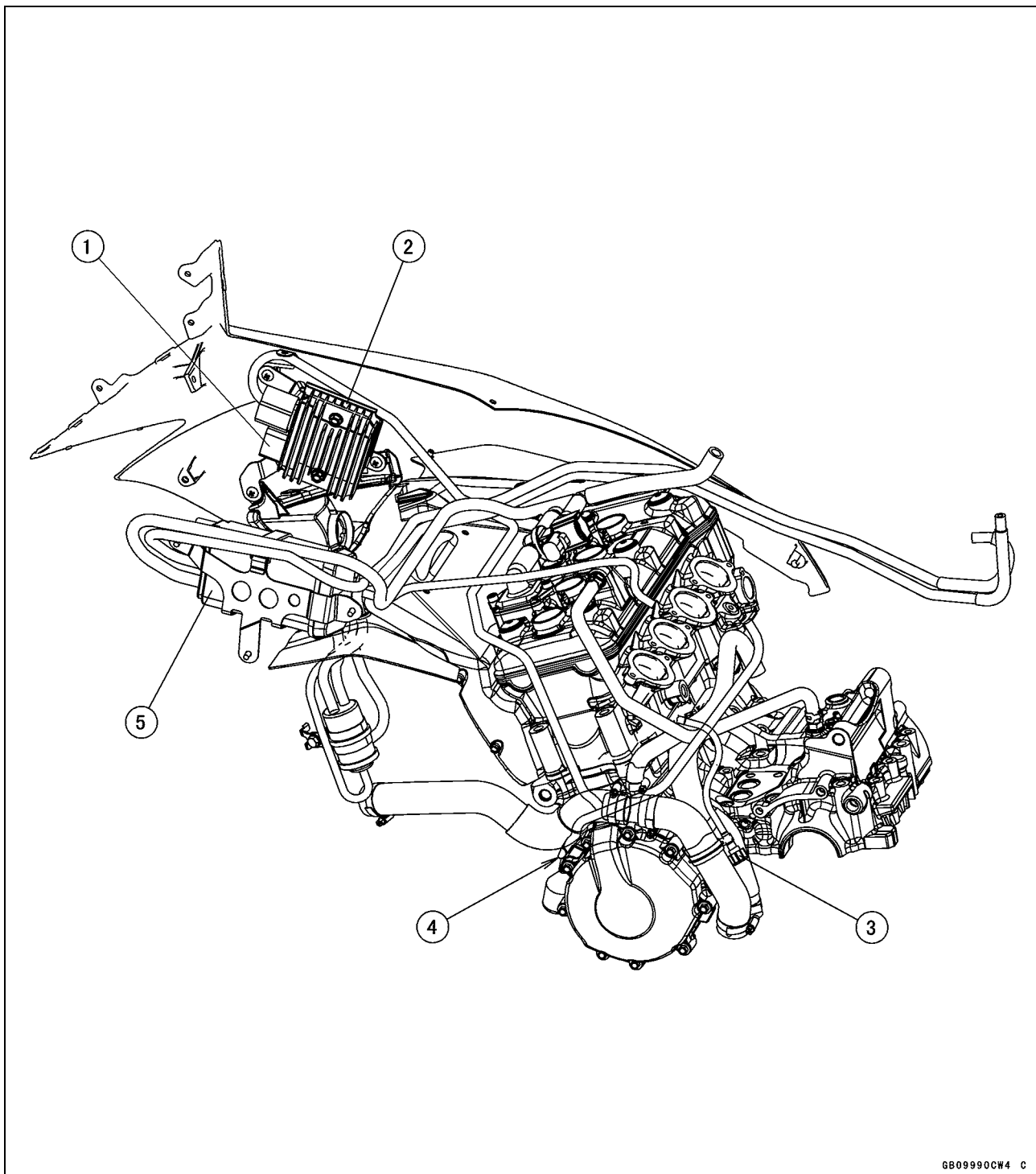


Cable, Wire, and Hose Routing

1. Install the engine ground terminal so that it touches to the stopper.
2. Install the engine ground cable as shown in the figure.
3. Rivet (Fix the heat insulation rubber plate to the frame.)
4. Air Cleaner Drain Hose
5. Breather Hose
6. Water Temperature Sensor Lead
7. Throttle Body Assy #2
8. Throttle Body Assy #3
9. Air Bleeder Hose
10. Gear Position Switch Lead Connector
11. Crankshaft Sensor Lead Connector
12. Oxygen Sensor Lead Connector (Equipped Models)
13. Main Harness
14. Hold the main harness and fix the heat insulation rubber plate to the frame.
15. Exhaust Butterfly Valve Cables
16. Frame Ground
17. Speed Sensor Lead Connector
18. Battery Negative (-) Cable
19. Heat Insulation Rubber Plate

17-18 APPENDIX

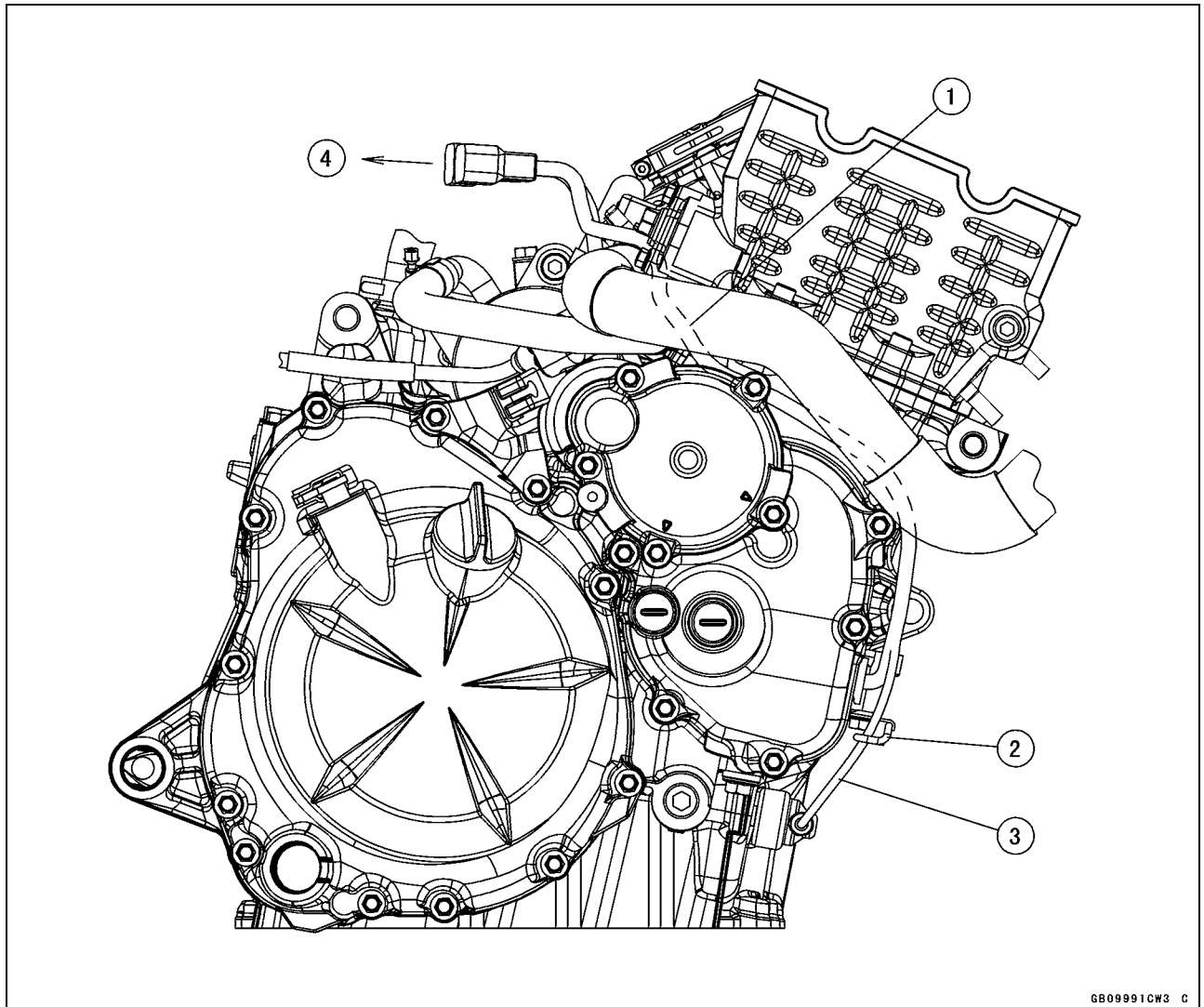
Cable, Wire, and Hose Routing



6B09990CW4 C

1. Main Harness Side
2. Regulator/Rectifier
3. Hold the idle adjusting screw cable end.
4. Hold the air cleaner drain hose.
5. Canister (California, Southeast Asia and Thailand Models)

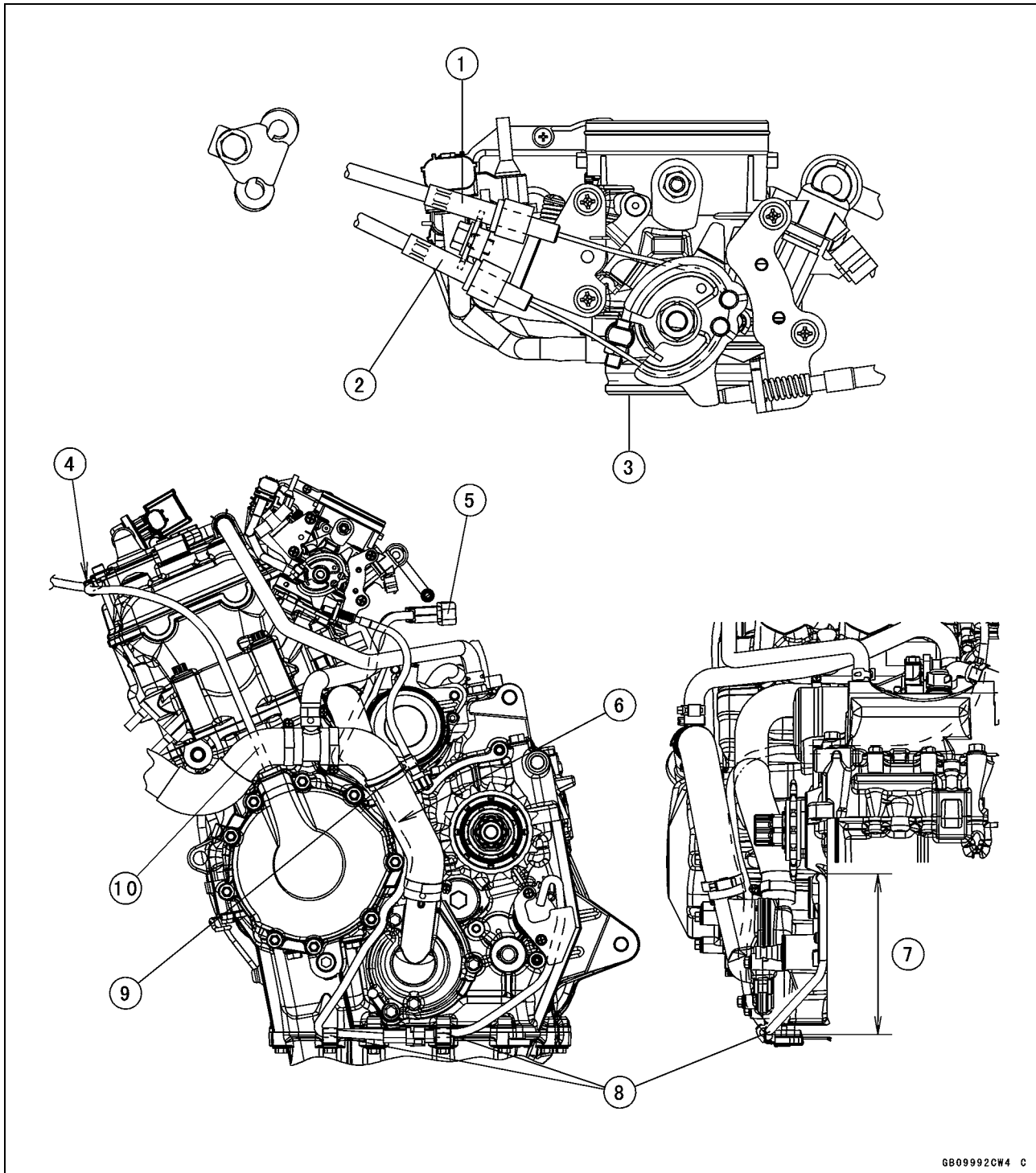
Cable, Wire, and Hose Routing



1. Run the oil pressure switch lead/crankshaft sensor lead to the inside of the water hose.
2. Run the oil pressure switch lead/crankshaft sensor lead into the clamp.
3. Oil Pressure Switch Lead/Crankshaft Sensor Lead
4. To Heat Insulation Rubber Plate

17-20 APPENDIX

Cable, Wire, and Hose Routing

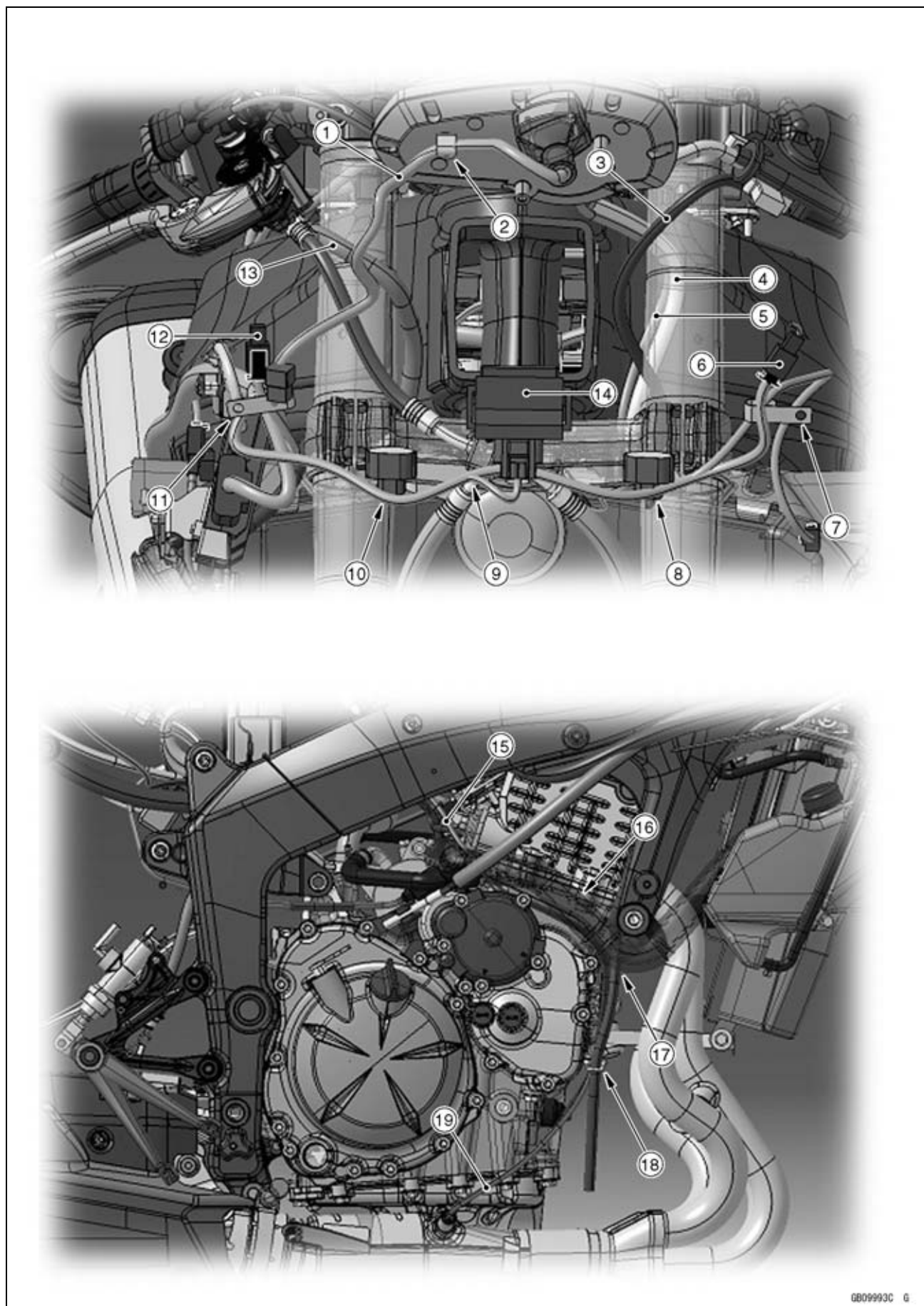


Cable, Wire, and Hose Routing

1. Throttle Cable (Decelerator)
2. Throttle Cable (Accelerator)
3. Throttle Body Assy
4. Hold the alternator lead.
5. Run the gear position switch lead to the right side of the outlet hose.
6. Run the gear position switch lead between the water hoses.
7. Do not slack the gear position sensor lead in this position.
8. Hold the gear position switch lead.
9. Hold the idle adjusting screw cable end.
10. Run the alternator lead under the water hose.

17-22 APPENDIX

Cable, Wire, and Hose Routing

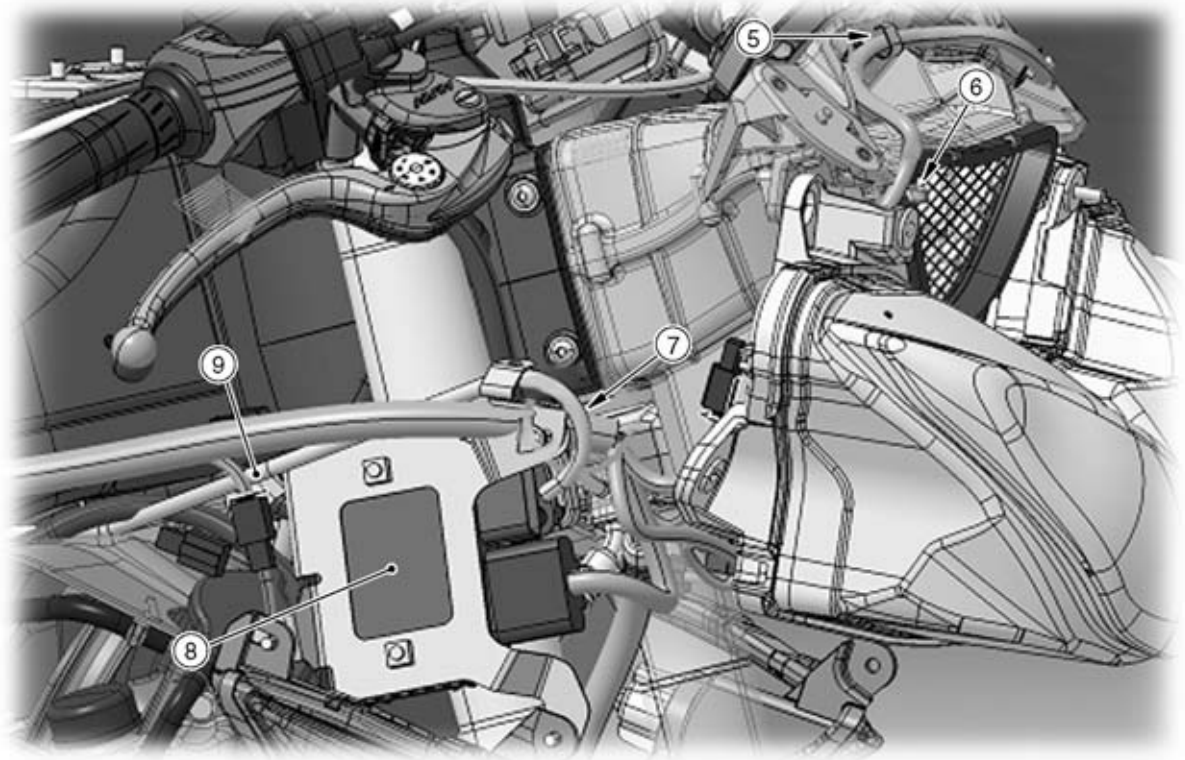
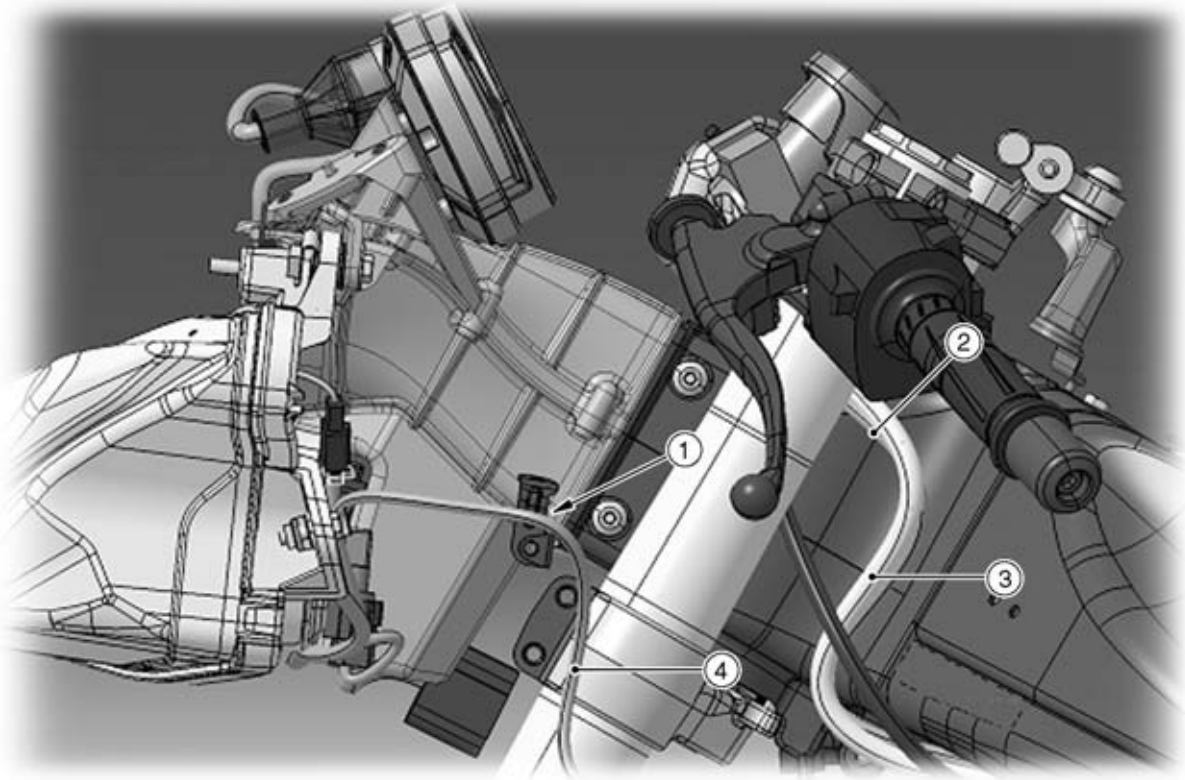


Cable, Wire, and Hose Routing

1. Meter Unit Lead
2. Hold the meter unit lead.
3. Left Switch Housing Lead
4. Ignition Switch Lead
5. Immobilizer Antenna Lead (Equipped Models)
6. Left City Light Lead Connector
7. Hold the left city light lead and front left turn signal light lead, bend the clamp faces backward (Do not fit the leads to the bolt head.).
8. Run the main harness to the front of the headlight (left side).
9. Run the main harness to the rear side of the immobilizer amplifier (equipped models), and hold the main harness to the hook of the air inlet duct.
10. Run the main harness to the front of the headlight (right side).
11. Hold the meter unit lead and right city light lead, bend the clamp faces backward (Do not fit the leads to the bolt head.).
12. Right City Light Lead Connector
13. Right Switch Housing Lead
14. Immobilizer Amplifier (Equipped Models)
15. Crankshaft Sensor Lead
16. Run the oxygen sensor lead (equipped models) and crankshaft sensor lead to the inside of the water hose.
17. Run the oxygen sensor lead (equipped models) and crankshaft sensor lead to the inside of the reserve tank overflow hose.
18. Run the reserve tank overflow hose and oxygen sensor lead (equipped models) into the clamp.
19. Oxygen Sensor Lead (Equipped Models)

17-24 APPENDIX

Cable, Wire, and Hose Routing

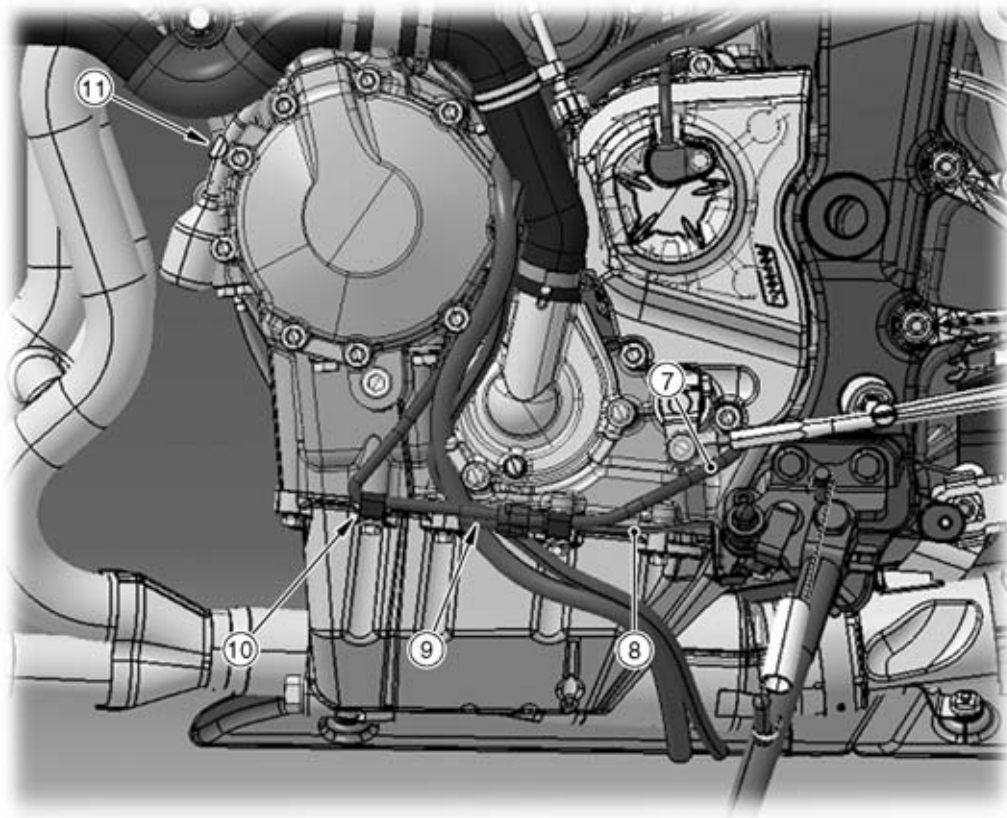
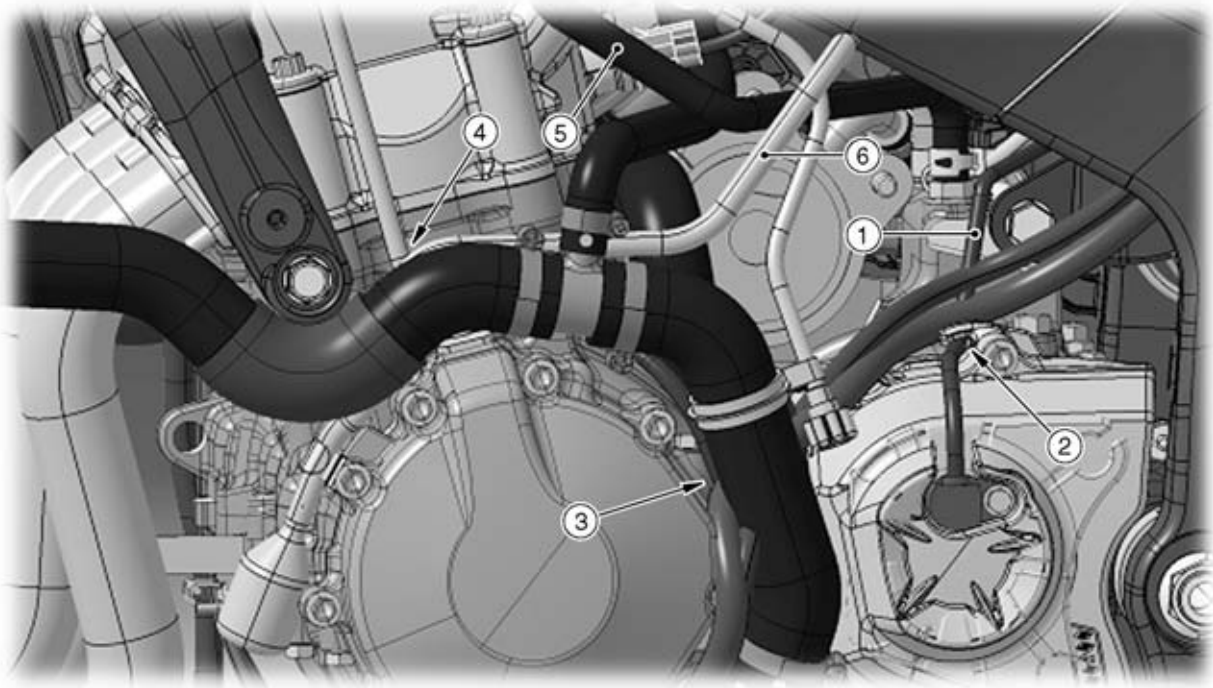


Cable, Wire, and Hose Routing

1. Hang the front left turn signal lead on the bracket.
2. Immobilizer Antenna Lead (Equipped Models)
3. Ignition Switch Lead
4. Front Left Turn Signal Light Lead
5. Hold the meter unit lead.
6. Hold the meter unit lead to the hook of the air inlet duct.
7. Run the alternator lead to the outside of the main harness.
8. Regulator/Rectifier
9. Alternator Lead

17-26 APPENDIX

Cable, Wire, and Hose Routing

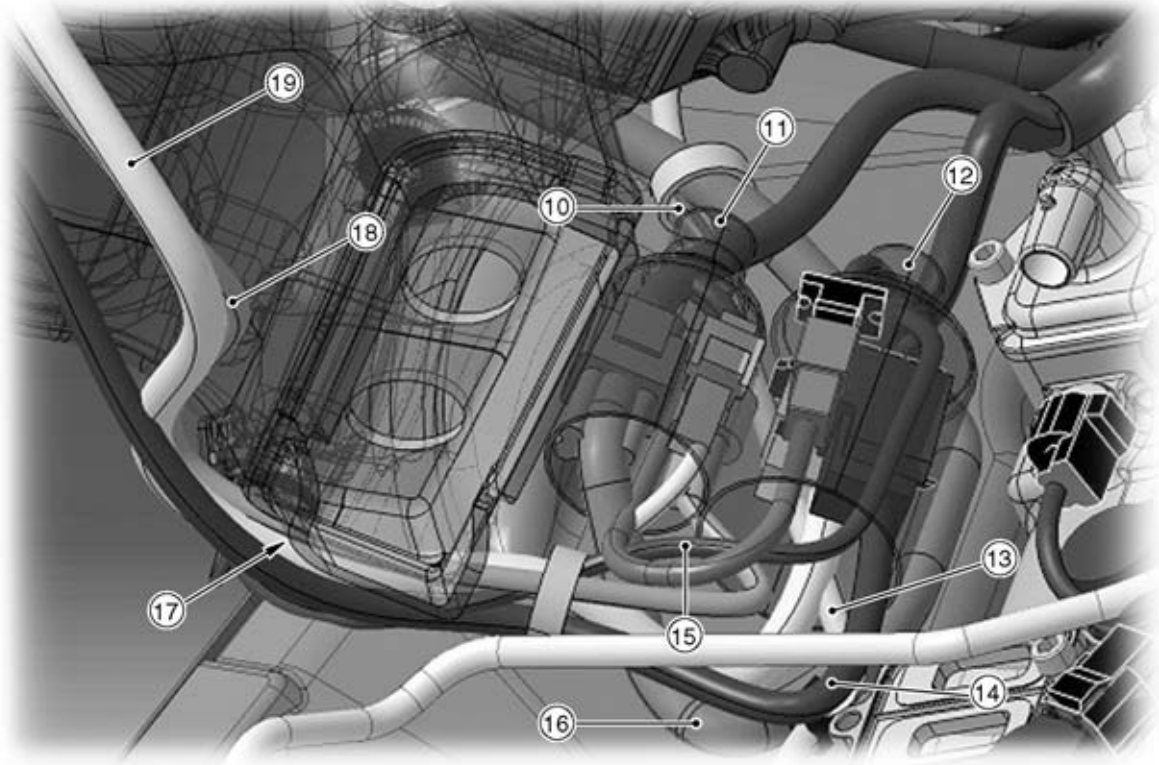
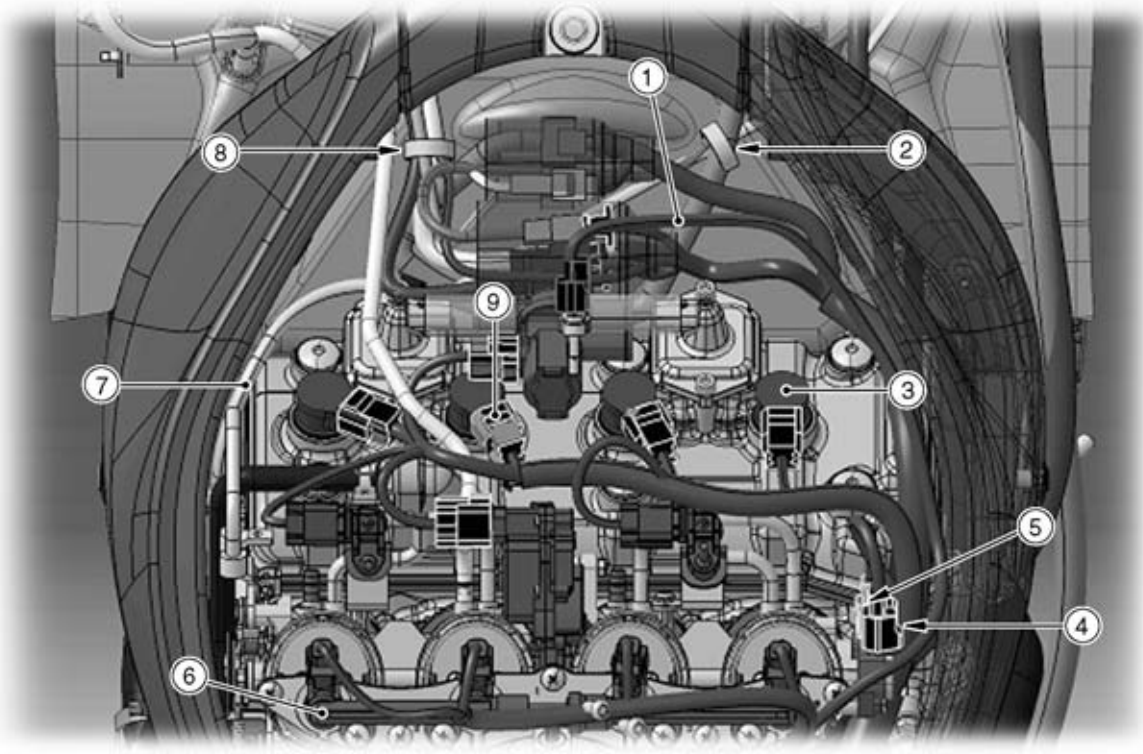


Cable, Wire, and Hose Routing

1. Speed Sensor Lead
2. Run the speed sensor lead to the hook of the engine sprocket cover.
3. Run the gear position switch lead to the inside of the fuel tank drain hose, fuel tank breather hose and water hose.
4. Run the air cleaner drain hose to the inside of the water hose, and outside of the alternator lead.
5. Breather Hose
6. Air Cleaner Drain Hose
7. Gear Position Switch Lead
8. Sidestand Switch Lead
9. Run the fuel tank drain hose and fuel tank breather hose to the inside of the gear position switch lead.
10. Hold the gear position switch lead.
11. Hold the air cleaner drain hose.

17-28 APPENDIX

Cable, Wire, and Hose Routing

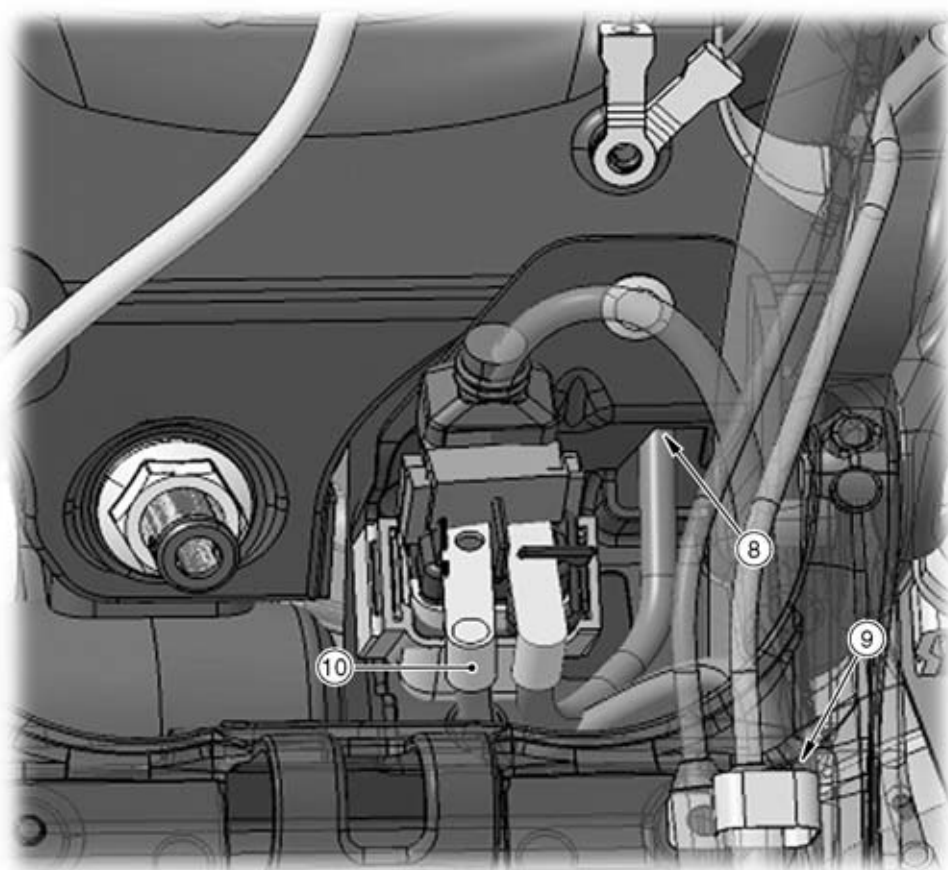
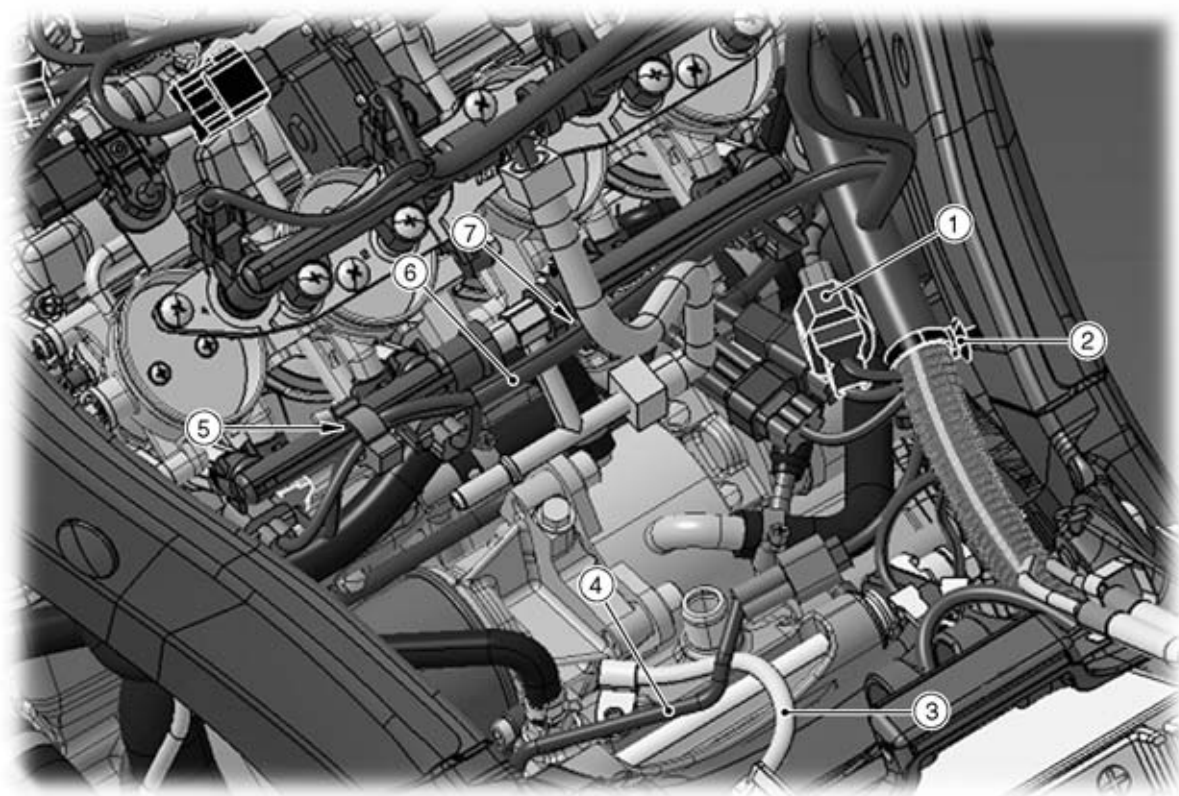


Cable, Wire, and Hose Routing

1. Inlet Air Temperature Sensor Lead
2. Hold the right switch housing lead, radiator fan motor lead and alternator lead.
3. Stick Coil
4. Subthrottle Sensor Lead Connector
5. Main Throttle Sensor Lead Connector
6. Secondary Fuel Injector
7. Alternator Lead
8. Hold the left switch housing lead, immobilizer antenna lead (equipped models), ignition switch lead and horn lead.
9. Air Switching Valve Lead Connector
10. Run the radiator fan motor lead under the small cover.
11. Small Cover (Cover the ignition switch lead, immobilizer antenna lead (equipped models) and right switch housing lead.)
12. Big Cover (Cover the radiator fan motor lead, horn lead, left switch housing lead and ignition switch lead.)
13. Run the alternator lead under the all leads and covers.
14. Left Switch Housing Lead
15. Horn Lead
16. Run the right switch housing lead under the all leads and covers (Exclude alternator lead).
17. Run the each lead to the outside of the radiator mount position.
18. Immobilizer Antenna Lead (Equipped Models)
19. Ignition Switch Lead

17-30 APPENDIX

Cable, Wire, and Hose Routing

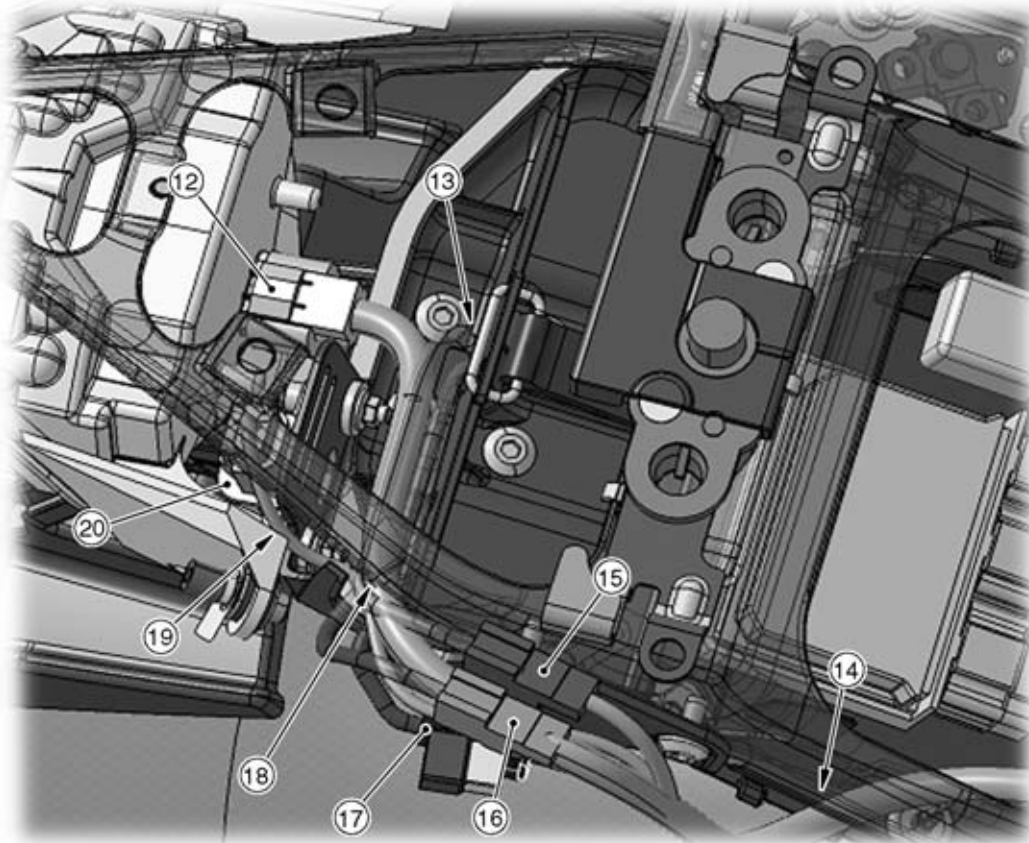
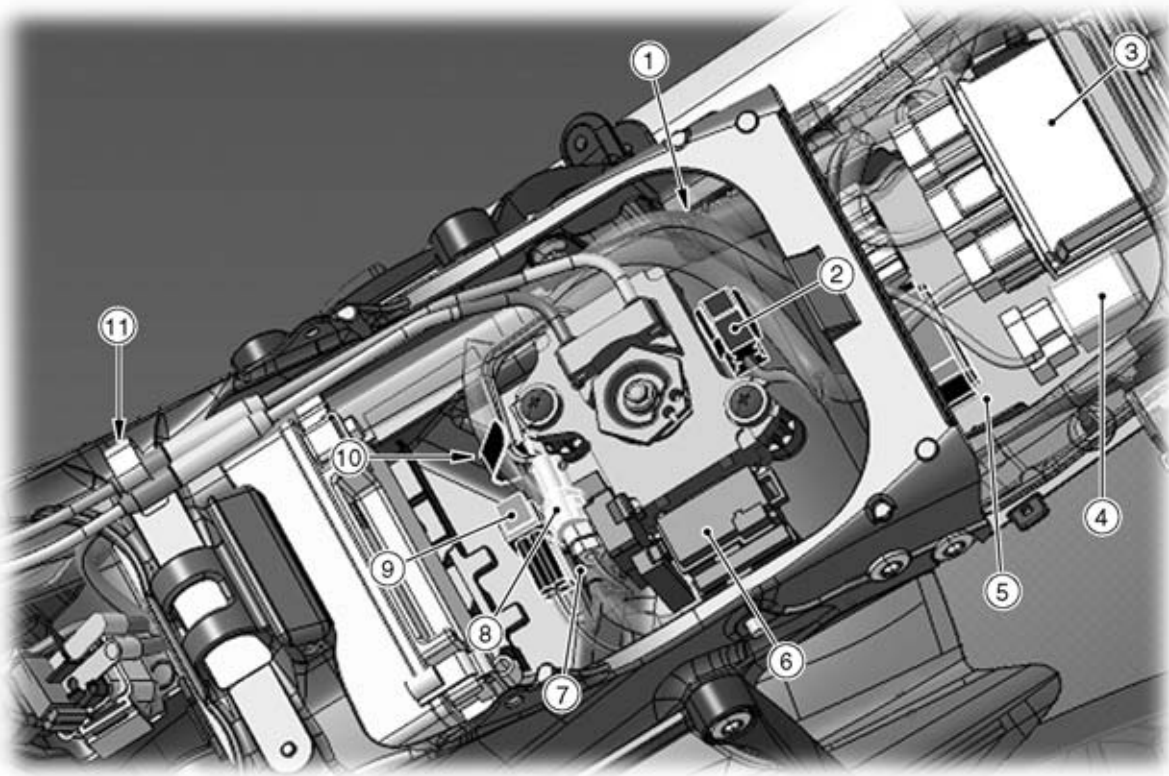


Cable, Wire, and Hose Routing

1. Oxygen Sensor Lead Connector (Equipped Models)
2. Hold the main harness and fix the clamp to the frame.
3. Battery Negative (-) Cable
4. Speed Sensor Lead
5. Hold the primary injector lead and water temperature sensor lead.
6. Fuel Injector Lead
7. Run the fuel injector lead to the front of the secondary fuel hose.
8. Run the starter motor cable into the hole.
9. Run the battery positive (+) cable behind the diverging point of the main harness.
10. Battery Positive (+) Cable

17-32 APPENDIX

Cable, Wire, and Hose Routing

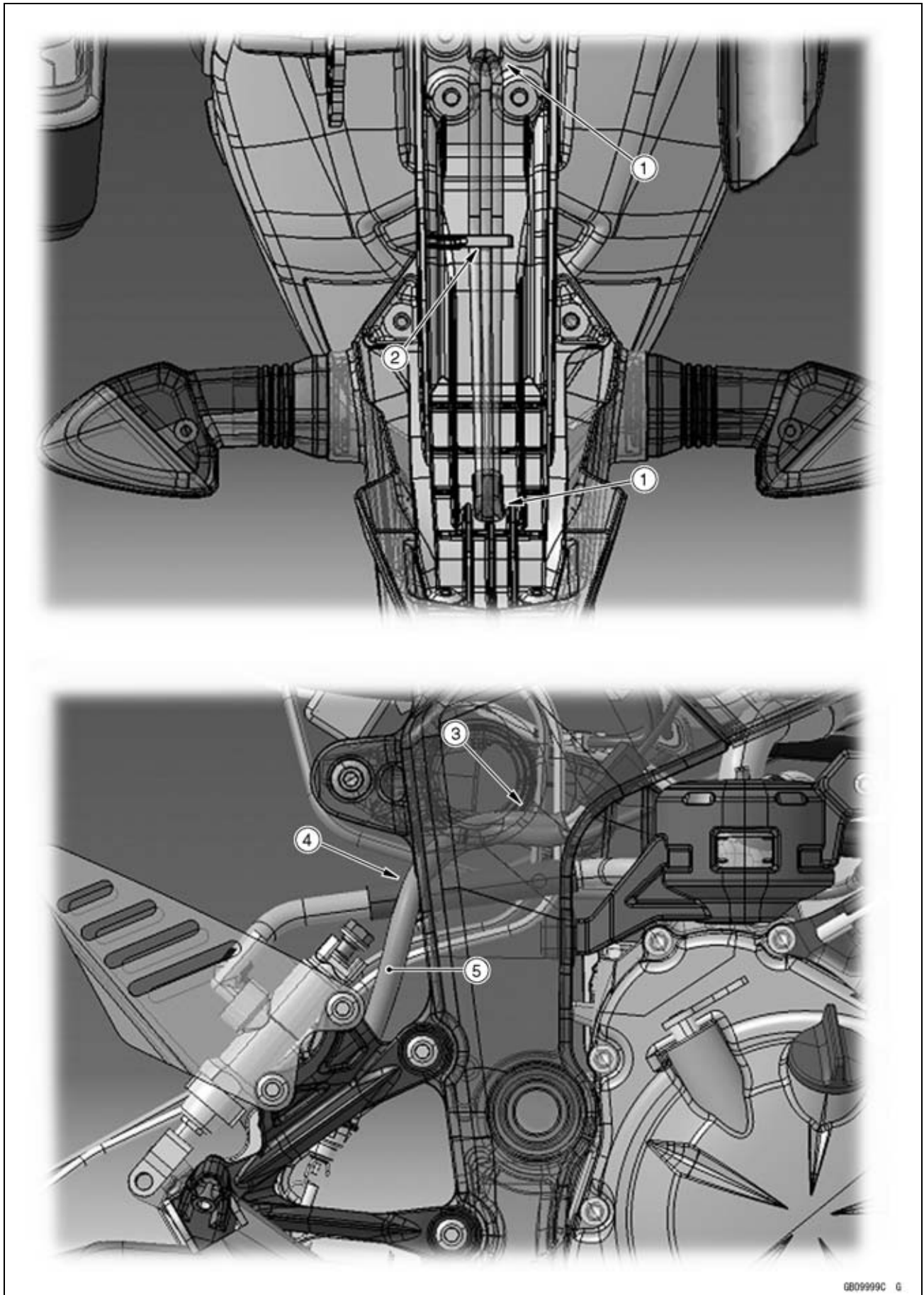


Cable, Wire, and Hose Routing

1. Run the main harness between the exhaust butterfly valve actuator and rear fender.
2. Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector
3. Relay Box
4. Turn Signal Relay
5. ECU
6. Fuse Box
7. Exhaust Butterfly Valve Actuator Lead Connector
8. Exhaust Butterfly Valve Actuator Sensor Lead Connector
9. Fuel Pump Lead Connector
10. Hold the main harness, exhaust butterfly valve actuator sensor lead and exhaust butterfly valve actuator lead.
11. Hold the exhaust butterfly valve cables and fuel pump lead.
12. Tail/Brake Light (LED) Lead Connector
13. Run the rear left and right turn signal light leads and license plate light lead into the hole.
14. Run the main harness from this position to the outside of the frame.
15. Rear Right Turn Signal Light Lead Connector
16. Rear Left Turn Signal Light Lead Connector
17. License Plate Light Lead Connector
18. Run the rear left and right turn signal light leads and license plate light lead and tail/brake light (LED) lead to the groove of the rear fender.
19. Run the vehicle-down sensor lead in this position as shown in the figure.
20. Vehicle-down Sensor

17-34 APPENDIX

Cable, Wire, and Hose Routing

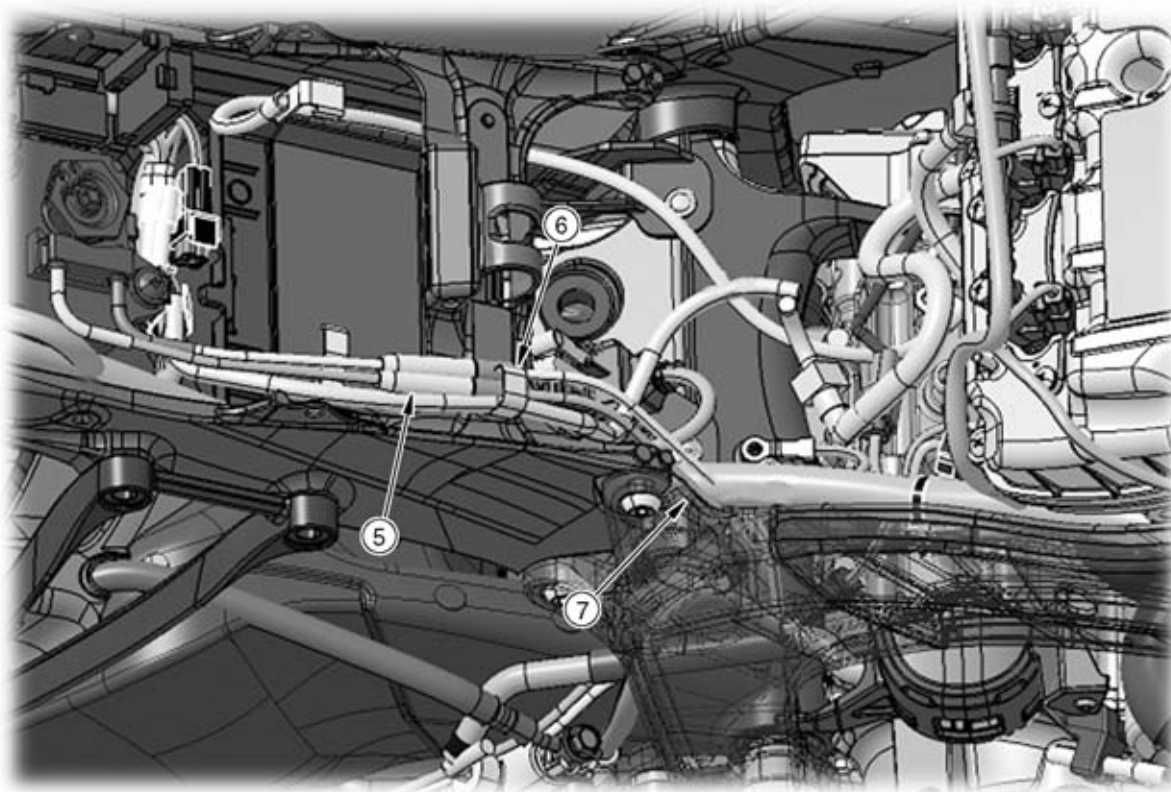
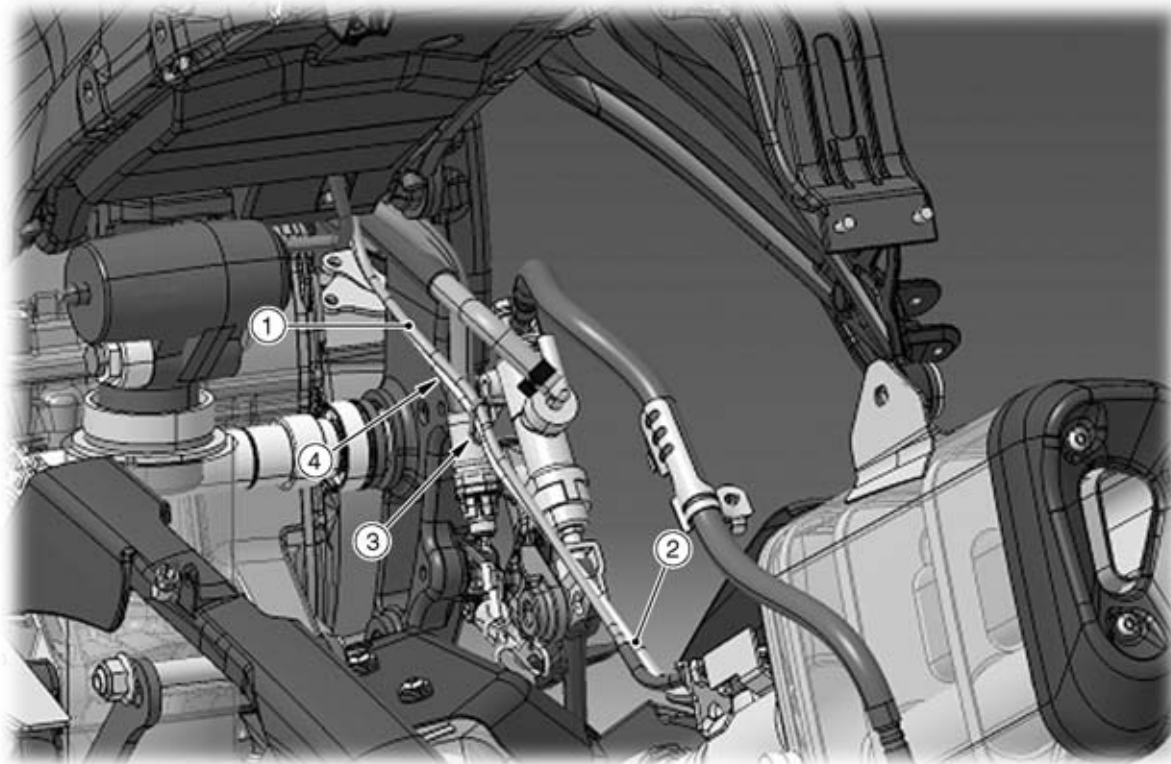


Cable, Wire, and Hose Routing

1. Run the rear left and right turn signal light leads and license plat light lead into the hole.
2. Hold the rear left and right turn signal light lead and license plat light lead.
3. Run the rear brake light switch lead to the outside of the exhaust butterfly valve cables.
4. Run the rear brake light switch lead to the outside of the brake hose.
5. Rear Brake Light Switch Lead

17-36 APPENDIX

Cable, Wire, and Hose Routing

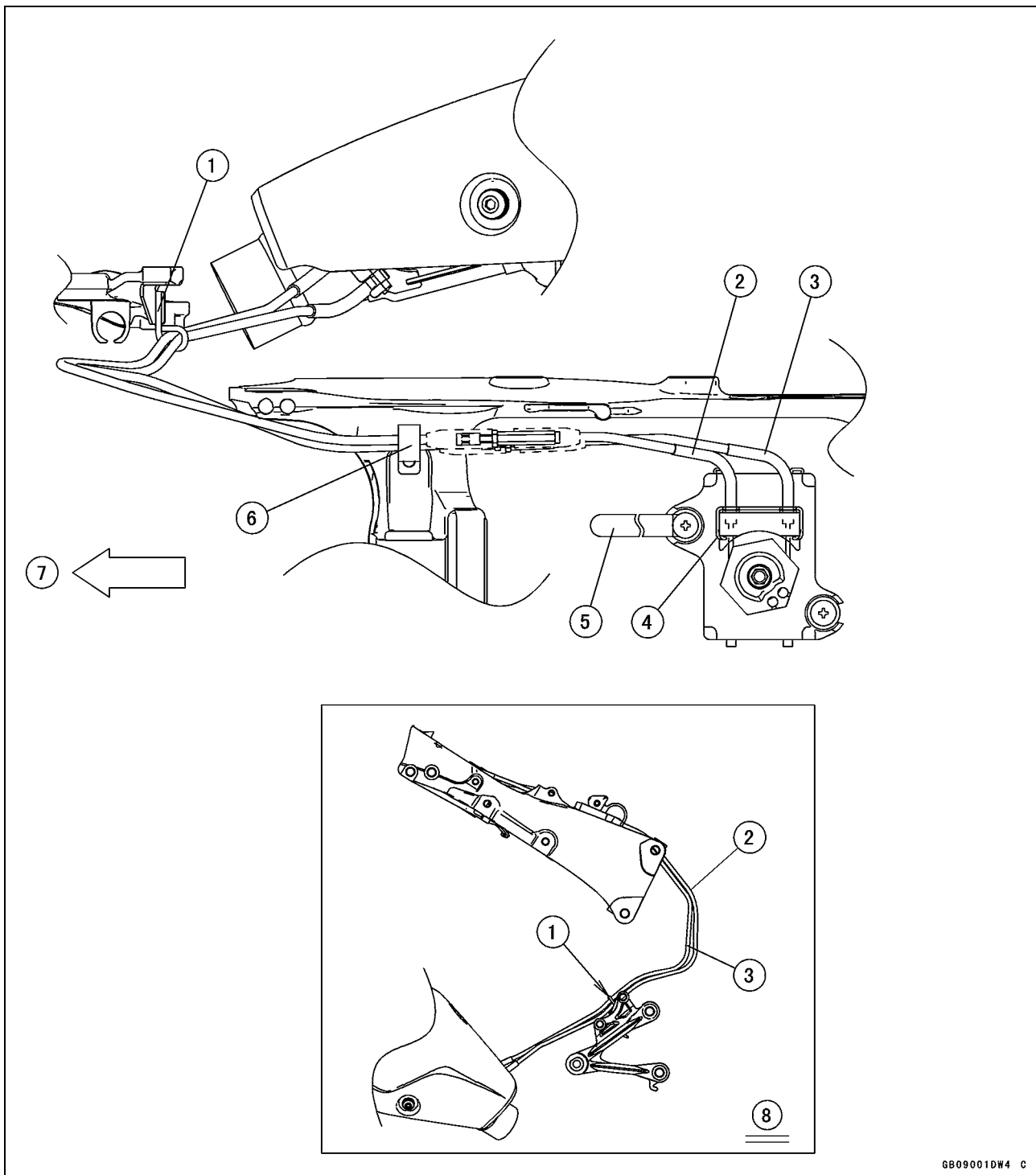


Cable, Wire, and Hose Routing

1. Exhaust Butterfly Valve Cable (Open)
2. Exhaust Butterfly Valve Cable (Close)
3. Run the exhaust butterfly valve cables into the clamp.
4. Run the exhaust butterfly valve cables to the inside of the rear brake light switch lead.
5. Align the exhaust butterfly valve cables, and then hold the them as shown in the figure.
6. Hold the exhaust butterfly valve cables and fuel pump lead.
7. Run the exhaust butterfly valve cables between the frame and main harness.

17-38 APPENDIX

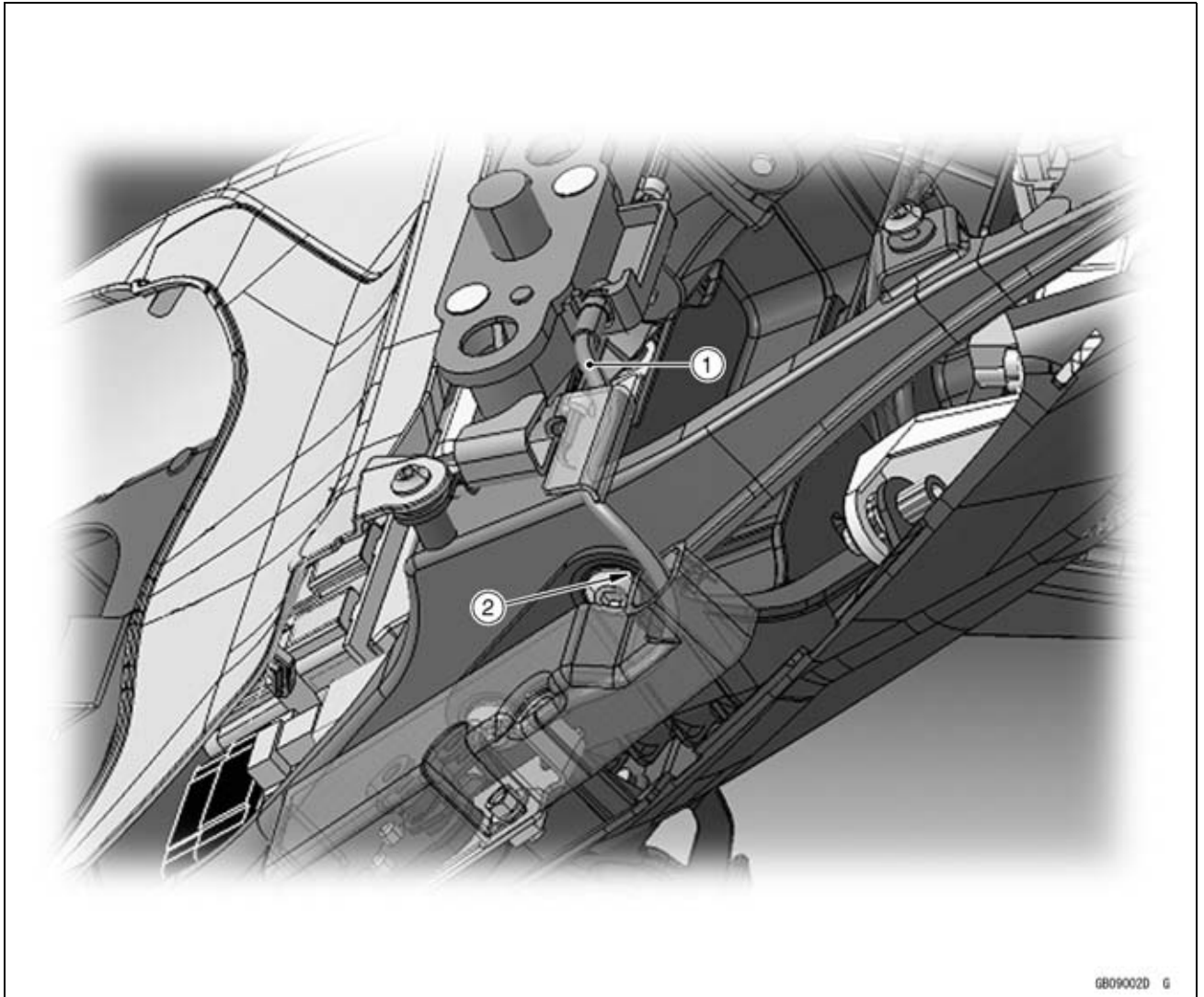
Cable, Wire, and Hose Routing



GB09001DW4 C

1. Clamp
2. Exhaust Butterfly Valve Cable (Open)
3. Exhaust Butterfly Valve Cable (Close)
4. Clamp
5. Clamp
6. Clamp
7. Front
8. View Right Side

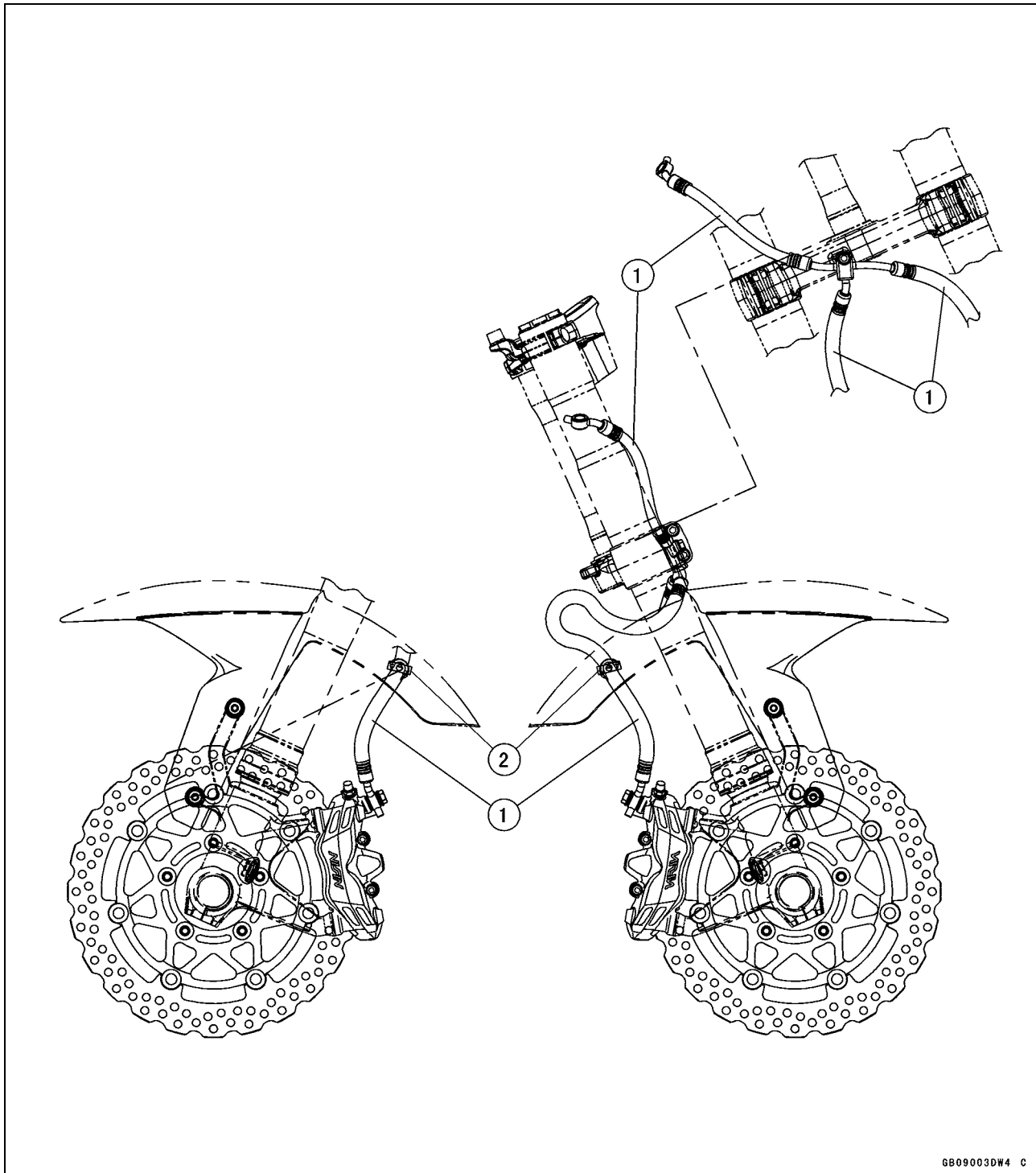
Cable, Wire, and Hose Routing



1. Seat Lock Cable
2. Run the seat lock cable into the hole of the seat lock cover.

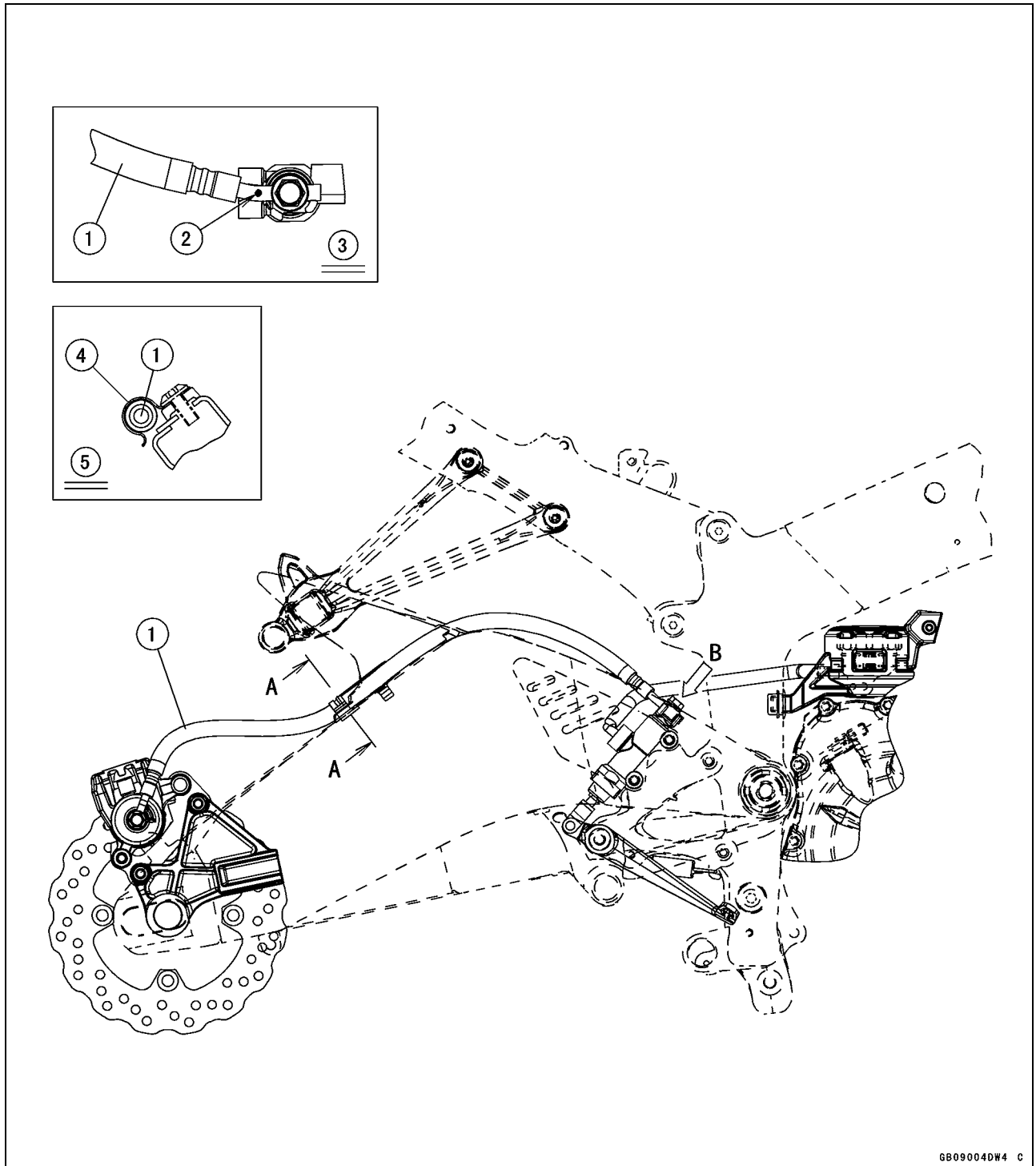
17-40 APPENDIX

Cable, Wire, and Hose Routing



- 1. Brake Hoses
- 2. Clamps

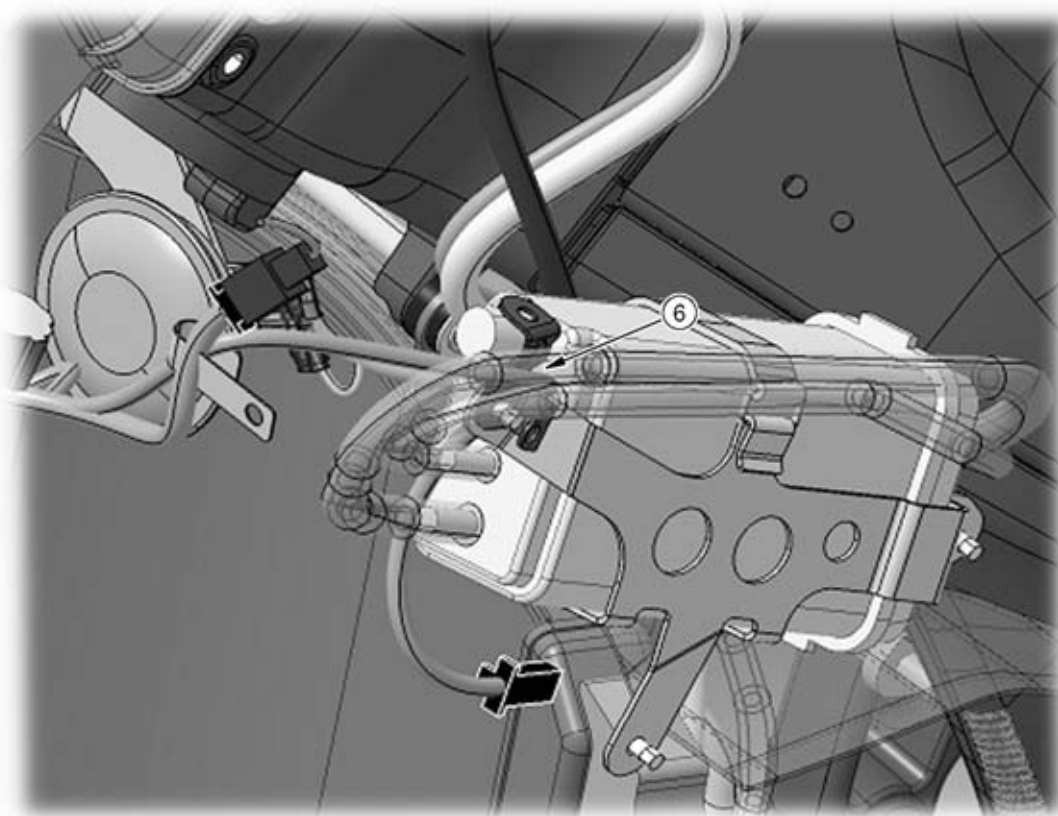
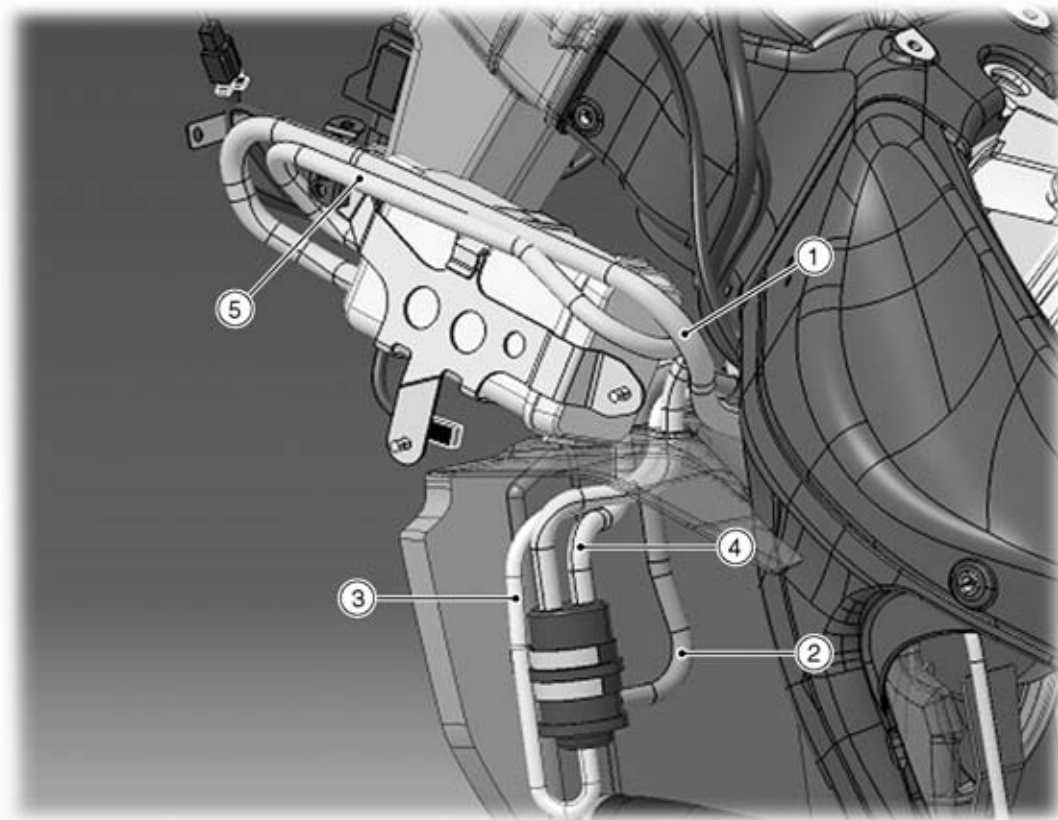
Cable, Wire, and Hose Routing



17-42 APPENDIX

Cable, Wire, and Hose Routing

California, Southeast Asia and Thailand Models



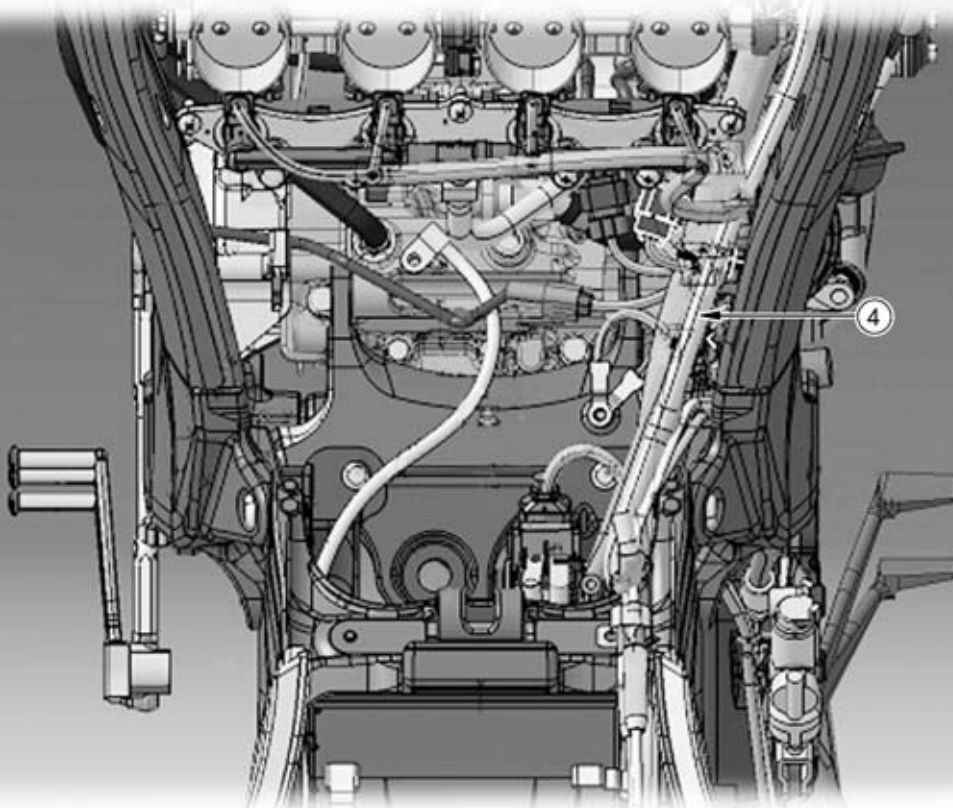
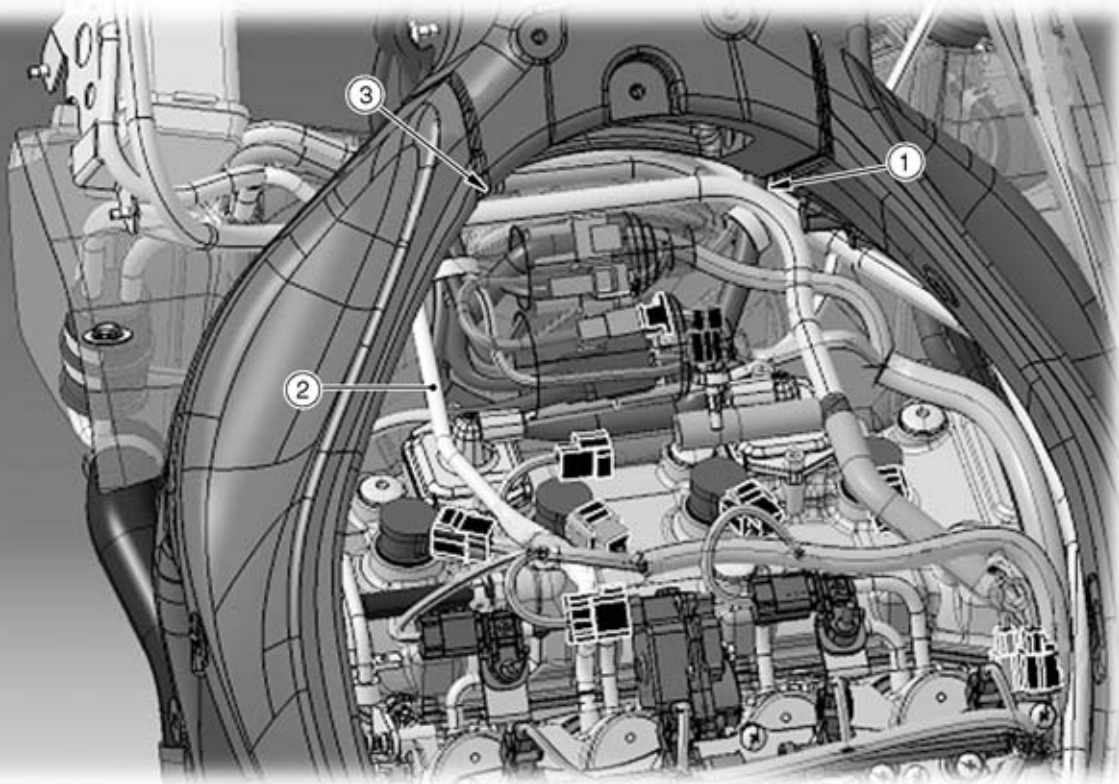
Cable, Wire, and Hose Routing

1. Green Hose (From canister to air switching valve)
2. Red Hose (From separator to fuel tank)
3. White Hose (From separator to throttle body assy #2)
4. Blue Hose (From separator to fuel tank)
5. Blue Hose (From separator to canister)
6. Hang the front left turn signal lead on the bracket.

17-44 APPENDIX

Cable, Wire, and Hose Routing

California, Southeast Asia and Thailand Models



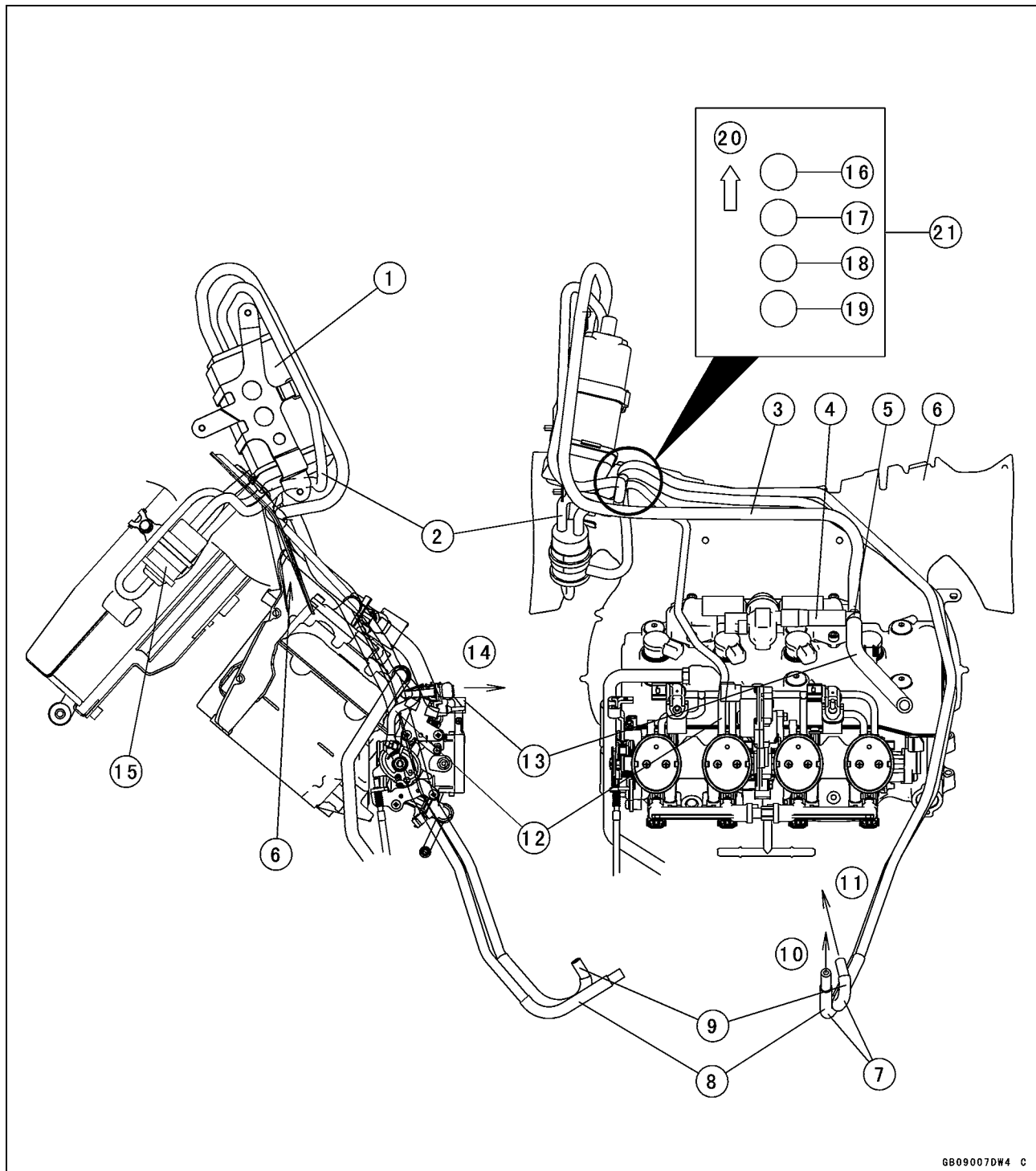
Cable, Wire, and Hose Routing

1. Run the blue hose and red hose under each lead in this position.
2. Run the white hose over each lead.
3. Run the blue hose and red hose under each lead.
4. Run the blue hose and red hose over the main harness, and under the inlet air temperature sensor.

17-46 APPENDIX

Cable, Wire, and Hose Routing

California, Southeast Asia and Thailand Models

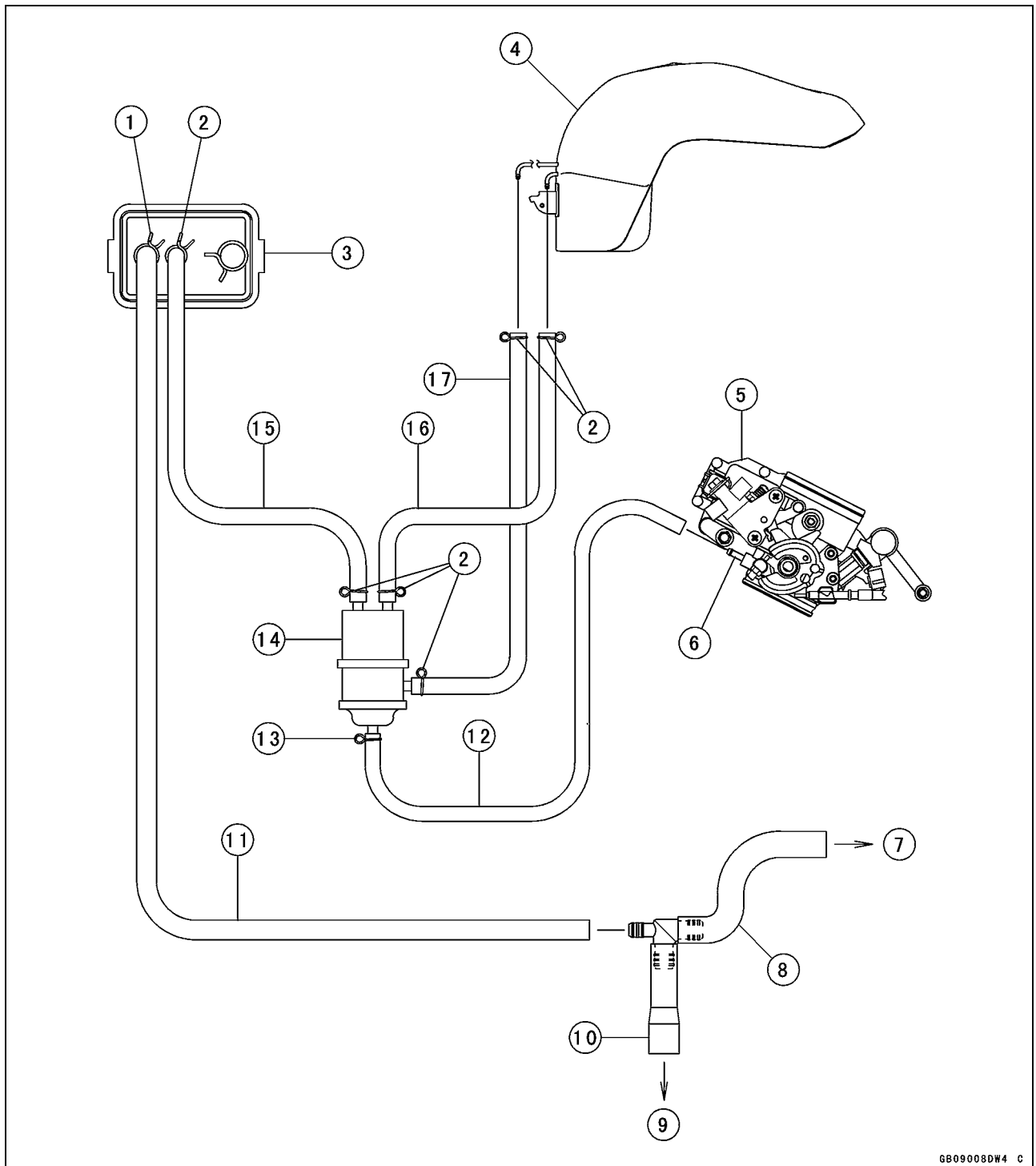


GB09007DW4 C

- | | |
|--------------------------|---|
| 1. Canister | 12. White Hose (To Throttle Body Assy #2) |
| 2. Blue Hose | 13. Hose |
| 3. Green Hose | 14. To Air Cleaner Housing |
| 4. Hose | 15. Separator |
| 5. Fitting | 16. Blue Hose (To Fuel Tank) |
| 6. Heat Insulation Plate | 17. Red Hose (To Fuel Tank) |
| 7. Protector Side | 18. White Hose (To Throttle Body Assy #2) |
| 8. Red Hose | 19. Blue Hose (To Canister) |
| 9. Blue Hose | 20. Front |
| 10. To Fuel Tank: Red | 21. View from Upside |
| 11. To Fuel Tank: Blue | |

Cable, Wire, and Hose Routing

California, Southeast Asia and Thailand Models



6809008DW4 C

- 1. Clamp
- 2. Clamps
- 3. Canister
- 4. Fuel Tank
- 5. Throttle Body Assy
- 6. Throttle Body Assy #2
- 7. To Air Cleaner Housing
- 8. Hose
- 9. To Air Switching Valve

- 10. Hose
- 11. Green Hose
- 12. White Hose
- 13. Clamp
- 14. Separator
- 15. Blue Hose
- 16. Blue Hose
- 17. Red Hose

Troubleshooting Guide

NOTE

- Refer to the *Fuel System* chapter for most of DFI trouble shooting guide.
- This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.

Engine Doesn't Start, Starting Difficulty:

Starter motor not rotating:

- Ignition and engine stop switch not ON
- Starter lockout switch or gear position switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relay not contacting or operating
- Starter button not contacting
- Starter system wiring shorted or open
- Ignition switch trouble
- Engine stop switch trouble
- Main 30 A or ignition fuse blown

Starter motor rotating but engine doesn't turn over:

- Vehicle-down sensor (DFI) coming off
- Immobilizer system trouble
- Starter clutch trouble
- Starter idle gear trouble

Engine won't turn over:

- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure

No fuel flow:

- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

No spark; spark weak:

- Vehicle-down sensor (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned OFF
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- Immobilizer system trouble
- Spark plug dirty, broken, or gap maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact

- Stick coil trouble
- ECU trouble
- Gear position, starter lockout, or sidestand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine stop switch shorted
- Starter system wiring shorted or open
- Main 30 A or ignition fuse blown

Fuel/air mixture incorrect:

- Bypass screw and/or idle adjusting screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Leak from oil filler cap, crankcase breather hose or air cleaner drain hose.

Compression Low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- No valve clearance
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed:

Spark weak:

- Battery voltage low
- Immobilizer system trouble
- Stick coil trouble
- Stick coil shorted or not in good contact
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble
- Crankshaft sensor trouble

Fuel/air mixture incorrect:

- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Throttle body assy holder loose
- Air cleaner housing holder loose

Compression low:

- Spark plug loose

Troubleshooting Guide

Cylinder head not sufficiently tightened down
 No valve clearance
 Cylinder, piston worn
 Piston ring bad (worn, weak, broken, or sticking)
 Piston ring/groove clearance excessive
 Cylinder head gasket damaged
 Cylinder head warped
 Valve spring broken or weak
 Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
 Camshaft cam worn

Run-on (dieseling):

Ignition switch trouble
 Engine stop switch trouble
 Fuel injector trouble
 Loosen terminal of battery (–) cable or ECU ground lead
 Carbon accumulating on valve seating surface
 Engine overheating

Other:

ECU trouble
 Throttle body assy not synchronizing
 Engine oil viscosity too high
 Drive train trouble
 Brake dragging
 Clutch slipping
 Engine overheating
 Air suction valve trouble
 Air switching valve trouble

Poor Running or No Power at High Speed:

Firing incorrect:

Spark plug dirty, broken, or maladjusted
 Spark plug incorrect
 Stick coil shorted or not in good contact trouble
 Stick coil trouble
 ECU trouble

Fuel/air mixture incorrect:

Air cleaner clogged, poorly sealed, or missing
 Air cleaner housing holder loose
 Water or foreign matter in fuel
 Throttle body assy holder loose
 Fuel to injector insufficient
 Fuel tank air vent obstructed
 Fuel line clogged
 Fuel pump trouble

Compression low:

Spark plug loose
 Cylinder head not sufficiently tightened down

No valve clearance
 Cylinder, piston worn
 Piston ring bad (worn, weak, broken, or sticking)
 Piston ring/groove clearance excessive
 Cylinder head gasket damaged
 Cylinder head warped
 Valve spring broken or weak
 Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking:

Carbon built up in combustion chamber
 Fuel poor quality or incorrect
 Spark plug incorrect
 ECU trouble

Miscellaneous:

Throttle valve won't fully open
 Brake dragging
 Clutch slipping
 Engine overheating
 Engine oil level too high
 Engine oil viscosity too high
 Drive train trouble
 Camshaft cam worn
 Air suction valve trouble
 Air switching valve trouble
 Catalytic converter melt down due to muffler overheating (KLEEN)

Overheating:

Firing incorrect:

Spark plug dirty, broken, or maladjusted
 Spark plug incorrect
 ECU trouble

Muffler overheating:

For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)
 For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)
 For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil
 For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)
 ECU trouble

Fuel/air mixture incorrect:

Throttle body assy holder loose
 Air cleaner housing holder loose
 Air cleaner poorly sealed, or missing
 Air cleaner clogged

17-50 APPENDIX

Troubleshooting Guide

Compression high:

Carbon built up in combustion chamber

Engine load faulty:

Clutch slipping

Engine oil level too high

Engine oil viscosity too high

Drive train trouble

Brake dragging

Lubrication inadequate:

Engine oil level too low

Engine oil poor quality or incorrect

Oil cooler incorrect:

Oil cooler clogged

Water temperature meter incorrect:

Water temperature meter broken

Water temperature sensor broken

Coolant incorrect:

Coolant level too low

Coolant deteriorated

Wrong coolant mixed ratio

Cooling system component incorrect:

Radiator fin damaged

Radiator clogged

Thermostat trouble

Radiator cap trouble

Radiator fan relay trouble

Fan motor broken

Fan blade damaged

Water pump not turning

Water pump impeller damaged

Over Cooling:**Water temperature meter incorrect:**

Water temperature meter broken

Water temperature sensor broken

Cooling system component incorrect:

Thermostat trouble

Clutch Operation Faulty:**Clutch slipping:**

Friction plate worn or warped

Steel plate worn or warped

Clutch spring broken or weak

Clutch hub or housing unevenly worn

No clutch lever play

Clutch inner cable trouble

Clutch release mechanism trouble

Clutch not disengaging properly:

Clutch plate warped or too rough

Clutch spring compression uneven

Engine oil deteriorated

Engine oil viscosity too high

Engine oil level too high

Clutch housing frozen on drive shaft

Clutch hub nut loose

Sub clutch hub spline damaged

Clutch friction plate installed wrong

Clutch lever play excessive

Clutch release mechanism trouble

Gear Shifting Faulty:**Doesn't go into gear; shift pedal doesn't return:**

Clutch not disengaging

Shift fork bent or seized

Gear stuck on the shaft

Gear positioning lever binding

Shift return spring weak or broken

Shift return spring pin loose

Shift mechanism arm spring broken

Shift mechanism arm broken

Shift pawl broken

Jumps out of gear:

Shift fork ear worn, bent

Gear groove worn

Gear dogs and/or dog holes worn

Shift drum groove worn

Gear positioning lever spring weak or broken

Shift fork guide pin worn

Drive shaft, output shaft, and/or gear splines worn

Overshifts:

Gear positioning lever spring weak or broken

Shift mechanism arm spring weak or broken

Abnormal Engine Noise:**Knocking:**

ECU trouble

Carbon built up in combustion chamber

Fuel poor quality or incorrect

Spark plug incorrect

Overheating

Piston slap:

Cylinder/piston clearance excessive

Cylinder, piston worn

Connecting rod bent

Piston pin, piston pin hole worn

Valve noise:

Valve clearance incorrect

Valve spring broken or weak

Camshaft bearing worn

Valve lifter worn

Other noise:

Connecting rod small end clearance excessive

Connecting rod big end clearance excessive

Piston ring/groove clearance excessive

Piston ring worn, broken, or stuck

Piston ring groove worn

Piston seizure, damage

Cylinder head gasket leaking

Troubleshooting Guide

Exhaust pipe leaking at cylinder head connection
 Crankshaft runout excessive
 Engine mounting portions loose
 Crankshaft bearing worn
 Primary gear worn or chipped
 Camshaft chain tensioner trouble
 Camshaft chain, sprocket, guide worn
 Air suction valve damaged
 Air switching valve damaged
 Alternator rotor loose
 Catalytic converter melt down due to muffler overheating (KLEEN)

Abnormal Drive Train Noise:

Clutch noise:

Clutch damper weak or damaged
 Clutch housing/friction plate clearance excessive
 Clutch housing gear worn
 Wrong installation of outside friction plate

Transmission noise:

Bearings worn
 Transmission gear worn or chipped
 Metal chips jammed in gear teeth
 Engine oil insufficient

Drive line noise:

Drive chain adjusted improperly
 Drive chain worn
 Rear and/or engine sprocket worn
 Chain lubrication insufficient
 Rear wheel misaligned

Abnormal Frame Noise:

Front fork noise:

Oil insufficient or too thin
 Spring weak or broken

Rear shock absorber noise:

Shock absorber damaged

Disc brake noise:

Pad installed incorrectly
 Pad surface glazed
 Disc warped
 Caliper trouble

Other noise:

Bracket, nut, bolt, etc. not properly mounted or tightened

Warning Indicator Light (Oil Pressure Warning) Doesn't Go OFF:

Engine oil pump damaged
 Engine oil screen clogged
 Engine oil filter clogged
 Engine oil level too low
 Engine oil viscosity too low
 Camshaft bearing worn

Crankshaft bearing worn
 Oil pressure switch damaged
 Wiring faulty
 Relief valve stuck open
 O-ring at the oil passage in the crankcase damaged

Exhaust Smokes Excessively:

White smoke:

Piston oil ring worn
 Cylinder worn
 Valve oil seal damaged
 Valve guide worn
 Engine oil level too high

Black smoke:

Air cleaner clogged

Brown smoke:

Air cleaner housing holder loose
 Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory:

Handlebar hard to turn:

Cable routing incorrect
 Hose routing incorrect
 Wiring routing incorrect
 Steering stem nut too tight
 Steering stem bearing damaged
 Steering stem bearing lubrication inadequate
 Steering stem bent
 Tire air pressure too low

Handlebar shakes or excessively vibrates:

Tire worn
 Swingarm pivot bearing worn
 Rim warped, or not balanced
 Wheel bearing worn
 Handlebar clamp bolt loose
 Steering stem nut loose
 Front, rear axle runout excessive
 Engine mounting portions loose

Handlebar pulls to one side:

Frame bent
 Wheel misalignment
 Swingarm bent or twisted
 Swingarm pivot shaft runout excessive
 Steering maladjusted
 Front fork bent
 Right and left front fork oil level uneven

Shock absorption unsatisfactory:

(Too hard)
 Front fork oil excessive
 Front fork oil viscosity too high
 Rear shock absorber adjustment too hard
 Tire air pressure too high
 Front fork bent
 (Too soft)

17-52 APPENDIX

Troubleshooting Guide

- Tire air pressure too low
- Front fork oil insufficient and/or leaking
- Front fork oil viscosity too low
- Rear shock adjustment too soft
- Front fork, rear shock absorber spring weak
- Rear shock absorber oil leaking

Brake Doesn't Hold:

- Air in the brake line
- Pad or disc worn
- Brake fluid leakage
- Disc warped
- Contaminated pad
- Brake fluid deteriorated
- Primary or secondary cup damaged in master cylinder
- Master cylinder scratched inside

Battery Trouble:

Battery discharged:

- Charge insufficient
- Battery faulty (too low terminal voltage)
- Battery cable making poor contact
- Load excessive (e.g., bulb of excessive wattage)
- Ignition switch trouble
- Alternator trouble
- Wiring faulty
- Regulator/rectifier trouble

Battery overcharged:

- Alternator trouble
- Regulator/rectifier trouble
- Battery faulty

MODEL APPLICATION

Year	Model	Beginning Frame No.
2009	ZX600R9F	JKAZX4R1□9A000001 or JKAZX600RRA000001

□:This digit in the frame number changes from one machine to another.



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