Kawasaki

VULCAN 1600 NOMAD

VN1600 CLASSIC TOURER



Motorcycle Service Manual

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Quick Reference Guide

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

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

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Motorcycle
Service Manual

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

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

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LIST OF ABBREVIATIONS

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

Read OWNER’S MANUAL before operating.

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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.

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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.

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Foreword

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

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

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

To get the longest life out of your vehicle:

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

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.

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General Information

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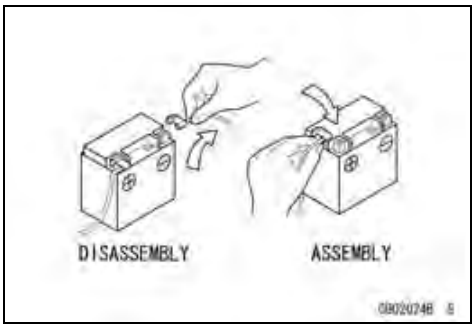
Before Servicing

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

Especially note the following:

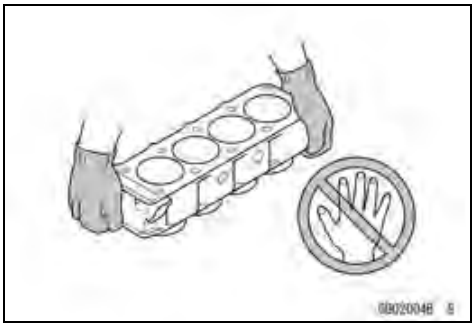
Battery Ground

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



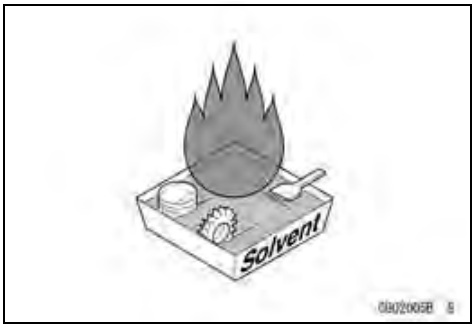
Edges of Parts

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



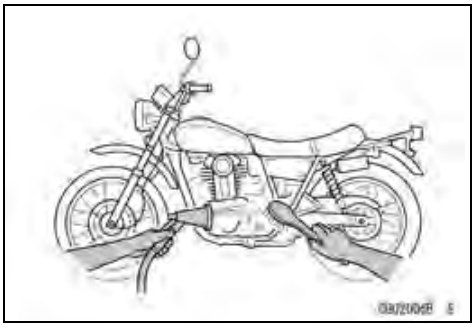
Solvent

Use a high-flush point solvent when cleaning parts. High -flush 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.

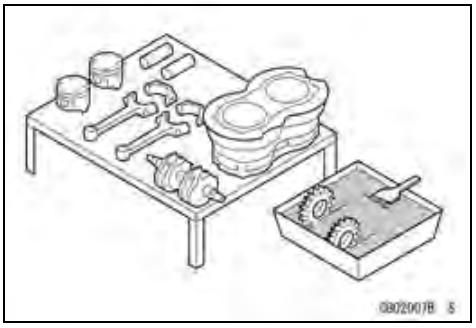


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Before Servicing

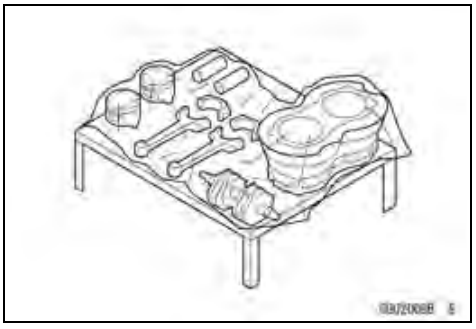
Arrangement and Cleaning of Removed Parts

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.



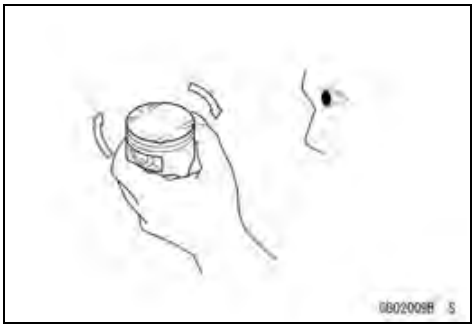
Storage of Removed Parts

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.



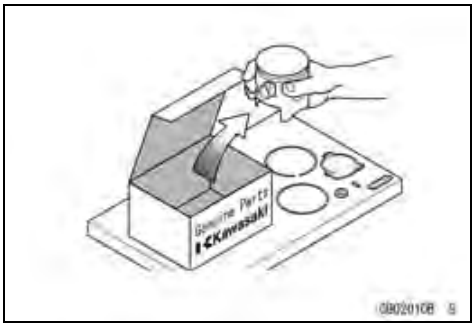
Inspection

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.



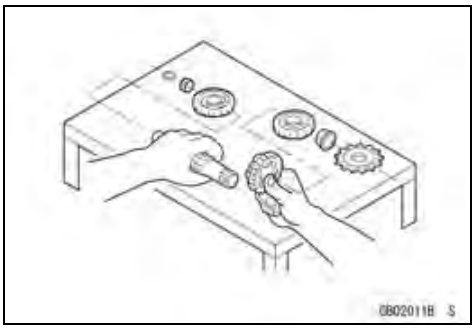
Replacement Parts

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.

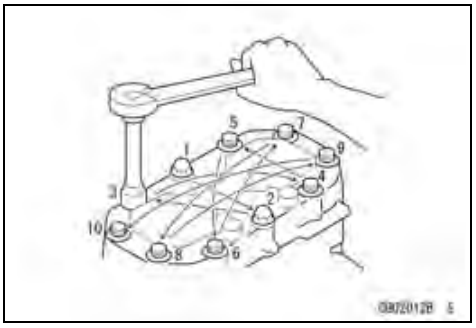


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Before Servicing

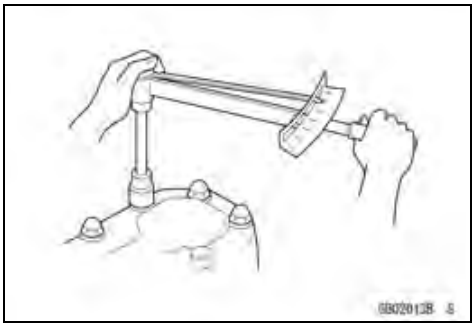
Tightening Sequence

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.



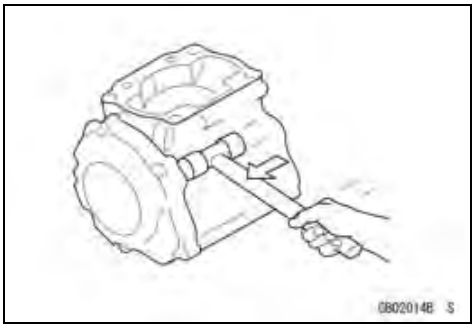
Tightening Torque

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.



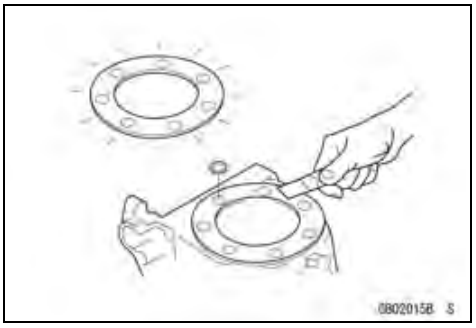
Force

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.



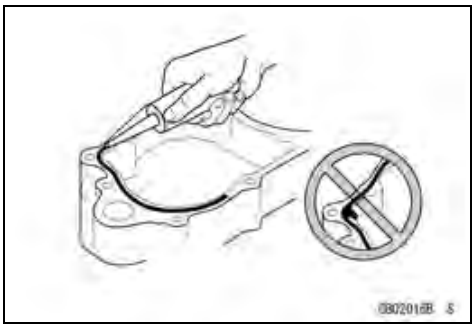
Gasket, O-ring

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 new gaskets and replace used O-rings when re-assembling



Liquid Gasket, Non-Permanent Locking Agent

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

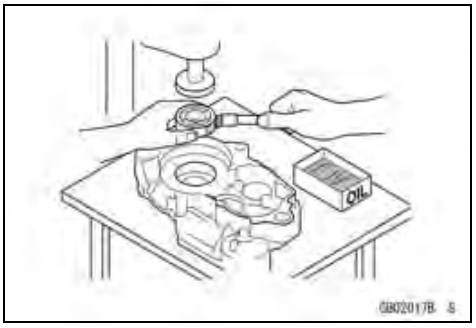


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Before Servicing

Press

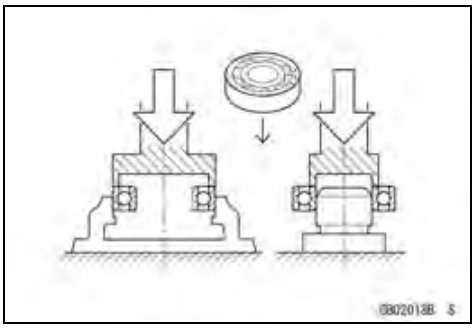
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing and Needle Bearing

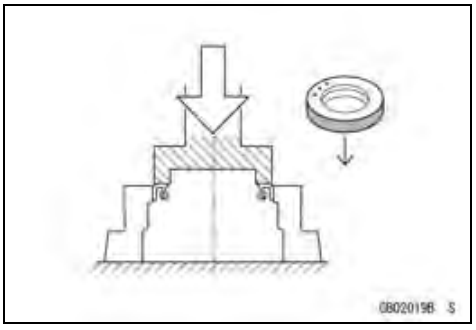
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

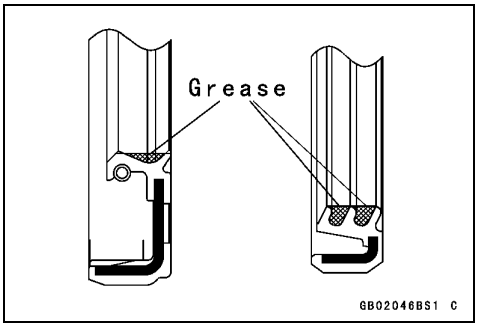


Oil Seal, Grease Seal

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.

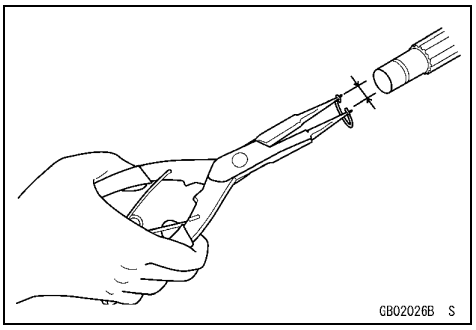


Apply specified grease to the lip of seal before installing the seal.



Circlips, Cotter Pins

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

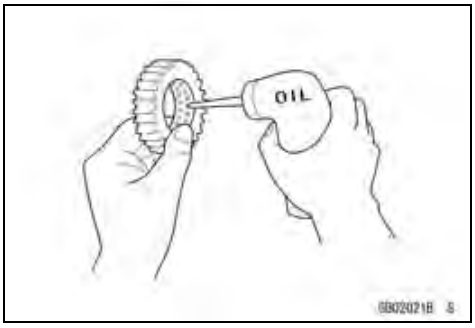


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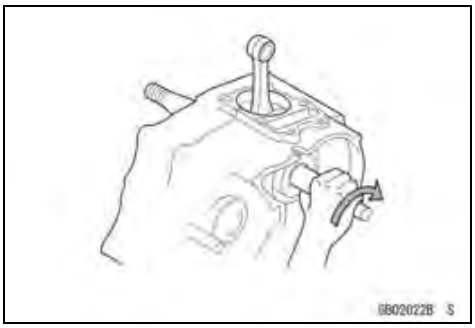
Lubrication

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.



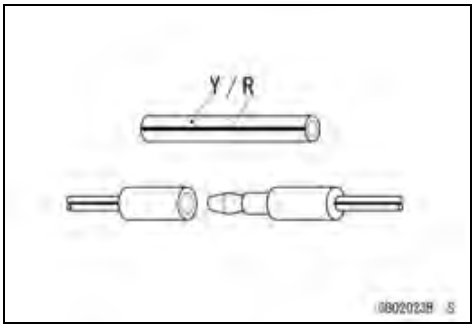
Direction of Engine Rotation

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.



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Model Identification

VN1600-D1 (US and Canada) Left Side View



VN1600-D1 (US and Canada) Right Side View



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Model Identification

VN1600-D1 (Europe) Left Side View



VN1600-D1 (Europe) Right Side View



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General Specifications

Items	VN1600-D1
Dimensions	
Overall Length	2 515 mm (99.02 in.)
Overall Width	1 040 mm (40.9 in.), (AU) 990 mm (39 in.)
Overall Height	1 460 mm (57.5 in.)
Wheelbase	1 690 mm (66.5 in.)
Road Clearance	150 mm (5.91 in.)
Seat Height	720 mm (28.3 in.)
Dry Mass	350 kg (675 lb)
Curb Mass:	
Front	164 kg (362 lb)
Rear	213 kg (470 lb)
Fuel Tank Capacity	20 L (5.3 US gal)
Fuel	Unleaded and high-octane gasoline (see VN1600-D1 Owner's Manual)
Performance	
Minimum Turning Radius	3.5 m (11.5 ft)
Engine	
Type	4-stroke, SOHC, V2-cylinder
Cooling System	Liquid-cooled
Bore and Stroke	102 × 95 mm (4.02 × 3.74 in.)
Displacement	1 552 mL (94.70 cu in.)
Compression Ratio	9.0 : 1
Maximum Horsepower	49 kW (67 PS) @4 700 r/min (rpm), (CA) (CAL) (US) – – –
Maximum Torque	127 N·m (12.95 kgf·m, 93.7 ft·lb) @2 700 r/min (rpm), (CA) (CAL) (US) – – –
Carburetion System	DFI (Digital Fuel Injection) System
Starting System	Electric starter
Ignition System	Battery and coil (transistorized)
Timing Advance	Electronically advanced (digital)
Ignition Timing	From 5° BTDC @950 r/min (rpm) ~ 25° BTDC @4 500 r/min (rpm)
Spark Plugs	NGK DPR6EA-9 or ND X20EPR-U9
Cylinder Numbering method	Front to Rear, 1-2
Firing Order	1-2
Valve Timing:	
Inlet:	
Open	22° BTDC
Close	66° ABDC
Duration	268°
Exhaust:	
Open	66° BBDC
Close	26° ATDC
Duration	272°
Lubrication System	Forced lubrication (wet sump)

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General Specifications

Items	VN1600-D1
Engine Oil:	
Type	API SE, SF or SG
	API SH or SJ with JASO MA
Viscosity	SAE 10W-40
Capacity	3.5 L (3.7 US qt, when engine is completely disassembled and dry)
Drive Train	
Primary Reduction System:	
Type	Gear
Reduction Ratio	1.517 (85/56)
Clutch Type	Wet multi disc
Transmission:	
Type	5-speed, constant mesh, return shift
Gear Ratios:	
1st	2.500 (40/16)
2nd	1.590 (35/22)
3rd	1.192 (31/26)
4th	0.965 (28/29)
5th	0.781 (25/32)
Final Drive System:	
Type	Shaft
Reduction Ratio	2.619 (15/21 × 33/9)
Overall Drive Ratio	3.105 @Top gear
Final Gear Case Oil:	
Grade	API Service Classification: GL-5 Hypoid gear oil
Viscosity	SAE90 (above 5°C), SAE80 (below 5°C)
Capacity	200 mL (6.76 US oz)
Frame	
Type	Tubular, double cradle
Caster (Rake Angel)	32°
Trail	184 mm (7.24 in.)
Front Tire:	
Type	Tubeless
Size	150/80 - 16 M/C 71H
Rear Tire:	
Type	Tubeless
Size	170/70B16 M/C 75H
Front Suspension:	
Type	Telescopic fork
Wheel travel	150 mm (5.91 in.)
Rear Suspension:	
Type	Swingarm, Shock absorber
Wheel travel	99 mm (3.90 in.)

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General Specifications

Items	VN1600-D1
Brake Type:	
Front	Dual disc
Rear	Single disc
Electrical Equipment	
Battery:	
Capacity	12 V 18 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 60/55 W (quartz-halogen)
Tail/Brake Light	12 V 5/21 W
Alternator:	
Type	Three-phase AC, twin rotor
Rated output	42 A × 14 V @6 000 r/min (rpm)

Specifications subject to change without notice, and may not apply to every country.
AU: Australia
CA: Canada
CAL: California
US: United States of America

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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 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 Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Pressure:

kPa	×	0.01020	=	kgf/cm²
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cmHg
kgf/cm²	×	98.07	=	kPa
kgf/cm²	×	14.22	=	psi
cmHg	×	1.333	=	kPa

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 Speed:

km/h	×	0.6214	=	mph

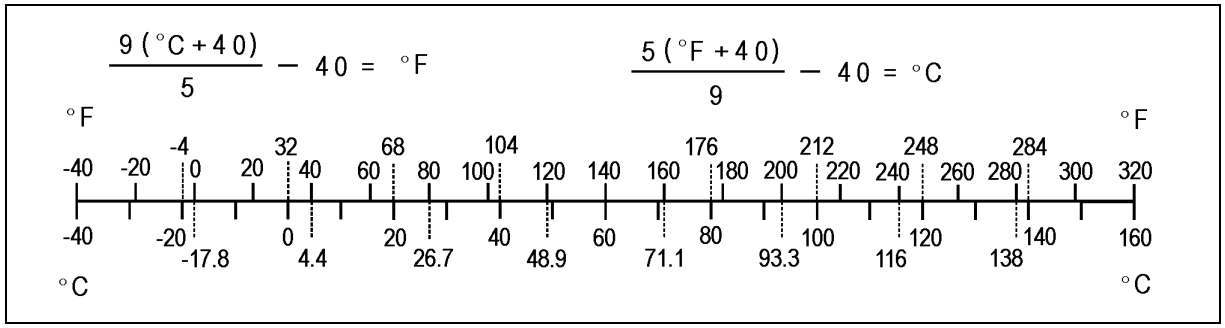
Units of Force:

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

Units of Power:

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

Units of Temperature:



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Periodic Maintenance

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Periodic Maintenance Chart

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

Periodic Inspection

FREQUENCY / INSPECTION	Whichever comes first → / Every ↓	* ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6)	6 (4)	12 (7.5)	18 (12)	24 (15)	30 (20)	36 (24)	See Page
Fuel System									
Air cleaner element - clean					●			●	2-16
Throttle control system (play, smooth return, no drag) - inspect	year	●		●		●		●	2-16
Idle speed - inspect		●		●		●		●	2-17
Fuel leak (fuel hose and pipe) - inspect	year	●		●		●		●	2-18
Fuel hose and pipe damage - inspect	year	●		●		●		●	2-18
Fuel hose and pipe installation condition - inspect	year	●		●		●		●	2-18
Cooling System									
Coolant level - inspect		●		●		●		●	2-19
Coolant leak (radiator hose and pipe) - inspect	year	●		●		●		●	2-19
Radiator hose damage - inspect	year	●		●		●		●	2-19
Radiator hose installation condition - inspect	year	●		●		●		●	2-19
Evaporative Emission Control System (CAL)									
Evaporative emission control system function - inspect		●	●	●	●	●	●	●	2-20
Air Suction System									
Air suction system damage - inspect				●		●		●	2-21
Clutch and Drive Train									
Clutch operation (play, disengagement, engagement) - inspect		●		●		●		●	2-21
Clutch fluid level - inspect	6 months	●	●	●	●	●	●	●	2-22
Clutch fluid leak - inspect	year	●	●	●	●	●	●	●	2-22
Clutch hose damage - inspect	year	●	●	●	●	●	●	●	2-22
Clutch hose installation condition - inspect	year	●	●	●	●	●	●	●	2-22
Final gear case oil level - inspect				●		●		●	2-23
Wheels and Tires									
Tire air pressure - inspect	year			●		●		●	2-24
Wheel/tire damage - inspect				●		●		●	2-24
Tire tread wear, abnormal wear - inspect				●		●		●	2-24
Wheel bearing damage - inspect	year			●		●		●	2-25

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2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

FREQUENCY / INSPECTION	Whichever comes first ➡ / Every ⬇	* ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6)	6 (4)	12 (7.5)	18 (12)	24 (15)	30 (20)	36 (24)	See Page
Brake System									
Brake fluid leak (brake hose and pipe) - inspect	year	●	●	●	●	●	●	●	2-25
Brake hose and pipe damage - inspect	year	●	●	●	●	●	●	●	2-26
Brake pad wear - inspect #			●	●	●	●	●	●	2-26
Brake hose installation condition - inspect	year	●	●	●	●	●	●	●	2-26
Brake fluid level - inspect	6 months	●	●	●	●	●	●	●	2-26
Brake operation (effectiveness, play, no drag) - inspect	year	●	●	●	●	●	●	●	2-27
Brake light switch operation - inspect		●	●	●	●	●	●	●	2-27
Suspensions									
Front forks/rear shock absorber operation (damping and smooth stroke) - inspect				●		●		●	2-28
Front forks/rear shock absorber oil leak - inspect	year			●		●		●	2-29
Swingarm pivot - lubricate						●			2-29
Steering System									
Steering play - inspect	year	●		●		●		●	2-30
Steering stem bearings - lubricate	2 years					●			2-31
Electrical System									
Lights and switches operation - inspect	year			●		●		●	2-32
Headlight aiming - inspect	year			●		●		●	2-34
Side stand switch operation - inspect	year			●		●		●	2-36
Engine stop switch operation - inspect	year			●		●		●	2-37
Others									
Chassis parts - lubricate	year			●		●		●	2-37
Bolts and nuts tightness - inspect		●		●		●		●	2-38

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

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

CAL: California Model

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Periodic Maintenance Chart

Periodic Replacement Parts

FREQUENCY / CHANGE/REPLACE ITEM	Whichever come first ➡ / ⬇ Every	* ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6)	12 (7.5)	24 (15)	36 (24)	48 (30)	See Page
Air cleaner element #					●		2-40
Engine oil #	year	●	●	●	●	●	2-41
Oil filter	year	●	●	●	●	●	2-42
Fuel hose	4 years					●	2-43
Coolant	3 years				●		2-44
Radiator hose and O-ring	3 years				●		2-47
Brake hose and pipe	4 years					●	2-48
Brake fluid	2 years			●		●	2-48
Rubber parts of master cylinder and caliper	4 years					●	2-50
Spark plug			●	●	●	●	2-55
Final gear case oil		●			●		2-56
Clutch hose and pipe	4 years					●	2-56
Clutch fluid	2 years			●		●	2-57
Clutch slave cylinder piston seal	4 years		●	●	●	●	2-59

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

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

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Torque and Locking Agent

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

Letters used in the “Remarks” column mean:
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease to the threads.
L: Apply a non-permanent locking agent to the threads.
LH: Left-hand-threads
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution (The molybdenum disulfide oil solution is a mixture of the engine oil and molybdenum disulfide grease weight ratio 10 :1).
O: Apply oil to the threads and seating surface.
R: Replacement parts
S: Tighten the fasteners following the specified sequence.
SI: Apply silicone grease (ex. PBC grease).
SS: Apply silicone sealant.
ST: Stake the fasteners to prevent loosening.
WL: Apply a soap and water solution or rubber lubricant.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System				
Air Cleaner Duct Holder Bolts	10	1.0	89 in·lb	
Choke Cable Plate Screw	2.9	0.30	26 in·lb	L
Fuel Pump Mounting Bolts	9.8	1.0	87 in·lb	L, S
Inlet Air Temperature Sensor Nut	7.8	0.80	69 in·lb	
Inlet Manifold Bolts	12	1.2	104 in·lb	
ISC Pipe Holder Bolts	11	1.1	97 in·lb	
Left Air Cleaner Base Bolt	11	1.1	97 in·lb	
Left Air Cleaner Base Screws	2.2	0.22	19 in·lb	L
Left Air Cleaner Cover Allen Bolt	16	1.6	12	
Right Air Cleaner Allen Bolts	11	1.1	97 in·lb	
Right Air Cleaner Base Bolt	11	1.1	97 in·lb	
Right Air Cleaner Base Screws	2.2	0.22	19 in·lb	L
Right Air Cleaner Cover Allen Bolt	16	1.6	12	
Spark Plug Lead Holder Bolts	11	1.1	97 in·lb	
Throttle Body Assy Holder Bolts	11	1.1	97 in·lb	
Water Temperature Sensor	18	1.8	13	SS
Cooling System				
Radiator Drain Bolt	2.2	0.22	19 in·lb	
Radiator Fan Bolts	8.3	0.85	73 in·lb	
Radiator Fan Switch	18	1.8	13	
Water Hose Clamp Screws	2.5	0.25	22 in·lb	
Water Pipe Bolts	11	1.1	97 in·lb	
Water Pump Air Bleeder Bolt	11	1.1	97 in·lb	
Water Pump Cover Bolts	11	1.1	97 in·lb	
Water Pump Drain Bolt	11	1.1	97 in·lb	
Water Pump Impeller Bolt	8.8	0.90	78 in·lb	LH
Water Temperature Sensor	18	1.8	13	SS

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Water Temperature Switch	7.8	0.80	69 in·lb	SS
Engine Top End				
Air Suction Valve Cover Bolts	7.4	0.75	65 in·lb	
Camshaft Chain Guide Bolts	11	1.1	97 in·lb	L
Camshaft Chain Guide Retainer Bolts	11	1.1	97 in·lb	L
Camshaft Sprocket Bolts	15	1.5	11	L
Chain Tensioner Cap	20	2.0	15	S
Chain Tensioner Lockbolts	4.9	0.50	43 in·lb	S
Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	S
Cylinder Head Nuts	25	2.5	18	S
Cylinder Nuts	25	2.5	18	S
Exhaust Pipe Cover Clamp Screws	6.9	0.70	61 in·lb	
Muffler Stay Mounting Bolts	25	2.5	18	
Oil Hose Flange Bolts	9.8	1.0	87 in·lb	
Plugs	20	2.0	15	L
Premuffler Chamber Bolts	29	3.0	21	
Rocker Case Bolts	8.8	0.90	78 in·lb	S
Rocker Case Cover Bolts	8.8	0.90	78 in·lb	S
Rocker Case Nuts (M12)	78	8.0	58	MO, S
Rocker Case Nuts (M8)	25	2.5	18	S
Rocker Shafts	25	2.5	18	M
Rotor Bolt Cap	1.5	0.15	13 in·lb	
Spark Plug Retainers	12	1.2	104 in·lb	
Spark Plugs	18	1.8	13	
Timing Inspection Cap	1.5	0.15	13 in·lb	
Water Pipe Bolts	11	1.1	97 in·lb	
Clutch				
Clutch Cover Bolts	11	1.1	97 in·lb	
Clutch Damper Cover Bolts	9.8	1.0	87 in·lb	L
Clutch Damper Plate Bolt	9.8	1.0	87 in·lb	EO
Clutch Hose Banjo Bolt (Upper)	25	2.5	18	
Clutch Hose Banjo Bolt (Lower)	25	2.5	18	
Clutch Hub Nut	145	14.8	107	MO
Clutch Lever Pivot Bolt	1.0	0.10	8.9 in·lb	SI
Clutch Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Clutch Master Cylinder Clamp Bolts	11	1.1	97 in·lb	S
Clutch Reservoir Cap Screws	1.5	0.15	13 in·lb	
Clutch Slave Cylinder Bleed Valve	7.8	0.80	69 in·lb	
Clutch Slave Cylinder Bolts	6.9	0.70	61 in·lb	L
Oil Filler Cap	1.5	0.15	13 in·lb	
Starter Lockout Switch Screw	1.2	0.12	11 in·lb	
Engine Lubrication System				
Oil Baffle Bolt	11	1.1	97 in·lb	L

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Drain Plug	20	2.0	15	
Oil Filter	18	1.8	13	EO, R
Oil Filter Pipe	25	2.5	18	SS
Oil Hose Banjo Bolt	9.8	1.0	87 in·lb	
Oil Hose Flange Bolts	9.8	1.0	87 in·lb	
Oil Hose Nozzle	2.9	0.30	26 in·lb	LH
Oil Nozzles	2.9	0.30	26 in·lb	
Oil Pipe Clamp Bolts	11	1.1	97 in·lb	L
Oil Pipe Holder Bolts	11	1.1	97 in·lb	L
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Screw	1.5	0.15	13 in·lb	G
Oil Pump Mounting Bolts	11	1.1	97 in·lb	
Oil Return Pipe Clamp Bolts	11	1.1	97 in·lb	L
Oil Screen Plug	20	2.0	15	
Relief Valve	15	1.5	11	L
Engine Removal/Installation				
Downtube Bolts	59	6.0	44	
Engine Ground Terminal Bolt	7.8	0.80	69 in·lb	
Engine Mounting Bracket Bolts	25	2.5	18	
Engine Mounting Nuts	44	4.5	32	
Crankshaft/Transmission				
Bearing Retainer Bolts	11	1.1	97 in·lb	L
Camshaft Chain Guide Bolts	11	1.1	97 in·lb	L
Camshaft Chain Guide Retainer Bolts	11	1.1	97 in·lb	L
Clutch Push Rod Guide Bolts	11	1.1	97 in·lb	L
Connecting Rod Big End Nuts	59	6.0	44	MO
Crankcase Bolt (M10, L = 115)	39	4.0	29	S
Crankcase Bolts (M10, L = 105)	39	4.0	29	S
Crankcase Bolts (M6, L = 80)	11	1.1	97 in·lb	S
Crankcase Bolts (M6, L = 70)	11	1.1	97 in·lb	S
Crankcase Bolts (M6, L = 40)	11	1.1	97 in·lb	S
Crankcase Bolts (M8)	21	2.1	15	S
Damper Cam Nut	195	20.0	144	MO, R
Frame Ground Bracket Bolt	11	1.1	97 in·lb	L
Gear Set Lever Bolt	11	1.1	97 in·lb	
Idle Shaft Holder Bolt	8.3	0.85	73 in·lb	
Left Balancer Gear Bolt	85	8.5	63	MO
Oil Baffle Bolt	11	1.1	97 in·lb	L
Oil Drain Plug	20	2.0	15	
Oil Filter	18	1.8	13 ft·lb	EO, R
Oil Hose Nozzle	2.9	0.30	26 in·lb	LH
Oil Nozzles	2.9	0.30	26 in·lb	
Oil Pressure Switch	15	1.5	11	SS

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Return Pipe Clamp Bolts	11	1.1	97 in·lb	L
Primary Gear Bolt	145	14.5	107	MO
Rear Shift Lever Clamp Bolt	12	1.2	106 in·lb	
Shift Drum Bearing Holder Bolts	11	1.1	97 in·lb	L
Shift Drum Cam Bolt	15	1.5	11	L
Shift Pedal Clamp Bolt	29	3.0	21	
Shift Rod Locknut (Front)	11	1.1	97 in·lb	
Shift Rod Locknut (Rear)	11	1.1	97 in·lb	LH
Shift Shaft Return Spring Pin	39	4.0	29	L
Starter Clutch Bolt	85	8.7	63	MO
Starter Clutch Coupling Bolts	15	1.5	11	L
Water Pump Chain Guide Bolt	8.3	0.85	73 in·lb	
Water Pump Chain Guide Spring Hook Bolt	2.9	0.30	26 in·lb	
Water Pump Drainage Hose Fitting	9.8	1.0	87 in·lb	
Water Pump Impeller Bolt	8.8	0.90	78 in·lb	LH
Wheels/Tires				
Front Axle Clamp Bolts	29	3.0	21	AL
Front Axle Shaft	108	11.0	80	
Front Brake Disc Bolts	27	2.8	20	
Muffler Stay Mounting Bolts	25	2.5	18	
Rear Axle Nut	108	11.0	80	
Rear Brake Disc Bolts	27	2.8	20	
Tire Air Valve Nuts	1.5	0.15	13 in·lb	
Final Drive				
Bearing Retainer Bolts (Front Gear)	8.8	0.90	78 in·lb	L
Bearing Retainer Bolt (Final Gear)	6.9	0.70	61 in·lb	L
Damper Cam Nut	195	20.0	144	MO, R
Drive Gear Nut	265	27.0	195	MO, R, ST
Driven Gear Assy Mounting Bolts	25	2.5	18	
Driven Gear Bolt	120	12.2	89	MO, R, ST
Final Gear Case Cover Bolt (M10)	34	3.5	25	L
Final Gear Case Cover Bolt (M8)	23	2.3	17	L
Final Gear Case Drain Plug	8.8	0.90	78 in·lb	
Final Gear Case Mounting Nut	34	3.5	25	
Front Gear Case Bolts (M8)	29	3.0	21	S
Front Gear Case Bolts (M6)	12	1.2	106 in·lb	S
Neutral Switch	15	1.5	11	
Oil Nozzle (Front)	2.9	0.30	26 in·lb	
Oil Nozzle (Right)	18	1.8	13	
Oil Pipe Banjo Bolts	12	1.2	106 in·lb	
Pinion Gear Nut	130	13.2	96	MO, R, ST
Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Brakes				
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 Clamp Bolt	25	2.5	18	
Front Brake Disc Bolts	27	2.8	20	L
Front Brake Hose Banjo Bolt	34	3.5	25	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Front Brake Reservoir Cap Screw	1.5	0.15	13 in·lb	
Front Caliper Bleed Valves	7.8	0.80	69 in·lb	
Front Caliper Mounting Bolts	34	3.5	25	
Front Footboard Bracket Bolts	34	3.5	25	
Front Master Cylinder Clamp Bolt	8.8	0.90	78 in·lb	S
Rear Brake Disc Bolts	27	2.8	20	L
Rear Brake Hose Banjo Bolts	25	2.5	18	
Rear Caliper Bleed Valves	7.8	0.80	69 in·lb	
Rear Caliper Holder Bolt	64	6.5	47	
Rear Caliper Mounting Bolts	34	3.5	25	
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	18	1.8	13	
Suspension				
Front Axle Clamp Bolts	29	3.0	21	AL
Front Fork Bottom Allen Bolts	30	3.1	22	L
Front Fork Clamp Bolts (Upper)	29	3.0	21	
Front Fork Clamp Bolts (Lower)	29	3.0	21	AL
Front Fork Inner Cover Bolts	4.0	0.40	35 in·lb	
Front Fork Top Plugs	22	2.2	16	
Rear Shock Absorber Nuts	34	3.5	25	
Swingarm Pivot Shaft	127	13.0	94	
Steering				
Front Fork Clamp Bolts (Upper)	29	3.0	21	
Front Fork Clamp Bolts (Lower)	29	3.0	21	AL
Handlebar Clamp Bolts	34	3.5	25	O, S
Handlebar Holder Nuts	34	3.5	25	
Steering Stem Head Nut	88	9.0	65	
Steering Stem Nut	4.9	0.50	43 in·lb	S
Frame				
Downtube Bolts	59	6.0	44	
Engine Mounting Bracket Bolts	25	2.5	18	
Front Footboard Bracket Bolts	34	3.5	25	
Rear Footboard Bracket Bolts	25	2.5	18	
Side Stand Nut	44	4.5	32	
Side Stand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
Tandem Grip Mounting Bolts	25	2.5	18	

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Electrical System				
Alternator Cover Bolts	11	1.1	97 in·lb	
Alternator Inner Cover Bolts	11	1.1	97 in·lb	
Alternator Outer Cover Assembly Bolts	6.9	0.70	61 in·lb	
Alternator Outer Cover Bolts	6.9	0.70	61 in·lb	WL
Alternator Outer Cover Damper Bolts	6.9	0.70	61 in·lb	L
Alternator Outer Cover Joint Bolts	6.9	0.70	61 in·lb	L
Alternator Rotor Bolt	78	8.0	58	MO
Alternator Stator Bolts	13	1.3	115 in·lb	L
Crankshaft Sensor Lead Holder Bolt	2.9	0.30	26 in·lb	L
Crankshaft Sensor Screws	2.9	0.30	26 in·lb	
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Fuel Level Sensor Mounting Bolts	6.9	0.70	61 in·lb	L
Fuel Pump Mounting Bolts	9.8	1.0	87 in·lb	S
Headlight Rim Screws	2.9	0.30	26 in·lb	
Headlight Unit Bracket Screws	1.0	0.10	8.9 in·lb	L
Inside Starter Holder Bolts	11	1.1	97 in·lb	L
Neutral Switch	15	1.5	11	
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Screw	1.5	0.15	13 in·lb	G
Radiator Fan Bolts	8.3	0.85	73 in·lb	
Radiator Fan Switch	18	1.8	13	
Regulator/Rectifier Bolts	6.5	0.66	57 in·lb	
Rotor Bolt Cap	1.5	0.15	13 in·lb	
Side Stand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
Spark Plugs	18	1.8	13	
Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L
Stater Lockout Switch Screw	1.2	0.12	11 in·lb	
Stater Motor Assembly Bolts	4.9	0.50	43 in·lb	
Stater Motor Mounting Bolts	11	1.1	97 in·lb	
Stater Motor Terminal Locknut	11	1.1	97 in·lb	
Stater Motor Terminal Nut	4.9	0.50	43 in·lb	
Stator Lead Holder Screw	11	1.1	97 in·lb	L
Tail/Brake Light Assembly Screws	1.2	0.12	11 in·lb	
Tail/Brake Light Lens Screws	1.2	0.12	11 in·lb	
Tail/Brake Light Mounting Nuts	5.9	0.60	52 in·lb	
Timing Inspection Cap	1.5	0.15	13 in·lb	
Turn Signal Light Lens Screws	1.0	0.10	8.9 in·lb	
Turn Signal Light Mounting Screws	6.9	0.70	61 in·lb	
Water Temperature Sensor	18	1.8	13	SS
Water Temperature Switch	7.8	0.80	69 in·lb	SS

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

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Specifications

Item	Standard	Service Limit
Fuel System (DFI)		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Idle Speed	950 ±50 r/min (rpm)	– – –
Air Cleaner Element	Paper filter	– – –
Cooling System		
Coolant:		
Type (Recommended)	Permanent type antifreeze	– – –
Color	Green	– – –
Mixed Ratio	Soft water 50%, Coolant 50%	– – –
Freezing Point	–35°C (–31°F)	– – –
Total Amount	2.3 L (2.4 US qt)	– – –
Engine Top End		
Valve Clearance	Non-adjustable (hydraulic lash adjusters)	– – –
Clutch		
Clutch Fluid:		
Grade	DOT4	– – –
Clutch Lever Free Play	Non-adjustable	– – –
Engine Lubrication System		
Engine Oil:		
Type	API SE, SF or SG API SH or SJ with JASO MA	– – –
Viscosity	SAE 10W-40	– – –
Capacity	2.9 L (3.1 US qt, when filter is not removed) 3.1 L (3.3 US qt, when filter is removed) 3.5 L (3.7 US qt, when engine is completely disassembled and dry)	– – – – – – – – –
Level	Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)	– – –
Tires		
Tread Depth:		
Front	BRIDGESTONE EXEDRA G721: 4.5 mm (0.18 in.)	1 mm (0.04 in.), (AT, CH, DE): 1.6 mm (0.06 in.)
Rear	BRIDGESTONE EXEDRA G722 G: 7.2 mm (0.28 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.1 in.)
Air Pressure: (When Cold)		
Front	Up to 185 kg (408 lb) load: 225 kPa (2.25 kgf/cm², 32 psi)	– – –
Rear	Up to 185 kg (408 lb) load: 280 kPa (2.8 kgf/cm², 40 psi)	– – –

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Specifications

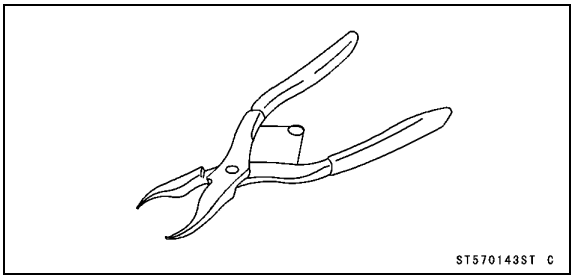
Item	Standard	Service Limit
Final Drive		
Final Gear Case Oil:		
Grade	API Service Classification: GL-5 hypoid gear oil	– – –
Viscosity	When above 5°C (41°F) SAE90 When below 5°C (41°F) SAE80	– – –
Oil Level	Filler opening bottom	– – –
Amount	200 mL (6.76 US oz.)	– – –
Brakes		
Brake Fluid:		
Grade	DOT4	– – –
Brake Pad Lining Thickness:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.)
Rear	7.0 mm (0.28 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 DPR6EA-9, ND X20EPR-U9	– – –

AT: Austria Model
CH: Switzerland Model
DE: Germany Model

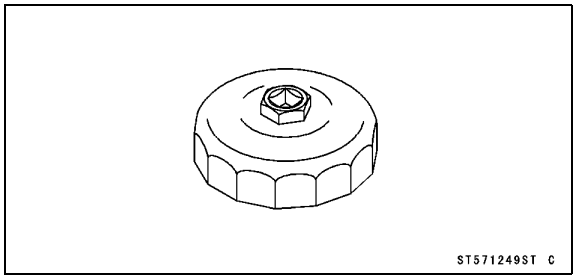
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Special Tools

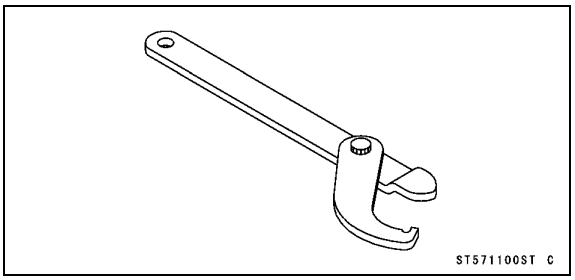
Inside Circlip Pliers:
57001-143



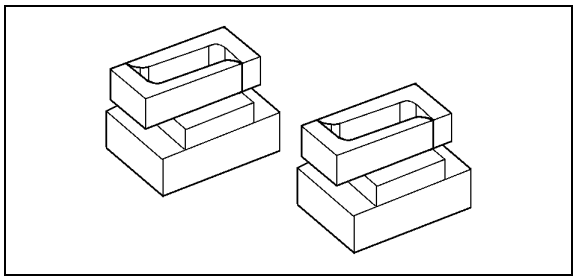
Oil Filter Wrench:
57001-1249



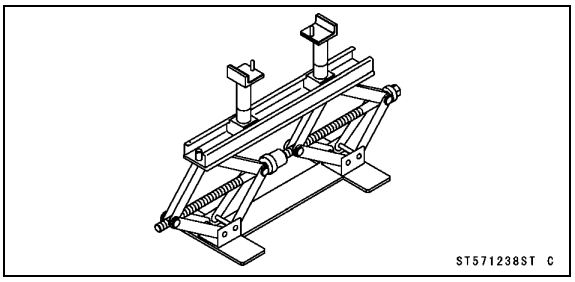
Steering Stem Nut Wrench:
57001-1100



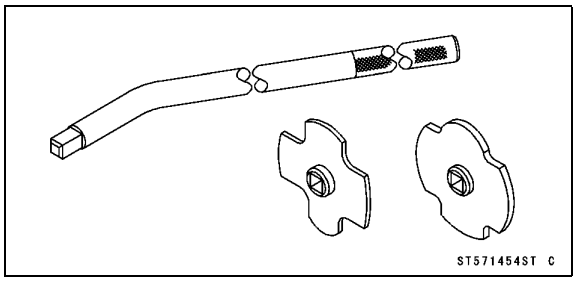
Attachment Jack:
57001-1398



Jack:
57001-1238



Filler Cap Driver:
57001-1454



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Periodic Maintenance Procedures

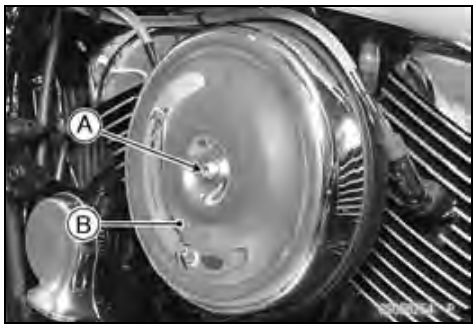
Fuel System

Air Cleaner Element Cleaning

NOTE

○*In dusty areas, the element should be cleaned more frequently than the recommended interval.*

○*After riding through rain or on muddy roads, the element should be cleaned immediately.*



● Remove:
Allen Bolt and Washer [A]
Left Air Cleaner Cover [B]



● Remove the element [A].
● Push a clean, lint-free towel into the lower air cleaner duct to keep dirt or other foreign material from entering.

⚠ WARNING

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

CAUTION

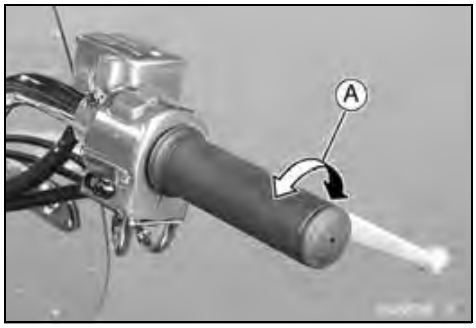
If dirt gets through into the engine, excessive engine wear and possibly engine damage will occur.

● Clean the element by tapping it lightly to loosen dust.
● Blow away the remaining dust by applying compressed air [A] from the inside to the outside (from the clean side to the dirty side).
● Visually check the element for no tears or no breaks and check the sponge gasket [B] also.
★If the element or gasket has any tears or breaks, replace the element.
● Install the left air cleaner cover.

Torque - Left Air Cleaner Cover Allen Bolt: 16 N·m (1.6 kgf·m, 12 ft·lb)

Throttle Control System Inspection

Throttle Grip Play Inspection



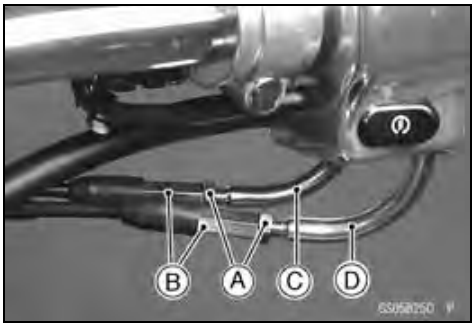
● Check the throttle grip free play [A].
★If the free play is incorrect, adjust the throttle cables.

Throttle Grip Free Play
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)

● Check that the throttle grip moves smoothly from close to full open, and the throttle closes quickly and completely in all steering positions by the return spring.
★If the throttle grip doesn't return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.
● Run the engine at the idle speed, and turn the handlebar all the way to the right and left to ensure that the idle speed doesn't change.
★If the idle speed increases, check the throttle grip free play and the cable routing.

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Periodic Maintenance Procedures



● If necessary, adjust the throttle cable as follows:
○Loosen the locknuts [A] and screw the adjusters [B] all the way in so as to give the throttle grip plenty of play.
○Turn out the adjuster of the decelerator cable [C] until there is no play.
○Tighten the locknut against the adjuster.
○Turn the adjuster of the accelerator cable [D] until the proper amount of throttle grip free play is obtained and tighten the locknut against the adjuster.

Idle Speed Inspection

● Start the engine and warm it up thoroughly.
○At first the engine will run fast to decrease warm up time (fast idle).
○Gradually the fast idle will lower to a certain RPM automatically. This is the idle speed.
● With the engine idling, turn the handlebar to both sides.
★If handlebar movement changes the idle speed, the throttle cables may be improperly adjusted or incorrectly routed or damaged. Be sure to correct any of these conditions before riding (see Cable, Wire, and Hose Routing section in the Appendix chapter).

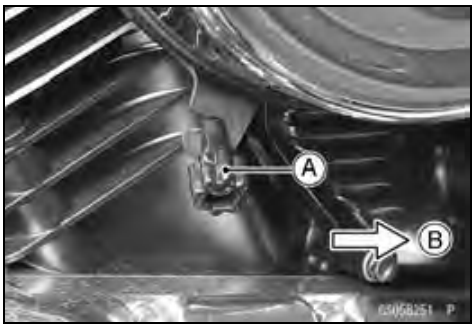
⚠ WARNING

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

● Check the idle speed.
★If the idle speed is out of the specified range, adjust it (see Idle Speed Adjustment in this chapter).

Idle Speed
Standard: 950 ±50 r/min (rpm)

Idle Speed Adjustment

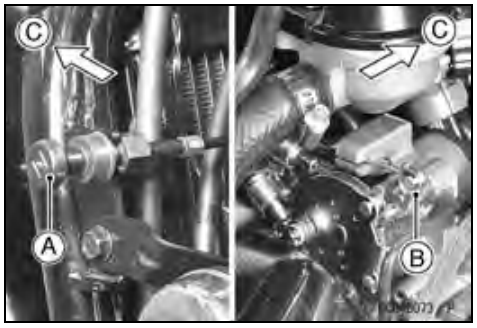


● Start the engine and warm it up thoroughly.
○Wait until fast idle speed lowers to a certain value.
● Turn the adjusting screw [A] until the idle speed is correct.
○Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.
Front [B]

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Periodic Maintenance Procedures

Choke Knob Operation



○Do not use the choke knob except when the engine has a starting difficulty, like in cold weather (10°C or below) or at high altitude. The DFI system has an automatic choke system, using ISC valves, a water temperature sensor, and an atmospheric pressure sensor, which provide start ability.

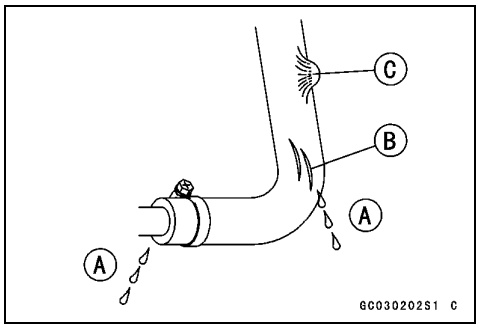
NOTE

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

Front [C]

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

Fuel Hose Inspection (Fuel Leak, Damage, Installation Condition)



○The fuel hoses are designed to be used throughout the motorcycle's life without any maintenance, however, if the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose to burst. Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter) and check the fuel hose.

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

● Check that the hoses are securely connected and clamps are tightened correctly.

● When installing, route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.

● When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.

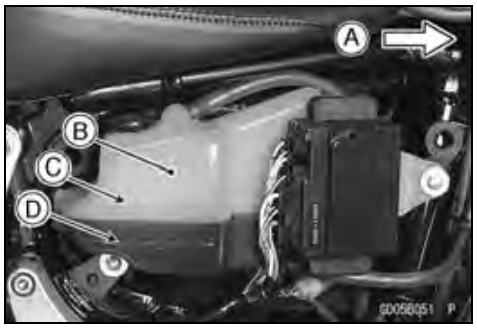
★Replace the hose if it has been sharply bent or kinked.

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Periodic Maintenance Procedures

Cooling System

Coolant Level Inspection



NOTE

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

● Check the coolant level in the reserve tank with the motorcycle held upright. The coolant level should be between the “F” (full) level and the “L” (low) level (In the photo, the right side cover has been removed for clarity).

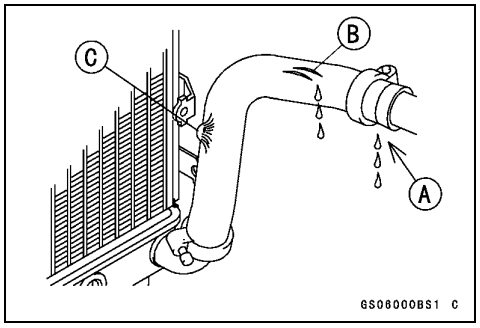
Front [A]
Reserve Tank [B]
“F” Level [C]
“L” Level [D]

★If the coolant level is lower than the “L” level, remove the right side cover and the reserve tank cap, then add coolant to the ”F” level.

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 can be added, but the diluted coolant must be returned to the correct mixture ratio within a few days.
If coolant must be added often or the reserve tank has run completely dry, there is probably leakage in the cooling system. Check the system for leaks.
Coolant ruins painted surfaces. Immediately wash away any coolant that spills on the frame, engine, wheels, or other painted parts.

Radiator Hose 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.

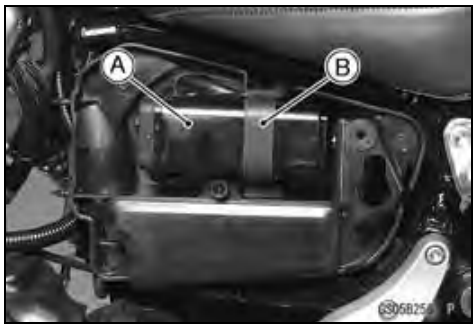
Torque - Water Hose Clamp Screws: 2.5 N·m (0.25 kgf·m, 22 in·lb)

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Periodic Maintenance Procedures

Evaporative Emission Control System

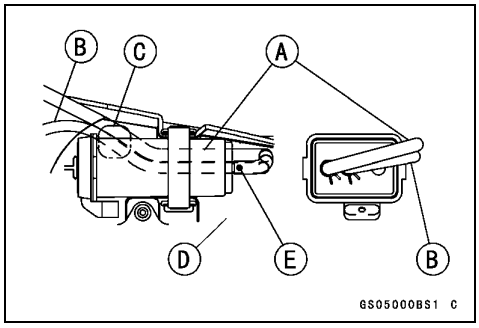
Evaporative Emission Control System Inspection (CAL)



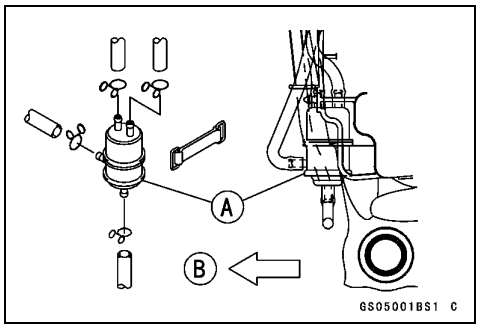
● Inspect the canister as follows:
○Remove the left side cover (see Left Side Cover Removal in the Frame chapter).
○Remove the band [A] and take out the canister [B].
○Visually inspect the canister for cracks and other damage.
★If the canister has any cracks or bad damage, replace it with a new one.

NOTE

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



○Run the purge hose (green) [A] above the canister breather hose (blue) [B] through the hole [C] into the tool case [D].
○Do not run these hoses side by side on the battery side of the canister. This prevents hoses from being flattened when installing the left side cover.
○Install the canister and the left side cover (see Left Side Cover Installation in the Frame chapter).
○Face the white mark [E] left as shown.



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

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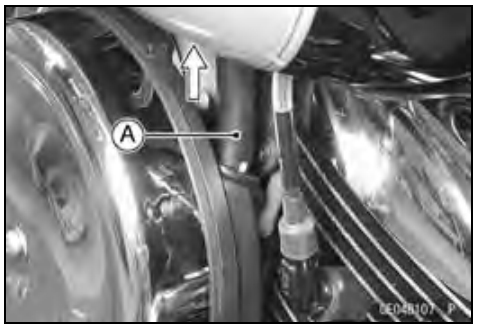
Periodic Maintenance Procedures

Air Suction System

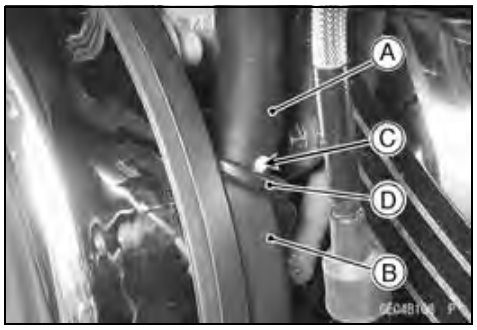
Air Suction System Damage Inspection

- Pull the vacuum switch hose [A] out of the right air cleaner base.
- Start the engine and run it at idle speed.
- Plug the vacuum switch hose end with your finger and feel vacuum pulsing in the hose.

★If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the vacuum switch valve (see Vacuum Switch Valve Unit Test in the Engine Top End chapter).



- Apply a soap and water solution or rubber lubricant to the end of the vacuum switch hose [A] and put the hose into the right air cleaner base [B] with the white mark [C] faced forward until the white mark aligns with the top of the grommet [D].



Clutch and Drive Train

Clutch Operation Inspection

- With the engine idling, make sure that there is no noise or abnormally heavy feeling when pulling [A] in the clutch lever fully. Also, make sure that the shift lever operates smoothly.
- When moving off the motorcycle by releasing the clutch lever gradually, make sure that the clutch does not slip and that the clutch engages smoothly.

★If the clutch operation is insufficiency, inspect the clutch system.



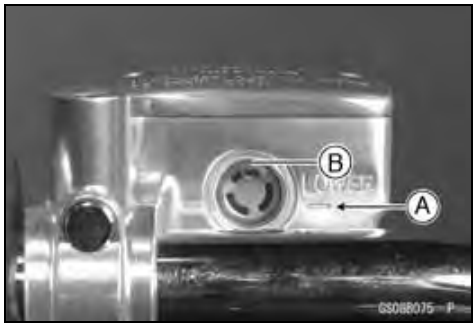
⚠ WARNING

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

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Periodic Maintenance Procedures

Clutch Fluid Level Inspection



- Hold the clutch fluid reservoir horizontal.
- Check that the clutch fluid level of the clutch reservoir is between the lower [A] and the upper [B] level lines.

★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line in the reservoir.

○Since the clutch fluid is the same as the brake fluid, refer to the Brake Fluid Level Inspection in this chapter for further details.

Torque - Clutch Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)

⚠ WARNING

Change the fluid in the clutch line completely if the fluid must be refilled but the type and brand of the fluid that already is in the reservoir are unidentified. After changing the fluid, use only the same type and brand of fluid thereafter. Mixing different types and brands of fluid lowers the fluid boiling point and could cause the clutch to be ineffective. It may also cause the rubber clutch parts to deteriorate.

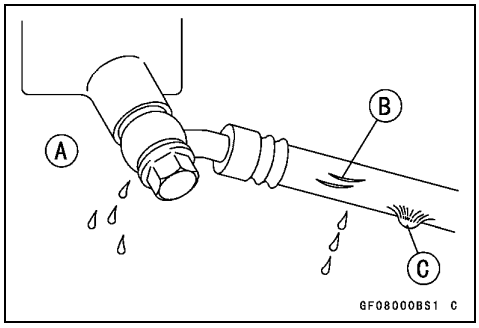
Clutch Fluid Leak (Clutch Hose and Pipe)



- Apply the clutch lever and inspect the clutch fluid leak from the clutch hose [A] and fitting.

★If the clutch fluid leaked from any position, inspect or replace the problem part.

Clutch Hose Damage and Installation Condition Inspection



- The high pressure inside the clutch 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 it if any fraying, cracks [B] or bulges [C] are noticed.

- Check that the hoses are securely connected and banjo bolts are tightened correctly.

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

- When installing the clutch hose, route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.

★Replace the hose if it has been sharply bent or kinked.

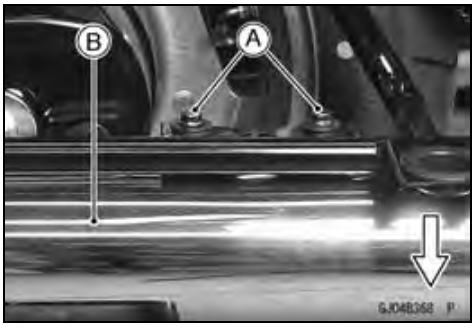
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Periodic Maintenance Procedures

Final Gear Case Oil Level Inspection

⚠ WARNING

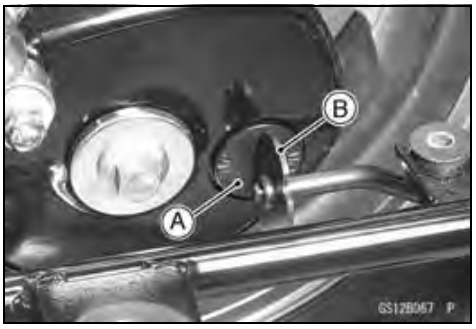
Motorcycle operation with insufficient, deteriorated, or contaminated oil causes accelerated wear and may result in seizure of the pinion and ring gears. Seizure can lock the rear wheel and skid the rear tire, with consequent less of control.



- Support the motorcycle perpendicular to the ground.
- Remove the left saddlebag (see Saddlebag Removal in the Frame chapter).
- Loosen the left muffler clamp bolt.
- Remove the left muffler stay mounting bolts [A].
- Lower the left muffler [B].

- Unscrew the filler cap [A], using the filler cap driver [B].

  Special Tool - Filler Cap Driver: 57001-1454



- The oil level [A] should come to the bottom of the filler opening.

★If it is low, first check the final gear case for oil leakage, remedy it if necessary, and add oil through the filler opening. Use the same type and brand of oil that is already in the final gear case.

- Install the filler cap.

  Special Tool - Filler Cap Driver: 57001-1454

- Tighten the left muffler clamp bolts and muffler stay mounting bolts.

  Torque - Muffler Stay Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

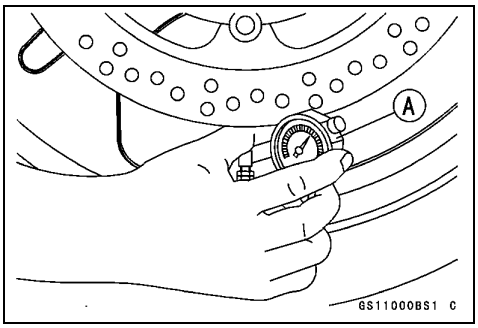


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Periodic Maintenance Procedures

Wheel and Tires

Tire Air Pressure Inspection



- Measure the tire air pressure with an air pressure gauge [A] when the tires are cold (that is, when the motorcycle has not been ridden more than a mile during the past 3 hours.)

★Adjust the tire air pressure according to the specifications if necessary.

Air Pressure (When Cold)

Front	Up to 185 kg (408 lb)	225 kPa (2.25 kgf/cm², 32 psi)
Rear	Up to 185 kg (408 lb)	280 kPa (2.8 kgf/cm², 40 psi)

⚠ WARNING

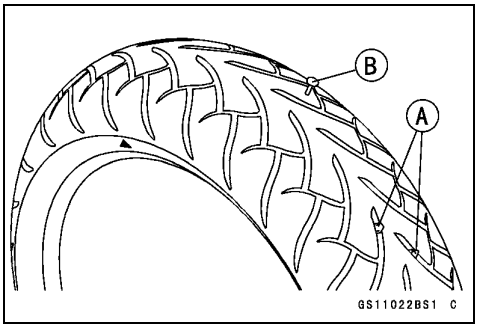
To ensure safe handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure. Use the same manufacture's tires on both front and rear wheels.

NOTE

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

○*Check and balance the wheel when a tire is replaced with a new one (see Balance Inspection in the Wheels/Tires chapter).*

Wheel/Tire Damage Inspection



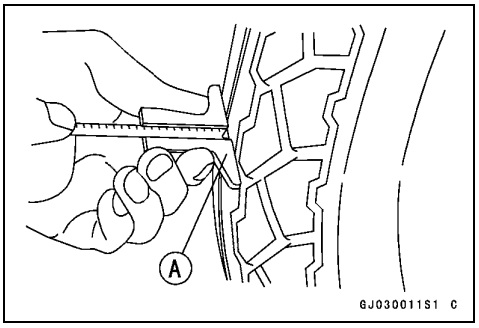
- Remove any imbedded stones [A] or other foreign particles [B] from the tread.
- Visually inspect the tire for cracks and cuts, replacing the tire in case of damage. Swelling or high spots indicate internal damage, requiring tire replacement.

Tire Tread Wear, Abnormal 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.

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Periodic Maintenance Procedures



- 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 and Installation in the Wheels/Tires chapter).

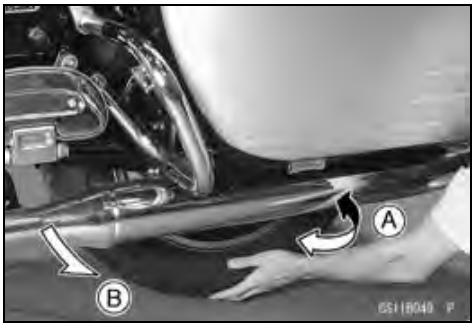
Tread Depth
Standard:
Front 4.5 mm (0.18 in.)
Rear 7.2 mm (0.28 in.)
Service Limit:
Front 1 mm (0.04 in.)
(AT, CH, DE) 1.6 mm (0.06 in.)
Rear 2 mm (0.08 in.): Up to 130 km/h (80 mph)
3 mm (0.1 in.): Over to 130 km/h (80 mph)

Wheel Bearing Damage Inspection



- Using a jack and attachment, raise the front wheel off the ground (see Front Wheel Removal in the Wheels/Tires chapter).
- Turn the handlebar all the way to the left or right.
- 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 Hub Bearings Inspection in the Wheels/Tires chapter).



- Using a jack and attachment, raise the rear wheel off the ground (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 Hub Bearings Inspection in the Wheels/Tires chapter) and coupling.

Brakes System

Brake Fluid Leak (Brake Hose and Pipe)



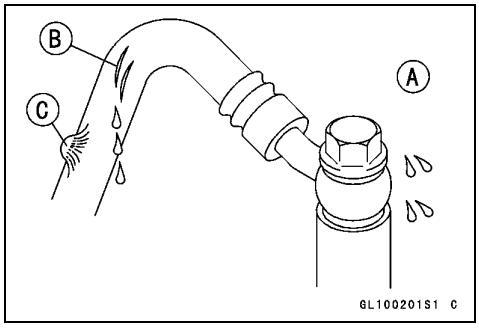
- Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A] and fitting.

★If the brake fluid leaked from any position, inspect or replace the problem part.

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Periodic Maintenance Procedures

Brake Hose Damage and Installation Condition Inspection



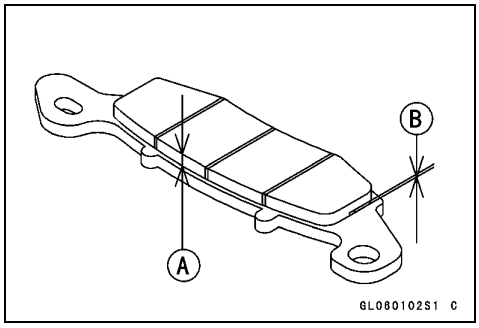
- Inspect the brake hose and fittings for deterioration, cracks and signs of leakage.

○The high pressure inside the brake line can cause fluid to leak [A] or the hose to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.

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

★Tighten any loose fittings.

Brake Pad Wear Inspection



- Remove the brake pads (see Front and Rear Brake Pad Removal in the Brakes chapter).
- Check the lining thickness [A] of the pads in each caliper.

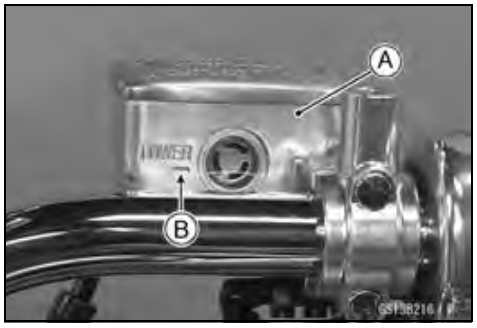
★If the lining thickness of either pad is less than the service limit [B], replace both pads in the caliper as a set (see Front and Rear Brake Pad Installation in the Brakes chapter).

Pad Lining Thickness

Standard:

Front	**4.5 mm (0.18 in.)**
Rear	**7.0 mm (0.28 in.)**
Service Limit:	**1 mm (0.04 in.)**

Brake Fluid Level Inspection



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

NOTE

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

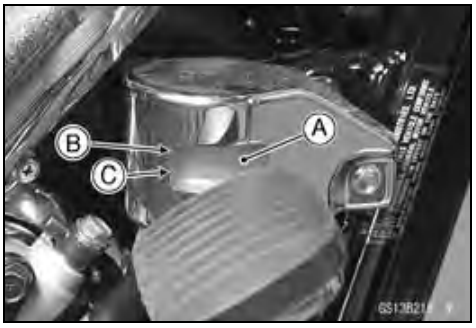
★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [A] in the reservoir [B].



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Periodic Maintenance Procedures

● Check that the brake fluid level in the rear brake reservoir [A] is between the upper [B] and the lower [C] level lines.
★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line.
○Use extra heavy-duty brake fluid only from a container marked DOT4.
○Brake fluid of DOT4 is installed in the brake system when shipped.



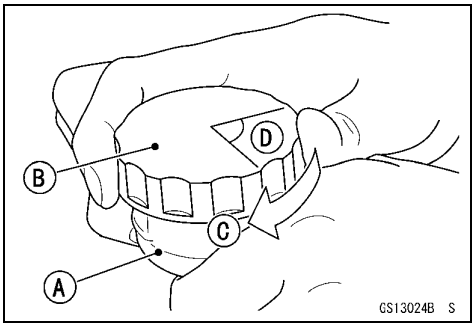
⚠ WARNING

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

● Install the front brake reservoir cap.

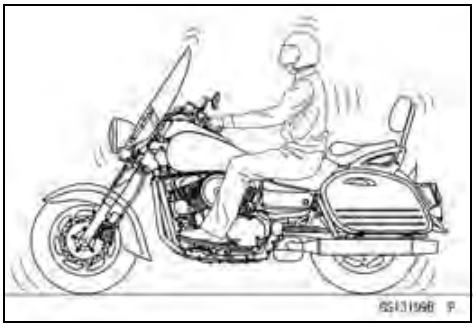
Torque - Front Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)

● Follow the procedure below to install the rear brake reservoir cap correctly.
○First, tighten the rear brake reservoir cap [B] clockwise [C] by hand until the 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 rear brake reservoir body [A].



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.

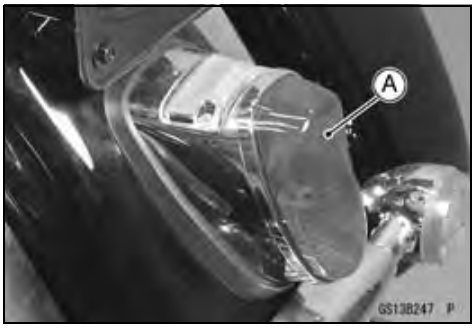


⚠ WARNING

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

Brake Light Switch Operation

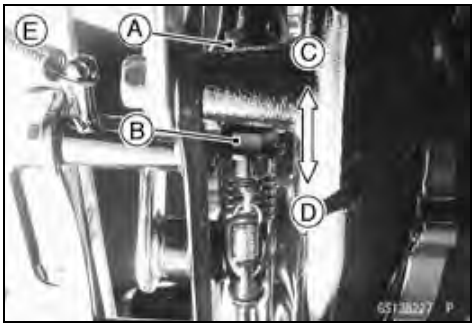
● Turn on the ignition switch.
● The brake light [A] should go on when the brake lever is applied or after the brake pedal is depressed about 10 mm (0.39 in.).



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Periodic Maintenance Procedures

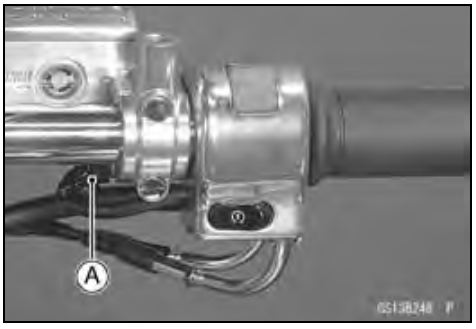
★If it does not, adjust the brake light switch.
● While holding the switch body, turn the adjusting nut to adjust the switch.
Switch Body [A]
Adjusting Nut [B]
Light sooner as the body rises [C]
Light later as the body lowers [D]
Bottom View [E]



CAUTION

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

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



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

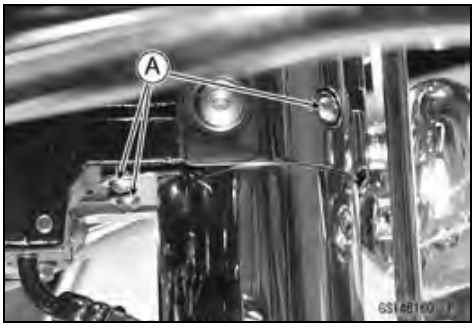


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Periodic Maintenance Procedures

Front Fork Oil Leak Inspection

- Remove the bolts [A] on both sides and then slide the front fork inner covers downward.



- Visually inspect the front forks [A] for oil leakage, scoring or scratches on the outer surface of the inner tubes.

★Replace or repair any defective parts, if necessary.



Rear Shock Absorber Oil Leak Inspection

- Remove the Saddlebags (see Saddlebag Removal in the Frame chapter).
- Visually inspect the shock absorbers [A] for oil leakage.

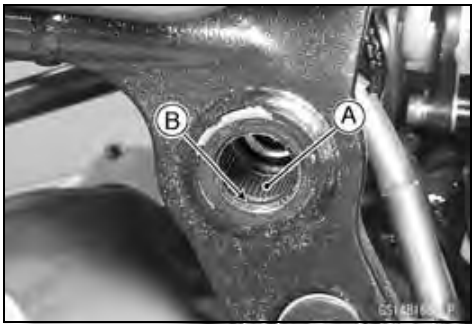
★If they are oil leaked, one unit feels weaker than the other, replace both shock absorber as a set (see Rear Shock Absorber Removal and Installation in the Suspension chapter).

- Install the Saddlebags (see Saddlebag Installation in the Frame chapter)



Swingarm Pivot Lubrication

- Remove the swingarm (see Swingarm Removal in the Suspension chapter).
- Clean the old grease out of the bearings.
- Apply grease to the inner surface of the needle bearings [A].
- Apply a thin coat of grease to the lips [B] of the grease seals.
- Install the swingarm (see Swingarm Installation in the Suspension chapter).

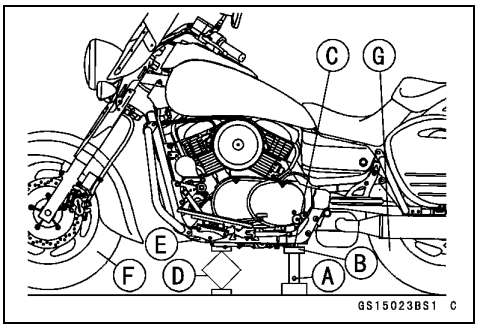


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Periodic Maintenance Procedures

Steering System

Steering Play Inspection



- Check steering as follows.

○Use the jack [A], the attachment jack [B] under the frame pipe ribs [C], and a commercially available jack [D] under the engine [E] to lift the front wheel [F] OFF the ground until the rear wheel [G] touches the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

○With the front wheel pointing straight ahead, alternately tap each end of the handlebar. The front wheel should swing fully right and left 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 fork.

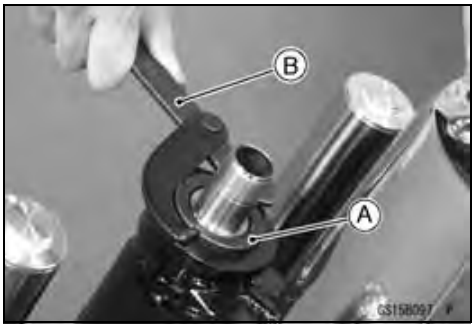
★If you feel looseness, the steering is too loose.

NOTE

○*The cables and wiring will have some effect on the motion of the fork which must be taken into account. Be sure the wires and cables are properly routed.*

○*The bearings must be in good condition and properly lubricated in order for any test to be valid.*

Steering Play Adjustment



- Remove the stem head (see Steering Stem Removal in the Steering chapter).
- Remove the claw washer.
- Adjust the stem nut [A] with the stem nut wrench [B] by tightening to the specified torque.

Special Tool - Steering Stem Nut Wrench: 57001-1100

Torque - Steering Stem Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)

- Install the stem head (see Steering Stem Installation in the Steering chapter).
- Tighten the following in the order listed.

Torque - Stem Head Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)
Front Fork Clamp Bolts (Upper): 29 N·m (2.9 kgf·m, 21 ft·lb)

○Run the throttle cables, brake hose, and clutch hose in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.

- Check and adjust the steering and throttle cables after installation.

⚠ WARNING

Do not attempt to ride the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc.
The brakes will not function on the first application of the lever if this is not done.

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Periodic Maintenance Procedures

Stem Bearing Lubrication



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

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Periodic Maintenance Procedures

Electrical System

Lights and Switches Operation

First Step

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

Models	United States	Canada	Europe	Australia
Position Lights [A]	goes on	goes on	–	–
City Light [B]	–	–	goes on	–
Taillight [C]	goes on	goes on	goes on	goes on
Licence Plate Light [D]	goes on	goes on	goes on	goes on
Meter Panel LCD [E]	goes on	goes on	goes on	goes on
Neutral Indicator LED [F]	goes on	goes on	goes on	goes on
FI Indicator LED [G]	goes on	goes on	goes on	goes on
Fuel Level Warning Indicator LED [H]	goes on (about 2 seconds)	goes on (about 2 seconds)	goes on (about 2 seconds)	goes on (about 2 seconds)

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

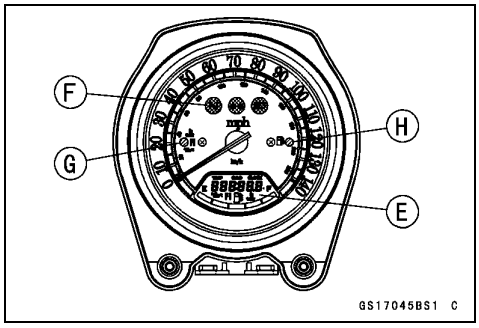
Battery (see Charging Condition Inspection in the Electrical System chapter)
Applicable Bulb (see Wiring Diagram in the Electrical System chapter)
Meter Unit for Meter Panel LCD (see Meter Unit Inspection in the Electrical System chapter)
Meter Unit for Neutral Indicator LED (see Meter Unit Inspection in the Electrical System chapter)
Meter Unit for Fuel Level Warning Indicator LED (see Meter Unit Inspection in the Electrical System chapter)
Meter Unit for FI Indicator 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 Fuse 10A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Switch Inspection in the Electrical System chapter)
Headlight Fuse 10A (see Fuse Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

- Turn off the ignition switch.
- The all lights should go off.

★If the light does not go off, replace the ignition switch.







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Periodic Maintenance Procedures

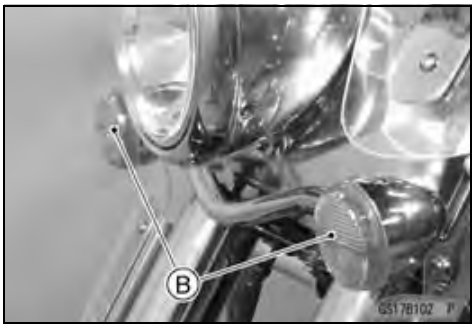
Second Step
- Turn the ignition switch to P (Park) position.
- The taillight and license plate light should go on.

★If the light does not go on, inspect or replace the following item.
Ignition Switch (see Switch Inspection in the Electrical System chapter)

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

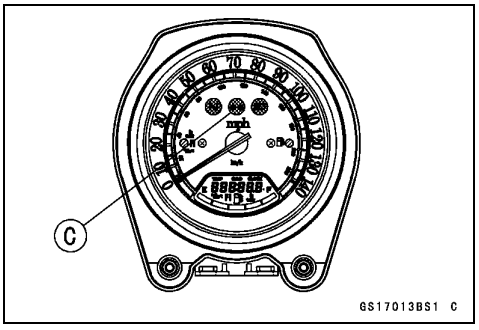
★If the each light does not flash, inspect or replace the following item.
Turn Signal Light Bulb (see Turn Signal Light Bulb Replacement in the Electrical System chapter)
Turn Signal Light Indicator Bulb (see Meter Unit Assembly in the Electrical System chapter)
Turn Signal Control Relay Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Turn Signal Switch (see Turn Signal Switch Electrical System chapter)
Turn Signal Control Relay (see Turn Signal Control Relay Inspection Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System Inspection in the chapter)





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

★If the light does not go off, inspect or replace the following item.
Turn Signal Switch (see Turn Signal Switch Inspection in the Electrical System chapter)
Turn Signal Control Relay (see Turn Signal Control Relay Inspection in the Electrical System chapter)

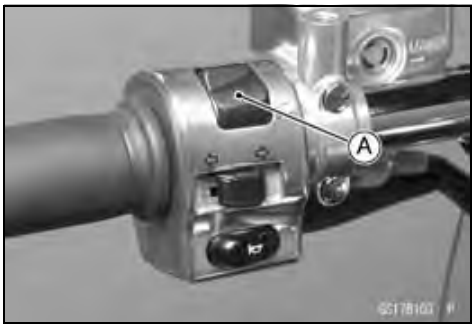


NOTE

○*Refer to the Electrical system chapter for the automatic turn signal canceling system.*

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

★If the low beam headlight does not go on, inspect or replace the following item.
Headlight Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Headlight Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)
Headlight Relay in Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)



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Periodic Maintenance Procedures

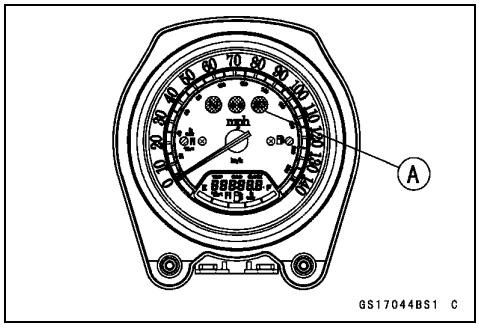
- Set the dimmer switch to high beam position.
- The high beam headlight should go on.
- The high beam indicator light [A] should go on.

★If the high beam headlight and/or high beam indicator light does not go on, inspect or replace the following item.
Headlight Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)

- Turn off the engine stop switch.
- The low beam and high beam headlights should stay going on.

★If the headlights and high beam indicator light does go off, inspect or replace the following item.
Headlight Relay in Relay Box (see Relay Circuit Inspection in the Electrical System chapter)

- Turn off the ignition switch.
- The headlights and high beam indicator light should go off.



Headlight Aiming Inspection

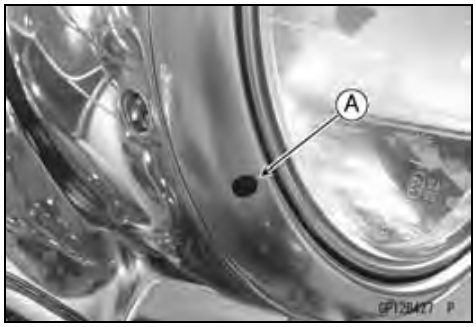
- Inspect the headlight beam for aiming.

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

Headlight Beam Horizontal Adjustment

- Turn the horizontal adjuster [A] on the headlight with a screwdriver in or out until the beam points straight ahead.

○Turn the adjuster clockwise to face the headlight to the left.



★If the headlight beam points too low or high, adjust the vertical beam.

Headlight Beam Vertical Adjustment

- Turn the vertical adjuster [A] in the headlight in or out with a screwdriver to adjust the headlight vertically.

○Turn the adjuster clockwise to face the headlight up.



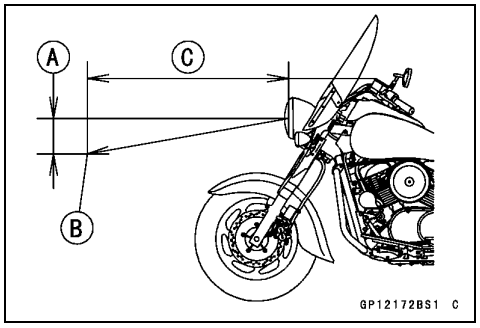
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Periodic Maintenance Procedures

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.*

○*For US model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2.0 in.) drop at 7.6 m (24.93 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 (24.93 ft.) [C]

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Periodic Maintenance Procedures

Side Stand Switch Operation Inspection

● Inspect the side stand switch [A] operation accordance to below table.



Side stand Switch Operation

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

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

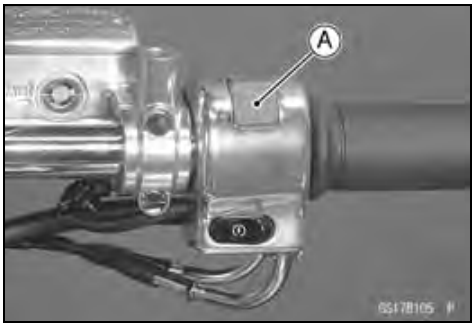
Battery (see Charging Condition Inspection in the Electrical System chapter)
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
Ignition Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Side Stand Switch (see Switch Inspection in the Electrical System chapter)
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)
Starter Button (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Switch Inspection in the Electrical System chapter)
Starter Control Relay (see Starter Relay Inspection in the Electrical System chapter)
Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Starter Control Relay (see Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

★If the all parts are good condition, replace the ECU.

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Periodic Maintenance Procedures

Engine Stop Switch Operation Inspection



First Step
- Turn on the ignition switch.
- Set the neutral position.
- Turn the engine stop switch [A] to stop position.
- Push the start button.
- The engine does not start.

★If the engine starts, inspect or replace the following item.
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)

Second Step
- Turn on the ignition switch.
- Set the neutral position.
- Turn the engine stop switch to run position.
- Push the start button and run the engine.
- Turn the engine stop switch to stop position.
- Immediately the engine should be stop.

★If the engine does not stop, inspect or replace the following item.
Engine Stop Switch (see Switch Inspection Electrical System chapter)

★If the engine stop switch is good condition, replace the ECU.

Others

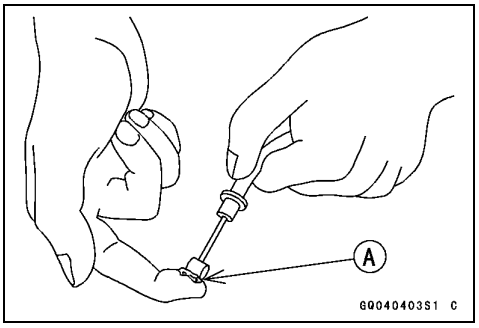
Chassis Parts Lubrication
- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

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 Motor Oil.
Rear Brake Rod Joint

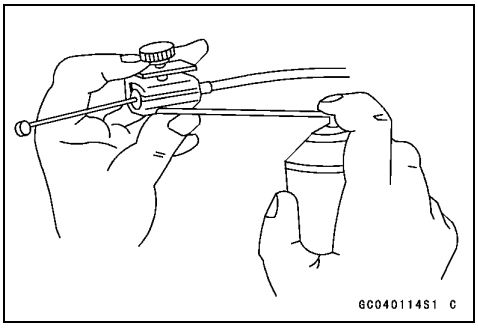
Points: Lubricate with Grease.
Throttle Inner Cable Upper Ends [A]
Clutch Lever Pivot (Apply silicone grease)
Brake Lever Pivot (Apply silicone grease)
Brake Pedal Pivot
Side stand



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Periodic Maintenance Procedures

Cable: Lubricate with Cable Lubricant.
Choke Cable
Throttle Cables

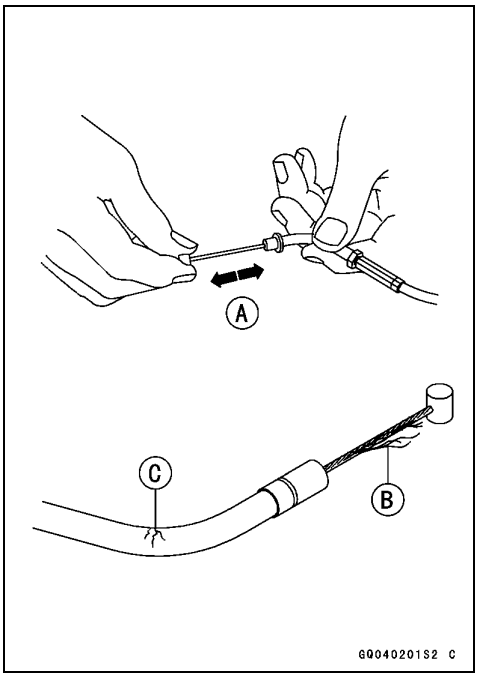


- Lubricate the cables by seeping the oil between the cable and housing.

○The cable may be lubricated by using a commercially available pressure cable lubricator with an aerosol cable lubricant.

- With the cable disconnected at both ends, the cable should move freely [A] within the cable housing.

★If cable movement is not free after lubricating, if the cable is frayed [B], or if the cable housing is kinked [C], replace the cable.



Bolts, Nuts and Fastener Tightness Inspection

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

NOTE

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

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

★If cotter pins are damaged, replace them with new ones.

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Periodic Maintenance Procedures

Bolt, Nut and Fastener to be checked

Wheels:
- Front Axle
- Front Axle Clamp Bolts
- Rear Axle Nut
- Rear Axle Nut Cotter Pin
- Front and Rear Fender Mounting Bolts

Final Drive:
- Final Gear Case Mounting Nuts

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

Suspension:
- Front Fork Clamp Bolts
- Rear Shock Absorber Mounting Nuts
- Swingarm Pivot Shaft

Steering:
- Stem Head Nut
- Handlebar Clamp Bolts

Engine:
- Throttle Cable Adjuster Locknuts
- Engine Mounting Bolts and Nuts
- Shift Pedal Bolts
- Muffler Stay Mounting Bolts
- Exhaust Pipe Holder Nuts
- Clutch Master Cylinder Clamp Bolts
- Clutch Lever Pivot Nut
- Radiator Mounting Bolt
- Radiator Bracket Bolts

Others:
- Side stand Bolt and Nut
- Front and Rear Footboard Bracket Bolts
- Tandem Grip Mounting Bolts
- Downtube Bolts
- Windshield Bolts
- Saddlebag Bolts

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Periodic Maintenance Procedures

Replacement Parts

Air Cleaner Element Replacement

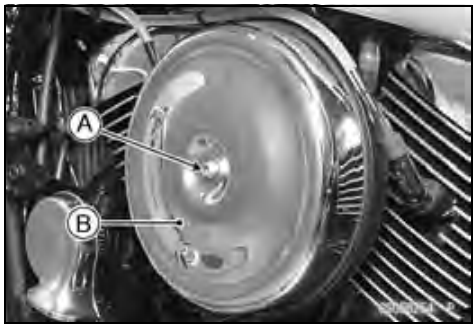
⚠ WARNING

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

CAUTION

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

- Remove:
  Allen Bolt and Washer [A]
  Left Air Cleaner Cover [B]



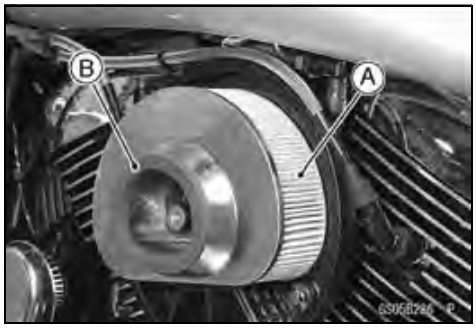
- Remove the element [A].
- Push a clean, lint-free towel into the lower air cleaner duct to keep dirt or other foreign material from entering.



- Replace the air cleaner element with a new one.
- Install a new element [A] with the smaller gasket [B] side facing outside.

CAUTION

Use only the recommended air cleaner element (Kawasaki part number 11013-1305). Using another air cleaner element will wear the engine prematurely or lower the engine performance.



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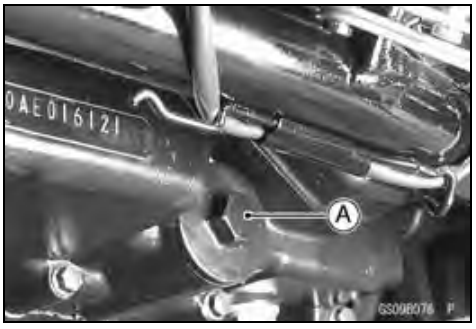
Periodic Maintenance Procedures

Engine Oil Change

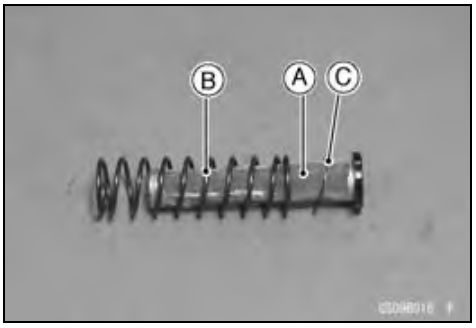
- Situate the motorcycle so that it is vertical after warming up the engine.
- Remove the engine oil drain plug [A] and drain the oil.



- Remove:
  Oil Screen Plug [A] (Right Side)



- Remove the oil screen [A], the spring [B], and the washer [C].
- Clean the oil screen with a high-flash point solvent and remove any particles stuck to it.
- Clean the screen thoroughly whenever the engine oil is changed.



⚠ WARNING

Clean the screen in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents.

NOTE

○*While cleaning the screen, check for any metal particles that might indicate internal engine damage.*

- Check the screen carefully for any damage: holes and broken wires.

★If the screen is damaged, replace it.

- Be sure to put in the oil screen with the rubber gasket end inside.
- Replace the screen plug O-ring with new one.

Torque - Oil Screen Plug: 20 N·m (2.0 kgf·m, 14 ft·lb)

○The oil in the filter can be drained by removing the filter (see Oil Filter Replacement in this chapter).

- Replace the drain plug gasket with a new one.

Torque - Engine Oil Drain Plug: 20 N·m (2.0 kgf·m, 14 ft·lb)
Oil Filter: 18 N·m (1.8 kgf·m, 13 ft·lb)

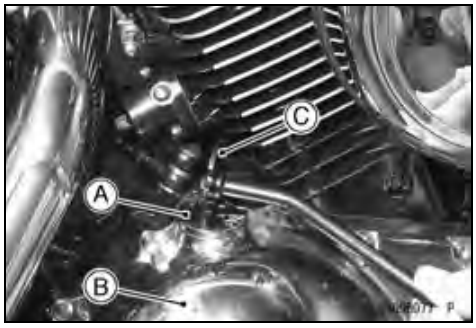
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Periodic Maintenance Procedures

● Remove the oil filler cap [A] with the filler cap driver [B] and pour in the specified type and amount of oil.
Clutch Cover [C]

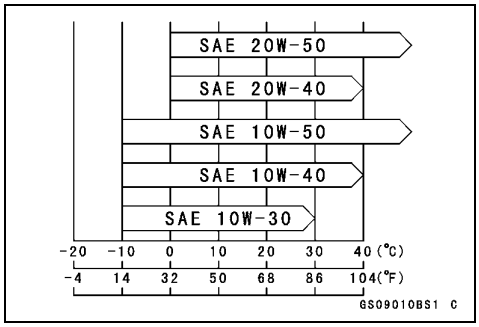
Special Tool - Filler Cap Driver: 57001-1454

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



Engine Oil

Type:	**API SE, SF or SG**
	API SH or SJ with JASO MA
Viscosity:	**SAE 10W-40**
Amount:	**2.9 L (3.1 US qt, when filter is not removed)**
	3.1 L (3.3 US qt, when filter is removed)
	3.5 L (3.7 US qt, when engine is completely disassembled and dry)



NOTE

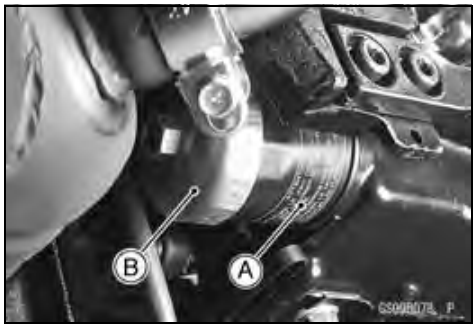
○*Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.*

Oil Filter Replacement

● Drain the engine oil (see Engine Oil Change in this chapter).

● Remove the oil filter [A] with the oil filter wrench [B] and discard the oil filter.

Special Tool - Oil Filter Wrench: 57001-1249



NOTE

○*The filter has an oil filter bypass valve which can not be removed.*

● Replace the oil filter with a new one.

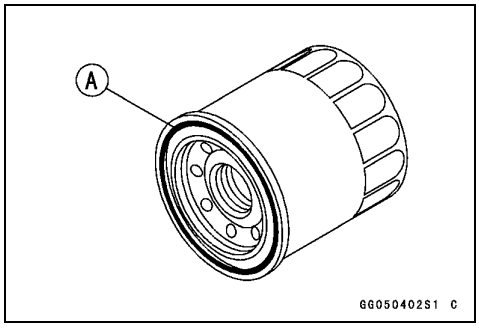
● Apply engine oil to the gasket [A] of the new filter before installation.

● Tighten the filter with the oil filter wrench.

Special Tool - Oil Filter Wrench: 57001-1249

Torque - Oil Filter: 18 N·m (1.8 kgf·m, 13 ft·lb)

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



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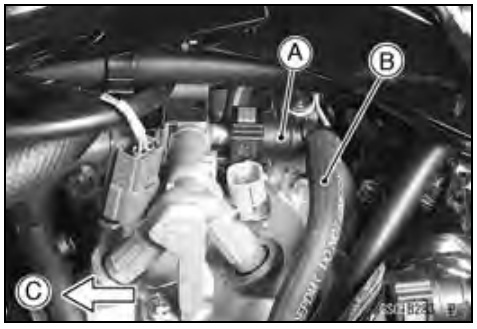
Periodic Maintenance Procedures

Fuel Hose Replacement

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the #2 fuel injector connector [A].



- Pinch the lock of the fuel hose joint #2 with fingers, disconnect the joint [A] and take out the fuel hose assy [B].
  Front [C]

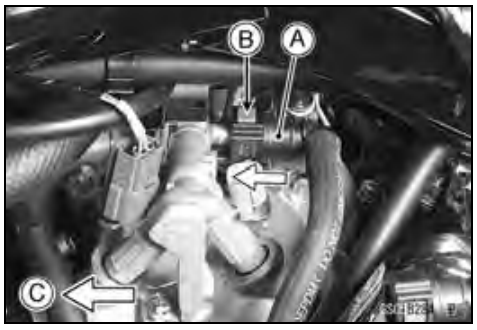


⚠ WARNING

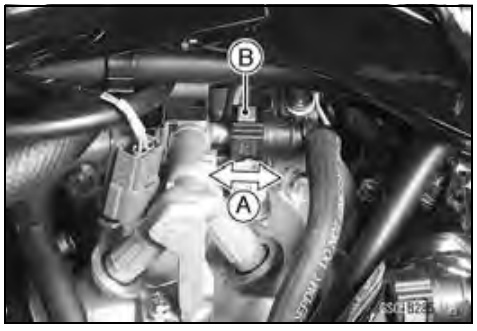
Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.
When the fuel hose is disconnected, fuel spills out from the hose and the pipe. Cover the hose connection with a clean shop towel to prevent fuel spillage.

- Replace the fuel hose with a new one.
- Fit the fuel hose joint #2 [A] onto the pipe (for delivery joint) until the joint clicks [B].

○Insert the hose joint straight along the pipe.
  Front [C]



- Push and pull [A] the fuel hose joint #2 [B] back and forth more than two times and make sure it is locked and doesn't come off. When the fuel hose joint #2 is correctly installed, it should slide on the delivery pipe about 5 mm (0.2 in.).



⚠ WARNING

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

★If it comes off, reinstall the hose joint.

- Connect the #2 fuel injector connector.
- Run the fuel hose in accordance with the Cable, Wire and Hose Routing section in the Appendix chapter.
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
- Start the engine and check the fuel hose for leaks.

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Periodic Maintenance Procedures

Coolant Change

⚠ WARNING

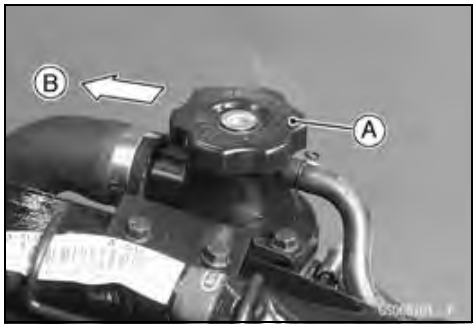
To avoid burns, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down.
Coolant on tires will make them slippery, and can cause an accident and injury.
Since coolant is harmful to the human body, do not use for drinking.



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

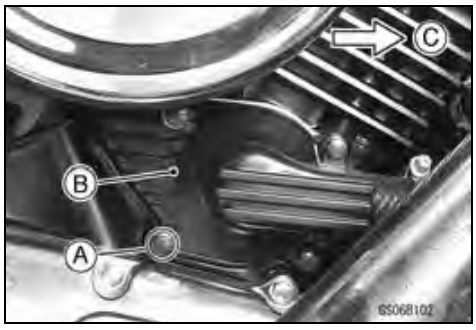
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Remove the radiator cap [A] in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.

○The coolant will drain from the radiator and engine.
Front [B]



- Remove the water pump drain bolt [A]. The remaining coolant will drain from the water pump [B].

○Place a conduit under the drain hole of the pump cover. The conduit leads to a container.
Front [C]



- Remove:
  Right Side Cover (see Right Side Cover Removal in the Frame chapter)
  Coolant Reservoir Tank Bolts [A]



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Periodic Maintenance Procedures



- Turn over the reservoir tank [A], remove the cap [B], and pour the coolant into a suitable container.
- Install the reservoir tank.

CAUTION

Soft or distilled water must be used with the antifreeze (see Specifications in this chapter) in the cooling system.
If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system.

Water and Coolant Mixture Ratio (Recommended)

Soft Water	**:**	**50%**
Coolant	**:**	**50%**
Freezing Point	**:**	**–35°C (–31°F)**
Total Amount	**:**	**2.3 L (2.4 US qt)**

- Tighten the drain bolts.

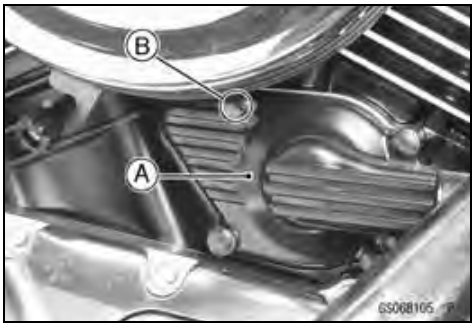
Torque - Radiator Drain Bolt: 2.2 N·m (0.22 kgf·m, 19 in·lb)
Water Pump Drain Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)

- Fill the coolant into the radiator.

NOTE

○*Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.*
○*Fill in the coolant slowly so that it can expel the air from the engine and radiator.*

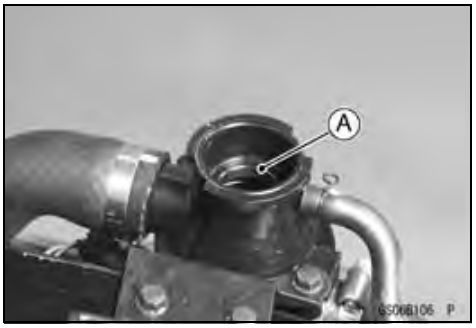
- Check the cooling system for leaks.



- Bleed the air from the water pump [A].

○Loosen the air bleeder bolt [B] until the coolant seeps out around the bolt, then tighten it.

Torque - Water Pump Air Bleeder Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)



- Tap the radiator hoses to force any air bubbles caught inside.
- Fill the radiator up to the filler neck [A] with coolant.
- Install the radiator cap.

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Periodic Maintenance Procedures

- Fill the reservoir tank up to the “F” (full) level line [A] with coolant and install the cap.
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
- Start the engine and warm it up thoroughly until the radiator fan turns on and then stop the engine.
- Check the coolant level in the reserve tank several times while the engine is cooling down, and replenish as necessary.

★If the coolant level is lower than the “L” level line, add coolant to the “F” level line.



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

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Periodic Maintenance Procedures

Radiator Hose and O-ring Replacement

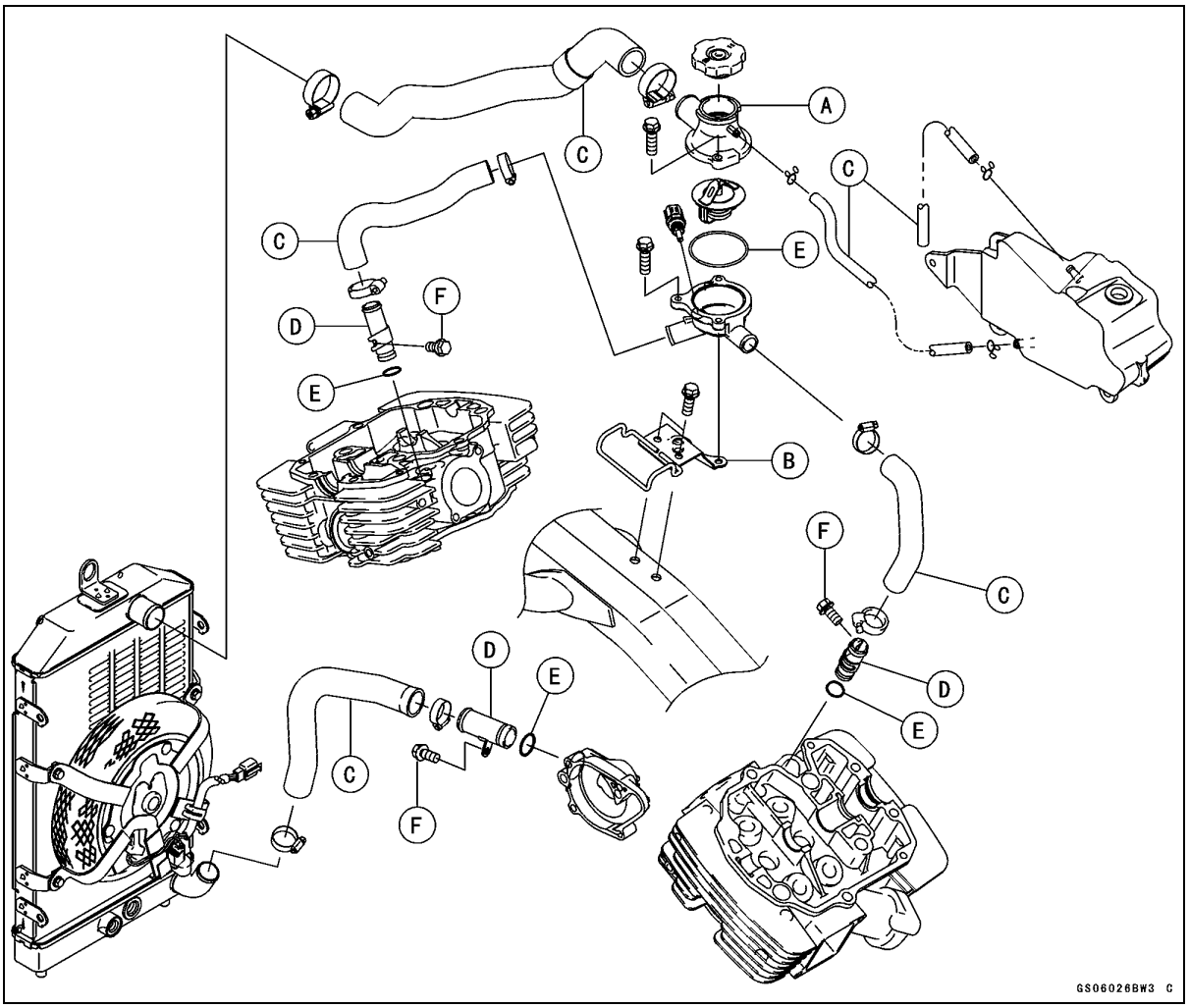
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Thermostat Housing [A] with Bracket [B] (see Thermostat Removal in the Cooling System chapter)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Right Side Cover (see Right Side Cover Removal in the Frame chapter)
- Loosen the radiator hose clamps and remove the hoses [C].
- Unscrew the bolts and remove the water pipes [D] and O-rings [E].
- Apply grease to the new O-ring and install the water pipes.
- Torque the water pipe bolts [F].

Torque - Water Pipe Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the new radiator hose and tighten the hose clamps securely.

Torque - Water Hose Clamp Screws: 2.5 N·m (0.25 kgf·m, 22 in·lb)

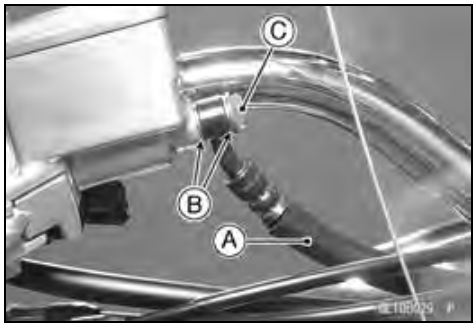
- Fill the coolant (see Coolant Change in this chapter).
- Check the cooling system for leaks.



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Periodic Maintenance Procedures

Brake Hose and Pipe Replacement



CAUTION

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

- When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
- When removing the brake hose [A], temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Install new brake hoses and pipes.
- Immediately wash away any brake fluid that spills.
- There are washers [B] on each side of the brake hose fitting. Replace them with new ones when installing.
- Tighten the banjo bolts [C] on the hose fittings.

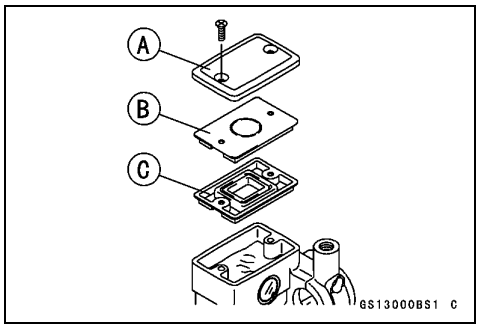
Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18.0 ft·lb)



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



Brake Fluid Change



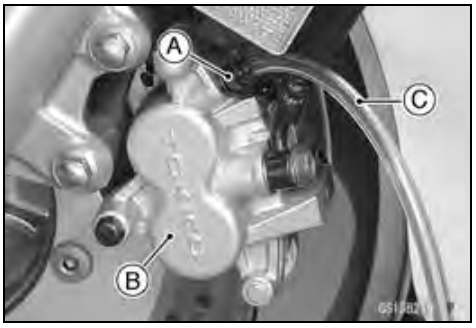
NOTE

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

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

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Periodic Maintenance Procedures



- Remove the rubber cap from the bleed valve [A] on the front caliper [B].
- Attach a clear plastic hose [C] 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 as follows:

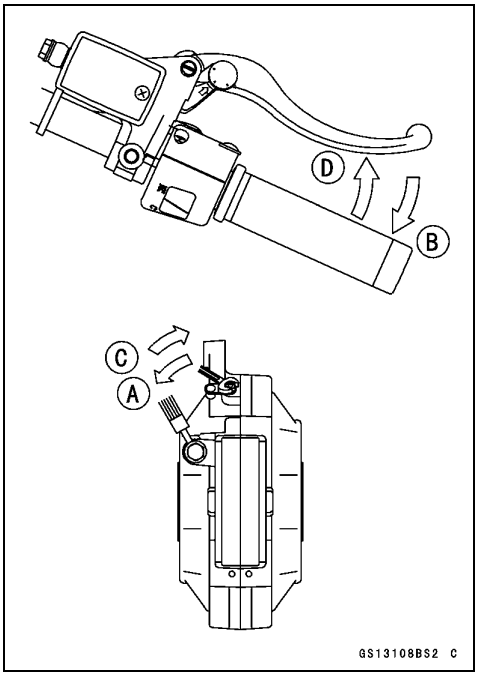
○Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.

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

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.*

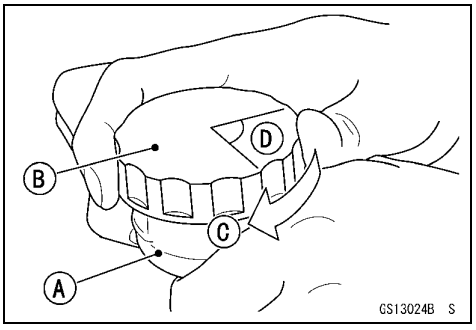


- Remove the clear plastic hose.
- Install the front brake reservoir cap.
- Tighten the bleed valves, and install the rubber caps.

Torque - Caliper Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)
Front Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)

- Follow the procedure below to install the rear brake reservoir cap correctly.

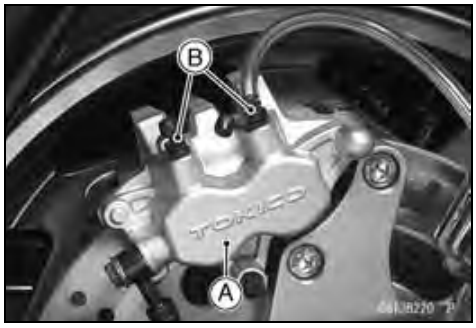
○First, tighten the rear brake reservoir cap [B] clockwise [C] by hand until the resistance is felt fully; then, tighten the cap an additional 1/6 turn [D] while holding the rear brake reservoir [A] body.



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Periodic Maintenance Procedures

○For the rear brake caliper [A], change the brake fluid for two bleed valves [B].
● After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.
★If necessary, bleed the air from the lines (see Brake Line Bleeding in the Brakes chapter).



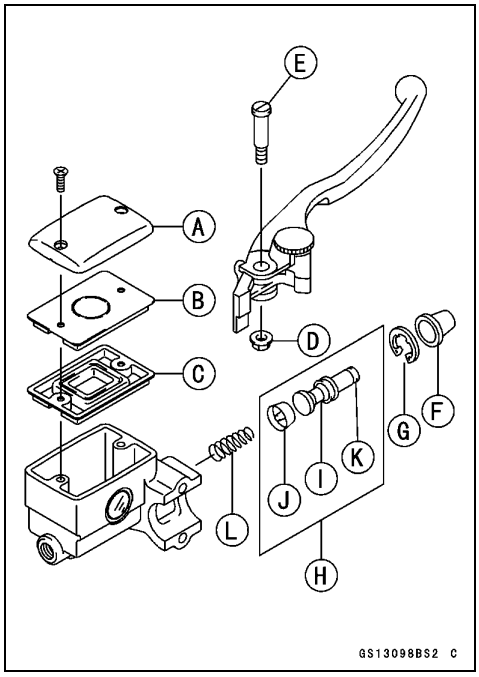
Brake Master Cylinder Rubber Parts Replacement

Front Master Cylinder Disassembly

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

Special Tool - Inside Circlip Pliers: 57001-143

● Pull out the piston assy [H] (piston [I], primary cup [J], secondary cup [K]), and return spring [L].
● Replace:
Piston Assy
Dust Cover
Diaphragm
Circlip



Rear Master Cylinder Disassembly

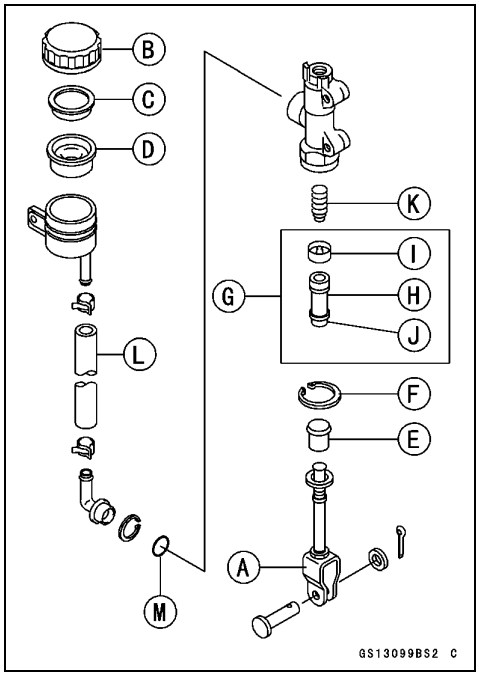
NOTE

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

● Remove the rear master cylinder (see Rear Master Cylinder Removal in the Brakes chapter).
● Remove the reservoir cap [B] plate [C] and diaphragm [D].
● Slide the dust cover [E] on the push rod out of place, and remove the circlip [F].

Special Tool - Inside Circlip Pliers: 57001-143

● Pull out the push rod with the piston stop.
● Take off the piston assy [G] (piston [H] primary cup [I], secondary cup [J]), and return spring [K].
● Replace:
Piston Assy
Dust Cover
Brake Hose [L]
Diaphragm
O-ring [M]
Circlips



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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 removed parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.

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

- Tighten the brake lever pivot bolt and the locknut.

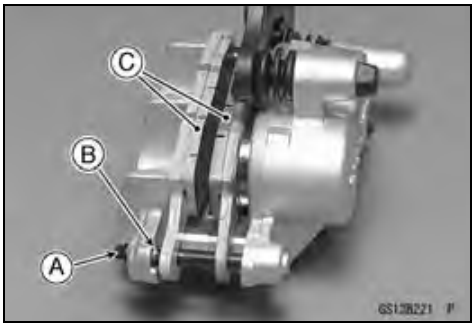
Silicone Grease - Brake Lever Pivot Bolt, Brake Lever Pivot Contact, Push Rod Contact, Dust Cover

Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 8.7 in·lb)
Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)

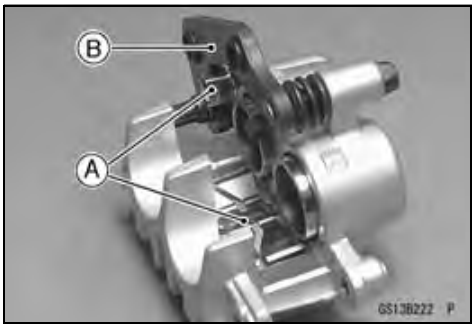
Caliper Rubber Parts Replacement

Front Caliper Disassembly

- Remove:
  Front Caliper (see Front Caliper Removal in the Brakes chapter)
  Cotter Pin [A]
  Pin [B]
  Pads [C]
- Push the piston in.



- Remove:
  Pad Springs [A]
  Caliper Holder [B]



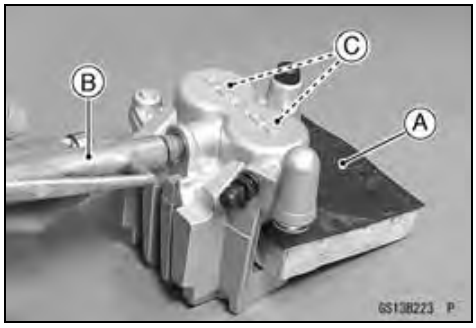
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Periodic Maintenance Procedures

● Using compressed air, remove the piston.

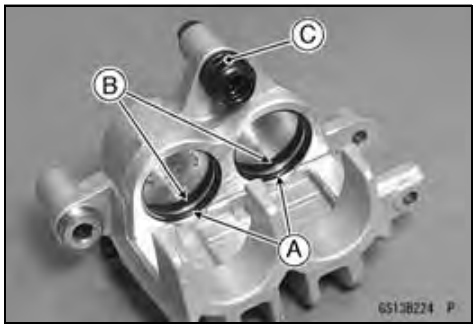
⚠ WARNING

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.



○Insert a wooden board [A] 5 mm (0.2 in.) thick inside the caliper opening.
○Apply compressed air [B] to the banjo bolt hole to allow the pistons [C] to protrude and stop at the wooden board.
○Remove the wooden board and pull out the piston by hand.
★If compressed air is not available, with the brake hose still attached, apply the brake lever to remove the pistons. The remaining process is as described above.

● Remove:
Dust Seals [A]
Fluid Seals (Piston Seals) [B]
Friction Boot [C]
Bleed Valve



CAUTION

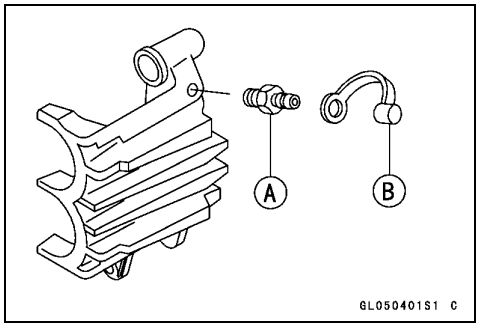
Immediately wash away any brake fluid that spills.

Front Caliper Assembly

● Clean all parts other than the outer and inner pads.

CAUTION

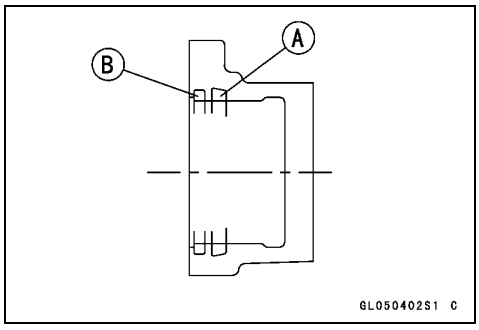
For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.



● Install the bleed valve [A] and the rubber cap [B].

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

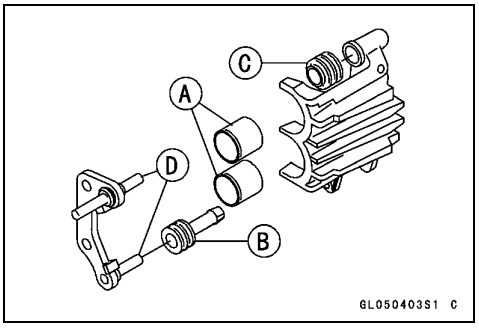
● Replace the fluid seals [A] with new ones, apply brake fluid to them, and install them in the caliper body. Either side of the fluid seal may face outboard.
● Check the dust seals [B] and replace them with new ones if they are damaged.



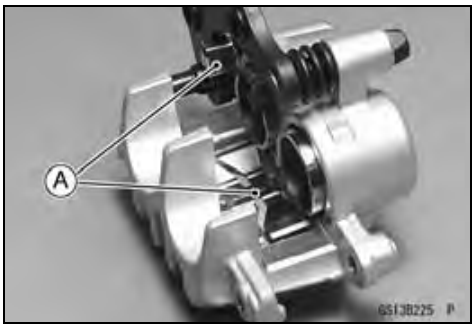
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Periodic Maintenance Procedures

- Apply brake fluid to the inside of the cylinders and to the outside of the pistons and push the pistons [A] into the cylinders.
- Check the friction boot [B] and dust boot [C] and replace them with new ones if they are damaged.
- Apply a thin coat of silicon grease to the holder shafts [D] and the holder holes.



- Install the pad springs [A].
- Install the pads (see Front Brake Pad Installation in the Brakes chapter).
- Wash the caliper with water to remove brake fluid and wipe it off.



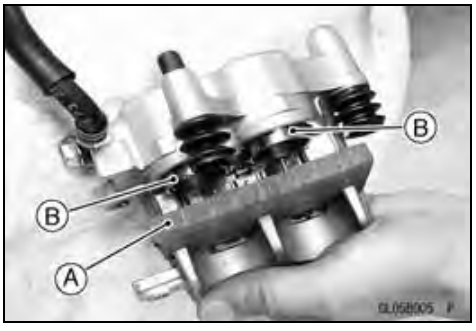
Rear Caliper Disassembly

- Remove the rear caliper with the hose installed (see Rear Caliper Removal in the Brakes chapter).
- Remove the pads (see Rear Brake Pad Removal in the Brakes chapter).

- Pull out the caliper holder [A].



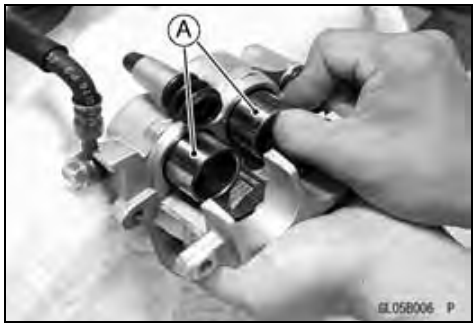
- Insert a wooden board [A] 5 mm (0.2 in.) thick inside the caliper opening.
- Pump the brake pedal until the pistons [B] push the wooden board.



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Periodic Maintenance Procedures

● Remove the board and pull out the pistons [A] by hand.
○These pistons can also be removed by disconnecting the hose and applying compressed air to the hose joint opening using the same wooden board. But be careful not to put your fingers or palm inside the caliper opening during work.



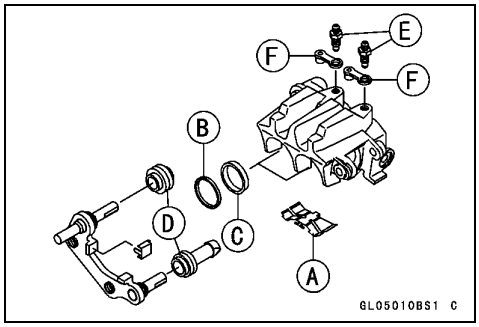
⚠ WARNING

To avoid serious injury, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the pistons may crush your hand or fingers.

CAUTION

Immediately wash away any brake fluid that spills.

● Remove:
Anti Rattle Spring [A]
Dust Seals [B] and Fluid Seals [C]
Rubber Friction Boots [D]
Bleed Valves [E] and Rubber Caps [F]

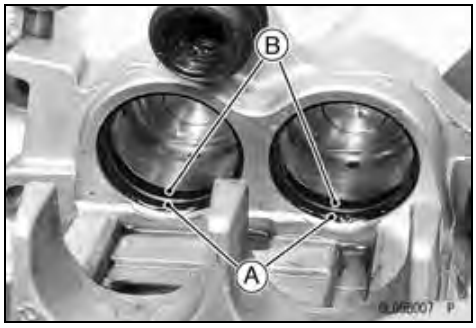


Rear Caliper Assembly

● Tighten the bleed valve.

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

○It is recommended that the fluid seal (piston seal) which is removed, be replaced with a new one.
● Replace the dust seals [A] if they are damaged.
● Install the fluid seal [B]. Either side of the seal may face outboard.



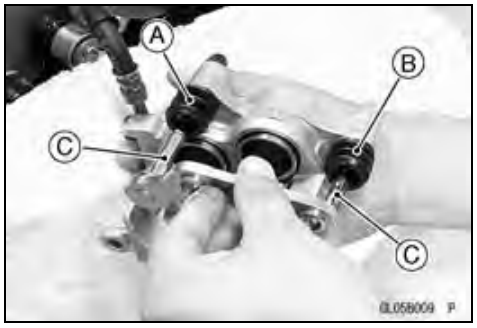
● Install the antirattle spring [A] in the caliper as shown.
● Apply brake fluid to the cylinders, pistons, and fluid seals (piston seals), and push the pistons into the cylinders by hand. Take care that neither the cylinder nor the piston skirt gets scratched.



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Periodic Maintenance Procedures

- Replace the caliper holder shaft rubber friction boot [A] and dust boot [B] if they are damaged.
- Apply a thin coat of silicone or PBC grease to the caliper holder shafts [C] and holder holes (Silicone or PBC grease is a special high temperature, water-resistance grease).
- Install the pads (see Rear Brake Pad Installation in the Brakes chapter).



Spark Plug Replacement

- Remove:
  Fuel Tank (for Rear Spark Plug, see Fuel System chapter)
  Spark Plug Caps [A]
- Remove the spark plug using the 18 mm (0.7 in.) plug wrench vertically.

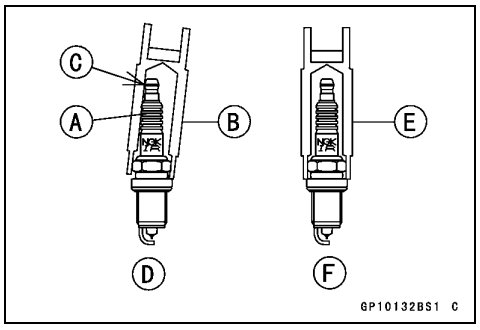
Special Tool - Spark Plug Wrench, Hex18: 57001-1024



CAUTION

The insulator [A] of the spark plug may break if when the wrench is inclined during loosening.

Inclined Spark Plug Wrench [B]
Contact (Spark Plug and Plug Wrench) [C]
Bad [D]
Vertically Spark Plug Wrench [E]
Good [F]



- Replace the spark plug with a new one.

Standard Spark Plug
Type: NGK DPR6EA-9 or ND X20EPR-UP

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

CAUTION

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

Special Tool - Spark Plug Wrench, Hex18: 57001-1024

Torque - Spark Plugs: 18 N·m (1.8 kgf·m, 13 ft·lb)



- Install the spark plug caps securely.

○Be sure the spark plug caps are installed by pulling up it lightly.

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Periodic Maintenance Procedures

Final Gear Case Oil Change

- Remove the left saddlebag (see Saddlebag Removal in the Frame chapter).
- Warm up the oil by running the motorcycle so that the oil will pick up any sediment and drain easily. Stop the motorcycle and turn the ignition switch OFF.
- Place an oil pan beneath the final gear case, and remove the filler cap and drain plug [A].



⚠ WARNING

When draining or filling the final gear case, be careful that no oil gets on the tire, spoke, or rim. Clean off any oil that inadvertently gets on them with a high-flash point solvent.

- After the oil has completely drained out, install the drain plug with a new gasket.

Torque - Final Gear Case Drain Plug: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Fill the final gear case with the specified oil and quantity.

Final Gear Case Oil

Amount:	**200 mL (6.76 US oz)**
Grade:	**API GL-5 hypoid gear oil**
Viscosity:	**When above 5°C (41°F) SAE 90**
	When below 5°C (41°F) SAE 80

NOTE

○*The term "GL-5" indicates a quality and additive rating. A "GL-6" rated hypoid gear oil can also be used.*

- Be sure the O-ring is in place, and install the filler plug.
- Install the left saddlebag (see Saddlebag Installation in the Frame chapter).

Clutch Hose and Pipe Replacement

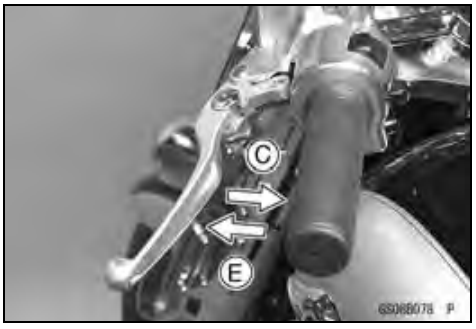
○Since the clutch hose is the same as the brake hose, refer to the Brake Hose Replacement in this chapter for clutch hose and Pipe Replacement.

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Periodic Maintenance Procedures

Clutch Fluid Change





- Level the clutch fluid reservoir and remove the reservoir cap.
- Remove the alternator outer cover (see Alternator Outer Cover Removal in the Electrical System chapter.) and the rubber cap from the bleed valve on the clutch slave cylinder.
- Attach a clear plastic hose [A] to the bleed valve and run the other end of the hose into a container.
- Fill the reservoir with fresh fluid.
- Change the clutch fluid as follows.

1. Open [B] the bleed valve, using a wrench.
2. Pump the clutch lever and hold [C] it.
3. Close [D] the bleed valve.
4. Release [E] the clutch lever.

○Repeat this operation until fresh fluid comes out from the plastic hose or the color of the fluid changes.

○Check the fluid level in the reservoir often, replenishing it as necessary.

NOTE

○*If the fluid in the reservoir runs completely out any time during fluid changing, the bleeding operation must be done over again from the beginning since air will have entered the line.*

⚠ WARNING

Do not mix two brands of fluid.

- After changing the fluid, check the clutch for good clutch power and no fluid leakage.

★If necessary, bleed the air from the lines (see Clutch Line Bleeding in the Clutch chapter).

- Remove the clear plastic hose.
- Install the reservoir cap.
- Tighten the bleed valve, and install the rubber cap.

Torque - Clutch Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)
Clutch Slave Cylinder Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)

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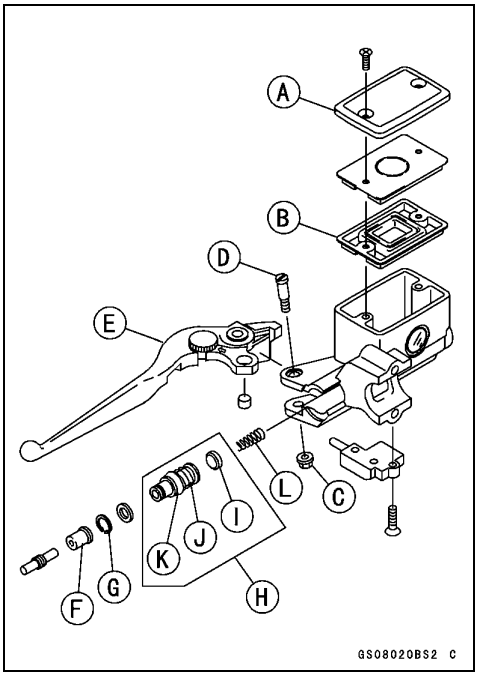
Periodic Maintenance Procedures

Clutch Master Cylinder Rubber Parts Replacement

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

Special Tool - Inside Circlip Pliers: 57001-143

- Pull out the piston assy [H] (primary cup [I], piston [J], secondary cup [K]), and return spring [L].
- Replace:
  Piston Assy
  Dust Cover
  Diaphragm
  Circlip



CAUTION

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

- Check the parts of the clutch master cylinder (see Clutch Master Cylinder Inspection in the Clutch chapter).

★If any part shows signs of damage, replace it.

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

CAUTION

Use only disc brake fluid, isopropyl alcohol or ethyl alcohol, for cleaning parts. Do not use any other fluid for cleaning these parts.
Gasoline, motor 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 cylinder.

- Apply clutch fluid to the parts removed and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Install the push rod with the dust seal fitted into the groove.

○The push rod round end must be faced inwards.

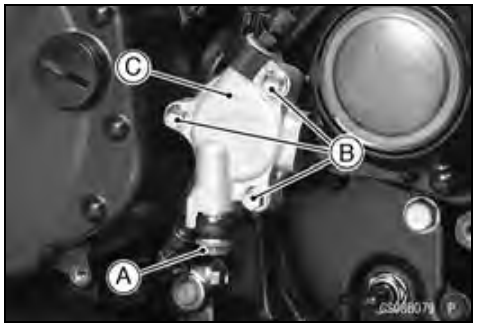
Torque - Clutch Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)
Clutch Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)

- Install the clutch master cylinder (see Clutch Master Cylinder Installation in the Clutch chapter).

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Periodic Maintenance Procedures

Clutch Slave Cylinder Piston Seal Replacement



- Remove the alternator outer cover (see Alternator Outer Cover Removal in the Electrical System).
- Loosen the banjo bolt [A] at the clutch pipe lower end, and tighten it loosely.
- Unscrew the slave cylinder bolts [B] and detach the slave cylinder with the pipe installed from the engine.
- Pump the clutch lever until the piston comes out of the cylinder.
- Unscrew the banjo bolt and remove the slave cylinder [C].

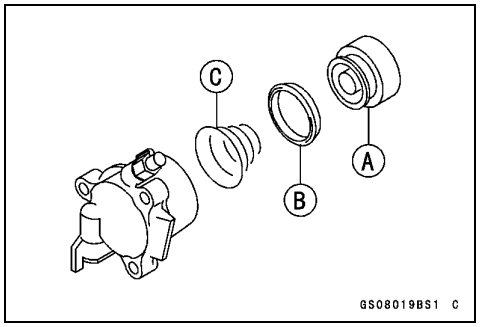
CAUTION

Immediately wash away any clutch fluid that spills. It may damage painted surfaces.

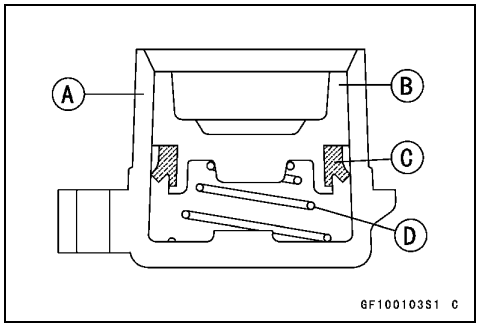
NOTE

○*If the clutch slave cylinder is removed and left alone, the piston will be pushed out by spring force.*

- Remove:
  Piston [A]
  Piston Seal [B]
  Spring [C]



- Replace the piston seal with a new one.
- Before assembly, apply clutch fluid to the outside of the piston and the piston seal.
- Install the piston seal as shown.
  Cylinder [A]
  Piston [B]
  Piston Seal [C]
  Spring [D]



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Fuel System (DFI)

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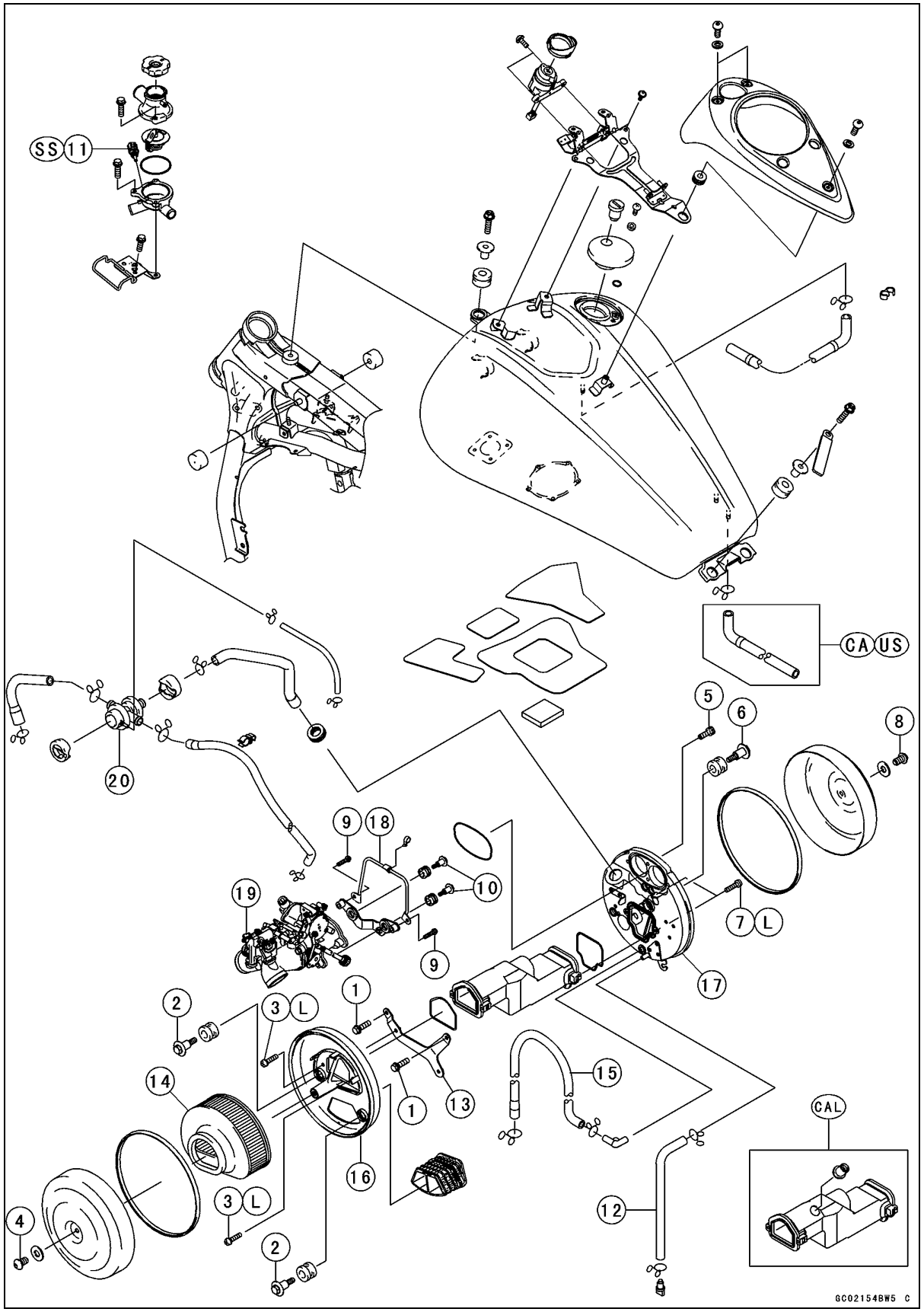
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Cleaner Duct Holder Bolts	10	1.0	89 in·lb	
2	Left Air Cleaner Base Bolt	11	1.1	97 in·lb	
3	Left Air Cleaner Base Screws	2.2	0.22	19 in·lb	L
4	Left Air Cleaner Cover Allen Bolt	16	1.6	12	
5	Right Air Cleaner Allen Bolts	11	1.1	97 in·lb	
6	Right Air Cleaner Base Bolt	11	1.1	97 in·lb	
7	Right Air Cleaner Base Screws	2.2	0.22	19 in·lb	L
8	Right Air Cleaner Cover Allen Bolt	16	1.6	12	
9	Spark Plug Lead Holder Bolts	11	1.1	97 in·lb	
10	Throttle Body Assy Holder Bolts	11	1.1	97 in·lb	
11	Water Temperature Sensor	18	1.8	13	SS

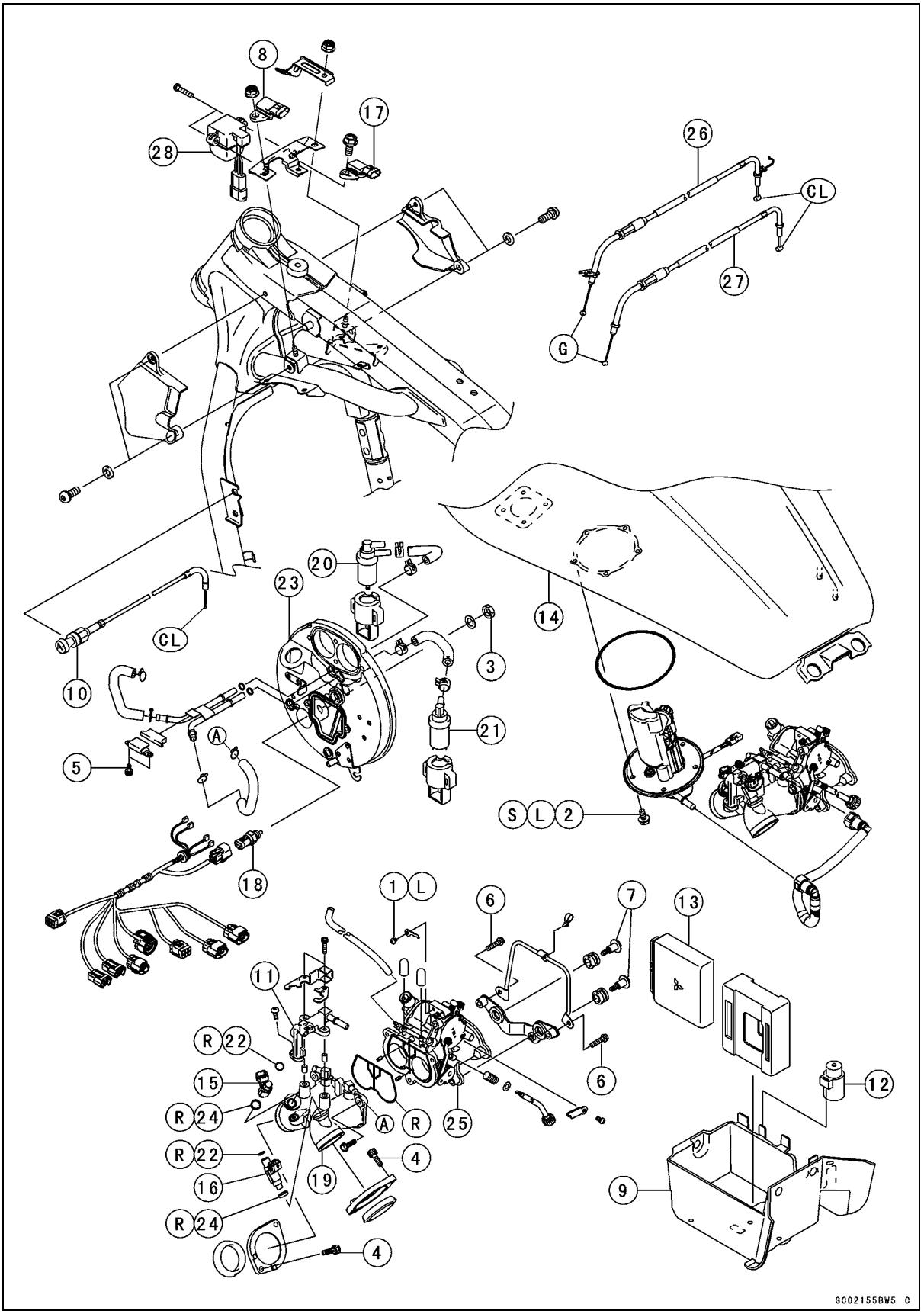
12. Air Cleaner Drain Hose
13. Air Cleaner Duct Holder
14. Air Cleaner Element
15. Crankcase Breather Hose
16. Left Air Cleaner Base
17. Right Air Cleaner Base
18. Right Spark Plug Lead Holder
19. Throttle Body Assy
20. Vacuum Switch Valve

L: Apply a non-permanent locking agent.
SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

CA: Canada Model
CAL: California Model
US: United States Model

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Exploded View



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Exploded View

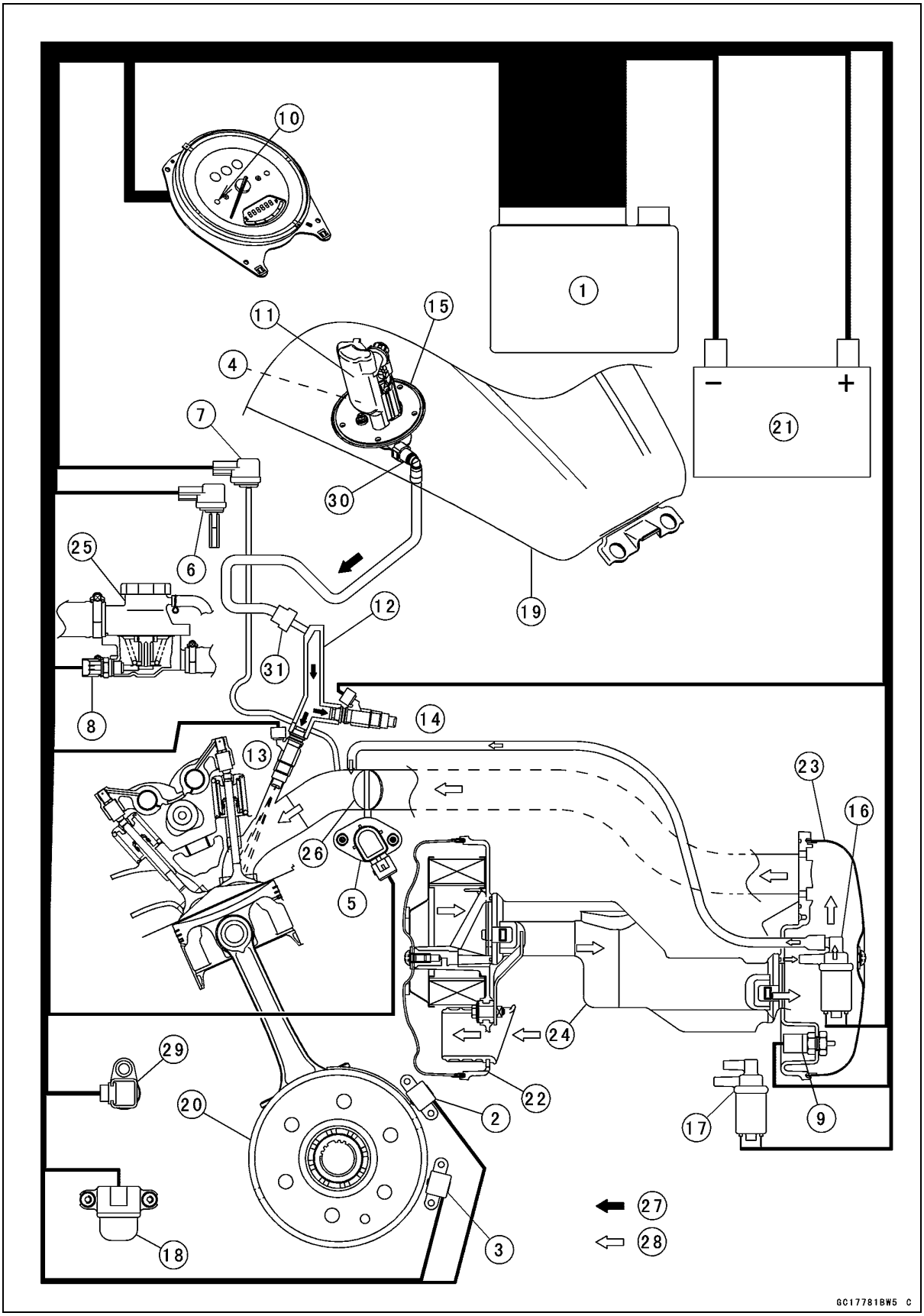
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Choke Cable Plate Screw	2.9	0.30	26 in·lb	L
2	Fuel Pump Mounting Bolts	9.8	1.0	87 in·lb	L, S
3	Inlet Air Temperature Sensor Nut	7.8	0.80	69 in·lb	
4	Inlet Manifold Bolts	12	1.2	104 in·lb	
5	ISC Pipe Holder Bolts	11	1.1	97 in·lb	
6	Spark Plug Lead Holder Bolts	11	1.1	97 in·lb	
7	Throttle Body Assy Holder Bolts	11	1.1	97 in·lb	

8. Atmospheric Pressure Sensor
9. Battery Case
10. Choke Cable
11. Delivery Joint
12. DFI Main Relay
13. ECU (Electronic Control Unit)
14. Fuel Tank
15. Injector #1 (for Front Cylinder)
16. Injector #2 (for Rear Cylinder)
17. Inlet air Pressure Sensor
18. Inlet Air Temperature Sensor
19. Inlet Manifold
20. ISC Valve #2 (for Front Cylinder)
21. ISC Valve #1 (for Rear Cylinder)
22. O-ring
23. Right Air Cleaner Base
24. Seal
25. Throttle Body
26. Throttle Cable (Accelerator)
27. Throttle Cable (Decelerator)
28. Vehicle-down Sensor

CL: Apply cable lubricant.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.

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DFI System



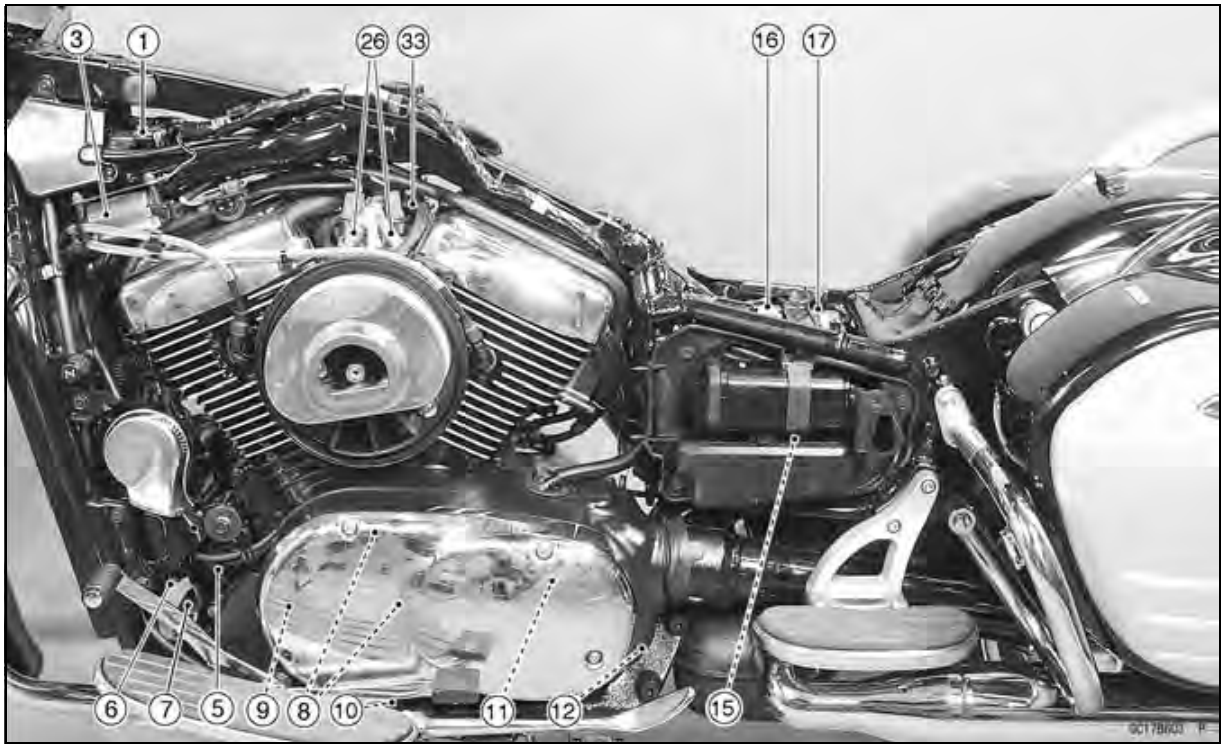
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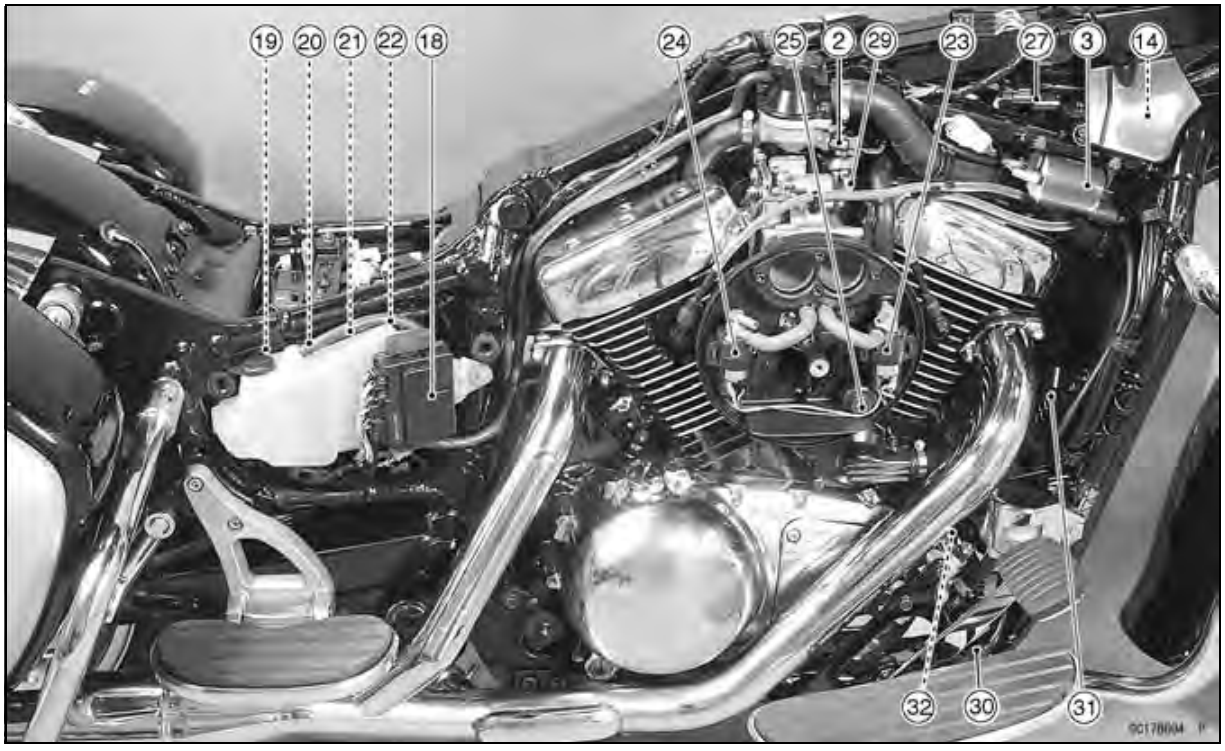
DFI System

#1: for Front Cylinder
#2: for Rear Cylinder
1. ECU (Electronic Control Unit)
2. Crankshaft Sensor #1
3. Crankshaft Sensor #2
4. Pressure Regulator
5. Throttle Sensor
6. Atmospheric Pressure Sensor
7. Inlet Air Pressure Sensor
8. Water Temperature Sensor
9. Inlet Air Temperature Sensor
10. FI Indicator LED Light
11. Fuel Filter
12. Delivery Joint
13. Injector #1
14. Injector #2
15. Fuel Pump
16. ISC Valve #2 (Front Side)
17. ISC Valve #1 (Rear Side)
18. Vehicle-down Sensor
19. Fuel Tank
20. Alternator Rotor
21. Sealed Battery
22. Left Air Cleaner Housing
23. Right Air Cleaner Housing
24. Lower Air Cleaner Duct
25. Thermostat Housing
26. Throttle Valves
27. Fuel Flow
28. Air Flow
29. Speed Sensor
30. Fuel Hose Joint (Fuel Pump Side)
31. Fuel Hose Joint (Delivery Joint Side)

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DFI Parts Location





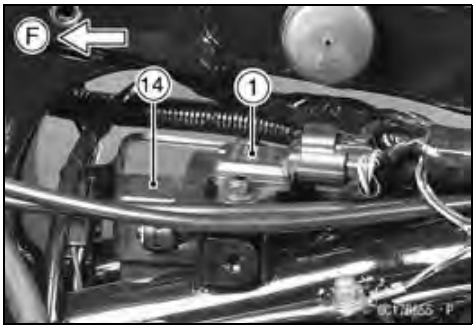
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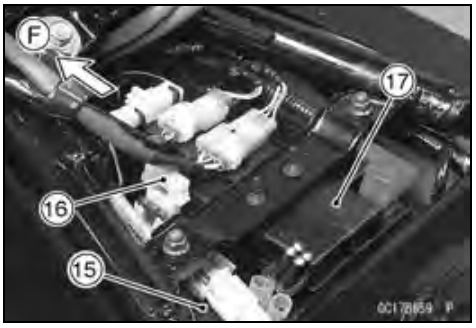
DFI Parts Location

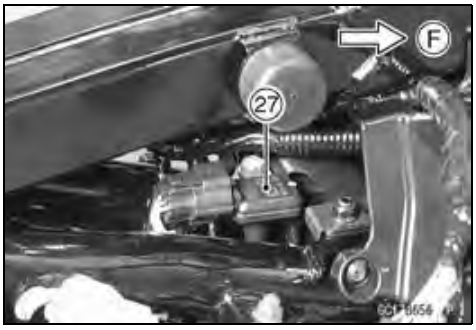
DFI: DFI Parts
F: Front
1. Atmospheric Pressure Sensor (DFI)
2. Water Temperature Sensor (DFI)
3. Ignition Coils
4. Ignition Switch (see next page)
5. Starter Motor
6. Water Temperature Switch
7. Regulator/Rectifier
8. Crankshaft Sensors
9. Alternator
10. Side stand Switch
11. Neutral Switch
12. Oil Pressure Switch
13. Fuel Pump (DFI) (see next page)
14. Vehicle-down Sensor (DFI)
15. ECU (DFI)
16. DFI Fuse 15 A
17. Sealed Battery
18. Junction Box
19. Starter Relay
20. Turn Signal Control Unit
21. DFI Main Relay
22. Oil Pressure Light Delay Unit
23. ISC Valve #2 (DFI, for Front Cylinder)
24. ISC Valve #1 (DFI, for Rear Cylinder)
25. Inlet Air Temperature Sensor (DFI)
26. Injectors (DFI)
27. Inlet Air Pressure Sensor (DFI)
28. FI Indicator LED Light (DFI) (see next page)
29. Throttle Sensor (DFI)
30. Rear Brake Light Switch
31. Radiator Fan
32. Radiator Fan Switch
33. Delivery Joint (DFI)
34. Pump Screen (see next page)
35. Fuel Filter (see next page)
36. Fuel Tank (Reverse Side)

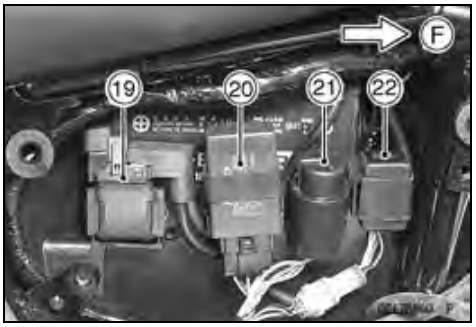
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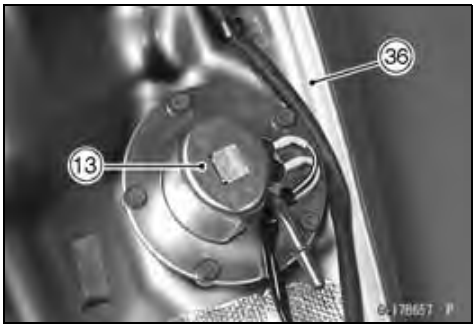
DFI Parts Location

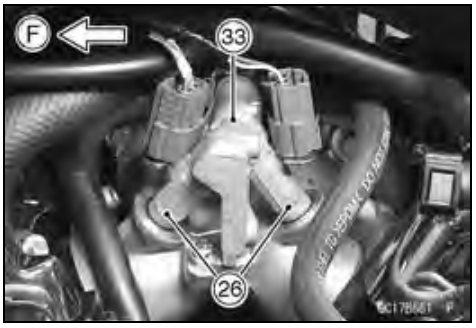


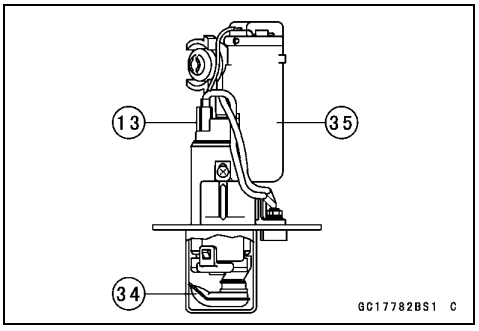


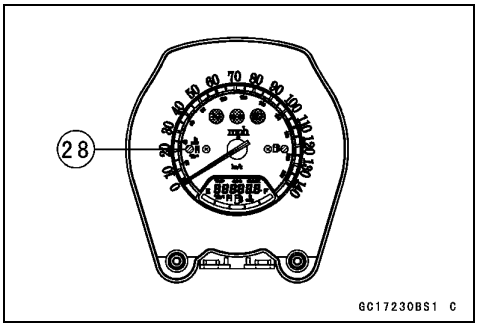
















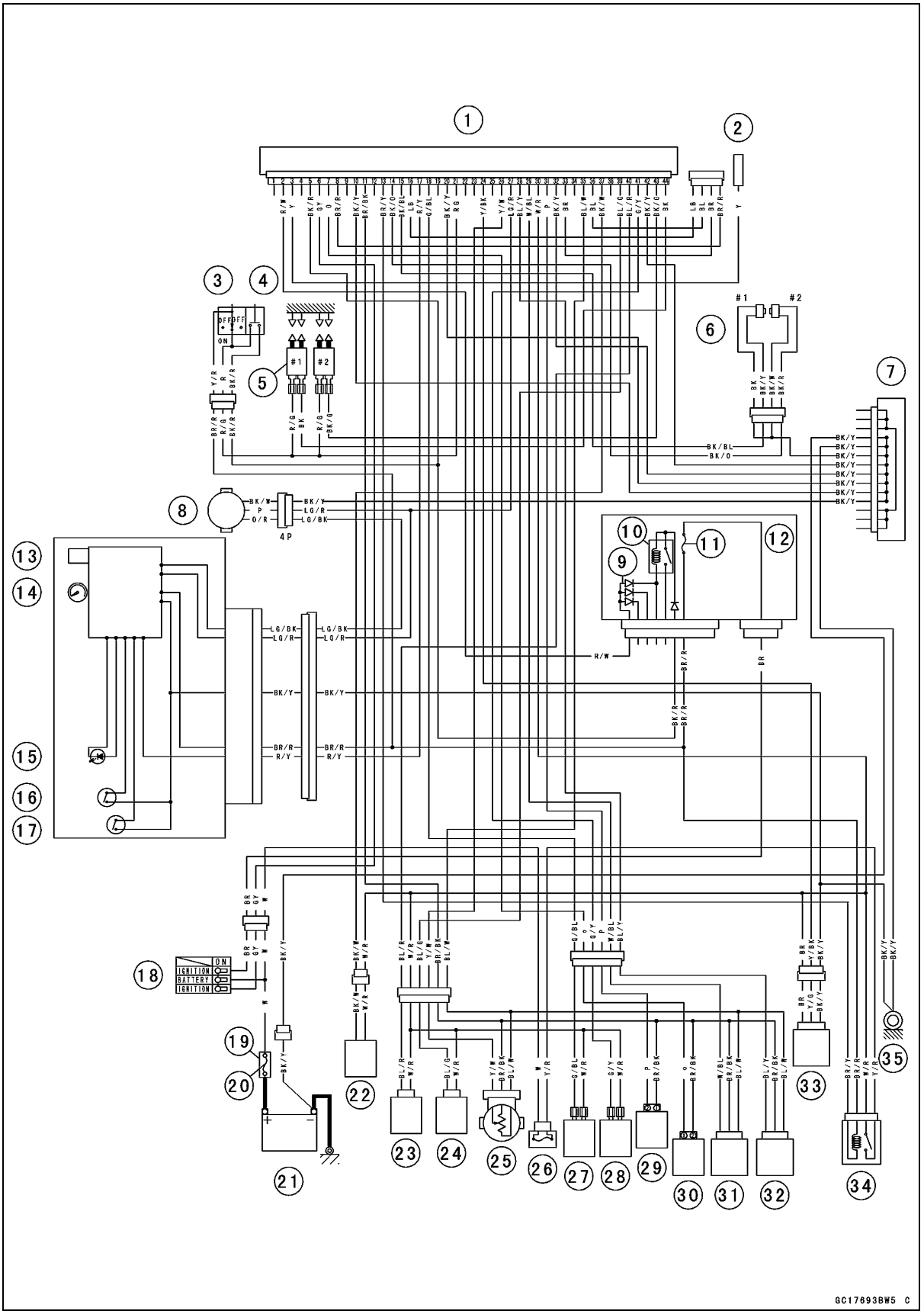
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DFI Parts Location



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DFI Wiring Diagram



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DFI Wiring Diagram

DFI and Electrical Parts

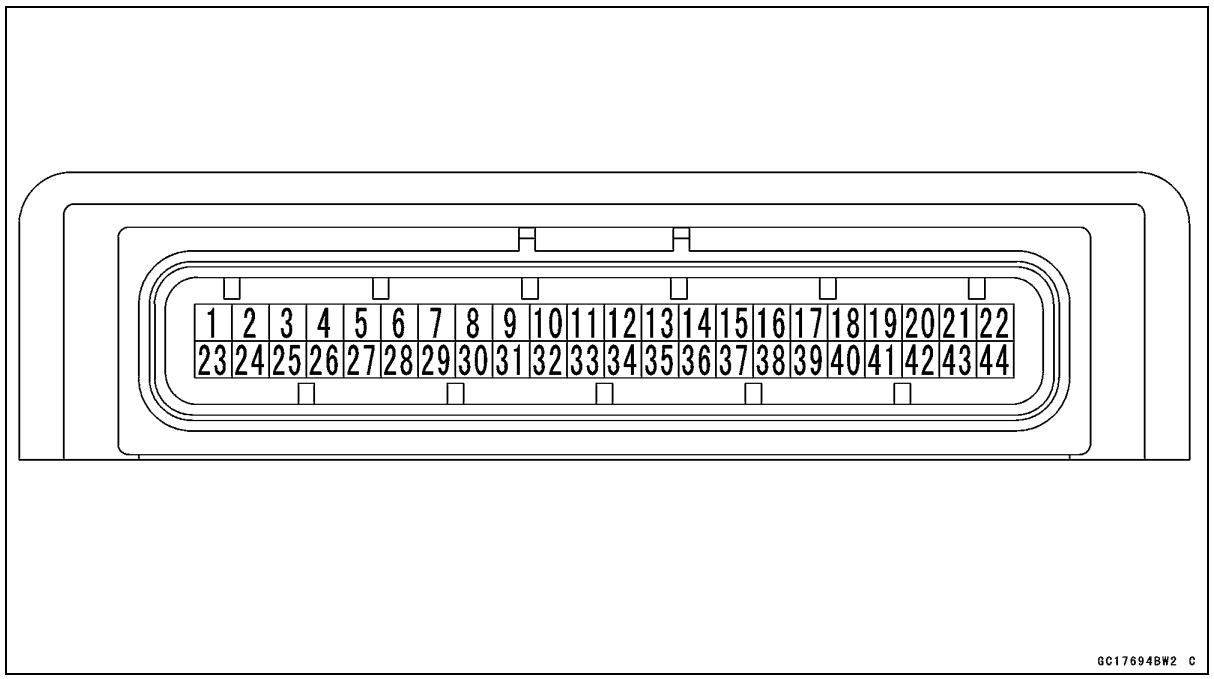
DFI: DFI Parts

1. ECU (Electronic Control Unit): (DFI)
2. Self-diagnosis Terminal
3. Engine Stop Switch
4. Starter Button
5. Ignition Coils
6. Crankshaft Sensors
7. Joint Connector 2
8. Speed Sensor
9. Interlock Diodes
10. Starter Circuit Relay
11. Ignition Fuse 10 A
12. Junction Box
13. LCD (Liquid Crystal Display)
14. Speedometer
15. FI Indicator LED Light: (DFI)
16. MODE Button
17. RESET Button
18. Ignition Switch
19. Stater Relay
20. Main Fuse 30 A
21. Sealed Battery
22. Fuel Pump: (DFI)
23. Fuel Injector #1: (DFI)
24. Fuel Injector #2: (DFI)
25. Throttle Sensor: (DFI)
26. DFI Fuse 15 A: (for ECU, Injectors, Fuel Pump, DFI Main Relay, and ISC Valves)
27. ISC Valve #2: (DFI)
28. ISC Valve #1: (DFI)
29. Inlet Air Temperature Sensor: (DFI)
30. Water Temperature Sensor: (DFI)
31. Inlet Air Pressure Sensor: (DFI)
32. Atmospheric Pressure Sensor: (DFI)
33. Vehicle-down Sensor: (DFI)
34. DFI Main Relay: (for ECU, Injectors, Fuel Pump, and ISC Valves)
35. Frame Ground

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DFI Wiring Diagram

Terminal Numbers of ECU Connectors



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DFI Wiring Diagram

Terminal Names

#1: for Front Cylinder
#2: for Rear Cylinder

1. Starter Lockout Switch Signal
2. Interlock Circuit Signal
3. Self-diagnosis Signal (Generated by grounding this terminal and shown by FI indicator LED light.)
4. Tachometer Signal
5. Electric Starter Button Signal
6. –
7. Water Temperature Sensor (+)
8. Power Source for Diagnosis Tool
9. –
10. ECU Power Source Circuit Ground to Battery (–) Terminal
11. Ground of Inlet Air Temperature, Water Temperature, Inlet Air Pressure, Atmospheric Pressure, and Throttle Sensors
12. Neutral Switch
13. DFI Main Relay Solenoid Ground in ECU
14. Crankshaft Sensor #2 Signal
15. Crankshaft Sensor #1 Signal
16. Com. Line A
17. FI Indicator LED Light Signal
18. ISC Valve #2 Signal
19. –
20. Ignition Control Circuit Ground to Battery (–) Terminal
22. –
23. –
24. Vehicle-down Sensor Signal
25. –
26. Throttle Sensor Signal
27. Speed Sensor Signal
28. Atmospheric Pressure Sensor Signal
29. Inlet Air Pressure Sensor Signal
30. Power Supply to ECU, ISC Valves, Injectors, and Fuel Pump, Vehicle-down Sensor
31. Inlet Air Temperature Sensor (+)
32. ECU Power Source Circuit Ground to Battery (–) Terminal (The same as No.10.)
33. Power Source Ground for Diagnosis Tool
34. –
35. Power Supply to Sensors (Inlet Air Pressure, Atmospheric Pressure, And Throttle Sensors) from ECU
36. Com. Line B
37. Fuel Pump Signal
38. –
39. Injector #2 Signal
40. Injector #1 Signal
41. ISC Valve #1 Signal
42. Ignition Control Circuit Ground to Battery (–) Terminal
43. Ignition Coil #2 Signal
44. Ignition Coil #1 Signal

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Specifications

Item	Standard
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
Air Cleaner Element	Paper filter
DFI System	
Make:	Mitsubishi Electric
Idle Speed:	950 ±50 r/min (rpm)
Throttle Body Assy:	
Type × Bore	Two barrel type × ϕ36 mm (1.4 in.)
ECU (Electronic Control Unit):	
Type	Digital memory type, with built in IC igniter, sealed with resin
Usable Engine Speed	100 ~ 5 900 r/min (rpm)
ISC Valves:	(Idle Speed Control Valve, or Fast Idle Solenoid Valve)
Maximum Air Flow Rate	75 ±7 L (19.8 ±1.8 US gal)/min
Solenoid Resistance	13.6 ~ 20.4 Ω
Fuel Pressure (High Pressure Line):	
Right after Ignition Switch ON	304 kPa (3.1 kgf/cm², 44 psi) with fuel pump running
After Pump Runs 3 seconds and Stops	280 kPa (2.9 kgf/cm², 41 psi) with fuel pump stopped
With Engine Idling	304 kPa (3.1 kgf/cm², 44 psi) with fuel pump running
Pressure Regulator:	
Regulated Fuel Pressure	294 ±4.9 kPa (3.00 ±0.05 kgf/cm², 43 ±0.73 psi)
Throttle Sensor:	
Input Voltage	4.75 ~ 5.25 V DC between BL/W and BR/BK leads
Output Voltage at Idle Throttle Opening	0.584 ~ 0.604 V DC between Y/W and BR/BK leads
Output Voltage at Full Throttle Opening	4.29 ~ 4.59 V DC between Y/W and BR/BK leads
Resistance	4 ~ 6 kΩ between BL/W and BR/BK leads
Atmospheric Pressure Sensor/Inlet Air Pressure Sensor:	
Input Voltage	4.75 ~ 5.25 V DC
Output Voltage	3.74 ~ 4.26 V DC at standard atmospheric pressure
Inlet Air Temperature Sensor:	
Resistance	5.4 ~ 6.6 kΩ at 0°C (32°F) 2.26 ~ 2.86 kΩ at 20°C (68°F) 0.29 ~ 0.39 kΩ at 80°C (176°F)
Water Temperature Sensor:	
Resistance	2.162 ~ 3.112 kΩ at 20°C (68°F) 0.785 ~ 1.049 kΩ at 50°C (122°F) 0.207 ~ 0.253 kΩ at 100°C (212°F)
Vehicle-down Sensor:	
Detection Angle	More than 45° ±5° for each bank
Detection Time	Within 0.5 ~ 1.0 second

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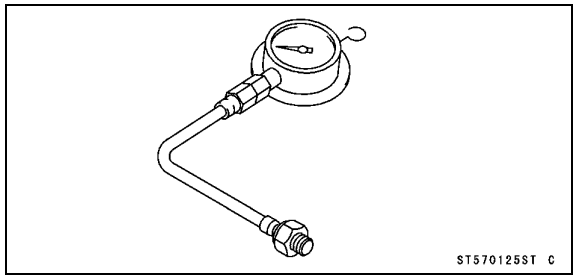
Specifications

Item	Standard
Fuel Injectors:	
Type	INP-281
Static Injection Quantity	273.0 ~ 289.8 mL (9.23 ~ 9.80 US oz)/min
Nozzle Type × Diameter	One spray type with 4 holes
Resistance	11.7 ~ 12.3 Ω at 20°C (68°F)
Fuel Pump:	
Type	Friction pump
Discharge	67 mL (2.27 US oz) or more for 3 seconds

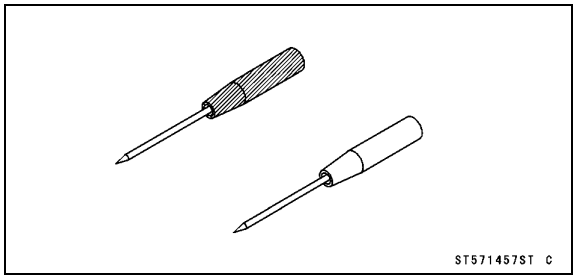
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Special Tools and Sealant

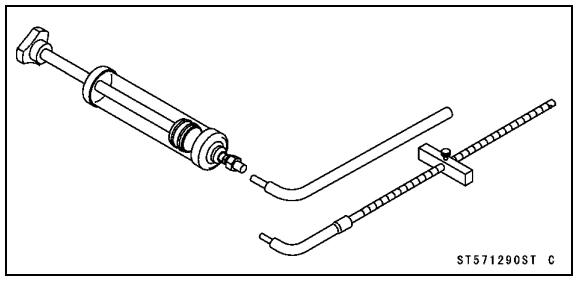
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



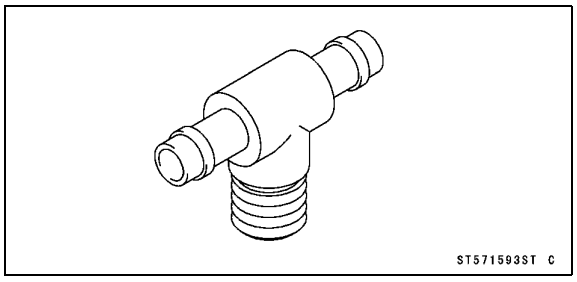
Needle Adapter Set:
57001-1457



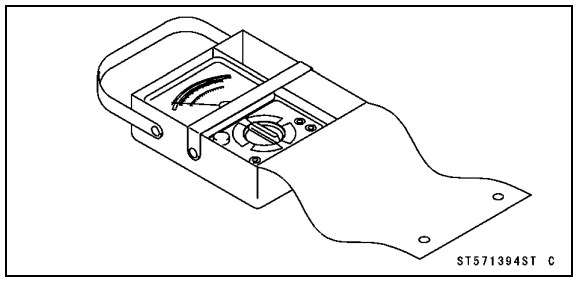
Fork Oil Level Gauge:
57001-1290



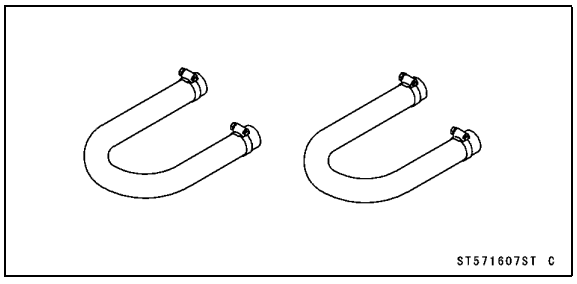
Fuel Pressure Gauge Adapter:
57001-1593



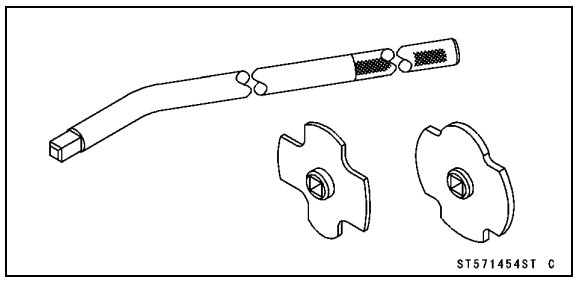
Hand Tester:
57001-1394



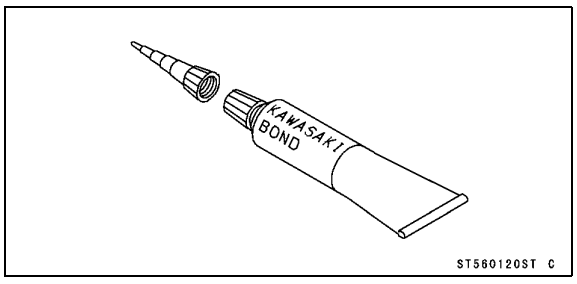
Fuel Hose:
57001-1607



Filler Cap Driver:
57001-1454



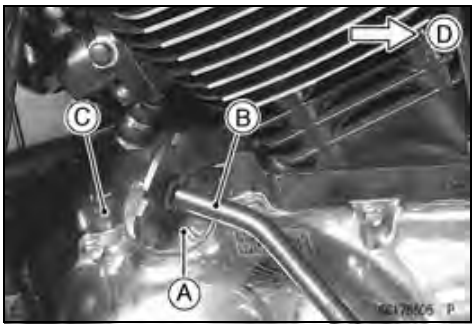
Kawasaki Bond (Silicone Sealant):
56019-120



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DFI Servicing Precautions

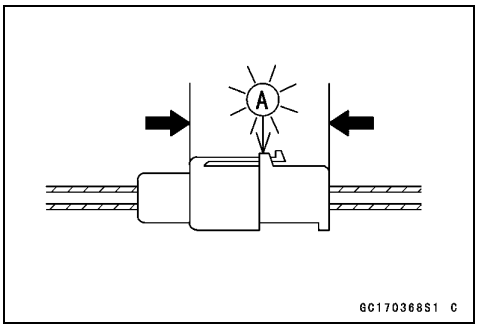
There are a number of important precautions that should be followed servicing the DFI system.



- 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 cap [A] after filling the engine oil, using the filler cap driver [B].
  Clutch Cover [C]
  Front [D]

  Special Tool - Filler Cap Driver: 57001-1454

  Torque - Oil Filler Cap: 1.5 N·m (0.15 kgf·m, 13 in·lb)
- 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 lead connections. This will damage the ECU.
- Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. Otherwise, surge damages the connector terminals or the DFI parts.
- 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.



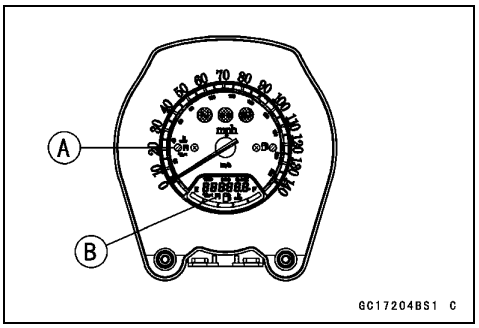
- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition switch, and disconnect the battery (–) terminal. Do not pull the lead, only the connector. Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- Connect 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 fault codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads, and wiring. Never water a vehicle with connectors unplugged because seals don't work and terminals could corrode.
- To prevent corrosion and deposits in the fuel system, do not add any fuel antifreeze chemicals to fuel.
- 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.

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Troubleshooting the DFI System

Outline

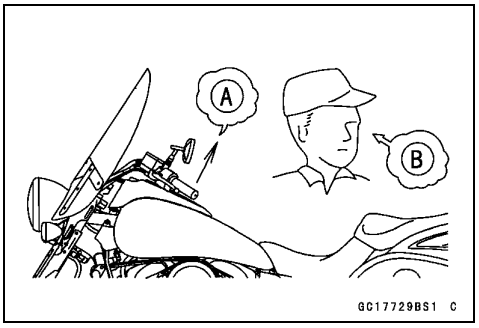
When an abnormality in the system occurs, the FI indicator LED light [A] and FI symbol [B] go on to alert the rider on the meter panel. In addition, the condition of the problem is stored in the memory of the ECU (electronic control unit).



With the engine stopped and turned in the self-diagnosis mode, the service code [A] is indicated by the number of times the FI indicator LED light blinks.

When due to a malfunction, the FI indicator LED light and FI symbol remains lit, ask the rider about the conditions [B] under which the problem occurred and try to determine the cause. Don't rely solely on the DFI self-diagnosis function, use common sense.

First conduct a self-diagnosis inspection, and then a non-self-diagnosis. The non-self-diagnosis items are not indicated by the FI indicator LED light.



Even when the DFI system is operating normally, the FI indicator LED light and FI symbol may light up under strong electrical interference. No repair needed. Turn the ignition switch OFF to stop the indicator light and FI symbol.

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

When the repair has been done, the LED light and FI symbol do not go on.

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

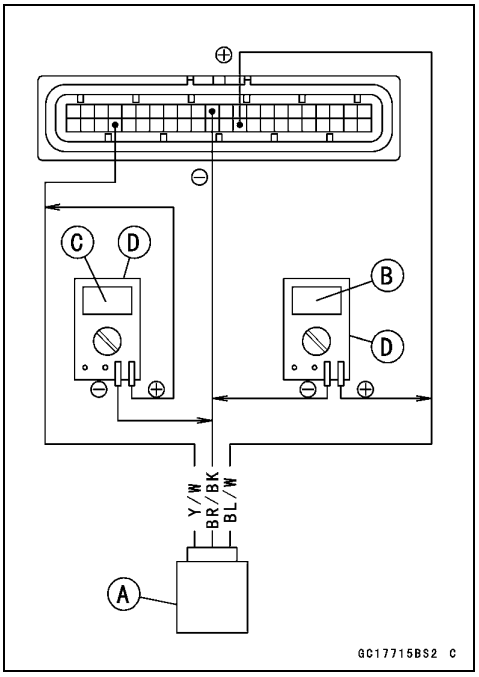
Voltage Check Method

○This method is conducted by measuring the input voltage [B] to a sensor [A] first, and then the output voltage [C] from the sensor.

○Sometime this method can detect a fault of the ECU.

○Refer to the each Sensor Inspection section for detail in this chapter.

● Use a fully charged battery, and a digital meter [D] which can be read two decimal places voltage or resistance.



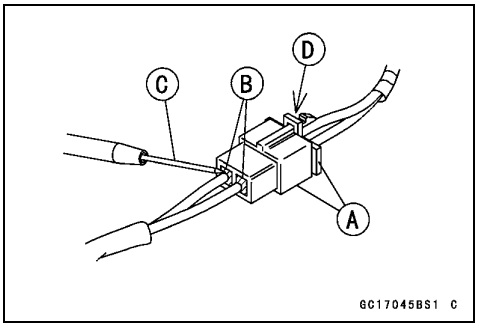
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Troubleshooting the DFI System

○The DFI part connectors [A] have seals [B], including the ECU (except for ISC valves).

● Join the connector [A] and insert the needle adapter (special tool) [C] inside the seal [B] from behind the connector until the adapter reaches the terminal.

Special Tool - Needle Adapter Set: 57001-1457



CAUTION

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

● Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of the hand tester or a digital meter.

● Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.

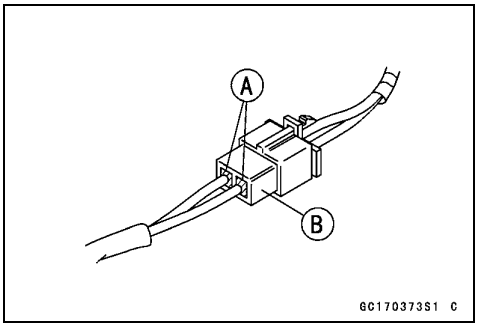
● Turn the ignition switch ON and measure the voltage with the connector joined.

CAUTION

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

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

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of Connector



● Always check battery condition before replacing the DFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.

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Troubleshooting the DFI System

Resistance Check Method

○This method is simple. No need for a fully charged battery and the needle adapter. Just do the following especially when a sensor [A] is suspect.

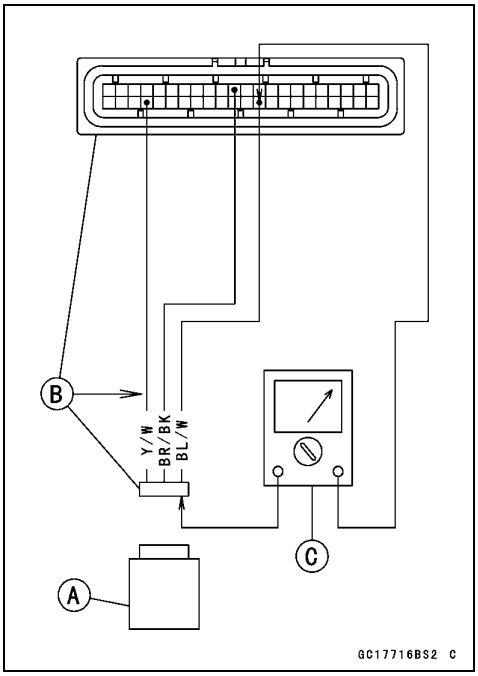
● Turn the ignition switch OFF and disconnect the connectors.

● Inspect the sensor resistance, using a digital meter (see each Sensor Inspection in this chapter).

● Inspect the wiring and connections [B] for continuity, using the hand tester [C] (special tool, analog tester) rather than a digital meter.

Special Tool - Hand Tester: 57001-1394

★If the sensor, the wiring and connections are good, inspect the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter). If the ground and power supply are good, the ECU is suspect. Replace the ECU.



● Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused by some other item or items, they too must be repaired or replaced, or the new replacement part will soon fail again.

● Measure coil winding resistance when the DFI part is cold (at room temperature)

● Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, short, etc. Deteriorated wires and bad connections can cause reappearance of problems and unstable operation of the DFI system.

★If any wiring is deteriorated, replace the wiring.

● Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.

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

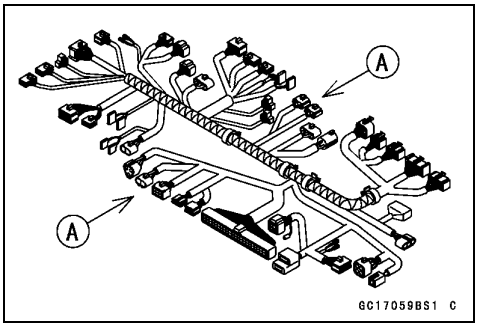
● Check the wiring for continuity.

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

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

○Set the tester to the × 1 Ω range, and read the tester.

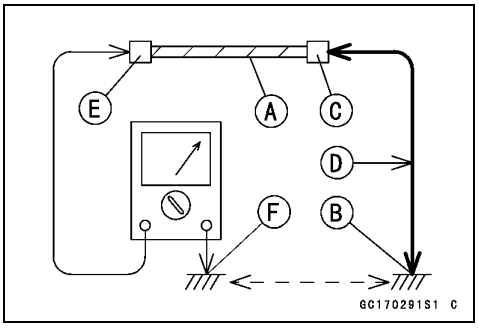
★If the tester does not read 0 Ω, the lead is defective. Replace the lead.



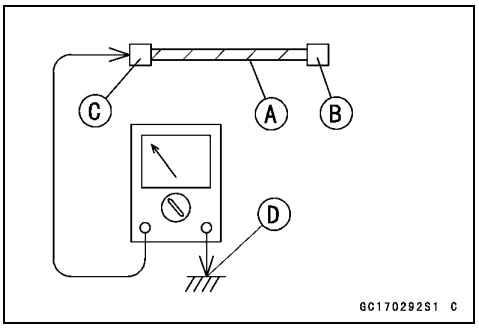
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Troubleshooting the DFI System

○If both ends of a harness [A] are far apart, ground [B] the one end [C], using an auxiliary wire [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.

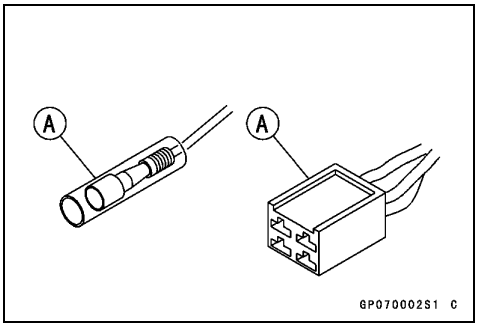


● Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.
★If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.
★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.
○The following diagnosis flow chart illustrates the above procedures.

○Wire Color Codes:

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

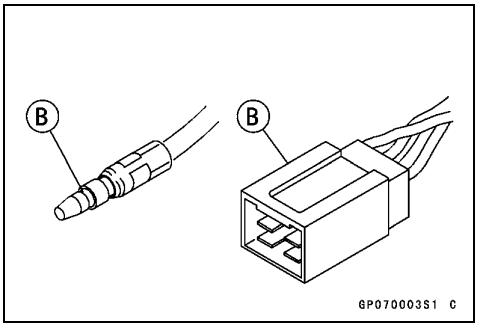
○Electric Connectors:
Female Connectors [A]



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Troubleshooting the DFI System

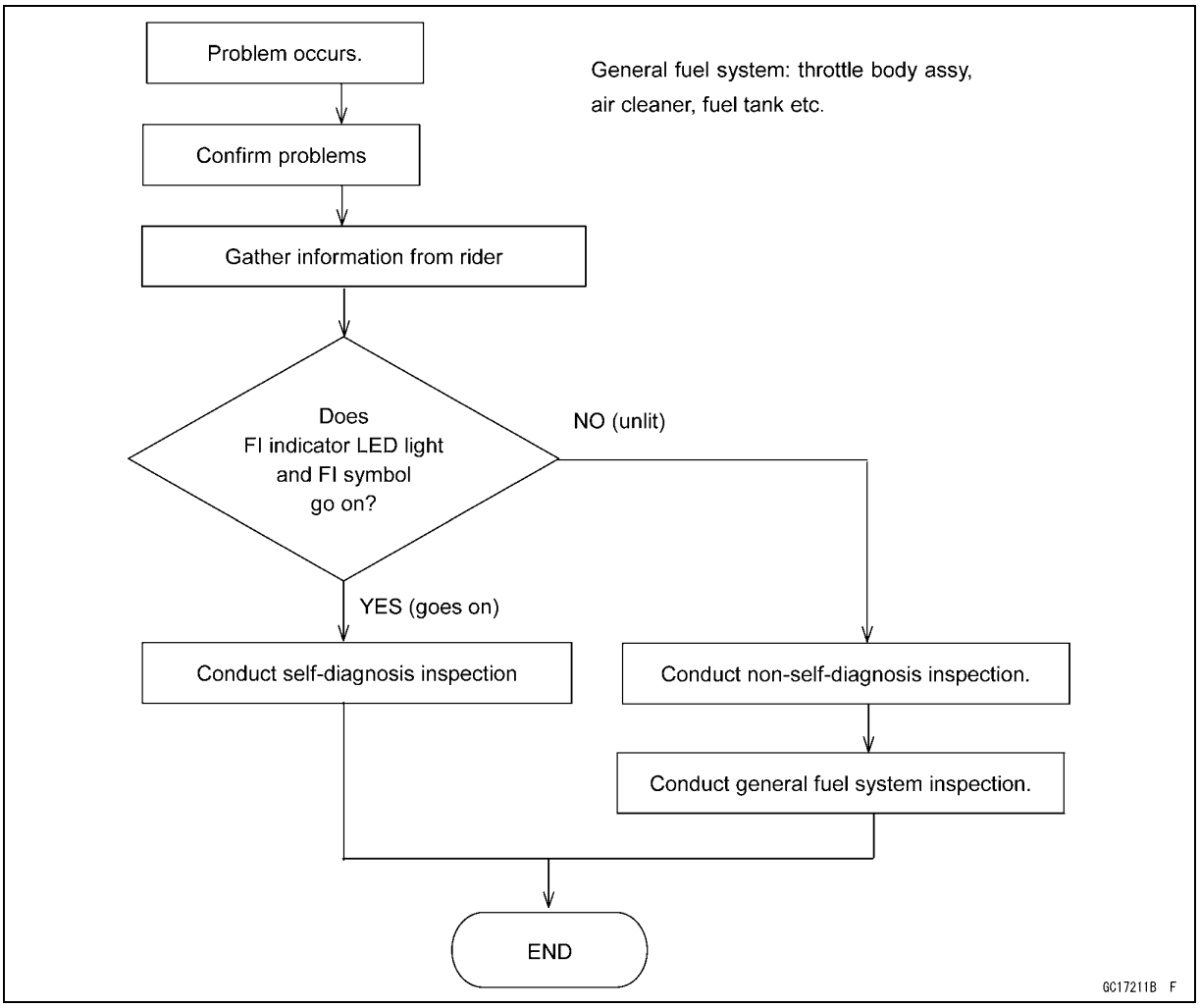
Male Connectors [B]



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Troubleshooting the DFI System

DFI Diagnosis Flow Chart



Inquiries to Rider

● Refer to the next sample diagnosis chart.

○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 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.

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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	☐ fine, ☐ cloudy, ☐ rain, ☐ snow, ☐ always, ☐ other:	
Temperature	☐ hot, ☐ warm, ☐ cold, ☐ very cold, ☐ always	
Problem frequency	☐ chronic, ☐ often, ☐ once	
Road	☐ street, ☐ highway, ☐ mountain road (☐ uphill, ☐ downhill), ☐ bumpy, ☐ pebble	
Altitude	☐ normal, ☐ high (about 1 000 m (3 281 ft) or more)	
Motorcycle conditions when problem occurred.		
FI indicator LED light	☐ light up immediately after ignition switch ON, and goes off after engine oil pressure is high enough (with engine running) (normal).	
	☐ lights up immediately after ignition switch ON, and stays on after engine oil pressure is high enough (with engine running) (DFI problem)	
	☐ lights up immediately after ignition switch ON, but goes off after about 10 seconds though engine oil pressure is high enough (with engine running) (DFI problem).	
	☐ unlights (LED light, ECU or its wiring fault).	
	☐ sometimes lights up (probably wiring fault).	
Starting difficulty	☐ starter motor not rotating.	
	☐ starter motor rotating but engine doesn't turn over.	
	☐ starter motor and engine don't turn over.	
	☐ no fuel flow (☐ no fuel in tank, ☐ no fuel pump sound).	
	☐ engine flooded (do not crank engine with throttle opened, which promotes engine flooding).	
	☐ no spark.	
	☐ choke knob is not pulled fully when using the knob (pull it fully when using).	
	☐ other:	
Engine stops	☐ right after starting.	
	☐ when opening throttle grip.	
	☐ when closing throttle grip.	
	☐ when moving off.	
	☐ when stopping the motorcycle.	
	☐ when cruising.	
	☐ other:	
Poor running at low speed	☐ choke knob left pulled out fully (push it in fully).	
	☐ very low fast idle speed.	
	☐ very low idle speed, ☐ very high idle speed, ☐ rough idle speed.	
	☐ battery voltage is low (charge the battery).	
	☐ spark plug loose (tighten it).	
	☐ spark plug dirty, broken, or gap maladjusted (adjust it).	
	☐ backfiring.	
	☐ afterfiring.	
	☐ hesitation when acceleration.	

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Troubleshooting the DFI System

	☐ engine oil viscosity too high.
	☐ brake dragging.
	☐ engine overheating.
	☐ clutch slipping.
	☐ other:
Poor running or no power at high speed	☐ choke knob left pulled out fully (push it in fully).
	☐ spark plug loose (tighten it).
	☐ spark plug dirty, broken, or gap maladjusted (remedy it).
	☐ spark plug incorrect (replace it).
	☐ knocking (fuel poor quality or incorrect, → use high-octane gasoline).
	☐ brake dragging.
	☐ clutch slipping.
	☐ engine overheating.
	☐ engine oil level too high.
	☐ engine oil viscosity too high.
	☐ other:

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DFI System Troubleshooting Guide

NOTE

○*This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.*

○*The ECU may be involved in the DFI electrical and ignition system troubles. If these parts and circuits checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.*

Engine Doesn't Start, Starting Difficulty

Symptoms or Possible Causes	Actions (chapter)
Starter motor not rotating	
Ignition and engine stop switches not ON	Turn both switches ON.
Starter lockout switch or neutral switch trouble	Inspect (see chapter 16).
Starter motor trouble	Inspect (see chapter 16).
Battery voltage low	Inspect and charge (see chapter 16).
Starter relays not contacting or operating	Inspect the starter relay (see chapter 16).
Starter button not contacting	Inspect and replace (see chapter 16).
Starter system wiring open or shorted	Inspect the wiring (see chapter 16).
Ignition switch trouble	Inspect and replace (see chapter 16).
Engine stop switch trouble	Inspect and repair or replace (see chapter 16).
Main 30 A or ignition fuse blown	Inspect and replace (see chapter 16).
Starter motor rotating but engine doesn't turn over	
Starter clutch trouble	Inspect (see chapter 9).
Starter idle gear trouble	Inspect (see chapter 9).
Engine won't turn over	
Valve seizure	Inspect and replace (see chapter 5).
Rocker arm seizure	Inspect and replace (see chapter 5).
Cylinder, piston seizure	Inspect and replace (see chapter 5).
Camshaft seizure	Inspect and replace (see chapter 5).
Connecting rod small end seizure	Inspect and replace (see chapter 9).
Connecting rod big end seizure	Inspect and replace (see chapter 9).
Crankshaft seizure	Inspect and replace (see chapter 9).
Transmission gear or bearing seizure	Inspect and replace (see chapter 9).
Balancer bearing seizure	Inspect and replace (see chapter 9).
No fuel flow	
No or little fuel in tank	Supply fuel (see Owner's Manual).
Fuel pump not rotating	Inspect (see chapter 3).
Fuel injector trouble	Inspect and replace (see chapter 3).
Fuel tank air vent obstructed	Inspect and repair (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3)
Fuel pressure regulator clogged	Inspect and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Engine flooded	
Spark plug dirty, broken or gap maladjusted	Clean spark plugs and adjust plug gap (see chapter 2).
Starting technique faulty	When flooded, don't crank engine with throttle fully opened.

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
No spark or spark weak	
Ignition and engine stop switches not ON	Turn both switches ON.
Clutch lever not pulled in and gear not in neutral whether side stand up or not	Pull the lever in and shift the gear in neutral.
Though clutch lever pulled in but side stand up and gear not in neutral	Side stand down and clutch lever pulled in whether gear in neutral, or not.
Vehicle-down sensor coming off	Reinstall (see chapter 3).
Vehicle-down sensor trouble	Inspect (see chapter 3).
ECU ground or power supply trouble	Inspect (see chapter 3).
Battery voltage low	Inspect and charge (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Clean spark plug and adjust plug gap (see chapter 2).
Spark plug cap or high tension wiring trouble	Inspect the ignition coil (see chapter 16).
Spark plug cap shorted or not in good contact	Reinstall or inspect the cap (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Neutral, starter lockout or side stand switch trouble	Inspect each switch (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Ignition switch shorted	Inspect and replace (see chapter 16).
Engine stop switch shorted	Inspect and repair or replace (see chapter 16).
Starter system wiring shorted or open	Inspect and repair or replace (see chapter 16).
Main 30 A or ignition fuse blown	Inspect and replace (see chapter 16).
Fuel/air mixture incorrect	
Air cleaner clogged, poorly sealed or missing	Clean or reinstall (see chapter 3).
Leak from oil filler cap, crankcase breather hose or air cleaner drain hose	Inspect and repair or replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
Fuel pressure may be low	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
ISC valve trouble	Inspect (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 3).
Compression low	
Spark plug loose	Reinstall (see chapter 16).
Cylinder head not sufficiently tightened down	Tighten (see chapter 5).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Cylinder, piston worn	Inspect and replace (see chapter 5).
Piston ring bad (worn, weak, broken or sticking)	Inspect and replace (see chapter 5).
Piston ring/groove clearance excessive	Inspect and replace (see chapter 5).
Cylinder head gasket damaged	Replace (see chapter 5).
Cylinder head warped	Inspect and replace (see chapter 5).
Valve guide worn	Inspect and replace (see chapter 5).
Valve spring broken or weak	Inspect and replace (see chapter 5).
Valve not seating properly (valve bent, worn or carbon accumulating on seating surface)	Inspect and repair or replace (see chapter 5).
KACR (compression release cam) sticks open (Engine stalls when moving off)	Inspect and repair or replace (see chapter 5).
HLA (hydraulic lash adjuster) damaged (worn, seizure or spring broken)	Inspect and replace (see chapter 5).
HLA oil passage clogged	Inspect and repair or replace (see chapter 5).

Poor Running at Low Speed

Symptoms or Possible Causes	Actions (chapter)
Spark weak	
Battery voltage low	Inspect and charge (see chapter 16).
Spark plug dirty, broken, or gap maladjusted	Clean spark plugs and adjust plug gap (see chapter 2).
Spark plug cap or high tension wiring trouble	Inspect the ignition coil (see chapter 16).
Spark plug cap shorted or not in good contact	Reinstall or inspect the cap (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
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 3).
Air cleaner duct loose	Reinstall (see chapter 3).
Air cleaner O-ring damaged	Replace (see chapter 3).
Fuel tank air vent obstructed	Inspect and repair (see chapter 3).
Throttle body assy loose	Reinstall (see chapter 3).
Throttle body assy O-ring damage	Replace (see chapter 3).
Choke knob left pulled out	Push in (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pressure regulator clogged	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Thermostat trouble	Inspect and replace (see chapter 4).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Unstable (rough) idling	
ISC valve trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Throttle sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Battery voltage low	Inspect and charge (see chapter 16).
Incorrect idle speed	
Water temperature sensor trouble	Inspect (see chapter 3).
Throttle sensor trouble	Inspect (see chapter 3).
ISC valve trouble	Inspect (see chapter 3).
Engine stalls easily	
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Throttle sensor trouble (engine stops when opening the throttle)	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel pressure regulator trouble	Inspect and replace (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Compression Low	
Spark plug loose	Reinstall (see chapter 16).
Cylinder head not sufficiently tightened down	Tighten (see chapter 5).
Cylinder, piston worn	Inspect and replace (see chapter 5).
Piston ring bad (worn, weak, broken or sticking)	Inspect and replace (see chapter 5).
Piston ring/groove clearance excessive	Inspect and replace (see chapter 5).
Cylinder head gasket damaged	Replace (see chapter 5).
Cylinder head warped	Inspect and replace (see chapter 5).
Valve guide worn or stem seal damaged	Inspect and replace (see chapter 5).
Valve spring broken or weak	Inspect and replace (see chapter 5).
Valve not seating properly (valve bent, worn or carbon accumulating on seating surface)	Inspect and repair or replace (see chapter 5).
Camshaft cam worn	Inspect and replace (see chapter 5).
KACR (compression release cam) sticks open	Inspect and repair or replace (see chapter 5).
HLA (hydraulic lash adjuster) damaged	Inspect and replace (see chapter 5).
HLA oil passage clogged	Inspect and repair or replace (see chapter 5).
Hesitation	
Too low fuel pressure	Inspect (see chapter 3).
Clogged fuel line	Inspect and repair (see chapter 3).
Cracked or obstructed inlet air pressure sensor hose	Inspect and repair or replace (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Throttle sensor malfunction	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Loose injector connectors	Remedy (see chapter 3).
Crankshaft sensor trouble	Inspect and repair or replace (see chapter 16).
Ignition coil trouble	Inspect and repair or replace (see chapter 16).
Loose terminal of battery (–) lead or engine ground lead	Inspect and repair (see chapter 16).
Delay of ignition timing	Inspect pickup coil and IC igniter in ECU (see chapter 16).
Poor acceleration	
Choke knob left pulled out	Push in (see chapter 3).
Too low fuel pressure	Inspect (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Clogged fuel filter	Inspect (see chapter 3) and replace fuel pump.
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3)
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Ignition coil trouble	Inspect and replace (see chapter 16).
Engine oil level too high	Repair (see chapter 7)
Spark plug dirty, broken or gap maladjusted	Clean spark plugs and adjust plug gap (see chapter 2)
Stumble	
Too low fuel pressure	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Throttle sensor malfunction	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air pressure 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 repair fuel line) (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	Clean spark plugs and adjust plug gap (see chapter 2)
Too low fuel pressure	Inspect (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Throttle sensor malfunction	Inspect (see chapter 3).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Vacuum switch valve broken	Inspect and replace (see chapter 5).
Air suction valve trouble	Inspect and replace (see chapter 5).
After fire	
Spark plug burned or gap maladjusted	Adjust plug gap or replace plug (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Run-on (dieseling)	
Ignition switch trouble	Inspect and replace (see chapter 16).
Engine switch trouble	Inspect and repair or replace (see chapter 16).
Fuel injector trouble	Inspect (see chapter 3).
Engine overheating	(see Overheating of Troubleshooting Guide, see chapter 17)
Other	
Engine oil viscosity too high	Change (see chapter 2).
Drive train trouble	Inspect tightness of bolts and nuts (see chapter 2) or bearing wear (see chapter 11).
Final gear case oil viscosity too high	Change (see chapter 2).
Brake dragging	Inspect caliper fluid seal damage or clogging of master cylinder relief and supply ports (see chapter 12).
Clutch slipping	Inspect friction plates for wear (see chapter 6).
Engine overheating	(see Overheating of Troubleshooting Guide in chapter 17)
Vacuum switch valve trouble	Inspect and replace (see chapter 5).
Air suction valve trouble	Inspect and replace (see chapter 5).
Intermittent any DFI fault and its recovery	Check that DFI connectors are clean and tight, and examine wires for signs of burning or fraying (see chapter 3).

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DFI System Troubleshooting Guide

Poor Running or No Power at High Speed

Symptoms or Possible Causes	Actions (detailed reference)
Firing incorrect	
Spark plug dirty, broken or maladjusted	Clean spark plug and adjust plug gap (see chapter 2).
Spark plug cap or high tension wiring trouble	Inspect plug cap and ignition coil (see chapter 16).
Spark plug cap shorted or not in good contact	Reinstall or inspect the cap (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 16)
IC igniter in ECU trouble	Inspect (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Fuel/mixture incorrect	
Choke knob left pulled out	Push in (see chapter 3).
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 3).
Air cleaner duct loose	Reinstall (see chapter 3).
Air cleaner O-ring damaged	Replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Throttle body assy loose	Reinstall (see chapter 3).
Throttle body assy O-ring damaged	Replace (see chapter 3).
Fuel tank air vent obstructed	Inspect and repair (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pump operates intermittently and often DFI fuse blows.	Pump bearings may wear. Replace the pump (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Throttle sensor malfunction	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Cracked or obstructed inlet air pressure sensor hose	Inspect and repair or replace (see chapter 3)
Injector clogged	Visually inspect and replace (see chapter 3)
Compression low	
Spark plug loose	Reinstall (see chapter 16).
Cylinder head not sufficiently tightened down	Tighten (see chapter 5).
Cylinder, piston worn	Inspect and replace (see chapter 5).
Piston ring bad (worn, weak, broken or sticking)	Inspect and replace (see chapter 5).
Piston ring/groove clearance excessive	Inspect and replace (see chapter 5).
Cylinder head gasket damaged	Replace (see chapter 5).
Cylinder head warped	Inspect and replace (see chapter 5).
Valve spring broken or weak	Inspect and replace (see chapter 5).
Valve not seating properly (valve bent , worn or carbon accumulating on the seating surface)	Inspect and repair or replace (see chapter 5).
KACR (compression release cam) sticks open (engine stalls when moving off)	Inspect and repair or replace (see chapter 5).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (detailed reference)
HLA (hydraulic lash adjuster) damaged (worn, seizure or spring broken)	Inspect and replace (see chapter 5).
Knocking	
Carbon built up in combustion chamber	Repair (see chapter 5).
Fuel poor quality or incorrect (Use high-octone gasoline recommended in the Owner's Manual)	Change fuel (see chapter 3).
Spark plug incorrect	Replace it with the correct plug (see chapter 16)
Ignition coil trouble	Inspect (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Miscellaneous	
Throttle valves won't fully open	Inspect throttle cable and lever linkage (see chapter 3).
Brake dragging	Inspect caliper fluid seal damage or clogging of master cylinder relief and supply ports (see chapter 12).
Clutch slipping	Inspect friction plates for wear (see chapter 6).
Engine overheating	(see Overheating of Troubleshooting Guide in chapter 17)
Engine oil level too high	Repair (see chapter 7).
Engine oil viscosity too high	Change (see chapter 3).
Drive train trouble	Inspect tightness of bolts and nuts (see chapter 2) or bearing wear (see chapter 11).
Final gear case oil viscosity too high	Change (see chapter 2).
Camshaft cam worn	Inspect and replace (see chapter 5).
Vacuum switch valve trouble	Inspect and replace (see chapter 5).
Air suction valve trouble	Inspect and replace (see chapter 5).
Catalytic converters melt down due to muffler overheating (KLEEN)	Replace muffler (see chapter 5).
Exhaust Smokes Excessively	
White smokes	
Piston oil ring worn	Inspect and replace (see chapter 5).
Cylinder worn	Inspect and replace (see chapter 5).
Valve oil seal damaged	Replace (see chapter 5).
Valve guide worn	Replace the guide (see chapter 5).
Engine oil level too high	Repair (see chapter 7).
Black smoke	
Air cleaner clogged	Clean (see chapter 3).
Choke knob left pulled out	Push in (see chapter 3).
Too high fuel pressure	Inspect (see chapter 3).
Injection stuck open	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect and replace (see chapter 3).
Inlet air temperature sensor trouble	Inspect and replace (see chapter 3).
Brown smoke	
Air cleaner duct loose	Reinstall (see chapter 3).

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DFI System Troubleshooting Guide

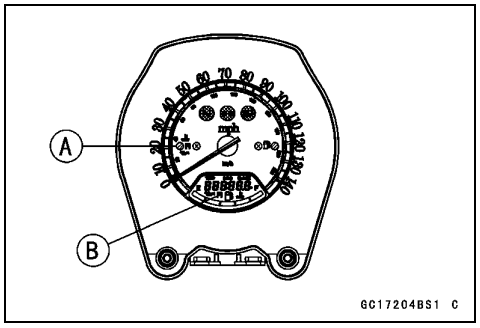
Symptoms or Possible Causes	Actions (detailed reference)
Air cleaner O-ring damaged	Replace (see chapter 3).
Too low fuel pressure	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect and replace (see chapter 3).
Inlet air temperature sensor trouble	Inspect and replace (see chapter 3).

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Self-Diagnosis

Self-diagnosis Procedures

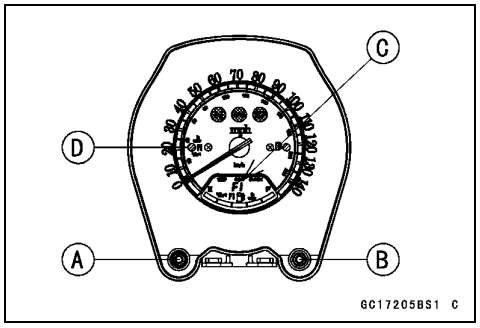
○When a problem occurs with the DFI system, the FI indicator LED light [A] and FI symbol [B] go on.



- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Ground [A] the self-diagnosis terminal [B] (yellow lead) to the battery (–) terminal [C], using a wire [D].



- Turn the ignition switch ON.
- Push the MODE button [A] and display the odo meter.
- Push the RESET button [B] for more than two seconds. The LCD FI characters [C] are displayed.
- Count the blinks of the LED light [D] to read the service code.



NOTE

○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the LED light blinks very slowly or doesn't blink.*

○*Keep the self-diagnosis female connector grounded during self-diagnosis, using a wire.*

- Any of the following procedures (conditions) ends self -diagnosis.

○When pushing the RESET button more than 2 seconds and 2 seconds passed.

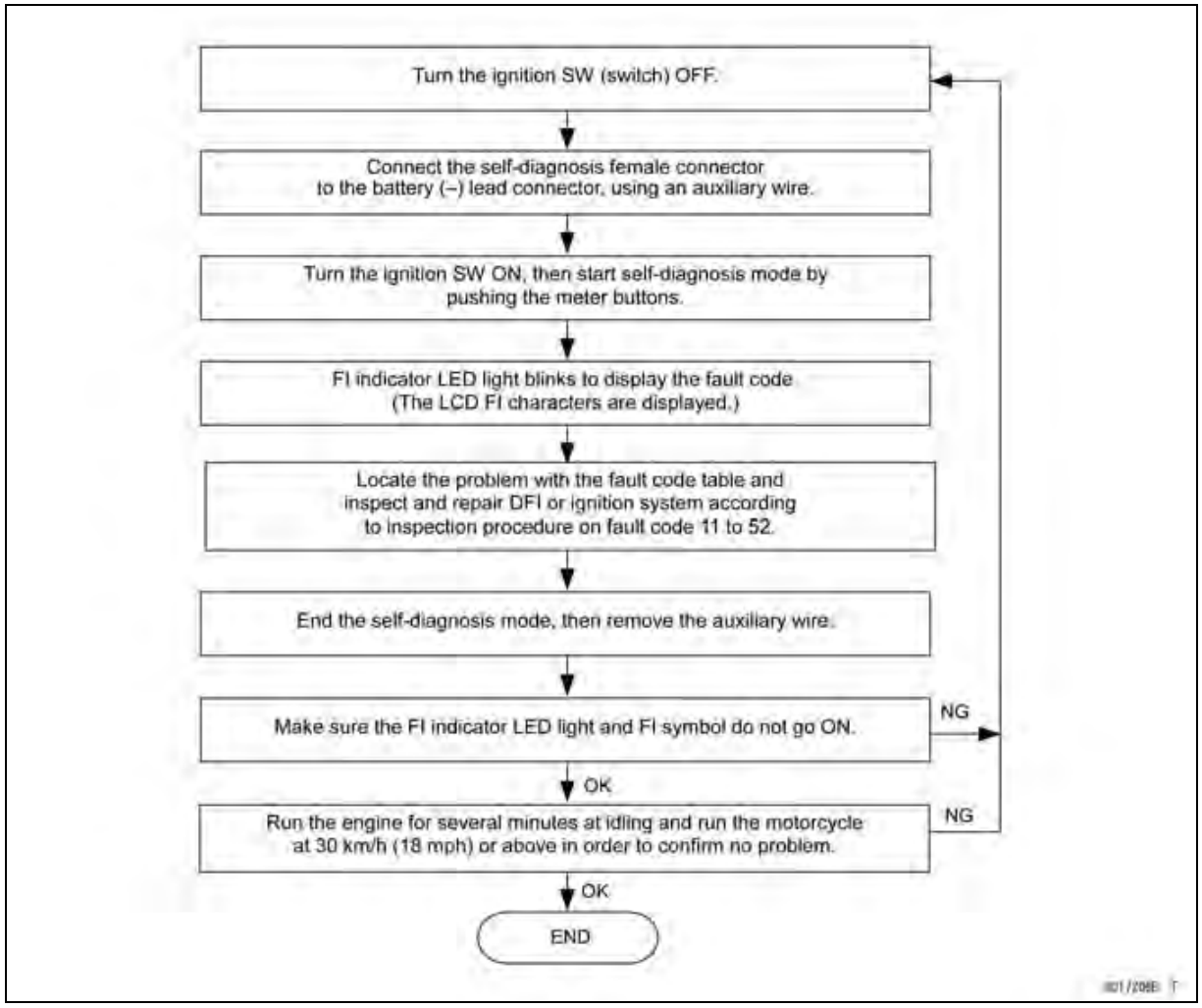
○When the ignition switch is turned to OFF.

○Pushing the MODE button and the trip meter is displayed.

○When the ECU receives the speed sensor signal.

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Self-Diagnosis



Service Code Reading

○Service codes are shown by a series of long and short blinks of the FI indicator LED light as shown below.

○Read 10th digit and unit digit as the FI indicator LED light blinks.

○When there are a number of problems, all the fault 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.

○For example, if four problems occurred in the order of 31, 15, 41, 12, the fault codes are displayed from the lowest number in the order listed.

(12 → 15 → 31 → 41) → (12 → 15 → 31 → 41) → · · · (repeated)

○If there is no problem or when the repair has been done, no service code is shown.

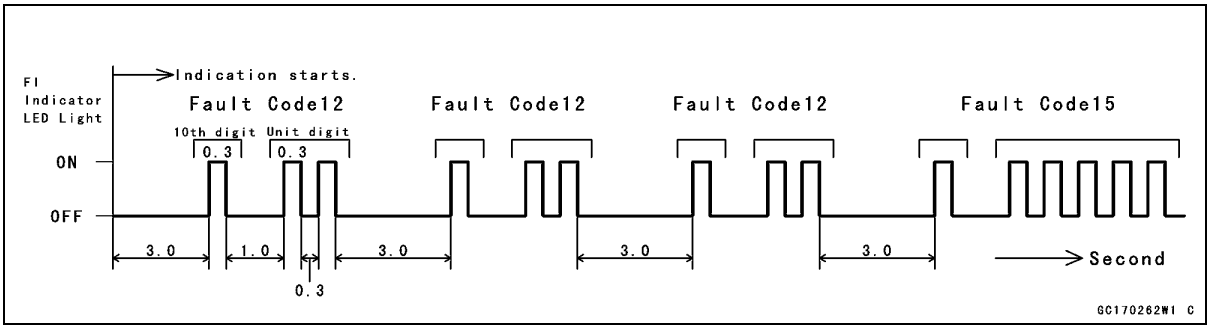
If the problem is with the following parts, the ECU cannot memorize these problems, the FI indicator LED light doesn't go on, and no fault codes can be displayed.

FI Indicator LED Light
ISC Valves
DFI Main Relay
Ignition Coil Secondary Wiring (check the internal resistance, see Electrical System chapter)
ECU Power Source Wiring and Ground Wiring (see ECU Inspection in this chapter)

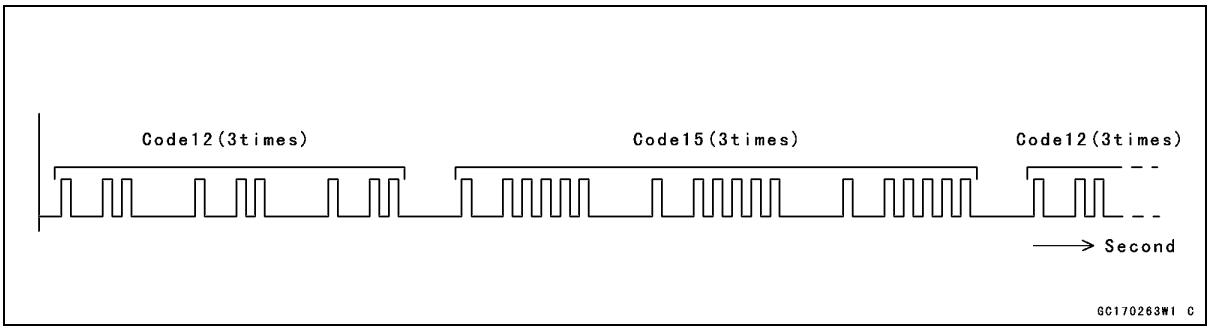
○For example, if two problems of 12 and 15 occur, the service code 12 and 15 are shown as follows.

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Self-Diagnosis



○Each service code is continuously repeated three times until the ignition switch is turned OFF.



Service Code Erasing

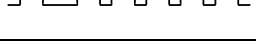
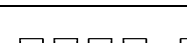
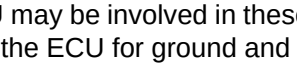
○When the repair has been done, the LED light will not show fault codes any more.

★But even if the repair has been done, the ignition switch is turned OFF, or the battery is disconnected, all the fault codes remain in the ECU, which need not be absolutely erased.

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Self-Diagnosis

Service Code Table

Service Code	FI Indicator LED Light	Problems (1)
11		Throttle sensor malfunction, wiring open or short
12		Vacuum sensor malfunction, wiring open or short
13		Inlet air temperature sensor malfunction, wiring open or short
14		Water temperature sensor malfunction, wiring open or short
15		Atmospheric pressure sensor malfunction, wiring open or short
21		Crankshaft sensor #1 malfunction, wiring open or short
22		Crankshaft sensor #2 malfunction, wiring open or short
31		Vehicle-down sensor malfunction wiring open or short
41		Injector #1 malfunction, wiring open or short
42		Injector #2 malfunction, wiring open or short
45		Fuel pump malfunction, wiring open or short
51		Ignition coil primary winding #1 malfunction, wiring open or short
52		Ignition coil primary winding #2 malfunction, wiring open or short

Notes:

○The ECU may be involved in these problems. If all the parts and circuits checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.

○When no service code is displayed, the electrical parts of the DFI system has no fault, and the mechanical parts of the DFI system and the engine are suspect.

#1: for Front Cylinder

#2: for Rear Cylinder

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Self-Diagnosis

Backups

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Throttle Sensor	Throttle Valve Opening Angle α = –4° ~ +85°	★If the throttle sensor system fails (the signal is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at full throttle open position and sets the DFI in the D-J method (1).
12	Vacuum Sensor	Absolute Vacuum Pv = 63 mmHg ~ 860 mmHg	★If the inlet air pressure sensor system fails (the signal Pv is out of the usable range, wiring short or open), the ECU sets the DFI in the α-N method (1).
13	Inlet Air Tempera-ture Sensor	Inlet Air Temperature Ta = –47°C ~ +178°C	★If the inlet air temperature sensor fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 45°C.
14	Water Tem-perature Sensor	Water Temperature Tw = –28C° ~ +161°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 86°C.
15	Atmo-spheric Pressure Sensor	Absolute Atmospheric Pressure Pa = 63 mmHg ~ 860 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 #1	Either crankshaft sensor must send signals (output voltage)	★If either crankshaft sensor generates 8 or more signals, the ECU runs the engine by the signal of the good crankshaft sensor, but neither crankshaft sensors generate signals, the engine stops by itself.
22	Crankshaft Sensor #2	8 or more times continuously to the ECU.	
31	Vehicle -down Sensor	Vehicle-down Sensor Output Voltage (signal) Vd = 0.2 V ~ 4.6 V	★If the vehicle-down sensor system has failures (the output voltage Vd is out of the usable range, wiring short or open), the ECU shuts off the fuel pump, the fuel injectors and the ignition system.
41	Fuel Injector #1	The injector must send signals (output voltage) 16 or more times continuously to the ECU.	★If the injector #1 fails (signals less than 16 times, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #1, though the engine keeps running.
42	Fuel Injector #2	The injector must send signals (output voltage) 16 or more times continuously to the ECU.	★If the injector #2 fails (signals less than 16 times, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #2, though the engine keeps running.
45	Fuel Pump	The pump must send signals (output voltage) continuously to the ECU.	★If the fuel pump fails (no signals to ECU, wiring short or open), the ECU shuts off the pump, and then the engine stops because of fuel pressure drop.

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Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
51	Ignition Coil #1	The ignition coil primary winding must send signals (output voltage) continuously to the ECU.	★If the ignition primary winding #1 has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running.
52	Ignition Coil #2	The ignition coil primary winding must send signals (output voltage) continuously to the ECU.	★If the ignition primary winding #2 has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running.

Note:

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

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Throttle Sensor (Service Code 11)

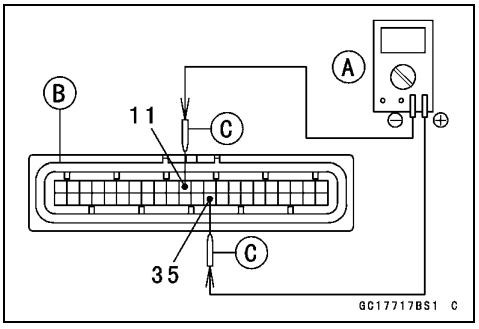
Removal/Adjustment



CAUTION

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

Input Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*
○*The inspection is the same as "Input Voltage Inspection" of the inlet air pressure sensor or the atmospheric pressure sensor.*

- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal in this chapter).

○Do not disconnect the ECU connector.

- Connect a digital meter [A] to the connector [B], using two needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

Throttle Sensor Input Voltage
Connections to ECU Connector
Meter (+) → BL/W lead (terminal 35)
Meter (–) → BR/BK lead (terminal 11)

- Measure the input voltage to the throttle sensor with the engine stopped, and with the connectors joined.
- Turn the ignition switch ON.

Input Voltage at ECU
Standard: 4.75 ~ 5.25 V DC

- Turn the ignition switch OFF.

★If the reading of input voltage is less than the standard, check the ECU for its ground, and power supply (see ECU Power Supply Inspection in this chapter).
★If the input voltage is within the standard range, remove the fuel tank, and check the wiring from the ECU to the throttle sensor for continuity.
★If the wiring is good, check the output voltage of the throttle sensor.

Output Voltage Inspection

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

Idle Speed
Standard: 950 ± 50 r/min (rpm)

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

- Turn off the ignition switch.

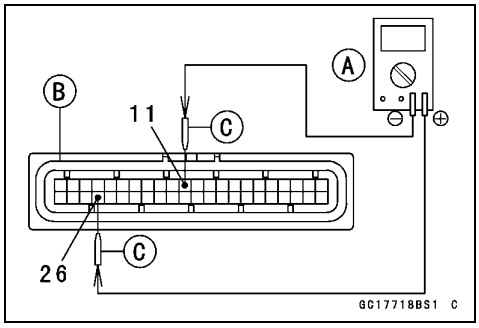
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Throttle Sensor (Service Code 11)

● Remove the ECU (see ECU Removal in this chapter).
○Do not disconnect the ECU connector.
● Connect a digital meter [A] to the connector [B], using the needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

Throttle Sensor Output Voltage
Connections to ECU Connector
Meter (+) → Y/W lead (terminal 26)
Meter (–) → BR/BK lead (terminal 11)



CAUTION

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

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

Output Voltage at ECU
Standard: 0.584 ~ 0.604 V DC (at idle throttle opening)
4.29 ~ 4.59 V DC (at full throttle opening)

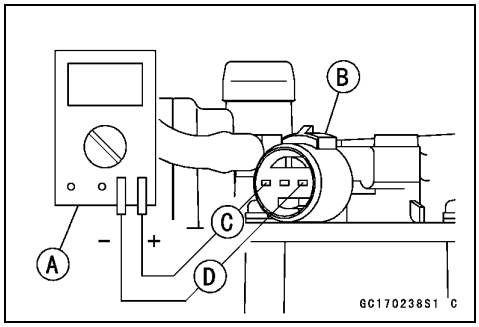
★If the output voltage is normal, replace the ECU.
★If the reading is out of the standard range, inspect the throttle sensor resistance.

● After throttle sensor inspection, remove the needle adapters, and apply silicone sealant to the seals of the connector for waterproofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

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

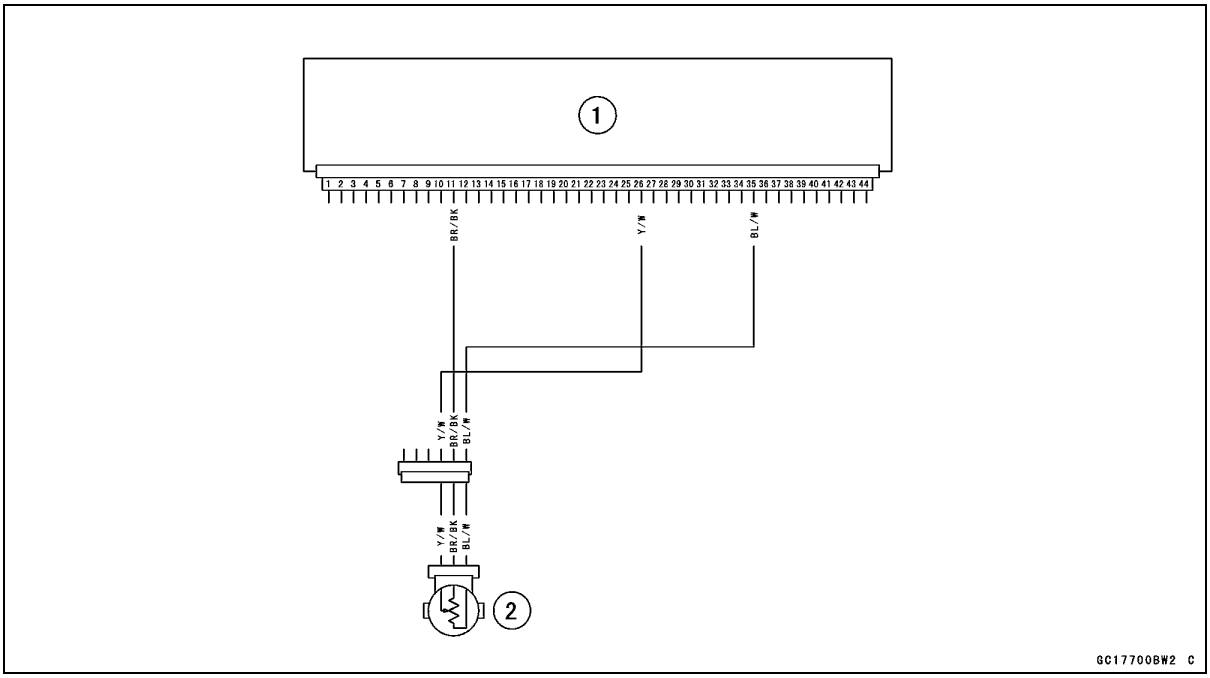
Throttle Sensor Resistance
Connections: BL/W lead [C] ←→ BR/BK lead [D]
Standard: 4 ~ 6 kΩ



★If the reading is out of the range, replace the throttle sensor along with the throttle body.
★If the reading is within the range, but the problem still exists, the ECU is suspect. Replace the ECU.

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Throttle Sensor (Service Code 11)



1. ECU
2. Throttle Sensor

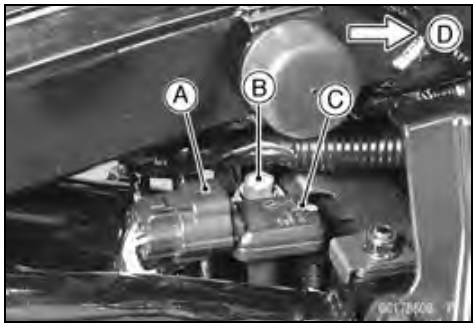
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Inlet Air Pressure Sensor (Service Code 12)

Removal

CAUTION

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



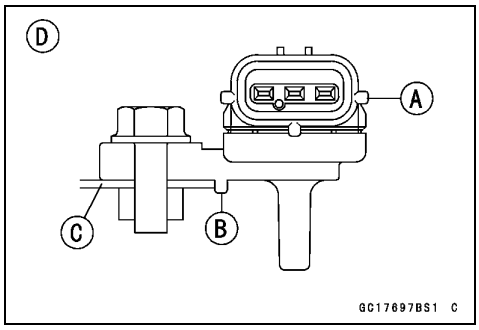
- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Disconnect the inlet air pressure sensor connector [A].
- Unscrew the inlet air pressure sensor bolt [B] and remove the sensor [C].
- Disconnect the vacuum hose from the sensor.

Front [D]

Installation

NOTE

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



- Route the vacuum hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter). Make sure it doesn't get pinched or kinked.
- Install the inlet air pressure sensor [A].

○The stopper [B] must not be on the sensor holder [C].

Rear View [D]

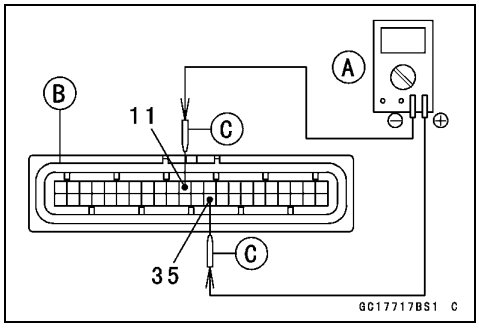
- Tighten the inlet air pressure sensor nut securely.
- Install the fuel tank (see Fuel Tank Installation in this chapter).

Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

○*The inspection is the same as "Input Voltage Inspection" of the throttle sensor or the atmospheric pressure sensor.*



- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal in this chapter).

○Do not disconnect the ECU connector.

- Connect a digital meter [A] to the connector [B], using two needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

Inlet Air Pressure Sensor Input Voltage
Connections to ECU
Meter (+) → BL/W lead (terminal 35)
Meter (–) → BR/BK lead (terminal 11)

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Inlet Air Pressure Sensor (Service Code 12)

- Measure the input voltage to the inlet air pressure sensor with the engine stopped, and with the connectors joined.
- Turn the ignition switch ON.

Input Voltage at ECU
Standard: 4.75 ~ 5.25 V DC

- Turn the ignition switch OFF.

★If the reading is less than the standard range, check the ECU for its ground, and power supply (see ECU Power Supply Inspection in this chapter). If the ground and power supply are good, the ECU is suspect. Replace the ECU.

★If the reading is within the standard range, check the sensor output voltage.

Output Voltage Inspection

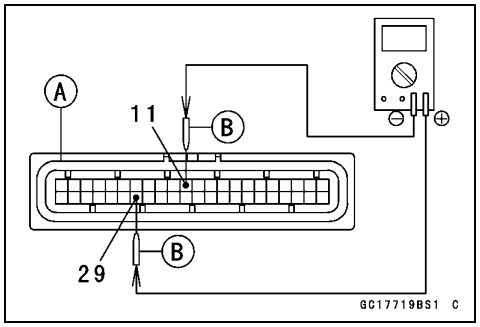
NOTE

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

- Check the output voltage of the sensor at the ECU connector [A].

Special Tool - Needle Adapter Set: 57001-1457

Inlet Air Pressure Sensor Output Voltage
Connections to ECU
Meter (+) → W/BL lead (terminal 29)
Meter (–) → BR/BK lead (terminal 11)



- Measure the output voltage with the engine stopped, and with the connector joined.
  Needle Adapters [B]
- Turn the ignition switch ON.

Output Voltage at ECU
Usable Range: 3.74 ~ 4.26 V DC at the standard atmospheric pressure (101.32 kPa, or 76 cmHg absolute)

★If the output voltage is at about 4.8 V, the ECU is normal. Remove the fuel tank and check the wiring between the ECU and the sensor.

★If the output voltage is at about 4.8 V and out of the usable range, remove the fuel tank and check the wiring. If the wiring is good, check the sensor itself as follows.

- Turn the ignition switch OFF and remove the needle adapters.
- Apply silicone sealant to the seals of the connector for waterproofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

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Inlet Air Pressure Sensor (Service Code 12)

★If the output voltage is normal, check the inlet air pressure sensor itself.

○Check the output voltage for vacuum as follows. If the output voltage changes within the usable range as vacuum changes, the sensor is normal and the ECU is suspect. Check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).

● Remove the inlet air pressure sensor [D] and disconnect the vacuum hose from the sensor.

● Connect an auxiliary hose [E] to the inlet air pressure sensor.

● Temporarily install the inlet air pressure sensor.

○Connect a commercially available digital meter [A], the needle adapters [F], vacuum gauge [B], and the fork oil level gauge [C] to the inlet air pressure sensor.
Front [G]

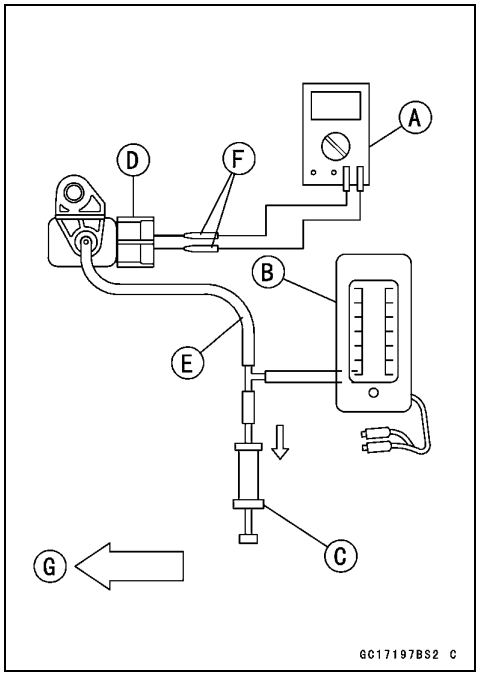
Special Tools - Fork Oil Level Gauge: 57001-1290
Needle Adapter Set: 57001-1457

Digital Meter Connections
Meter (+) → W/BL lead of Inlet Air Pressure Sensor
Meter (–) → BR/BK lead of Inlet Air Pressure Sensor

○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.

○Inspect the inlet air pressure sensor output voltage, using the following formula and charts for Pv = 24 ~ 55 cmHg and 55 ~ 86 cmHg.



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Inlet Air Pressure Sensor (Service Code 12)

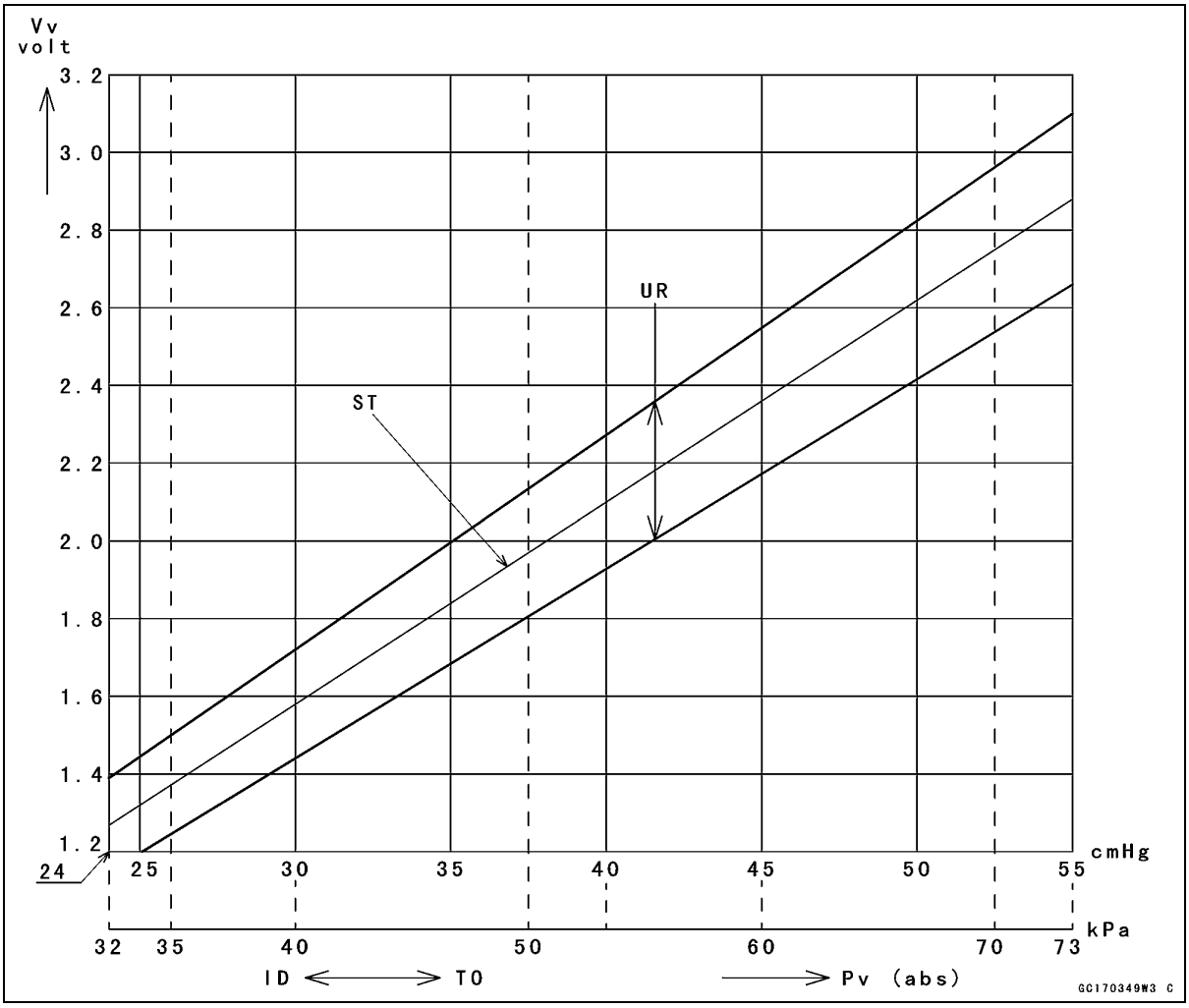
Suppose:
Pg: Vacuum (gauge) of Throttle Assy
Pl: Local Atmospheric Pressure (absolute) measured by a barometer
Pv: Vacuum (absolute) of Throttle Assy
Vv: Sensor Output Voltage (v)

then
Pv = Pl – Pg

For example, suppose the following data is obtained in the chart of the next page.
Pg = 8 cmHg (vacuum gauge reading)
Pl = 70 cmHg (barometer reading)
Vv = 3.2 V (digital volt meter reading)

then
Pv = 70 – 8 = 62 cmHg (abs)

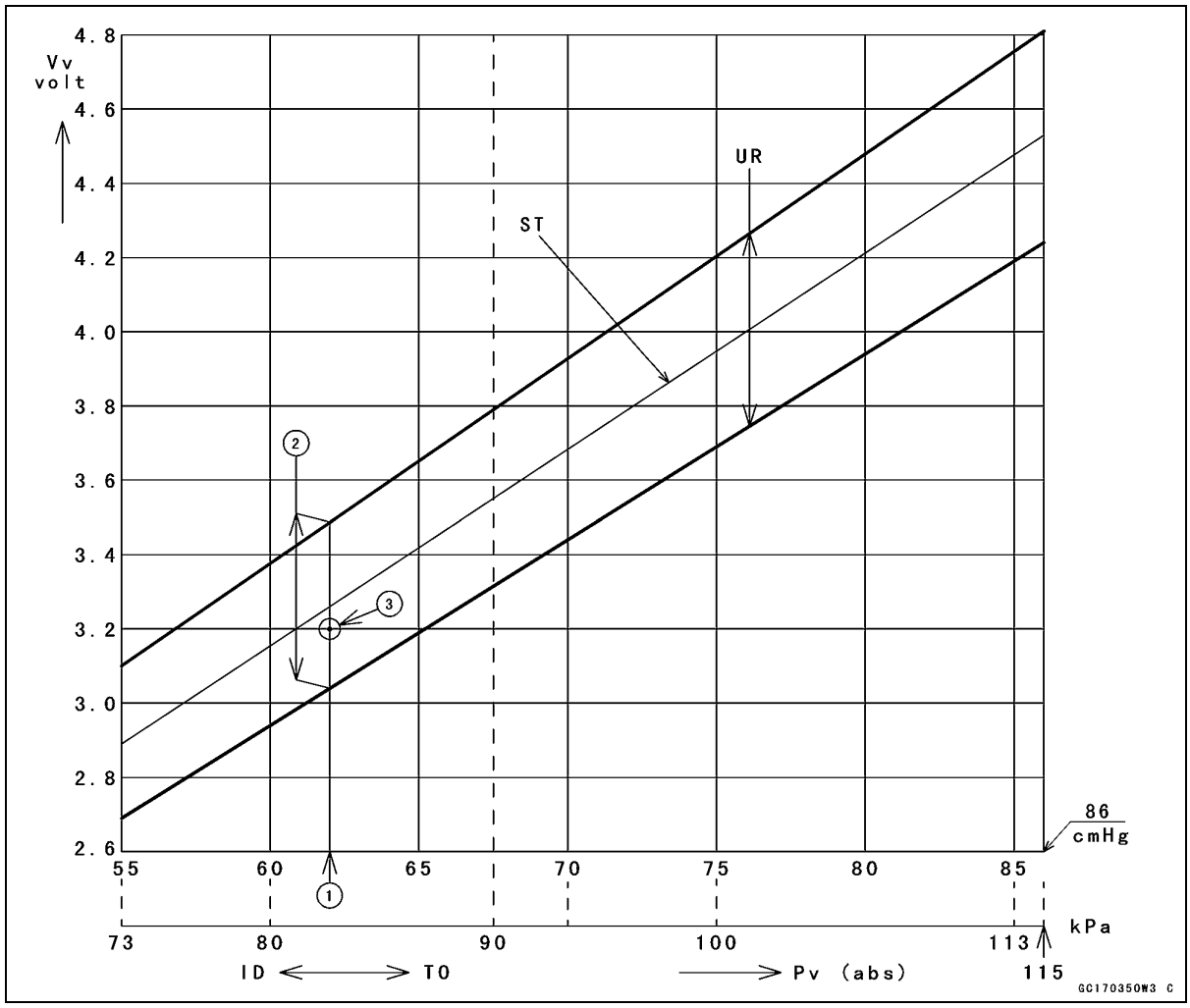
Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.
Usable range = 3.04 ~ 3.49 V
Plot Vv (3.2 V) on the vertical line. → Point [3].
Results: In the chart, Vv is within the usable range and the sensor is normal.
Pv = 24 ~ 55 cmHg



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Inlet Air Pressure Sensor (Service Code 12)

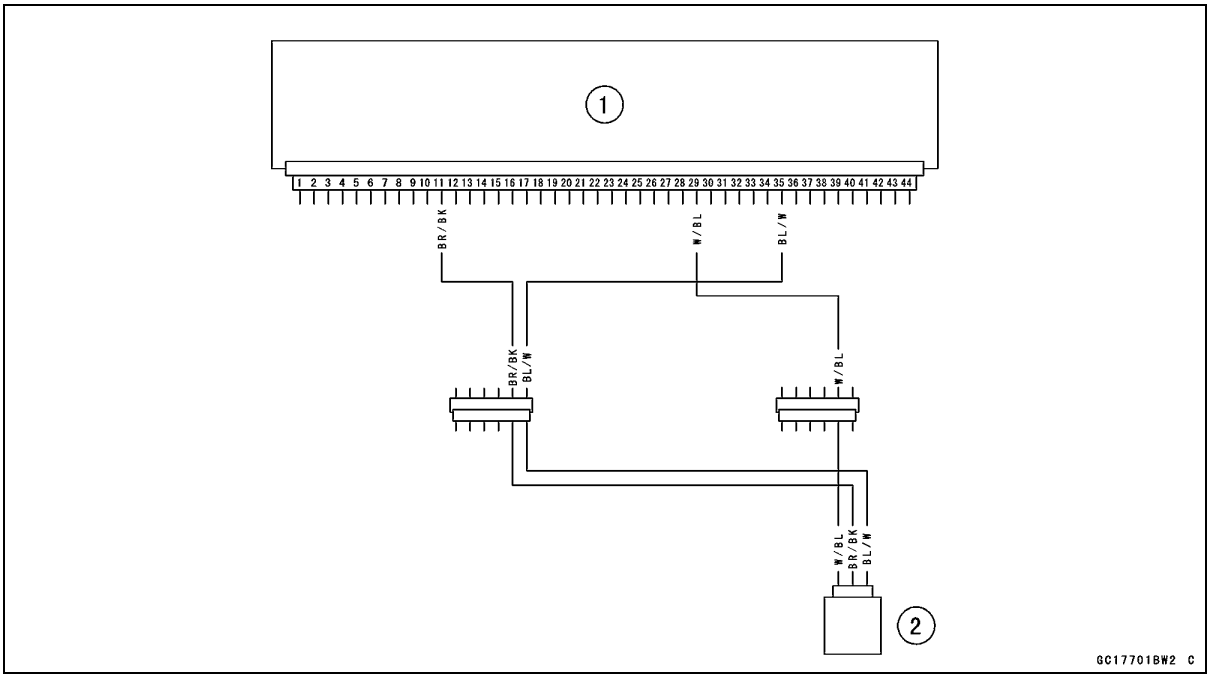
Pv = 55 ~ 86 cmHg



ID: Idling
Ps: Standard Atmospheric Pressure (absolute)
Pv: Throttle Vacuum (absolute)
ST: Standard of Sensor Output Voltage (v)
TO: Throttle Full Open
UR: Usable Range of Sensor Output Voltage (v)
Vv: Inlet Air Pressure Sensor Output Voltage (V) (Digital Meter Reading)

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Inlet Air Pressure Sensor (Service Code 12)



1. ECU
2. Inlet Air Pressure Sensor

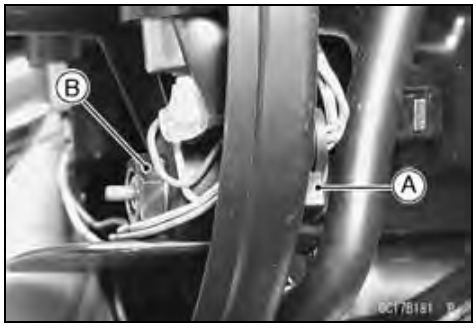
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Inlet Air Temperature Sensor (Service Code 13)

Removal/Installation

CAUTION

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



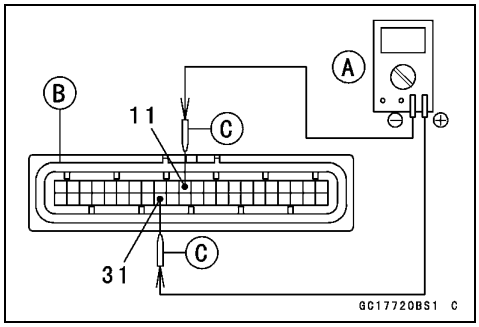
- Remove the right air cleaner base (see Right Air Cleaner Housing Removal in this chapter).
- Disconnect the connector [A] from the inlet air temperature sensor, and unscrew the nut [B].
- Remove the inlet air temperature sensor.

Torque - Inlet Air Temperature Sensor Nut: 7.8 N·m (0.80 kgf·m, 69 in·lb)

Output Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*
○*The output voltage changes according to the inlet air temperature.*



- Remove the ECU (see ECU Removal in this chapter).

○Do not disconnect the ECU connector.

- Connect a digital meter [A] to the ECU connector [B], using two needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

Inlet Air Temperature Sensor Output Voltage
Connections to ECU Connector
Meter (+) → P lead (terminal 31)
Meter (–) → BR/BK lead (terminal 11)

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

Output Voltage at ECU
Standard: 2.4 V at inlet air temperature 25°C (77°F)

- Turn the ignition switch OFF.

★If the output voltage is normal but there is still trouble, check the sensor resistance.

★If the output voltage is about 4.8 V, the ECU is normal. Remove the right air cleaner base and check the wiring between the ECU and the sensor.

★If the output voltage is not about 4.8 V and out of the specified, remove the right air cleaner base, check the wiring between the ECU and the inlet air temperature sensor.

★If the wiring is good, check the sensor resistance.

- Remove the needle adapters, and apply silicone sealant to the seals of the connector for waterproofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

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Inlet Air Temperature Sensor (Service Code 13)

Resistance Inspection

- Remove the inlet air temperature sensor (see Removal/Installation in this section).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion and threaded portion are submerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with the sensor.

NOTE

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

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

Inlet Air Temperature Sensor Resistance

Standard: 5.4 ~ 6.6 kΩ at 0°C (32°F)

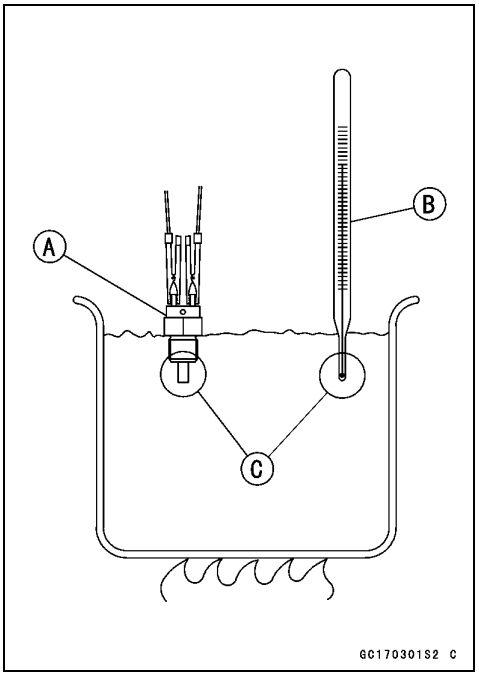
2.26 ~ 2.86 kΩ at 20°C (68°F)

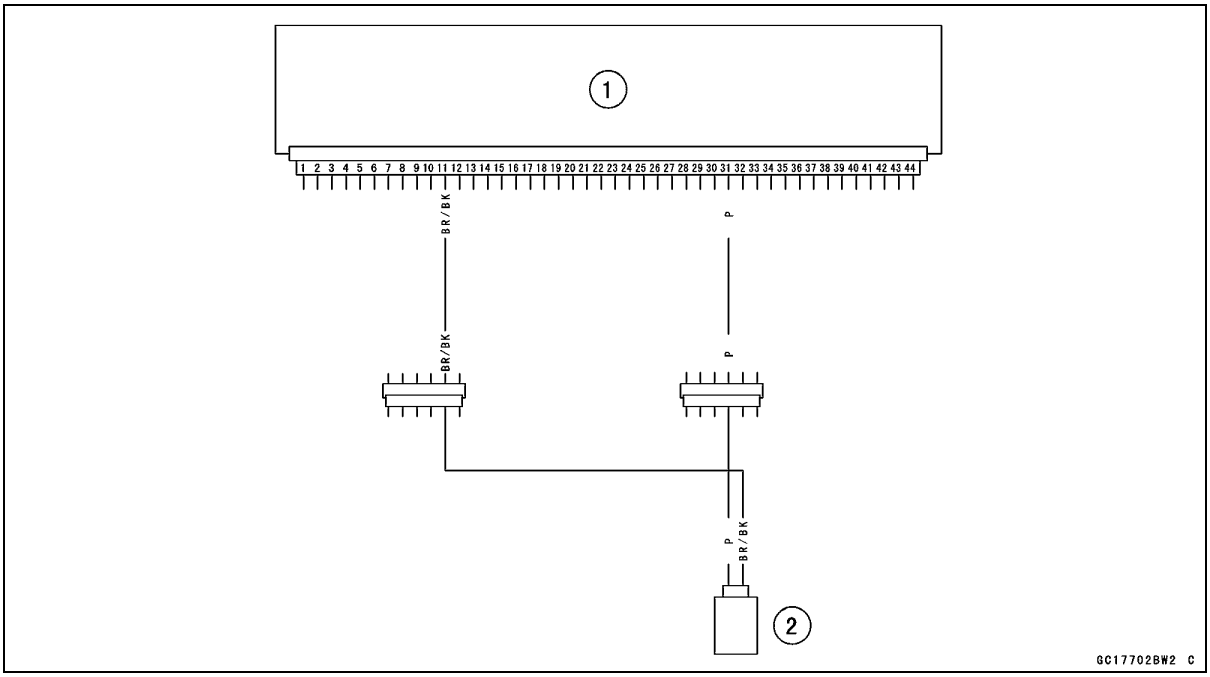
0.29 ~ 0.39 kΩ at 80°C (176°F)

★If the measurement is out of the range, replace the sensor.

★If the measurement is within the specified, check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).

- Clean off machine oil that inadvertently gets on the sensor, especially on the terminals with a high-flush point solvent.



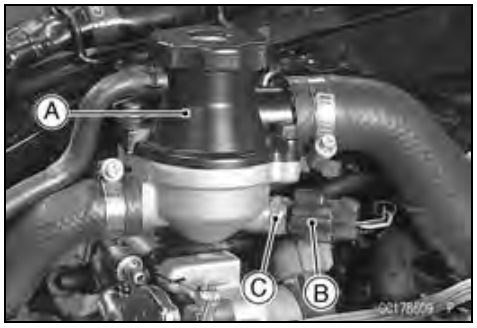


1. ECU
2. Inlet Air Temperature Sensor

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Water Temperature Sensor (Service Code 14)

Removal/Installation



CAUTION

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

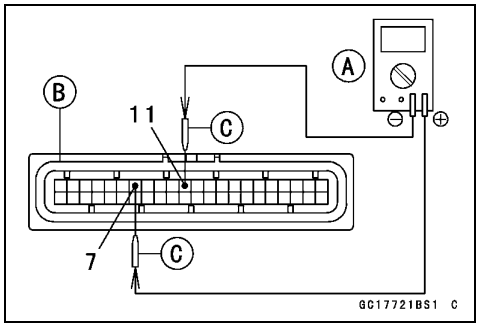
- Remove the thermostat housing [A] (see Thermostat Removal in the Cooling System chapter).
- Disconnect the sensor connector [B], and unscrew the water temperature sensor [C].

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Threads of Water Temperature Sensor

Torque - Water Temperature Sensor: 18 N·m (1.8 kgf·m, 13 ft·lb)

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

Output Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*
○*The output voltage changes according to the coolant temperature in the engine.*

- Remove the ECU (see ECU Removal in this chapter).

○Do not disconnect the ECU connector.

- Connect a digital meter [A] to the ECU connector [B], using two needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

Water Temperature Sensor Output Voltage
Connections to ECU
Meter (+) → O lead (terminal 7)
Meter (–) → BR/BK lead (terminal 11)

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

Output Voltage at ECU
Standard: 3.38 V at coolant temperature 25°C (77°F)

★If the output voltage is normal but there is still trouble, check the sensor resistance.

★If the output voltage is about 4.8 V, the ECU is normal. Remove the fuel tank and check the wiring between the ECU and the sensor.

- Turn the ignition switch OFF.

★If the output voltage is not about 4.8 V and out of the specified, remove the fuel tank and check the wiring between the ECU and the water temperature sensor for continuity.

★If the wiring is good, check the water temperature sensor resistance.

- Remove the needle adapters, and apply silicone sealant to the seals of the connector for waterproofing.

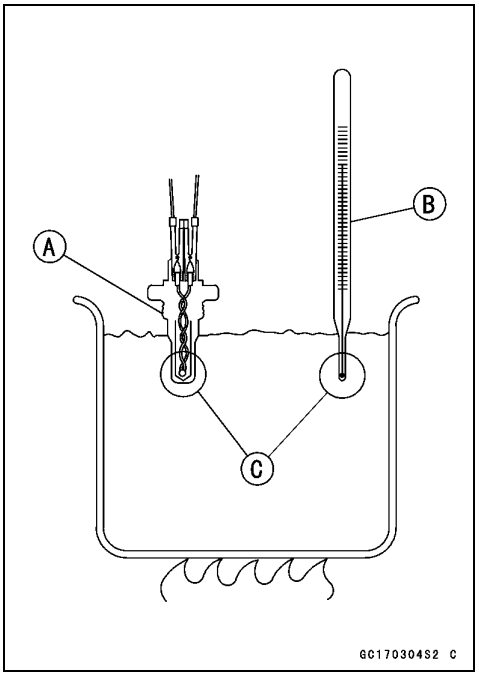
Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

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Water Temperature Sensor (Service Code 14)

Resistance Inspection

- Remove the water temperature sensor (see Removal in this section).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion and threaded portion are submerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with the sensor.



NOTE

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

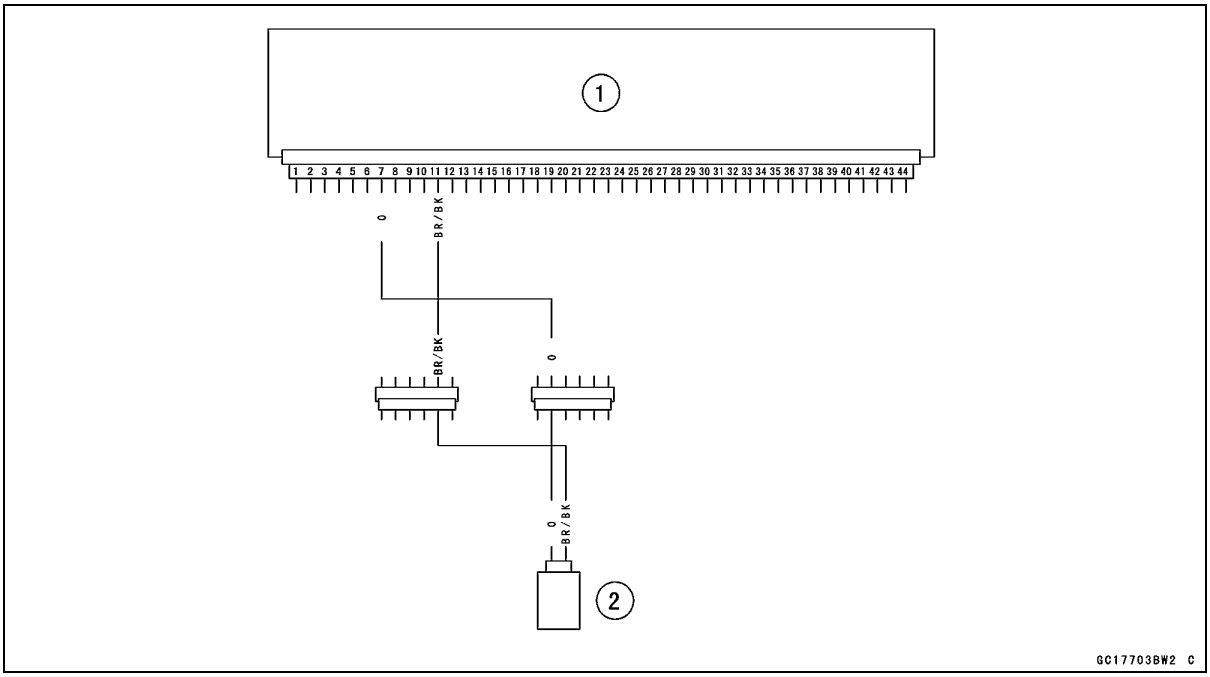
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the table.

Water Temperature Sensor Resistance

Standard: 2.162 ~ 3.112 kΩ at 20°C (68°F)
0.785 ~ 1.049 kΩ at 50°C (122°F)
0.207 ~ 0.253 kΩ at 100°C (212°F)

★If the measurement is out of the range, replace the sensor.
★If the measurement is within the specified, check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).

- Clean off machine oil that inadvertently gets on the sensor, especially on the terminals with a high-flush point solvent.



1. ECU
2. Water Temperature Sensor

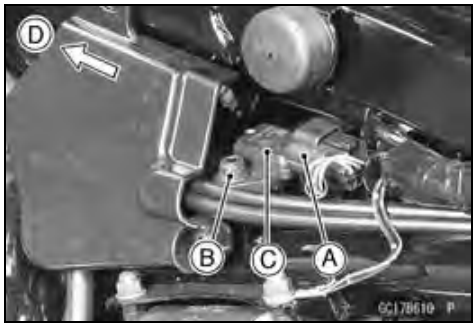
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Atmospheric Pressure Sensor (Service Code 15)

Removal

CAUTION

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



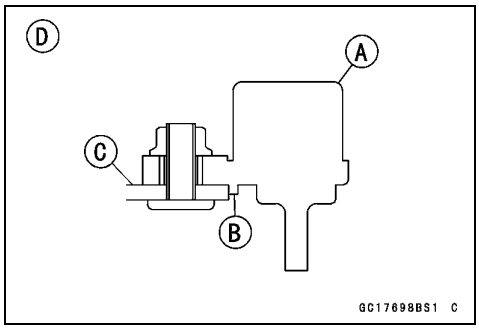
- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Disconnect the atmospheric pressure sensor connector [A].
- Remove the sensor nut [B].
- Remove the atmospheric pressure sensor [C].

Front [D]

Installation

NOTE

○*The atmospheric pressure sensor is the same part as the inlet air pressure sensor except for different wiring and no hose.*



- Install the atmospheric pressure sensor [A].

○The stopper [B] must not be on the sensor holder [C].

Rear View [D]

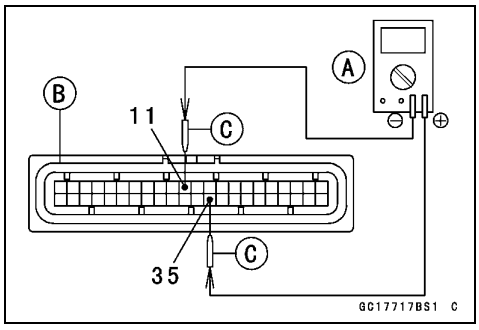
- Tighten the atmospheric pressure sensor nut securely.
- Install the fuel tank (see Fuel Tank Installation in this chapter).

Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

○*The inspection is the same as "Input Voltage Inspection" of the throttle sensor or the inlet air pressure sensor.*



- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal in this chapter).

○Do not disconnect the ECU connector.

- Connect a digital meter [A] to the connector [B], using two needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

Atmospheric Pressure Sensor Input Voltage
Connections to ECU
Meter (+) → BL/W lead (terminal 35)
Meter (–) → BR/BK lead (terminal 11)

- Measure the input voltage to the sensor with the engine stopped, and with the connectors joined.
- Turn the ignition switch ON.

Input Voltage at ECU
Standard: 4.75 ~ 5.25 V DC

- Turn the ignition switch OFF.

★If the reading is less than the standard range, check the ECU for its ground, and power supply (see ECU Power Supply Inspection in this chapter).

★If the reading is within the standard range, check the sensor output voltage.

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Atmospheric Pressure Sensor (Service Code 15)

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

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

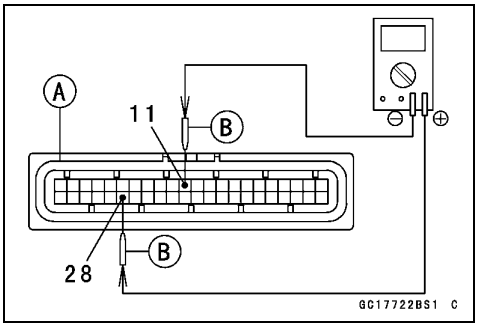
Output Voltage Inspection

NOTE

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

★Check the output voltage of the sensor at the ECU connector [A].
Needle Adapters [B]

Special Tool - Needle Adapter Set: 57001-1457



Atmospheric Pressure Sensor Output Voltage
Connections to ECU
Meter (+) → BL/Y lead (terminal 28)
Meter (–) → BR/BK lead (terminal 11)

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

Output Voltage at ECU
Usable Range: 3.74 ~ 4.26 V DC at the standard atmospheric pressure (101.32 kPa, or 76 cmHg abs)

★If the output voltage is about 4.8 V, the ECU is normal. Remove the fuel tank and check the wiring between the ECU and the sensor.

★If the output voltage is not about 4.8 V and out of the usable range, remove the fuel tank and check the wiring. If the wiring is good, check the sensor itself as follows.

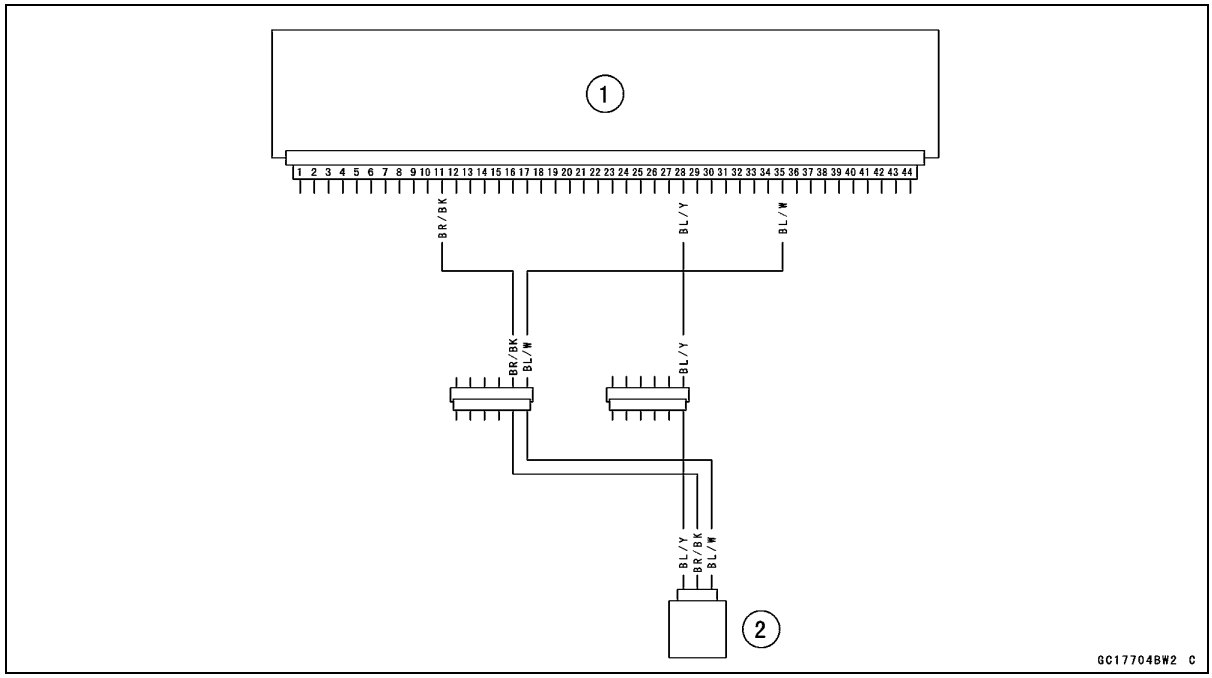
★If the output voltage is normal, check the output voltage for vacuum (see Inlet Air Pressure Sensor section in this chapter). If the output voltage changes within the usable range as vacuum changes, the sensor is normal and the ECU is suspect. Check the ECU for its ground and power supply.

- Turn the ignition switch OFF and remove the needle adapters.
- Apply silicone sealant the seals of the connector for waterproofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

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Atmospheric Pressure Sensor (Service Code 15)



1. ECU
2. Atmospheric Pressure Sensor

★If you need to check the atmospheric pressure sensor for various altitudes other than sea level, check the output voltage as follows:

○Determine the local altitude (elevation).

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

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

★If you know the local altitude, use the following chart.

For example:

Suppose the local altitude is 1 300 m (4 200 ft) and the sensor output voltage Va is 3.3 V.

Plot this H (1 300 m) at a point [1] on the following chart and draw a vertical line through the point.

Then, you can get the usable range [2] of the sensor output voltage.

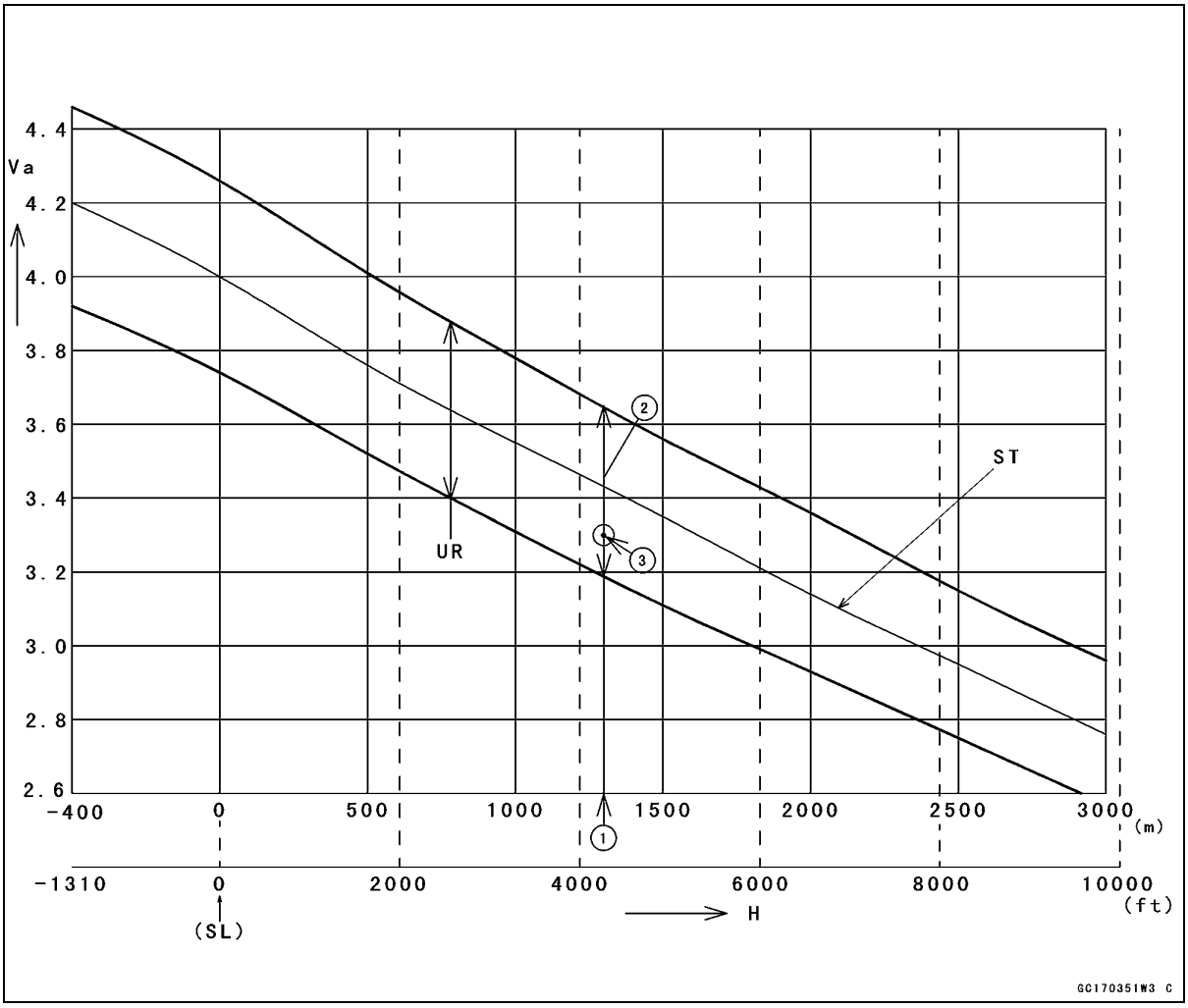
Usable Range = 3.2 ~ 3.64 V

Plot Va (3.3 V) on the vertical line → Point [3]

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

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Atmospheric Pressure Sensor (Service Code 15)



H: Altitude (m or feet)
SL: Sea Level (0 m)
ST: Standard of Sensor Output Voltage (v)
UR: Usable Range of Sensor Output Voltage (v)
Va: Atmospheric Pressure Sensor Output Voltage (v)

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Crankshaft Sensors (#1, #2: Service Code 21, 22)

Crankshaft Sensor #1: for Front Cylinder (Service Code 21)
Crankshaft Sensor #2: for Rear Cylinder (Service Code 22)

Crankshaft Sensor Removal/Installation

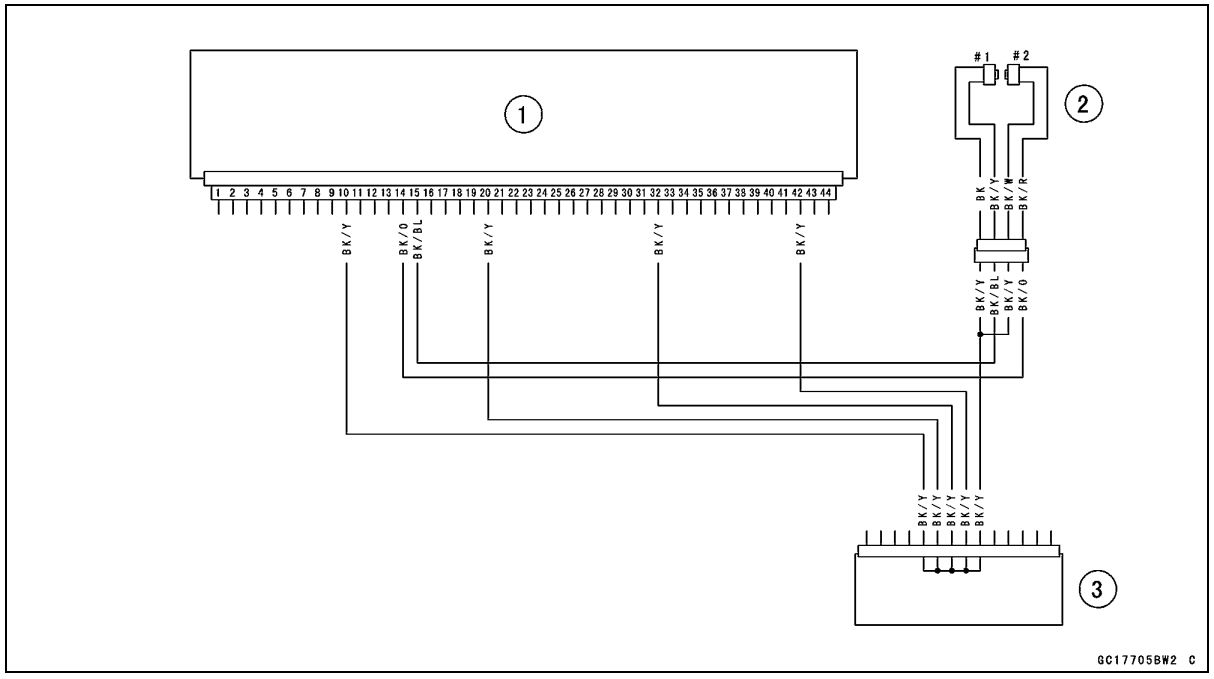
● See Crankshaft Sensor Removal/Installation in the Electrical System chapter.

Crankshaft Sensor Inspection

○The crankshaft sensors have no power source, and when the engine stops, the crankshaft sensors generates no signals.

● Remove the alternator outer cover and check the wiring for continuity, using the following diagram.

● Crank the engine and measure the peak voltage of the crankshaft sensors (see Crankshaft Sensor Inspection in the Electrical System chapter) in order to check the coils.



1. ECU
2. Crankshaft Sensors
3. Joint Connector 2

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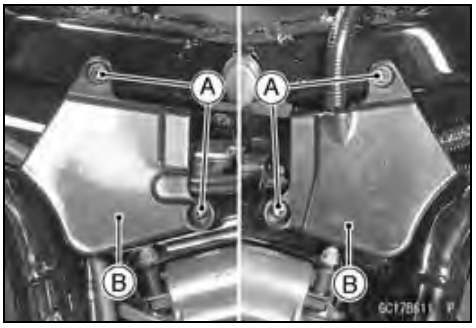
Vehicle-down Sensor (Service Code 31)

Removal

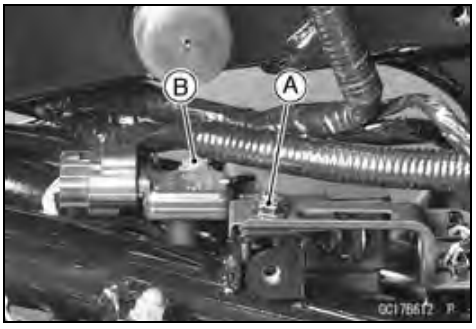
CAUTION

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

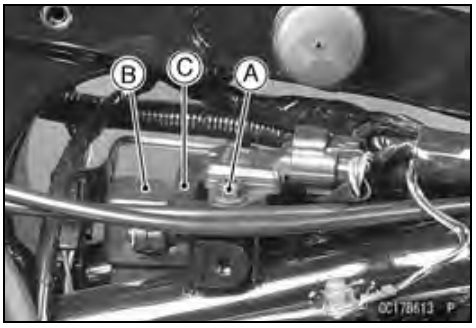
- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Remove the bolts [A] and take out the covers [B].



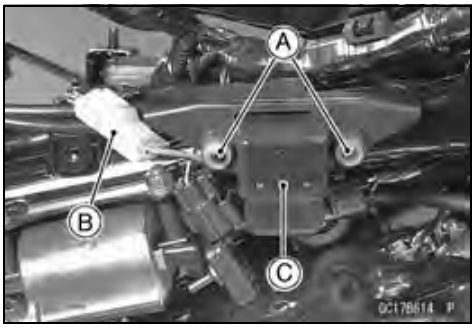
- Remove:
  Bracket Nut [A]
  Inlet Air Pressure Sensor Bolt [B]



- Remove the bracket nuts [A] and pull the vehicle down sensor [B] with the bracket [C] out of the frame.



- Unscrew the screws [A] and disconnect the connector [B].
- Remove the vehicle down sensor [C].

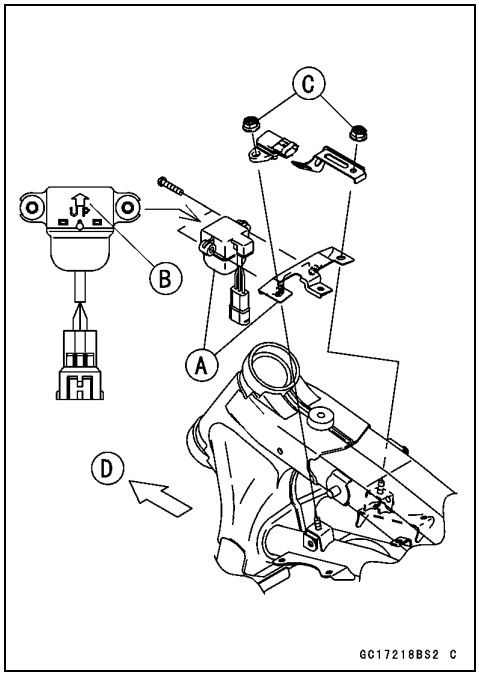


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Vehicle-down Sensor (Service Code 31)

Installation

- Install the vehicle-down sensor assy [A] in the original position. The arrow mark [B] on the sensor must be on the front and point upward.
- Do not install the sensor upside down.
- Tighten the sensor bracket nuts [C] securely.
  Front [D]
- Install the Fuel Tank (see Fuel Tank Installation in this chapter).



⚠ 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 down sensor is held in place by the bracket and its bolt as shown.

Vehicle-down Sensor Inspection

NOTE

○*Be sure the battery is fully charged.*

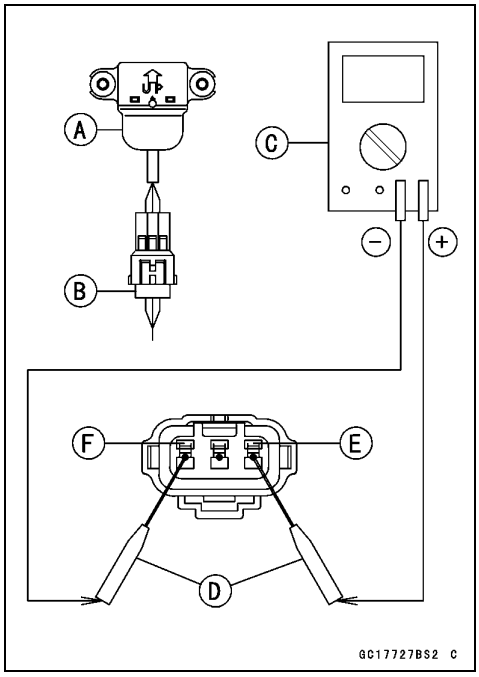
- Take out the vehicle-down sensor [A] (see Removal in this section).

○Do not disconnect the connector [B].

- Connect a digital volt meter [C] to the connector (natural, 3-pin), using two needle adapters [D].

Special Tool - Needle Adapter Set: 57001-1457

Vehicle-down Sensor Power Source Voltage
Connections to Sensor
Meter (+) → BR lead [E]
Meter (–) → BK/Y lead [F]



- Turn the ignition switch ON, and measure the power source voltage with the connector joined.

Output Voltage at Sensor
Standard: Battery Voltage (12.5 V or more)

- Turn the ignition switch OFF.

★If there is no battery voltage, check the DFI power source circuit (see DFI Power Source Circuit in the DFI Power Source section).

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Vehicle-down Sensor (Service Code 31)

★If the power source is normal, check the output voltage of the sensor.

● Connect a digital volt meter [A] to the connector (natural, 3-pin), using two needle adapters [B].

Vehicle-down Sensor Output Voltage
Connections to Sensor
Meter (+) → Y/G lead [E]
Meter (–) → BK/Y lead [F]

● Turn the ignition switch ON, and measure the output voltage with the connector joined.

○Tilt the sensor (40 ~ 50°) or more [C] right or left, then hold the sensor almost vertical [D] with the arrow mark pointed up, and measure the output voltage.

Output Voltage at Sensor
Standard: with sensor tilted 40 ~ 50° or more right or left: 3.7 ~ 4.4 V
with sensor arrow mark pointed up: 0.4 ~ 1.4 V

NOTE

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

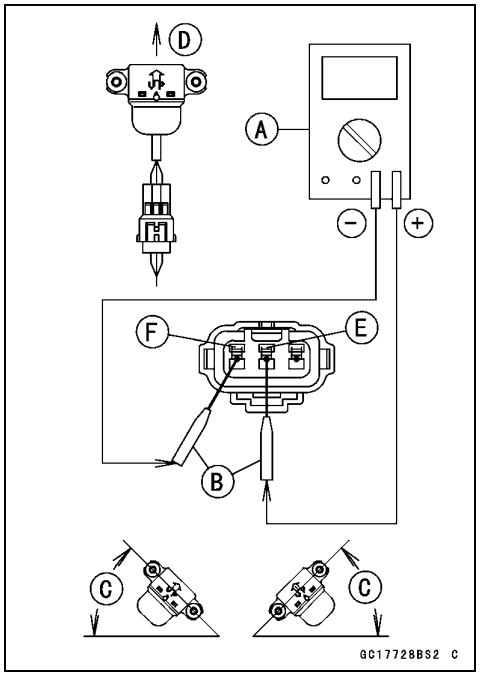
● Turn the ignition switch OFF.

● Remove the needle adapters, and apply silicone sealant to the seals of the connector for waterproofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of Vehicle-down Sensor Connector

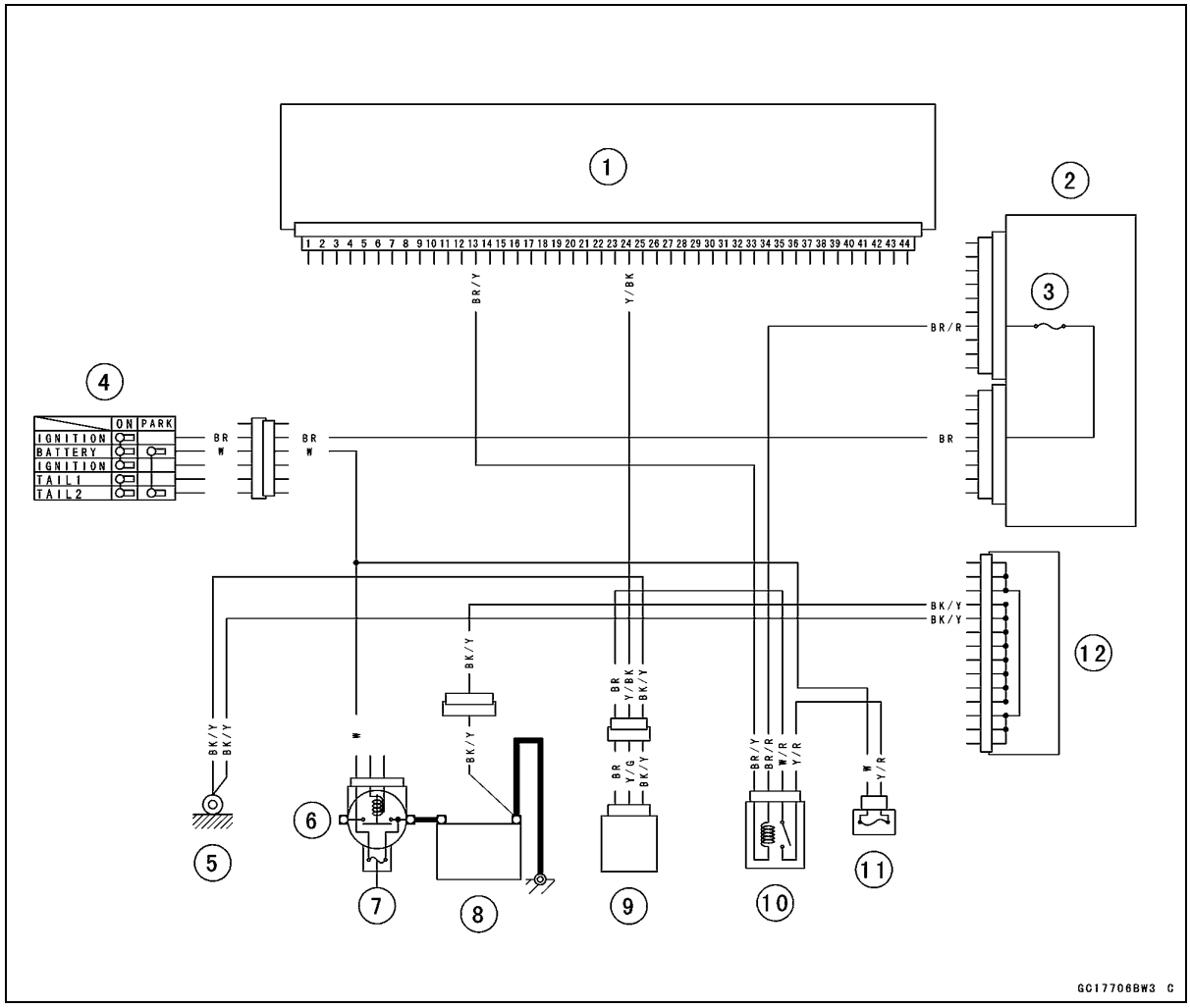
★If the output voltage is out of the specified, replace the vehicle-down sensor.

★If the output voltage is normal, the wiring is suspect. Check the wiring. If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).



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Vehicle-down Sensor (Service Code 31)



1. ECU
2. Junction Box
3. Ignition Fuse 10 A
4. Ignition Switch
5. Frame Ground
6. Starter Relay
7. Main Fuse 30 A
8. Battery
9. Vehicle-down Sensor
10. DFI Main Relay
11. DFI Fuse 15 A
12. Joint Connector 2

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Fuel Injectors (#1, #2: Service Code 41, 42)

Fuel Injector #1: Front Fuel Injector for Front Cylinder (Service Code 41)
Fuel Injector #2: Rear Fuel Injector for Rear Cylinder (Service Code 42)

CAUTION

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

Injector Removal

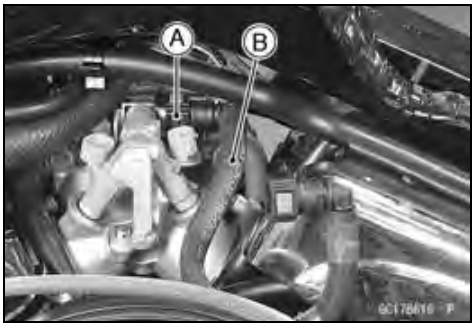
⚠ WARNING

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

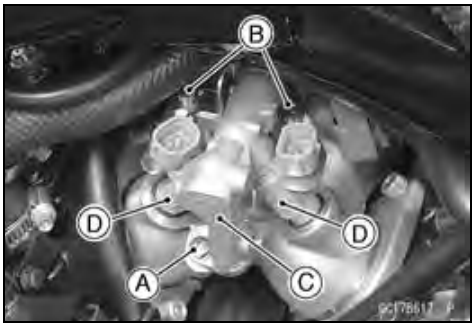
- Check to see that the battery (–) lead terminal is disconnected.
- Remove:
  Fuel Tank (see Fuel Tank Removal in this chapter)
  Front and Rear Injector Connectors [A]



- Remove the fuel hose joint #2 [A] from the pipe for the delivery joint and take out the fuel hose assy (outlet hose) [B].



- Unscrew the delivery joint screw [A] and bolts [B], and lift up the delivery joint [C] with the injectors [D].
- Remove the injectors from the delivery joint.



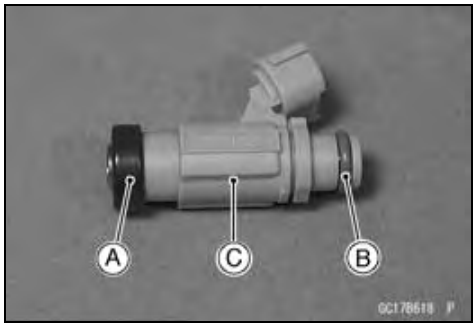
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Fuel Injectors (#1, #2: Service Code 41, 42)

Injector Installation

○The front and rear injectors are the same.

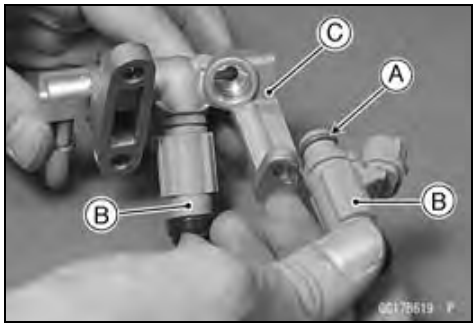
- Replace the seal [A] and, O-ring [B] with new ones, and install them onto the injector [C].
- Apply engine oil to the O-ring, and install them onto the injector.



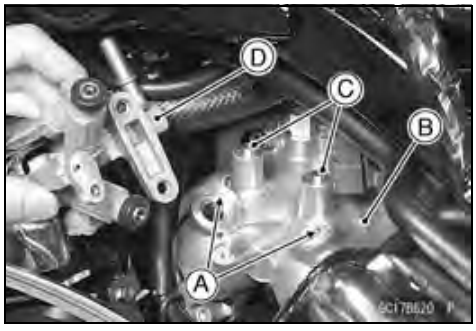
CAUTION

To avoid air and fuel leak, be careful not to get dirt or dust on the O-ring. Be careful not to damage the O-ring.

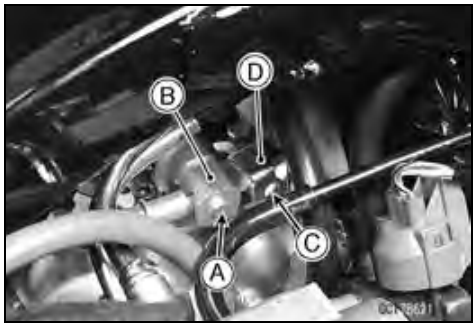
- Apply engine oil to the O-ring [A], and install each injector [B] into the delivery joint [C].



- Check that there is no dirt or dust on the injector seating surface [A] of the inlet manifold [B].
- Check that the two dowel pins [C] are in place in the inlet manifold.
- Fit the end of the injector into the delivery joint [D], and install them into the inlet manifold [B].



- Align the projection [A] on the delivery joint [B] with the hole [C] of the left side bracket [D].



- Fit [A] the connectors [B] of the injector into the bracket recesses [C].
- Tighten the delivery joint screw and bolts securely.



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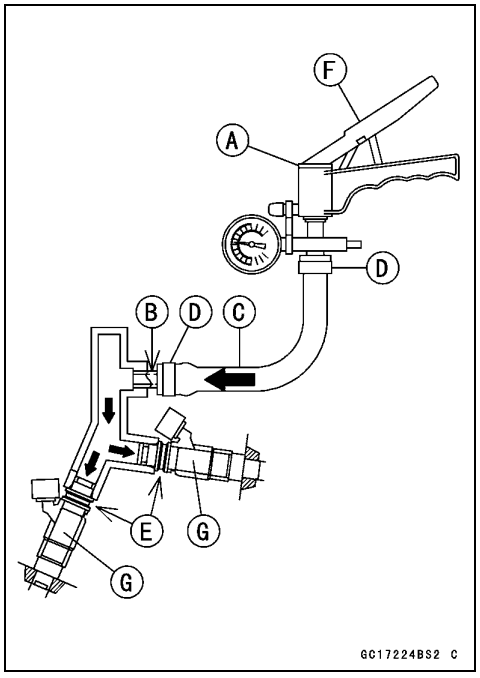
Fuel Injectors (#1, #2: Service Code 41, 42)

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

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

○Apply a soap and water solution to the areas [E] shown.
○Watching the pressure gauge, squeeze the pump lever [F], and build up the pressure until the pressure reaches the maximum pressure.

Injector Fuel Line Maximum Pressure
Standard: 300 kPa (3.06 kgf/cm², 43 psi)



CAUTION

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

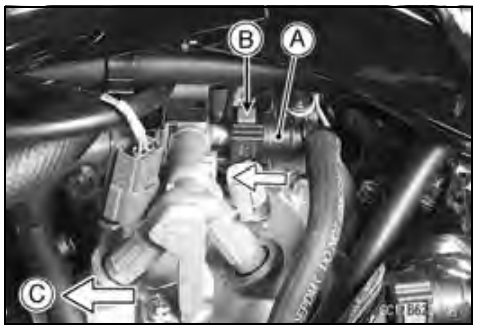
● Watch the gauge for at least 6 seconds.
★If the pressure holds steady, the system is good.
★If the pressure drops at once, or if bubbles are found in the area, the line is leaking. Perform the following as necessary.
○Retighten the fuel hose clamps [D].

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

○Replace:
O-ring, and Seal Ring of Injectors [G]
○Repeat the leak test, and check the fuel line for no leakage.

● Install the fuel outlet hose (see Fuel Tank Installation in this chapter).
● Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

● Fit the fuel hose joint #2 [A] onto the pipe (for delivery joint) until the joint clicks [B].
○Insert the hose joint #2 straight along the pipe.
Front [C]



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Fuel Injectors (#1, #2: Service Code 41, 42)

● Push and pull [A] the fuel hose joint #2 [B] back and forth more than two times and make sure it is locked and doesn't come off. When the fuel hose joint #2 is correctly installed, it should slide on the delivery pipe about 5 mm (0.2 in.).



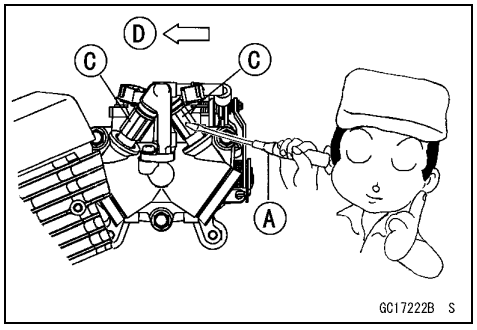
⚠ WARNING

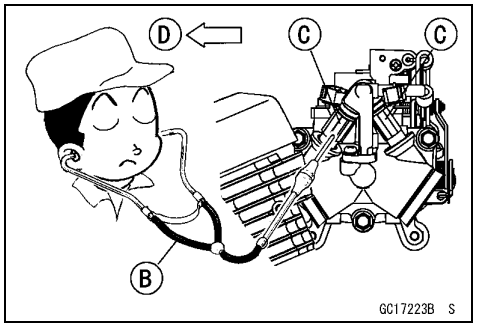
Make sure the fuel hose joint is installed correctly on the delivery pipe by sliding the joint, or the fuel could leak.

● Install the fuel tank (see Fuel Tank Installation in this chapter) and connect the battery (–) terminal.

Audible Inspection

● Remove the left air cleaner housing (see Left Air Cleaner Housing Removal in this chapter).
● Start the engine.
● Apply the tip of a screwdriver [A] to the injector [C]. Put the grip end onto your ear, and listen whether the injector is clicking or not.
○A sound scope [B] can also be used.
● Do the same for the other injector.
Front [D]
★If all the injectors click at a regular intervals, the injectors are good. The trouble may be related to the fuel line, requiring fuel pressure inspection (see Fuel Pressure Inspection in this chapter).
○The click interval becomes shorter as the engine speed rises.
★If either injector doesn't click, the DFI circuit or the injector is suspect. Perform "Power Source Voltage Inspection", first.





Power Source Voltage Inspection

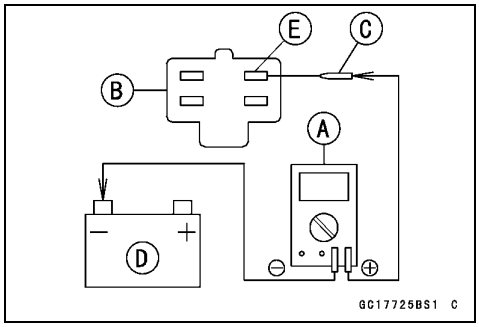
NOTE

○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.
● Remove the reserve tank (see Coolant Change in the Periodic Maintenance chapter).
● Connect a digital meter [A] to the DFI main relay connector [B], using the needle adapter [C].
Battery [D] in the frame

Special Tool - Needle Adapter Set: 57001-1457

Injector Power Source Voltage at DFI Main Relay Connections
Meter (+) → W/R Lead Terminal [E]
Meter (–) → Battery (–) Terminal



● Measure the power source voltage of the injector with the engine stopped, and with the connectors joined.
● Turn the ignition switch ON.

Power Source Voltage at DFI Main Relay
Standard: Battery Voltage (12.5 V or more)

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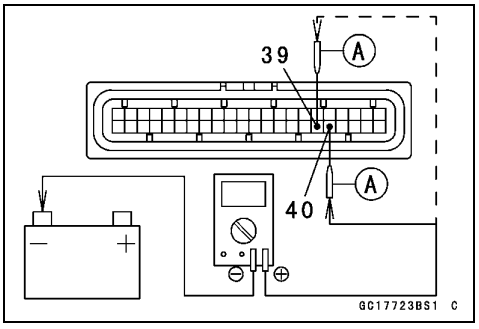
Fuel Injectors (#1, #2: Service Code 41, 42)

★If the power source voltage is incorrect, check the DFI power source (see DFI Main Relay Inspection in this chapter).
★If the DFI power source is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).
★If the ground and power supply of the ECU are good, the ECU is suspect. Replace the ECU.
★If the power source voltage is normal, check the output voltage of the injector.

Output Voltage Inspection

● Remove the ECU (see ECU Removal in this chapter).
○Do not disconnect the ECU connector.
● Measure the output voltage of the injector at the ECU connector in the same way as power source voltage inspection.
Needle Adapter [A]

Special Tool - Needle Adapter Set: 57001-1457



Injector Output Voltage at ECU
Connections for Injector #1
Meter (+) → BL/R lead (terminal 40)
Meter (–) → Battery (–) Terminal
Connections for Injector #2
Meter (+) → BL/G lead (terminal 39)
Meter (–) → Battery (–) Terminal

Output Voltage at ECU
Standard: Battery Voltage (12.5 V or more)

★If the output voltage is normal, perform “Injector Signal Test”.
★If the output voltage is out of the standard, turn the ignition switch OFF, remove the fuel tank, and check the injector wiring for continuity.

Injector Wiring Inspection

ECU Connector		Injector Connectors
Terminal 30	→	Injector #1 Terminal (W/R)
Terminal 30	→	Injector #2 Terminal (W/R)
Terminal 40	→	Injector #1 Terminal (BL/R)
Terminal 39	→	Injector #2 Terminal (BL/G)

★If the wiring is good, inspect the resistance of the injectors (see Injector Resistance Inspection in this section).
● Remove the needle adapter.
● Apply silicone sealant to the seals of the ECU connector for waterproofing.

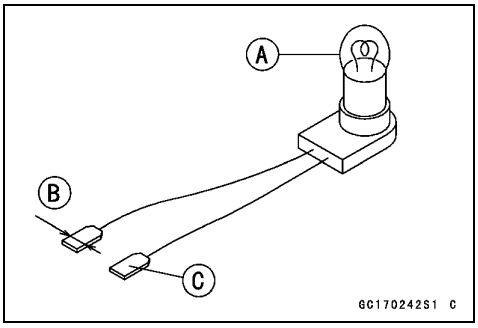
Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connectors

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Fuel Injectors (#1, #2: Service Code 41, 42)

Injector Signal Test

- Prepare two test light sets with male terminals as shown.
  Rating of Bulb [A]: 12 V × 3 ~ 3.4 W
  Terminal Width [B]: 1.8 mm (0.07 in.)
  Terminal Thickness [C]: 0.8 mm (0.03 in.)

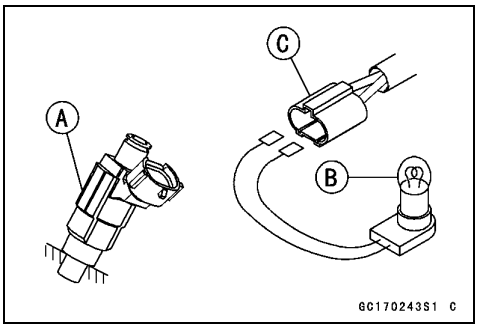


CAUTION

Do not use larger terminals than specified above. A larger terminal could damage the injector main harness connector (female), leading to harness repair or replacement.
Be sure to connect bulbs in series. The bulb works as a current limiter to protect the solenoid in the injector from excessive current.

- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Plug the fuel hose ends.
- Remove connectors for injector [A].
- Connect each test light set [B] to the injector main harness connector [C].
- Connect the battery (–) lead terminal.
- While cranking the engine with the starter motor, watch the test lights.

★If the test lights flicker at regular intervals, the injector circuit in the ECU, and the wiring are good. Perform the "Injector Resistance Inspection".



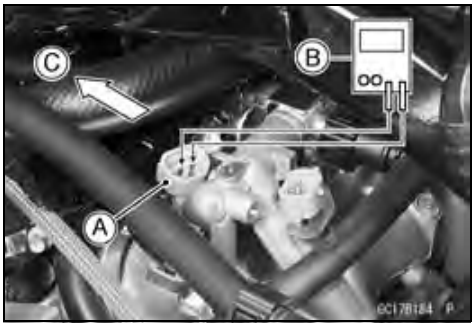
○Injector signals can be also confirmed by connecting the hand tester (× 10 V AC) instead of the test light set to the injector main harness (female) connector. Crank the engine with the starter motor, and check to see if the needle oscillates at regular intervals.

Special Tool - Hand Tester: 57001-1394

★If the test light doesn't flicker (or the tester needle doesn't oscillates), check the wiring and connectors again. If the wiring is good, the ECU is suspect. Replace the ECU.

Injector Resistance Inspection

- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Disconnect the connector from the injector [A] (see Injector Removal in this chapter).
- Measure the injector resistance with a digital meter [B].
  Front [C]



Injector Resistance

Connections to Injector		
Meter (+)		**Meter (–)**
#1: W/R	←→	**BL/R Terminal**
#2: W/R	←→	**BL/G Terminal**

Standard: 11.7 ~ 12.3 Ω at 20°C (68°F)

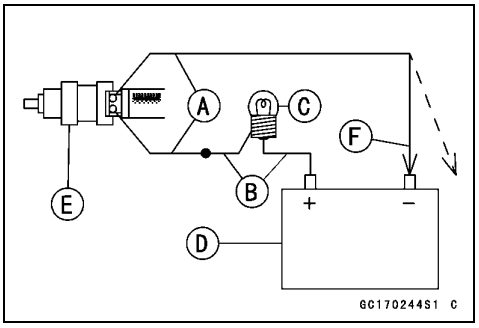
★If the reading is out of the range, perform the "Injector Unit Test".

★If the reading is normal, perform the "Injector Unit Test" for confirmation.

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Fuel Injectors (#1, #2: Service Code 41, 42)

Injector Unit Test



- Use two wires [A] and the same test light set [B] as in "Injector Signal Test".
  Rating of Bulb [C]: 12 V × (3 ~ 3.4) W
  12 V Sealed Battery [D]

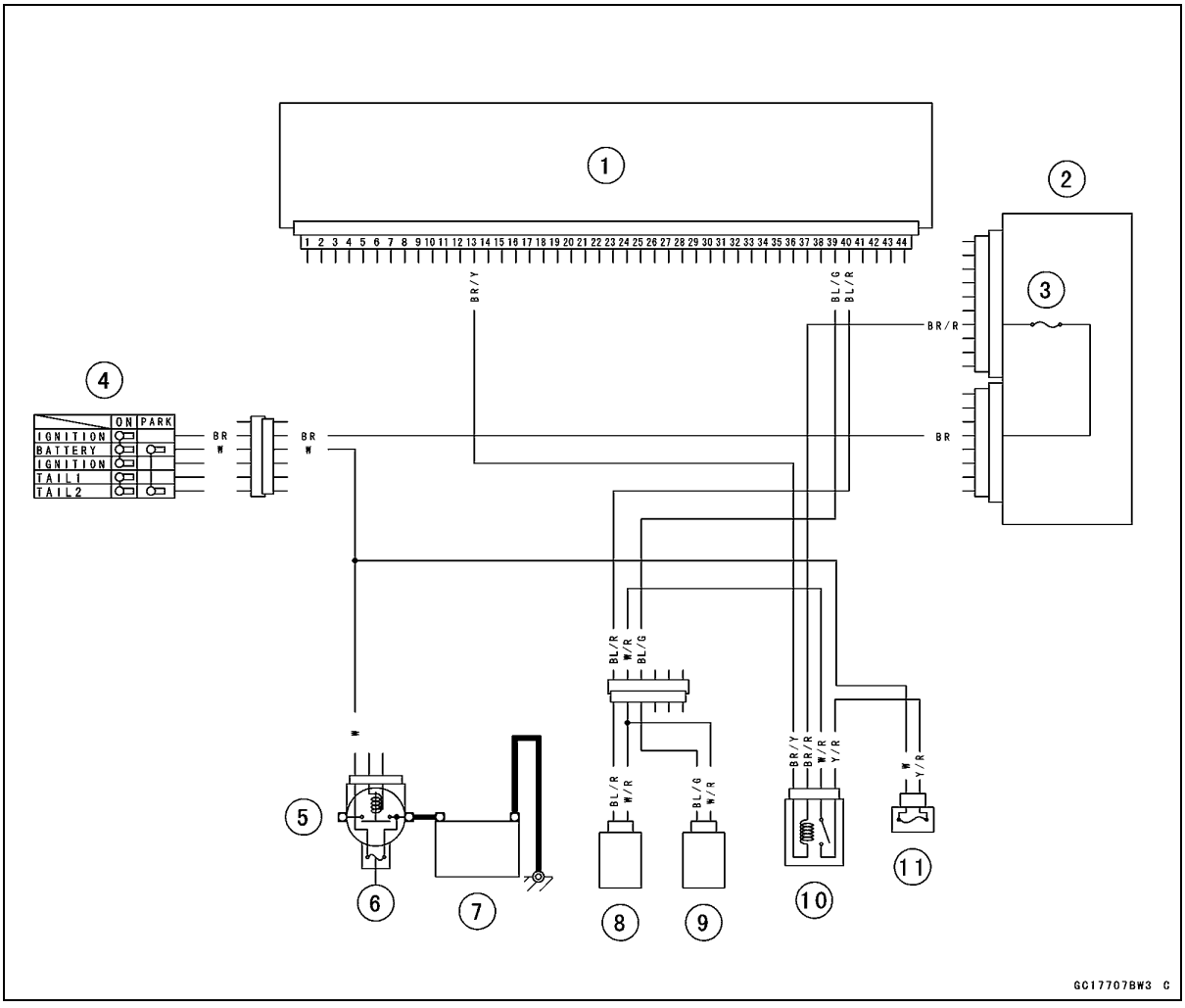
CAUTION

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

- Connect the test light set to the injector [E] as shown.
- Open and connect [F] the end of the wire to the battery (–) terminal repeatedly. The injector should click.

★If the injector does not click, replace the injector.

★If the injector clicks, check the wiring again. If the wiring is good, replace the injector (may be clogged) or ECU.



1. ECU
2. Junction Box
3. Ignition Fuse 10 A
4. Ignition Switch
5. Stater Relay
6. Main Fuse 30 A
7. Battery
8. Fuel Injector #1
9. Fuel Injector #2
10. DFI Main Relay
11. DFI Fuse 15 A

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Fuel Pump (Service Code 45)

Fuel Pump Removal

CAUTION

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

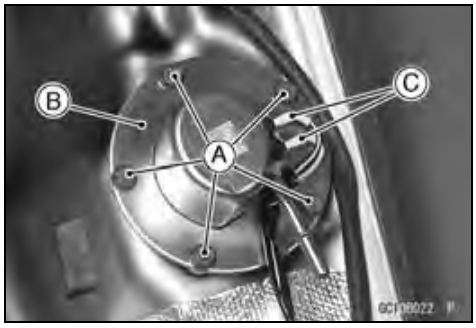
⚠ WARNING

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

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

○Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump. Plug the fuel pipe of the fuel tank.

- Turn the fuel tank upside down.
- Remove the fuel pump inlet hose.
- Unscrew the fuel pump bolts [A], and take out the fuel pump [B] and gasket.
- Discard the fuel pump gasket.

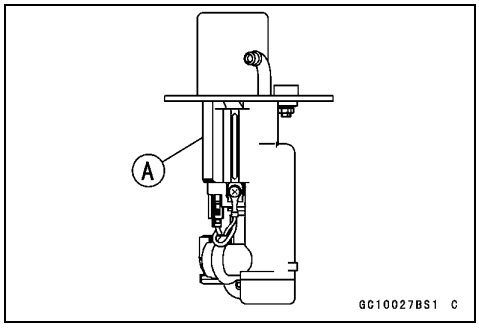


CAUTION

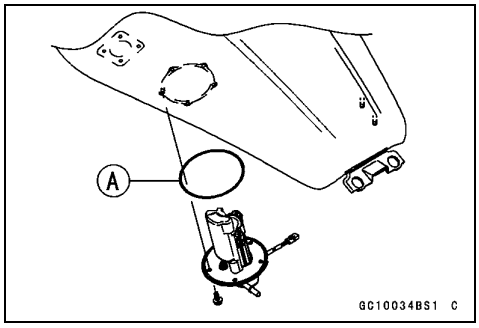
Do not pull the leads [C] of the fuel pump. If they are pulled, the lead terminals may be damaged.

Fuel Pump Installation

- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.

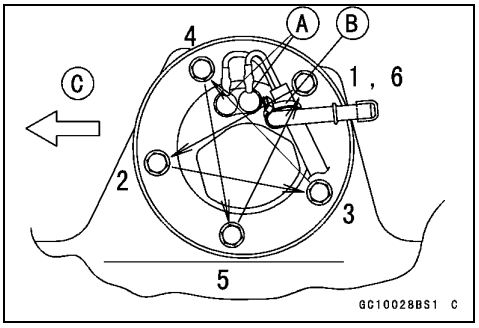


- Replace the fuel pump gasket [A] with a new one.



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Fuel Pump (Service Code 45)



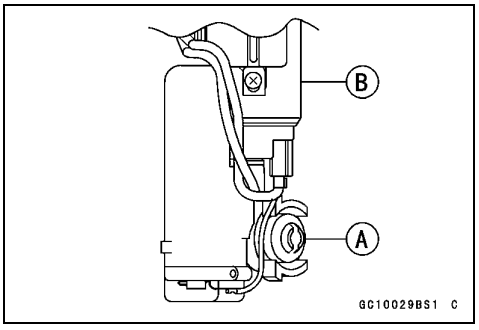
- Check that the fuel pump (–) terminals [A] and band [B] are in place.
  Front [C]
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts to a snug fit, following the tightening sequence shown.
- Following the tightening sequence, tighten the pump bolts to the specified torque.

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

- Tighten the pump bolts again to check the tightness in the order shown.

Pressure Regulator Removal

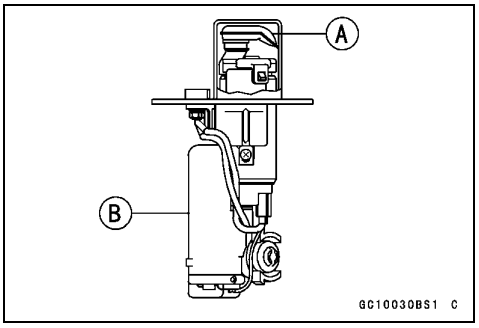
○The pressure regulator [A] is built into the fuel pump [B] and cannot be removed.



Pump Screen, Fuel Filter Cleaning

○The pump screen [A] and fuel filter [B] are built into the pump and cannot be cleaned or checked.

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



Operation Inspection

NOTE

○*Be sure the battery is fully charged.*

○*Just listen to the pump sound in the fuel tank to confirm pump operation.*

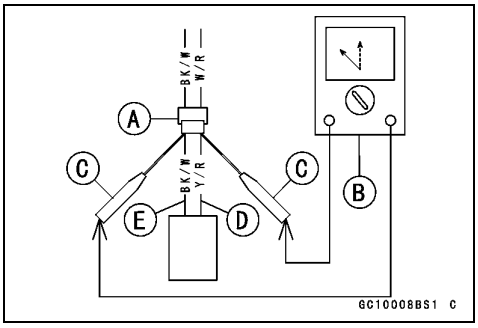
- Turn the ignition switch ON and make sure that the fuel pump operates (make light sounds) for 3 seconds, and then stops.
- Turn the ignition switch OFF.

★If the pump does not work as described above, inspect the power source voltage.

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Fuel Pump (Service Code 45)

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).
- Connect the hand tester (25 V DC) [B] to the fuel pump connector [A] with two needle adapters [C].

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457

Pump Operating Voltage at Pump Connections to Pump Connectors
Tester (+) → Y/R Lead [D]
Tester (–) → BK/W Lead [E]

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

○The tester needle should indicate battery voltage for 3 seconds, and then 0 V.

Operating Voltage at Pump Connector
Standard: Battery Voltage (12.6 V or more) for 3 seconds, and then 0 V.

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

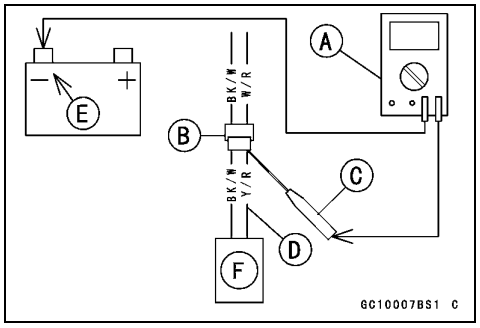
- After inspection, remove the needle adapter, and apply silicone sealant to the seal of the connector for water-proofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of Fuel Pump Connector

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Fuel Pump (Service Code 45)

Power Source Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Connect a digital meter [A] to the fuel pump connector [B] (2-pin), using the needle adapter [C].

Special Tool - Needle Adapter Set: 57001-1457

Pump Power Source Voltage
Connections to Pump Connector
Tester (+) → Y/R lead [D]
Tester (–) → Battery (–) Terminal [E]

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

Power Source Voltage at Pump Connector
Standard: Battery Voltage (12.5 V or more)

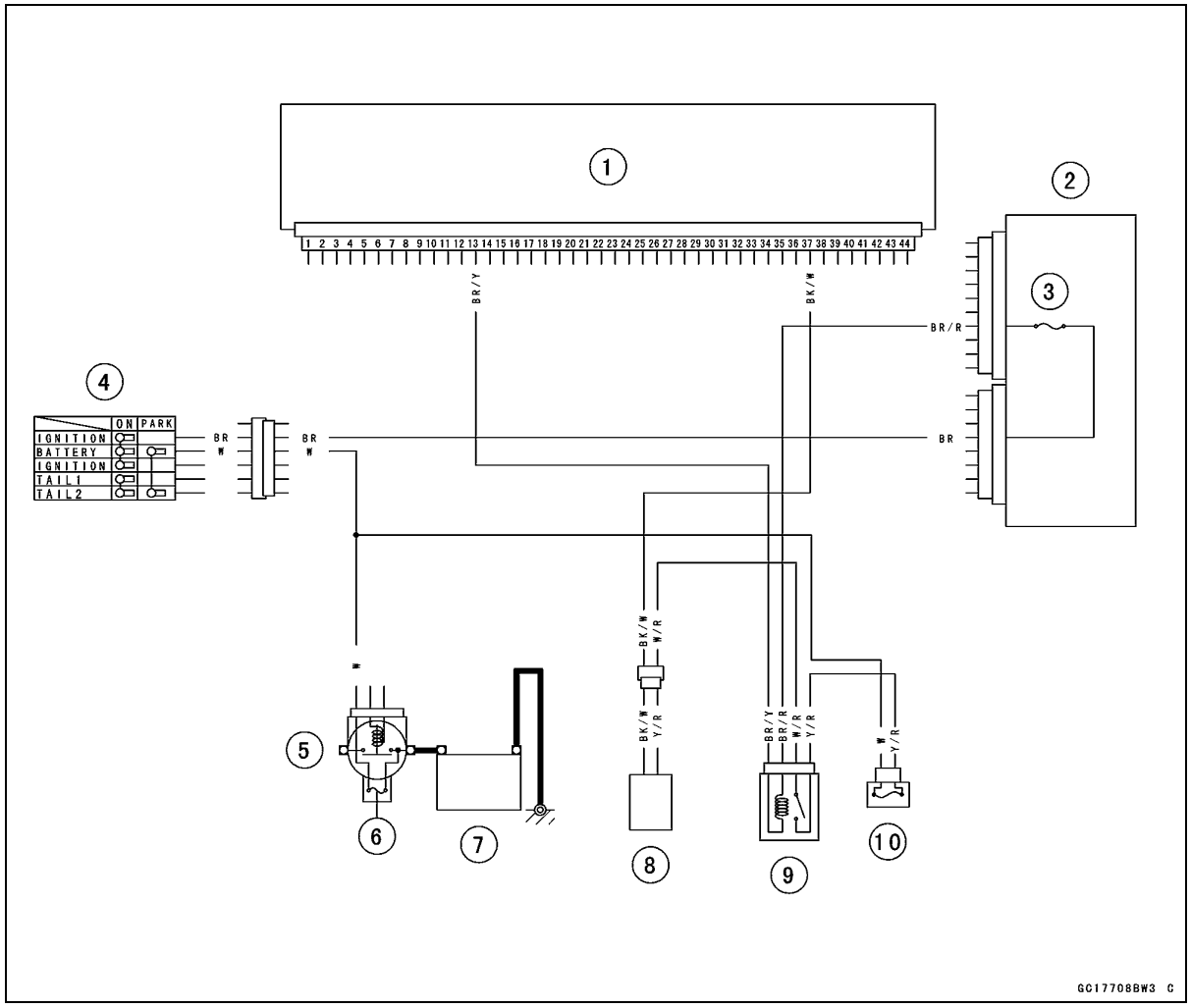
Fuel Pump [F]

★If the reading is good, the power source voltage is normal. Inspect operating source voltage (see Operating Voltage Inspection in this chapter).

★If the reading is incorrect, check the following:
Battery
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
DFI Fuse 15 A (see DFI Fuse Inspection this chapter)
Ignition Fuse 10 A in Junction Box (see Fuse Inspection in the Electrical System chapter)
DFI Main Relay (see DFI Main Relay Inspection in this chapter)
Wiring for Fuel Pump Power Source (see next page)
Vehicle-down Sensor (see vehicle-down Sensor Inspection in this chapter)

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Fuel Pump (Service Code 45)



1. ECU
2. Junction Box
3. Ignition Fuse 10 A
4. Ignition Switch
5. Starter Relay
6. Main Fuse 30 A
7. Battery
8. Fuel Pump
9. DFI Main Relay
10. DFI Fuse 15 A

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Ignition Coils (#1, #2: Service Code 51, 52)

Ignition Coil #1: Ignition Coil for Front Cylinder (Service Code 51)
Ignition Coil #2: Ignition Coil for Rear Cylinder (Service Code 52)

Removal/Installation

CAUTION

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

- See Ignition Coil Removal/Installation of the Ignition System section in the Electrical System chapter.

Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal in this chapter).

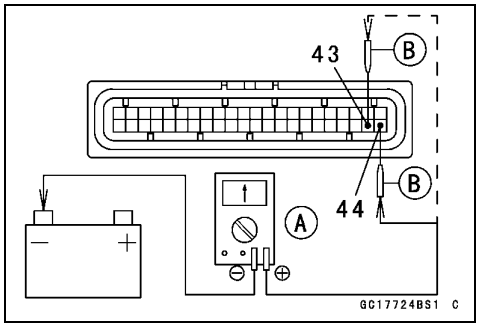
○Do not disconnect the ECU connector.

- Connect a digital meter [A] as shown, using two needle adapters [B].

Special Tool - Needle Adapter Set: 57001-1457

Ignition Coil Input Voltage at ECU
Connections for Ignition Coil #1
Meter (+) → BK lead (terminal 44)
Meter (–) → Battery (–) Terminal

Connections for Ignition Coil #2
Meter (+) → BK/G lead (terminal 43)
Meter (–) → Battery (–) Terminal



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

Input Voltage at ECU
Standard: Battery Voltage (12.5 V or more)

★If the reading is out of the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).

★If the reading is good remove the fuel tank and check the wiring between the ECU and the primary lead terminals at the ignition coils.

★If the wiring is good, crank the engine, and check the peak voltage of the ignition coils (see Ignition Coil Primary Peak Voltage in the Electrical System chapter) in order to check the primary coils.

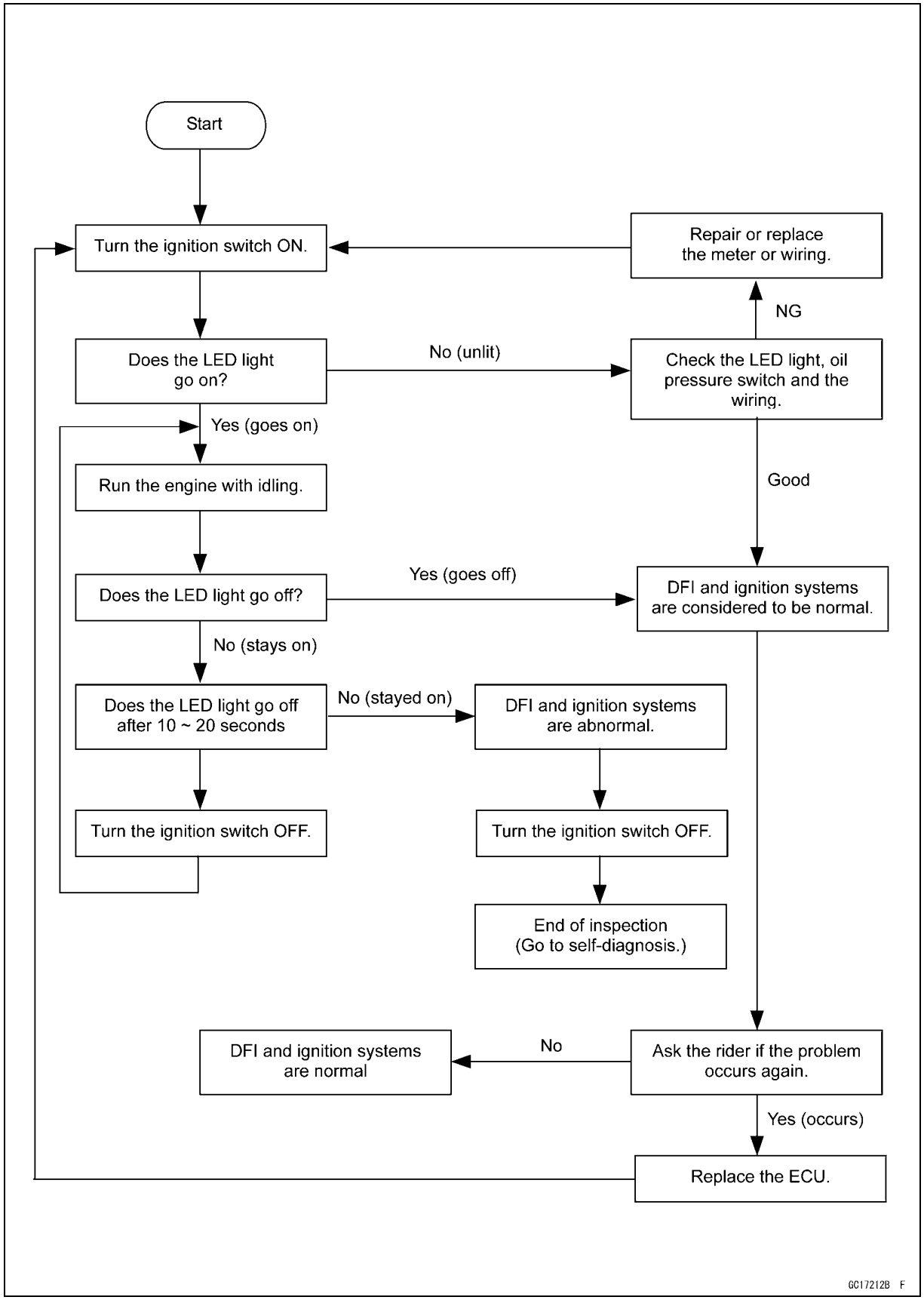
- Remove the needle adapters.
- Apply silicone sealant to the seals of the connector for waterproofing.

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
-Seals of ECU Connector

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FI Indicator LED Light

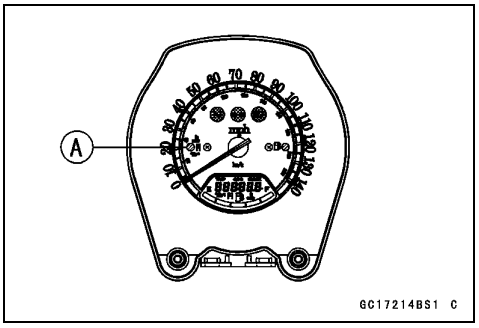
Inspection Flow Chart



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FI Indicator LED Light

The FI indicator LED light [A] goes ON when the ignition switch is turned ON and the LED light goes OFF when the engine oil pressure is high enough (the engine is running). This is to ensure that the FI indicator LED light has not burned out and the DFI system and the ignition system function properly.



LED Light Inspection

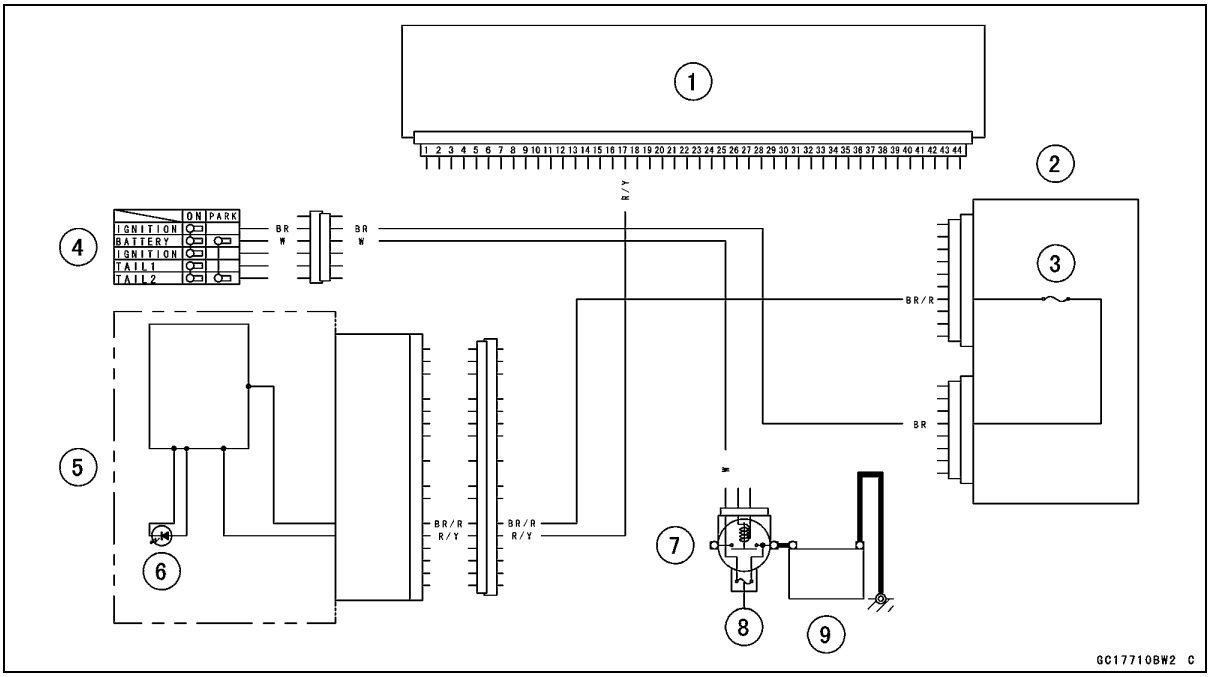
● Refer to the Meter, Gauge section in the Electrical System chapter for LED Light Inspection.

⚠ WARNING

This inspection may produce sparks. Keep the battery and the meter unit away from the fuel tank.

★If the LED light is abnormal, replace the meter unit.

★If the FI indicator LED light is normal, the wiring or ECU has trouble. Check the wiring (see next diagram). If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in this chapter).



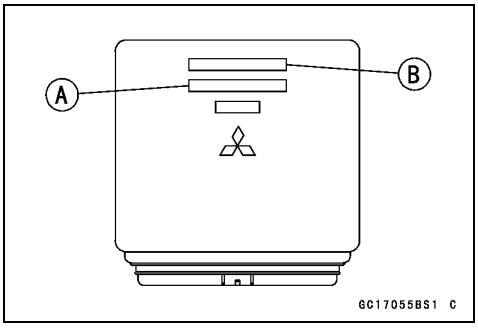
1. ECU
2. Junction Box
3. Ignition Fuse 10 A
4. Ignition Switch
5. Meter Unit
6. FI Indicator LED Light
7. Starter Relay
8. Main Fuse 30 A
9. Battery

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ECU

ECU Identification

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



ECU Identification

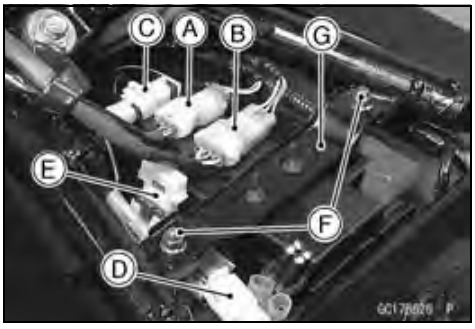
Models	Type [A]	Part No. [B]
CA and US	F8T97373	21175-0048
EUR	F8T37974	21175-0078
AU	F8T97373	21175-0048

AU: Australia Model
CA: Canada Model
EUR: Europe Model
US: United States Model

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 (see Front Seat Removal in the Frame chapter).
- Disconnect:
  Fuel Pump Connector [A]
  Fuel Level Sensor Connector [B]
  Battery (–) Lead Connector [C]
  Rear Turn Signal/Taillight Lead Connector [D]
- Remove:
  DFI Fuse [E]
  Nuts [F]
  Battery Holder [G]



- Pull the ECU [A] out along with the harness.

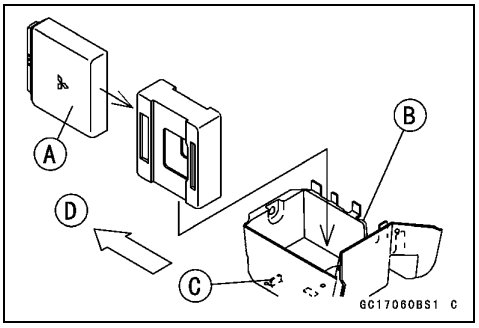
★If necessary, push the lock and disconnect the ECU connectors.

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ECU

ECU Installation

- Connect the ECU connector.
- Fit the ECU [A] in behind the left side rib [C] of the battery case [B] until the ECU bottoms.
  Front [D]



ECU Power Supply Inspection

- Remove the ECU (see ECU Removal in this section).
- Visually inspect the terminals of the ECU connector.

★If the connector is clogged with mud or dust, blow it off with compressed air.

★Replace the main harness if the terminals [A] of the main harness connectors are cracked, bent, or otherwise damaged.

★Replace the ECU if the terminals of the ECU connector are cracked, bent, or otherwise damaged.



- With the ECU connector [A] joined, check the following ground leads for continuity with the ignition switch OFF, using a digital meter [B].
  Battery [C] in the Frame

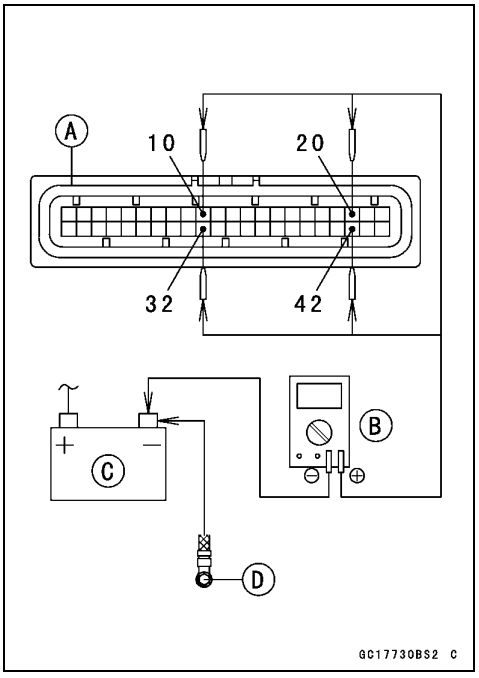
Special Tool - Needle Adapter Set: 57001-1457

ECU Grounding Inspection
Meter Connections:

10, 20, 32, or 42 (BK/Y) Terminal	⟷	**Battery (–) Terminal**
Engine Ground Terminal [D]	⟷	**Battery (–) Terminal**

Readings: 0 Ω

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



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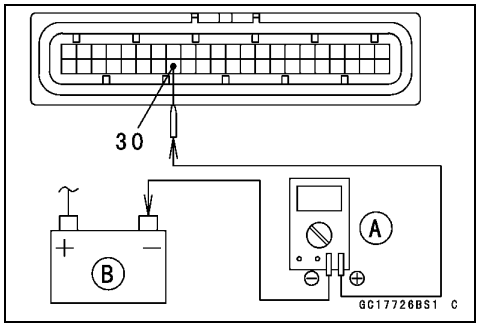
ECU

● Check the power source voltage of the ECU with a digital meter [A].
Battery [B] in the Frame

Special Tool - Needle Adapter Set: 57001-1457

ECU Power Source Inspection

Meter Connection:	**between 30 (W/R) Terminal and Battery (–) Terminal**
Ignition Switch OFF:	**0 V**
Ignition Switch ON:	**Battery Voltage (12.5 V or more)**



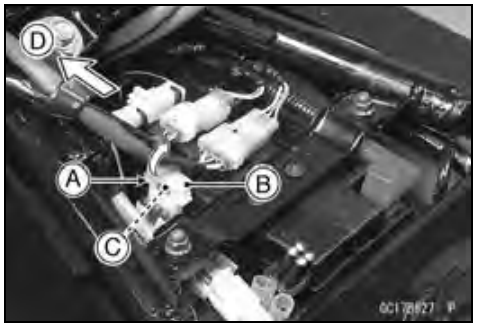
★If the digital meter does not read as specified, check the following:
Power Source Wiring (see wiring diagram of DFI Power Source section in this chapter).
DFI Fuse 15 A (see DFI Fuse Inspection in this chapter)
DFI Main Relay (see DFI Main Relay Inspection)
Ignition Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)

★If the inspection checks good, the ECU is damaged. Replace the ECU. The ECU itself cannot be checked or serviced.

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DFI Power Source

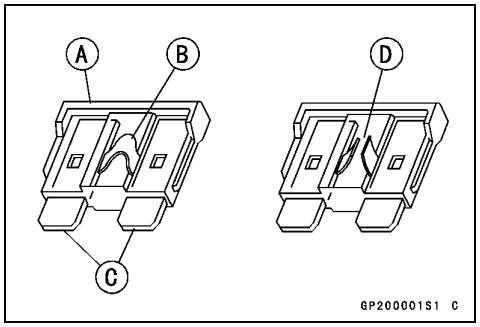
DFI Fuse Removal



- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Pull the lock [A] and open the lid [B].
- Pull out the DFI fuse [C] from the case with needle nose pliers.
  Front [D]

★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.

DFI Fuse Inspection



- Remove the fuse (see DFI Fuse Removal in this section).
- Inspect the fuse element.

★If it is open, 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] and Blown Element [D]
  Terminals [C]

CAUTION

When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Do not use a fuse rated for other than amperage and voltage specified in the Wiring Diagram.

DFI Main Relay Removal

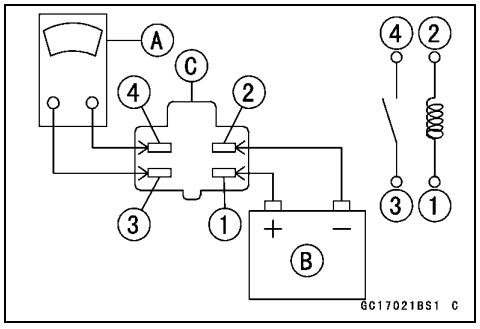
CAUTION

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



- Remove:
  Right Side Cover (see Right Side Cover Removal in the Frame chapter)
  Coolant Reservoir Tank (see Coolant Change in the Periodic Maintenance chapter)
- Remove the DFI main relay [A] and disconnect the connector.
  Front [B]

DFI Main Relay Inspection



- Remove the DFI main relay (see DFI Main Relay Removal in this section).
- Connect the hand tester [A] and one 12 V battery [B] to the relay connector [C] as shown.

Special Tool - Hand Tester: 57001-1394

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

Testing Relay

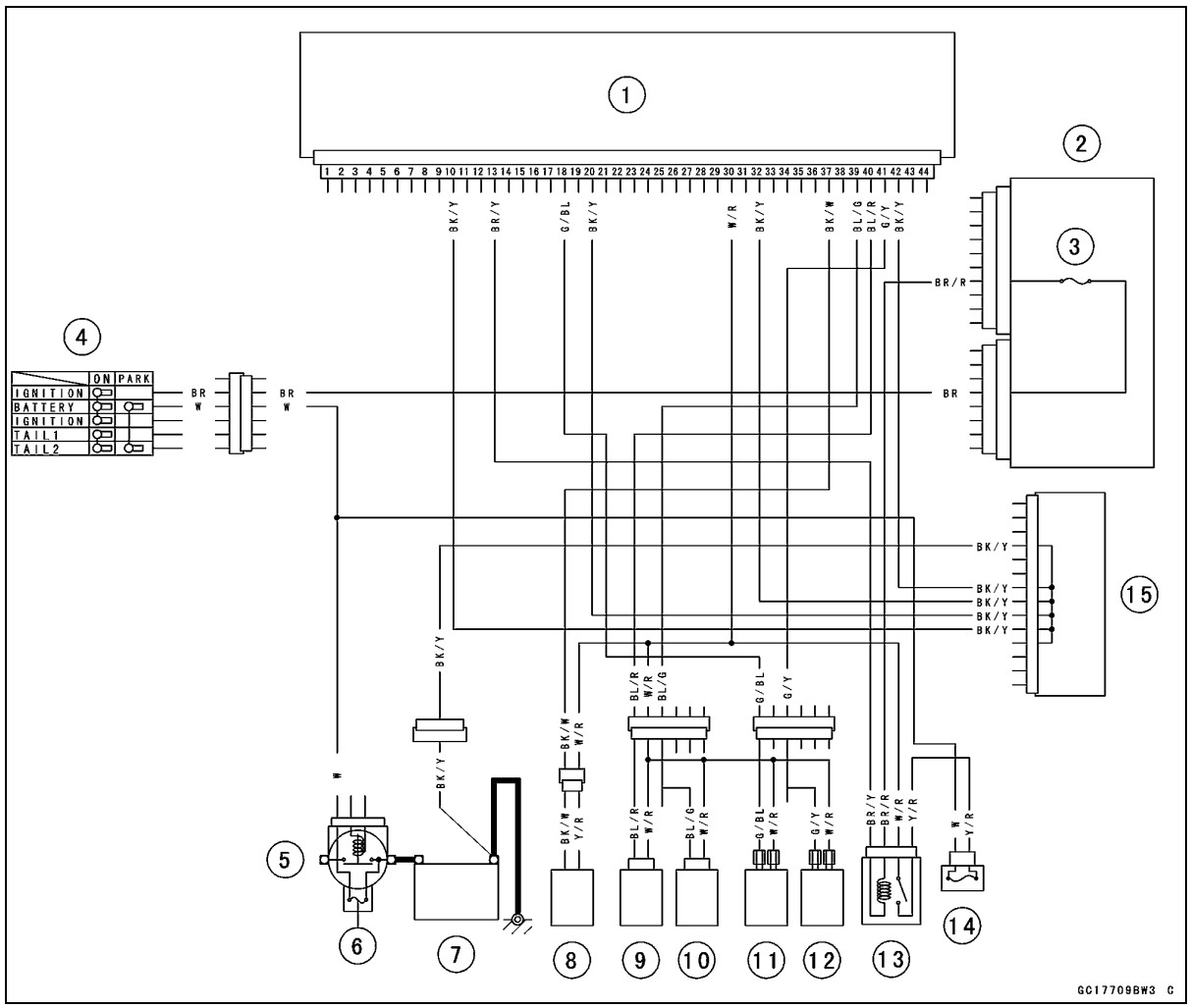
Tester range:	**1 Ω range**
Criteria:	**When battery is connected → 0 Ω**
	When battery is disconnected → ∞ Ω

★If the relay does not work as specified, replace the relay.

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DFI Power Source

DFI Power Source Circuit



1. ECU
2. Junction Box
3. Ignition Fuse 10 A
4. Ignition Switch
5. Starter Relay
6. Main Fuse 30 A
7. Battery
8. Fuel Pump
9. Fuel Injector #1
10. Fuel Injector #2
11. ISC Valves #2
12. ISC Valves #1
13. DFI Main Relay (Actuators: Fuel Pump, Fuel Injectors #1 and #2, ISC Valves #1 and #2)
14. DFI Fuse 15 A
15. Joint Connector 2

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ISC Valves

Removal/Installation

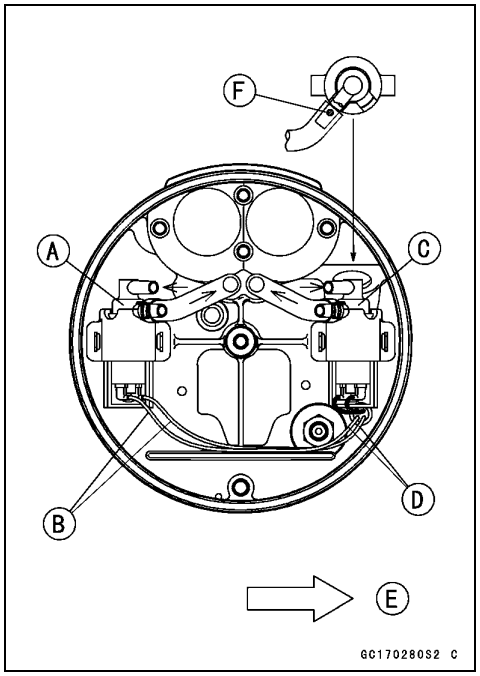
CAUTION

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

○The ISC valves are removed during right air cleaner housing removal (see Right Air Cleaner Housing Removal in this chapter).

○The ISC valve itself is the same for front and rear, but wiring is different. Be careful not to reverse the leads.
ISC Valve #1 [A] → G/Y, W/R leads [B]
ISC Valve #2 [C] → G/BL, W/R leads [D]
Front [E]

● Install the ISC hoses as shown.
ISC Hose #1 with the red paint mark on the top
ISC Hose #2 with the blue paint mark [F] on the top



Power Source Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

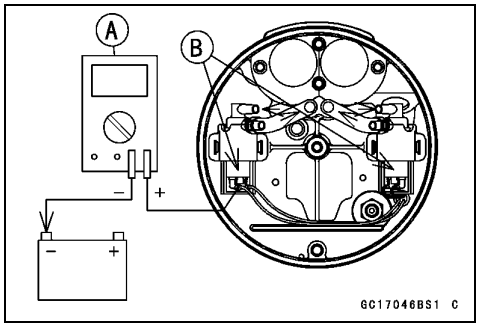
○*The inspection is the same as "Power Source Voltage Inspection" of the fuel pump.*

● Turn the ignition switch OFF.

● Remove the right air cleaner cover (see Right Air Cleaner Housing Removal in this chapter).

● Connect a digital voltmeter [A] to the connectors [B] of each ISC valve.

Power Source Voltage at ISC Valve Connector
Connections to ISC Valve #1, #2
Meter (+) → W/R Lead Terminal
Meter (–) → Battery (–) Terminal



● Measure the power source voltage with the engine stopped, and with the connectors joined.

● Turn the ignition switch ON.

Power Source Voltage at ISC Valve Connector
Standard: Battery Voltage (12.5 V or more)

● Turn the ignition switch OFF.

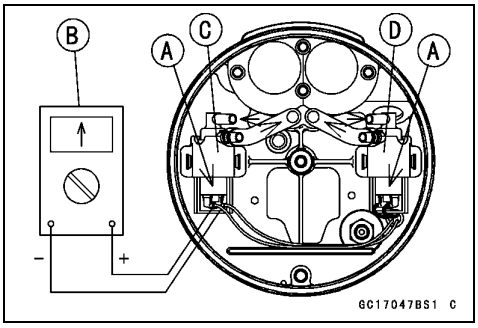
★If there is no battery voltage, check the DFI power source circuit (see DFI Power Source Circuit in the DFI Power Source section).

★If the reading is normal, the power supply voltage is normal. Check the output voltage.

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ISC Valves

Output Voltage Inspection



- Check the output voltage at the connectors [A] of the ISC Valves.
- Remove the right air cleaner cover (see Right Air Cleaner Housing Removal this chapter).

Special Tool - Hand Tester [B] : 57001-1394

Output Voltage of ISC Valves
Connections for ISC Valve #1 [C]
Tester (+) → W/R lead
Tester (–) → G/Y lead

Connections for ISC Valve #2 [D]
Tester (+) → W/R lead
Tester (–) → G/BL lead

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

Output Voltage at ISC Valve
Reading: The needle points battery voltage (12.5 V or more) and 11 seconds later 0 V.

★If the reading is incorrect, check the resistance of the ISC valve (see Resistance Inspection in this chapter).
★If the reading of the resistance is normal, check the wiring for continuity (see next page).
★If the wiring is normal, check the ECU for its ground, and power supply (see ECU Power Supply Inspection in this chapter).

Resistance Inspection

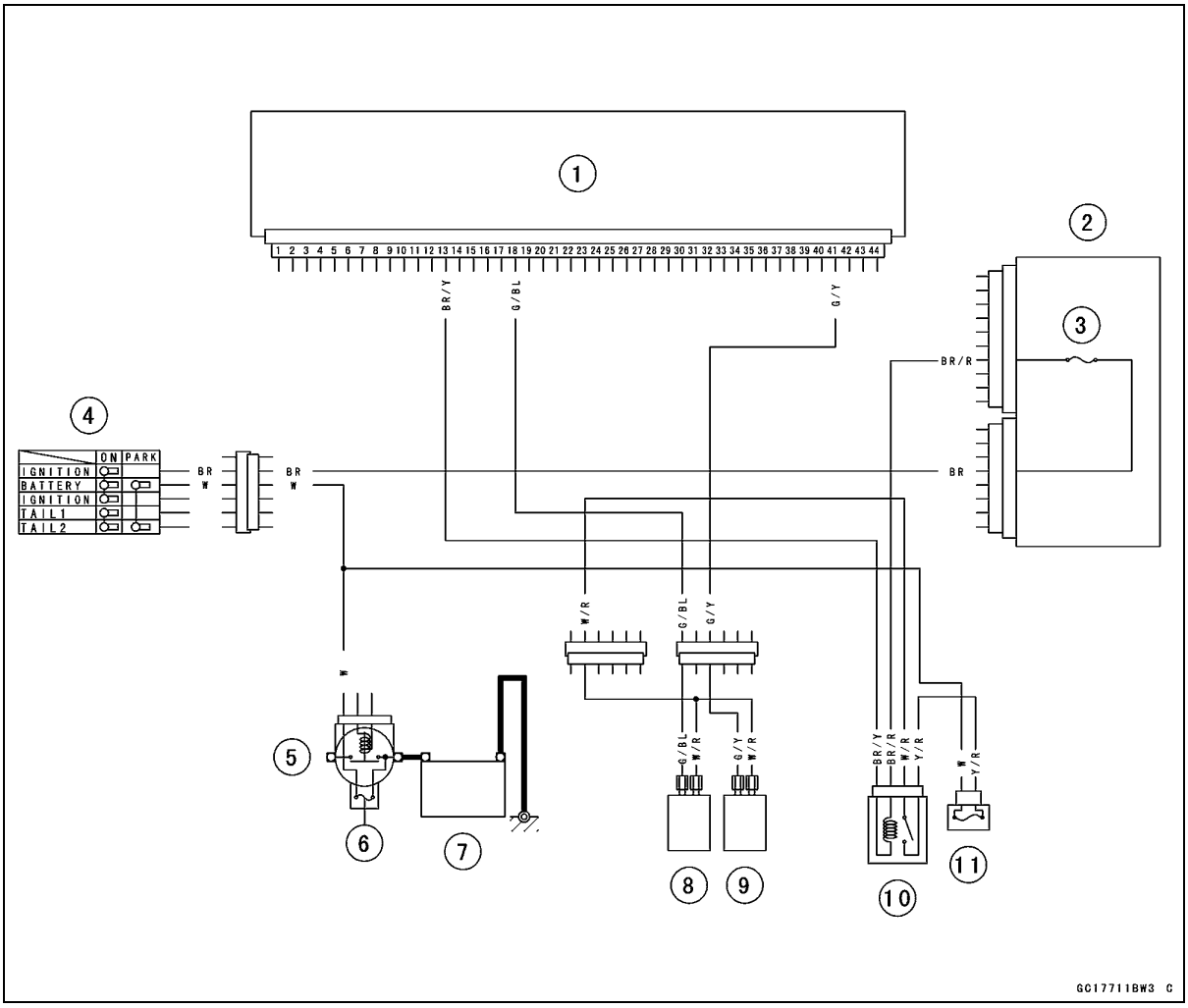
- Disconnect the connectors from the ISC valve.
- Measure the resistance between the terminals of the ISC valve with a digital meter.

ISC Valve Solenoid Resistance (#1, #2)
Standard: 13.6 ~ 20.4 Ω

★If the reading is out of the standard range, replace the ISC valve.

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ISC Valves

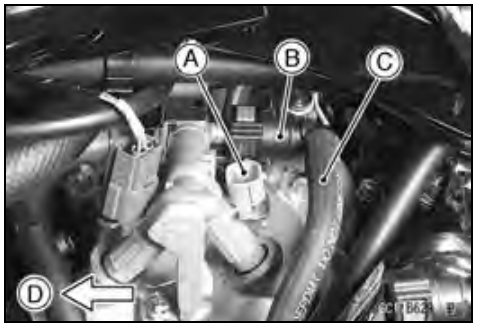


1. ECU
2. Junction Box
3. Ignition Fuse 10 A
4. Ignition Switch
5. Starter Relay
6. Main Fuse 30 A
7. Battery
8. ISC Valve #2
9. ISC Valve #1
10. DFI Main Relay
11. DFI Fuse 15 A

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Fuel Line

Fuel Pressure Inspection



NOTE

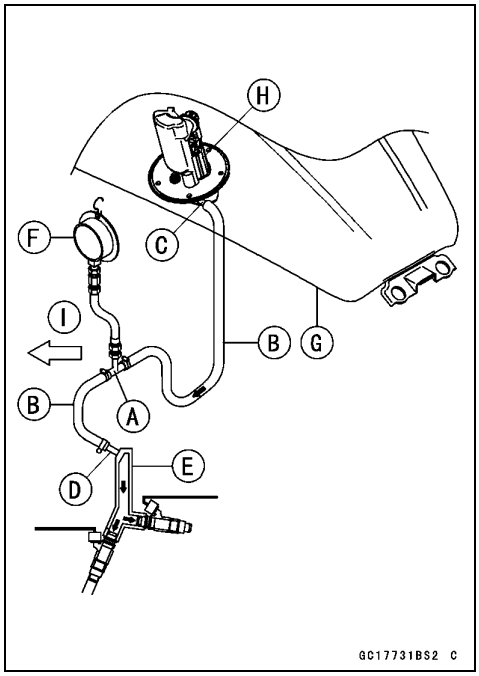
○*This inspection can determine which trouble the DFI system has, mechanical or electrical trouble.*
○*It is preferable to measure the fuel pressure while running the motorcycle when the trouble has occurred in order to know symptom well.*
○*Be sure the battery is fully charged.*

- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Disconnect the #2 fuel injector connector [A].
- Pinch the lock of the fuel hose joint #2 with fingers, disconnect the joint [B] and take out the fuel hose assy [C].

Front [D]

⚠ WARNING

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



- Install the fuel pressure gauge adapter [A] (special tool) and Fuel Hoses [B] (special tool) between the fuel tank outlet pipe [C] and the inlet pipe [D] to the delivery joint [E].

○Put the fuel pressure gauge adapter outside the frame.

- Connect the pressure gauge [F] (special tool) to the fuel pressure gauge adapter.

Fuel Tank [G]
Fuel Pump [H]
Front [I]
→: Fuel Flow

Special Tools - Fuel Pressure Gauge Adapter: 57001-1593
Fuel Hoses: 57001-1607
Oil Pressure Gauge: 57001-125

- Connect the #2 fuel injector connector.
- Temporarily, install the fuel tank.
- Connect:

Fuel Pump Connector (2-pin)
Battery Lead (–) Terminal

⚠ WARNING

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

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Fuel Line

- Turn the ignition switch ON. The fuel pump will turn for 3 seconds, and then stop.
- Measure the fuel pressure with the engine stopped.

Fuel Pressure
right after Ignition Switch ON, with pump running:
Standard: 304 kPa (3.1 kgf/cm², 44 psi)
after 3 seconds from Ignition Switch ON, with pump stopped:
Standard: 280 kPa (2.9 kgf/cm², 41 psi, residual fuel pressure)
The system should hold the residual pressure about 30 seconds.

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

Fuel Pressure (idling)
Standard: 304 kPa (3.1 kgf/cm², 44 psi)

NOTE

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

★If the fuel pressure is normal, the fuel circulation system (fuel pump, pressure regulator, and oil passage) is no faults. Check the DFI electronic control system (injectors, sensors, crankshaft sensors, and ECU).

★If the fuel pressure is much higher than the specified, check the following:
Delivery Pipe Clogging
Injector Clogging

★If the fuel pressure is much lower than specified, check the following:
Fuel Pump for Operation (Check the sound of the pump.)
Fuel Line Leakage or Clogging
Amount of Fuel Flow (see Fuel Flow Rate Inspection in this section)

★If the fuel pressure is much lower than specified, and if inspection above checks out good, replace the fuel pump assy (the fuel filter may be clogged) and measure the fuel pressure again.

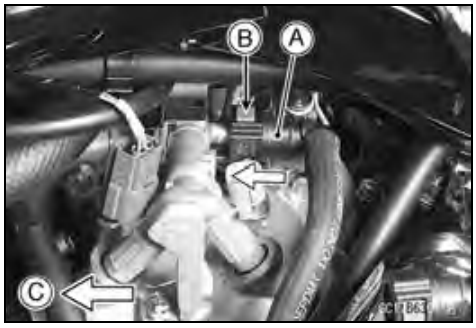
★If the residual pressure 260 ~ 280 kPa drops at once, the high pressure fuel line could be leaking.

- Remove the fuel pressure gauge and adapter.
- Run the fuel hoses in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter

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Fuel Line

● Fit the fuel hose joint #2 [A] onto the pipe (for delivery joint) until the joint clicks [B].
○Insert the hose joint straight along the pipe.
Front [C]



● Push and pull [A] the fuel hose joint #2 [B] back and forth more than two times and make sure it is locked and doesn't come off. When the fuel hose joint #2 is correctly installed, it should slide on the delivery pipe about 5 mm (0.2 in.).



⚠ WARNING

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

Fuel Flow Rate Inspection

NOTE

○*Be sure the battery is fully charged.*

⚠ WARNING

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



● Turn both ignition switch, and engine stop switch OFF.
● Wait until the engine cools down.
● Open the fuel tank cap [A] to lower the pressure in the tank.
Front [B]

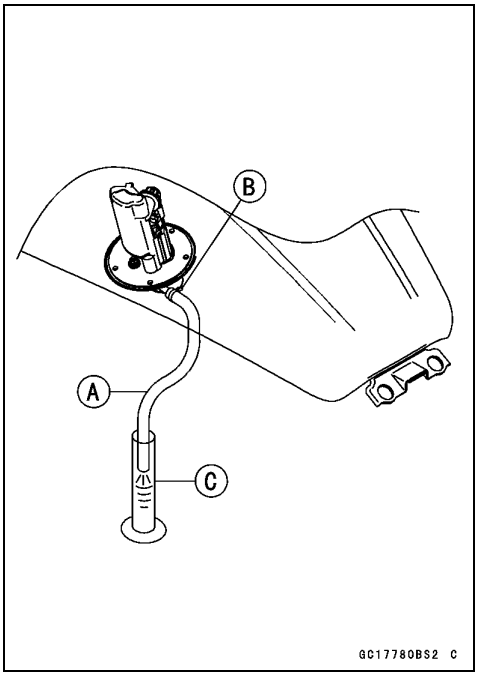
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Fuel Line

- Prepare a plastic hose of the inside diameter 7.5 mm (0.30 in.) × L = about 400 mm (15.7 in.) and a measuring cylinder.
- Remove:
  Front Seat (see Front Seat Removal in the Frame chapter)
  Meter Cover (see Fuel Tank Removal in this chapter).
  Fuel Tank Bolts
- Raise the fuel tank.
- Stuff a clean shop towel around the fuel outlet hose joint.

○While pinching the locks of the hose joint #1 with fingers, disconnect the joint (see Fuel Tank Removal in this chapter) and insert the plastic hose [A] quickly onto the tank outlet pipe.

- Secure the plastic hose with a clamp [B].
- Run the other side of the plastic hose into the measuring cylinder [C].
- Temporarily install the fuel tank and close the fuel tank cap.



⚠ WARNING

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

- With the engine stopped, turn the ignition switch ON. The fuel pump should operate for 3 seconds, and then should stop. Repeat this several times until the plastic hose is filled with fuel.
- Measure the discharge for 3 seconds with the plastic hose filled with fuel.

Amount of Fuel Flow
Standard: 67 mL (2.27 US oz) or more for 3 seconds

★If the fuel flow is much less than the specified, check the battery condition (see Charging Condition Inspection in the Electrical System chapter). If the battery is good, replace the fuel pump.

- After inspection, connect the fuel hoses, and install the fuel tank (see Fuel Tank Installation in this chapter).
- Start the engine and check for no fuel leakage.

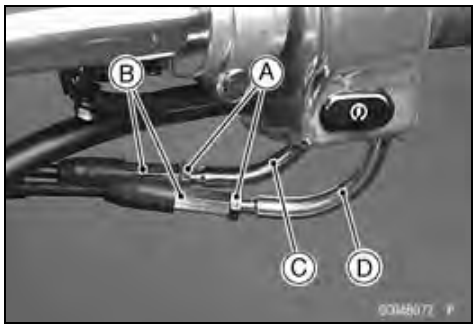
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Throttle Grip and Cables

Throttle Grip Free Play Inspection

- Refer to the Throttle Control System Check in the Periodic Maintenance Chapter.

Throttle Grip Free Play Adjustment



- Loosen the locknuts [A] and screw the adjusters [B] all the way in so as to give the throttle grip plenty of play.
- Turn out the adjuster of the decelerator cable [C] until there is no play.
- Tighten the locknut against the adjuster.
- Turn the adjuster of the accelerator cable [D] until the proper amount of throttle grip free play is obtained and tighten the locknut against the adjuster.

⚠ WARNING

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

Choke Knob Operation

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

Choke Cable Free Play Inspection

○Choke cable free play cannot be adjusted.

- Check that the choke inner cable slides smoothly by pulling and pushing the choke knob lightly.

★If there is any irregularity, or the choke lever doesn't work when the choke knob is pulled fully, replace the choke cable.

Cable Removal/Installation

○See Throttle Body Assy section in this chapter for removal/installation of the throttle cables and choke cable.

Cable Lubrication and Inspection

- Whenever the choke cable or the throttle cables are removed or in accordance with the Periodic Maintenance Chart, lubricate the these cables. Refer to the General Lubrication in the Periodic Maintenance Chapter.

○Use a commercially available pressure cable lubricator to lubricate these cables.

○With the cable disconnected at both ends, the cable should move freely in the cable housing.

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Throttle Body Assy

Idle Speed Check

● Refer to the Idle Speed Inspection in the Periodic Maintenance Chapter.

Idle Speed Adjustment

● Refer to the Idle Speed Adjustment in the Periodic Maintenance Chapter.

High Altitude Performance Adjustment

○Any modification is not necessary in this model since the atmospheric pressure sensor senses pressure change due to high altitude and the ECU compensates the change.

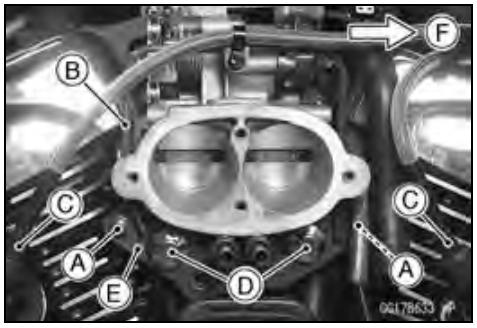
Throttle Body Assy Removal

● Remove the fuel tank (see Fuel Tank Removal in this chapter).

⚠ WARNING

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

● Remove:
Thermostat Housing (see Thermostat Removal in the Cooling System chapter)
Left Air Cleaner Base (see Left Air Cleaner Housing Removal/Installation in this chapter)
Right Air Cleaner Base (see Right Air Cleaner Housing Removal in this chapter)
Spark Plug Lead Holder Bolts [A]
Spark Plug Lead Holder [B] and Spark Plug Caps [C]
Throttle Body Assy Holder Bolts [D]
Throttle Body Assy Holder [E]
Front [F]



● Disconnect:
Throttle Sensor Connector [A]
Vacuum Hose [B] (From Inlet Air Pressure Sensor)
Vacuum Hose [C] (Between Vacuum Switch Valve and Throttle Body Assy)



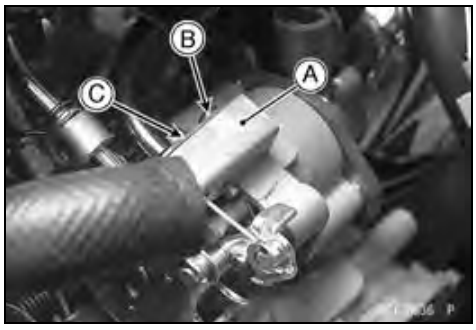
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Throttle Body Assy

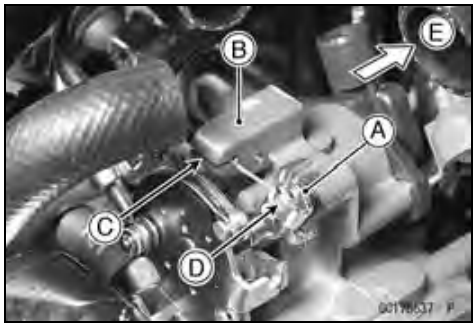
- Disconnect the front and rear injector connectors [A].
  Front [B]



- Remove the following from the choke cable holder [A].
  Screw [B]
  Choke Cable Plate [C]



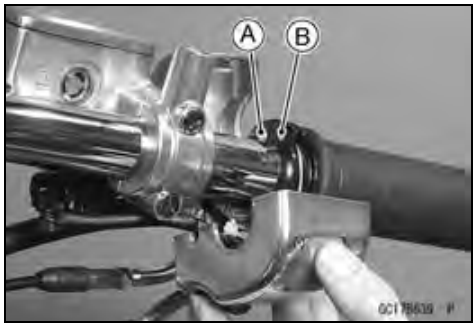
- While pushing the choke lever [A] forward, remove the cable housing from the choke cable holder [B] and the inner cable out of the holder slit [C].
- Take off the lower end [D] from the choke lever.
  Front [E]



- Remove the screws [A] and take off the right switch housing [B].



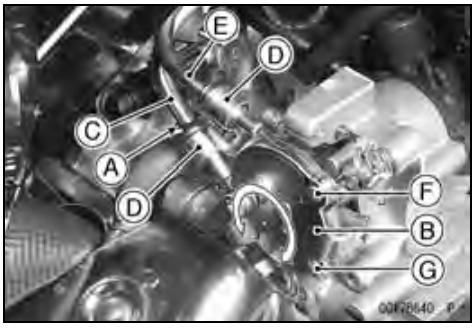
- Remove the accelerator cable end [A] and decelerator cable end [B] at the throttle grip.



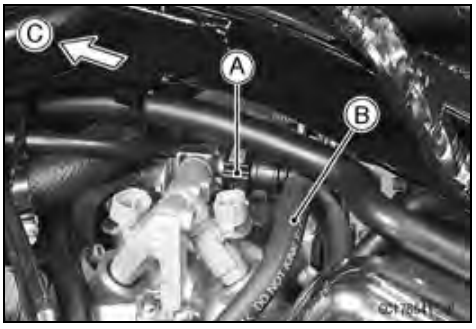
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Throttle Body Assy

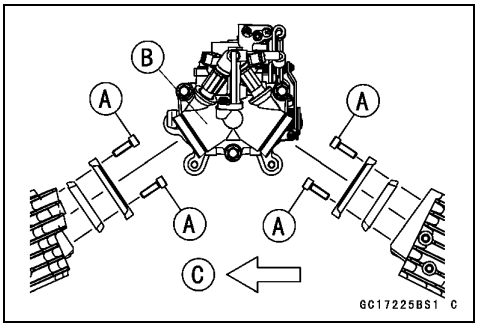
- Remove the cable clip [A].
- Turn the throttle pulley [B] as shown, and pull out the accelerator cable housing [C] from the cable holder [D].
- Return the pulley, and pull out the decelerator cable housing [E] from the cable holder.
- Remove the decelerator cable end [F] and the accelerator cable end [G] from the throttle pulley [B].



- Pinch the lock of the fuel hose joint #2 [A] with fingers, pull the joint #2 out along the pipe (for delivery joint), and take out the fuel hose assy [B].
  Front [C]



- Unscrew the inlet manifold bolts [A].
  Inlet Manifold [B]
  Front [C]



- Take out the throttle body assy [A] from the right side, while tilting it up.

○Be careful not to damage (dent, nick, flaw, and crack) the flange mating surface and the plastic parts.

○Do not drop the throttle body assy, especially on a hard surface.



⚠ WARNING

The throttle body assy should never be allowed to fall. Throttle may become stuck, possibly causing an accident.

- Stuff a piece of lint-free, clean cloth into the throttle body assy, and the inlet ports of the cylinder heads to keep dirt out of the engine.

⚠ WARNING

If dirt or dust is allowed to pass through into the throttle bore, 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.

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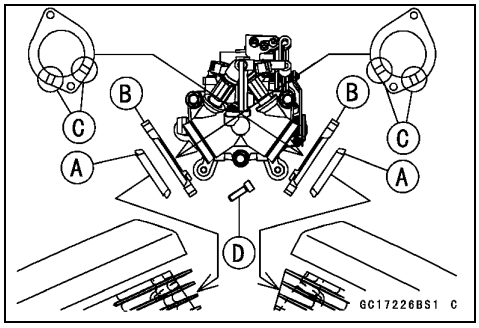
Throttle Body Assy

Throttle Body Assy Installation

- Install the lower air cleaner duct between cylinders.
- Replace the flange seal [A] with a new one.
- With a high-flash point solvent, clean off the flange surface of the cylinder head and wipe dry.
- Install the flange [B] and the seal in the direction shown. Face the ribs [C] of the flange and the smaller diameter end upwards.

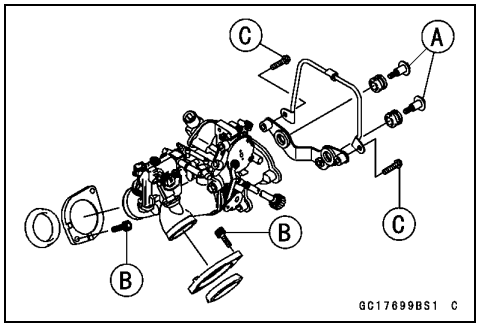
○The seal should be centered on the flange.

- Tighten the inlet manifold bolts [D] to a snag fit.



- First, tighten the throttle body assy holder bolts [A], secondly the inlet manifold bolts [B] and spark plug lead holder bolts [C] to the specified torque.

Torque - Throttle Body Assy Holder Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)
Inlet Manifold Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)
Spark Plug Lead Holder Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



- Install the lower ends of the throttle cables in the throttle pulley.

Accelerator Cable [A] and Decelerator Cable [B]

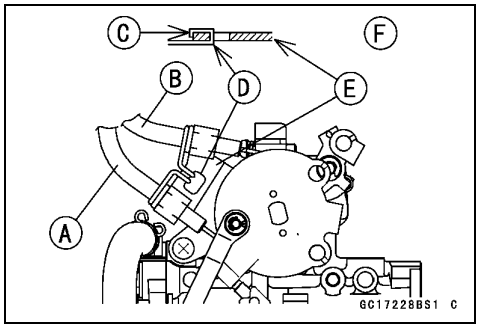
- Run the throttle cables correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Stake [C] the cable clip [D] on the throttle cable holder [E].

Rear View [F]

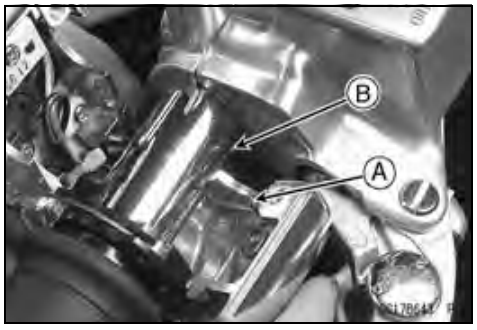
- Install the lower end of the choke cable in the choke lever.
- Apply a non-permanent locking agent to the threads of the choke cable plate screw.

Torque - Choke Cable Plate Screw: 2.9 N·m (0.30 kgf·m, 26 in·lb)

- Run the choke cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter) and check that the choke knob moves smoothly.



- Apply a thin coating of grease to the throttle cable upper ends.
- Install the upper ends of the throttle cables in the grip.
- Fit the projection [A] of the right switch housing into the hole [B] of the handlebar.
- Turn the throttle grip and make sure that the throttle valves move smoothly and return by spring force.
- Check the throttle grip free play (see Throttle Control System Play Inspection in the Periodic Maintenance chapter).



⚠ WARNING

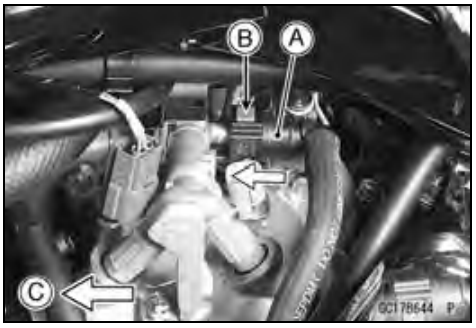
Operation with an incorrectly routed cable could result in an unsafe riding condition.

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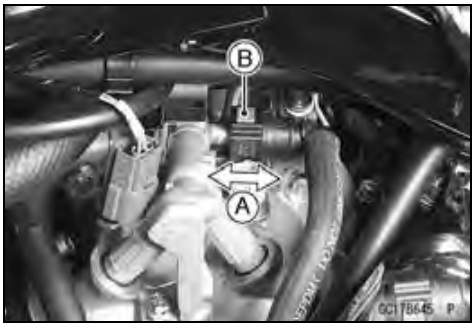
Throttle Body Assy

- Fit the fuel hose joint #2 [A] onto the pipe (for delivery joint) until the joint clicks [B].

○Insert the hose joint straight along the pipe.
Front [C]



- Push and pull [A] the fuel hose joint #2 [B] back and forth more than two times and make sure it is locked and doesn't come off. When the fuel hose joint #2 is correctly installed, it should slide on the delivery pipe about 5 mm (0.2 in.).



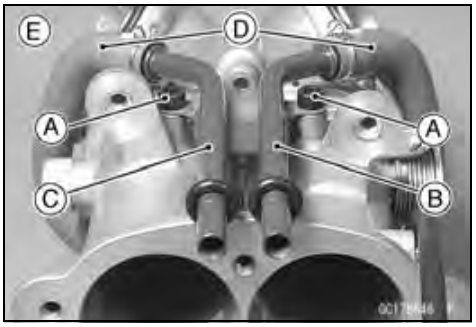
⚠ WARNING

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

- Install the removed parts (see appropriate chapters).

Throttle Body Assy Disassembly/Assembly

- Remove the throttle body assy (see Throttle Body Assy Removal in this section).
- Unscrew two bolts [A], and pull out the ISC pipe #1 [B], and ISC pipe #2 [C] from the hoses [D].
Bottom View [E]



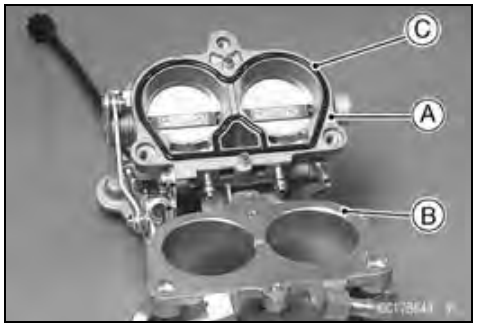
- Remove the three throttle body flange bolts [A].



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Throttle Body Assy

- Split the throttle body assy into the throttle body [A] and the inlet manifold [B]. The gasket [C] comes off.
- Discard the gasket.



○Do not remove or adjust the following parts. These parts are set at the factory and cannot be readjusted.

CAUTION

Adjustment of some of these parts could result in poor performance, requiring replacement of the throttle body.

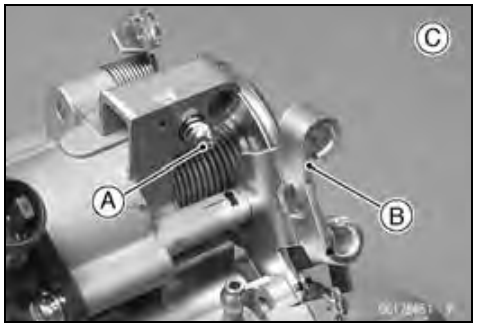


Throttle Sensor [A]:
Turning the sensor body could spoil the ignition timing and injection quantity.
Front View [B]

Throttle Stop Screw [A]:
Tampering with this screw could spoil the idling performance since the screw sets the gap between the throttle valves and the throttle bore with throttle grip closed.
Rear View [B]



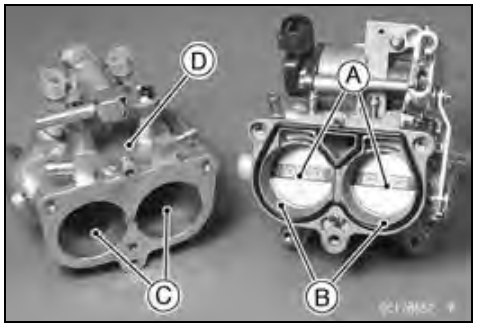
Choke Lever Stop Screw [A]:
This screw sets the throttle valve opening when the choke knob is pulled fully. Tampering with the screw could cause malfunction of the choke lever.
Throttle Cable Holder [B]:
This is sold with a throttle body as a unit.
Rear View [C]
Throttle Valve and Throttle Shaft:
They are not allowed to remove because of difficulty of removal.



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Throttle Body Assy

- Remove the delivery joint and injectors (see Injector Removal in this chapter).
- Open the butterfly valves [A], and wipe any carbon off the throttle bores [B] around the valves, using a piece of lint-free cloth penetrated with a high-flash point solvent.
- Clean the bores [C] of the inlet manifold [D] as well.
- Blow away dirt or dust from the throttle body and the inlet manifold by applying compressed air.



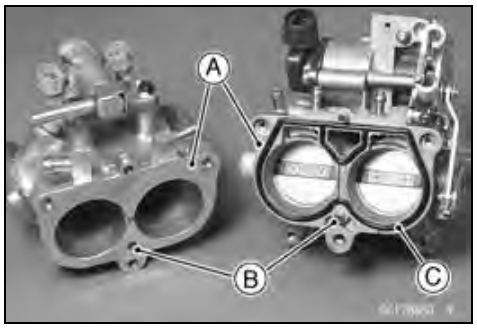
CAUTION

Do not immerse the throttle body (or throttle assy) in a high-flash point solvent for cleaning. This could damage the throttle sensor on the throttle body.

- Before assembly, visually inspect the mating surfaces [A] for any damage, like dent, nick, rust, flaw, and crack.
- Nick or rust damage can sometimes be repaired by using emery paper (first No. 200, then 400) to remove sharp edges or raised areas.

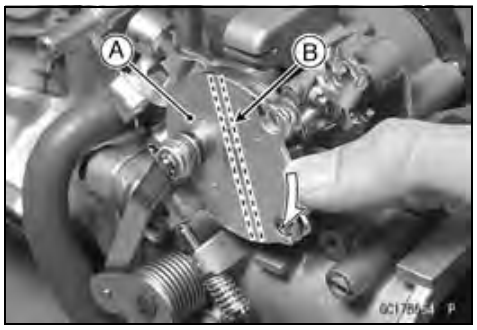
★If the damage is not repairable, replace the throttle body and/or the inlet manifold to prevent leakage.

- With a high-flash point solvent, clean off the mating surfaces and wipe dry.
- Be sure to install the dowel pins [B].
- Fit the new gasket [C] into the groove. Be careful not to pinch the gasket between the mating surfaces.
- Tighten the flange bolts evenly.



- Turn the throttle pulley [A] to check that the throttle valves [B] move smoothly and return by spring force.

★If the throttle valves do not move smoothly, replace the throttle body.



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Air Cleaner

Air Cleaner Element Removal

● Remove:
Allen Bolt and Washer [A]
Left Air Cleaner Cover [B]



● Remove the element [A].
● Push a clean, lint-free towel into the lower air cleaner duct to keep dirt or other foreign material from entering.



⚠ WARNING

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

CAUTION

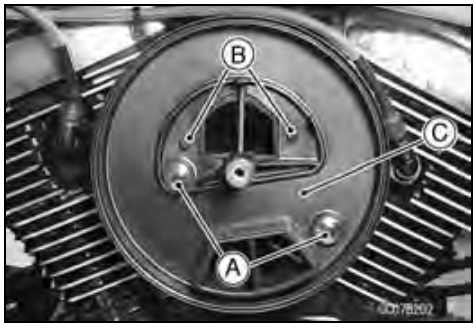
If dirt gets through into the engine, excessive engine wear and possibly engine damage will occur.

Air Cleaner Element Cleaning

● Refer to the Air Cleaner Element Cleaning in the Periodic Maintenance Chapter.

Left Air Cleaner Housing Removal/Installation

● Remove:
Air Cleaner Element (see Air Cleaner Element Removal in this section)
Air Cleaner Base Bolts [A] and Screws [B]
● Remove the air cleaner base [C].



○Be careful not to lose the air cleaner base mounting nuts [A]. These nuts and lower air cleaner duct are sold as a unit.
● Apply a non-permanent locking agent to the threads of the air cleaner base screws.

Torque - Left Air Cleaner Base Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)
Left Air Cleaner Base Screws: 2.2 N·m (0.22 kgf·m, 19 in·lb)
Left Air Cleaner Cover Allen Bolt: 16 N·m (1.6 kgf·m, 12 ft·lb)



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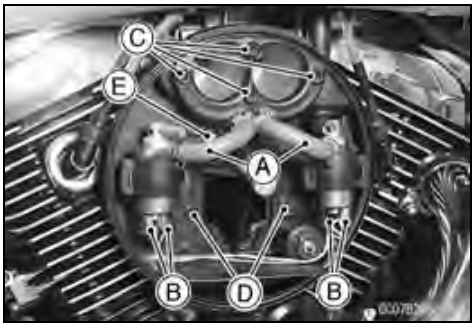
Air Cleaner

Right Air Cleaner Housing Removal

● Remove:
Allen Bolt and Washer [A]
Right Air Cleaner Cover [B]

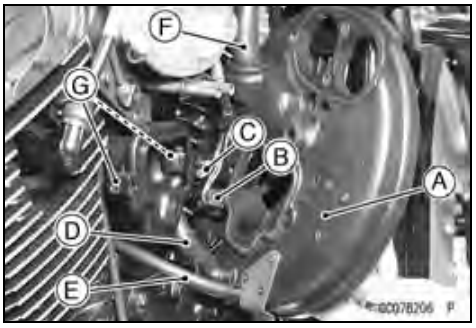


● Remove:
ISC Valve Hoses [A]
ISC Valve Lead Connectors [B]
Air Cleaner Allen Bolts [C] and Screws [D]
Air Cleaner Base Bolt [E]
Choke Knob [F]



● Remove:
Air Cleaner Base [A]
Inlet Air Temperature Sensor Connector [B]
ISC Valve Leads [C]
Crankcase Breather Hose [D]
Air Cleaner Drain Hose [E] (separate from the base [A])
Vacuum Switch Valve Air Hose [F]

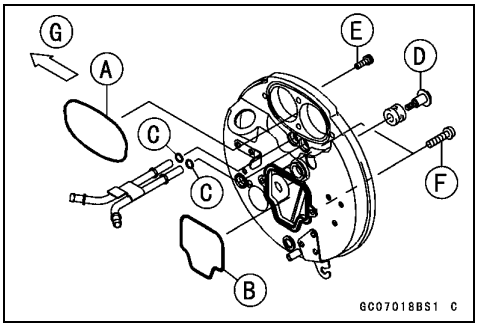
○Be careful not to lose the air cleaner base mounting nuts [G]. These nuts and lower air cleaner duct are sold as a unit.



Right Air Cleaner Housing Installation

● Check to see that the seals [A], [B] and the ISC pipe O -rings [C] are in place.
● Apply a non-permanent locking agent to the threads of the right air cleaner base screws.
● Tighten:

Torque - Right Air Cleaner Base Bolt [D]: 11 N·m (1.1 kgf·m, 97 in·lb),
Right Air Cleaner Allen Bolts [E]: 11 N·m (1.1 kgf·m, 97 in·lb),
Right Air Cleaner Base Screws [F]: 2.2 N·m (0.22 kgf·m, 19 in·lb)



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Air Cleaner

★If the air cleaner drain hose [A] has been removed with it attached to the right air cleaner base, pull the drain hose off the right air cleaner base. Remove the left air cleaner base and insert the drain hose under the lower air cleaner duct.

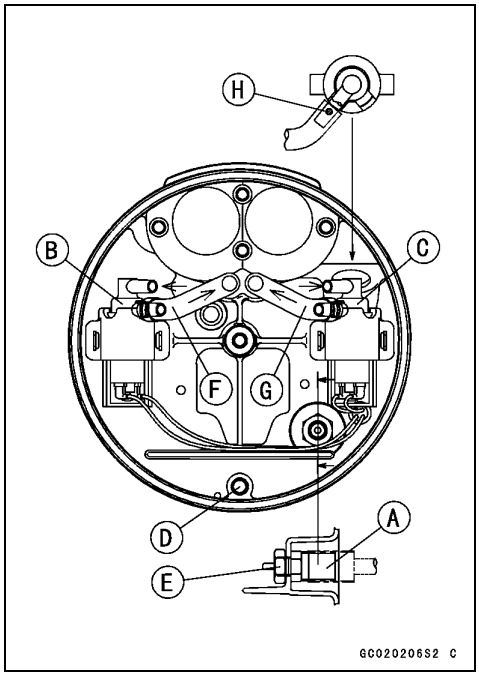


● Install the inlet air temperature sensor [A], the ISC valve #1 [B], ISC valve #2 [C], and the crankcase breather hose [D].

Torque - Inlet Air Temperature Sensor Nut [E]: 7.8 N·m (0.80 kgf·m, 69 in·lb)

○The ISC valve #1 is connected to W/R and G/Y leads, and the hose [F] marked red.
○The ISC valve #2 is connected to W/R and G/BL leads, and the hose [G] marked blue.
○The ISC valve #1 and #2 are the same parts.
Top Marks [H]

Torque - Right Air Cleaner Cover Allen Bolt: 16 N·m (1.6 kgf·m, 12 ft·lb)



Lower Air Cleaner Duct Removal/Installation

● Remove:
Left Air Cleaner Housing (see Left Air Cleaner Housing Removal/Installation in this section)
Right Air Cleaner Housing (see Right Air Cleaner Housing Removal in this section)
Throttle Body Assy (see Throttle Body Assy Removal in this chapter)

● Remove:
Oil Hose Clamps [A]
Lower Air Cleaner Duct [B]
Air Cleaner Duct Holder [C]

Torque - Air Cleaner Duct Holder Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)



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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. 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 with a pump as much as possible when the engine is cold.
Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

- Turn both ignition switch, and engine stop switch OFF.
- Wait until the engine cools down.
- Open the fuel tank cap [A] to lower the pressure in the tank, and draw the fuel out from the fuel tank with a commercially available pump.



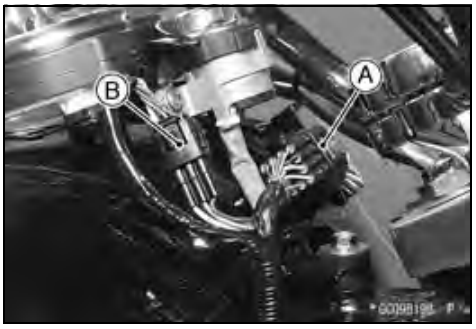
⚠ WARNING

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

- Remove the Allen bolts [A] and take out the meter cover [B].



- Disconnect the meter [A] and ignition switch [B] connectors.



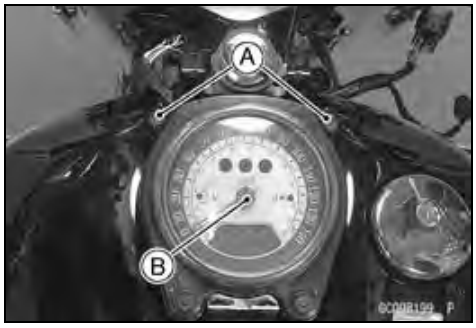
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Fuel Tank

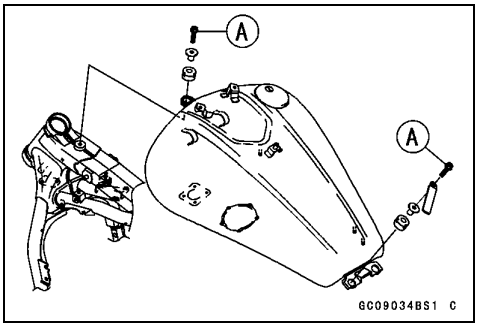
● Remove the bolts [A] and take out the meter unit [B].

CAUTION

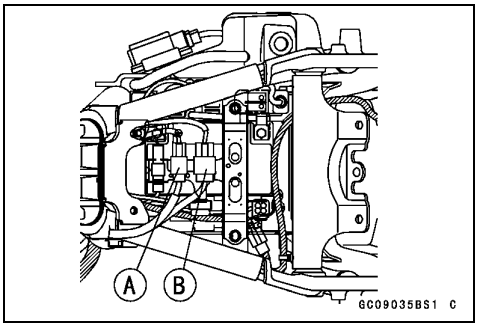
Place the meter so that the face is up. If a meter is left upside down or sideways for any length of time, it will malfunction.



● Remove:
Front Seat (see Front Seat Removal in the Frame chapter)
Fuel Tank Bolts [A]
● Disconnect the battery (–) terminal.



● Disconnect:
Fuel Pump Connector (2-pin) [A]
Fuel Level Sensor Connector (3-pin) [B]

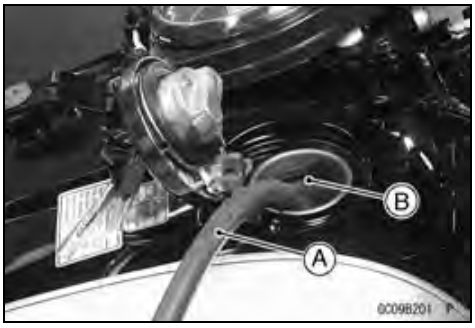


NOTE

○*During tank removal, keep the fuel tank cap [A] open to release pressure in the fuel tank. This makes fuel spillage less.*



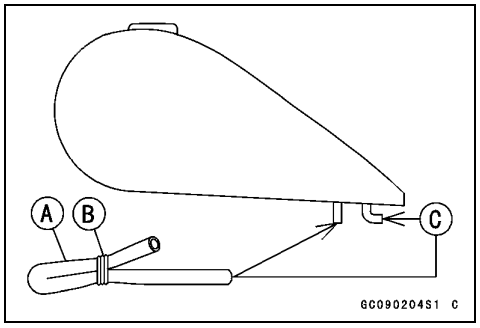
● Draw the fuel out from the fuel tank with a commercially available pump.
○Put the soft plastic hose [A] into the drain pipe [B] and draw the fuel out.



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Fuel Tank

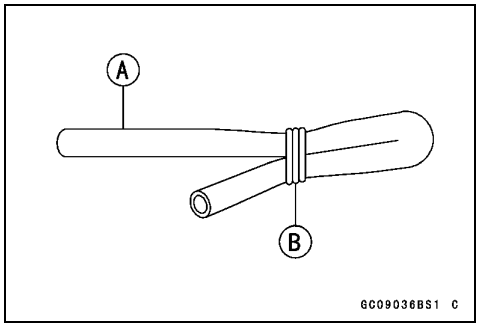
- Prepare rubber hoses of the inside diameter 5 ~ 5.8 mm (0.20 ~ 0.23 in.) [e.g. Rubber Tube: Part No. 92191 -1272] × L = 80 mm (3.1 in.) and make plug hoses [A] of the rubber hose with one end tied with a wire [B].
- Raise the rear of the tank up, and disconnect the hoses on the bottom.
- Plug these pipes [C] with plug hoses to prevent fuel spillage.



- Disconnect the fuel drain hose [A].
  Front [B]



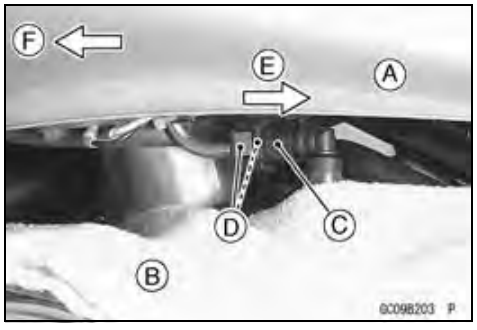
- Prepare a rubber hose of the inside diameter 7.3 ~ 7.5 mm (0.29 ~ 0.30 in.) [e.g. Part No. 92191-1264] × L = 100 mm (3.9 in.) and make a plug hose [A] with one end tied with a wire [B].



- Raise the fuel tank [A] up, and make sure that the shop towel [B] is around the fuel hose joint #1 [C].
- A person should pinch the hose joint locks [D] with fingers, disconnect the joint [E], and plug the tank outlet pipe with the plug hose.
  Front [F]

⚠ WARNING

Immediately wipe up fuel that spills.



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Fuel Tank

- Close the fuel tank cap.
- Remove the fuel tank from the vehicle, and place it on a flat surface.

CAUTION

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

- For California Model, note the following:

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

⚠ WARNING

For California model, be careful not to spill the gasoline through the return hose. Spilled fuel is hazardous.

★If liquid or gasoline flows into the breather hose, remove the hose and blow it clean with compressed air (California Model).

○Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump.

⚠ WARNING

Store the fuel tank in an area which is well -ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.

Fuel Tank Installation

- Read the above WARNING.
- Route the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- For California Model, note the following:

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

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

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

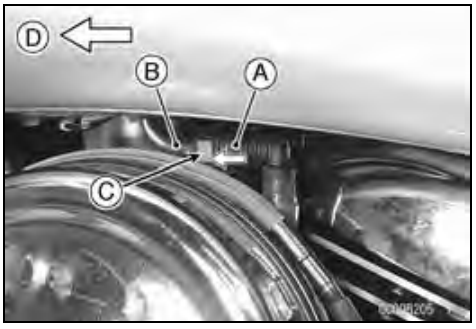
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Fuel Tank

● Check that the rubber dampers [A] are in place.
★If the dampers are damaged or deteriorated, replace them.
○Remove the plug hoses, and ϕ8 mm (0.03 in.) plug, then quickly install the fuel hoses one by one.
● Be sure the hoses are clamped securely to prevent leakage.



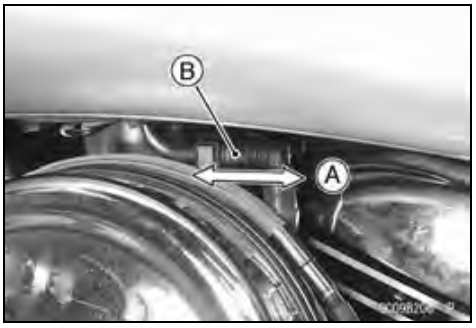
● Insert the fuel hose joint #1 [A] straight onto the tank outlet pipe [B] until the hose joint clicks [C]
Front [D]



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

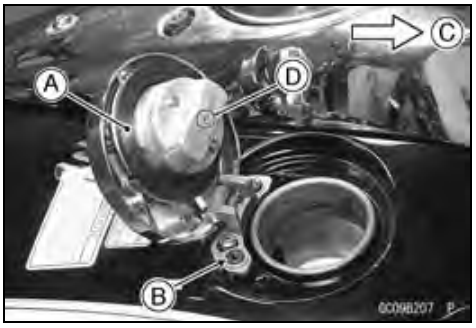
⚠ WARNING

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



★If it does not slide, reinstall the hose joint.
● Connect the fuel pump and the fuel level sensor connectors and the battery (–) lead terminal.

Fuel Tank and Cap Inspection
● Visually inspect the gasket [A] on the tank cap for any damage.
★Replace the gasket if it is damaged.
● Check to see if the breather pipe [B] in the tank is not clogged.
★If the breather pipe is clogged, blow the breather free with compressed air.
★If the tank cap breather is clogged, replace the tank cap.
Front [C]



CAUTION

Do not apply compressed air to the air vent holes [D] in the tank cap. This could damage and clog the labyrinth in the cap.

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Fuel Tank

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 of highly flammable liquids, do not use gasoline or low-flash point solvent to clean the tank.

- Remove the fuel tank (see Fuel Tank Removal in this chapter).
- Remove the fuel pump from the fuel tank (see Fuel Pump Removal in this chapter).
- Fill the fuel tank with some high-flash point solvent, and shake the tank to remove dirt and fuel deposits.
- Draw the solvent out of the tank.
- Dry the tank with compressed air.
- Install the fuel pump on the fuel tank (see Fuel Pump Installation in this chapter).
- Install the fuel tank (see Fuel Tank Installation in this chapter).

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Evaporative Emission Control System

The Evaporative Emission Control System for California Model 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.
- Be sure to plug the return hose to prevent fuel spilling before fuel tank removal.

⚠ WARNING

When removing the fuel tank, 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.

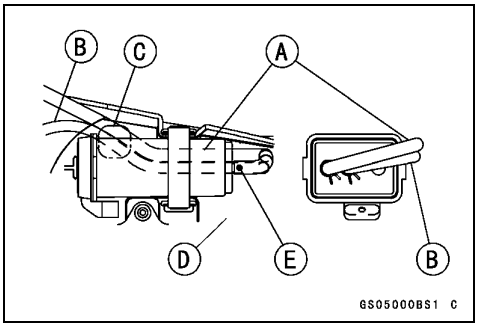
- Connect the hoses according to the diagram of the system (see Cable, Wire, and Hose Routing section in the Appendix chapter). Make sure they do not get pinched or kinked.
- Route hoses with a minimum of bending so that the air or vapor will not be obstructed.

Canister Installation

- Run the purge hose (green) [A] above the canister breather hose (blue) [B] through the hole [C] into the tool case [D].

○Do not run these hoses side by side on the battery side of the canister. This prevents hoses from being flattened when installing the left side cover.

- Install the canister and the left side cover (see Left Side Cover Installation in the Frame chapter).
- Face the white mark [E] left as shown.



Canister Inspection

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

Separator Inspection

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

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Evaporative Emission Control System

Hose Inspection

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

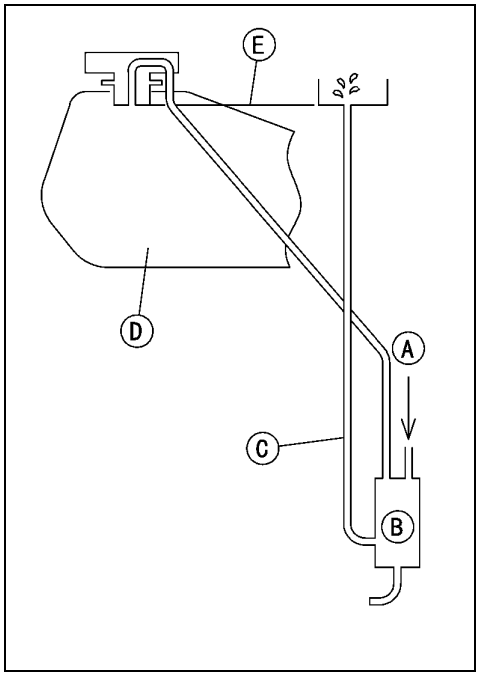
Separator Operation Test

⚠ 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.

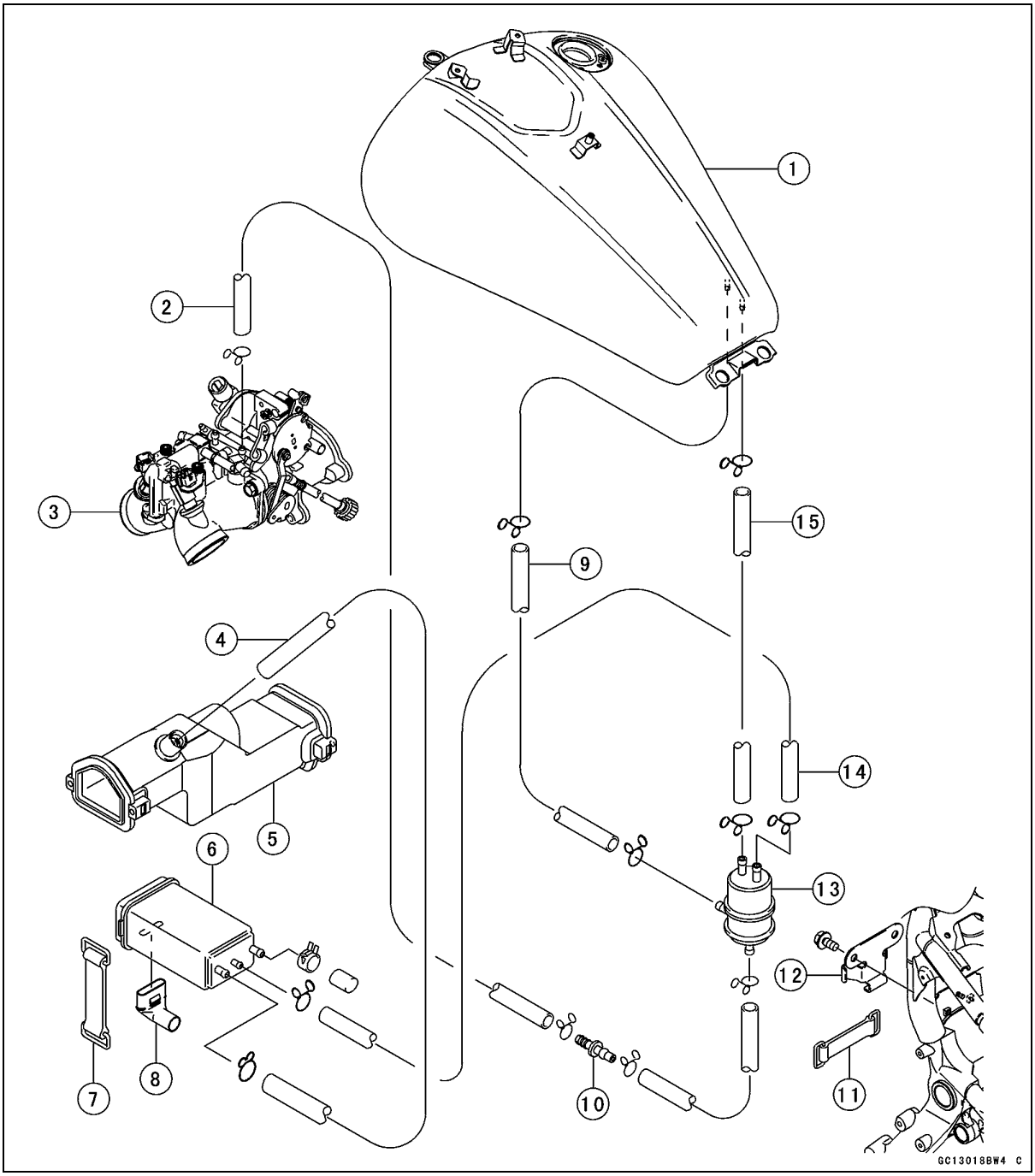
- Remove:
  Front Seat (see Front Seat Removal in the Frame chapter)
  Left Side Cover (see Left Side Cover Removal in the Frame chapter)
- Connect the hoses to the separator.
- Disconnect the breather hose from the separator, and inject about **20 mL (0.68 US oz.)** of gasoline [A] into the separator [B] through the hose fitting.
- Disconnect the evaporative fuel return hose [C] from the fuel tank [D]
- Run the open end of the return hose into the container 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.



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Evaporative Emission Control System



1. Fuel Tank
2. White Hose (Vacuum)
3. Throttle Body
4. Green Hose (Purge)
5. Lower Air Cleaner Duct
6. Canister
7. Band (for Canister)
8. Inlet
9. Red Hose (Rear, Return)
10. Fitting
11. Band (for Separator)
12. Bracket
13. Separator
14. Blue Hose (Breather)
15. Blue Hose (Front, Breather)

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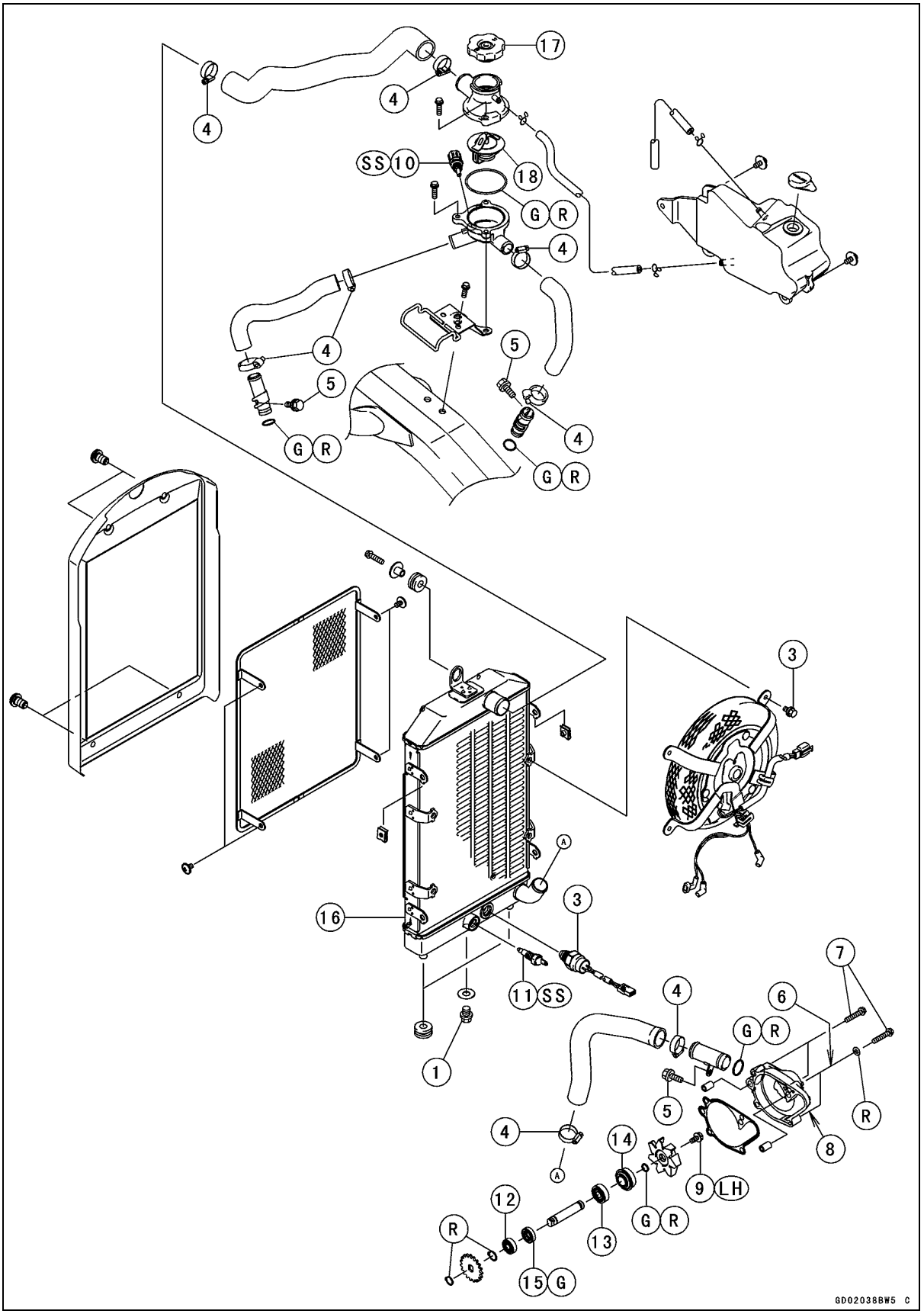
Cooling System

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Radiator Drain Bolt	2.2	0.22	19 in·lb	
2	Radiator Fan Bolts	8.3	0.85	73 in·lb	
3	Radiator Fan Switch	18	1.8	13	
4	Water Hose Clamp Screws	2.5	0.25	22 in·lb	
5	Water Pipe Bolts	11	1.1	97 in·lb	
6	Water Pump Air Bleeder Bolt	11	1.1	97 in·lb	
7	Water Pump Cover Bolts	11	1.1	97 in·lb	
8	Water Pump Drain Bolt	11	1.1	97 in·lb	
9	Water Pump Impeller Bolt	8.8	0.90	78 in·lb	LH
10	Water Temperature Sensor	18	1.8	13	SS
11	Water Temperature Switch	7.8	0.80	69 in·lb	SS

12. Ball Bearing
13. Double Seal Bearing
14. Mechanical Seal
15. Oil Seal
16. Radiator
17. Radiator Cap
18. Thermostat

G: Apply grease.
LH: Left-hand threads
R: Replacement Parts
SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

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4-4 COOLING SYSTEM

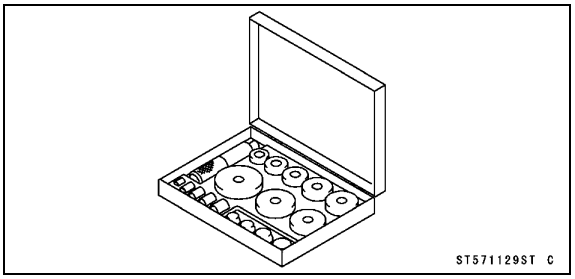
Specifications

Coolant provided when shipping	
Type (Recommended)	Permanent type antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Color	Green
Mixed Ratio	Soft water 50%, coolant 50%
Freezing Point	−35°C (−31°F)
Total Amount	2.3 L (2.4 US qt) (Reserve tank full level including radiator and engine)
Radiator Cap	
Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13.5 ~ 17.8 psi)
Thermostat	
Valve Opening Temperature	58 ~ 62°C (136 ~ 144°F)
Valve Full Opening Lift	8 mm (0.3 in.) or more @ 75°C (167°F)

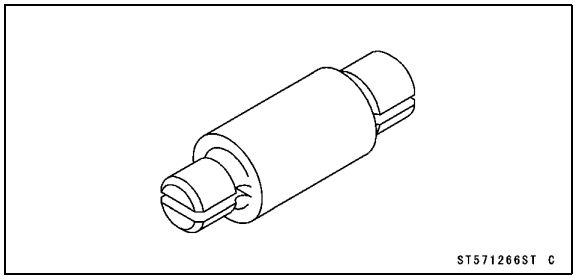
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Special Tools and Sealant

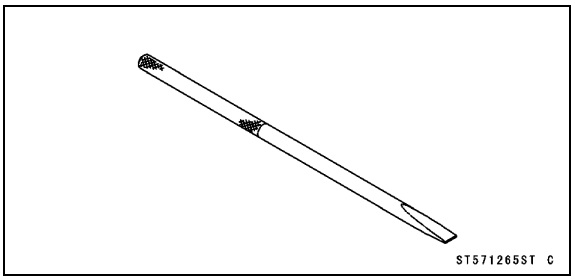
Bearing Driver Set:
57001-1129



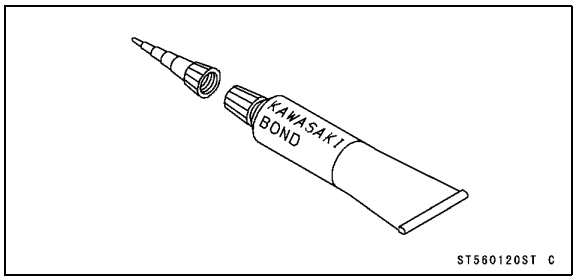
Bearing Remover Head, ϕ10 × ϕ12:
57001-1266



Bearing Remover Shaft, ϕ9:
57001-1265

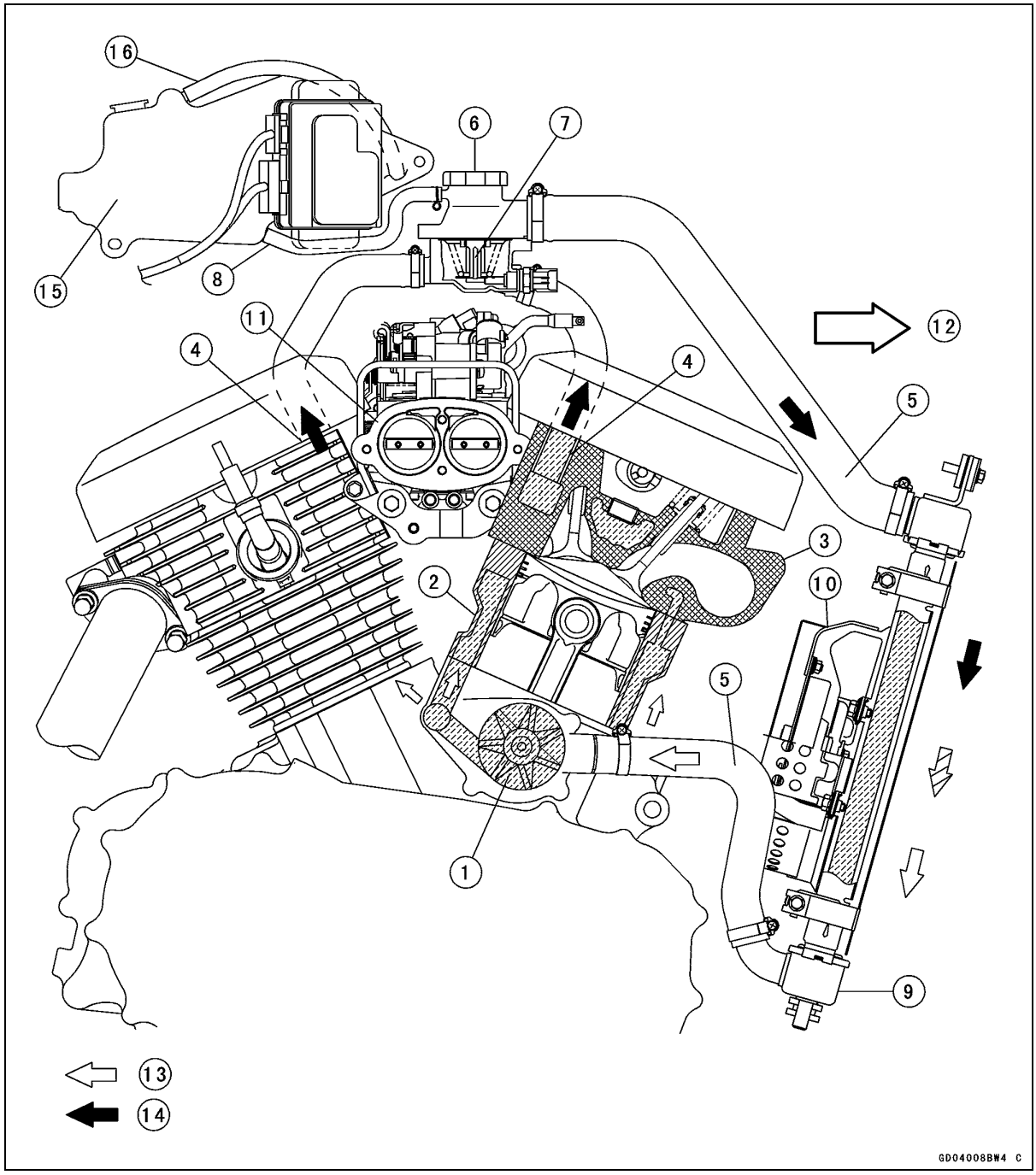


Kawasaki Bond (Silicone Sealant):
56019-120



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Coolant Flow Chart



1. Water Pump
2. Water Jacket
3. Cylinder Head
4. Water Pipe
5. Water Hose
6. Radiator Cap
7. Thermostat
8. Reserve Tank Hose
9. Radiator
10. Radiator Fan
11. Throttle Body Assy
12. Front
13. Cold Coolant
14. Hot Coolant
15. Reserve Tank
16. Reserve Tank Overflow Hose

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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 as coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is below 58 ~ 62°C (136 ~ 144°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 ~ 110°C (212 ~ 230°F), the radiator fan switch conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is below 97 ~ 103°C (207 ~ 217°F), the fan switch opens and the radiator fan stops.

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

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

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm^2, 13.5 ~ 17.8 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm^2, 13.5 ~ 17.8 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to from a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

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Coolant

Coolant Deterioration Inspection



- Remove the right side cover (see Right Side Cover Removal in the Frame chapter).
- Visually inspect the coolant [A] in the reservoir tank.

★If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flash 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 the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Remove the radiator cap, and install a cooling system pressure tester [A] on the radiator filler neck [B].

NOTE

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

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm², 17.8 psi).

CAUTION

During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm², 17.8 psi).

- Watch the gauge for at least 6 seconds.

★If the pressure holds 93 kPa (0.95 kgf/cm², 13.5 psi) or more, the system is all right.

★If the pressure drops and no external source is found, check for internal leakage. Droplets in the engine oil indicate internal leakage. Check the cylinder head and cylinder gaskets and the water pump.

- Remove the pressure tester, replenish the coolant, and install the radiator cap.

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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.

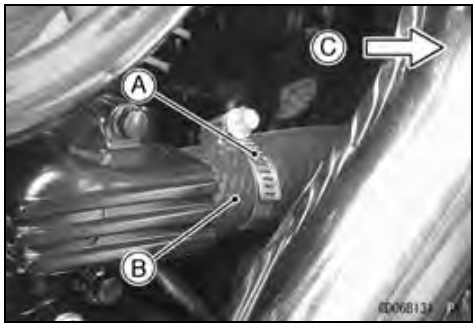
- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant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

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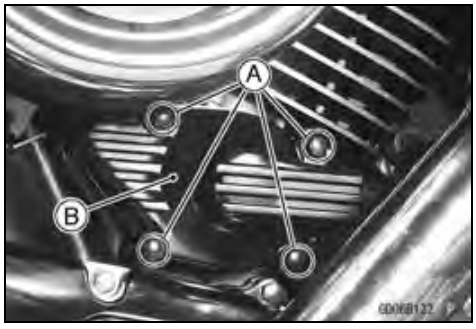
Water Pump

Water Pump Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Water Hose Clamp [A]
  Water Hose [B]
  Front [C]



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



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

NOTE

○*The impeller bolt has left-hand threads. Turn the bolt clockwise and remove it.*



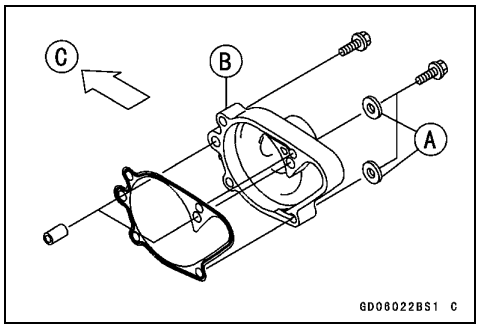
Water Pump Installation

- Tighten the water pump impeller bolt by turning the bolt counterclockwise.

Torque - Water Pump Impeller Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Replace the water pump cover gasket with a new one.
- There are aluminum gasket [A] on rear side of the water pump cover [B]. Replace them with new ones when installing.
  Front [C]

Torque - Water Pump Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

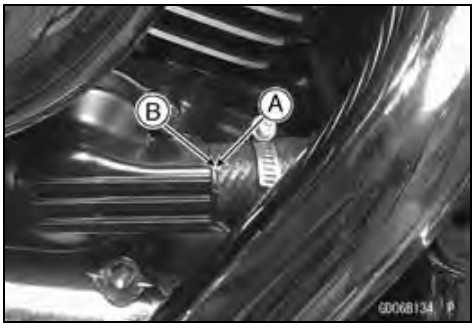


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Water Pump

- Insert the pump inlet hose until the hose end [A] touches the pump inlet step [B].
- Tighten the hose clamp screw securely.

Torque - Water Hose Clamp Screw: 2.5 N·m (0.25 kgf·m, 22 in·lb)



Water Pump Inspection

- Check the water pump drainage outlet hose [A] at the bottom of the water pump for coolant leakage.

★If the mechanical seal is damaged, the coolant leaks through the seal and drain through the passage. Replace the mechanical seal.



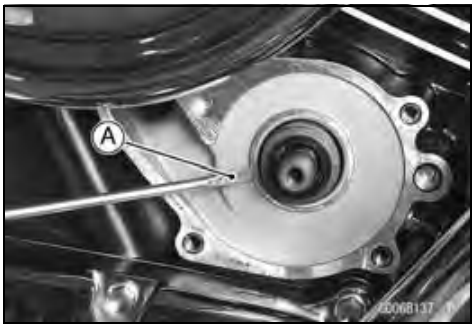
- Visually inspect the impeller [A].

★If the surface is corroded, or if the blades are damaged, replace the impeller.



Mechanical Seal Replacement

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



CAUTION
Be careful not to damage the water pump shaft and the inner sealing surface of the crankcase.

- Replace the mechanical seal with a new one.

NOTE

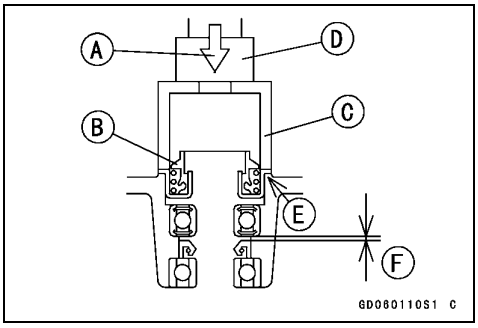
○*Since the replacement mechanical seal has an adhesive coated body, do not apply a liquid gasket to the exterior surface of the body.*

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Water Pump

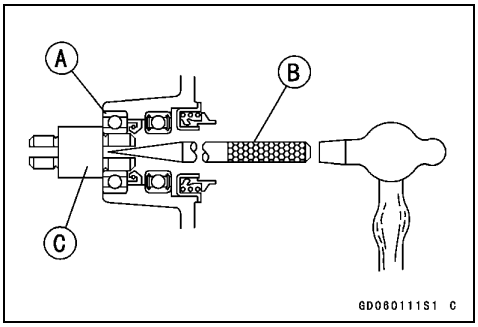
● Press [A] the mechanical seal [B] by using a suitable 28 mm socket [C] and a bearing driver [D] until its flange touches the step [E].
Gap [F]

Special Tool - Bearing Driver Set: 57001-1129



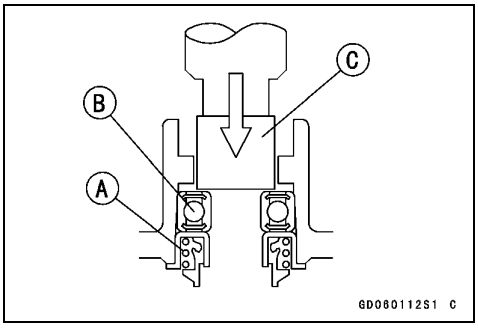
★If the coolant still leaks through the drainage outlet hose, the seal and ball bearings is probably damaged. Replace the mechanical seal, ball bearings, and oil seal by splitting the crankcase.
● Split the crankcase (see Crankcase Disassembly in the Crankshaft/Transmission chapter).
● Remove the water pump impeller (see Water Pump Removal in this section).
● Pull out the water pump shaft from the inside of the right crankcase.
● Take the bearing [A] out of the right crankcase, using the bearing remover.

Special Tools - Bearing Remover Shaft [B]: 57001-1265
Bearing Remover Head ϕ10 × ϕ12 [C]: 57001-1266



● Using a thin-bladed screwdriver, pry out the oil seal.
● Press out the mechanical seal [A] and ball bearing [B] from the inside of the right crankcase with the bearing driver set [C].

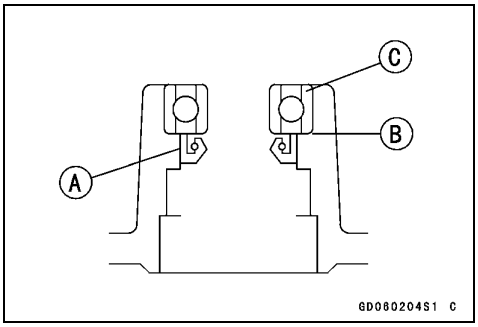
Special Tool - Bearing Driver Set: 57001-1129



○Be sure to replace the mechanical seal, oil seal, O-ring, and ball bearings with new ones because these parts will be damaged by removal.
● Apply plenty of high-temperature grease to the oil seal lips.
● Apply oil to the outer circumference of the oil seal.
● Press the oil seal [A] into the hole from the inside of the right crankcase with the bearing driver set so that the spring side of the seal lips is toward the inside of the crankcase.

Special Tool - Bearing Driver Set: 57001-1129

● Press the oil seal in until the seal end is even with step [B] of the hole as shown.
○Use the bearing driver which has a larger diameter than the oil seal.
● Press in each ball bearing [C] with its manufacturer's mark facing out until it bottoms out.

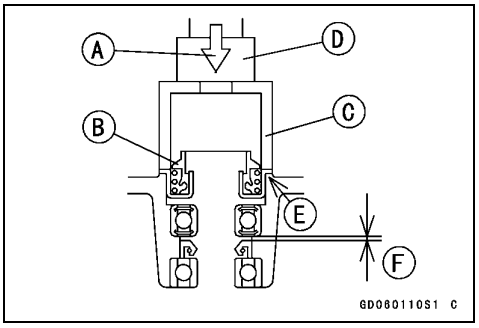


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Water Pump

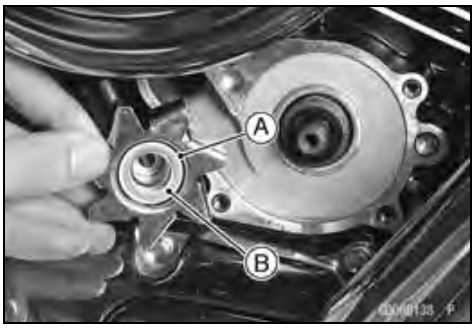
- Press [A] the mechanical seal [B] by using a suitable 28 mm socket [C] and a bearing driver [D] until its flange touches the step [E].
  Gap [F]
- Install the water pump shaft from the inside of the right crankcase.

Special Tool - Bearing Driver Set: 57001-1129



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

Torque - Water Pump Impeller Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)



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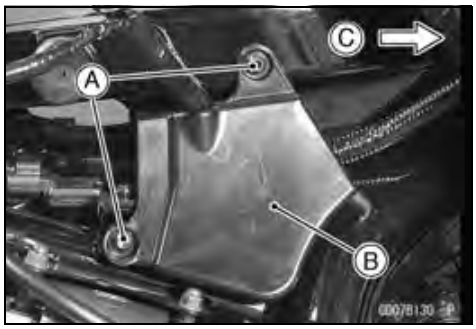
Radiator

⚠ WARNING

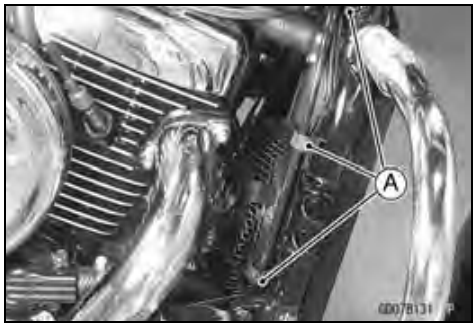
The radiator fan is connected directly to the battery. The radiator fan may start even if the ignition switch is off.
NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.

Radiator Removal

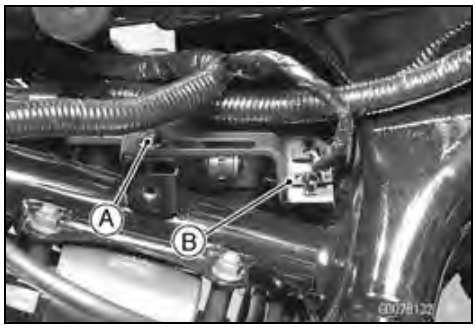
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Cover Bolts [A]
  Cover [B]
  Front [C]



- Pry the plastic clamps [A].



- Remove:
  Nut [A]
  Radiator Fan Motor Connector [B]



- Remove:
  Radiator Hose Clamps [A]
  Radiator Hoses [B]



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Radiator

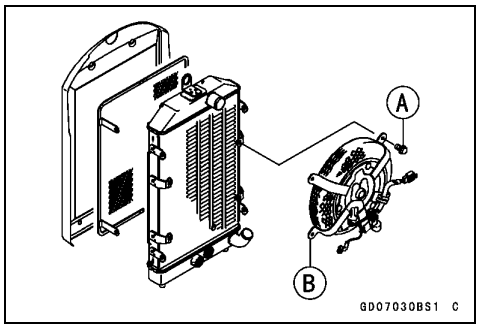
- Remove the mounting bolt [A].
- Lift up the radiator to clear the stoppers.
- Remove the radiator.



CAUTION

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

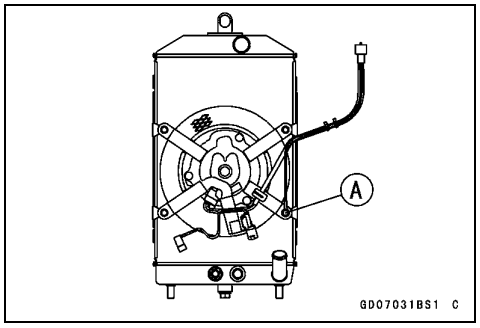
- Remove:
  Radiator Fan Bolts [A]
  Radiator Fan [B]



Radiator Installation

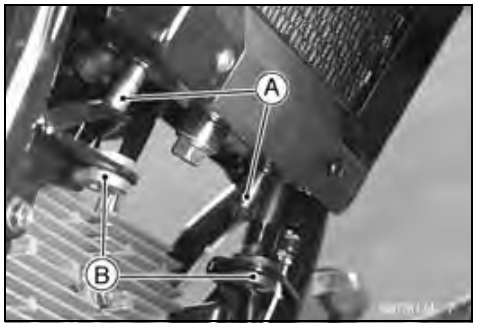
- Be sure to install the radiator fan ground lead terminal [A].

Torque - Radiator Fan Bolts: 8.3 N·m (0.85 kgf·m, 73 in·lb)



- Fit the radiator stoppers [A] into the left and right grommets [B].
- Install the pump inlet hose and position the hose clamp (see Water Pump Installation in this chapter).
- Tighten the hose clamp screw securely.

Torque - Water Hose Clamp Screws: 2.5 N·m (0.25 kgf·m, 22 in·lb)



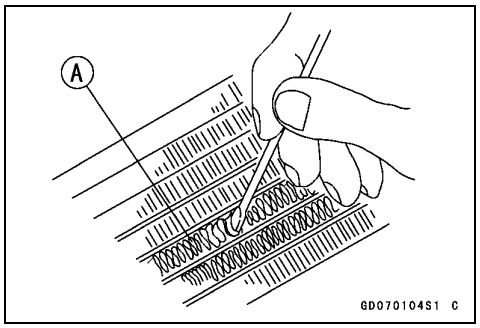
Radiator Inspection

- Remove the radiator (see Radiator Removal in this section).
- 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.

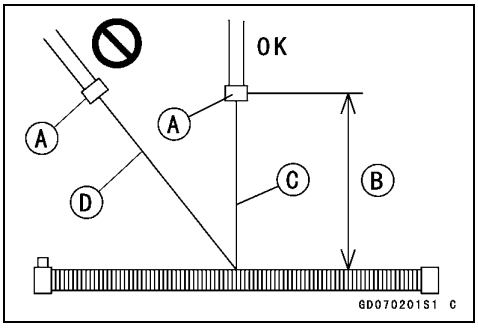


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Radiator

CAUTION

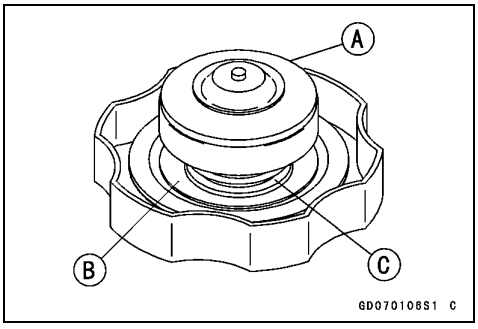
When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage.
1.Keep the steam gun [A] away more than 0.5 m (1.6 ft) [B] from the radiator core.
2.Hold the steam gun perpendicular [C] (not oblique [D]) to the core surface and run the steam gun following the core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



Radiator Cap Inspection

- Remove the radiator cap (see Coolant Change in the Periodic Maintenance chapter).
- Check the condition of the top and bottom valve seals of the radiator cap.

★If any one of them shows visible damage, replace the cap.
Bottom Valve Seal [A]
Top Valve Seal [B]
Valve Spring [C]

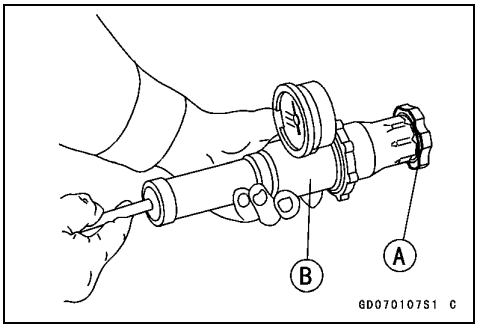


- Install the cap [A] on a cooling system pressure tester [B].

NOTE

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

- 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 needle must remain within the same range at least 6 seconds.



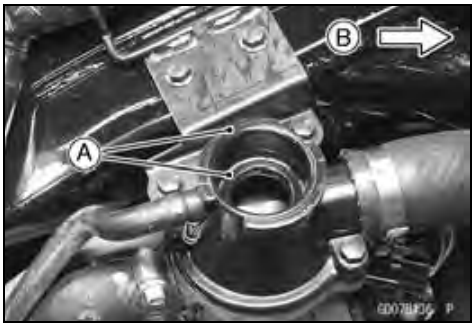
Radiator Cap Relief Pressure
Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13.5 ~ 17.8 psi)

★If the cap holds too much pressure or cannot hold the specified pressure, replace it with a new one.

Radiator Filler Neck Inspection

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

Front [B]

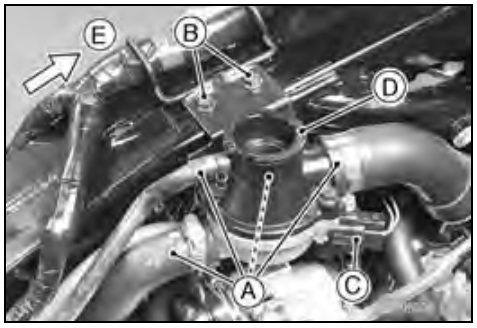


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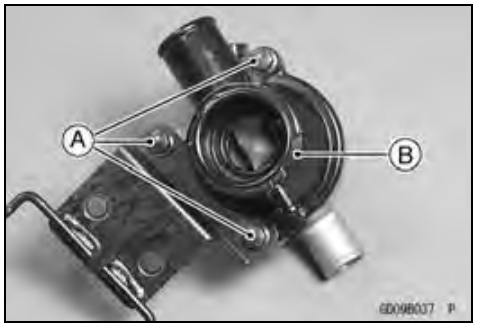
Thermostat

Thermostat Removal

- Drain the coolant (about 200 mL, 6.8 US oz.).
- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Water Hoses [A]
  Bracket Bolts [B]
  Water Temperature Sensor Connector [C]
- Remove the thermostat housing [D] along with the bracket.
  Front [E]

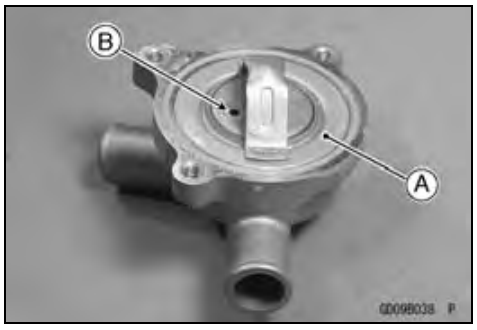


- Remove the bolts [A], take off the cap [B], and take out the thermostat.



Thermostat Installation

- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.
- Install a new O-ring into the housing.
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).



Thermostat Inspection

- Remove the thermostat (see Thermostat Removal in this section), and inspect the thermostat valve at room temperature.

★If the valve is open, replace the valve with a new one.

- To check valve opening temperature, suspend the thermostat [A] and an accurate thermometer [B] in a container of water with the heat-sensitive portions [C] in almost the same depth.

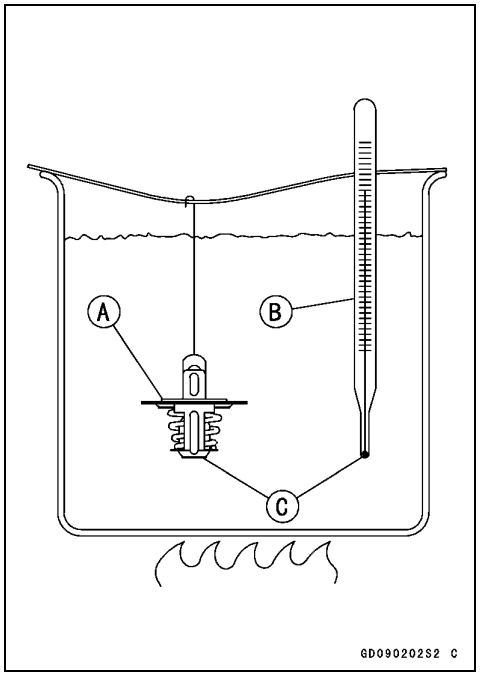
NOTE

○*The thermostat must be completely submerged and the thermostat and thermometer must not touch the container sides or bottom.*

- Gradually raise the temperature of the water while stirring the water gently for even temperature.

★If the measurement is out of the range, replace the thermostat.

Thermostat Valve Opening Temperature
58 ~ 62°C (136 ~ 144°F)



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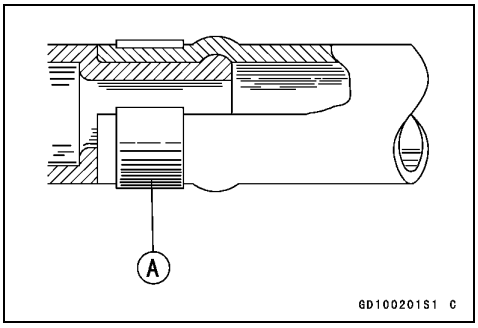
Hoses and Pipes

Hose Installation

- Install the hoses and pipes being careful to follow bending direction. Avoid sharp bending, kinking, flattening, or twisting.
- Install the clamps [A] as near as possible to the hose end to clear the raised rib on the fitting. This will prevent the hoses from working loose.

○The clamp screws should be positioned correctly to prevent the clamps from contacting the other parts.

Torque - Water Hose Clamp Screws: 2.5 N·m (0.25 kgf·m, 22 in·lb)



Hose Inspection

- Whenever the radiator or water hoses are removed or in accordance with the Periodic Maintenance Chart, check the radiator or water hoses and their connections. Refer to the Radiator Hose Inspection (Coolant Leak, Damage, Installation Condition) in the Periodic Maintenance chapter.

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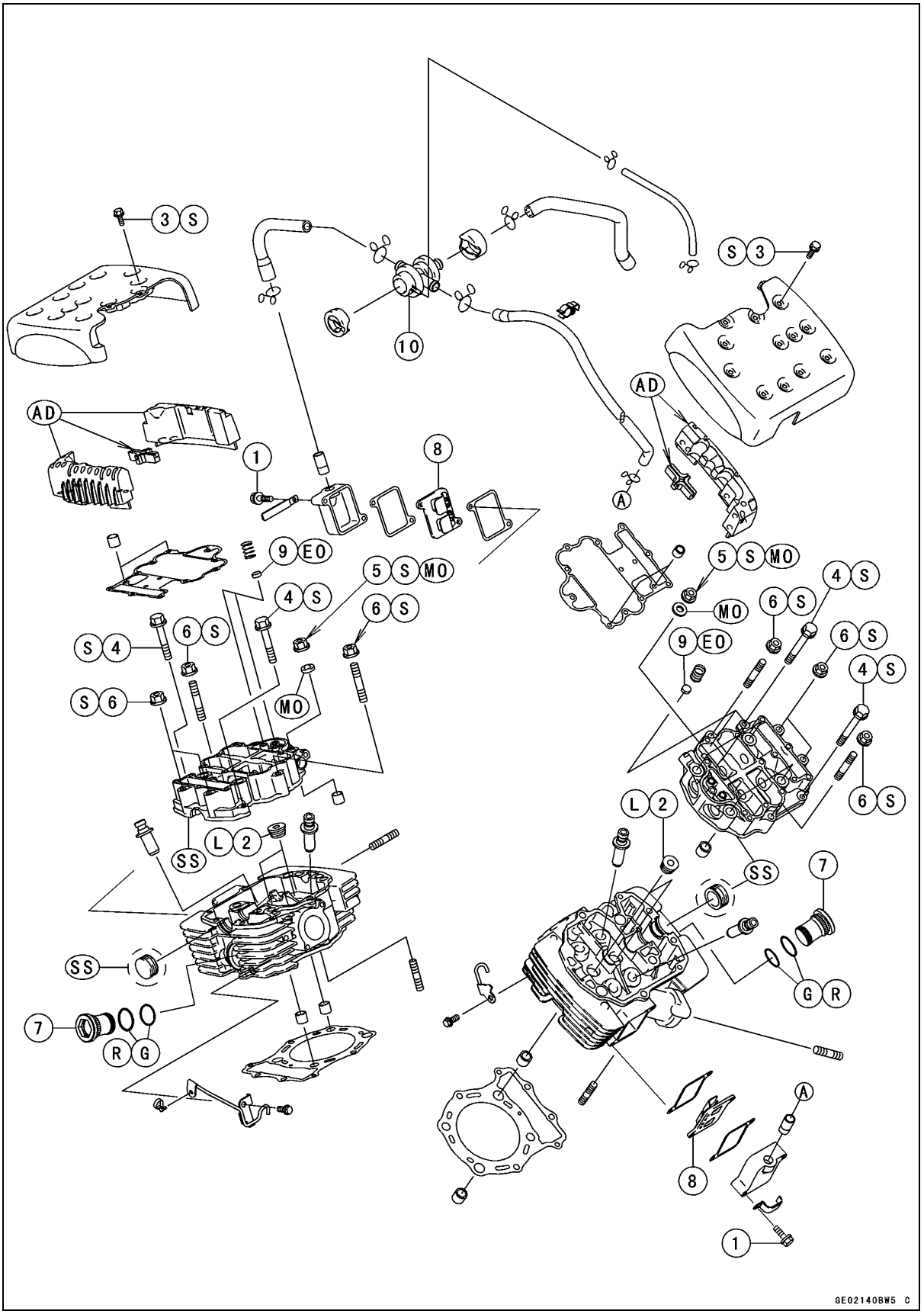
Engine Top End

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Exploded View



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Exploded View

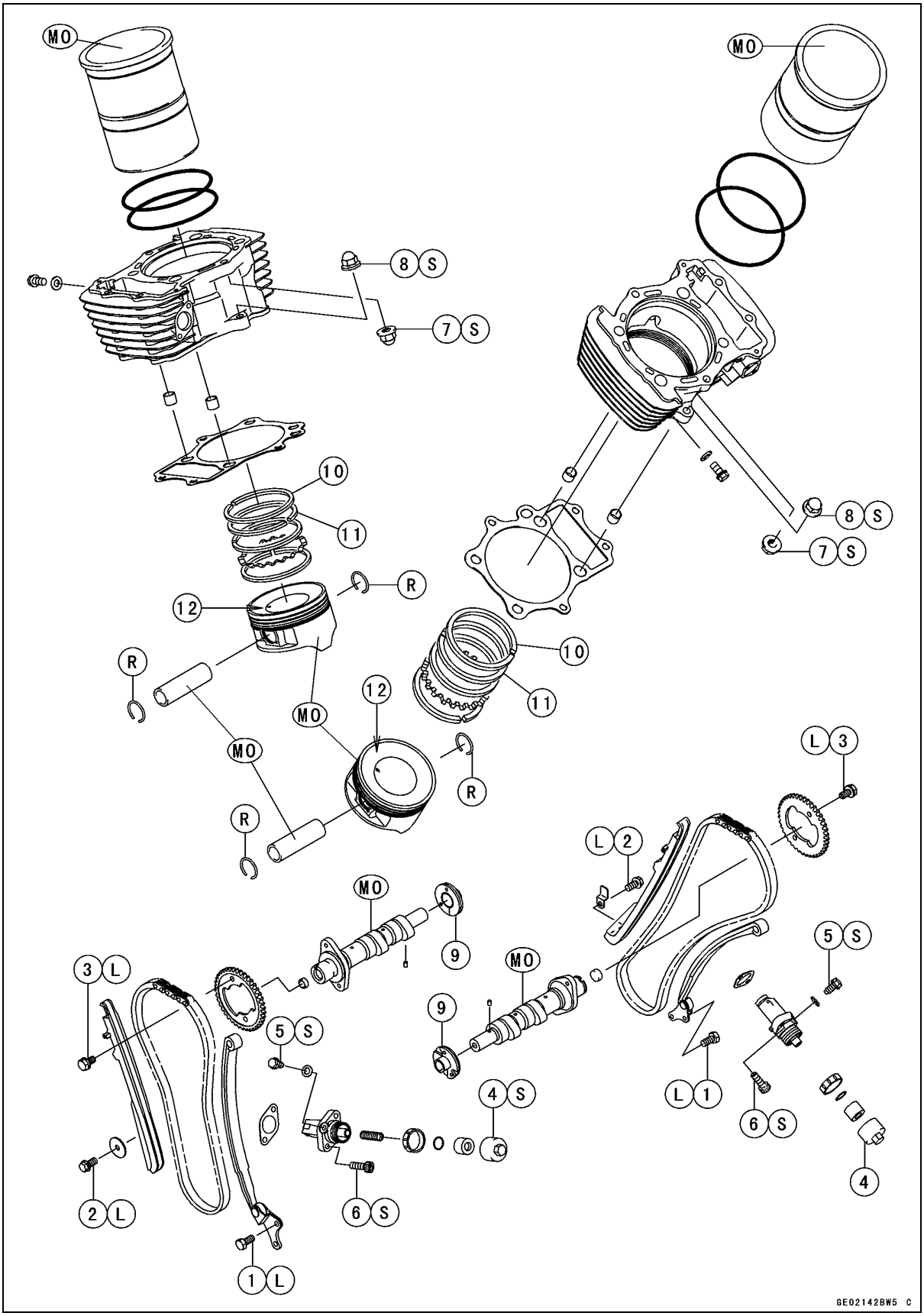
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Suction Valve Cover Bolts	7.4	0.75	65 in·lb	
2	Plugs	20	2.0	15	L
3	Rocker Case Cover Bolts	8.8	0.90	78 in·lb	S
4	Rocker Case Bolts	8.8	0.90	78 in·lb	S
5	Rocker Case Nuts (M12)	78	8.0	58	MO, S
6	Rocker Case Nuts (M8)	25	2.5	18	S
7	Spark Plug Retainers	12	1.2	104 in·lb	

8. Air Suction Valves
9. HLA (Hydraulic Lash Adjuster) Oil Filters
10. Vacuum Switch Valve

AD: Apply adhesive.
EO: Apply engine oil.
G: Apply 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 specific tightening sequence.
SS: Apply silicone sealant (Kawasaki Bond: 92104-0004).

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Exploded View



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Exploded View

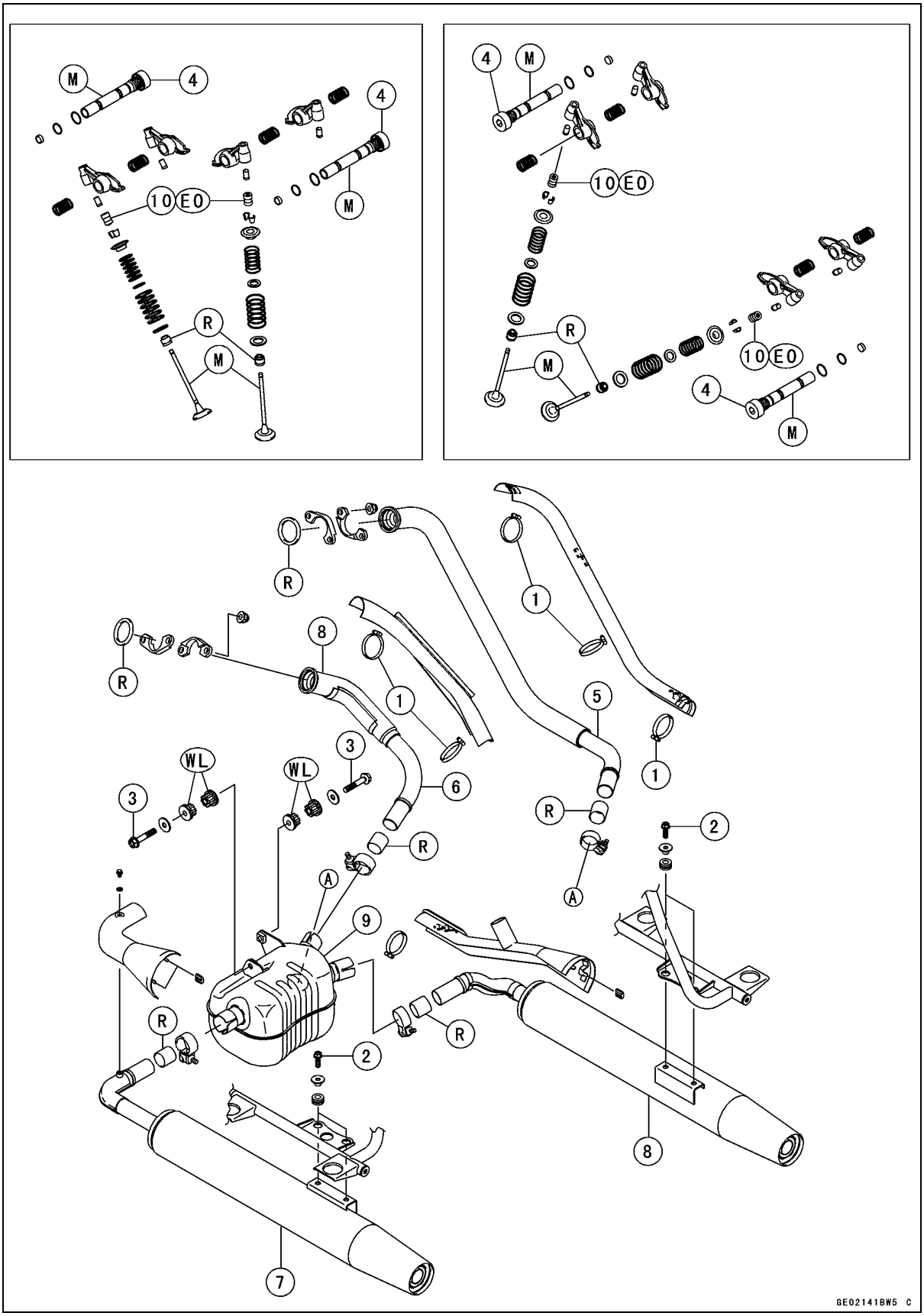
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Camshaft Chain Guide Bolts	11	1.1	97 in·lb	L
2	Camshaft Chain Guide Retainer Bolts	11	1.1	97 in·lb	L
3	Camshaft Sprocket Bolts	15	1.5	11	L
4	Chain Tensioner Cap	20	2.0	15	S
5	Chain Tensioner Lockbolts	4.9	0.50	43 in·lb	S
6	Chain Tensioner Mounting Bolts	11	1.1	97 in·lb	S
7	Cylinder Head Nuts	25	2.5	18	S
8	Cylinder Nuts	25	2.5	18	S

9. KACR (Kawasaki Automatic Compression Release) Unit
10. “R” marked side faces up.
11. “RN” marked side faces up.
12. Each circle mark points to the front side.

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 10 : 1)
R: Replacement Parts
S: Follow the specific tightening sequence.

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Exploded View



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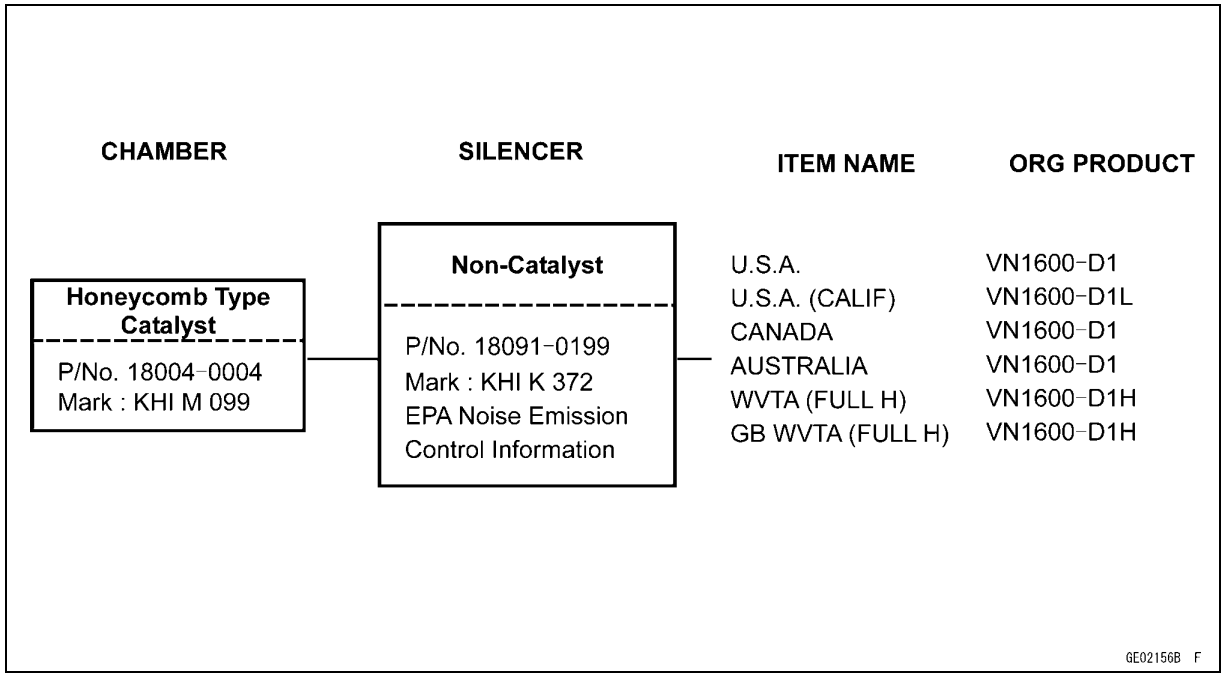
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Exhaust Pipe Cover Clamp Screws	6.9	0.70	61 in·lb	
2	Muffler Stay Mounting Bolts	25	2.5	18	
3	Premuffler Chamber Bolts	29	3.0	21	
4	Rocker Shafts	25	2.5	18	M

5. Front Exhaust Pipe
6. Rear Exhaust Pipe
7. Left Muffler
8. Right Muffler
9. Premuffler Chamber
10. HLA (Hydraulic Lash Adjusters)

EO: Apply engine oil.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
WL: Apply a soap and water solution or rubber lubricant.

Exhaust System

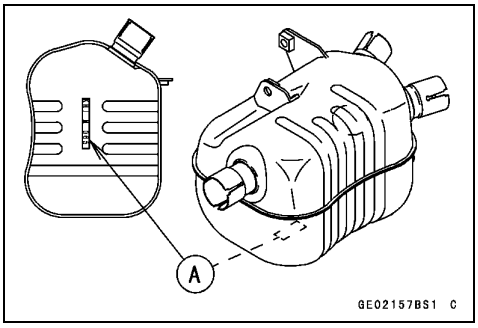


Full: Full Power
H: Honeycomb Type Catalyst
GB: United Kingdom Model

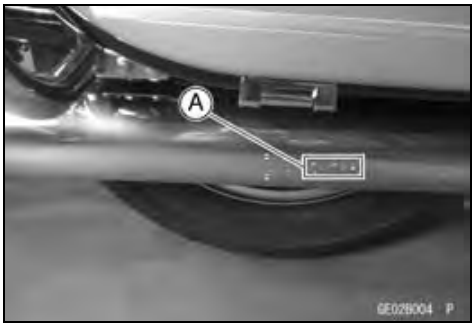
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Exploded View

Chamber Mark Position [A]



Silencer Mark Position [A]



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Specifications

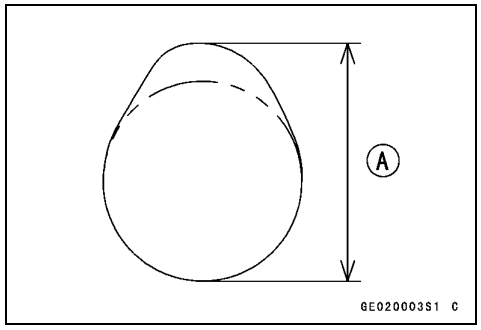
Item	Standard	Service Limit
Clean Air System		
Vacuum Switch Valve Closing Pressure:	Open → Close 49.3 ~ 65.3 kPa (370 ~ 490 mmHg)	– – –
Camshafts		
Cam Height:		
Exhaust	33.487 ~ 33.601 mm (1.3184 ~ 1.3229 in.)	33.39 mm (1.315 in.)
Inlet	33.805 ~ 33.919 mm (1.3309 ~ 1.3354 in.)	33.71 mm (1.327 in.)
Camshaft/Rocker Case Clearance:		
ϕ25	0.020 ~ 0.062 mm (0.0008 ~ 0.0024 in.)	0.15 mm (0.0059 in.)
ϕ17	0.016 ~ 0.055 mm (0.0006 ~ 0.0022 in.)	0.14 mm (0.0055 in.)
Camshaft Journal Diameter:		
ϕ25	24.959 ~ 24.980 mm (0.9826 ~ 0.9835 in.)	24.93 mm (0.981 in.)
ϕ17	16.966 ~ 16.984 mm (0.6680 ~ 0.6687 in.)	16.94 mm (0.667 in.)
Rocker Case Bearing Inside Diameter:		
ϕ25	25.000 ~ 25.021 mm (0.9843 ~ 0.9851 in.)	25.08 mm (0.987 in.)
ϕ17	17.000 ~ 17.021 mm (0.6693 ~ 0.6701 in.)	17.08 mm (0.672 in.)
Camshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
Rocker Arm Inside Diameter	16.000 ~ 16.018 mm (0.6299 ~ 0.6306 in.)	16.05 mm (0.632 in.)
Rocker Shaft Diameter	15.966 ~ 15.984 mm (0.6286 ~ 0.6293 in.)	15.94 mm (0.628 in.)
Cylinder Head		
Cylinder Compression Usable Range	340 ~ 590 kPa (3.5 ~ 6.0 kg/cm², 50 ~ 85 psi) @300 r/min (rpm) with electric starter	– – –
Cylinder Head Warp	– – –	0.05 mm (0.002 in.)
Valve		
Valve Clearance	Non-adjustable (Auto adjuster)	– – –
Valve Head Thickness:		
Exhaust	0.9 ~ 1.1 mm (0.03 ~ 0.04 in.)	0.7 mm (0.03 in.)
Inlet	0.9 ~ 1.1 mm (0.03 ~ 0.04 in.)	0.5 mm (0.02 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	6.955 ~ 6.970 mm (0.2738 ~ 0.2744 in.)	6.94 mm (0.273 in.)
Inlet	6.965 ~ 6.980 mm (0.2742 ~ 0.2748 in.)	6.95 mm (0.274 in.)

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Specifications

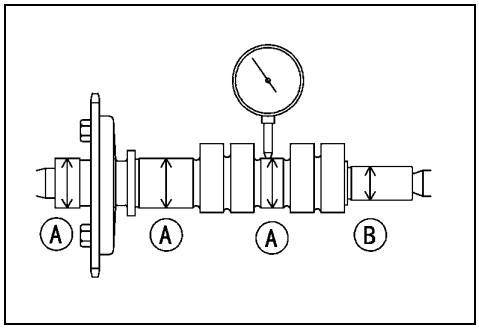
Item	Standard	Service Limit
Valve Guide Inside Diameter:		
Exhaust	7.000 ~ 7.015 mm (0.2756 ~ 0.2762 in.)	7.08 mm (0.279 in.)
Inlet	7.000 ~ 7.015 mm (0.2756 ~ 0.2762 in.)	7.08 mm (0.279 in.)
Valve/Valve Guide Clearance (Wobble Method):		
Exhaust	0.08 ~ 0.15 mm (0.003 ~ 0.006 in.)	0.35 mm (0.014 in.)
Inlet	0.05 ~ 0.13 mm (0.002 ~ 0.005 in.)	0.33 mm (0.013 in.)

Cam Height



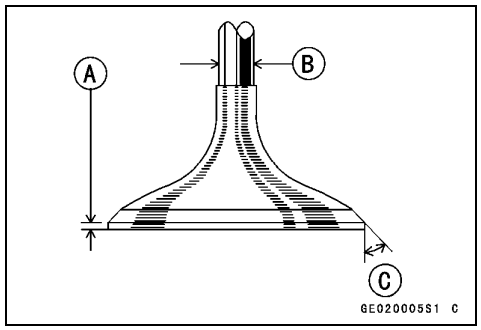
Cam Height (maximum) [A]

Camshaft Journals and Runout



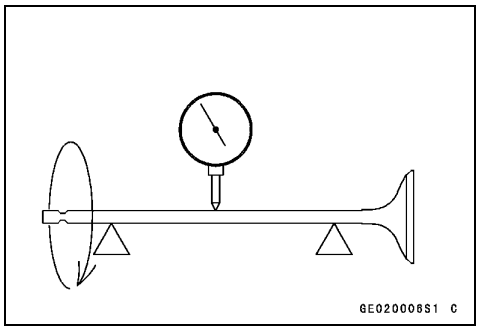
ϕ25 mm (0.984 in.) [A]
ϕ17 mm (0.669 in.) [B]

Valve Head Thickness



Valve Head Thickness [A]
Valve Stem Diameter [B]
45° [C]

Valve Stem Bend



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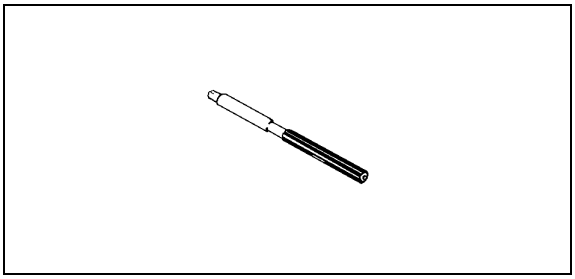
Specifications

Item	Standard	Service Limit
Valve Seat Surface:		
Valve Seat Cutting Angle	45°, 32°, 55°	– – –
Outside Diameter:		
Exhaust	28.9 ~ 29.1 mm (1.14 ~ 1.15 in.)	– – –
Inlet	31.9 ~ 32.1 mm (1.25 ~ 1.26 in.)	– – –
Width:		
Exhaust	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	– – –
Inlet	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	– – –
Valve Spring Free Length:		
Outer (EX, IN)	44.76 mm (orange) (1.762 in.)	43.2 mm (1.70 in.)
Inner (EX, IN)	39.82 mm (orange) (1.568 in.)	38.3 mm (1.51 in.)
Cylinder, Piston		
Cylinder Inside Diameter	102.000 ~ 102.012 mm (4.0157 ~ 4.0162 in.)	102.10 mm (4.020 in.)
Piston Diameter	101.942 ~ 101.957 mm (4.0135 ~ 4.0140 in.)	101.79 mm (4.007 in.)
Piston/Cylinder Clearance	0.043 ~ 0.070 mm (0.0017 ~ 0.0028 in.)	– – –
Oversize Piston And Rings	+0.5 mm (0.02 in.)	– – –
Piston Ring/Groove Clearance:		
Top	0.050 ~ 0.090 mm (0.0020 ~ 0.0035 in.)	0.19 mm (0.0075 in.)
Second	0.030 ~ 0.070 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Piston Ring Groove Width:		
Top	1.24 ~ 1.26 mm (0.049 ~ 0.050 in.)	1.34 mm (0.053 in.)
Second	1.22 ~ 1.24 mm (0.048 ~ 0.049 in.)	1.32 mm (0.052 in.)
Piston Ring Thickness:		
Top	1.17 ~ 1.19 mm (0.046 ~ 0.047 in.)	1.10 mm (0.043 in.)
Second	1.17 ~ 1.19 mm (0.046 ~ 0.047 in.)	1.10 mm (0.043 in.)
Piston Ring End Gap:		
Top	0.25 ~ 0.35 mm (0.010 ~ 0.014 in.)	0.7 mm (0.03 in.)
Second	0.40 ~ 0.55 mm (0.016 ~ 0.022 in.)	0.9 mm (0.04 in.)
Oil	0.30 ~ 0.90 mm (0.012 ~ 0.035 in.)	1.2 mm (0.05 in.)

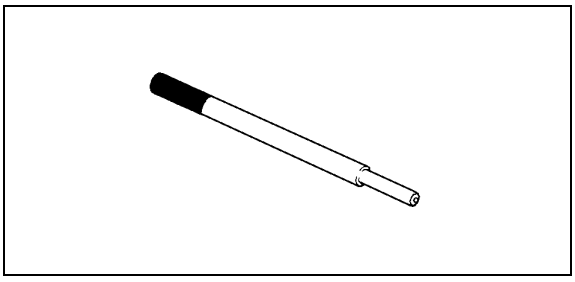
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Special Tools and Sealants

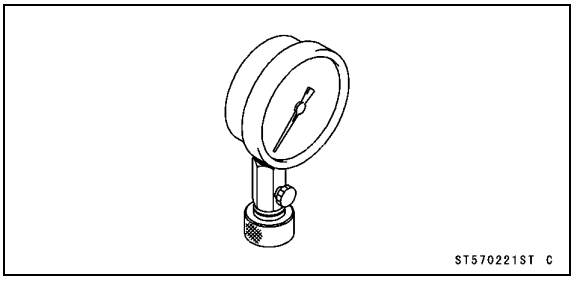
Valve Guide Reamer, ϕ7:
57001-162



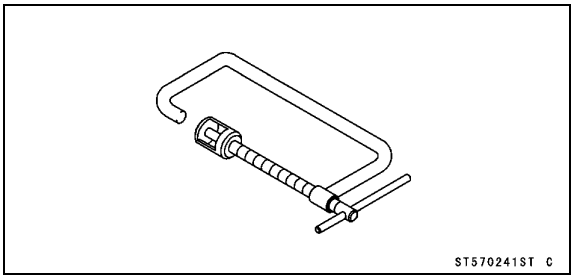
Valve Guide Arbor, ϕ7:
57001-163



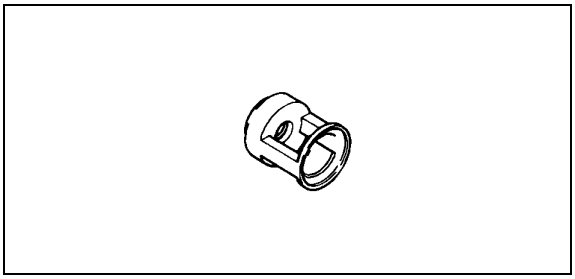
Compression Gauge, 20 kgf/cm²:
57001-221



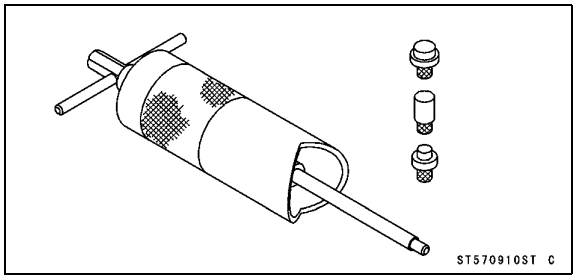
Valve Spring Compressor Assembly:
57001-241



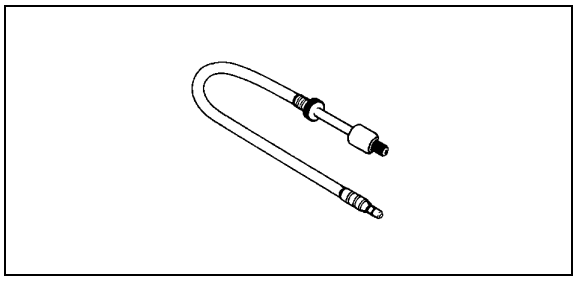
Valve Spring Compressor Adapter, ϕ28.2:
57001-243



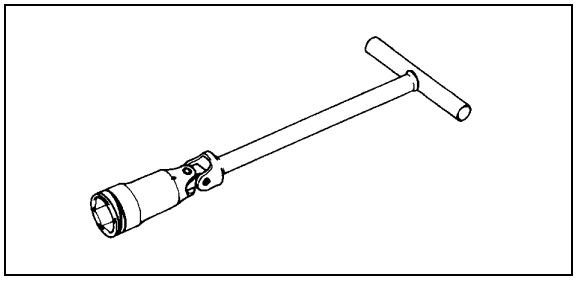
Piston Pin Puller Assembly:
57001-910



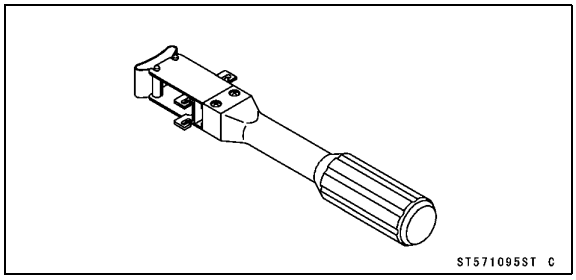
Compression Gauge Adapter, M12 × 1.25:
57001-1018



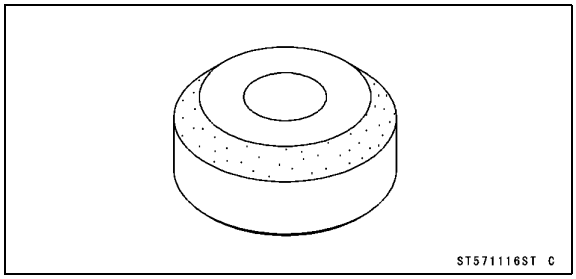
Spark Plug Wrench, Hex 18:
57001-1024



Piston Ring Compressor Grip:
57001-1095



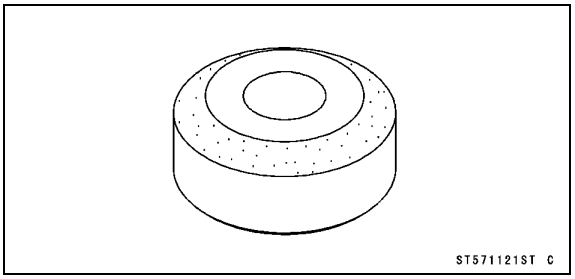
Valve Seat Cutter, 45° - ϕ35:
57001-1116



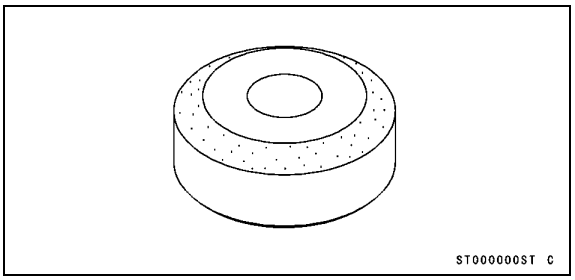
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Special Tools and Sealants

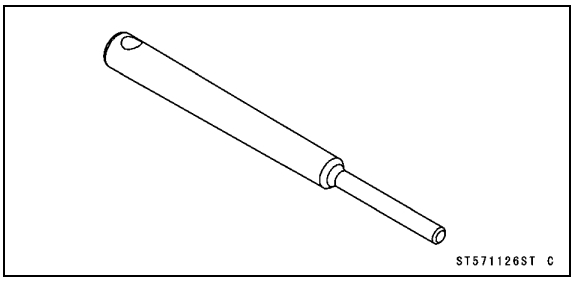
Valve Seat Cutter, 32° - ϕ35:
57001-1121



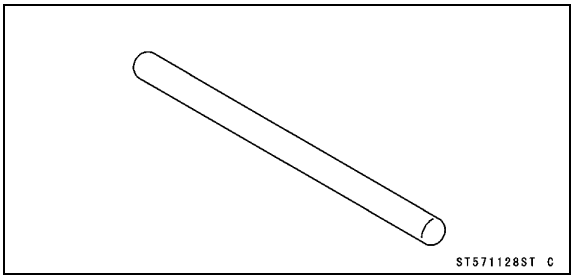
Valve Seat Cutter, 32° - ϕ38.5:
57001-1122



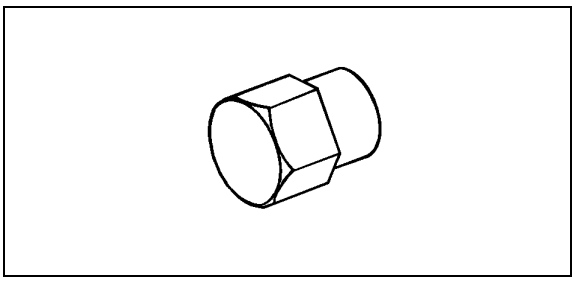
Valve Seat Cutter Holder, ϕ7:
57001-1126



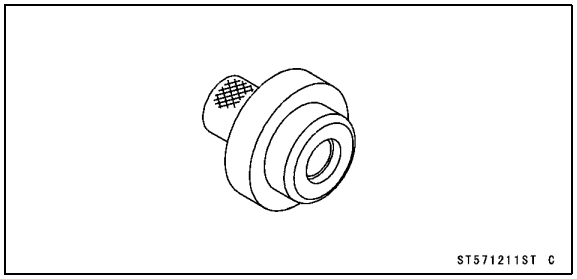
Valve Seat Cutter Holder Bar:
57001-1128



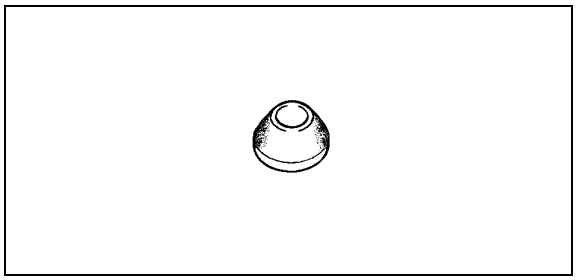
Hexagon Wrench, Hex 27:
57001-1210



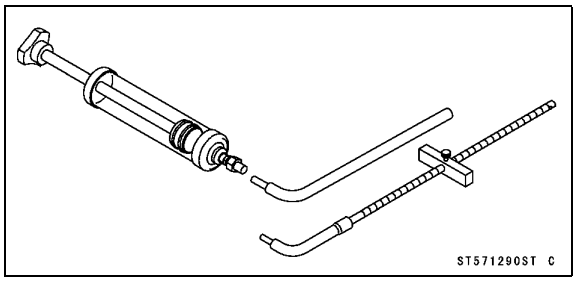
Piston Pin Puller Adapter, ϕ14:
57001-1211



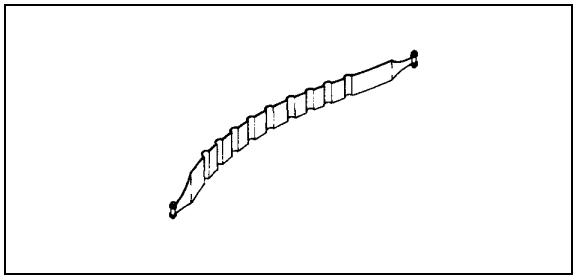
Valve Seat Cutter, 55° - ϕ35:
57001-1247



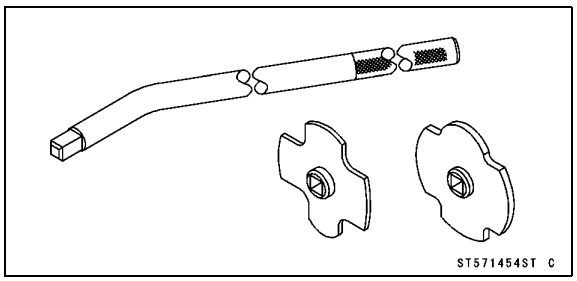
Fork Oil Level Gauge:
57001-1290



Piston Ring Compressor Belt, ϕ95 ~ ϕ108:
57001-1358



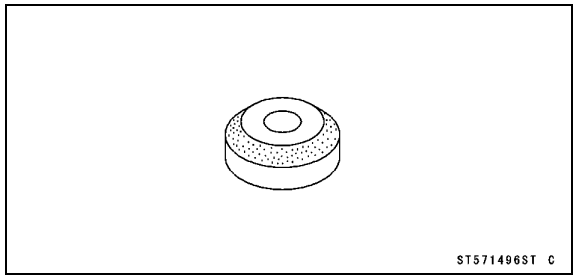
Filler Cap Driver:
57001-1454



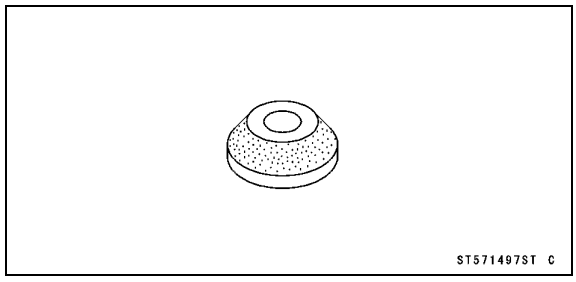
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Special Tools and Sealants

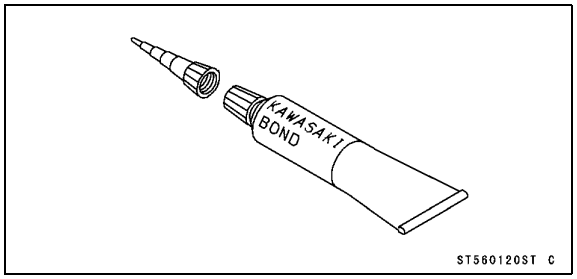
Valve Seat Cutter, 45° - ϕ40:
57001-1496



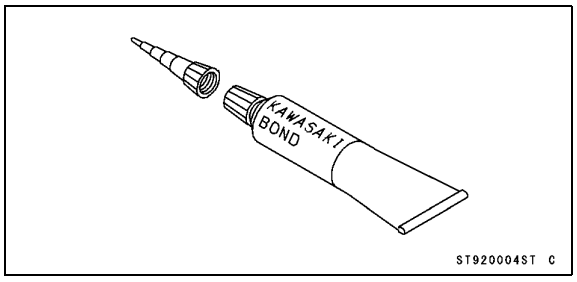
Valve Seat Cutter, 55° - ϕ38.5:
57001-1497



Kawasaki Bond (Silicone Sealant):
56019-120



Kawasaki Bond (Silicone Sealant):
92104-0004



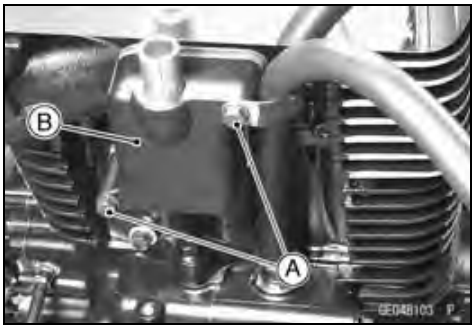
○Compression Gauge Adapter, M12 × 1.25: 57001-1183 can also be used.
○Valve Seat Cutter, 32° - ϕ33: 57001-1199 can also be used instead of Valve Seat Cutter, 32° - ϕ35: 57001-1121

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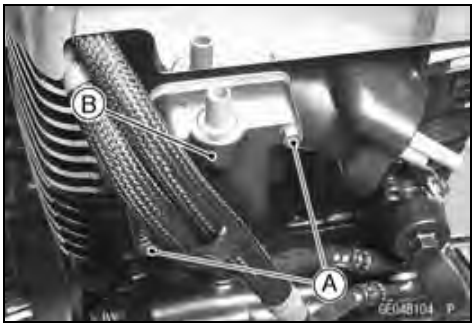
Clean Air System

Air Suction Valve Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Vacuum Switch Valve (see Vacuum Switch Valve Removal in this section)
- Unscrew the mounting bolts [A] and remove the front air suction valve cover [B].
- Remove the front air suction valve.



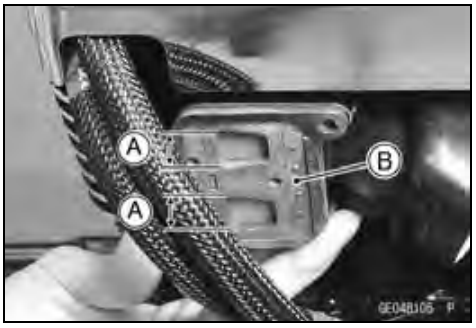
- Unscrew the mounting bolts [A] and remove the rear air suction valve cover [B].
- Remove the rear air suction valve.



Air Suction Valve Installation

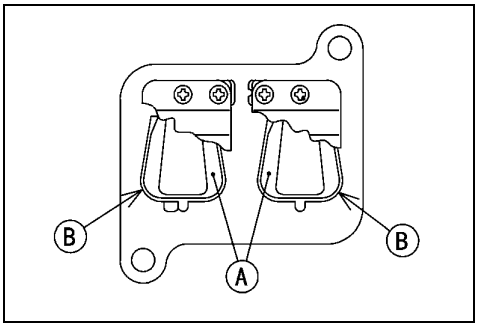
- Replace the gaskets with new ones.
- Install each air suction valve so that its wider side [A] of the reed faces left.
  Rear Air Suction Valve [B]
- Tighten:

Torque - Air Suction Valve Cover Bolts: 7.4 N·m (0.75 kgf·m, 65 in·lb)



Air Suction Valve Check

- Remove the air suction valve (see Air Suction Valve Removal in this chapter).
- Visually inspect the reeds for cracks, folds, warps, heat damage or other damage.
- ★If there is any doubt as to the condition of the reeds [A], replace the air suction valve as an assembly.
- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.



- If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high-flash point solvent.

CAUTION

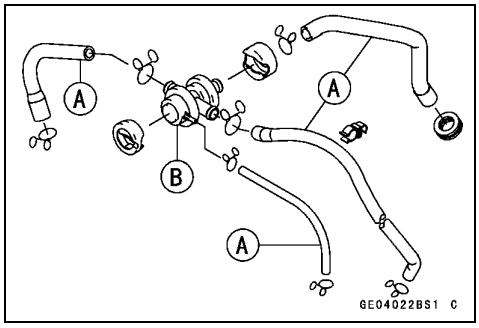
Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.

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Clean Air System

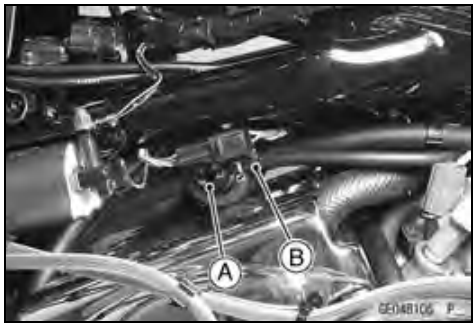
Vacuum Switch Valve Removal

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Pull off the hoses [A] and take out the vacuum switch valve [B].



Vacuum Switch Valve Installation

- Install the vacuum switch valve [A] so that the inlet vacuum hose [B] faces rear side.
- Route the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



Vacuum Switch Valve Operation Test

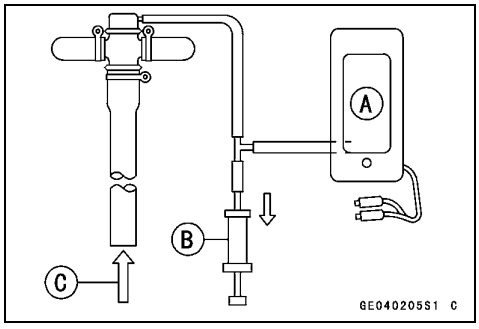
- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Vacuum Switch Valve Unit Test

- Remove the vacuum switch valve (see Vacuum Switch Valve Removal in this section).
- Connect a commercially available vacuum gauge [A] and syringe [B] (or fork oil level gauge) to the vacuum hoses as shown.

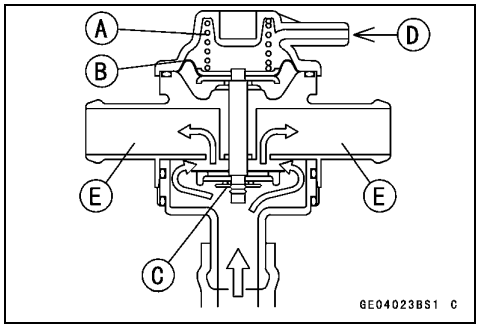
Special Tool - Fork Oil Level Gauge: 57001-1290

Air Flow [C]



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

Spring [A]
Diaphragm [B]
Valve [C]
Low Vacuum [D]
Secondary air flows [E].



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Clean Air System

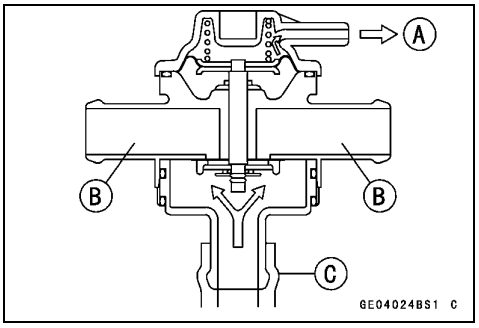
★If the vacuum switch valve does not operate as described, replace it with a new one.

NOTE

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

Vacuum Switch Valve Closing Pressure (Open → Close)
Standard: 49.3 ~ 65.3 kPa (370 ~ 490 mmHg)

High Vacuum [A]
Secondary air cannot flow [B].



Clean Air System Hose Inspection

● Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the right air cleaner base, vacuum switch valve, throttle body, and air suction valve covers.

★If they are not, correct them. Replace them if they are damaged.

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Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

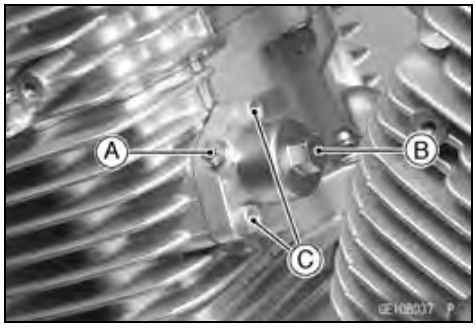
CAUTION

This is a non-return type cam 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 cam chain timing, and damage the valves.

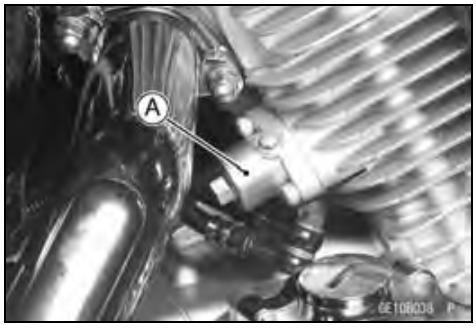
- For the front chain tensioner, remove the lower air cleaner duct and left air cleaner base holder (see Air Cleaner section in the Fuel System (DFI) chapter).

○The procedure to remove the front chain tensioner is as follows.

- Loosen the lockbolt [A] and remove the tensioner cap [B].
- Remove the tensioner mounting bolts [C] and take off the chain tensioner.



- For the rear chain tensioner [A], removal is the same as for the front chain tensioner.

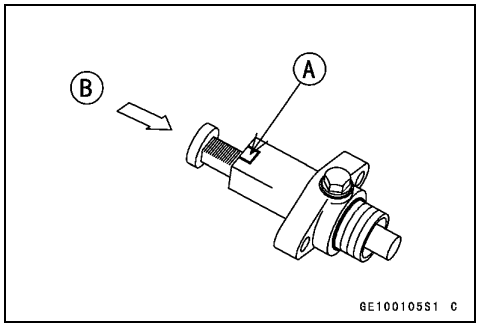


Camshaft Chain Tensioner Installation

CAUTION

Be sure to install the camshaft chain tensioner after camshaft chain is timed.

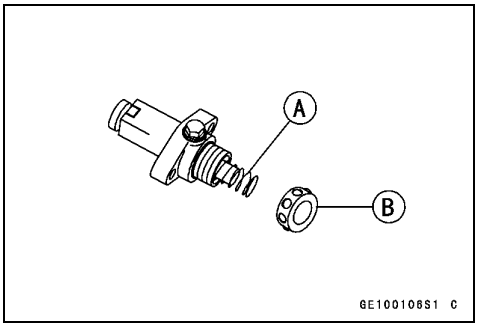
- Push the stopper [A] to release the ratchet and push the push rod [B] into the tensioner body.



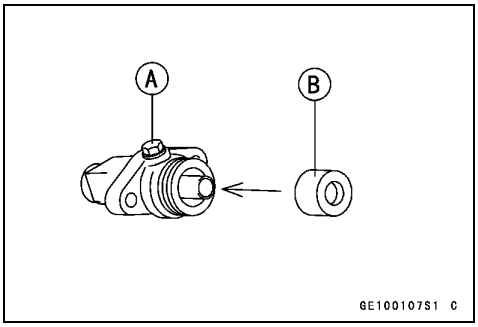
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Camshaft Chain Tensioner

● Install the larger spring [A], and then the ball bearing assy [B].
○Fit the ball bearing assy into the body until it bottoms out, using a thin-bladed screwdriver.

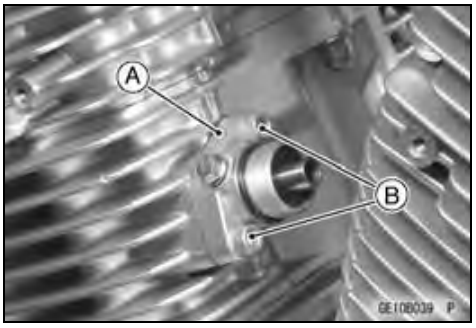


● Screw in the lockbolt [A] finger-tight to hold the ball bearing assy temporarily.
● Install the retainer [B].



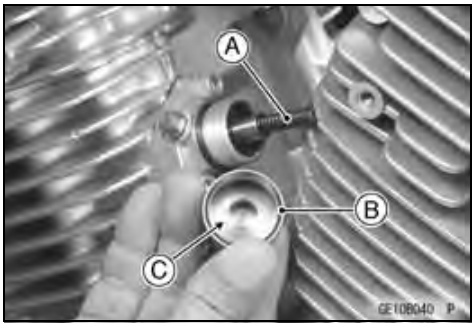
● Install the tensioner body [A] and tighten the mounting bolts [B] to the specified torque.

Torque - Chain Tensioner Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



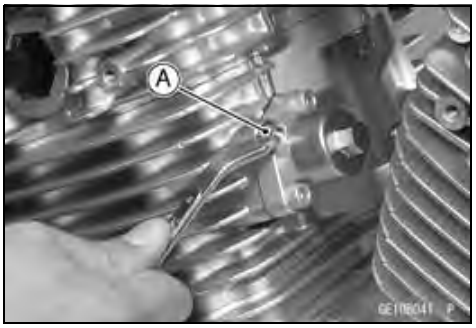
● Install the smaller spring [A] and the tensioner cap [B].
○Set the spring end into the hollow [C] of the cap.
● Tighten the tensioner cap to the specified torque.

Torque - Chain Tensioner Cap: 20 N·m (2.0 kgf·m, 15 ft·lb)



● Remove the lockbolt [A] and check to be sure that the larger spring clicks, then install the lockbolt.

Torque - Chain Tensioner Lockbolt: 4.9 N·m (0.50 kgf·m, 43 in·lb)

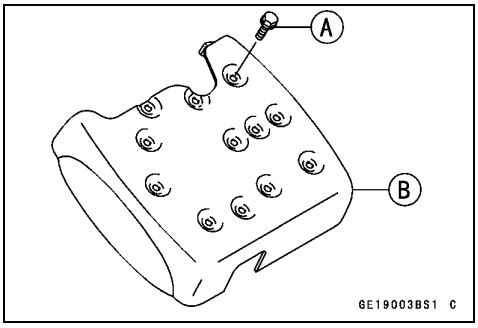


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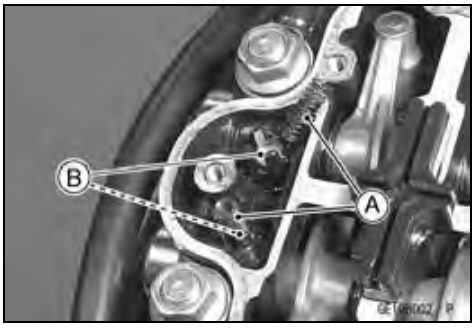
Rocker Case Cover

Rocker Case Cover Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Vacuum Switch Valve (see Vacuum Switch Valve Removal in this chapter)
- Remove the bolts [A] and take off the cover [B] from the rocker case.



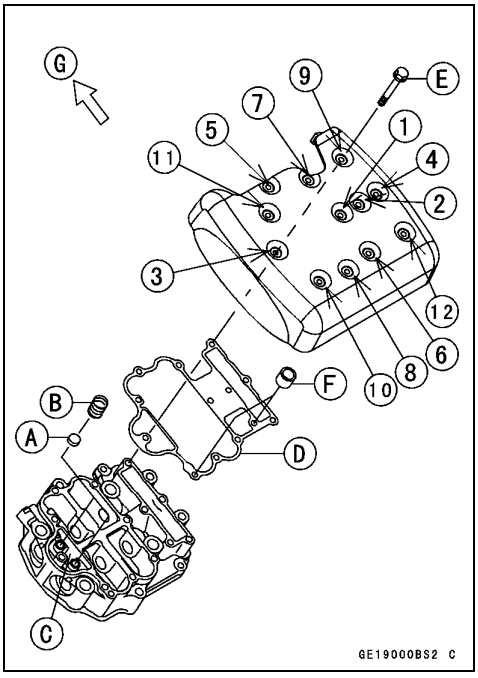
- Take out the oil filter springs [A] and HLA oil filters [B].



Rocker Case Cover Installation

- Replace the HLA oil filters [A] with new ones.
- Install the oil filter springs [B].
- After installing the rocker case, fill the oil reservoir [C] with engine oil.
- Replace the cover gasket [D] with a new one.
- Tighten the cover bolts [E] to the specified torque following the tightening sequence.
  Dowel Pins [F]
  Inlet Side [G]

Torque - Rocker Case Cover Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



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Rocker Case Cover

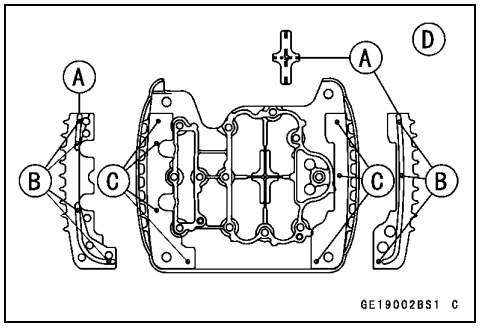
Rocker Case Cover Assembly

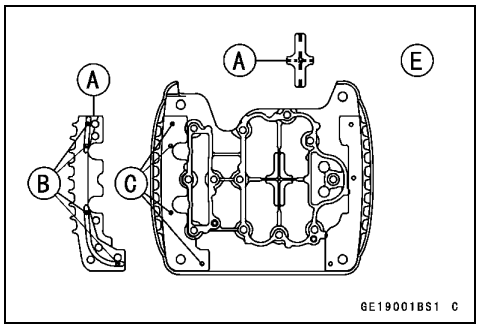
● Apply adhesive to the rubber dampers [A] and install them on the rocker case cover as shown.

○Insert the projections [B] of the dampers to the holes [C] of the cover.

Front Cover [D]

Rear Cover [E]





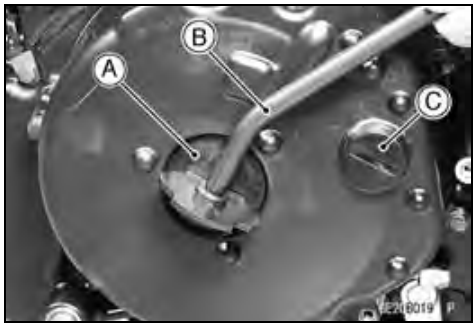
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Rocker Case

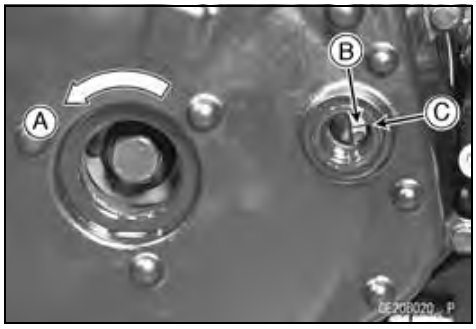
Rocker Case Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Rocker Case Covers (see Rocker Case Cover Removal in this chapter)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
- Remove the timing inspection cap [A] and rotor bolt cap [B].

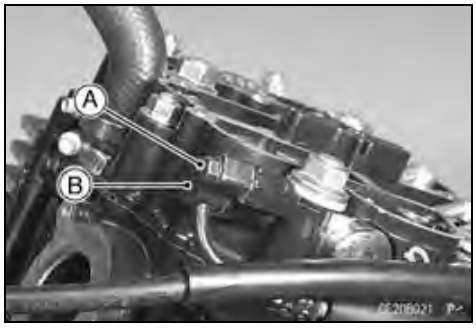
Special Tool - Filler Cap Driver [C]: 57001-1454



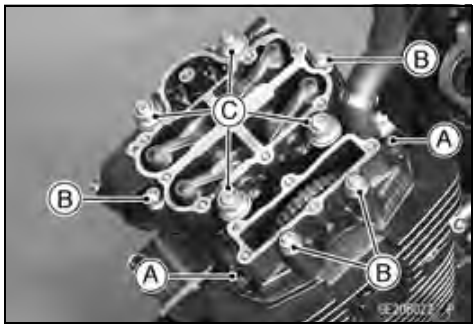
- Turn the crankshaft counterclockwise [A] and align the "**F**" mark (TDC mark for front piston) [B] with the middle of the notch [C].



- Remove:
  Oil Hose Flange Bolt [A]
  Oil Hose [B]



- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal in this chapter).
- Remove the rocker case bolts [A], smaller nuts [B], and then larger nuts [C].



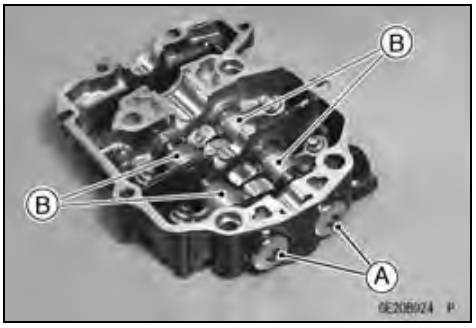
- Using the pry points [A], take the rocker case out of the cylinder head.



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Rocker Case

- Unscrew the rocker shafts [A], and take the rocker arms [B] out of the rocker case.
- Take out the oil filters if necessary.
- Remove the lash adjuster if necessary (see HLA Removal in this chapter).



CAUTION

The cylinder head and rocker case are machined in the assembled state, so they must be used as a set. Be careful not to mix them up for front and rear cylinders.

Rocker Case Installation

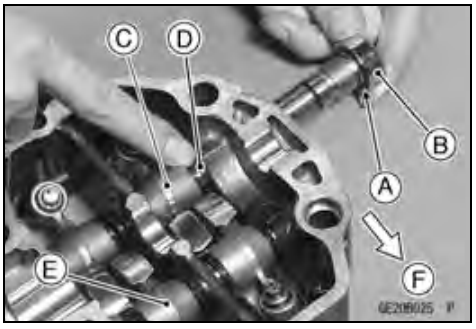
- Replace the O-rings [A] with new ones and install them on the rocker shaft [B].
- Apply molybdenum disulfide grease to the rocker shafts.
- Install the rocker arms [C] and retaining springs [D] on each rocker shaft as shown. These retaining springs are the same.

○The rocker arm [E] of the exhaust side [F] next to the chain tunnel is different from the others.

○Be careful not to tip the rocker arm and not to allow the oil to leak out of HLA.

- Tighten the rocker shafts to the specified torque.

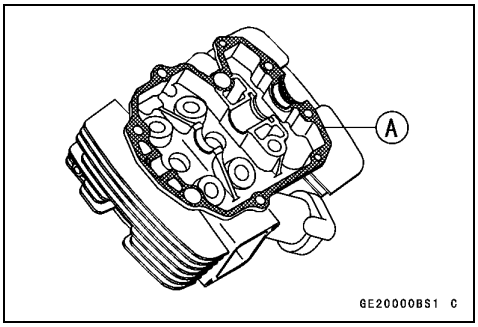
Torque - Rocker Shafts: 25 N·m (2.5 kgf·m, 18 ft·lb)



- Apply silicone sealant [A] to the rocker case mating surface and the outer circumference of the plugs as shown.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

○Do not apply silicone sealant around the camshaft bearing.

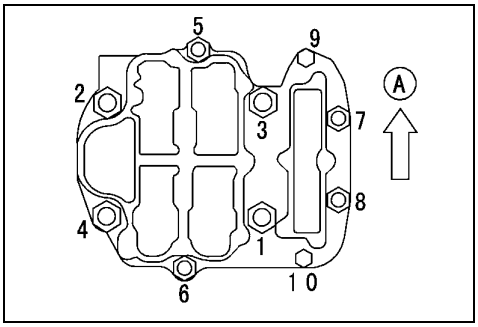


- Apply molybdenum disulfide oil solution to the threads and seating surface of M12 nuts and both sides of washers.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

- Tighten the rocker case nuts and bolts temporarily following the tightening sequence shown, and then tighten them to the specified torque.

Torque - M12 Rocker Case Nuts (1 ~ 4): 78 N·m (8.0 kgf·m, 58 ft·lb)
M8 Rocker Case Nuts (5 ~ 8): 25 N·m (2.5 kgf·m, 18 ft·lb)
Rocker Case Bolts (9, 10): 8.8 N·m (0.90 kgf·m, 78 in·lb)



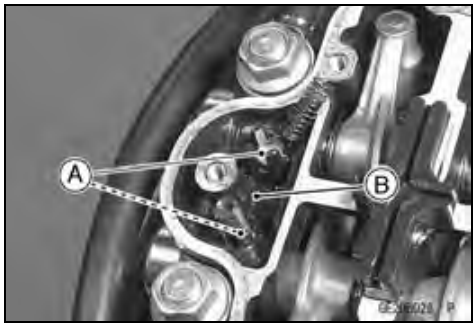
Inlet Side [A]

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Rocker Case

- Replace the HLA oil filters [A] with new ones.
- After installing the rocker case, fill the oil reservoir [B] with engine oil.
- Tighten:

Torque - Oil Hose Flange Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



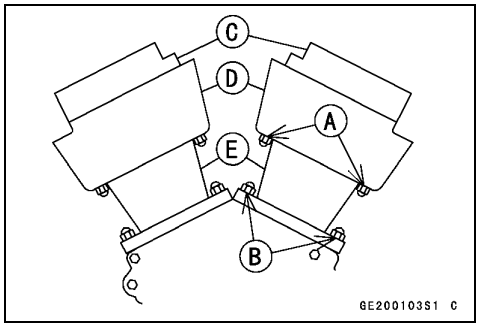
- Tighten the cylinder head nuts [A] and cylinder nuts [B] to the specified torque.

Torque - Cylinder Head Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Cylinder Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Rocker Cases [C]
Cylinder Heads [D]
Cylinders [E]

Special Tool - Filler Cap Driver: 57001-1454

Torque - Timing Inspection cap: 1.5 N·m (0.15 kgf·m, 13 in·lb)
Rotor Bolt Cap: 1.5 N·m (0.15 kgf·m, 13 in·lb)

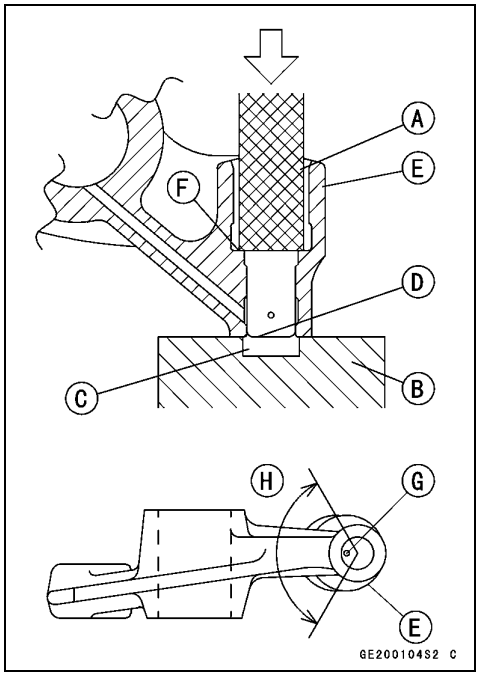


- Install:
  Throttle Body Assy (see Throttle Body Assy Installation in the Fuel System (DFI) chapter)
  Rocker Case Covers (see Rocker Case Cover Installation in this section)
  Engine (see Engine Installation in the Engine Removal/Installation chapter)

Rocker Arm Assembly

- Prepare a flat-end bar [A] and a block [B] with a recess [C].
- Press the oil chamber [D] for the HLA into the rocker arm end [E] until the chamber end is even with the step [F] of the hole.

○Install the oil chamber as shown so that the air bleed hole [G] is placed within 120 degrees [H]. This makes HLA bleeding easier.

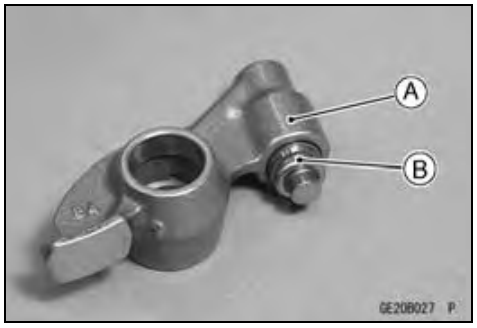


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Rocker Case

HLA Removal

- Remove the rocker arms (see Rocker Case Removal in this section).
- Pull the HLA (hydraulic lash adjuster) [B] out of the rocker arm [A] with fingers.



CAUTION

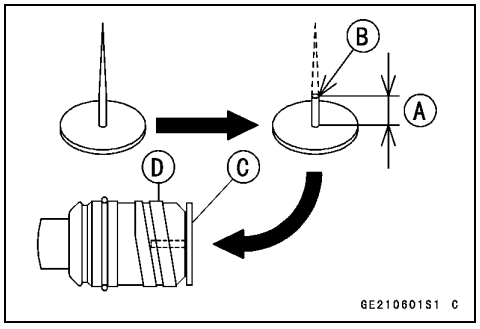
Be careful not to damage or deform an HLA by tapping it during removal or installation.
Do not drop the HLA or hit it sharply. If it is damaged, the plunger will not operate smoothly.

HLA Air Bleeding

- Remove the HLA (see HLA Removal in this section).
- Fill a container with engine oil.
- Prepare a thumbtack and cut its needle to 2.1 ~ 2.3 mm (0.0827 ~ 0.0906 in.) long [A]. Grind its cutting edge [B] smooth.
- Push in the check valve of the HLA [D] with the needle of the tack [C] and move the plunger up and down in the oil bath.

★If the plunger sinks into the HLA body, repeat the air bleeding procedure and then push the plunger.

★After air bleeding, if the plunger sinks into the HLA body again, replace the HLA.



CAUTION

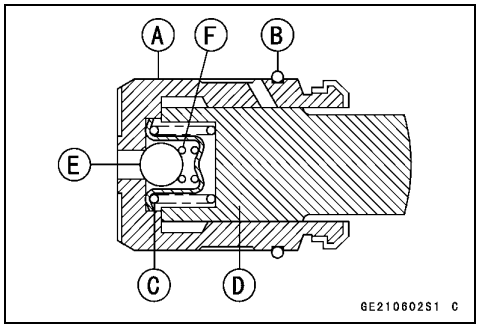
Do not push the check valve in more than 2.1 ~ 2.3 mm. Pushing too deep may cause the damage of the HLA.

HLA Installation

- Check that the HLA plunger is not damaged.

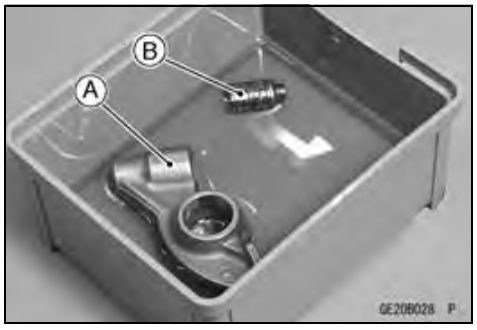
★If the plunger does damage, replace the HLA.

HLA Body [A]
O-ring [B]
Plunger Spring [C]
Pivot Plunger [D]
Check Valve [E]
Check Valve Spring [F]



- Air-bleed the HLA (see HLA Air Bleeding in this section).
- Soak a rocker arm [A] in engine oil, and then insert the HLA [B] into the rocker arm.

○Be careful not to tip the rocker arm having the HLA, and not to allow engine oil to leak out of the HLA.



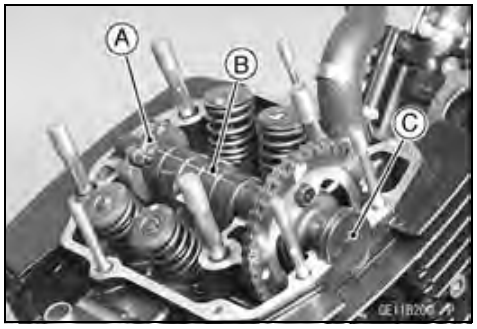
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Camshafts

Camshaft Removal

● Remove:
Rocker Case Covers (see Rocker Case Cover Removal in this chapter)
Rocker Cases (see Rocker Case Removal in this chapter)

● Remove the camshaft [B] along with the KACR [A].
○Remove the camshaft plug [C].
● Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.

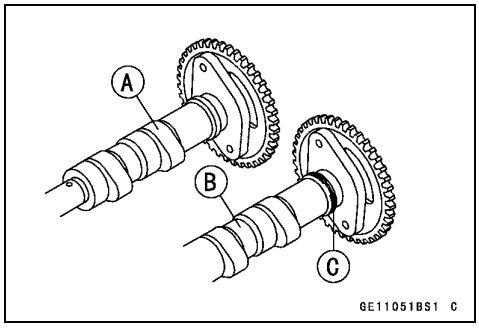


CAUTION

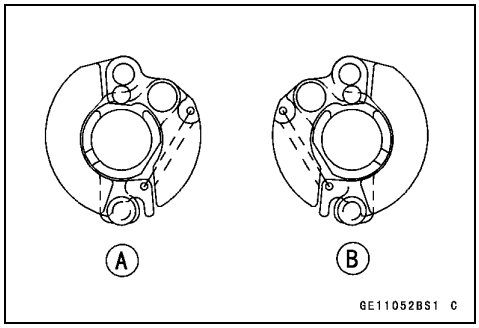
The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both chain and sprocket.

Camshaft Installation

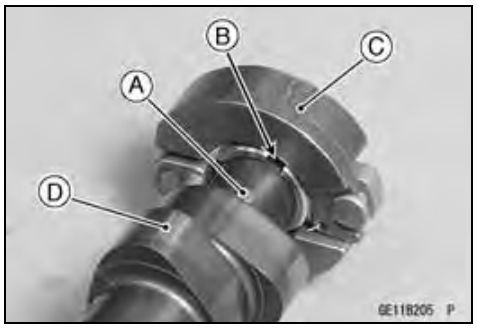
○The front camshaft [A] and rear camshaft [B] are different. The rear camshaft has a groove [C].



● Install the KACR on each camshaft.
○The front KACR [A] and rear KACR [B] are different (inside view). Do not confuse these KACRs.



● Fit the pin [A] into the notch [B], and install the KACR [C] onto the camshaft [D].
● Apply molybdenum disulfide oil solution to all cam parts, including their journals.
○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).
● Remove the timing inspection cap and check that the "**F**" mark aligns with the middle of the notch (front piston TDC) (see Camshaft Removal in this section).
★If necessary, align them.



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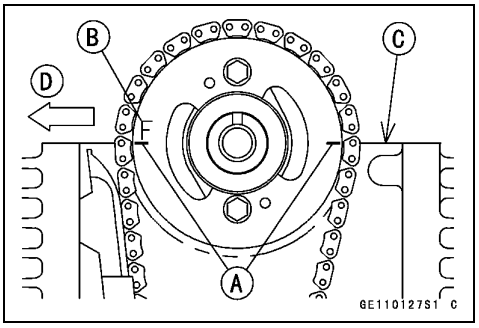
Camshafts

● First, install the front camshaft.

○Engage the front camshaft sprocket with the camshaft chain as shown.
Timing Marks [A]
"**F**" mark [B]
Cylinder Head Upper Surface [C]
Front [D]

○Pull the front side (exhaust side) of the chain taut to install the camshaft.

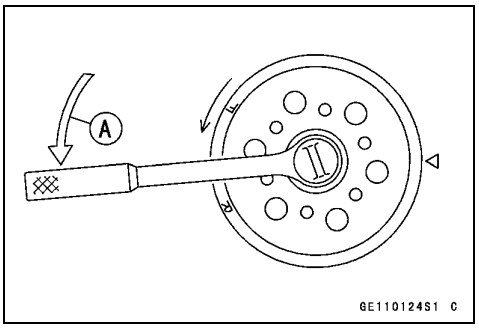
○Install the front chain tensioner (see Camshaft Chain Tensioner Installation in this chapter). The timing marks must be aligned with the cylinder head upper surface.



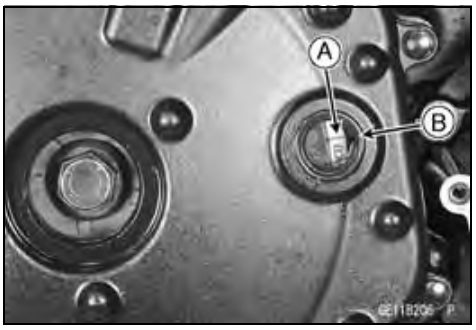
● Next, install the rear camshaft.

○Check to be sure that the front camshaft chain timing is correct.

○Turn the crankshaft counterclockwise [A].



● Align the "**R**" mark [A] (TDC mark for the rear piston) with the middle of the notch [B] (310° turn from the front piston TDC).



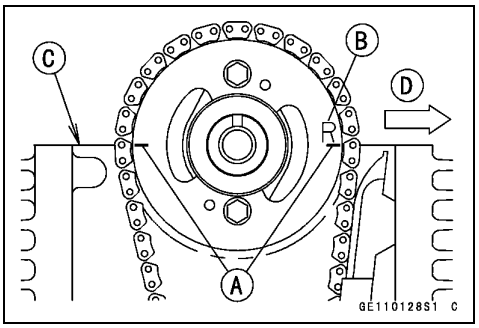
● Engage the rear camshaft sprocket with the camshaft chain as shown.
Timing Marks [A] and "**R**" Mark [B]
Cylinder Head Upper Surface [C]
Front [D]

○Pull the front side (inlet side) of the chain taut to install the camshaft.

● Install the rear chain tensioner and check the front/rear chain timing again.

○The timing marks must be aligned with the cylinder head upper surface and positioned as shown after chain tensioner installation.

● Install:
Rocker Cases (see Rocker Case Installation in this chapter)
Rocker Case Covers (see Rocker Case Cover Installation in this chapter)



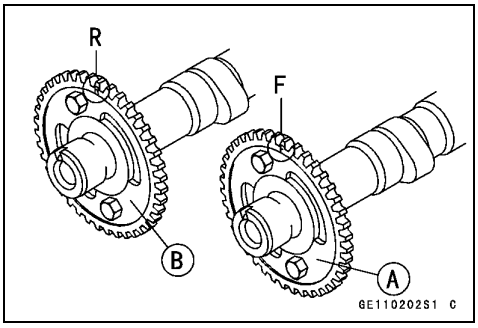
Special Tool - Filler Cap Driver: 57001-1454

Torque - Timing Inspection Cap: 1.5 N·m (0.15 kgf·m, 13 in·lb)
Rotor Bolt Cap: 1.5 N·m (0.15 kgf·m, 13 in·lb)

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Camshafts

Camshaft Sprocket Installation



- Use the sprocket marked "**F**" for the front camshaft [A] and the sprocket marked "**R**" for the rear camshaft [B].
- Apply a non-permanent locking agent to the camshaft sprocket bolts and tighten them to the specified torque.

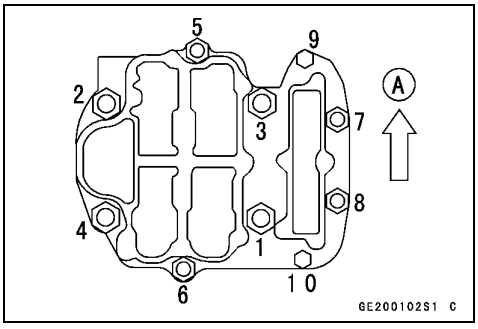
Torque - Camshaft Sprocket Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)

Camshaft/Rocker Case Wear

- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Measure each clearance between the camshaft and the rocker case using plastigage.

NOTE

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



- Apply molybdenum disulfide oil solution to the threads and seating surface of M12 nuts and both sides of washers.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10:1).

- Tighten the rocker case nuts and bolts temporarily following the tightening sequence shown, and then tighten them to the specified torque.

Torque - M12 Rocker Case Nuts (1 ~ 4): 78 N·m (8.0 kgf·m, 58 ft·lb)
M8 Rocker Case Nuts (5 ~ 8): 25 N·m (2.5 kgf·m, 18 ft·lb)
Rocker Case Bolts (9, 10): 8.8 N·m (0.90 kgf·m, 78 in·lb)

Inlet Side [A]

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Camshafts

● Remove the rocker case again, and measure the plastigage width [A] to determine the clearance between each journal and the rocker case. Measure the maximum plastigage width.



Camshaft/Rocker Case Clearance
Standard:

ϕ25	**0.020 ~ 0.062 mm (0.0008 ~ 0.0024 in.)**
ϕ17	**0.016 ~ 0.055 mm (0.0006 ~ 0.0022 in.)**

Service Limit:

ϕ25	**0.15 mm (0.0059 in.)**
ϕ17	**0.14 mm (0.0055 in.)**

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

Camshaft Journal Diameter
Standard:

ϕ25	**24.959 ~ 24.980 mm (0.9826 ~ 0.9835 in.)**
ϕ17	**16.966 ~ 16.984 mm (0.6680 ~ 0.6687 in.)**

Service Limit:

ϕ25	**24.93 mm (0.981 in.)**
ϕ17	**16.94 mm (0.667 in.)**

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

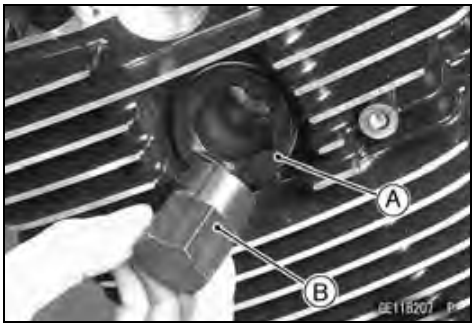
CAUTION

The rocker case and cylinder head are machined in the assembled state, so they must be replaced as a set.

Front Camshaft Chain Removal

● Remove:
Front Camshaft (see Camshaft Removal in this section)
Spark Plug (see Spark Plug Removal in the Electrical System chapter)
Spark Plug Retainer [A]

Special Tool - Hexagon Wrench, Hex 27 [B]: 57001-1210



● Remove:
Alternator Inner Cover (see Alternator Inner Cover Removal in the Electrical System chapter)
Alternator Inside Stator (Alternator Inside Stator Removal in the Electrical System chapter)
Crankshaft Balancer Gear (see Crankcase Disassembly in the Crankshaft/Transmission chapter)
Lower Chain Guide Bolts [A]
Lower Chain Guide [B]



● Take out the front camshaft chain [C].

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Camshafts

Front Camshaft Chain Installation

- Apply a non-permanent locking agent to the threads of the chain guide bolts, and tighten them to the specified torque.

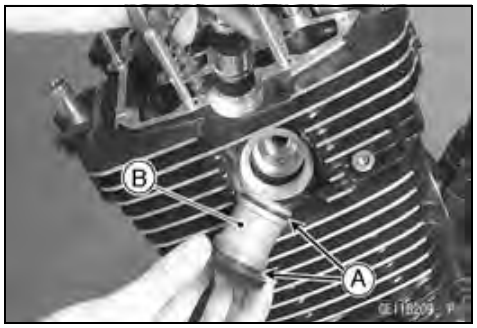
  Torque - Camshaft Chain Guide Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Install:
  Crankshaft Balancer Gear (see Crankcase Assembly in the Crankshaft/Transmission chapter)
  Alternator Inside Stator (see Alternator Inside Stator Installation in the Electrical System chapter)
  Alternator Inner Cover (see Alternator Inner Cover Installation in the Electrical System chapter)

- Apply grease to the O-ring [A].
- Pull the camshaft chain up the chain tunnel, insert the spark plug retainer [B] through the chain loop, and tighten it.

  Special Tool - Hexagon Wrench, Hex 27: 57001-1210

  Torque - Spark Plug Retainer: 12 N·m (1.2 kgf·m, 104 in·lb)

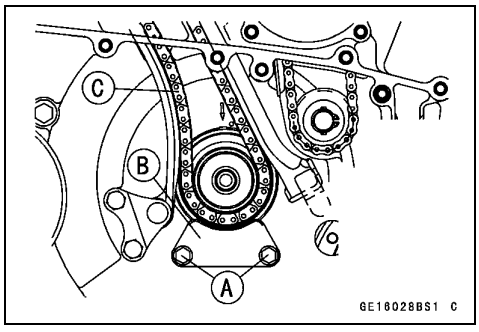


- Install:
  Spark Plug (see Spark Plug Installation in the Electrical System chapter)
  Front Camshaft (see Camshaft Installation in this section)

Rear Camshaft Chain Removal

- Remove:
  Rear Camshaft (see Camshaft Removal in this section)
  Spark Plug (see Spark Plug Removal in the Electrical System chapter)
  Spark Plug Retainer (see Front Camshaft Chain Removal in this section)
  Clutch (see Clutch Removal in the Clutch chapter)
  Starter Clutch Gear (see Crankcase Disassembly in the Crankshaft/Transmission chapter)
  Primary Gear (see Primary Gear Removal in the Crankshaft/Transmission chapter)

- Remove:
  Lower Chain Guide Bolts [A]
  Lower Chain Guide [B]
- Take out the rear camshaft chain [C].



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Camshafts

Rear Camshaft Chain Installation

- Apply a non-permanent locking agent to the threads of the chain guide bolts, and tighten them to the specified torque.

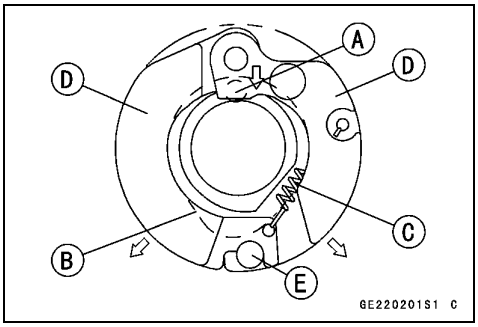
Torque - Camshaft Chain Guide Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Install the spark plug retainer (see Front Camshaft Chain Installation in this section).
- Install the removed parts (see appropriate chapters).

KACR (Kawasaki Automatic Compression Release) Inspection

○Due to the simplicity of the KACR, no periodic maintenance is needed. There are only two symptoms of problems with the KACR mechanism compression is not released during starting, and compression is released during running.

○The cylinder compression is not released during starting (abnormal): the pin [A] stays within the cam [B] and will not push up the exhaust rocker arm.



- Remove the KACR unit and visually inspect the spring [C].

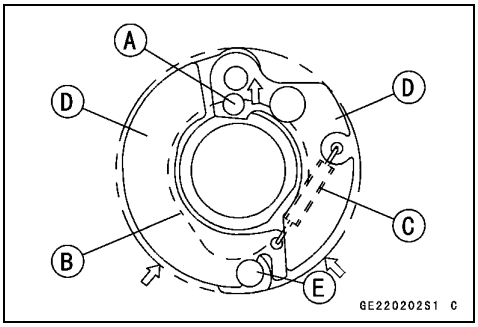
★If the spring is damaged, deformed, or missing, replace the spring.

- Remove the spring and move the weights [D] back and forth.

★If the weights do not move smoothly all the way, replace the KACR unit. Also inspect the exhaust rocker arm for any damage, and replace the rocker arm if necessary.

Stopper [E]

○The cylinder compression is released while the engine is running (abnormal): the pin [A] stays out the cam [B] and pushes up the exhaust rocker arm.



- Remove the spring [C] and move the weights [D] back and forth.

★If the weights do not move easily from the retracted position, replace the KACR unit. Also inspect the exhaust rocker arm for any damage, and replace the rocker arm if necessary.

Stopper [E]

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Cylinder Head

Cylinder Compression Measurement

NOTE

○*Be sure the battery is fully charged.*

- Warm up the engine thoroughly.
- Stop the engine.
- Remove one spark plug and attach the compression gauge and adapter firmly into the spark plug hole. Do not remove the other spark plug, only the plug lead.
- For the other cylinder, remove both spark plugs.

Special Tool - Spark Plug Wrench, Hex 18 [A]: 57001-1024



- 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 [A]: 57001-221
Compression Gauge Adapter, M12 × 1.25 [B]: 57001-1018 (or 57001-1183)



Cylinder Compression
Usable Range: 340 ~ 590 kPa (3.5 ~ 6.0 kg/cm², 50 ~ 85 psi) @300 r/min (rpm)

○The compression gauge adapter: 57001-1183 can also be used.

- Repeat the measurement for the other cylinder.
- Install the spark plugs.

Torque - Spark Plugs: 18 N·m (1.8 kgf·m, 13 ft·lb)

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Cylinder Head

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

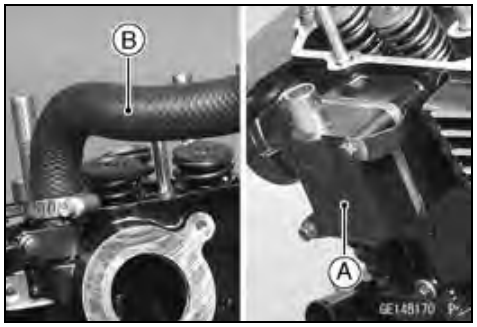
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon buildup on piston and in combustion chamber possibly due to damaged valve stem, valve guide, stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket thickness.	Replace the gasket with a standard part.
	Damaged or missing compression release cam spring.	Replace the spring.
	Compression release weights do not move smoothly.	Replace the compression release unit.
Cylinder compression is lower than usable range	Gas leakage around cylinder head	Replace damaged gasket and check cylinder head warp.
	Bad condition of valve seats, valves, and valve springs.	Repair them if necessary.
	HLA seizure.	Replace the HLA.
	Incorrect piston/cylinder clearance	Replace the piston and/or cylinder.
	Piston seizure.	Inspect the cylinder and liner 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.
	Compression release weights do not move smoothly.	Replace the compression release unit.

Cylinder Head Removal

● Remove:
Engine (see Engine Removal in the Engine Removal/Installation chapter)
Rocker Cases (see Rocker Case Removal in this chapter)
Camshafts (see Camshaft Removal in this chapter)
Spark Plug Retainers (see Front Camshaft Chain Removal in this chapter)

○The camshaft chain comes off.

● Remove:
Air Suction Valves [A] (see Air Suction Valve Removal in this chapter)
Cooling Pipes with Hoses [B]



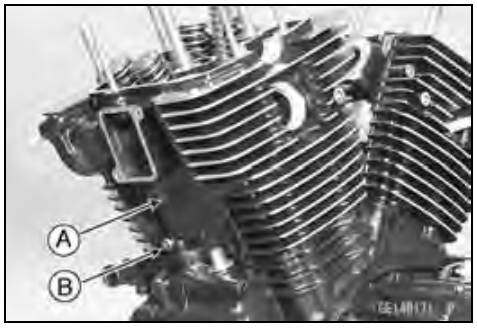
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Cylinder Head

- Remove the cylinder head nuts [A].
- Take the cylinder head off the cylinder.

NOTE

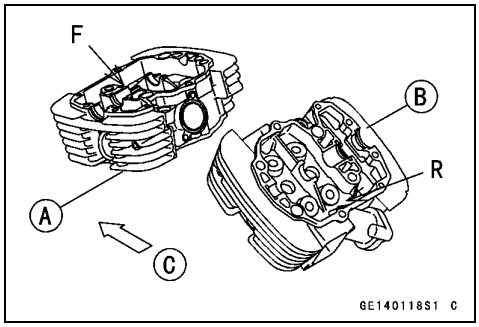
○*Do not remove the coolant drain plug [B] yet.*



Cylinder Head Installation

○The front cylinder head [A] has an "**F**" mark while the rear cylinder head [B] has an "**R**" mark. Be careful not to mix them up.

Front [C]



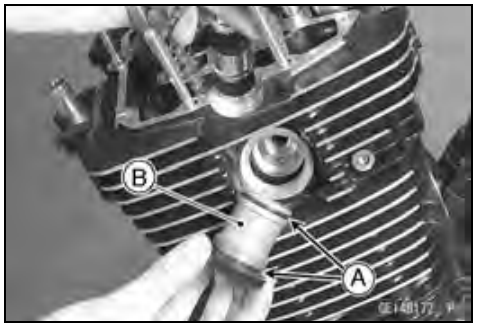
CAUTION

The cylinder head and rocker case are machined in the assembled state, so they must be used as a set.

- Replace the cylinder head gasket with a new one.
- Tighten the cylinder head nuts temporarily (These nuts are tightened to the specified torque after installing rocker case installation).
- Apply grease to the O-ring [A].
- Pull the camshaft chain up the chain tunnel, insert the spark plug retainer [B] through the chain loop, and tighten it.

Special Tool - Hexagon Wrench, Hex 27: 57001-1210

Torque - Spark Plug Retainer: 12 N·m (1.2 kgf·m, 104 in·lb)



- Install:

  Spark Plugs (see Spark Plug Installation in the Electrical System chapter)

  Camshafts (see Camshaft Installation in this chapter)

  Rocker Cases (see Rocker Case Installation in this chapter)

  Air Suction Valves (see Air Suction Valve Installation in this chapter)

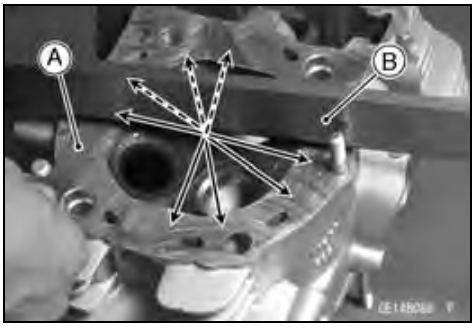
- Tighten:

Torque - Cylinder Head Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Cylinder Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Water Pipe Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

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Cylinder Head

Cylinder Head Warp



- Remove the cylinder head (see Cylinder Head Removal in this chapter).
- 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 straight edge [B] and the head.

Cylinder Head Warp
Standard: – – –
Service Limit: 0.05 mm (0.002 in.)

★If they cylinder head is warped more than the service limit, replace it.

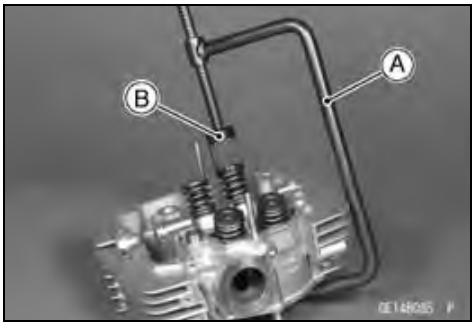
★If they cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).

Valve Clearance Adjustment

NOTE

○*Since the hydraulic lash adjusters constantly maintain zero clearance, it is not necessary to inspect or adjust the valve clearance.*

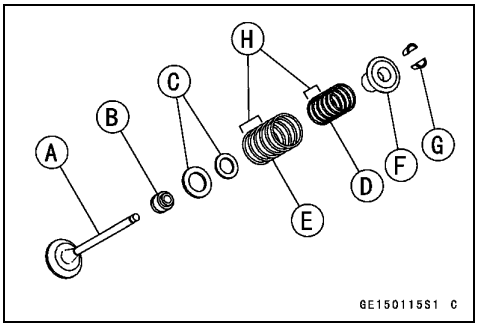
Valve Removal



- Remove the cylinder head (see Cylinder Head Removal in this section).
- Swing open the rocker arm.
- Using the valve spring compressor assembly, remove the valve.

Special Tools - Valve Spring Compressor Assembly [A]: 57001-241
Valve Spring Compressor Adapter, ϕ28.2 [B]: 57001-243

Valve Installation



- Replace the stem 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 [A] and Stem Oil Seal [B]
Spring Seats [C]
Inner Spring [D] and Outer Spring [E]
Retainer [F] and Split Keepers [G]
Closed Coil End [H]

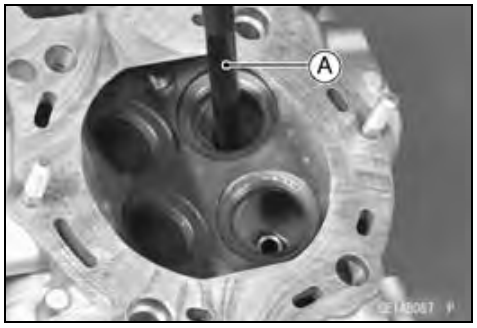
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Cylinder Head

Valve Guide Removal

- Remove the valve, stem oil seal and spring seats.
- 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.

Special Tool - Valve Guide Arbor, ϕ7: 57001-163



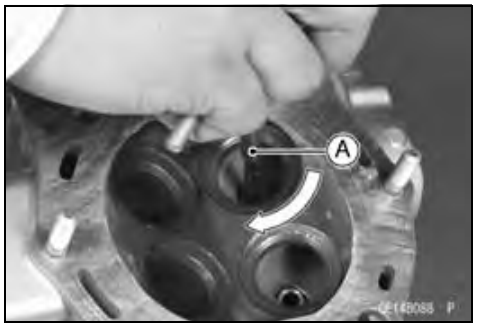
CAUTION

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

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) in the engine oil.
- Drive the valve guide in from the top of the head using the valve guide arbor. The flange stops the guide from going in too far.

Special Tool - Valve Guide Arbor, ϕ7: 57001-163



- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.

○Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counter-clockwise or it will be dulled.

○Once the guides are reamed, they must be cleaned thoroughly.

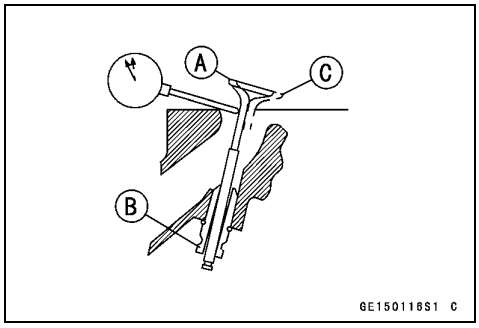
Special Tool - Valve Guide Reamer, ϕ7: 57001-162

Valve Guide Wear (Wobble Method)

○If a small bore gauge is not available, inspect the valve guide wear by measuring the valve-to-guide clearance with the wobble method as indicated below. The reading is not actual valve-to-guide clearance because the measuring point is above the guide.

- 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-to-valve guide clearance.
- Repeat the measurement in a direction at a right angle (90°) to the first.

★If the reading exceeds the service limit, replace the guide.



Valve-to-Guide Clearance (Wobble Method)

Standard:

Exhaust	**0.08 ~ 0.15 mm (0.003 ~ 0.006 in.)**
Inlet	**0.05 ~ 0.13 mm (0.002 ~ 0.005 in.)**

Service Limit:

Exhaust	**0.35 mm (0.014 in.)**
Inlet	**0.33 mm (0.013 in.)**

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Cylinder Head

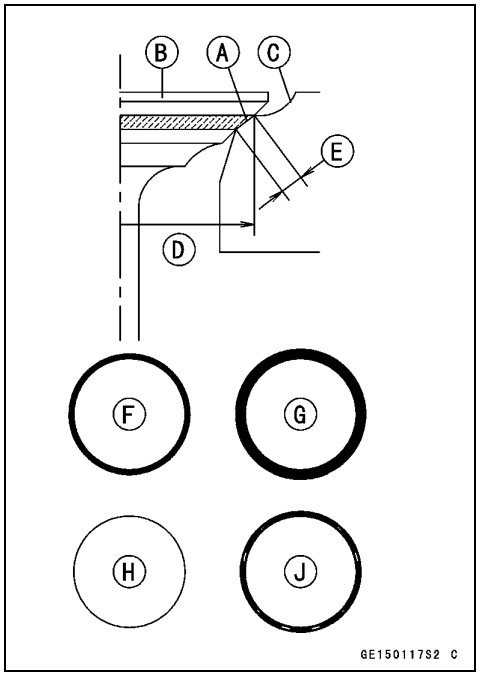
Valve Seat Inspection

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

Valve Seat Surface Outside Diameter
Standard:
Exhaust 28.9 ~ 29.1 mm (1.14 ~ 1.15 in.)
Inlet 31.9 ~ 32.1 mm (1.25 ~ 1.26 in.)

○Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with vernier calipers.
Good [F]
★If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair in this section).

Valve Seat Surface Width
Standard:
Exhaust 0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)
Inlet 0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)



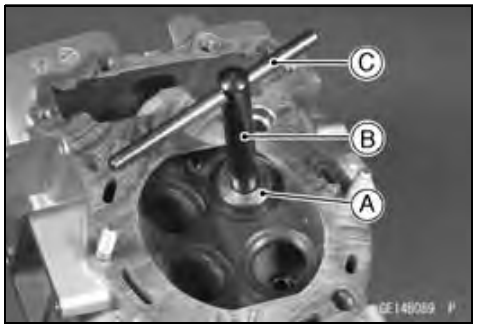
Valve Seat Repair

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

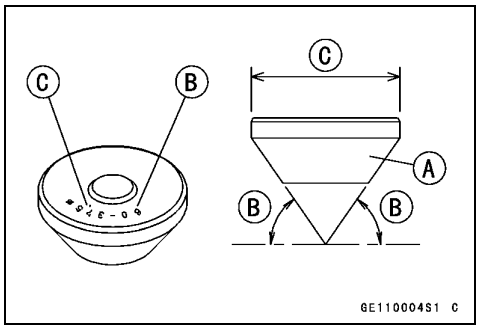
Special Tools - Valve Seat Cutter Holder, φ7 [B]: 57001-1126
Valve Seat Cutter Holder Bar [C]: 57001 -1128

For Exhaust Valve Seat
Valve Seat Cutter, 45° - φ35: 57001-1116
Valve Seat Cutter, 32° - φ35: 57001-1121
(or 32° - φ33: 57001-1199)
Valve Seat Cutter, 55° - φ35: 57001-1247

For Inlet Valve Seat
Valve Seat Cutter, 45° - φ40: 57001-1496
Valve Seat Cutter, 32° - φ38.5: 57001-1122
Valve Seat Cutter, 55° - φ38.5: 57001-1497



○The marks stamped on the back of the cutter [A] represent the following.
55° ..... Cutter Angle [B]
φ37.5 ..... Outer Diameter of Cutter [C]
★If the manufacturer's instructions are not available, use the following procedure.



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Cylinder Head

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.

Do not drop or shock the valve seat cutter, or the diamond particles may fall off.

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.

CAUTION

Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

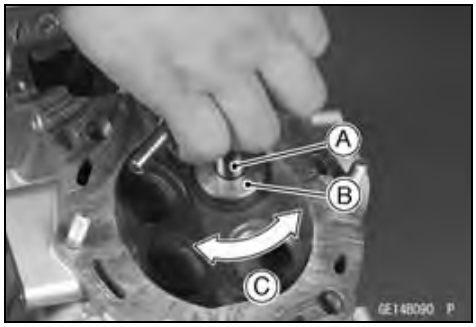
NOTE

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

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

Operating Procedures

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



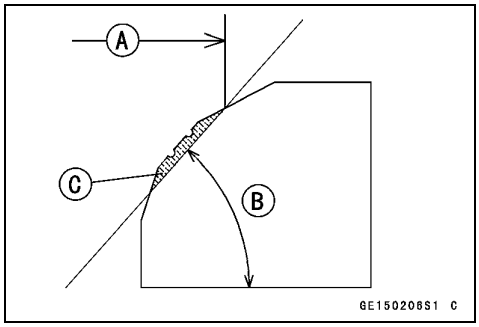
CAUTION

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, HLA could not work and the cylinder head must be replaced.

- Measure the outside diameter [A] of the seat surface (seat O.D.) with vernier calipers.

★If the seat O.D. is too small, repeat the 45° grind [B] until the diameter is within the specified range.

Ground Voluum [C]



NOTE

○*Remove all pittings or flaws from 45° ground surface.*

○*After grinding with 45° cutter, apply thin coat of machinist's dye to seat surface. This makes seat surface distinct and 32° and 55° grinding operation easier.*

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

★If the seat O.D. is too large, make the 32° grind described below.

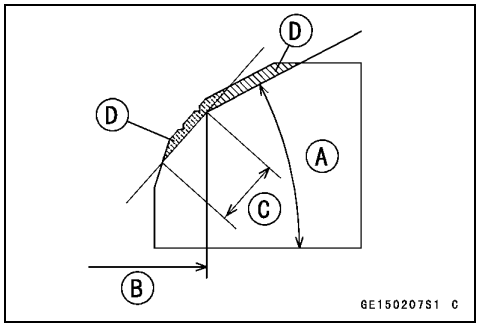
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Cylinder Head

○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.

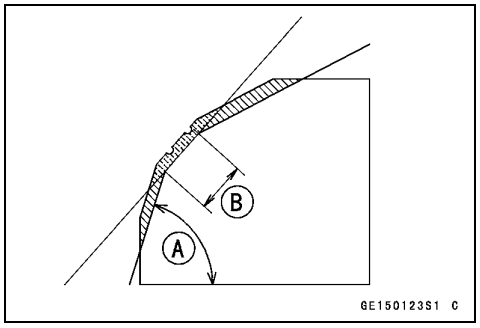
CAUTION

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

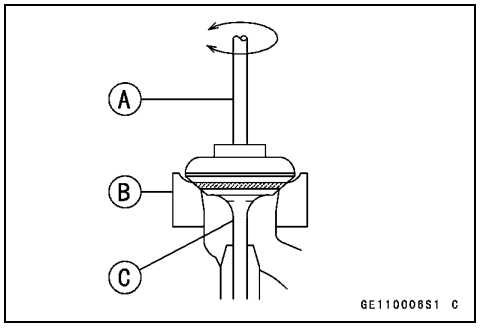


● Grind the seat at a 32° angle [A] until the seat O.D. [B] is within the specified range.
★If the seat O.D. is within the specified range, measure the seat width as described below.
● To measure the seat width, use vernier calipers to measure the width [C] of the 45° angle portion of the seat at several places around the seat.
Ground Voluum [D]
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then measure the seat O.D..

★If the seat width is too wide, make the 55° grind described below.
● To make the 55° grind, fit 55° cutter into the holder, and slide it into the valve guide.
● Turn the holder, while pressing down lightly.
● Grind the seat at a 55° angle [A] until the seat width [B] is within the specified range.
★If the seat width is within the specified range, lap the valve to the seat as described below.



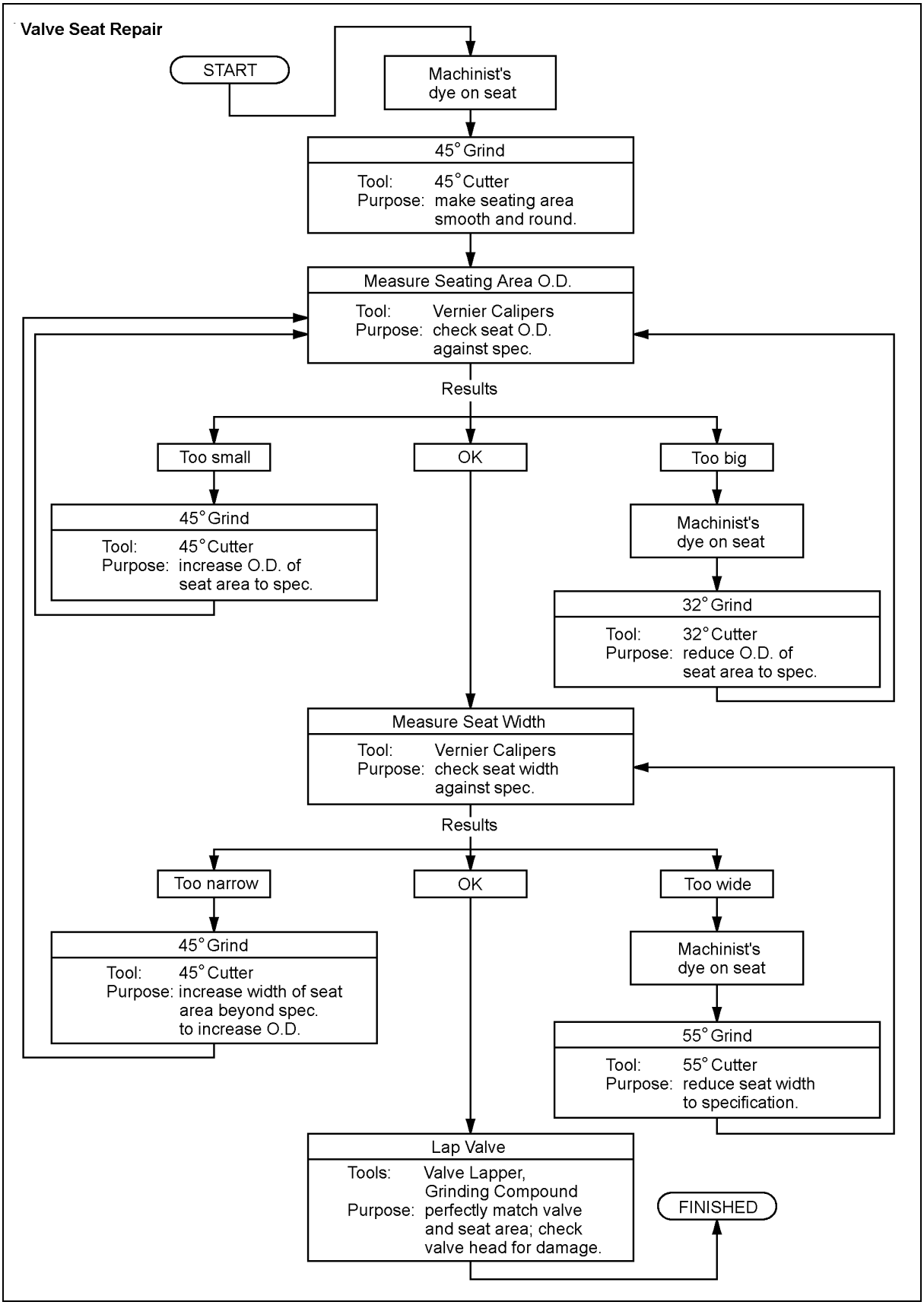
● Lap the valve to the seat, once the seat width and O.D. are within the ranges specified above.
○Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
○Spin the valve against the seat until the grinding compound produces a smooth, matched surface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



● The seat 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.

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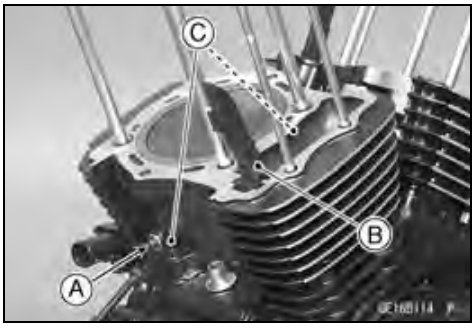
Cylinder Head



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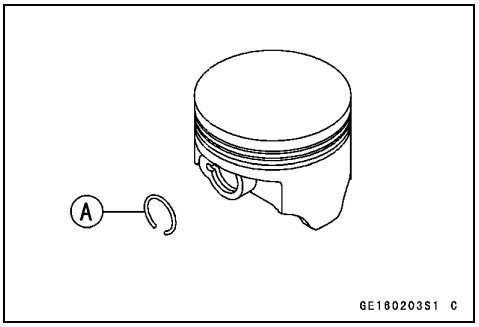
Cylinders, Piston

Cylinder Removal



- Remove the cylinder head (see Cylinder Head Removal in this chapter).
- Remove the coolant drain plug [A] and drain the coolant from the cylinder.
- Pull out the front camshaft chain guide [B].
- Remove the cylinder nuts [C].
- Tap lightly up the cylinder with a plastic mallet to separate from the crankcase.
- Remove the cylinder base gasket.

Piston Removal



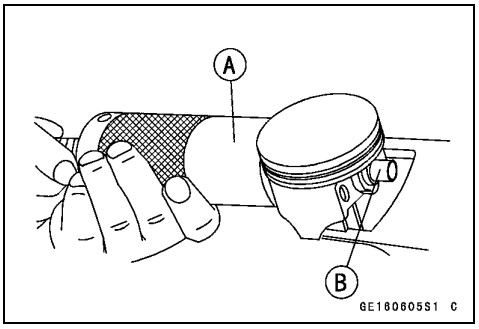
- Remove the cylinder block (see Cylinder Removal in this section).
- Place a piece of clean cloth under the piston and remove the piston pin snap rings [A] from the outside of each piston.

CAUTION

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

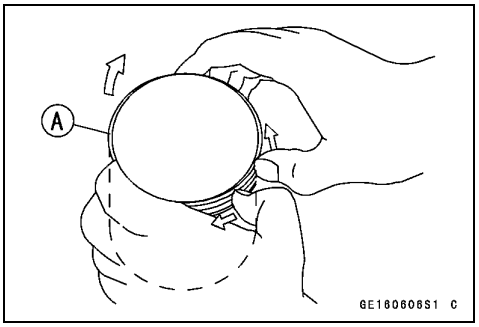
- Using the piston pin puller assembly, remove the piston pins.

Special Tools - Piston Pin Puller Assembly [A]: 57001-910
Piston Pin Puller Adapter [B]: 57001-1211



- Remove the piston.

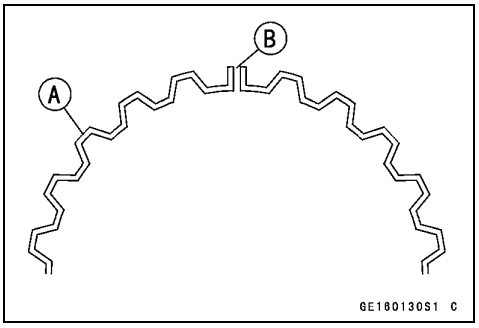
- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



Cylinder, Piston Installation

NOTE

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



- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.

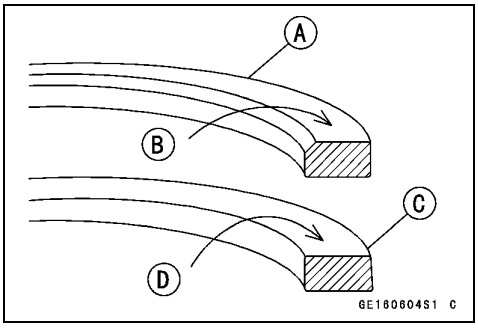
○Spread the rail with your thumbs, but only enough to fit the rail over the piston.

○Release the rail into the bottom piston ring groove.

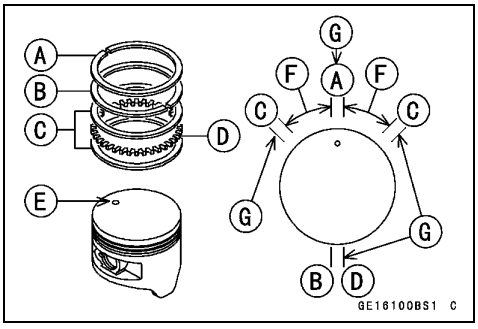
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Cylinders, Piston

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



- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 ~ 45° [F] of angle from the opening of the top ring.
  Top Ring [A]
  Second Ring [B]
  Oil Ring Steel Rails [C]
  Oil Ring Expander [D]
  Circle mark [E] must be faced toward the engine front.
  Opening Positions [G]

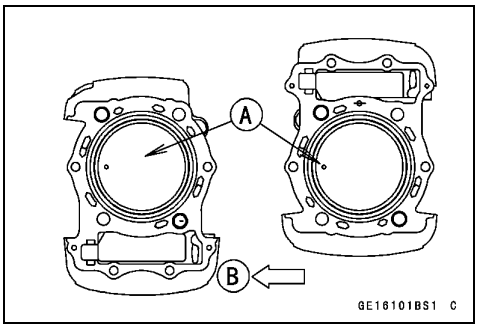


- Face the circle mark [A] on each piston toward the front side [B].

○The front and rear pistons are the same, but they should be installed in their original positions.

CAUTION

Incorrect installation of the piston could cause piston seizure and result in severe engine damage.

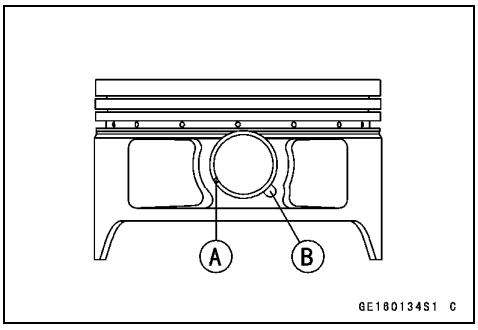


- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- Apply molybdenum disulfide oil solution to the outer surface of the piston pin.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

○When installing the piston pin snap ring, compress it only enough to install it and no more.

- Apply molybdenum disulfide oil solution to the cylinder bore.
- Apply molybdenum disulfide oil solution to the front and rear of the piston skirt.
- Install the rear cylinder first, with the rear piston at TDC.

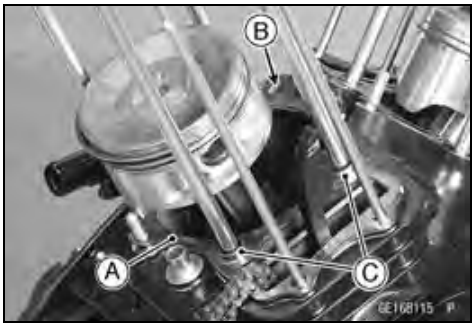


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Cylinders, Piston

NOTE

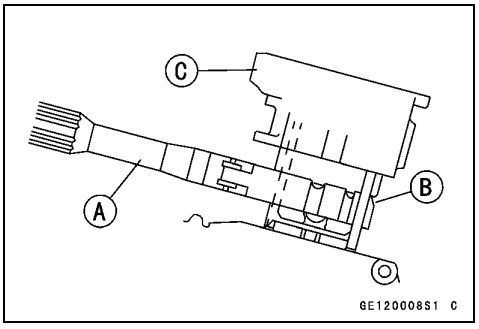
○*If a new piston or cylinder is used, check piston to cylinder clearance (see Piston/Cylinder Clearance in this section), and use new piston ring.*



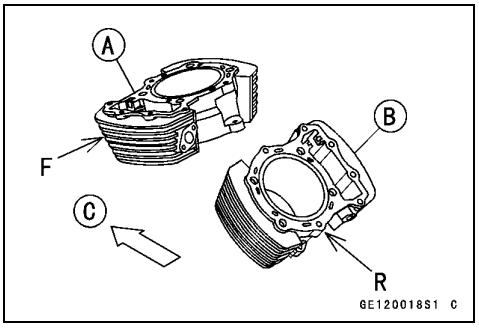
● Replace the cylinder base gasket [A] with a new one, and install the gaskets aligning the holes with the crankcase water passages [B].
● Be sure to install the dowel pins [C].

● Using the piston ring compressor assembly [A] with the chamfered side [B] upward, install the cylinder block [C].

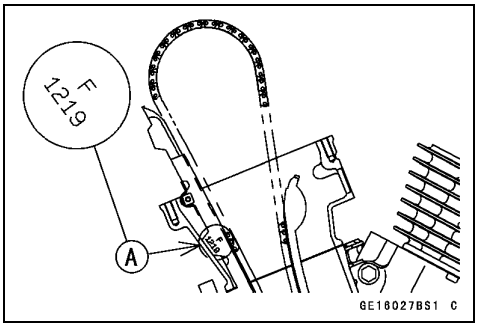
Special Tools - Piston Ring Compressor Grip: 57001-1095
Piston Ring Compressor Belt, ϕ95 ~ ϕ108: 57001-1358

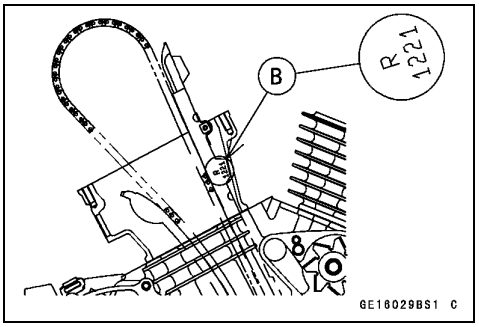


○The front cylinder [A] has an "**F**" mark and the rear cylinder [B] has an "**R**" mark. Be careful not to mix them up.
Front [C]



● Insert the chain guide into the cylinder.
○The front chain guide for the front cylinder has an "**F**" mark [A] and the front chain guide for the rear cylinder has an "**R**" mark [B]. Be careful not to mix up these chain guides since the front chain guide for the rear cylinder is longer.





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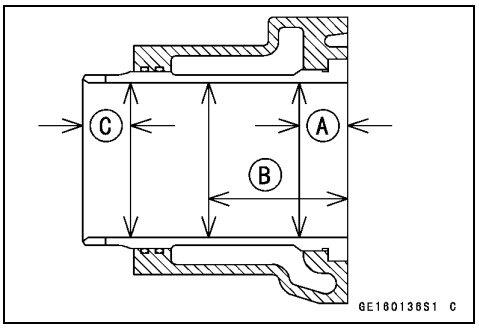
Cylinders, Piston

● Install the front cylinder in the same way.
○Position the front piston at TDC.
○Tighten the cylinder nuts temporarily (These nuts are tightened to the specified torque after rocker case installation).

Cylinder Wear

● Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the three locations (total of six measurements) shown in the figure.

★If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.
10 mm (0.39 in.) [A]
70 mm (2.76 in.) [B]
20 mm (0.79 in.) [C]



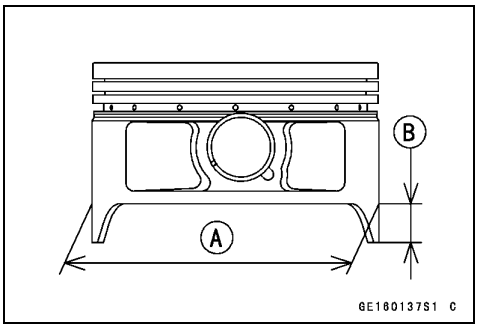
Cylinder Inside Diameter

Standard:	**102.000 ~ 102.012 mm (4.0157 ~ 4.0162 in.), and less than 0.01 mm (0.0004 in.) difference between any two measurements.**
Service Limit:	**102.10 mm (4.020 in.) or 0.05 mm (0.002 in.) difference between any two measurements.**

Piston Wear

● Measure the outside diameter [A] of each piston 5 mm [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:	**101.942 ~ 101.957 mm (4.0135 ~ 4.0140 in.)**
Service Limit:	**101.79 mm (4.007 in.)**

Piston/Cylinder Clearance

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

Piston/Cylinder Clearance
Standard: 0.043 ~ 0.070 mm (0.0017 ~ 0.0028 in.)

★If the piston/cylinder clearance is less than the specified range, use a smaller piston made within the standard diameter or increase the cylinder inside diameter within the standard diameter by honing.

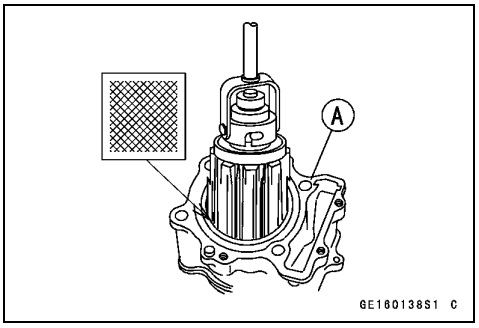
★If the piston/cylinder clearance is greater than specified range, use a larger piston made within the standard diameter.

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

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Cylinders, Piston

Cylinder Boring and Honing



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

Oversize Piston and Rings: 0.5 mm (0.02 in.) oversize

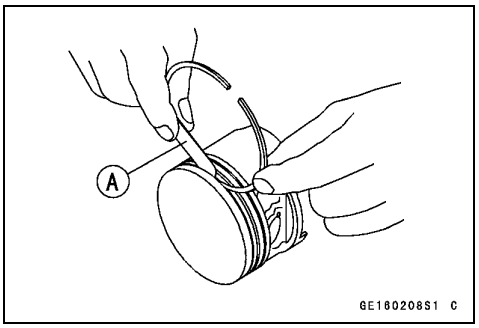
● Before boring a cylinder [A], first measure the exact diameter of the oversize piston, and then, according to the standard clearance in the Specifications, determine the rebore diameter. However, if the amount of boring necessary would make the inside diameter greater than **0.5 mm (0.02 in.)**, the cylinder block must be replaced.

○Cylinder inside diameter must not vary more than **0.01 mm (0.0004 in.)** at any point.

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

○In the case of rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus **0.1 mm (0.004 in.)** and the service limit for the piston is the oversize piston original diameter minus **0.15 mm (0.0059 in.)**. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

Piston Ring, Piston Ring Groove Wear



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

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

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

Piston Ring/Groove Clearance

Standard:

Top	**0.050 ~ 0.090 mm (0.0020 ~ 0.0035 in.)**
Second	**0.030 ~ 0.070 mm (0.0012 ~ 0.0028 in.)**

Service Limit:

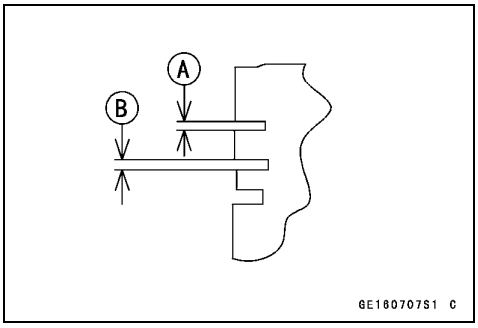
Top	**0.19 mm (0.0075 in.)**
Second	**0.17 mm (0.0067 in.)**

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

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Cylinders, Piston

Piston Ring Groove Width



● Measure the width of the top [A] and second [B] ring grooves.
○Use vernier calipers at several points around the piston.

Piston Ring Groove Width
Standard:

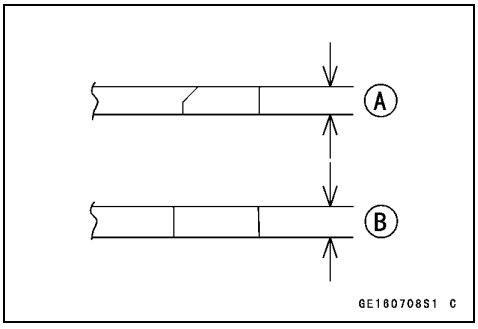
Top	**1.24 ~ 1.26 mm (0.049 ~ 0.050 in.)**
Second	**1.22 ~ 1.24 mm (0.048 ~ 0.049 in.)**

Service Limit:

Top	**1.34 mm (0.053 in.)**
Second	**1.32 mm (0.052 in.)**

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

Piston Ring Thickness



● Measure the thickness of the top [A] and second [B] rings.
○Use a micrometer to measure at several points around the ring.

Piston Ring Thickness
Standard:

Top	**1.17 ~ 1.19 mm (0.046 ~ 0.047 in.)**
Second	**1.17 ~ 1.19 mm (0.046 ~ 0.047 in.)**

Service Limit:

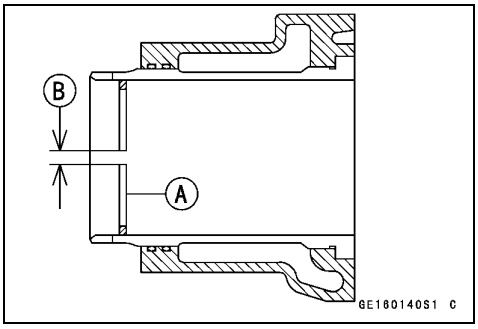
Top	**1.10 mm (0.043 in.)**
Second	**1.10 mm (0.043 in.)**

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

NOTE

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

Piston Ring End Gap



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

Piston Ring End Gap
Standard:

Top	**0.25 ~ 0.35 mm (0.010 ~ 0.014 in.)**
Second	**0.40 ~ 0.55 mm (0.016 ~ 0.022 in.)**
Oil	**0.30 ~ 0.90 mm (0.012 ~ 0.035 in.)**

Service Limit:

Top	**0.7 mm (0.03 in.)**
Second	**0.9 mm (0.04 in.)**
Oil	**1.2 mm (0.05 in.)**

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

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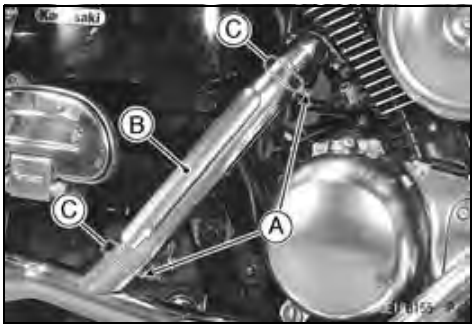
Mufflers

Exhaust Pipe Removal

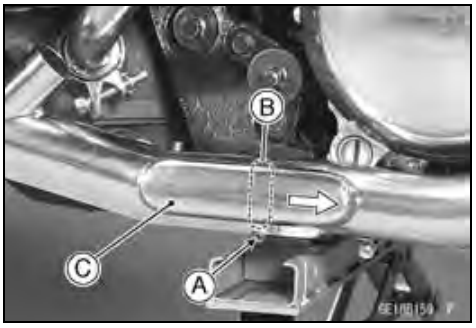
⚠ WARNING

To avoid a serious burn, do not remove the exhaust pipe or muffler when the engine is still hot. Wait until the muffler cools down.

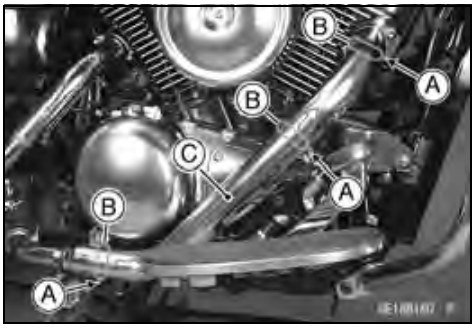
- Loosen the clamp screws [A] on the rear exhaust pipe cover [B].
- Detach the clamps [C] by sliding it up.
- Remove the rear exhaust pipe cover.



- Loosen the clamp screw [A].
- Detach the clamp [B] by sliding it forward.
- Remove the lower front exhaust pipe cover [C] by sliding it forward.



- Loosen the clamp screws [A].
- Detach the clamps [B] by sliding them up or forward.
- Remove the front exhaust pipe cover [C].



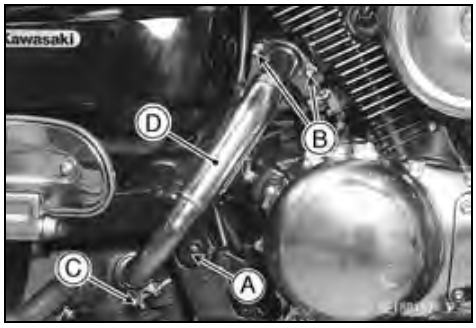
- Loosen the front exhaust pipe clamp bolt [A].
- Remove the front exhaust pipe holder nuts [B].
- Take off the front exhaust pipe [C].



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Mufflers

- Loosen the left chamber bolt.
- Remove:
  Right Chamber Bolt [A]
  Rear Exhaust Pipe Holder Nuts [B]
- Loosen the rear exhaust pipe clamp bolt [C].
- Pull the upper end of the rear exhaust pipe outward and twist clockwise a little, and then take off the rear exhaust pipe [D].



Muffler Removal

- Remove:
  Left and Right Saddlebag (see Saddlebag Removal in the Frame chapter)
  Lower Front Exhaust Pipe Cover (Right Muffler only, see Exhaust Pipe Removal in this section)
  Muffler Stay Mounting Bolts [A] (Both Sides)
- Loosen the left and right muffler clamp bolts [B].
- Move the left and right muffler [C] backward and remove it.



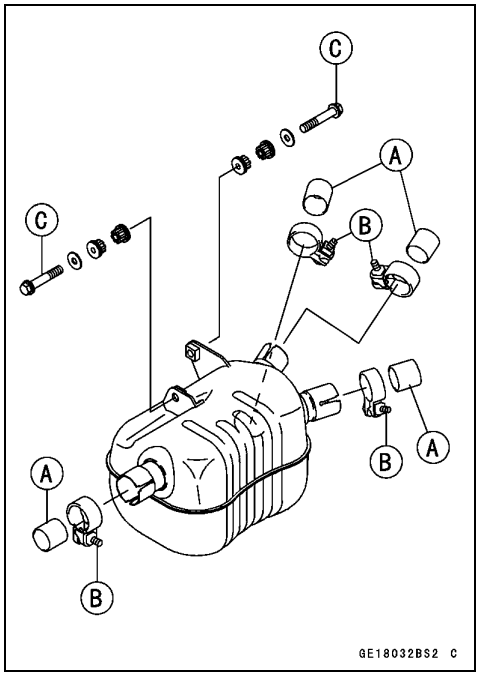
Exhaust Pipe, Muffler Installation

- Replace the exhaust pipe holder gasket [A] with new ones.



- Replace the exhaust pipe and muffler flange gasket [A] with new ones.
- Install the exhaust pipe and muffler pipe clamps [B] with its bolt downward.
- Tighten:

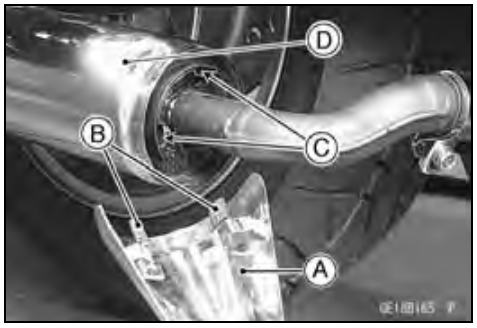
Torque - Premuffler Chamber Bolts [C]: 29 N·m (3.0 kgf·m, 21 ft·lb)
Muffler Stay Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



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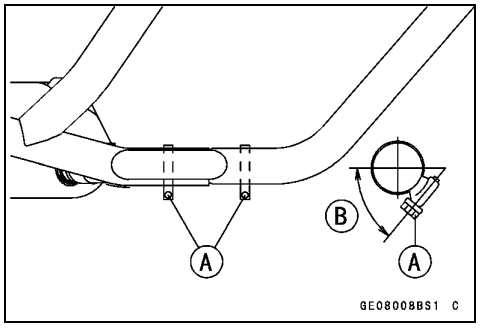
Mufflers

● Install the lower front exhaust pipe cover [A].
○Fit the two plastic tabs [B] of the front lower exhaust cover into the slots [C] in the lower muffler [D].



● Tighten the lower and front exhaust pipe cover clamp lower screws [A] with they are head inclined at 50° [B] or less to horizontal as shown. This prevents the screw from touching ground when banking.

Torque - Exhaust Pipe Cover Clamp Screws: 6.9 N·m (0.70 kgf·m, 61 in·lb)



● First, tighten all the bolts and nuts to a snug fit.
● Secondary, tighten the exhaust pipe holder nuts evenly.
● Finally, tighten the rest of the mounting bolts and clamp bolts securely.
● Thoroughly warm up the engine, wait until the engine cools down, and retighten all the clamp bolts.

Chamber Removal/Installation

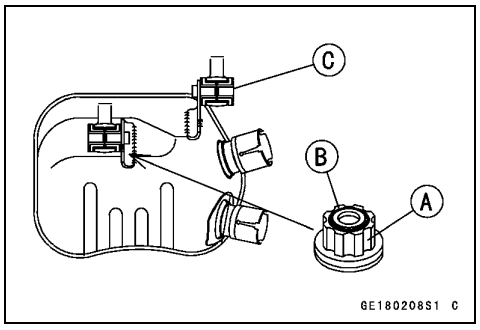
● Remove:
Front and Rear Exhaust Pipes (see Exhaust Pipe Removal in this section)
Left and Right Mufflers (see Muffler Removal in this section)
Left Chamber Bolts [A]
● Take out the premuffler chamber [B].
● Tighten:

Torque - Premuffler Chamber Bolts: 29 N·m (3.0 kgf·m, 21 ft·lb)



Chamber Assembly

● Apply a soap and water solution or rubber lubricant to the surface of the rubber bushings and install them into the brackets of the chamber as shown (Top View).
Rubber Bushings [A] ϕ24.8 mm (0.98 in.) with a raised ring [B]
Rubber Bushings [C] ϕ25.3 mm (1.0 in.) without raised ring



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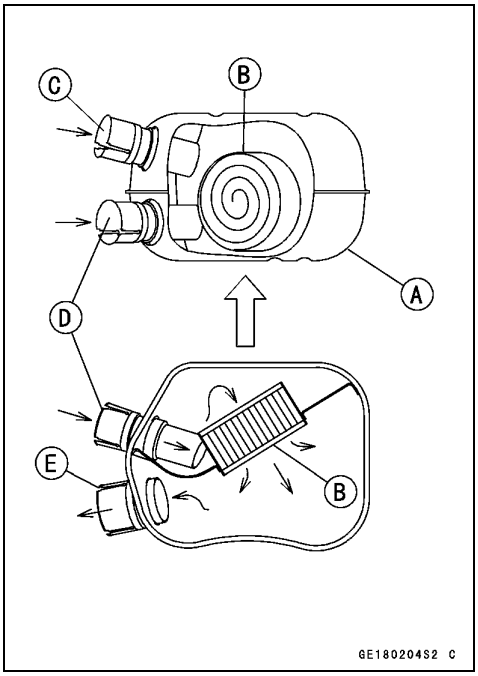
Mufflers

Chamber Identification

○The this models have a premuffler chamber (Identification No. KHI M 099) with a honeycomb type catalytic converter and without any catalyst protection system. Do not mix up this chamber with the other type chamber (especially with a non-catalyst chamber). The motorcycle could not clear the emission regulation.

→ : Exhaust Gas Flow
Premuffler Chamber [A]
Honeycomb Type Catalytic Converter [B]
Inlet [C] from Rear Exhaust Pipe
Inlet [D] from Front Exhaust Pipe
Premuffler Chamber Outlet [E]

○Refer to the VN1500 G/H Service Manual (Part No. 99924-1241) for more information about the KLEEN (theory, maintenance, and handling precautions), including the secondary air injection system.



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Clutch

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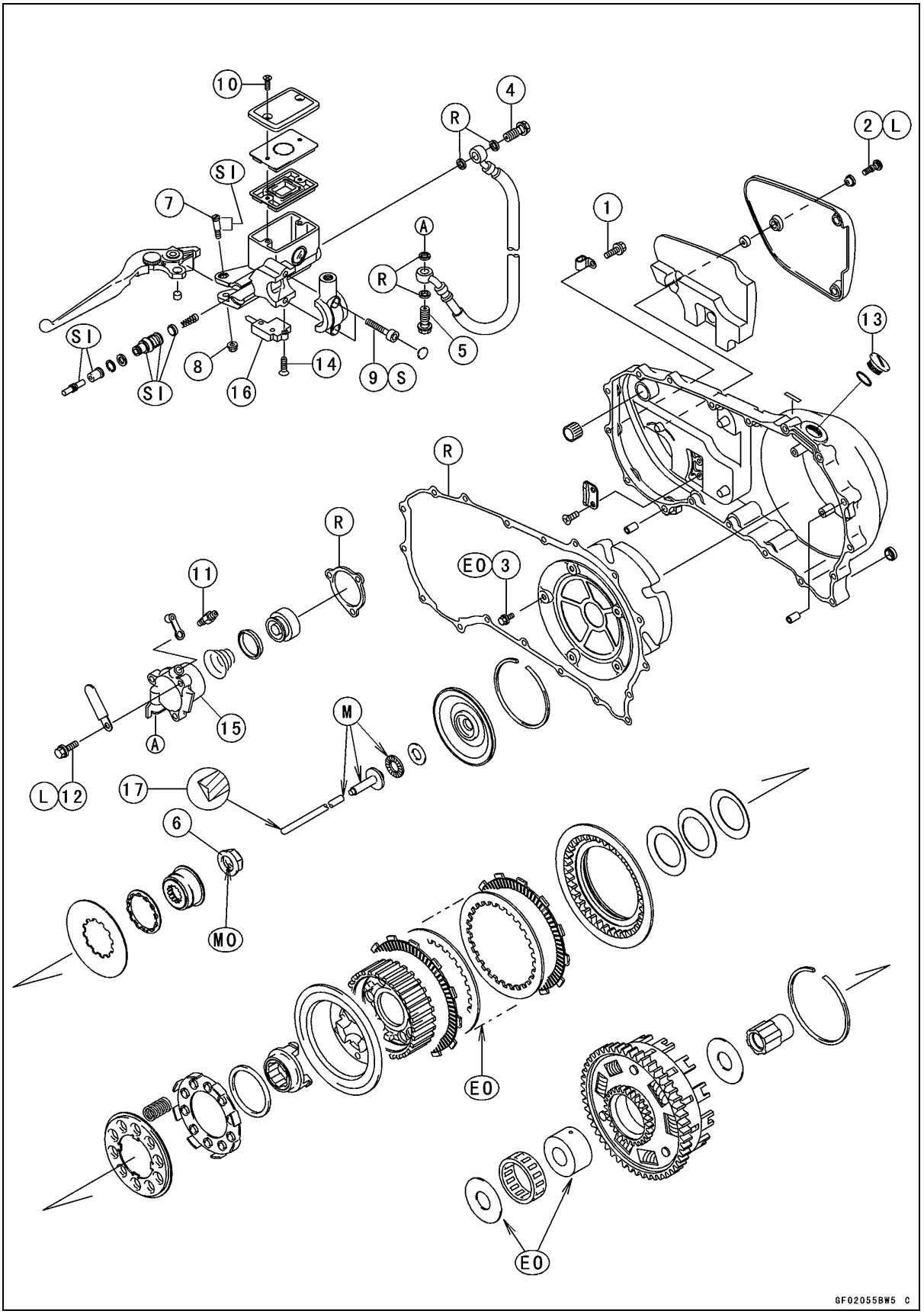
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Cover Bolts	11	1.1	97 in·lb	
2	Clutch Damper Cover Bolts	9.8	1.0	87 in·lb	L
3	Clutch Damper Plate Bolts	9.8	1.0	87 in·lb	EO
4	Clutch Hose Banjo Bolt (Upper)	25	2.5	18	
5	Clutch Hose Banjo Bolt (Lower)	25	2.5	18	
6	Clutch Hub Nut	145	14.8	107	MO
7	Clutch Lever Pivot Bolt	1.0	0.10	8.9 in·lb	SI
8	Clutch Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
9	Clutch Master Cylinder Clamp Bolts	11	1.1	97 in·lb	S
10	Clutch Reservoir Cap Screws	1.5	0.15	13 in·lb	
11	Clutch Slave Cylinder Bleed Valve	7.8	0.80	69 in·lb	
12	Clutch Slave Cylinder Bolts	6.9	0.70	61 in·lb	L
13	Oil Filler Cap	1.5	0.15	13 in·lb	
14	Starter Lockout Switch Screw	1.2	0.12	11 in·lb	

15. Clutch Slave Cylinder
16. Starter Lockout Switch
17. Cup point side faces outside.

EO: Apply engine oil.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specific tightening sequence.
SI: Apply silicone grease or PBC grease.

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6-4 CLUTCH

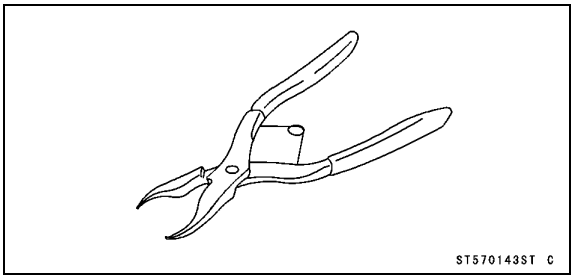
Specifications

Item	Standard	Service Limit
Clutch Fluid		
Grade	DOT4 (provided when shipping)	– – –
Clutch Lever Position	No. 1 (to suit rider)	5-way adjustable
Clutch Lever Free Play	Non-adjustable	– – –
Clutch		
Clutch Spring Free Height	4.3 mm (0.17 in.)	4.0 mm (0.16 in.)
Spring Plate Gap	(Usable Range)	
	1.95 ~ 2.45 mm (0.077 ~ 0.096 in.)	– – –
Friction Plate Thickness	3.3 ~ 3.5 mm (0.13 ~ 0.14 in.)	3.1 mm (0.12 in.)
Friction or Steel Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.01 in.)

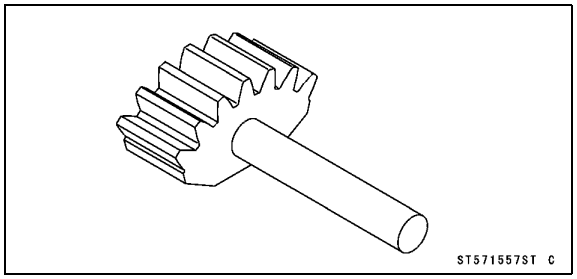
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Special Tools

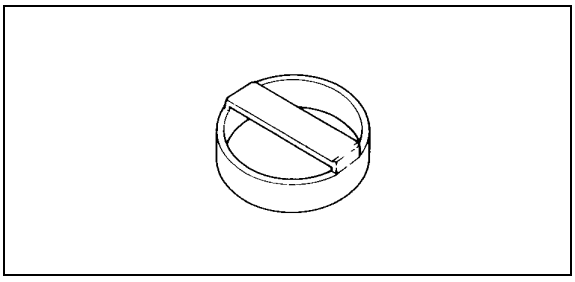
Inside Circlip Pliers:
57001-143



Gear Holder:
57001-1557



Clutch Spring Compressor:
57001-1162



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Clutch Fluid

Clutch Fluid Level Inspection

● Refer to the Clutch Fluid Level Inspection in the Periodic Maintenance chapter.

Clutch Fluid Change

● Refer to the Clutch Fluid Change in the Periodic Maintenance chapter.

Clutch Line Bleeding

● Remove the alternator outer cover (see Alternator Outer Cover Removal in the Electrical System chapter).

● With the reservoir cap off, slowly pump the clutch lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. This bleeds the air from the master cylinder end of the line.

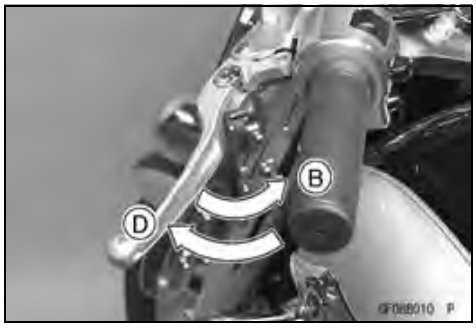


NOTE

○*Tap the clutch hose lightly going from the lower end to the upper end and bleed the air off at the reservoir.*

● Attach a clear plastic hose [A] to the bleed valve on the clutch slave cylinder, and run the other end of the hose into a container.

● Bleed the clutch line as follows.
Pump the clutch lever a few times until it becomes hard and then hold it applied [B].
Quickly open and close [C] the bleed valve.
Release [D] the clutch lever.
Check the fluid level in the reservoir often, replenishing it as necessary.



NOTE

○*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.*

○Repeat this operation until no more air can be seen coming out into the plastic hose.

⚠ WARNING

Do not mix different grades and brands of fluid.

Torque - Clutch Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)
Clutch Slave Cylinder Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)

Clutch Hose Removal/Installation

○Since the clutch hose is the same as the brake hose, refer to the Brake Hoses section in the Brakes chapter for clutch hose removal or installation.

Clutch Hose and Connection Check

● Refer to the Clutch Hose Damage and Installation Condition Inspection Check in the Periodic Maintenance chapter.

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Clutch Master Cylinder

Clutch Lever Adjustment

The adjuster has 5 positions so that the clutch lever position can be adjusted to suit the operator's hand.

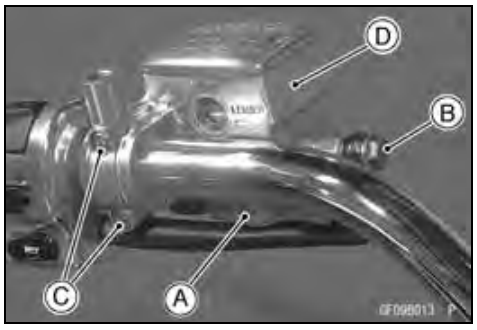
- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.

○The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



Clutch Master Cylinder Removal

- Disconnect the starter lockout switch connector [A].
- Draw out the clutch fluid from the reservoir with a means like the fork oil level gauge.
- Remove the banjo bolt [B] to disconnect the clutch hose from the master cylinder.
- Unscrew the clamp bolts [C], and take off the master cylinder [D] as an assembly with the clutch reservoir, clutch lever, and starter lockout switch installed.



CAUTION

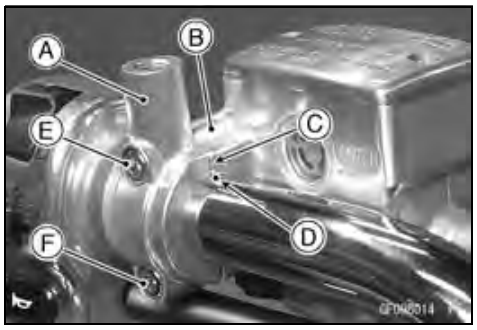
Clutch fluid quickly ruins painted surface; any spilled fluid should be completely washed away immediately.

Clutch Master Cylinder Installation

○The master cylinder clamp must be installed with the rear view mirror boss [A] upward.

- Set the clutch master cylinder [B] to match its mating surface [C] to the punch mark [D] of the handlebar.
- Tighten the upper clamp bolt [E] first, and then the lower clamp bolt [F]. There will be a gap at the lower part of the clamp after tightening.

Torque - Clutch Master Cylinder Clamp Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



- Use a new flat washer on each side of the clutch hose fitting.
- Tighten the clutch hose banjo bolt.

Torque - Clutch Hose Banjo Bolt (Upper): 25 N·m (2.5 kgf·m, 18 ft·lb)

- Replenish the clutch fluid into the reservoir and bleed the clutch line (see Clutch Line Bleeding in this chapter).
- Check that the clutch line has proper fluid pressure and no fluid leakage.

Clutch Master Cylinder Disassembly/Assembly

- Refer to the Clutch Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

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Clutch Master Cylinder

Clutch Master Cylinder Inspection

● Disassemble the clutch master cylinder (see Clutch Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).

CAUTION

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

● Check that there are no scratches, rust or pitting on the inside of the master cylinder [A] and on the outside of the piston [B].

★If the 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 clutch lever, the piston assembly should be replaced to renew the cups.

● Check the dust cover [E] for damage.

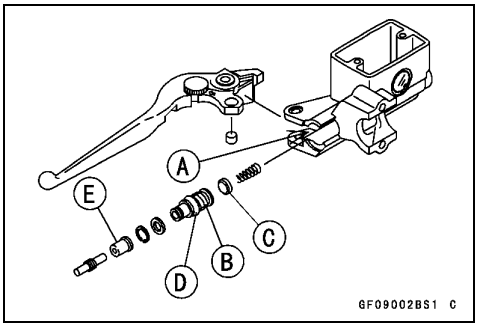
● If it is damaged, replace it.

● Check that the relief and supply ports are not plugged.

★If the small relief port becomes plugged, the clutch will drag. Blow the ports clean with compressed air.

● Check the piston return spring for any damage.

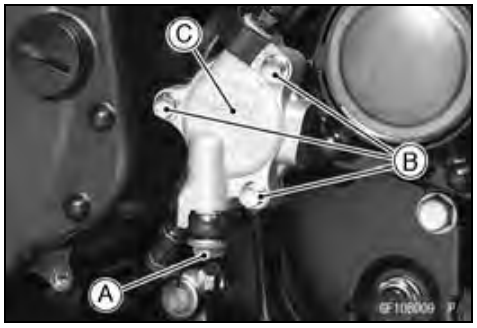
★If the spring is damaged, replace it.



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Clutch Slave Cylinder

Clutch Slave Cylinder Removal



● Remove:
Alternator Outer Cover (see Alternator Outer Cover Removal in the Electrical System chapter)
Banjo Bolt [A]
Clutch Slave Cylinder Bolts [B]
Slave Cylinder [C]

CAUTION

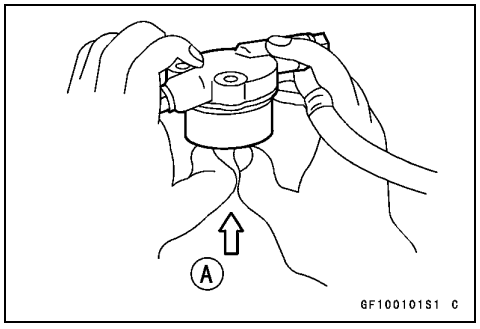
Immediately wash away any clutch fluid that spills. It may damage painted surfaces.

● Perform the following if the clutch slave cylinder is to be removed but not disassembled.

CAUTION

If the clutch slave cylinder is removed and left alone, the piston will be pushed out by spring force and the clutch fluid will drain out.

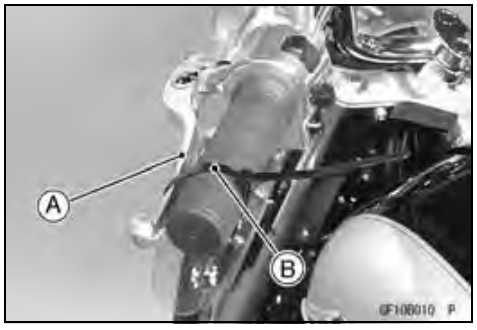
○Remove the clutch slave cylinder with the pipe installed.
○Push [A] the piston into the cylinder as far as it will go.



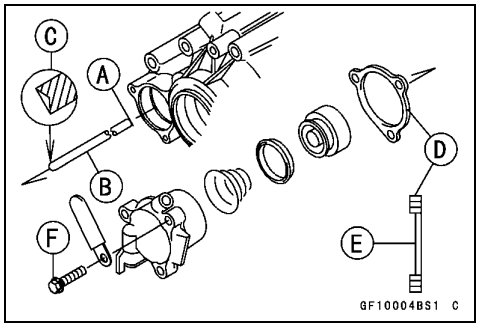
○Apply the clutch lever [A] slowly and hold it with a band [B].

NOTE

○*Holding the clutch lever keeps the piston from coming out.*



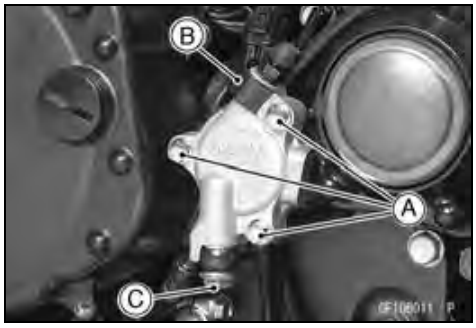
Clutch Slave Cylinder Installation



● Apply molybdenum disulfide grease to the flat end [A] of the push rod [B].
● Install the push rod so that the flat end faces in.
Cup Point [C]
● Replace the spacer [D] of the clutch slave cylinder with a new one.
● Install the spacer so that the stepped side [E] faces outward.
● Apply a non-permanent locking agent to the threads of the clutch slave cylinder bolts [F].
● Finger tighten the clutch slave cylinder bolts.
● Remove the band from the clutch lever and release the clutch lever.

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Clutch Slave Cylinder



- Tighten:

Torque - Clutch Slave Cylinder Bolts [A]: 6.9 N·m (0.70 kgf·m, 61 in·lb)

○Put the clamp [B] together the clutch slave cylinder bolt and bend along the slave cylinder with the end of the clamp straight to the engine side as shown in the figure. This clamp is to prevent the edge of the slave cylinder from damaging the wire, not to clamp the wire.

- Replace the washers on each side of the clutch hose fitting with new ones.
- Tighten the banjo bolt [C] to the specified torque.

Torque - Clutch Hose Banjo Bolt (Lower): 25 N·m (2.5 kgf·m, 18 ft·lb)

- Check the fluid level in the master cylinder reservoir, and bleed the air in the clutch line.
- Check the clutch operation.

Clutch Slave Cylinder Disassembly/Assembly

- Refer to the Clutch Slave Cylinder Piston Seal Replacement in the Periodic Maintenance chapter.

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Clutch

Clutch Cover Removal

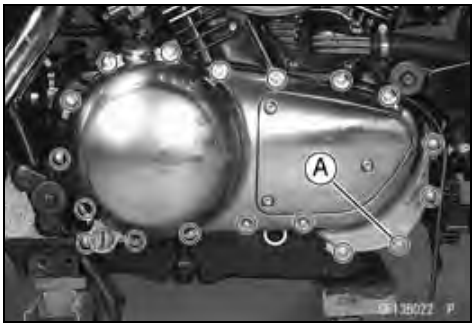
- Raise the rear wheel off the ground (see Rear Wheel Removal in the Wheels/Tires chapter).
- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:

  Right Front Guard (see Front Guard Removal/Installation in the Frame chapter)

  Front Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)

  Downtube (see Downtube Removal in the Frame chapter, but remove the downtube with the right front footboard and rear master cylinder left installed.)

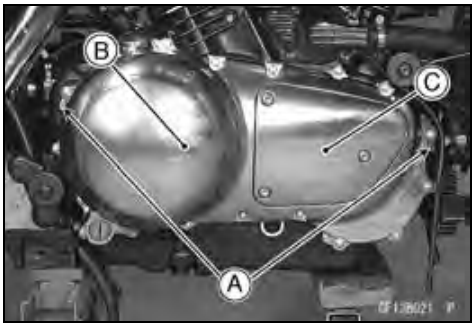
- Unscrew the clutch cover bolts (18) [A].



- Using the pry points [A], take the cover [B] off the crankcase.

NOTE

○*Do not remove the damper cover [C].*



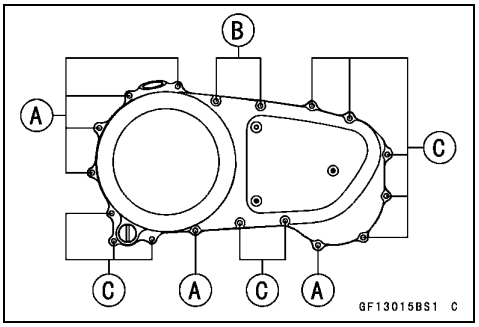
Clutch Cover Installation

- Replace the clutch cover gasket with a new one.
- Tighten:

Torque - Clutch Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

L = 35 mm (1.3 in.) [A]
L = 30 mm (1.2 in.) [B]
L = 25 mm (1.0 in.) [C]

- Install the removed parts (see appropriate chapters).



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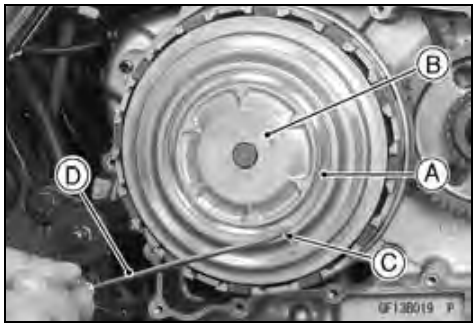
Clutch

Clutch Removal

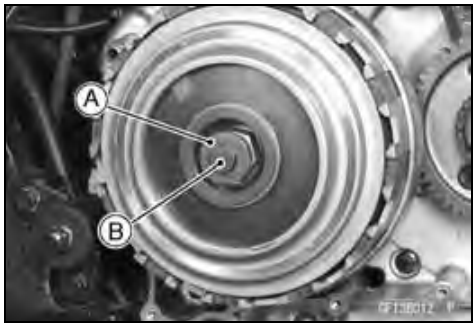
NOTE

○*Use an air impact wrench for removal of the clutch hub nut.*

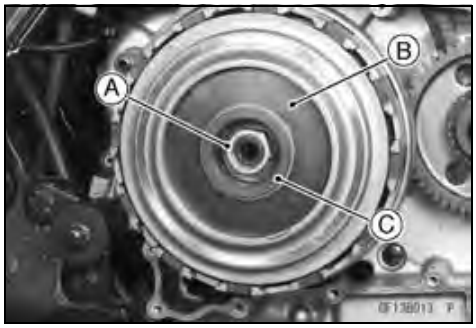
- Remove the clutch cover (see Clutch Cover Removal in this section).
- Remove the retaining ring [A] using a cutout portion [C], and take the operating plate [B] out of the clutch assembly.
  Screw Driver [D]



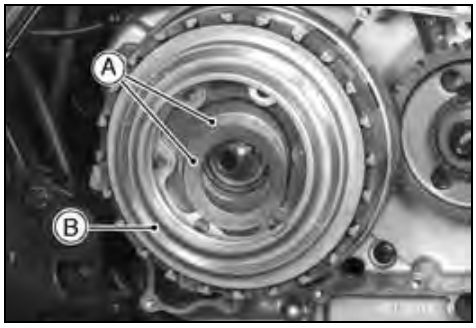
- Remove:
  Washer [A]
  Spring Plate Pusher [B]
  Needle Bearing
  Washer



- Unscrew the clutch hub nut [A] by using an air impact wrench.
- Take the clutch spring [B], and the clutch spring holders [C] out of the clutch hub.



- Take the back torque limiter springs [A], and the clutch spring plate out of the clutch housing.



- Take the friction/steel plate [A], and outer clutch hub [B] out of the clutch housing.



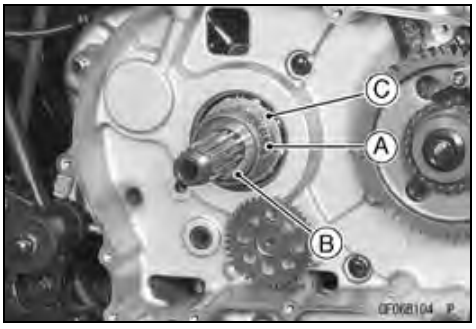
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Clutch

● Take the inner clutch hub [A], collar [B], washer [C] and clutch housing [D] out of the crankcase.



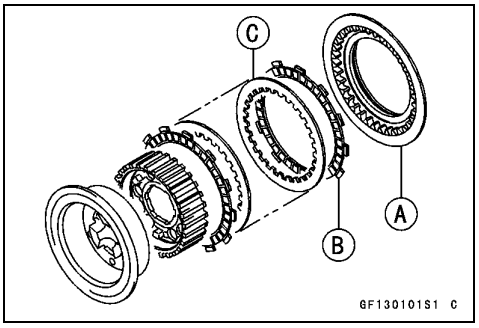
● Pull the needle bearing [A], sleeve [B], and thrust washer [C] off the drive shaft.



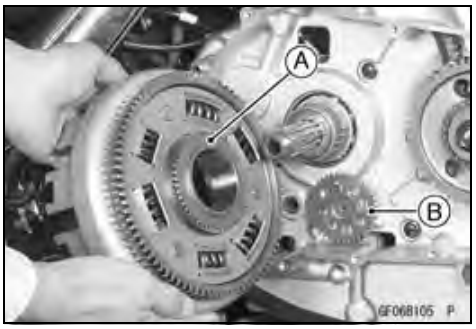
Clutch Installation

★When replacing any one of the following parts, check the spring plate gap (see Spring Plate Gap Measurement in this section).

Spring Plate [A]
Friction Plates [B]
Steel Plates [C]

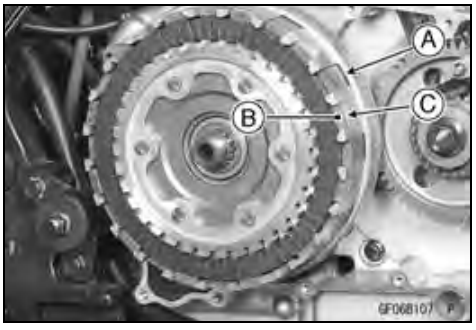


● When installing the clutch housing, mesh the oil pump drive gear [A] with the oil pump gear [B] so that the pump gear turns smoothly.



CAUTION

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



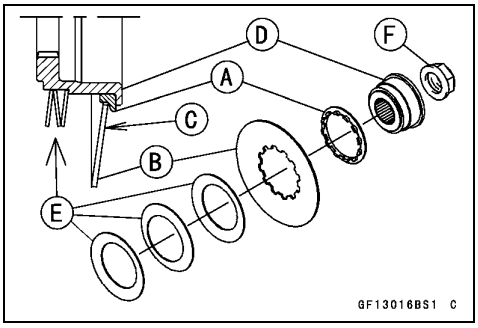
● Install the friction plates and steel plates, starting with a friction plate and alternating them.

● First, install the friction plates, fitting their tangs in the deeper grooves [A], and finally the outermost friction plate [B] in the shallower grooves [C].

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Clutch

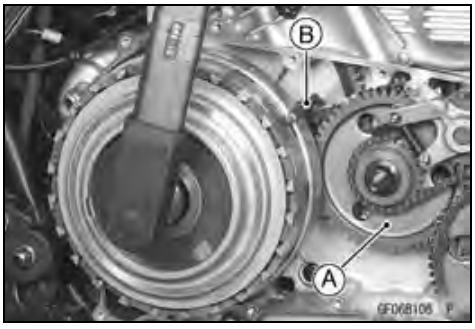
● Install the clutch spring holder outer [A] on the spring holder [B], and convex direction of outside [C] on the spring holder [D].
● Apply grease to the back torque limiter springs [E] and install the each direction them on the spring holder as shown.
Clutch Hub Nut [F] (for Reference)



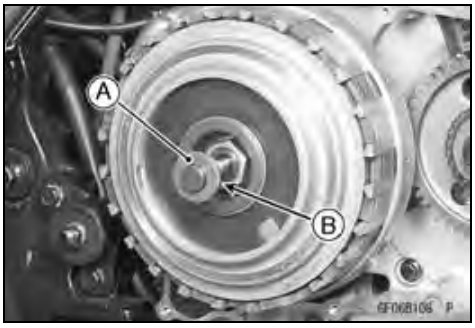
● Apply molybdenum disulfide oil solution to the threads and seating surface of the clutch hub nut.
○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).
● Tighten the clutch hub nut to the specified torque while holding the primary gear [A] with the gear holder [B].

Torque - Clutch Hub Nut: 145 N·m (14.8 kgf·m, 107 ft·lb)

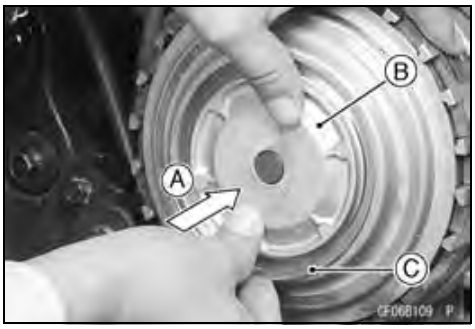
Special Tool - Gear Holder : 57001-1557



● The spring plate pusher [A] into the clutch hub. Squeeze the clutch lever slowly and hold it with a band.
○Install the needle bearing [B] and the washer onto the pusher.



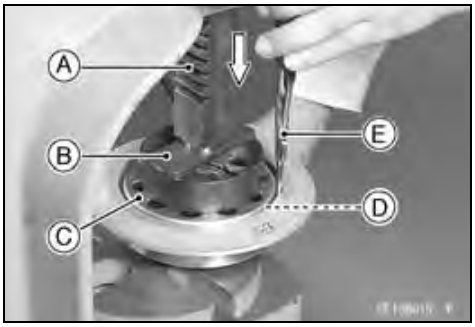
● Pushing [A] the operating plate [B] into the clutch hub, and insert the retaining ring [C] by hand.
● Install the clutch cover (see Clutch Cover Installation in this section)



Inner Clutch Hub Disassembly

● Remove the inner clutch hub (see Clutch Removal in this section)
● Using a press [A], and the clutch spring compressor [B], push the damper spring holder [C] to remove the retaining ring [D].

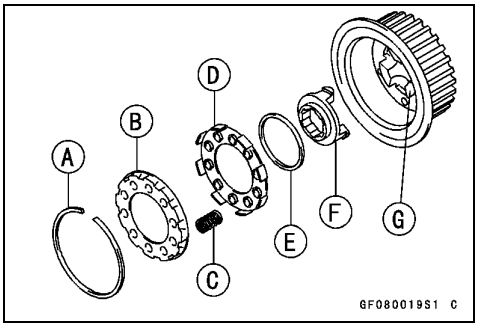
Special Tools - Clutch Spring Compressor: 57001-1162
Inside Circlip Pliers [E]: 57001-143



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Clutch

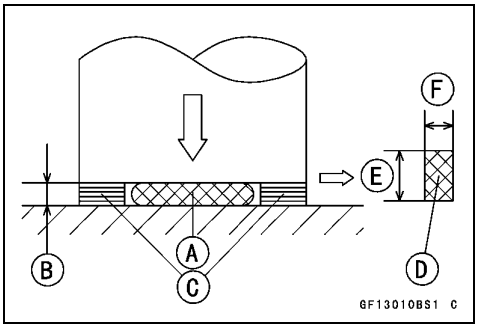
● Remove:
Retaining Ring [A]
Spring Holder [B]
Damper Spring [C]
Spring Holder [D]
Spacer [E]
Damper Cam [F]
Inner Clutch Hub [G]



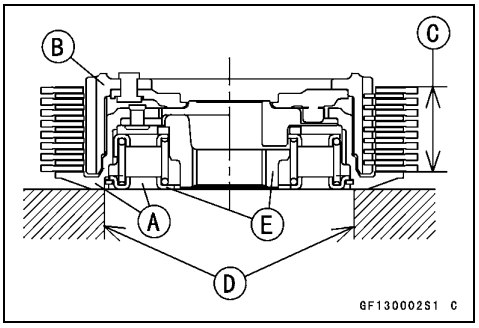
Spring Plate Gap Measurement

Insufficient spring plate gap will cause the engine braking effect to be more sudden, resulting in rear wheel hop. On the other hand, if the spring plate gap is excessive, the clutch may slip or the clutch lever may feel “spongy” or pulsate when pulled.

● Prepare sheet gum (chewing gum) or about 5 g (0.176 oz) clay [A].
● Make an about 2.5 mm (0.10 in.) thick sheet [B] of gum or clay, using a press and two thickness gauges [C] which are overlapped to about 2.5 mm (0.10 in.).
● Cut the sheet with scissors into four strips [D] of gum or clay as shown.
7 mm (0.276 in.) [E]
4 mm (0.157 in.) [F]



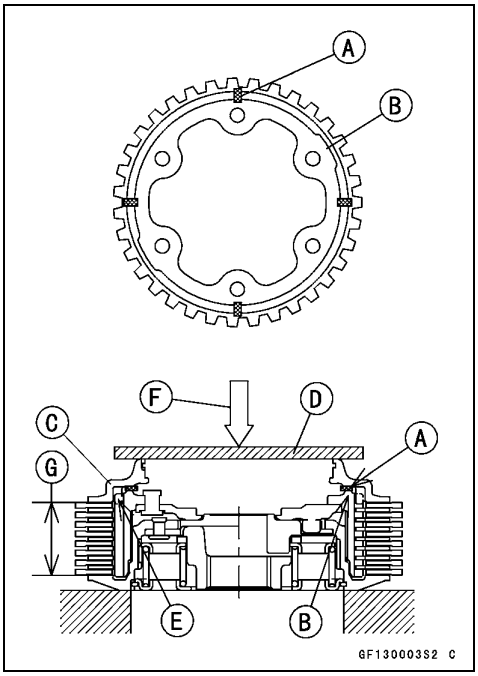
● Remove the clutch (see Clutch Removal in this chapter).
● Place the inner clutch hub, spring holder assy [A], the outer clutch hub [B], and the clutch plates (friction and steel plates) [C] on blocks [D].
○Do not support the spring holder [E] with the blocks.



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Clutch

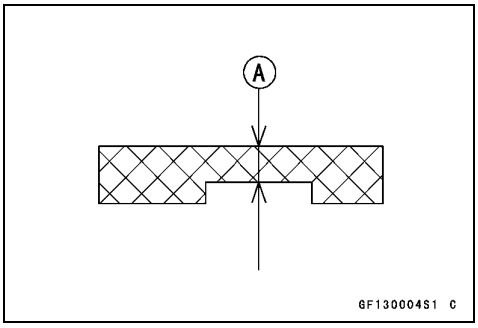
● Apply a soap and water solution to the strips. This is to separate the strips easily from the clutch spring plate and clutch hub when removing strips.
● Place these four strips [A] on the raised surface [B] of the outer clutch hub in a criss-cross pattern as shown.
● Install the clutch spring plate [C] and a block [D].
○While noting the positions of the spline teeth [E], fit the clutch spring plate into the outer clutch hub smoothly. Be careful not to move these strips.
● Press [F] the block until the clutch plates [G] seat closely.



CAUTION

Do not press the block too much. This could damage the clutch parts. The maximum press force is 100 kg.

● Remove the clutch spring plate.
● Peel off these strips with a thin-bladed screwdriver.
● Measure the pressed thickness [A] of each strip with vernier calipers.
○The thickness represents the spring plate gap.



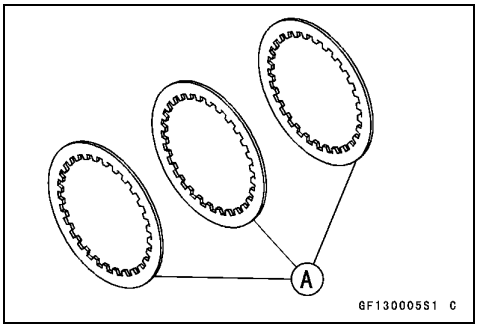
Spring Plate Gap
Usable Range: 1.95 ~ 2.45 mm (0.077 ~ 0.096 in.)

NOTE

○*In case of rear wheel hop, adjust the spring plate gap a bit larger, and in case of clutch slip or "spongy" clutch lever, adjust the gap a bit smaller within the usable range.*

Spring Plate Gap Adjustment

★If the plate gap is out of the usable range, change one of the steel plates [A] to a thicker or thinner one to get the correct gap.
○Use the standard steel plates (2.0 mm, 0.079 in. thick) × (6 ~ 7) plates, and the adjustment steel plate (1.6 or 2.3 mm, 0.063 or 0.090 in. thick) × (0 ~ 1) plates: total 7 plates.



Steel Plates

Thickness	Part Number
1.6 mm (0.063 in.)	13089-1080
2.0 mm (0.079 in.) (STD)	13089-1075
2.3 mm (0.090 in.)	13089-1081

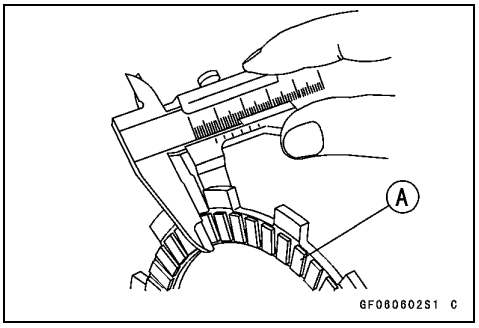
CAUTION

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

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Clutch

Friction and Steel Plate Wear, and Damage Inspection



- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.

★If any plates show signs of damage, replace the plates.

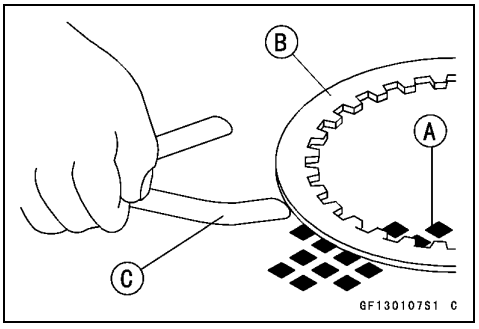
- Measure the thickness of the friction plates [A] at several points.

★If they have worn past the service limit, replace the friction plate and measure the spring plate gap and adjust it if necessary.

Friction Plate Thickness

Standard:	**3.3 ~ 3.5 mm (0.13 ~ 0.14 in.)**
Service Limit:	**3.1 mm (0.12 in.)**

Friction or Steel Plate Warp



- 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.

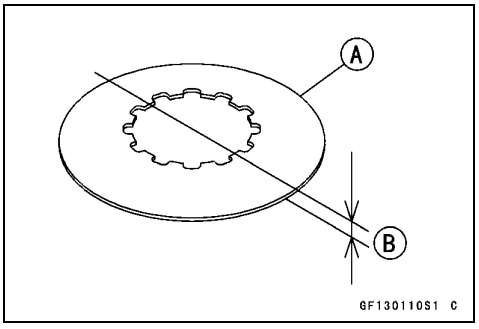
★If any friction plate is warped over the service limit, replace it and measure the spring plate gap, and adjust it if necessary.

★If any steel plate is warped over the service limit, replace it with a new one of the same thickness.

Friction or Steel Plate Warp

Standard:	**0.2 mm (0.008 in.) or less**
Service Limit:	**0.3 mm (0.01 in.)**

Clutch Spring Height Measurement



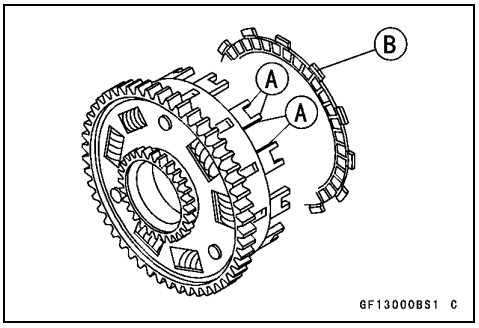
- Measure the height [B] of the clutch spring [A].

★If the spring height is less than the service limit, it must be replaced.

Clutch Spring Height

Standard:	**4.3 mm (0.17 in.)**
Service Limit:	**4.0 mm (0.16 in.)**

Clutch Housing Finger Inspection



- Visually inspect the fingers [A] of the clutch housing where the tangs [B] of the friction plates 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 and measure the spring plate gap and adjust it if necessary.

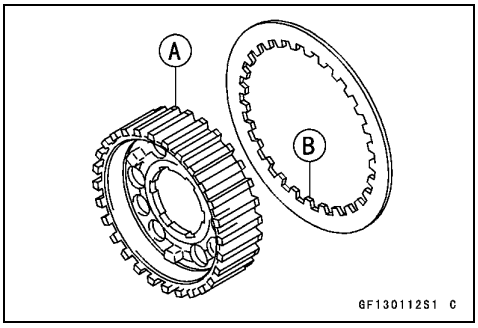
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Clutch

Outer Clutch Hub Spline Inspection

- Visually inspect where the teeth [B] on the steel plates wear against the splines [A] of the outer clutch hub.

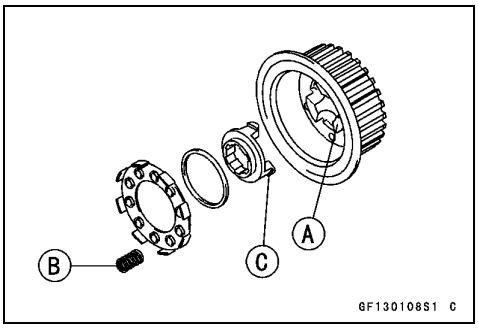
★If there are notches worn into the splines, replace the outer clutch hub. Also, replace the steel plate with a new one of the same thickness if their teeth are damaged.



Cam Damper Inspection

- Disassemble the clutch (see Inner Clutch Hub Disassembly in this section).
- Visually inspect the damper cam [A], damper spring [B], and cam follower [C].

★Replace any damaged parts.



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Engine Lubrication System

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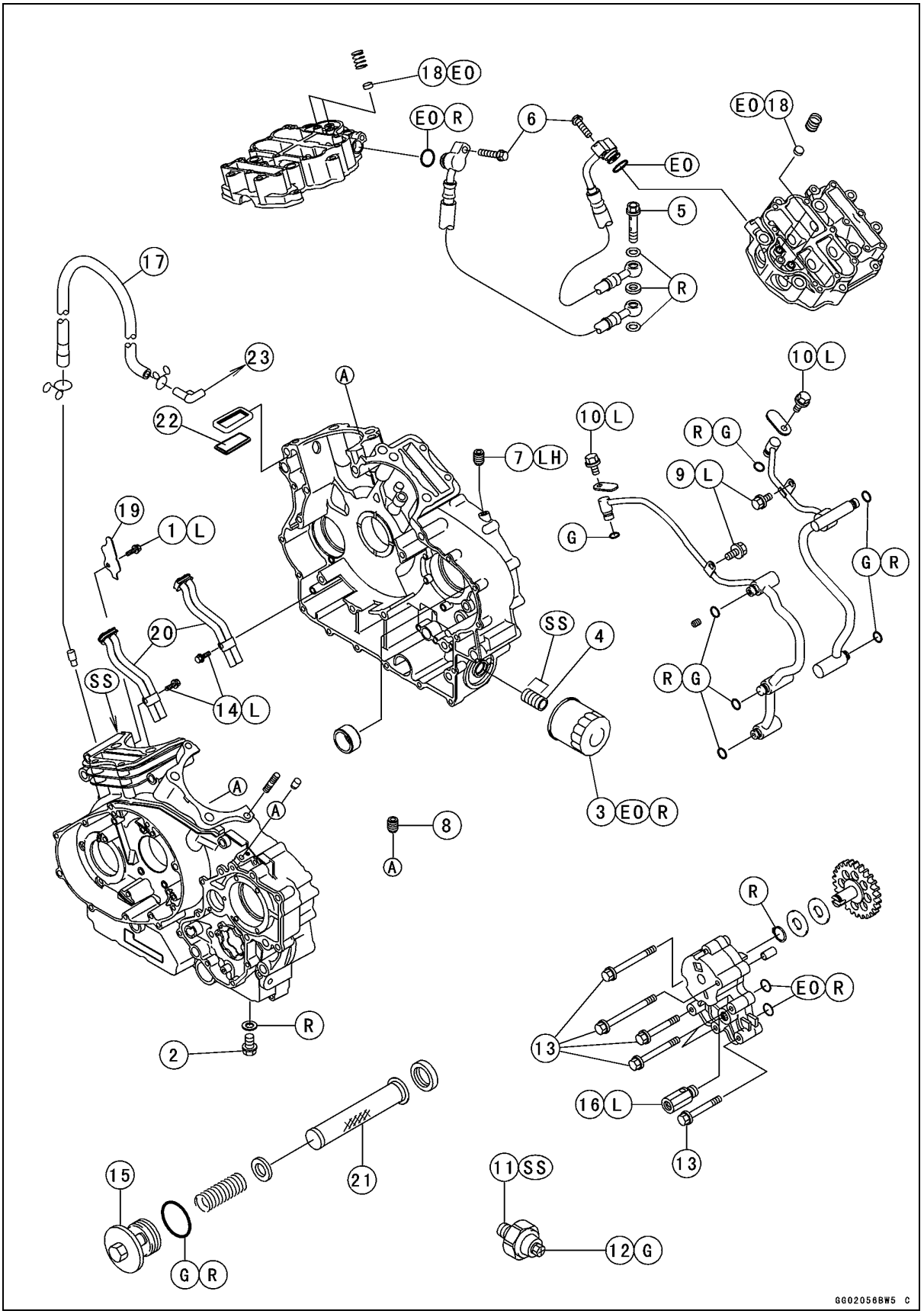
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Baffle Bolt	11	1.1	97 in·lb	L
2	Oil Drain Plug	20	2.0	15	
3	Oil Filter	18	1.8	13	EO, R
4	Oil Filter Pipe	25	2.5	18	SS
5	Oil Hose Banjo Bolt	9.8	1.0	87 in·lb	
6	Oil Hose Flange Bolts	9.8	1.0	87 in·lb	
7	Oil Hose Nozzle	2.9	0.30	26 in·lb	LH
8	Oil Nozzles	2.9	0.30	26 in·lb	
9	Oil Pipe Clamp Bolts	11	1.1	97 in·lb	L
10	Oil Pipe Holder Bolts	11	1.1	97 in·lb	L
11	Oil Pressure Switch	15	1.5	11	SS
12	Oil Pressure Switch Terminal Screw	1.5	0.15	13 in·lb	G
13	Oil Pump Mounting Bolts	11	1.1	97 in·lb	
14	Oil Return Pipe Clamp Bolts	11	1.1	97 in·lb	L
15	Oil Screen Plug	20	2.0	15	
16	Relief Valve	15	1.5	11	L

17. Crankcase Breather Hose
18. HLA Oil Filters
19. Oil Baffle
20. Oil Return Pipes
21. Oil Screen
22. Oil Separator (Smaller side goes first.)
23. To Right Air Cleaner Base

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
LH: Left-hand Threads
R: Replacement Parts
SS: Apply silicone sealant to the threads of the oil pressure switch (Kawasaki Bond: 56019-120).
SS: Apply silicone sealant to the threads of the oil filter pipe (Three Bond: TB1401B).
SS: Apply silicone sealant to the left crankcase mating surface of the separator (Three Bond: TB1207B).

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7-4 ENGINE LUBRICATION SYSTEM

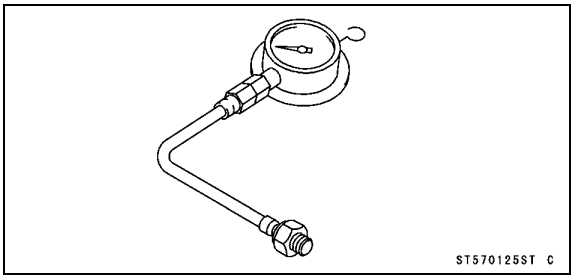
Specifications

Item	Standard
Engine Oil	
Type	API SE, SF or SG
	API SH or SJ with JASO MA
Viscosity	SAE 10W-40
Capacity	2.9 L (3.1 US qt) (when filter is not removed)
	3.1 L (3.3 US qt) (when filter is removed)
	3.5 L (3.7 US qt) (when engine is completely disassembled and dry)
Level (Wait 2 ~ 3 Minutes After Idling or Running)	Between upper and lower level lines
Oil Pressure Measurement	
Oil Pressure @2 000 r/min (rpm), Oil Temperature. 90°C (194°F)	340 ~ 440 kPa (3.5 ~ 4.5 kgf/cm², 50 ~ 64 psi)

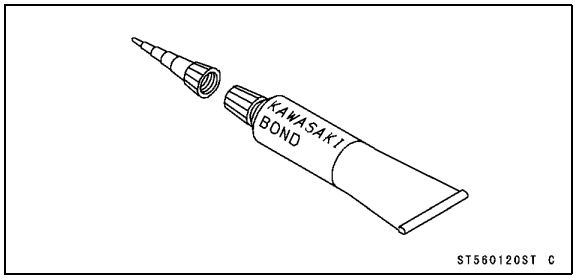
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Special Tools and Sealant

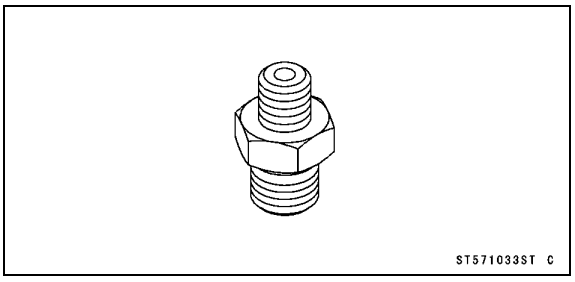
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



Kawasaki Bond (Silicone Sealant):
56019-120

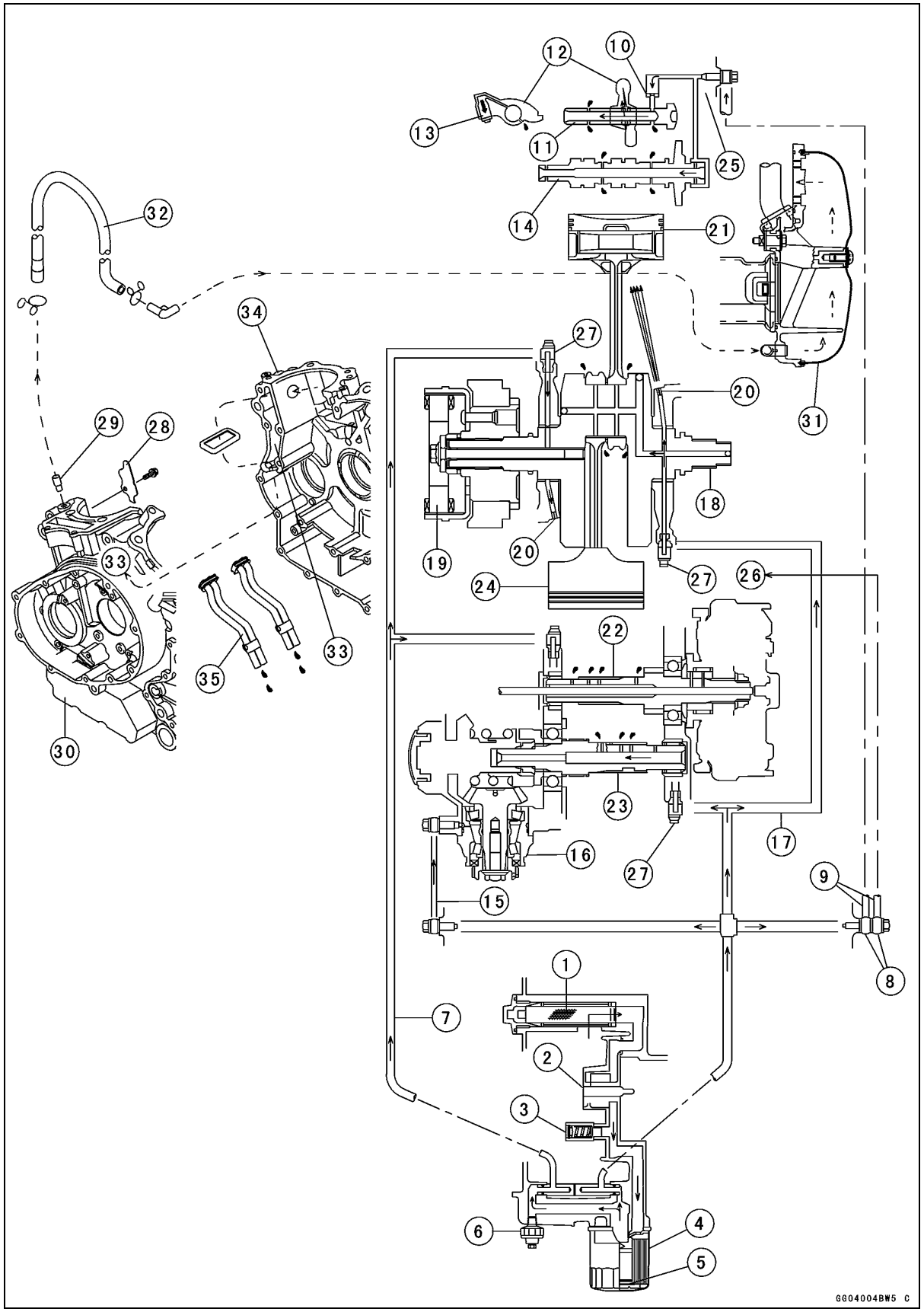


Oil Pressure Gauge Adapter, PT 1/8:
57001-1033



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Engine Oil Flow Chart



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Engine Oil Flow Chart

→: Oil Flow (1 ~ 30)
--→: Blowby Gas
1. Oil Screen
2. Oil Pump
3. Relief Valve
4. Oil Filter
5. Bypass Valve
6. Oil Pressure Switch
7. Inside Oil Pipe
8. Banjo Bolts of Right Crankcase Rear
9. Outside Oil Hoses
10. HLA Oil Filter
11. Rocker Shafts
12. Rocker Arms
13. HLA (Hydraulic Lash Adjuster)
14. Camshafts
15. Outside Oil Pipe
16. Front Gear Case
17. Inside Oil Pipe
18. Crankshaft
19. Alternator Rotor
20. Oil Nozzle
21. Front Piston
22. Drive Shaft
23. Output Shaft
24. Rear Piston
25. Front Rocker Case
26. Rear Rocker Case
27. Inside Oil Pipe Fittings
28. Oil Baffle
29. Fitting
30. Left Crankcase
31. Right Air Cleaner Housing
32. Crankcase Breather Hose
33. Oil Separating Chambers
34. Right Crankcase
35. Oil Return Pipes

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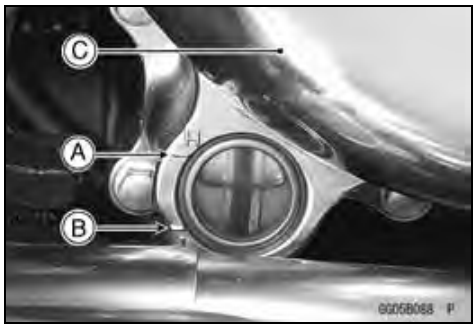
Engine Oil and Oil Filter

⚠ 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

- Situate the motorcycle so that it is vertical.
- Check that the engine oil level is between the upper [A] and lower [B] levels in the gauge.
  Clutch Cover [C]



NOTE

○*Situate the motorcycle so that it is perpendicular to the ground.*

○*If the motorcycle has just been used, wait 2 ~ 3 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 2 ~ 3 minutes until the oil settles.*

CAUTION

Racing the engine before the oil reaches every part can cause engine seizure.
If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

★If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.

★If the oil level is too low, add the correct amount of oil through the oil 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

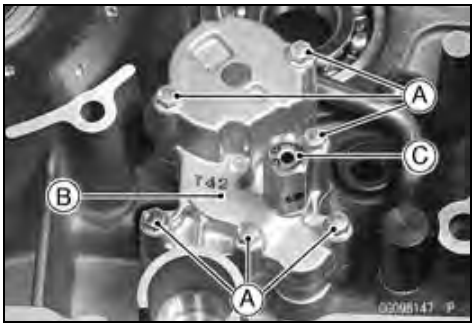
- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

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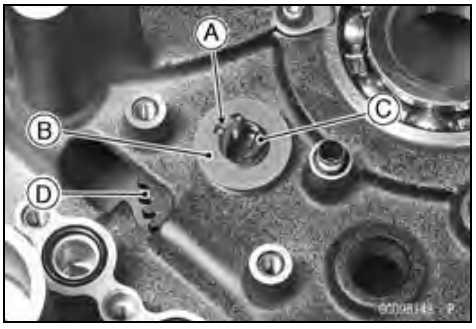
Oil Pump and Oil Line

Oil Pump Removal

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Split the crankcase (see Crankcase Disassembly in the Crankshaft/Transmission chapter).
- Remove the oil pump mounting bolts [A], and take off the pump [B] out of the right crankcase.
- Unscrew the relief valve [C] if necessary.



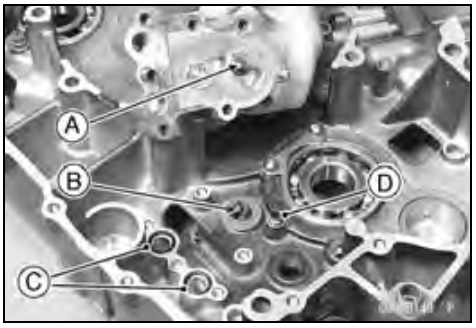
- Remove:
  Circlip [A]
  Washer [B]
  Pump Shaft [C]
  Pump Gear [D]



Oil Pump Installation

- Note the position of the oil pump shaft tang [A] and turn the pump gear shaft so that the tang fits into the slot [B] of the oil pump gear.
- Replace the O-rings [C] with new ones if they are damaged.
- Be sure to install the dowel pins [D].
- Tighten:

Torque - Oil Pump Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

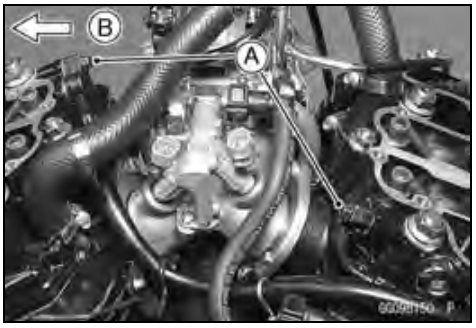


- Check that the oil pump gear turns smoothly in the left side of the right crankcase.
- Apply a non-permanent locking agent to the threads of the relief valve and install it.

Torque - Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)

Oil Hose Removal

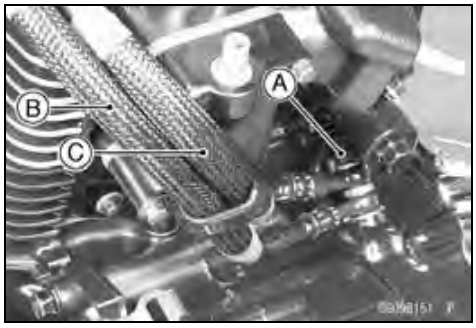
- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Rocker Case Covers (see Rocker Case Cover Removal in the Engine Top End chapter)
  Oil Hose Flange Bolts [A]
  Front [B]



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Oil Pump and Oil Line

● Remove:
Oil Hose Banjo Bolt [A]
Front Oil Hose [B]
Front Oil Hose [C]

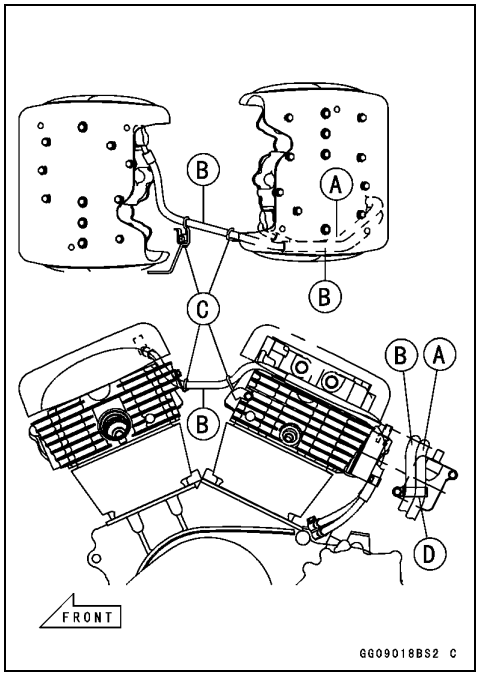


Oil Hose Installation

● Run the front oil hose over the rear oil hose as shown.
○Insert the rear oil hose [A] first.
○Next insert the front oil hose [B].
○Run both oil hoses between the rocker case and the rocker case cover.

Torque - Oil Hose Flange Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

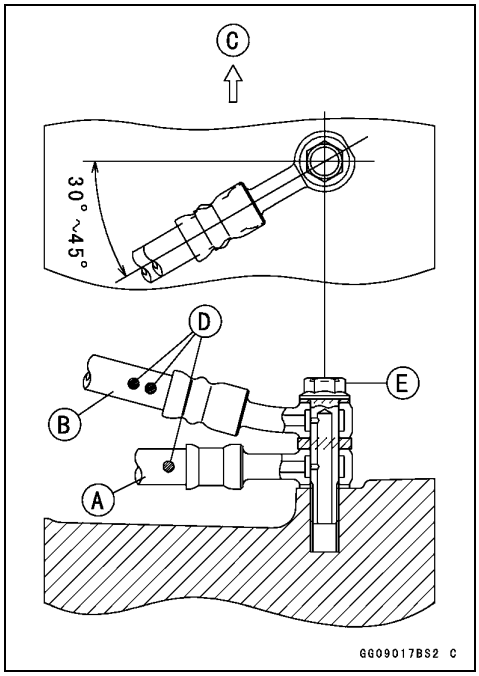
● Hook the front oil hose to the clamps [C].
● Fit the clamp [D] as shown.



● Install each bottom end of the oil hoses on the right crankcase behind the rear cylinder as shown.
Front Oil Hose [A]
Rear Oil Hose [B]
Front [C]
○Face the paint marks [D] rearward.
● Replace the copper washers on each side of the banjo bolt with new ones.

Torque - Oil Hose Banjo Bolt [E]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

● Install the removed parts (see appropriate chapters).

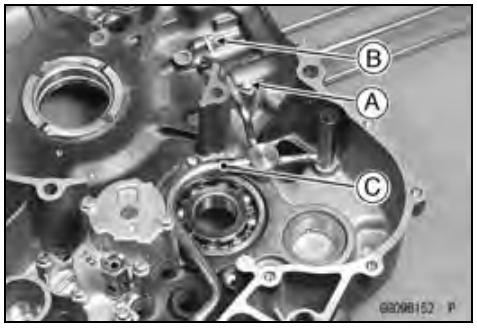


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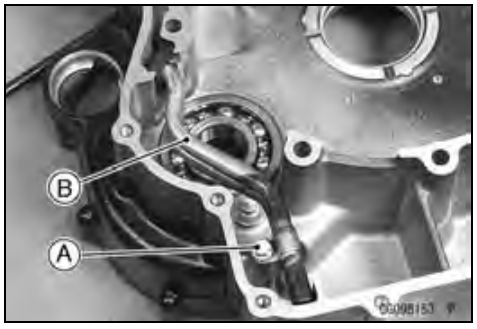
Oil Pump and Oil Line

Inside Oil Pipe Removal

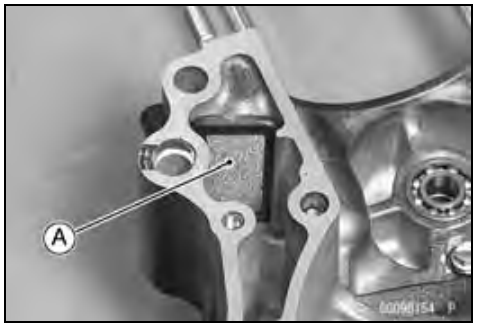
- Split the crankcase (see Crankcase Disassembly in the Crankshaft/Transmission chapter).
- Remove:
  Oil Pipe Clamp Bolt [A]
  Oil Pipe Holder Bolt [B]
- Remove the inside oil pipe [C] from the right crankcase.



- Remove the oil return pipe clamp bolt [A], and oil return pipe [B].

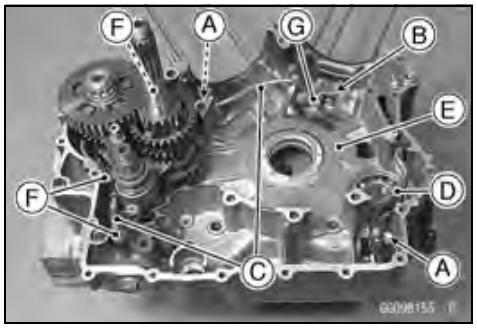


- Remove the oil separator [A].



- Remove:
  Oil Pipe Clamp Bolts [A]
  Oil Pipe Holder Bolt [B]
- Remove the inside oil pipe [C] and the oil return pipe [D] from the left crankcase [E].

○Pull out the large size fittings [F] first, and remove the small size fitting [G] upward.



- Remove the bolt [A] and the oil baffle [B].

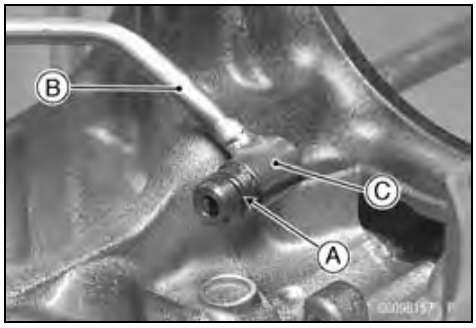


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Oil Pump and Oil Line

Inside Oil Pipe Installation

- Check that the oil pipe fitting O-rings [A] are in good condition.
- Apply grease to the O-rings before installation.
  Oil Pipe [B]
  Fitting [C]



- Install the inside oil pipe [A], separator [B] and the oil return pipe [C] to left crankcase [D] as shown.

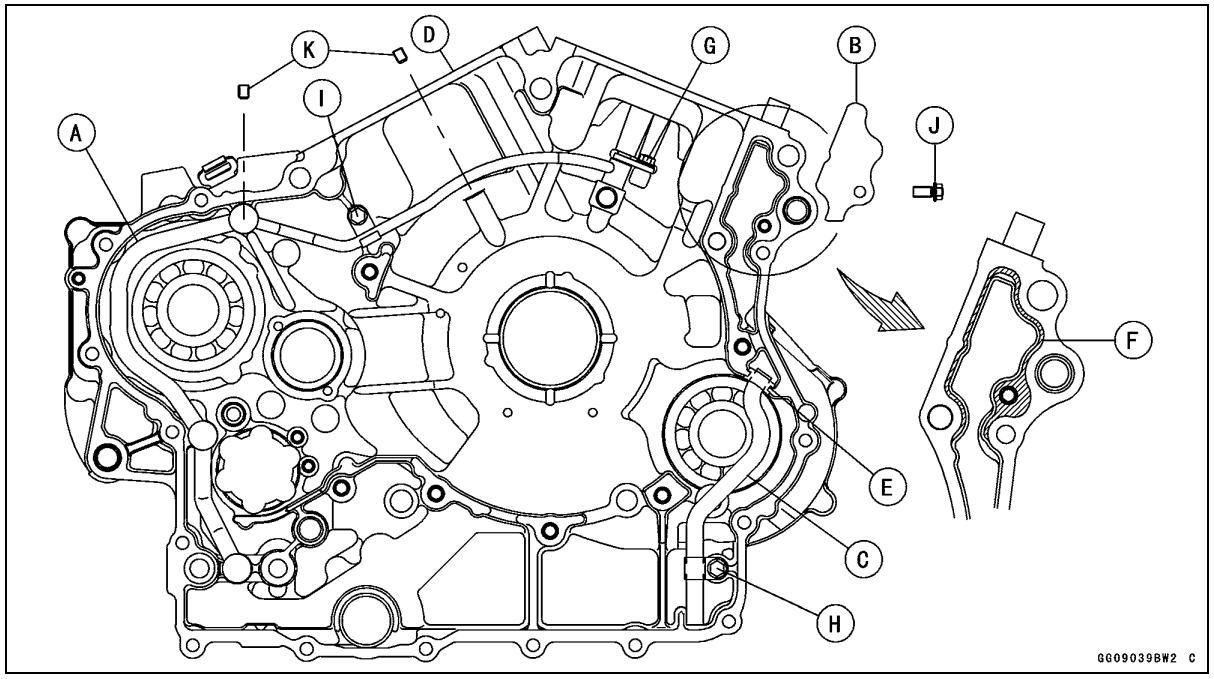
○Do not apply silicone sealant to the groove of the grommet and the mating surface of the grommet [E].

○Apply silicone sealant to the crankcase mating surface [F] of the separator.

Sealant - Three Bond: TB1207B

○Apply a non-permanent locking agent to the oil pipe holder bolt [G], oil return pipe clamp bolt [H] oil pipe clamp bolts [I], and oil baffle bolt [J].

○If the oil nozzles [K] are removed, install them.

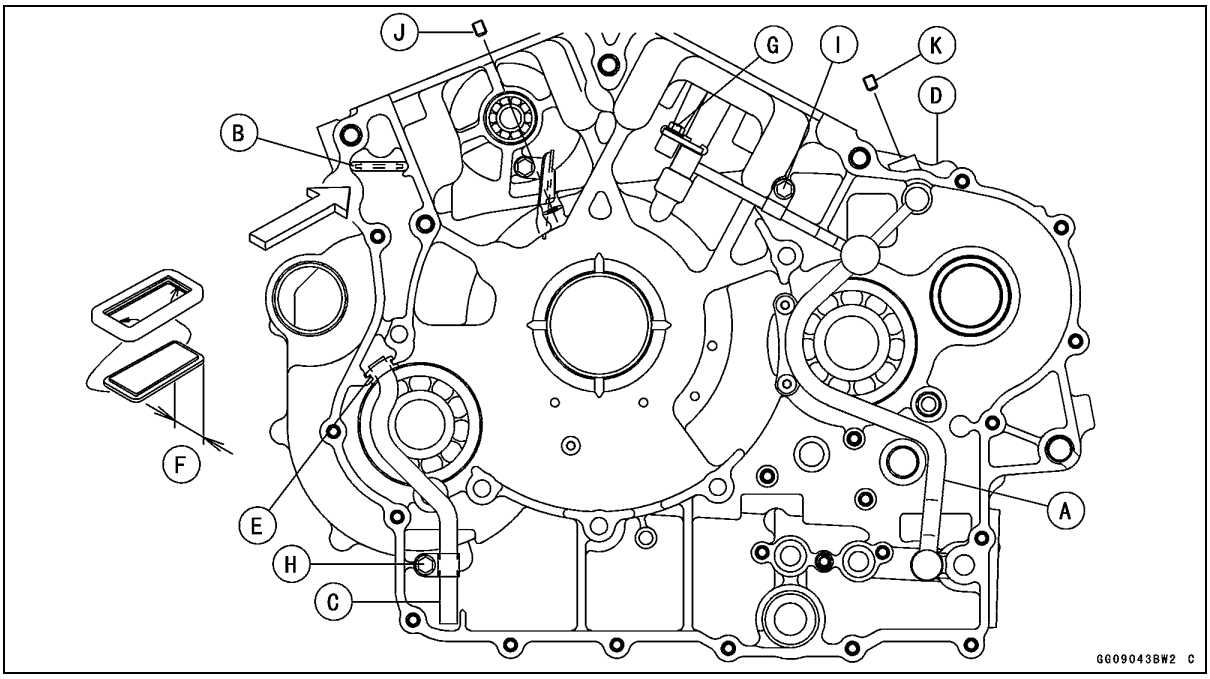


Torque - Oil Pipe Holder Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Return Pipe Clamp Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Pipe Clamp Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Baffle Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Nozzles: 3.0 N·m (0.30 kgf·m, 26 in·lb)

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Oil Pump and Oil Line

● Install the inside oil pipe [A], separator [B], and the oil return pipe [C] to the right crankcase [D].
○Do not apply silicone sealant to the groove of the grommet and the mating surface of the grommet [E].
○Install the separator so that it's smaller side [F] faces inside.
○Apply a non-peramanet locking agent to the oil pipe holder bolt [G], oil return pipe clamp bolt [H] and oil pipe clamp bolts [I].
○If the oil nozzle [J] is removed, install it.
○The oil hose nozzle [K] has left-hand threads.

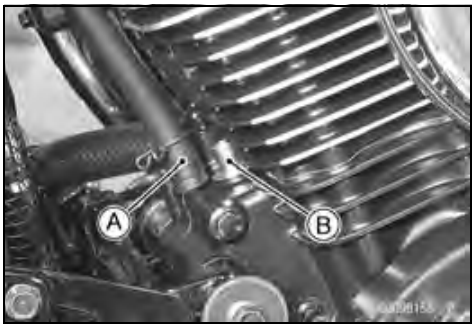


Torque - Oil Pipe Holder Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Return Pipe Clamp Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Pipe Clamp Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)
Oil Hose Nozzle: 3.0 N·m (0.30 kgf·m, 26 in·lb)
Oil Nozzle: 3.0 N·m (0.30 kgf·m, 26 in·lb)

● Install the removed parts (see appropriate chapters).

Blowby Gas System Inspection

● Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the oil reserve tank and right air cleaner base.
★If they are not, correct them.
● Inspect the breather hoses [A], breather pipe [B], and the air cleaner drain hose for damage or signs of deterioration.
○These hoses should not be hard and brittle, nor should be soft or swollen.
★Replace it if any cracks or swelling are noticed.
● Check that the hoses are securely connected.



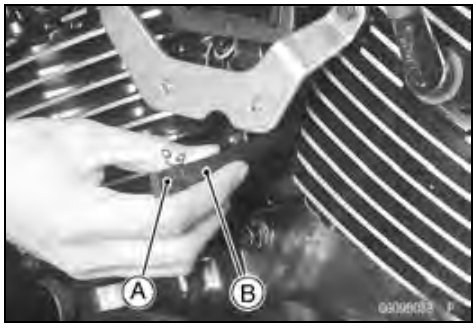
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Oil Pump and Oil Line

Breather Drain Cleaning

○The air cleaner drain hose is provided beneath the right air cleaner housing, and catches the water or oil from the crankcase breather hose. Usually water or oil does not collect at the bottom. In the event that rain water is drawn in through the air cleaner or if engine oil is blown back, drain the housing.

- Remove the left air cleaner housing (see Left Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Remove the drain plug [A] from the air cleaner drain hose [B] to drain the water or breather.
- Install the plug on its original position.



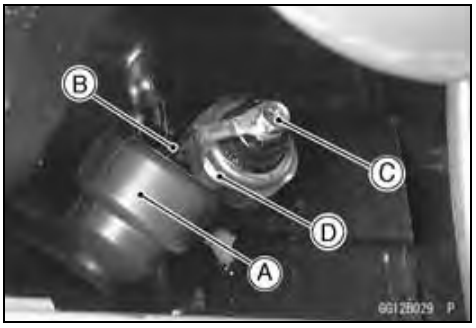
⚠ WARNING

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

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Oil Pressure

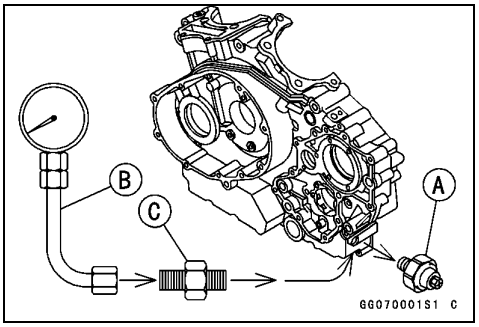
Oil Pressure Measurement



- Slide out the rubber boot [A].
- Disconnect the oil pressure switch lead [B] from the terminal screw [C].
- Unscrew the oil pressure switch [D].

NOTE

○*Measure the oil pressure after the engine is warmed up.*



- Attach the oil pressure gauge [B] and adapter [C] to the switch hole.

  Oil Pressure Switch [A]

  Special Tools - Oil Pressure Gauge, 5 kgf/cm²: 57001-125
  Oil Pressure Gauge Adapter, PT 1/8: 57001-1033

- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

★If the oil pressure is much lower than the standard, check the oil pump, oil pressure relief valve, and/or crankshaft bearing wear and con-rod big end bearing insert wear immediately.

★If the reading is much higher than the standard, check the oil screen first, and the oil passages for dirt or clogging. Also, replace the oil filter.

Oil Pressure
Standard: 340 ~ 440 kPa (3.5 ~ 4.5 kgf/cm², 50 ~ 64 psi) @ 2 000 r/min (rpm), oil temperature 90°C (194°F)

- Stop the engine.
- Remove the oil pressure gauge and adapter.

⚠ WARNING

Take care against burns from hot engine oil that will drain through the oil passage when the plug is removed.

- When installing the oil pressure switch, apply silicone sealant to the threads of the switch, and tighten it to the specified torque.

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

  Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Apply grease to the oil pressure switch terminal screw.

  Torque - Oil Pressure Switch Terminal Screw: 1.5 N·m (0.15 kgf·m, 13 in·lb)

- Connect the oil pressure switch lead and slide back the rubber boot to the original position.

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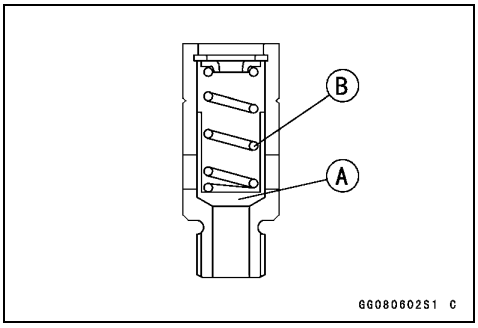
Oil Pressure

Relief Valve Inspection

- Remove the relief Valve (see Oil Pump Removal in this chapter).
- Check to see if the valve slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring 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.

Valve [A]
Spring [B]

★If cleaning does not solve the problem, replace the relief valve as an assembly. The relief valve is precision made with no allowance for replacement of individual parts.

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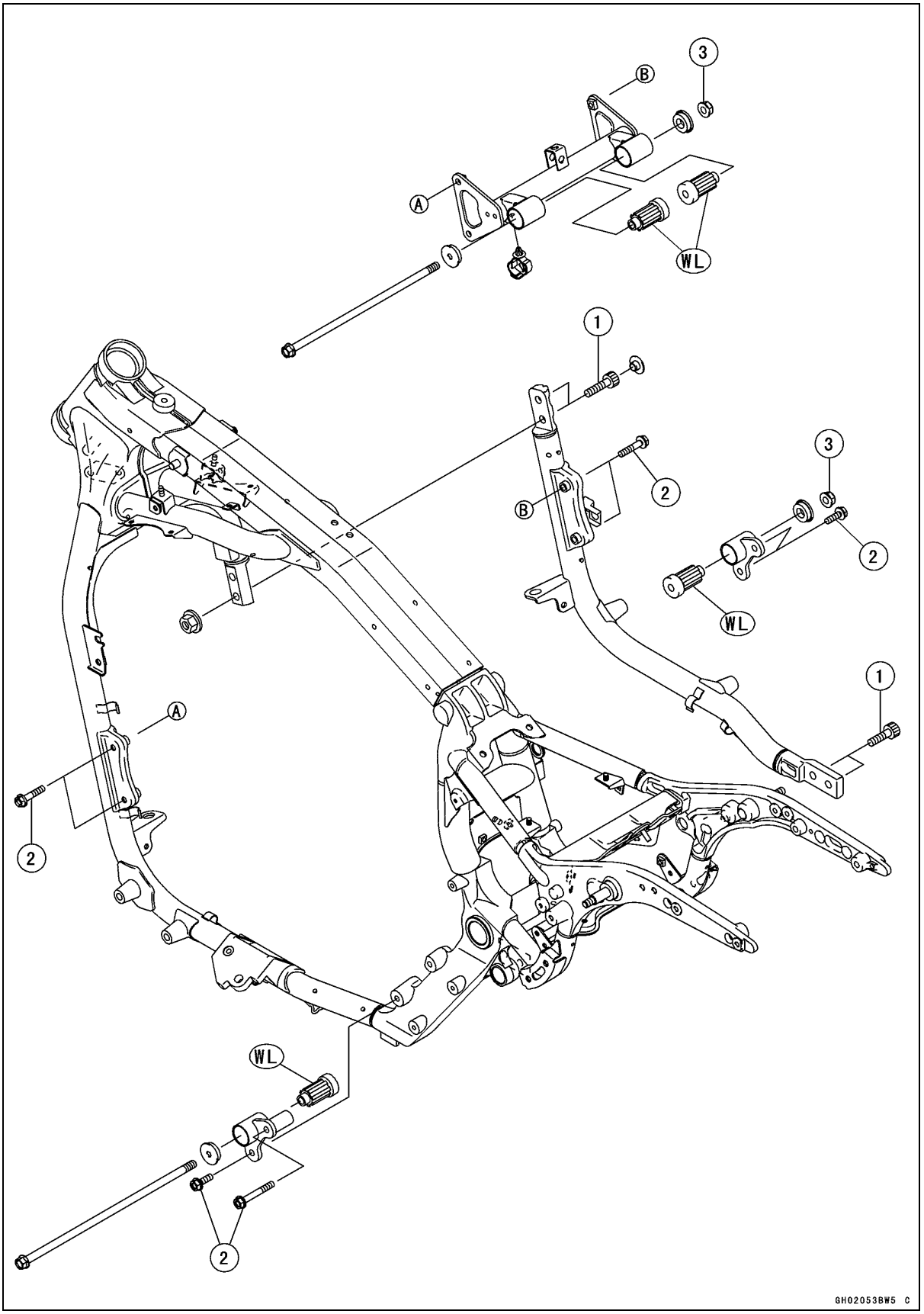
Engine Removal/Installation

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Exploded View



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Exploded View

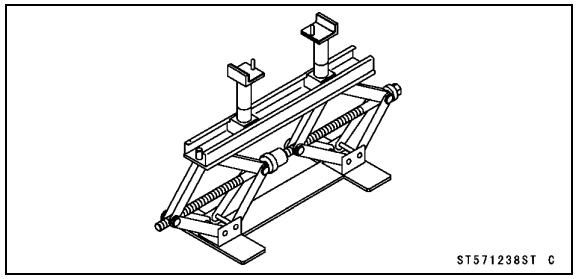
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Downtube Bolts	59	6.0	44	
2	Engine Mounting Bracket Bolts	25	2.5	18	
3	Engine Mounting Nuts	44	4.5	33	

WL: Apply a soap and water solution or rubber lubricant.

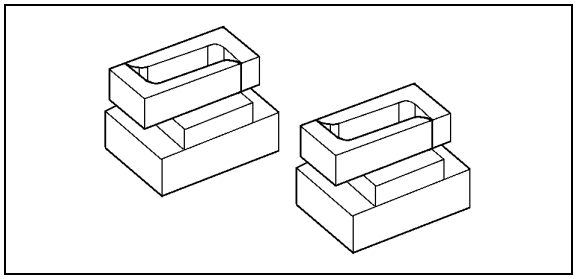
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Special Tools

Jack:
57001-1238



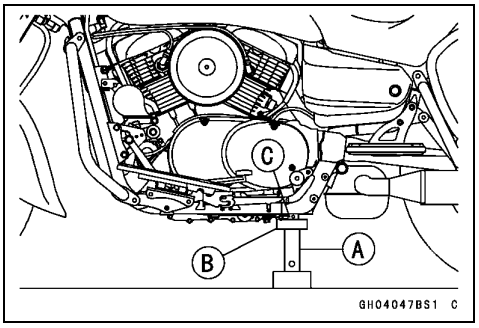
Attachment Jack:
57001-1398



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Engine Removal/Installation

Engine Removal



- Support the rear part of the frame on the jack [A] and the attachment jack [B].

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

○Fit the ribs [C] of the frame into the groove of the attachments.



- 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:
  Coolant (see Coolant Change in the Periodic Maintenance chapter)
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Battery Cables (see Battery Removal in the Electrical System chapter)
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Left Air Cleaner Housing (see Left Air Cleaner Housings Removal/Installation in the Fuel System (DFI) chapter)
  Right Air Cleaner Housing (see Right Air Cleaner Housings Removal in the Fuel System (DFI) chapter)
  Throttle Cable (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Front and Rear Exhaust Pipes (see Exhaust Pipe Removal in the Engine Top End chapter)
  Alternator Outer Cover (see Alternator Outer Cover Removal in the Electrical System chapter)
  Radiator (see Radiator Removal in the Cooling System chapter)
  Thermostat Housing (see Thermostat Removal in the Cooling System chapter)
  Ignition Coil #1 and #2 (see Ignition Coil Removal in the Electrical System chapter)
  Left and Right Front Guards (see Front Guard Removal/Installation in the Frame chapter)

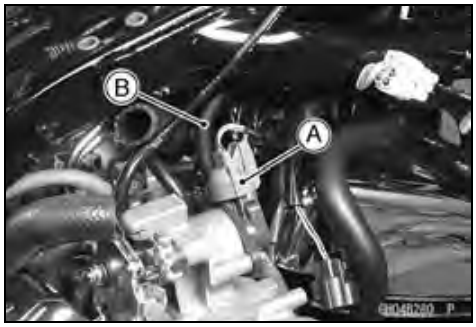
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Engine Removal/Installation

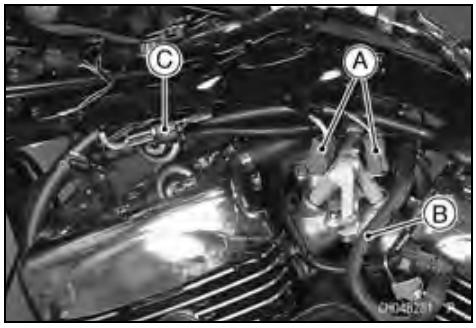
● Remove:
Right Spark Plug Lead Holder [A]
Throttle Body Assy Holder [B]
Engine Ground Terminal [C]



● Remove:
Throttle Sensor Connector [A]
Inlet Air Pressure Sensor Hose [B]



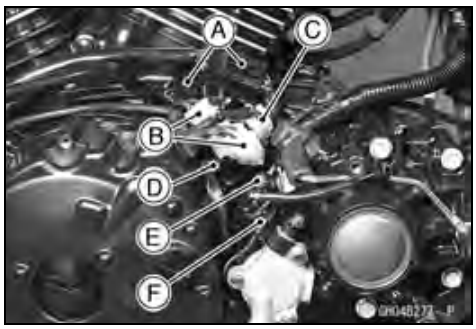
● Remove:
Injector Connectors [A]
Fuel Hose [B]
Connector [C]



● Remove:
Horn [A]
Choke Knob [B]



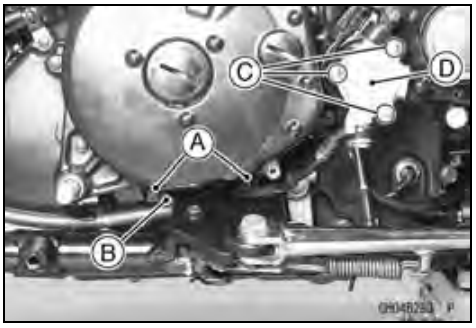
● Disconnect:
Regulator/Rectifier Lead Connectors [A]
Alternator Lead Connectors [B]
Crankshaft Sensor Lead Connector [C]
Side Stand Switch Lead Connector [D]
Speed Sensor Lead Connector [E]
Oil Pressure Switch/Neutral Switch Connector [F]



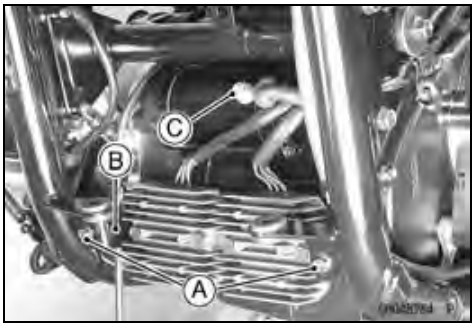
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Engine Removal/Installation

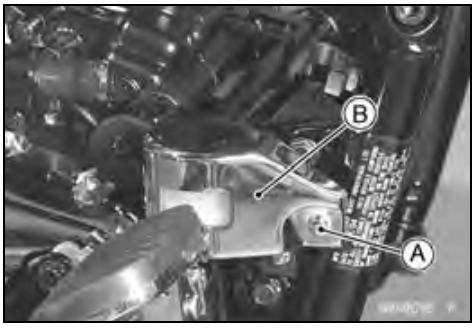
- Remove:
  Bracket Bolts [A]
  Clutch Hose Bracket [B]
  Clutch Slave Cylinder Bolts [C]
  Clutch Slave Cylinder [D] (see Clutch Slave Cylinder Removal in the Clutch chapter)



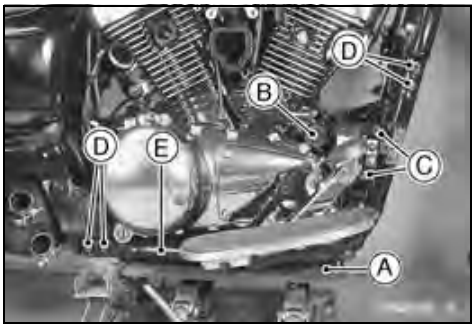
- Remove:
  Bracket Bolts [A]
  Regulator/Rectifier Bracket [B]
  Starter Motor Terminal Nut [C]



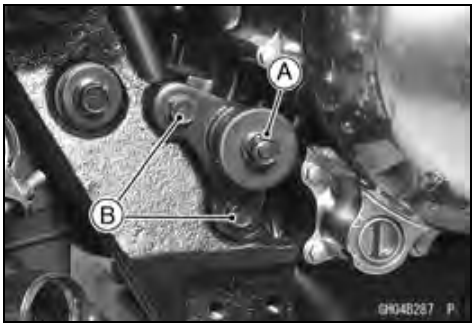
- Remove:
  Brake Reservoir Cover Bolt [A]
  Brake Reservoir Cover [B]



- Support the engine with a commercially available stand [A].
- Remove:
  Engine Mounting Nut [B]
  Engine Mounting Bracket Bolts [C] (Both Sides)
  Downtube Bolt Cap and Bolts [D]
- Remove the downtube [E] with the right front footboard and rear master cylinder installed.



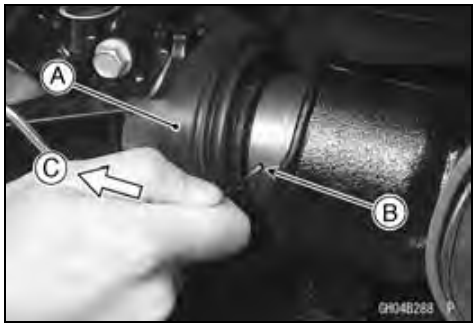
- Remove:
  Engine Mounting Nuts [A]
  Engine Mounting Bracket Bolts [B] (Both Sides)



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Engine Removal/Installation

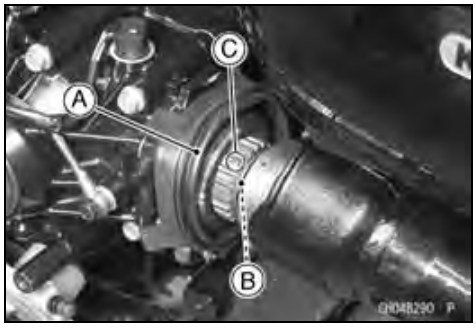
● Disengage the propeller shaft from the engine.
○Pull off the rubber boot [A] and push on the lockpin [B] a little with a pin.
○Move the engine forward [C] to free it from the rear propeller shaft.



● Remove the engine [A] from the motorcycle right side.



Engine Installation
● Support the engine with a commercially available stand and move them inside the frame in the reverse order of removal.
● Install the rubber boot [A] on the rear end of the front bevel gear case.
● Fit the spring [B] into the front bevel gear joint.
● Put the lockpin [C] into the front bevel gear joint.



● Apply a thin coat of high temperature grease to the driven gear joint and to the propeller shaft joint.
● Push on the lockpin [A] and move back the engine to engage the front bevel gear joint with the propeller shaft joint.



● Insert the rear mounting bolt from the left side of the engine to set the engine into its original position in the frame.
● Tighten:

Torque - Downtube Bolts: 59 N·m (6.0 kgf·m, 44 ft·lb)
Engine Mounting Nuts: 44 N·m (4.5 kgf·m, 33 ft·lb)
Engine Mounting Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

● Run the leads, cables and hoses correctly (see Cable, Wire and Hose Routing section in the Appendix chapter).

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Engine Removal/Installation

- Connect the engine ground lead [A] down to the engine as shown.

Torque - Engine Ground Terminal Bolt: 7.8 N·m (0.80 kgf·m, 69 in·lb)



- Install the removed parts (see appropriate chapters).
- Adjust the throttle cables (see Throttle Grip Free Play Adjustment in the Fuel System (DFI) chapter).
- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Adjust the idling (see Idle Speed Inspection in the Periodic Maintenance chapter).
- Check the clutch operation.
- Check the brake effectiveness.

⚠ WARNING

Do not attempt to ride the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brake will not function on the first application of the lever or pedal if this is not done.

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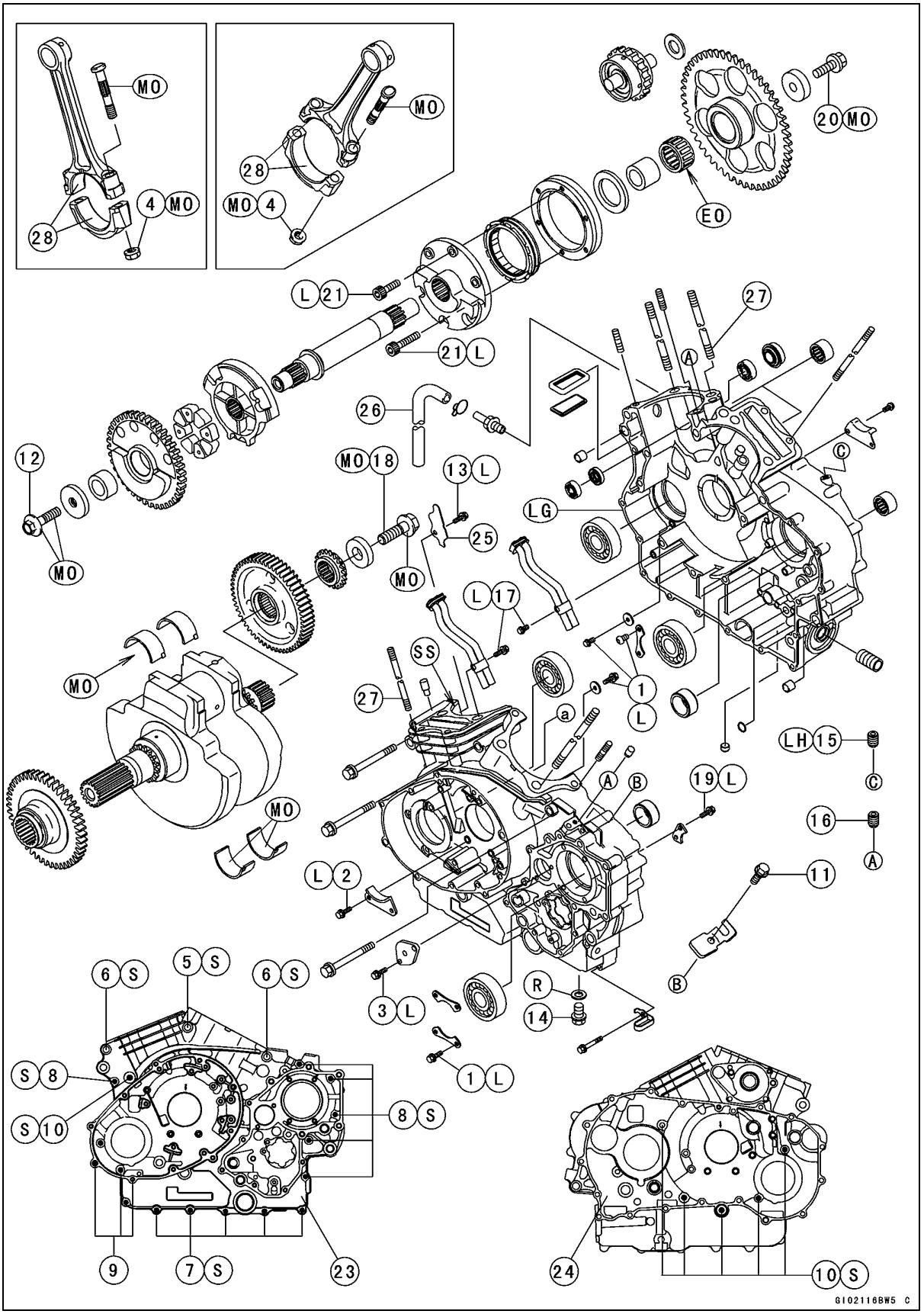
Crankshaft/Transmission

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Exploded View



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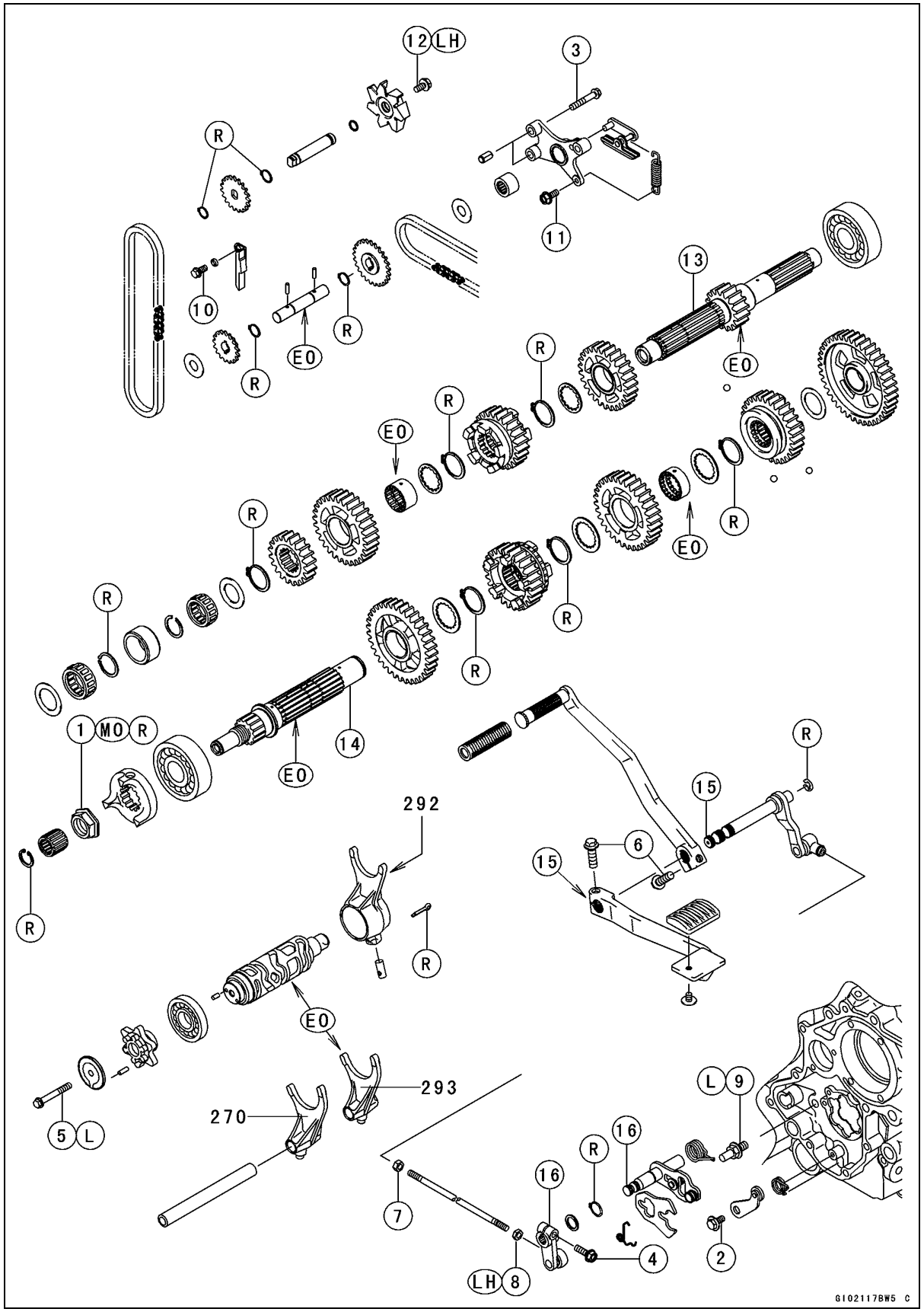
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bearing Retainer Bolts	11	1.1	97 in·lb	L
2	Camshaft Chain Guide Bolts	11	1.1	97 in·lb	L
3	Clutch Push Rod Guide Bolts	11	1.1	97 in·lb	L
4	Connecting Rod Big End Nuts	59	6.0	44	MO
5	Crankcase Bolt (M10, L = 115 mm)	39	4.0	29	S
6	Crankcase Bolts (M10, L = 105 mm)	39	4.0	29	S
7	Crankcase Bolts (M6, L = 80 mm)	11	1.1	97 in·lb	S
8	Crankcase Bolts (M6, L = 70 mm)	11	1.1	97 in·lb	S
9	Crankcase Bolts (M6, L = 40 mm)	11	1.1	97 in·lb	S
10	Crankcase Bolts (M8)	21	2.1	15	S
11	Frame Ground Bracket Bolt	11	1.1	97 in·lb	L
12	Left Balancer Gear Bolt	85	8.5	63	MO
13	Oil Baffle Bolt	11	1.1	97 in·lb	L
14	Oil Drain Plug	20	2.0	15	
15	Oil Hose Nozzle	2.9	0.30	26 in·lb	LH
16	Oil Nozzles	2.9	0.30	26 in·lb	
17	Oil Return Pipe Clamp Bolts	11	1.1	97 in·lb	L
18	Primary Gear Bolt	145	14.5	107	MO
19	Shift Drum Bearing Holder Bolts	11	1.1	97 in·lb	L
20	Starter Clutch Bolt	85	8.7	63	MO
21	Starter Clutch Coupling Bolts	15	1.5	11	L
22	Water Pump Drainage Hose Fitting	9.8	1.0	87 in·lb	

23. Left Crankcase
24. Right Crankcase
25. Oil Baffle
26. Water Pump Drainage Hose
27. Apply a non-permanent locking agent to the tap end of this stud only.
28. Do not apply any oil.

EO: Apply engine oil.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket (Kawasaki Bond: 92104-1064).
LH: Left-hand Threads
MO: Apply molybdenum disulfide oil solution to the threads and the seating surface. (mixture of engine oil and molybdenum disulfide grease with a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specific tightening sequence.
SS: Apply silicone sealant (Three Bond: TB1207B).

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Damper Cam Nut	195	20.0	144	MO, R
2	Gear Set Lever Bolt	11	1.1	97 in·lb	
3	Idle Shaft Holder Bolts	8.3	0.85	73 in·lb	
4	Rear Shift Lever Clamp Bolt	12	1.2	104 in·lb	
5	Shift Drum Cam Bolt	15	1.5	11	L
6	Shift Pedal Clamp Bolts	29	3.0	21	
7	Shift Rod Locknut (Front)	11	1.1	97 in·lb	
8	Shift Rod Locknut (Rear)	11	1.1	97 in·lb	LH
9	Shift Shaft Return Spring Pin	39	4.0	29	L
10	Water Pump Chain Guide Bolt	8.3	0.85	73 in·lb	
11	Water Pump Chain Guide Spring Hook Bolt	2.9	0.30	26 in·lb	
12	Water Pump Impeller Bolt	8.8	0.90	78 in·lb	LH

13. Drive Shaft
14. Output Shaft
15. Align the punch marks.
16. Align the punch mark with the slit.

EO: Apply engine oil.
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

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Specifications

Item	Standard	Service Limit
Crankshaft, Connecting Rods		
Connecting Rod Bend	– – –	TIR 0.2/100 mm (0.08/3.94 in.)
Connecting Rod Twist	– – –	TIR 0.2/100 mm (0.08/3.94 in.)
Connecting Rod Big End Side Clearance	0.16 ~ 0.46 mm (0.006 ~ 0.018 in.)	0.7 mm (0.03 in.)
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.026 ~ 0.057 mm (0.0010 ~ 0.0022 in.)	0.10 mm (0.004 in.)
Crankpin Diameter:	54.981 ~ 55.000 mm (2.1646 ~ 2.1654 in.)	54.97 mm (2.164 in.)
Marking:		
None	54.981 ~ 54.991 mm (2.1646 ~ 2.1650 in.)	– – –
○	54.992 ~ 55.000 mm (2.1650 ~ 2.1654 in.)	– – –
Connecting Rod Big End Bore Diameter:	58.000 ~ 58.020 mm (2.2835 ~ 2.2842 in.)	– – –
Marking:		
None	58.000 ~ 58.010 mm (2.2835 ~ 2.2839 in.)	– – –
○	58.011 ~ 58.020 mm (2.2839 ~ 2.2842 in.)	– – –
Connecting Rod Big End Bearing Insert Thickness:		
Brown	1.483 ~ 1.487 mm (0.0584 ~ 0.0585 in.)	– – –
Black	1.487 ~ 1.491 mm (0.0585 ~ 0.0587 in.)	– – –
Blue	1.491 ~ 1.495 mm (0.0587 ~ 0.0589 in.)	– – –

Connecting Rod Big End Bearing Insert Selection

Con-Rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028-1476
None	None	Black	92028-1475
○	○		
○	None	Blue	92028-1474

Crankshaft Side Clearance	0.05 ~ 0.55 mm (0.002 ~ 0.020 in.)	0.75 mm (0.030 in.)
Crankshaft Web Length	96.85 ~ 96.95 mm (3.813 ~ 3.817 in.)	96.6 mm (3.80 in.)
Crankshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.002 in.)

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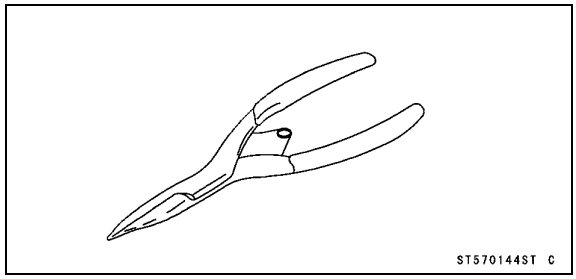
Specifications

Item	Standard	Service Limit
Crankshaft Main Bearing/Journal Clearance	0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in.)	0.10 mm (0.004 in.)
Crankshaft Main Journal Diameter	54.986 ~ 55.000 mm (2.1648 ~ 2.1654 in.)	54.96 mm (2.164 in.)
Crankcase Main Bearing Bore Diameter	55.025 ~ 55.038 mm (2.1663 ~ 2.1668 in.)	55.07 mm (2.168 in.)
Transmission		
Shift Fork Ear Thickness	5.9 ~ 6.0 mm (0.23 ~ 0.24 in.)	5.8 mm (0.23 in.)
Gear Shift Fork Groove Width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.25 mm (0.246 in.)
Shift Fork Guide Pin Diameter	7.9 ~ 8.0 mm (0.311 ~ 0.315 in.)	7.8 mm (0.307 in.)
Shift Drum Groove Width	8.05 ~ 8.20 mm (0.317 ~ 0.323 in.)	8.30 mm (0.327 in.)

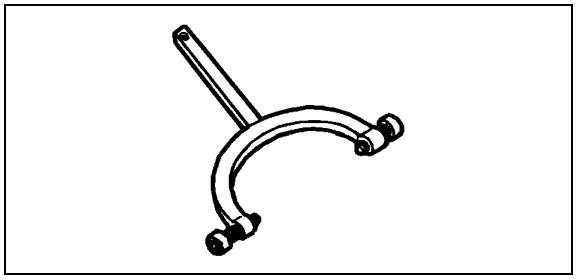
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Special Tools and Sealant

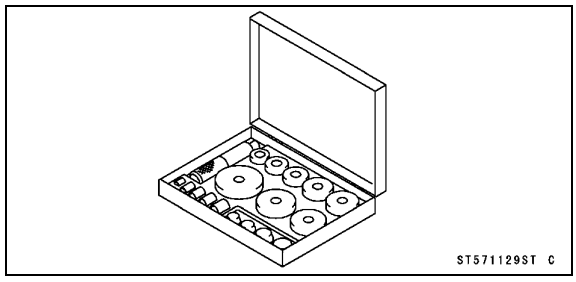
Outside Circlip Pliers:
57001-144



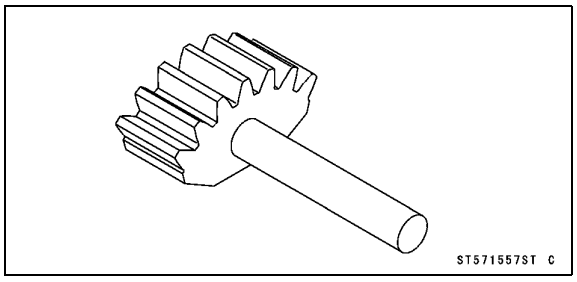
Flywheel Holder:
57001-1410



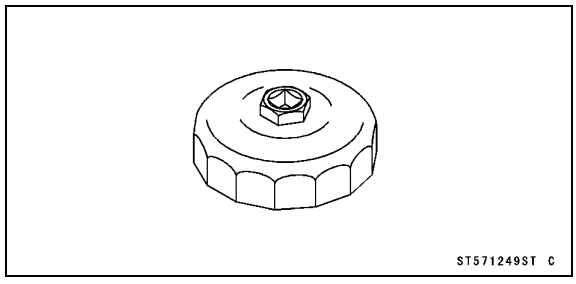
Bearing Driver Set:
57001-1129



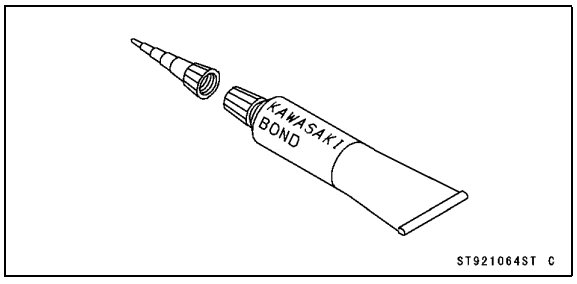
Gear Holder, m2.0:
57001-1557



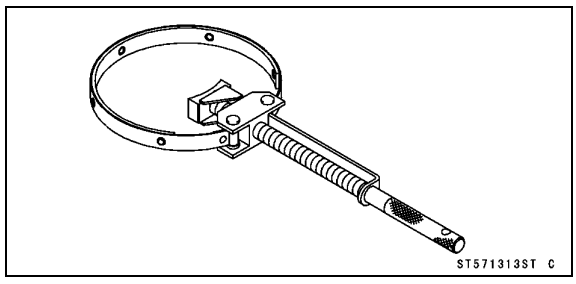
Oil Filter Wrench:
57001-1249



Kawasaki Bond:
92104-1064



Flywheel Holder:
57001-1313



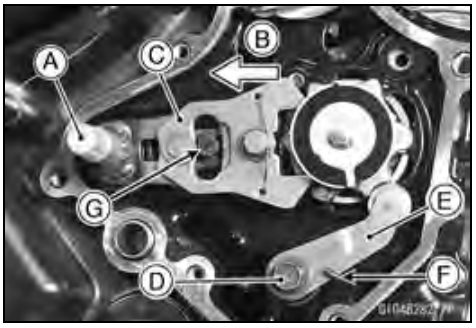
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Crankcase

Crankcase Disassembly

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Water Pump (see Water Pump Removal in the Cooling System chapter)
  Rocker Case Covers (see Rocker Case Cover Removal in the Engine Top End chapter)
  Rocker Cases (see Rocker Case Removal in the Engine Top End chapter)
  Cylinder Heads (see Cylinder Head Removal in the Engine Top End chapter)
  Cylinder Blocks (see Cylinder Removal in the Engine Top End chapter)
  Pistons (see Piston Removal in the Engine Top End chapter)
  Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  Clutch (see Clutch Removal in the Clutch chapter)
  Front Gear Case (see Front Gear Case Removal in the Final Drive chapter)
  Damper Cam (see Damper Cam Removal in the Final Drive chapter)
  Alternator Cover (see Alternator Cover Removal/Installation in the Electrical System chapter)
  Alternator Inner Cover (see Alternator Inner Cover Removal in the Electrical chapter)

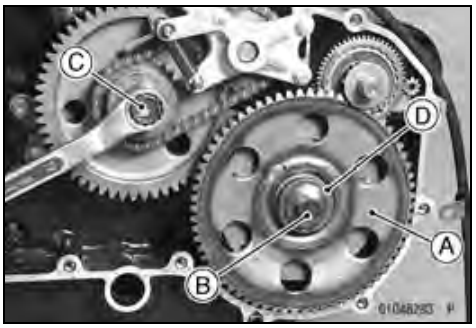
- Remove the shift shaft [A] while pushing [B] the shift mechanism arm [C] towards the shift shaft.
- Unscrew the bolt [D] and remove the gear set lever [E] and its spring [F].
- Remove the shift shaft return spring pin [G].



- Pull the starter clutch gear [A] out of the starter clutch.

○The starter clutch gear can be removed with the engine in the frame.

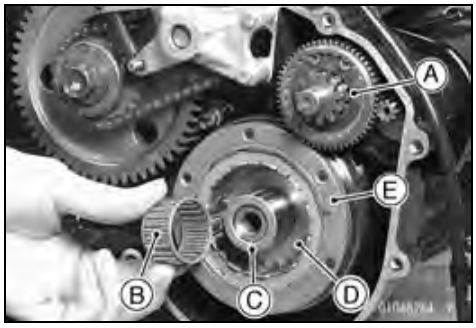
- Unscrew the starter clutch bolt [B] while holding the primary gear bolt [C].
- Remove the washer [D].



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Crankcase

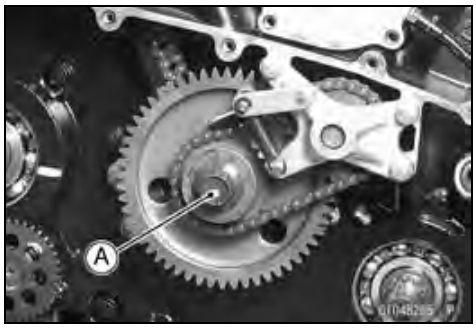
- Take out the torque limiter [A].
- Remove the following from the right end of the balancer shaft.
  Needle Bearing [B]
  Collar [C]
  Copper Washer [D]
  Starter Clutch [E]



- Unscrew the primary gear bolt [A] while holding the alternator rotor steady with the flywheel holder.

○The primary gear can be removed with the engine in the frame.

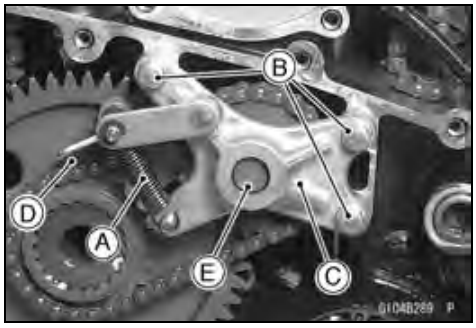
Special Tool - Flywheel Holder: 57001-1410



- Take the end of the spring [A] off the hook and unscrew the bolts [B].
- Remove the idle shaft holder [C] and chain guide [D] from the right crankcase.

○The idle shaft holder can be removed with the engine in the frame.

○Pushing the idle shaft [E], remove the holder.



- Remove the washer [A].
- Take out the water pump drive sprocket [B], chain [C] and idle shaft sprocket [D] as a set.
- Take the idle shaft [E] out of the crankcase.

○The idle shaft has two pins.



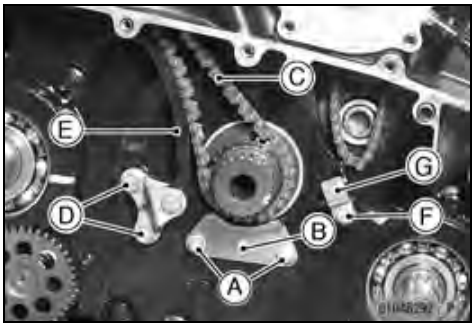
- Pull the primary gear [A] out of the crankshaft.
- Remove the idle shaft sprocket [B] with the flat washer from the water pump chain [C].



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Crankcase

- Remove:
  Lower Chain Guide Bolts [A]
  Lower Chain Guide [B]
  Rear Camshaft Chain [C]
  Rear Chain Guide Bolts [D]
  Rear Chain Guide [E]
  Front Chain Guide Retainer Bolt [F]
  Front Chain Guide Retainer [G]



- Loosen the left balancer gear bolt [A], using the flywheel holder [B].

○The left balancer gear bolt has right-hand threads.

Special Tool - Flywheel Holder: 57001-1410

- Remove the alternator rotor bolt [C] and the alternator rotor [D].



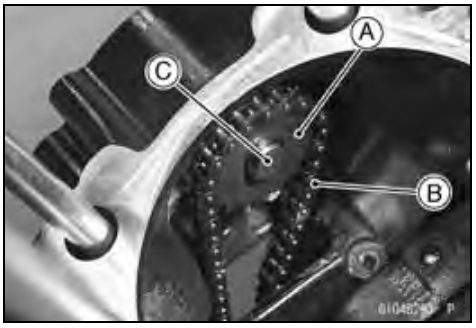
- Remove the alternator inside stator (see Alternator Inside Stator Removal in the Electrical System chapter).
- Take the balancer drive gear [A].
- Remove the left balancer gear bolt.
- Take the balancer gear [B], washer, and left balancer off the balancer shaft as a set.



- Remove:
  Lower Chain Guide Bolts [A]
  Lower Chain Guide [B]
  Front Camshaft Chain [C]
  Rear Chain Guide Bolts [D]
  Rear Chain Guide [E]
  Front Chain Guide Retainer Bolt [F]
  Front Chain Guide Retainer [G]



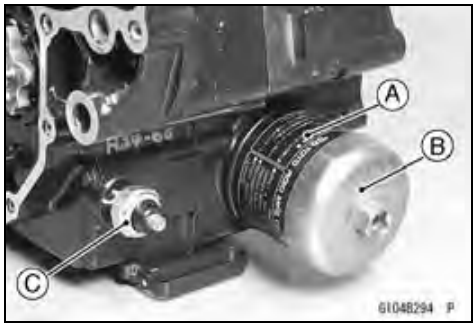
- Pull the water pump sprocket [A] with it's chain [B] and shaft [C].



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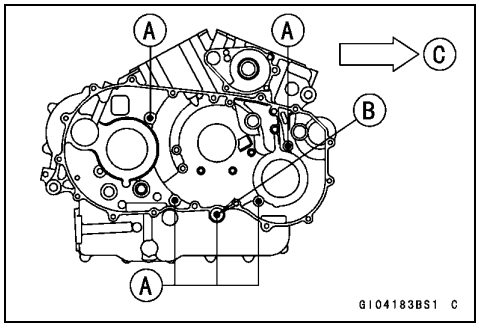
Crankcase

● Remove the oil filter [A] with the oil filter wrench [B].
Special Tool - Oil Filter Wrench: 57001-1249
● Remove the oil pressure switch [C].

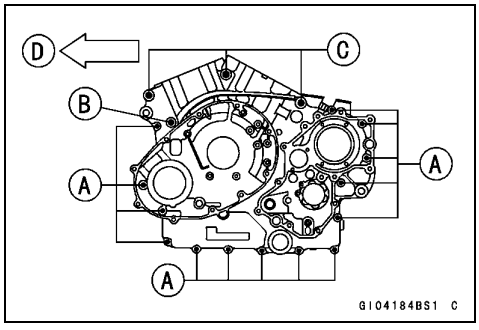


● Remove:
Oil Hoses (see Oil Hose Removal in the Engine Lubrication chapter)
Starter Motor (see Starter Motor Removal in the Electrical System chapter)

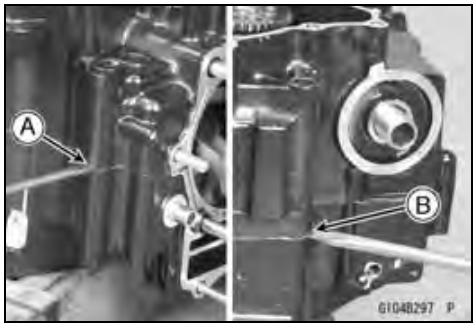
● Remove the right crankcase bolts.
M8 Bolts (5) [A]
○Be sure to remove this bolt [B].
Front [C]



● Remove all the left crankcase bolts in the order listed.
M6 Bolts (14) [A]
M8 Bolt (1) [B]
M10 Bolts (3) [C]
Front [D]

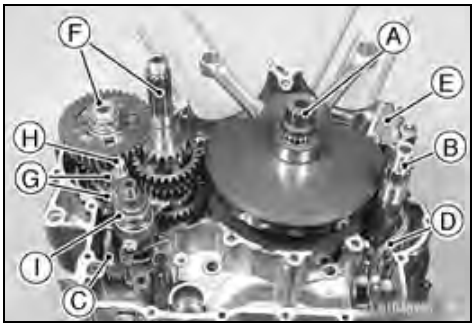


● Turn the left crankcase down.
● Lift up the right crankcase.
○Using the pry points, split the crankcase halves.
Pry Point (Front) [A]
Pry Point (Rear) [B]

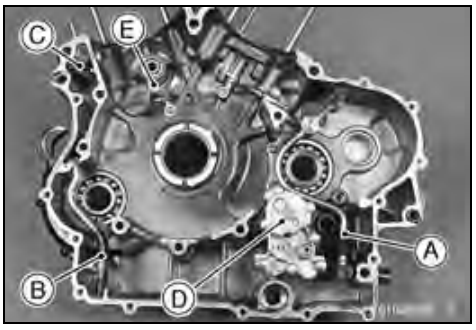


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Crankcase



- Remove the following from the left crankcase.
  Crankshaft [A]
  Balancer Shaft [B]
  Inside Oil Pipe [C] and Oil Return Pipe [D] (see Inside Oil Pipe Removal in the Engine Lubrication System chapter)
  Oil Baffle [E]
  Transmission Assy [F] (see Transmission Removal in this chapter)
  Shift Forks [G] and Shift Rod [H]
  Shift Drum Assy [I]



- Remove the following from the right crankcase.
  Inside Oil Pipe [A] and Oil Return Pipe [B] (see Inside Oil Pipe Removal in the Engine Lubrication System chapter)
  Oil Separator [C]
  Oil Pump [D] (see Oil Pump Removal in the Engine Lubrication System chapter)
  Water Pump Chain Guide [E]

CAUTION

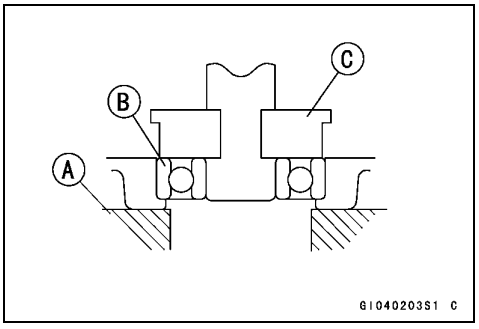
Do not remove the bearings and the oil seals unless it is necessary.
Removal may damage them.

Crankcase Assembly

CAUTION

The left and right crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

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



- Support the crankcase bearing boss with a suitable retainer [A].
- Using a press and the bearing driver set [C], install a new bearing [B] or/and race by pushing the bearing outer race until it bottoms out.

CAUTION

Support the crankcase bearing boss when pushing the bearing, otherwise the crankcase could be damaged.

- Press the three needle bearings with manufacturer's marks facing out into holes on the right side of the right crankcase. Push the needle bearing outer race until the face of the bearing is even with the end of the hole, using a driver.

Special Tool - Bearing Driver Set: 57001-1129

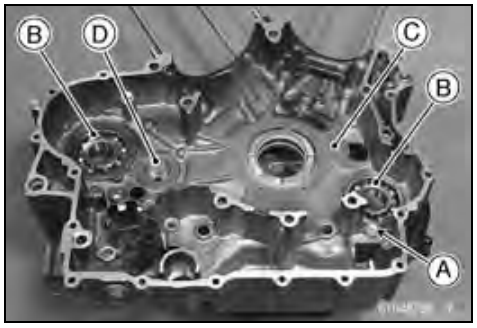
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Crankcase

● Apply a non-permanent locking agent to the threads of the bearing retainer bolt.
● Install the bearing retainer [A].

Torque - Bearing Retainer Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

Bearings [B]
Race [C]
Left Crankcase [D]

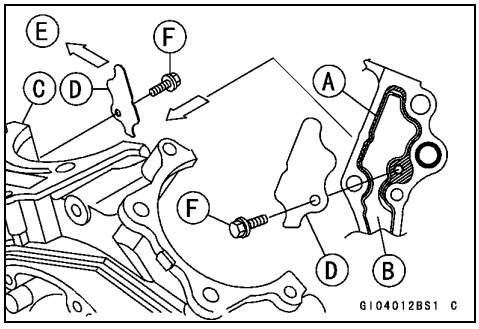


● Apply silicone sealant [A] to the step of the oil separating chamber [B] in the left crankcase [C].

Sealant - Three Bond: TB1207B

● Apply a non-permanent locking agent to the threads of the oil baffle bolt [F].
● Install the oil baffle [D] on the chamber.
Front [E]

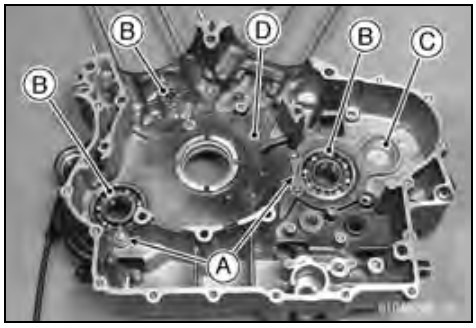
Torque - Oil Baffle Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)



● Apply a non-permanent locking agent to the threads of the bearing retainer bolts.
● Install the bearing retainers [A].

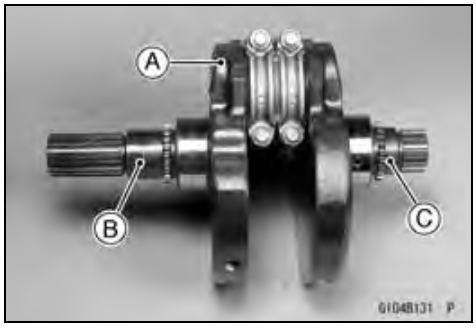
Torque - Bearing Retainer Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

Bearings [B]
Race [C]
Right Crankcase [D]



● Install the following in the left crankcase.
Transmission Assy and Shift Drum Assy (see Transmission Installation in this chapter)
Shift Fork and Shift Rod (see Transmission Installation in this chapter)
Oil Pipe and Oil Return Pipe (see Inside Oil Pipe Installation in the Engine Lubrication System chapter)
● Apply engine oil to the transmission gears, ball bearings, shift drum, and crankshaft main bearing.

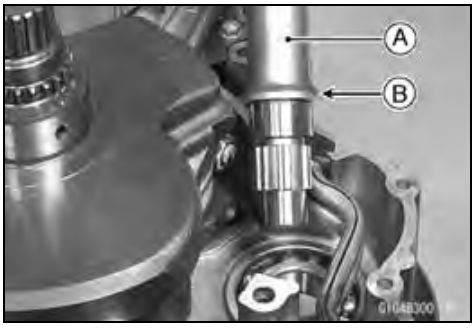
● Insert the left crankshaft tapered end (the longer end) into the left crankcase.
○The left shaft [B] of the crankshaft [A] is longer than the right shaft [C].



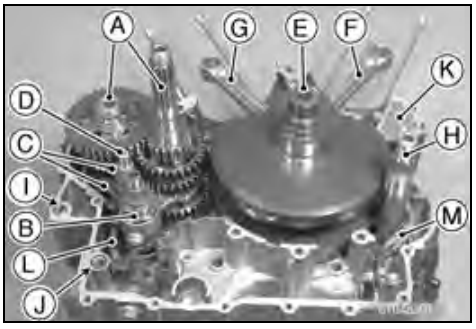
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Crankcase

● Install the balancer shaft [A] so that the flanged side [B] faces downward (toward the left crankcase).



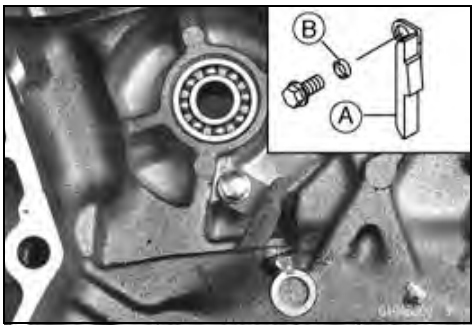
● Check to see that the following parts are in place in the left crankcase.
Transmission Assy [A] and Shift Drum Assy [B]
Shift Fork [C] and Shift Rod [D]
Crankshaft [E]
Front Connecting Rod [F] (Right)
Rear Connecting Rod [G] (Left)
Balancer Shaft [H]
Dowel Pins [I]
O-ring [J]
Oil Baffle [K]
Oil Pipe [L]
Oil Return Pipe [M]



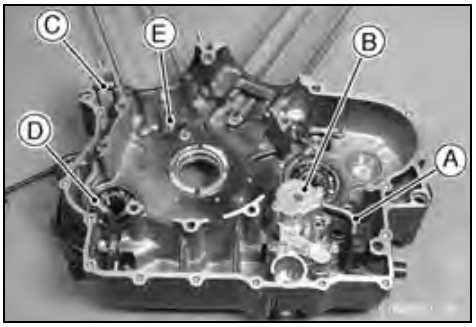
● Install the following in the right crankcase.
Inside Oil Pipe and Oil Return Pipe (see Inside Oil Pipe Installation in the Engine Lubrication System chapter)
Oil Separator (see Inside Oil Pipe Installation in the Engine Lubrication chapter)
Oil Pump (see Oil Pump Installation in the Engine Lubrication System chapter)

● Install the water pump chain guide [A].
○Be sure to install the collar [B] in the bolt hole.

Torque - Water Pump Chain Guide Bolt: 8.3 N·m (0.85 kgf·m, 73 in·lb)



● Check to see that the following parts are in place in the right crankcase.
Oil Pipe [A]
Oil Pump [B]
Oil Separator [C]
Oil Return Pipe [D]
Water Pump Chain Guide [E]



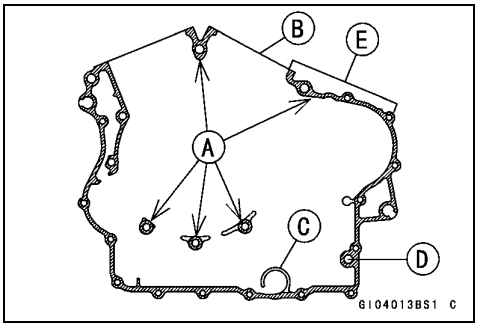
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Crankcase

● Apply liquid gasket [A] to the mating surface of the right crankcase [B].

Sealant - Kawasaki Bond: 92104-1064

○Do not apply liquid gasket to the area [C] around the hole of the oil screen.
○Do not drop liquid gasket into the oil passage [D].
○After tightening the crankcase bolts, wipe up the liquid gasket seeping out around the mating surface, especially around the area [E].



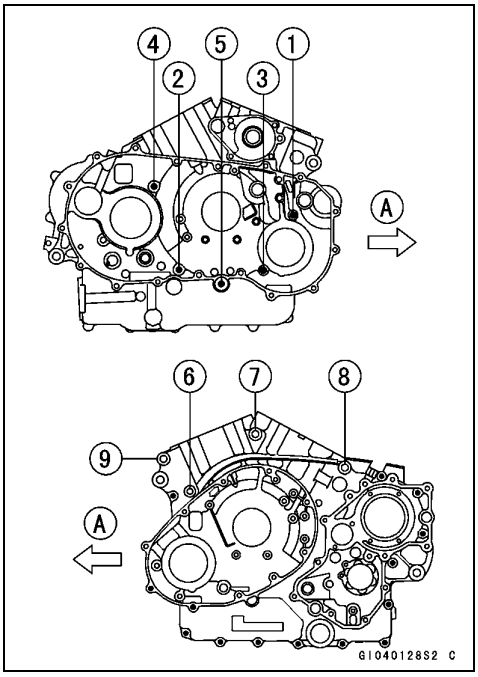
NOTE

○*Make the application finish within 30 minutes when the liquid gasket to the mating surface of the right crankcase half is applied.*
○*Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.*

● Tighten the crankcase bolts as follows.
○Lightly tighten all the bolts to a snug fit.
○Tighten the **M8** and **M10** bolts in the order shown, and then tighten the **M6** bolts to the specified torque.

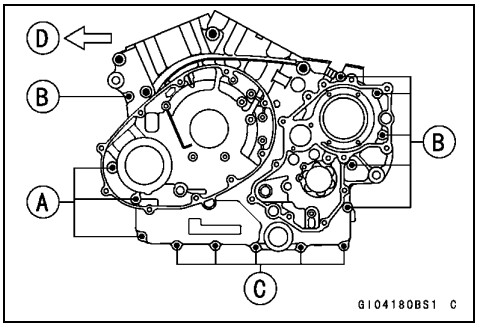
Torque - M8 Crankcase Bolts (1 ~ 6): 21 N·m (2.1 kgf·m, 15 ft·lb)
M10 Crankcase Bolts (7 ~ 9): 39 N·m (4.0 kgf·m, 29 ft·lb)

Front [A]



Torque - M6 Crankcase Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

L = 80 mm (3.1 in.) [A]
L = 70 mm (2.8 in.) [B]
L = 40 mm (1.6 in.) [C]
Front [D]

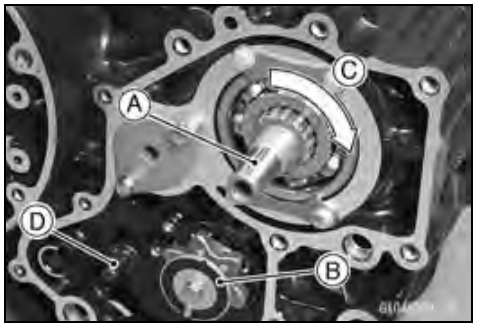


● After tightening all the crankcase bolts, check the following items.
○Wipe up the liquid gasket that seeps out around the crankcase mating surface.
○Turn the right crankcase down, and check that the drive shaft and output shaft turn freely.

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Crankcase

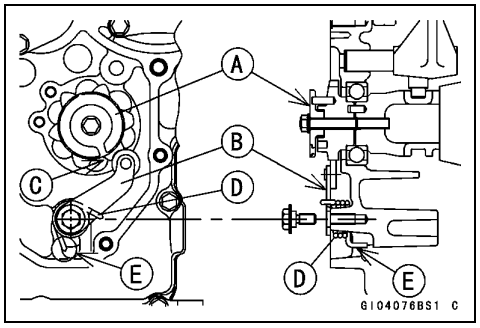
○Check that the positive neutral finder operates properly. While spinning [C] the output shaft [A] using an air impact wrench, gears shift smoothly from the 1st, 2nd · · · 5th gear, and 5th, 4th · · · 1st. When the output shaft stays still, the gear can be shifted to only the 1st gear or neutral. It should not be shifted to the 2nd gear or other higher gear positions.
Shift Drum [B]



● Apply a non-permanent locking agent to the shift shaft return spring pin [D], and tighten it.

Torque - Shift Shaft Return Spring Pin: 39 N·m (4.0 kgf·m, 29 ft·lb)

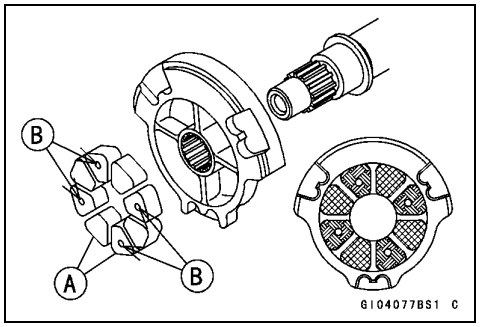
● Set the gear set lever to the neutral position.
Shift Drum Cam [A]
Gear Set Lever [B]
Neutral Position [C]
Spring [D]



● Set the spring end to the crankcase as shown [E].

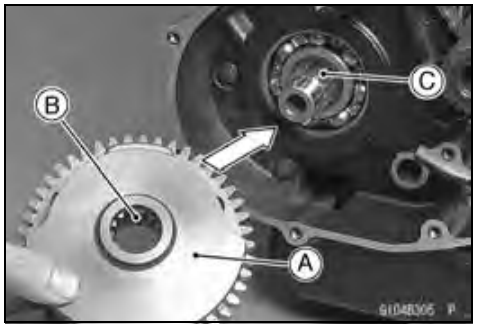
Torque - Gear Set Lever Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)

● Install the balancer dampers [A] so that each damper hole [B] is positioned alternately.



● Install the left balancer [A] on the balancer shaft in the engine left side while fitting the alignment tooth [B] onto the alignment notch [C] of the splines.

● Install the left balancer gear bolt.



● Apply a non-permanent locking agent to the threads of the chain guide bolts and chain guide retainer bolt.

● Install:
Front Camshaft Chain [A]
Lower Chain Guide [B]
Front Chain Guide Retainer [C]
Rear Chain Guide [D]



Torque - Camshaft Chain Guide Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)
Camshaft Chain Guide Retainer Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)

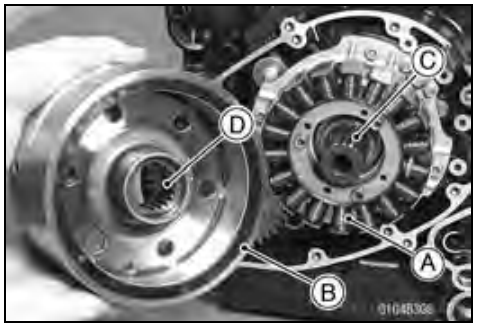
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Crankcase

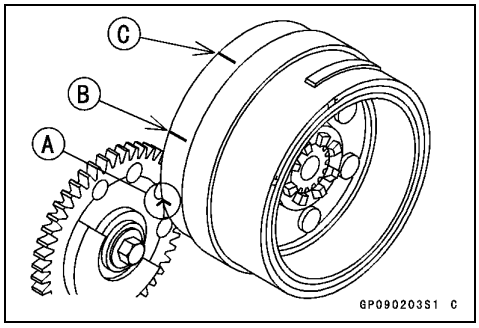
● Turn the crankshaft counterclockwise [A] and align the alignment tooth [B] with the middle of the crankcase rib [C]. This makes the front piston set to its top dead center.
● Install the crankshaft balancer gear [D] while fitting the alignment notch of the splines onto the alignment tooth.
○Aligning the balancer gear marks (line mark) [E] with the front piston on its top dead center.



● Install:
Alternator Inside Stator [A] (see Alternator Inside Stator Installation in the Electrical System chapter)
Alternator Rotor [B]
○Install the alternator rotor while fitting the alignment notch [C] of the splines onto the alignment tooth [D].



○Be sure to align the balancer gear mark with the alternator mark (shorter line mark) [A] while keeping the front piston on its top dead center.
Top Mark for Rear Piston [B] (Longer Mark)
Top Mark for Front Piston [C] (Longer Mark)



● Apply molybdenum disulfide oil solution to the threads and the seating surface of the left balancer gear bolt, and alternator rotor bolt.
○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10:1).
● Holding the alternator rotor steady with the flywheel holder [A].

Special Tool - Flywheel Holder: 57001-1410

● Install the ratchet [B].
● Tighten:

Torque - Left Balancer Gear Bolt [C]: 85 N·m (8.7 kgf·m, 63 ft·lb)
Alternator Rotor Bolt [D]: 78 N·m (8.0 kgf·m, 58 ft·lb)

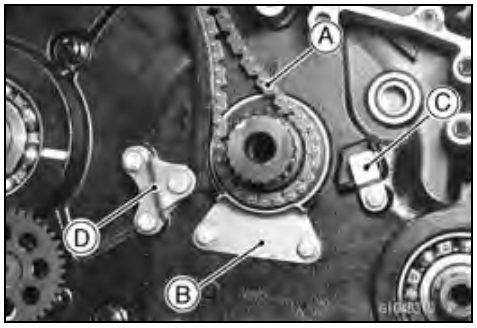


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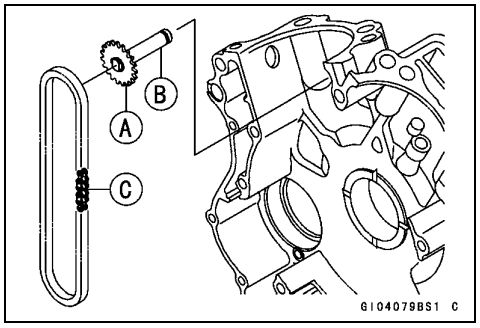
Crankcase

● Apply a non-permanent locking agent to the threads of the chain guide bolts and chain guide retainer bolt.
● Install:
Rear Camshaft Chain [A]
Lower Chain Guide [B]
Front Chain Guide Retainer [C]
Rear Chain Guide [D]

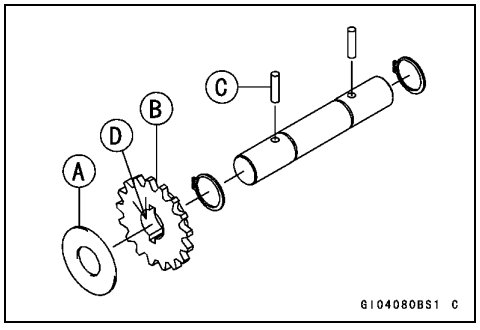
Torque - Camshaft Chain Guide Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)
Camshaft Chain Guide Retainer Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)



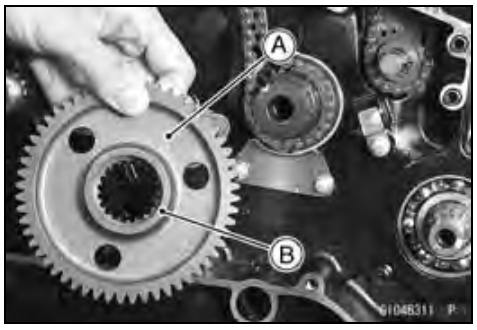
● Install:
Water Pump Sprocket [A] with Shaft [B]
Chain [C]



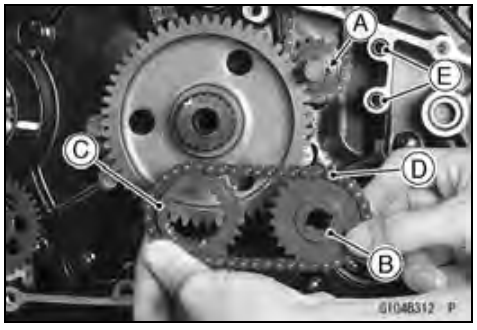
● Install:
Washer [A]
Idle Shaft Sprocket [B]
○Fit the pin [C] into the slots [D] of the idle shaft sprocket.



● Install the primary gear [A] with the boss [B] facing toward the engine inside.



● Install:
Pin [A]
Idle Shaft Sprocket [B]
Water Pump Drive Sprocket [C] and Chain [D]
Dowel Pins [E]
○Stuff the cloth on the holes of the crankcase so that the pin does not drop into the crankcase bottom.

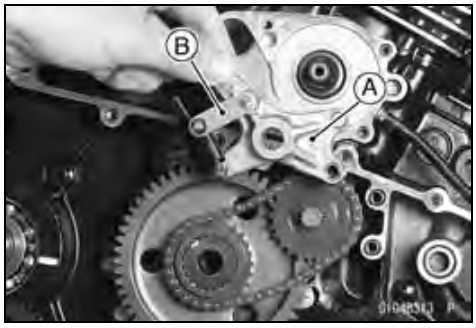


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Crankcase

● Install:
Idle Shaft Holder [A] and Water Pump Chain Guide [B] as shown.

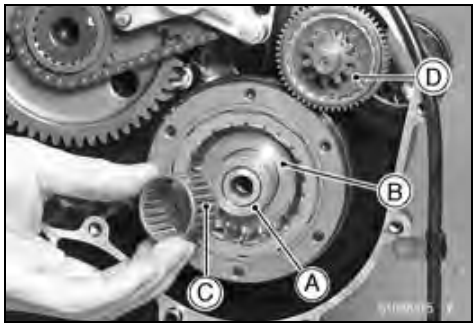
Torque - Idle Shaft Holder Bolts: 8.3 N·m (0.85 kgf·m, 73 in·lb)



● Fit the alignment tooth [A] of the splines of the right balancer onto the alignment notch [B] of the balancer shaft.



● Install the collar [A], copper washer [B], and needle bearing [C] in the order listed.
○The copper washer must be on the collar.
● Install the starter torque limiter [D].



● Install the primary gear bolt [A].
● Tighten the primary gear bolt while holding the alternator rotor steady with the flywheel holder.

Special Tool - Flywheel Holder: 57001-1410

Torque - 143 N·m (14.5 kgf·m, 107 ft·lb)

● Push the starter clutch gear [B] in and turn it clockwise [C] and install it.
● Apply molybdenum disulfide oil solution to the threads and seating surface of the starter clutch bolt [D] and tighten it to the specified torque while holding the primary gear bolt.
○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

Torque - Starter Clutch Bolt: 85 N·m (8.7 kgf·m, 63 ft·lb)

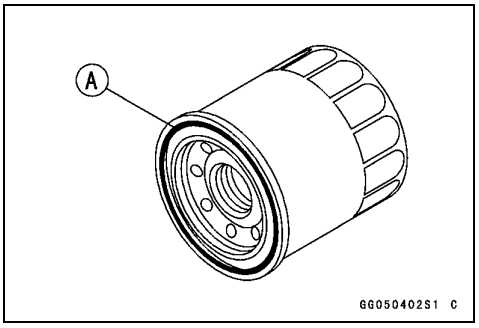
○Be sure to install the washer [E] onto the torque limiter.



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Crankcase

- Apply engine oil to the gasket [A] of the oil filter before installation.



- Tighten the oil filter [A] with the oil filter wrench [B].

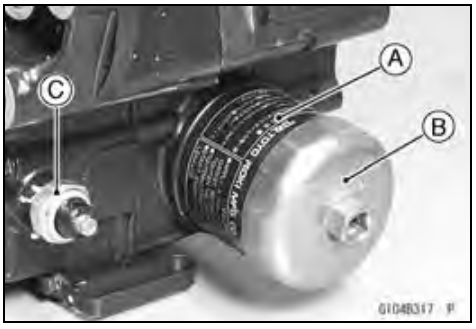
  Special Tool - Oil Filter Wrench: 57001-1249

  Torque - Oil Filter: 18 N·m (1.8 kgf·m, 13 ft·lb)

- Apply silicone sealant to the threads of the oil pressure switch [C], and tighten it to the specified torque.

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

  Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)

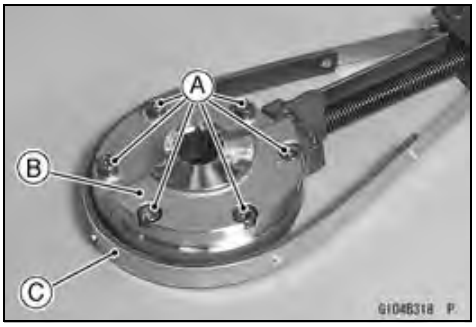


- Install:
  Shift Mechanism (see External Shift Mechanism Installation in this chapter)
  Stater Motor (see Starter Motor Installation in the Electrical System chapter)
  Oil Hoses (see Oil Hose Installation in the Engine Lucubration chapter)
- Install the removed parts (see appropriate chapters).

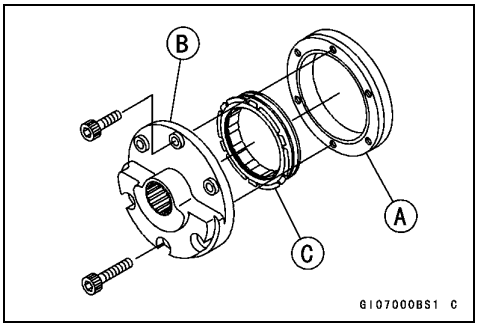
Starter Clutch Disassembly

- Remove the starter clutch assy (see Crankcase Disassembly in this section).
- Remove the Allen bolts [A] with the balancer mass [B] held with the flywheel holder [C].

  Special Tool - Flywheel Holder: 57001-1313



- Pull the coupling [A] out of the right balancer [B].
- Take the one-way clutch [C] out of the coupling.



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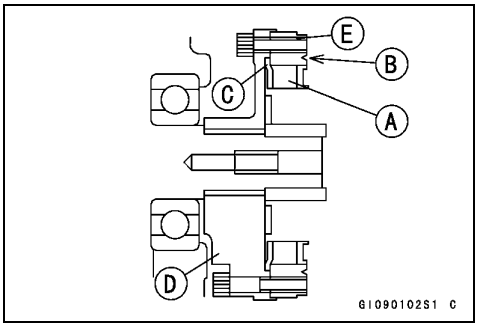
Crankcase

Starter Clutch Assembly

- Install the one way clutch [A] so that its groove [B] faces outward and its flange [C] fits between the right balancer [D] and the coupling [E].
- Apply a non-permanent locking agent to the threads of the coupling bolts, and tighten them to the specified torque.

Torque - Starter Clutch Coupling Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)

Special Tool - Flywheel Holder: 57001-1313



Starter Clutch Inspection

- Remove the starter clutch gear [A] and torque limiter, then reinstall the starter clutch gear into the starter clutch.
- Turn the starter clutch to both side.

○When viewed from the right side of the engine, the clutch should turn clockwise [B] freely, but should not turn counterclockwise [C].



★If the starter clutch does not operate as it should or if it makes noise, disassemble the starter clutch.

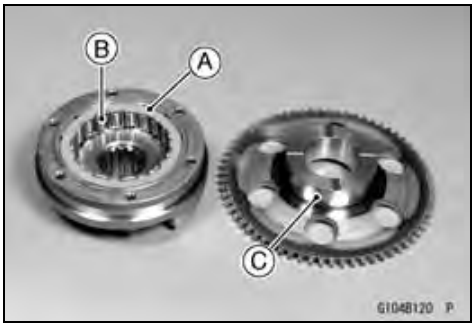
★If one-way clutch [A] installation is wrong, reinstall it.

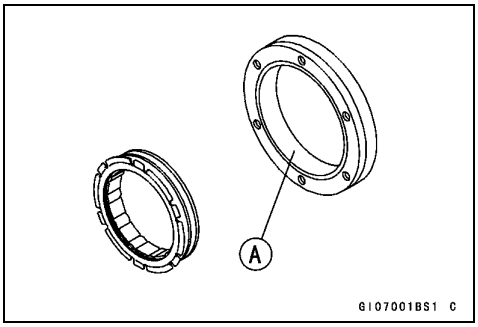
★Visually inspect the one-way clutch, coupling and starter clutch gear for damage.

★If there is any worn or damaged surface in the following parts, replace it.

Sliding Surface [B] and Cage of One-way Clutch
Sliding Surface [C] of Starter Clutch Gear

Sliding Surface [A] of Coupling



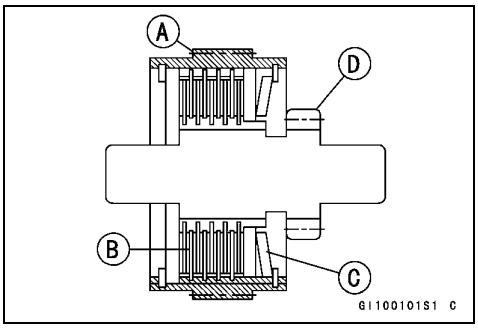


Starter Torque Limiter Check

- Remove the torque limiter (see Crankcase Disassembly in this section) and visually inspect it.

★If the limiter has wear, discoloration, or other damage, replace it as a set.

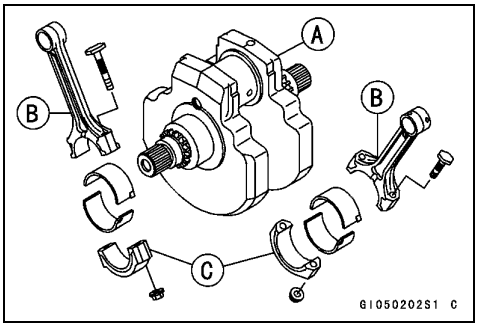
Gear [A]
Friction Plates [B]
Spring [C]
Pinion [D]



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Crankshaft/Connecting Rods

Connecting Rod Removal



- Remove the crankshaft (see Crankcase Disassembly in this chapter).
- Remove the connecting rod big end nuts, and take off the rod and cap along with the bearing inserts from the crankshaft [A].

NOTE

○*Mark and record the locations of the connecting rods [B] and their big end caps [C] with the bearing inserts left attached so that they can be installed in their original positions.*

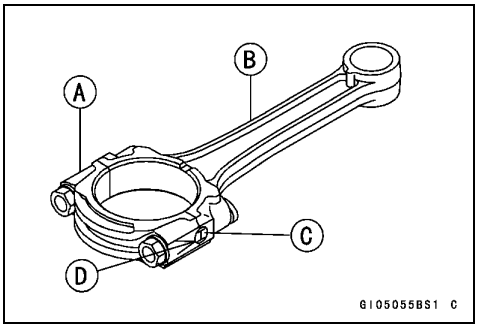
CAUTION

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

Connecting Rod Installation

CAUTION

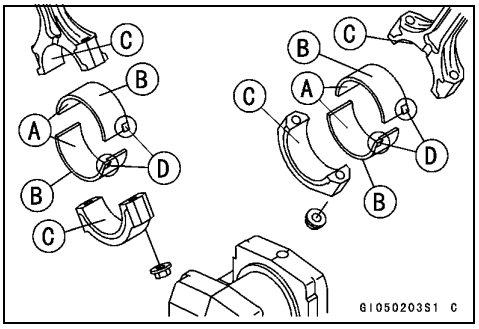
To minimize vibration, the connecting rods should have the same weight mark.



Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark (Around Weight Mark) [D]: "○" or no mark

CAUTION

If the connecting rods, bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage before assembling engine to be sure the correct bearing inserts are installed.



- Apply molybdenum disulfide oil solution to the inside [A] of the big end bearing inserts.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

★If bearing inserts are replaced, install them as follows.

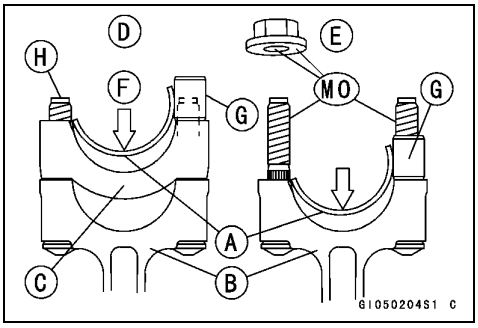
○Do not apply molybdenum disulfide oil solution to the outside [B] of the inserts or the inside [C] of the connecting rod and cap.

○Install the inserts so that their nails [D] are on the same side and fit into the recess of the connecting rod and cap.

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Crankshaft/Connecting Rods

○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]
Dowel Pin [G]
Connecting Rod Bolts [H]



- Install the cap on the connecting rod, aligning the weight and diameter marks.
- Remove debris and clean the surface of inserts.
- Apply molybdenum disulfide oil solution [MO] to the threads, seating surfaces of the big end nuts and threads of con-rod bolts.
- Tighten the big end nuts to the specified torque.

Torque - Connecting Rod Big End Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

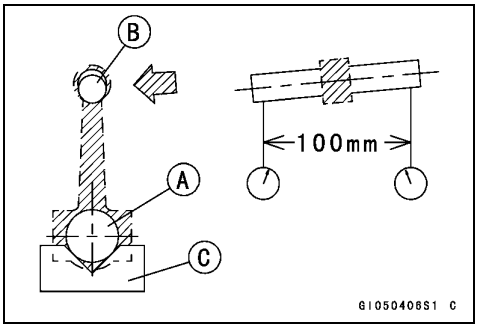
Crankshaft/Connecting Rod Cleaning

- 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

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

★If connecting rod bend exceeds the service limit, the connecting rod must be replaced.

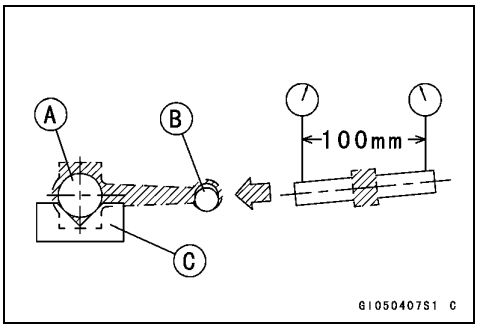


Connecting Rod Bend
Service Limit: TIR 0.2/100 mm (0.08/3.94 in.)

Connecting Rod Twist

- With the big-end arbor [A] still on the V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being parallel with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.

★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

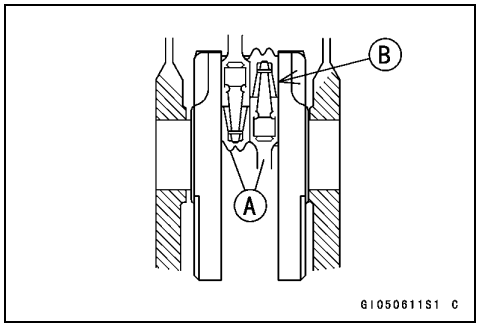


Connecting Rod Twist
Service Limit: TIR 0.2/100 mm (0.08/3.94 in.)

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Crankshaft/Connecting Rods

Connecting Rod Big End Side Clearance



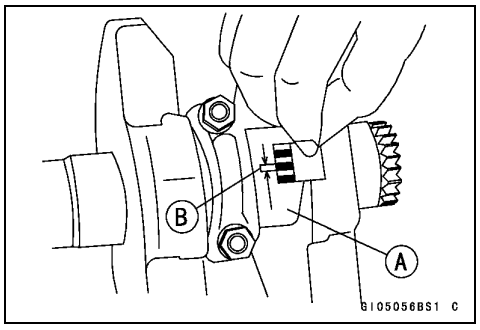
- Measure the side clearance [B] of the connecting rod big end [A].

○Insert a thickness gauge between the big end and either crank web to determine clearance.

Connecting Rod Big End Side Clearance
Standard: 0.16 ~ 0.46 mm (0.006 ~ 0.018 in.)
Service Limit: 0.7 mm (0.03 in.)

★If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

Connecting Rod Big End Bearing Wear



- Remove the big end cap and place a strip of plastigage on the crankpin [A].
- Apply molybdenum disulfide oil solution to the threads and seating surface of the big end nuts.

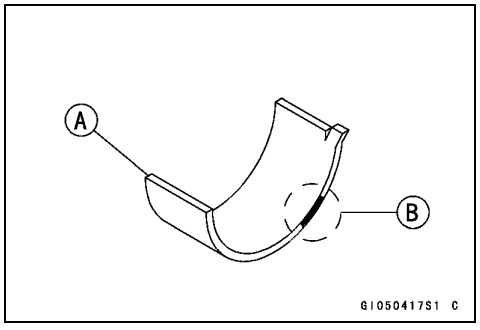
○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10:1).

- Tighten the big end nuts to the specified torque to compress the plastigage and measure the plastigage width [B] to determine the bearing insert/crankpin clearance (see Camshaft/Rocker Case Wear in the Engine Top End chapter).

Torque - Connecting Rod Big End Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

○Do not move the connecting rod and crankshaft during clearance measurement.

Connecting Rod Big End Bearing/Crankpin Clearance
Standard: 0.026 ~ 0.057 mm (0.0010 ~ 0.0022 in.)
Service Limit: 0.10 mm (0.004 in.)



★If the clearance is within the standard, no bearing insert replacement is required.

★If the clearance is between 0.057 mm (0.0022 in.) and the service limit (0.10 mm, 0.004 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/crankpin clearance with plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

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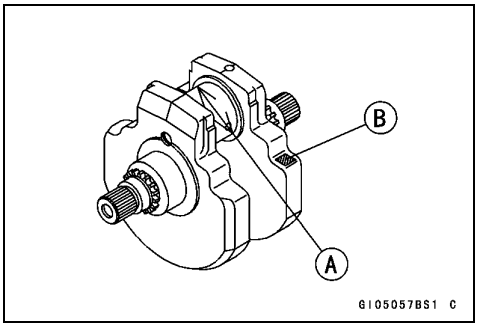
Crankshaft/Connecting Rods

★If the clearance exceeds the service limit, measure the diameter of the crankpin [A].

Crankpin Diameter
Standard: 54.981 ~ 55.000 mm (2.1646 ~ 2.1654 in.)
Service Limit: 54.97 mm (2.1642 in.)

★If the crankpin has worn past the service limit, replace the crankshaft with a new one.

★If the measured crankpin diameter is not less than the service limit, but does not coincide with the original diameter marking on the crankshaft, make a new mark on it.



Crankpin Diameter Marks
None 54.981 ~ 54.991 mm (2.1646 ~ 2.1650 in.)
○ 54.992 ~ 55.000 mm (2.1650 ~ 2.1654 in.)

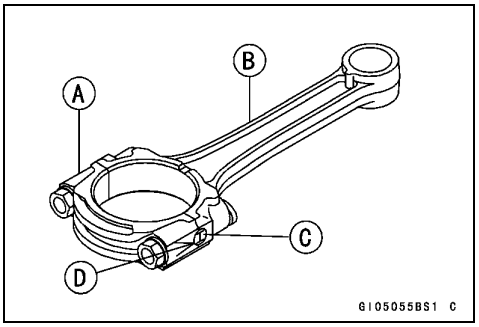
Crankpin Diameter Mark: "○" mark or no mark [B]

● Apply molybdenum disulfide oil solution to the threads and seating surface of the big end nuts.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10:1).

● Temporarily, install the big end cap and tighten the big end nuts to the specified torque.

Torque - Connecting Rod Big End Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)



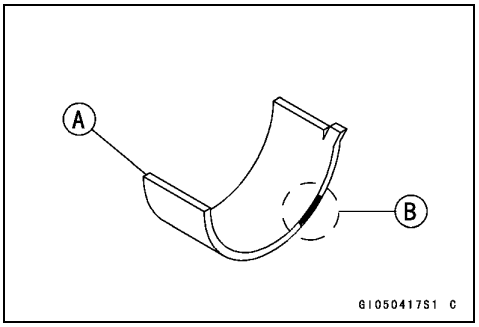
● Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.

○The mark already on the big end should almost coincide with the measurement because of little wear.

Connecting Rod Big End Inside Diameter Marks
None 58.000 ~ 58.010 mm (2.2835 ~ 2.2839 in.)
○ 58.011 ~ 58.020 mm (2.2839 ~ 2.2842 in.)

Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark (around weight mark) [D]: "○" or no mark

● Select the proper bearing insert [A] identified by the size color [B] in accordance with the combination of the connecting rod and crankshaft coding.



Big End Bearing Insert Selection

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028-1476
None	None	Black	92028-1475
○	○		
○	None	Blue	92028-1474

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

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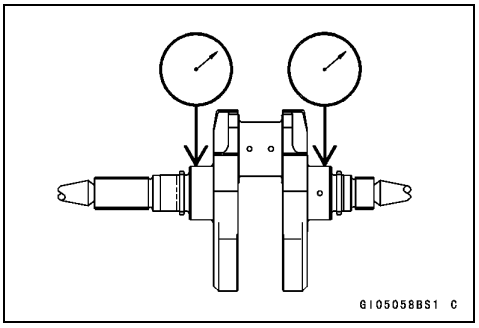
Crankshaft/Connecting Rods

Crankshaft Runout

● Measure the crankshaft runout.

★If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout
Standard: TIR 0.02 mm (0.0008 in.) or less
Service Limit: TIR 0.05 mm (0.002 in.)

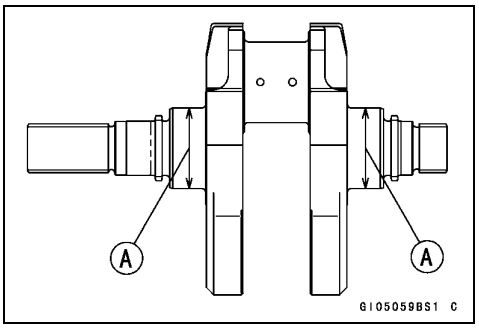


Crankshaft Main Bearing/Journal Wear

● Measure the diameter [A] of the crankshaft main journal.

Crankshaft Main Journal Diameter
Standard: 54.986 ~ 55.000 mm (2.1648 ~ 2.1654 in.)
Service Limit: 54.96 mm (2.164 in.)

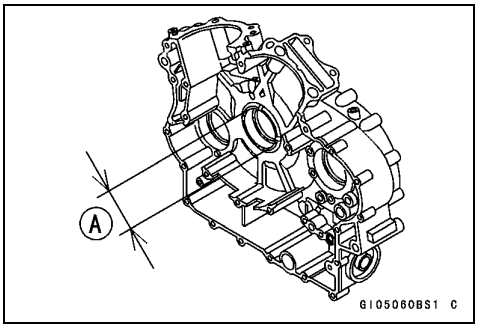
★If any journal has worn past the service limit, replace the crankshaft with a new one.



● Measure the main bearing bore diameter [A] in the crankcase halves.

Crankcase Main Bearing Bore Diameter
Standard: 55.025 ~ 55.038 mm (2.1663 ~ 2.1668 in.)
Service Limit: 55.07 mm (2.168 in.)

★If they are any signs of seizure, damage, or excessive wear, replace the crankcase halves as a set.

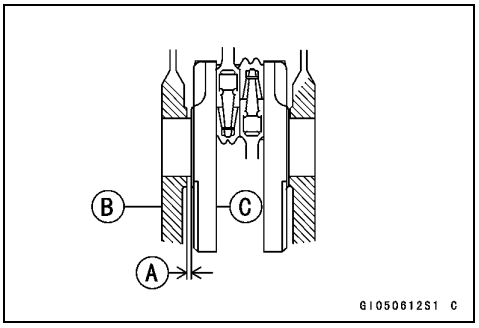


Crankshaft Side Clearance

● Measure the crankshaft side clearance.

Crankshaft Side Clearance
Standard: 0.05 ~ 0.55 mm (0.002 ~ 0.020 in.)
Service Limit: 0.75 mm (0.030 in.)

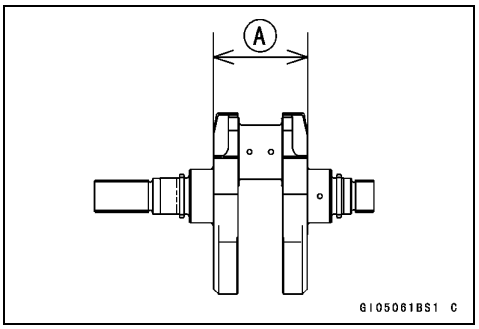
Clearance [A]
Crankcase [B]
Crankshaft [C]



★If the clearance is greater than the service limit, measure the crankshaft web length [A] to see whether the crankshaft or the crankcase is faulty.

Crankshaft Web Length
Standard: 96.85 ~ 96.95 mm (3.813 ~ 3.817 in.)
Service Limit: 96.6 mm (3.80 in.)

★If the length measurement is smaller than the service limit, replace the crankshaft. Otherwise, replace the crankcase halves as a set.



CAUTION

The right and left crankcase halves are machined at the factory in the assembled state, so they must be replaced as a set.

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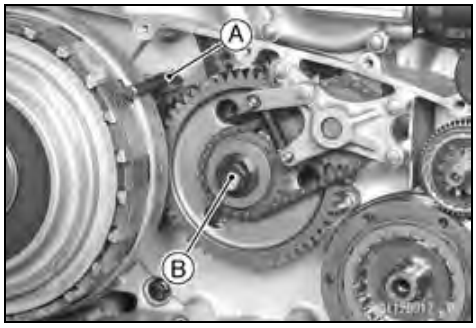
Primary Gear

Primary Gear Removal

● Remove:
Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
Starter Clutch Gear (see Crankcase Disassembly in this chapter)

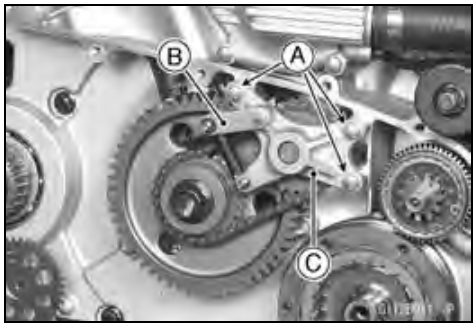
● Using the gear holder [A] to loosen the primary gear bolt [B].

Special Tool - Gear Holder, m2.0: 57001-1557



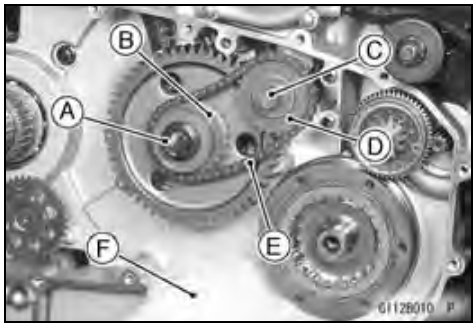
● Remove:
Clutch (see Clutch Removal in the Clutch chapter)
Bolts [A]

● Remove the water pump chain guide [B] and water pump idle shaft holder [C] from the right crankcase.

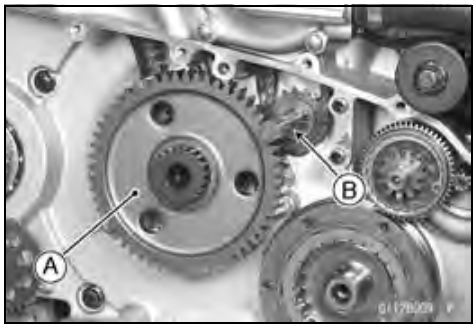


● Remove the primary gear bolt [A], water pump drive sprocket [B], idle shaft [C], and idle shaft sprocket [D].
Water Pump Chain [E]

○Stuff the cloth [F] on the holes of the crankcase so that the pin close not drop into the crankcase bottom.

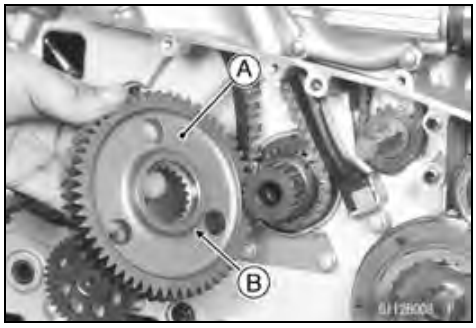


● Pull the primary gear [A] out of the crankshaft, and take the pin [B] out of the idle shaft.



Primary Gear Installation

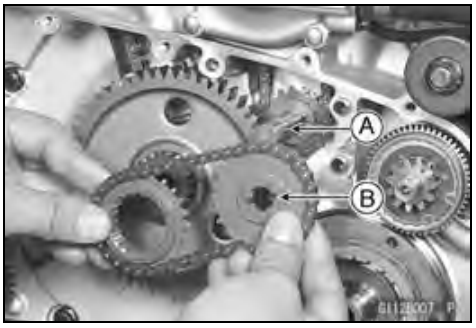
● Fit the primary gear [A] with the boss [B] facing toward the engine inside.



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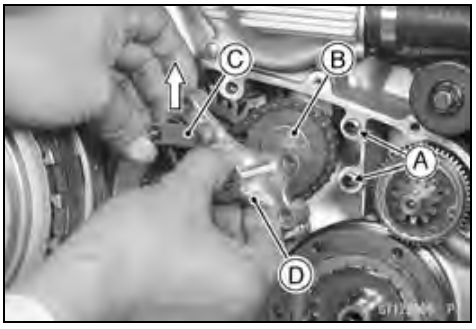
Primary Gear

● Fit the pin [A] into the slot [B] of the water pump drive sprocket boss and install the sprockets.



● Install:
Dowel Pins [A]
Washer [B]
● Pulling the chain guide [C] and install the idle shaft holder [D].
● Install the clutch (see Clutch Installation in the Clutch chapter).

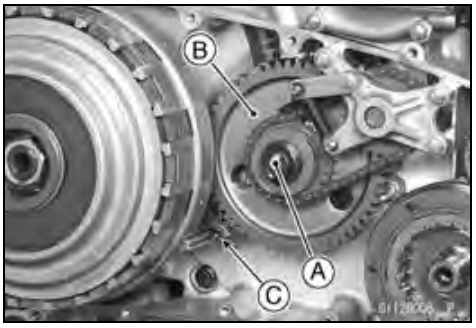
Torque - Idle Shaft Holder Bolts: 8.3 N·m (0.85 kgf·m, 73 in·lb)



● Apply molybdenum disulfide oil solution to the threads and seating surface, and tighten the primary gear bolt [A], while holding the primary gear [B] with the gear holder [C].
○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

Special Tool - Gear Holder, m2.0: 57001-1557

Torque - Primary Gear Bolt: 145 N·m (14.5 kgf·m, 107 ft·lb)

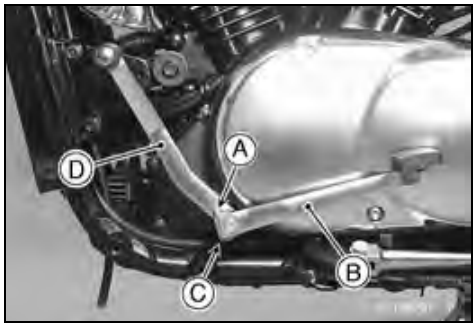


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Shift Pedal Removal

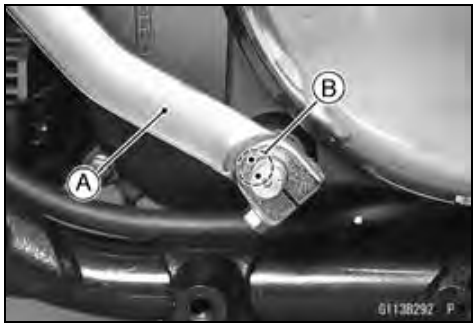
- Remove the left front footboard (see Front Footboard Removal/Installation in the Frame chapter).
- Unscrew the rear shift pedal clamp bolt [A] and take off the rear shift pedal [B].
- Unscrew the front shift pedal clamp bolt [C] and pull out the front shift pedal [D].



Shift Pedal Installation

- For the front shift pedal, install the shift pedal [A] so that the punched mark on the shaft is aligned [B] with the punched mark on the shaft.
- Tighten the clamp bolt.

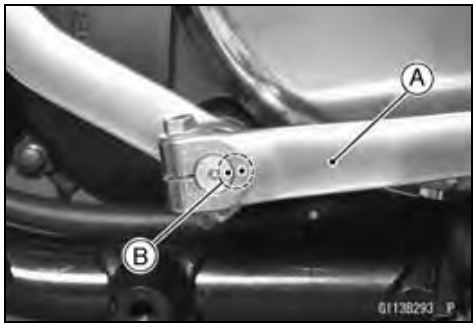
Torque - Shift Pedal Clamp Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)



- For the rear shift pedal, install the shift pedal [A] so that the punched mark on the shaft is aligned [B] with the punched mark on the pedal.
- Tighten the clamp bolt.

Torque - Shift Pedal Clamp Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)

- Install the left front footboard (see Front Footboard Removal/Installation in the Frame chapter).



External Shift Mechanism Removal

- Remove:
  Engine (see Engine Removal in the Engine Removal/Installation chapter)
  Alternator Cover [A] (see Alternator Outer Cover Removal in the Electrical System chapter)
  Front and Rear Shift Levers [B]
  Front Gear Case [C] (see Front Gear Case Removal in the Final Drive chapter)



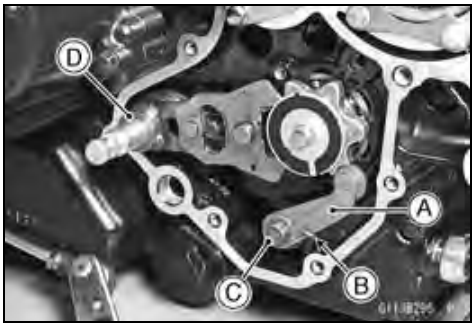
- Remove the shift shaft [A] while pushing [B] the shift mechanism arm [C] towards the shift shaft.
- Unscrew the bolt [D] and remove the gear set lever [E] and its spring [F].



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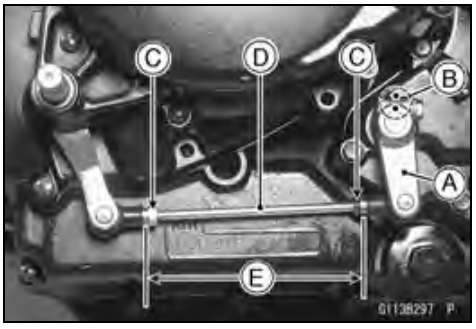
External Shift Mechanism Installation



- Install the gear set lever [A] and the spring [B] in the crankcase and tighten the bolt [C].

Torque - Gear Set Lever Bolt: 11 N·m (1.1 kgf·m, 97 in·lb)

- Install the shift mechanism arm assy. Be sure to install the washer [D] onto the shift shaft.
- Install the front gear case (see Front Gear Case Installation in the Final Drive chapter).



- Install:
  Alternator Cover (see Alternator Cover Removal/Installation)
  Front and Rear Shift Levers

○Install the rear shift lever [A] on the shift shaft so that the punched mark on the shaft is aligned [B] with the slot of the rear shift lever.

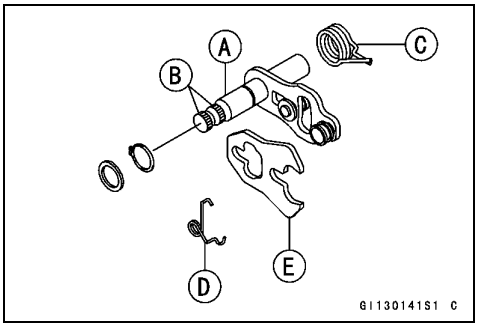
- Loosen the locknuts [C] and turn the shift rod [D] so that the outside length [E] of the locknuts is **112 ±1 mm (4.4 ±0.04 in.)**.

○The rear locknut has left-hand threads.

Torque - Shift Rod Locknut (Front): 11 N·m (1.1 kgf·m, 97 in·lb)
Shift Rod Locknut (Rear): 11 N·m (1.1 kgf·m, 97 in·lb)
Rear Shift Lever Clamp Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)

- Install:
  Engine (see Engine Installation in the Engine Removal/Installation chapter)
  Shift Pedal (see Shift Pedal Installation in this section)

External Shift Mechanism Inspection



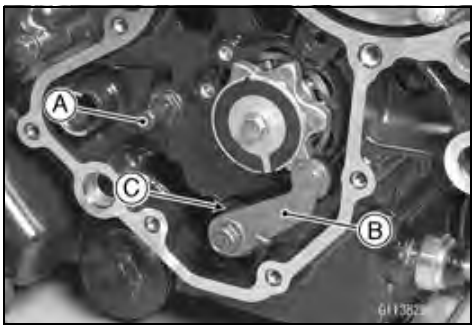
- Examine the shift shaft [A] for any damage.

★If the shaft is bent, straighten or replace it.

★If the serrations [B] are damaged, replace the shaft.

★If the springs [C] [D] are damaged in any way, replace them.

★If the shift mechanism arm [E] is damaged in any way, replace the arm.



- Check the return spring pin [A] is not loose.

★If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

Torque - Shift Shaft Return Spring Pin: 39 N·m (4.0 kgf·m, 29 ft·lb)

- Check the gear set lever [B], and its spring [C] for breaks or distortion.

★If the lever or spring is damaged in any way, replace it.

- Visually inspect the shift drum pins, pin holder, and pin plate.

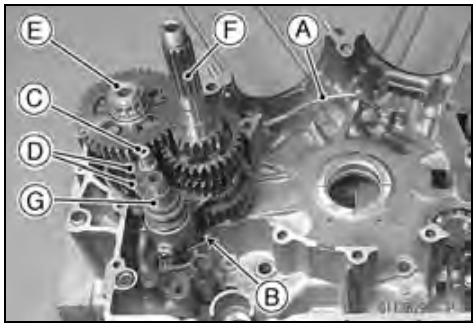
★If they are badly worn or if they show any damage, replace them.

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Transmission Removal

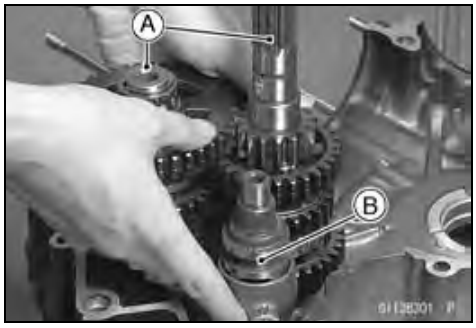
- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Split the crankcase (see Crankcase Disassembly in this chapter).
- Remove the crankshaft (see Crankcase Disassembly in this chapter).
- First, remove the oil pipe [A] (see Inside Oil Pipe Removal in the Engine Lubrication System chapter), and then remove the shift drum bearing holder bolts and holder [B].
- Pull out the shift rod [C] and take the shift forks [D] out of the output shaft 4th gear.
  Output Shaft [E]
  Drive Shaft [F]
  Shift Drum Assy [G]



- Align the shift drum cam [A] with the cutoff [B] of the left crankcase by turning the shift drum.

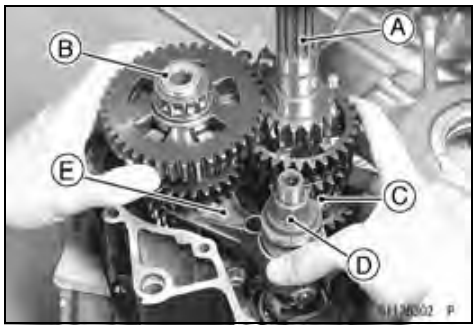


- Take out the transmission shafts [A] and shift drum assy [B] as a set.
- Separate the drive and output shafts, shift drum, and shift forks.



Transmission Installation

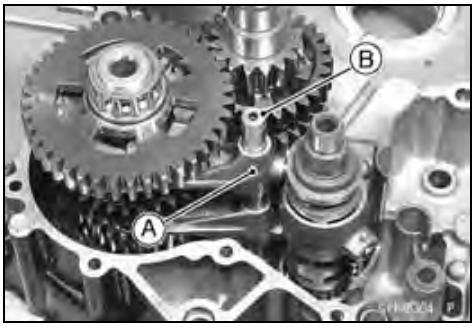
- Install the drive and output shafts, shift drum assy, and output shaft 5th gear shift fork as a set.
  Drive Shaft Assy [A]
  Output Shaft Assy [B]
  Shift Fork (Drive Shaft, 3rd Gear) [C] and Shift Drum Assy [D]
  Shift Fork (No. 270, Output Shaft, 5th Gear) [E]



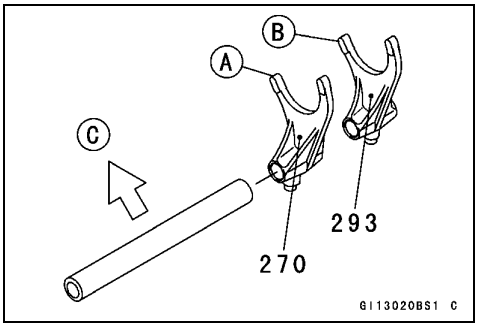
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Transmission

● Install:
Shift Fork (No. 293 Output Shaft, 4th Gear) [A]
Shift Rod [B]



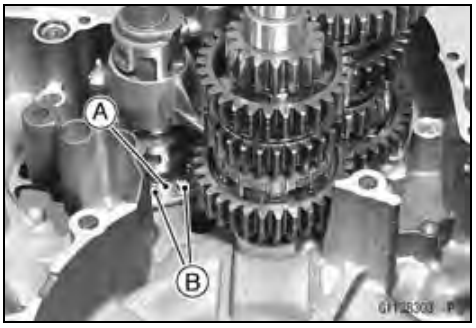
○Each output shaft shift fork has an identification number. Do not confuse them.
● Install the shift forks with each number faced left as shown.
Shift Fork (No. 270, 5th Gear) [A]
Shift Fork (No. 293, 4th Gear) [B]
Front [C].



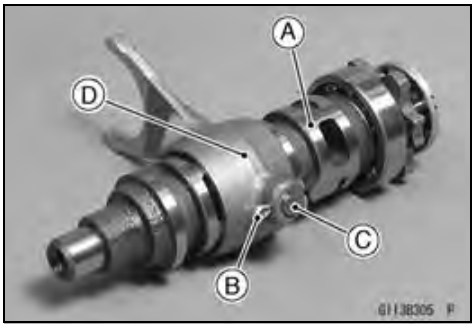
● Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolts.
● Install:
Shift Drum Bearing Holder [A]
Bolts [B]

Torque - Shift Drum Bearing Holder Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

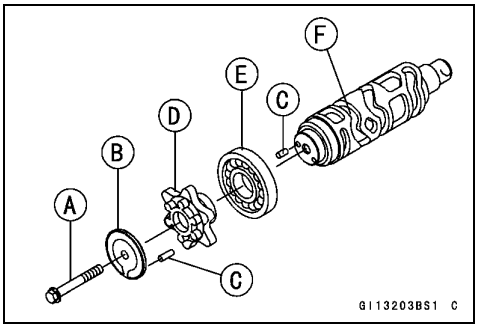
● Apply engine oil to the shift rod, the shift forks, and Transmission gears.



Shift Drum Disassembly/Assembly
● Remove the shift drum assy [A] (see Transmission Removal in this section).
● Remove:
Cotter Pin [B]
Pin [C]
Drive Shaft Shift Fork (No. 292, Drive Shaft) [D]



● Disassemble the shift drum assy as shown.
Shift Drum Cam Bolt [A]
Pin Plate [B]
Pin [C]
Cam [D]
Bearing [E]
Shift Drum [F]

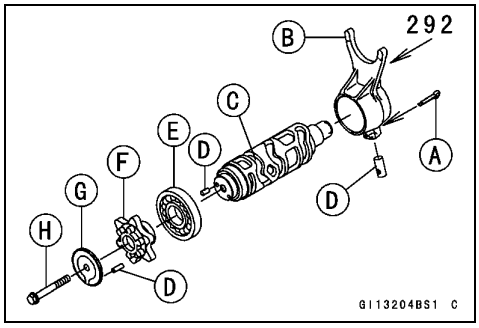


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Transmission

- Be sure to face the number to the right and insert the cotter pin [A] of the drive shaft shift fork [B] from the right as shown.
  Shift Drum [C]
  Pin [D]
  Bearing [E]
  Cam [F]
  Pin Plate [G]
- Apply a non-permanent locking agent to the threads of the shift drum cam bolt [H].

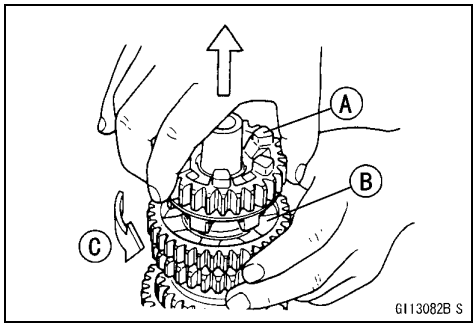
Torque - Shift Drum Cam Bolt: 15 N·m (1.5 kgf·m, 11 ft·lb)



Transmission Disassembly

- Remove the transmission shafts (see Transmission Removal in this section).
- Using the circlip pliers (special tool), remove the circlips, and disassemble the transmission shaft.

Special Tool - Outside Circlip Pliers: 57001-144



○The 4th gear [A] on the output shaft has three steel balls for the positive neutral finder mechanism.

- Remove the 4th gear as follows.

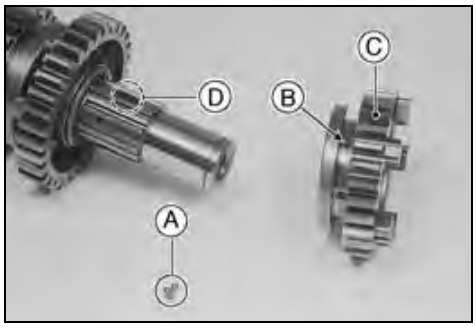
○Set the output shaft in a vertical position holding the 3rd gear [B].
○Spin the 4th gear quickly [C] and pull it off upward.

Transmission Assembly

- Refer to the transmission assembly illustration on ahead.
- Align each gear oil hole with the drive shaft oil hole when installing the 3rd gear [9] and the 5th gear [6].
- Align each oil hole with the output shaft oil hole, when installing the 3rd gear [17], bushing [18], and the 5th gear [16].

CAUTION

Do not apply grease to the steel balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.



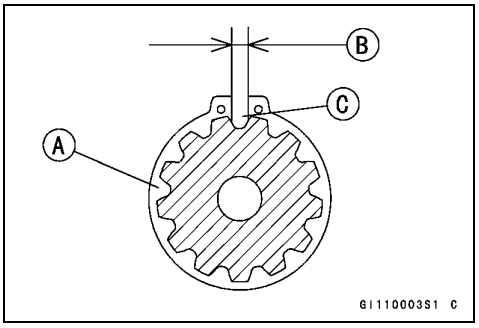
- Fit the three steel balls [A] into the holes [B] of the output 4th gear [C], and then install the gear on the output shaft so that the steel balls align with the recesses [D] in the shaft.

○After assembling the 4th gear with steel balls in place on the output shaft, check the ball-locking effect that the 4th gear does not come out of the output shaft when moving it up and down by hand.

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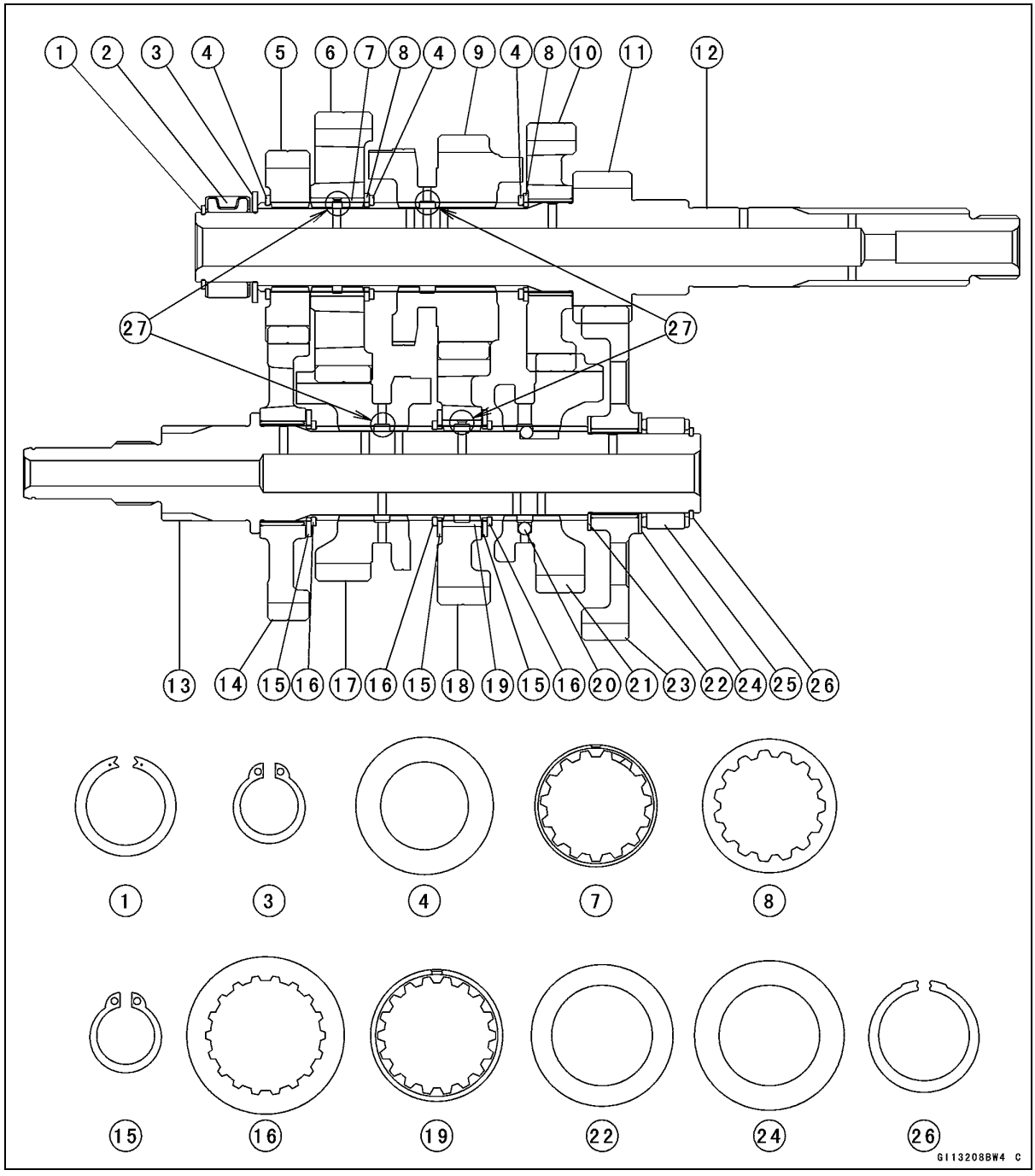
Transmission

- Replace any circlip [A] that were removed with new ones.
- Install the circlips so that the opening [B] is aligned with a spline groove [C].



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Transmission



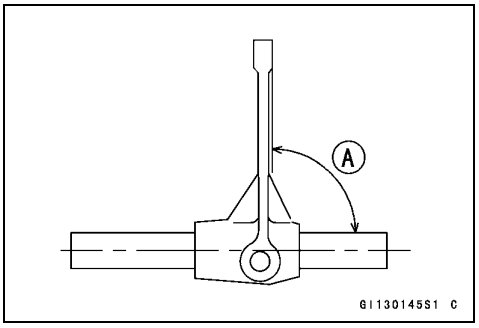
1. Circlip, ϕ20 mm (0.79 in.)
2. Needle Bearing
3. Thrust Washer, ϕ22.3 mm (0.88 in.)
4. Three Circlips, ϕ28 mm (1.10 in.)
5. 2nd Gear
6. 5th (Top) Gear
7. Bushing (5th Gear)
8. Two Splined Washers, ϕ28.5 mm (1.12 in.)
9. 3rd Gear
10. 4th Gear
11. 1st Gear
12. Drive Shaft
13. Output Shaft
14. 2nd Gear
15. Three Splined Washers, ϕ30.3 mm (1.20 in.)
16. Three Circlips, ϕ29 mm (1.14 in.)
17. 5th (Top) Gear
18. 3rd Gear
19. Bushing (3rd Gear)
20. Steel Balls
21. 4th Gear
22. Washer, ϕ25.5 mm (1.00 in.)
23. 1st Gear
24. Washer, ϕ25.5 mm (1.00 in.)
25. Needle Bearing
26. Circlip, ϕ25 mm (0.98 in.)
27. Align gear or bushing oil holes with the shaft holes.

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Transmission

Shift Fork Bending

● Visually inspect the shift forks, and replace any fork that is bend. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear under load.
90° [A]



Shift Fork/Gear Groove Wear

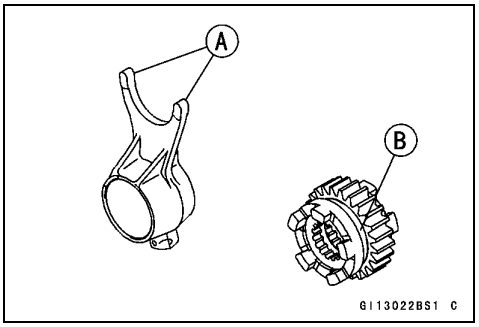
● Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves.

★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

Shift Fork Ear Thickness
Standard: 5.9 ~ 6.0 mm (0.23 ~ 0.24 in.)
Service Limit: 5.8 mm (0.23 in.)

★If the gear groove is worn over the service limit, the gear must be replaced.

Gear Groove Width
Standard: 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)
Service Limit: 6.25 mm (0.246 in.)



Shift Fork Guide Pin/Drum Groove Wear

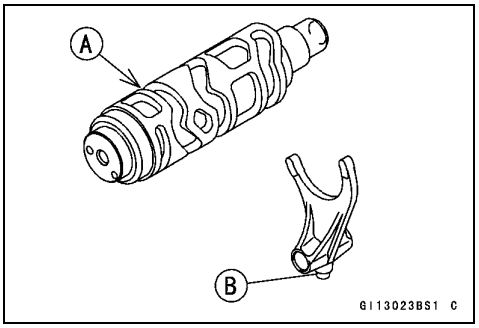
● Measure the diameter of each shift fork guide pin [B], and measure the width [A] of each shift drum groove.

★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: 7.9 ~ 8.0 mm (0.311 ~ 0.315 in.)
Service Limit: 7.8 mm (0.307 in.)

★If any shift drum groove is worn over the service limit, the drum must be replaced.

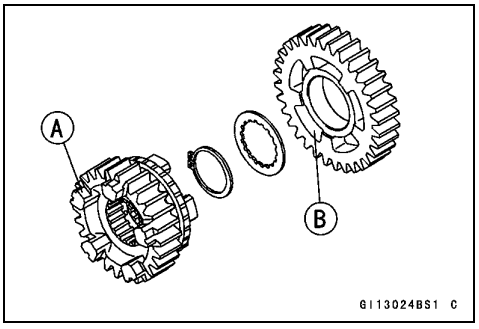
Shift Drum Groove Width
Standard: 8.05 ~ 8.20 mm (0.317 ~ 0.323 in.)
Service Limit: 8.30 mm (0.327 in.)



Gear Dog and Gear Dog Hole Damage

● Visually inspect the gear dogs [A] and gear dog holes [B].

★Replace any damaged gears or gears with excessively worn dogs or dog holes.



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Ball Bearing, Needle Bearing, and Oil Seal

Ball Bearing and Outer Race Replacement

CAUTION

Do not remove the ball bearing or needle bearing outer race unless it is necessary. Removal may damage them.

● Using a press or puller, remove the ball bearing and/or needle bearing outer race.

NOTE

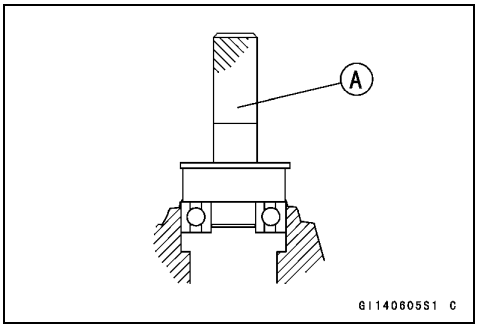
○*In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max., and tapping the bearing in or out.*

CAUTION

Do not heat the case with a blowtorch. This will warp the case. Soak the case in oil and heat the oil.

● Using a press and the bearing driver set [A], install the new bearing or outer race until it stops at the bottom of its housing.

Special Tool - Bearing Driver Set: 57001-1129



Ball and Needle Bearing Wear

CAUTION

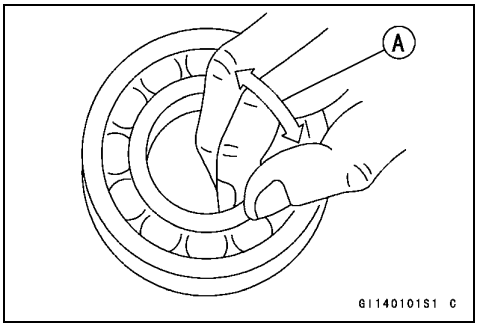
Do not remove the ball bearings for inspection. Removal may damage them.

● Check the ball bearings.

○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

○Spin [A] the bearing by hand to check its condition.

★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.



● Check the needle bearings.

○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If there is any doubt as to the condition of a needle bearing, replace it.

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Ball Bearing, Needle Bearing, and Oil Seal

Oil Seal Inspection

● Inspect the oil seal.

★ Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

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Wheels/Tires

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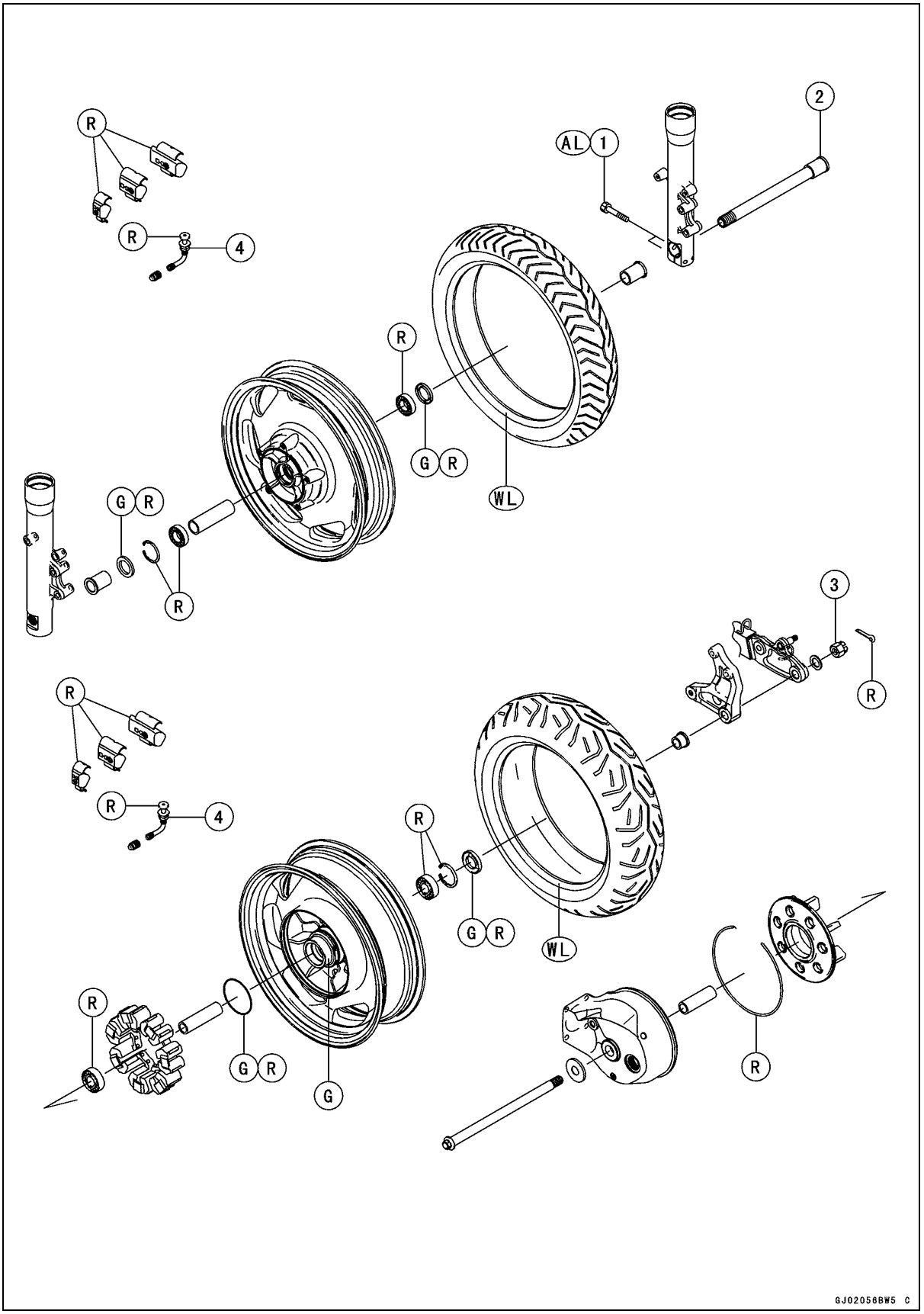
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Clamp Bolts	29	3.0	21	AL
2	Front Axle Shaft	108	11.0	80	
3	Rear Axle Nut	108	11.0	80	
4	Tire Air Valve Nuts	1.5	0.15	13 in·lb	

AL: Tighten the two front axle clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

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Specifications

Item	Standard	Service Limit
Wheels (Rims)		
Rim Runout:		
Axial	– – –	TIR 0.5 mm (0.02 in.)
Radial	– – –	TIR 0.8 mm (0.03 in.)
Axle Runout/100 mm	TIR 0.05 mm (0.002 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.4 oz.) or less	– – –
Balance Weights	10 g (0.4 oz.), 20 g (0.7 oz.), 30 g (1.1 oz.)	– – –
Tires		
Air Pressure (When Cold):		
Front	Up to 185 kg (408 lb) load: 225 kPa (2.25 kg/cm², 32 psi)	– – –
Rear	Up to 185 kg (408 lb) load: 280 kPa (2.80 kg/cm², 40 psi)	– – –
Tread Depth:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	7.2 mm (0.28 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.1 in.)
Standard Tires:	Make, Type	Size
Front	BRIDGESTONE EXEDRA G721	150/80-16 M/C (71H)
Rear	BRIDGESTONE EXEDRA G722 G	170/70B 16 M/C (75H)

AT: Austria
CH: Switzerland
DE: Germany

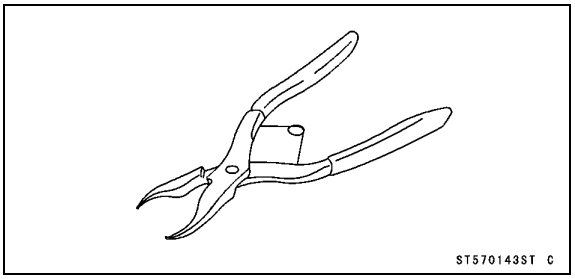
⚠ WARNING

Use the same manufacturer's tires on both front and rear wheels.

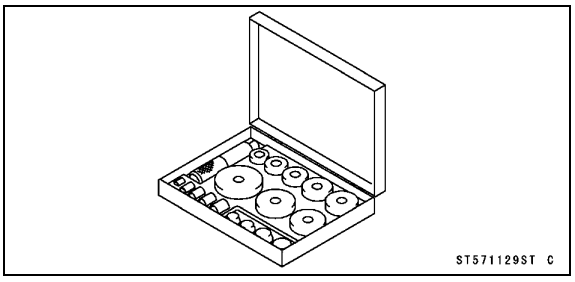
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Special Tools

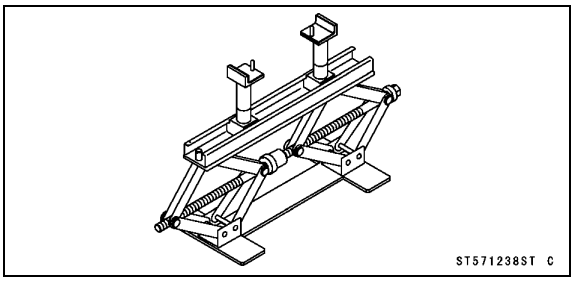
Inside Circlip Pliers:
57001-143



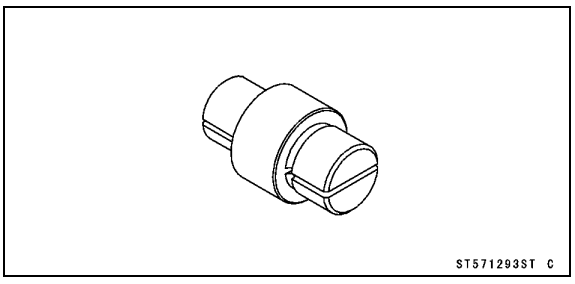
Bearing Driver Set:
57001-1129



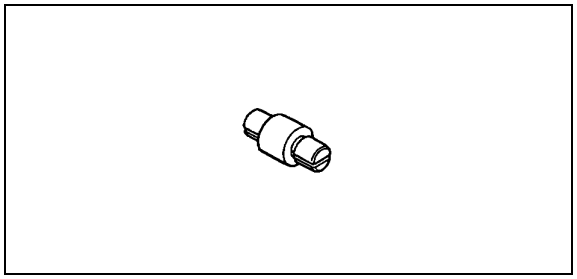
Jack:
57001-1238



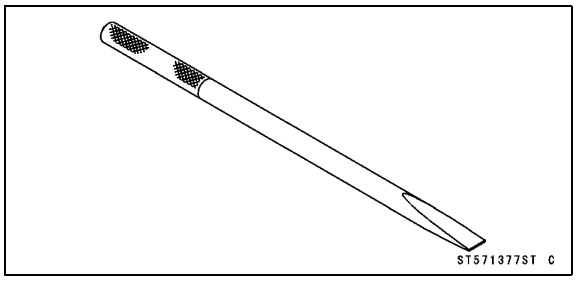
Bearing Remover Head, ϕ20 × ϕ22:
57001-1293



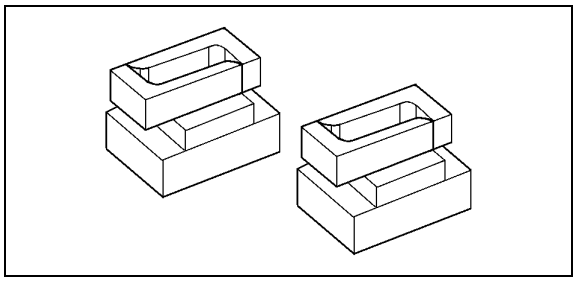
Bearing Remover Head, ϕ25 × ϕ28:
57001-1346



Bearing Remover Shaft, ϕ13:
57001-1377



Attachment Jack:
57001-1398

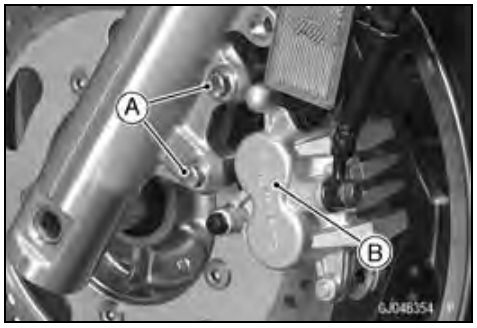


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Wheels (Rims)

Front Wheel Removal

- Remove the front fender (see Rear Fender Removal in the Frame chapter).
- Unscrew the front brake caliper mounting bolts [A] and remove the brake calipers [B] with the hose installed.

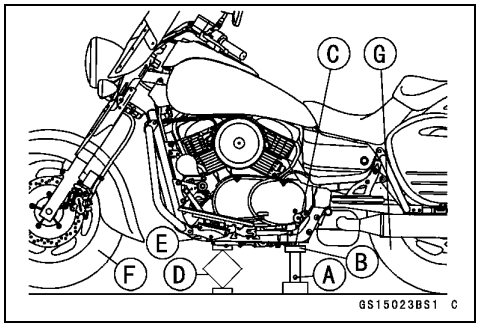


- Loosen:
  Front Axle Clamp Bolts [A]
  Front Axle [B]



○Using the jack [A] and the attachment jack [B] under the frame pipe ribs [C], and a commercially available jack [D] under the engine [E], lift the front wheel [F] OFF the ground until the rear wheel [G] touches the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398



CAUTION

Be sure to put the rear wheel ON the ground when removing the front wheel, or the motorcycle may fall over. The motorcycle could be damaged.

⚠ WARNING

Be sure to put the rear wheel ON the ground when removing the front wheel, or the motorcycle may fall over. It could cause an accident and injury.

- Unscrew the axle to the right and drop the front wheel [A] out of the fork.



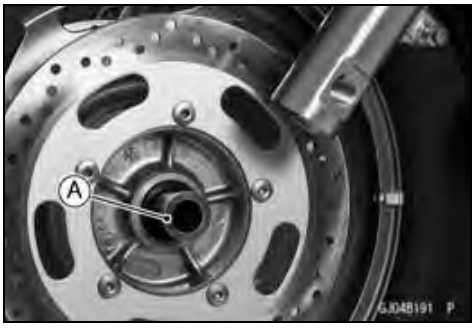
CAUTION

Do not lay the wheel directly 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.

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Wheels (Rims)

Front Wheel Installation



- Apply grease to the seal lips.
- Fit the collars [A] on the both side of the hub.

○The collars are identical.

- Insert the axle from the right side of the wheel.
- Tighten the axle.

Torque - Front Axle Shaft: 108 N·m (11.0 kgf·m, 80 ft·lb)



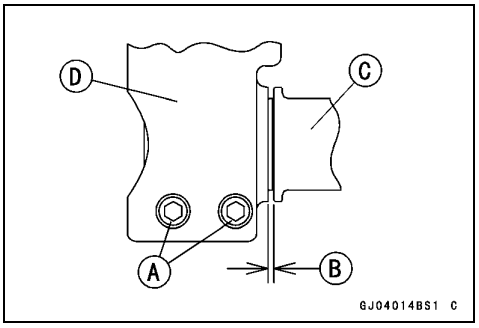
- Before tightening the clamp bolts on the right fork leg, pump the forks up and down [A] 4 or 5 times to allow the right fork leg to find a neutral position on the front axle.

NOTE

○*Do not apply the front brake during this process to stop the motorcycle from rolling forward. Put a block in front of the wheel to stop it from moving.*

- Tighten the axle clamp bolts [A] to the specified torque.

Torque - Front Axle Clamp Bolts: 29 N·m (3.0 kgf·m, 21 ft·lb)



NOTE

○*Tighten the two front axle clamp bolts alternately two times to ensure even tightening torque.*

- Check the clearance [B] between the front axle collar [C] and the right fork leg [D]. The clearance between the front axle collar and the right fork leg should be between 1.05 ~ 3.19 mm (0.041 ~ 0.124 in.).

★If the clearance is out of this range, remove the front wheel again and check the axle, wheel hub and other related parts for damage.

- Tighten the caliper mounting bolts.

Torque - Front Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Check the front brake effectiveness.

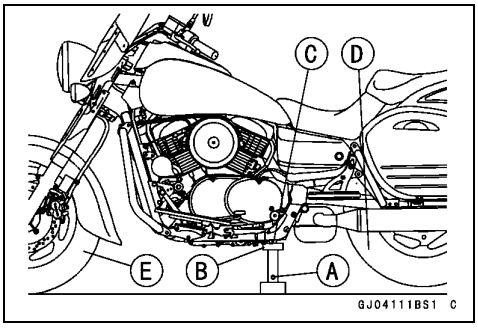
⚠ WARNING

Do not attempt to ride the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brakes will not function on the first application of the lever if this is not done.

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Wheels (Rims)

Rear Wheel Removal



- Using the jack [A] and attachment jack [B] under the frame pipe ribs [C], lift the rear wheel [D] OFF the ground until the front wheel [E] touches the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

CAUTION

Be sure to put the front wheel ON the ground when removing the rear wheel, or the motorcycle may fall over. The motorcycle could be damaged.

⚠ WARNING

Be sure to put the front wheel ON the ground when removing the rear wheel, or the motorcycle may fall over. It could cause an accident and injury.



- Squeeze the brake lever slowly and hold it with a band [A]

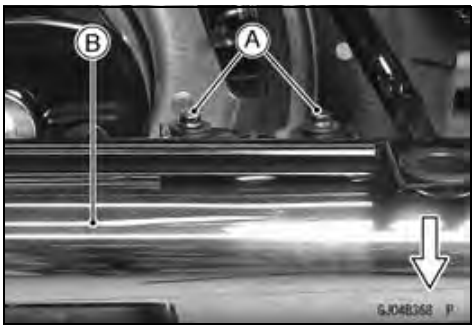
CAUTION

Be sure to hold the front brake when removing the rear wheel, or the motorcycle may fall over. The motorcycle could be damaged.

⚠ WARNING

Be sure to hold the front brake when removing the rear wheel, or the motorcycle may fall over. It could cause an accident and injury.

- Remove:
  Left and Right saddlebags (see saddlebag Removal in the Frame chapter)
  Rear Fender (see Rear Fender Removal in the Frame chapter)

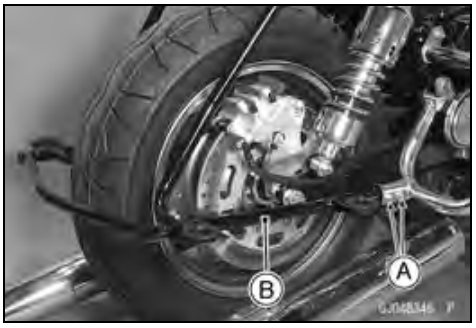


- Loosen the left and right muffler clamp bolts.
- Remove the left and right muffler stay mounting bolts [A].
- Lower the left and right mufflers [B].

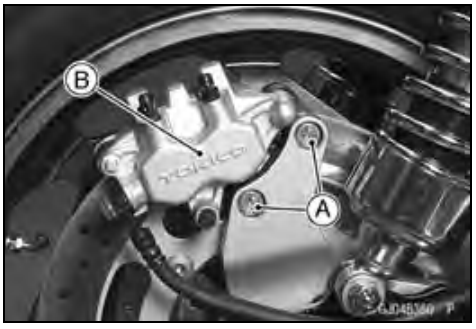
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Wheels (Rims)

● Remove:
Bolts [A] (Both Sides)
Saddlebag Stay (Lower) [B]



● Remove:
Caliper Mounting Bolts [A]
Caliper [B]



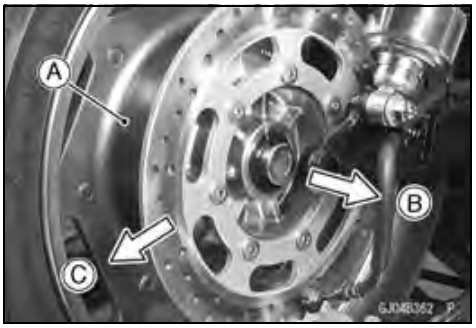
● Remove:
Caliper Holder Bolt [A]
Axle Nut Cotter Pin [B]
Axle Nut [C]
○Pull the silencer out side and straighten the cotter pin.



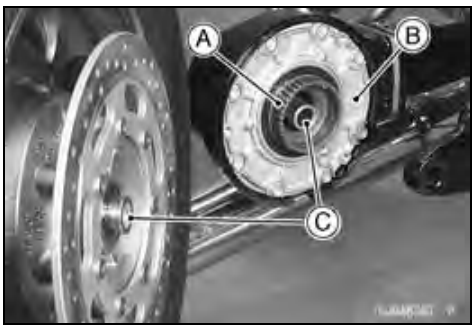
● Pull out the axle, and slide the rear wheel [A] toward the right [B] to disengage the wheel from the final gear case.
● Move the rear wheel back [C] and remove it.

CAUTION

Do not lay the wheel directly 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 grease to the grease seal of the wheel.
● Apply grease to the ring gear hub splines [A] of the final gear case [B].
● Insert the collars [C] on both sides of the hub.



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Wheels (Rims)

- Insert the axle [A] from the left side of the rear wheel.
- Slide the rear wheel to the left side, and engage the ring gear hub splines with the wheel coupling hub splines.
- Pull the axle little and install the caliper holder.
- Tighten:

Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 80 ft·lb)
Rear Caliper Holder Bolt: 64 N·m (6.5 kgf·m, 47 ft·lb)
Rear Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



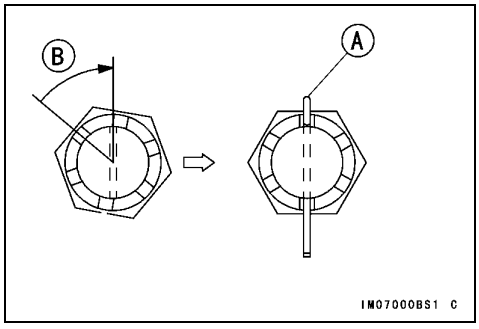
⚠ WARNING

If the axle nut is not securely tightened, an unsafe riding condition may result.

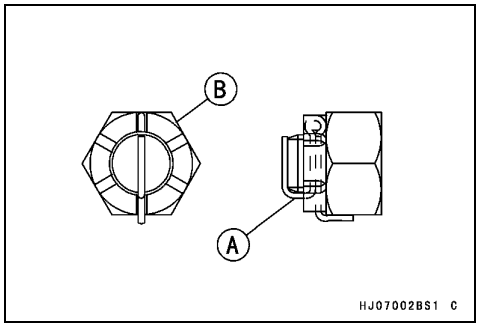
- Insert a new cotter pin [A].

NOTE

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



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



- Tighten the left and right muffler clamp bolts and stay mounting bolts.

Torque - Muffler Stay Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Visually inspect the tire for stuck any grease [A].
★If any grease have stuck to the surface of the tire, wash the tire clean with soap and water solution.
- Check the rear brake effectiveness.



⚠ WARNING

Do not attempt to ride 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.

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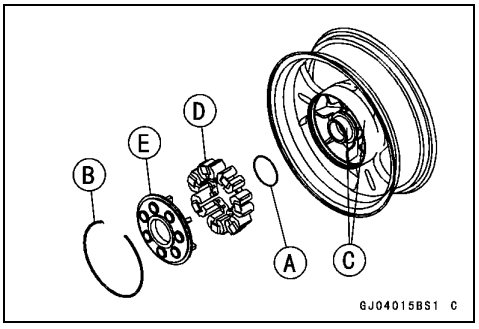
Wheels (Rims)

Wheel Coupling Removal



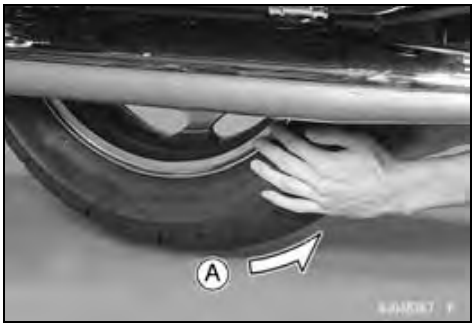
- Remove the rear wheel (see Rear Wheel Removal in this section).
- Remove the coupling retaining ring [A].
- Remove the wheel coupling [B] with a bearing puller if necessary.

Wheel Coupling Installation



- Replace the O-ring [A] and the retaining ring [B].
- Grease the following:
  O-ring
  Bosses [C] of Rear Drum Hub
- Install:
  Rubber Damper [D]
  Coupling [E]
  Retaining Ring

Wheel Inspection



- Raise the front or rear wheel off the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

- Spin [A] the wheel lightly, and check for roughness or binding.

★If roughness or binding is found, replace the hub bearings.

- Inspect the front and rear axles for damage (see Axle Inspection in this section).

★If the axle is damaged or bent, replace it.

- Inspect the wheel for small cracks, dents, bending, or warp.

★If there is any damage to the wheel, replace the wheel.

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Wheels (Rims)

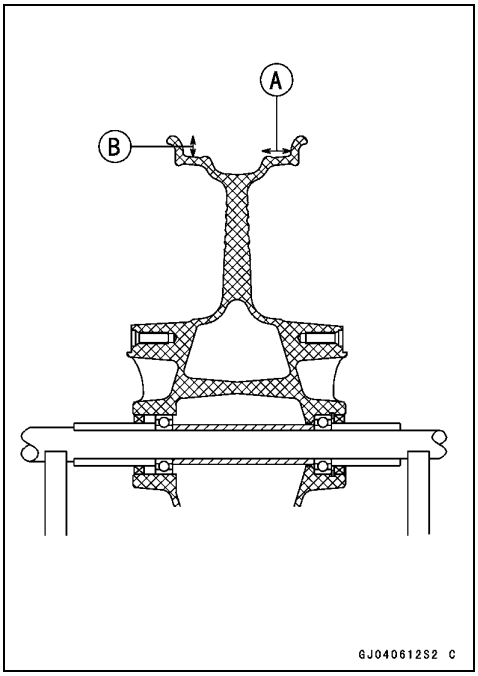
- Remove the wheel, and support it without the tire by the axle.
- Measure the rim runout, radial [A] and axial [B], with a dial gauge.

★If the rim runout exceeds the service limit, check the hub bearings. Replace them if they are damaged.

★If the problem is not due to the bearings, replace the wheel.

Rim Runout
Service Limit:

Axial	**0.5 mm (0.02 in.)**
Radial	**0.8 mm (0.03 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.

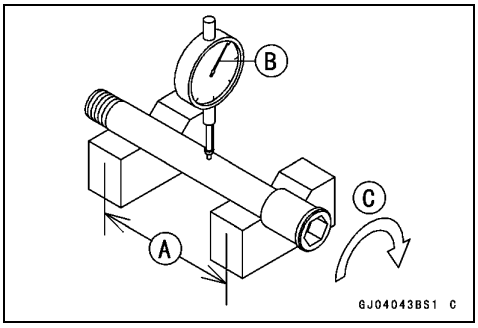
Axle Inspection

- Visually inspect the front and rear axles for damage.

★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

Standard:	**TIR 0.05 mm (0.002 in.) or less**
Service Limit:	**TIR 0.2 mm (0.008 in.)**

Wheel Balance

○To improve stability and decrease vibration at high speed, the front and rear wheels must be kept balanced.

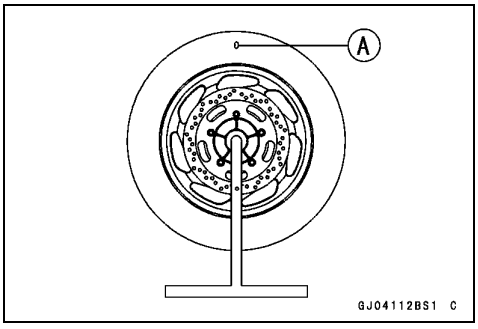
- Check and balance the wheels when required, or when a tire is replaced with a new one.

Balance Inspection

- Remove the wheel (see Front/Rear Wheel Removal in this section).
- 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.

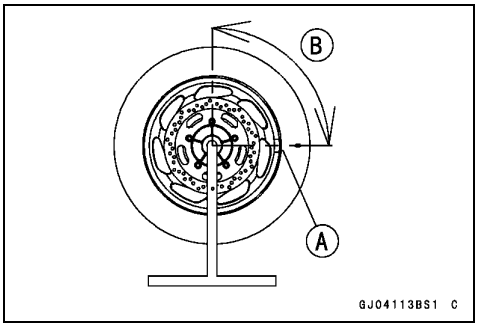
★If the wheel always stops in one position, adjust the wheel balance.



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Wheels (Rims)

Balance Adjustment



● If the wheel always stops in one position, provisionally attach a balance weight [A] to the rim flange at the marking, using adhesive tape.

⚠ WARNING

Use only the genuine balance weights.

● 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.

★If proper balance has been achieved, permanently install the balance weight.

Balance Weight

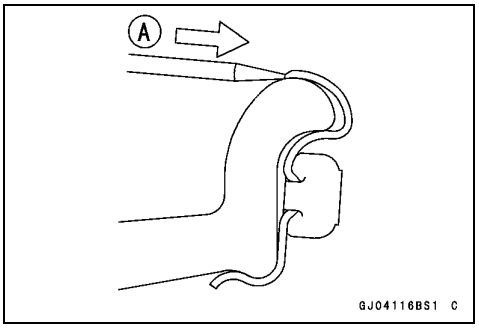
Part Number	Weight (grams)
41075-0014	10 (0.4 oz.)
41075-0015	20 (0.7 oz.)
41075-0016	30 (1.1 oz.)

NOTE

○*Balance weights are available from Kawasaki Dealers in 10, 20, and 30 gram (0.4, 0.7 and 1.1 oz.) sizes. An imbalance of less than 10 grams (0.4 oz.) will not usually affect running stability.*

○*Do not use four or more balance weights (more than 90 gram, 3.2 oz.). If the wheel requires an excess balance weight, remove and disassemble the wheel to find the cause.*

Balance Weight Removal



(a) When the tire is not on the rim.

● Push [A] the blade portion toward the outside with a regular tip screw driver, and slip the weight off the rim flange.

● Discard the used balance weight.

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Wheels (Rims)

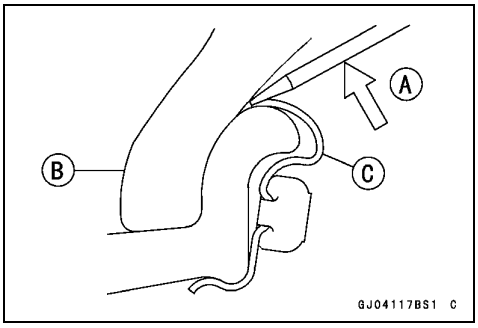
(b) When the tire is on the rim.

● Pry [A] the balance weight off the rim flange using a regular tip screw driver as shown in the figure.

○Insert a tip of the screw driver between the tire bead [B] and weight blade [C] until the end of the tip reaches the end of the weight blade.

○Push the driver grip toward the tire so that the balance weight slips off the rim flange.

● Discard the used balance weight.



Balance Weight Installation

● Check if the weight portion has any play on the brade-and -clip plate.

★If it does, discard it.

⚠ WARNING

If the balance weight has any play on the rim flange, 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.

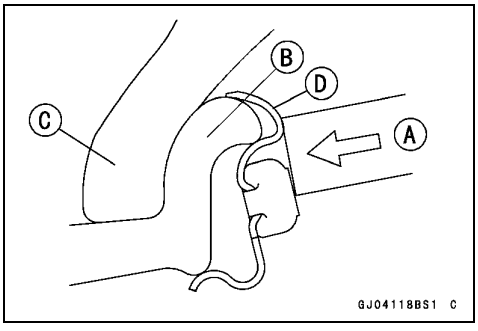
● Lubricate the balance weight blade, tire bead, and rim flange with a soap and water solution or rubber lubricant. This helps the balance weight slip onto the rim flange.

CAUTION

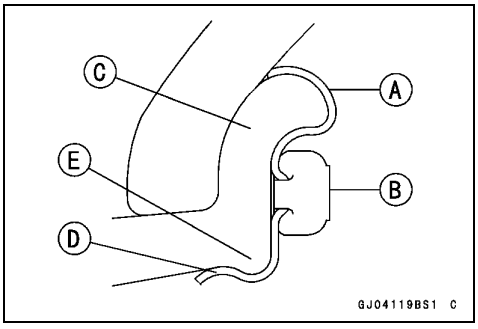
Do not lubricate the tire bead with engine oil or petroleum distillates because they will deteriorate the tire.

● Install the balance weight on the rim.

○Slip the weight on the rim flange [B] by pushing or lightly hammering [A] the weight in the direction shown in the figure.
Tire Bead [C]
Blade [D]



● Check that the blade [A] and weight [B] seat fully on the rim flange [C], and that the clip [D] is hooked over the rim ridge [E] and reaches rim flat portion.

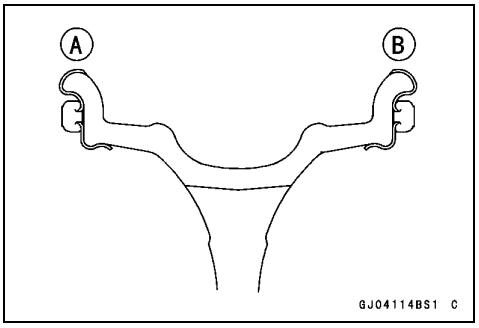


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Wheels (Rims)

● When required total weight exceeds 20 g (0.7 oz.), install balance weight at both sides of rim flange as shown.

Required Total Weight	Weight Selection	
	One Side [A]	Other Side [B]
10 g (0.4 oz.)	10 g (0.4 oz.)	–
20 g (0.7 oz.)	10 g (0.4 oz.)	10 g (0.4 oz.)
30 g (1.1 oz.)	20 g (0.7 oz.)	10 g (0.4 oz.)
40 g (1.4 oz.)	20 g (0.7 oz.)	20 g (0.7 oz.)
50 g (1.8 oz.)	30 g (1.1 oz.)	20 g (0.7 oz.)
60 g (2.1 oz.)	30 g (1.1 oz.)	30 g (1.1 oz.)
70 g (2.5 oz.)	20 g (0.7 oz.) + 20 g (0.7 oz.)	30 g (1.1 oz.)
80 g (2.8 oz.)	20 g (0.7 oz.) + 20 g (0.7 oz.)	20 g (0.7 oz.) + 20 g (0.7 oz.)
90 g (3.2 oz.)	20 g (0.7 oz.) + 30 g (1.1 oz.)	20 g (0.7 oz.) + 20 g (0.7 oz.)



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Tires

Air Pressure Inspection/Adjustment

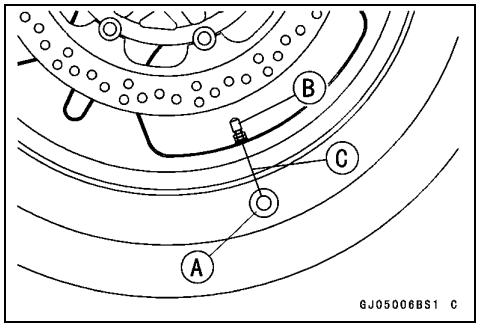
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

Tire Inspection

- Refer to the Wheel/Tire Damage Inspection in the Periodic Maintenance chapter.

Tire Removal

- Remove the following.
  Wheel (see Front/Rear Wheel Removal in this chapter)
  Brake Disc (see Brake Disc Removal in the Brakes chapter)
  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 commercially available tire changer.

NOTE

○*The tires cannot be removed with hand tools because they fit the rims too tightly.*

Tire Installation

⚠ WARNING

To ensure safe handling and stability, use only the standard tires for replacement, inflated to the standard pressure. Use the same manufacturer's tires on both front and rear wheels.

- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

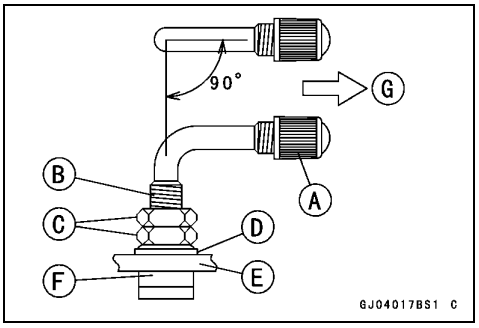
CAUTION

Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

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Tires

○Insert the new air valve in the front and rear wheel rim.
Valve Cap [A]
Valve Body [B]
Valve Nuts [C]
Valve Washer [D]
Rim [E]
Valve Grommet [F]
Coupling Damper Side (Left Side) [G]



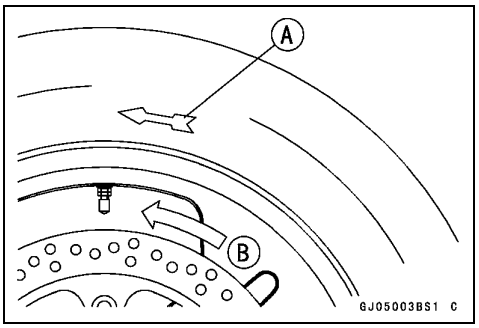
○Remove the valve cap, valve nuts, valve washer and insert the valve stem through the rim from the inside out.

Torque - Tire Air Valve Nuts: 1.5 N·m (0.15 kgf·m, 13 in·lb)

● Apply a soap and water solution, or rubber lubricant to the rim flange and tire beads.

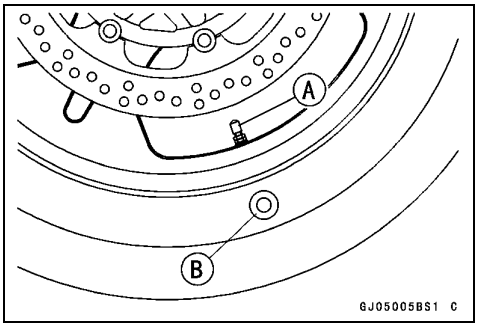
CAUTION

Never lubricate with mineral oil (engine oil) or gasoline because they will cause deterioration of the tire.



● Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.
Tire Rotation Mark [A]
Rotation Direction [B]
○The front rim is no right and left distinction.
○Install the rear tire on the rim so that the damper faces left.

● Position the tire on the rim so that the valve [A] is at the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
● Install the tire bead over the rim flange using a 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.

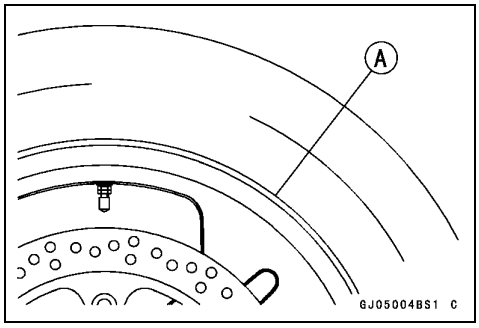


⚠ WARNING

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.

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Tires



- Check to see that the bead lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.

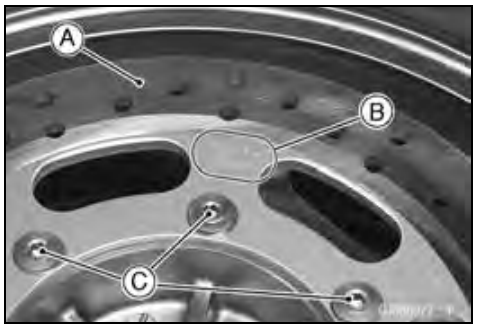
★If the rim flanges and tire sidewall bead lines are not parallel, remove the valve core.

- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leakage.

○Inflate the tire slightly above standard inflation.

○Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.

- Adjust the air pressure to the specified pressure (see Tire Air Pressure Inspection in the Periodic Maintenance chapter).
- Install the air valve cap.



- Install the brake disc [A] so that the marked side [B] faces out.
- Apply a non-permanent locking agent, and tighten the brake disc bolts [C].

Torque - Front Brake Disc Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)
Rear Brake Disc Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)

- Adjust the wheel balance.

⚠ WARNING

Check and balance the wheel when a tire is replaced with a new one. New tires are slippery and may cause loss of control and injury. A break-in period of 160 km (100 mile) is necessary to establish normal tire traction. During break-in, avoid sudden and maximum braking and acceleration, and hard cornering.

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.

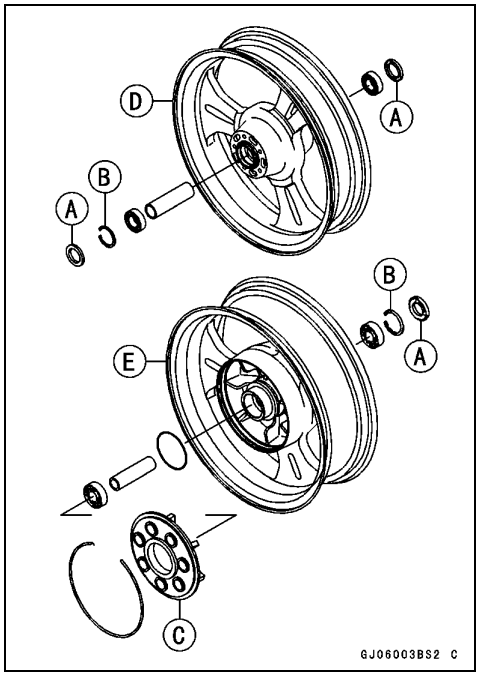
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Hub Bearings (Wheel Bearings)

Hub Bearings Removal

● Remove the wheel, and take out the following.
Collars
Grease Seals [A]
Circlips [B]
Coupling [C] (Out of Rear Hub)
Front Hub [D]
Rear Hub [E]

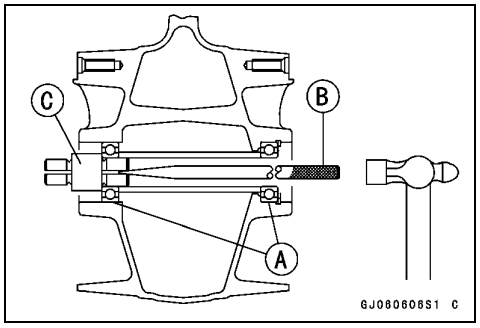
Special Tool - Inside Circlip Pliers: 57001-143



● Use the bearing remover to remove the hub bearings [A].

CAUTION

Do not lay the wheel directly 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 Shaft, ϕ13 [B]: 57001 -1377
Bearing Remover Head, ϕ25 × ϕ28 [C]: 57001-1346 (for Front Hub)
Bearing Remover Head, ϕ20 × ϕ22 [C]: 57001-1293 (for Rear Hub)

Hub Bearings Installation

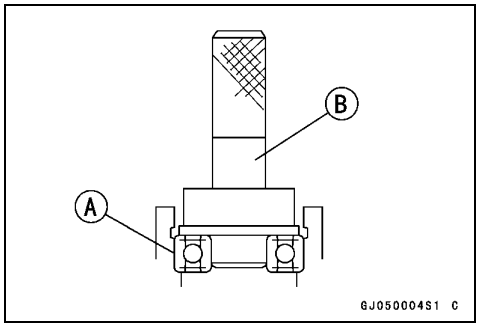
● Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
● Replace the bearings with new ones.

NOTE

○*Install the bearings so that the marked side faces out.*

● Install the bearings by using a bearing driver.
● First, press each right bearing [A] in until it bottoms out.

Special Tool - Bearing Driver Set [B]: 57001-1129



● Next, install the following.
New Circlip
Distance Collar
Left Bearing

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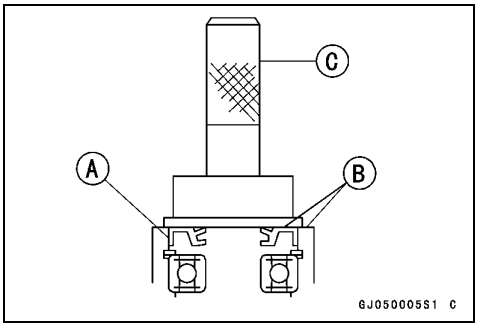
Hub Bearings (Wheel Bearings)

○Replace the circlips with new ones.

Special Tool - Inside Circlip Pliers: 57001-143

● 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

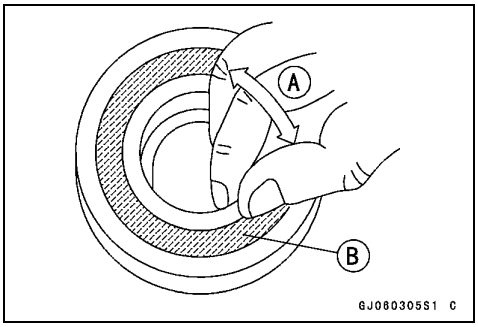


Hub Bearings Inspection

○Since the hub bearings are made to extremely close tolerance, the clearance cannot normally be measured.

NOTE

○*Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.*



● Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
★If bearing play, roughness, or binding is found, replace the bearing.
● Examine the bearing seal [B] for tears or leakage.
★If the seal is torn or is leaking, replace the bearing.

Hub Bearings Lubrication

NOTE

○*Since the hub bearings are packed with grease and sealed, lubrication is not required.*

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Final Drive

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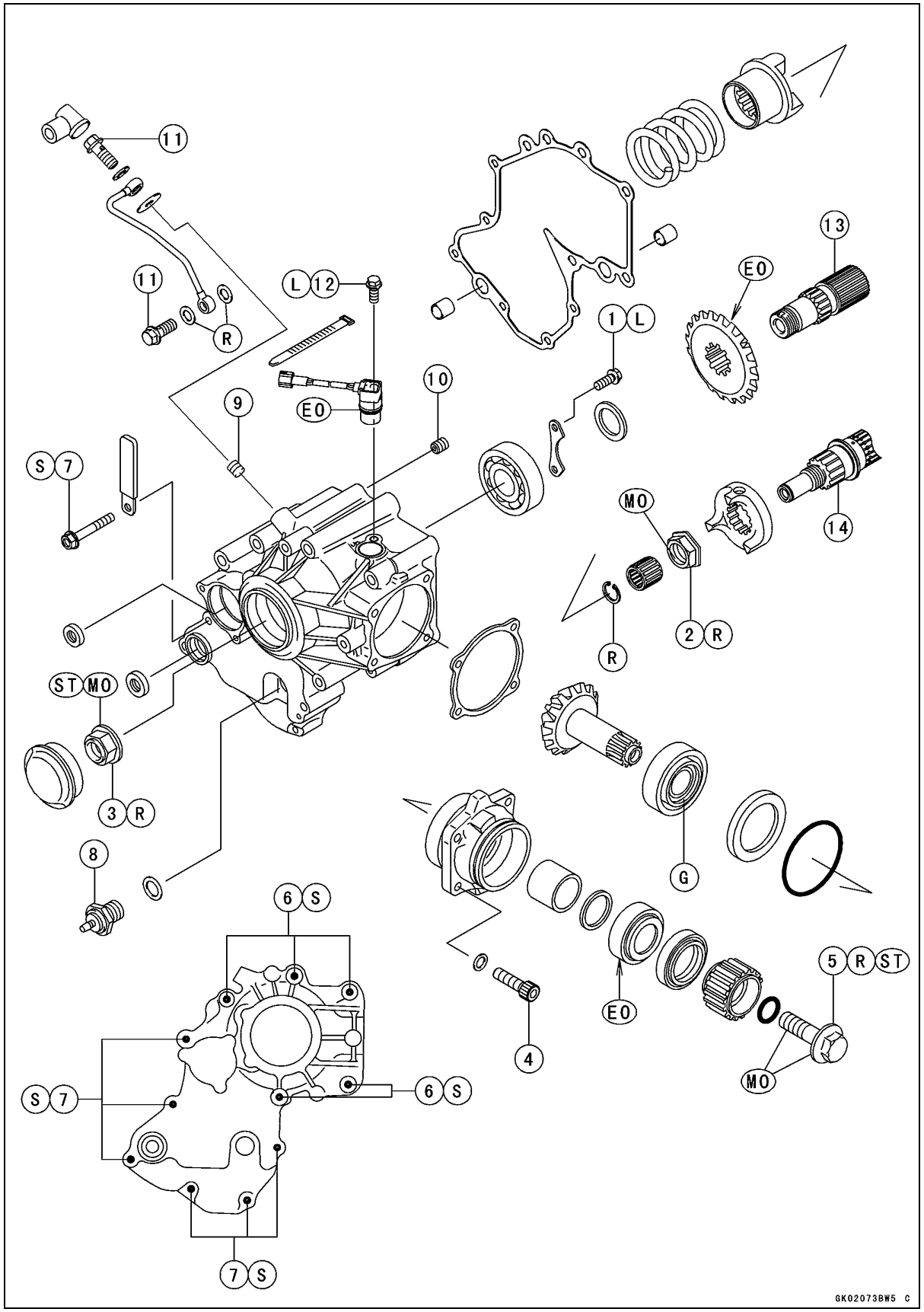
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Exploded View



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Exploded View

Front Gear Case

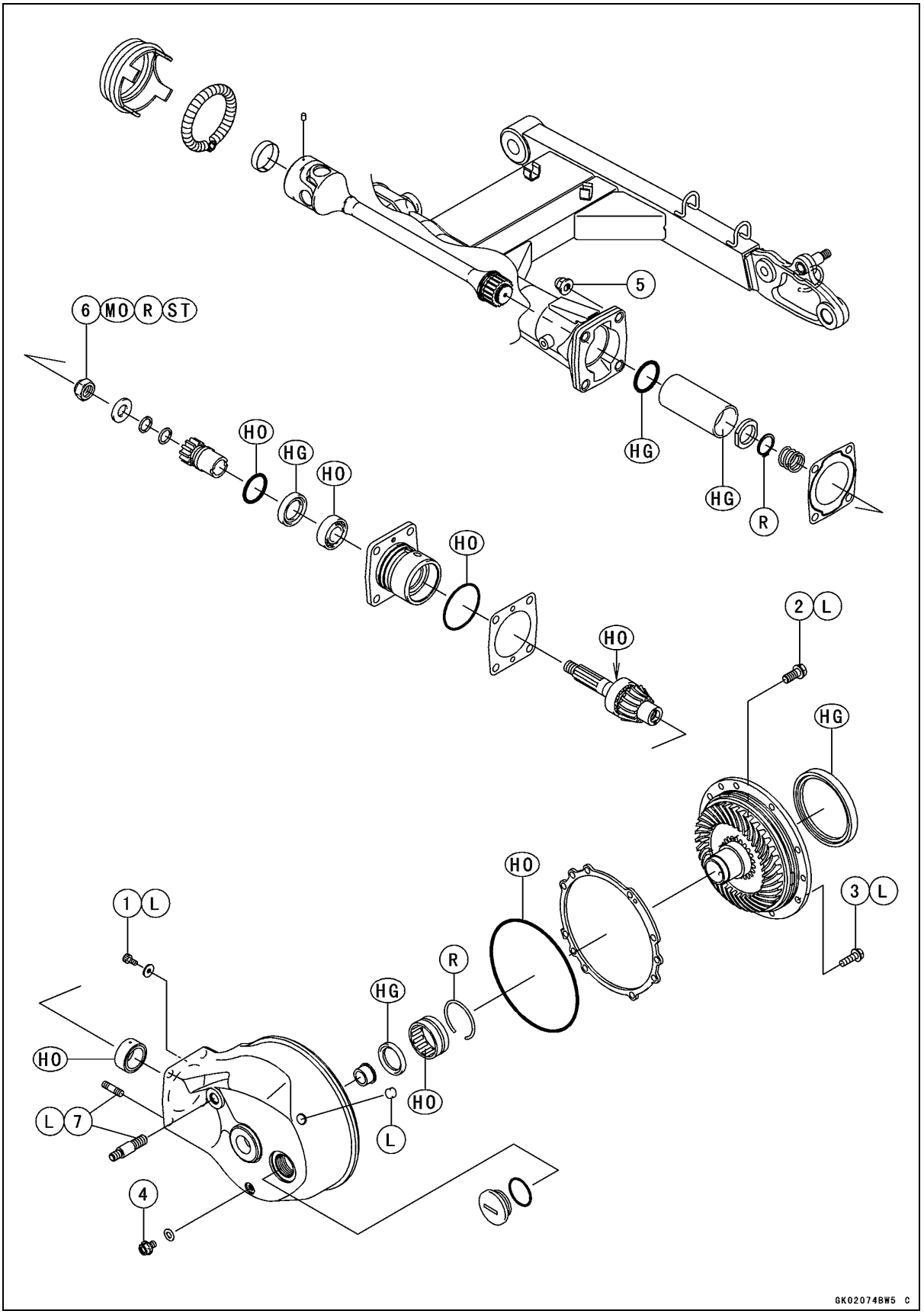
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bearing Retainer Bolts (Front Gear)	8.8	0.90	78 in·lb	L
2	Damper Cam Nut	195	20.0	144	MO, R
3	Drive Gear Nut	265	27.0	195	MO, R, ST
4	Driven Gear Assy Mounting Bolts	25	2.5	18	
5	Driven Gear Bolt	120	12.2	89	MO, R, ST
6	Front Gear Case Bolts (M8)	29	3.0	21	S
7	Front Gear Case Bolts (M6)	12	1.2	104 in·lb	S
8	Neutral Switch	15	1.5	11	
9	Oil Nozzle (Front)	2.9	0.30	26 in·lb	
10	Oil Nozzle (Right)	18	1.8	13	
11	Oil Pipe Banjo Bolts	12	1.2	104 in·lb	
12	Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L

13. Drive Gear Shaft
14. Output Shaft

EO: Apply engine oil.
G: Apply 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
ST: Stake the fasteners.

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Exploded View



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Exploded View

Final Gear Case

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Bearing Retainer Bolt (Final Gear)	6.9	0.70	61 in·lb	L
2	Final Gear Case Cover Bolts (M10)	34	3.5	25	L
3	Final Gear Case Cover Bolts (M8)	23	2.3	17	L
4	Final Gear Case Drain Plug	8.8	0.90	78 in·lb	
5	Final Gear Case Mounting Nuts	34	3.5	25	
6	Pinion Gear Nut	127	13.0	94	MO, R, ST

HG: Apply high-temperature grease.
HO: Apply hypoid gear 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
ST: Stake the fasteners.

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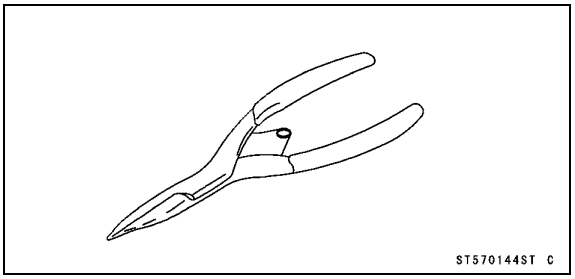
Specifications

Item	Standard
Final Gear Case Oil	
Grade	API GL-5 hypoid gear oil
Viscosity	When above 5°C (41°F) SAE90 When below 5°C (41°F) SAE80
Oil Level	Filler opening bottom
Amount	200 mL (6.76 US oz.)
Final Bevel Gear Backlash	0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.) (at ring gear hub splines)
Preload for Pinion Gear Bearing	
Torque Wrench	0.6 ~ 1.0 N·m (0.06 ~ 0.10 kgf·m, 5.2 ~ 8.7 in·lb)
Spring Scale	3.0 ~ 5.0 N (0.30 ~ 0.50 kg, 0.7 ~ 1.1 lb)
Propeller Shaft Joint Grease	20 mL (0.68 US oz.), high-temperature grease
Front Bevel Gear Backlash	0.10 ~ 0.15 mm (0.004 ~ 0.006 in.) (at gear tooths)
Preload for Front Bevel Gear Bearing	
Torque Wrench	0.5 ~ 0.9 N·m (0.05 ~ 0.09 kgf·m, 4.3 ~ 7.8 in·lb)
Spring Scale	3.0 ~ 4.0 N (0.30 ~ 0.50 kg, 0.6 ~ 1.0 lb)

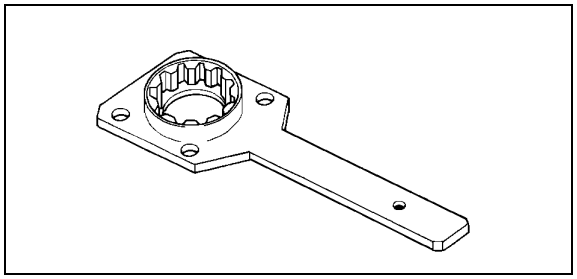
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Special Tools

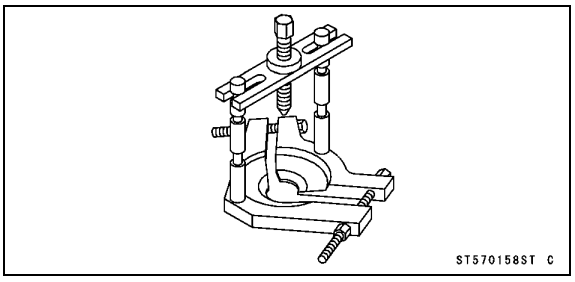
Outside Circlip Pliers:
57001-144



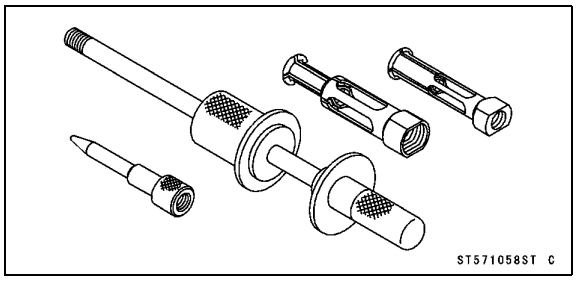
Driven Gear Holder, m2:
57001-1027



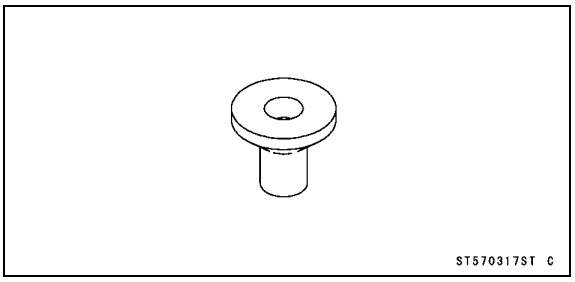
Bearing Puller:
57001-158



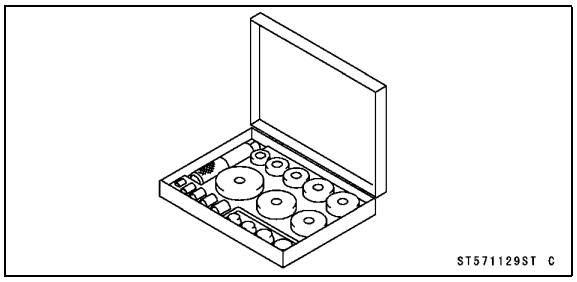
Oil Seal & Bearing Remover:
57001-1058



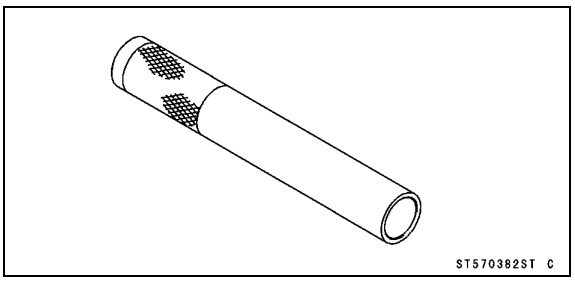
Bearing Puller Adapter:
57001-317



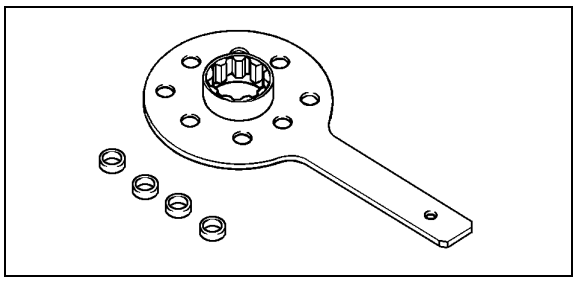
Bearing Driver Set:
57001-1129



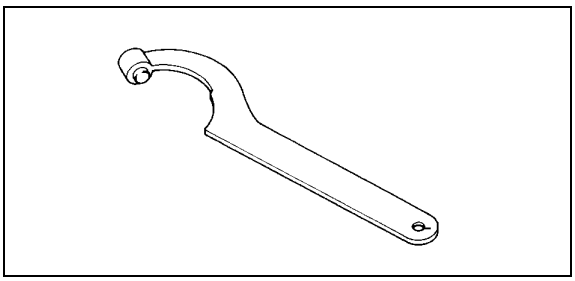
Bearing Driver, ϕ32:
57001-382



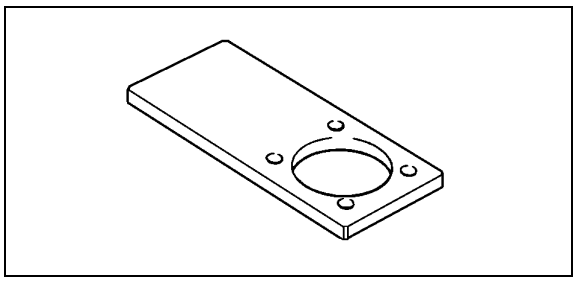
Pinion Gear Holder, m1.9:
57001-1165



Damper Cam Holder:
57001-1025



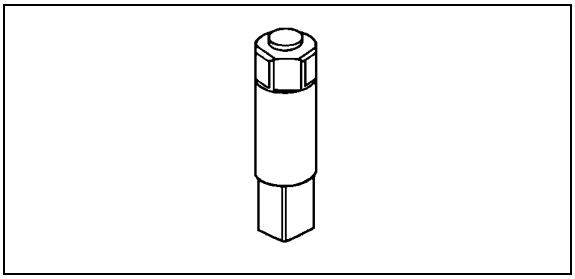
Final Gear Case Holder:
57001-1250



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Special Tools

Drive Shaft Holder:
57001-1407



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Final Gear Case and Oil

Oil Level Inspection

- Refer to the Oil Level Inspection in the Periodic Maintenance chapter.

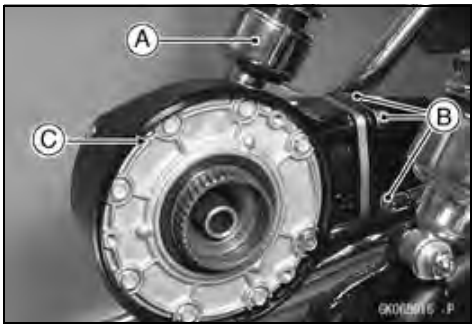
Oil Change

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

Final Gear Case Removal

★If the final gear case is to be disassembled, drain the final gear case oil (see Oil Change in the Periodic Maintenance chapter).

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).
- Remove the left rear shock absorber [A] from its studs by taking off the nuts.
- Remove the final gear case by taking off the nuts [B]. The spring comes off with the case.

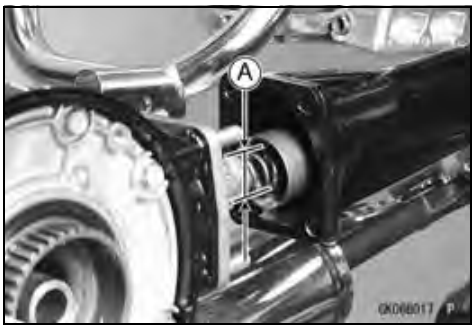


NOTE

○*If the final gear case is full of oil, place the case so that the breather hole [C] is on top.*

Final Gear Case Installation

- Lubricate the propeller shaft joint (see Propeller Shaft Joint Lubrication in this chapter).
- Install the spring so that the smaller diameter end [A] faces toward the final gear case.



- Fit the pinion gear splines into the propeller shaft joint while turning the ring gear hub [A].
- Tighten the final gear case mounting nuts to the specified torque.

Torque - Final Gear Case Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

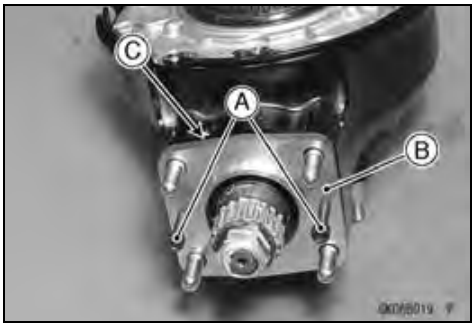


★If the final gear case oil was drained, fill the case with oil (see Oil Change in the Periodic Maintenance chapter).

- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).

Final Gear Case Disassembly

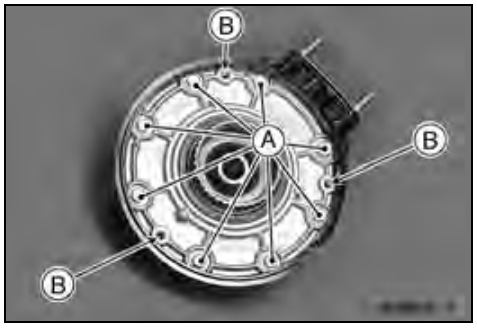
- Remove the final gear case (see Final Gear Case Removal in this section).
- Using 6 mm (0.2 in.) bolts [A] with 10 mm (0.4 in.) pitch threads, jack up the pinion gear assembly [B].
- Remove the pinion gear assembly and shim(s) [C] from the final gear case.



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Final Gear Case and Oil

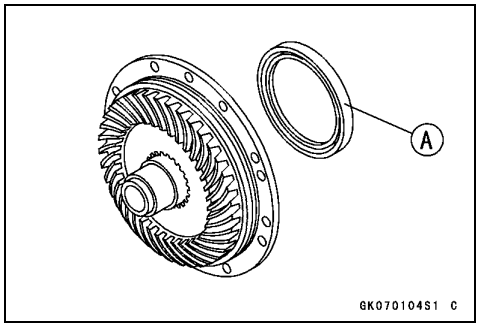
● Remove the final gear case cover bolts [A].
● Use three tapped holes [B] to lift the ring gear assy from the gear case. The shim(s) comes off with the assy.



NOTE

○*Do not disassemble the ring gear assy (ring gear, ring gear hub, and final gear case cover), but the oil seal can be removed.*

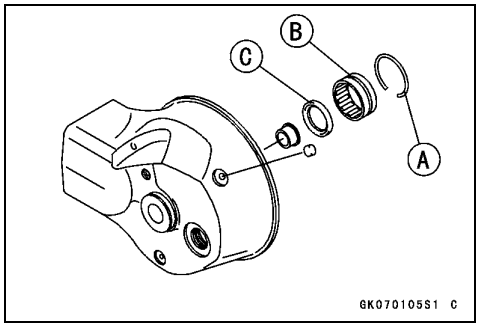
● To remove the ring gear oil seal [A], heat the ring gear assy in an oil bath to **120 ~ 150°C (248 ~ 302°F)**, then pry out the oil seal with an awl or other tool. Be careful not to scratch the sealing surface on the ring gear hub.



CAUTION

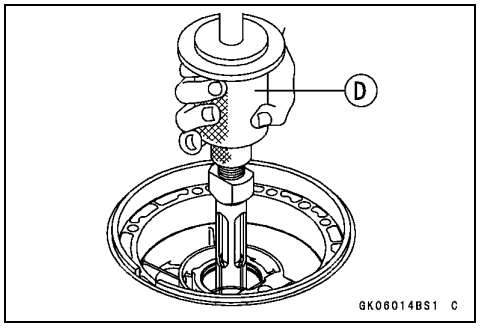
Do not heat the case with a blowtorch. This will warp the case.

● Remove the snap ring [A] and pull out the needle bearing [B].
★If the small ring gear oil seal [C] is damaged, remove it using the oil seal and bearing remover.



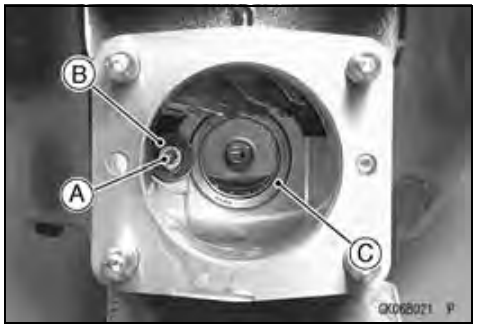
○Remove the small ring gear oil seal if damaged.

Special Tool - Oil Seal & Bearing Remover [D]: 57001-1058



● Unscrew the bearing retainer bolt [A] and washer [B].
● Pull out the needle bearing [C].

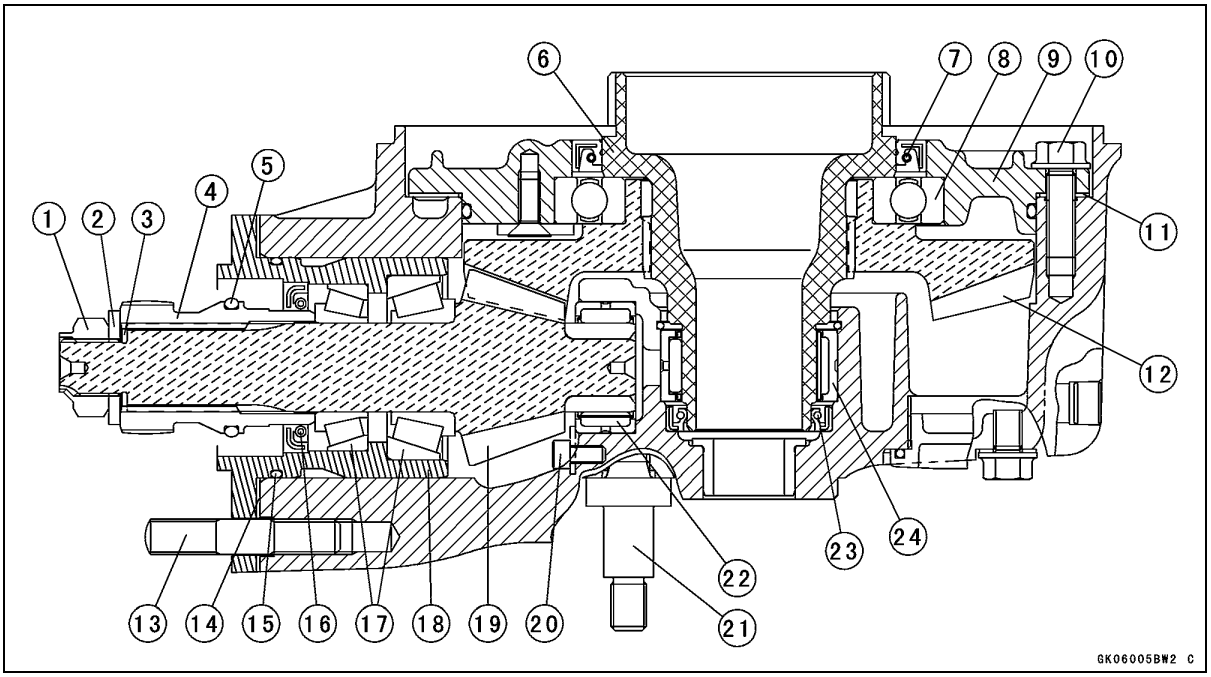
Special Tool - Oil Seal & Bearing Remover: 57001-1058



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Final Gear Case and Oil

Final Gear Case



1. Pinion Gear Nut
2. Washer
3. Shim(s) for Preload
4. Pinion Gear Joint
5. O-ring
6. Ring Gear Hub
7. Ring Gear Oil Seal
8. Ball Bearing
9. Final Gear Case Cover
10. Cover Mounting Bolts
11. Ring Gear Shim(s)
12. Ring Gear
13. Studs
14. Pinion Gear Shim(s)
15. O-ring
16. Oil Seal
17. Tapered Roller Bearings
18. Pinion Gear Bearing Housing
19. Pinion Gear
20. Retainer Bolt
21. Stud
22. Needle Bearing
23. Small Ring Gear Oil Seal
24. Needle Bearing

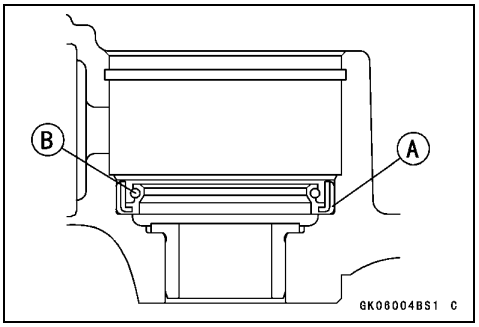
Final Gear Case Assembly

○The ring gear and pinion gear are lapped as a set in the factory to get the best tooth contact. They must be installed as a pair, and never replace one without the other.

● Press the small ring gear oil seal [A] until it bottoms out with its spring [B] facing inward.

Special Tool - Bearing Driver Set: 57001-1129

● Apply a thin coat of high-temperature grease to the oil seal lip.



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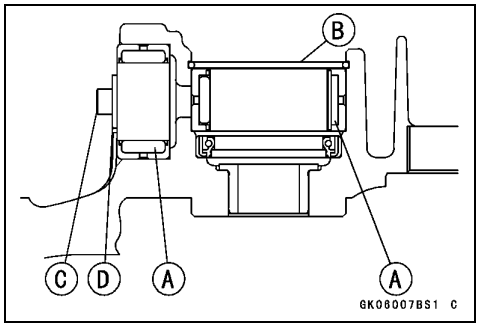
Final Gear Case and Oil

● Replace the needle bearings [A] with new ones.
● Apply a hypoid gear oil to the roller parts of the needle bearings.

NOTE

○*Install the bearing so that the marked side faces out.*
○*Press in the bearings until they are bottomed.*

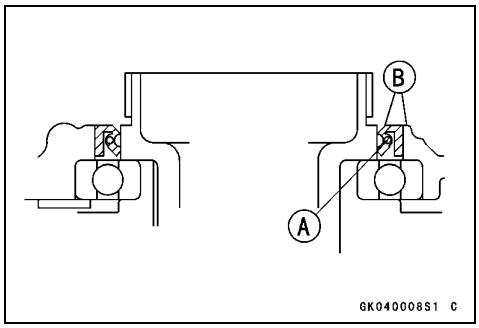
Special Tool - Bearing Driver Set: 57001-1129



● Install the snapring [B] secure.
● Apply a non-permanent locking agent to the bearing retainer bolt [C].
● Install the washer [D] and the bearing retainer bolt.

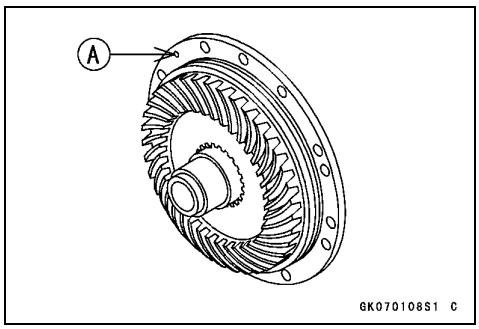
Torque - Bearing Retainer Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)

● Apply a thin coat of high-temperature grease to the oil seal lip of the ring gear oil seal.
● Install the ring gear oil seal with its spring [A] facing inward using a suitable driver until the face of the seal is even [B] with the end of the hole.



● Blow the breather hole [A] in the final gear case cover clean with compressed air.
● Apply a non-permanent locking agent to the threads of each stud and install them to the case if they were removed.
● Reinstall the original ring gear shim(s) to keep the gear backlash and the tooth contact unchanged.
○When final gear case parts are replaced, the final bevel gear must be adjusted (see Backlash Adjustment and Tooth Contact Adjustment in this section).
● Apply a non-permanent locking agent to the threads of the final gear case cover bolts.
● Tighten:

Torque - Final Gear Case Cover Bolts:
M10: 34 N·m (3.5 kgf·m, 25 ft·lb)
M8: 23 N·m (2.3 kgf·m, 17 ft·lb)



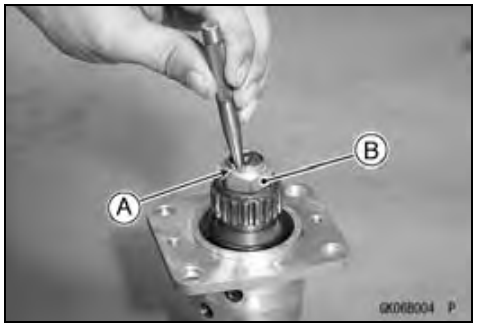
● Insert the pinion gear assembly into the final gear housing.
○Reinstall the pinion gear assembly shim(s) to keep the gear backlash and the tooth contact unchanged.

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Final Gear Case and Oil

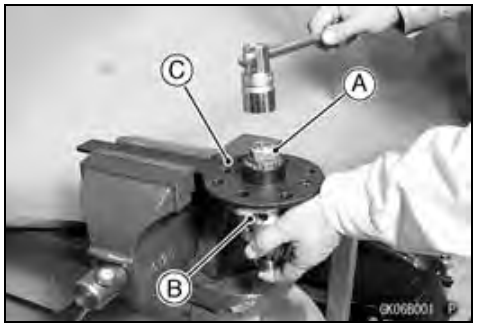
Pinion Gear Removal

● Pry open the staking [A] on the pinion gear nut [B].

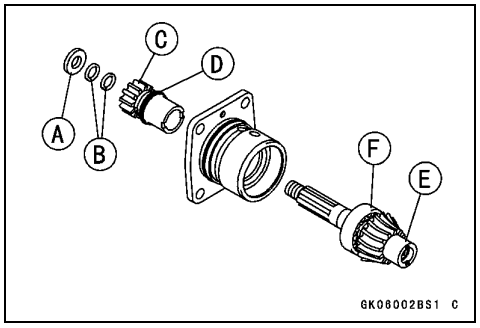


● Unscrew the nut [A] while holding the pinion gear assembly [B] with the pinion gear holder [C].

Special Tool - Pinion Gear Holder, m1.9: 57001-1165

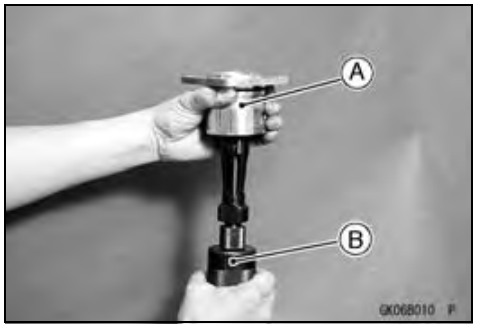


● Remove:
Washer [A]
Shim(s) [B]
Pinion Gear Joint [C] with the O-ring [D]
Pinion Gear [E] with the Tapered Roller Bearing [F]



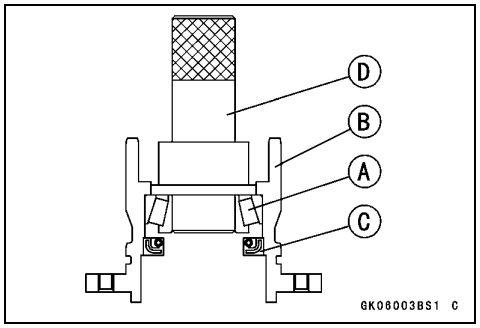
● Drive out the bearing outer race from the bearing housing [A].

Special Tool - Oil Seal & Bearing Remover [B]: 57001-1058



● Drive out the tapered roller bearing [A] in the bearing housing [B] and the oil seal [C] using the bearing driver set [D].

Special Tool - Bearing Driver Set: 57001-1129



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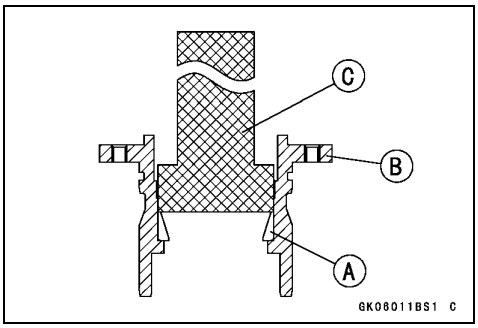
Final Gear Case and Oil

Pinion Gear Installation

- The pinion gear and ring gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Check the tapered roller bearing (see Tapered Roller Bearing Inspection in this chapter).
- Apply a hypoid gear oil to the roller bearings.

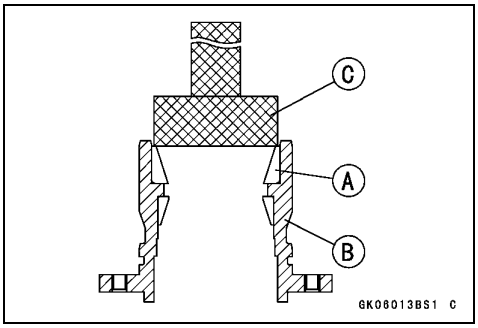
- Drive the tapered roller bearing [A] into the pinion gear housing [B] using the bearing driver set [C].

  Special Tool - Bearing Driver Set: 57001-1129



- Drive the tapered roller bearing outer race [A] into the pinion gear housing [B] using the bearing driver set [C].

  Special Tool - Bearing Driver Set: 57001-1129



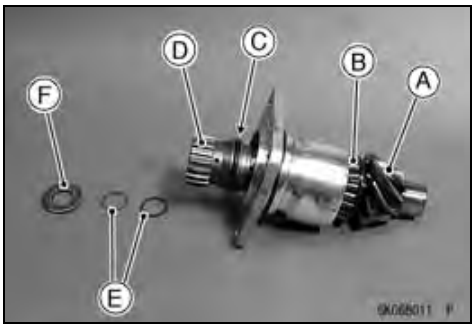
- Insert the pinion gear [A].

○Install the pinion gear with the tapered roller bearing as [B] one unit.

- Check the O-ring [C] on the pinion gear joint [D] for any kind of damage.

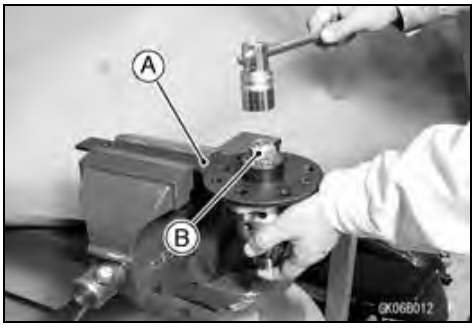
★Replace it if necessary.

- Apply a hypoid gear oil to the O-ring.
- Install the pinion gear joint, shim(s) [E] and washer [F].



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Final Gear Case and Oil



- Replace the pinion gear nut with a new one.
- Apply molybdenum disulfide oil solution to the threads and seating surface of the pinion gear nut.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

- Using the pinion gear holder [A], tighten the pinion gear nut [B].

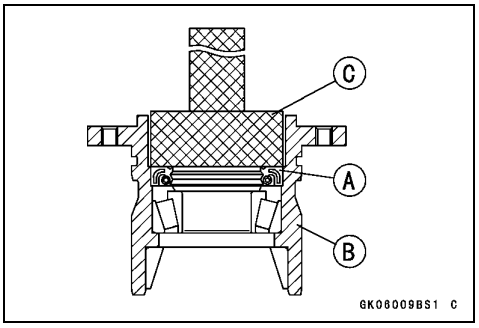
Special Tool - Pinion Gear Holder, m1.9: 57001-1165

Torque - Pinion Gear Nut: 127 N·m (13.0 kgf·m, 94 ft·lb)

○Check the pinion gear bearing preload (see Preload Adjustment in this chapter).

- Remove:

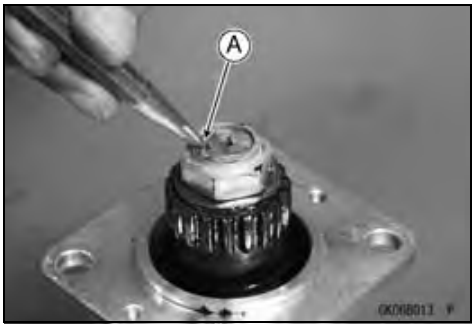
Pinion Gear Nut
Washer
Shim(s)
Pinion Gear Joint with the O-ring
Pinion Gear with the Tapered Roller Bearing



- Replace the oil seal with a new one.
- Drive the oil seal [A] using the bearing driver set [B].

Special Tool - Bearing Driver Set [C]: 57001-1129

- Apply a thin coat of high-temperature grease to the oil seal lip.



- Reinstall the above removed parts.

○Stake [A] the pinion gear nut with a punch.

CAUTION

When staking the nut, be careful not to apply shock to the pinion gear and its bearing. Such a shock could damage the pinion gear and/or bearing.

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Final Gear Case and Oil

Pinion Gear Bearing Preload Adjustment

Preload Measurement

- Check and adjust the bearing preload in the following case.

○When any of the parts listed below are replaced with new ones.

Tapered Roller Bearings
Bevel Gears
Bearing Housing
Pinion Gear Joint

○When the pinion gear nut is loosened, even if the purpose is not to replace the parts.

- Assemble the pinion gear bearing housing, and tighten the pinion gear nut to the specified torque. Oil seal installation is not required until the correct bearing preload is obtained.

CAUTION

To start with, choose a shim or shims so that the bearings are just SNUG with NO play but also with NO preload.
Any over-preload on the bearings could damage the bearings.

- Apply a little hypoid gear oil to the bearings, and turn the gear shaft more than 5 turns to allow the bearings to seat.
- Measure the bearing preload. Bearing preload is defined as the force or torque which is needed to start the gear shaft turning.

Preload for Pinion Gear Bearing

Using Torque Wrench:

0.6 ~ 1.0 N·m (0.06 ~ 0.10 kgf·m, 5.2 ~ 8.7 in·lb)

Using Spring Scale:

3.0 ~ 5.0 N (0.30 ~ 0.50 kg, 0.7 ~ 1.1 lb)

NOTE

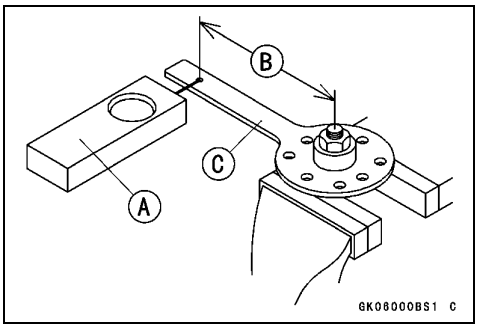
○*Preload can be measured either with a spring scale or a beam-type torque wrench. When measured with a spring scale, the preload is designated by force (N, kg, lb), and when measured with a torque wrench, it is designated by torque N·m, (kgf·m, in·lb).*

Using Spring Scale

- Hook the spring scale [A] on the handle at the point 200 mm (7.87 in.) [B] from the center of the gear shaft.
- Hold the bearing housing in a vise so that the gear shaft axis is vertical.
- Apply force to the handle horizontally and at a right angle to it.

Special Tool - Pinion Gear Holder, m1.9 [C]: 57001-1165

★If the preload is out of the specified range, replace the shims under the flat washer, and re-check the preload. Refer to the next paragraph to select suitable shims.



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Final Gear Case and Oil

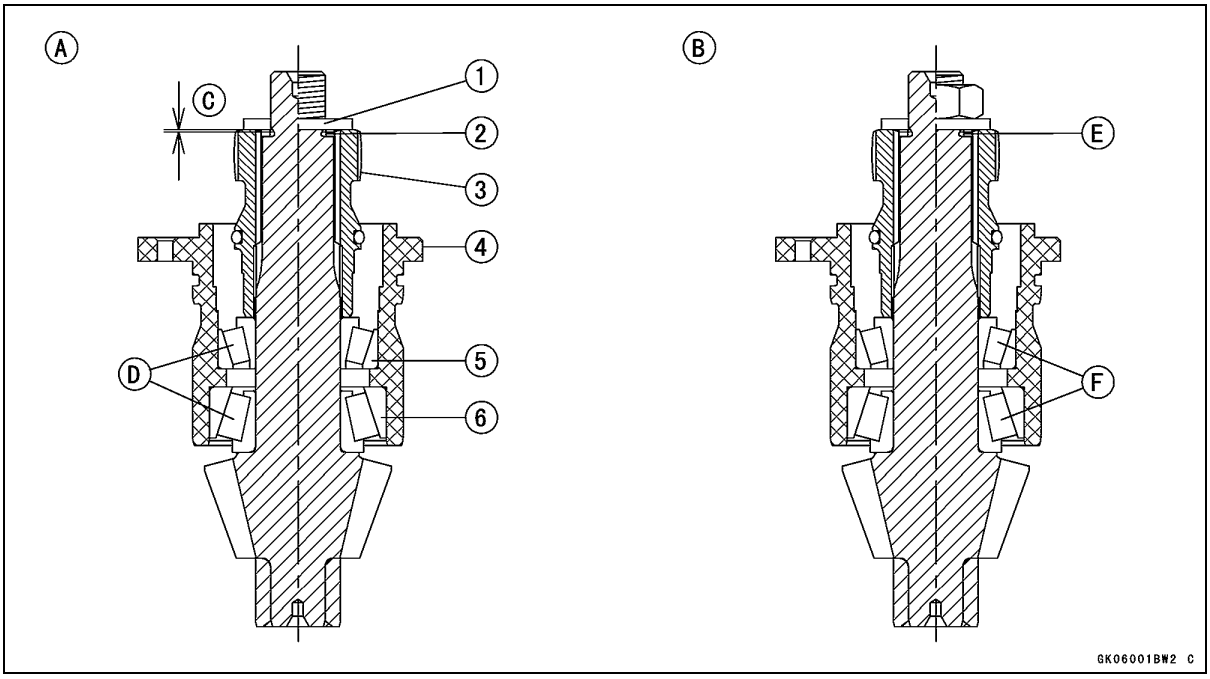
Preload Adjustment

- To increase preload, decrease the thickness of the size of the shim(s). To decrease preload increase the thickness of the shim(s).
- Change the thickness a little at a time.
- Re-adjust the bearing preload, and re-adjust if necessary.

Shims for Preload Adjustment

Thickness	Part Number
0.1 (0.004 in.)	92025-1219
0.2 (0.008 in.)	92025-1220
0.3 (0.012 in.)	92025-1221
0.5 (0.020 in.)	92025-1222
0.6 (0.024 in.)	92025-1223
0.7 (0.028 in.)	92025-1224
0.8 (0.031 in.)	92025-1225
* 0.9 (0.035 in.)	92025-1226
1.0 (0.040 in.)	92025-1227
1.30 (0.051 in.)	92025-1214
1.32 (0.052 in.)	92025-1215
1.34 (0.053 in.)	92025-1216
1.36 (0.054 in.)	92025-1217
1.38 (0.0543 in.)	92025-1218

*: Standard



1. Washer
2. Shim(s)
3. Pinion Gear Joint
4. Bearing Housing
5. Tapered Roller Bearing
6. Tapered Roller Bearing

A. Before Tightening
B. After Tightening
C. Initial Clearance
D. Under No Preload
E. No Clearance
F. Under Preload

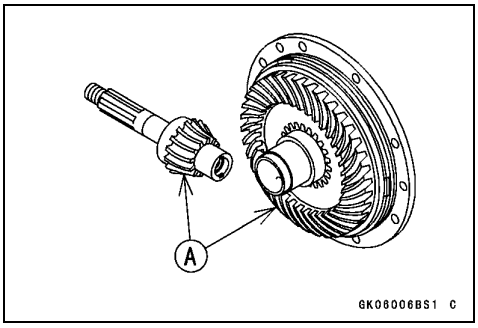
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Final Gear Case and Oil

Bevel Gear Inspection

- Visually check the bevel gears [A] for scoring, chipping, or other damage.

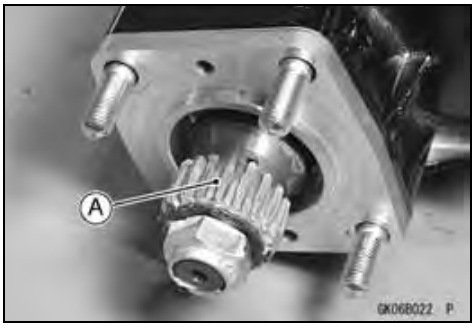
★Replace the bevel gears as a set if either gear is damaged.



Pinion Gear Joint Inspection

- Visually inspect the splines [A] of the pinion gear joint.

★If they are badly worn or chipped, replace the joint with a new one. Also, inspect the propeller shaft sliding joint.



Final Bevel Gear Adjustment

○The **backlash** and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

- After replacing any of the backlash-related parts, be sure to check and adjust the backlash and tooth contact of the bevel gears. First, adjust backlash, and then tooth contact by replacing shims.

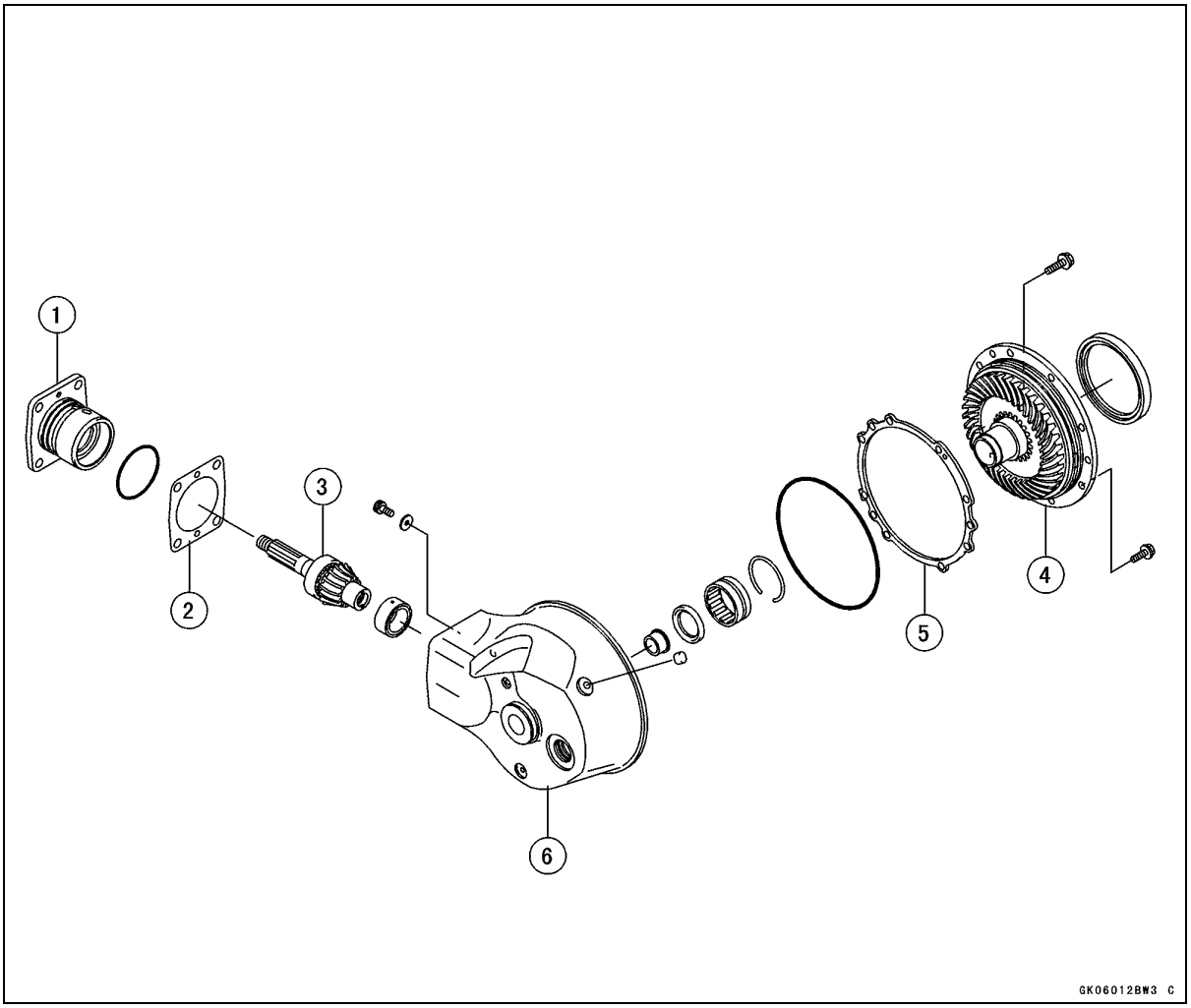
○The amount of backlash is influenced by the ring gear position more than by the pinion gear position.

○Tooth contact locations is influenced by pinion gear position more than by ring gear position.

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Final Gear Case and Oil

Backlash-Related Parts



1. Pinion Gear Bearing Housing
2. Pinion Gear Shim(s)
3. Pinion Gear Assy
4. Ring Gear Assy
5. Ring Gear Shim(s)
6. Final Gear Case

Ring Gear Shims for Backlash Adjustment

Thickness (mm)	Part Number
0.15 (0.006 in.)	92025-1783
0.5 (0.020 in.)	92025-1784
0.6 (0.024 in.)	92025-1785
0.7 (0.028 in.)	92025-1786
0.8 (0.031 in.)	92025-1787
0.9 (0.035 in.)	92025-1788
1.0 (0.039 in.)	92025-1789
1.2 (0.047 in.)	92025-1790

Pinion Gear Shims for Tooth Contact Adjustment

Thickness (mm)	Part Number
0.15 (0.006 in.)	92180-0009
0.5 (0.020 in.)	92180-0010
0.6 (0.024 in.)	92180-0011
0.7 (0.028 in.)	92180-0012
0.8 (0.031 in.)	92180-0013
0.9 (0.035 in.)	92180-0014
1.0 (0.039 in.)	92180-0015
1.2 (0.047 in.)	92180-0016

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Final Gear Case and Oil

Backlash Adjustment

● Clean any dirt and oil off the bevel gear teeth with a high -flash point solvent.

CAUTION
Do not install the O-ring or oil seals during adjustment.

● Install the pinion gear bearing housing with the primary shim (**1.0 mm, 0.04 in. thickness**).

● Hold the pinion gear steady with the pinion gear holder [A] and tighten the final gear case mounting nuts to the specified torque.

Special Tool - Pinion Gear Holder, m1.9: 57001-1165

Torque - Final Gear Case Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

● Install the ring gear assy with the primary shim (**1.0 mm, 0.04 in. thickness**), and tighten the cover bolts to the specified torque.

Torque - Final Gear Case Cover Bolts:
M10: 34 N·m (3.5 kgf·m, 25 ft·lb)
M8: 23 N·m (2.3 kgf·m, 17 ft·lb)

○Check the backlash during tightening of the cover bolts, and stop tightening them immediately if the backlash disappears. Then, change the ring gear shim to a thicker one.

● Mount a dial gage [D] on a vise so that the tip of the gage is against the splines of the ring gear hub.

● To measure the backlash, turn the ring gear hub [B] back and forth [C] while holding the pinion gear steady with the pinion gear holder [A]. The difference between the highest and the lowest gage reading is the amount of backlash.

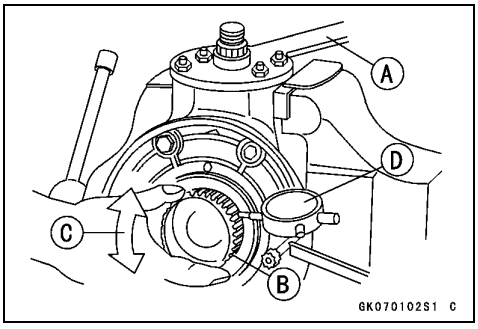
○Measure backlash at three locations equally spaced on the splines.

Final Bevel Gear Backlash:
0.10 ~ 0.20 mm (0.0039 ~ 0.0079 in.)
(at ring gear hub splines)

★If the backlash is out of the limit, replace the ring gear shims. To increase backlash, increase the thickness of the shim(s). To decrease backlash, decrease the thickness of the shim(s).

★Change the thickness a little at a time.

● Recheck the backlash, and readjust as necessary.



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Final Gear Case and Oil

Tooth Contact Adjustment

- Clean any dirt and oil off the bevel gear teeth with a high -flash point solvent.
- Apply checking compound to 4 or 5 teeth of the pinion gear.

NOTE

○*Apply checking compound to the teeth in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.*

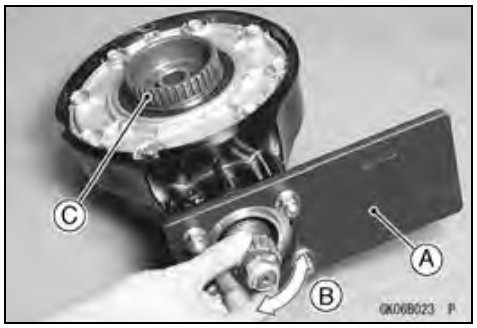
○*The checking compound must be smooth and firm, with the consistency of tooth paste.*

○*Special compounds are available at automotive supply stores for the purpose of checking differential gear tooth patterns and contact.*

- Hold the pinion gear assembly with the final gear case holder [A].

Special Tool - Final Gear Case Holder: 57001-1250

Torque - Final Gear Case Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)



- Turn the pinion gear for one revolution [B] back and forth, while creating a drag on the ring gear hub [C].
- Remove the ring gear assy and pinion gear assy to check the drive pattern and coast pattern of the bevel gear teeth. The tooth contact patterns of both (drive and coast) sides should be centrally located between the top and bottom of the tooth. The drive pattern can be a little closer to the toe and the coast pattern can be a somewhat longer and closer to the toe.

★If the tooth contact pattern is incorrect, replace the pinion gear shim(s), following the examples shown. Then erase the tooth contact patterns, and check them again. Also check the backlash every time the shim(s) are replaced. Repeat the shim change procedure as necessary.

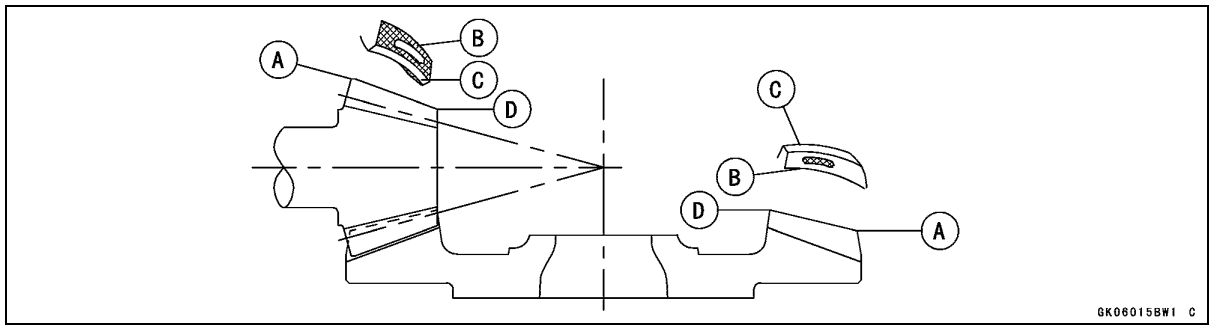
NOTE

○*If the backlash is out of the standard range after changing the pinion gear shim(s), replace the ring gear shim(s) to correct the backlash before checking the tooth contact pattern.*

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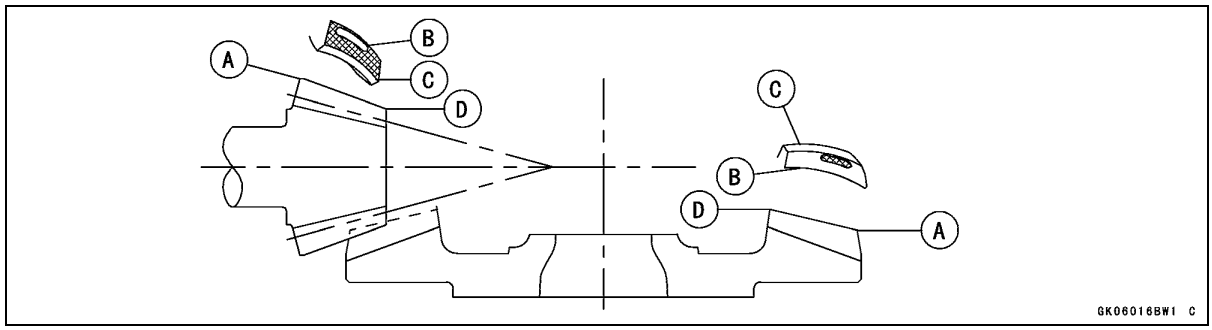
Final Gear Case and Oil

Correct Tooth Contact Pattern: No adjustment is required.



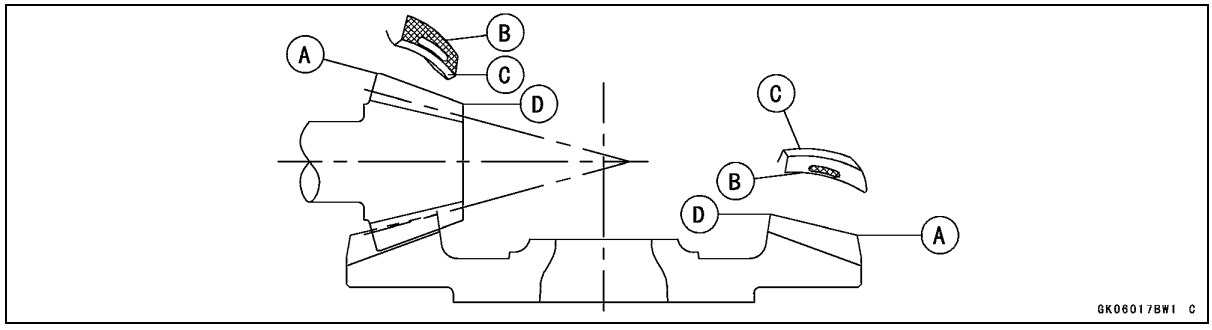
Heel [A]
Bottom [B]
Top [C]
Toe [D]

Incorrect Tooth Contact Patterns (Example 1)



○Decrease the thickness of the pinion gear shim(s) by **0.05 mm (0.002 in.)** to correct the pattern shown above.
Heel [A]
Bottom [B]
Top [C]
Toe [D]

Incorrect Tooth Contact Patterns (Example 2)



○Increase the thickness of the pinion gear shim(s) by **0.05 mm (0.002 in.)** to correct the pattern shown above.
Heel [A]
Bottom [B]
Top [C]
Toe [D]

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Propeller Shaft

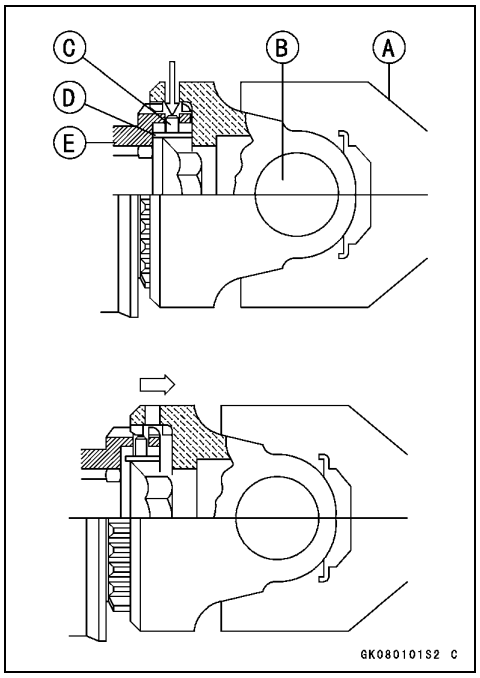
Propeller Shaft Removal

- Remove:
  Final Gear Case (see Final Gear Case Removal in this chapter)
  Swingarm (see Swingarm Removal in the Suspension chapter)
- Remove the propeller shaft from the front driven gear joint.

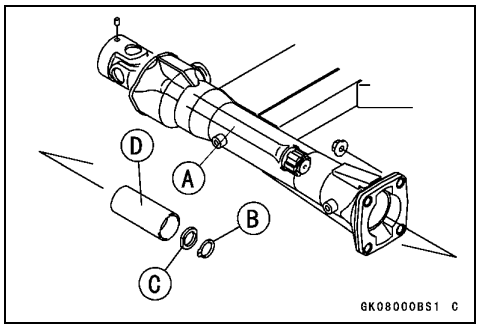


○Turn the propeller shaft so that the lockpin access hole [A] in the propeller shaft comes outside.

○Move back the propeller shaft and slip the propeller shaft off the driven gear joint while pushing on the lockpin.
  Propeller Shaft [A]
  Universal Joint [B]
  Lockpin [C]
  Spring [D]
  Driven Gear Joint [E]

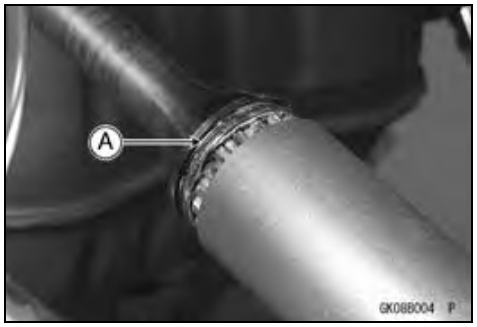


- Remove the circlip [B] from the rear end of the propeller shaft [A] using a circlip pliers.
- Remove the washer [C] and pull out the propeller shaft sliding joint [D].



Propeller Shaft Installation

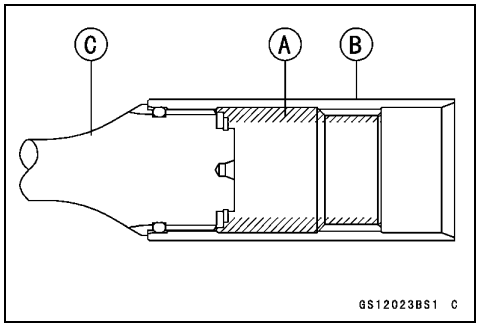
- Check the O-ring [A] on the rear end of the propeller shaft for any kind of damage, and replace it if necessary.
- Lubricate the propeller shaft joint (see Propeller Shaft Joint Lubrication in this section).
- After connecting the propeller shaft to the driven gear joint, pull the propeller shaft rearward to check that the shaft is secured in place by the lockpin.
- Install:
  Swingarm (see Swingarm Installation in the Suspension chapter)
  Final Gear Case (see Final Gear Case Installation in this chapter)



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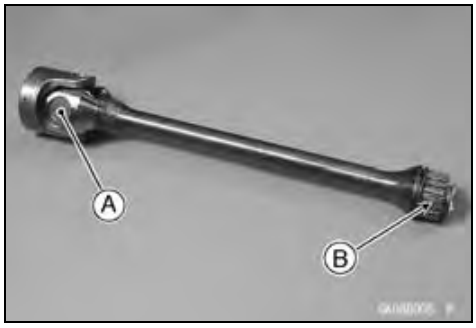
Propeller Shaft

Propeller Shaft Joint Lubrication



- Remove:
  Final Gear Case (see Final Gear Case Removal in this chapter)
  Propeller Shaft (see Propeller Shaft Removal in this section)
- Wipe the old grease off the propeller shaft sliding joint and pinion joint.
- Pack the propeller shaft sliding joint with 20 mL (0.68 US oz.) of high-temperature grease [A].
  Sliding Joint [B]
  Propeller Shaft [C]
- Install:
  Propeller Shaft (see Propeller Shaft Installation in this section)
  Final Gear Case (see Final Gear Case Installation in this chapter)

Propeller Shaft Inspection



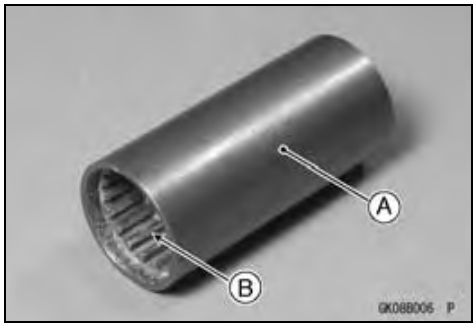
- Check that the universal joint [A] works smoothly without rattling or sticking.

★If it does not work smoothly, the needle bearings of the universal joint are damaged. Replace the propeller shaft assy with a new one.

- Visually inspect the bearing of the shaft and the wear of the splines [B] at the rear end of the shaft.

★If it is bent at all, replace the propeller shaft assy. Do not attempt to straighten a bent shaft.

Sliding Joint Inspection



- Visually inspect the internal splines [B] of the propeller shaft sliding joint [A].

★If they are badly worn or chipped, replace the joint with a new one.

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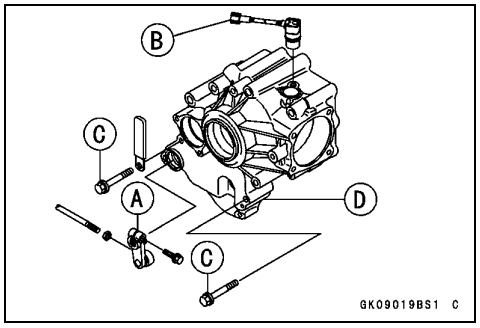
Front Bevel Gears

Front Gear Case Removal

● Remove:
Engine (see Engine Removal in the Engine Removal/Installation chapter)
Rear Shift Lever [A] (see External Shift Mechanism Removal in the Crankshaft/Transmission chapter)

○The speed sensor connector [B] is disconnected during engine removal.

● Unscrew the front gear case bolts [C] and remove the front gear case [D].



○The cam follower [A] and the damper spring [B] come off with the gear case.

● Check that the shift shaft oil seal and replace it if damaged.



Front Gear Case Installation

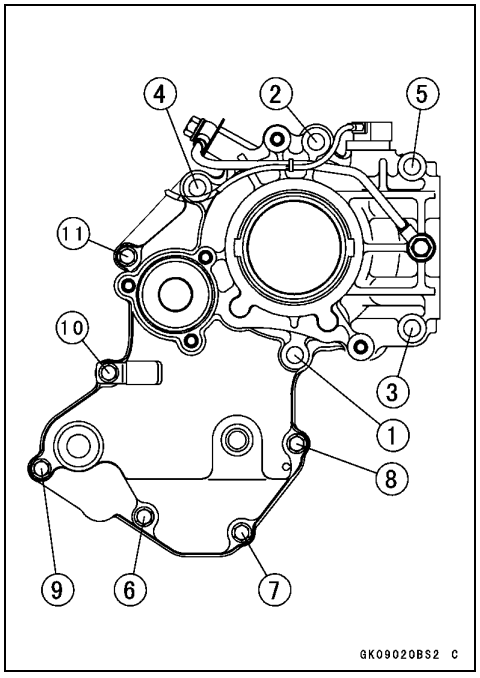
● Tighten the front gear case bolts as follows.

○Tighten the bolt [1] and bolt [2] alternately until contact to the mating surface of the left crankcase.

○Tighten the bolts in the order shown.

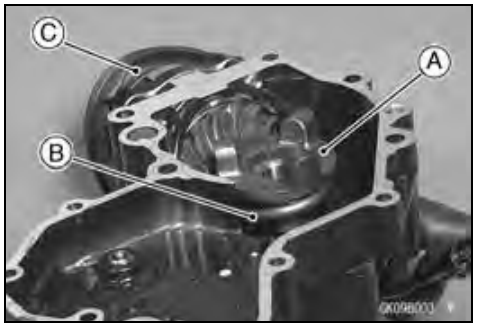
Torque - M8 Front Gear Case Bolts (1 ~ 5): 29 N·m (3.0 kgf·m, 21 ft·lb)
M6 Front Gear Case Bolts (6 ~ 11): 12 N·m (1.2 kgf·m, 104 in·lb)

● Install the removed parts (see appropriate chapters).



Front Gear Case Disassembly

● Remove:
Front Gear Case (see Front Gear Case Removal in this section)
Cam Follower [A]
Damper Spring [B]
Rubber Boot [C]



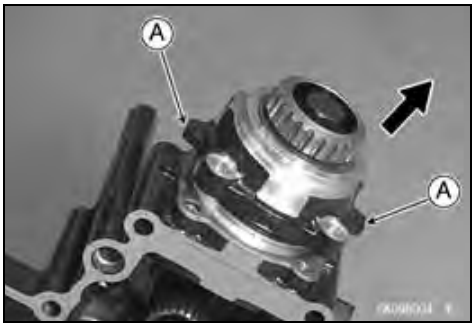
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Front Bevel Gears

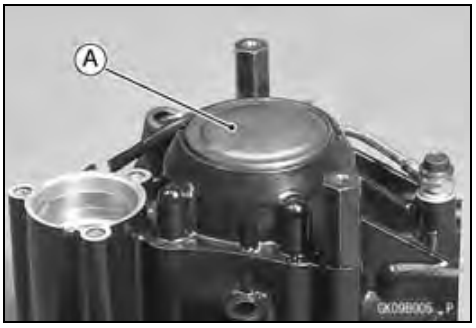
● Remove the driven gear assy mounting bolts [A] and pry the assy [B] off the case.



○Raise the driven gear, using the following pry points [A].

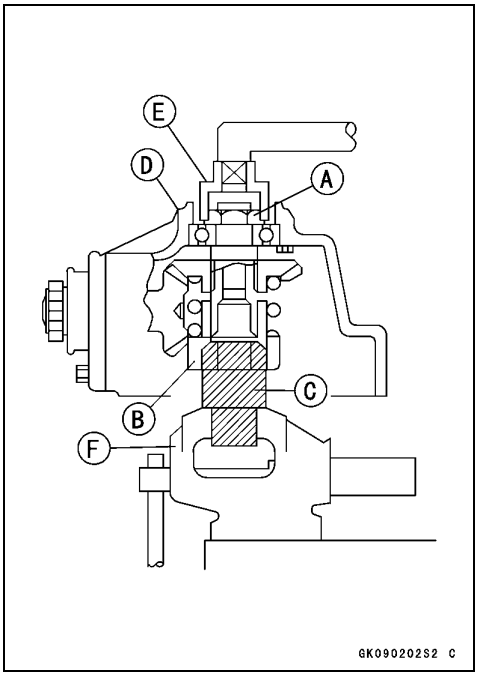


● Remove the drive gear assy as follows.
○Pry off the gear case cap [A] with a tool.



○Pry open the drive gear nut [A] with a small chisel.
○Install:
Damper Spring
Cam Follower [B]
○Unscrew the drive gear nut while holding the drive gear shaft with the drive shaft holder [C] (special tool).
Front Gear Case [D]
Socket Wrench [E]
Vise [F]

Special Tool - Drive Shaft Holder: 57001-1407

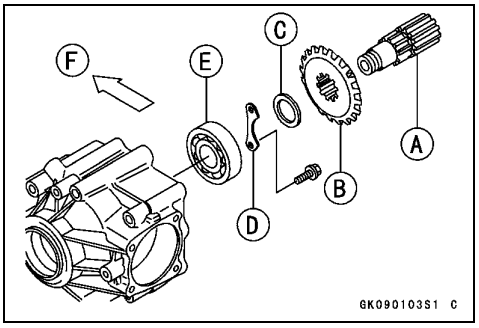


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Front Bevel Gears

- Pull off the drive gear shaft [A], the drive gear [B], and shim(s) [C].
- Remove the bearing holder [D] from the gear case.
- Remove the drive gear shaft ball bearing [E] using the bearing driver set.
  Front [F]

Special Tool - Bearing Driver Set: 57001-1129

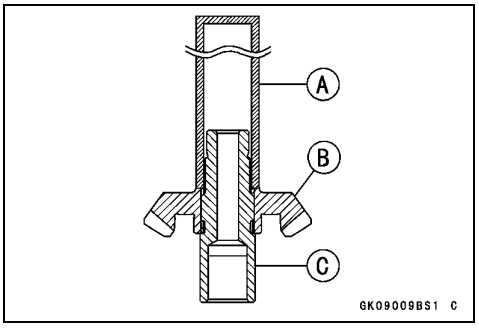


Front Gear Case Assembly

○The drive and driven gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.

- Press the drive gear [B] slowly with the driver [A] onto the shaft [C].

Special Tool - Bearing Driver, ϕ32: 57001-382



- Apply a non-permanent locking agent to the threads of the bearing retainer bolts.

Torque - Bearing Retainer Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Be sure to check and adjust the bearing preload, the bevel gear backlash, and tooth contact, when any of the backlash-related parts are replaced (see Front Bevel Gear Adjustment in this section).
- After completing all adjustment, reassemble the front gear case.

○Replace the drive gear nut with a new one.

○Apply molybdenum disulfide oil solution to the threads and seating surface of the nut, and tighten it to the specified torque to settle the bearings in place.

○Loosen the nut completely and retighten it to the specified torque.

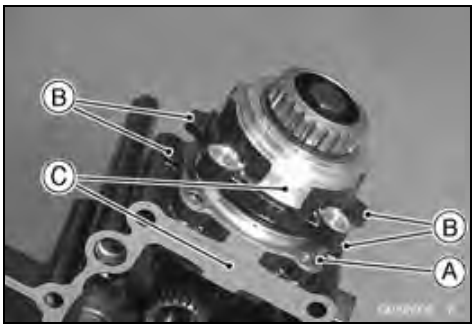
Torque - Drive Gear Nut: 265 N·m (27.0 kgf·m, 195 ft·lb)

○Stake the nut to secure it in place.

CAUTION
When staking the nut, be careful not to apply shock to the shaft and its bearing. Such a shock could damage the shaft and/or bearing.

- Install the shim [A].
- Install the driven gear assy so that the pry ribs [B] and machined surfaces [C] align.
- Tighten the driven gear assy mounting bolts to the specified torque.

Torque - Driven Gear Assy Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



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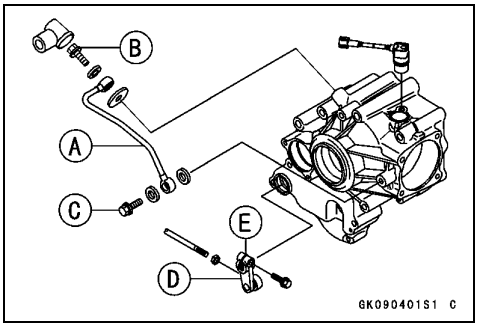
Front Bevel Gears

★If the oil pipe [A] was removed, use a new flat washer on each side of the fittings, and tighten the banjo bolts to the specified torque.

○Tighten the front banjo bolt [B] first, then the rear banjo bolt [C].

● Install the rear shift lever [D], aligning the lever slit [E] with the punch mark of the shaft.

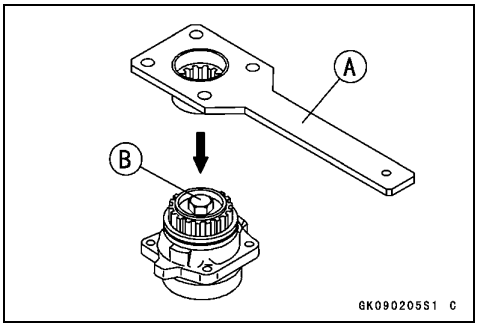
Torque - Oil Pipe Banjo Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)
Rear Shift Lever Clamp Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)



Driven Gear Disassembly

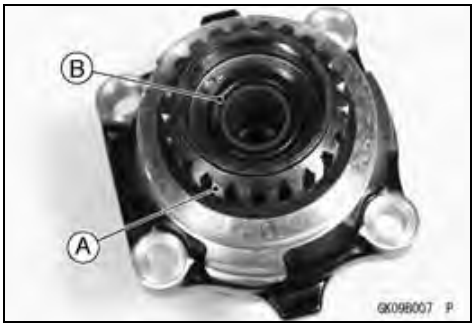
● Holding the driven gear joint with the driven gear holder [A] in a vise, unscrew the driven gear bolt [B].

Special Tool - Driven Gear Holder, m2: 57001-1027



● Remove the driven gear joint [A] with the O-ring [B].
● Remove the driven gear from the bearing housing.
● Remove the oil seal from the housing with a hook, and pull the tapered roller bearing out of the housing.
● Remove the tapered roller bearing which is pressed onto the driven gear shaft with the bearing puller and adapter.

Special Tools - Bearing Puller: 57001-158
Bearing Puller Adapter: 57001-317



Driven Gear Assembly

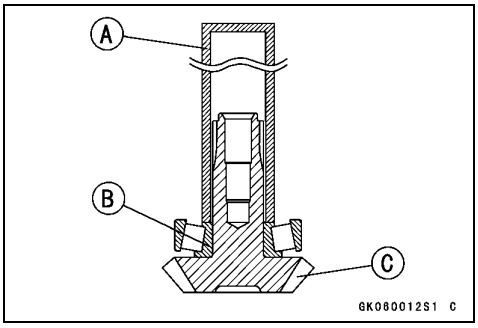
● Replace the driven gear bolt with a new one.

○The drive and driven gears are lapped as a set at the factory to get the best tooth contact. They must be replaced as a set.

● Be sure to check and adjust the bearing preload, the bevel gear backlash, and tooth contact (see Front Bevel Gear Adjustment in this section).

● Drive the tapered roller bearing inner race [B] onto the driven gear shaft [C] using the bearing driver [A].

Special Tool - Bearing Driver, ϕ32: 57001-382



● After completing the bearing preload adjustment, reassemble the driven gear assy.

○Using the bearing driver set, press the oil seal in until the face of the seal is level with the end of the bearing housing hole.

Special Tool - Bearing Driver Set: 57001-1129

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Front Bevel Gears

○Apply molybdenum disulfide oil solution to the threads and the seating surface of the driven gear bolt.
○Tighten the driven gear bolt to the specified torque.

Torque - Driven Gear Bolt: 120 N·m (12.2 kgf·m, 89 ft·lb)

○Stake [A] the driven gear bolt to prevent it from loosening.



CAUTION

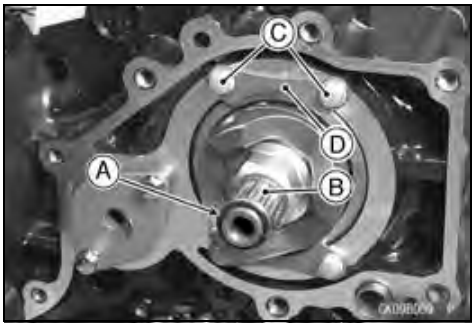
When staking the bolt, be careful not to apply shock to the driven gear and their bearings. Such a shock could damage the driven gear and/or bearings.

Damper Cam Removal

- Remove the front gear case (see Front Gear Case Removal in this section).
- Remove the circlip [A] and needle bearing [B] of the output shaft.

Special Tool - Outside Circlip Pliers: 57001-144

- Remove the crankcase bearing upper retainer bolts [C] and retainer [D].

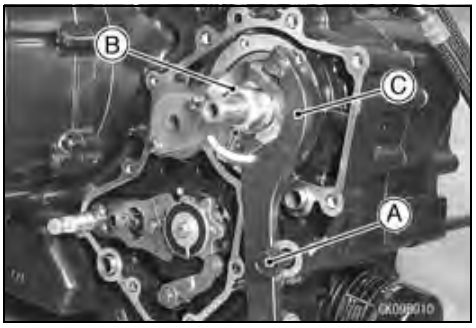


- Insert a bolt (ϕ12 mm, L = 100 mm, ϕ0.47 in., L = 3.94 in.) [A] into the engine mounting bolt hole.
- Unscrew the damper cam nut [B] using a damper cam holder [C] (special tool) and deep socket wrench.

Special Tool - Damper Cam Holder: 57001-1025

- Apply a non-permanent locking agent to the threads of the retainer bolts.
- Install the upper retainer.

Torque - Bearing Retainer Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



Damper Cam Installation

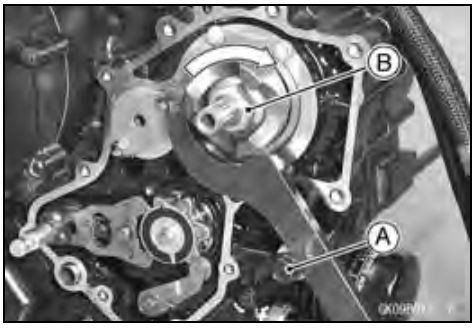
- Replace the damper cam nut with a new one.
- Insert the bolt (ϕ12 mm, L = 100 mm, ϕ0.47 in., L = 3.94 in.) [A] into the engine mounting bolt hole.
- Apply molybdenum disulfide oil solution to the threads and seating surface of the damper cam nut.

○The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).

- Tighten the damper cam nut [B] to the specified torque.

Special Tool - Damper Cam Holder: 57001-1025

Torque - Damper Cam Nut: 195 N·m (20.0 kgf·m, 144 ft·lb)



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Front Bevel Gears

● Install:
Needle Bearing [A]
Circlip [B]
Front Gear Case (see Front Gear Case Installation in this chapter)

Special Tool - Outside Circlip Pliers: 57001-144



Front Bevel Gear Adjustment

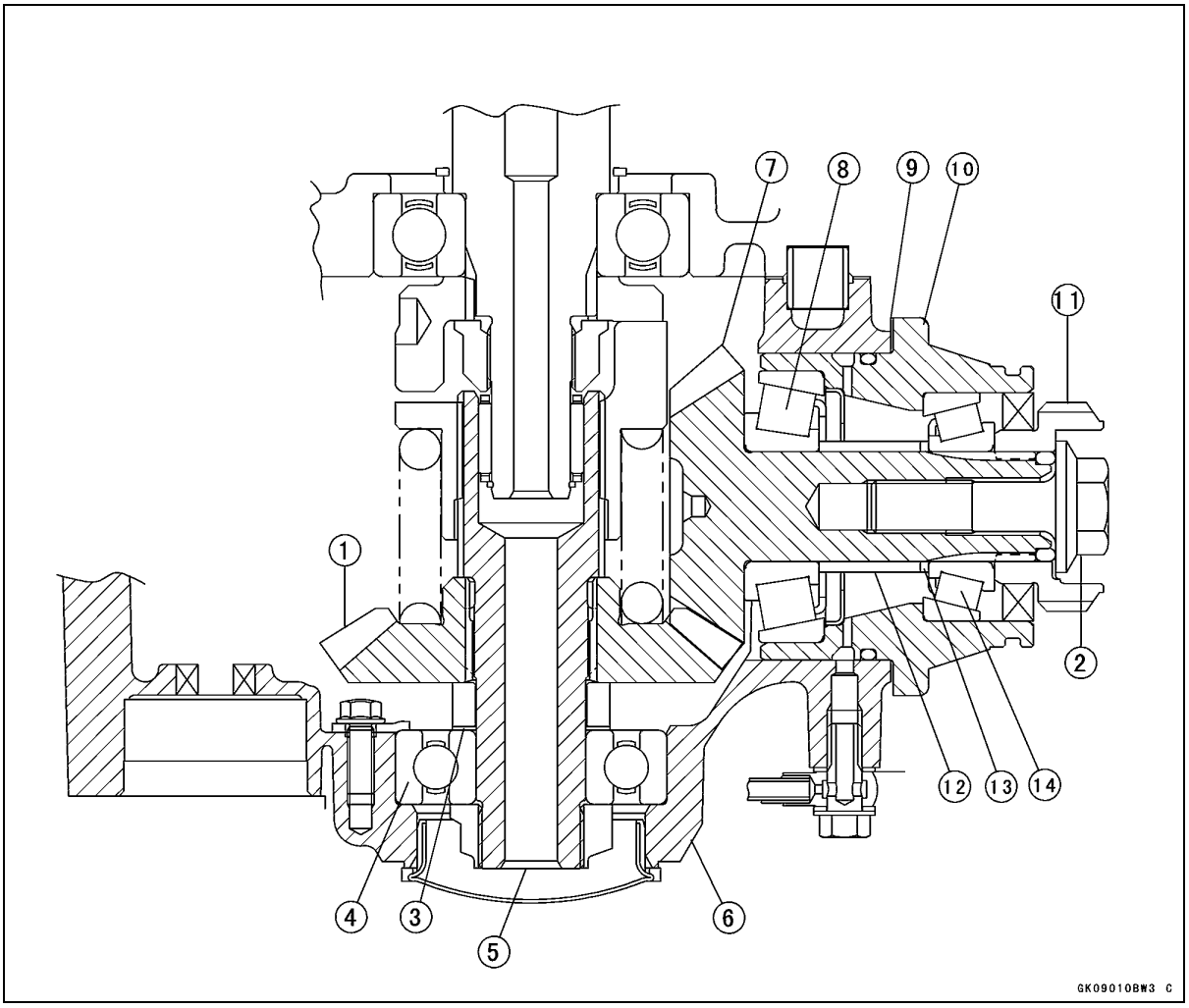
In order to prevent one gear from moving away from the other gear under load, the tapered roller bearings must be properly **preloaded**. Also the **backlash** (the distance one gear will move back and forth without moving the other gear) and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

Above three adjustments are of critical importance and must be carried out in the correct sequence and method.

○Preload adjustment is necessary whenever the driven gear bolt [2] loosened, even if the purpose is not to replace the parts.

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Front Bevel Gears



Backlash-related Parts

1. Drive Gear
2. Driven Gear Bolt
3. Drive Gear Shim(s)
4. Ball Bearing
5. Drive Gear Shaft
6. Front Gear Case
7. Driven Gear
8. Tapered Roller Bearing
9. Driven Gear Shim(s)
10. Driven Gear Bearing Housing
11. Driven Gear Joint

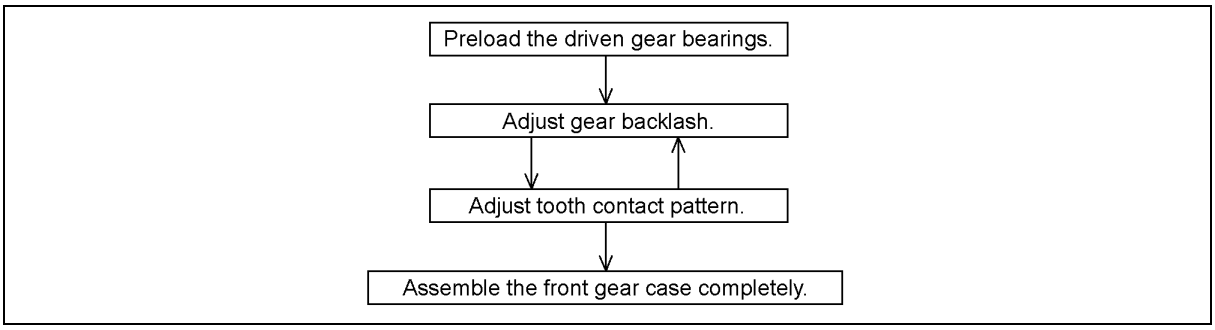
Preload-related Parts

12. Collar (Preload Adjustment)
13. Spacer (Preload Adjustment)
14. Tapered Roller Bearing

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Front Bevel Gears

Front Bevel Gear Adjustment



○When any of the backlash-related parts are replaced, or the driven gear bolt is loosened; even if the purpose is not to replace the parts, be sure to check and adjust the bearing preload, the bevel gear backlash, and tooth contact by replacing shims.

Preload Adjustment

● Install the driven gear assy, and tighten the driven gear nut to the specified torque.

Torque - Driven Gear Bolt: 120 N·m (12.2 kgf·m, 89 ft·lb)

○Do not install the oil seal, and O-ring, and do not stake the bolt until the correct bearing preload is obtained.

CAUTION

To start with, choose a shim or collar so that the bearings are just SNUG with NO play and also with NO preload.
Any overpreload on the bearings could damage the bearings.

● Apply a little engine oil to the bearings, and turn the gear shaft more than 5 turns to allow the bearings to seat.

● Measure the bearing preload. Bearing preload is defined as a force or torque which is needed to start the gear shaft turning.

Preload for Driven Gear Bearing
Using Torque Wrench:
0.5 ~ 0.9 N·m (0.05 ~ 0.09 kgf·m, 4.3 ~ 7.8 in·lb)
Using Spring Scale:
3.0 ~ 4.0 N (0.30 ~ 0.50 kg, 0.6 ~ 1.0 lb)

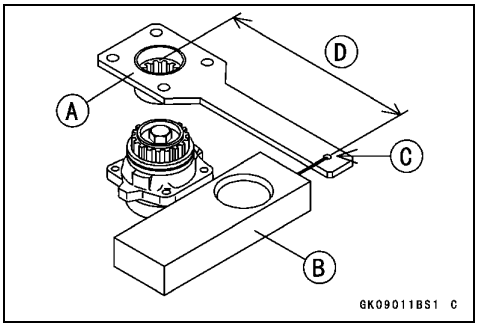
NOTE

○*Preload can be measured either with a spring scale or a beam-type torque wrench. When measured with a spring scale, the preload is designated by force (N, kg, lb), and when measured with a torque wrench, it is designated by torque (N·m, kgf·m, in·lb).*

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Front Bevel Gears

Preload Measurement with Spring Scale



- Hold the bearing housing in a vise so that the gear shaft axis is vertical.
- Hook [C] the spring scale [B] on the driven gear holder [A] at a point 200 mm (7.9 in.) [D] apart from the center of the gear shaft.
- Apply force to the handle horizontally and at a right angle to it.

Special Tool - Driven Gear Holder, m2: 57001-1027

★If the preload is out of specified range, replace the bearing collar and/or spacer. To increase preload, decrease the stack length of the collar and spacer. To decrease preload, increase the stack length of the collar and spacer.

★Change the stack length a little at a time.

- Recheck the bearing preload, and readjust if necessary.

Collars for Preload Adjustment

Length (mm)	Part Number
22.8 (0.898 in.)	92027-1152
22.9 (0.902 in.)	92027-1153
23.0 (0.906 in.)	92027-1154
23.1 (0.909 in.)	92027-1155
23.2 (0.913 in.)	92027-1156
23.3 (0.917 in.)	92027-1157
23.4 (0.921 in.)	92027-1158
23.5 (0.925 in.)	92027-1159
23.6 (0.929 in.)	92027-1160
23.7 (0.933 in.)	92027-1161
23.8 (0.937 in.)	92027-1162
23.9 (0.941 in.)	92027-1163
24.0 (0.945 in.)	92027-1164
24.1 (0.949 in.)	92027-1165

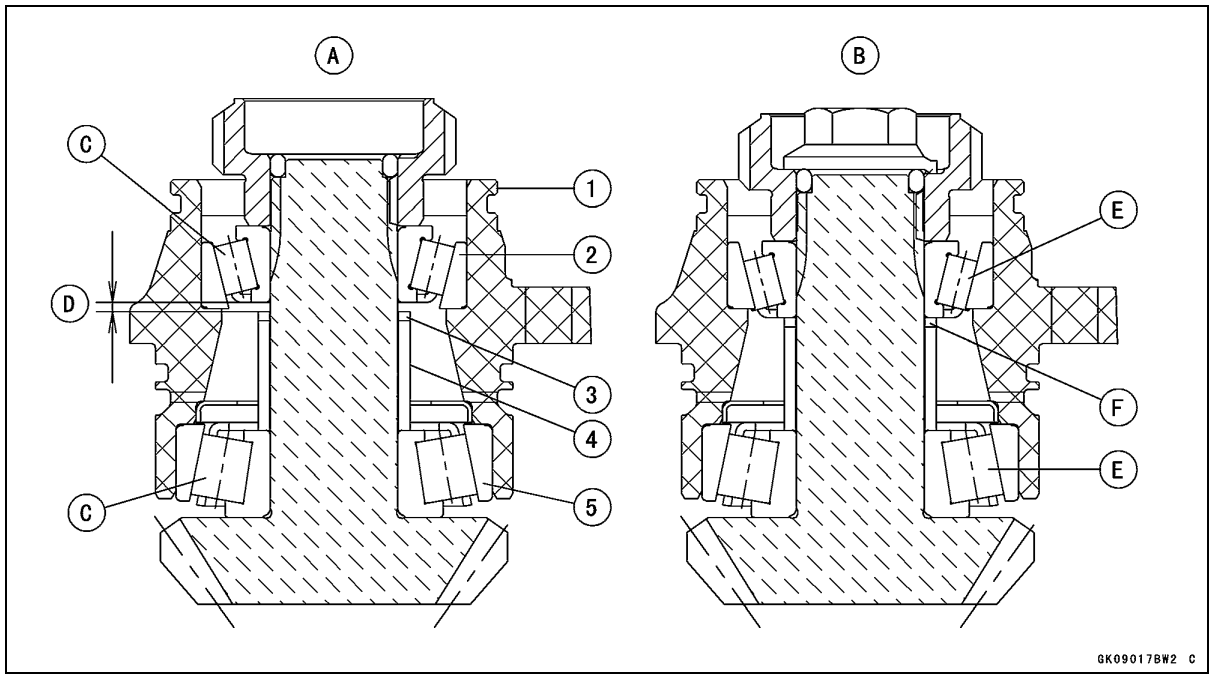
Spacers for Preload Adjustment

Thickness (mm)	Part Number
1.70 (0.0669 in.)	92025-1072
1.72 (0.0677 in.)	92025-1073
1.74 (0.0685 in.)	92025-1074
1.76 (0.0693 in.)	92025-1075
1.78 (0.0701 in.)	92025-1076
1.80 (0.0709 in.)	92025-1077

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Front Bevel Gears

Bearing Preloading Mechanism



1. Bearing Housing
2. Tapered Roller Bearing
3. Spacer
4. Collar
5. Tapered Roller Bearing

A. Before Tightening
B. After Tightening
C. Under No Preload
D. Initial Clearance
E. Under Preload
F. No Clearance

Backlash Adjustment

- Clean any dirt and oil off bevel gear teeth with a high-flash point solvent.
- Install the drive gear with the primary shim (1.0 mm, 0.04 in., thickness), and tighten the nut to the specified torque.

Torque - Drive Gear Nut: 265 N·m (27.0 kgf·m, 195 ft·lb)

NOTE

○*Do not stake the head of the nut until both backlash and tooth contact adjustments are finished.*

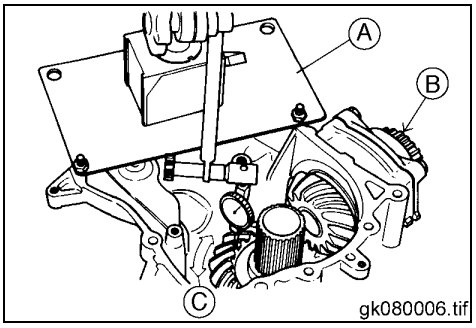
- Install the driven gear assy in the front gear case with the primary shim (1.0 mm, 0.04 in., thickness), and tighten the mounting bolts to the specified torque.

Torque - Driven Gear Assy Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

○Check backlash during tightening of the mounting bolts, and stop tightening them immediately if the backlash disappears. Then, change the shim to a thicker one.

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Front Bevel Gears



- Install a holder [A] with 6 mm bolts and nuts on the front gear case to mount a dial gage.
- Set up a dial gage against a drive gear tooth to check gear backlash. The gage stem must be in line with the direction of tooth travel.
- To measure the backlash, move the drive gear back and forth [C] while holding [B] the driven gear steady with a tool. The difference between the highest and lowest gage readings is the amount of backlash.

★If the backlash is not within the limit, replace the gear shim(s) at the drive and/or driven gear. To increase backlash, increase the thickness of the shim(s). To decrease backlash, decrease the thickness of the shim(s).

★Change the thickness a little at a time.

- Recheck the backlash, and readjust as necessary.

NOTE

○*It is OK to pack two shims. Do not pack three or more shims.*

Front Bevel Gear Backlash (at gear tooths)
0.10 ~ 0.15 mm (0.004 ~ 0.006 in.)

Shims for Drive Gear

Thickness (mm)	Part Number
0.15 (0.006 in.)	92025-1688
0.5 (0.020 in.)	92025-1689
0.6 (0.023 in.)	92025-1690
0.7 (0.028 in.)	92025-1691
0.8 (0.031 in.)	92025-1692
0.9 (0.035 in.)	92025-1693
1.0 (0.039 in.)	92025-1694
1.1 (0.043 in.)	92025-1695
1.2 (0.047 in.)	92025-1696

Shims for Driven Gear

Thickness (mm)	Part Number
0.1 (0.039 in.)	92025-1826
0.15 (0.006 in.)	92025-1818
0.5 (0.020 in.)	92025-1819
0.6 (0.023 in.)	92025-1820
0.7 (0.028 in.)	92025-1821
0.8 (0.031 in.)	92025-1822
0.9 (0.035 in.)	92025-1823
1.0 (0.039 in.)	92025-1824
1.2 (0.047 in.)	92025-1825

Tooth Contact Adjustment

- Clean any dirt and oil off the bevel gear teeth with a high -flash point solvent.
- Apply checking compound to 4 or 5 teeth on the driven gear.

NOTE

○*Apply checking compound to the teeth in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.*

○*The checking compound must be smooth and firm, with the consistency of tooth paste.*

○*Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use this for checking the bevel gears.*

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Front Bevel Gears

- Turn the driven gear for 3 or 4 revolutions in the drive and reverse (coast) directions, while creating a drag on the drive gear.
- Check the drive pattern and coast pattern of the bevel gear teeth. The tooth contact patterns of both drive and coast sides should be centrally located between the top and bottom of the tooth, and little closer to the toe of the tooth.

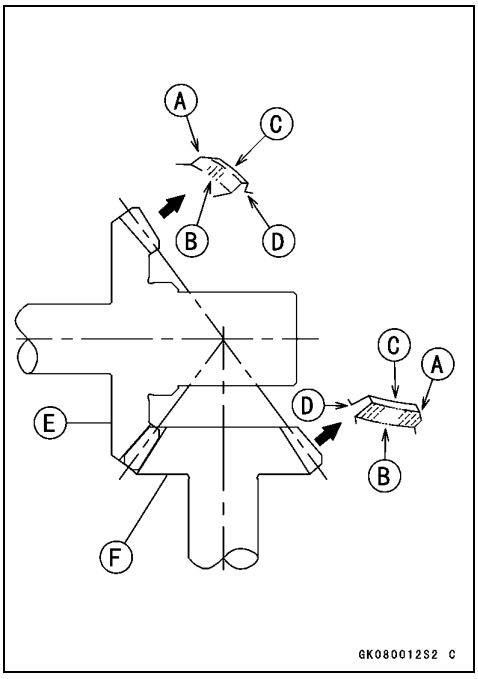
★If the tooth contact pattern is incorrect, replace the shim(s) at the driven gear and shim(s) at the driven gear, following the examples shown. Then erase the tooth contact patterns, and check them again. Also check the backlash every time the shims are replaced. Repeat the shim change procedure as necessary.

NOTE

○*If the backlash goes out of standard range after changing shims, correct the backlash before checking the tooth contact pattern.*

○*It is OK to pack two shims. Do not pack three or more shims.*

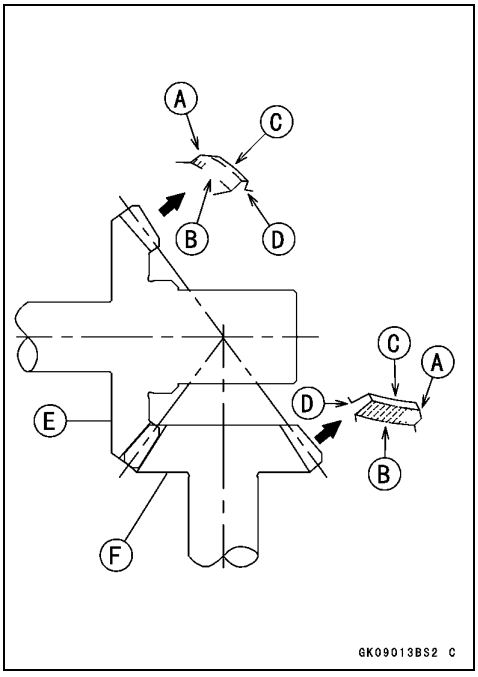
Heel [A]
Bottom [B]
Top [C]
Toe [D]
Drive Gear [E]
Driven Gear [F]



Incorrect Tooth Contact Patterns (Example 1)

- Increase the thickness of the drive gear shim(s) by 0.05 mm (0.002 in.), and/or increase the thickness of the driven gear shim(s) by 0.05 mm (0.002 in.) to correct the pattern shown below. Repeat in 0.05 mm (0.002 in.) steps if necessary.

Heel [A]
Bottom [B]
Top [C]
Toe [D]
Drive Gear [E]
Driven Gear [F]



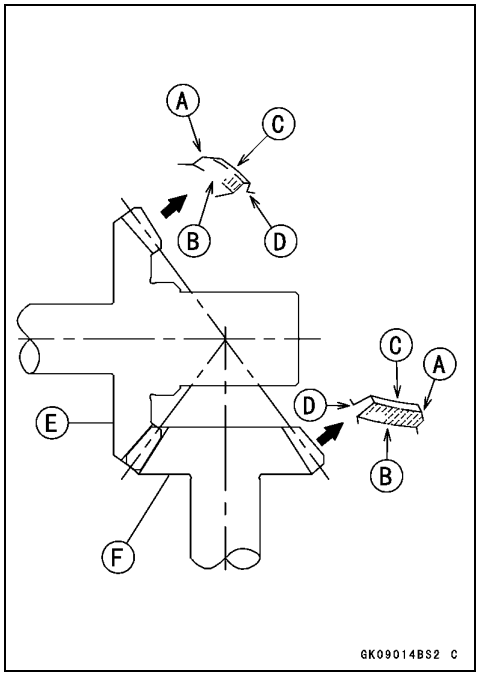
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Front Bevel Gears

Incorrect Tooth Contact Patterns (Example 2)

- Decrease the thickness of the drive gear shim(s) by 0.05 mm (0.002 in.), and/or decrease the thickness of the driven gear shim(s) by 0.05 mm (0.002 in.) to correct the pattern shown below. Repeat in 0.05 mm (0.002 in.) steps if necessary.

Heel [A]
Bottom [B]
Top [C]
Toe [D]
Drive Gear [E]
Driven Gear [F]



Bevel Gear Inspection

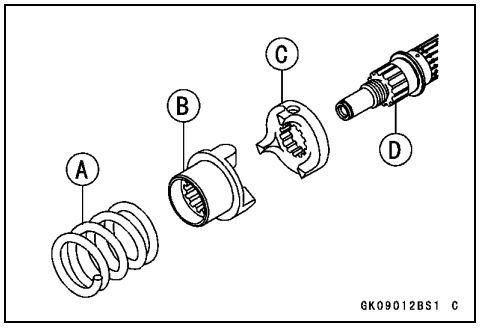
- Visually check the bevel gears for scoring, chipping, or other damage.

★Replace the bevel gears as a set if either gear is damaged.

Cam Damper Inspection

- Visually inspect the spring [A], cam follower [B], damper cam [C], and output shaft [D].

★Replace the damaged parts.



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Bearing and Oil Seal

Ball or Needle Bearing Replacement

● Using the bearing driver set or the oil seal and bearing remover, remove the bearings.

Special Tools - Oil Seal & Bearing Remover: 57001-1058
Bearing Driver Set: 57001-1129

NOTE

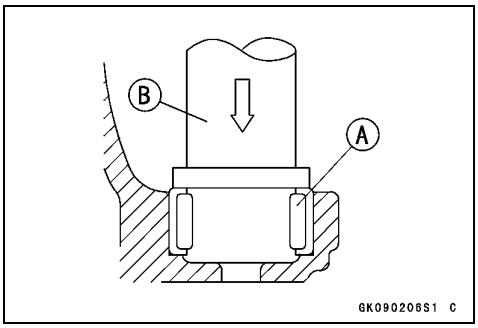
○*In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max., and tapping the bearing in or out.*

CAUTION

Do not heat the case with a blowtorch. This will warp the case. Soak the case in oil and heat the oil.

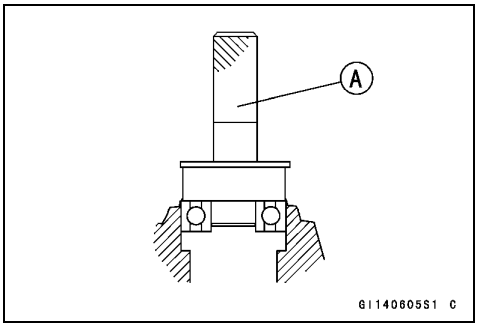
● Install a new needle bearing [A] with the marked side facing out until it bottoms out, using the bearing driver set [B]. This prevents bearing damage.

Special Tool - Bearing Driver Set: 57001-1129



● Using a press and the bearing driver set [A], install a new ball bearing until it stops at the bottom of the case.

Special Tool - Bearing Driver Set: 57001-1129



Ball Bearing Wear

CAUTION

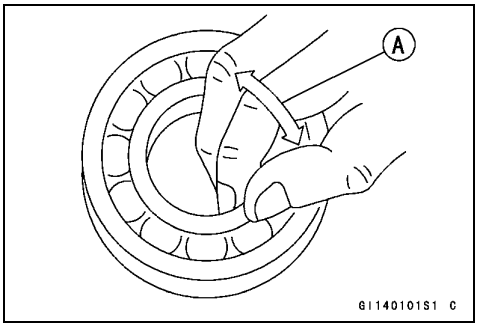
Do not remove the bearings for inspection. Removal may damage them.

● Check the ball bearings.

○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high-flash point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

○Spin [A] the bearing by hand to check its condition.

★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.



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Bearing and Oil Seal

Tapered Roller Bearing Inspection

CAUTION
Do not remove the tapered roller bearing for inspection. Removal may damage them.

● Visually inspect the bearing in the front and final gear cases for abrasion, color change, or other damage.
★ If there is any doubt as to the condition of the bearing, replace it.

Needle Bearing Inspection

CAUTION
Do not remove the needle bearing in the final gear case for inspection. Removal may damage them.

● Check the needle bearings in the front and final gear cases.
○ The rollers in the needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
★ If there is any doubt as to the condition of a needle bearing, replace it.

Oil Seal Inspection

● Inspect the oil seals.
★ Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

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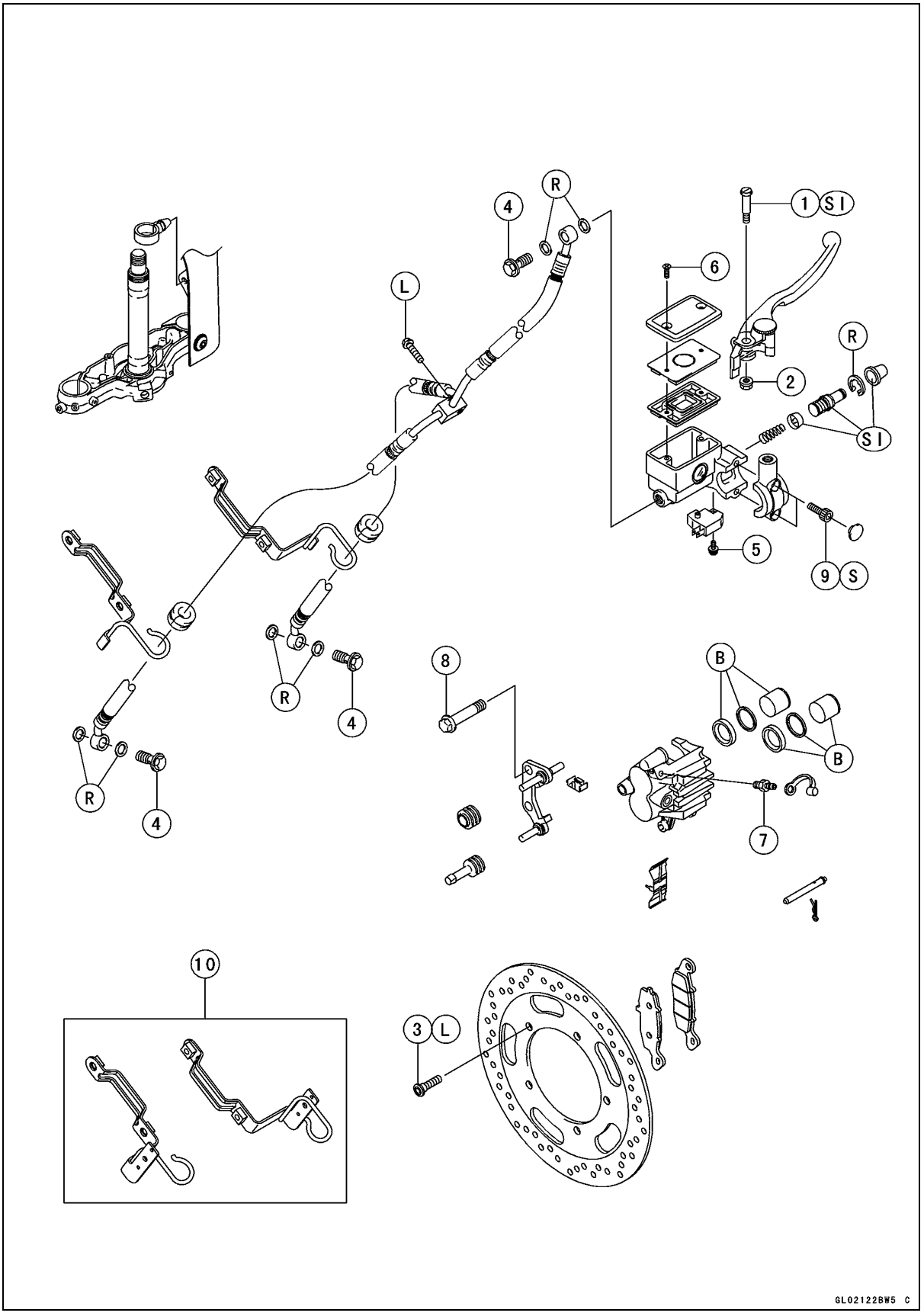
Brakes

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Exploded View



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Exploded View

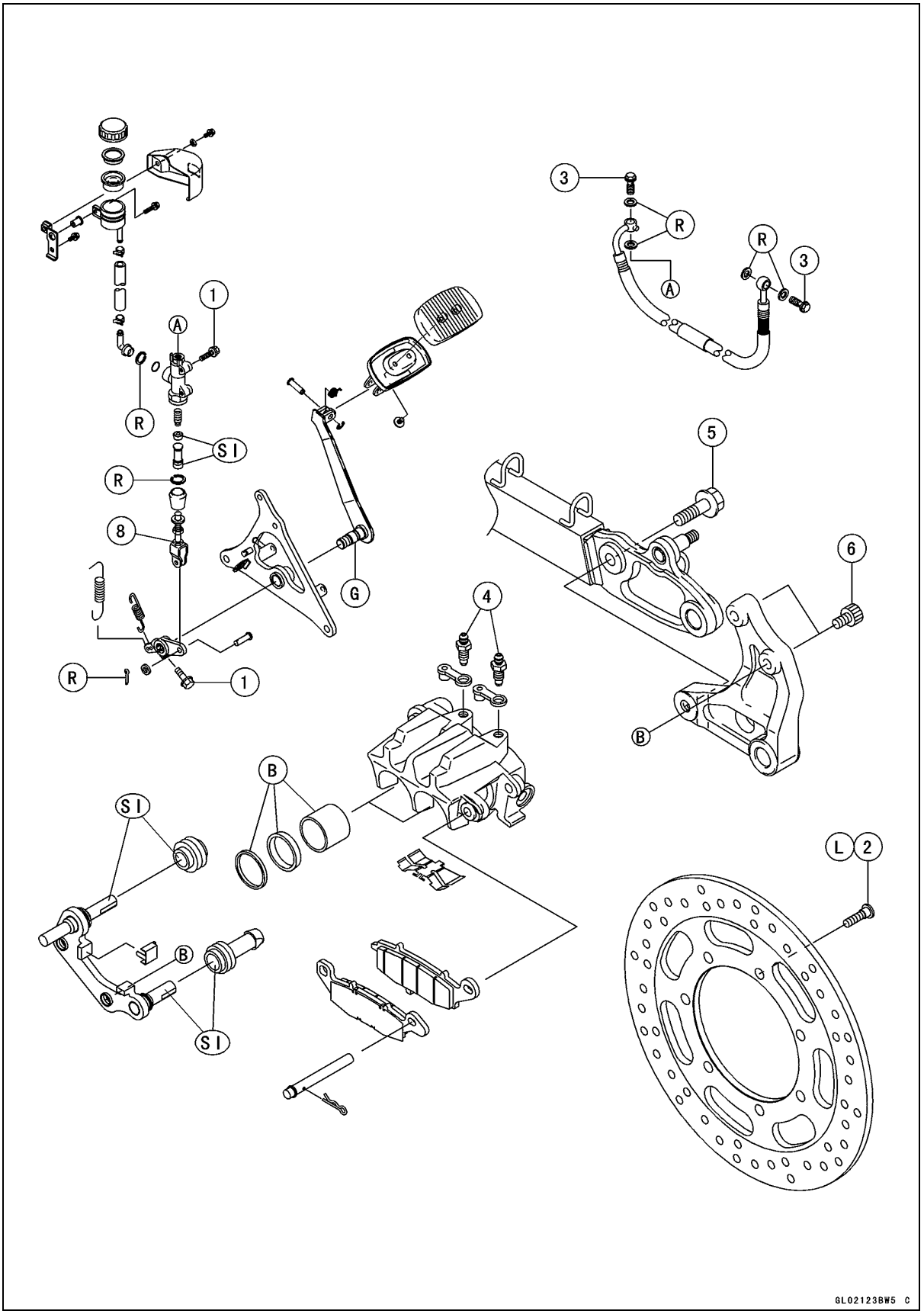
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Lever Pivot Bolt	1.0	0.10	8.9 in·lb	SI
2	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
3	Front Brake Disc Bolts	27	2.8	20	L
4	Front Brake Hose Banjo Bolts	34	3.5	25	
5	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
6	Front Brake Reservoir Cap Screws	1.5	0.15	13 in·lb	
7	Front Caliper Bleed Valves	7.8	0.80	69 in·lb	
8	Front Caliper Mounting Bolts	34	3.5	25	
9	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S

10. Hose Holders (U.S.A. and Canada Models)

B: Apply brake fluid.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specific tightening sequence.
SI: Apply silicone grease or PBC grease.

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Pedal Clamp Bolt	25	2.5	18	
2	Rear Brake Disc Bolts	27	2.8	20	L
3	Rear Brake Hose Banjo Bolts	34	3.5	25	
4	Rear Caliper Bleed Valves	7.8	0.80	69 in·lb	
5	Rear Caliper Holder Bolt	64	6.5	47	
6	Rear Caliper Mounting Bolts	34	3.5	25	
7	Rear Master Cylinder Mounting Bolts	25	2.5	18	
8	Rear Master Cylinder Push Rod Locknut	18	1.8	13	

B: Apply brake fluid.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
SI: Apply silicone grease or PBC grease.

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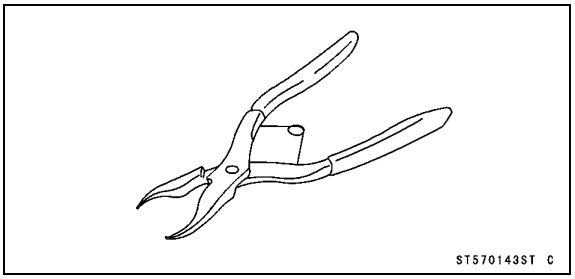
Specifications

Item	Standard	Service Limit
Brake Lever, Brake Pedal		
Brake Lever Position	No.1	5-way adjustable
Brake Lever Free Play	Non-adjustable	– – –
Pedal Free Play	Non-adjustable	– – –
Pedal Position	About 110 mm (4.3 in.) (height from pedal top to footpeg top)	– – –
Brake Fluid		
Grade	DOT4	– – –
Brake Pads		
Pad Lining Thickness:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.)
Rear	7.0 mm (0.28 in.)	1 mm (0.04 in.)
Brake Discs		
Thickness:		
Front	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Rear	6.8 ~ 7.2 mm (0.27 ~ 0.28 in.)	6.0 mm (0.24 in.)
Runout	TIR 0.15 mm (0.006 in.) or less	TIR 0.3 mm (0.01 in.)

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Special Tool

Inside Circlip Pliers:
57001-143



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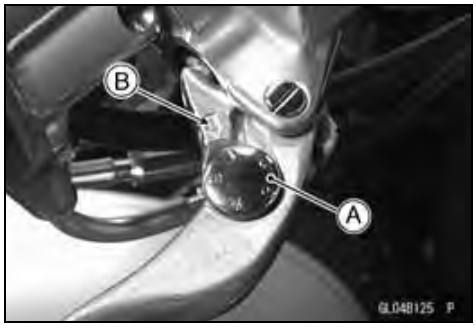
Brake Lever, Brake Pedal

Brake Lever Position Adjustment

The brake lever adjuster has 5 positions so that the brake lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.

○The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



Brake Pedal Position Adjustment

- Check that the brake pedal [A] is in the correct position.

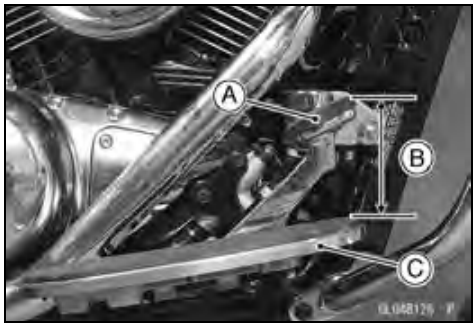
Pedal Position

Standard: About 110 mm (4.3 in.) [B] (height from pedal top to footboard top [C])

NOTE

○*Usually it's not necessary to adjust the pedal position, but always adjust it when push rod locknut has been loosened.*

○*If the push rod length cannot be adjusted by turning the clevis, the brake pedal may be deformed or incorrectly installed.*



- Unscrew the brake fluid reservoir cover bolt [A] and remove the brake fluid reservoir cover [B].



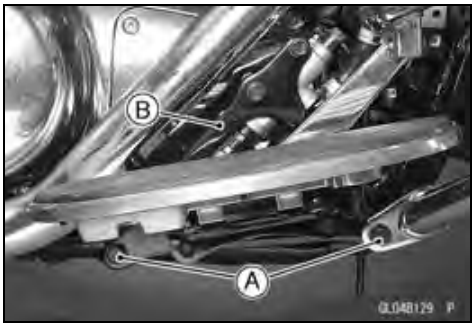
- Unscrew the reservoir bolt [A] and take off the brake fluid reservoir [B].



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Brake Lever, Brake Pedal

- Remove the right front footboard bracket bolts [A] and turn over the footboard bracket [B].

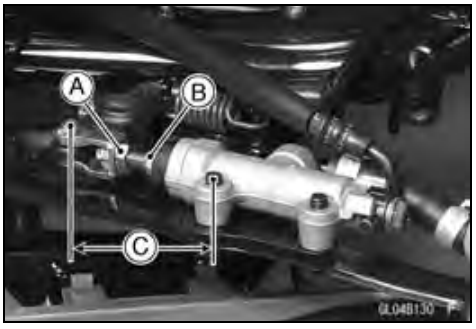


- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.

★If the length [C] is **80 ±1 mm (3.1 ±0.04 in.)**, the pedal position will be within the standard range.

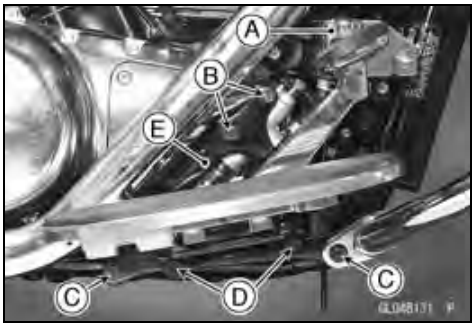
- Tighten:

Torque - Rear Master Cylinder Push Rod Locknut: 18 N·m (1.8 kgf·m, 13 ft·lb)
Front Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

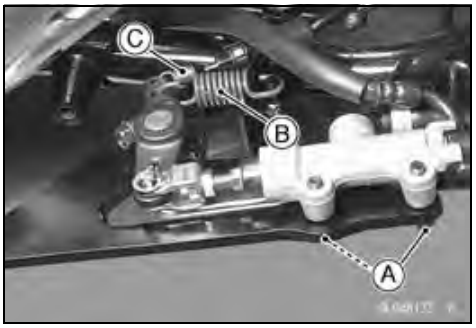


Brake Pedal Removal

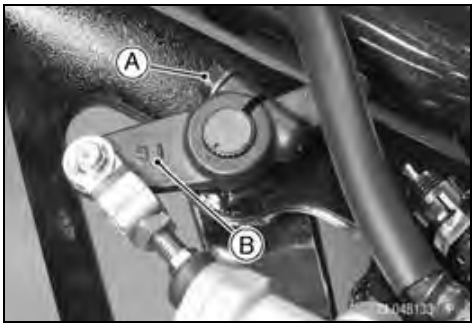
- Remove the brake fluid reservoir [A] (see Brake Pedal Position Adjustment in this section).
- Loosen the rear master cylinder mounting bolts [B].
- Remove the right front footboard bracket bolts [C] and footboard bolts [D], and turn over the footboard bracket [E].



- Remove:
  Rear Master Cylinder Mounting Bolts [A]
  Brake Pedal Return Spring [B]
  Brake Switch Return Spring [C]



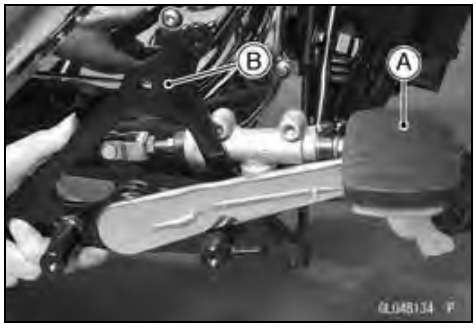
- Unscrew the brake pedal clamp bolt [A].
- Pull out the brake lever [B] with the master cylinder installed.



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Brake Lever, Brake Pedal

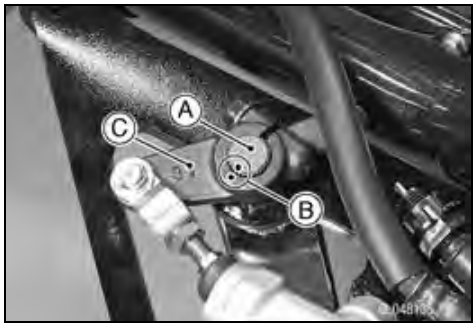
- Pull out the brake pedal [A] from the right footboard bracket [B].



Brake Pedal Installation

- Apply grease to the brake pedal shaft.
- Install the pedal shaft [A] so that the punched mark on the shaft is aligned [B] with the punched mark on the brake lever [C].
- Install:
  Brake Pedal Return Spring
  Brake Switch Return Spring
- Tighten:

Torque - Brake Pedal Clamp Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



- Replenish the fluid in the reservoir, and bleed the brake line (see Brake Line Bleeding in this chapter).
- Check the brake for proper braking power, no brake drag, and no fluid leakage.

⚠ WARNING

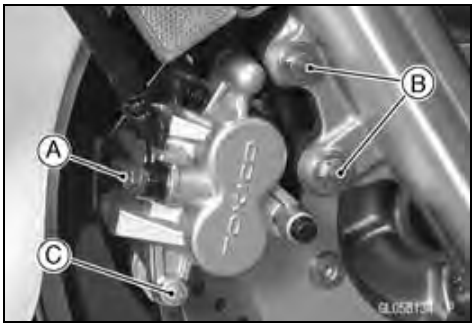
Do not attempt to ride the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.

- Check the brake pedal position and adjust it if necessary.
- Check the rear brake light switch operation and adjust the switch if necessary (see Brake Light Switch Operation in the Periodic Maintenance chapter).

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Calipers

Front Caliper Removal



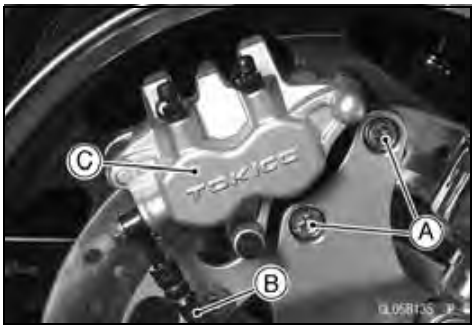
- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B].

CAUTION

Do not loosen the caliper assembly bolt [C]. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leakage. Immediately wash away any brake fluid that spills.

- Take off the caliper.
- Unscrew the banjo bolt and remove the brake hose from the caliper.

Rear Caliper Removal



- Remove:
  Right Saddlebag (see Saddlebag Removal in the Frame chapter)
  Caliper Mounting Bolts [A]
  Brake Hose [B]
  Rear Caliper [C]

Caliper Installation

- Install the caliper and brake hose lower end.

○Replace the washer on each side of hose fitting with new ones.

- Tighten the caliper mounting bolts and banjo bolt.

Torque - Front Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Rear Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Front Brake Hose Banjo Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Rear Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Check the fluid level in the brake reservoirs (see Brake Fluid Level Inspection in the Periodic Maintenance chapter).
- Bleed the brake line (see Brake Line Bleeding in this chapter).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

Do not attempt to ride 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.

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Calipers

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.

Caliper Fluid Seal Damage

The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

● Replace the fluid seal if it exhibits any of the conditions listed below.

○Brake fluid leakage around the pad.

○Brakes overheat.

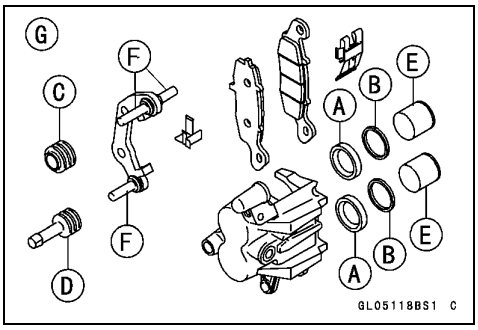
○Considerable difference in inner and outer pad wear.

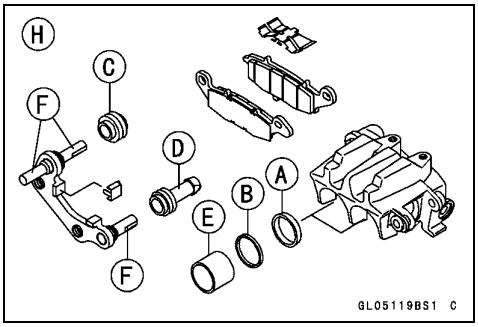
○Seal and piston are stuck together.

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

Front Caliper [G]

Rear Caliper [H]





Caliper Dust Boot and Friction Boot Damage

● Check that the dust boot [C] and friction boot [D] are not cracked, worn, swollen, or otherwise damaged.

● If they show any damage, replace it.

Caliper Piston and Cylinder Damage

● Visually inspect the piston [E] and cylinder surfaces.

★Replace the caliper if the cylinder and piston are badly scored or rusty.

Caliper Holder Shaft Wear

The caliper body must slide smoothly on the caliper holder shafts. If the body does not slide smoothly, one pad will wear more than the other, and constant drag on the disc may cause the temperature of the discs or the brake fluid to increase.

● Visually inspect that the caliper holder shafts [F] are not badly worn or bent.

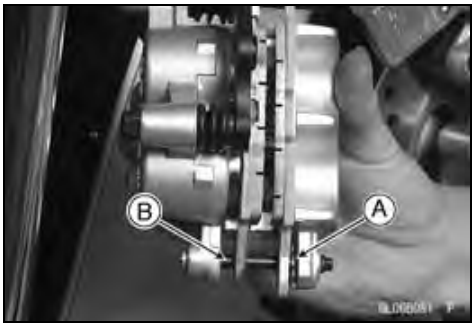
★If the caliper holder shafts are damaged, replace the entire caliper assembly.

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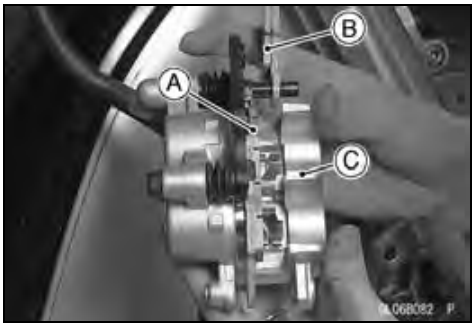
Brake Pads

Front Brake Pad Removal

- Remove the front caliper with the hose installed (see Front Caliper Removal in this chapter).
- Remove:
  Snap Pin [A]
  Pad Pin [B]

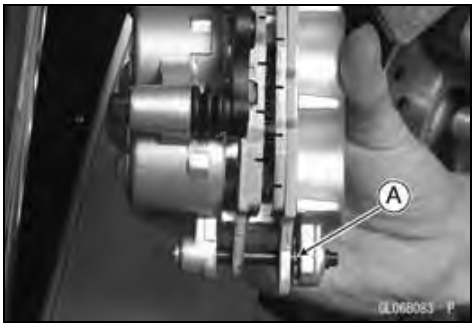


- Remove the jaw side pad [A], and then remove the piston side pad [B].
  Jaw [C]



Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install the brake pads.
- Install the pad pin and snap pin [A]. The snap pin must be "outside" of the pads.



⚠ WARNING

Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

Rear Brake Pad Removal

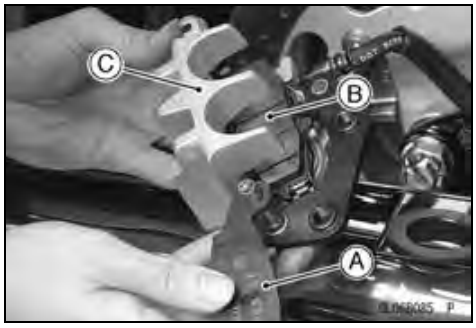
- Remove the rear caliper with the hose installed (see Rear Caliper Removal in this chapter).
- Remove:
  Snap Pin [A]
  Pad Pin [B]



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Brake Pads

● Remove the jaw side pad [A], and then remove the piston side pad [B].
  Jaw [C]



Rear Brake Pad Installation

● Before installation, clean the pads with a high-flash point solvent.
● Push [A] the caliper pistons in by hand as far as they will go.
● Be sure to install the snap pin for the caliper.



⚠ WARNING

Do not attempt to ride the motorcycle until a full 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.

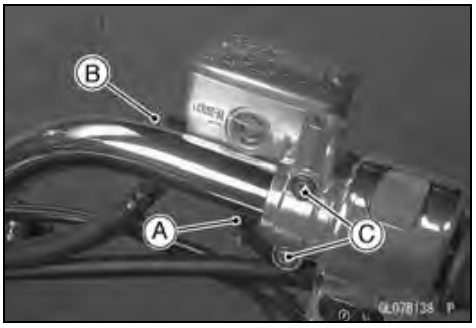
Brake Pad Wear Inspection

● Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

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Master Cylinder

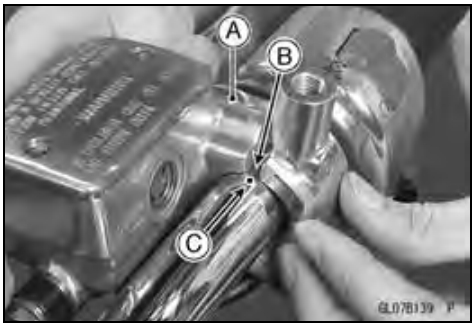
Front Master Cylinder Removal



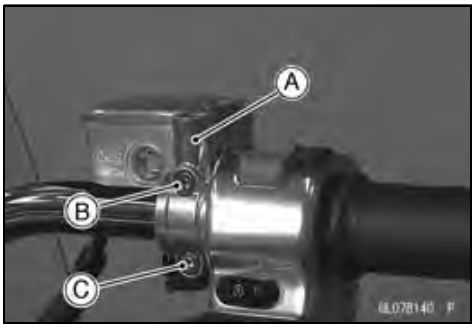
- Disconnect the front brake light switch connectors [A].
- Draw out the brake fluid from the reservoir with a means like the fork oil level gage.
- Pull the bolt caps out.
- Remove the banjo bolt [B] to disconnect the brake hose from the master cylinder (see Brake Hose Removal/Installation in this chapter).
- Remove the clamp bolt caps.
- Unscrew the clamp bolts [C], and take off the master cylinder as an assembly with the reservoir, brake lever, and brake switch installed.

CAUTION
Immediately wash away any brake fluid that spills.

Front Master Cylinder Installation



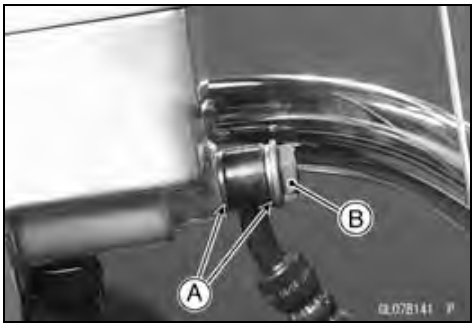
- Set the front master cylinder [A] to match its mating surface [B] to the punched mark [C] of the handlebar.



○The master cylinder clamp must be installed with the rear view mirror boss [A] faced upward.

- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C]. There will be a gap at the lower part of the clamp after tightening.

Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Install the clamp bolt caps.
- Use a new flat washers [A] on each side of the brake hose fitting.
- Tighten the brake hose banjo bolt [B].

Torque - Front Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

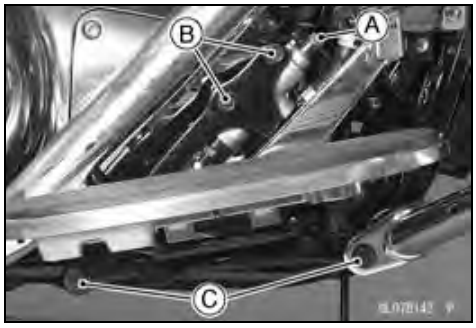
- Replenish the fluid in the reservoir, and bleed the brake line (see Bleeding the Brake Line in this chapter).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

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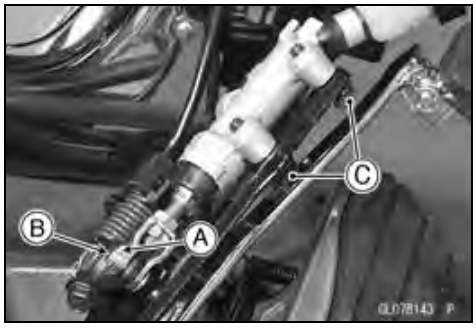
Master Cylinder

Rear Master Cylinder Removal

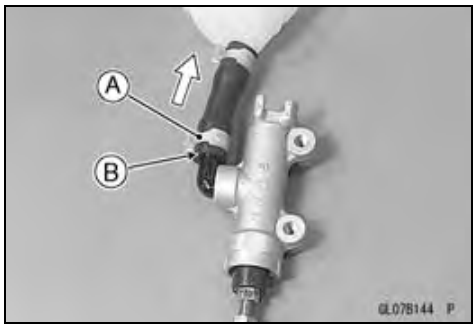
- Remove the brake fluid reservoir cover (see Brake Pedal Position Adjustment in this chapter).
- Draw out the brake fluid from the reservoir with a means like the fork oil level gage.
- Remove the brake fluid reservoir (see Brake Pedal Position Adjustment in this chapter).
- Unscrew the brake hose banjo bolt [A] on the master cylinder.
- Loosen the master cylinder mounting bolts [B].
- Unscrew the front footboard bracket bolts [C].



- Remove:
  Cotter Pin [A]
  Joint Pin [B]
  Rear Master Cylinder Mounting Bolts [C]



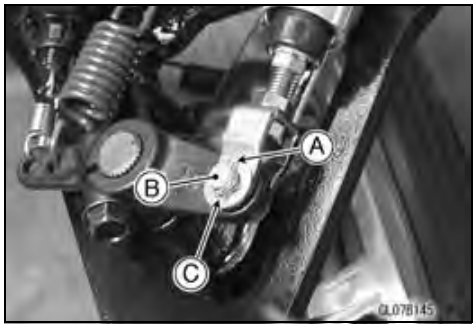
- Slide the reservoir hose lower end clamp [A].
- Pull out the reservoir hose lower end [B], and drain the brake fluid into a container.



Rear Master Cylinder Installation

- Replace the cotter pin with a new one.
- Insert the cotter pin [A] to the hole of the joint pin [B] and separate [C] the cotter pin ends.
- Use a new flat washer on each side of the brake hose fitting.
- Tighten:

Torque - Front Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)



- Bleed the brake line (see Brake Line Bleeding in this chapter).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

Do not attempt to ride 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.

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Master Cylinder

Front Master Cylinder Disassembly

● Refer to the Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Master Cylinder Disassembly

● Refer to the Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Assembly

● Refer to the Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Inspection

● Disassemble the front and rear master cylinders (see Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).

CAUTION

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

● 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 assy should be replaced to renew the cups.

★If fluid leakage is noted at the brake lever, the piston assy should be replaced to renew the cups.

● Check the dust covers [E] for damage.

★If they are damaged, replace them.

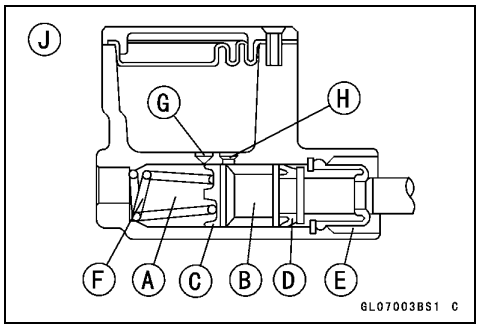
● Check the piston return spring [F] for any damage.

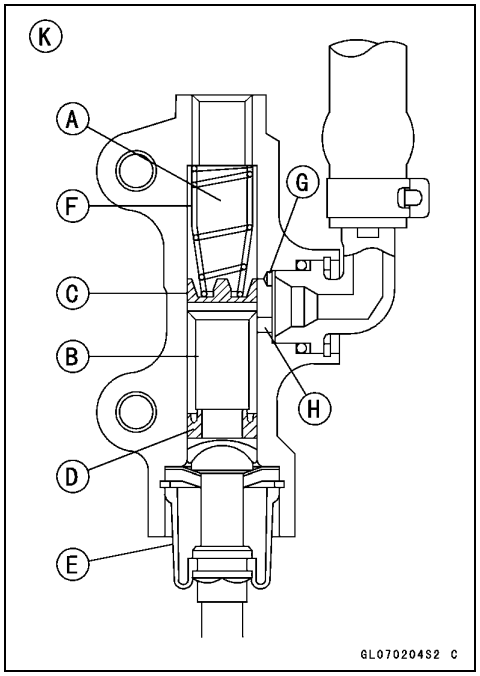
★If the springs are damaged, replace them.

● 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 [J]
Rear Master Cylinder [K]





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Brake Discs

Brake Disc Removal

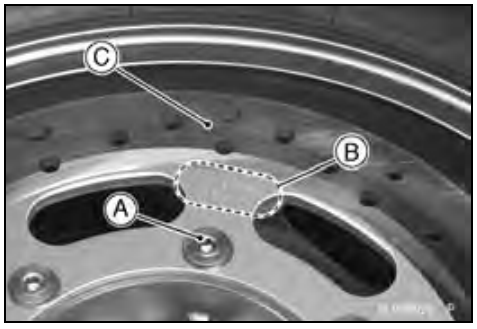
- Remove the wheel (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc.



Brake Disc Installation

- Install the brake disc [A] on the wheel so that the marked side [B] faces out.
- Apply a non-permanent locking agent to the threads of the brake disc bolts [C].
- Tighten:

Torque - Front Brake Disc Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)
Rear Brake Disc Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)



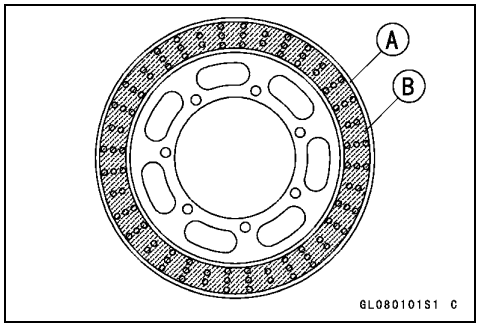
Brake Disc Wear

- Measure the thickness of each disc [A] at the point where it has worn the most.
  Measuring Area [B]

★Replace the disc if the sliding surface has worn past the service limit.

Brake Discs Thickness

Standard:	
Front	**4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)**
Rear	**6.8 ~ 7.2 mm (0.27 ~ 0.28 in.)**
Service Limit:	
Front	**4.5 mm (0.18 in.)**
Rear	**6.0 mm (0.24 in.)**



Brake Disc Warp

- Jack up the motorcycle so that the wheel is off the ground (see Front/Rear Wheel Removal in the Wheels/Tires chapter).

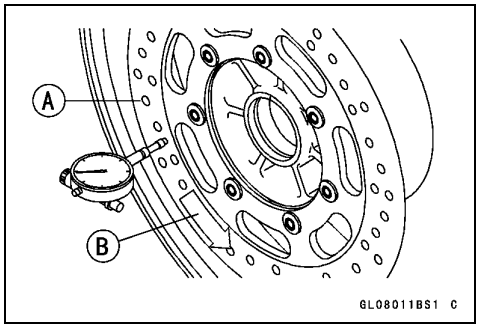
○For front disc inspection, turn the handlebar fully to one side.

- Set up a dial gage against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.

★If the 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.)**



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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.

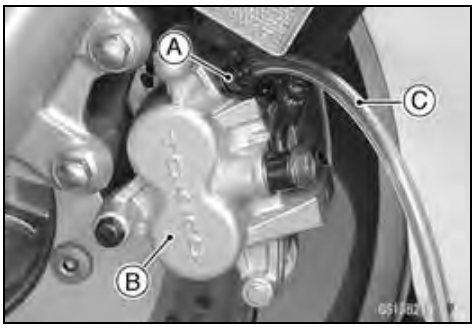
NOTE

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

- Remove the reservoir cap, and fill the reservoir with fresh specified brake fluid to the upper level line in the reservoir.
- With the reservoir cap off, slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes [A] at the bottom of the reservoir.



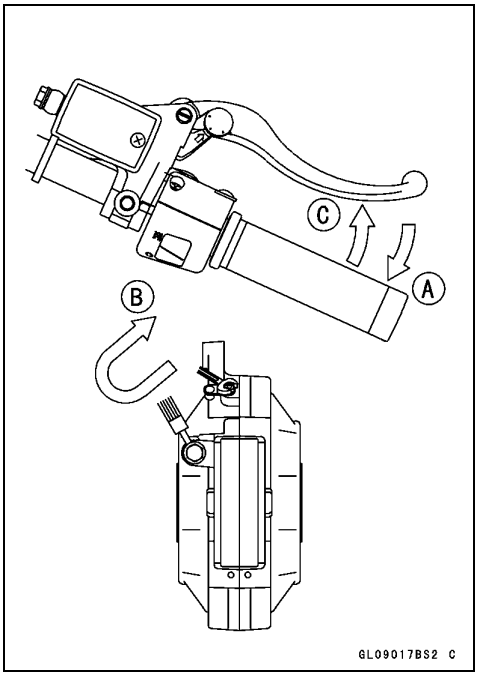
- Remove the rubber cap from the bleed valve [A] on the front caliper [B].
- Attach a clear plastic hose [C] to the bleed valve, and run the other end of the hose into a container.



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Brake Fluid

● Bleed the brake line and the caliper.
○Repeat this operation until no more air can be seen coming out into the plastic hose.
1. Pump the brake lever until it becomes hard, and apply the brake lever and hold it [A].
2. Quickly open and close [B] the bleed valve while holding the brake lever applied.
3. Release the brake lever [C].



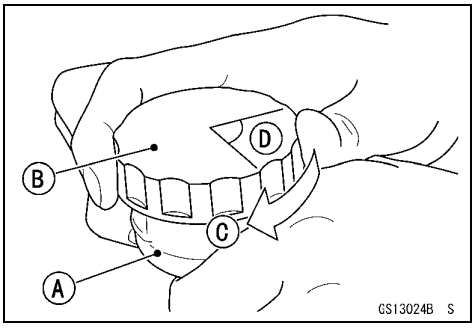
NOTE

○*The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*
○*Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.*
○*Front Brake: Repeat the above steps for the other caliper.*

● Remove the clear plastic hose.
● Tighten:

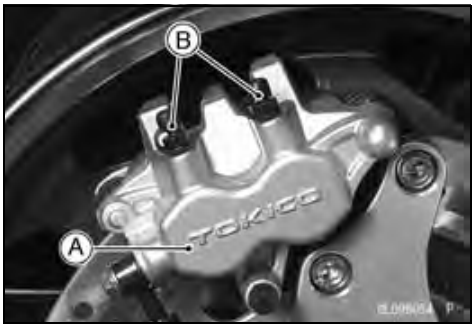
Torque - Caliper Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)
Front Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)

● Follow the procedure below to install the rear brake fluid reservoir cap correctly.
○First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until the 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].



NOTE

○*For the rear brake caliper [A], bleed the brake line for two bleed valves [B].*



● 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.

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Brake Fluid

⚠ WARNING

When working with the disc brake, observe the precautions listed below.

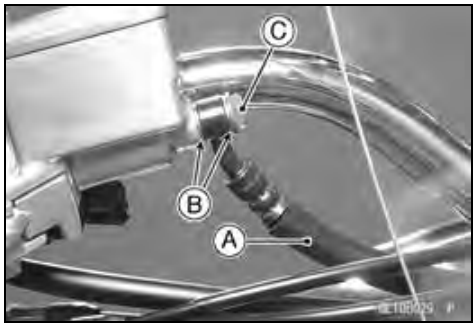
1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off [A] for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handing 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 washed away immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE**.



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Brake Hoses

Brake Hose Removal/Installation



CAUTION

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

- When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
- When removing the brake hose [A], temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Immediately wash away any brake fluid that spills.
- There are washers [B] on each side of the brake hose fitting. Replace them with new ones when installing.
- Tighten the banjo bolts [C] on the hose fittings.

Torque - Front Brake Hose Banjo Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Rear Brake Hose Banjo Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)





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

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Suspension

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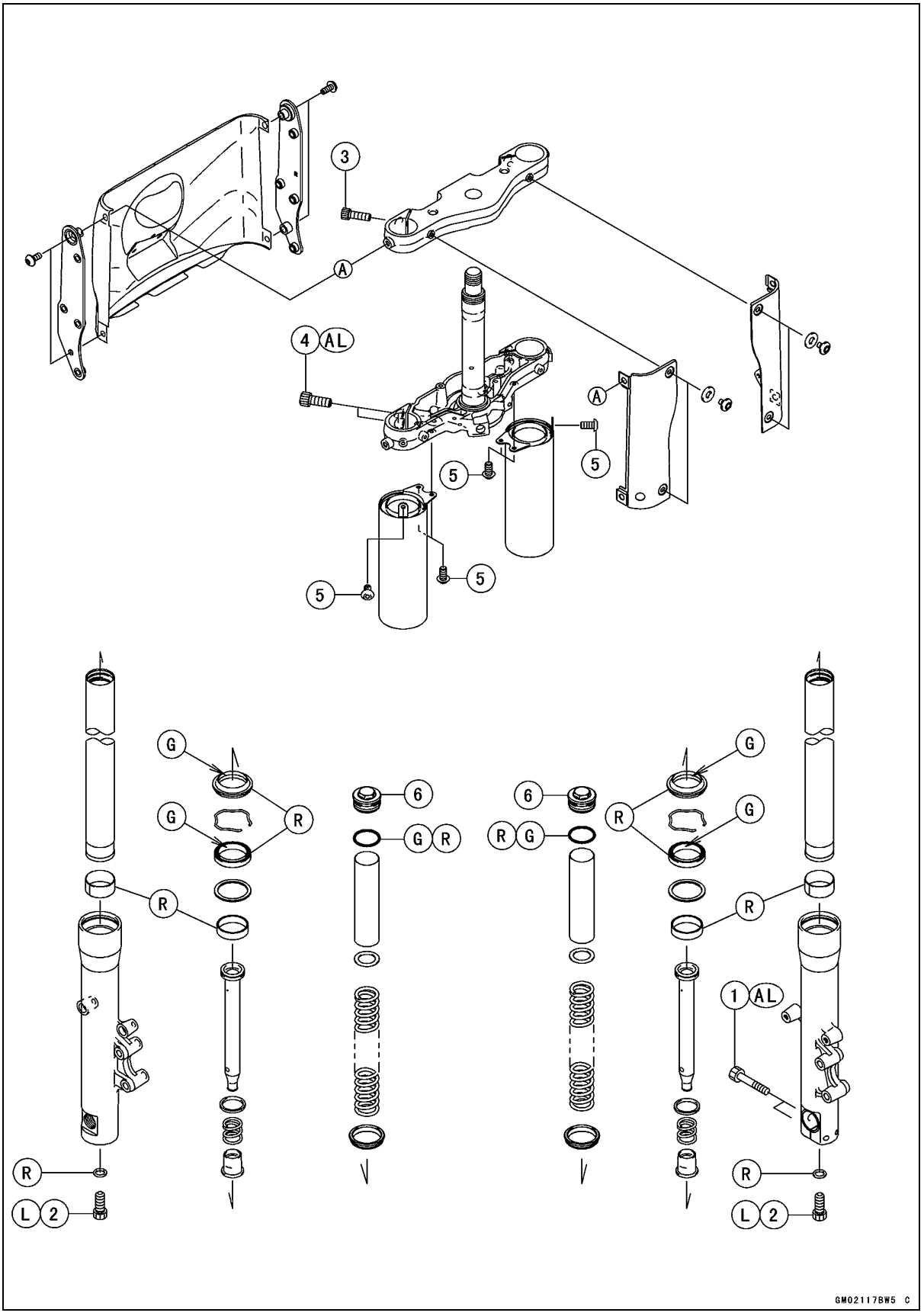
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Exploded View



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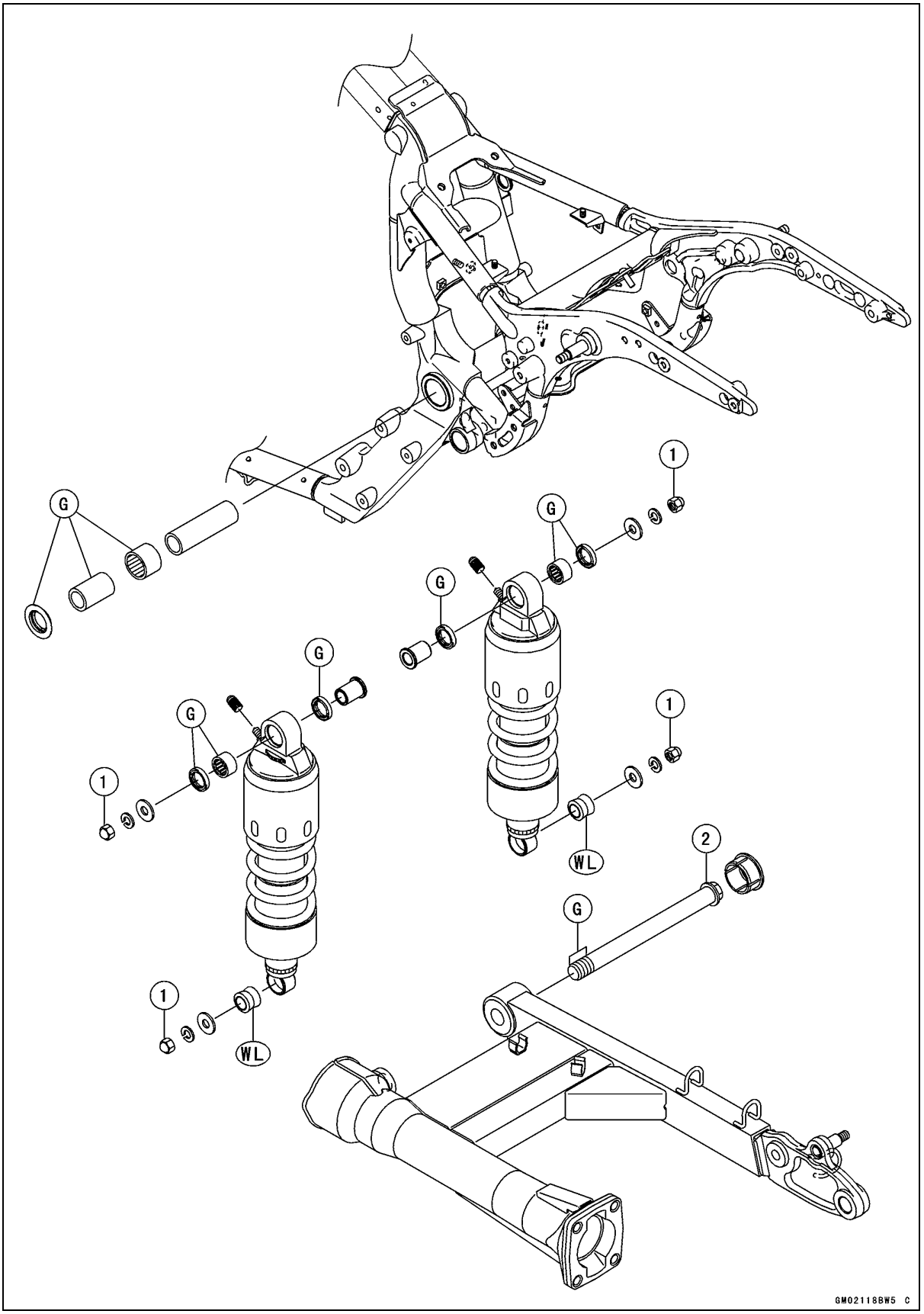
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Clamp Bolts	29	3.0	21	AL
2	Front Fork Bottom Allen Bolts	30	3.1	22	L
3	Front Fork Clamp Bolts (Upper)	29	3.0	21	
4	Front Fork Clamp Bolts (Lower)	29	3.0	21	AL
5	Front Fork Inner Cover Bolts	4.0	0.40	35 in·lb	
6	Front Fork Top Plugs	22	2.2	16	

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

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Shock Absorber Nuts	34	3.5	25	
2	Swingarm Pivot Shaft	127	13.0	94	G

G: Apply grease.
WL: Apply a soap and water solution or rubber lubricant.

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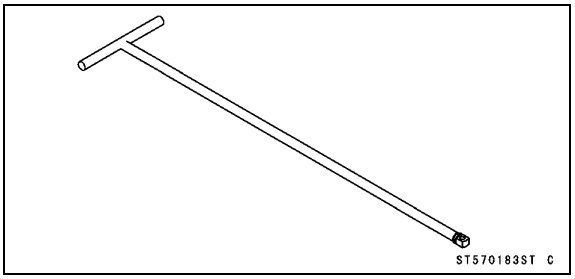
Specifications

Item	Standard
Front Fork (Per One Unit)	
Fork Inner Tube Diameter	ϕ43 mm (ϕ 1.7 in.)
Fork Spring Setting	Non-adjustable
Air Pressure	Atmospheric pressure (Non-adjustable)
Rebound Damper Setting	Non-adjustable
Fork Oil:	
Type	KAYABA G10 (SAE 10W-20) or equivalent
Amount:	
When Changing Oil	Approx. 440 mL (14.8 US oz.)
After Disassembly and Completely Dry	513 ±4 mL (17.3 ±0.1 US oz.)
Fork Oil Level: (Fully Compressed, Without Fork Spring, below from the top of the Inner Tube)	135 ±2 mm (5.31 ±0.08in.)
Fork Spring Free Length	393.9 mm (15.50 in.) (Service Limit: 386 mm (15.2 in.))
Rear Shock Absorber	
Rebound Damper Set	No.II of 4 positions
Air Pressure:	
Standard	Atmospheric Pressure
Usable Range	Atmospheric Pressure ~ 290 kPa (3.0 kgf/cm², 43 psi)

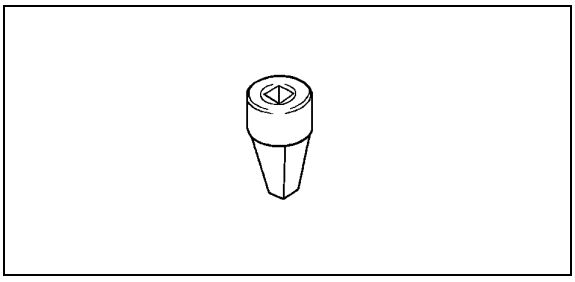
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Special Tools

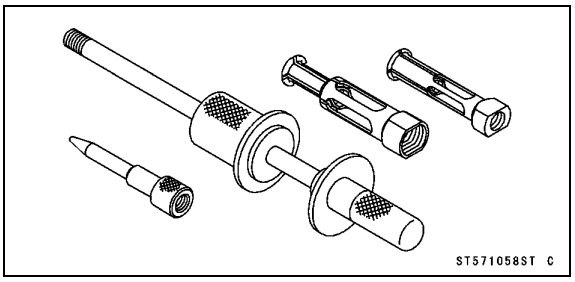
Fork Cylinder Holder Handle:
57001-183



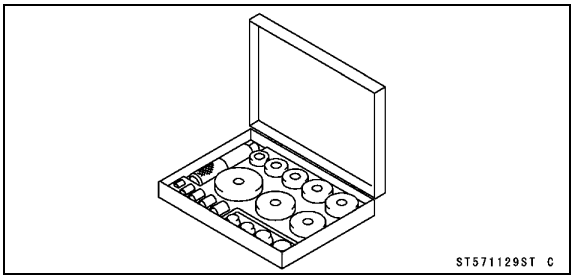
Fork Cylinder Holder Adapter:
57001-1057



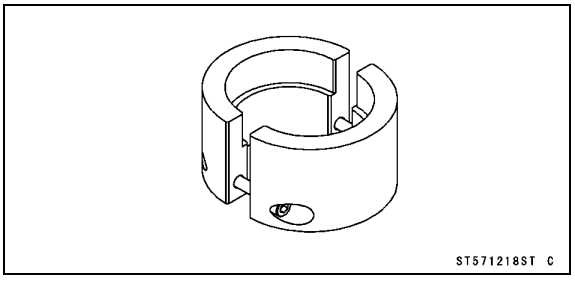
Oil Seal & Bearing Remover:
57001-1058



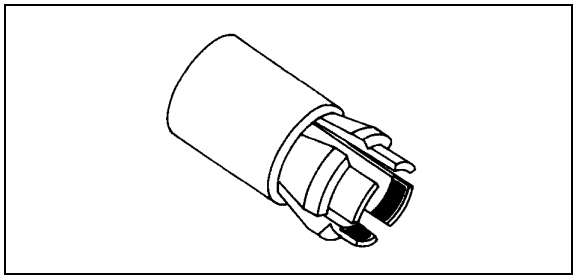
Bearing Driver Set:
57001-1129



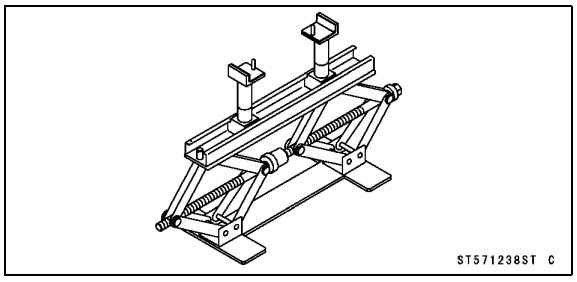
Fork Outer Tube Weight:
57001-1218



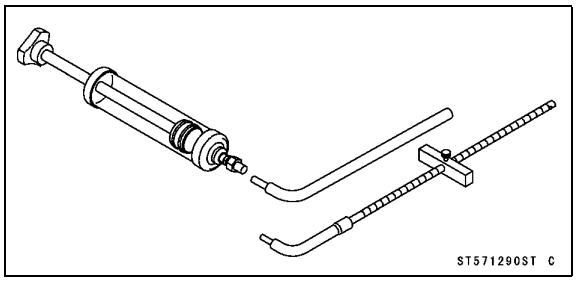
Front Fork Oil Seal Driver:
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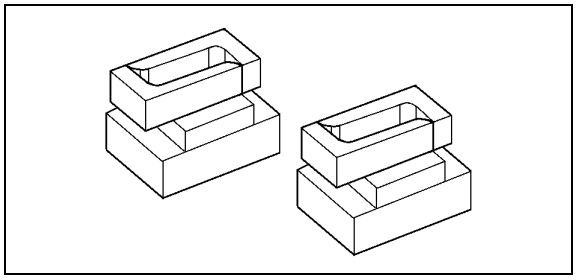
Jack:
57001-1238



Fork Oil Level Gauge:
57001-1290



Attachment Jack:
57001-1398

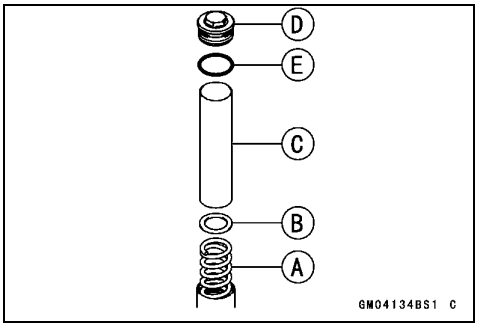


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Front Fork

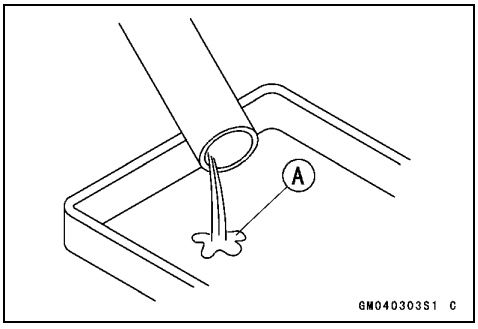
Fork Oil Change (Each Fork Leg)

- Remove the front fork (see Front Fork Removal in this section).
- Hold the outer tube vertically in a vise.
- Remove:
  Top Plug [D] (with O-ring [E])
  Collar [C]
  Washer [B]
  Spring [A]



- Pour out the fork oil [A] with the fork upside down.
- Hold the outer tube vertically in a vise.
- Fill the front fork with the specified oil.

Fork Oil
Type:
KAYABA G10 (SAE 10W-20) or equivalent
Amount (per side):
When changing oil:
approx. 440 mL (14.8 US oz.)
After disassembly and completely dry:
513 ±4 mL (17.3 ±0.1 US oz.)

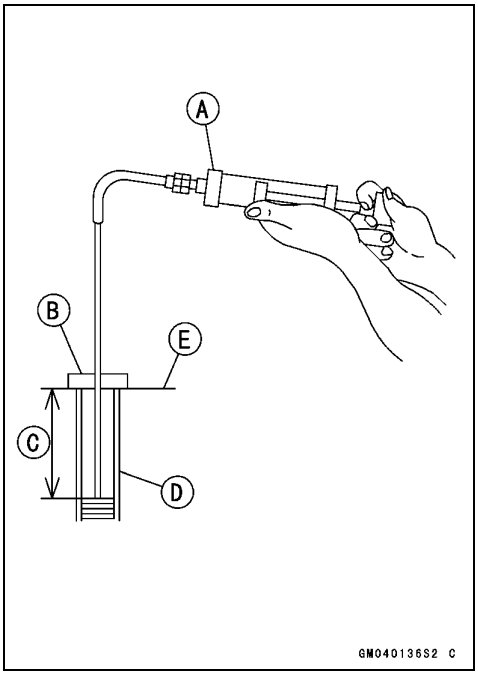


- Wait for about five minutes so that any suspended air bubbles can surface.
- Measure the oil level, using the fork oil level gauge [A].

Special Tool - Fork Oil Level Gauge: 57001-1290

○Set the gauge stopper [B] so that its lower side shows the oil level distance specified [C].
○Insert the gage tube into the inner tube [D] and position the stopper across the top of the inner tube [E].
○Pull the handle slowly to draw out the excess oil until no more oil comes up the tube.
★If no oil is drawn out from the beginning, there is not enough oil in the fork. Pour in some more oil, then draw out the excess.

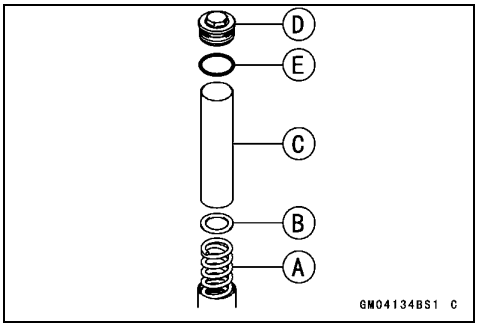
Front Fork Oil Level (fully compressed, without fork spring)
Standard: 135 ±2 mm (5.31 ±0.08 in.) (from the top of the inner tube)



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Front Fork

● Install:
Fork Spring [A]
Washer [B]
Spacer [C]
Top Plug [D] with O-ring [E]

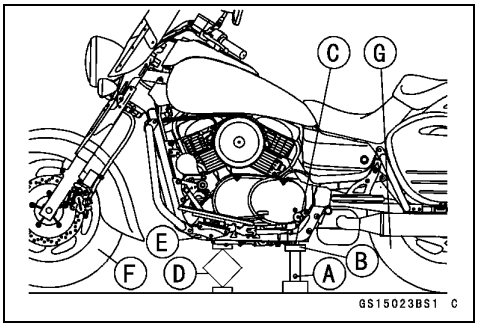


● Install the front fork (see Front Fork Installation in this section).

Front Fork Removal

● Using the jack [A] and attachment jack [B] under the frame pipe ribs [C], and a commercially available jack [D] under the engine [E], lift the front wheel [F] OFF the ground until the rear wheel [G] touches the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398



CAUTION

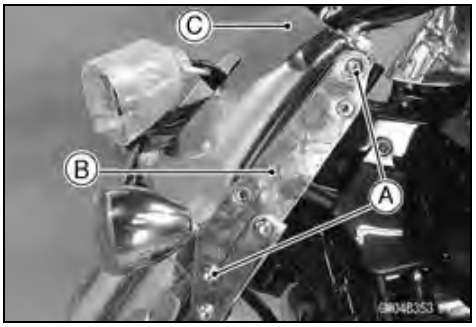
Be sure to put the rear wheel on the ground when removing the front fork, or the motorcycle may fall over. The motorcycle could be damaged.

⚠ WARNING

Be sure to put the rear wheel on the ground when removing the front fork, or the motorcycle may fall over. It could cause an accident and injury.

● Remove:
Windshield (see Windshield Removal in the Frame chapter)
Headlight Body (see Headlight Body Removal in the Electrical System chapter)
Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)

● Remove:
Bolts [A] (Both Sides)
Left and Right Windshield Brackets [B]
Front Fork Center Cover [C]



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Front Fork

● Remove:
Bolts [A] and Washers
Brake Hose Clamp [B]
Front Turn Signal Light Bracket [C]



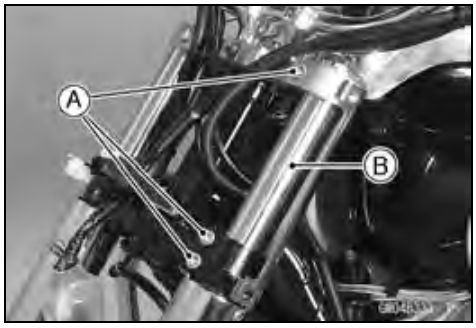
● Loosen the front fork clamp bolt (upper) [A] and fork top plug [B] before hand if the fork leg is to be disassembled.

NOTE

○*Loosen the fork top plug after loosening the front fork clamp bolt (upper).*



● Remove:
Front Fork Clamp Bolts [A]
Front Fork [B]

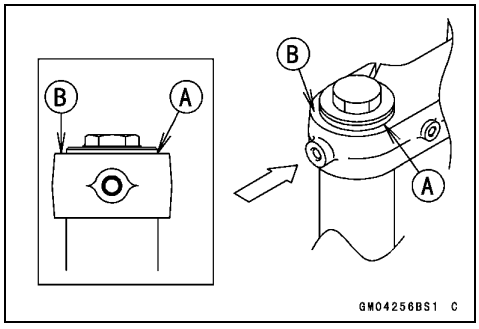


Front Fork Installation

● Install the fork so that the top end [A] of the inner tube is flush with the upper surface [B] of the steering stem head bracket.

● Tighten:

Torque - Front Fork Clamp Bolts (Lower):
29 N·m (3.0 kgf·m, 21 ft·lb)
Front Fork Top Plug: 22 N·m (2.2 kgf·m, 16 ft·lb)



NOTE

○*Tighten the top plug before tightening the front fork clamp bolt (upper).*

○*Tighten the two front fork clamp bolts (lower) alternately two times to ensure even tightening torque.*

● Tighten:

Torque - Front Fork Clamp Bolt (Upper):
29 N·m (3.0 kgf·m, 21 ft·lb)

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Front Fork

- Install the removed parts (see appropriate chapters).
- Check the front brake effectiveness after installation.

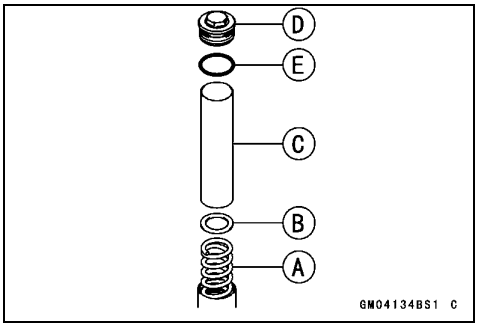
⚠ WARNING

Do not attempt to ride 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.

Front Fork Disassembly

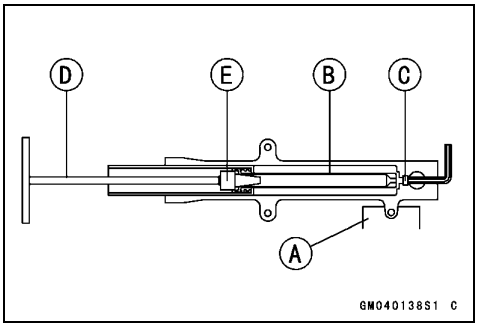
- Remove the front fork (see Front Fork Removal in this section).
- Drain the fork oil (see Fork Oil Change in this section).

○The following parts are removed during draining the fork oil.
Top Plug [D] with O-ring [E]
Spacer [C]
Washer [B]
Fork Spring [A]



- Hold the front fork horizontally in a vise [A].
- Stop the cylinder unit [B] from turning by using the special tools.
- Unscrew the Allen bolt [C], and take the gasket out of the bottom of the outer tube.

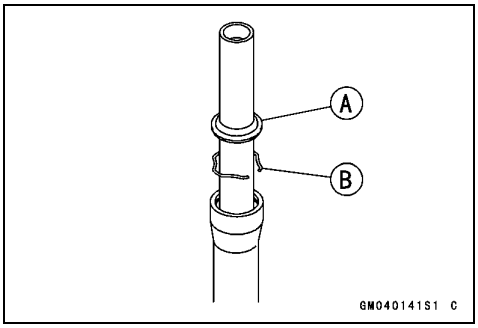
Special Tools - Fork Cylinder Holder Handle [D]: 57001-183
Fork Cylinder Holder Adapter [E]: 57001-1057



- Take the cylinder unit out of the inner tube.

- Separate the inner tube from the outer tube as follows:

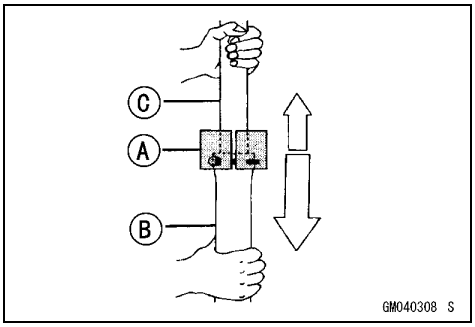
○Remove the dust seal [A] from the outer tube.
○Remove the retaining ring [B] from the outer tube.



○Use the fork outer tube weight [A] to separate the outer tube [B] from the inner tube [C].
○Holding the inner tube by hand, pull the outer tube several times to pull out the inner tube.

Special Tool - Fork Outer Tube Weight: 57001-1218

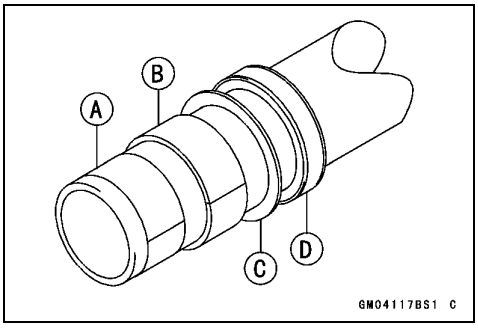
○Take out the cylinder base out of the outer tube.



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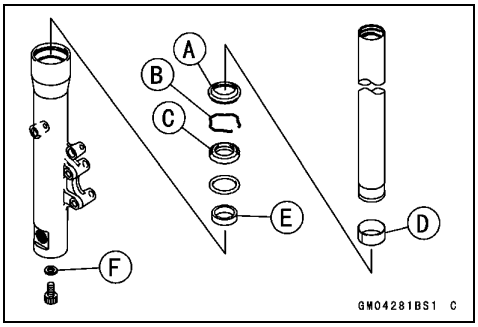
Front Fork

● Remove the inner tube guide bushing [A], outer tube guide bushing [B], washer [C], and oil seal [D] from the inner tube.

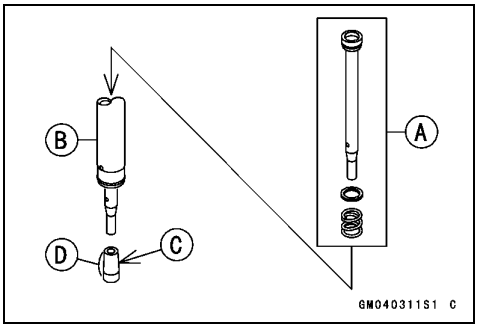


Front Fork Assembly

● Replace the following parts with new ones after removal.
Dust Seal [A]
Retaining Ring [B]
Oil Seal [C]
Inner Guide Bushing [D]
Outer Guide Bushing [E]
Bottom Allen Bolt Gasket [F]

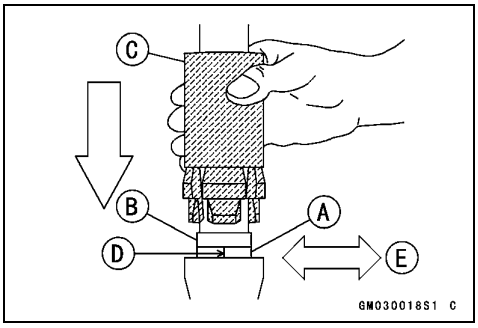


● Put the cylinder unit [A] with the spring into the inner tube [B], protruding from the inner tube, and install the cylinder base [C] onto the bottom end of the cylinder unit.
○Install the cylinder base with the tapered end [D] up.
● Install the inner tube, cylinder unit, and cylinder base as a set into the outer tube.



● Install the new guide bushing [A] with a used guide bushing [B] on it by tapping the used guide bushing with fork oil seal driver [C] until it stops.
○The split [D] of the bushing should face toward the side [E] of the vehicle.

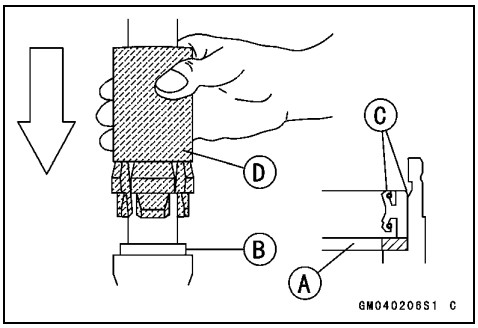
Special Tool - Front Fork Oil Seal Driver: 57001-1219



● Apply molybdenum disulfide grease to the oil seal lips and install the washer [A] and the oil seal [B] into the outer tube.
○Face the flat side [C] of the seal upward.

Special Tool - Front Fork Oil Seal Driver [D]: 57001-1219

● Install:
Retaining Ring
Dust Seal



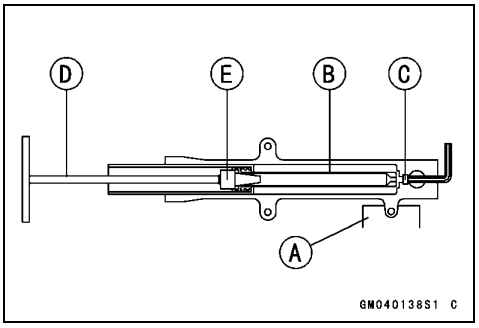
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Front Fork

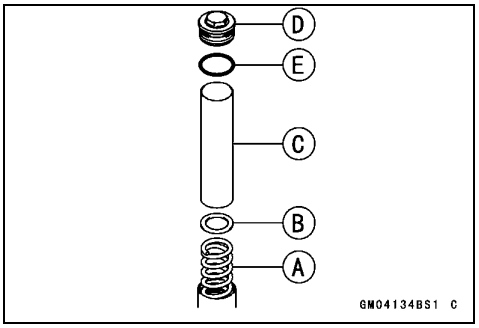
- Apply a non-permanent locking agent to the threads of the Allen bolt and screw the Allen bolt into the bottom of the outer tube.
- Hold the front fork horizontally in a vise [A].
- Hold the cylinder unit [B] with the special tools and tighten the Allen bolt [C].

Special Tools - Fork Cylinder Holder Handle [D]: 57001-183
Fork Cylinder Holder Adapter [E]: 57001-1057

Torque - Front Fork Bottom Allen Bolt: 30 N·m (3.1 kgf·m, 22 ft·lb)



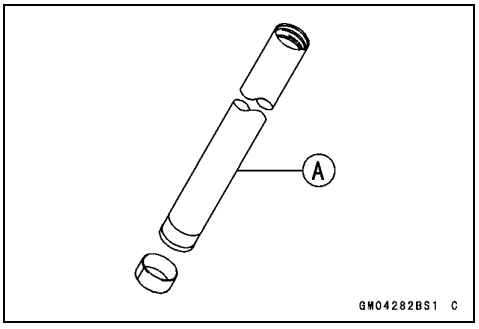
- Pour in the specified type of oil (see Fork Oil Change (Each Fork Leg) in this section).
- Install:
  Fork Spring [A]
  Washer [B]
  Spacer [C]
  Top Plug [D] with O-ring [E]
- Install the front fork (see front fork Installation in this section)



Inner Tube, Outer Tube Inspection

- Visually inspect the inner tube [A] and repair any damage.
- Nick or rust damage can sometimes be repaired by using a wet- stone to remove sharp edges or raised areas which cause seal damage.

★If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

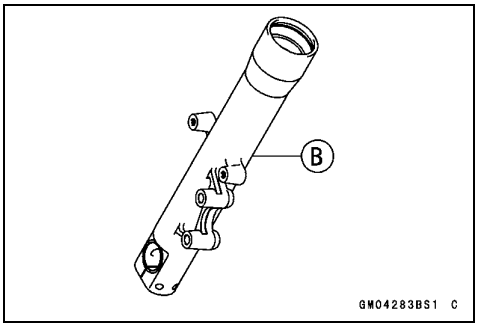


CAUTION

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

- Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.

★If you feel binding or catching, the inner and outer tubes must be replaced.



⚠ WARNING

A straightened inner or outer fork tube [B] may fail 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.

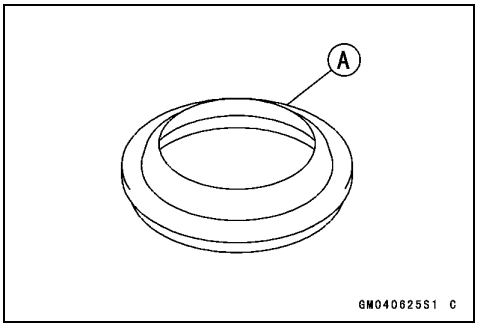
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Front Fork

Dust Seal Inspection

★Inspect the dust seal [A] for any signs of deterioration or damage.

★Replace them if necessary.

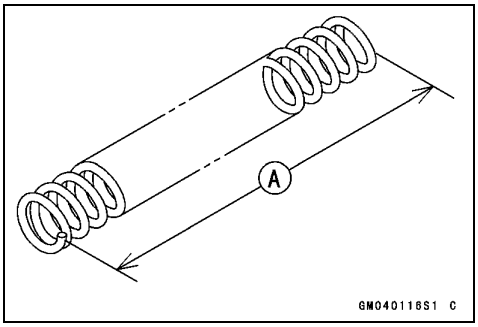


Spring Tension

● Since the 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:	**393.9 mm (15.50 in.)**
Service Limit:	**386 mm (15.2 in.)**

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Rear Shock Absorber (Air Type)

Rebound Damping Adjustment

The rebound damping force adjuster on each rear shock absorber has 4 positions so that the rebound damping force can be adjusted for different road and loading conditions. The numbers on the adjuster show the setting position.



● Turn the adjuster [A] until the desired number [B].

○The standard adjuster setting is **No.II** for an average-build rider of 68 kg (150 lb) with no passenger and no accessories.

★If the damper setting feels too soft or too stiff, adjust it in accordance with the following table.

Rebound Damping Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
I	Weak	Soft	Light	Good	Low
II	↑	↑	↑	↑	↑
III	↓	↓	↓	↓	↓
IIII	Strong	Hard	Heavy	Bad	High

⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

Air Pressure Adjustment

The air pressure in the rear shock absorbers can be adjusted for different road and loading conditions.

The following table shows an example of air pressure adjustment. To obtain stable handling and a suitable ride, adjust the air pressure as indicated. The standard air pressure is **atmospheric pressure** for an average-build rider of 68 kg (150 lb) with no passenger and no accessories. Ordinarily, the heavier the total load becomes, the higher the air pressure should be set.

Air Pressure Adjustment

Air Pressure	Setting	Load	Road
Atmospheric Pressure (0 kgf/cm², 0 psi)	Soft	Light	Good
↑	↑	↑	↑
↓	↓	↓	↓
290 kPa (3.0 kgf/cm², 43 psi)	Hard	Heavy	Bad

● Adjust the air pressure.

NOTE

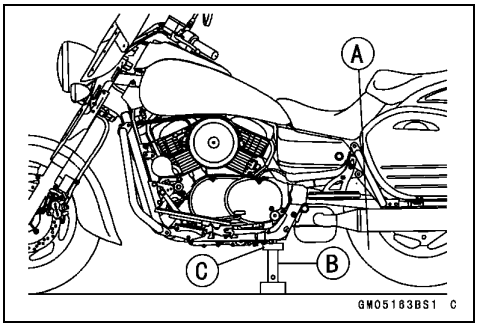
○*Check and adjust the air pressure when the rear shock absorbers are cold (room temperature).*

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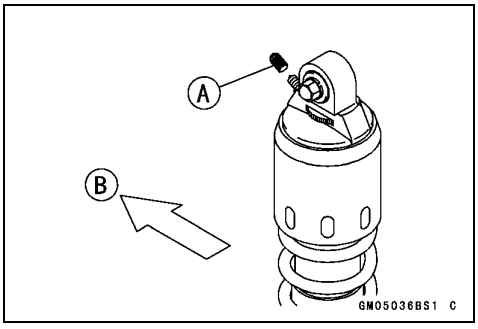
Rear Shock Absorber (Air Type)

● Raise the rear wheel [A] off the ground, using the jack [B], and the attachment jack [C].

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398



● Take off each air valve cap [A] on the right and left shock absorbers.
Front [B]
● Check the air pressure with the air pressure gauge.



NOTE

○*Do not use tire gauges for checking air pressure. They may not indicate the correct air pressure because of air leakage that occur when the gauge is applied to the valve.*

○To lower the air pressure, push the valve core in slightly. To raise the pressure, inject air through the valve with a tire pump. Change the air pressure within the range specified in the preceding table to suit various riding conditions.

CAUTION

Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 490 kPa (5.0 kgf/cm², 71 psi) may damage the oil seal.
Try to set the air pressure of the right and left shock absorbers as equally as possible.

⚠ WARNING

Be sure to adjust the air pressure within the usable range. Pressure too high can produce a hazardous riding condition.
Only air or nitrogen gas can be used. Never inject oxygen or any kind of explosive gas.

Rear Shock Absorber Removal

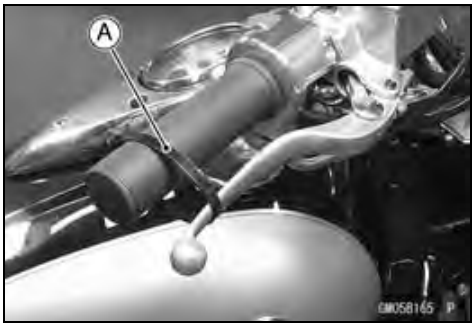
● Lift the rear wheel off the ground, using the jack and the attachment jack.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

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Rear Shock Absorber (Air Type)

● Squeeze the brake lever slowly and hold it with a band [A].



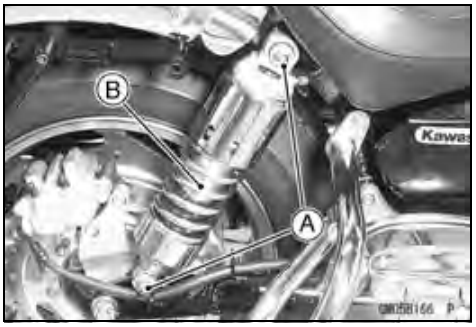
CAUTION

Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. The motorcycle could be damaged.

⚠ WARNING

Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.

● Remove the left and right saddlebags (see Saddlebag Removal in the Frame chapter).
● Remove the nuts [A], lock washers, and flat washers from both ends of the rear shock absorber [B].
● Pull the rear shock absorber off the frame.

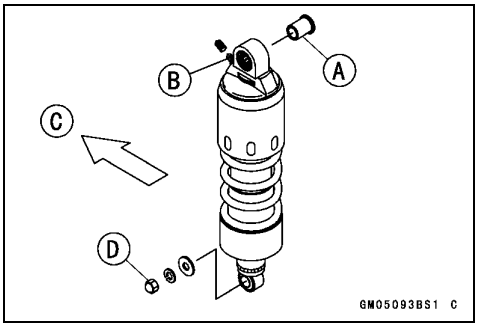


Rear Shock Absorber Installation

● Install the sleeve [A] so the flange side faces inside.
● Install the rear shock absorber so that the air valve [B] faces forward [C].
● Tighten the rear shock absorber nuts [D] to the specified torque.

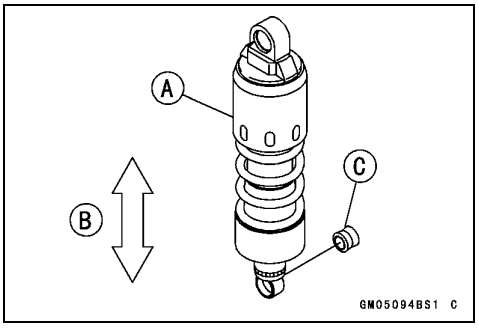
Torque - Rear Shock Absorber Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

● Install the left and right saddlebags (see Saddlebag Installation in the Frame chapter).



Rear Shock Absorber Inspection

● Remove the rear shock absorbers [A].
● Visually inspect the following items.
Smooth Stroke [B]
Oil Leakage (see Rear Shock Absorber Oil Leak Inspection in the Periodic Maintenance chapter)
Crack or Dent
★If there is any damage to the rear shock absorber, one unit feels weaker than the other, replace both shock absorbers as a set.
● Visually inspect the rubber bushings [C].
★If they show any signs of damage, replace them.

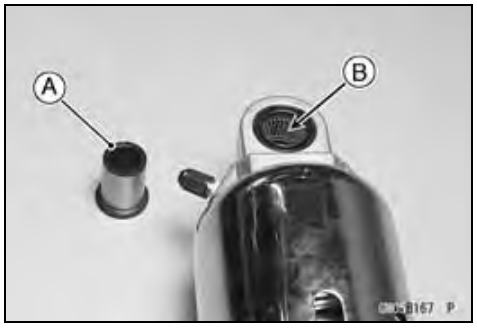


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Rear Shock Absorber (Air Type)

- Visually inspect the shock absorber sleeves [A] and needle bearings [B].
- The roller in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing in the shock absorber for abrasion, color change, or other damage.

★If there is any doubt as to the condition of any of the needle bearings or sleeves, replace the sleeves, and needle bearings as a set.

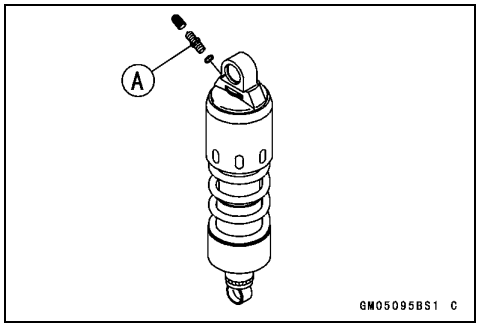


Rear Shock Absorber Scrapping

- Remove the rear shock absorber (see Rear Shock Absorber Removal in this section).

⚠ WARNING

Since the rear shock absorber contains air, do not incinerate the rear shock absorber without first releasing the air or it may explode.
Before a rear shock absorber is scrapped, remove the air valve [A].



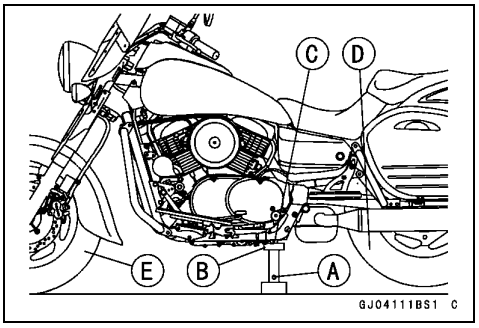
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Swingarm

Swingarm Removal

- Using the jack [A] and attachment jack [B] under the frame pipe ribs [C], lift the rear wheel [D] OFF the ground until the front wheel [E] touches the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398



- Squeeze the brake lever slowly and hold it with a band [A].



CAUTION

Be sure to hold the front brake when removing the swingarm, or the motorcycle may fall over. The motorcycle could be damaged.

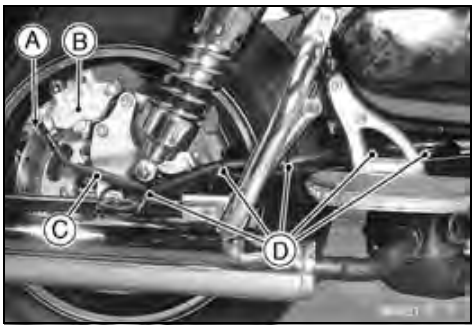
⚠ WARNING

Be sure to hold the front brake when removing the swingarm, or the motorcycle may fall over. It could cause an accident and injury.

- Remove:
  Left and Right Saddlebags (see Saddlebag Removal in the Frame chapter)
  Rear Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  Front Exhaust Pipe Cover (see Exhaust Pipe Removal in the Engine Top End chapter)
  Swingarm Pivot Cap [A]



- Before removing the swingarm, unscrew the banjo bolt [A] on the rear caliper [B].
- ○Temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Immediately wash away any brake fluid that spills.
- Detach the rear brake hose [C] from the holders [D] on the swingarm.



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Swingarm

- Remove:
  Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  Final Gear Case (see Final Gear Case Removal in the Final Drive chapter)
  Right Rear Shock Absorber (see Rear Shock Absorber Removal in this chapter)
- Unscrew the pivot shaft [A], and pull it out while turning.
- Pull the swingarm [B] rearward, and take it off.



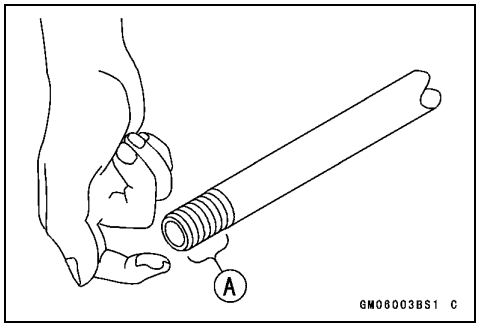
CAUTION

Do not tap the swingarm pivot shaft when removing or installing. Push or pull the pivot shaft while turning the shaft. Tapping on the shaft could damage the needle bearings in the swingarm.

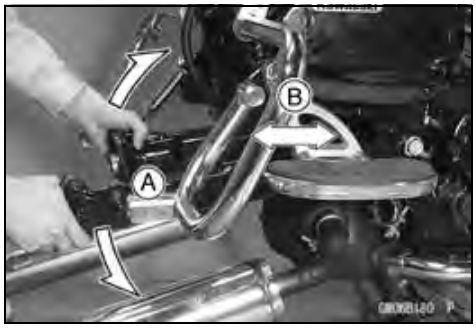
Swingarm Installation

- Apply grease to the needle bearings and grease seals.
- Apply grease to the threads [A] of the swingarm pivot shaft.

Torque - Swingarm Pivot Shaft: 127 N·m (13.0 kgf·m, 94 ft·lb)

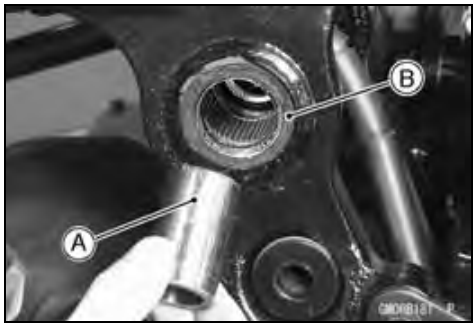


- Move the swingarm up and down [A] to check for abnormal friction, and push and pull [B] it to check for bearing play.
- Install:
  Right Rear Shock Absorber (see Rear Shock Absorber Installation in this chapter)
  Final Gear Case (see Final Gear Case Installation in the Final Drive chapter)
  Rear Wheel (see Rear Wheel Installation in the Wheels/Tires chapter)
- Install the removed parts (see appropriate chapters).
- After installing the swingarm, replenish the brake fluid into the reservoir and bleed the brake line (see Brake Line Bleeding in the Brakes chapter).



Swingarm Bearing Removal

- Remove:
  Swingarm (see Swingarm Removal in this chapter)
  Propeller Shaft (see Propeller Shaft Removal in the Final Drive chapter)
  Left and Right Sleeves [A]
  Left and Right Grease Seals [B]



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Swingarm

- Remove the needle bearings, using the oil seal & bearing remover [A].

Special Tool - Oil Seal & Bearing Remover: 57001-1058

- Replace the bearings and sleeves with new ones.
- Remove the other side bearing in the same manner.

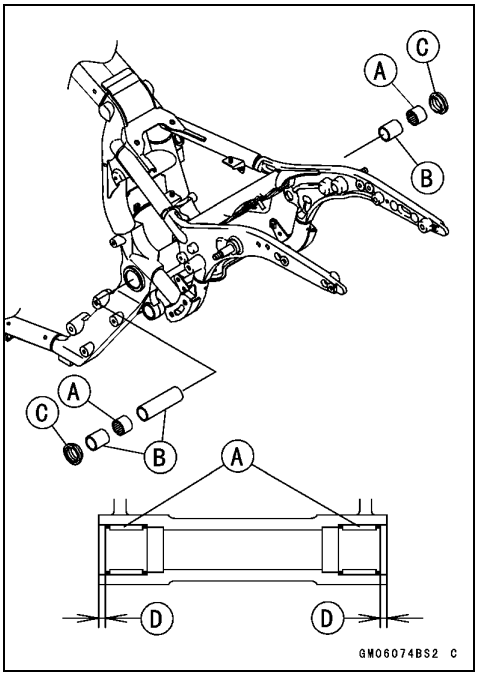


Swingarm Bearing Installation

- Apply plenty of grease to the needle bearings, and sleeve.
- Be sure to install the needle bearings so that the manufacturer's marks are faced out. This prevents bearing damage.
- Position the bearings [A] as shown, using a suitable bearing driver in the bearing driver set.

Sleeves [B]
Grease Seals [C]
5 mm (0.2 in.) [D]

Special Tool - Bearing Driver Set: 57001-1129

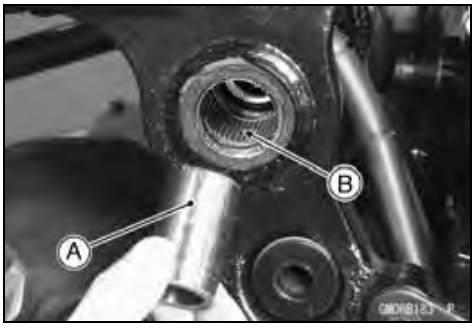


Swingarm Bearing, Sleeve Inspection

CAUTION
Do not remove the needle bearings for inspection. Remove may damage them.

- Visually inspect the swingarm 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 in the swingarm 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.



Grease Seal and Needle Bearing Lubrication

- Refer to the Swingarm Pivot Lubrication in the Periodic Maintenance chapter.

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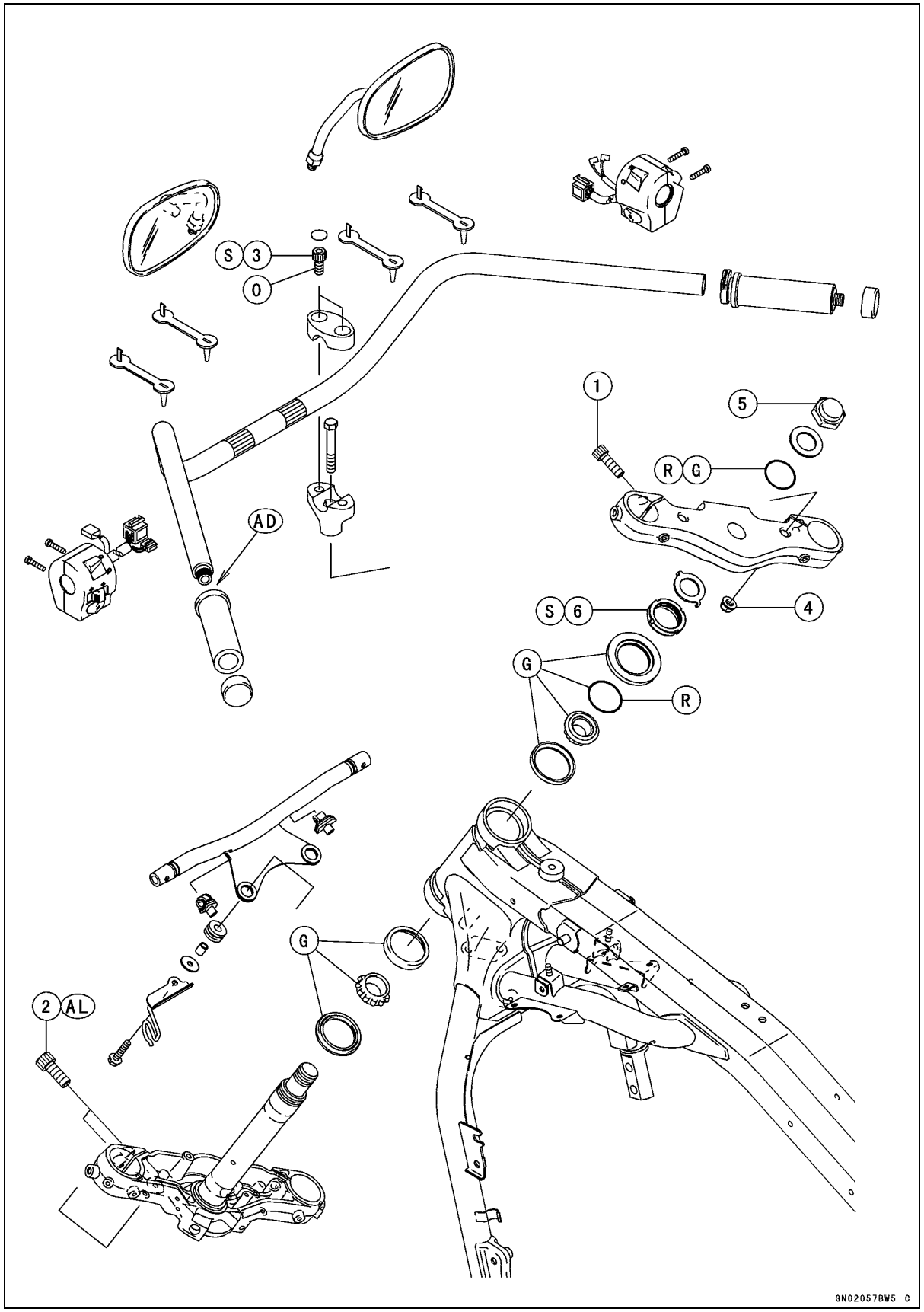
Steering

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Exploded View



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Exploded View

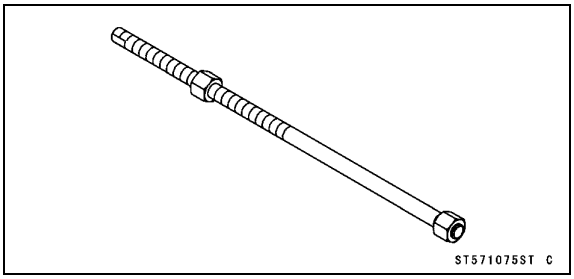
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fork Clamp Bolts (Upper)	29	3.0	22	
2	Front Fork Clamp Bolts (Lower)	29	3.0	22	AL
3	Handlebar Clamp Bolts	34	3.5	25	O, S
4	Handlebar Holder Nuts	34	3.5	25	
5	Steering Stem Head Nut	88	9.0	65	
6	Steering Stem Nut	4.9	0.50	43 in·lb	S

AD: Apply adhesive.
AL: Tighten the two front fork clamp bolts (lower) alternately two times to ensure even tightening torque.
G: Apply grease.
O: Apply 2 stroke oil.
R: Replacement Parts
S: Follow the specific tightening sequence.

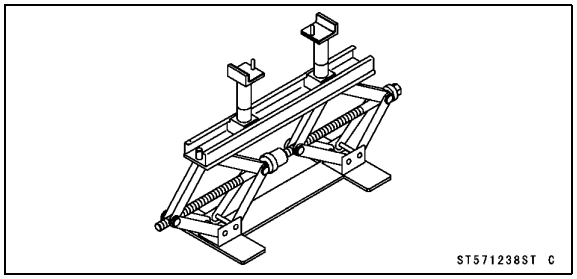
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Special Tools

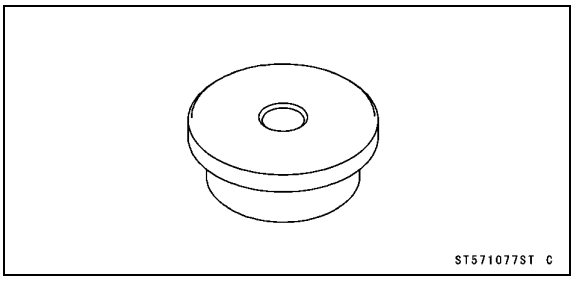
Head Pipe Outer Race Press Shaft:
57001-1075



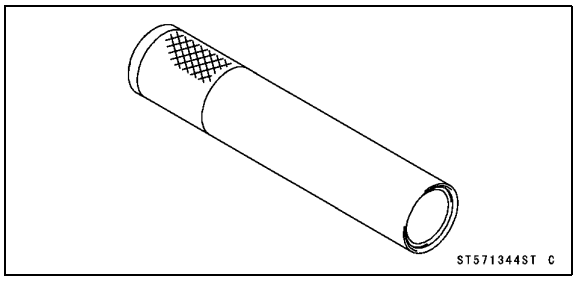
Jack:
57001-1238



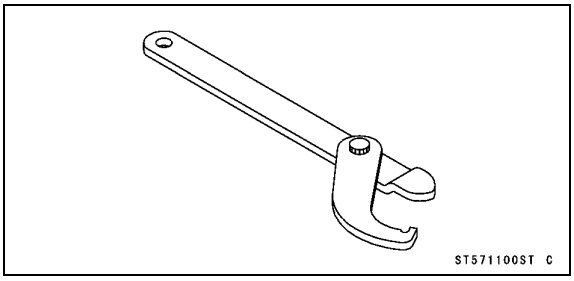
Head Pipe Outer Race Driver, ϕ54.5:
57001-1077



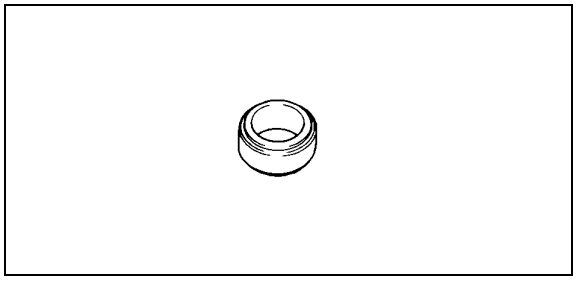
Steering Stem Bearing Driver, ϕ42.5:
57001-1344



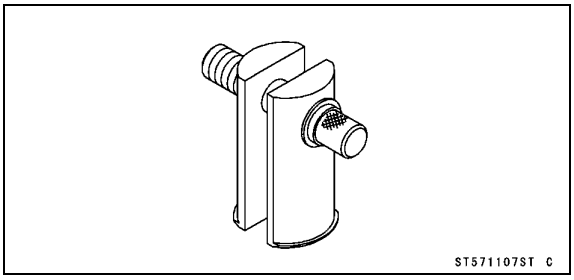
Steering Stem Nut Wrench:
57001-1100



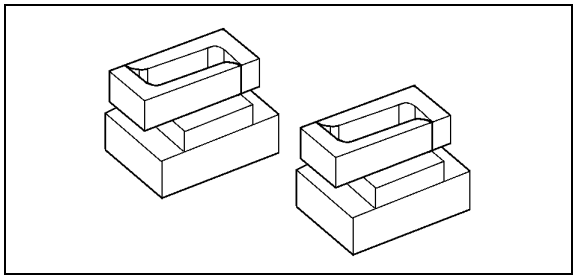
Steering Stem Bearing Driver Adapter, ϕ41.5:
57001-1345



Head Pipe Outer Race Remover ID > 37 mm:
57001-1107



Attachment Jack:
57001-1398

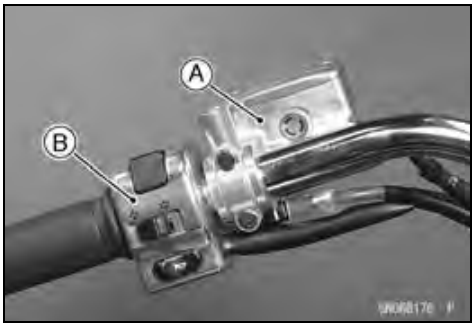


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Handlebar

Handlebar Removal

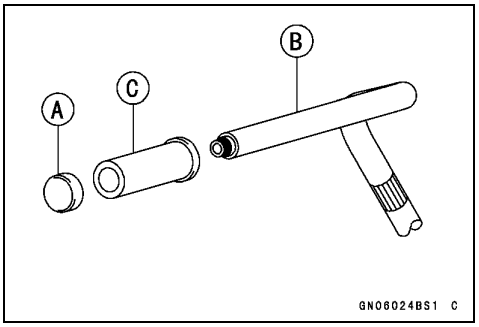
- Cut the straps.
- Remove:
  Clutch Master Cylinder [A] (see Clutch Master Cylinder Removal in the Clutch chapter)
  Left Handlebar Switch Housing [B]



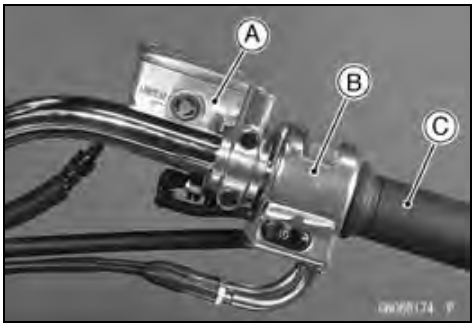
- Remove the left grip end cap [A] from the handlebar [B].

○The left grip end cap has left-hand threads.

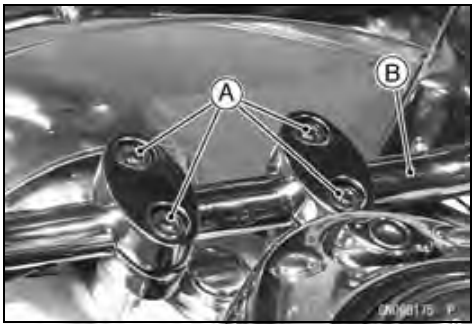
- Remove the left grip [C].



- Remove:
  Front Brake Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
  Right Handlebar Switch Housing [B]
  Throttle Grip [C]



- Remove the handlebar clamp bolt caps.
- Unscrew the handlebar clamp bolts [A] and remove the handlebar [B] from the stem head.

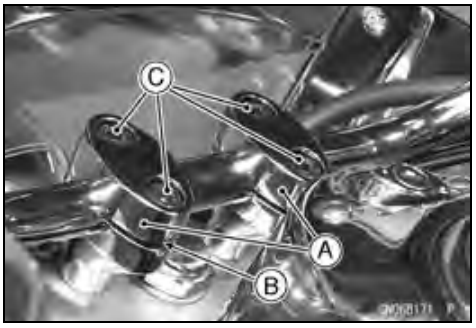


Handlebar Installation

- Apply 2 stroke oil to the threads of the handlebar clamp bolts.
- Install the handlebar clamp [A] together with the handlebar so that the cut side [B] on the clamp points at the rear.
- Tighten the handlebar clamp bolts [C].

○Tighten the clamp bolts, front first and then the rear. If the handlebar clamp is correctly installed, there will be no gap at the front and a gap at the rear after tightening.

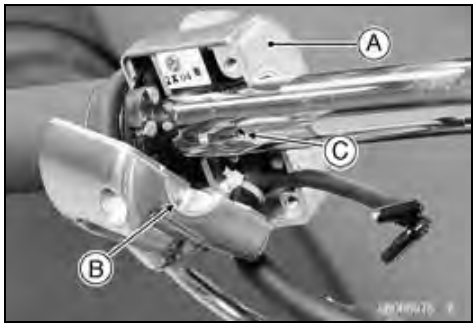
Torque - Handlebar Clamp Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



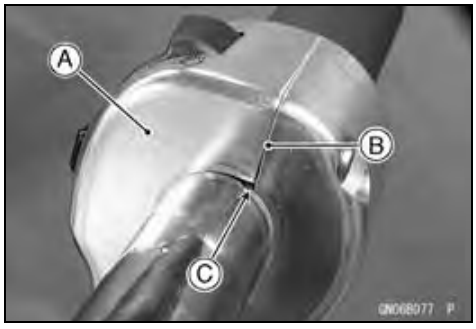
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Handlebar

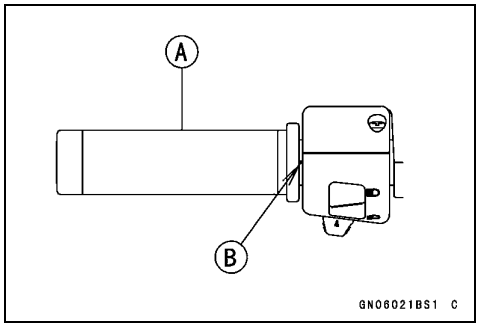
- The front half of the right handlebar switch housing [A] has a small projection [B]. Fit the projection into the small hole [C] in the handlebar.



- Set the left handlebar switch housing [A] to match its mating surface [B] to the punched mark [C] of the handlebar.
- Install the handlebar switch housings.
- Install:
  Clutch Master Cylinder (see Clutch Master Cylinder Installation in the Clutch chapter)
  Front Brake Master Cylinder (see Front Master Cylinder Installation in the Brakes chapter)



- Apply adhesive the inside the left grip [A].
- Insert the left grip until punched mark [B] in the handlebar.
- Check and adjust the throttle cables (see Throttle Control System Inspection in the Periodic Maintenance chapter) and rear view mirrors.



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Steering

Steering Check

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

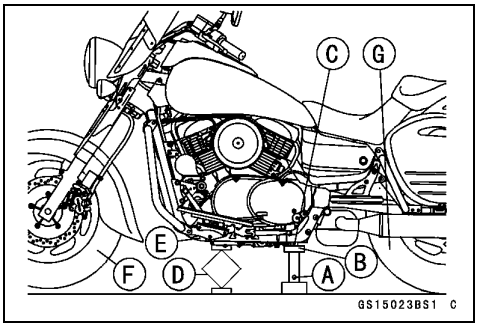
Steering Adjustment

- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

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Steering Stem

Steering Stem Removal



- Using the jack [A] and attachment jack [B] under the frame pipe ribs [C], and a commercially available jack [D] under the engine [E], lift the front wheel [F] OFF the ground until the rear wheel [G] touches the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

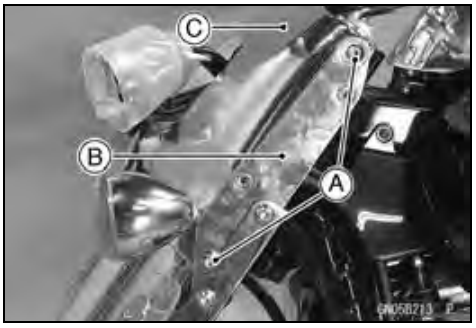
CAUTION

Be sure to put the rear wheel on the ground when removing the steering, or the motorcycle may fall over. The motorcycle could be damaged.

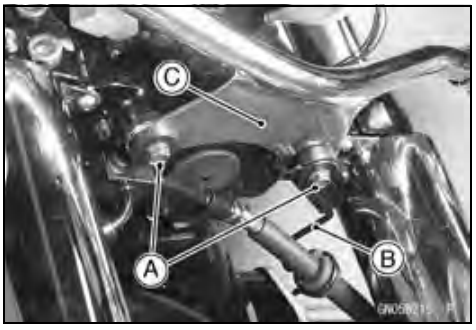
⚠ WARNING

Be sure to put the rear wheel on the ground when removing the steering, or the motorcycle may fall over. It could cause an accident and injury.

- Remove:
  Windshield (see Windshield Removal in the Frame chapter)
  Headlight Body (see Headlight Body Removal in the Electrical System chapter)
  Front Wheel (see Front Wheel Removal in the Tires/Wheels chapter)



- Remove:
  Bolts [A] (Both Sides)
  Left and Right Windshield Brackets [B]
  Front Fork Center Cover [C]

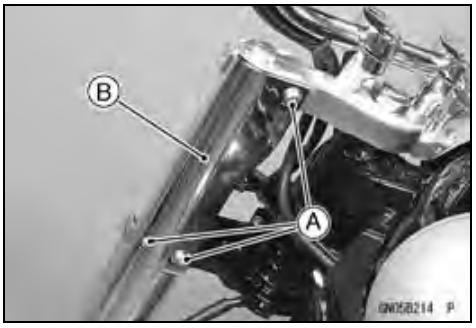


- Remove:
  Bolts [A]
  Brake Hose Clamp [B]
  Turn Signal Rights Bracket [C]

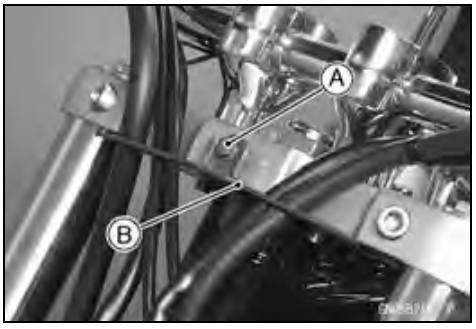
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Steering Stem

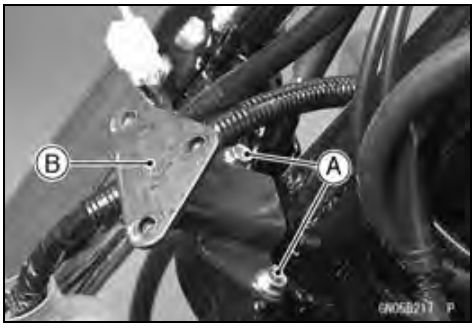
- Remove:
  Bolts [A] (Both Sides)
  Front Fork Rear Covers [B]



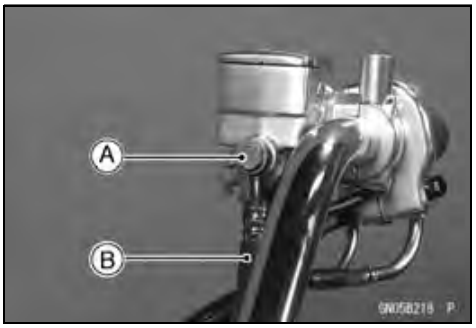
- Remove:
  Bolt [A]
  Cable Bracket [B]



- Remove:
  Bolts [A]
  Headlight Body Stay [B]



- Remove:
  Brake Hose Banjo Bolt [A]
  Brake Hose [B]



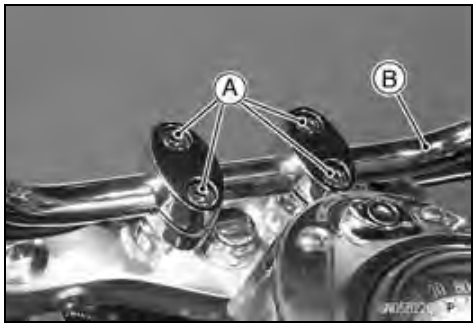
- Remove the brake hose joint bolt [A].



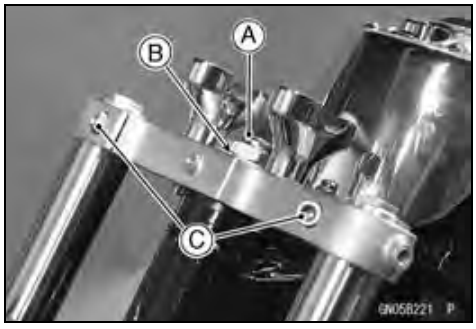
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Steering Stem

● Remove:
Handlebar Holder Bolt Cap and Bolts [A]
Handlebar [B]



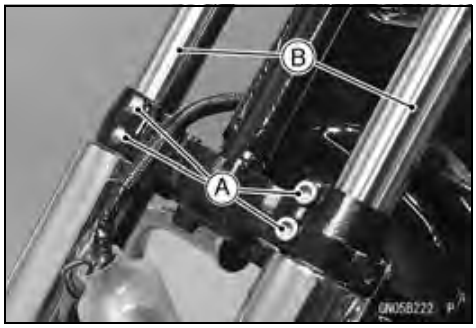
● Remove:
Steering Stem Head Nut [A]
Washer [B]
● Loosen the front fork clamp bolts (upper) [C].



● Remove:
O-ring [A]
Steering Stem Head [B] with Handlebar Holder



● Loosen the front fork clamp bolts (lower) [A].
● Remove the fork legs [B].



● Remove:
Bolts [A] (Both Sides)
Front Fork Inner Covers [B]



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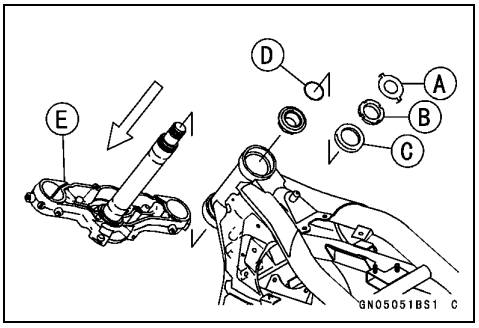
Steering Stem

● Remove:
Claw Washer [A]
Steering Stem Nut [B]
Stem Cap [C]
O-ring [D]

NOTE

○*Be sure to remove the O-ring for removal of the steering stem.*

● Pull out the steering stem [E] from the bottom.

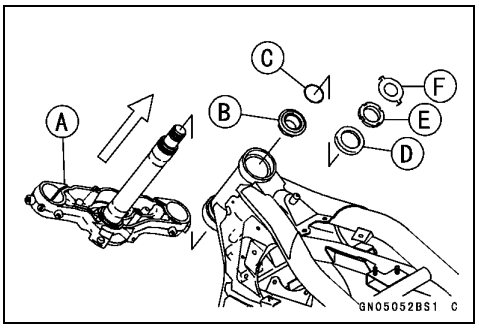


Steering Stem Installation

● Install:
Steering Stem [A]
Bearing [B]
New O-ring [C]
Stem Cap [D]
Stem Nut [E]
Claw Washer [F]

● Tighten:

Torque - Steering Stem Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)

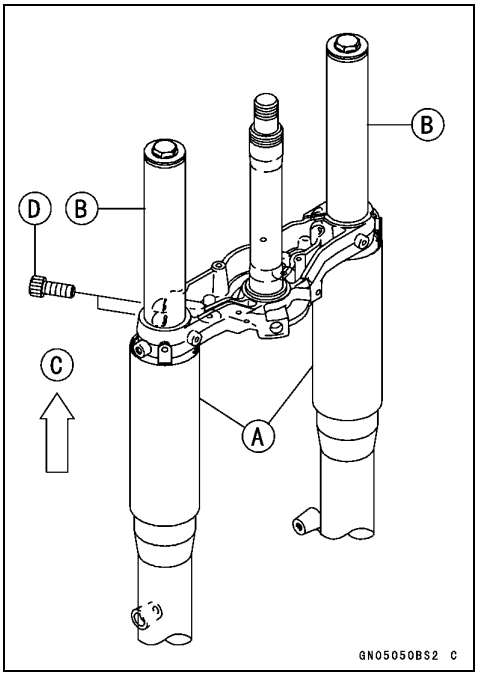


● Install the front fork inner covers [A].

Torque - Front Fork Inner Cover Bolts: 4.0 N·m (0.40 kgf·m, 35 in·lb)

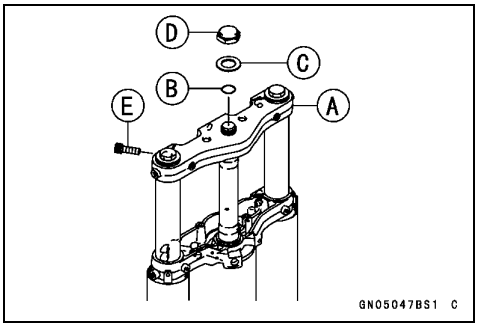
● Install the fork legs [B] and push it up [C] tightly against the stem bottom.

● Temporarily tighten the front fork clamp bolts (lower) [D].



● Install:
Steering Stem Head [A] with Handlebar Holder
O-ring [B]
Washer [C]
Stem Head Nut [D]

● Temporarily tighten the front fork clamp bolts (upper) [E].



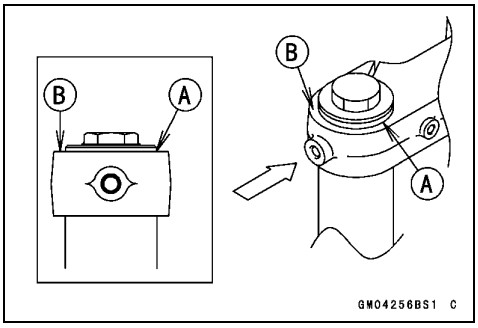
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Steering Stem

○Check that the top end [A] of the inner tube is flush with the upper surface [B] of the steering stem head. Otherwise reinstall the fork leg.

● Tighten the front fork clamp bolts (upper) and then the stem head nut, and finally the front fork clamp bolts (lower).

Torque - Front Fork Clamp Bolts (Upper): 29 N·m (3.0 kgf·m, 22 ft·lb)
Steering Stem Head Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)
Front Fork Clamp Bolts (Lower): 29 N·m (3.0 kgf·m, 22 ft·lb)



NOTE

○*Tighten the two front fork clamp bolts (lower) alternately two times to ensure even tightening torque.*

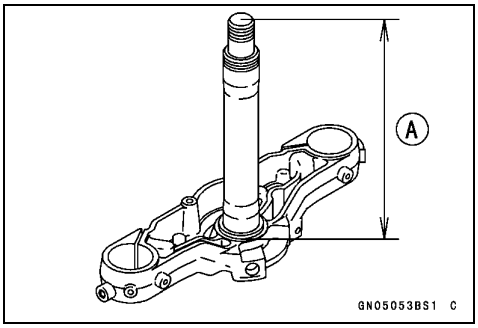
● Install the removed parts (see appropriate chapters).
● Check and adjust the following items after installation.
Steering (see Steering Play Inspection in the Periodic Maintenance chapter)
Throttle Cables (see Throttle Grip Free Play Adjustment in the Fuel System (DFI) chapter)
Headlight Aim (see Headlight Beam Horizontal and vertical Adjustment in the Electrical System chapter)
● Check the front brake effectiveness.

⚠ WARNING

Do not attempt to ride the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brakes will not function on the first application of the lever if this is not done.

Steering Stem Warp

● Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.
★If the steering stem [A] is bent, replace the steering stem.



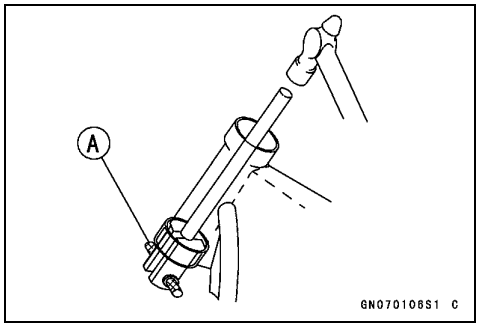
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Steering Stem Bearing

Stem Bearing Removal

- Remove the steering stem (see Steering Stem Removal in this chapter).
- Drive out the bearing outer races from the head pipe.

Special Tool - Head Pipe Outer Race Remover ID > 37 mm [A]: 57001-1107

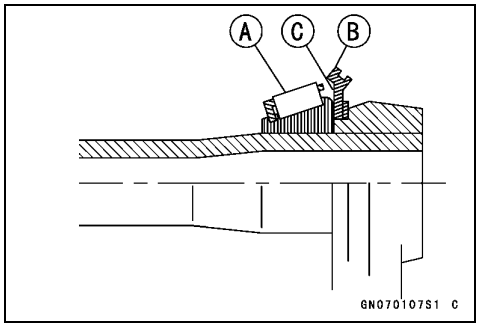


NOTE

○*If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) be replaced with new ones.*

- Remove the lower inner race [A] which is pressed onto the steering stem, using a chisel.

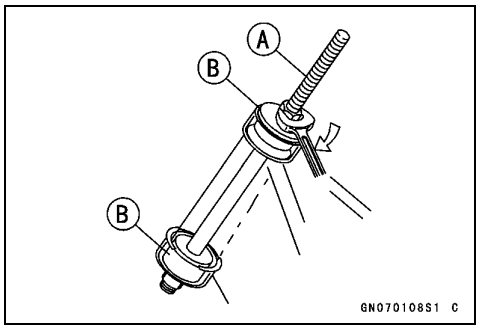
Grease Seal [B]
Tap here [C]



Stem Bearing Installation

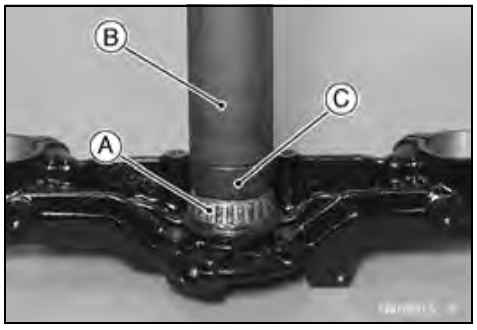
- Replace the bearing outer races with new ones.
- Apply grease to the outer races, and drive them into the head pipe at the same time.

Special Tools - Head Pipe Outer Race Press Shaft [A]: 57001-1075
Head Pipe Outer Race Driver, φ54.5 [B]: 57001-1077



- Replace the stem bearing inner races with new ones.
- Apply grease to the lower inner race [A], and drive it onto the stem base.

Special Tools - Steering Stem Bearing Driver, φ42.5 [B]: 57001-1344
Steering Stem Bearing Driver Adapter, φ41.5 [C]: 57001-1345



- Install the steering stem (see Steering Stem Installation in this chapter).

NOTE

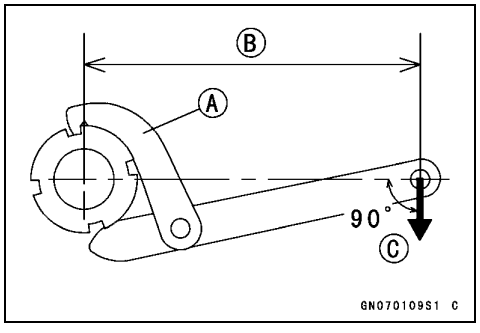
○*Do not install the O-rings yet.*

- Settle the bearings in place as follows:

○Tighten the stem nut to **78 N·m (8.0 kgf·m, 58 ft·lb)** of torque. (To tighten the steering stem nut to the specified torque, hook the wrench on the stem nut, and pull the wrench at the hole by **440 N (45.0 kg, 99 lb)** force in the direction shown.)

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

180 mm (7.1 in.) [B]
Force [C]



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Steering Stem Bearing

○Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.

- Remove the stem nut.
- Install the O-rings and adjust the steering (see Steering Play Adjustment in the Periodic Maintenance chapter).

Torque - Steering Stem Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)

Stem Bearing Lubrication

- In accordance with the Periodic Maintenance Chart, lubricate the steering stem bearings. Refer to the Stem Bearing Lubrication in the Periodic Maintenance chapter.

Stem Cap Deterioration, Damage

★Replace the stem cap if its grease seal [A] shows damage.



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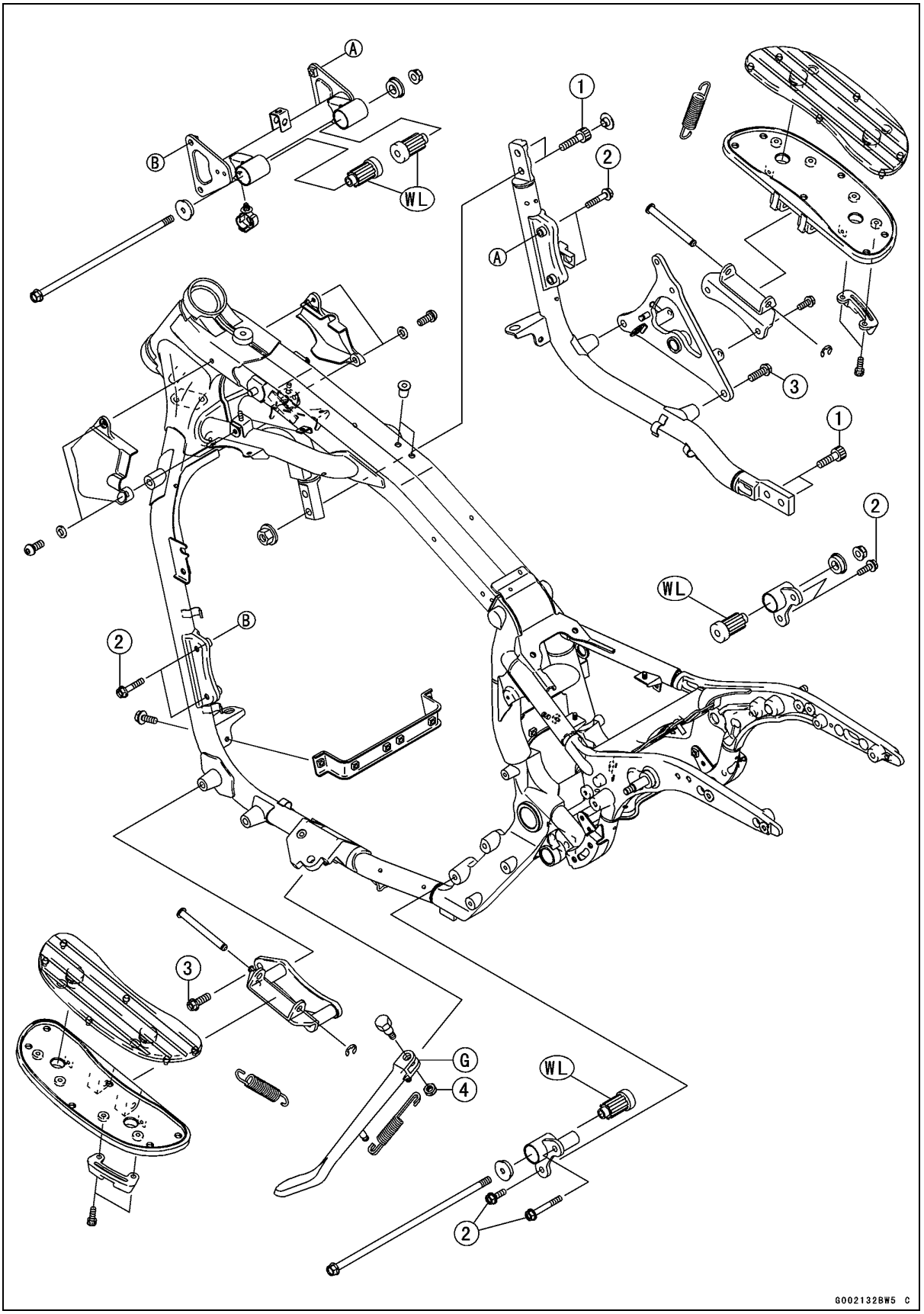
Frame

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Exploded View



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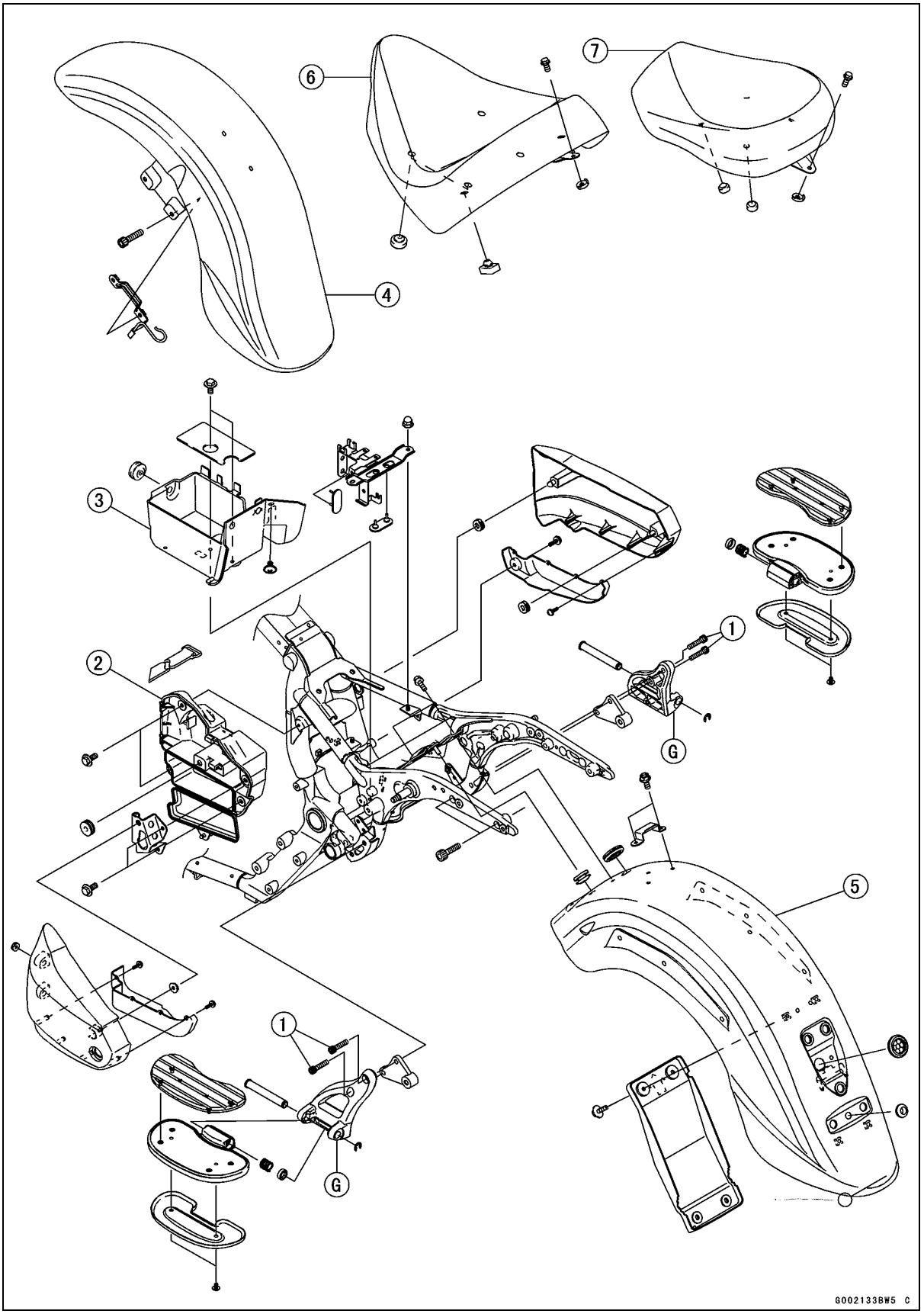
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Downtube Bolts	59	6.0	44	
2	Engine Mounting Bracket Bolts	25	2.5	18	
3	Front Footboard Bracket Bolts	34	3.5	25	
4	Side Stand Nut	44	4.5	32	

G: Apply grease.
WL: Apply a soap and water solution or rubber lubricant.

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Exploded View



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Exploded View

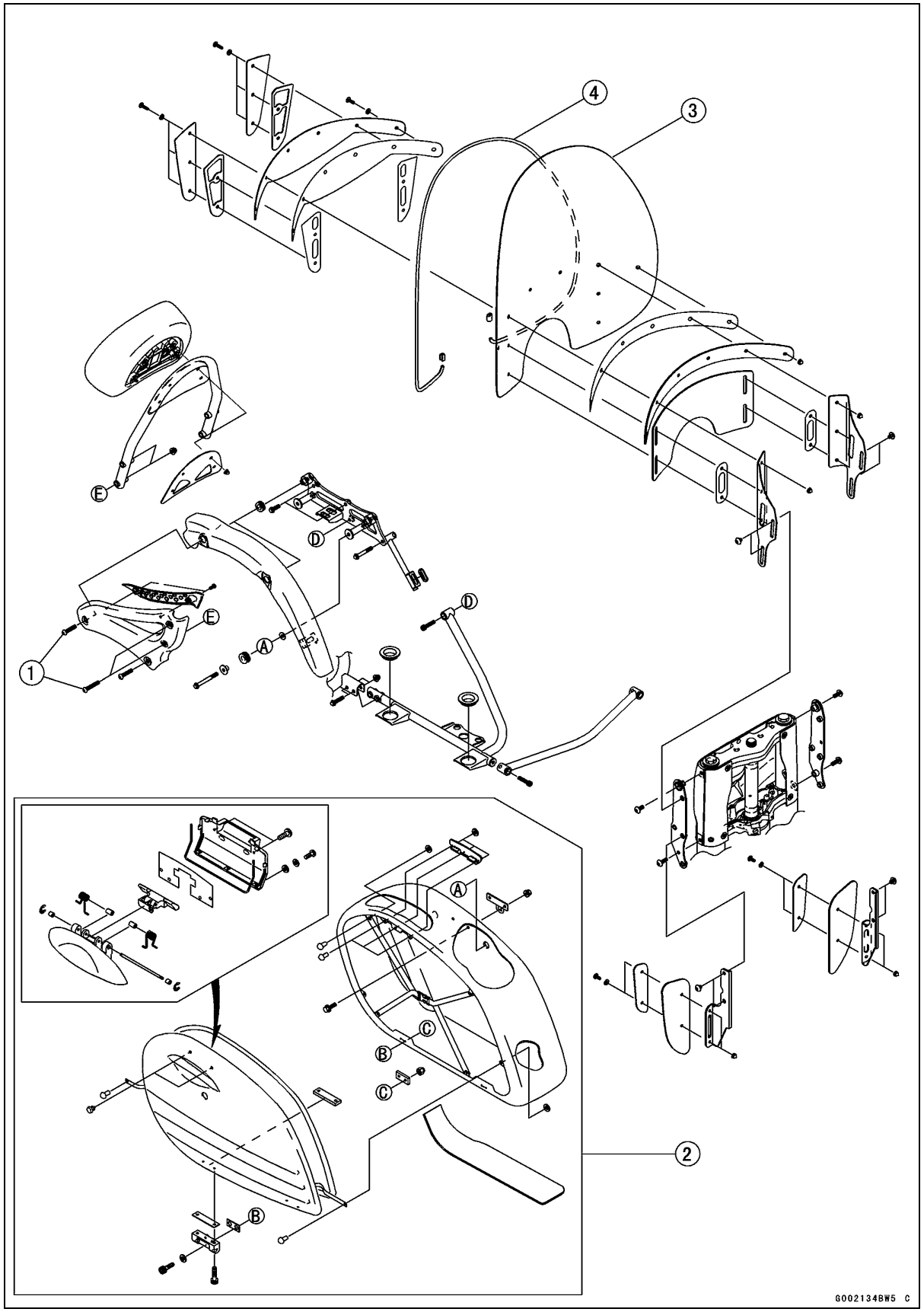
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Footboard Bracket Bolts	25	2.5	18	

2. Tool Box
3. Battery Case
4. Front Fender
5. Rear Fender
6. Front Seat
7. Rear Seat

G: Apply grease.

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Exploded View



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Exploded View

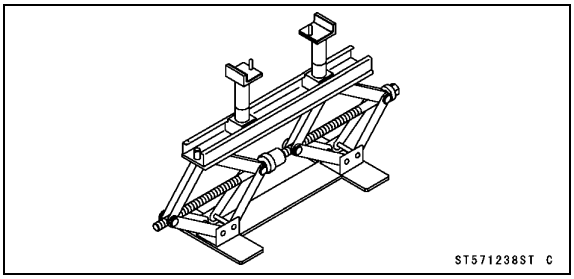
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Tandem Grip Mounting Bolts	25	2.5	18	

2. Saddlebags
3. Windshield
4. Trim (other than US, Canada and Australia)

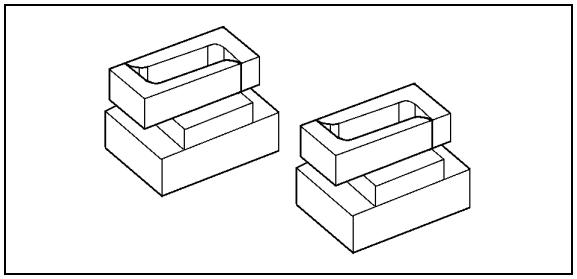
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Special Tools

Jack:
57001-1238



Attachment Jack:
57001-1398



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Seats

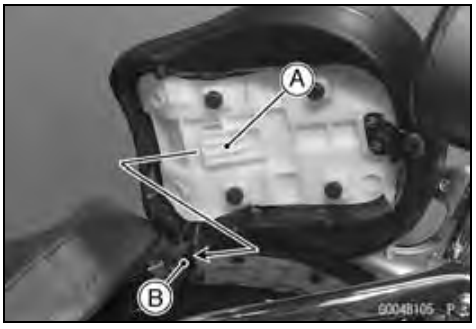
Rear Seat Removal

- Remove the rear seat bolt [A] and move the rear seat backwards [B] and remove it.



Rear Seat Installation

- Slip the hook [A] of the rear seat into the bracket [B] on the rear fender.
- Tighten the rear seat bolt.



Front Seat Removal

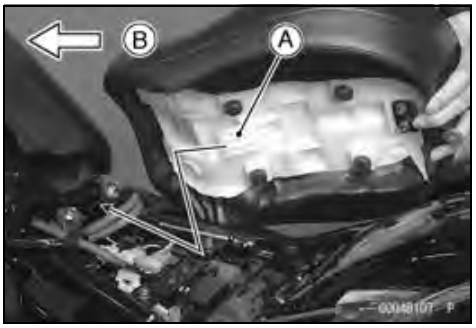
- Remove the rear seat (see Rear Seat Removal in this section).
- Remove the front seat bolt [A].
- Pull the front seat [B] backwards and up, then remove it.



Front Seat Installation

- Insert the hook [A] of the seat under the fuel tank bracket.
- Tighten the front seat bolt.
- Install the rear seat (see Rear Seat Installation in this section).

Front [B]



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Side Covers

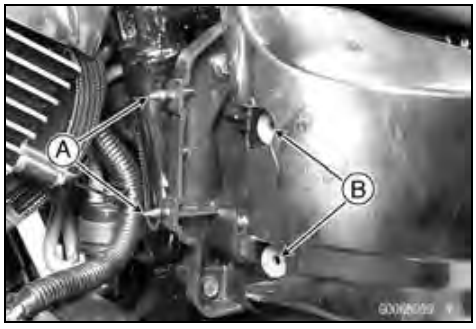
Left Side Cover Removal

- Insert the ignition switch key [A] into the left side cover, and turn the key clockwise until the key slot is vertical.
- Pull [B] the rear part of the left side cover, push [C] the left side cover slightly forward, and remove it.

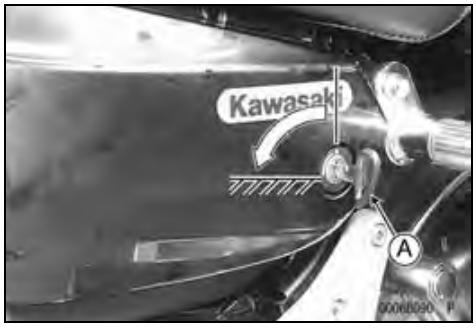


Left Side Cover Installation

- Put the front stoppers [A] into the grommets [B] first, then put the rear stopper into the grommet.



- Turn the ignition switch key [A] counterclockwise until the key slot is horizontal [B] to secure the left side cover.



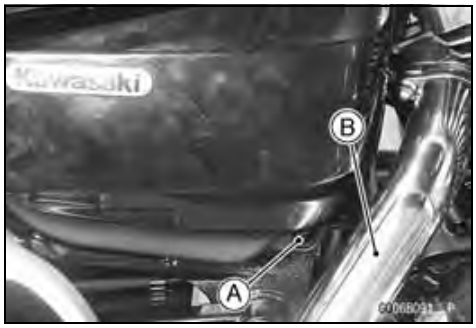
Right Side Cover Removal

- Remove the screw [A].

CAUTION

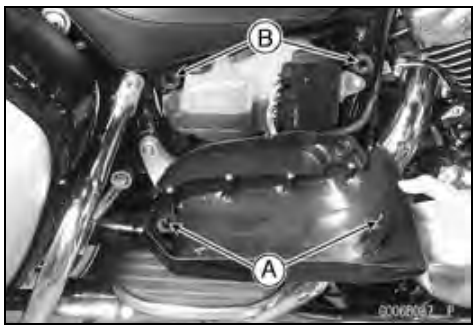
Be careful not to scratch the right side cover surface with the rear exhaust pipe [B] during removal or installation.

- Cover the rear exhaust pipe with a shop towel and pull the right side cover evenly outward to clear the stoppers.



Right Side Cover Installation

- Put the stoppers [A] into the grommets [B].
- Tighten the screw.



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Fenders

Front Fender Removal

CAUTION
Be careful not to scratch the painted surface during removal or installation.



- Remove the mounting bolts [A] on both sides to separate the fender from the front fork.
- Move the fender forwards with the wheel installed and remove it.

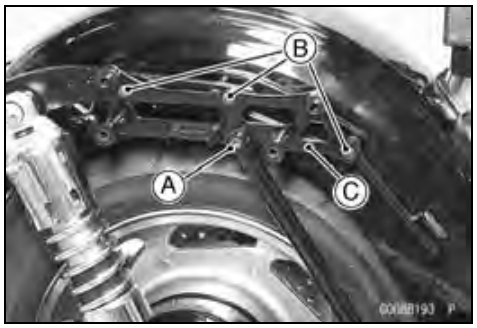
Rear Fender Removal

CAUTION
Be careful not to scratch the painted surface during removal or installation.

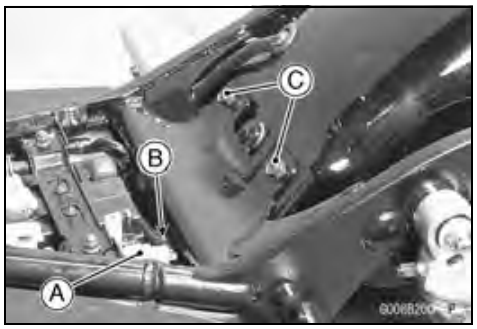


- Remove:
  Rear Seat (see Rear Seat Removal in this chapter)
  Front Seat (see Front Seat Removal in this chapter)
  Left and Right Saddlebags (see Saddlebag Removal in this chapter)
  Tandem Grip (see Tandem Grip Removal in this chapter)
- Remove the left and right rear fender covers [A].

- Remove:
  Allen Bolts [A] (Both Sides)
  Bolts [B] (Both Sides)
  Left and Right Saddlebag Stays (Upper) [C]



- Disconnect the rear turn signal and tail/brake lead connector [A] and pull off the female connector along with the strap [B].
- Remove the rear fender bolts [C].



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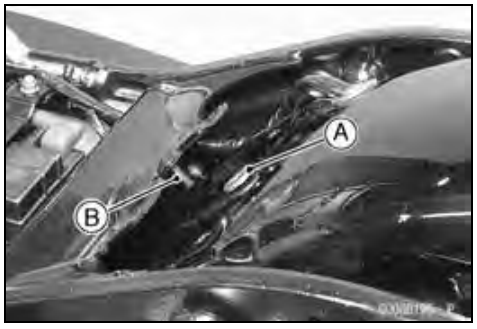
Fenders

- Remove the rear fender bolts [A] on both sides.
- Remove the rear fender [B] rearwards.



Rear Fender Installation

- Installation is reverse of removal, note the following.
  - ○Put the grommet [A] of the rear fender into the stopper [B] of the frame.
  - ○Be sure the harness in place (see Cable, Wire, and Hose Routing section in the Appendix chapter).



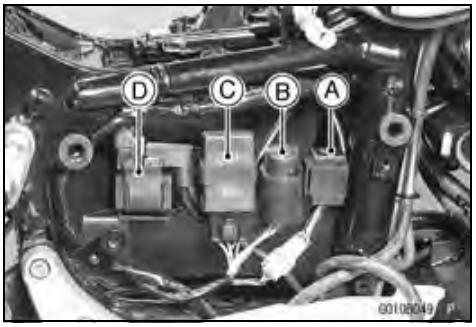
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Battery Case

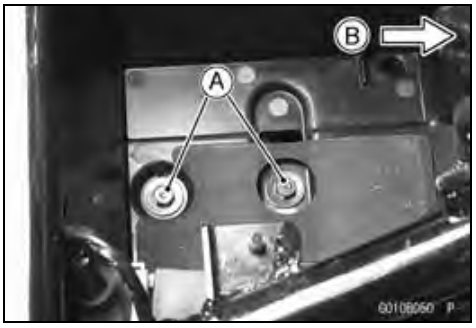
Battery Case Removal

● Remove:
Front Seat (see Front Seat Removal in this chapter)
Battery (see Battery Removal in the Electrical System chapter)
ECU (see ECU Removal in the Fuel System (DFI) chapter)
Rear Fender (see Rear Fender Removal in this chapter)
Coolant Reservoir Tank (see Coolant Change in the Periodic Maintenance chapter)

● Pull the following upwards:
Oil Pressure Light Delay Unit [A]
DFI Main Relay [B]
Turn Signal Control Unit [C]
Starter Relay [D]



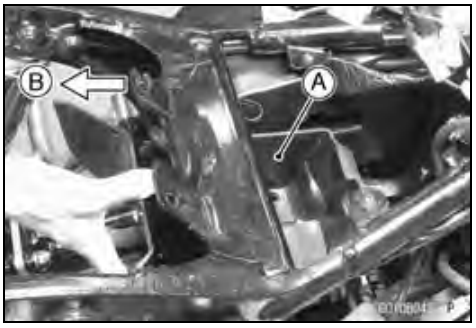
● Remove the bolts [A].
Front [B]



● Remove:
Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
Screws [A]
Rear View [B]



● Remove the battery case [A] towards the rear [B].

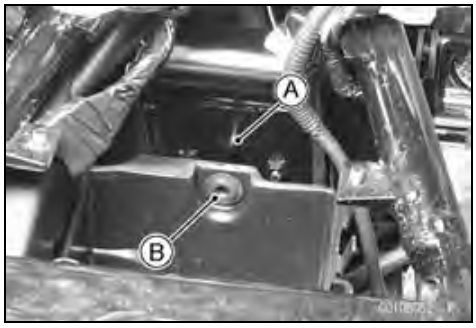


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Battery Case

Battery Case Installation

- Put the grommet [B] of the battery case into the stopper [A] of the frame.
- Install the removed parts (see appropriate chapters).

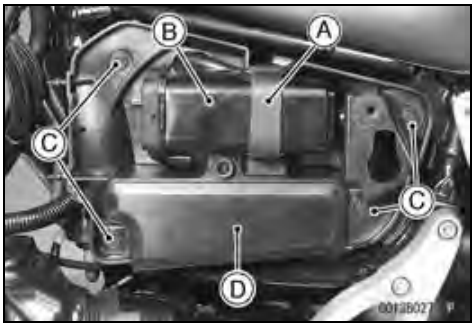


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Tool Box

Tool Box Removal

- Remove the left side cover (see Left Side Cover Removal in this chapter).
- For California model, remove the band [A] and canister [B].
- Unscrew the bolts [C].
- Pull the tool box [D] out.



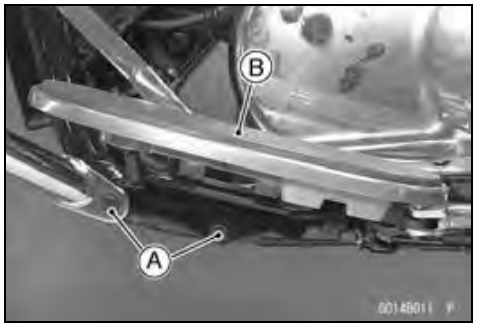
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Footboard

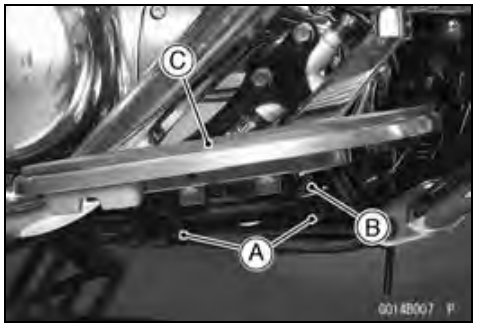
Front Footboard Removal/Installation

- Remove:
  Footboard Bracket Bolts [A]
  Left Front Footboard [B]
- Tighten:

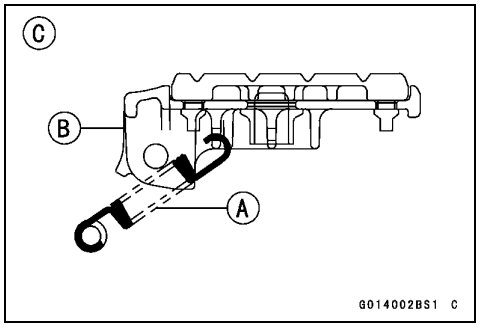
Torque - Front Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



- Remove:
  Footboard Bolts [A]
  Spring [B]
  Right Front Footboard [C]

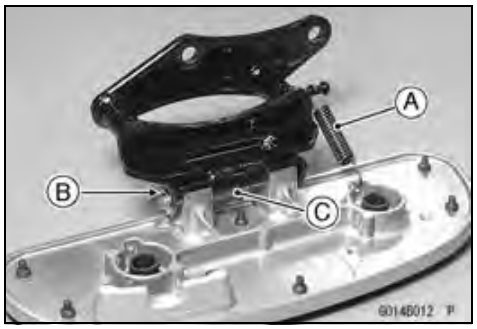


- Install the spring [A] as shown.
  Right Front Footboard [B]
  Rear View [C]

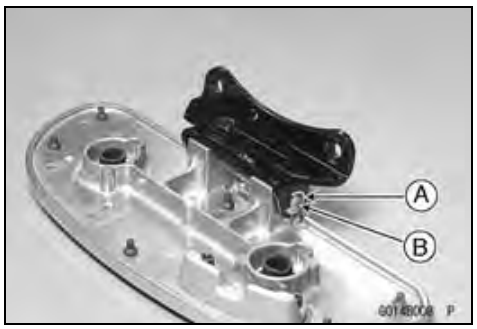


Front Footboard Disassembly

- Remove the left front footboard (see Front Footboard Removal/installation in this section).
- Remove:
  Spring [A]
  Circlip [B]
  Pin [C]



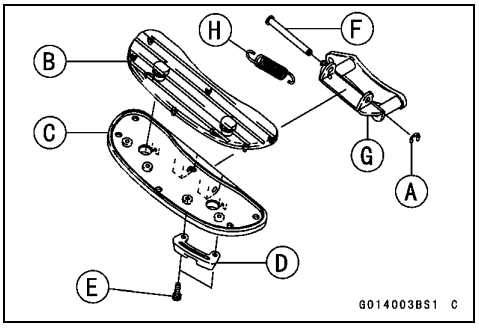
- Remove the right front footboard (see Front Footboard Removal/Installation in this section).
- Remove:
  Circlip [A]
  Pin [B]



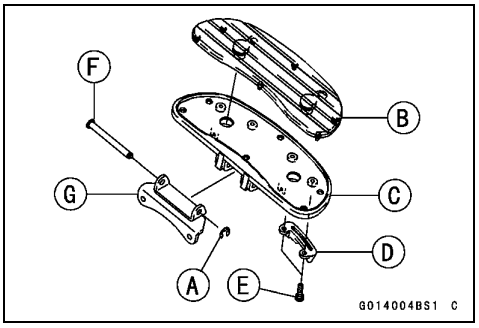
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Footboard

Front Footboard Assembly



- Replace the circlip [A] with a new one.
- Install:
  Left Front Footboard Damper [B]
  Left Front Footboard [C]
  Bank Sensor [D]
  Bank Sensor Bolts [E]
- Insert the pin [F] from the front side of the footboard bracket [G].
- Install the new circlip.
- Install the spring [H] hook direction as shown.



- Replace the circlip [A] with a new one.
- Install:
  Right Front Footboard Damper [B]
  Right Front Footboard [C]
  Bank Sensor [D]
  Bank Sensor Bolts [E]
- Insert the pin [F] from the front side of the footboard bracket [G].
- Install the new circlip.

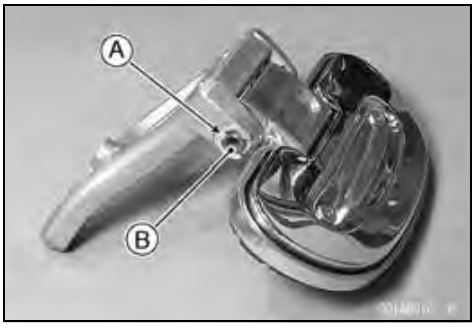
Rear Footboard Removal/Installation



- Remove:
  Allen Bolts [A]
  Rear Footboard [B]
- Tighten:

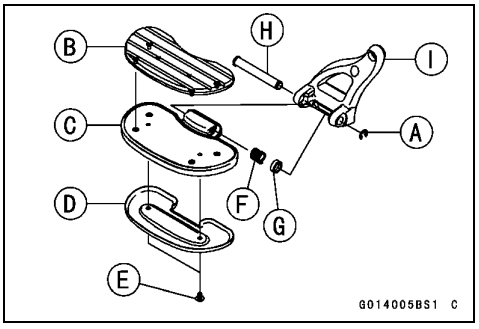
Torque - Rear Footboard Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Rear Footboard Disassembly



- Remove the rear footboard (see Rear Footboard Removal in this section).
- Remove:
  Circlip [A]
  Pin [B]

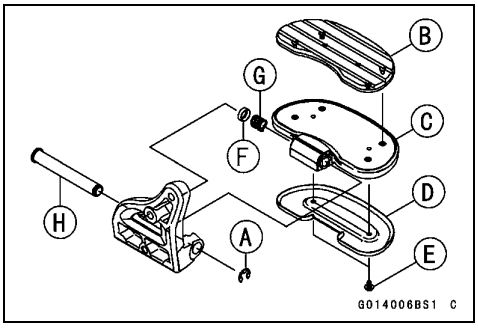
Rear Footboard Assembly



- Replace the circlip [A] with a new one.
- Install:
  Left Rear Footboard Damper [B]
  Left Rear Footboard [C]
  Left Rear Footboard Cover [D]
  Cover Bolt [E]
- Install the spring [F] and spring cap [G] from the rear side of the left rear footboard.
- Insert the pin [H] from the front side of the footboard bracket [I].
- Install the new circlip.

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Footboard



- Replace the circlip [A] with a new one.
- Install:
  Right Rear Footboard Damper [B]
  Right Rear Footboard [C]
  Right Rear Footboard Cover [D]
  Footboard Cover [D]
  Cover Bolt [E]
- Install the spring [G] and spring cap [F] from the front side of the right rear footboard.
- Insert the pin [H] from the front side of the right front footboard.
- Install the new circlip.

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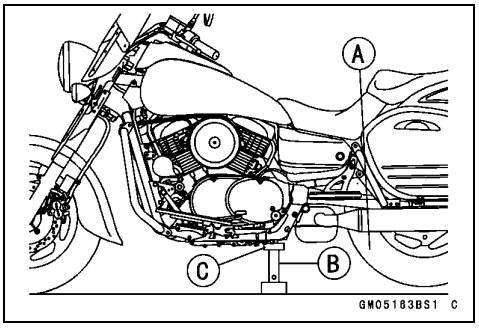
Side Stand

Side Stand Removal

- Raise the rear wheel [A] off the ground, using the jack [B] and the attachment jack [C].

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

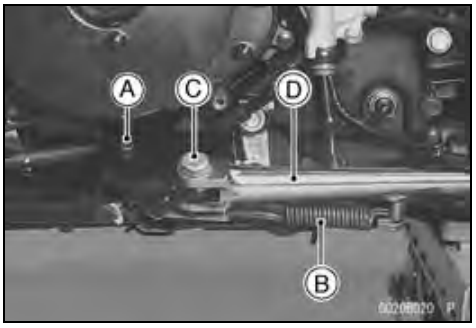
- Remove the alternator outer cover (see Alternator Outer Cover Removal in the Electrical System chapter).



- Disconnect the side stand switch lead connector [A].



- Remove:
  Side Stand Switch Bolt [A]
  Spring [B]
  Side Stand Bolt [C]
  Side Stand [D]



Side Stand Installation

- Apply grease to the contact surface of the frame and side stand.
- Install:
  Side Stand [A]
  Side Stand Mounting Bolt [B] and Nut [C]
- Tighten the bolt and lock them with the nut.

Torque - Side Stand Mounting Nut: 44 N·m (4.5 kgf·m, 33 ft·lb)

- Hook the spring [D] so that face the long spring end upward.

○Install the spring hook direction as shown.

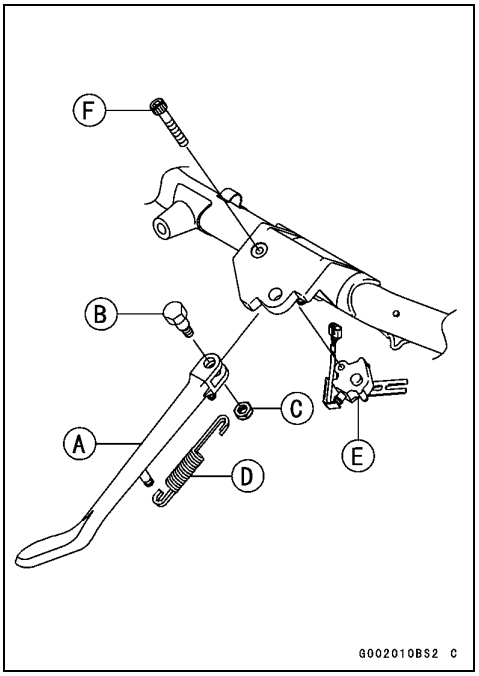
- Install the side stand switch.

○Apply a non-permanent locking agent to the side stand switch mounting bolt [F].

- Tighten:

Torque - Side Stand Switch Mounting Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

- Check that the side stand switch mounting bolt and nut is not loosening.
- Run the side stand switch lead correctly (see Cable, Wire, and Hose Routing section in Appendix chapter).
- Install the alternator outer cover (see Alternator Outer Cover Installation in the Electrical chapter).



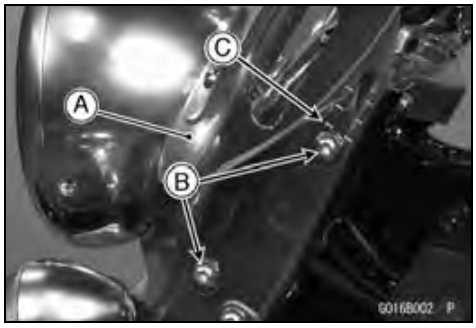
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Windshield

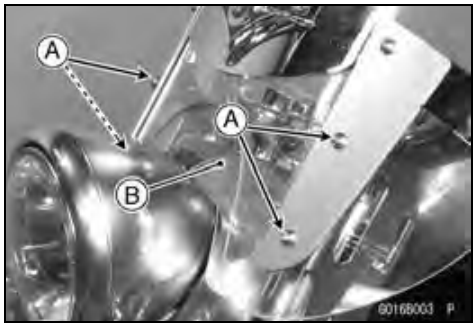
Windshield Height Adjustment

○The windshield [A] can be adjusted within 45 mm (1.8 in.) in height (The sliding range is within 50 mm, 2.0 in.) to suit the rider's preference.

- Loosen the upper and lower bolts [B] on both sides and slide the windshield up or down.
- Check to see that the position marks [C] are in the same relative position on both sides.
- Tighten the bolts securely.



- Loosen the subwindshield bolts [A] on both sides and slide the subwindshield [B] up or down so the clearance [C] is 10 mm (0.4 in.) between the subwindshield lower edge and the headlight body.
- Tighten the subwindshield bolts.

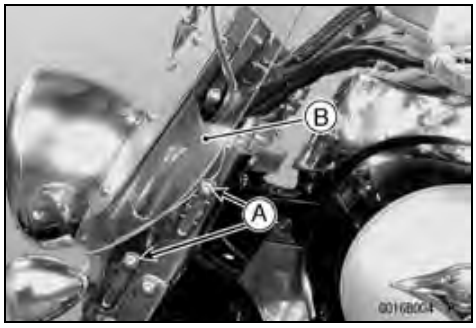


Windshield Removal

CAUTION

Be careful not to damage the surface of the windshield.

- Remove the upper and lower bolts [A] on both sides and remove the windshield [B].



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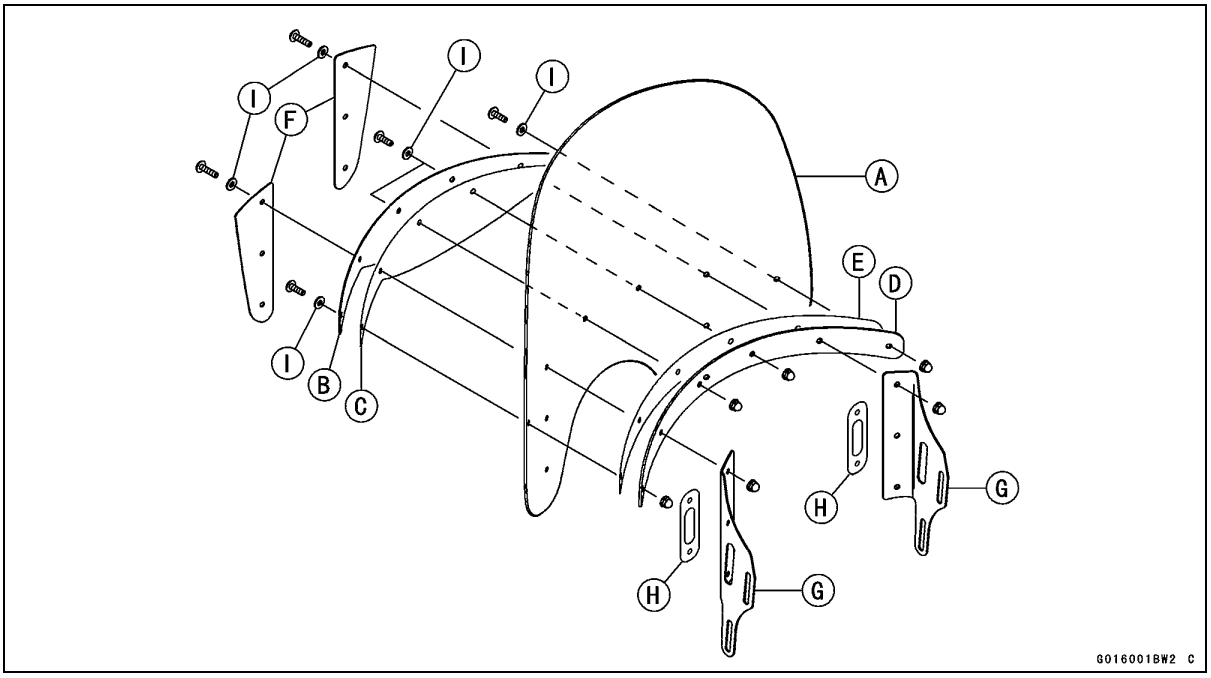
Windshield

Windshield Assembly/Installation

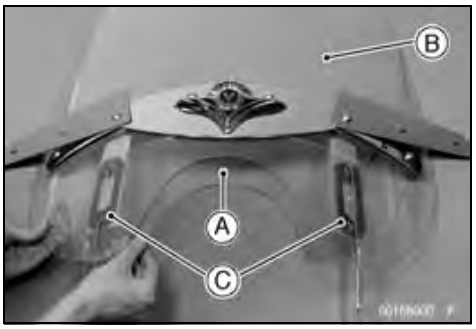
CAUTION
Be careful not to damage the surface of the windshield.

- Install the following with the bolts and nuts to the windshield [A].
  Outer Center Plate [B] and Damper [C]
  Inner Center Plate [D] and Damper [E]
  Left and Right Outer Plates [F]
  Left and Right Stays [G] and Dampers [H]
  Washers [I]

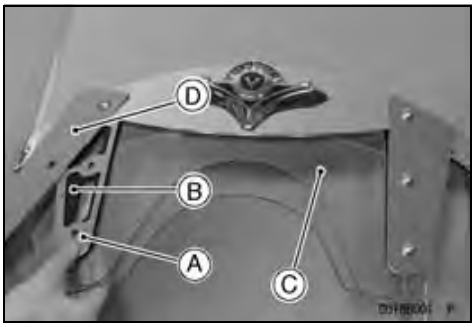
○The left outer plate has an **L** mark on its back and the right outer plate an **R** mark (front view).



- Insert the subwindshield [A] between the windshield [B] and the dampers [C].



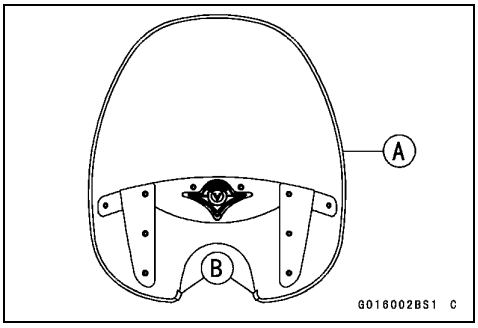
- Install the left and right inner plates [A] and dampers [B] between the windshield [C] and left and right outer plates [D].
- First, tighten all the bolts and nuts to a snug fit and finally tighten them evenly.
- Pull the subwindshield all the way up.



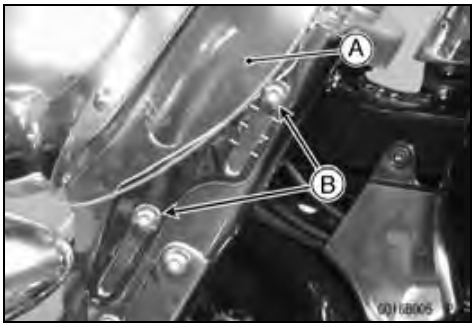
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Windshield

- For the European Model, install the trim [A] to around the windshield.
- Install the trim caps [B] to the end of the trim.

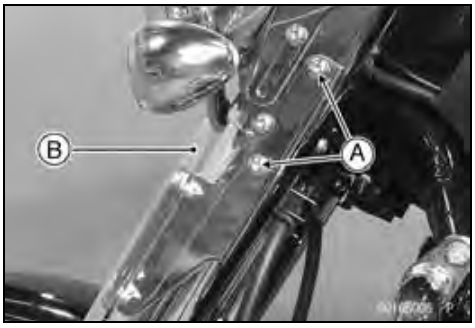


- Install the windshield [A] on the brackets with the bolts.
- Set the windshield all the way down and tighten the bolts [B] securely.



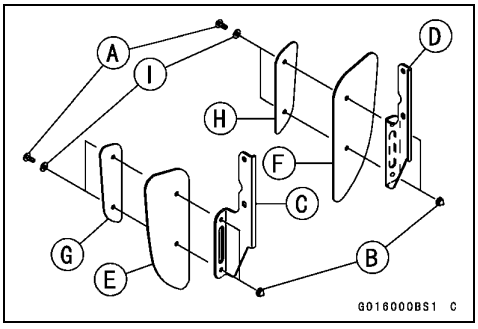
Deflector Removal

- Remove:
  Bolts [A]
  Deflector [B]



Deflector Assembly

- Assemble the following with the bolts [A] and nuts [B].
  Left Stay [C]
  Right Stay [D]
  Left [E] and Right [F] Deflectors
  Left Deflector Bracket [G]
  Right Deflector Bracket [H]
  Washers [I]

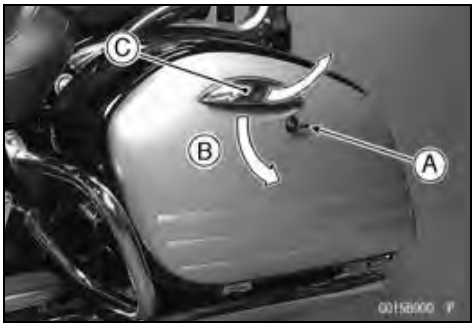


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Travel Trunk and Saddlebags

Lid Unlatching

- Insert the ignition key into the lid lock [A], turn the key counterclockwise [B], and pull the knob [C] outward. The lid will open.



Lid Latching

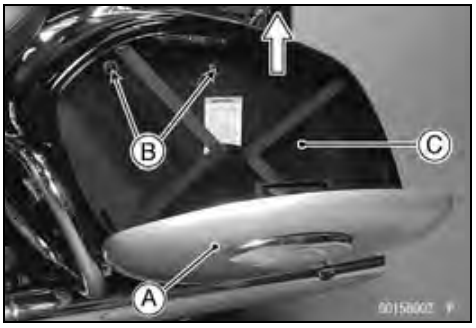
- While pulling the knob [A] up, close the lid [B], release the knob, and then turn the key clockwise [C].
- Pull the knob to make sure the lid is locked.

CAUTION
Do not slam the lid shut. Otherwise the lid will not latch and could damage.



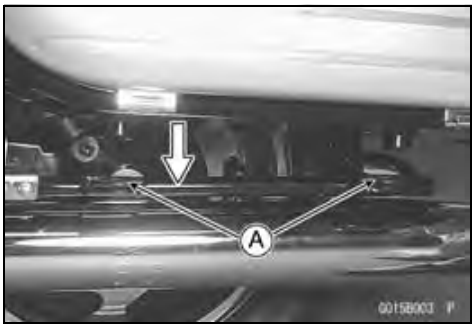
Saddlebag Removal

- Open the lid [A] (see Lid Unlatching in this section).
- Unscrew the bolts [B].
- Close the lid (see Lid Latching in this section).
- Lift the saddlebag [C] to clear the bottom stoppers, and remove the bag.



Saddlebag Installation

- Fit the stoppers on the bottom of the saddlebag into the dampers [A] in the saddlebag stay (lower).



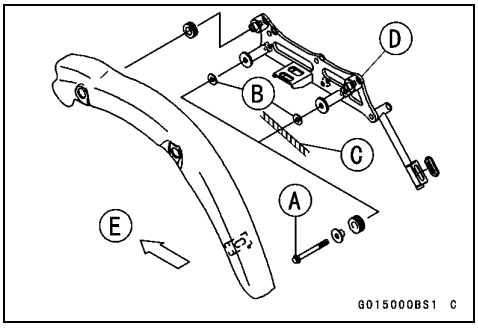
- Fit the hook [A] behind the bag [B] into the catch [C] on the saddlebag stay (upper) [D]. At this point, the bag is free to move on the mounts.



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Travel Trunk and Saddlebags

- Open the lid (see Lid Unlatching in this section) and tighten the bag bolts [A].
  Washer(s) [B]
  Saddlebag [C]
  Saddlebag Stay (upper) [D]
  Front [E]
- Close the lid (see Lid Latching in this section).



★If the lid does not work properly, adjust the bag clearance to mount the bag snugly without being distorted.

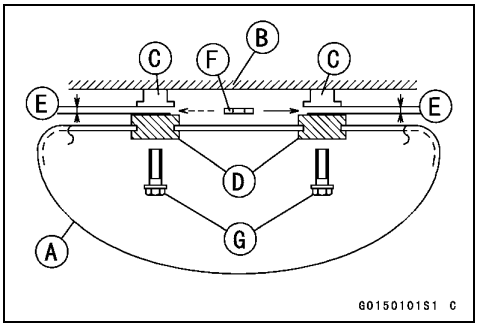
- Remove the bag bolts [G].
- Lightly push the bag [A] towards the upper stay [B] and measure each bag clearance [E] between the boss [C] and damper [D] with a thickness gauge.

★If both clearances are **1.0 mm (0.04 in.) or less** (standard clearance), the bag can be mounted snugly and the lid may be locked.

★If either clearance is **more than 1.0 mm (0.04 in.)** when the other clearance is 0 mm, insert the washer(s) [F] as shown to get the standard clearance.

- Install the bag and bag bolts and tighten the bolts securely.
- Open and close the lid several times to check for smooth operation. Be sure the lid latches and locks securely.

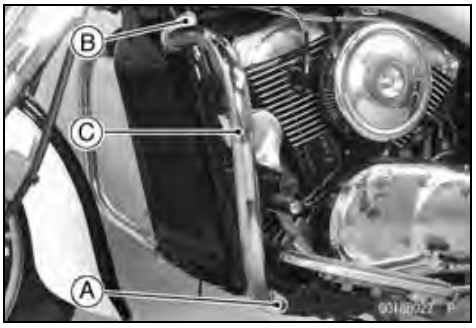
★If the lid does not work properly, remove the bag bolts and readjust the clearance.



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Guards

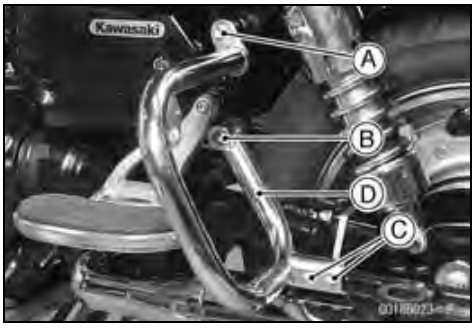
Front Guard Removal/Installation



- Remove:
  - Front Footboard Bracket Bolt [A]
  - Front Guard Bolt [B]
  - Front Guard [C]
- Tighten:

Torque - Front Footboard Bracket Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

Rear Guard Removal



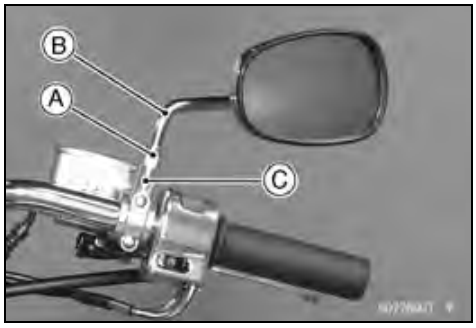
- Remove:
  - Saddlebag (see Saddlebag Removal in this chapter)
  - Rear Guard Bolt (Upper) [A]
  - Rear Guard Bolt Cap and Bolt (Middle) [B]
  - Rear Guard Bolts (Lower) [C]
  - Rear Guard [D]

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Rear View Mirrors

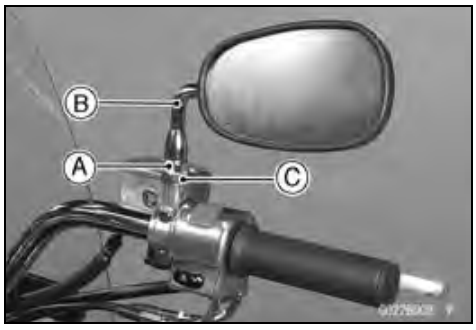
Rear View Mirror Removal (Other than European Model)

- Loosen the locknut [A].
- Turn the rear view mirror stay [B] counterclockwise to remove the rear view mirror from the holder [C].



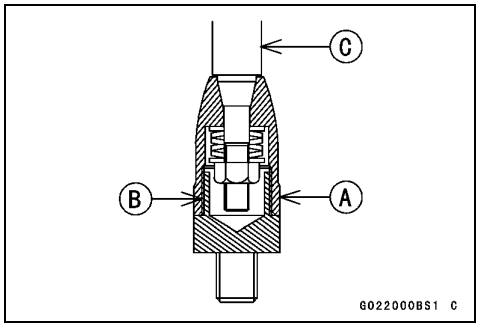
Rear View Mirror Removal (European Model)

- Loosen the lower hexagonal area [A].
- Turn the rear view mirror stay [B] counterclockwise to remove the rear view mirror from the holder [C].



CAUTION

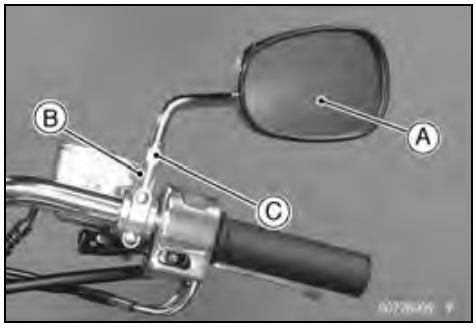
Do not force to tighten and/or loosen the upper hexagonal area (adapter) [A] with a pair of spanners or wrench. Disassembly of this area is not possible. Non-permanent locking agent [B] is already applied to the threads of this inner area. Forcible loosening may damage the adapter and/or the turning mechanism of the stay [C].



Rear View Mirror Installation (Other than European Model)

- Loosen the locknut all the way up.
- Screw the mounting area of the rear view mirror [A] into the holder [B] all the way, then back it two turns out.
- Turn the stay to assure visibility to the rear with the rider sitting on the motorcycle, and tighten the locknut [C] securely.
- Adjust the rear view mirror by slightly moving only the mirror portion of the assembly.

○Installation and adjustment of the left side are common with the those of right side. Follow the procedure specified at the right side.

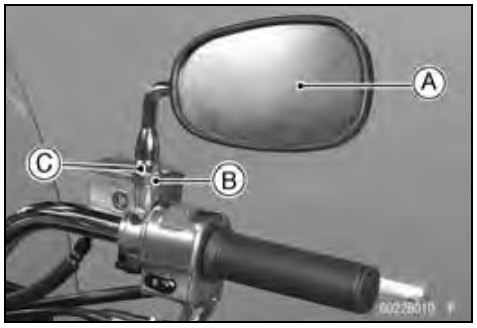


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Rear View Mirrors

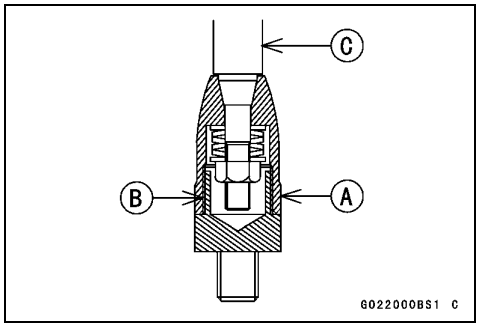
Rear View Mirror Installation (European Model)

- Screw the mounting area of the rear view mirror [A] into the holder [B] all the way, and tighten the lower hexagonal area [C] securely.



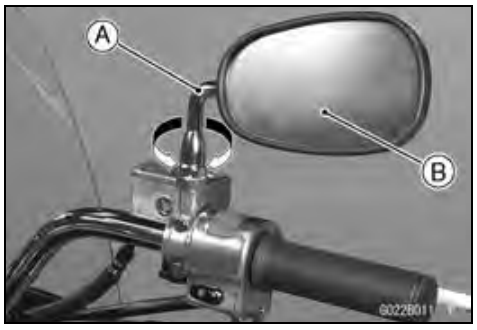
CAUTION

Do not force to tighten and/or loosen the upper hexagonal area (adapter) [A] with a pair of spanners or wrench. Disassembly of this area is not possible. Non-permanent locking agent [B] is already applied to the threads of this inner area. Forcible loosening may damage the adapter and/or the turning mechanism of the stay [C].



- Turn the stay [A] to assure visibility to the rear with the rider sitting on the motorcycle.
- Adjust the rear view mirror [B] by slightly moving only the mirror portion of the assembly.

○Installation and adjustment of the left side are common with the those of right side. Follow the procedure specified at the right side.



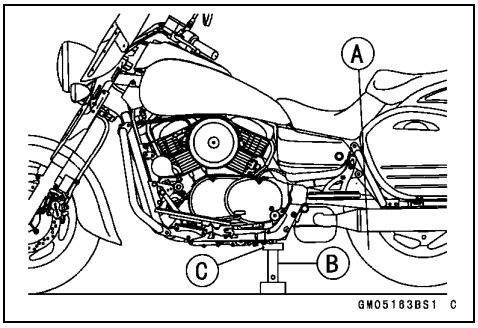
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Downtube

Downtube Removal

- Raise the rear wheel [A] off the ground, using the jack [B], and the attachment jack [C]

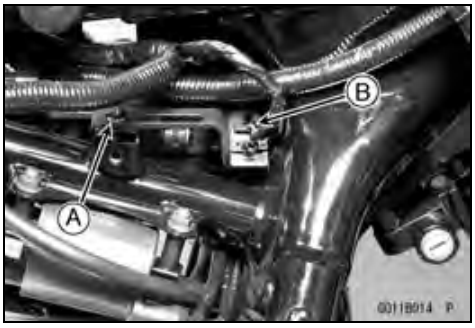
Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398



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



- Remove:
  Nut [A]
  Rear Brake Light Switch Connector [B]



- Remove the front exhaust pipe (see Exhaust Pipe Removal in the Engine Top End chapter).
- Pry the plastic clamps [A].



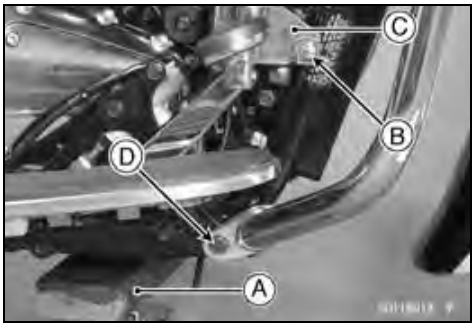
- Remove the regulator/rectifier bracket bolt [A].



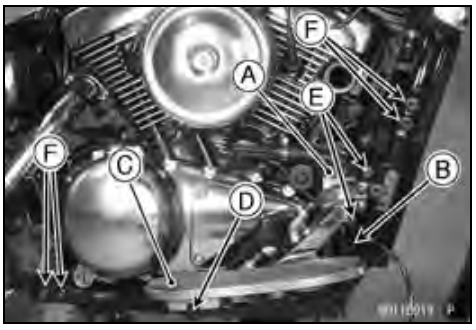
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Downtube

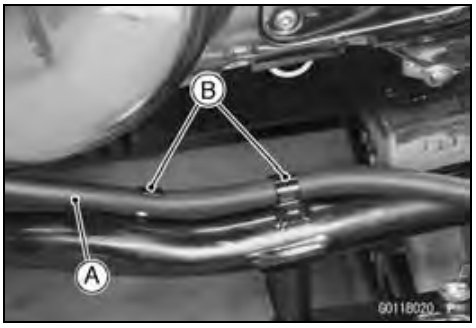
- Supper the engine with a commercially available stand [A].
- Remove:
  Bolt [B]
  Rear Brake Reservoir Cover [C]
  Right Front Footboard Bracket Bolt [D]



- Remove the rear brake reservoir [A].
- Pry the plastic clamp [B].
- Remove the right front footboard [C] by taking off the bolt [D] with brake pedal and rear master cylinder installed.
- Remove:
  Engine Mounting Bracket Bolts [E]
  Downtube Bolt Caps and Bolts [F]



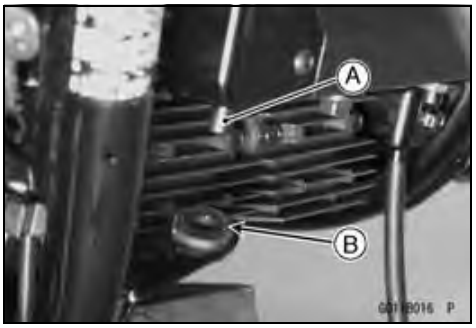
- Take off the brake hose [A] from the clamps [B].



Downtube Installation

- Run the brake hose inside the downtube and clamp it.
- Put left and right stoppers [A] of the radiator into the grommets [B] of the downtube.
- Tighten:

Torque - Downtube Bolts: 59 N·m (6.0 kgf·m, 44 ft·lb)
Engine Mounting Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



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Frame

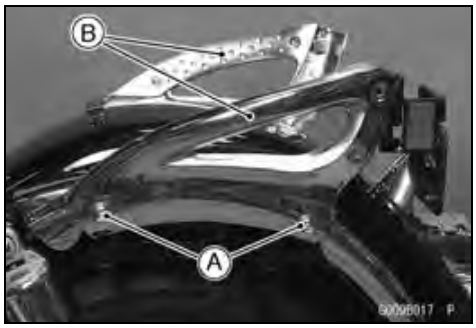
Tandem Grip Removal/Installation

- Remove the left and right saddlebags (see Saddlebag Removal in this chapter).
- Remove:
  Bolts [A] (Both Sides)
  Back Rest [B]



- Remove:
  Tandem Grip Mounting Bolts [A] (Both Sides)
  Left and Right Tandem Grips [B]
- Tighten:

Torque - Tandem Grip Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



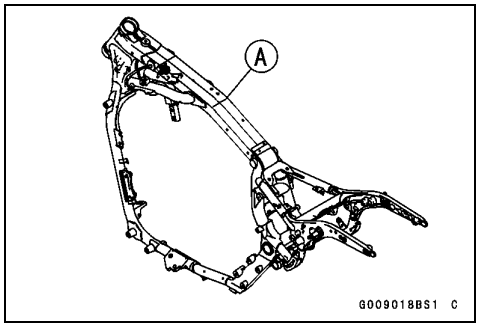
Frame Inspection

- Visually inspect the frame [A] 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.



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Electrical System

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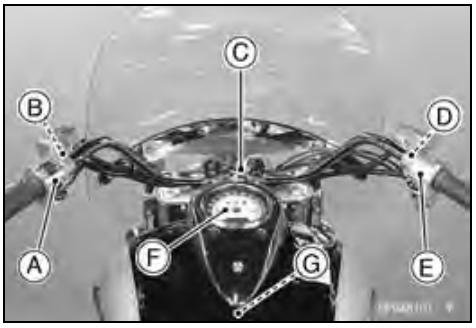
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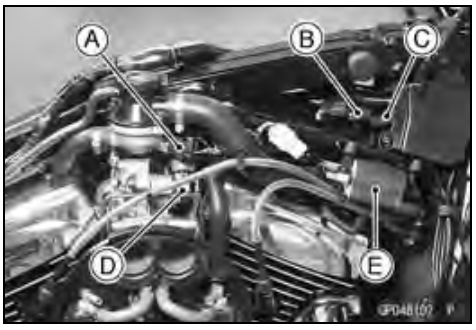
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Electrical Parts Location

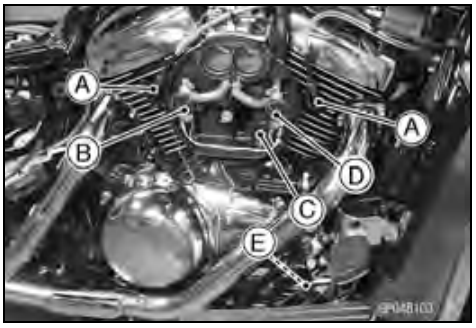
Left Handlebar Switches [A]
Starter Lockout Switch [B]
Ignition Switch [C]
Front Brake Light Switch [D]
Right Handlebar Switches [E]
Meter Unit [F]
Fuel Pump with Fuel Reserve Switch [G]



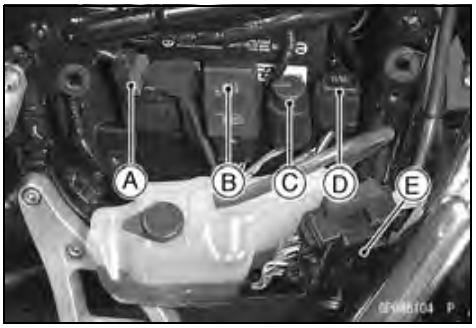
Water Temperature Sensor [A]
Inlet Air Pressure Sensor [B]
Vehicle-down Sensor [C]
Throttle Sensor [D]
Ignition Coil #2 [E]



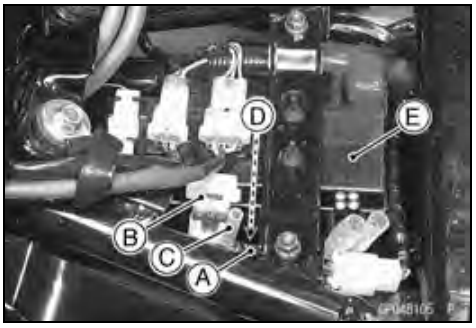
Spark Plugs [A]
ISC Valve #2 (for Rear Cylinder) [B]
Inlet Air Temperature Sensor [C]
ISC Valve #1 (for Front Cylinder) [D]
Rear Brake Light Switch [E]



Starter Relay and Maine Fuse 30 A [A]
Turn Signal Control Relay [B]
DFI Maine Relay [C]
Oil Pressure Light Delay Unit [D]
Junction Box [E]



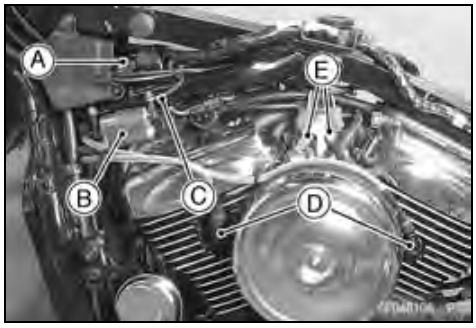
Diode [A] (in main harness)
DFI Fuse 15 A [B]
Self-diagnosis Terminal [C]
ECU (Electronic Control Unit) [D]
Battery [E]



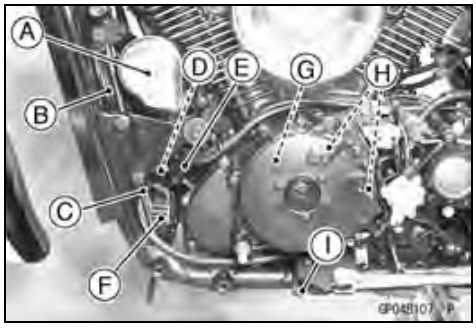
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Electrical Parts Location

Atmospheric Pressure Sensor [A]
Ignition Coil #1 [B]
Frame Ground Terminal [C]
Spark Plugs [D]
Injectors [E]



Horn [A]
Radiator Fan [B]
Water Temperature Switch [C]
Radiator Fan Switch [D]
Starter Motor [E]
Regulator/Rectifiers [F]
Alternator [G]
Crankshaft Sensors [H]
Side stand Switch [I]



Speed Sensor [A]
Engine Ground Terminal [B]
Neutral Switch [C]
Oil Pressure Switch [D]



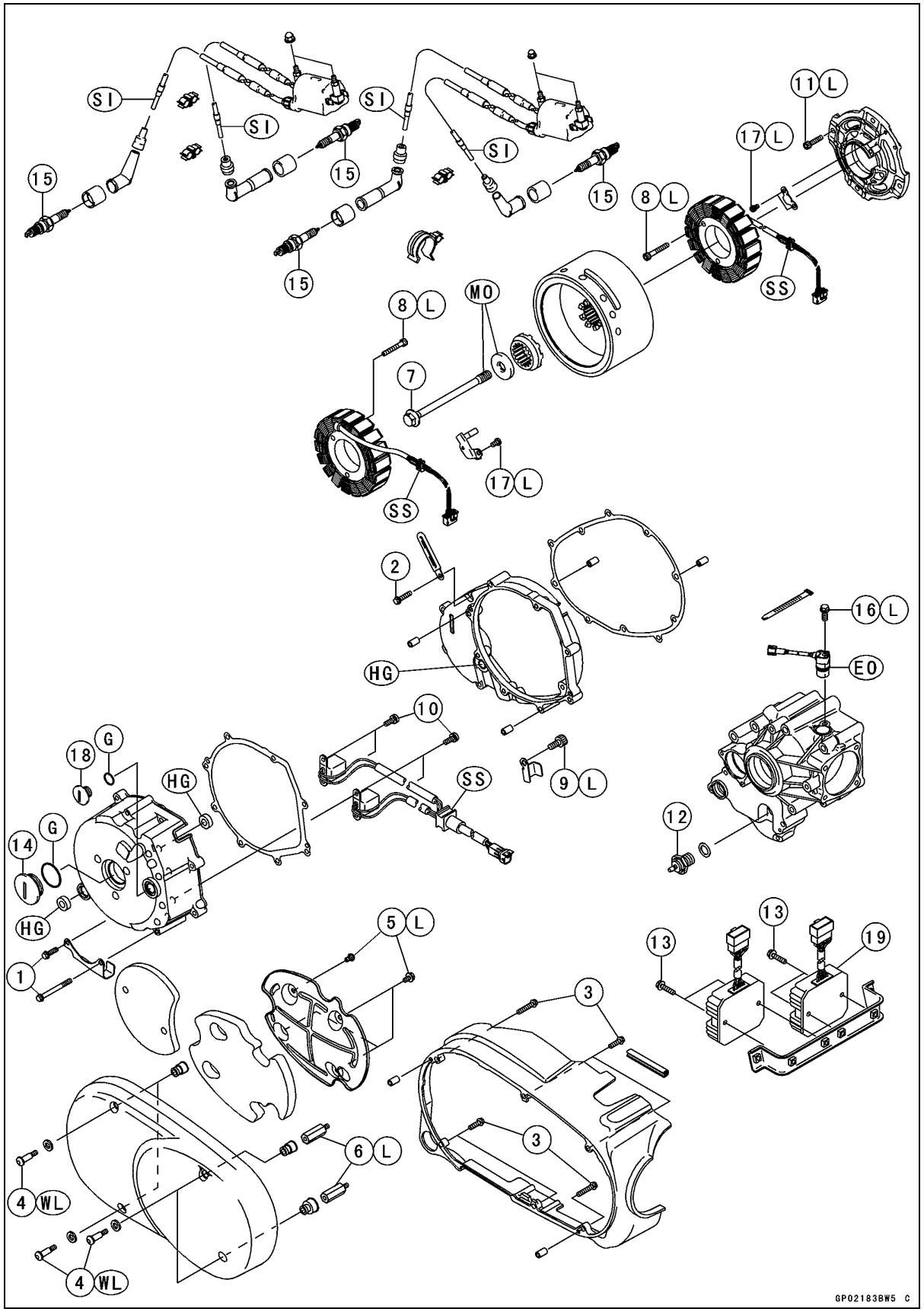
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Electrical Parts Location

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Exploded View



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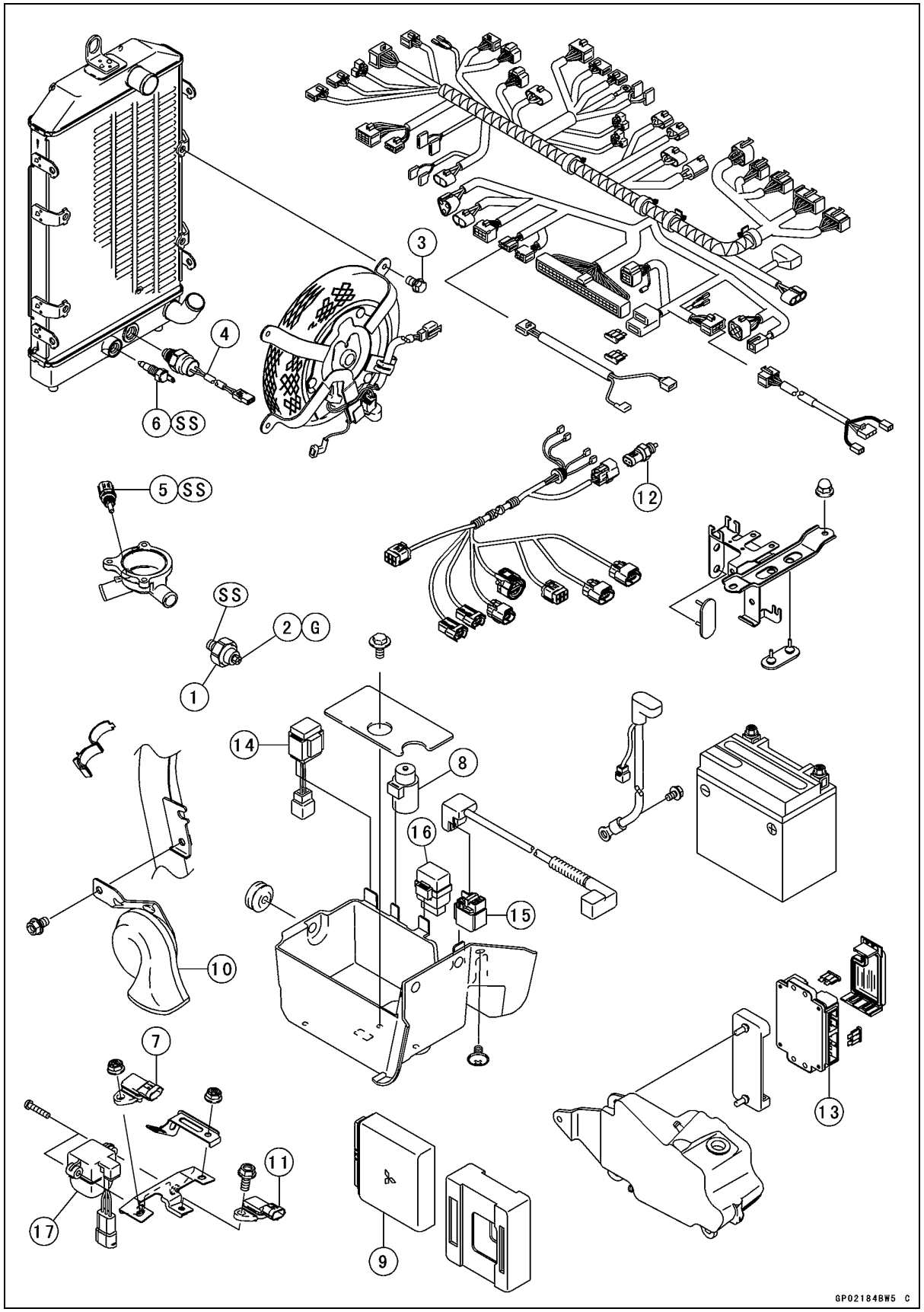
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Alternator Cover Bolts	11	1.1	97 in·lb	
2	Alternator Inner Cover Bolts	11	1.1	97 in·lb	
3	Alternator Outer Cover Assembly Bolts	6.9	0.70	61 in·lb	
4	Alternator Outer Cover Bolts	6.9	0.70	61 in·lb	WL
5	Alternator Outer Cover Damper Bolts	6.9	0.70	61 in·lb	L
6	Alternator Outer Cover Joint Bolts	6.9	0.70	61 in·lb	L
7	Alternator Rotor Bolt	78	8.0	58	MO
8	Alternator Stator Bolts	13	1.3	115 in·lb	L
9	Crankshaft Sensor Lead Holder Bolt	2.9	0.30	26 in·lb	L
10	Crankshaft Sensor Screws	2.9	0.30	26 in·lb	
11	Inside Stator Holder Bolts	11	1.1	97 in·lb	L
12	Neutral Switch	15	1.5	11	
13	Regulator/Rectifier Bolts	6.5	0.66	57 in·lb	
14	Rotor Bolt Cap	1.5	0.15	13 in·lb	
15	Spark Plugs	18	1.8	13	
16	Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L
17	Stator Lead Holder Screw	11	1.1	97 in·lb	L
18	Timing Inspection Cap	1.5	0.15	13 in·lb	

19. Regulator/Rectifier
EO: Apply engine oil.
HG: Apply high temperature grease.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil solution to the threads.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)
SI: Apply silicone grease.
SS: Apply silicone sealant (Kawasaki Bond: 92104-0004).
WL: Apply a soap and water solution or rubber lubricant.

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Exploded View



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Exploded View

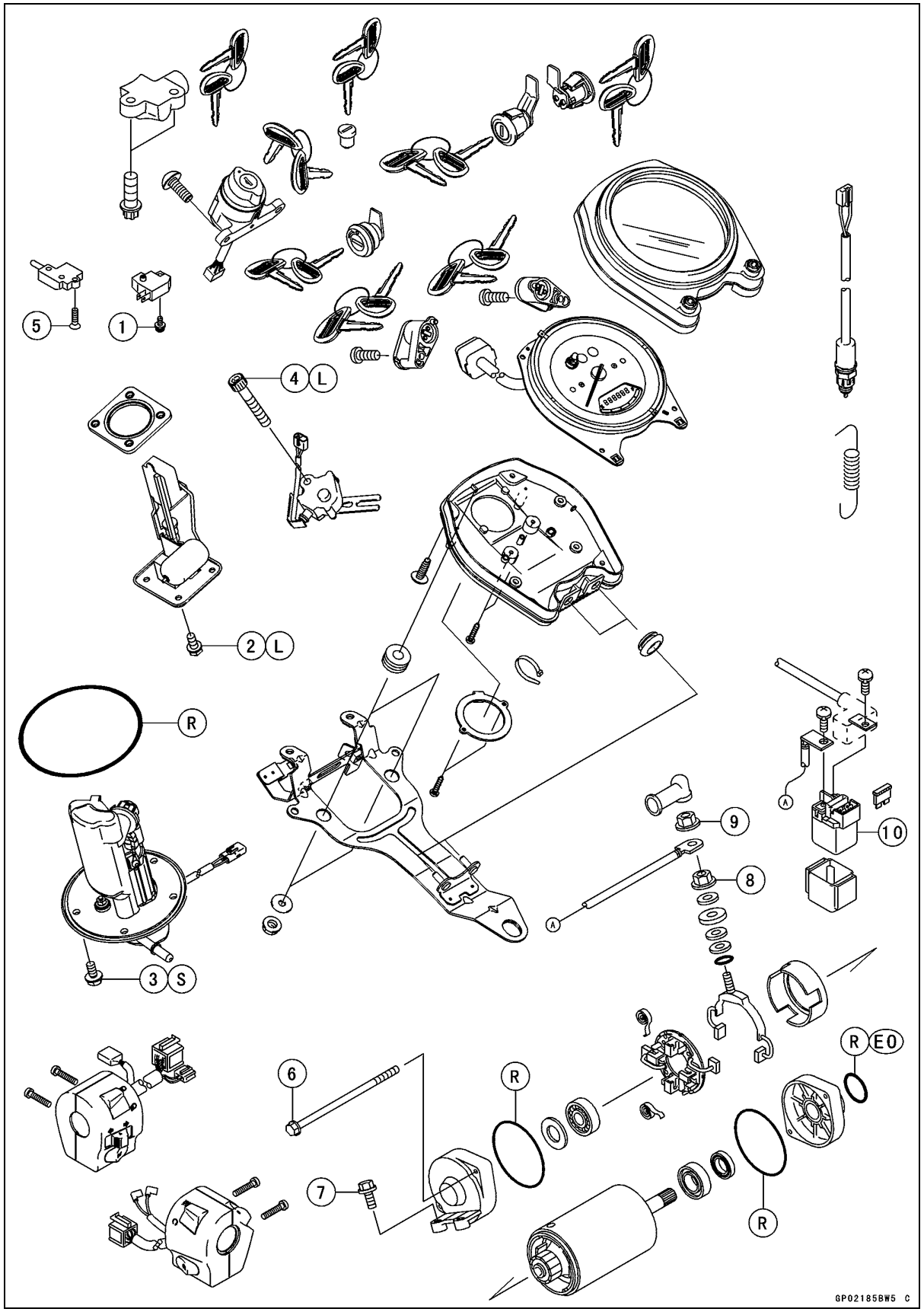
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Pressure Switch	15	1.5	11	SS
2	Oil Pressure Switch Terminal Screw	1.5	0.15	13 in·lb	G
3	Radiator Fan Bolts	8.3	0.85	73 in·lb	
4	Radiator Fan Switch	18	1.8	13	
5	Water Temperature Sensor	18	1.8	13	SS
6	Water Temperature Switch	7.8	0.80	69 in·lb	SS

7. Atmospheric Pressure Sensor
8. DFI Main Relay
9. ECU (Electronic Control Unit)
10. Horn
11. Inlet Air Pressure Sensor
12. Inlet Air Temperature Sensor
13. Junction Box
14. Oil Pressure Light Delay Unit
15. Starter Relay
16. Turn Signal Control Relay
17. Vehicle-Down Sensor

G: Apply grease
SS: Apply Silicone Sealant (Kawasaki Bond: 56019-120).

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Exploded View



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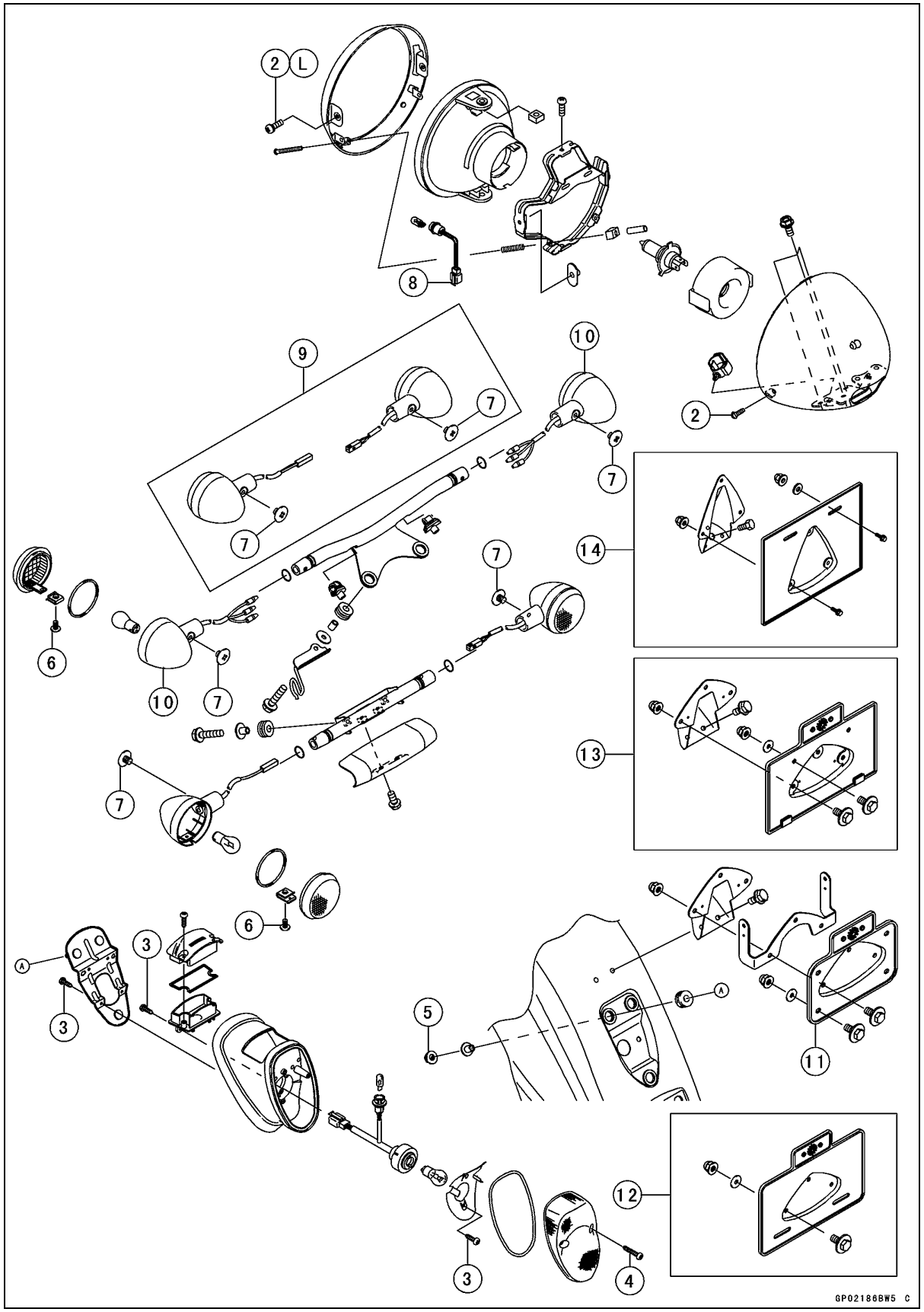
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
2	Fuel Level Sensor Mounting Bolts	6.9	0.70	61 in·lb	L
3	Fuel Pump Mounting Bolts	9.8	1.0	87 in·lb	S
4	Side Stand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
5	Starter Lockout Switch Screw	1.2	0.12	11 in·lb	
6	Starter Motor Assembly Bolts	4.9	0.50	43 in·lb	
7	Starter Motor Mounting Bolts	11	1.1	97 in·lb	
8	Starter Motor Terminal Locknut	11	1.1	97 in·lb	
9	Starter Motor Terminal Nut	4.9	0.50	43 in·lb	

10. Starter Relay
EO: Apply engine oil.
L: Apply a non-permanent locking agent.
S: Follow the specific tightening sequence.
R: Replacement Parts

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Headlight Rim Screws	2.9	0.30	26 in·lb	
2	Headlight Unit Bracket Screws	1.0	0.10	8.9 in·lb	L
3	Tail/Brake Light Assembly Screws	1.2	0.12	11 in·lb	
4	Tail/Brake Light Lens Screws	1.2	0.12	11 in·lb	
5	Tail/Brake Light Mounting Nuts	5.9	0.60	52 in·lb	
6	Turn Signal Light Lens Screws	1.0	0.10	8.9 in·lb	
7	Turn Signal Light Mounting Screws	6.9	0.70	61 in·lb	

8. City Light (Other than US, Canada and Australia Models)
9. Other than US and Canada Models
10. US and Canada Models
11. US Model
12. Canada Model
13. Australia Model
14. Other than US, Canada and Australia Models

L: Apply a non-permanent locking agent.

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Specifications

Item	Standard
Battery	
Type	Sealed Battery
Model Name	FTZ16-BS
Capacity	12 V 18 Ah
Voltage	12.6 V or more
Charging System	
Alternator Type	Three-phase AC with delta connection, and rare-earth single magnet rotor
Battery Charging Voltage	14.2 ~ 15.2 V @3 000 r/min (rpm)
Alternator Output Voltage (No Load)	60 ~ 90 V @3 000 r/min (rpm)
Stator Coil (Battery Charging Coil) Resistance	0.33 ~ 0.49 Ω
Regulator/Rectifier:	
Type	Load dumping regulator with full-wave rectifier
Resistance	in the text
Ignition System	
Ignition Coil:	
3 Needle Arcing Distance	6 mm (0.2 in.) or more
Primary Winding Resistance	1.9 ~ 2.9 Ω
Secondary Winding Resistance	18 ~ 28 kΩ
Primary Peak Voltage:	
Front	208 V or more
Rear	192 V or more
Spark Plug:	
Spark Plug Gap	0.8 ~ 0.9 mm (0.03 ~ 0.04 in.)
Spark Plug Cap Resistance	3.75 ~ 6.25 kΩ
Crankshaft Sensor:	
Crankshaft Sensor Peak Voltage:	
Front	2.2 V or more
Rear	2.0 V or more
Crankshaft Sensor Resistance	380 ~ 560 Ω
Crankshaft Sensor Air Gap	1.0 mm (0.04 in.) (Non-measurable and non-adjustable)
Electric Starter System	
Starter Motor:	
Brush Length	12 mm (0.47 in.) (Service limit 8.5 mm, 0.33 in.)
Commutator Diameter	28 mm (1.10 in.) (Service limit 27 mm, 1.06 in.)
Switch And Sensor	
Fuel Level Sensor Resistance	FULL position: 3 ~ 5 Ω EMPTY position: 213 ~ 219 Ω
Rear Brake Light Switch Timing	ON after about 10 mm (0.4 in.) pedal travel
Engine Oil Pressure Switch Resistance	When engine is stopped: ON When engine is running: OFF

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Specifications

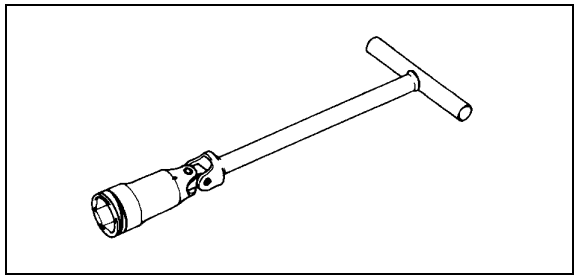
Item	Standard
Radiator Fan Switch Resistance:	
Rising Temperature	From OFF to ON @102 ~ 108°C (212 ~ 226°F)
Falling Temperature	From ON to OFF @97 ~ 103°C (207 ~ 217°F) ON: Less than 0.5 Ω OFF: More than 1 MΩ
Water Temperature Switch Resistance:	
Rising Temperature	From OFF to ON: 113 ~ 117°C (235 ~ 243°F)
Falling Temperature	From ON to OFF: 108°C (226°F) ~ temperature less than ON temperature ON: Less than 0.5 Ω OFF: More than 1 MΩ

● Refer to the Fuel System (DFI) chapter for specifications of DFI parts.

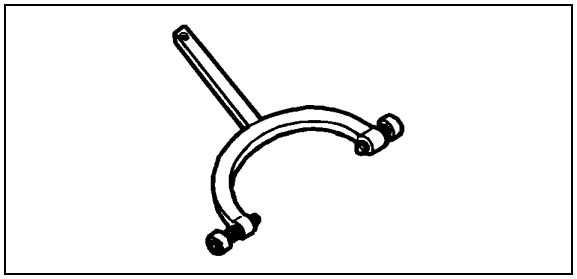
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Special Tools and Sealants

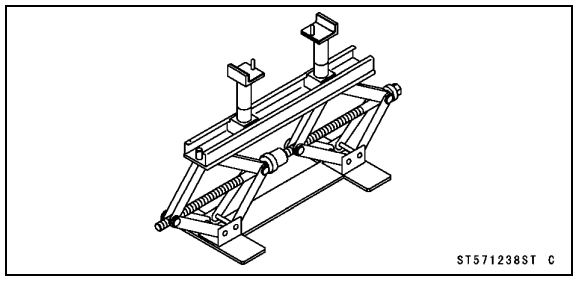
Spark Plug Wrench, Hex 18:
57001-1024



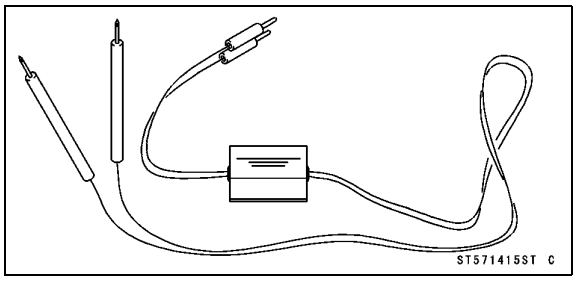
Flywheel Holder:
57001-1410



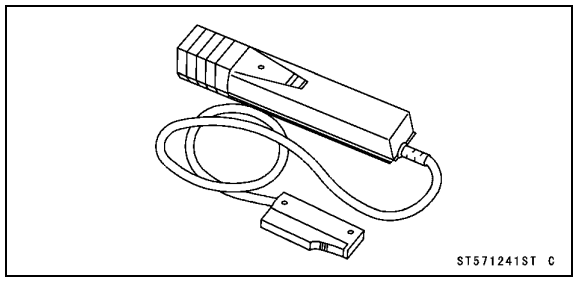
Jack:
57001-1238



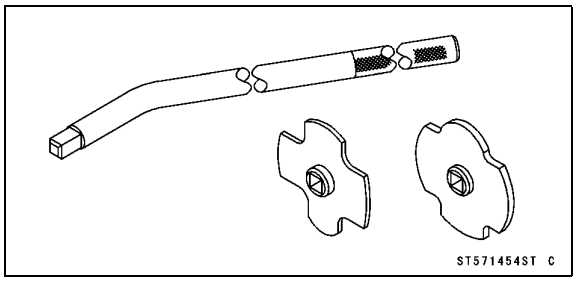
Peak Volt Adapter:
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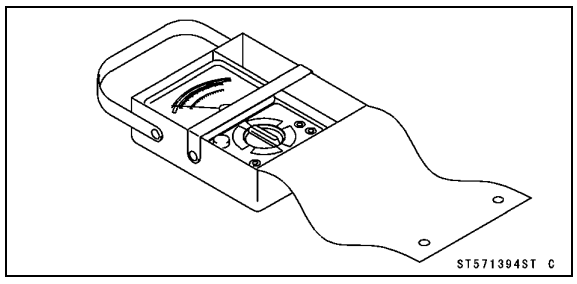
Timing Light:
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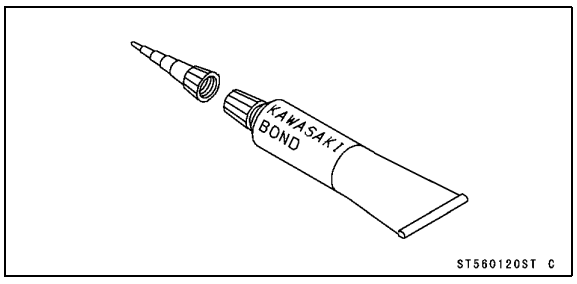
Filler Cap Driver:
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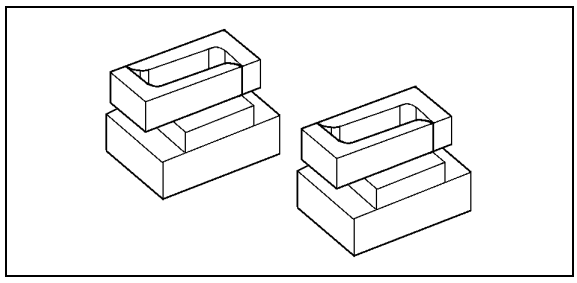
Hand Tester:
57001-1394



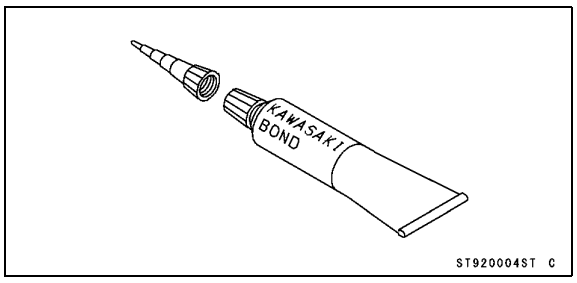
Kawasaki Bond (Silicone Sealant):
56019-120



Attachment Jack:
57001-1398



Kawasaki Bond (Silicone Sealant):
92104-0004



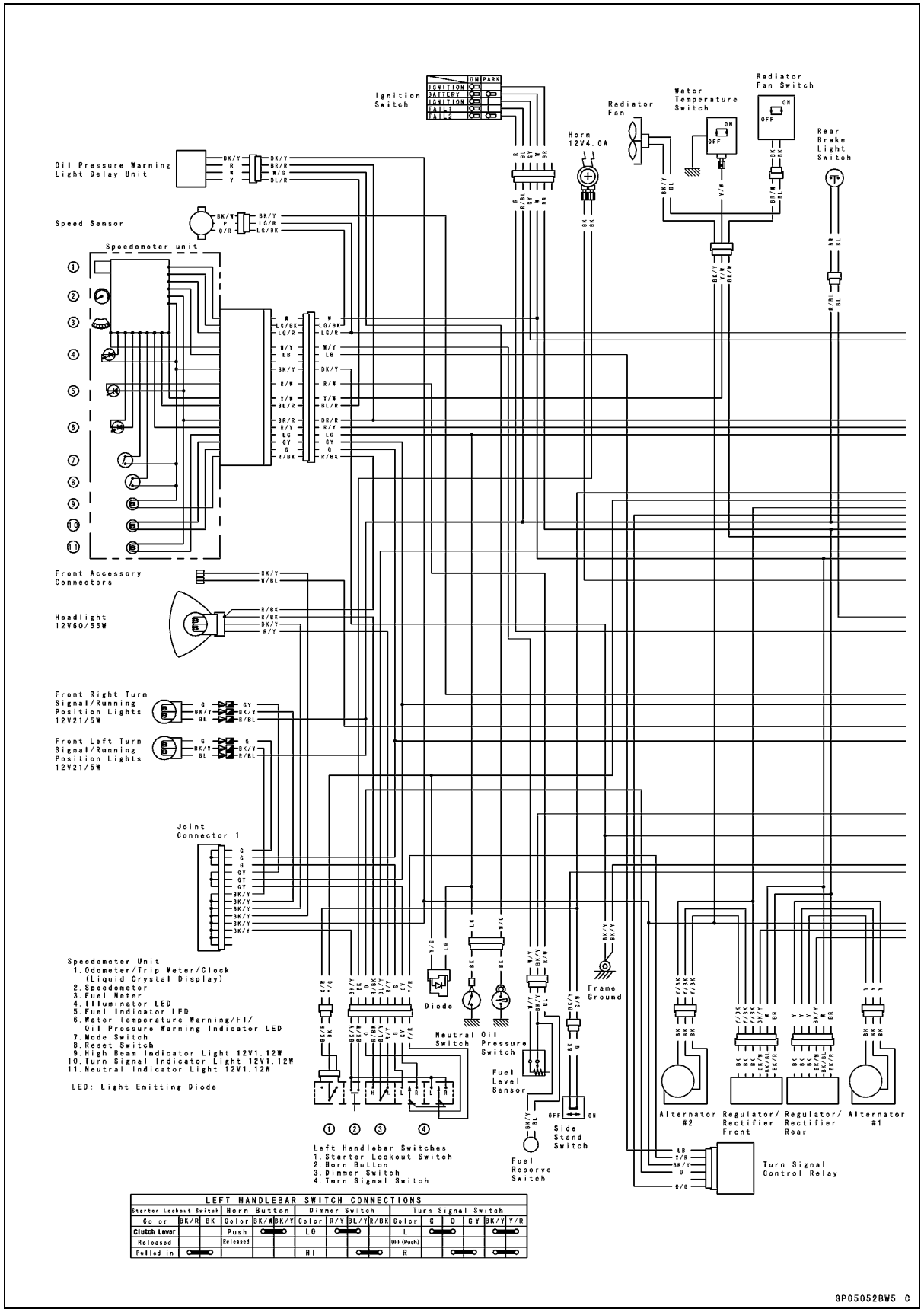
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Special Tools and Sealants

Dummy Page

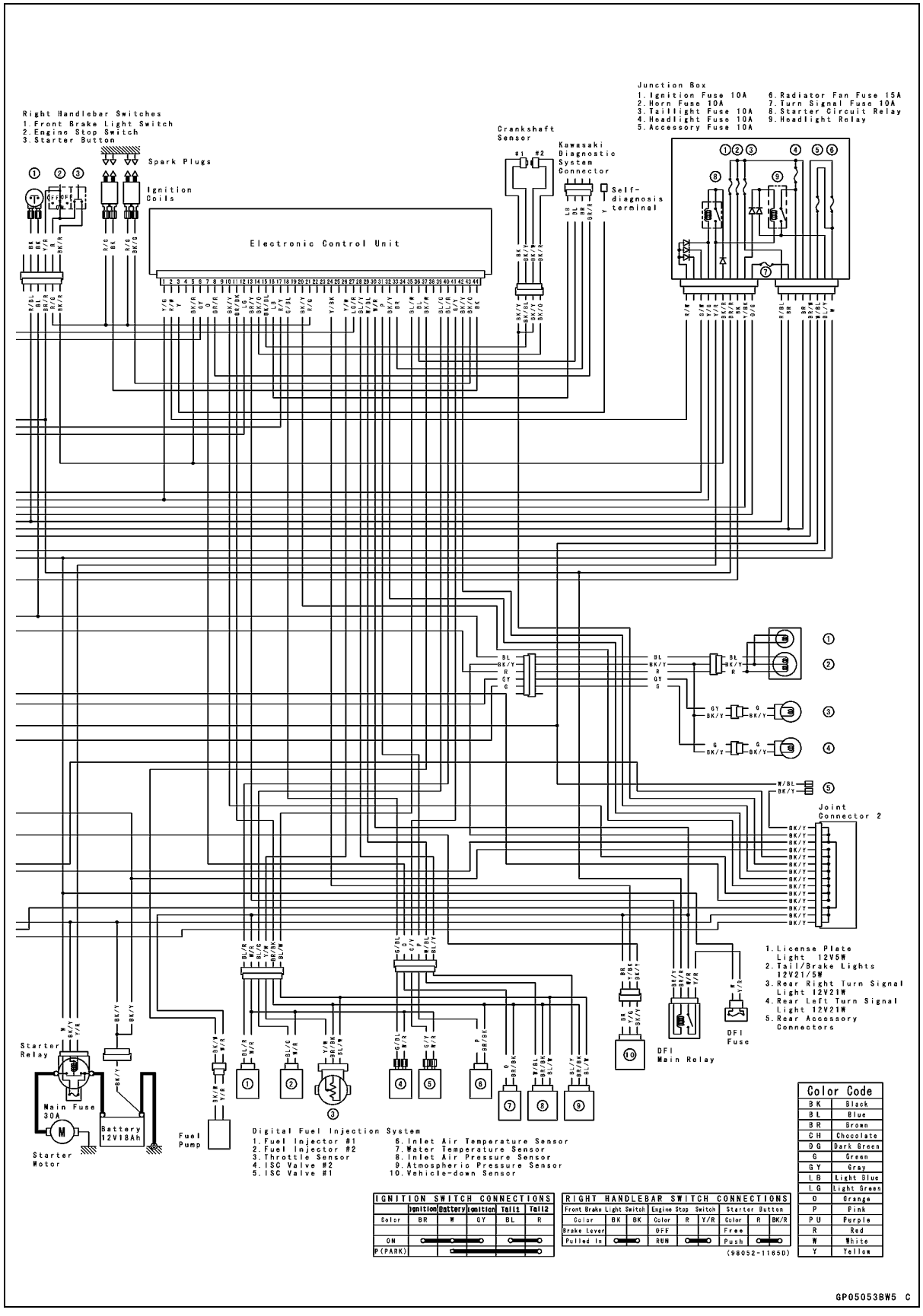
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Wiring Diagram (United States and Canada)



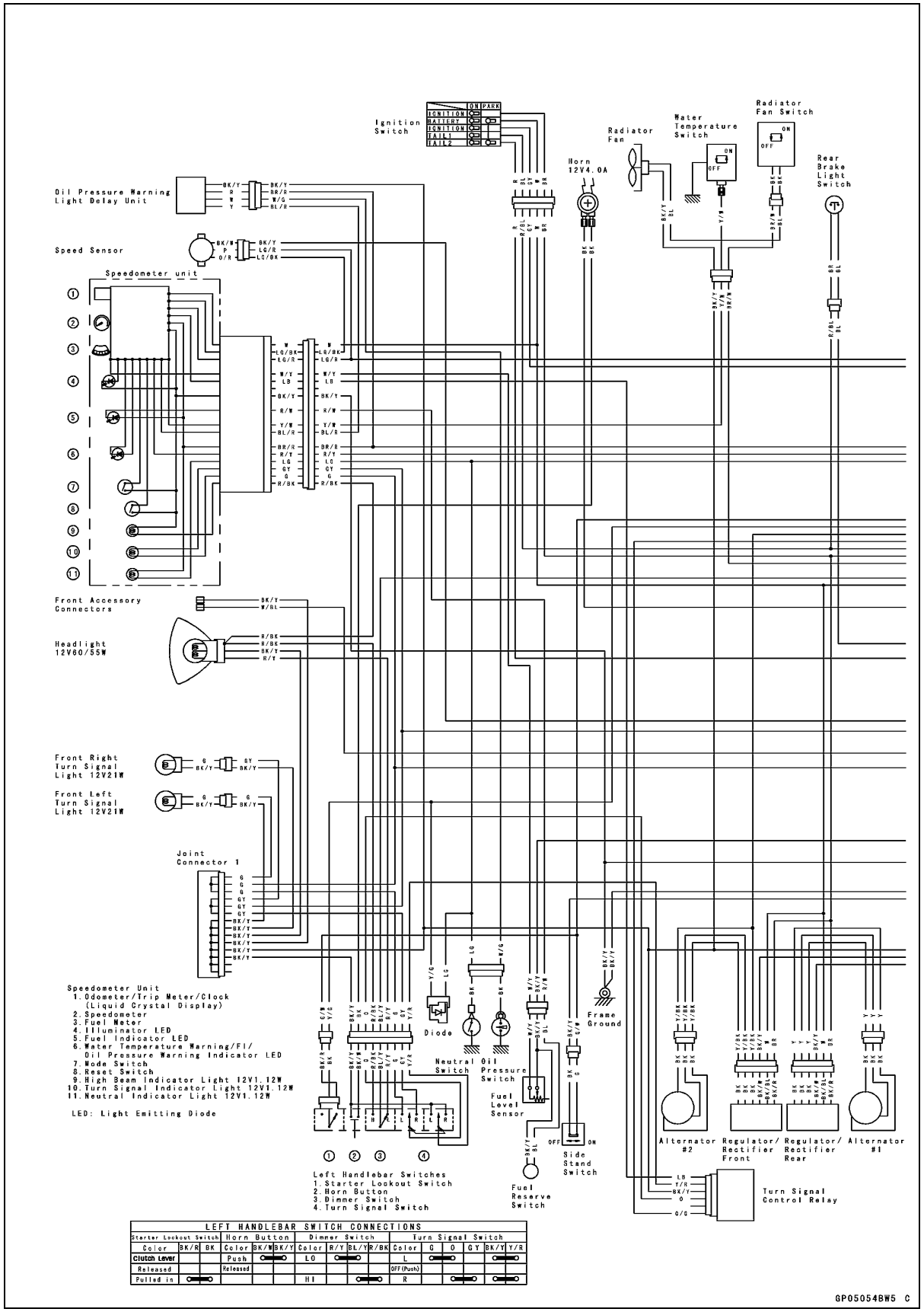
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Wiring Diagram (United States and Canada)



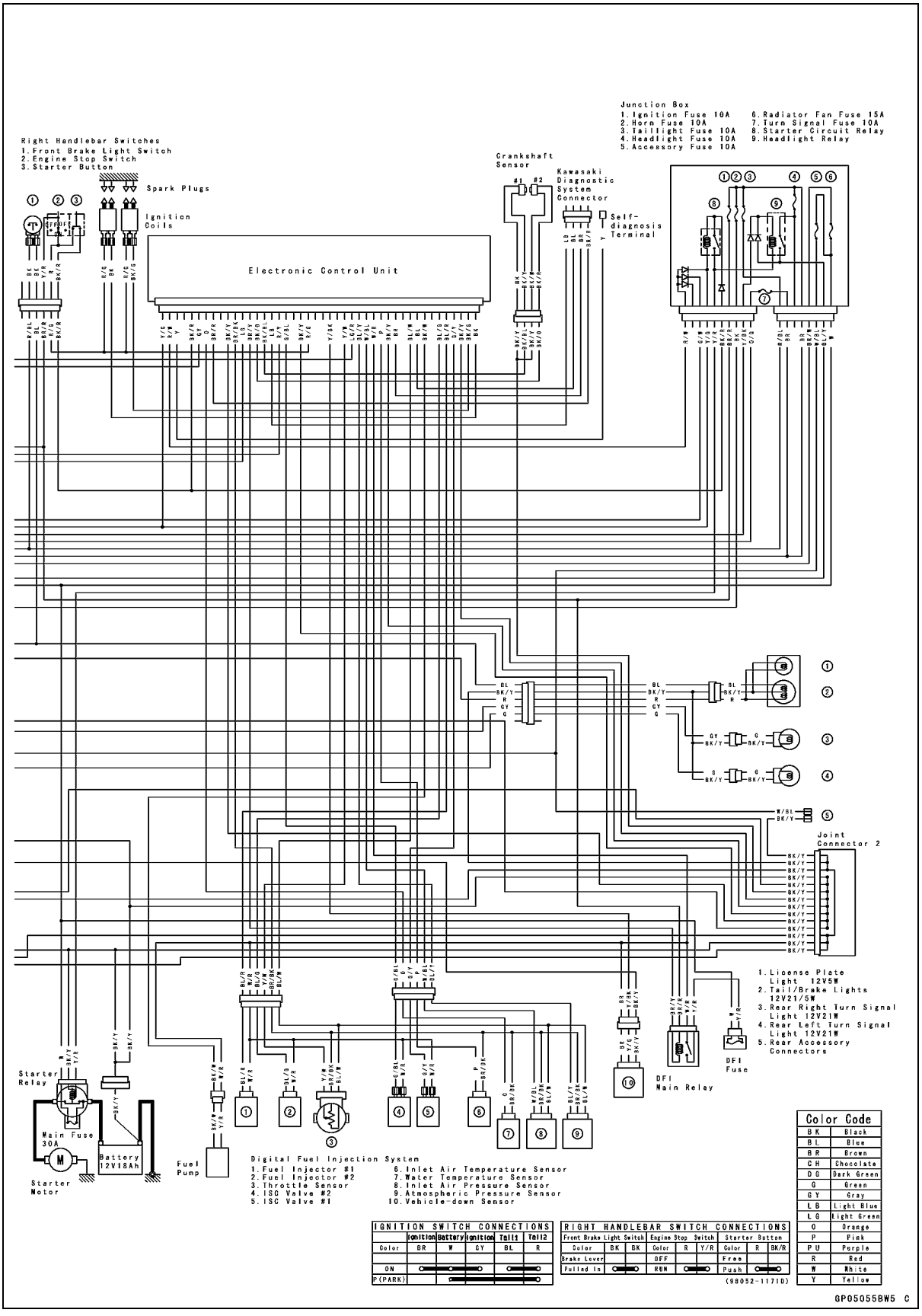
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Wiring Diagram (Australia)



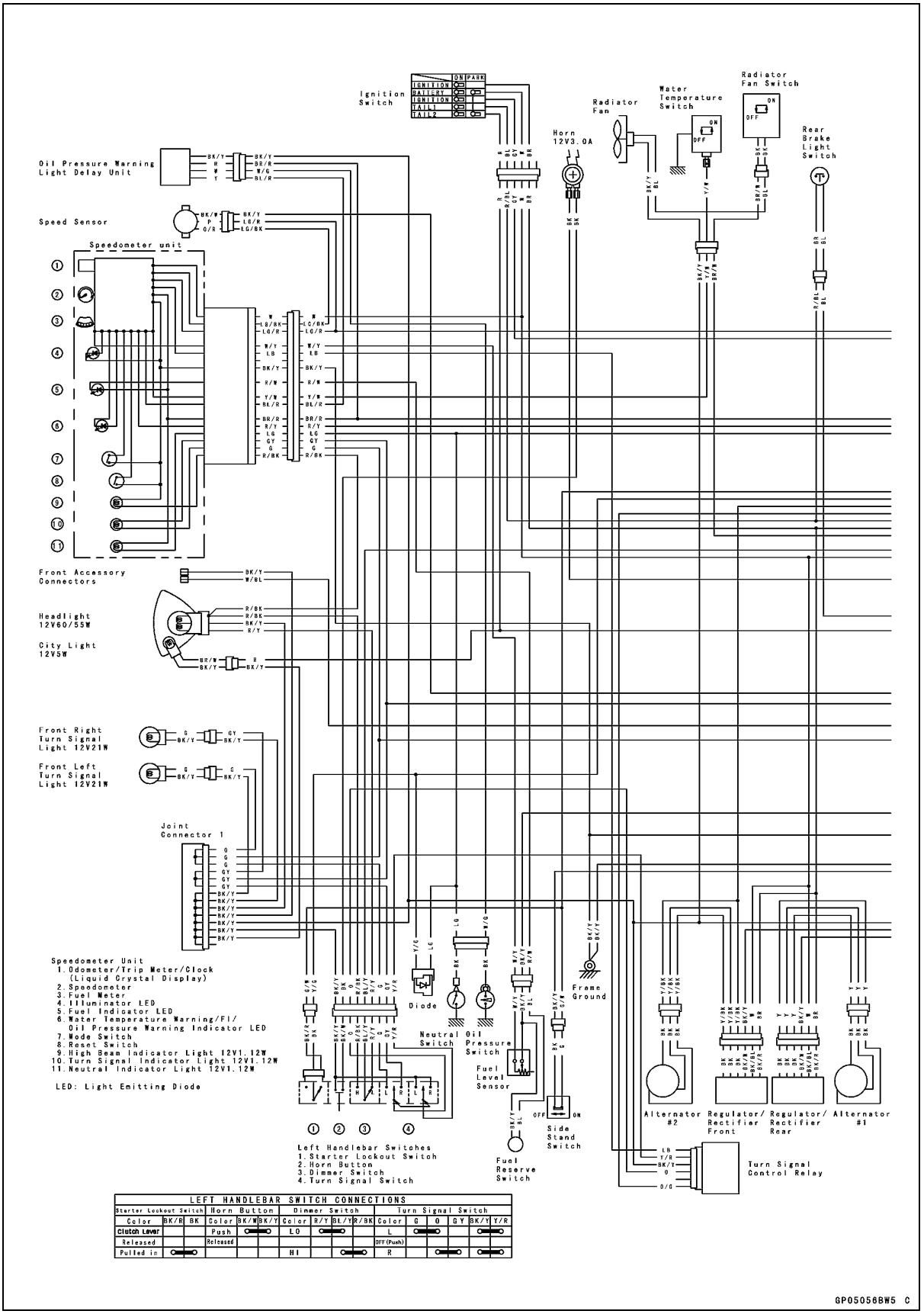
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Wiring Diagram (Australia)



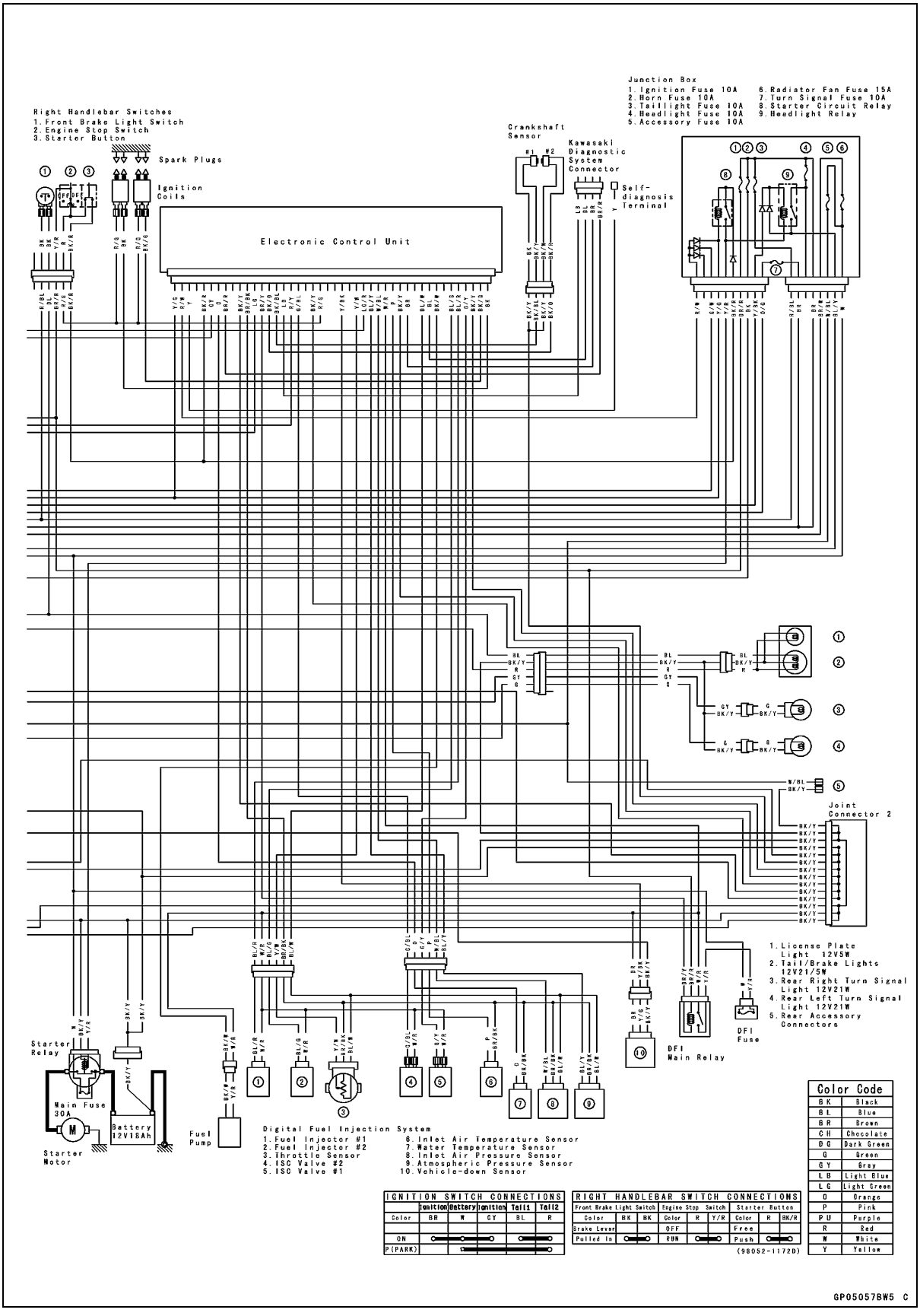
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Wiring Diagram (Other than United States, Canada and Australia)



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Wiring Diagram (Other than United States, Canada and Australia)



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Servicing Precautions

There are a number of important precautions that should be followed servicing electrical systems.

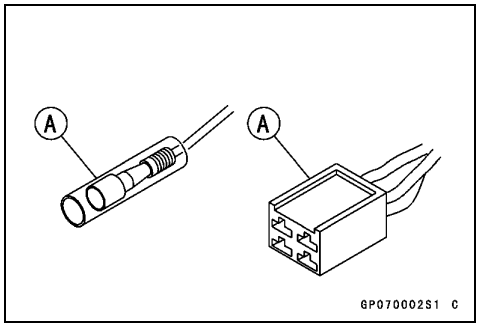
- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should 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 leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).
- Wire Color Codes:

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

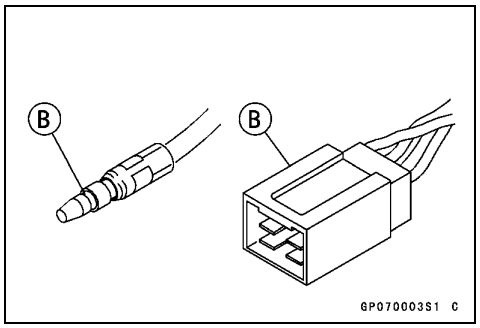
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Servicing Precautions

○Electrical Connectors
Female Connectors [A]



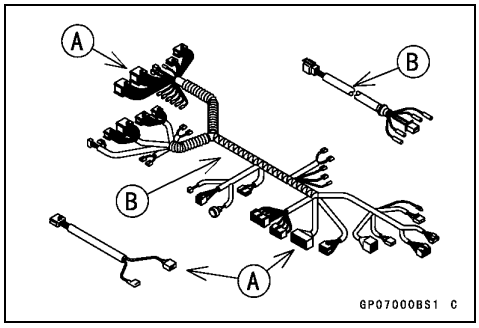
Male Connectors [B]



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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 that the connectors are not loose.
- Check the wiring for continuity.

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

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

Special Tool - Hand Tester: 57001-1394

○Set the tester to the × 1 Ω range, and read the tester.

★If the tester does not read 0 Ω, the lead is defective. Replace the wire or the wiring harness [B] if necessary.

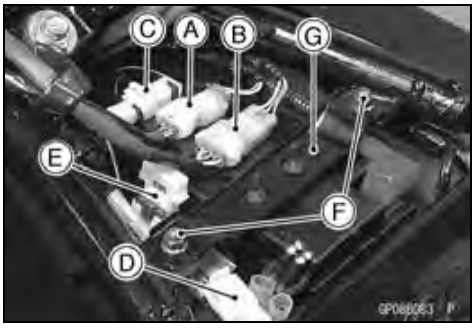
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Battery

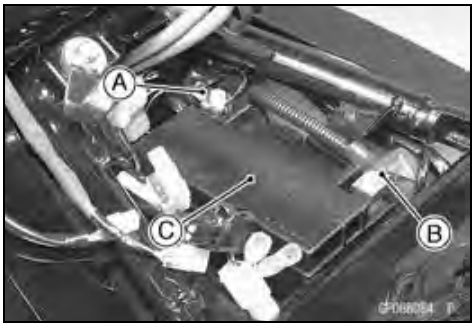
Battery Removal

CAUTION

Do not disconnect the battery cables or any other electrical connections when the ignition switch in ON, as this could damage the ECU (Electronic Control Unit).
Never reverse the connections of the battery, this could damage the ECU.



- Turn off the ignition switch.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect:
  Fuel pump Connector [A]
  Fuel Level Sensor Connector [B]
  Battery (–) Lead Connector [C]
  Rear Turn Signal/Taillight Lead Connector [D]
- Remove:
  DFI Fuse [E]
  Nuts [F]
  Battery Holder [G]



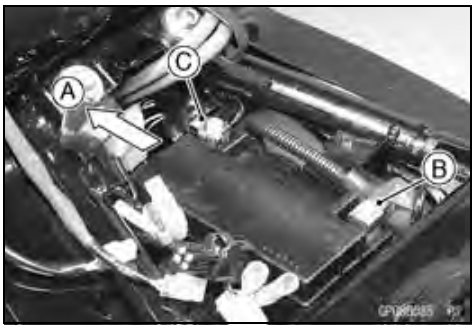
- Slide the black and red caps out.
- Disconnect the negative (–) cable [A] from the battery first and then the positive (+) cable [B] from the battery.

CAUTION

Be sure to disconnect the negative (–) cable first.

Pull the battery [C] out of the case.
Clean the battery using a solution of baking soda and water.
Be sure that the wire connections are clean.

Battery Installation



- Visually inspect the surface of the battery container.
★If any sings of cracking or electrolyte leakage from the sides of the battery.
- Face the (–) terminal forward [A] and put the battery into the battery case.

CAUTION

Do not install the battery backwards.

- Connect the positive cable [B] (red cap) to the (+) terminal first , and then the negative cable [C] (black cap) to the (–) terminal.
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the terminals with the black and red caps.

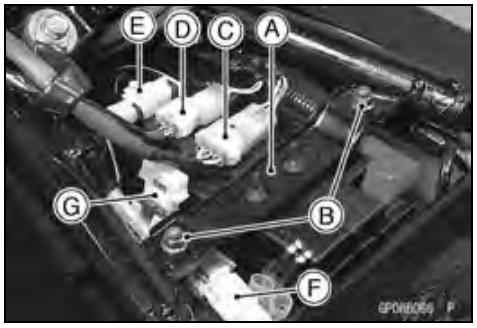
CAUTION

If each battery cable is not correctly disconnected or connected, sparks can arise at electrical connections, causing damage to electrical and DFI parts.

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Battery

- Put the battery holder [A] on the battery.
- Tighten the nuts [B] securely.
- Connect:
  Fuel Pump Connector (2-pin) [C]
  Fuel Level Sensor Connector (3-pin) [D]
  Battery (–) Lead Connector [E]
  Rear Turn Signal/Taillight Lead Connector [F]
- Install:
  DFI Fuel [G]
  Front Seat (see Front Seat Installation in the Frame chapter)

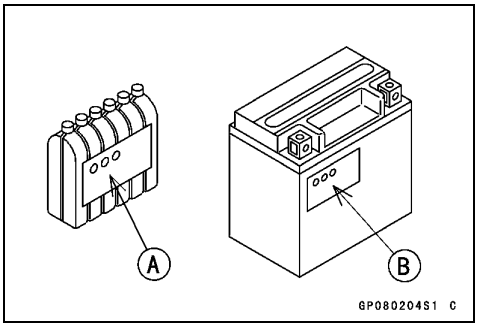


Battery Activation

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 VN1600-D1: FTZ16-BS

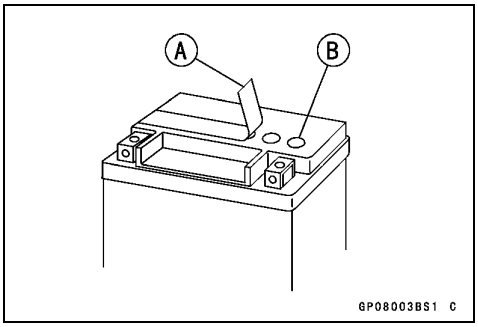


CAUTION

Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.

CAUTION

Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.



- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

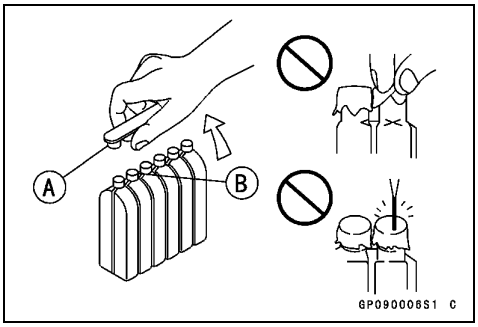
NOTE

○*The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*

- 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

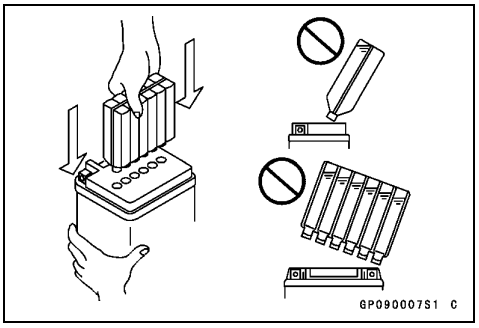
○*Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*



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Battery

● Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

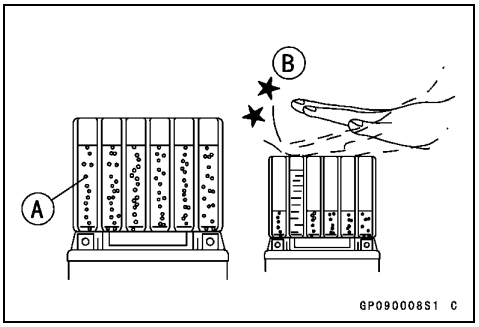


NOTE

○*Do not tilt the electrolyte container*

● Check the electrolyte flow.

★If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.



● Keep the container in place for **20** minutes or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.

CAUTION

Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.

● Gently remove the container from the battery.

● Let the battery sit for **60** 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 **60** 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 1.8 A × 5 ~ 10 hours

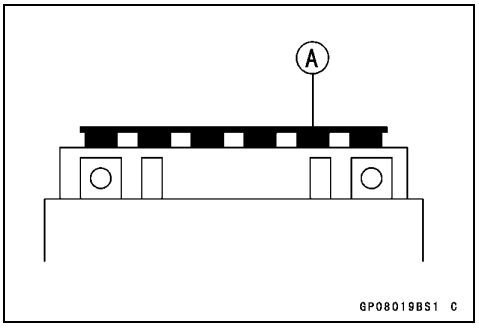
★If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

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.

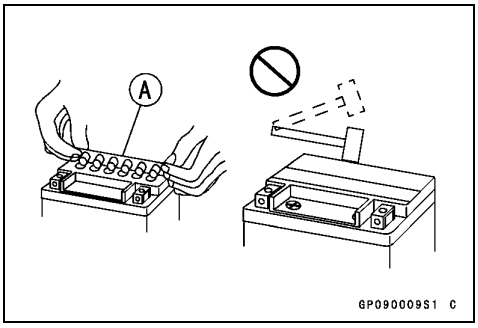
NOTE

○*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 12.6 volts, repeat charging cycle.*

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Battery

● 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 [A] is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.

NOTE

○*To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds.*
Re-check voltage and if less than 12.6 volts repeat the charging cycle and load test. If still below 12.6 volts the battery is defective.

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 this chapter).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

CAUTION

This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal 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 medial attention if severe.

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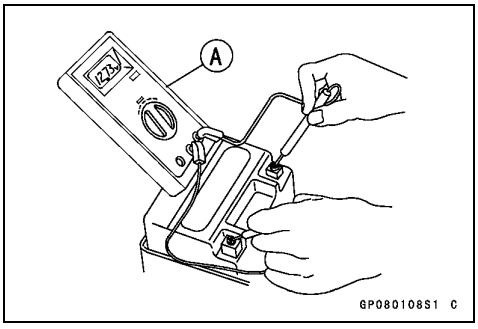
Battery

Interchange

The sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace the sealed battery only on a motorcycle which was originally equipped with the sealed battery.

Be careful, if the 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 meter [A].

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Disconnect the battery terminals (see Battery Removal in this section).

CAUTION

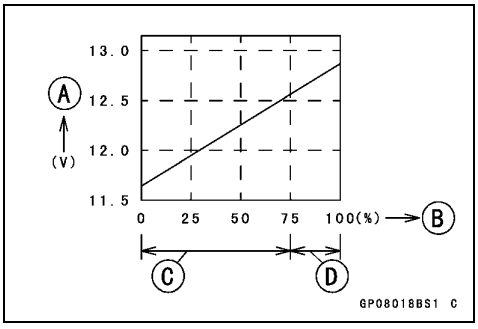
Be sure to disconnect the negative (–) cable first.

- Measure the battery terminal voltage.

NOTE

○*Measure with a digital voltmeter which can be read one decimal place voltage.*

★If the reading is 12.6 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

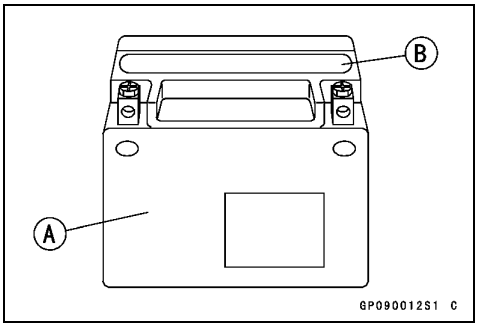


Battery Terminal Voltage

Standard: 12.6 V or more

Terminal Voltage (V) [A]
Battery Charge Rate (%) [B]
Refresh charge is required [C]
Good [D]

Refreshing Charge



- Remove the battery [A] (see Battery Removal in this section).
- Do refresh charge by following method according to the battery terminal voltage.

⚠ WARNING

This battery is sealed type. Never remove seal cap [B] even at charging. Never add water. Charge with current and time as stated below.

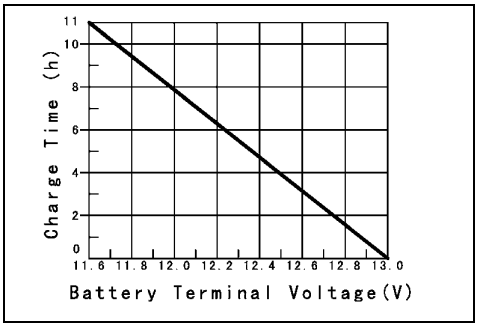
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Battery

Terminal Voltage: 11.5 ~ less than 12.6 V

Standard Charge **1.8 A × 5 ~ 10 h (see following chart)**

Quick Charge **9 A × 1 h**

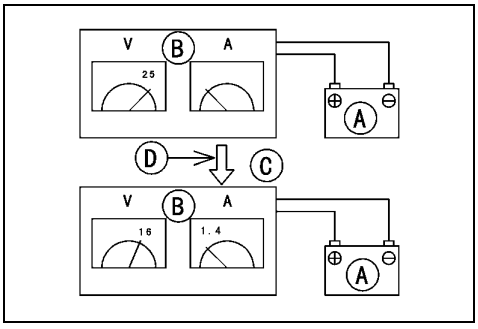


CAUTION

If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.

Terminal Voltage: less than 11.5 V

Charging Method: **1.8 A × 20 h**



NOTE

○*Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.*

Battery [A]
Battery Charger [B]
Standard Value [C]
Current starts to flow [D]

● Determine the battery condition after refresh charge.
○Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

Criteria	Judgement
12.6 V or higher	Good
12.0 ~ lower than 12.6 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace

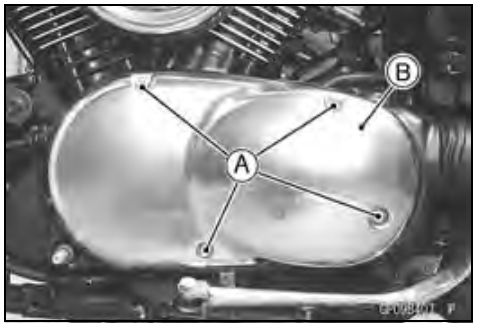
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Charging System

Alternator Outer Cover Removal

- Remove:
  Left Front Footboard (see Front Footboard Removal/Installation in the Frame chapter)
  Front and Rear Shift Pedals (see Shift Pedal Removal in the Crankshaft/Transmission chapter)

- Unscrew the bolts [A] and take off the alternator outer cover [B].

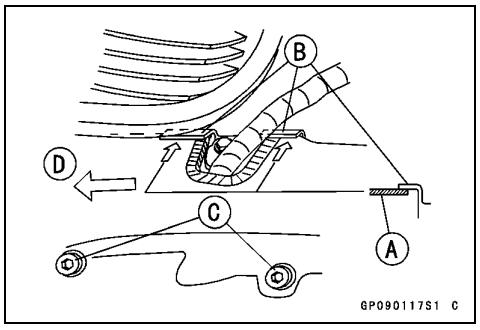


Alternator Outer Cover Installation

- First, insert the upper edge [A] of the alternator outer cover under the left crankcase ribs [B]. This prevents the rib failure.
- Apply a soap and water solution or rubber lubricant to the body of the alternator outer cover bolts [C] for easy installation and tighten them.

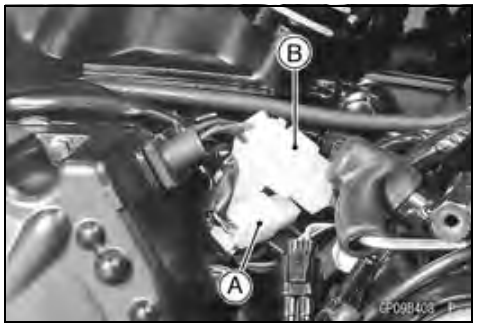
  Torque - Alternator Outer Cover Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)

  Front [D]
- Install:
  Front and Rear Shift Pedals (see Shift Pedal Installation in the Crankshaft/Transmission chapter)
  Left Front Footboard (see Front Footboard Removal/Installation in the Frame chapter)



Alternator Cover Removal/Installation

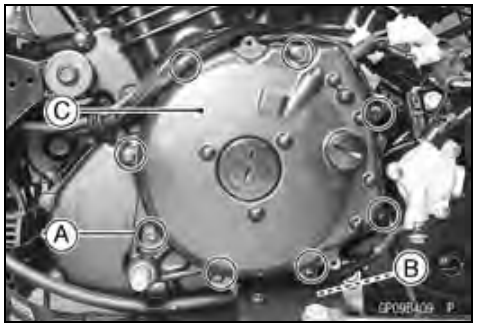
- Remove the alternator outer cover (see Alternator Outer Cover Removal in this section).
- Disconnect the crankshaft sensor lead connector [A] and alternator lead connector [B].



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Charging System

● Remove:
Alternator Cover Bolts [A]
Bracket [B]
Alternator Cover [C]

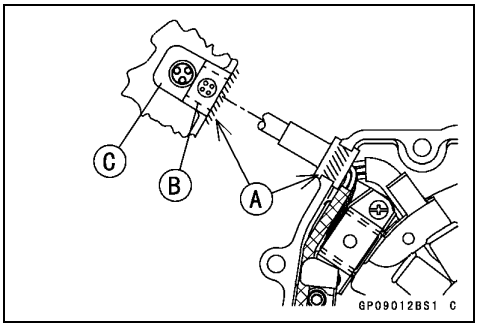


● Replace the gasket with a new one.
● Apply silicone sealant to the area [A] to the crankshaft sensor wire grommet [B].
Stator Lead Grommet [C]

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

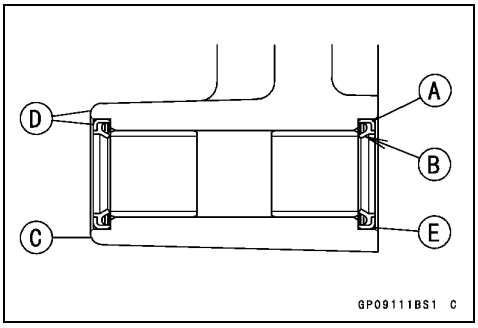
● Tighten the Alternator cover bolts.

Torque - Alternator Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



Alternator Cover Assembly

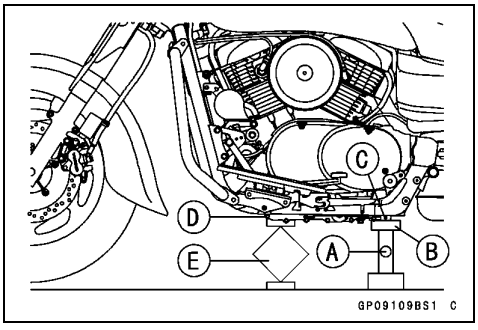
● Install each shift shaft grease seal [A] with the lip [B] facing inside the alternator cover [C] until the seal side is even [D] with the end of the hole.
● Apply a little high temperature grease on the lips [E].



Alternator Inner Cover Removal

● Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
● Using the jack [A] and the attachment jack [B], raise the front and rear wheels just off the ground.
Frame Pipe Rib [C]
● Support the front part of the engine bottom [D], using a commercially available jack [E].

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

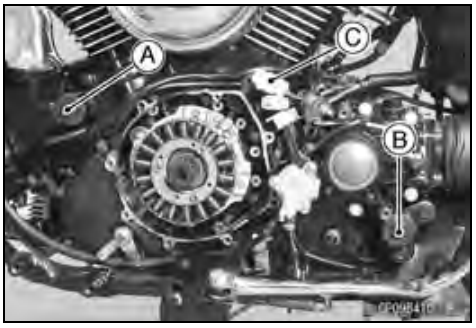


● Remove:
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
Alternator Outer Cover (see Alternator Outer Cover Removal in this section)
Alternator Cover (see Alternator Cover Removal/Installation in this section)
Alternator Rotor (see Alternator Removal in this section)
Front and Rear Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)

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Charging System

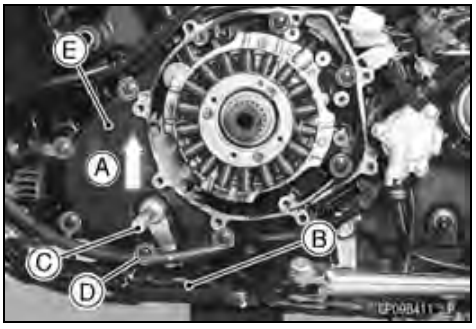
- Remove the front engine mounting bolt [A].
- Loosen the rear engine mounting bolt [B].
- Disconnect the alternator lead connector [C].



- Lift up [A] the front part of the engine, using the jack until the lower part of the alternator inner cover clears the lower frame [B].

NOTE

○*Turn the propeller shaft so that the engine can be raised as high as possible.*



- Pull out the shift shaft [C] from the alternator inner cover.
- Unscrew the bolts [D] and take off the alternator inner cover [E].

Alternator Inner Cover Installation

- Replace the gasket with a new one.
- Apply silicone sealant to the grommet and fit it into the notch of the alternator inner cover.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

- Install the alternator inner cover.

Torque - Alternator Inner Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Move the engine into its original position and tighten the engine mounting bolts.

Torque - Engine Mounting Bolts and Nuts: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Install the removed parts (see appropriate chapters).

Alternator Rotor Removal

- Remove the alternator cover (see Alternator Cover Removal/Installation in this section).
- Hold the alternator rotor [A] steady with the flywheel holder [B], and remove the rotor bolt [C].

Special Tool - Flywheel Holder: 57001-1410

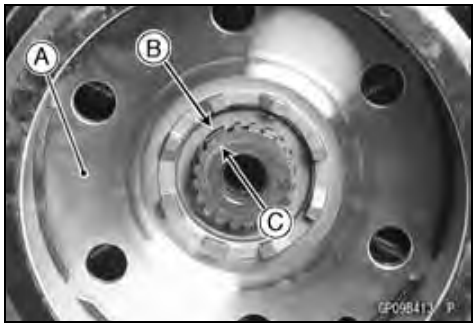
- Take the alternator rotor, washer, and ratchet off the crankshaft.



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Charging System

Alternator Rotor Installation

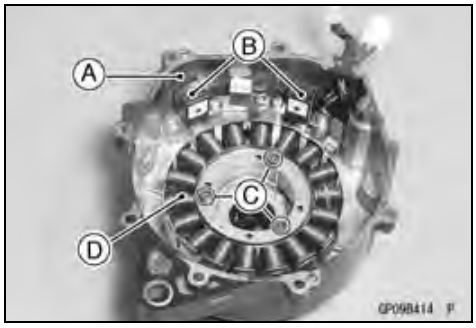


- Install the alternator rotor [A] while fitting the alignment notch [B] of the splines onto the alignment tooth [C].
- Apply molybdenum disulfide oil solution to the threads of the alternator rotor bolt.
  - The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10:1).
- Tighten:

Torque - Alternator Rotor Bolt: 78 N·m (8.0 kgf·m, 58 ft·lb)

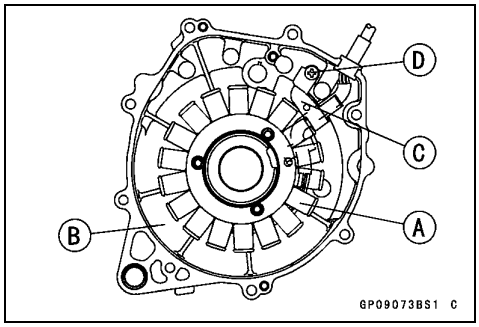
- Install the alternator cover (see Alternator Cover Removal/Installation in this section).

Alternator Outside Stator Removal



- Remove the alternator cover [A] (see Alternator Cover Removal/Installation in this section).
- Remove the crankshaft sensors [B] (see Crankshaft Sensor Removal in this chapter).
- Unscrew the Allen bolts [C] and take the stator [D] off the alternator cover.

Alternator Outside Stator Installation



- Apply a non-permanent locking agent to the threads of the alternator stator bolts.
- Install the stator [A] with the BK leads on the alternator cover [B].

Torque - Alternator Stator Bolts: 13 N·m (1.3 kgf·m, 115 in·lb)

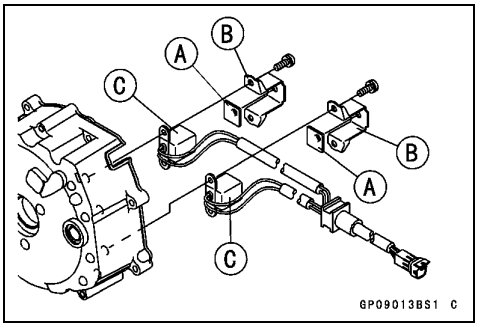
- Apply a non-permanent locking agent to the threads of the stator lead holder screw.
- Install the stator lead holder [C] and tighten the screw [D].

Torque - Stator Lead Holder Screw: 9.8 N·m (1.0 kgf·m, 87 in·lb)

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Charging System

● Set up the dampers [A] and crankshaft sensor holders [B] to the pickup coils [C].



● Install the crankshaft sensors as shown.
○Crankshaft sensor [A] with shorter leads (BK and BK/Y) for #1 (front).
○Crankshaft sensor [B] with longer leads (BK/W and BK/R) for #2 (rear).

Torque - Crankshaft Sensor Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)

● Apply a non-permanent locking agent to the threads of the crankshaft sensor lead holder bolt.
○Run the longer crankshaft sensor leads over the shorter crankshaft sensor leads above the alternator leads.

Torque - Crankshaft Sensor Lead Holder Bolt: 2.9 N·m (0.30 kgf·m, 26 in·lb)

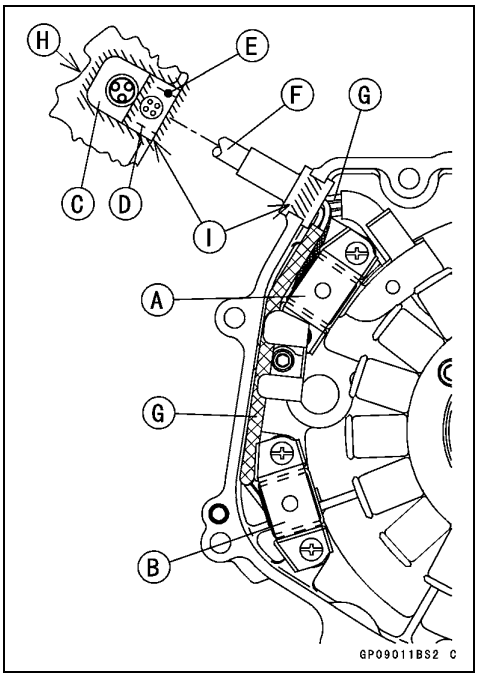
● Apply silicone sealant to the sides [H] of the grommets as shown, and fit the grommets into the notch of the alternator cover.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

○First, install the grommet [C] for the alternator leads, and then the grommet [D] for the crankshaft sensor leads with the round mark [E] up.
● Pull [F] the alternator leads and crankshaft sensor leads [G] outside the alternator cover, and **reduce the slack of leads inside the cover as possible** in order to prevent contact with the rotor.
● Apply silicone sealant to the mating surface [I] of the grommet.

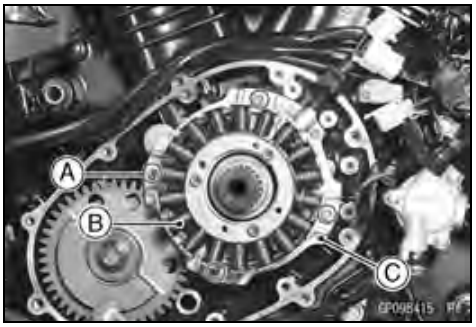
Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

● Connect the outside alternator connector (BK leads) to the connector (Y leads) of the regulator/rectifire.



Alternator Inside Stator Removal

● Remove:
Alternator Rotor (see Alternator Rotor Removal in this section)
Alternator Inner Cover (see Alternator Inner Cover Removal in this section)
● Unscrew the inside stator holder bolts [A] and take the inside stator [B] and holder [C] off the left crankcase.



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Charging System

Alternator Inside Stator Installation

- Apply a non-permanent locking agent to the threads of the inside stator holder bolts.
- Install the inside stator with the BK leads on the left crankcase.

Torque - Inside Stator Holder Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

- Apply silicone sealant to the grommet and fit it into the notch of the alternator inner cover.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004

- Connect the inside alternator connector (BK leads) to the connector (Y/BK leads) of the regulator/rectifier.

Charging Voltage Inspection

- Check the battery condition (see Charging condition Inspection in this chapter).
- 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 to the battery as shown in the table.

Special Tool - Hand Tester: 57001-1394

Battery Charging Voltage

Tester Range	Connections		Reading @3 000 rpm
	Tester (+) to	Tester (–) to	
25 V DC	Battery (+)	Battery (–)	14.2 ~ 15.2 V

- Turn on the ignition switch and 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 in the headlight unit). The readings should show nearly battery voltage when the engine speed is low, and as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.
- 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 output 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.

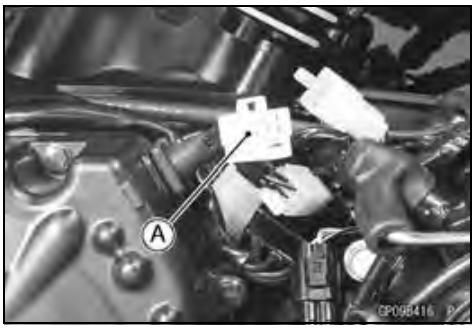
★If the battery voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

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Charging System

Alternator Inspection

There are three types of alternator failures: short, open (lead burned out), or loss in rotor magnetism. A short or open in one of the stator coil lead will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.



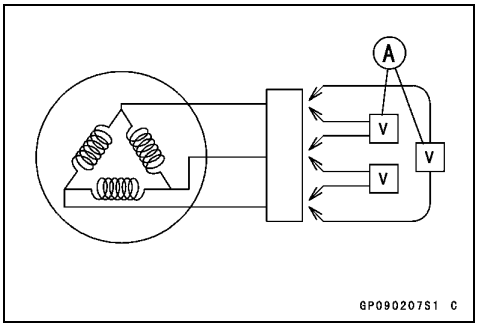
● To check the alternator output voltage, do the following procedures.
○Remove the alternator outer cover and disconnect the outside alternator connector [A].
○Connect the hand tester to the outer as shown.

Special Tool - Hand Tester: 57001-1394

○Start the engine.
○Run it at 3 000 rpm of the engine speed.
○Note the voltage readings.

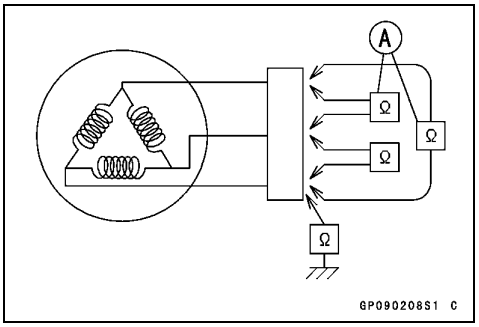
Alternator Output Voltage

Tester Range	Connections		Reading @3 000 rpm
	Tester (+) to	Tester (–) to	
250 V AC	One black lead	Another black lead	60 ~ 90 V



★If the output voltage shows the value in the table, the alternator operates properly and the regulator/rectifier is damaged. A much lower reading than the value in the table indicates that the alternator is defective.
○Repeat the test for the other black leads.
Hand Tester [A]

● Check the stator coil resistance as follows:
○Stop the engine.
○Connect the hand tester [A] to the connector as shown in the table.
○Note the resistance readings.



Stator Coil Resistance

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
×1 Ω	One black lead	Another black lead	0.33 ~ 0.49 Ω

★If there is more resistance than shown in the table, or no hand tester reading (infinity), the stator has an open wire and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
● Using the highest resistance range of the hand tester, measure the resistance between each of the black leads and chassis ground.
★Any hand tester reading less than infinity (∞) 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.
○Repeat the test for the other black leads.
○Repeat the test for the inside alternator connector.

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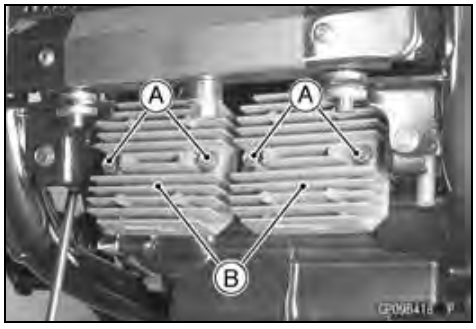
Charging System

Regulator/Rectifier Removal

- Remove:
  Alternator Outer Cover (see Alternator Outer Cover Removal in this section)
  Regulator/Rectifier Lead Connectors [A]



- Remove:
  Regulator/Rectifier Bolts [A]
  Regulator/Rectifiers [B]



Regulator/Rectifier Installation

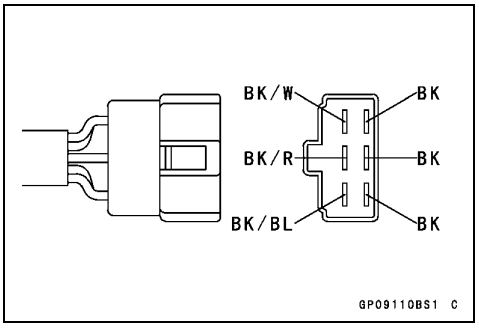
- Run the regulator/rectifier leads according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Tighten:

Torque - Regulator/Rectifier Bolts: 6.5 N·m (0.66 kgf·m, 57 in·lb)

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Charging System

Regulator/Rectifier Inspection



- Remove the alternator outer cover (see Alternator Outer Cover Removal in this section).
- Check the rectifier resistance as follows.
- Disconnect the regulator/rectifier connector.
- Connect the hand tester (special tool) to the regulator/rectifier as shown in the table, and check the resistance in both directions of each diode in the rectifier following the table.

★The resistance should be low in one direction and more than ten times as much in the other direction. If any two wires are low or high in both directions, the rectifier is defective and the regulator/rectifier must be replaced.

NOTE

○*The actual tester reading varies with the hand tester used and the individual rectifier, but, generally speaking, the lower reading should be from zero to one half the scale.*

Rectifier Circuit Inspection

No.	Connections		Reading	Tester Range
	Tester (+) to	Tester (–) to		
1	BK1	BK/BL	∞	× 10 Ω or × 100 Ω
2	BK2			
3	BK3			
4	BK1	BK/W	1/2 scale	
5	BK2			
6	BK3			
7	BK/BL	BK1		
8		BK2		
9		BK3		
10	BK/W	BK1	∞	
11		BK2		
12		BK3		

- Repeat the test for another regulator/rectifier.

Regulator Inspection

○To test the regulator out of circuit, use three 12 V batteries and a test light (12 V 3 ~ 6 W bulb in a socket with leads).

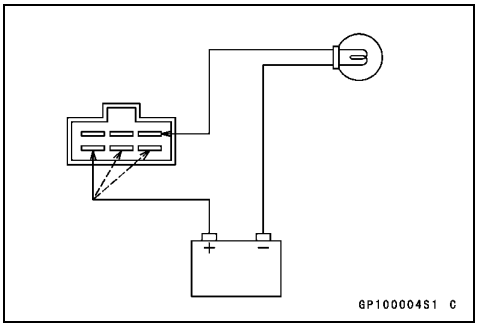
CAUTION

The test light works as an indicator and also as a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.

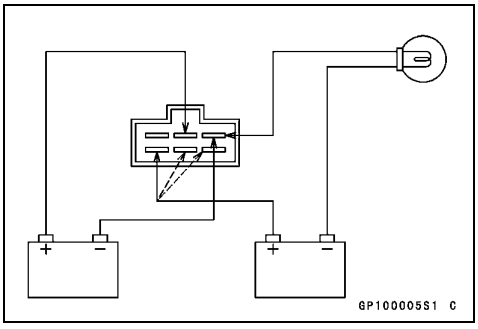
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Charging System

● Do the 1st step regulator circuit test.
○Connect the test light and the 12 V battery to the regulator/rectifier as shown.
○Check BK1, BK2, BK3 terminals respectively.
★If the test light turns on, the regulator/rectifier is defective. Replace it.
★If the test light does not turn on, continue the test.



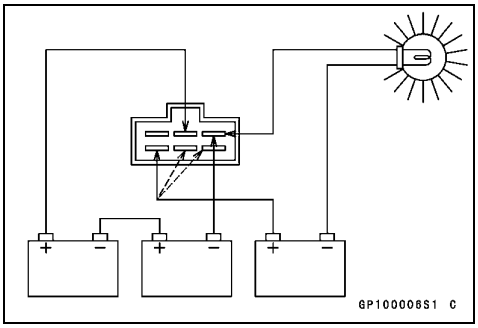
● Do the 2nd step regulator circuit test.
○Connect the test light and the 12 V battery in the same manner as specified in the “1st step regulator circuit test”.
○Apply 12 V to the BK/R terminal.
○Check BK1, BK2, and BK3 terminals respectively.
★If the test light turns on, the regulator/rectifier is defective. Replace it.
○If the test light does not turn on, continue the test.



● Do the 3rd step regulator circuit test.
○Connect the test light and the 12 V battery in the same manner as specified in the “1st step regulator circuit test”.
○Momentarily apply 24 V to the BK/R terminal by adding a 12 V battery.
○Check BK1, BK2, and BK3 terminals respectively.

CAUTION

Do not apply more than 24 volts. If more than 24 volts is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.

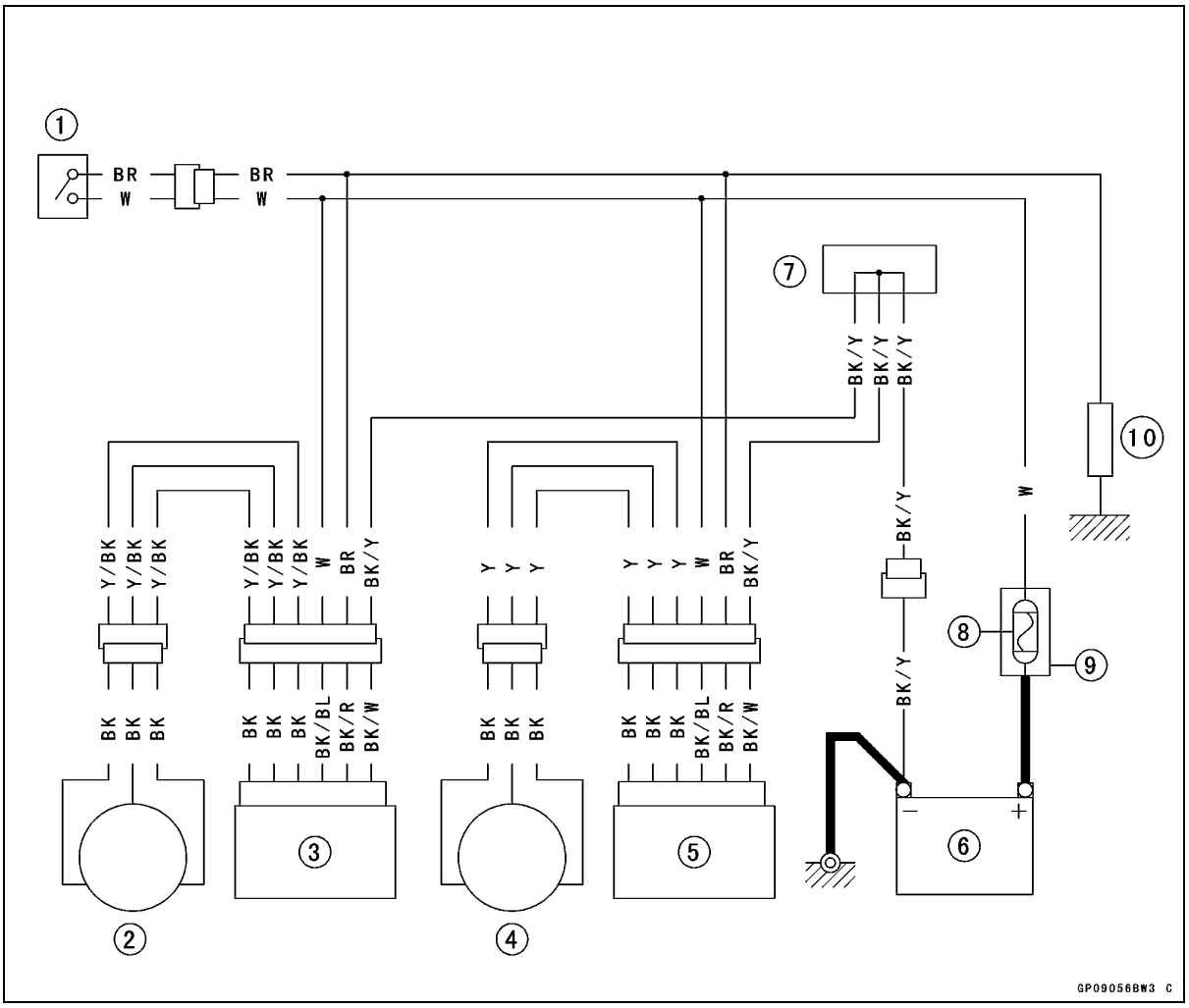


★If the test light does not light when 24 V is applied momentarily to the BK/R terminal, the regulator/rectifier is defective. Replace it.
★If the regulator/rectifier passes all the tests described, it may still be defective. If the charging system still does not work properly after checking all the components and the battery, test the regulator/rectifier by replacing it with a known good unit.
● Repeat the test for another regulator/rectifier.

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Charging System

Charging System Circuit

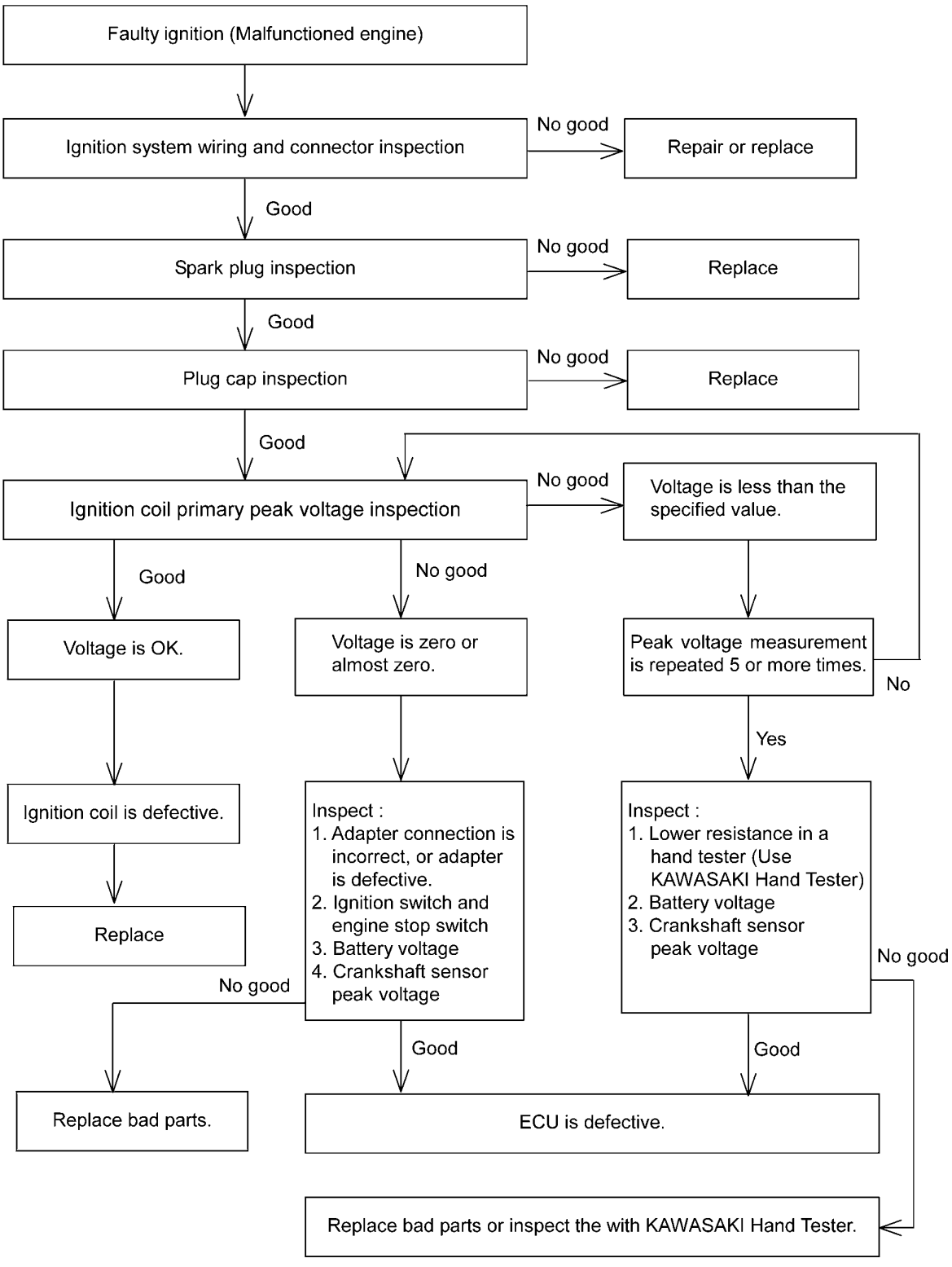


1. Ignition Switch
2. Alternator #2 (inside stator)
3. Regulator/Rectifier #2
4. Alternator #1 (outside stator)
5. Regulator/Rectifier #1
6. Battery
7. Joint Connector 2
8. Main Fuse 30 A
9. Starter Relay
10. Load

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Ignition System

Ignition System Troubleshooting



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Ignition System

⚠ WARNING

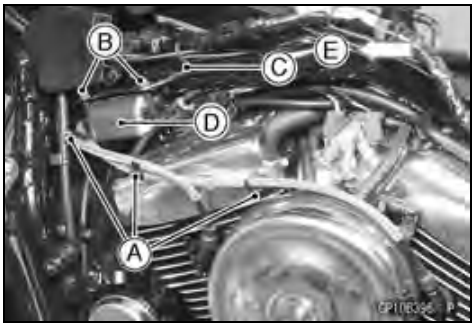
The ignition system produces extremely high voltage. Do not touch the spark plugs, ignition coils, or spark plug high-tension cables while the engine is running, or you could receive a severe electrical shock.

CAUTION

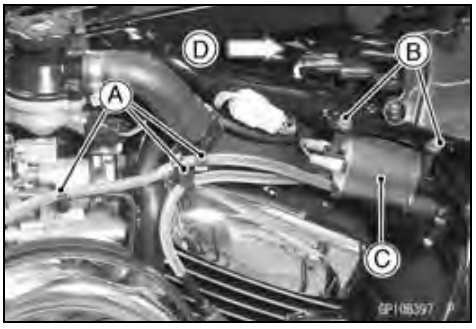
Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC igniter damage in the ECU.
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the IC igniter in the ECU and the diodes.

Ignition Coil Removal

- Remove fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Remove:
  Clamps [A]
  Primary Leads
  Ignition Coil Mounting Nuts [B]
  Frame Ground Lead [C]
  Ignition Coil #1 [D]
  Front [E]



- Remove:
  Clamps [A]
  Primary Leads
  Ignition Coil Mounting Nuts [B]
  Ignition Coil #2 [C]
  Front [D]



Ignition Coil Installation

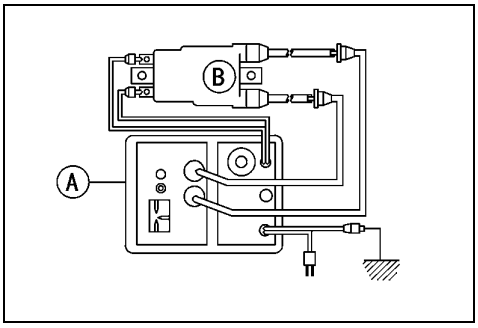
- Connect the primary leads to the ignition coil terminals and run the high-tension cables according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the frame ground lead [A] to the rear mounting bolt of the ignition coil #1.



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Ignition System

Ignition Coil Inspection



- Remove the ignition coils (see Ignition Coil Removal in this chapter).
- Measure the arcing distance with a commercially available coil tester [A] to check the condition of the ignition coil [B].
- Connect the ignition coil (with the spark plug cap left attached at the end of the spark plug terminal) to the tester in the manner prescribed by the manufacturer and measure the arcing distance.

3 Needle Arcing Distance
Standard: 6 mm (0.2 in.) or more

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the coil body or leads.

★If the distance reading is less than the specified value, the ignition coil or spark plug caps are defective.

- To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. Remove the caps by turning them counterclockwise.

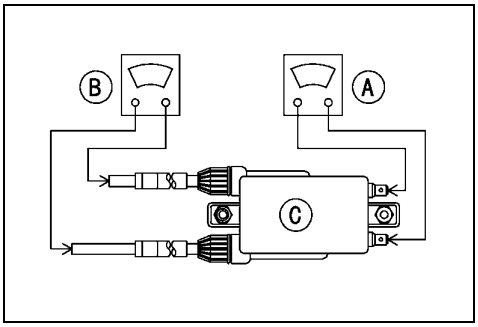
★If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug cap.

★If the coil tester is not available, the coil can be checked for a broken or badly shorted winding with the hand tester.

Special Tool - Hand Tester: 57001-1394

NOTE

○*The hand tester cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.*



- Measure the primary winding resistance as follows.

○Connect the hand tester between the coil terminals.
○Set the tester to the × 1 Ω range, and read the tester.

- Measure the secondary winding resistance as follows.

○Remove the plug caps by turning them counterclockwise.
○Connect the tester between the spark plug High-Tension cables.
○Set the tester to the × 1 kΩ range and read the tester.

Measure primary winding resistance [A].
Measure secondary winding resistance [B].
Ignition Coil [C]

Ignition Coil Winding Resistance
Primary Windings: 1.9 ~ 2.9 Ω
Secondary Windings: 18 ~ 28 kΩ

★If the tester does not read as specified, replace the coil.
○To install the plug cap, turn it clockwise.

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Ignition System

Spark Plug Removal

- Remove the spark plug caps.
- Remove the spark plugs using the 18 mm (0.7 in.) plug wrench.

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

Spark Plug Installation

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

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

Torque - Spark Plugs: 18 N·m (1.8 kgf·m, 13 ft·lb)

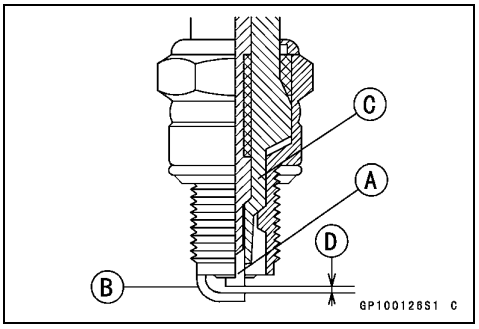
- Fit the plug caps securely.



Spark Plug Cleaning/Inspection

- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high-flash point solvent and a wire brush or other tool.
- ★If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug.
- Use the standard spark plug or its equivalent.
- Measure the gap [D] with a wire-type thickness gauge.
- ★If the gap is incorrect, carefully bend the side electrode with a tool to obtain the correct gap.

Spark Plug Gap: 0.8 ~ 0.9 mm (0.03 ~ 0.03 in.)



Ignition Coil Primary Peak Voltage

NOTE

○*Be sure the battery is fully charged.*

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Remove all the spark plug caps but do not remove the spark plugs.
- Install new spark plugs into all the spark plug caps, and ground them onto the engine.

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Ignition System

● Install a commercially available peak voltage adapter [A] into the hand tester [B].
● Connect the adapter between the ignition coil primary wire terminal and the engine ground with the primary lead left connected.

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

○Insert the adapter probe into the terminal of the primary lead [C].
ECU [D]
Battery [E]
Ignition Coil [F]
New Spark Plug [G]

Special Tool - Hand Tester: 57001-1394

Hand Tester Range: DC 1 000 V

Primary Lead Connections:

	Adapter (R, +)		Adapter (BK, –)
Front Ignition Coil:	**BK**	←→	**Ground**
Rear Ignition Coil:	**BK/G**	←→	**Ground**

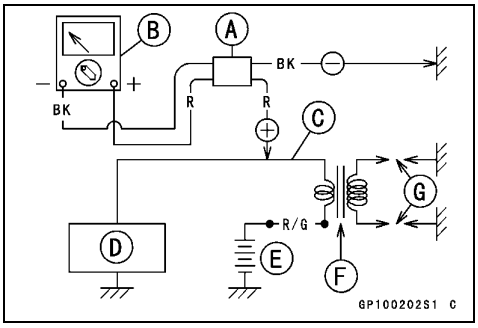
⚠ WARNING

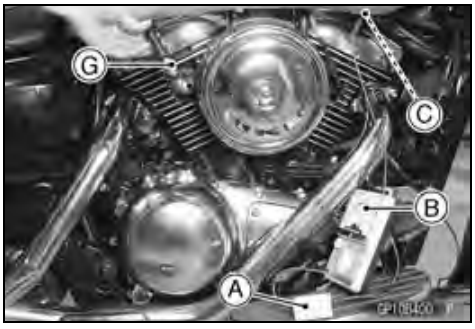
To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

● Turn the ignition switch and the engine stop switch ON.
● Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
● Repeat the measurements 5 or more times for one ignition coil.

Ignition Coil Primary Peak Voltage
Standard:
Front: 208 V or more
Rear: 192 V or more

● Repeat the test for the other ignition coil.
★If the reading is less than the specified value, check the following:
Ignition Coils (see Ignition Coil Inspection in this section)
Crankshaft Sensors (see Crankshaft Sensor Inspection in this section)
★If the ignition coils and crankshaft sensors are normal, check the ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).

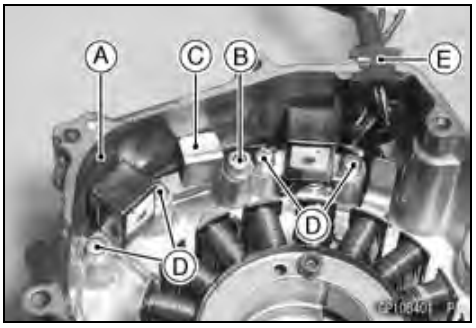




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Ignition System

Crankshaft Sensor Removal



- Remove the alternator cover [A] (see Alternator Cover Removal/Installation in this chapter).
- Unscrew the holder bolt [B] and take off the crankshaft sensor lead holder [C].
- Unscrew the screws [D] and take off the crankshaft sensors with the grommet [E].

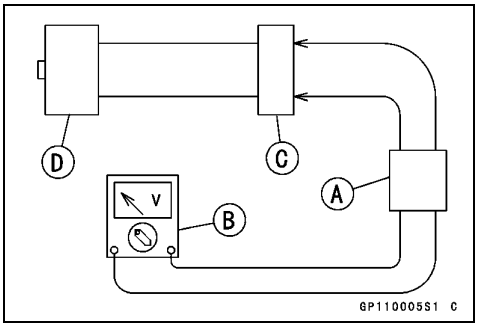
Crankshaft Sensor Installation

- Refer to the Alternator Stator Installation in this chapter.

Crankshaft Sensor Inspection



- Remove the alternator outer cover (see Alternator Outer Cover Removal in this chapter).
- Remove all the spark plug caps but do not remove the spark plugs.
- Disconnect the crankshaft sensor lead connector [A].



- Connect a commercially available peak voltage adapter [A] to the hand tester [B].

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

Special Tool - Hand Tester: 57001-1394

- Insert the adapter probes into the connector [C] of the crankshaft sensor [D] as shown.

Connections:

	Adapter (R, +)		Adapter (BK, –)
Front Crankshaft Sensor:	**BK/Y**	←→	**BK**
Rear Crankshaft Sensor:	**BK/R**	←→	**BK/W**

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Ignition System

NOTE

○*Be sure the battery is fully charged.*

Hand Tester Range: DC 10 V

- Turn the ignition switch and the engine stop switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurements 5 or more times for one crankshaft sensor.
- Repeat the test for the other crankshaft sensor.

Crankshaft Sensor Peak Voltage
Standard:

Front	**2.2 V or more**
Rear	**2.0 V or more**

★If the reading is less than the specified value, replace the crankshaft sensor.

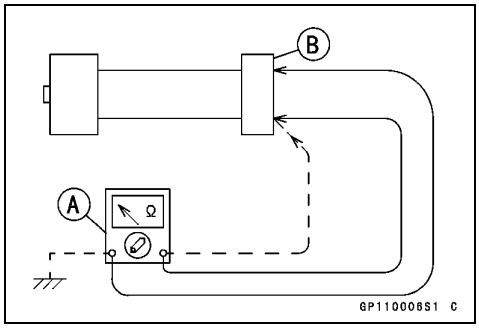
★If the reading is normal, check the ECU (see ECU Power Supply Inspection Fuel System (DFI) chapter).

★If the peak voltage adapter is not available, the coil can be checked for a broken or badly shorted winding with the hand tester (special tool).

NOTE

○*Using the peak voltage adapter is a more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.*

- Disconnect the crankshaft sensor lead connector.
- Set the hand tester [A] to the × 100 Ω range and wire it to the crankshaft sensor lead connector [B].



Connections:

	Tester Connections		
Front Crankshaft Sensor:	**BK/Y**	⟷	**BK**
Rear Crankshaft Sensor:	**BK/R**	⟷	**BK/W**

★If there is more resistance than the specified value, the coil has an open wire and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

Crankshaft Sensor Resistance: Standard: 380 ~ 560 Ω

- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.

★Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the crankshaft sensor assy.

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Ignition System

Ignition Timing Inspection

- Remove the alternator outer cover (see Alternator Outer Cover Removal in this chapter).
- Remove the timing inspection cap [A].

Special Tool - Filler Cap Driver: 57001-1454



- Attach the timing light [A] to the front ignition coil lead in the manner prescribed by the manufacturer.

Special Tool - Timing Light: 57001-1241

- Start the engine and aim the timing light at the ignition timing mark on the alternator rotor.
- Run the engine at the speeds specified and note the alignment of the ignition timing marks.



Ignition Timing

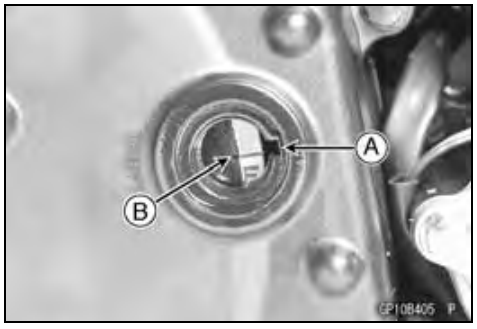
Engine speed r/min (rpm)	Hole notch [A] aligns with:
950	F or R mark [B] on alternator rotor

F Mark: for Front Cylinder
R Mark: for Rear Cylinder

- Repeat the test for the rear cylinder, using the rear ignition coil lead.

★If the ignition timing is incorrect, check the crankshaft sensor (see Crankshaft Sensor Inspection in this section).

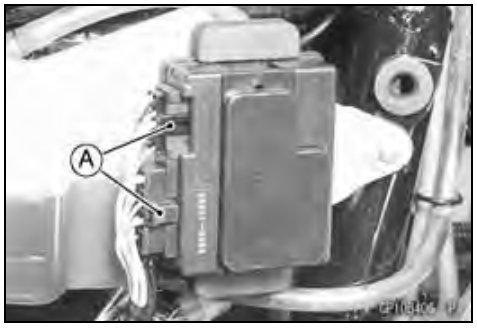
★If the crankshaft sensor are normal, check the ECU (see ECU Power Supply in the Fuel System (DFI) chapter).



Interlock Operation Inspection

- Raise the rear wheel off the ground (see Rear Wheel Removal in the Wheels/Tires chapter).
- Remove the right side cover (see Right Side Cover Removal in the Frame chapter).

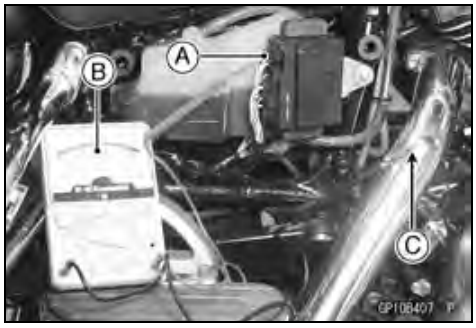
○Do not disconnect the connectors [A].



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Ignition System

1st Check



- Measure the terminal voltage of the R/W lead in the junction box connector [A] in accordance with the following procedure.

○Set the tester [B] to the 10 V DC range, connect it to the R/W lead and frame ground [C].

Connection:
Tester (+) Terminal → R/W Lead Terminal
Tester (–) Terminal → Frame Ground

Condition:
Transmission Gear → 1st Position
Clutch Lever → Release
Side Stand → Down

○Turn the ignition switch on.
○Read the voltage.

Interlock Operation Voltage
Standard: 4 V or more

★If the voltage is lower than the standard, inspect the side stand switch, starter lockout switch, gear position switch and junction box.
★If their parts are normality, replace the ECU.
★If the voltage is standard, push the starter button.
○Then the starter motor should not turn when the starter system circuit is normality.
★If the starter motor turned, ECU is defective. Replace the ECU.

2nd 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
Side Stand → Up

- Set the side stand on the ground, then the engine will stop.

★If whichever may not be stopped, inspect the gear position switch, starter lockout switch, side stand switch and junction box.
★If their parts are normality, replace the ECU.

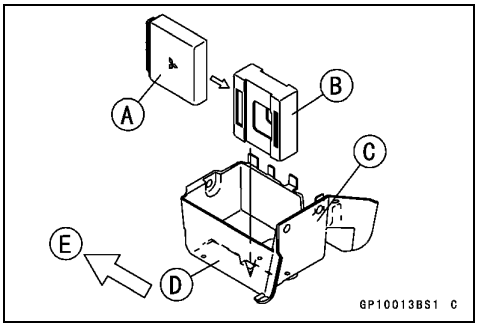
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Ignition System

IC Igniter Inspection

○The IC igniter is built in the ECU [A].
Damper [B]
Battery Case [C]
Groove [D]
Front [E]

● Refer to the Fuel System (DFI) chapter for ECU Inspection.

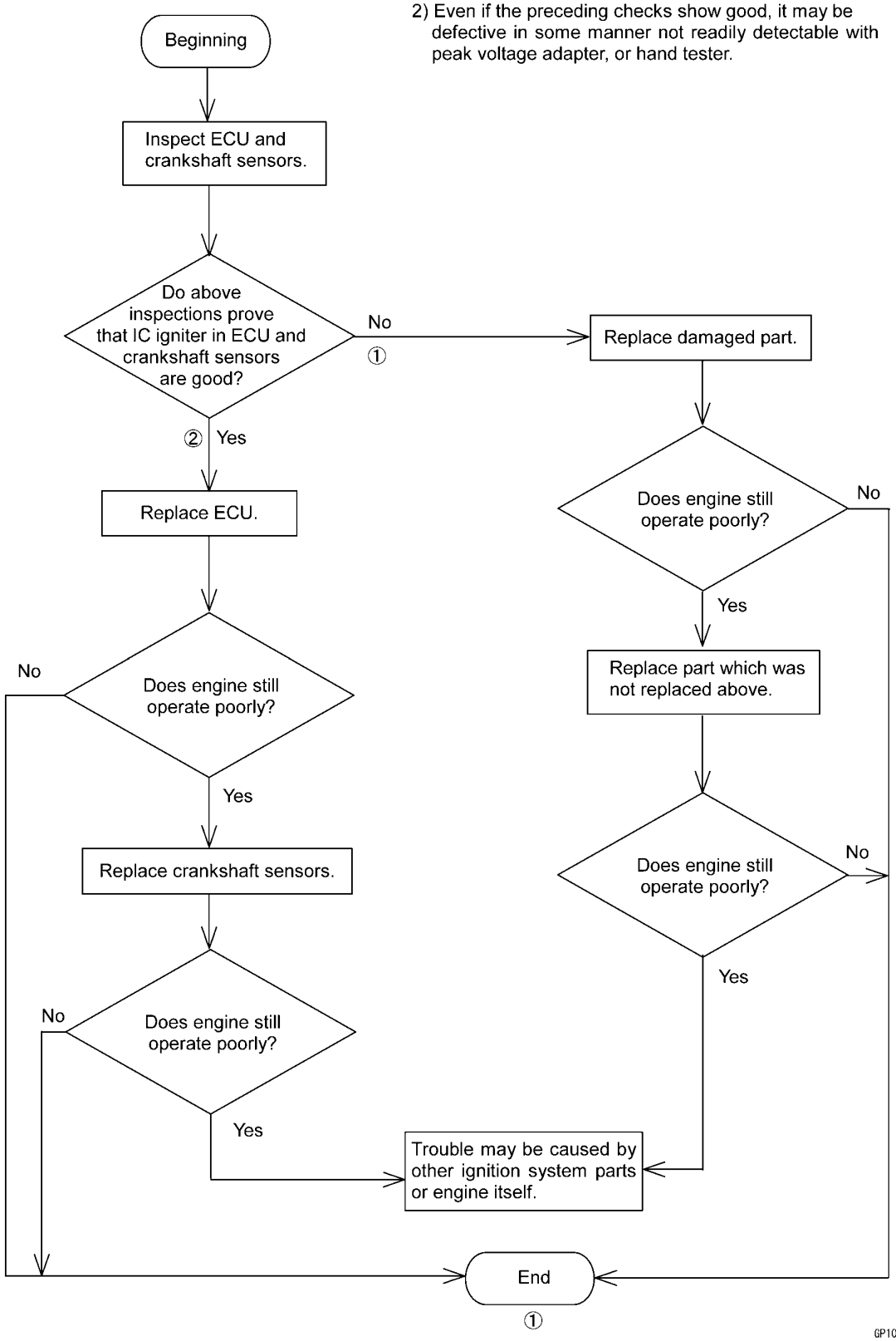


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Ignition System

IC igniter in ECU Troubleshooting

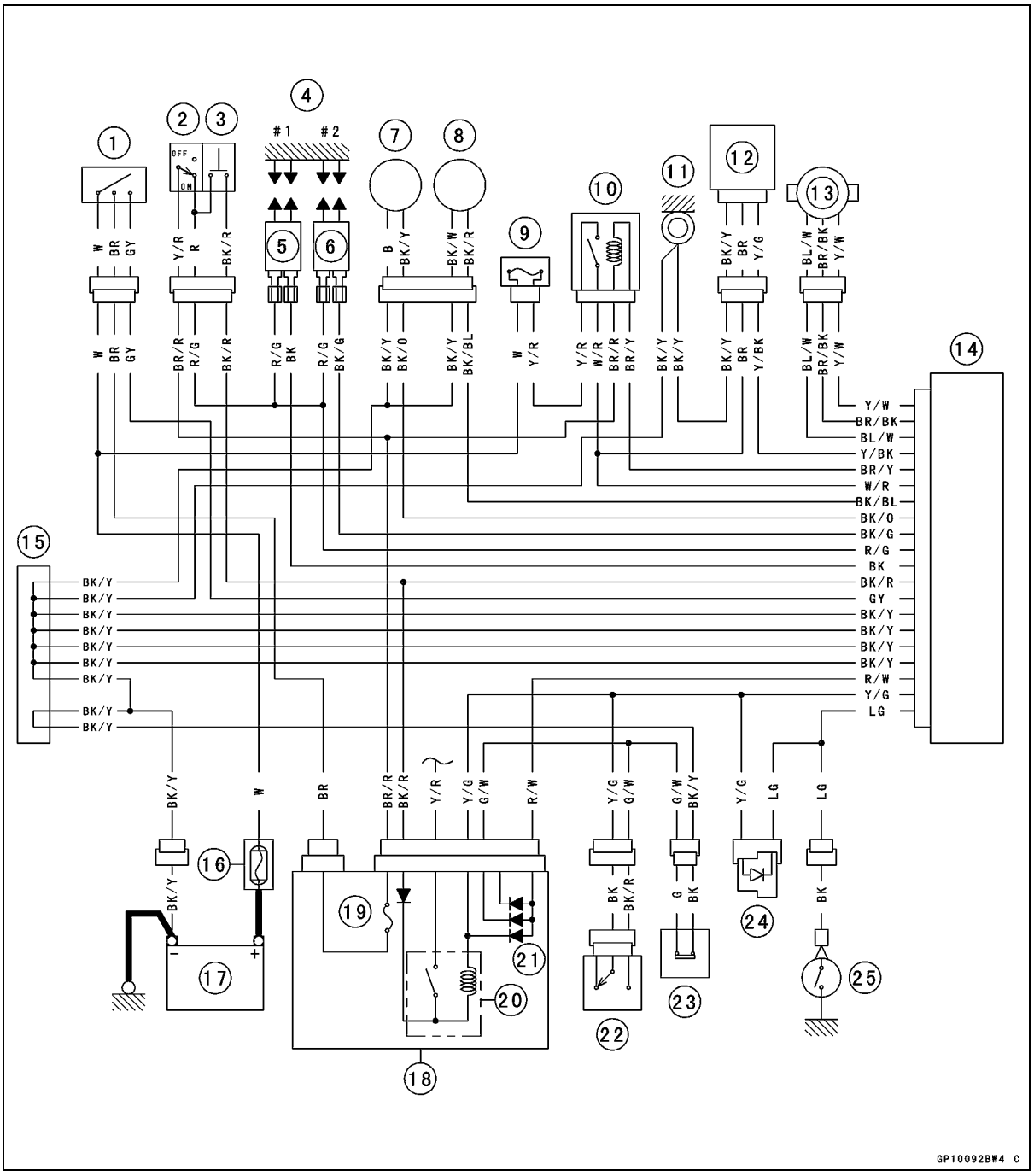
1) IC igniter in ECU or crankshaft sensor is damaged.
2) Even if the preceding checks show good, it may be defective in some manner not readily detectable with peak voltage adapter, or hand tester.



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Ignition System

Ignition System Circuit



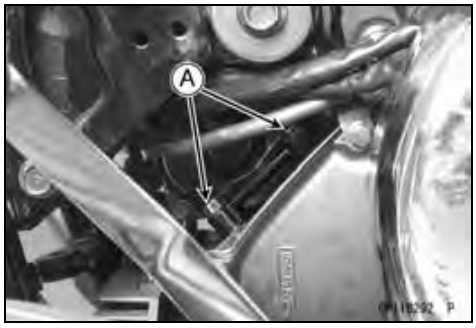
1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Spark Plugs
5. Ignition Coil #1 (front cylinder)
6. Ignition Coil #2 (rear cylinder)
7. Crankshaft Sensor #1 (front cylinder)
8. Crankshaft Sensor #2 (rear cylinder)
9. DFI Fuse 15 A
10. DFI Main Relay
11. Frame Ground
12. Vehicle-down Sensor
13. Throttle Sensor
14. Electronic Control Unit
15. Joint Connector 2
16. Main Fuse 30 A
17. Battery
18. Junction Box
19. Ignition Fuse 10 A
20. Starter Circuit Relay
21. Interlock Diodes
22. Starter Lockout Switch
23. Side Stand Switch
24. Diode
25. Neutral Switch

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Starter Motor

Starter Motor Removal

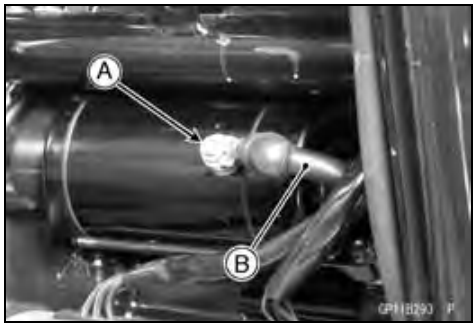
- Remove:
  Radiator (see Radiator Removal in the Cooling System chapter)
  Starter Motor Bolts [A]



- Remove the starter motor terminal nut [A] and cable [B].

CAUTION

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

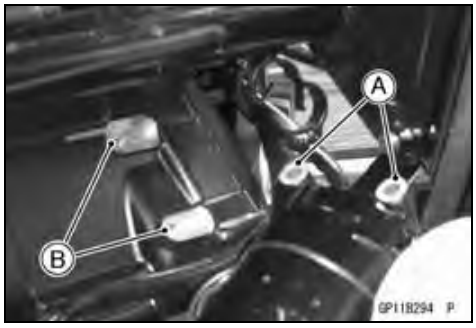


Starter Motor Installation

CAUTION

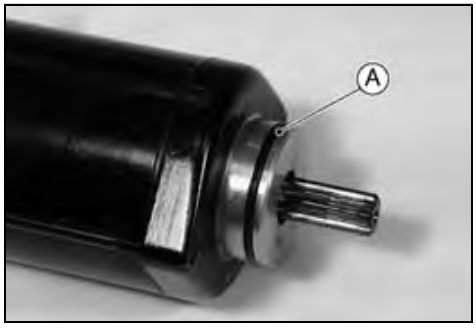
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.



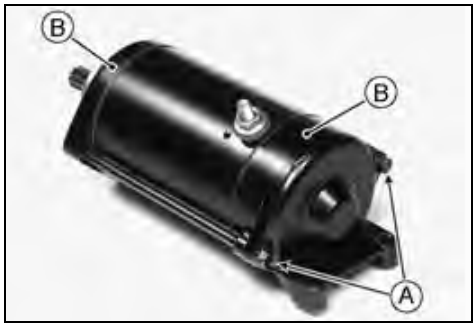
- Replace the O-ring [A] with a new one.
- Apply a small amount of engine oil to the O-ring.

Torque - Starter Motor Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)
Starter Motor Terminal Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)



Starter Motor Disassembly

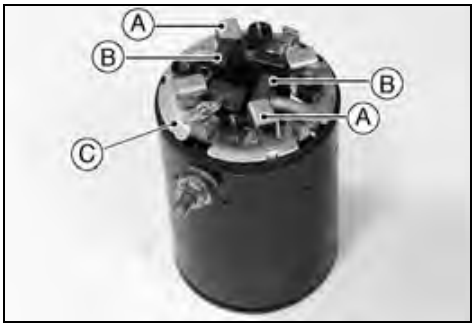
- Remove the starter motor (see Starter Motor Removal in this section).
- Take off the starter motor assembly bolts [A] and remove both end covers [B] and pull the armature out of the yoke.



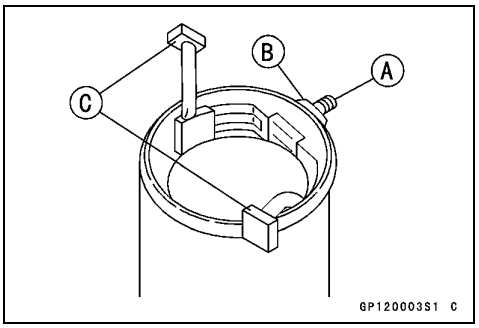
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Starter Motor

- Take the positive carbon brushes [B] out of the brush holders [A].
- Take off the brush plate [C] with brush wire from the yoke.

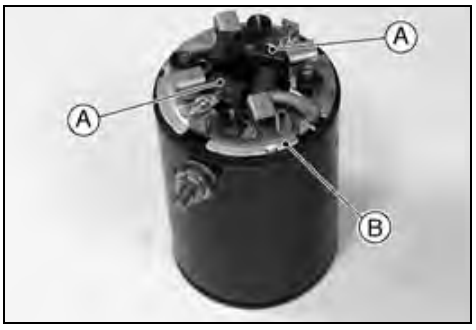


- Unscrew the terminal locknut [B] and remove the terminal bolt [A].
- Take the positive carbon brushes and wire assy [C] out of the yoke.



NOTE

○*Do not remove the negative carbon brushes [A] from the brush plate [B].*

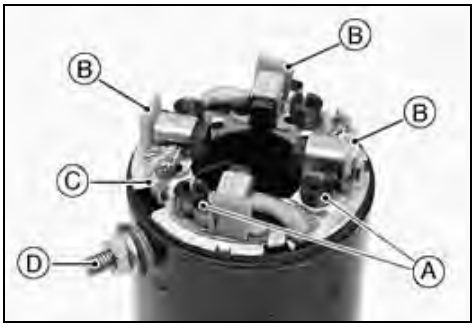


Starter Motor Assembly

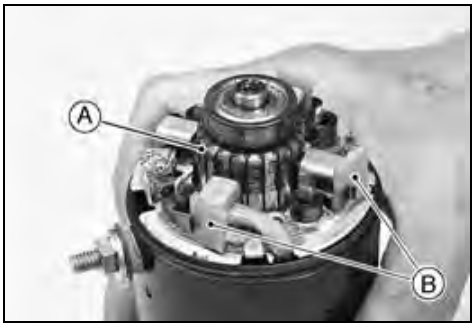
- Holding the springs [A] with plastic washers [B], insert the brushes.

○Fit the brush wire into the holder groove.

- Align the tang [C] with the terminal bolt [D].



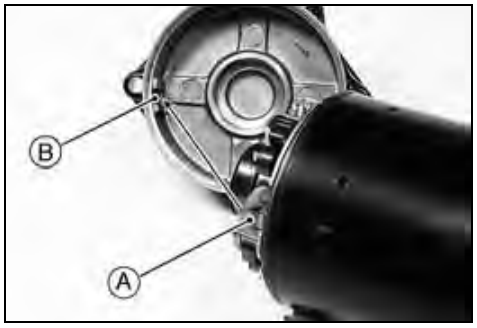
- Put the armature [A] among the brushes, and remove the plastic washers [B].



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Starter Motor

● Fit the tang [A] of the brush plate into the left end cover groove [B].



● Apply a thin coat of grease to the oil seal [B] in the right end cover [A].

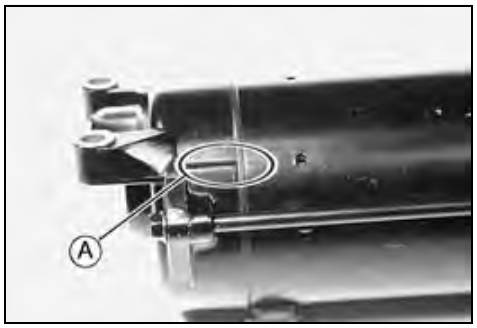


● Apply a thin coat of grease to the left bearing [A].
● Fit shims onto the right end cover.



○The line on the yoke should align [A] with the line on the left cover.

Torque - Starter Motor Assembly Bolts: 4.9 N·m (0.50 kgf·m, 43 in·lb)

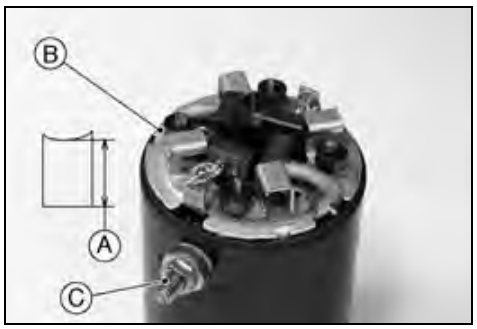


Brush Inspection

● Measure the length [A] of each brush.
★If any is worn down to the service limit, replace the carbon brush holder assy [B] and the terminal bolt assy [C].

Starter Motor Brush Length

Standard:	**12 mm (0.47 in.)**
Service Limit:	**8.5 mm (0.33 in.)**

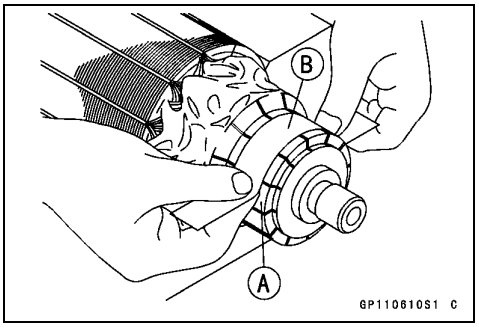


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Starter Motor

Commutator Cleaning and Inspection

● Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.

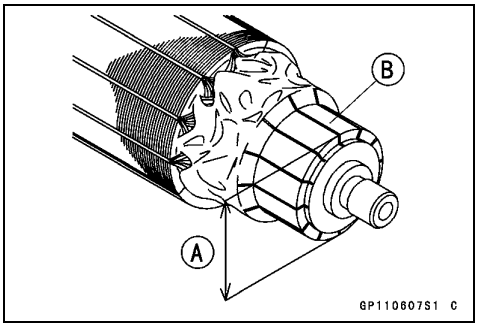


● Measure the diameter [A] of the commutator [B].

★Replace the starter motor with a new one if the commutator diameter is less than the service limit.

Commutator Diameter

Standard:	**28 mm (1.10 in.)**
Service Limit:	**27 mm (1.06 in.)**



Armature Inspection

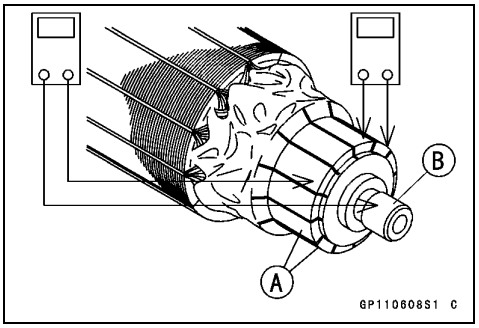
● Using the × 1 Ω hand tester range, measure the resistance between any two commutator segments [A].

★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.

Special Tool - Hand Tester: 57001-1394



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 components 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.*

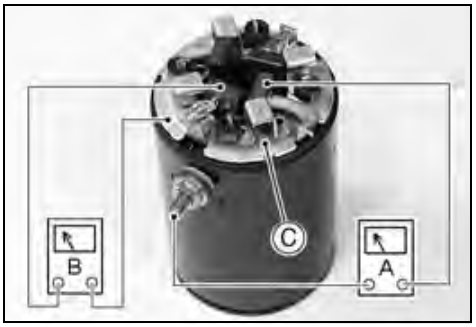
Brush Assy Inspection

● Using the × 1 Ω hand tester range, measure the resistance as follows.

Terminal Bolt and Positive Brushes [A]
Brush Plate and Negative Brushes [B]
Plastic [C]

○The reading should be zero.

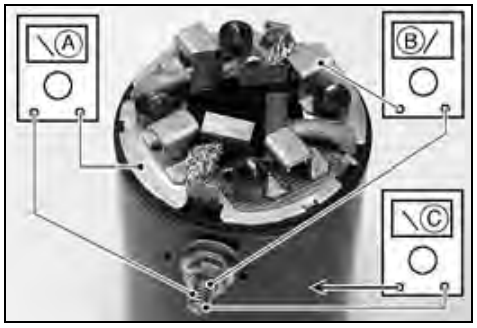
★If there is not close to zero ohms, the brush lead has an open. Replace the terminal bolt assembly and the brush holder assembly.



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Starter Motor

Brush Plate and Terminal Bolt Inspection

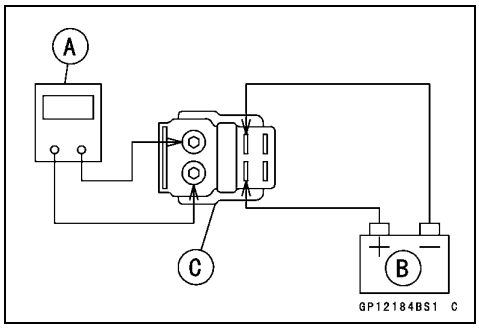


- Using the highest hand tester range, measure the resistance as shown.
  Terminal Bolt and Brush Plate [A]
  Terminal Bolt and Negative Brush Holders [B]
  Terminal Bolt and Yoke [C]

○The reading should be infinite (∞ Ω).

★If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.

Starter Relay Inspection



- Remove the right side covers (see Right Side Cover Removal in the Frame chapter).
- Remove the coolant reserve tank, then the starter relay.
- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown.

★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

Tester Range: × 1 Ω range

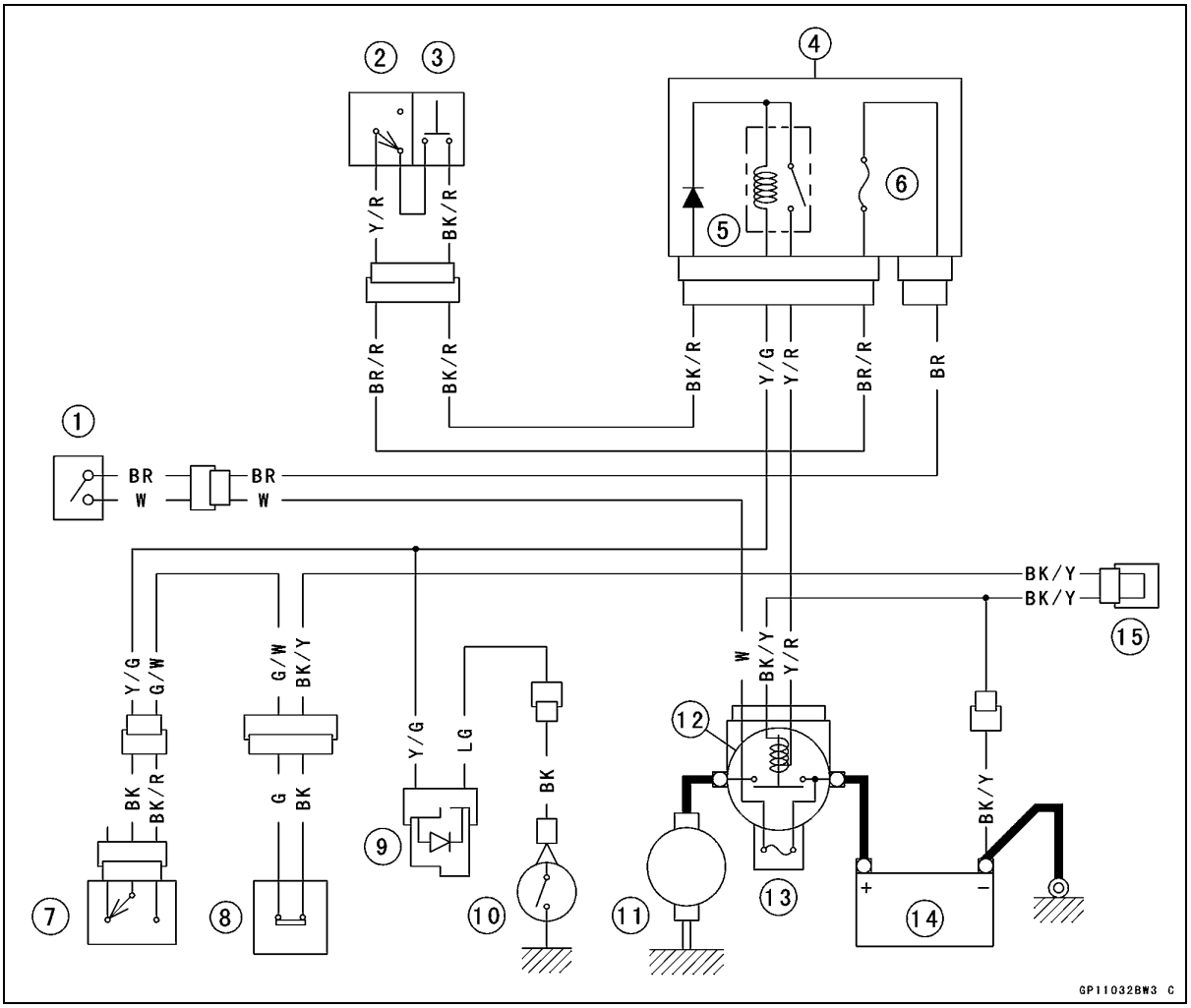
Criteria: When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω

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Starter Motor

Electric Starter Circuit



1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Junction Box
5. Starter Circuit Relay
6. Ignition Fuse 10 A
7. Starter Lockout Switch
8. Side Stand Switch
9. Diode
10. Neutral Switch
11. Starter Motor
12. Starter Relay
13. Main Fuse 30 A
14. Battery
15. Joint Connector 2

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Lighting System

This model adopts the daylight system and has a headlight relay in the junction box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on when the engine starts running and stays on even if the engine stalls. The headlight goes out when the ignition switch is turned off. It also goes out while the starter button is depressed.

Headlight Beam Horizontal Adjustment

- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Beam Vertical Adjustment

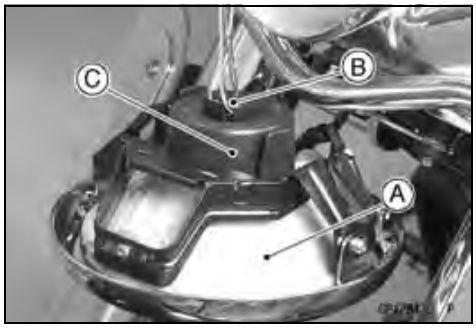
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Bulb Replacement

- Remove the headlight rim screws [A] on both sides.



- Pull the headlight unit [A] and drop it out.
- Pull the headlight connector [B].
- Remove the headlight dust cover [C].



- Push the hook [A] to unlock.



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Lighting System

● Take out the bulb [A].



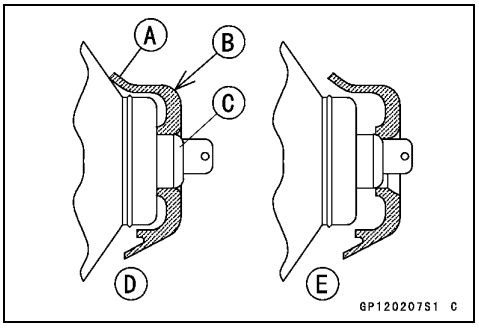
CAUTION

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.

○Clean off any contamination that inadvertently gets on the bulb with alcohol or a soap and water solution.

● Replace the headlight bulb.
● Fit the dust cover [A] with the TOP mark [B] upward onto the bulb [C] firmly as shown.
Good [D]
Bad [E]
● Tighten:

Torque - Headlight Rim Screws: 2.9 N·m (0.30 kgf·m, 26 in·lb)



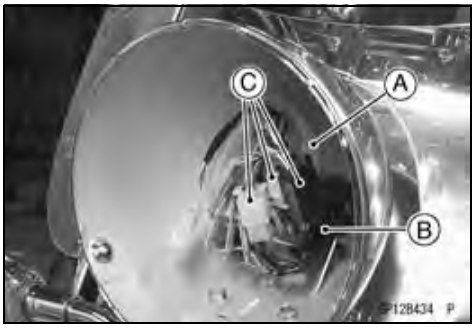
● After installation, adjust the headlight aim (see Headlight Beam Horizontal/Vertical Adjustment in this section).

Headlight Body Removal

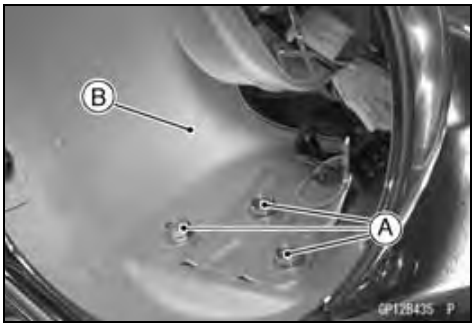
● Remove the headlight rim screws [A] on both sides.
● Pull the headlight unit [B] and drop it out.



● Remove:
Rubber Cover [A]
Clamp [B]
Connectors [C]



● Remove the headlight body bolts [A], then take off the body [B].



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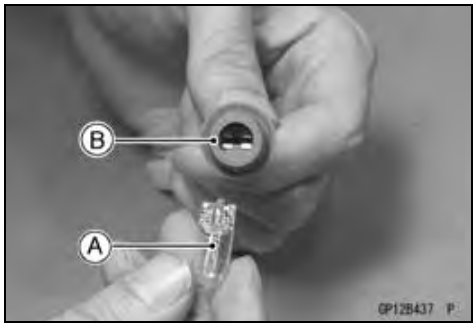
Lighting System

City Light Bulb Replacement (Other than US, CA and AU)

US: United States Model
CA: Canada Model
AU: Australia Model



- Remove the headlight unit (see Headlight Body Removal in this section).
- Pull out the socket [A] together with the bulb.

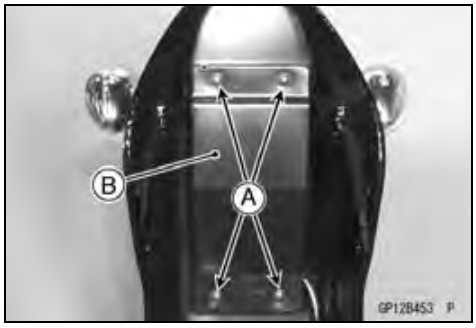


- Remove the wedge-base type bulb [A], pull the bulb straight out of the socket [B].
- Replace the bulb with a new one.

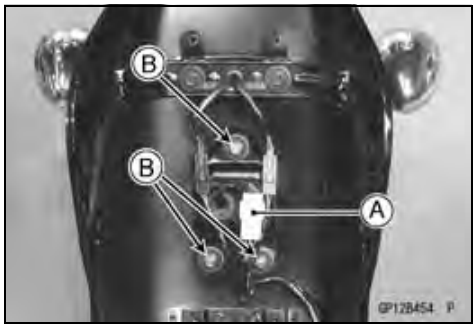
CAUTION

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.

Tail/Brake Light Removal/Installation



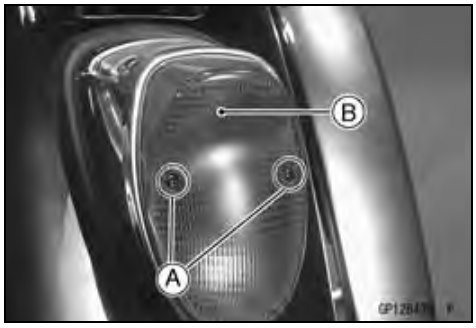
- Remove the rear fender (see Rear Fender Removal in the Frame chapter).
- Turn over the rear fender, and remove the cover bolts [A] and cover [B].



- Disconnect the tail/brake light lead connector [A].
- Remove the nuts [B].
- Remove the tail/brake light from the rear fender.
- Tighten:

Torque - Tail/Brake Light Mounting Nuts: 5.9 N·m (0.60 kgf·m, 52 in·lb)

Tail/Brake Light Bulb Replacement

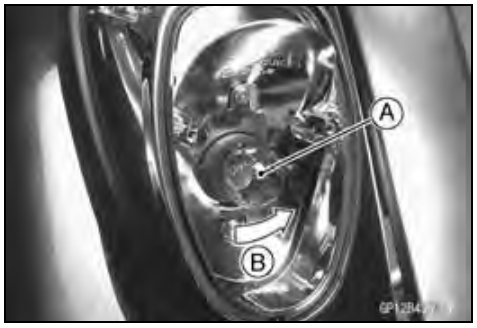


- Unscrew the screws [A] in the taillight lens.
- Pull the lens [B] off.

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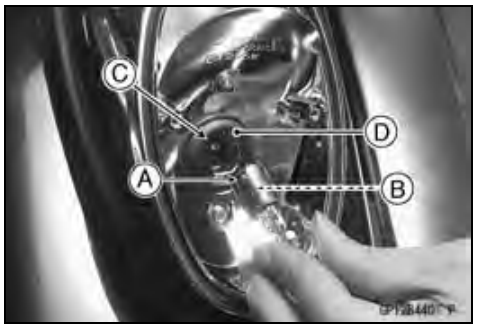
Lighting System

- Push the bulb [A] in, turn it counterclockwise [B], and pull it out.
- Replace the bulb with a new one.



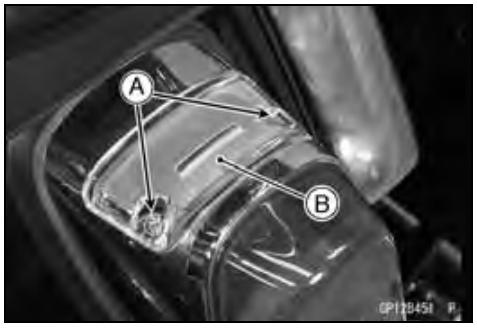
- With the front pin [A] up and the rear pin [B] down, insert the new bulb by aligning the front pin with the left groove [C] in the walls of the socket [D].
- Push the bulb in, turn it clockwise, and release it. It should lock in position.
- Tighten:

Torque - Tail/Brake Light Lens Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)



Licence Plate Light Bulb Replacement

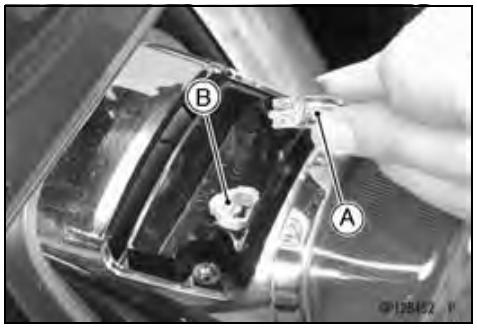
- Remove the licence plate light lens screws [A] and take off the lens [B].



- Remove the wedge-base type bulb [A], pull the bulb straight out of the socket [B].

CAUTION

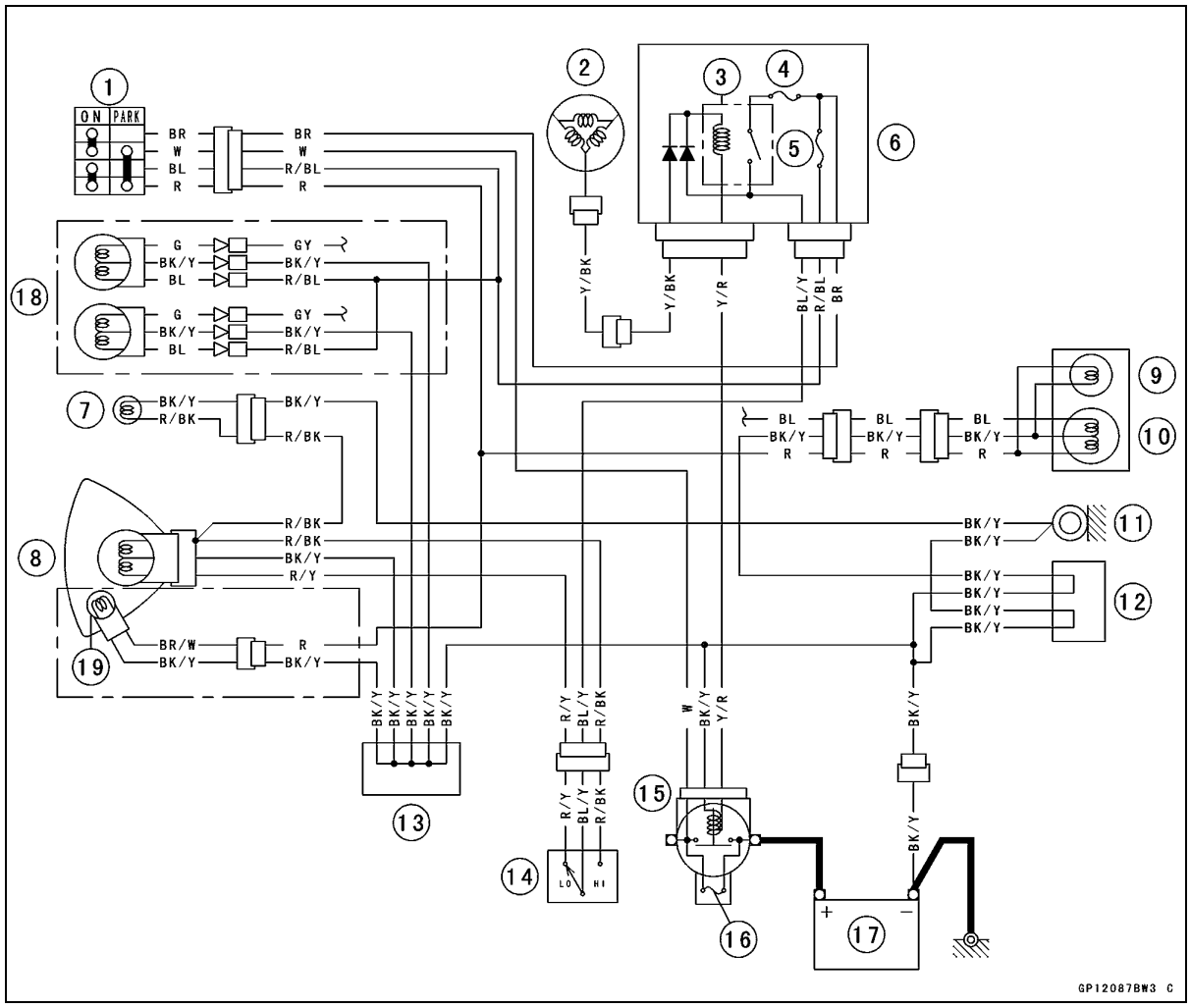
Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.



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Lighting System

Headlight/Tail Light Circuit



1. Ignition Switch
2. Alternator
3. Headlight Relay
4. Headlight Fuse 10 A
5. Taillight Fuse 10 A
6. Junction Box
7. High Beam Indicator Light
8. Headlight
9. License Plate Light
10. Tail/Brake Lights
11. Frame Ground
12. Joint Connector 2
13. Joint Connector 1
14. Dimmer Switch
15. Starter Relay
16. Main Fuse 30 A
17. Battery
18. Running Position Lights (US and Canada Models)
19. City Light (Other than US, Canada and Australia Models)

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Automatic Turn Signal Canceling System

Automobiles use a turn signal canceling system actuated by steering wheel turn. But, motorcycles turn with a bank additionally, and so have a smaller steer angle. This makes difficult to adopt an automobile type turn signal canceling system because of inaccurate operation in motorcycles. So, motorcycles adopt time & distance counting system.

The canceling system consists of a battery, turn signal control relay, distance sensor, and turn signal switch. When the turn signal switch is pushed onto the right or left, the turn signals start flashing and the control relay starts counting off **8 seconds**. At the end of this time, the control relay starts calculating distance traveled using pulses from the distance sensor in the speedometer. The control relay keeps working even after the tern signal switch was released and returned to the neutral position by spring force. When the motorcycle has traveled an additional **65 meters (213 foots)**, the control relay shuts off the current, turns off the turn signal lights, and resets itself.

★If the turn signal canceling system does not function properly, first check all the wiring connections carefully.
- Secondly, inspect the distance sensor.
- Thirdly, inspect the turn signal switch in the left handlebar switch.
- Lastly, check the turn signal control relay.

Wiring Inspection



- Connect all the connectors.
- Remove:
  Right Side Cover (see Right Side Cover Removal in the Frame chapter)
  Coolant Reservoir Tank (see Coolant Change in the Periodic Maintenance chapter)
- Remove the turn signal control relay [A].
- Pull off the 6-pin connector of the relay, the 9-pin and 4-pin meter connectors in the headlight housing, and the 9-pin left handlebar switch connector under the fuel tank.
- Make sure all connector terminals are clean and tight, and none of them have been bent.

○Clean the dirty terminals, and straighten slightly-bent terminals.

- Check conductivity or voltage of the numbered terminals with the hand tester.

○The terminal numbers are shown in the wiring diagram of Turn Signal Canceling System.

Special Tool - Hand Tester: 57001-1394

Wiring Inspection

Connectors	Tester Connection	Tester Reading
Turn Signal Control Relay ←→ Distance Sensor	1 - 8 3 - 7	0 Ω
Turn Signal Control Relay ←→ Left Handlebar Switch	2 - 11 3 -9 4 - 10	
Turn Signal Control Relay ←→ Battery	6- Battery (+)	Battery Voltage with IG. Switch. ON 0 V with IG. Switch. OFF

IG. Switch: Ignition Switch

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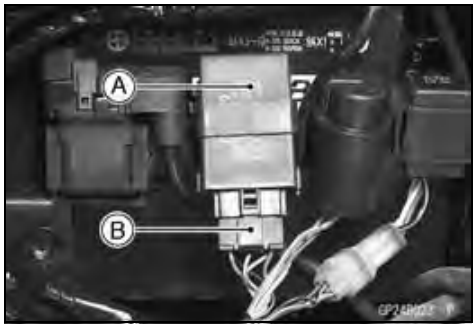
Automatic Turn Signal Canceling System

★If any one of the hand tester readings shows an improper values, check the wiring and connections of the turn signal switch, distance sensor, and turn signal control relay. Check the turn signal control relay (see Turn Signal Control Relay Inspection in this section) if all of them turn out good.

Distance Sensor Inspection

Remove:
Right Side Cover (see Right Side Cover Removal in the Frame chapter)
Coolant Reservoir Tank (see Coolant Change in the Periodic Maintenance chapter)

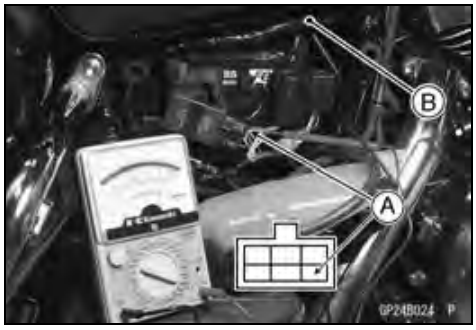
● Remove the turn signal control relay [A].
○Do not disconnect the connector [B].



● Use the jack and the attachment jack to lift the rear wheel (see Rear Wheel Removal in the Wheel/Tires chapter).

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

● Set the hand tester to the DC25 V range and connect it to the LB lead terminal [A] and battery (–) terminal [B] as shown.



Connections
Hand Tester (+) → LB Lead Terminal
Hand Tester (–) → Battery (–) Terminal

● Remove all the spark plugs and shift the gear into 1st.
● Turn the rear wheel slowly to see that the tester's pointer fluctuates repeated by reading 0.5 V and 12 V.
★If the tester's pointer fluctuates, distance sensor is normal.
★If the tester's pointer does not fluctuate, inspect the speed sensor and turn signal control relay. If the speed sensor and control relay are good, replace the digital meter assembly.

Turn Signal Switch Inspection

● Open the headlight housing (see Headlight Body Removal in this chapter).
● Unplug the 9-pin connectors that leads to the left handlebar switch.
● Check the turn signal switch connections according to the table.
★If the switch has an open circuit or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement.
★If any parts are not repairable, the left handlebar switch must be replaced as a unit.

Turn Signal Switch Connections

Color	G	O	GY	BK/Y	Y/R
L (left)	●	●		●	●
OFF (push)					
R (right)		●	●	●	●

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Automatic Turn Signal Canceling System

Turn Signal Control Relay Inspection

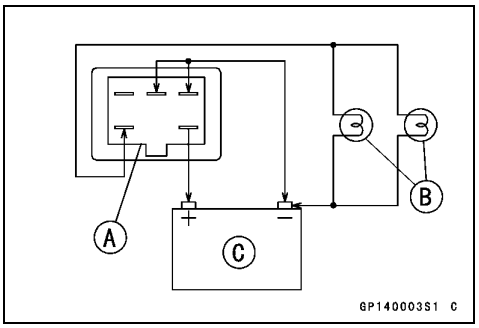
CAUTION

Never drop the turn signal control relay, especially on a hard surface. Such a shock to the unit can damage it.

● Remove:
Right Side Cover (see Right Side Cover Removal in the Frame chapter)
Reservoir Tank (see Coolant Change in the Periodic Maintenance chapter)

● 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 Control Relay Connector [A]
Turn Signal Lights [B]
12 V Battery [C]

★If the lights do not flash as specified, replace the turn signal control relay.



Testing Turn Signal Control Relay Inspection

Load		Flashing Times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	21 ~ 23	140 ~ 250
2	42 ~ 46	75 ~ 95

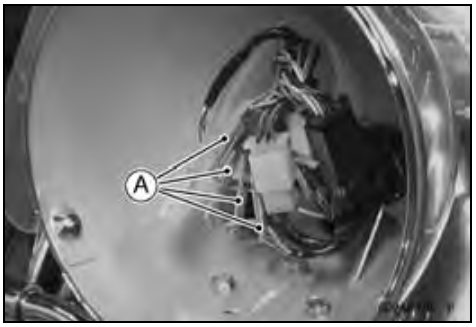
(*): Cycle(s) per minute
(**): corresponds to “one light burned out, and the other lights stay ON”.

NOTE

○*Even if the foregoing checks show the turn signal control relay to be good, it may be defective in some manner especially for automatic turn signal canceling operation not readily detectable with above checks. If all other checks are good, replace the turn signal control relay.*

Turn Signal Light Removal/Installation

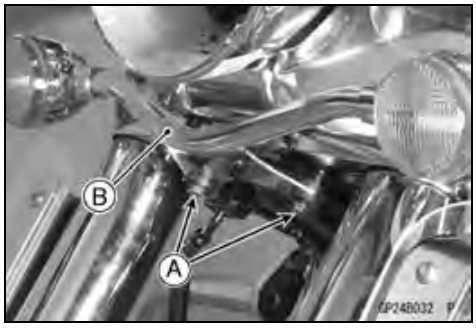
● For front turn signal light removal, remove the headlight unit (see Headlight Removal in this chapter).
● Disconnect the connectors [A].



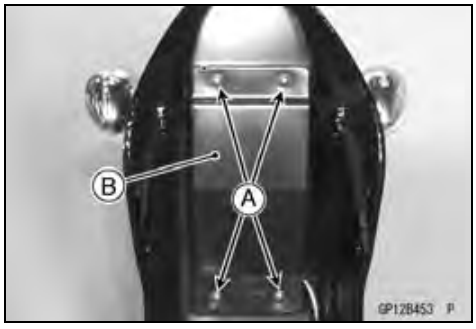
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Automatic Turn Signal Canceling System

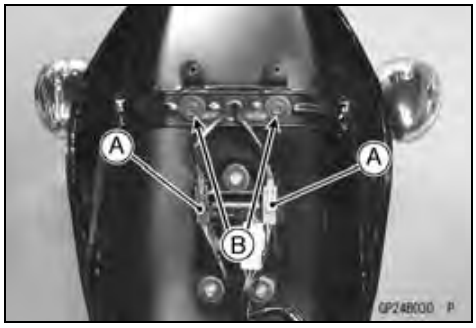
- Remove:
  Front Turn Signal Light Bracket Bolts [A]
  Front Turn Signal Light Assy [B]



- For rear turn signal light removal, remove the rear fender (see Rear Fender Removal in the Frame chapter).
- Turn over the rear fender, and remove the cover bolts [A] and cover [B].

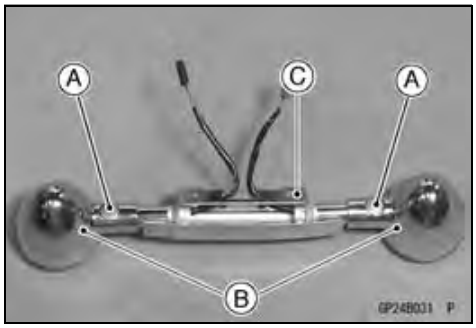


- Disconnect the connectors [A].
- Remove the rear turn signal light bracket bolts [B].
- Remove the rear turn signal light assy from the rear fender.



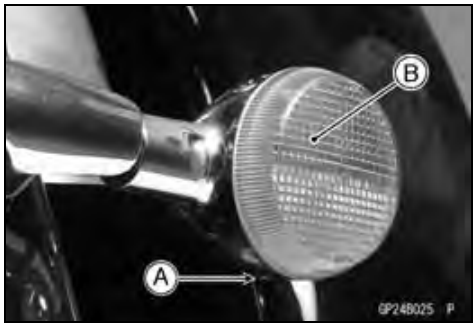
- Remove the turn signal light mounting screws [A].
- Remove the turn signal light [B] from the bracket [C].
- Tighten:

Torque - Turn Signal Light Mounting Screws: 6.9 N·m (0.70 kgf·m, 61 in·lb)



Turn Signal Light Bulb Replacement

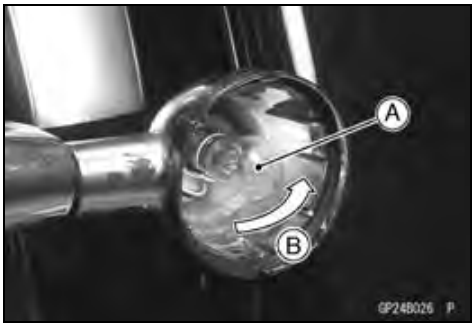
- Remove the turn signal light lens screw [A] and take off the lens [B].



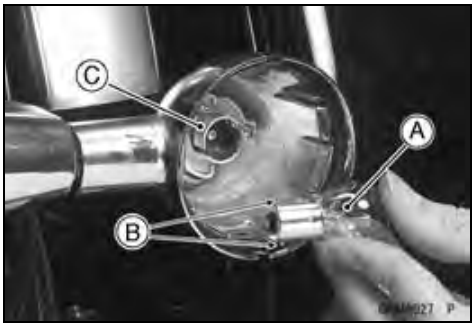
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Automatic Turn Signal Canceling System

- Push the bulb [A] in the socket and turn the bulb counterclockwise [B].
- Replace the bulb with a new one.

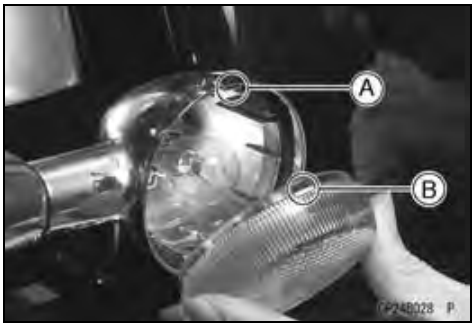


- Insert the new bulb [A] by aligning the pins [B] with the groove in the walls of the socket [C].



- Fit the projection [A] in the recess [B] of the lens.
- Tighten:

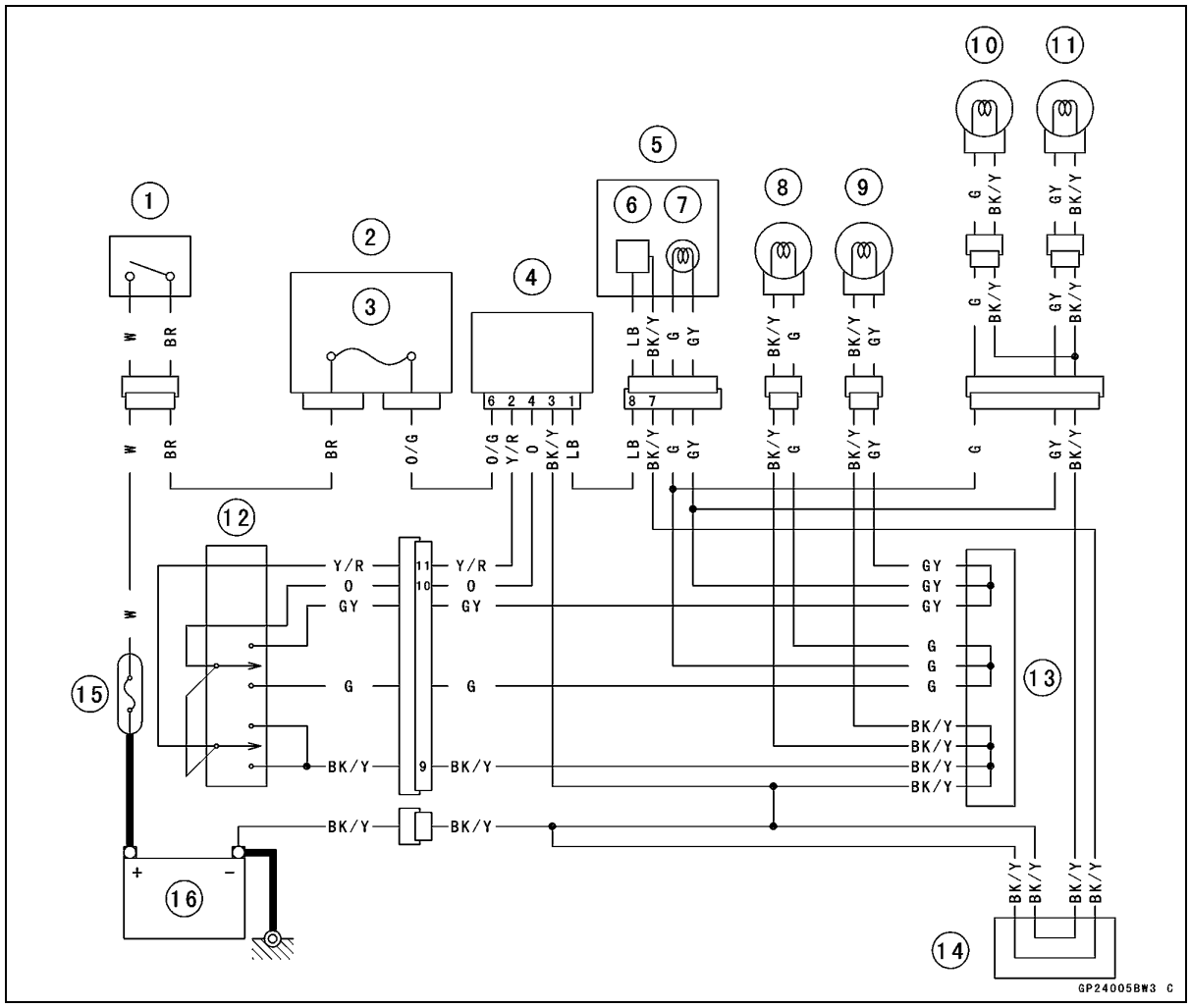
Torque - Turn Signal Light Lens Screws: 1.0 N·m (0.10 kgf·m, 8.7 in·lb)



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Automatic Turn Signal Canceling System

Turn Signal Cancelling System Circuit



1. Ignition Switch
2. Junction Box
3. Turn Signal Control Relay Fuse 10 A
4. Turn Signal Control Relay
5. Meter Unit
6. Distance Sensor
7. Turn Signal Indicator Light
8. Front Left Turn Signal Light
9. Front Right Turn Signal Light
10. Rear Left Turn Signal Light
11. Rear Right Turn Signal Light
12. Turn Signal Switch
13. Joint Connector 1
14. Joint Connector 2
15. Main Fuse 30 A
16. Battery

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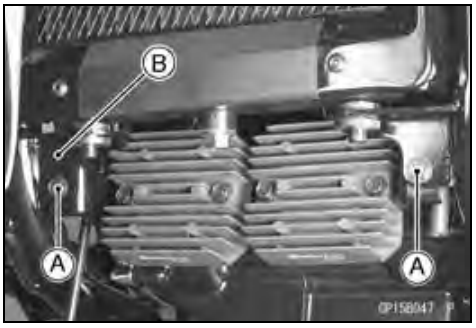
Radiator Fan System

⚠ WARNING

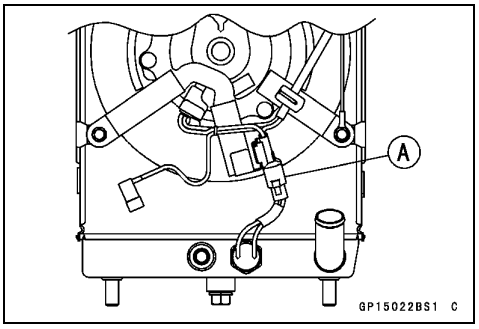
The radiator fan is connected directly to the battery. The fan may start even if the ignition switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.

Fan System Circuit Inspection

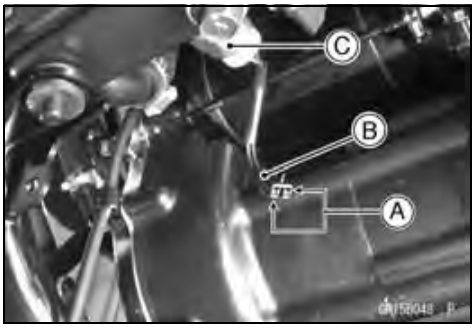
● Remove:
Bolts [A]
Regulator/Rectifier Bracket [B]



● Disconnect the radiator fan switch connector [A].

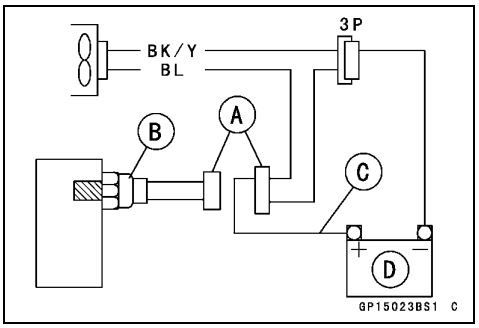


● Using an auxiliary lead [A], connect the radiator fan switch connector [B].
Radiator Fan Switch [C]
★If the fan rotates, inspect the fan switch (see Radiator Fan Switch Inspection in this chapter).
★If the fan does not rotate, inspect the following.
Leads and Connectors
Main Fuse 30 A and Fan Fuse 15 A (see Fuse Inspection in this chapter)
Fan Motor (see Fan Motor Inspection in this section)



Fan Motor Inspection

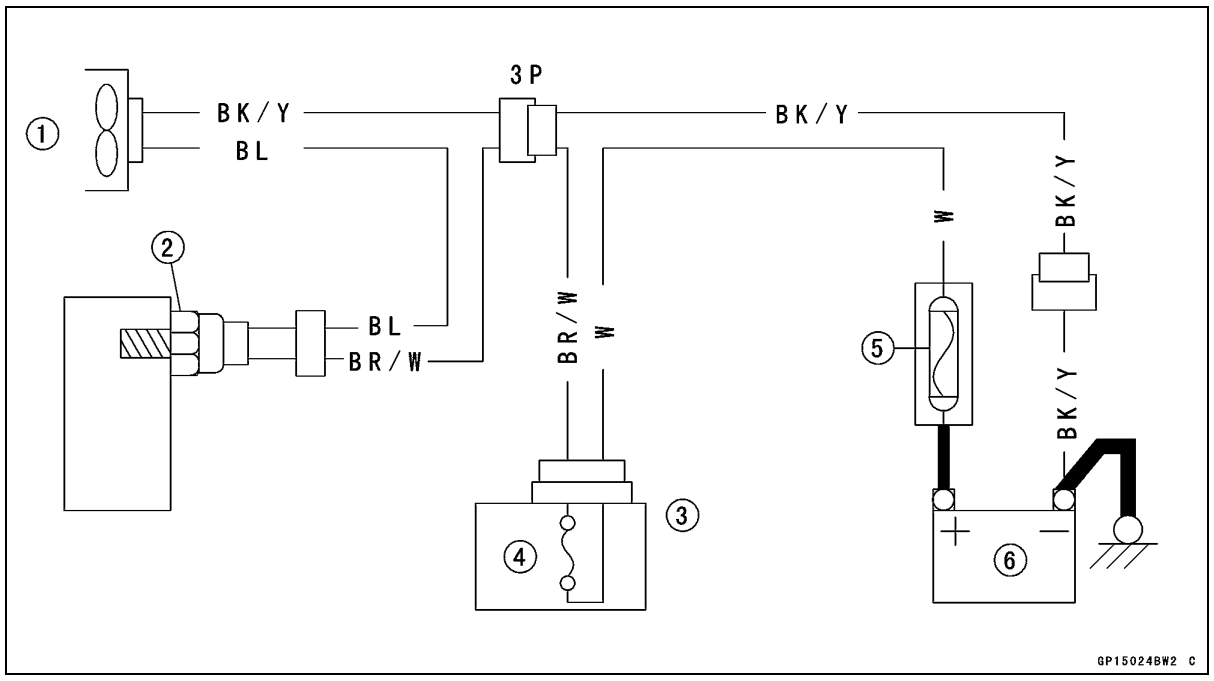
● Disconnect the connector [A] from the radiator fan switch [B].
● Using an auxiliary lead [C], supply battery power to the fan motor.
★If the fan does not rotate, the fan motor is defective and must be replaced.
Battery [D]



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Radiator Fan System

Radiator Fan Circuit



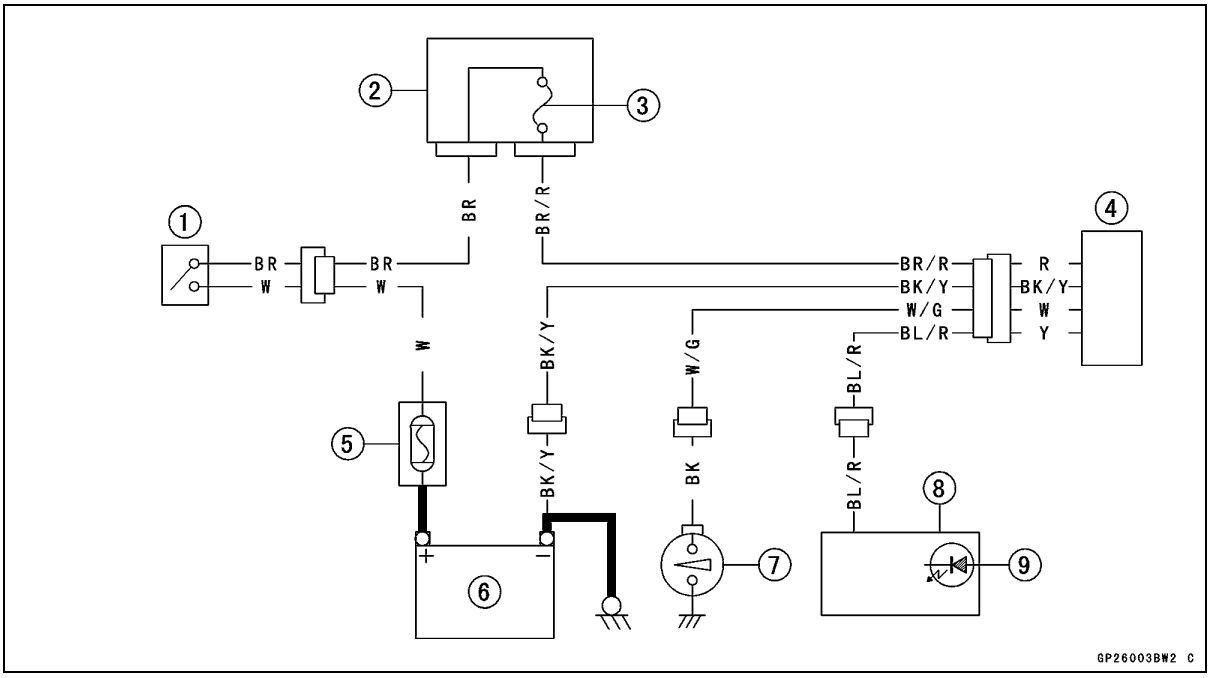
1. Radiator Fan
2. Radiator Fan Switch
3. Junction Box
4. Fan Fuse 15 A
5. Main Fuse 30 A
6. Battery

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Oil Pressure Warning System

Motorcycle operation with low engine oil level, even if it is higher than the lower level line, will cause oil level change when sudden acceleration, or deceleration, and may lead flicker of the oil pressure warning light because of too rapid response of the oil pressure switch. To improve this operation, the oil pressure light delay unit is adopted, which prevents flicker of the oil pressure warning light by delaying its lighting.

Oil Pressure Warning System Circuit



1. Ignition Switch
2. Junction Box
3. Ignition Fuse 10 A
4. Oil Pressure Light Delay Unit
5. Main Fuse 30 A
6. Battery
7. Oil Pressure Switch
8. Meter Unit
9. Oil Pressure Warning LED Light

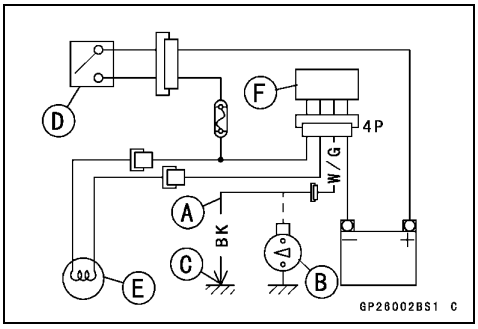
Oil Pressure Light Delay Unit Removal

- Remove:
  Coolant Reservoir Right Side Cover (see Right Side Cover Removal in the Frame chapter)
  Coolant Reservoir Tank (see Coolant Change in the periodic Maintenance chapter)
- Pull the connectors out of the oil pressure light delay unit [A].



Oil Pressure Light Delay Unit Inspection

- Disconnect the lead [A] of the oil pressure switch [B], and ground [C] it to the engine, using an auxiliary wire.
- Turn the ignition switch [D] ON.
- ★If the oil pressure warning LED light [E] in the meter unit is lit, check the oil pressure switch connections (see Switch Inspection in this chapter).
- ★If the warning LED light is not lit, check the warning LED light and wiring (see Meter Unit Inspection in this chapter).
- ★If the LED light and wiring are good, replace the oil pressure light delay unit [F].



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Oil Pressure Warning System

- Turn the ignition switch ON.
- Ground the oil pressure switch lead to the engine, then the oil pressure warning LED light should be lit with a delay.
- Measure this delay time from grounding of the switch lead to lighting of the warning LED light.

Lighting Delay Time
Standard: about 3 seconds

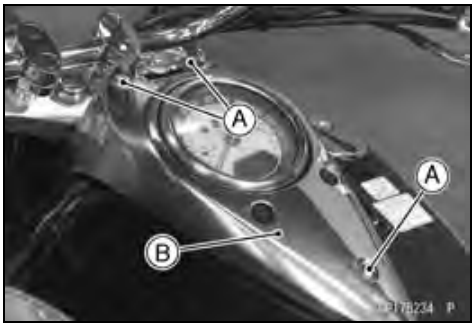
★If the lighting delay time is out of the standard too far, replace the oil pressure light delay unit.

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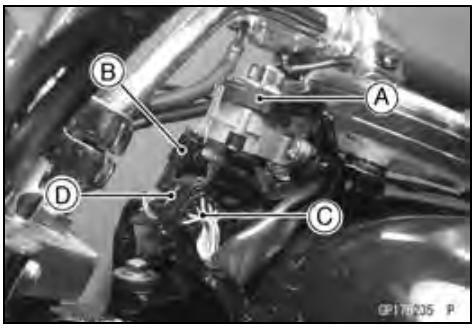
Meter, Gauge

Meter Unit Removal

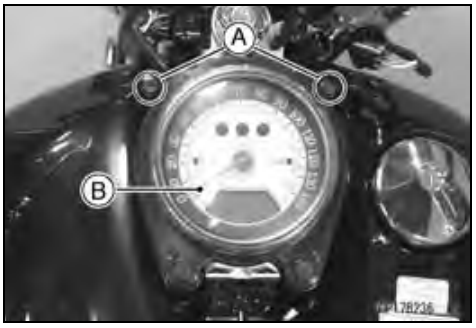
● Remove:
Bolts [A] and Washers
Meter Cover [B]



● Remove:
Cover [A]
Ignition Switch Lead Connector [B]
Meter Unit Lead Connector [C]
● Remove the connector [D] from the bracket.



● Remove:
Bolts [A]
Meter Unit [B] with Bracket



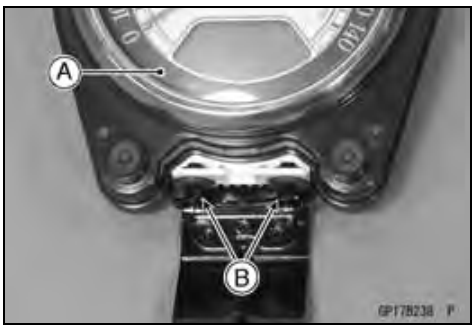
● Remove:
Nuts [A] and Washers



● Pull out the meter unit [A] from the pins [B] on the bracket.

CAUTION

Never drop the meter unit, especially on a hard surface. Such a shock to the unit can damage it. Place the speedometer so that the face is up. If the meter is left upside down or sideways for any length of time, it will malfunction.

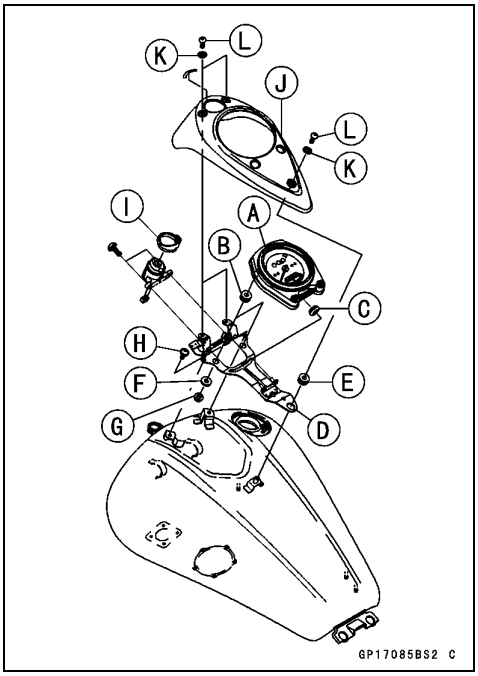


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Meter, Gauge

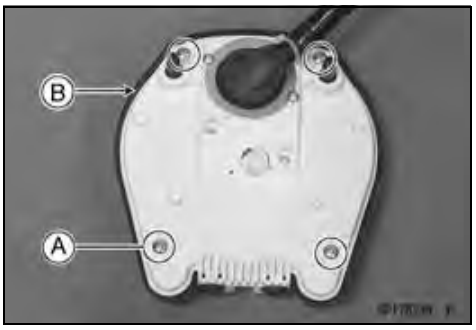
Meter Unit Installation

● Install:
Meter Unit [A]
Damper [B] (ϕ: 22 mm, 0.87 in.)
Damper [C] (ϕ: 16 mm, 0.63 in.)
Bracket [D]
Damper [E] (ϕ: 24 mm, 0.94 in.)
Washers [F] (Steel)
Nuts [G]
Bolts [H] (L = 12 mm, 0.47 in.)
Cover [I]
Meter Cover [J]
Washers [K] (Nylon)
Bolts [L] (L = 10 mm, 0.39 in.)

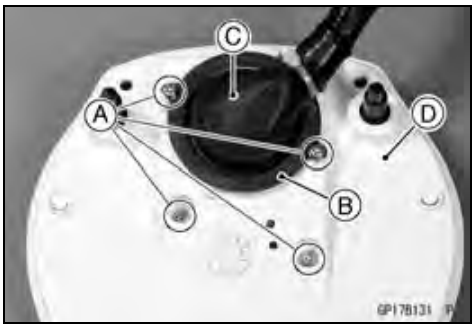


Meter Unit Disassembly

● Remove the meter unit (see Meter Unit Removal in this section).
● Remove:
Screws [A]
Upper Meter Cover [B]



● Remove:
Screws [A]
Holder [B]
● Remove the grommet [C] from the lower meter cover [D].



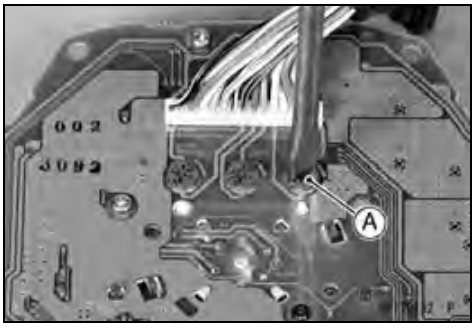
NOTE

○*The water temperature warning LED light, oil pressure warning LED light and FI indicator LED light can not be exchanged.*

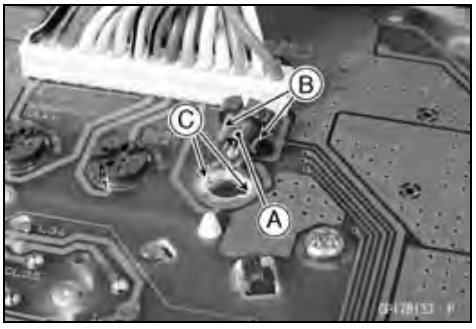
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Meter, Gauge

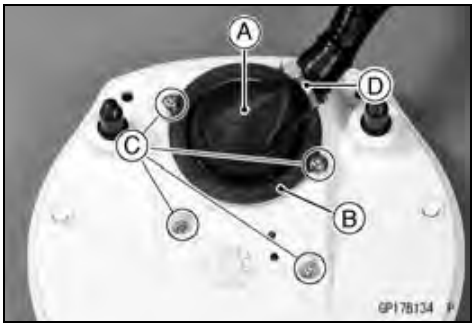
● Turn out the socket [A] counterclockwise.
○These sockets are for the high beam indicator light, turn signal indicator light and neutral indicator light.



Meter Unit Assembly
● Insert the bulb [A] so that the projections [B] align with the grooves [C] in the panel, and turn in the socket clockwise.



● Fit the grommet [A] in the lower meter cover.
● Install:
Holder [B]
Screws [C]
● Tighten the band [D] as shown.



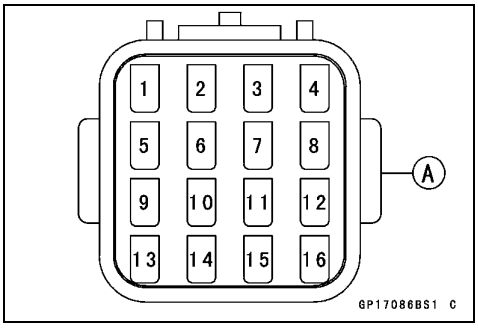
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Meter, Gauge

Meter Unit Inspection

LCD Segment Inspection

● Remove the meter unit (see Meter Unit Removal in this section).



CAUTION

Do not drop the meter unit. Such a shock to the meter unit can damage it. Place the meter facing up. If a meter is left upside down or sideways for any length of time, it will malfunction.

[A] Meter Unit Lead Connector
[1] Neutral Indicator Light (–)
[2] FI Indicator LED Light (–)
[3] Oil Pressure Warning LED Light (–)
[4] Water Temperature Warning LED Light (–)
[5] Speed Signal for Turn Signal Control Relay
[6] Unused
[7] Battery (+)
[8] Ignition, Neutral Indicator Light (+) and Illumination (+)
[9] Battery (–), High Beam Indicator Light (–) and Illumination (–)
[10] Speed Sensor Supply Voltage
[11] Speed Sensor Signal
[12] Fuel Level Sensor Signal
[13] Right Turn Signal Indicator Light (±)
[14] Left Turn Signal Indicator Light (±)
[15] Fuel Level Warning Indicator LED Light (–)
[16] High Beam Indicator Light (+)

CAUTION

Do not short each terminals. When inspecting the meter unit be sure to connect each connections.

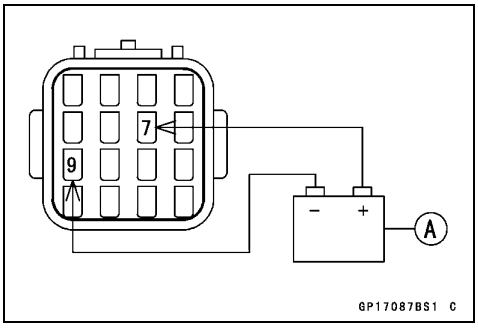
Check 1

● Using the auxiliary leads, connect a 12 V battery [A] to the meter unit lead connector terminals.

Connections

Battery Positive Terminal (+) → Terminal [7]

Battery Negative Terminal (–) → Terminal [9]



○When the terminals are connected, the speedometer needle momentary points to the last reading, and then return to the 0 position.

★If the needle function does not work, replace the meter unit.

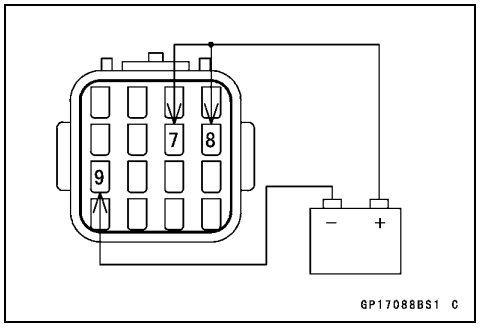
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Meter, Gauge

Check 2

- Using the auxiliary lead, connect the battery positive terminal to terminal [8].
- Verify that all the LCD segments (the letters and numbers of the liquid crystal display) to appear for 3 seconds, and the speedometer needle momentary points to the last reading and then return to the 0 position. Then the clock or meters operates normally depending on the mode selected.
- Disconnect the terminal [8].
- Verity that all the LCD segments and symbols disappear.

★If the display function does not work, replace the meter unit.

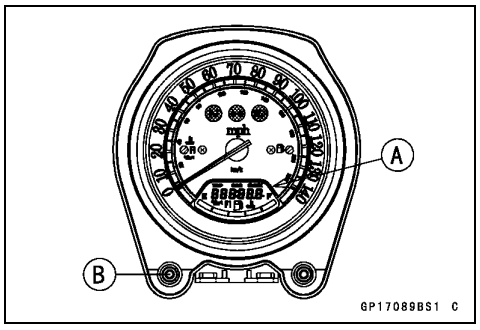


Mode Button Operation Checks

- Connect the lead in the same circuit as for the LCD Segment Inspection, Check 2.
- Check that the display [A] changes to the CLOCK, ODO, and TRIP display each time the mode button [B] is pushed.

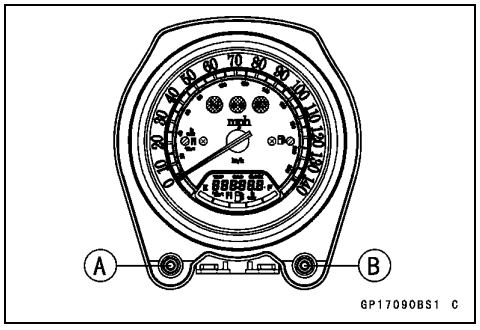
CLOCK → ODO → TRIP

★If the display does not work, replace the meter unit.



- Push the mode button [A] to TRIP and push the reset button [B] more than 2 seconds. The display shows “0.0”.

★If the display does not show “0.0”, replace the meter unit.



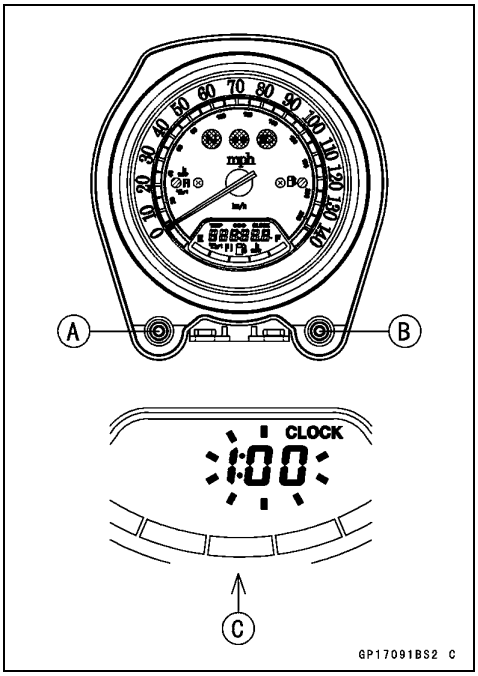
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Meter, Gauge

● Push the mode button [A] to CLOCK.
● Push the reset button [B] more than 2 seconds, then the display turns to the HOUR/MINUTE mode [C].
○In the HOUR/MINUTE mode, the numbers flash on the display.
● Check that the flashing number changes to the HOUR or MINUTE display each time the reset button is pushed.

HOUR / MINUTE → HOUR → MINUTE

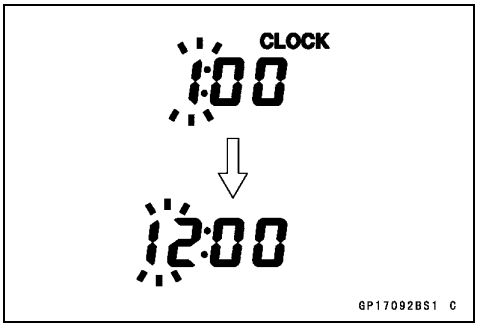
★If the display does not work, replace the meter unit.



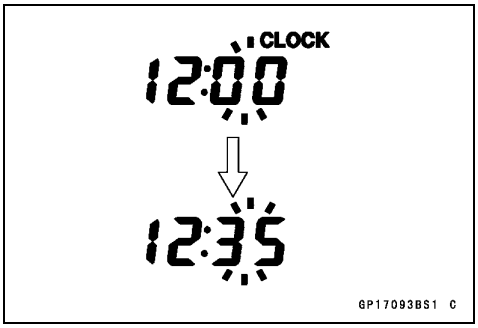
● Check that the time can be set.
★If the time cannot be set, replace the meter unit.

Clock Setting

● In the HOUR/MINUTE mode, push the reset button again to effect the HOUR setting mode.
○The hour display flashes on the display.
● Push the mode button to set the hour.



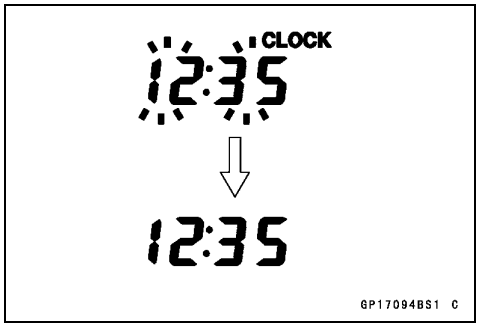
● In the HOUR mode, push the reset button once to effect the MINUTE setting mode.
○The minute display flashes on the display.
● Push the mode button to set the minute.



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Meter, Gauge

● Set the minute, push the reset button to return to the HOUR/MINUTE mode.
● Push the mode button to complete the time setting process.
○The clock starts counting the seconds as soon as the mode button is pushed.



Speedometer Inspection

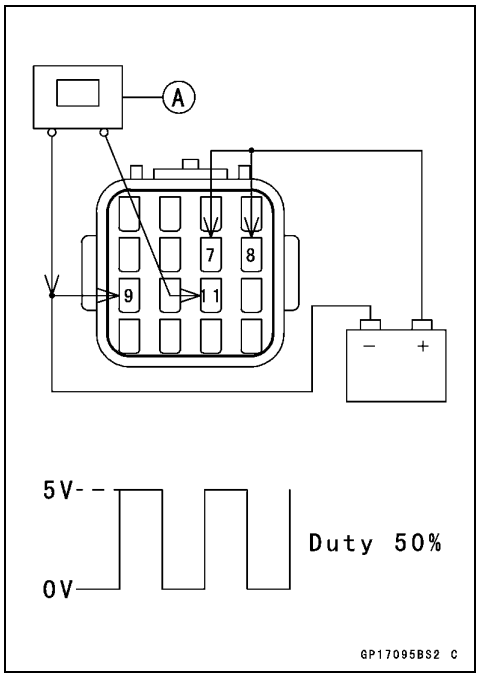
● Connect the leads in the same circuit as for the LCD Segment Inspection, check 2.
● Connect the oscillator [A] to the terminal [11]. The vehicle speed that corresponds to the input frequency will be displayed when a short wave form such as the one show in the diagram is input.

Example

An input frequency of 720 Hz will display about 60 mph.

An input frequency of 450 Hz will display about 60 km/h.

★If the meter does not function correctly, replace the meter unit.



★If an oscillator is unavailable, check the speedometer as follows.
○Install the meter unit (see Meter Unit Installation in this section).
○Use the jack and the attachment jack to lift the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1398

○Turn the ignition switch ON.
○Turn the rear wheel by hand to see if the speedometer shows the vehicle speed that corresponds to the wheel rotation.
★If it does not show properly, inspect the speed sensor and speed sensor power supply voltage.
★If the speed sensor and speed sensor power supply voltage are normal, replace the meter unit.

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Meter, Gauge

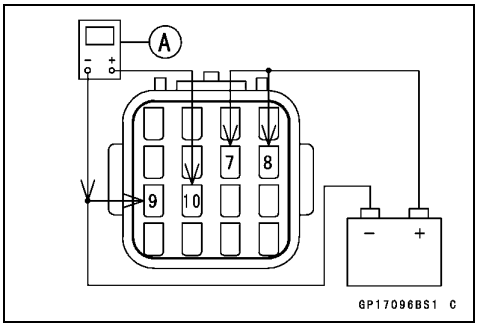
Speed Sensor Power Supply Voltage Inspection

- Connect the leads in the same circuit as for the LCD Segment Inspection, Check 2.
- Set the hand tester [A] to DC25 V, check the voltage between terminal [10] and battery negative lead.

Connections
Hand Tester (+) → Terminal [10]
Hand Tester (–) → Battery Negative (–) Terminal

Special Tool - Hand Tester: 57001-1394

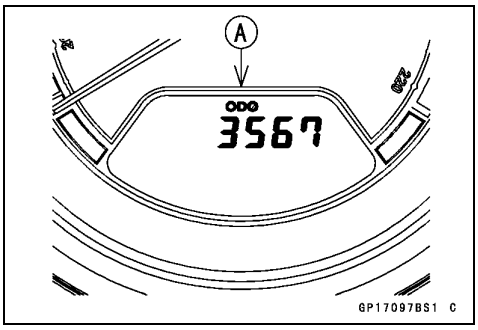
★If the voltage is less than 6 V, replace the meter unit.



ODO Meter Inspection

- Connect the leads in the same circuit as for the Speedometer Inspection.
- Push the mode button to ODO [A].
- Raise the input frequency of the oscillator to quickly see the result of this inspection.

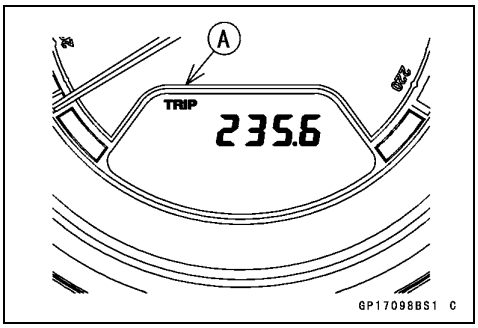
★If the value indicated by the odo meter does not increase, replace the meter unit.



TRIP Meter Inspection

- Connect the leads in the same circuit as for the Speedometer Inspection.
- Push the mode button to TRIP [A].
- Rise the input frequency of the oscillator to quickly see the result of this inspection.

★If the value indicated by the trip meter does not increase, replace the meter unit.



Fuel Level Gauge Inspection

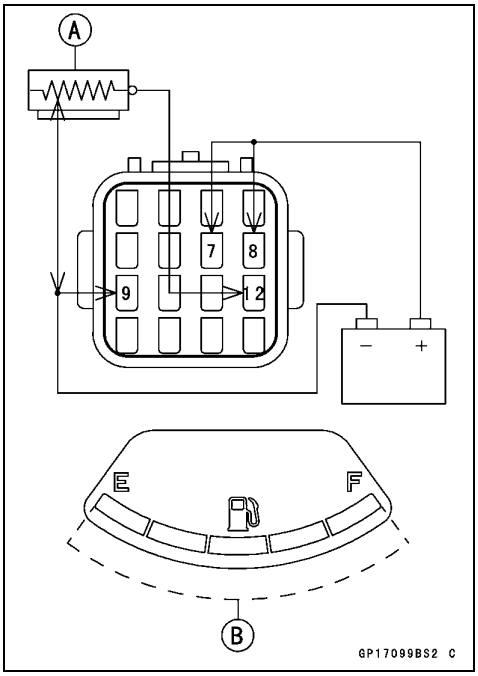
- Connect the leads in the same circuit as for the LCD segment inspection, Check 2.
- Connect a variable rheostat [A] to the terminal [12] and battery negative lead as shown.
- Check that the number of segments [B] matches the resistance value of the variable rheostat.

○When terminal [12] is connected, one segment should appear about 10 ~ 15 seconds.

Resistance (Ω)	Number of Segments
50	5
100	3
210	1

Resistance values are standard and they have tolerance.

★If this indicator function does not work, replace the meter unit.



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Meter, Gauge

LED Light Inspection

● Connect the leads in the same circuit as for the LCD Segments Inspection, Check 2.

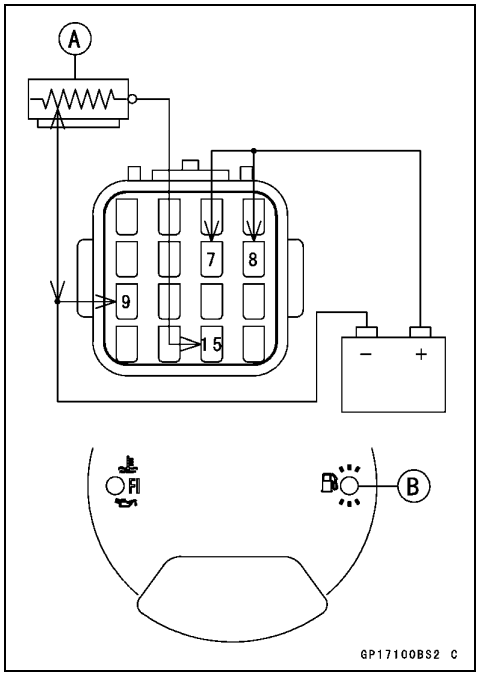
Fuel Level Warning Indicator LED Light

● Connect an about 30 Ω resistor [A] to the terminal [15] and battery negative lead.

Fuel Level Warning Indicator LED Light Connections
Battery Negative Lead (–) to Terminal [15]

○The fuel level warning indicator LED light [B] should go on.

★If the fuel level warning indicator LED light does not go on, replace the meter unit.



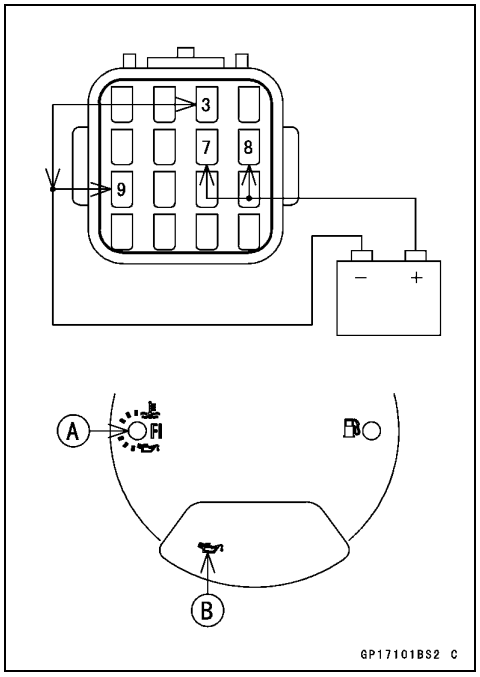
Oil Pressure Warning Indicator LED Light and LCD Symbol

● Connect the lead to the terminal [3] and battery negative lead.

Oil Pressure Warning Indicator LED Light Connections
Battery Negative Lead (–) to Terminal [3]

○The oil pressure warning indicator LED light [A] and symbol [B] in the LCD should go on.

★If the LED light and/or symbol do not go on, replace the meter unit.



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Meter, Gauge

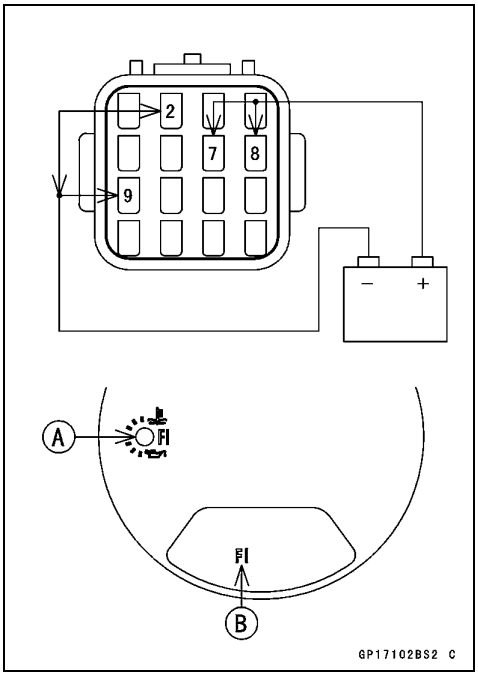
FI Indicator LED Light and LCD Symbol

● Connect the lead to the terminal [2] and battery negative lead.

FI Indicator LED Light Connections
Battery Negative Lead (–) to Terminal [2]

○The FI indicator LED light [A] and symbol [B] in the LCD should go on.

★If the LED light and/or symbol do not go on, replace the meter unit.



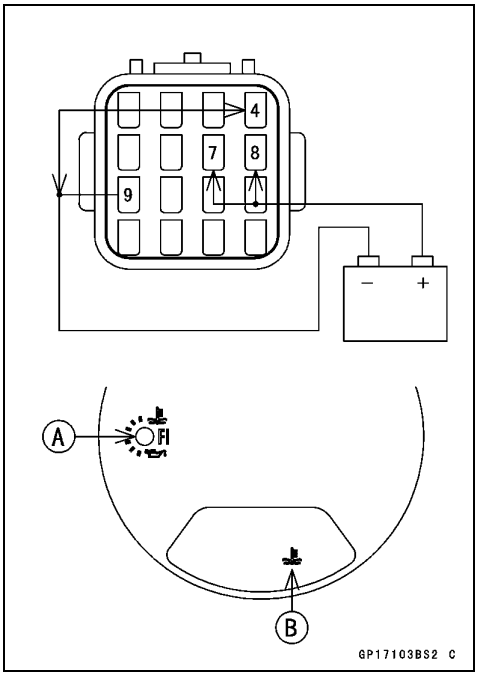
Water Temperature Warning Indicator LED Light and LCD Symbol

● Connect the lead to the terminal [4] and battery negative lead.

Water Temperature Warning Indicator LED Light Connections
Battery Negative Lead (–) to Terminal [4]

○The water temperature warning indicator LED light [A] and symbol [B] in the LCD should go on.

★If the LED light and/or symbol do not go on, replace the meter unit.



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Meter, Gauge

Indicator Light Inspection

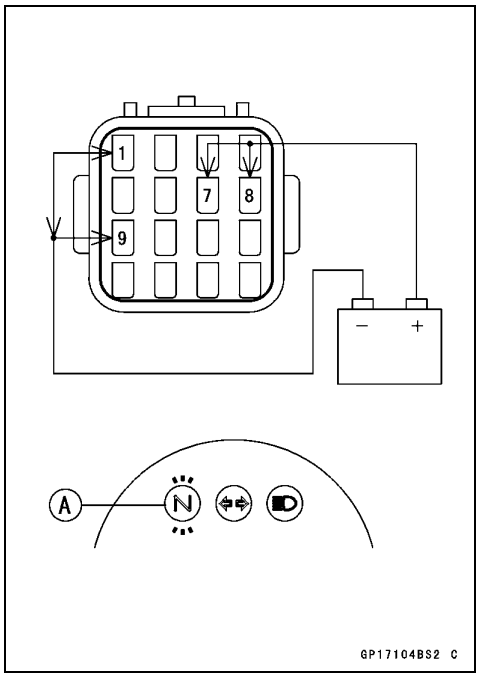
● Connect the leads in the same circuit as for the LCD Segments Inspection, Check 2.

Neutral Indicator Light

● Connect the lead to the terminal [1] and battery negative lead.

Neutral Indicator Light Connections
Battery Negative Lead (–) to Terminal [1]

○The neutral indicator light [A] should go on.
★If the indicator light does not go on, inspect the bulb.
● Check conductivity of the bulb with the hand tester.
★If the bulb is open, replace the bulb.
★Even if the bulb is replacement but the indicator light does not go on, replace the meter unit.



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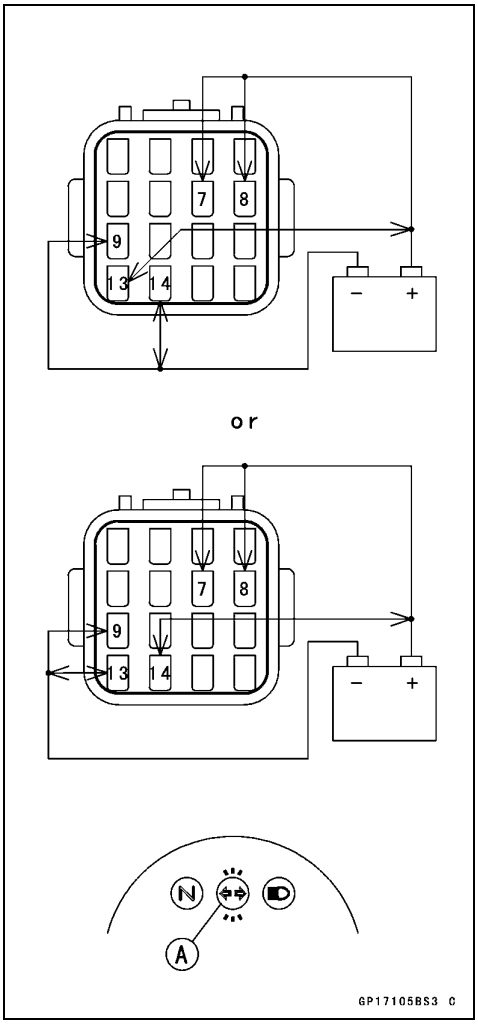
Meter, Gauge

Turn Signal Indicator Light

● Connect the lead to the terminal [13] and [14] as follows.

Neutral Indicator Light Connections:
Battery Positive Lead (+) to Terminal [13]
Battery Negative Lead (–) to Terminal [14]
or
Battery Positive Lead (+) to Terminal [14]
Battery Negative Lead (–) to Terminal [13]

○The turn signal indicator light [A] should go on.
★If the indicator light does not go on, inspect the bulb.
● Check conductivity of the bulb with the hand tester.
★If the bulb is open, replace the bulb.
★Even if the bulb is replacement but the indicator light does not go on, replace the meter unit.

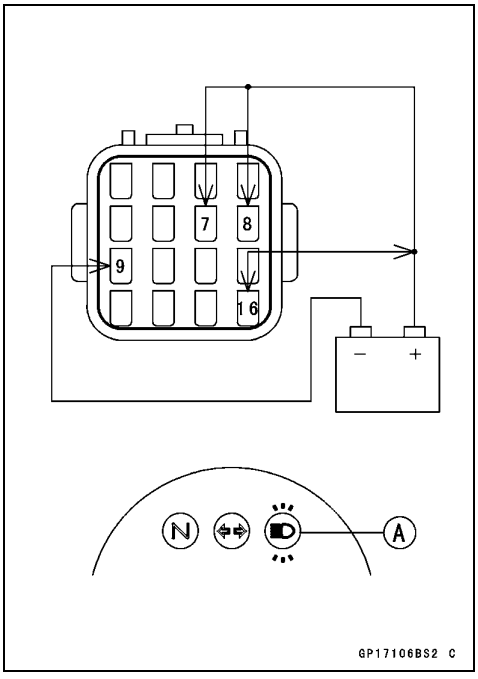


High Beam Indicator Light

● Connect the lead to the terminal [16] and battery positive lead.

High Beam Indicator Light Connections:
Battery Positive Lead (+) to Terminal [16]

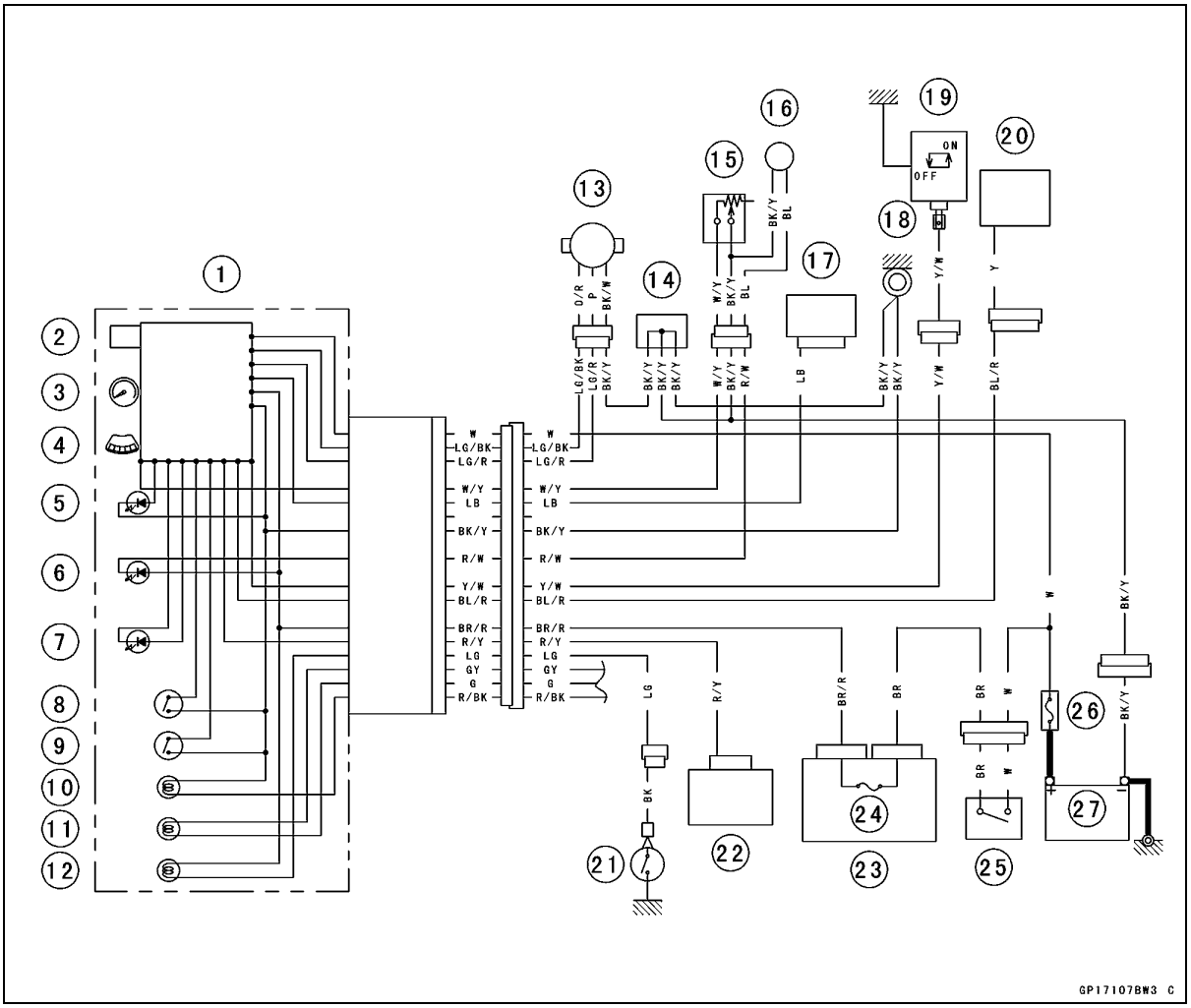
○The high beam indicator light [A] should go on.
★If the indicator light does not go on, inspect the bulb.
● Check conductivity of the bulb with the hand tester.
★If the bulb is open, replace the bulb.
★Even if the bulb is replacement but the indicator light does not go on, replace the meter unit.



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Meter, Gauge

Meter Unit Circuit



1. Meter Unit
2. Odometer/Trip Meter/Clock LCD
3. Speedometer
4. Fuel Meter
5. Illuminator LED
6. Fuel Indicator LED
7. Water Temperature Warning/FI/Oil Pressure Warning Indicator LED
8. Mode Button
9. Reset Button
10. High Beam Indicator Light
11. Turn Signal Indicator Light
12. Neutral Indicator Light
13. Speed Sensor
14. Joint Connector 2
15. Fuel Level Sensor
16. Fuel Reserve Switch
17. Turn Signal Control Relay
18. Frame Ground
19. Water Temperature Switch
20. Oil Pressure Warning Light Delay Unit
21. Neutral Switch
22. Electronic Control Unit
23. Junction Box
24. Ignition Fuse 10 A
25. Ignition Switch
26. Main Fuse 30 A
27. Battery

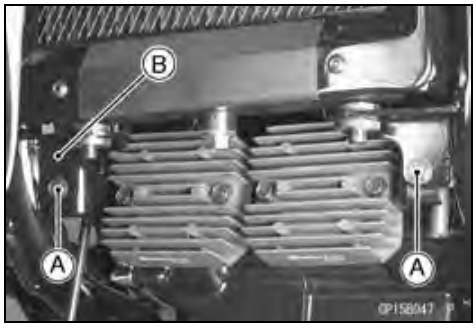
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Water Temperature Warning System

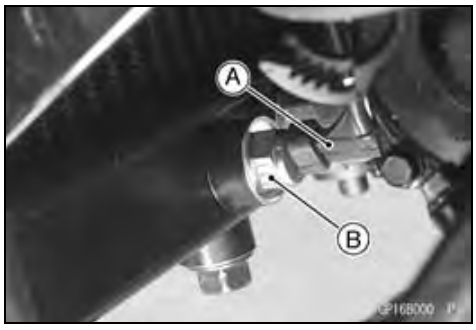
Water Temperature Warning System Check

The water temperature warning LED light goes on when the ignition switch is turned on and goes off soon to ensure that its circuit functions properly and the warning LED light has not burned out. The warning LED light also goes on whenever the coolant temperature rises to **113 ~ 117° (235 ~ 243°F)** when the motorcycle is in operation. If it stays on, stop the engine and check the coolant level in the reserve tank after the engine cools down.

● Remove:
Bolts [A]
Regulator/Rectifier Bracket [B]



● Inspect the water temperature warning LED light and the system wiring.
○Turn on the ignition switch.
○Disconnect the water temperature switch lead [A] then ground it to the frame or engine using an auxiliary lead.
★If the water temperature warning LED light is lit, inspect the water temperature switch [B] (see Water Temperature Switch Inspection in this chapter). Replace the switch if damaged.
★If the warning LED light is not lit, check the warning LED light and wiring.

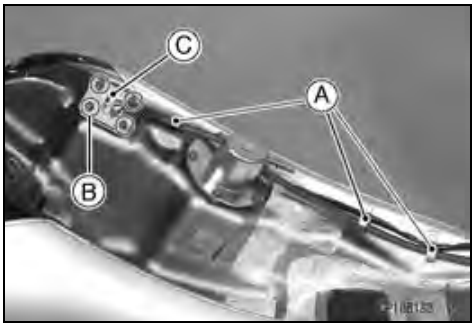


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Switch and Sensors

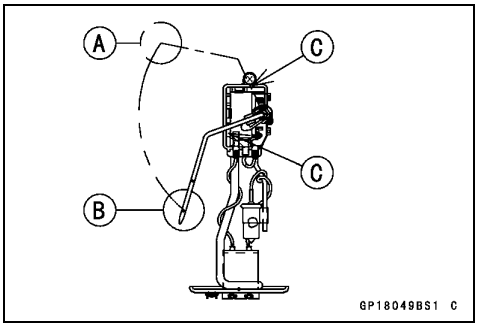
Fuel Level Sensor Inspection

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Open the clamps [A].
- Remove:
  Bolts [B]
  Fuel Level Sensor [C]



- Check that the float moves up and down smoothly without binding. It should go down under its own weight.

★If the float does not move smoothly, replace the sensor.
  Float in Full Position [A]
  Float in Empty Position [B]
  Float Arm Stoppers [C]

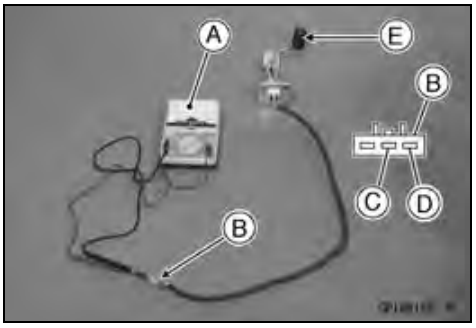


- Using the hand tester [A], measure the resistance across the terminals in the fuel level sensor lead connector [B].
  Black/Yellow [C]
  White/Yellow [D]

Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457

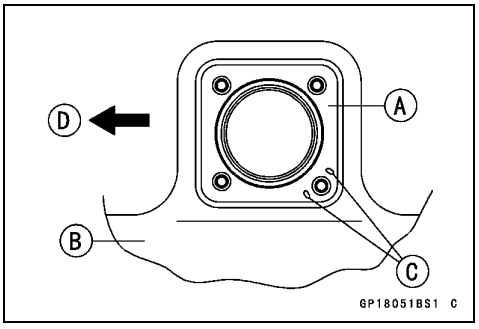
★If the tester readings are not as specified, or do not change smoothly according as the float moves up and down, replace the sensor.

Fuel Level Sensor Resistance
Standard: Full position [E]: 3 ~ 5 Ω
Empty position: 213 ~ 219 Ω



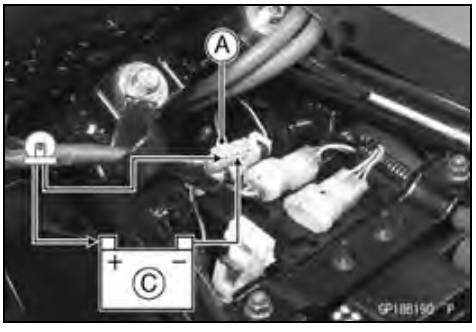
- Install a new gasket [A] on the fuel tank [B] as shown.
  [C] Hollows
  [D] Front Side
- Apply a non-permanent locking agent to the threads of the level sensor mounting bolts and tighten it.

Torque - Fuel Level Sensor Mounting Bolts: 6.9 N·m (0.7 kgf·m, 61 in·lb)



Fuel Reserve Switch Inspection

- Fill the fuel tank with fuel.
- Close the fuel tank cap surely.
- Remove:
  Front Seat (see Front Seat Removal in the Frame chapter)
  Fuel Level Sensor Lead Connector [A]
- Connect the test light [B] (12 V 3.4 W bulb in a socket with leads) and the 12 V battery [C] to the fuel level sensor lead connector.



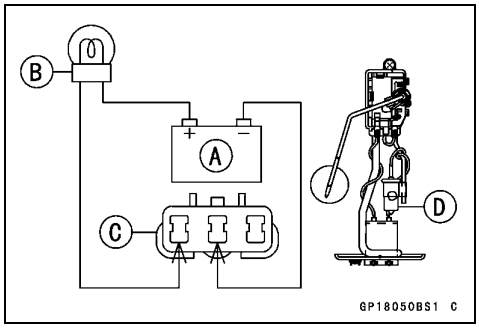
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Switch and Sensors

Connections

Battery (+) → 12 V 3.4 W Bulb (one side)
12 V 3.4 W Bulb (other side) → LB Lead Terminal
Battery (–) → BK/Y Lead Terminal

★If the test light turn on, the reserve switch is defective. Replace the fuel level sensor.



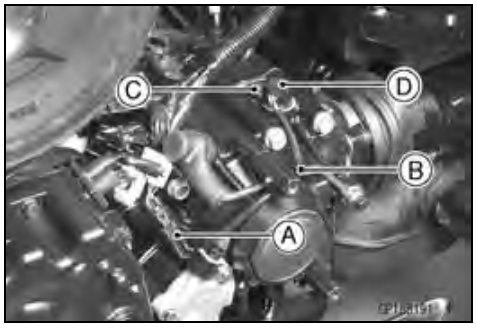
- Remove:
  Fuel Level Sensor (see Fuel Level Sensor Inspection in this section)
- Connect the test light (12 V 3.4 W bulb in a socket with leads) and the 12 V battery to the fuel level sensor lead connector as shown.
  12 V Battery [A]
  Test Light [B]
  Fuel Level Sensor Connector [C]
  Fuel Reserve Switch [D]

★If the test light doesn't light, replace the fuel level sensor.

NOTE

○*It may take a long time to turn on the test light in case that the fuel reserve switch is inspected just after the fuel level sensor is removed.*
Leave the fuel reserve switch with leads for inspection connected for few minutes.

Speed Sensor Removal



- Remove:
  Alternator Outer Cover (see Alternator Outer Cover Removal in this chapter)
  Speed Sensor Lead Connector [A]
  Band [B]
  Bolt [C]
  Speed Sensor [D]

Speed Sensor Installation



- Apply grease to the O-ring [A] on the speed sensor.
- Apply a non-permanent locking agent to the threads of the speed sensor mounting bolt.
- Tighten:

Torque - Speed Sensor Mounting Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

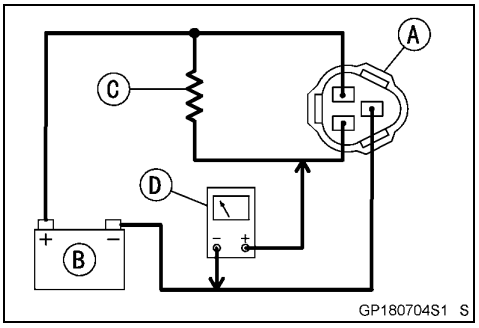
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Switch and Sensors

Speed Sensor Inspection

- Remove the speed sensor (see Speed Sensor Removal in this section).
- Connect the speed sensor connector [A] with a battery [B], 10 kΩ resistor [C] and hand tester [D] as shown.
- Set the tester to the DC 25 V range.

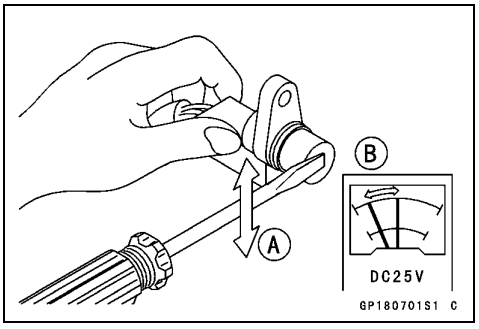
Special Tool - Hand Tester : 57001-1394



- Trace [A] the speed sensor surface with the screw driver.

○Then the tester indicator should flick [B].

★If the tester indicator does not flick, replace the speed sensor.



Front Brake Light Switch Inspection

- Refer to the Brake Light Switch Operation in the Periodic Maintenance chapter.

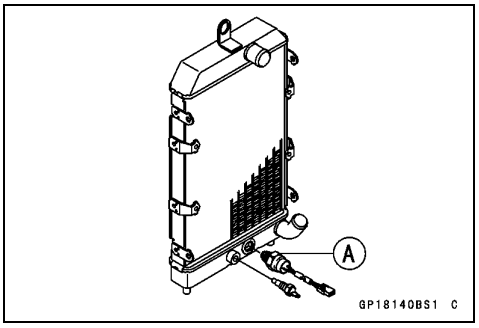
Rear Brake Light Switch Check/Adjustment

- Refer to the Brake Light Switch Operation in the Periodic Maintenance chapter.

Radiator Fan Switch Removal

CAUTION
Never drop the fan switch, especially on a hard surface. Such a shock to the part can damage it.

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Disconnect the fan switch connector (see Fan System Circuit Inspection in this chapter).
- Unscrew the radiator fan switch [A] from the radiator.



Radiator Fan Switch Installation

- Tighten:

Torque - Radiator Fan Switch: 18 N·m (1.8 kgf·m, 13 ft·lb)

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

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Switch and Sensors

Radiator Fan Switch Inspection

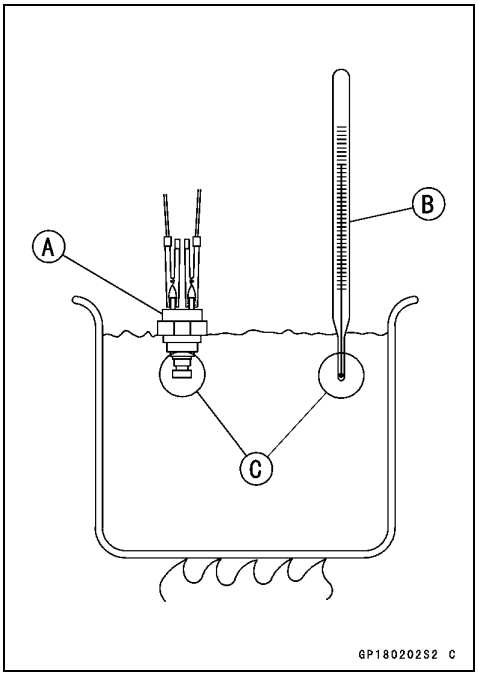
- Remove the fan switch from the radiator (see Radiator Fan Switch Removal in this section).
- Suspend the switch [A] in a container of machine oil so that the heat-sensitive portion and threaded portion are submerged.
- Suspend an accurate thermometer [B] with heat-sensitive portions [C] located in almost the same depth.

NOTE

○*The switch and thermometer must not touch the container sides or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using the hand tester (special tool), measure the internal resistance of the switch across the terminals at the temperatures shown in the table.

★If the measurement is out of the range, replace the switch.



Fan Switch Resistance

○**Rising temperature:**

From OFF to ON at 102 ~ 108°C (212 ~ 226°F)

○**Falling temperature:**

From ON to OFF at 97 ~ 103°C (203 ~ 217°F)

ON: Less than 0.5 Ω

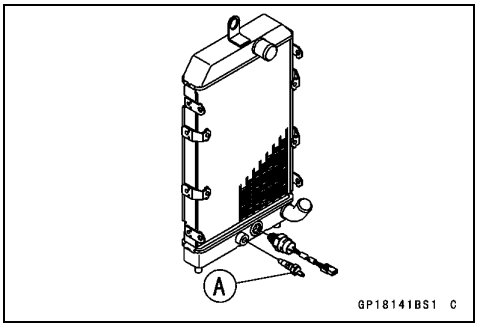
OFF: More than 1 MΩ

Water Temperature Switch Removal

CAUTION

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

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Disconnect the switch connector (see Water Temperature Warning System Inspection in this chapter).
- Remove the water temperature switch [A] from the radiator.



Water Temperature Switch Installation

- Apply silicone sealant to the threads of the water temperature switch.

Sealant - Kawasaki Bond (Silicone Sealant): 59019-120

Torque - Water Temperature Switch: 7.8 N·m (0.80 kgf·m, 69 in·lb)

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

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Switch and Sensors

Water Temperature Switch Inspection

- Remove the water temperature switch.
- Suspend the switch [A] in a container of machine oil so that the heat-sensitive portion and threaded portion are submerged.
- Suspend an accurate thermometer [B] with heat-sensitive portions [C] located in almost the same depth.

NOTE

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

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using the hand tester, measure the internal resistance of the switch across the terminal and the body at the temperatures shown in the table.

★If the measurement is out of the range, replace the switch.

Water Temperature Switch Resistance

○**Rising temperature:**

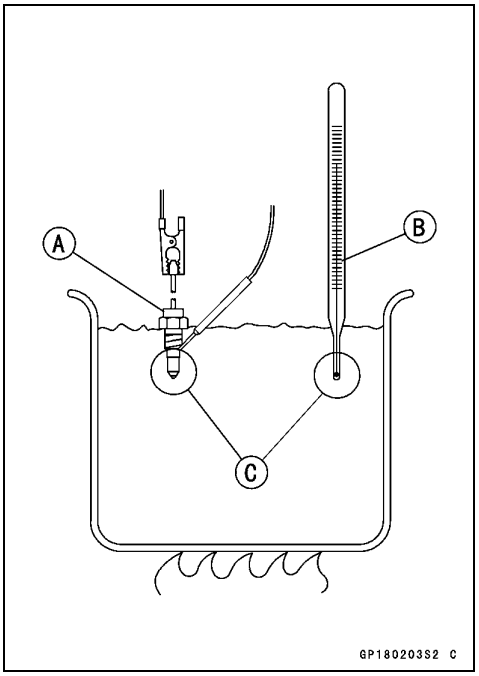
From OFF to ON at 113 ~ 117°C (235 ~ 243°F)

○**Falling temperature:**

From ON to OFF at 108°C (226°F) ~ temperature less than ON temperature

ON: Less than 0.5 Ω

OFF: More than 1 MΩ



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Switch and Sensors

Switch Inspection

● Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).

○For the handlebar switches and the ignition switch, refer to the tables in the Wiring Diagram.

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

Special Tool - Hand Tester: 57001-1394

Rear Brake Light Switch Connections		
Color	BR	BL
When brake pedal is pushed down	○———	———○
When brake pedal is released		

Side Stand Switch Connections		
Color	G	BK
When side stand is up	○———	———○
When side stand is down		

Neutral Switch Connections		
Color	SW. Terminal	Ground
When transmission is in neutral	○———	———○
When transmission is not in neutral		

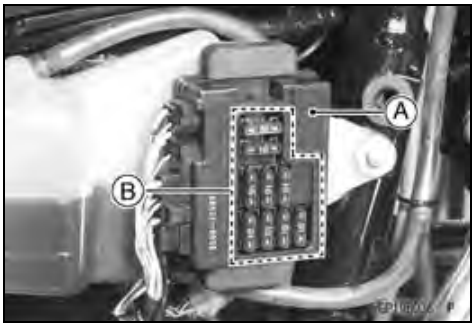
Oil Pressure Switch Connections *		
Color	SW. Terminal	Ground
When engine is stopped	○———	———○
When engine is running		

*: Engine lubrication system is in good condition

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Junction Box

The junction box [A] has fuses [B], relays, and diodes. The relays and diodes can not be removed.



Junction Box Fuse Circuit Inspection

- Remove the right side cover (see Right Side Cover Removal in the Frame chapter).
- Remove the junction box.
- Pull off the connectors from the junction box.
- Make sure all connector terminals are clean and tight, and none of them have been bent.

★Clean the dirty terminals, and straighten slightly-bent terminals.

- Check conductivity of the numbered terminals with the hand tester (see Junction Box Internal Circuit in this section).

★If the tester does not read as specified, replace the junction box.

Fuse Circuit Inspection

Tester Connection	Tester Reading (Ω)
1 – 1A	0
1 – 2	0
3A – 4	0
6 – 5	0
6 – 10	0
6 – 7	0
6 – 17	0

Tester Connection	Tester Reading (Ω)
1A – 8	∞
2 – 8	∞
3A – 8	∞
6 – 2	∞
6 – 3A	∞
17 – 3A	∞

Starter Circuit/Headlight Relay Inspection

- Remove the junction box.
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the junction box as shown (see Junction Box Internal Circuit in this section).

★If the tester does not read as specified, replace the junction box.

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Junction Box

Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading (Ω)
Headlight Relay	7 – 8	∞
	7 – 13	∞
	(+) (–) 13 – 9	Not ∞*

	Tester Connection	Tester Reading (Ω)
Starter Circuit Relay	9 – 11	∞
	12 – 13	∞
	(+) (–) 13 – 11	∞
	(+) (–) 12 – 11	Not ∞*

(*): The actual reading varies with the hand tester used.
(+): Apply tester positive lead.
(–): Apply tester negative lead.

Relay Circuit Inspection (with the battery connected)

Reading	Battery Connection (+) (–)	Tester Connection	Tester Reading (Ω)
Headlight Relay	9 – 13	7 – 8	0
Starter Circuit Relay	11 – 12	(+) (–) 13 – 11	Not ∞*

(*): The actual reading varies with the hand tester used.
(+): Apply tester positive lead.
(–): Apply tester negative lead.

Diode Circuit Inspection

- Remove the junction box.
- Check conductivity of the following pairs of terminals (see Junction Box Internal Circuit in this section).

Diode Circuit Inspection

Tester Connection	13-8, 13 - 9, 12 -11, 12 - 14, 15 -14, 16 - 14

★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the junction box must be replaced.

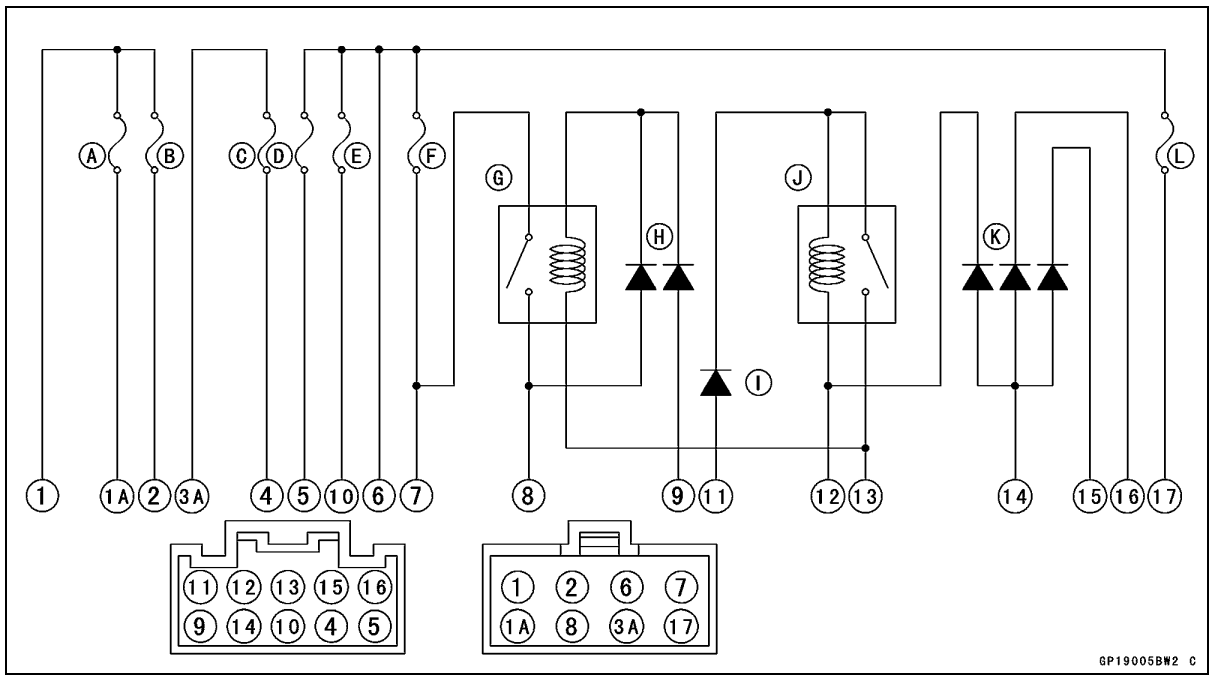
NOTE

○*The actual meter reading varies with the meter or tester used and the individual diodes, but generally speaking, the lower reading should be from zero to one half the scale.*

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Junction Box

Junction Box Internal Circuit



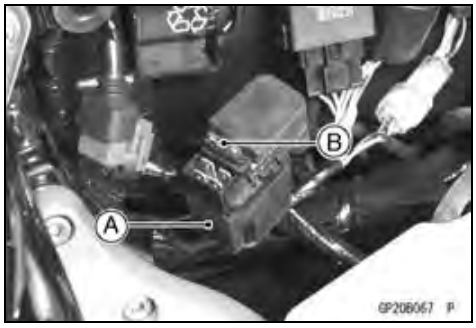
A. Accessory Fuse 10 A
B. Fan Fuse 15 A
C. Turn Signal Fuse 10 A
D. Horn Fuse 10 A
E. Ignition Fuse 10 A
F. Headlight Fuse 10 A
G. Headlight Relay
H. Headlight Diodes
I. Starter Diode
J. Starter Circuit Relay
K. Interlock Diodes
L. Taillight Fuse 10 A

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Fuse

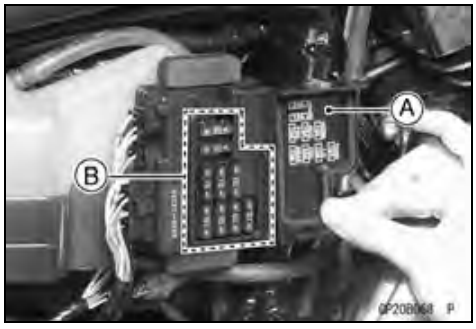
Main Fuse Removal

- Remove:
  Right Side Cover (see Right Side Cover Removal in the Frame chapter)
  Coolant Reservoir Tank (see Coolant Change in the Periodic Maintenance chapter)
- Remove the starter relay [A].
- Pull out the main fuse [B] from the starter relay with needle nose pliers.



Junction Box Fuse Removal

- Remove the right side cover (see Right Side Cover Removal in the Frame chapter).
- Unlock the hook to lift up the lid [A].
- Pull the fuses [B] straight out of the junction box with needle nose pliers.



Fuse Installation

★If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.

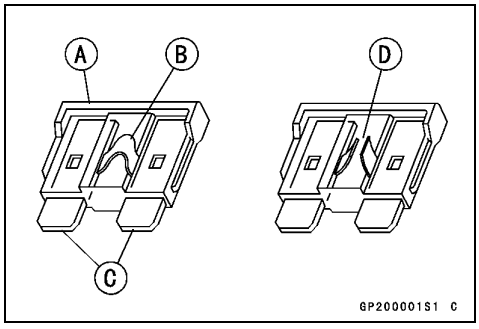
- Install the junction box fuses on the original position as specified on the lid.

Fuse Inspection

- Remove the fuse (see Main Fuse/Junction Box Fuse Removal in this section).
- Inspect the fuse element.

★If it is down 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]



NOTE

○*A mass current flows to the battery according to the state of the battery which needs refreshing charge when the engine is turned causing main fuse blown out.*

CAUTION

Do not use a fuse rated for other amperage and voltage specified in the wiring diagram. Installation of a fuse with a higher rating may cause damage to wiring and components, and a fuse of a lower rating will soon blow again.

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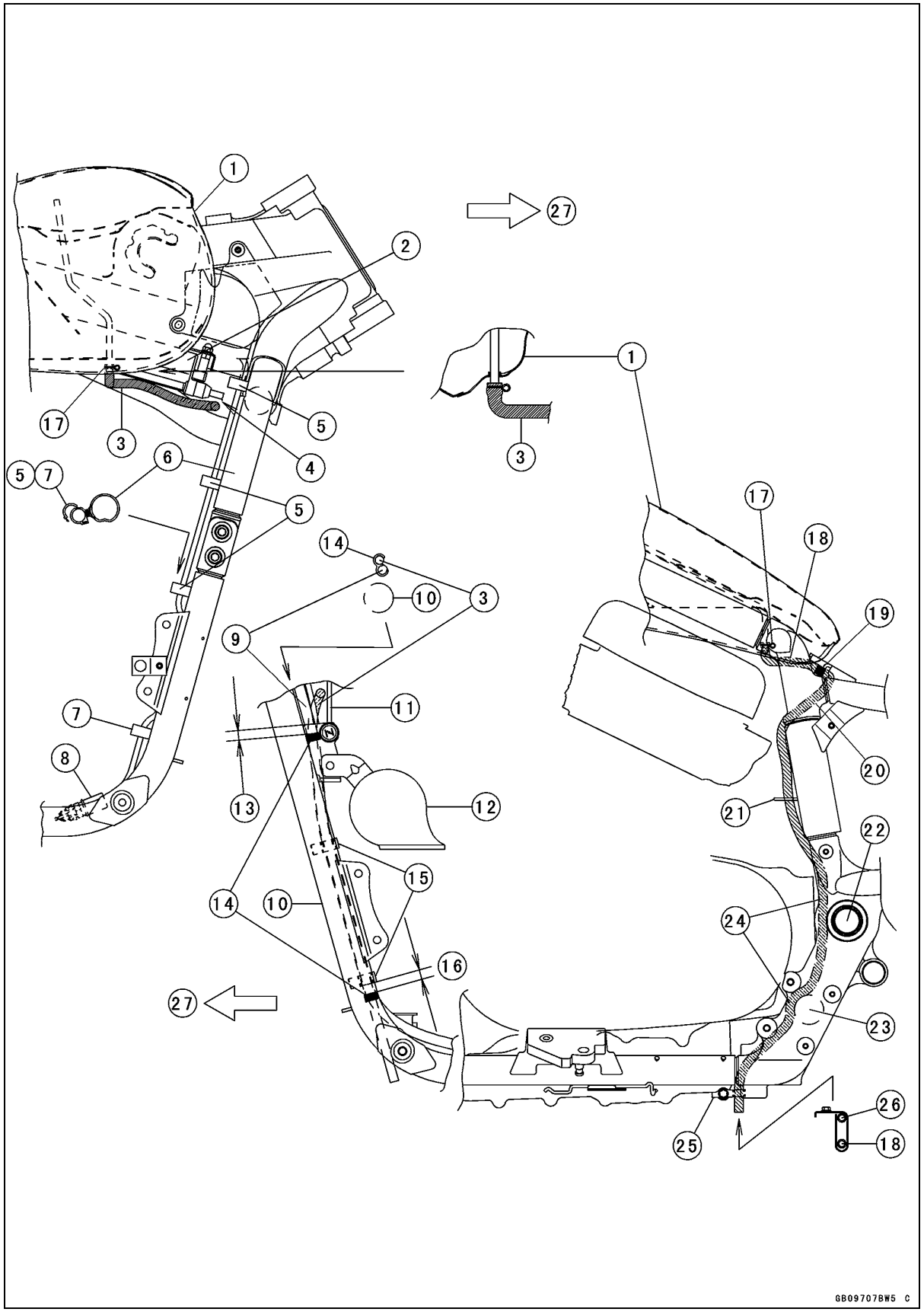
Appendix

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Cable, Wire, and Hose Routing 17-2
Troubleshooting Guide 17-28

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Cable, Wire, and Hose Routing



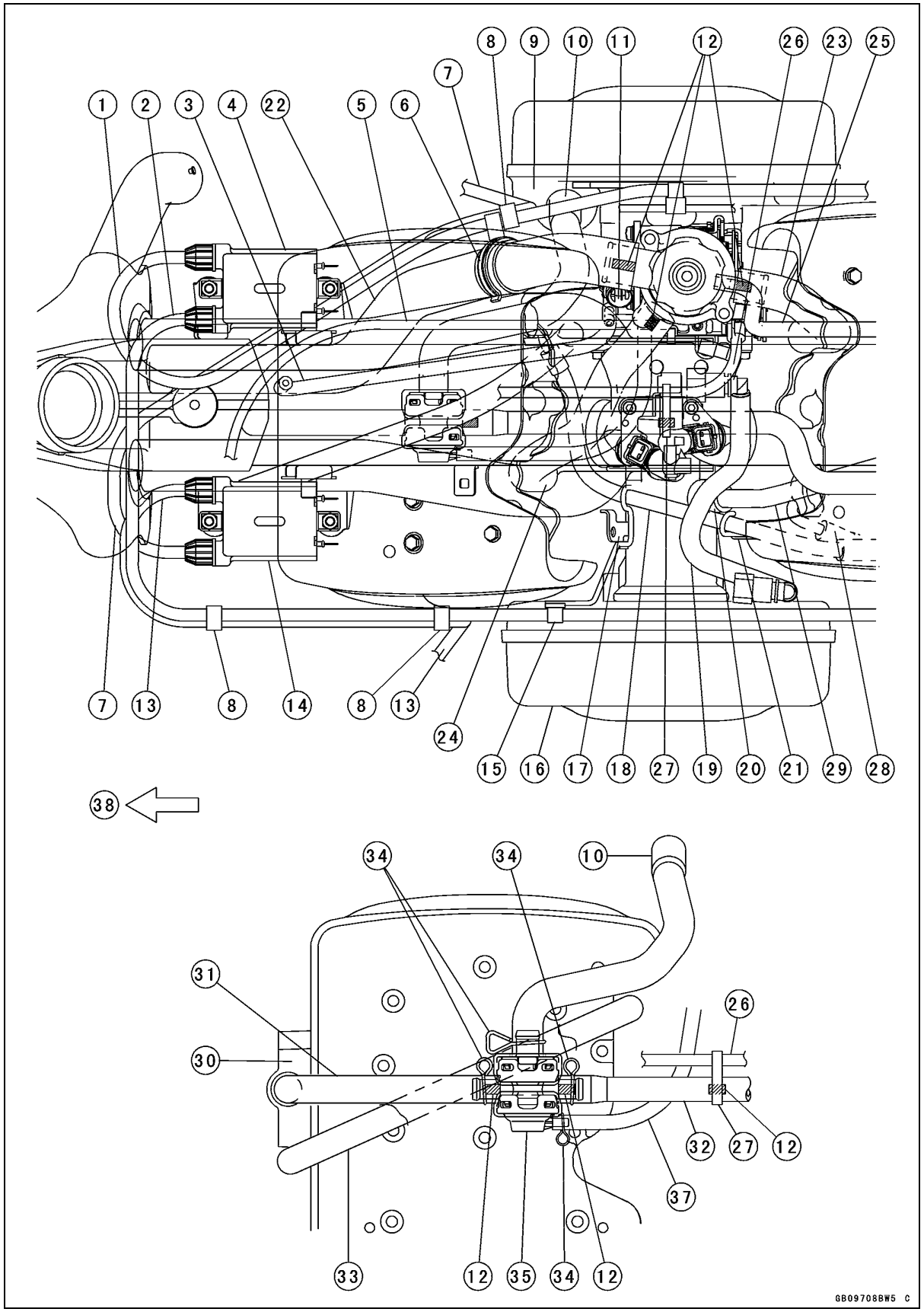
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Cable, Wire, and Hose Routing

1. Fuel Tank
2. Ignition Coil for Rear Spark Plugs
3. Fuel Tank Water Drain Hose
4. Run the hose over the cooling hose.
5. Plastic Snap-on Clamps (Rear Brake Light Switch and Radiator Fan Leads)
6. Right Frame Pipe
7. Plastic Snap-on Clamp (Rear Brake Light Switch Lead)
8. Rear Brake Light Switch
9. Clutch Hose
10. Left Frame Pipe
11. Choke Knob and Cable
12. Horn
13. Fit the clamp position with the choke knob (Permissible valve: within 10 mm (0.4 in.))
14. Clamp
15. Welded Clamps
16. 10 ~ 30 mm (0.4 ~ 1.2 in.)
17. Clamp
18. Fuel Tank Breather Hose (Except California Model)
19. Marking (Position here.)
20. Run the fuel tank breather hose between the bracket and the right frame pipe.
21. Holder
22. Swingarm Pivot
23. Cross Pipe
24. Run the hose in front of swingarm pivot and cross pipe.
25. Clamp
26. Coolant Reserve Tank Overflow Hose
27. Front

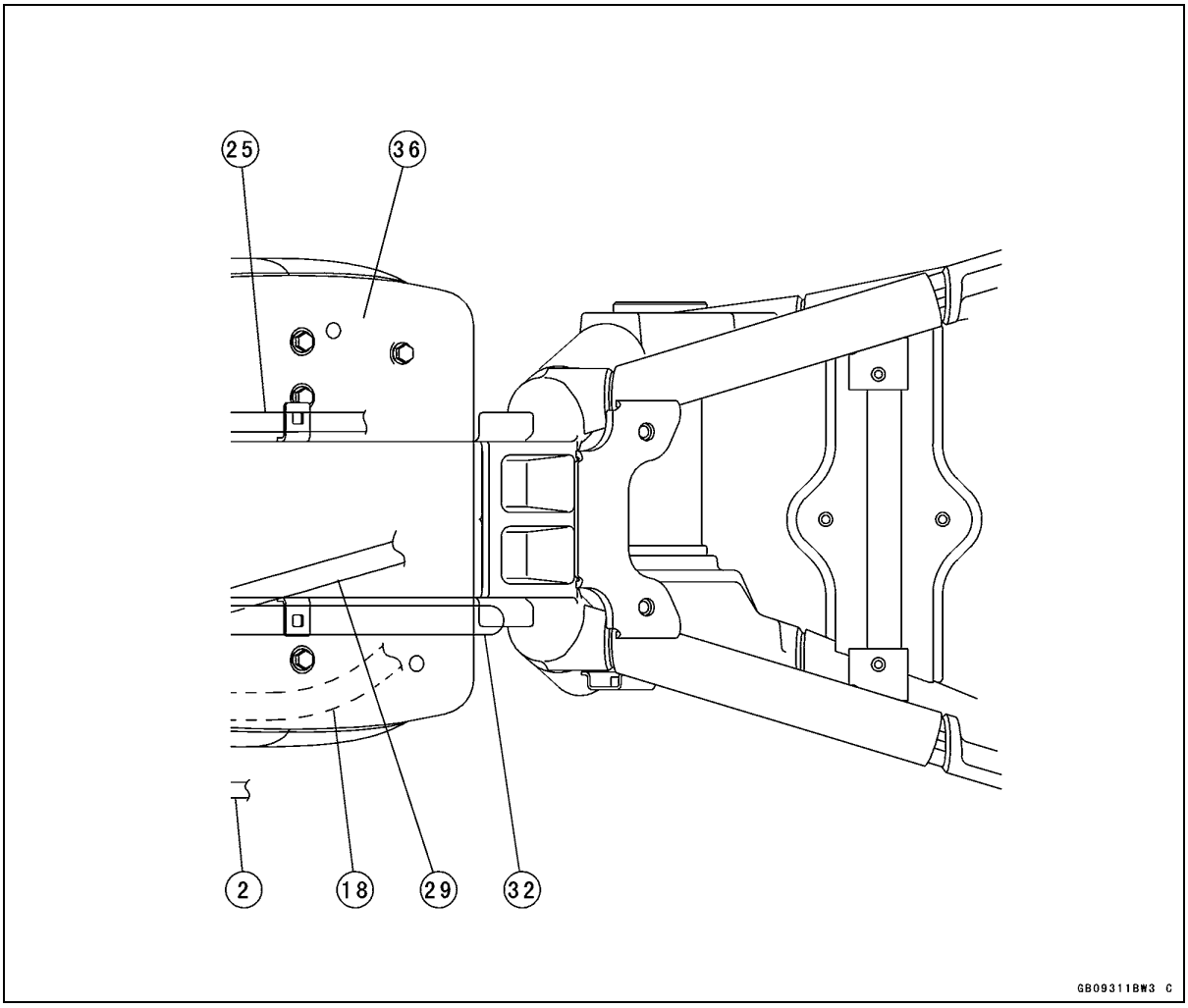
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Cable, Wire, and Hose Routing



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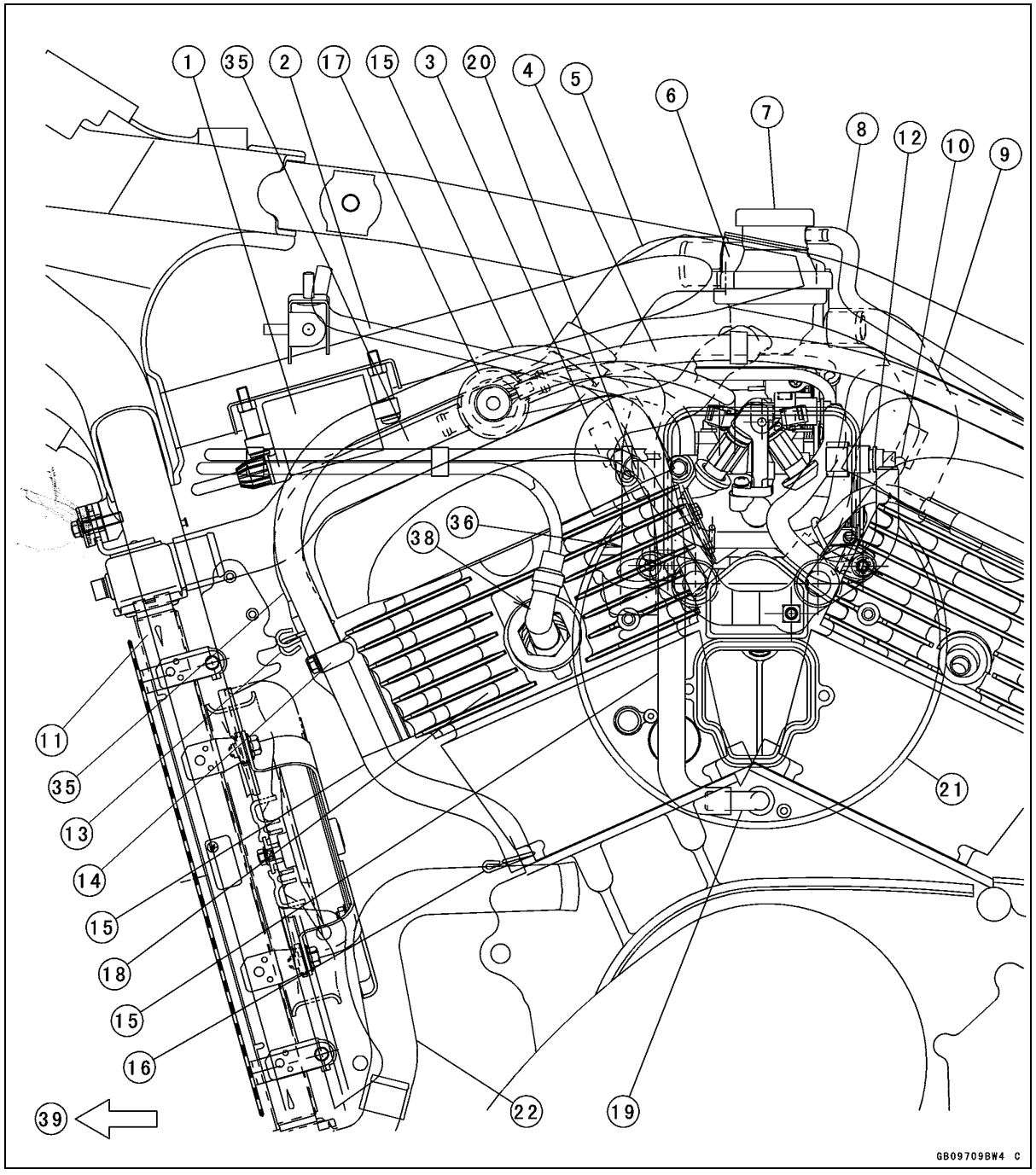
Cable, Wire, and Hose Routing



1. Right Rear Spark Plug Lead
2. Left Rear Spark Plug Lead
3. Inlet Air Pressure Hose
4. Ignition Coil for Rear Spark Plugs
5. Choke Cable
6. Clamp
7. To Right Front Spark Plug
8. Plastic Clamps
9. Right Air Cleaner Base
10. Vacuum switch valve hose to the right air cleaner base.
11. Throttle Sensor
12. White Marks faced upwards
13. Left Front Spark Plug Lead
14. Ignition Coil for Front Spark Plugs
15. Plastic Clamp
16. Left Air Cleaner Housing
17. Clamp
18. Front Oil Hose
19. Fuel Pump Outlet Hose
20. Grommet (California Model only)
21. Clamp
22. Radiator Inlet Hose
23. Rear Coolant Hose
24. Front Coolant Hose
25. Reserve Tank Hose (Without Mark)
26. Throttle Cables (Upper: Decelerator, Lower: Accelerator)
27. Plastic Clamp (Align the clamp with the mark faced upward)
28. Rear oil hose into the rear rocker case cover.
29. Canister Purge Hose (Green) for California Model
30. Air Suction Valve
31. Front Vacuum Switch Valve Hose
32. Rear Vacuum Switch Valve Hose
33. Run the crankcase breather hose over the vacuum switch valve
34. Wire Clamps (Face the tab as shown.)
35. Vacuum Switch Valve
36. Rear Rocker Case Cover
37. Vacuum Hose to Throttle Body
38. Front

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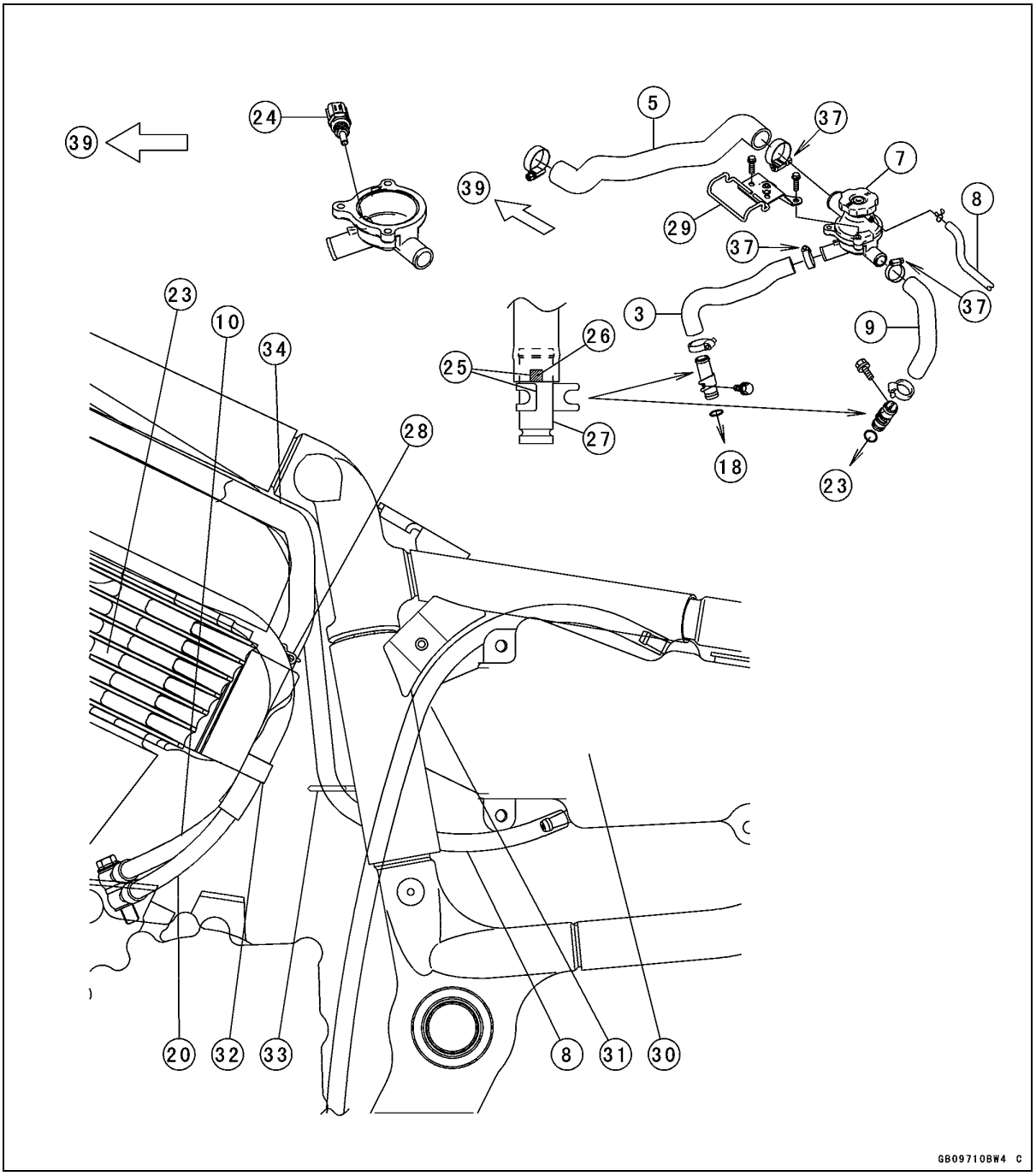
Cable, Wire, and Hose Routing



1. Ignition Coil for Front Spark Plugs
2. Inlet Air Pressure Sensor Hose
3. Front Coolant Hose
4. Vacuum Switch Valve Hose (vacuum)
5. Radiator Inlet Hose
6. Thermostat Housing
7. Radiator Cap
8. Coolant Reserve Tank Hose
9. Rear Coolant Hose
10. Rear Oil Hose
11. Radiator
12. Fuel Pump Outlet Hose
13. Clamp
14. Clamp
15. Crankcase Breather Tube
16. Clamp
17. Vacuum Switch Valve
18. To Front Cylinder Head
19. Elbow Joint

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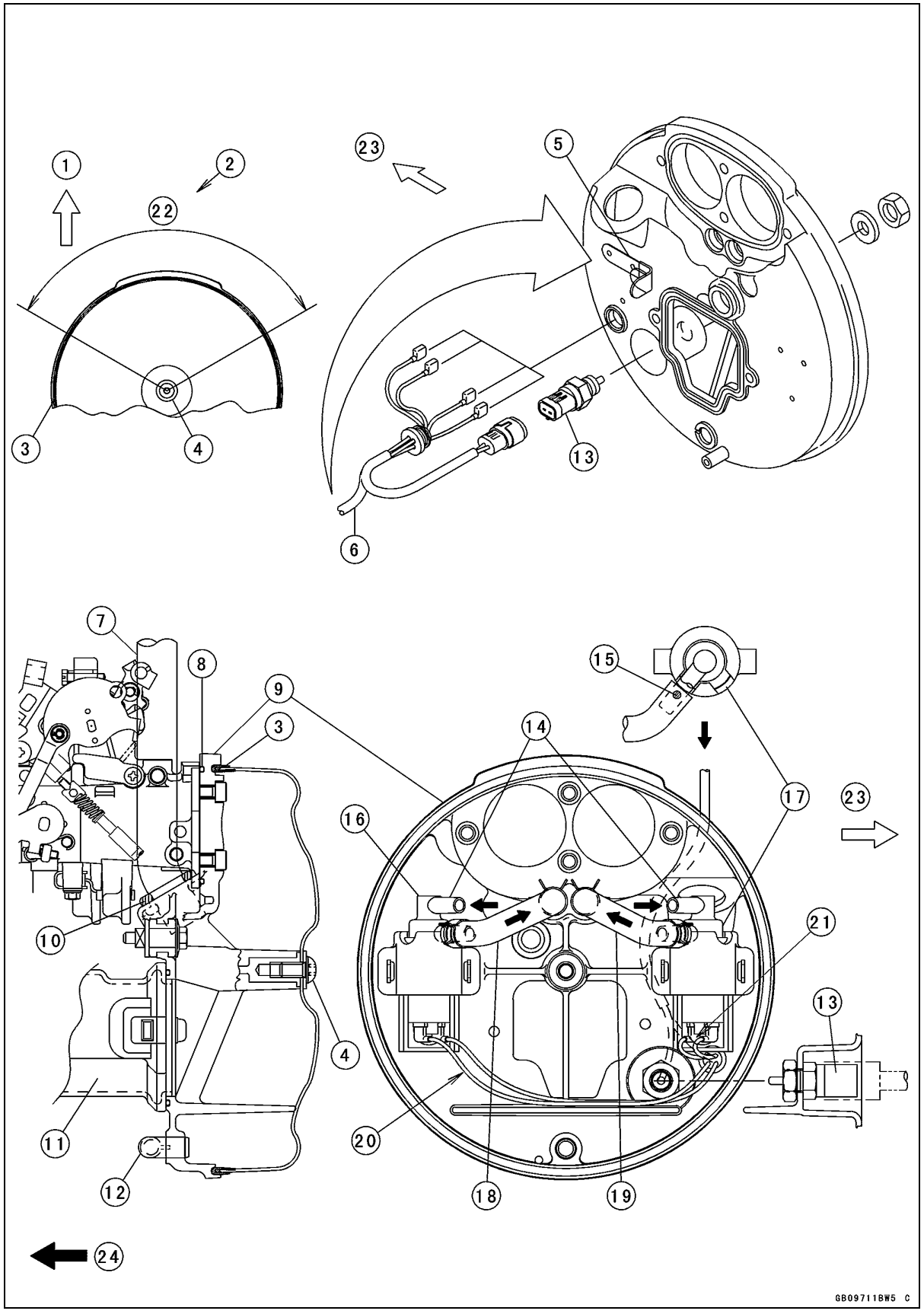
Cable, Wire, and Hose Routing



20. Front Oil Hose
21. Right Air Cleaner Base
22. Radiator Outlet Hose
23. To Rear Cylinder Head
24. Water Temperature Sensor
25. Align the mark with the clamp end.
26. White Marks on the Coolant Hoses
27. Water Pipes
28. Wire clamp with the tab on the left
29. Main Harness Bracket
30. Coolant Reserve Tank
31. Coolant Reserve Tank Overflow Hose
32. Clamp
33. Holder
34. Rear Vacuum Switch Valve Hose
35. Front Vacuum Switch Valve Hose
36. Vacuum switch valve hose to the right air cleaner base.
37. Note each position and direction of the clamp bolts.
38. Install the ignition coil lead as shown.
39. Front

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Cable, Wire, and Hose Routing



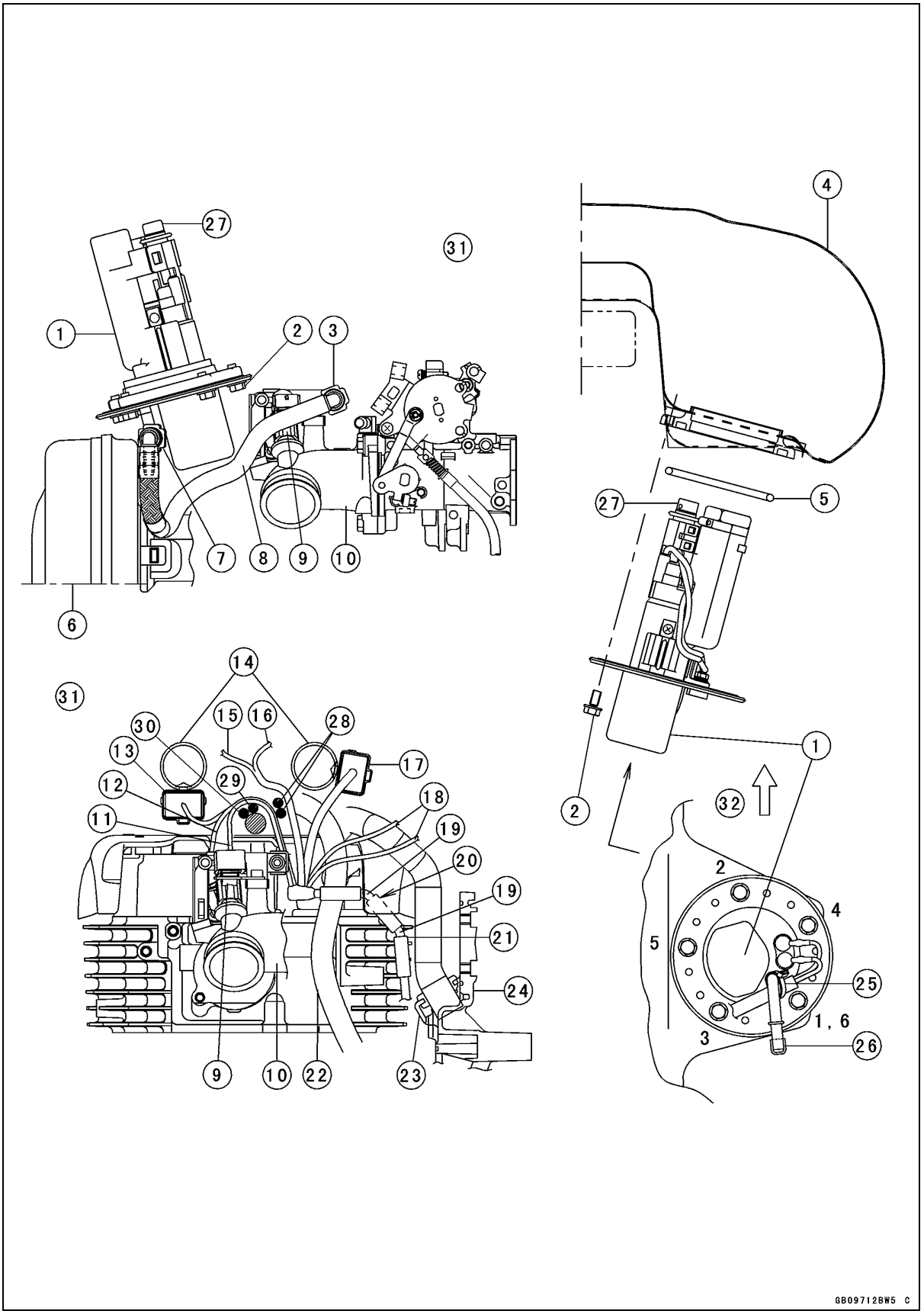
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Cable, Wire, and Hose Routing

1. Top
2. Locate the glued joint of the gasket within the angle.
3. Gasket
4. Right Air Cleaner Cover Allen Bolt
5. Clamp (Inlet Air Temperature Sensor and ISC Valve Leads)
6. Inlet Air Temperature Sensor and ISC Valve Leads
7. Vacuum Switch Valve Hose
8. O-ring
9. Right Air Cleaner Base
10. Grommet
11. Lower Air Cleaner Duct between #1 and #2 Cylinders
12. Elbow joint connected to crankcase breather hose
13. Inlet Air Temperature Sensor
14. ISC Valve Inlets
15. Mark faced upward
16. ISC Valve #1 (for Rear Cylinder)
17. ISC Valve #2 (for Front Cylinder)
18. ISC Valve Hose #2 (Red Mark)
19. ISC Valve Hose #1 (Blue Mark)
20. ISC Valve #1 (G/Y, W/R Leads)
21. ISC Valve #2 (G/BL, W/R Leads)
22. 120°
23. Front
24. Air Flow

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Cable, Wire, and Hose Routing



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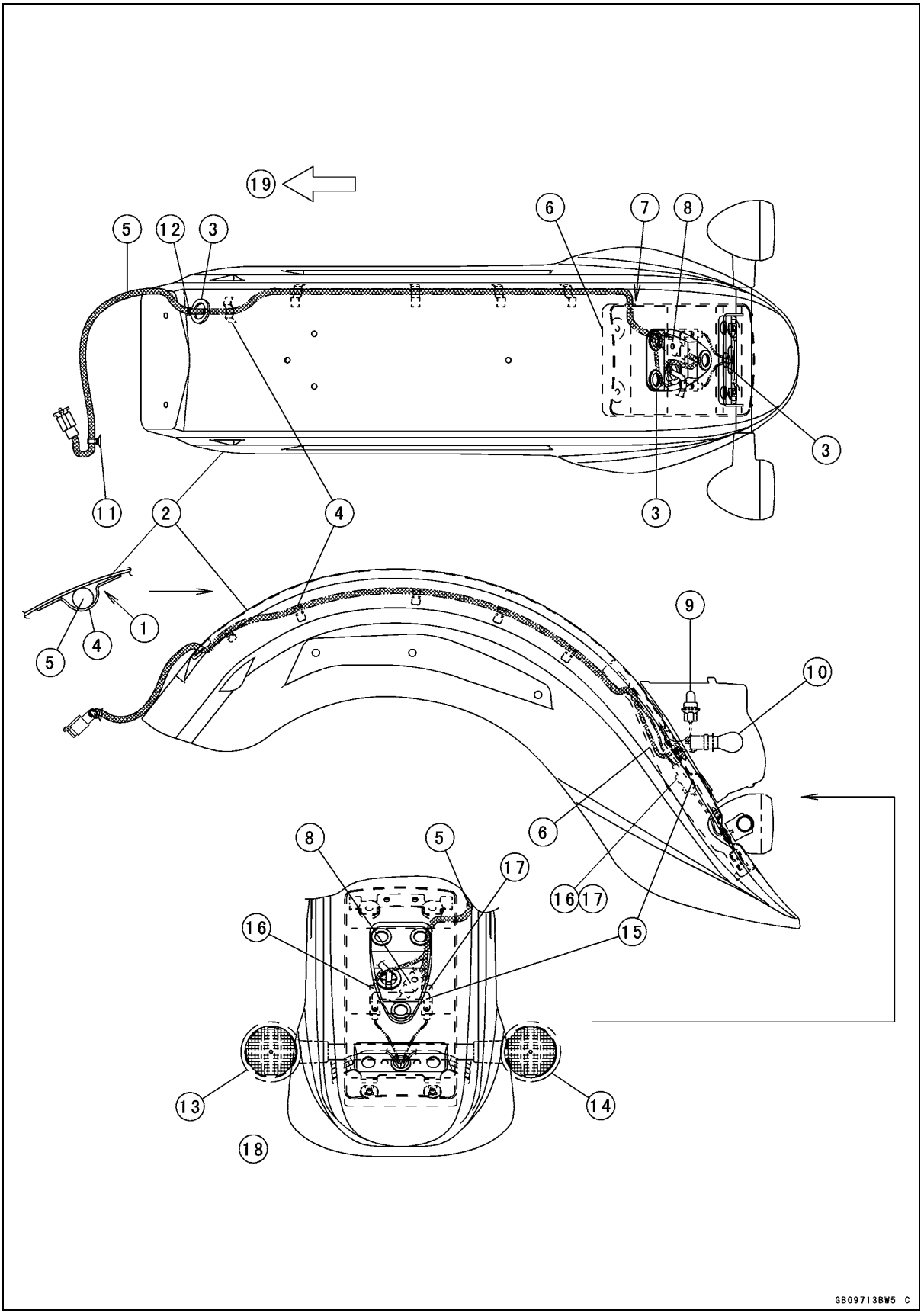
Cable, Wire, and Hose Routing

Rear View

1. Fuel pump with the fuel filter and screen belt in.
2. Fuel Pump Bolts
3. Fuel Hose Joint (Delivery Joint)
4. Fuel Tank
5. O-ring
6. Left Air Cleaner Cover
7. Fuel Hose Joint (Fuel Pump)
8. Fuel Pump Outlet Hose
9. Fuel Injector #2
10. Inlet Manifold
11. Injector Lead #2
12. Injector Lead #1 (White Tape)
13. Connector (Black)
14. Frame Pipes
15. Atmospheric Pressure Sensor Lead
16. Inlet Air Pressure Sensor Lead (White Tape)
17. Connector (Natural)
18. Water Temperature Sensor Lead
19. Bend before install.
20. Run the lead inlet air temperature sensor and ISC valve leads inside the rocker case cover.
21. Inlet Air Temperature Sensor and ISC Valve Leads
22. Breather Hose
23. Grommet
24. Right Air Cleaner Base
25. Strap
26. Fuel Pump Outlet Pipe
27. Pressure Regulator
28. Throttle Cables
29. Vacuum Switch Valve Hose
30. Inlet Air Pressure Sensor Hose
31. Rear View
32. Front

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Cable, Wire, and Hose Routing



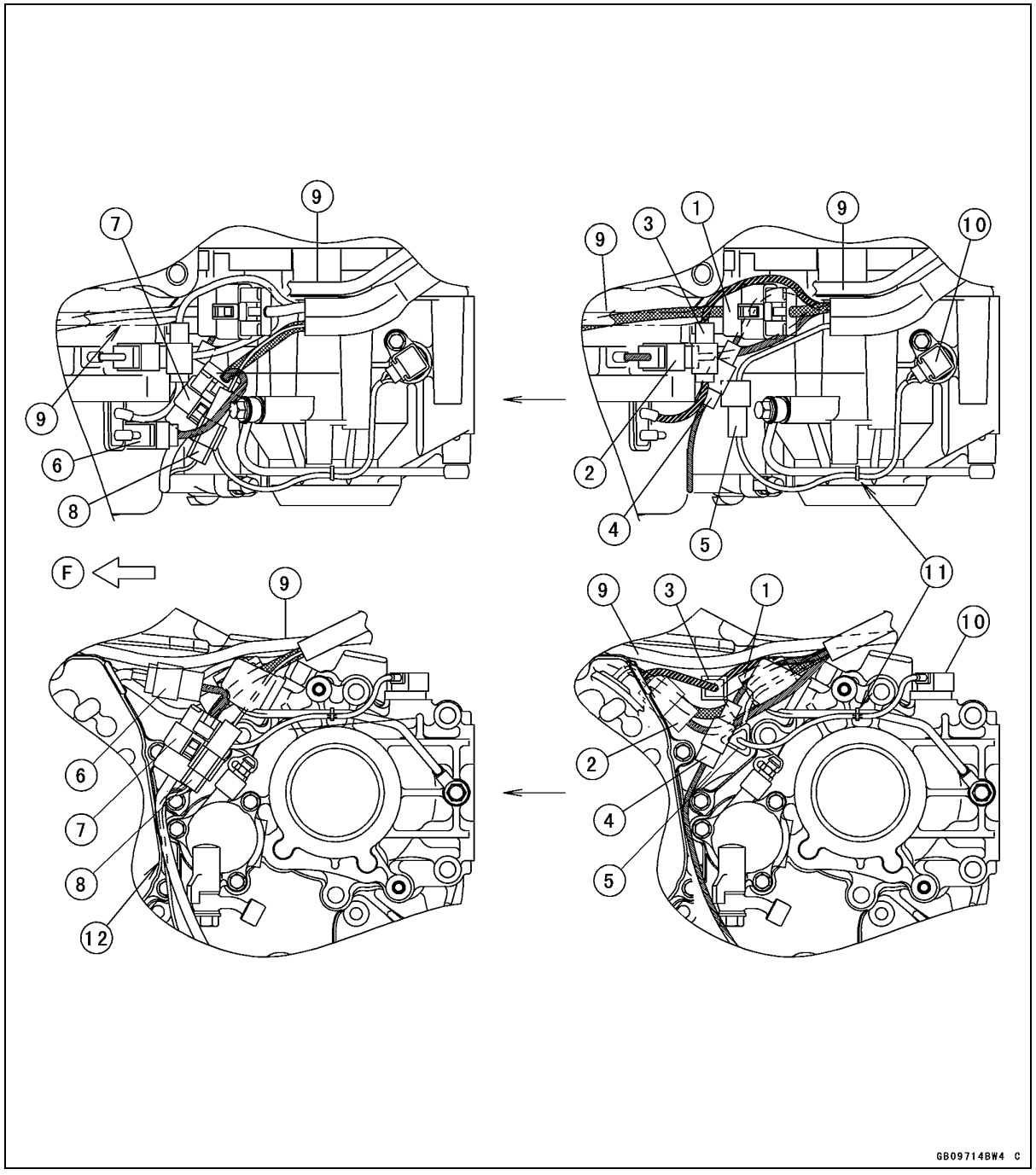
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Cable, Wire, and Hose Routing

1. Rear Fender
2. Grommets
3. Five Clamps
4. Rear Fender Harness
5. Plastic Cover
6. Run the rear fender harness into the cut of plastic cover.
7. Connector for Licence Plate and Tail/Brake Lights
8. License Plate Light
9. Tail/Brake Light
10. Snap-on Strap
11. White Mark of Rear Fender Harness (Position here.)
12. Rear Left Turn Signal Light
13. Rear Right Turn Signal Light
14. Bracket
15. Connector of Rear Left Turn Signal Light (The female plug is fitted into bracket.)
16. Connector of Rear Right Turn Signal Light (The female plug is fitted into bracket.)
17. Press by hands: Clamp the rear fender harness with these clamps and press each end of clamps by hands against the rear fender.
18. Rear View
19. Front

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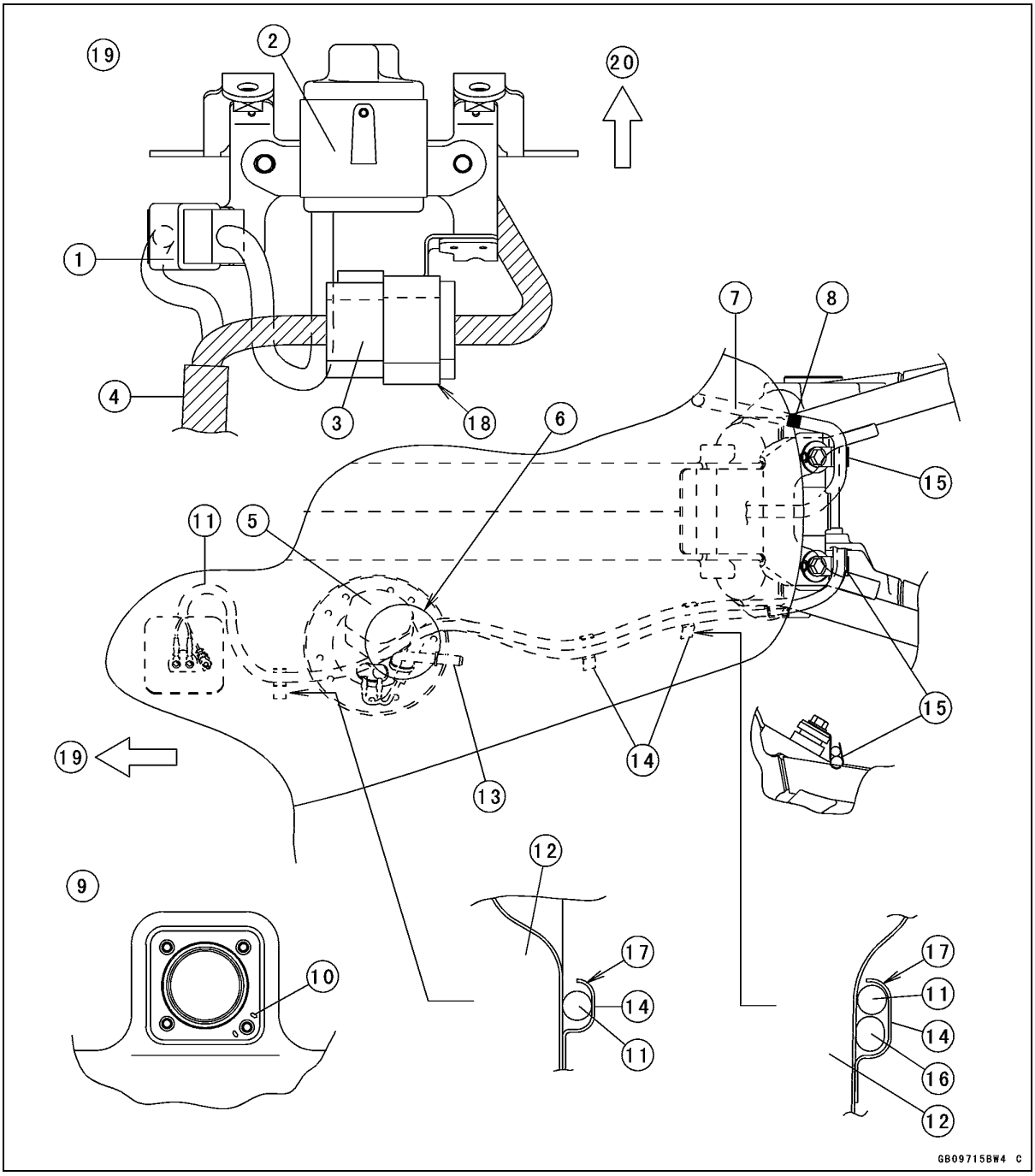
Cable, Wire, and Hose Routing



1. Left Regulator/Rectifier Connector
2. Inside Alternator Connector
3. Crankshaft Sensor Connector
4. Oil Pressure Switch/Neutral Switch Connector
5. Speed Sensor Connector
6. Outside Alternator Connector
7. Right Regulator/Rectifier Connector
8. Side stand Switch Connector
9. Starter Motor Lead
10. Speed Sensor
11. Strap (Speed Sensor Lead)
12. Insert the oil pressure/neutral switch leads and side stand switch leads in this order between the alternator cover and the clutch slave cylinder.

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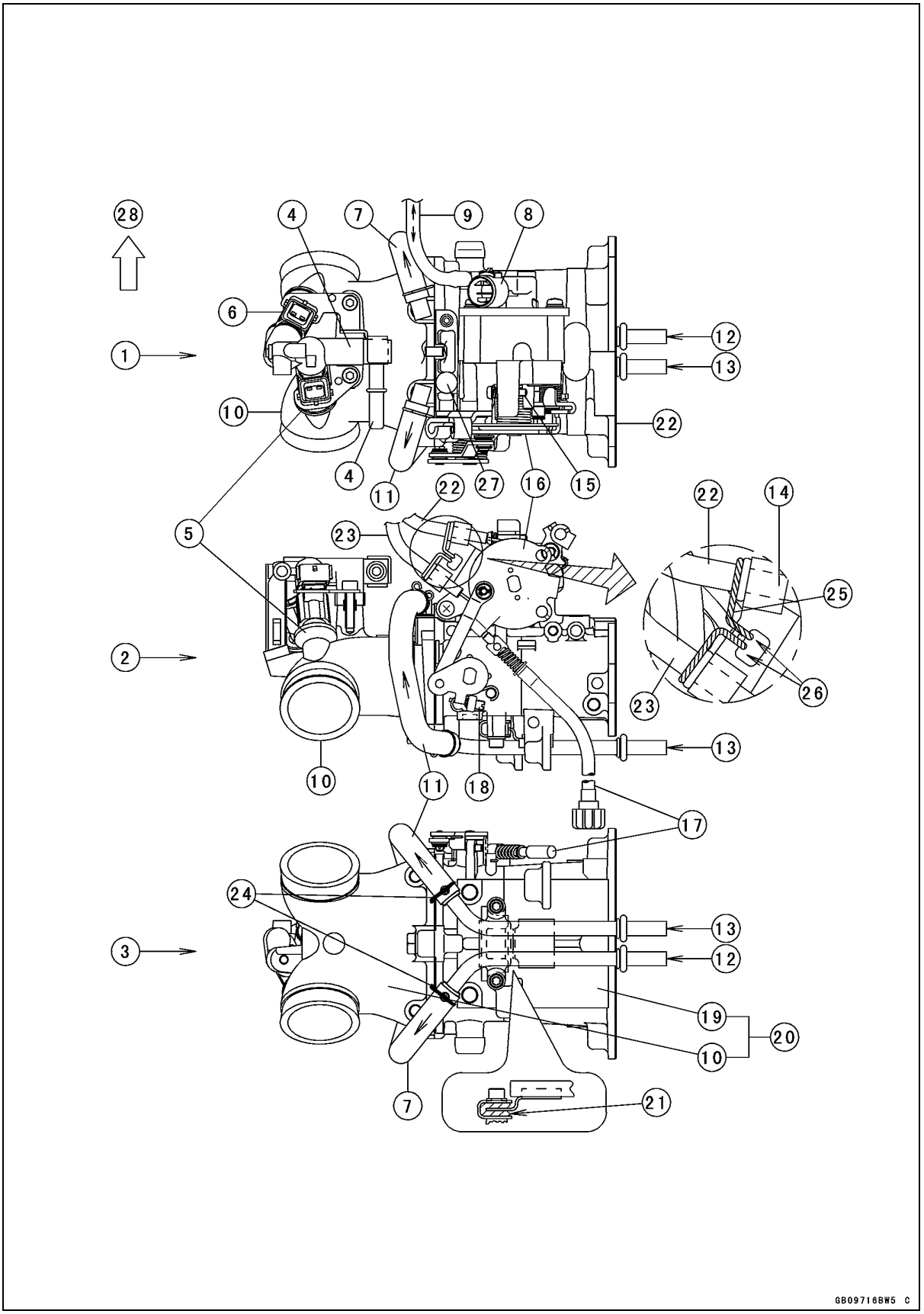
Cable, Wire, and Hose Routing



1. Ignition Switch Connector (Push the lock to disconnect. Join the connector and fit it into the slit of the bracket.)
2. Ignition Switch
3. Speedometer/Fuel Level Sensor Connector
4. Main Harness
5. Fuel Pump
6. Run the fuel level sensor lead between the fuel pump and the fuel pump outlet pipe.
7. Fuel Tank Breather Hose
8. Mark (Position here.)
9. Fuel Tank Bottom View
10. Two Recesses (Position here.)
11. Fuel Level Sensor Lead
12. Inside of Fuel Tank
13. Fuel Pump Outlet Pipe
14. Clamps
15. Clamp
16. Fuel Pump Lead
17. Press the clamps.
18. Raise the lock to disconnect.
19. Front
20. Top

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Cable, Wire, and Hose Routing



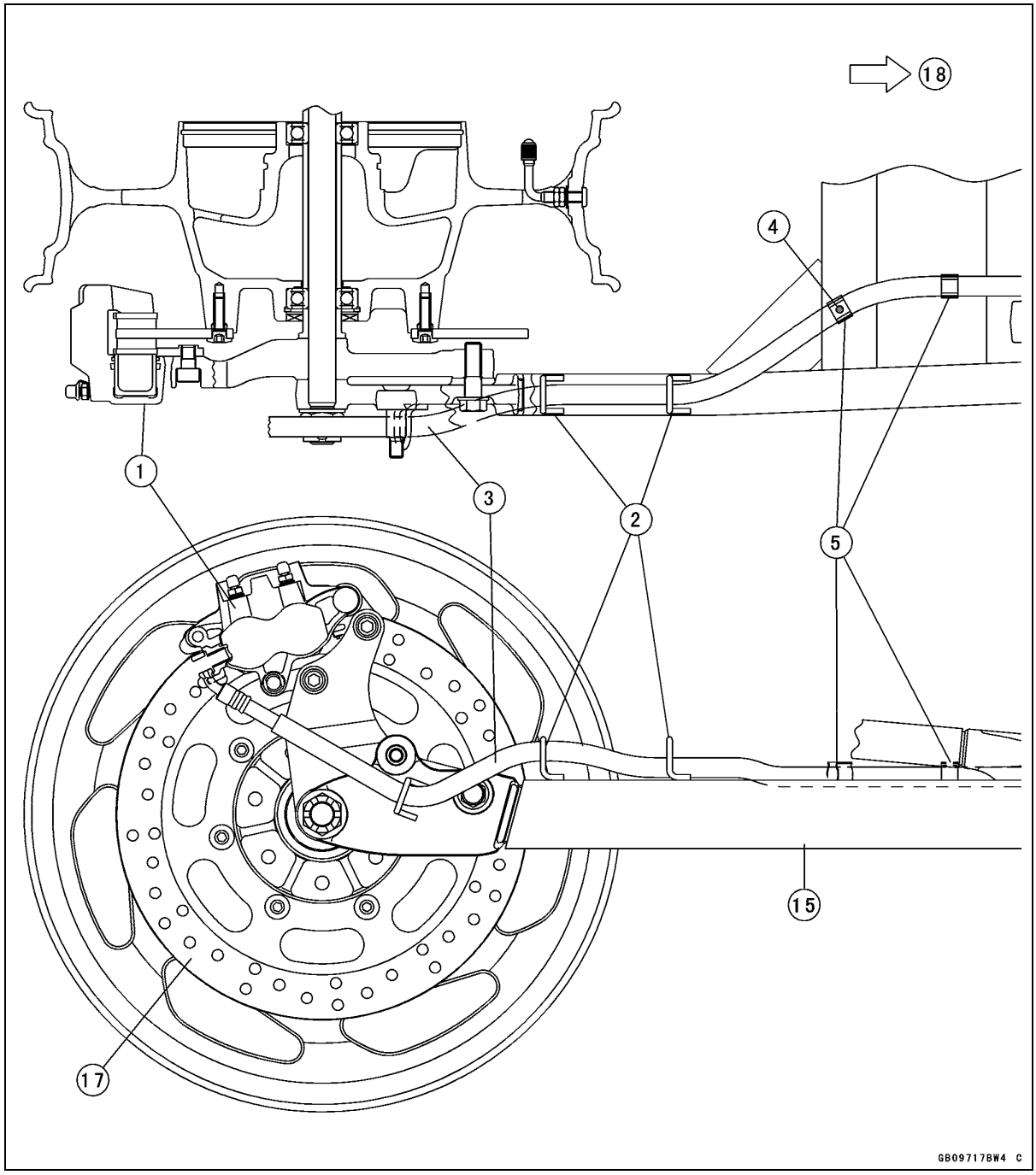
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Cable, Wire, and Hose Routing

←→: Vacuum Pulsation
→: Bypass Air Flow
#1: For Front Cylinder
#2: For Rear Cylinder
1. Top View
2. Rear View
3. Bottom View
4. Delivery Joint
5. Fuel Injector #2
6. Fuel Injector #1
7. ISC Hose #1 (Blue Mark)
8. Throttle Sensor
9. Vacuum Hose to Inlet Air Pressure Sensor
10. Inlet Manifold
11. ISC Hose #2 (Red Mark)
12. ISC Pipe #1
13. ISC Pipe #2
14. Throttle Cable Holder
15. Choke Lever Stop Screw
16. Throttle Pulley
17. Idle Adjusting Screw
18. Throttle Stop Screw
19. Throttle Body
20. Throttle Body Assy
21. ISC Pipe Damper
22. Throttle Cable (Decelerator)
23. Throttle Cable (Accelerator)
24. Position the white marks here.
25. Cable Clip
26. Stake the cable clip on the throttle cable holder.
27. Rubber Plug (except California)
28. Front

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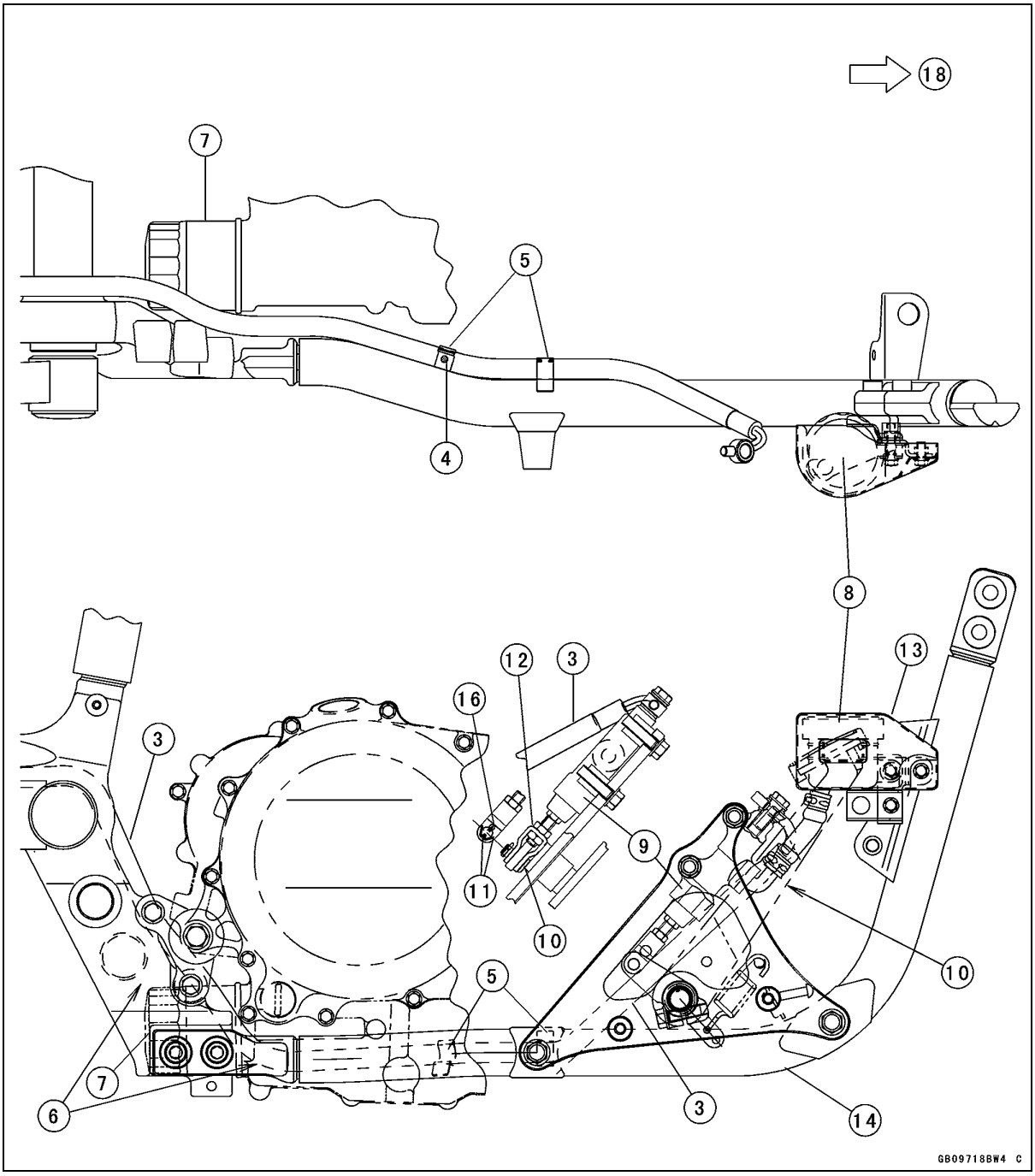
Cable, Wire, and Hose Routing



1. Rear Brake Caliper
2. Hose Holders
3. Rear Brake Hose
4. Hose White Marks (Position here.)
5. Hose Clamps
6. Run the brake hose between the engine mounting bracket bosses and the oil filter, and then along the downtube towards the front.
7. Oil Filter

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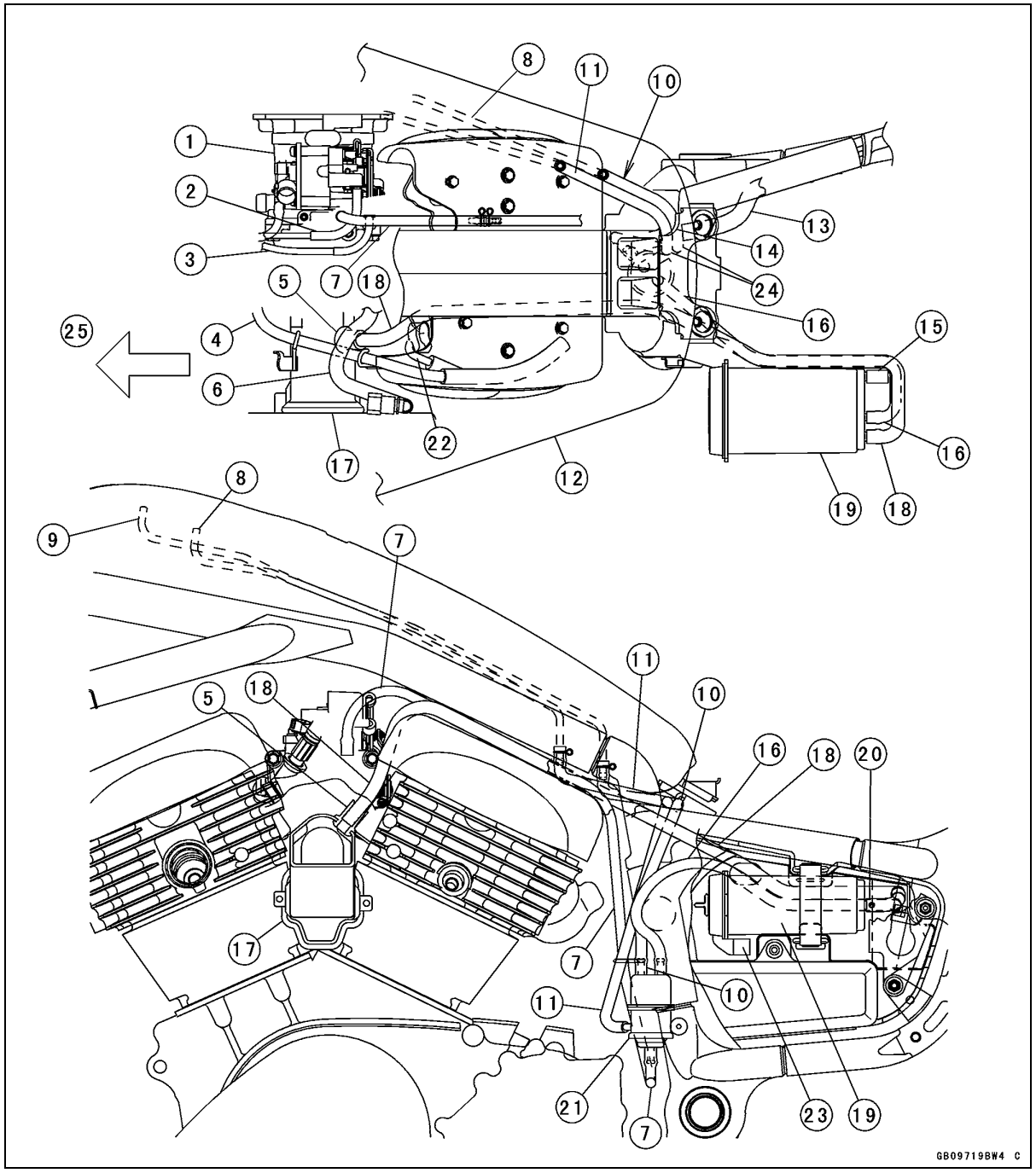
Cable, Wire, and Hose Routing



8. Rear Brake Reservoir
9. Rear Master Cylinder
10. Brake Pedal
11. Bend both ends of the cotter pin as shown.
12. Clevis
13. Rear Brake Reservoir Cover
14. Downtube
15. Swingarm
16. Cotter Pin
17. Rear Brake Disc
18. Front

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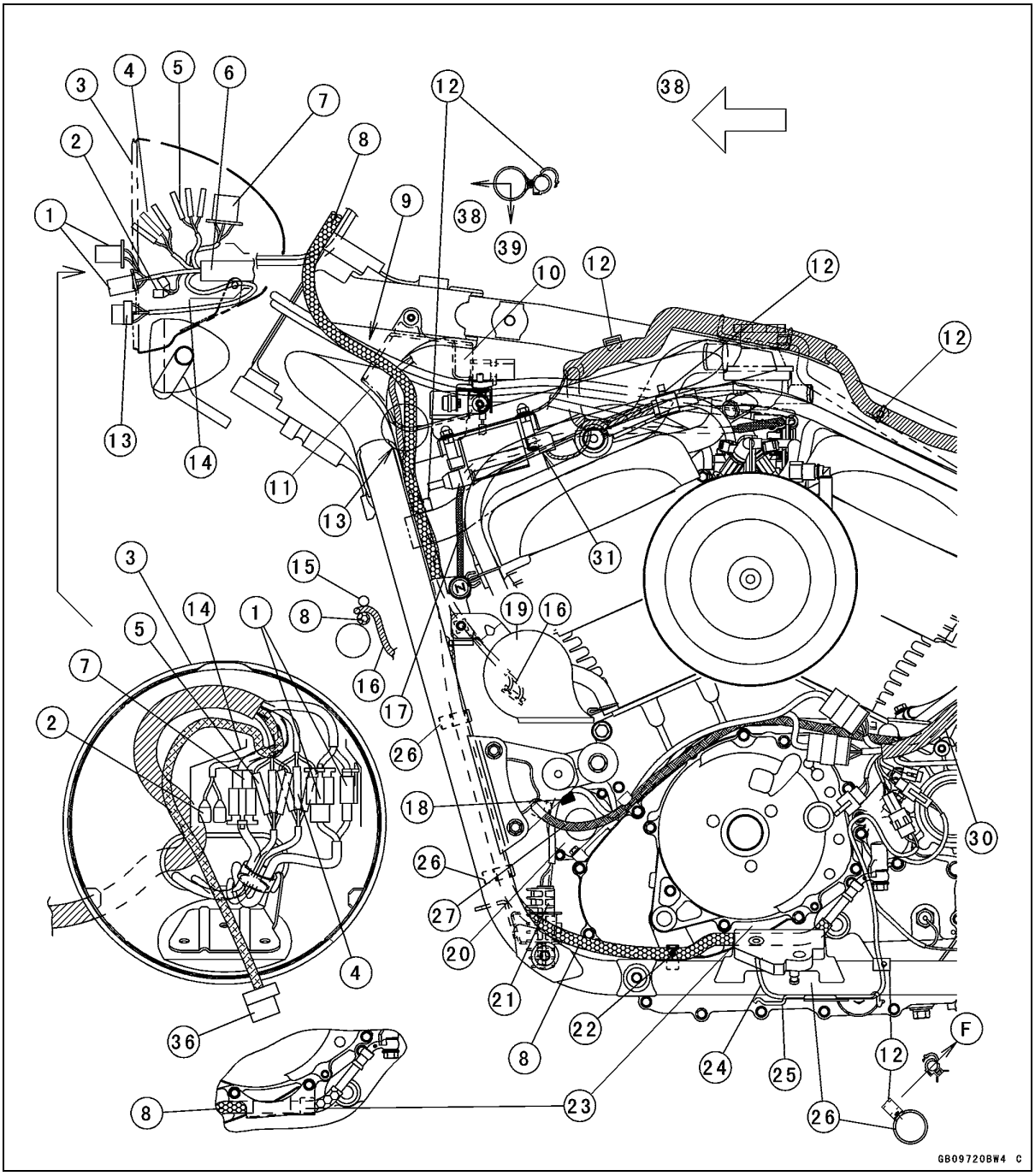
Cable, Wire, and Hose Routing



1. Throttle Body Assy
2. Throttle Cable (Decelerator)
3. Throttle Cable (Accelerator)
4. Front Oil Hose
5. Grommet
6. Fuel Pump Outlet Hose
7. Separator Vacuum Hose (White)
8. Fuel Tank Breather Pipe
9. Filler Drainpipe
10. Fuel Tank Breather Hose (Blue, Rear)
11. Fuel Tank Return Hose (Red, Front)
12. Fuel Tank
13. Main Harness
14. Run the hoses through the hole.
15. Plug
16. Separator Breather Hose (Blue)
17. Lower Air Cleaner Duct
18. Canister Purge Hose (Green)
19. Canister
20. Face the white mark left.
21. Separator
22. Rear Oil Hose
23. Separator Inlet
24. Run these hoses on the left of the main harness.
25. Front

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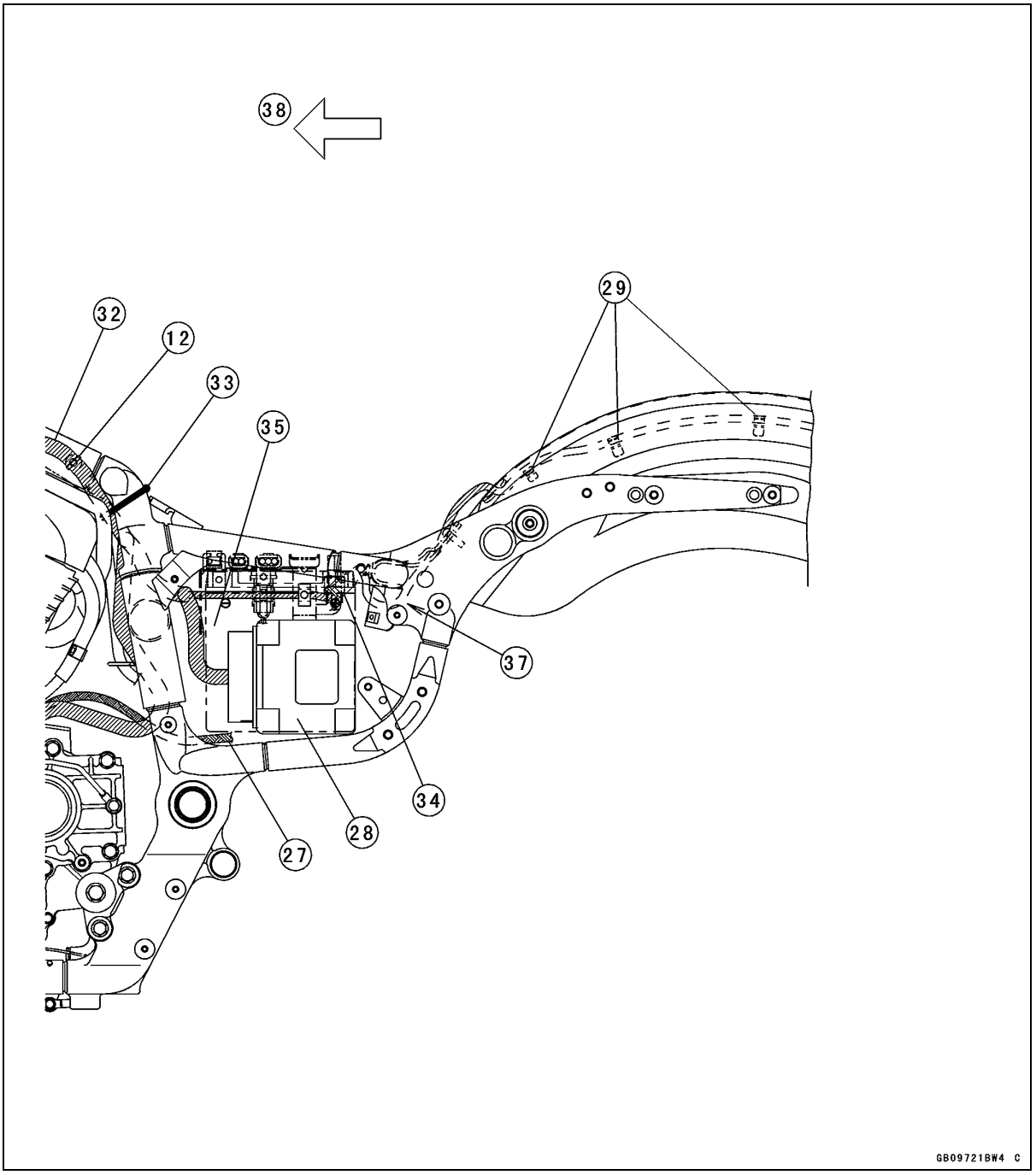
Cable, Wire, and Hose Routing



1. Left Handlebar Switch Connectors
2. Accessory Lead Connectors
3. Headlight Body
4. Front Left Turn Signal Light Lead Connectors
5. Front Right Turn Signal Light Lead Connectors
6. Main Harness
7. Right Handlebar Switch Connectors
8. Clutch Hose
9. Run the throttle cables inside the clutch hose.
10. Run the throttle cables inside the head pipe cover.
11. Head Pipe Cover
12. Plastic Snap-on Clamps (Fit them into the frame pipe.)
13. Put the clutch hose into the hole of the head pipe cover.
14. Water Baffle Plats
15. Fuel Tank Water Drain Hose
16. Horn Leads
17. Starter Cable
18. Clamp (Fit it into the engine mount bracket, and clamp the left and right regulator/rectifier leads.)
19. Horn
20. Starter Motor
21. Front Regulator/Rectifier
22. White Mark (Position it here.)
23 Run the clutch hose in the bracket (with white mark outside)

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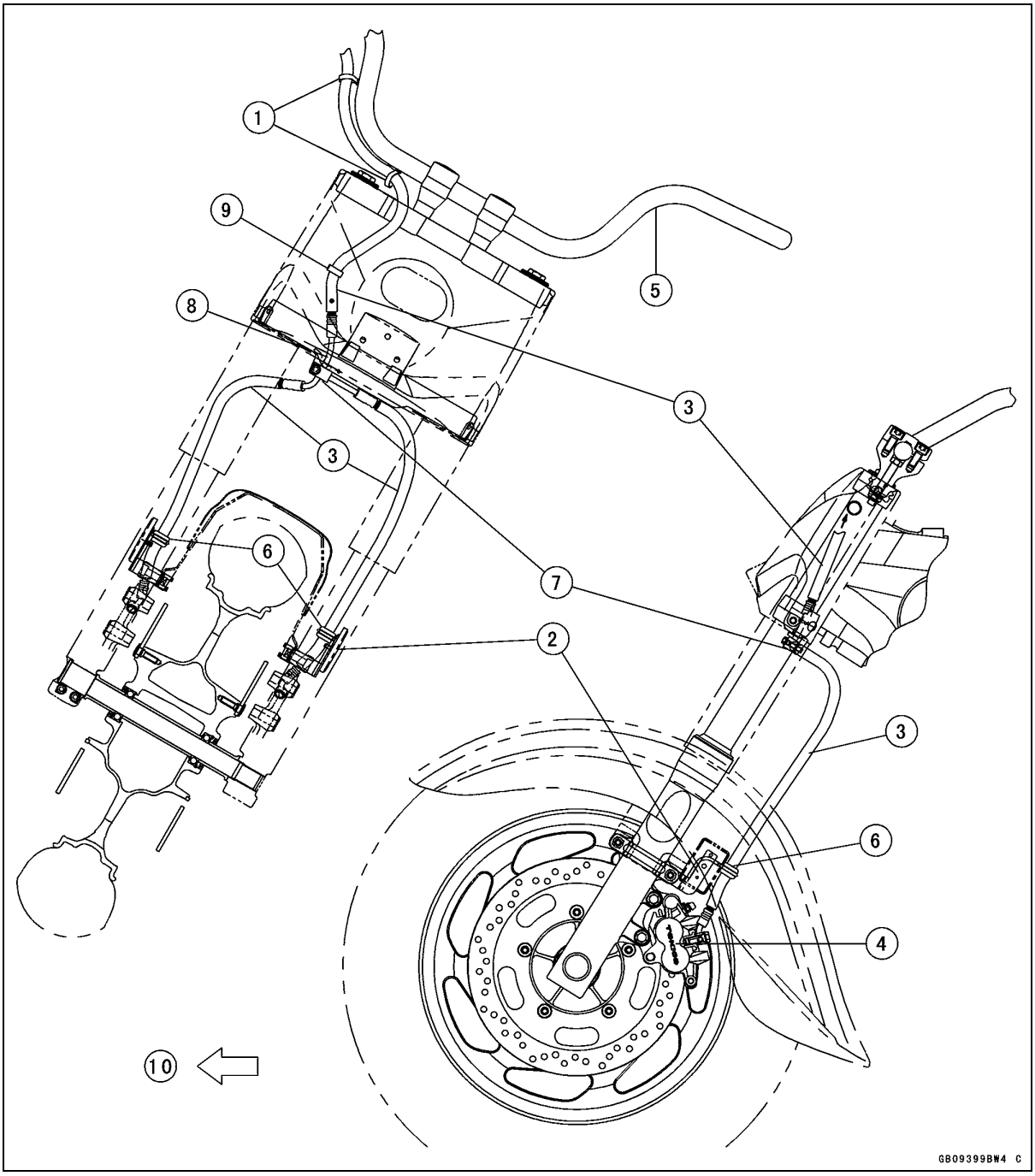
Cable, Wire, and Hose Routing



24. Side stand Switch Leads (Run the lead through the front and rear hooks and hold them with the snap on clamp a bit tight behind the side stand bracket.
25. Welded Clamp
26. Left Frame Pipe
27. Starter Motor Lead
28. ECU (Fit it into the battery case behind the case rib on the bottom.)
29. Five Clamps
30. Install the alternator outer cover and make sure the sheath of the harness is inside the cover.
31. Connect the ignition primary lead connector as shown.
32. Main Harness
33. Strap (main harness and California purge hose-green)
34. Rear Turn Signal/Taillight Lead Connector
35. Sealed Battery
36. Headlight Connector
37. Run the rear harness under the pipe.
38. Front
39. Left Side

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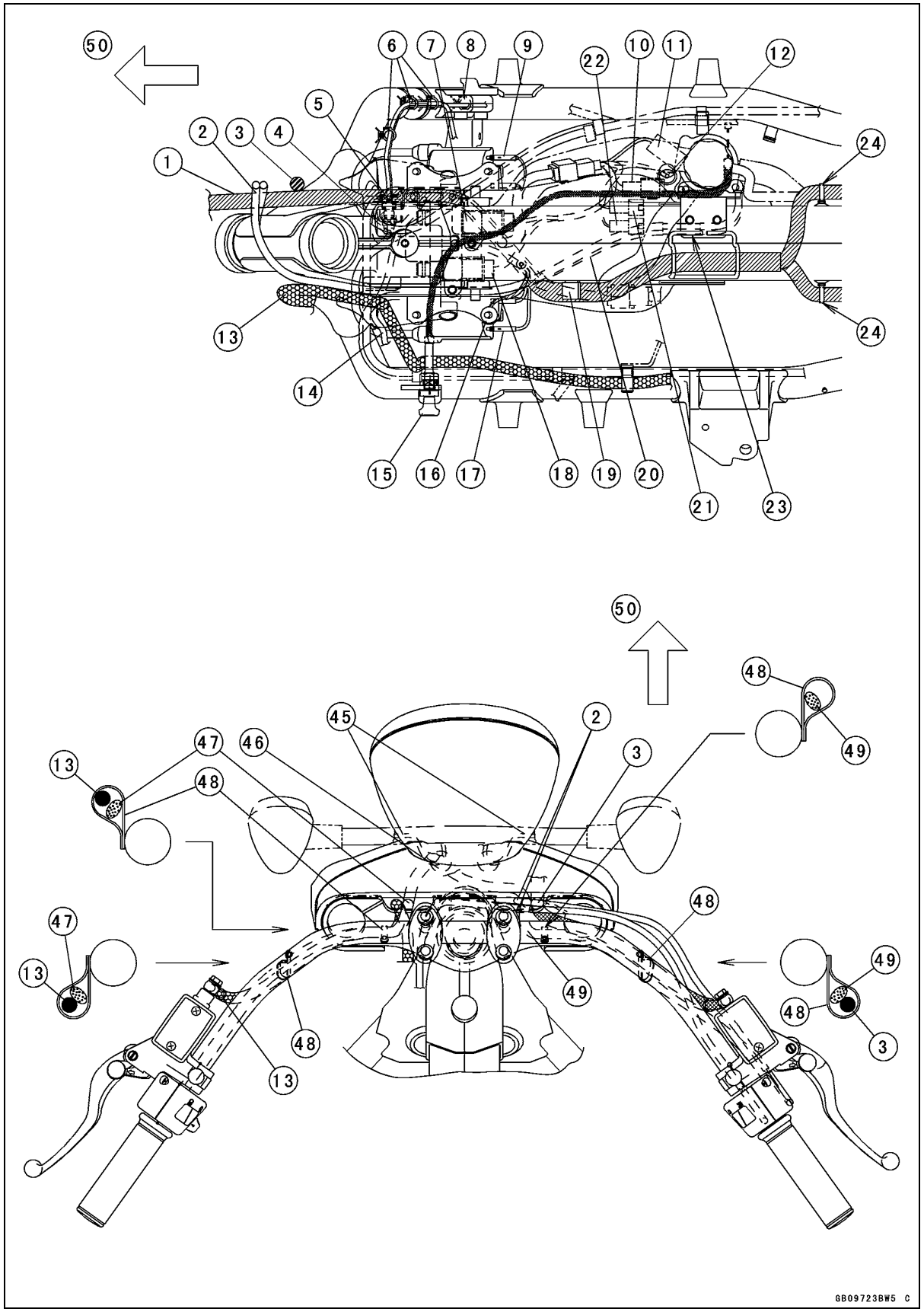
Cable, Wire, and Hose Routing



1. Snap-on Straps
2. Front Brake Hose Holders
3. Front Brake Hose Assembly
4. Front Brake Calipers
5. Handlebar
6. Grommets
7. Brake Hose Joint
8. Run the front brake hose through the steering stem bracket.
9. Clamp
10. Front

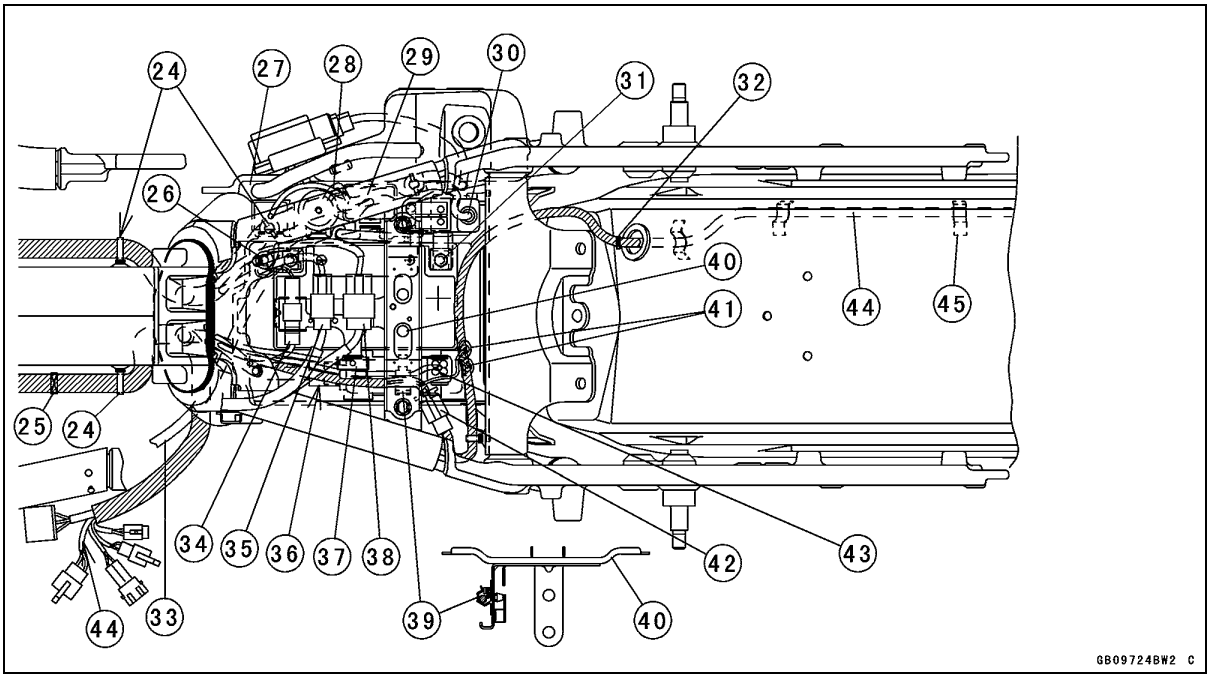
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Cable, Wire, and Hose Routing



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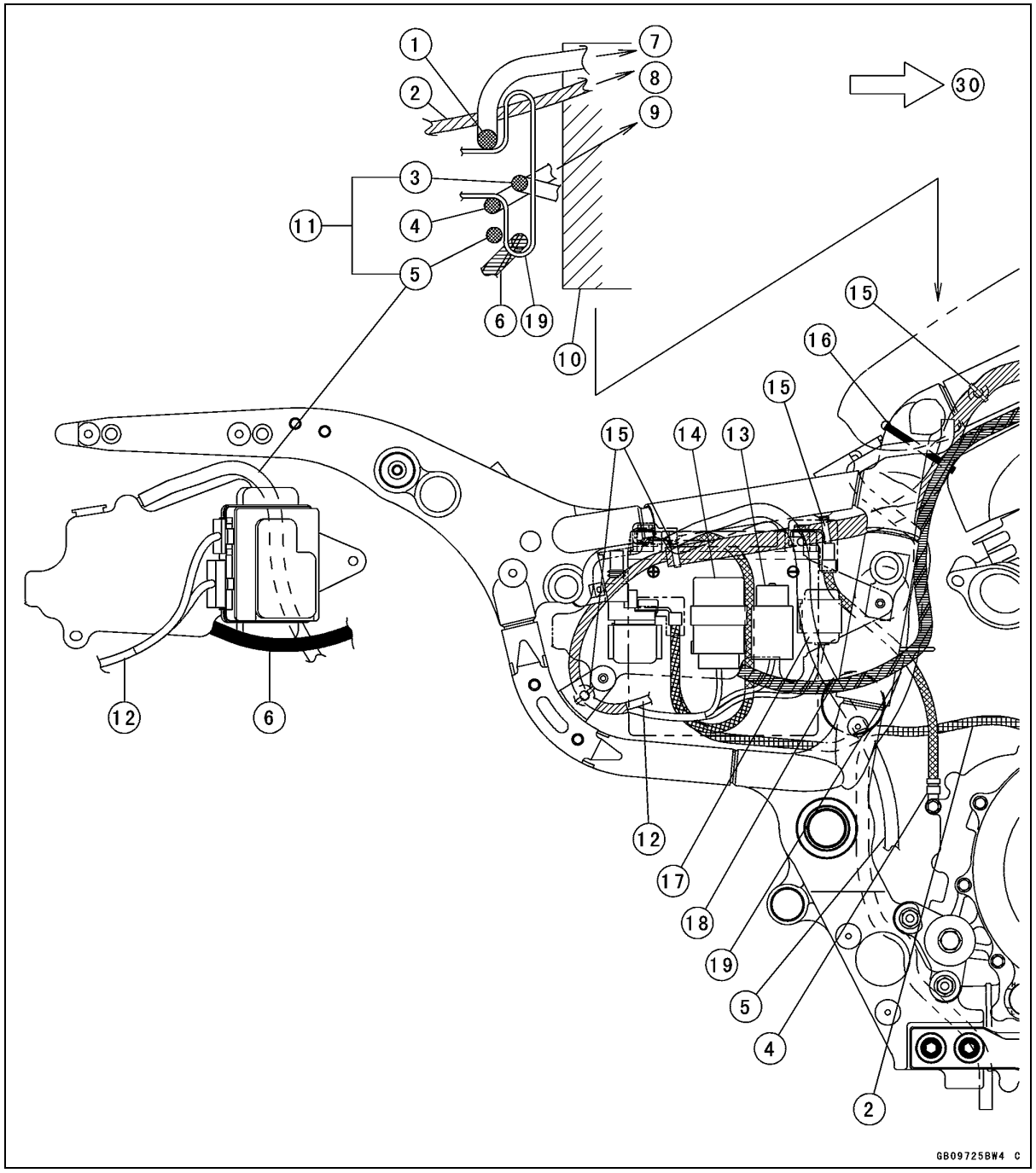
Cable, Wire, and Hose Routing



1. Main Harness (Run it into the headlight body and inside the brake hose.)
2. Throttle Cables
3. Front Brake Hose
4. Rear Brake Light Switch Connector (BR, BL leads, under the radiator fan connector)
5. Radiator Fan Connector (BK/Y, Y/W, BR/W lead, over the brake light switch connector)
6. Plastic Snap-on Clamp (Radiator Fan and Rear Brake Light Switch Leads)
7. Inlet Air Pressure Sensor Connector
8. Plastic Snap-on Clamp (Rear Brake Light Switch Lead)
9. Ignition Coil Primary Lead Connectors (for Rear Cylinder)
10. Inlet Air Temperature Sensor and ISC Valve Leads
11. Water Temperature Sensor Connector
12. Throttle Sensor Connector
13. Clutch Hose
14. Horn Lead
15. Choke Knob
16. Frame Ground Terminal
17. Ignition Coil Primary Lead Connectors (for Front Cylinders)
18. Atmospheric Pressure Sensor Connector
19. Harness Clamp (Fit it into the frame pipe.)
20. Throttle Cables
21. Injector #2 Connector (Rear)
22. Injector #1 Connector (Front)
23. Main Harness Bracket
24. Fit the straps into the frame pipe
25. White Tape for Identification
26. Battery (–) Lead from engine ground lead
27. Oil Pressure Light Delay Unit
28. ECU Main Relay
29. Turn Signal Control Unit
30. Starter Relay
31. Batter Positive (+) Terminal
32. White Tape (Align it with the grommet.)
33. Starter Motor Lead
34. Battery negative (–) Lead Connector
35. Fuel Pump Connector
36. ECU Connector
37. ECU Main Fuse
38. Fuel Level Sensor Connector
39. Plastic Snap-on Clamp (Run the self-diagnosis accessory and rear harness.)
40. Battery Holder (Fit the fuel pump, fuel level sensor connectors, ECU main Fuse and plastic snap on clamp.)
41. Accessory Lead Connectors (Female)
42. Rear Turn Signal/Taillight Lead Connector
43. Self-Diagnosis Terminal
44. Put these connectors into the alternator outer cover.
45. Front Turn Signal Light Leads (Connect them in the headlight body.)
46. Run the front turn signal light leads into the holes of the bracket.
47. Left Handlebar Switch Leads (Connect them in the headlight body.)
48. Straps
49. Right Handlebar Switch Leads
50. Front

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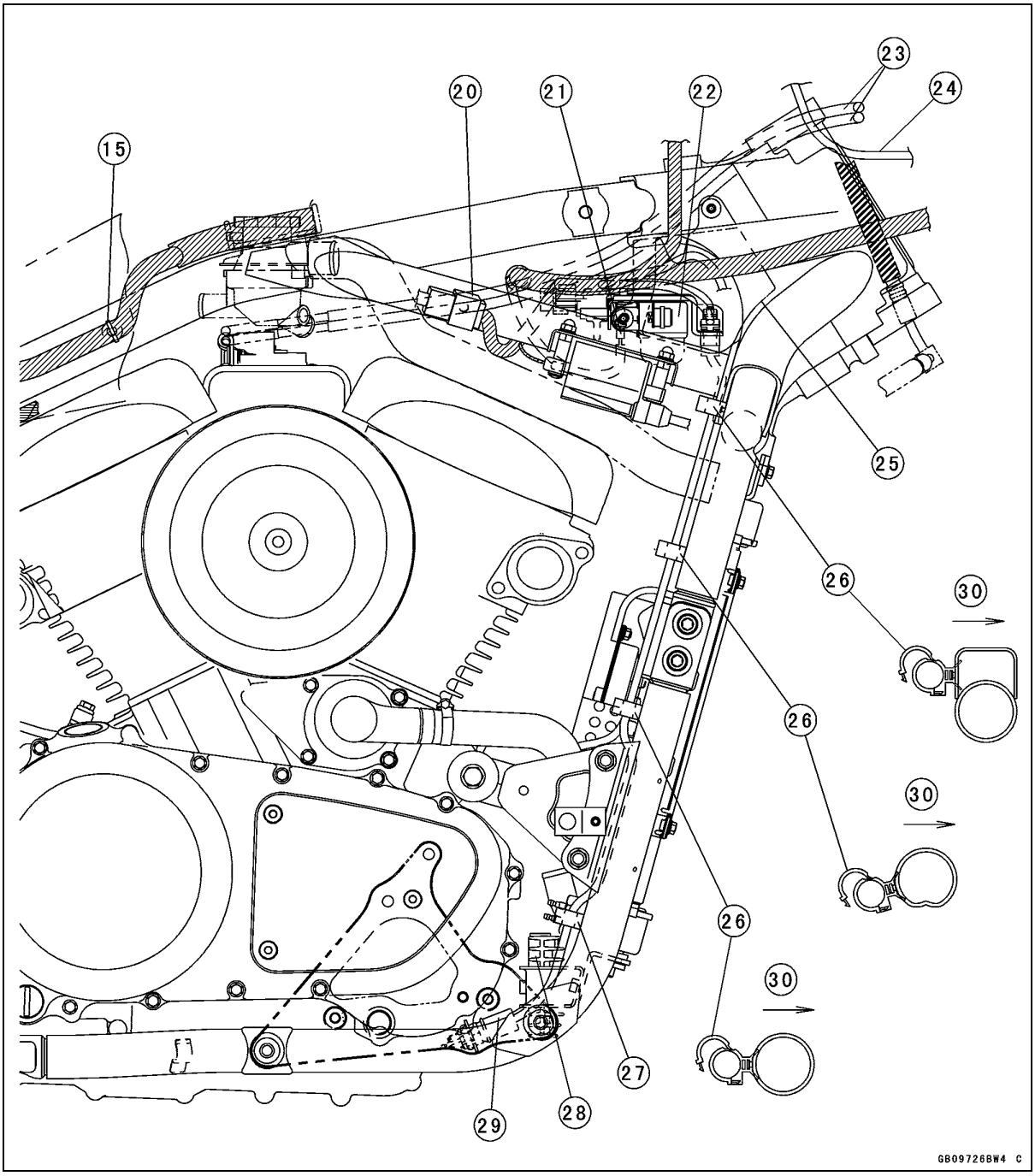
Cable, Wire, and Hose Routing



1. Main Harness
2. Starter Motor Lead
3. Fuel Tank Filler Drain Hose (Except California Model)
4. Engine Ground Lead (Run it downward.)
5. Coolant Reserve Tank Overflow Hose
6. Coolant Reserve Tank Hose (from the radiator cap to the coolant reserve tank)
7. To the inside of the alternator outer cover
8. Through the alternator outer cover to the starter motor.
9. To the engine ground
10. Crankcase
11. To the crankcase backward lower clamp
12. Junction Box Lead
13. ECU Main Relay
14. Turn Signal Control Unit
15. Insert the band attached main harness
16. Band (Fix the main harness and frame joint part only. California model run the green hose inside the band.)
17. Oil Pressure Light Delay Unit
18. Coolant Reserve Tank Hose (Run the upper side of the frame bracket.)
19. Holder

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Cable, Wire, and Hose Routing



20. Insert the sub harness connector to the frame.
21. Vehicle-down Sensor Connector
22. Vehicle-down Sensor
23. Throttle Cables
24. Right Handlebar Switch Lead
25. Head Pipe Cover
26. Plastic Snap-on Clamps (ϕ15 mm, Rear Brake Light Switch and Radiator Fan Leads)
27. Plastic Snap-on Clamps (ϕ15 mm, Rear Brake Light Switch)
28. Right Regulator/Rectifier
29. Rear Brake Light Switch
30. Front

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Troubleshooting Guide

NOTE

○*Refer to Fuel System chapter for most of DFI troubleshooting guide.*

○*This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.*

Engine Doesn't Start, Starting Difficulty

Starter motor not rotating
- Starter lockout switch or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relays not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Fuse blown

Starter motor rotating but engine doesn't turn over
- Starter clutch trouble
- Vehicle-down sensor coming off

Engine won't turn over
- Valve seizure
- Rocker arm seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Balancer bearing seizure

No fuel flow
- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

Engine flooded
- Clean spark plugs and adjust plug gaps
- Starting technique faulty (When flooded, do not crank the engine with the throttle fully opened. This promotes engine flood because more fuel is supplied automatically by DFI.)

No spark; spark weak
- Vehicle-down sensor coming off
- Ignition switch not ON
- Engine stop switch turned off
- Clutch lever not pulled in and gear not in neutral whether side stand up or down
- Though clutch lever pulled in, side stand up and gear not in neutral
- Battery voltage low
- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter in ECU trouble
- Neutral, starter lockout, or side stand switch trouble
- Crankshaft position sensor trouble
- Ignition coil trouble
- Ignition switch or engine stop switch shorted
- Wiring shorted or open
- Fuse blown

Fuel/air mixture incorrect
- Air cleaner clogged, poorly sealed, or missing

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
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
- KACR (compression release cam) sticks open (engine stalls when moving off)
- HLA (hydraulic lash adjuster) damaged (worn, seizure, or spring broken)
- HLA oil passage clogged

Poor Running at Low Speed

Spark weak
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter in ECU trouble
- Crankshaft sensor trouble
- Ignition coil trouble

Fuel/air mixture incorrect
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Throttle body assy loose

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Choke knob left pulled out
Throttle body assy O-ring damage
Air cleaner duct loose
Air cleaner O-ring damaged
Fuel pump trouble

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 warped
Cylinder head gasket damaged
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
KACR sticks open (engine stalls when moving off)
HLA seizure

Backfiring when deceleration
Vacuum switch valve broken
Air suction valve trouble

Other
IC igniter in ECU trouble
Engine oil viscosity too high
Drive train trouble
Final gear case oil viscosity too high
Brake dragging
Engine overheating
Clutch slipping
Air suction valve trouble
Vacuum switch valve trouble

Poor Running or No Power at High Speed

Firing incorrect
Spark plug dirty, broken, or maladjusted
Spark plug cap or high tension wiring trouble
Spark plug cap shorted or not in good contact
Spark plug incorrect
IC igniter in ECU trouble
Crankshaft sensor trouble
Ignition coil trouble

Fuel/air mixture incorrect
Choke knob left pulled out
Air cleaner clogged, poorly sealed, or missing
Air cleaner duct loose
Air cleaner O-ring damaged
Water or foreign matter in fuel
Throttle body assy loose
Throttle body assy O-ring damage
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
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.)
KACR sticks open (engine stalls when moving off)
HLA seizure

Knocking
Carbon built up in combustion chamber
Fuel poor quality or incorrect (Be sure to use high-octane gasoline recommended by Owner's Manual)
Spark plug incorrect
IC igniter in ECU trouble

Miscellaneous
Throttle valves won't fully open
Brake dragging
Clutch slipping
Engine overheating
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Final gear case oil viscosity too high
Air suction valve trouble
Vacuum switch valve trouble
Catalytic converters melt down due to muffler overheating (KLEEN)

Overheating

Firing incorrect
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
IC igniter in 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)

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Troubleshooting Guide

For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the spark plug
For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)
IC igniter in ECU trouble

Fuel/air mixture incorrect
Throttle body assy loose
Throttle body assy O-ring damage
Air cleaner duct loose
Air cleaner poorly sealed, or missing
Air cleaner O-ring damaged
Air cleaner clogged

Compression high
Carbon built up in combustion chamber
KACR sticks close

Engine load faulty
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Final gear case oil viscosity too high
Brake dragging

Lubrication inadequate
Engine oil level too low
Engine oil poor quality or incorrect

Water temperature warning system incorrect
Water temperature warning light broken
Water temperature switch broken

Coolant incorrect
Coolant level too low
Coolant deteriorated
Wrong coolant mixed ratio

Cooling system component incorrect
Radiator fin damaged
Radiator clogged
Thermostat trouble
Radiator cap trouble
Radiator fan switch trouble
Fan motor broken
Fan blade damaged
Water pump not turning
Water pump impeller damaged

Over Cooling

Cooling system component incorrect
Radiator fan switch trouble
Thermostat trouble

Clutch Operation Faulty

Clutch slipping
Friction plate worn or warped
Steel plate worn or warped
Spring plate free play maladjustment
Clutch spring broken or weak
Clutch slave cylinder trouble
Clutch hub or housing unevenly worn
Clutch master cylinder trouble

Clutch not disengaging properly
Clutch plate warped or too rough
Spring plate free play maladjustment
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch slave cylinder trouble
Clutch hub nut loose
Clutch hub spline damaged
Clutch friction plate installed wrong
Clutch fluid leakage
Clutch fluid deteriorated
Clutch master cylinder primary or secondary cup damaged
Clutch master cylinder scratched inside
Air in the clutch fluid line

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 set lever binding
Shift return spring weak or broken
Shift return spring pin loose
Shift mechanism arm spring broken
Shift mechanism arm broken

Jumps out of gear
Shift fork ear worn, bent
Gear groove worn
Gear dogs and/or dog holes worn
Shift drum groove worn
Gear set lever spring weak or broken
Shift fork guide pin worn
Drive shaft, output shaft, and/or gear splines worn

Overshifts
Gear set lever spring weak or broken
Shift mechanism arm spring broken

Abnormal Engine Noise

Knocking
IC igniter in ECU trouble
Carbon built up in combustion chamber
Fuel poor quality or incorrect (Be sure to use high-octane gasoline recommended in Owner's Manual)
Spark plug incorrect
Overheating

Piston slap
Cylinder/piston clearance excessive
Cylinder, piston worn

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Connecting rod bent
Piston pin, piston pin hole worn

Valve noise
Engine not sufficiently warmed up after HLA installation
HLA damaged (worn, seizure, or spring broken)
HLA aeration due to low oil level
Air in HLA
Metal chips or dust jammed in HLA
Engine operated in red zone
Valve spring broken or weak
Camshaft bearing portion worn

Other noise
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring worn, broken, or stuck
Piston seizure, damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mounts loose
Crankshaft bearing worn
Primary gear worn or chipped
Camshaft chain tensioner trouble
Camshaft chain, sprocket, guide worn
Air suction valve damaged
Vacuum switch valve damaged
Alternator rotor loose
Catalytic converters melt down due to muffler overheating (KLEEN)
Balancer gear worn or chipped
Balancer shaft position maladjusted
Balancer bearing worn
Balancer shaft coupling rubber damper damaged
Water pump chain, sprocket worn

Abnormal Drive Train Noise

Clutch noise
Clutch rubber 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 gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

Drive line noise
Bevel gear bearings worn
Bevel gears worn or chipped
Bevel gears maladjusted
Rear wheel coupling damaged
Final gear case oil level too low or oil too thin
Insufficient grease in propeller shaft joint

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
Master cylinder damaged

Other noise
Bracket, nut, bolt, etc. not properly mounted or tightened

Oil Pressure Warning Light Goes On

Engine oil pump damaged
Engine oil screen clogged
Engine oil filter clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearing portion worn
Crankshaft bearings worn
Oil pressure switch damaged
Oil pressure switch lead damaged
Relief valve stuck open
O-ring at the oil pipe 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
Choke knob left pulled out

Brown smoke
Air cleaner duct loose
Air cleaner O-ring damaged
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory

Handlebar hard to turn
Cable routing incorrect
Hose routing incorrect
Wiring routing incorrect

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Troubleshooting Guide

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 sleeve or pivot bearings worn
Wheel rim warped, or not balanced
Wheel bearing worn
Handlebar nuts loose
Steering stem head nut loose
Front, rear axle runout excessive

Handlebar pulls to one side
Frame bent
Swingarm bent or twisted
Swingarm pivot shaft runout excessive
Steering maladjusted
Front fork bent
Right and/or left front fork oil level incorrect

Shock absorption unsatisfactory
(Too hard)
Front fork oil excessive
Front fork oil viscosity too high
Rear shock absorber adjustment too hard
Tire air pressure too high
Front fork bent
(Too soft)
Tire air pressure too low
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Rear shock adjustment too soft
Front fork, rear shock absorber spring weak
Rear shock absorber oil leaking

Brake Doesn't Hold

Air in the brake line
Pad or disc worn
Brake fluid leakage
Disc warped
Contaminated pad
Brake fluid deteriorated
Primary or secondary cup damaged in master cylinder
Master cylinder scratched inside

Battery Trouble

Battery discharged
Charge insufficient
Battery faulty (too low terminal voltage)
Battery leads 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

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MODEL APPLICATION

Year	Model	Beginning Frame No.
2005	VN1600-D1	JKBVNKD1□5A000001 or JKBVNT60ADA013001

□:This digit in the frame number changes from one machine to another.

Kawasaki
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