Kawasaki

VULCAN 2000
VN2000
VULCAN 2000 LIMITED
VULCAN 2000 CLASSIC
VULCAN 2000 CLASSIC LT



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

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

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

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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)
kg	(mass)		
kgf	(force)		
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 Service Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

How to Use This Manual

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

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

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

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

⚠ WARNING

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

CAUTION

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

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

NOTE

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

- Indicates a procedural step or work to be done.

○Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.

★Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

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

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General Information

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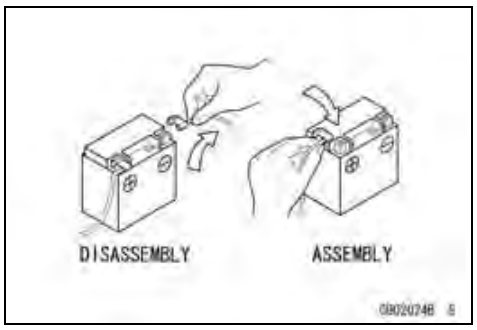
Before Servicing

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 cables from the battery to prevent the engine from accidentally turning over. Disconnect the battery cable (−) first and then the battery cable (+). When completed with the service, first connect the battery cable (+) to the positive (+) terminal of the battery then the battery cable (−) to the negative terminal.



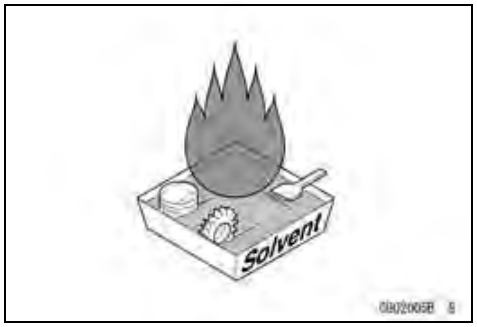
Edges of Parts

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



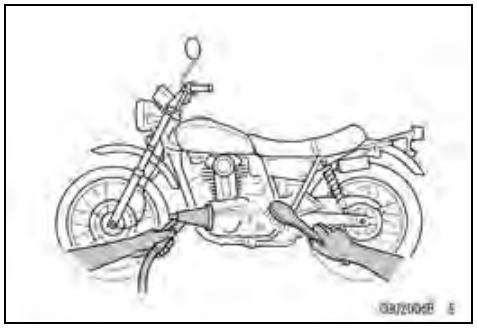
Solvent

Use a high-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.

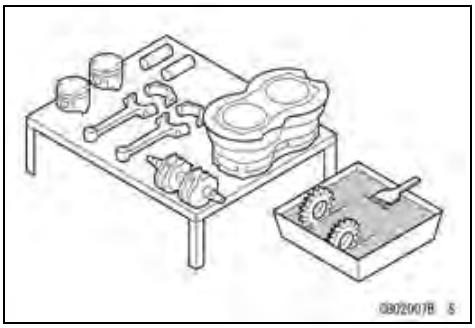


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Before Servicing

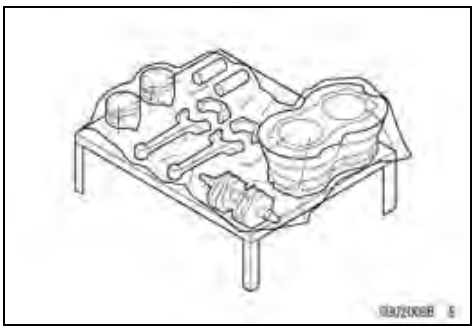
Arrangement and Cleaning of Removed Parts

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.



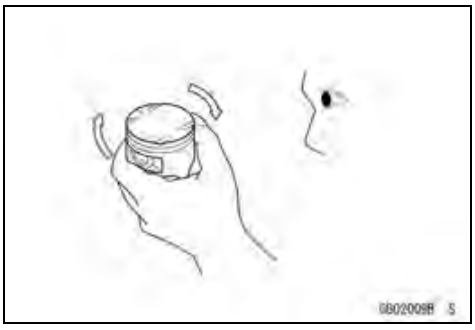
Storage of Removed Parts

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.



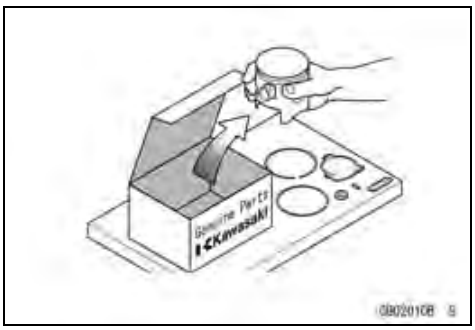
Inspection

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.



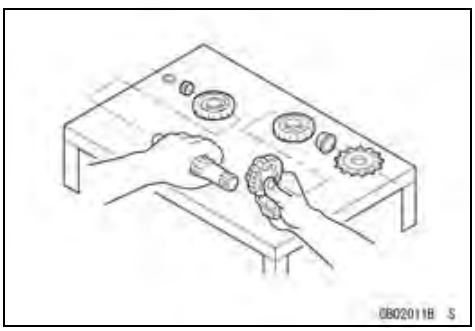
Replacement Parts

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.

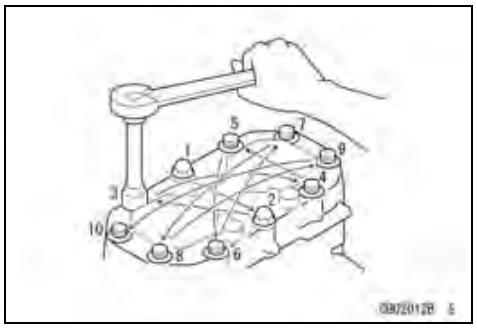


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Before Servicing

Tightening Sequence

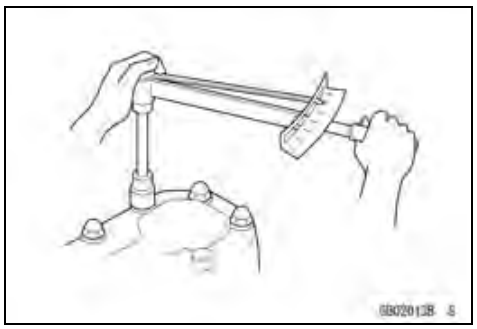
Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. Conversely when loosening the bolts, nuts, or 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

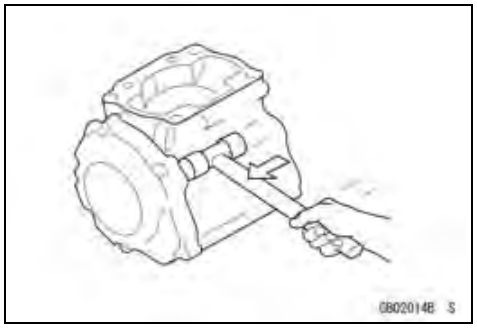
Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.

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



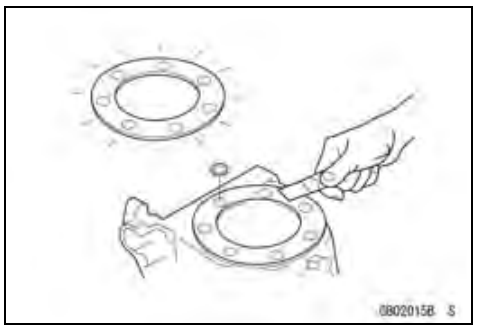
Force

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



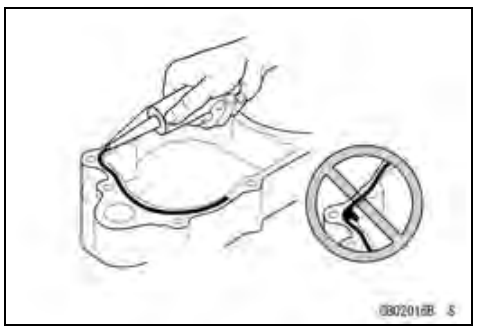
Gasket, O-ring

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



Liquid Gasket, Non-permanent Locking Agent

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

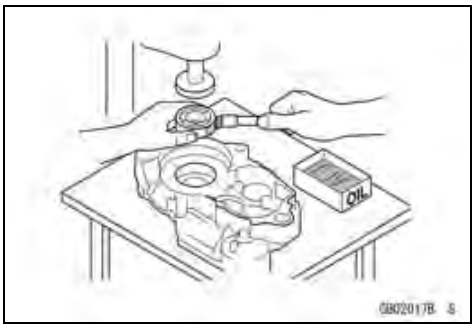


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Before Servicing

Press

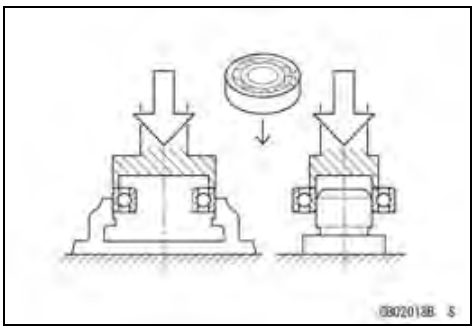
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing and Needle Bearing

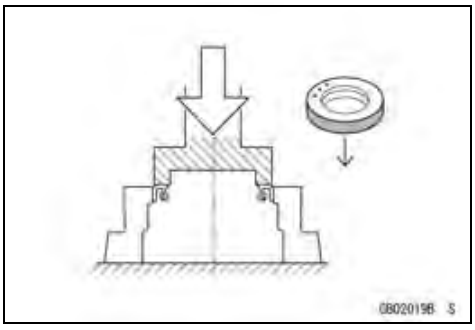
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

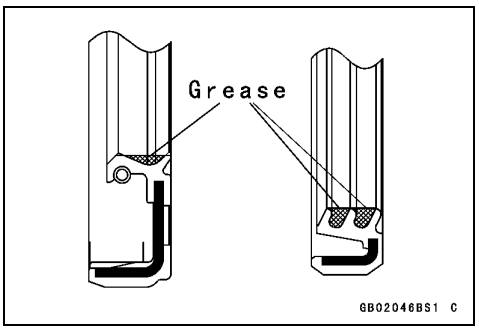


Oil Seal, Grease Seal

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.

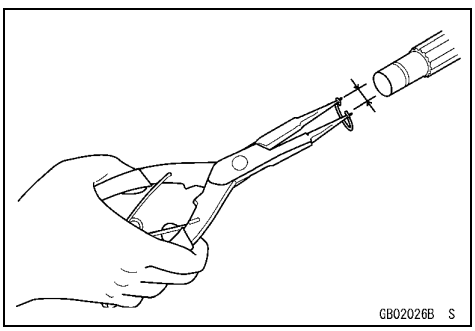


Apply specified grease to the lip of seal before installing the seal.



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.

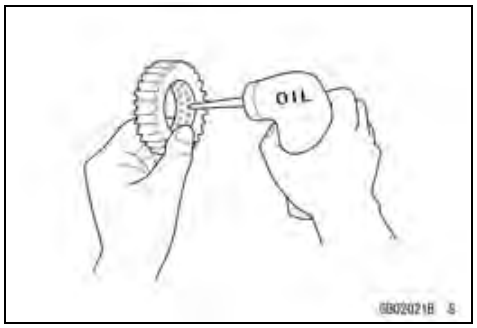


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Before Servicing

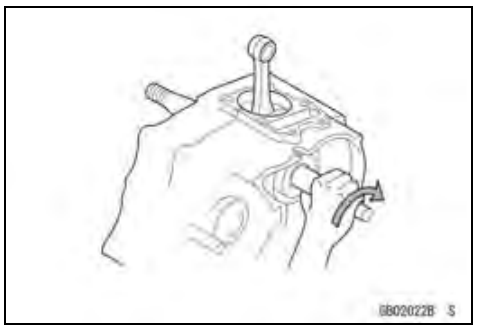
Lubrication

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



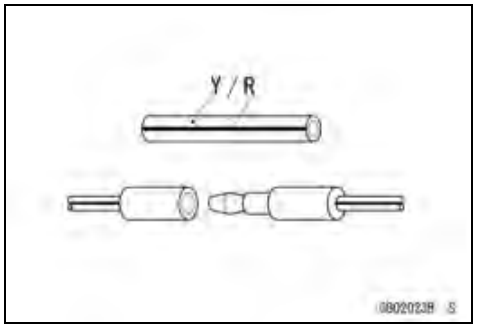
Direction of Engine Rotation

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



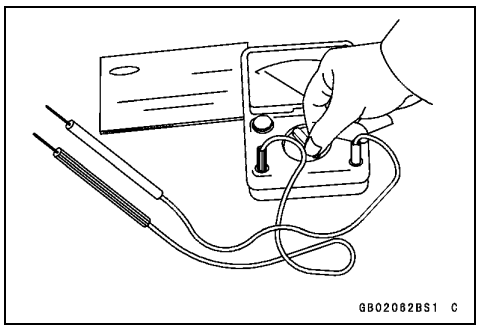
Electrical Leads

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



Instrument

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



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Model Identification

VN2000-A1 (US, and Canada) Left Side View



VN2000-A1 (US, and Canada) Right Side View



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Model Identification

VN2000-A1 (Europe) Left Side View



VN2000-A1 (Europe) Right Side View



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Model Identification

VN2000-D1 (US, and Canada) Left Side View



VN2000-D1 (US, and Canada) Right Side View



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Model Identification

VN2000E6F (US) Left Side View



VN2000E6F (US) Right Side View



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Model Identification

VN2000F6F (US, Canada and Australia) Left Side View



VN2000F6F (US, Canada and Australia) Right Side View



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General Specifications

Items	VN2000-A1 ~, A6F ~/D1, D6F	VN2000E6F ~	VN2000F6F ~
Dimensions			
Overall Length	2 535 mm (99.80 in.)		
Overall Width	1 025 mm (40.35 in.), (AU) 985 mm (38.8 in.)		
Overall Height	1 155 mm (45.47 in.)		1 480 mm (58.27 in.)
Wheelbase	1 735 mm (68.31 in.)		
Road Clearance	135 mm (5.32 in.)		
Seat Height	680 mm (26.8 in.)		
Dry Mass	340 kg (750 lb)		361 kg (796 lb)
Curb Mass:			
Front	176 kg (388 lb)	174 kg (384 lb)	178 kg (329 lb)
Rear	195 kg (429 lb)	197 kg (434 lb)	214 kg (472 lb)
Fuel Tank Capacity	21 L (5.5 US gal)		
Fuel	Unleaded and high-octane gasoline (see Owner's Manual)		
Performance			
Minimum Turning Radius	3.2 m (10.5 ft)		
Engine			
Type	4-stroke, OHV, V2-cylinder		
Cooling System	Liquid-cooled		
Bore And Stroke	103 × 123.2 mm (4.06 × 4.850 in.)		
Displacement	2 053 cm³ (125.3 cu in.)		
Compression Ratio	9.5 : 1		
Maximum Horsepower	76 kW (103 PS) @4 800 r/min (rpm), WVTA (FULL H), GB WVTA (FULL H) 76 kW (103 PS) @5 100 r/min (rpm), (AU) (MY) – (US)		
Maximum Torque	177 N·m (18.05 kgf·m, 130.6 ft·lb) @3 200 r/min (rpm), WVTA (FULL H), GB WVTA (FULL H) 177 N·m (18.05 kgf·m, 130.6 ft·lb) @3 000 r/min (rpm), (AU) (MY) – (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			
Front	From 13° BTDC @900 r/min (rpm) ~ 51° BTDC @4 000 r/min (rpm)		
Rear	From 15° BTDC @900 r/min (rpm) ~ 51° BTDC @4 000 r/min (rpm)		
Spark Plugs	NGK IZFR6F-11		
Cylinder Numbering Method	Front to Rear, 1-2		
Firing Order	1-2		
Valve Timing:			
Inlet			
open	39° BTDC		
close	69° ABDC		
duration	288°		

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General Specifications

Items	VN2000-A1 ~, A6F ~/D1, D6F	VN2000E6F ~	VN2000F6F ~
Exhaust			
Open	69° BBDC		
Close	39° ATDC		
Duration	288°		
Lubrication System	Forced lubrication (semi-dry sump)		
Engine Oil:			
Grade	API SE, SF or SG API SH or SJ with JASO MA API SH, SJ or SL with JASO MA (VN2000A7F/E7F/F7F)		
Viscosity	SAE10W-40		
Capacity	5.5 L (5.8 US qt, when engine is completely disassembled and dry)		
Drive Train			
Primary Reduction System:			
Type	Chain		
Reduction Ratio	1.500 (48/32)		
Clutch Type	Wet multi disc		
Transmission:			
Type	5-speed, constant mesh, return shift		
Gear Ratios:			
1st	2.550 (51/20)		
2nd	1.629 (44/27)		
3rd	1.218 (39/32)		
4th	0.939 (31/33)		
5th	0.729 (27/37)		
Final Drive System:			
Type	Belt		
Reduction Ratio	2.743 (50/41 × 72/32), 2.454 (48/44 × 72/32) WVTA (FULL H), GB WVTA (FULL H) (AU)		
Overall Drive Ratio	3.003 @Top gear, 2.686 @Top gear WVTA (FULL H), GB WVTA (FULL H) (AU)		
Frame			
Type	Tubular, double cradle		
Caster (Rake Angel)	32°		
Trail	182 mm (7.17 in.)		
Front Tire:			
Type	Tubeless		
Size	150/80 R16M/C 71V		
Rear Tire:			
Type	Tubeless		
Size	200/60 R16M/C 79V		
Rim size:			
Front	16 × 3.50		
Rear	16 × 6.00		

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General Specifications

Items	VN2000-A1 ~, A6F ~/D1, D6F	VN2000E6F ~	VN2000F6F ~
Front Suspension:			
Type	Telescopic fork		
Wheel Travel	150 mm (5.91 in.)		
Rear Suspension:			
Type	Swingarm with mono-shock (non-link type)		
Wheel Travel	100 mm (3.94 in.)		
Brake Type:			
Front	Dual disc		
Rear	Single disc		
Electrical Equipment			
Battery:			
Capacity	12 V 18 Ah		
Headlight:			
Type	Semi-sealed beam		
Bulb	12 V 65 W (quartz-halogen) 12 V 55 W (quartz-halogen)	12 V 60/55 W (quartz-halogen)	
Brake/Tail Light:			
Bulb	12 V 21/5 W		
Alternator:			
Type	Three-phase AC		
Rated Output	38 A × 14 V @5 000 r/min (rpm) (VN2000-A1) 45 A × 14 V @5 000 r/min (rpm)		

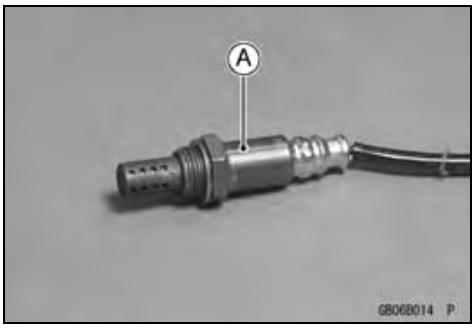
Specifications are subject to change without notice, and may not apply to every country.
AU: Australia Model
CAL: California Model
CA: Canada Model
MY: Malaysia Model
US: United States Model
WV TA (FULL H): WVTA Model with Honeycomb Catalistic Converter (Full Power)
GB WVTA (FULL H): WVTA Model with Honeycomb Catalistic Converter (Left Side Traffic, Full Power)

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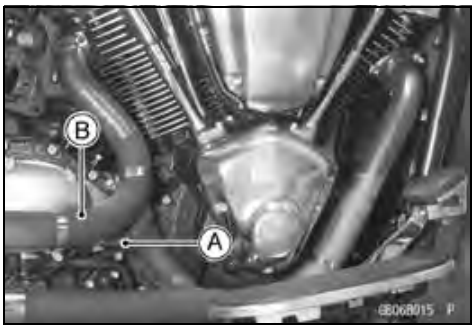
Technical Information – Oxygen Sensor (Equipped Model)

Overview

Kawasaki has adopted an oxygen sensor [A] for the European and California models in addition to the secondary air injection system and honeycomb catalyst. This helps Kasawaki keep the motorcycle with cleaner exhaust gas and cope with the emission regulations.



The oxygen sensor [A] is mounted above the exhaust manifold [B], whereas the honeycomb catalyst is located inside the silencer in the downstream of the exhaust gas.



The oxygen sensor uses the substance called zirconia (ZrO_2). The electromotive force varies depending on the density of the oxygen. The sensor measures the oxygen density of the exhaust gas to detect whether the air/fuel mixture is lean or rich in relation to the optimum air/fuel mixture.

When the ECU is in the oxygen sensor feedback mode, it controls combustion by making the fuel injection amount of the injector rich or lean through the signal from the sensor.

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Technical Information – Oxygen Sensor (Equipped Model)

Construction and Operation

The oxygen sensor uses, a solid electrolyte called zirconia.

An electrolyte is a substance that has positive (+) and negative (−) ions and can move freely in a liquid.

For explanation purposes, picture a solid electrolyte plate as a wall and chambers A and B are divided by this wall. If both sides of the wall have platinum electrodes with holes, the difference in oxygen density (weight) between chambers A and B will move the oxygen from the chamber of higher oxygen density to the chamber of lower oxygen density until the two chambers are about equal in density. What actually moves are the oxygen ions (−) through the wall of the solid electrolyte.

The higher-density-side chamber will receive the “Pt” electrode surface with holes on the solid electrolyte wall and will become minus the oxygen ions (O_{2}^{-}). At this point, the O_{2}^{-} ions reach the “Pt” electrode of the opposite side.

Since the result of this O_{2}^{-} move also brings movement of “e^{-}” (just like “cells” work in a battery), voltage will be built within the sensor.

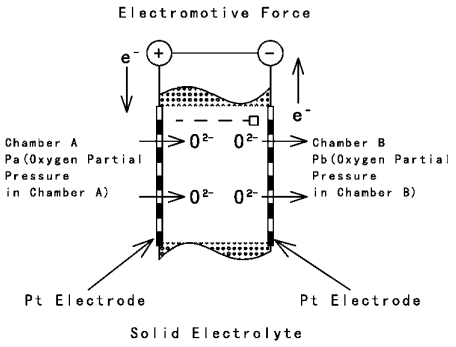


Fig. 1
Operation Principle of Zirconia Solid Electrolyte Element

GB06117BS2 C

The (conceptual) sectional view of the actual element in the oxygen sensor is shown. The sensor is exposed to exhaust gas. The shape of the sensor is tubular since the atmospheric side and exhaust gas side are parted by the wall. That means that the inside of this tubular solid electrolyte is the atmosphere side (higher oxygen density), and the outside of the tube faces the exhaust gas. The outside surface, which is in the stream of exhaust gases, has a coated layer of porous ceramic. Voltage is generated and can be measured because of the difference in oxygen density (positive and negative ions).

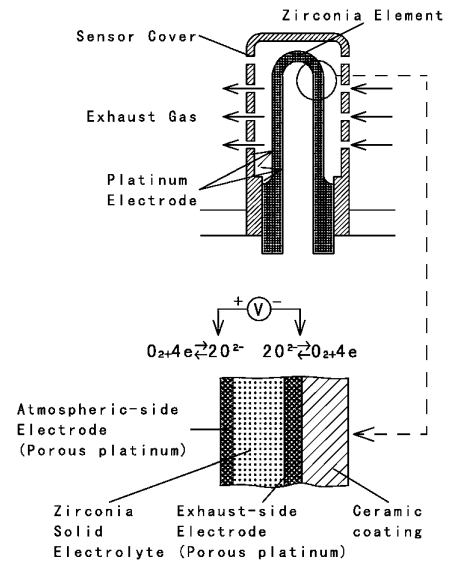


Fig. 2
Sectional View(Conceptual)of Oxygen Sensor Element

GB06118BS2 C

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Technical Information – Oxygen Sensor (Equipped Model)

The sensor, uses the fresh air as the oxygen reference, and consists of a passageway to lead the fresh air inside the tubular element. Installed in this passageway is, a air permeable filter that allows the fresh air to pass through, but won't allow moisture through. This keeps the sensor in touch with the atmosphere.

At a normal temperature, Zirconia (solid electrolyte) is an insulator and not able to sense the gases. Since the exhaust gas temperature does not become hot instantly, it takes sometime before the sensor starts to work. To solve the problem of the slow temperature increase of exhaust gases (which warms the electrolyte element), a built -in heater located inside the tubular element increases the temperature of the sensor so it can operate at a low exhaust gas temperature. Furthermore this built-in heater helps keep the sensor at a constant temperature.

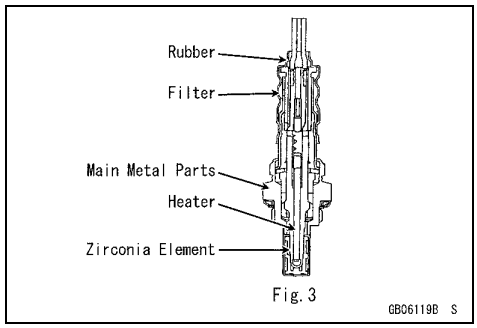
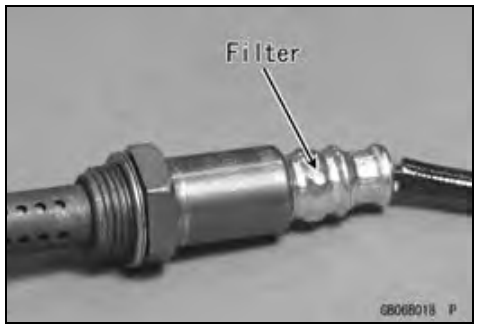


Fig. 3

GB06119B S



Air/Fuel Ratio Control By Oxygen Sensor

"λ=1" indicates the optimum air/fuel ratio point, meaning the air/fuel ratio at which optimum (complete) combustion can be obtained. In the proximity of this mixture, the purification efficiency of the catalyst will be maximized.

The purification ratio of the three kinds of gas, HC (hydrocarbons), CO (carbon monoxide), Nox (nitrogen oxides) using the ternary (three) catalyst is shown in Fig. 4.

The best purification rate is at the zone where the oxygen sensor's signal shows the sharp changes. This zone is called the "window" and if the oxygen sensor signal moves back and forth between the rich side (fuel rich) and lean side (fuel lean) from the oprimum mix ratio (but still within the width of the window), it indicates that the exhaust gas is in a good purification rate zone.

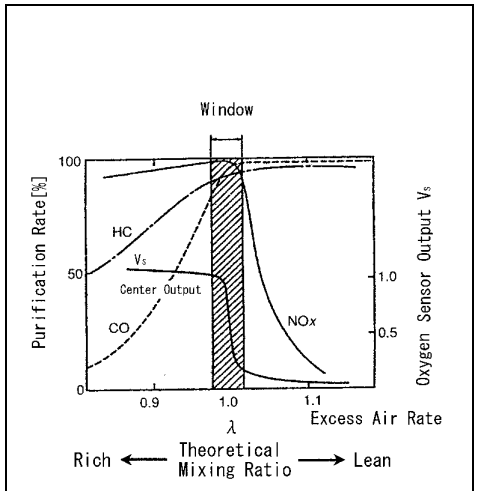


Fig. 4 Purification Rate by Ternary Catalyst

GB06120B S

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Technical Information – Oxygen Sensor (Equipped Model)

Figure 5 shows how the sensor operates the controlling factors.

There is a sharp voltage drop of about 1V (in reality, about 0.9 V) the sensor uses for control (a standard reference). By utilizing this voltage and using 0.45 V as the reference line, an output larger than the line indicates that exhaust gas is in the lean zone. So, when the system senses a “rich” condition through the sensor’s output voltage, it controls the fuel injection amount to make the fuel gradually leaner. When it reaches a leaner point, the sensor voltage signal drops sharply at the proximity λ=1 and goes below 0.45V. The system, at this level, senses that it has changed to “lean” and reverse the voltage signal to make the fuel richer. It then controls the fuel injection amount to make the fuel gradually richer. When it drops to a richer point, the signal drops sharply at the proximity λ=1 and goes over 0.45V. The system, at this level, senses that it has changed to “rich” and reverse the signal to make the fuel leaner. By having the signal repeat back and forth between the rich and lean sides, it can constantly stay within the window of the good purification rates. Thereby the oxygen sensor, works as a combustion control sensor for the optimum air/fuel ratio.

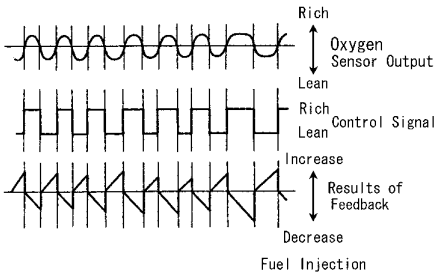


Fig. 5 “λ=1” Feedback Control Method by Oxygen Sensor

GB06121B S

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Technical Information – Oxygen Sensor (Equipped Model)

Maintenance

1) Periodic Inspections
   Periodic inspections or special maintenance is not required for the sensor.
2) Oxygen Sensor Removal and Installation
   Handle the oxygen sensor with care. Be careful not to damage sensor wires. Do not service the oxygen sensor while it is hot and not use an inpact wrench while removing or installing the oxygen sensor.
   Avoid the fouling (damaging) of the sensing part of the sensor with foreign substances such as coolant, battery fluid, anti-corrosion fluid, and brake fluid.
   Stop using the sensor if it is fouled with these substances.
   Also stop using the sensor if the head part of the sensor (exposed to the atmosphere) is fouled. Since the sensor has a filter that allows air to escape but stop water, fouling of the sensor head may clog this filter.
   Being subjected to a flame is also unacceptable for the sensor with the same reason as above.
3) Condition of the Sensor
   Perform resistance measurements and visually check for scars, bends, and clogging of the sensor filter.
4) If trouble with the sensor occurs, one of the following service codes will be displayed. Accordingly, follow the related procedures in the Service Manual for necessary maintenance.

Service Code	Outline of trouble
33	Oxygen sensor is not activated
67	Heater trouble due to wiring short or open
94	Oxygen sensor output voltage is incorrect

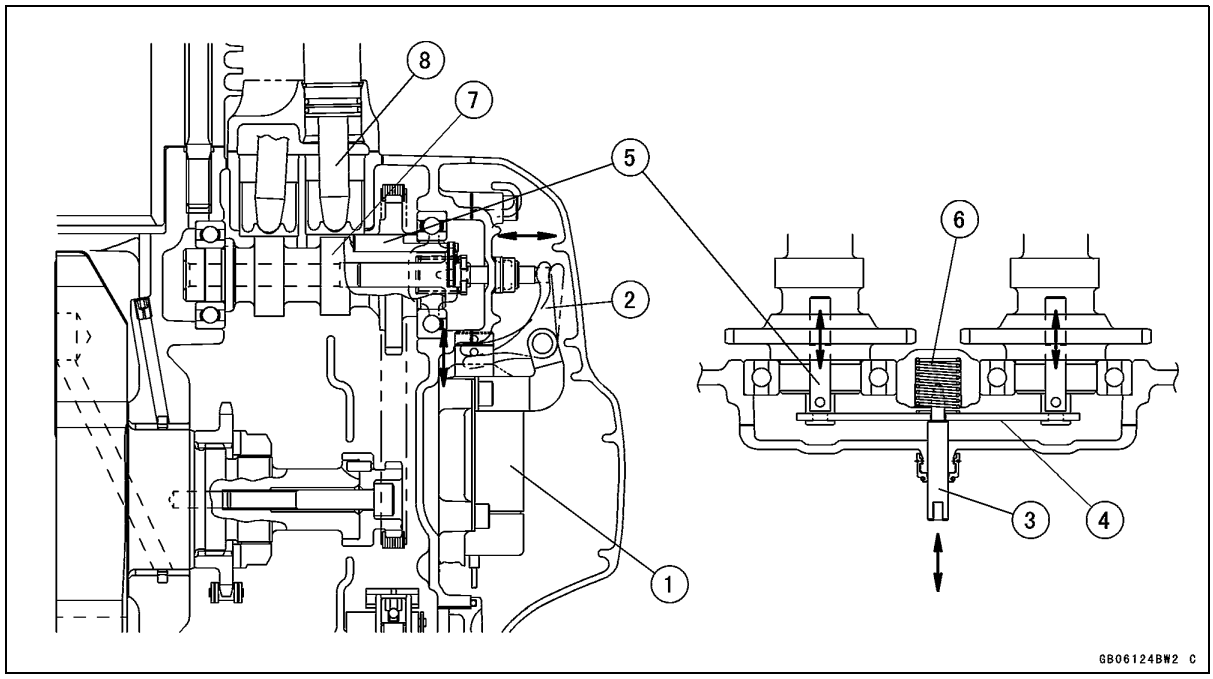
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Technical Information – Electric Solenoid Operated Decompressor

An automatic decompressor (Automatic Compression Reliese) system is installed to the right side of the engine. This decompressor is activated by an electric solenoid to make starting engine easy. When the ignition is switched on and the starter button depressed, the solenoid pulls a fulcrum-mounted link that depresses push rods in each camshaft.

The push rods activate the decompression mechanism to partially open the exhaust valves as the piston nears top dead center, releasing some of compression that can cause resistance during starting.

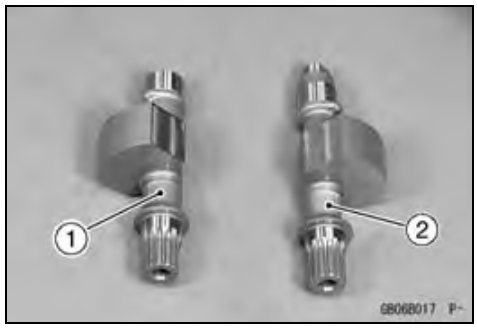
Releasing the starter button de-activates the solenoid and a spring returns the push rods to their normal operating position.



1. Decompression Solenoid
2. Decompression Lever
3. Decompression Push Rod
4. Holder
5. Decompression Shaft
6. Spring
7. Exhaust Cam
8. Push Rod

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Technical Information – Dual Balancer Shaft System



Dual balancers harmonize primary balance and reduce vibration.

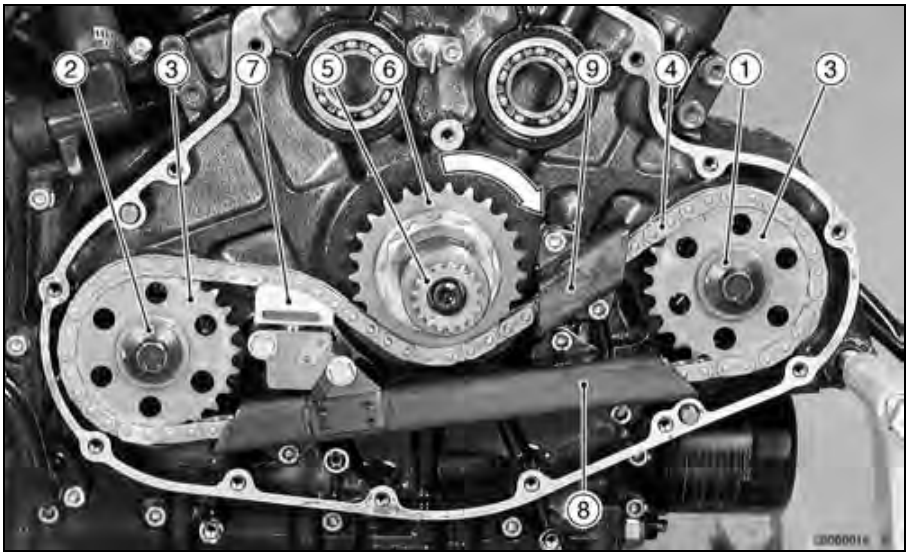
The VN2000 engine applied two balancer shafts, one [1] is located in front of the front cylinder and another one [2] is behind the rear cylinder.

Each balancer shaft is driven by the chain which driven to the counterclockwise by crankshaft sprocket that rotate to the clockwise viewed from the righr side.

The hydraulically operated chain tensioner is located between crankshaft and rear balancer shaft.

The hydraulic chain tensioner is supplied the oil pressure from lubrication feed pump.

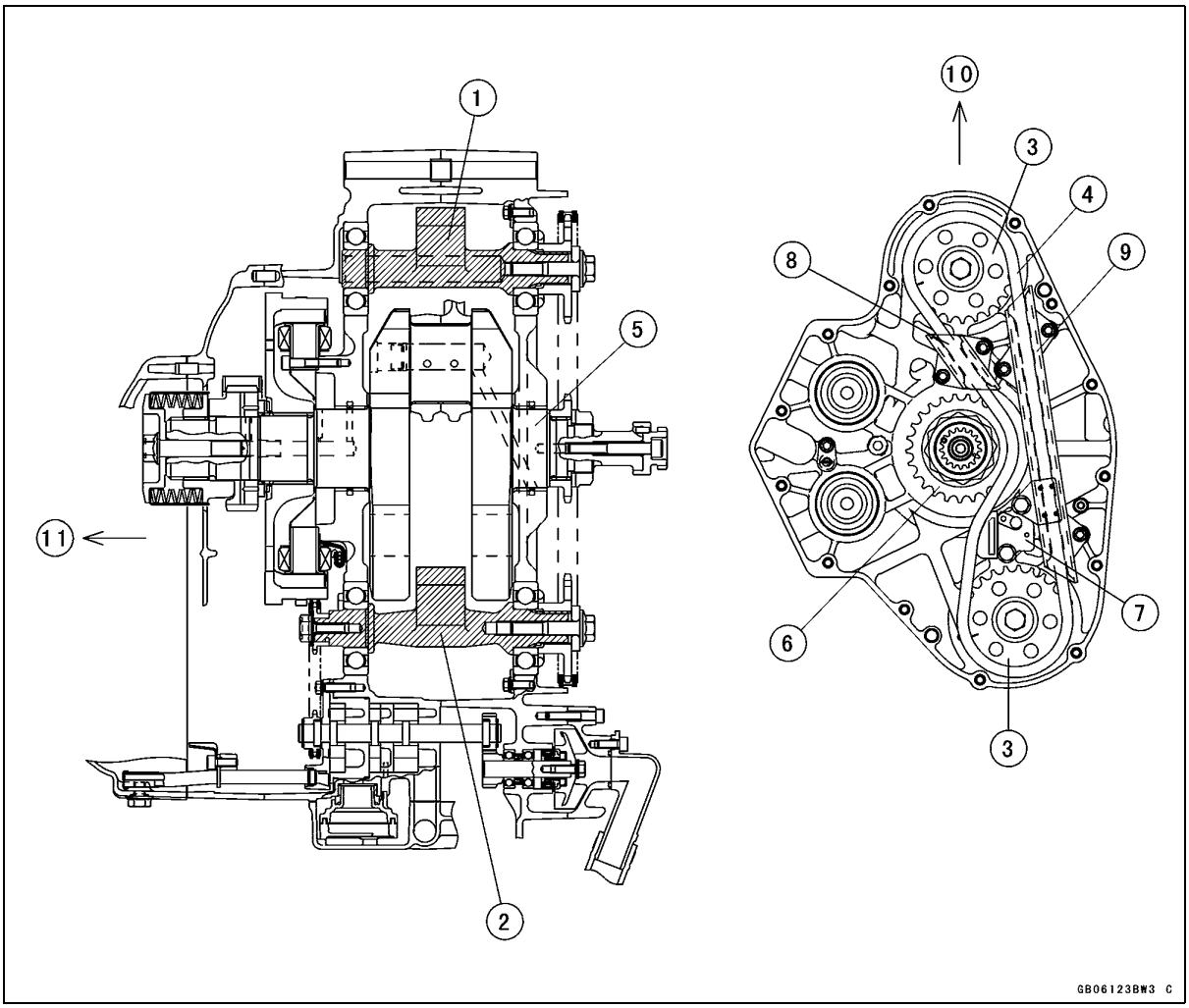
Two chain guides applied, one is between the crankshaft and front balancer shaft and another is under the crankshaft sprocket.



1. Front Balancer Shaft
2. Rear Balancer Shaft
3. Front and Rear Balancer Sprocket
4. Balancer Drive Chain
5. Crankshaft
6. Balancer Drive Sprocket
7. Hydraulic Chain Tensioner
8. Chain Guide (under Crankshaft)
9. Chain Guide (between Crankshaft and Front Balancer Shaft)

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Technical Information – Dual Balancer Shaft System



1. Front Balancer Shaft
2. Rear Balancer Shaft
3. Front and Rear Balancer Sprocket
4. Balancer Drive Chain
5. Crankshaft
6. Balancer Drive Sprocket
7. Hydraulic Chain Tensioner
8. Chain Guide (between Crankshaft and Front Balancer Shaft)
9. Chain Guide (under Crankshaft)
10. Front
11. Left

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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 Mass

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume

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

Units of Force

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

Units of Length

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

Units of Torque

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

Units of Pressure

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

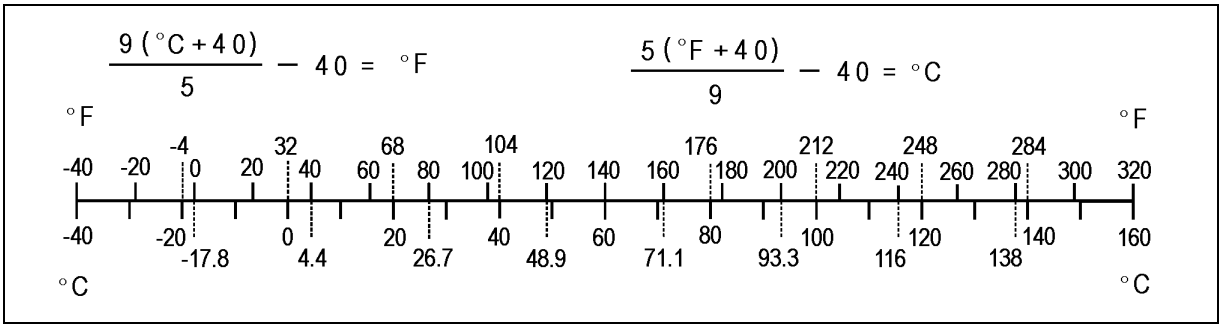
Units of Speed

km/h	×	0.6214	=	mph

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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2-2 PERIODIC MAINTENANCE

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	Which ever-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									
Throttle control system (play, smooth return, no drag)-inspect	year	●		●		●		●	2-14
Idle speed-inspect		●		●		●		●	2-14
Fuel leak (fuel hose)-inspect	year	●		●		●		●	2-15
Fuel hoses damage-inspect	year	●		●		●		●	2-15
Fuel hoses installation condition-inspect	year	●		●		●		●	2-15
Evaporative Emission Control System (CAL)									
Evaporative emission control system function-inspect		●	●	●	●	●	●	●	2-15
Cooling System									
Coolant level-inspect		●		●		●		●	2-16
Coolant leak (radiator hose and pipe)-inspect	year	●		●		●		●	2-17
Water hose and pipe damage-inspect	year	●		●		●		●	2-17
Water hose condition-inspect	year	●		●		●		●	2-17
Air Suction System									
Air suction system damage-inspect				●		●		●	2-17
Clutch and Final Drive									
Clutch operation (play, disengagement, engagement)-inspect		●		●		●		●	2-17
Belt deflection-inspect		●	●	●	●	●	●	●	2-18
Belt wear and damage-inspect		●	●	●	●	●	●	●	2-21
Wheels and Tires									
Tire air pressure-inspect	year			●		●		●	2-23
Wheel/tire damage-inspect				●		●		●	2-24
Tire tread wear, abnormal wear-inspect				●		●		●	2-24
Wheel bearing damage-inspect	year			●		●		●	2-24
Brakes									
Brake light switch operation-inspect		●	●	●	●	●	●	●	2-25
Brake pad wear-inspect #			●	●	●	●	●	●	2-26
Brake fluid level-inspect	6 month	●	●	●	●	●	●	●	2-26
Brake fluid leak (brake hose and pipe)-inspect	year	●	●	●	●	●	●	●	2-27
Brake hose damage-inspect	year	●	●	●	●	●	●	●	2-27

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Periodic Maintenance Chart

FREQUENCY / INSPECTION	Which ever-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 hose installation condition-inspect	year	●	●	●	●	●	●	●	2-27
Brake operation (effectiveness, no drag)-inspect	year	●	●	●	●	●	●	●	2-28
Suspensions									
Front forks/rear shock absorber operation (smooth stroke)-inspect				●		●		●	2-28
Front forks/rear shock absorber oil leak-inspect	year			●		●		●	2-28
Swingarm pivot-lubrication						●			2-29
Steering System									
Steering play-inspect	year	●		●		●		●	2-29
Steering stem bearing-lubricate	2 year					●			2-31
Electrical									
Spark plug condition-Inspect				●		●		●	2-31
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			●		●		●	2-36
Others									
Chassis parts-lubricate	year			●		●		●	2-37
Bolts and nuts tightness-inspect		●		●		●		●	2-38

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

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

(CAL): California

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2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

Periodic Replacement Parts

FREQUENCY / ITEM	Whichever comes first ➡ / ⬇ Every	* ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6)	12 (7.5)	24 (15)	36 (24)	48 (30)	See Page
Fuel hose-replace	4 year					●	2-39
Air cleaner element-replace #					●		2-40
Coolant-change	3 year				●		2-41
Water hose and O-ring-replace	3 year				●		2-44
Engine oil change #	year	●	●	●	●	●	2-44
Oil filter-replace	year	●	●	●	●	●	2-46
Master cylinder/caliper Rubber Parts-replace	4 year					●	2-47
Brake fluid-change	2 year			●		●	2-51
Brake hoses-replace	4 year					●	2-53
Spark plug-replace						●	2-53

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

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

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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
MO: Apply molybdenum disulfide grease oil solution.
MG: Apply molybdenum grease.
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.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System				
Fuel Pump Bolts	9.8	1.0	87 in·lb	S, L
Water Temperature Sensor	12	1.2	104 in·lb	
Oxygen Sensor	44	4.5	33	
Gear Position Switch Mounting Bolts	6.9	0.70	61 in·lb	
Gear Position Switch Lead Clamp Bolts	6.9	0.70	61 in·lb	
Camshaft Position Sensor Bolt	9.8	1.0	87 in·lb	L
Fuel Level Sensor Mounting Bolts	6.9	0.70	61 in·lb	L
Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L
Delivery Joint Bolts	9.8	1.0	87 in·lb	L
Throttle Body Assy Holder Bolts	9.8	1.0	87 in·lb	L
Inlet Manifold Bolts	9.8	1.0	87 in·lb	L
Air Cleaner Housing Bolts	9.8	1.0	87 in·lb	
Air Cleaner Housing Allen Bolts	9.8	1.0	87 in·lb	
Cooling System				
Water Temperature Sensor	12	1.2	104 in·lb	
Water Pipe Bolts	9.8	1.0	87 in·lb	
Radiator Fan Bolts	8.3	0.85	74 in·lb	
Reserve Tank Bolts	6.9	0.70	61 in·lb	
Radiator Cover Bolts	11	1.1	97 in·lb	
Water Pump Impeller Bolt	12	1.2	104 in·lb	Lh
Coolant Drain Bolt	9.8	1.0	87 in·lb	
Water Pump Air Bleeder Bolt	7.8	0.80	69 in·lb	
Radiator Screen Screws	6.9	0.70	61 in·lb	
Engine Top End				
Rocker Case Cover Bolts	12	1.2	104 in·lb	S, AL
Rocker Case Bolts	15	1.5	11	S
Oil Pipe Banjo Bolts	54	5.5	40	
Oil Pipe Bolts	9.8	1.0	87 in·lb	
Upper Cylinder Head Nuts, ϕ10 mm	15	1.5	11	first, S, MO

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Upper Cylinder Head Nuts, ϕ10 mm	29	3.0	21	final, S, MO
Upper Cylinder Head Nuts, ϕ12 mm	29	3.0	21	first, S, MO
Upper Cylinder Head Nuts, ϕ12 mm	88	9.0	65	final, S, MO
Lower Cylinder Head Nuts	25	2.5	18	S
Water Jacket Plugs	22	2.2	16	L
Water Jacket Plugs	15	1.5	11	L
Rocker Shaft Bolts	12	1.2	104 in·lb	
Cylinder Mounting Bolts	25	2.5	18	L
Coolant Drain Bolt	9.8	1.0	87 in·lb	
Push Rod Cover Bolts	12	1.2	104 in·lb	
Camshaft Chain Guide Bolts	12	1.2	104 in·lb	L
Camshaft Chain Tensioner Bolts	12	1.2	104 in·lb	
Inner Camshaft Cover Bolts	12	1.2	104 in·lb	
Stopper Pin Plug	2.5	0.25	22 in·lb	L
Middle Camshaft Cover Bolts L 95 mm	12	1.2	104 in·lb	
Middle Camshaft Cover Bolts L 35 mm	12	1.2	104 in·lb	
Camshaft End Cover Bolts	12	1.2	104 in·lb	
Decompression Solenoid Bolts	9.8	1.0	87 in·lb	
Outer Camshaft Cover Bolts	12	1.2	104 in·lb	
Muffler Bracket Bolts	25	2.5	18	
Exhaust Pipe Cover Clamp Screws	6.9	0.70	61 in·lb	
Clutch				
Primary Chain Upper Guide Bolts	9.8	1.0	87 in·lb	
Primary Chain Lower Guide Bolts	9.8	1.0	87 in·lb	
Cam Damper Bolt	69	7.0	51	
Inner Clutch Cover Bolts	12	1.2	104 in·lb	S, see text
Outside Plate Bolt	9.8	1.0	87 in·lb	L
Clutch Hub Nut	135	14.0	101	MO
Clutch Spring Bolts	98	1.0	87 in·lb	
Outer Clutch Cover Bolts	12	1.2	104 in·lb	S, see text
Plug On Outer Clutch Cover	20	2.0	15	
Clutch Cover Oil Drain Plug	21	2.1	15	
Clutch Release Lever Bolt	5.9	0.60	52 in·lb	
Starter Lockout Switch Screw	–	–	–	L
Inside Plate Bolt	9.8	1.0	87 in·lb	
Engine Lubrication System				
Rocker Shaft Oil Pipe Bolts	9.8	1.0	87 in·lb	
Cylinder Head Oil Pipe Banjo Bolts	54	5.4	40	
Oil Filter	18	1.8	13	
Oil Passage Bolt	29	3.0	21	
Oil Passage Adapter Drain Plug	9.8	1.0	87 in·lb	
Relief Valve	15	1.5	11	L
Camshaft Oil Pipe Bolt	9.8	1.0	87 in·lb	

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Pipe Bolt L16	9.8	1.0	87 in·lb	L
Oil Pipe Bolt L30	12	1.2	104 in·lb	
Oil Pump Drive Sprocket Bolt	29	3.0	21	
Oil Pump Chain Tensioner Bolt	12	1.2	104 in·lb	
Oil Pump Cover Bolts	9.8	1.0	87 in·lb	
Inside Plate Bolt	9.8	1.0	87 in·lb	
Outside Plate Bolt	9.8	1.0	87 in·lb	L
Clutch Cover Drain Plug	21	2.1	15	
Oil Pressure Switch	15	1.5	11	SS
Oil Passage Adapter	20	2.0	15	L
Oil Pan Plug	20	2.0	15	L
Oil Pipe Stopper Bolt	6.9	0.70	61 in·lb	
Oil Screen Bolt For Crank Room	9.8	1.0	87 in·lb	
Oil Pan Bolts	15	1.5	11	S
Engine Oil Drain Plug (L/H)	20	2.0	15	
Engine Oil Drain Plug (R/H)	15	1.5	11	
Engine Removal/Installation				
Front Downtube Nuts	88	9.0	65	S, AL
Upper Adjusting Bolt	9.8	1.0	87 in·lb	S
Lower Adjusting Bolt	9.8	1.0	87 in·lb	S
Upper Adjusting Bolt Locknut	49	5.0	36	S
Lower Adjusting Bolt Locknut	49	5.0	36	S
Upper Rear Engine Mounting Nut	59	6.0	43	S
Lower Rear Engine Mounting Nut	59	6.0	43	S
Upper Engine Bracket Nuts	59	6.0	43	S, AL
Upper Engine Mounting Bolts	44	4.5	33	S
Lower Engine Bracket Bolts	59	6.0	43	S
Front Engine Mounting Nut	44	4.5	33	S
Rear Downtube Bolts	108	11.0	80	S, AL
Crankshaft/transmission				
Connecting Rod Big End Bolts	59	6.0	43	MO
Balancer Chain Sprocket Nut	125	13.0	92.2	MO
Camshaft Chain Sprocket Bolt	29	3.0	22	
Balancer Sprocket Bolts	83	8.5	61	
Upper Balancer Chain Guide Bolts	12	1.2	104 in·lb	
Lower Balancer Chain Guide Bolts	12	1.2	104 in·lb	
Balance Chain Tensioner Bolts	12	1.2	104 in·lb	
Bearing Retainer Screws At Output Shaft	6.9	0.70	61 in·lb	
Bearing Retainer Bolts	–	–	–	L
Speed Sensor Bolt	9.8	1.0	87 in·lb	L
Bearing Retainer Screws At Pulley Shaft	6.9	0.70	61 in·lb	
Crankcase Bolts, ϕ8	29	3.0	22	S
Crankcase Bolts, ϕ6	12	1.2	104 in·lb	S

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Outer Transmission Cover Bolts	12	1.2	104 in·lb	S,see text
Inner Transmission Cover Bolts	12	1.2	104 in·lb	S,see text
Transfer Gear Nut (Output Shaft)	196	20.0	145	MO, Lh
Transfer Gear Nut (Pulley Shaft)	78	8.0	58	MO
Gear Set Lever Nut	7.8	0.80	69 in·lb	
Shift Shaft Return Spring Pin	39	4.0	30	L
Rear Shift Lever Bolt	25	2.5	18	
Front Shift Lever Clamp Bolt	25	2.5	18	
Shift Dram Cam Bolt	12	1.2	104 in·lb	L
Shift Rod Locknuts	9.8	1.0	87 in·lb	Lh
Engine Pulley Mounting Nut	177	18	130	MO
Wheels/tires				
Front Axle Nut	127	13	94	
Front Axle Clamp Bolts	25	2.5	18	AL
Rear Axle Nut	108	11	80	
Valve Nuts	1.5	0.15	13 in·lb	
Valve Cap	0.15	0.015	1.3 in·lb	
Final Drive				
Engine Pulley Inside Cover Bolts	12	1.2	104 in·lb	
Engine Pulley Mounting Nut	177	18	130	MG
Rear Axle Nut	108	11	80	
Rear Coupling Stud Bolts	44	4.5	33	L
Ring Screws	6.9	0.70	61 in·lb	
Rear Pulley Mounting Nuts	69	7.0	51	
Brakes				
Brake Hose Banjo Bolts	25	2.5	18	
Front Brake Reservoir Cap Screws	1.5	0.15	13 in·lb	
Brake Lever Pivot Bolt	1.0	0.10	8.7 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Front Brake Light Switch Screw	1.2	0.12	10 in·lb	
Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
Brake Disc Bolts	27	2.8	20	L
Front Caliper Mounting Bolts	25	2.5	18	
Front Caliper Assembly Bolts	21	2.1	15	
Front Brake Pad Pins	15	1.5	11	
Caliper Bleed Valves	7.8	0.80	69 in·lb	
Front Brake Pad Spring Bolts	2.9	0.30	26 in·lb	
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	17	1.7	12	
Brake Pedal Clamp Bolt	25	2.5	18	
Rear Caliper Mounting Bolts	34	3.5	25	
Suspension				
Front Fork Upper Clamp Bolts	20	2.0	15	

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Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Front Fork Lower Clamp Bolts	34	3.5	25	AL
Cover Stopper Bolts	4.2	0.43	37 in·lb	
Front Axle Clamp Bolts	25	2.5	18	AL
Front Fork Bottom Allen Bolts	23	2.3	17	L
Rear Shock Absorber Mounting Bolt And Nut	59	6.0	43	
Swingarm Pivot Shaft Nut	127	13	94	
Steering				
Handlebar Clamp Bolts	34	3.5	25	O, S
Handlebar Holder Nuts	34	3.5	25	
Steering Stem Head Nut	108	11	80	
Front Fork Upper Clamp Bolts	20	2.0	15	
Steering Stem Nut	4.9	0.50	43 in·lb	
Front Fork Lower Clamp Bolts	34	3.5	25	AL
Frame				
Front Downtube Nuts	88	9.0	65	S, AL
Upper Engine Bracket Nuts	59	6.0	43	S
Upper Engine Mounting Bolts	44	4.5	33	S
Lower Engine Bracket Bolts	59	6.0	43	S
Rear Downtube Bolts	108	11	80	S, AL
Side Stand Mounting Bolt (VN2000-A1 ~)	44	4.5	33	
Side Stand Mounting Bolt (VN2000-D1 ~)	59	6.0	43	
Side Stand Mounting Nut	44	4.5	33	
Adjust Bolts	9.8	1.0	87 in·lb	S
Footboard Bracket Bolts	34	3.5	25	
Front Engine Mounting Nut	44	4.5	33	S
Adjusting Bolt Locknuts	49	5.0	36	S
Rear Engine Mounting Nuts	59	6.0	43	S
Side Stand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
Footpeg Bracket Bolts	25	2.5	18	
Muffler Bracket Mounting Bolts	25	2.5	18	
Electrical System				
Spark Plugs	18	1.8	13	
Alternator Stator Coil Mounting Bolts	12	1.2	104 in·lb	L
Crankshaft Sensor Mounting Bolts	6.9	0.70	61 in·lb	
Oil Pressure Switch	15	1.5	11	SS
Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L
Gear Position Switch Mounting Bolts	4.9	0.50	43 in·lb	L
Gear Position Switch Lead Clamp Bolts	4.9	0.50	43 in·lb	L
Side Stand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
Regulator/rectifier Bolts	8.8	0.90	78 in·lb	
Oxygen Sensor	44	4.5	33	
Water Temperature Sensor	12	1.2	104 in·lb	
Camshaft Position Sensor 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	
Decompression Solenoid Bolts	9.8	1.0	87 in·lb	
Starter Lockout Switch Screw	1.2	0.12	10 in·lb	
Front Brake Light Switch Screw	1.2	0.12	10 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	L, S
Starter Motor Terminal Nut	9.8	1.0	87 in·lb	
Starter Motor Terminal Locknut	11	1.1	95 in·lb	
Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	
Starter Motor Assembly Bolts	4.9	0.50	43 in·lb	
Headlight Rim Screws (VN2000E6F, F6F)	2.9	0.30		
Turn Signal Light Lens Screws	1.0	0.10	8.7 in·lb	
Front Turn Signal Light Screws	6.9	0.70	61 in·lb	
Tail/brake Light Unit Mounting Nuts	5.9	0.60	52 in·lb	
Rear Turn Signal Light Screws	6.9	0.70	61 in·lb	
License Plate Light Lens Mounting Screws	1.2	0.12	10 in·lb	

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 ~ 33	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	900 ±50 r/min (rpm)	– – –
Air Cleaner Element	Viscous paper element	– – –
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	2.5 L (2.6 US qt)	– – –
Engine Top End		
Valve Clearance	Non-adjustable (hydraulic lash adjusters)	– – –
Clutch		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Engine Lubrication System		
Engine Oil:		
Grade	API SE, SF or SG	– – –
	API SH or SJ with JASO MA API SH, SJ or SL with JASO MA (VN2000A7F/E7F/F7F)	
Viscosity	SAE 10W-40	– – –
Capacity	4.4 L (4.7 US qt, when filter is not removed)	– – –
	4.6 L (4.9 US qt, when filter is removed)	– – –
	5.5 L (5.8 US qt, when engine is completely disassembled and dry)	– – –
Level	Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)	– – –
Wheels/Tires		
Tread Depth:		
Front	BRIDGESTONE BATTLAX BT020F	1 mm (0.04 in.)
	4.3 mm (0.17 in.)	(DE, AT, CH): 1.6 mm (0.063 in.)
Rear	BRIDGESTONE BATTLAX BT020R	Up to 130 km/h (80 mph):
	7.0 mm (0.28 in.)	2 mm (0.08 in.)
		Over 130km/h (80mph):
		3 mm (0.1 in.)
Rim Runout:		
Axial	0.5 mm (0.02 in.) or less	1.0 mm (0.04 in.)
Radial	0.8 mm (0.03 in.) or less	1.0 mm (0.04 in.)
Air Pressure: (When Cold)		
Front	Up to 186 kg (410 lb) load: 250 kPa (2.5 kgf/cm², 36 psi)	– – –

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Specifications

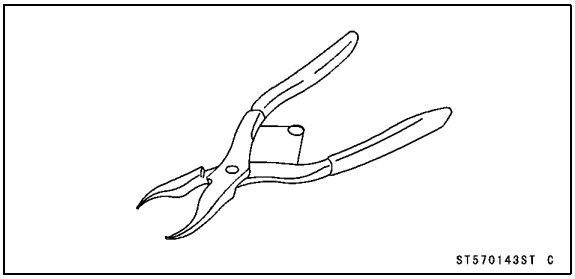
Item	Standard	Service Limit
Rear	Up to 186 kg (410 lb) load: 290 kPa (3.0 kgf/cm², 42 psi)	– – –
Final Drive		
Drive Belt Deflection:		– – –
(44.1 N, 4.5 kgf, 10 lb force)	2.5 ~ 4.0 mm (0.10 ~ 0.16 in.)	– – –
When Installing New Belt or Engine Remounted	2.5 mm (0.10 in.)	– – –
Brakes		
Brake Fluid		
Grade	DOT4	– – –
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	7.5 mm (0.30 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	IZFR6F-11	– – –
Spark Plug Gap	1.0 ~ 1.1 mm (0.039 ~ 0.043 in.)	– – –

AT: Republic of Austria
CH: Swiss Confederation
DE: Federal Republic of Germany

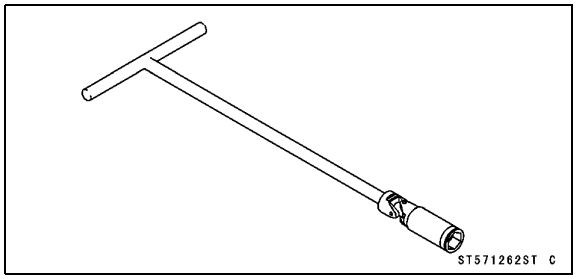
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Special Tools

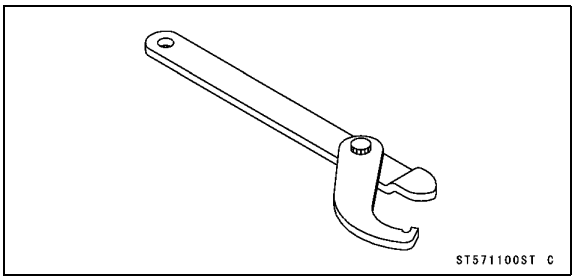
Inside Circlip Pliers:
57001-143



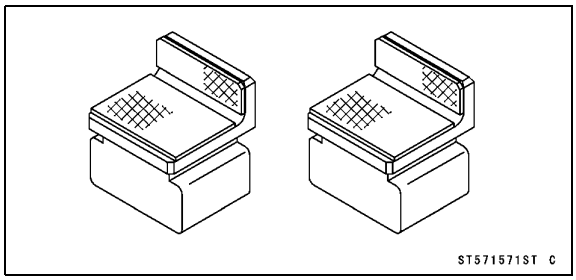
Spark Plug Wrench, Hex 16:
57001-1262



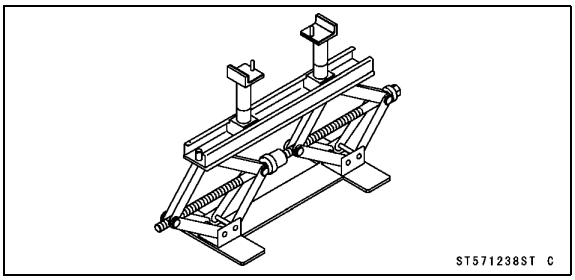
Steering Stem Nut Wrench:
57001-1100



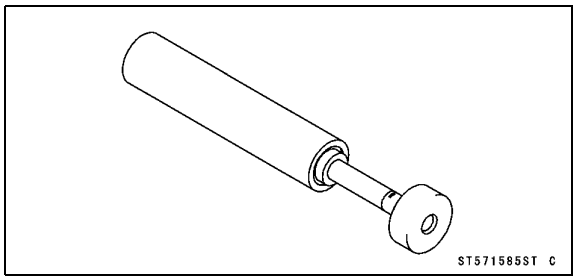
Jack Attachment:
57001-1571



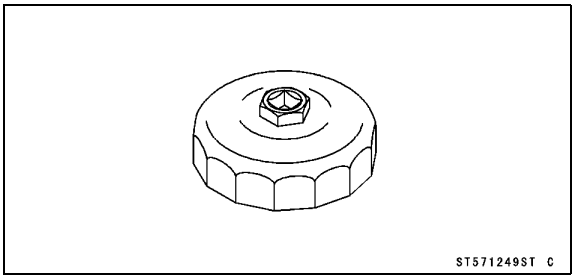
Jack:
57001-1238



Tension Gauge:
57001-1585



Oil Filter Wrench:
57001-1249



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Periodic Maintenance Procedures

Fuel System (DFI)

Throttle Control System Inspection



- Check the throttle grip free play [A].

★If the free play is incorrect, adjust the throttle cable (see below).

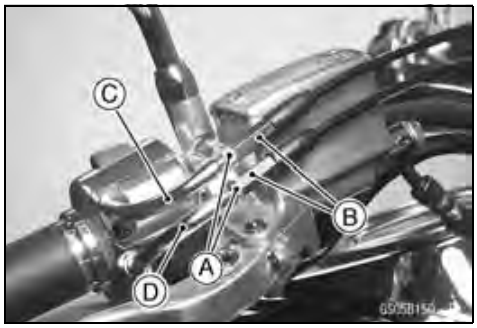
Throttle Grip Free Play
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)

- 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.



- 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 (rear view).

○Turn out the adjuster of the decelerator cable [D] until there is no play.

○Tighten the locknut against the adjuster.

○Turn the adjuster of the accelerator cable [C] 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.

- Check the idle speed.

Idle Speed
Standard: 900 ±50 r/min (rpm)

- 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).

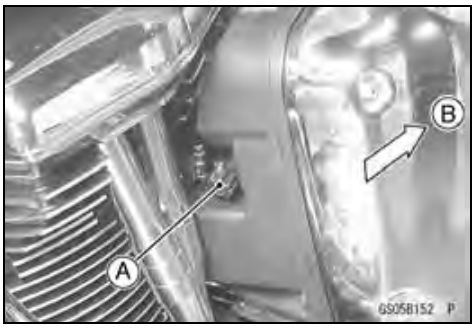
⚠ WARNING

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

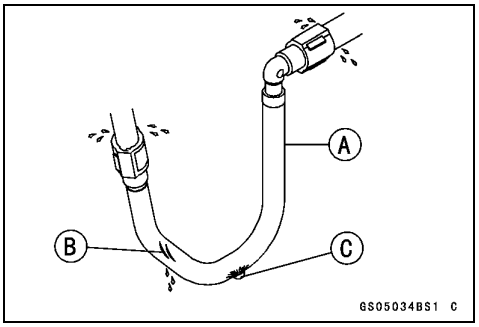
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Periodic Maintenance Procedures

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

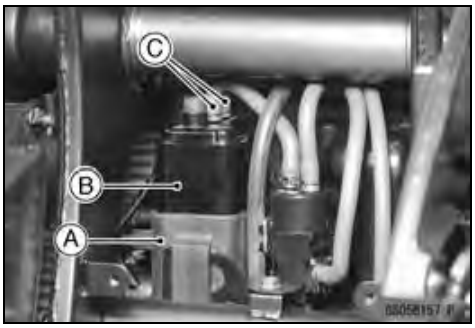


Fuel Hose Connection Inspection
○The fuel hose [A] is designed to be used throughout the motorcycle's life without any maintenance, however, if the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak or the hose to burst. Remove the fuel tank (see Fuel System (DFI) chapter) and check the fuel hose.
★Replace the fuel hose if any fraying, cracks [B] or bulges [C] are noticed.
● Check that the hose joints are securely connected.
● When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting.
★Replace the hose if it has been sharply bent or kinked flattening or twisting.



Evaporative Emission Control System Inspection (CAL)

Evaporative Emission Control System Inspection
● Inspect the canister as follows:
○Remove the rear inner cover (see Frame chapter).
○Remove the holder [A] and take out the canister [B].
○Disconnect the hoses [C] from the canister.
○Visually inspect the canister for cracks and other damage.
★If the canister has any cracks or bad damage, replace it with a new one.



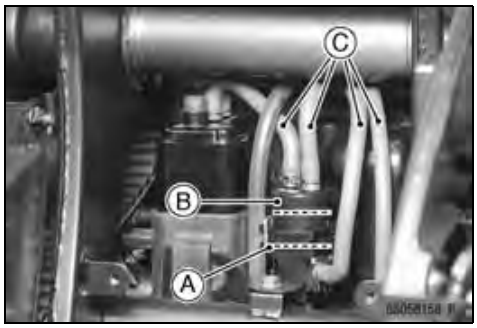
NOTE

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

○Install the canister and 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 (DFI) chapter too.
○Install the rear inner cover (see Frame chapter).

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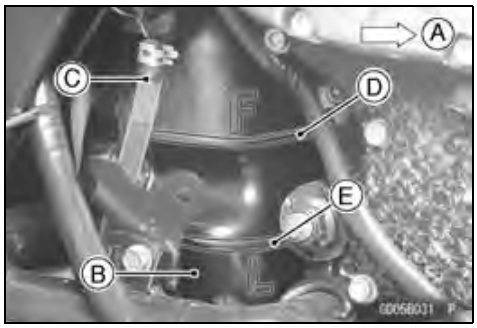
Periodic Maintenance Procedures



- Check the liquid/vapor separator as follows:
  - ○Remove the rear inner cover (see Frame chapter).
  - ○Remove the band [A] and take out the separator [B].
  - ○Disconnect the hoses [C] from the separator.
  - ○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.

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 mufflers have been removed for clarity).
  - Front [A]
  - Reserve Tank [B]
  - Coolant Level Hose [C]
  - “F” Level [D]
  - “L” Level [E]
  - ★If the coolant level is lower than the “L” level, remove 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.

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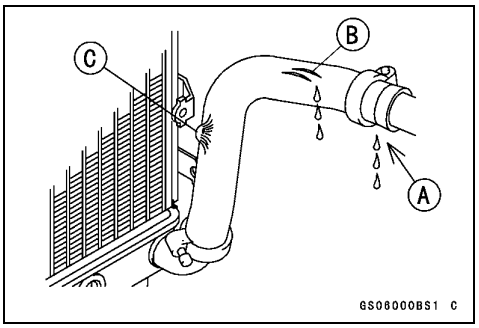
Periodic Maintenance Procedures

Radiator Hose and Connection Inspection

○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.



Air Suction System

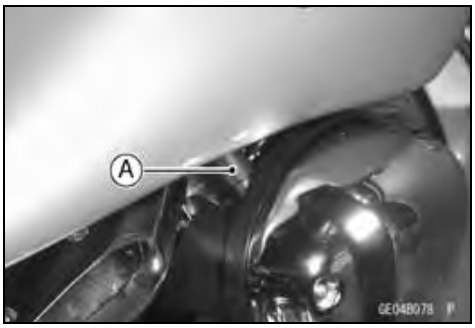
Air Switching Valve Operation Inspection

● Pull the air switching valve hose [A] out of the right air cleaner base.

● Start the engine and run it at idle speed.

● Plug the air switching valve hose end with your finger and feel vacuum pulsing in the hose.

★If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the air switching valve (see Air Switching Valve Inspection in Electrical System chapter).



Clutch and Final Drive

Clutch Operation Inspection

● Pull the clutch lever just enough to take up the free play [A].

● Measure the gap between the lever and the lever holder.

★If the gap is too wide, the clutch may not release fully. If the gap is too narrow, the clutch may not engage fully. In either case, adjust it.

Clutch Lever Free Play

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



⚠ WARNING

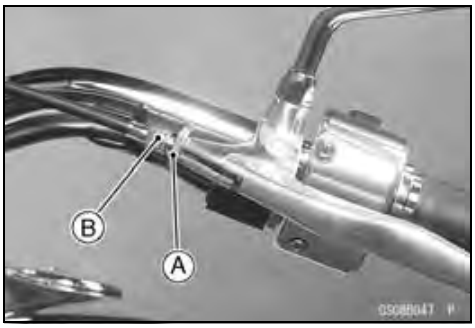
To avoid a serious burn, never touch the or exhaust pipe during clutch adjustment.

● Loosen the locknut [A] at the clutch lever.

● Turn the adjuster [B] until the proper amount of clutch lever free play is obtained.

● Tighten the locknut securely.

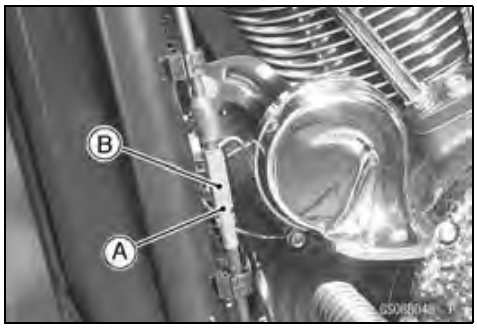
★If it cannot be done, use the adjuster at the middle of the cable.



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Periodic Maintenance Procedures

● Loosen the locknut [A] at the middle of the clutch cable.
● Turn the adjusting nut [B] until the proper amount of clutch lever free play is obtained.
● Tighten the locknut securely.



⚠ WARNING

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

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

Belt Deflection Inspection

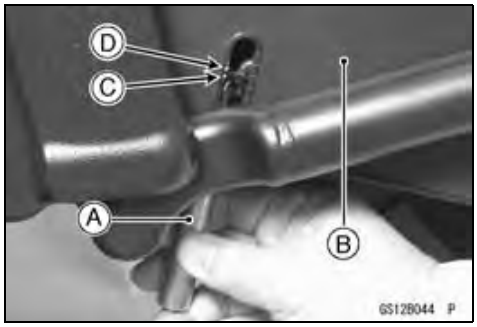
NOTE

○*Belt deflection must be checked and adjusted when the belt is cold (at room temperature).*
○*Belt deflection also should be checked at first 1000 km ride after belt replacement.*

● Check to see if wheel alignment is properly adjusted.
○The left and right notches on the belt adjuster should point to the same marks or positions on the swingarm.
★If they do not, adjust wheel alignment (see Wheel Alignment Inspection/Adjustment).

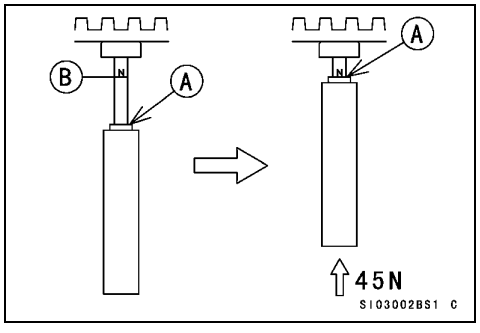
● Using the jack and jack attachment under the frame pipe ribs, lift the rear wheel off the ground (see Rear Wheel Removal in the Wheels/Tires chapter).
● Visually inspect the belt for damage (see Belt Wear and Damage Inspection).
★If the belt is damaged, replace it with a new one.

● Mark the initial belt position [C] on the belt cover window.
● Using the tension gauge [A], push up 45 N (4.5 kgf, 10 lb) of force from under and on the center of the belt at the gauge of the lower belt cover [B].
● Measure the deflection (length between mark [D] and [C]) of the belt.



NOTE

○*Push the belt by the gauge until the top surface [A] of the stopper comes to the 45 N loaded scale [B], marked "45N".*
○*Push up on the center of the belt. An inaccurate reading will occur if the edge of the belt is pushed up.*
○*Look parallel to the belt during inspection. An inaccurate reading will occur if looking from any other angle.*



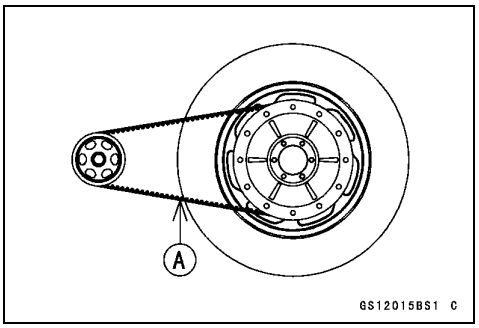
● Inspect the belt deflection at two positions by rotating the rear wheel.

Special Tool - Tension Gauge: 57001-1585

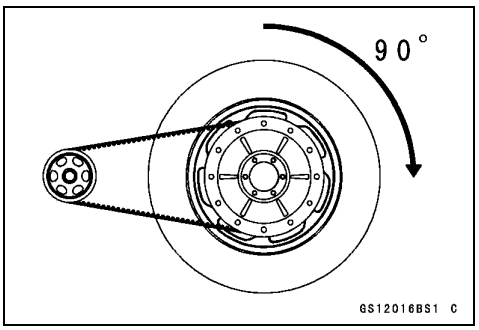
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Periodic Maintenance Procedures

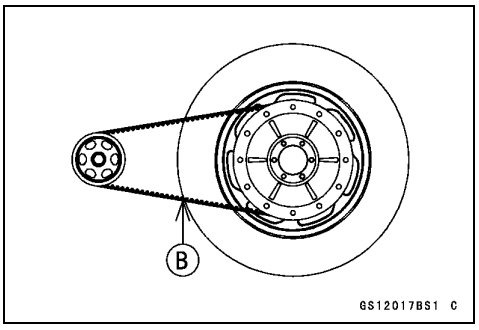
● Inspect the drive belt deflection at arbitrary position, and record the value [A].



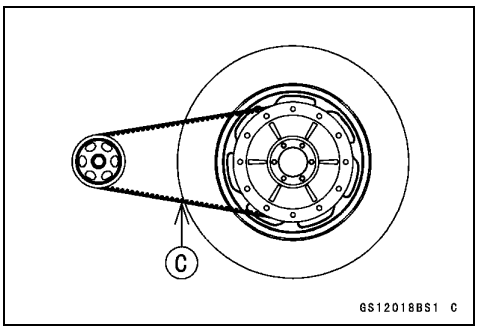
● Turn the rear wheel 90 degrees.



● Inspect the drive belt deflection, and record the value [B].



● Decide the belt deflection at the position [C] of one where deflection is large.



Drive Belt Deflection (with 45 N, 4.5 kgf, 10 lb force)

Standard: 2.5 ~ 4.0 mm (0.10 ~ 0.16 in.)

Drive Belt Deflection (with 45 N, 4.5 kgf, 10 lb force, when installing new belt or engine remounted)

Standard: 2.5 mm (0.10 in.)

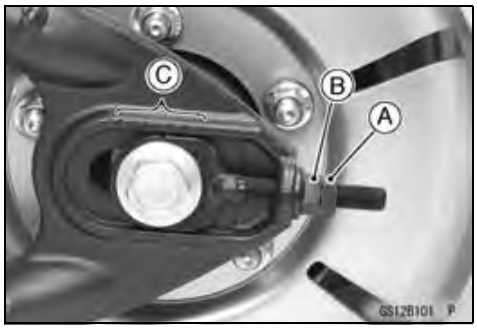
★If the deflection is out of the specification, adjust it.

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Periodic Maintenance Procedures

Belt Deflection Adjustment

- Remove:
  Muffler Body (see Engine Top End chapter)
  Upper Belt Cover
- Remove the axle cotter pin, and loosen the axle nut.
- Using the jack and jack attachment under the frame pipe ribs, lift the rear wheel off the ground (see Rear Wheel Removal in the Wheels/Tires chapter).



- Loosen the left and right belt adjuster locknuts [A].

★If the belt is too tight, back out the left and right belt adjuster nuts [B], and kick the wheel forward until the belt is too loose.

- Turn in the left and right belt adjuster nuts evenly until the drive belt has the correct amount of deflection.

○To keep the belt and wheel aligned, the notch on the left belt adjuster should align with the same swingarm mark [C] that the right belt adjuster notch aligns with.

- Tighten both belt adjuster locknuts.

⚠ WARNING

Misalignment of the wheel will result in abnormal wear, and may result in an unsafe riding condition. Tighten both belt adjuster locknuts, and make sure the axle stays aligned.

- Tighten the axle nut.

Torque - Rear Axle Nut: 108 N·m (11 kgf·m, 80 ft·lb)

- Inspect the drive belt deflection (see Drive Belt Deflection Inspection).

★Readjust if necessary.

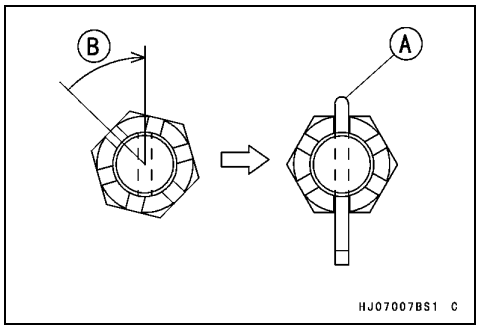
- Insert a new cotter pin [A].

NOTE

○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*

○*It should be within 30 degree.*

○*Loosen once and tighten again when the slot goes past the nearest hole.*

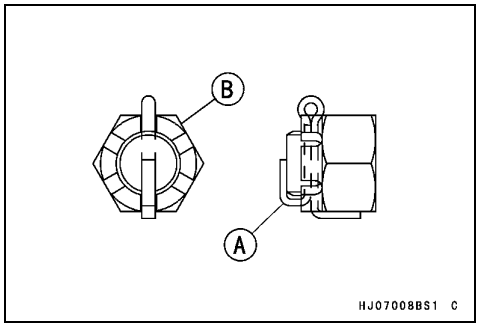


- Bend the cotter pin [A] over the nut.

⚠ WARNING

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

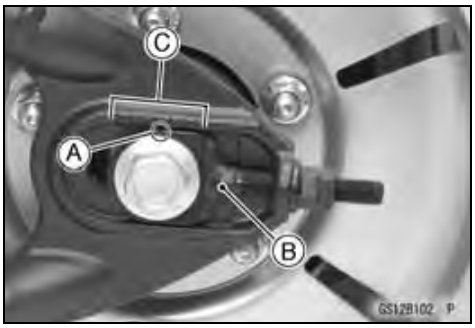
- Check the rear brake for weak braking power and brake drag.



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Periodic Maintenance Procedures

Wheel Alignment Inspection/Adjustment



- Check that the notch [A] on the left belt adjuster [B] aligns with the same swingarm mark [C] or position that the right belt adjuster notch aligns with.

★If they do not, adjust the belt deflection (see Belt Deflection Adjustment) and align the wheel alignment.

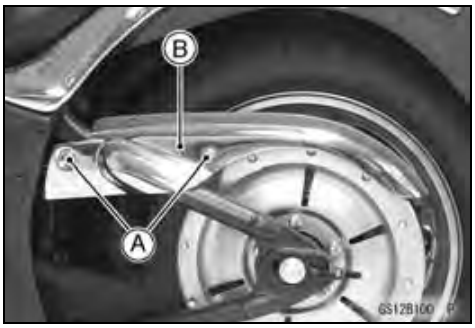
NOTE

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

⚠ WARNING

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

Belt Wear and Damage Inspection



- Using the jack and jack attachment under the frame pipe ribs, lift the rear wheel off the ground (see Rear Wheel Removal in the Wheels/Tires chapter).
- Remove:
  Bolts [A] and Washers
  Upper Belt Cover [B]



- Visually inspect the belt [A] for wear and damage.

★If the nylon fabric facing of any portion is worn off, and the polyurethane compound is exposed, or belt is damaged, replace the belt immediately with a new one.

- Otherwise, refer to the Drive Belt Tooth Wear Patterns and perform the according to the table of Drive Belt Wear Analysis.

★Whenever the belt is replaced, inspect the engine and rear pulleys (see Pulley Wear Inspection in Final Drive chapter).

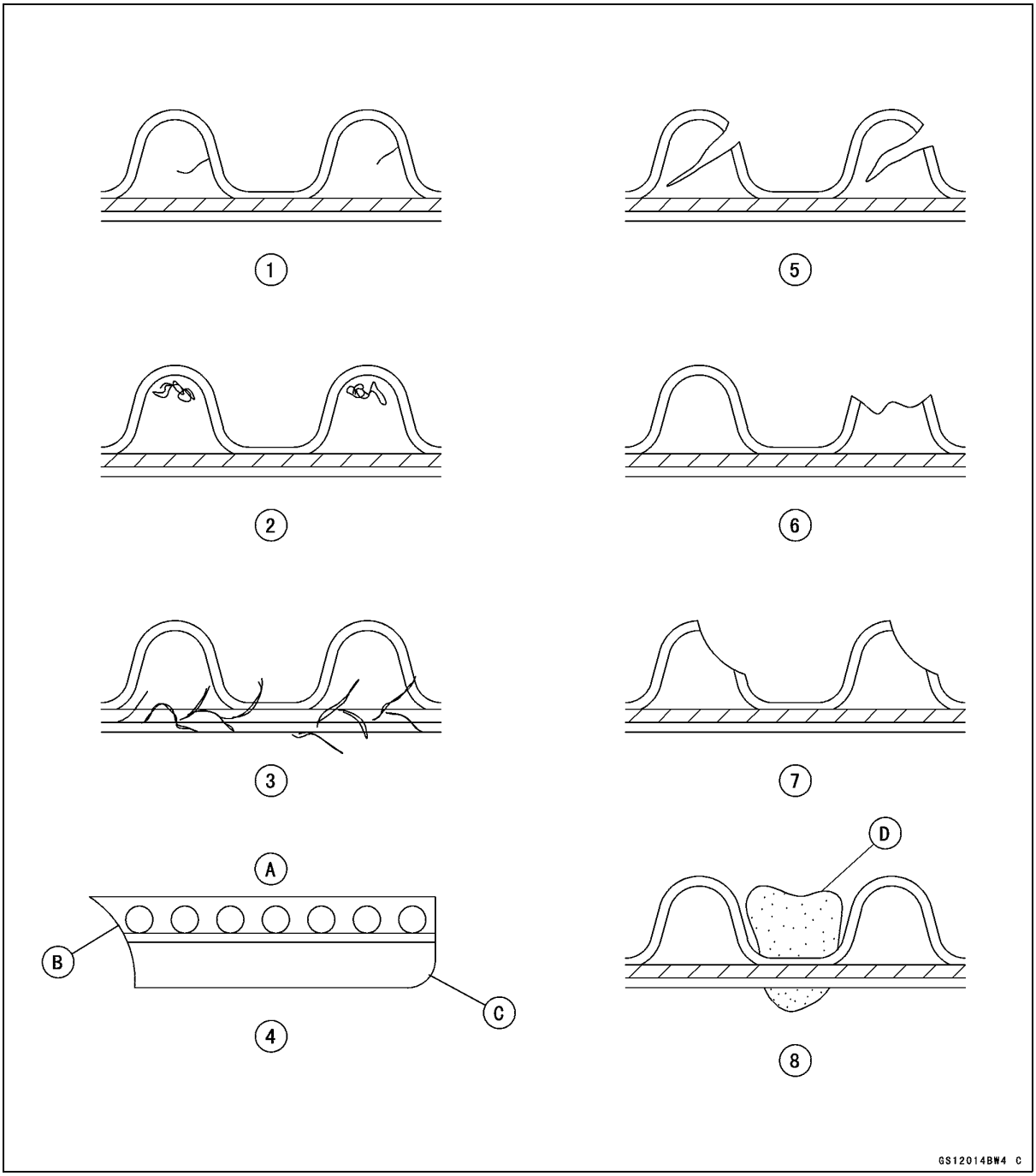
⚠ WARNING

A belt worn past the nylon fabric facing must be replaced. Such a worn belt may cause a serious accident.

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Periodic Maintenance Procedures

Drive Belt Tooth Wear and Damage Patterns



A. Belt Cross Section
B. Edge Bevel Wear
C. Rub Wear
D. Stone

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Periodic Maintenance Procedures

Drive Belt Wear and Damage Analysis

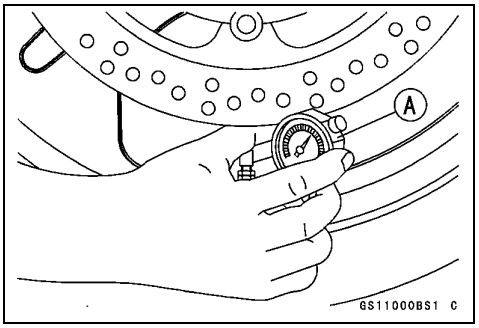
Pattern	Condition	Required Action
1	Internal tooth cracks (slight)	O.K. for continued use, but inspect the belt periodically.
2	Scuffing to side of teeth	O.K. for continued use, but inspect the belt periodically. Also check the pulley flange.
3	Fraying edge cord	O.K. for continued use, but inspect the belt periodically (replace the belt if excessive).
4	Beveled wear	O.K. for continued use, check the pulley alignment and flange condition.
5	External tooth cracks (severe)	Replace the drive belt.
6	Severe fractured or missing teeth	Replace the drive belt.
7	Tooth hook wear	Replace the drive belt. Inspect the pulley for wear.
8	Stone damage	Remove stone, O.K. for continued use it not near edge of the belt. Inspect the pulley for damage.

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 186 kg (410 lb)	250 kPa (2.5 kgf/cm², 36 psi)
Rear	Up to 186 kg (410 lb)	290 kPa (3.0 kgf/cm², 42 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 Wheels/Tires chapter).*

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Periodic Maintenance Procedures

Wheel/Tire Damage Inspection

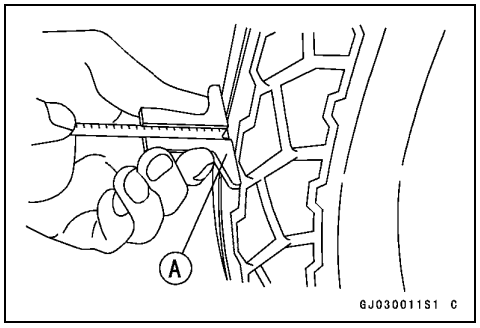


- Remove any imbedded stones [A] or other foreign particles [B] from tread.
- Visually inspect the tire for cracks and cuts replacing the tire in case of damage. Swelling or high spots indicate internal damage, requiring tire replacement.
- Visually inspect the wheel for cracks, cuts and dents damage.

★If any damage is found, replace the wheel if necessary.

Tire Tread Wear Inspection

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



- Measure the tread depth at the center of the tread with a depth gauge [A]. Since the tire may wear unevenly, take measurement at several places.

★If any measurement is less than the service limit, replace the tire (see Wheels/Tires chapter).

Tread Depth

Standard:

Front	**4.3 mm (0.17 in.)**
Rear	**7.0 mm (0.28 in.)**

Service Limit:

Front	**1 mm (0.04 in.)**
	(DE, AT, CH) 1.6 mm (0.063 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

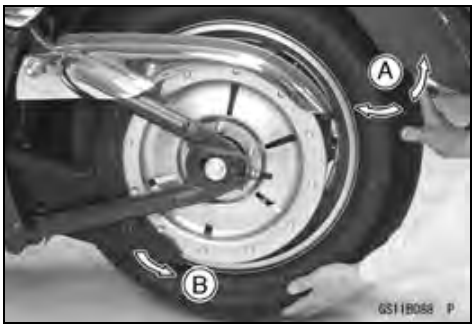


- Using a jack and attachment, raise the front wheel off the ground (see Wheels/Tires chapter).
- Turn the handlebar all the way to the right or left.
- Inspect the roughness of the front wheel bearing by move [A] the wheel.
- Spin [B] the front wheel lightly, and check for smoothly turn, roughness, binding or noise.

★If roughness, binding or noise is found, remove the front wheel and inspect the wheel bearing (see Wheels/Tires chapter).

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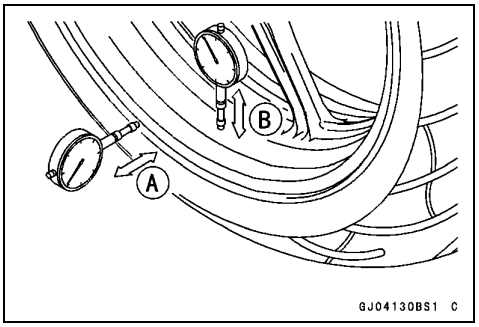
Periodic Maintenance Procedures



- Using a jack and attachment, raise the rear wheel off the ground (see Wheels/Tires chapter).
- Inspect the roughness of the rear wheel bearing by the swinging 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 Wheels/Tires chapter) and coupling (see Final Drive chapter).

Rim Runout Inspection



- Raise the front/rear wheel of the ground.

Special Tool - Jack: 57001-1238

- Check the rim for damage or warpage.

★If there is any damage to the rim, replace the rim.

- Measure the axial [A] and radial [B] rim runout by placing a dial gauge against the sides and the outer circumference of the rim, and slowly rotating the wheel.

Rim Runout (with tire installed)

Standard:	
Axial Runout	**TIR 0.5 mm (0.02 in.) or less**
Radial Runout	**TIR 0.8 mm (0.03 in.) or less**
Service Limit:	
Axial Runout	**TIR 1.0 mm (0.04 in.)**
Radial Runout	**TIR 1.0 mm (0.04 in.)**

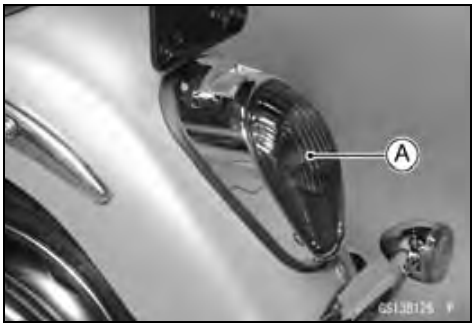
★If rim runout exceeds the service limit, inspect the hub bearings. If the problem is not due to the bearings, retighten the spokes.

⚠ WARNING

Never attempt to repair a damaged wheel part. If the wheel part is damaged, it must be replaced with a new part.

Brakes

Brake Light Switch Operation

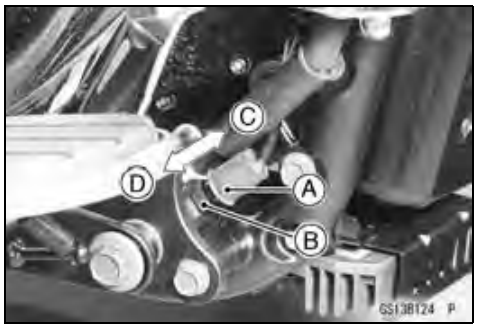


- Turn on the ignition switch.
- The brake light [A] should go on when the brake lever is applied or after the brake pedal is depressed about 10 mm (0.39 in.).

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Periodic Maintenance Procedures

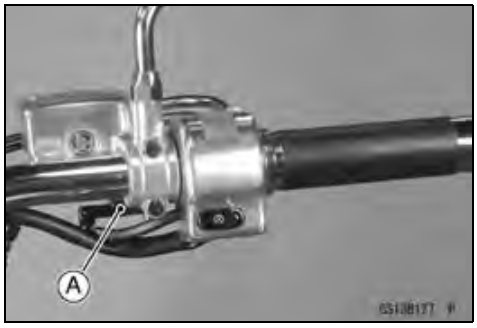
★If it does not, adjust the brake light switch.
● While holding the switch body, turn the adjusting nut to adjust the switch.
Switch Body [A]
Adjusting Nut [B]
Light sooner as the body rises [C]
Light later as the body lowers [D]



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 Electrical System chapter)
Brake Light Bulb (see Electrical System chapter)
Main Fuse 30 A and Taillight Fuse 10 A (see Electrical System chapter)
Front Brake Light Switch [A] (see Electrical System chapter)
Rear Brake Light Switch (see Electrical System chapter)
Harness (see Wiring Inspection in Electrical System chapter)

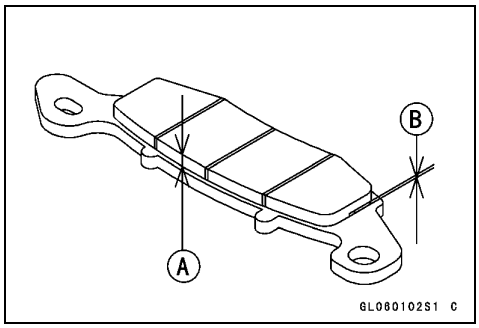


Brake Pad Wear Inspection

● 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 Brakes chapter).

Pad Lining Thickness

Standard:	
Front	**4.0 mm (0.16 in.)**
Rear	**7.5 mm (0.30 in.)**
Service Limit:	**1 mm (0.04 in.)**

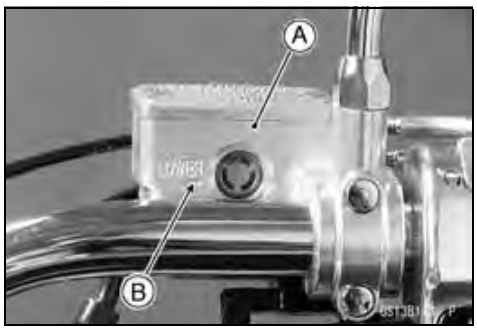


Brake Fluid Level Inspection

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

NOTE

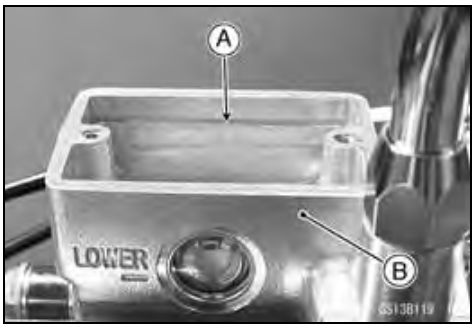
○*Hold the reservoir horizontal by turning the handlebar when checking brake fluid level.*



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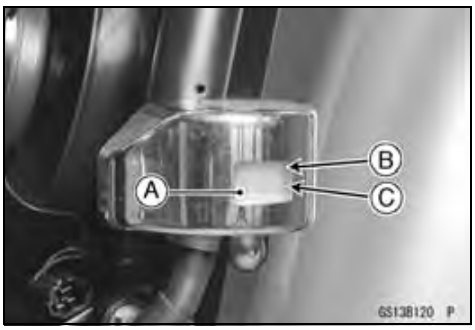
Periodic Maintenance Procedures

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



● 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.

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



⚠ 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.

Brake Fluid Leak (Brake Hose and Pipe)

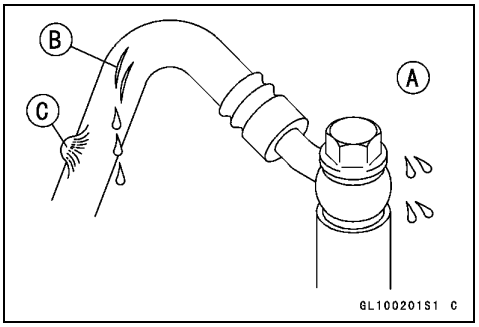
● Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A] and fitting.
★If the brake fluid leaked from any position, inspect or replace the problem part.



Brake Hose Damage and Installation Connection 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], bulges [C] or leakage are noticed.
★Tighten any banjo bolts.

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

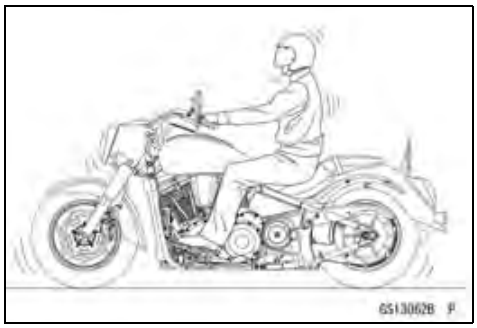


● Inspect the brake hose routing.
★If any brake hose routing is incorrect, route the brake hose according to Cable, Wire and Hose Routing section in the Appendix chapter.

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Periodic Maintenance Procedures

Brake Operation Inspection



- Inspect the operation of the front and rear brake by running the vehicle on the dry road.

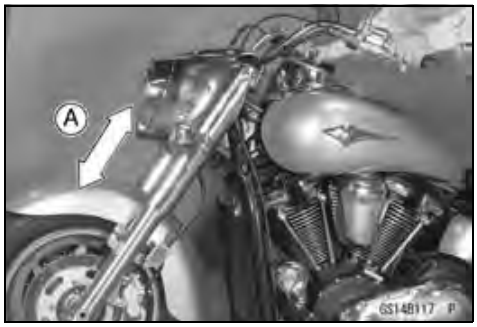
★If the brake operation is insufficiency, inspect the brake system.

⚠ WARNING

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

Suspensions

Front Forks/Rear Shock Absorber Operation Inspection



- Pump the forks down and up [A] 4 or 5 times, and inspect the smooth stroke.

★If the forks do not smoothly or noise is found, inspect the fork oil level or fork clamps.



- 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) or shock absorber mounting condition.

Front Fork Oil Leak Inspection



- Visually inspect the front forks [A] for oil leakage.

★Replace or repair any defective parts, if necessary.

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Periodic Maintenance Procedures

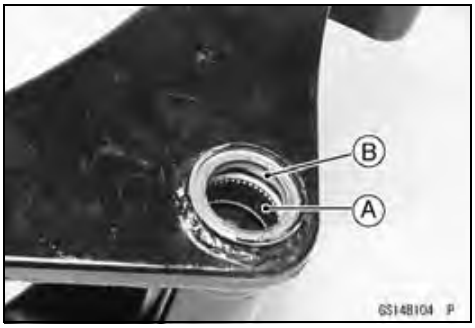
Rear Shock Absorber Oil Leak Inspection



- Remove:
  Seats (see Frame chapter)
  Battery Cover
- Visually inspect the shock absorber [A] for oil leakage.

★If it is oil leaked, replace the shock absorber.

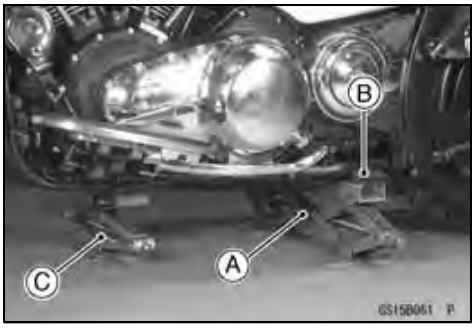
Swingarm Pivot Lubrication



- Remove the swingarm (see 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 Suspension chapter).

Steering

Steering Play Inspection



- Check steering as follows.

○Use the jack [A] and jack attachment [B] under the frame pipe, and a commercially available jack [C] under the engine to lift the front wheel off the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571

○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.*

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Periodic Maintenance Procedures

Steering Play Adjustment

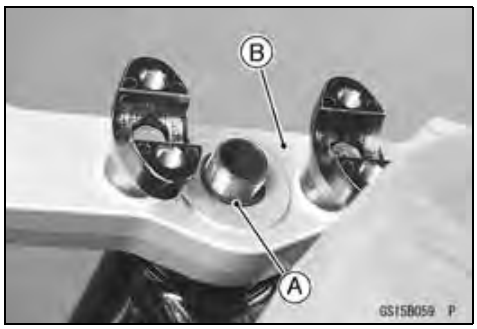
★Adjust the steering, if necessary.

● Remove:
Nacelle (see Frame chapter)
Handlebar (see Steering chapter)
Stem Head Nut [A]
Washer

● Loosen the upper fork clamp bolts on both sides.



● Remove:
O-ring [A]
Steering Stem Head [B]



● Remove the claw washer.

● Adjust the stem nut [A] with the stem nut wrench [B] by tightening to the specified torque.

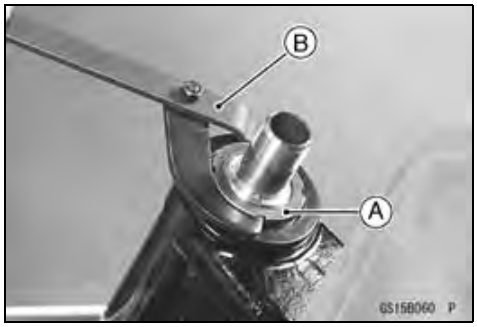
Special Tool - Steering Stem Nut Wrench: 57001-1100

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

● Install the stem head.

● Tighten the following in the order listed.

Torque - Steering Stem Head Nut: 108 N·m (11 kgf·m, 80 ft·lb)
Front Fork Upper Clamp Bolts: 20 N·m (2.0 kgf·m, 15 in·lb)



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

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

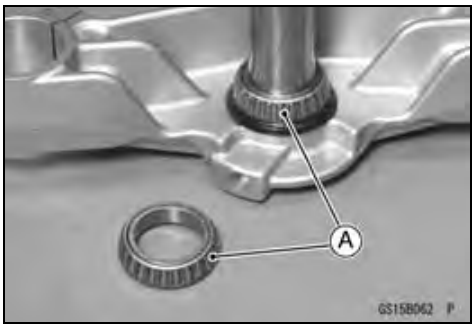
⚠ WARNING

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

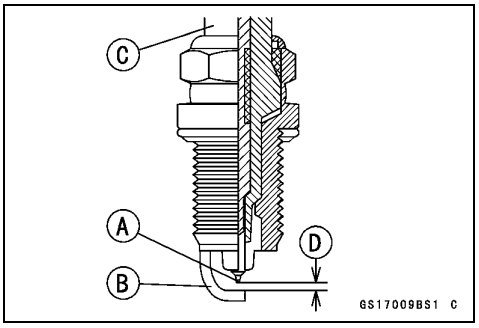
Steering Stem Bearing Lubrication



- Remove the steering stem. (see Steering chapter).
- Using a high-flash point solvent, wash the upper and lower tapered rollers [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 bearing as a set (see Steering chapter).
- Pack the upper and lower tapered roller 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 chapter).

Electrical System

Spark Plug Condition Inspection



- Visually inspect the spark plugs.
- ★If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug.
- ★If the spark plug is dirtied or the carbon is accumulated, replace the spark plug.
- Measure the gap [D] with a wire-type thickness gauge.
- ★If the gap is incorrect, replace the spark plug.

Spark Plug Gap: 1.0 ~ 1.1 mm (0.039 ~ 0.043 in.)

- Use the standard spark plug or its equivalent.

Spark Plug: IZFR6F-11

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Periodic Maintenance Procedures

Lights and Switches Operation

First Step

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

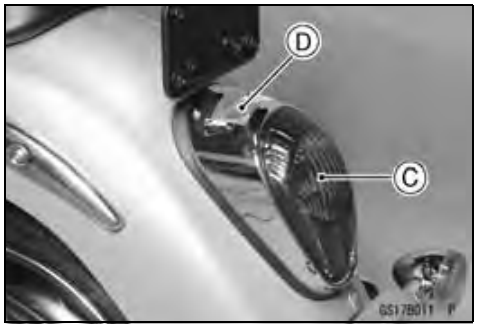
Models	Position Lights [A]	City Light [B]	Taillight [C]	License Plate Light [D]	Neutral Indicator light [E] in meter unit
United States	go on	–	goes on	goes on	goes on
Canada	go on	–	goes on	goes on	goes on
Europe	–	goes on	goes on	goes on	goes on
Aus-tralia	–	–	goes on	goes on	goes on
Malaysia	–	–	goes on	goes on	goes on

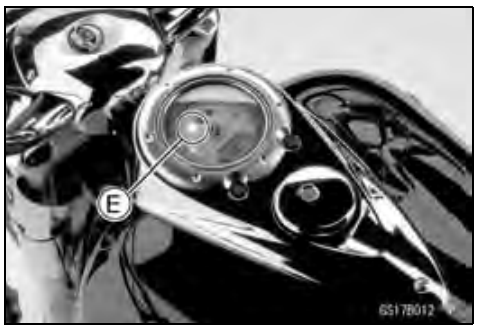
★If the light does not go on, inspect or replace the following item.
Battery (see Electrical System chapter)
Applicable Bulb (see Electrical System chapter)
Main Fuse 30 A and Taillight Fuse 10 A (see Electrical System chapter)
Ignition Switch (see Electrical System chapter)
Gear Position Switch (for neutral indicator light, see Electrical System chapter)
Harness (see Wiring Inspection in 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.







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 Electrical System chapter)

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Periodic Maintenance Procedures

Third Step

- Turn on the turn signal switch [A] (left or right position).
- The left or right turn signal lights [B] (front and rear) according to the switch position should flash.
- The turn signal indicator light [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 Electrical System chapter)
Turn Signal Light Indicator Bulb (see Electrical System chapter)
Turn Signal Control Relay Fuse 10 A (see Electrical System chapter)
Turn Signal Switch (see Electrical System chapter)
Turn Signal Control Relay (see Electrical System chapter)
Harness (see Wiring Inspection in Electrical System chapter)

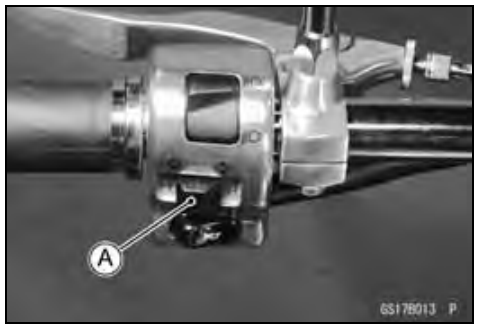
- Push the turn signal switch.
- The turn signal lights and indicator light should go off.

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

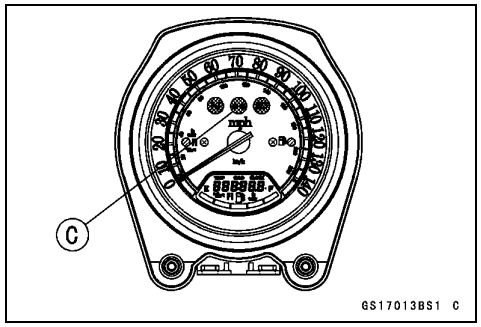
Turn Signal Switch (see Electrical System chapter)
Turn Signal Control Relay (see Electrical System chapter)

NOTE

○*Refer to 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 Low Beam Bulb (see Electrical System chapter)
Headlight Fuse 10 A (see Electrical System chapter)
Dimmer Switch (see Electrical System chapter)
Headlight Relay in Relay Box (see Electrical System chapter)
Harness (see Wiring Inspection in Electrical System chapter)



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Periodic Maintenance Procedures

- Set the dimmer switch to high beam position.
- The low beam [A] and high beam [B] headlights should go on.
- The high beam indicator light [C] should go on.

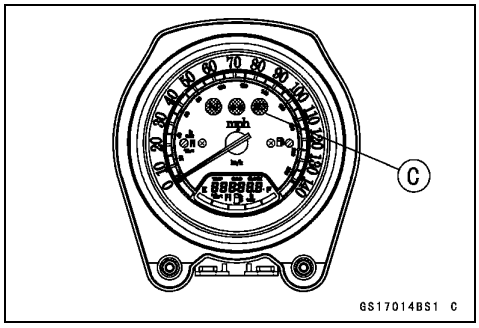
★If the high beam headlight and/or high beam indicator light does not go on, inspect or replace the following item.
Headlight High Beam Bulb (see Electrical System chapter)
Dimmer Switch (see Electrical System chapter)

- 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 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.

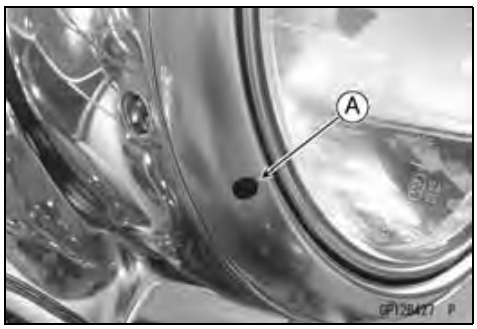
Headlight Beam Horizontal Adjustment

- Remove the cap [A].
- Turn the horizontal adjuster 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.



VN2000E6F/F6F ~



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

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Periodic Maintenance Procedures

Headlight Beam Vertical Adjustment

- Remove the cap [A].
- 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.



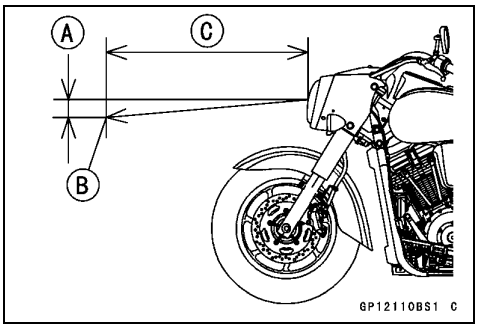
VN2000E6F/F6F ~



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 in.) drop at 7.6 m (25 ft.) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.*



50 mm (2 in.) [A]
Center of Brightest Spot [B]
7.6 m (25 ft.) [C]

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Periodic Maintenance Procedures

Side Stand Switch Operation Inspection



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

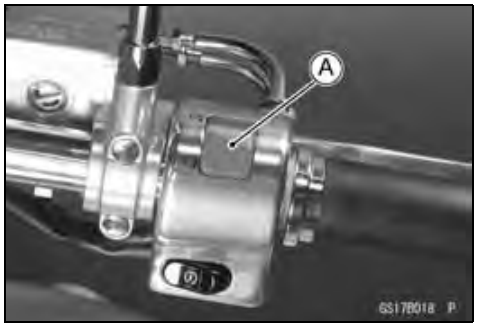
Sidestand Switch Operation

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	Stops
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 Electrical System chapter)
Main Fuse 30 A (see Electrical System chapter)
Ignition Fuse 10 A (see Electrical System chapter)
Ignition Switch (see Electrical System chapter)
Side Stand Switch (see Electrical System chapter)
Engine Stop Switch (see Electrical System chapter)
Starter Button (see Electrical System chapter)
Gear Position Switch (see Electrical System chapter)
Starter Control Relay (see Electrical System chapter)
Relay Box (see Electrical System chapter)
Starter Control Relay (see Electrical System chapter)
Harness (see Wiring Inspection in Electrical System chapter)

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

Engine Stop Switch Operation Inspection



First Step

● Turn on the ignition switch.
● Set the neutral position.
● Turn the engine stop switch 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 Electrical System chapter)

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Periodic Maintenance Procedures

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 Electrical System chapter)

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

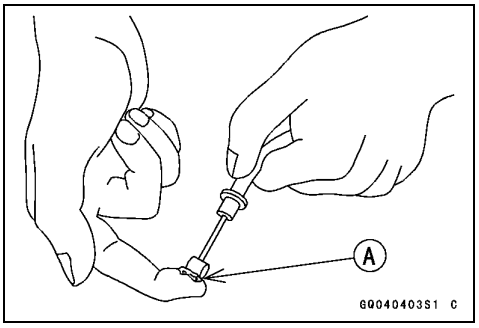
Others

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

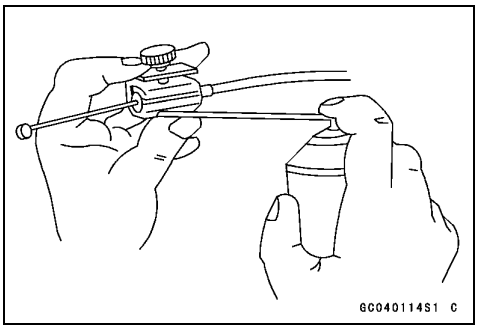
○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

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



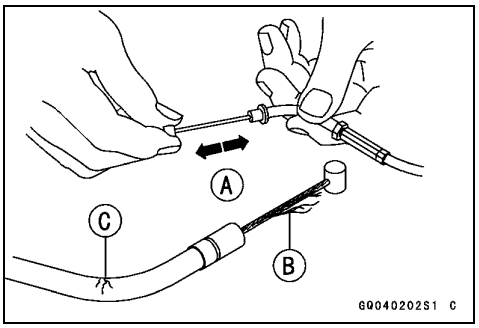
Cable: Lubricate with Cable Lubricant.
Throttle Cables
Clutch Cable
- Lubricate the cables by seeping the oil between the cable and housing.

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



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● 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 and Nuts 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.

Nut, Bolt and Fastener to be checked

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

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

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

Steering:
- Stem Head Nut
- Handlebar Clamp Bolts

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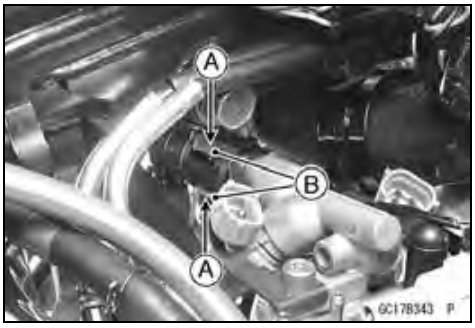
Periodic Maintenance Procedures

Engine:
Throttle Cable Adjuster Locknuts
Engine Mounting Bolts and Nuts
Shift Pedal Bolts
Muffler Mounting Bolt and Nut
Exhaust Pipe Holder Nuts
Clutch Lever Pivot Nut
Radiator Mounting Bolt
Radiator Bracket Bolts
Others:
Side Stand Bolt and Nut
Footboard Bracket Bolts
Footpeg Bracket Mounting Bolts
Downtube Bolts

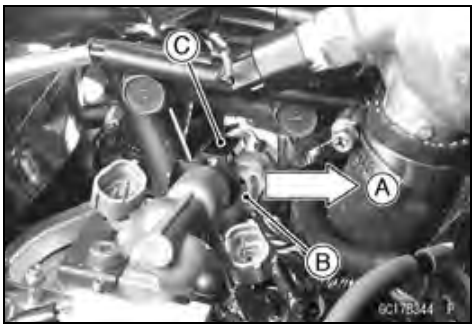
Replacement Parts

Fuel Hose Replacement

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Remove or disconnect:
  Air Switching Valve (see Engine Top End chapter)
  Vacuum Hoses on Throttle Body Assy (see Fuel System (DFI) chapter).
  Injector Connectors (see Injector Removal in the Fuel System (DFI) chapter).
- Push [A] the joint lock claws [B].



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



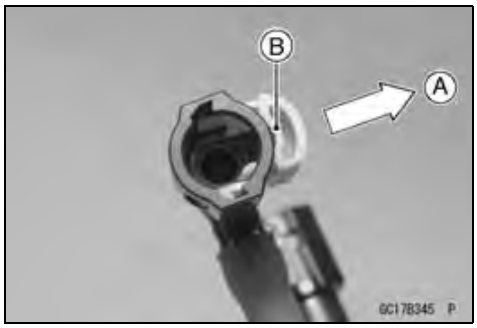
⚠ WARNING

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

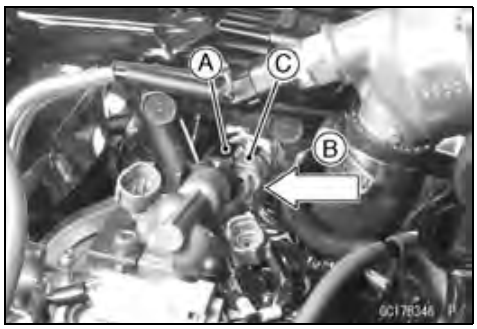
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Periodic Maintenance Procedures

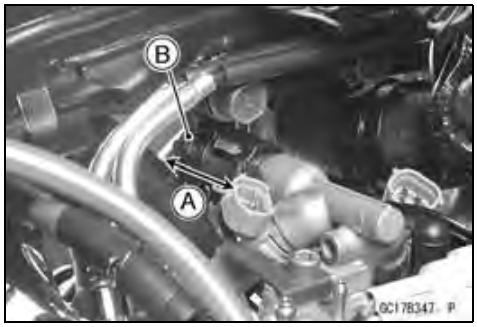
● Install the new fuel hose.
● Pull [A] the joint lock [B] fully as shown.



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



● Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and doesn't come off.



⚠ WARNING

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

★If it comes off, reinstall the hose joint.
● Run the fuel hose in accordance with the Cable, Wire and Hose Routing section in the Appendix chapter.
● Install the removed part
● Start the engine and check the fuel hose for leaks.

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.

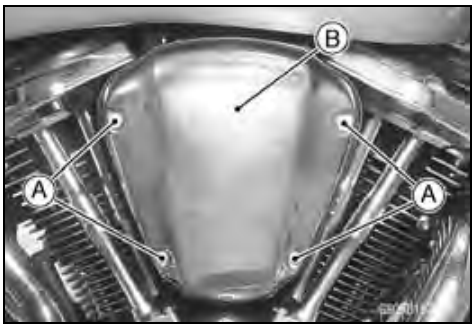
CAUTION

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

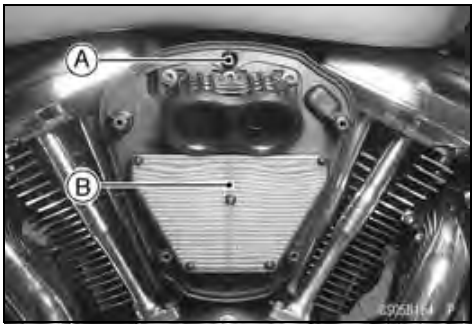
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Periodic Maintenance Procedures

● Remove:
Air Cleaner Cover Screws [A]
Air Cleaner Cover [B]



● Unscrew the air cleaner element screw [A] and remove the air cleaner element [B].
● Discard:
Air Cleaner Element



● Install a new element [A] with the mesh side facing up -ward.

CAUTION

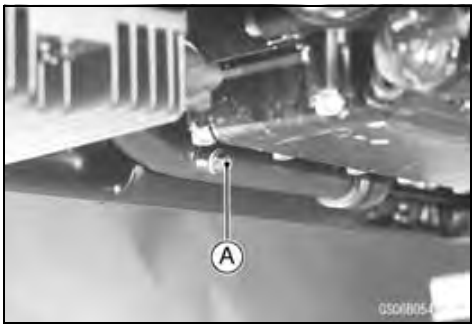
Use only the recommended air cleaner element (Kawasaki part number 11013-0002). Using another air cleaner element will wear the engine prematurely or lower the engine performance.



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.

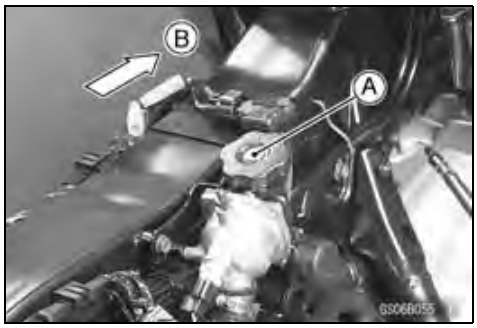


● Place a container under the coolant drain bolt [A], then remove the drain bolt.

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Periodic Maintenance Procedures

● Remove the fuel tank (see 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]



● Suck [A] the coolant with a hose [B] and pour the coolant into a suitable container.
● Install the reserve 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 (when recommended)

Soft Water	**:**	**50%**
Coolant	**:**	**50%**
Freezing Point	**:**	**−35°C (−31°F)**
Total Amount	**:**	**2.6 L (2.5 US gt.)**

● Tighten the drain bolts.

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

● Pour the coolant into the radiator.

NOTE

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

● Check the cooling system for leaks.

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Periodic Maintenance Procedures

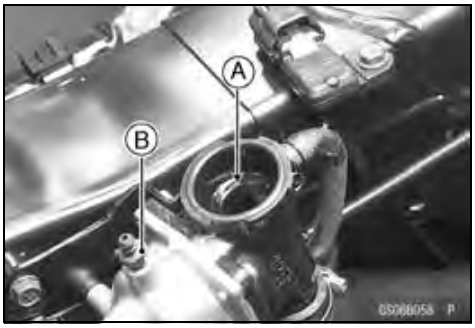
Before Engine No. 006705

- Loosen the air bleeder bolt [A] on the thermostat housing. Front [B]
- Replenish the coolant into the radiator until the coolant begins to flow out the air bleeder bolt hole (that is, all the remaining air is forced out).
- 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.
- Tighten the air bleeder bolt [B].

Torque - Water Pump Bleeder Bolt: 7.8 N·m (0.80 kgf·m, 69 in·lb)



After Engine No. 006706 (non air bleeder bolt type)

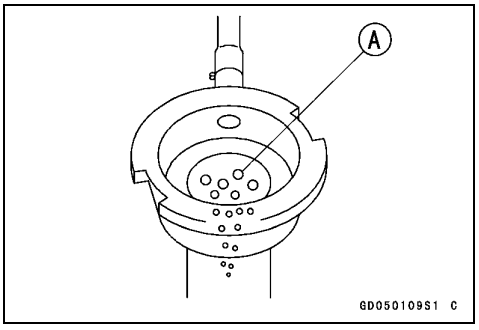
- Bleed the air from the cooling system while the engine is running.

○Start the engine with the radiator cap removed and run it until no more air bubbles [A] can be seen in the coolant.

○Tap the radiator hoses to force any air bubbles caught inside.

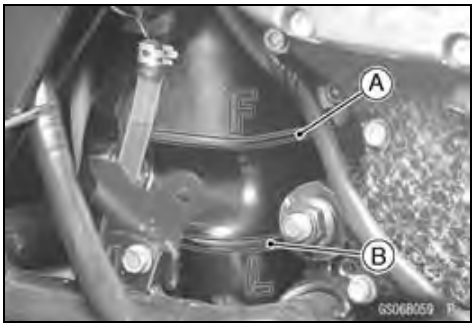
○Stop the engine and add coolant up to the radiator filler neck.

- Install the radiator cap.



- Fill the reserve tank up to the “F” (full) level line [A] with coolant and install the cap (in the photo, the muffler has been removed for clarity).
- Install the fuel tank (see Fuel System 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 [B], 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

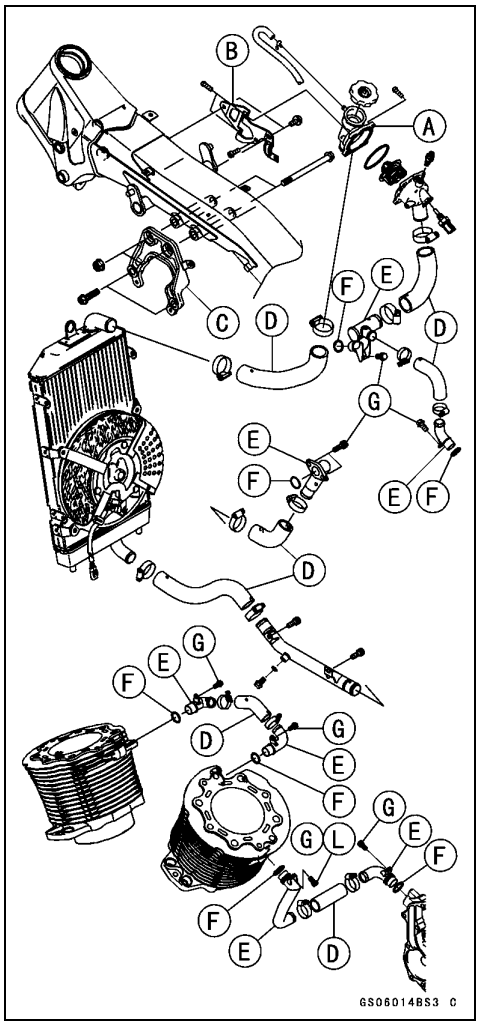
Water Hose and O-ring Replacement

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Thermostat [A] Bracket [B] (see Thermostat Removal in the Cooling System chapter)
  Upper Engine Bracket [C] (see Engine Removal/Installation chapter)
- Loosen the water hose clamps and remove the hoses [D].
- Unscrew the bolts and remove the water pipes [E] and O-rings [F].
- Apply grease to the new O-ring and install the water pipes.
- Torque the water pipe bolts [G].

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

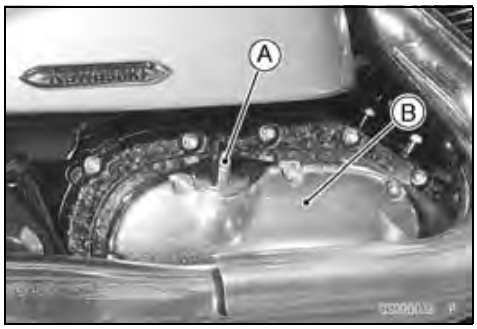
○For the water pipe bolt on the rear cylinder, apply a non-permanent locking agent [L].

- Install the new water hose and tighten the hose clamps securely.
- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.

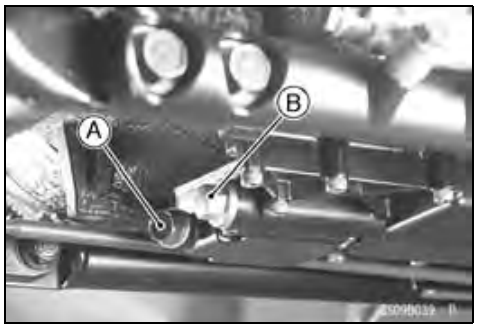


Engine Oil Change

- Situate the motorcycle so that it is vertical after warning up the engine.
- Remove the oil filler cap [A] on the transmission cover [B].



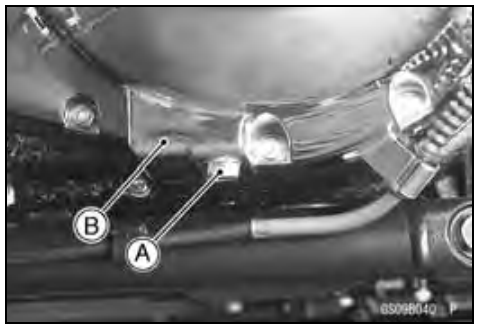
- Remove the left [A] and right [B] engine oil drain plugs and drain the oil.



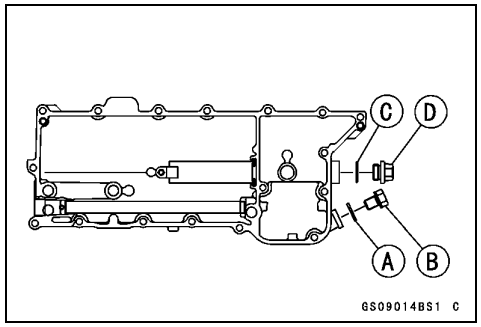
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Periodic Maintenance Procedures

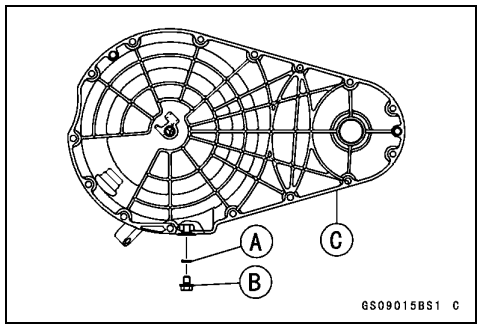
● Remove the clutch drain plug [A] on the outside clutch cover [B].
○The oil in the oil filter can be drained by removing the filter (see Oil Filter Change).



★Replace the gasket [A] for engine oil drain plug (L/H) [B] with a new one if it is damaged.
★Replace the O-ring [C] for engine oil drain plug (R/H) [D] with a new one.



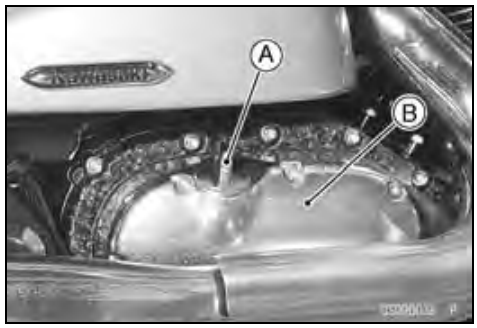
★Replace the O-ring [A] for drain plug [B] on the outside clutch cover [C].



● Tighten the drain plugs.

Torque - Engine Oil Pan Drain Plug (L/H): 20 N·m (2.0 kgf·m, 15 ft·lb)
Engine Oil Pan Drain Plug (R/H): 15 N·m (1.5 kgf·m, 11 ft·lb)
Clutch Cover Oil Drain Plug: 21 N·m (2.1 kgf·m, 15 ft·lb)

● Remove the oil filler cap [A] and pour in the specified type and amount of oil.
Transmission Cover [B]

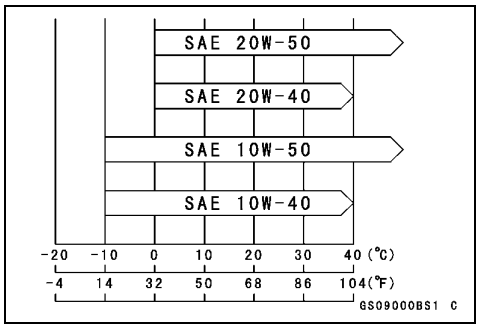


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Periodic Maintenance Procedures

Engine Oil

Grade:	**API SE, SF or SG**
	API SH or SJ with JASO MA
	API SH, SJ or SL with JASO MA (VN2000A7F/E7F/F7F)
Viscosity:	**SAE 10W-40**
Amount:	**4.4 L (4.7 US qt, when filter is not removed)**
	4.6 L (4.9 US qt, when filter is removed)
	5.5 L (5.8 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.*

● Check the oil level (see Engine Lubrication System chapter).

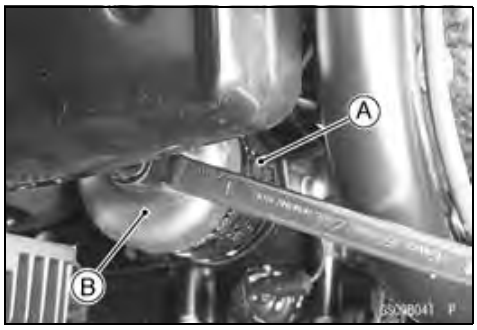
NOTE

○*Because of the semi-dry sump lubrication system, the engine oil level indicated on the dipstick will fluctuate depending on the motorcycle's position and engine speed when the engine is shut off. To ensure a proper reading of the engine oil level, follow the Oil Level Inspection procedures closely.*

Oil Filter Replacement

● Drain the engine oil (see Engine Oil Change in this section).
● 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 the new one.
● Apply oil to the gasket of the new filter before installation.
● Tighten the filter with the oil filter wrench.
● Pour in the specified type and amount of oil.

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

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Periodic Maintenance Procedures

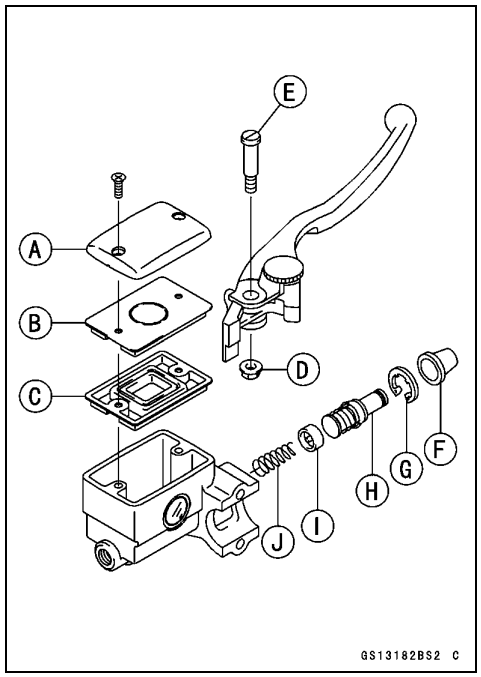
Master Cylinder Rubber Parts Replacement

Front Master Cylinder Disassembly

- Remove the front master cylinder.
- 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], and primary cup [I] return spring [J].
- Replace:
  Circlip [G]
  Piston Assembly [H]
  Primary Cup [I]
  Return Spring [J]



Rear Master Cylinder Disassembly

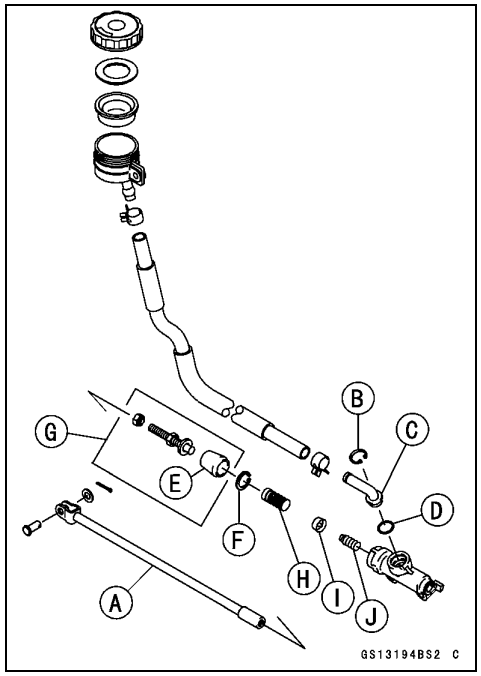
NOTE

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

- Remove the rear master cylinder (see Brakes chapter).
- Remove the circlip [B], connector [C] and O-ring [D].
- Slide the dust cover [E] out of place, remove the circlip [F].

Special Tool - Inside Circlip Pliers: 57001-143

- Take off the push rod assembly [G].
- Pull out the piston assembly [H], primary cup [I], and return spring [J].
- Replace:
  Circlip [B]
  O-ring [D]
  Circlip [F]
  Push Rod Assembly [G]
  Piston Assembly [H]
  Primary Cup [I]
  Return Spring [J]



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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 new 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 [K] from the piston since removal will damage it.

- Tighten the brake lever pivot bolt and the locknut.

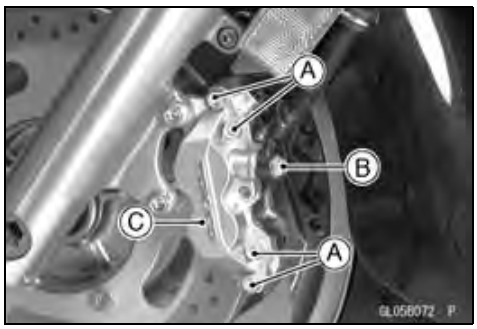
Silicone Grease -
Brake Lever Pivot Bolt, Brake Lever Pivot Contact, Piston Rod Contact, Dust Cover

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

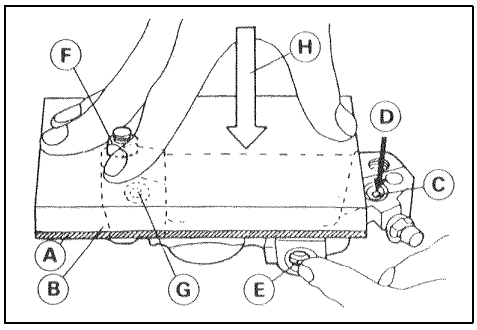
- Loosen the front caliper assembly bolts [A] and banjo bolt [B] and tighten them loosely.
- Remove:
  Front Caliper (see Brakes chapter) [C]
  Brake Pad
  Front Caliper Assembly Bolts
  O-rings



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

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

○Lightly apply compressed air [D] to the oil passage until the pistons hit the rubber gasket. Block the hose joint opening [E] during this operation if the caliper half has the opening.
  [F] Bolt and Nut
  [G] Oil Passage Sealed by Rubber Gasket
  [H] Push down.

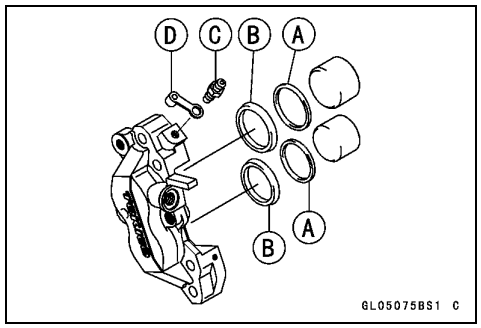


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Periodic Maintenance Procedures

⚠ WARNING

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



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

NOTE

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

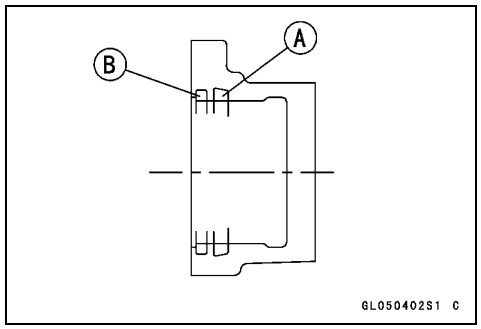
Front Caliper Assembly
- Clean the caliper parts except for the pads.

CAUTION

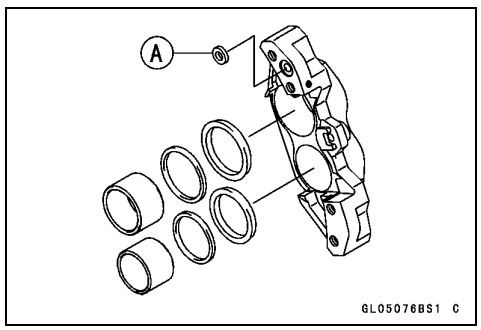
For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.

- Install the bleed valve and rubber cap.

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



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



- Replace the O-ring [A].
- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
- Be sure to install the O-rings.
- Tighten:

Torque - Front Caliper Assembly Bolts: 21 N·m (2.1 kgf·m, 15 ft·lb)

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

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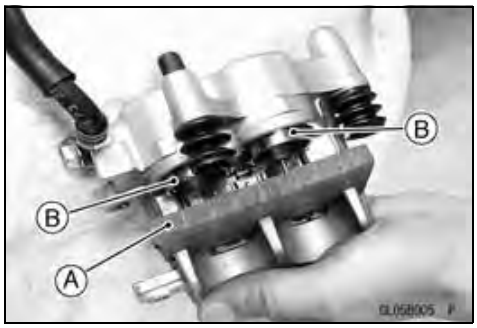
Periodic Maintenance Procedures

Rear Caliper Disassembly

- Remove the caliper with the hose installed (see Brakes chapter).
- Remove the pads (see Brakes chapter).
- Pull out the caliper holder [A].

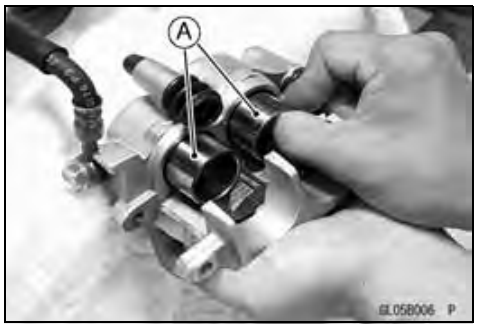


- Insert a wooden board [A] 5 mm (0.2 in.) thick inside the caliper opening.
- Pump the brake pedal until the pistons [B] push the wooden board.



- Remove the board and pull out the piston [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.



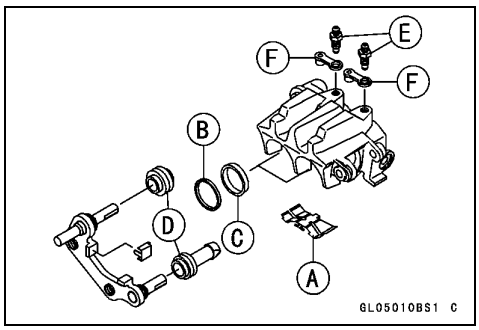
⚠ WARNING

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 the pad spring [A].
- Remove the dust seals [B] and fluid seals [C].
- Remove the rubber boots [D].
- Remove the bleed valves [E] and rubber caps [F].



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Periodic Maintenance Procedures

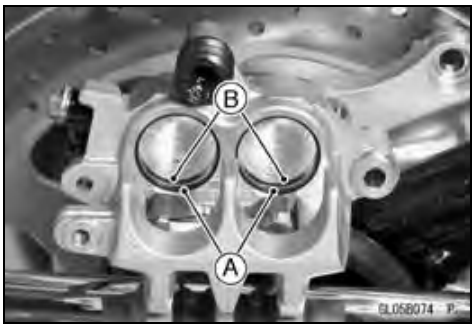
Rear Caliper Assembly

- 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.

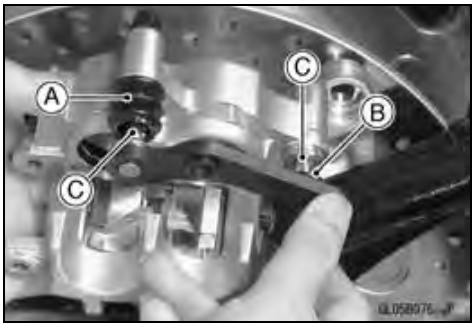
- Replace the dust seals [A].
- Replace the fluid seal [B]. Either side of the seal may face outboard.



- Install the pad 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.



- Replace the caliper holder shaft rubber boot [A] [B].
- Apply a thin coat of silicone or PBC grease to the caliper holder shaft [C] and holder holes (Silicone or PBC grease is a special high temperature, water-resistance grease).
- Install the pads (see Brakes chapter).

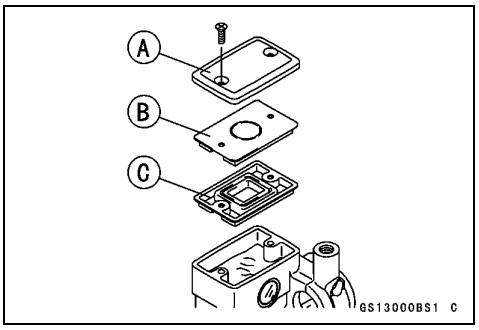


Brake Fluid Change

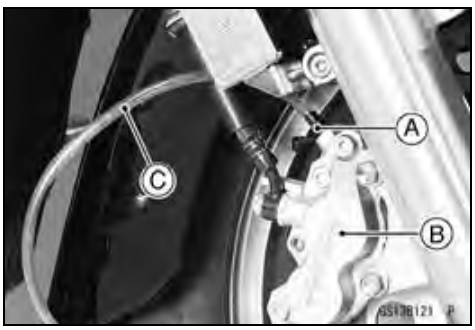
NOTE

○*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 the reservoir cap [A], plate [B] and diaphragm [C].



- 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 new brake fluid.
- Temporarily install the reservoir cap.
- Change the brake fluid as follows:



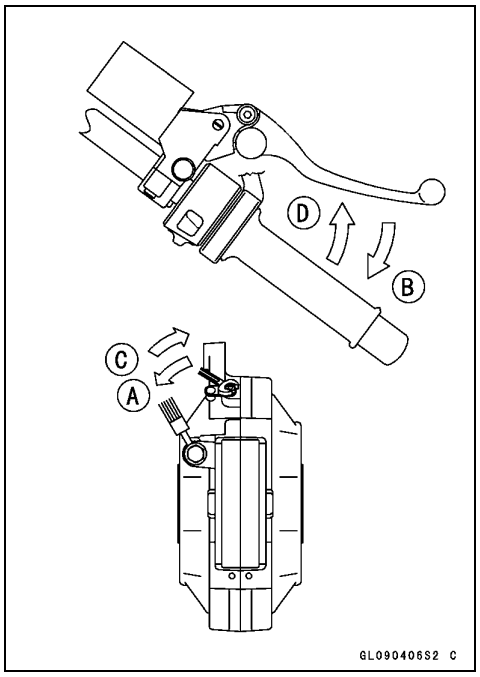
NOTE

○*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.*

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Periodic Maintenance Procedures

○Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
Open the bleed valve [A].
Pump the brake lever and hold it [B].
Close the bleed valve [C].
Release the brake lever [D].
Front Brake: Repeat the above steps for other caliper.

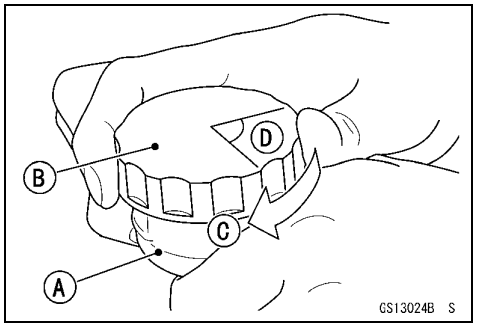


- Remove the clear plastic hose.
- Install the reservoir cap.
- Follow the procedure below to install the rear brake fluid reservoir cap correctly.

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

- Tighten the bleed valves, and install the rubber caps.

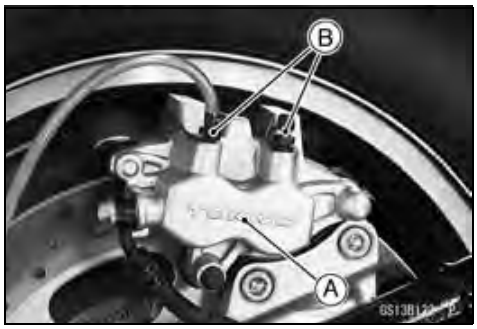
Torque - Caliper Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)
Front Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)



○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 Brakes chapter).



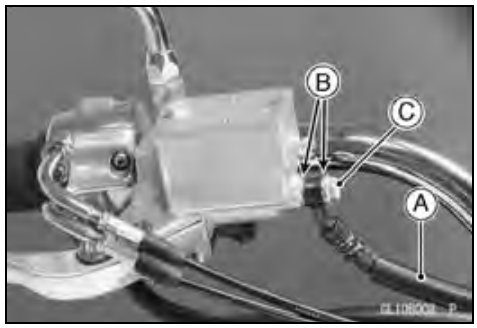
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Periodic Maintenance Procedures

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 [A], take care not to spill the brake fluid on the painted or plastic parts.
- Immediately wash away any brake fluid that spills.
- Install new brake hoses and pipes.
- 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 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).



Spark Plug Replacement

- Remove:
  Fuel Tank (for Rear Spark Plug, see Fuel System chapter)
  Spark Plug Caps [A]
- Remove the spark plug using the 16 mm (0.63 in.) plug wrench vertically.

Special Tool - Spark Plug Wrench, Hex16: 57001-1262



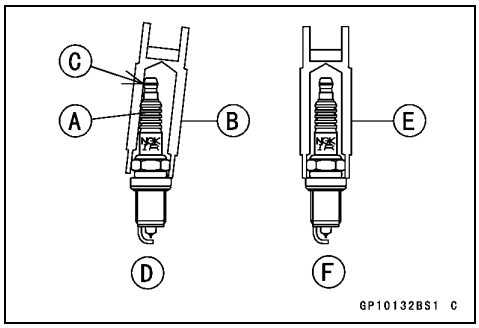
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Periodic Maintenance Procedures

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]



- 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, Hex16: 57001-1262

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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Fuel System (DFI)

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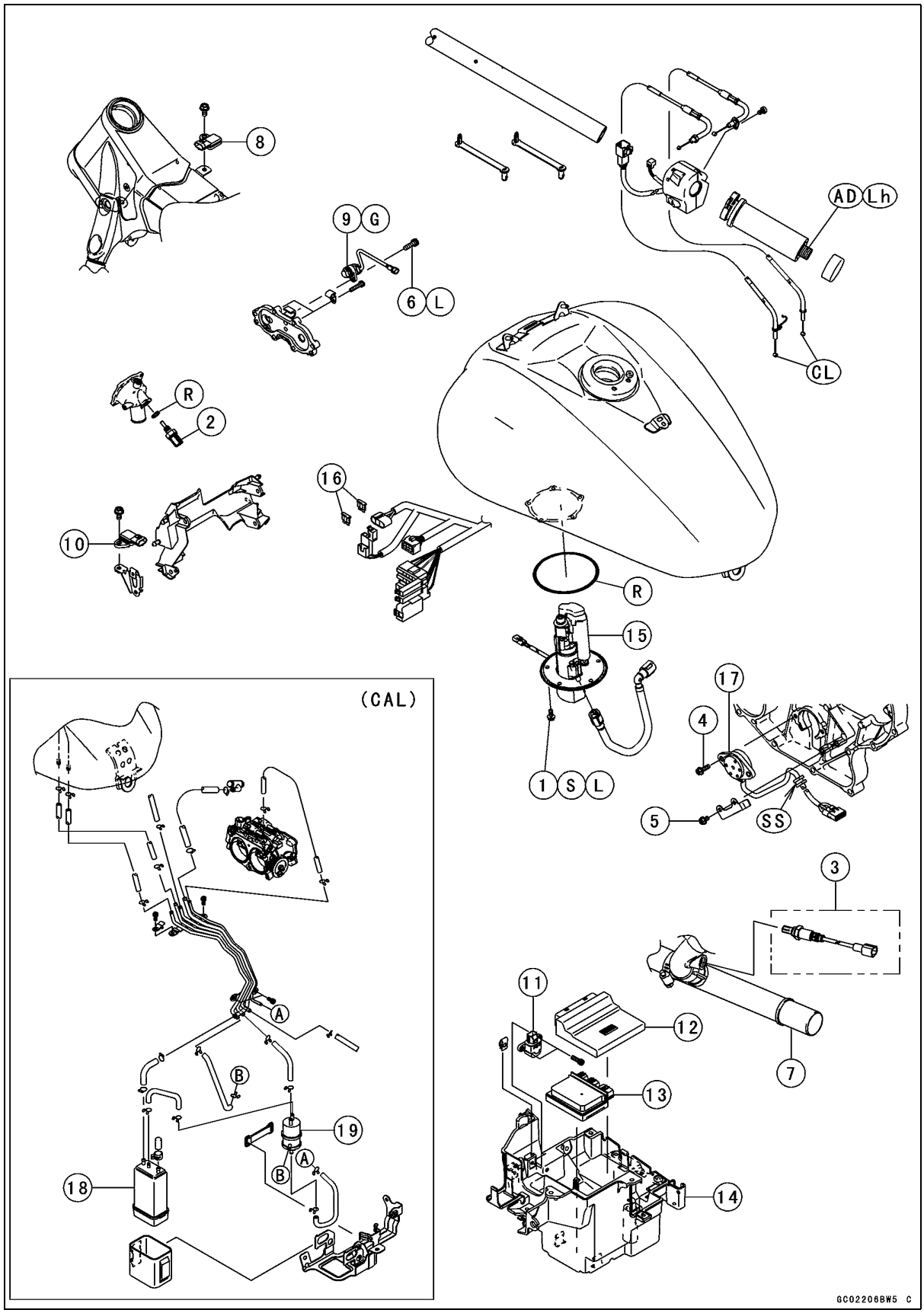
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Fuel Pump Bolts	9.8	1.0	87 in·lb	S, L
2	Water Temperature Sensor	12	1.2	104 in·lb	
3	Oxygen Sensor (CAL, HF, HU)	44	4.5	33	
4	Gear Position Switch Mounting Bolts	6.9	0.70	61 in·lb	
5	Gear Position Switch Lead Clamp Bolts	6.9	0.70	61 in·lb	
6	Camshaft Position Sensor Bolt	9.8	1.0	87 in·lb	L

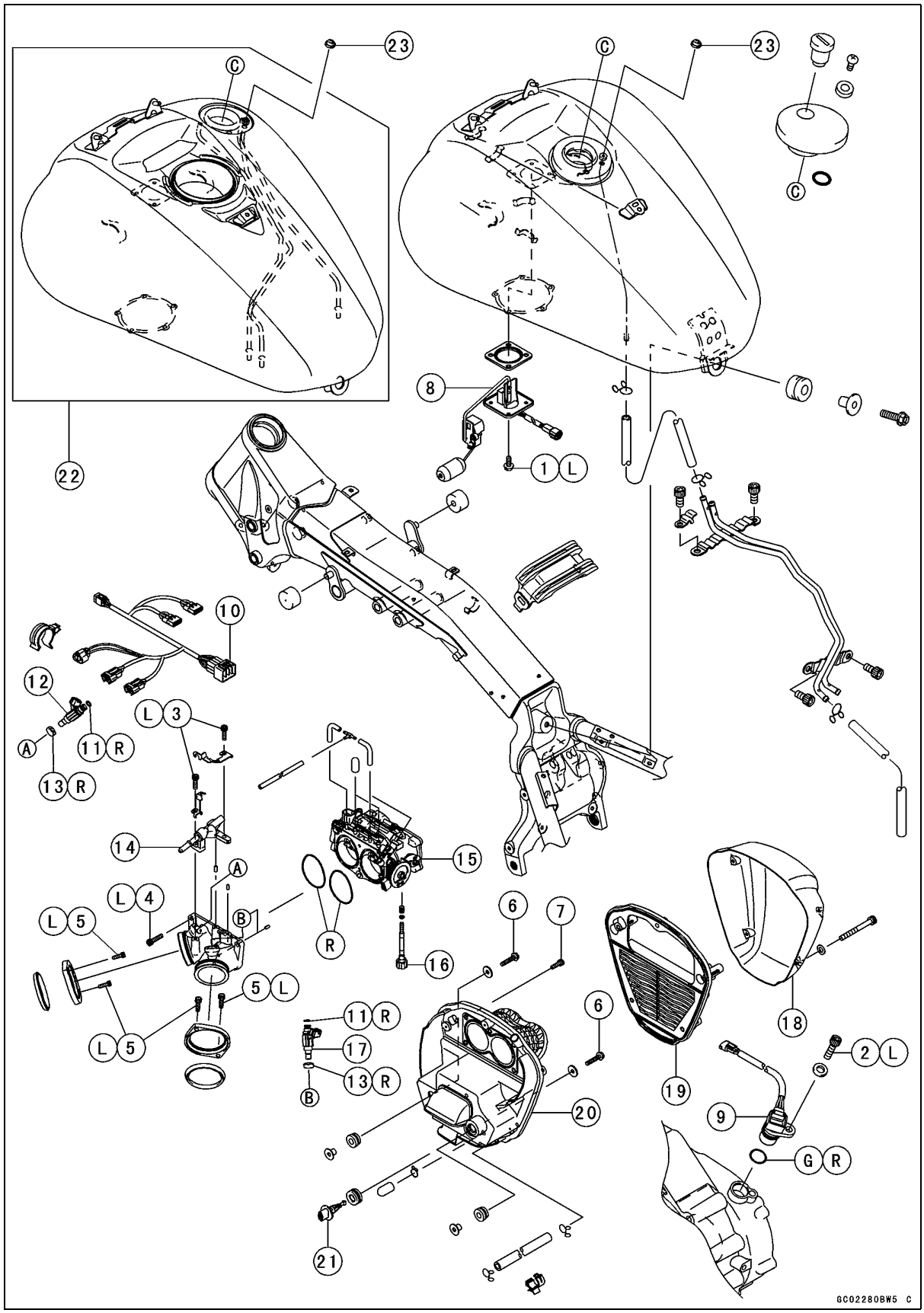
7. Exhaust Pipe
8. Inlet Air Pressure Sensor
9. Camshaft Position Sensor
10. Atmospheric Pressure Sensor
11. Vehicle-Down Sensor
12. Ecu (Electronic Control Unit)
13. Relay Box
14. Battery Case
15. Fuel Pump
16. Fuse 30 A
17. Gear Position Switch
18. Canister
19. Separater

AD: Apply Adhesive Cement.
CL: Apply Cable Lubricant.
G: Apply Grease.
L: Apply A Non-Permanent Locking Agent.
Lh: Left-Hand Threads
R: Replacement Parts
S: Follow The Specified Tightening Sequence.
SS: Apply Silicone Sealant (Kawasaki Bond (Silicone Sealant) TB1211F: 92104-0004)

CAL: California Model

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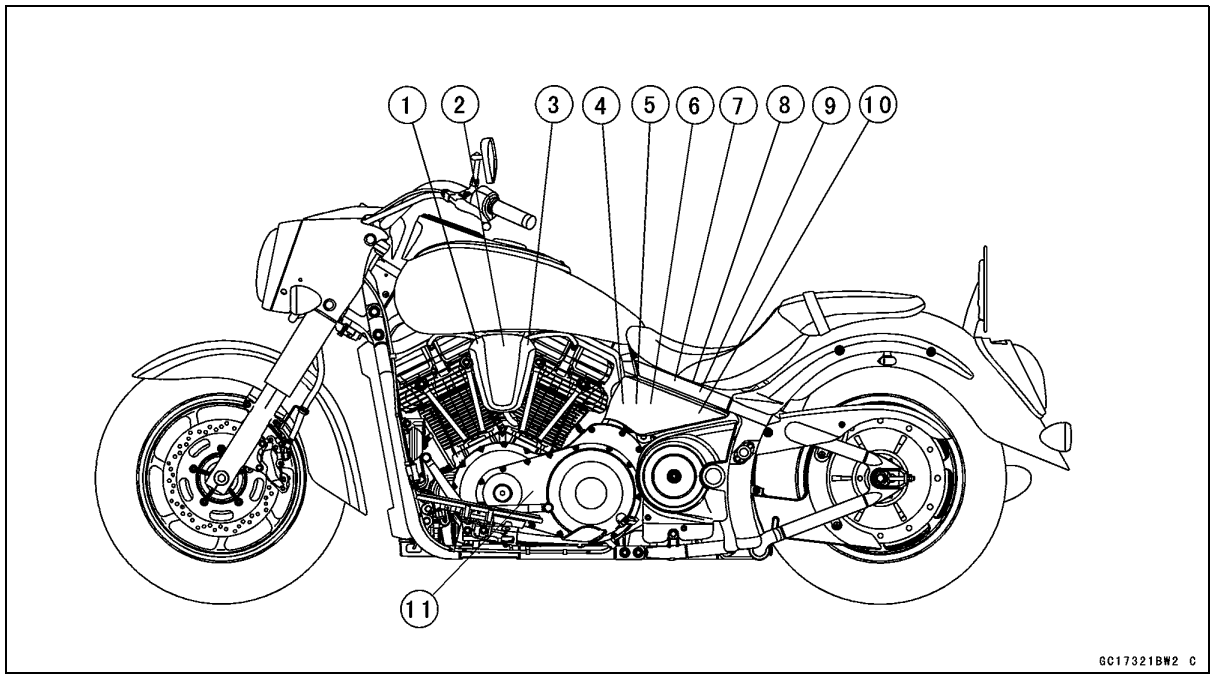
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Fuel Level Sensor Mounting Bolts	6.9	0.70	61 in·lb	L
2	Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L
3	Delivery Joint Bolts	9.8	1.0	87 in·lb	L
4	Throttle Body Assy Holder Bolts	9.8	1.0	87 in·lb	L
5	Inlet Manifold Bolts	9.8	1.0	87 in·lb	L
6	Air Cleaner Housing Bolts	9.8	1.0	87 in·lb	
7	Air Cleaner Housing Allen Bolts	9.8	1.0	87 in·lb	

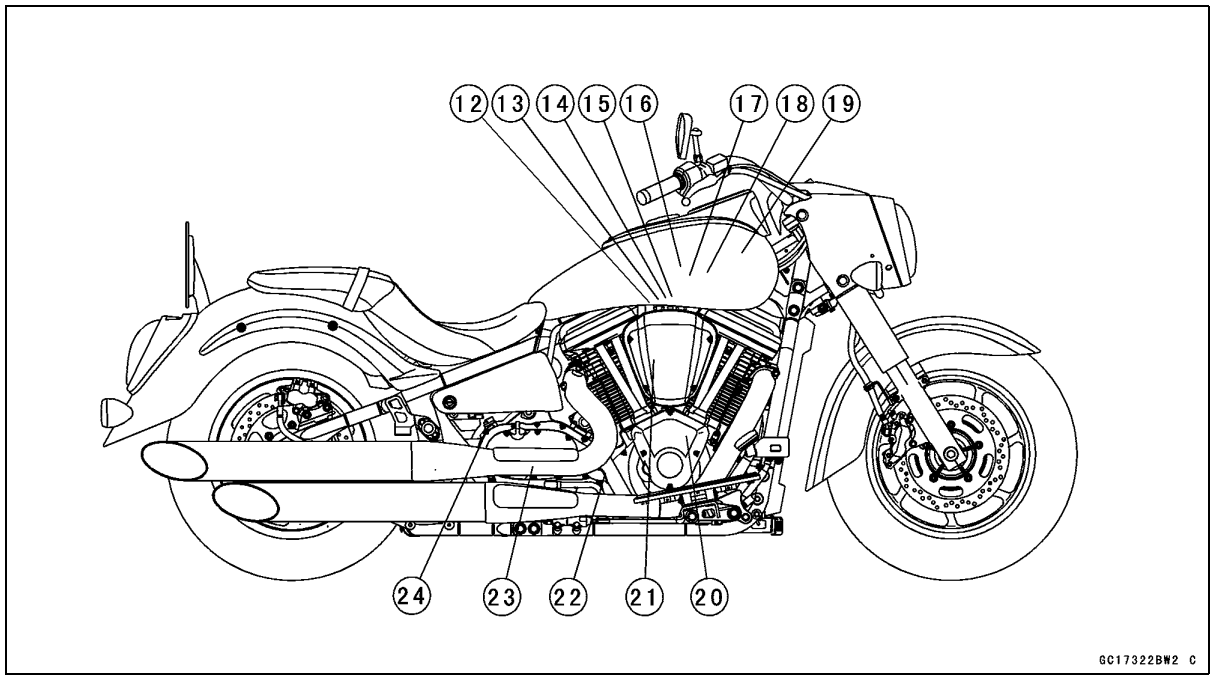
8. Fuel Level Sensor
9. Speed Sensor
10. Sub Harness
11. O-rings
12. #1, Injector
13. Seals
14. Delivery Pipe
15. Throttle Body Assy
16. Idle Adjuster
17. #2, Injector
18. Air Cleaner Cover
19. Air Cleaner Element
20. Air Cleaner Housing
21. Inlet Air Temperature Sensor
22. VN2000E6F ~/F6F ~
23. Seal (VN2000A7F/E7F/F7F)

G: Apply Grease.
L: Apply A Non-Permanent Locking Agent.
R: Replacement Parts

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DFI Parts Location

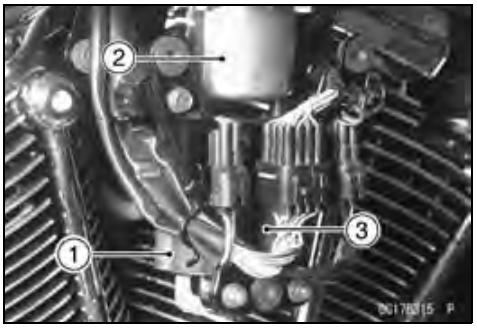


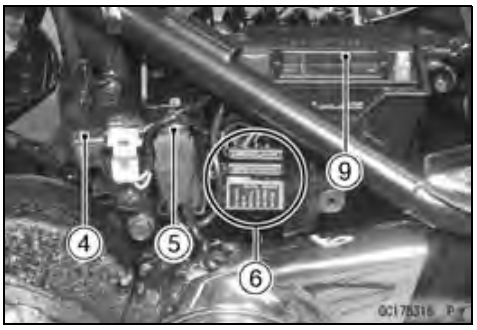


1. Ignition Coil #1
2. Fuel Pump
3. Ignition Coil #2
4. Atmospheric Pressure Sensor
5. Main Fuse 30 A
6. Fuse Box
7. Vehicle Down Sensor
8. ECU
9. Sealed Battery
10. Relay Box
11. Crankshaft Sensor
12. Air Switching Valve
13. Injector #2
14. Injector #1
15. Water Temperature Sensor
16. Main Throttle Sensor
17. Subthrottle Sensor
18. Subthrottle Valve Actuator
19. Inlet Air Pressure Sensor
20. Camshaft Position Sensor
21. Inlet Air Temperature Sensor
22. Oxygen Sensor (CAL, WVTA (FULL H), GB WVTA (FULL H) Models)
23. Gear Position Switch
24. Speed Sensor

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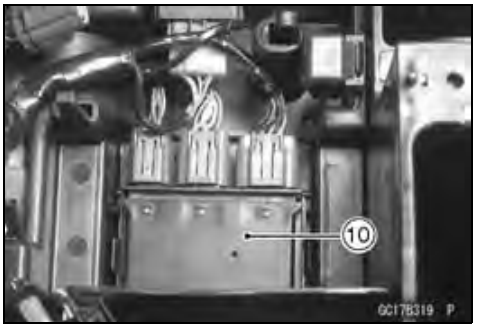
DFI Parts Location

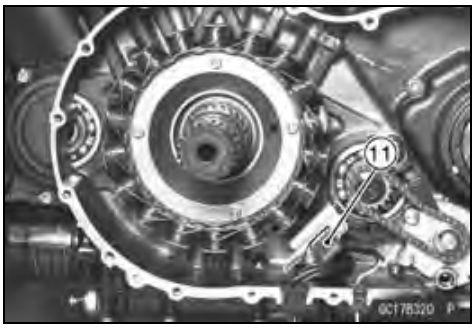


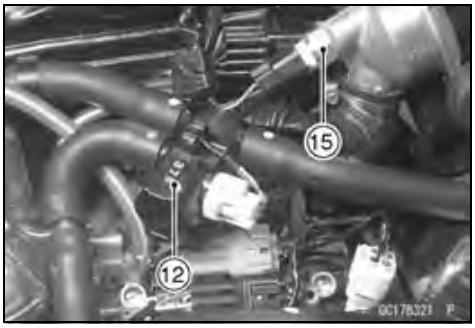


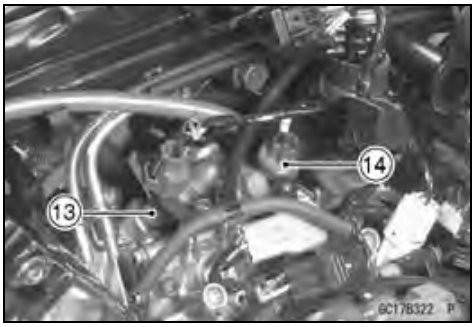


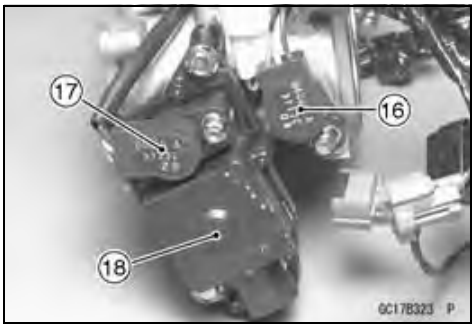


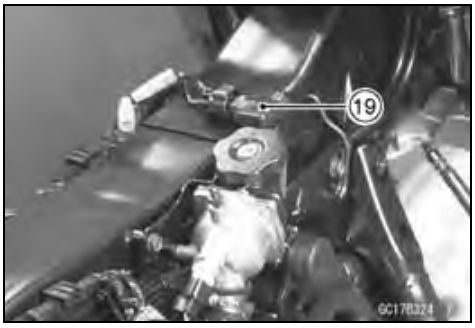








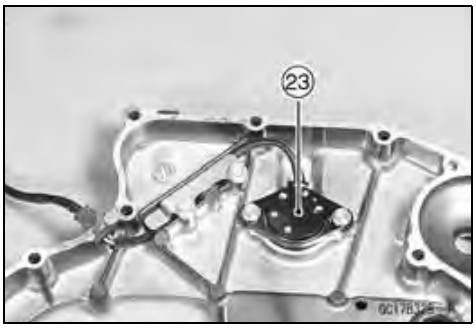


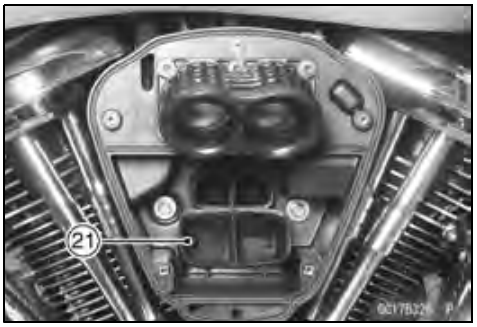


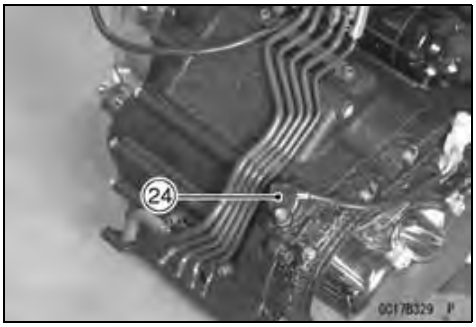
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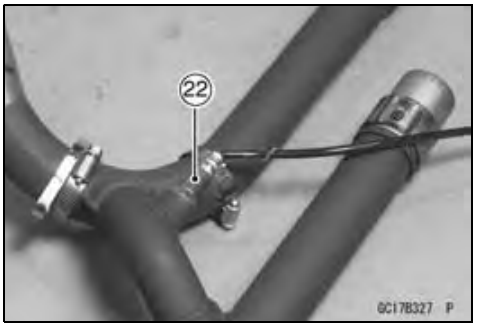
DFI Parts Location











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Specifications

Item	Standard
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
Air Cleaner Element	Viscous paper element
DFI System	
Make	Denso
Idle Speed	900 ±50 r/min (rpm)
Throttle Body Assy:	
Type × Bore	Two barrel type × ϕ 46 mm (1.81 in.)
ECU (Electronic Control Unit):	
Type	Digital memory type, with built in IC igniter, sealed with resin
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
Throttle Sensor:	Non-adjustable and non-removable
Input Voltage	4.75 ~ 5.25 V DC between BL/W and BR/BK leads
Output Voltage	1.02 ~ 4.62 V DC between Y/W and BR/BK leads (at idle throttle opening to full throttle opening)
Resistance	4 ~ 6 kΩ
Atmospheric Pressure Sensor or Inlet Air Pressure Sensor:	
Input Voltage	4.75 ~ 5.25 V DC
Output Voltage	3.80 ~ 4.20 V DC at standard atmospheric pressure
Inlet Air Temperature Sensor:	
Resistance	1.6 ~ 3.7 kΩ at 20°C (68°F) 0.24 ~ 0.43 kΩ at 80°C (176°F)
Water Temperature Sensor:	
Resistance	1.055 ~ 1.199 kΩ at 40° C (104° F) 0.151 ~ 0.162 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 seconds
Fuel Injectors:	
Type	INP-284
Static Injection Quantity	379.9 ~ 403.5 mL/min
Nozzle Type × Diameter	One spray type with 12 holes
Resistance	11.7 ~ 12.3 Ω at 20° C (68° F)
Fuel Pump:	
Type	Friction pump
Discharge	67 mL or more for 3 seconds
Speed Sensor:	
Input Voltage At Sensor	about 9 ~ 11 V DC at Ignition Switch ON
Output Voltage At Sensor	about 0.05 ~ 0.07 V DC at Ignition Switch ON and 0 km/h

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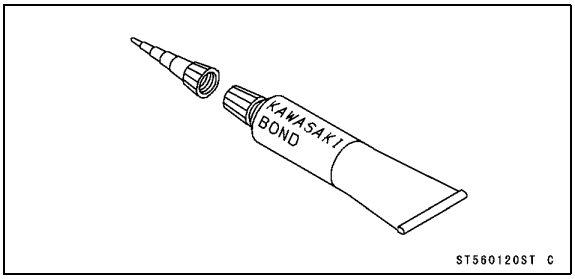
Specifications

Item	Standard
Subthrottle Sensor:	Non-adjustable and non-removable
Input Voltage	4.75 ~ 5.25 V DC between BL/W and BR/BK leads
Output Voltage	1.02 ~ 4.62 V DC between Y and BR/BK leads (at idle throttle opening to full throttle opening)
Resistance	4 ~ 6 kΩ
Subthrottle Valve Actuator:	
Resistance	about 5 ~ 7 Ω
Input Voltage	about 8.5 ~ 10.5 V DC
Oxygen Sensor (CAL, WVTA (FULL H), GB WVTA (FULL H) Models):	
Output Voltage (Rich)	0.7 ~ 0.8 V
Output Voltage (Lean)	approx. 0.1 V
Heater Resistance	14.1 ~ 19.3 Ω at 20°C (68°F)

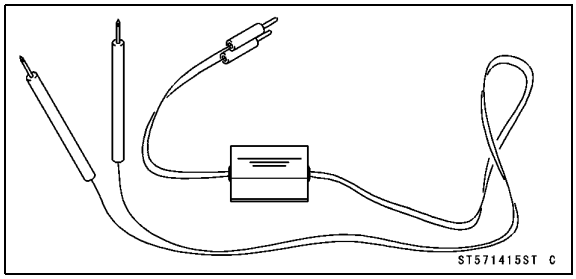
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Special Tools and Sealant

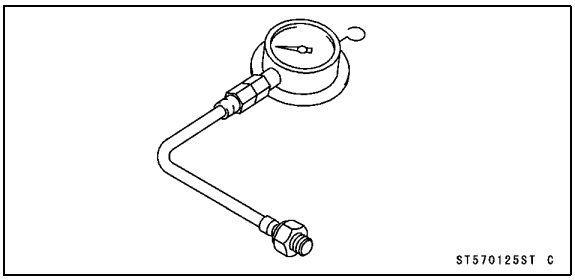
Kawasaki Bond (Silicone Sealant):
56019-120



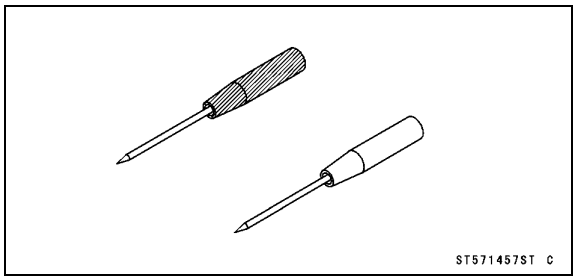
Peak Voltage Adapter:
57001-1415



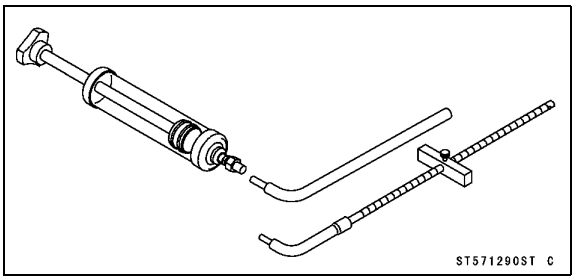
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



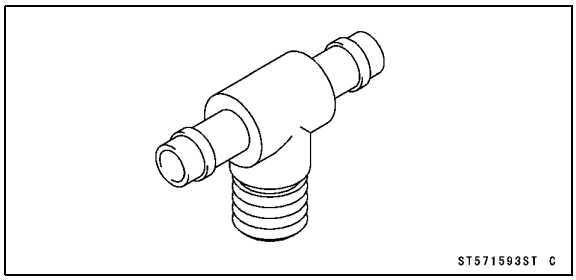
Needle Adapter Set:
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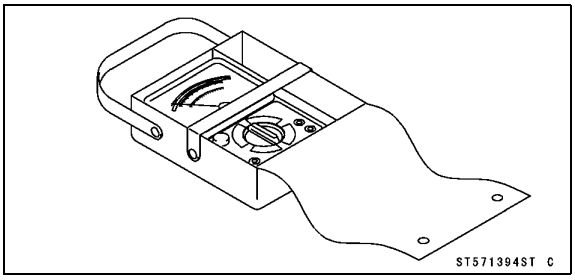
Fork Oil Level Gauge:
57001-1290



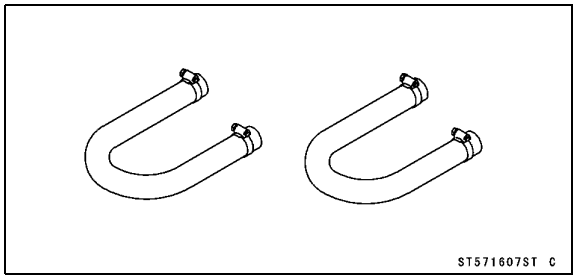
Fuel Pressure Gauge Adapter:
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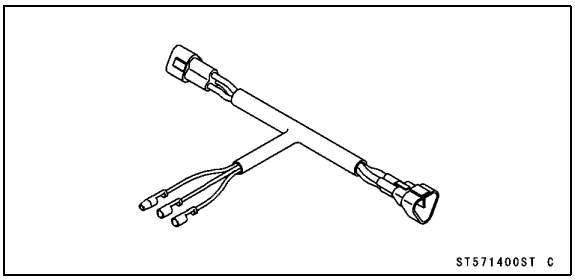
Hand Tester:
57001-1394



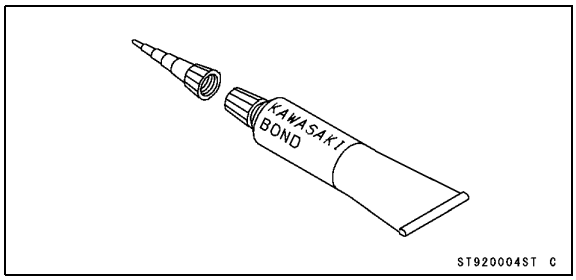
Fuel Hose:
57001-1607



Throttle Sensor Setting Adapter #1:
57001-1400



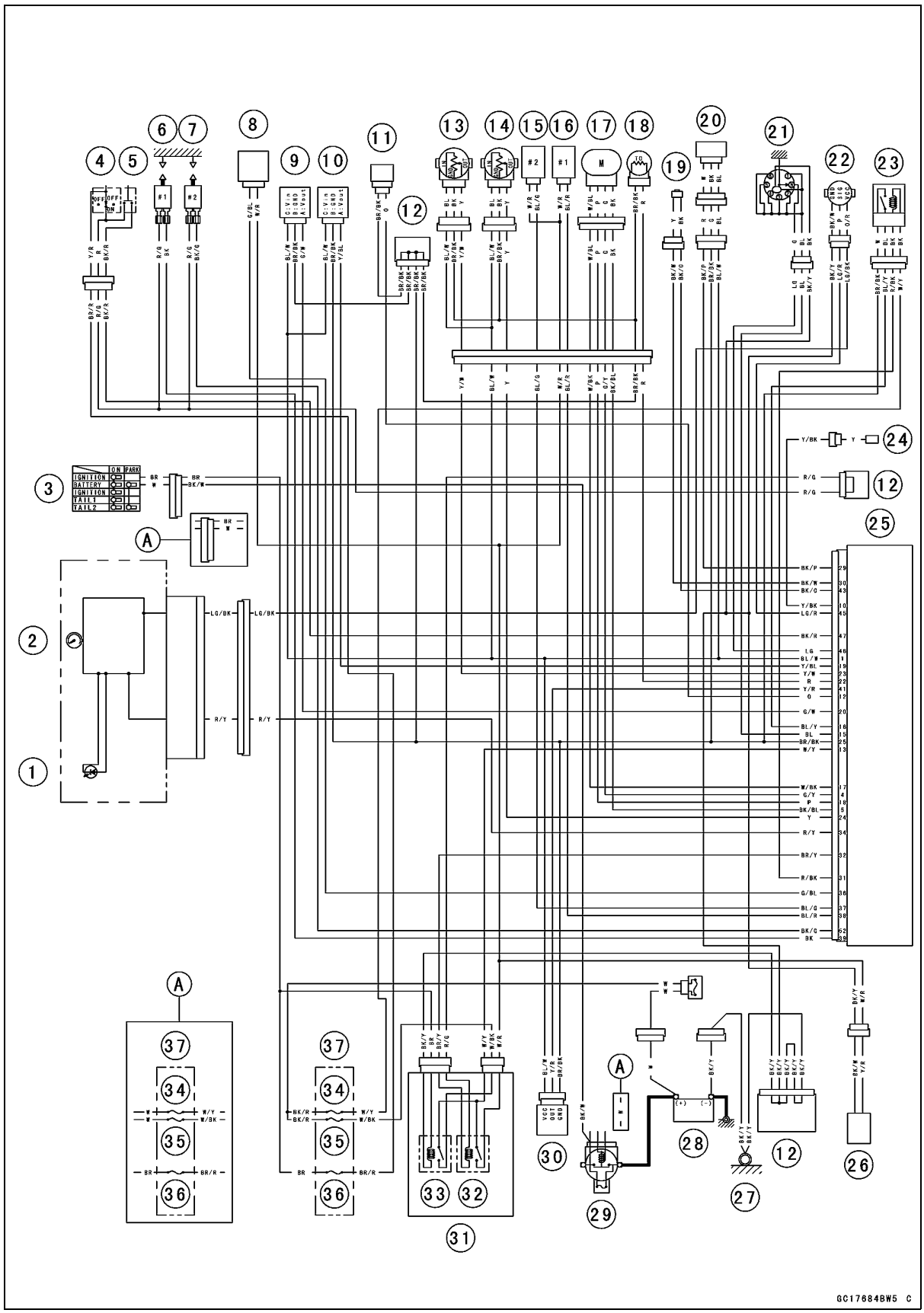
Kawasaki Bond (Silicone Sealant) TB1211F:
92104-0004



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DFI System

DFI System Wiring Diagram



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DFI System

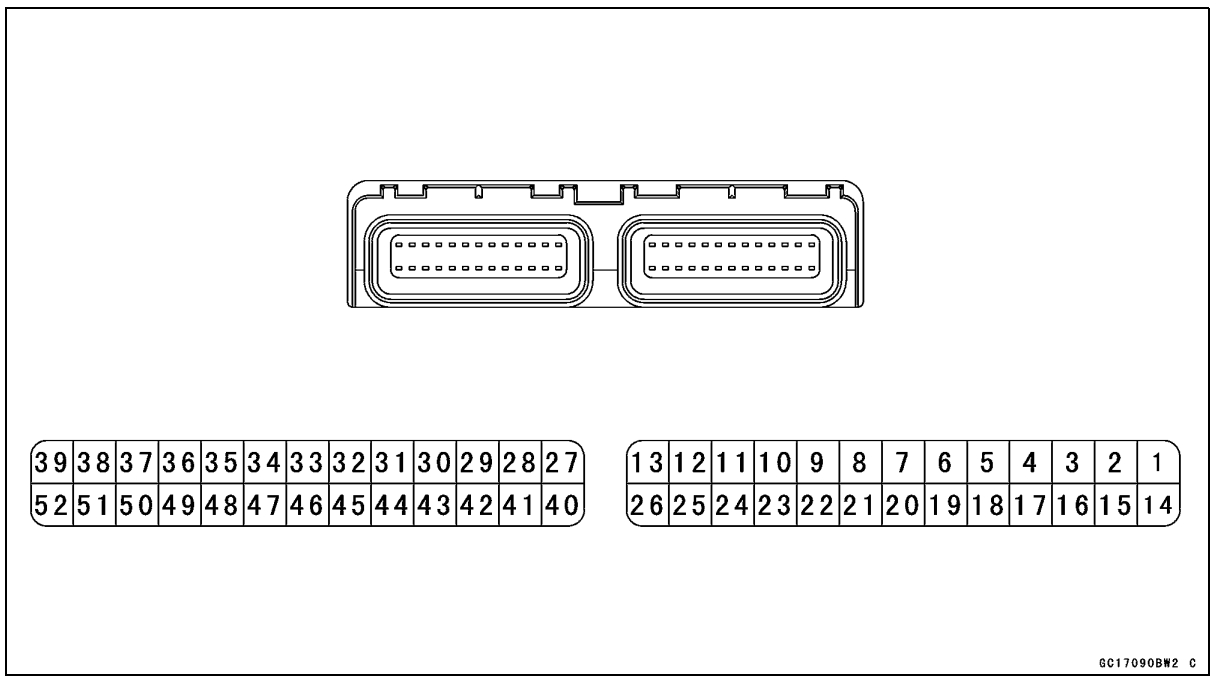
Part Name

1. FI Indicator LED Light
2. Speedometer
3. Ignition Switch
4. Engine Stop Switch
5. Starter Button
6. Ignition Coil #1
7. Ignition Coil #2
8. Air Switching Valve
9. Atmospheric Pressure Sensor
10. Inlet Air Pressure Sensor
11. Water Temperature Sensor
12. Joint Connector
13. Main Throttle Sensor
14. Subthrottle Sensor
15. Injector #2
16. Injector #1
17. Subthrottle Valve Actuator
18. Inlet Air Temperature Sensor
19. Crankshaft Sensor
20. Camshaft position Sensor
21. Gear Position Switch
22. Speed Sensor
23. Oxygen Sensor (CAL, WVTA (FULL H), GB WVTA (FULL H) Models)
24. Self-diagnosis Terminal
25. ECU (Electric Control Unit)
26. Fuel Pump
27. Frame Ground
28. Battery
29. Main Fuse 30 A
30. Vehicle-down Sensor
31. Relay Box
32. Fuel Pump Relay
33. ECU Main Relay
34. Compression Release Solenoid Fuse 10 A
35. ECU Fuse 15 A
36. Ignition Fuse 10 A
37. Fuse Box

A: VN2000-A1

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DFI System



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DFI System

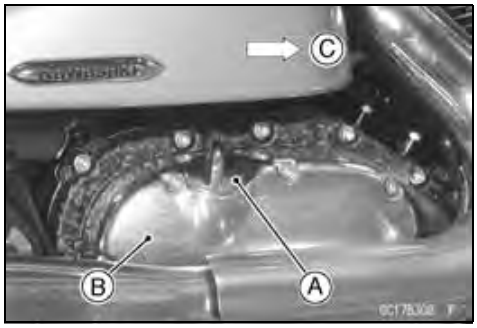
Terminal Names

1. Power Supply to Sensors
2. Unused
3. Radiator Fan Signal
4. Subthrottle Valve Actuator Signal 3
5. Subthrottle Valve Actuator Signal 1
6. Unused
7. Engine Stop Switch Output Signal
8. Unused
9. –
10. Self-diagnosis Terminal
11. Back up Power Supply from Battery
12. Water Temperature Sensor Output Signal
13. Power Supply to ECU from ECU Relay
14. Unused
15. Gear Position Sensor Output Signal
16. Oxygen Sensor Output Signal (CAL, WVTA (FULL H), GB WVTA (FULL H) Models)
17. Subthrottle Valve Actuator Signal 4
18. Subthrottle Valve Actuator Signal 2
19. Inlet Air Pressure Sensor Output Signal
20. Atmospheric Pressure Sensor Output Signal
21. Unused
22. Inlet Air Temperature Output Signal
23. Main Throttle Sensor Output Signal
24. Subthrottle Sensor Output Signal
25. Ground for Sensors
26. Ground for ECU
27. Ground for Power
28. Unused
29. Camshaft Position Sensor (+) Output Signal
30. Crankshaft Sensor (+) Output Signal
31. Oxygen Sensor Heater Signal (CAL, WVTA (FULL H), GB WVTA (FULL H) Models)
32. Fuel Pump Relay Signal
33. Decompression Solenoid Signal
34. FI Indicator LED Light
35. Water Temperature Warning Light
36. Air Switching Valve Signal
37. Injector #2 Signal
38. Injector #1 Signal
39. Injector Coil #1 Signal
40. Starter Control Relay Signal
41. Vehicle-down Sensor Output Signal
42. Unused
43. Crankshaft Sensor (−) Output Signal
44. Interlock Circuit Signal
45. Speed Sensor Output Signal
46. Gear Position Switch (Neutral) Output Signal
47. Starter Button Output Signal
48. Starter Lockout Switch Output Signal
49. Injector #3 Output Signal Communication for DIAG
50. Unused
51. Ground for Ignition System
52. Ignition Coil #2 Signal

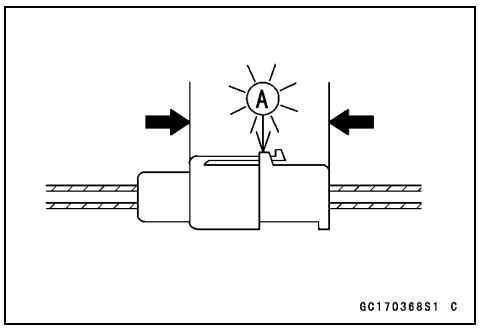
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DFI Servicing Precautions

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/dipstick [A] after filling the engine oil.
  Outer Transmission Cover [B]
  Front [C]
- 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.



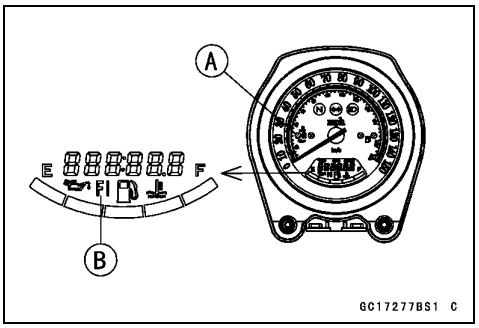
- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition switch, and disconnect the battery (–) terminal. Do not pull the lead, only the connector. Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- Connect 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

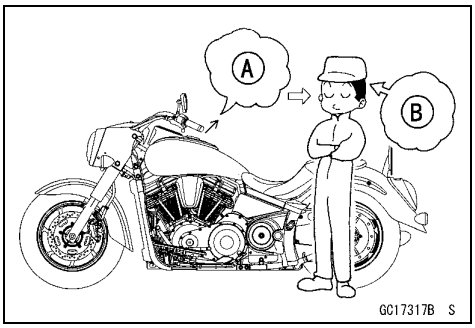
When an abnormality in the system occurs, the FI indicator LED light [A] and FI symbol [B] go on to alert the rider on the meter panel. In addition, the condition of the problem is stored in the memory of the ECU (electronic control unit).



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.

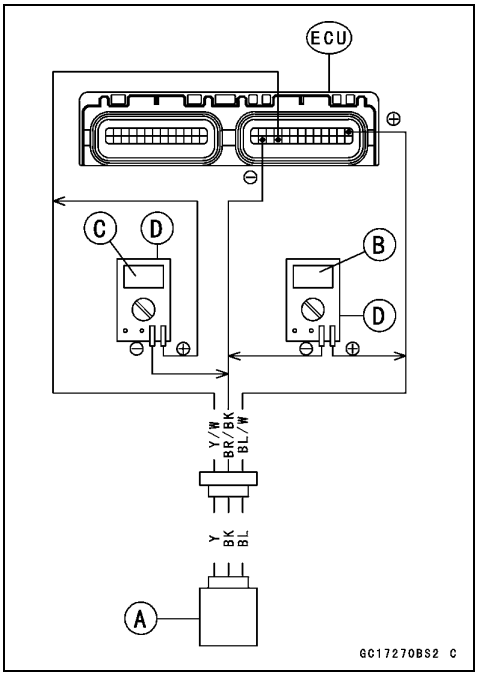
○There are two ways to inspect the DFI system. One is Voltage Check Method and the other is Resistance Check Method.

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.



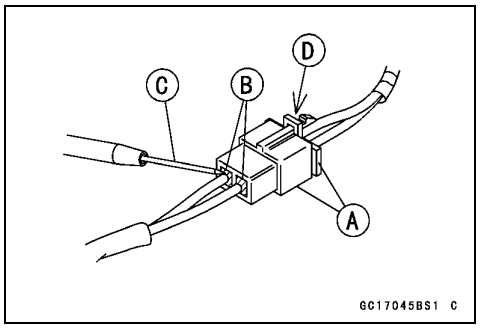
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Troubleshooting the DFI System

○The DFI part connectors [A] have seals [B], including the ECU.

● 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.

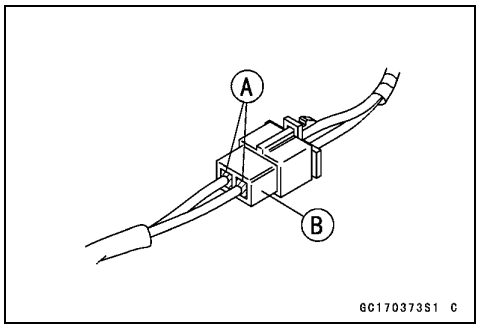
● Turn the ignition switch ON and measure the voltage with the connector joined.

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.

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

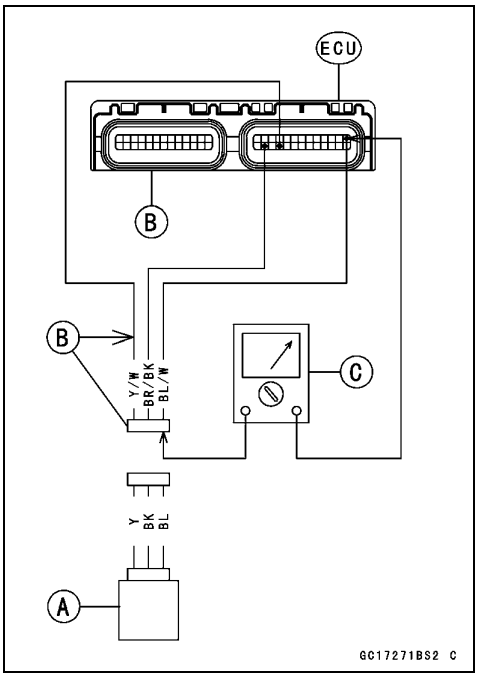


● Always check battery condition before replacing the DFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.

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Troubleshooting the DFI System

Resistance Check Method



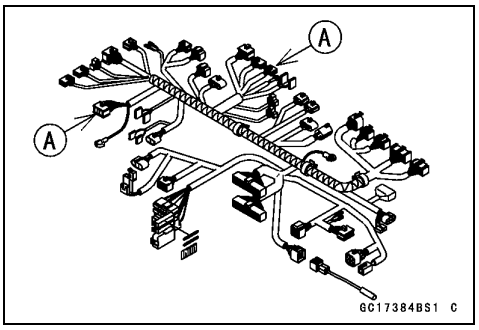
○This method is simple. No need for a fully charged battery and the needle adapter. Just do the following especially when a sensor [A] is suspect.

- 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 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.

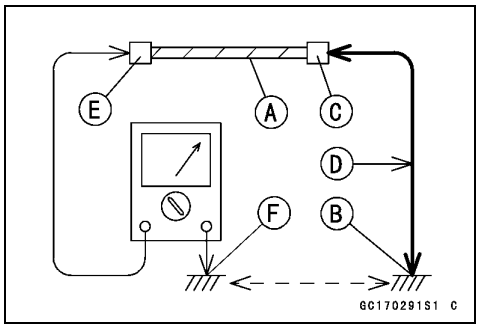
- Check the wiring for continuity.

○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.

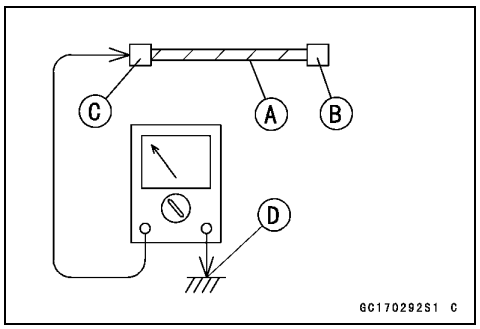
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Troubleshooting the DFI System

○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.

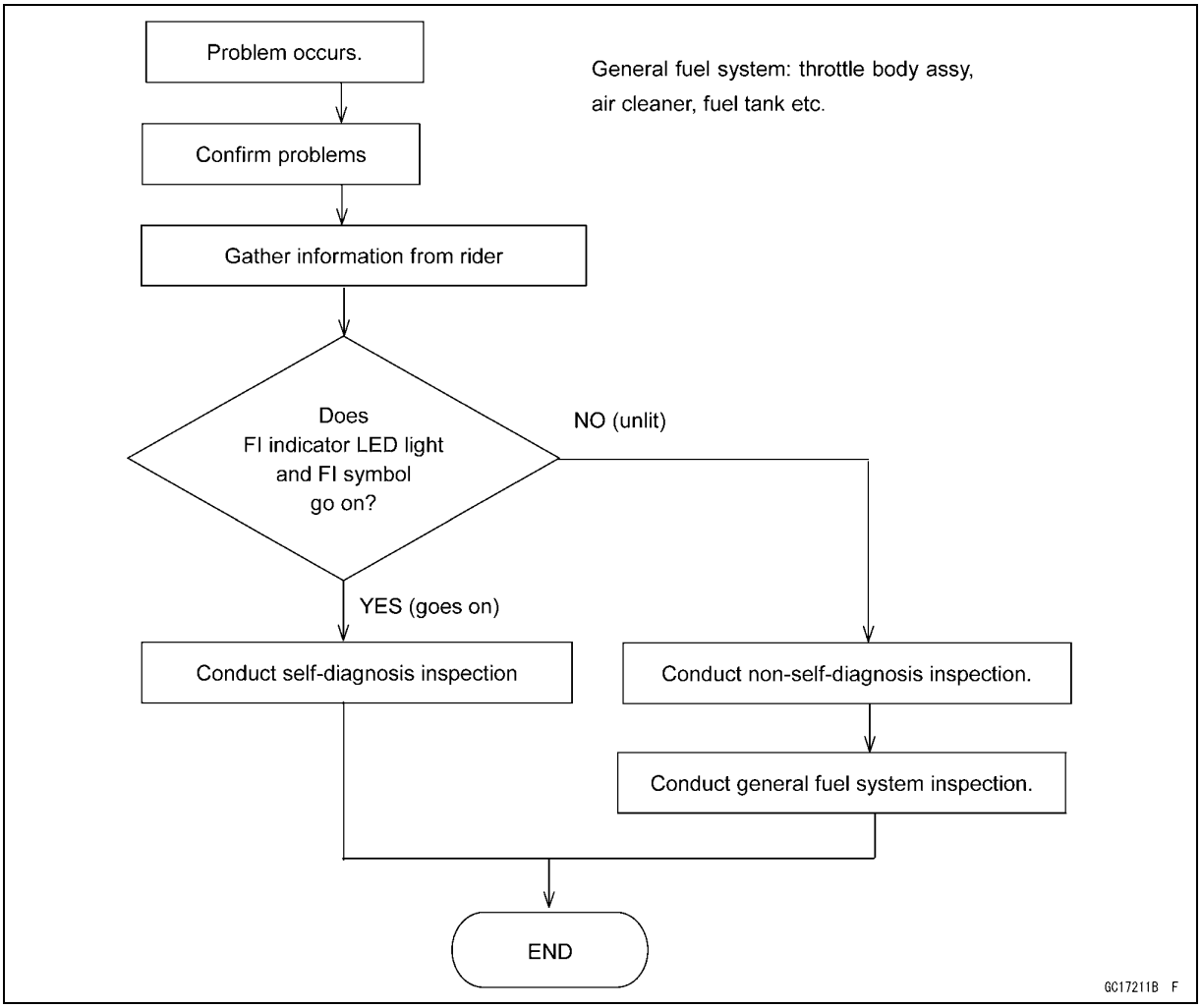
○Wire Color Codes:

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

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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 1000 m 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.	
	□ 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	□ 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.	

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Troubleshooting the DFI System

	□ hesitation when acceleration.
	□ engine oil viscosity too high.
	□ brake dragging.
	□ engine overheating.
	□ clutch slipping.
	□ other:
Poor running or no power at high speed	□ 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 sidestand up or not	Pull the lever in and shift the gear in neutral.
Though clutch lever pulled in but sidestand up and gear not in neutral	Sidestand down and clutch lever pulled inwhether 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 sidestand 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).
Throttle valves or actuator 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).
Compression release mechanism 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).
Throttle valves or actuator trouble	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	
Throttle valves or actuator 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).
Throttle valves or actuator 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).
Compression release mechanism	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 crankshaft sensor and IC igniter in ECU (see chapter 16).
Poor acceleration	
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).
Inlet air temperature sensor trouble	Inspect (see chapter 3).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
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).
Air switching 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 belt trouble	Inspect and replace (se chapter 11).
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
Air switching valve trouble	Inspect and replace (see chapter 16).
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	
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).
Compression release mechanism 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).

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (detailed reference)
Knocking	
Carbon buit 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 fulley 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 belt trouble	Inspect and replace (see chapter 11).
Camshaft cam worn	Inspect and replace (see chapter 5).
Air switching 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	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).
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).
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 Outline

The self-diagnosis system has three modes and can be switched to another mode by grounding the self-diagnosis terminal [A].



User Mode

The ECU notifies the rider of troubles in DFI system and ignition system by lighting the FI indicator when DFI system and ignition system parts are faulty, and initiates fail-safe function. In case of serious troubles ECU stops the injection/ignition/starter motor operation.

Dealer Mode 1

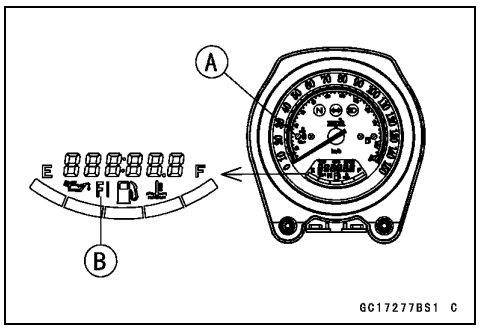
The FI indicator LED light emits service code(s) to show the problem(s) which the DFI system and ignition system has at the moment of diagnosis.

Dealer Mode 2

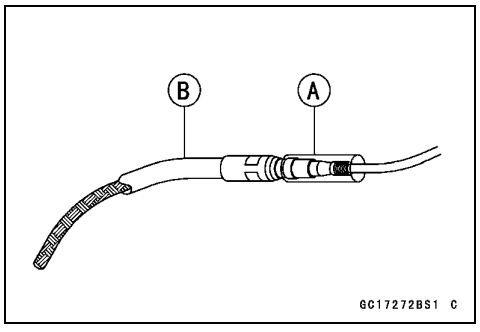
The FI indicator light LED emits service code(s) to show the problem(s) which the DFI system and ignition system had in the past.

Self-diagnosis Procedures

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



- Remove the seats and the battery cover (see Frame and Electrical System chapter).
- Pull the self-diagnosis terminal [A] and connect an auxiliary lead [B] for grounding to the self-diagnosis terminal.



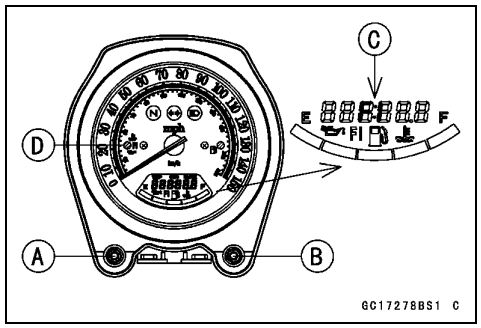
NOTE

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

○*Keep the self-diagnosis terminal grounded during self -diagnosis, with a auxiliary lead.*

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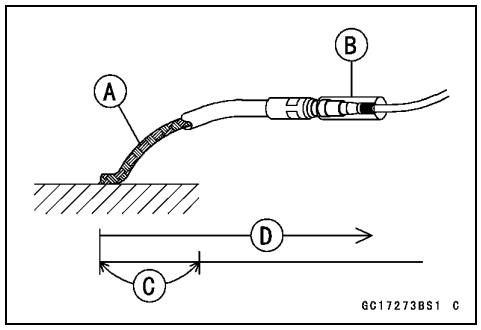
Self-Diagnosis



- Turn the ignition switch ON.
- Push the MODE button [A] and display the odometer.
- Push the RESET button [B] for more than two seconds. The LCD FI characters [C] are displayed.

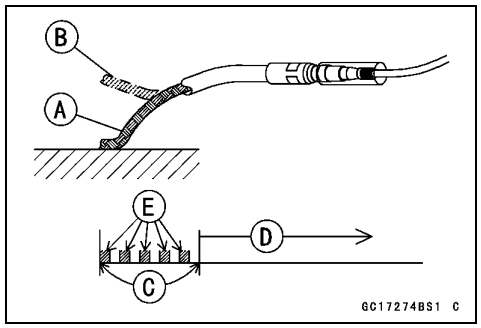
- Count the blinks of the LED light [D] to read the service code after entering the self-diagnosis mode 1 or 2.
- Any of the following procedures (conditions) ends self -diagnosis.

○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.



- To enter the self-diagnosis dealer mode 1 ground [A] the self-diagnosis terminal [B] to the ground for more than 2 seconds [C], and then keep it grounded continuously [D].

○Count the blinks of the LED light to read the service code. Keep the auxiliary lead ground until you finish reading the service code.



- To enter the self-diagnosis dealer mode 2 repeat opening [B] and grounding [A] the lead more than five times [E] within 2 seconds [C] after the lead is first grounded, and then keep it grounded continuously [D] for more than 2 seconds.

○Count the blinks of the LED light to read the service code. Keep the auxiliary lead ground until you finish reading the service code.

NOTE

○*If the self-diagnosis mode is in dealer mode 1 then you need to enter the dealer mode 2, turn off the ignition switch once.*

Service Code Clearing Procedures

- Enter the self-diagnosis dealer mode 2 (see Self- diagnosis Procedures).

NOTE

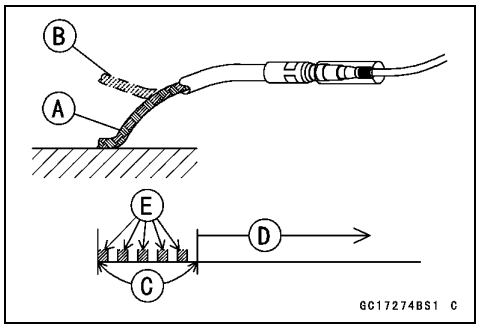
○*Make sure to keep the grounding until the following opening and grounding starts.*

- Pull the clutch lever in more than 5 seconds, and then release it.

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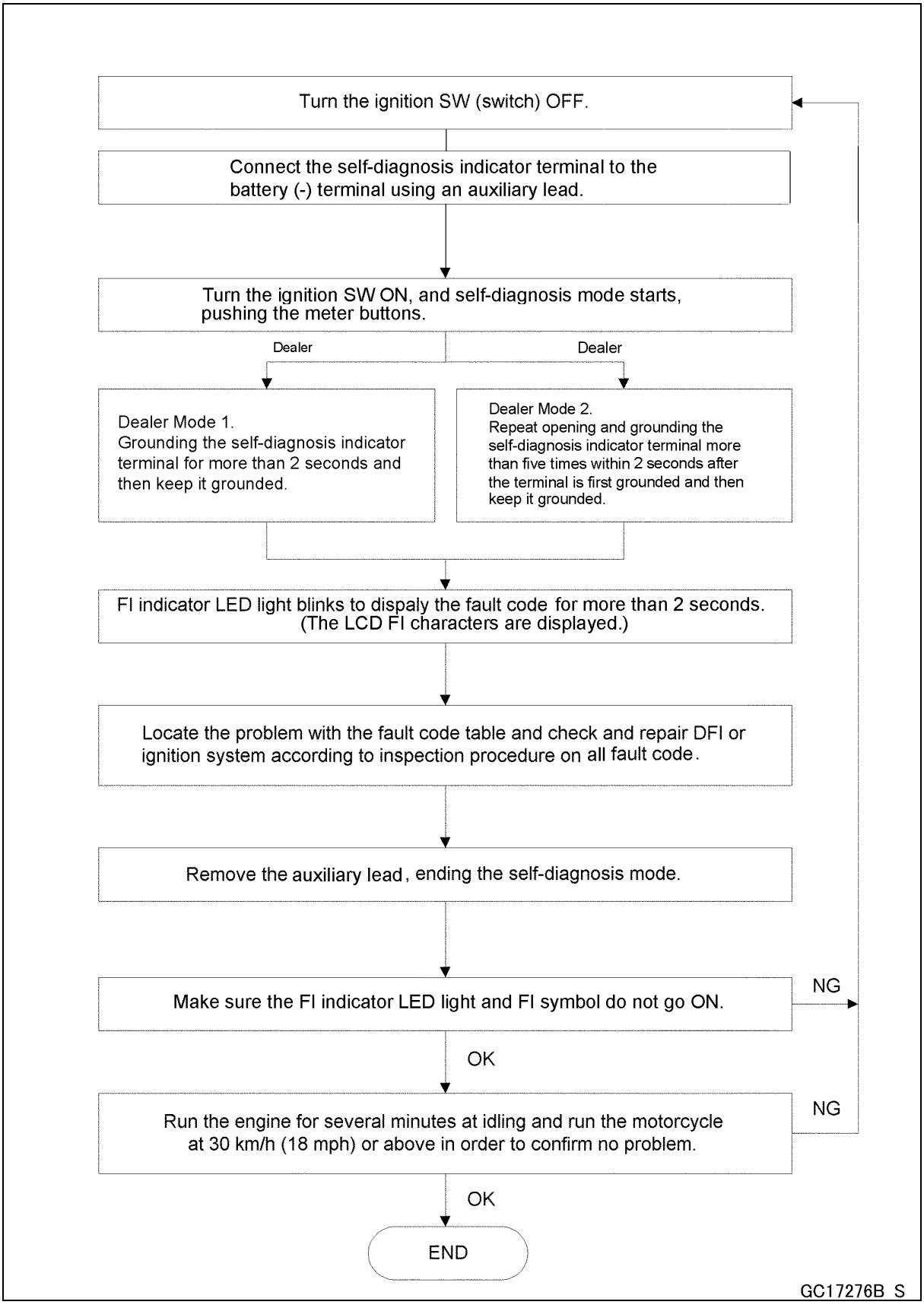
Self-Diagnosis

- Repeat opening [B] and grounding [A] the lead (self-diagnosis terminal) more than five times [E] within 2 seconds [C] after the lead is grounded, and then keep it grounded continuously [D] for more than 2 seconds.



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Self-Diagnosis



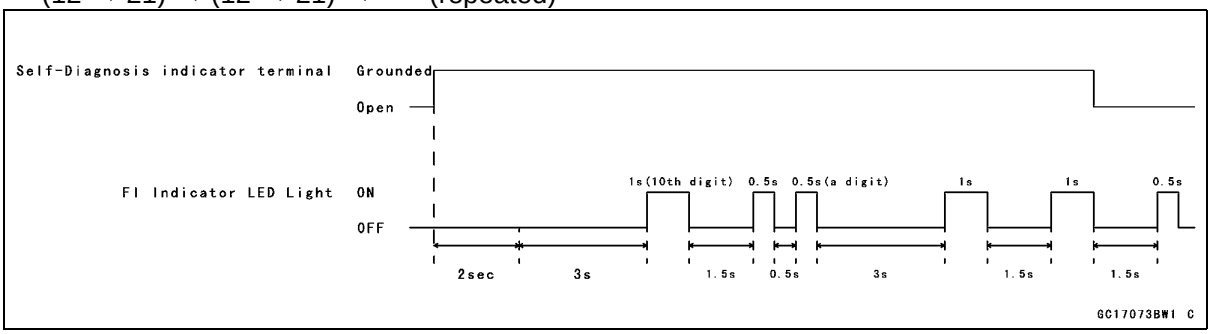
How to Read Service Codes

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

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Self-Diagnosis

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



○If the problem is with the following parts, the ECU cannot memorize these problems, the FI indicator LED light doesn't go on, and no service codes can be displayed.
FI Indicator LED Light
ECU Main Relay
ECU Power Source Wiring and Ground Wiring (see ECU Inspection in this chapter)

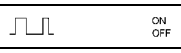
How to Erase Service Codes

○Even if the ignition switch is turned OFF, the battery or the ECU are disconnected, or the problem is solved, all service codes remain in the ECU.
● Refer to the Service Code Clearing Procedure for the service code erasure.

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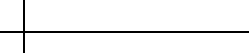
Self-Diagnosis

Service Code Table

Service Code	FI Indicator LED Light	Problems (1)
11		Main throttle sensor malfunction, wiring open or short
12		Inlet air pressure sensor malfunction, wiring open or short
13		Inlet air temperature sensor malfunction, wiring open or short
14		Water temperature sensor malfunction, wiring open or short
15		Atmospheric pressure sensor malfunction, wiring open or short
21		Crankshaft sensor malfunction, wiring open or short
23		Camshaft position sensor malfunction, wiring open or short
24		Speed sensor malfunction, wiring open or short
25		Gear position sensor malfunction, wiring open or short
31		Vehicle-down sensor, malfunction, wiring open or short
32		Subthrottle sensor malfunction, wiring open or short
33*		Oxygen sensor inactication, 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 #1 primary winding malfunction, wiring or short
52		Ignition coil #2 primary winding malfunction, wiring or short
55		Starter relay malfunction, wiring open or short
56		Radiator fan relay malfunction, wiring open or short
62		Subthrottle valve actuator malfunction, wiring open or short

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Self-Diagnosis

Service Code	FI Indicator LED Light	Problems (1)
64		Air switching valve malfunction, wiring open or short
66		Decompression solenoid malfunction, wiring open or short
67*		Oxygen sensor heater malfunction, wiring open or short
85		Subthrottle stepping driver malfunction, wiring open or short
94*		Oxygen sensor malfunction, wiring open or short

Footnotes

(1) 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.

*: CAL, WVTA (FULL H), GB WVTA (FULL H) Models

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Self-Diagnosis

Backups

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Main Throttle Sensor	Main Throttle Sensor Output Voltage 0.2 ~ 4.8 V	If the main throttle sensor system fails (the signal is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method. Also, the main throttle sensor system and inlet air pressure fails, the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the α-N method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure (absolute) Pv = 100 mmHg ~ 900 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 40°C.
14	Water Tem-perature Sensor	Water Temperature Tw = – 30C° ~ + 120°C	If the water temperature sensor system fails (the signal is out of the usable range, wiring short or op en), the ECU sets Tw at 80°C.
15	Atmo-spheric Pressure Sensor	Absolute Atmospheric Pressure Pa = 100 mmHg ~ 900 mmHg	If the atmospheric pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pa at 760 mmHg (the standard atmospheric pressure).
21	Crankshaft Sensor	Crankshaft sensor must send 23 signals (output signal) to the ECU at the one cranking.	If crankshaft sensor generates less than 23 or more signals, the engine stops by itself.
23	Camshaft Position Sensor	Cam sensor must send one signal (output signal) to the ECU at the two cranking	If the camshaft position sensor system fails (the signal is missing, wiring short or open), the ECU continues to ignite cylinders in the same sequence following the last good signal.
25	Gear Position Switch	The gear position is decided by the signal of the speed sensor.	If the speed sensor system fails (no signal, wiring short or open), the ECU set the top (5) gear position.
31	Vehicle -down Sensor	Vehicle-down Sensor Output Voltage (signal) Vd = 0.4 V ~ 4.4 V	If the vehicle-down sensor system has failures (the output voltage Vd is more than usable range, wiring open), the ECU shuts off the fuel pump, the fuel injectors and the ignition system.
32	Subthrottle sensor	Subthrottle Sensor Output Voltage 0.15 ~ 4.85 V	If the subthrottle sensor system fails (the signal is out of the usable range, wiring short or open), the actuator locks sub throttle valve at full open position.
33**	Oxygen Sensor	The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU.	If the oxygen Sensor is not activated, the ECU stops oxygen Sensor feedback mode.

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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.
62	Subthrottle Valve Actuator	The actuator operates open and close of the subthrottle valve by the pulse signal from the ECU.	If the sub throttle actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator.
67**	Oxygen Sensor Heater	The oxygen sensor heater raise temperature of the sensor for its earlier activation. 12V-6.0W, 0.5A	If the oxygen sensor heater fails (wiring short or open), the ECU stops the current to the heater.
85	Subthrottle Stepping Driver	The subthrottle stepping driver must send signals continuously to the ECU	If the subthrottle stepping driver fails, the ECU stops the current to the subthrottle valve actuator.
94**	Oxygen Sensor	The oxygen sensor must send signals (output voltage) continuously to the ECU	If the oxygen sensor output voltage is incorrect, the ECU stops oxygen sensor feed back mode.

Note

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

* This depends on the number of stopped cylinders.

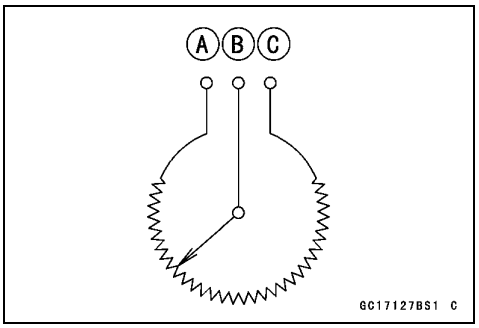
**: CAL, WVTA (FULL H), GB WVTA (FULL H) Models

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Main Throttle Sensor (Service Code 11)

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

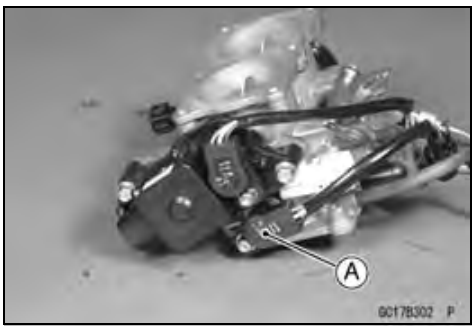
Input Terminal [A]
Output Terminal [B]
Ground Terminal [C]



Main Throttle Sensor Removal/Adjustment

CAUTION

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



Input Voltage Inspection

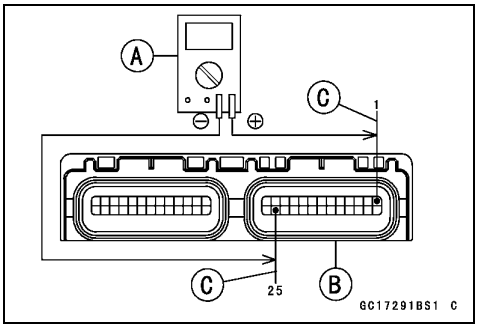
NOTE

○*Be sure the battery is fully charged.*

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

Special Tool - Needle Adapter Set: 57001-1457

Main Throttle Sensor Input Voltage
Connections to ECU Connector
Meter (+)→ BL/W lead (terminal 1)
Meter (–)→ BR/BK lead (terminal 25)



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

Input Voltage at ECU Connector
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, power supply and wiring shorted (see ECU section).

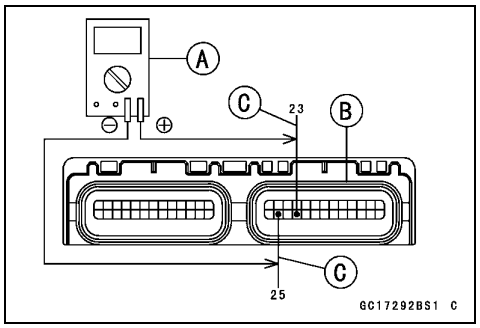
★If the input voltage is within the standard range remove the fuel tank, and check wiring from ECU to the throttle sensor for continuity.

★If the wiring is good, check the output voltage of the throttle sensor.

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Main Throttle Sensor (Service Code 11)

Output Voltage Inspection



- Measure the output voltage at the ECU in the same way as input voltage inspection. Note the following.
  Digital Voltmeter [A]
  Connector [B]

  Special Tool - Needle Adapter Set [C]: 57001-1457

  Main Throttle Sensor Output Voltage
  Connections to ECU
  Meter (+) → Y/W lead (terminal 23)
  Meter (–) → BR/BK lead (terminal 25)

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

  Idle Speed
  Standard: 900 ±50 r/min (rpm)

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

- Turn the ignition switch OFF.
- Measure the output voltage with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.
- Measure the output voltage when the throttle is fully opened or completely closed.

  Output Voltage at ECU
  Standard: 1.02 ~ 4.62 V DC (at idle throttle opening to full throttle opening)

NOTE

○*The throttle sensor is operating correctly if the following voltages are obtained:*
• 1.02 VDC (or slightly higher) with the throttle at the idle position.
• 4.62 VDC (or slightly lower) with the throttle at the fully open position.

CAUTION

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

NOTE

○*The standard voltage marked with an asterisk refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
Example:
In the case of a input voltage of 4.75 V.
1.02 × 4.75 ÷ 5.00 = 0.97 V
4.62 × 4.75 ÷ 5.00 = 4.39 V
Thus, the valid range is 0.97 ~ 4.39 V

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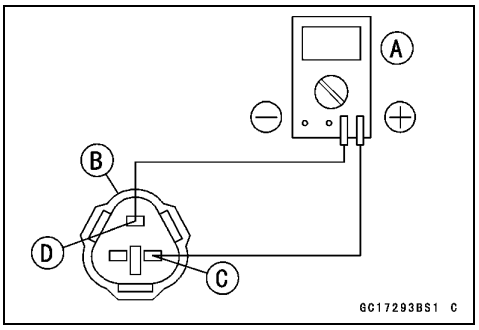
Main Throttle Sensor (Service Code 11)

★If the output voltage is within the standard range, check the wiring for continuity (see next diagram).
★If the output voltage is far out of the standard range (e.g. when the wiring is open, the reading is 0 V), check the throttle sensor resistance.

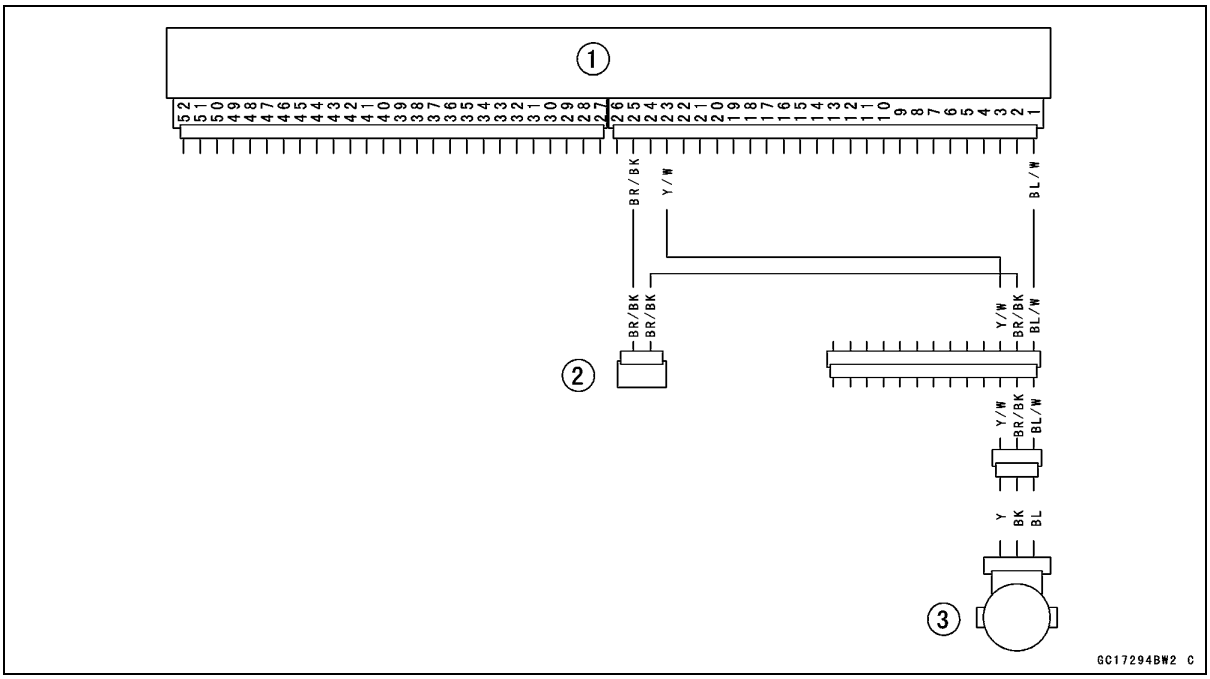
Resistance Inspection

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

Main Throttle Sensor Resistance
Connections: **BL lead [C] ←→ BK lead [D]**
Standard: **4 ~ 6 kΩ**



★If the reading is out of the range, replace the throttle body assy.
★If the reading is within the range, but the problem still exists, replace the ECU.



1. ECU
2. Joint Connector
3. Main Throttle Sensor

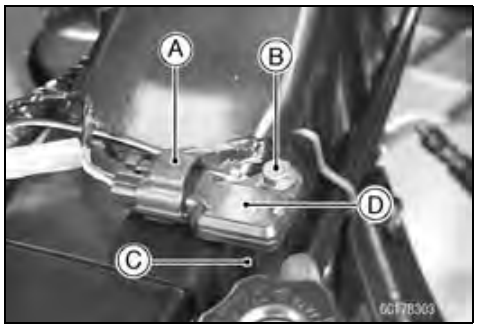
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Inlet Air Pressure Sensor (Service Code 12)

Removal

CAUTION

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

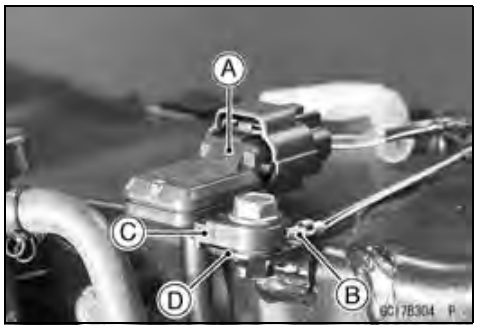


- Remove the fuel tank (see Fuel Tank section in this chapter).
- Disconnect the inlet air pressure sensor connector [A].
- Unscrew the inlet air pressure sensor bolt [B] and remove the sensor [D].
- Disconnect the vacuum hose [C] from the sensor.
  Front [E]

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].

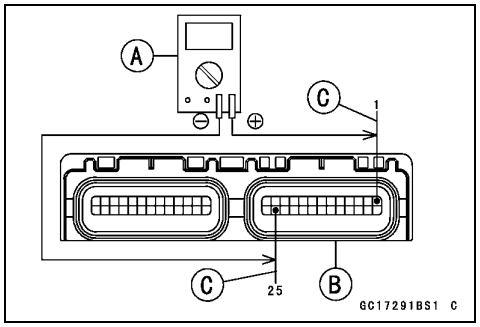
○Be sure he frame ground terminal [B] is in position.
○The stopper [C] must not be on the sensor holder [D].

- Tighten the inlet air pressure sensor bolt securely.
- Install the fuel tank (see Fuel Tank Installation).

Input Voltage Inspection

NOTE

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



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

Special Tool - Needle Adapter Set: 57001-1457

Inlet Air Pressure Sensor Input Voltage
Connections to ECU
Meter (+)→ BL/W lead (terminal 1)
Meter (–) → BR/BK lead (terminal 25)

- Measure the input voltage 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

★If the reading is less than the standard range, check the ECU for its ground, and power supply and wiring shorted (see ECU section in this chapter). If the ground and power supply are good, replace the ECU.

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Inlet Air Pressure Sensor (Service Code 12)

★If the reading is within the standard range, remove the fuel tank, and check wiring from ECU to the inlet pressure sensor for continuity.

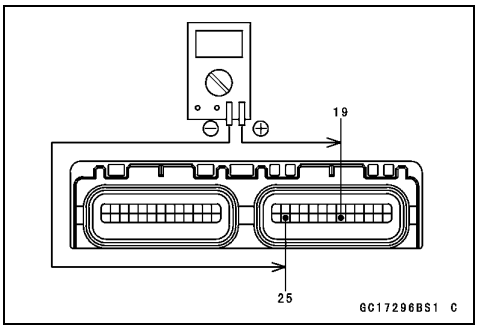
★If wiring is good, check the output voltage of the inlet air pressure sensor.

Output Voltage Inspection

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

Inlet Air Pressure Sensor Output Voltage
Connections to ECU
Meter (+) → Y/BL lead (terminal 19)
Meter (–) → BR/BK lead (terminal 25)

Output Voltage at ECU
Usable Range: 3.80 ~ 4.20 V DC at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs).



NOTE

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

○*The vacuum sensor output voltage is based on a nearly perfect vacuum in the small chamber of the sensor. So, the sensor indicates absolute vacuum pressure.*

★If the output voltage is out of the usable range, replace the sensor

★If the output voltage is normal, check the inlet air pressure sensor for vacuum other than 76 cmHg (abs), check the output voltage as follows:

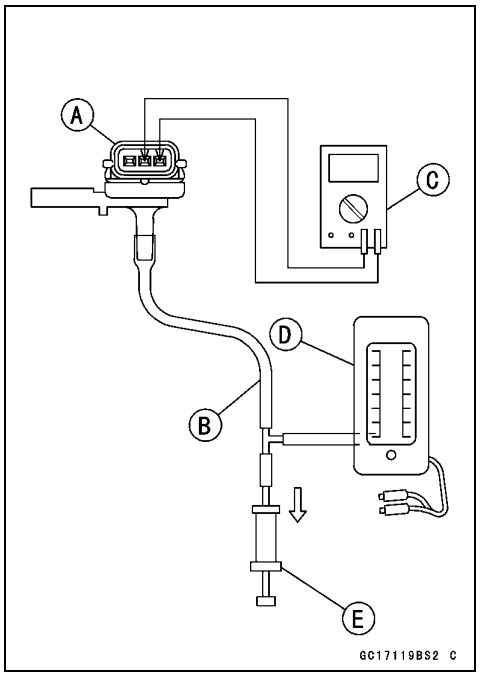
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Inlet Air Pressure Sensor (Service Code 12)

● Remove the inlet air pressure sensor [A] and disconnect the vacuum hose from the sensor.
○Do not disconnect the sensor connector.
● Connect an auxiliary hose [B] to the inlet air pressure sensor.
● Temporarily install the inlet air pressure sensor.
○Connect a commercially available digital meter [C], vacuum gauge [D], and the fork oil level gauge [E] to the inlet air pressure sensor.

Special Tool - Fork Oil Level Gauge: 57001-1290

Inlet Air Pressure Sensor Output Voltage Connection to Sensor
Meter (+) → Y/BL lead
Meter (–) → BR/BK lead



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

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

then
Pv = Pl – Pg

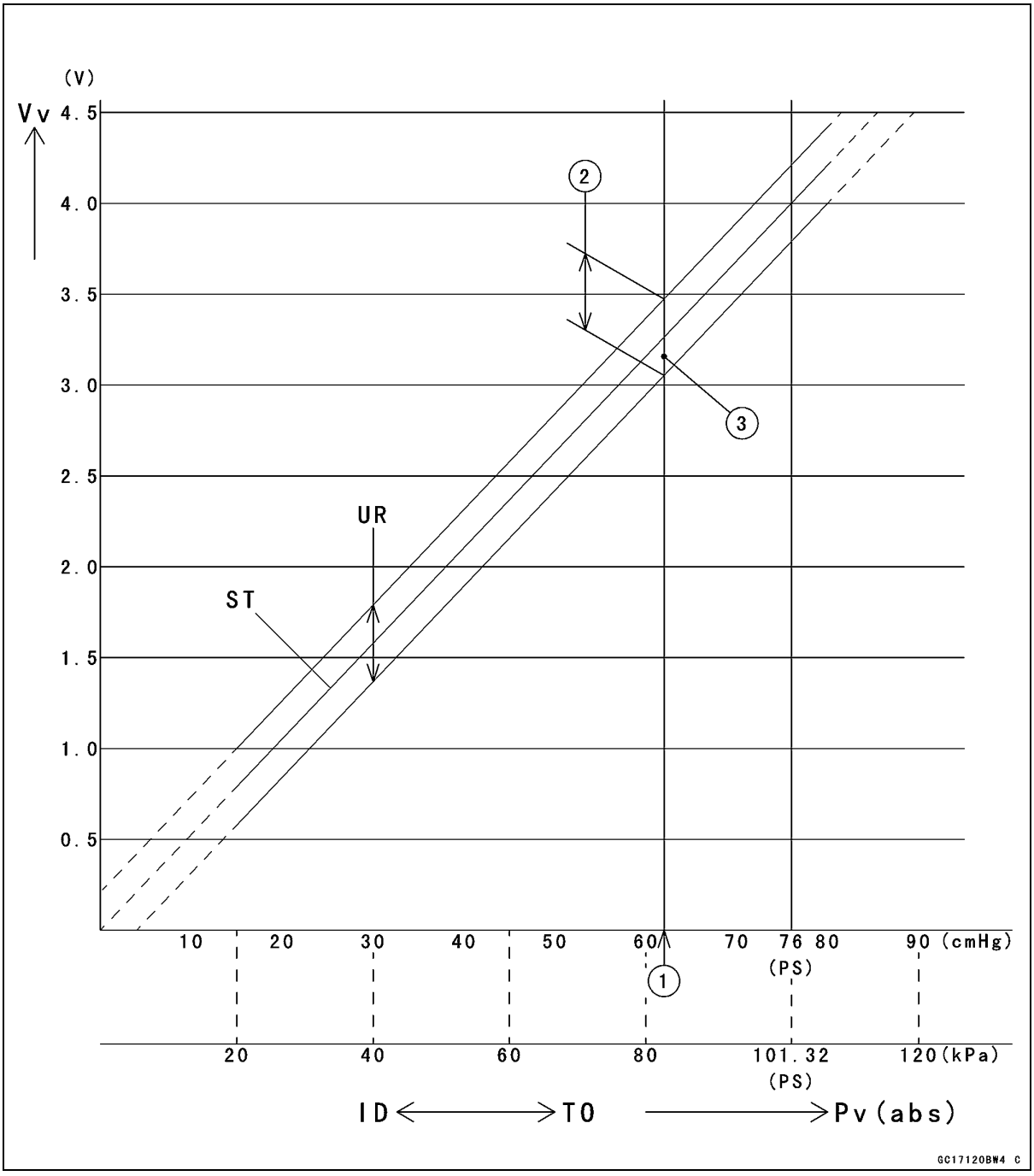
For example, suppose the following data is obtained:
Pg = 8 cmHg (vacuum gauge reading)
Pl = 70 cmHg (barometer reading)
Vv = 3.2 V (digital volt meter reading)

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 = 3.08 ~ 3.48 V
Plot Vv (3.2 V) on the vertical line. → Point [3].
Results: In the chart, Vv is within the usable range and the sensor is normal.

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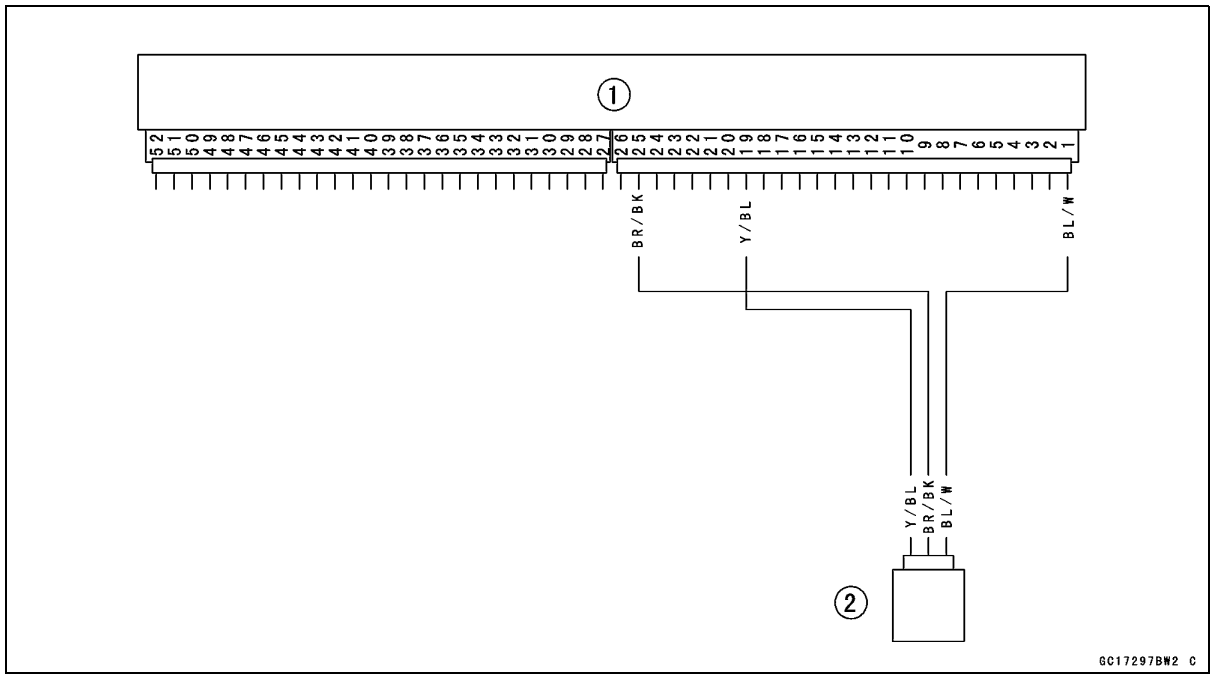
Inlet Air Pressure Sensor (Service Code 12)



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

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Inlet Air Pressure Sensor (Service Code 12)



1. ECU
2. Inlet Air Pressure Sensor

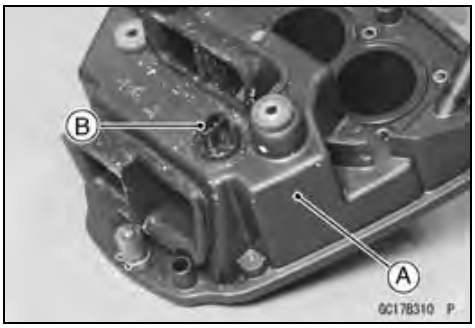
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Inlet Air Temperature Sensor (Service Code 13)

Removal/Installation

CAUTION

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



- Remove the air cleaner housing (see Air Cleaner Housing Removal in this chapter).
- Take the inlet air temperature sensor [B] out of the air cleaner housing..

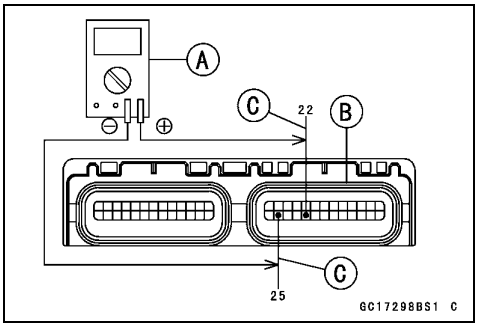
Output Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Remove the ECU (see ECU Removal). Do not disconnect the ECU connectors.
- Connect a digital voltmeter [A] to the ECU connector [B], using needle adapter set [C].

Special Tool - Needle Adapter Set: 57001–1457



Inlet Air Temperature Sensor Output Voltage
Connections to ECU Connector
Meter (+) → R lead (terminal 22)
Meter (–) → BR/BK lead (terminal 25)

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

Output Voltage at ECU
Standard: about 2.25 ~ 2.50 V at inlet air temperature 20°C (68°F)

NOTE

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

- Turn the ignition switch OFF.

★If the output voltage is out of the specified, check the ECU for its ground, and power supply (see ECU section in this chapter). If the ground and power supply are good, remove the air cleaner housing, check the wiring between the ECU and the inlet air temperature sensor.

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

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Inlet Air Temperature Sensor (Service Code 13)

Sensor Resistance Inspection

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

NOTE

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

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

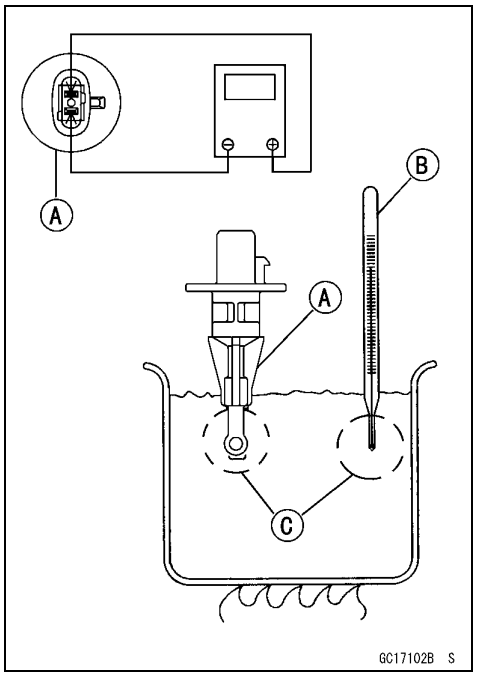
Inlet Air Temperature Sensor Resistance

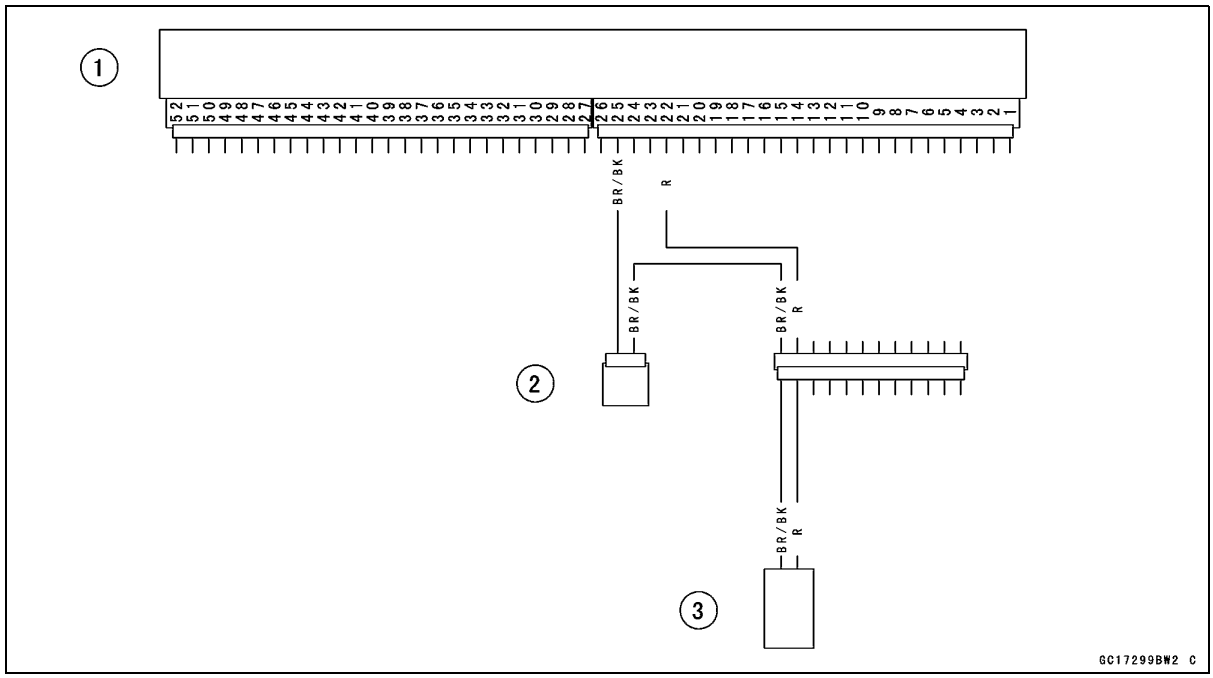
Standard: 1.6 ~ 3.7 kΩ at 20°C (68°F)

0.24 ~ 0.43 kΩ at 80°C (176°F)

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

★If the measurement is within the specified, replace the ECU.



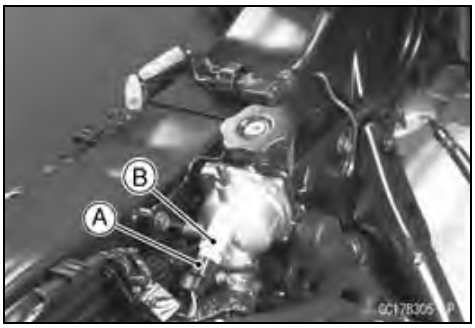


1. ECU
2. Joint Connector
3. Inlet Air Temperature Sensor

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Water Temperature Sensor (Service Code 14)

Removal/Installation



CAUTION

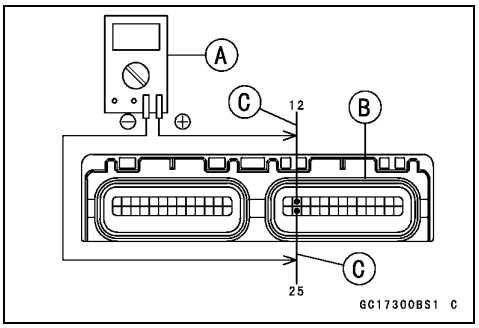
Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the sensor connector [A], and unscrew the water temperature sensor [B].

Torque - Water Temperature Sensor: 12 N·m (1.2 kgf·m, 104 in·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). Do not disconnect the connectors.
- Connect a digital voltmeter [A] to the ECU connector [B], using two needle adapters [C].

Special Tool - Needle Adapter Set: 57001-1457

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

Water Temperature Sensor Output Voltage
Connections to ECU
Meter (+) → O lead (terminal 12)
Meter (–) → BR/BK lead (terminal 25)
Standard: 3.38 V at coolant temperature 25°C

- Turn the ignition switch OFF.

★If the output voltage is out of the specified, check the ECU for its ground, and power supply (see ECU section in this chapter). If the ground and power supply are good, 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.

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Water Temperature Sensor (Service Code 14)

Water Temperature Sensor Resistance Inspection

- Remove the water temperature sensor (see 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

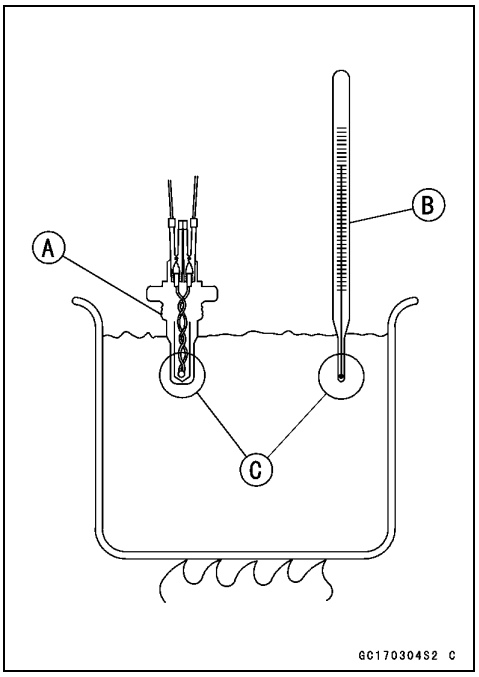
Standard: 1.055 ~ 1.199 kΩ at 40°C (104°F)

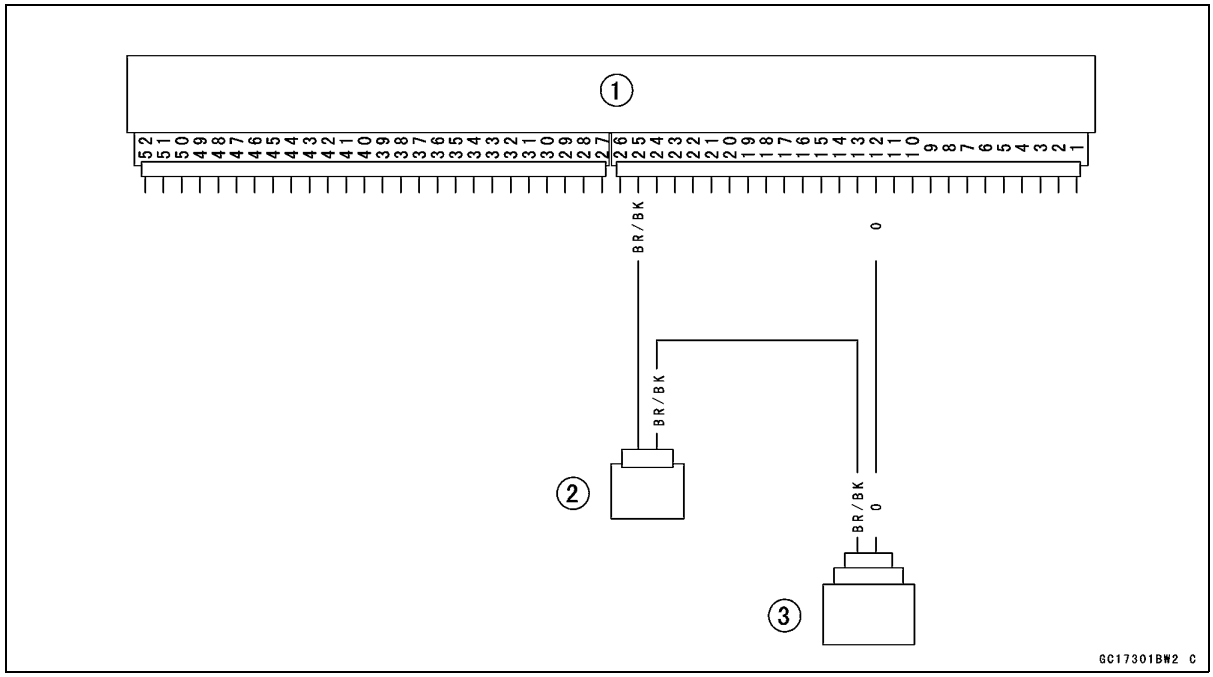
0.151 ~ 0.162 kΩ at 100°C (212°F)

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

★If the measurement is within the specified, the ECU is suspect. Replace the ECU.

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





1. ECU
2. Joint Connector
3. Water Temperature Sensor

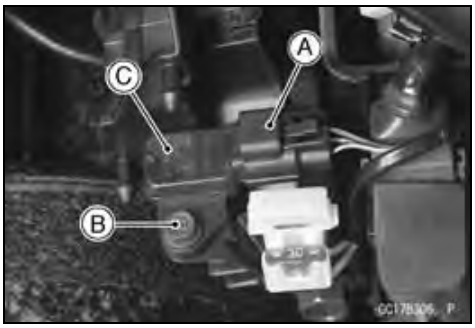
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Atmospheric Pressure Sensor (Service Code 15)

Removal

CAUTION

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

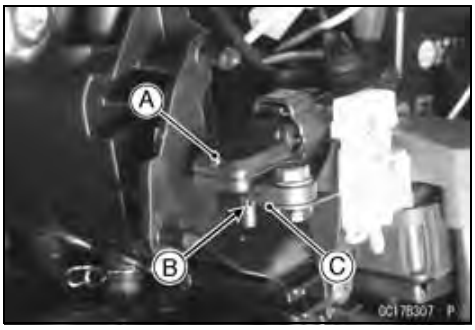


- Turn the ignition switch OFF.
- Remove the left side cover (see Frame chapter).
- Disconnect the atmospheric pressure sensor connector [A].
- Remove the sensor bolt [B].
- Remove the atmospheric pressure sensor [C].

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].

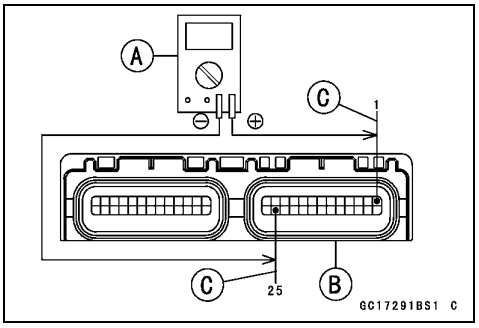
- Tighten the atmospheric pressure sensor bolt securely.
- Install the left side cover (see Frame chapter).

Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

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



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

Special Tool - Needle Adapter Set: 57001–1457

Atmospheric Pressure Sensor Input Voltage
Connections to ECU

Meter (+) → BL/W lead (terminal 1)

Meter (–) → BR/BK lead (terminal 25)

- Measure the input voltage 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

★If the reading of input voltage is less than the standard range, check the ECU for its ground, and power supply (see ECU section in this chapter). If the ground and power supply are good, replace the ECU.

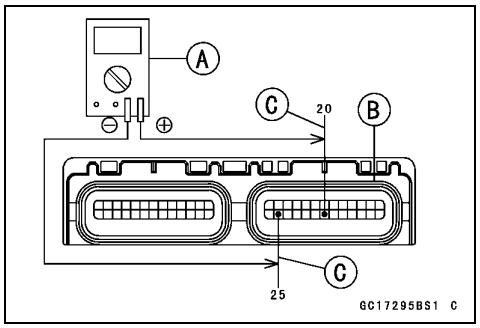
★If the reading is within the standard range, check the wiring between the ECU and atmospheric pressure sensor for continuity.

★If the wiring is good, check the output voltage.

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Atmospheric Pressure Sensor (Service Code 15)

Output Voltage Inspection



● Measure the output voltage at the ECU in the same way as input voltage inspection. Note the following.
Digital Meter [A]
ECU Connector [B]

Atmospheric Pressure Sensor Output Voltage
Connections to ECU

Meter (+) → G/W lead (terminal 20)

Meter (–) → BR/BK lead (terminal 25)

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

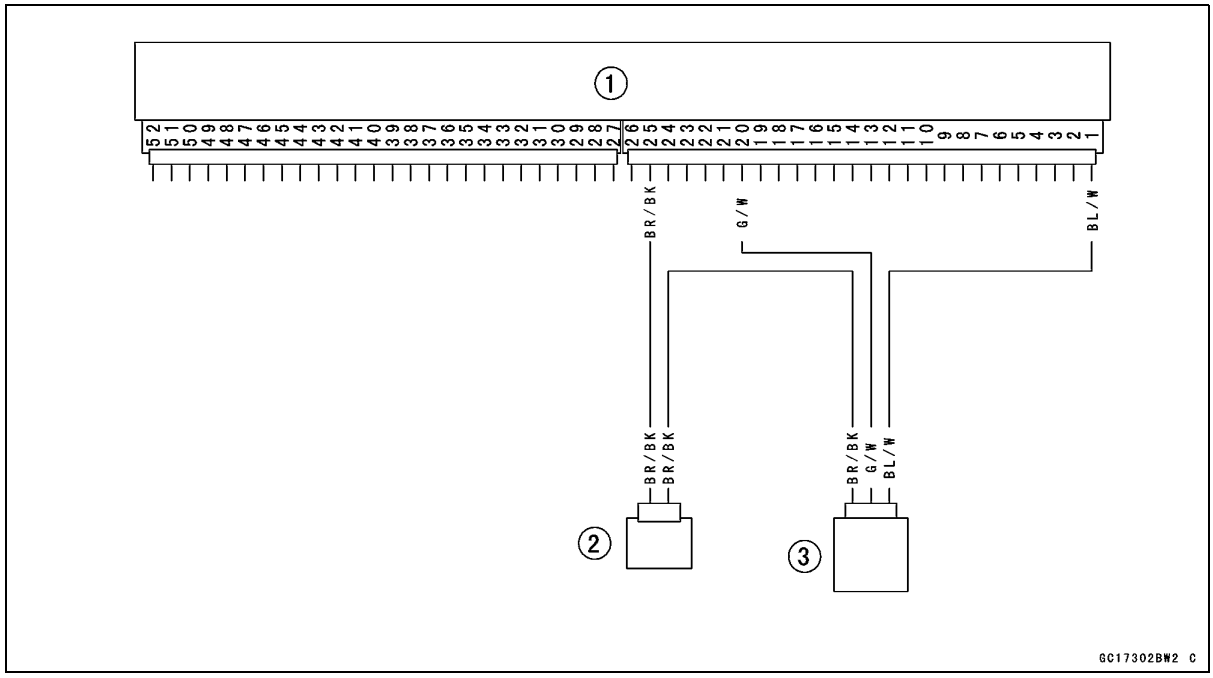
NOTE

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

○*The atmospheric sensor output voltage is based on a nearly perfect vacuum in the small chamber of the sensor. So, the sensor indicates absolute atmospheric pressure.*

★If the output voltage is normal, check the output voltage for atmospheric pressure other than 76 cmHg (abs) (see Inlet Air Pressure Sensor section in this chapter). If the output voltage changes within the usable range as atmospheric pressure changes, the sensor is normal and the ECU is suspect. Replace the ECU.

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



1. ECU
2. Joint Connector
3. Atmospheric Pressure Sensor

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Atmospheric Pressure Sensor (Service Code 15)

★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).

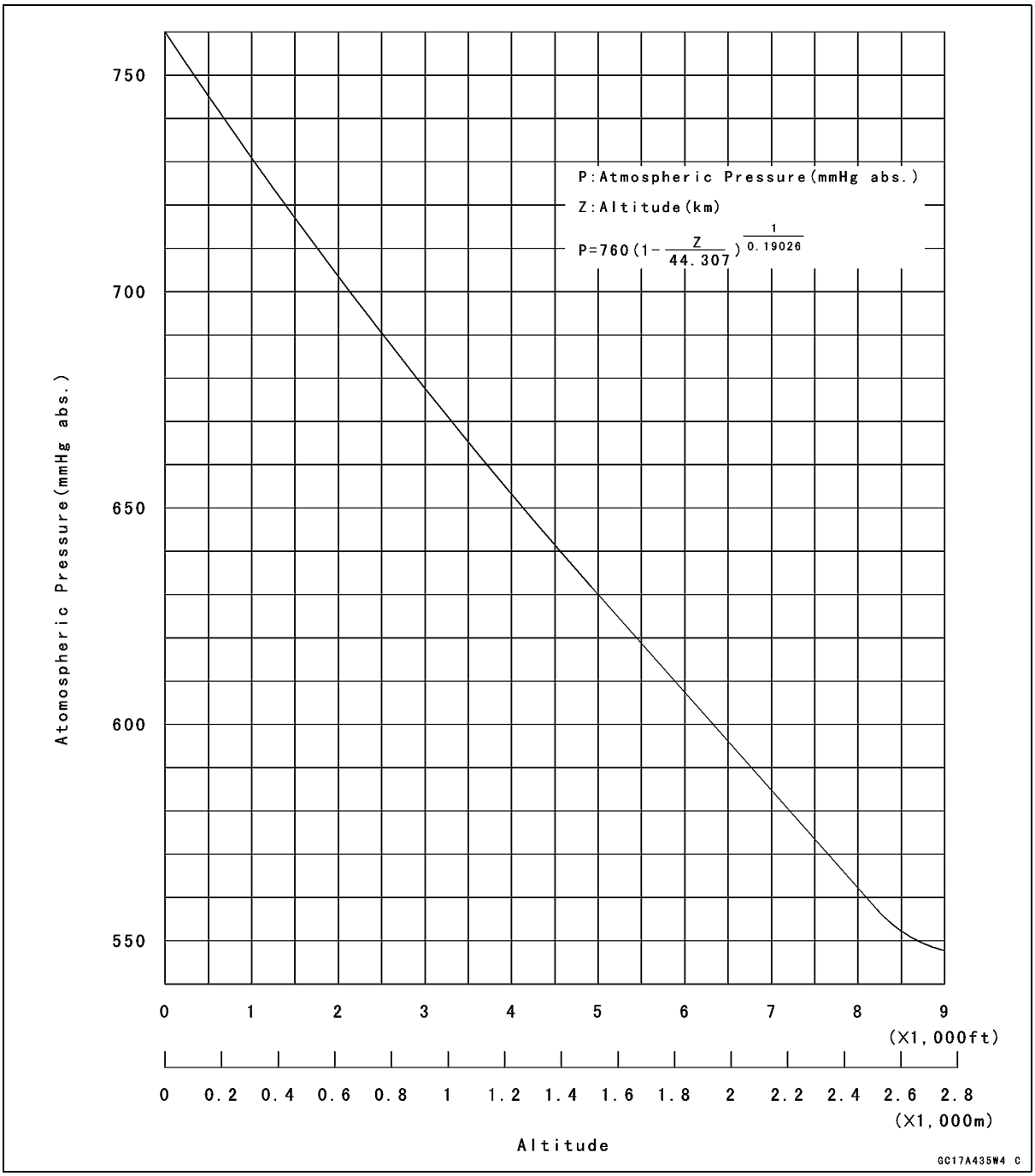
★If you know the local atmospheric pressure using a barometer, substitute the atmospheric pressure for throttle vacuum pressure in the inlet air pressure sensor chart (see intake Air Pressure Sensor section in this chapter). And get the usable range of the atmospheric pressure sensor output voltage and check if output voltage is within the standard or not in the same way as Output Voltage Inspection of the inlet air pressure sensor.

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

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Atmospheric Pressure Sensor (Service Code 15)

Atmospheric Pressure/Altitude Relationship



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Crankshaft Sensor (Service Code 21)

Start the engine and switch the diagnosis mode to Dealer 1 mode to know all the problem that the DFI system has at the time of self-diagnosis. If the engine cannot be started, the self-diagnosis system does not detect dynamic condition of the crankshaft sensor. In this case turn off the ignition switch and turn it on again to enter the Dealer 2 mode. In this mode the system tells all the troubles which the DFI system had in both static and dynamic conditions.

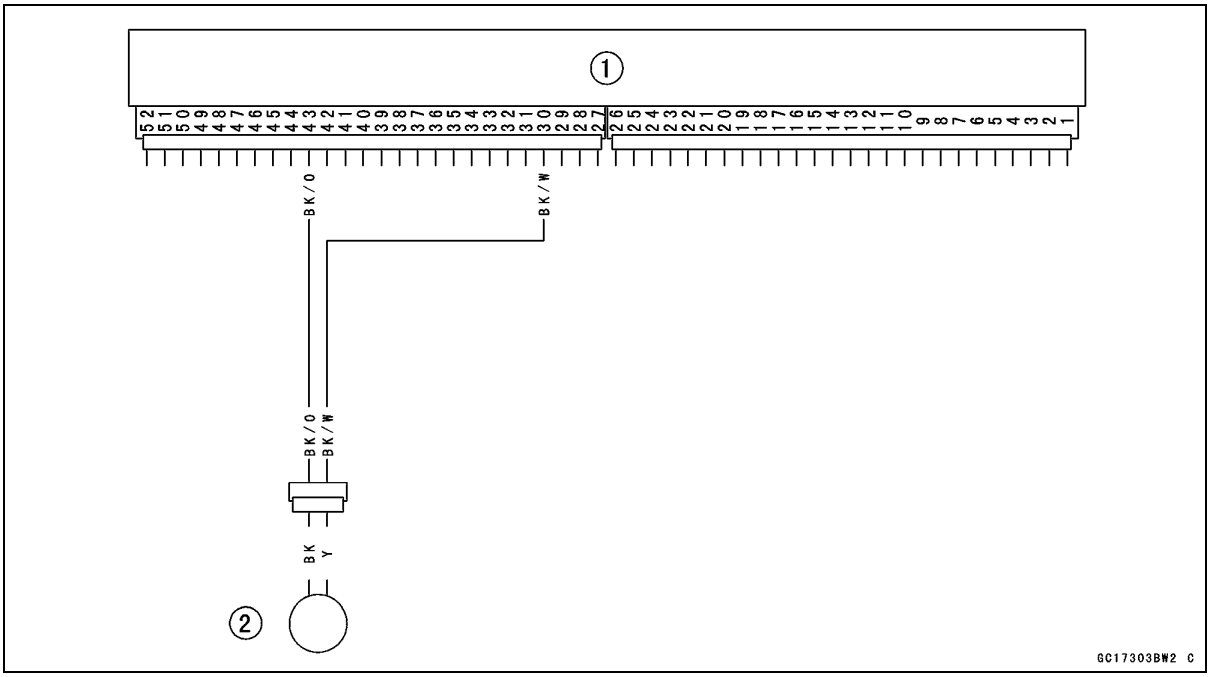
Crankshaft Sensor Removal/Installation

- See the Ignition System section in Electrical System chapter.

Crankshaft Sensor Inspection

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

- Crank the engine and measure the peak voltage of the crankshaft sensor (see Electrical System chapter) in order to check the sensor.
- Check the wiring for continuity, using the following diagram.



1. ECU
2. Crankshaft Sensor

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Camshaft Position Sensor (Service Code 23)

Camshaft Position Sensor Removal/Installation

● See the Ignition System section in Electrical System chapter.

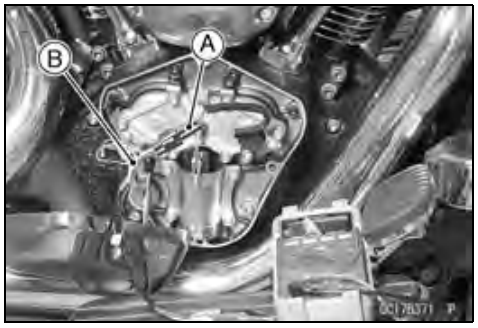
Camshaft Position Sensor Inspection

● See the Ignition System section in Electrical System chapter.

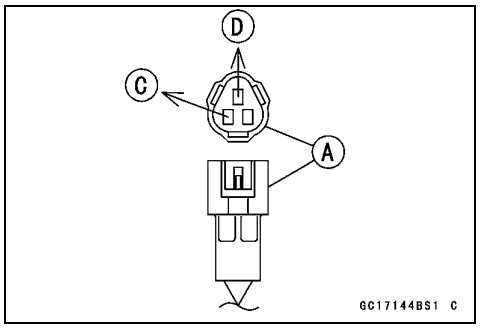
NOTE

○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.
● Remove the outer camshaft cover (see Compression Release Mechanism Removal in the Engine Top End chapter).
● Disconnect the camshaft position sensor connector [A] and connect the harness adapter [B] between the harness connector and camshaft position sensor connector.
● Connect a digital meter to the harness adapter leads.



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



Speed Sensor Input Voltage
Connector to Sensor
Meter (+) → BLlead [C]
Meter (−) → BK lead [D]

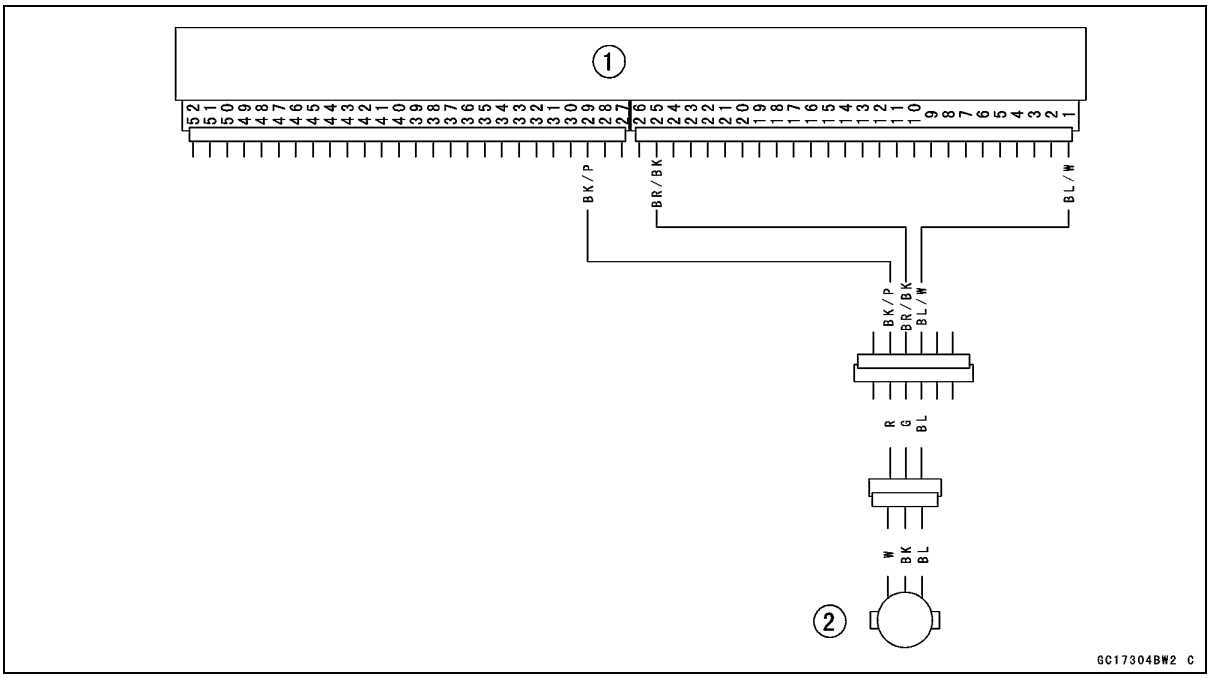
● Measure the sensor input voltage with the engine stopped, and with the connector joined.
● Turn the ignition switch ON.

Input Voltage at Sensor
Standard: About 4.75 ~ 5.25 V DC at Ignition Switch ON

● Turn the ignition switch OFF.
★If the reading is out of the range, check the ECU for its ground and power supply (see ECU section). If the ground and power supply are good, the ECU is suspect. Replace the ECU.
★If the reading is good, check the sensor output wiring from the sensor to the ECU (see witing diagram in this section).
★If the witing and sensor itself are good, the ECU is suspect.

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Camshaft Position Sensor (Service Code 23)



1. ECU
2. Camshaft Position Sensor

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Speed Sensor (Service Code 24)

Speed Sensor Removal/Installation

● See the Switches and Sensors section in Electrical System chapter.

Speed Sensor Inspection

● See the Switches and Sensors section in Electrical System chapter.

Input Voltage Inspection

NOTE

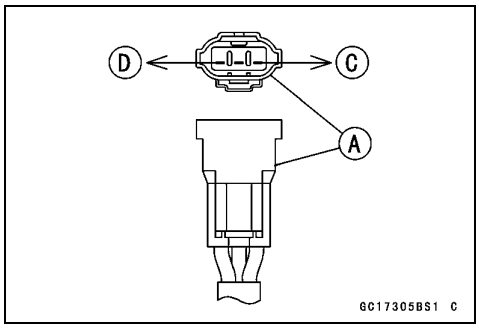
○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.
● Remove the seats (see Frame chapter).
● Connect a digital meter to the connector [A], using the needle adapter set [E].

Special Tool - Needle Adapter Set: 57001-1457



Speed Sensor Input Voltage
Connector to Sensor
Meter (+) → O/R lead [C]
Meter (−) → BK/W lead [D]



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

Input Voltage at Sensor

Standard:	**About 9 ~ 11 V DC at Ignition Switch ON**

★If the reading is out of the range, check the wiring (see wiring diagram in this section), and meter (see Electrical System chapter).
★If the reading is good, check the output voltage.
● Turn the ignition switch OFF.

Output Voltage Inspection

● Before this inspection, inspect the input voltage (see Input Voltage Inspection).

NOTE

○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.

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Speed Sensor (Service Code 24)



● Connect a digital meter [A] to the connector [A], using the needle adapter set [E].

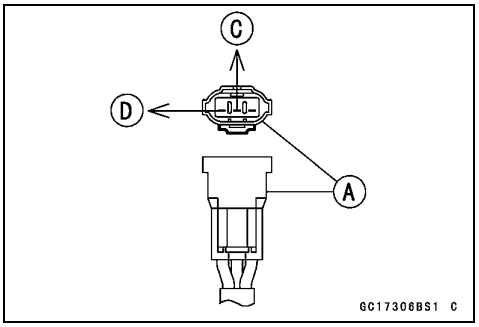
Special Tool - Needle Adapter Set: 57001-1457

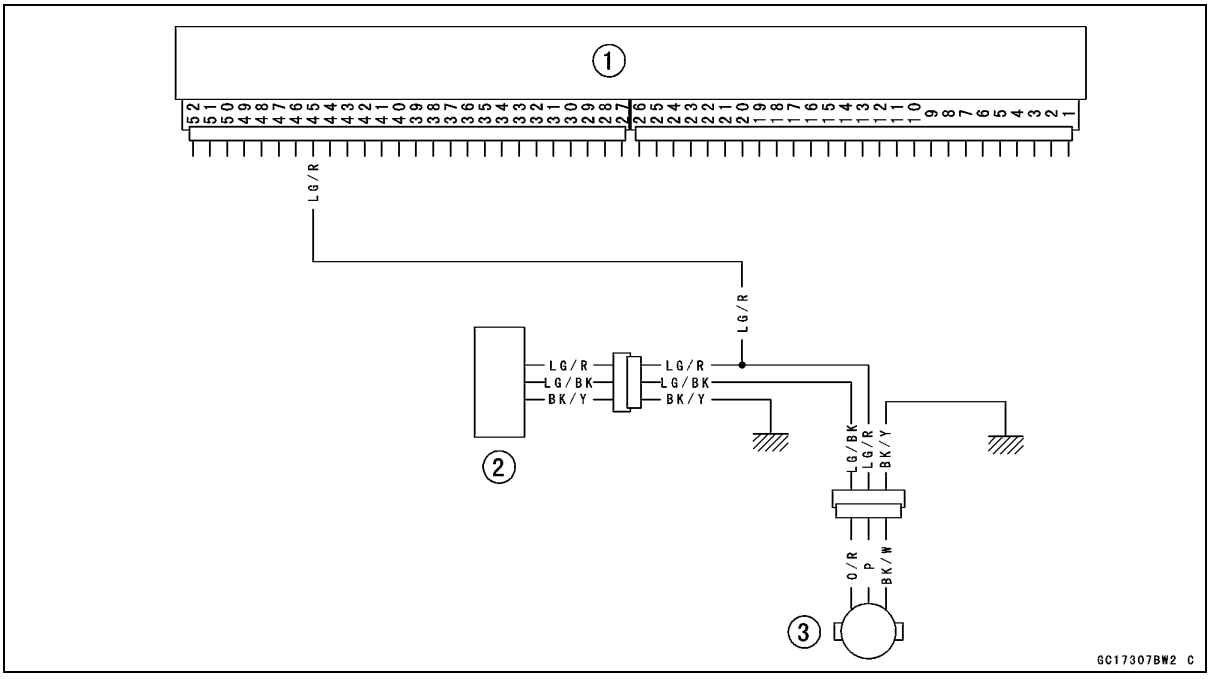
Throttle Sensor Output Voltage
Connections to Sensor
Meter (+) → P lead [C]
Meter (–) → BK/W lead [D]

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

Output Voltage at Sensor
Standard: About 0.05 ~ 0.07 V DC

★If the reading is out of the range, check the speed sensor (see Electrical System chapter) and the wiring to ECU (see wiring diagram in this section).
★If the reading, speed sensor and wiring are good, replace the ECU.





1. ECU
2. Meter Assembly
3. Speed Sensor

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Gear Position Switch (Service Code 25)

Gear Position Switch Removal/Installation

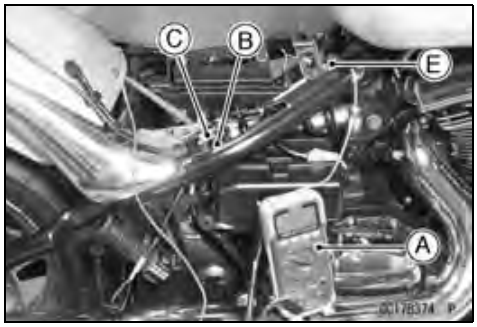
● See the Switches and Sensors section in Electrical System chapter.

Gear Position Switch Inspection

● See the Switches and Sensors section in Electrical System chapter.

NOTE

○*Be sure the battery is fully charged.*



● Turn the ignition switch OFF.
● Remove the seats (see Frame chapter).
● Connect a digital meter [A] to the sensor connector [B], with the needle adapter set [C].

Special Tool - Needle Adapter Set: 57001-1457

Gear Position Switch Input Voltage at Neutral Position
Connector to Sensor
Meter (+) → G lead
Meter (−) → Frame Ground [E]

Gear Position Switch Input Voltage at Other Gear Positions
Connector to Sensor
Meter (+) → BL
Meter (−) → Frame Ground [E]

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

Input Voltage at Neutral Position
Standard: About 0 V DC

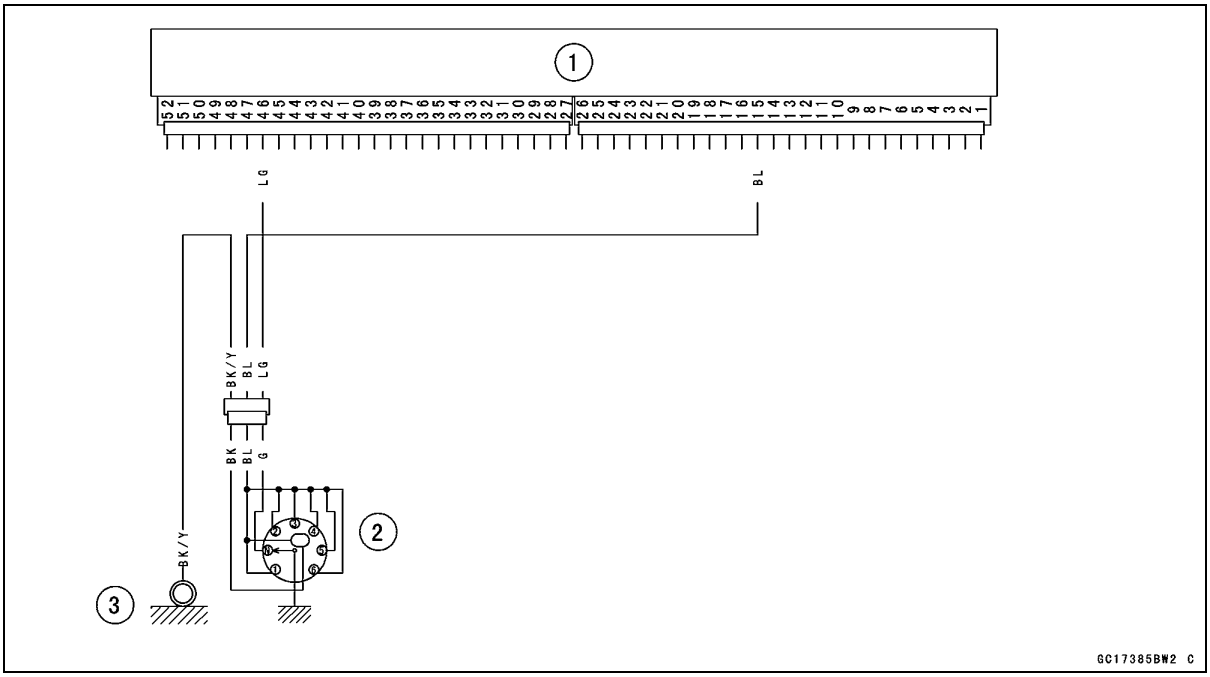
Input Voltage at Other Gear Positions
Standard:

1st	**About 5 V**
2nd	**About 5 V**
3rd	**About 5 V**
4th	**About 5 V**
5th	**About 5 V**

● Turn the ignition switch OFF.
★If the reading is out of the standard range, check the wiring (see wiring diagram in this section).
★If the reading is good, the input voltage is normal. Check the gear position switch.

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Gear Position Switch (Service Code 25)



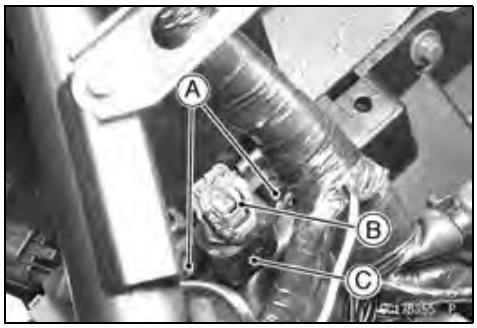
1. ECU
2. Gear Position Switch
3. Frame Ground

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Vehicle-down Sensor (Service Code 31)

Vehicle-down Sensor Removal

- Remove the battery (see Frame chapter).
- Unscrew the screws [A] and disconnect the connector [B].
- Remove the vehicle down sensor [C].

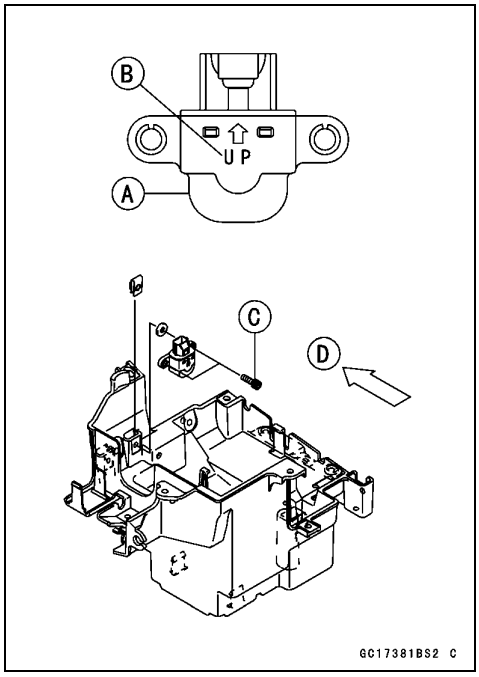


Installation

- Install the vehicle-down sensor [A] and washer in the original position. The arrow mark [B] on the sensor must be on the rear and point upward.
- Do not install the sensor upside down.
- Tighten the sensor bolts [C] securely.
  Front [D]
- Install the seats (see Frame 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 its bolt as shown.



Vehicle-down Sensor Inspection

NOTE

○*Be sure the battery is fully charged.*

- Take out the vehicle-down sensor [A] (see Vehicle-down Sensor Removal). Do not disconnect the connector [B].
- Connect a digital volt meter [C] to the connector, using two needle adapters [D].

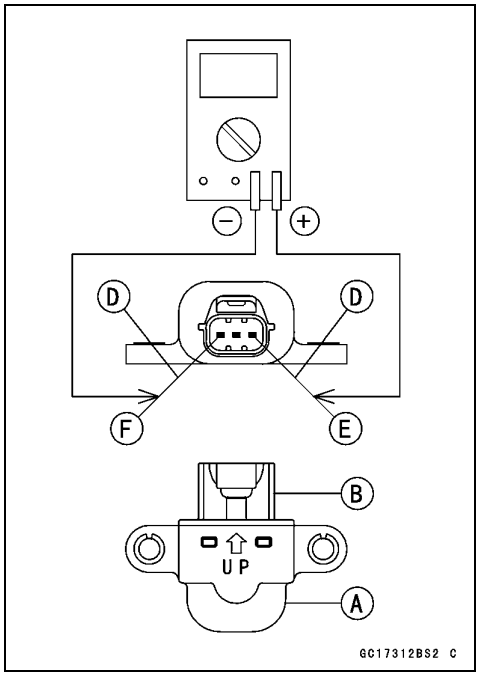
Special Tool - Needle Adapter Set: 57001-1457

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

Vehicle-down Sensor Power Source Voltage
Connections to Sensor
Meter (+) → BL/W lead [E]
Meter (–) → BR/BK lead [F]
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, power supply and wiring shorted,

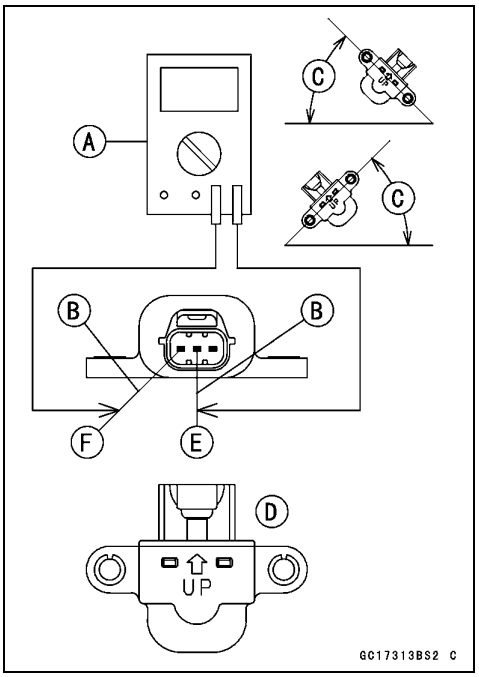


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Vehicle-down Sensor (Service Code 31)

★If the power source is normal, check the output voltage of the sensor.
- Connect a digital volt meter [A] to the connector, using two needle adapters [B].
- 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.



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

Standard: with sensor tilted 40 ~ 50° or more right or left: 0.65 ~ 1.35 V
with sensor arrow mark pointed up: 3.55 ~ 4.45 V

NOTE

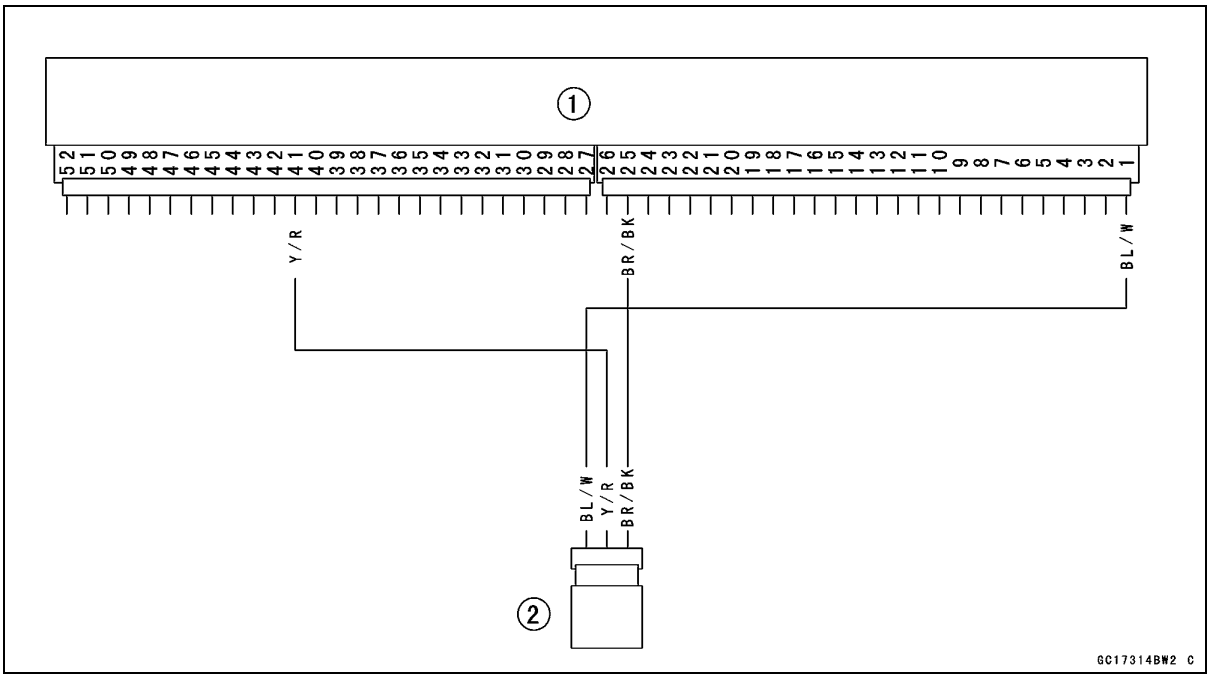
○*If you need to test again, turn the ignition switch OFF, and then ON.*

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

Silicone Sealant (Kawasaki Bond: 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.



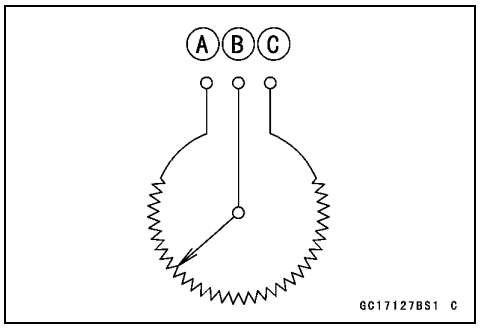
A. ECU
B. Vehicle-down Sensor

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Subthrottle Sensor (Service Code 32)

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

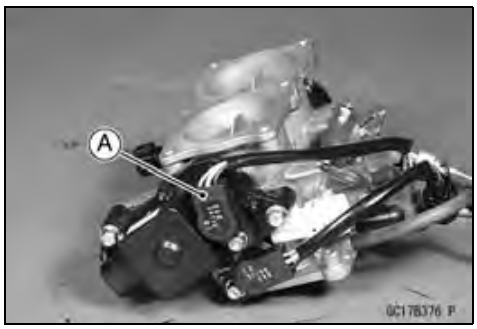
Input Terminal [A]
Output Terminal [B]
Ground Terminal [C]



Subthrottle Sensor Removal/Adjustment

CAUTION

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



Subthrottle Sensor Connector [B]

Input Voltage Inspection

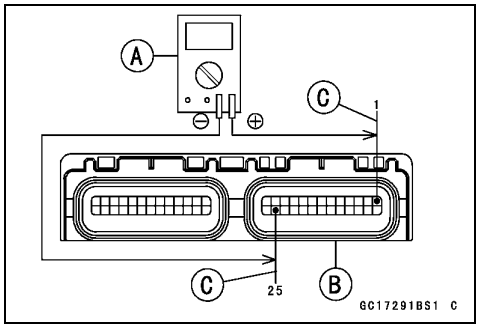
NOTE

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

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

Special Tool - Needle Adapter Set: 57001–1457

Subthrottle Sensor Input Voltage
Connections to ECU Connector
Meter (+)→ BL/W lead (terminal 1)
Meter (–)→ BR/BK lead (terminal 25)



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

Input Voltage at ECU Connector
Standard: 4.75 ~ 5.25 V DC

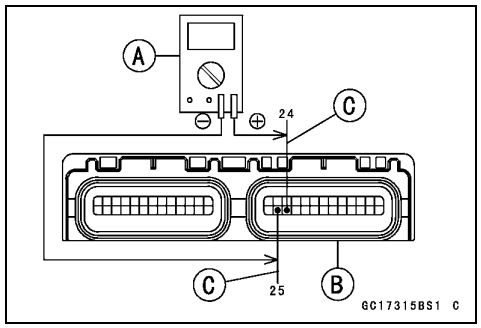
- Turn the ignition switch OFF.

★If the reading of input voltage is less than the standard, check the ECU for its ground, power supply and wiring shorted.
★If the input voltage is within the standard range, remove the fuel tank, and check wiring from ECU to the subthrottle sensor for continuity.
★If the wiring is good, check the output voltage of the subthrottle sensor.

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Subthrottle Sensor (Service Code 32)

Output Voltage Inspection



- Measure the output voltage at the ECU in the same way as input voltage inspection. Note the following.
  Digital Voltmeter [A]
  Connector [B]

  Special Tool - Needle Adapter Set: 57001–1457

  Subthrottle Sensor Output Voltage
  Connections to ECU
  Meter (+) → Y lead (terminal 24)
  Meter (–) → BR/BK lead (terminal 25)
- Turn the ignition switch ON.
- Measure the output voltage when the subthrottle valve is fully opened or completely closed by hand.

  Output Voltage at ECU
  Standard: 1.08 ~ 4.60 V DC (at subthrottle valve full opening to closing)

NOTE

○*The throttle sensor is operating correctly if the following voltages are obtained:*
• 1.08 VDC (or slightly higher) with the subthrottle valve at the closed position.
• 4.60 VDC (or slightly lower) with the subthrottle valve at the fully open position.

CAUTION

Do not remove or adjust the subthrottle sensor. It has been adjusted and set with precision at the factory.
Never drop the sensor can especially on a hard surface. A shock to the sensor can damage it.

NOTE

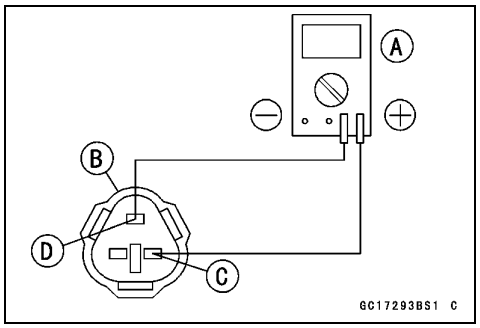
○*The standard voltage marked with an asterisk refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
Example:
In the case of a input voltage of 4.75 V.
1.08 × 4.75 ÷ 5.00 = 1.03 V
4.60 × 4.75 ÷ 5.00 = 4.37 V
Thus, the valid range is 1.03 ~ 4.37 V

★If the output voltage is within the standard range, check the wiring for continuity (see next diagram).
★If the output voltage is far out of the standard range (e.g. when the wiring is open, the reading is 0 V), check the throttle sensor resistance.

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Subthrottle Sensor (Service Code 32)

Resistance Inspection



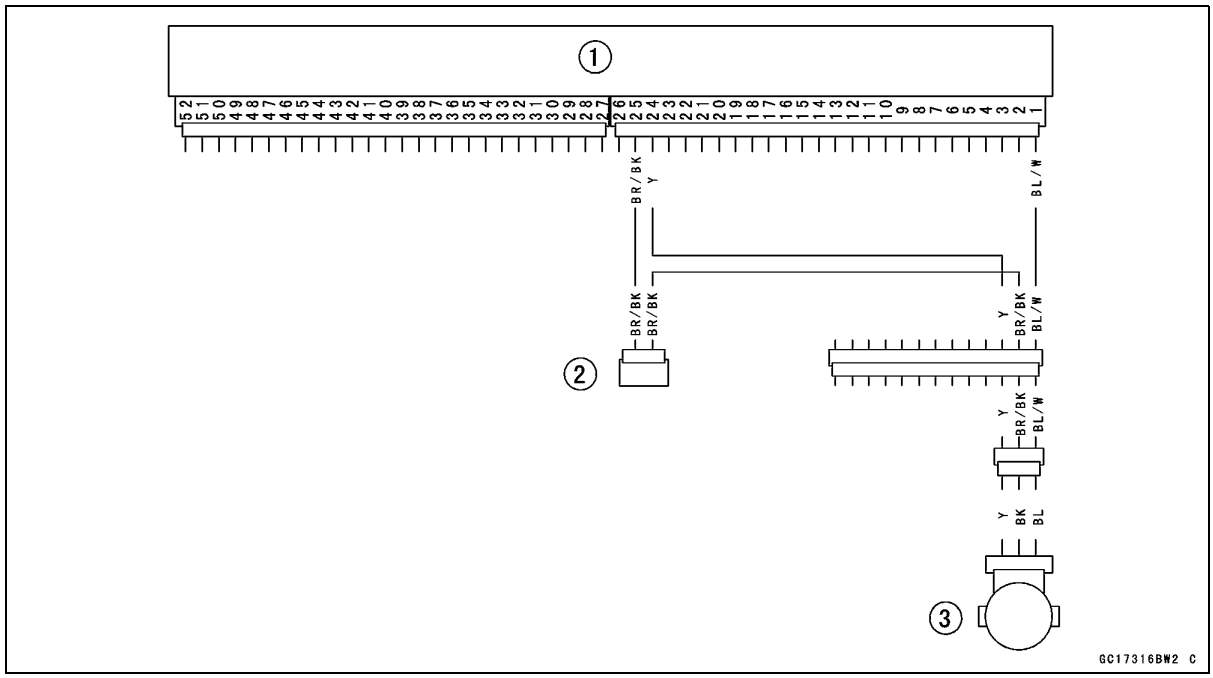
- Turn the ignition switch OFF.
- Disconnect the subthrottle sensor connector.
- Connect a digital meter [A] to the subthrottle sensor connector [B].
- Measure the subthrottle sensor resistance.

Throttle Sensor Resistance

Connections:	**BL lead [C] ←→ BK lead [D]**
Standard:	**4 ~ 6 kΩ**

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

★If the reading is within the range, but the problem still exists, replace the ECU.



1. ECU
2. Joint Connector
3. Subthrottle Sensor

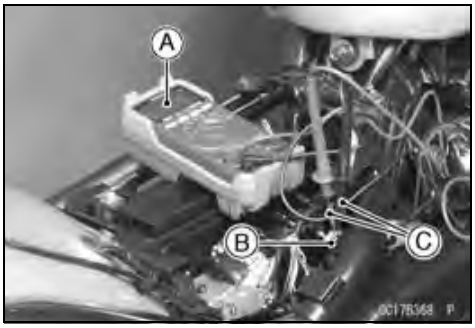
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Oxygen Sensor-not activated (Service Code 33): Sensor Equipped Model

Oxygen Sensor Removal/Installation

● Refer to Oxygen Sensor Removal and Installation in the Electrical System chapter.

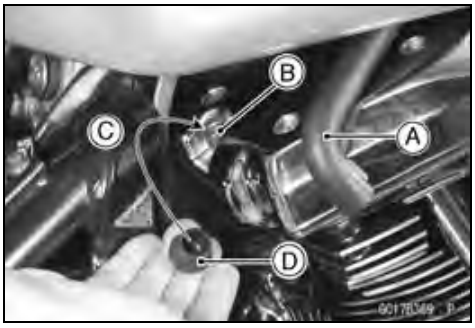
Oxygen Sensor Inspection



● Warm up the engine thoroughly.
● Turn the ignition switch OFF.
● Remove the seats (see Frame chapter).
● Connect a digital voltmeter [A] to the oxygen sensor connector [B] (main harness side), using the needle adapter set [C].

Special Tool - Needle Adapter Set: 57001-1457

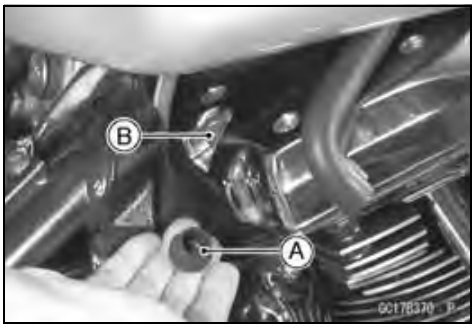
Oxygen Sensor Output Voltage
Connections to Oxygen Sensor Connector
Meter (+) → BL/Y lead
Meter (−) → BR/BK lead



● Remove the air switching valve hoses [A] (both sides) from the fittings [B].
● Install [C] the suitable plugs [D] (both sides) on the fittings and shut off the secondary air.

● Turn the ignition switch ON.
● Start the engine, and let it idle.
● Measure the output voltage of the sensor with the connector joined.

Oxygen Sensor Output Voltage (with Plugs)
Standard: 0.7 ~ 0.8 V



● Next, remove the plugs [A] (both sides) from the fittings [B] with idling.

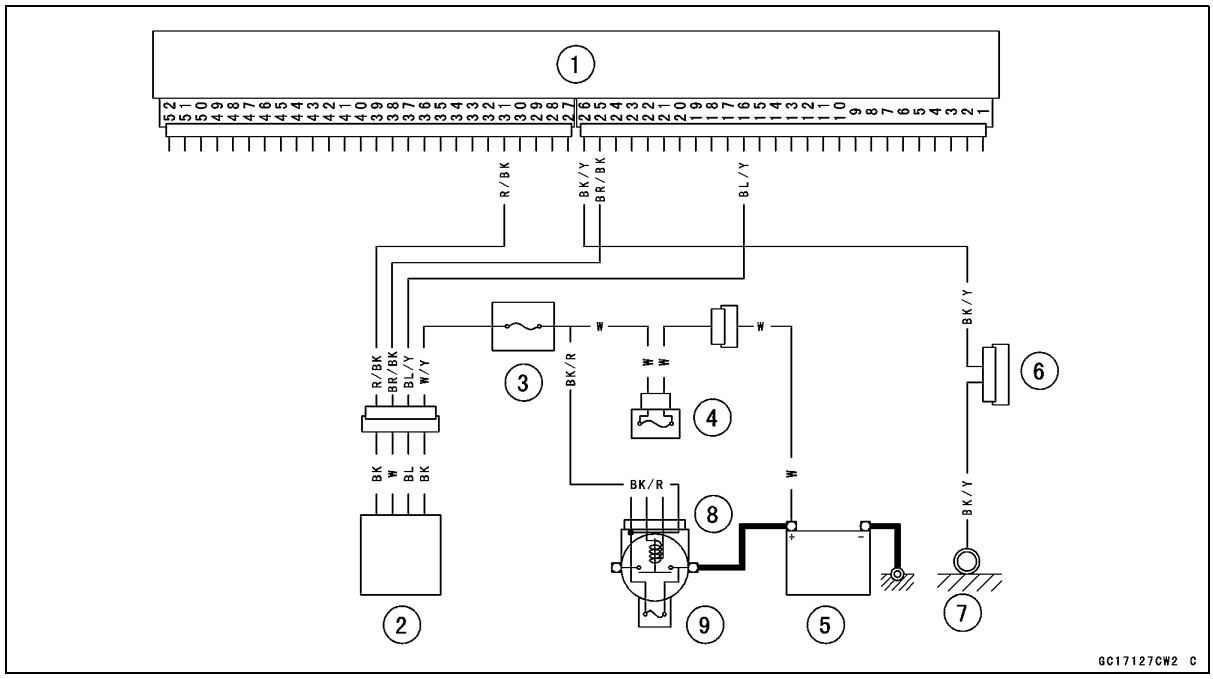
● Measure the output voltage of the sensor with the connector joined.

Oxygen Sensor Output Voltage (without Plugs)
Standard: approx. 0.1 V

★If the reading is within range (with plugs: 0.7 ~ 0.8 V, without plugs: approx. 0.1 V), the oxygen sensor is good.
★If the reading is without range, replace the oxygen sensor.

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Oxygen Sensor-not activated (Service Code 33): Sensor Equipped Model



1. ECU
2. Oxygen Sensor
3. Decompression Fuse 10 A
4. ECU Main Fuse 30 A
5. Battery
6. Joint Connector
7. Frame Ground
8. Starter Relay
9. Main Fuse 30 A

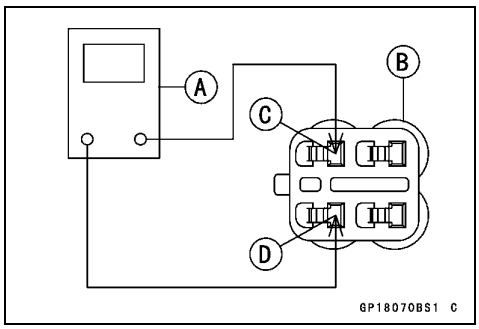
Oxygen Sensor Heater Inspection

● Set the hand tester [A] to the × 1 Ω range and connect it to the terminals in the oxygen sensor lead connector [B].
Black [C]
Black [D]

Special Tool - Hand Tester: 57001-1394

Oxygen Sensor Resistance
Standard: 14.1 ~ 19.3 Ω at 20°C (68°F)

★If the tester reading is not as specified, replace the oxygen sensor with a new one.



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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.

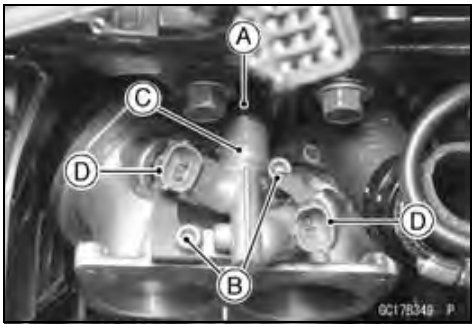
Injector Removal

⚠ 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)
  Throttle Body Assy (see Throttle Body Assy and Intake Manifold Removal)

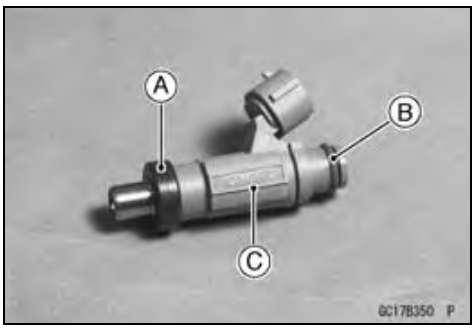
- Disconnect the fuel hose joint connector [A] (see Fuel Line section in this chapter).
- Unscrew the delivery joint bolts [B], and lift up the delivery joint [C] with the injectors [D].
  Front [E]
- Remove the injectors from the delivery joint.



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.



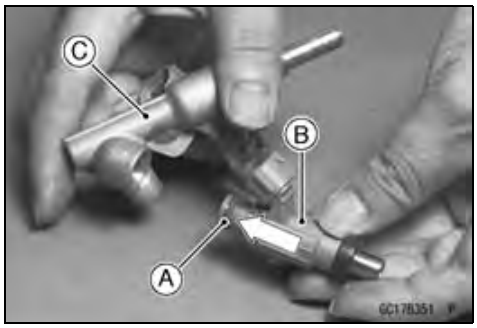
CAUTION

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.

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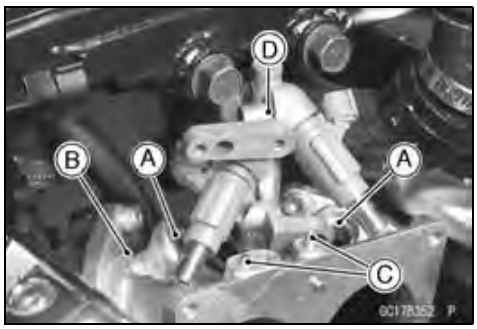
Fuel Injectors (#1, #2: Service Code 41, 42)

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

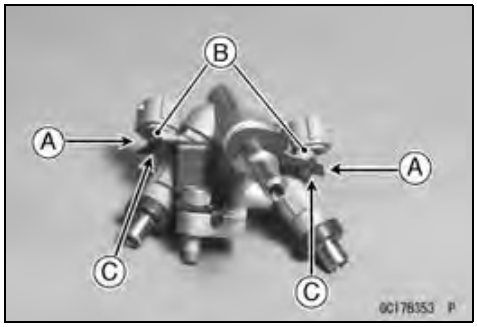


- Check that there is no dirt or dust on the injector seating surface [A] of the inlet manifold [B].
- Check that the two dowel pins [C] are in place in the inlet manifold.
- Fit the end of the injector into the delivery joint [D], and install them into the inlet manifold [B].
- Apply a non-permanent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

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



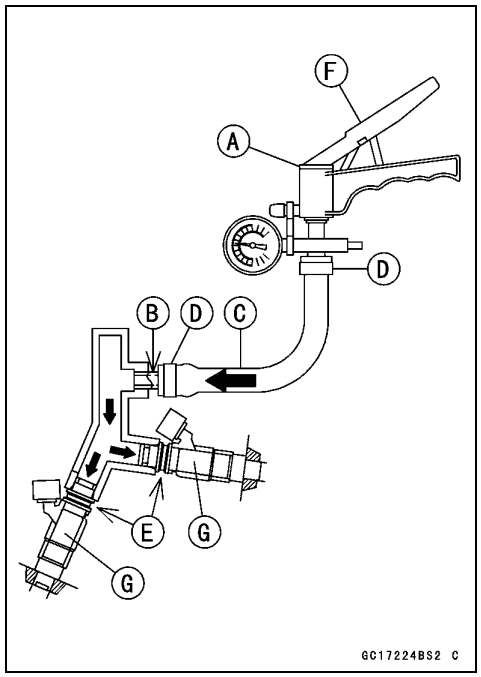
- Fit [A] the connectors [B] of the injector into the bracket recesses [C].



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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]) and securely tighten the clamp screws.
○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)

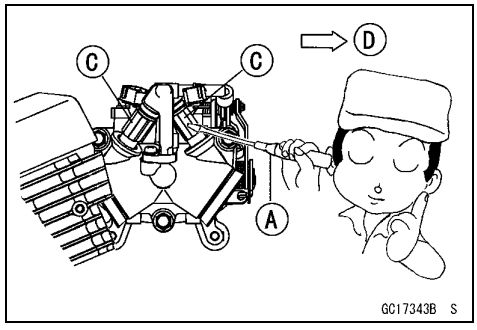
CAUTION

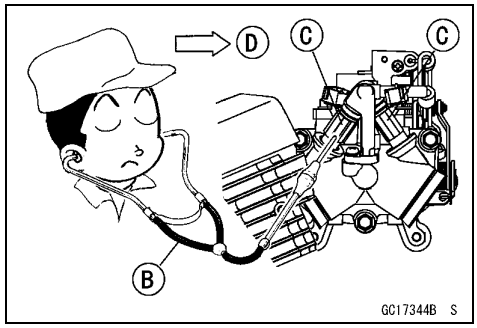
During pressure testing, do not exceed the maximum pressure for which the system is designed.

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

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

Audible Inspection
● Start the engine.
● Insert a screwdriver from the engine right side between the fuel tank buttom end and the engine top end.
● 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 Line section 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.

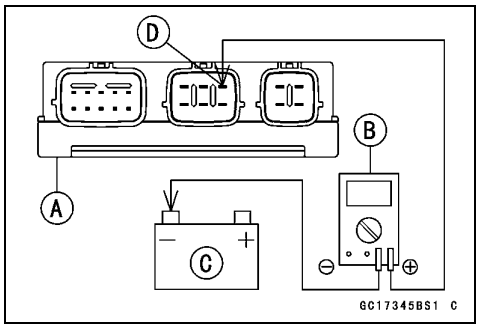




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Fuel Injectors (#1, #2: Service Code 41, 42)

Power Source Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the relay box (see Electrical System chapter). Do not disconnect the relay box connector.
- Connect a digital voltmeter [B] to the ECU main relay connector [A], using the needle adapter.
  Battery [C] in the frame

Special Tool - Needle Adapter Set: 57001-1457

○Measure the power source voltage of the injector with the engine stopped, and with the connectors joined.

- Turn the ignition switch ON.
- Start the engine.

Injector Power Source Voltage at ECU Main Relay Connections

Meter (+) → W/BK Lead Terminal [D]

Meter (–) → Battery (–) Terminal

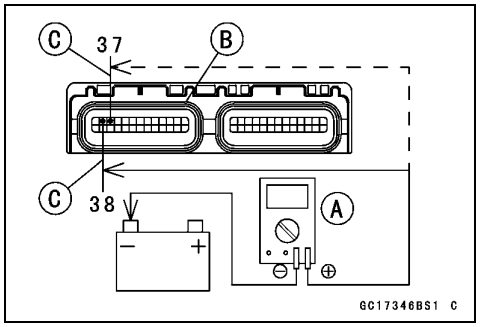
Standard: Battery Voltage (12.5 V or more)

- Turn the ignition switch OFF.

★If the power source voltage is incorrect, check the ECU main relay (see Electrical System chapter).

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

Output Voltage Inspection



- Turn the ignition switch OFF.
- Remove the ECU (see ECU section in this chapter). Do not disconnect the ECU connector.
- Connect a digital voltmeter [A] to the connector [B], using the needle adapter set [C].

Special Tool - Needle Adapter Set: 57001-1457

Injector Output Voltage at ECU Connections for Injector #1

Meter (+) → BL/R lead (terminal 38)

Meter (–) → Battery (–) Terminal

Connections for Injector #2

Meter (+) → BL/G lead (terminal 37)

Meter (–) → Battery (–) Terminal

- Turn the ignition switch ON.
- Start the engine.

Standard: Battery Voltage (12.5 V or more)

- Turn the ignition switch OFF.

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

★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.

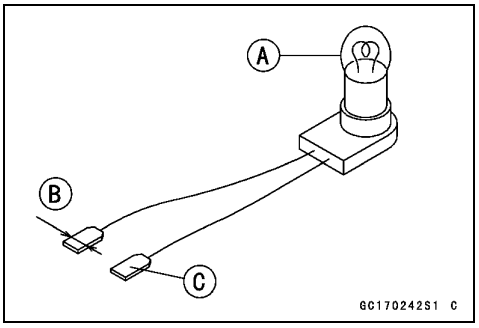
Injector Wiring Inspection

ECU Connector		Injector Connectors
Terminal 13	→	**Injector #1 Terminal (W/R)**
Terminal 13	→	**Injector #2 Terminal (W/R)**
Terminal 38	→	**Injector #1 Terminal (BL/R)**
Terminal 37	→	**Injector #2 Terminal (BL/G)**

★If the wiring is good, inspect the resistance of the injectors (see Injector Resistance Inspection in chapter).

Injector Signal Test

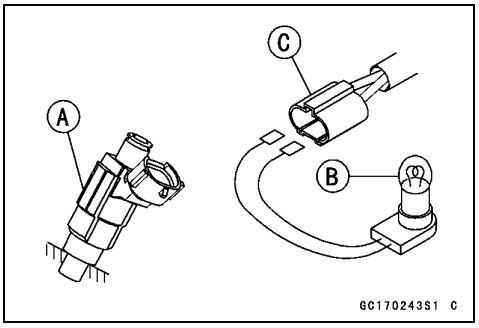
● Prepare two test light sets with male terminals as shown.
Rating of Bulb [A]: 12 V × 3 ~ 3.4 W
Terminal Width [B]: 1.8 mm
Terminal Thickness [C]: 0.8 mm



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:
Fuel Tank (see Fuel Tank Removal)
Air Switching Valve with Hoses (see Engine Top End chapter)
Vacuum Hoses on Throttle Body Assy
● 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.

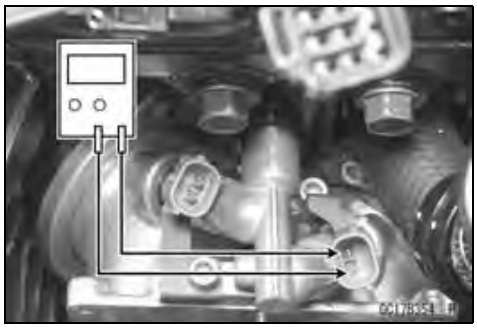
Special Tool - Hand Tester: 57001-1394

★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.

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

Injector Resistance Inspection



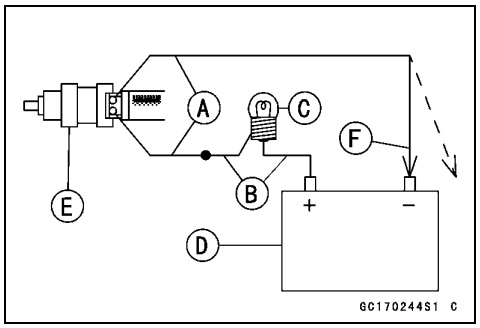
- Remove:
  Fuel Tank (see Fuel Tank Removal)
  Air Switching Valve with Hoses (see Engine Top End chapter)
  Vacuum Hoses on Throttle Body Assy
- Disconnect the connector from the injector [A] (see Injector Removal).
- Measure the injector resistance with a digital voltmeter [B].
  Front [C]

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.

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

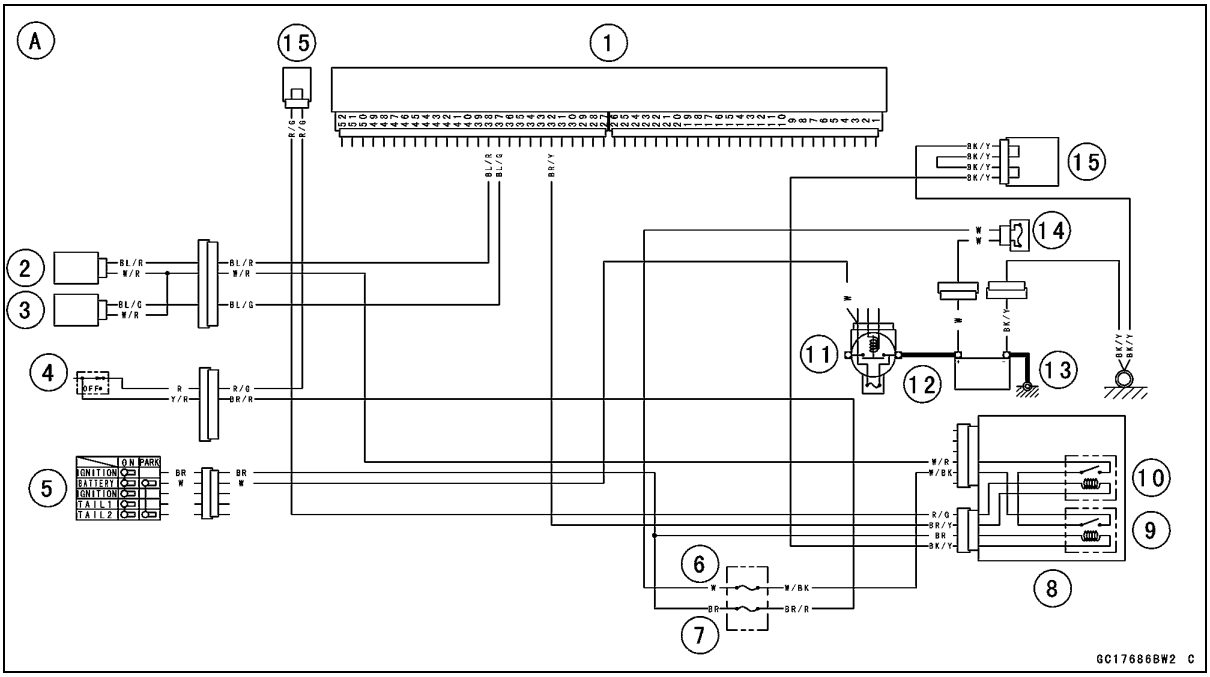
Be sure to connect the bulb in series. The bulb works as a current limiter to protect the solenoid in the injector from excessive current.

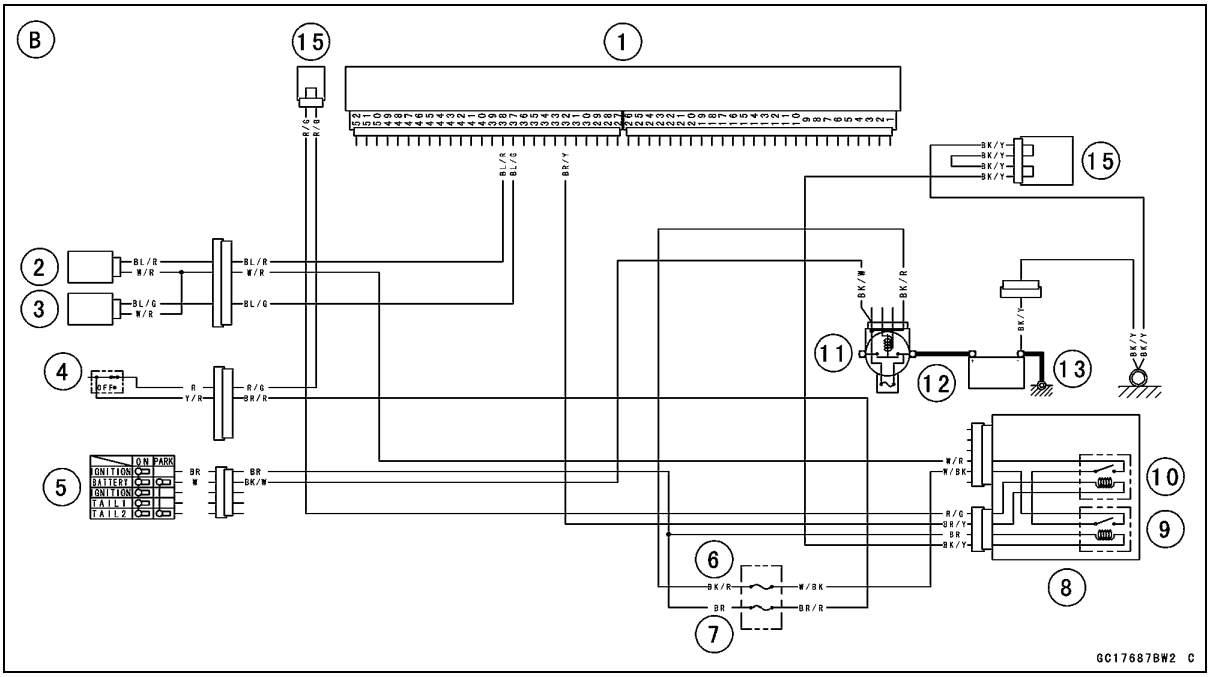
- Connect the test light set to the injector [E] as shown.
- Open and connect [F] the end of the wire to the battery (–) terminal repeatedly. The injector should click.

★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.

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





1. ECU
2. Injector #1
3. Injector #2
4. Engine Stop Switch
5. Ignition Switch
6. ECU Fuse 15 A
7. Ignition Fuse 10 A
8. Relay Box
9. ECU Main Relay
10. Fuel Pump Relay
11. Main Fuse 30 A
12. Starter Relay
13. Battery
14. Fuse 30 A (VN2000-A1 Model)
15. Joint Connector

A: VN2000-A1 Model
B: On and after VN2000-A2/D1 Models

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Fuel Pump (Service Code 45)

Fuel Pump Removal

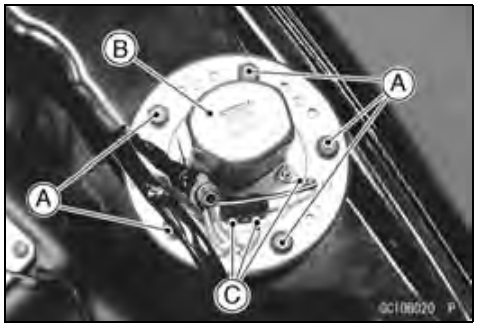
CAUTION

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).
  ○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.

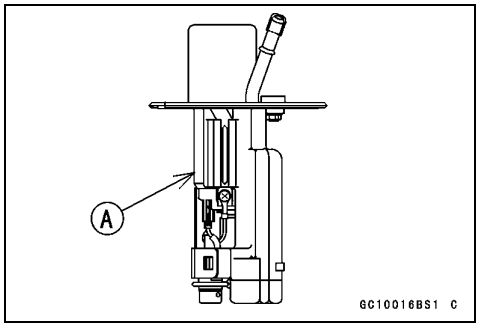


CAUTION

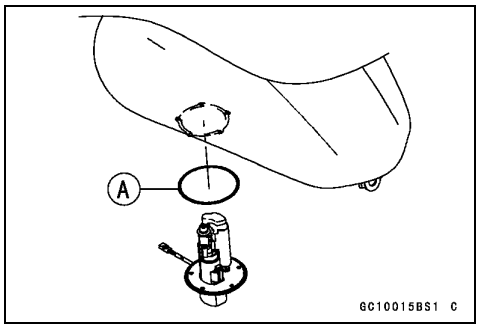
Do not pull the leads (C) of the fuel pump. If they are pulled, the lead terminals may be damaged.

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.



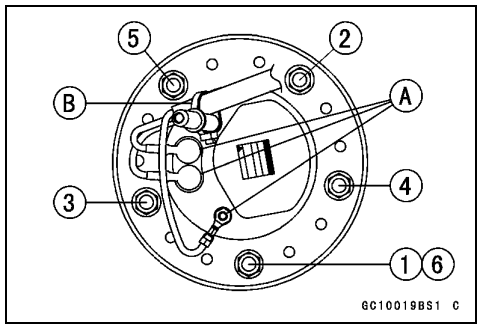
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Fuel Pump (Service Code 45)

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

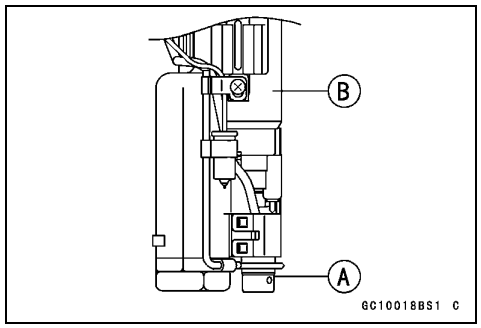
Torque - Fuel Pump Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

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



Pressure Regulator Removal

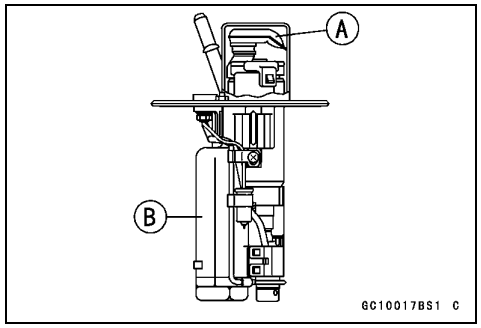
○The pressure regulator [A] is built into the fuel pump [B] and cannot be removed.



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 ignition coil bracket cover (see Frame chapter).
- Connect the hand tester (25 V DC) to the fuel pump connector [A] with needle adapter set.

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

○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.

Pump Operating Voltage at Pump Connections to Pump Connectors

Tester (+) → Y/R Lead

Tester (–) → BK/W Lead

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 fuel pump relay.

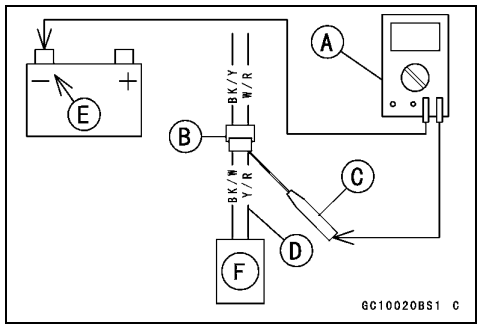
★If the voltage is in specification, but the pump doesn't work, replace the pump.

★If there is still no battery voltage, check the pump relay (see Electrical System chapter).

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Fuel Pump (Service Code 45)

Power Source Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

- Remove the ignition coil bracket cover (see Frame chapter).
- Connect a digital voltmeter [A] to the fuel pump connector [B] (3P), using the needle adapter [C].

Special Tool - Needle Adapter Set: 57001-1457

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

Pump Power Source Voltage
Connections to Pump Connector
Tester (+) → Y/R lead [D]
Tester (–) → Battery (–) Terminal [E]
Standard: Battery Voltage (12.6 V or more)

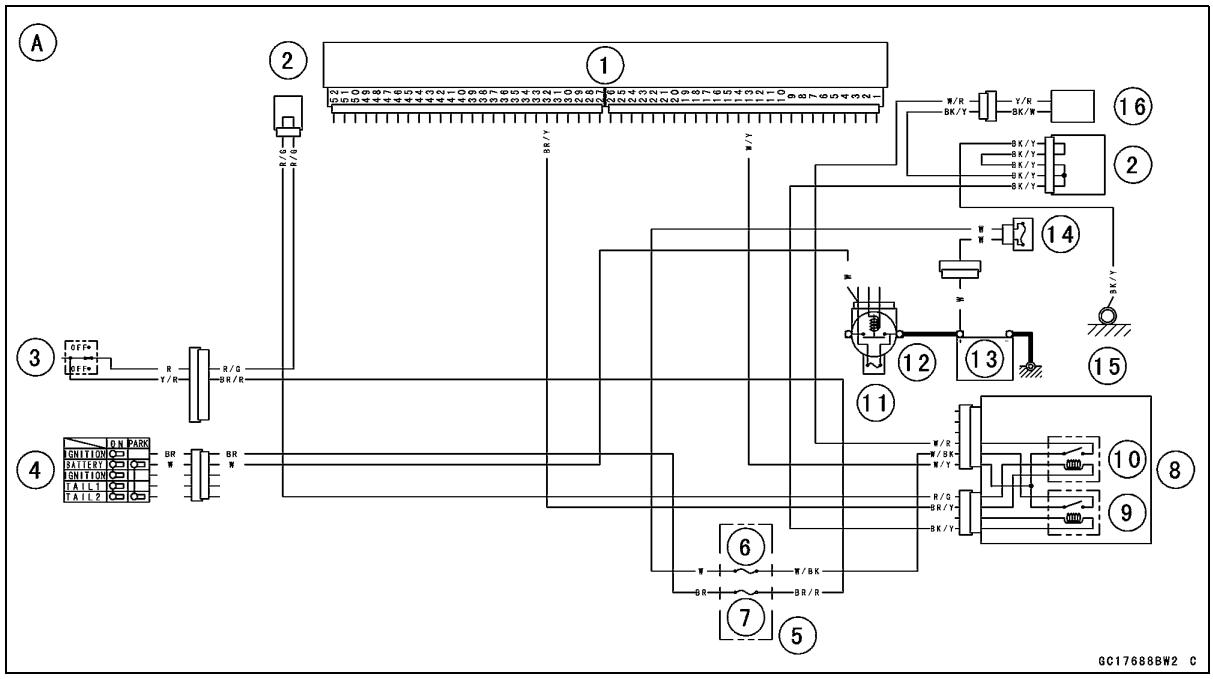
Fuel Pump [F]

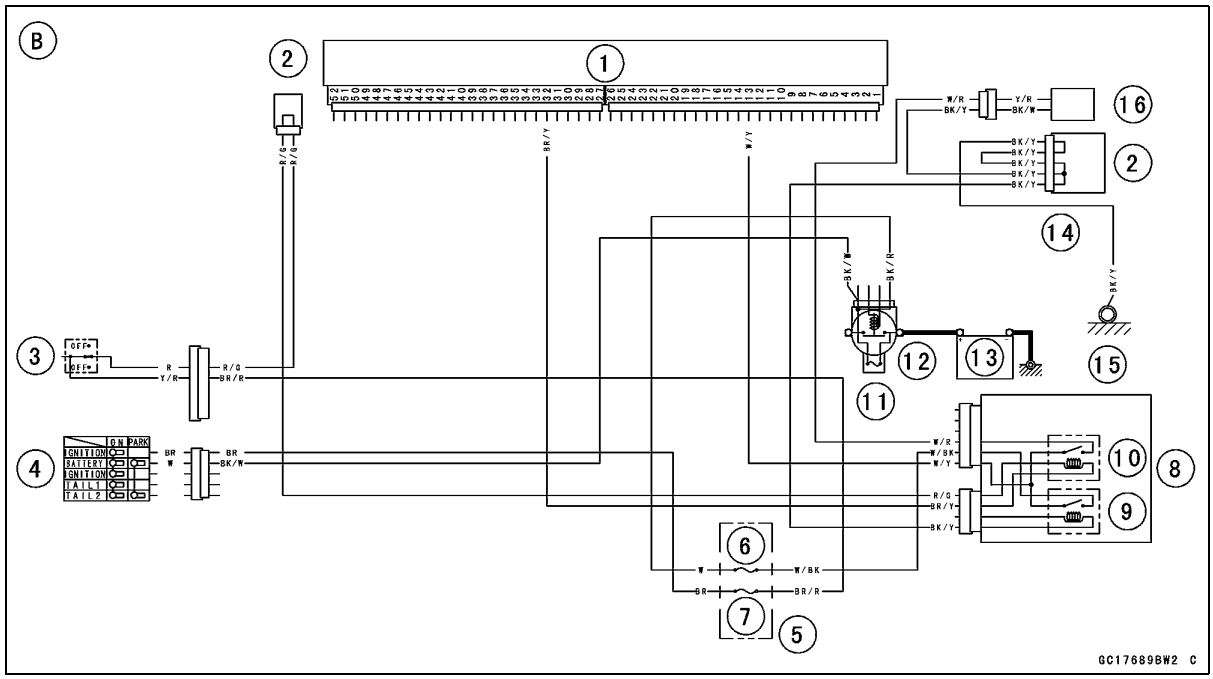
★If the reading is good, the power source voltage is normal. Inspect operating source voltage (see in this section).

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

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Fuel Pump (Service Code 45)





1. ECU
2. Joint Connector
3. Engine Stop Switch
4. Ignition Switch
5. Fuse Box
6. ECU Fuse 15 A
7. Ignition Fuse 10 A
8. Relay Box
9. ECU Main Relay
10. Fuel Pump Relay
11. Main Fuse 30 A
12. Starter Relay
13. Battery
14. Fuse 30 A (VN2000-A1 Model)
15. Frame Ground
16. Fuel Pump

A: VN2000-A1 Model
B: On and after VN2000-A2/D1 Models

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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.

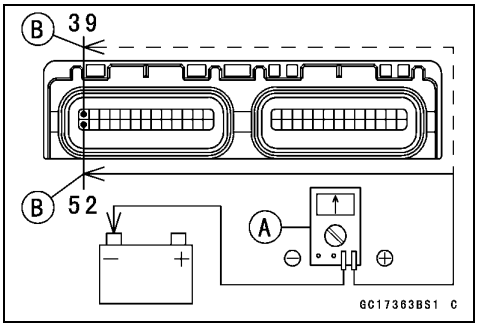
● See Ignition Coil Removal/Installation of the Ignition System section in Electrical System chapter.

Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.
● Remove the ECU (see ECU Removal). Do not disconnect the ECU connector.
● Connect a digital voltmeter [A] as shown, using two needle adapters [B].
○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.



Ignition Coil Input Voltage at ECU
Connections for Ignition Coil #1
Meter (+) → BK lead (terminal 39)
Meter (–) → Battery (–) Terminal
Connections for Ignition Coil #2
Meter (+) → BK/G lead (terminal 52)
Meter (–) → Battery (–) Terminal
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 section).
★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 Electrical System chapter) in order to check the primary coils.

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Starter Control Relay (Service Code 55)

Starter Control Relay Removal and Installation

- Refer to the Starter Control Relay Inspection in the Electrical System chapter.

Starter Control Relay Inspection

- Refer to the Starter Control Relay Inspection and Electric Starter Circuit in the Electrical System chapter.

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Radiator Fan Relay (Service Code 56)

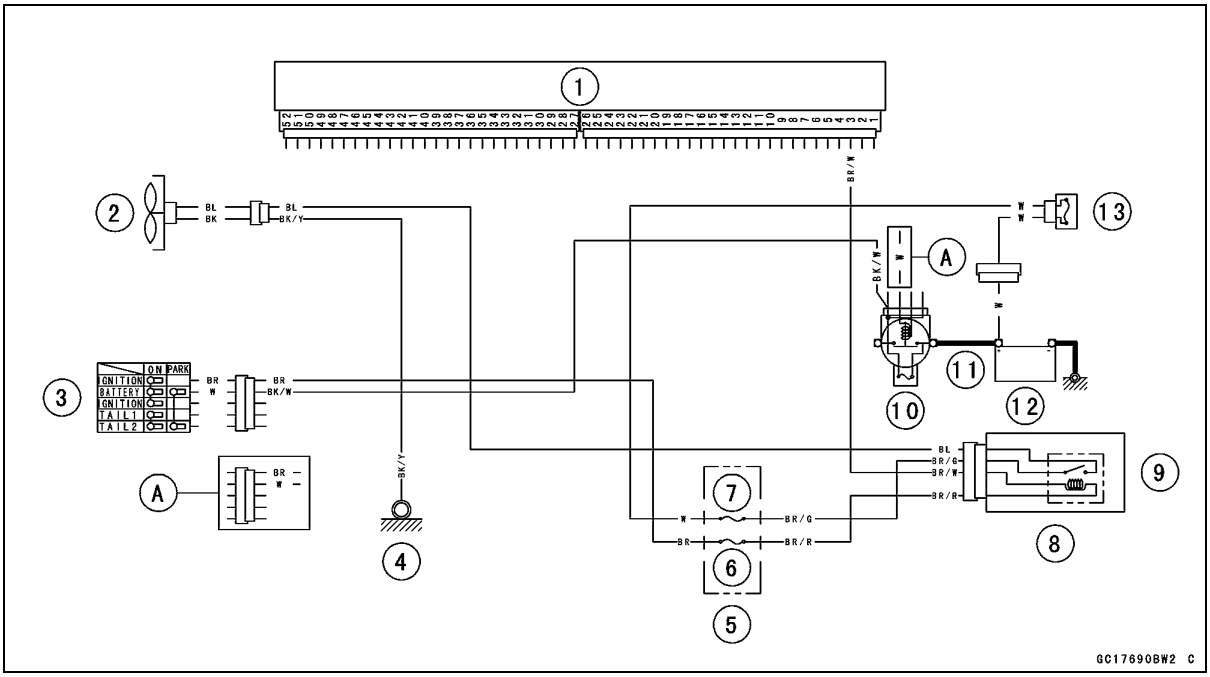
Radiator Fan Relay Removal/Installation

- Radiator fan relay is bult in the relay box.
- Remove the relay box (see Electrical System chapter).

Radiator Fan Relay Inspection

- See Relay Circuit Inspection in Electrical System chapter.
- Remove the relay box and ECU (see this chapter). Do not disconnect the relay box and ECU connectors. Check the wiring for continuity, using the following diagram.

★If wiring and radiator fan relay are good, check the ECU for its ground, and power supply (see ECU section in this chapter). If the ground and power supply are good, replace the ECU.



1. ECU
2. Radiator Fan
3. Ignition Switch
4. Frame Ground
5. Fuse Box
6. Ignition Fuse 10 A
7. Fan Fuse 20 A
8. Relay Box
9. Fan Relay
10. Main Fuse 30 A
11. Starter Relay
12. Battery
13. ECU Main Relay

A: VN2000-A1 Model

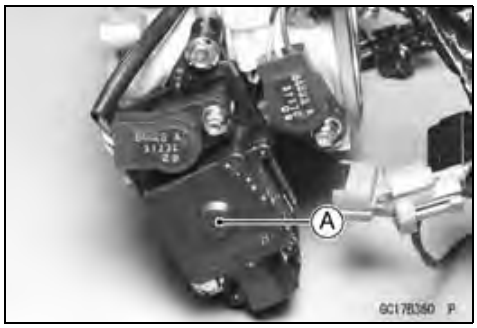
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Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Removal

CAUTION

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



Subthrottle Valve Actuator Inspection

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Turn the ignition switch ON.
- Check to see that all subthrottle valves [A] open and close smoothly.

★If the subthrottle valves do not operate, check the actuator internal resistance (see Resistance Inspection).

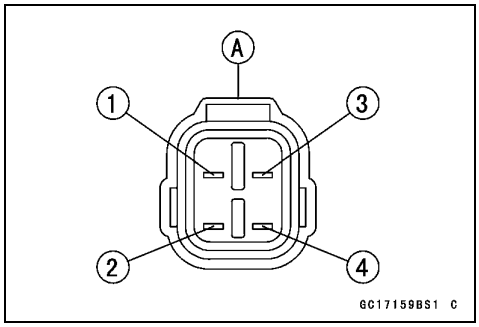


Resistance Inspection

- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the subthrottle valve actuator connector [A].
- Connect a digital meter to the subthrottle valve actuator connector [A].
- Measure the subthrottle valve actuator resistance.

Subthrottle Valve Actuator Resistance

Connections:	**BK lead [1] ←→ P lead [2]**
	G lead [3] ←→ W/BL lead [4]
Standard:	**About 5 ~ 7 Ω**



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

★If the reading is within the range, check the input voltage (see Input Voltage Inspection).

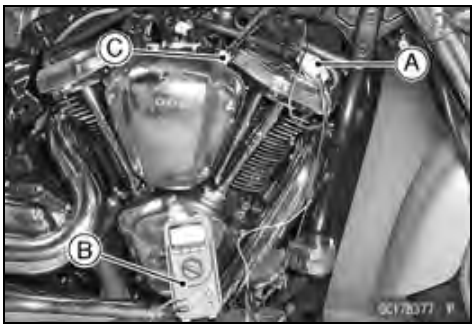
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Subthrottle Valve Actuator (Service Code 62)

Input Voltage Inspection

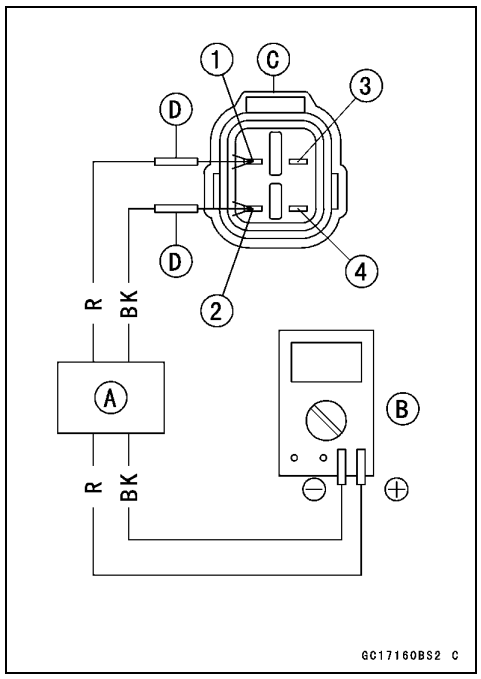
NOTE

○*Be sure the battery is fully charged.*



● Turn the ignition switch OFF.
● Remove the fuel tank (see Fuel Tank Removal).
● Connect the peak voltage adapter [A] and a digital meter [B] to the connector [C], using the needle adapter set [D].

Special Tools - Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B
Needle Adapter Set: 57001-1457



● Temporarilly install the fuel tank.
○Connect the following
Fuel Hose
Meter Leads Connector
Fuel Pump Leads Connector
Fuel Level Sensor Leads Connector

Subthrottle Valve Actuator Input Voltage
Connections to Harness Connector

(I) Meter (+) → BK lead [1]
Meter (–) → P lead [2]
(II) Meter (+) → G lead [3]
Meter (–) → W/BL lead [4]

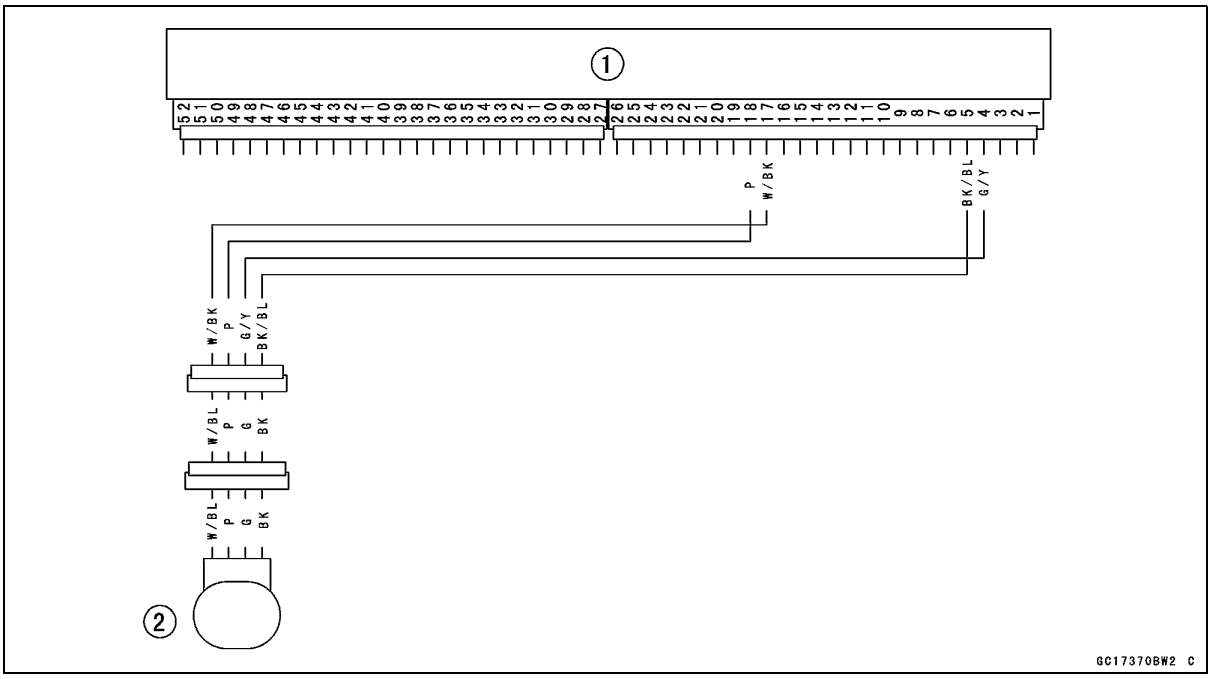
● Measure the actuator input voltage with the engine stopped, and with the connector joined.
● Turn the ignition switch ON.

Input Voltage at Sensor
Standard: about 8.5 ~ 10.5 V DC

★If the reading is out of the range, check the wiring to ECU (see wiring diagram in this section).
★If the wiring is good, replace the ECU.
● Install the fuel tank.
○Be sure the fuel tank dampers are in position.

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Subthrottle Valve Actuator (Service Code 62)



1. ECU
2. Subthrottle Valve Actuator

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Air Switching Valve (Service Code 64)

Air Switching Valve Removal/Instalation

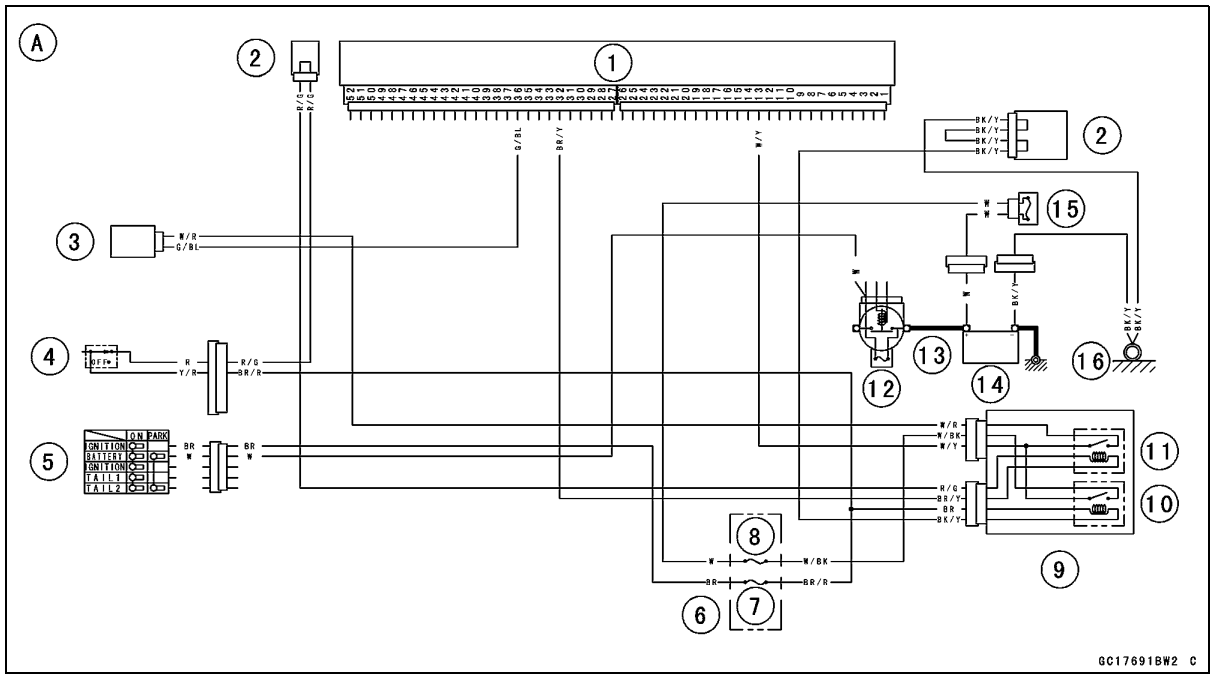
- See the Engine Top End chapter.

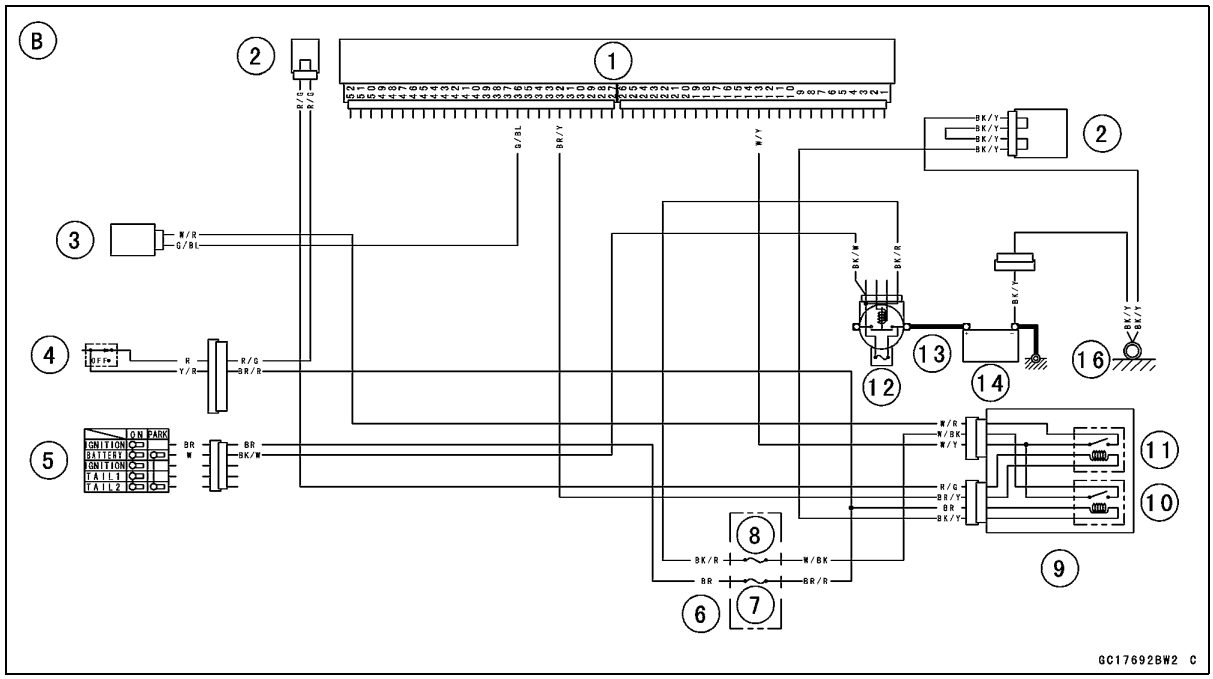
Air Switching Valve Inspection

- See the Air Switching Valve Unit Test in Electrical System chapter.
- Remove the fuel tank and check the wiring continuity, using the following diagram.

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Air Switching Valve (Service Code 64)





1. ECU
2. Joint Connector
3. Air Switching Valve
4. Engine Stop Switch
5. Ignition Switch
6. Fuse Box
7. Ignition Fuse 10 A
8. ECU Fuse 10 A
9. Relay Box
10. ECU Main Relay
11. Fuel Pump Relay
12. Main Fuse 30 A
13. Starter Relay
14. Battery
15. ECU Main Fuse (VN2000-A1 Model)
16. Frame Ground

A: VN2000-A1 Model
B: On and after VN2000-A2/D1 Models

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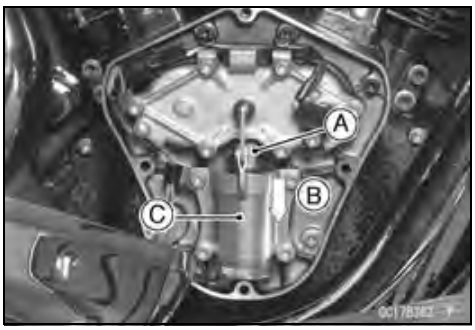
Decompression Solenoid (Service Code 66)

Decompression Solenoid Removal/Installation

- See Decompression Release Mechanism Removal and Installation section in Engine Top End chapter.

Decompression Solenoid Inspection

- Remove the outer camshaft cover (see Decompression Mechanism Removal in the Engine Top End chapter).
- Set the neutral gear. Push the starter button and check that the rod [A] is pulled [B] in the solenoid [C] when the starter button is pushed.

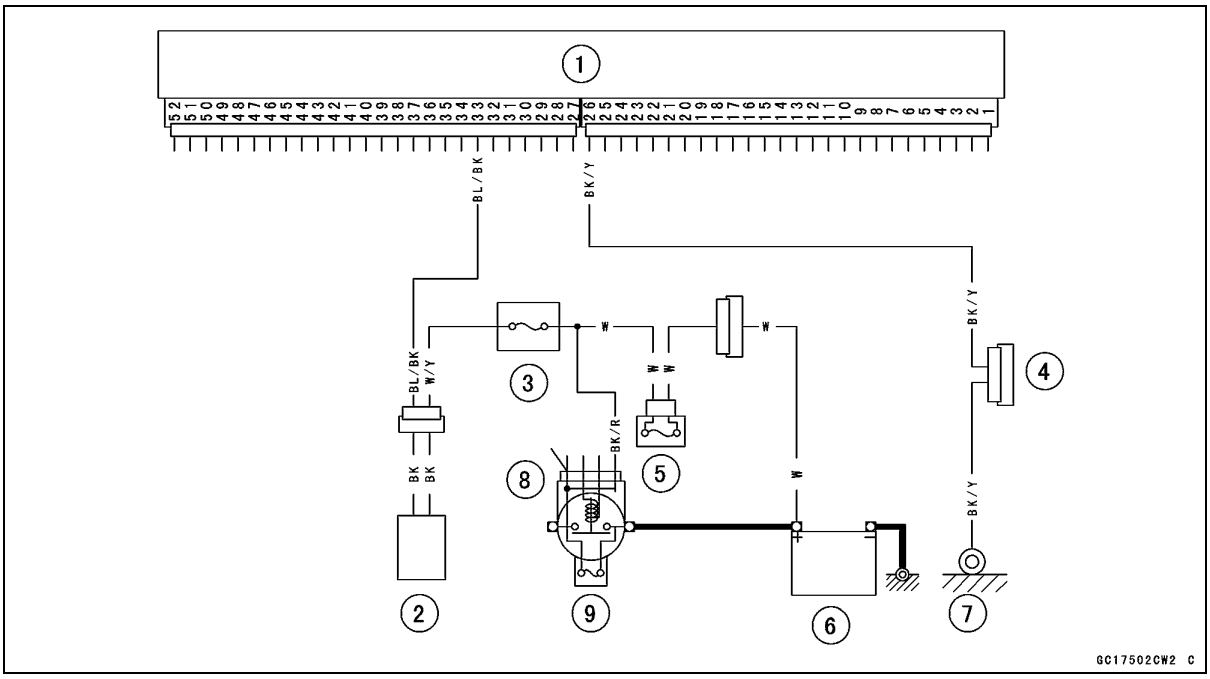


NOTE

○*The rod in the solenoid returns to the original position when the starter button is released.*

★If the rod is not pulled in the solenoid, check the solenoid resistance (see Decompression Solenoid Inspection in the Electrical System chapter) and check the wiring for continuity, using the following diagram.

★If wiring and the decompression solenoid are good, check the ECU for its ground and power supply (see this chapter). If the ground and power supply are good, replace the ECU.



1. ECU
2. Decompression Solenoid
3. Decompression Fuse 10 A
4. Joint Connector
5. ECU Main Fuse 30 A
6. Battery
7. Frame Ground
8. Starter Relay
9. Main Fuse 30 A

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Oxygen Sensor Heater (Service Code 67): Sensor Equipped Model

Oxygen Sensor Heater Removal/Installation

The oxygen sensor heater is bult in the oxygen sensor. So, the heater itself can not be removed. Remove the oxygen sensor (see Oxygen Sensor Removal/Installation in the Electrical System chapter).

Oxygen Sensor Heater Inspection

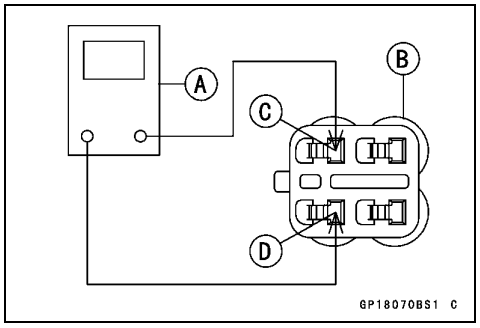
● Remove:
Seats (see Frame chapter)
Right Cover (see Frame chapter)
● Disconnect the oxygen sensor lead connector [A].



● Set the hand tester [A] to the × 1 Ω range and connect it to the terminals in the oxygen sensor lead connector [B].
Black [C]
Black [D]

Special Tool - Hand Tester: 57001-1394

Oxygen Sensor Resistance
Standard: 14.1 ~ 19.3 Ω at 20°C (68°F)



★If the tester reading is not as specified, replace the oxygen sensor with a new one.

★If he tester reading is specified, check the power source voltage Inspection.

NOTE

○*Be sure the battery is fully charged.*

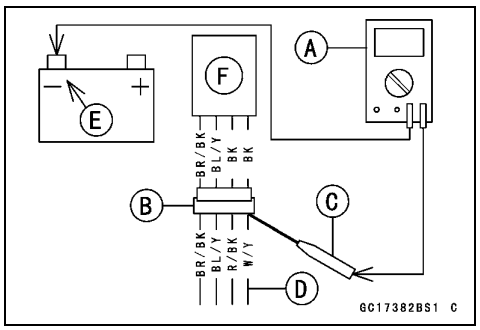
● Connect a digital voltmeter [A] to the oxygen sensor connector (4P), using the needle adapter [C].

Special Tool - Needle Adapter Set: 57001-1457

● Measure the power source voltage with the engine stopped, and with the oxygen sensor connector joined.

Oxygen Sensor Power Source Voltage
Connections to Oxygen Sensor Connector
Tester (+) → W/Y lead [D]
Tester (−) → Battery (−) Terminal [E]

Standard: Battery Voltage



Oxygen Sensor [F]

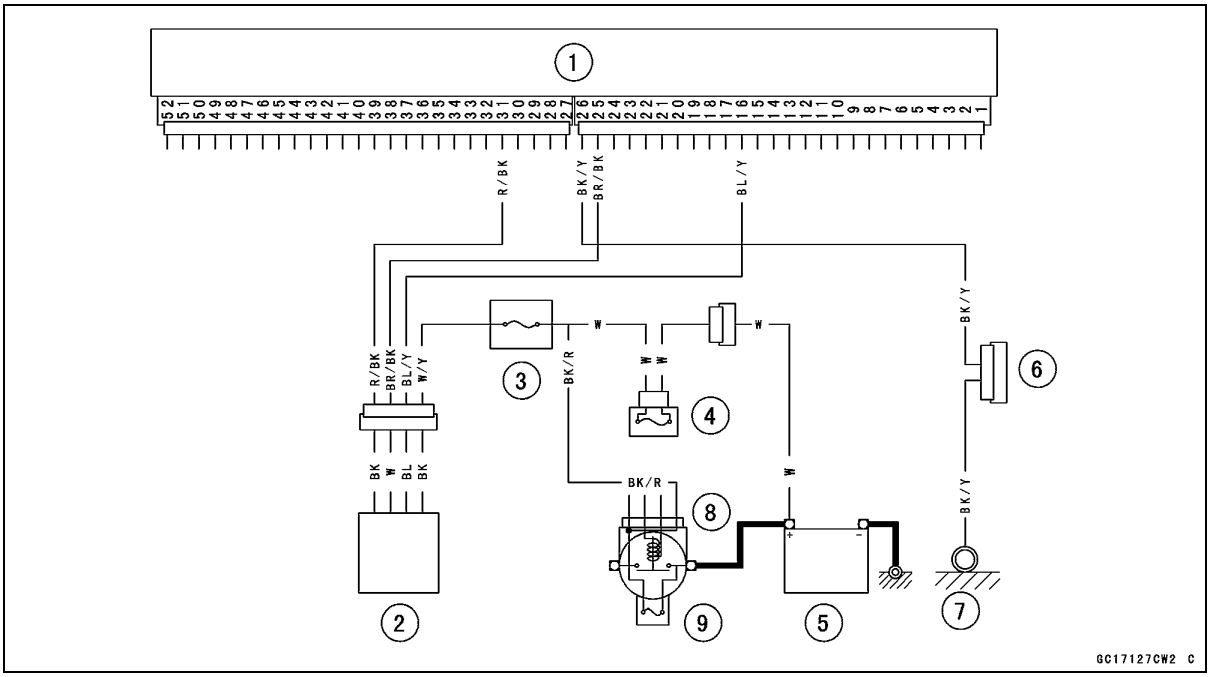
★If the reading is incorrect, check the following.
Battery
ECU Main Fuse 30 A
Decompression Fuse 10 A

★If the reading is good, the power source voltage is normal, Inspect the Red/Black lead between the oxygen sensor connector and the ECU for continuity, using the following diagram.

★If the wiring is good, inspect the ECU for its ground, and power supply (see ECU section in this chapter). If the ground and power supply are good, replace the ECU.

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Oxygen Sensor Heater (Service Code 67): Sensor Equipped Model



1. ECU
2. Oxygen Sensor
3. Decompression Fuse 10 A
4. ECU Main Fuse 30 A
5. Battery
6. Joint Connector
7. Frame Ground
8. Starter Relay
9. Main Fuse 30 A

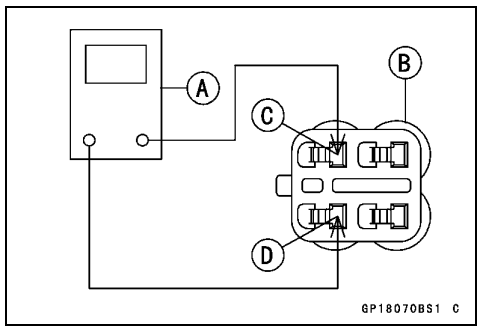
Oxygen Sensor Heater Inspection

● Set the hand tester [A] to the × 1 Ω range and connect it to the terminals in the oxygen sensor lead connector [B].
Black [C]
Black [D]

Special Tool - Hand Tester: 57001-1394

Oxygen Sensor Resistance
Standard: 14.1 ~ 19.3 Ω at 20°C (68°F)

★If the tester reading is not as specified, replace the oxygen sensor with a new one.



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Subthrottle Motor Driver (Service Code 85)

Subthrottle Motor Driver Removal/Installation

- Subthrottle motor driver is the internal circuit of the ECU. Subthrottle motor driver itself can not be removed from the ECU.

Subthrottle Motor Driver Inspection

- Service code 85 is appeared, replace the ECU.

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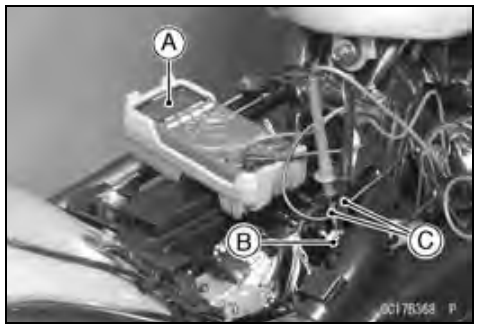
Oxygen Sensor-Incorrect Output Voltage (Service Code 94): Sensor Equipped Model

Oxygen Sensor Removal/Installation

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

Oxygen Sensor Inspection

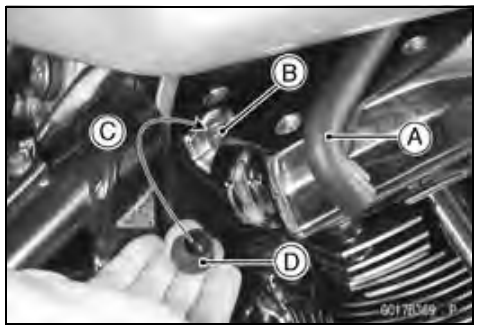
- Warm up the engine thoroughly.
- Turn the ignition switch OFF.
- Remove the seats (see Frame chapter).
- Connect a digital voltmeter [A] to the oxygen sensor connector [B] (main harness side), using the needle adapter set [C].



Special Tool - Needle Adapter Set: 57001-1457

Oxygen Sensor Output Voltage
Connections to Oxygen Sensor Connector
Meter (+) → BL/Y lead
Meter (−) → BR/BK lead

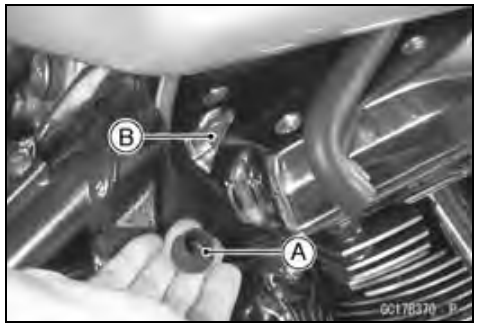
- Remove the air switching valve hoses [A] (both sides) from the fittings [B].
- Install [C] the suitable plugs [D] (both sides) on the fittings and shut off the secondary air.



- Turn the ignition switch ON.
- Start the engine, and let it idle.
- Measure the output voltage of the sensor with the connector joined.

Oxygen Sensor Output Voltage (with Plugs)
Standard: 0.7 ~ 0.8 V

- Next, remove the plugs [A] (both sides) from the fittings [B] with idring.



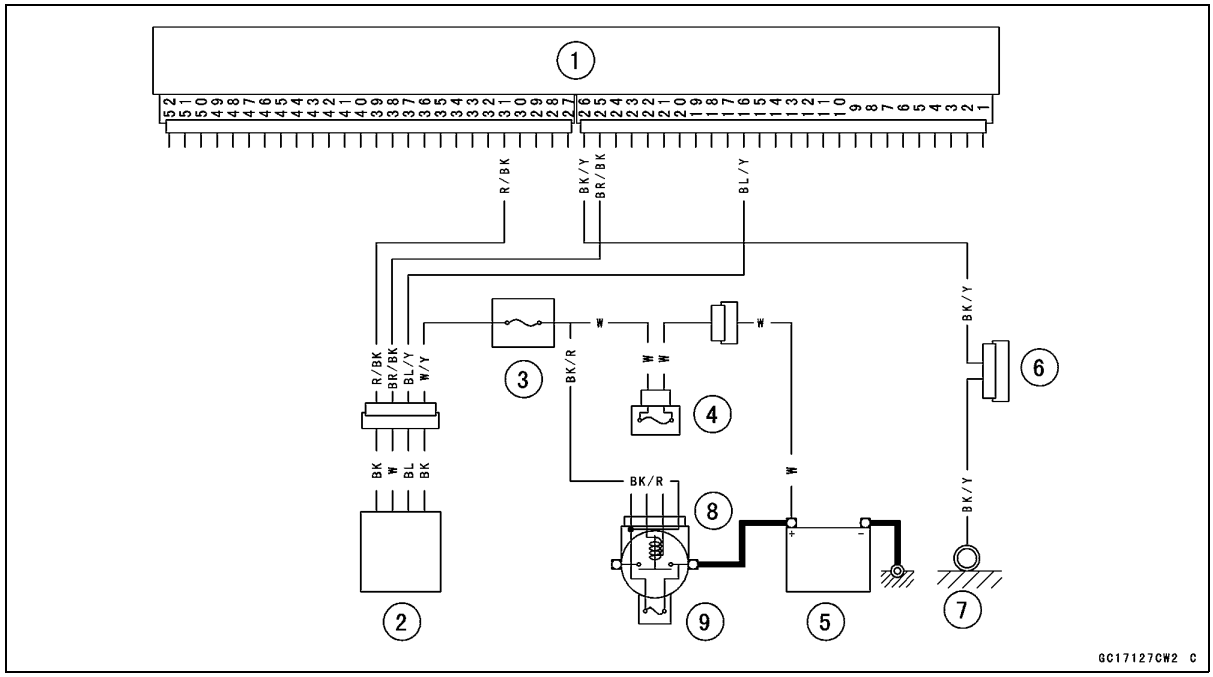
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Oxygen Sensor-Incorrect Output Voltage (Service Code 94): Sensor Equipped Model

● Measure the output voltage of the sensor with the connector joined.

Oxygen Sensor Output Voltage (without Plugs)
Standard: approx. 0.1 V

★If the reading is within range (with plugs: 0.7 ~ 0.8 V, without plugs: approx. 0.1 V), the oxygen sensor is good.
★If the reading is out of the range, inspect the engine and fuel supply system.
★If the engine and fuel supply system good, replace the oxygen sensor.



1. ECU
2. Oxygen Sensor
3. Decompression Fuse 10 A
4. ECU Main Fuse 30 A
5. Battery
6. Joint Connector
7. Frame Ground
8. Starter Relay
9. Main Fuse 30 A

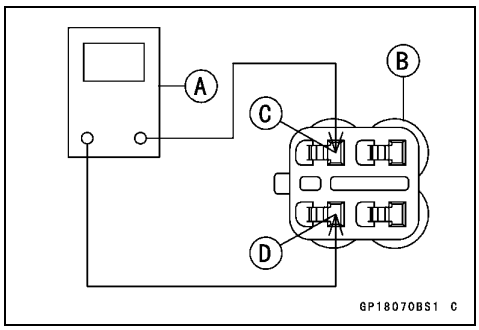
Oxygen Sensor Heater Inspection

● Set the hand tester [A] to the × 1 Ω range and connect it to the terminals in the oxygen sensor lead connector [B].
Black [C]
Black [D]

Special Tool - Hand Tester: 57001-1394

Oxygen Sensor Resistance
Standard: 14.1 ~ 19.3 Ω at 20°C (68°F)

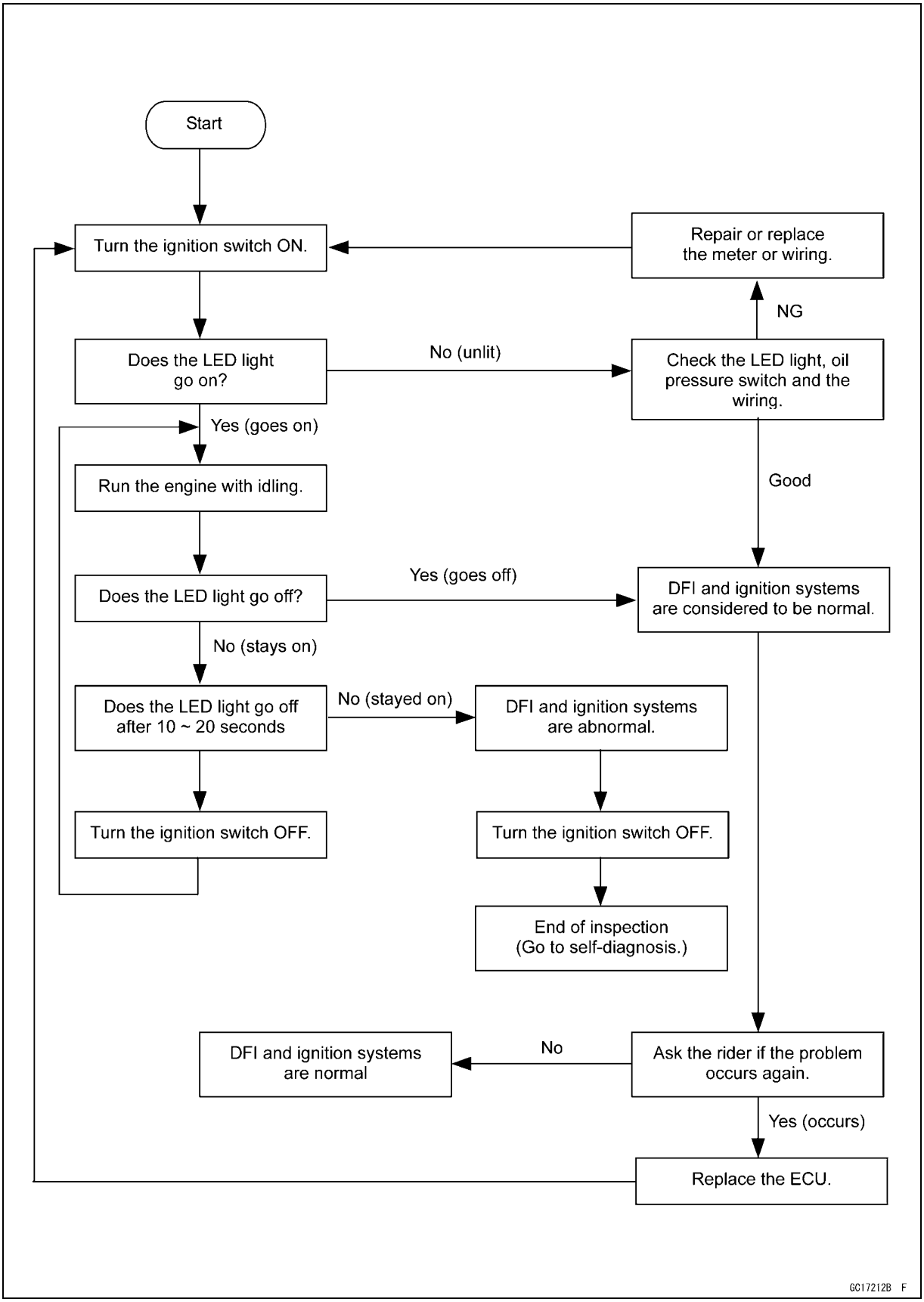
★If the tester reading is not as specified, replace the oxygen sensor with a new one.



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FI Indicator LED Light

Inspection Flow Chart



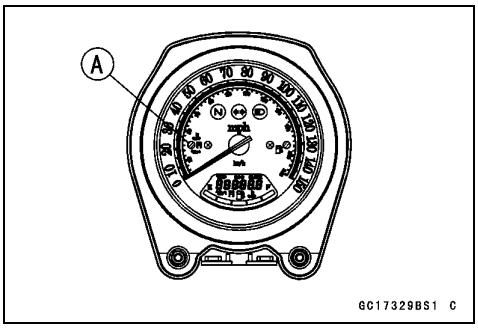
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FI Indicator LED Light

LED Light Inspection

○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.

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

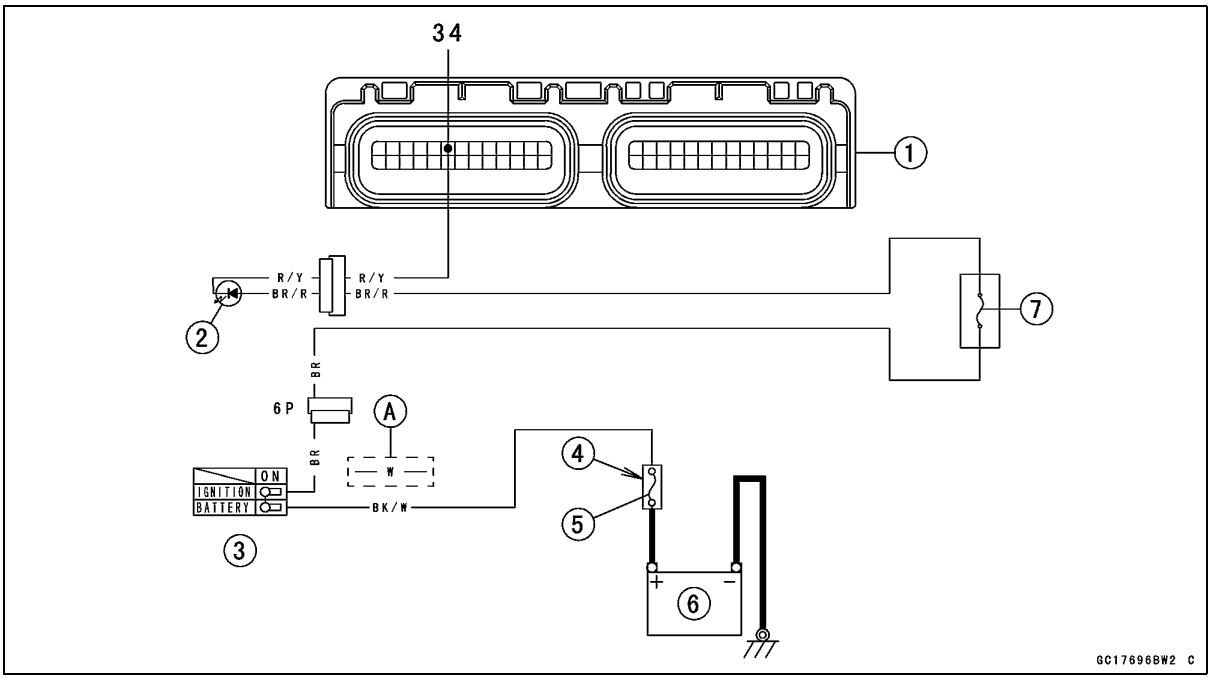


⚠ WARNING

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

★If the LED light is ubnormal, 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 section).



1. ECU
2. FI Indicator LED Light
3. Ignition Switch
4. Starter Relay
5. Main Fuse 30 A
6. Battery
7. Ignition Fuse 10 A

A: VN2000-A1 Model

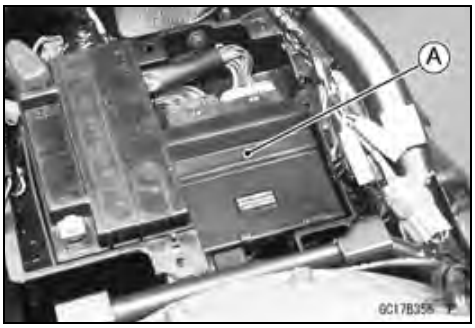
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ECU

ECU Removal

CAUTION

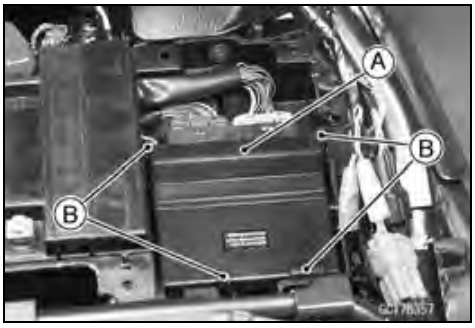
Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.



- Remove:
  Seats (see Frame chapter)
  Rear Shock Absorber (see Suspension chapter)
  Tool Case (see Frame chapter)
- Pull the ECU [A] out along with the harness.

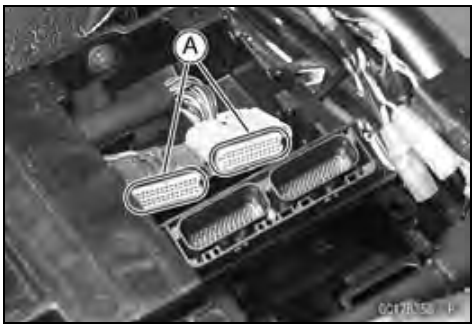
★If necessary, push the lock and disconnect the ECU connectors.

ECU Installation



- Connect the ECU connector.
- Fit the ECU [A] in the ribs [B].

ECU Power Supply Inspection



- 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 ON or OFF, using a digital voltmeter [D].

ECU Grounding Inspection
Meter Connections:

26, 27, 51 (BK/Y) Terminal	**←→ Battery (–) Terminal**
25 (BR/BK) Terminal	**←→ Battery (–) Terminal**
Engine Ground Terminal [B]	**←→ Battery (–) Terminal**

Readings: **0 Ω (regardless of the ignition switch ON or OFF)**

★If no continuity, check the connector, the engine ground lead, or main harness, and repair or replace them if necessary.
Battery [C] in the Frame

Special Tool - Needle Adapter Set: 57001-1457

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ECU

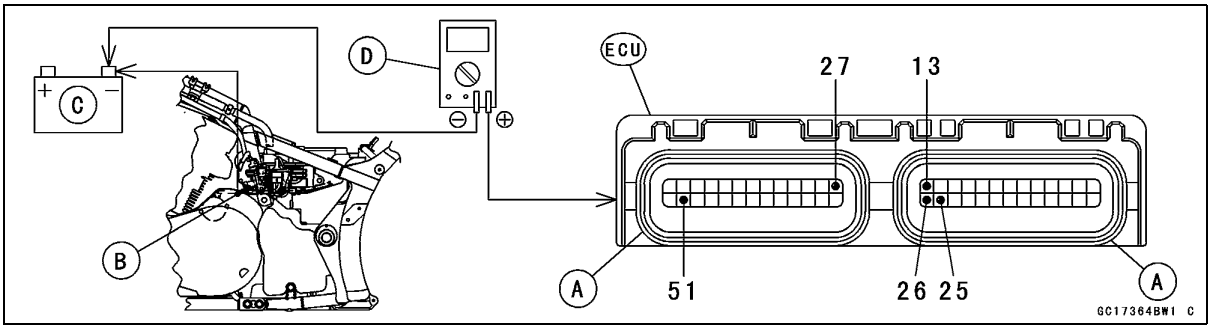
● Check the power source voltage of the ECU with a digital voltmeter.

ECU Power Source Inspection

Meter Connection:	**between 13 (W/Y) Terminal and Battery (–) Terminal**
Ignition Switch OFF:	**0 V**
Ignition Switch ON:	**Battery Voltage (12.6 V or more)**

★If the voltmeter does not read as specified, check the following:
Power Source Wiring (see wiring diagram of DFI Power Source section in this chapter).
ECU Main Fuse 30 A (see DFI Power Source section)
ECU Main Relay (see DFI Power Source section)
Ignition Fuse 10 A (see 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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Fuel Line

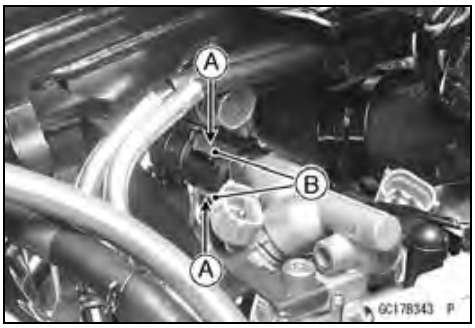
Fuel Pressure Inspection

NOTE

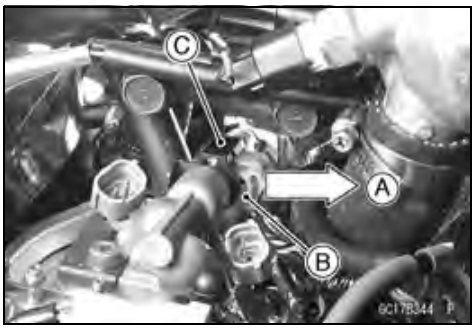
○This inspection can determine which trouble the DFI system has, mechanical or electrical trouble.
○It is preferable to measure the fuel pressure while running the motorcycle when the trouble has occurred in order to know symptom well.
○Be sure the battery is fully charged.

- Remove the fuel tank (see Fuel Tank Removal).
- Remove or disconnect:
  Air Switching Valve (see Engine Top End chapter)
  Vacuum Hoses on Throttle Body Assy
  Injector Connectors

- Push [A] the joint lock claws [B].



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



⚠ WARNING

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

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Fuel Line

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

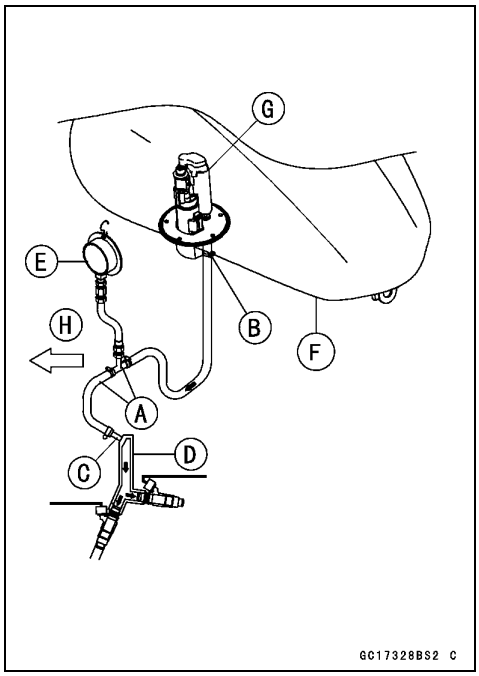
○Put the fuel pressure gauge adapter outside the frame.

● Connect the pressure gauge [E] (special tool) to the fuel pressure gauge adapter.

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

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

● Temporarily, install the removed parts.



⚠ WARNING

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

● 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.

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Fuel Line

- 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

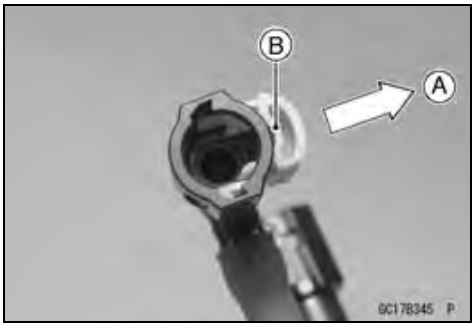
★If the fuel pressure is much lower than specified, check the following:
Fuel Pump for Operation (check the sound of the pump)
Fuel Line Leakage or Clogging
Amount of Fuel Flow (see Fuel Flow Rate Inspection)

★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.

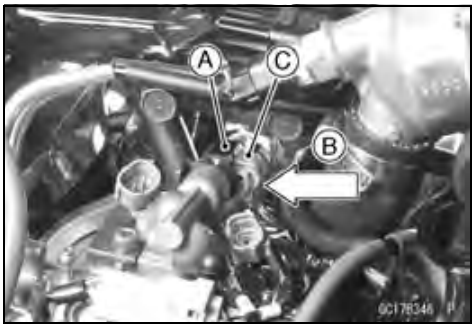
★If the residual pressure 260 ~ 280 (2.7 ~ 2.9 kgf/cm², 38 ~ 41 psi) kPa drops at once, the high pressure fuel line could be leaking.

- Remove the fuel pressure gauge and adapter.

- Pull [A] the joint lock [B] fully as shown.



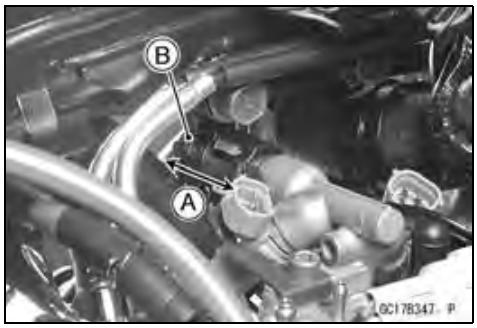
- Insert the fuel hose joint [A] straight onto the delivery pipe.
- Push [B] the joint lock [C] until the hose joint clicks.



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Fuel Line

● Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and doesn't come off.



⚠ WARNING

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

★If it comes off, reinstall the hose joint.
● Run the fuel hose in accordance with the Cable, Wire and Hose Routing section in the Appendix chapter.
● Install the removed part

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.

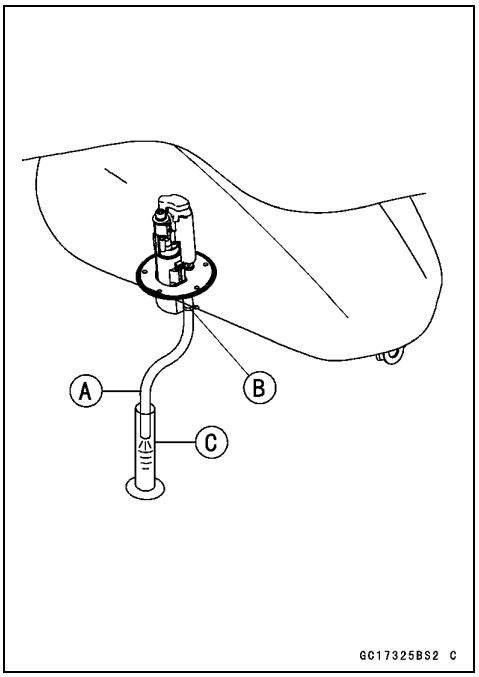
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Fuel Line

- Prepare a plastic hose of the inside diameter 7.5 mm (0.30 in.) × L about 400 mm (16 in.) and a measuring cylinder.
- Remove:
  Seat (see Frame 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) 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 or more for 3 seconds

★If the fuel flow is much less than the specified, check the battery condition (see 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).
- Start the engine and check for no fuel leakage.

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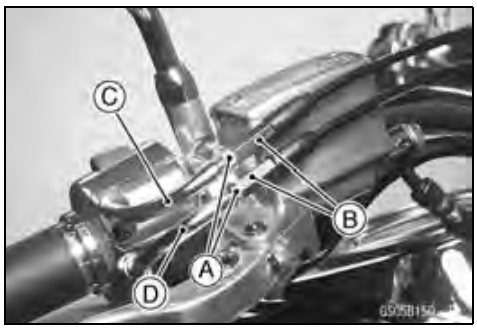
Throttle Grip and Cables

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 [D] until there is no play.
- Tighten the locknut against the adjuster.
- Turn the adjuster of the accelerator cable [C] 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.

Cable Removal/Installation

○See Throttle Body Assy and Intake Manifold section in this chapter for removal/installation of the throttle cables and choke cable.

Cable Lubrication and Inspection

- Whenever the throttle cables are removed or in accordance with the Periodic Maintenance Chart, lubricate the these cables. Refer to 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 Check in the Periodic Maintenance Chapter.

Idle Speed Adjustment

● Refer to the Idle Speed Check in the Periodic Maintenance Chapter.

Throttle Bore Cleaning

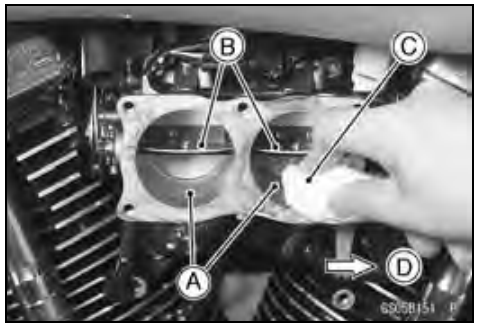
● Check the throttle bore for cleanliness as follows:

○Remove the air cleaner housing (see Air Cleaner Housing Removal).

○Check the throttle bores [A] at the throttle valves [B] and around them for carbon deposits by opening the valves.

★If any carbon accumulates, wipe the carbon off the throttle bores around the throttle valves, using a lint-free cloth [C] penetrated with a high-flash point solvent.

Front [D]



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 and Intake Manifold Removal

● Remove the fuel tank (see Fuel Tank Removal).

⚠ WARNING

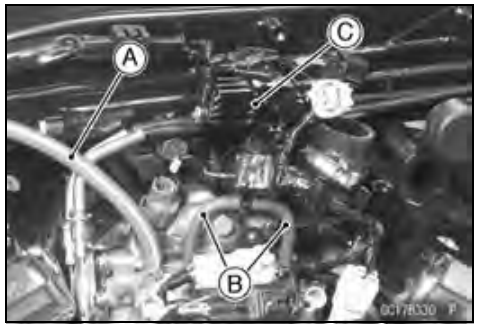
Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Disconnect the battery (–) terminal.
Be prepared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

● Remove:

Thermostat Housing (see Thermostat Removal in the Cooling System chapter)
Air Cleaner Housing (see Air Cleaner Housing Removal)
Air Switching Valve with Hoses (see Engine Top End chapter)

● Disconnect:

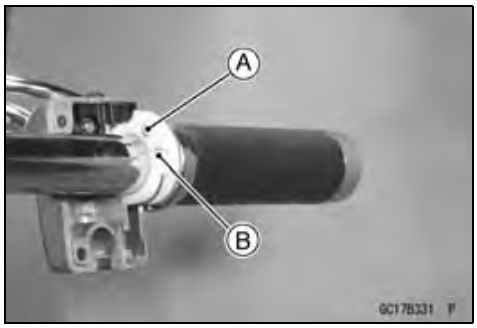
Vacuum Hose [A] from Separator (California Model)
Vacuum Hose [B] from Inlet Air Pressure Sensor
Subharness Connector [C]



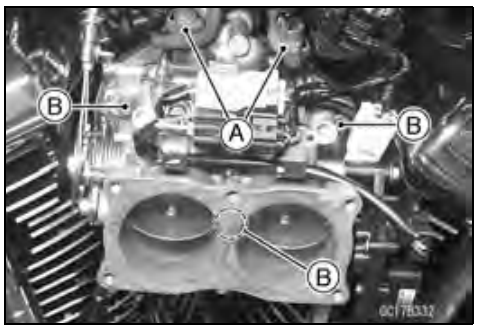
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Throttle Body Assy

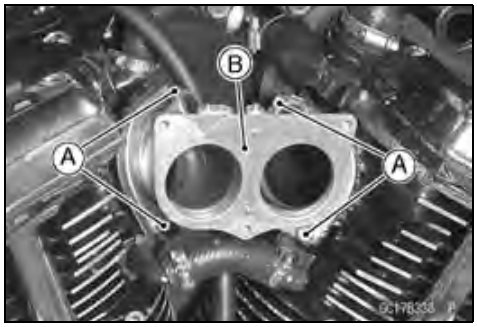
- Remove the screws and take off the right switch housing.
- Remove the accelerator cable end [A] and decelerator cable end [B] at the throttle grip.



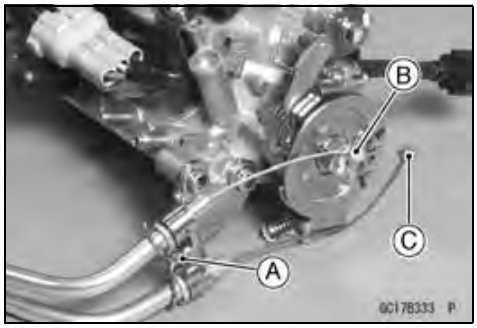
- Disconnect the injection connectors [A].
- Unscrew the bolts [B] and remove the throttle body assy [C] with the throttle cables from the intake manifold.



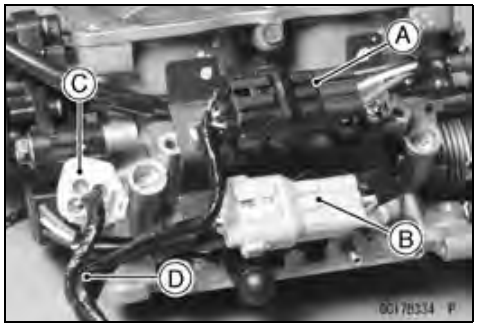
- Remove the injectors (see Injector Removal).
- Unscrew the mounting bolts [A] and remove the intake manifold [B].



- Remove:
  Clip [A]
  Accelerator Cable End [B]
  Decelerator Cable End [C]



- Disconnect:
  Subthrottle Sensor Connector [A]
  Main Throttle Sensor Connector [B]
  Subthrottle Valve Actuator Connector [C]
- Remove the subharness [D] from the throttle body assy.



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Throttle Body Assy

○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.

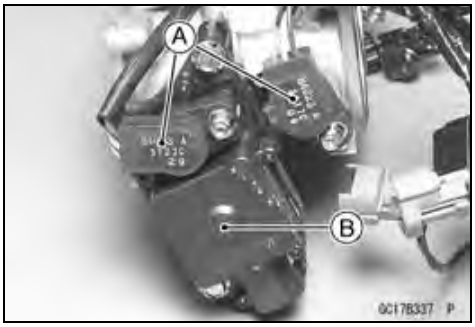
⚠ WARNING

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.

● Do not remove or adjust the throttle sensors [A] and sub throttle valve actuator [B]. These parts are set at the factory and cannot be readjusted.

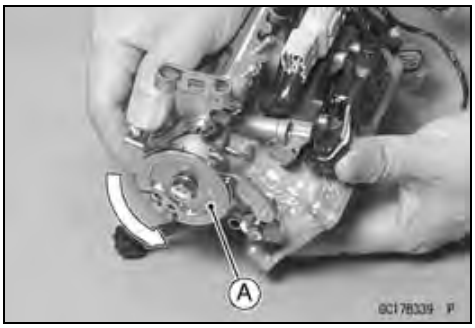


CAUTION

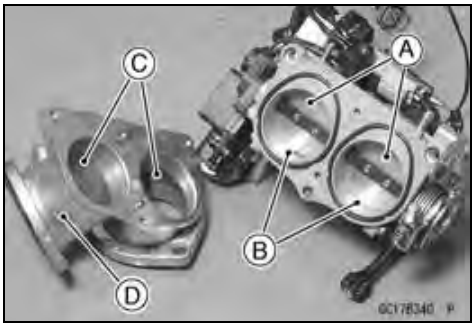
Adjustment of some parts could result in poor performance, requiring replacement of the throttle body.

Throttle Body Assy and Intake manifold Installation

● Turn the throttle pulley [A] to check that the throttle valves move smoothly and return by spring force.
★If the throttle valves do not move smoothly, replace the throttle body.



● 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.

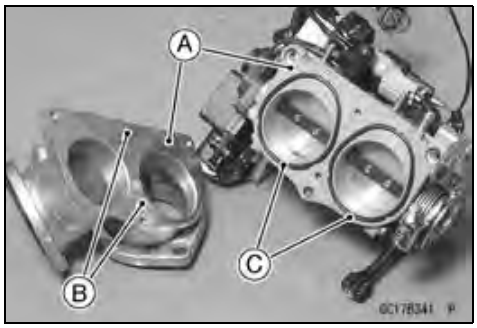
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Throttle Body Assy

- Before Installation, 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.

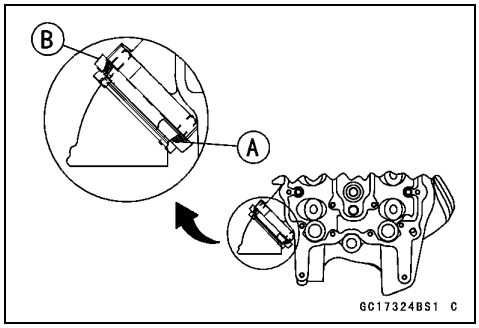


- Be sure the two dowel pins are in position.
- Replace the flange seal [A] with a new one.
- With a high-flash point solvent, clean off the flange surface of the cylinder head and wipe dry.
- Install the flange [B] and seal in the direction shown. Face the smaller diameter end upwards.

○The seal should be centered on the flange.

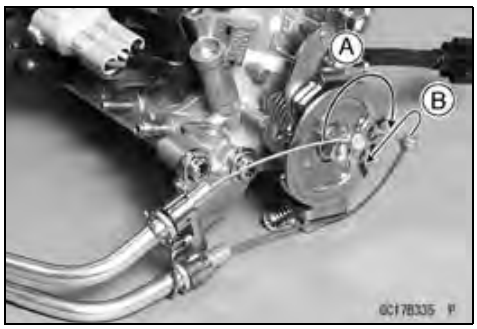
○Apply a non-permanent locking agent to the inlet manifold bolts and torque them.

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



- Install the lower end of the throttle cables in the throttle pulley.

  Accelerator Cable [A]
  Decelerator Cable [B]

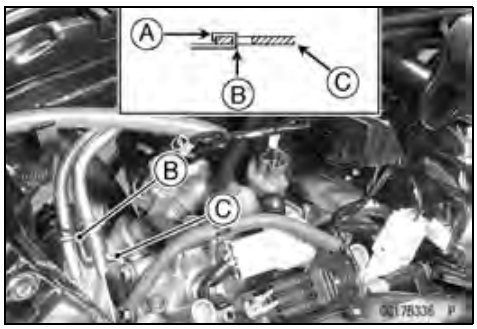


- Install the throttle body assy.

○Apply a non-permanent locking agent to the throttle body assy holder bolts and torque them.

Torque - Throttle Body Assy Holder Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

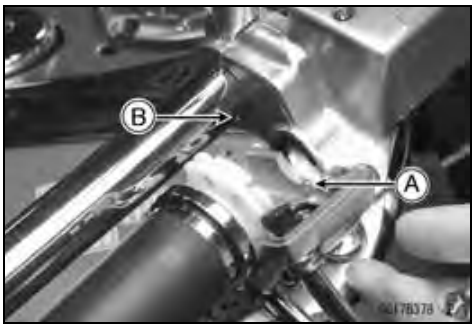
- Stake [A] the cable clip [B] on the throttle cable holder [C].



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Throttle Body Assy

- 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 (front view).
- 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 Grip Free Play Inspection).



⚠ WARNING

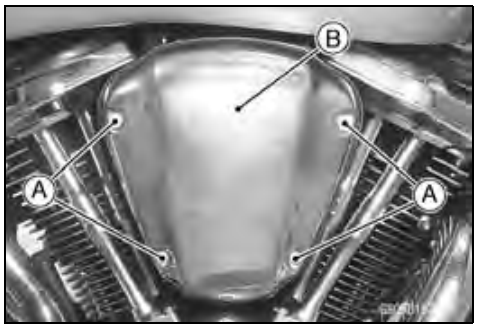
Operation with an incorrectly routed cable could result in an unsafe riding condition.

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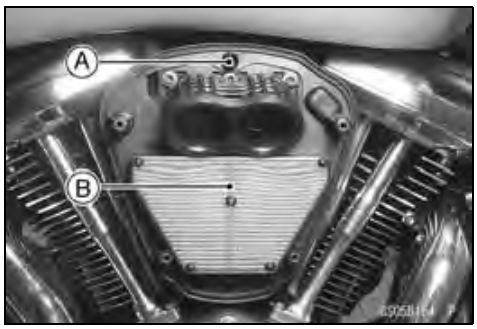
Air Cleaner

Element Removal

● Remove:
Air Cleaner Cover Screws [A]
Air Cleaner Cover [B]



● Unscrew the air cleaner element scerw [A] and remove the air cleaner element [B].



⚠ WARNING

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

CAUTION

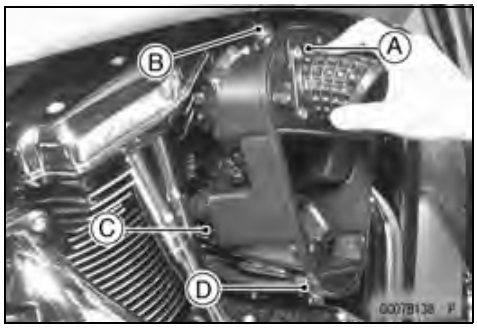
If dirt gets through into the engine, excessive engine wear and possibly engine damage will occur.

Air Cleaner Housing Removal

● Remove the air cleaner housing bolts and Allen bolts [A].



● Pull the air cleaner housing [A] and disconnect the following.
Air Switching Valve Hose [B]
Inlet Air Temperature Sensor Connector [C]
Crankcase Breather Hose [D]
● Remove the air cleaner housing.



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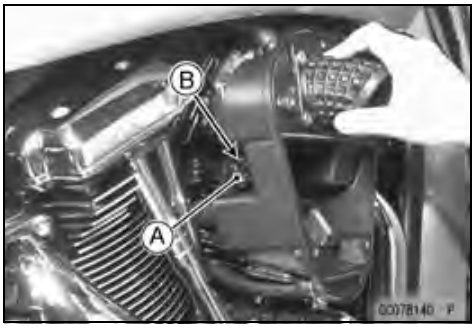
Air Cleaner

Air Cleaner Housing Installation

● Check that oil is in the breather drain cap [A].
★If necessary, drain the oil in the cap.

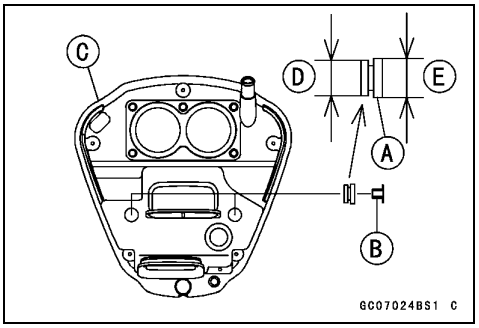


● Fit the idle speed screw [A] in the recess [B] on the air cleaner housing.



● Be sure the dampers [A] and collors [B] are in position.
○Install the damper [A] into the air cleaner housing [C] as shown.
Smaller Diameter [D]
Larger Diameter [E]

Torque - Air Cleaner Housing Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
Air Cleaner Housing Allen Bolts: 9.8 N·m (1.0 kgf·m, 87 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.



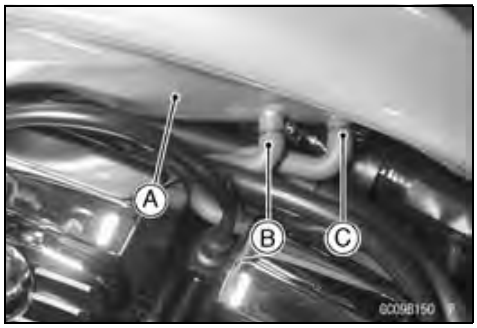
⚠ WARNING

The fuel cannot be removed completely from the fuel tank. Be careful for remained fuel spillage.

- Disconnect the battery (−) terminal.
- Remove:
  Rear Seat and Front Seat (see Frame chapter)
  Fuel Tank Bolt [A]



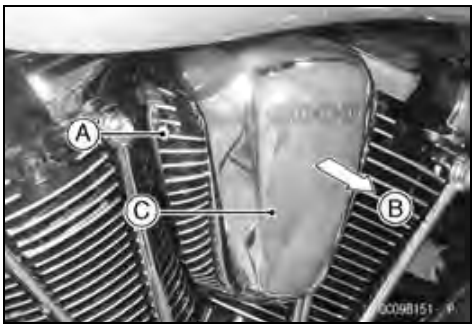
- Disconnect the following from the fuel tank [A].
  Breather Hose (Blue) [B]
  Fuel Return Hose (Red-California Model) [C]



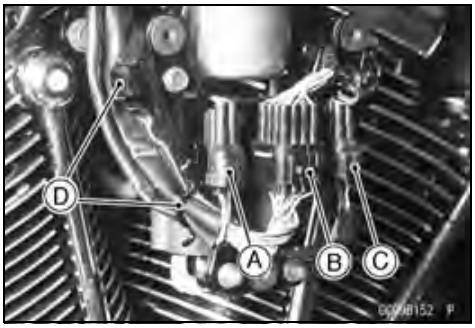
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Fuel Tank

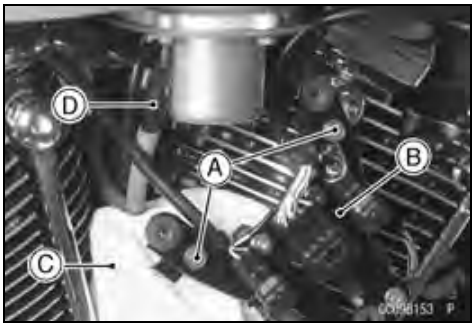
● Unscrew the screw [A] and pull [B] out the cover [C].



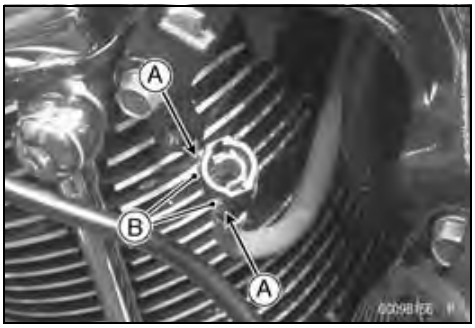
● Disconnect:
Fuel Level Sensor Connector [A]
Meter Connector [B]
Fuel Pump Connector [C]
● Free the leads from the clamps [D].



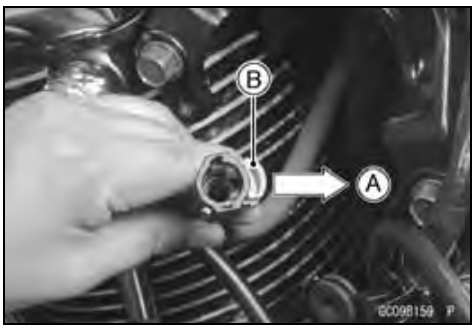
● Unscrew the bracket bolts [A] and pull down the bracket [B].
● Place a cloth [C] around the fuel hose joint [D].
● Pull down the fuel hose joint as follows.



○Push [A] the joint lock claws [B] (in the photo, the fuel hose joint has been removed for clarity).



○Pull [A] joint lock [B] as shown (in the photo, the fuel hose joint has been removed for clarity).
● Pull down the fuel hose joint.



⚠ 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.

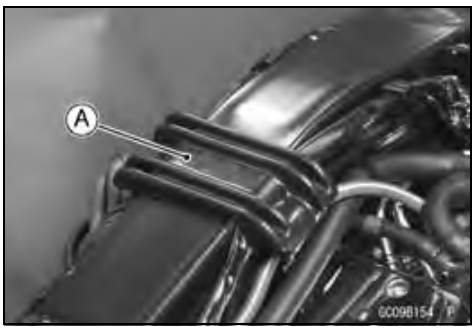
Fuel Tank Installation
● Read the above WARNING.
● Route the hoses correctly (see Appendix chapter).
● For California model, note the following:
○To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
○Connect the hoses according to the diagram 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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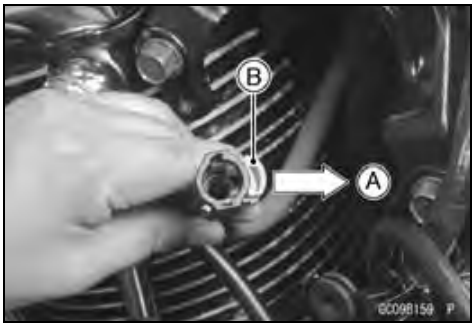
Fuel Tank

● Check that the rubber dampers [A] are in place.
★If the dampers are damaged or deteriorated, replace them.

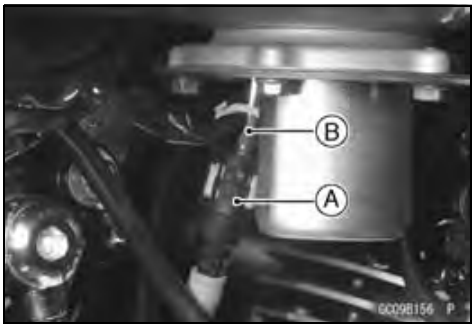




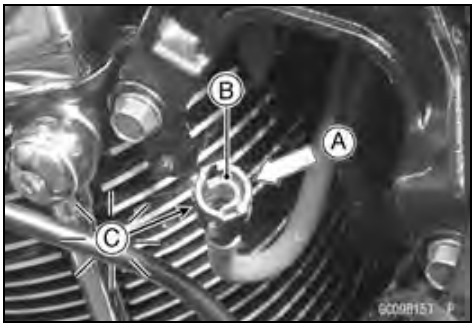
● Pull [A] the joint lock [B] fully as shown.



● Insert the fuel hose joint [A] straight onto the tank outlet pipe [B].



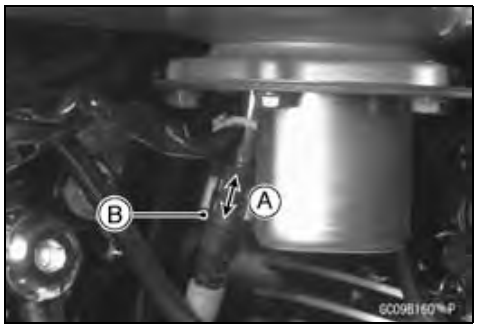
● Push [A] the joint lock [B] until the hose joint clicks [C] (in the photo, the fuel hose joint has been removed for clarity).



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Fuel Tank

● Push and pull [A] the hose joint [B] up and down more than two times and make sure it is locked and doesn't come off.



⚠ WARNING

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

★If it comes off, reinstall the hose joint.

● Connect the fuel pump, meter and the fuel level sensor connectors and the battery (–) lead terminal.

Fuel Tank and Cap Inspection

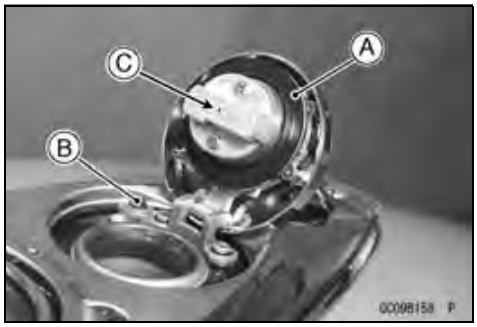
● Visually inspect the gasket [A] on the tank cap for any damage.

★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.



CAUTION

Do not apply compressed air to the air vent holes [C] in the tank cap. This could damage and clog the labyrinth in the cap.

Fuel Tank Cleaning

⚠ WARNING

Clean the tank in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area. Because of the danger 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).

● Remove the fuel pump from the fuel tank (see Fuel Pump Removal).

● 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).

● Install the fuel tank (see Fuel Tank Installation).

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Evaporative Emission Control System (CAL Model)

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

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

Canister Inspection (Periodic Inspection)

- Refer to the Evaporative Emission Control System Check in the Periodic Maintenance Chapter.

Separator Inspection (Periodic Inspection)

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

Hose Inspection (Periodic Inspection)

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

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Evaporative Emission Control System (CAL Model)

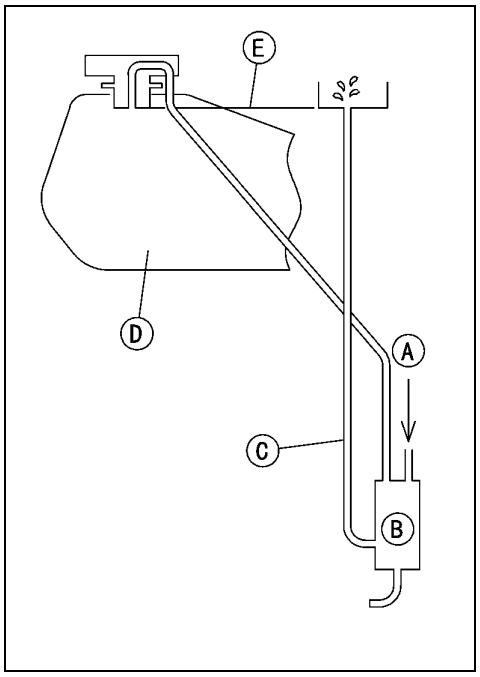
Separator Operation Test

⚠ 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.

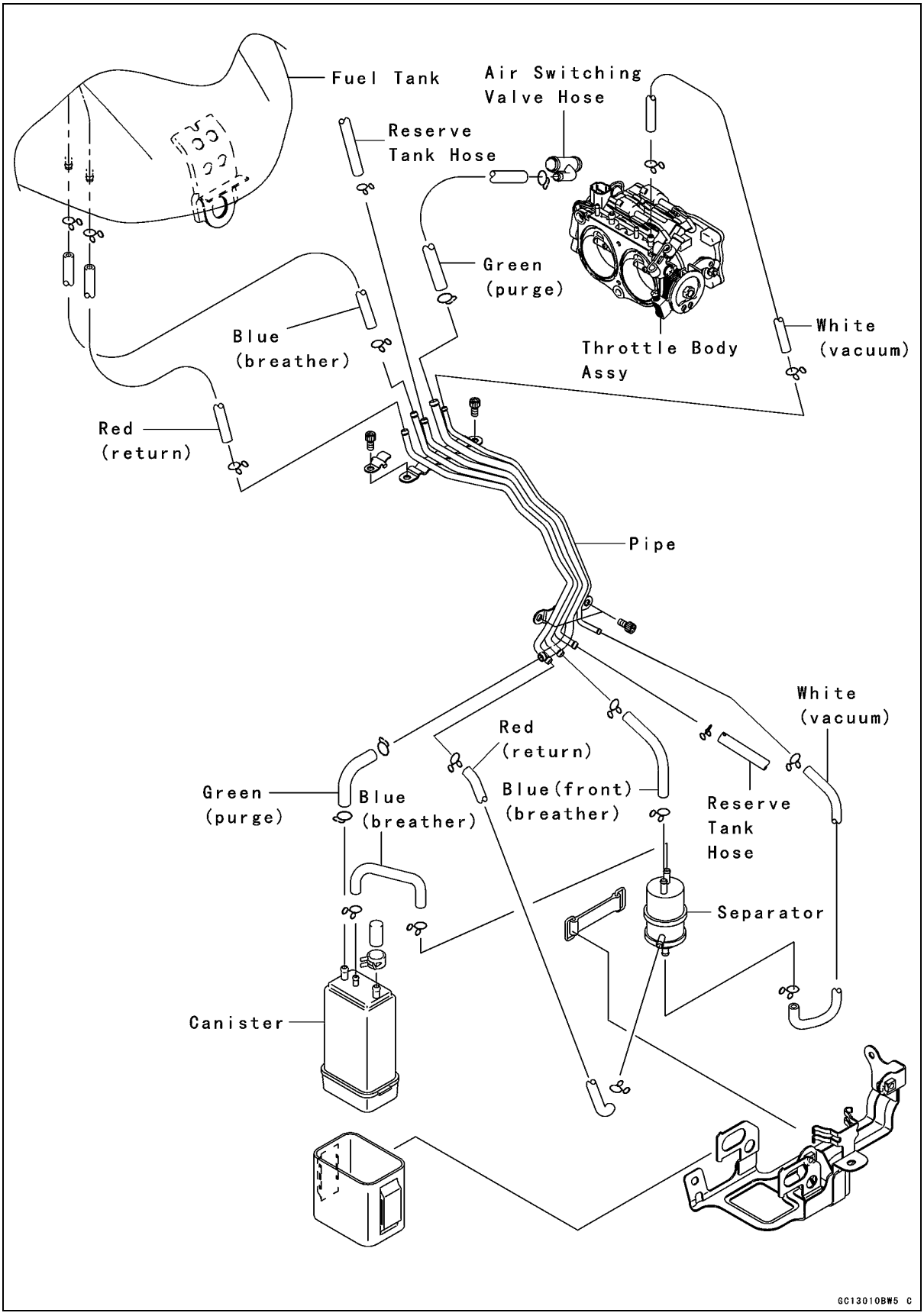
- Remove the seat and left side cover (see Frame chapter).
- Connect the hoses to the separator.
- Disconnect the breather hose from the separator, and inject about **20 mL** of gasoline [A] into the separator [B] through the hose fitting.
- Disconnect the evaporative fuel return hose [C] from the fuel 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 (CAL Model)



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Cooling System

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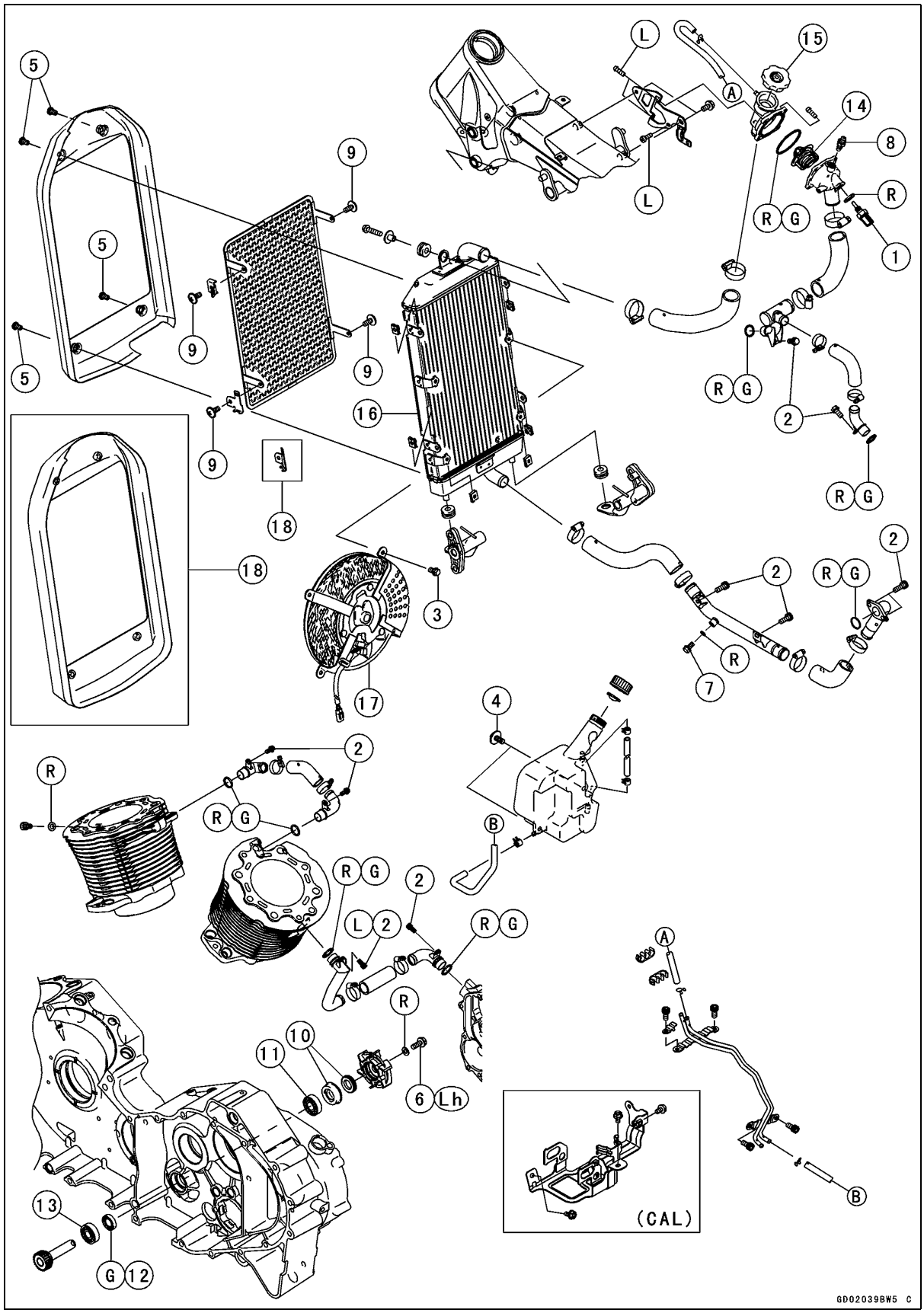
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Temperature Sensor (DFI)	12	1.2	104 in·lb	
2	Water Pipe Bolts	9.8	1.0	87 in·lb	
3	Radiator Fan Bolts	8.3	0.85	74 in·lb	
4	Reserve Tank Bolts	6.9	0.70	61 in·lb	
5	Radiator Cover Bolts	11	1.1	97 in·lb	
6	Water Pump Impeller Bolt	12	1.2	104 in·lb	Lh
7	Coolant Drain Bolt	9.8	1.0	87 in·lb	
8	Water Pump Air Bleeder Bolt (Before Engine No.006704)	7.8	0.80	69 in·lb	
9	Radiator Screen Screws	6.9	0.70	61 in·lb	

10. Mechanical seal
11. Double seal bearing
12. Oil seal
13. Ball bearing
14. Thermostat
15. Radiator cap
16. Radiator
17. Radiator Fan
18. VN2000-A1 Model

G: Apply grease.
L: Apply a non-permanent locking agent.
Lh: Left-hand threads
R: Replacement parts

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4-4 COOLING SYSTEM

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 less than 55° (131°F), the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is 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 relay opens and the radiator fan stops.

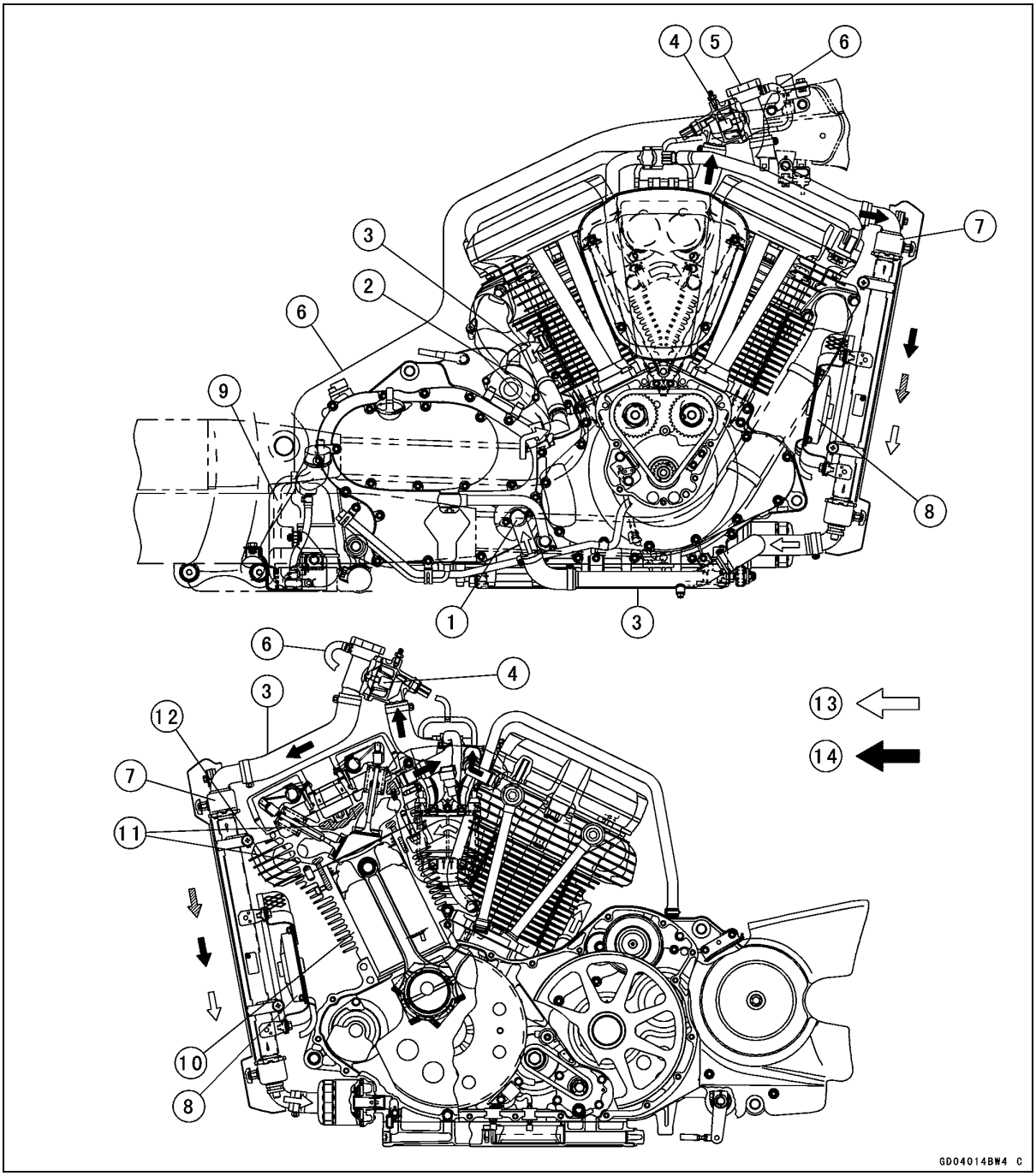
In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.

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

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kpa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kpa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to 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 Flow Chart



1. Water Pump
2. Water Hose
3. Water Pipe
4. Thermostat
5. Radiator Cap
6. Reserve Tank Hose
7. Radiator
8. Radiator Fan
9. Reserve Tank
10. Cylinder
11. Water Jacket
12. Cylinder Head
13. Cold Coolant
14. Hot Coolant

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4-6 COOLING SYSTEM

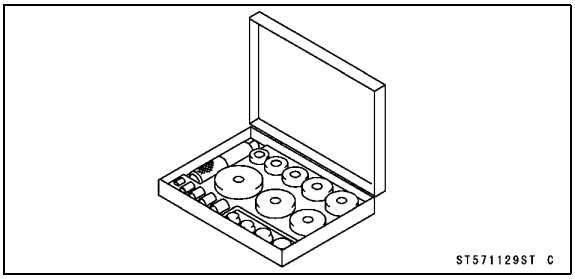
Specifications

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	2.5 L (2.6 US qt., reserve tank full level including radiator and engine)
Radiator Cap	
Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 14 ~ 18 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)

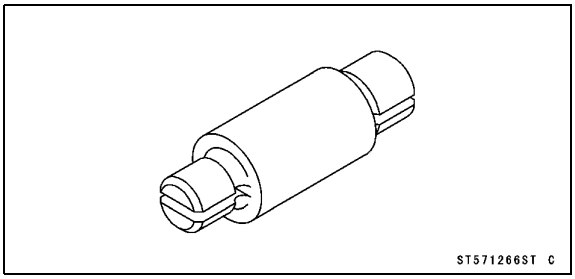
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Special Tools and Sealant

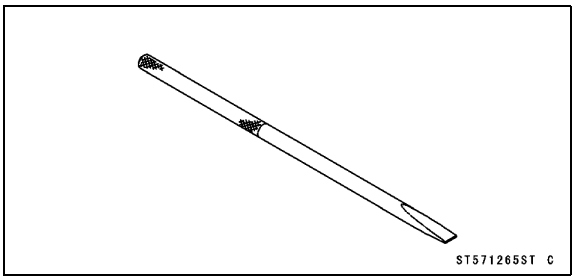
Bearing Driver Set:
57001-1129



Bearing Remover Head, ϕ10 × ϕ12:
57001-1266



Bearing Remover Shaft, ϕ9:
57001-1265



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Coolant

Coolant Deterioration Inspection



- Visually inspect the coolant [A] in the coolant level hose [B] (In the photo, the muffler have been removed for clarity).

★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.

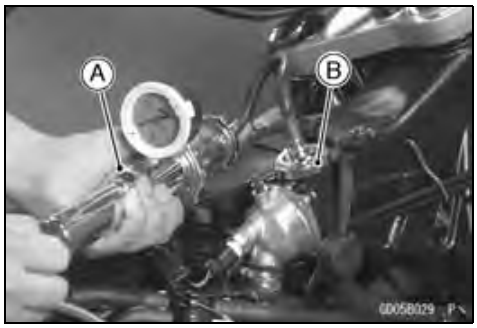
Coolant Draining

- 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 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, 18 psi).

CAUTION

During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm², 17.8 psi).

- Watch the gauge for at least 6 seconds.

★If the pressure holds 93 kPa (0.95 kgf/cm², 14 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).

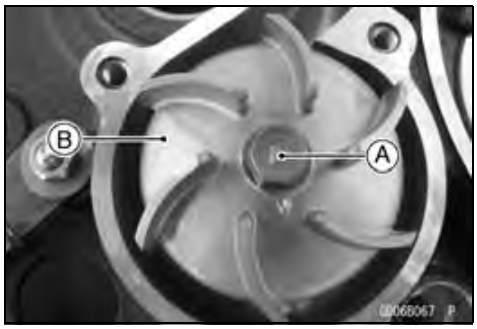
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Water Pump

Water Pump Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Muffler (see Engine Top End chapter)
  Exhaust Pipe (see Engine Top End chapter)
  Outer Transmission Cover (see Crankshaft/Transmission chapter)
  Inner Transmission Cover (see Crankshaft/Transmission chapter)

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



NOTE

○*The impeller bolt has left-hand threads. Turn the bolt clockwise and remove it.*

Water Pump Installation

- Put the washer on the water pump impeller bolt and tighten the bolt by turning the bolt counter clockwise.

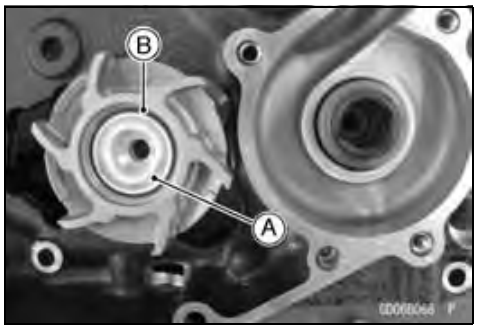
Torque - Water Pump Impeller Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)

Water Pump Inspection

- Visually inspect the mechanical seal.

★If any one of the parts is damaged, replace the mechanical seal as a unit.

○The sealing seat and rubber seal may be removed easily by hand.
  Impeller Sealing Seat Surface [A]
  Rubber Seal [B]



- Visually inspect the impeller [A].

★If the surface is corroded, or if the blades are damaged, replace the impeller.



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Water Pump

Mechanical Seal Replacement



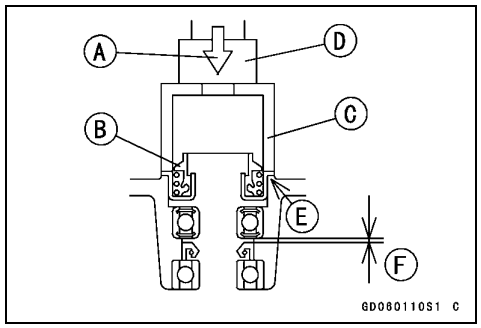
- Remove the water pump impeller (see Water Pump Removal in this chapter).
- Pry the mechanical seal flange off with a small chisel [A].
- Pull the mechanical seal out of the right crankcase with needle nose pliers. Discard the mechanical seal.

CAUTION

Be careful not to damage the water pump shaft and the inner sealing surface of the crankcase.

NOTE

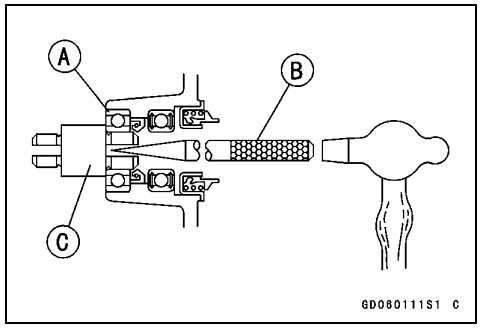
○*Since the replacement mechanical seal has an adhesive coated body, do not apply a liquid gasket to the exterior surface of the body.*



- Press [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]

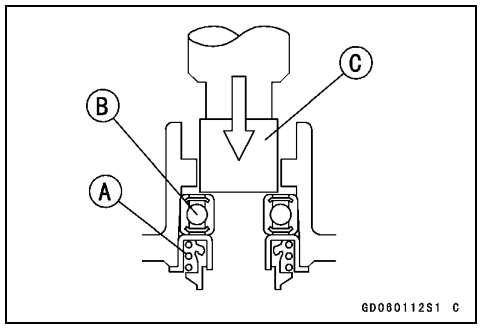
Special Tool - Bearing Driver Set: 57001-1129

★If the seal and ball bearings are damaged, replace the mechanical seal, ball bearings, and oil seal by splitting the crankcase.



- Split the crankcase (see Crankshaft/Transmission chapter).
- Remove the water pump impeller.
- 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, ϕ9: 57001-1265 [B]
Bearing Remover Head, ϕ10 × ϕ12: 57001-1266 [C]



- 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

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Water Pump

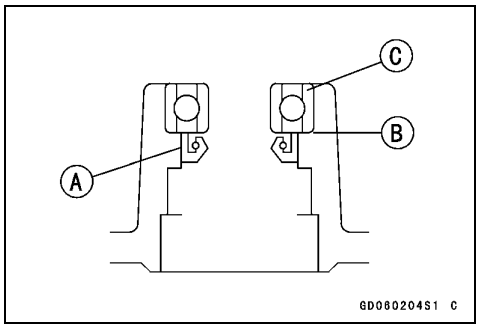
○Be sure to replace the mechanical seal, oil seal, O-ring, and ball bearings with new ones because these parts will be damaged by removal.

● 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.

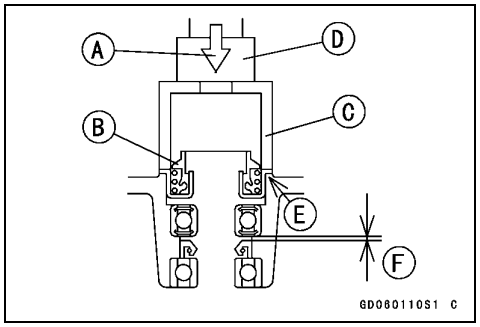
○Use the bearing driver which has a larger diameter than the oil seal.

● Press in each ball bearing [C] with its manufacturer's mark facing out until it bottoms out.

● 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

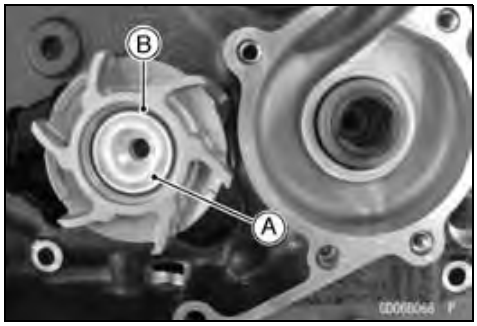


● Clean both sliding surfaces of a new mechanical seal with a high-flash point solvent (e.g. ethyl alcohol), and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.

● 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: 12 N·m (1.2 kgf·m, 104 in·lb)



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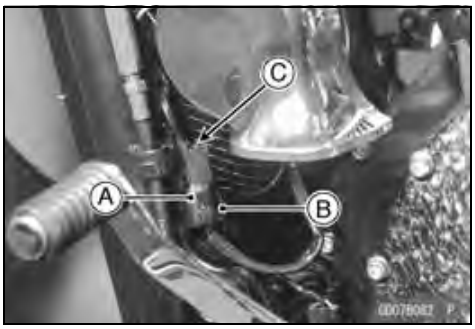
Radiator

⚠ WARNING

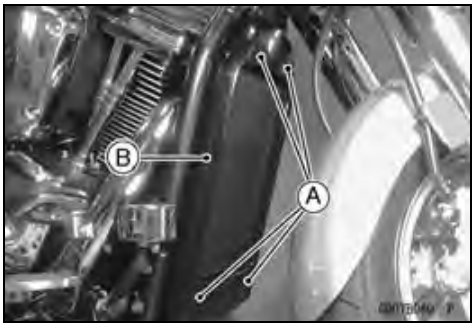
The radiator fan is connected directly to the battery. The radiator fan may start even if the ignition switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.

Radiator Removal

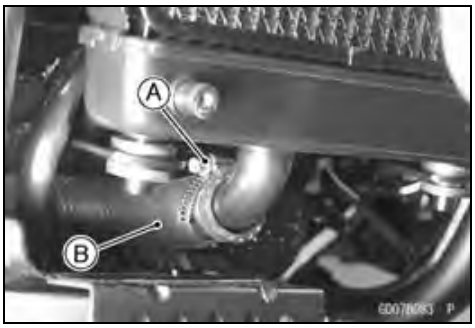
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Pull up the radiator fan motor connector [A] out of the bracket [B], pushing the thin plate [C] to the front side.
- Remove the radiator fan motor connector [A].



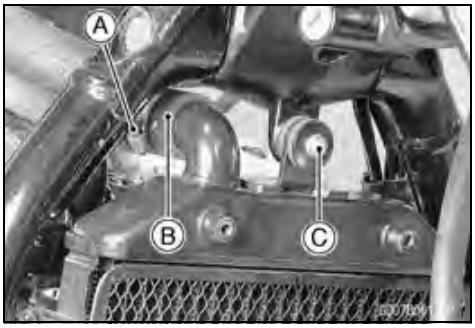
- Remove:
  Radiator Cover Bolts [A]
  Radiator Cover [B]



- Remove:
  Hose Clamp [A] (Loosen)
  Water Hose [B]



- Remove:
  Hose Clamp [A] (Loosen)
  Water Hose [B]
  Radiator Bolt [C]



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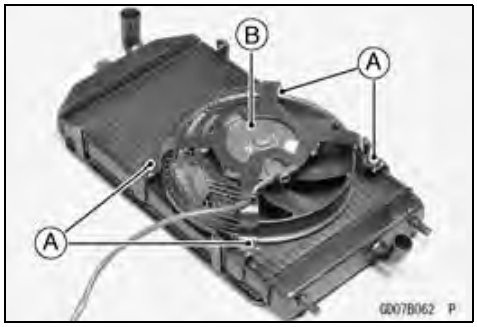
Radiator

- 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]



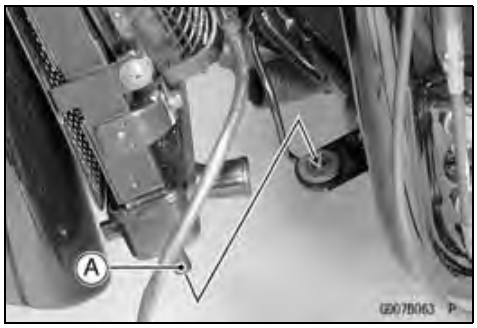
Radiator Installation

- Torque the radiator fan bolts.

  Torque - Radiator Fan Bolts: 8.3 N·m (0.85 kgf·m, 74 in·lb)

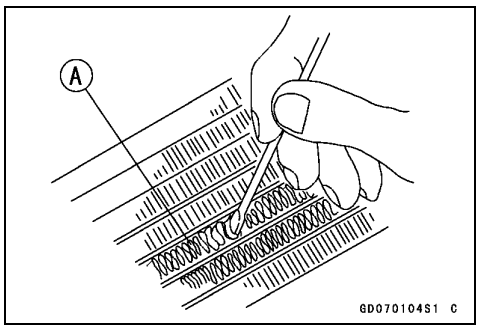
- Fit the radiator stoppers [A] into the right and left grommets.
- Torque:

  Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 17 in·lb)
  Radiator Cover Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)



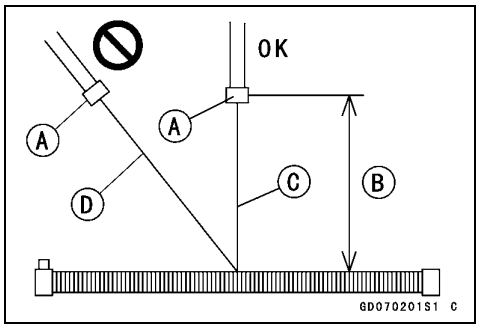
Radiator Inspection

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



CAUTION

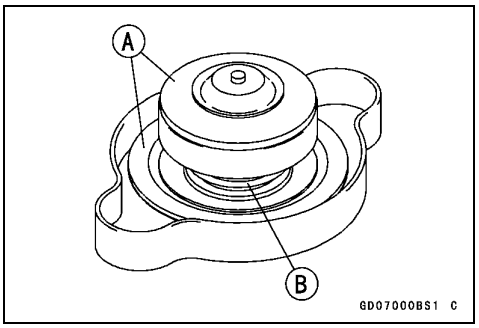
When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage.
Keep the steam gun [A] away more than 0.5 m (0.6 ft) [B] from the radiator core.
Hold the steam gun perpendicular [C] (not oblique [D]) to the core surface and run the steam gun following the core fin direction.



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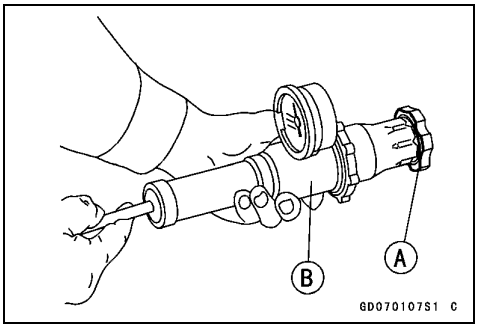
Radiator

Radiator Cap Inspection



- 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

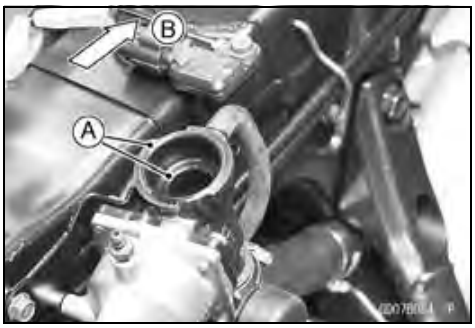
○*Wet the cap sealing surfaces with water or coolant to prevent pressure leakage.*

- 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, 14 ~ 18 psi) for 6 seconds

★If the cap holds too much pressure or cannot hold the specified pressure, replace it with a new one.

Radiator Filler Neck Inspection



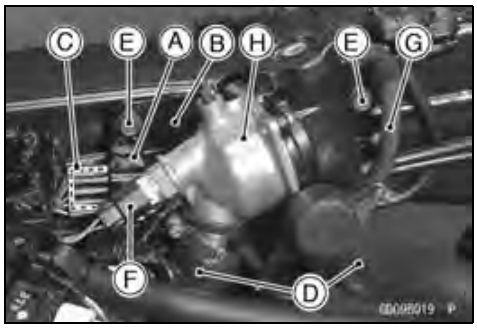
- Remove the radiator cap.
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.
Front [B]

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Thermostat

Thermostat Removal

- Remove:
  Coolant : Drain about 200 mL (6.8 US oz)
  Fuel Tank (see Fuel System (DFI) chapter)
- Pull back throttle body harness connector [A] out of the bracket [B], pushing the thin plate [C] to right side.
  Water Hoses [D]
  Bracket Bolts [E]
  Water Temperature Sensor Connector [F]
  Reserve Tank Hose [G]
- Remove the thermostat housing [H] along with the bracket.

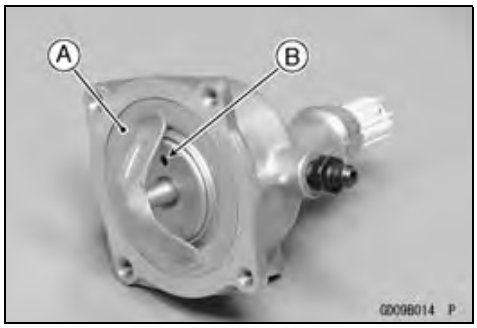


- Remove the screws [A], take off the cap [B], and take out the thermostat.

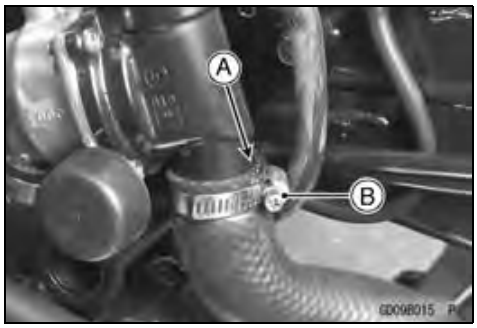


Thermostat Installation

- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.
- Install a new O-ring into the housing.
- Apply a non-permanent locking agent to the thermostat cap screws.
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).



- Align the projection [A] on the thermostat housing with the water hose clamp body [B].



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Thermostat

Thermostat Inspection

- Remove the thermostat, 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.

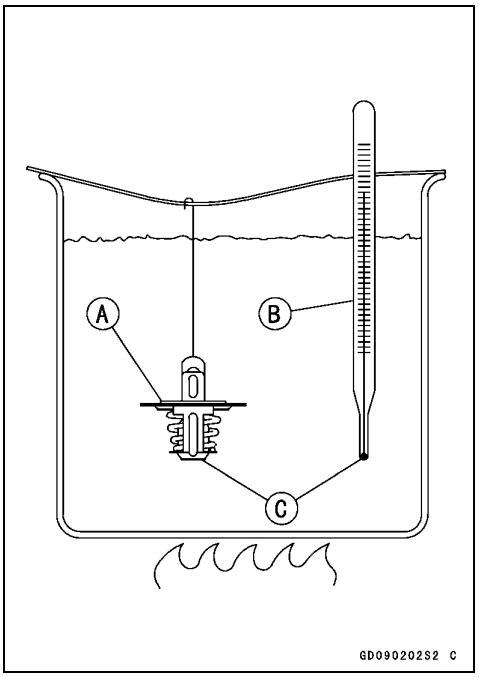
NOTE

○*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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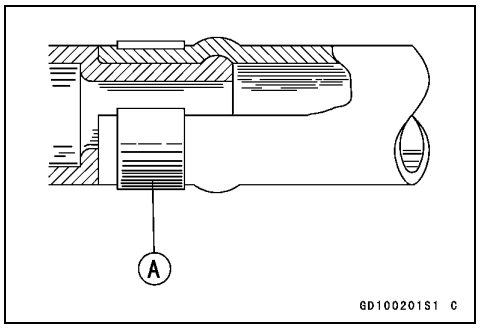
Hoses and Pipes

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: 2.0 N·m (0.20 kgf·m, 17 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 Water Hose and Connection Check in the Periodic Maintenance Chapter.

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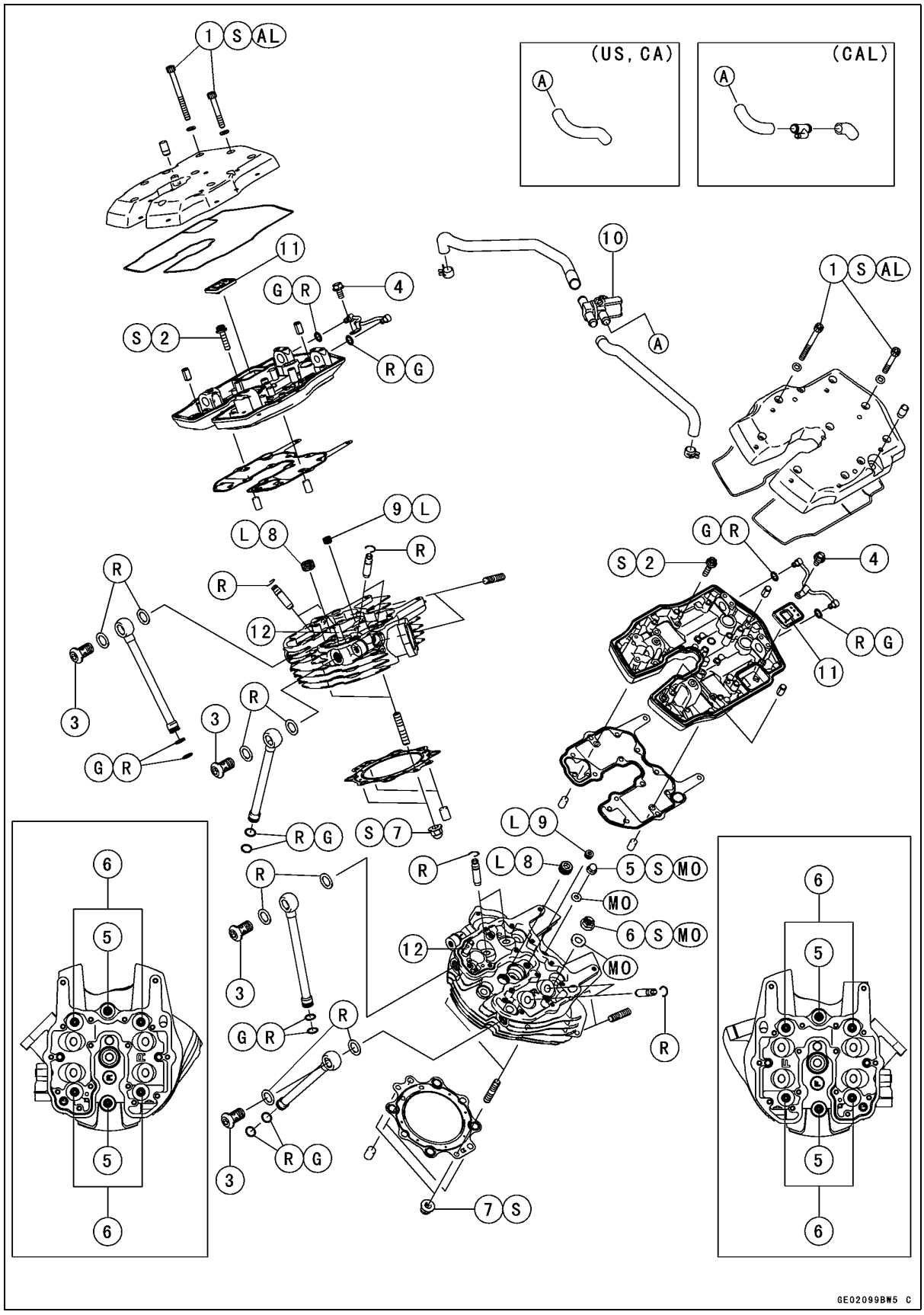
Engine Top End

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rocker Case Cover Bolts	12	1.2	104 in·lb	S, AL
2	Rocker Case Bolts	15	1.5	11	S
3	Oil Pipe Banjo Bolts	54	5.5	40	
4	Oil Pipe Bolts	9.8	1.0	87 in·lb	
5	Upper Cylinder Head Nuts, ϕ10 mm	15	1.5	11	first, S, MO
5	Upper Cylinder Head Nuts, ϕ10 mm	29	3.0	21	final, S, MO
6	Upper Cylinder Head Nuts, ϕ12 mm	29	3.0	21	first, S, MO
6	Upper Cylinder Head Nuts, ϕ12 mm	88	9.0	65	final, S, MO
7	Lower Cylinder Head Nuts	25	2.5	18	S
8	Water Jacket Plugs	22	2.2	16	L
9	Water Jacket Plugs	15	1.5	11	L

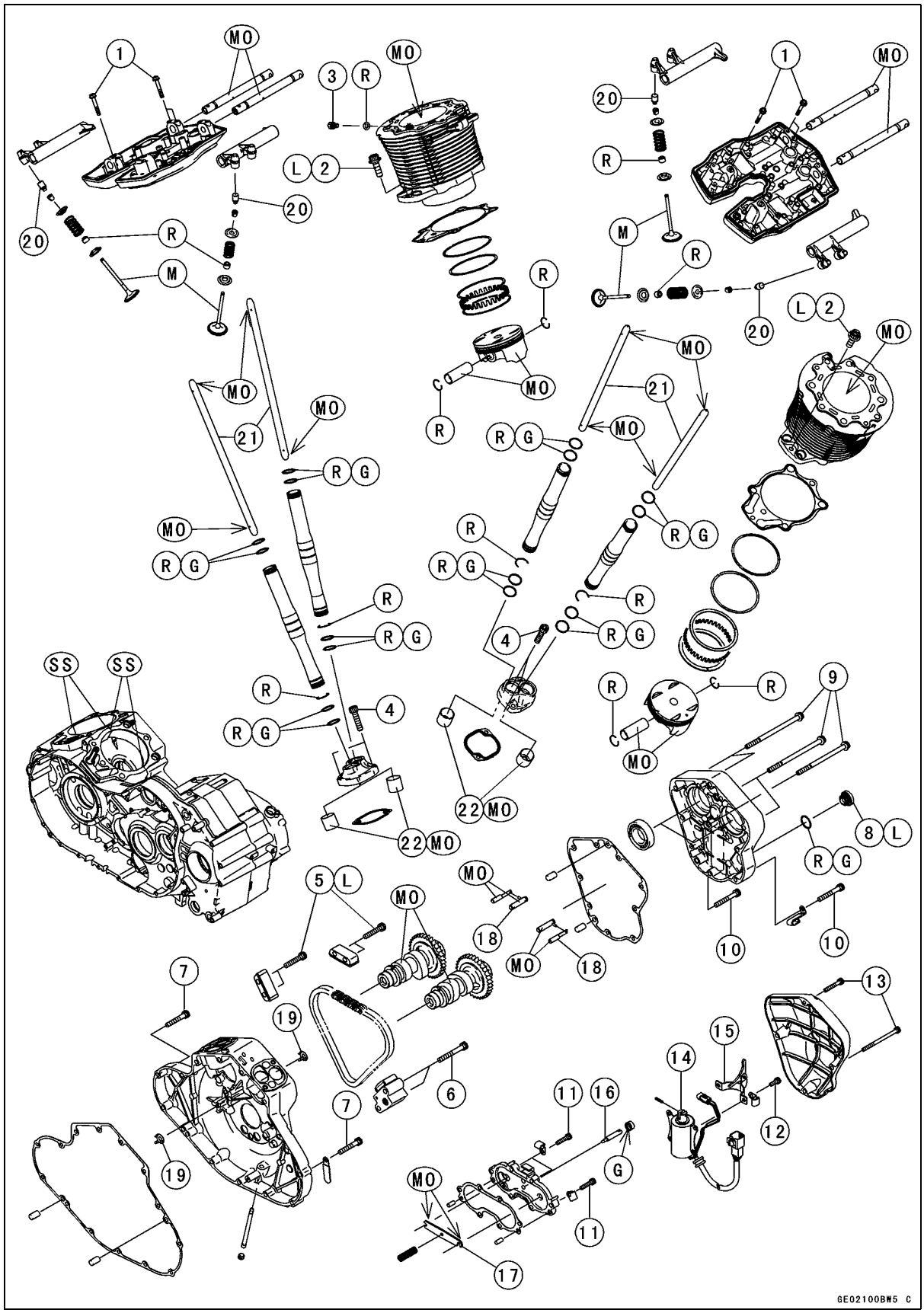
10. Air Switching Valve
11. Air Suction Valves
12. Oil Fitting

AL: Tighten all the bolts alternating diagonally two times to ensure even tightening torque.
G: Apply grease.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil.
R: Replacement Parts
S: Follow the specific tightening sequence.

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

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Exploded View



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Exploded View

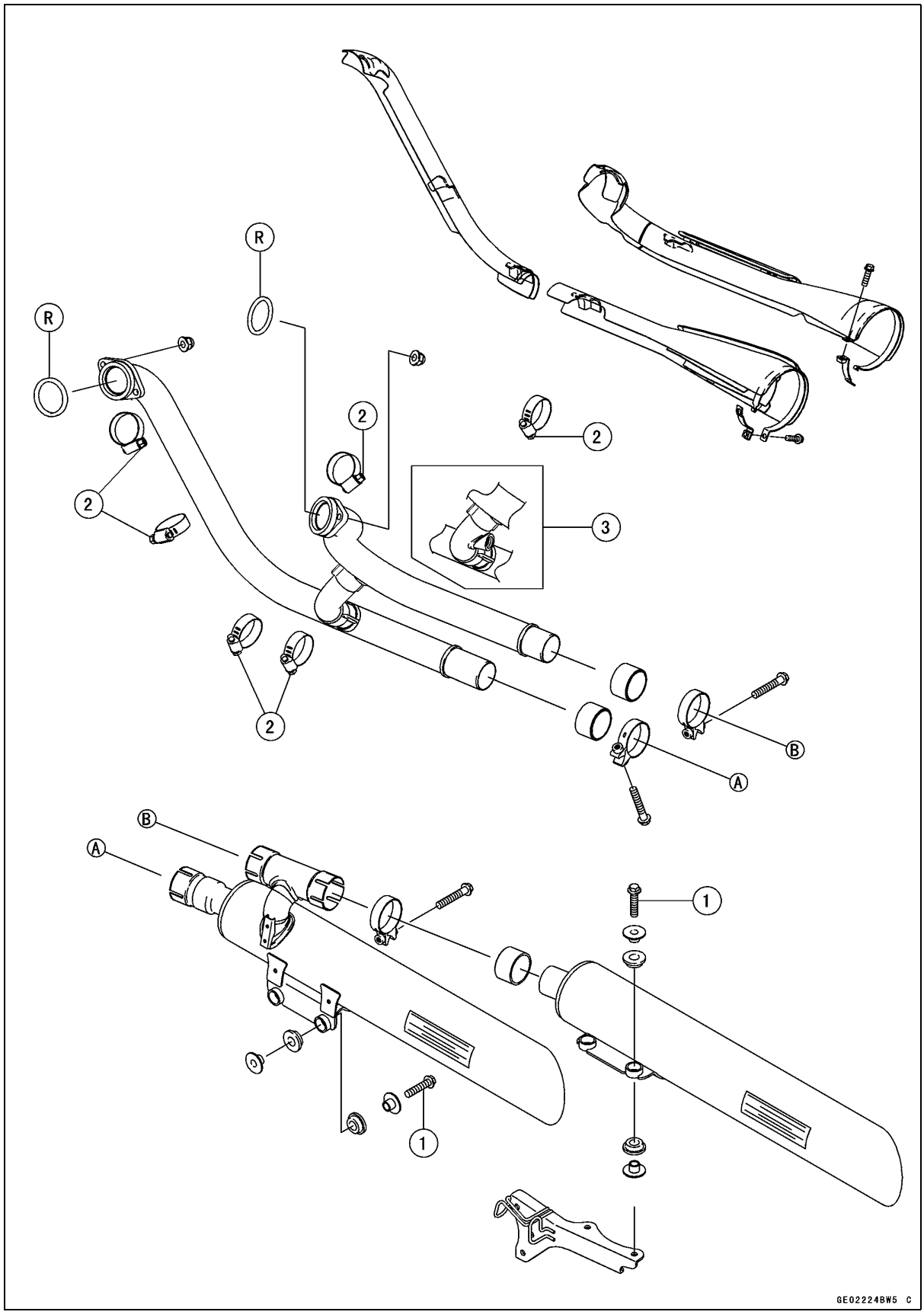
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rocker Shaft Bolts	12	1.2	104 in·lb	
2	Cylinder Mounting Bolts	25	2.5	18	L
3	Coolant Drain Bolt	9.8	1.0	87 in·lb	
4	Push Rod Cover Bolts	12	1.2	104 in·lb	
5	Camshaft Chain Guide Bolts	12	1.2	104 in·lb	L
6	Camshaft Chain Tensioner Bolts	12	1.2	104 in·lb	
7	Inner Camshaft Cover Bolts	12	1.2	104 in·lb	
8	Stopper Pin Plug	2.5	0.25	22 in·lb	L
9	Middle Camshaft Cover Bolts L 95 mm	12	1.2	104 in·lb	
10	Middle Camshaft Cover Bolts L 35 mm	12	1.2	104 in·lb	
11	Camshaft End Cover Bolts	12	1.2	104 in·lb	
12	Decompression Solenoid Bolts	9.8	1.0	87 in·lb	
13	Outer Camshaft Cover Bolts	12	1.2	104 in·lb	

14. Decompression Solenoid
15. Decompression Lever
16. Push Rod (Decompression)
17. Holder
18. Decompression Shafts
19. Spacers
20. Hydraulic Lash Adjusters
21. Push Rods (Rocker Arm)
22. Tappets

L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil.
R: Replacement Parts
SS: Apply silicone sealant (Three Bond: TB1211F)

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Muffler Bracket Bolts	25	2.5	18	
2	Exhaust Pipe Cover Clamp Screws	6.9	0.70	61 in·lb	

3. CAL, WVTA (FULL H), GB WVTA (FULL H) Models
R: Replacement Parts

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Exploded View

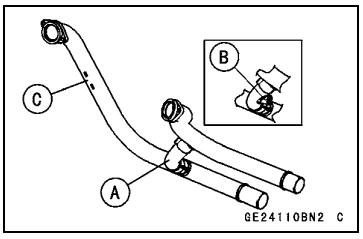
Exhaust System

MANIFOLD	MUFFLER BODY	SPECIFICATION	MODEL
Manifold without Boss for Oxygen Sensor P/No. 18088-0145	Honeycomb Type Catalyst P/No. 18091-0172 P/No. 18091-0173 Mark : EPA Noise Emission Control Information	U.S.A.	VN2000-A1/A2/A6F ~ VN2000-D1/D6F/E6F ~/F6F ~
		Canada	VN2000-A1/A2/A6F ~ VN2000-D1/D6F/E6F ~/F6F ~
	Honeycomb Type Catalyst P/No. 18091-0143 P/No. 18091-0144 Mark : KHI K 480	Australia	VN2000-A1/A2/A6F ~ VN2000F6F ~
		Malaysia	VN2000-A1/A2/A6F ~
Manifold with Boss for Oxygen Sensor P/No. 18088-0132 **VN2000-A1** P/No. 18088-0144 Mark: KHI E051	Honeycomb Type Catalyst P/No. 18091-0172 P/No. 18091-0173 Mark : EPA Noise Emission Control Information	U.S.A. (California)	VN2000-A1/A2/A6F ~ VN2000-D1/D6F/E6F ~/F6F ~
	Honeycomb Type Catalyst P/No. 18091-0174 P/No. 18091-0175 Mark : KHI K 467	WVTA (FULL H)	VN2000-A1/A2/A6F ~
		GB WVTA (FULL H)	VN2000-A1/A2/A6F ~

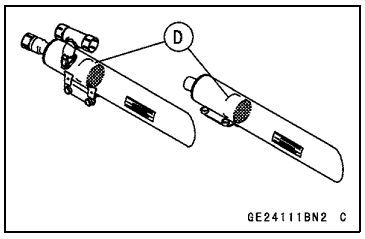
GE24042B F

FULL H: Full Power Honeycomb Type Catalyst

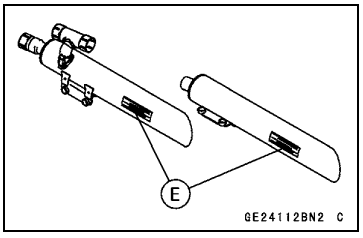
Manifold [A] without Boss for Oxygen Sensor
Manifold with Boss [B] for Oxygen Sensor
Manifold Mark Position [C]



Honeycomb Type Catalyst Position [D]



Muffler Body Mark Position [E]



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Specifications

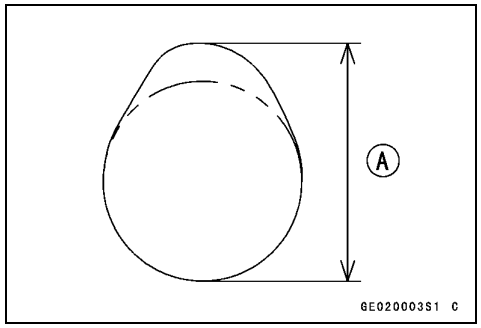
Item	Standard	Service Limit
Push Rod		
Push Rod Length	295.18 mm (11.6212 in.)	– – –
Push Rod Bend	TIR 0.2 mm (0.008 in.)	– – –
Camshafts		
Cam Height:		
Front		
Exhaust	37.351 ~ 37.467 mm (1.47051 ~ 1.47508 in.)	37.25 mm (1.4665 in.)
Inlet	37.871 ~ 37.987 mm (1.49098 ~ 1.49555 in.)	37.77 mm (1.4870 in.)
Rear		
Exhaust	39.571 ~ 39.687 mm (1.55791 ~ 1.56248 in.)	39.47 mm (1.5539 in.)
Inlet	36.411 ~ 36.527 mm (1.43350 ~ 1.43807 in.)	36.31 mm (1.4295 in.)
Camshaft Journal Diameter:		
ϕ28	27.967 ~ 27.980 mm (1.101061 ~ 1.101573 in.)	27.94 mm (1.10000 in.)
Camshaft Bearing Inside Diameter:		
ϕ28	27.990 ~ 28.000 mm (1.101966 ~ 1.102360 in.)	28.06 mm (1.10472 in.)
Camshaft Journal Diameter:		
ϕ22	21.975 ~ 21.990 mm (0.865156 ~ 0.865746 in.)	21.95 mm (0.86417 in.)
Camshaft Bearing Inside Diameter:		
ϕ22	21.990 ~ 22.000 mm (0.865746 ~ 0.866140 in.)	22.06 mm (0.86850 in.)
Rocker Arm Inside Diameter	16.000 ~ 16.018 mm (0.629921 ~ 0.630630 in.)	16.05 mm (0.63189 in.)
Rocker Shaft Diameter	15.966 ~ 15.984 mm (0.628583 ~ 0.629291 in.)	15.94 mm (0.62756 in.)
Cylinder Head		
Cylinder Compression Usable Range	284 ~ 500 kPa (2.9 ~ 5.1 kgf/m², 41 ~ 72 psi) @300 r/min (rpm) with electric starter	– – –
Cylinder Head Warp	– – –	0.05 mm (0.0020 in.)
Valve		
Valve Clearance	Non-adjustable (Auto adjuster)	– – –
Valve Head Thickness:		
Exhaust	0.6 mm (0.236 in.)	0.3 mm (0.0118 in.)
Inlet	0.6 mm (0.236 in.)	0.3 mm (0.0118 in.)
Valve Stem Bend	TIR 0.01 mm (0.00039 in.) or less	TIR 0.05 mm (0.0020 in.)

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Specifications

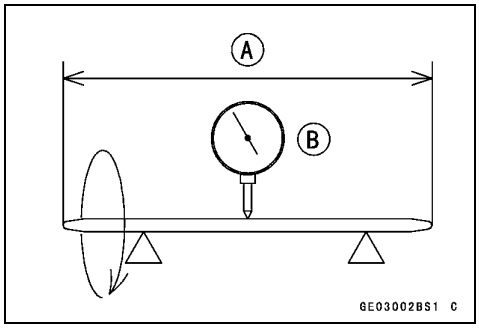
Item	Standard	Service Limit
Valve Stem Diameter:		
Exhaust	5.955 ~ 5.970 mm (0.23445 ~ 0.23504 in.)	5.94 mm (0.2339 in.)
Inlet	5.965 ~ 5.980 mm (0.23484 ~ 0.23543 in.)	5.95 mm (0.2343 in.)
Valve Guide Inside Diameter:		
Exhaust	6.000 ~ 6.012 mm (0.23622 ~ 0.23669 in.)	6.08 mm (0.2394 in.)
Inlet	6.000 ~ 6.012 mm (0.23622 ~ 0.23669 in.)	6.08 mm (0.2394 in.)
Valve/valve Guide Clearance (Wobble Method):		
Exhaust	0.07 ~ 0.12 mm (0.0028 ~ 0.0047 in.)	0.27 mm (0.0106 in.)
Inlet	0.04 ~ 0.10 mm (0.0016 ~ 0.0039 in.)	0.25 mm (0.0098 in.)

Cam Height



Cam Height (maximum) [A]

Push Rod Length and Runout

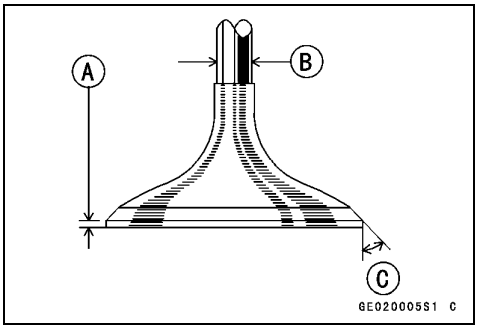


Push Rod Length [A]
Push Rod Runout [B]

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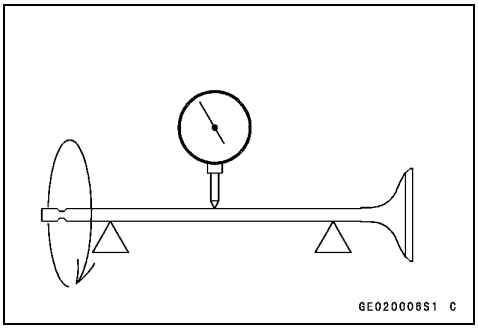
Specifications

Valve Head Thickness

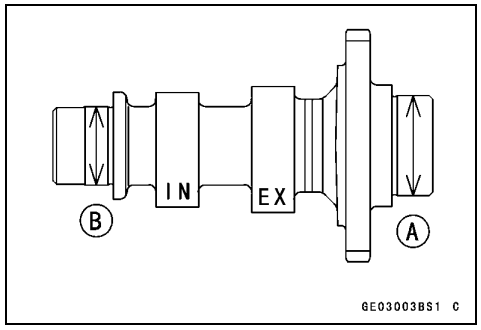


Valve Head Thickness [A]
Valve Stem Diameter [B]
45° [C]

Valve Stem Bend



Camshaft Journals



ϕ28 mm (1.1024 in.) [A]
ϕ22 mm (0.8661 in.) [B]

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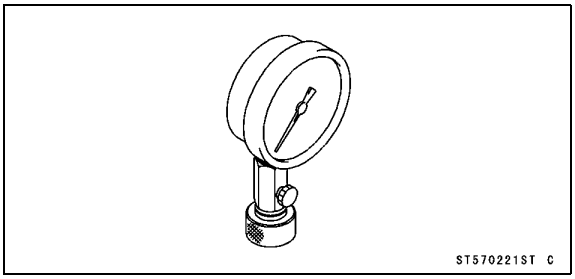
Specifications

Item	Standard	Service Limit
Valve Seat Surface		
Valve Seat Cutting Angle	45°, 32°, 60°	– – –
Outside Diameter:		
Exhaust	34.9 ~ 35.1 mm (1.374 ~ 1.382 in.)	– – –
Inlet	38.9 ~ 39.1 mm (1.531 ~ 1.539 in.)	– – –
Width:		
Exhaust	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	– – –
Inlet	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	– – –
Valve Spring Free Length:		
Outer (Ex, In)	44.76 mm (orange) (1.7622 in.)	43.2 mm (1.700 in.)
Inner (Ex, In)	39.82 mm (orange) (1.5677 in.)	38.3 mm (1.508 in.)
Cylinder, Piston		
Cylinder Inside Diameter	102.994 ~ 103.006 mm (4.054874 ~ 4.055346 in.)	103.10 mm (4.05905 in.)
Piston Diameter	102.965 ~ 102.980 mm (4.053732 ~ 4.04802 in.)	102.82 mm (4.04802 in.)
Piston/cylinder Clearance	0.043 ~ 0.070 mm (0.00169 ~ 0.00276 in.)	– – –
Piston Ring/groove Clearance:		
Top	0.035 ~ 0.070 mm (0.00138 ~ 0.00276 in.)	0.17 mm (0.00669 in.)
Second	0.02 ~ 0.06 mm (0.00079 ~ 0.00236 in.)	0.16 mm (0.00630 in.)
Piston Ring Groove Width:		
Top	1.225 ~ 1.240 mm (0.048228 ~ 0.048819 in.)	1.32 mm (0.05197 in.)
Second	1.21 mm ~ 1.23 mm (0.04764 ~ 0.04843 in.)	1.31 mm (0.05157 in.)
Piston Ring Thickness:		
Top	1.17 mm ~ 1.19 mm (0.04606 ~ 0.04685 in.)	1.10 mm (0.0433 in.)
Second	1.17 mm ~ 1.19 mm (0.04606 ~ 0.04685 in.)	1.10 mm (0.0433 in.)
Piston Ring End Gap:		
Top	0.25 ~ 0.35 mm (0.0098 ~ 0.0138 in.)	0.7 mm (0.028 in.)
Second	0.40 ~ 0.55 mm (0.0157 ~ 0.0217 in.)	0.8 mm (0.031 in.)
Oil	0.3 ~ 0.9 mm (0.012 ~ 0.035 in.)	1.2 mm (0.0472 in.)

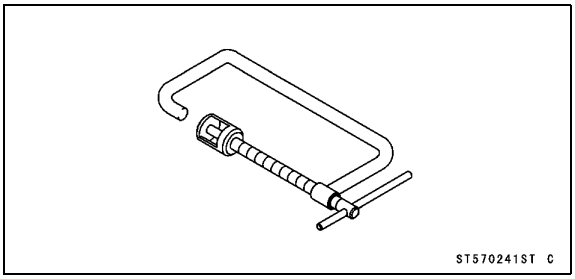
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Special Tools and Sealant

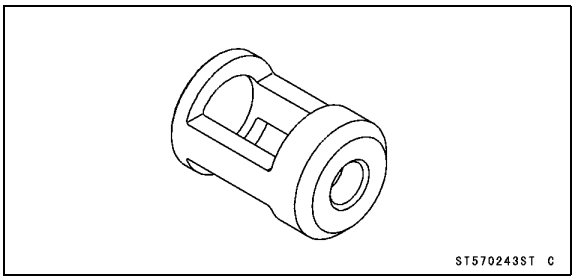
Compression Gauge, 20 kgf/cm²:
57001-221



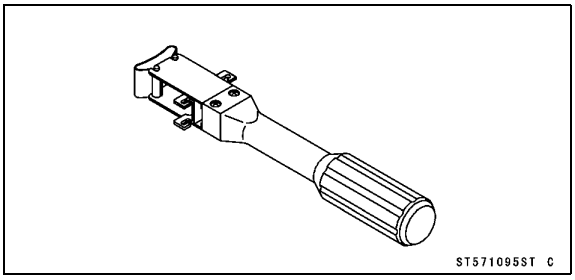
Valve Spring Compressor Assembly:
57001-241



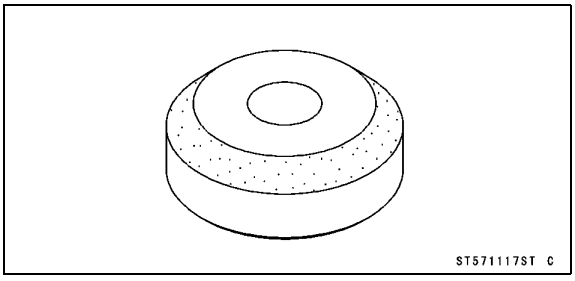
Valve Spring Compressor Adapter, ϕ28.2:
57001-243



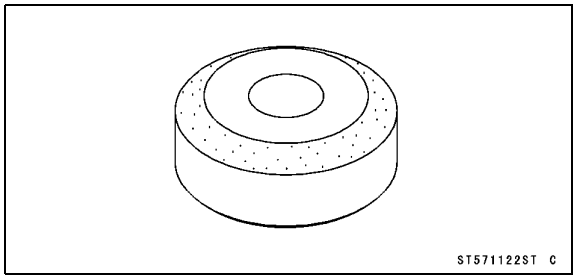
Piston Ring Compressor Grip:
57001-1095



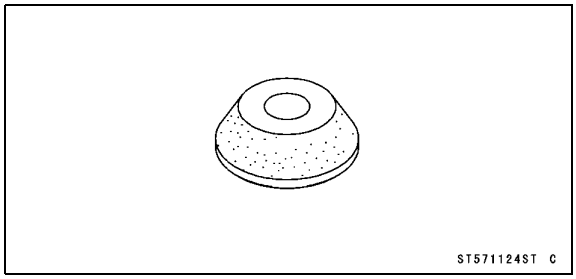
Valve Seat Cutter, 45°-ϕ41.5:
57001-1117



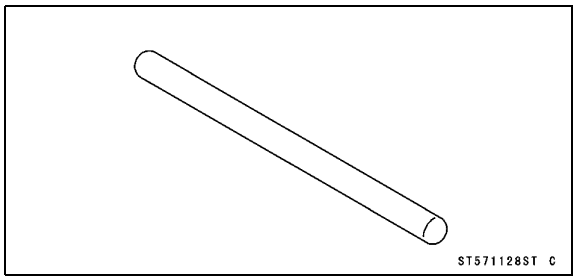
Valve Seat Cutter, 32°-ϕ38.5:
57001-1122



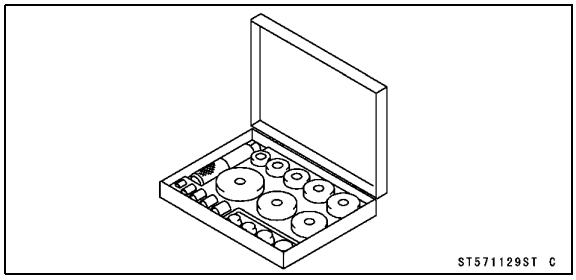
Valve Seat Cutter, 60°-ϕ41:
57001-1124



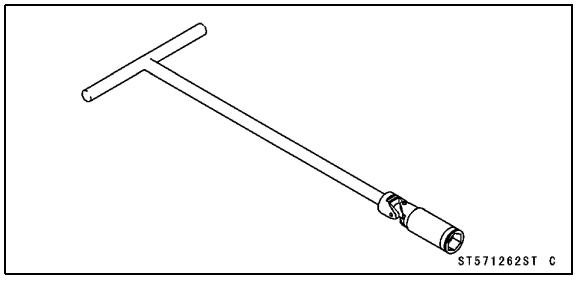
Valve Seat Cutter Holder Bar:
57001-1128



Bearing Driver Set:
57001-1129



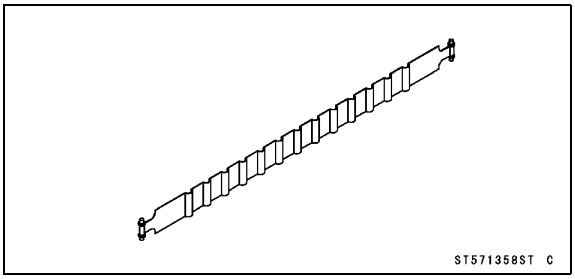
Spark Plug Wrench, Hex 16:
57001-1262



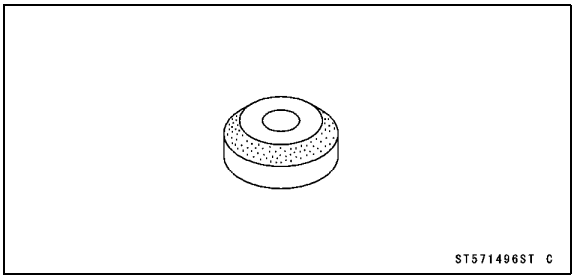
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Special Tools and Sealant

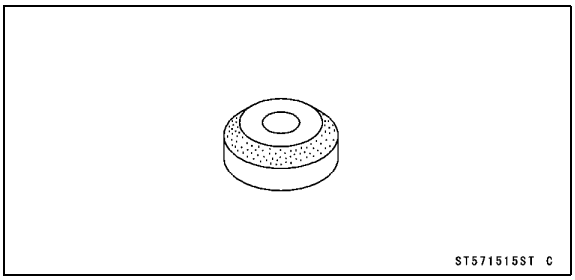
Piston Ring Compressor Belt, ϕ95 ~ ϕ108:
57001-1358



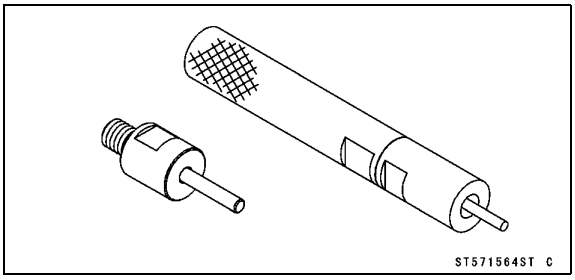
Valve Seat Cutter, 45°-ϕ40:
57001-1496



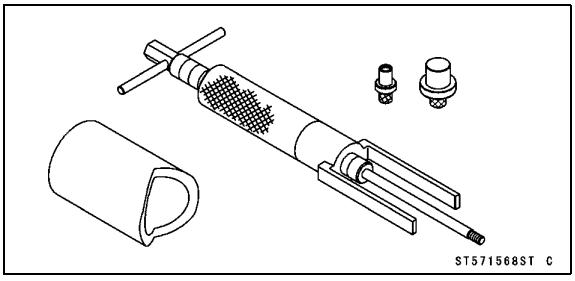
Valve Seat Cutter, 32°-ϕ44:
57001-1515



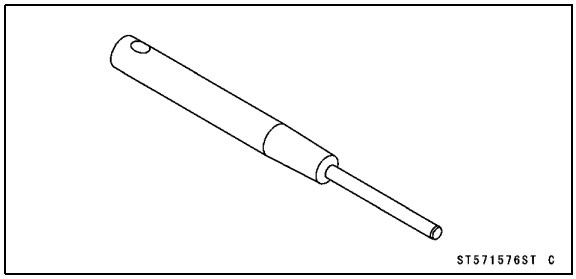
Valve Guide Driver:
57001-1564



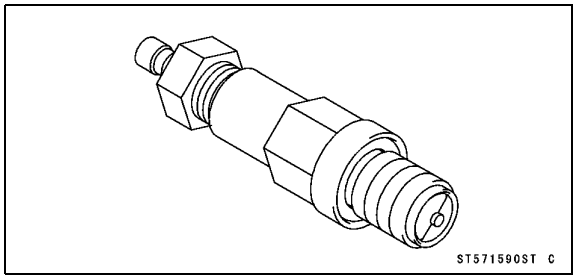
Piston Pin Puller:
57001-1568



Valve Seat Cutter Holder, ϕ6:
57001-1576



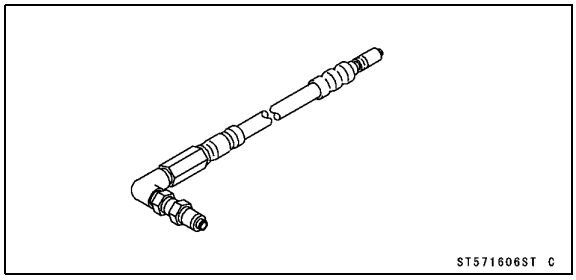
Compression Gauge Adapter, M14 × 1.25:
57001-1590



Valve Guide Reamer, ϕ6:
57001-1596



L-Shape Hose:
57001-1606

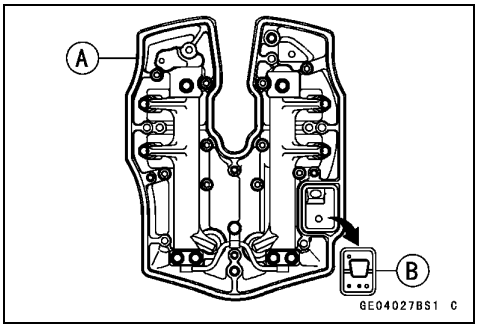


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Clean Air System

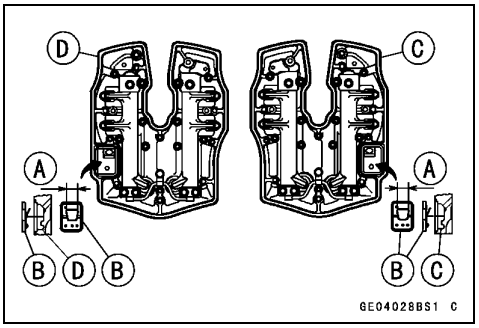
Air Suction Valve Removal

- Remove the rocker case covers (see Rocker Case Cover Removal).
- Remove the air suction valves.
  Front Rocker Case [A]
  Front Air Suction Valve [B]



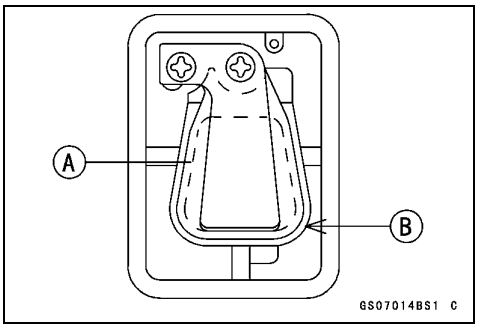
Air Suction Valve Installation

- Install each air suction valve so that its wider side [A] of the reed faces left.
  Air Suction Valves [B]
  Front Rocker Case [C]
  Rear Rocker Case [D]



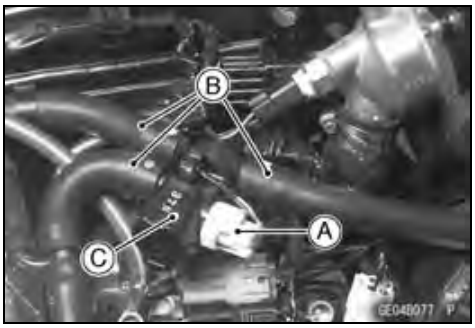
Air Suction Valve Inspection

- Remove the air suction valve (see Air Suction Valve Removal).
- Visually inspect the reeds for cracks, folds, warps, heat damage or other damage.
- ★If there is any doubt as to the condition of the reeds [A], replace the air suction valve as an assembly.
- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.



Air Switching Valve Removal

- Remove:
  Fuel Tank (see Fuel System (DFI) Chapter)
- Disconnect the air switching valve connector [A] and pull off the hoses [B].
- Remove the air switching valve [C].



Air Switching Valve Installation

- Route the hoses correctly (see Appendix chapter).

Air Switching Valve Operation Test

- Refer to the Air Switching Valve Operation Test in the Periodic Maintenance chapter.

Air Switching Valve Inspection

- Refer to the Air Switching Valve Inspection in the Electrical System chapter.

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Clean Air System

Clean Air System Hose Inspection

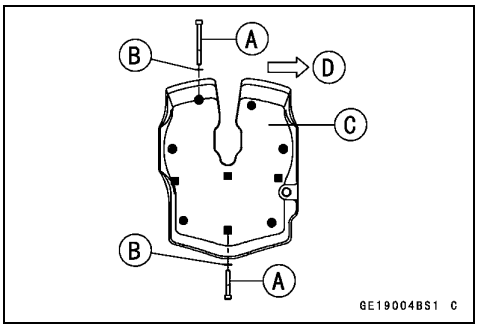
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the right air cleaner base, air switching valve, and fittings on the rocker case covers

★If they are not, correct them. Replace them if they are damaged.

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Rocker Case Cover

Rocker Case Cover Removal



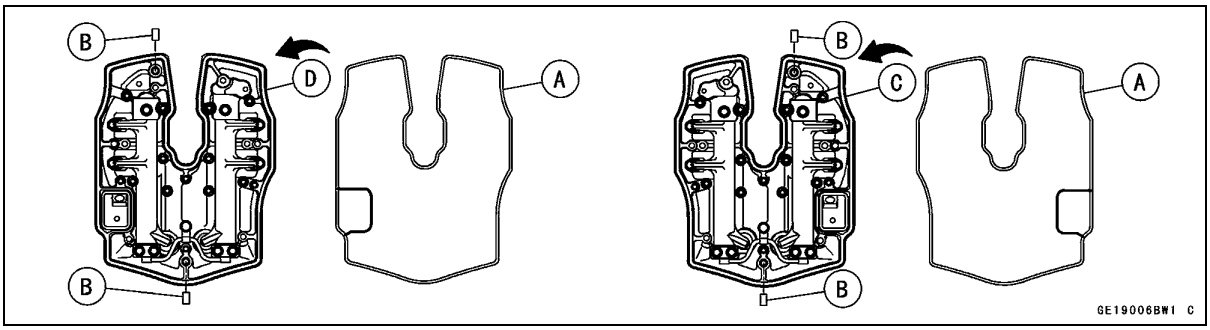
- Remove the engine (see Engine Removal/Installation chapter).
- Remove the rocker case cover bolts and take off the rocker case cover from the rocker case.

  Front Rocker Case Cover Bolts [A] and Washers [B]
  Front Rocker Case Cover [C]
  Front [D]

Rocker Case Cover Installation

- Replace the cover gaskets [A] with a new one.
- Be sure the dowel pins [B] are in position.

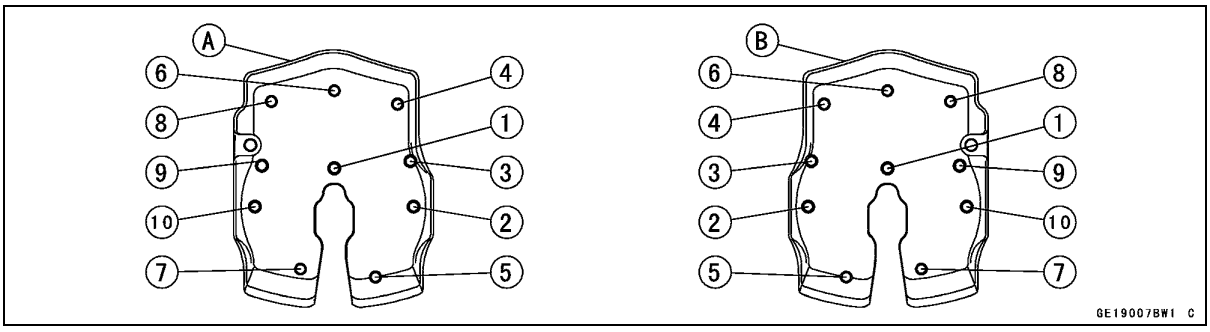
  Front Rocker Case [C]
  Rear Rocker Case [D]



- Tighten the cover bolts following the tightening sequence as shown.
- Tighten all the bolts two times in the same method.

Torque - Rocker Case Cover Bolts: 12 N·m (1.2 kgf·m, 104in·lb)

Front Rocker Case [A]
Rear Rocker Case [B]



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Rocker Case

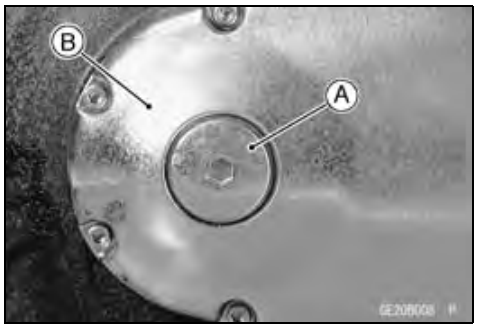
Rocker Case Removal

- Remove the engine (see Engine Removal/Installation chapter).
- Remove the throttle body assy (see Fuel System (DFI) chapter).
- Remove the rocker case covers (see Rocker Case Cover Removal).

- Position the #1 or #2 piston TDC as follows.

○Remove the spark plugs.

○Remove the plug [A] on the outer clutch cover [B].

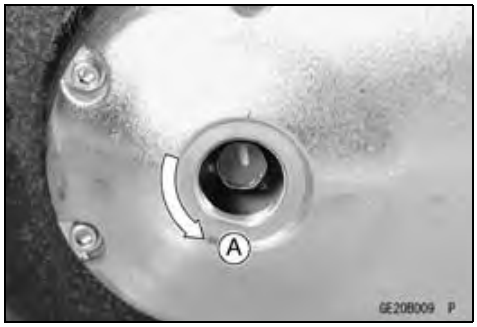


○Turn the crankshaft counterclockwise [A] and position #1 piston at TDC, observing the piston movement through the spark plug hole.

Front Spark Plug Hole [B]

Front [C]

○For the #2 piston, position it at TDC in a similar way.

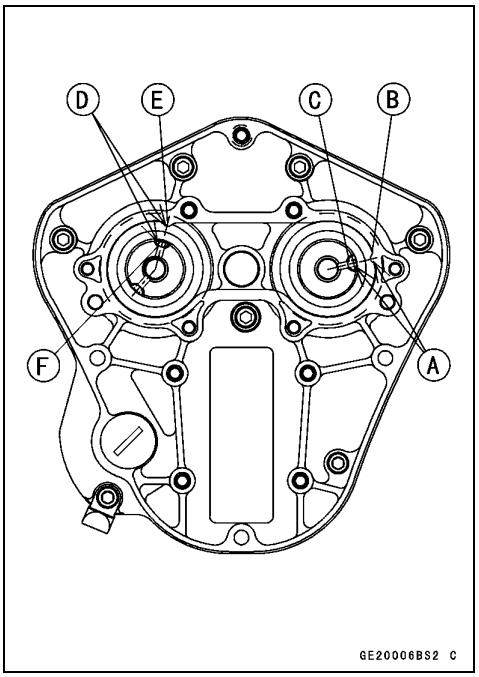




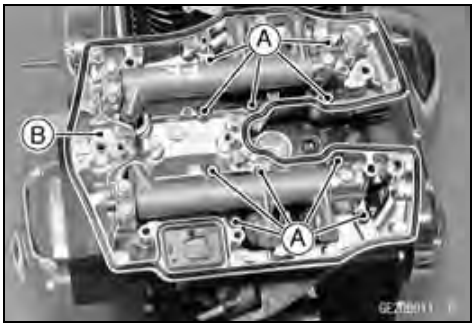
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Rocker Case

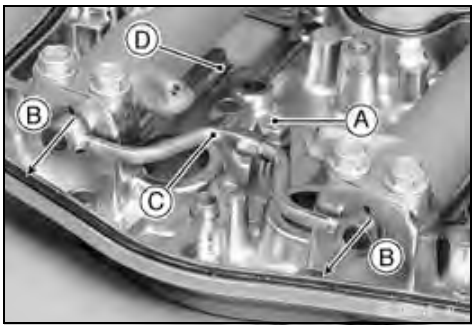
○Another way to position each piston at TDC is as follows.
○Remove the outer camshaft cover and camshaft end cover (see Decompression Mechanism Removal in this chapter).
○Turn the crankshaft couterclockwise and position #1 piston at TDC, aligning [A] the projection [B] on the middle camshaft cover with the front decompression pin [C].
○Turn the crankshaft counterclockwise and position #2 piston at TDC, aligning [D] the projection [E] on the middle camshaft cover with the rear decompression pin [F].



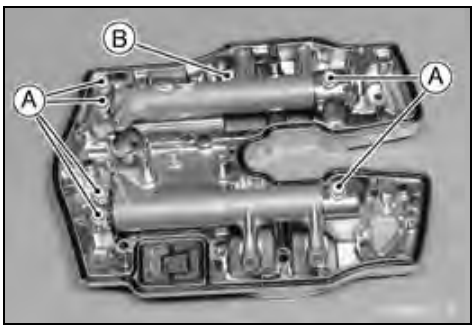
● Unscrew the rocker case bolts and remove the rocker cases.
Front Rocker Case Bolts [A]
Front Rocker Case [B]



● Remove the oil pipe bolt [A] and pull [B] the oil pipe [C].
Front Rocker Case [D]



● Remove the rocker shaft bolts [A] and pull out the rocker shafts.
Front Rocker Case [B]



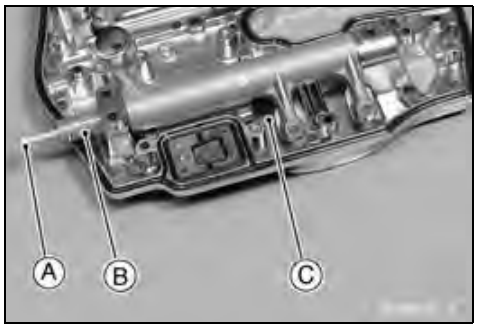
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Rocker Case

NOTE

○*Mark and record the rocker shafts so that they can be reinstalled in their original positions. If the rocker shaft does not be pulled out easily, pull it out by tightening the removed rocker shaft bolt [A] into the shaft [B].*

Front Rocker Case [C]



● Remove the lash adjuster if necessary (see HLA Removal).

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

● Be sure the oil filters [A] are at the end of the intake side rocker shafts [B].

★If nesessary, replace the oil filter.

● Apply molybdenum disulfide oil to the rocker shafts [C].

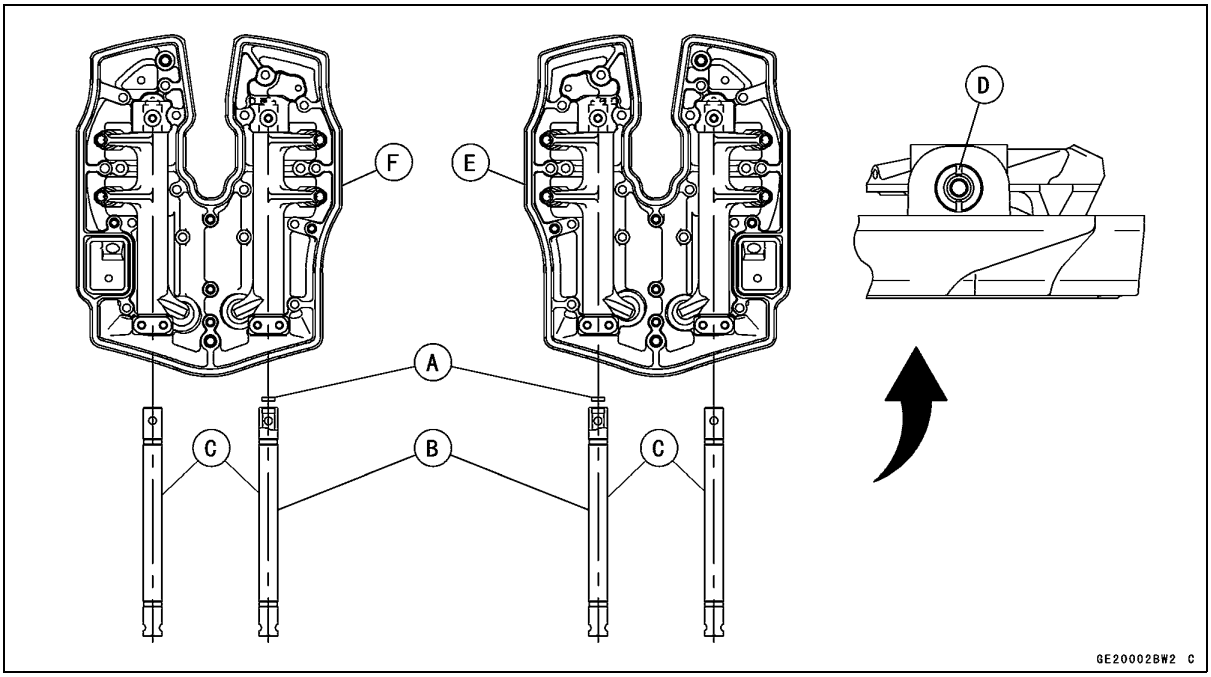
● Install the rocker shafts so that their grooves [D] are placed vertically as shown.

Front Rocker Case [E]

Rear Rocker Case [F]

● Torque the rocker shaft bolts.

Torque - Rocker Shaft Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)



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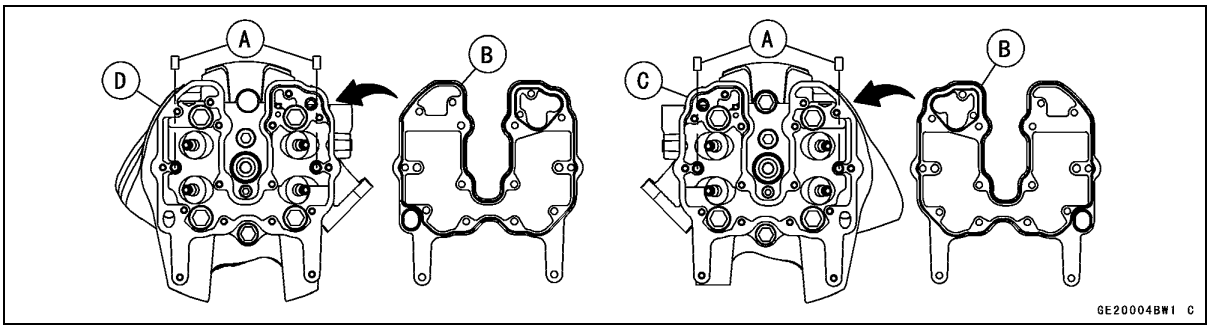
Rocker Case

- Replace the O-rings [A] on each oil pipe [B] with new ones and grease them.
- Torque the oil pipe bolts.

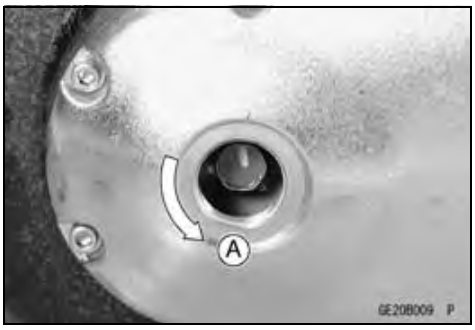
Torque - Oil Pipe Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



- Be sure the dowel pins [A] on each cylinder head are in position.
- Replace each rocker case gasket [B] with a new one.
  Front Rocker Case [C]
  Rear Rocker Case [D]



- Turn the crankshaft counterclockwise [A] and position the #1 or #2 piston at TDC, observing piston movement through each spark plug hole.
  Front Spark Plug Hole [B]
  Front [C]

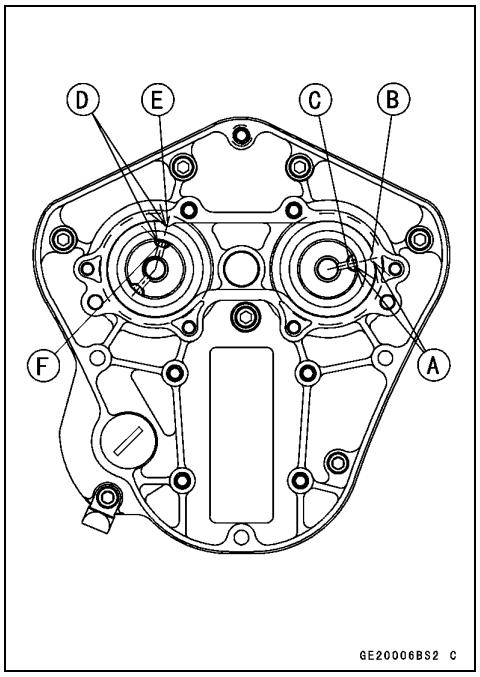




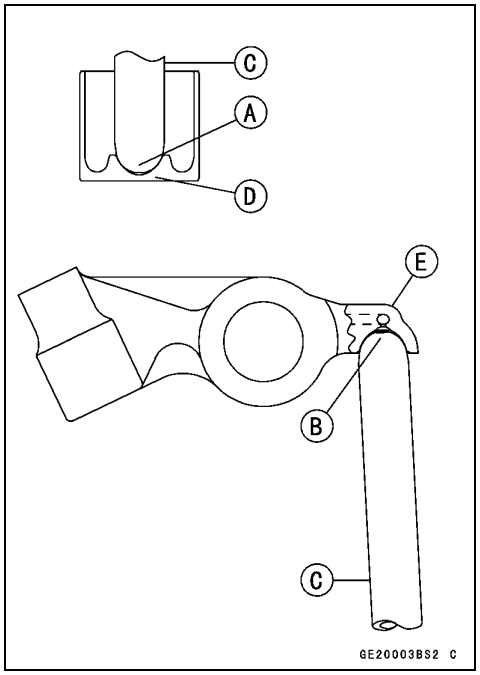
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Rocker Case

○Another way to position each piston at TDC is as follows.
○Remove the outer camshaft cover and camshaft end cover (see Decompression Mechanism Removal in this chapter).
○Turn the crankshaft couterclockwise and position #1 piston at TDC, aligning [A] the projection [B] on the middle camshaft cover with the front decompression pin [C].
○Turn the crankshaft counterclockwise and position #2 piston at TDC, aligning [D] the projection [E] on the middle camshaft cover with the rear decompression pin [F].



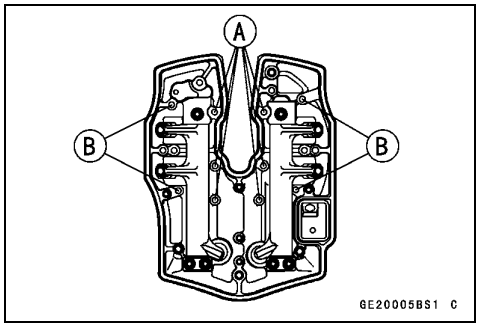
● Install the rocker case on the cylinder head.
○Fit the lower end [A] and upper end [B] of the push rod [C] to the tappet [D] and rocker arm [E] as shown.



★If the rocker case does not fit the cylinder head, turn the crankshaft counterclockwise by one rotation (360°) further.
● Torque the rocker case bolts.

Torque - Rocker Case Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)

○First tighten the six inside bolts [A] and then tighten the four outside bolts [B].



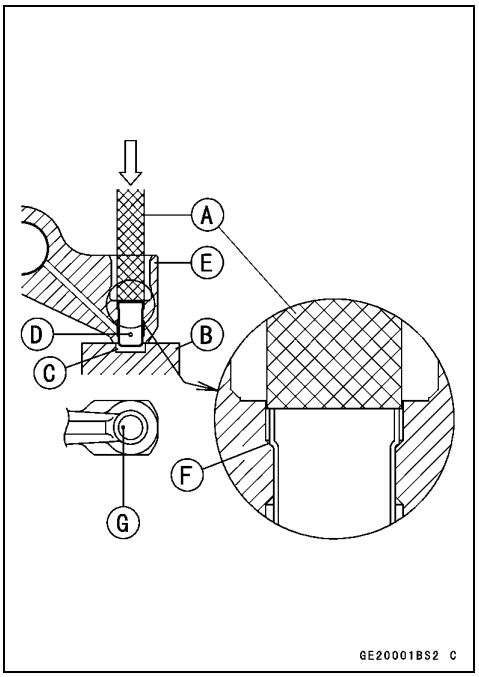
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Rocker Case

Rocker Arm Assembly

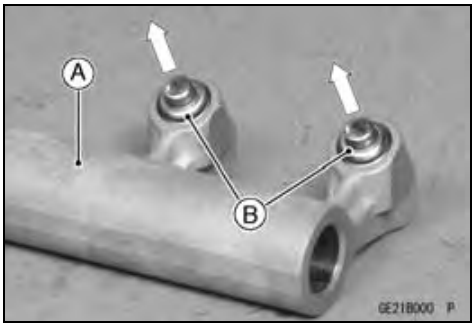
- Prepare a flat-end bar [A] and a block [B] with a recess [C].
- Press the oil chamber [D] for the HLA into the rocker arm end [E] until the chamber end is even with the step [F] of the hole.

○Install the oil chamber so that the air bleed hole [G] is placed as shown. This makes HLA bleeding easier.



HLA Removal

- Remove the rocker case (see Rocker Case Removal).
- Remove the rocker arms.
- Pull the HLA (hydraulic lash adjuster) [B] out of the rocker arm [A] with your fingers.



CAUTION

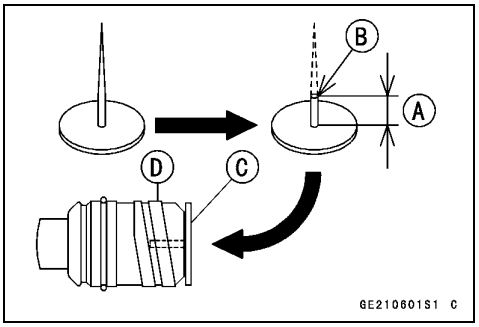
Be careful not to damage or deform an HLA by tapping it during removal or installation.
Do not drop the HLA or hit it sharply. If it is damaged, the plunger will not operate smoothly.

HLA Air Bleeding

- 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.

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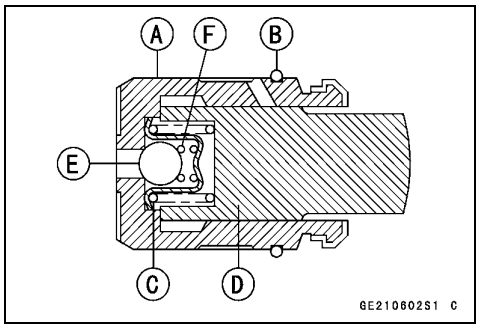
Rocker Case

HLA Installation

● Check that the HLA plunger is not damaged.

★If the plunger does damage, replace the HLA.

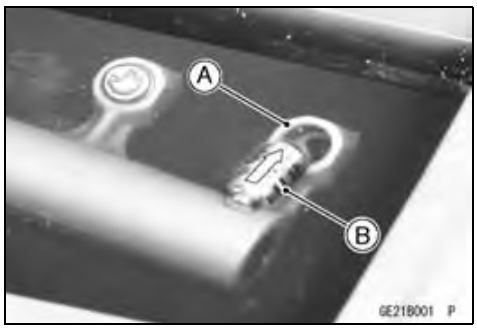
HLA Body [A]
O-ring [B]
Plunger Spring [C]
Pivot Plunger [D]
Check Valve Spring [F]



● Air-bleed the HLA (see HLA Air Bleeding).

● 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.

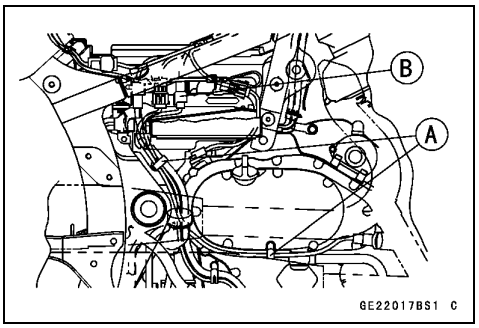


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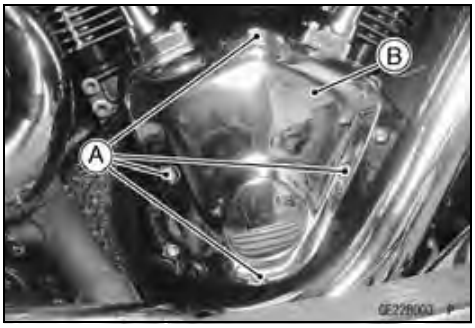
Decompression Mechanism

Decompression Mechanism Removal

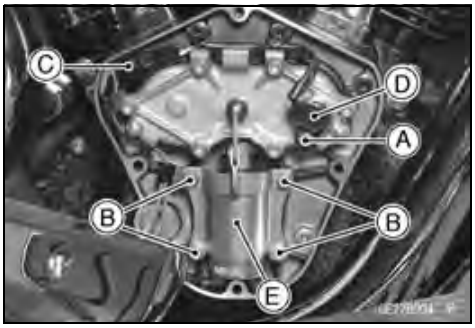
- Remove the right side cover (see Frame chapter).
- Loosen the clamps [A].
- Disconnect the decompression solenoid lead connector [B].



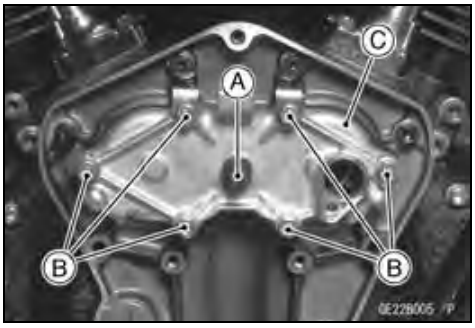
- Unscrew the outer camshaft cover bolts [A] and remove the outer camshaft cover [B].



- Remove:
  Camshaft Position Sensor Bolt [A]
  Decompression Solenoid Bolts [B]
  Camshaft Position Sensor Lead Connector [C]
  Camshaft Position Sensor [D]
  Decompression Solenoid [E]



- Drain the engine oil (see Engine Lubrication System chapter).
- Remove:
  Decompression Push Rod [A]
  Camshaft End Cover Bolts [B]
  Camshaft End Cover [C]

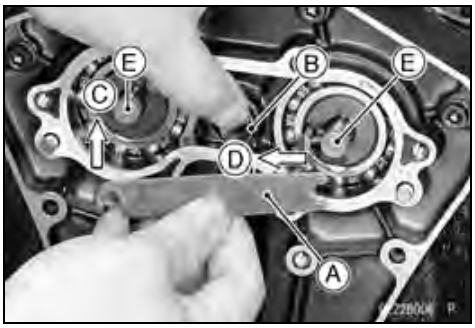


- Remove the holder [A] from the camshaft ends, compressing the spring [B].

○Pull up [C] the left end of the holder and pull the right end backwards [D].

NOTE

○*To remove the decompression shafts [E], remove the middle camshaft cover (see Camshaft Removal in this chapter).*



CAUTION

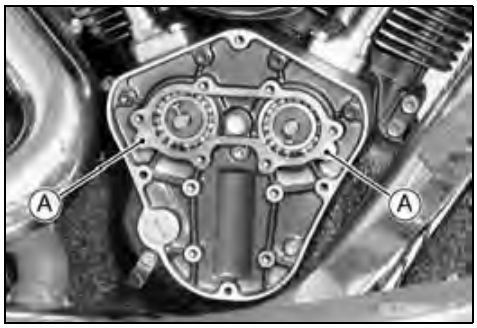
Do not remove the middle camshaft cover without removing the rocker case or the engine internal prts damage will occur.

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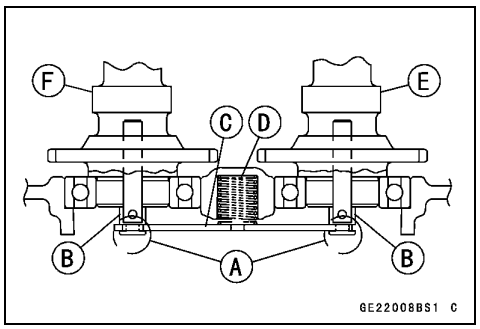
Decompression Mechanism

Decompression Mechanism Installation

● Be sure the dowel pins [A] are in position.



● Apply molybdenum disulfide oil to the rubbing surfaces [A] of the decompression shaft ends [B].
Holder [C]
Spring [D]
Front Camshaft [E]
Rear Camshaft [F]



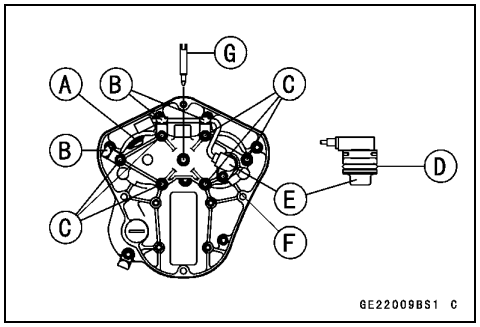
● Install the new gasket [A].
● Position and bend the clamp [B] as shown.
● Torque the camshaft end cover bolts [C].

Torque - Camshaft End Cover Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)

● Grease the O-ring [D] on the camshaft position sensor [E] and torque the camshaft position sensor bolt [F].
○Apply a non-permanent locking agent to the camshaft position sensor bolt.

Torque - Camshaft Position Sensor Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

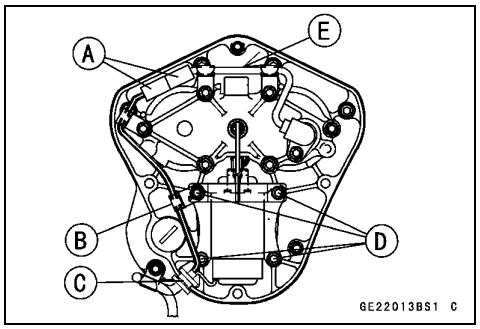
● Install the decompression push rod [G] after installing the camshaft end cover.



● Install the decompression solenoid.
○Connect the camshaft position sensor lead connectors [A].
○Position the clamp [B] and grommet [C] as shown.
○Torque the decompression solenoid bolts [D].

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

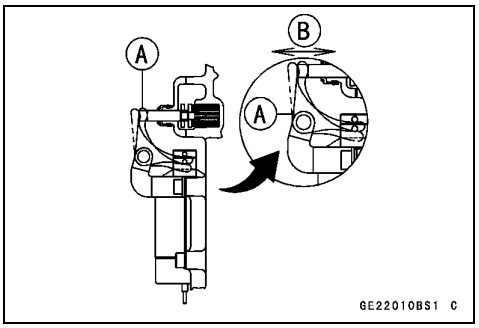
○Do not make the lead [E] slacken as much as possible.



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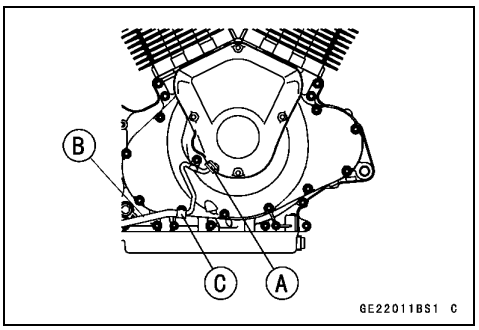
Decompression Mechanism

● Be sure that the decompression lever [A] moves back end forth [B] smoothly.



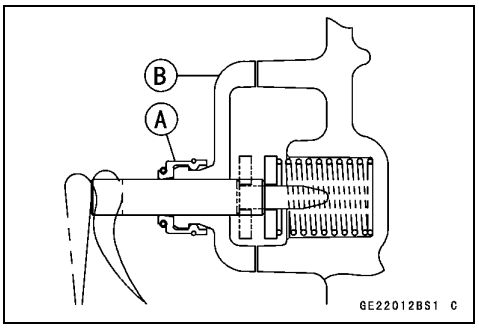
● Position the grommet [A] and route the decompression solenoid leads [B] and bend [C] the clamp.
● Install the outer camshaft cover.

Torque - Outer Camshaft Cover Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)



Oil Seal Inspection

● Inspect the oil seal [A] on the camshaft end cover [B].
★Replace if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

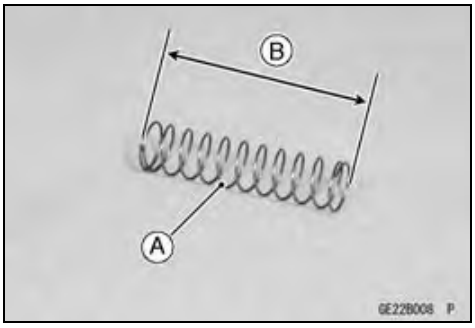


Spring Tension

● Since the spring [A]becomes shorter as it weakens, check its free length [B] to determine its condition.
★If the spring is shorter than the service limit, it must be replaced.

Spring Free Length

Standard:	**56.5 mm (2.22 in.)**
Service Limit:	**55.4 mm (2.18 in.)**



Decompression Solenoid Inspection

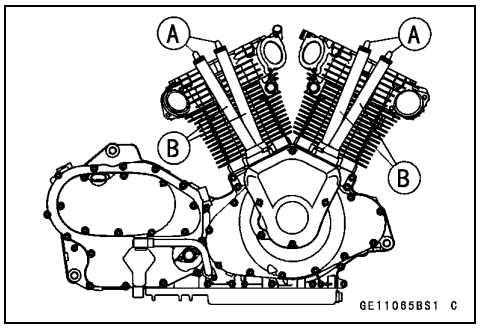
● Refer to the Decompression Solenoid Inspection in the Fuel (DFI) and Electrical System chapter

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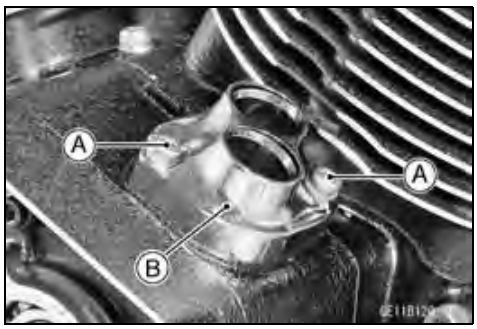
Camshafts

Camshaft Removal

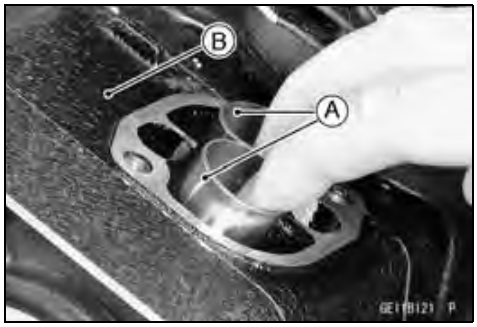
- Remove the engine (see Engine Removal/Installation chapter).
- Remove the rocker cases (see Rocker Case Removal).
- Remove:
  Push Rods [A]
  Pipes [B]



- Remove the outer camshaft cover and camshaft end cover (see Compression Release Mechanism Removal in this chapter).
- Unscrew the push rod cover bolts and remove the push rod covers.
  Front Push Rod Cover Bolts [A]
  Front Push Rod Cover [B]



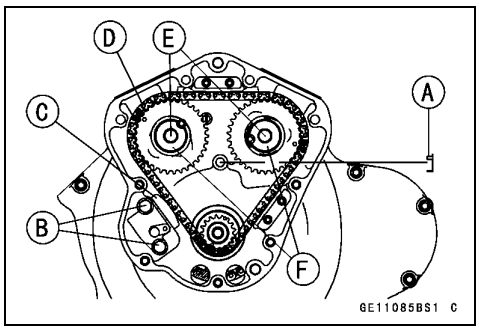
- Pull the tappets [A] out of the inner camshaft cover [B].



- Remove:
  Middle Camshaft Cover Bolts [A]
  Stopper Pin Plug [B]
  Middle Camshaft Cover [C]



- Remove:
  Spacer [A]
  Camshaft Chain Tensioner Bolts [B]
  Camshaft Chain Tensioner [C]
  Camshaft Chain [D]
  Decompression Shafts [E]
  Camshafts [F]

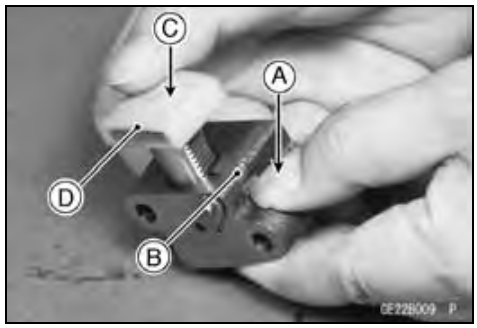


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Camshafts

Camshaft Installation

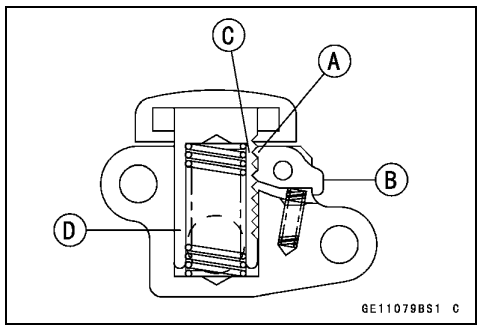
● Push [A] the chain tensioner ratchet [B] and push down [C] the tensioner shoe [D].



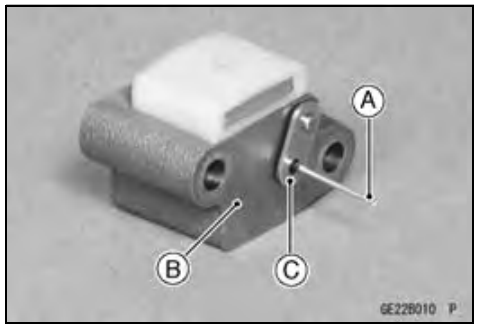
CAUTION

Be careful the oil remaining in the tensioner body dashes out.

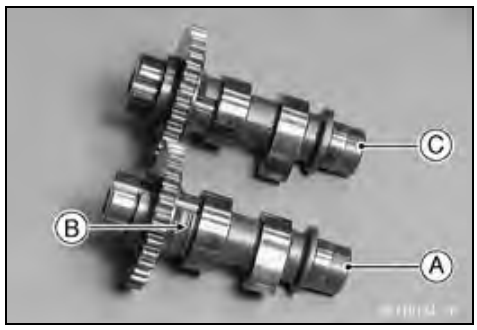
● Engage the first teeth [A] of the ratchet [B] with second groove [C] of the plunger [D].



● Insert the suitable stopper pin [A] into the chain tensioner body [B] through the link plate [C].



● The rear camshaft [A] has a groove [B] and the front camshaft [C] has no groove.



● Install the front [A] and rear [B] camshafts.
● Install the camshaft chain [C].
○Align the crankshaft timing mark [D] with the middle link of three blue colored links [E] and camshaft timing marks [F] with the blue colored links [G].
● Install the camshaft tensioner [H] with the stopper pin [I].

Torque - Camshaft Chain Tensioner Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)

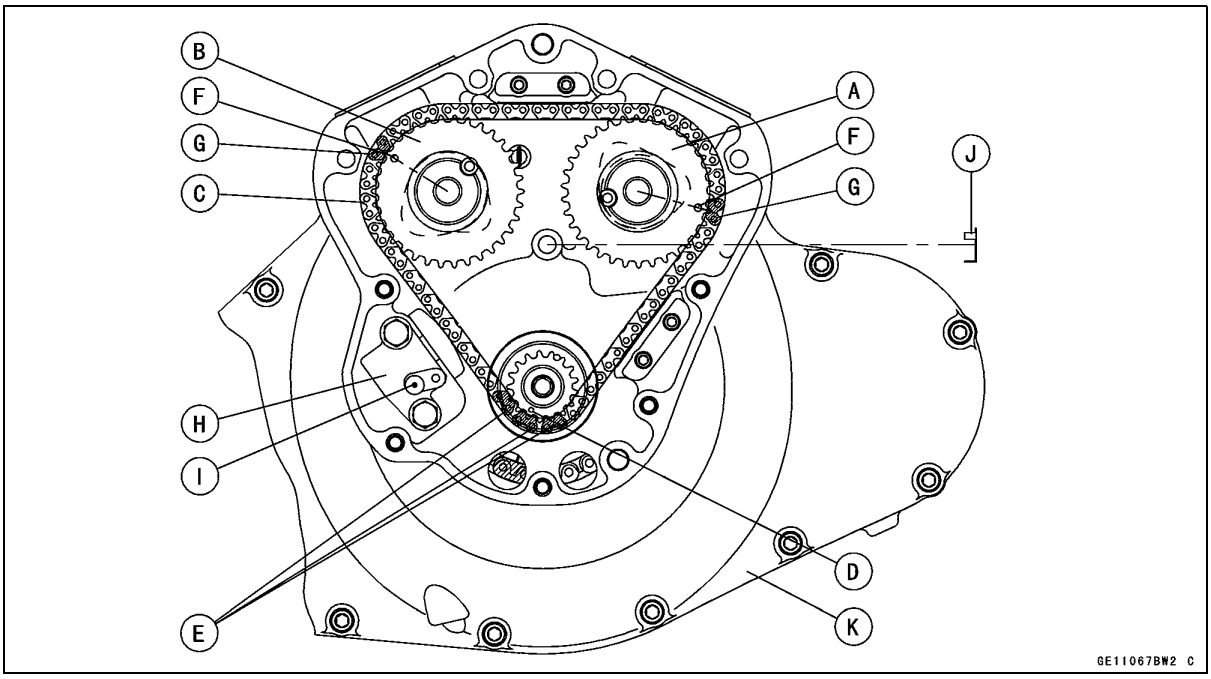
NOTE

○*Do not the pull the stopper pin out of the camshaft tensioner. Pull out the stopper pin after installing the middle camshaft cover.*

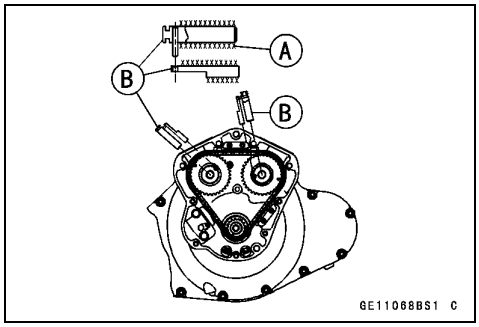
● Put the spacer [J] on the inner camshaft cover [K].

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Camshafts



● Apply molybdenum disulfide oil to the surface [A], shown with X marks of the decompression shafts [B] and install them to the camshafts.



● Be sure the dowel pins [A] are in position.
● Install the new gasket [B].

NOTE

○*Pull the stopper pin [C] after installing the middle camshaft cover (see below).*

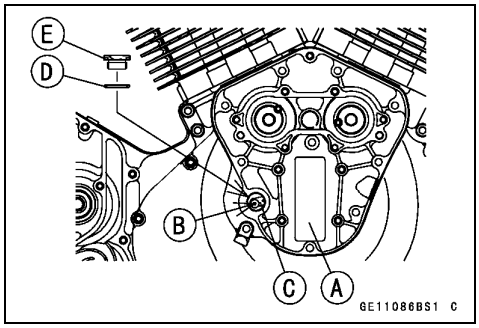


● Install the middle camshaft cover [A].

Torque - Middle Camshaft Cover Bolts (Length: 95 mm, 105mm): 12 N·m (1.2kgf·m, 104 in·lb)
Middle Camshaft Cover Bolts (Length: 35 mm): 12 N·m (1.2 kgf·m, 104in·lb)

● Pull the stopper pin [B] through the hole [C] of the middle camshaft cover.
● Gease the O-ring [D] on the plug [E].
● Install the stopper pin plug on the middle camshaft cover.
○Apply a non-permanent locking agent to the stopper pin plug.

Torque - Stopper Pin Plug: 2.5 N·m (0.25 kgf·m, 22 in·lb)



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Camshafts

Ball Bearing and Outer Race Replacement

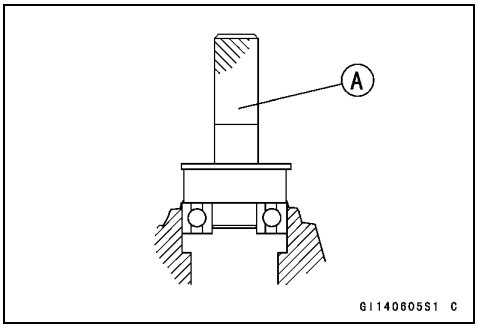
CAUTION

Do not remove the ball bearing [A] on the middle cover [B], unless it is necessary. Removal may damage them.

● Using a press or puller, remove the ball bearing.

● Using a press and the bearing driver set [A], install the new bearing until it stops at the bottom of its housing.

Special Tool - Bearing Driver Set: 57001-1129



Ball Bearing Wear

CAUTION

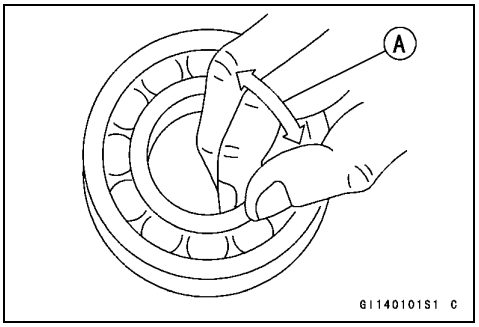
Do not remove the ball bearings for inspection. Removal may damage them.

● 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.



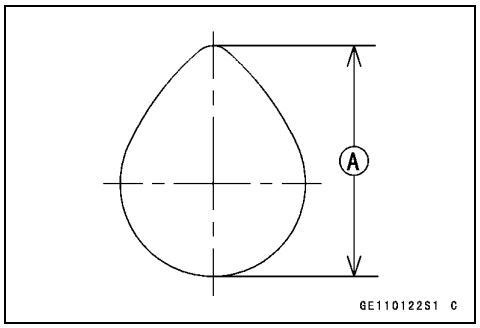
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Camshafts

Cam Wear

- Remove the camshaft (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.

★If the cams are worn down past the service limit, replace the camshaft.



Cam Height

Standard:

Inlet (Front)	**37.871 ~ 37.987 mm (1.49098 ~ 1.49555 in.)**
Exhaust (Front)	**37.77 mm (1.4870 in.)**

Service Limit:

Inlet (Front)	**37.351 ~ 37.467 mm (1.47051 ~ 1.47508 in.)**
Exhaust (Front)	**37.25 mm (1.4665 in.)**

Standard:

Inlet (Rear)	**36.411 ~ 36.527 mm (1.43350 ~ 1.43807 in.)**
Exhaust (Rear)	**36.31 mm (1.4295 in.)**

Service Limit:

Inlet (Rear)	**39.571 ~ 39.687 mm (1.55791 ~ 1.56248 in.)**
Exhaust (Rear)	**39.47 mm (1.5539 in.)**

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Cylinder Head

Cylinder Compression Measurement

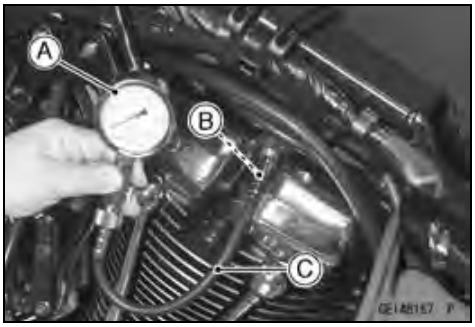
NOTE

○*Be sure the battery is fully charged.*

- Warm up the engine thoroughly.
- Stop the engine.
- Remove the fuel tank (see Fuel System (DFI) chapter).
- Remove one spark plug and attach the compression gauge and adapter firmly into the spark plug hole.
- For the other cylinder, remove the spark plug.

Special Tool - Spark Plug Wrench, Hex 16: 57001-1262

- 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: 57001-221 [A]
Compression Gauge Adapter, M14 × 1.25: 57001-1590 [B]
L-Shape Hose: 57001-1606 [C]

Cylinder Compression (Usable Range)
284 ~ 500 kPa (2.9 ~ 5.1 kg/cm², 41 ~ 72 psi) @200 r/min (rpm)

- Repeat the measurement for the other cylinder.
- Install the spark plugs.

Torque - Spark Plugs: 17 N·m (1.7 kgf·m, 12 ft·lb)

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Cylinder Head

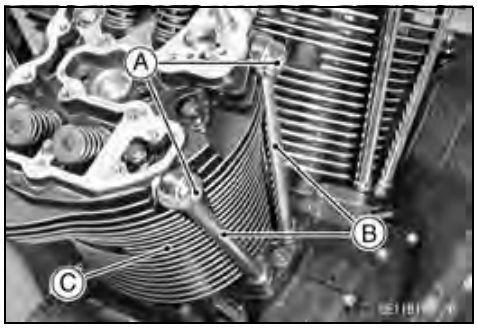
The following table should be consulted if the obtainable compression reading is not within the usable range.

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 mechanism	Replace the compression release mechanism parts.
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 prings	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.

Cylinder Head Removal

- Remove:
  Engine (see Engine Removal/Installation chapter)
  Rocker Cases (see this chapter)

- Remove the oil pipe bolts [A] and pull up the oil pipes [B].
  Front Cylinder [C]



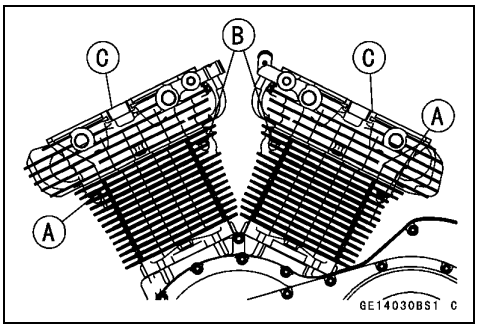
- Remove the push rods and pipes.
- Remove the cylinder head nuts [A].



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Cylinder Head

- Remove the lower cylinder head nuts [A].
- Take the cylinder heads [B] off the cylinders [C].

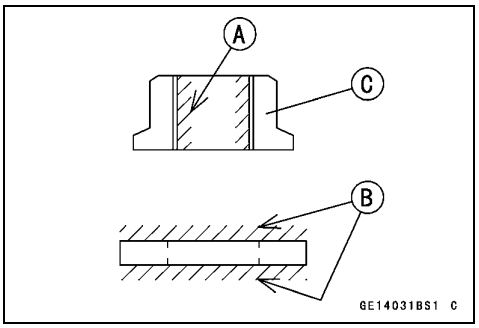


Cylinder Head Installation

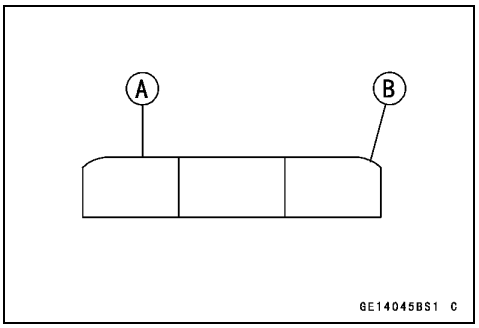
CAUTION

The cylinder head and rocker case are machined in the assembled state, so they must be used as a set.

- Apply molybdenum disulfide oil [A] to both sides of the washers [B] and the cylinder head nut [C] threads.



- For the washers [A]under M12 cylinder head nuts, put them so that their chamber side [B] faces upwards.



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Cylinder Head

- Be sure the dowel pins [A] are in position.
- Replace the cylinder head gaskets [B].

○The front gasket has an “F” mark [C] while the rear gasket has an “R” mark [D].

○Install the gasket so that their can be read and be sure that the projections [E] are in position.

- Temporarily torque the cylinder head nuts (M10, M12) and then torque them, folowing the specified tightening sequence.

Temporary Torque

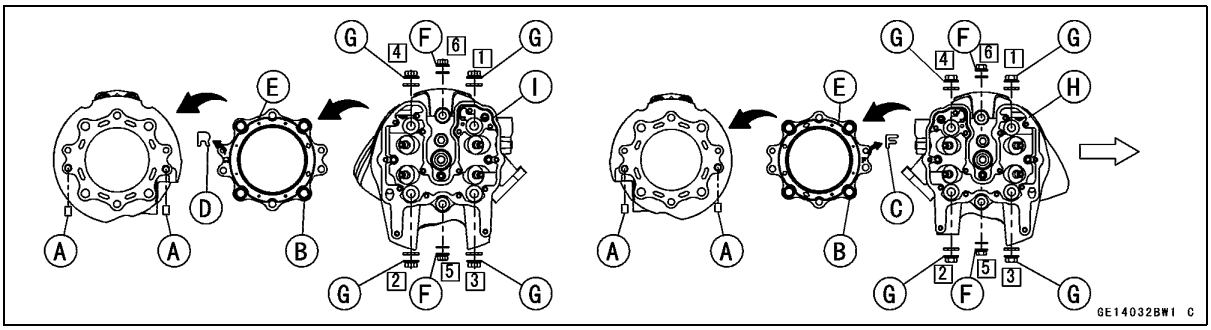
Upper Cylinder Head Nuts ϕ10 mm [F]: 15 N·m (1.5 kgf·m, 11 ft·lb)

Upper Cylinder Head Nuts ϕ12 mm [G]: 29 N·m (3.0 kgf·m, 21 ft·lb)

Torque - Upper Cylinder Head Nuts ϕ10 mm [F]: 29 N·m (3.0 kgf·m, 21 ft·lb)

Upper Cylinder Head Nuts ϕ12 mm [G]: 88 N·m (9.0 kgf·m, 65 ft·lb)

Front Cylinder Head [H]
Rear Cylinder Head [I]

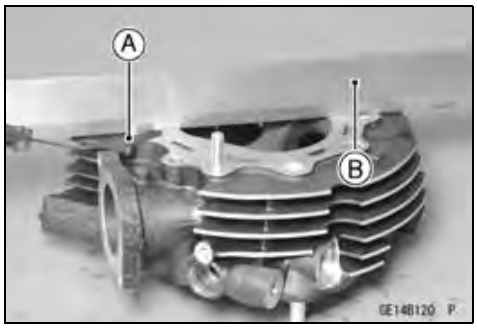


- Torque the lower cylinder head nuts after the cylinder head nuts are torqued.

Torque - Lower Cylinder Head Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Cylinder Head Warp

- Remove the cylinder head (see Cylinder Head Removal).
- 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).

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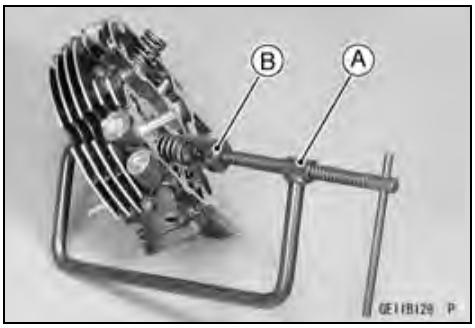
Valve

Valve Clearance Adjustment

NOTE

○*Since the hydraulic lash adjusters constantly maintain zero clearance, it is not necessary to inspect or adjust the valve clearance.*

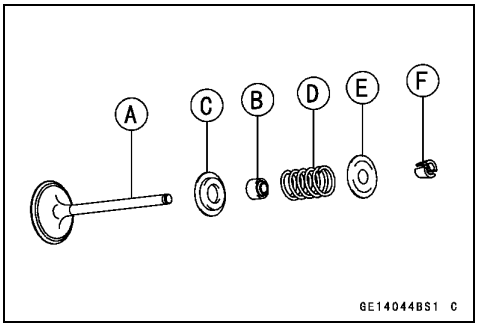
Valve Removal



- Remove the cylinder head (see Cylinder Head Removal).
- Swing open the rocker arm.
- Using the valve spring compressor assembly, remove the valve.

Special Tools - Valve Spring Compressor Assembly: 57001 -241 [A]
Valve Spring Compressor Adapter, ϕ28.2: 57001-243 [B]

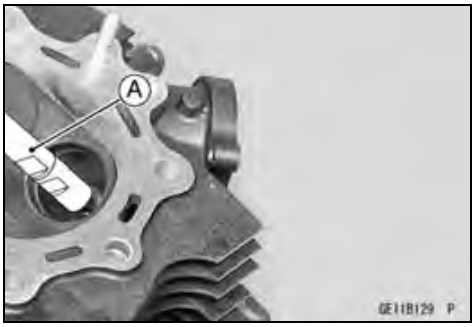
Valve Installation



- 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 spring so that the closed coil end faces downwards.

Valve [A] and Stem Oil Seal [B]
Spring Seat [C]
Spring [D]
Retainer [E] and Split Keepers [F]

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 Driver: 57001-1564

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.

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Valve

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, ϕ5.7: 57001-1564

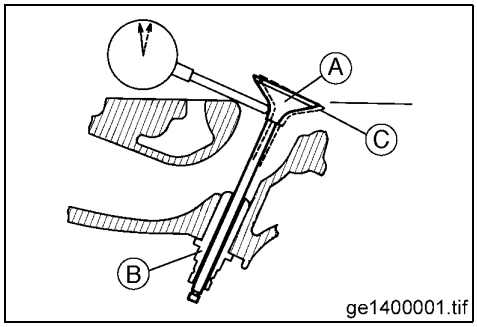
- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.

○Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counterclockwise or it will be dulled.

○Once the guides are reamed, they must be cleaned thoroughly.

Special Tool - Valve Guide Reamer, ϕ6: 57001-1596

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.

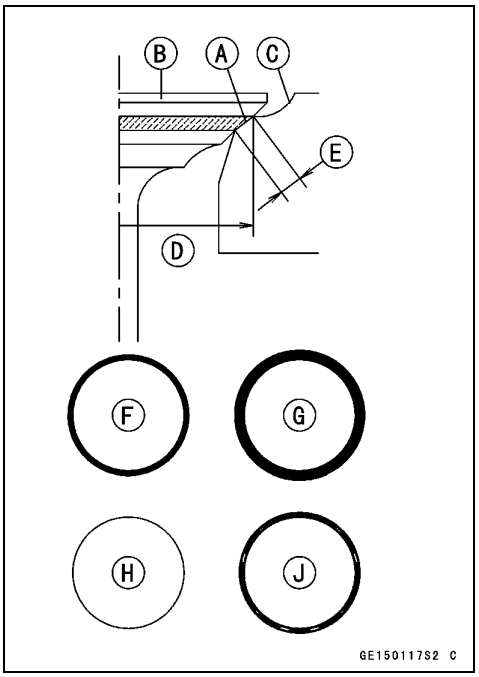
Valve-to-Guide Clearance (Wobble Method)

Standard:	
Exhaust	**0.07 ~ 0.12 mm (0.0028 ~ 0.0047 in.)**
Inlet	**0.04 ~ 0.10 mm (0.0016 ~ 0.0039 in.)**
Service Limit:	
Exhaust	**0.27 mm (0.0106 in.)**
Inlet	**0.25 mm (0.0098 in.)**

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Valve

Valve Seat Inspection



- Remove the valve (see Valve Removal).
- 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 Seat Repair).

Valve Seat Surface Outside Diameter (Seat O.D.)
Standard:

Exhaust	**34.9 ~ 35.1 mm (1.374 ~ 1.382 in.)**
Inlet	**38.9 ~ 39.1 mm (1.531 ~ 1.539 in.)**

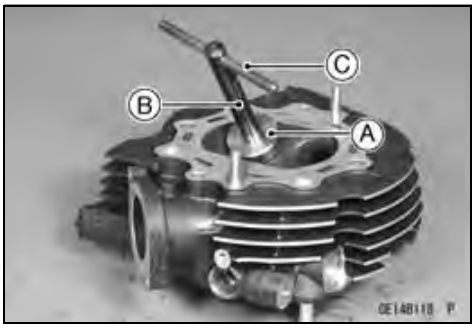
○Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with vernier calipers.
Good [F]

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

Valve Seat Surface Width (or Seat Width)
Standard:

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

Valve Seat Repair

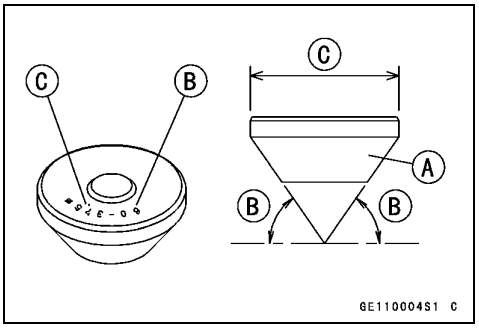


- Repair the valve seat with the valve seat cutters [A].

Special Tools - Valve Seat Cutter Holder, ϕ6: 57001-1576 [B]
Valve Seat Cutter Holder Bar: 57001-1128 [C]

[For Exhaust Valve Seat]
Valve Seat Cutter, 45°-ϕ40: 57001-1496
Valve Seat Cutter, 32°-ϕ38.5: 57001-1122
Valve Seat Cutter, 60°-ϕ41: 57001-1124

[For Inlet Valve Seat]
Valve Seat Cutter, 45°-ϕ41.5: 57001-1117
Valve Seat Cutter, 32°-ϕ44: 57001-1515
Valve Seat Cutter, 60°-ϕ41: 57001-1124



○The marks stamped on the back of the cutter [A] represent the following.
55° ..... Cutter Angle [B]
37.5ϕ ..... Outer Diameter of Cutter [C]

★If the manufacturer's instructions are not available, use the following procedure.

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Valve

Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve seat 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.

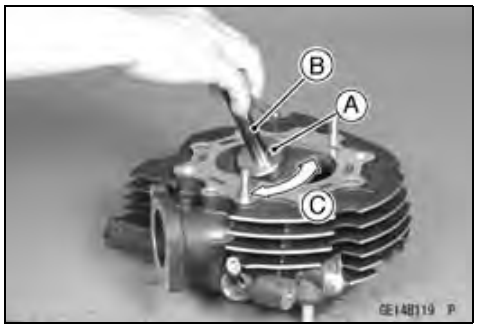
NOTE

○*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

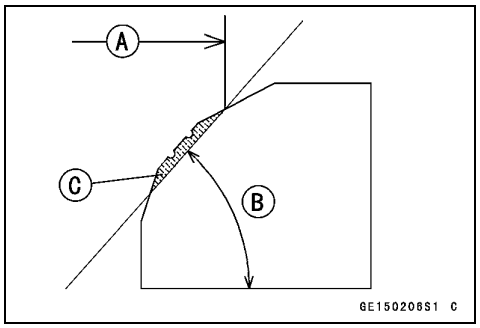
- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter [A] into the holder [B] and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left [C]. Grind the seat surface only until it is smooth.



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 outside diameter) with vernier calipers.

★If the seat outside diameter is too small, repeat the 45° grind [B] until the diameter is within the specified range.
Ground Voluum [C]



NOTE

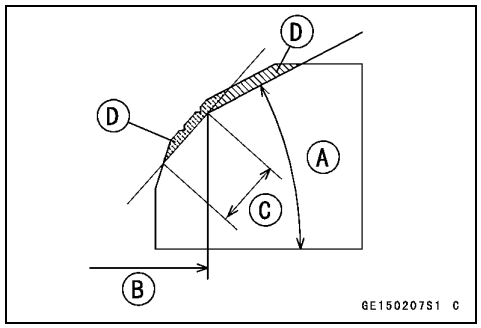
○*Remove all pittings or flaws from 45° ground surface.*
○*After grinding with 45° cutter, apply thin coat of machinist's dye to seat surface. This makes seat surface distinct and 32° and 60° grinding operation easier.*
○*When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*

★If the seat outside diameter is too large, make the 32° grind described below.

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Valve

○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.

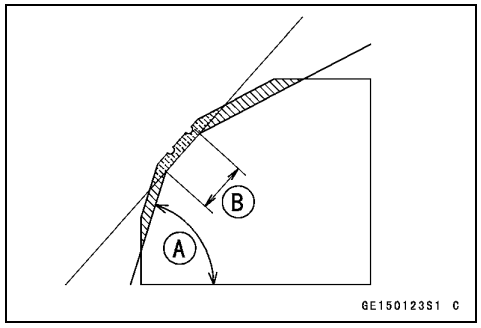


CAUTION

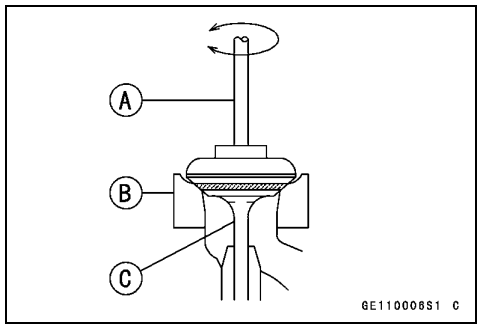
The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.

● Grind the seat at a 32° angle [A] until the seat outside diameter [B] is within the specified range.
★If the seat outside diameter 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 Volum [D]
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then measure the seat outside diameter.

★If the seat width is too wide, make the 60° grind described below.
● To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
● Turn the holder, while pressing down lightly.
● Grind the seat at a 60° 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 outside diameter are within the ranges specified above.
○Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
○Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
○Repeat the process with a fine grinding compound.
Lapper [A]
Valve Seat [B]
Valve [C]

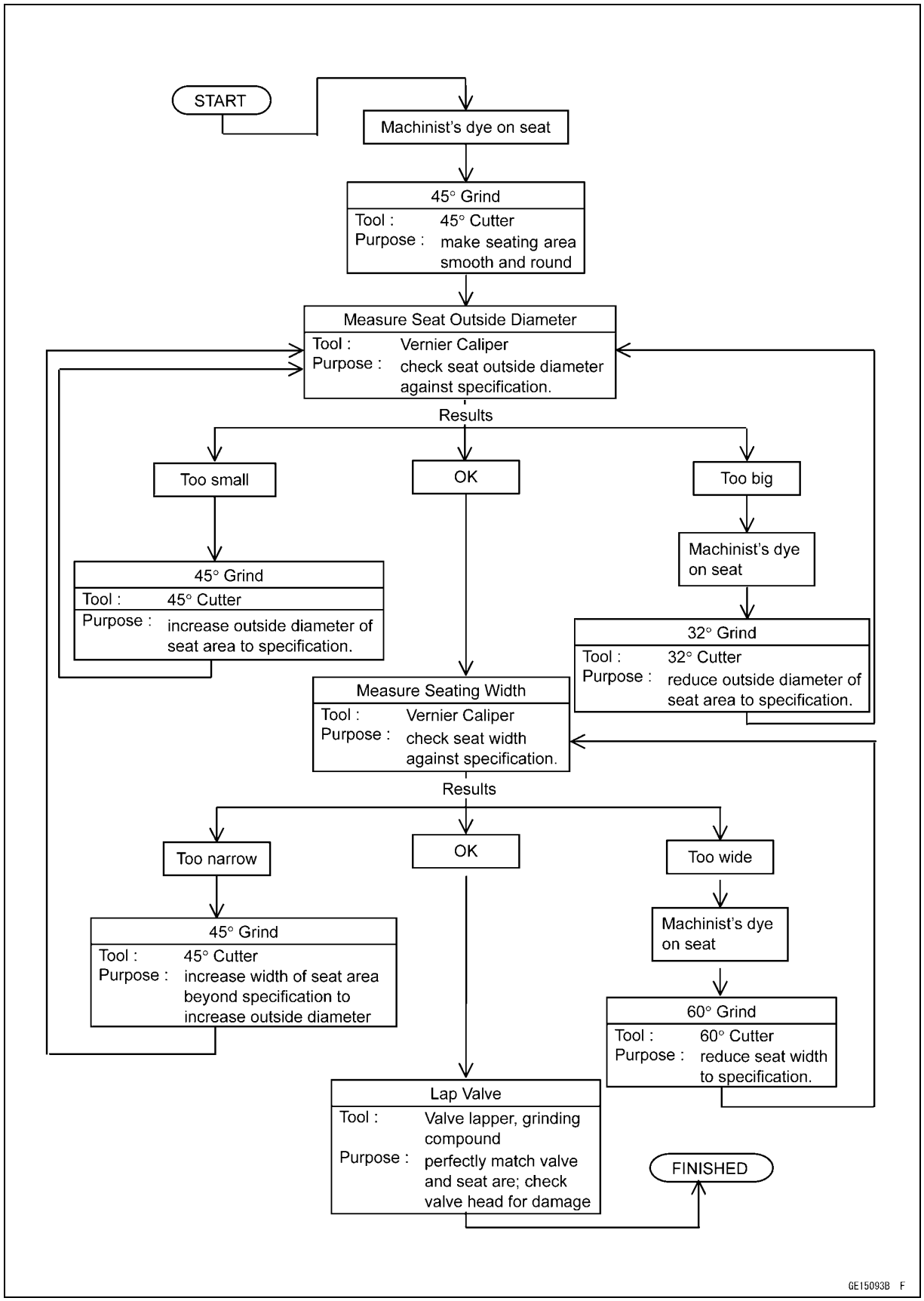


● The seat area should be marked about in the middle of the valve face.
★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
● Be sure to remove all grinding compound before assembly.

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Valve

Valve Seat Repair

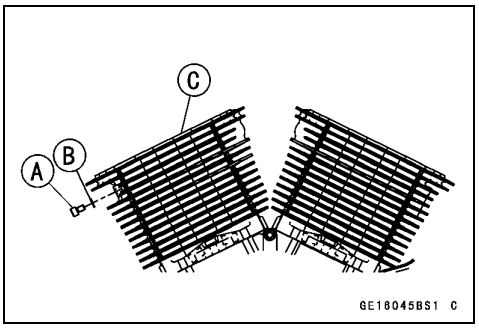


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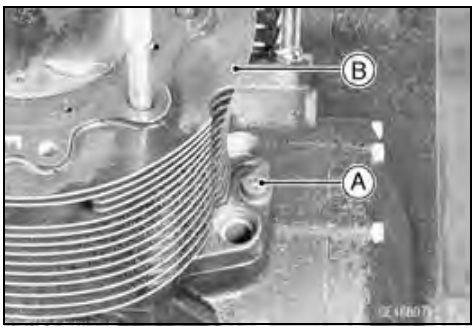
Cylinders, Piston

Cylinder Removal

- Remove the cylinder head (see Cylinder Head Removal).
- Remove the coolant drain plug [A] and washer [B] to drain the coolant from the front cylinder [C].



- Remove the cylinder mounting bolt [A].
- Tap lightly up the cylinder with a plastic mallet to separate from the crankcase.
- Remove the cylinder base gasket.
  Front Cylinder [B]

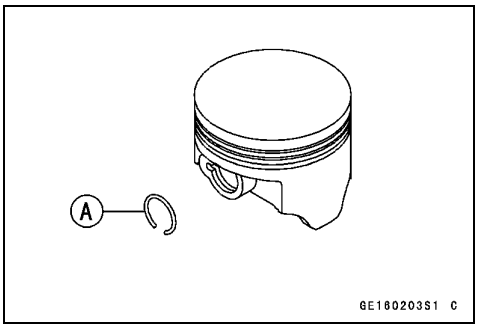


Piston Removal

- Remove the cylinder block (see Cylinder Removal).
- 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.



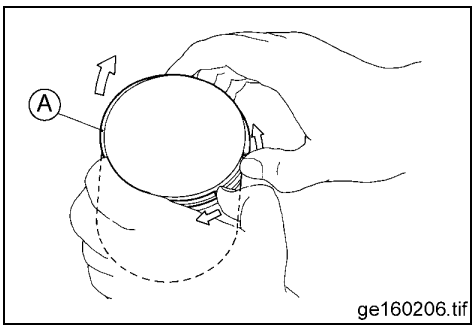
- Using the piston pin puller assembly, remove the piston pins.

  Special Tool - Piston Pin Puller [A]: 57001-1568

- Remove the piston.



- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



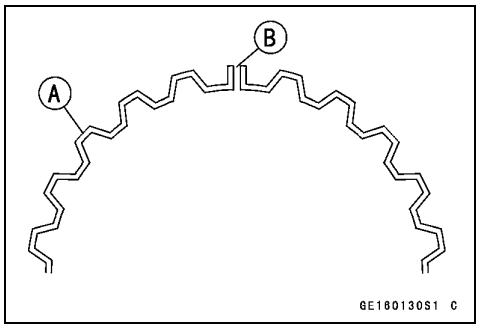
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Cylinders, Piston

Cylinder, Piston Installation

NOTE

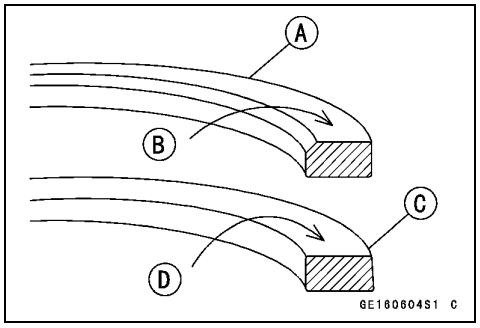
○*The oil ring rails have no "top" or "bottom".*



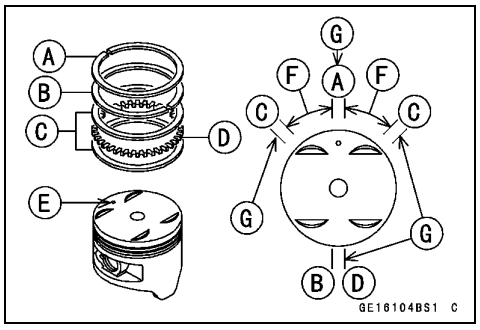
- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.

○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.

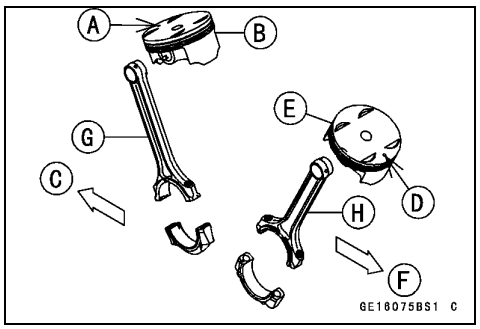


- Do not mix up the top ring and second ring.
- Install the top ring [A] so that the "**R**" mark [B] faces up.
- Install the second ring [C] so that the "**RN**" mark [D] faces up.



- 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]
  Hollow [E] must be faced toward Exhaust Side
  Opening Positions [G]



- Face the circle mark [A] on the front piston [B] toward the front side [C] and the circle mark [D] on the rear piston [E] toward the rear side [F] as shown.

NOTE

○*Install the front piston [B] to the right side connecting rod [G] while install the rear piston [E] to the left side connecting rod [H].*

○The front and rear pistons are the same, but they should be installed in their original positions.

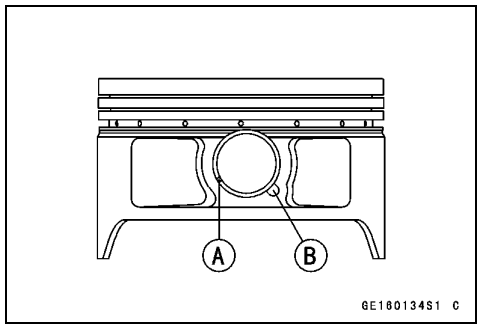
CAUTION

Incorrect installation of the piston could cause piston seizure and result in severe engine damage.

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Cylinders, Piston

● Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
● Apply molybdenum disulfide oil to the outer surface of the piston pin.
○The molybdenum disulfide oil 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 to the cylinder bore.
● Apply molybdenum disulfide oil to the front and rear of the piston skirt.
● Install the rear cylinder first, with the rear piston at TDC.



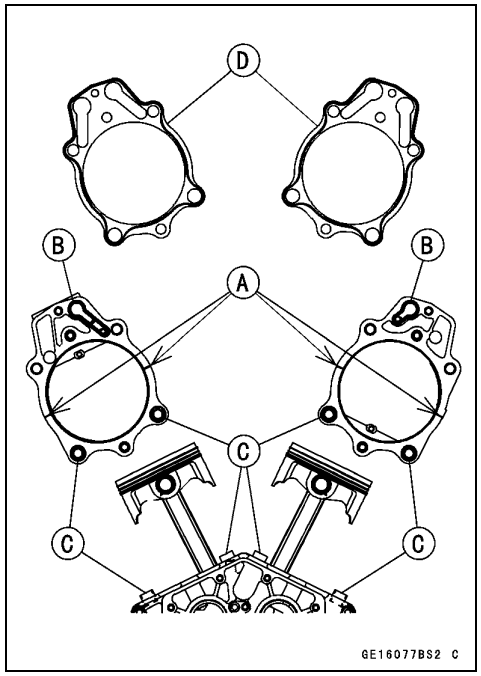
NOTE

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

○Apply silicone sealant to the stepped parts [A] on the mating surfaces of the left and right crankcase halves.

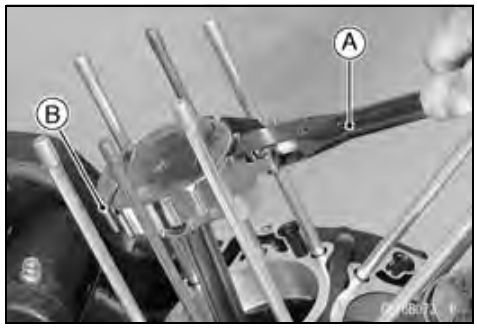
Sealant - Three Bond: TB1211F

○Grease the new O-rings [B].
○Be sure to install the dowel pins [C].
○Replace the cylinder base gaskets [D].



○Using the piston ring compressor assembly [A] with the chamfered side [B] upward, install the cylinder block.

Special Tools - Piston Ring Compressor Grip: 57001-1095
Piston Ring Compressor Belt, ϕ95 ~ ϕ108: 57001-1358



○The front cylinder has the coolant drain plug and the rear cylinder has no coolant drain plug. Be careful not to mix them up.

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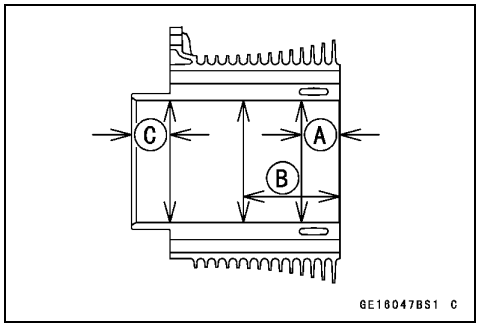
Cylinders, Piston

● Install the front cylinder in the same way.
○Position the front piston at TDC.
○Torque the cylinder mounting bolts.
○Apply a non-permanent locking agent to the circumference of bolt threads.

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

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 (0.4 in.) [A]
70 mm (2.8 in.) [B]
20 mm (0.8 in.) [C]

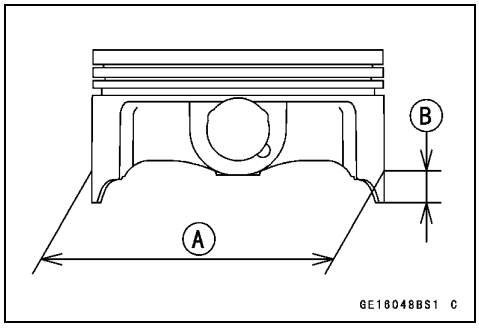


Cylinder Inside Diameter

Standard:	**102.994 ~ 103.006 mm (4.054874 ~ 4.055346 in.), and less than 0.01 mm (0.0004 in.) difference between any two measurements.**
Service Limit:	**103.10 mm (4.05905 in.) or 0.05 mm (0.002 in.) difference between any two measurements.**

Piston Wear

● Measure the outside diameter [A] of each piston 10.2mm [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.

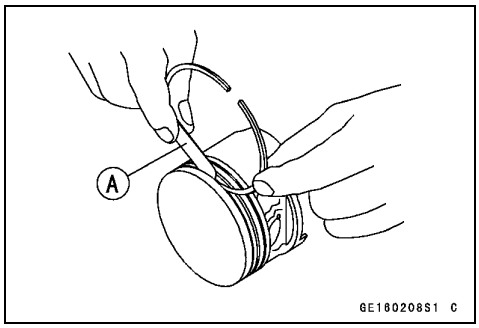


Piston Diameter

Standard:	**102.965 ~ 102.980 mm (4.053732 ~ 4.054323 in.)**
Service Limit:	**102.82 mm (4.04802 in.)**

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	**0.035 ~ 0.070 mm (0.00138 ~ 0.00276 in.)**
Second	**0.02 ~ 0.06 mm (0.00079 ~ 0.00236 in.)**
Service Limit:	
Top	**0.17 mm (0.00669 in.)**
Second	**0.16 mm (0.00630 in.)**

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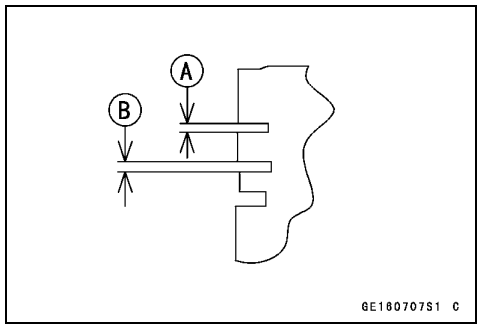
Cylinders, Piston

★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.

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	**1.225 ~ 1.240 mm**
	(0.048228 ~ 0.048819 in.)
Second	**1.21 ~ 1.23 mm**
	(0.04764 ~ 0.04843 in.)

Service Limit:

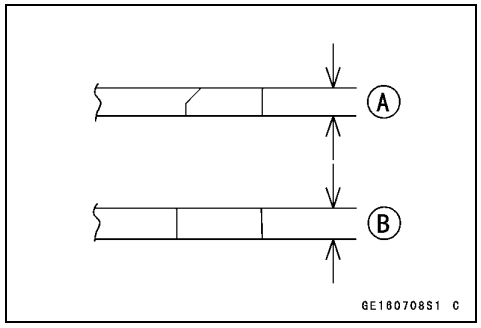
Top	**1.32 mm (0.05197 in.)**
Second	**1.31 mm (0.05157 in.)**

★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 (0.04606 ~ 0.04685 in.)**
Second	**1.17 ~ 1.19 mm (0.04606 ~ 0.04685 in.)**

Service Limit:

Top	**1.10 mm (0.0433 in.)**
Second	**1.10 mm (0.0433 in.)**

★If any of the measurements is less than the service limit on either of the rings, replace all the rings.

NOTE

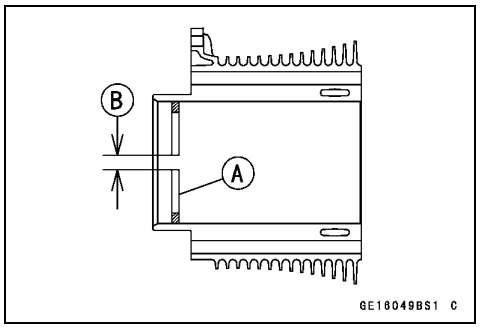
○*When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.*

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Cylinders, 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 (0.0098 ~ 0.0138 in.)**
Second	**0.40 ~ 0.55 mm (0.0157 ~ 0.0217 in.)**
Oil	**0.3 ~ 0.9 mm (0.012 ~ 0.035 in.)**

Service Limit:

Top	**0.7 mm (0.028 in.)**
Second	**0.8 mm (0.031 in.)**
Oil	**1.2 mm (0.0472 in.)**

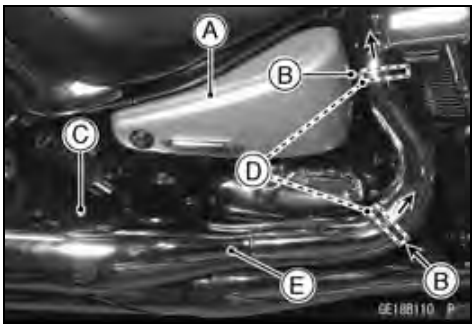
★If the end gap of either ring is greater than the service limit, replace all the rings.

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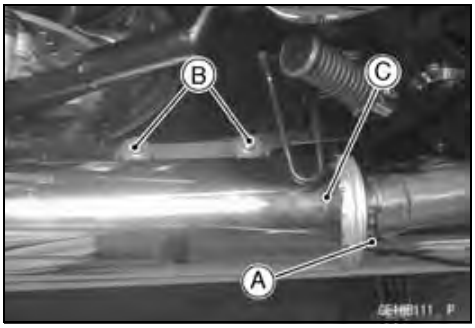
Mufflers

Upper Muffler Removal

- Remove:
  Right Side Cover [A] (see Frame chapter)
  Clamp Screws [B] (Loosen)
  Clamp Bolt [C]
- Detach the clamps [D] by sliding them up or forward.
- Remove the upper exhaust pipe cover [E].

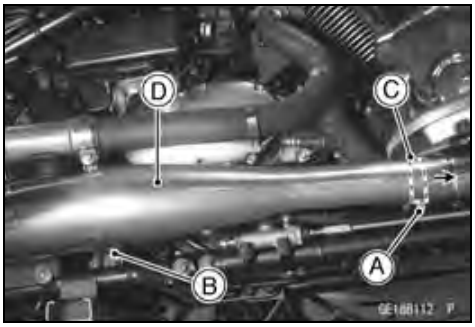


- Remove:
  Clamp Bolt [A] (Loosen)
  Upper Muffler Bracket Bolts [B]
  Upper Muffler [C]

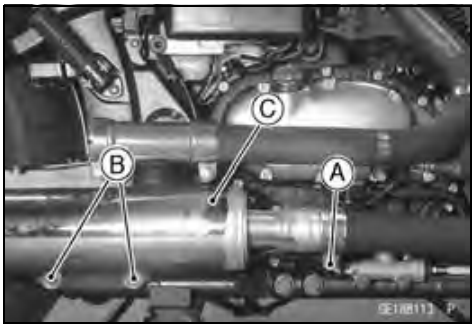


Lower Muffler Removal

- Remove:
  Upper Muffler (see above)
  Clamp Screw [A] (Loosen)
  Clamp Bolt [B]
- Detatch the clamp [C] by sliding it forward.
- Remove the lower rear exhaust pipe cover [D].

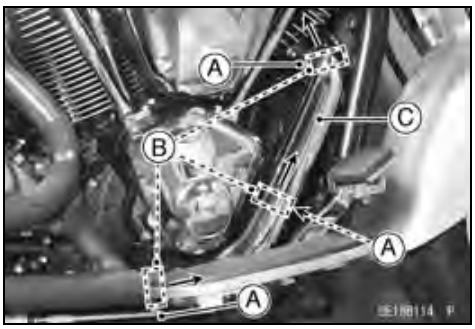


- Remove:
  Clamp Bolt [A] (Loosen)
  Lower Muffler Bracket Bolts [B]
  Lower Muffler [C]



Exhaust Manifold Removal

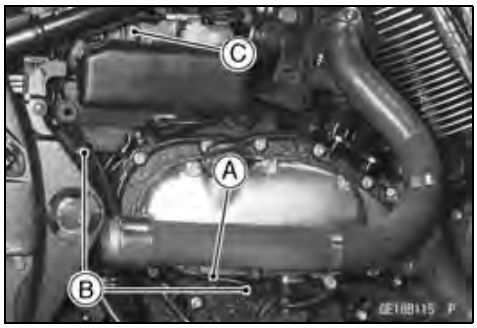
- Loosen the clamp screws [A].
- Detach the clamps [B] by sliding them up or forward.
- Remove the lower front exhaust cover [C].



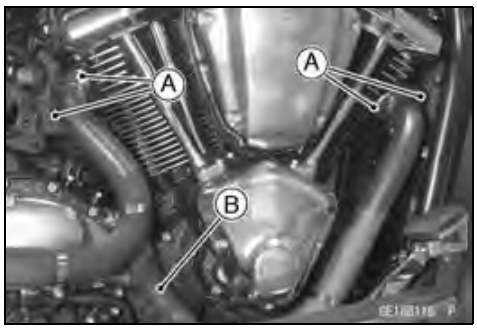
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Mufflers

- Free the Oxygen sensor lead [A] from the clamps [B] and disconnect the Oxygen sensor lead connector [C] (sensor equipped model).

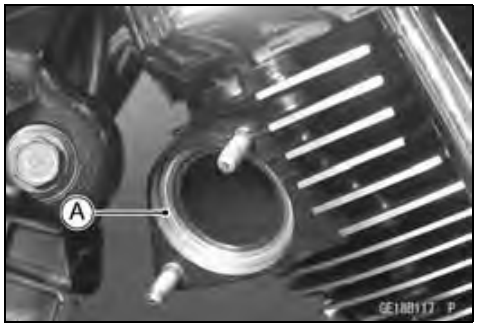


- Remove the exhaust pipe holder nuts [A].
- Remove the exhaust pipe [B].

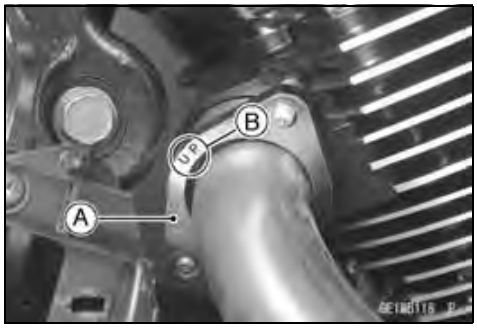


Muffler, Exhaust Pipe Installation

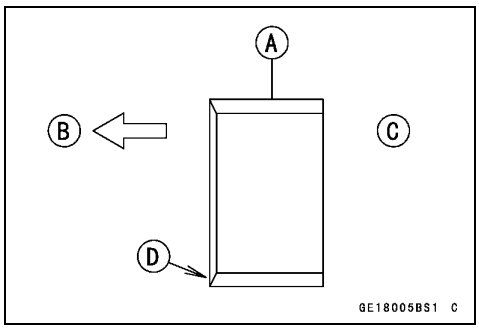
- Replace the exhaust pipe holder gasket [A] with new ones.



- Install the exhaust pipe holder [A] so that its “UP” mark [B] faces upward.



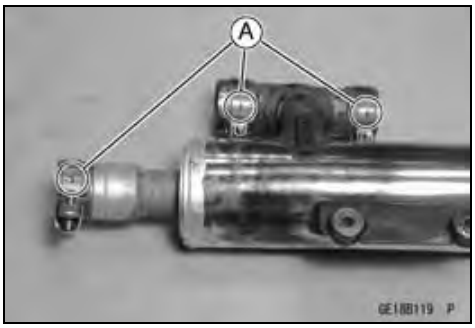
- Insert the exhaust pipe joint gaskets [A] direction as shown.
  Front [B]
  Rear [C]
  Chamfer Side [D]



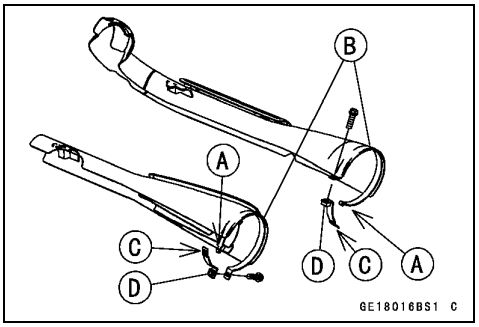
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Mufflers

● Be sure that the tabs on the muffler are fitted [A] into the slots on the clamps.



● Install the claws [A] on the exhaust pipe cover ends [B] into the slots [C] on the clamps [D].



● First, tighten all the bolts and nuts to a snug fit.
● Secondary, tighten the exhaust pipe holder nuts evenly.
● Finaly tighten the rest of the mounting bolts and clamp bolts securely.

Torque - Upper and Lower Muffler Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

Torque - Exhaust Pipe Cover Clamp Screws: 6.9 N·m (0.70 kgf·m, 61 in·lb)

● Route the O_2 sensor lead correctly (CAL, WVTA (FULL H), GB WVTA (FULL H) models, see Cable, Wire and Harness Routing in the Appendix chapter).
● Thoroughly warm up the engine, wait until the engine cools down, and retighten all clamp bolts.

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Clutch

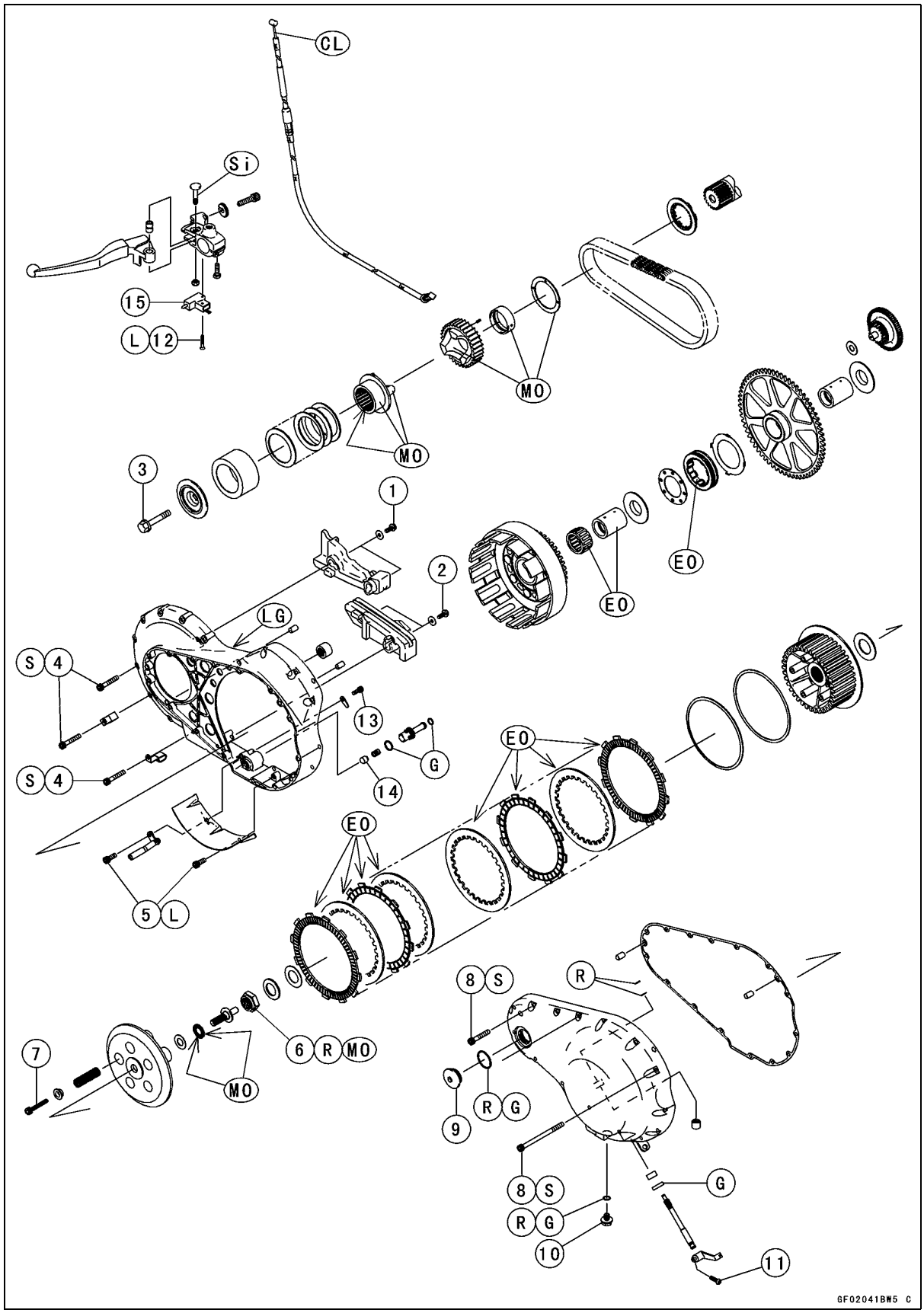
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Primary Chain Upper Guide Bolts	9.8	1.0	87 in·lb	
2	Primary Chain Lower Guide Bolts	9.8	1.0	87 in·lb	
3	Cam Damper Bolt	69	7.0	51	
4	Inner Clutch Cover Bolts	12	1.2	104 in·lb	S, see Text
5	Outside Plate Bolts	9.8	1.0	87 in·lb	L
6	Clutch Hub Nut	135	14.0	101	R, MO
7	Clutch Spring Bolts	98	1.0	87 in·lb	
8	Outer Clutch Cover Bolts	12	1.2	104 in·lb	S, see Text
9	Plug On Outer Clutch Cover	20	2.0	15	
10	Clutch Cover Oil Drain Plug	21	2.1	15	
11	Clutch Release Lever Bolt	5.9	0.60	52 in·lb	
12	Starter Lockout Switch Screw	–	–	–	L
13	Inside Plate Bolt	9.8	1.0	87 in·lb	

14. Check Valve
15. Starter Lockout Switch

CL: Apply cable lubricant.
EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket (Kawasaki Bond: 56019-120).
MO: Apply molybdenum disulfide oil.
R: Replacement Parts
S: Follow the specific tightening sequence.
Si: Apply silicone grease or PBC grease.

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6-4 CLUTCH

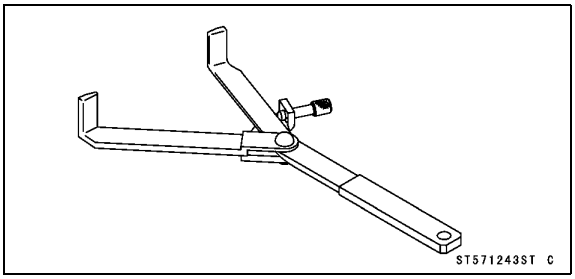
Specifications

Item	Standard	Service Limit
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Clutch		
Clutch Spring Free Length	81.17 mm (3.20 in.)	77.5 mm (3.05 in.)
Clutch Plate Assembly Length	51.32 ~ 52.32 mm (2.02 ~ 2.06 in.)	– – –
Friction Plate Thickness	3.3 ~ 3.5 mm (0.130 ~ 0.138 in.)	3.1 mm (0.122 in.)
Friction or Steel Plate Warp	0.2 mm (0.0079 in.) or less	0.3 mm (0.012 in.)

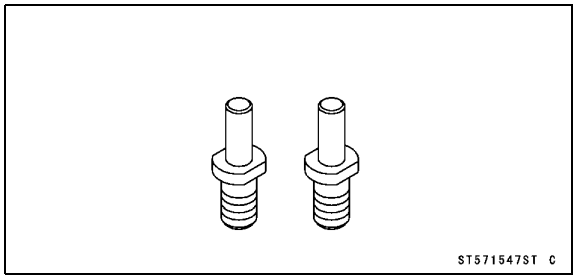
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Special Tools and Sealant

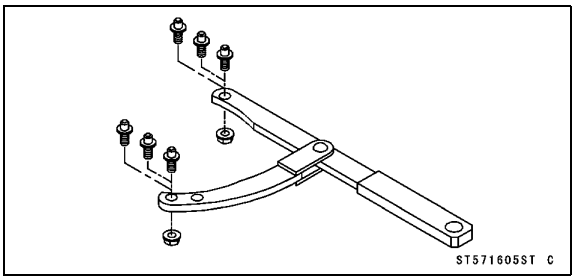
Clutch Holder:
57001-1243



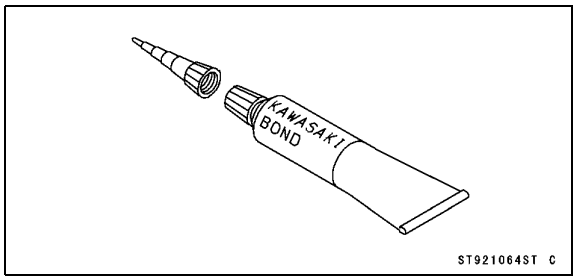
Holder Attachment:
57001-1547



Flywheel & Pulley Holder:
57001-1605



Kawasaki Bond (Liquid Gasket - Brack) TB1216:
92104-1064



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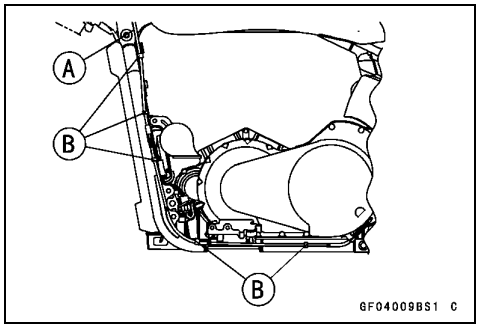
Clutch Lever and Cable

Lever Free Play Inspection

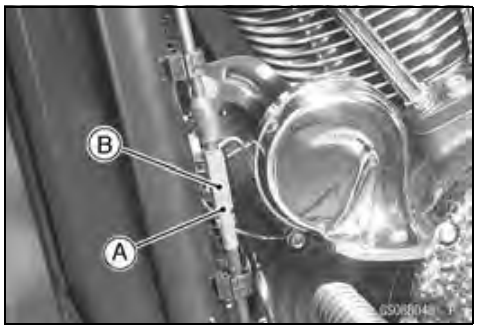
● Refer to Clutch in the Periodic Maintenance chapter.

Clutch Cable Removal

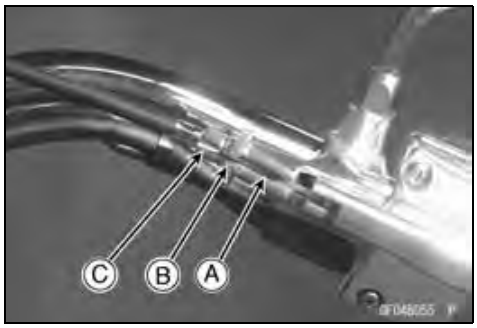
● Free the clutch cable [A] from the clamps [B].



● Loosen the locknut [A] at the middle of the clutch cable.
● Turn the adjusting nut [B] to give the cable plenty of play.



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



Clutch Cable Installation

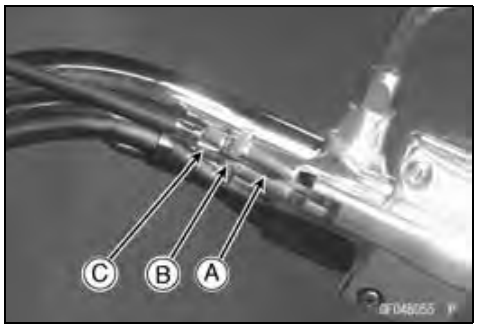
● Run the clutch cable correctly (see Appendix chapter).
● Adjust the clutch cable (see clutch in the Periodic Maintenance chapter).

Clutch Cable Lubrication

● Refer to the General Lubrication in the Periodic Maintenance chapter.

Clutch Lever Installation

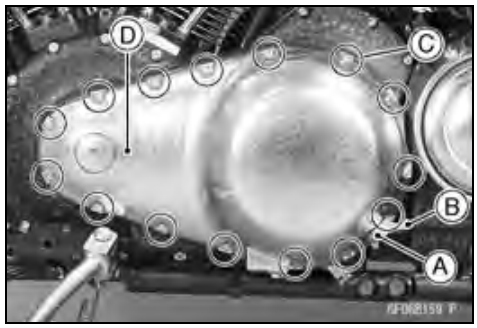
● Install the clutch lever so that the punch mark [A] on the handlebar is aligned with the mating surface [B] of the clutch lever clamp.



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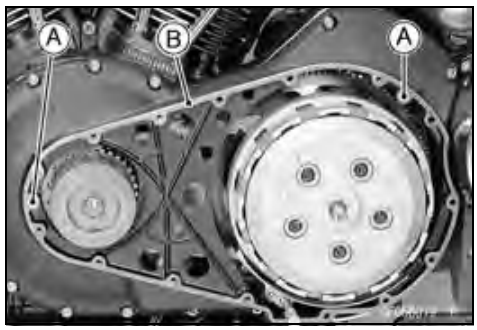
Clutch

Outer Clutch Cover Removal



- Drain the engine oil (see Engine Lubrication System in the Periodic Maintenance chapter).
- Remove the left footboard (see Frame chapter).
- Remove:
  Clutch Cable (see this chapter).
  Release Lever Bolt [A]
  Release Lever [B]
  Outer Clutch Cover Bolts [C]
  Outer Clutch Cover [D]

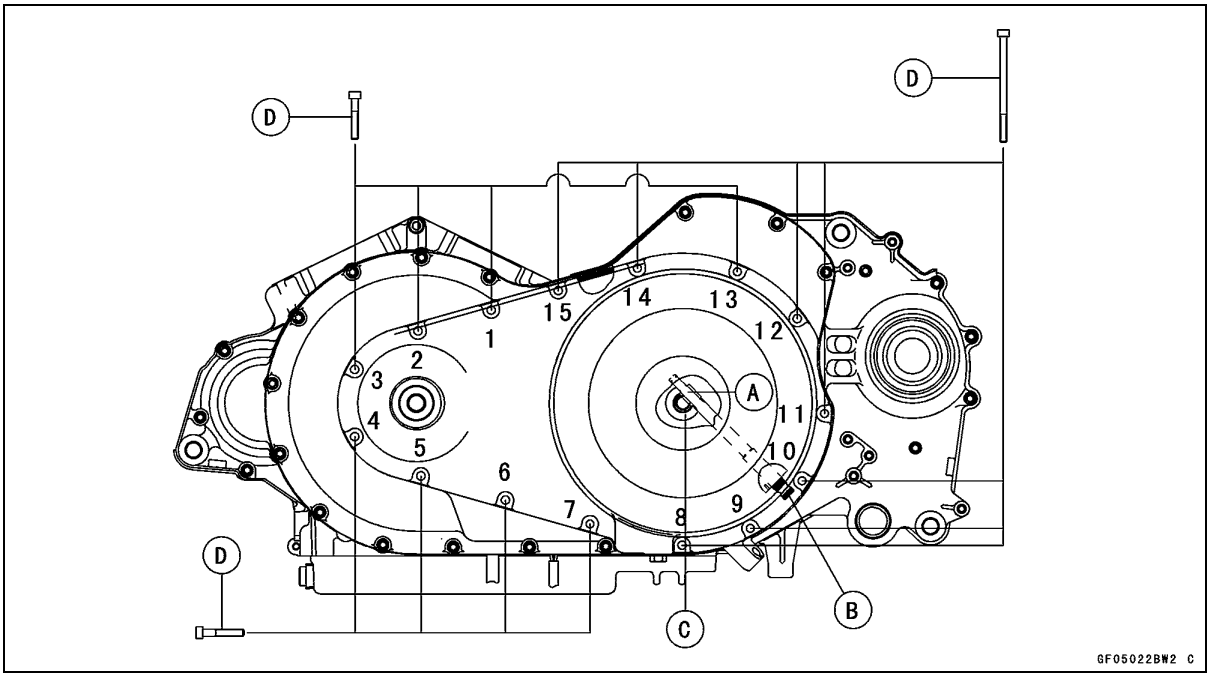
Outer Clutch Cover Installation



- Be sure the dowel pins [A] are in position.
- Replace the gasket [B] with a new one.
- Install the outer clutch cover.

○Engage [A] the gear of the release shaft [B] with the gear of the pull rod [C].
○Tighten the outer clutch cover bolts [D] to a snug fit.
○First, torque the No.1 or 15 bolts and torque the remaining bolts counterclockwise.
○For the No.1, 2, 3, 4 bolts, torque them again.

Torque - Outer Clutch Cover Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)



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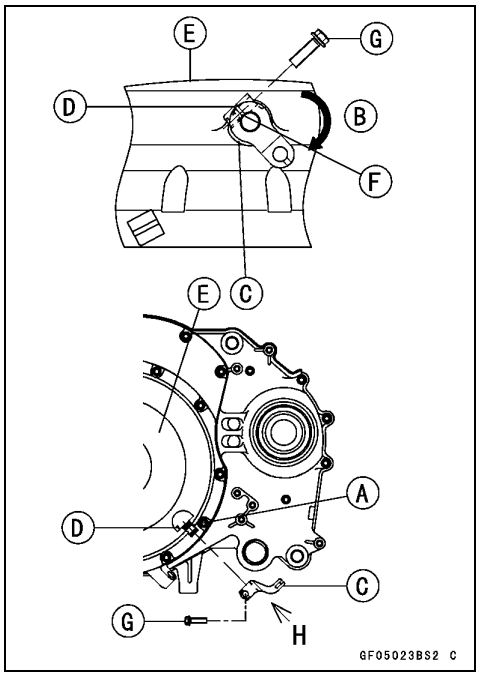
Clutch

- Turn the release shaft [A] clockwise [B] (viewed from H) until it stops.
- Insert the release lever [C] to the release shaft.

○Align the projection [D] on the outer clutch cover [E] with the slit [F] of the release lever.

- Torque the release lever bolt [G].

Torque - Clutch Release Lever Bolt: 5.9 N·m (0.60 kgf·m, 52in·lb)

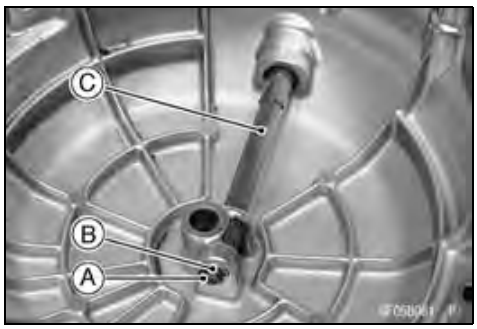


Release Shaft Removal

CAUTION

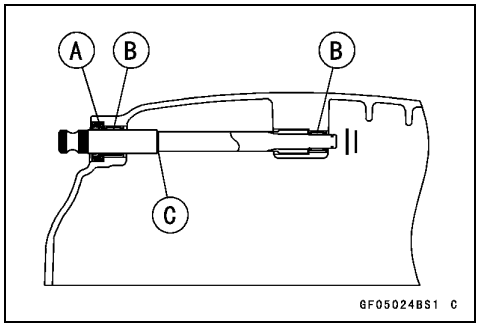
Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.

- Remove:
  Outer Clutch Cover (see Outer Clutch Cover Removal)
  Circlip [A]
  Washer [B]
  Release Shaft [C]



Release Shaft Installation

- Apply high-temperature grease to the oil seal lip [A] on the lower ridge of the outer clutch cover.
- Apply oil to the bearings [B] in the hole of the outer clutch cover.
- Insert the release shaft [C] straight into the lower hole of the outer clutch cover.



CAUTION

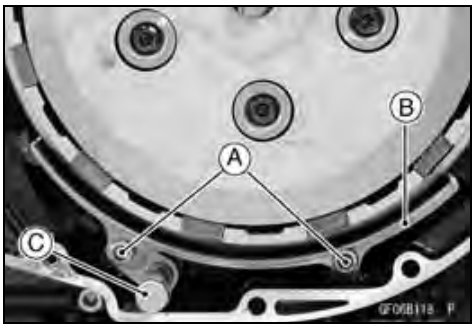
When inserting the release shaft, be careful not to remove the spring of the oil seal.

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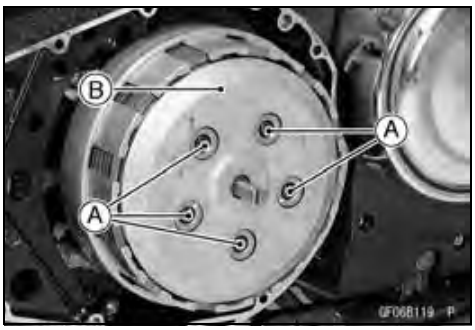
Clutch

Clutch Removal

- Drain the engine oil (see Engine Lubrication System in the Periodic Maintenance chapter).
- Remove the outer clutch cover (see Outer Clutch Cover Removal).
- Remove:
  Plate Bolts [A]
  Plate [B]
  Oil Pipe [C]



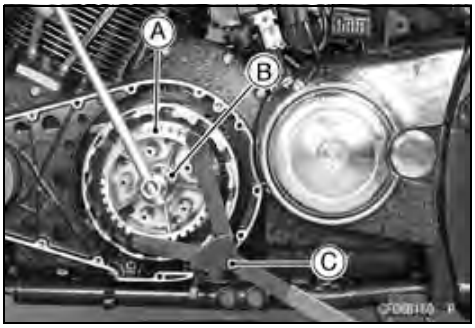
- Remove:
  Clutch Spring Bolts [A]
  Clutch Spring Plate [B] (with Springs)



- Remove:
  Washer [A]
  Thrust Bearing [B]
  Rod [C]
  Friction Plates and Steel Plates



- Holding the clutch hub [A], remove the clutch hub nut [B].
  Special Tool - Clutch Holder: 57001-1243 [C]



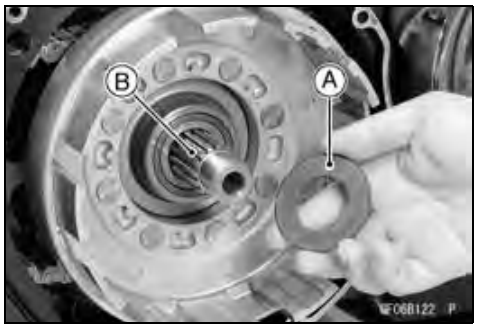
- Remove:
  Washer [A]
  Spring Washer [B]
  Clutch Hub [C]



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Clutch

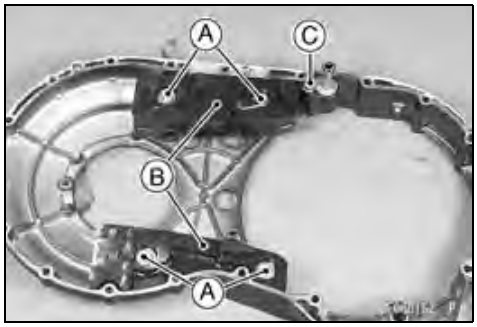
● Remove the spacer [A] from the drive shaft [B].



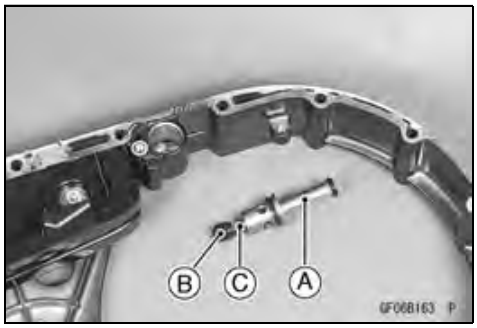
● Remove the outside and middle covers on the inside cover [A] (see Final Drive chapter).
● Remove the left downtube (see Frame chapter).
● Remove:
Inner Clutch Cover Bolts [B]
Inner Clutch Cover [C]



● Remove:
Chain Guide Bolts [A]
Chain Guides [B]
Inside Pipe Bolt [C]

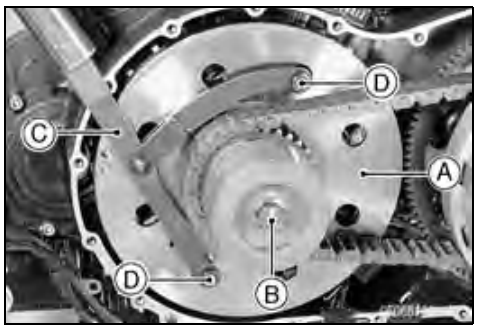


● Pull:
Oil Pipe [A]
Valve [B] with Spring [C]



● Holding the alternator rotor [A], remove the cam damper bolt [B]

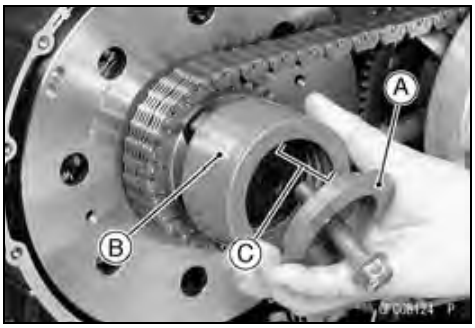
Special Tools - Flywheel & Pulley Holder: 57001-1605 [C]
Holder Attachment: 57001-1547 [D]



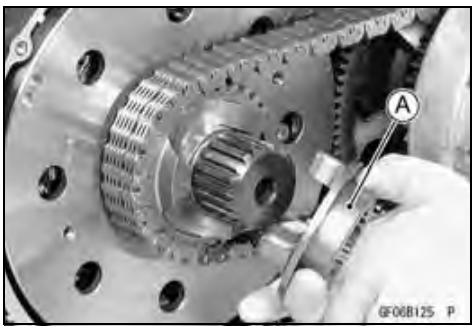
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Clutch

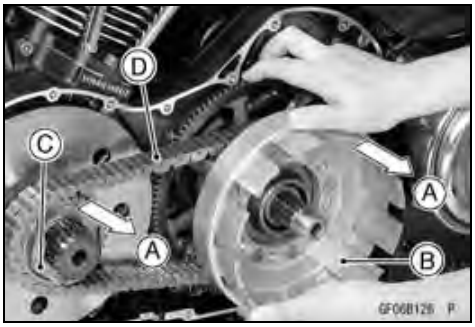
- Remove:
  Spring Retainer [A]
  Holder [B] and Springs [C] (as a set)



- Remove the damper cam [A] from the crankshaft.



- Pull [A] the clutch housing [B] and the sprocket [C] with the primary reduction chain [D].



- Remove:
  Starter Clutch Gear [A]
  Collor [B]
  Spacer [C]



- Remove the washer [A] from the crankshaft.



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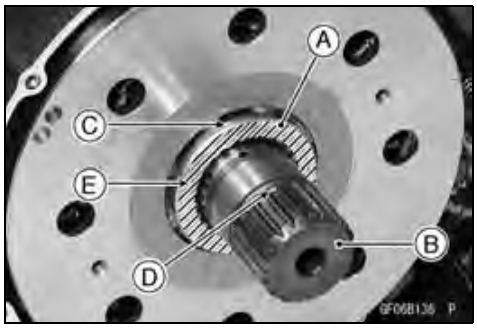
Clutch

Clutch Installation

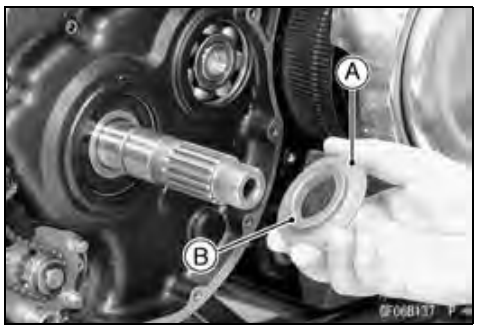
- Install the washer [A] to the crankshaft [B].

○Align the punch mark [C] on the washer with the punch mark [D] on the crankshaft.

- Apply molybdenum disulfide oil to the hatched portion [E] of the washer.



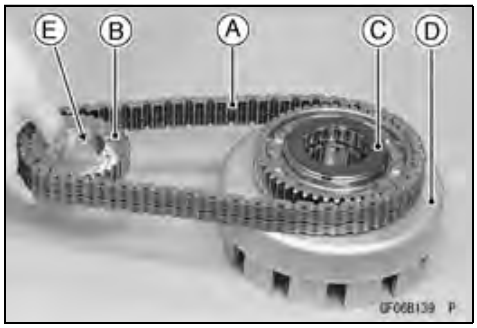
- Install the spacer [A] to the input shaft so that its stepped side [B] faces inward.



- Put the starter torque limiter [A] without the pinion.
- Install the collor [B] and starter clutch gear [C] to the input shaft [D].



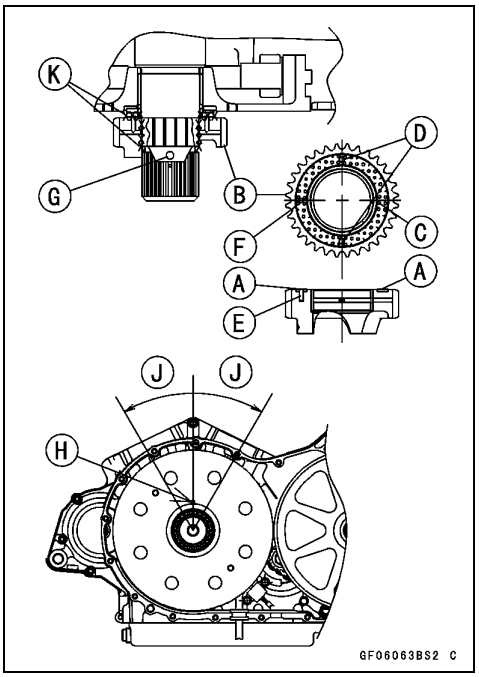
- Engage the chain [A] with the sprocket [B] and the one -way clutch [C] with the clutch housing [D] as shown.
- Apply molybdenum disulfide oil to the inner surface [E] of the sprocket.



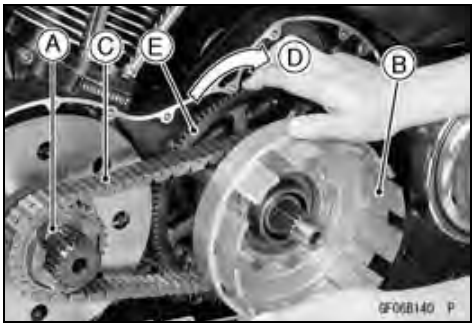
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Clutch

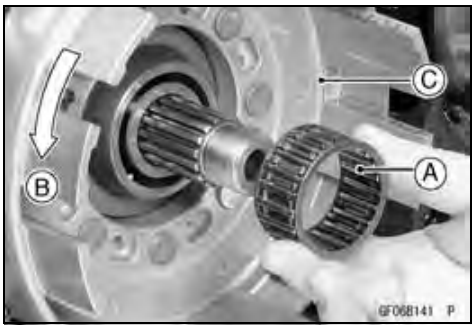
● Put the spacer [A] on the sprocket [B] so that its dint [C] side faces outward as shown.
○To prevent the spacer from dropping when the sprocket installing, apply grease to the spacer. Do not grease the oil passages [D].
○Align the pin [E] with the hole [F] on the spacer.
● Install the sprocket to the crankshaft so that the punch mark [G] on the sprocket is aligned with the punch mark [H] on the alternator rotor within the range of 30 degree [J].
○Apply molybdenum disulfide oil [K] to the X the surface, shown with X marks.



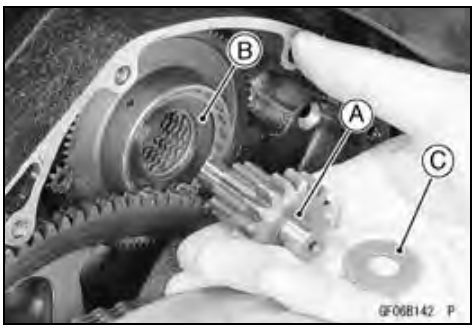
● Install the sprocket [A] and the clutch housing [B] with the chain [C], turning clockwise [D] the starter clutch gear [E].



● Install the needle bearing [A] to the input shaft, turning counterclockwise [B] the clutch housing [C].



● Put the pinion [A] on the starter torque limiter [B].
● Put the washer [C] on the pinion.



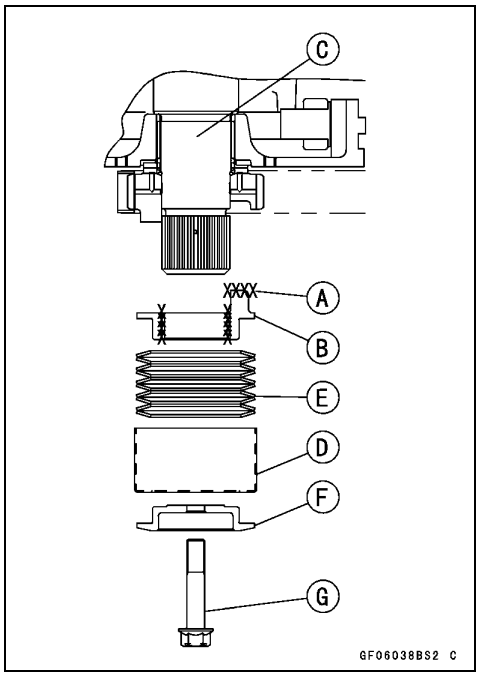
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Clutch

- Apply [A] molybdenum disulfide oil to the X-mark portions of the cam damper [B] and install it to the crankshaft [C].
- Install:
  Spring Holder [D] and Springs [E]
  Spring Retainer [F] and Cam Damper Bolt [G]
- Torque the retainer bolt, using the clutch holder.

Torque - Cam Damper Bolt: 69 N·m (7.0 kgf·m, 51 ft·lb)

Special Tool - Clutch Holder: 57001-1243



- Put the spacer [A] on the input shaft [B],
- Install the clutch hub [C] and put the washer [D].
- Put the spring washer [E] so that its “OUT SIDE” mark [F] faces outward.
- Replace the clutch hub nut [G] with a new one.
- Torque the clutch hub nut [G] using the clutch holder.

○Apply molybdenum disulfide oil to the nut flange portion and threads.

Torque - Clutch Hub Nut: 135 N·m (14.0 kgf·m, 101 ft·lb)

Special Tool - Clutch Holder: 57001-1243

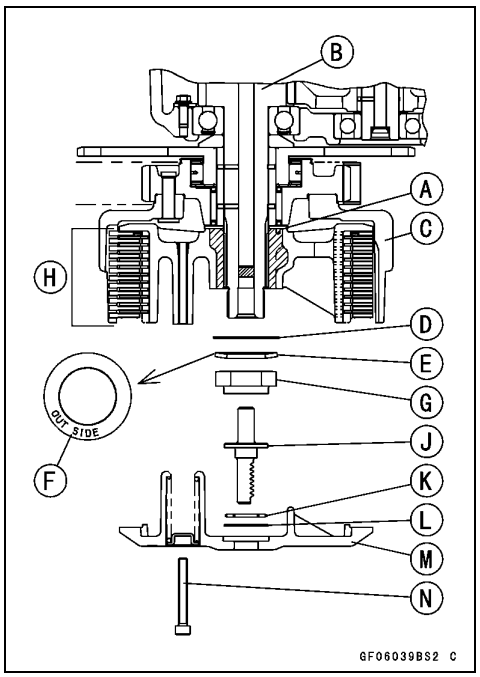
- Install the friction and steel plates [H], starting with a friction plate and alternating them.

CAUTION

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

- Install:
  Rod [J]
  Thrust Bearing [K]
  Washer [L]
  Clutch Spring Plate [M]
- Torque the clutch spring bolts [N].

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



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Clutch

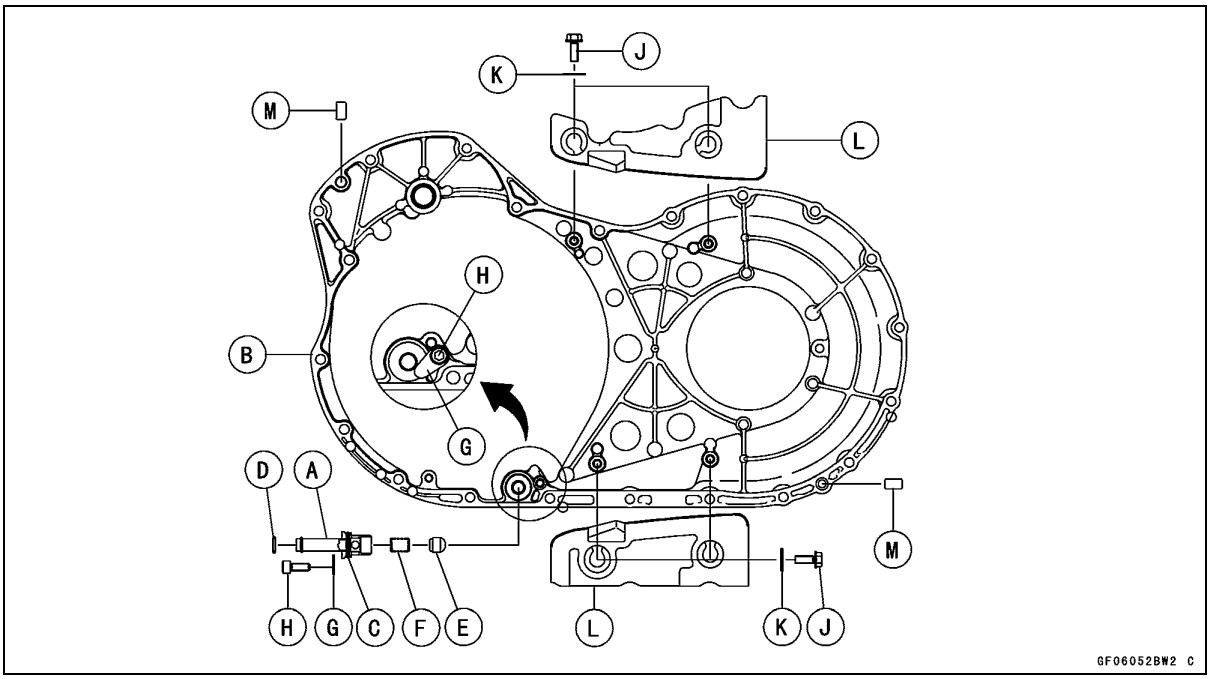
● Install the oil pipe [A] to the inner clutch cover [B].
○Apply grease to the O-rings [C] [D].
○Install:
Valve [E]
Spring [F]
Oil Pipe [A] with O-ring [C]
O-ring [D]
Positioning Plate [G]
Inside Pipe Bolt [H]

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

● Torque the chain guide bolts [J] and washer [K], and chain guides [L].

Torque - Primary Chain Guide Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

● Be sure the dowel pins [M] are in position.

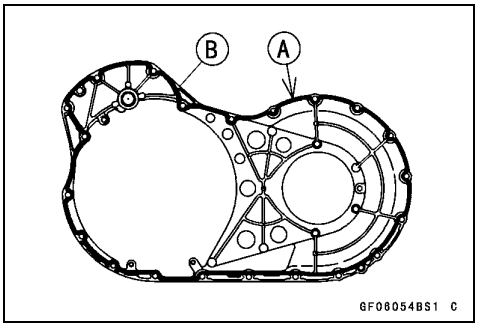


● Apply liquid gasket [A] to the mating surface of the inner clutch cover [B].

NOTE

○*Make the application finish 20 minutes when the liquid gasket to the mating surface of the inner clutch cover is applied.*

Sealant - Kawasaki Bond (Liquid Gasket - Brack) TB1216: 92104-1064



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Clutch

- Install the inner clutch cover.
- Tighten the inner clutch cover bolts to a snug fit.
- First, torque the No.1 bolt and torque from the No.2 to the No.14, following the tightening order.
- For the No.9, 10, 11, bolts, torque them again.

NOTE

○*There are grommet for stator leads on the back side of the 9, 10, 11 bolts, and torque valve of bolts falls in tightening one time.*

Torque - Inner Clutch Cover Bolts [E]: 12 N·m (1.2 kgf·m, 104 in·lb)

○Clamp [B] the stator [C] and crankshaft sensor [D] leads (see Cable, Wire and Hose Routing in the Appendix chapter).

Torque - Inside Plate Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

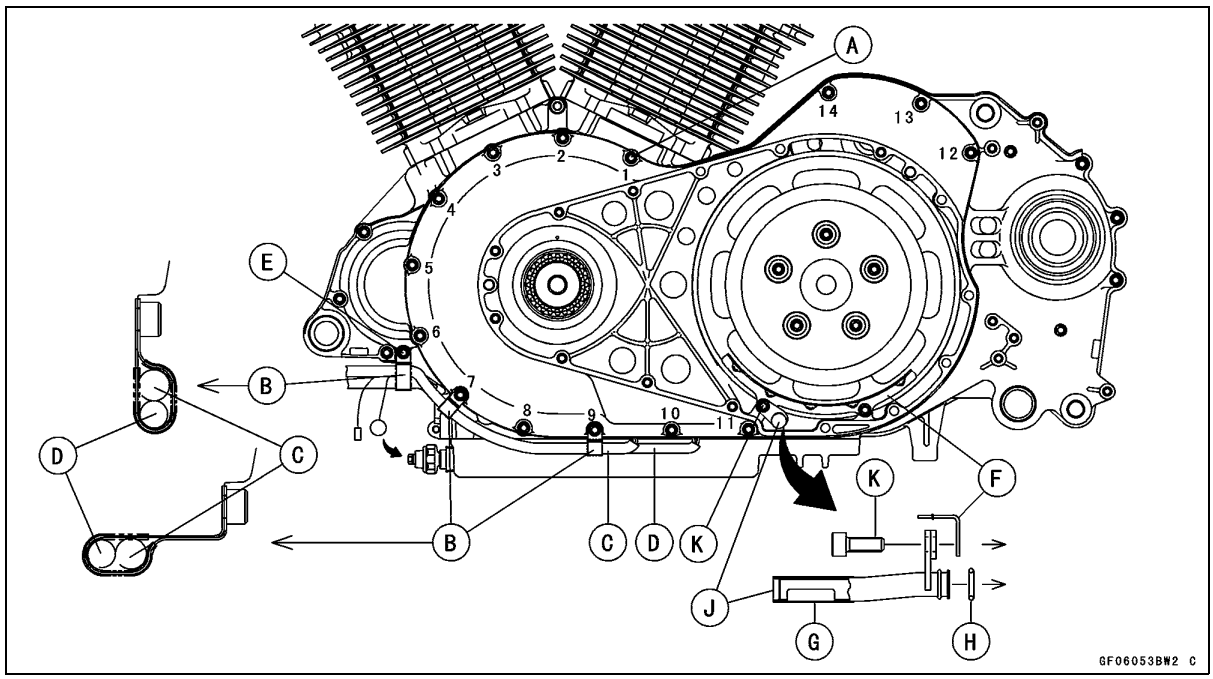
- Install the plate [F] as shown.

★If the oil pipe filter [G] is clogged, clean the filter.

- Apply grease the O-ring [H].
- Install the oil pipe [J] with the O-ring and torque the outside plate bolts [K].

○Apply a non-permanent locking agent to the outside plate bolts.

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

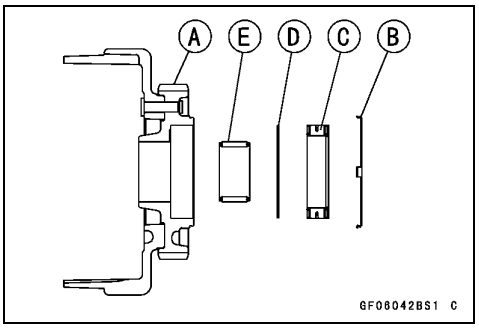


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Clutch

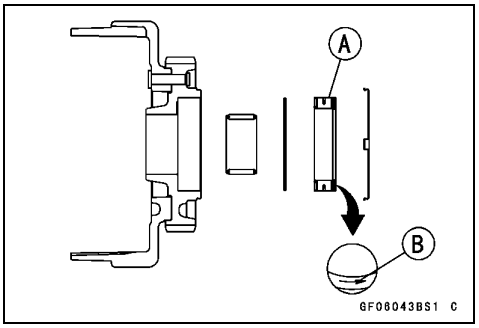
Starter Clutch Disassembly

- Remove the clutch housing with the one-way clutch (see Clutch Removal).
- Remove the following from the clutch housing [A].
  Plate [B]
  One-way Clutch [C]
  Washer [D]
  Needle Bearing [E]



Starter Clutch Assembly

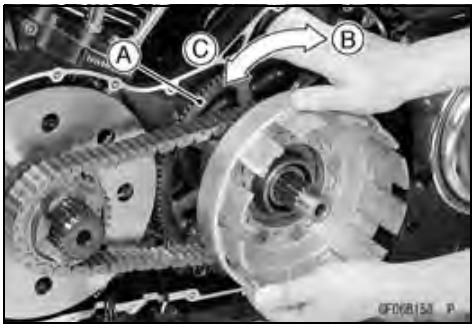
- Install the one-way clutch [A] so that its arrow [B] faces outward.



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].

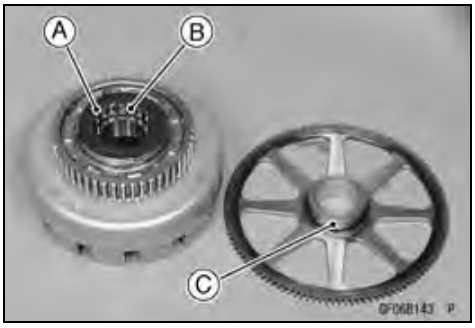


★If the starter clutch does not operate as it should or if it makes noise, disassemble the starter clutch.

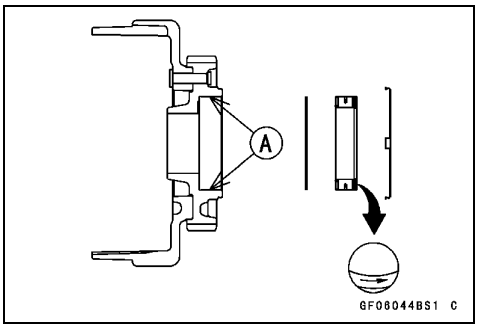
★If one-way clutch [A] installation is wrong, reinstall it.

★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



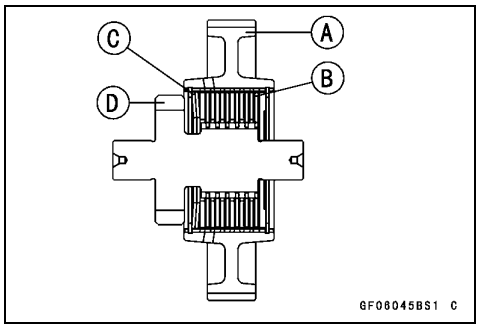
Sliding Surface [A] of Clutch Housing



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Clutch

Starter Torque Limiter Check

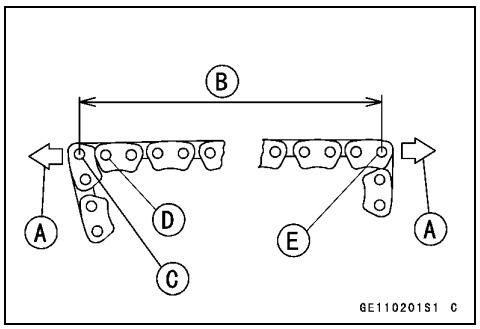


- Remove the torque limiter (see Clutch Removal) and visually inspect it.

★If the limiter has wear, discoloration, or other damage, replace it as a set.

Gear [A]
Friction Plates [B]
Spring [C]
Pinion [D]

Primary Chain Wear



- Hold the chain taut with a force [A] of about 49 N·m (5 kgf·m, 11 in·lb) in some manner, and measure a 20-link length [B]. Since the chain may wear unevenly, take measurements at several places.

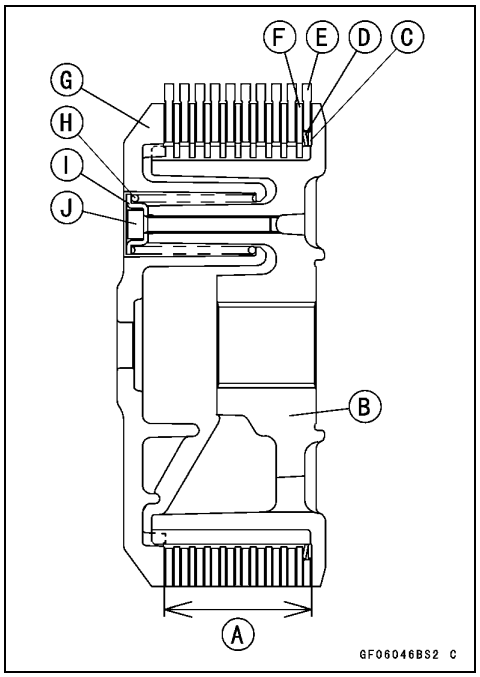
★If any measurement exceeds the service limit, replace the chain. Also, replace the sprockets and the crankshaft when the chain is replaced.

1st Pin [C], 2nd Pin [D], and 21st Pin [E]

Primary Chain 20-Link Length

Standard:	**190.50 ~ 190.97 mm (7.50000 ~ 7.51849 in.)**
Service Limit:	**193.4 mm (7.6142 in.)**

Clutch Plate Assembly Inspection



- Inspect the friction plate thickness (see Clutch Plate, Wear, Damage Inspection).
- Measure the length [A] of the clutch plate assembly as shown.

○Assemble:

Clutch Hub [B]
Spring Seat [C]
Spring [D]
Friction Plate [E]
Steel Plate [F]
Spring Plate [G]
Springs [H]
Spring Holders [I]
Spring Bolts [J]

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

Clutch Plate Assembly

Standard: 51.32 ~ 52.32 mm (2.02 ~ 2.06 in.)

★If the length is not within the specified range, adjust the length (see Clutch Plate Assembly Adjustment).

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Clutch

Clutch Plate Assembly Adjustment

● Inspect the clutch plate assembly length, and then replace the steel plate(s) which brings the length within the specified range.

○Remove:
Spring Bolts
Spring Holders
Springs
Spring Plate

○Replace the following steel plate(s).

Part No.	Thickness
13089-1080	1.6 mm (0.063 in.)
13089-1081	2.3 mm (0.091 in.)

● Install the removed parts, and inspect the clutch plate assembly length.

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

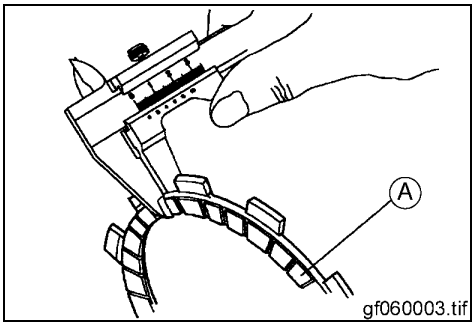
Friction and Steel Plate Wear, and Damage Inspection

● 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

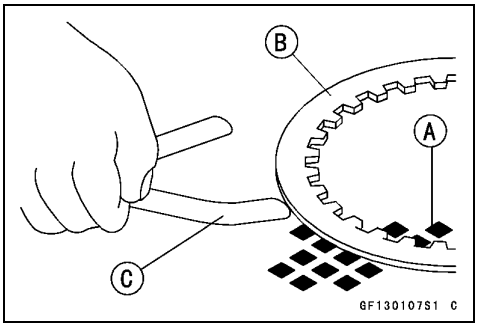
Standard:	**3.3 ~ 3.5 mm (0.130 ~ 0.138 in.)**
Service Limit:	**3.1 mm (0.122 in.)**

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 (0.0079 in.) or less**
Service Limit:	**0.3 mm (0.012 in.)**

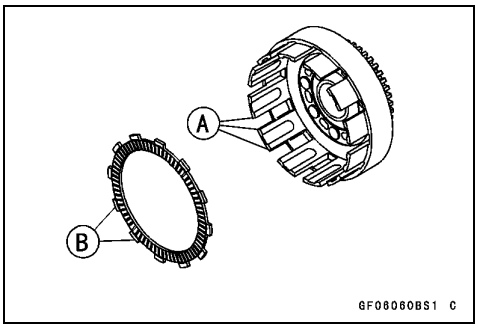
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Clutch

Clutch Housing Finger Inspection

- Visually inspect the fingers [A] of the clutch housing where the tangs [B] of the friction plates hit them.

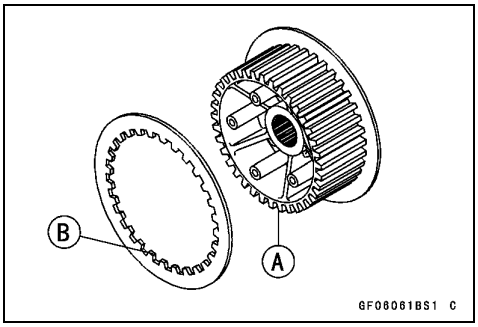
★If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged and measure the spring plate gap and adjust it if necessary.



Outer Clutch Hub Spline Inspection

- Visually inspect where the teeth [A] on the steel plates wear against the splines [B] of the outer clutch hub.

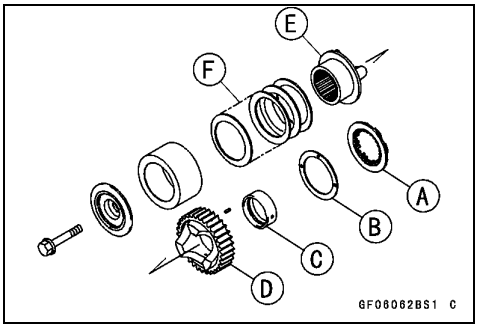
★If there are notches worn into the splines, replace the outer clutch hub. Also, replace the steel plate with a new one of the same thickness if their teeth are damaged.



Cam Damper Inspection

- Remove the clutch housing and sprocket with the primary chain (see Clutch Removal in this chapter).
- Visually inspect the washer [A], spacer [B], bushing [C] sprocket [D], damper cam [E], and damper spring [F].

★Replace any damaged parts.



Clutch Spring Free Length Measurement

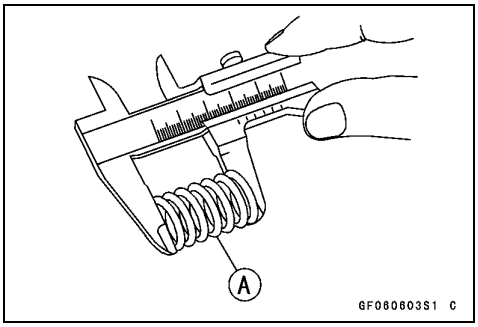
- Measure the free length of the clutch springs [A].

★If any spring is shorter than the service limit, it must be replaced.

Clutch Spring Free Length

Standard: 81.7 mm (3.196 in.)

Service Limit: 77.5 mm (3.05 in.)



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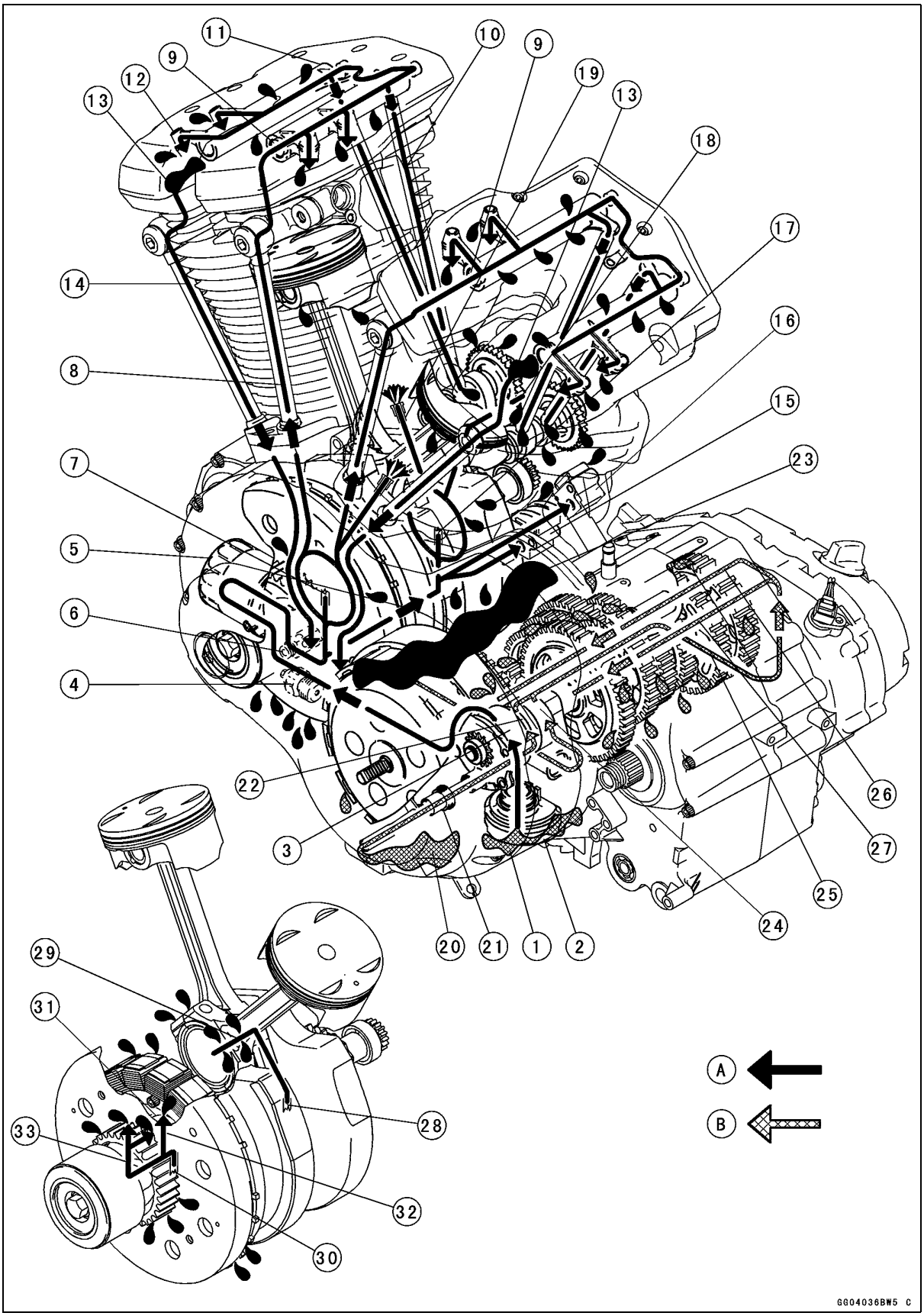
Engine Lubrication System

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Engine Oil Flow Chart



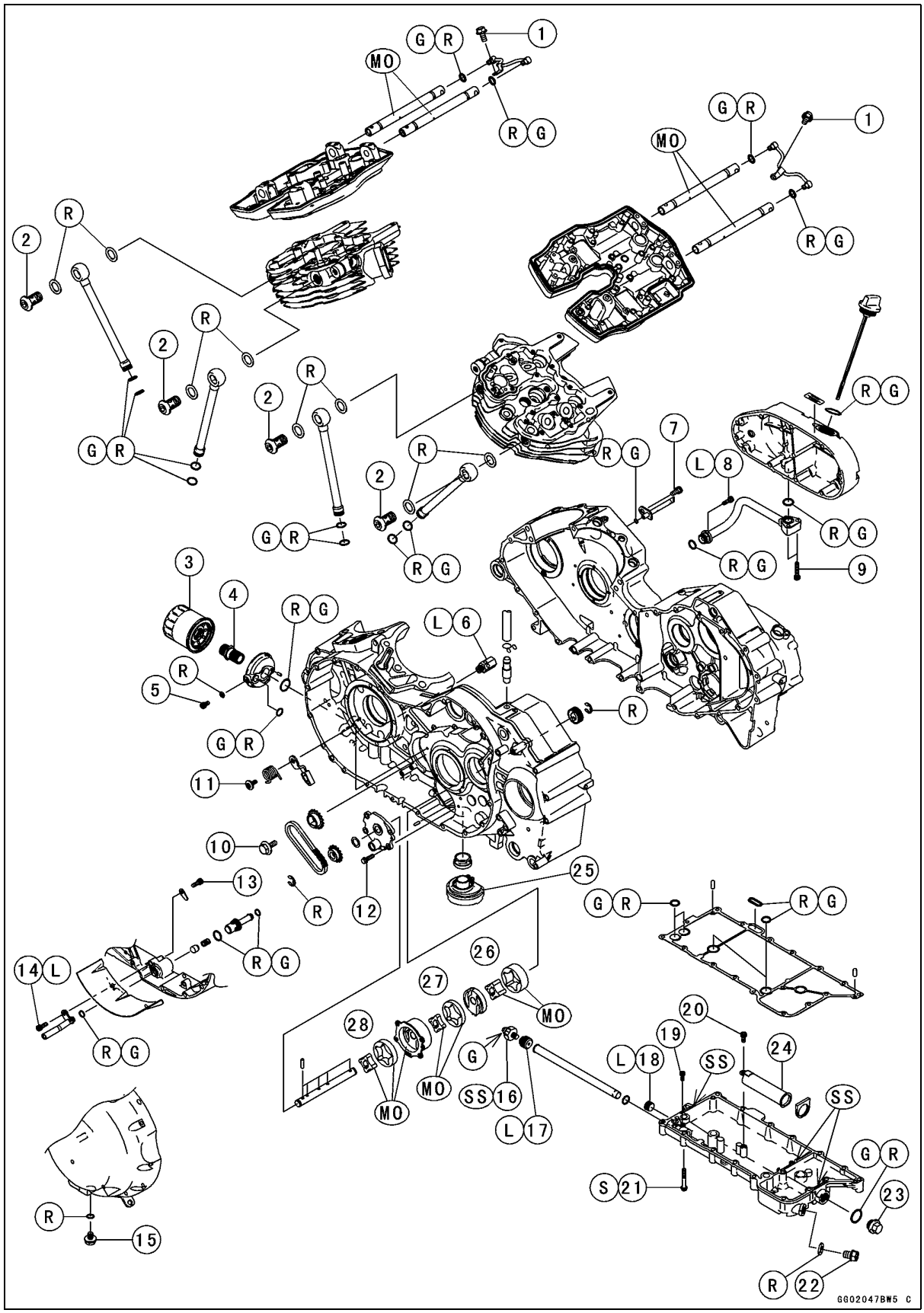
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Engine Oil Flow Chart

A. Feeding Oil Flow
B. Scavenging Oil Flow
1. Oil in Transmission Room
2. Oil Screen
3. Feed Pump
4. Oil Pressure Switch
5. Oil Filter
6. Relief Valve
7. To Left Side Crankshaft
8. Inlet Oil Line from Left Crankcase Half
9. Oil Filter in Rocker Shaft
10. Oil Line in Push Rod
11. Rocker Arm
12. HLA (Hydraulic Lash Adjuster)
13. Oil in Rocker Case
14. Outlet (Return) Oil Line to Crank Room
15. Chain Tensioner for Balancer Drive Chain
16. Chain Tensioner for Camshaft Chain
17. To Right Side Crankshaft
18. Oil Pipe for Camshaft
19. Oil Jet
20. Oil in Clutch Room
21. Check Valve
22. Return Oil Pump for Clutch Room
23. Oil in Crank Room
24. Return Oil Pump for Crank Room
25. Oil Line from Right Crankcase Half to Outer Transmission Cover
26. Oil Line in Input Shaft
27. Oil Line in Output Shaft
28. From Oil Line in Right Crankcase Half
29. Oil Line in Connecting Rod Big End
30. From Oil Line in Left Crankcase Half
31. Left Side Crankshaft
32. Oil Line for Cooling Stator
33. Oil Line for Cam Damper

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rocker Shaft Oil Pipe Bolts	9.8	1.0	87 in·lb	
2	Cylinder Head Oil Pipe Banjo Bolts	54	5.4	40	
3	Oil Filter	18	1.8	13	
4	Oil Passage Bolt	29	3.0	21	
5	Oil Passage Adapter Drain Plug	9.8	1.0	87 in·lb	
6	Relief Valve	15	1.5	11	L
7	Camshaft Oil Pipe Bolt	9.8	1.0	87 in·lb	
8	Oil Pipe Bolt, L16	9.8	1.0	87 in·lb	L
9	Oil Pipe Bolt L30	12	1.2	104 in·lb	
10	Oil Pump Drive Sprocket Bolt	29	3.0	21	
11	Oil Pump Chain Tensioner Bolt	12	1.2	104 in·lb	
12	Oil Pump Cover Bolts	9.8	1.0	87 in·lb	
13	Inside Plate Bolt	9.8	1.0	87 in·lb	
14	Outside Plate Bolt	9.8	1.0	87 in·lb	L
15	Clutch Cover Drain Plug	21	2.1	15	
16	Oil Pressure Switch	15	1.5	11	SS
17	Oil Passage Adapter	20	2.0	15	L
18	Oil Pan Plug	20	2.0	15	L
19	Oil Pipe Stopper Bolt	6.9	0.70	61 in·lb	
20	Oil Screen Bolt For Crank Room	9.8	1.0	87 in·lb	
21	Oil Pan Bolts	15	1.5	11	S
22	Engine Oil Drain Plug (L/H)	20	2.0	15	
23	Engine Oil Drain Plug (R/H)	15	1.5	11	

24. Oil screen for crank room
25. Oil screen for transmission room
26. Scavenge pump for crank room
27. Scavenge pump for clutch room
28. Feed pump

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil.
R: Replacement Parts
SS: Apply silicone sealant (Kawasaki Bond: 56019-120 for oil pressure switch).
(Kawasaki Bond: 92104-0004 for oil pan)

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7-6 ENGINE LUBRICATION SYSTEM

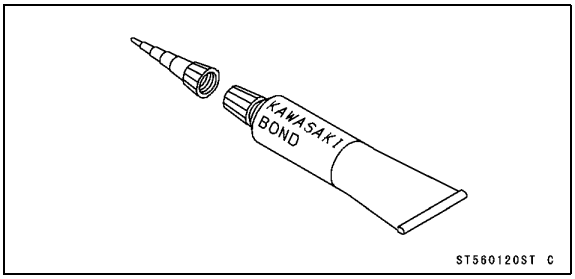
Specifications

Item	Standard
Engine Oil	
Grade	API SE, SF or SG
	API SH or SJ with JASO MA
	API SH, SJ or SL with JASO MA (VN2000A7F/E7F/F7F)
Viscosity	SAE 10W-40
Capacity	4.4 L (4.7 US qt, when filter is not removed)
	4.6 L (4.9 US qt, when filter is removed)
	5.5 L (5.8 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)	127 ~ 167 kPa (1.3 ~ 1.7 kgf/cm², 18 ~ 24 psi)

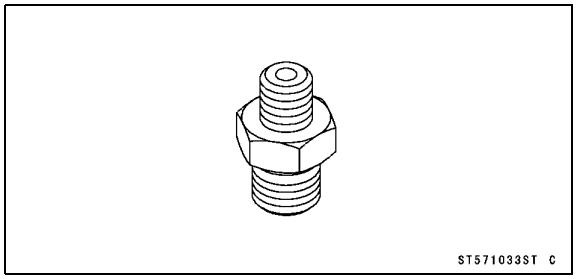
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Special Tools and Sealant

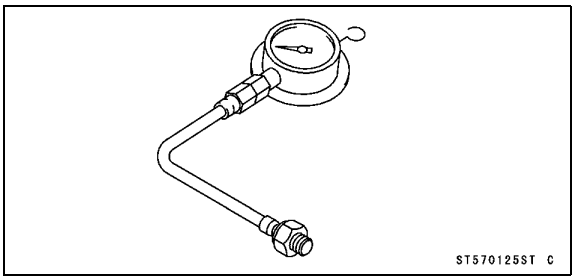
Kawasaki Bond (Silicone Sealant):
56019-120



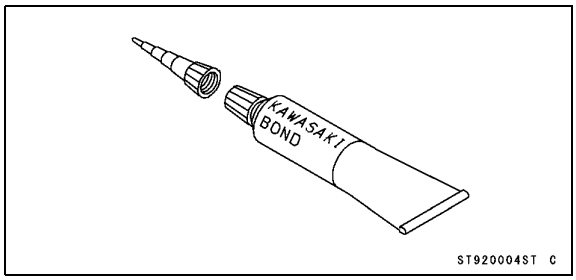
Oil Pressure Gauge Adapter, PT 1/8:
57001-1033



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



Kawasaki Bond (Silicone Sealant) TB1211F:
92104-0004



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Engine Oil and Oil Filter

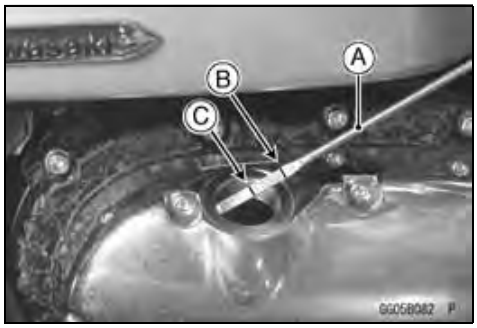
Because of the semi-dry sump lubrication system, the engine oil level indicated on the dipstick will fluctuate depending on the motorcycle's position and engine speed when the engine is shut off. To ensure a proper reading of the engine oil level, follow the Oil Level Inspection procedures closely.

⚠ 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.
- Remove the oil filler cap/dipstick [A], wipe it dry and thread in the oil filler cap/dipstick fully clockwise then remove again to check the oil level.
- Check that the engine oil level is between the H (High) [B] and L (Low) [C] levels on the dip stick.



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 or the oil temperature is low, start the engine and run it* ***at idle speed*** *until the oil temperature in the transmission room goes up about 50°C (122°F).* ***Do not run the engine at high engine 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.

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Engine Oil and Oil Filter

Oil Filter Replacement

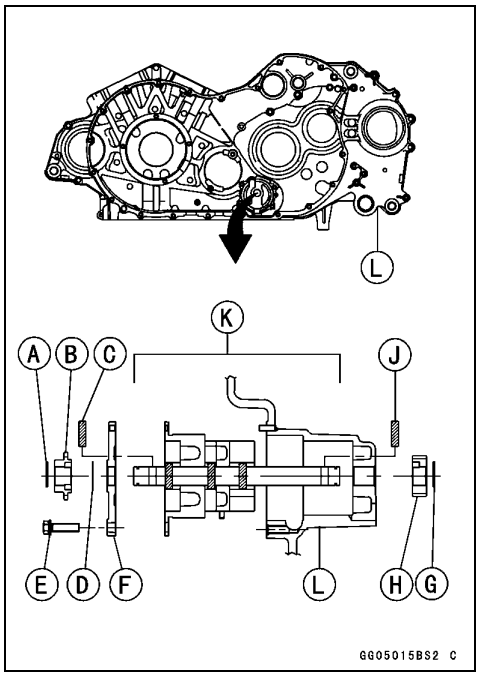
- Refer to the Oil Filter Replacement in the Periodic Maintenance Chapter.

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Oil Pump and Oil Line

Oil Pump Removal

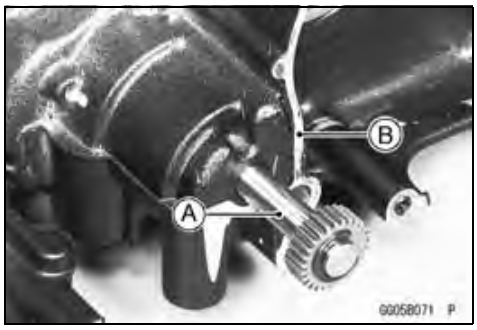
- Remove the engine (see Engine Removal/Installation chapter).
- Split the crankcase (see Crankshaft/Transmission chapter).
- Remove:
  Circlip [A]
  Oil Pump Sprocket [B]
  Pin [C]
  Washer [D]
  Oil Pump Cover Bolts [E]
  Oil Pump Cover [F]
  CIrclip [G]
  Oil Pump Gear [H]
  Pin [J]
- Remove the rotor assembly with the pump shaft [K] from the left crankcase half [L].



Oil Pump Installation

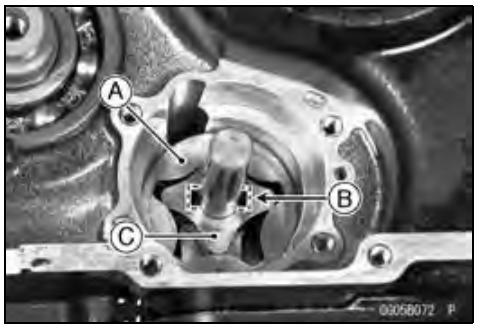
- Install the oil pump shaft [A] to the inside of the left crankcase half [B].

○Apply molybdenum disulfide oil to the rubbing surfaces of the shaft and rotors.

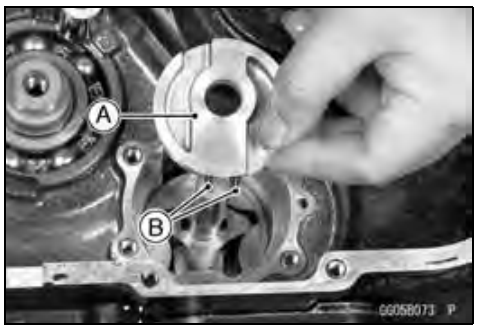


- Install the return oil pump for the crank room oil.

○Install the outer rotor [A], pin [B] and inner rotor [C].



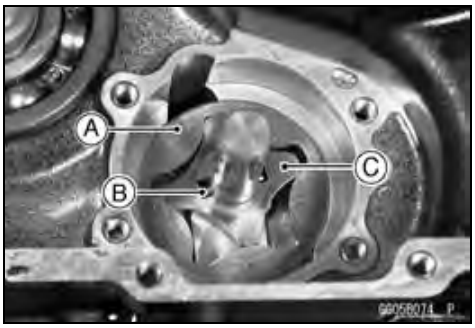
- Install the spacer [A] so that their pins [B] face downward.



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Oil Pump and Oil Line

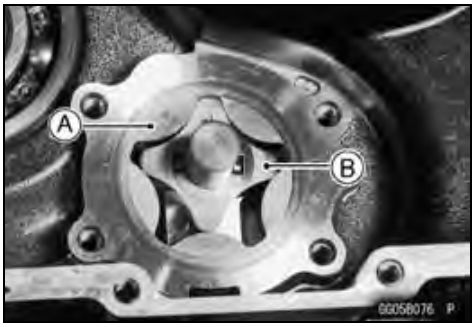
● Install the return oil pump for the clutch room oil.
○Install the outer rotor [A], pin [B] and inner rotor [C].



● Install the oil pump body [A].
○Be sure the dowel pin [B] is in position.
● Install the pin [C].



● Install the feed oil pump.
○Install the outer [A] and inner rotor [B].

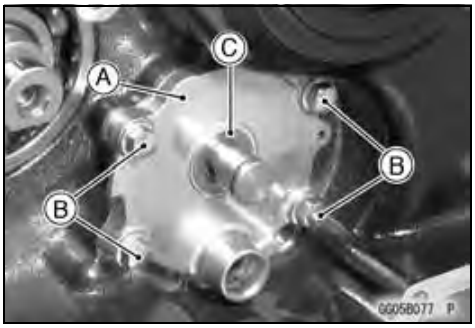


● Install:
Oil Pump Cover [A]
Oil Pump Cover Bolts [B]
Washer [C]

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

● Install the following to the pump shaft.
Pin
Oil Pump Sprocket
Circlip

● Check that the oil pump shaft turns smoothly in the left crankcase half.

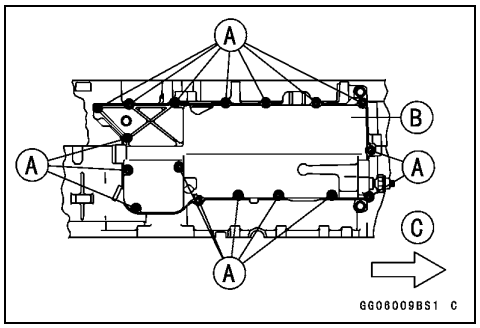


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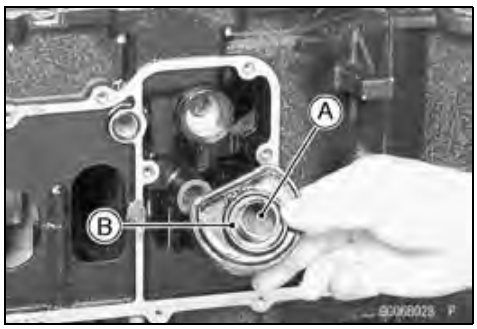
Oil Pan

Oil Pan Removal

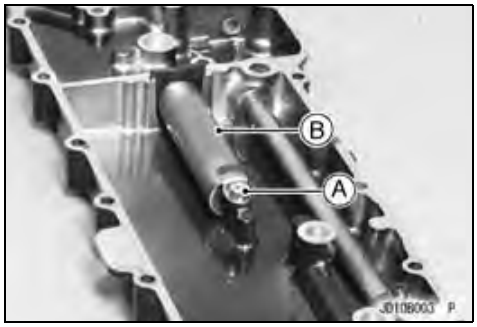
- Drain the engine oil (see Engine Lubrication System in the Periodic Maintenance chapter).
- Disconnect the oil pressure switch lead from the terminal screw (see Oil Pressure Measurement).
- Remove:
  Engine Oil Drain Plugs [A]
  Oil Pan [B]
  Front [C]



- Remove the oil screen [A] for transmission room with the O-ring [B].



- Remove:
  Oil Screen Bolt [A]
  Oil Screen [B] for Crankcase Room

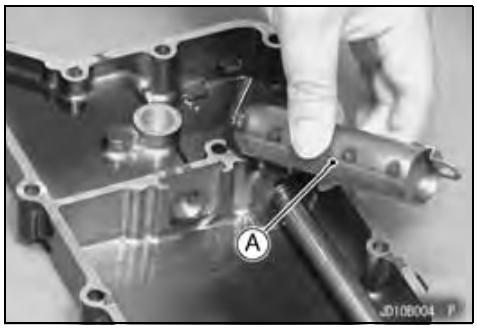


Oil Pan Installation

- Clean the oil screens [A] with high-flash point solvent and remove any particles stuck to it.

⚠ WARNING

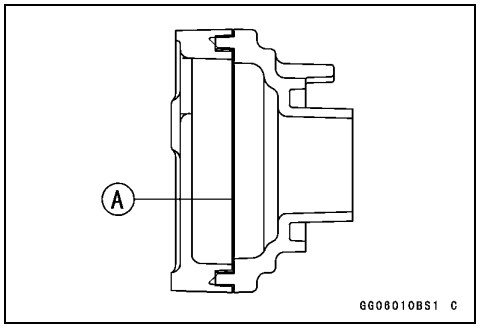
Clean the screen in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents.



NOTE

○*While cleaning the screen, check for any metal particles that might indicate internal engine damage.*
○*Check the screen carefully for any damage: hole and broken wire.*

★If the screen is damaged, replace it.

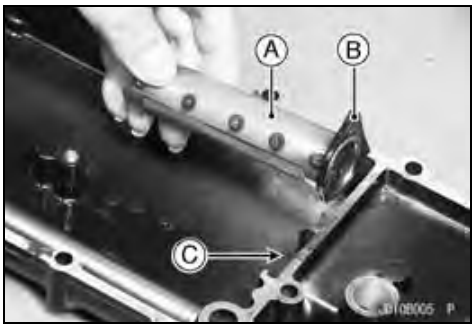


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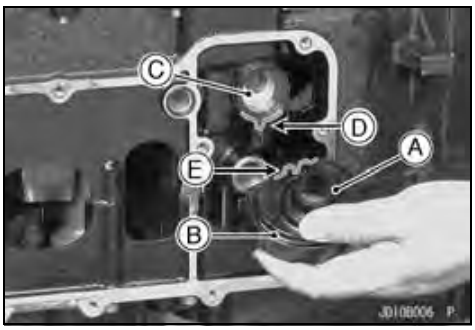
Oil Pan

● Install the oil screen for crankcase room [A].
○Install the holder [B] to the oil pan [C],noting holder direction.
○Torque the oil screen bolt.

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



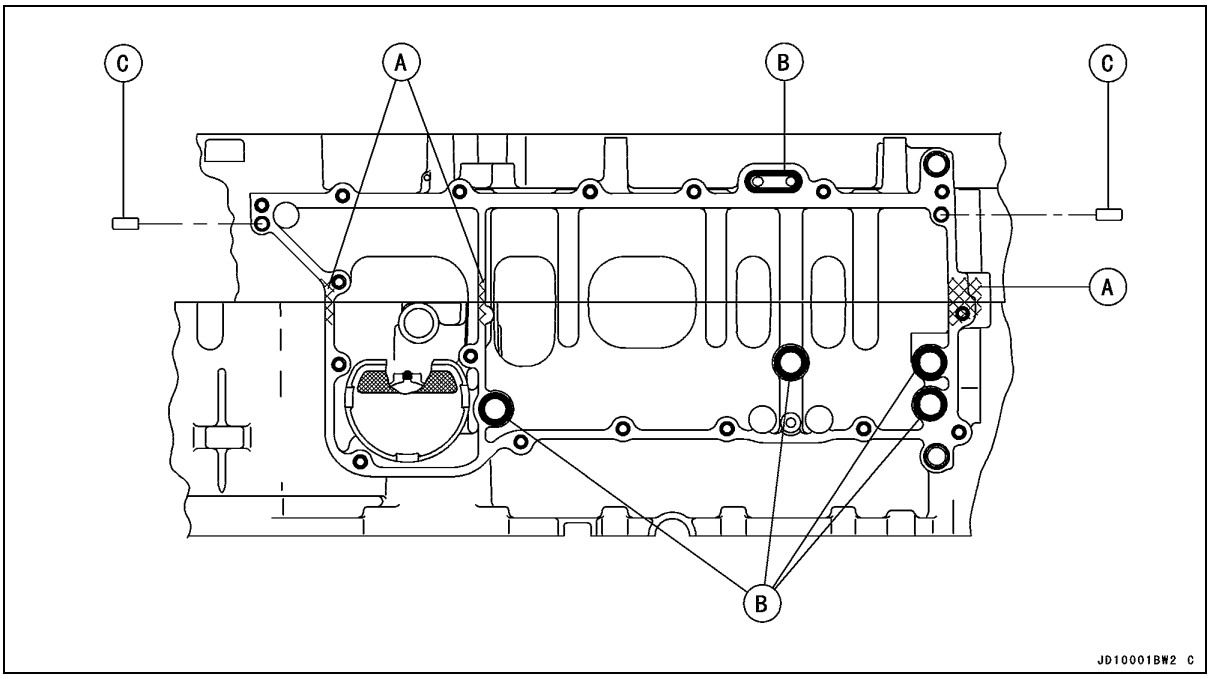
● Put the O-ring [A] to the oil screen for transmission room [B].
● Instal the oil screen with the O-ring to the left crankcase half [C], aligning the projection [D] on the left crankcase half with the recess [E] on the O-ring.



● Apply silicone sealant [A] to the mating surfaces of the crankcase halves.

Sealant - Kawasaki Bond (Silicone Sealant) TB1211F: 92104-0004

● Apply grease the O-rings [B] and put them on the crankcases.
● Be sure the dowel pins [C] are in position.

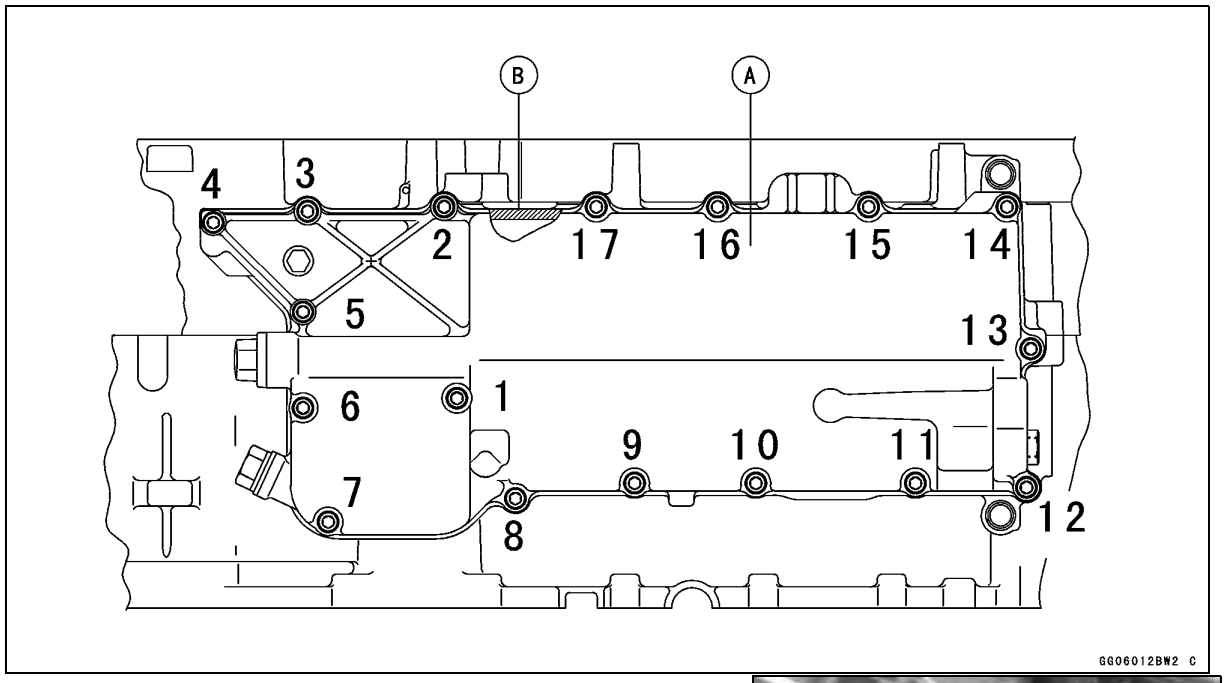


● Install the oil pan [A].
○Install a new gasket [B].
○Torque the oil pan bolts following the specified sequence.
○Torque the No.1 bolt agin after tightening all the bolts.

Torque - Oil Pan Bolt: 15 N·m (1.5 kgf·m, 11 ft·lb)

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Oil Pan



Blowby Gas System Inspection

- Be certain that the hose is routed without being flattened or kinked, and is connected correctly to the air cleaner base.

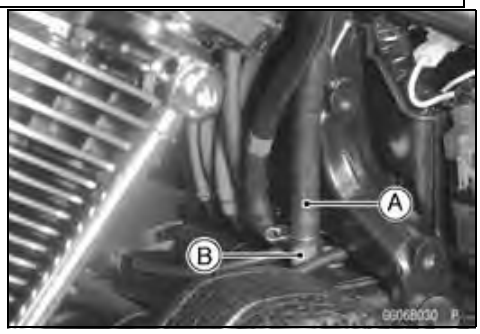
★If it is not, correct it.

- Inspect the breather hose [A], breather pipe [B], and the air cleaner drain cap for damage or signs of deterioration.

○The hose and drain cap should not be hard and brittle, nor should be soft or swollen.

★Replace them if any cranks or swelling are noticed.

- Check that the hose is securely connected.



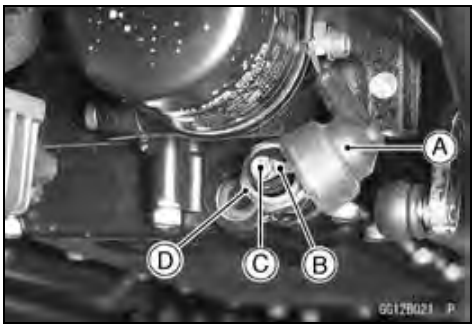
Breather Drain Cleaning

- Refer to the Air Cleaner Housing Installation in the Fuel (DFI) System chapter.

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Oil Pressure

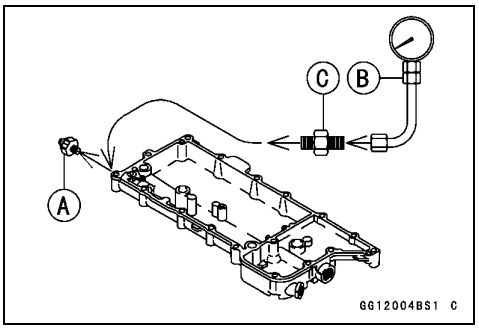
Oil Pressure Measurement



- 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: 127 ~ 167 kPa (1.3 ~ 1.7 kgf/cm², 18 ~ 24 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.

Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)

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

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Oil Pressure

Relief Valve Inspection

- Split the crankcase (see Crankshaft/Transmission chapter).
- Remove the relief valve [A] from the left crankcase half [B].
- 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

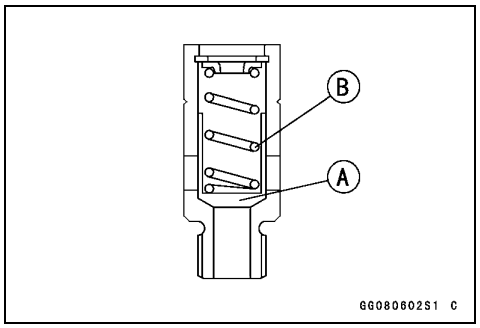
○*Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

★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 in a well-ventilated area.

○Take care that there is no spark or flame anywhere near the working area.

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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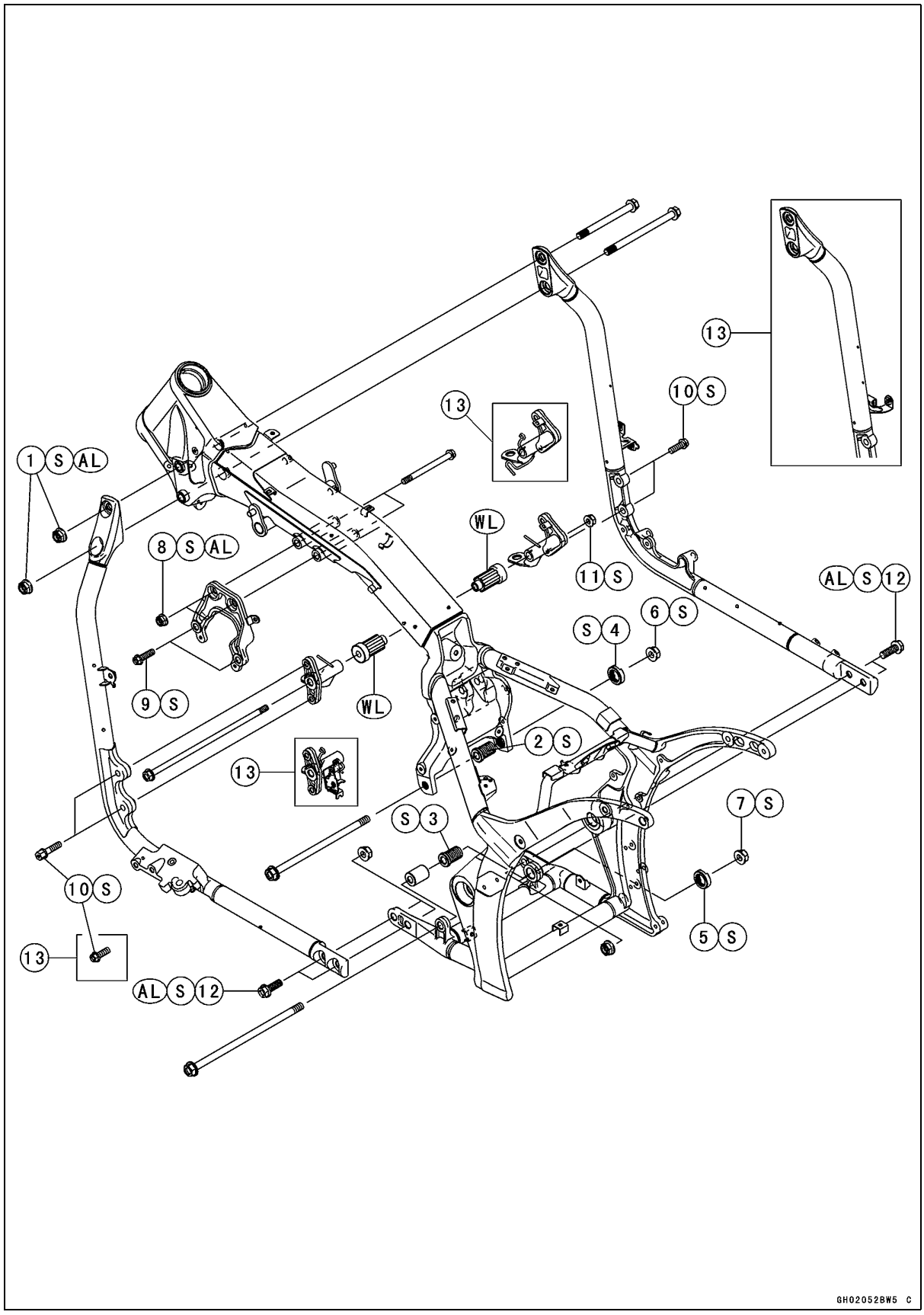
Engine Removal/Installation

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Exploded View



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Exploded View

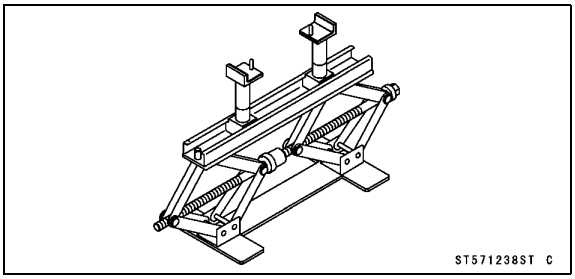
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Downtube Nuts	88	9.0	65	S, AL
2	Upper Adjusting Bolt	9.8	1.0	87 in·lb	S
3	Lower Adjusting Bolt	9.8	1.0	87 in·lb	S
4	Upper Adjusting Bolt Locknut	49	5.0	36	S
5	Lower Adjusting Bolt Locknut	49	5.0	36	S
6	Upper Rear Engine Mounting Nut	59	6.0	43	S
7	Lower Rear Engine Mounting Nut	59	6.0	43	S
8	Upper Engine Bracket Nuts	59	6.0	43	S, AL
9	Upper Engine Mounting Bolts	44	4.5	33	S
10	Lower Engine Bracket Bolts	59	6.0	43	S
11	Front Engine Mounting Nut	44	4.5	33	S
12	Rear Downtube Bolts	108	11.0	80	S, AL

13. VN2000-A1 Model
AL: Tighten the two bolts or nuts alternately two times to ensure even tightening torque.
S: Tighten the fasteners following the specified sequence (from this table No.1 to No.12)
WL: Apply a soap and water solution or rubber lubricant.

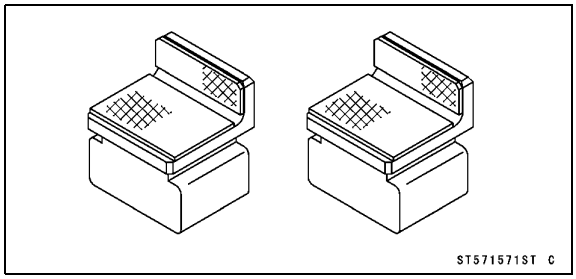
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Special Tools

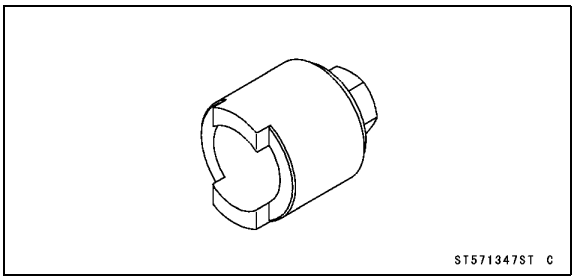
Jack:
57001-1238



Jack Attachment:
57001-1571



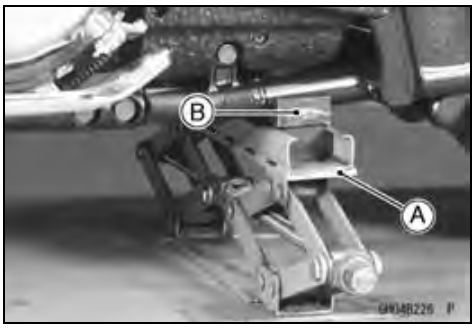
Socket Wrench:
57001-1347



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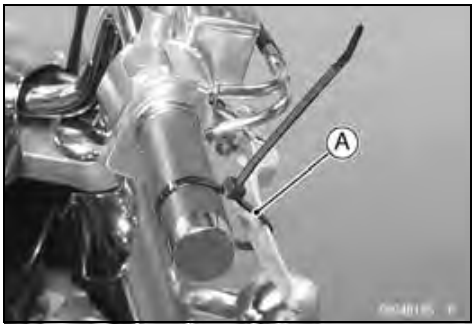
Engine Removal/Installation

Engine Removal



- Support the rear part of the frame on the jack [A] and the attachment jack [B].

Special Tools - Jack: 57001-1238
Jack Attachment : 57001-1571



- Squeeze the brake lever slowly and hold it with a band [A].

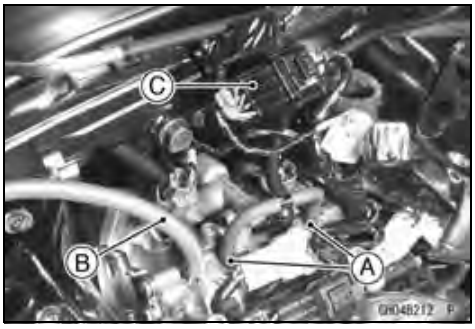
⚠ WARNING

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 Cooling System chapter)
  Engine Oil (see Engine Lubrication System chapter)
- Remove:
  Battery Cables
  Fuel Tank (see Fuel (DFI) System chapter)
  Air Cleaner Housings (see Fuel (DFI) System chapter)
  Air Switching Valve with Hoses (see Engine Top End chapter)
  Exhaust Pipes and Mufflers (see Engine Top End chapter)
  Clutch Cable (see Clutch chapter)
  Pulley (see Final Drive chapter)
  Shift Pedals and rod (see Crankshaft/Transmission chapter)
  Radiator (see Cooling System chapter)
  Thermostat (see Cooling System chapter)
  Throttle Cable Upper Ends (see Throttle Body Assy Removal)

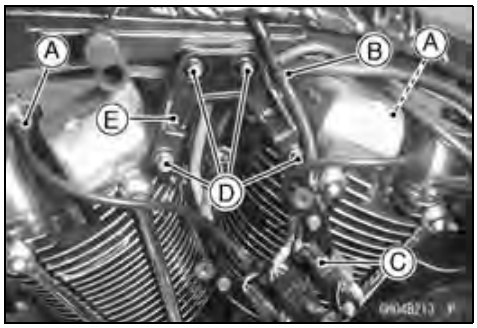


- Disconnect:
  Inlet Air Pressure Sensor Hoses [A]
  Vacuum Hose [B]
  Subharness Connector [C]

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Engine Removal/Installation

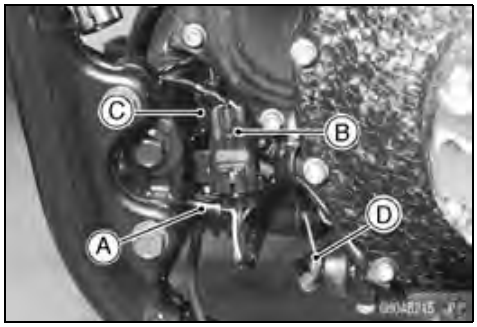
● Remove:
Spark Plug Caps [A]
Clamp [B]
Ignition Coil Bracket [C] (Place it on the frame).
Engine Bracket Bolts [D]
Engine Bracket [E]



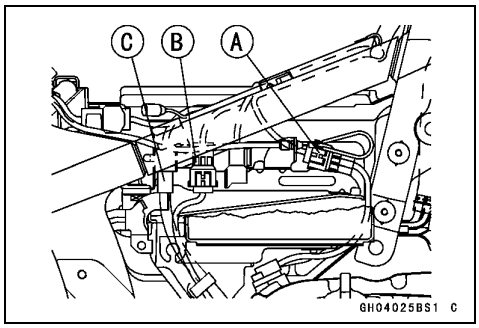
● Disconnect the horn lead connectors [A].



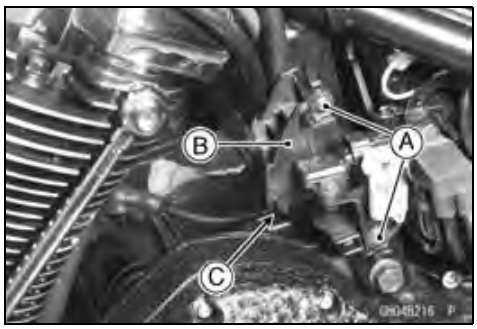
● Disconnect:
Alternator Lead Connector [A]
Crankshaft Sensor Lead Connector [B]
Side Stand Switch Lead Connector [C]
Oil Pressure Switch Terminal [D]



Speed Sensor Lead Connector [A]
Gear Position Switch Lead Connector [B]
Compression Release Solenoid Lead Connector [C]



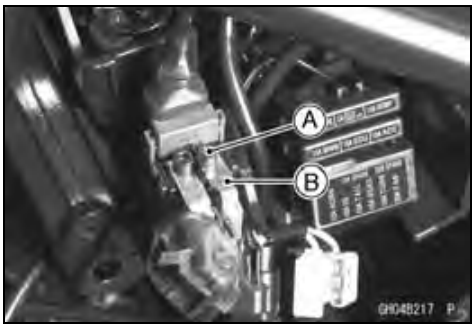
● Remove:
Hose Cover Screws [A] (Both Sides)
Hose Cover [B]
Engine Ground Terminal [C]



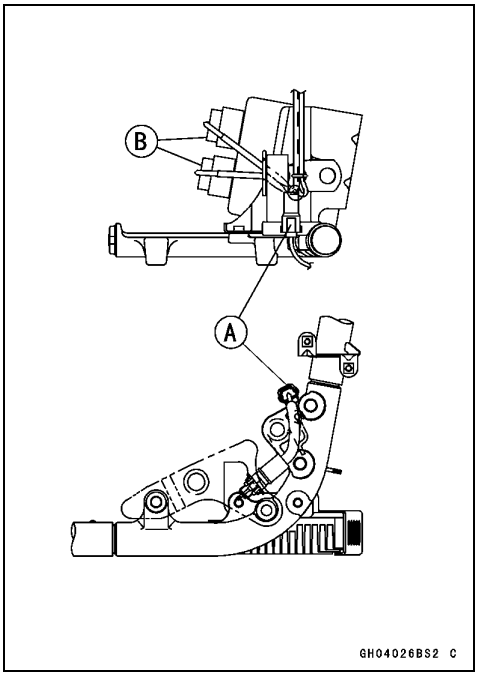
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Engine Removal/Installation

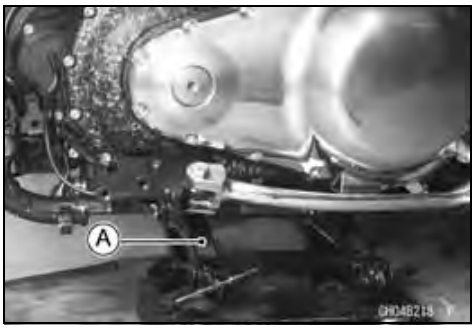
● Unscrew the Allen bolt [A] and disconnect the starter motor cable terminal [B].



● Disconnect:
Rear Brake Switch Connector [A]
Regulator/Rectifier Connectors [B]



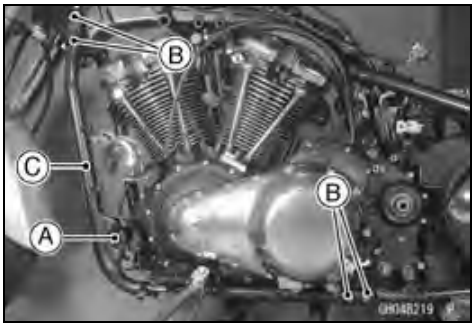
● Support the engine with a commercially available stand [A].



● Remove:
Front Engine Mounting Bolt and Nut [A]
Downtube Bolts and Nuts [B] (Both Sides)
Downtubes [C] (Both Sides)

NOTE

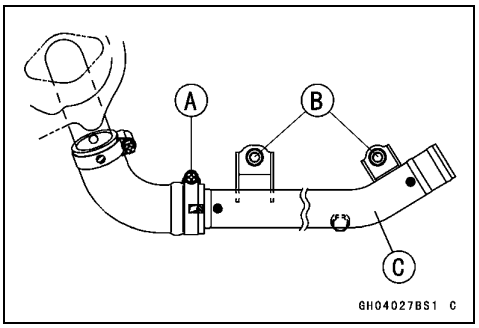
○*Remove the right downtube with the right footboard, regulator/rectifier and rear master cylinder installed.*



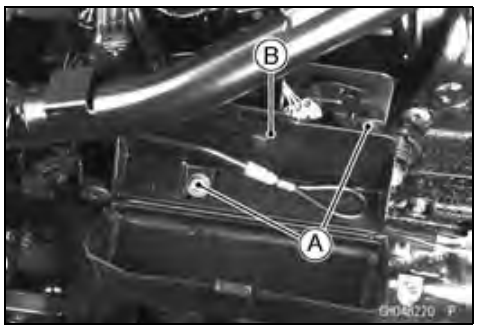
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Engine Removal/Installation

● Remove:
Clamp [A]
Water Pipe Bolts [B]
Water Pipe [C]



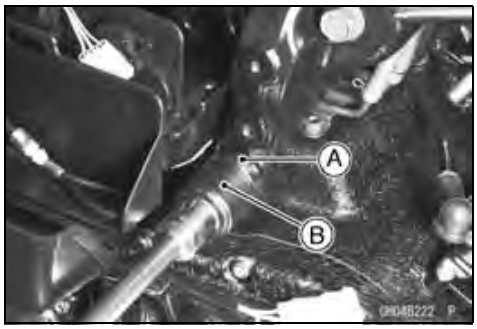
● Remove the bolts [A] holding the ower's tool box [B] and move it to left side.



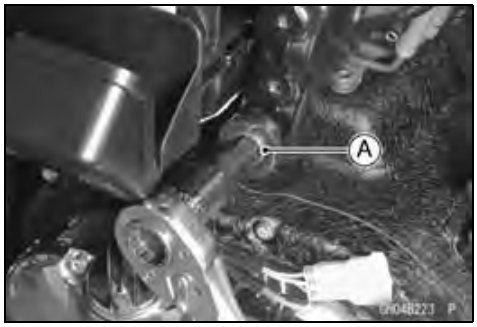
● Remove:
Rear Engine Mounting Bolts and Nuts [A]



● Unscrew the upper and lower adjuster locknuts [A].
Special Tool - Socket Wrench: 57001-1347 [B]

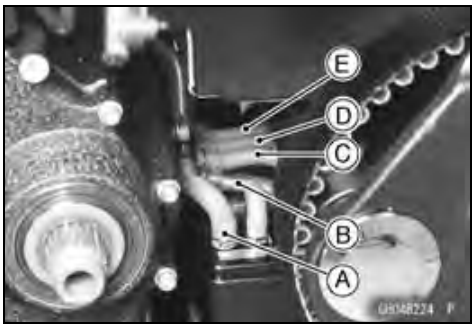


● Unscrew the upper and lower adjusters [A] to make a space between the engine and frame.



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Engine Removal/Installation



- Move [A] the engine forward a little.
- Disconnect the following hoses.
  Canister Purge Hose [A] (Green, California Model, to Air Switching Valve Hose)
  Reserve Tank Hose [B] (Brown, to Thermostat Housing)
  Fuel Tank Breather Hose [C] (Blue)
  Fuel Tank Return Hose [D] (Red, California Model)
  Vacuum Hose [E] (White, California Model, to Throttle Body Assy)



- Remove the engine [A] from the motorcycle right side.

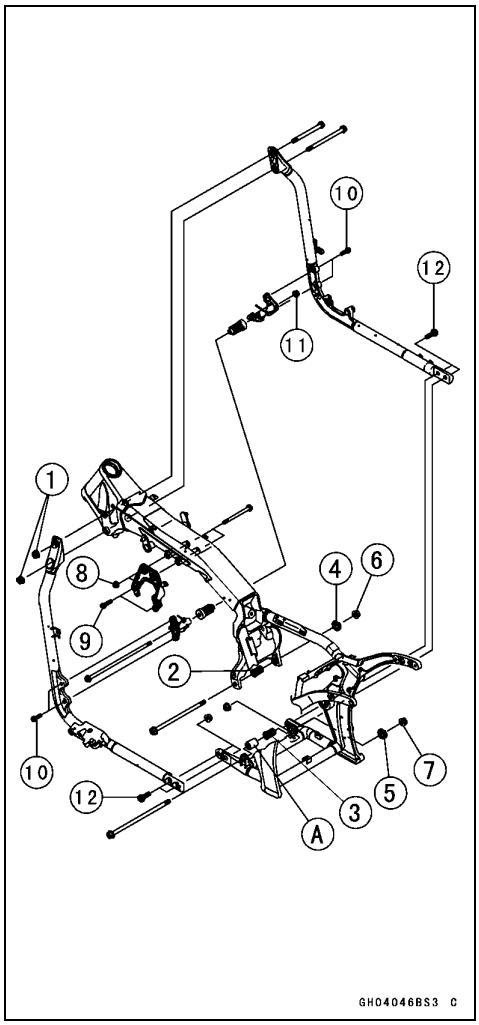
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Engine Removal/Installation

Engine Installation

- Support the engine with a suitable stand.
- Set the collar [A] and insert the lower rear engine mounting bolt.
- Torque the fasteners following the specified sequence.

Torque - Front Downtube Nuts [1]: 88 N·m (9.0 kgf·m, 65 ft·lb)
Upper Adjusting Bolt [2]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
Lower Adjusting Bolt [3]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
Upper Adjusting Bolt Locknut [4]: 49 N·m (5.0 kgf·m, 36 ft·lb)
Lower Adjusting Bolt Locknut [5]: 49 N·m (5.0 kgf·m, 36 ft·lb)
Upper Rear Engine Mounting Nut [6]: 59 N·m (6.0 kgf·m, 43 ft·lb)
Lower Rear Engine Mounting Nut [7]: 59 N·m (6.0 kgf·m, 43 ft·lb)
Upper Engine Bracket Nuts [8]: 59 N·m (6.0 kgf·m, 43 ft·lb)
Upper Engine Mounting Bolts [9]: 44 N·m (4.5 kgf·m, 33 ft·lb)
Lower Engine Bracket Bolts [10]: 59 N·m (6.0 kgf·m, 43 ft·lb)
(This bolts are not removed when removing the engine, however torque them)
Front Engine Mounting Nut [11]: 44 N·m (4.5 kgf·m, 33 ft·lb)
Rear Downtube Bolts [12]: 108 N·m (11 kgf·m, 80 ft·lb)



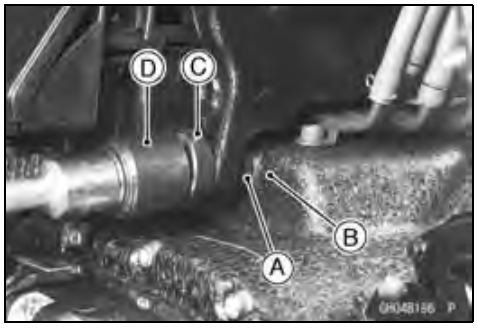
NOTE

○*For the front downtube nuts [1], upper engine bracket nuts [8], and rear downtube bolts [12], tighten the fasteners alternately two times to ensure even tightening torque.*

- For the adjusting bolt and locknut, noting the following.

○Turn the adjusting bolt [A] (upper and lower) until the clearance between the bolt heads and crankcase [B] come to zero mm (zero in.).
○Torque the adjusting bolt locknut [C], using the socket wrench [D].

Special Tool - Socket Wrench: 57001-1347



- Run the leads, cables and hoses correctly (see Cable, Wire and Hose Routing section in Appendix chapter).

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Engine Removal/Installation

- Install the removed parts (see appropriate chapters).
- Adjust the throttle cables (see Fuel System (DFI) chapter).
- Fill the engine with engine oil (see Periodic Maintenance chapter).
- Fill the engine with coolant and bleed the air from the cooling system (see Periodic Maintenance chapter).
- Adjust the idling (see Periodic Maintenance chapter).
- Adjust the drive belt (see 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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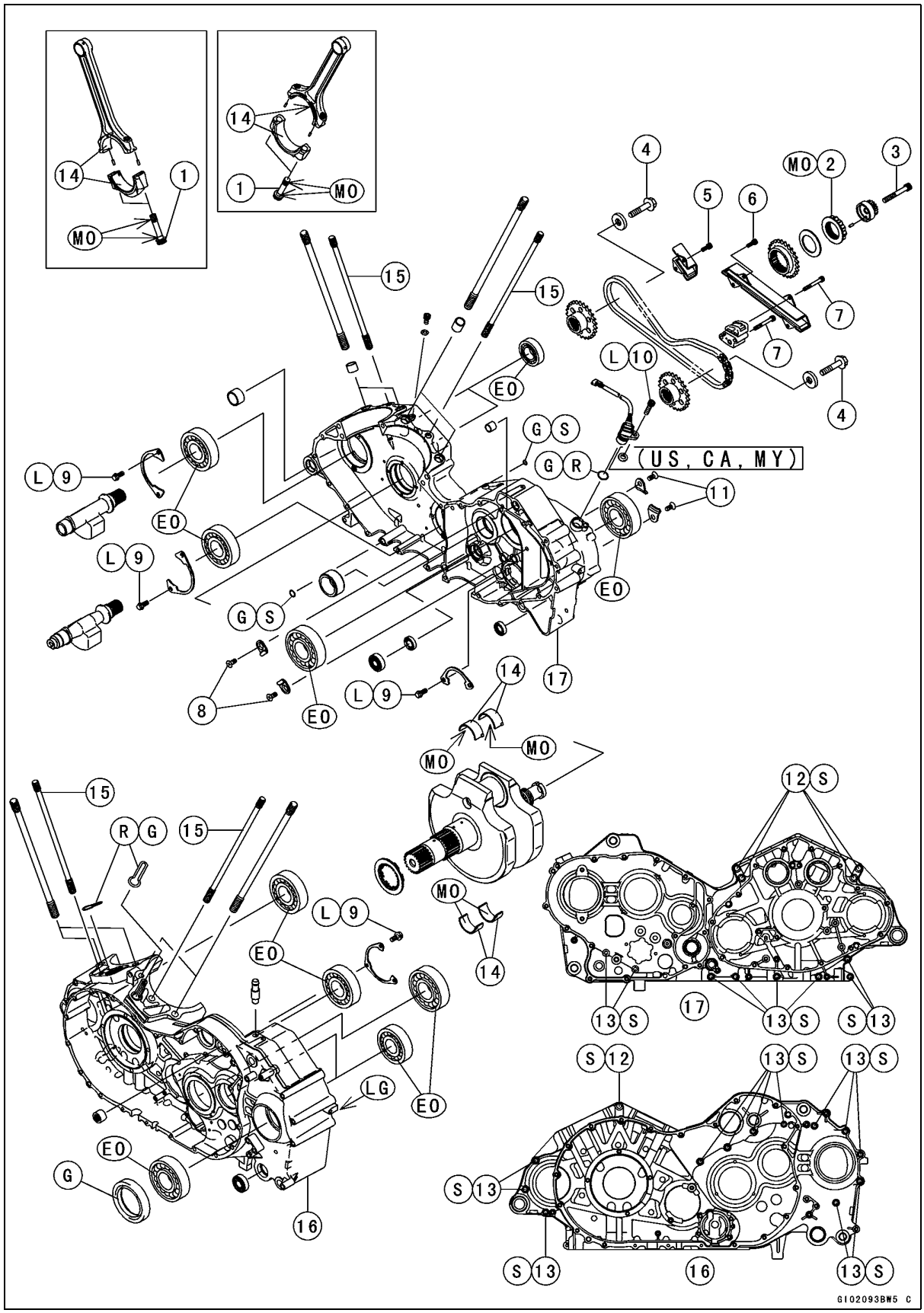
Crankshaft/Transmission

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Connecting Rod Big End Bolts	59	6.0	43	MO
2	Balancer Chain Sprocket Nut	125	13.0	92.2	MO
3	Camshaft Chain Sprocket Bolt	29	3.0	22	
4	Balancer Sprocket Bolts	83	8.5	61	
5	Upper Balancer Chain Guide Bolts	12	1.2	104 in·lb	
6	Lower Balancer Chain Guide Bolts	12	1.2	104 in·lb	
7	Balance Chain Tensioner Bolts	12	1.2	104 in·lb	
8	Bearing Retainer Screws At Output Shaft	6.9	0.70	61 in·lb	
9	Bearing Retainer Bolts	–	–	–	L
10	Speed Sensor Bolt	9.8	1.0	87 in·lb	L
11	Bearing Retainer Screws At Pulley Shaft	6.9	0.70	61 in·lb	
12	Crankcase Bolts, ϕ8	29	3.0	22	S
13	Crankcase Bolts, ϕ6	12	1.2	104 in·lb	S

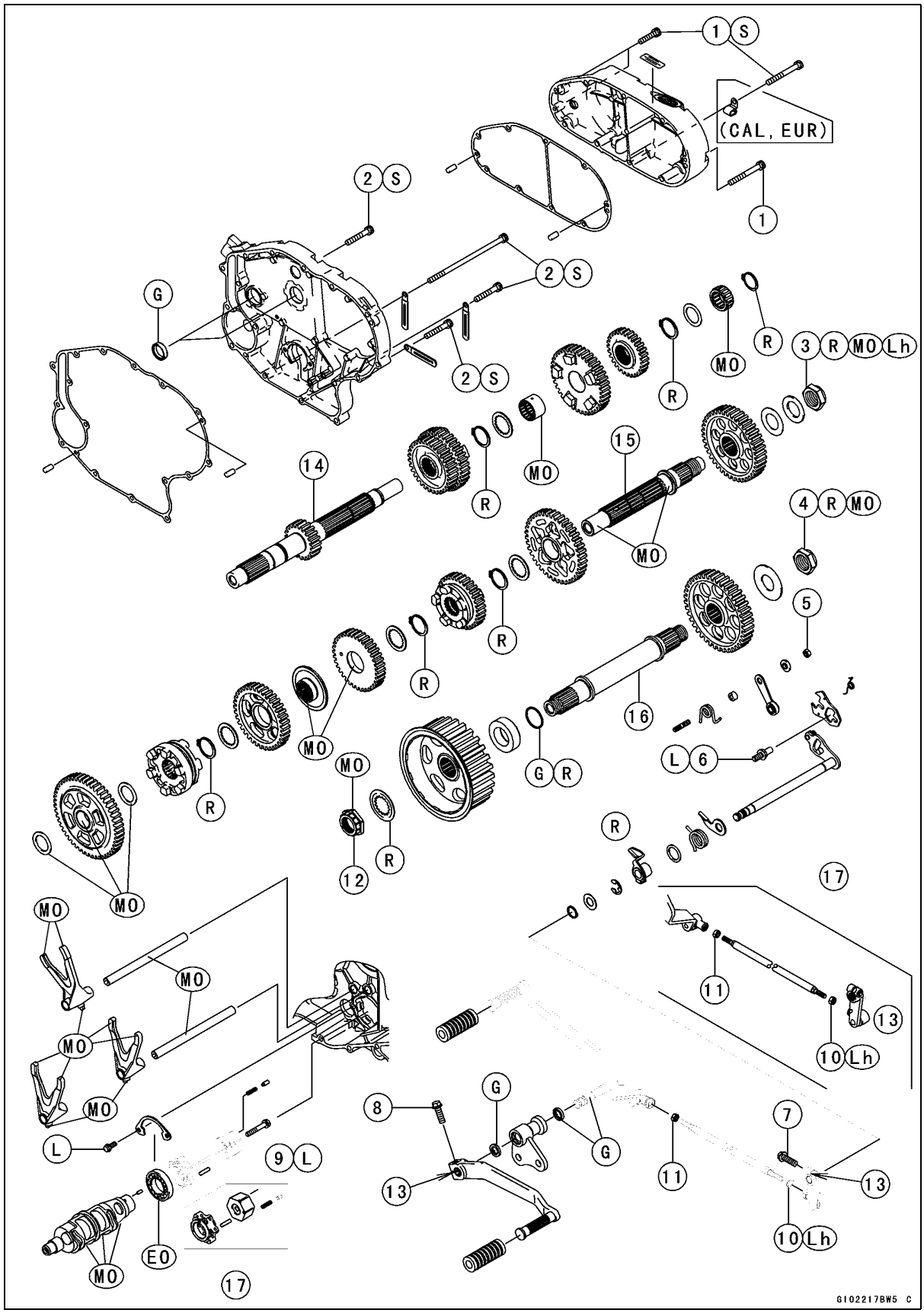
14. Do not apply any oil.
15. Apply a non-permanent locking agent to the tap end of this stud only.
16. Left Crankcase Half
17. Right Crankcase Half

EO: Apply engine oil.
G: Apply grease
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket (Kawasaki Bond: 92104-1064).
MO: Apply molybdenum disulfide oil to the threads and the seating surface. The molybdenum disulfide oil is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).
S: Follow the specific tightening sequence.

CA: Canada Model
MY: Malaysian 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	Outer Transmission Cover Bolts	12	1.2	104 in·lb	S, see text
2	Inner Transmission Cover Bolts	12	1.2	104 in·lb	S, see text
3	Transfer Gear Nut (Output Shaft)	196	20.0	145	R, MO, Lh
4	Transfer Gear Nut (Pulley Shaft)	78	8.0	58	R, MO
5	Gear Set Lever Nut	7.8	0.80	69 in·lb	
6	Shift Shaft Return Spring Pin	39	4.0	30	L
7	Rear Shift Lever Bolt	25	2.5	18	
8	Front Shift Lever Clamp Bolt	25	2.5	18	
9	Shift Drum Cam Bolt	12	1.2	104 in·lb	L
10	Rear Shift Rod Locknut	9.8	1.0	87 in·lb	Lh
11	Front Shift Rod Locknut	9.8	1.0	87 in·lb	
12	Pulley Mounting Nut	177	18	130	MO

13. Align the punch marks.
14. Drive Shaft
15. Output Shaft
16. Pulley Shaft
17. VN2000-A1 Model

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
Lh: Left-hand Threads
MO: Apply molybdenum disulfide oil.
R: Replacement Parts
S: Follow the specific tightening sequence.

CAL: California Model
EUR: European Model

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Specifications

Item	Standard	Service Limit
Crankshaft, Connecting Rods		
Connecting Rod Bend	– – –	0.2/100 mm (0.008/3.94 in.)
Connecting Rod Twist	– – –	0.2/100 mm (0.008/3.94 in.)
Connecting Rod Big End Side Clearance	0.08 ~ 0.30 mm (0.0031 ~ 0.0118 in.)	0.5 mm (0.0197 in.)
Connecting Rod Big End Bearing Insert/crankpin Clearance	0.026 ~ 0.057 mm (0.001024 ~ 0.0022 in.)	0.10 mm (0.0039 in.)
Crankpin Diameter:	54.981 ~ 55.000 mm (2.1646 ~ 2.1654 in.)	54.97 mm (2.1642 in.)
Marking		
None	54.981 ~ 54.991 mm (2.1646 ~ 2.16500 in.)	– – –
○	54.992 ~ 55.000 mm (2.16504 ~ 2.1654 in.)	– – –
Connecting Rod Big End Bore Diameter:	58.000 ~ 58.019 mm (2.2835 ~ 2.2842 in.)	– – –
Marking		
None	58.000 ~ 58.010 mm (2.2835 ~ 2.28386 in.)	– – –
○	58.011 ~ 58.019 mm (2.28390 ~ 2.2842 in.)	– – –
Connecting Rod Big End Bearing Insert Thickness:		
Brown	1.483 ~ 1.487 mm (0.05839 ~ 0.05854 in.)	– – –
Black	1.487 ~ 1.491 mm (0.05854 ~ 0.05870 in.)	– – –
Blue	1.491 ~ 1.495 mm (0.05870 ~ 0.05886 in.)	– – –

Connecting Rod Big End Bearing Insert Selection:

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Parts Number
None	○	Brown	92028-1476
None	None	Black	92028-1475
○	○		
○	None	Blue	92028-1474

Crankshaft Side Clearance	0.05 ~ 0.35 mm (0.00197 ~ 0.0138 in.)	0.55 mm (0.0217 in.)
Crankshaft Web Length	103.85 ~ 103.95 mm (4.0886 ~ 4.0925 in.)	103.6 mm (4.0787 in.)
Crankshaft Runout	TIR 0.06 mm (0.0024 in.) or less	TIR 0.15 mm (0.0059 in.)

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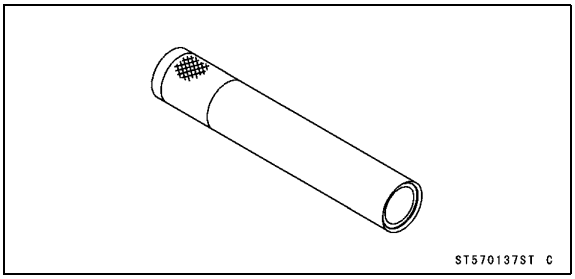
Specifications

Item	Standard	Service Limit
Crankshaft Main Bearing/journal Clearance	0.025 ~ 0.052 mm (0.00098 ~ 0.00205 in.)	0.10 mm (0.00394 in.)
Crankshaft Main Journal Diameter	56.986 ~ 57.000 mm (2.2435 ~ 2.2441 in.)	56.96 mm (2.2425 in.)
Crankcase Main Bearing Bore Diameter	57.030 ~ 57.049 mm (2.2559 ~ 2.2460 in.)	57.08 mm (2.2472 in.)
Transmission		
Shift Fork Ear Thickness	6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)	6.8 mm (0.268 in.)
Gear Shift Fork Groove Width	7.05 ~ 7.15 mm (0.278 ~ 0.281 in.)	7.3 mm (0.287 in.)
Shift Fork Guide Pin Diameter	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Shift Drum Groove Width	6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)	6.3 mm (0.248 in.)

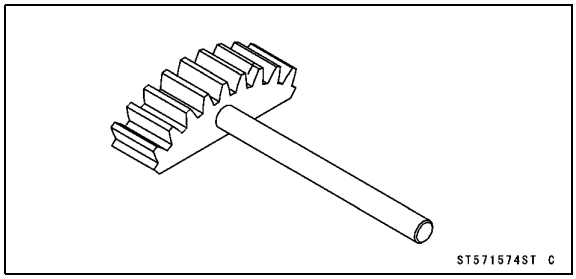
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Special Tools and Sealants

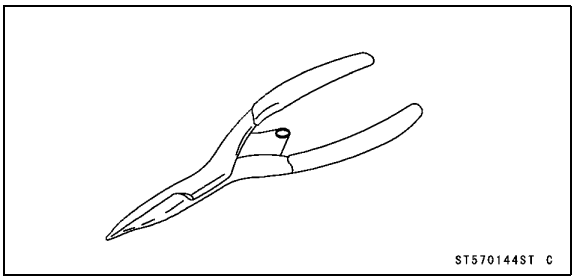
Steering Stem Bearing Driver:
57001-137



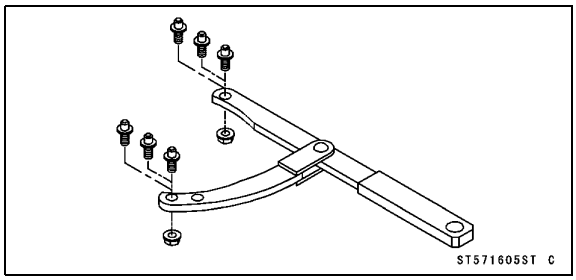
Gear Holder:
57001-1574



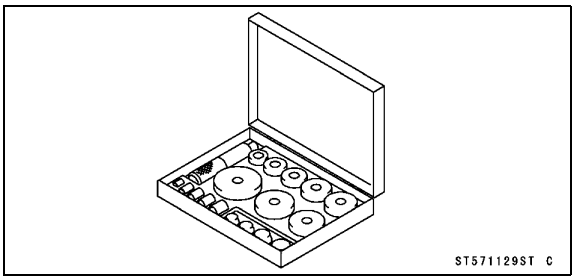
Outside Circlip Pliers:
57001-144



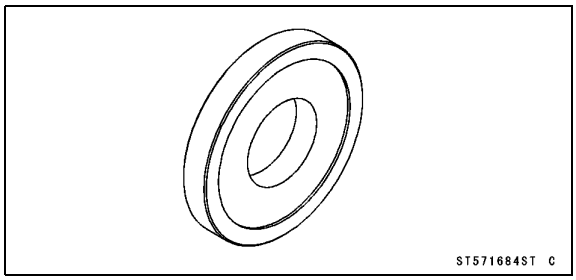
Flywheel & Pulley Holder:
57001-1605



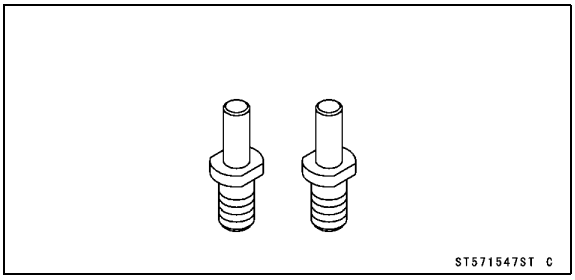
Bearing Driver Set:
57001-1129



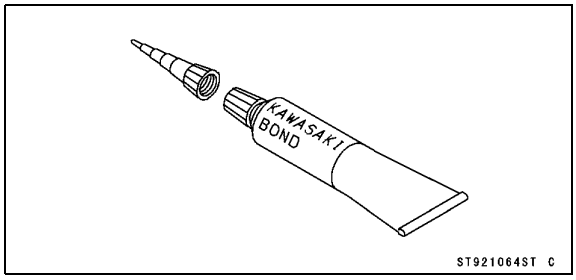
Bearing Driver:
57001-1684



Holder Attachment:
57001-1547



Kawasaki Bond (Liquid Gasket - Brack) TB1216:
92104-1064



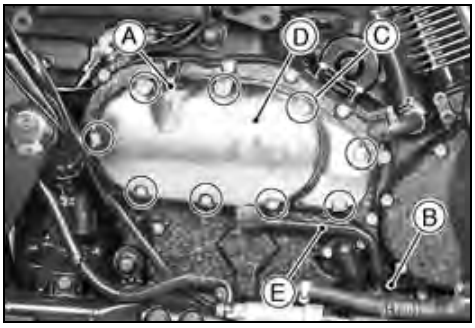
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Crankcase

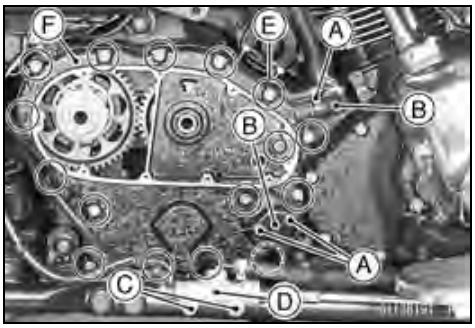
Crankcase Disassembly

- Drain the engine oil (see Periodic Maintenance chapter).
- Remove:
  Engine (see Engine Removal/Installation chapter)
  Cylinder Blocks (see Engine Top End chapter)
  Pistons (see Engine Top End chapter)
  Starter Motor (see Electrical System chapter)
  Camshafts (see Engine Top End chapter)
  Balancer Mechanism (see Balancer Mechanism Removal)
  External Shift Mechanism (see External Shift Mechanism Removal)
  Clutch (see Clutch chapter)
  Alternator Rotor (see Electrical System chapter)
  Oil Filter (see Periodic Maintenance chapter)
  Oil Pan (see Engine Lubrication chapter)

- Remove:
  Oil Filler Cap with Dipstick [A]
  Oil Pipe Bolt [B]
  Outer Transmission Cover Bolt [C]
- Remove the outer transmission cover [D] with the oil pipe [E].



- Unscrew the bolts [A] and remove the water pipes [B].
- Remove the bolts [C] and pull down the rear master cylinder [D] with the hoses.
- Remove:
  Reserver Tank Cap
  Gear Position Switch Lead Connector
  Inner Transmission Cover Bolts [E]
  Inner Transmission Cover [F]
- Remove the shift mechanism parts (see External Shift Mechanism Removal).



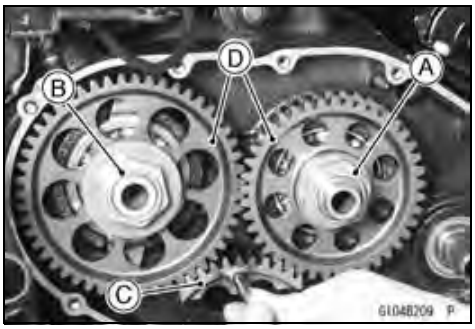
- Loosen:
  Transfer Gear Nut [A] on Output Shaft
  Transfer Gear Nut [B] on Pulley Shaft

NOTE

○*The transfer gear nut on the output shaft has left-hand threads. Turn the nut clockwise and remove it.*

Special Tool - Gear Holder [C]: 57001-1574

- Remove:
  Transfer Gear Nuts
  Transfer Gears [D]

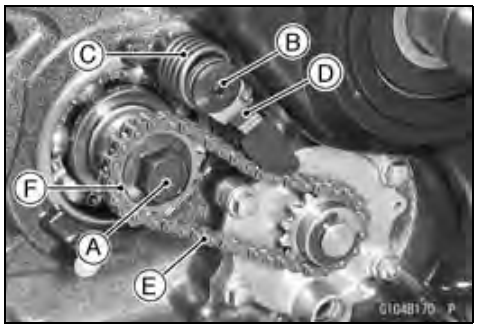


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Crankcase

- Temporarily install the balancer gear to the rear balancer shaft.
- Holding the rear balancer gear with the flywheel & pulley holder, remove the oil pump drive sprocket bolt [A] (see Balancer Mechanism Removal).

  Special Tool - Flywheel & Pulley Holder: 57001-1605

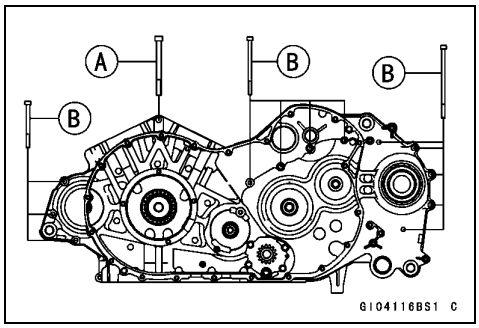


- Remove:
  Oil Pump Chain Tensioner Bolt [B]
  Spring [C]
  Chain Tensioner [D]
  Chain [E]
  Oil Pump Drive Sprocket [F]

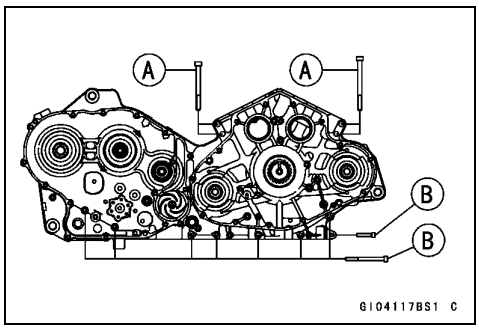
- Remove:
  Collor [A] on Pulley Shaft [B]
  O-ring [C]



- Remove the left crankcase bolts.
  ϕ8 mm Bolts (1) [A]
  ϕ6 mm Bolts (12) [B]



- Remove the right crankcase bolts.
  ϕ8 mm Bolts (1) [A]
  ϕ6 mm Bolts (12) [B]

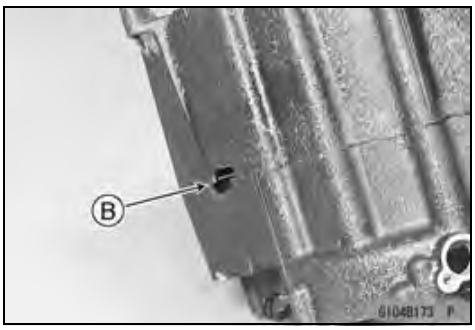


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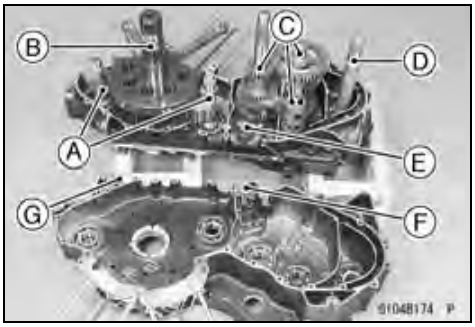
Crankcase

● Turn the right crankcase down.
● Lift up the left crankcase.
○Using the pry points, split the crankcase halves.
Pry Point (Front) [A]
Pry Point (Rear) [B]





● Remove the following from the right crankcase.
Balancer Shafts [A]
Crankshaft [B]
Transmission Gear Assy [C] (see Transmission Removal)
Pulley Shaft [D]
Water Pump Shaft [E] (see Cooling System chapter)
● Remove the following from the left crankcase.
Oil Pump Shaft [F] (see Engine Lubrication System chapter)
Relief Valve [G] (see Engine Lubrication System chapter)

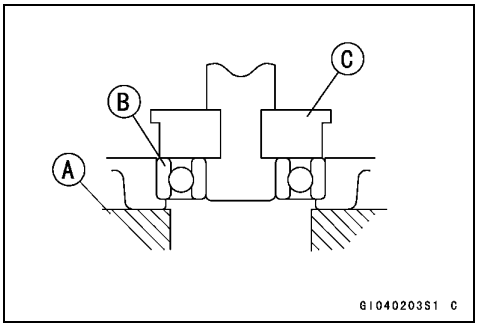


CAUTION

The right and left crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

Crankcase Assembly

● 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.



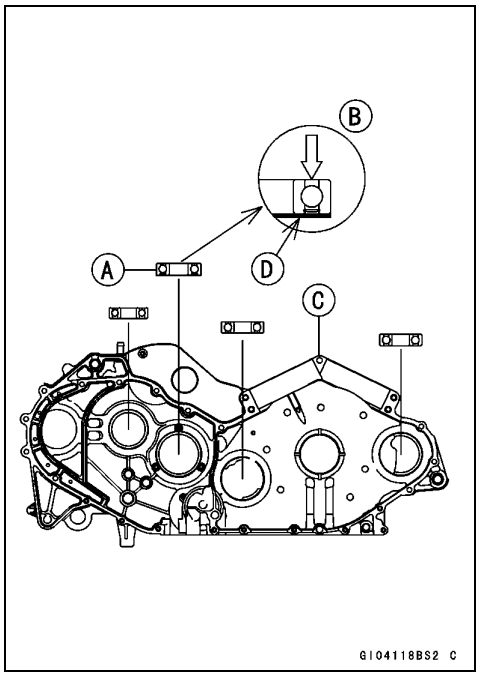
CAUTION

Support the crankcase bearing boss when pushing the bearing, otherwise the crankcase could be damaged.

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Crankcase

○For the drive shaft bearing [A], press [B] the bearing on the left crankcase [C] so that its sealed side [D] faces downward.

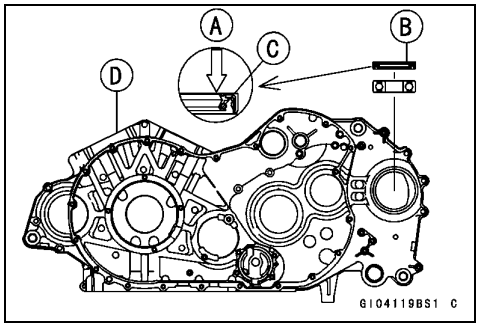


● Press the needle bearing with manufacturer's mark facing out into hole on the left side of the left crankcase. Push the needle bearing outer race until the face of the bearing is even with the end of the hole, using a driver.

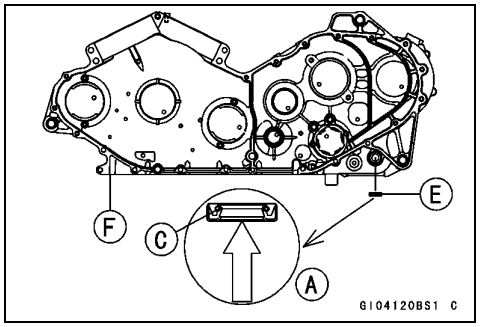
Special Tool - Bearing Driver Set: 57001-1129

● Press [A] the following oil seals into the crankcase halves with the bearing driver set so that spring side of the seal lips is toward the inside of the crankcase halves.
Oil Seal [B] at Pulley Shaft
Spring [C]
Left Crankcase Half [D]
Oil Seal [E] at Shift Shaft
Right Crankcase Half [F]

Special Tool - Bearing Driver Set: 57001-1129



○For the mechanical seal and oil seal installation at the water pump, see Cooling System chapter.

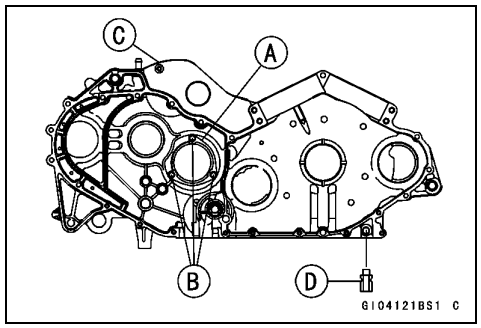


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Crankcase

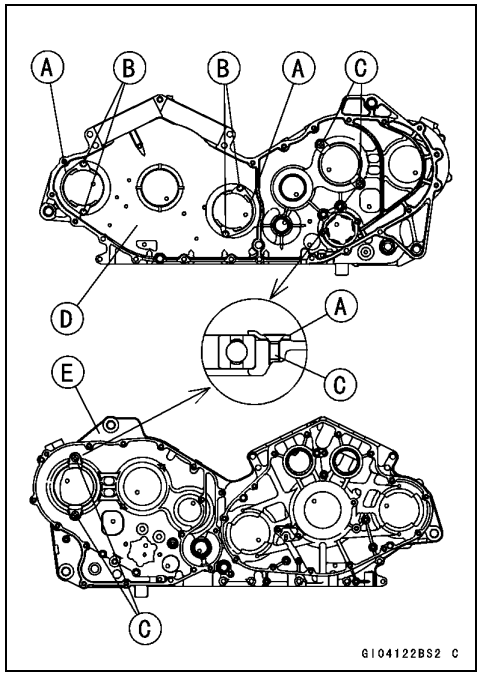
● Install the bearing retainer.
Bearing Retainer [A]
Bearing Retainer Bolts [B]
Left Crankcase Half (Inside) [C]
● Install the relief valve [D].
● Apply a non-permanent locking agent to the thread of the relief valve and torque it.

Torque - Relief Valve: 15 N·m (1.5 kgf·m, 11 in·lb)

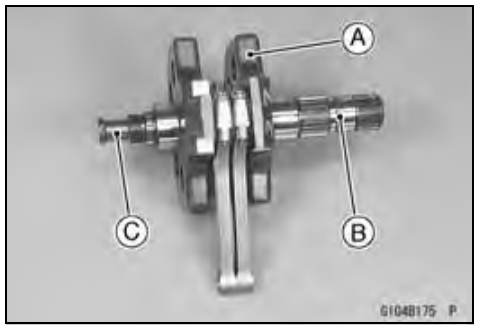


● Install the bearing retainers.
Bearing Retainers [A]
Bearing Retainer Bolts [B] at Balancer
Bearing Retainer Screws [C] at Output Shaft
Right Crankcase Half (Inside) [D]
Right Crankcase Half (Outside) [E]
Bearing Retainer Screws [F] at Pulley Shaft

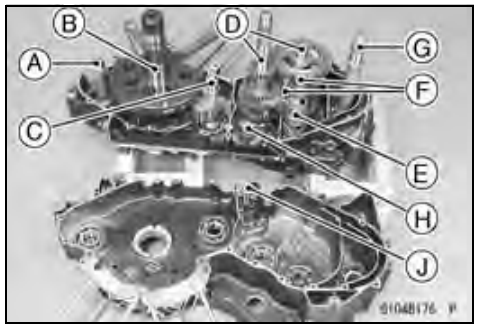
Torque - Bearing Retainer Screws at Output Shaft: 6.9 N·m (0.70 kgf·m, 61 in·lb)
Bearing Retainer Screws at Pulley Shaft: 6.9 N·m (0.70 kgf·m, 61 in·lb)



● Apply molybdenum disulfide oil to the transmission gears, ball bearings, shift drum, and crankshaft main bearing.
○The left shaft [B] of the crankshaft [A] is longer than the right shaft [C].



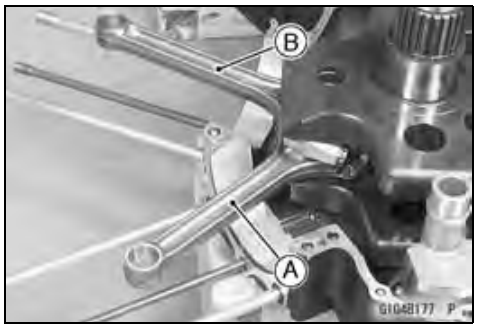
● Check to see that the following parts are in position in right crankcase half.
Front Balancer Shaft [A]
Crankshaft [B]
Rear Balancer Shaft [C]
Transmission Assy [D] and Shift Drum [E]
Shift Forks and Shift Rods [F]
Pulley Shaft [G]
Water Pump Shaft [H]
Oil Pump Shaft [J]



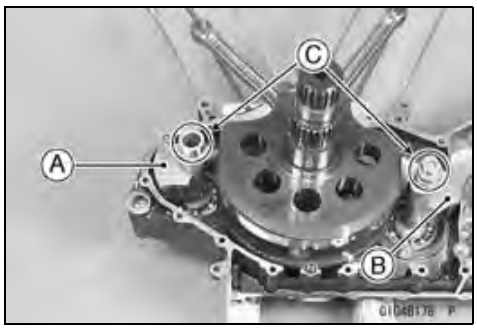
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Crankcase

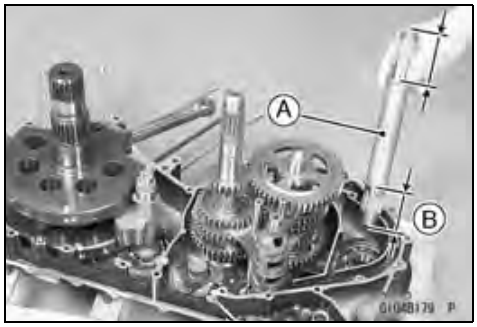
○Position the right side connecting rod [A] to the front and left side connecting rod [B] to the rear as shown.



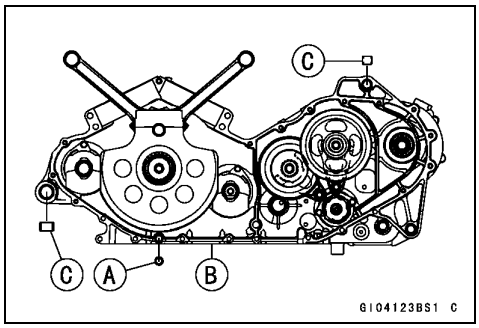
○Install the front [A] and rear [B] balancers so that their splined shaft ends face downward (toward the right crankcase half), noting the shapes [C] of their opposite shaft end.



○Install the pulley shaft [A] so that the shorter side [B] from the flange to the shaft end faces downward (toward the right crankcase half).

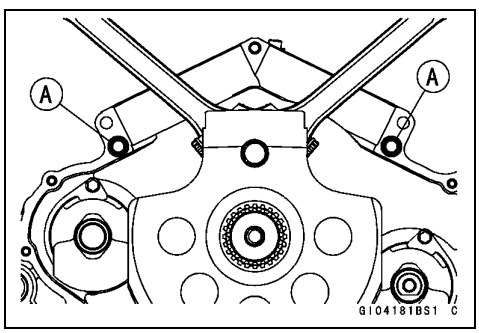


- Apply grease the O-ring [A] and put it to the right crankcase half [B].
- Be sure the dowel pins [C] are in position.



Except VN2000-A1

- Apply liquid gasket (Three Bond: TB1207B) to around the M8 bolt holes [A] of the right crankcase half.



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Crankcase

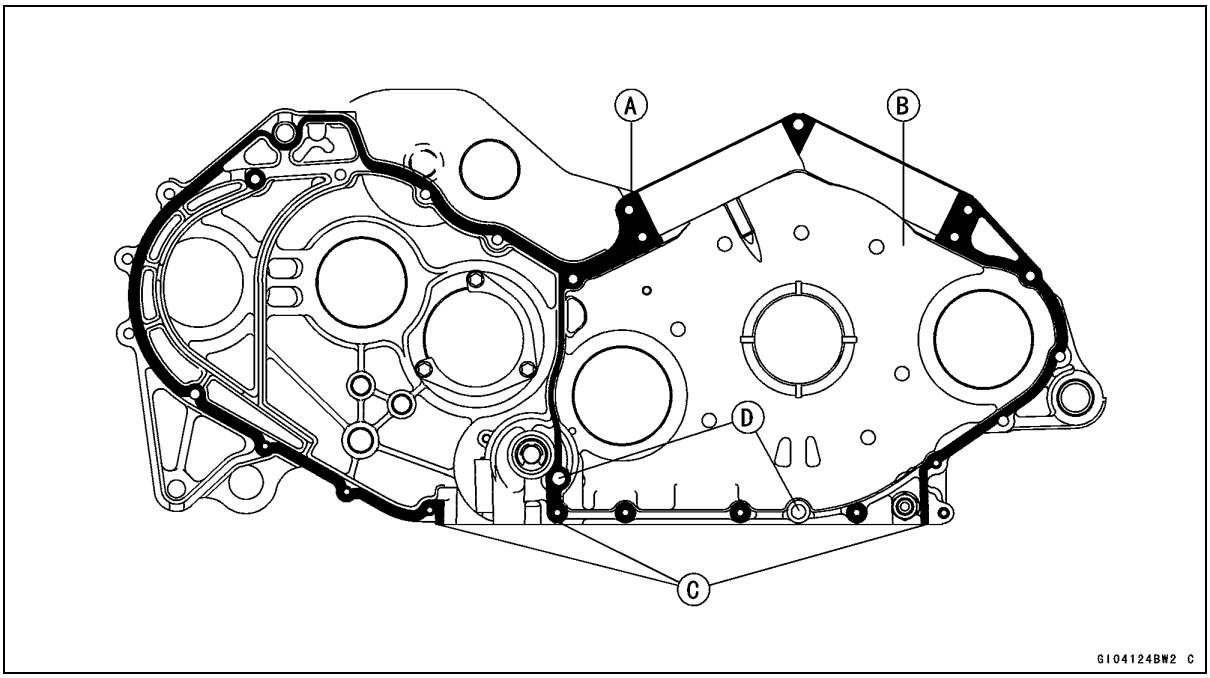
● Apply liquid gasket [A] to the mating surface of the left crankcase [B].

Sealant - Kawasaki Bond (Liquid Gasket - Brack) TB1216: 92104-1064

○Be sure liquid gasket is applied to the lower ends [C] indicated in the figure.
○Do not drop liquid gasket into the oil passages [D].
○After tightening the crankcase bolts, wipe up the liquid gasket seeping out around the mating surface.

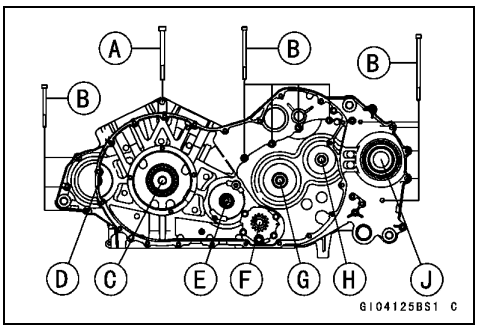
NOTE

○*Make the application finish within 20 minutes when the liquid gasket to the mating surface of the left crankcase half is applied.*
○*Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.*



● Tighten the left crankcase bolts as follows.
○First, tighten the 8 mm bolts [A], and next, 6 mm bolts [B] temporarily.
○First torque the 8 mm bolts and next, 6 mm bolts.

Torque - 8 mm Crankcase Bolts: 29 N·m (3.0 kgf·m, 22 ft·lb)
6 mm Crankcase Bolts: 12 N·m (1.2 kgf·m, 104 ft·lb)



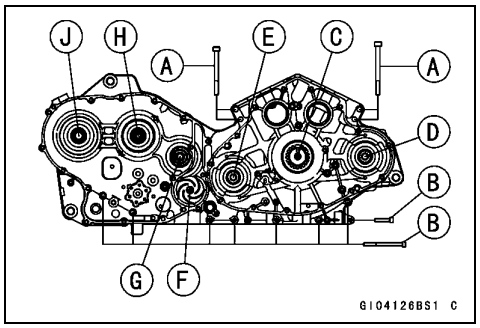
● Check the following turn freely.
Crankshaft [C]
Front [D] and Rear [E] Balancer Shafts
Oil Pump Shaft [F]
Drive Shaft [G] and Output Shaft [H]
Pulley Shaft [J]

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Crankcase

● Tighten the right crankcase bolts as follows.
○First, tighten the 8 mm bolts [A], and next, 6 mm bolts [B] temporarily.
○First, torque the 8 mm bolts, and next, 6 mm bolts.

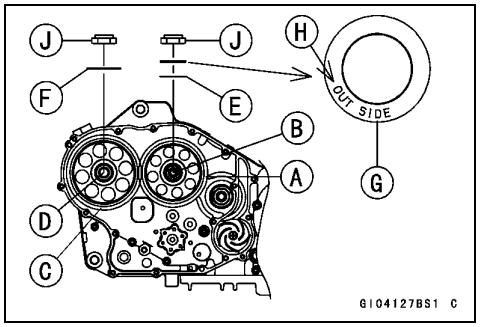
Torque - 8 mm Crankcase Bolts: 29 N·m (3.0 kgf·m, 22 ft·lb)
6 mm Crankcase Bolts: 12 N·m (1.2 kgf·m, 8.8 ft·lb)



● Check the following turn freely.
Crankshaft [C]
First [D] and Rear [E] Balancer Shafts
Water Pump Shaft [F]
Drive Shaft [G] and Output Shaft [H]
Pulley Shaft [J]
● After tightening all the crankcase bolts, check the following items.
○Wipe up the liquid gasket that seeps out around the crankcase mating surface.

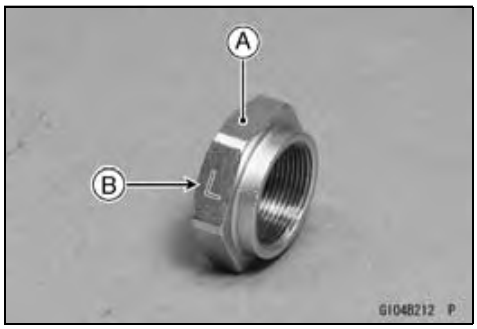
● Install the transfer gears
○Install the transfer gear [A] which has shorter diameter to the output shaft [B].
○Install the transfer gear [C] which has larger diameter to the pulley shaft [D].
○Put the washer [E] which has shorter diameter to the output shaft.
○Put the washer [F] which has larger diameter to the pulley shaft.
○Put the washer [G] so that their “OUT SIDE” marks [H] face outward to the output shaft.
○Replace the transfer gear nuts with new ones.
○Apply molybdenum disulfide oil to the nut [J] thread and seating surfaces of the washers and nuts.
○Temporarily tighten the transfer gear nuts.

Special Tool - Gear Holder: 57001-1574



NOTE

○*The transfer gear nut [A] on the output shaft has left -hand threads. It is silver color and has “L” [B] mark. Turn the nut counterclockwise and tighten it.*



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Crankcase



○Check that the positive neutral finder operates propely: While spinning [A] the output shaft [B] 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 shoud not be shifted to the 2nd gear or other higher gear positions.
Shift Drum [C]

● If the positive neutral finder operates propely, torque the transfer gear nuts.

Torque - Transfer Gear Nut (Output Shaft): 196 N·m (20.0 kgf·m, 145 ft·lb)
Transfer Gear Nut (Pulley Shaft): 78 N·m (8.0 kgf·m, 58 ft·lb)

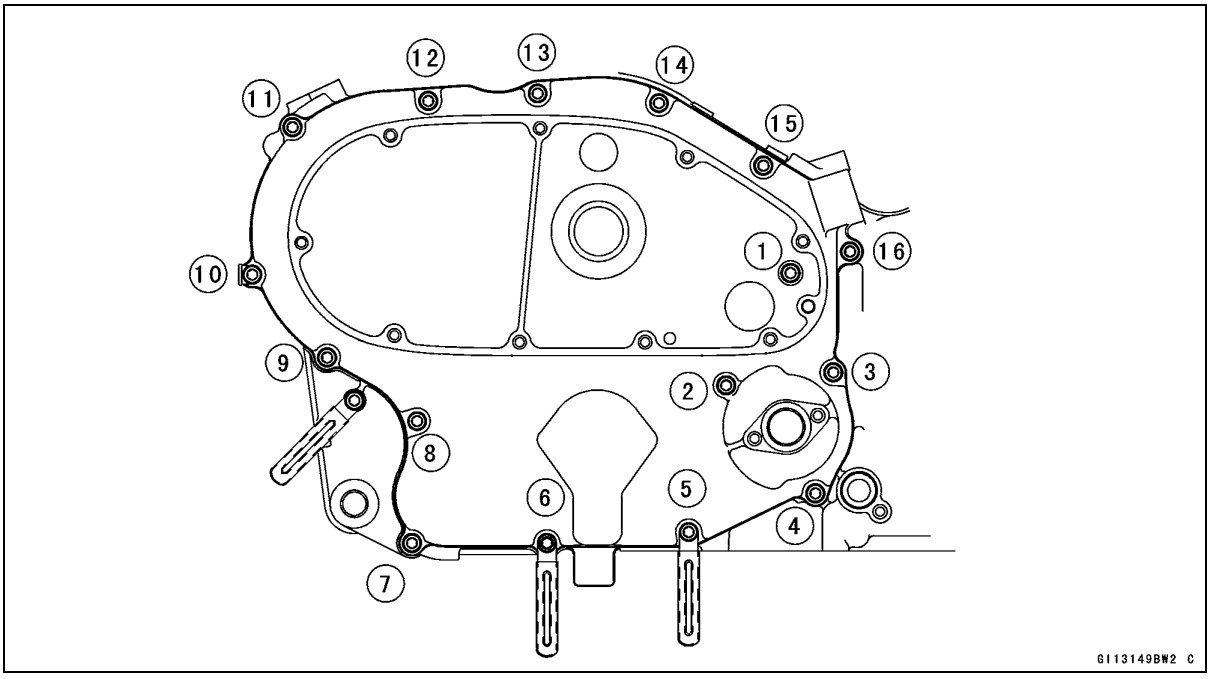
Special Tool - Gear Holder: 57001-1574

● Install the shift mechanism parts (see External Shift Mechanism).
● Replace the gasket for inner transmission cover with a new one.
● Install the inner transmission cover
○Apply silicone sealant to the grommet for the gear potion switch lead.

Sealant - Three Bond: TB1211F

○Tighten the inner transmission cover bolts to a snug fit.
○Torque the bolts, following the tightening order (No.1 ~ No.16).
○For the No.1 and 2 bolts, torque them again.

Torque - Inner Transmission Cover Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)



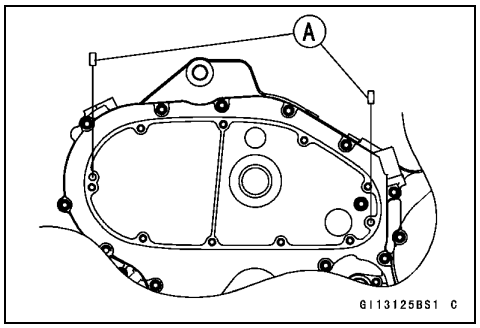
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Crankcase

● Apply grease to the O-rings and install the water pipes.

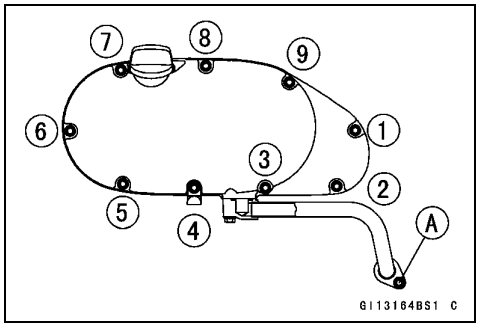
Torque - Water Pipe Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

● Be sure the dowel pins [A] are in position.
● Replace the gasket with a new one.



● Install the outer transmission cover with the oil pipe.
○Tighten the outer transmission cover bolts to a snug fit.
○Torque the bolts, following the tightening order (No.1 ~ No.9) and torque them again.
○Apply a non-permanent locking agent to the oil pipe bolt [A] and torque it.

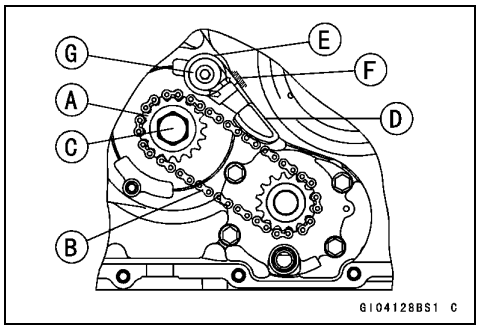
Torque - Outer Transmission Cover Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)
Oil Pipe Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)



● Install the sprocket [A] and oil pump chain [B].
● Tighten the sprocket bolt [C].
○Temporarily install the balancer gear to the rear balancer shaft.
○Holding the rear balancer gear with the flywheel & pulley holder, torque the sprocket bolt.

Torque - Oil Pump Drive Sprocket Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)

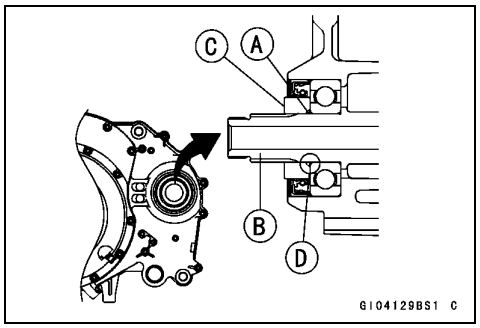
Special Tool - Flywheel & Pulley Holder: 57001-1605



● Install the tensioner [D] with the spring [E].
○Position the spring so that its end is applied to the crankcase wall [F]
● Torque the tensioner bolt [G].

Torque - Oil Pump Chain Tensioner Bolt: 12 N·m (1.2 kgf·m, 8.8ft ·lb)

● Apply grease to the O-ring [A] and put it on the pulley shaft [B].
● Install the color [C] so that its chamfer side [D] faces inward.



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Crankcase

- Install:
  Oil Pan (see Engine Lubrication System)
  Oil Filter (see Periodic Maintenance chapter)
  Alternator Rotor (see Electrical System chapter)
  Clutch (see Clutch chapter)
  External Shift Mechanism (see this chapter)
  Balancer Mechanism (see this chapter)
  Camshaft (see Engine Top End chapter)
  Starter Motor (see Electrical System chapter)
  Pistons (see Engine Top End chapter)
  Engine (see Engine Removal/Installation chapter)

Starter Clutch Disassembly

- Refer to the Starter Clutch Disassembly in the Clutch chapter.

Starter Clutch Assembly

- Refer to the Starter Clutch Assembly in the Clutch chapter.

Starter Clutch Inspection

- Refer to the Starter Clutch Inspection in the Clutch chapter.

Starter Torque Limiter Check

- Refer to the Starter Torque Limiter Check in the Clutch chapter.

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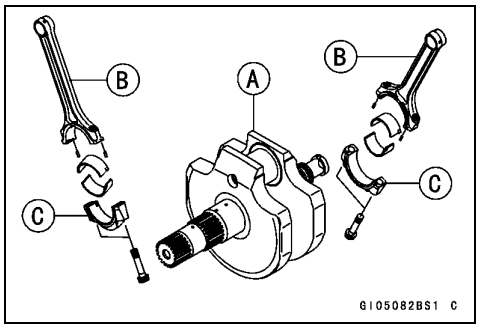
Crankshaft/Connecting Rods

Connecting Rod Removal

- Remove the crankshaft.
- Remove the connecting rod big end bolts, 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.*

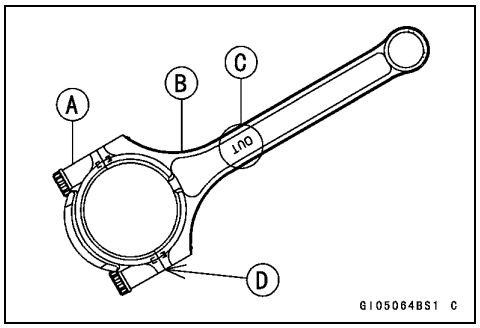


CAUTION

To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

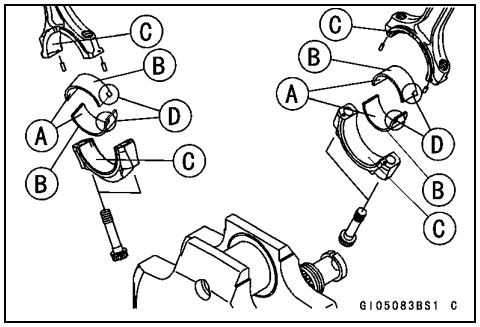
Connecting Rod Installation

Big End Cap [A]
Connecting Rod [B]
OUT Mark [C]
Diameter 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 to the inside [A] of the big end bearing inserts.

○The molybdenum disulfide oil 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.

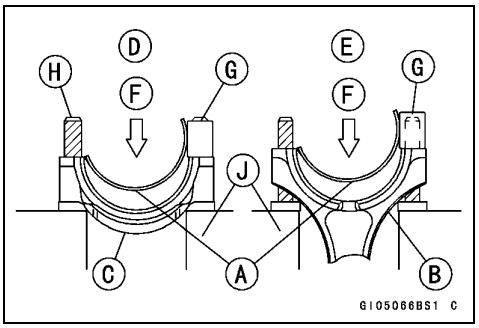
○Do not apply molybdenum disulfide oil to the outside [B] of the inserts or the inside [C] of the connecting rod and cap.

○Install the inserts so that their nails [D] are on the same side and fit into the recess of the connecting rod and cap.

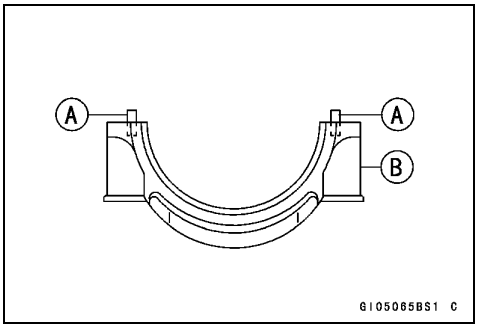
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Crankshaft/Connecting Rods

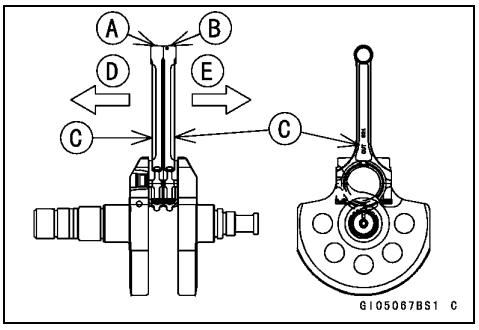
○When installing the inserts [A], be careful not to damage the insert surface with the edge of the connecting rod [B] or the cap [C]. One way to install inserts is as follows:
Installation [D] to Cap
Installation [E] to Connecting Rod
Push [F]
Dowel Pin [G]
Connecting Rod Big End Bolts [H]
Suitable Blocks [J]



● Be sure the dowel pins [A] on the caps [B] are in position.



● Install the cap on the connecting rod, aligning the diameter mark.
○Left side connecting rod [A] is for the rear cylinder and right side connecting rod [B] is for the front cylinder.
○Install the connecting rods so that their “OUT” marks [C] face outward.
Engine Left Side [D]
Engine Right Side [E]



● Remove debris and clean the surface of inserts.
● Apply molybdenum disulfide oil [MO] to the threads and flanged portions of the connecting rod big end bolts.
● Tighten the big end bolts to the specified torque.

Torque - Connecting Rod Big End Bolts: 59 N·m (6.0 kgf·m, 43 ft·lb)

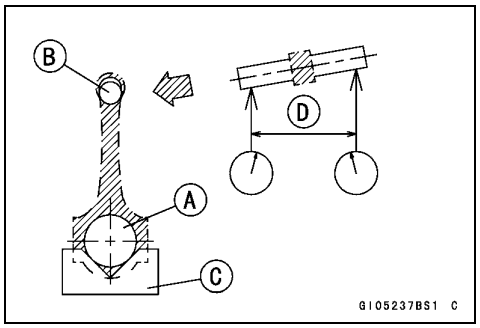
Crankshaft/Connecting Rod Cleaning

● 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.

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Crankshaft/Connecting Rods

Connecting Rod Bend

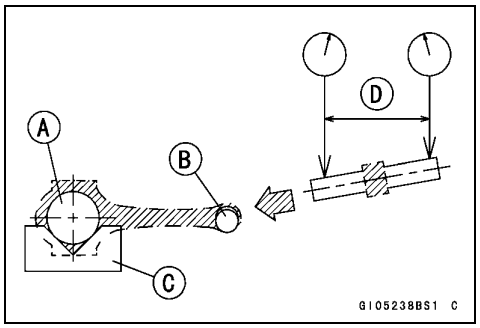


- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on 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.) [D] 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: 0.2/100 mm (0.08/3.94 in.)

Connecting Rod Twist

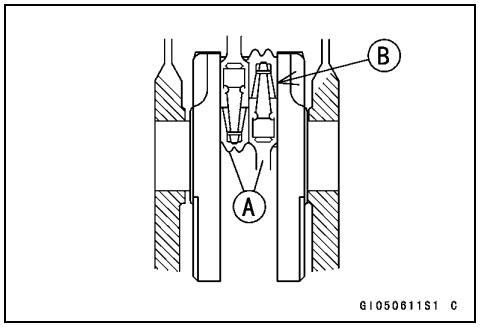


- With the big-end arbor [A] still on the V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being parallel with the surface plate over a 100 mm (3.94 in.) [D] length of the arbor to determine the amount of connecting rod twist.

★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist
Service Limit: 0.2/100 mm (0.08/3.94 in.)

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.

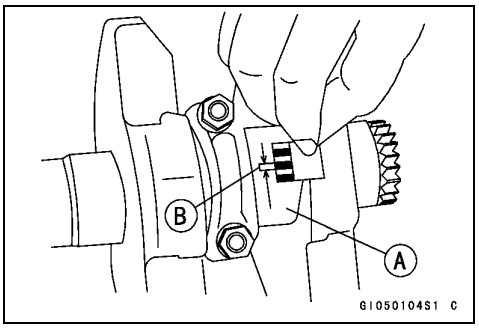
Connecting Rod Big End Side Clearance
Standard: 0.08 ~ 0.30 mm (0.0031 ~ 0.0118 in.)
Service Limit: 0.5 mm (0.0197 in.)

★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.

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Crankshaft/Connecting Rods

Connecting Rod Big End Bearing Wear



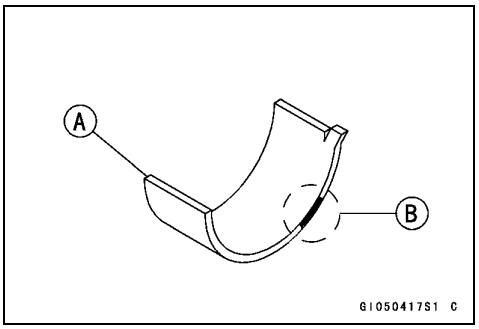
- Remove the big end cap and place a strip of plastigage on the crankpin [A].
- Tighten the big end bolts to the specified torque to compress the plastigage and measure the plastigage width [B] to determine the bearing insert/crankpin clearance.

Molybdenum Disulfide Oil- Threads and Flanged Portion of Big End Bolts

Torque - Connecting Rod Big End Bolts: 59 N·m (6.0 kgf·m, 43 ft·lb)

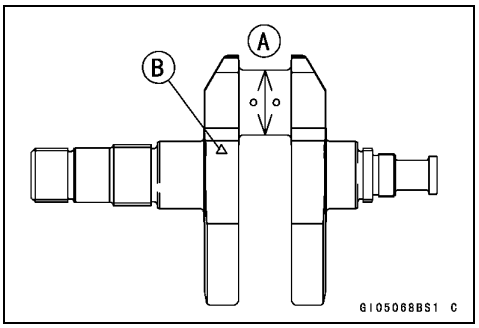
○Do not move the connecting rod and crankshaft during clearance measurement.

Connecting Rod Big End Bearing/Crankpin Clearance
Standard: 0.026 ~ 0.057 mm (0.001024 ~ 0.0022 in.)
Service Limit: 0.10 mm (0.0039 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, or 0.0039 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.



★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 ~ 2.16500 in.)
○: 54.992 ~ 55.000 mm (2.16504 ~ 2.1654 in.)

Crankpin Diameter Mark: "○" mark or no mark [B]

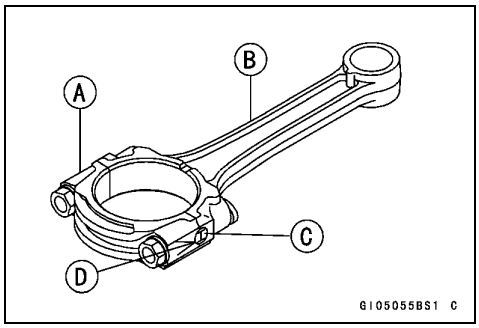
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Crankshaft/Connecting Rods

● Temporarily, install the big end cap and tighten the big end bolts to the specified torque.

Molybdenum Disulfide Oil -
Threads and Flanged Portion of Big End Bolts

Torque - Connecting Rod Big End Bolts: 59 N·m (6.0 kgf·m, 43 ft·lb)



● Measure the connecting rod big end bore 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.

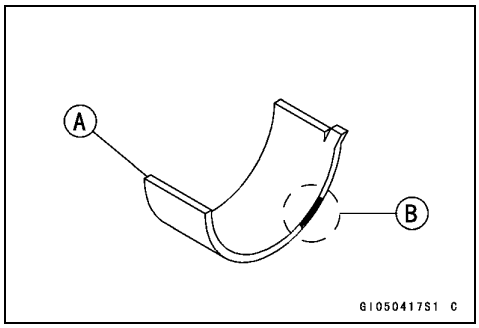
Connecting Rod Big End Bore Diameter Marks

None: 58.000 ~ 58.010 mm (2.2835 ~ 2.28386 in.)

○: 58.011 ~ 58.019 mm (2.28390 ~ 2.2842 in.)

Big End Cap [A]
Connecting Rod [B]
OUT Mark [C]
Diameter 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

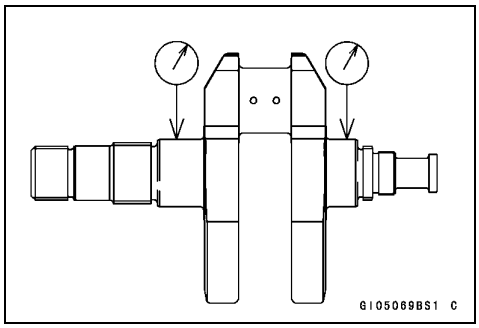
Con-rod Big End Bore Diameter Marking	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028-1476
None	None	Black	92028-1475
○	○		
○	None	Blue	92028-1474

● Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

Crankshaft Runout

● Measure the crankshaft runout.

★If the measurement exceeds the service limit, replace the crankshaft.



Crankshaft Runout

Standard: TIR 0.06 mm (0.0024 in.) or less

Service Limit: TIR 0.15 mm (0.0059 in.)

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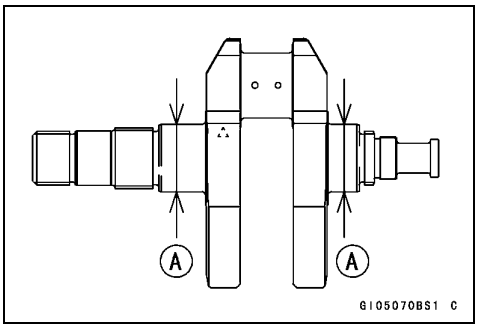
Crankshaft/Connecting Rods

Crankshaft Main Bearing/Journal Wear

● Measure the diameter [A] of the crankshaft main journal.

Crankshaft Main Journal Diameter
Standard: 56.986 ~ 57.000 mm (2.2435 ~ 2.2441 in.)
Service Limit: 56.96 mm (2.2425 in.)

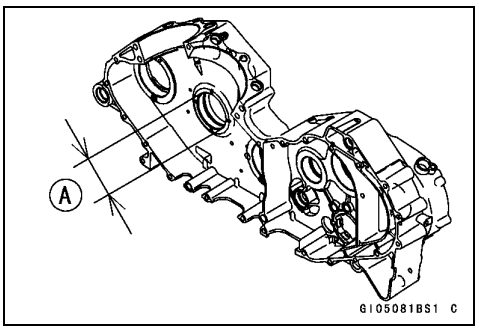
★If any journal has worn past the service limit, replace the crankshaft with a new one.



● Measure the main bearing bore diameter [A] in the crankcase halves.

Crankcase Main Bearing Bore Diameter
Standard: 57.030 ~ 57.049 mm (2.2559 ~ 2.2460 in.)
Service Limit: 57.08 mm (2.2472 in.)

★If they are any signs of seizure, damage, or excessive wear, replace the crankcase halves as a set.

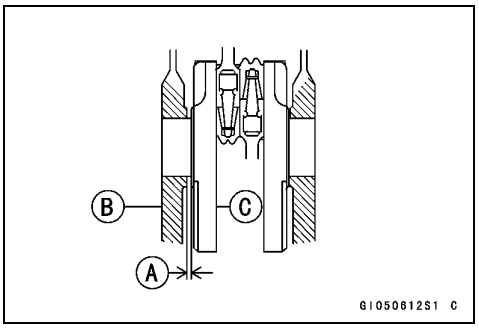


Crankshaft Side Clearance

● Measure the crankshaft side clearance.

Crankshaft Side Clearance
Standard: 0.05 ~ 0.35 mm (0.00197 ~ 0.0138 in.)
Service Limit: 0.55 mm (0.0217 in.)

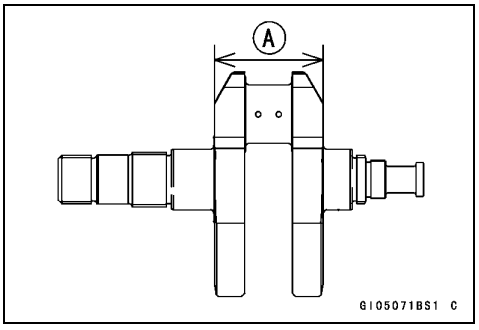
Clearance [A]
Crankcase [B]
Crankshaft [C]



★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: 103.85 ~ 103.95 mm (4.0886 ~ 4.0925 in.)
Service Limit: 103.6 mm (4.0787 in.)

★If the length measurement is smaller than the service limit, replace the crankshaft. Otherwise, replace the crankcase halves as a set.



CAUTION

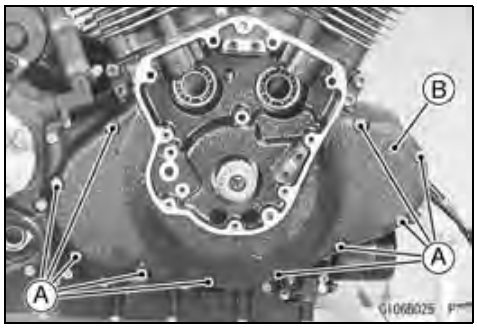
The right and left crankcase halves are machined at the factory in the assembled state, so they must be replaced as a set.

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Balancer Mechanism

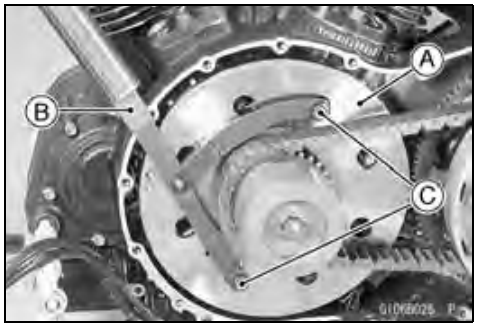
Balancer Mechanism Removal

- Drain the engine oil (see Periodic Maintenance chapter).
- Remove:
  Engine (see Engine Removal/Installation chapter)
  Rocker Cases (see Engine Top End chapter)
  Camshafts (see Engine Top End chapter)
  Inner Clutch Cover (see Clutch chapter)
- Remove:
  Inner Camshaft Cover Bolts [A]
  Inner Camshaft Cover [B]
  Inner Clutch Cover (see Clutch chapter)

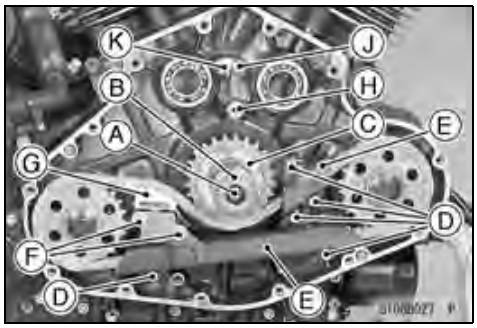


- Hold the alternator rotor [A] to remove the camshaft chain sprocket bolt.

Special Tools - Flywheel & Pulley Holder: 57001-1605 [B]
Holder Attachment: 57001-1547 [C]

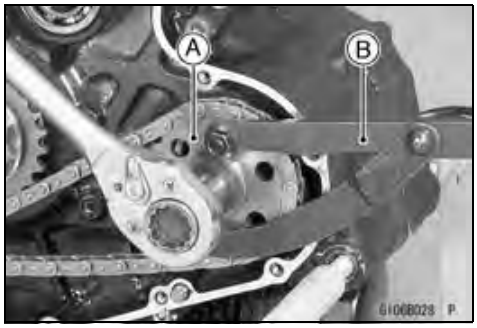


- Remove the following holding the alternator rotor.
  Camshaft Chain Sprocket Bolts [A]
  Camshaft Chain Sprocket [B]
  Roller
  Balancer Chain Sprocket Nut [C]
  Washer
- Remove:
  Balancer Chain Guide Bolts [D]
  Balancer Chain Guide [E]
  Chain Tensioner Bolts [F]
  Chain Tensioner [G]
  Spacer [H]
  Oil Pipe Bolt [J]
  Oil Pipe [K]



- Holding the balancer sprocket [A] with the flywheel & pulley holder, remove the front and rear balancer sprocket bolts.

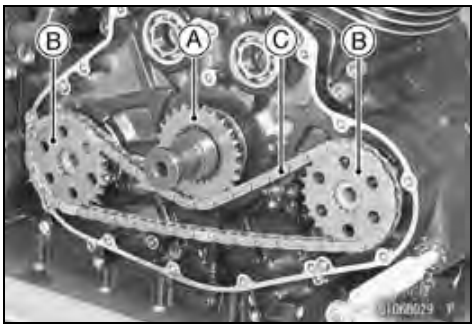
Special Tool - Flywheel & Pulley Holder: 57001-1605 [B]



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Balancer Mechanism

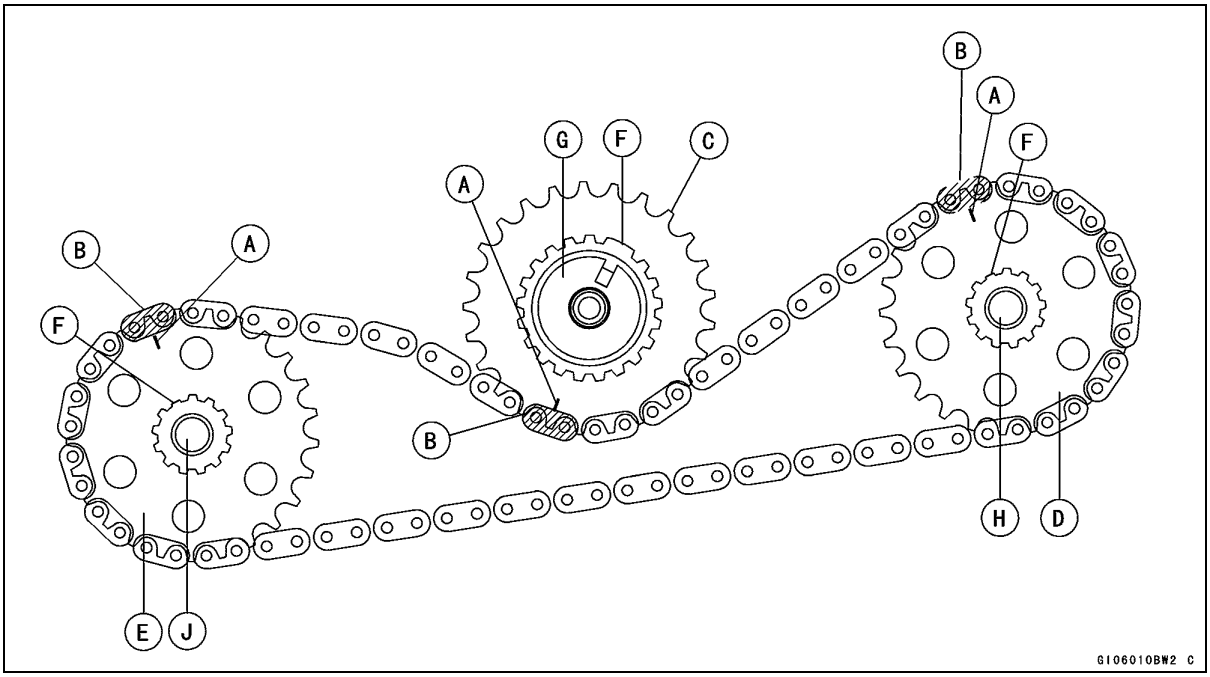
● Remove the balancer chain sprocket [A] and balancer sprockets [B] with the chain [C].



Balancer Mechanism Installation

● Align the marks [A] on the following with the colored chain link [B] as shown.
  Balancer Chain Sprocket [C]
  Front Balancer Sprocket [D]
  Rear Balancer Sprocket [E]

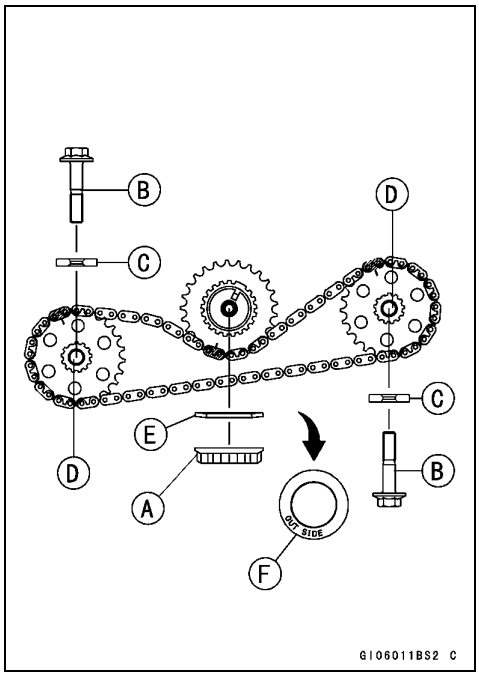
● Install the balancer chain sprocket and balancer sprockets by aligning [F] the wide grooves with the wide teeth on the following shafts.
  Crankshaft [G]
  Front Balancer Shaft [H]
  Rear Balancer Shaft [J]



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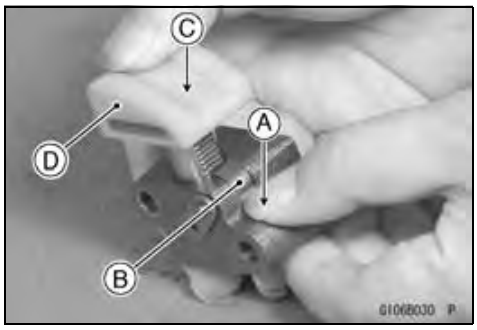
Balancer Mechanism

● Temporally tighten the balancer chain sprocket nut [A] and balancer sprocket bolts [B].
○Put the washers [C] to the balancer shafts [D].
○Put the washer [E] to the crankshaft so that its “OUT SIDE” [F] mark faces outward.



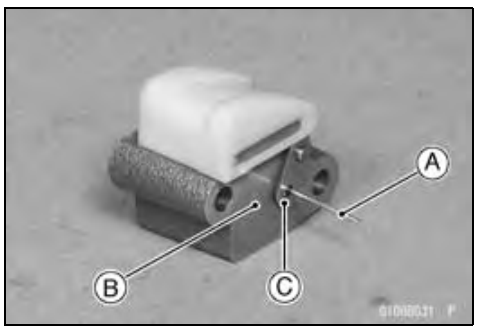
● Push [A] the chain tensioner ratchet [B] and push down [C] the tensioner shoe [D].

CAUTION
Be careful the oil remaining in the tensioner body dashes out.



● Engage the first teeth [A] of the ratchet [B] with second groove [C] of the plunger [D].

● Insert the suitable stopper pin [A] into the chain tensioner body [B] through the link plate [C].



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Balancer Mechanism

● Install:
Chain Guides [A]
Chain Tensioner [B]

Torque - Upper and Lower Balancer Chain Guide Bolts [C]: 12 N·m (1.2 kgf·m, 8.7 ft·lb)
Balancer Chain Tensioner Bolts [D]: 12 N·m (1.2 kgf·m, 8.7 ft·lb)

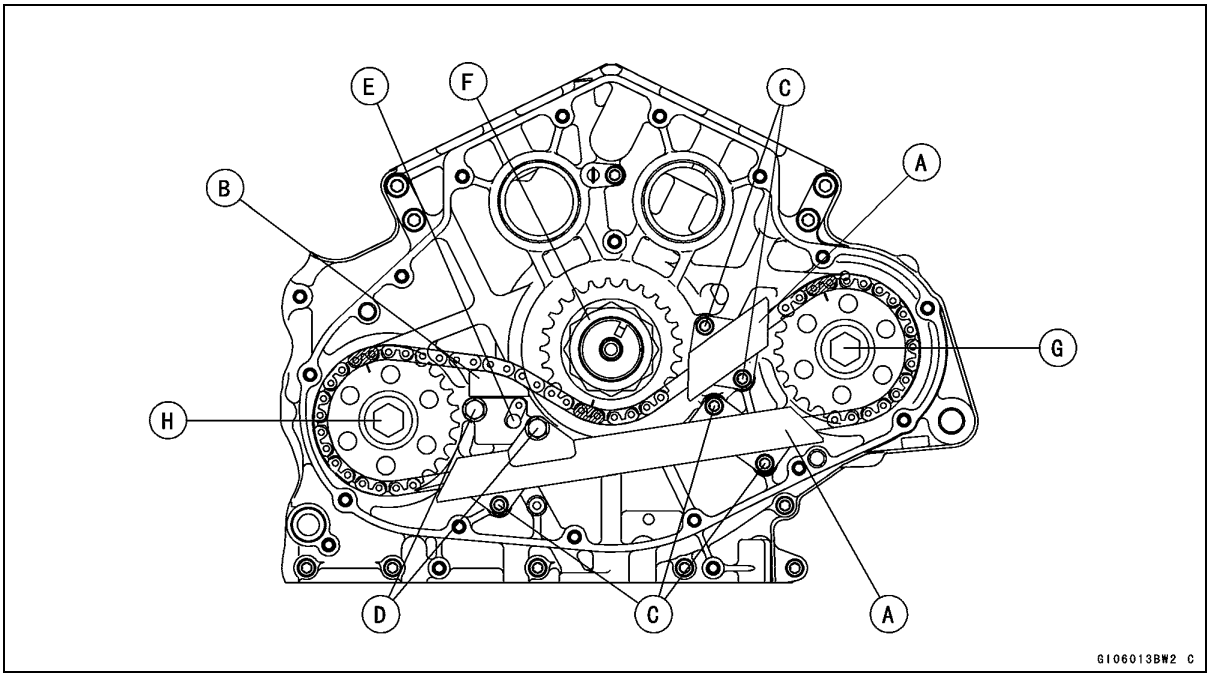
● Pull the stopper pin [E] out of the chain tensioner body.
● Apply molybdenum disulfide oil to the threads and flange portion of balancer chain sprocket nut.
● Torque:

Torque - Balancer Chain Sprocket Nut [F]: 125 N·m (13.0 kgf·m, 92.2 ft·lb)

Special Tools - Holder Attachment: 57001-1547
Flywheel & Pulley Holder: 57001-1605

Torque - Front [G] and Rear [H] Balancer Sprocket Bolts: 83 N·m (8.5 kgf·m, 61 ft·lb)

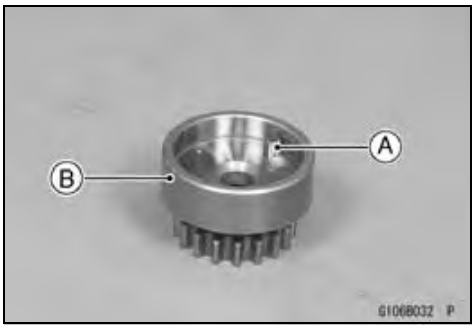
Special Tool - Flywheel & Pulley Holder: 57001-1605



● Be sure the roller [A] is on the camshaft chain sprocket [B] and torque the camshaft chain sprocket bolt.

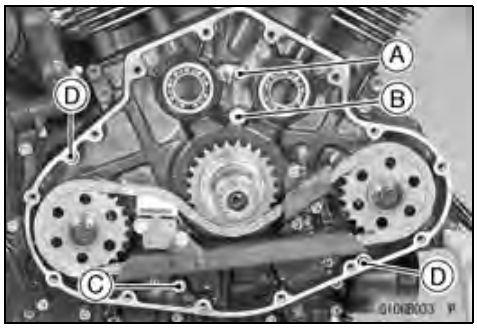
Torque - Camshaft Chain Sprocket Bolt: 29 N·m (3.0 kgf·m, 22 ft·lb)

Special Tools - Flywheel & Pulley Holder Adapter: 57001-1547
Flywheel & Pulley Holder: 57001-1605



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Balancer Mechanism



- Torque the camshaft oil pipe bolt [A].

  Torque - Camshaft Oil Pipe Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Be sure the following are in position.
  Spacer [B]
  O-ring [C]
  Dowel Pins [D]
- Install the inner camshaft cover and torque the inner camshaft cover bolts.

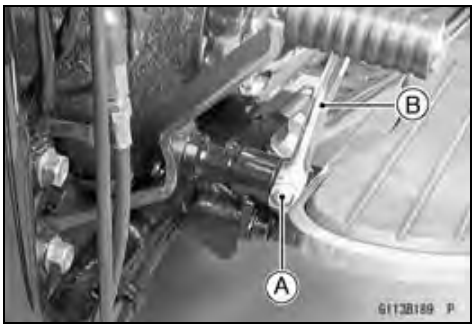
  Torque - Inner Camshaft Cover Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)

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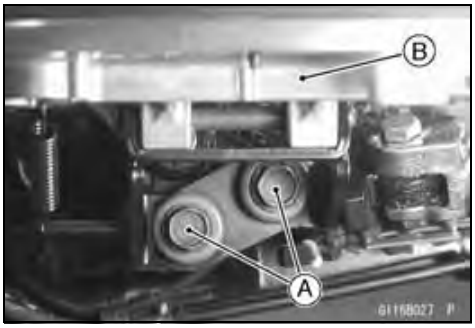
Transmission

Shift Pedal Removal

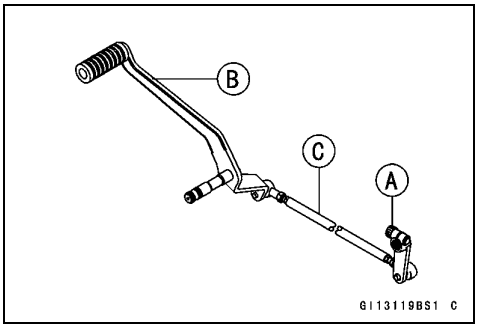
- Unscrew the rear shift pedal clamp bolt [A] and take off the rear shift pedal [B].



- Unscrew the bolts [A] and remove the left footboard [B].

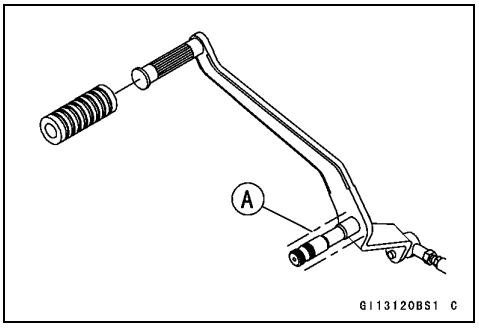


- Unscrew the rear shift lever bolt [A] and remove the front shift pedal [B] with the shift rod [C].

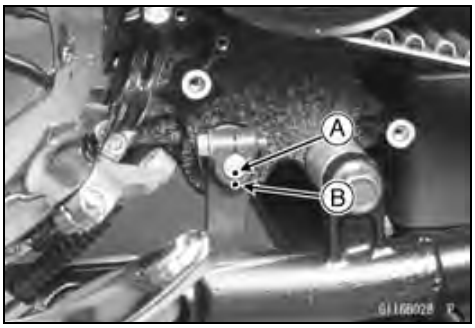


Shift Pedal Installation

- Apply grease [A] to the front shift pedal shaft.



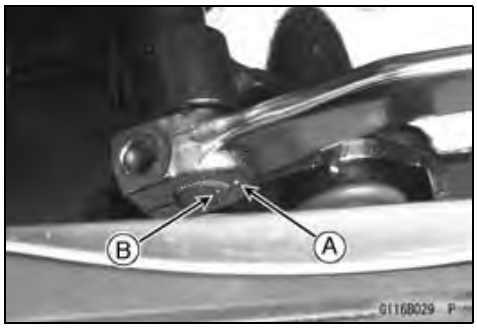
- Install the rear shift lever on the shift shaft so that the punched mark [A] on the shaft is aligned with the punched mark [B] of the rear shift lever.



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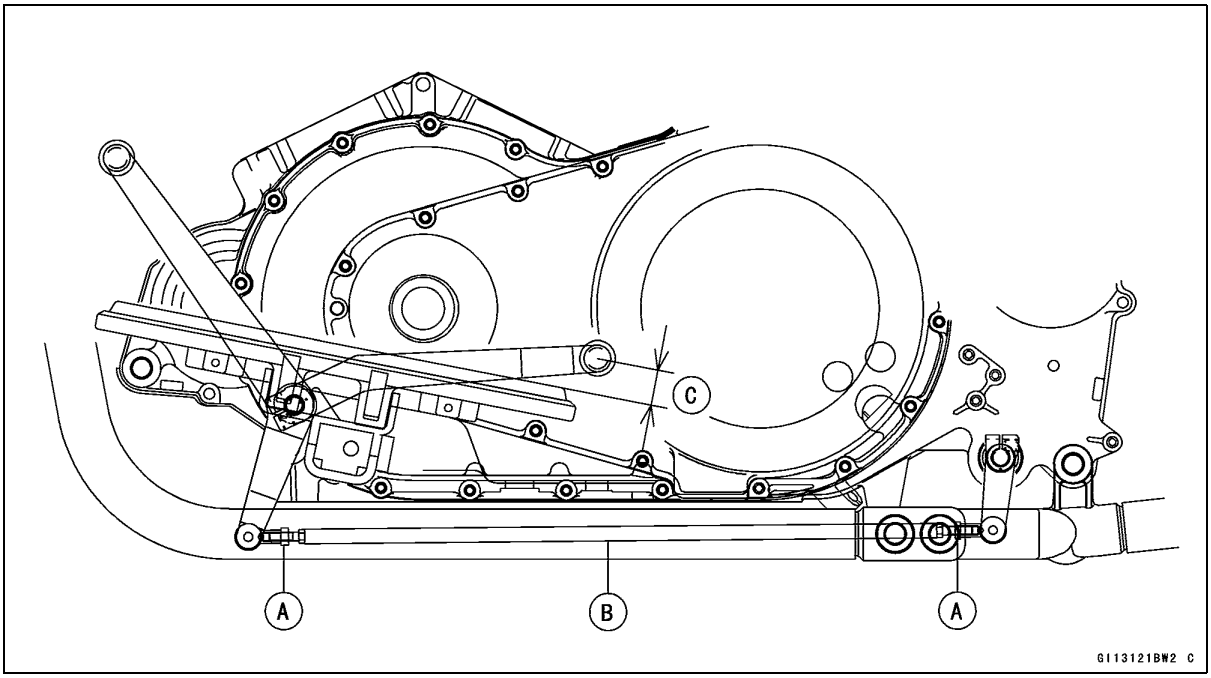
Transmission

● Install the front the rear shift pedal on the front shift pedal shaft so that the punched mark [A] on the rear shift pedal boss is aligned with the punched mark [B] on the front shift pedal shaft.



● Loosen the locknuts [A] and turn the shift rod [B] to adjust shift pedal center.
Shift Pedal Position [C] = 24 mm (0.94 in.)
○The rear locknut has left-hand threads.
● Torque:

Torque - Rear Shift Lever Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Shift Lever Clamp Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)
Shift Rod Locknuts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



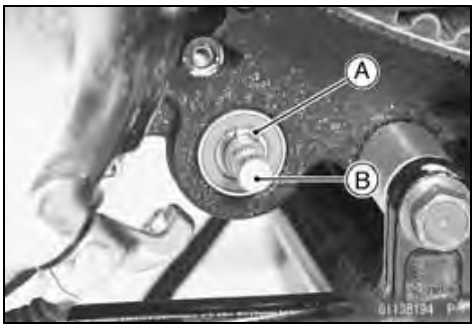
External Shift Mechanism Removal

● Remove the mufflers (see Engine Top End chapter).
● Remove the outer transmission cover and inner transmission cover (see Crankcase Disassembly).

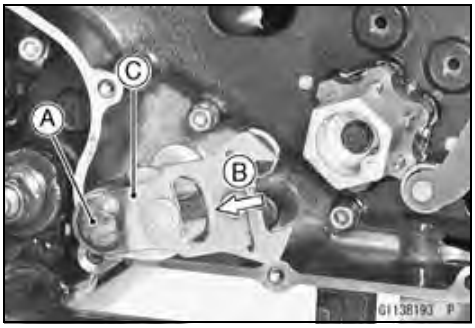
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Transmission

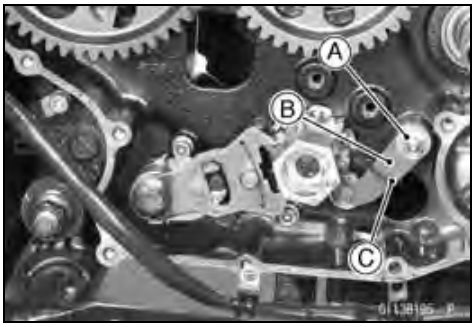
- Remove the outer and inner belt cover on the engine left side (see Final Drive chapter).
- Unscrew the rear shift lever bolt and remove the rear shift lever (see Shift Pedal Removal).
- Remove the circlip [A] on the shift shaft [B].



- Remove the shift shaft [A] while pushing [B] the shift mechanism arm [C] towards the shift shaft.



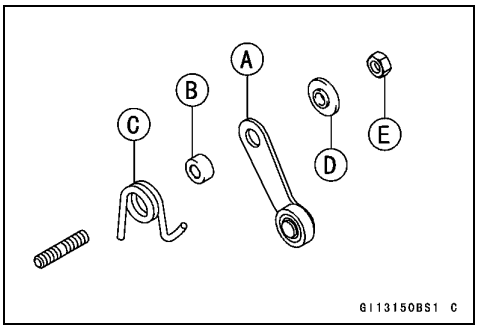
- Unscrew the nut [A] and remove the gear set lever [B] and its spring [C].



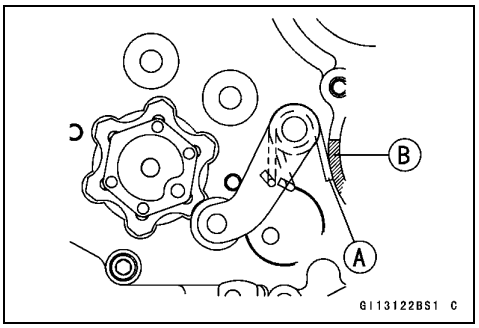
External Shift Mechanism Installation

- Install the gear set lever [A], collar [B], spring [C] and spacer [D] in the stud, and tighten the nut [E].

  Torque - Gear Set Lever Nut: 7.8 N·m (0.80 kgf·m, 69 in·lb)



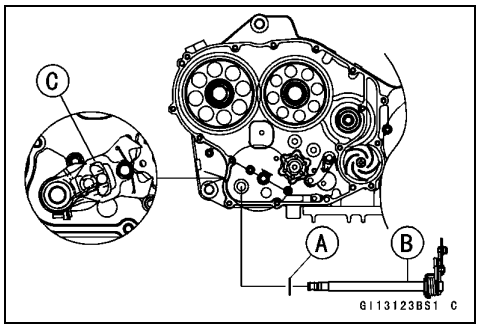
○Apply the spring end [A] to the wall [B] of water pump room.



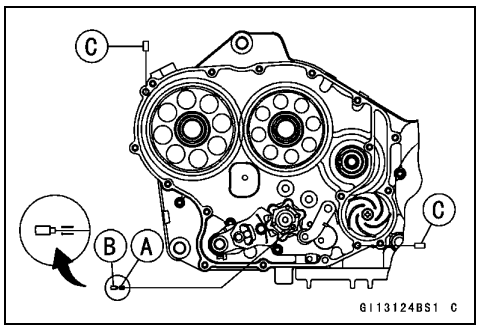
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Transmission

● Put the washer [A] on the shift shaft [B] and install the shift mechanism assy [C].



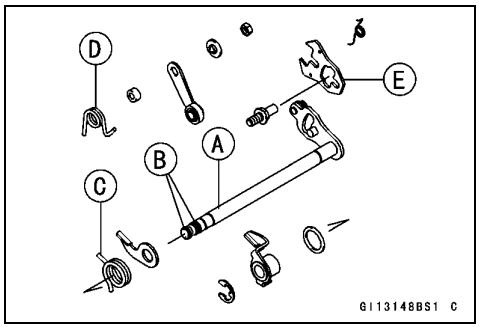
● Be sure that the spring [A] and pin [B] are in position.
● Be sure that the dowel pins [C] are in position.



● Install the inner transmission cover and outer transmission cover (see Crankcase Assembly).

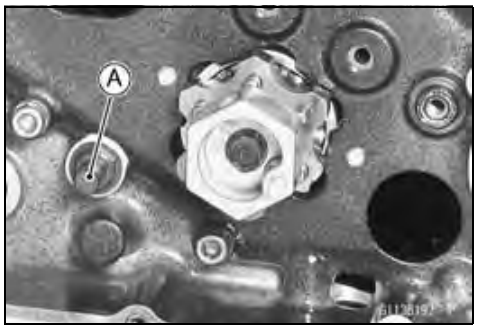
External Shift Mechanism Inspection

● 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 spring [C] [D] is damaged in any way, replace it.
★If the shift mechanism arm [E] is damaged in any way, replace the arm with the shaft.



● Check the return spring pin [A] is not loose.
★If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

Torque - Shift Shaft Return Spring Pin: 39 N·m (4.0 kgf·m, 30 ft·lb)



● Check the gear set lever, and its spring 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 cam.
★If they are badly worn or if they show any damage, replace them.

Pulley Shaft Removal

● Remove:
Outer Transmission Cover (see Crankcase Disassembly)
Inner Transmission Cover (see Crankcase Disassembly)
Pulley (Refer to the Pulley Removal in the Final Drive chapter)

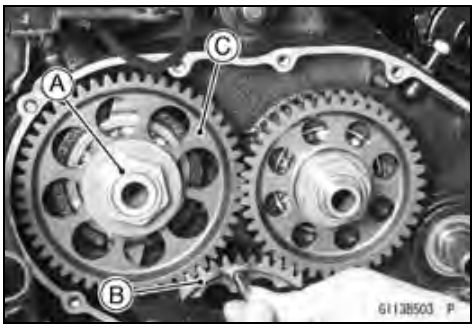
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Transmission

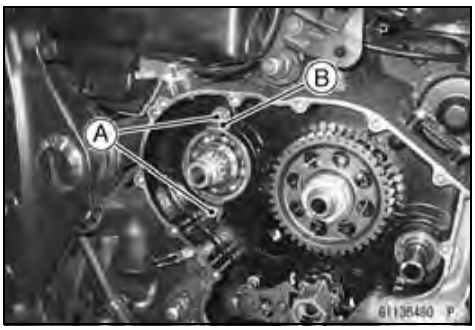
- Loosen the transfer gear nut [A] on pulley shaft.

  Special Tool - Gear Holder [B]: 57001-1574

- Remove:
  Transfer Gear Nut
  Transfer Gear [C]



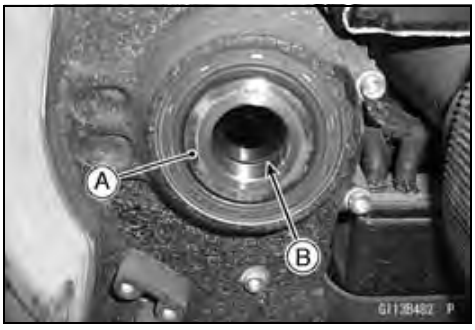
- Remove the bearing retainer screws [A] and bearing retainers at pulley shaft [B].



- Drive out the pulley shaft [A] from the pulley side (left side), then remove the pulley shaft with bearing from the right side.



- Remove the collar [A] and O-ring [B].



Pulley Shaft Installation

- Insert the pulley shaft [A] and the bearing [B] from the right side.

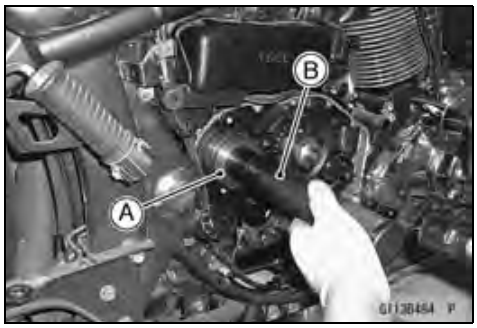


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Transmission

- Install the bearing by using a bearing driver.
- Drive the bearing into the crankcase until it bottoms out.

Special Tool - Bearing Driver [A]: 57001-1684
Steering Stem Bearing Driver [B]: 57001 -137



- Install the pulley shaft bearing retainers and screws.

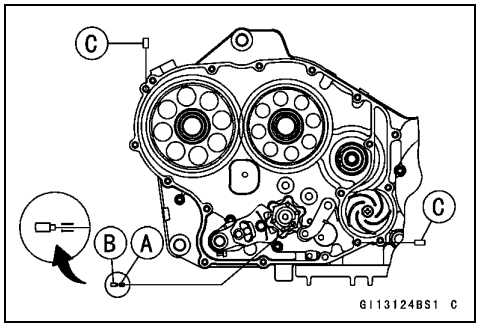
Torque - Bearing Retainer Screw: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Install the transfer gear and the washer.
- Replace the transfer gear nut with a new one.
- Apply molybdenum disulfide oil to the nut thread and seating surfaces of washer and nut.
- Tighten the transfer gear nut.

Torque - Transfer Gear Nut (Pulley Shaft): 78 N·m (8.0 kgf·m, 58 ft·lb)

Special Tool - Gear Holder: 57001-1574

- Be sure that the spring [A] and pin [B] are in position.
- Be sure that the dowel pins [C] are in position.



- Replace the inner transmission cover gasket with a new one.
- Apply silicone sealant to the grommet for the gear position switch lead in the inner transmission cover.

Sealant - Kawasaki Bond: 92104-0004 (Three Bond TB1211F)

- Install the inner transmission cover and outer transmission cover (see Crankcase Assembly).

- Connect the gear position switch lead connector.
- Apply grease the O-ring [B].
  (Replace the O-ring with a new one.)
- Install the collar [A] and O-ring [C] on the pulley shaft [B].
- Install the pulley (Refer to the Pulley Installation in the Final Drive chapter).

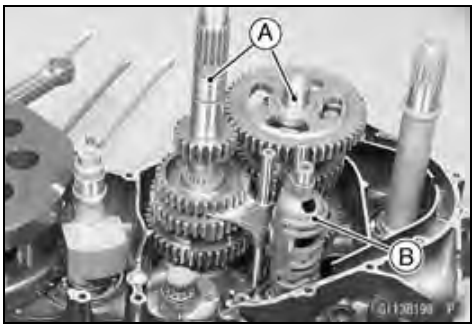


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Transmission

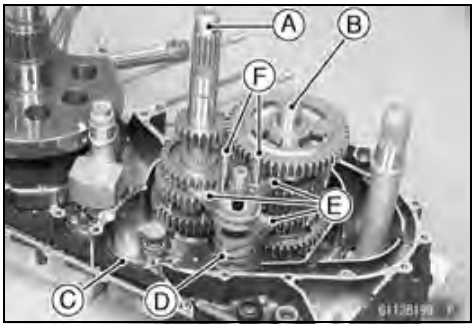
Transmission Removal

- Remove the engine (see Engine Removal/Installation chapter).
- Split the crankcase (see this chapter).
- Take out the transmission shafts [A] and shift drum [B] as a set.
- Separate the drive and output shafts, shift drum and shift forks.

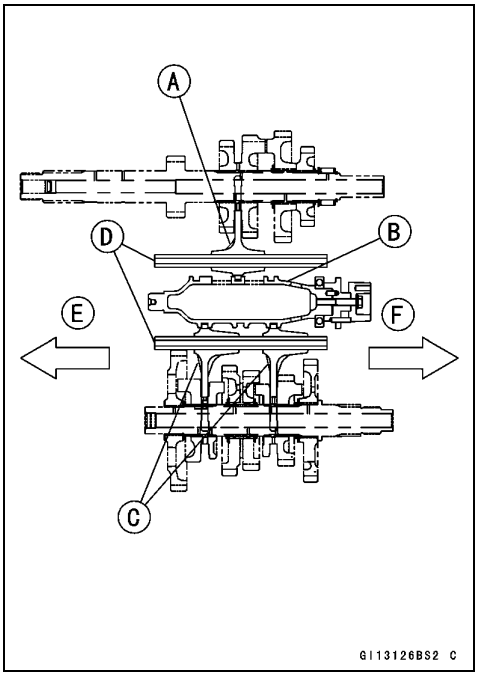


Transmission Installation

- Install the drive [A] and output [B] shaft assy into the right crankcase half [C].
- Install the shift drum [D] and shift forks [E] with the rod [F].
- Apply molybdenum disulfide oil to the sliding surfaces of the gears and bearings.

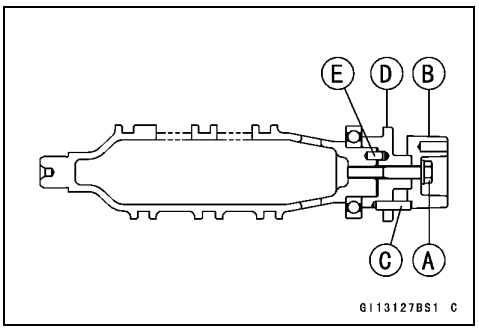


○Instal the shift forks as shown.
○Position the one with larger rib [A] on the drive shaft and place the pin in the center groove in the shift drum [B].
○The two forks [C] on the output shaft are identical.
○Install the shift rods [D], noting the groove position. The rods are identical.
E. Engine Left Side
F. Engine Right Side



Shift Drum Disassembly

- Remove the shift drum assy (see Transmission Removal).
- Remove:
Pin and Spring for Gear Position Switch
(If above parts are installed on the shift drum holder)
Shift Drum Cam Bolt [A]
Shift Drum Holder [B]
Rollers [C]
Shift Drum Cam [D]
Dowel Pin [E]



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Transmission

Shift Drum Assembly

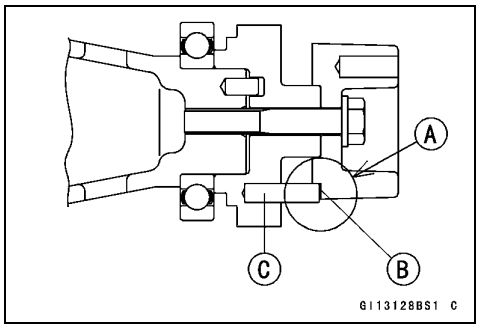
VN2000-A1

- Align [A] the recess [B] on the holder with the roller [C] on the cam.

On and after VN2000-A2/D1

- Align [A] the recess [B] on the holder with the longest roller [C] on the cam.
- Apply a non-permanent locking agent to the shift drum cam bolt, and tighten it.

Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)



Transmission Disassembly

- Remove the transmission shafts (see Transmission Removal).
- Using the circlip pliers (special tool), remove the circlips, and disassemble the transmission shaft.

Special Tool - Outside Circlip Pliers: 57001-144

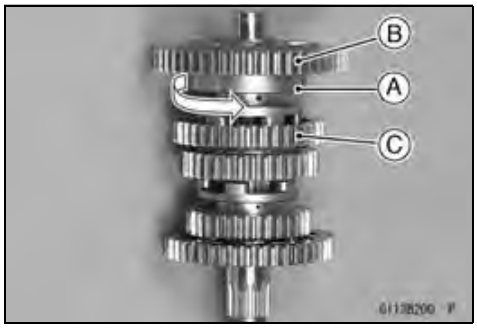
○The shiffer [A] on the output shaft has three steel balls for the positive neutral finder mechanism.

- Remove the shiffer gear as follows.

○Remove 1st gear [B].

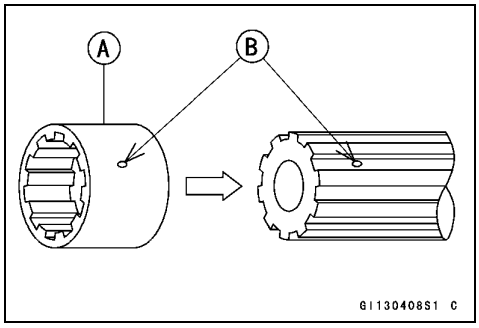
○Set the output shaft in a vertical position holding the 3rd gear [C].

○Spin the shifter quickly [C] and pull it off upward.



Transmission Assembly

- Install the gear bushing [A] on the shafts with their oil holes [B] aligned.

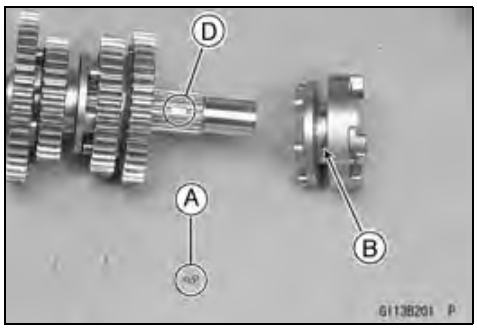


CAUTION

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 shiffer, and then install the gear on the output shaft so that the steel balls align with the recesses [D] in the shaft.

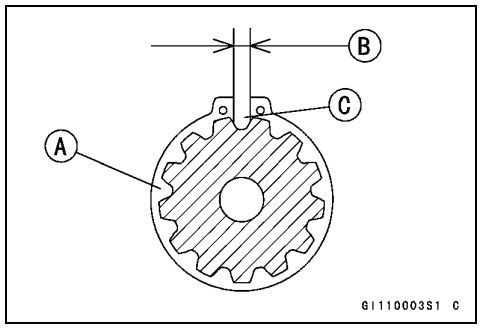
○After assembling the shifter with steel balls in place on the output shaft, check the ball-locking effect that the shifter gear does not come out of the output shaft when moving it up and down by hand.



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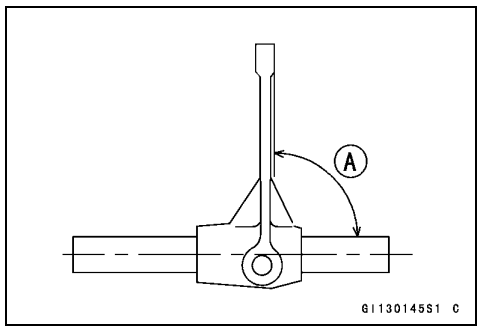
Transmission

- 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].



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.

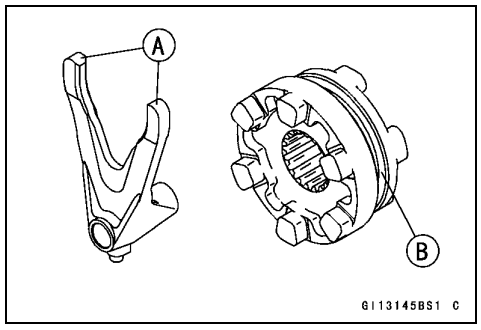
Shift Fork Ear Thickness

Standard:	**6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)**
Service Limit:	**6.8 mm (0.268 in.)**

★If the gear groove is worn over the service limit, the gear must be replaced.

Gear Groove Width

Standard:	**7.05 ~ 7.15 mm (0.278 ~ 0.281 in.)**
Service Limit:	**7.3 mm (0.287 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.

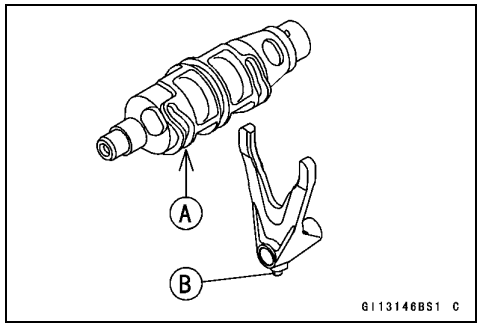
Shift Fork Guide Pin Diameter

Standard:	**5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)**
Service Limit:	**5.8 mm (0.228 in.)**

★If any shift drum groove is worn over the service limit, the drum must be replaced.

Shift Drum Groove Width

Standard:	**6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)**
Service Limit:	**6.3 mm (0.248 in.)**

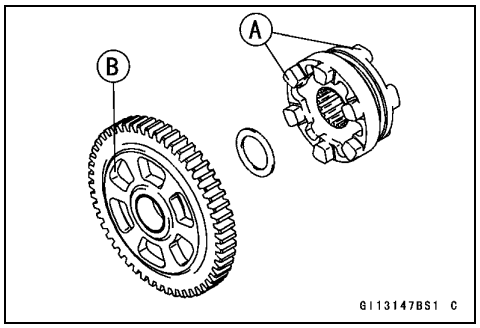


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Transmission

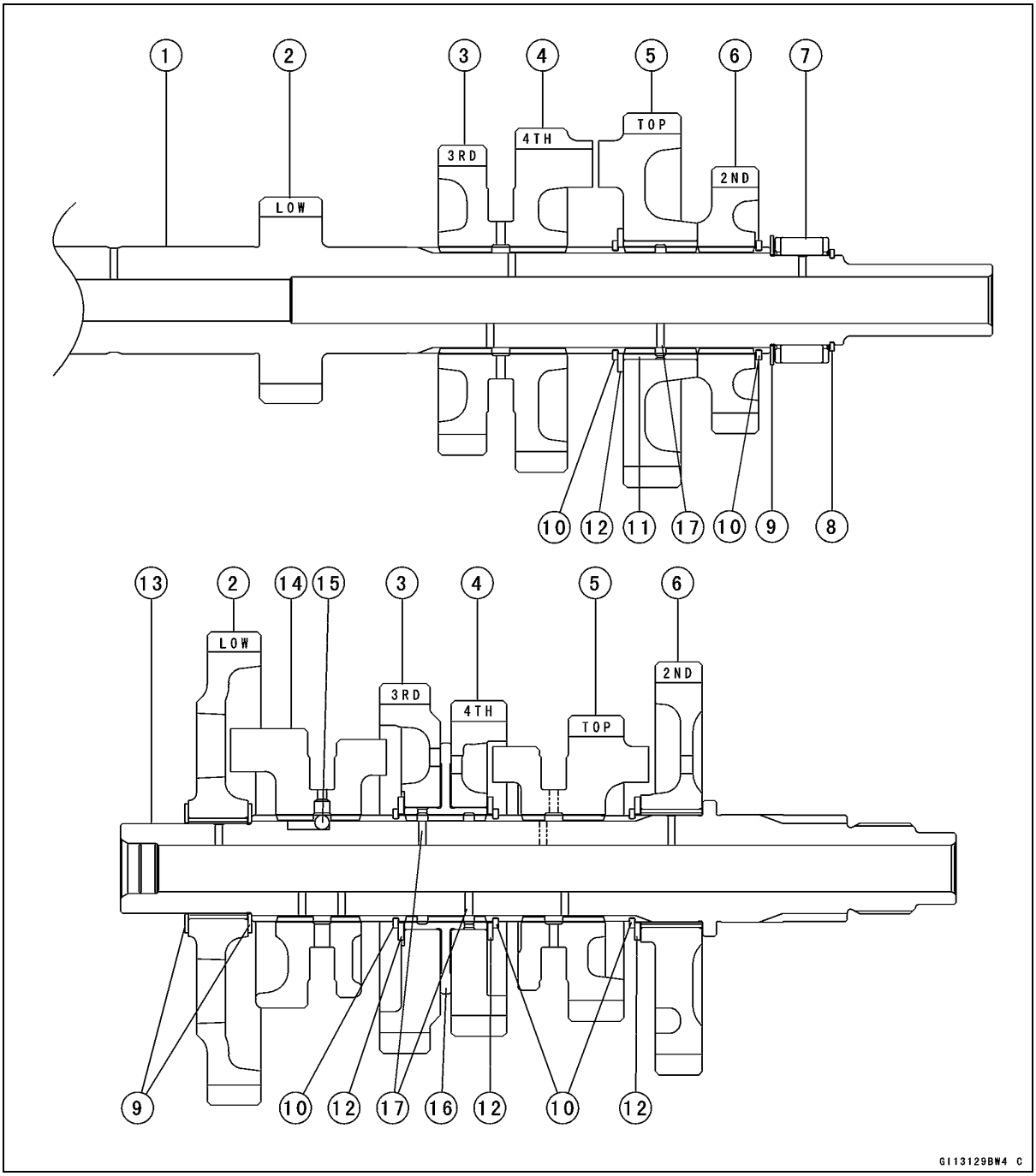
Gear Dog and Gear Dog Hole Damage

- 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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Transmission



1. Drive Shaft
2. Low (1st) Gear
3. 3rd Gear
4. 4th Gear
5. Top (5th) Gear
6. 2nd Gear
7. Needle Bearing
8. Circlip (23.2 × 27.9 × t1.2)
9. Three Thrust Washers (25.5 × 36 × t1)
10. Five Circlips (26.9 × 32.2 × t1.5)
11. Bushing (Top Gear)
12. Four Splined Washers (30.3 × 40 × t1.5)
13. Output Shaft
14. Shifter
15. Steel Balls
16. Bushing (3rd & 4th Gears)
17. Align bushing oil holes with the shaft 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

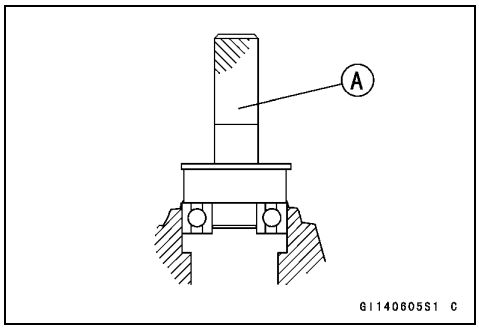
○*In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max., and tapping the bearing in or out.*

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

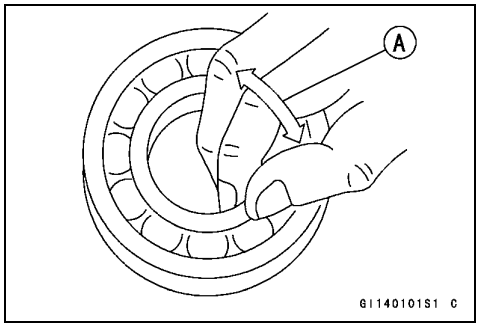
Do not remove the ball bearings for inspection. Removal may damage them.

● 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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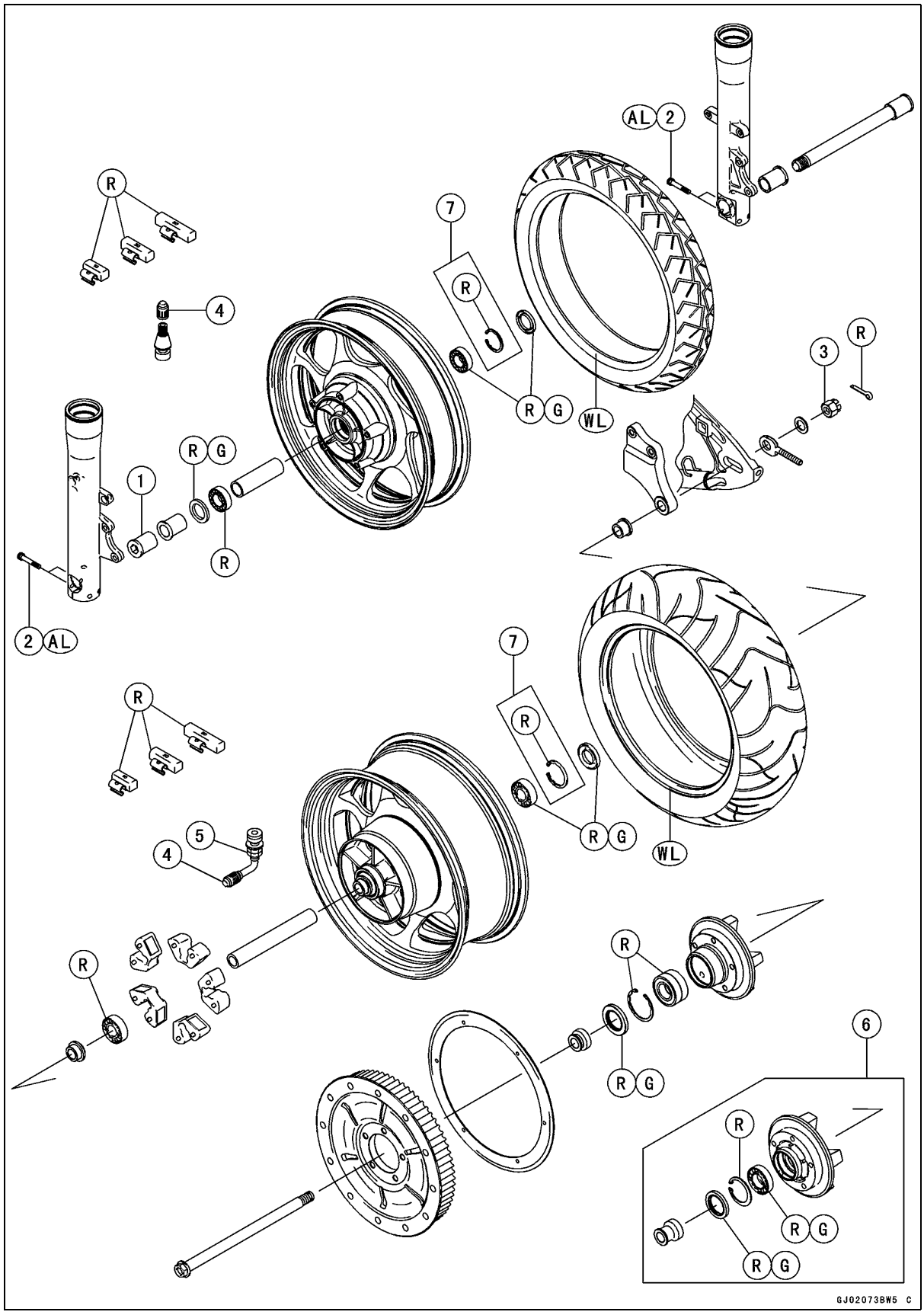
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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Nut	127	13	94	
2	Front Axle Clamp Bolts	25	2.5	18	AL
3	Rear Axle Nut	108	11	80	
4	Valve Caps	0.15	0.015	1.3 in·lb	
5	Valve Nuts	1.5	0.15	13 in·lb	

6. VN2000-A1 (Befor Frame No. 010360)
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
G: Apply grease (VN2000-A1 only)
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

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Specifications

Item	Standard	Service Limit
Wheels (Rims)		
Rim Size:		
Front	16 × 3.50	
Rear	16 × 6.00	
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 1.0 mm (0.04 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 1.0 mm (0.04 in.)
Axle Runout/100 mm	TIR 0.05 mm (0.002 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.35 oz.) or less	– – –
Balance Weights:		
Usable Numbers	4 pieces or less	– – –
Total Weights	90 g (3.17 oz.) or less	– – –
Tires		
Air Pressure (When Cold):		
Front	Up to 186 kg (410 lb) load: 250 kPa (2.5 kg/cm², 36 psi)	– – –
Rear	Up to 186 kg (410 lb) load: 290 kPa (3.0 kg/cm², 42 psi)	– – –
Tread Depth:		
Front		
(STD)	4.3 mm (0.17 in.)	
(Replacement):		1 mm (0.04 in.) (DE, AT, CH) 1.6 mm (0.063 in.)
BRIDGESTONE	4.3 mm (0.17 in.)	
DUNLOP	4.4 mm (0.17 in.)	
Rear	7.0 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 BATTLAX BT020F	150/80R16M/C 71V
Rear	BRIDGESTONE BATTLAX BT020R	200/60R16M/C 79V
Replacement Tires:	Make, Type	Size
Front	BRIDGESTONE BATTLAX BT020F (WHITE WALL)	150/80R16M/C 71V
	DUNLOP D251F	
Rear	BRIDGESTONE BATTLAX BT020R (WHITE WALL)	200/60R16M/C 79V
	DUNLOP D251	

⚠ WARNING

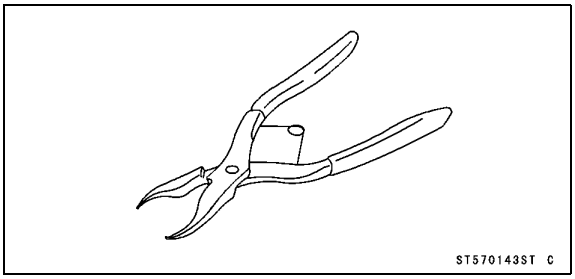
Use the same manufacturer's tires on both front and rear wheels.

AT: Austria
CH: Switzerland
DE: Germany

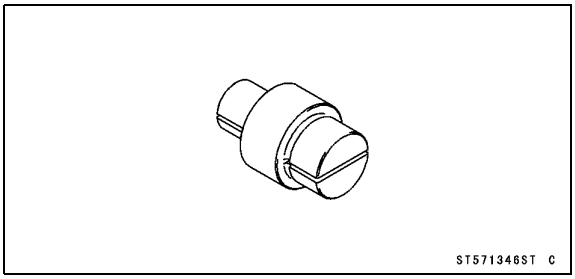
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Special Tools

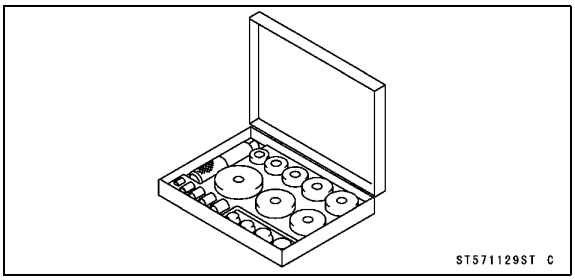
Inside Circlip Pliers:
57001-143



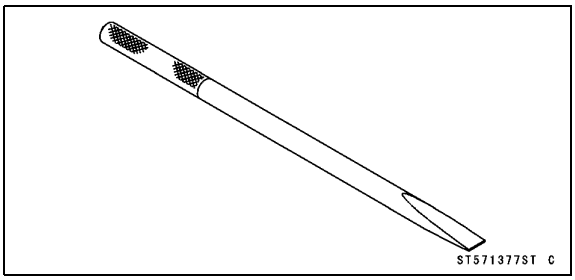
Bearing Remover Head, ϕ25 × ϕ28:
57001-1346



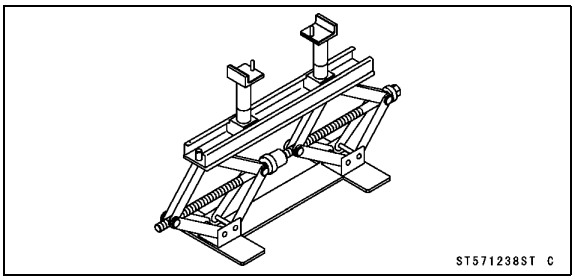
Bearing Driver Set:
57001-1129



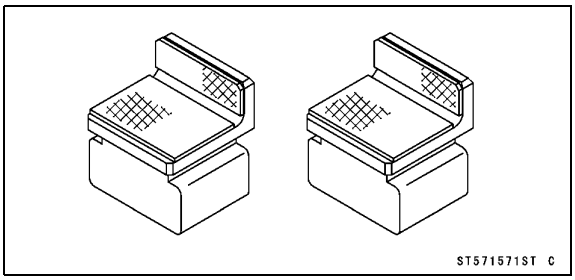
Bearing Remover Shaft, ϕ13:
57001-1377



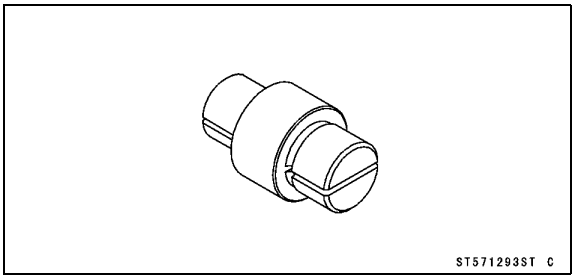
Jack:
57001-1238



Jack Attachment:
57001-1571



Bearing Remover Head, ϕ20 × ϕ22:
57001-1293

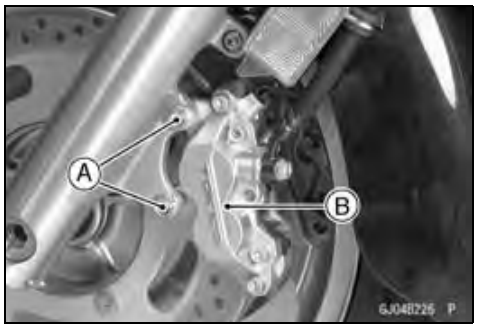


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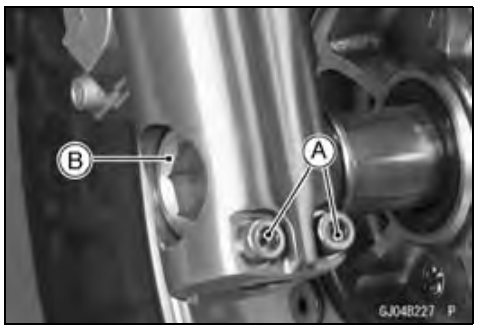
Wheels (Rims)

Front Wheel Removal

● Unscrew the front brake caliper mounting bolts [A] and remove the brake calipers [B] with the hose installed.

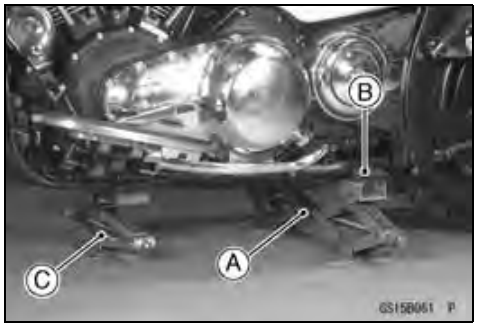


● Loosen:
Front Axle Clamp Bolts (Right Side Only) [A]
Front Axle [B]



○Using the special tool jack [A] and the jack attachment [B] under the frame pipe, and a commercially available jack [C] under the engine, lift the front wheel off the ground until the rear wheel touches the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571



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 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.



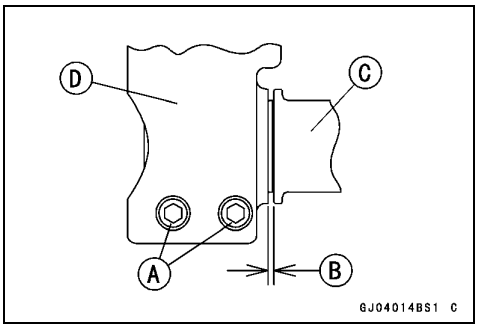
- Insert the axle from the right side of the wheel.
- Tighten the axle.

Torque - Front Axle Nut: 127 N·m (13 kgf·m, 94 ft·lb)

- Before tightening the clamp bolts on the right fork leg, pump the forks down and up [A] 4 or 5 times to allow the right fork leg to find a neutral position on the front axle.

NOTE

○*Do not apply the front brake during this process to stop the motorcycle from rolling forward. Put a block [B] in front of the wheel to stop it from moving.*



- Tighten the axle clamp bolts [A] to the specified torque.

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

NOTE

○*Tighten the two 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: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Check the front brake effectiveness.

⚠ WARNING

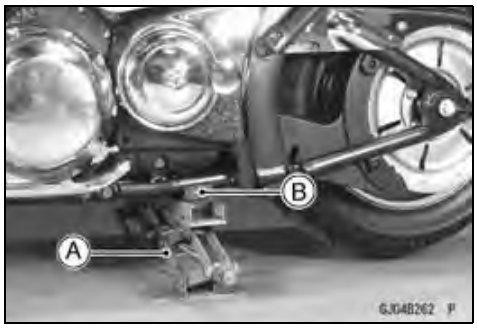
Do not attempt to ride the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brakes will not function on the first application of the lever if this is not done.

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Wheels (Rims)

Rear Wheel Removal

- Remove:
  Muffler (see Engine Top End chapter)
  Rear Fender (see Frame chapter)
  Upper Belt Cover (see Frame chapter)
- Using the jack [A] and jack attachment [B] under the frame pipe, lift the rear wheel off the ground.



CAUTION

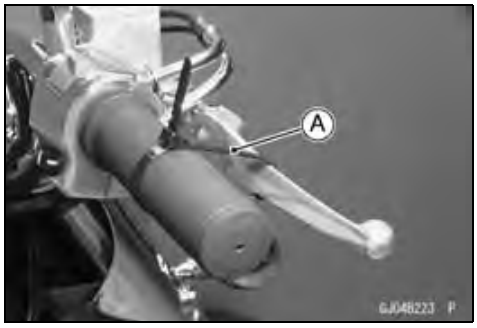
Be sure to put the front wheel ON the ground when removing the rear wheel, or the motorcycle may fall over. The motorcycle could be damaged.

⚠ 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.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571

- 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.

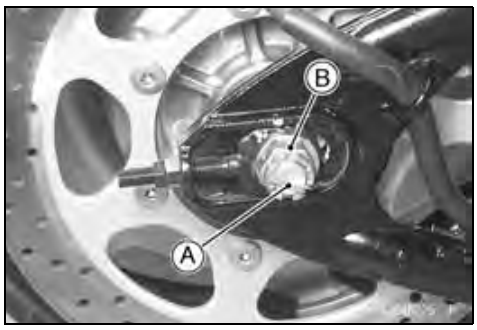
⚠ WARNING

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:
  Caliper Mounting Bolts [A]
  Caliper [B]



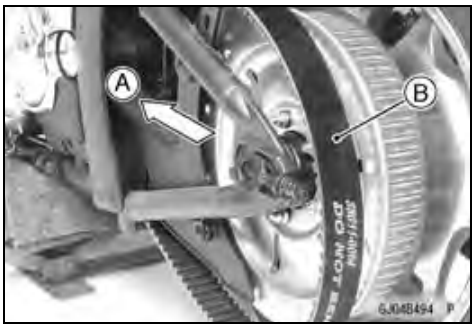
- Remove:
  Axle Nut Cotter Pin [A]
  Axle Nut [B]



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Wheels (Rims)

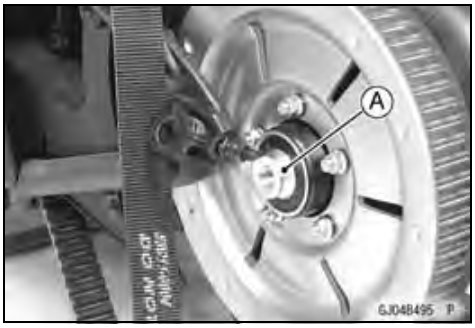
● Pull out the axle, and move the rear wheel toward the front [A] to disengage the wheel from the drive belt [B].
● Move the rear wheel back and remove it.



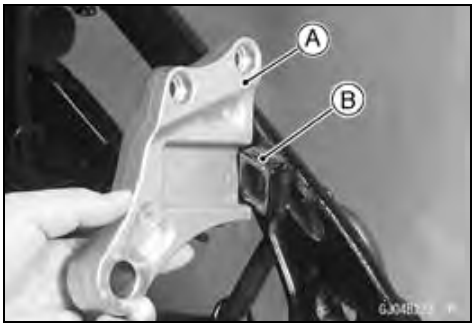
CAUTION

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.
● Insert the collars [A] on both sides of the hub.

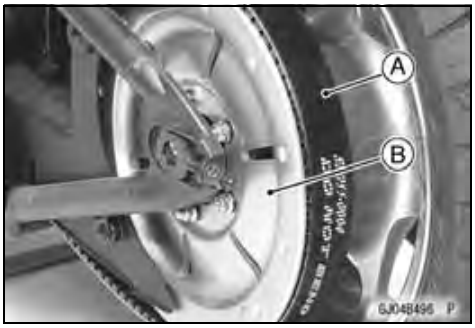


● Install the caliper bracket [A] onto the swingarm stop [B].



● Engage the drive belt [A] with the wheel coupling [B].
● Insert the axle from the left side of the rear wheel.
● Tighten:

Torque - Rear Axle Nut: 108 N·m (11 kgf·m, 80 ft·lb)
Rear Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



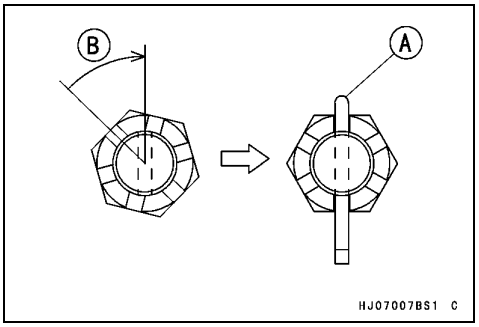
⚠ WARNING

If the axle nut is not securely tightened, an unsafe riding condition may result.

● Insert a new cotter pin [A].

NOTE

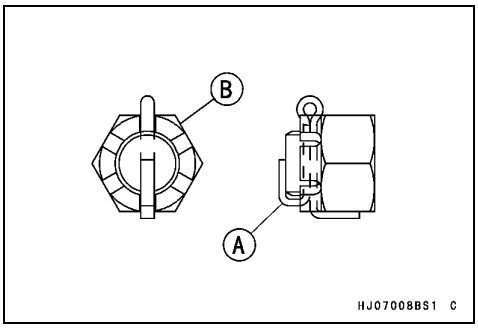
○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30 degree.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*



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Wheels (Rims)

● Bend the cotter pin [A] over the nut as shown.



● Visually inspect the tire for stuck any grease.
★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.

Wheel Inspection

● Raise the front or rear wheel off the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571

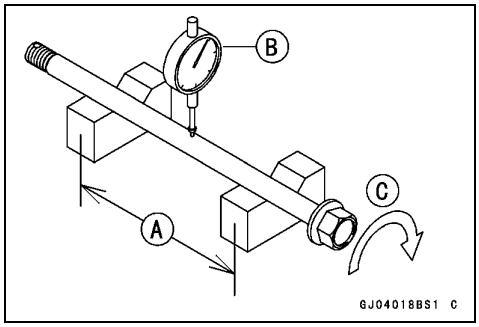


● Spin [A] the wheel lightly, and check for roughness or binding.
★If roughness or binding is found, replace the hub bearings.
● Inspect the roughness of the wheel bearing by pushing and pulling the wheel.
★If roughness is found, replace the hub bearing.
● Inspect the wheel for small cracks, dents, bending, or warp.
★If there is any damage to the wheel, replace the wheel.

Rim Inspection

● Refer to the Rim Runout Inspection in the Periodic Maintenance chapter.

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 (3.94 in.)
Standard: TIR 0.05 mm (0.002 in.) or less
Service Limit: TIR 0.2 mm (0.008 in.)

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Wheels (Rims)

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

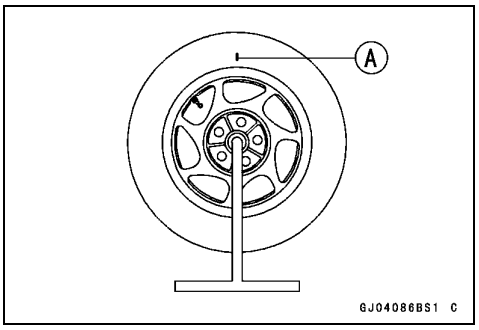
● Remove the wheel.

● 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.

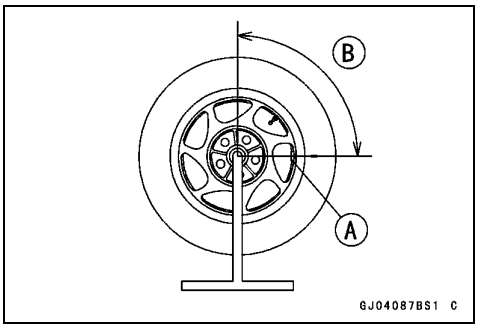


Balance Adjustment

★If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.

⚠ 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.

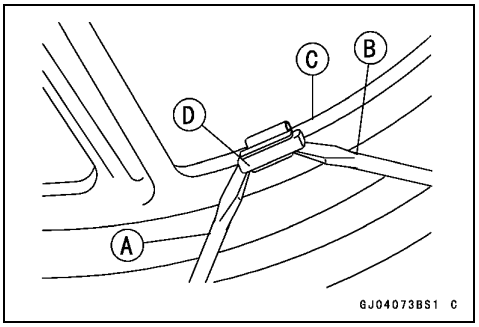
● Repeat the entire procedure as many times as necessary to achieve correct wheel balance.

● Permanently install the balance weight.

Balance Weight Removal

● Insert a standard screwdrivers [A] [B] between the rib [C] and the weight [D] as shown.

● Pry the weight two screwdrivers and remove the balance weight.



CAUTION

When removing the balance weight, do not touch the brake disc. The disc could be damaged. Do not tap the screwdrivers. The rim could be damaged.

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Wheels (Rims)

Balance Weight Installation

● Check if the weight portion has any play on the clip.
★If it does, discard it.

⚠ WARNING

If the balance weight has any play on the rim, the clip of the weight has been stretched. Replace the loose balance weight.
Do not reuse used balance weight.
Unbalanced wheels can create an unsafe riding condition.

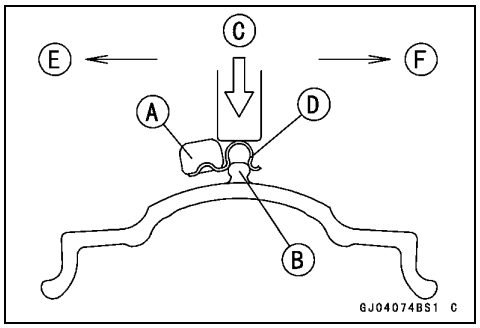
Balance Weight

Part Number	Weight
41075-0007	10 g (0.35 oz.)
41075-0008	20 g (0.71 oz.)
41075-0009	30 g (1.06 oz.)

NOTE

○*Balance weights are available from Kawasaki dealers in 10, 20, and 30 rams (0.35, 0.71, and 1.06 oz.) sizes. An imbalance of less than 10 rams (0.35 oz.) will not usually affect running stability.*
○*Do not use four or more balance weight (more than 90 gram, 3.17 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.*

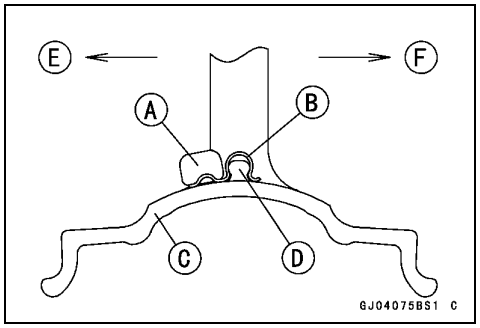
○Slip the balance weight [A] on the rib [B] by pushing or lightly hammering [C] the clip [D].
Left Side [E]
Right Side [F]



CAUTION

When installing the balance weight, do not touch the brake disc. The disc could be damaged.

● Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].
Left Side [E]
Right Side [F]



⚠ WARNING

If the balance weight has any play on the rim, the clip of the weight has been stretched. Replace the loose balance weight.
Do not reuse balance weight.
Unbalanced wheels can create an unsafe riding condition.

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Tires

Air Pressure Inspection/Adjustment

● Refer to Tire Inspection in the Periodic Maintenance chapter.

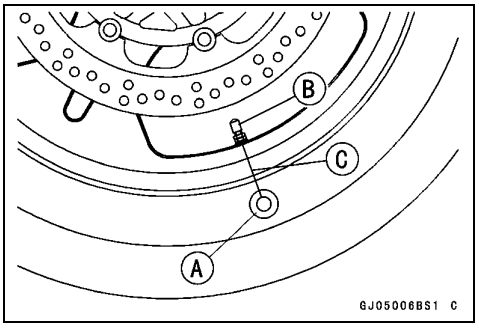
Tire Inspection

● Refer to Tire Inspection in the Periodic Maintenance chapter.

Tire Removal

● Remove the following.
Wheel (see Front Wheel Removal, Rear Wheel Removal)
Brake Disc (see Brakes chapter)
Valve Core (let out the air)

● To maintain wheel balance, mark the air valve position on the tire with chalk so that the tire can be reinstalled in the same position.
Chalk Mark or Yellow Mark [A]
Air Valve [B]
Align [C]



● 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

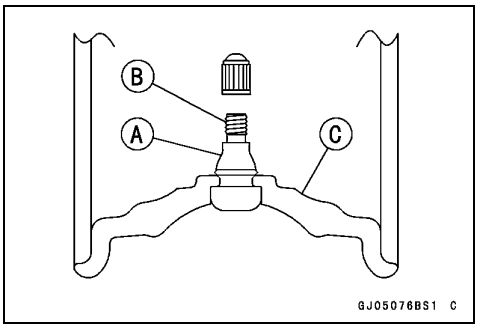
Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

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Tires

● Install a new air valve in the front wheel rim.

○Remove the valve cap, lubrication the stem seal [A] with a soap and water solution or rubber lubricant, and pull the valve stem [B] through the rim [C] from the inside out until it snaps into place.

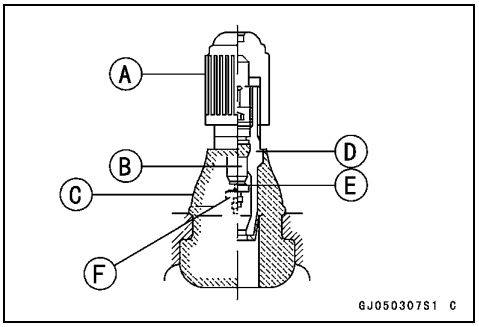


CAUTION

Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.

○The air valve is shown in the figure.

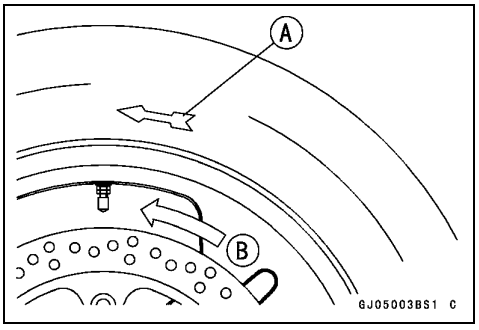
Valve Cap [A]
Valve Core [B]
Stem Seal [C]
Valve Stem [D]
Valve Seat [E]
Valve Opened [F]



● Check the fire rotation mark on the front and rear tires and install them on the rim accordingly.

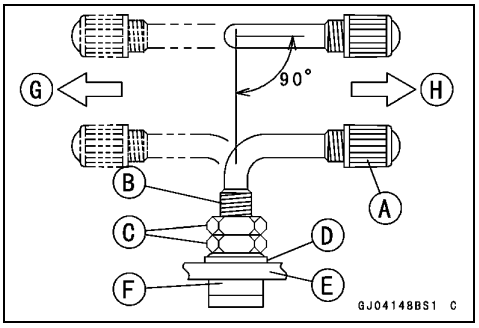
○Position the air valve to the left side for front tire.

Tire Rotation Mark [A]
Rotation Direction [B]



● Install a new air valve in the rear wheel rim.

Valve Cap [A]
Valve Stem [B]
Valve Nuts [C]
Valve Washer [D]
Rim [E]
Valve Grommet [F]
Coupling Damper Side [G] (VN2000-A1)
Right Side [H]



○Remove the valve cap, valve nuts, valve washer and insert the valve stem through the rim from the inside out.

Torque - Valve Nuts: 1.5 N·m (0.15 kgf·m, 13 in·lb)
Valve Cap: 0.15 N·m (0.015 kgf·m, 1.3 in·lb)

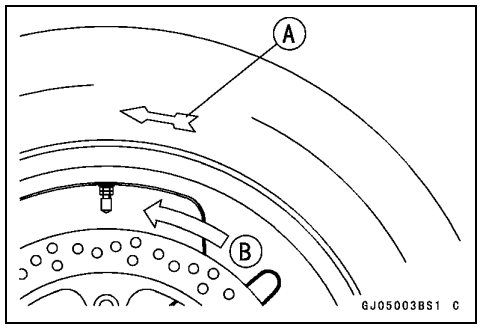
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Tires

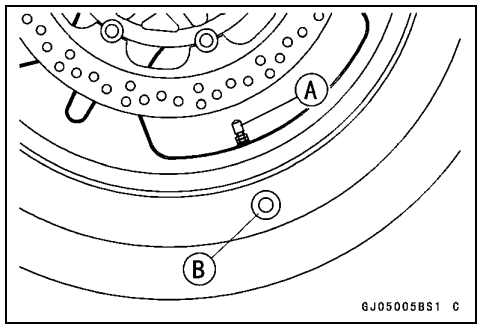
● Apply a soap and water solution, or rubber lubricant to the rim flange and tire beads.

CAUTION

Never lubricate with mineral oil (engine oil) or gasoline because they will cause deterioration of the tire.



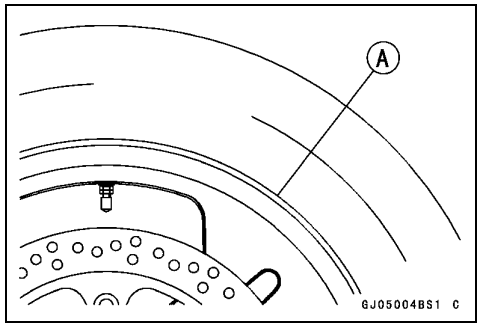
● Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.
Tire Rotation Mark [A]
Rotation Direction [B]



● Position the tire on the rim so that the air valve [A] is at the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
● 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 kg/cm², 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.



● Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.
★If the rim flanges and tire sidewall 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 Inspection).

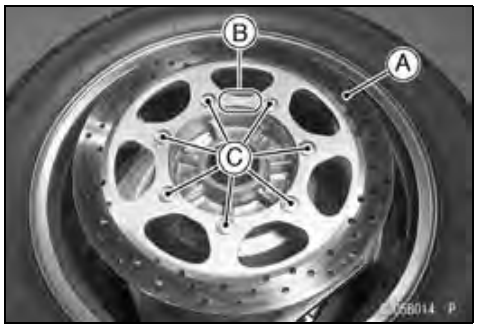
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Tires

- 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 - 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 mi) is necessary to establish normal tire traction. During break-in, avoid sudden and maximum braking and acceleration, and hard cornering.

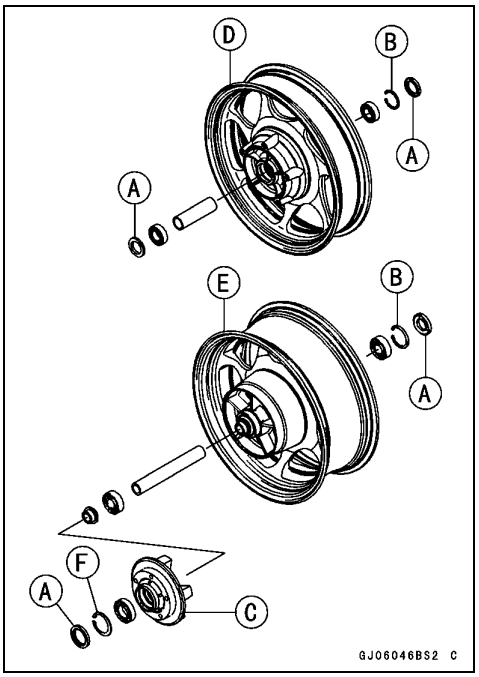
Tire Repair

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)

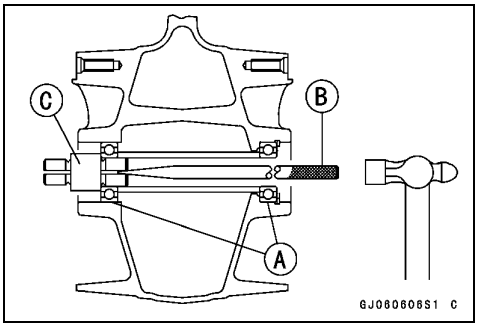
Hub Bearings Removal



- Remove the wheel, and take out the following.
  Collars
  Grease Seals [A]
  Circlips [B] VN2000A6F (Before Frame No. 010360)
  Coupling [C]
  Front Hub [D]
  Rear Hub [E]
  Circlip [F]

Special Tool - Inside Circlip Pliers: 57001-143

- Use the bearing remover to remove the hub bearings [A].

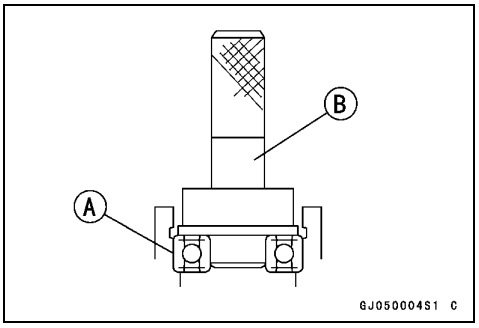


CAUTION

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 × ϕ22:57001 -1293 (for Rear Hub)

Hub Bearings Installation



- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.

NOTE

○*Install the bearings so that the marked side faces out.*

- Install the bearings by using a bearing driver.
- First, press each right bearing [A] in until it bottoms out.

Special Tool - Bearing Driver Set [C]: 57001-1129 [B]

- Next, install the following:
  New Circlip VN2000A6F (Before Frame No. 010360)
  Distance Collar
  Left Bearing

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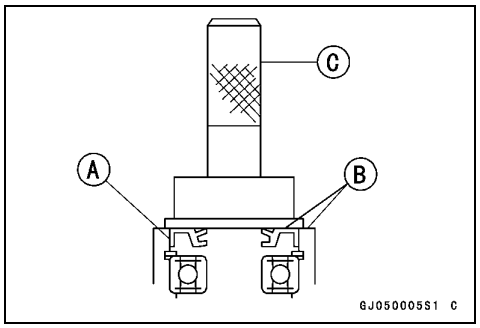
Hub Bearings (Wheel Bearings)

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

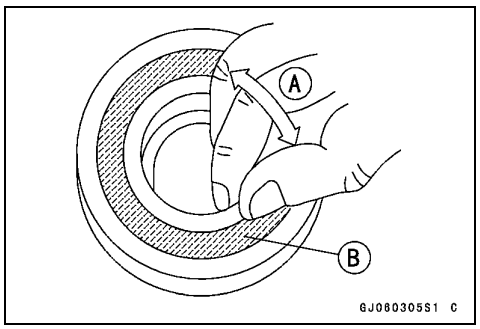


Hub Bearings Inspection

○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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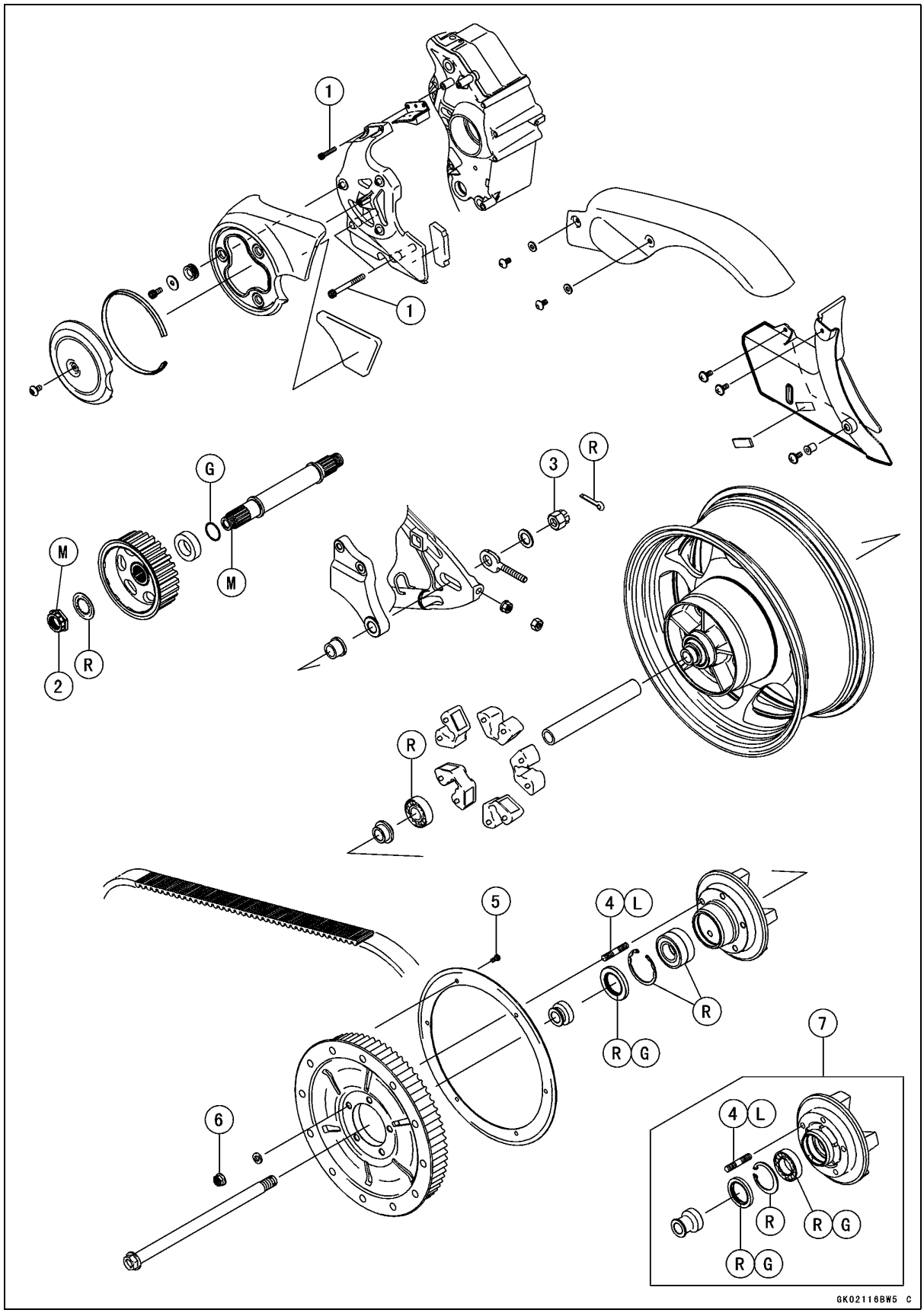
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Exploded View



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Exploded View

Front Gear Case

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Pulley Inside Cover Bolts	12	1.2	104 in·lb	
2	Pulley Mounting Nut	177	18	130	MG
3	Rear Axle Nut	108	11	80	
4	Rear Coupling Stud Bolts	44	4.5	33	L
5	Ring Screws	6.9	0.70	61 in·lb	
6	Rear Pulley Mounting Nuts	69	7.0	51	

7. VN2000-A1
G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum grease.
R: Replacement Parts

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11-4 FINAL DRIVE

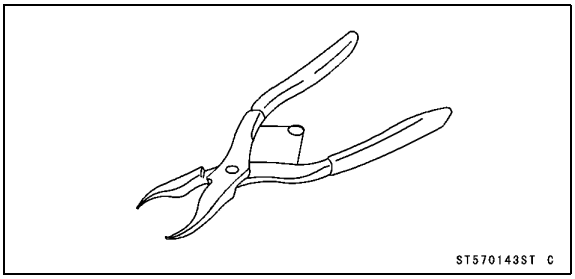
Specifications

Item	Standard	Service Limit
Drive Belt		
Make	GATES, 133T	– – –
Belt Deflection (44.1 N, 4.5 kgf force)	2.5 ~ 4.0 mm (0.10 ~ 0.16 in.)	– – –
(When installing new belt or engine is remounted)	2.5 mm (0.10 in.)	– – –

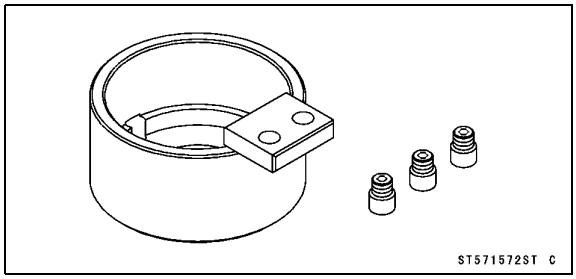
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Special Tools

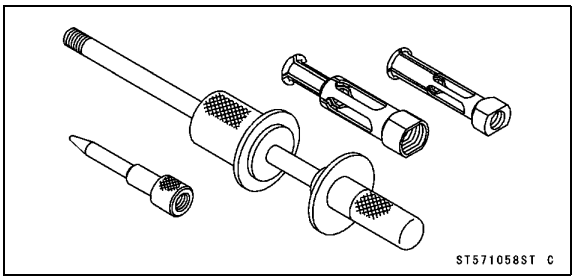
Inside Circlip Pliers:
57001-143



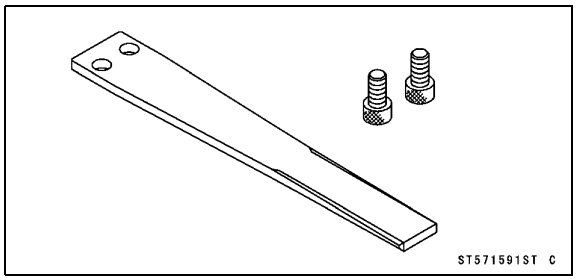
Pulley Holder:
57001-1572



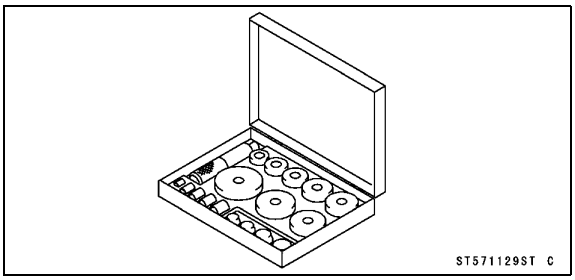
Oil Seal & Bearing Remover:
57001-1058



Grip:
57001-1591



Bearing Driver Set:
57001-1129



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Drive Belt

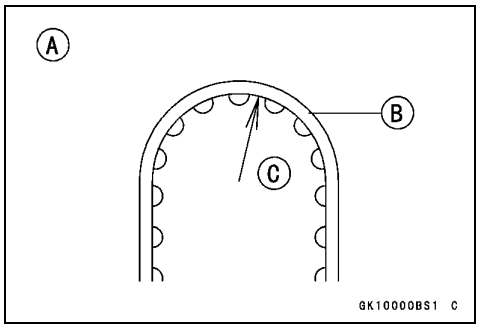
The drive belt must be checked, and adjusted in accordance with the Periodic Maintenance Chart for safety and to prevent excessive wear. If the belt becomes badly worn or maladjusted-either too loose or too tight-the belt could jump off the pulley or break.

Belt Handling Precautions

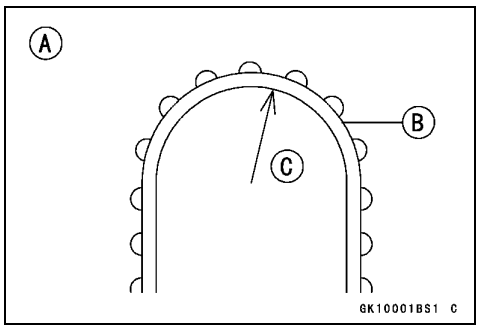
CAUTION
Do not adhere battery electrolyte, thinner or other solvents to the belt. Immediately wash away any solvent that spills on the belt.

- ○Drive belt is extremely durable and give long life in a properly designed drive. However, improper handling of the belt before or during installation can result in dramatically shortened service life.
- ○The belt's tensile cords are designed to carry large loads in tension but not compression.
- ○Compression causes damage to the tensile cords of the belt and can also lead to adhesion problems.
- ○Handling situations that can cause compression in tensile cord include aggressive bending and twisting.

- ● When assembly, handling and storage, the forward bending [A] radius of the drive belt [B] shall not be smaller than 63.5 mm (2.5 in.) [C].



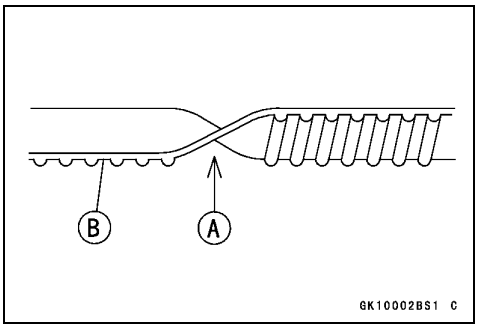
- ● When assembly, handling and storage, the back bending [A] radius of the drive belt [B] shall not be smaller than 127 mm (5.0 in.) [C].



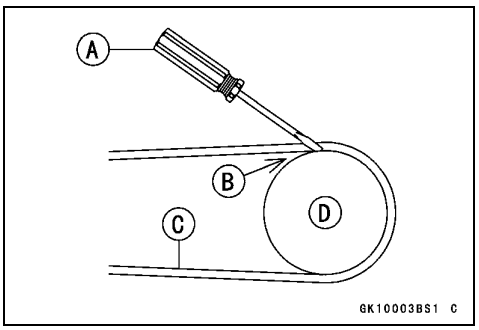
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Drive Belt

● Do not twist [A] the drive belt [B] as shown.
○This includes coiling the belt to make it smaller for packaging.



● Do not use tools [A] to pry [B] the drive belt [C] onto the application.
○Bring the rear pulley [D] front side so that the belt can be easily put on by hand.



Drive Belt Wear Inspection

● Refer to the Belr Wear Inspection in the Periodic Maintenance chapter.

Drive Belt Deflection Inspection

● Refer to the Belt Deflection Inspection in the Periodic Maintenance chapter.

Drive Belt Deflection Adjustment

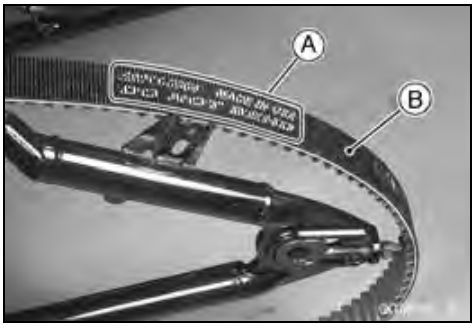
● Refer to the Belt Deflection Adjustment in the Periodic Maintenance chapter.

Drive Belt Removal

● Remove:
Rear Wheel (see Wheels/Tires chapter)
Engine Pulley (see Engine Pulley Removal)
Swingarm (see Suspension chapter)

NOTE

○*Before removing, observe the direction the belt's printed information [A] (such as manufacture's name) is facing so that it may be reinstalled on the pulleys to rotate in the same direction as originally installed.*



● Remove the drive belt [B].

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Drive Belt

Drive Belt Installation

- Installation is reverse of removal. Note the following

NOTE

○*Be sure the printed information faces the same direction so the belt rotates in the same direction as originally instead. When installing a new belt, install it so the printed information can be read from left side of the motorcycle.*

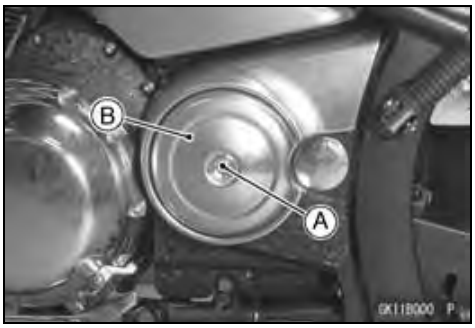
- Tighten the swingarm pivot shaft nut to the specified torque (see Exploded View in Suspension chapter).
- Adjust the drive belt deflection (see Drive Belt Deflection Adjustment in Periodic Maintenance chapter).

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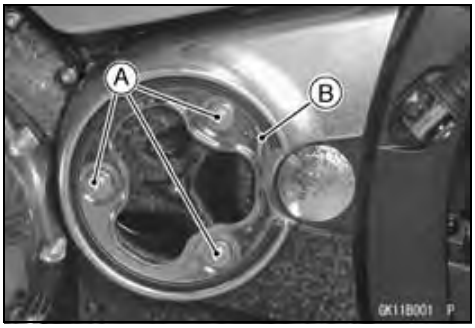
Pulley and Coupling

Pulley Cover Removal

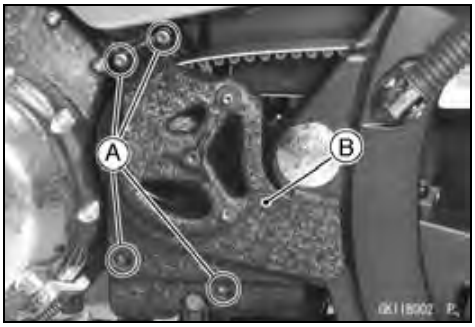
● Remove:
Bolt [A]
Outside Cover [B]



● Remove:
Bolts [A], Washers and Dampers
Middle Cover [B]

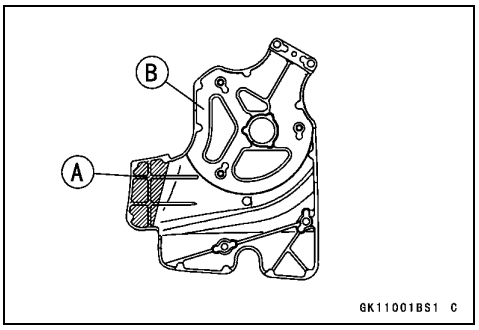


● Remove:
Bolts [A]
Inside Cover [B] and Guide



Pulley Cover Installation

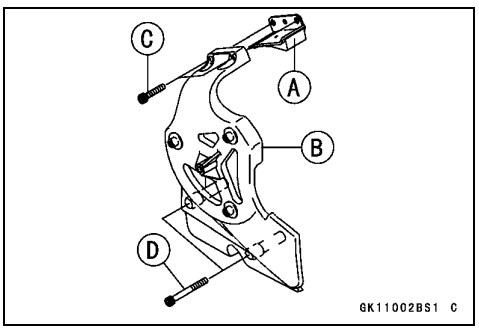
● Confirm the position of the damper [A] in the inside cover [B] as shown.
○Face the thin side of the damper to outside.



● Install:
Guide [A]
Inside Cover [B]
● Tighten:

Torque - Pulley Inside Cover Bolts [C] [D]: 12 N·m (1.2 kgf·m, 104 in·lb)

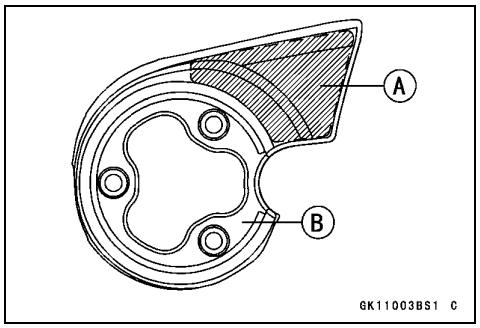
30 mm (1.2 in.) [C]
55 mm (2.2 in.) [D]



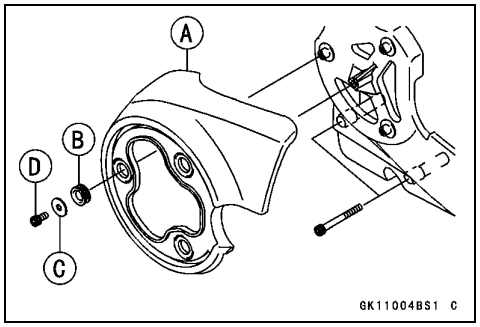
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Pulley and Coupling

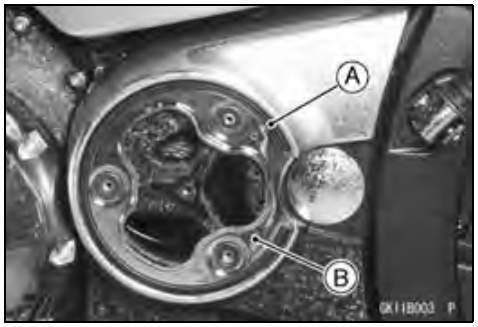
● Confirm the position of the damper [A] in the middle cover [B] as shown.



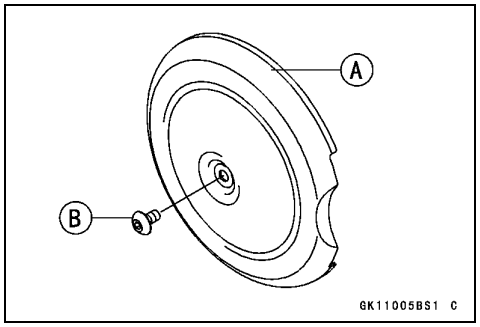
● Install:
Middle Cover [A]
Dampers [B]
Washers [C]
Bolts [D]



● Confirm the position of the damper [A] in the middle cover [B] as shown.
○Face the thin side of the damper to outside.



● Install:
Outside Cover [A]
Bolt [B]

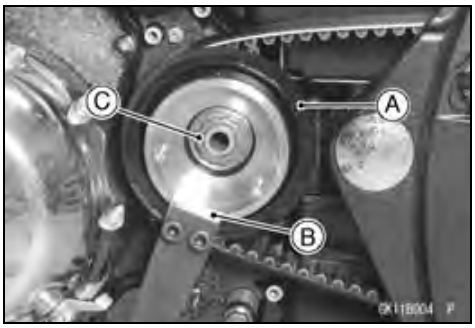


Pulley Removal

● Remove the pulley cover (see Engine Pulley Cover Removal).
● Loosen the belt fully (see Drive Belt Tension Adjustment in Periodic Maintenance chapter).
● Flatten out the bent washer.

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Pulley and Coupling



- Hold the pulley [A] steady with the pulley holder [B], and remove the pulley mounting nut [C],

  Special Tools - Pulley Holder: 57001-1572
  Grip: 57001-1591

- Pull out the pulley from the pulley shaft.

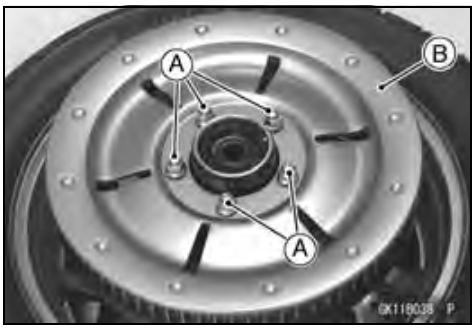
Pulley Installation

- Installation is reverse of removal. Note the following.
- Fit the grooves inside the pulley onto the splines on the pulley shaft.
- Replace the washer with a new one.
- Apply molybdenum grease to the threads of the pulley shaft and seating surface of the pulley mounting nut.
- Tighten:

  Torque - Pulley Mounting Nut: 177 N·m (18 kgf·m, 130 ft·lb)

  Special Tools - Pulley Holder: 57001-1572
  Grip: 57001-1591

- Bend the one side of the washer over the nut.
- Adjust the drive belt deflection (see Drive Belt Deflection Adjustment in Periodic Maintenance chapter).



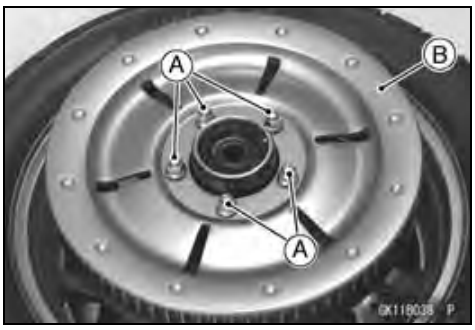
Rear Pulley Removal

- Remove:
  Rear Wheel (see Wheels/Tires chapter)
  Rear Pulley Mounting Nuts [A] and Washers
  Rear Pulley [B]

Rear Pulley Installation

- Install:
  Rear Pulley
  Washers and Rear Pulley Mounting Nuts
- Tighten:

  Torque - Rear Pulley Mounting Nuts: 69 N·m (7.0 kgf·m, 51 ft·lb)



Rear Pulley Coupling Removal

- Remove:
  Rear Wheel (see Wheels/Tires chapter)
- Loosen (lightly):
  Rear Pulley Mounting Nuts [A]
- Remove the rear pulley [B] with the rear pulley coupling from the wheel.
- Remove:
  Rear Pulley Mounting Nuts and Washers
- Remove the rear pulley from the rear pulley coupling.

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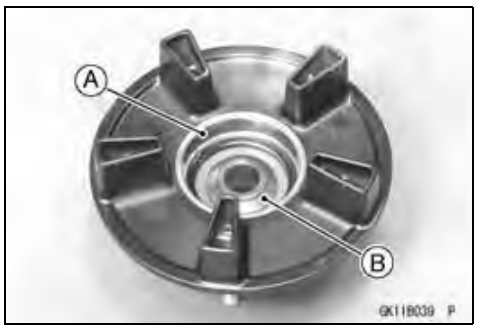
Pulley and Coupling

Rear Pulley Coupling Installation

● Install the coupling dampers [A] so that the projections [B] face to the outside.

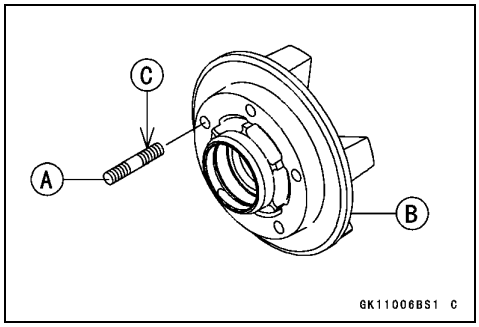


● Apply grease to the inside [A] of the coupling bushing.
● Install:
Sleeve [B]
● Install the coupling on the coupling dampers.



● When installing the stud bolt [A] in the coupling [B], note the following.
● Apply a non-permanent locking agent to the threads [C] of the coupling side.
● Tighten:

Torque - Rear Coupling Stud Bolts: 44 N·m (4.5 kgf·m, 33 ft·lb)



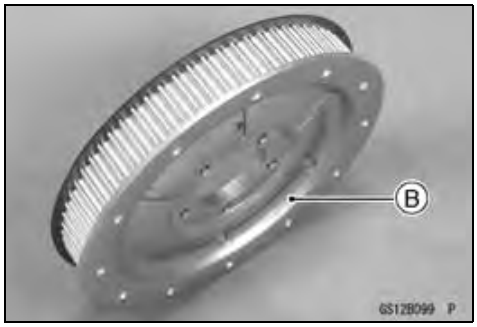
Pulley Wear Inspection

● Visually inspect the pulley and rear pulley teeth for wear and damage.
★ If the teeth are worn, damage, or loss of the chrome plating exists, replace the pulley, and inspect the drive belt wear (see Drive Belt Wear Inspection in Periodic Maintenance chapter).
Pulley [A]
Rear Pulley [B]



NOTE

○ *If the pulley requires replacement, the belt is probably worn also. Whenever replacing the pulley, inspect the belt.*



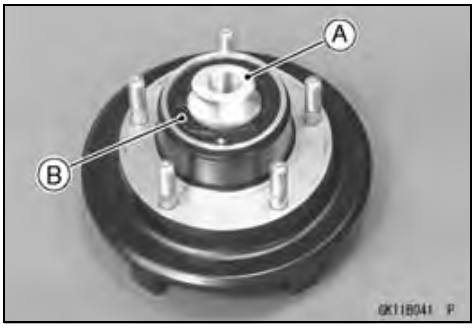
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Pulley and Coupling

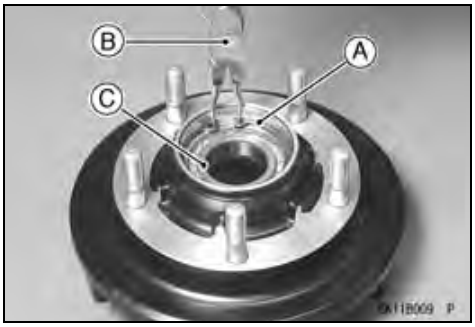
Coupling Bearing Removal



- Remove:
  Rear Pulley Coupling (see Rear Pulley Coupling Removal)
  Sleeve [A]



- Remove:
  Collar [A]
  Grease Seal [B]



- Remove:
  Circlip [A]

  Special Tool - Inside Circlip Pliers [B]: 57001-143
- Remove:
  Ball Bearing [C]

  Special Tool - Oil Seal & Bearing Remover: 57001-1058

Coupling Bearing Installation

- Apply grease to the new ball bearing.
- Press the ball bearing until it is bottomed.

  Special Tool - Bearing Driver Set: 57001-1129
- Install:
  Circlip

  Special Tool - Inside Circlip Pliers: 57001-143
- Replace the grease seal with a new one.
- Press the seal in until the face of the seal is level with the end of the grease seal hole.

  Special Tool - Bearing Driver Set: 57001-1129
- Apply grease to the grease seal lip.
- Install:
  Collar

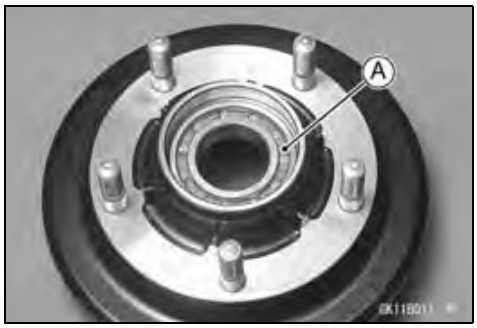
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Pulley and Coupling

Coupling Bearing Inspection and Lubrication (VN2000-A1)

Since the coupling bearing [A] is made to extremely close tolerances, the clearance cannot normally be measured.

- Wash the bearing with a high-flash-point solvent, dry it (do not spin it while it is dry), and oil it.
- Spin it by hand to check its condition.
- ★If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced.
- ★If the same bearing is to be sued again, re-wash it with a high-flash-point solvent, dry it, and pack it with good quality bearing grease before installation.
- Turn the bearing by hand a few times to make sure the grease is distributed uniformly inside the bearing.



Coupling Bearing Inspection (Other than VN2000-A1)

Since the coupling bearing [A] is made to extremely close tolerance, the clearance cannot normally be measured.

- Spin it by hand to check its condition.
- ★If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced.

NOTE

○*Since the coupling bearing are packed with grease and sealed, lubrication is not required.*

Rubber Damper Inspection

- Remove the rear wheel (see Rear Wheel Removal in Wheels/Tires chapter).
- Remove the rear wheel coupling and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.

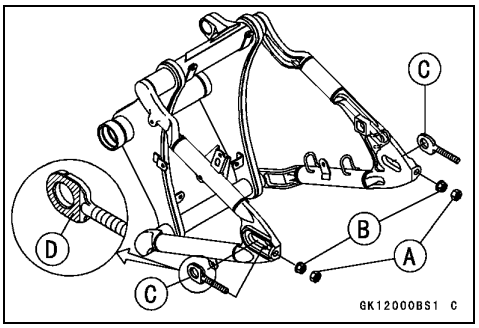


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Belt Adjuster

Belt Adjuster Removal

- Remove the left and right belt adjuster locknuts [A] and belt adjuster nuts [B].
- Remove the belt adjuster [C] from the swingarm.



Belt Adjuster Installation

- Insert the left and right belt adjuster into the swingarm facing its machined surface [D] outward.

CAUTION
Wrong installation of belt adjuster may cause the failure of drive components.

- Install the left and right belt adjuster nuts and belt adjuster locknuts.

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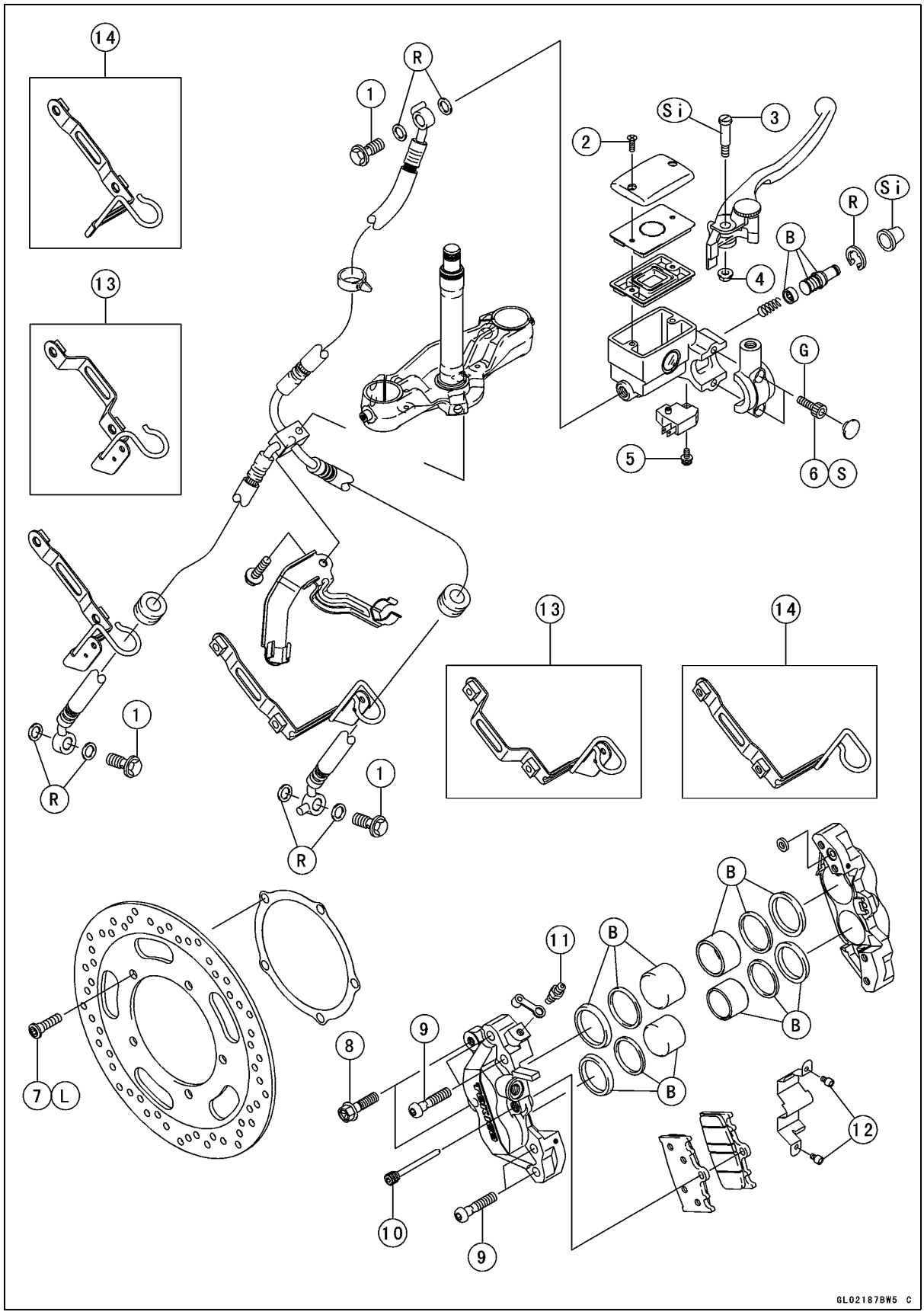
Brakes

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Exploded View



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Exploded View

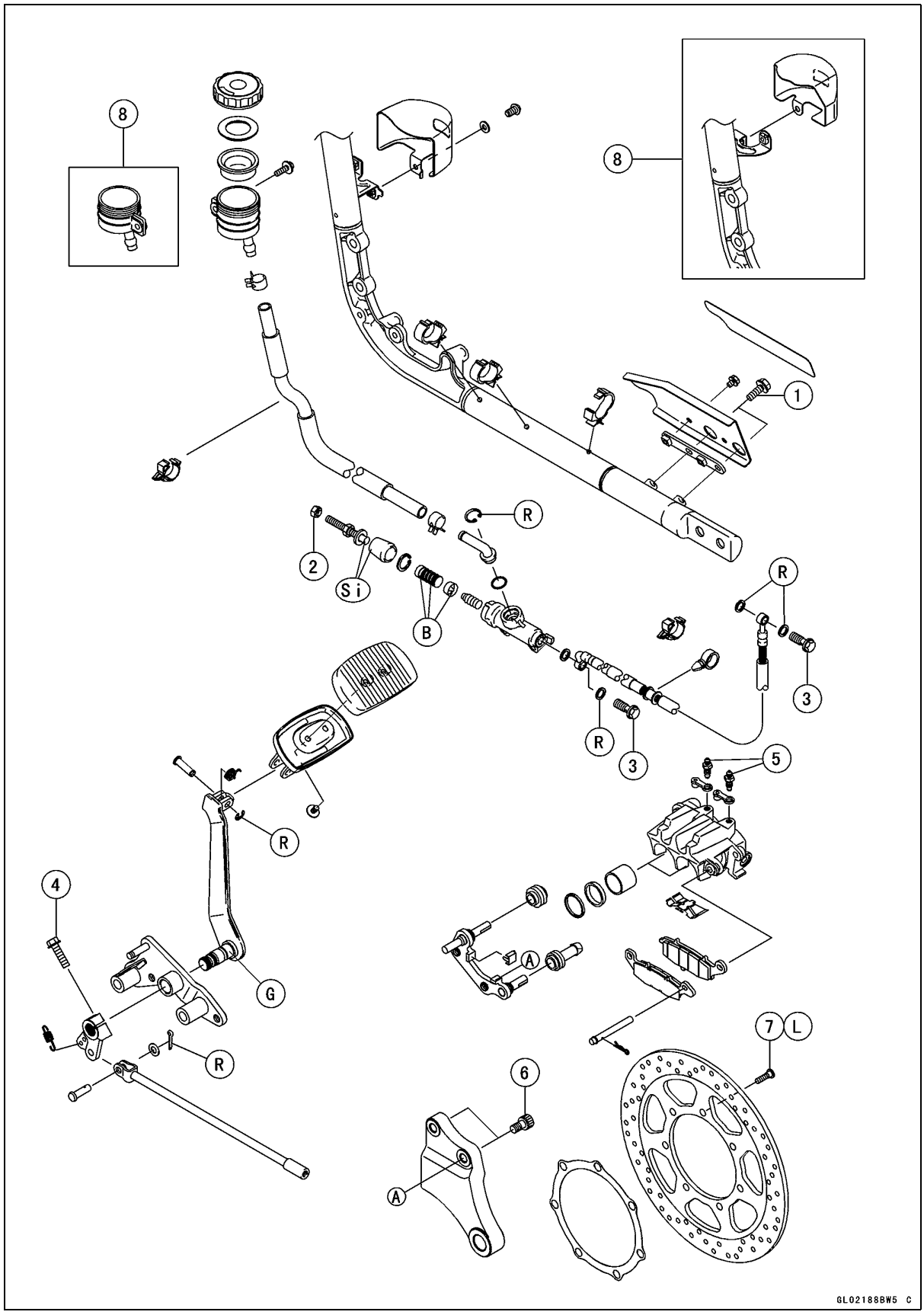
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Hose Banjo Bolts	25	2.5	18	
2	Front Brake Reservoir Cap Screws	1.5	0.15	13 in·lb	
3	Brake Lever Pivot Bolt	1.0	0.10	87 in·lb	Si
4	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
5	Front Brake Light Switch Screw	1.2	0.12	10 in·lb	
6	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
7	Brake Disc Bolts	27	2.8	20	L
8	Front Caliper Mounting Bolts	25	2.5	18	
9	Front Caliper Assembly Bolts	21	2.1	15	
10	Front Brake Pad Pins	15	1.5	11	
11	Caliper Bleed Valves	7.8	0.8	69 in·lb	
12	Front Brake Pad Spring Bolts	2.9	0.30	26 in·lb	

13. VN2000-A1 Model
14. VN2000E6F ~/F6F ~

B: Apply brake fluid.
G: Apply grease.
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	Rear Master Cylinder Mounting Bolts	25	2.5	18	
2	Rear Master Cylinder Push Rod Locknut	17	1.7	12	
3	Brake Hose Banjo Bolts	25	2.5	18	
4	Brake Pedal Clamp Bolt	25	2.5	18	
5	Caliper Bleed Valves	7.8	0.80	69 in·lb	
6	Rear Caliper Mounting Bolts	34	3.5	25	
7	Brake Disc Bolts	27	2.8	20	L

8. VN2000-A1 Model
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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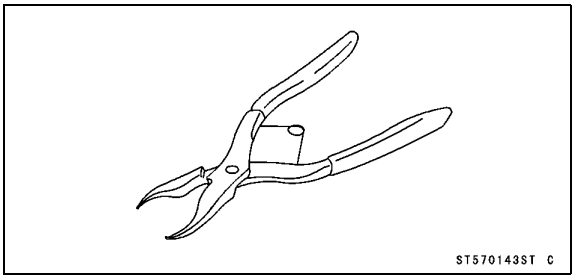
Specifications

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 117 mm (4.61 in.) (height from pedal top to footboard top)	– – –
Brake Fluid		
Grade	DOT4	– – –
Brake Pads		
Pad Lining Thickness:		
Front	4.0 mm (0.157 in.)	1 mm (0.04 in.)
Rear	7.5 mm (0.295 in.)	1 mm (0.04 in.)
Brake Discs		
Thickness:		
Front	4.8 ~ 5.2 mm (0.189 ~ 0.205 in.)	4.5 mm (0.18 in.)
Rear	6.8 ~ 7.2 mm (0.268 ~ 0.283 in.)	6.0 mm (0.24 in.)
Runout	TIR 0.15 mm (0.0059 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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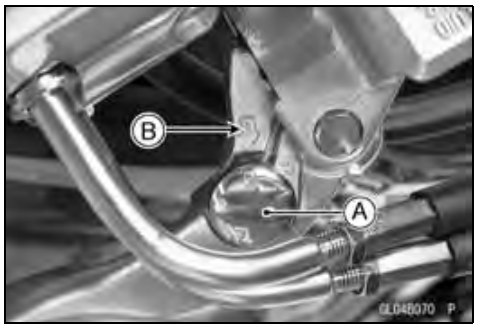
Brake Lever, Brake Pedal

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 117 mm (4.61 in.) [B]

(height from pedal top to footboard [C] top)



NOTE

○*Usually it's not necessary to adjust the pedal position, but always adjust it when push rod locknut has been loosened.*

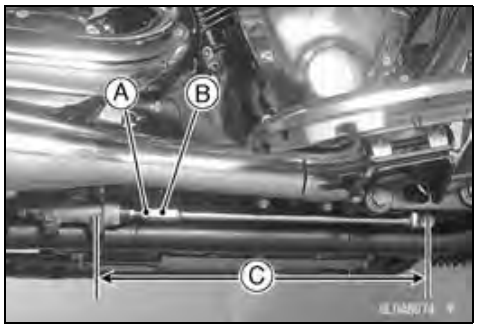
○*If the push rod length cannot be adjusted by turning the clevis, the brake pedal may be deformed or incorrectly installed.*

- 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 **370 ±1.5 mm (14.6 ±0.06 in.)**, the pedal position will be within the standard range.

- Tighten:

Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 12 ft·lb)

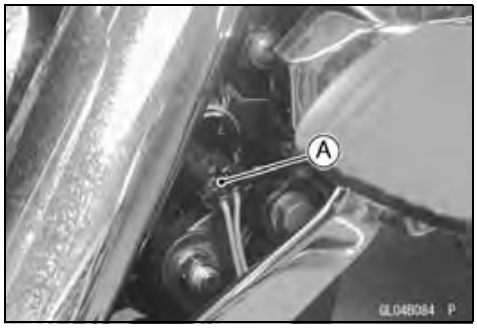


Brake Pedal Removal

- Remove:

  Right Footboard (see Frame chapter)

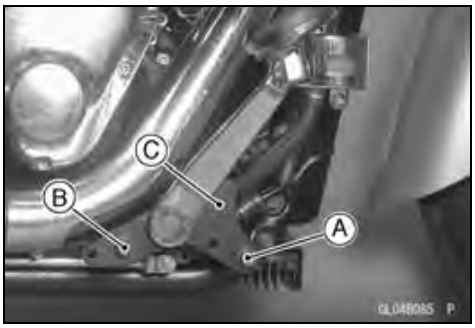
- Disconnect the brake switch lead connector [A].



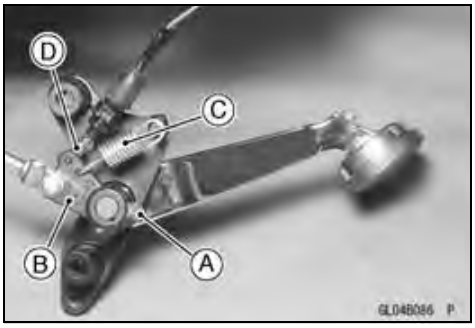
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Brake Lever, Brake Pedal

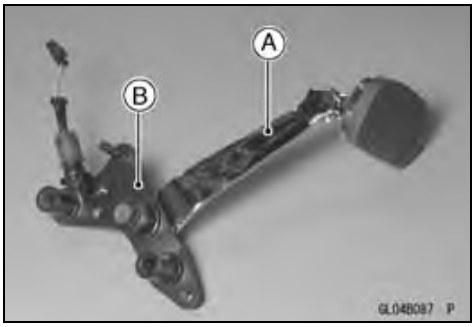
● Remove:
Right Footboard Bracket Front Bolt [A]
Right Footboard Bracket Rear Bolt [B]
Right Footboard Bracket Assembly [C]



● Remove:
Brake Lever Bolt [A]
Brake Lever [B]
Brake Pedal Return Spring [C]
Brake Switch Return Spring [D]

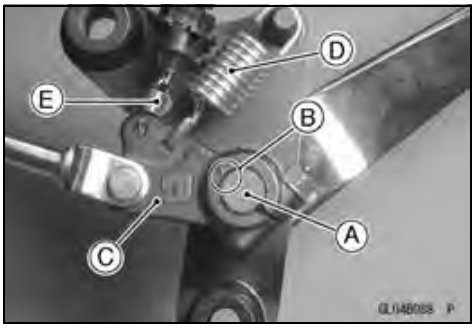


● Pull out the brake pedal [A] from the right footboard bracket [B].



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 [D]
Brake Switch Return Spring [E]
● Tighten:

Torque - Brake Pedal Clamp Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)
Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



● 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.

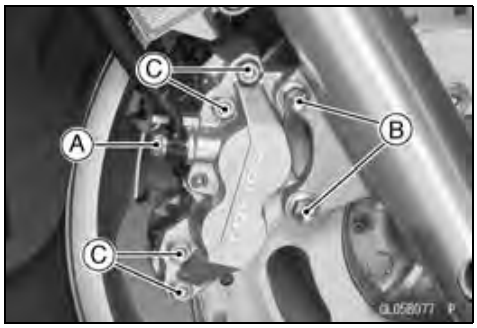
● Check the brake pedal position and adjust it if necessary.
● Check the rear brake light switch operation and adjust the switch if necessary (see Periodic Maintenance chapter).

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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].



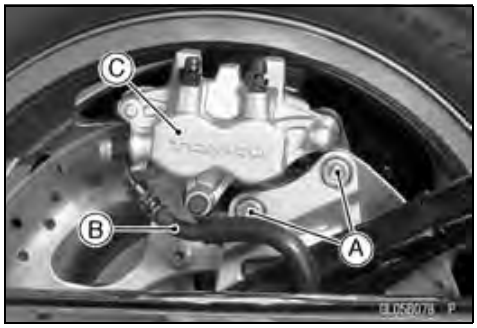
CAUTION

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:
  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: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

Do not attempt to 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.

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.

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Calipers

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 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.

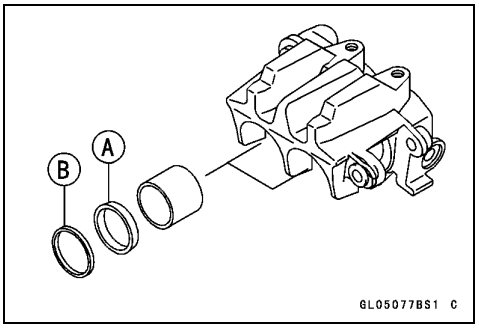
○Brake fluid leakage around the pad.

○Brakes overheat.

○Considerable difference in inner and outer pad wear.

○Seal and piston are stuck together.

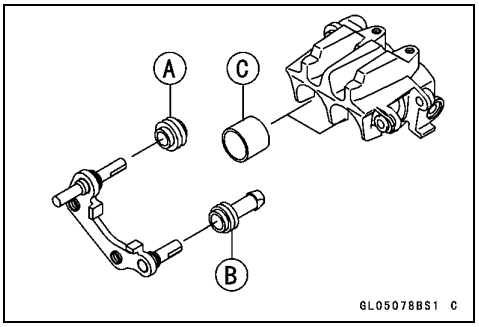
★If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.



Caliper Rubber Boot Damage

● Check that the rubber boot [A] [B] are not cracked, worn, swollen, or otherwise damaged.

★If they show any damage, replace it.



Caliper Piston and Cylinder Damage

● Visually inspect the pistons [C] and cylinder surfaces.

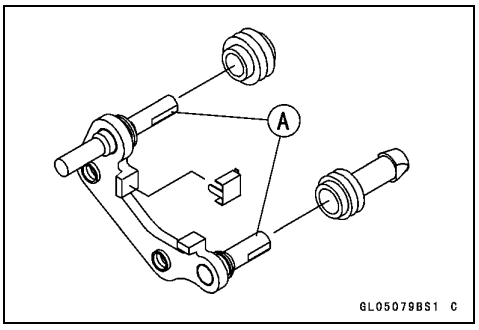
★Replace the caliper if the cylinder and piston are badly scored or rusty.

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 [A] are not badly worn or bent.

★If the caliper holder shafts are damaged, replace the entire caliper assembly.



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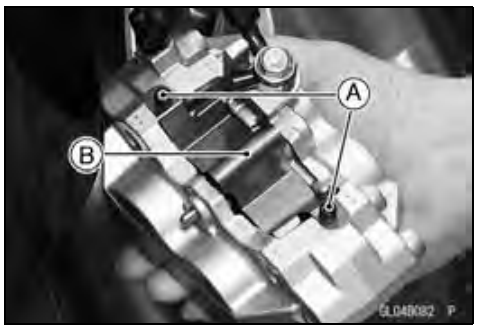
Brake Pads

Front Brake Pad Removal

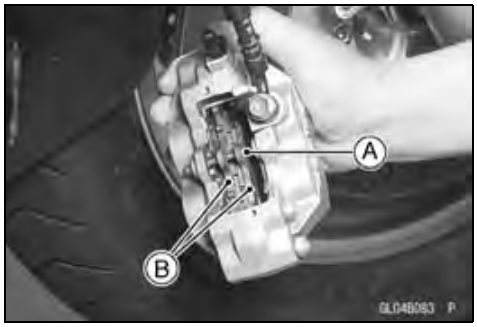
- Loosen the front brake pad pin [A] lightly.
- Remove the caliper mounting bolts [B] with the hose installed.
- Remove:
  Caliper [C] (with the hose installed)



- Remove:
  Pad Spring Bolts [A]
  Pad Spring [B]



- Remove:
  Front Brake Pad Pin [A]
  Brake Pads [B]



Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install:
  Brake Pads
  Front Brake Pad Pin
- Tighten:

Torque - Front Brake Pad Pin: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Install the pad spring and bolts.
- Tighten:

Torque - Front Brake Pad Spring Bolts: 2.9 N·m (0.30 kgf·m, 26 in·lb)

⚠ WARNING

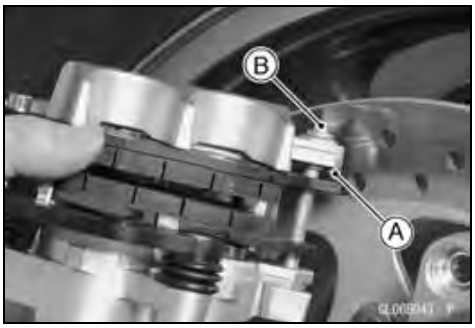
Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

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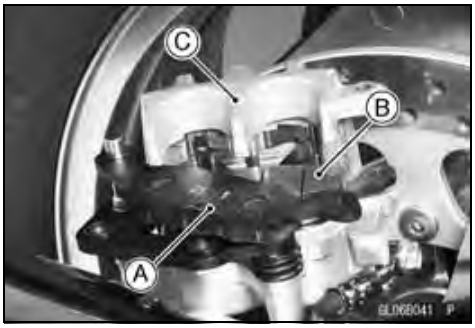
Brake Pads

Rear Brake Pad Removal

- Remove the caliper with the hose installed (see Caliper Removal).
- Remove:
  Snap Pin [A]
  Pad Pin [B]



- Remove the jaw side pad [A], and then remove the piston side pad [B].
  Outer Pad [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

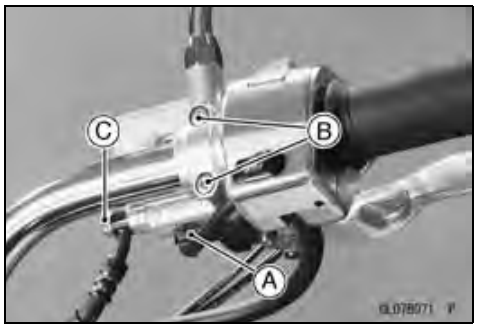
- Refer to Brake Pad Wear Inspection in the Periodic Maintenance chapter.

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Master Cylinder

Front Master Cylinder Removal

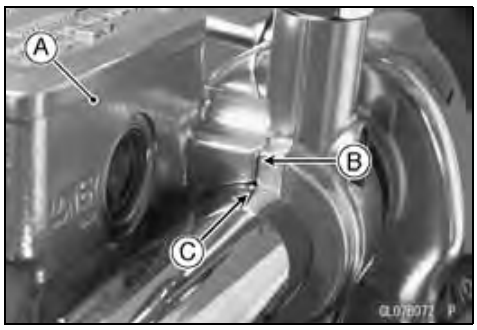
- Disconnect the front brake light switch connector [A].
- Draw out the brake fluid from the reservoir with a means like the fork oil level gage.
- Pull the bolt caps out.
- Remove the banjo bolt [C] to disconnect the brake hose from the master cylinder (see Brake Hose Removal/Installation).
- Unscrew the clamp bolts [B], and take off the master cylinder as an assembly with the reservoir, brake lever, and brake switch installed.



CAUTION
Immediately wash away any brake fluid that spills.

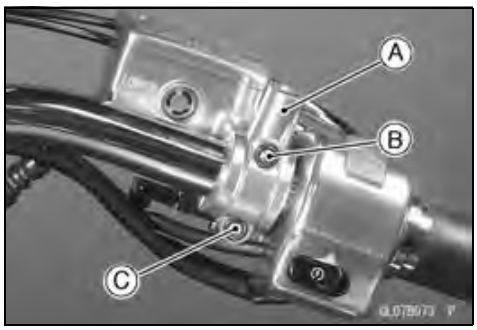
Front Master Cylinder Installation

- Set the front master cylinder [A] to match its mating surface [B] to the punched mark [C] of the handlebar.



- 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 [A] after tightening.

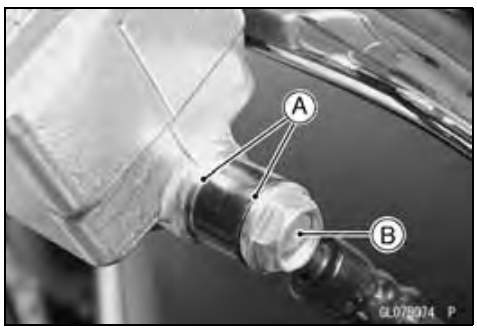
Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)



- Install the bolt caps.
- Use a new flat washers [A] on each side of the brake hose fitting.
- Tighten the brake hose banjo bolt [B].

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

- Replenish the fluid in the reservoir, and bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

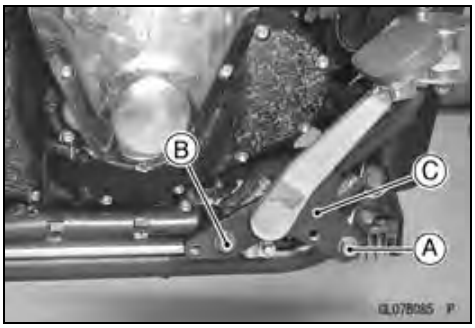


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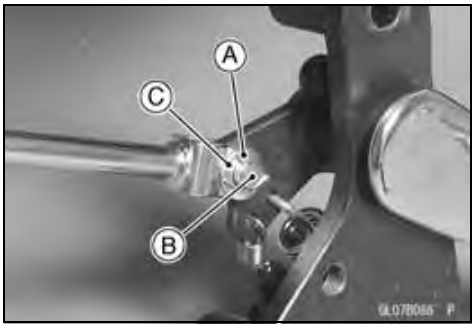
Master Cylinder

Rear Master Cylinder Removal

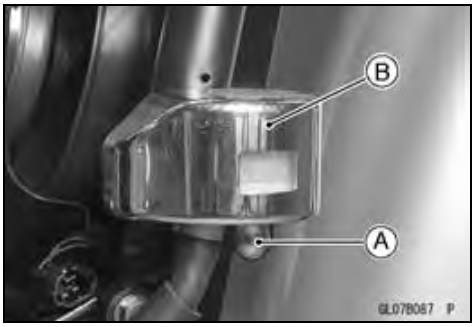
● Remove:
Right Footboard (see Frame chapter)
Muffler and Exhaust Manifold (see Engine Top End chapter)
Rear Brake Light Switch Lead Connector (disconnect)
Right Footboard Bracket Front Bolt [A]
Right Footboard Bracket Rear Bolt [B]
Right Footboard Bracket Assembly [C]



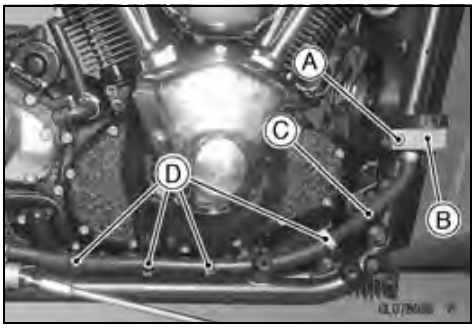
● Remove:
Cotter Pin [A]
Joint Pin [B] and Washer [C]



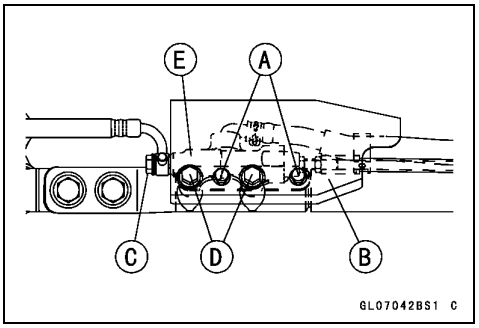
● Remove:
Rear Brake Fluid Reservoir Cover Bolt [A]
Rear Brake Fluid Reservoir Cover [B]



● Remove:
Rear Brake Fluid Reservoir Bolt [A]
Rear Brake Fluid Reservoir [B]
● Remove the brake hose [C] from the clamps [D].



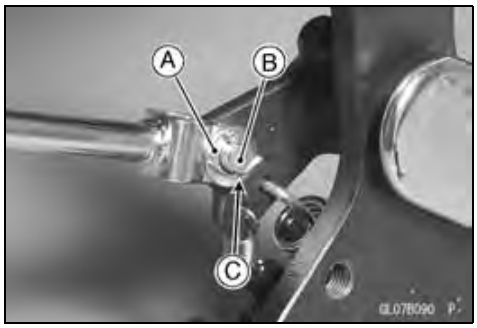
● Remove:
Cover Bolts [A]
Cover [B]
Brake Hose Banjo Bolt [C]
Rear Master Cylinder Mounting Bolts [D]
Rear Master Cylinder [E]



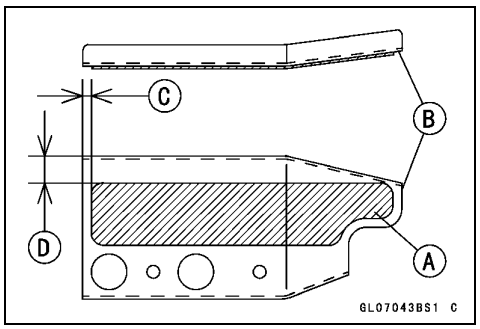
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Master Cylinder

Rear Master Cylinder Installation



- Replace the cotter pin with a new one.
- Install the washer [A].
- Insert the cotter pin [B] to the hole of the joint pin [C] and separate [D] the cotter pin ends.
- Use a new flat washer on each side of the brake hose fitting.



- Paste the pad [A] to the cover [B] as shown in the figure.
  about 5 mm (0.20 in.) [C]
  about 15 mm (0.59 in.) [D]

- Tighten:

Torque - 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)
Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

Do not attempt to 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.

Front Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Assembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

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Master Cylinder

Master Cylinder Inspection

- Disassemble the front and rear master cylinders (see Periodic Maintenance chapter).

Special Tool - Inside CIrclip Pliers: 57001-143

- 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.

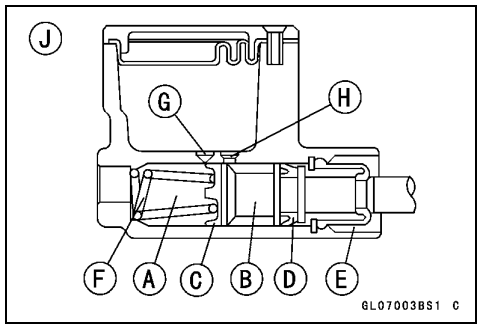
- Check the piston return spring [F] for any damage.

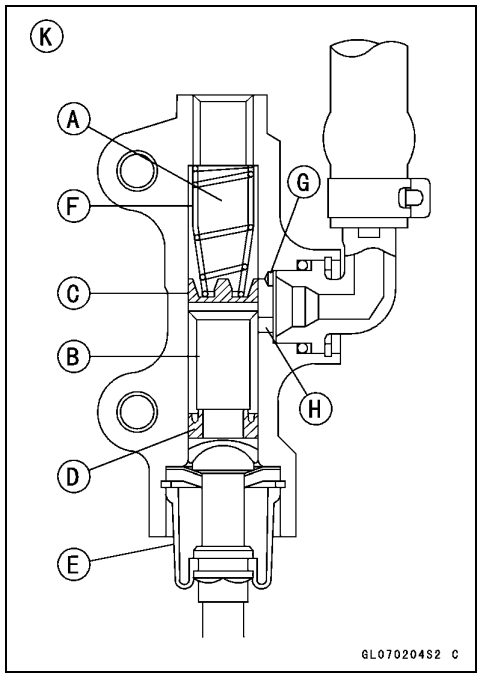
★If the springs are damaged, replace them.

- 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

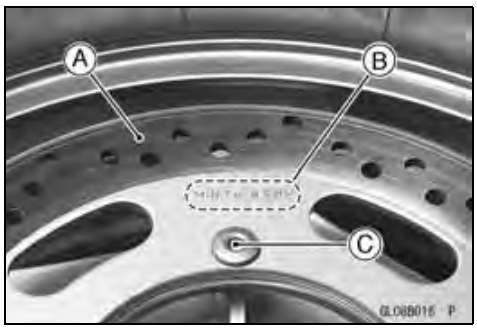
- Remove the wheel (see Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc.



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 - 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]

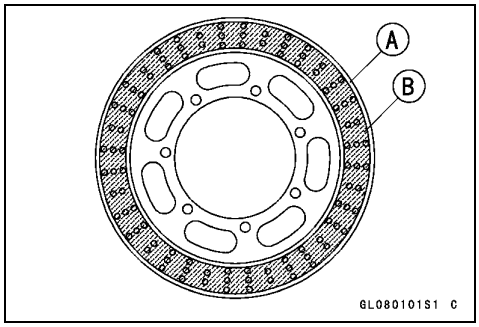
★Replace the disc if the sliding surface has worn past the service limit.

Front Disc Thickness

Standard:	**4.8 ~ 5.2 mm (0.189 ~ 0.205 in.)**
Service Limit:	**4.5 mm (0.18 in.)**

Rear Disk Thickness

Standard:	**6.8 ~ 7.2 mm (0.268 ~ 0.283 in.)**
Service Limit:	**6.0 mm (0.24 in.)**



Brake Disc Warp

- Jack up the motorcycle so that the wheel is off the ground (see Wheels/Tires chapter).

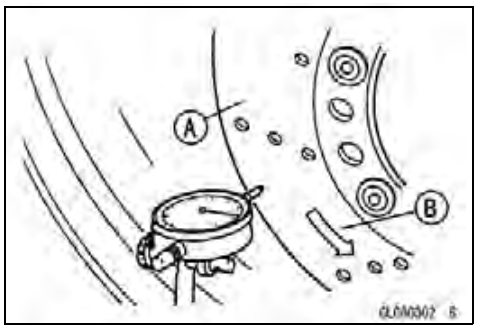
○For front disc inspection, turn the handlebar fully to one side.

- 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 (0.0059 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 Periodic Maintenance chapter.

Brake Fluid Change

- Refer to the Brake Fluid Change in 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.

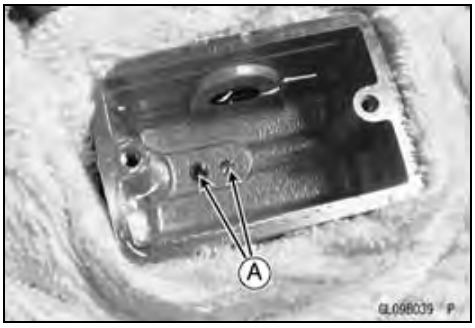
⚠ WARNING

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 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.
- Install the reservoir cap.



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Brake Fluid

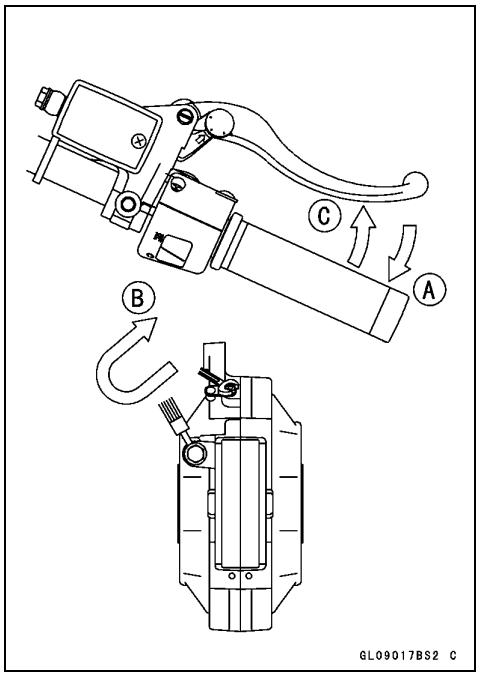
- Remove the rubber cap from the bleed valve on the caliper.
- Attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Bleed the brake line and the caliper as follows:

○Repeat this operation until no more air can be seen coming out into the plastic hose.

Pump the brake lever until it becomes hard, and apply the brake lever and hold it [A].

Quickly open and close [B] the bleed valve while holding the brake lever applied.

Release the brake lever [C].



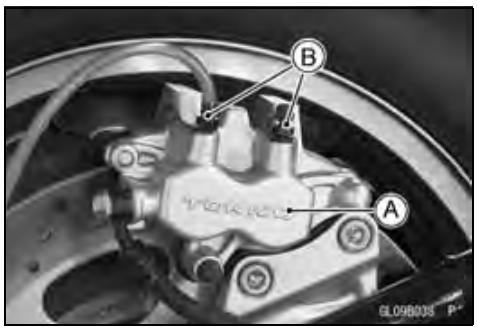
NOTE

○*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.*

- 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)



- Repeat the above steps for other caliper.

NOTE

○*For the rear brake caliper [A], bleed the brake line for two bleed valves [B].*

- Check the fluid level.
- 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 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

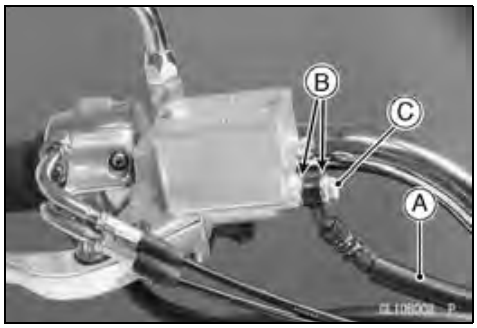
Brake Hose Removal/Installation

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 - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 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 Changing).





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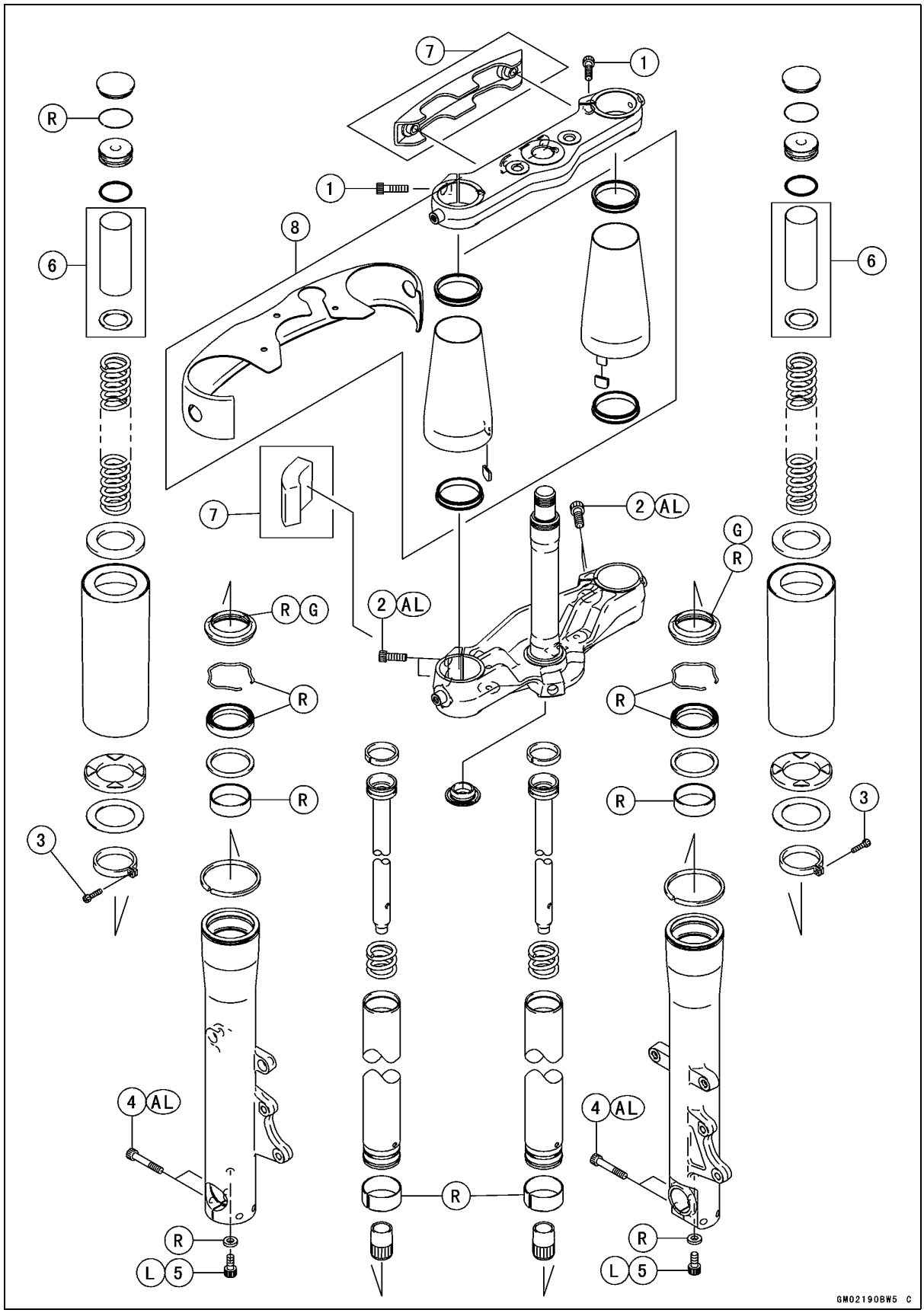
Suspension

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Exploded View



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Exploded View

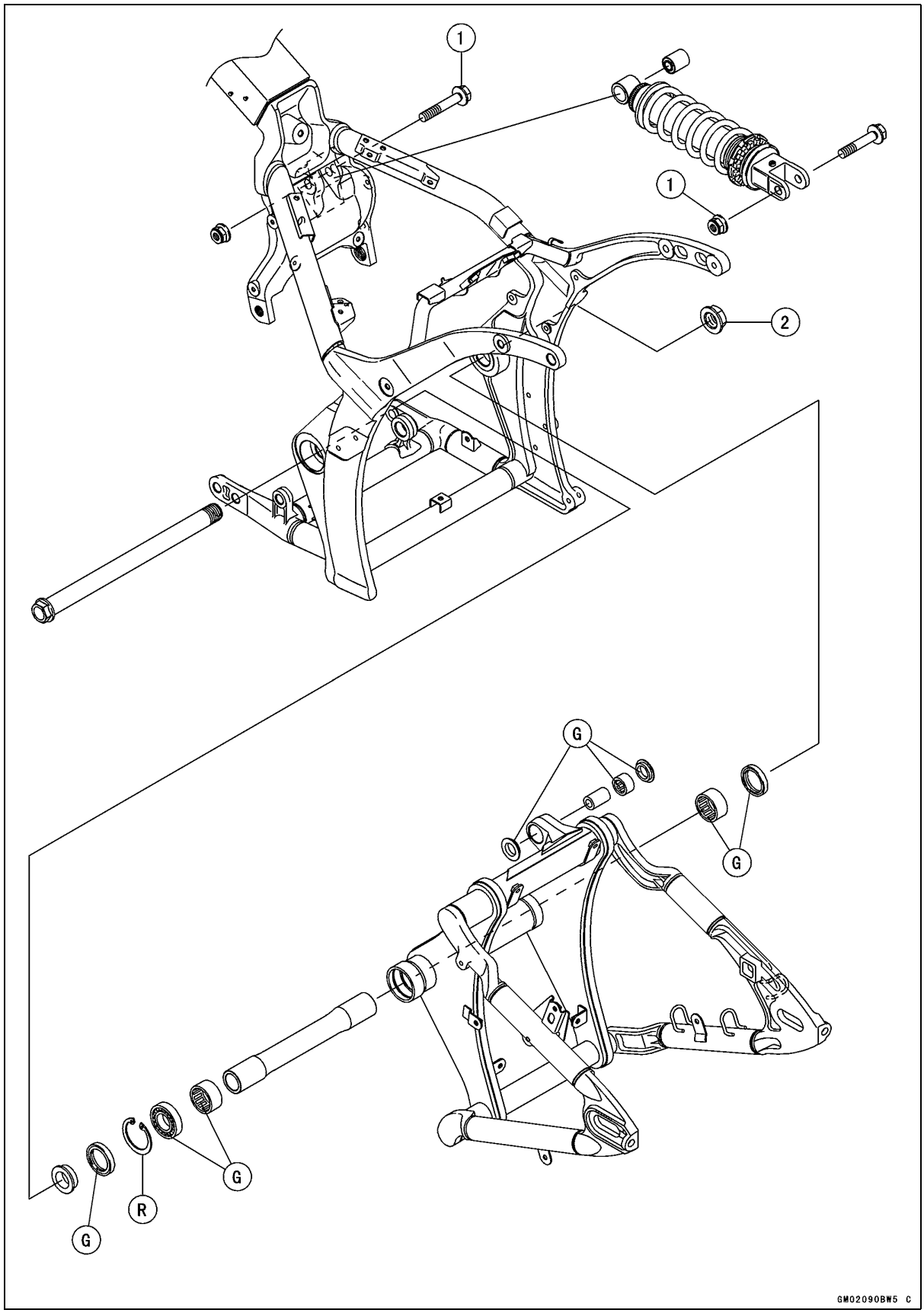
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fork Upper Clamp Bolts	20	2.0	15	
2	Front Fork Lower Clamp Bolts	34	3.5	25	AL
3	Cover Stopper Bolts	4.2	0.43	37 in·lb	
4	Front Axle Clamp Bolts	25	2.5	18	AL
5	Front Fork Bottom Allen Bolts	20	2.0	15	L

6. VN2000-A1 ~, A6F/D1
7. VN2000E6F ~/F6F ~
8. Steering Stem Head Cover (VN2000E6F ~)

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 Bolt And Nut	59	6.0	43	
2	Swingarm Pivot Shaft Nut	127	13	94	

G: Apply grease.
R: Replacement Parts

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Specifications

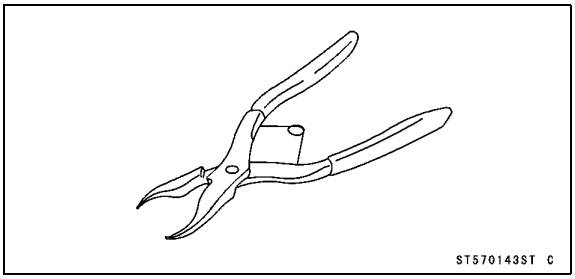
Item	Standard
Front Fork (per one unit)	
Fork Inner Tube Diameter	ϕ49 mm (ϕ1.9 in.)
Fork Spring Setting	Non-adjustable
Air Pressure	Atmospheric pressure (Non-adjustable)
Rebound Damper Setting	Non-adjustable
Fork Oil	SHOWA SS-8 or equivalent
Fork Oil Capacity	*605 ±2.5 mL (20.5 ±0.085 US oz.) (completely disassembled and dry) **617 ±2.5 mL (20.9 ±0.085 US oz.) (completely disassembled and dry) *approx. 515 mL (17.4 US oz.) (when changing oil) **approx. 525 mL (17.8 US oz.) (when changing oil)
Fork oil level	Fully compressed, without fork spring, below from inner tube top *203 ±2 mm (7.99 ±0.08 in.) **195 ±2 mm (7.68 ±0.08 in.)
Fork spring free length	*470.9 mm (18.54 in.) (Service limit: 461 mm (18.1 in.)) **567.3 mm (22.33 in.) (Service limit: 556 mm (21.9 in.))
Rear Shock Absorber	
Rebound damper setting	
(VN2000-A1)	6 clicks out from the fully clockwise position
(On and after VN2000-A1)	5 clicks out from the fully clockwise position
Spring preload setting:	Length between spring end and flange end
Standard	32.5 mm (1.28 in.)
Usable Range	27.5 ~ 37.5 mm (1.08 ~ 1.48 in.)

*: VN2000-A1 ~, A6F/D1
**: VN2000A7F/E6F ~/F6F ~

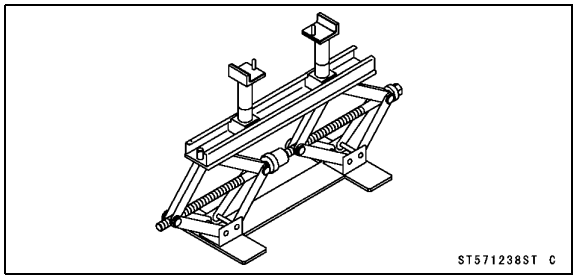
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Special Tools

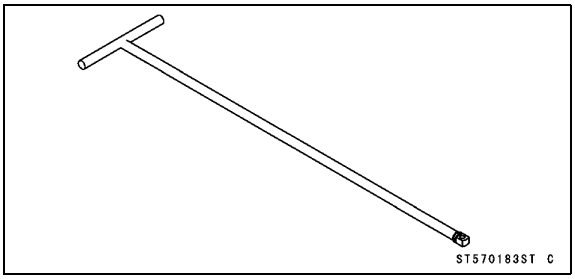
Inside Circlip Pliers:
57001-143



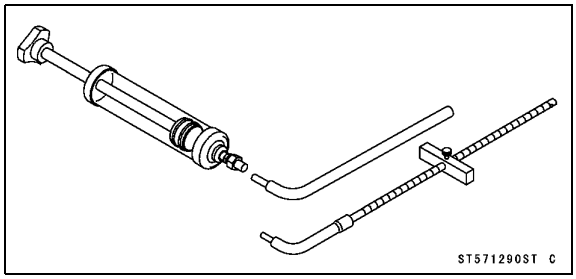
Jack:
57001-1238



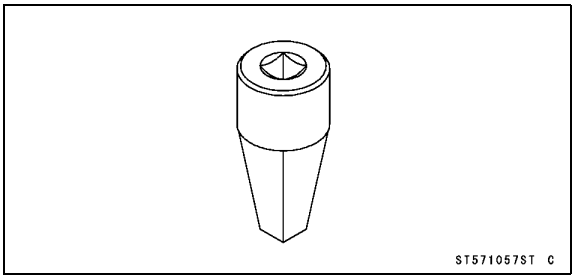
Fork Cylinder Holder Handle:
57001-183



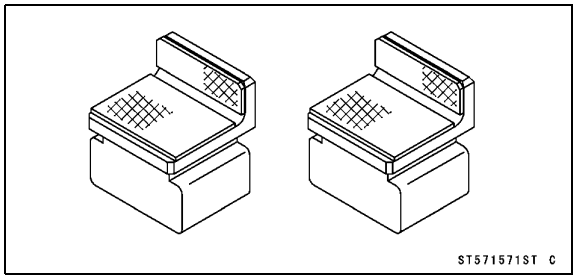
Fork Oil Level Gauge:
57001-1290



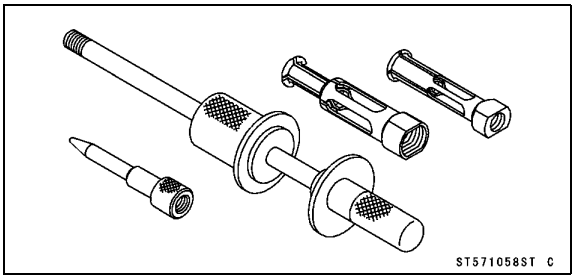
Fork Cylinder Holder Adapter:
57001-1057



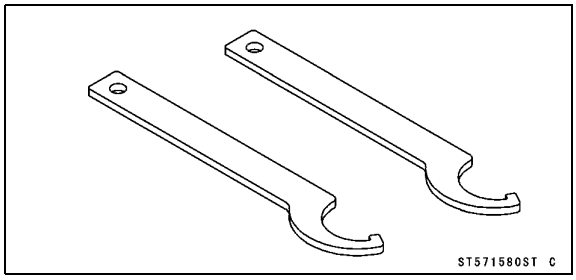
Jack Attachment:
57001-1571



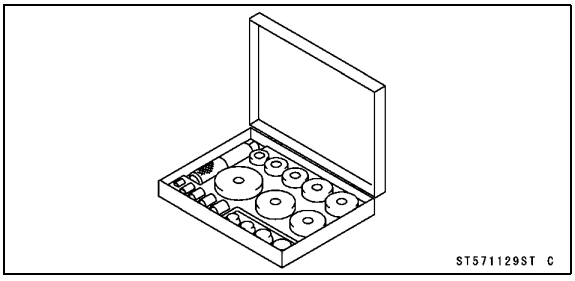
Oil Seal & Bearing Remover:
57001-1058



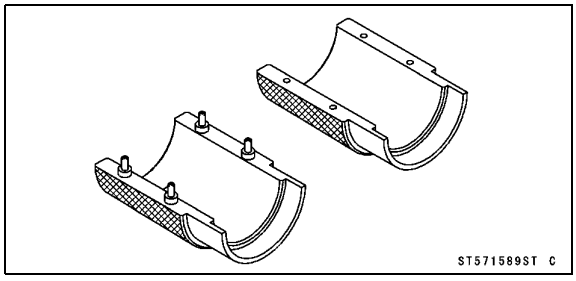
Hook Wrench R=35:
57001-1580



Bearing Driver Set:
57001-1129



Fork Oil Seal Driver, ϕ49:
57001-1589



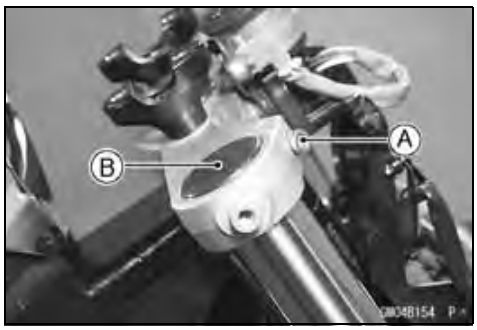
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Front Fork

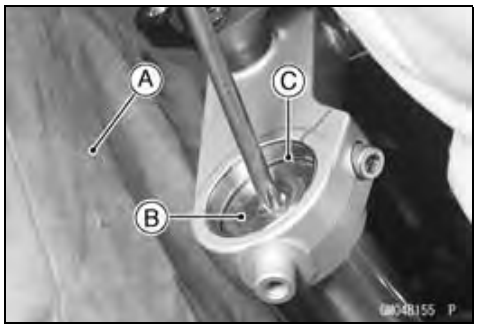
Fork Oil Change

● Remove:
Front Wheel (see Wheels/Tires chapter)
Front Fender (see Frame chapter)
Nacelle (see Frame chapter)
Handlebar (from handlebar clamp)

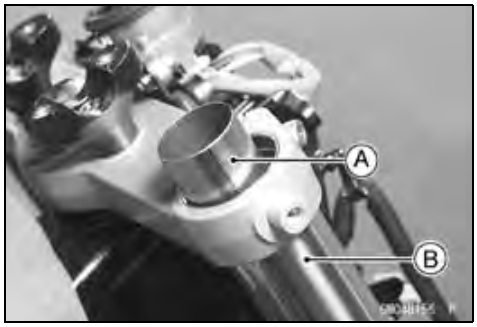
● Loosen the front fork upper clamp bolt [A].
● Remove the cap [B].



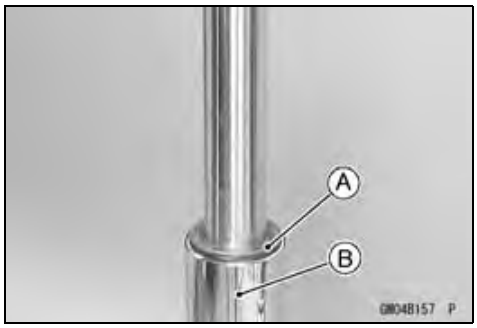
● Cover the fuel tank with a cloth [A].
● Push down the top plug [B], and remove the stopper ring [C].



● Remove:
Collar [A] (VN2000-A1 ~, A6F/D1)
Front Fork [B]



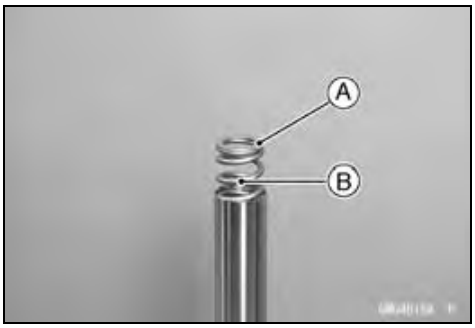
● Remove:
Rubber Damper [A]
Cover [B]



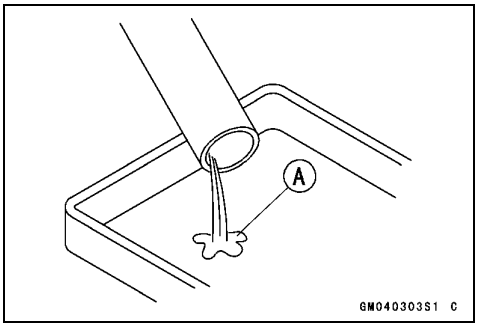
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Front Fork

● Remove:
Washer [A] (VN2000-A1 ~, A6F/D1)
Spring [B]



● Drain the fork oil [A] into a suitable container.
○Pump the inner tube up and down at least ten times to expel the oil from the fork.



● Fill the front fork with the specified oil.

Fork Oil: SHOWA SS-8 or equivalent

Fork Oil Capacity (when changing oil):

Approx. 515 mL (17.4 US oz.) VN2000-A1, A2, A6F/D1

Approx. 525 mL (17.8 US oz.) VN2000A7F/E6F ~/F6F ~

● Wait for about five minutes so that any suspended air bubbles can surface.

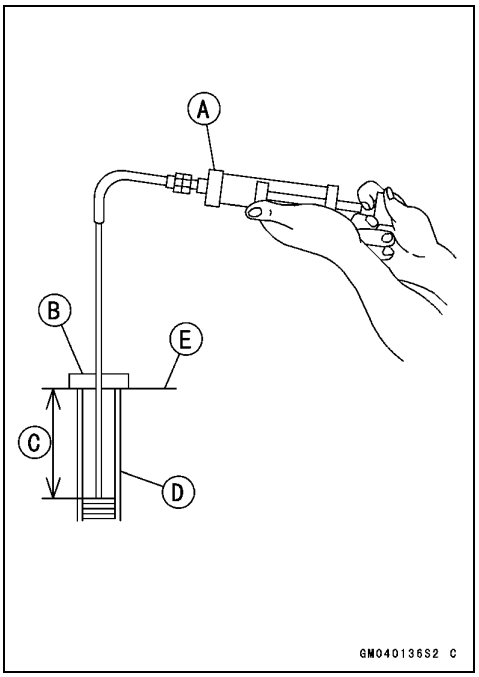
● Measure the oil level, using the fork oil level gauge [A].

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 gauge 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: 203 ±2 mm (7.99 ±0.08 in.)
VN2000-A1, A2, A6F/D1
195 ±2 mm (7.68 ±0.08 in.)
VN2000A7F/E6F ~/F6F ~

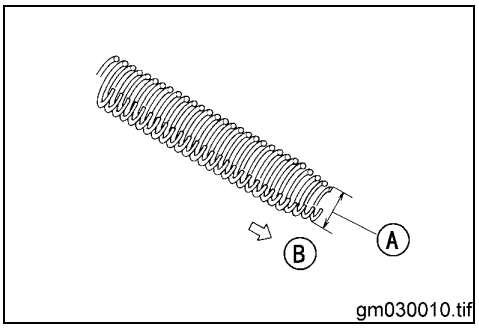


● Install
Cover
Rubber Damper

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Front Fork

- Install the fork spring with the smaller diameter end [A] facing down [B].
- Install:
  Washer



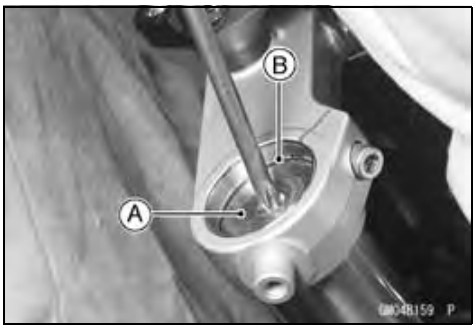
- Install the front fork in the fork clamps, and tighten the fork lower clamp bolt only.

Torque - Front Fork Lower Clamp Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

NOTE

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

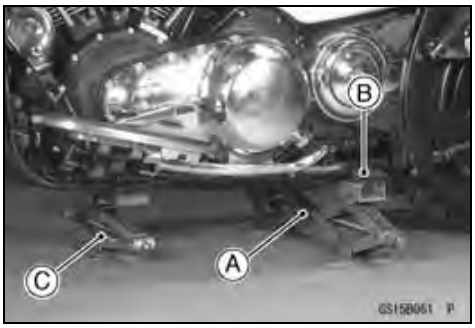
- Install:
  Collar
- Put the plug and new stopper ring in the inner tube.
- Push down the top plug [A], and install the stopper ring [B] into the groove in the inner tube.
- Install the cap and reinstall the front fork correctly (see Front Fork Installation).



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Front Fork

Front Fork Removal



● Using the jack [A] and jack attachment [B] under the frame pipes, and a commercially available jack [C] under the engine, lift the front wheel off the ground until the rear wheel touches the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571

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.

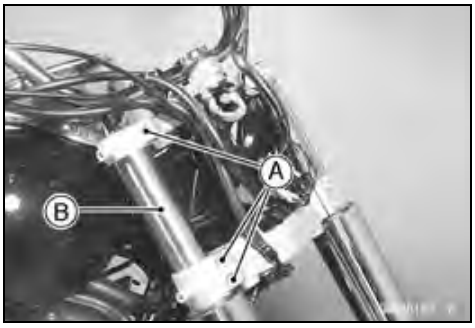
⚠ WARNING

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:
Front Wheel (see Wheels/Tires chapter)
Front Fender (see Frame chapter)
Headlight Cover (see Frame chapter)

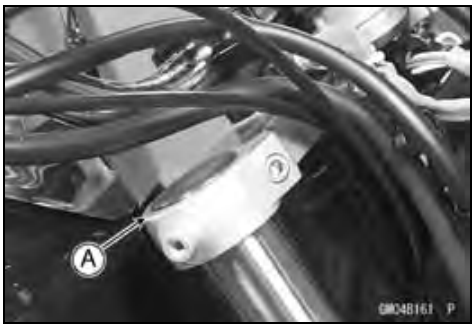
NOTE

○*If the front fork is to be disassembled or oil changed after removal, remove the plug before the front is removed (see Fork Oil Change).*



● Loosen:
Front Fork Clamp Bolts [A]
● Remove:
Front Fork [B]

Front Fork Installation



● Install the fork so that the top end of the inner tube is flush with the upper surface [A] of the steering stem head bracket.
● Tighten:

Torque - Front Fork Upper Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Front Fork Lower Clamp Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

NOTE

○*Tighten the two lower clamp bolts alternately two times to ensure even tightening torque.*

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Front Fork

● Install the removed parts and tighten:

Torque - Front Axle Nut: 127 N·m (13 kgf·m, 94 ft·lb)
Front Axle Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Caliper Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)

NOTE

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

● Check the front brake effectiveness after installation.

⚠ WARNING

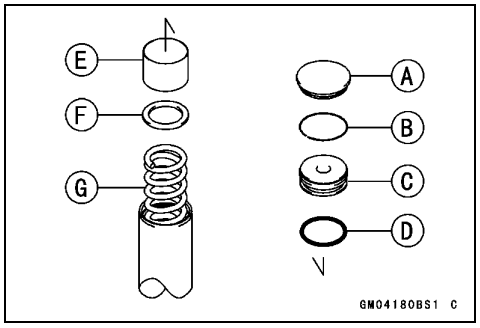
Do not attempt to ride the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

Front Fork Disassembly

● Drain the fork oil (see Fork Oil Change).

○The following parts are removed during draining the fork oil.

Cap [A]
Stopper Ring [B]
Top Plug [C]
O-ring [D]
Collar [E] (VN2000-A1 ~, A6F/D1)
Washer [F] (VN2000-A1 ~, A6F/D1)
Spring [G]

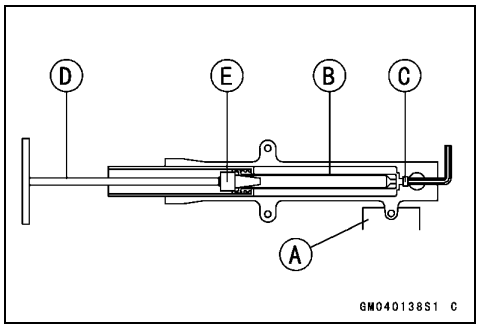


● Hold the front fork horizontally in a vise [A].

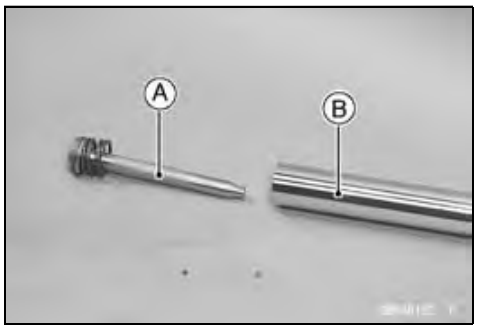
● Stop the cylinder unit [B] from turning by using the special tools.

● Unscrew the bottom 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



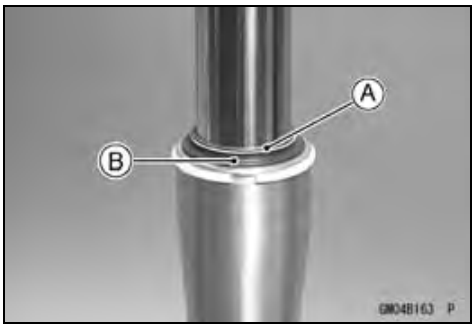
● Take the cylinder unit [A] out of the inner tube [B].



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Front Fork

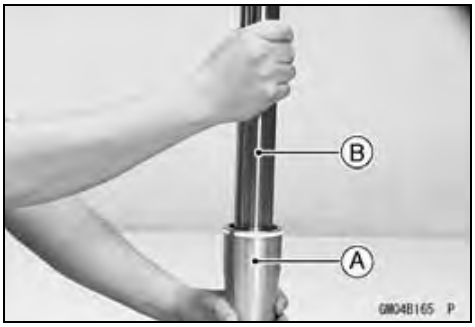
● Separate the inner tube from the outer tube as follows:
○Remove the spring band [A] and dust seal [B] from the outer tube.



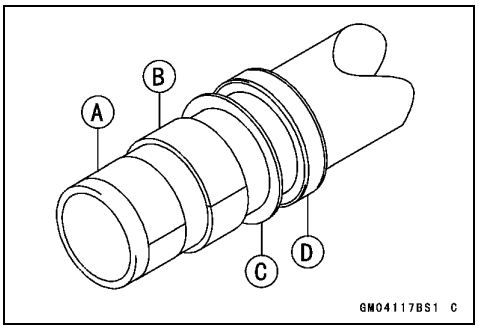
○Remove the retaining ring [A] from the outer tube.



○Holding the outer tube [A] by hand, pull the inner tube [B] several times to pull out the inner tube.
○Take out the cylinder base out of the outer tube.

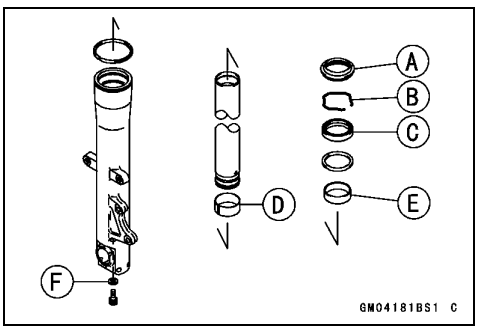


● Remove the guide bushings [A], [B] washer [C], and oil seal [D] from the inner tube.



Front Fork Assembly

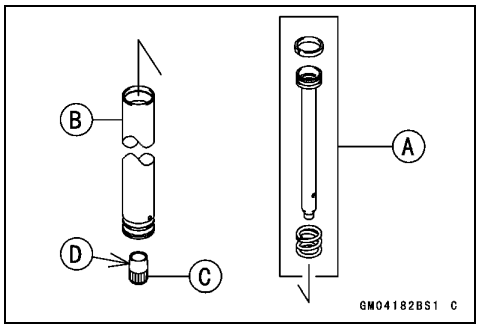
● Replace the following parts with new ones after removal.
Dust Seal [A]
Retaining Ring [B]
Oil Seal [C]
Inner Guide Bushing [D]
Outer Guide Bushing [E]
Bottom Allen Bolt Gasket [F]



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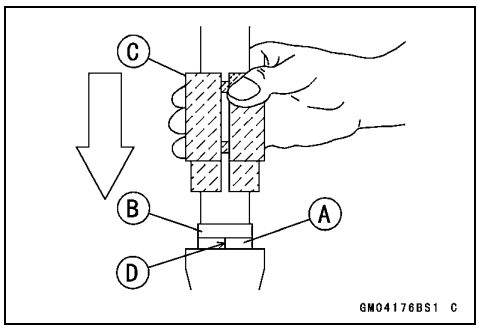
Front Fork

● 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 of the vehicle.

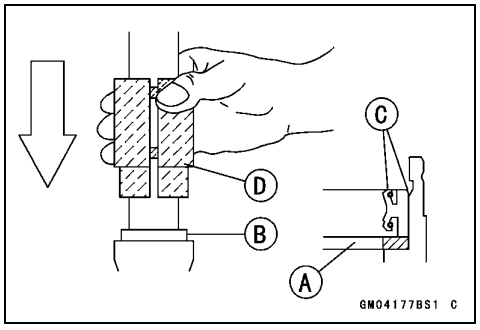
Special Tool - Fork Oil Seal Driver: 57001-1589



● 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 - Fork Oil Seal Driver [D]: 57001-1589

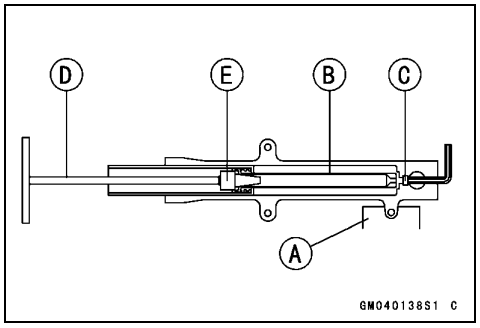
● Install:
Retaining Ring
● Apply molybdenum disulfide grease to the dust seal lips and install it,



● 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

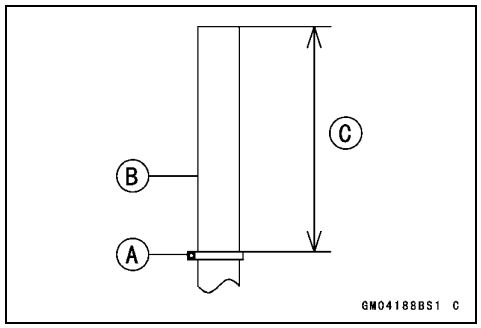
Torque - Front Fork Bottom Allen Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)



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Front Fork

● Install the cover stopper [A] as shown.
Inner Tube [B]
252.0 ~ 252.6 mm (9.92 ~ 9.95 in.) [C]



● Tighten:

Torque - Cover Stopper Bolt: 4.2 N·m (0.43 kgf·m, 37 in·lb)

● Pour in the specified type of oil.

Fork Oil: SHOWA SS-8 or equivalent

Fork Oil Capacity (Completely dry):

605 ±2.5 mL (20.5 ±0.085 US oz) VN2000-A1 ~, A6F/D1

617 ±2.5 mL (20.9 ±0.085 US oz) VN2000A7F/E6F ~/F6F ~

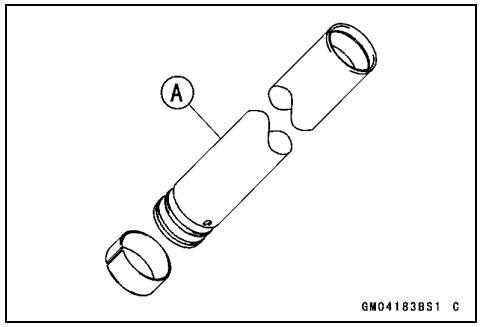
● Install the removed parts.

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.

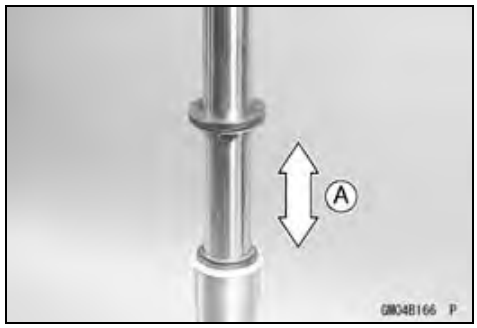


CAUTION

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 [A] them back and forth manually to check for smooth operation.

★If you feel binding or catching, the inner and outer tubes must be replaced.



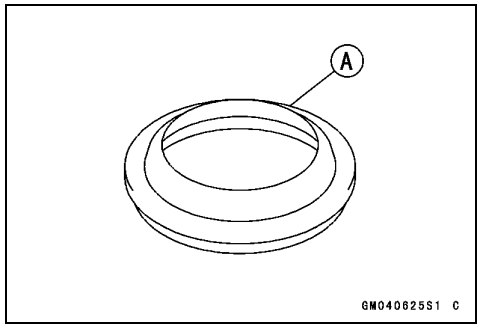
⚠ WARNING

A straightened inner or outer fork tube may 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.

Dust Seal Inspection

★Inspect the dust seal [A] for any signs of deterioration or damage.

★Replace them if necessary.



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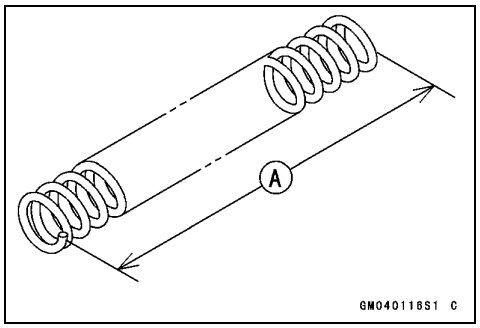
Front Fork

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.



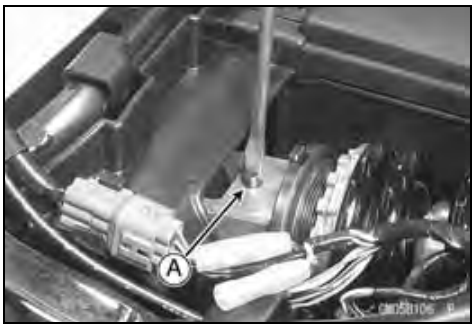
Spring Free Length

Standard:	**470.9 mm (18.54 in.)**
	567.3 mm (22.33 in.) VN2000A7F/E6F ~/F6F ~
Service Limit:	**461 mm (18.1 in.)**
	556 mm (21.9 in.) VN2000A7F/E6F ~/F6F ~

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Rear Shock Absorber

Rebound Damping Force Adjustment



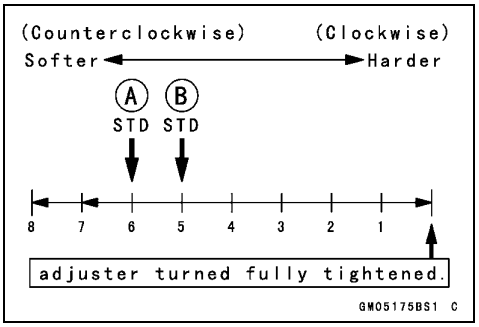
- Remove the seats (see Frame chapter).
- To adjust the rebound damping force, turn the rebound damping adjuster [A] to the desired position.

○The standard adjuster setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories 6 clicks (VN2000-A1) or 5 clicks (On and after VN2000 -A2/D1) turns out of the fully clockwise position.

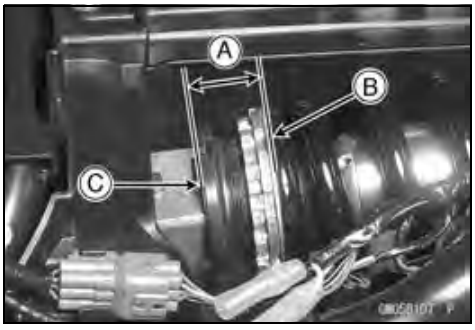
Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
7 ~ 8	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High

[A]: VN2000-A1
[B]: Other than VN2000-A1



Spring Preload Adjustment

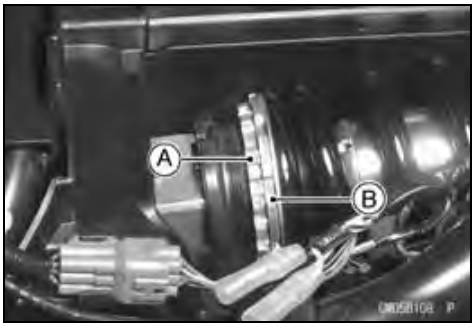


- Remove:
  Seats (see Frame chapter)
  Battery Cover
- Measure the length [A] of the spring preload setting position as shown.
  Spring End [B]
  Flange End [C]

Spring Preload Setting Length
Standard: 32.5 mm (1.28 in.)
Usable Range: 27.5 ~ 37.5 mm (1.08 ~ 1.48 in.)

★If the spring action feels too soft or to stiff, adjust it.

- To adjust the spring preload, loosen the locknut [A] and turn the adjusting nut [B] to the desired position.

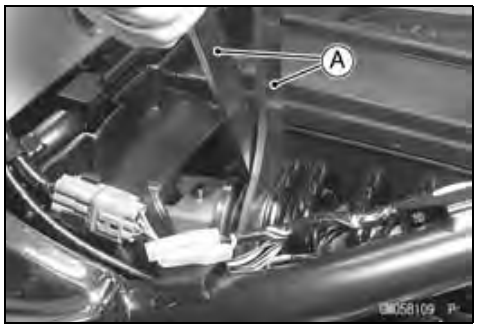


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Rear Shock Absorber

● Using the hook wrenches [A], Adjust the spring preload.

Special Tool - Hook Wrench R=35: 57001-1580



Spring Adjustment

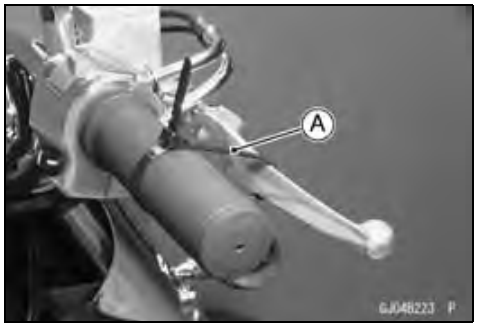
Position	Spring Force	Setting	Load	Terrain	Speed
27.5 mm	Weak	Soft	Light	Smooth	Low
(1.08 in.)	↑	↑	↑	↑	↑
↑					
↓					
37.5 mm	↓	↓	↓	↓	↓
(1.48 in.)	Stronger	Hard	Heavy	Rough	High

● Tighten the locknut.

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: 57001-1571



● Squeeze the brake lever slowly and hold it with a band [A].

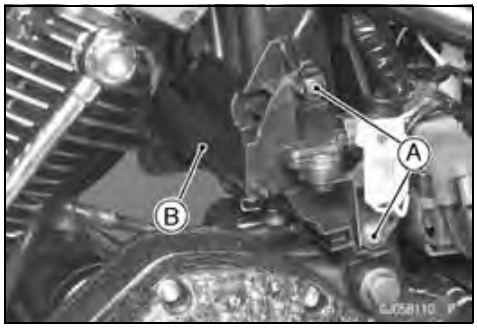
CAUTION

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.

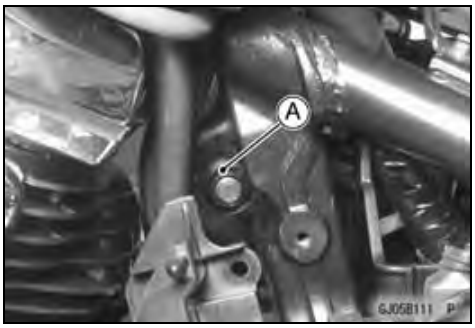
● Remove:
Seats (see Frame chapter)
Battery Cover
Left Side Cover (see Frame chapter)
Hose Cover Screws [A] (both sides)
Hose Cover [B]



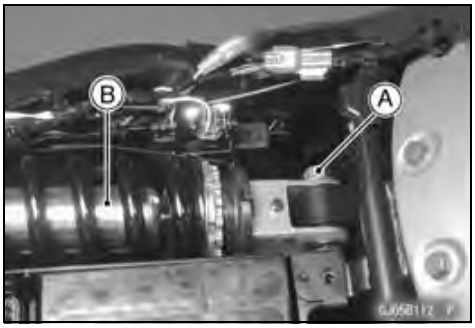
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Rear Shock Absorber

● Remove:
Rear Shock Absorber Front Mounting Bolt and Nut [A]



● Remove:
Rear Shock Absorber Rear Mounting Bolt [A] and Nut
○Lifting up the rear wheel a little, pull out the rear mounting bolt.
● Remove:
Rear Shock Absorber [B]

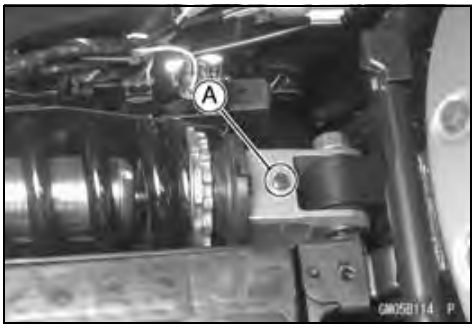


Rear Shock Absorber Installation
● Apply grease to the needle bearing and oil seals [A].

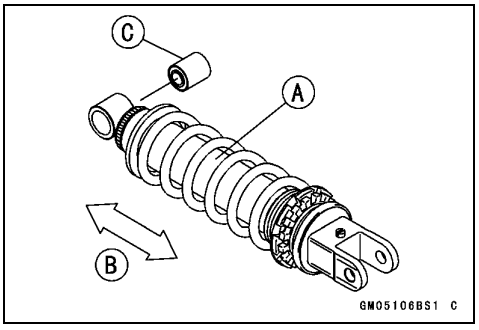


● Install the rear shock absorber so that the rebound damping adjuster [A] faces upside.
● Tighten the rear shock absorber nuts to the specified torque.

Torque - Rear Shock Absorber Mounting Bolt and Nut: 59 N·m (6.0 kgf·m, 43 ft·lb)



Rear Shock Absorber Inspection
● Remove the rear shock absorber [A].
● Visually inspect the following items.
Smooth Stroke [B]
Oil Leakage (see Periodic Maintenance chapter)
Crack or Dent
★If there is any damage to the rear shock absorber replace.
● Visually inspect the rubber bushing [C].
★If they show any signs of damage, replace them.



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Swingarm

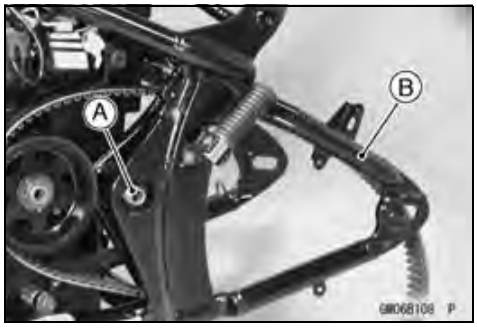
Swingarm Removal

- Remove:
  Rear Wheel (see Wheels/Tires chapter)
  Rear Shock Absorber (see Rear Shock Absorber Removal)
  Rear Brake Caliper (see Brakes chapter)
  Mud Guard (see Frame chapter)
  Drive Belt Lower Cover (see Frame chapter)

- Remove:
  Cap
  Swingarm Pivot Shaft Nut [A]

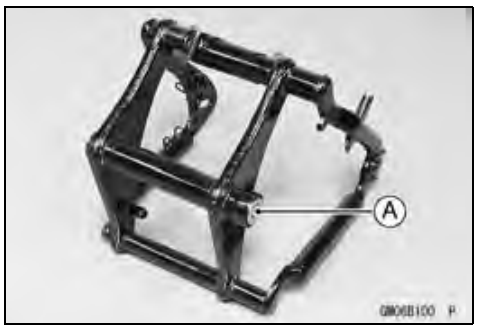


- Remove:
  Swingarm Pivot Shaft [A]
  Swingarm [B]



Swingarm Installation

- Apply plenty of grease to the bearings and oil seals.
- Install:
  Collar [A]



- Install the swingarm and insert the swingarm pivot shaft from the right side.
- Tighten:

  Torque - Swingarm Pivot Shaft Nut: 127 N·m (13 kgf·m, 94 ft·lb)

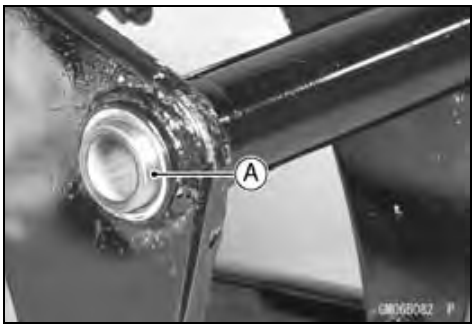
- Install the removed parts (see appropriate chapters).
- After installing the swingarm, replenish the brake fluid into the reservoir and bleed the brake line (see Brake Line Bleeding in Brakes chapter).

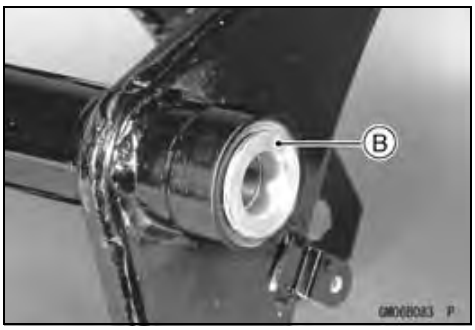
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Swingarm

Swingarm Bearing Removal

● Remove:
Swingarm (see Swingarm Removal)
Sleeve [A] and Collar [B]





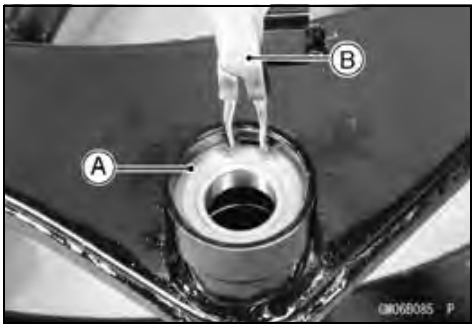
Left Side

● Remove:
Oil Seal [A]



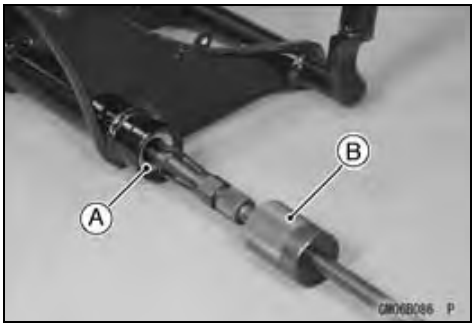
● Remove:
Circlip [A]

Special Tool - Inside Circlip Pliers [B]: 57001-143



● Remove:
Ball Bearing [A]
Needle Bearing

Special Tool - Oil Seal & Bearing Remover [B]: 57001-1058



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Swingarm

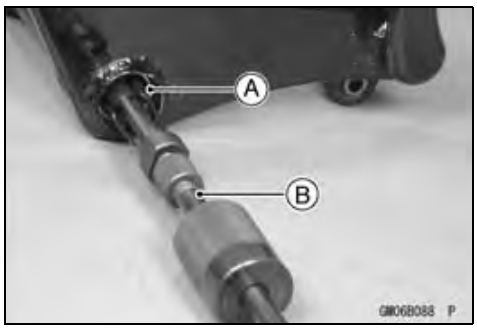
Right Side

● Remove:
Oil Seal [A]



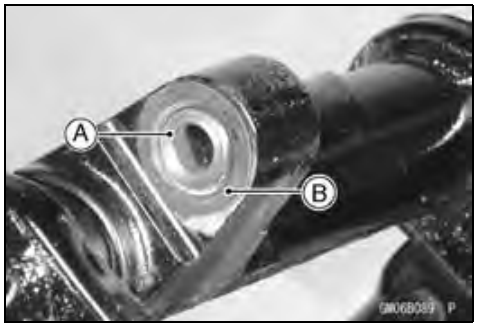
● Remove:
Needle Bearing [A]

Special Tool - Oil Seal & Bearing Remover [B]: 57001-1058



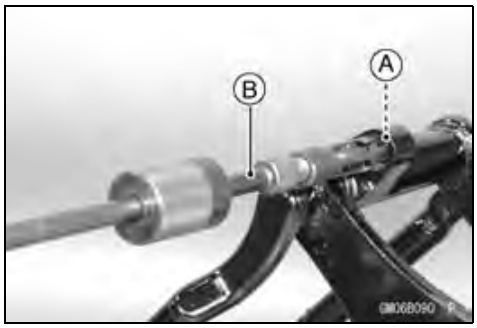
Upper Side

● Remove:
Sleeve [A]
Oil Seals [B]



● Remove:
Needle Bearing [A]

Special Tool - Oil Seal & Bearing Remover [B]: 57001-1058



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 following bearings as shown, using a suitable bearing driver in the bearing driver set.

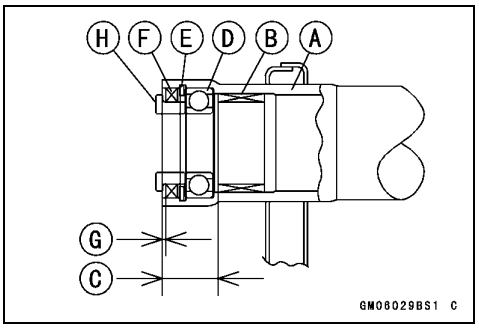
Special Tool - Bearing Driver Set: 57001-1129

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Swingarm

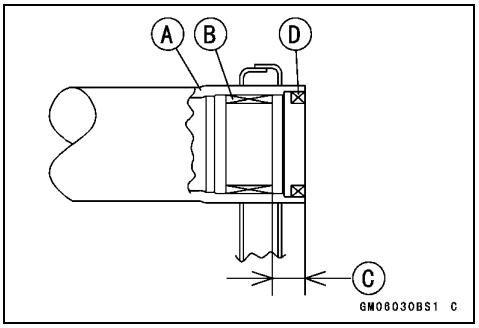
Left Side

Swingarm [A]
Needle Bearing [B]
23.6 ~ 24.4 mm (0.93 ~ 0.96 in.) [C]
Ball Bearing (until bottom end) [D]
Circlip [E]
Oil Seal [F]
1.1 ~ 1.9 mm (0.043 ~ 0.075 in.) [G]
Collar [H]



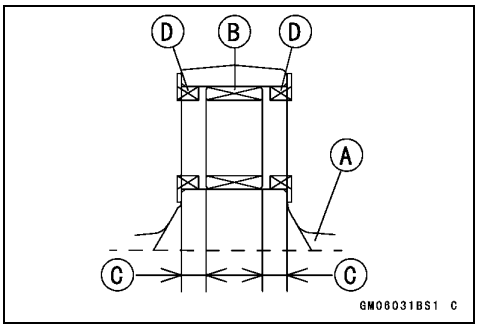
Right Side

Swingarm [A]
Needle Bearing [B]
13.6 ~ 14.4 mm (0.535 ~ 0.567 in.) [C]
Oil Seal [D]
Sleeve



Upper Side

Swingarm [A]
Needle Bearing [B]
6.1 ~ 6.9 mm (0.240 ~ 0.272 in.) [C]
Oil Seals [D]



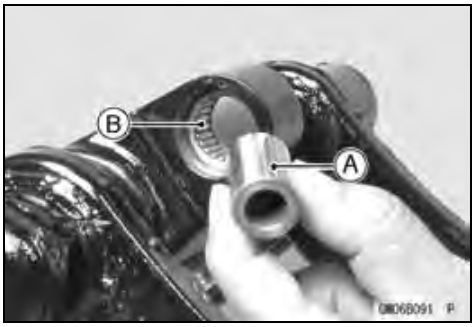
Swingarm Bearing, Sleeve Inspection

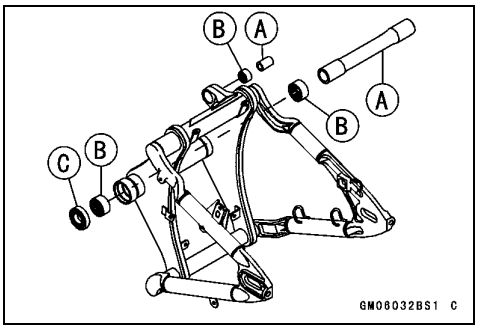
CAUTION

Do not remove the bearings for inspection. Remove may damage them.

- Inspect the swingarm sleeves [A], needle bearings [B] and ball bearing [C] installed in the swingarm.
- The rollers and balls in the bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearings in the swingarm for abrasion, discoloration, or other damage.

★If the sleeves, needle bearing and ball bearing show any sings of abnormal wear, discoloration, or damage, replace them as a set.





Grease Seal and Needle Bearing Lubrication

- Refer to the Swingarm Pivot Lubrication in the Periodic Maintenance chapter.

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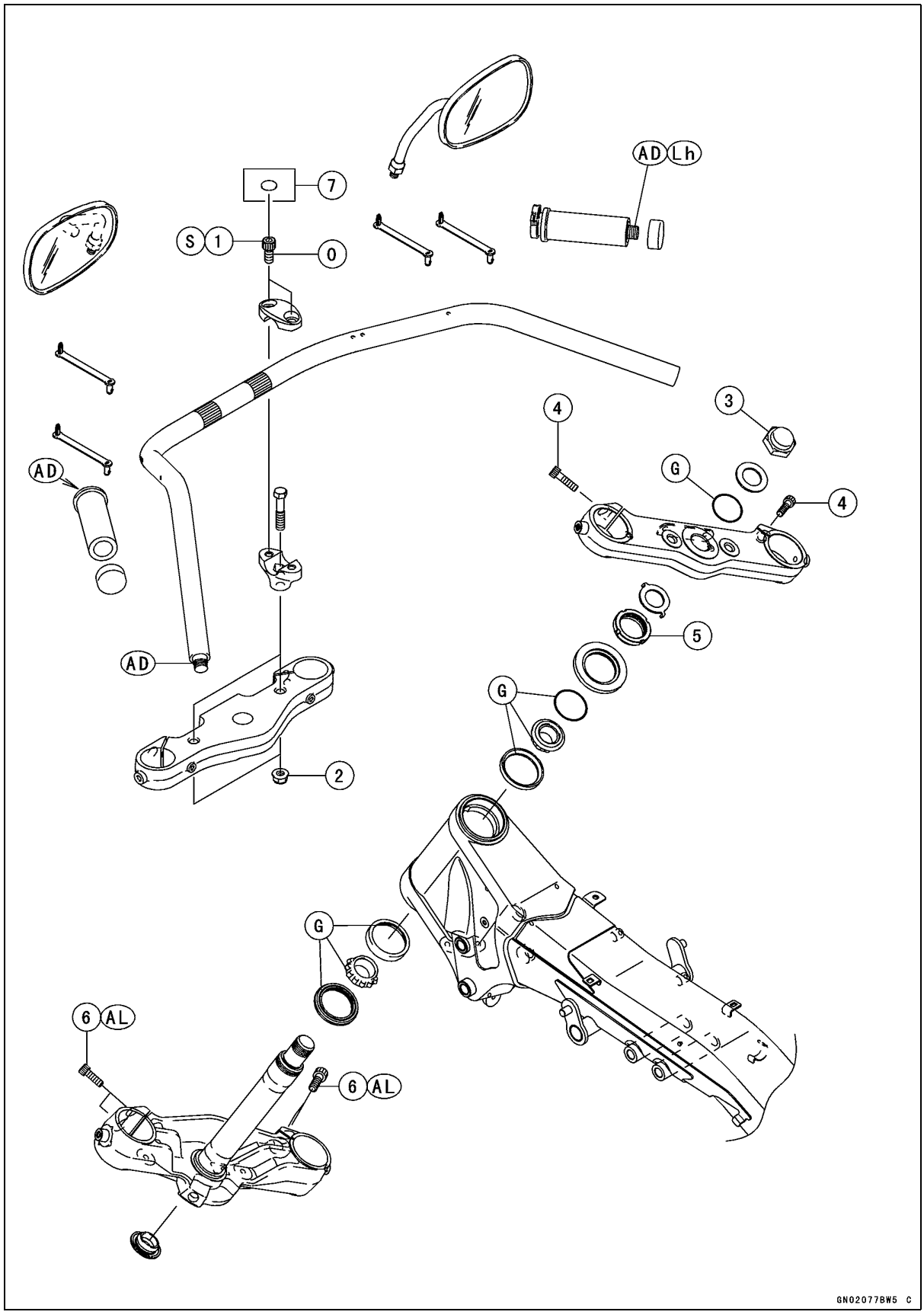
Steering

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Exploded View



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Exploded View

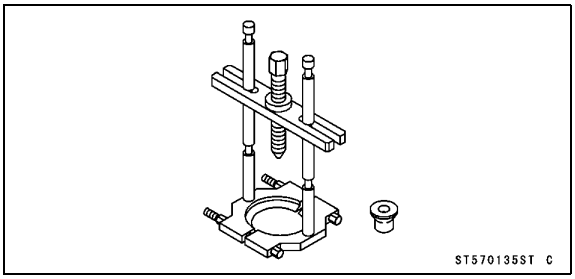
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Clamp Bolts	34	3.5	25	O, S
2	Handlebar Holder Nuts	34	3.5	25	
3	Steering Stem Head Nut	108	11	80	
4	Front Fork Upper Clamp Bolts	20	2.0	15	
5	Steering Stem Nut	4.9	0.50	43 in·lb	
6	Front Fork Lower Clamp Bolts	34	3.5	25	AL

7. Plugs (VN2000E6F ~/F6F ~)
AD: Apply adhesive.
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
Lh: Left-hand Threads
O: Apply 2 stroke oil.
S: Follow the specific tightening sequence.

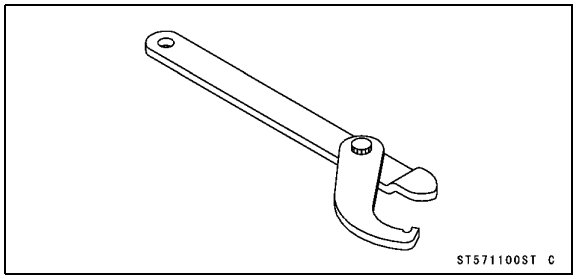
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Special tools

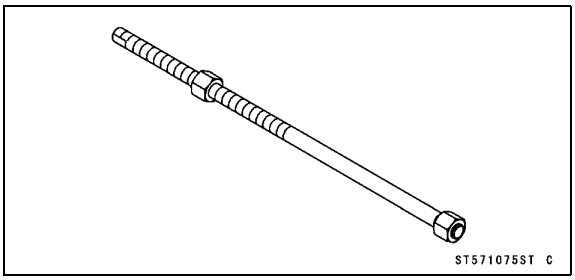
Bearing Puller:
57001-135



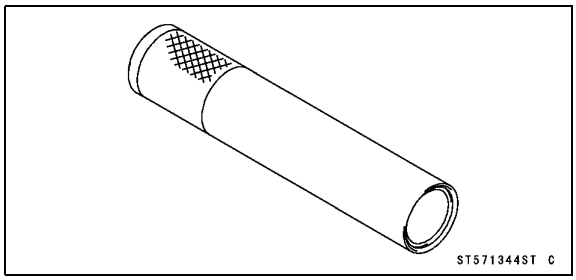
Steering Stem Nut Wrench:
57001-1100



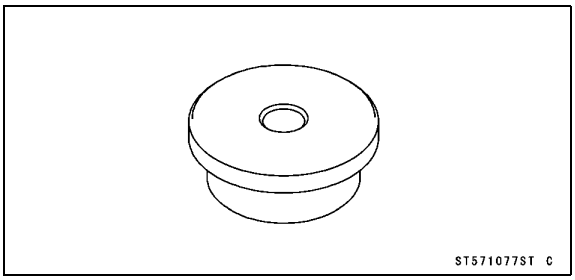
Head Pipe Outer Race Press Shaft:
57001-1075



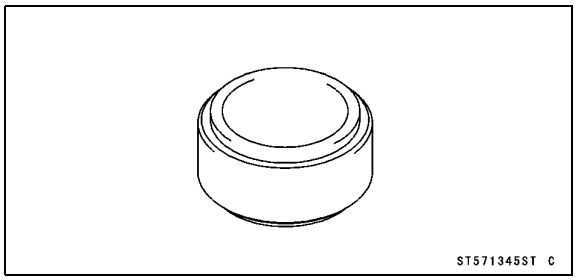
Steering Stem Bearing Driver, ϕ42.5:
57001-1344



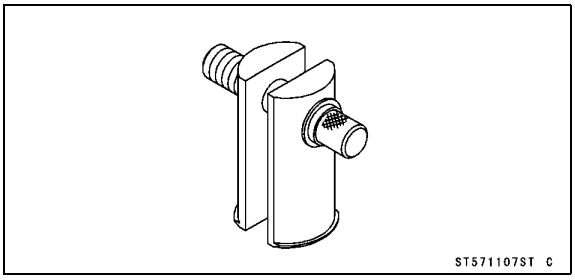
Head Pipe Outer Race Driver, ϕ54.5:
57001-1077



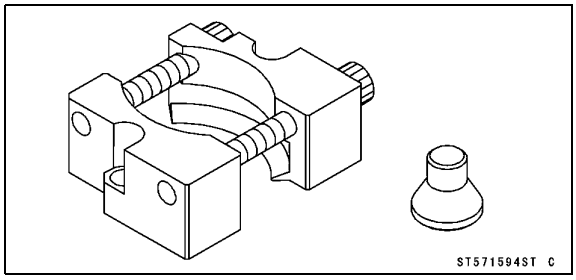
Steering Stem Bearing Driver Adapter, ϕ41.5:
57001-1345



Head Pipe Outer Race Remover ID > 37 mm:
57001-1107



Bearing Puller:
57001-1594

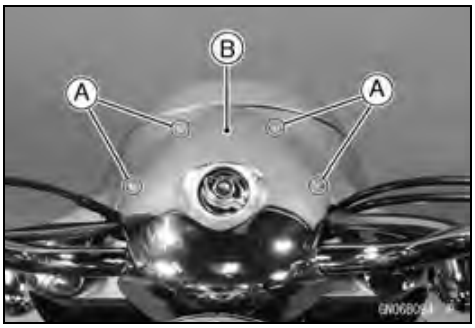


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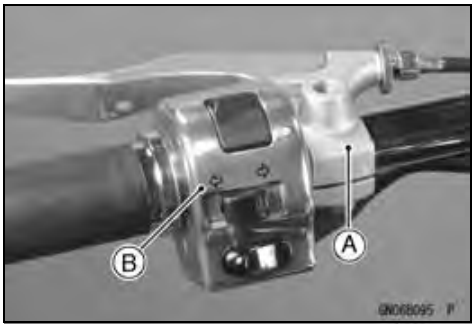
Handlebar

Handlebar Removal

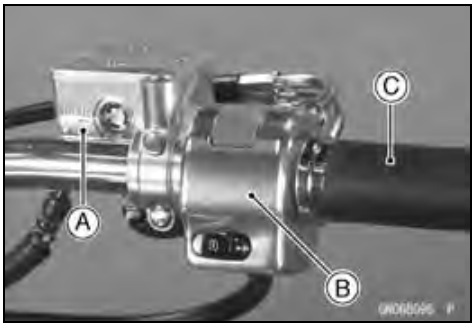
● Remove:
Headlight Upper Cover Bolts [A]
Headlight Upper Cover [B]



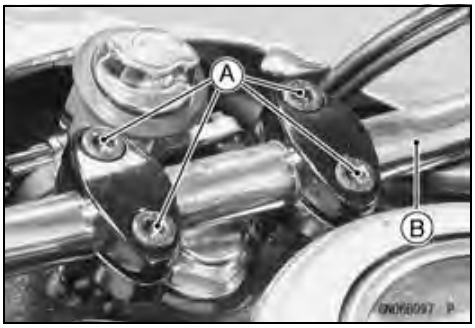
● Remove:
Clutch Lever Assembly [A]
Left Handlebar Switch Housing [B]



● Remove:
Front Brake Master Cylinder [A]
Right Handlebar Switch Housing [B]
Throttle Grip [C]



● Unscrew the clamp bolts [A] and remove the handlebar [B] from the stem head.

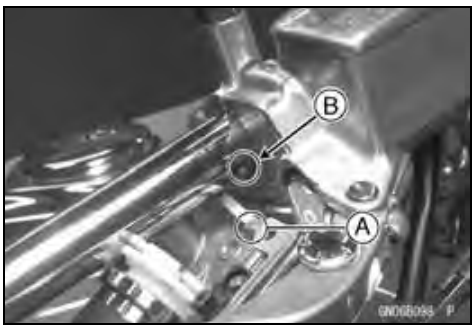


Handlebar Installation

● Apply 2 stroke oil to the threads of the handlebar clamp bolts.
● Tighten the handlebar clamp bolts.

Torque - Handlebar Clamp Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

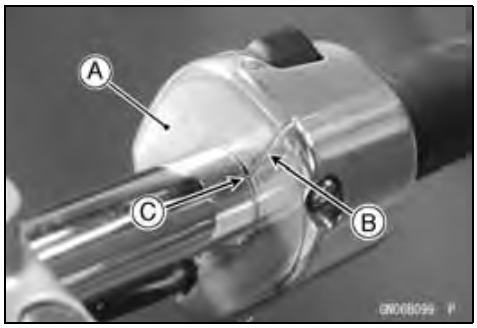
○The front half of the right handlebar switch housing has a small projection [A].
● Fit the projection into the small hole [B] in the handlebar, and install the housing.



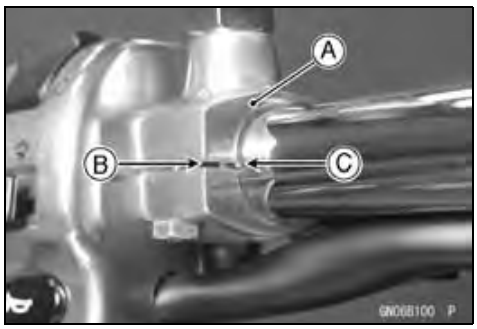
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Handlebar

- 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 housing.



- Set the clutch lever assembly [A] to mutch its mating surface [B] to the punched mark [C] of the handlebar.
- Install:
  Front Brake Master Cylinder (see Brakes chapter)

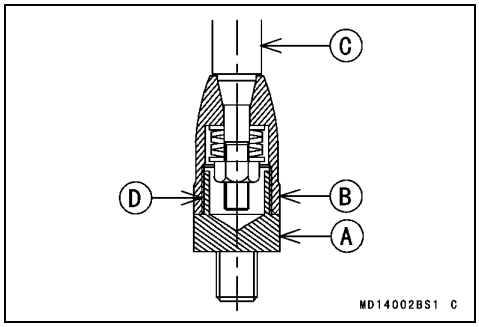


Rear View Mirror Removal (WVTA (FULL), GB WVTA (FULL) Models)

- Loosen the lower hexagonal area [A] for tightening to remove the rear view mirror from the holder.

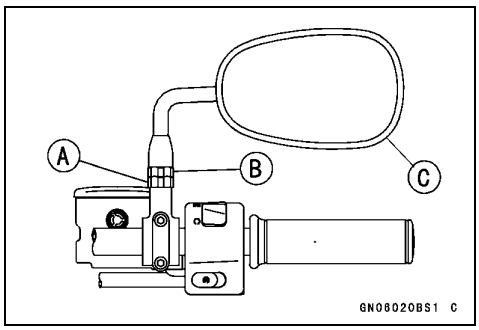
CAUTION

Do not force to tighten and/or loosen the upper hexagonal area (Adapter) [B] with a pair of spanners. Disassembly of this area is Not Available. Non-permanent locking agent [D] 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 Mirrors Installation (WVTA (FULL), GB WVTA (FULL) Models)

- Screw the mounting area of the right rear view mirror into the holder all the way, and tighten the lower hexagonal area for tightening securely.
  [A] Lower Hexagonal Area for Tightening
  [B] upper Hexagonal Area (Adapter)
  [C] Rear View Mirror (Right)



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Steering

Steering Check

- Refer to the Steering Check in the Periodic Maintenance chapter.

Steering Adjustment

- Refer to the Steering Adjustment in the Periodic Maintenance chapter.

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Steering Stem

Steering Stem Removal

● Remove the front wheel (see Tires/Wheels chapter).

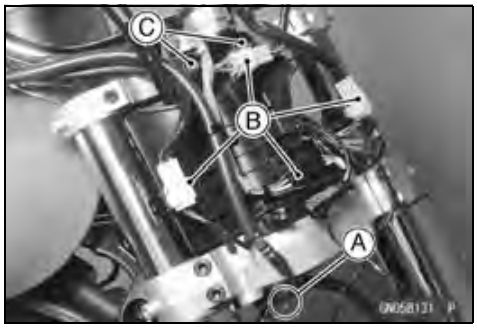
CAUTION

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.

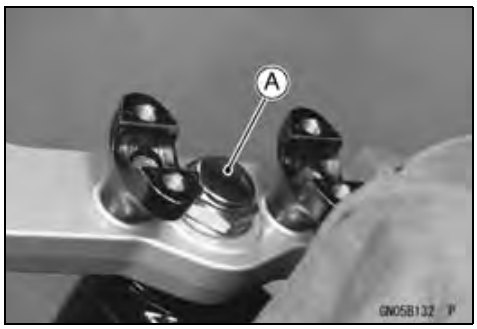
⚠ WARNING

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.

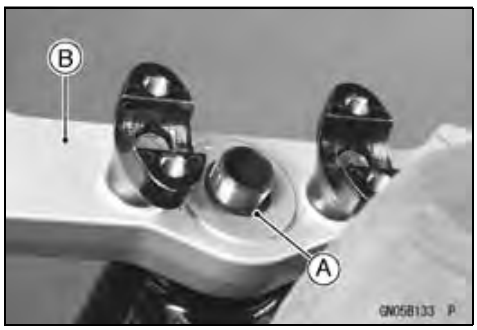
● Remove:
Headlight Unit (see Electrical System chapter)
Headlight Cover (see Frame chapter)
Front Turn Signal Light (see Electrical System chapter)
Brake Hose Clamp Bolt [A]
Brake Lever, Master Cylinder, and Hose Assembly
Connectors [B] (disconnect)
Stem Cover Bolts [C]
Stem Cover



● Remove:
Handlebar Clamp Bolts and Clamp
Handlebar Assembly
Steering Stem Head Nut [A] and Washer
Front Fork (see Suspension chapter)



● Remove:
O-ring [A]
Steering Stem Head [B]



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Steering Stem

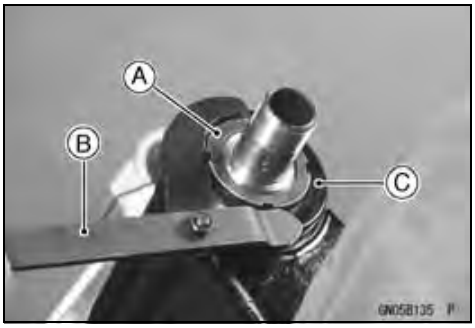
● Remove:
Claw Washer [A]



● Remove:
Steering Stem Nut [A]

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

● Remove:
Oil Seal [C]

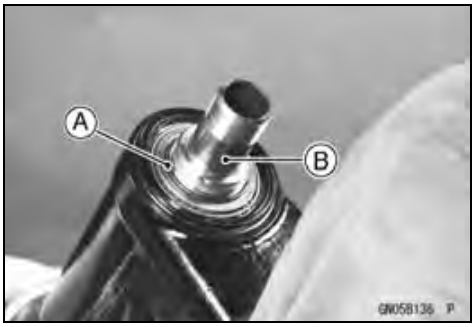


● Remove:
O-ring [A]

NOTE

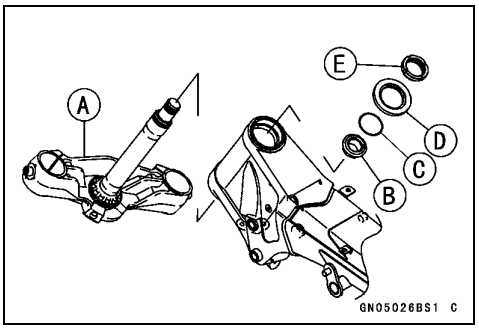
○*Be sure to remove the O-ring for removal of the steering stem.*

● Pull out the steering stem [B] from the bottom.



Steering Stem Installation

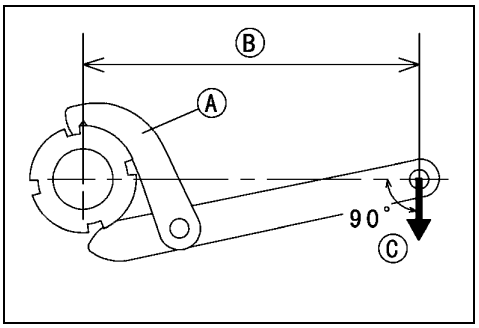
● Apply grease to the bearings.
● Install:
Steering Stem [A]
Bearing [B]
New O-ring [C] (I.D. 34.5 × ϕ2 mm)
Stem Cap [D]
Steering Stem Nut [E]



● Settle the bearings in place as follows:
○Tighten the stem nut to **39 N·m (4 kgf·m, 29 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 **218 N (22.2 kgf, 49 lb)** force in the direction shown.)

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

180 mm (7.09 in.) [B]
Force [C]



○Loosen the stem nut.
○Retighten the stem nut to the specified torque.

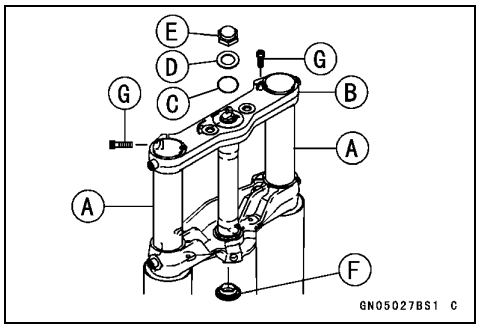
Torque - Steering Stem Nut: 4.9 N·m (0.50 kgf·m, 43 in·lb)

○For the torque of 4.9 N·m (0.50 kgf·m, 43 in·lb), pull the wrench at the hole by 27 N (2.8 kgf, 6 lb) force.

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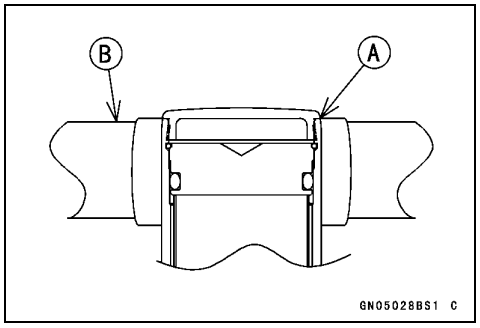
Steering Stem

● Install the claw washer.
● Install the fork legs [A] and push it up tightly against the stem bottom.
● Temporarily tighten the fork lower clamp bolts.
● Install:
Steering Stem Head [B] with Handlebar
O-ring [C]
Washer [D]
Stem Head Nut [E]
Plug [F]
● Temporarily tighten the fork upper clamp bolts [G].



○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 fork upper clamp bolts and then the stem head nut.
● Unscrew the stem head nut, and Retighten the it with the specified torque.
● Tighten the fork lower clamp bolts

Torque - Front Fork Upper Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Steering Stem Head Nut: 108 N·m (11 kgf·m, 80 ft·lb)
Front Fork Lower Clamp Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



NOTE

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

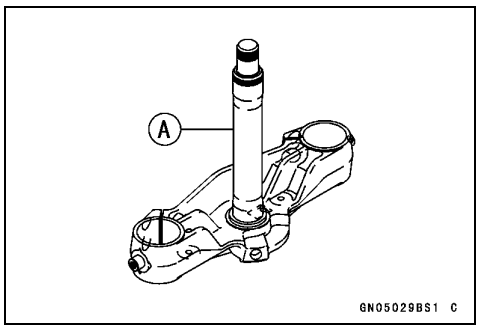
● Install the removed parts.
● Check and adjust the following items after installation.
Steering (see Periodic Maintenance chapter)
Throttle Cables (see Fuel System chapter)
Headlight Aim (see Periodic Maintenance chapter)
● Check the front brake effectiveness.

⚠ 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.



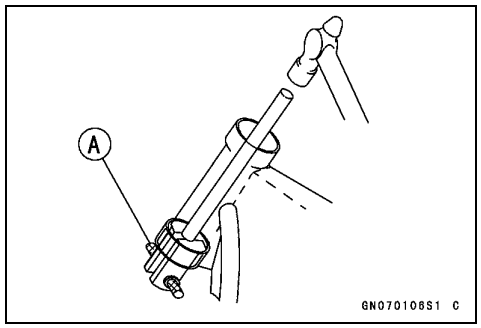
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Steering Stem Bearing

Stem Bearing Removal

- Remove the steering stem (see Steering Stem Removal).
- Drive out the bearing outer races from the head pipe.

Special Tool - Head Pipe Outer Race Remover ID > 37 mm [A]: 57001-1107

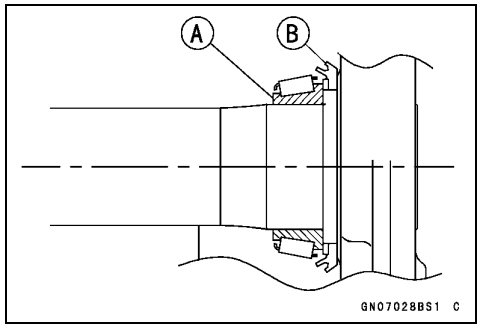


NOTE

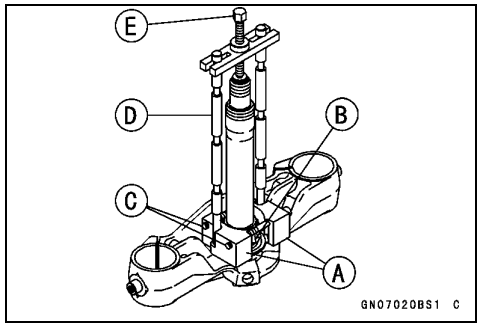
○*If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) be replaced with new ones.*

- Remove the lower inner race [A] which is pressed onto the steering stem, using Special Tools.
  Grease Seal [B]

Special Tools - Bearing Puller: 57001-1594
Bearing Puller: 57001-135



○Insert the each half-split base [A] under the bottom of the bearing [B] and connect the both bases by tightening the M10 bolts [C].
○Assemble the parts of the bearing puller [D] as shown in the figure.
○Turn the center bolt [E] by a wrench and pull the bearing off.



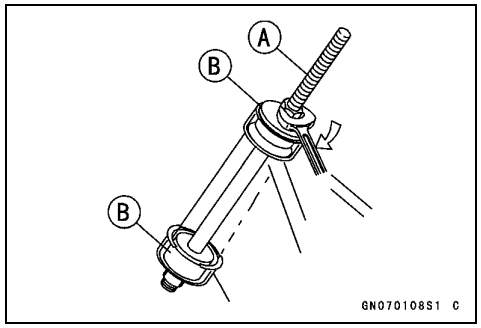
NOTE

○*Tighten evenly two bases by the two M10 bolts.*

Stem Bearing Installation

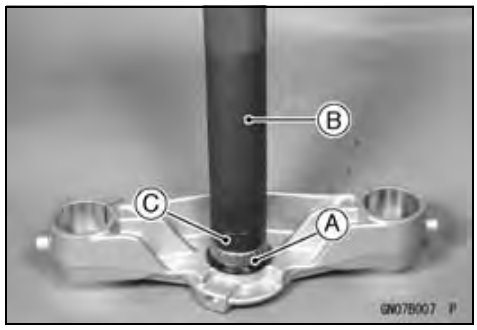
- Replace the bearing outer races with new ones.
- Apply grease to the outer races, and drive them into the head pipe at the same time.

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 bearing [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).

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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.

Stem Bearing Lubrication

In accordance with the Periodic Maintenance Chart, lubricate the steering stem bearings. Refer to the Stem Bearing Lubrication in Periodic Maintenance chapter.

Stem Cap Deterioration, Damage

★Replace the stem cap if its grease seal [A] shows damage.



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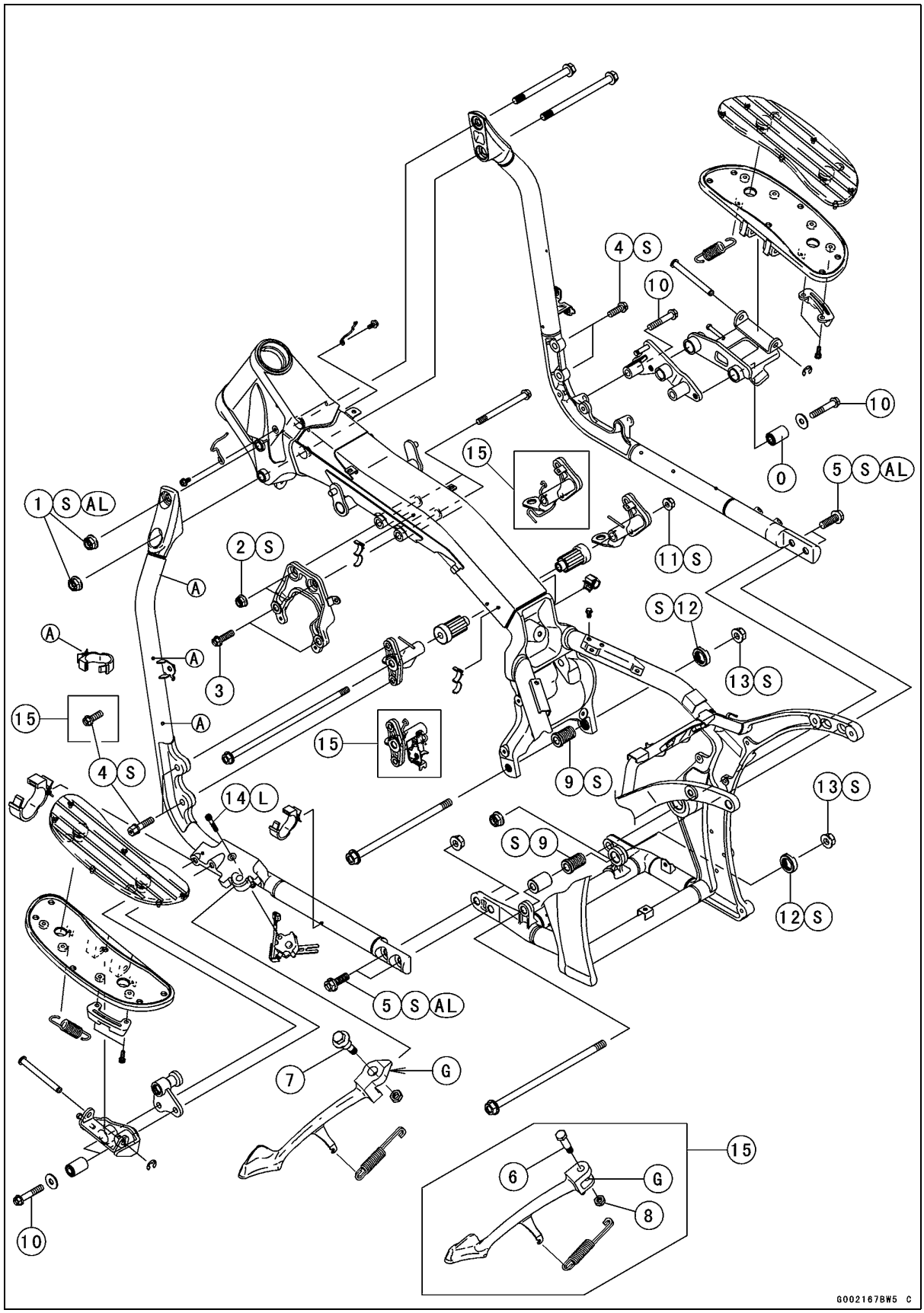
Frame

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Exploded View



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Exploded View

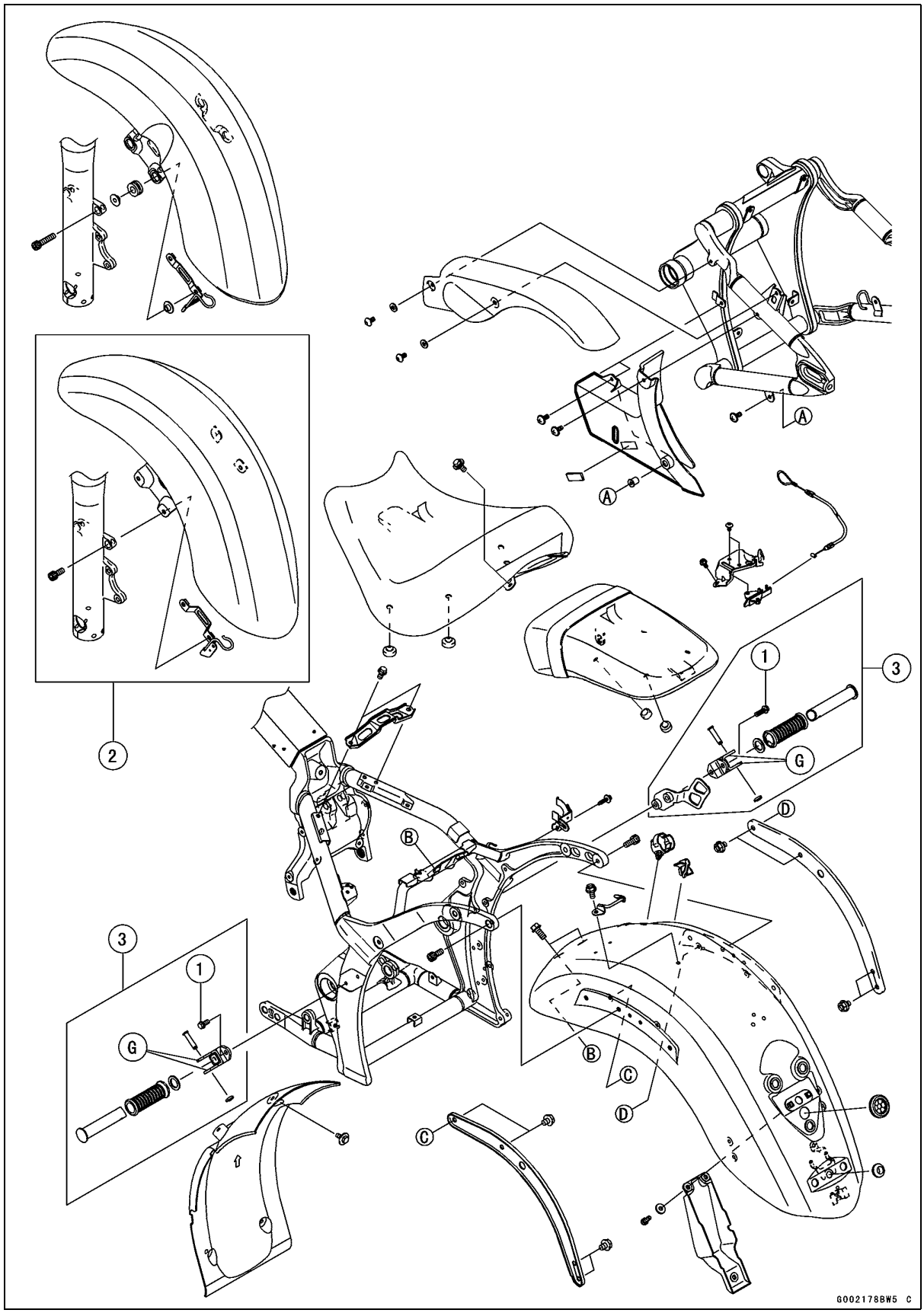
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Downtube Nuts	88	9.0	65	S, AL
2	Upper Engine Bracket Nuts	59	6.0	43	S
3	Upper Engine Mounting Bolts	44	4.5	33	S
4	Lower Engine Bracket Bolts	59	6.0	43	S
5	Rear Downtube Bolts	108	11	80	S, AL
6	Sidestand Mounting Bolt (VN2000-A1, A2)	44	4.5	33	
7	Sidestand Mounting Bolt	59	6.0	43	
8	Sidestand Mounting Nut	44	4.5	33	
9	Adjust Bolts	9.8	1.0	87 in·lb	S
10	Footboard Bracket Bolts	34	3.5	25	
11	Front Engine Mounting Nut	44	4.5	33	S
12	Adjusting Bolt Locknuts	49	5.0	36	S
13	Rear Engine Mounting Nuts	59	6.0	43	S
14	Sidestand Switch Mounting Bolt	8.8	0.90	78 in·lb	L

15. VN2000-A1, A2

AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
L: Apply a non-permanent locking agent.
O: Apply oil.
S: Follow the specific tightening sequence (see Engine Removal/Installation chapter).

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Exploded View



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Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Footpeg Bracket Bolts	25	2.5	18	

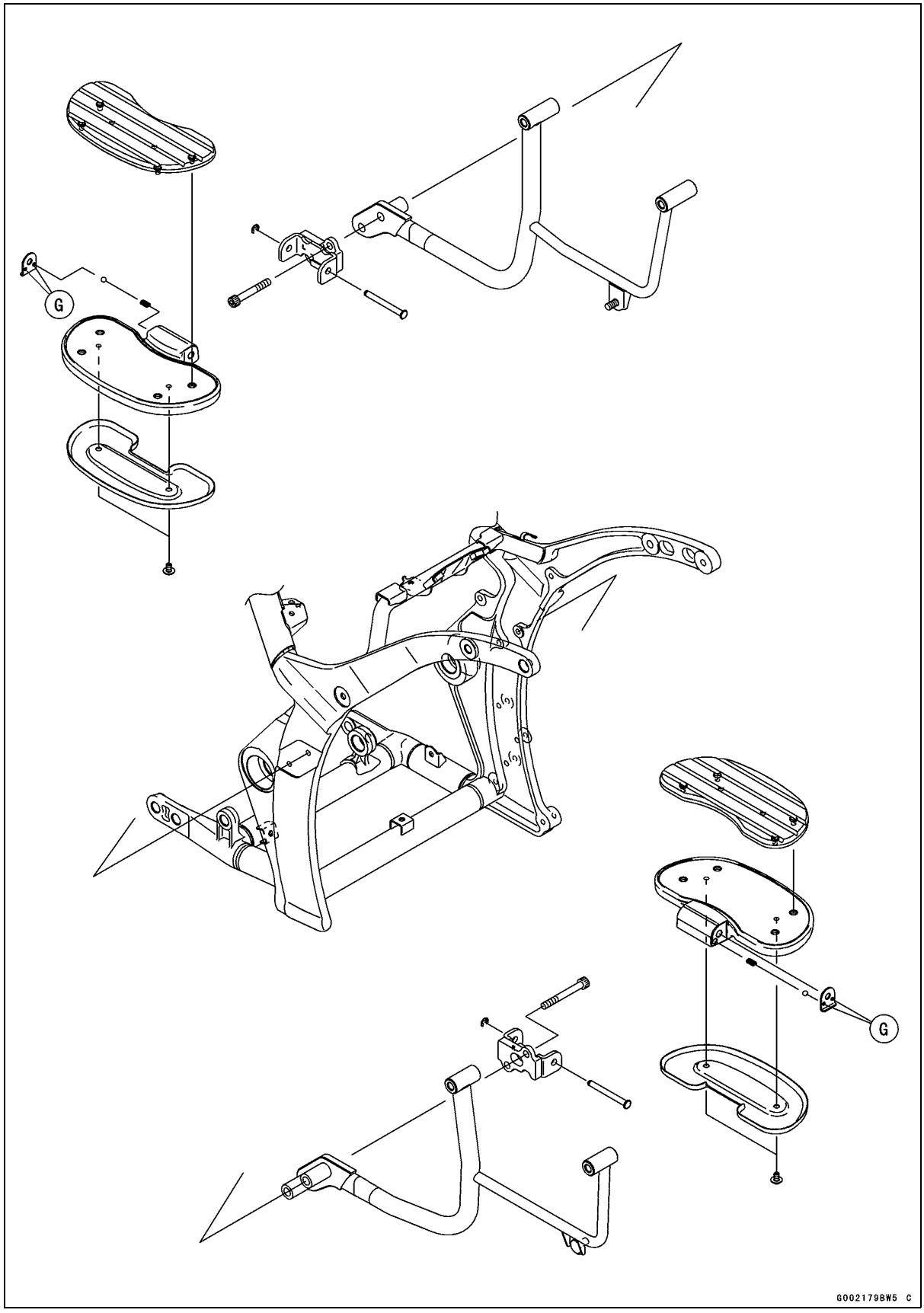
2. VN2000-A1 Model
3. Other than VN2000F6F ~

G: Apply grease.

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Exploded View

VN2000F6F



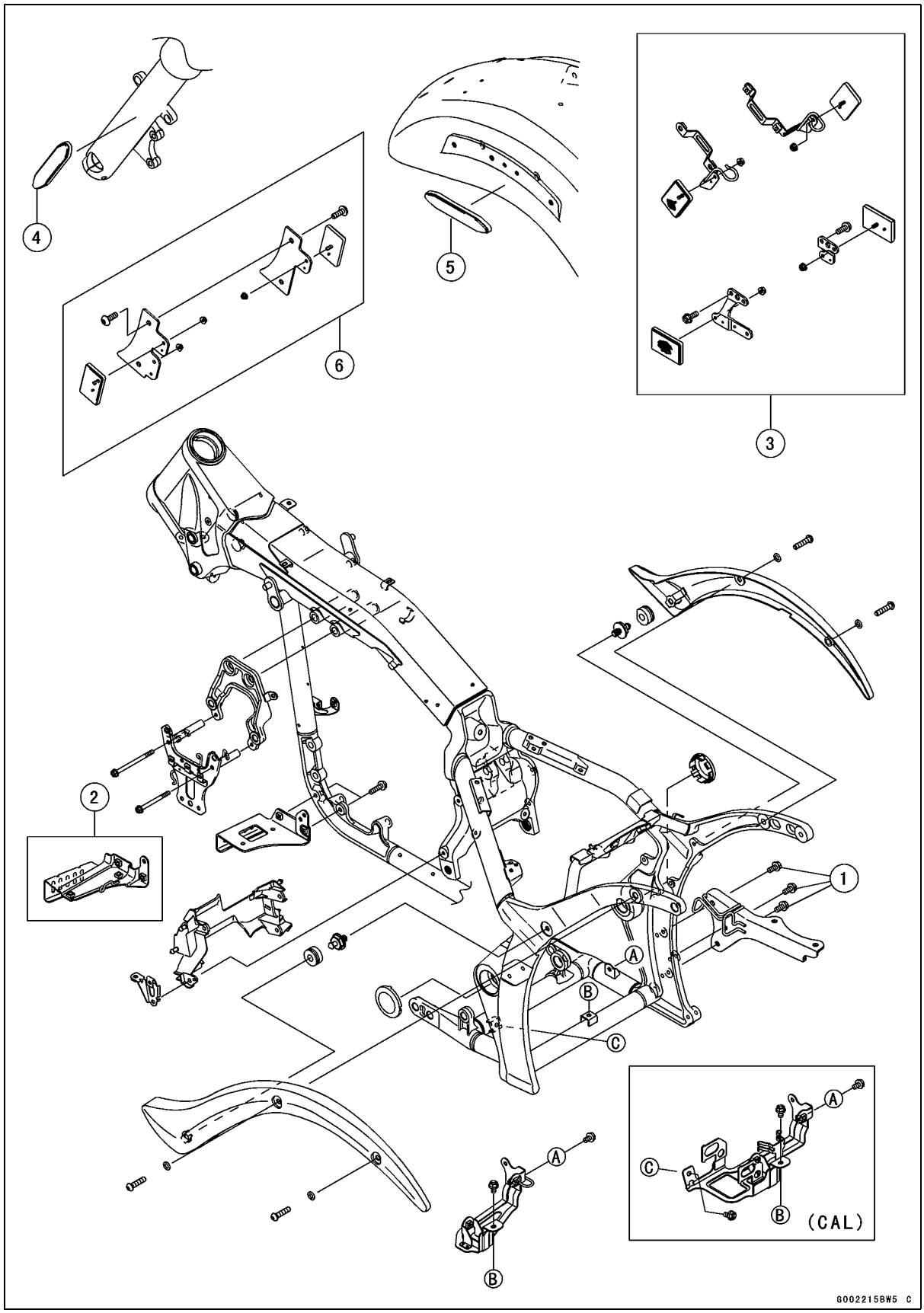
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G: Apply grease

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Exploded View

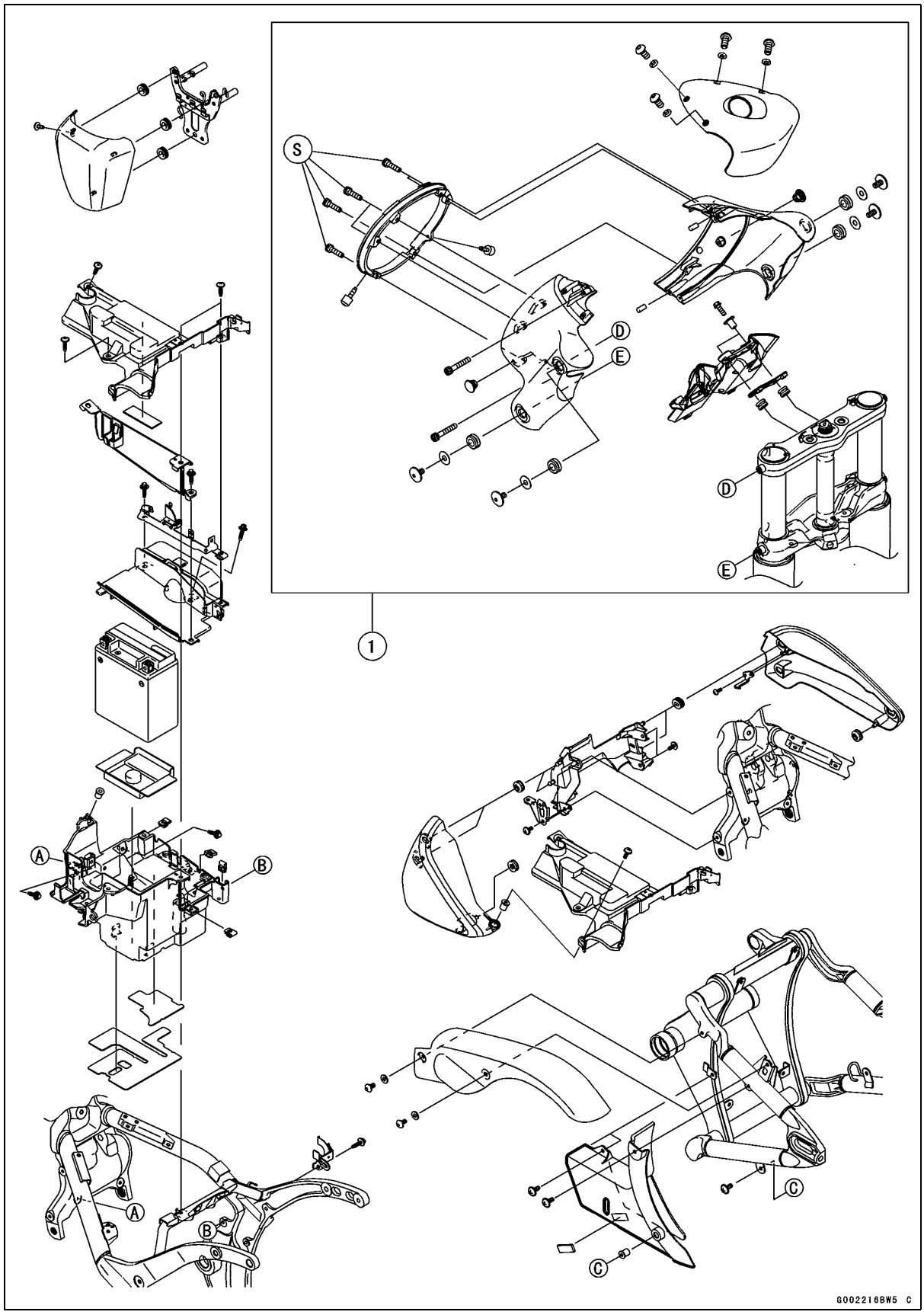
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Muffler Bracket Mounting Bolts	25	2.5	18	

2. VN2000-A1 Model
3. Other than VN2000E6F ~/F6F ~
4. VN2000E6F ~/F6F ~
5. VN2000E6F ~
6. VN2000F6F ~

CAL: California Model

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Exploded View



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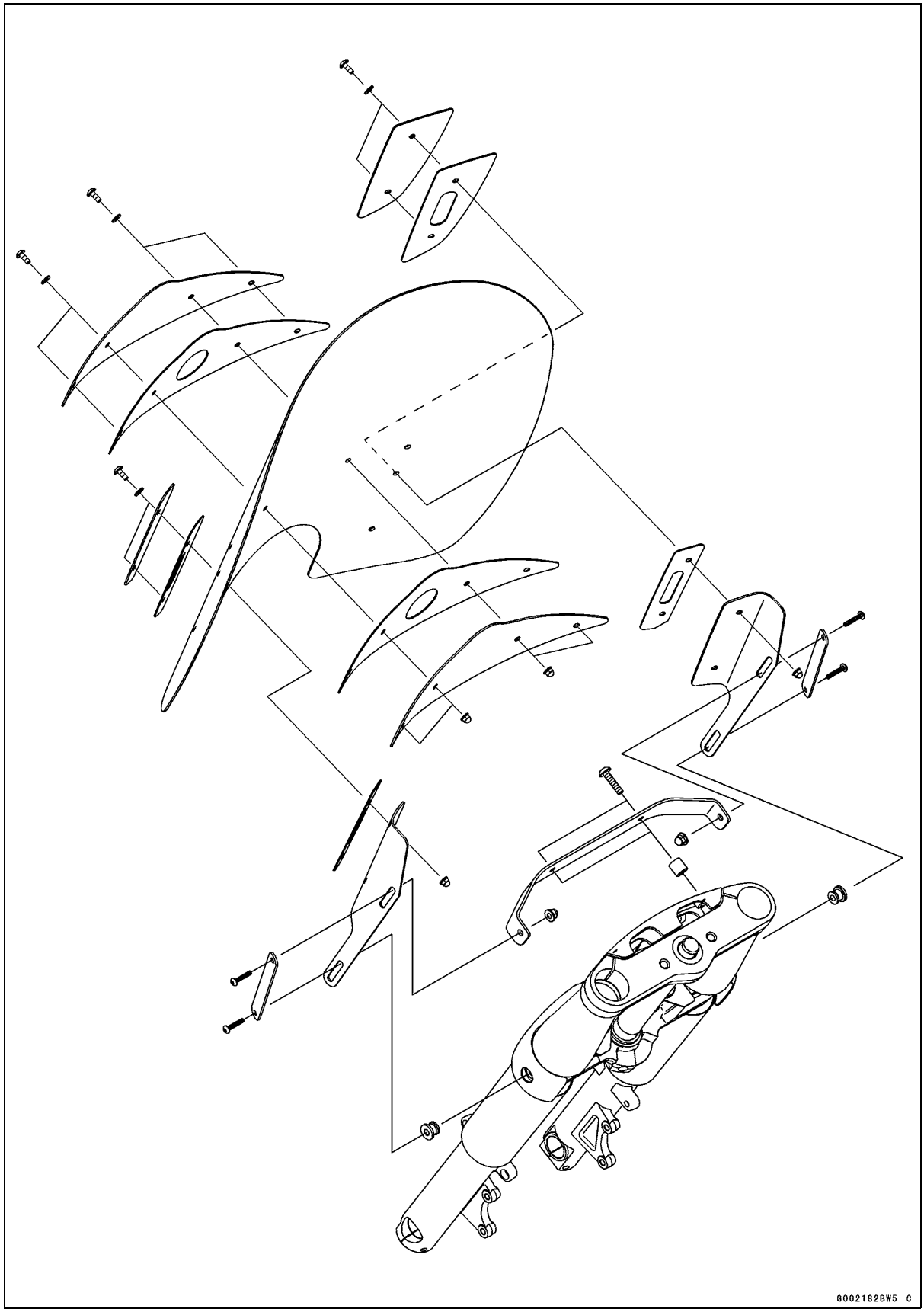
Exploded View

1. Other than VN2000E6F ~/F6F ~
S: Follow the specific tightening sequence.

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Exploded View

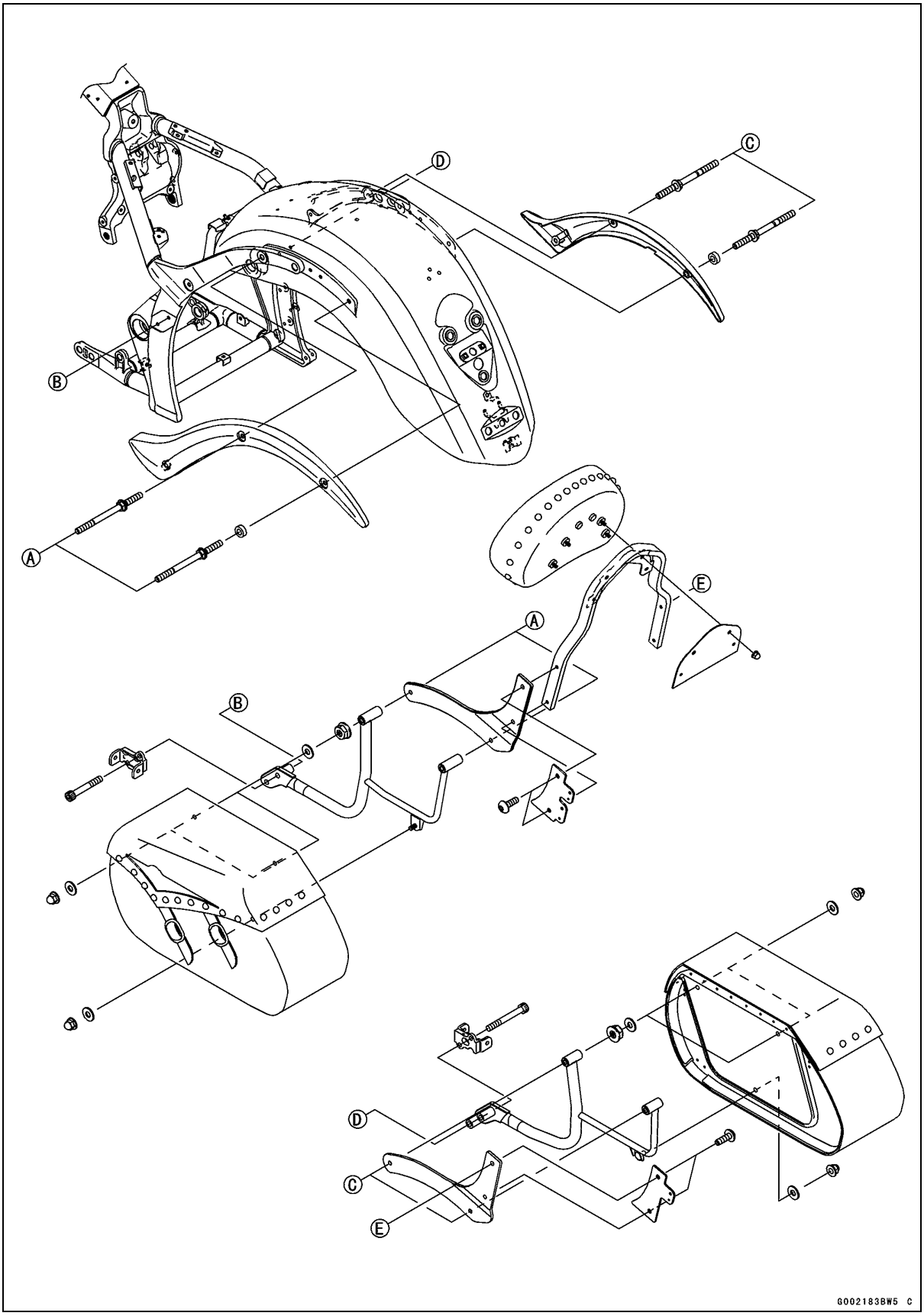
VN2000F6F ~



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Exploded View

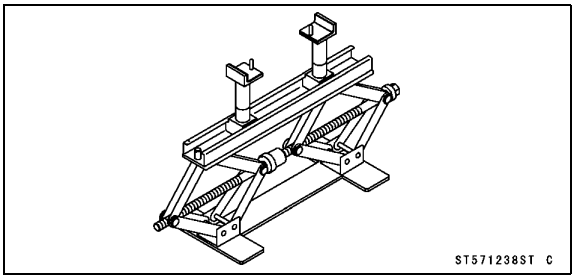
VN2000F6F ~



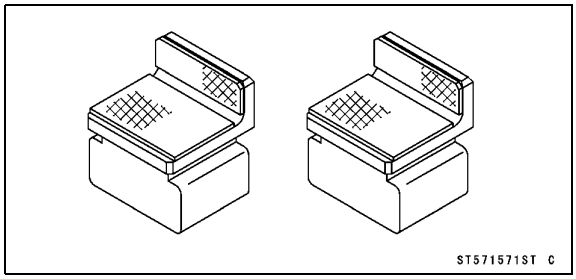
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Special Tools

Jack:
57001-1238



Jack Attachment:
57001-1571

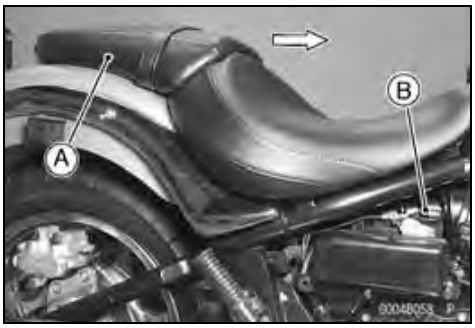


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Seats

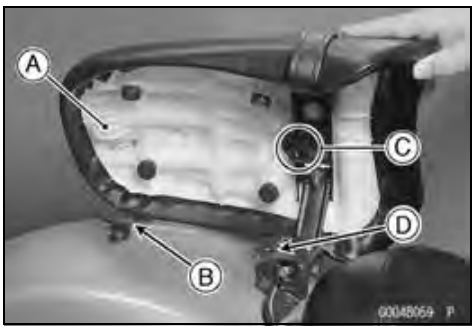
Rear Seat Removal

- Remove:
  Right Side Cover (see Right Side Cover Removal)
- Remove the rear seat [A] by pulling the looped seat latch [B] and then pulling the rear seat up to the front.



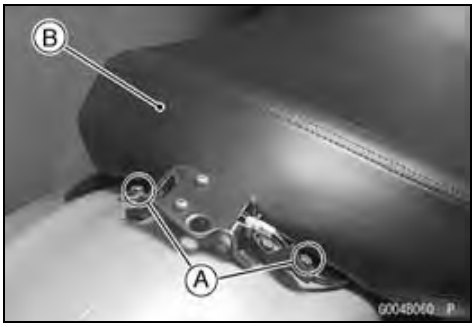
Rear Seat Installation

- Slip the rear seat hook [A] into the brace [B] on the rear fender, and put the stopper [C] into the hole [D] in the seat bracket.
- Push down the front part of the rear seat until the lock with a click.



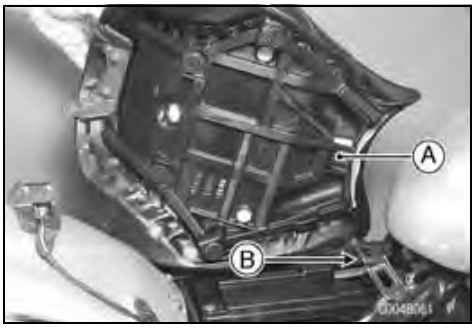
Front Seat Removal

- Remove:
  Rear Seat (see Rear Seat Removal)
  Front Seat Mounting Bolts [A]
- Remove the front seat [B] by pulling the rear seat up to the rear.



Front Seat Installation

- Slip the front seat hook [A] into the front seat bracket [B] on the frame.
- Tighten the front seat mounting bolts.
- Install the rear seat (see Rear Seat Installation).

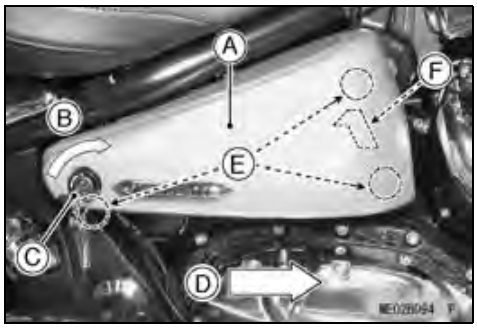


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Side Covers

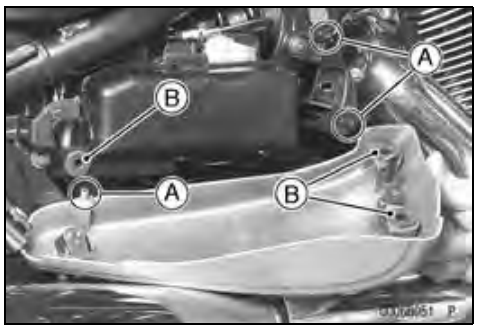
Right Side Cover Removal

- Insert the ignition key [C] into the right side cover [A], and turn the key clockwise [B] until the key slot is vertical.
- Pull the right side cover forward [D] to clear the hook [F], and then remove the side cover pulling it outward to clear the projections [E].



Right Side Cover Installation

- Put the stoppers [A] into the grommets [B].



- Turn the ignition switch key [A] counterclockwise [B] until the key slot is horizontal to secure the right side cover [C].



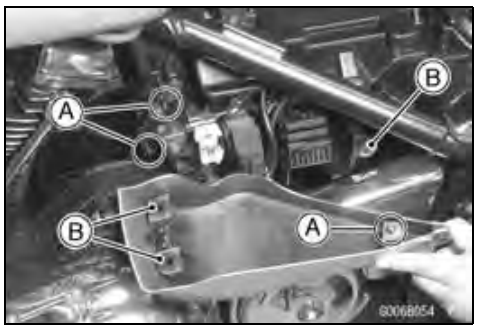
Left Side Cover Removal

- Remove the screw [A].
- Pull [B] the left side cover evenly outward to clear the stoppers and remove the left side cover.



Left Side Cover Installation

- Put the stoppers [A] into the grommets [B].
- Tighten the screw.



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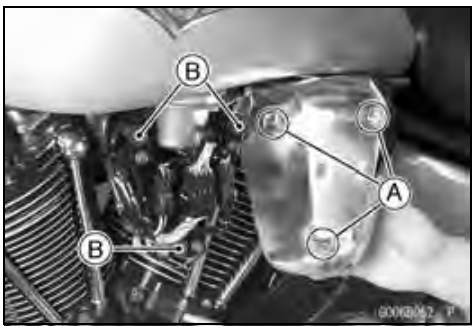
Side Covers

Ignition Coil Bracket Cover Removal



- Remove:
  Ignition Coil Bracket Cover Screw [A]
- Pull [B] the ignition coil bracket cover [C] evenly outward to clear the stoppers and remove the cover.

Ignition Coil Bracket Cover Installation



- Put the stoppers [A] into the grommets [B].
- Tighten the screw.
- Refer to the Ignition Coil Installation in the Electrical System chapter for the position of the ignition coil secondary cables.

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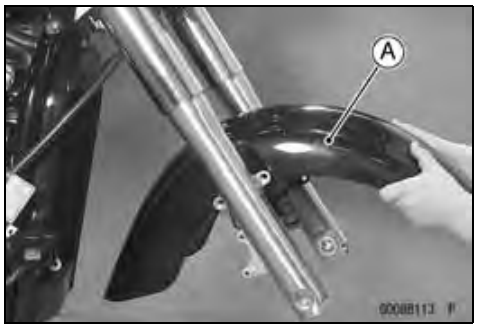
Fenders

Front Fender Removal

CAUTION

Be careful not to scratch the painted surface during removal or installation.

- Remove:
  Front Wheel (see Wheels/Tire chapter)
  Front Fender Bolts [A]
  Front Fender [B]

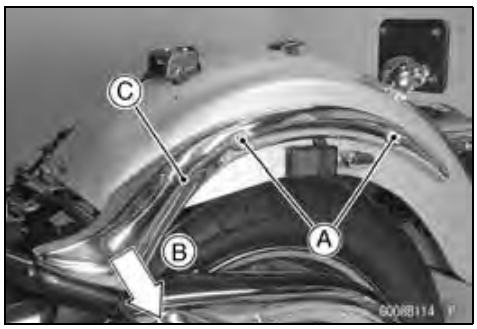


Rear Fender Removal

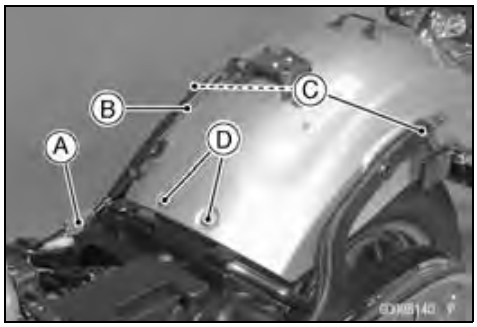
CAUTION

Be careful not to scratch the painted surface during removal or installation.

- Remove:
  Seats (Seats Removal)
  Rear Fender Cover Bolts [A] and Washers
- Pull [B] the rear fender cover [C] to clear the stopper and remove it.

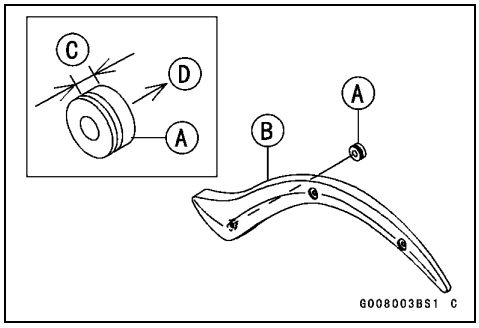


- Disconnect the rear turn signal and taillight lead connector [A].
- Remove:
  Seat Lock Cable [B] (from bracket of latch side)
  Rear Fender Front Bolts [C]
  Rear Fender Allen Bolts [D] (both sides)
- Remove the rear fender rearwards.

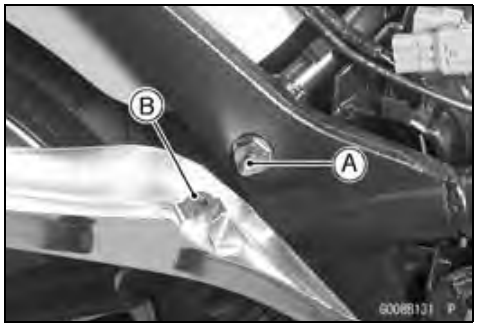


Rear Fender Installation

- Install the grommets [A] into the rear fender cover [B] so that the wider side [C] faces to frame [D].



- Put the stopper [A] into the grommet [B].
- Run the seat lock cable and rear turn signal and taillight lead in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.

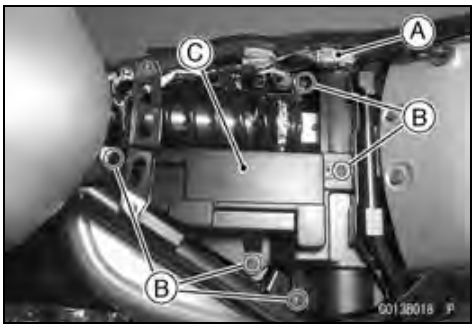


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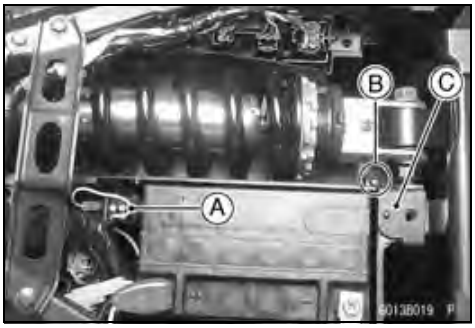
Battery Case/Tool Case

Tool Case Removal

- Remove:
  Seats (see Front/Rear Seats Removal)
  Connector [A]
  Battery Cover Screws [B]
  Battery Cover [C]



- Remove:
  Kawasaki Diagnostic System Connector [A]
  Partition Bolt [B]
  Partition [C]



- Remove:
  Seat Lock Cable
  Connectors [A]



- Remove:
  Tool Bag [A]
  Cable Lock Bracket Bolt [B]
  Cable Lock Bracket [C]



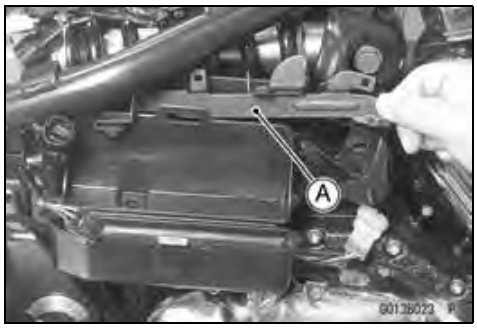
- Remove:
  Tool Case Bolts [A]



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Battery Case/Tool Case

● Remove:
Connector Bracket [A]



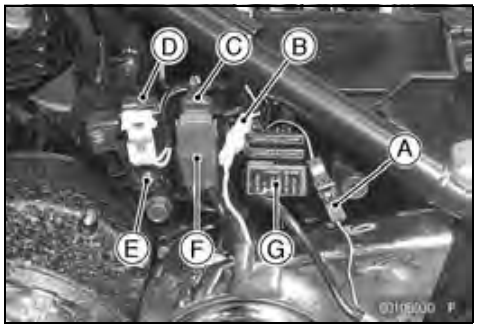
● Remove:
Tool Case [A]



Battery Case Removal
● Remove:
Seats (see Front/Rear Seats Removal)
Battery (see Electrical System chapter)
Battery Damper [A]



● Disconnect:
Ground Lead Connector [A]
White Lead Connector [B]
Starter Relay Lead Connector [C]
Atmospheric Pressure Sensor Lead Connector [D]
● Remove:
Bracket Screw [E]
Starter Relay [F]
Fuse Box [G]



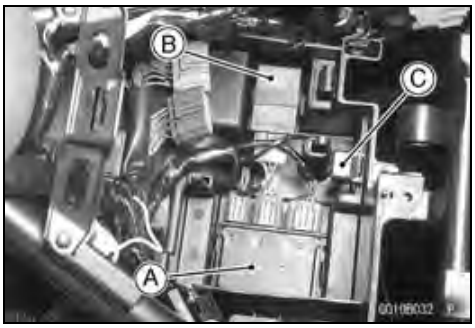
● Remove:
Tool Case (see Tool Case Removal)
Rear Shock Absorber (see Suspension chapter)
ECU [A]



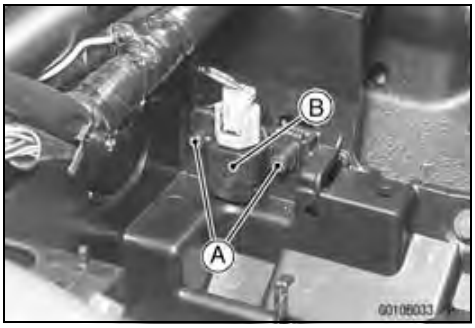
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Battery Case/Tool Case

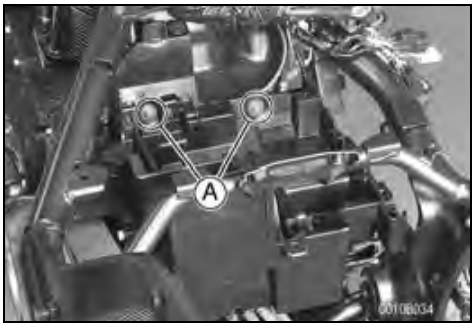
● Remove:
Relay Box [A]
Turn Signal Control Relay [B]
Starter Control Relay [C]



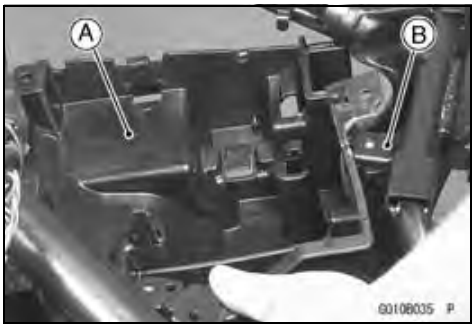
● Remove:
Vehicle-down Sensor Bolts [A]
Vehicle-down Sensor [B]



● Remove:
Rear Fender (see Rear Fender Removal)
Rear Wheel (see Wheels/Tires chapter)
Swingarm (see Suspension chapter)
Battery Case Bolts [A]



● Move the battery case [A] to clear the bracket [B] of the frame.



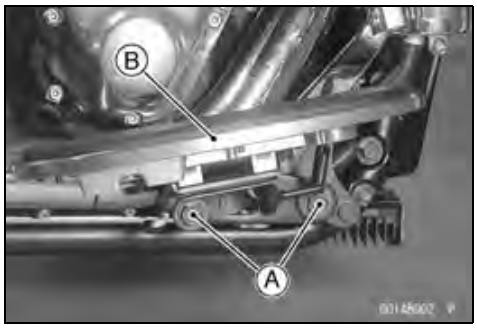
● Remove the battery case [A] to rearward.



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Footboard and Sidestand

Front Footboard Removal (R/H)



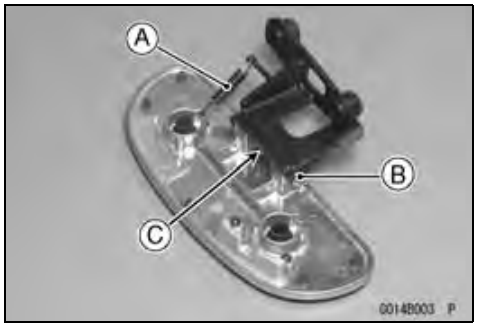
- Remove:
  Footboard Bracket Bolts [A]
  Footboard [B]

Front Footboard Installation (R/H)

- Tighten:

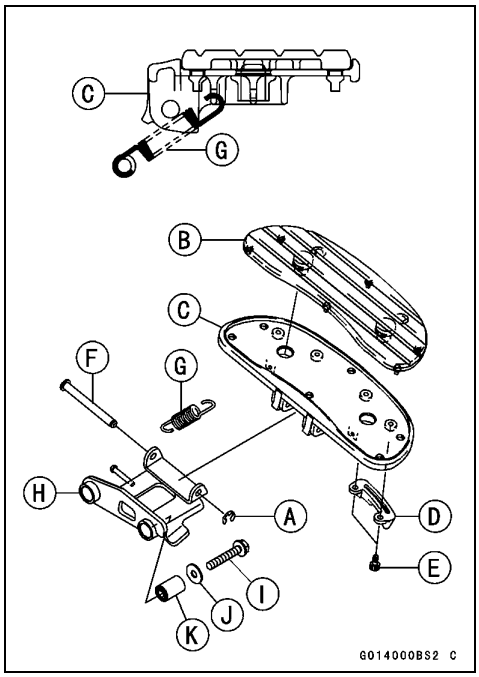
Torque - Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

Front Footboard Disassembly (R/H)



- Remove:
  Right Footboard (see Right Footboard Removal)
  Spring [A]
  Circlip [B]
  Pin [C]

Front Footboard Assembly (R/H)

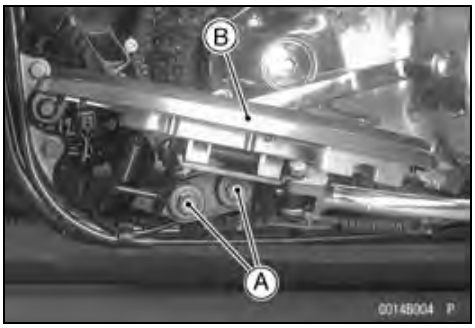


- Replace the circlip [A] with a new one.
- Install:
  Footboard Damper [B]
  Footboard [C]
  Bank Sensor [D]
  Bank Sensor Bolts [E]
  Pin [F]
  Circlip
- Install the spring [G] as shown.
- Install:
  Footboard Bracket [H]
  Footboard Bracket Bolts [I]
  Washers [J]
- Apply oil to the bushings [K], and install them.

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Footboard and Sidestand

Front Footboard Removal (L/H)



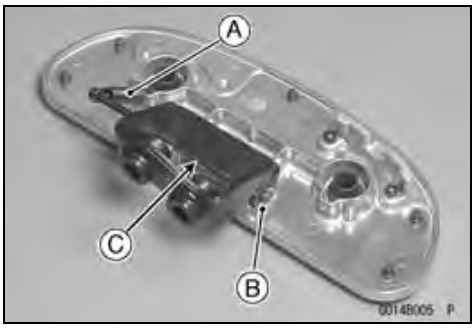
- Remove:
  Footboard Bracket Bolts [A]
  Footboard [B]

Front Footboard Installation (L/H)

- Instal the shift pedal.
- Tighten:

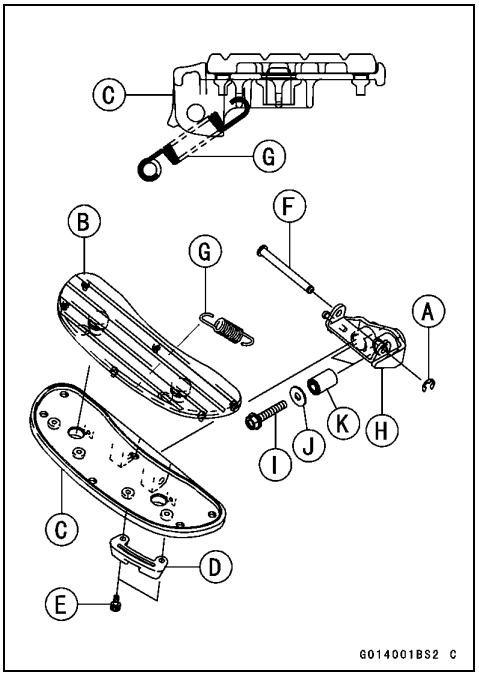
Torque - Footboard Bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

Front Footboard Disassembly (L/H)



- Remove:
  Left Footboard (see Left Footboard Removal)
  Spring [A]
  Circlip [B]
  Pin [C]

Front Footboard Assembly (L/H)

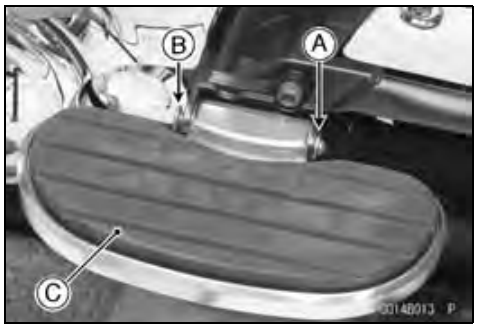


- Replace the circlip [A] with a new one.
- Apply grease to the contact positions of the footboard, footboard bracket and pin.
- Install:
  Footboard Damper [B]
  Footboard [C]
  Bank Sensor [D]
  Bank Sensor Bolts [E]
  Pin [F]
  Circlip
- Install the spring [G] as shown.
- Install:
  Footboard Bracket [H]
  Footboard Bracket Bolts [I]
  Washers [J]
- Apply oil to the bushings [K], and install them.

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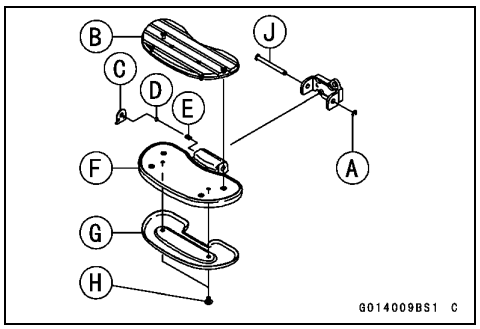
Footboard and Sidestand

Rear Footboard Removal (VN2000F6F)



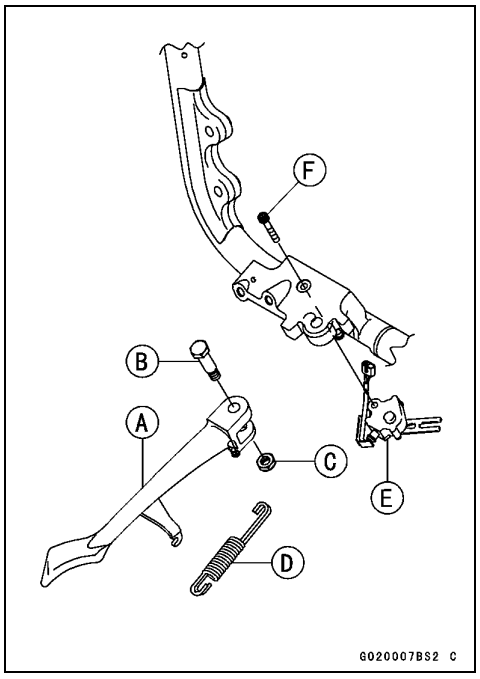
- Remove:
  Circlip [A]
  Pin [B]
  Rear Footboard [C]

Rear Footboad Installation (VN2000F6F)



- Replace the circlip [A] with a new one.
- Install:
  Rear Footboard Damper [B]
  Stopper [C]
  Steel Ball [D]
  Spring [E]
  Rear Footboard [F]
  Rear Footboard Cover [G]
  Cover Bolt [H]
  Pin [J]
- Install the spring [E] and steel ball [D] of the rear footboard.
- Apply grease on the stopper [C].
- Instal the footboad bracket between rear footboad [F].

Sidestand Installation



- Apply grease to the contact surface of the frame and side stand.
- Install:
  Sidestand [A]
  Sidestand Mounting Bolt [B] and Nut [C]
- Tighten:

Torque - Sidestand Mounting Bolt, Nut: 44 N·m (4.5 kgf·m, 33 ft·lb) (VN2000-A1, A2)
Sidestand Mounting Bolt: 59 N·m (6.0 kgf·m, 43 ft·lb)

- Install:
  Spring [D]
  Sidestand Switch [E]
- Apply a non-permanent locking agent to the sidestand switch mounting bolt [F].
- Tighten:

Torque - Sidestand Switch Mounting Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

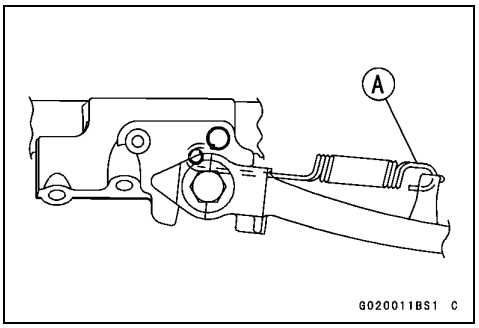
- Check that the sidestand switch mounting bolt is not loosening.
- Run the sidestand switch lead correctly (see Cable, Wire, and Hose Routing section in Appendix chapter).

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Footboard and Sidestand

Other than VN2000-A1, A2

- Install the spring so that the spring short end [A] faces as shown.



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Downtube

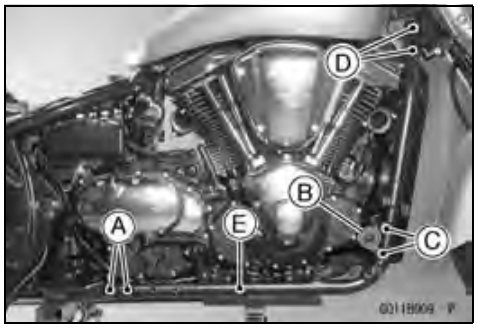
Downtube Removal

● Using the jack and the jack attachment, raise the rear wheel off the ground (see Wheels/Tires chapter).

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571

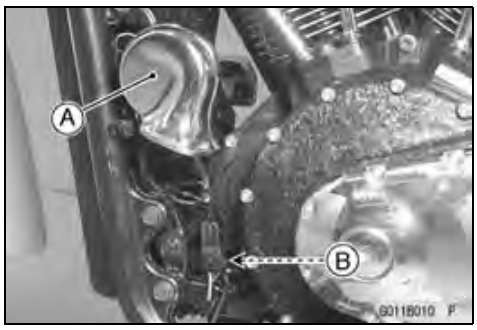
Right Side

● Remove:
Muffler and Exhaust Pipes (see Engine Top End chapter)
Right Footboard (see Footboard Removal)
Brake Pedal and Rear Master Cylinder (see Brake System chapter)
Lower Downtube Mounting Bolts [A]
Engine Mounting Bolt [B]
Engine Mounting Bracket Bolts [C] and Bracket
Upper Downtube Mounting Bolts [D]
Downtube [E]

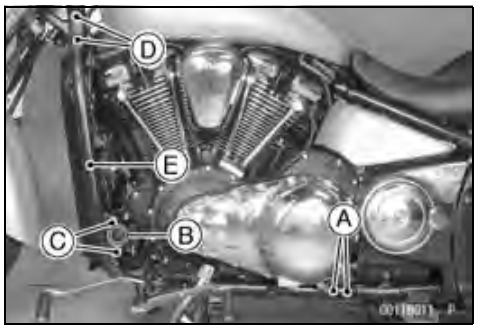


Left Side

● Remove:
Left Footboard (see Frame chapter)
Clutch Cable (see Clutch chapter)
Horn [A]
Side Stand Switch Lead Connector [B]



● Remove:
Lower Downtube Mounting Bolts [A]
Engine Mounting Bolt [B]
Engine Mounting Bracket Bolts [C] and Bracket
Upper Downtube Mounting Bolts [D]
Downtube [E]



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Downtube

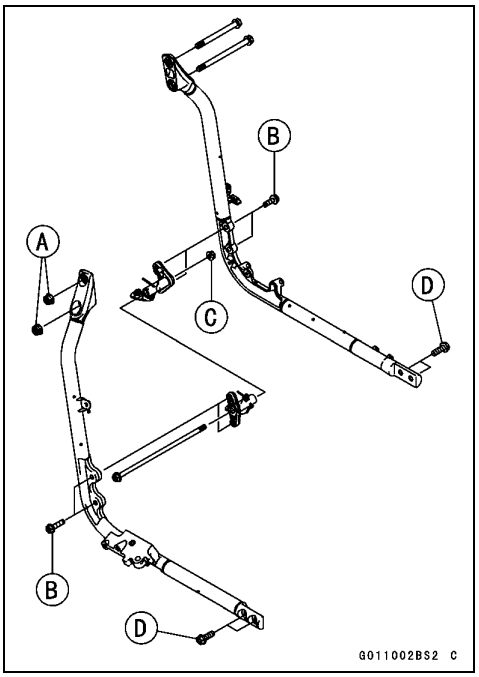
Downtube Installation

- Tighten the bolts to the specified torque following the tightening sequence.
  1. Front Downtube Nuts [A]
  2. Lower Engine Bracket Bolts [B]
  3. Front Engine Mounting Nut [C]
  4. Rear Downtube Bolts [D]
- Tighten:

Torque - Front Downtube Nuts: 88 N·m (9.0 kgf·m, 65 ft·lb)
Lower Engine Bracket Bolts: 59 N·m (6.0 kgf·m, 43 ft·lb)
Front Engine Mounting Nut: 44 N·m (4.5 kgf·m, 33 ft·lb)
Rear Downtube Bolts: 108 N·m (11 kgf·m, 80 ft·lb)

NOTE

○*Tighten the tow downtube mounting bolts [A][D] alternately two times to ensure even tightening torque.*

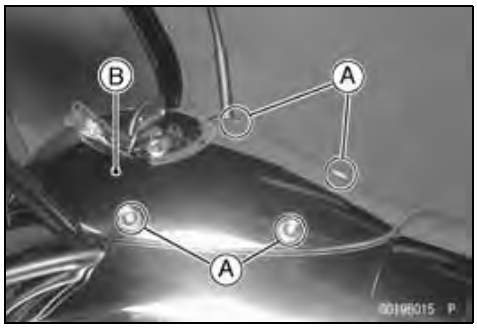


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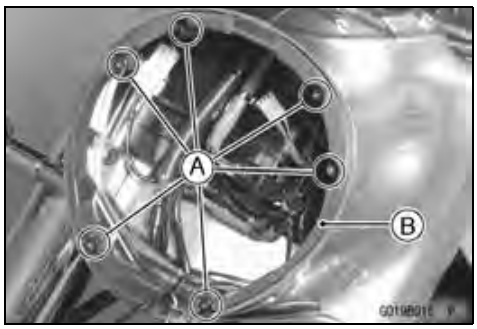
Headlight Cover (Other than VN2000E6F ~/F6F ~)

Headlight Cover Removal

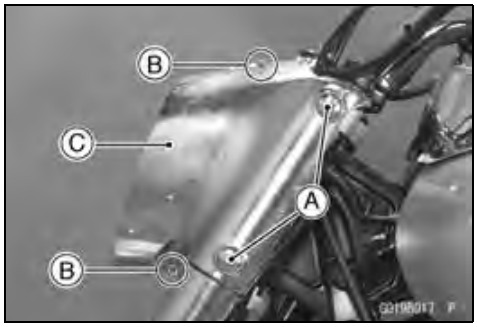
● Remove:
Headlight Unit (see Electrical System chapter)
Headlight Upper Cover Bolts [A] and Washers
Headlight Upper Cover [B]



● Remove:
Headlight Holder Bolts [A]
Headlight Holder [B]



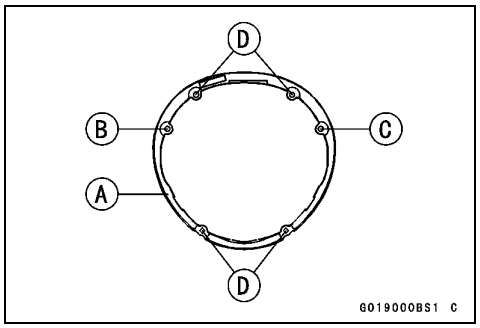
● Remove:
Headlight Cover Bolts [A] (both sides)
Headlight Cover Bolts [B]
Headlight Covers [C] (both sides)



Headlight Cover Installation

● Install:
Headlight Covers
Headlight Cover Bolts
Headlight Holder [A]

● Tighten the holder bolts to the specified torque following the tightening sequence as shown.
1. Bolt [B]
2. Bolt [C]
3. Bolts [D] (no sequence)



● Install:
Headlight Upper Cover Bolts and Washers
Headlight Upper Cover

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Frame

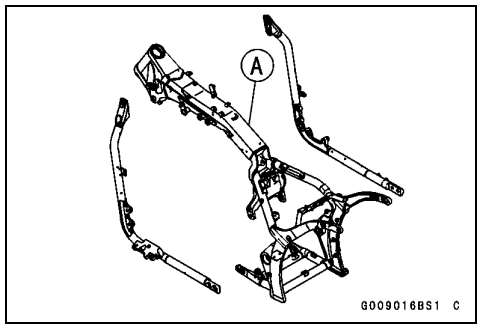
Frame Inspection

- Visually inspect the frame [A] for cracks, dents, bending, or warp.

★If there is any damage to the frame, replace it.

⚠ WARNING

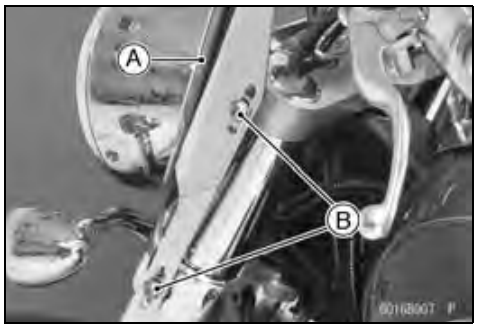
A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.



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Windshield (VN2000F6F ~)

Windshield Height Adjustment



○The windshield [A] can be adjusted within 35 mm (1.4 in.) in height (The sliding range is within 40 mm, 1.6 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 the position same relative position on both sides.
- Tighten the bolts securely.

Windshield Removal/Installation

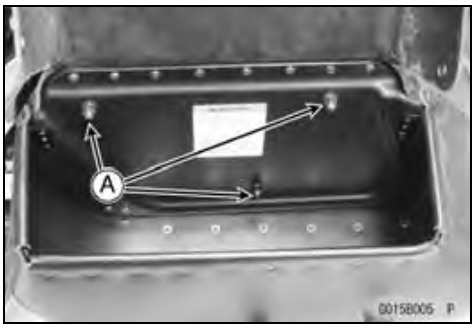
CAUTION
Be careful not to damage the surface of the windshield.

- Remove the upper and lower bolts [B] on both sides and remove the windshield [A].
- Install the windshield assy all the way down and tighten the bolts [B] securely.

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Saddlebags (VN2000F6F ~)

Saddlebag Removal/Installation



- Open the lid.
- Unscrew the cap nuts [A] and remove the washers.
- Remove the bag.
- Install the bag and washers with cap nuts [A] and tighten the nut securely.

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Electrical System

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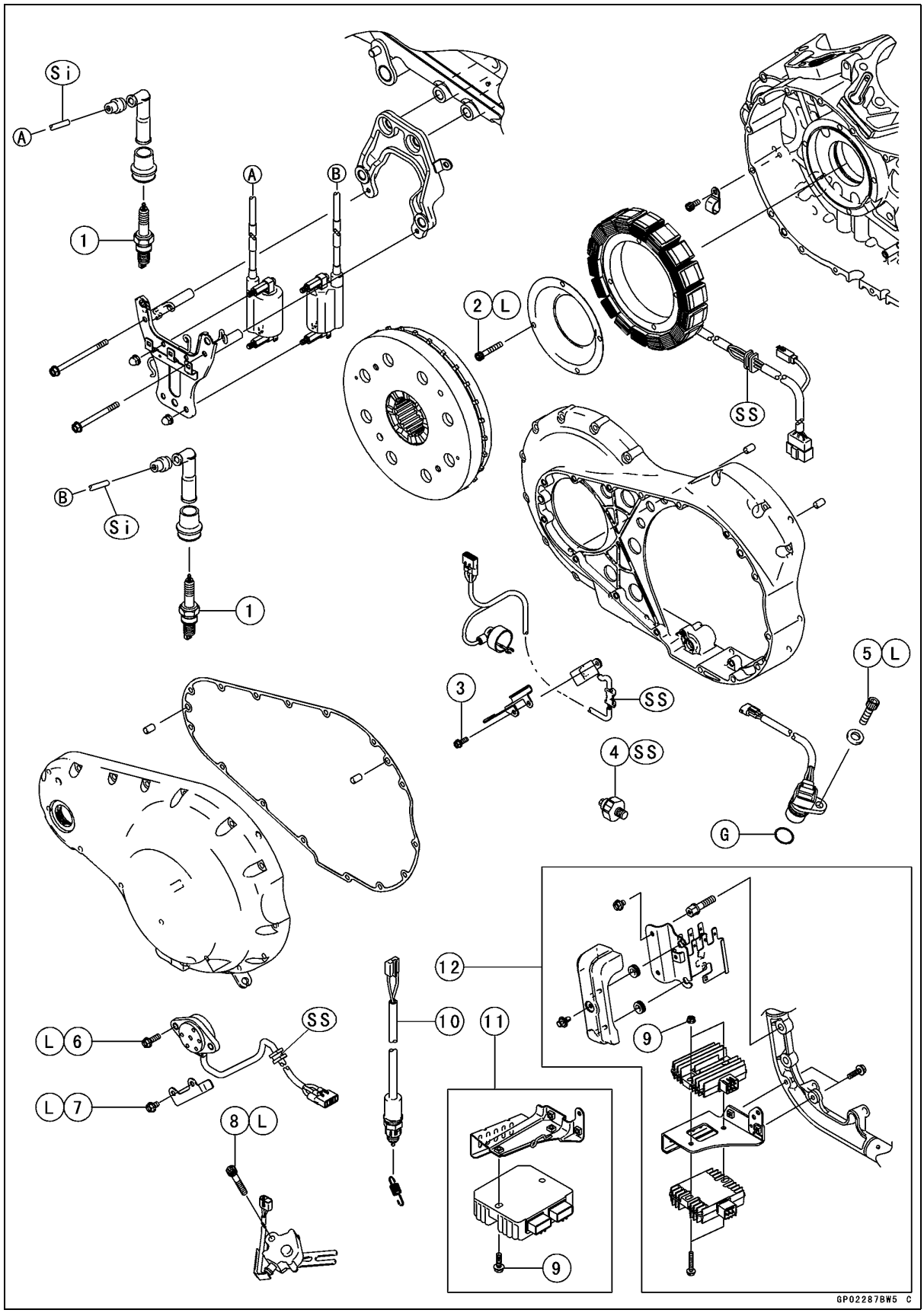
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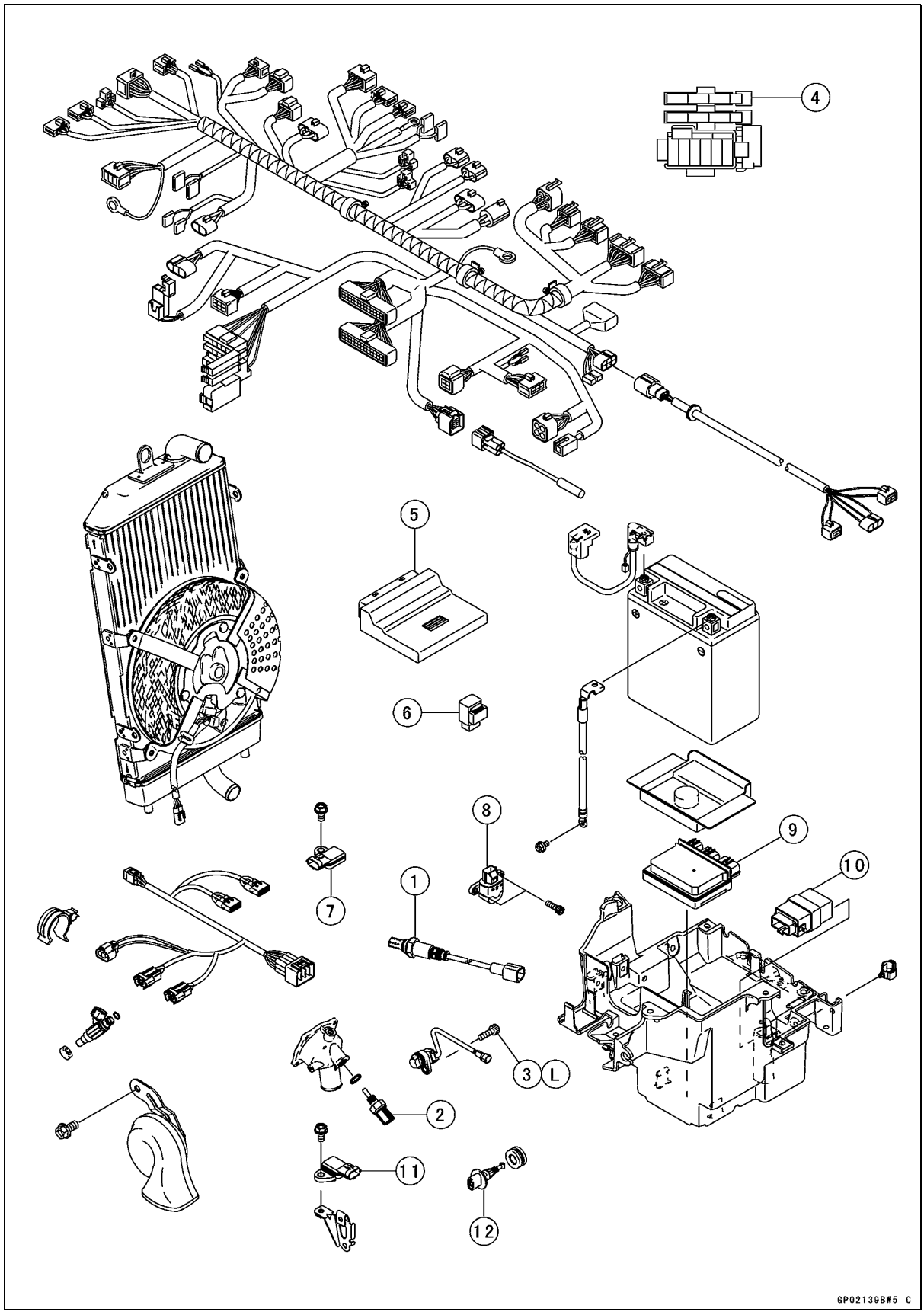
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Spark Plugs	18	1.8	13	
2	Alternator Stator Coil Mounting Bolts	12	1.2	104 in·lb	L
3	Crankshaft Sensor Mounting Bolts	6.9	0.70	61 in·lb	
4	Oil Pressure Switch	15	1.5	11	SS
5	Speed Sensor Mounting Bolt	9.8	1.0	87 in·lb	L
6	Gear Position Switch Mounting Bolts	4.9	0.50	43 in·lb	L
7	Gear Position Switch Lead Clamp Bolts	4.9	0.50	43 in·lb	L
8	Sidestand Switch Mounting Bolt	8.8	0.90	78 in·lb	L
9	Regulator/rectifier Bolts	8.8	0.90	78 in·lb	

10. Front Brake Light Switch
11. VN2000-A1 Model
12. Other than VN2000-A1 Models

G: Apply grease.
L: Apply a non-permanent locking agent.
Si: Apply silicone grease.
SS: Apply silicone sealant (Kawasaki Bond: (Silicone sealant) TB1211F: 92104–0004

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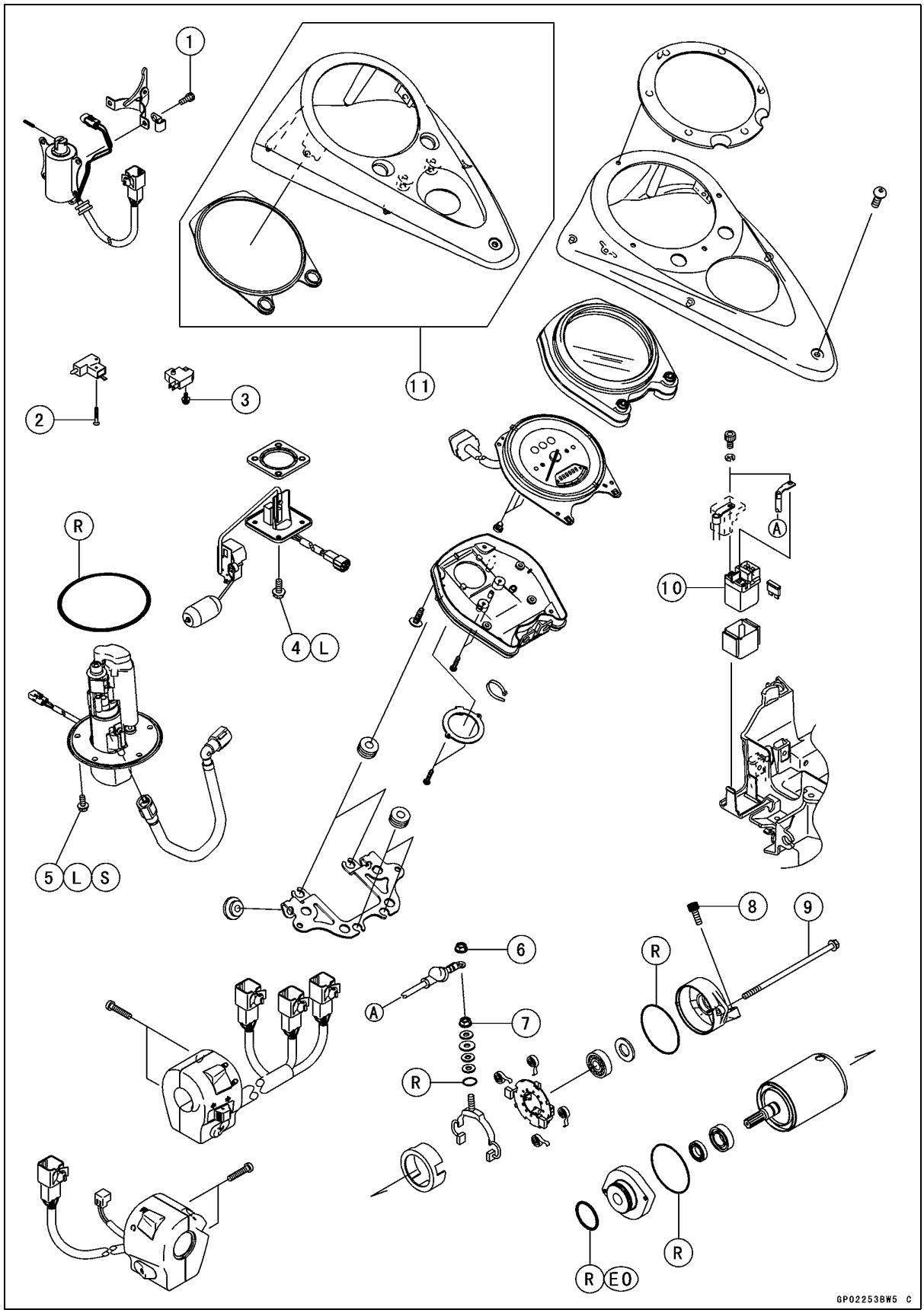
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oxygen Sensor	44	4.5	33	
2	Water Temperature Sensor	12	1.2	104 in·lb	
3	Camshaft Position Sensor Bolt	9.8	1.0	87 in·lb	L

4. Fuse Box
5. ECU (Electronic Control Unit)
6. Starter Control Relay
7. Inlet Air Pressure Sensor
8. Vehicle-down Sensor
9. Relay Box
10. Turn Signal Control Relay
11. Atmospheric Pressure Sensor
12. Inlet Air Temperature Sensor

L: Apply a non-permanent locking agent.

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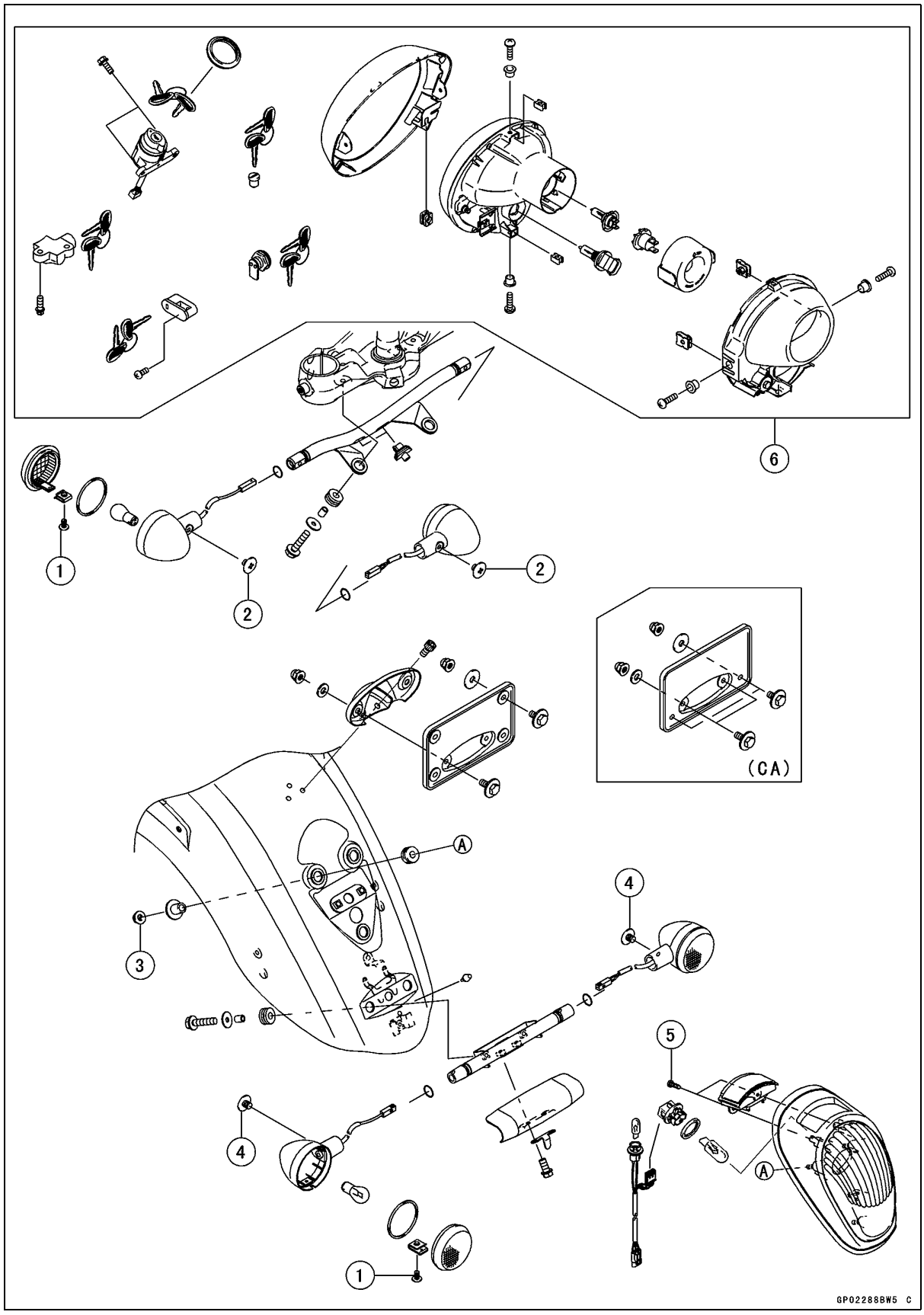
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Decompression Solenoid Bolts	9.8	1.0	87 in·lb	
2	Starter Lockout Switch Screw	1.2	0.12	10 in·lb	
3	Front Brake Light Switch Screw	1.2	0.12	10 in·lb	
4	Fuel Level Sensor Mounting Bolts	6.9	0.70	61 in·lb	L
5	Fuel Pump Mounting Bolts	9.8	1.0	87 in·lb	L, S
6	Starter Motor Terminal Nut	9.8	1.0	87 in·lb	
7	Starter Motor Terminal Locknut	11	1.1	95 in·lb	
8	Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	
9	Starter Motor Assembly Bolts	4.9	0.50	43 in·lb	

10. Starter Relay
11. VN2000E6F ~/F6F ~

EO: Apply engine oil.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specific tightening sequence.

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Exploded View



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Exploded View

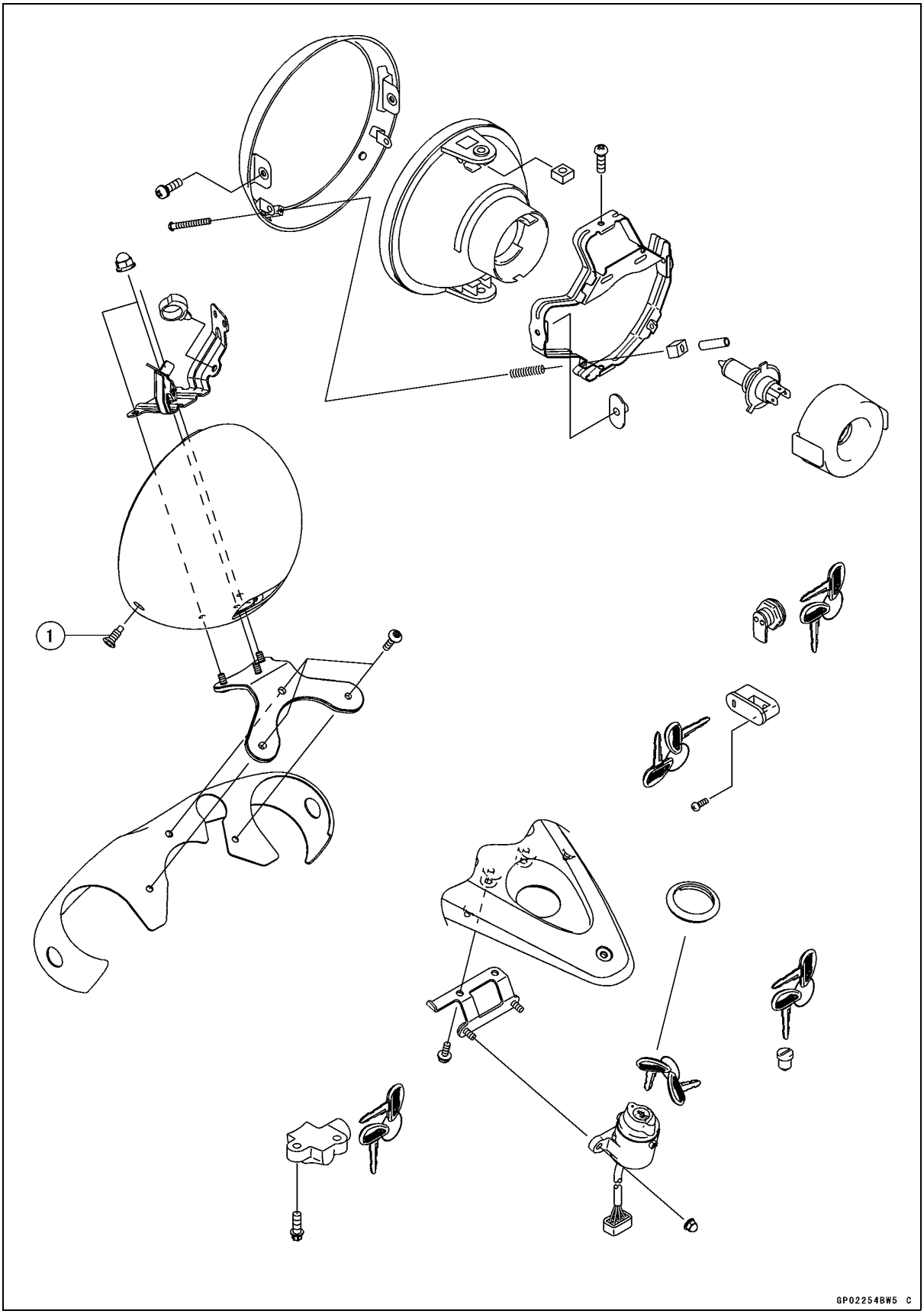
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Turn Signal Light Lens Screws	1.0	0.10	8.7 in·lb	
2	Front Turn Signal Light Screws	6.9	0.70	61 in·lb	
3	Tail/brake Light Unit Mounting Nuts	5.9	0.60	52 in·lb	
4	Rear Turn Signal Light Screws	6.9	0.70	61 in·lb	
5	License Plate Light Lens Mounting Screws	1.2	0.12	10 in·lb	

6. Other than VN200E6F ~/F6F ~
CA: Canada Model

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Exploded View

VN2000E6F ~/F6F ~



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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	

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Specifications

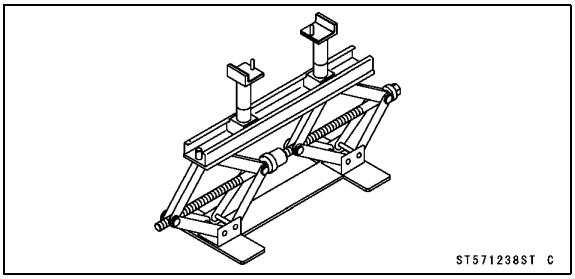
Item	Standard
Battery	
Type	Sealed Battery
Model name	FTZ16-BS
Capacity	12 V 18 Ah
Voltage	12.6 V or more
Charging System	
Alternator Type	Three-phase AC with delta connection, and rare-earth single magnet rotor
Battery Charging Voltage	14.2 ~ 15.2 V @3 000 r/min (rpm)
Alternator Output Voltage (no load)	70 ~ 95 V @3 000 r/min (rpm)
Stator Coil Resistance	0.18 ~ 0.22 Ω (VN2000–A1)
	0.25 ~ 0.31 Ω (Other than VN2000-A1)
Regulator/rectifier:	
Type	Load dumping regulator with full-wave rectifier
Resistance	in the text
Ignition System	
Ignition Coil:	
3 Needle Arcing Distance	6 mm (0.24 in.) or more
Primary Winding Resistance	1.9 ~ 2.5 Ω
Secondary Winding Resistance	10 ~ 16 kΩ
Primary Peak Voltage	210 V or more
Spark Plug:	
Spark Plug Gap	1.0 ~ 1.1 mm (0.039 ~ 0.043 in.)
Spark Plug Cap Resistance	3.75 ~ 6.25 kΩ
Crankshaft Sensor:	
Crankshaft Sensor Peak Voltage	3.0 V or more
Crankshaft Sensor Resistance	420 ~ 520 Ω
Crankshaft Sensor Air Gap	1.0 mm (0.04 in.) (Non-measurable and non-adjustable)
Electric Starter Syste	
Starter Motor:	
Brush Length	12.5 mm (0.49 in.) (Service limit 5 mm, 0.20 in.)
Commutator Diameter	28 mm (1.10 in.) (Service limit 27 mm, 1.06 in.)
Air Switching Valve	
Air Switching Valve Resistance	18 ~ 22 Ω at 20°C (68°F)
Decompression Solenoid	
Decompression Solenoid Resistance	3.0 ~ 3.7 Ω
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 (0.39 in.) pedal travel
Engine Oil Pressure Switch	When engine is stopped: ON
	When engine is running: OFF
Water Temperature Sensor Resistance	in the text

● Refer to Fuel System chapter for specifications of DFI parts.

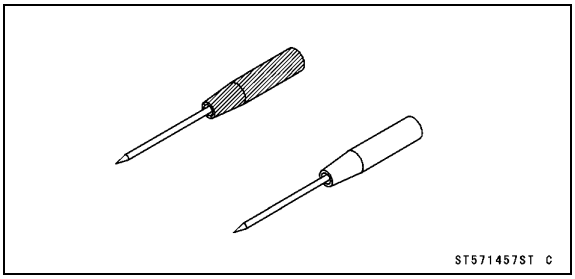
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Special Tools and Sealant

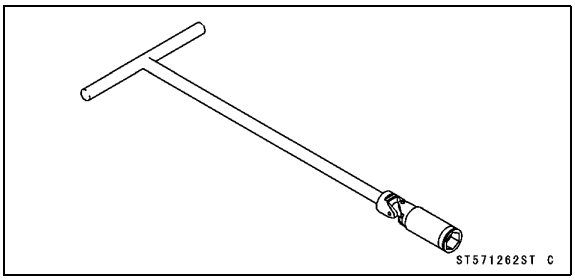
Jack:
57001-1238



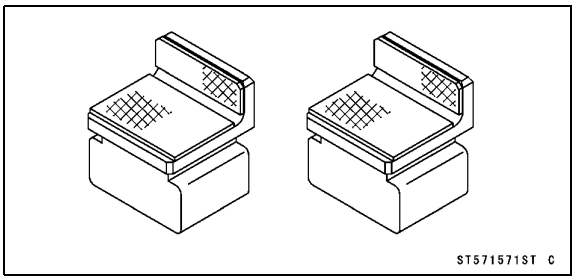
Needle Adapter Set:
57001-1457



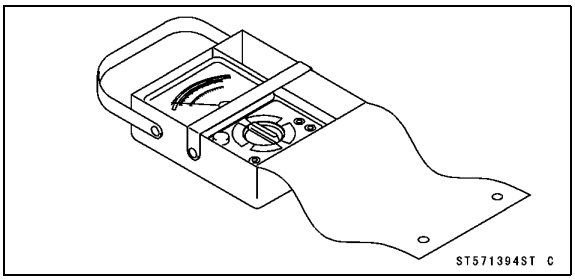
Spark Plug Wrench, Hex 16:
57001-1262



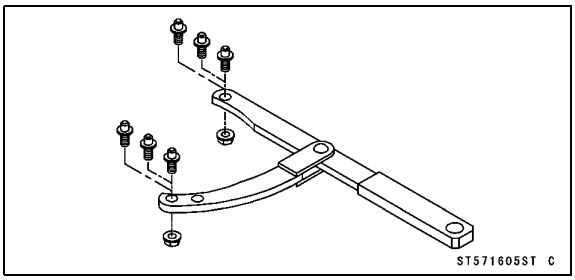
Jack Attachment:
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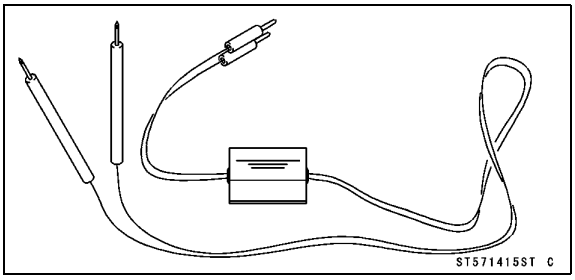
Hand Tester:
57001-1394



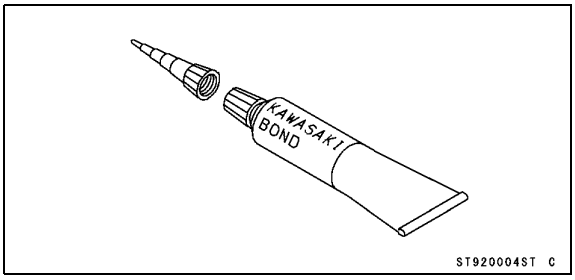
Flywheel & Pulley Holder:
57001-1605



Peak Voltage Adapter:
57001-1415



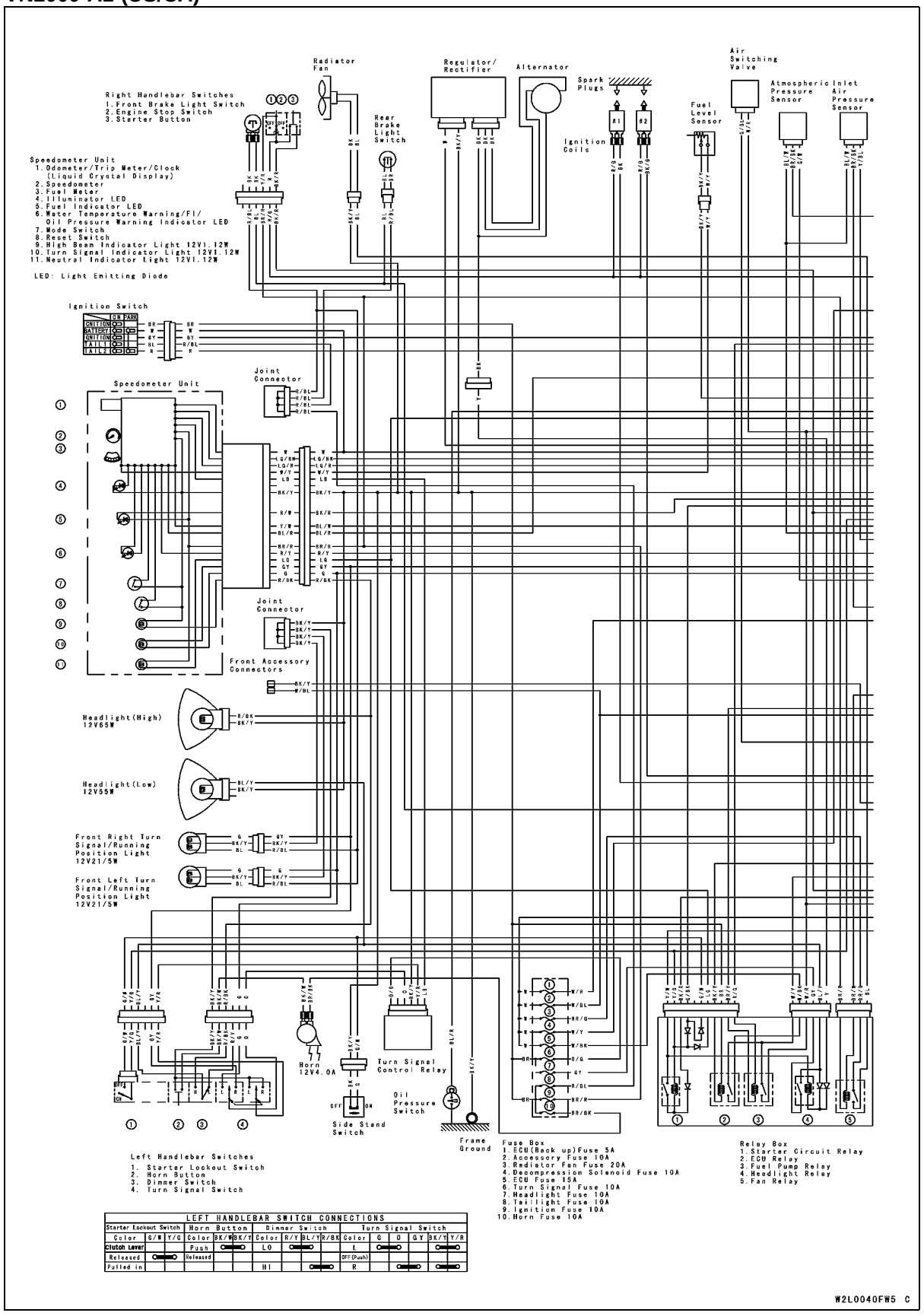
Kawasaki Bond (Silicone Sealant) TB1211F:
92104-0004



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Wiring Diagram

VN2000-A1 (US/CA)

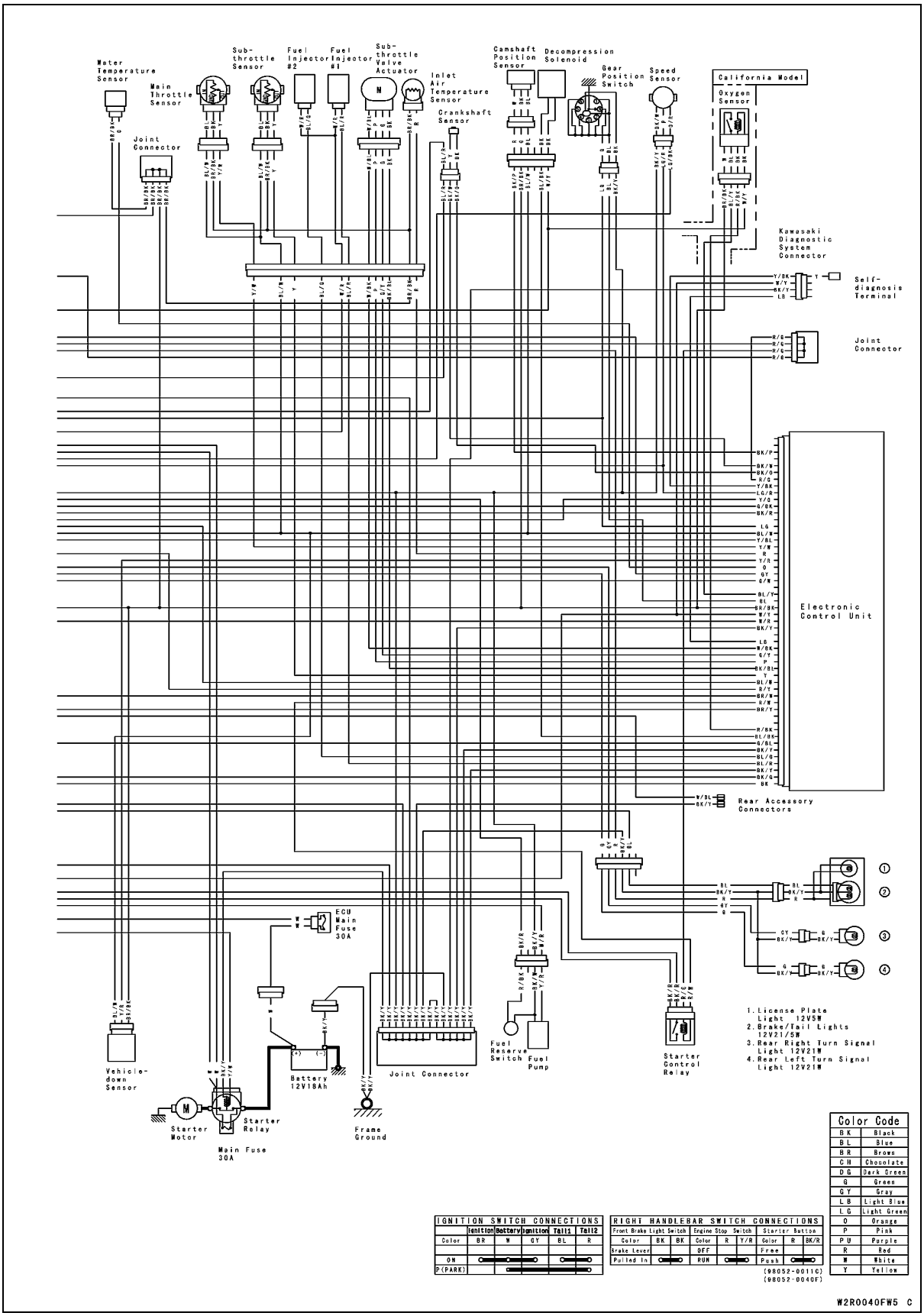


LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Horn Button			Dimmer Switch				Turn Signal Switch					
Color	G/W	Y/G	Color	BK/W	BK/Y	Color	R/Y	BL/Y	R/BK	Color	G	O	GY	BK/Y	Y/R
Clutch Lever			Push			LO				L					
Released			Released							OFF (Push)					
Pulled in						HI				R					

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Wiring Diagram



IGNITION SWITCH CONNECTIONS						
	Ignition	Battery	Ignition	Tail	Tail
Color	BR	W	GY	BL	R
ON					
P(PARK)					

RIGHT HANDLEBAR SWITCH CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	R	Y/R	Color	R	BK/R
Brake Lever			OFF			Free		
Pulled In			RUN			Push		

(98052-0011C)
(98052-0040F)

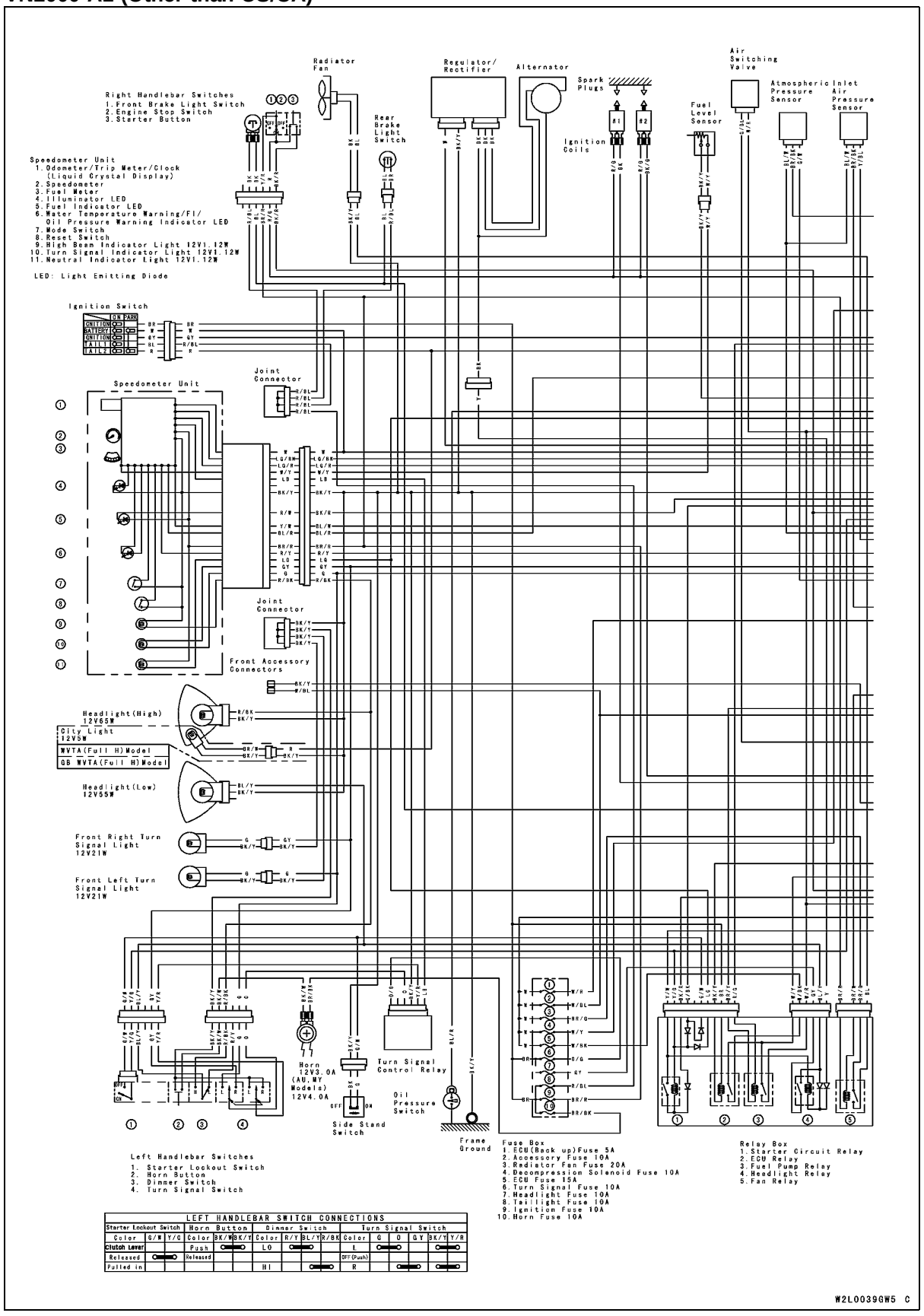
Color Code	
BK	Black
BL	Blue
BR	Brown
CH	Chocolate
DG	Dark Green
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

W2R0040FW5 C

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Wiring Diagram

VN2000-A1 (Other than US/CA)

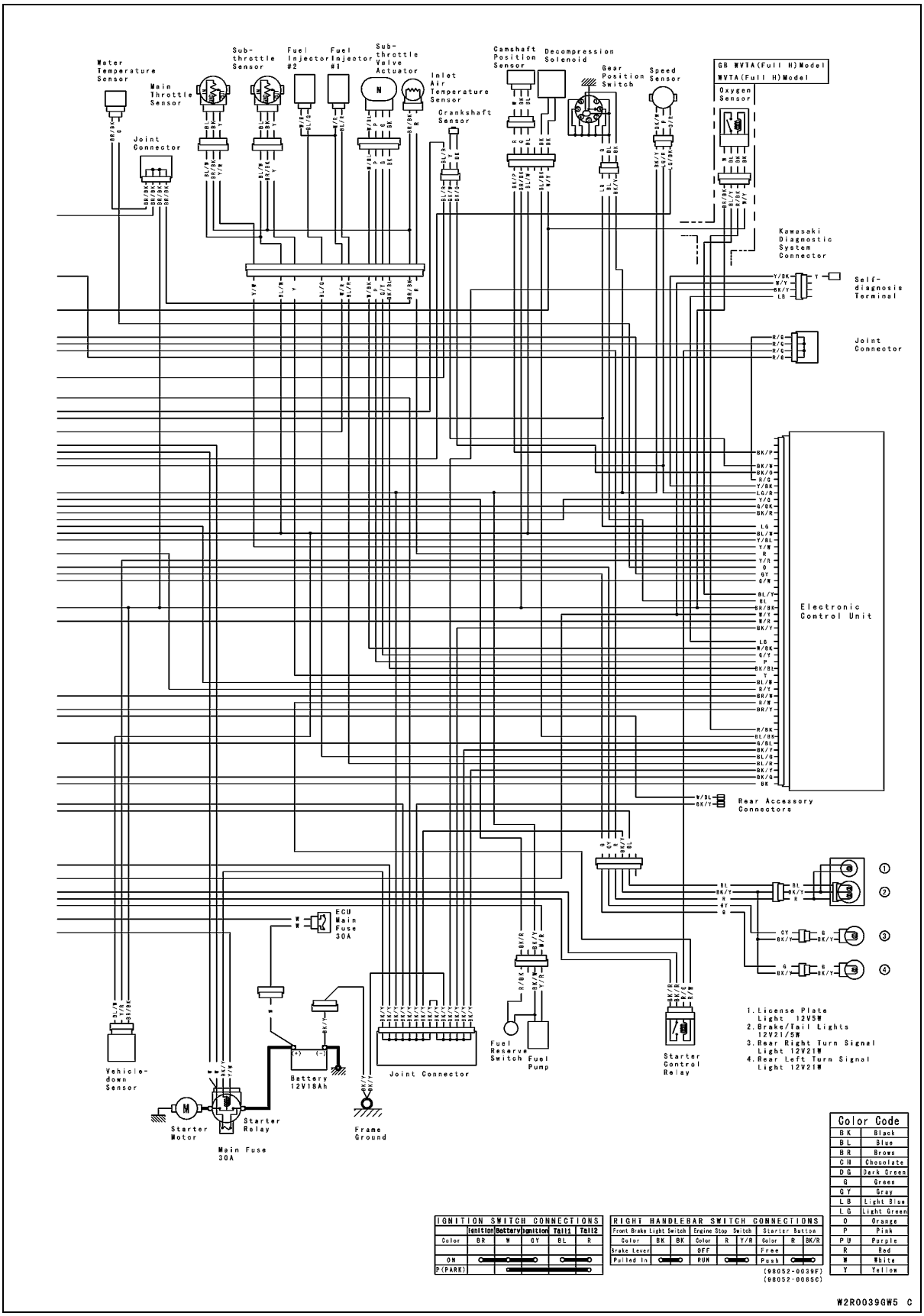


LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Horn Button			Dimmer Switch				Turn Signal Switch					
Color	G/W	Y/G	Color	BK/W	BK/Y	Color	R/Y	BL/Y	R/BK	Color	G	O	GY	BK/Y	Y/R
Clutch Lever			Push			LO				L					
Released			Released							OFF (Push)					
Pulled in						HI				R					

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Wiring Diagram



IGNITION SWITCH CONNECTIONS						
	Ignition	Battery	Ignition	Tail	Tail
Color	BR	W	GY	BL	R
ON					
P(PARK)					

RIGHT HANDLEBAR SWITCH CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	R	Y/R	Color	R	BK/R
Brake Lever			OFF			Free		
Pulled In			RUN			Push		

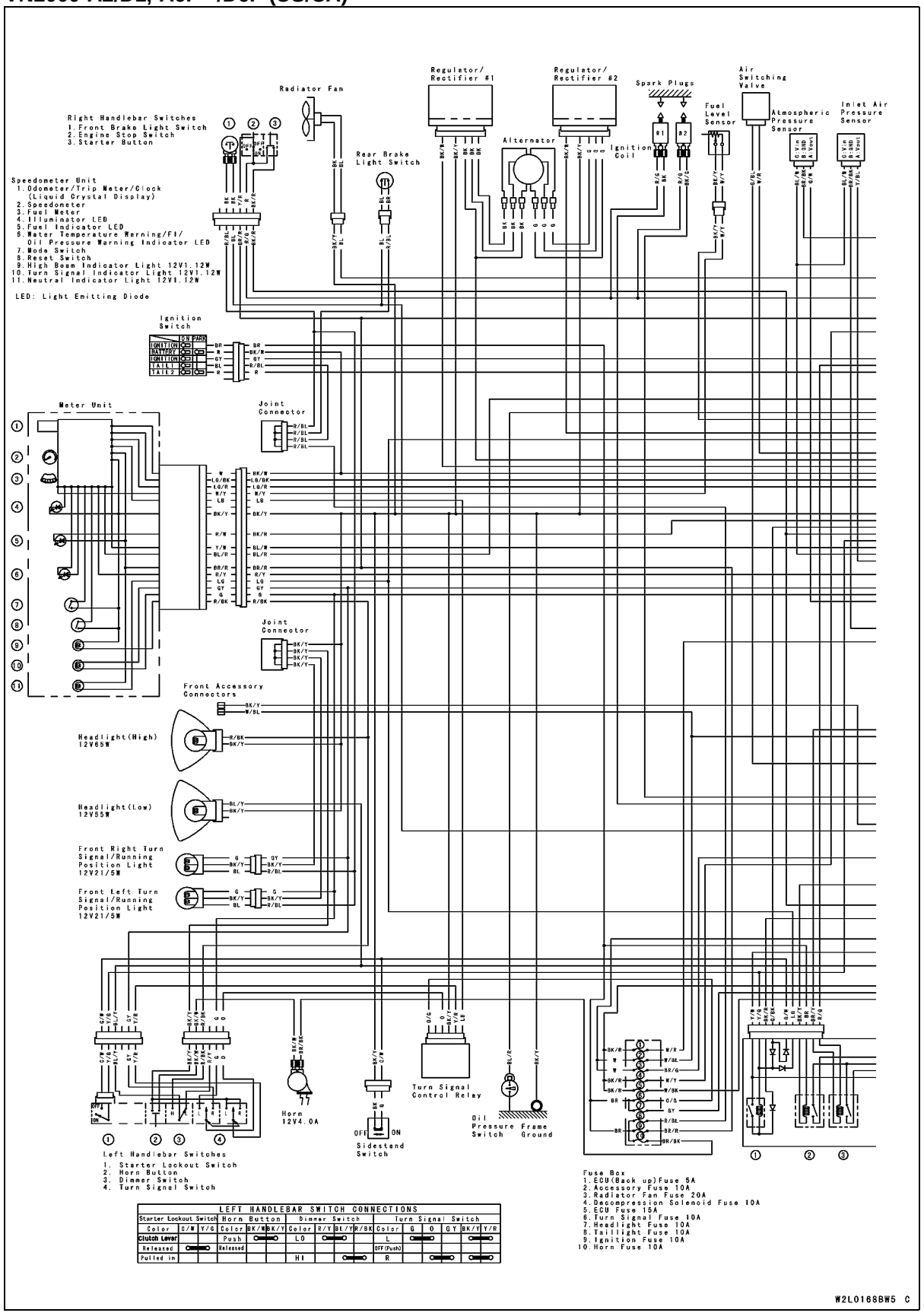
(98052-0039F)
(98052-0085C)

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

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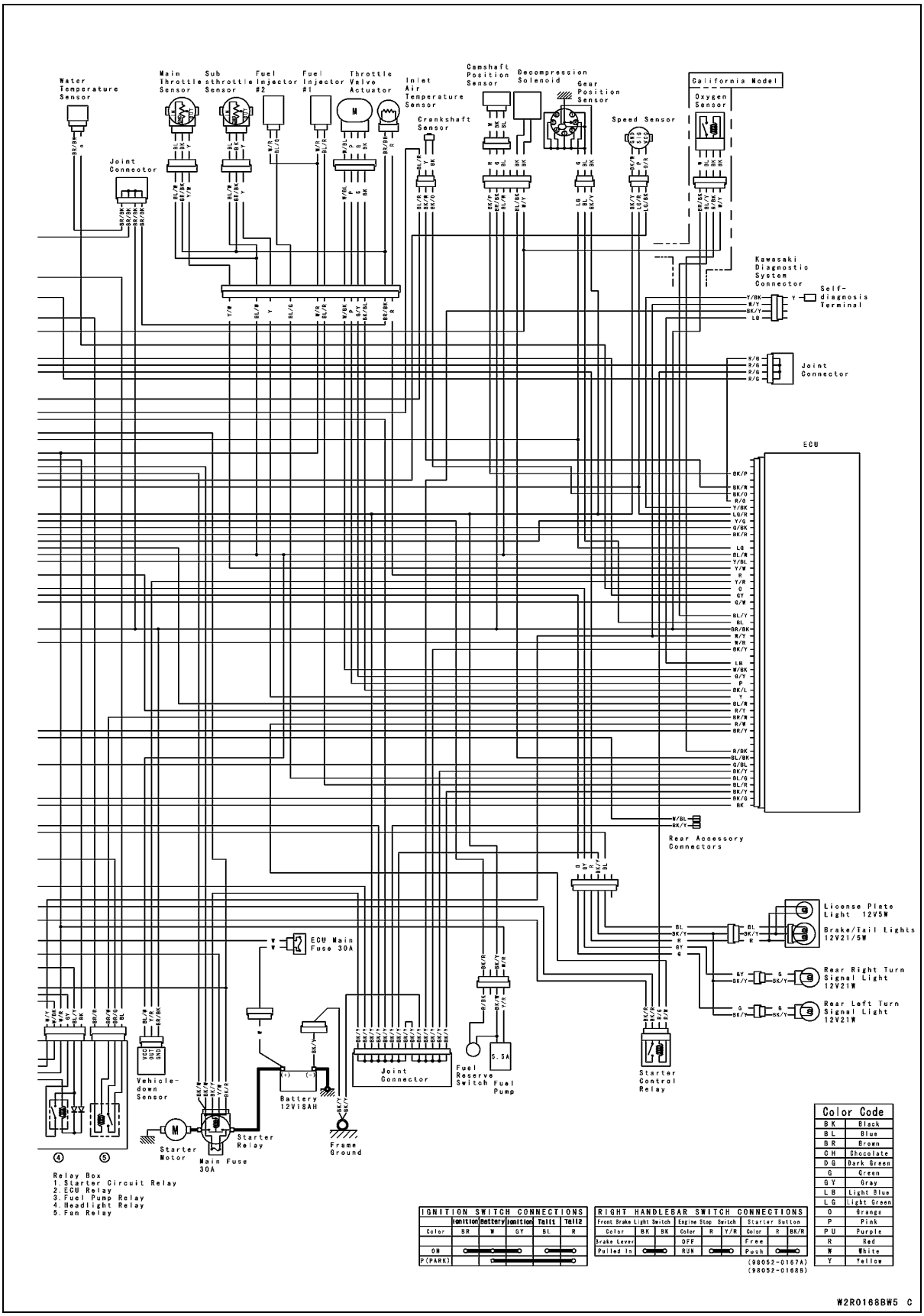
Wiring Diagram

VN2000-A2/D1, A6F ~/D6F (US/CA)



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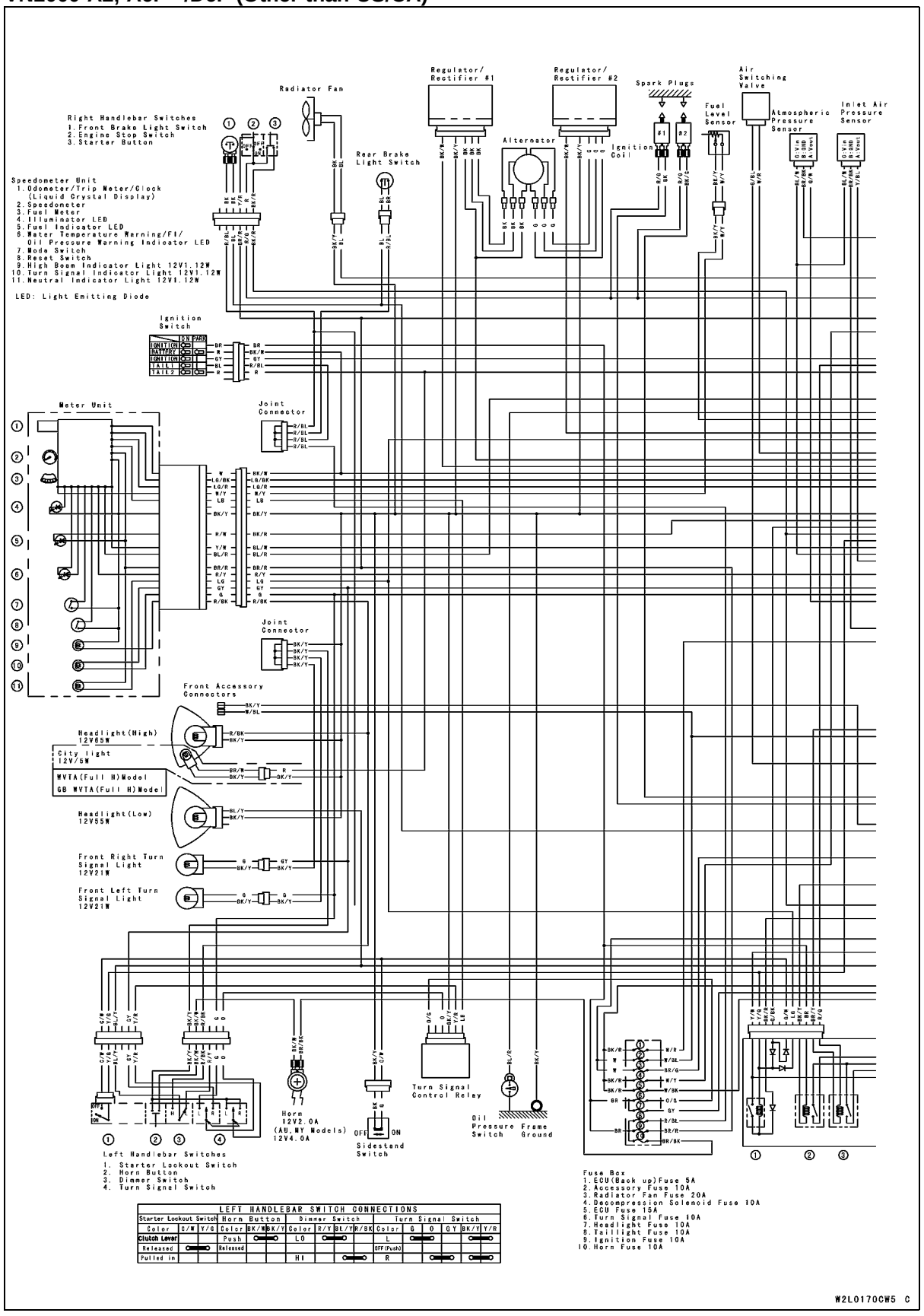
Wiring Diagram



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Wiring Diagram

VN2000-A2, A6F ~/D6F (Other than US/CA)

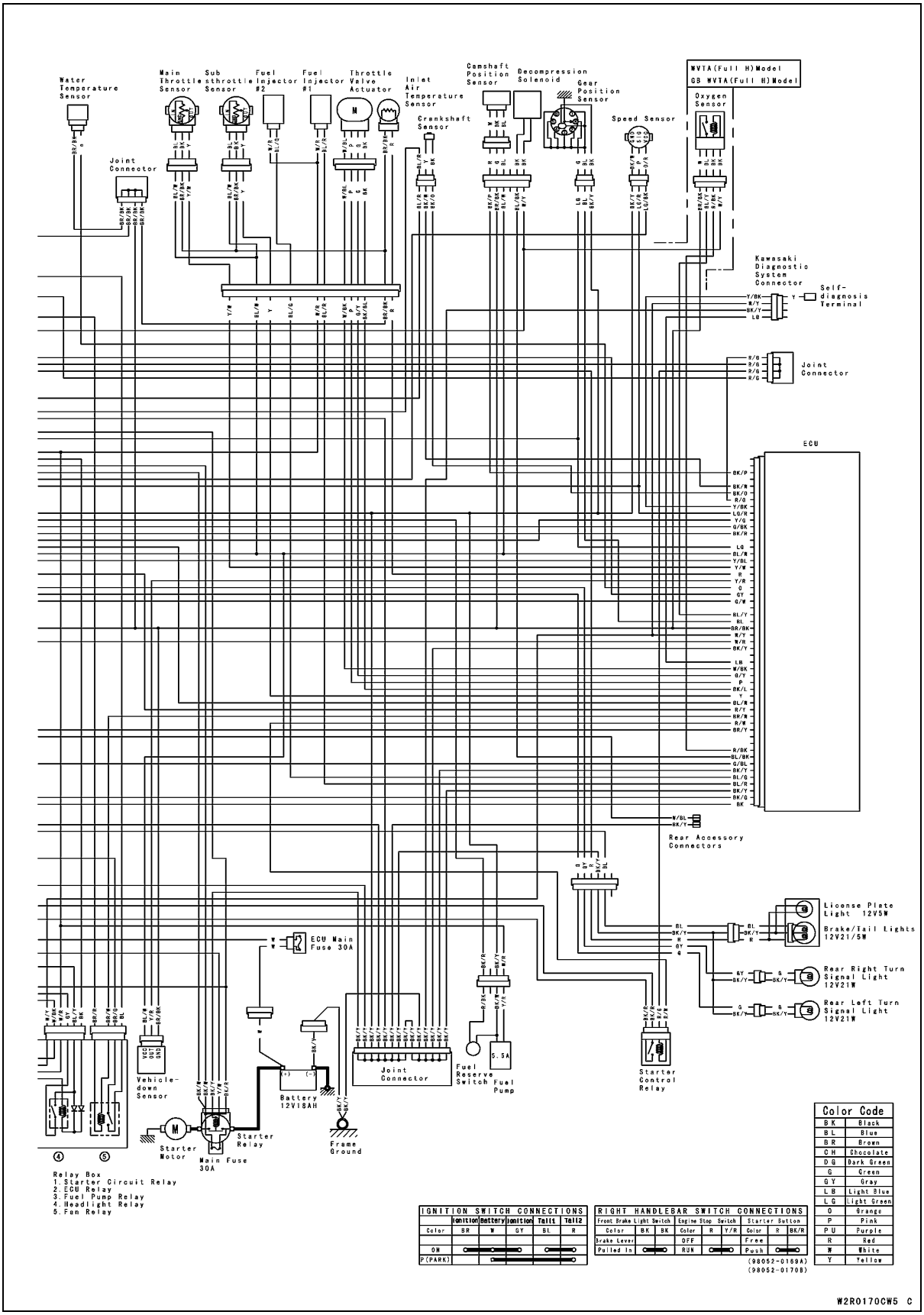


LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Horn Button			Dimmer Switch				Turn Signal Switch					
Color	G/W	Y/G	Color	BK/W	BK/Y	Color	R/Y	BL/Y	R/BK	Color	G	O	GY	BK/Y	Y/R
Clutch Lever			Push			LO				L					
Released			Released							OFF (Push)					
Pulled in						HI				R					

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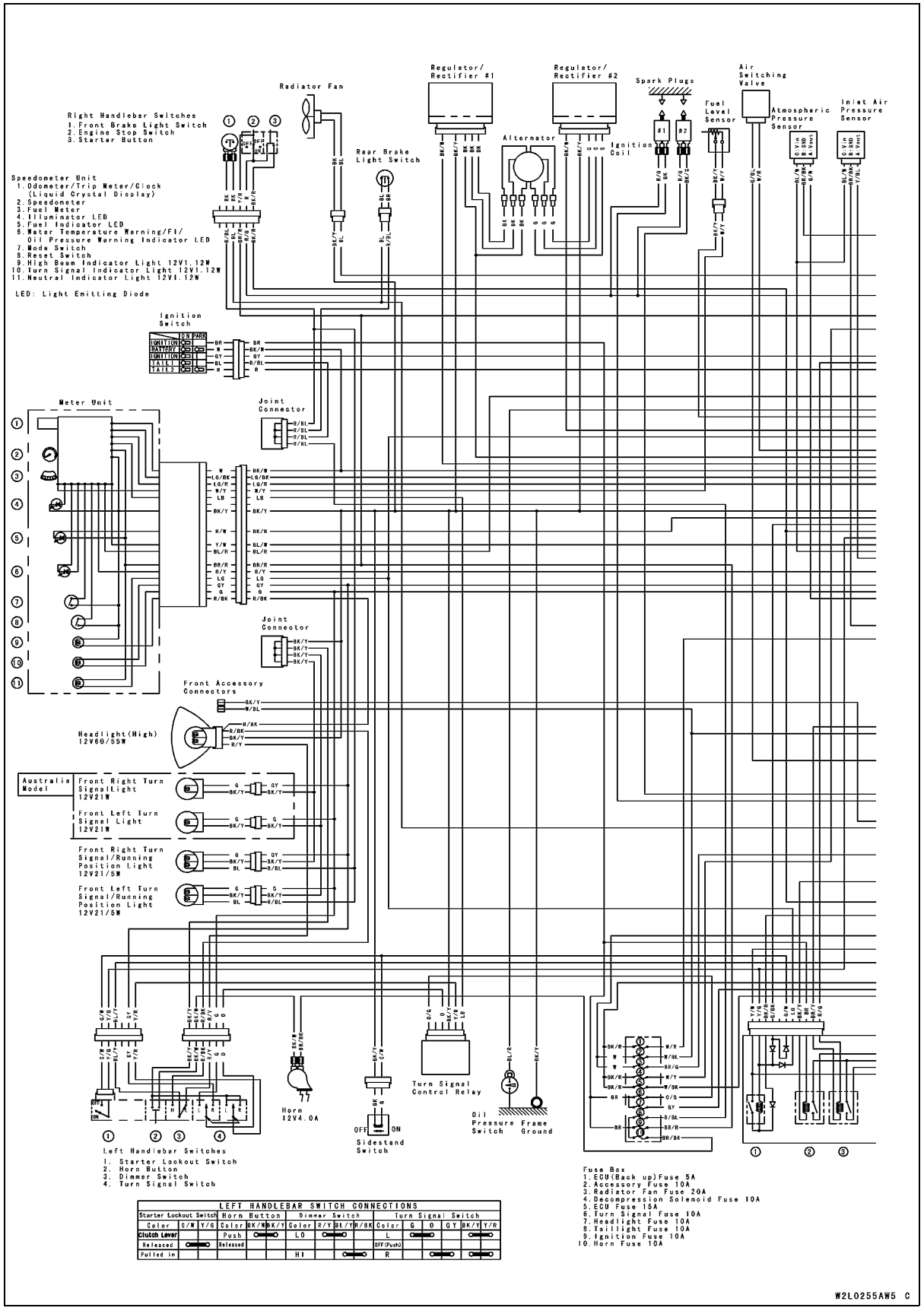
Wiring Diagram



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Wiring Diagram

VN2000E6F ~/F6F ~

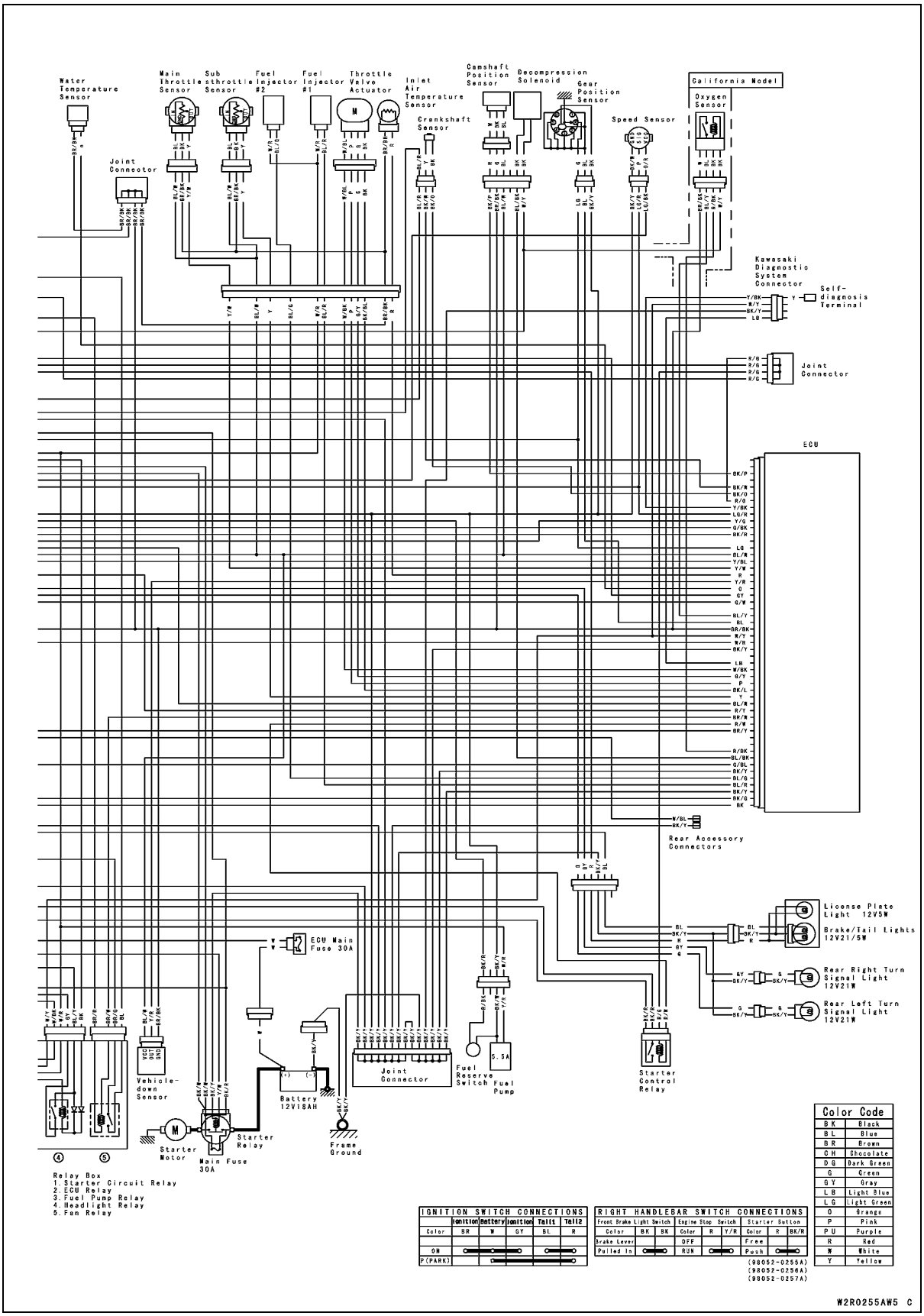


LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Horn Button			Dimmer Switch					Turn Signal Switch					
Color	G/W	Y/G	Color	BK/W	BK/Y	Color	R/Y	BL/Y	R/BK		Color	G	O	GY	BK/Y	Y/R
Clutch Lever			Push			LO					L					
Released			Released								OFF(Push)					
Pulled in						HI					R					

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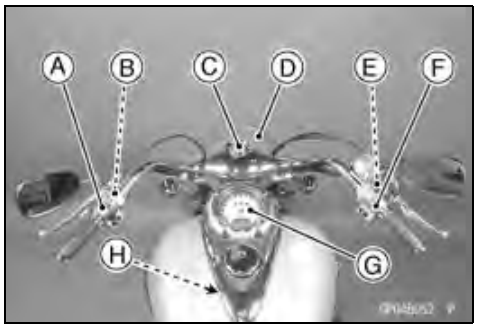
Wiring Diagram



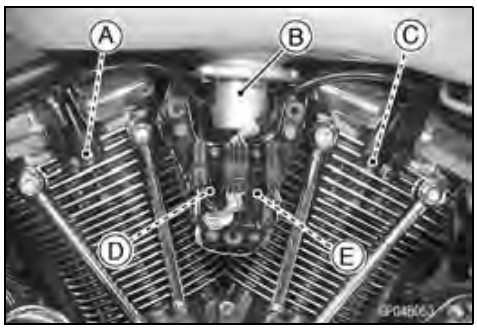
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Electrical Parts Location

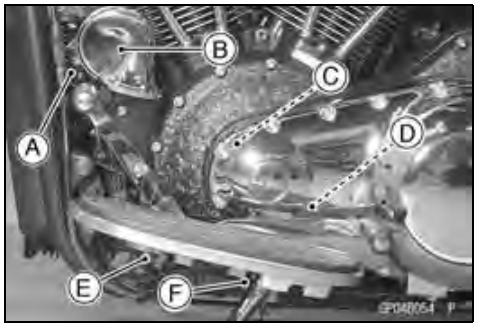
Left Handlebar Switches [A]
Starter Lockout Switch [B]
Ignition Switch [C]
Headlight [D]
Front Brake Light Switch [E]
Right Handlebar Switches [F]
Meter Unit [G]
Fuel Level Sensor [H]



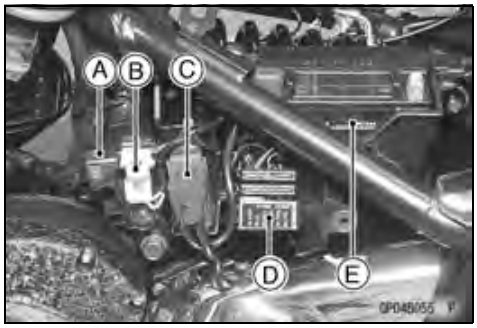
Spark Plug [A] (Front)
Fuel Pump [B]
Spark Plug [C] (Rear)
Ignition Coil [D] (Front)
Ignition Coil [E] (Rear)



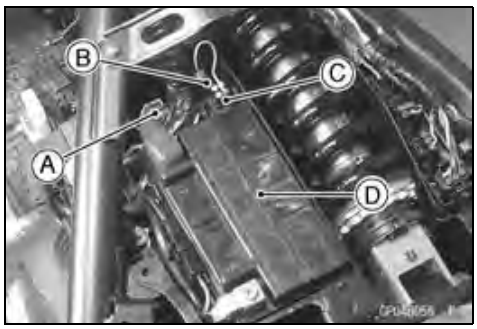
Radiator Fan [A]
Horn [B]
Alternator [C]
Crankshaft Sensor [D]
Oil Pressure Switch [E]
Sidestand Switch [F]



Atmospheric Pressure Sensor [A]
ECU Fuse 30 A [B]
Starter Relay and Main Fuse 30 A [C]
Fuse Box [D]
Battery [E]



Vehicle-down Sensor [A]
Self-diagnosis Terminal [B]
Kawasaki Diagnostic System Connector [C]
Battery [D]



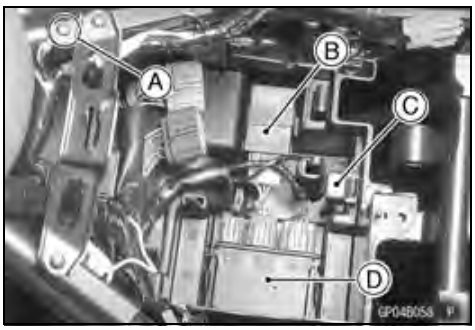
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Electrical Parts Location

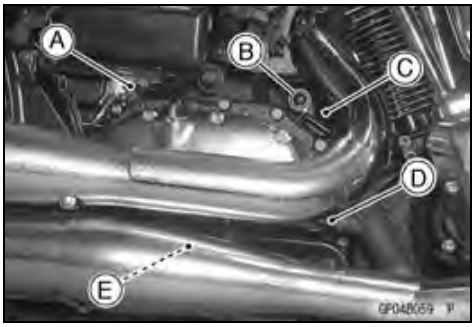
ECU (Electronic Control Unit) [A]



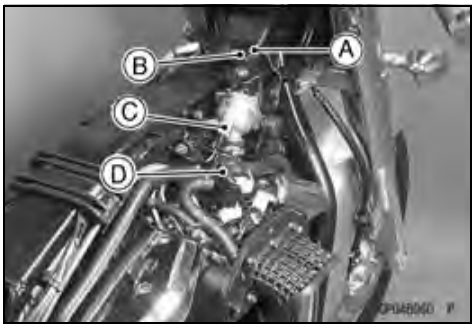
Frame Ground Terminal [A]
Turn Signal Control Relay [B]
Starter Control Relay [C]
Relay Box [D]



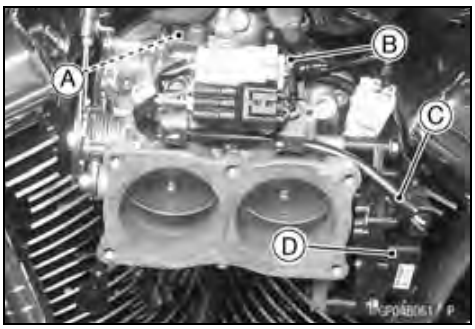
Speed Sensor [A]
Engine Ground Terminal [B]
Starter Motor [C]
Oxygen Sensor [D]
Gear Position Switch [E]



Frame Ground Terminal [A]
Inlet Air Pressure Sensor [B]
Water Temperature Sensor [C]
Air Switching Valve [D]



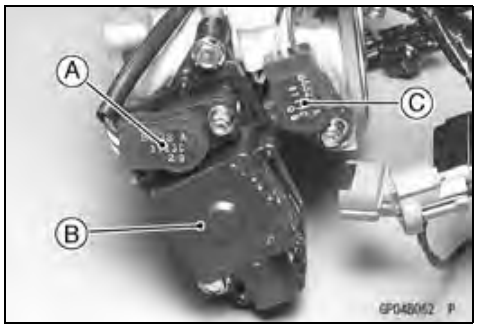
#2 Injector [A] (Rear)
#1 Injector [B] (Front)
Sub Throttle Sensor [C]
Sub Throttle Sensor Actuator [D]



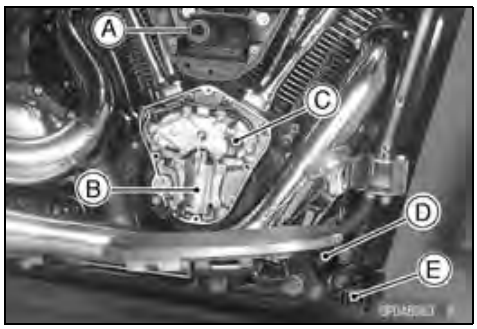
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Electrical Parts Location

Sub Throttle Sensor [A]
Sub Throttle Sensor Actuator [B]
Main Throttle Sensor [C]



Inlet Air Temperature Sensor [A]
Decompression Solenoid [B]
Camshaft Position Sensor [C]
Rear Brake Light Switch [D]
Regulator/Rectifier [E]



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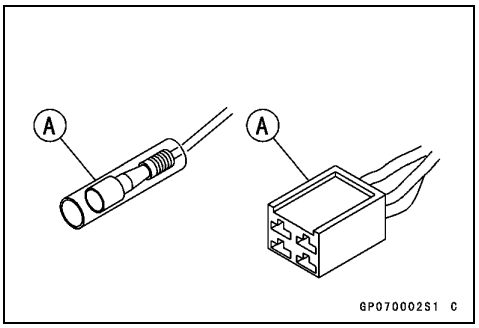
Servicing Precautions

There are a number of important precautions that should be followed servicing electrical systems.

- ○Do not reverse the battery lead 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.
- ○Do not use a meter illumination bulb rated for other than voltage or wattage specified in the wiring diagram, as the meter or gauge panel could be warped by excessive heat radiated from the bulb.
- ○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 leads for signs of burning, fraying, etc. Poor leads and bad connections will affect electrical system operation.
- ○Measure coil and winding resistance when the part is cold (at room temperature).
- ○Lead 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

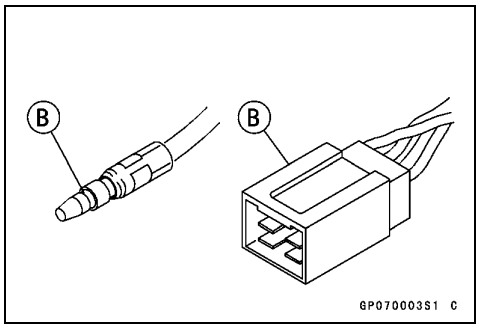
- ○Electrical Connectors
  Connectors [A]



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Servicing Precautions

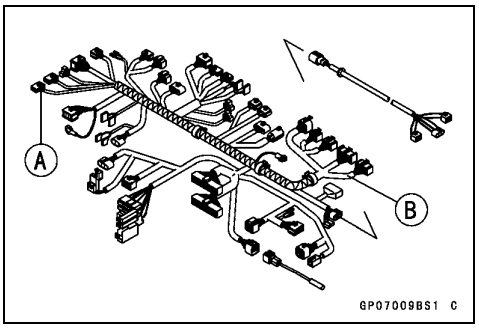
Connectors [B]



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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 lead which is suspected of being a problem.
- ○Connect the hand tester between the ends of the leads.

Special Tool - Hand Tester: 57001-1394

- ○Set the tester to the × 1 Ω range, and read the tester.
- ★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the wiring harness [B] if necessary.

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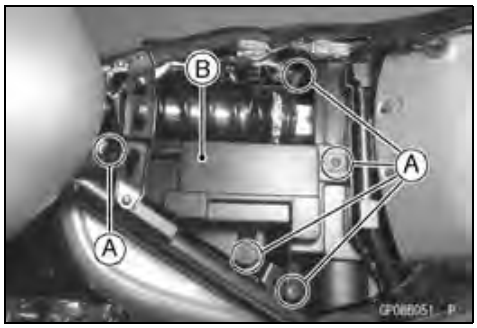
Battery

Battery Removal

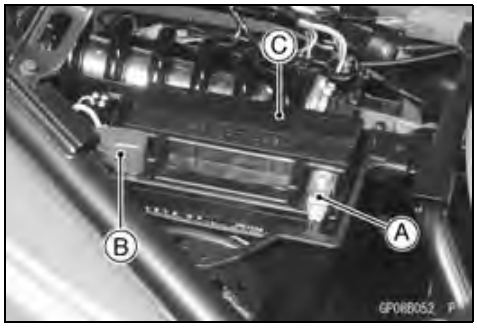
CAUTION

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:
  Seats (see Frame chapter)
  Screws [A]
  Battery Cover [B]

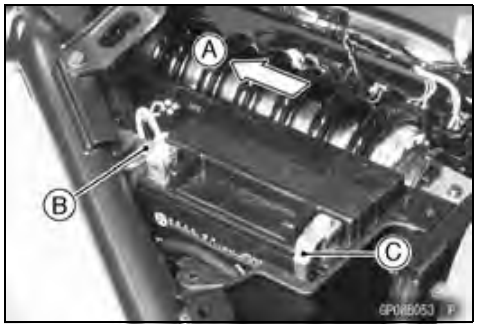


- Disconnect the battery cable (–) [A] from the battery first.
- Slide the red cap out.
- Disconnect the battery cable (+) [B] from the battery.
- Pull the battery [C] out of the case.
- Clean the battery using a solution of baking soda and water. Be sure that the wire connections are clean.



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 battery cable [B] (red cap) to the (+) terminal first , and then the battery cable [C] to the (–) terminal.
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the terminals with the red cap.

CAUTION

If each battery cable is not correctly disconnected or connected, sparks can arise at electrical connections, causing damage to electrical and DFI parts.

- Put the battery cover on the battery.
- Tighten the screws securely.
- Install the seats (see Frame chapter).

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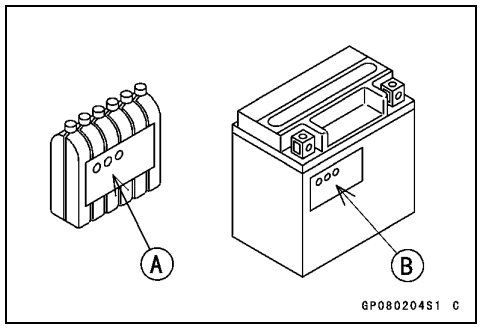
Battery

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 VN2000: FTZ16-BS

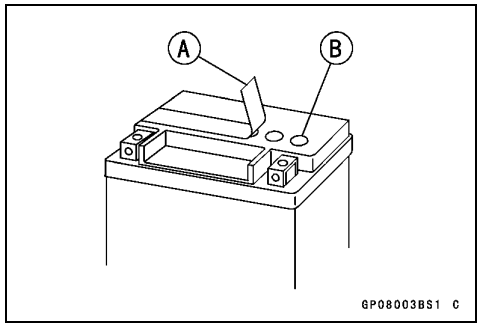


CAUTION

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.

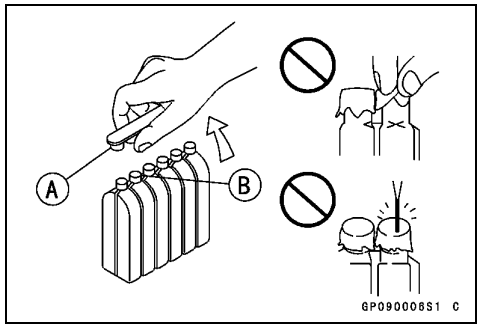


- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

NOTE

○*The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*

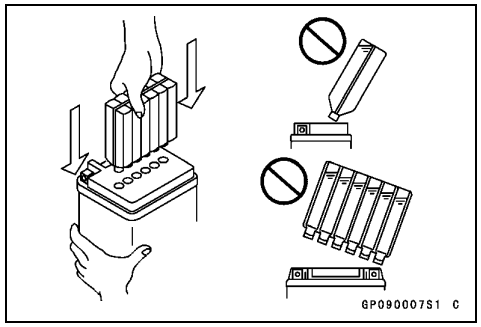
- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.



NOTE

○*Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*

- 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.



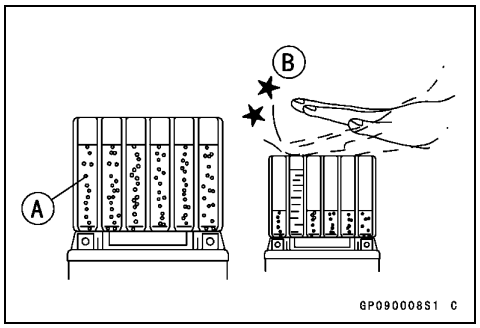
NOTE

○*Do not tilt the electrolyte container*

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Battery

● 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

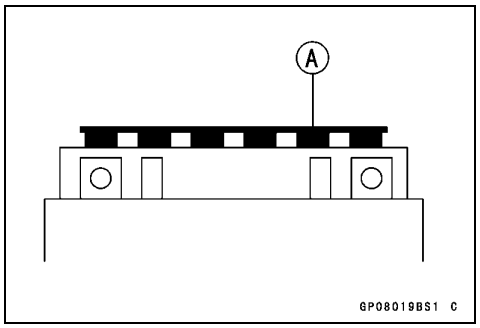
● Place the strip [A] of caps loosely over the filler ports.
● Newly activated sealed batteries require an initial charge.

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.



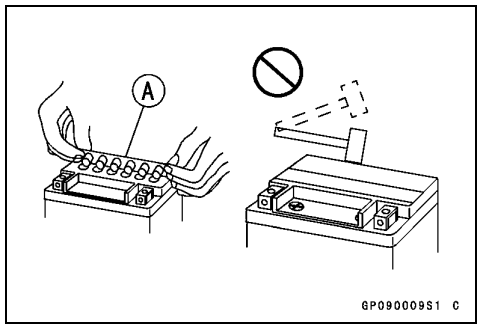
NOTE

○*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.

Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric

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Battery

system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

Charging Condition Inspection

○Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].



- Remove:
  Seats (see Frame chapter)
  Battery Cover
- Disconnect the battery terminals.

CAUTION

Be sure to disconnect the negative (–) cable first.

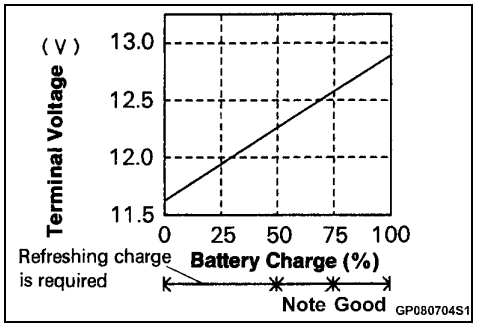
- Measure the battery terminal voltage.

NOTE

○*Measure with a digital voltmeter which can be read one decimal place voltage.*

★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

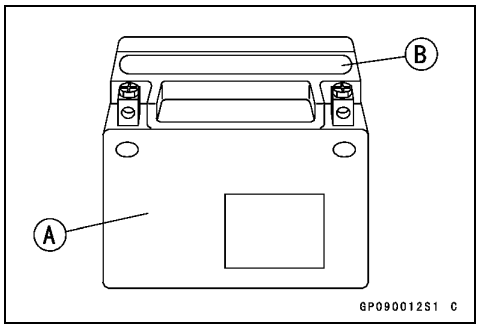


Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

⚠ WARNING

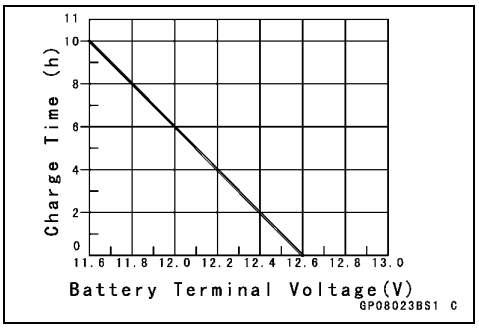
This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.



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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

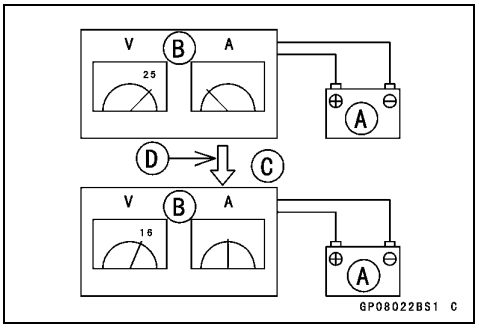


CAUTION
If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.

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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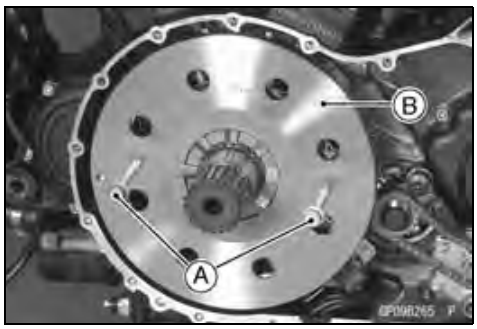
Charging System

Alternator Rotor Removal

● Remove:
Clutch and Damper Cam (see Clutch chapter)
Washer [A]

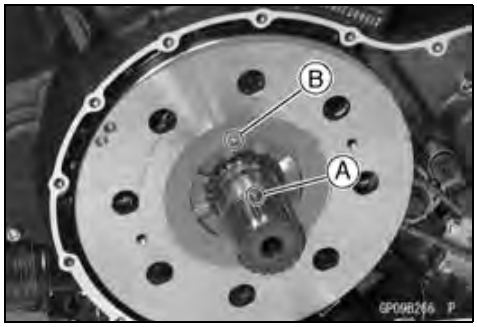


● Install suitable 2 bolts (M8) [A] in the rotor [B], and remove the rotor.

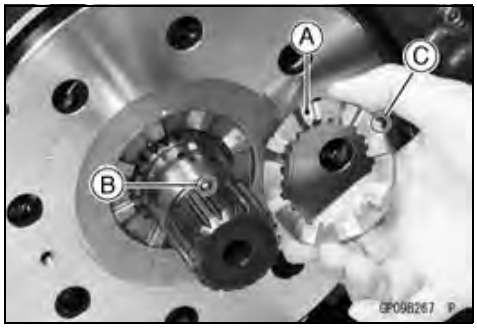


Alternator Rotor Installation

● Align the punch mark [A] on the crankshaft with the punch mark [B] on the rotor.

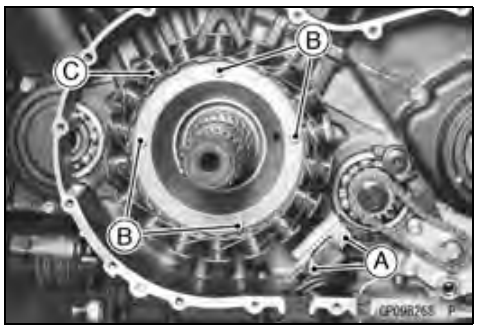


● Face the projections of the washer [A] to inside and align the punch mark [B] on the crankshaft with the punch mark [C] on the washer.



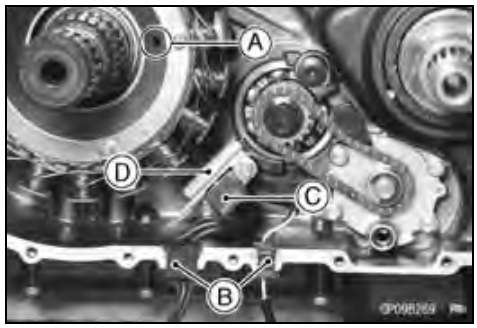
Alternator Stator Removal

● Remove:
Regulator/Rectifier
Crankshaft Sensor Lead Connector
Oil Pressure Switch Lead Connector
Alternator Rotor (see Alternator Rotor Removal)
Crankshaft Sensor Mounting Bolts [A], Crankshaft Sensor and Clamp
Alternator Stator Coil Mounting Bolts [B]
Alternator Stator Coil [C]



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Charging System



Alternator Stator Installation

- Install the alternator stator coil so that the hole [A] faces rearward.
- Apply a non-permanent locking agent to the alternator stator coil mounting bolts.
- Tighten:

Torque - Alternator Stator Coil Mounting Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)

- Apply silicone sealant to the all sides of the grommets [B], and fit the grommets into the notches of the crankcase.

Sealant - Kawasaki Bond (Silicone Sealant) TB1211F: 92104-0004

- Install the crankshaft sensor [C] and clamp [D] as shown.
- Tighten:

Torque - Crankshaft Sensor Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)

- Install the removed parts.

Charging Voltage Inspection

- Remove the seats (see Frame chapter).
- Check the battery condition.
- Warm up the engine to obtain actual alternator operating conditions.
- 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 (–)	14.5 ~ 15.5 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 regulator/rectifier and disconnect the connector [A].

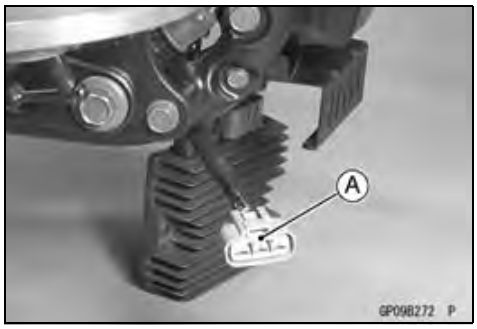
○Connect the hand tester to the connector as shown.

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

VN2000-A1

Tester Range	Connections		Reading @3 000 rpm
	Tester (+) to	Tester (–) to	
250 V AC	One black lead	Another black lead	70 ~ 95 V

Other than VN2000-A1

Tester Range	Connections		Reading @3 000 rpm
	Tester (+) to	Tester (–) to	
250 V AC	One black lead	Another black lead	51 ~ 69 V
	One yellow lead	Another yellow lead	

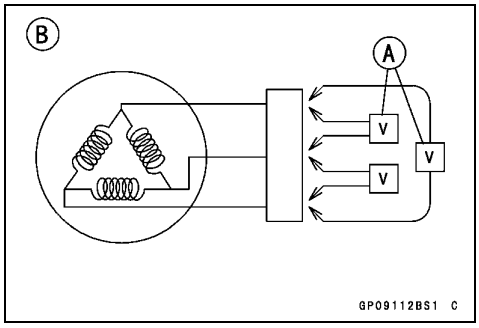
★If the output voltage shows the value in the table, the alternator operates properly and the regulator/rectifier is damaged. A much lower reading than the value in the table indicates that the alternator is defective.

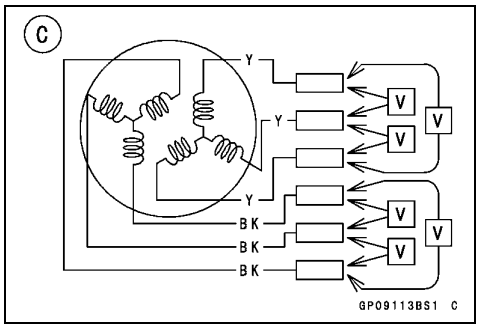
○Repeat the test for the other black or yellow leads.

Hand Tester [A]

VN2000-A1 [B]

Other than VN2000-A1 [C]

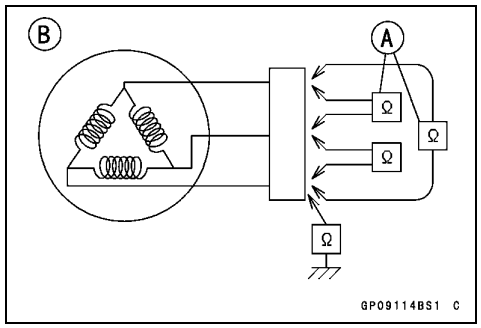




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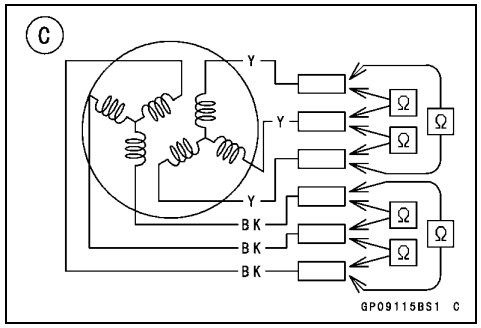
Charging System

● Check the stator coil resistance as follows:
○Turn off the ignition switch.
○Connect the hand tester [A] to the connector as shown in the table.
○Note the resistance readings.
VN2000-A1 [B]
Other than VN2000-A1 [C]



Stator Coil Resistance
VN2000-A1

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
×1 Ω	One black lead	Another black lead	0.18 ~ 0.22 Ω



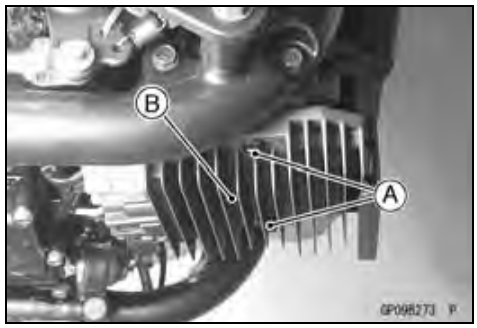
Other than VN2000-A1

Tester Range	Connections		Reading
	Tester (+) to	Tester (–) to	
×1 Ω	One black lead	Another black lead	0.25 ~ 0.31 Ω
	One yellow lead	Another yellow lead	

★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 or yellow leads.

Regulator/Rectifier Removal (VN2000-A1)

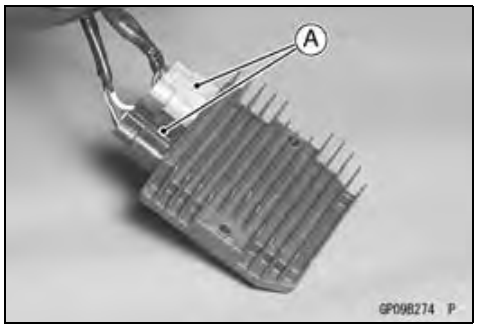
● Remove:
Regulator/Rectifier Mounting Bolts [A]
Regulator/Rectifier [B]



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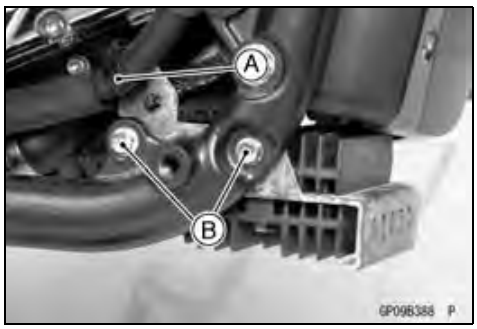
Charging System

● Disconnect the connectors [A] from the regulator/rectifier.

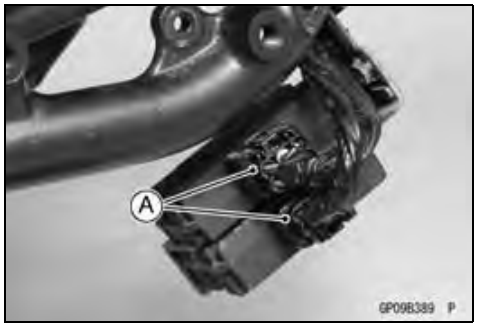


Regulator/Rectifier Removal (Other than VN2000-A1)

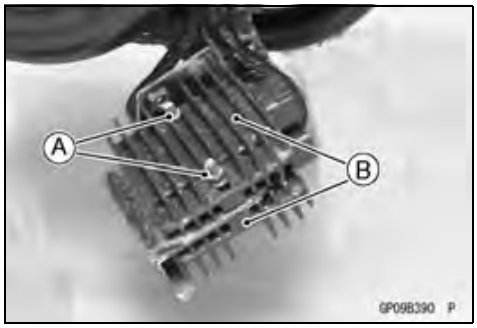
● Remove:
Right Footboard (see Frame chapter)
Right Footboard Assembly
Brake Hose Clamp [A]
Regulator/Rectifier Bracket Bolts [B]



● Disconnect the connectors [A] from the regulator/rectifiers:



● Remove:
Regulator/Rectifier Mounting Bolts and Nuts [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:

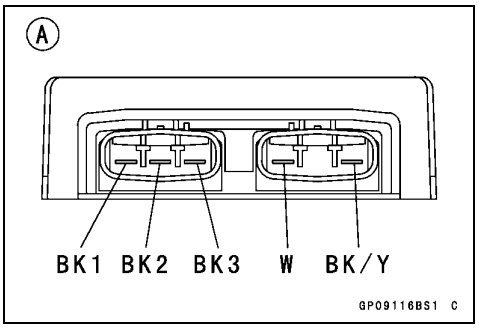
Torque - Regulator/Rectifier Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)

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Charging System

Regulator/Rectifier Inspection

● Remove the regulator/rectifier (see Regulator/Rectifier Removal).
VN2000-A1 [A]
Other than VN2000-A1 [B]

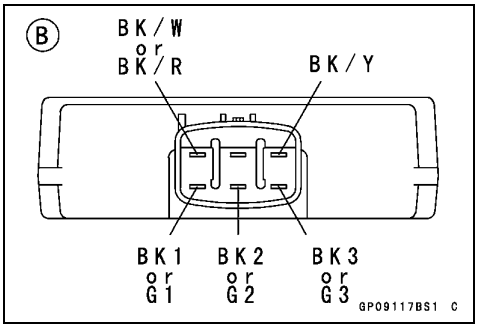


● Set the hand tester to the × 1 kΩ range and make the measurements shown in the table.

Special Tool - Hand Tester: 57001-1394

● Connect the hand tester to the regulator rectifier.

★If the tester readings are not as specified, replace the regulator/rectifier.



CAUTION

Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.
If a megger or a meter with a large capacity battery is used, the regulator/rectifier will be damaged.

Regulator/Rectifier Resistance (Unit: kΩ)
VN2000-A1

		Tester (+) Lead Connection				
	Terminal	W	BK1	BK2	BK3	BK/Y
(–)*	W	–	500 ~ ∞	500 ~ ∞	500 ~ ∞	500 ~ ∞
	BK1	2 ~ 20	–	500 ~ ∞	500 ~ ∞	500 ~ ∞
	BK2	2 ~ 20	500 ~ ∞	–	500 ~ ∞	500 ~ ∞
	BK3	2 ~ 20	500 ~ ∞	500 ~ ∞	–	500 ~ ∞
	BK/Y	2 ~ 40	2 ~ 20	2 ~ 20	2 ~ 20	–

(−)*: Tester (−) Lead Connection

Other than VN2000-A1

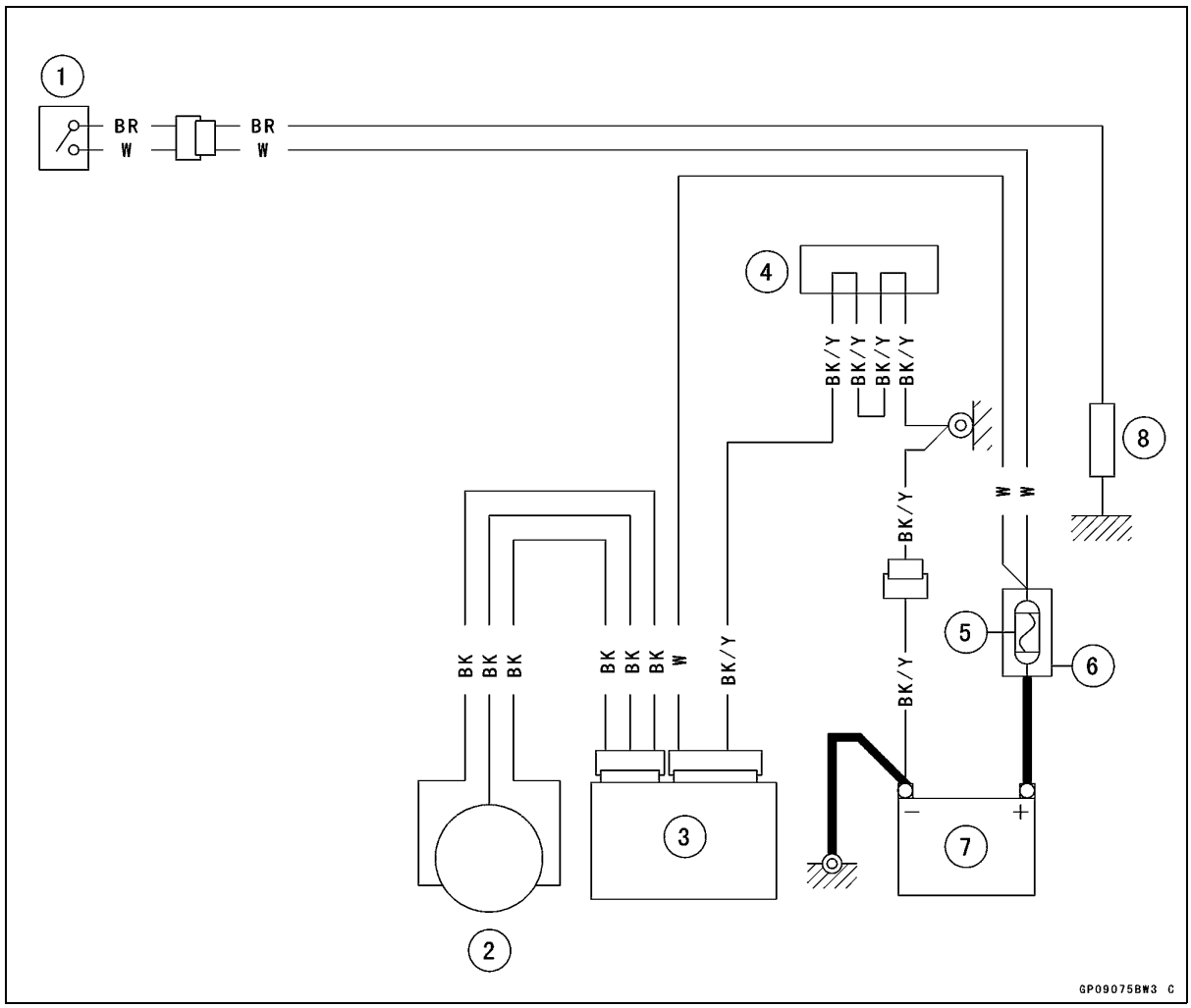
		Tester (+) Lead Connection				
	Terminal	BK/W or BK/R	BK1 or G1	BK2 or G2	BK3 or G3	BK/Y
(–)*	BK/W or BK/R	–	∞	∞	∞	∞
	BK1 or G1	2.1 ~ 22	–	∞	∞	∞
	BK2 or G2	2.1 ~ 22	∞	–	∞	∞
	BK3 or G3	2.1 ~ 22	∞	∞	–	∞
	BK/Y	3.0 ~ 62	2.1 ~ 22	2.1 ~ 22	2.1 ~ 22	–

(−)*: Tester (−) Lead Connection

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Charging System

Charging System Circuit (VN2000-A1)

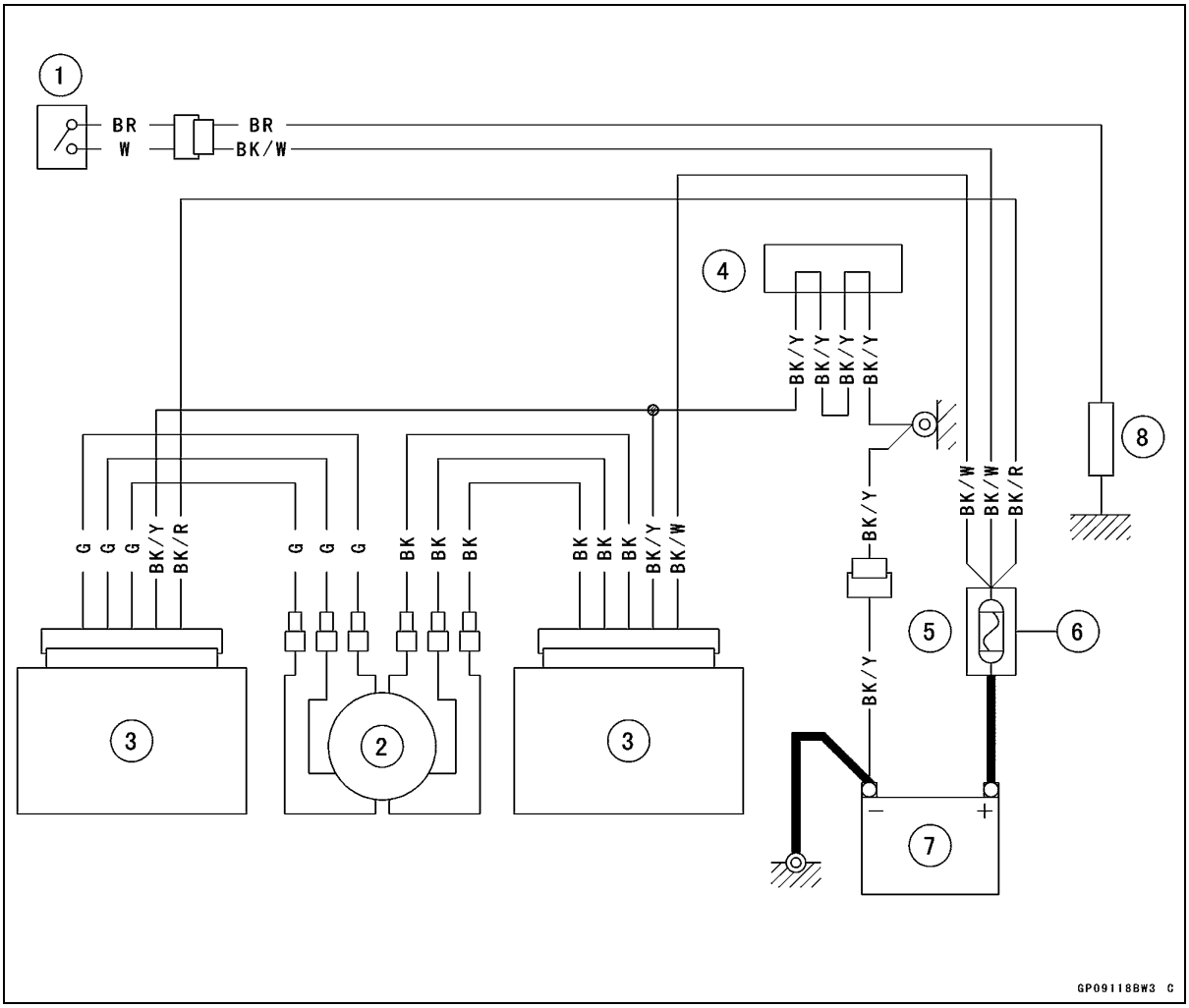


1. Ignition Switch
2. Alternator
3. Regulator/Rectifier
4. Joint Connector
5. Main Fuse 30 A
6. Starter Relay
7. Battery
8. Load

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Charging System

Charging System Circuit (Other than VN2000-A1)

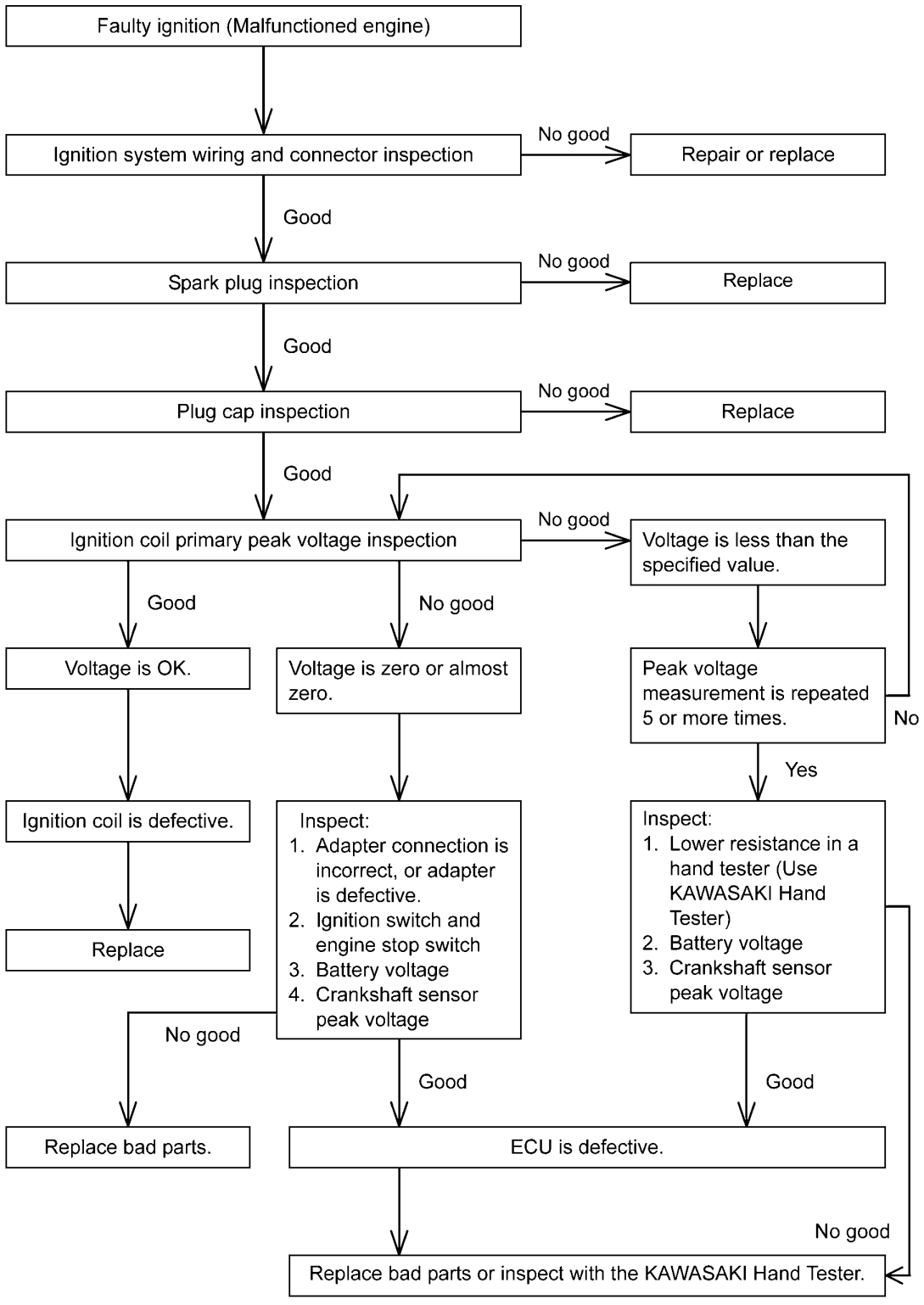


1. Ignition Switch
2. Alternator
3. Regulators/Rectifiers
4. Joint Connector
5. Main Fuse 30 A
6. Starter Relay
7. Battery
8. Load

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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 leads while the engine is running, or you could receive a severe electrical shock.

CAUTION

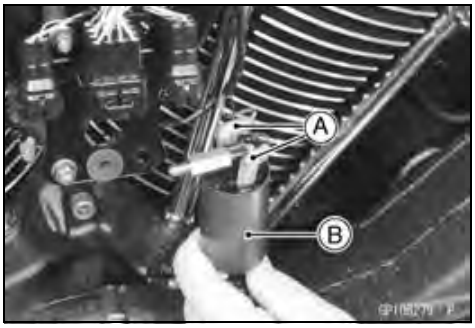
Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC igniter damage in the ECU.
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the IC igniter in the ECU and the diodes.

Ignition Coil Removal

● Remove:
Ignition Coil Cover (see Frame chapter)
Fuel Tank (for Rear Ignition Coil, see Fuel System (DFI) chapter)
Spark Plug Caps
Ignition Coil Mounting Nuts [A]



● Remove:
Primary Leads [A]
Ignition Coil [B]



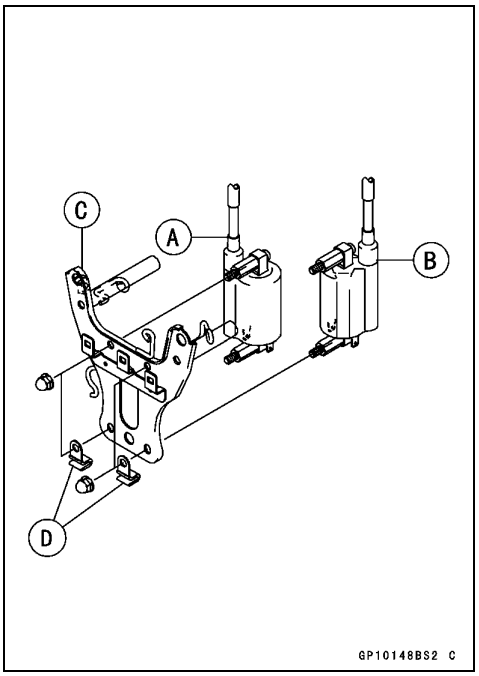
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Ignition System

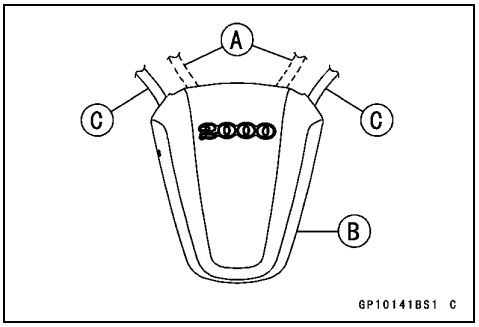
Ignition Coil Installation

- Connect the primary leads to the ignition coil terminals and run the secondary cables according to the Cable, Wire, and Hose Routing section in the Appendix chapter.

[A] Front Ignition Coil
R/G Lead → (+)
BK Lead → (−)
[B] Rear Ignition Coil
R/G Lead → (+)
BK/G Lead → (−)
[C] Bracket
[D] Clamps

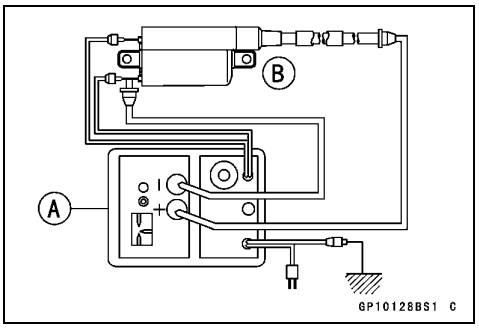


- Do not position the secondary cables [A] inside the cover [B] as shown.
- Run the cables [C] at positions of the figure.



Ignition Coil Inspection

- Remove the ignition coils (see Ignition Coil Removal).
- 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 (0.24 in.) or more

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the coil body or leads.

★If the distance reading is less than the specified value, the ignition coil or spark plug caps are defective.

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Ignition System

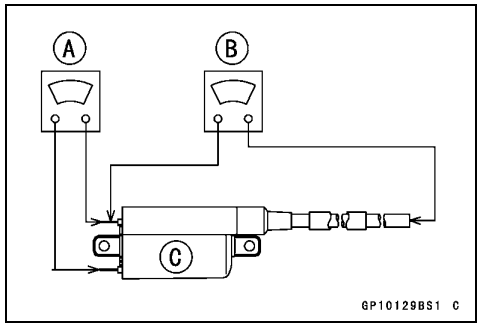
● To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. Remove the caps by turning them counterclockwise.
★If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is 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 coil terminal and High -Tension Lead.
○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 ~ 2.5 Ω**
Secondary Windings:	**9 ~ 13 kΩ**

★If the tester does not read as specified, replace the coil.
○To install the plug cap, turn it clockwise.

Spark Plug Removal

● Remove:
Fuel Tank (for Rear Spark Plug, see Fuel System (DFI) chapter)
Spark Plug Caps [A]
● Remove the spark plug using the 16 mm (0.63 in.) plug wrench vertically.

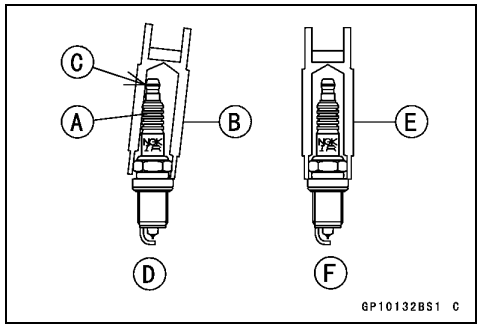
Special Tool - Spark Plug Wrench, Hex16: 57001-1262



CAUTION

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

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



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Ignition System

Spark Plug Installation



- Insert the 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, Hex16: 57001-1262

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.

Spark Plug Cleaning/Inspection

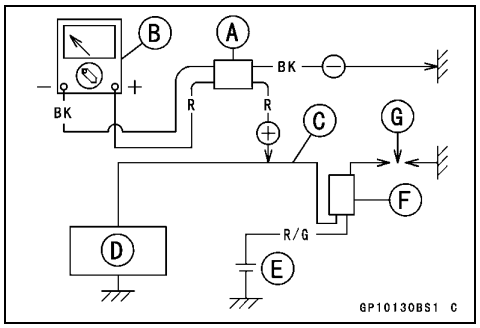
- Refer to the Spark Plug Condition Inspection in the Periodic Maintenance chapter.

Ignition Coil Primary Peak Voltage

NOTE

○*Be sure the battery is fully charged.*

- Remove the fuel tank (see 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.



- Install the peak voltage adapter [A] into the hand tester [B].
- Connect the adapter between the ignition coil primary lead terminal and the engine ground with the primary lead left connected.

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

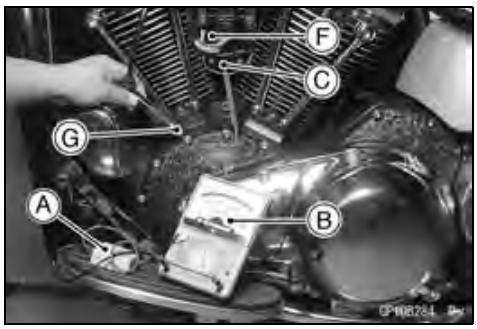
○Insert the adapter probe into the terminal of the primary lead [C].
ECU [D]
Battery [E]
Ignition Coil [F]
New Spark Plug [G]

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**



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Ignition System

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the ignition switch and the engine stop switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 or more times for one ignition coil.

Ignition Coil Primary Peak Voltage
Standard: 210 V or more

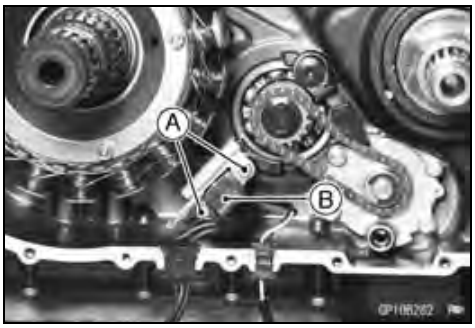
- Repeat the test for the other ignition coil.

★If the reading is less than the specified value, check the following:
Ignition Coils (see Ignition Coil Inspection)
Crankshaft Sensors (see Crankshaft Sensor Inspection)

★If the ignition coils and crankshaft sensors are normal, check the ECU (see Fuel System (DFI) chapter).

Crankshaft Sensor Removal

- Remove:
  Clutch and Damper Cam (see Clutch chapter)
  Alternator Rotor (see Alternator Rotor Removal)
  Oil Pressure Switch Lead Terminal
  Crankshaft Sensor Mounting Bolts [A]
  Crankshaft Sensor [B] and Clamp

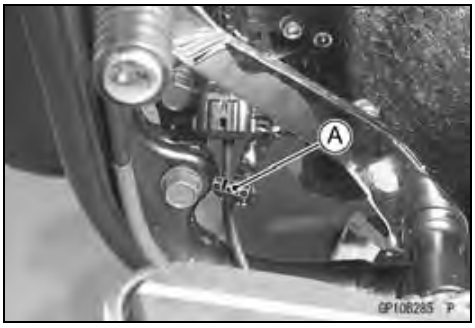


Crankshaft Sensor Installation

- Refer to the Alternator Stator Installation in this chapter.

Crankshaft Sensor Inspection

- Remove all the spark plug caps but do not remove the spark plugs.
- Disconnect the crankshaft sensor lead connector [A].

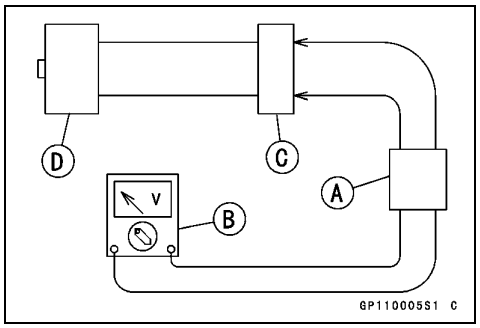


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Ignition System

● Connect the peak voltage adapter [A] to the hand tester [B].

Special Tools - Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B
Hand Tester: 57001-1394



● Insert the adapter probes into the connector [C] of the crankshaft sensor [D] as shown.

Connections

	Adapter (R, +)		Adapter (BK, –)
Crankshaft Sensor:	**Y**	←→	**BK**

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.

Crankshaft Sensor Peak Voltage
Standard: 3.0 V or more

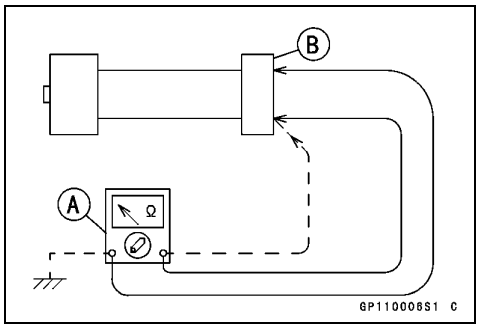
★If the reading is less than the specified value, replace the crankshaft sensor.
★If the reading is normal, check the ECU (see Fuel System (DFI) chapter).
★If the peak voltage adapter is not available, the coil can be checked for a broken or badly shorted winding with the hand tester (special tool).

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
Crankshaft Sensor:	**Y ←→ BK**

★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.

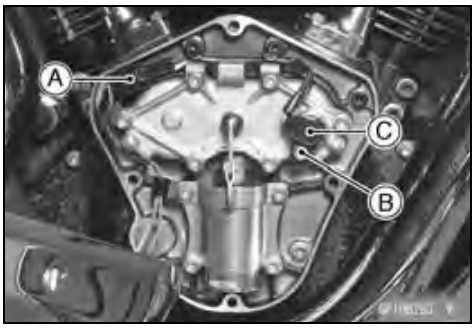
Crankshaft Sensor Resistance
Standard: 420 ~ 520 Ω

● 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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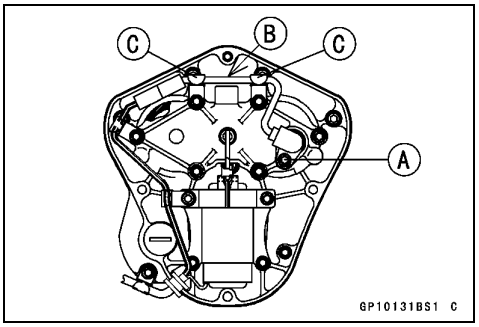
Ignition System

Camshaft Position Sensor Removal



- Remove:
  Right Engine Cover Bolts
  Right Engine Cover
  Camshaft Position Sensor Connector [A] (disconnect)
  Camshaft Position Sensor Bolt [B]
  Camshaft Position Sensor [C]

Camshaft Position Sensor Installation

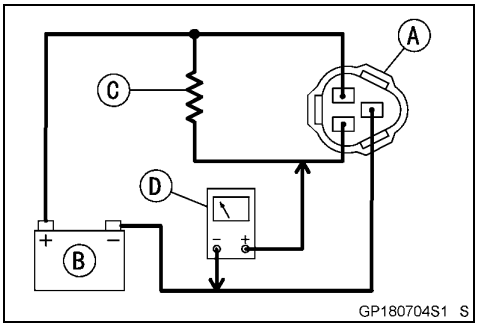


- Apply grease to the O-ring on the camshaft position sensor.
- Apply a non-permanent locking agent to the camshaft position sensor bolt [A].
- Tighten:

Torque - Camshaft Position Sensor Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

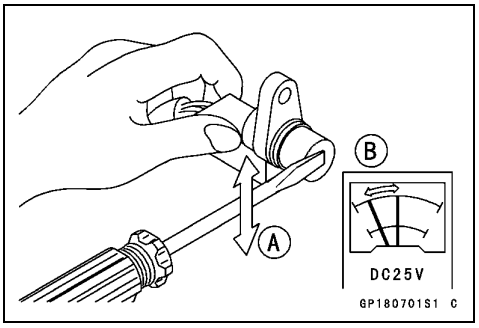
- Do not slacken the part [B] of the camshaft position sensor lead.
  Clamps [C]

Camshaft Position Sensor Inspection



- Remove:
  Camshaft Position Sensor (see Camshaft Position Sensor Removal)
- Connect the camshaft position sensor [A] with a battery [B], 10 kΩ resister [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 camshaft position sensor surface with the screw driver.

○Then the tester indicator should flick [B].

★If the tester indicator does not flick, replace the camshaft position sensor.

Interlock Operation Inspection

- Using a jack and attachment, raise the rear wheel off the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571

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Ignition System

1st Check

● Start the engine to the following conditions.

Condition

Transmission Gear → 1st position

Clutch Lever → Release

Sidestand → Down or Up

○Turn the ignition switch on and push the starter button.
○Then the starter motor should not turn when the starter system circuit is normality.
★If the engine is start, inspect the starter lockout switch, gear position switch, and relay box.
★If their parts are normality replace the ECU.

2nd Check

● Start the engine to the following conditions.

Condition

Transmission Gear → 1st position

Clutch Lever → Pulled in

Sidestand → Up

○Turn the ignition switch on and push the starter button.
○Then the starter motor should turn when the starter system circuit is normality.
★If the starter motor is not turn, inspect the starter lockout switch, gear position switch, and relay box.
★If their parts are normality replace the ECU.

3rd Check

● Inspect the engine for its secure stop after the following operations are completed.
● Run the engine to the following conditions.

Condition

Transmission Gear → 1st Position

Clutch Lever → Release

Sidestand → Up

● Set the sidestand on the ground, then the engine will stop.
★If whichever may not be stopped, inspect the gear position switch, starter lockout switch, sidestand switch and relay box.
★If their parts are normality, replace the ECU.

IC Igniter Inspection

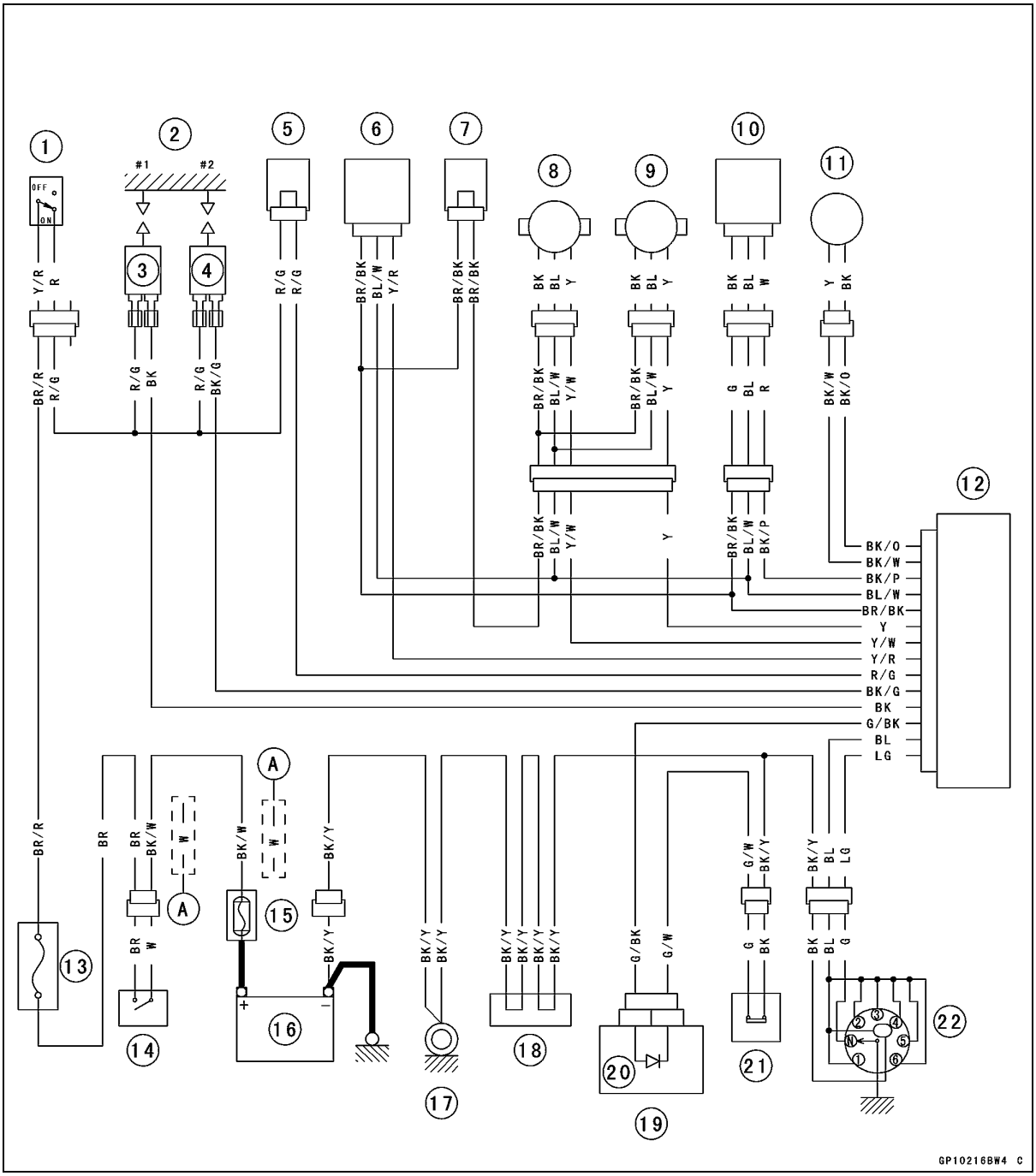
○The IC igniter is built in the ECU [A].
● Refer to Fuel System (DFI) chapter for ECU Inspection.



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Ignition System

Ignition System Circuit



1. Engine Stop Switch
2. Spark Plugs
3. Ignition Coil #1 (front cylinder)
4. Ignition Coil #2 (rear cylinder)
5. Joint Connector
6. Vehicle-down Sensor
7. Joint Connector
8. Main Throttle Sensor
9. Sub Throttle Sensor
10. Camshaft Position Sensor
11. Crankshaft Sensor
12. Electronic Control Unit
13. Ignition Fuse 10 A
14. Ignition Switch
15. Main Fuse 30 A
16. Battery
17. Frame Ground
18. Joint Connector
19. Relay Box
20. Diode
21. Sidestand Switch
22. Gear Position Switch

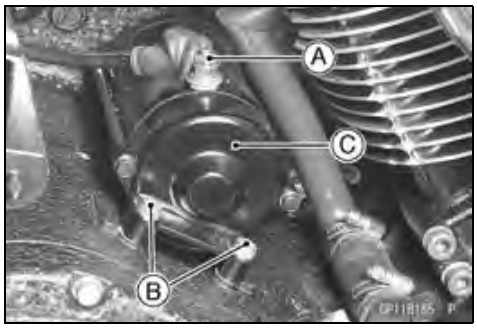
A: VN2000-A1 Model

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Starter Motor

Starter Motor Removal

- Remove:
  Rear Exhaust Pipe (see Engine Top End chapter)
  Starter Motor Terminal Nut [A] and Cable
  Starter Motor Bolts [B]
- Pull the starter Motor [C] toward the right.



CAUTION

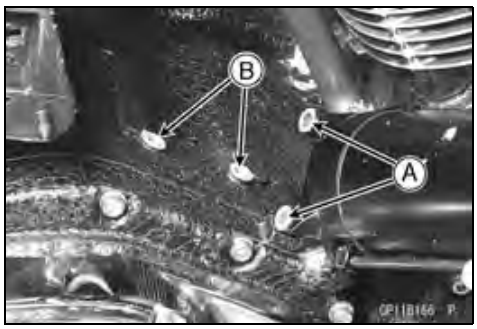
Never drop the starter motor, especially on a hard surface.
Such a shock to the motor can damage it.

Starter Motor Installation

CAUTION

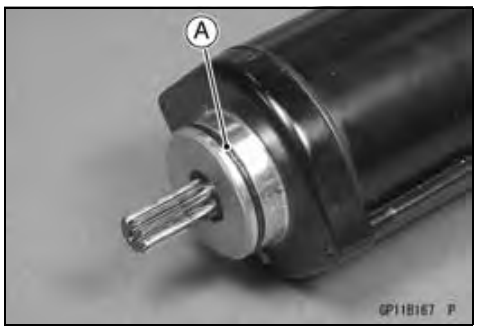
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.



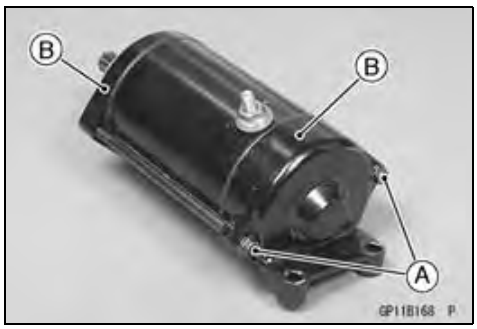
- Replace the O-ring [A] with a new one.
- Apply a small amount of engine oil to the O-ring.

Torque - Starter Motor Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
Starter Motor Terminal Nut: 9.8 N·m (1.0 kgf·m, 87 in·lb)

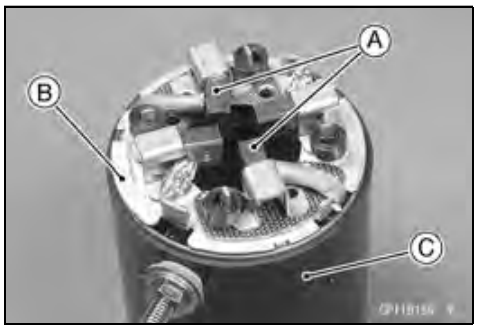


Starter Motor Disassembly

- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor assembly bolts [A] and remove both end covers [B] and pull the armature out of the yoke.



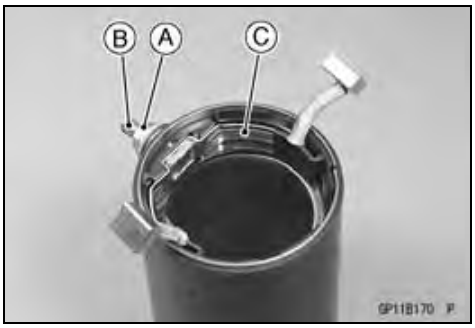
- Take the positive carbon brushes [A] out of the brush holders.
- Take off the brush plate [B] with brush wire from the yoke [C].



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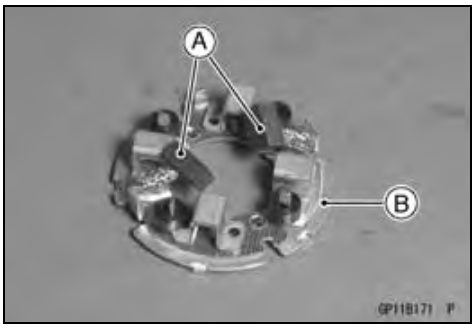
Starter Motor

- Unscrew the terminal locknut [A] and remove the terminal bolt [B].
- 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].*



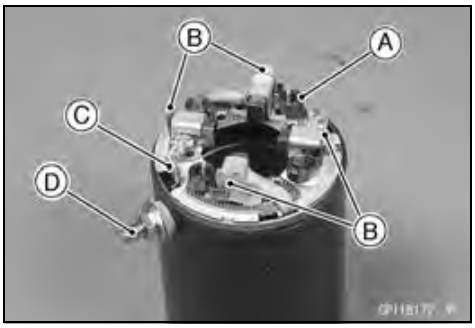
Starter Motor Assembly

- Holding the springs [A] with suitable plastic washers [B], insert the brushes in the brush holders.

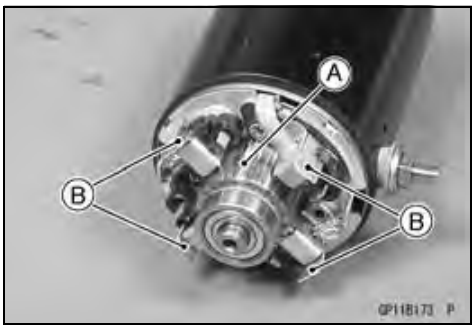
○Fit the brush wire into the holder groove.

- Align the tang [C] with the terminal bolt [D].
- Tighten:

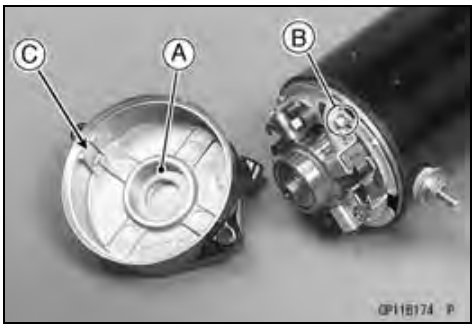
Torque - Starter Motor Terminal Locknut: 11 N·m (1.1 kgf·m, 95 in·lb)



- Put the armature [A] among the brushes, and remove the plastic washers [B].



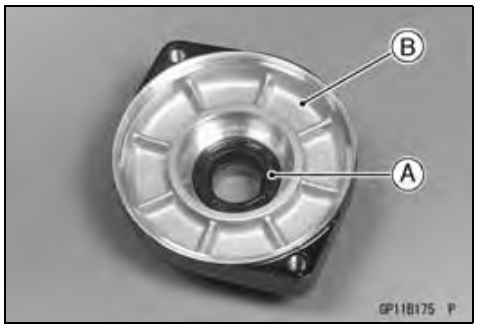
- Install the washer [A].
- Fit the tang [B] of the brush plate into the left end cover groove [C].



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Starter Motor

● Apply a thin coat of grease to the oil seal [A] in the right end cover [B].

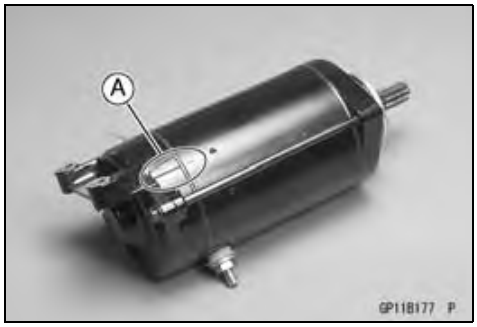


● Apply a thin coat of grease to the left bearing [A].
● Fit shims onto the right end cover.



○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)

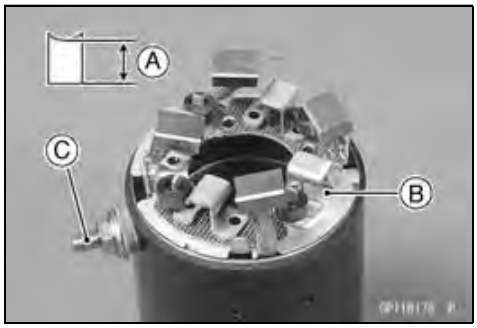


Brush Inspection

● 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].

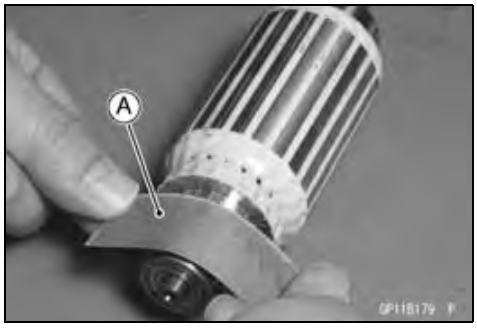
Starter Motor Brush Length

Standard:	**12.5 mm (0.49 in.)**
Service Limit:	**5 mm (0.20 in.)**



Commutator Cleaning and Inspection

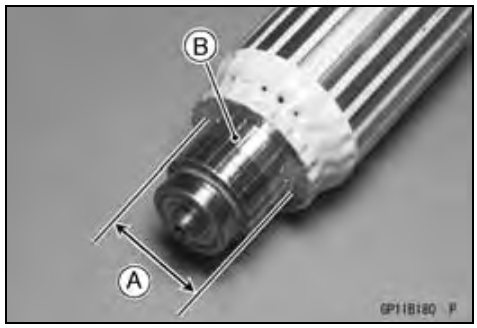
● Smooth the commutator surface if necessary with fine emery cloth [A], and clean out the grooves.



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Starter Motor

● 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.

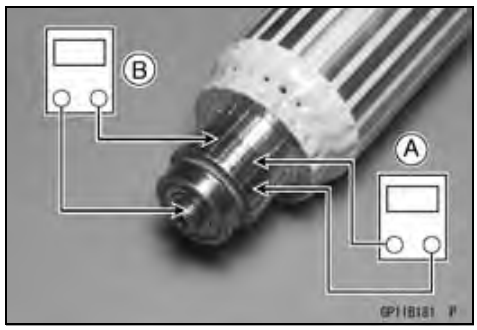


Commutator Diameter

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.



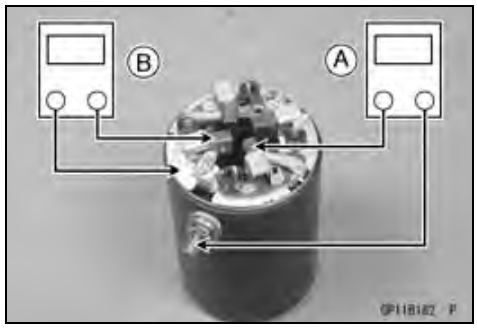
Special Tool - Hand Tester: 57001-1394

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.*

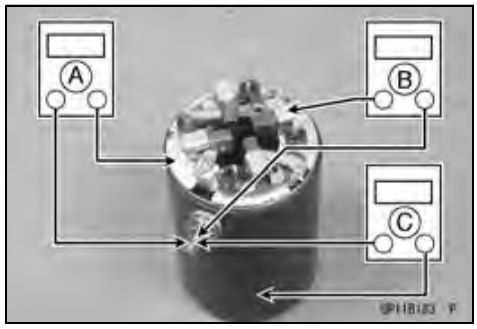
Brush Assy Inspection

● Using the × 1 Ω hand tester range, measure the resistance as follows.
Terminal Bolt and Positive Brushes [A]
Brush Plate and Negative Brushes [B]
○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.



Brush Plate and Terminal Bolt Inspection

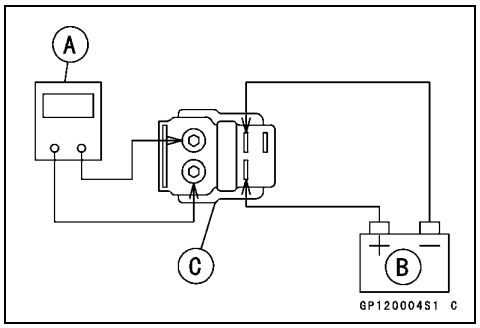
● Using the highest hand tester range, measure the resistance as shown.
Terminal Bolt and Brush Plate [A]
Terminal Bolt and Negative Brush Holders [B]
Terminal Bolt and Yoke [C]
○The reading should be infinite (∞ Ω).
★If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.



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Starter Motor

Starter Relay Inspection



- Remove the right side covers (see 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.

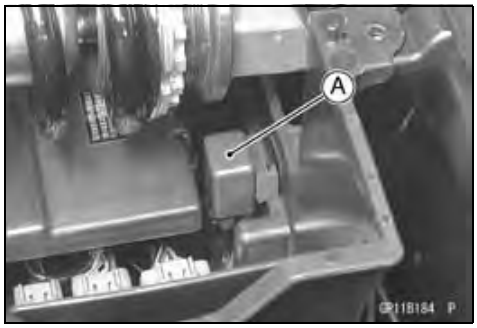
Testing Relay

Tester Range: × 1 Ω range

Criteria: When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω

Starter Control Relay Inspection



- Remove:

  Seats (see Frame chapter)

  Tool Case (see Frame chapter)

  Starter Control Relay [A]

- Connect the hand tester [A] and a 12 V battery [B] to the starter control relay [C] as shown.

★If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

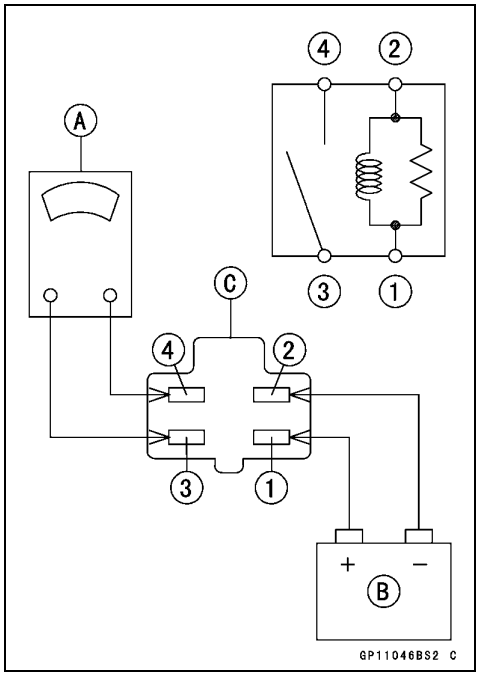
Hand Tester Range: × 1 Ω

Criteria: When battery is connected ⇒ 0 Ω

When battery is disconnected ⇒ ∞ Ω

Relay Coil Terminals [1] and [2]

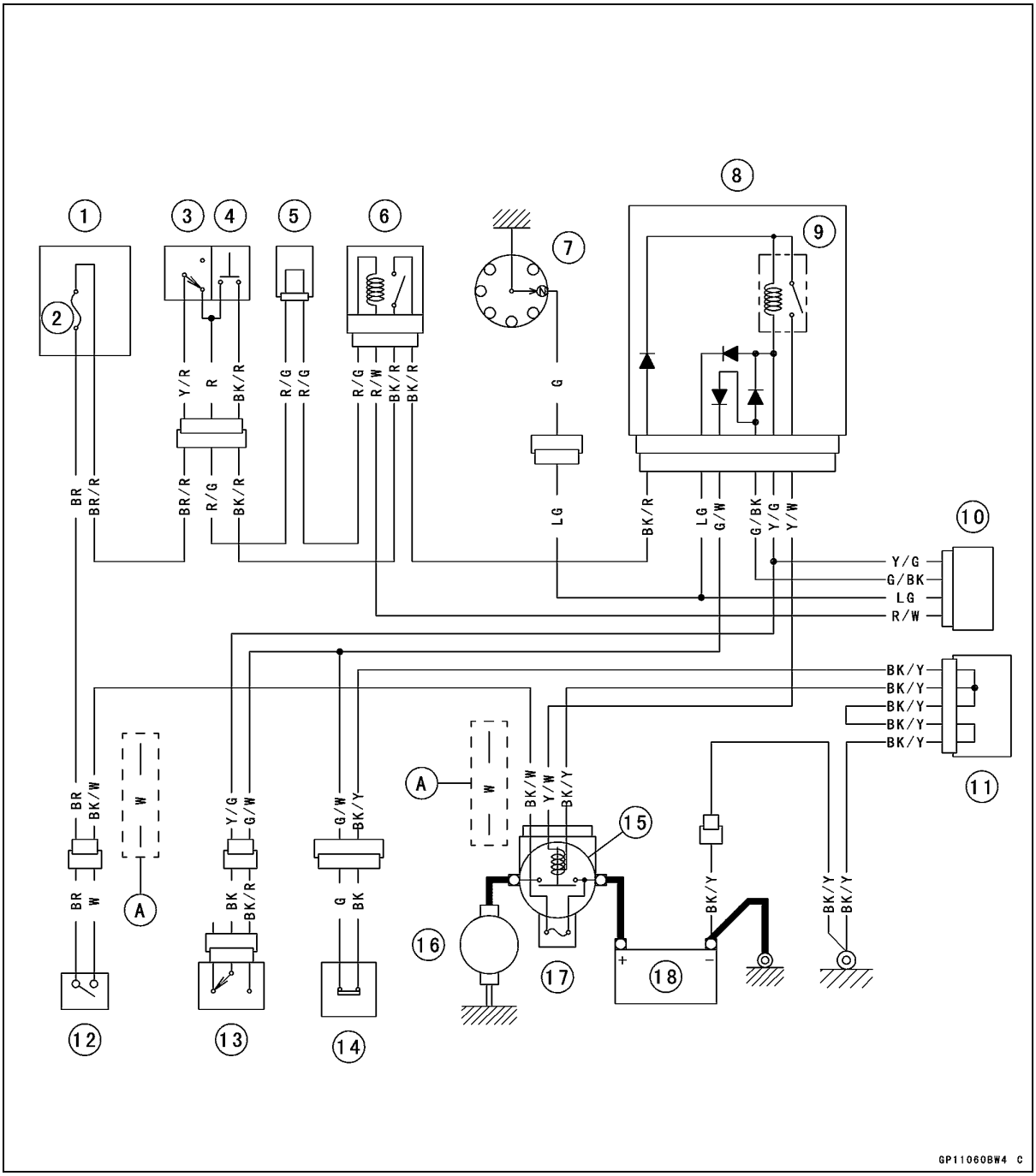
Relay Switch Terminals [3] and [4]



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Starter Motor

Electric Starter Circuit



1. Fuse Box
2. Ignition Fuse 10 A
3. Engine Stop Switch
4. Starter Button
5. Joint Connector
6. Starter Control Relay
7. Gear Position Switch
8. Relay Box
9. Starter Circuit Relay
10. ECU
11. Joint Connector
12. Ignition Switch
13. Starter Lockout Switch
14. Sidestand Switch
15. Starter Relay
16. Starter Motor
17. Main Fuse 30 A
18. Battery

A: VN2000-A1 Model

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Lighting System

This model adopts the daylight system and has a headlight relay in the relay box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on 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

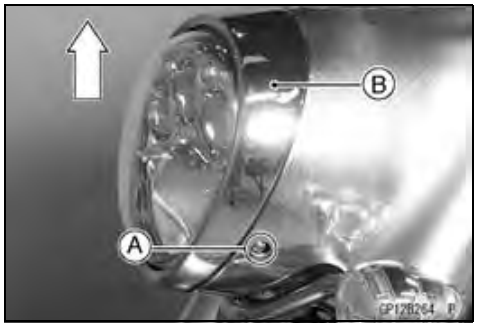
- Refer to Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Beam Vertical Adjustment

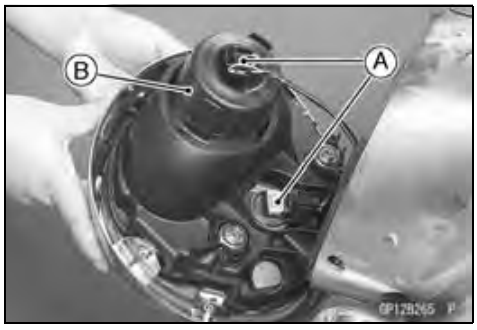
- Refer to Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Bulb Replacement (Other than VN2000E6F ~, F6F ~)

- Remove the headlight rim bolts [A] on both sides.
- Pull the headlight unit [B] up.



- Pull the headlight connectors [A].
- Remove the headlight dust cover [B].



Low Beam Bulb

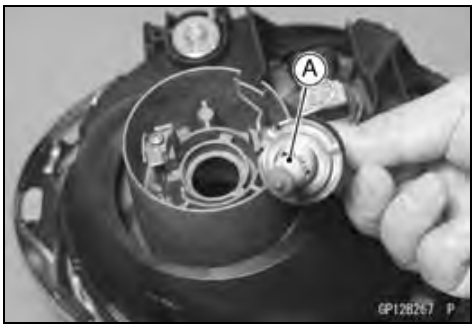
- Push the hook [A] to unlock.



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Lighting System

● Take out the low beam bulb [A].

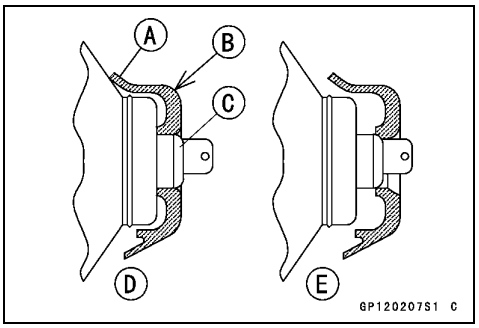


CAUTION

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.

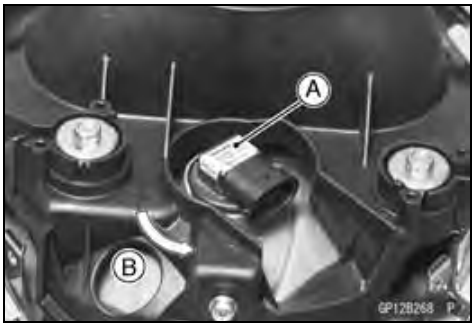
○Clean off any contamination that inadvertently gets on the bulb with alcohol or a soap and water solution.

● 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]
● After installation, adjust the headlight aim (see Headlight Aiming Inspection in Periodic Maintenance chapter).



High Beam Bulb

● Turn the High beam bulb socket [A] counterclockwise [B], and pull it out.



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 low beam bulb with a new one.

● Fit the projection [A] into the groove [B] in the housing.
● Push the socket in, turn it clockwise and release it.
○It should lock in position.



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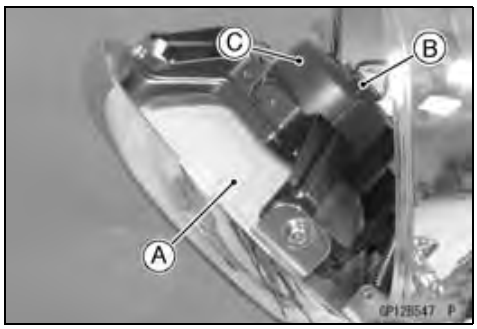
Lighting System

Headlight Bulb Replacement (VN2000E6F ~/F6F ~)

● Remove the headlight rim screws [A] on both side.



● 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.



● 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.

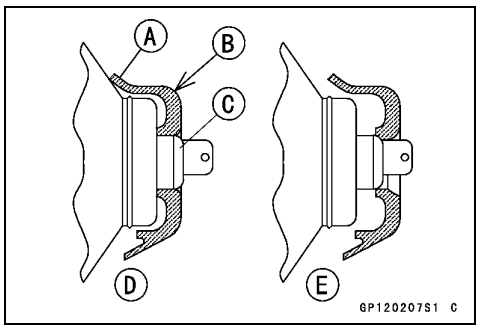


○Clean off any contamination that inadvertently gets on the bulb with alcohol or a soap and water solution.

● 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).

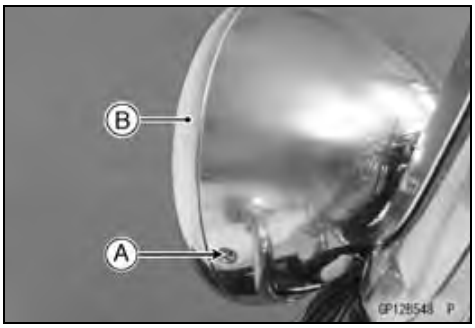


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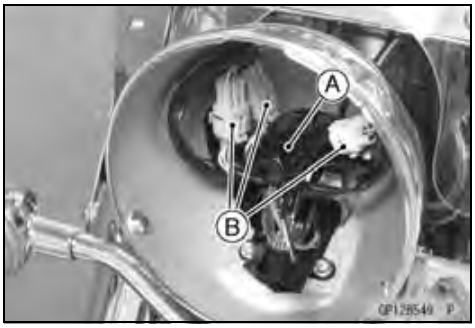
Lighting System

Headlight Body Removal (VN2000E6F ~/F6F ~)

- Remove the headlight rim screws [A] on both sides.
- Pull the headlight unit [B] and drop it out.



- Remove:
  Clamp [A]
  Connectors [B]



- Remove the headlight body cap nuts [A], then take off the body [B].



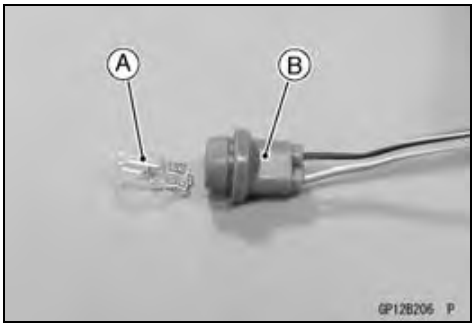
City Light Bulb Replacement (Europe Model)

- Remove the headlight unit (see Headlight Bulb Replacement).
- 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].

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.

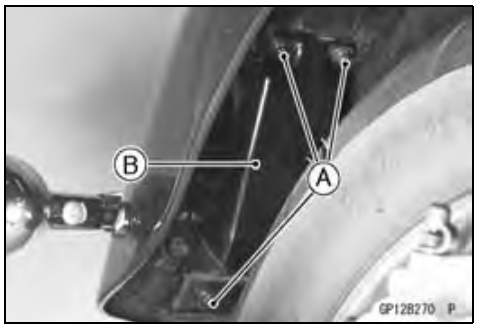


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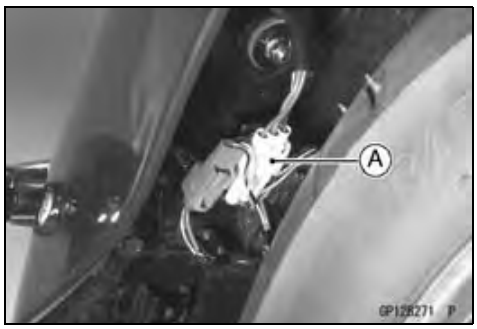
Lighting System

Tail/Brake Light Bulb Replacement

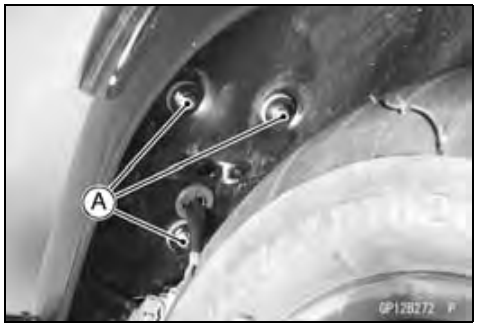
● Remove:
Bolts [A] and Washers
Cover [B]



● Disconnect:
Tail/Brake Light Lead Connector [A]



● Remove:
Tail/Brake Light Unit Mounting Nuts [A]
Tail/Brake Light Unit



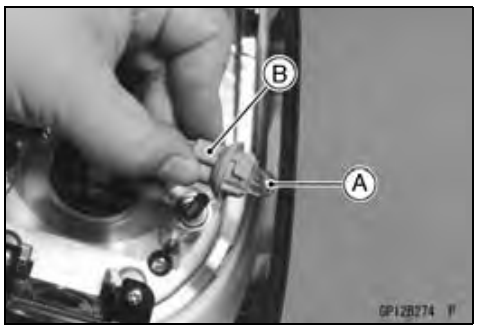
● Turn the license light bulb socket [A] counterclockwise [B] and pull it out.



● 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

- Disconnect the tail/brake light lead connector [A].



- Turn the tail/brake light bulb socket [A] counterclockwise [B] and pull it out.



- Align the arrow [A] of the new bulb socket with the arrow [B] end of the housing, and turn the socket clockwise.



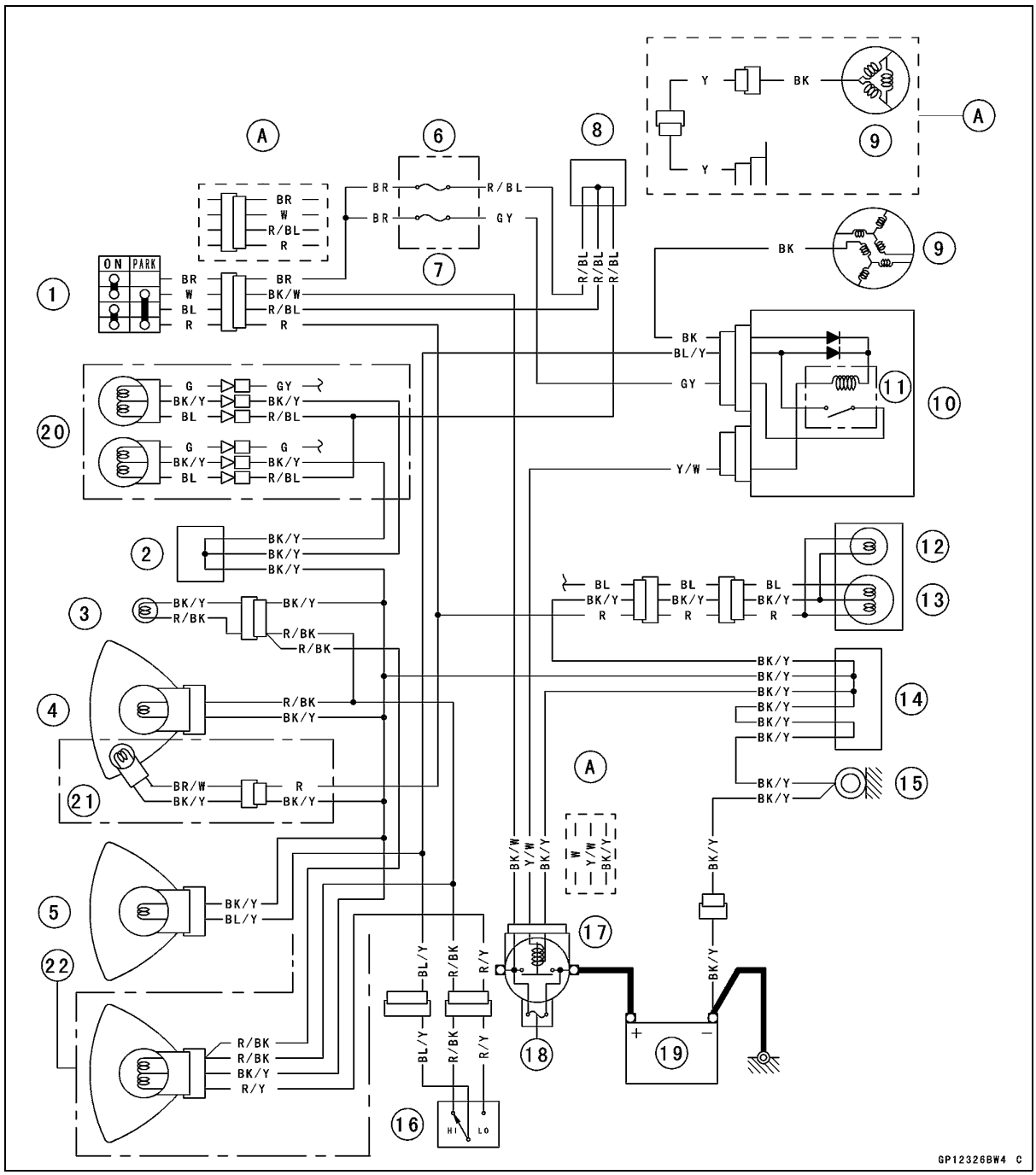
- Install the tail/brake light unit.
- Tighten:

Torque - Tail/Brake Light Unit Mounting Nuts: 5.9 N·m (0.60 kgf·m, 52 in·lb)

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Lighting System

Headlight/Tail Light Circuit



1. Ignition Switch
2. Joint Connector
3. High Beam Indicator Light
4. Headlight (Hi) (Other than VN2000E6F ~/F6F ~)
5. Headlight (Lo) (Other than VN2000E6F ~/F6F ~)
6. Taillight Fuse 10 A
7. Headlight Fuse 10 A
8. Joint Connector
9. Alternator
10. Relay Box
11. Headlight Relay
12. License Plate Light
13. Tail/Brake Lights
14. Joint Connector
15. Frame Ground
16. Dimmer Switch
17. Starter Relay
18. Main Fuse 30A
19. Battery
20. Running Position Lights (US, CA Models)
21. City Light (Other than US, CA, AU, MY Models)
22. Headlight (VN2000E6F ~/F6F ~)

A: VN2000-A1 Model

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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.

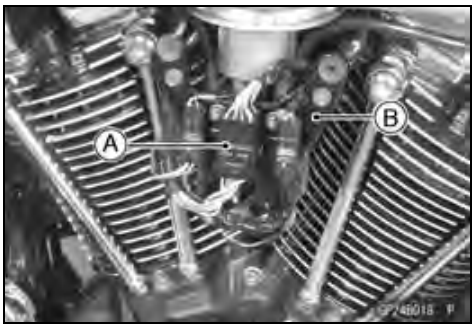
★If the turn signal canceling system does not function properly, first check all the wiring connections carefully.
- Secondly, inspect the distance sensor.
- Thirdly, inspect the turn signal switch in the left handlebar switch.
- Lastly, check the turn signal control relay.

Wiring Inspection
- Refer to the Wiring Inspection, and note the following.
- 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.

Distance Sensor Inspection
- Remove:
  Ignition Coil Bracket Cover (see Frame chapter)
- Remove the meter lead connector [A] from the bracket [B].

○Do not disconnect the connector.
- Using a jack and attachment, raise the rear wheel off the ground.

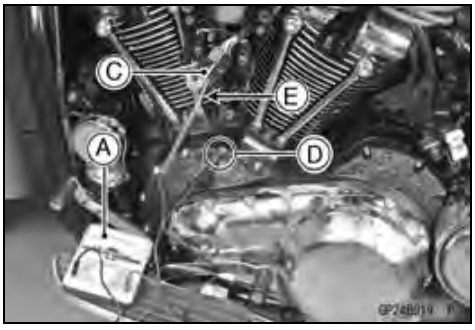
Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1571



- Set the hand tester [A] to the DC25 V range and connect it to the LB lead terminal [B] in the connector [C] and ground [D] as shown.

Connections
Hand Tester (+) → Needle Adapter [E] → LB Lead Terminal
Hand Tester (–) → Ground

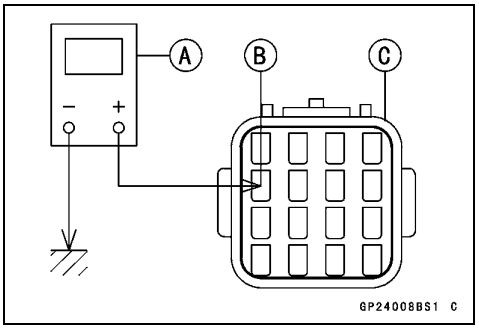
Special Tools - Hand Tester: 57001-1394
Needle Adapter Set: 57001-1457



- Turn the ignition switch ON.
- 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.

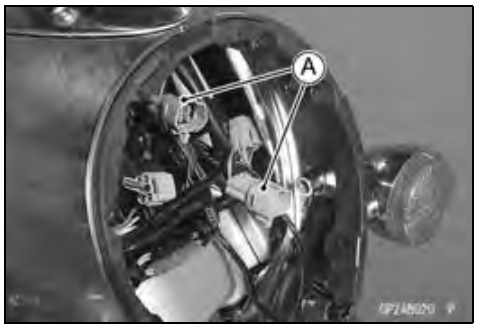
★If the tester's pointer does not fluctuate, inspect the speed sensor and turn signal control relay. If the speed sensor and control relay are good, replace the digital meter assembly.



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Automatic Turn Signal Canceling System

Turn Signal Switch Inspection



- Open the headlight housing.
- Unplug the 9-pin connectors [A] 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)		●	●	●	●

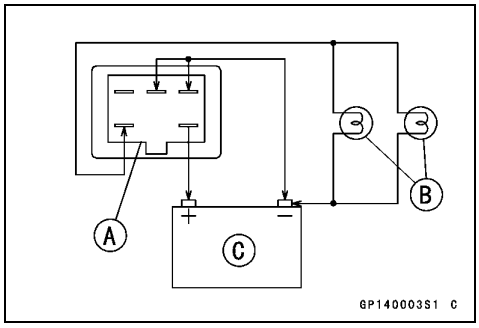
Turn Signal Control Relay Inspection



CAUTION

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

- Remove:
  ECU (see Fuel System (DFI) chapter)
  Turn Signal Control Relay [A]



- Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights flash for one minute.
  Turn Signal 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

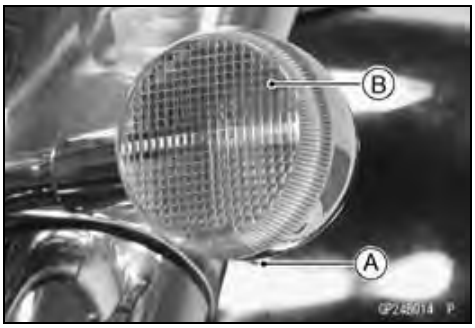
○*Even if the foregoing checks show the turn signal control relay to be good, it may be defective in some manner especially for automatic turn signal canceling operation not readily detectable with above checks. If all other checks are good, replace the turn signal control relay.*

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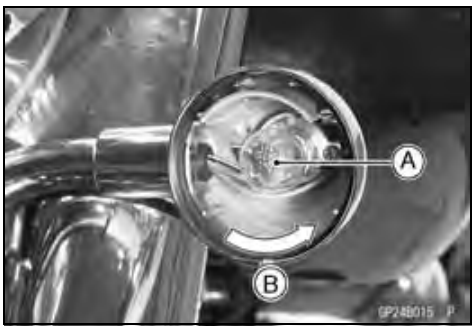
Automatic Turn Signal Canceling System

Turn Signal Light Bulb Replacement

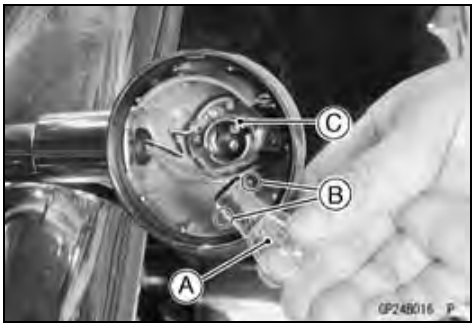
- Remove the turn signal light lens screw [A] and take off the lens [B].



- Push the bulb [A] in the socket and turn the bulb counterclockwise [B].
- Replace the bulb.

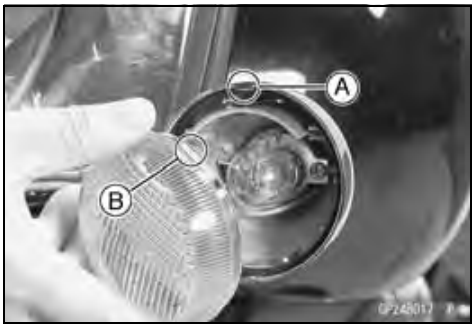


- Insert the new bulb [A] by aligning the pins [B] with the groove in the walls of the socket [C].



- Fit the projection [A] in the recess [B] of the lens.
- Tighten:

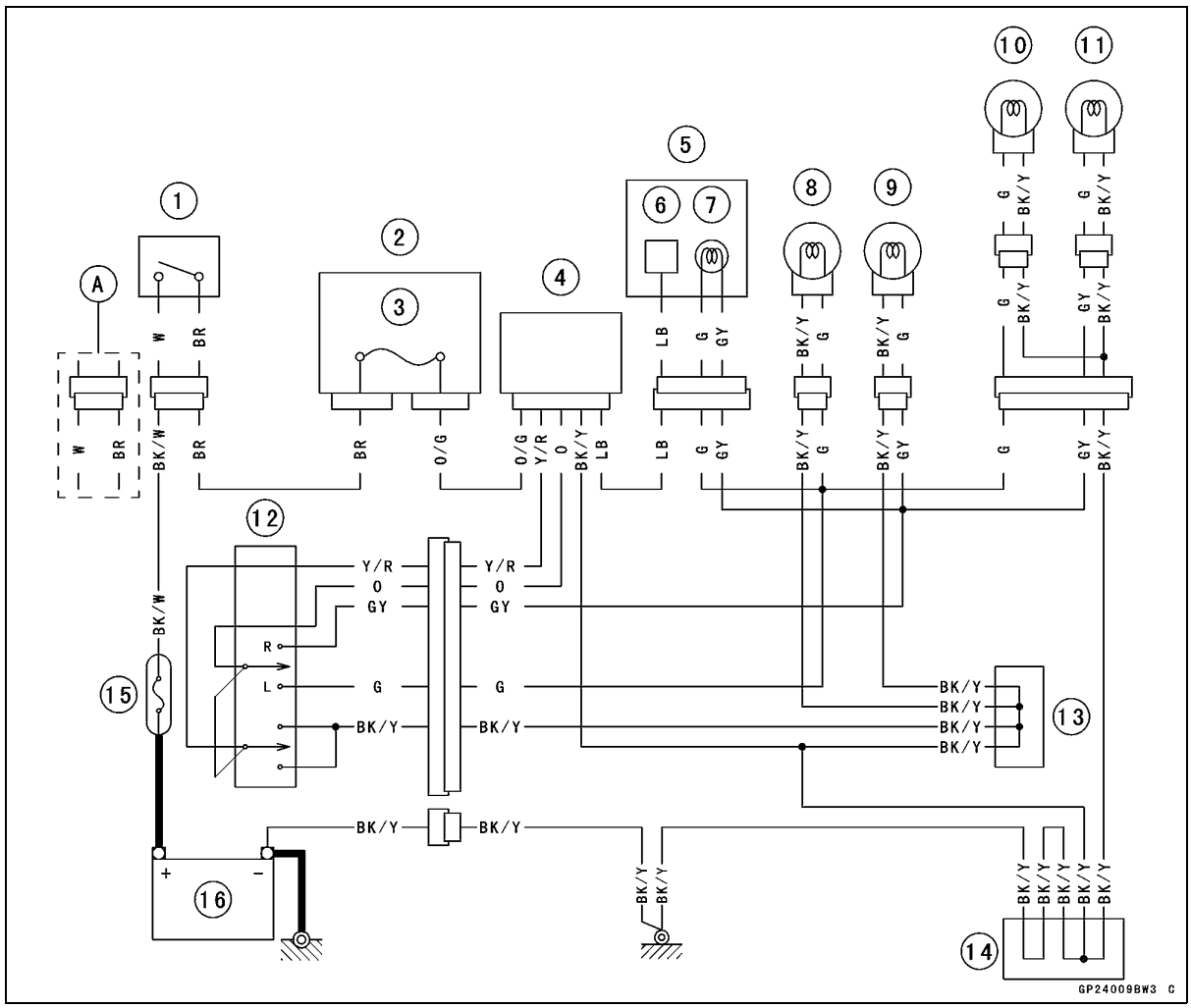
Torque - Turn Signal Light Lens Screws: 1.0 N·m (0.10 kgf·m, 8.7 in·lb)



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Automatic Turn Signal Canceling System

Turn Signal Cancelling System Circuit



1. Ignition Switch
2. Fuse 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
14. Joint Connector
15. Main Fuse 30 A
16. Battery

A: VN2000-A1 Model

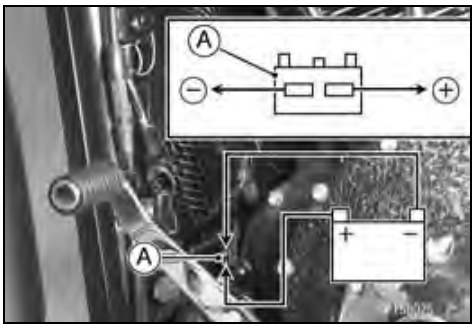
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Radiator Fan System

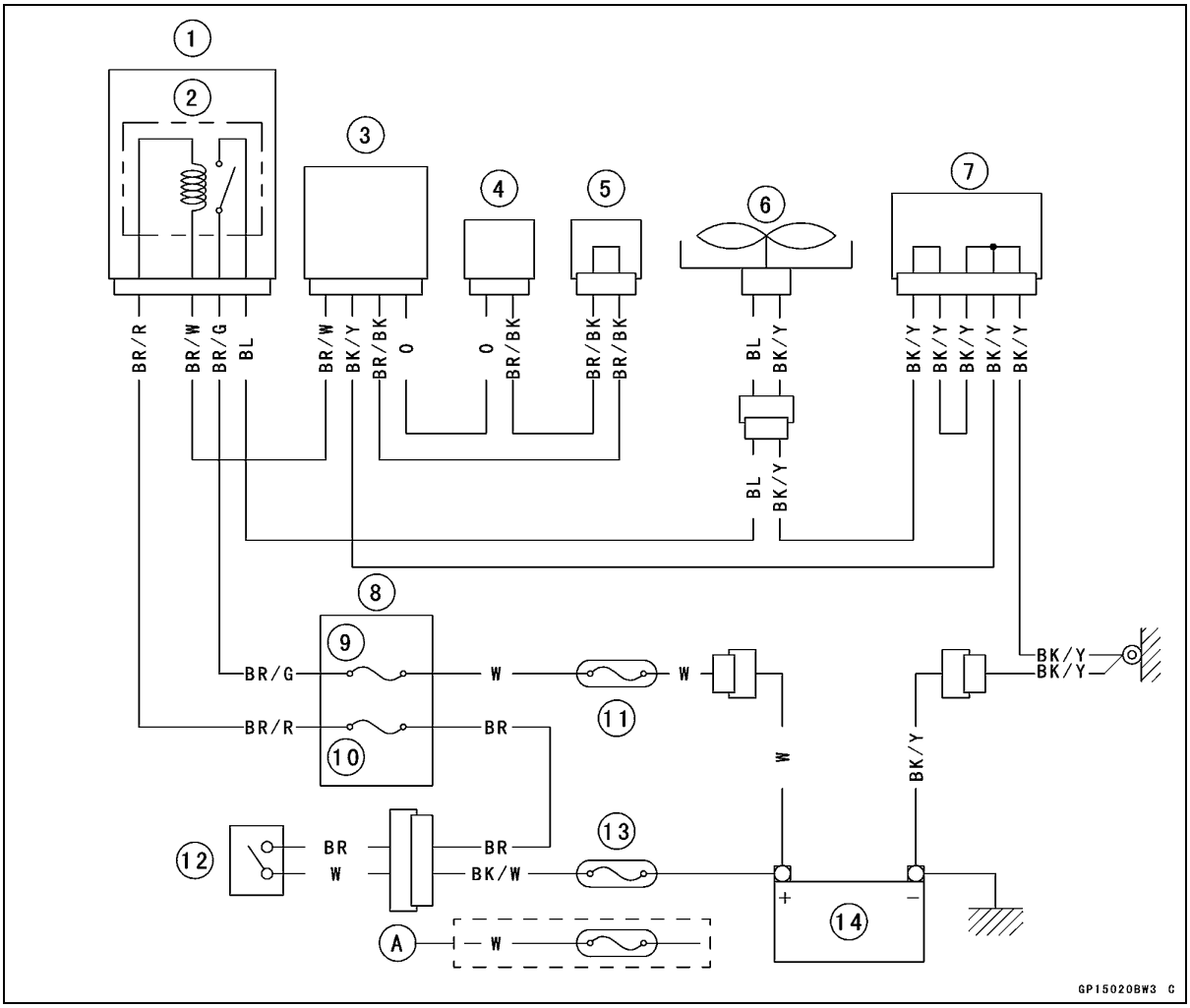
Fan Motor Inspection

- Disconnect the connector [A].
- Using an auxiliary leads, supply battery power to the fan motor.

★If the fan does not rotate, the fan motor is defective and must be replaced.



Radiator Fan Circuit



1. Relay Box
2. Radiator Fan Relay
3. Electronic Control Unit
4. Water Temperature Sensor
5. Joint Connector
6. Radiator Fan
7. Joint Connector
8. Fuse Box
9. Fan Fuse 10 A
10. Ignition Fuse 10 A
11. ECU Fuse 30 A
12. Ignition Switch
13. Main Fuse 30 A
14. Battery

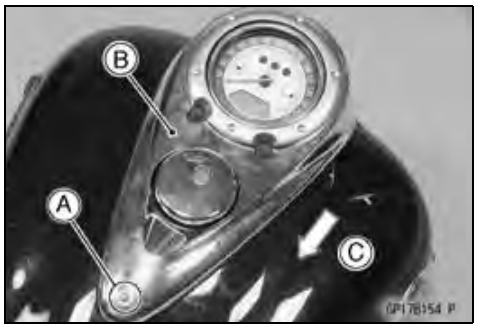
A: VN2000-A1 Model

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Meter, Gauge

Meter Unit Removal

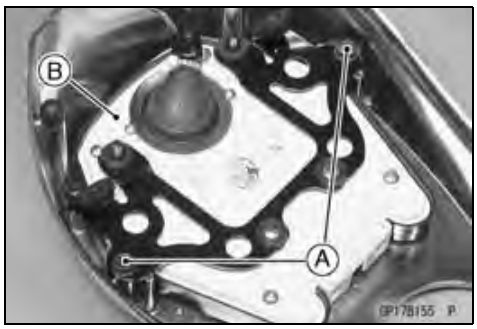
- Remove:
  Fuel Tank (see Fuel System (DFI) chapter)
  Bolt [A]
- Remove the meter assembly [B] backward [C].



- Remove:
  Bolts [A]
  Meter Unit [B]

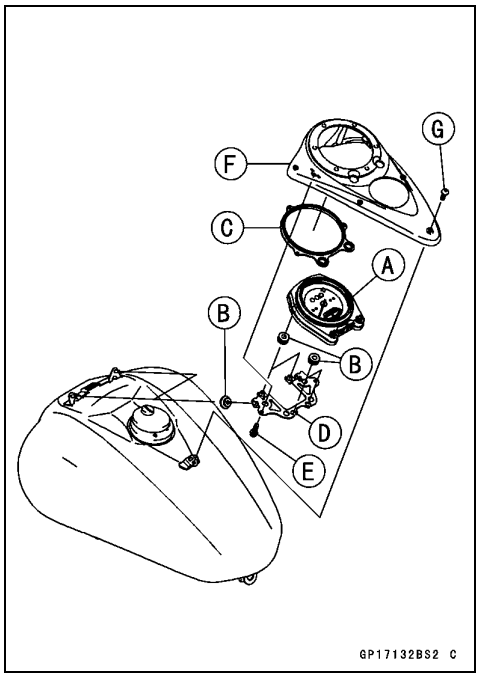
CAUTION

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.



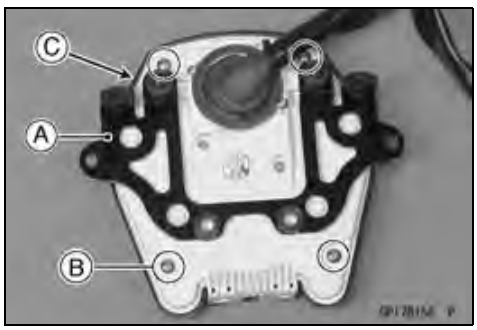
Meter Unit Installation

- Install:
  Meter Unit [A]
  Dampers [B]
  Damper [C]
  Bracket [D]
  Bolts [E]
  Meter Cover [F]
  Bolt [G]



Meter Unit Disassembly

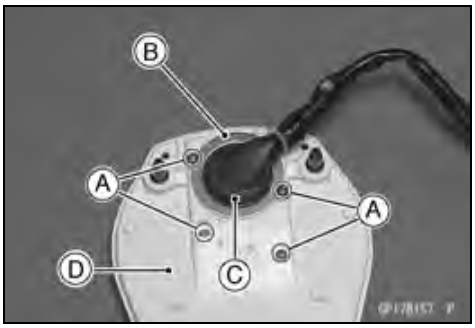
- Remove:
  Meter Unit (see Meter Unit Removal)
  Bracket [A]
  Screws [B]
  Upper Meter Cover [C]



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Meter, Gauge

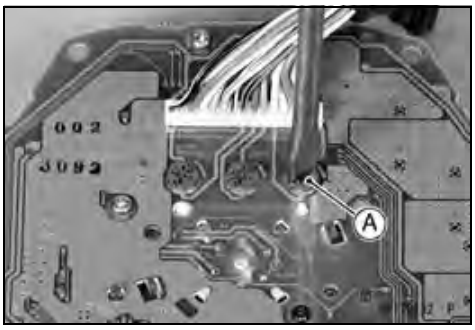
● Remove:
Screws [A]
Holder [B]
● Remove the grommet [C] from the lower meter cover [D].



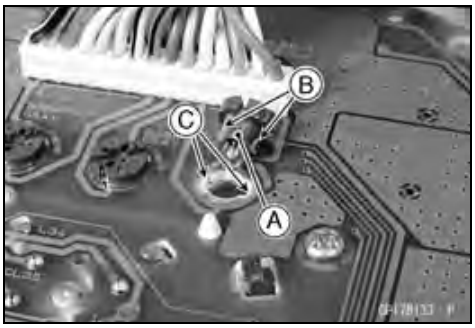
NOTE

○*The water temperature warning LED light, oil pressure warning LED light and FI indicator LED light can not be exchanged.*

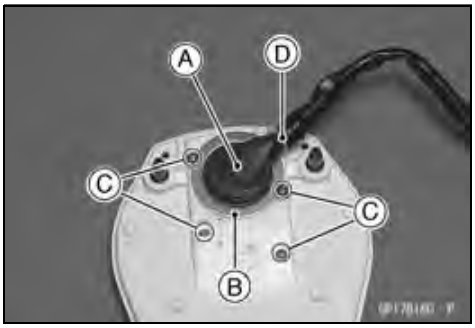
● Turn out the socket [A] counterclockwise.
○These sockets are for the high beam indicator light, turn signal indicator light and neutral indicator light.



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.



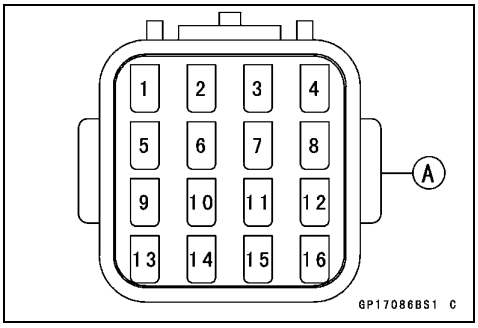
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Meter, Gauge

Meter Unit Inspection

LCD Segment Inspection

● Remove the meter unit (see Meter Unit Removal).
[A] Meter Unit Lead Connector



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.

[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 (+)

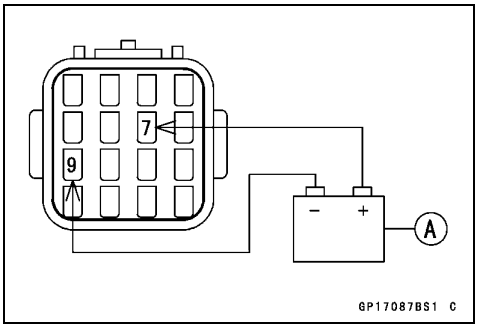
CAUTION

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]



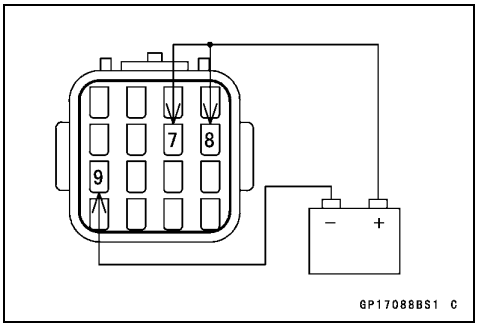
○When the terminals are connected, the speedometer needle momentary points to the last reading, and then return to the 0 position.

★If the needle function does not work, replace the meter unit.

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Meter, Gauge

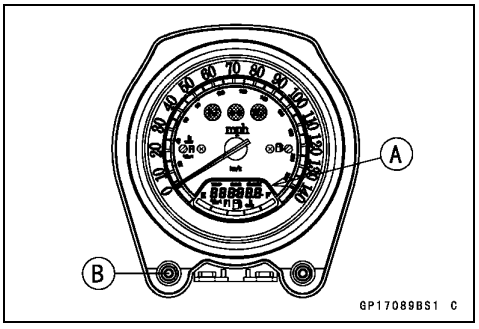
Check 2



- 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.

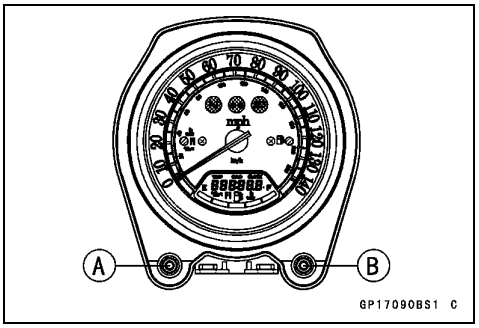
Mode Button Operation Checks



- 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.

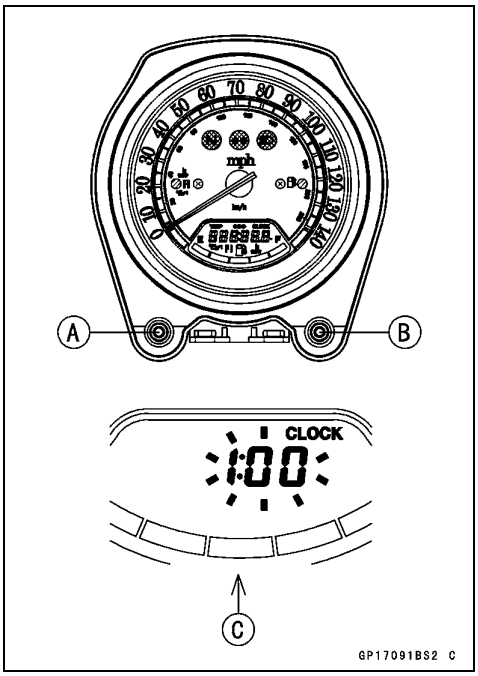
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Meter, Gauge

● 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

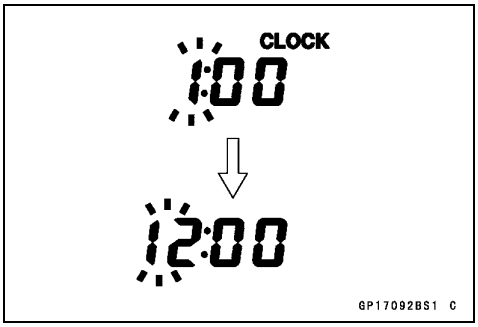
★If the display does not work, replace the meter unit.



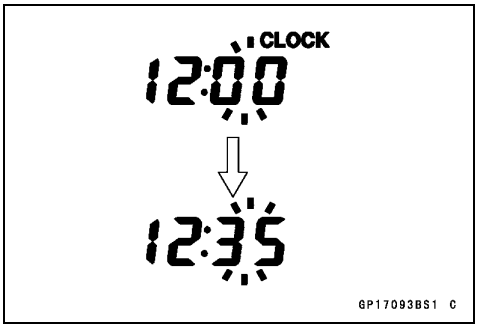
● Check that the time can be set.
★If the time cannot be set, replace the meter unit.

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.



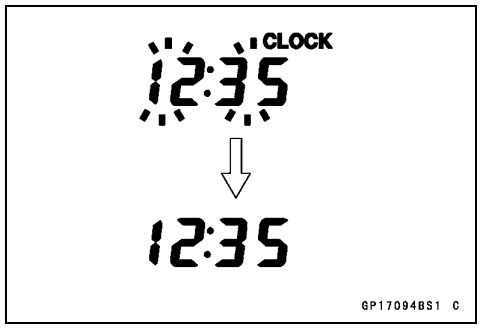
● In the HOUR mode, push the reset button once to effect the MINUTE setting mode.
○The minute display flashes on the display.
● Push the mode button to set the minute.



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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

for United States Model:

An input frequency of 1450 Hz will display about 60 mph.

for Europe and Australia Models:

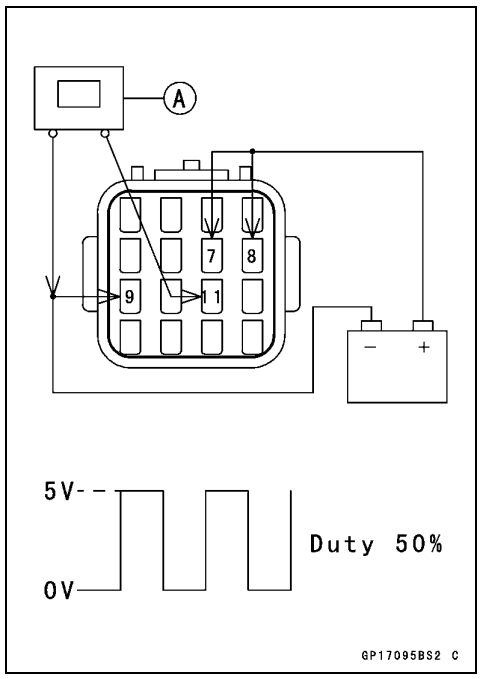
An input frequency of 870 Hz will display about 60 km/h.

for United Kingdom Model:

An input frequency of 1390 Hz will display about 60 mph.

for Canada and Malaysia Models:

An input frequency of 910 Hz will display about 60 mph.



★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.
○Use the jack and the attachment jack to lift the rear wheel.

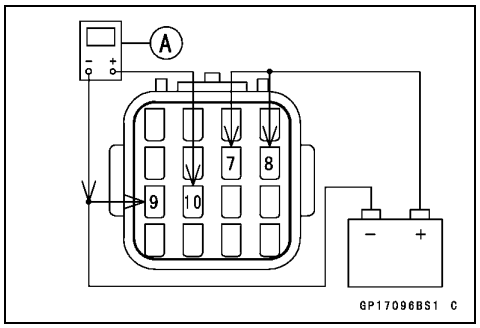
Special Tools - Jack: 57001-1238
Jack Attachment : 57001-1571

○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



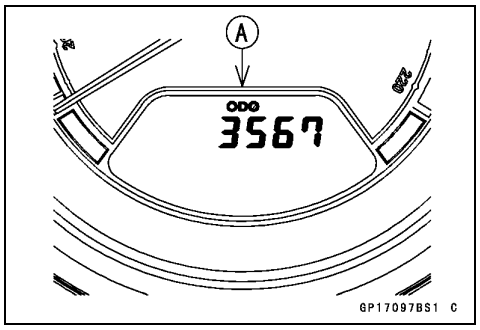
- Connect the leads in the same circuit as for the LCD Segment Inspection, Check 2.
- Set the hand tester [A] to DC25 V, check the voltage between terminal [10] and battery negative lead.

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.

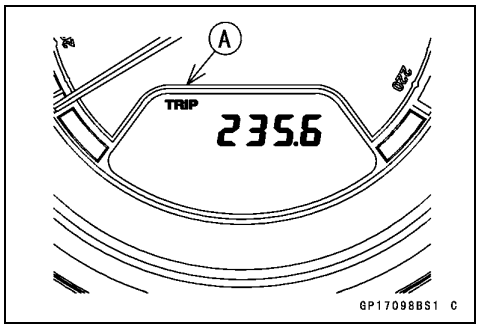
ODO Meter Inspection



- 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.

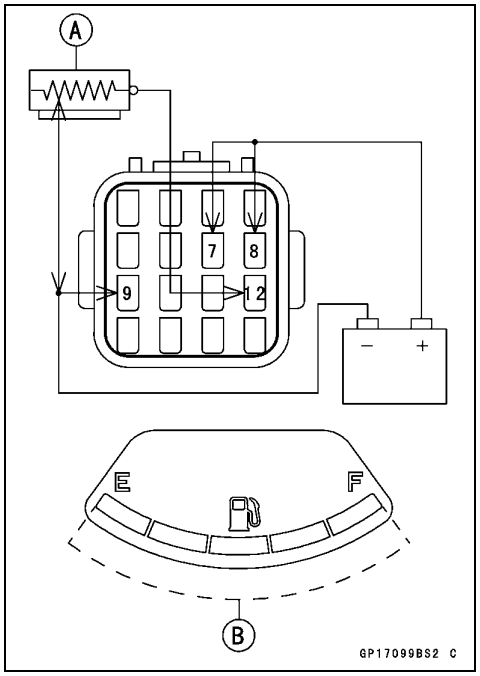
TRIP Meter Inspection



- 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.

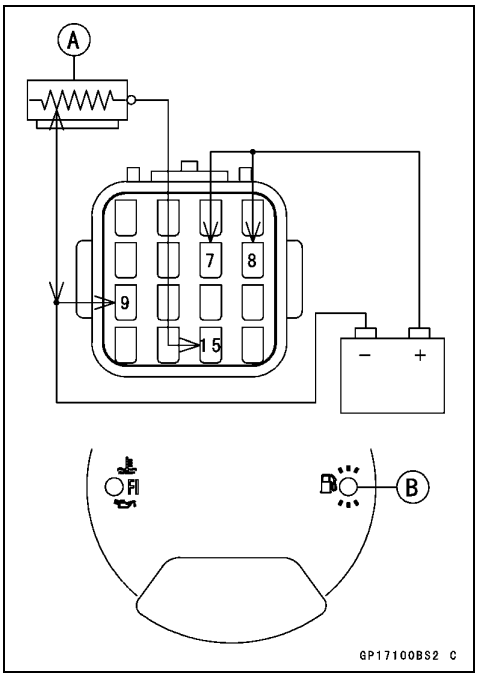
Fuel Level Warning Indicator LED Light

● 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.



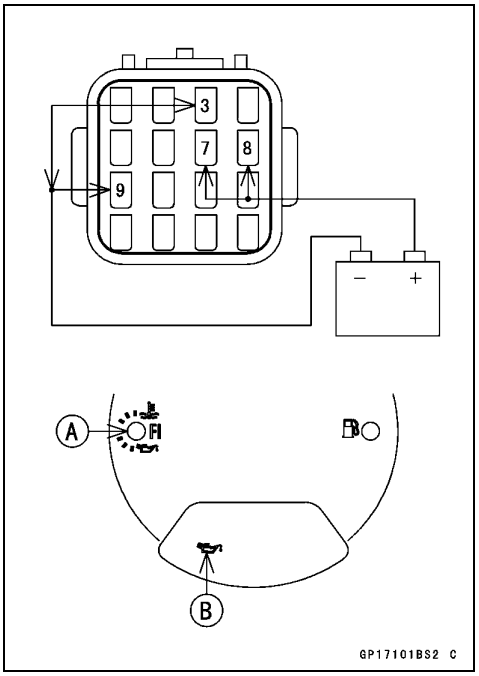
Oil Pressure Warning Indicator LED Light and LCD Symbol

● 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

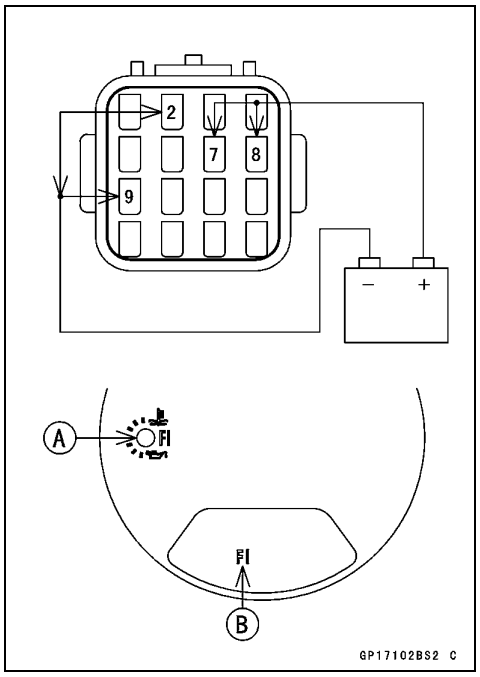
FI Indicator LED Light and LCD Symbol

● 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.



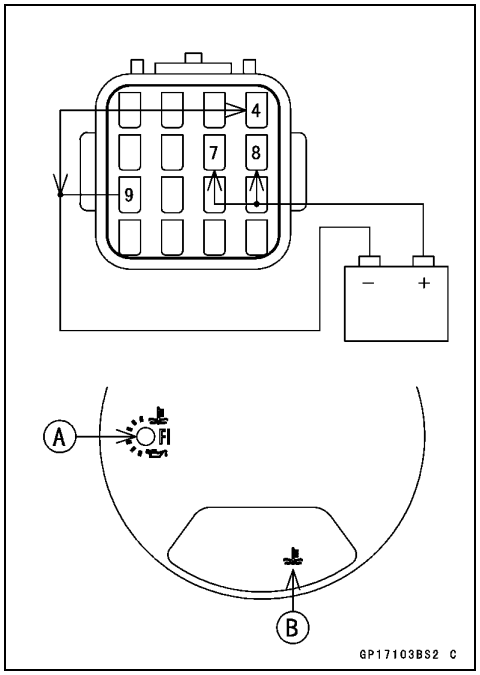
Water Temperature Warning Indicator LED Light and LCD Symbol

● 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.



Indicator Light Inspection

● Connect the leads in the same circuit as for the LCD Segments Inspection, Check 2.

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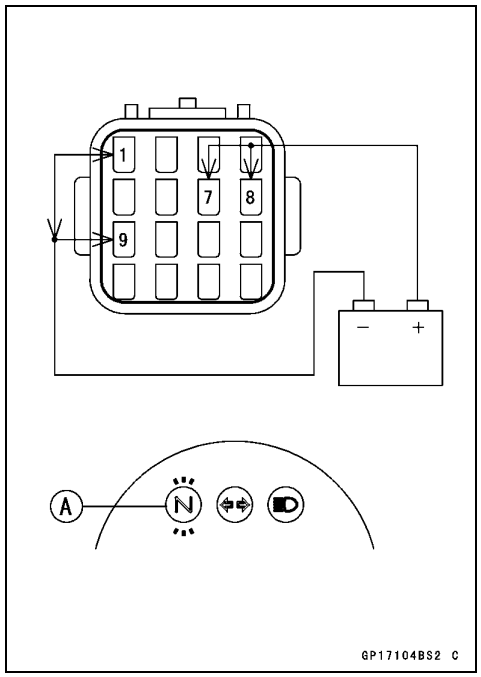
Meter, Gauge

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.

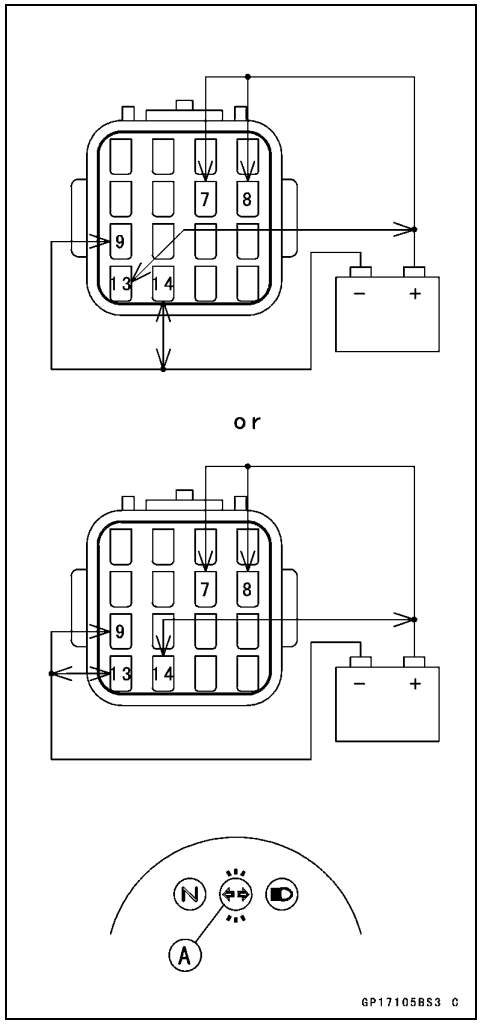


Turn Signal Indicator Light

● 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.



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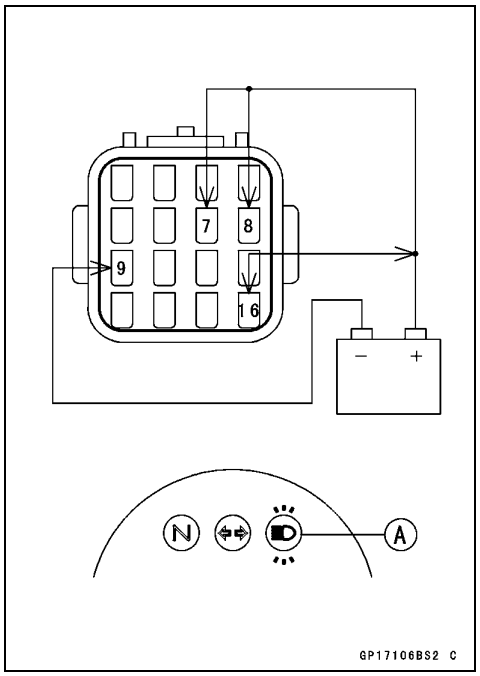
Meter, Gauge

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]

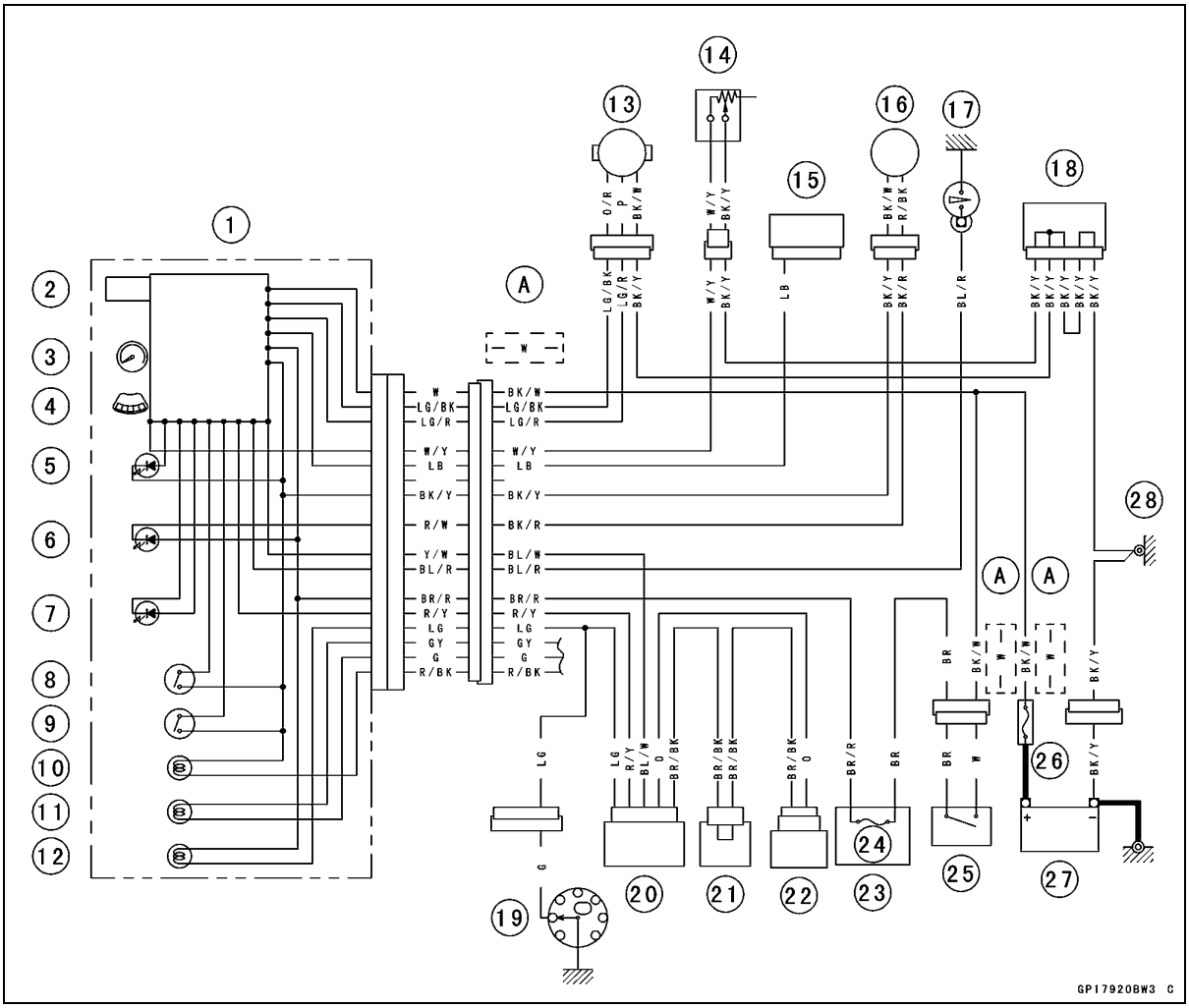
○The high beam indicator light [A] should go on.
★If the indicator light does not go on, inspect the bulb.
● Check conductivity of the bulb with the hand tester.
★If the bulb is open, replace the bulb.
★Even if the bulb is replacement but the indicator light does not go on, replace the meter unit.



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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. Fuel Level Sensor
15. Turn Signal Control Relay
16. Fuel Reserve Switch
17. Oil Pressure Warning Light Switch
18. Joint Connector
19. Gear Position Switch
20. Electronic Control Unit
21. Joint Connector
22. Water Temperature Sensor
23. Fuse Box
24. Ignition Fuse 10 A
25. Ignition Switch
26. Main Fuse 30 A
27. Battery
28. Frame Ground

A: VN2000-A1 Model

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Air Switching Valve

Air Switching Valve Operation Test

● Refer to the Air Switching Valve Operation Test in the Periodic Maintenance chapter.

Air Switching Valve Unit Test

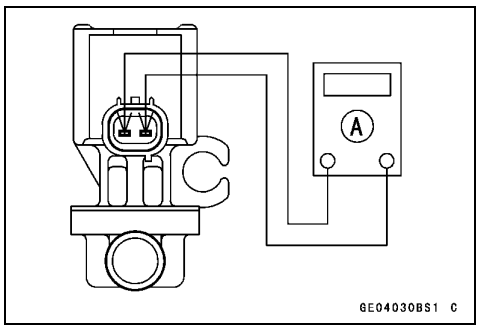
● Remove the air switching valve (see Engine Top End chapter).

● Set the hand tester [A] to the × Ω range and connect it to the air switching valve terminals as shown.

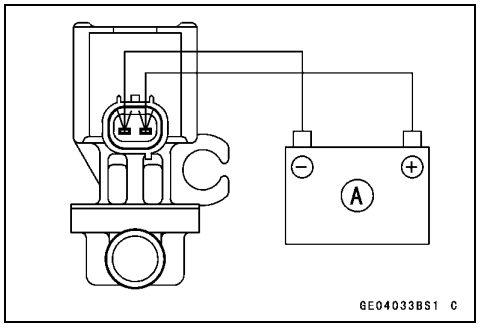
Special Tool - Hand Tester: 57001-1394

Air Switching Valve Resistance
Standard: 18 ~ 22 Ω at 20°C (68°F)

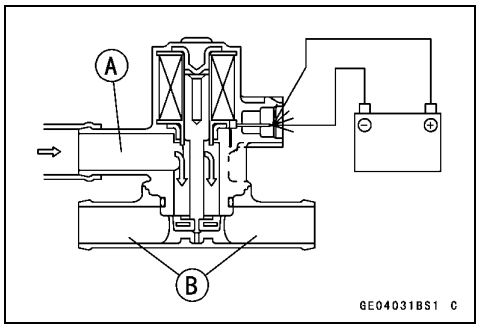
★If the resistance reading is except the specified value, replace it with a new one.



● Connect the 12 V battery [A] to the air switching valve terminals as shown.



● Blow the air to the inlet air duct [A], and make sure does not flow the blown air from the outlet air ducts [B].



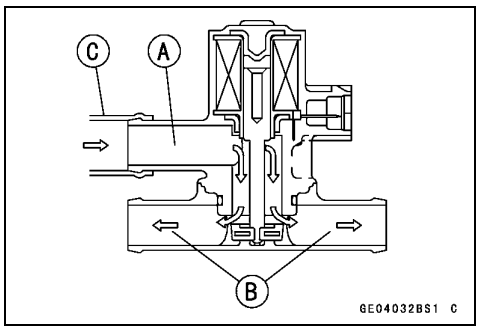
● Disconnect the 12 V battery.

● Blow the air to the inlet air duct [A] again, and make sure flow the blown air from the outlet air ducts [B].

★If the air switching valve dose not operate as described, replace it with a new one.

NOTE

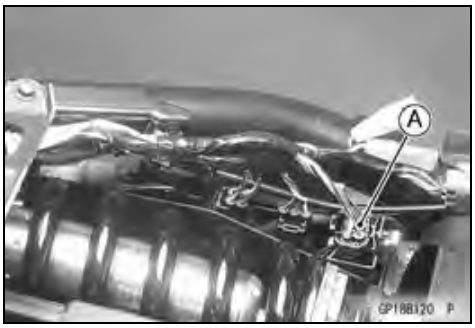
○*To check air flow through the air switching valve, just blow through the air cleaner hose [C].*



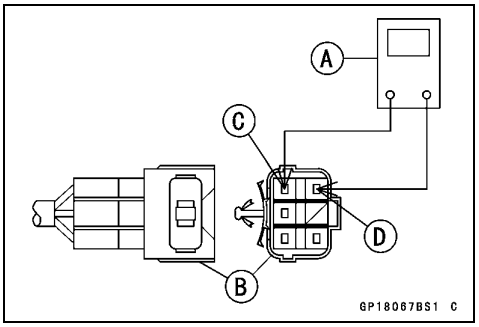
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Decompression Solenoid

Decompression Solenoid Inspection



- Remove:
  Seats (see Frame chapter)
  Right Cover (see Frame chapter)
- Disconnect the decompression solenoid lead connector [A].



- Set the hand tester [A] to the ×1 Ω range and connect it to the terminals in the decompression solenoid lead connector [B].
  Black [C]
  Black [D]

Special Tool - Hand Tester: 57001-1394

Decompression Solenoid Resistance
Standard: 3.0 ~ 3.7 Ω

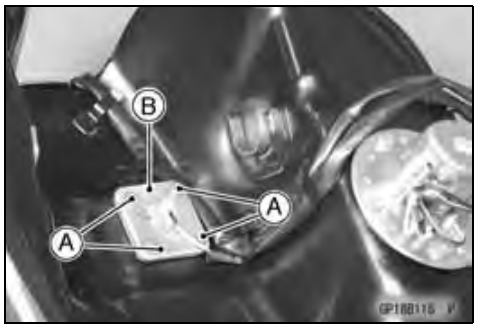
★If the tester reading is not as specified, replace the decompression solenoid with a new one.

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Switch and Sensors

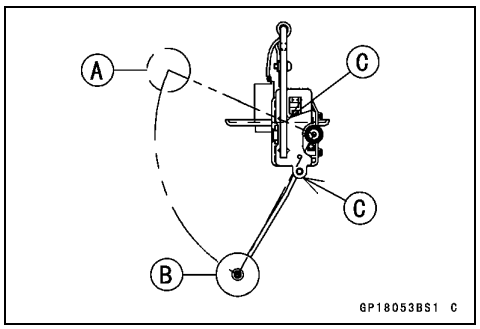
Fuel Level Sensor Inspection

- Remove:
  Fuel Tank (see Fuel System (DFI) chapter)
- Open the clamps.
- Remove:
  Bolts [A]
  Fuel Level Sensor [B]



- 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]

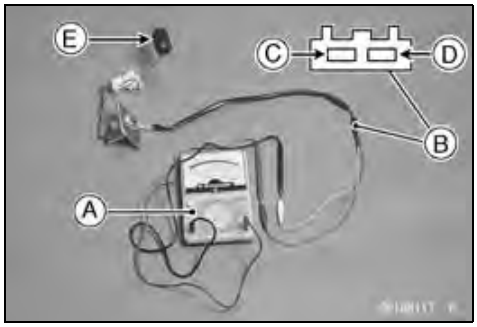


- Using the hand tester [A], measure the resistance across the terminals in the fuel level sensor lead connector [B].
  Black/Yellow [C]
  White/Yellow [D]

Special Tool - Hand Tester: 57001-1394

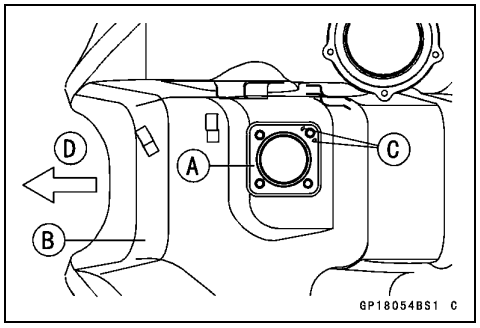
★If the tester readings are not as specified, or do not change smoothly according as the float moves up and down, replace the sensor.

Fuel Level Sensor Resistance
Standard: Full position: 3 ~ 5 Ω
Empty position [E]: 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.

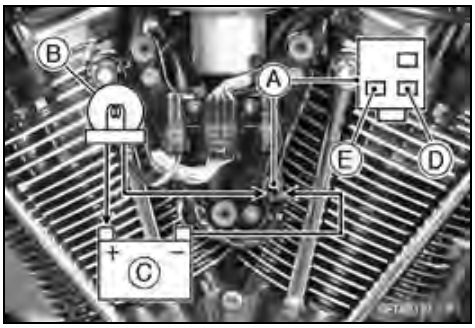
Torque - Fuel Level Sensor Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)



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Switch and Sensors

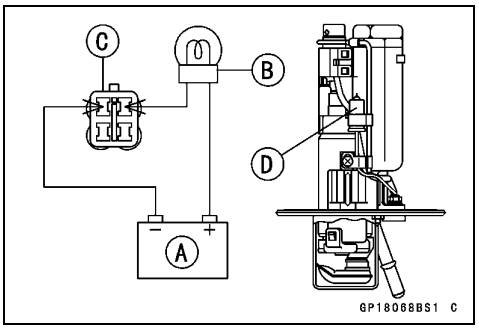
Fuel Reserve Switch Inspection



- Fill the fuel tank with fuel.
- Close the fuel tank cap surely.
- Remove:
  Left Engine Cover (see Frame chapter)
  Fuel Pump 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.

Connections
Battery (+) → 12 V 3.4 W Bulb (one side)
12 V 3.4 W Bulb (other side) → R/BK Lead Terminal [D]
Battery (–) → BK/W Lead Terminal [E]

★If the test light turn on, the reserve switch is defective. Replace the fuel pump.



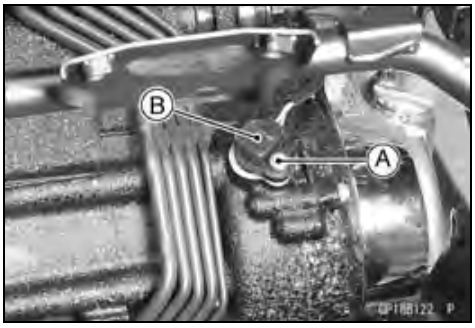
- Remove:
  Fuel Pump (see Fuel System (DFI) chapter)
- Connect the test light (12 V 3.4 W bulb in a socket with leads) and the 12 V battery to the fuel pump lead connector as shown.
  12 V Battery [A]
  Test Light [B]
  Fuel Pump Lead Connector [C]
  Fuel Reserve Switch [D]

★If the test light doesn't light, replace the fuel pump.

NOTE

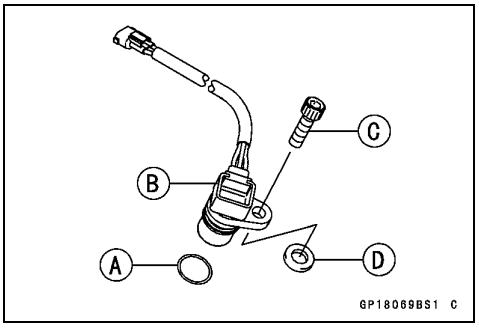
○*It may take a long time to turn on the test light in case that the fuel reserve switch is inspected just after the fuel level sensor is removed.*
Leave the fuel reserve switch with leads for inspection connected for few minutes.

Speed Sensor Removal



- Remove:
  Battery Case (see Frame chapter)
  Bolt [A]
  Speed Sensor [B]

Speed Sensor Installation



- Apply grease to the O-ring [A] on the speed sensor [B].
  [D] Washer (US, Canada and Malaysia models)
- Tighten:

Non-permanent Locking Agent -
Speed Sensor Mounting Bolt [C]

Torque - Speed Sensor Mounting Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

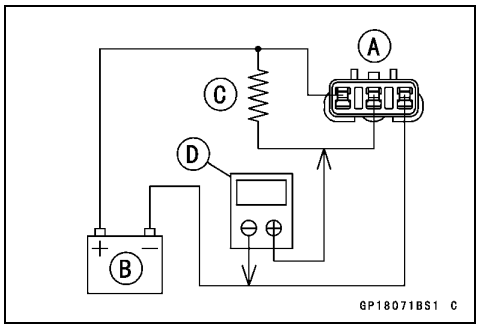
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Switch and Sensors

Speed Sensor Inspection

- Remove:
  Speed Sensor (see Speed Sensor Removal)
- 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.

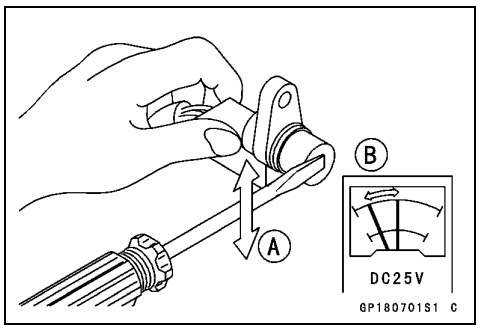
Special Tool - Hand Tester: 57001-1394



- 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.

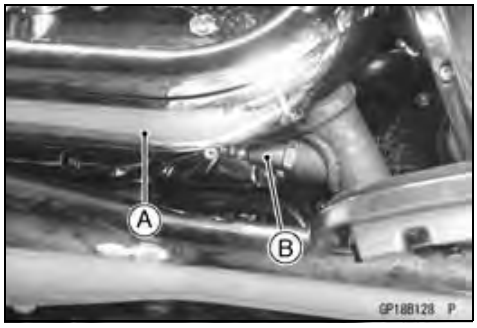


Oxygen Sensor Removal (CAL, WVTA (FULL H), GB WVTA (FULL H) models)

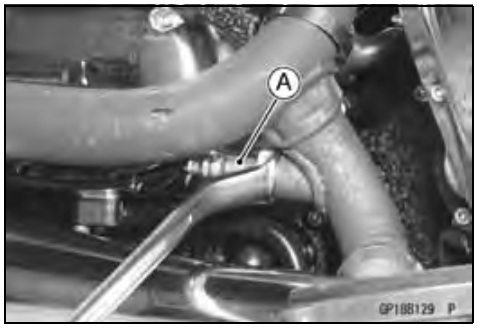
- Remove:
  Seats (see Frame chapter)
  Right Cover (see Frame chapter)
- Disconnect the oxygen sensor lead connector [A].



- Remove:
  Upper Exhaust Pipe Cover [A] (see Mufflers section in Engine Top end chapter)
  [B] Oxygen Sensor



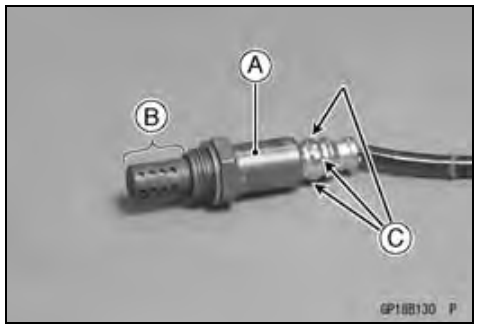
- Remove:
  Oxygen Sensor [A]



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Switch and Sensors

Oxygen Sensor Installation (CAL, WVTA (FULL H), GB WVTA (FULL H) models)



CAUTION

Never drop the Oxygen Sensor [A], especially on a hard surface. Such a shock to the unit can damage it.
Do not touch the sensing part [B] and filter holes [C] of the sensor to prevent oil contact. Oil contamination from hands can reduce sensor performance.

- Refer to the General Information for oxygen sensor handling.
- Tighten:

Torque - Torque-Oxygen Sensor: 44 N·m (4.5 kgf·m, 33 ft·lb)

- Run the oxygen sensor lead correctly (see Cable, Wire, and Hose Routing section in Appendix chapter).

Oxygen Sensor Inspection (CAL, WVTA (FULL H), GB WVTA (FULL H) models)

- Refer to the Fuel System (DFI) chapter for oxygen sensor inspection.

Front Brake Light Switch Inspection

- Refer to the Front Brake Light Switch Inspection in the Periodic Maintenance chapter.

Rear Brake Light Switch Check/Adjustment

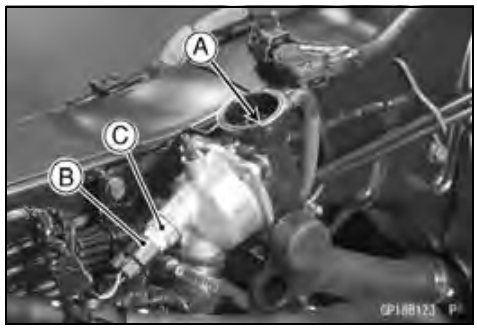
- Refer to the Rear Brake Light Switch Check/Adjustment in the Periodic Maintenance chapter.

Water Temperature Sensor Removal

CAUTION

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

- Remove:
  Fuel Tank (see Fuel System (DFI) chapter)
  Radiator Cap
- Pump out the coolant [A] in the thermostat using a syringe.
- Disconnect:
  Water Temperature Sensor Connector [B]
- Remove:
  Water Temperature Sensor [C]



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Switch and Sensors

Water Temperature Sensor Installation

● Tighten:

Torque - Water Temperature Sensor: 12 N·m (1.2 kgf·m, 104 in·lb)

● Fill the engine with coolant and bleed the air from the cooling system (see Coolant Filling in Cooling System chapter).

Water Temperature Sensor Inspection

● Remove the water temperature sensor.

● Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion and threaded portion are submerged.

● Suspend an accurate thermometer [B] with heat-sensitive portions [C] located in almost the same depth.

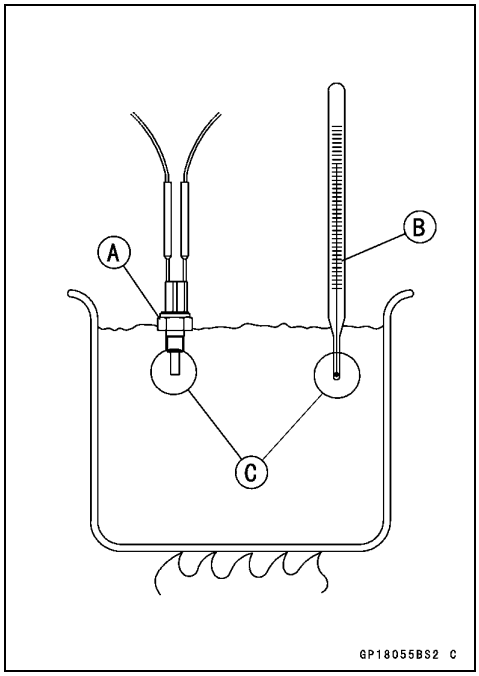
NOTE

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

● Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.

● Using the hand tester, measure the internal resistance of the sensor across the terminal and the body at the temperatures shown in the table.

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



Water Temperature Sensor Resistance

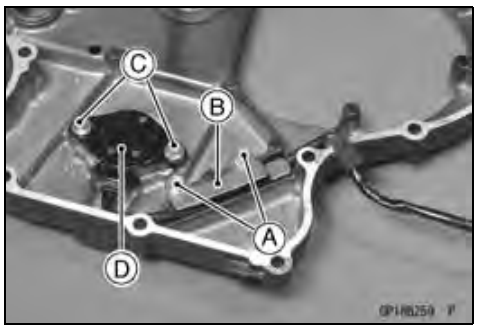
Temperature	Resistance (kΩ)
−20°C (−4°F)	*18.80 ±2.37
0°C (32°F)	*(about 6.544)
40°C (104°F)	1.136 ±0.095
100°C (212°F)	0.1553 ±0.0070

*: Reference Information

Gear Position Switch Removal

● Remove:

Transmission Cover (see Crankshaft/Transmission chapter)
Gear Position Switch Lead Clamp Bolts [A]
Gear Position Switch Lead Clamp [B]
Gear Position Switch Mounting Bolts [C]
Gear Position Switch [D]



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Switch and Sensors

Gear Position Switch Installation

- Apply silicone sealant to the gear position switch lead grommet.

Sealant - Kawasaki Bond (Silicone Sealant) TB1211F: 92104-0004

- Apply a non-permanent locking agent:
  Gear Position Switch Mounting Bolts
  Gear Position Switch Lead Clamp Bolts
- Tighten:

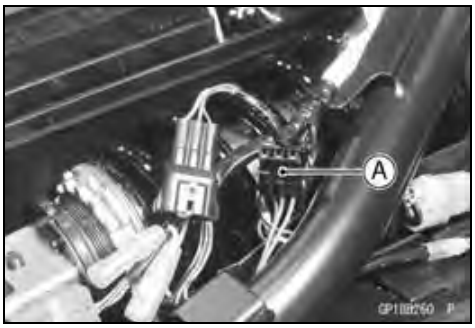
Torque - Gear Position Switch Mounting Bolts: 4.9 N·m (0.50 kgf·m, 43 in·lb)
Gear Position Switch Lead Clamp Bolts: 4.9 N·m (0.50 kgf·m, 43 in·lb)

Gear Position Switch Inspection

NOTE

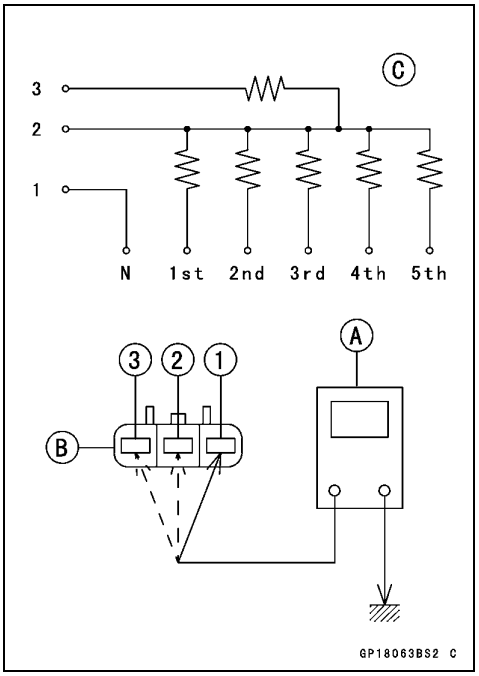
○*Be sure the transmission mechanism is good condition.*

- Remove:
  Seats (see Frame chapter)
  Battery Cover (see Battery Removal)
- Disconnect the gear position switch lead connector [A].



- Set the hand tester [A] to the ×1 kΩ or ×100 Ω range and connect it to the terminals in the gear position switch lead connector [B] and ground.
  [C] Internal Circuit
  [1] Green Lead
  [2] Blue Lead
  [3] Black Lead

Special Tool - Hand Tester: 57001-1394



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Switch and Sensors

Gear Position Switch Resistance

	Connections		
Gear Position	1-Ground	2-Ground	3-Ground
Neutral	about 0 Ω	–	–
1st	–	3.00 ~ 3.32 kΩ	11.63 ~ 12.87 kΩ
2nd	–	1.70 ~ 1.89 kΩ	10.33 ~ 11.44 kΩ
3rd	–	1.07 ~ 1.19 kΩ	9.70 ~ 10.74 kΩ
4th	–	0.695 ~ 0.769 kΩ	9.32 ~ 10.32 kΩ
5th	–	0.430 ~ 0.476 kΩ	9.06 ~ 10.03 kΩ

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

Switch Inspection

● Using a hand tester, check to see that only the connections shown in 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

	BR	BL
When brake pedal is pushed down	○——	——○
When brake pedal is released		

Sidestand Switch Connections

	G	BK
When side stand is up	○——	——○
When side stand is down		

Oil Pressure Switch Connections*

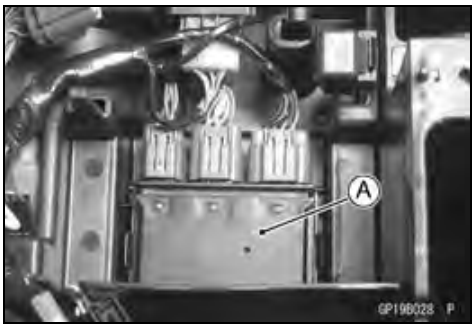
	SW. Terminal	⏚
When engine is stopped	○——	——○
When engine is running		

*: Engine lubrication system is in good condition.

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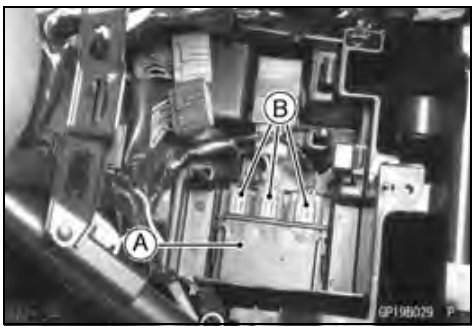
Relay Box

The relay box [A] has relays and diodes. The relays and diodes can not be removed.



Relay Box Removal

- Remove:
  Battery (See Battery Removal)
  ECU (see Fuel System (DFI) chapter)
- Take out the relay box [A] and disconnect the connectors [B].



Relay Circuit Inspection

- Remove the relay box.
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the relay box as shown (see Relay Box Internal Circuit).

★If the tester does not read as specified, replace the relay box.

Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading (Ω)
Headlight Relay	11-16	∞
ECU Main Relay	12-13	∞
	5-10	Not ∞*
Fuel Pump Relay	12-14	∞
	1-7	Not ∞*
Starter Circuit Relay	6-9	∞
	3-9	∞
Fan Relay	17-19	∞
	18-20	Not ∞*

(*): The actual reading varies with the hand tester used.

Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (–)	Tester Connection	Tester Reading (Ω)
ECU Main Relay	15-9	11-16	0
	5-10	12-13	0
Fuel Pump Relay	7-1	12-14	0
Fan Relay	18-20	17-19	0

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Relay Box

	Battery Connection (+) (–)	Tester Connection DC 25V Range (+) (–)	Tester Reading (V)
Starter Circuit Relay	6-3	9-3	Battery Voltage

(+): Apply positive lead.
(–): Apply negative lead.

Diode Circuit Inspection

- Remove the relay box.
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit).

Diode Circuit Inspection

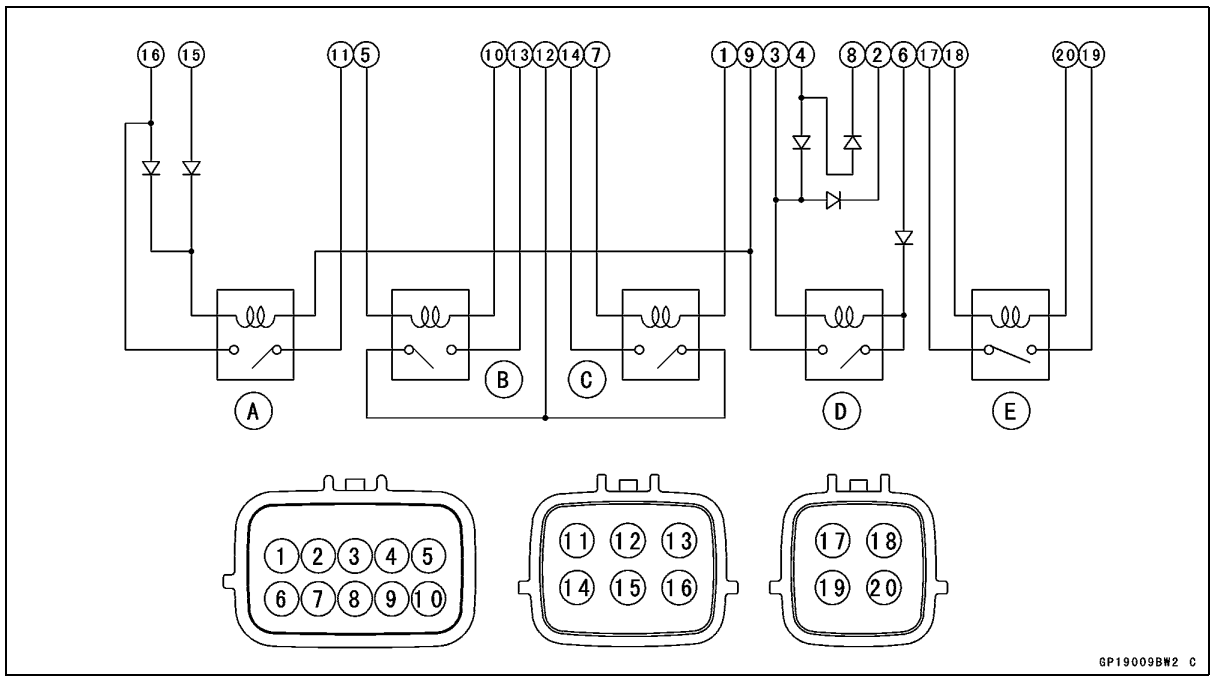
Tester Connection	2-3, 2-4, 3-4, 3-6, 4-8, 9-15, 9-16

★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

NOTE

○*The actual meter reading varies with the meter or tester used and the individual diodes, but generally speaking, the lower reading should be from zero to one half the scale.*

Relay Box Internal Circuit



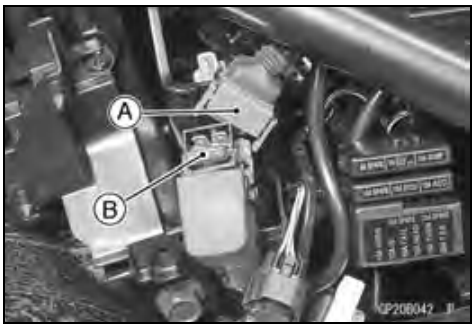
A. Headlight Relay
B. ECU Main Relay
C. Fuel Pump Relay
D. Starter Circuit Relay
E. Fan Relay

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Fuse

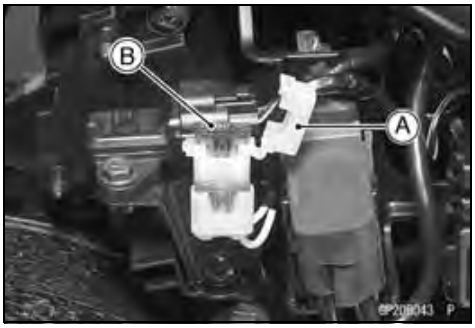
Main Fuse Removal

- Remove the left side cover (see Frame chapter).
- Disconnect the starter relay connector [A].
- Pull out the main fuse [B] from the starter relay with needle nose pliers.



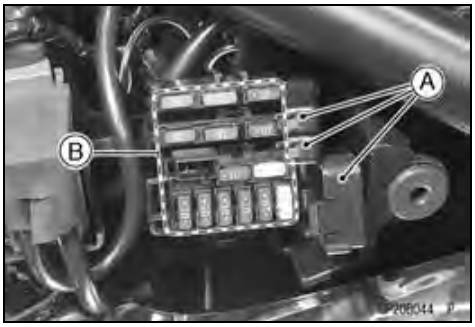
ECU Fuse Removal

- Remove the left side cover (see Frame chapter).
- Open the cap [A] and pull out the ECU fuse [B].



Fuse Box Fuse Removal

- Remove the left side cover (see Frame chapter).
- Unlock the hook to lift up the lids [A].
- Pull the fuses [B] straight out of the fuse box with needle nose pliers.



Fuse Installation

★If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.

- Install the junction box fuses on the original position as specified on the lid.

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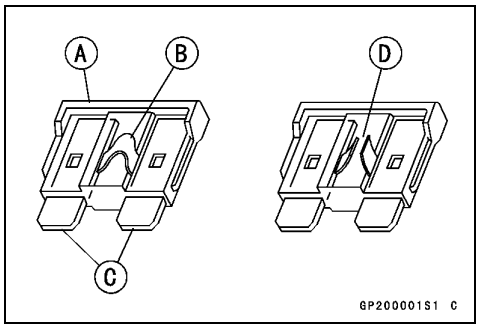
Fuse

Fuse Inspection

- Remove the fuse (see Fuse Removal).
- 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

○*If the engine is operated under the condition which the battery needs refreshing charge, a main fuse may blow out due to a mass current flows to the battery.*

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

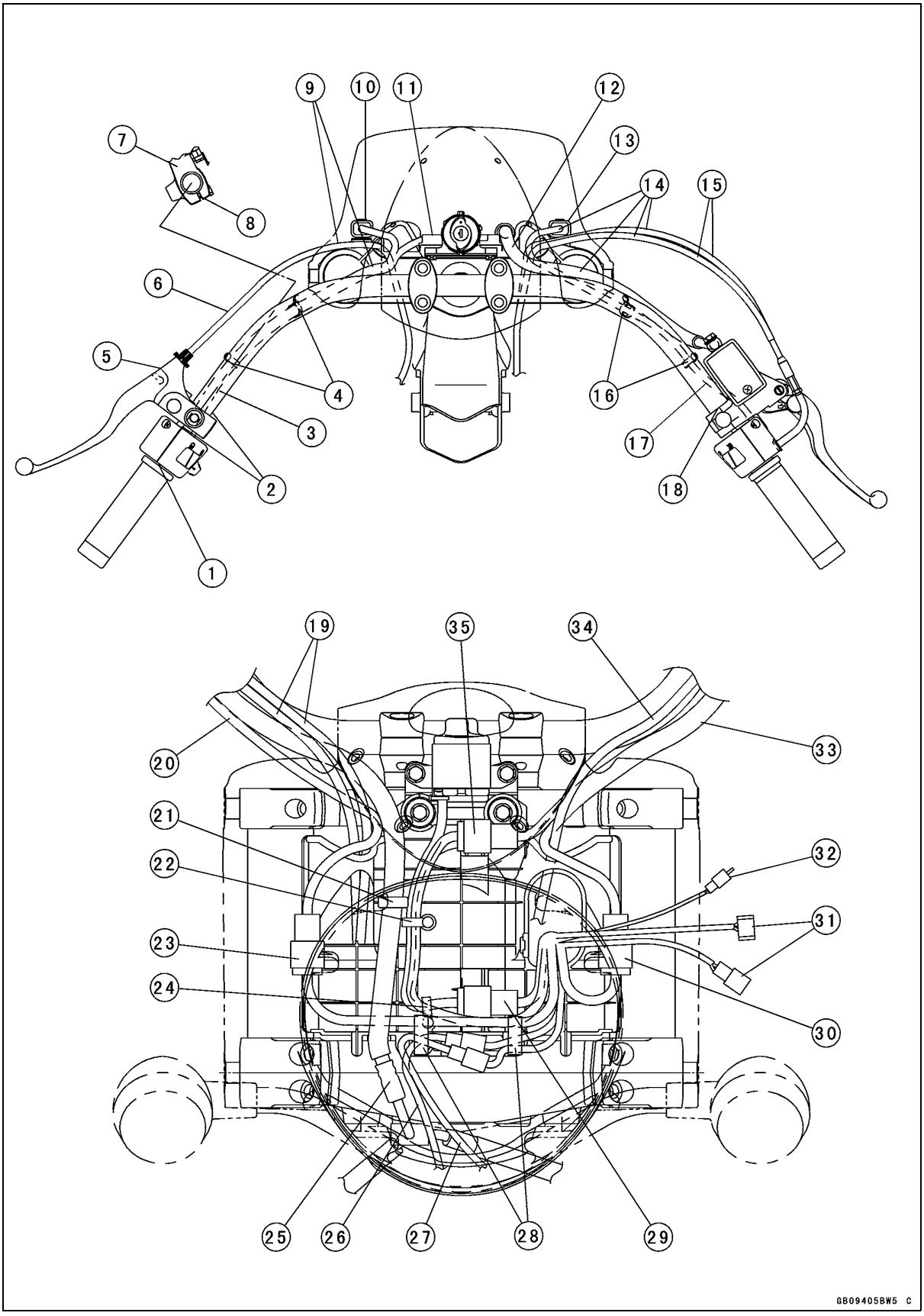
Table of Contents

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Troubleshooting Guide (except DFI) 17-60

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Cable, Wire, and Hose Routing

Other than VN2000E6F ~/F6F ~



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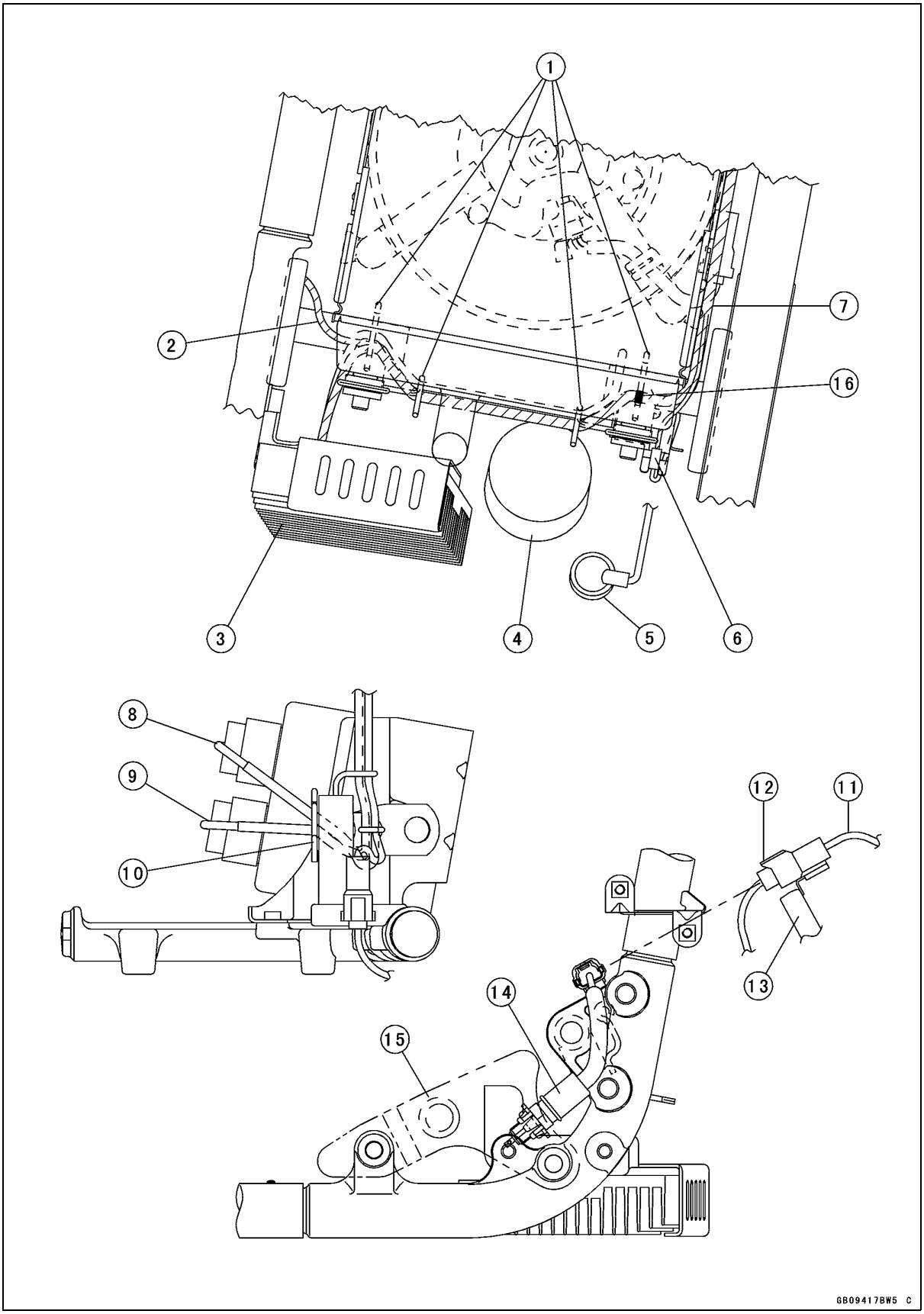
Cable, Wire, and Hose Routing

1. Insert the end of the grip up to the punch mark.
2. Align the mating surface with the punch mark. After the installation, confirm the punch mark.
3. Left Switch Housing Lead
4. Clamps (Left Switch Housing Lead)
5. The gap is 2 ~ 3 mm (0.08 ~ 0.12 in.).
6. Clutch Cable
7. Clutch Lever Assembly
8. Punch Mark
9. Run the cable and lead from the recess of the headlight upper cover to front of the steering stem head.
10. Left Switch Housing Lead Connector
11. Stem Cover
12. Brake Hose
13. Right Switch Housing Lead Connector
14. Run the cables, brake hose and lead from the recess of the headlight upper cover to front of the steering stem head.
15. Throttle Cables
16. Clamps (Right Switch Housing Lead)
17. Right Switch Housing Lead
18. Align the mating surface with the punch mark. After the installation, confirm the punch mark.
19. Throttle Cables
20. Right Switch Housing Lead
21. Clamp (Brake Hose)
22. Clamp (Left Switch Housing Lead, Ignition Switch Lead)
23. Right Switch Housing Lead Connector (Insert the connector in the Cover.)
24. Clamp (Left Switch Housing Lead, Ignition Switch Lead)
25. Brake Hose
26. Run the front right turn signal light lead between the headlight cover and steering stem base.
27. Run the front left turn signal light lead between the headlight cover and steering stem base.
28. Clamps (Right and Left Turn Signal Light Leads and Right Switch Housing Lead)
29. Ignition Switch Lead Connector (Insert the connector in the Cover.)
30. Left Switch Housing Lead Connector (Insert the connector in the Cover.)
31. Headlight Leads Connectors
32. City Light Lead Connector (Europe Model)
33. Left Switch Housing Lead
34. Clutch Cable
35. Left Switch Housing Lead Connector (Insert the connector in the Cover.)

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Cable, Wire, and Hose Routing

VN2000-A1



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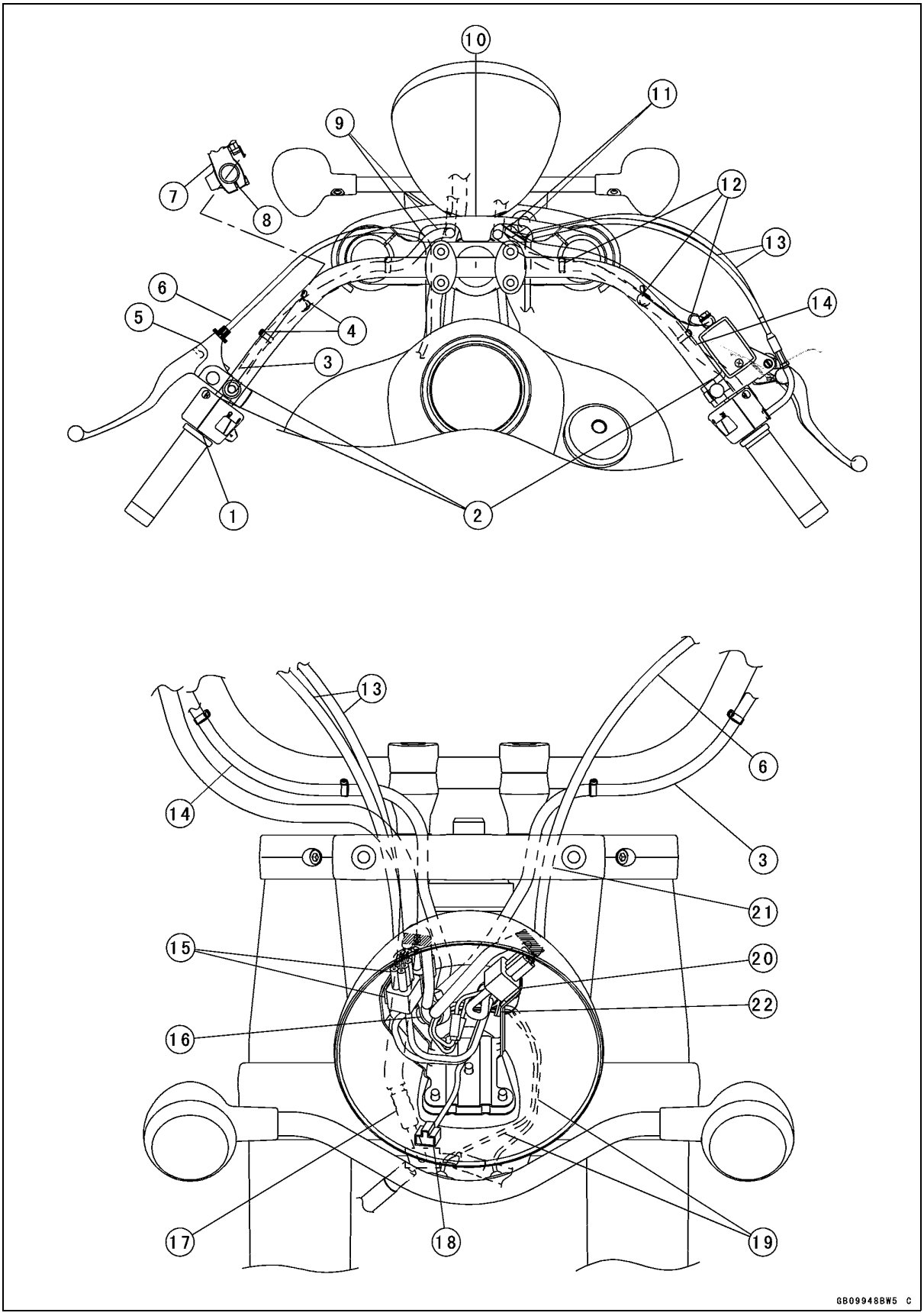
Cable, Wire, and Hose Routing

1. Clamps
2. Main Harness
3. Regulator/Rectifier
4. Oil Filter
5. Oil Pressure Warning Light Switch
6. Insert the alternator lead connector in the bracket.
7. Main Harness
8. Main Harness
9. Alternator Lead
10. Clamp
11. Main Harness
12. Rear Brake Light Switch Lead Connector
13. Engine Bracket
14. Rear Brake Light Switch
15. Right Footboard Bracket Assembly
16. Fit the white mark on the main harness and clamp.

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Cable, Wire, and Hose Routing

VN2000E6F ~/F6F ~



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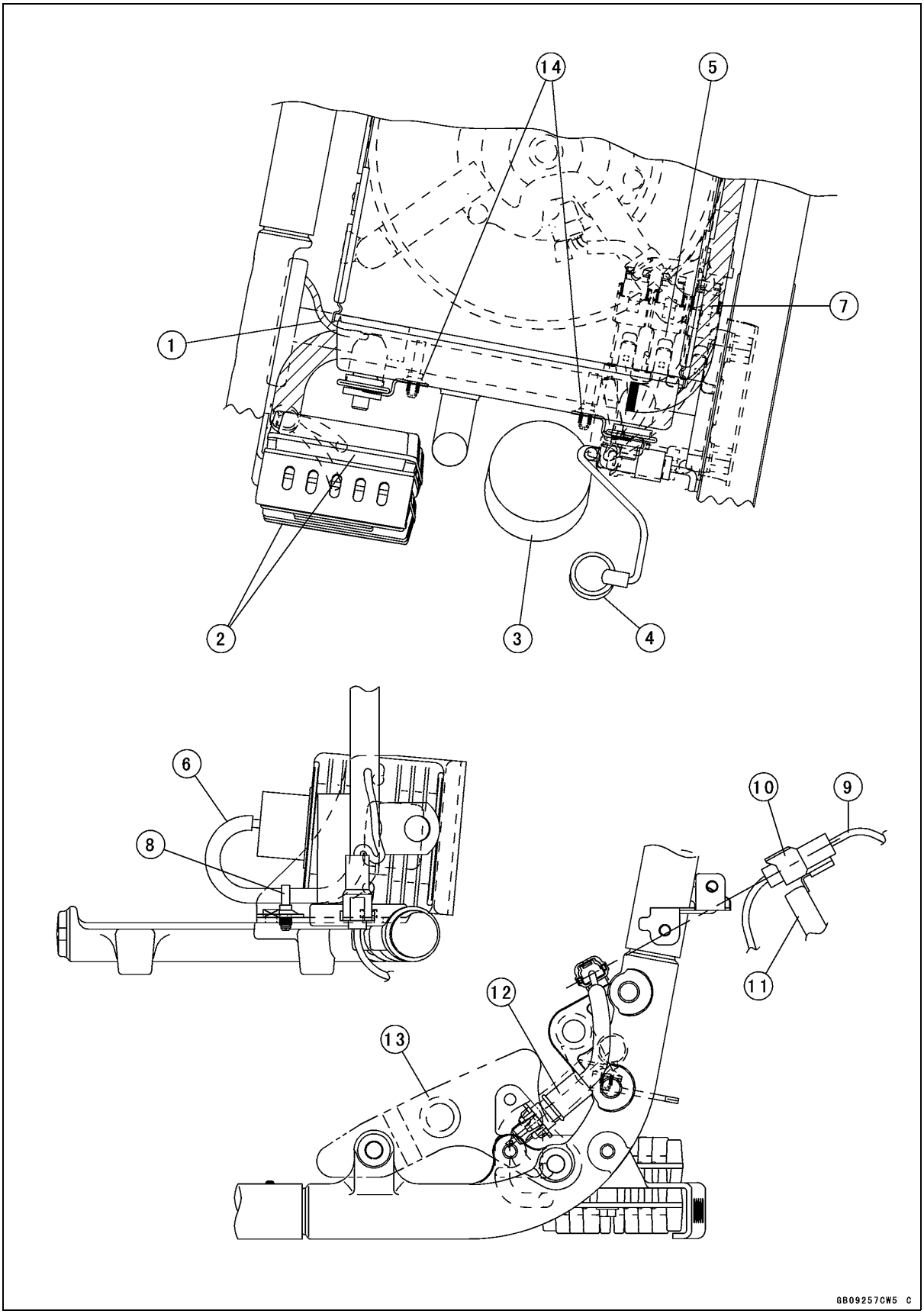
Cable, Wire, and Hose Routing

1. Insert the end of the grip up to the punch mark.
2. Align the mating surface with the punch mark. After the installation, confirm the punch mark.
3. Left Switch Housing Lead
4. Clamps (Left Switch Housing Lead)
5. The gap is 2 ~ 3 mm (0.08 ~ 0.12 in.).
6. Clutch Cable
7. Clutch Lever Assembly
8. Punch Mark
9. Run the cable and lead from the steering stem head between the stem head cover upper.
10. Stem Cover Upper
11. Run the brake hose from the steering stem head and steering stem between the stem head covers.
12. Clamps (Right Switch Housing Lead)
13. Throttle Cables
14. Right Switch Housing Lead
15. Left Switch Housing Lead Connectors (Insert the connector in the Bracket.)
16. Clamp (Left Switch Housing Lead, Signal Light Leads)
17. Brake Hose
18. Headlight Lead Connector
19. Run the front left turn signal light leads the headlight body of the left side.
20. Right Switch Housing Lead Connector (Insert in the bracket.)
21. Steering Stem Head Cover Upper.
22. Main Harness (Insert in the bracket)

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Cable, Wire, and Hose Routing

Other than VN2000-A1



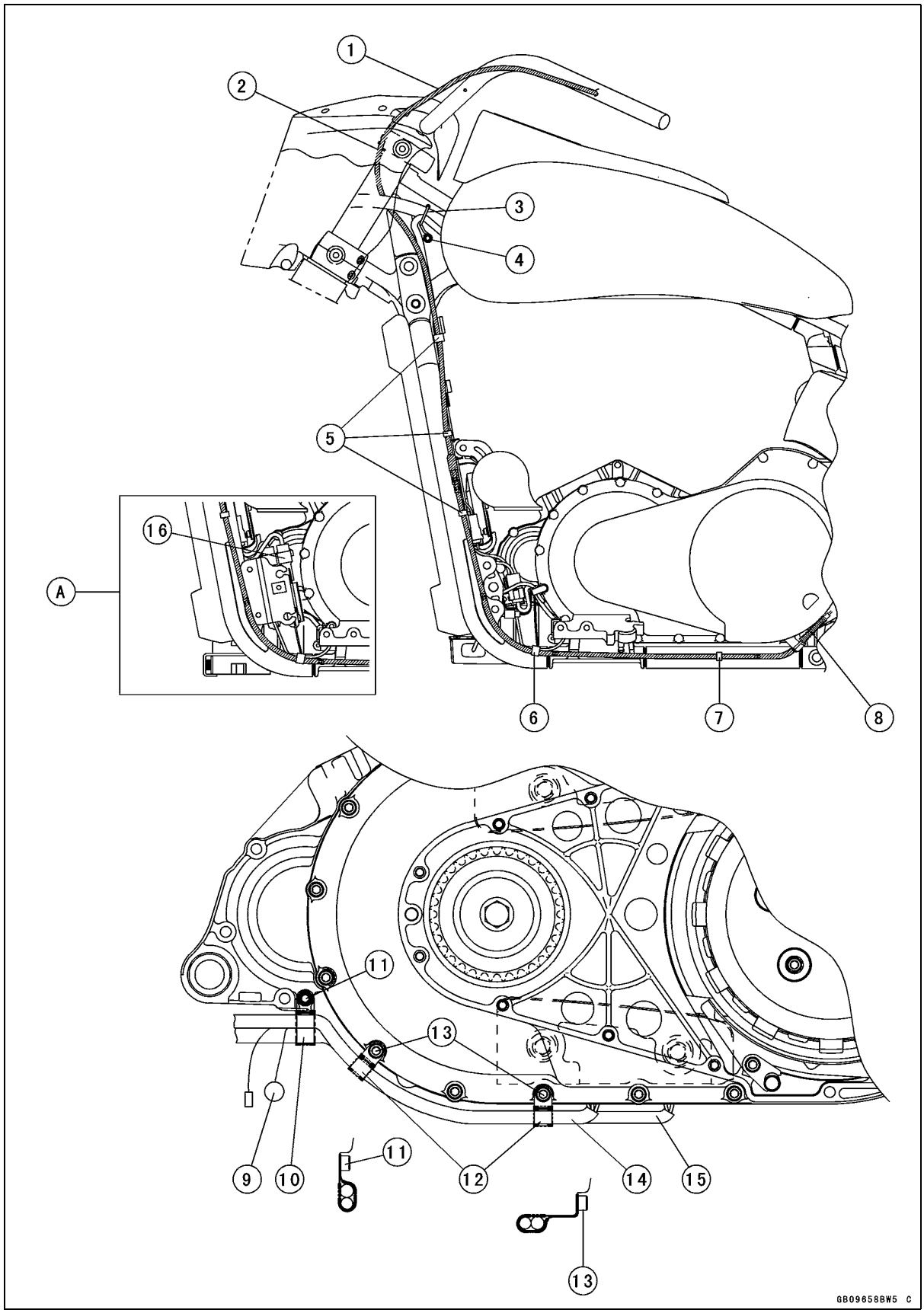
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Cable, Wire, and Hose Routing

1. Main Harness
2. Regulators/Rectifiers
3. Oil Filter
4. Oil Pressure Warning Light Switch
5. Insert the connectors in the bracket.
6. Main Harness
7. Main Harness
8. Clamp
9. Main Harness
10. Rear Brake Light Switch Lead Connector
11. Engine Bracket
12. Rear Brake Light Switch
13. Right Footboard Bracket Assembly
14. Insert the clamps to the engine bracket

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Cable, Wire, and Hose Routing



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Cable, Wire, and Hose Routing

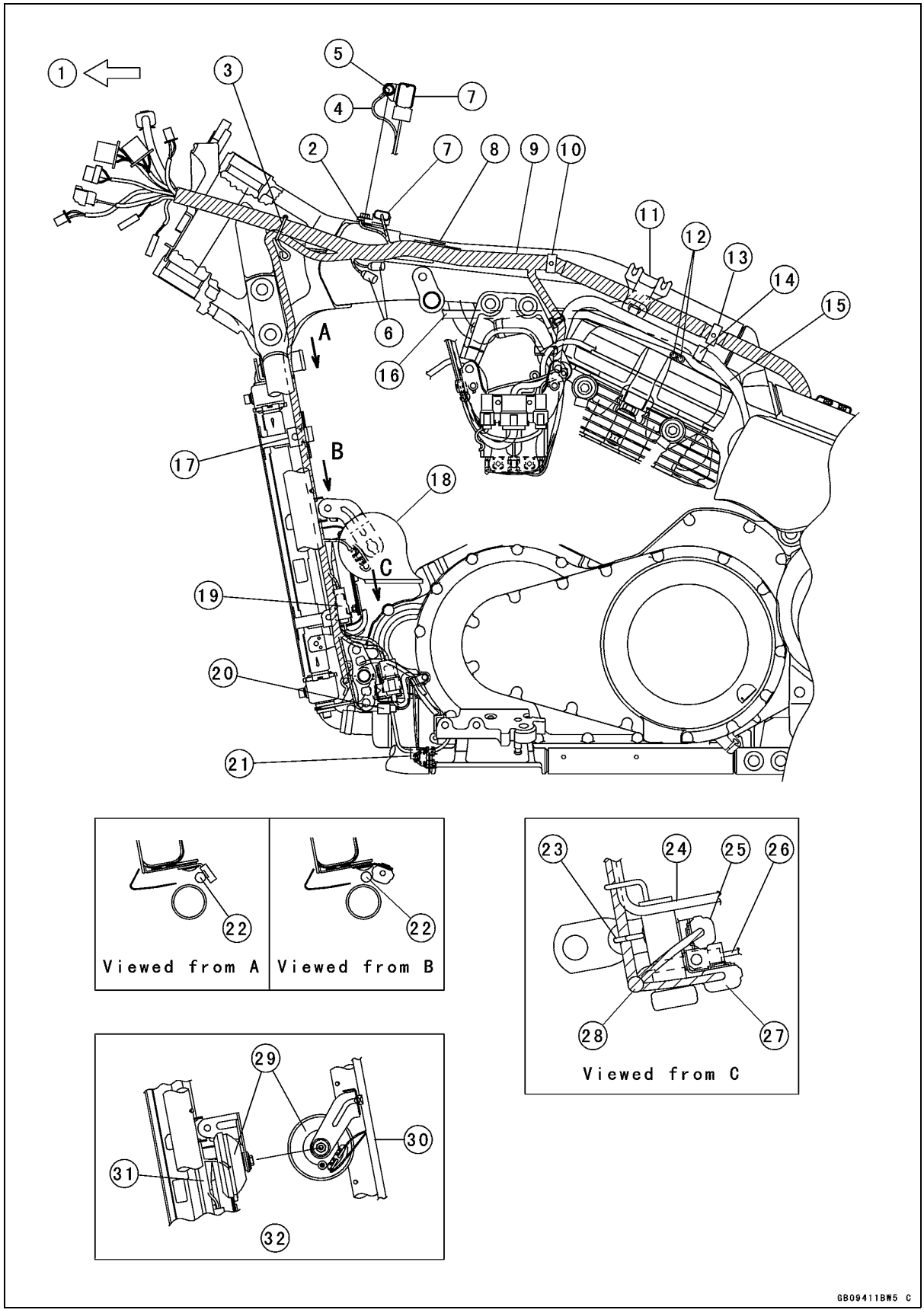
1. Clutch Cable
2. Run the clutch cable the front side of the steering stem head.
3. Clamp
4. Bolt
5. Clamps (ϕ10)
6. Clamp (ϕ15)
7. Clamp (ϕ10)
8. Install the rubber boot to the metal fitting.
9. Oil Pressure Warning Light Terminal Switch Lead Terminal
10. Clamp
11. Bolt
12. Clamps
13. Bolts
14. Alternator Lead
15. Crankshaft Position Sensor Lead
16. Alternator Lead Connectors

A. Other than VN2000-A1 Model

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Cable, Wire, and Hose Routing

VN2000-A1



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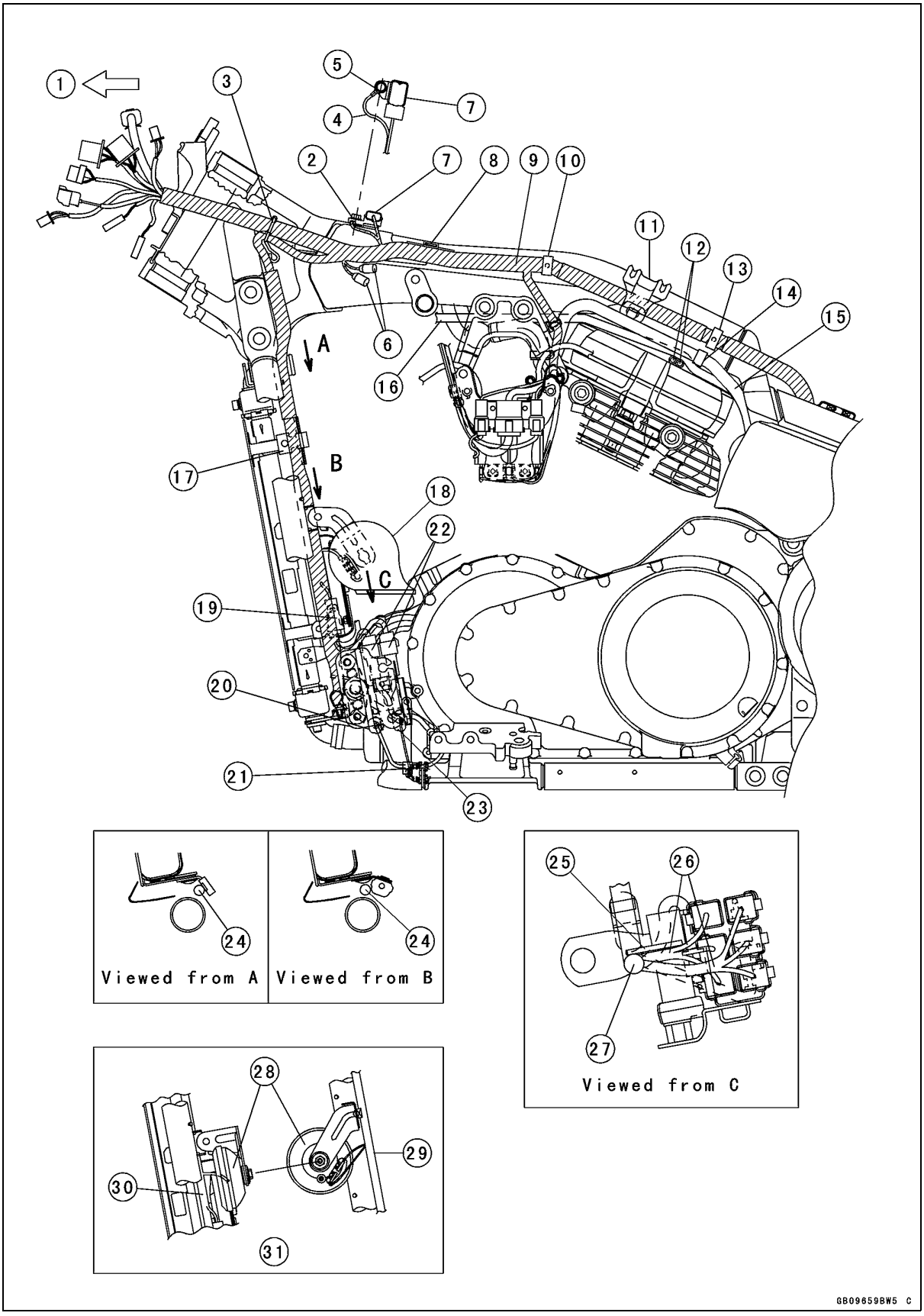
Cable, Wire, and Hose Routing

1. Front
2. Frame Ground Terminal
3. Clamp
4. Frame Ground Terminal Lead
5. Put the frame ground terminal so that the flat side faces downward.
6. Accessory Lead Terminals
7. Inlet Air Pressure Sensor
8. Insert the clamp in the frame.
9. Main Harness
10. Clamp (ϕ25)
11. Damper
12. Fuel Tank Tubes (Blue and Red)
13. Clamp (ϕ20)
14. Clamp (ϕ15)
15. Breather Hose
16. Coolant Reservoir Hose
17. Insert the clamp in the frame.
18. Horn (US, CA Models)
19. Insert the radiator fan lead connector to the bracket.
20. Sidestand Switch Lead Connector
21. Clamp the clutch cable and sidestand switch lead.
22. Alternator leads Connectors (6 pieces)
23. Clamp
24. Alternator Leads
25. Side Stand Switch Connector
26. Alternator Lead
27. Oil Pressure Warning Light Switch Lead and Crankshaft Position Sensor Lead Connector
28. Main Harness
29. Horn
30. Radiator
31. Horn Lead
32. Europe Model

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Cable, Wire, and Hose Routing

On and after VN2000-A2/D1



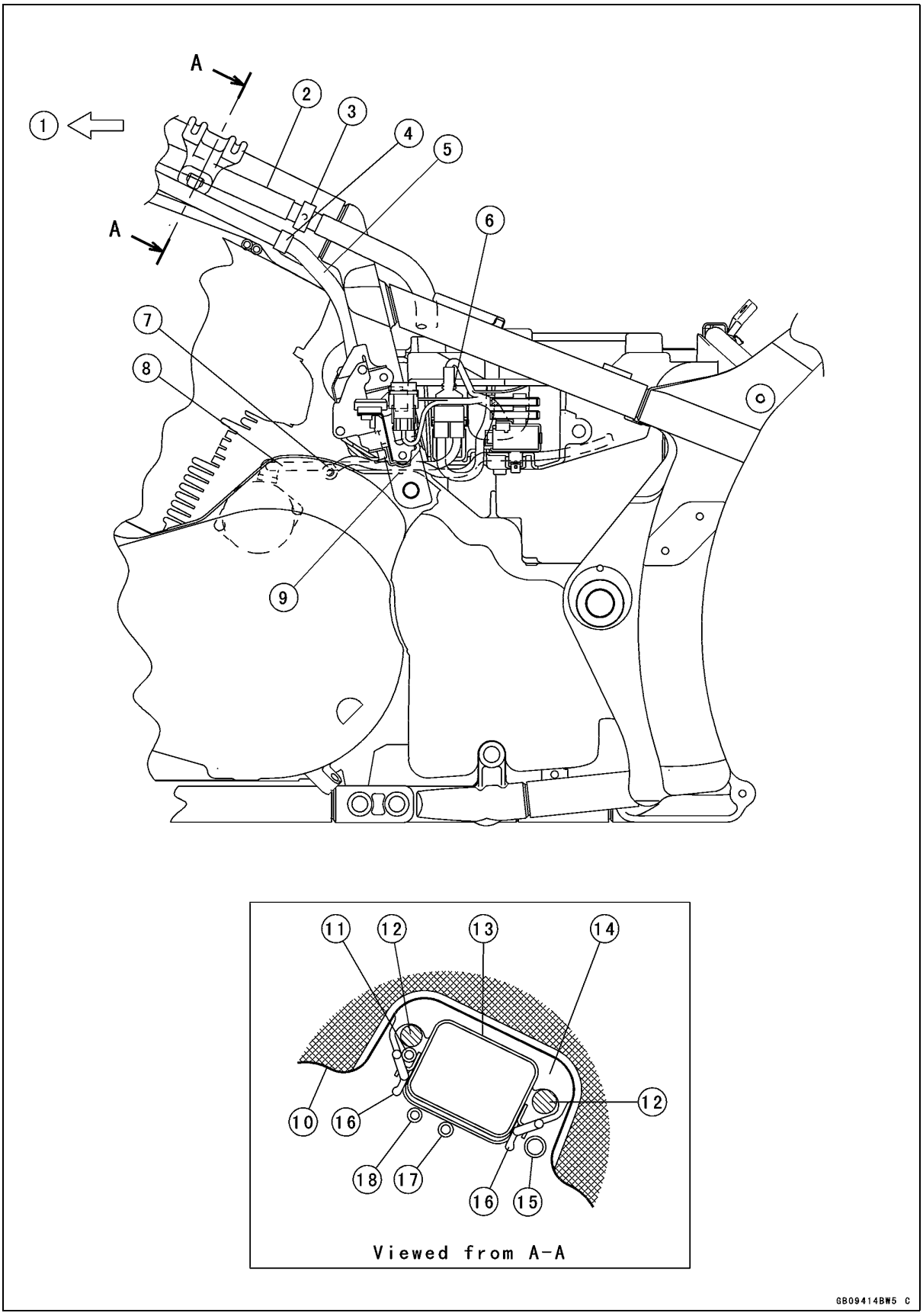
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Cable, Wire, and Hose Routing

1. Front
2. Frame Ground Terminal
3. Clamp
4. Frame Ground Terminal Lead
5. Put the frame ground terminal so that the flat side faces downward.
6. Accessory Lead Terminals
7. Inlet Air Pressure Sensor
8. Insert the clamp in the frame
9. Main Harness
10. Clamp (ϕ25)
11. Damper
12. Fuel Tank Tubes (Blue and Red)
13. Clamp (ϕ25)
14. Clamp (ϕ15)
15. Breather Tube
16. Coolant Reservoir Tube
17. Insert the clamp in the frame
18. Horn (US, CA Models)
19. Insert the radiator fan lead connector to the bracket.
20. Sidestand Switch Lead Connector
21. Clamp the clutch cable and sidestand switch lead.
22. Alternator Leads Connectors (6 pieces)
23. Oil Pressure Warning Light Switch Lead and Crankshaft Position Sensor Lead Connector
24. Main Harness
25. Clamp
26. Alternator Leads
27. Main Harness
28. Horn
29. Radiator
30. Horn Lead
31. Europe Model

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Cable, Wire, and Hose Routing



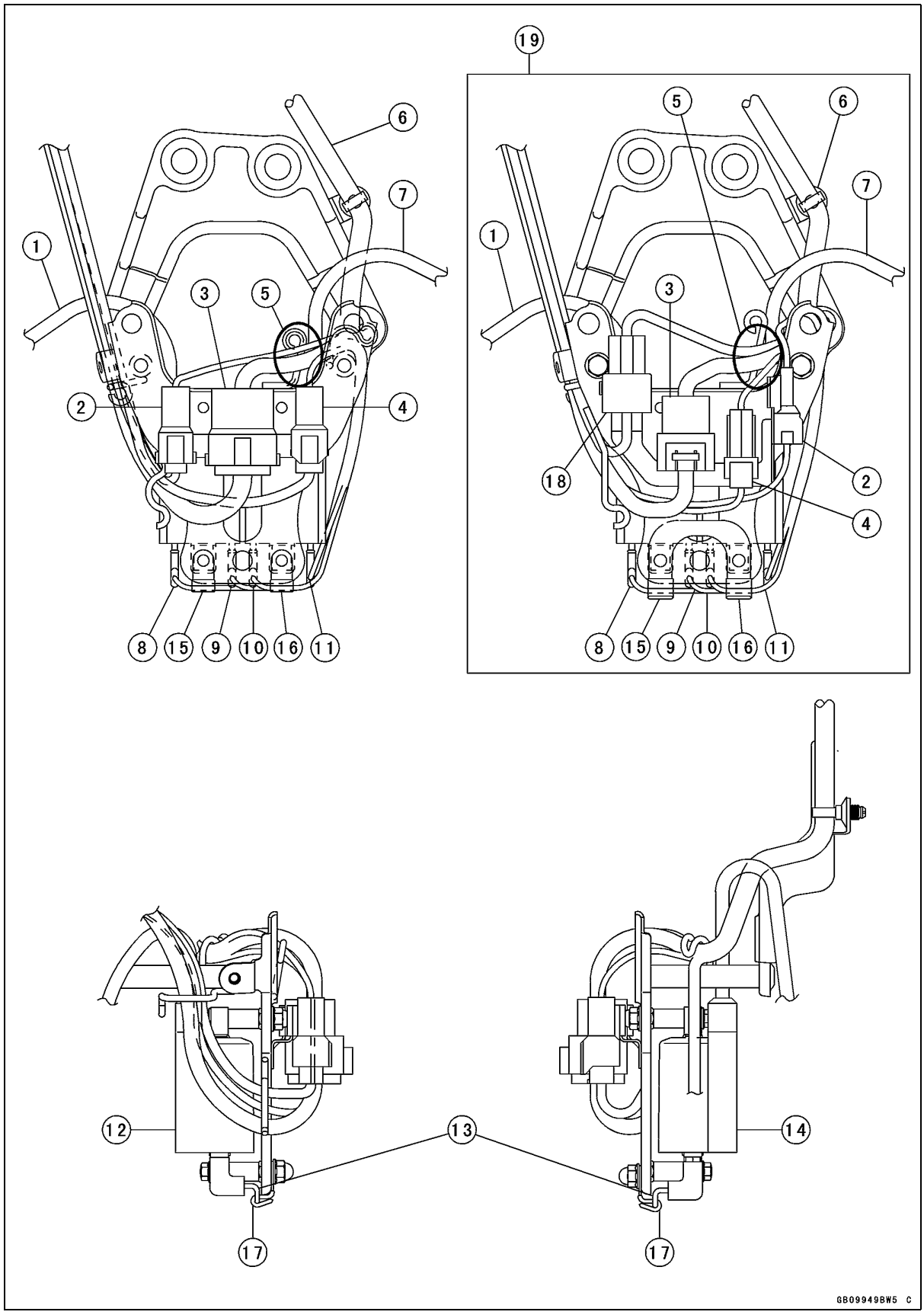
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Cable, Wire, and Hose Routing

1. Front
2. Main Harness
3. Clamp (ϕ20)
4. Clamp (ϕ15)
5. Breather Tube
6. Starter Relay
7. Engine Ground Terminal
8. Starter Motor Cable
9. Run the starter motor cable and engine ground lead between the engine mount and frame bracket.
10. Fuel Tank Bottom
11. Vacuum Tube (White, California Model)
12. Main Harness
13. Frame
14. Damper
15. Breather Tube
16. Hold the harness with the damper and fit the damper on the hook of frame.
17. Coolant Reservoir Tube
18. Tube (Green, California Model)

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Cable, Wire, and Hose Routing



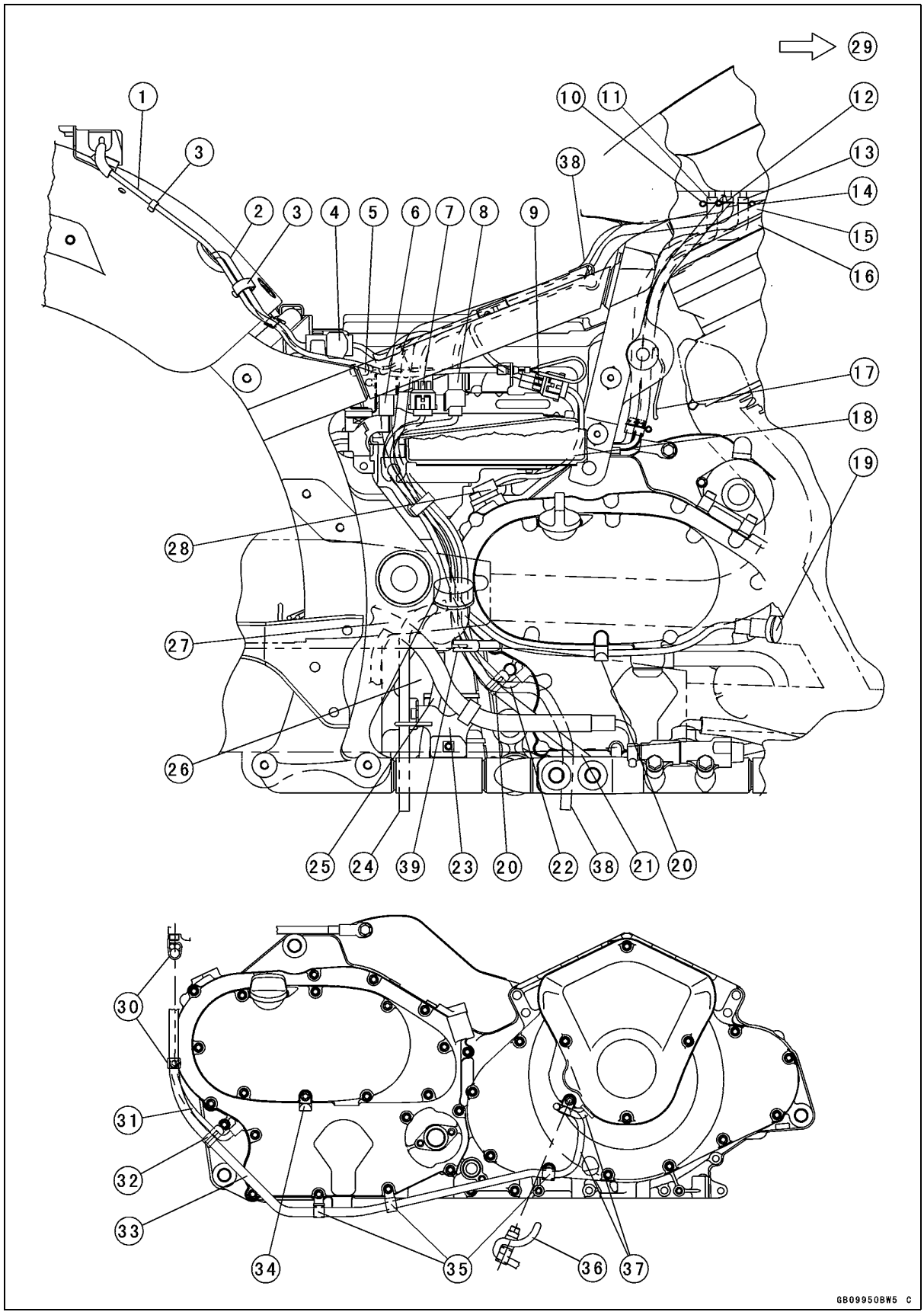
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Cable, Wire, and Hose Routing

1. Front Ignition Coil High Tension Lead
2. Fuel Level Sensor Lead Connector
3. Meter Unit Lead Connector
4. Fuel Pump Lead Connector
5. Run the leads outside of the clamp.
6. Insert the clamp in the bracket.
7. Rear Ignition Coil High Tension Lead
8. Front Ignition Coil Primary Lead (Red/Green)
9. Front Ignition Coil Primary Lead (Black)
10. Rear Ignition Coil Primary Lead (Black/Green)
11. Rear Ignition Coil Primary Lead (Red/Green)
12. Front Ignition Coil
13. Direction of the Ignition Coil Primary Lead
14. Rear Ignition Coil
15. Clamp (Red/Green Ignition Coil Lead)
16. Clamp (Red/Green, Black and Black/Green Ignition Coil Leads)
17. Clamp the ignition coil lead and then bend the clamp along the bracket.
18. Ignition Switch Lead Connector
19. VN2000E6F ~/F6F ~

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Cable, Wire, and Hose Routing



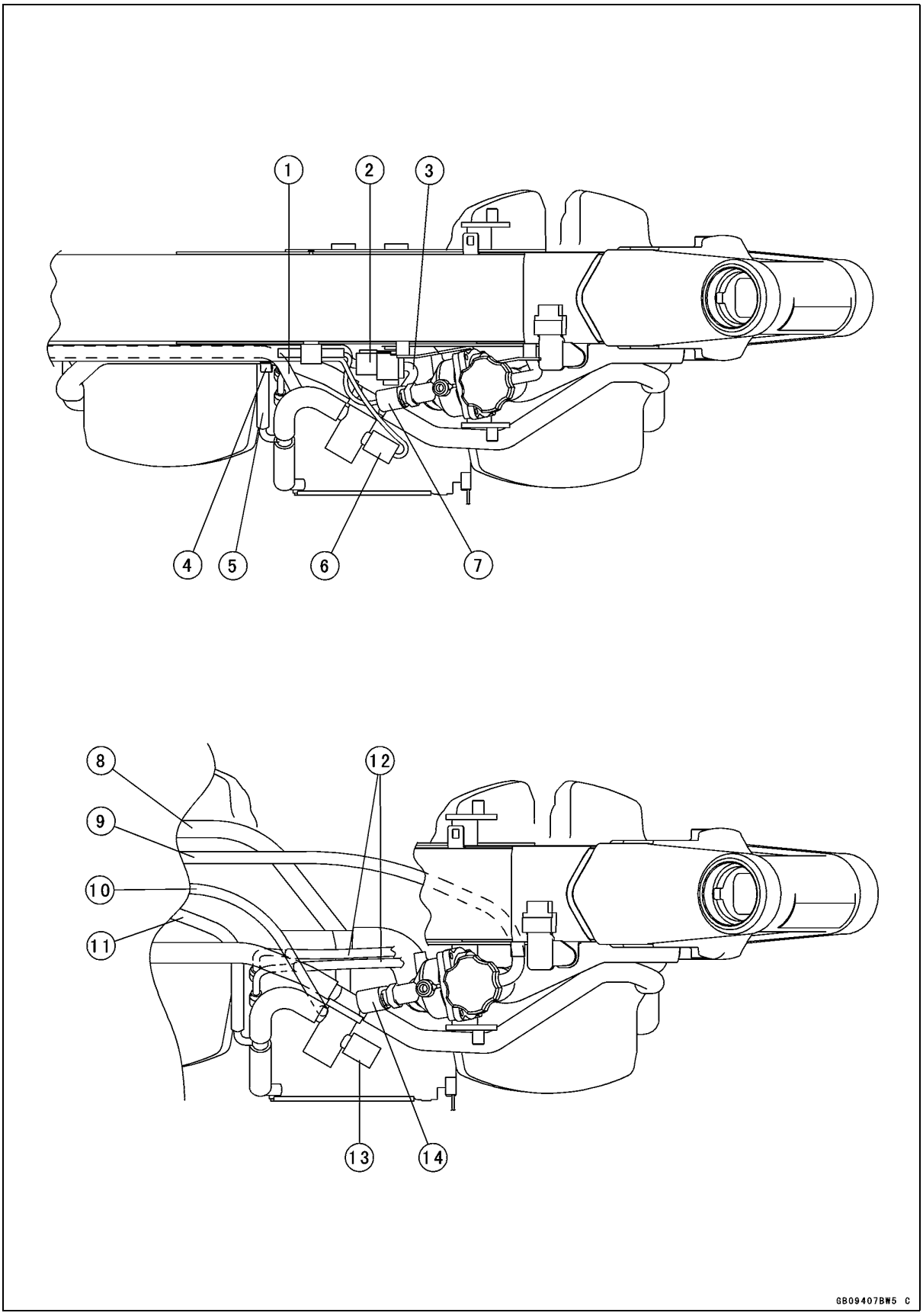
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Cable, Wire, and Hose Routing

1. Seat Lock Cable
2. Rear Harness
3. Clamp
4. Fit the rear harness connector in battery case.
5. Accessory Lead Terminals
6. Decompression Solenoid/Camshaft Sensor Lead Connector
7. Gear Position Switch Lead Connector
8. Oxygen Sensor Lead Connector (CAL, WVTA (FULL H), GB WVTA (FULL H) Models)
9. Speed Sensor Lead Connector
10. Clamp (California Model)
11. Return Hose (Red, California Model)
12. Drain Hose (VN2000E6F ~/F6F ~)
13. Breather Hose (Blue)
14. Clamp
15. Coolant Reservoir Hose (Black)
16. Hose (Green, California Model)
17. Cover
18. Tool Case
19. Oxygen Sensor (California and Europe Models)
20. Clamp
21. Decompression Solenoid/Camshaft Sensor Lead
22. Gear Position Switch Lead
23. Coolant Reservoir Bracket
24. Fuel Tank Breather Hose (Blue, except California Model) Run the breather tube inside of brake hose and in the clamp of reservoir.
25. Coolant Reservoir Level Gauge
26. Coolant Reservoir
27. Brake Hose
28. Speed Sensor
29. Front
30. Clamp
31. Gear Position Switch Lead
32. Clamp
33. Run the decompression solenoid/camshaft sensor lead straight.
34. Calmp
35. Clamps (Put the Clamp around the lead.)
36. Run the lead from upper to lower, and clamp it.
37. Do not slacken the lead.
38. Drain Hose (VN2000E6F ~/F6F ~)
39. Clamp (VN2000E6F ~/F6F ~)

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Cable, Wire, and Hose Routing



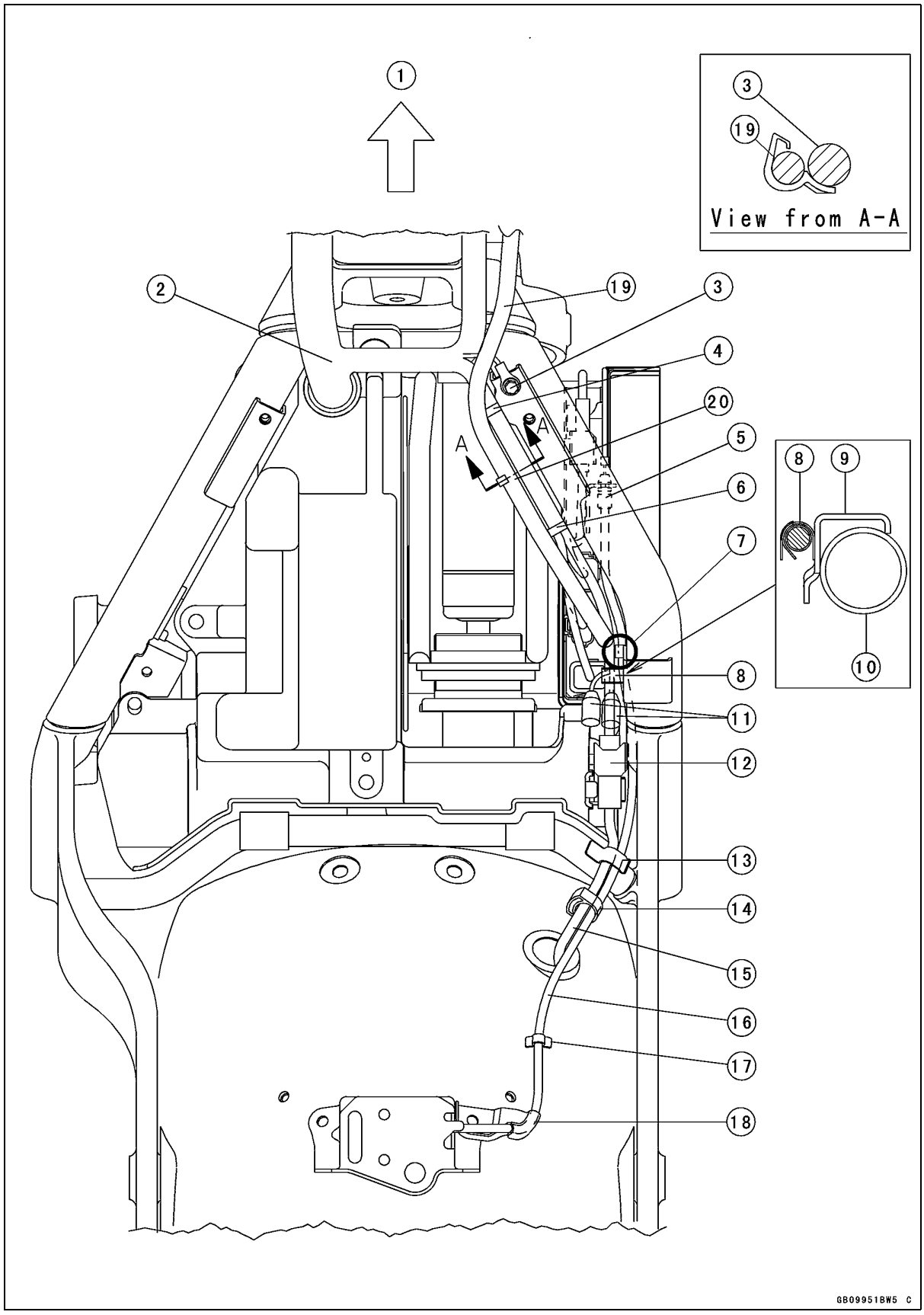
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Cable, Wire, and Hose Routing

1. Vacuum Hose (White, California Model)
2. Insert the throttle body lead connector in the thermostat bracket.
3. Throttle Body Lead
4. Clamp (Air Hose)
5. Hose (Green, California Model)
6. Air Switching Valve
7. Water Temperature Sensor
8. Breather Hose
9. Coolant Reservoir Hose (Black, Brown Pipe ~ Thermostat Cap)
10. Vacuum Hose (White, White Pipe ~ Throttle Body, California Model)
11. Hose (Green, Green Pipe ~ Air Cleaner, California Model)
12. Throttle Cables
13. Air Switching Valve
14. Water Temperature Sensor

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Cable, Wire, and Hose Routing



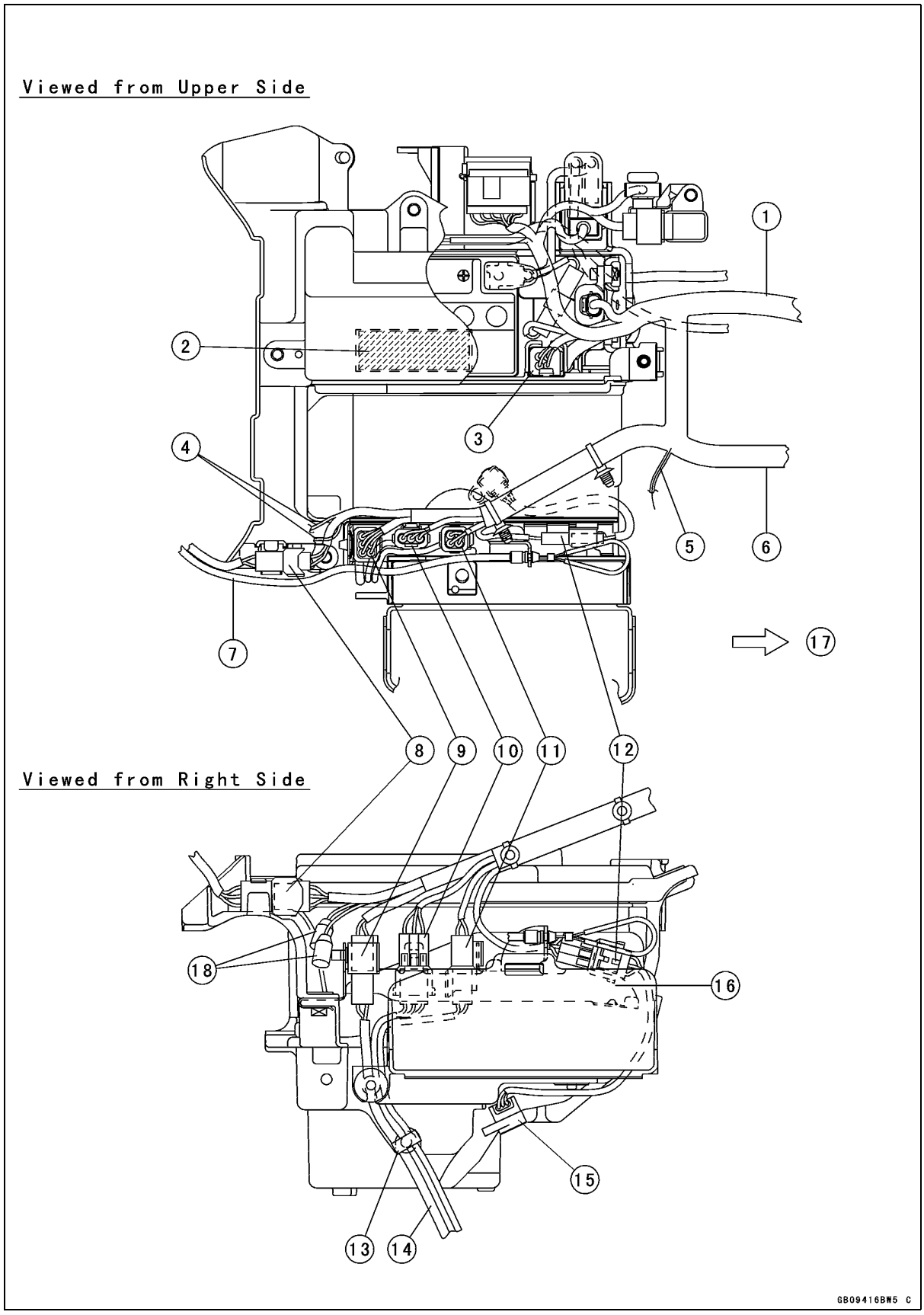
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Cable, Wire, and Hose Routing

1. Front
2. Main Harness
3. Install the frame ground terminal so that it is parallel to seat rail.
4. Insert the clamp in the bracket.
5. Fit the seat lock cable in the bracket.
6. Insert the clamp in the bracket.
7. Run the seat lock cable outside of the cable hook.
8. Hold the harness with the clamp, and bend the clamp to bracket.
9. Bracket
10. Frame
11. Put the accessory terminals under the rear harness connector.
12. Fit the rear harness connector on the battery case cover.
13. Clamp
14. Clamp
15. Rear Harness
16. Seat Lock Cable
17. Clamp
18. Seat Bracket
19. Drain Hose (VN2000E6F ~/F6F ~)
20. Clamp the drain hose at the yellow tape portion.

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Cable, Wire, and Hose Routing



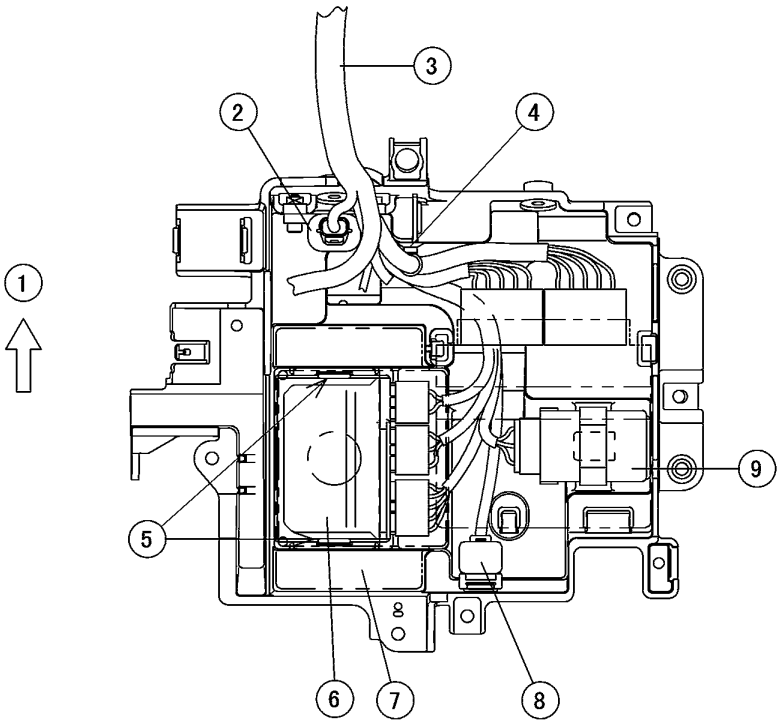
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Cable, Wire, and Hose Routing

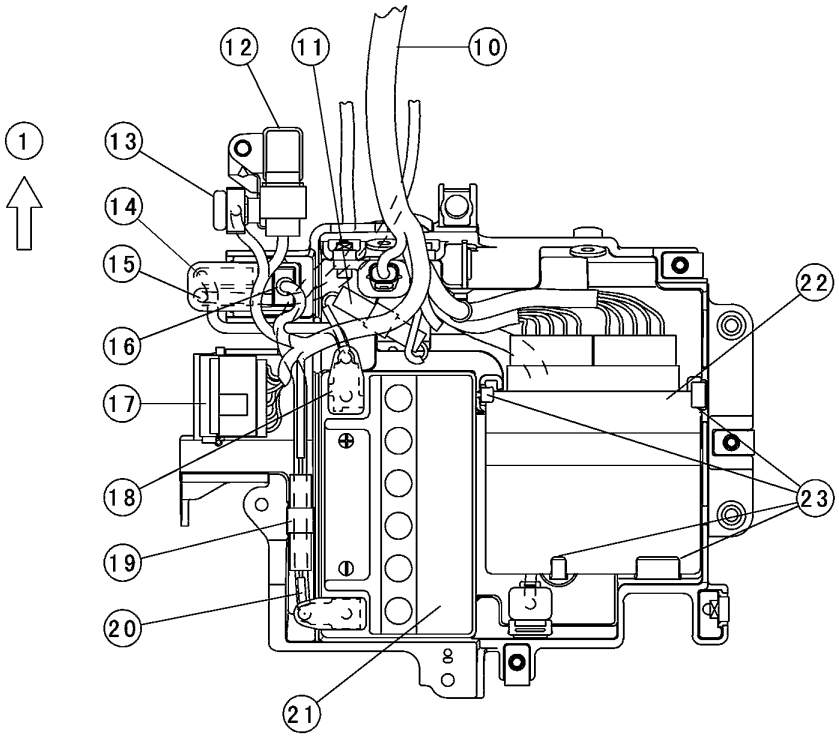
1. Main Harness (Left Side)
2. Damper (Inside of Battery Cover)
3. Fit the Kawasaki Diagnostic System connector in the battery cover.
4. Put the accessory terminals under the rear harness connector.
5. To Frame Ground
6. Main Harness (Right Side)
7. Seat Lock Cable
8. Fit the rear harness connector on the battery case cover.
9. Before connection, fit the decompression solenoid/camshaft sensor lead connector in the bracket.
10. After connection, fit the gear position switch lead connector in the bracket.
11. After connection, fit the oxygen sensor lead connector in the bracket. (California and Europe models)
12. Speed Sensor Lead Connector
13. Insert the clamp in the battery case. (Gear Position Switch Lead, Decompression Solenoid/Camshaft Sensor Lead and Oxygen Sensor Lead)
14. To Engine
15. Speed Sensor
16. Connector Bracket
17. Front
18. Put the accessory terminals under the rear harness connector.

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Cable, Wire, and Hose Routing



Viewed from Upper Side



Viewed from Upper Side

GB09415BW5 C

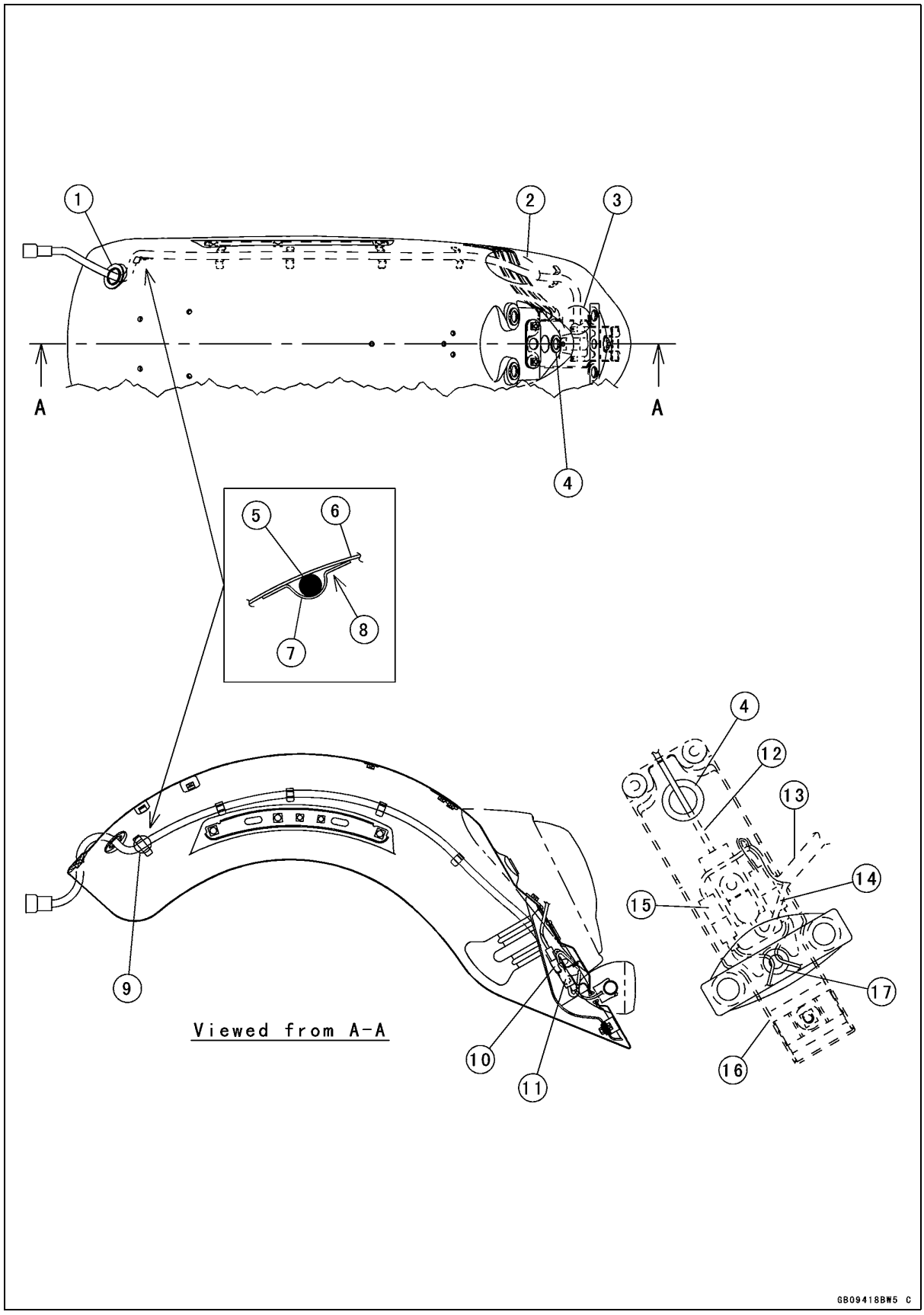
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Cable, Wire, and Hose Routing

1. Front
2. Vehicle-down Sensor
3. Main Harness (Left Side)
4. Insert the clamp in the battery case.
5. Fit the relay box in the tab of the battery case.
6. Relay Box
7. Put the damper on the relay box.
8. Fit the starter control relay on the battery case.
9. Turn Signal Control Relay
10. Main Harness (Left Side)
11. Battery (+) Lead Connector (White)
12. Atmospheric Pressure Sensor
13. ECU Main Fuse 30 A
14. Battery Cable (+)
15. Starter Motor Cable
16. Starter Relay
17. Fuse Box
18. Battery Cable (+)
19. Insert the battery (−) lead connector (black) in the battery case.
20. Run the battery (−) lead under the connector.
21. Battery
22. ECU
23. Insert the ECU in the tab of the battery case and fit it.

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Cable, Wire, and Hose Routing



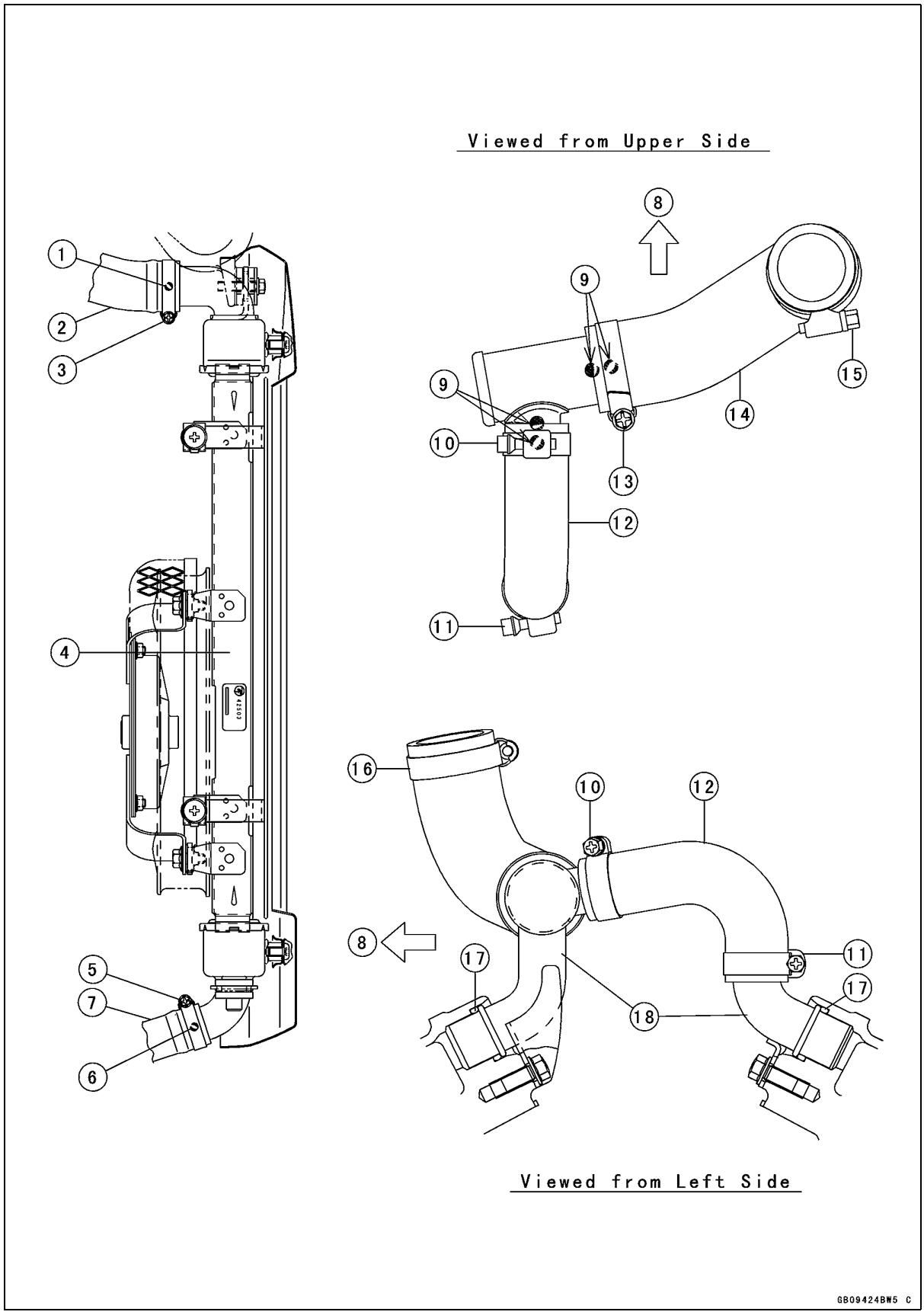
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Cable, Wire, and Hose Routing

1. Install the grommet in the rear fender.
2. Run the rear harness between the rear fender and fender brace.
3. Fit the rear harness in the recess of the cover.
4. Grommet
5. Rear Harness
6. Rear Fender
7. Clamp
8. Push
9. Clamp the white mark of the rear harness at this position.
10. Rear Harness Connector (Insert the clamp of the rear harness in the fender.)
11. Turn Signal Light Lead Connector
12. Tail/Brake and License Plate Light Lead
13. Rear Harness
14. Right Turn Signal Light Lead
15. Left Turn Signal Light Lead Connector
16. Cover
17. Grommet

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Cable, Wire, and Hose Routing



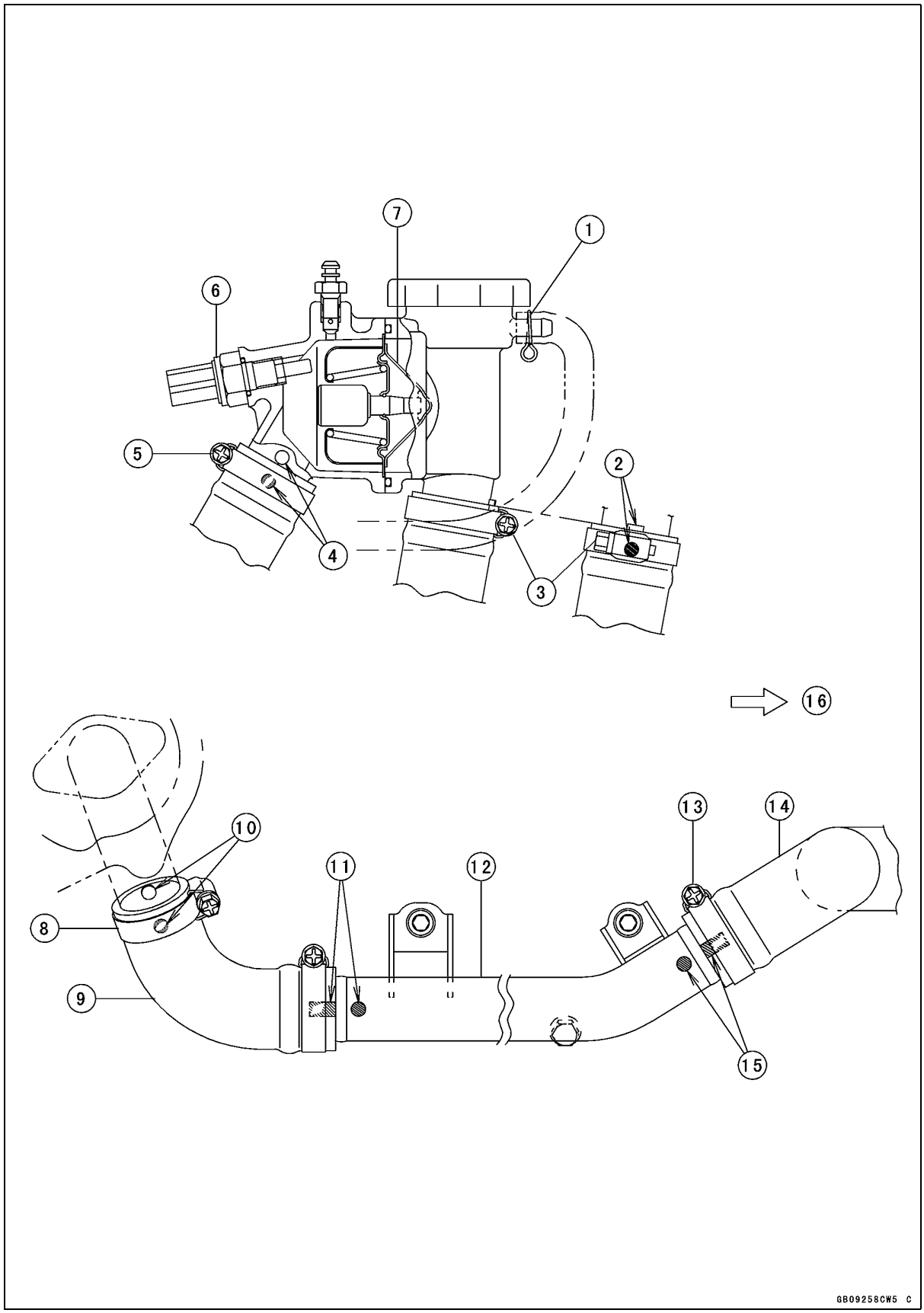
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Cable, Wire, and Hose Routing

1. Position the mark of the hose at right side, and tighten the clamp. (VN2000-A1)
2. Water Hose (First Install the hose to thermostat.)
3. Clamp
4. Radiator Assembly
5. Clamp
6. Position the mark of the hose at right side, and tighten the clamp. (VN2000-A1)
7. Water Hose
8. Front
9. Align the marks and install the water hose until the center of the paint mark, and then tighten the clamp.
10. Clamp
11. Clamp
12. Water Hose
13. Clamp
14. Water Hose
15. Clamp
16. Clamp
17. O-ring
18. Water Pipe

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Cable, Wire, and Hose Routing



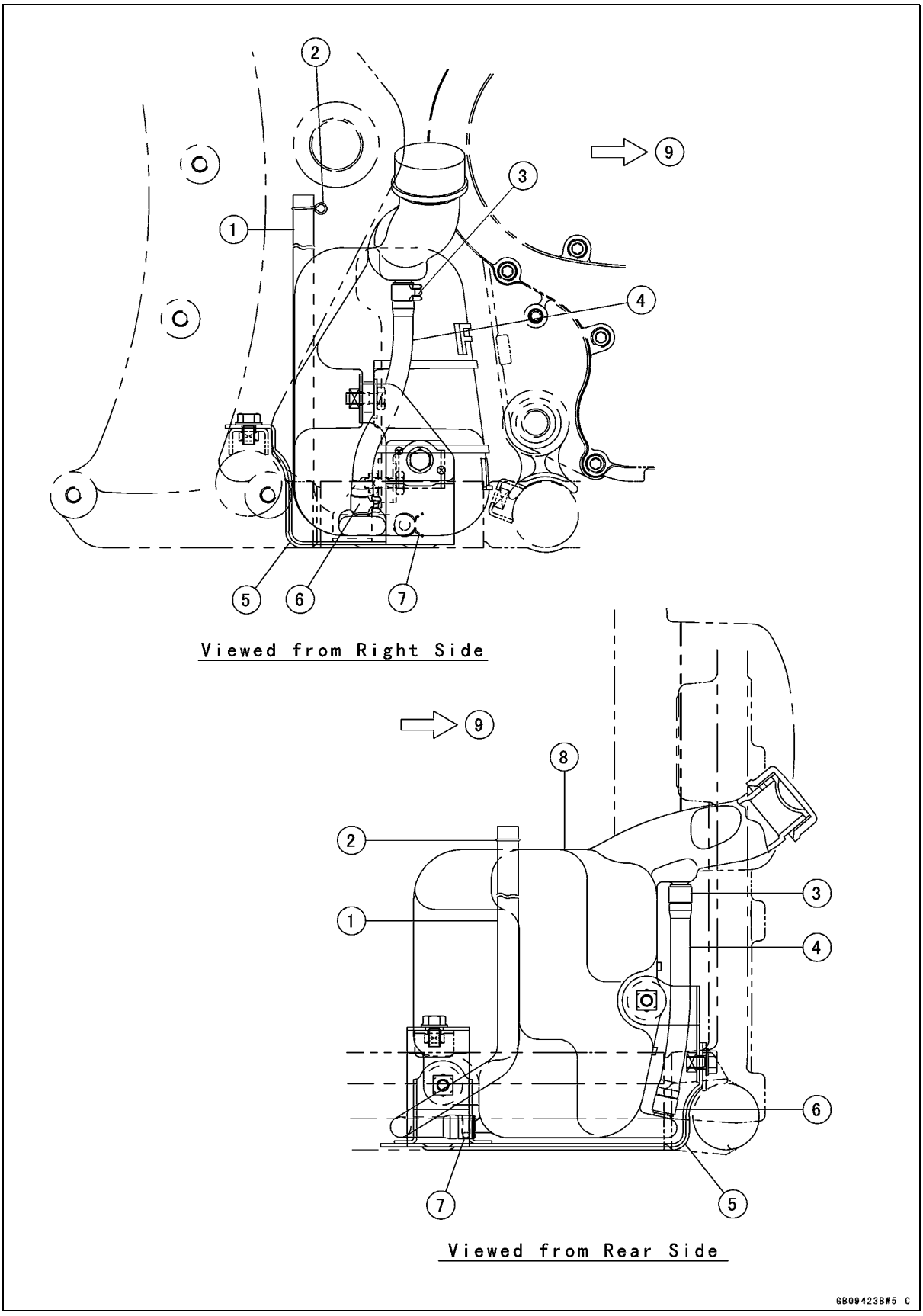
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Cable, Wire, and Hose Routing

1. Clamp
2. Align the marks and tighten the clamp.
3. Clamp
4. Align the marks and tighten the clamp. (VN2000-A1)
5. Clamp
6. Water Temperature Sensor
7. Thermostat
8. Clamp
9. Water Hose
10. Align the marks and tighten (VN2000-A1)
11. Align the marks and tighten the clamp.
12. Water Pipe
13. Clamp
14. Water Hose
15. Align the marks and tighten the clamp.
16. Front

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Cable, Wire, and Hose Routing



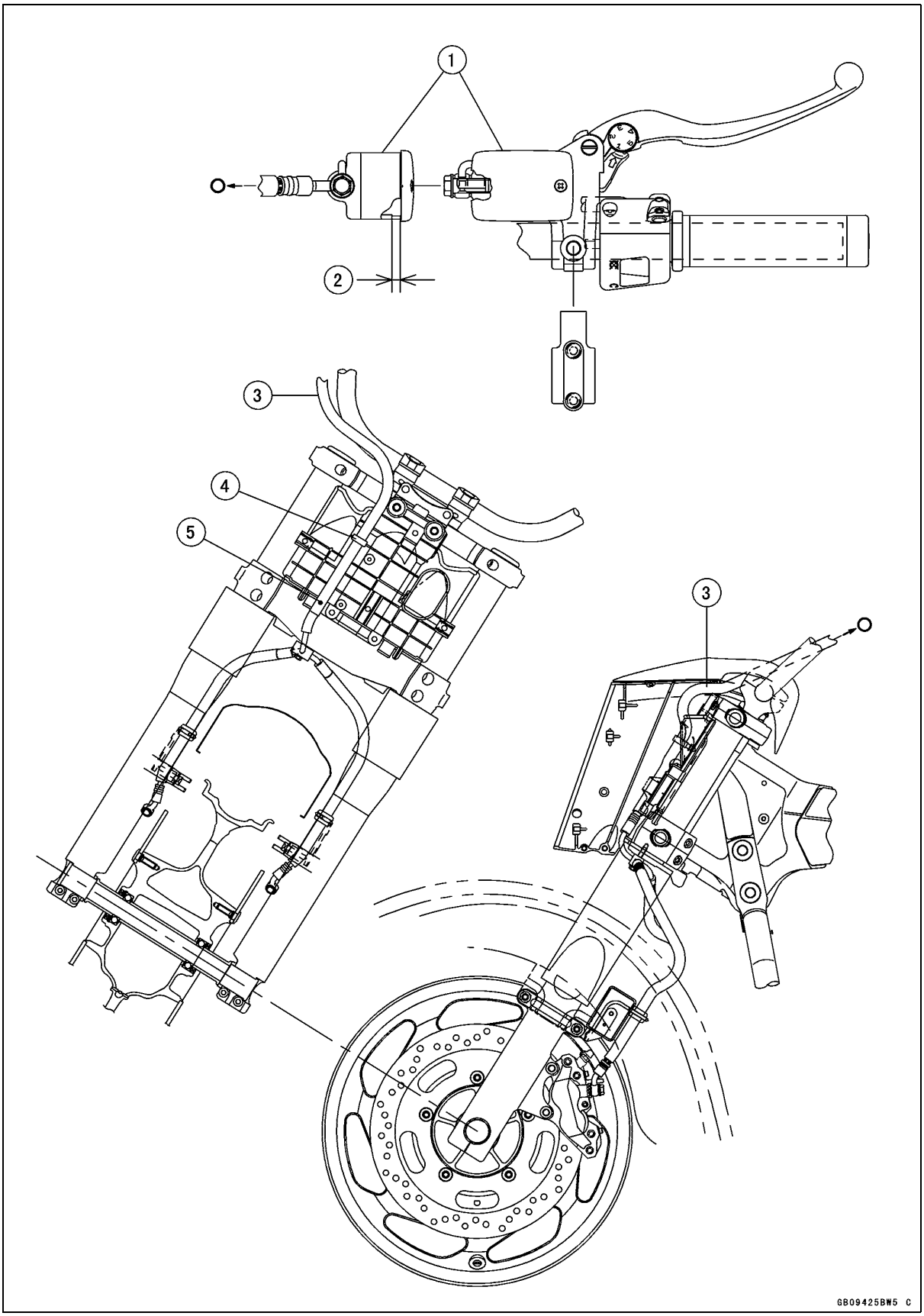
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Cable, Wire, and Hose Routing

1. Water Hose
2. Clamp
3. Clamp
4. Coolant Level Hose
5. Frame Bracket
6. Clamp
7. Clamp
8. Coolant Reservoir
9. Front

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Cable, Wire, and Hose Routing



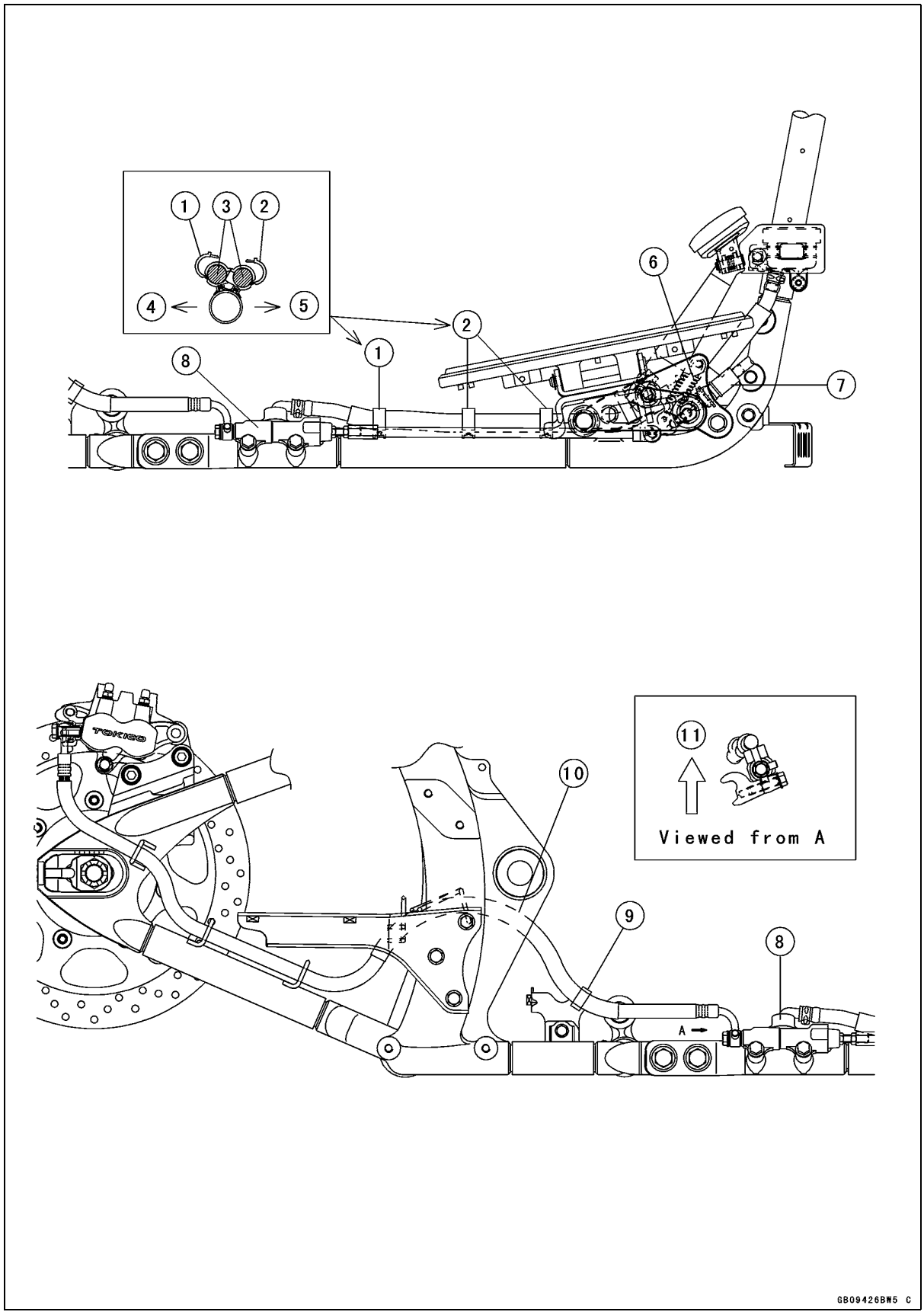
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Cable, Wire, and Hose Routing

1. Front Brake Fluid Reservoir
2. 6 mm (0.24 in.)
3. Brake Hose
4. Clamp
5. White Paint Mark

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Cable, Wire, and Hose Routing



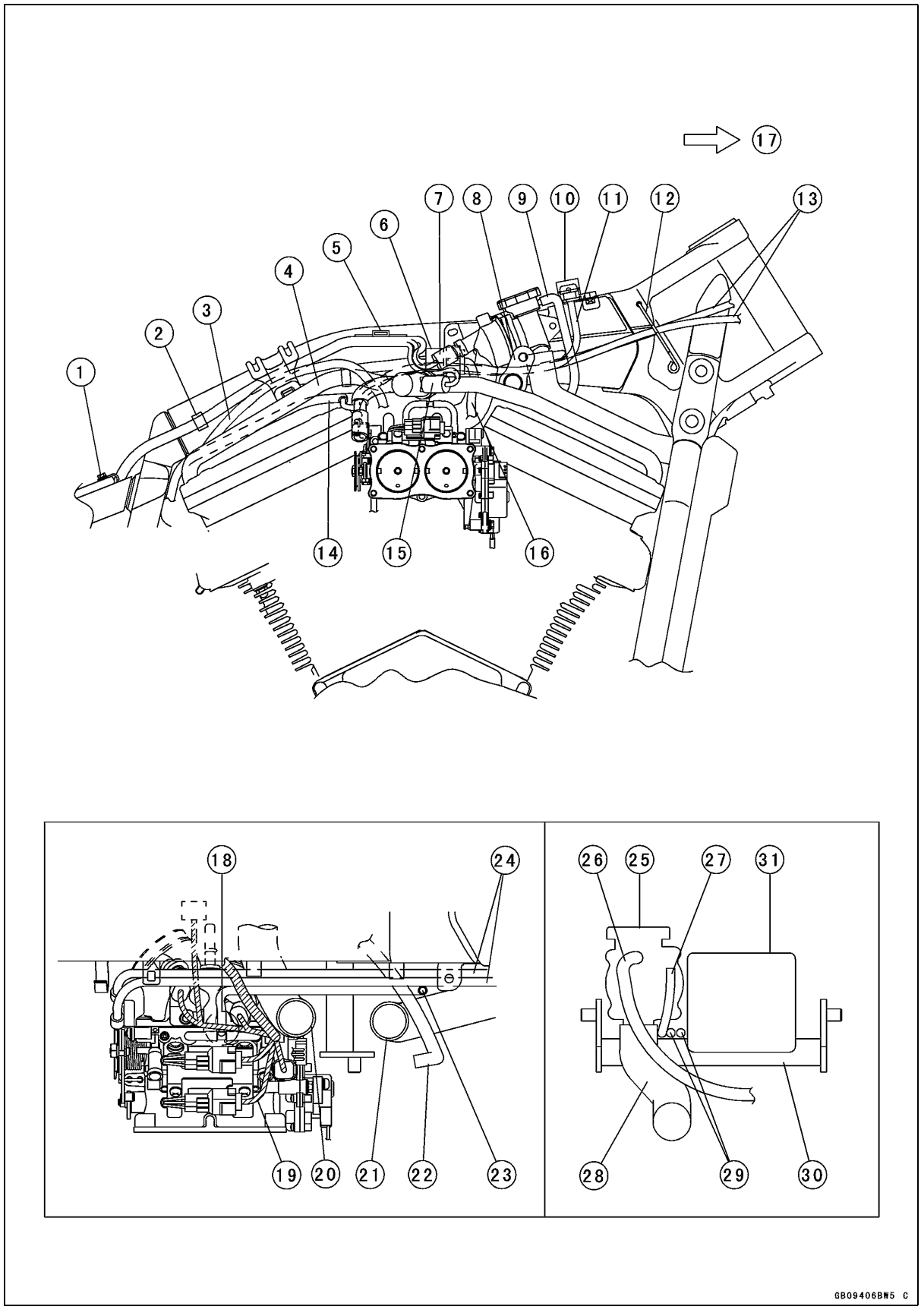
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Cable, Wire, and Hose Routing

1. Clamp
2. Clamps
3. Brake Hose
4. Right Side
5. Engine Side
6. Insert the clamp in the regulator bracket.
7. Rear Brake Light Switch
8. Rear Master Cylinder
9. Insert the clamp in the coolant reservoir bracket.
10. Run the brake hose between the swingarm and frame.
11. Upper Side

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Cable, Wire, and Hose Routing



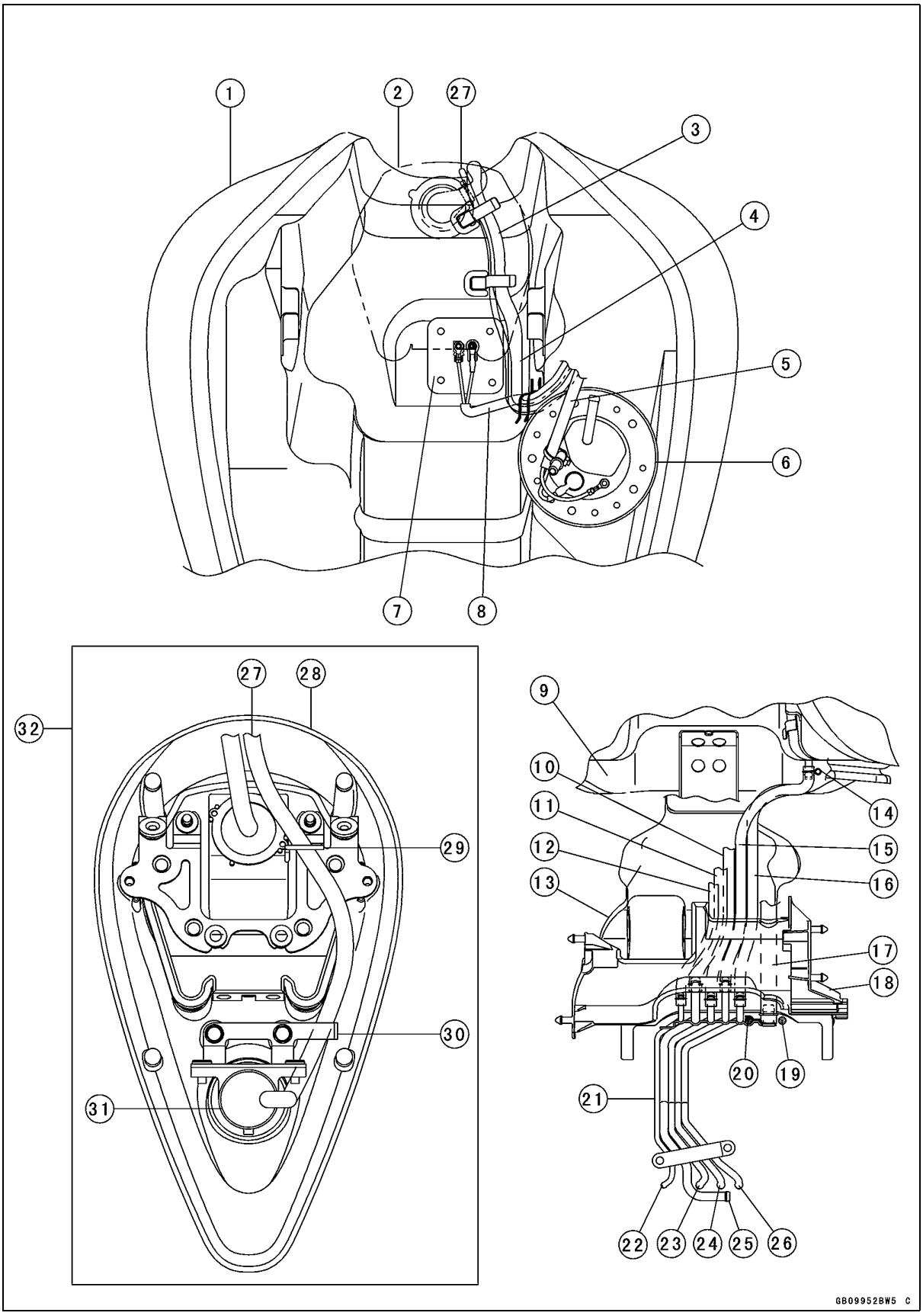
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Cable, Wire, and Hose Routing

1. Frame Ground Terminal Bolt
2. Clamp
3. Vacuum Hose (White, California Model)
4. Air Hose
5. Insert the clamp of harness in the frame.
6. Throttle Body Lead Connector
7. Water Temperature Sensor
8. Run the throttle cable between the thermostat and fuel tank bracket.
9. Coolant Reservoir Hose (Black)
10. Inlet Air Pressure Sensor
11. Inlet Air Pressure Sensor Hose
12. Clamp
13. Throttle Cables
14. Run the green hose upper side of the cylinder head and left side of the frame. (California Model)
15. Air Switching Valve
16. Throttle Body Lead
17. Front
18. Run the throttle body lead on the inlet air pressure sensor hose.
19. Throttle Body Lead
20. Water Hose
21. Water Hose
22. Coolant Reservoir Hose (Black)
23. Inlet Air Pressure Sensor Hose
24. Throttle Cables
25. Thermostat
26. Coolant Reservoir Hose (Black)
27. Inlet Air Pressure Sensor Hose
28. Water Hose
29. Throttle Cables
30. Fuel Tank Bracket
31. Frame

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Cable, Wire, and Hose Routing



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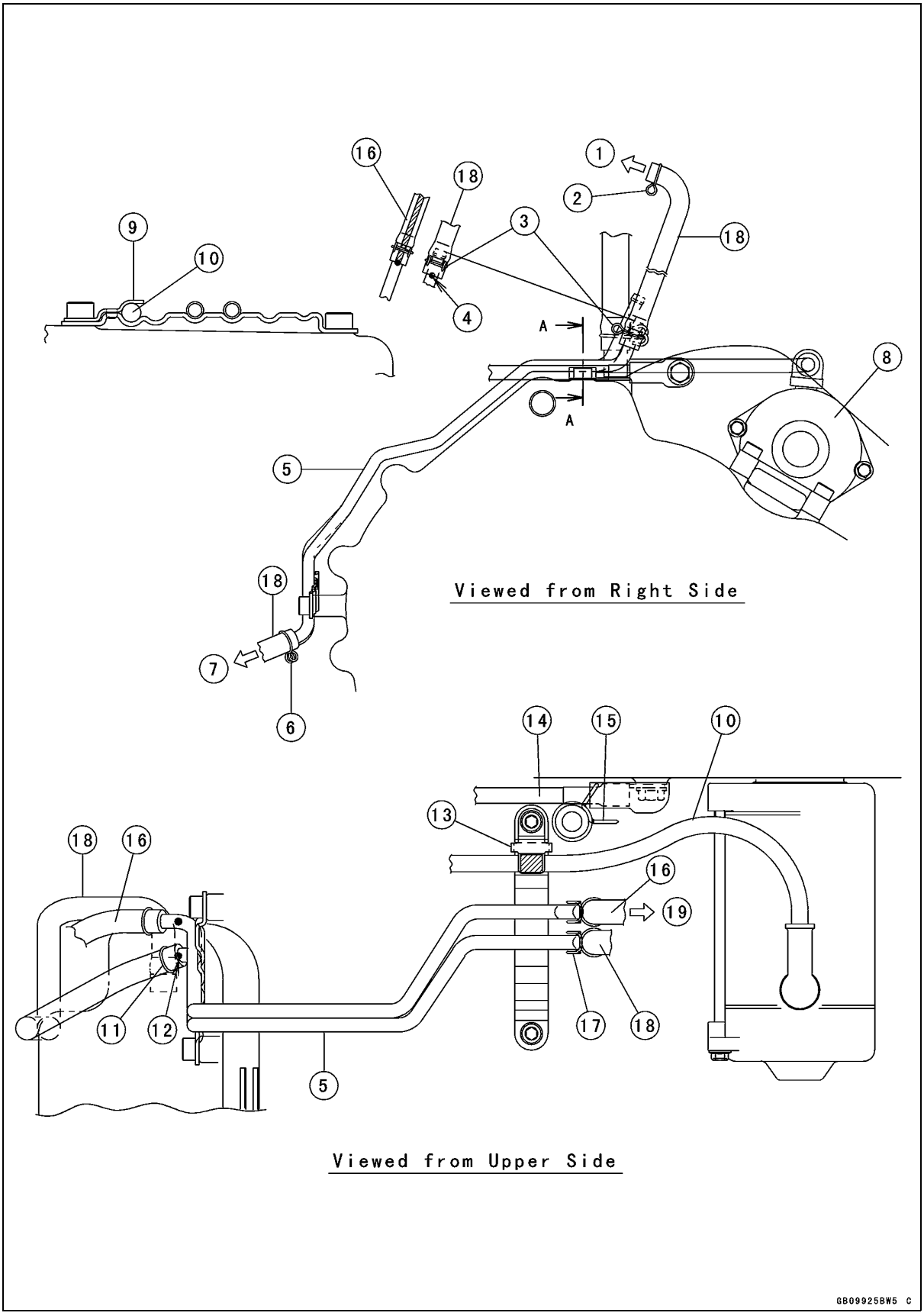
Cable, Wire, and Hose Routing

1. Fuel Tank
2. Meter Unit
3. Meter Unit Lead
4. Run the meter unit lead beside the fuel level sensor.
5. Fuel Pump Lead
6. Fuel Pump
7. Fuel Level Sensor
8. Fuel Level Sensor Lead
9. Fuel Tank
10. Coolant Reservoir Hose (Black) (Brown Pipe ~ Thermostat Cap)
11. Green Hose (Green Pipe ~ Air Switching Valve, California Model)
12. White Hose (White Pipe ~ Throttle Body, California Model)
13. Frame
14. Clamp
15. Fuel Tank Breather Hose (Blue) (Blue Pipe ~ Fuel Tank Blue Fitting, California Model)
16. Fuel Tank Return Hose (Red) (Red Pipe ~ Fuel Tank Red Fitting, California Model)
17. Breather Hose
18. Cover
19. (−) lead
20. Starter Motor Cable
21. Pipe Assembly
22. White
23. Brown
24. Blue
25. Green
26. Red
27. Ignition Switch Lead
28. Meter Cover
29. Clamp
30. Run the ignition switch lead from the meter cover between the ignition switch bracket.
31. Ignition Switch
32. VN2000E6F ~/F6F ~

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Cable, Wire, and Hose Routing

Other than California Model



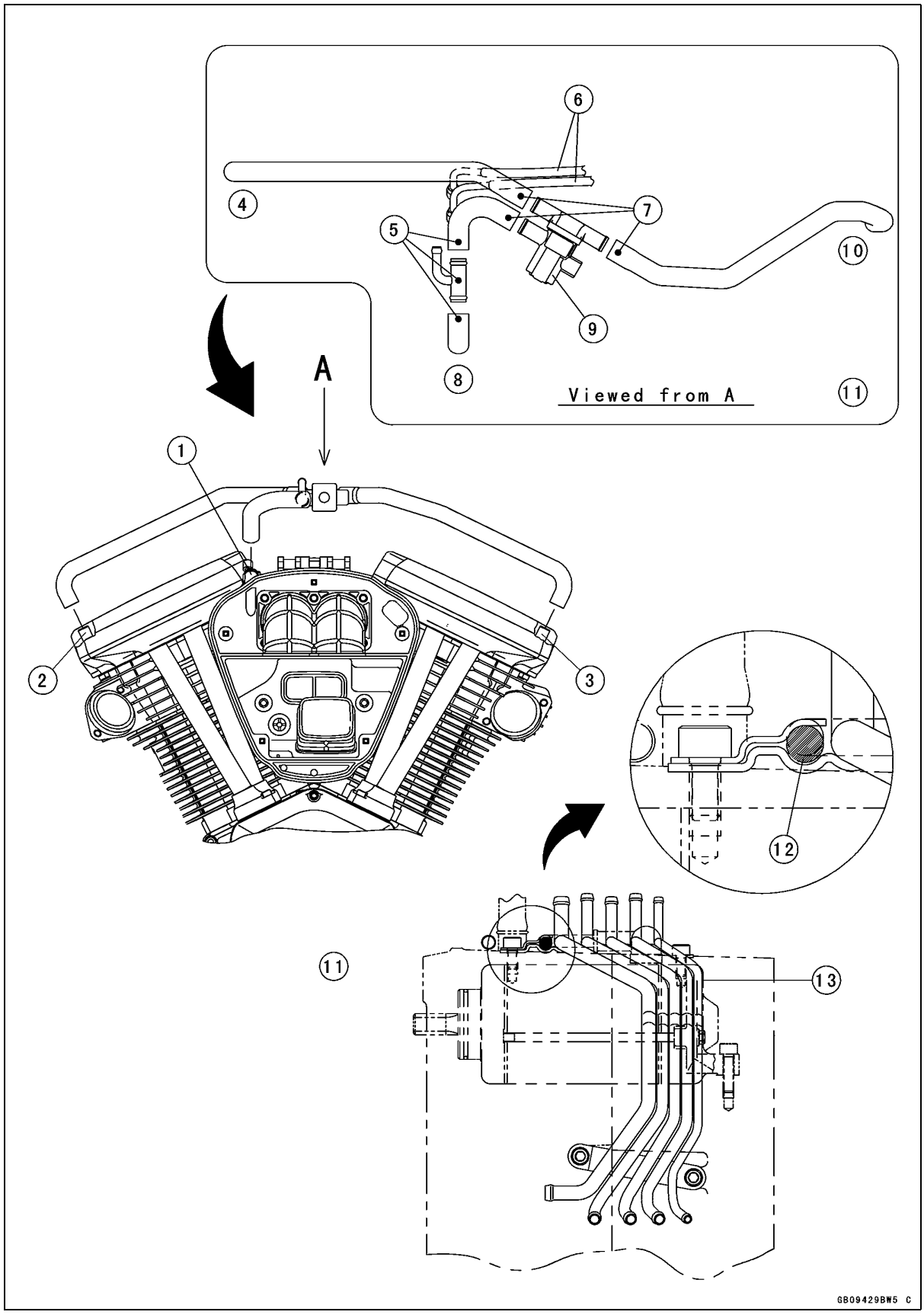
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Cable, Wire, and Hose Routing

1. To Thermostat
2. Clamp
3. Clamp
4. Align the marks and install the coolant hose until the center of the paint mark, and then tighten the clamp.
5. Pipe Assembly
6. Clamp
7. To Coolant Reservoir
8. Starter Motor
9. Clamp
10. Starter Motor Cable
11. Clamp
12. Align the marks and install the coolant hose until the center of the paint mark, and then tighten the clamp.
13. Clamp
14. Battery Cable (Engine Ground)
15. Clamp
16. Fuel Tank Breather Hose
17. Clamp
18. Coolant Hose
19. To fitting of Fuel Tnak

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Cable, Wire, and Hose Routing



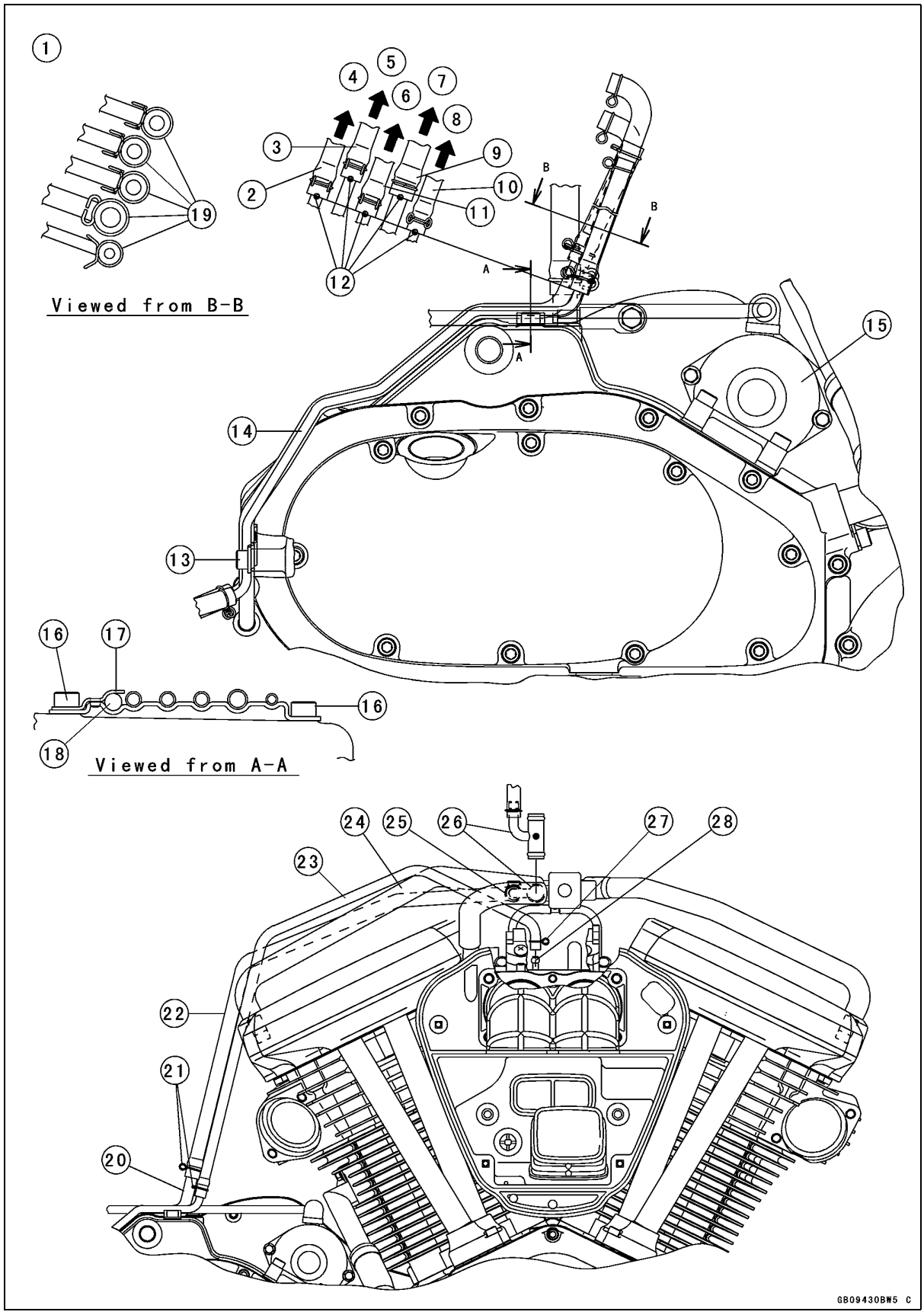
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Cable, Wire, and Hose Routing

1. Air Cleaner Housing
2. Rear Cylinder Fitting
3. Front Cylinder Fitting
4. To Rear Cylinder Fitting
5. Red Paint Marks
6. Throttle Cables
7. White Paint Marks
8. To Air Cleaner Housing Fitting
9. Air Switching Valve
10. To Front Cylinder Fitting
11. California Model
12. Starter Motor Cable
13. Pipe Assembly

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Cable, Wire, and Hose Routing



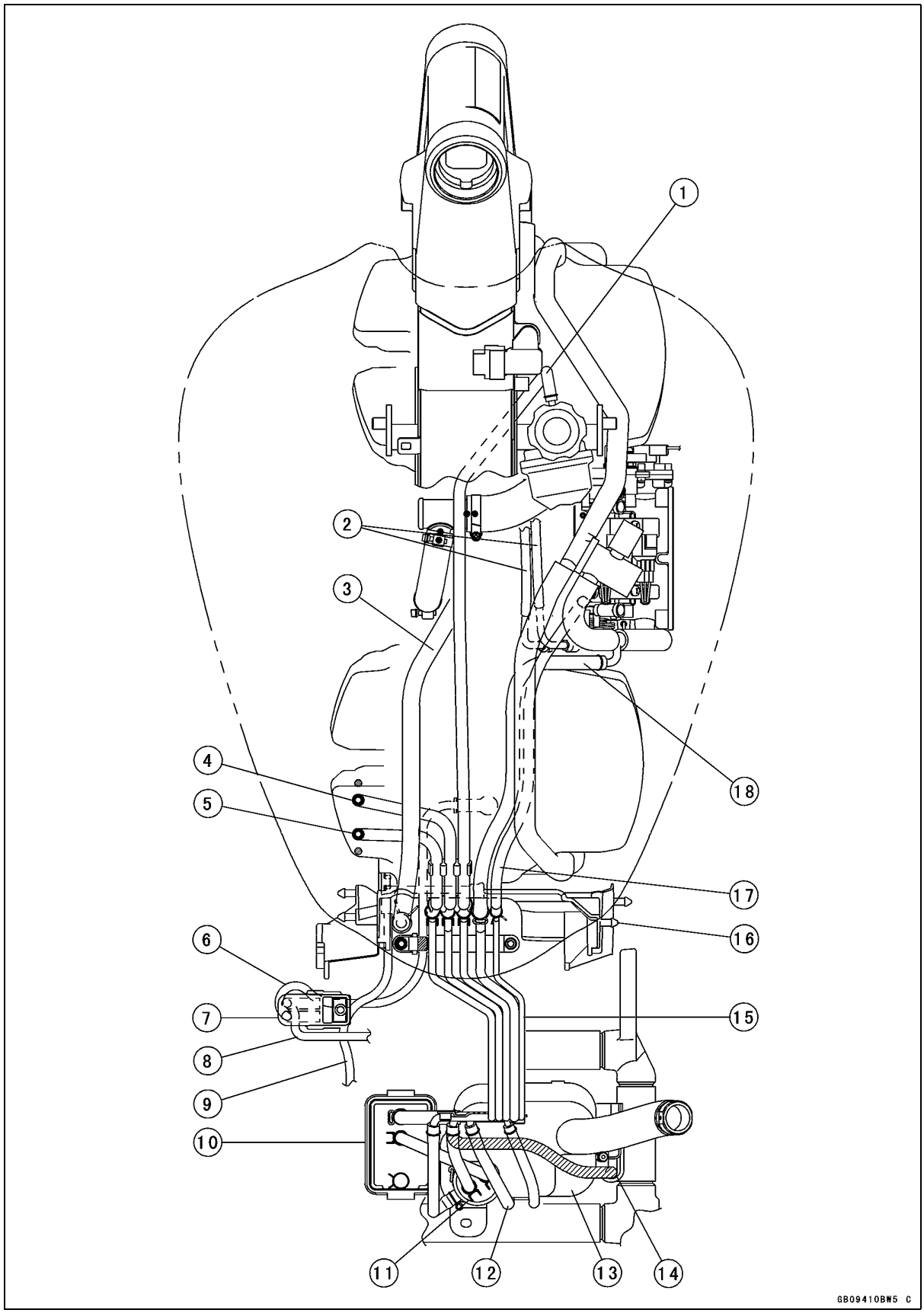
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Cable, Wire, and Hose Routing

1. California Model
2. Red Hose
3. Blue Hose
4. To Red Fitting of Fuel Tank
5. To Blue Fitting of Fuel Tank
6. To Thermostat
7. To Air Switching Valve
8. To Throttle Body
9. Green Hose
10. White Hose
11. Coolant Hose
12. Align the marks and install the hoses until the center of the paint mark, and then tighten the clamps.
13. Bolt
14. Pipe Assembly
15. Starter Motor
16. Bolts
17. Clamp
18. Starter Motor Cable
19. Clamps
20. Pipe Assembly
21. Clamps
22. Green Tape Hose
23. White Stripe Hose
24. Rear Hose
25. Clamp
26. Fitting
27. Clamp
28. Fitting of Throttle Body

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Cable, Wire, and Hose Routing



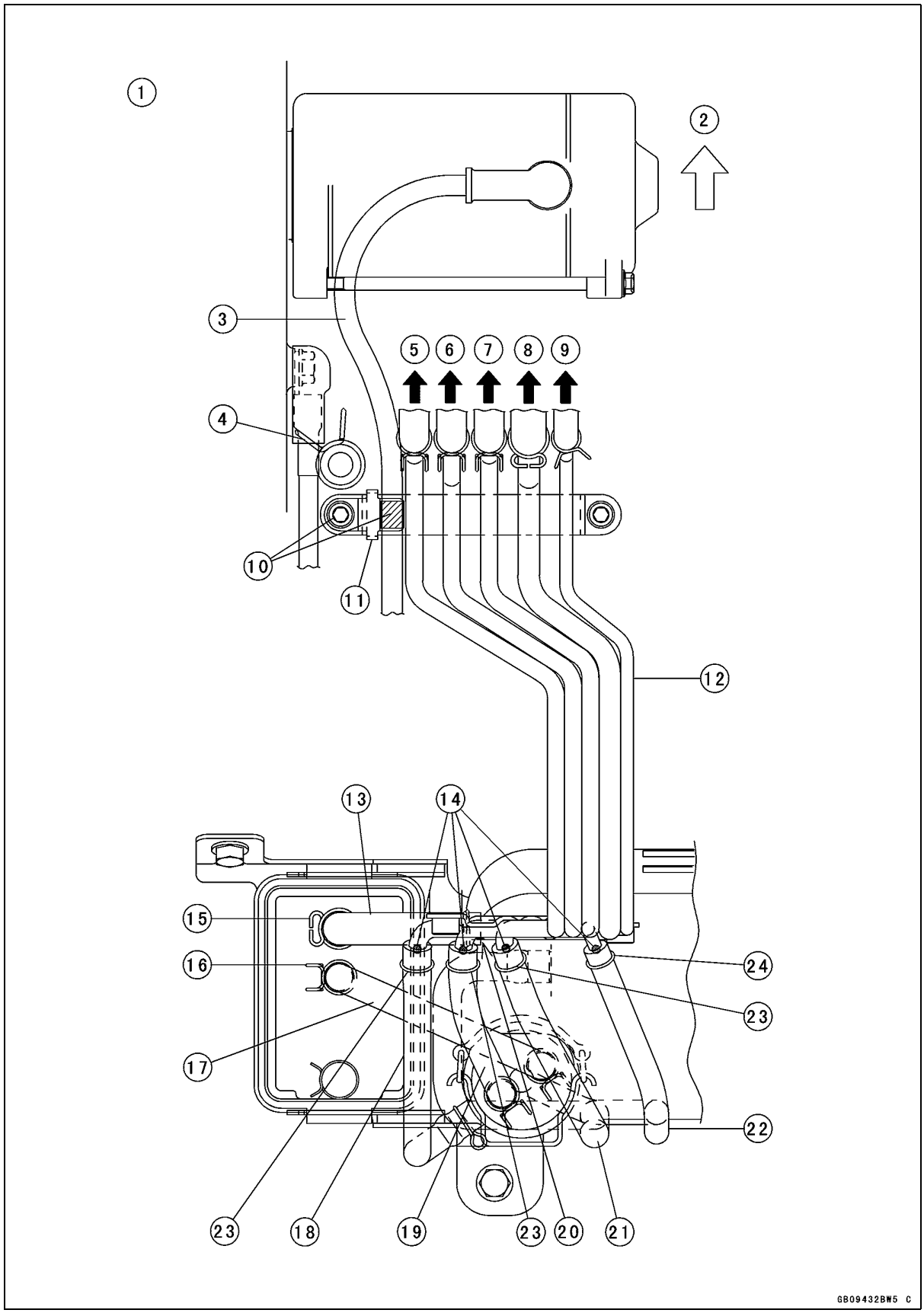
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Cable, Wire, and Hose Routing

1. Coolant Reservoir Hose (Black) (Brown Pipe ~ Thermostat Cap)
2. Throttle Cables
3. Breather Hose
4. Fuel Tank Breather Hose (Blue) (Blue Pipe ~ Blue Fitting of Fuel Tank)
5. Fuel Tank Return Hose (Red) (Red Pipe ~ Red Fitting of Fuel Tank, California Model)
6. Starter Motor Cable
7. Starter Relay
8. Battery Cable (+)
9. Battery Cable (−)
10. Canister (California Model)
11. Separator (California Model)
12. Coolant Reservoir Hose (Black) (Brown Pipe ~ Coolant Reservoir)
13. Coolant Reservoir
14. Fuel Tank Breather Hose (Blue) (Blue Pipe ~ Right Under of Frame, Except California Model)
15. Pipe Assembly
16. Cover
17. Vacuum Hose (White) (White Pipe ~ Throttle Body, California Model)
18. Green Hose (Green) (Green Pipe ~ Air Switching Valve and Air Cleaner, California Model)

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Cable, Wire, and Hose Routing



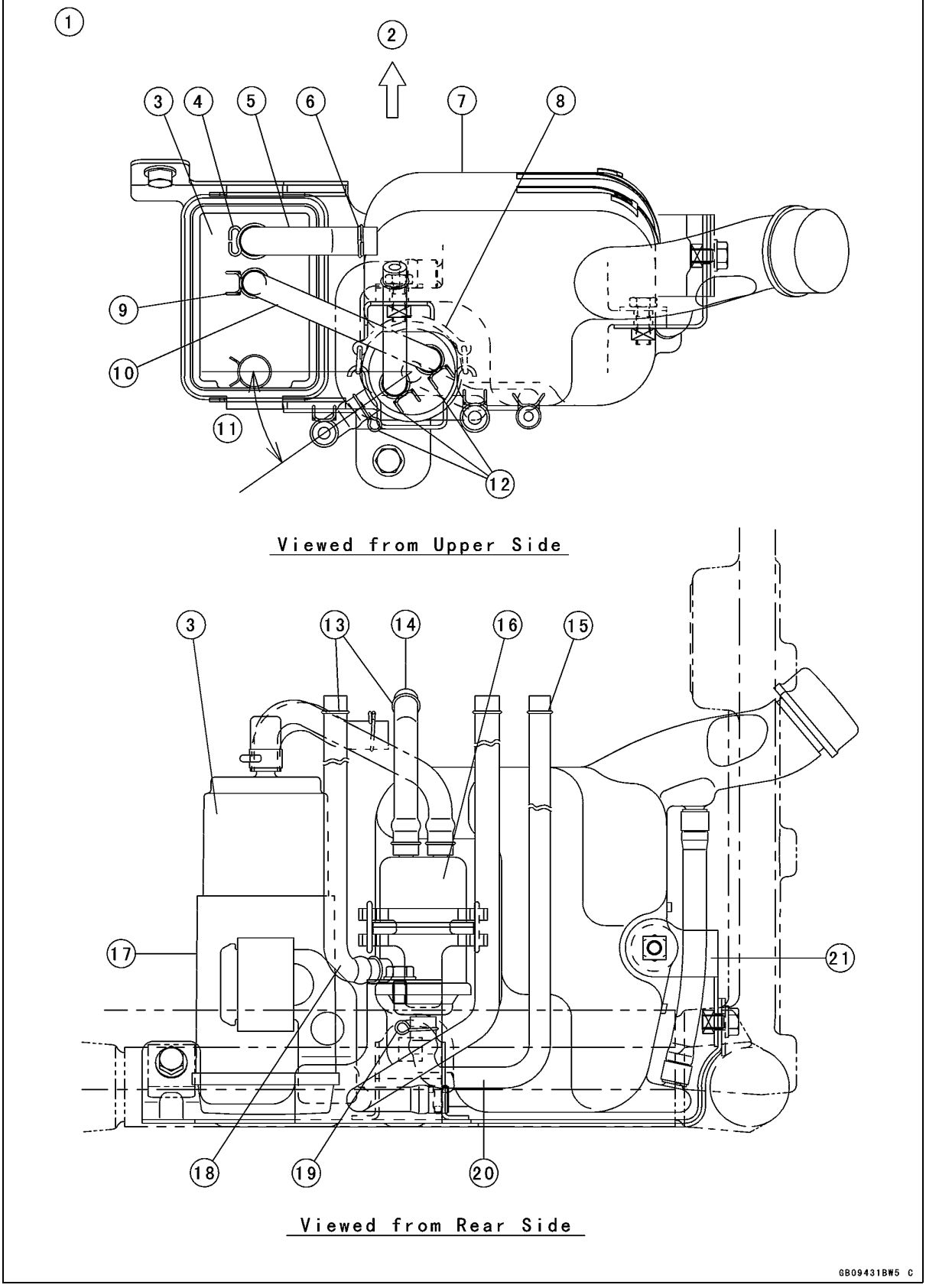
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Cable, Wire, and Hose Routing

1. California Model
2. Front
3. Starter Motor Cable
4. Clamp
5. To Red Fitting of Fuel Tank
6. To Blue Fitting of Fuel Tank
7. To Thermostat
8. To Air Switching Valve
9. To Throttle Body
10. Bolt (Position the red tape of the starter motor at diagonal lines in the figure.)
11. Clamp
12. Pipe Assembly
13. Green Hose
14. Align the marks and install the hoses until the center of the paint mark, and then tighten the clamp.
15. Clamp
16. Clamp
17. Blue Hose
18. Red Hose
19. Blue Hose
20. Align the marks and install the hoses until the center of the paint mark, and then tighten the clamp. Green Mark
21. Coolant Hose
22. White Hose
23. Clamp
24. Clamp

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Cable, Wire, and Hose Routing



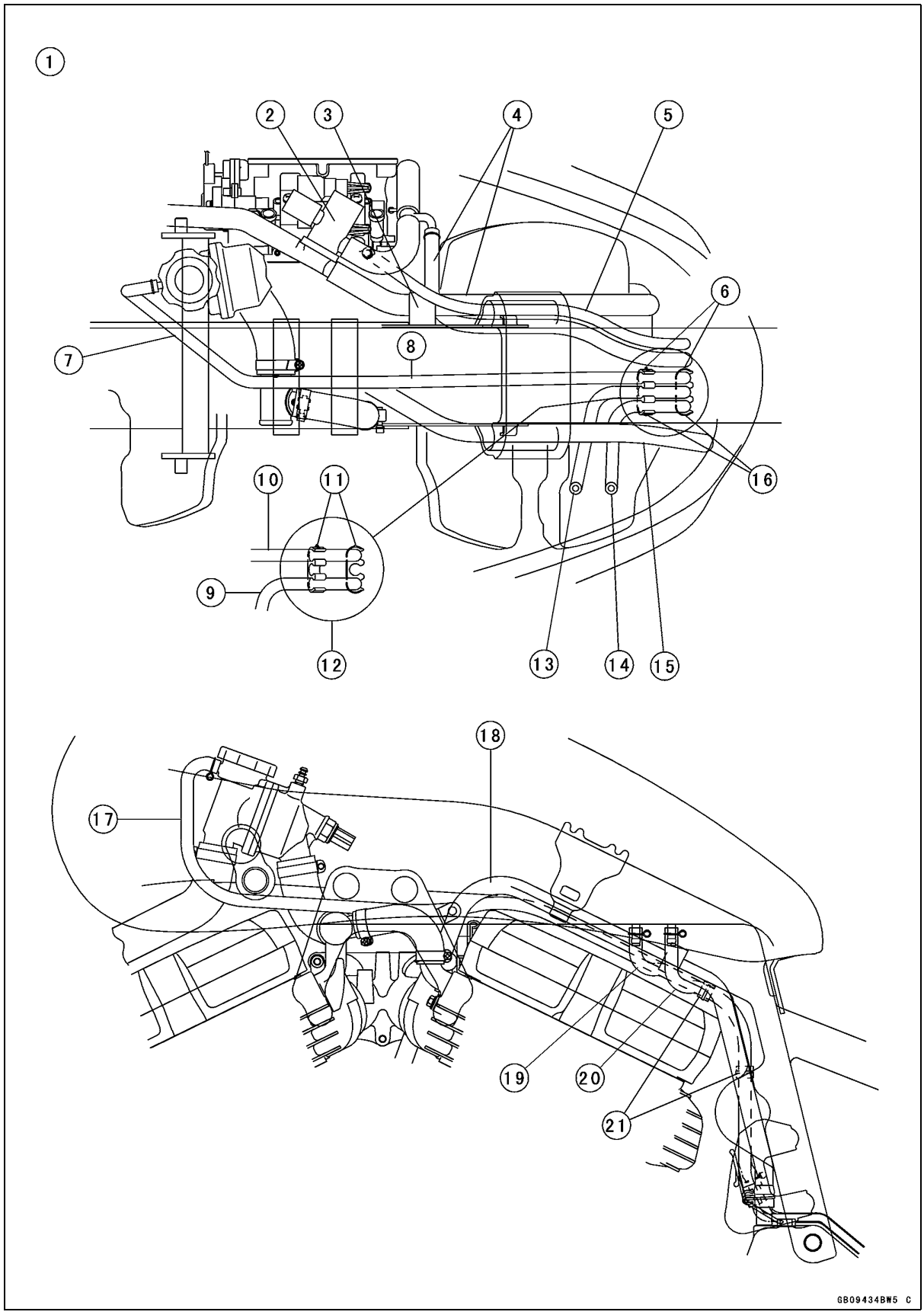
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Cable, Wire, and Hose Routing

1. California Model
2. Front
3. Canister
4. Clamp
5. Green Hose
6. Clamp
7. Coolant Reservoir
8. Band
9. Clamp
10. Blue Hose
11. about 35°
12. Clamps
13. Clamps
14. Blue Hose
15. Clamp
16. Separator
17. Holder
18. Red Hose
19. Clamp
20. White Hose
21. Bracket

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Cable, Wire, and Hose Routing



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Cable, Wire, and Hose Routing

1. California Model
2. Air Switching Valve
3. Hold the hose in the clamp of the frame
4. Run the green hoses under the white hose.
5. Run the white hose between the damper and frame.
6. Put the clamp so that the projection side faces to coolant hose side.
7. Coolant Hose
8. Run the coolant hose right side the water hose.
9. Blue Hose
10. Coolant Hose
11. Clamps
12. Except California Model
13. Blue Hose
14. Red Hose
15. Engine Breather Hose
16. Clamps
17. Coolant Hose
18. Engine Breather Hose
19. Blue Hose (Run the blue hose under the engine breather hose.)
20. Red Hose (Run the blue hose under the engine breather hose.)
21. Clamps

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Troubleshooting Guide (except DFI)

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 gear position 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 (DFI) 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 (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned off
- Clutch lever not pulled in and gear not in neutral whether sidestand up or down
- Though clutch lever pulled in, sidestand 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
- Gear position, starter lockout, or sidestand switch trouble
- Crankshaft 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)
- Decompression mechanism 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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Throttle body assy O-ring damage
Air cleaner duct loose
Air cleaner O-ring damaged
Fuel pump (DFI) 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)
Decompression mechanism sticks open (engine stalls when moving off)
HLA seizure

Backfiring when deceleration:
Air switching valve broken
Air suction valve trouble

Other:
IC igniter in ECU trouble
Engine oil viscosity too high
Drive train trouble
Brake dragging
Engine overheating
Clutch slipping
Air suction valve trouble
Air switching valve trouble

Poor Running or No Power at High Speed:

Firing incorrect:
Spark plug dirty, broken, or maladjusted
Spark plug 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
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 (DFI)
Fuel tank air vent obstructed
Fuel line clogged
Fuel pump trouble (DFI)

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.)
Decompression mechanism 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
Air suction valve trouble
Air switching 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)
For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the spark plug

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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
Decompression mechanism sticks close

Engine load faulty:
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Brake dragging

Lubrication inadequate:
Engine oil level too low
Engine oil poor quality or incorrect

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
ECU trouble
Fan motor broken
Fan blade damaged
Water pump not turning
Water pump impeller damaged

Over Cooling:

Cooling system component incorrect:
ECU 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 hub or housing unevenly worn
No clutch lever play
Clutch inner cable trouble
Clutch release mechanism trouble

Clutch not disengaging properly:
Clutch plate warped or too rough
Spring plate free play maladjustment
Clutch spring compression uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch hub nut loose
Clutch hub spline damaged
Clutch friction plate installed wrong
Clutch lever play excessive
Clutch release mechanism trouble

Gear Shifting Faulty:

Doesn't go into gear; shift pedal doesn't return:
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft
Gear 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
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)

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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
Air switching 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
Water pump gear, sprocket worn

Abnormal Drive Train Noise:

Clutch noise:
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:
Drive belt adjusted improperly
Drive belt worn
Rear and/or engine sprocket worn
Rear wheel coupling damaged

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
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
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

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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.
2004	VN2000-A1	JKBVNMA1□4A000001 or JKBVNW00AAA000001 or VNW00A-000001
2005	VN2000-A2	JKBVNMA1□5A006001 or JKBVNW00AAA006001 or VNW00A-006001
2005	VN2000-D1	JKBVNMD1□5A000001
2006	VN2000A6F	JKBVNMA1□6A010001 or JKBVNW00AAA010001
2006	VN2000D6F	JKBVNMD1□6A003001
2006	VN2000E6F	JKBVNME1□6A000001
2006	VN2000F6F	JKBVNMF1□6A000001
2007	VN2000A7F	JKBVNMA1□7A012001
2007	VN2000E7F	JKBVNME1□7A002001
2007	VN2000F7F	JKBVNMF1□7A004001

□:This digit in the frame number changes from one machine to another.

Kawasaki
KAWASAKI HEAVY INDUSTRIES, LTD.
Consumer Products & Machinery Company

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