VERSYS 650
VERSYS 650 ABS

Motorcycle
Service Manual

Kawasaki

Quick Reference Guide

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

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

Kawasaki

VERSYS 650
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LIST OF ABBREVIATIONS

A	ampere(s)	IC	integrated circuit
ABDC	after bottom dead center	in.	inch(es)
ABS	antilock brake system	km/h	kilometers per hour
AC	alternating current	L	liter(s)
Ah	ampere hour	LCD	liquid crystal display
ATDC	after top dead center	LED	light emitting diode
BBDC	before bottom dead center	lb	pound(s)
BDC	bottom dead center	m	meter(s)
BTDC	before top dead center	min	minute(s)
°C	degree(s) Celsius	mmHg	millimeters of mercury
cmHg	centimeters of mercury	mph	miles per hour
CPU	central processing unit	N	newton(s)
cu in.	cubic inch(es)	oz	ounce(s)
DC	direct current	Pa	pascal(s)
DFI	digital fuel injection	PS	horsepower
DOHC	double overhead camshaft	psi	pound(s) per square inch
DOT	department of transportation	qt	quart(s)
ECU	electronic control unit	r	revolution
F	farad(s)	rpm	revolution(s) per minute
°F	degree(s) Fahrenheit	s	second(s)
ft	foot, feet	TDC	top dead center
g	gram(s)	TIR	total indicator reading
gal	gallon(s)	V	volt(s)
h	hour(s)	W	watt(s)
HP	horsepower(s)	Ω	ohm(s)

COUNTRY AND AREA CODES

AT	Austria	ID	Indonesia
AU	Australia	MY	Malaysia
AU LAMS	Australia Leaner Approved Motorcycle Scheme model	PH	Philippines
CA	Canada	SEA-B1	Southeast Asia B1 (with Evaporative Emission Control System)
CAL	California	SEA-B2	Southeast Asia B2
CH	Switzerland	TH	Thailand
CN	China	US	United States
DE	Germany	WVTA (FULL H)	WVTA Model with Honeycomb Catalytic Converter (Full Power)
EUR	Europe		

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 intake 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.

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

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

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

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

NOTE

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

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

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

TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

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

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

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

Foreword

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

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

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

To get the longest life out of your vehicle.

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

How to Use This Manual

In this manual, the product is divided into its major systems and these systems make up the manual's chapters. The Quick Reference Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

For example, if you want stick 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 Stick Coil section.

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

⚠ DANGER

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

⚠ WARNING

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

NOTICE

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

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

NOTE

○*NOTE indicates information that may help or guide you in the operation or service of the vehicle.*

- Indicates a procedural step or work to be done.

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

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

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

General Information

Table of Contents

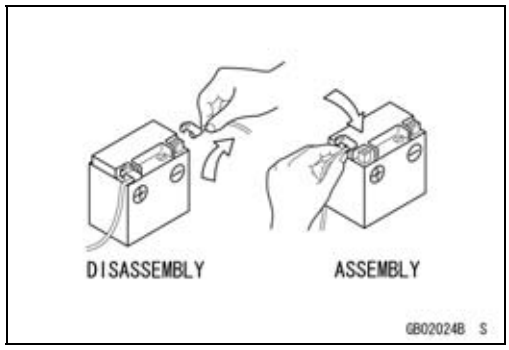
Before Servicing

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

Especially note the following.

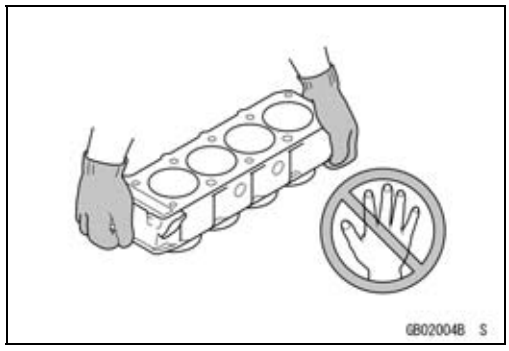
Battery Ground

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



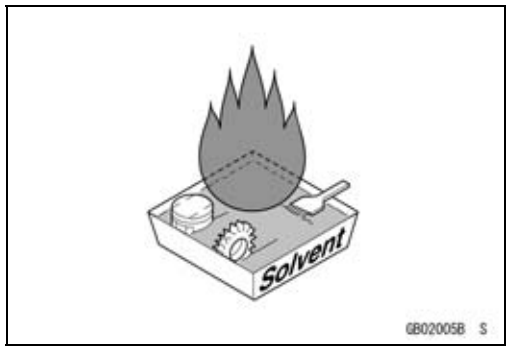
Edges of Parts

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



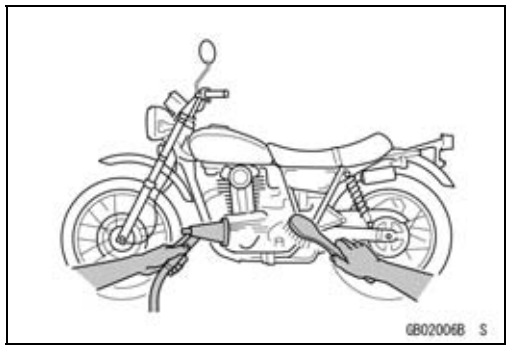
Solvent

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



Cleaning Vehicle before Disassembly

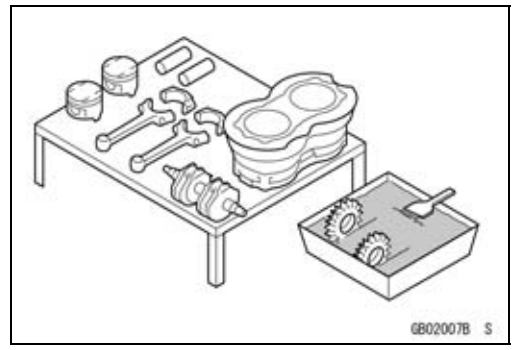
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



Before Servicing

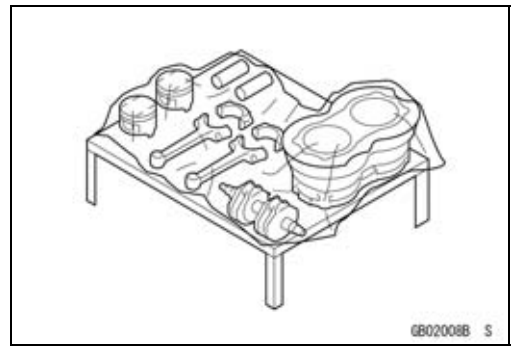
Arrangement and Cleaning of Removed Parts

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



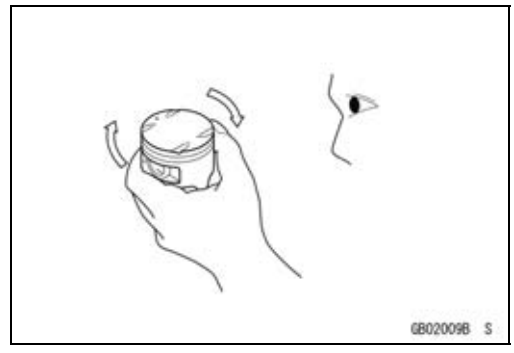
Storage of Removed Parts

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



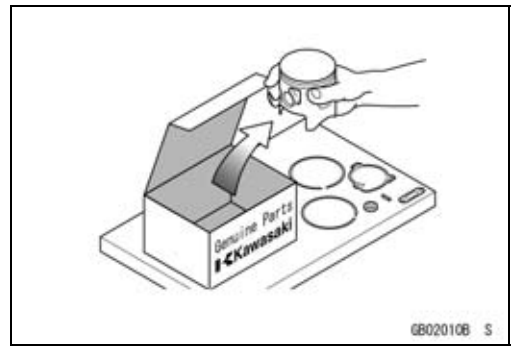
Inspection

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



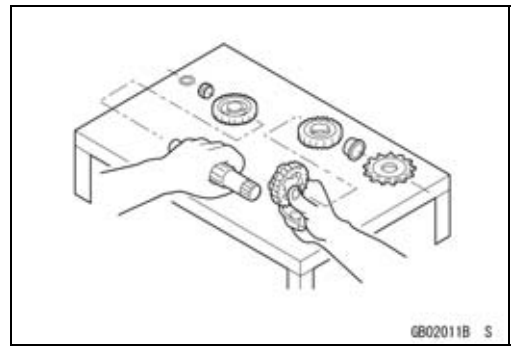
Replacement Parts

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



Assembly Order

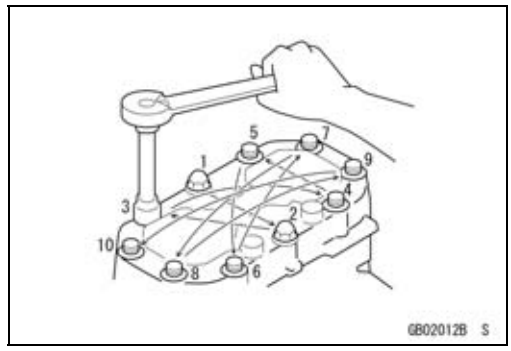
In most cases assembly order is the reverse of disassembly, however, if assembly order is provided in this Service Manual, follow the procedures given.



Before Servicing

Tightening Sequence

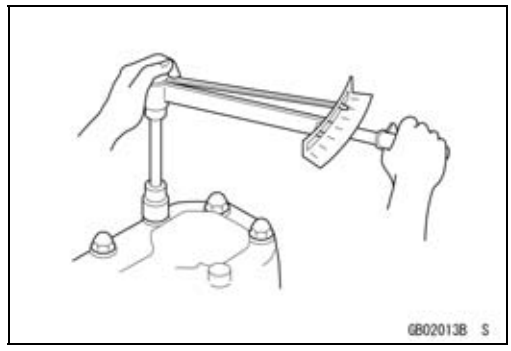
Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. Conversely when loosening the bolts, nuts, or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

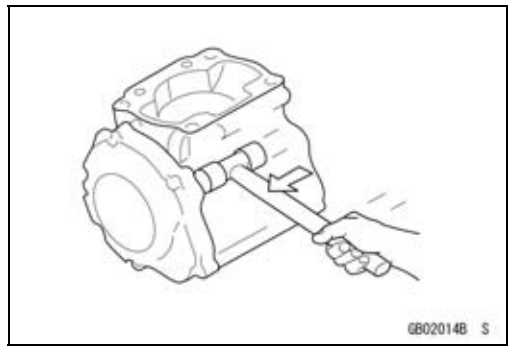
Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.

All of the tightening torque values are for use with dry, solvent - cleaned threads unless otherwise indicated. If a fastener which should have dry, clean threads gets contaminated with lubricant, etc., applying even the specified torque could damage it.



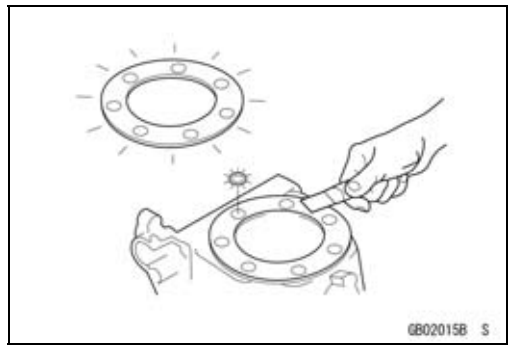
Force

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



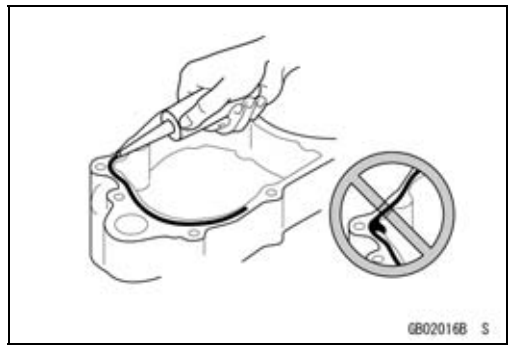
Gasket, O-ring

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



Liquid Gasket, Non-permanent Locking Agent

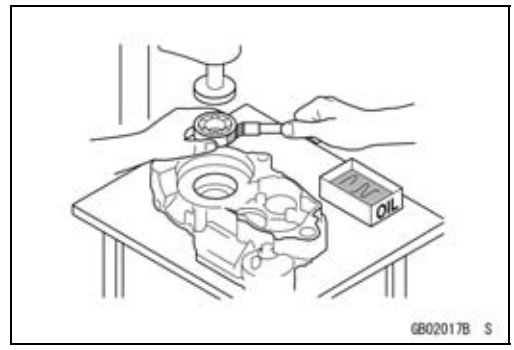
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



Before Servicing

Press

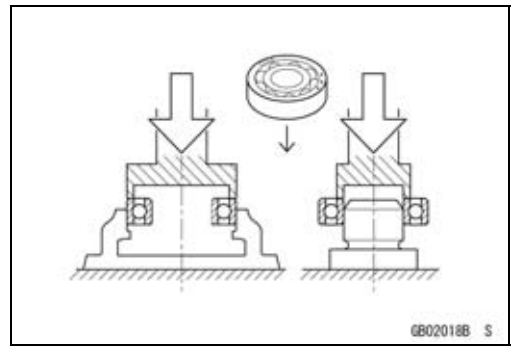
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing and Needle Bearing

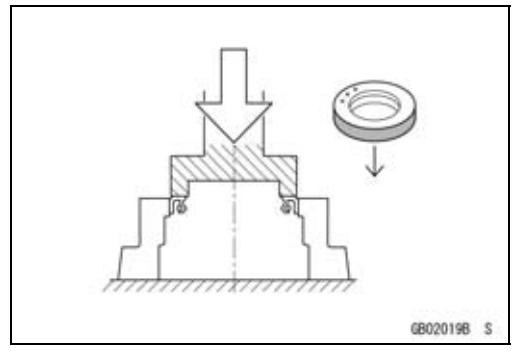
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

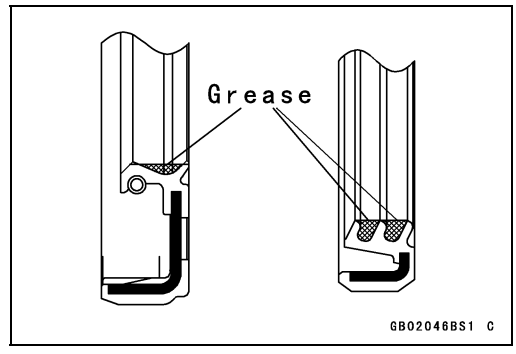


Oil Seal, Grease Seal

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

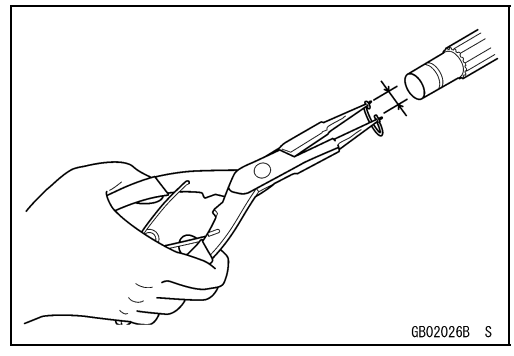


Apply specified grease to the lip of seal before installing the seal.



Circlips, Cotter Pins

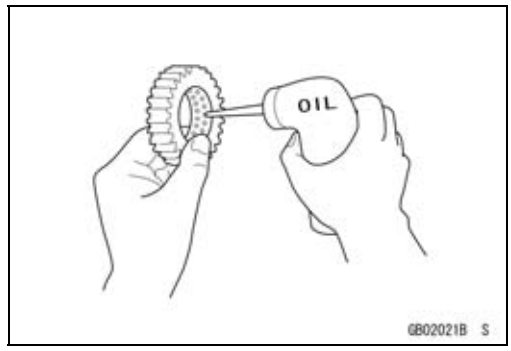
Replace the circlips or cotter pins that were removed with new ones. Take care not to open the clip excessively when installing to prevent deformation.



Before Servicing

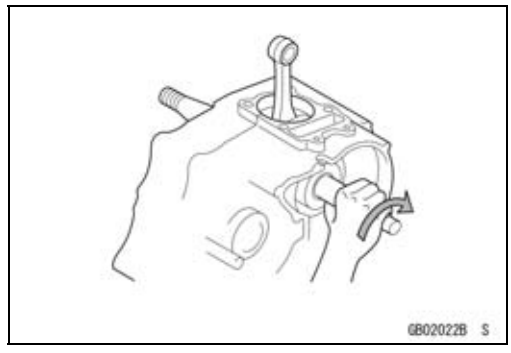
Lubrication

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



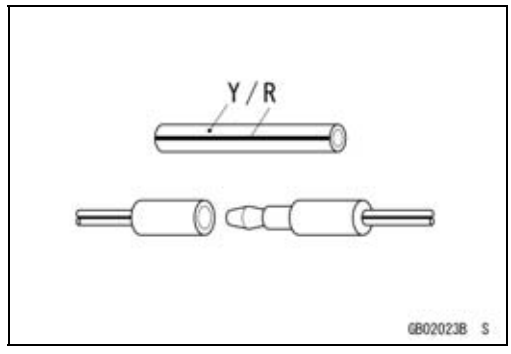
Direction of Engine Rotation

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



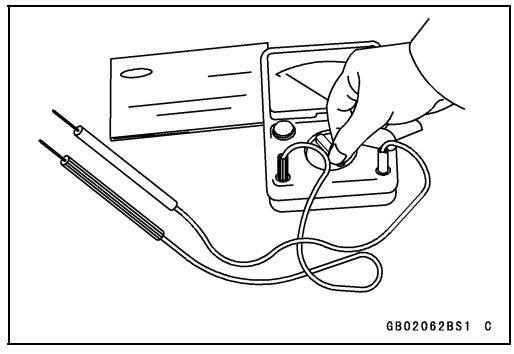
Electrical Wires

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



Instrument

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

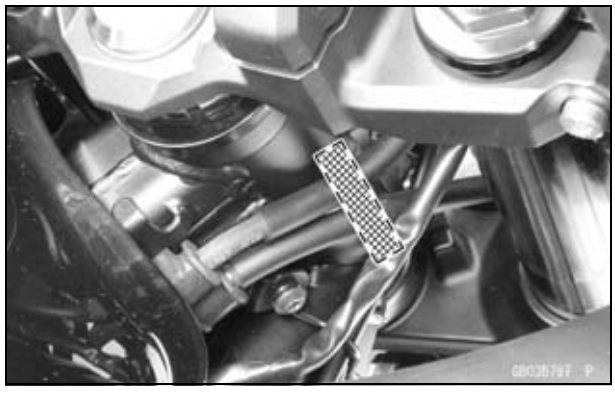


Model Identification

KLE650EF Left Side View

KLE650EF Right Side View

Frame Number



Engine Number

Model Identification

KLE650FF Left Side View

KLE650FF Right Side View

General Specifications

Items	KLE650EF/FF
Dimensions	
Overall Length	2 165 mm (85.24 in.)
Overall Width	840 mm (33.07 in.)
Overall Height/High Position	1 400 mm (55.12 in.)/1 450 mm (57.09 in.)
Wheel Base	1 415 mm (55.71 in.)
Ground Clearance	170 mm (6.69 in.)
Seat Height	840 mm (33.1 in.)
Curb Mass:	
KLE650E	214 kg (472 lb)
KLE650F	216 kg (476 lb)
Front:	
KLE650E	108 kg (238 lb)
KLE650F	109 kg (240 lb)
Rear:	
KLE650E	106 kg (234 lb)
KLE650F	107 kg (236 lb)
Fuel Tank Capacity	21 L (5.5 US gal)
Performance	
Minimum Turning Radius	2.7 m (8.9 ft.)
Engine	
Type	4-stroke, DOHC, 2-cylinder
Cooling System	Liquid-cooled
Bore and Stroke	83.0 × 60.0 mm (3.27 × 2.36 in.)
Displacement	649 cm^3 (39.6 cu in.)
Compression Ratio	10.8:1
Maximum Horsepower	51 kW (69 PS) @8 500 r/min (rpm) (EUR) 51.0 kW (69 PS) @8 500 r/min (rpm) (AU-LAMS) 39 kW (53 PS) @7 800 r/min (rpm) (CN) 48 kW (65 PS) @8 000 r/min (rpm) (CA, CAL, US) – – –
Maximum Torque	64 N·m (6.5 kgf·m, 47 ft·lb) @7 000 r/min (rpm) (EUR) 64.0 N·m (6.5 kgf·m, 48 ft·lb) @7 000 r/min (rpm) (AU-LAMS) 57 N·m (5.8 kgf·m, 42 ft·lb) @3 800 r/min (rpm) (CN) 61 N·m (6.2 kgf·m, 45 ft·lb) @7 000 r/min (rpm) (CA, CAL, US) – – –
Fuel System	FI (Fuel injection) KEIHIN TTK38 × 2
Fuel Type:	Unleaded gasoline
Minimum Octane Rating:	
Research Octane number (RON)	91
Antiknock Index (RON + MON)/2	87
Starting System	Electric Starter
Ignition System	Battery and coil (transistorized)
Timing Advance	Electronically advanced (IC igniter in ECU)

General Specifications

Items	KLE650EF/FF
Ignition Timing	From 10° BTDC @1 300 r/min (rpm) to 56° BTDC @5 200 r/min (rpm)
Spark Plug	NGK CR9EIA-9
Cylinder Numbering Method	Left to right, 1-2
Firing Order	1-2
Valve Timing:	
Intake:	
Open	26° BTDC
Close	54° ABDC
Duration	260°
Exhaust:	
Open	47° BBDC
Close	25° ATDC
Duration	252°
Lubrication System	Forced lubrication (semi-dry sump)
Engine Oil:	
Grade	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2
Viscosity	SAE 10W-40
Capacity	2.3 L (2.4 US qt)
Drive Train	
Primary Reduction System:	
Type	Gear
Reduction Ratio	2.095 (88/42)
Clutch Type	Wet multi disc
Transmission:	
Type	6-speed, constant mesh, return shift
Gear Ratios:	
1st	2.438 (39/16)
2nd	1.714 (36/21)
3rd	1.333 (32/24)
4th	1.111 (30/27)
5th	0.966 (28/29)
6th	0.852 (23/27)
Final Drive System:	
Type	Chain drive
Reduction Ratio	3.067 (46/15)
Overall Drive Ratio	5.473 @Top gear
Frame	
Type	Tubular, diamond
Caster (Rake Angle)	25°
Trail	108 mm (4.25 in.)

General Specifications

Items	KLE650EF/FF
Front Tire:	
Type	Tubeless
Size	120/70ZR 17M/C (58W)
Rim Size	J17M/C × MT3.50
Rear Tire:	
Type	Tubeless
Size	160/60ZR 17M/C (69W)
Rim Size	J17M/C × MT4.50
Front Suspension:	
Type	Telescopic fork (upside-down)
Wheel Travel	150 mm (5.91 in.)
Rear Suspension:	
Type	Swingarm
Wheel Travel	145 mm (5.71 in.)
Brake Type:	
Front	Dual discs
Rear	Single disc
Electrical Equipment	
Battery	12 V 10 Ah (10 HR)
Headlight:	
High Beam	12 V 55 W × 2
Low Beam	12 V 55 W
Brake/Tail Light	LED
Alternator:	
Type	Three-phase AC
Maximum Output	14 V – 24 A @5 000 r/min (rpm)

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

Unit Conversion Table

Prefixes for Units:

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

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

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

Units of Force:

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

Units of Length:

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

Units of Torque:

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

Units of Pressure:

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

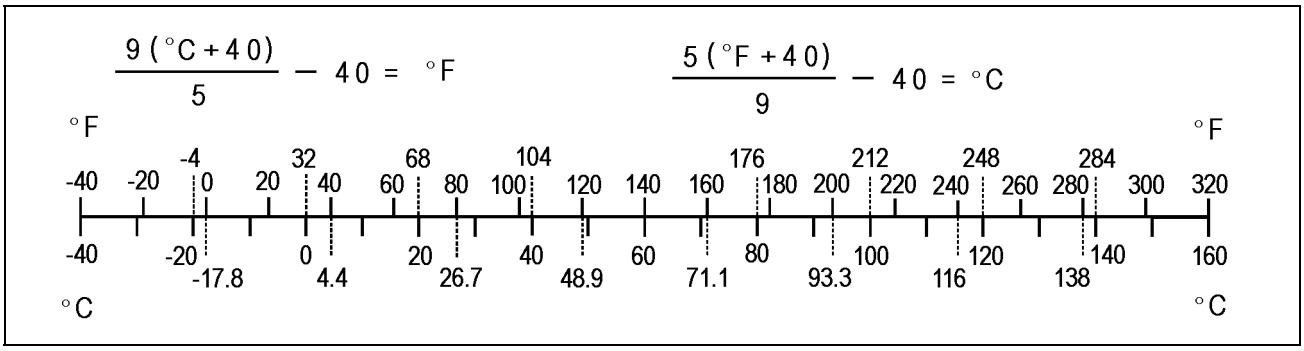
Units of Speed:

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:



Periodic Maintenance

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Periodic Maintenance Chart

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

Periodic Inspection

*A: Service at number of years shown or indicated odometer reading intervals, whichever comes first.
*B: For higher odometer readings, repeat at the frequency interval established here.
*C: Service more frequently when operating in severe conditions: dusty, wet, muddy, high speed, or frequent starting/stopping.
○: Emission Related Item

Q: Inspection
: Change or Replace
: Lubrication

	Items	year (*A)	Odometer Reading (*B) × 1 000 km (× 1 000 mile) 1 (0.6)	6 (3.8)	12 (7.6)	18 (11.4)	24 (15.2)	See Page
Fuel System								
○	Air cleaner element (*C)							2-14
○	Idle speed		Q		Q		Q	2-15
○	Throttle control system (play, smooth return, no drag)	Q:1	Q		Q		Q	2-15
○	Engine vacuum synchronization				Q		Q	2-16
	Fuel system	Q:1	Q		Q		Q	2-19
	Fuel hose	:5						2-20
○	Evaporative emission control system (CAL, SEA-B1, TH and CN Models)		Q	Q	Q	Q	Q	2-22
Cooling System								
	Coolant level		Q		Q		Q	2-22
	Cooling system	Q:1	Q		Q		Q	2-23
	Coolant, water hoses and O-rings	:3	: every 36 000 km (22 500 mile)					2-23, 2-25
Engine Top End								
○	Valve clearance (US and CA Models)						Q	2-25
	Valve clearance (Other than US and CA Models)		Q: every 42 000 km (26 250 mile)					2-25
○	Air suction system				Q		Q	2-31
Clutch								
	Clutch operation (play, engagement, disengagement)		Q		Q		Q	2-32
Engine Lubrication System								
	Engine oil and oil filter (*C)	:1						2-33, 2-34
Wheels and Tires								
	Tire air pressure	Q:1			Q		Q	2-35
	Wheels and tires	Q:1			Q		Q	2-35

2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

	Items	year (*A)	Odometer Reading (*B) × 1 000 km (× 1 000 mile) 1 (0.6)	6 (3.8)	12 (7.6)	18 (11.4)	24 (15.2)	See Page
	Wheel bearing damage	Q:1			Q		Q	2-36
Final Drive								
	Drive chain lubrication condition (*C)		Q: every 600 km (400 mile)					2-37
	Drive chain slack (*C)		Q: every 1 000 km (600 mile)					2-37
	Drive chain wear (*C)				Q		Q	2-39
	Drive chain guide wear				Q		Q	2-40
Brakes								
	Brake system	Q:1	Q	Q	Q	Q	Q	2-40
	Brake operation (effectiveness, play, no drag)	Q:1	Q	Q	Q	Q	Q	2-41
	Brake fluid level	Q:0.5	Q	Q	Q	Q	Q	2-41
	Brake fluid (front and rear)	R:2					R	2-42
	Brake hoses	R:4						2-44
	Rubber parts of brake master cylinder and caliper	R:4	R: every 48 000 km (30 000 mile)					2-47, 2-48
	Brake pad wear (*C)			Q	Q	Q	Q	2-51
	Brake light switch operation		Q	Q	Q	Q	Q	2-52
Suspension								
	Suspension system	Q:1			Q		Q	2-52
Steering								
	Steering play	Q:1	Q		Q		Q	2-53
	Steering stem bearings	L:2					L	2-55
Electrical System								
	Electrical system	Q:1			Q		Q	2-56
○	Spark plugs				R		R	2-61
Others								
	Chassis parts	L:1			L		L	2-61
	Condition of bolts, nuts and fasteners		Q		Q		Q	2-62

Torque and Locking Agent

The following tables list the tightening torque for the major fasteners requiring use of a non-permanent locking agent or silicone sealant etc. All of the values are for use with dry solvent - cleaned threads unless otherwise indicated.

Letters used in the “Remarks” column mean:
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
Lh: Left-hand Threads
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)
R: Replacement Parts
S: Follow the specified tightening sequence.
Si: Apply silicone grease.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System (DFI)				
Spark Plugs	15	1.5	11	
Water Temperature Sensor	12	1.2	106 in·lb	
Crankshaft Sensor Bolts	6.0	0.61	53 in·lb	
Intake Air Temperature Sensor Screw	1.2	0.12	11 in·lb	
Air Cleaner Housing Assembly Screws	1.2	0.12	11 in·lb	
Air Cleaner Element Screw	1.2	0.12	11 in·lb	
Vehicle-down Sensor Mounting Bolls	6.9	0.70	61 in·lb	
Air Cleaner Housing Clamp Bolt	2.0	0.20	18 in·lb	
Speed Sensor Bolt	7.8	0.80	69 in·lb	L
Oxygen Sensor	25	2.5	18	
Switch Housing Screws	3.5	0.36	31 in·lb	
Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
Throttle Valve Assy Clamp Mounting Screw	2.1	0.21	19 in·lb	
Delivery Pipe Assy Mounting Screws	3.4	0.35	30 in·lb	
Canister Bracket Bolts	9.8	1.0	87 in·lb	
Purge Valve Mounting Nut	7.0	0.71	62 in·lb	
Cooling System				
Radiator Mounting Bolt	7.9	0.81	70 in·lb	
Coolant Reserve Tank Bolts	7.9	0.81	70 in·lb	
Radiator Fan Assembly Mounting Bolts	8.4	0.86	74 in·lb	
Water Hose Clamp Screws	3.0	0.31	27 in·lb	
Thermostat Housing Bolts	12	1.2	106 in·lb	
Water Temperature Sensor	12	1.2	106 in·lb	
Water Pump Cover Bolts, L = 30 mm (1.2 in.)	12	1.2	106 in·lb	
Water Pump Cover Bolts, L = 40 mm (1.6 in.)	12	1.2	106 in·lb	
Coolant Drain Bolt	12	1.2	106 in·lb	
Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
Engine Top End				
Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	
Bracket Mounting Bolts	6.9	0.70	61 in·lb	
Clamp Mounting Bolt	9.8	1.0	87 in·lb	
Camshaft Sprocket Bolts	15	1.5	11	L
Camshaft Cap Bolts	12	1.2	106 in·lb	S
Cylinder Head Plugs	19.6	2.00	14.5	L
Rear Camshaft Chain Guide Bolts	20	2.0	15	L
Throttle Body Assy Holder Clamp Bolts	2.0	0.20	18 in·lb	
Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	
Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in·lb	
Cylinder Head Bolts (M10), L = 158 mm (6.2 in.), First	25	2.5	18	MO, S
Cylinder Head Bolts (M10), L = 158 mm (6.2 in.), Final	55.9	5.70	41.2	MO, S
Cylinder Head Bolts (M10), L = 176 mm (6.9 in.), First	25	2.5	18	MO, S
Cylinder Head Bolts (M10), L = 176 mm (6.9 in.), Final	55.9	5.70	41.2	MO, S
Cylinder Head Bolts (M10), L = 80 mm (3.1 in.), First	25	2.5	18	MO, S
Cylinder Head Bolts (M10), L = 80 mm (3.1 in.), Final	55.9	5.70	41.2	MO, S
Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
Cylinder Bolt (M8)	27.5	2.80	20.3	MO, S
Cylinder Bolts (M6)	12	1.2	106 in·lb	S
Cylinder Nut	49	5.0	36	MO, S
Muffler Body Mounting Bolt	20	2.0	15	
Muffler Body Mounting Nut	20	2.0	15	
Exhaust Pipe Holder Nuts	17	1.7	13	
Clutch				
Clutch Lever Holder Clamp Bolts	7.8	0.80	69 in·lb	S
Clutch Cable Holder Bolts	9.8	1.0	87 in·lb	L
Clutch Cover Bolts	9.8	1.0	87 in·lb	S
Timing Inspection Cap	3.9	0.40	35 in·lb	
Timing Rotor Bolt Cap	4.9	0.50	43 in·lb	
Clutch Spring Bolts	9.8	1.0	87 in·lb	
Clutch Hub Nut	200	20.4	148	R
Oil Pump Sprocket Bolt	12	1.2	106 in·lb	L, Lh
Oil Pump Chain Guide Bolt, L = 12 mm (0.47 in.)	12	1.2	106 in·lb	L
Oil Pump Chain Guide Bolt, L = 11 mm (0.43 in.)	12	1.2	106 in·lb	
Engine Lubrication System				
Oil Filter	17.5	1.78	12.9	G, R
Oil Filter Pipe	25	2.5	18	L

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Pressure Switch	15	1.5	11	LG
Oil Pressure Relief Valve	15	1.5	11	L
Oil Pipe Retaining Plate Bolt	9.8	1.0	87 in·lb	L
Oil Passage Plug (PT3/8)	20	2.0	15	L
Oil Pump Sprocket Bolt	12	1.2	106 in·lb	L, Lh
Oil Pump Chain Guide Bolt, L = 12 mm (0.47 in.)	12	1.2	106 in·lb	L
Oil Pump Chain Guide Bolt, L = 11 mm (0.43 in.)	12	1.2	106 in·lb	
Oil Pump Cover Bolts	9.8	1.0	87 in·lb	L
Oil Strainer Holder Bolts	9.8	1.0	87 in·lb	L
Oil Pan Bolts	12	1.2	106 in·lb	S
Engine Oil Drain Bolt	30	3.1	22	
Engine Removal/Installation				
Engine Bracket Bolts	25	2.5	18	S
Front Engine Mounting Bolt, L = 110 mm (4.33 in.)	44	4.5	32	S
Front Engine Mounting Bolt, L = 150 mm (5.90 in.)	44	4.5	32	S
Upper Engine Mounting Nut	44	4.5	32	S
Lower Engine Mounting Nut	44	4.5	32	S
Adjusting Collar Locknut	49	5.0	36	
Adjusting Collar	9.8	1.0	87 in·lb	
Crankshaft/Transmission				
Connecting Rod Big End Nuts	see Text	–	–	MO
Side Oil Plate Bolts	9.8	1.0	87 in·lb	L
Oil Pipe Bolts	9.8	1.0	87 in·lb	L
Middle Oil Plate Bolts	9.8	1.0	87 in·lb	L
Oil Passage Plug (M6)	3.5	0.36	31 in·lb	
Oil Passage Plug (PT3/8)	20	2.0	15	L
Breather Plate Bolts	9.8	1.0	87 in·lb	L
Shift Shaft Return Spring Pin	29	3.0	21	L
Bottom Oil Plate Bolts	9.8	1.0	87 in·lb	L
Crankcase Bolts (M8, Front), L = 60 mm (2.4 in.)	27.5	2.80	20.3	MO, S
Crankcase Bolts (M8), L = 73 mm (2.9 in.)	25.5	2.60	18.8	MO, S
Crankcase Bolts (M9), L = 113 mm (4.45 in.)	44.1	4.50	32.5	MO, S
Crankcase Bolts (M8), L = 110 mm (4.3 in.)	27.5	2.80	20.3	S
Crankcase Bolt (M8, Rear), L = 60 mm (2.4 in.)	27.5	2.80	20.3	S
Crankcase Bolts (M6) L = 45 mm (1.8 in.)	19.6	2.00	14.5	S
Crankcase Bolts (M6) L = 38 mm (1.5 in.)	19.6	2.00	14.5	S
Crankcase Bolt (M8), L = 50 mm (2.0 in.)	27.5	2.80	20.3	S
Crankcase Bolt (M6) L = 32 mm (1.3 in.)	19.6	2.00	14.5	S
Crankcase Bolts (M9), L = 83 mm (3.3 in.)	44.1	4.50	32.5	MO, S
Upper Crankcase Bolt (M8), L = 120 mm (4.72 in.)	27.5	2.80	20.3	S
Upper Crankcase Bolts (M8), L = 110 mm (4.33 in.)	27.5	2.80	20.3	S
Transmission Case Bolts, L = 30 mm (1.2 in.)	20	2.0	15	S
Transmission Case Bolts, L = 26 mm (1.0 in.)	20	2.0	15	S

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Gear Positioning Lever Bolt	12	1.2	106 in·lb	L
Transmission Case Oil Nozzle	2.9	0.30	26 in·lb	L
Neutral Switch Holder Screw	4.9	0.50	43 in·lb	L
Shift Drum Cam Holder Bolt	12	1.2	106 in·lb	L
Shift Drum Bearing Holder Screws	4.9	0.50	43 in·lb	L
Shift Rod Retaining Plate Bolt	9.8	1.0	87 in·lb	L
Drive Shaft Bearing Holder Screw	4.9	0.50	43 in·lb	L
Race Holder Screw	4.9	0.50	43 in·lb	L
Shift Shaft Cover Bolts, L = 45 mm (1.8 in.)	9.8	1.0	87 in·lb	L, S
Shift Shaft Cover Bolt, L = 30 mm (1.2 in.)	9.8	1.0	87 in·lb	L, S
Neutral Switch	15	1.5	11	
Shift Shaft Cover Bolts, L = 30 mm (1.2 in.)	12	1.2	106 in·lb	S
Shift Shaft Cover Bolt, L = 40 mm (1.6 in.)	12	1.2	106 in·lb	S
Shift Shaft Cover Screw	4.9	0.50	43 in·lb	L, S
Shift Lever Bolt	12	1.2	106 in·lb	
Shift Lever Tie-rod Locknuts	9.8	1.0	87 in·lb	Lh (1)
Wheels/Tires				
Front Axle Clamp Bolts	34	3.5	25	
Front Axle	108	11.0	79.7	
Rear Axle Nut	108	11.0	79.7	
Final Drive				
Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
Speed Sensor Bolt	7.8	0.80	69 in·lb	L
Speed Sensor Bracket Bolts	9.8	1.0	87 in·lb	
Engine Sprocket Nut	165	16.8	122	MO
Rear Sprocket Nuts	59	6.0	44	R
Rear Axle Nut	108	11.0	79.7	
Brakes				
Front Brake Fluid Reservoir Cap Screws	1.5	0.15	13 in·lb	
Brake Lever Pivot Bolt	1.0	0.10	8.9 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Brake Hose Banjo Bolts	25	2.5	18	
Front Master Cylinder Clamp Bolts	11	1.1	97 in·lb	S
Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
Front Caliper Mounting Bolts	25	2.5	18	
Front Caliper Holder Shafts	22	2.2	16	L, Si
Bleed Valves	7.8	0.80	69 in·lb	
Front Brake Pad Pins	17	1.7	13	
Front Brake Disc Mounting Bolts	27	2.8	20	L
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Brake Pedal Bolt	8.8	0.90	78 in·lb	
Rear Master Cylinder Push Rod Locknut	17	1.7	13	
Rear Caliper Holder Pin Bolt	27	2.8	20	Si

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Rear Brake Pad Pin	17	1.7	13	
Rear Caliper Holder Bolt	22	2.2	16	Si
Rear Caliper Mounting Bolts	25	2.5	18	
Rear Brake Disc Mounting Bolts	27	2.8	20	L
Brake Pipe Joint Nuts	18	1.8	13	
Suspension				
Upper Front Fork Clamp Bolts	20	2.0	15	
Lower Front Fork Clamp Bolts	29	3.0	21	AL
Daming Adjuster Guide Rod Nut	19.5	1.99	14.4	
Front Fork Top Plugs	35	3.6	26	
Preload Adjuster Guide Rod Nut	27.5	28.0	20.3	
Rod Guide Case	90	9.2	66	
Front Fork Bottom Allen Bolt	20	2.0	15	L
Upper Rear Shock Absorber Bolt	59	6.0	44	
Swingarm Pivot Shaft Nut	108	11.0	79.7	
Lower Rear Shock Absorber Nut	59	6.0	44	R
Steering				
Handlebar Holder Bolts	25	2.5	18	S
Steering Stem Head Bolt	108	11.0	79.7	
Upper Front Fork Clamp Bolts	20	2.0	15	
Steering Stem Nut	20	2.0	15	
Switch Housing Screws	3.5	0.36	31 in·lb	
Lower Handlebar Holder Mounting Nuts	34	3.5	25	R
Lower Front Fork Clamp Bolts	29	3.0	21	AL
Frame				
Footpeg Bracket Bolts	25	2.5	18	
Side Stand Switch Bolt	8.8	0.90	78 in·lb	L
Side Stand Bolt	29	3.0	21	
Side Stand Nut	44	4.5	32	R
Footpeg Holder Bolt	34	3.5	25	L
Windshield Plate Bolts	0.43	0.044	3.8 in·lb	
Lower Fairing Bracket Bolts	12	1.2	106 in·lb	L
Lower Fairing Mounting Bolts	8.8	0.90	78 in·lb	
Grab Rail Bolts	25	2.5	18	
Electrical System				
Vehicle-down Sensor Mounting Bolts	6.9	0.70	61 in·lb	
Switch Housing Screws	3.5	0.36	31 in·lb	
License Plate Light Screws	1.2	0.12	11 in·lb	
Regulator/Rectifier Bolts	9.8	1.0	87 in·lb	
Engine Ground Terminal Bolt	9.8	1.0	87 in·lb	
Side Stand Switch Bolt	8.8	0.90	78 in·lb	L
Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	L
Starter Motor Terminal Locknut	11	1.1	97 in·lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Starter Motor Cable Terminal Nut	6.0	0.61	53 in·lb	
Starter Relay Terminal Bolts	3.6	0.37	32 in·lb	
Starter Motor Through Bolts	5.0	0.51	44 in·lb	
Starter Motor Brush Holder Screw	3.8	0.39	34 in·lb	
Stator Coil Bolts	12	1.2	106 in·lb	L
Alternator Lead Holding Plate Bolt	9.8	1.0	87 in·lb	L
Alternator Cover Bolts	12	1.2	106 in·lb	S
Starter Motor Clutch Bolts	34	3.5	25	L
Alternator Rotor Bolt (without center hole type)	155	15.8	114	MO
Alternator Rotor Bolt (with center hole type)	200	20.4	148	MO
Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
Timing Rotor Bolt	40	4.1	30	
Crankshaft Sensor Bolts	6.0	0.61	53 in·lb	
Neutral Switch	15	1.5	11	
Speed Sensor Bolt	7.8	0.80	69 in·lb	L
Spark Plugs	15	1.5	11	
Oil Pressure Switch	15	1.5	11	LG
Water Temperature Sensor	12	1.2	106 in·lb	
Oxygen Sensor	25	2.5	18	Si

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

Basic Torque for General Fasteners

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

Specifications

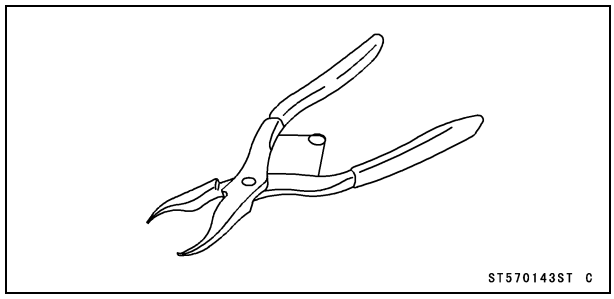
Item	Standard	Service Limit
Fuel System		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Idle Speed	1 300 ±50 r/min (rpm)	– – –
Throttle Body Vacuum	37.9 ±1.3 kPa (284 ±10 mmHg) at idle speed	– – –
Bypass Screws (Turn Out)	0 ~ 2 1/2 (for reference)	– – –
Air Cleaner Element	Viscous paper element	– – –
Cooling System		
Coolant:		
Type (Recommended)	Permanent type of antifreeze	– – –
Color	Green	– – –
Mixed Ratio	Soft water 50%, coolant 50%	– – –
Freezing Point	–35°C (–31°F)	– – –
Total Amount	1.2 L (1.3 US qt)	– – –
Engine Top End		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	– – –
Intake	0.15 ~ 0.21 mm (0.0059 ~ 0.0083 in.)	– – –
Clutch		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Engine Lubrication System		
Engine Oil:		
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2	– – –
Viscosity	SAE 10W-40	– – –
Capacity	1.6 L (1.7 US qt) (When filter is not removed.)	– – –
	1.8 L (1.9 US qt) (When filter is removed.)	– – –
	2.3 L (2.4 US qt) (When engine is completely dry.)	– – –
Level	Between upper and lower level lines (Wait several minutes after idling or running)	– – –
Wheels/Tires		
Tread Depth:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	6.4 mm (0.25 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Tire Air Pressure (when cold):		
Front	Up to 150 kg (331 lb) load: 225 kPa (2.30 kgf/cm², 32.6 psi)	– – –
Rear	Up to 150 kg (331 lb) load: 250 kPa (2.55 kgf/cm², 36.2 psi)	– – –

Specifications

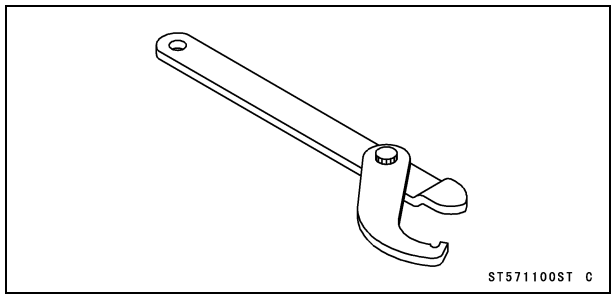
Item	Standard	Service Limit
Final Drive		
Drive Chain Slack	25 ~ 35 mm (1.0 ~ 1.4 in.)	– – –
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	319 mm (12.6 in.)
Standard Chain:		
Make	DAIDO	– – –
Type	DID 520VP2-T	– – –
Link	114 links	– – –
Brakes		
Brake Fluid:		
Grade	DOT4	– – –
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Light Timing:		
Front	Pulled ON	– – –
Rear	ON after about 12 mm (0.47 in.) of pedal travel	– – –
Electrical System		
Spark Plug:		
Type	NGK CR9EIA-9	– – –
Gap	0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)	– – –

Special Tools

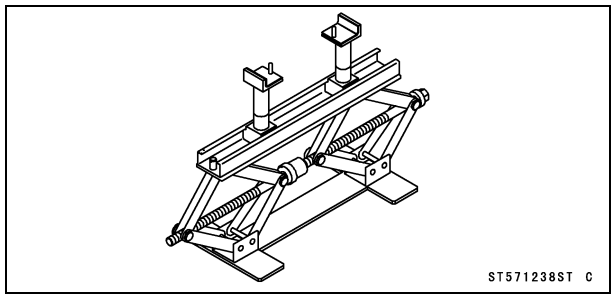
Inside Circlip Pliers:
57001-143



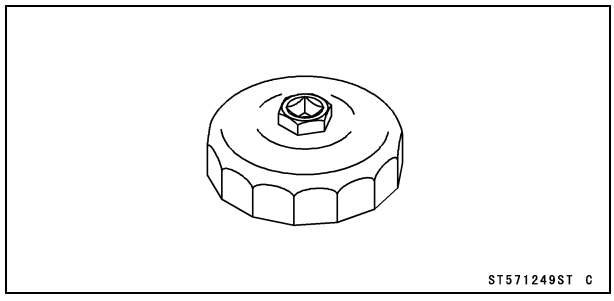
Steering Stem Nut Wrench:
57001-1100



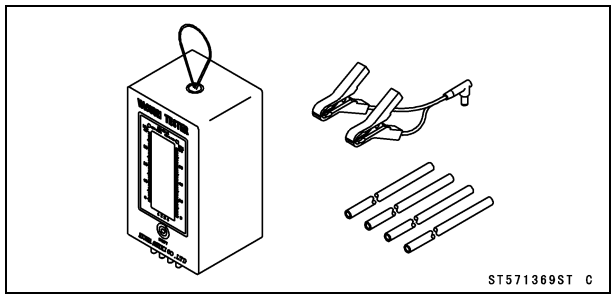
Jack:
57001-1238



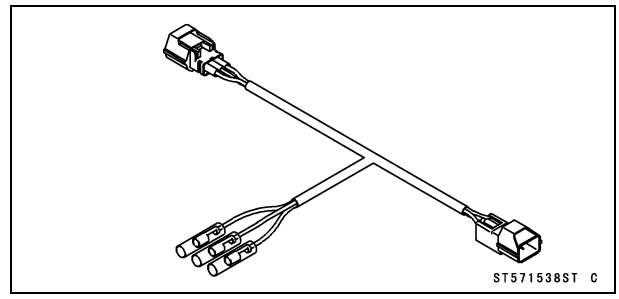
Oil Filter Wrench:
57001-1249



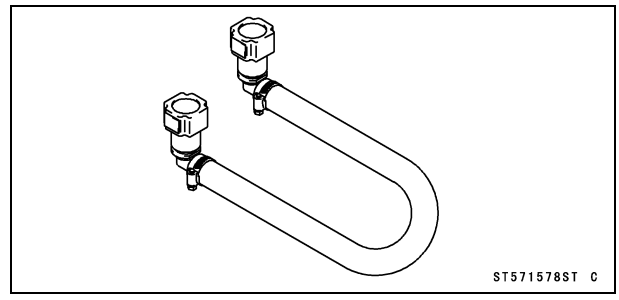
Vacuum Gauge:
57001-1369



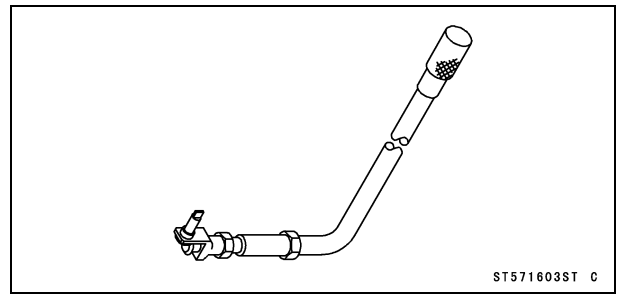
Throttle Sensor Setting Adapter:
57001-1538



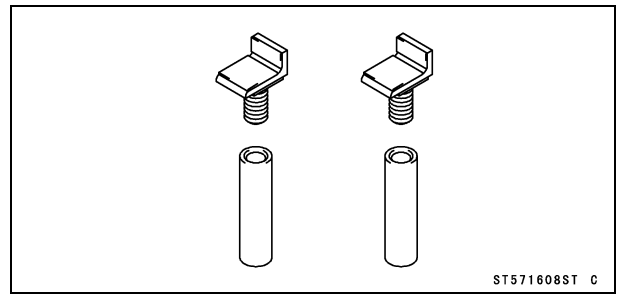
Extension Tube:
57001-1578



Pilot Screw Adjuster, E:
57001-1603



Jack Attachment:
57001-1608



Periodic Maintenance Procedures

Fuel System (DFI)

Air Cleaner Element Replacement

NOTE

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

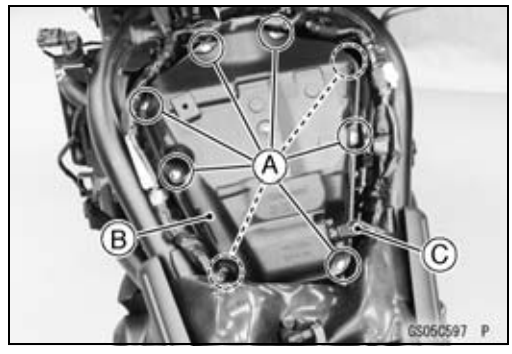
⚠ WARNING

If dirt or dust is allowed to pass through into the throttle body assy, the throttle may become stuck, possibly causing accident. Replace the air cleaner element according to the maintenance chart.

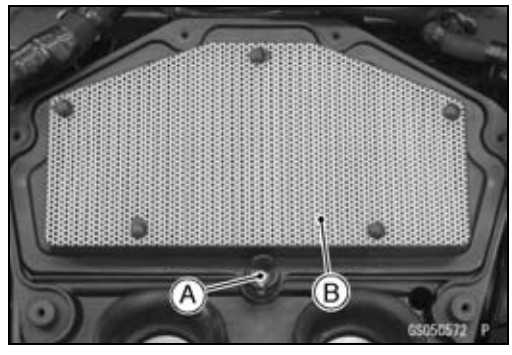
NOTICE

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

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing Assembly Screws [A]
  Upper Air Cleaner Housing [B]
- Disconnect:
  Intake Air Temperature Sensor Lead Connector [C]



- Remove the air cleaner element screw [A].
- Discard the air cleaner element [B].



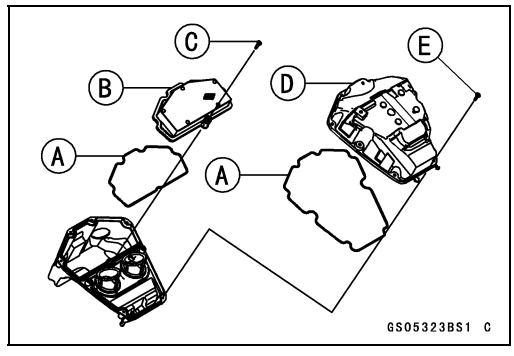
- Make sure the seals [A] are installed
- Install a new element [B] so that the screen side faces upward.
- Tighten:

  Torque - Air Cleaner Element Screw [C]: 1.2 N·m (0.12 kgf·m, 11 in·lb)

- Install:
  Upper Air Cleaner Housing [D]
- Tighten:

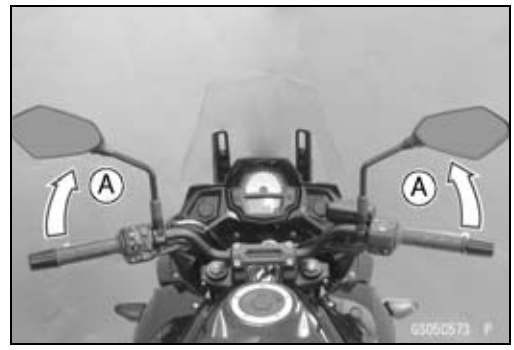
  Torque - Air Cleaner Housing Assembly Screws [E]: 1.2 N·m (0.12 kgf·m, 11 in·lb)

- Connect the intake air temperature sensor lead connector.
- Install:
  Fuel Tank (see Fuel Tank Installation in the Fuel System (DFI) chapter)



Periodic Maintenance Procedures

Idle Speed Inspection



- Start the engine and warm it up thoroughly.
- With the engine idling, turn the handlebars to both sides [A].

★If handlebars movement changes the idle speed, the throttle cables may be improperly adjusted or incorrectly routed, or damaged. Be sure to correct any of these conditions before riding (see Throttle Control System Inspection and Cable, Wire, and Hose Routing section in the Appendix chapter).

⚠ WARNING

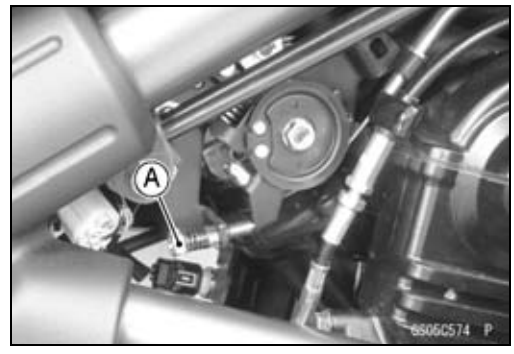
Operation with improperly adjusted, incorrectly routed or damaged cables could result in an unsafe riding condition. Follow the service manual to be make sure to correct any of these conditions.

- Check the idle speed.

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

Idle Speed
Standard: 1 300 ±50 r/min (rpm)

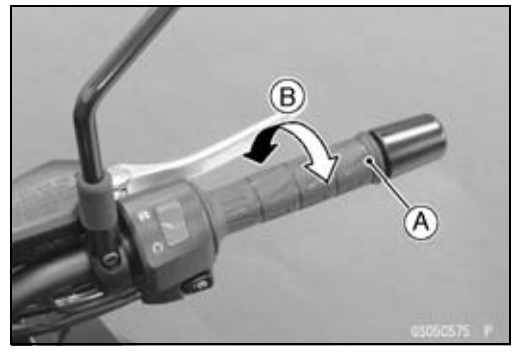
Idle Speed Adjustment



- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.

○Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.

Throttle Control System Inspection

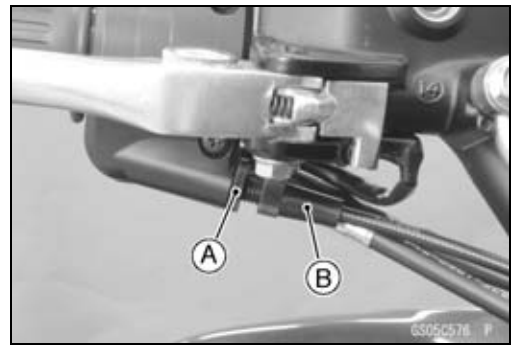


- Check that the throttle grip [A] moves smoothly from full open to close, and the throttle closes quickly and completely by the return spring in all steering positions.

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

- Check the throttle grip free play [B].

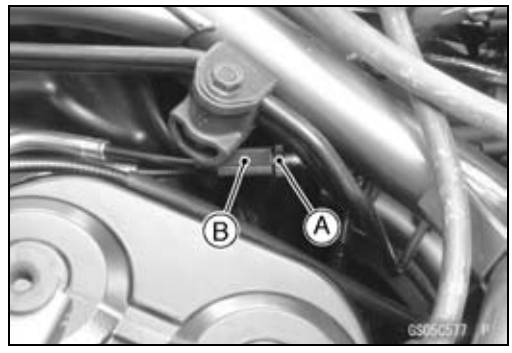
Throttle Grip Free Play
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)



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

- Remove the right middle fairing (see Middle Fairing Removal in the Frame chapter).
- Loosen the locknut [A] at the upper end of the accelerator cable.
- Turn the adjuster [B] in completely so as to give the throttle grip plenty of play.

Periodic Maintenance Procedures



- Loosen the locknut [A] at the middle of the decelerator cable.
- Turn the adjuster [B] until there is no play when the throttle grip is completely closed.
- Tighten the locknut.
- Turn the accelerator cable adjuster until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip free play is obtained.
- Tighten the locknut.

★If the free play can not be adjusted with the adjusters, replace the cable.

Engine Vacuum Synchronization Inspection

NOTE

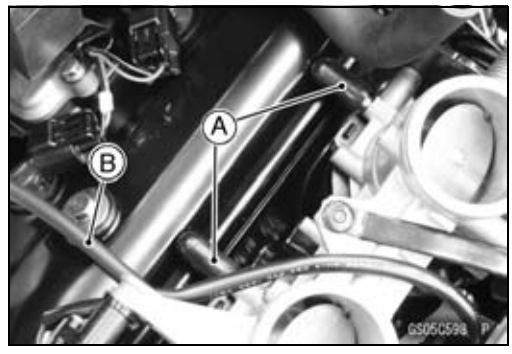
○*These procedures are explained on the assumption that the intake and exhaust systems of the engine are in good condition.*

- Situate the motorcycle so that it is vertical.
- Remove:

  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)

  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)

  Fuel Hose (see Fuel Hose Replacement)

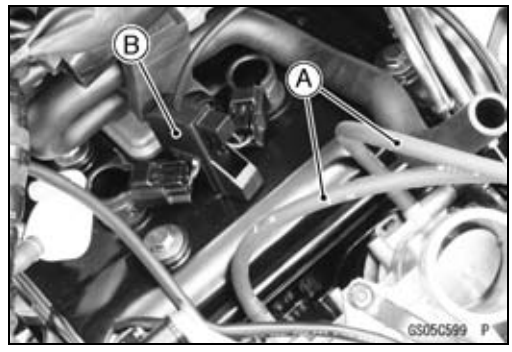


- Pull off the rubber caps [A] or vacuum hoses from the fittings of each throttle body.

○The CAL, SEA-B1, TH or CN Models are equipped the vacuum hoses.

NOTE

○*Do not disconnect the intake air pressure sensor hose [B] on the left side of the throttle body assy.*



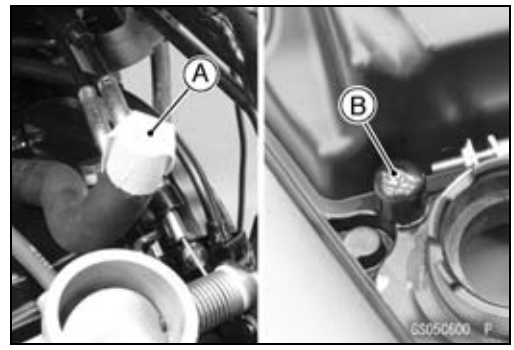
- Connect a vacuum gauge and hoses [A] (Special Tool: 57001-1369) to the fittings on the throttle body.

  Special Tool - Vacuum Gauge: 57001-1369

- Connect a highly accurate tachometer lead [B] to one of the stick coil primary leads.

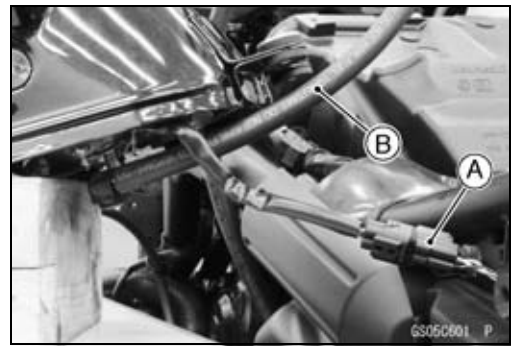
Periodic Maintenance Procedures

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



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

Special Tool - Extension Tube: 57001-1578



● Start the engine and warm it up thoroughly.
● Check the idle speed using a highly accurate tachometer.

Idle Speed
Standard: 1 300 ±50 r/min (rpm)

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

NOTE

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

● While idling the engine, inspect the throttle body vacuum, using the vacuum gauge.

Throttle Body Vacuum
Standard: 37.9 ±1.3 kPa (284 ±10 mmHg) at idle speed

Periodic Maintenance Procedures

★If any vacuum is not within specifications, turn the bypass screws [A].

Special Tool - Pilot Screw Adjuster, E [B]: 57001-1603

NOTICE

Do not over-tighten the bypass screw. The tapered portion of the bypass screw could be damaged.

- Adjust the each vacuum (#1, #2) to the standard value.
- Open and close the throttle valves after each measurement.
- Check the vacuums as before.

★If all vacuums are within the specification range, finish the engine vacuum synchronization.

★If any vacuum can not be adjusted within the specification, replace the bypass screws #1 and #2 with new ones, refer to the following procedure.

NOTE

○*In this photo, the fuel hose and main throttle sensor lead have been disconnected for clarity.*

- Remove the throttle body assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter).
- Turn in the bypass screw [A] with counting the number of turns until it seals fully but not tightly. Record the number of turns.
- Remove:
  Bypass Screw
  Spring [B]
  Washer [C]
  O-ring [D]
- Check the bypass screw hole in the throttle body for carbon deposits.

★If any carbons accumulate, wipe the carbons off from the hole, using a cotton pad penetrated with a high flash-point solvent.

- Replace the bypass screw, spring, washer and O-ring as a set.
- Turn in the bypass screw until it seats fully but not tightly.

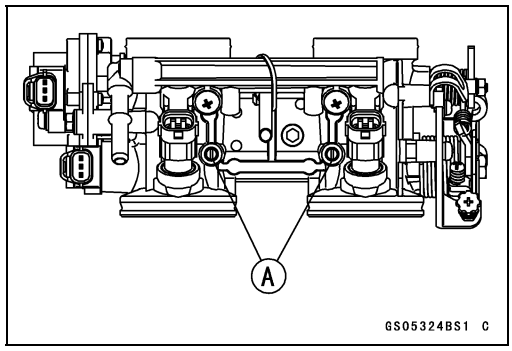
NOTICE

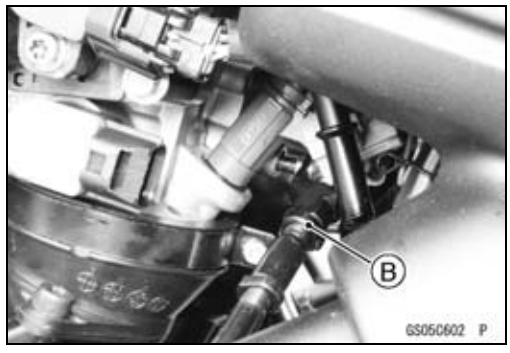
Do not over-tighten the bypass screw. The tapered portion [E] of the bypass screw could be damaged.

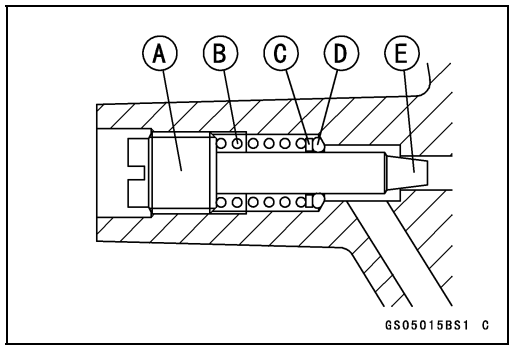
- Back out the same number of turns counted when first turned in. This is to set the screw to its original position.

NOTE

○*A throttle body has different "turns out" of the bypass screw for each individual unit. On setting the bypass screw, use the "turns out" determined during disassembly.*







Periodic Maintenance Procedures

- Repeat the same procedure for the other bypass screw.
- Repeat the synchronization.

★If the vacuums are correct, check the output voltage of the main throttle sensor (see Main Throttle Sensor Output Voltage Inspection in the Fuel System (DFI) chapter).

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

Main Throttle Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor Y/R) lead
Digital Meter (–) → W (sensor BR/BK) lead

Standard: DC 0.99 ~ 1.05 V at idle throttle opening

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

- Remove the vacuum gauge hoses and install the rubber caps or vacuum hoses to the original position.

○The CAL, SEA-B1, TH and CN Models are equipped the vacuum hoses.

○Run the vacuum hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.

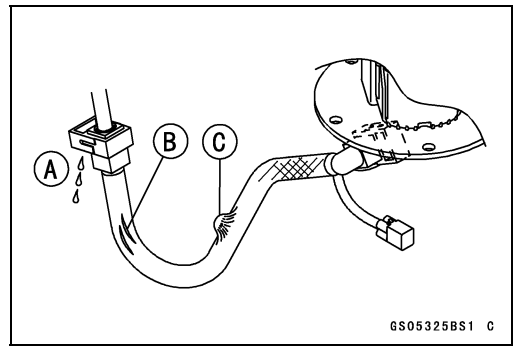
- Install the removed parts (see appropriate chapters).

Fuel System Inspection

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

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

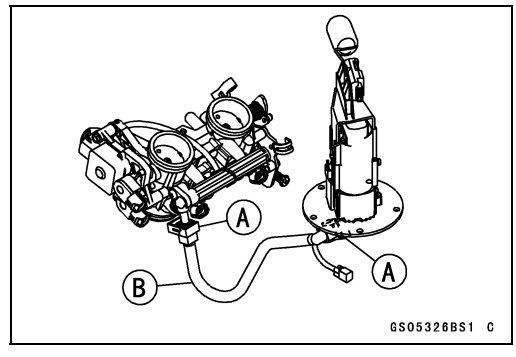
★Replace the fuel hose if any fraying, cracks [B] or bulges [C] are noticed.



- Check that the fuel hose is routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.

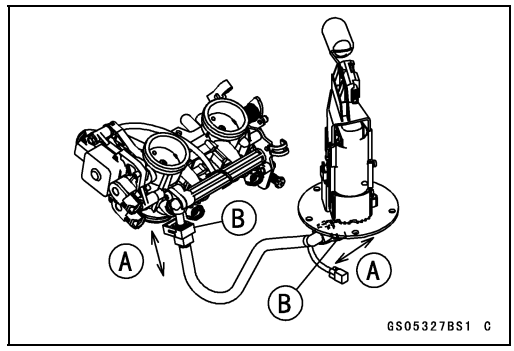
★Replace the hose if it has been sharply bent or kinked.

Hose Joints [A]
Fuel Hose [B]



Periodic Maintenance Procedures

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



NOTICE

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

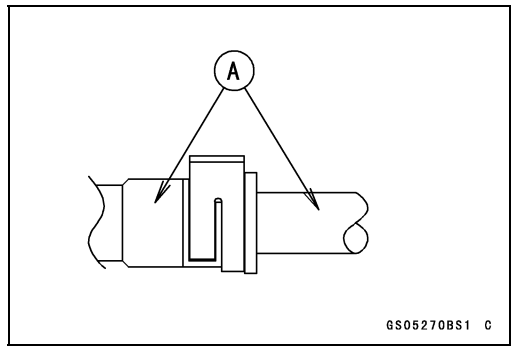
⚠ WARNING

Leaking fuel can cause a fire or explosion resulting in serious burns. Make sure the hose joint is installed correctly on the delivery pipe by sliding the joint.

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

Fuel Hose Replacement

● Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
● Be sure to place a piece of cloth around the fuel hose joint.
● Wipe off the dirt of the surface [A] around the connection using a cloth or a soft brush.

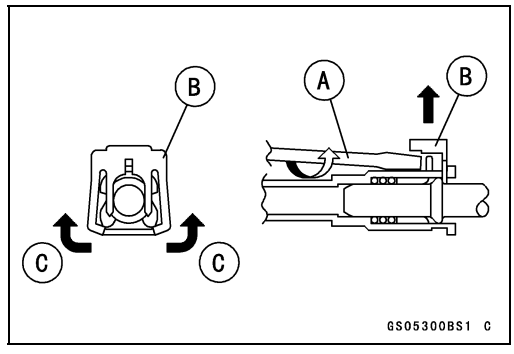


When removing with flat tip screwdriver

● Insert the flat tip screwdriver [A] into slit on the joint lock [B].
● Turn the driver to disconnect the joint lock.

When removing with fingers

● Open and push up [C] the joint lock with your fingers.



NOTICE

Prying or excessively widening the joint lock ends for fuel hose removal will permanently deform the joint lock, resulting in a loose or incomplete lock that may allow fuel to leak and create the potential for a fire explosion. To prevent fire or explosion from a damaged joint lock, do not pry or excessively widen the joint lock ends when removing the fuel hose. The joint lock has a retaining edge that locks around the housing.

Periodic Maintenance Procedures

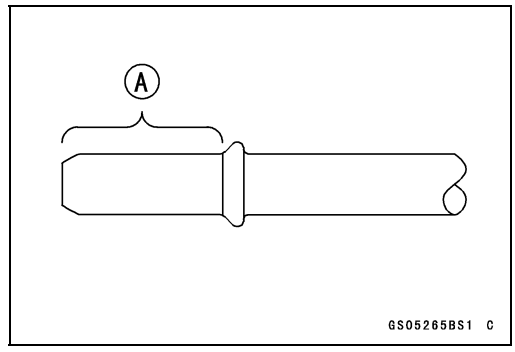
● Pull the fuel hose joint out of the delivery pipe.

⚠ WARNING

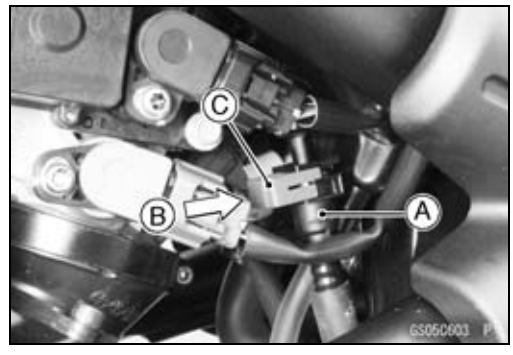
Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe. Cover the hose connection with a clean shop towel to prevent fuel spillage.

● Clean the delivery pipe.
● Cover the delivery pipe with the vinyl bag to keep it clean.

● Remove the vinyl bag on the pipe.
● Check that there are no flaws, burrs, and adhesion of foreign materials on the delivery pipe [A].



● Replace the fuel hose with a new one.
● Install the new fuel hose.
○The “L” shape side of the fuel hose is the fuel tank side.
● Insert the fuel hose joint [A] straight onto the delivery pipe until the hose joint clicks.
● Push [B] the joint lock [C].

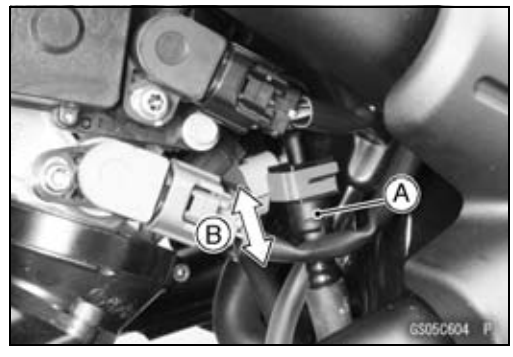


● Push and pull the fuel hose joint [A] back and forth [B] more than two times and make sure it is locked and does not come off.

⚠ WARNING

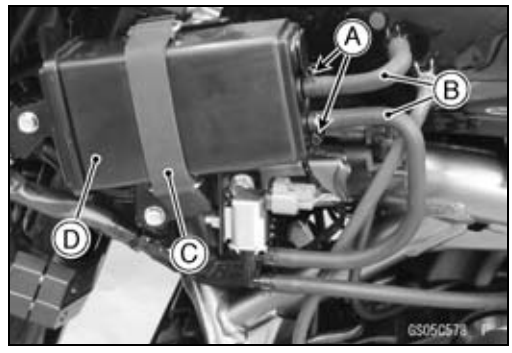
Leaking fuel can cause a fire or explosion resulting in severe burns. Make sure the fuel hose joint is installed correctly on the delivery pipe and that it doesn’t leak.

★If it comes off, reinstall the hose joint.
● Install the removed parts (see appropriate chapters).
● Start the engine and check the fuel hose for leaks.



Periodic Maintenance Procedures

Evaporative Emission Control System Inspection (CAL, SEA-B1, TH and CN Models)



- Inspect the canister as follows.

○Remove the left middle fairing (see Middle Fairing Removal in the Frame chapter).
○Slide the clamps [A].
○Disconnect the hoses [B].
○Remove the band [C] and the canister [D].
○Visually inspect the canister for cracks or other damage.
★If the canister has any cracks or bad damage, replace it with a new one.

NOTE

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

- Inspect the purge valve (see Purge Valve Inspection in the Fuel System (DFI) chapter).

○Check that the hoses are securely connected and clamps are in position.
○Replace any kinked, deteriorated or damaged hoses.
○Run the hoses according to the Exploded View section in the Fuel System (DFI) chapter.
○When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and run the hoses with a minimum of bending so that the emission flow will not be obstructed.

Cooling System

Coolant Level Inspection

NOTE

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

- Check the coolant level in the coolant reserve tank [A] with the motorcycle held perpendicular (Do not use the side stand).

★If the coolant level is lower than the "L" level line [B], unscrew the reserve tank cap and add coolant to the "F" level line [C].
"L": Low
"F": Full

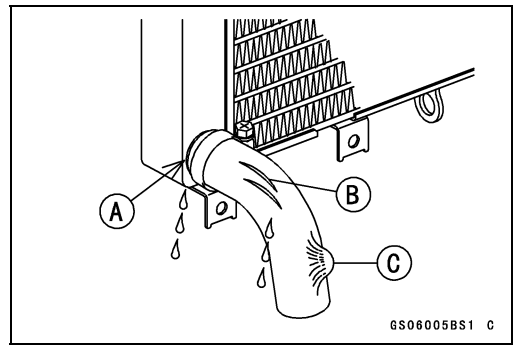
NOTICE

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

Periodic Maintenance Procedures

Cooling System Inspection

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



○The high pressure inside the water hose can cause coolant to leak [A] or the hose to burst if the line is not properly maintained.

● Visually inspect the hoses for signs of deterioration. Squeeze the hoses. A hose should not be hard and brittle, nor should it be soft or swollen.

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

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

Torque - Water Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)

Coolant Change

⚠ WARNING

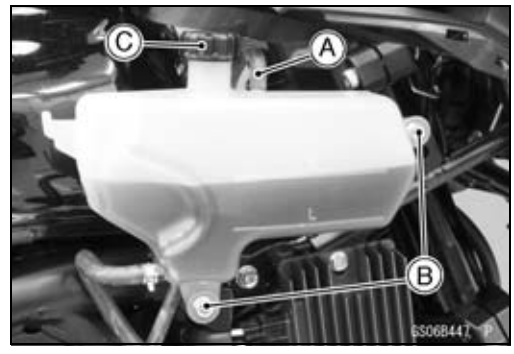
Coolant can be extremely hot and cause severe burns, is toxic and very slippery. Do not remove the radiator cap or attempt to change the coolant when the engine is hot; allow it cool completely. Immediately wipe any spilled coolant from tires, frame, engine or other painted parts. Do not ingest coolant.

● Remove:
Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)

● Disconnect the coolant reserve tank overflow hose [A].

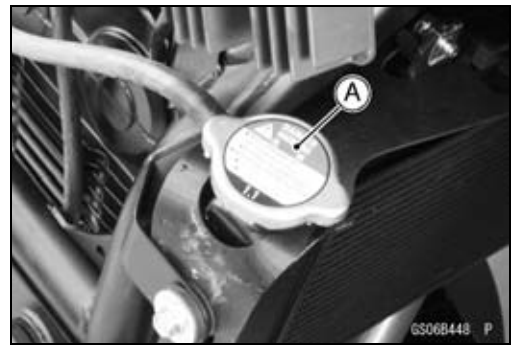
● Remove:
Coolant Reserve Tank Bolts [B]
Cap [C]

● Pour the coolant into a container.



● Remove:
Radiator Cap [A]

○Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.



Periodic Maintenance Procedures

- Remove:
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
- Place a container under the drain bolt [A] of the water pump cover.
- Drain the coolant from the radiator by removing the drain bolt.

- Install the coolant reserve tank and the cap.
- Tighten:

Torque - Coolant Reserve Tank Bolts: 7.9 N·m (0.81 kgf·m, 70 in·lb)

- Connect the coolant reserve tank overflow hose.
- Tighten the drain bolt with new gasket.

Torque - Coolant Drain Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)

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

NOTICE

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

Water and Coolant Mixture Ratio (Recommended)

Soft Water:	**50%**
Coolant:	**50%**
Freezing Point:	**–35°C (–31°F)**
Total Amount:	**1.2 L (1.3 US qt)**

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

NOTE

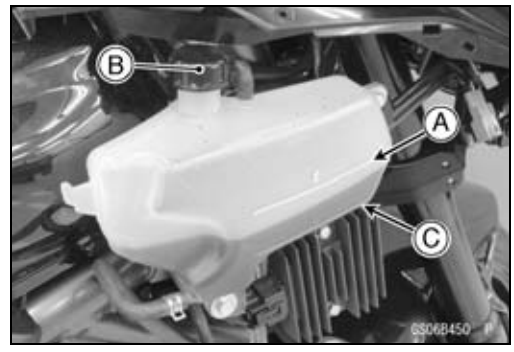
○*Pour in the coolant slowly so that it can expel the air from the engine and radiator.*

- Check the cooling system for leaks.
- Tap the water hoses to force any air bubbles caught inside.
- Fill the radiator up to the filler neck with coolant.
- Install the radiator cap.

Periodic Maintenance Procedures

- Fill the reserve tank up to the “F” (full) level line [A] with coolant and install the cap [B].
- Start the engine, warm it up thoroughly until the radiator fan turns on and then stop the engine.
- Check the coolant level in the reserve tank after the engine cools down.

★If the coolant level is lower than the “L” (low) level line [C], add coolant to the “F” level line.



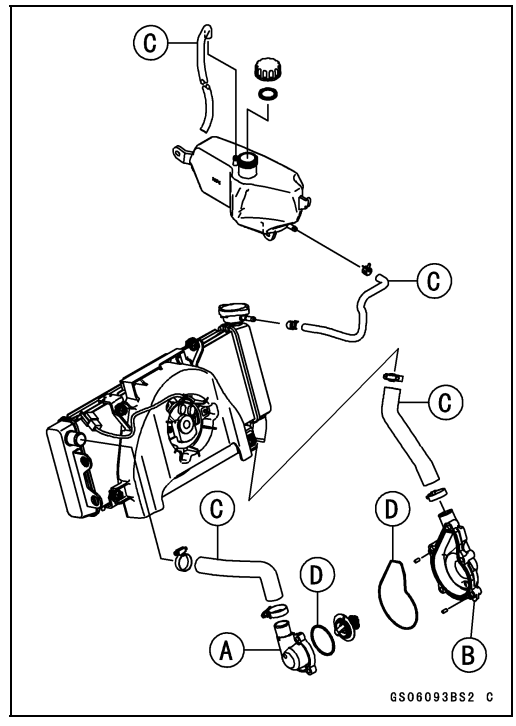
NOTICE
Do not add more coolant above the “F” level line.

Water Hose and O-ring Replacement

- Drain the coolant (see Coolant Change).
- Remove:
  Middle Fairings (see Middle Fairing Removal in the Frame chapter)
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Thermostat Housing [A] (see Thermostat Removal in the Cooling System chapter)
  Water Pump Cover [B] (see Water Pump Removal in the Cooling System chapter)
- Replace the hoses [C] and O-rings [D] with new ones.
- Apply grease or soap and water solution to the new O -rings.
- Run the new hoses according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Tighten:

  Torque - Water Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)

- Install the removed parts (see appropriate chapters).
- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.



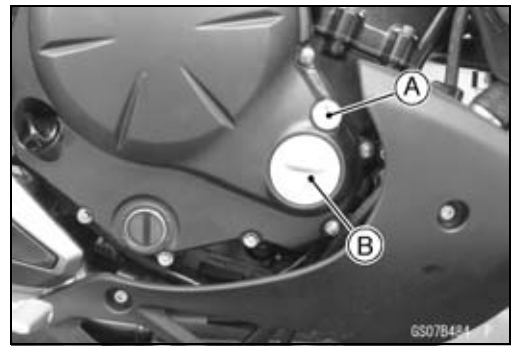
Engine Top End

Valve Clearance Inspection

NOTE

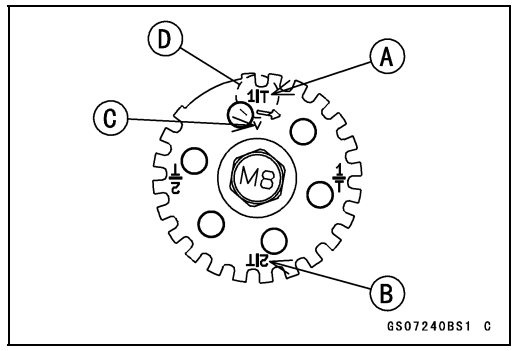
○*Valve clearance must be checked and adjusted when the engine is cold (room temperature).*

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

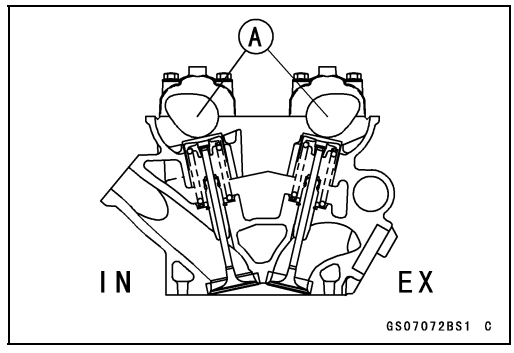


Periodic Maintenance Procedures

● Check the valve clearance when the pistons are at TDC.
○The pistons are numbered beginning with the engine left side.
● Using a wrench, turn the timing rotor clockwise until the "1/T" [A] or "2/T" [B] mark line aligns with the notch [C] on the timing inspection hole [D].
For #1 Cylinder: "1/T" Mark Line
For #2 Cylinder: "2/T" Mark Line



○Measure the valve clearance of the valves for which the cams [A] are turned away from each other.



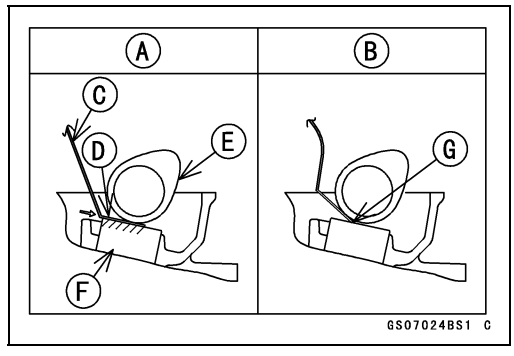
● Using the thickness gauge [A], measure the valve clearance between cam and valve lifter.

Valve Clearance
Standard:
Exhaust 0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)
Intake 0.15 ~ 0.21 mm (0.0059 ~ 0.0083 in.)

NOTE

○*Thickness gauge is horizontally inserted on the valve lifter.*

Appropriateness [A]
Inadequacy [B]
Thickness Gauge [C]
Horizontally Inserts [D]
Cam [E]
Valve Lifter [F]
Hits the Valve Lifter Ahead [G]



Periodic Maintenance Procedures

○Each piston has two intake and two exhaust valves. Measure these two intake or exhaust valves at the same crankshaft position.

NOTE

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

Valve Clearance Measuring Position

#1 Piston TDC at End of Compression Stroke:

Intake Valve Clearances of #1 Piston

Exhaust Valve Clearances of #1 Piston

#2 Piston TDC at End of Compression Stroke:

Intake Valve Clearances of #2 Piston

Exhaust Valve Clearances of #2 Piston

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

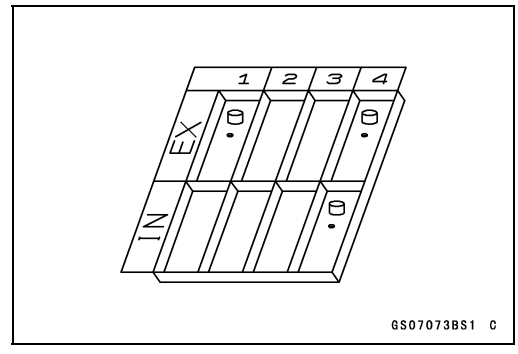
★If the valve clearance is not within the specified range, first record the clearance, and then adjust it.

Valve Clearance Adjustment

● To change the valve clearance, remove the camshaft chain tensioner, camshafts and valve lifters. Replace the shim with one of a different thickness.

NOTE

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



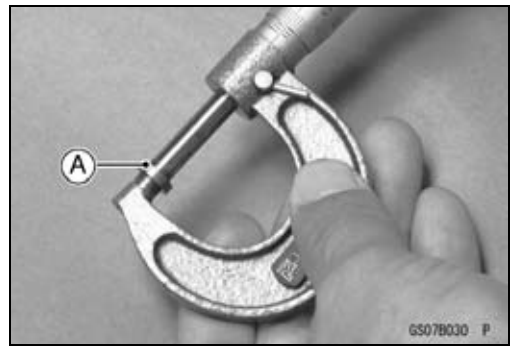
○Besides the standard shims in the valve clearance adjustment charts, the following shims may be installed at the factory. Although they are not available as spare parts, they can be used to adjust valve clearance.

Adjustment Shims

Thickness
2.675 mm
2.725 mm
2.775 mm
2.825 mm
2.875 mm
2.925 mm
2.975 mm
3.025 mm
3.075 mm
3.125 mm
3.175 mm

Periodic Maintenance Procedures

- Clean the shim to remove any dust or oil.
- Measure the thickness of the removed shim [A].



Periodic Maintenance Procedures

VALVE CLEARANCE ADJUSTMENT CHART INTAKE VALVE

	PRESENT SHIM									Example											
PART No. (92180-)	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054
MARK	50	55	60	65	70	75	80	85	90	95	00	05	10	15	20	25	30	35	40	45	50
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50

VALVE CLEARANCE MEASUREMENT (Example)																						
0.00~0.02	–	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	
0.03~0.07	–	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	
0.08~0.12	–	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	
0.13~0.14	–	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	
0.15~0.24	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																					
0.25~0.27	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
0.28~0.32	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50			
0.33~0.37	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50				
0.38~0.42	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50					
0.43~0.47	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50						
0.48~0.52	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50							
0.53~0.57	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50								
0.58~0.62	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50									
0.63~0.67	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50										
0.68~0.72	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50											
0.73~0.77	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50												
0.78~0.82	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50													
0.83~0.87	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50														
0.88~0.92	3.20	3.25	3.30	3.35	3.40	3.45	3.50															
0.93~0.97	3.25	3.30	3.35	3.40	3.45	3.50																
0.98~1.02	3.30	3.35	3.40	3.45	3.50																	
1.03~1.07	3.35	3.40	3.45	3.50																		
1.08~1.12	3.40	3.45	3.50																			
1.13~1.17	3.45	3.50																				
1.18~1.22	3.50																					

INSTALL THE SHIM OF THIS THICKNESS (mm)

GSO7122BW3 C

1. Measure the clearance (when engine is cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. Install the shim specified where the lines intersect. This shim will give the proper clearance.

Example: Present shim is **2.95 mm**
Measured clearance is **0.45 mm**
Replace **2.95 mm** shim with **3.20 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

Periodic Maintenance Procedures

VALVE CLEARANCE ADJUSTMENT CHART EXHAUST VALVE

	PRESENT SHIM									←Example												
PART No. (92180-)	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054
MARK	50	55	60	65	70	75	80	85	90	95	00	05	10	15	20	25	30	35	40	45	50
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
0.00~0.04	-	-	-	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25
0.05~0.09	-	-	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30
0.10~0.14	-	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35
0.15~0.19	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
0.20~0.21	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
0.22~0.31	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																				
0.32~0.34	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
0.35~0.39	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
0.40~0.44	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50			
0.45~0.49	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50				
0.50~0.54	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50					
0.55~0.59	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50						
0.60~0.64	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50							
0.65~0.69	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50								
0.70~0.74	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50									
0.75~0.79	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50										
0.80~0.84	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50											
0.85~0.89	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50												
0.90~0.94	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50													
0.95~0.99	3.20	3.25	3.30	3.35	3.40	3.45	3.50														
1.00~1.04	3.25	3.30	3.35	3.40	3.45	3.50															
1.05~1.09	3.30	3.35	3.40	3.45	3.50																
1.10~1.14	3.35	3.40	3.45	3.50																	
1.15~1.19	3.40	3.45	3.50																		
1.20~1.24	3.45	3.50																			
1.25~1.29	3.50																				

Example

VALVE CLEARANCE MEASUREMENT

INSTALL THE SHIM OF THIS THICKNESS (mm)

GS0712OBW3 C

1. Measure the clearance (when engine is cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. Install the shim specified where the lines intersect. This shim will give the proper clearance.

Example: Present shim is **2.95 mm.**
Measured clearance is **0.47 mm.**
Replace **2.95 mm** shim with **3.15 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

Periodic Maintenance Procedures

NOTICE
Be sure to remeasure the clearance after selecting a shim according to the table. If the clearance is out of the specified range, use the additional shim.

○If there is no valve clearance, use a shim that is a few sizes smaller, and remeasure the valve clearance.

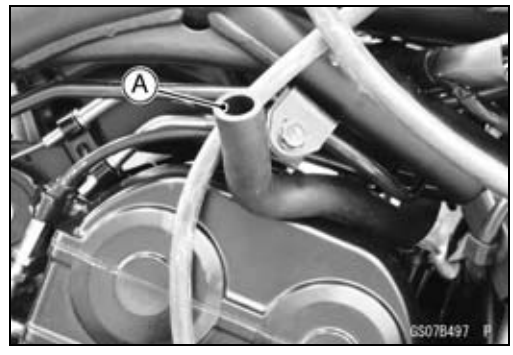
- When installing the shim, face the marked side toward the valve lifter. At this time, apply engine oil to the shim or the valve lifter to keep the shim in place during camshaft installation.

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

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

Air Suction System Damage Inspection

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
- Bring the air switching valve hose end [A] to the outside of the frame.
- Reinstall the air cleaner housing (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter).



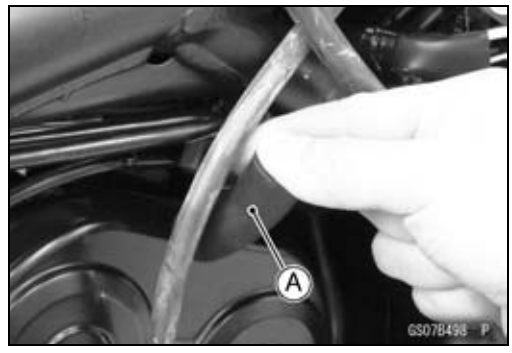
- Connect the fuel pump lead connector [A].
- Using the extension tube [B], connect the fuel tank to the throttle body.

Special Tool - Extension Tube: 57001-1578

Periodic Maintenance Procedures

- Start the engine and run it at idle speed.
- Plug the air switching valve hose end [A] with your finger and feel vacuum pulsing in the hose.

★If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the air switching valve (see Air Switching Valve Unit Test in the Electrical System chapter) or air suction valve (see Air Suction Valve Inspection in the Engine Top End chapter).



- Remove:
  Extension Tube
  Fuel Pump Lead Connector (Disconnect)
- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).

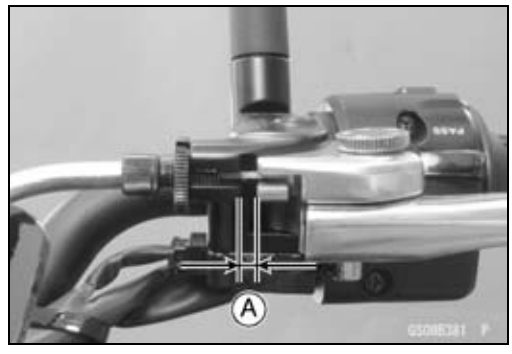
- Install:
  Air Cleaner Housing (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter)
  Fuel Tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).

Clutch

Clutch Operation Inspection

- Pull the clutch lever just enough to take up the free play [A].
- Measure the gap between the lever and the lever holder.

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

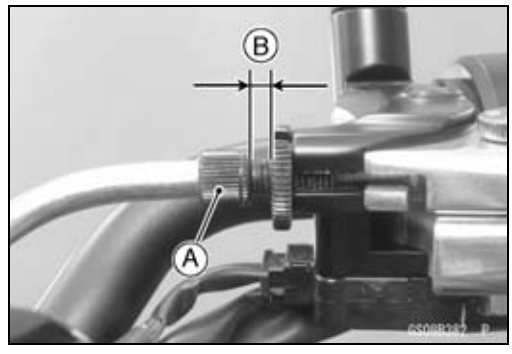


Clutch Lever Free Play
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)

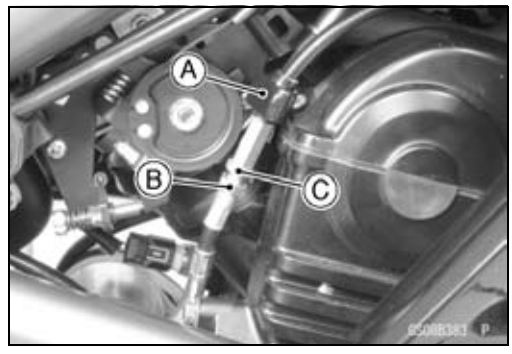
⚠ WARNING

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

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



- Open the clamp [A] and slide the dust cover at the middle of the clutch cable out of place.
- Loosen the locknut [B].
- Turn the adjusting nut [C] until the free play is correct.



⚠ WARNING

Too much cable play can prevent clutch disengagement and cause an accident resulting in serious injury or death. When adjusting the clutch or replacing the cable, be sure the upper end of the clutch outer cable is fully seated in its fitting, or it could slip into place later, creating enough cable play to prevent clutch disengagement.

- Tighten the locknut.
- Install the dust cover.
- Hold the clutch cable with the clamp.
- After the adjustment, start the engine and check that the clutch does not slip and that it releases properly.

Engine Lubrication System

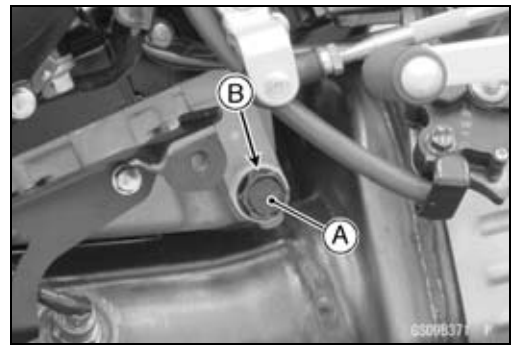
Engine Oil Change

- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Situate the motorcycle so that it is vertical after warming up the engine.
- Remove the engine oil drain bolt [A] to drain the oil.

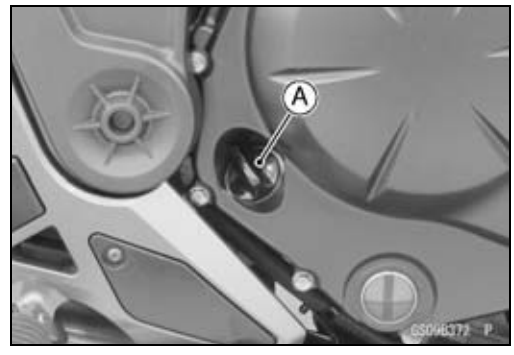
○The oil in the oil filter can be drained by removing the filter (see Oil Filter Replacement).

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

Torque - Engine Oil Drain Bolt: 30 N·m (3.1 kgf·m, 22 ft·lb)

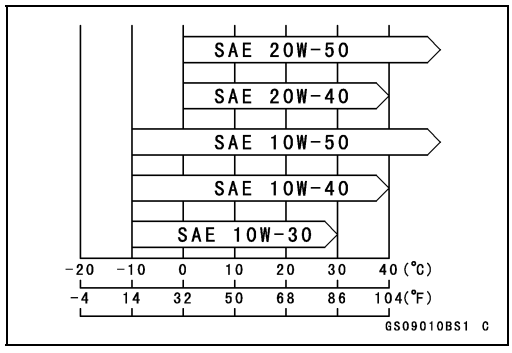


- Remove the oil filler plug [A].



Periodic Maintenance Procedures

● Pour in the specified type and amount of oil.



Recommended Engine Oil

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

Viscosity: **SAE 10W-40**

Capacity: **1.6 L (1.7 US qt) (When filter is not removed.)**

1.8 L (1.9 US qt) (When filter is removed.)

2.3 L (2.4 US qt) (When engine is completely dry.)

NOTE

○*Do not add any chemical additive to the oil. Oils fulfilling the above requirements are fully formulated and provide adequate lubrication for both the engine and the clutch.*

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

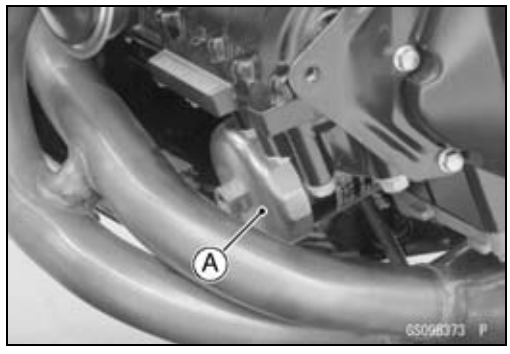
● Replace the O-ring of the oil filler plug with a new one.
● Apply grease to the new O-ring.
● Install the oil filler plug.
● Check the oil level (see Oil Level Inspection in the Engine Lubrication System chapter).

Oil Filter Replacement

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

Special Tool - Oil Filter Wrench: 57001-1249

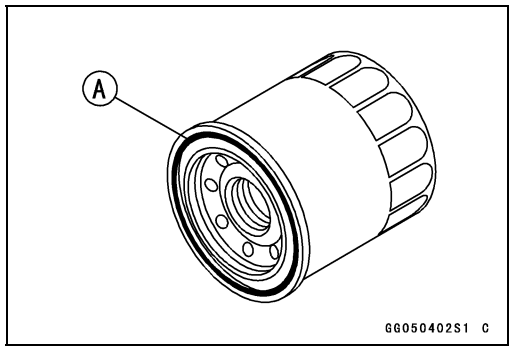
○In this photo, the left lower fairing has been removed for clarity.



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

Special Tool - Oil Filter Wrench: 57001-1249

Torque - Oil Filter: 17.5 N·m (1.78 kgf·m, 12.9 ft·lb)



NOTE

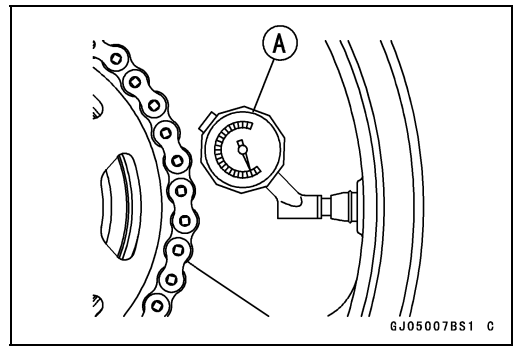
○*Hand tightening of the oil filter can not be allowed since it does not reach to this tightening torque.*

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

Periodic Maintenance Procedures

Wheels/Tires

Air Pressure Inspection



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

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

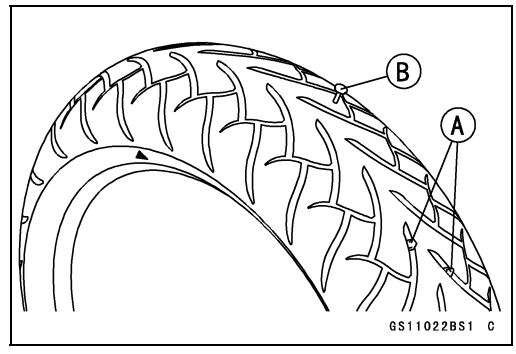
Tire Air Pressure (when cold):

Front: Up to 150 kg (331 lb) load:
225 kPa (2.30 kgf/cm², 32.6 psi)

Rear: Up to 150 kg (331 lb) load:
250 kPa (2.55 kgf/cm², 36.2 psi)

Wheels and Tires Inspection

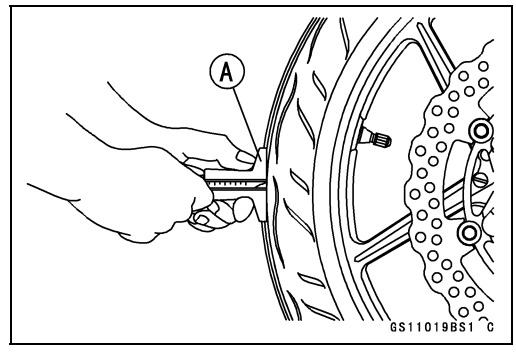
Wheel/Tire Damage Inspection



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

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

Tire Tread Wear Inspection



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

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

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

Tread Depth

Standard:

Front	**4.5 mm (0.18 in.)**
Rear	**6.4 mm (0.25 in.)**

Service Limit:

Front	**1 mm (0.04 in.)**
	(AT, CH, DE) 1.6 mm (0.06 in.)
Rear	**2 mm (0.08 in.) (Up to 130 km/h (80 mph))**
	3 mm (0.12 in.) (Over 130 km/h (80 mph))

Periodic Maintenance Procedures

⚠ WARNING

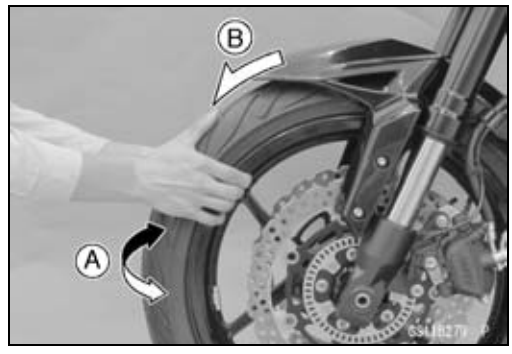
Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

NOTE

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

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

Wheel Bearing Damage Inspection

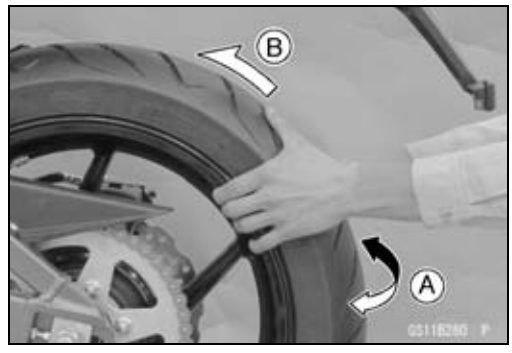


- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheels/Tires chapter).

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608

- Turn the handlebars all the way to the right or left.
- Inspect the roughness of the front wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the front wheel lightly, and check for smoothly turn, roughness, binding or noise.

★If roughness, binding or noise is found, remove the front wheel and inspect the wheel bearing (see Front Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter).



- Raise the rear wheel off the ground with a stand (see Rear Wheel Removal in the Wheels/Tires chapter).
- Inspect the roughness of the rear wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the rear wheel lightly, and check for smoothly turn, roughness, binding or noise.

★If roughness, binding or noise is found, remove the rear wheel and inspect the wheel bearing (see Rear Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter) and coupling (see Coupling Bearing Inspection in the Final Drive chapter).

Periodic Maintenance Procedures

Final Drive

Drive Chain Lubrication Condition Inspection

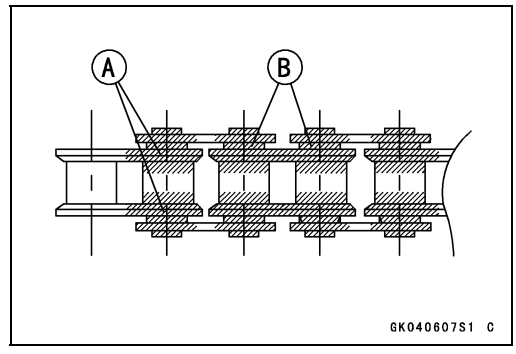
Lubrication is necessary after riding through rain or on wet roads, or any time that the chain appears dry.

Use a lubricant for sealed chains to prevent deterioration of chain seals. If the chain is especially dirty, clean it using a cleaner for sealed chains following the instructions supplied by the chain cleaner manufacturer.

NOTICE

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

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



Drive Chain Slack Inspection

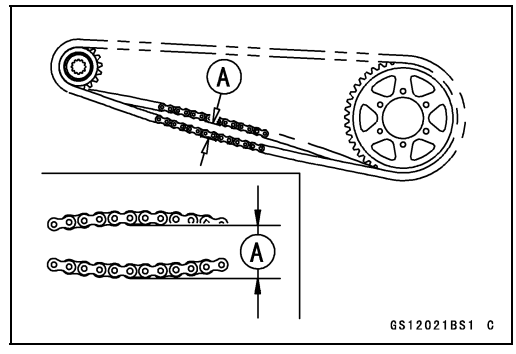
NOTE

- ○*Check the slack with the motorcycle setting on its side stand.*
- ○*Clean the chain if it is dirty, and lubricate it if it appears dry.*

- Check the wheel alignment (see Wheel Alignment Inspection).
- Rotate the rear wheel to find the position where the chain is tightest.
- Measure the vertical movement (chain slack) [A] midway between the sprockets.

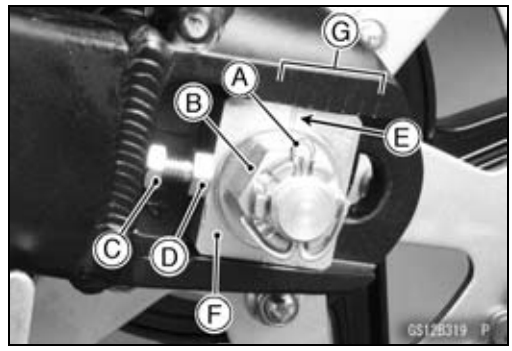
★If the chain slack exceeds the standard, adjust it.

Chain Slack
Standard: 25 ~ 35 mm (1.0 ~ 1.4 in.)



Periodic Maintenance Procedures

Drive Chain Slack Adjustment



- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].

★If the chain is too loose, turn out the right and left chain adjusters [D] evenly.

★If the chain is too tight, turn in the right and left chain adjusters evenly, and kick the wheel forward.

- Turn both chain adjusters evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the notch [E] on the left wheel alignment indicator [F] should align with the same swingarm mark or position [G] that the right indicator notch aligns with.

⚠ WARNING

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

- Tighten both chain adjuster locknuts securely.
- Tighten:

Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.

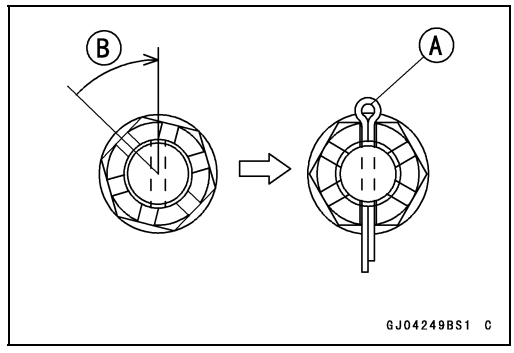
- Insert a new cotter pin [A].

NOTE

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

○*It should be within 30 degrees.*

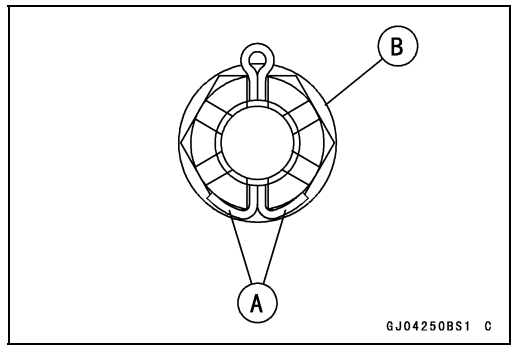
○*Loosen once and tighten again when the slot goes past the nearest hole.*



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

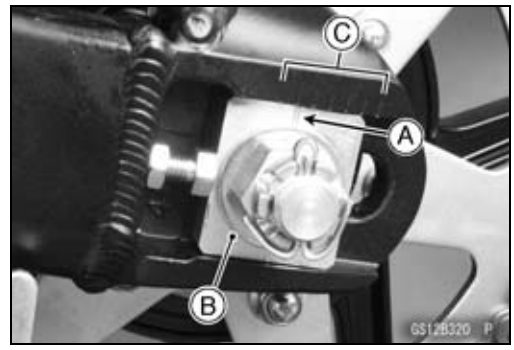
⚠ WARNING

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



Periodic Maintenance Procedures

Wheel Alignment Inspection



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

★If they are not, adjust the chain slack and align the wheel alignment (see Drive Chain Slack Adjustment).

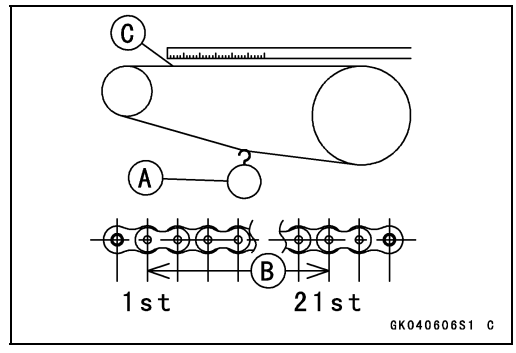
NOTE

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

⚠ WARNING

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

Drive Chain Wear Inspection



- Remove the chain cover (see Drive Chain Removal in the Final Drive chapter).
- Rotate the rear wheel to inspect the drive chain for damaged rollers, and loose pins and links.

★If there is any irregularity, replace the drive chain.

★Lubricate the drive chain if it appears dry.

- Stretch the chain taut by hanging a 10 kg (22 lb) weight [A] on the chain.
- Measure the length of 20 links [B] on the straight part [C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.

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

Drive Chain 20-link Length

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

Service Limit: 319 mm (12.6 in.)

⚠ WARNING

A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control. Inspect the chain for damage and proper adjustment before each ride. If chain wear exceeds the service limit, replace it with the standard chain.

Standard Chain

Make: DAIDO

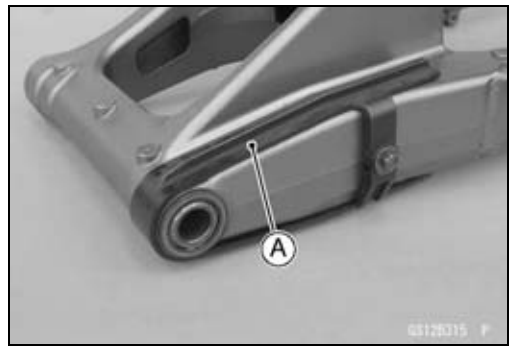
Type: DID 520VP2-T

Link: 114 links

- Install the chain cover (see Drive Chain Installation in the Final Drive chapter).

Periodic Maintenance Procedures

Chain Guide Wear Inspection



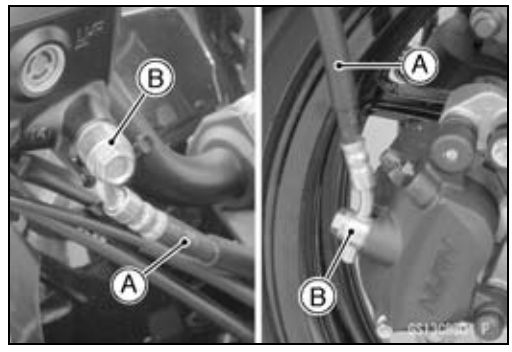
- Remove the swingarm (see Swingarm Removal in the Suspension chapter).
- Visually inspect the chain guide [A].

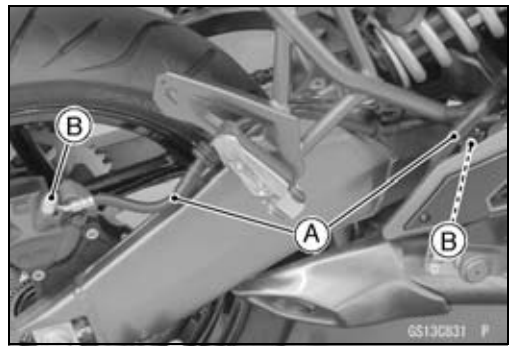
★Replace the chain guide if it shows any signs of abnormal wear or damage.

Brakes

Brake System Inspection

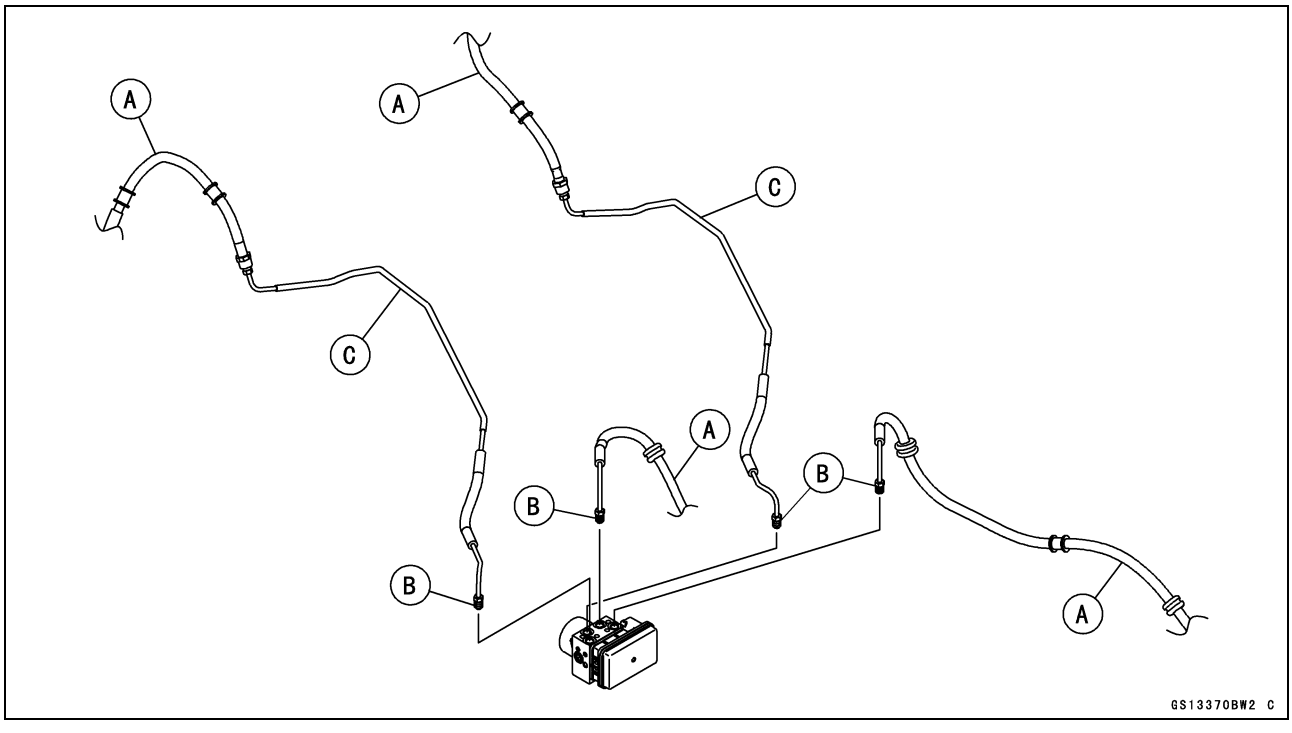
Brake Fluid Leak (Brake Hose and Pipe) Inspection





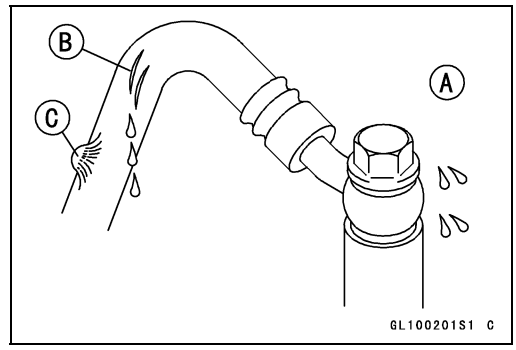
- For ABS equipped models, remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A], fittings [B] and pipes [C] (ABS equipped models).

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



Periodic Maintenance Procedures

Brake Hose and Pipe Damage and Installation Condition Inspection



- For ABS equipped models, remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Inspect the brake hoses, pipes 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, pipe (ABS equipped models) to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.

★Replace the hose and pipe (ABS equipped models) if any crack [B], bulge [C] or leakage is noticed.

★Tighten any brake hose banjo bolts and brake pipe joint nuts.

Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Pipe Joint Nuts (ABS Equipped Models): 18 N·m (1.8 kgf·m, 13 ft·lb)

- Inspect the brake hose and pipe routing.

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

Brake Operation Inspection

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

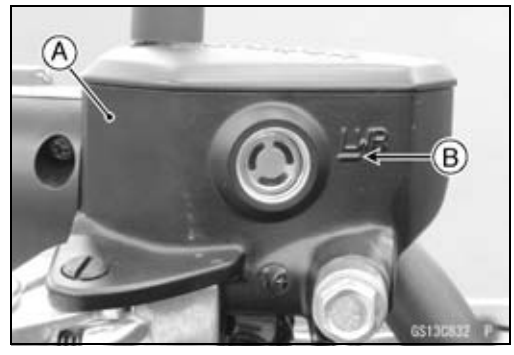
★If the brake operation is insufficiency, inspect the brake system.

⚠ WARNING

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

Brake Fluid Level Inspection

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



NOTE

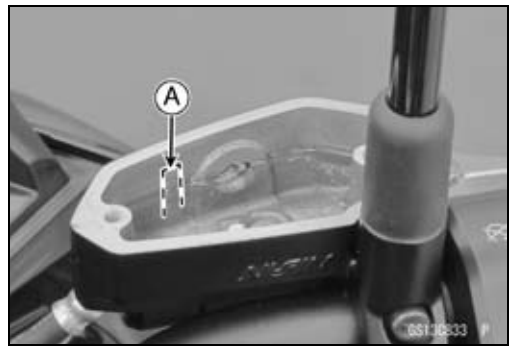
○*Hold the reservoir horizontal by turning the handlebars when checking brake fluid level.*

Periodic Maintenance Procedures

★If the fluid level is lower than the lower level line, remove the reservoir cap and fill the reservoir to the upper level line [A].

● Tighten:

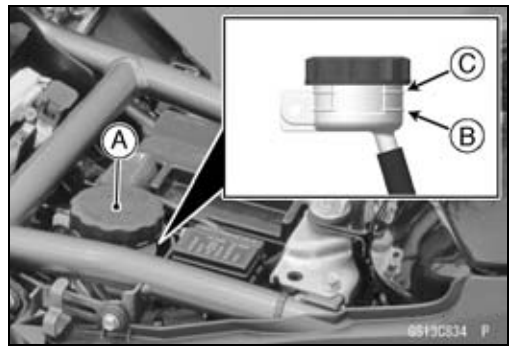
Torque - Front Brake Fluid Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)



● Remove the seat (see Seat Removal in the Frame chapter).

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

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



⚠ WARNING

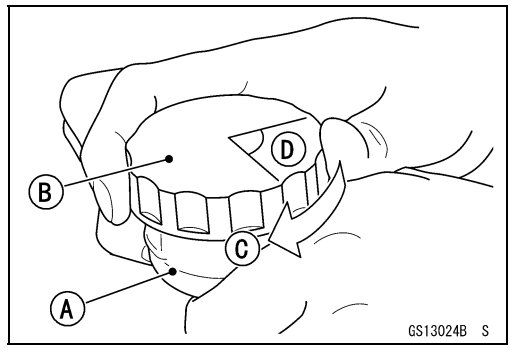
Mixing brands and types of brake fluid can reduce the brake system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid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

Recommended Disc Brake Fluid
Grade: DOT4

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

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

● Install the stopper and tighten the screw.

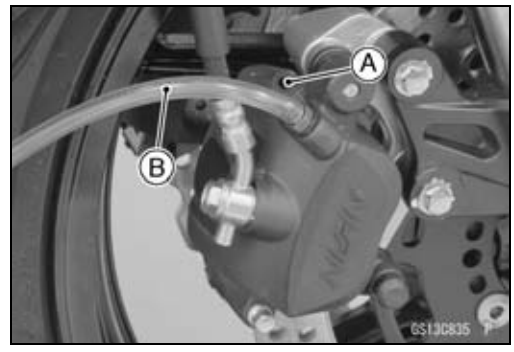


Brake Fluid Change

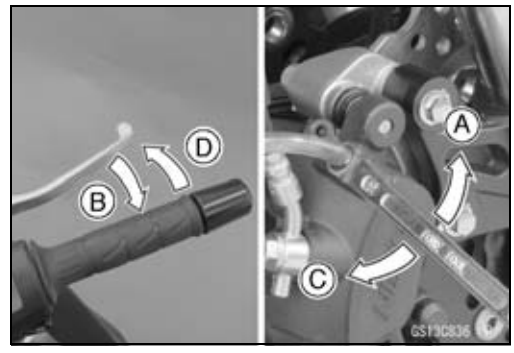
NOTE

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

Periodic Maintenance Procedures



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



- Change the brake fluid.

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

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

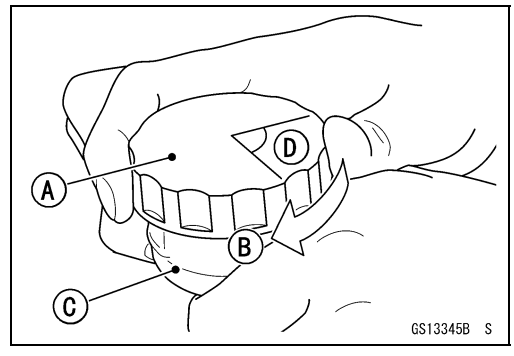
NOTE

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

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

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

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



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

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

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

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

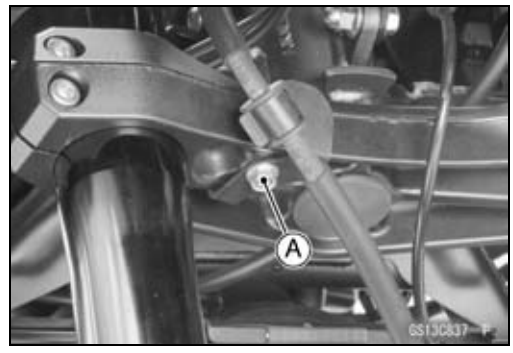
- After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.

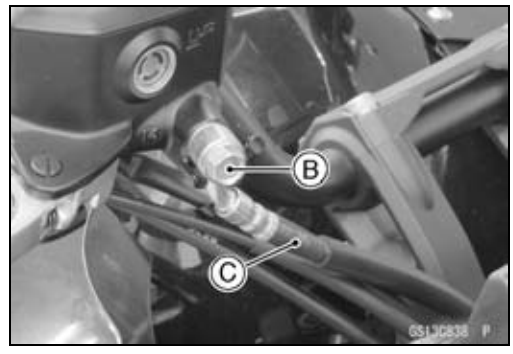
★If necessary, bleed the air from the lines.

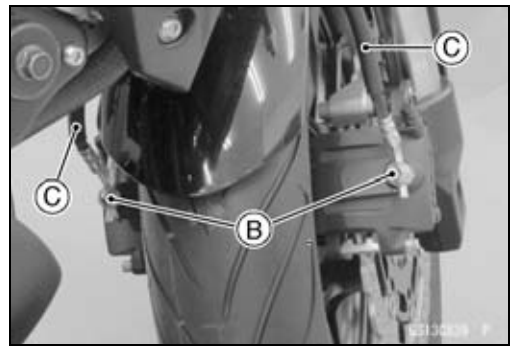
Periodic Maintenance Procedures

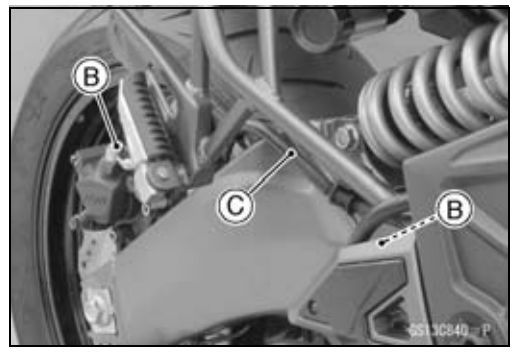
Brake Hose and Pipe Replacement

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









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

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

- Fill the brake line after installing the brake hose (see Brake Fluid Change).

Periodic Maintenance Procedures

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Periodic Maintenance Procedures

● For ABS equipped models; note the following.

NOTE

○*When removing the brake pipes and hoses on the hydraulic unit, remove them with the flare nut wrench according to each assembly of the exploded view in the Brakes chapter.*

● Remove:
Upper Fairing Cover (see Upper Fairing Removal in the Frame chapter)
Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
Rear Fender Front (see Rear Fender Front Removal in the Frame chapter)
Brake Pipe Joint Nuts [A]
Brake Hose Banjo Bolts [B]
Bolts [C]
Brackets
Dampers
Clamps

● There are washers on each side of the brake hose and pipe fitting. Replace them with new ones when installing.

● Before installing the brake pipe, check to see that there is no damage on the threads of the brake pipe joint nut.

★If there is any damage, replace the damaged parts with new ones.

NOTE

○*Tighten the brake pipe joint nut at both ends of the brake pipe temporarily and then tighten them to the specified torque.*

● Install the brake pipes and brake hoses to the specified angle (see Cable, Wire, and Hose Routing section in the Appendix chapter).

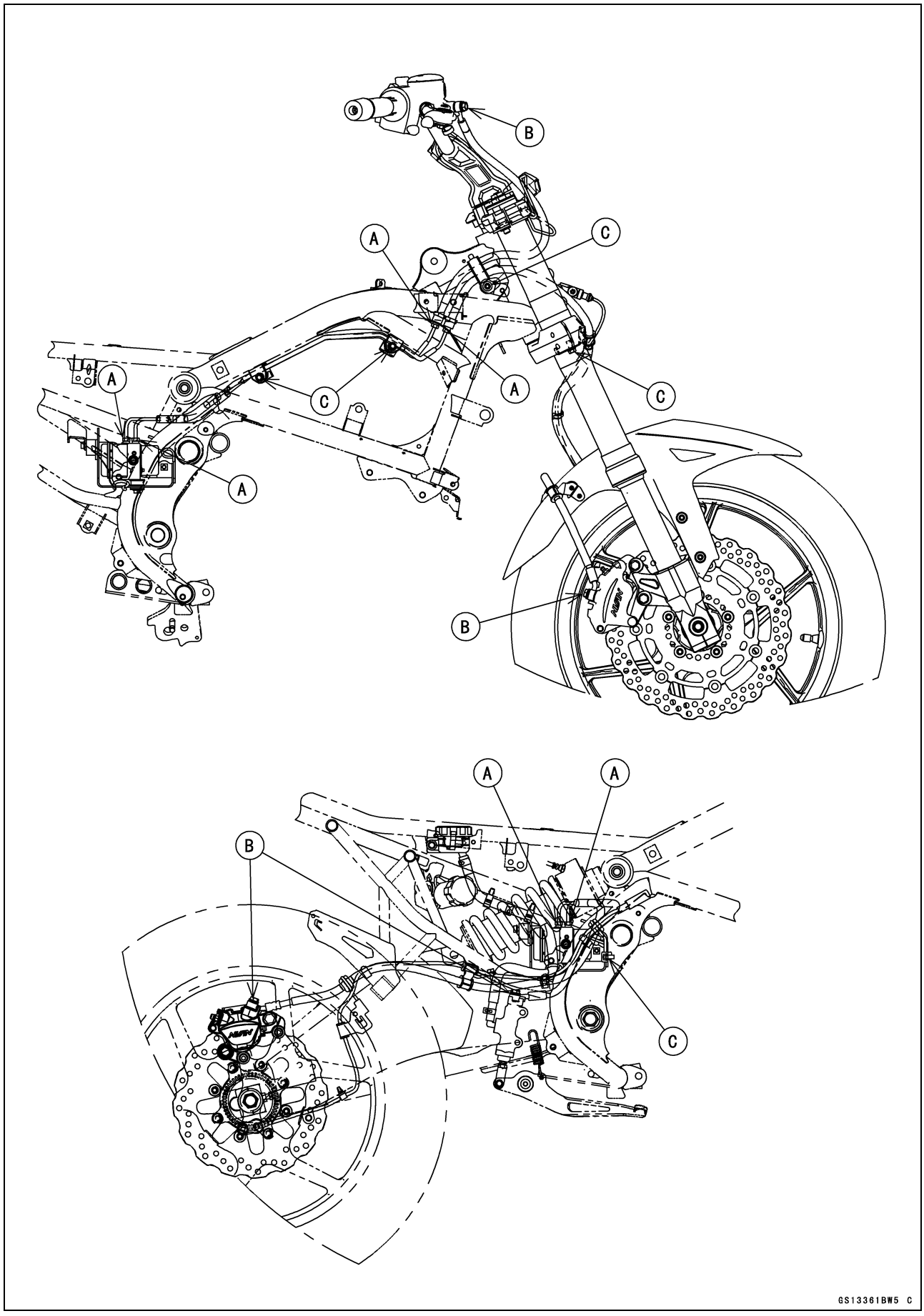
● Tighten the brake pipe joint nuts with the flare nut wrench.

● Tighten:

Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Pipe Joint Nuts: 18 N·m (1.8 kgf·m, 13 ft·lb)

● Fill the brake line after installing the brake hose and pipe (see Brake Fluid Change).

Periodic Maintenance Procedures



Periodic Maintenance Procedures

Master Cylinder Rubber Parts Replacement

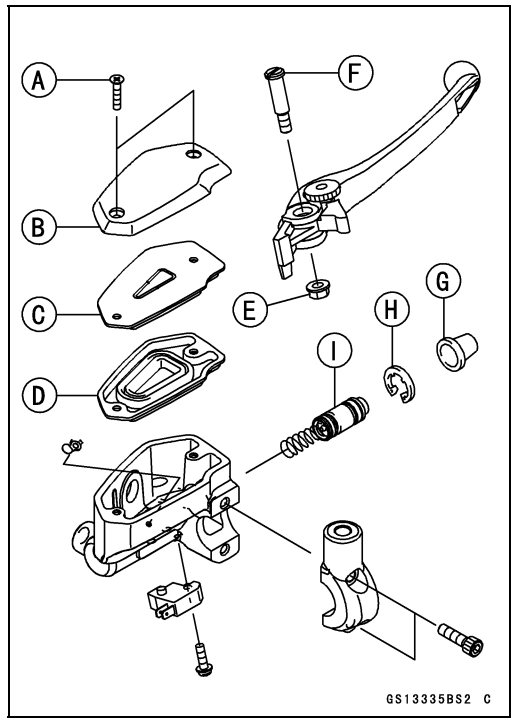
Front Master Cylinder Disassembly

- Remove the front master cylinder (see Front Master Cylinder Removal in the Brakes chapter).
- Remove:
  Front Brake Reservoir Cap Screws [A]
  Reservoir Cap [B]
  Diaphragm Plate [C]
  Diaphragm [D]
- Unscrew the locknut [E] and pivot bolt [F], and remove the brake lever.
- Remove the dust cover [G] and circlip [H].

  Special Tool - Inside Circlip Pliers: 57001-143
- Pull out the piston assembly [I].

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

- Replace:
  Diaphragm [D]
  Dust Cover [G]
  Circlip [H]
  Piston Assembly [I]



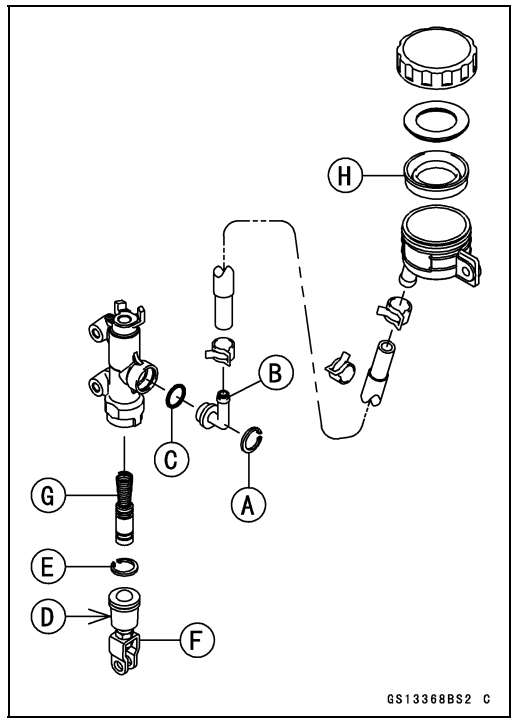
Rear Master Cylinder Disassembly

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

  Special Tool - Inside Circlip Pliers: 57001-143
- Slide the dust cover [D] out of place, and remove the circlip [E].
- Pull out the push rod assembly [F].
- Remove the piston assembly [G].

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

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



Periodic Maintenance Procedures

Master Cylinder Assembly

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

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

- Apply brake fluid to the new parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Apply silicone grease to the followings.

  Front: Brake Lever Pivot Bolt

  Rear: Dust Cover of Push Rod Assembly

- For the front master cylinder, tighten the brake lever pivot bolt and the locknut.

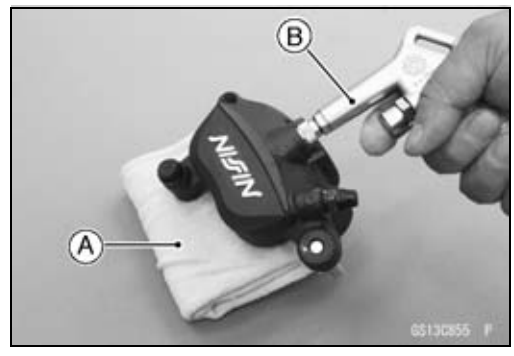
Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)
Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)

Caliper Rubber Parts Replacement

Front Caliper Disassembly

- Remove:
  Front Caliper (see Front Caliper Removal in the Brakes chapter)
  Brake Pads (see Front Brake Pad Removal in the Brakes chapter)
- Using compressed air, remove the pistons.

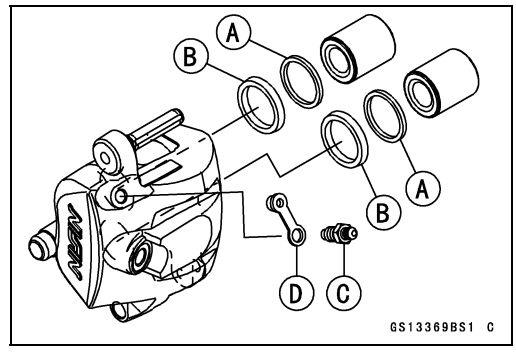
○Cover the piston area with a clean, thick cloth [A].
○Blow compressed air [B] into the hole for the banjo bolt to remove the piston.



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

○Pull out the pistons by hand.

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



NOTE

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

Periodic Maintenance Procedures

Front Caliper Assembly

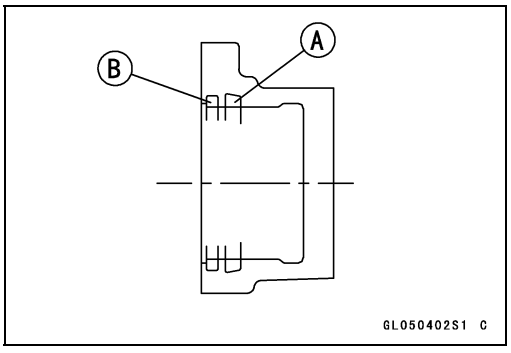
- Clean the caliper parts except for the pads.

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

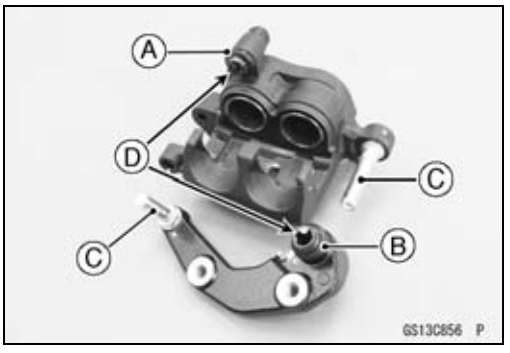
- Install the bleed valve and rubber cap.

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

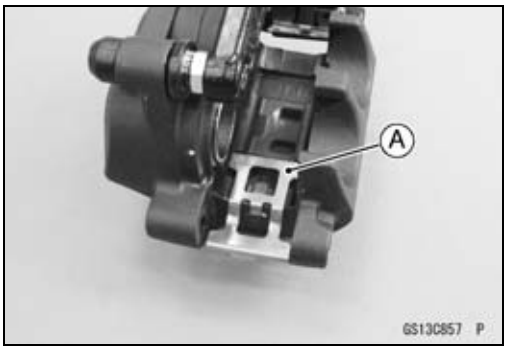
- Replace the fluid seals [A] with new ones.
- ○Apply brake fluid to the fluid seals, and install them into the cylinders by hand.
- Replace the dust seals [B] with new ones if they are damaged.
- ○Apply brake fluid to the dust seals, and install them into the cylinders by hand.



- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
- Check the shaft rubber friction boot [A] and the dust cover [B] replace them with new ones if they are damaged.
- Apply a silicone grease to the caliper holder shafts [C] and the holes [D].

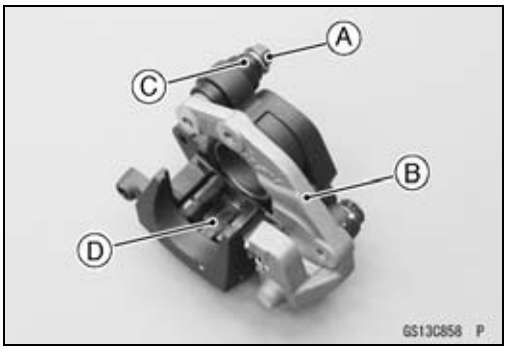


- Install the pad spring [A].
- Install the pads (see Front Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.

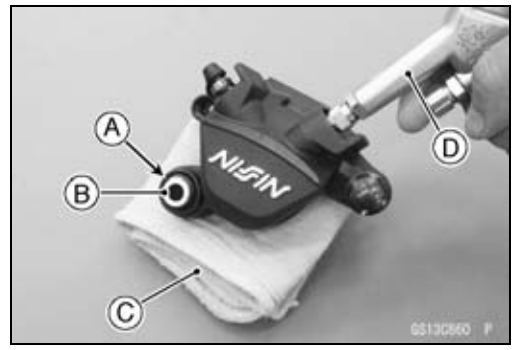


Rear Caliper Disassembly

- Remove:
  Rear Caliper (see Rear Caliper Removal in the Brakes chapter)
  Brake Pad (see Rear Brake Pad Removal in the Brakes chapter)
  Rear Caliper Holder Bolt [A]
  Rear Caliper Holder [B]
  Friction Boot [C]
  Pad Spring [D]



Periodic Maintenance Procedures



- Remove:
  Dust Boot [A]
  Sleeve [B]
- Using compressed air, remove the piston.

○Cover the caliper opening with a clean, heavy cloth [C].
○Remove the piston by lightly applying compressed air [D] to where the brake line fits into the caliper.

⚠ WARNING

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

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

NOTE

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

Rear Caliper Assembly

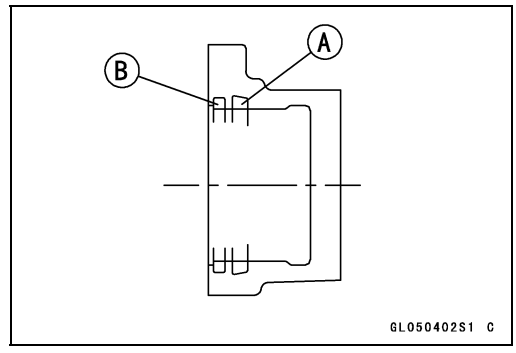
- Clean the caliper parts except for the pads.

NOTICE

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

- Install the bleed valve and rubber cap.

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



- Replace the fluid seal [A] with a new one.

○Apply silicone grease to the fluid seal, and install it into the cylinder by hand.

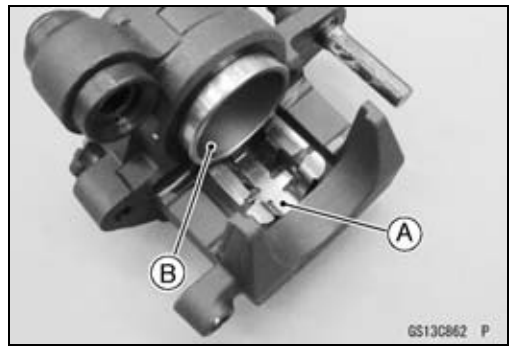
- Replace the dust seal [B] with a new one.

○Apply silicone grease to the dust seal, and install it into the cylinder by hand.

Periodic Maintenance Procedures

● Replace the dust boot [A].
● Install the sleeve [B] with dust boot.
○Apply silicone grease to the sleeve.

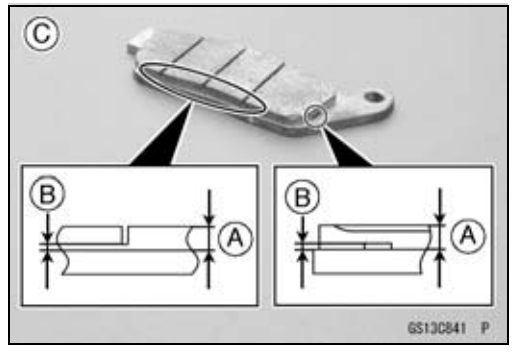
● Install the pad spring [A] in the caliper as shown in the figure.
● Apply brake fluid to the outside of the piston [B], and push it into the cylinder by hand.



● Install:
Friction Boot [A]

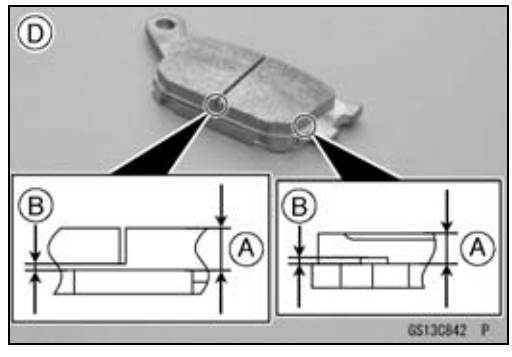
Brake Pad Wear Inspection

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



Pad Lining Thickness

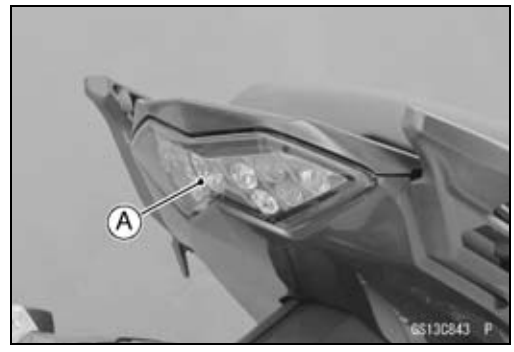
Standard:	
Front	**4.0 mm (0.16 in.)**
Rear	**5.0 mm (0.20 in.)**
Service Limit:	**1 mm (0.04 in.)**



Periodic Maintenance Procedures

Brake Light Switch Operation Inspection

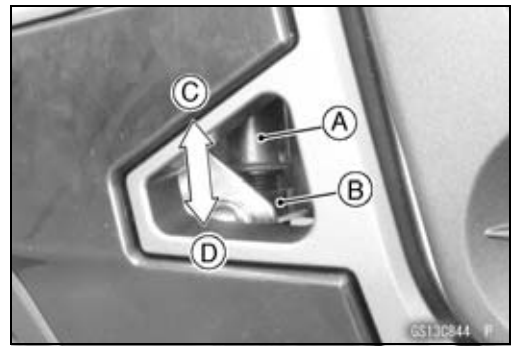
- Turn the ignition switch on.
- The brake light (LED) [A] should go on when the brake lever is applied or after the brake pedal is depressed about 12 mm (0.47 in.).



★If it does not, adjust the brake light switch.

- While holding the switch body, turn the adjusting nut to adjust the switch.

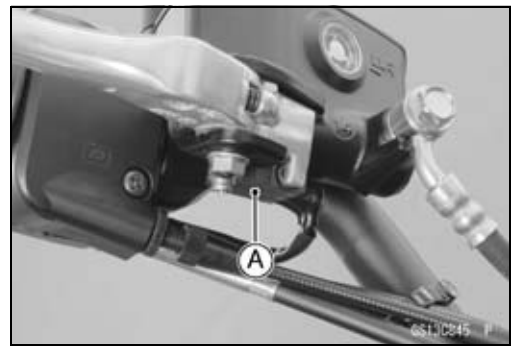
Switch Body [A]
Adjusting Nut [B]
Light sooner as the body rises [C]
Light later as the body lowers [D]



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

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

Battery (see Charging Condition Inspection in the Electrical System chapter)
Brake Light (LED) (see Tail/Brake Light (LED) Removal/Installation in the Electrical System chapter)
Main Fuse 30 A and Brake Light/Horn Fuse 7.5 A (see Fuse Inspection in the Electrical System chapter)
Front Brake Light Switch [A] (see Switch Inspection in the Electrical System chapter)
Rear Brake Light Switch (see Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)



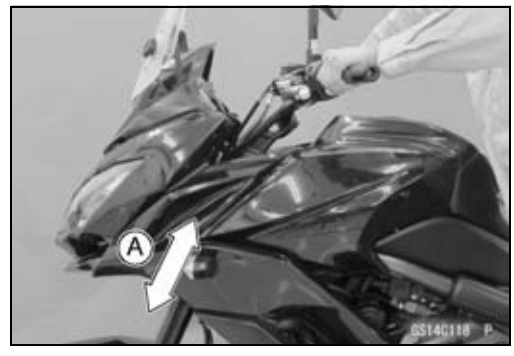
Suspension

Suspension System Inspection

Front Forks/Rear Shock Absorber Operation Inspection

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

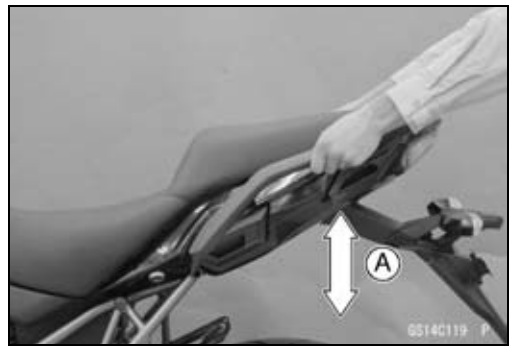
★If the forks do not smoothly or noise is found, inspect the fork oil level or fork clamps (see Front Fork Oil Change in the Suspension chapter).



Periodic Maintenance Procedures

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

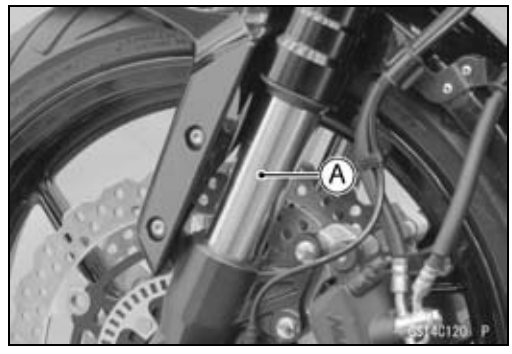
★If the shock absorber does not smoothly stroke or noise is found, inspect the oil leak (see Rear Shock Absorber Oil Leak Inspection).



Front Fork Oil Leak Inspection

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

★Replace any defective parts, if necessary.



Rear Shock Absorber Oil Leak Inspection

- Visually inspect the rear shock absorber [A] for oil leakage.

★If the oil leakage is found on it, replace the rear shock absorber with a new one.

Steering

Steering Play Inspection

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

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608

- With the front wheel pointing straight ahead, alternately tap each end of the handlebars. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.

★If the wheel binds or catches before the stop, the steering is too tight.

- Feel for steering looseness by pushing and pulling [A] the forks.

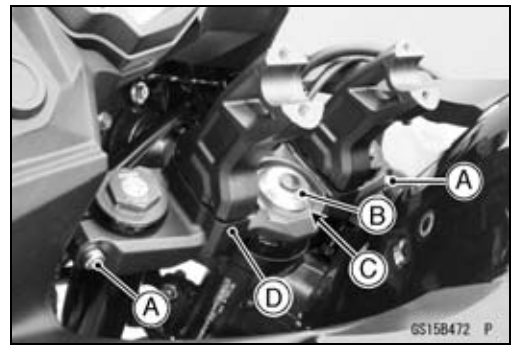
★If you feel looseness, the steering is too loose.

NOTE

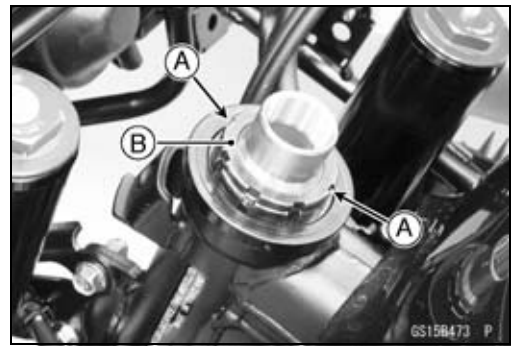
○*The cables and wiring will have some effect on the motion of the fork which must be taken into account.*
○*Be sure the leads and cables are properly routed.*
○*The bearings must be in good condition and properly lubricated in order for any test to be valid.*

Periodic Maintenance Procedures

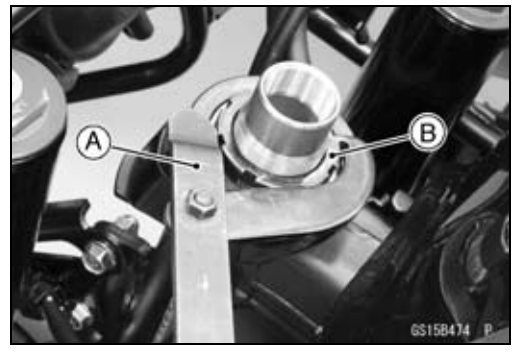
Steering Play Adjustment



- Remove:
  Middle Fairings (see Middle Fairing Removal in the Frame chapter)
  Handlebars (see Handlebar Removal in the Steering chapter)
- Loosen the upper front fork clamp bolts [A].
- Remove:
  Steering Stem Head Bolt [B] and Washer
  Stem Head [D]



- Straighten the claws [A] of the washer .
- Remove:
  Steering Stem Locknut [B]
  Claw Washer



- Adjust the steering using the steering stem nut wrench [A].

Special Tool - Steering Stem Nut Wrench: 57001-1100

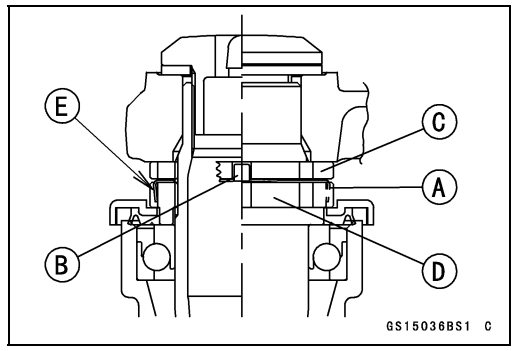
★If the steering is too tight, loosen the stem nut [B] a fraction of a turn.

★If the steering is too loose, tighten the stem nut a fraction of a turn.

NOTE

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

Periodic Maintenance Procedures



- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until it touches the claw washer.
- Hand tighten the stem locknut clockwise until the claws are aligned with the second groove of stem nut [D], and bend the 2 claws downward [E].
- Install the steering stem head.
- Install the washer, and temporary tighten the stem head bolt.

NOTE

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

Torque - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

⚠ WARNING

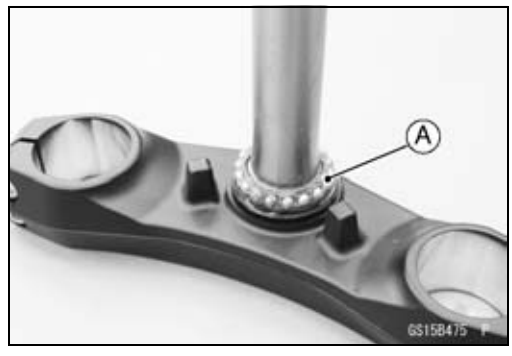
If the handlebars do not turn to the steering stop, they may cause an accident resulting in injury or death. Be sure the cables, harnesses and hoses are routed properly and do not interfere with handlebar movement (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Check the steering again.

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

- Install the removed parts (see appropriate chapters).

Steering Stem Bearing Lubrication



- Remove the steering stem (see Stem, Stem Bearing Removal in the Steering chapter).
- Using a high flash-point solvent, wash the upper and lower ball bearings [A] in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean off grease and dirt.
- Visually check the outer races and the ball bearings.

★Replace the bearing assemblies if they show wear or damage.

- Pack the upper and lower ball bearings in the cages with grease, and apply a light coat of grease to the upper and lower outer races.
- Install the steering stem (see Stem, Stem Bearing Installation in the Steering chapter).
- Adjust the steering (see Steering Play Adjustment).

Periodic Maintenance Procedures

Electrical System

Lights and Switches Operation Inspection

First Step

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

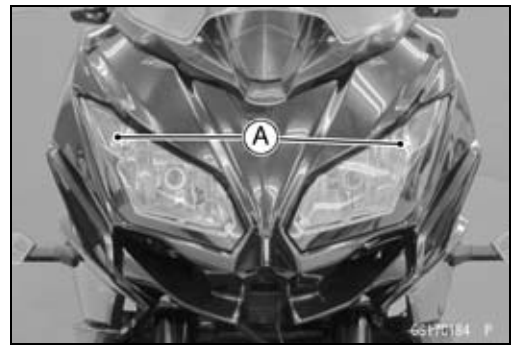
City Lights [A]	Goes on
Taillight (LED) [B]	Goes on
License Plate Light [C]	Goes on
Meter Panel Illumination (LED) [D]	Goes on
Meter Panel LCD [E]	Goes on
Green Neutral Indicator (LED) [F]	Goes on
Oil Pressure Warning Indicator [G] and Red Warning Indicator (LED) [H]	Goes on
Yellow ABS Indicator (LED) [I] (ABS Equipped Models)	Goes on

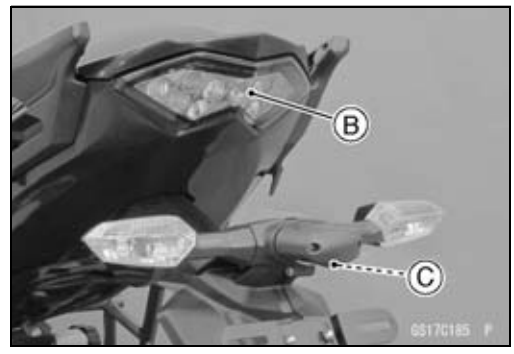
★If the light does not go on, inspect or replace the following parts.

Battery (see Charging Condition Inspection in the Electrical System chapter)
City Light (LED) (see City Light (LED) Removal/Installation in the Electrical System chapter)
License Plate Light Bulb (see License Plate Light Bulb Replacement in the Electrical System chapter)
Meter Panel LCD (see Meter Unit Inspection in the Electrical System chapter)
Green Neutral Indicator (LED) (see Meter Unit Inspection in the Electrical System chapter)
Red Warning Indicator (LED) (Oil Pressure Warning) (see Meter Unit Inspection in the Electrical System chapter)
Meter Panel Illumination (LED) (see Meter Unit Inspection in the Electrical System chapter)
ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)
Main Fuse 30 A, Meter Fuse 10 A and Brake Light/Horn Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Oil Pressure Switch (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Neutral Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)
Yellow ABS Indicator (LED) (ABS Equipped Models) (see Yellow ABS Indicator (LED) Inspection in the Brakes chapter)

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

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





Periodic Maintenance Procedures

Second Step
- Turn the ignition switch to hazard position.
- The all lights should go off.

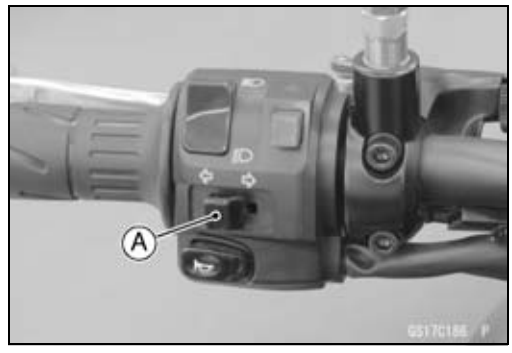
★If the light goes on, inspect or replace the following item.
Ignition Switch (see Switch Inspection in the Electrical System chapter)

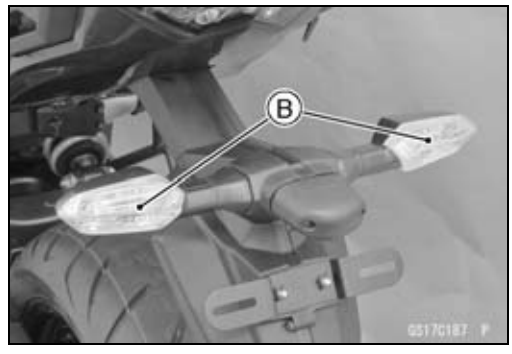
Third Step
- Turn the ignition switch on.
- Turn on the turn signal switch [A] (left or right position).
- The left or right turn signal lights [B] (front and rear) according to the switch position should blink.
- The green turn signal indicators (LED) [C] in the meter unit should blink.

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

- Push the turn signal switch.
- The turn signal lights and green turn signal indicator (LED) should go off.

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





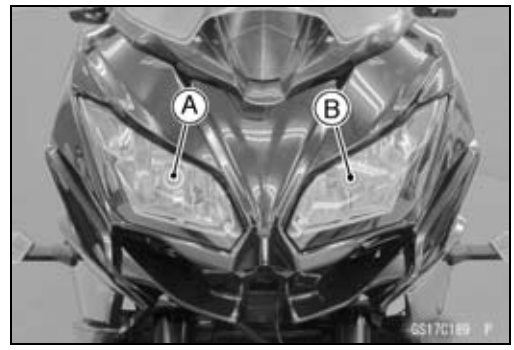
Fourth Step
- Set the dimmer switch [A] to low beam position.
- Start the engine.
- The low beam headlight should go on.

★If the low beam headlight does not go on, inspect or replace the following parts.
Headlight Bulb (see Headlight Blub Replacement in the Electrical System chapter)
Headlight Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)
Headlight Relay (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

Periodic Maintenance Procedures

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

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



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

★If the headlights and blue high beam indicator (LED) do not go off, inspect or replace the headlight relay (see Relay Circuit Inspection in the Electrical System chapter).

- Turn the ignition switch off.
- The headlights and blue high beam indicator (LED) should go off.

Headlight Aiming Inspection

- Inspect the headlight beam for aiming.

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

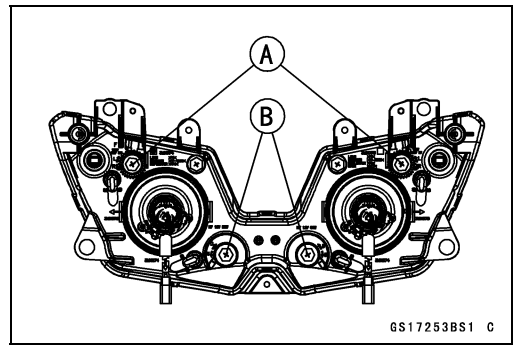
Headlight Beam Horizontal Adjustment

- Turn the horizontal adjuster [A] in both headlights in or out until the beam points straight ahead.

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

Headlight Beam Vertical Adjustment

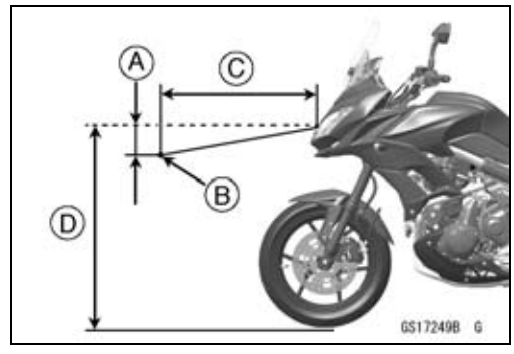
- Turn the vertical adjuster [B] in both headlights in or out to adjust the headlight vertically.



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



50 mm (2.0 in.) [A]
Center of Brightest Spot [B]
7.6 m (25 ft) [C]
Height of Headlight Center [D]

Periodic Maintenance Procedures

Side Stand Switch Operation Inspection

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

Side Stand Switch Operation

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

Periodic Maintenance Procedures

★If the side stand switch operation does not work, inspect or replace the following parts.
Battery (see Charging Condition Inspection in the Electrical System chapter)
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
Ignition Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Side Stand Switch (see Switch Inspection in the Electrical System chapter)
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)
Starter Button (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Switch Inspection in the Electrical System chapter)
Starter Lockout Switch (see Switch Inspection in the Electrical System chapter)
Starter Relay (see Starter Relay Inspection in the Electrical System chapter)
Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Starter Circuit Relay (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

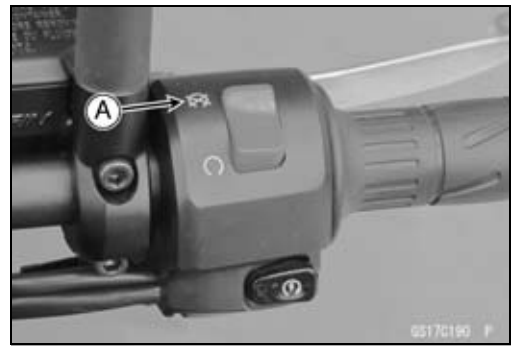
★If the all parts are good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

Engine Stop Switch Operation Inspection

First Step

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

★If the engine starts, inspect or replace the engine stop switch (see Switch Inspection in the Electrical System chapter).



Second Step

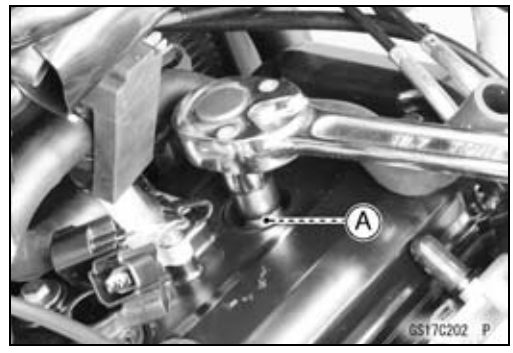
- Turn the ignition switch on.
- Set the gear position in the neutral position.
- Turn the engine stop switch to run position [A].
- Push the starter button and start the engine.
- Turn the engine stop switch to stop position.
- Immediately the engine should be stop.

★If the engine does not stop, inspect or replace the engine stop switch (see Switch Inspection in the Electrical System chapter).

★If the engine stop switch is good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

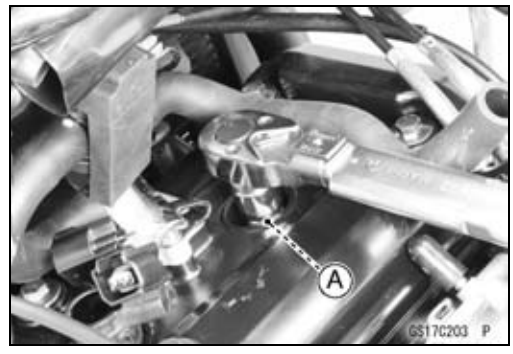
Periodic Maintenance Procedures

Spark Plug Replacement



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

Standard Spark Plug
Type: NGK CR9EIA-9



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

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

- Tighten:

Torque - Spark Plugs: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Install the stick coils (see Stick Coil Installation in the Electrical System chapter).
- After installation, be sure the stick coils are installed securely by pulling up them lightly.

Others

Chassis Parts Lubrication

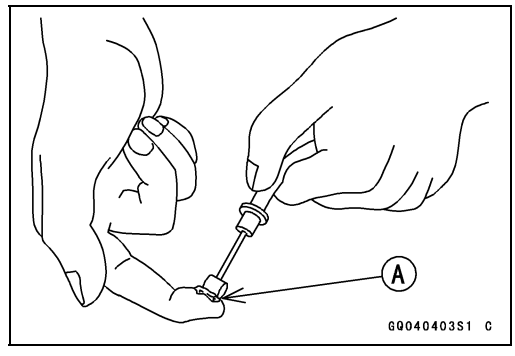
- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

NOTE

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

Pivots: Lubricate with Grease.
Brake Lever
Brake Pedal
Clutch Lever
Rear Master Cylinder Push Rod Joint Pin
Side Stand

Points: Lubricate with Grease.
Clutch Inner Cable Upper and Lower Ends [A]
Throttle Inner Cable Upper and Lower Ends

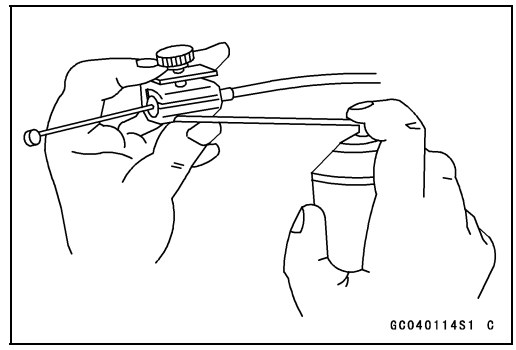


Periodic Maintenance Procedures

Cables: Lubricate with Rust Inhibitor.
Clutch Cable
Throttle Cables

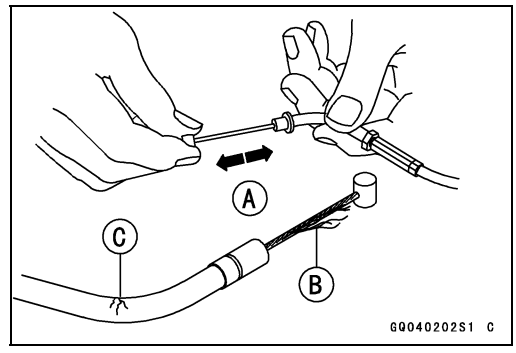
- Lubricate the cables by seeping the oil between the cable and housing.

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



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

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



Condition of Bolts, Nuts and Fasteners Tightness Inspection

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

NOTE

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

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

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

Periodic Maintenance Procedures

Bolt, Nut and Fastener to be checked

Engine:
- Clutch Lever Pivot Bolt Locknut
- Engine Mounting Bolts and Nuts
- Exhaust Pipe Holder Nuts
- Muffler Body Mounting Bolts

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

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

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

Steering:
- Handlebar Holder Bolts
- Steering Stem Head Bolt

Others:
- Footpeg Bracket Bolts
- Front Fender Mounting Bolts
- Side Stand Bolt

Fuel System (DFI)

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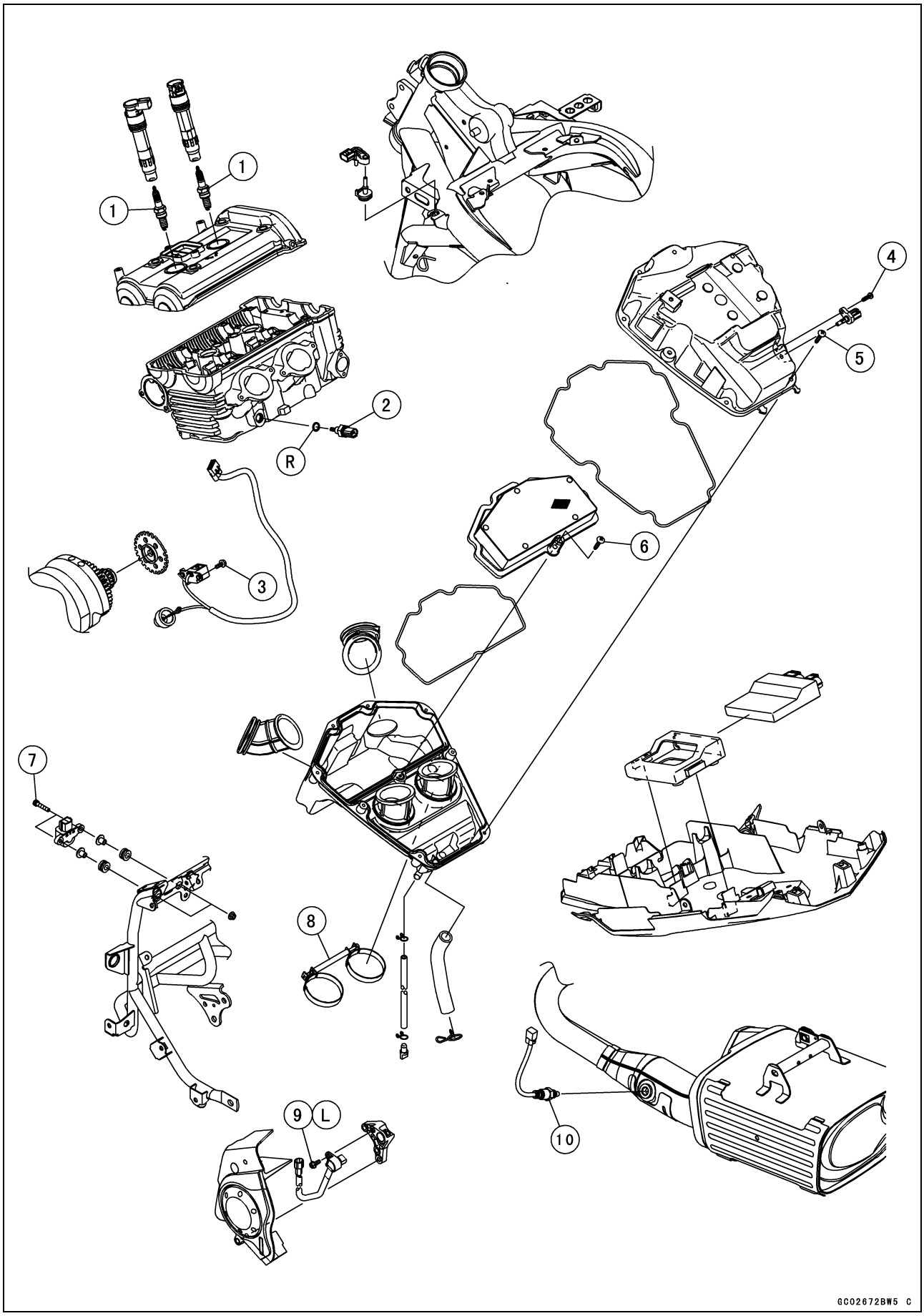
Exploded View

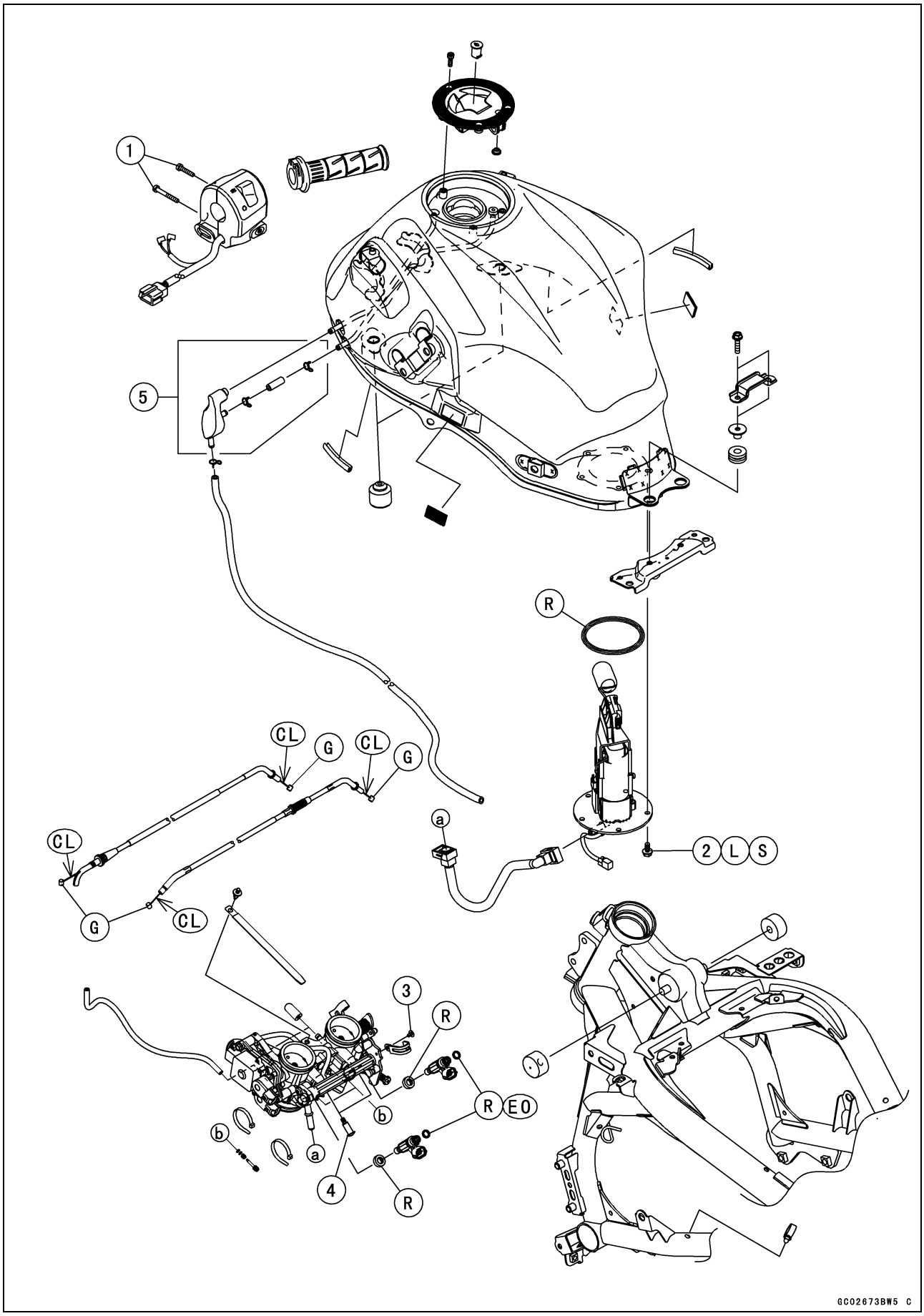


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Spark Plugs	15	1.5	11	
2	Water Temperature Sensor	12	1.2	106 in·lb	
3	Crankshaft Sensor Bolts	6.0	0.61	53 in·lb	
4	Intake Air Temperature Sensor Screw	1.2	0.12	11 in·lb	
5	Air Cleaner Housing Assembly Screws	1.2	0.12	11 in·lb	
6	Air Cleaner Element Screw	1.2	0.12	11 in·lb	
7	Vehicle-down Sensor Mounting Bolls	6.9	0.70	61 in·lb	
8	Air Cleaner Housing Clamp Bolt	2.0	0.20	18 in·lb	
9	Speed Sensor Bolt	7.8	0.80	69 in·lb	L
10	Oxygen Sensor	25	2.5	18	

L: Apply a non-permanent locking agent.
R: Replacement Parts

Exploded View



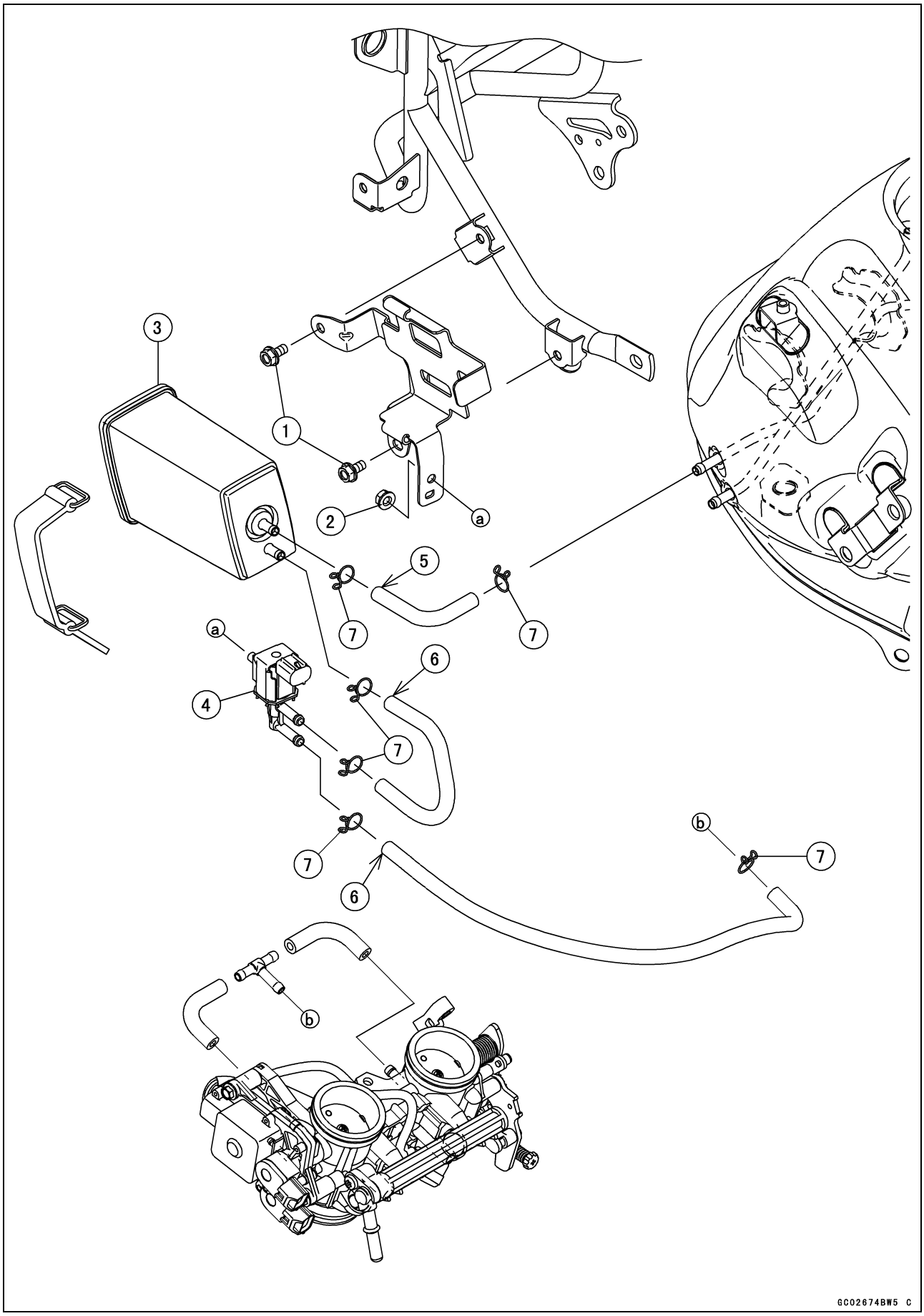
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Switch Housing Screws	3.5	0.36	31 in·lb	
2	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
3	Throttle Valve Assy Clamp Mounting Screw	2.1	0.21	19 in·lb	
4	Delivery Pipe Assy Mounting Screws	3.4	0.35	30 in·lb	

5. Other than CAL, SEA-B1, TH and CN Models.
CL: Apply cable lubricant.
EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.

Exploded View

CAL, SEA-B1, TH and CN Models



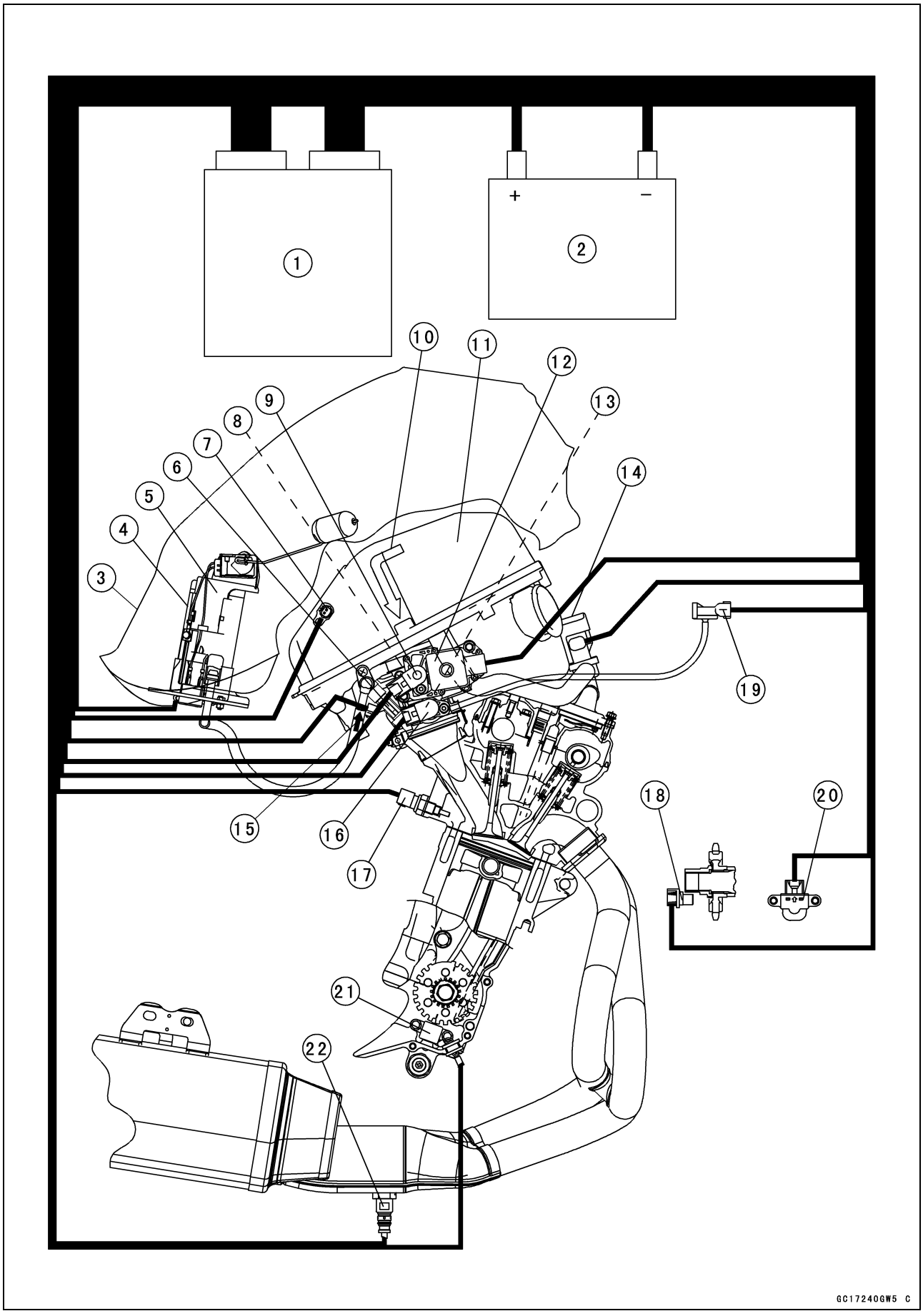
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Canister Bracket Bolts	9.8	1.0	87 in·lb	
2	Purge Valve Mounting Nut	7.0	0.71	62 in·lb	

3. Canister
4. Purge Valve
5. Blue Paint Mark
6. Green Paint Mark
7. Place the clamp knob as shown.

DFI System

DFI System

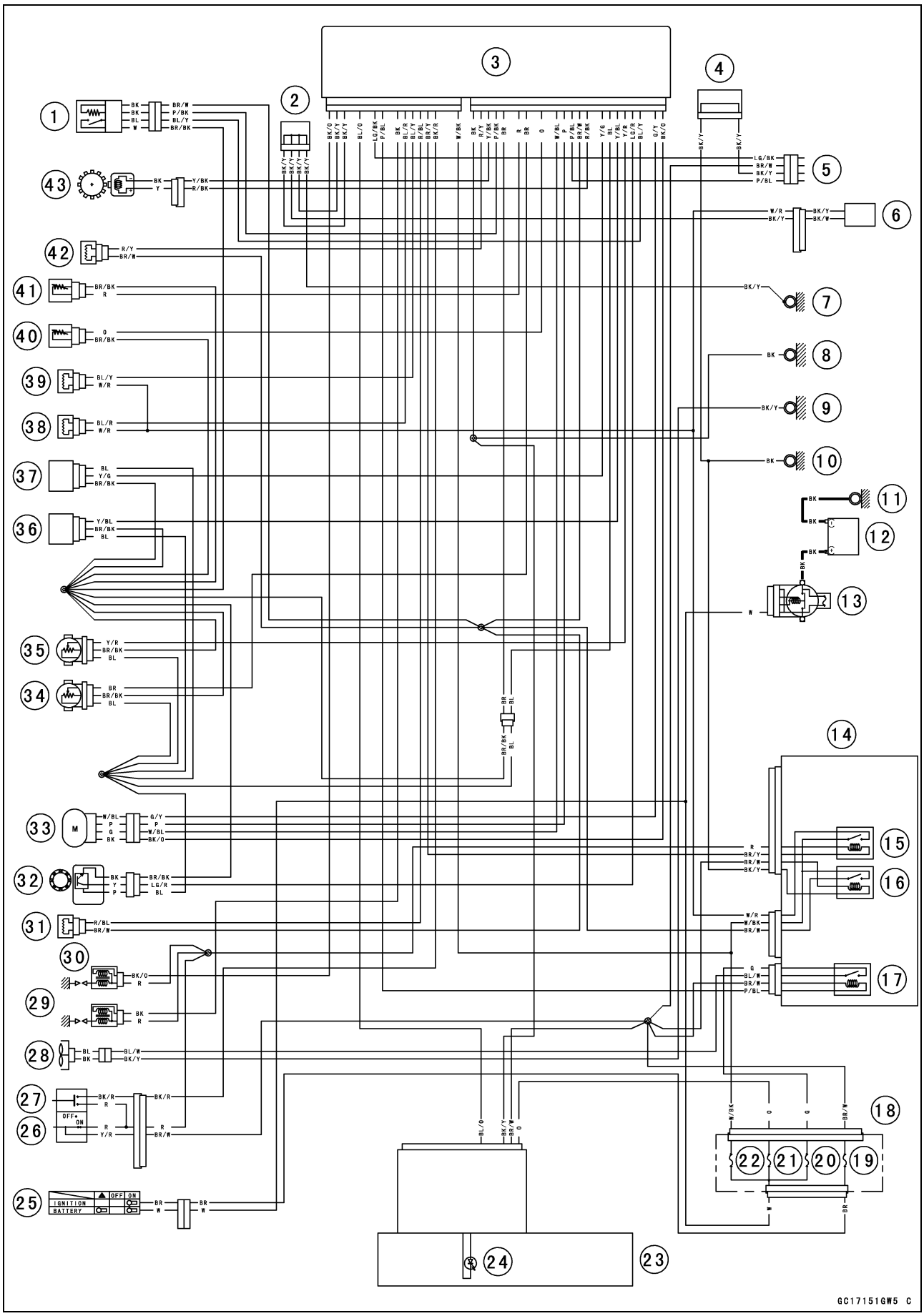


DFI System

1. ECU
2. Battery 12 V 10 Ah
3. Fuel Tank
4. Pressure Regulator
5. Fuel Pump
6. Fuel Injectors
7. Intake Air Temperature Sensor
8. Subthrottle Valve
9. Subthrottle Sensor
10. Air Flow
11. Air Cleaner Housing
12. Subthrottle Valve Actuator
13. Subthrottle Valve
14. Air Switching Valve
15. Fuel Flow
16. Main Throttle Sensor
17. Water Temperature Sensor
18. Speed Sensor
19. Intake Air Pressure Sensor
20. Vehicle-down Sensor
21. Crankshaft Sensor
22. Oxygen Sensor

DFI System

DFI System Wiring Diagram



DFI System

Part Names

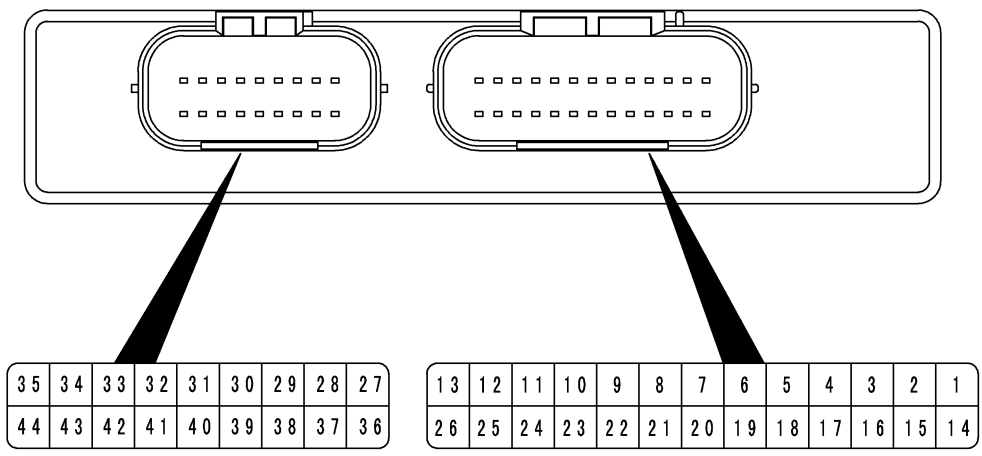
1. Oxygen Sensor
2. Joint Connector G
3. ECU
4. Joint Connector B
5. Kawasaki Diagnostic System Connector
6. Fuel Pump
7. Frame Ground 1
8. Frame Ground 5
9. Frame Ground 6
10. Frame Ground 2
11. Engine Ground
12. Battery 12 V 10 Ah
13. Main Fuse 30 A
14. Relay Box
15. Fuel Pump Relay
16. ECU Main Relay
17. Radiator Fan Relay
18. Fuse Box 1
19. Ignition Fuse 10 A
20. Fan Fuse 15 A
21. Meter Fuse 10 A
22. ECU Fuse 15 A
23. Meter Unit
24. Yellow Engine Warning Indicator Light (LED)
25. Ignition Switch
26. Engine Stop Switch
27. Starter Button
28. Fan Motor
29. Spark Plugs
30. Stick Coil #1, #2
31. Air Switching Valve
32. Speed Sensor
33. Subthrottle Valve Actuator
34. Subthrottle Sensor
35. Main Throttle Sensor
36. Intake Air Pressure Sensor
37. Vehicle-down Sensor
38. Fuel Injector #1
39. Fuel Injector #2
40. Water Temperature Sensor
41. Intake Air Temperature Sensor
42. Purge Valve (CAL, SEA-B1, TH and CN Models)
43. Crankshaft Sensor

○Color Codes:

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

DFI System

Terminal Numbers of ECU Connectors

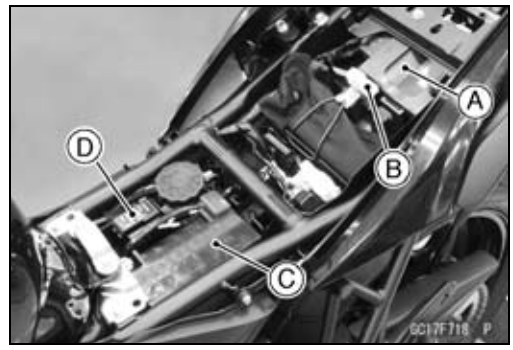


Terminal Names

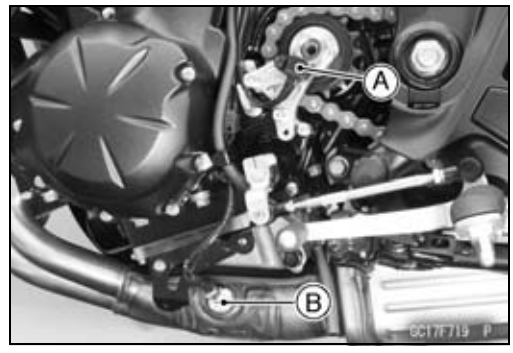
1. Subthrottle Valve Actuator: BK/O
2. Subthrottle Valve Actuator: G/Y
3. Unused
4. Oxygen Sensor: BL/Y
5. Speed Sensor: LG/R
6. Main Throttle Sensor: Y/R
7. Intake Air Pressure Sensor: Y/BL
8. Power Supply to Sensors: BL
9. Vehicle-down Sensor: Y/G
10. Neutral Switch: LG
11. Crankshaft Sensor (+): R/BK
12. Power Supply to ECU (from ECU Main Relay): BR/W
13. External Communication Line (Self -diagnosis System): P/BL
14. Subthrottle Valve Actuator: P
15. Subthrottle Valve Actuator: W/BL
16. Unused
17. Water Temperature Sensor: O
18. Unused
19. Subthrottle Sensor: BR
20. Intake Air Temperature Sensor: R
21. Unused
22. Ground for Sensors: BR
23. Oxygen Sensor Heater: P/BK
24. Crankshaft Sensor (–): Y/BK
25. Purge Valve (CAL, SEA-B1, TH and CN Models): R/Y
26. Ground for ECU: BK
27. Power Supply to ECU (from Battery): W/BK
28. Engine Stop Switch: R
29. Starter Lockout Switch: R/G
30. Starter Button: BK/R
31. Fuel Pump Relay: BR/Y
32. Air Switching Valve: R/BL
33. Fuel Injector #2: BL/Y
34. Fuel Injector #1: BL/R
35. Stick Coil #1: BK
36. Side Stand Switch: G/BK
37. Radiator Fan Relay: P/BL
38. External Communication Line: LG/BK
39. Meter Unit (Tachometer): LB
40. External Communication Line (Meter): BL/O
41. –
42. Ground for Fuel System: BK/Y
43. Ground for Ignition System: BK/Y
44. Stick Coil #2: BK/O

DFI Parts Location

ECU [A]
Kawasaki Diagnostic System Connector [B]
Battery 12 V 10 Ah [C]
Fuse Box 1 [D]

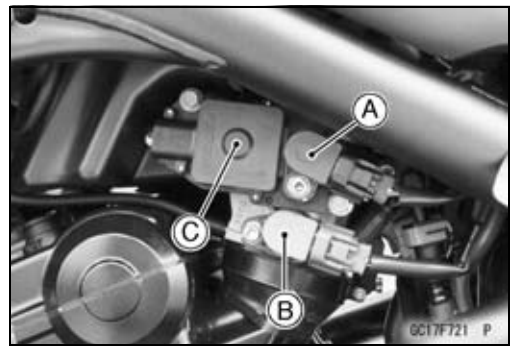


Speed Sensor [A]
Oxygen Sensor [B]



Water Temperature Sensor [A]

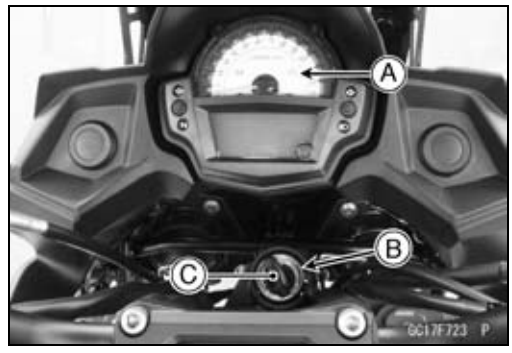
Subthrottle Sensor [A]
Main Throttle Sensor [B]
Subthrottle Valve Actuator [C]



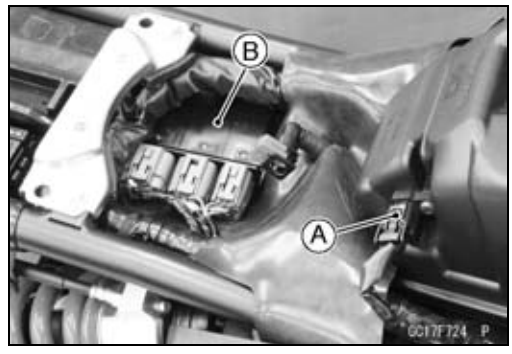
Intake Air Pressure Sensor [A]

DFI Parts Location

Yellow Engine Warning Indicator Light (LED) [A]
Ignition Switch [B]
Ignition Key [C]

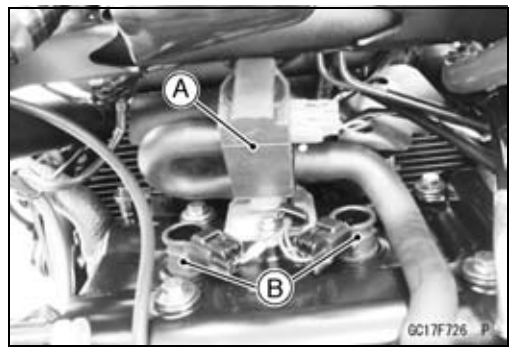


Intake Air Temperature Sensor [A]
Relay Box [B]

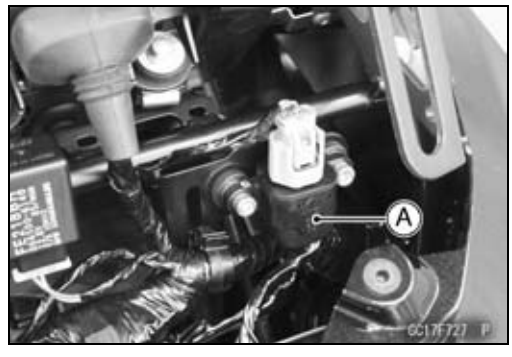


Fuel Injectors #1, #2 [A]

Air Switching Valve [A]
Stick Coils #1, #2 [B]

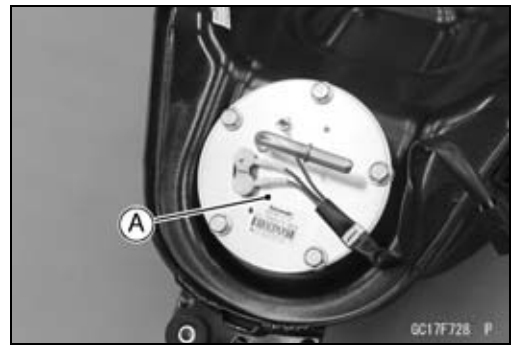


Vehicle-down Sensor [A]



DFI Parts Location

Fuel Pump [A]



Crankshaft Sensor [A]

Purge Valve (CAL, SEA-B1, TH and CN Models) [A]

Specifications

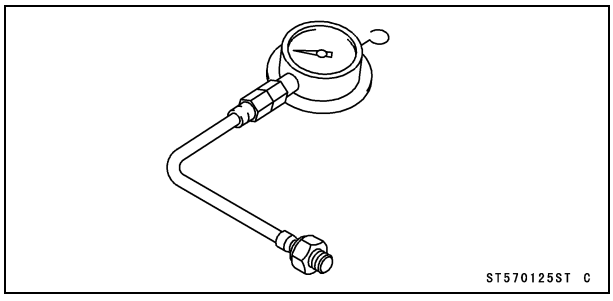
Item	Standard
Digital Fuel Injection System	
Idle Speed	1 300 ±50 r/min (rpm)
Throttle Body Assy:	
Throttle Valve	Dual throttle valves
Bore	ϕ38 mm (1.5 in.)
Throttle Body Vacuum	50.7 ±1.3 kPa (380 ±10 mmHg) at idle speed
Bypass Screws	2 1/2 (for reference)
ECU (Electronic Control Unit):	
Make	Denso
Type	Digital memory type, with built in IC igniter, sealed with resin
Fuel Pressure (High Pressure Line)	294 kPa (3.0 kgf/cm², 43 psi) with engine idling
Fuel Pump:	
Type	In-tank pump (in fuel tank)
Discharge	50 mL (1.7 US oz.) or more for 3 seconds
Fuel Injectors:	
Type	INP-287
Nozzle Type	Fine atomizing type with 12 holes
Resistance	About 11.7 ~ 12.3 Ω @20°C (68°F)
Main Throttle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 0.99 ~ 1.05 V at idle throttle opening
	DC 4.11 ~ 4.50 V at full throttle opening (for reference)
Resistance	4 ~ 6 kΩ
Intake Air Pressure Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 3.80 ~ 4.20 V at standard atmospheric pressure (101.32 kPa, 76 cmHg)
Intake Air Temperature Sensor:	
Output Voltage	About DC 2.25 ~ 2.50 V @20°C (68°F)
Resistance	5.4 ~ 6.6 kΩ @0°C (32°F)
	0.290 ~ 0.390 kΩ @80°C (176°F)
Water Temperature Sensor:	
Output Voltage	About DC 2.80 ~ 2.97 V @20°C (68°F)
Speed Sensor:	
Input Voltage	About DC 4.75 V ~ 5.25 V
Output Voltage	About DC 0.6 V or less, or 4.8 V or more at Ignition Switch ON and 0 km/h
Vehicle-down Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	with sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V
	with sensor arrow mark pointed up: DC 3.55 ~ 4.45 V

Specifications

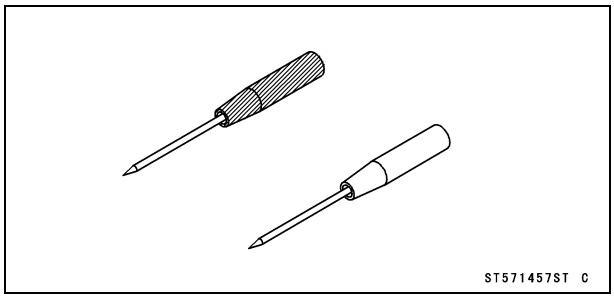
Item	Standard
Subthrottle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 0.46 ~ 0.95 V @subthrottle valve full close position (for reference)
	DC 4.05 ~ 4.15 V @subthrottle valve full open position
Resistance	4 ~ 6 kΩ
Subthrottle Valve Actuator:	
Input Voltage	About DC 8.5 ~ 10.5 V and then 0 V or About DC 8.5 ~ 10.5 V
Resistance	5.2 ~ 7.8 Ω
Oxygen Sensor:	
Output Voltage (Rich)	DC 0.5 V or more
Output Voltage (Lean)	DC 0.2 V or less
Heater Resistance	5.49 ~ 6.91 kΩ @20°C (68°F)
Purge Valve (Equipped Models):	
Resistance	30 ~ 34 Ω @20°C (68°F)
Throttle Grip and Cables	
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
Air Cleaner	
Air Cleaner Element	Viscous paper element

Special Tools and Sealant

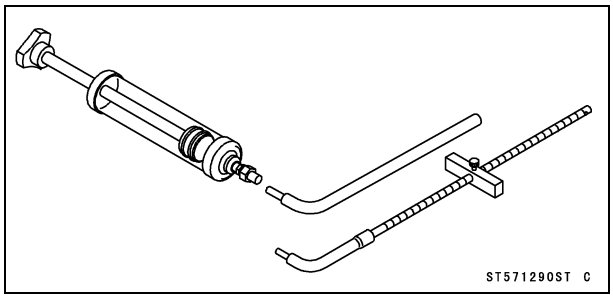
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



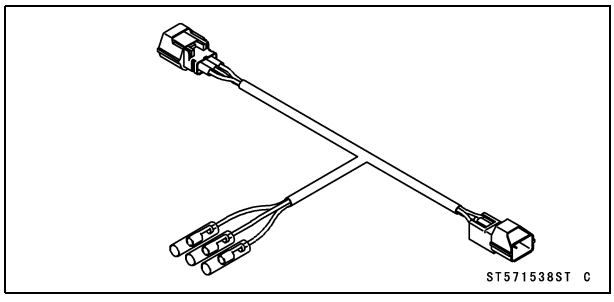
Needle Adapter Set:
57001-1457



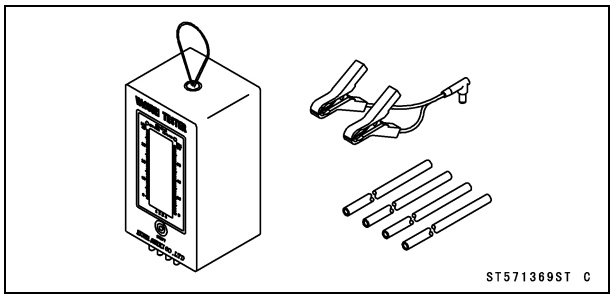
Fork Oil Level Gauge:
57001-1290



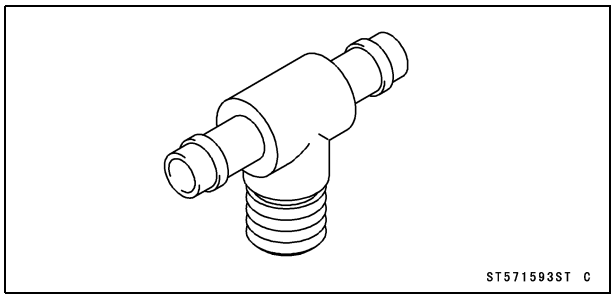
Throttle Sensor Setting Adapter:
57001-1538



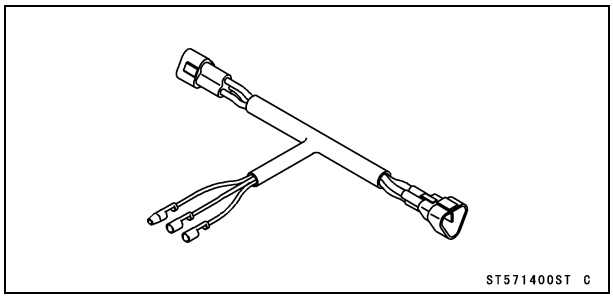
Vacuum Gauge:
57001-1369



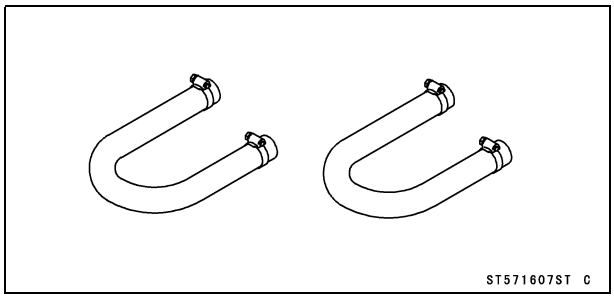
Fuel Pressure Gauge Adapter:
57001-1593



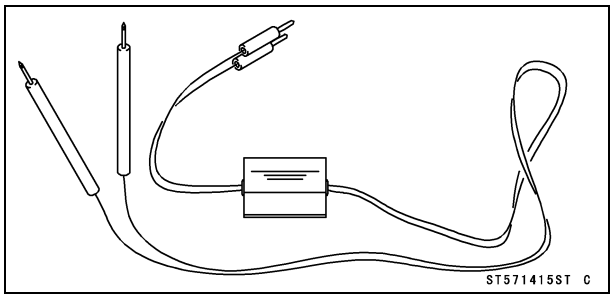
Throttle Sensor Setting Adapter #1:
57001-1400



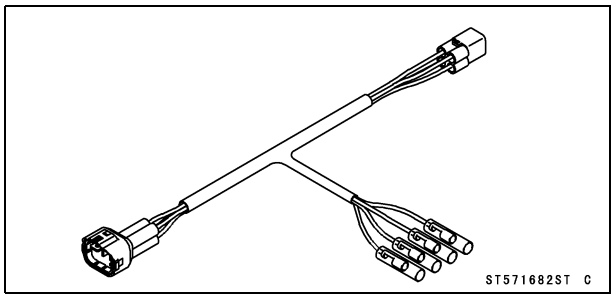
Fuel Hose:
57001-1607



Peak Voltage Adapter:
57001-1415

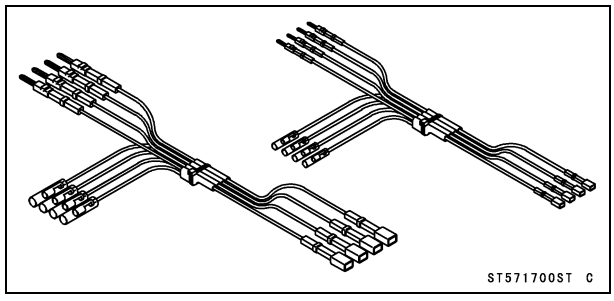


Oxygen Sensor Measuring Adapter:
57001-1682

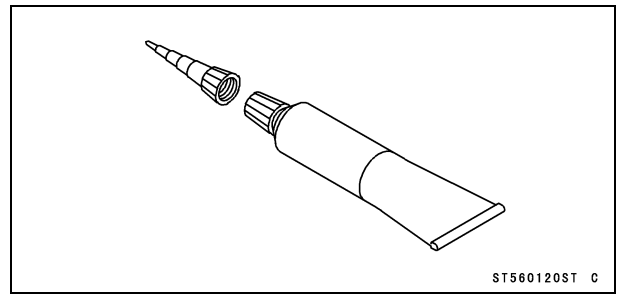


Special Tools and Sealant

Measuring Adapter:
57001-1700



Liquid Gasket, TB1211:
56019-120

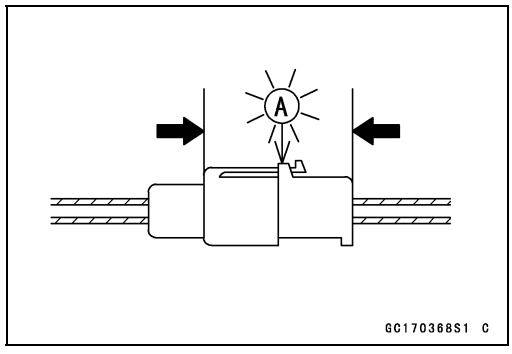


DFI Servicing Precautions

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

- This DFI system is designed to be used with a 12 V sealed battery as its power source. Do not use any other battery except for a 12 V sealed battery as a power source.
- Do not reverse the battery cable connections. This will damage the ECU.
- To prevent damage to the DFI parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- When charging, remove the battery from the motorcycle. This is to prevent ECU damage by excessive voltage.

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

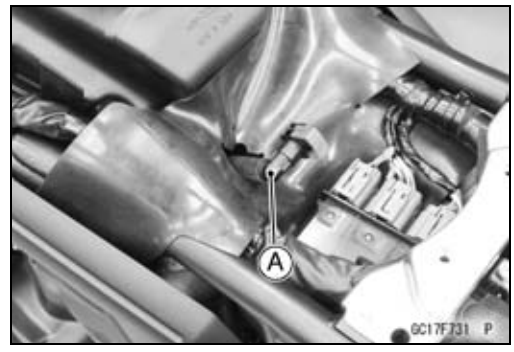


- Do not turn the ignition switch on while any of the DFI electrical connectors are disconnected. The ECU memorizes service codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of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

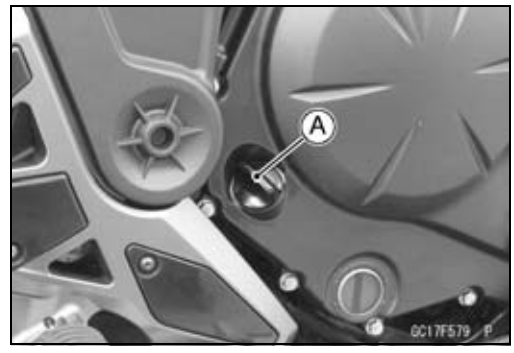
DFI Servicing Precautions

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

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



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



Troubleshooting the DFI System

Outline

When a problem occurs with DFI system, the yellow engine warning indicator light (LED) [A] goes on to alert the rider.

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

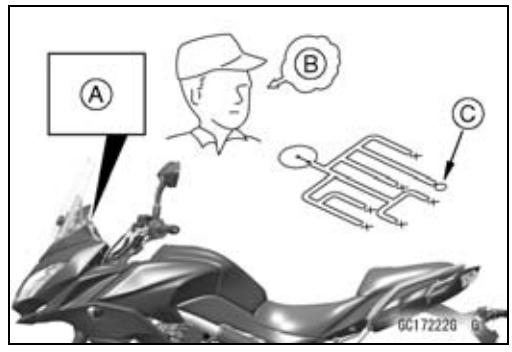
If the problem is with the following parts, the ECU can not recognize these problem. Therefore, the yellow engine warning indicator light (LED) does not go on, and service code is not displayed.

Fuel Pump
Fuel Pump Relay
Stick Coil Secondary Wiring and Ground Wiring
ECU Main Relay

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

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

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



Troubleshooting the DFI System

Even when the DFI system is operating normally, the yellow engine warning indicator light (LED) goes on may be displayed under strong electrical interference. Additional measures are not required. Turn the ignition switch off to stop the indicator light.

If the yellow engine warning indicator light (LED) of the motorcycle brought in for repair still goes on, check the service code.

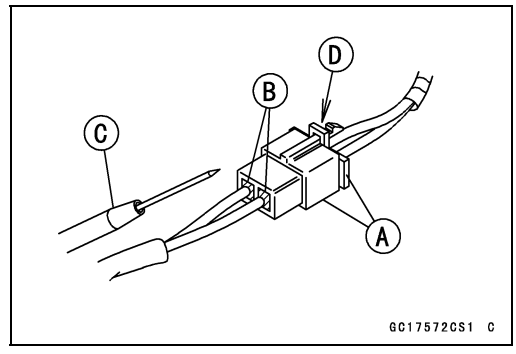
When the repair has been done, the yellow engine warning indicator light (LED) goes off. But the service codes stored in memory of the ECU are not erased to preserve the problem history. The problem history can be referred using the KDS (Kawasaki Diagnostic System) when solving unstable problems.

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

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

- When checking the DFI parts, use a digital meter which can be read two decimal place voltage or resistance.

○The DFI part connectors [A] have seals [B], including the ECU. When measuring the input or output voltage with the connector joined, use the needle adapter set [C]. Insert the needle adapter inside the seal until the needle adapter reaches the terminal.



Special Tool - Needle Adapter Set: 57001-1457

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

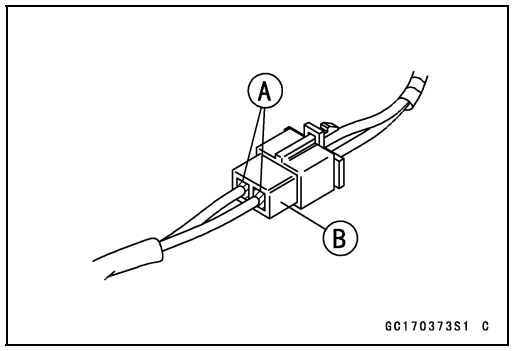
- Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of a digital meter.
- Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.
- Turn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

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

Troubleshooting the DFI System

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

Sealant - Liquid Gasket, TB1211: 56019-120



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

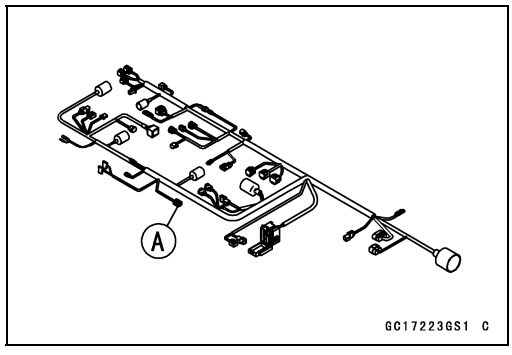
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.

- Check the wiring for continuity.

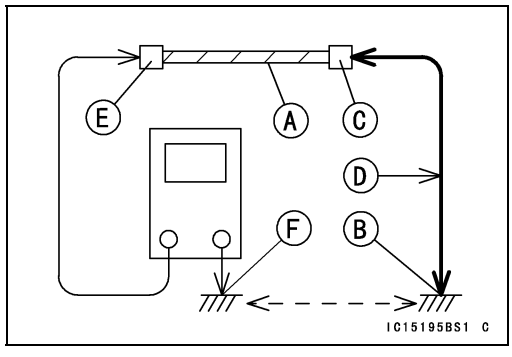
○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

○Connect a tester between the ends of the leads.

★If the tester does not read about 0 Ω, the lead is defective. Replace the lead or the main harness or the subharness.

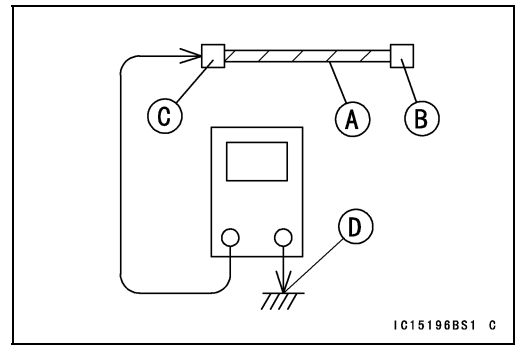


○If both ends of a harness [A] are far apart, ground [B] the one end [C], using a jumper lead [D] and check the continuity between the end [E] and the ground [F]. This enables to check a long harness for continuity. If the harness is open, repair or replace the harness.



Troubleshooting the DFI System

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



- Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.

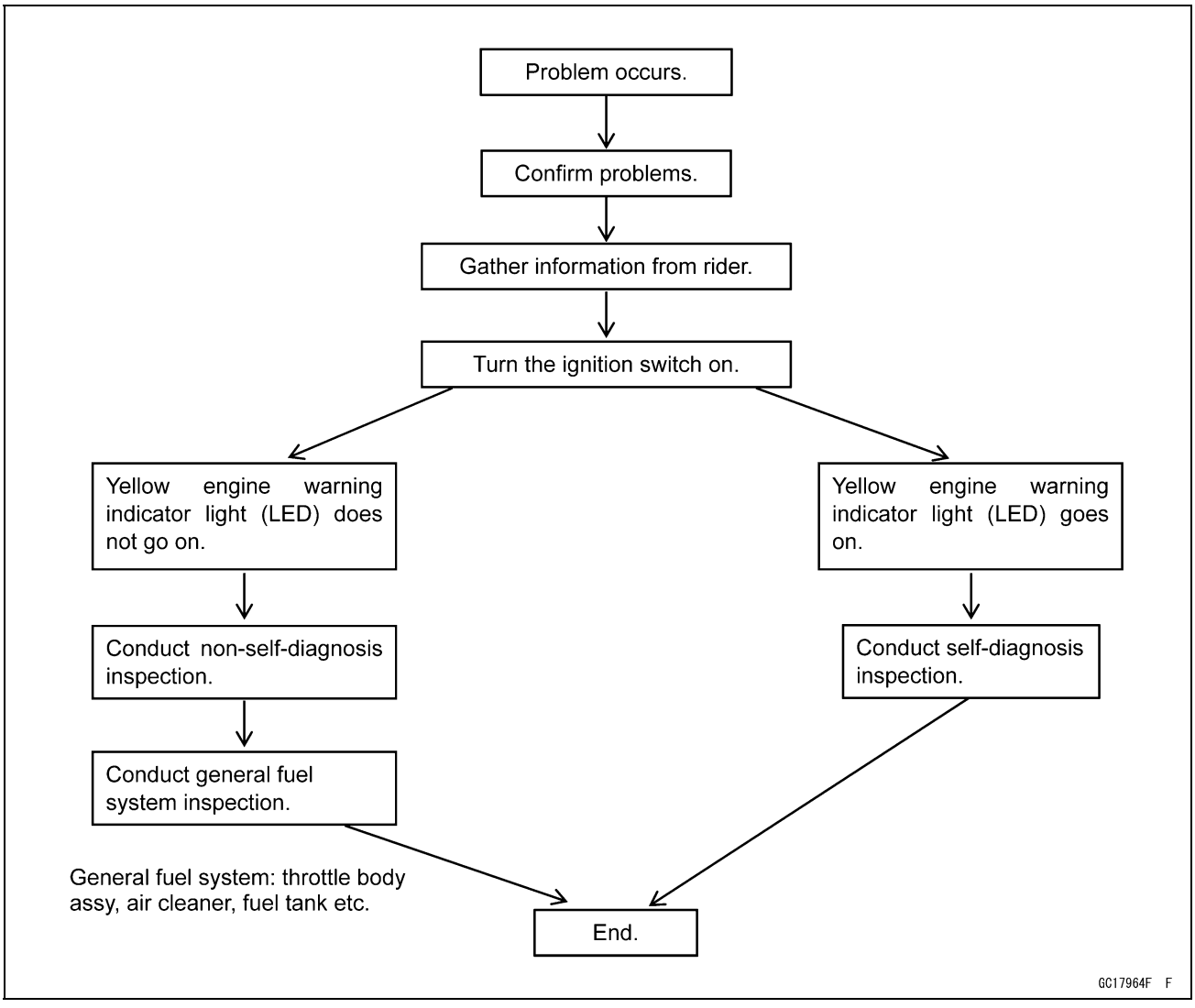
★If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.

★If an abnormality is found, replace the affected DFI part.

★If no abnormality is found in the wiring, connectors, and DFI parts, replace the ECU.

Troubleshooting the DFI System

DFI Diagnosis Flow Chart



Inquiries to Rider

○Each rider reacts to problems in different ways, so it is important to confirm what kind of symptoms the rider has encountered.

○Try to find out exactly what problem occurred under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem.

○The following sample diagnosis sheet will help prevent you from overlooking any areas, and will help you decide if it is a DFI system problem, or a general engine problem.

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, ☐ other:	
Problem frequency	☐ chronic, ☐ often, ☐once	
Road	☐ street, ☐ highway, ☐ mountain road (☐ uphill, ☐ downhill), ☐ bumpy, ☐ pebble	
Altitude	☐ normal, ☐ high (about 1 000 m or more)	
Motorcycle conditions when problem occurred.		
Yellow engine warning indicator light (LED)	☐ goes on immediately after turning the ignition switch on, and goes off after about 1 second (normal)	
	☐ goes on immediately after turning the ignition switch on, goes off after about 1 second, and goes on again after about 10 seconds (ECU communication error)	
	☐ goes on immediately after turning the ignition switch on, goes off after about 1 second, and goes on again and stays on [DFI problem]	
	☐ does not go on after turning the ignition switch on [indicator light (LED), meter unit fault]	
Red warning indicator light (LED)	☐ Does not go on about 1 second after ignition switch on (ECU or meter unit fault).	
	☐ light up (battery, oil pressure, water temperature or meter unit problem)	
Starting difficulty	☐ starter motor not rotating.	
	☐ starter motor rotating but engine do not turn over.	
	☐ starter motor and engine do not turn over.	
	☐ no fuel flow (☐ no fuel in tank, ☐ no fuel pump sound).	
	☐ no spark.	
	☐ other:	
Engine stalls	☐ right after starting.	
	☐ when opening throttle grip.	
	☐ when closing throttle grip.	
	☐ when moving off.	
	☐ when stopping the motorcycle.	
	☐ when cruising.	
	☐ other:	

Troubleshooting the DFI System

Poor running at low 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 (remedy it).
	☐ backfiring.
	☐ afterfiring.
	☐ 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:

DFI System Troubleshooting Guide

NOTE

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

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

Engine Won't Turn Over

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

Poor Running at Low Speed

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

DFI System Troubleshooting Guide

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

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Stumble:	
Fuel pressure too low	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Intake air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Surge:	
Unstable fuel pressure	Fuel pressure regulator trouble (Inspect and replace fuel pump) or kinked fuel line (Inspect and replace fuel pump) (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Backfiring when deceleration:	
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Fuel pressure too low	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Intake air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Air switching valve trouble	Inspect and replace (see chapter 16).
Air suction valve trouble	Inspect and replace (see chapter 5).
After fire:	
Spark plug burned or gap maladjusted	Replace (see chapter 2).
Fuel injector trouble	Inspect (see chapter 3).
Intake air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Other:	
Intermittent any DFI fault and its recovery	Check that DFI connectors are clean and tight, and examine leads for signs of burning or fraying (see chapter 3).

DFI System Troubleshooting Guide

Poor Running or No Power at High Speed

Symptoms or Possible Causes	Actions (chapter)
Firing incorrect:	
Stick coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
ECU trouble	Inspect (see chapter 3).
Fuel/air mixture incorrect:	
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 2).
Air duct loose	Reinstall (see chapter 3).
Throttle body assy holder loose	Reinstall (see chapter 3).
Throttle body assy dust seal damage	Replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel injector O-ring damage	Replace (see chapter 3).
Fuel injector clogged	Inspect and repair (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pump operates intermittently and often DFI fuse blows.	Fuel pump bearings may wear. Replace the fuel pump (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Intake air pressure sensor trouble	Inspect (see chapter 3).
Cracked or obstructed intake air pressure sensor vacuum hose	Inspect and repair or replace (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Knocking:	
Fuel poor quality or incorrect	Fuel change (Use the gasoline recommended in the Owner's Manual).
Spark plug incorrect	Replace it with the correct plug (see chapter 2).
Stick coil trouble	Inspect (see chapter 16).
ECU trouble	Inspect (see chapter 3).
Engine vacuum not synchronizing	Inspect and adjust (see chapter 2).
Intake air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
Miscellaneous:	
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Throttle valves will not fully open	Inspect throttle cables and lever linkage (see chapter 3).
Engine overheating - Water temperature sensor or crankshaft sensor trouble	(see Overheating of Troubleshooting Guide in chapter 17)

DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Air switching valve trouble	Inspect and replace (see chapter 16).
Air suction valve trouble	Inspect and replace (see chapter 5).
Exhaust Smokes Excessively:	
(Black smoke)	
Air cleaner element clogged	Clean element (see chapter 2).
Fuel pressure too high	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).
(Brown smoke)	
Air duct loose	Reinstall (see chapter 3).
Fuel pressure too low	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Intake air temperature sensor trouble	Inspect (see chapter 3).

Self-Diagnosis

Self-Diagnosis Outline

The self-diagnosis system is monitoring the following mechanisms.

DFI System and Ignition System

The following indicator lights (LED) are used for warning indicators of below table.

LED Color	Warning Indicators
Red [A]	Oil Pressure Battery Water Temperature
Yellow [B]	FI

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

User Mode

The ECU notifies the rider of troubles in DFI system and ignition system by lighting or blinking the yellow engine warning indicator light (LED) [A] when DFI and ignition system parts are faulty, and initiates fail-safe function. In case of serious troubles, ECU stops the injection and ignition operations.

Dealer Mode

The LCD (Liquid Crystal Display) displays the service code(s) [A] to show the problem(s) which the above system has at the moment of diagnosis.

Self-Diagnosis Procedures

NOTE

○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the warning indicator light (LED) and indicator do not light or blink.*

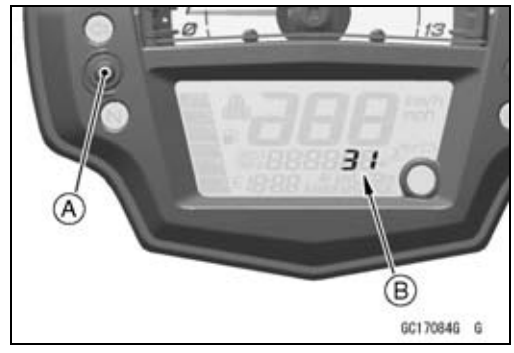
● Turn the ignition switch on.

○When a problem occurs with DFI system and ignition system, the yellow engine warning indicator light (LED) [A] goes on to alert the rider.

Self-Diagnosis

○Push the left meter button [A] to display the odometer.

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



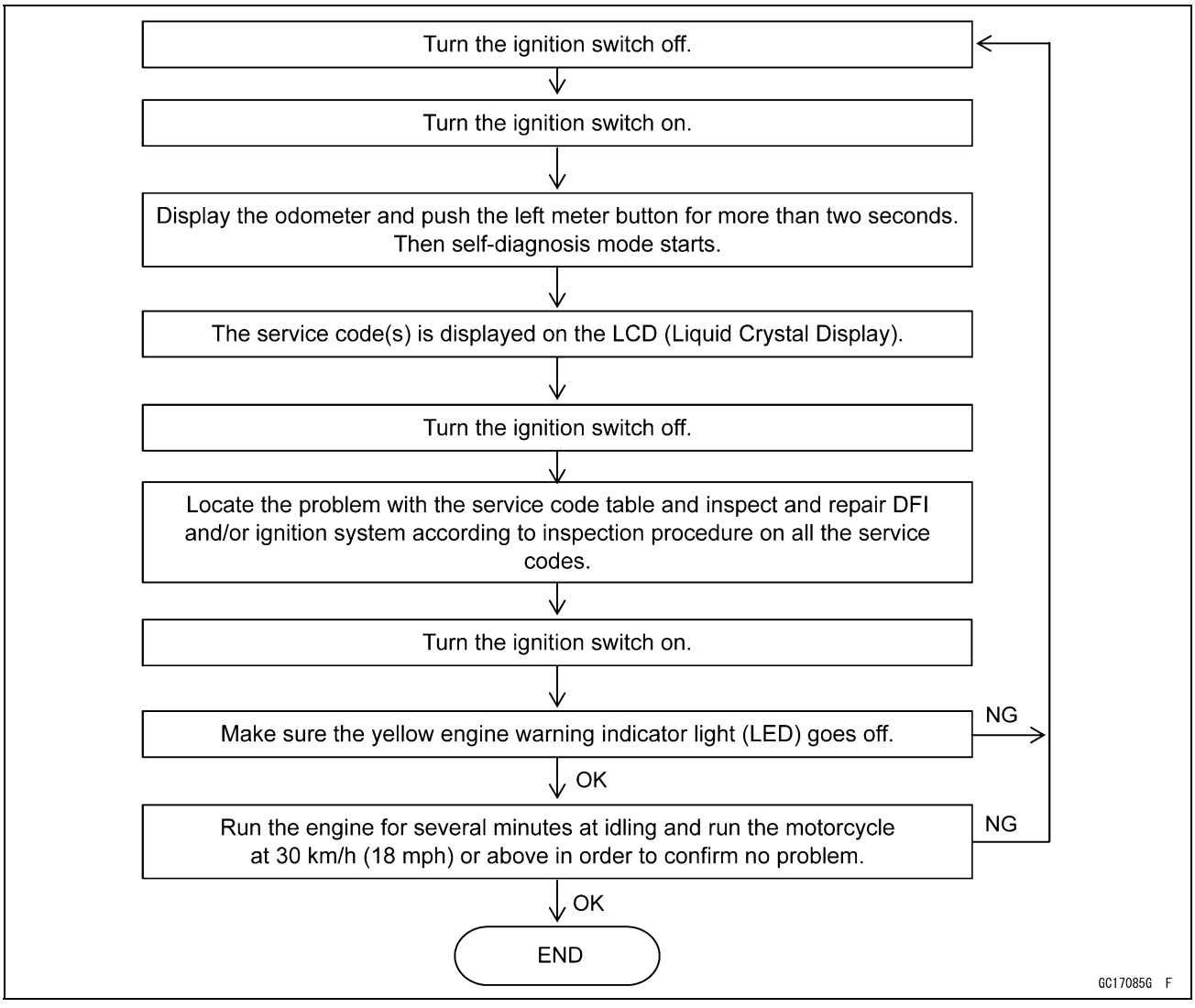
- Any of the following procedures ends self-diagnosis.

○When the service code is displayed on the LCD, push the left meter button for more than two seconds. The display will return to the previous display.

○When the ignition switch is turned off.

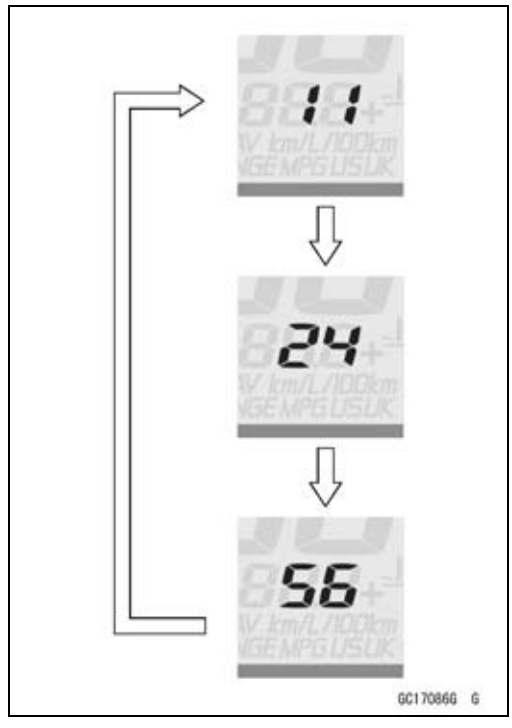
Self-Diagnosis

Self-Diagnosis Flow Chart



Service Code Reading

- The service code(s) is displayed on the LCD by the number of two digits.
- When there are a number of problems, all the service codes can be stored and the display will begin starting from the lowest number service code in the numerical order.
- Then after completing all codes, the display is repeated until the ignition switch is turned off or left button is pushed for more than two seconds.
- For example, if three problems occurred in the order of 56, 11, 24, the service codes are displayed (each two seconds) from the lowest number in the order listed as shown below. (11→24→56)→(11→24→56)→· · ·(repeated)



Self-Diagnosis

○If there is no problem or when the repair has been done, yellow engine warning indicator light (LED) goes off and service code is not displayed.

Service Code Erasing

○When repair has been done, yellow engine warning indicator light (LED) goes off and service code is not displayed.

★The service codes stored in memory of the ECU can be erased using Kawasaki Diagnostic System (KDS Ver.3).

Service Code Table

Service Code	Problems
11	Main throttle sensor malfunction, wiring open or short
12	Intake air pressure sensor malfunction, wiring open or short
13	Intake air temperature sensor malfunction, wiring open or short
14	Water temperature sensor malfunction, wiring open or short
21	Crankshaft sensor malfunction, wiring open or short
24	Speed 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 inactivation, wiring open or short
39	ECU communication error
41	Fuel injector #1 malfunction, wiring open or short
42	Fuel injector #2 malfunction, wiring open or short
51	Stick coil #1 malfunction, wiring open or short
52	Stick coil #2 malfunction, wiring open or short
56	Radiator fan relay malfunction, wiring open or short
62	Subthrottle valve actuator malfunction, wiring open or short
64	Air switching valve malfunction, wiring open or short
67	Oxygen sensor heater malfunction, wiring open or short
94	Oxygen sensor malfunction, wiring open or short
3A	Purge valve malfunction, wiring open or short (CAL, SEA B-1, TH and CN models)

Notes:

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

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

Backups

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

Self-Diagnosis

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 output voltage is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method (1). Also, the main throttle sensor system and intake 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 (2).
12	Intake Air Pressure Sensor	Intake Air Pressure (absolute) Pv = 150 ~ 800 mmHg	If the intake air pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets the DFI in the α - N method.
13	Intake Air Temperature Sensor	Intake Air Temperature Ta = –30°C ~ +120°C	If the intake 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 Temperature Sensor	Water Temperature Tw = –30°C ~ +120°C	If the water temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Tw at 80°C.
21	Crankshaft Sensor	Crankshaft sensor must send 22 signals to the ECU at the one cranking.	If the crankshaft sensor generates other than 22 signals, the engine stops by itself.
24 or 25	Speed Sensor	Speed sensor must send 4 signals to the ECU at the one rotation of the engine sprocket. 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 speedometer shows 0, and the ECU sets the top (6) gear position.
31	Vehicle-down Sensor	Output Voltage (signal) Vd = 0.65 ~ 4.45 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	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 ECU drive the subthrottle valve to the full closed position, and it stops the current to the actuator.
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.
39	ECU	The ECU sends the data (for service code) to the meter unit.	–

Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
41	Fuel Injector #1*	The injectormust send signals continuously to the ECU.	If the injector #1 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #1, though the engine keeps running.
42	Fuel Injector #2*	The injectormust send signals continuously to the ECU.	If the injector #2 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #2, though the engine keeps running.
51	Stick Coil #1*	The ECU must send signals continuously to the stick coil primary winding.	If the stick coil #1 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running.
52	Stick Coil #2*	The ECU must send signals continuously to the stick coil primary winding.	If the stick coil #2 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running.
56	Radiator Fan Relay	When the radiator fan relay is OFF, the relay is opened.	–
62	Subthrottle Valve Actuator	The actuator operates open and close of the subthrottle valve by the pulse signal from the ECU.	If the subthrottle valve actuator fails (the signal is out of the usable range, wiring short or open), the ECU stops the current to the actuator.
64	Air Switching Valve	The air switching valve controls the flow of the secondary air by opening and shutting the solenoid valve.	–
67	Oxygen Sensor Heater	The oxygen sensor heater raise temperature of the sensor for its earlier activation. 12 V-6.6 W, 0.62 A	If the oxygen sensor heater fails (wiring short or open), the ECU stops the current to the heater.
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.
3A	Purge Valve (CAL, SEA B-1, TH and CN Models)	The purge valve controls the flow of the purge air for the canister and shutting the solenoid valve.	–

Note:

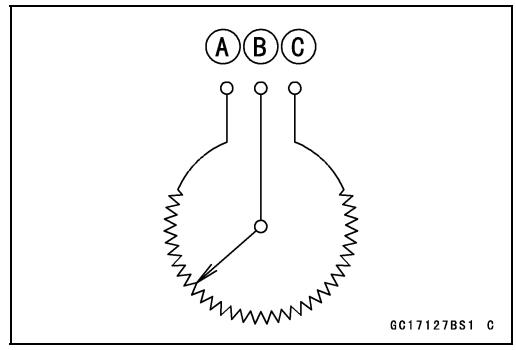
(1): D-J Method: When the engine load is light like at idling or low speed, the ECU determines the injection quantity by calculating from the throttle vacuum (intake air pressure sensor output voltage) and engine speed (crankshaft sensor output voltage). This method is called D-J method (low-speed mode).

(2): α - N 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 (high-speed mode).
(*): This depends on the number of stopped cylinders.

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]: BL
Output Terminal [B]: Y/R
Ground Terminal [C]: BR/BK



Main Throttle Sensor Removal/Adjustment

NOTICE

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

Main Throttle Sensor Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Disconnect the main throttle sensor connector and connect the setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

- Connect a digital meter to the setting adapter leads.

Main Throttle Sensor Input Voltage
Connections to Adapter:
Digital Meter (+) → BK (sensor BL) lead
Digital Meter (–) → W (sensor BR/BK) lead

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

Input Voltage
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch off.

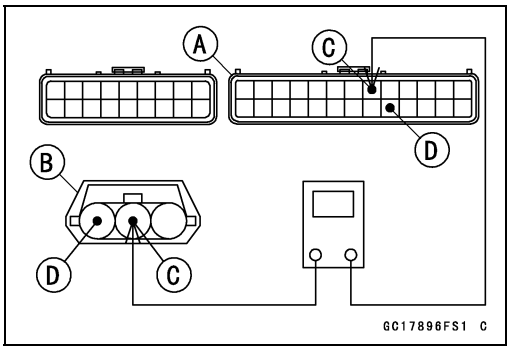
★If the reading is within the standard, check the main throttle sensor resistance (see Main Throttle Sensor Resistance Inspection).

Main Throttle Sensor (Service Code 11)

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

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Main Throttle Sensor Connector [B]
BL lead (ECU terminal 8) [C]
BR/BK lead (ECU terminal 22) [D]



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

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

Main Throttle Sensor Resistance Inspection

- Turn the ignition switch off.
- Disconnect the main throttle sensor connector.
- Connect the setting adapter [A] to the sensor connector only.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

- Measure the main throttle sensor resistance.

Main Throttle Sensor Resistance
Connections to Adapter:
Digital Meter (+) → BK (sensor BL) lead
Digital Meter (–) → W (sensor BR/BK) lead

Standard: 4 ~ 6 kΩ

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

★If the reading is within the standard, check the output voltage (see Main Throttle Sensor Output Voltage Inspection).

Main Throttle Sensor Output Voltage Inspection

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

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

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

Main Throttle Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor Y/R) lead
Digital Meter (–) → W (sensor BR/BK) lead

- Start the engine and warm it up thoroughly.
- Check idle speed to ensure the throttle opening is correct (see Idle Speed Inspection in the Periodic Maintenance chapter).

Idle Speed
Standard: 1 300 ±50 r/min (rpm)

Main Throttle Sensor (Service Code 11)

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

Output Voltage
Standard: DC 0.99 ~ 1.05 V at idle throttle opening
DC 4.11 ~ 4.50 V at full throttle opening (for reference)

NOTE

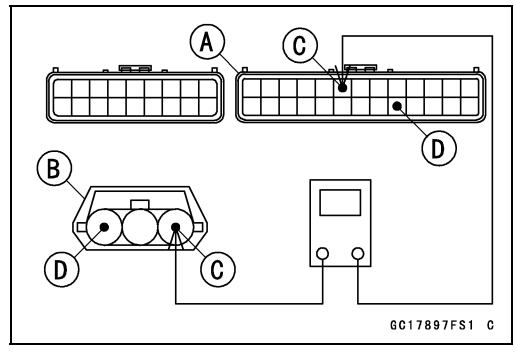
○*Open the throttle, confirm the output voltage will be raise.*
○*The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
Example:
In the case of a input voltage of 4.75 V.
0.99 × 4.75 ÷ 5.00 = 0.941 V
1.05 × 4.75 ÷ 5.00 = 0.998 V
Thus, the valid range is 0.941 ~ 0.998 V

- Turn the ignition switch off.

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

★If the reading is within the standard, replace the ECU and check the wiring for continuity between main harness connectors.
○Disconnect the ECU and sensor connectors.

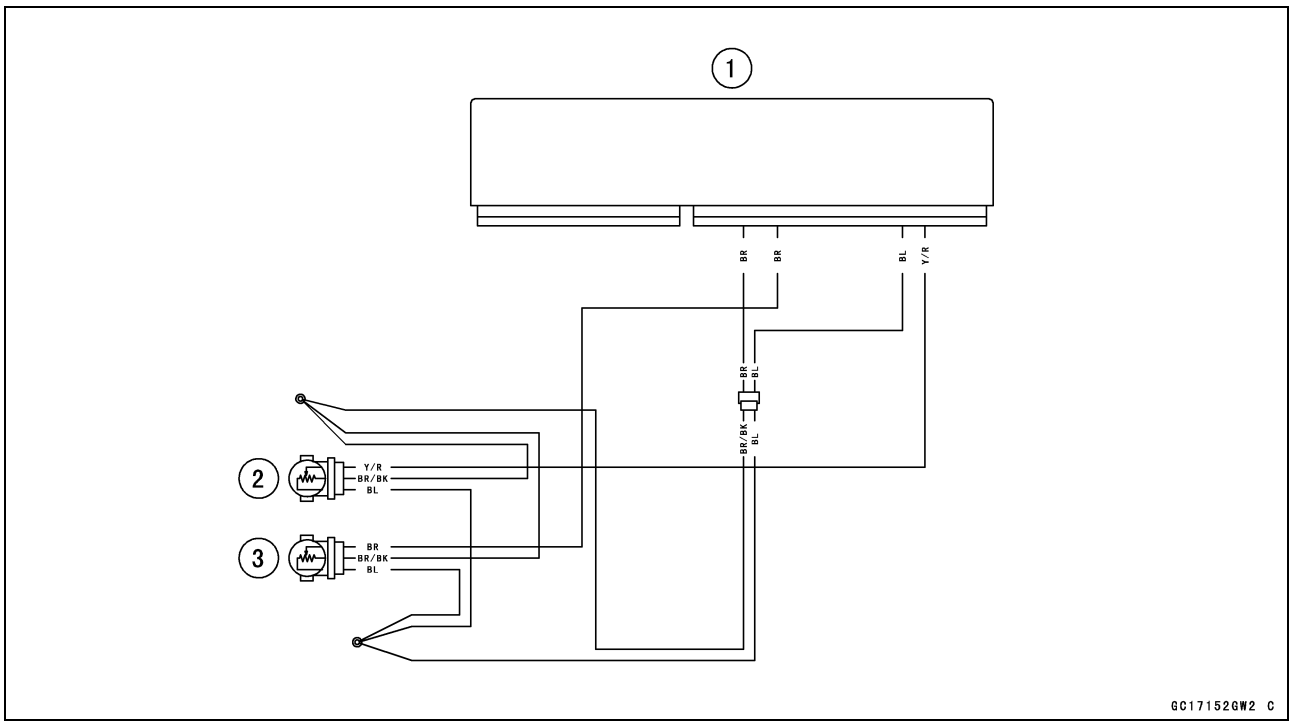
Wiring Continuity Inspection
ECU Connector [A] ←→
Main Throttle Sensor Connector [B]
Y/R lead (ECU terminal 6) [C]
BR/BK lead (ECU terminal 22) [D]



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

Main Throttle Sensor (Service Code 11)

Main Throttle Sensor Circuit

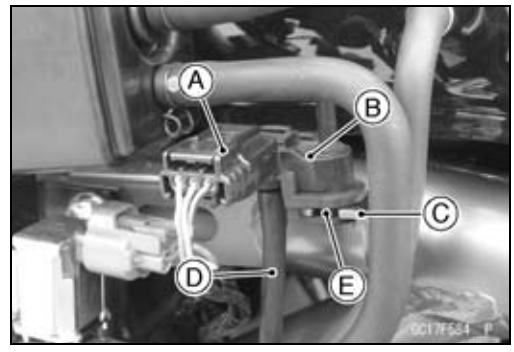


1. ECU
2. Main Throttle Sensor
3. Subthrottle Sensor

Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Removal

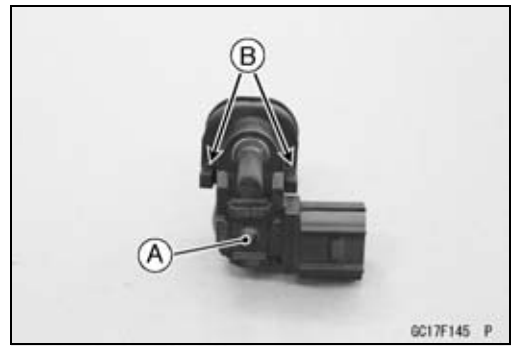
NOTICE
Never drop the intake air pressure sensor especially on a hard surface. Such a shock to the sensor can damage it.



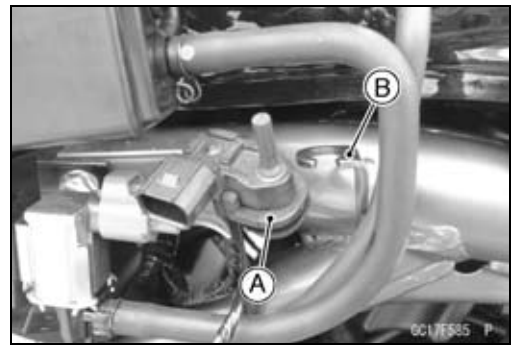
- Remove:
  Left Middle Fairing (see Middle Fairing Removal in the Frame chapter)
- Disconnect:
  Intake Air Pressure Sensor Connector [A]
- Disconnect the intake air pressure sensor [B] from the bracket [C].
- Disconnect the vacuum hose [D].
- Remove the rubber damper [E] from the intake air pressure sensor.

Intake Air Pressure Sensor Installation

- Installation is the reverse of removal.
- Position the intake air pressure sensor [A] between the projections [B] on the rubber damper.

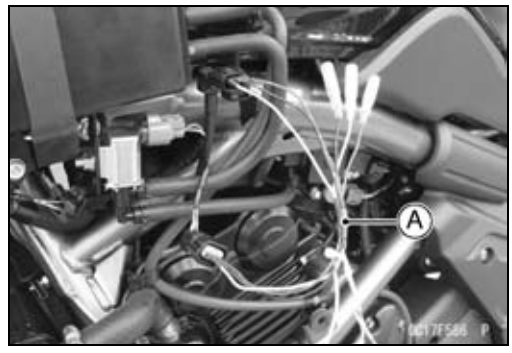


- Install the rubber damper [A] on the bracket [B].



Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Input Voltage Inspection



NOTE

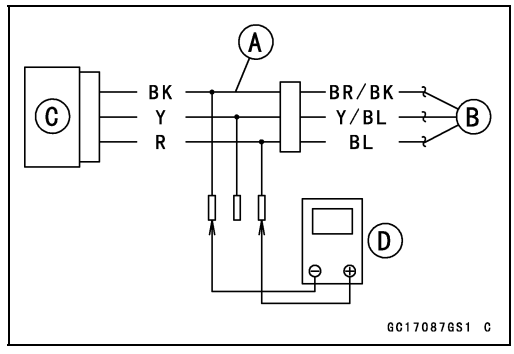
○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Remove the left middle fairing (see Middle Fairing Removal in the Frame chapter).
- Disconnect the intake air pressure sensor connector and connect the measuring adapter [A] between these connectors.
  Main Harness [B]
  Intake Air Pressure Sensor [C]

Special Tool - Measuring Adapter: 57001-1700

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

Intake Air Pressure Sensor Input Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor BL) lead
Digital Meter (–) → BK (sensor BR/BK) lead



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

Input Voltage
Standard: DC 4.75 ~ 5.25 V

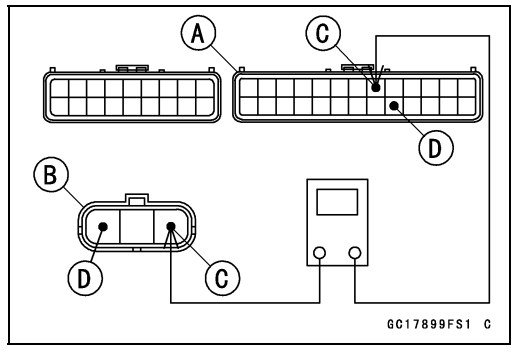
- Turn the ignition switch off.

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

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

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Pressure Sensor Connector [B]
BL lead (ECU terminal 8) [C]
BR/BK lead (ECU terminal 22) [D]

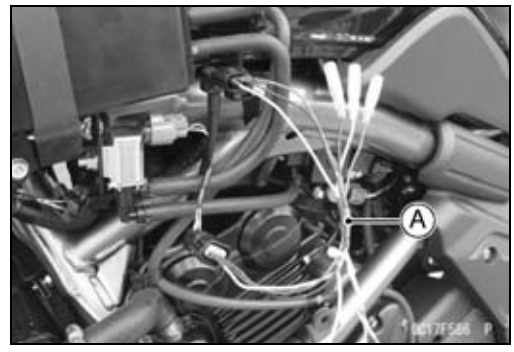


★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

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

Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Output Voltage Inspection

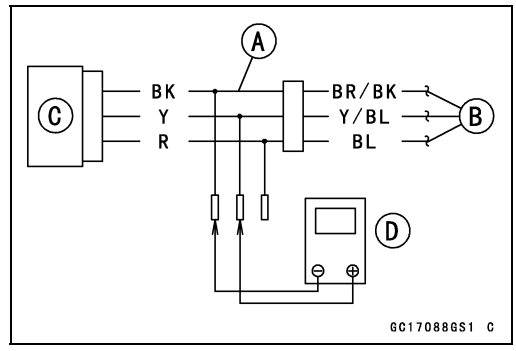


● Measure the output voltage at the intake air pressure sensor in the same way as input voltage inspection, note the following.

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

Main Harness [B]
Intake Air Pressure Sensor [C]
Digital Meter [D]

Special Tool - Measuring Adapter: 57001-1700



Intake Air Pressure Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → Y (sensor Y/BL) lead
Digital Meter (–) → BK (sensor BR/BK) lead

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

● Turn the ignition switch on.

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

NOTE

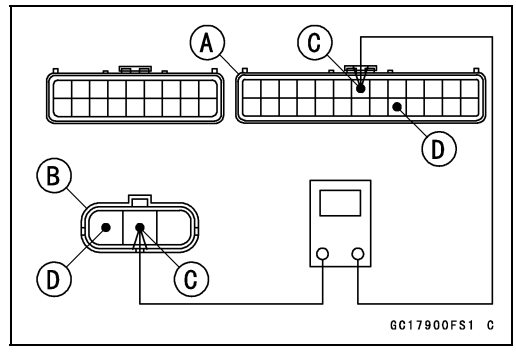
○*The output voltage changes according to local atmospheric pressure.*

● Turn the ignition switch off.

★If the reading is out of the usable range, replace the sensor (see Intake Air Pressure Sensor Removal/Installation).

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

○Disconnect the ECU and sensor connectors.



Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Pressure Sensor Connector [B]
Y/BL lead (ECU terminal 7) [C]
BR/BK lead (ECU terminal 22) [D]

Intake Air Pressure Sensor (Service Code 12)

★If the wiring is good, check the sensor for various vacuum.
- Remove the intake air pressure sensor [A] and disconnect the vacuum hose from the sensor.
- Connect an auxiliary hose [B] to the intake air pressure sensor.
- Temporarily install the intake air pressure sensor.

○Connect a digital meter [C], vacuum gauge [D], the fork oil level gauge [E] and the measuring adapter to the intake air pressure sensor.

Special Tools - Fork Oil Level Gauge: 57001-1290
Vacuum Gauge: 57001-1369
Measuring Adapter: 57001-1700

Intake Air Pressure Sensor Output Voltage Connections to Adapter:

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

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

○Turn the ignition switch on.

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

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

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

then
Pv = Pl – Pg

For example, suppose the following data is obtained:
Pg = 8 cmHg (Vacuum Gauge Reading)
Pl = 70 cmHg (Barometer Reading)
Vv = 3.2 V (Digital Meter Reading)

then
Pv = 70 – 8 = 62 cmHg (Absolute)

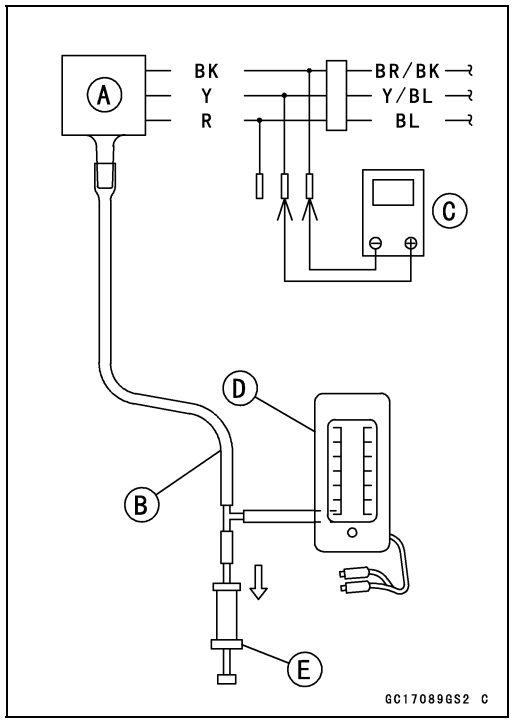
Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.
Usable range = 3.08 ~ 3.48 V
Plot Vv (3.2 V) on the vertical line. → Point [3].

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

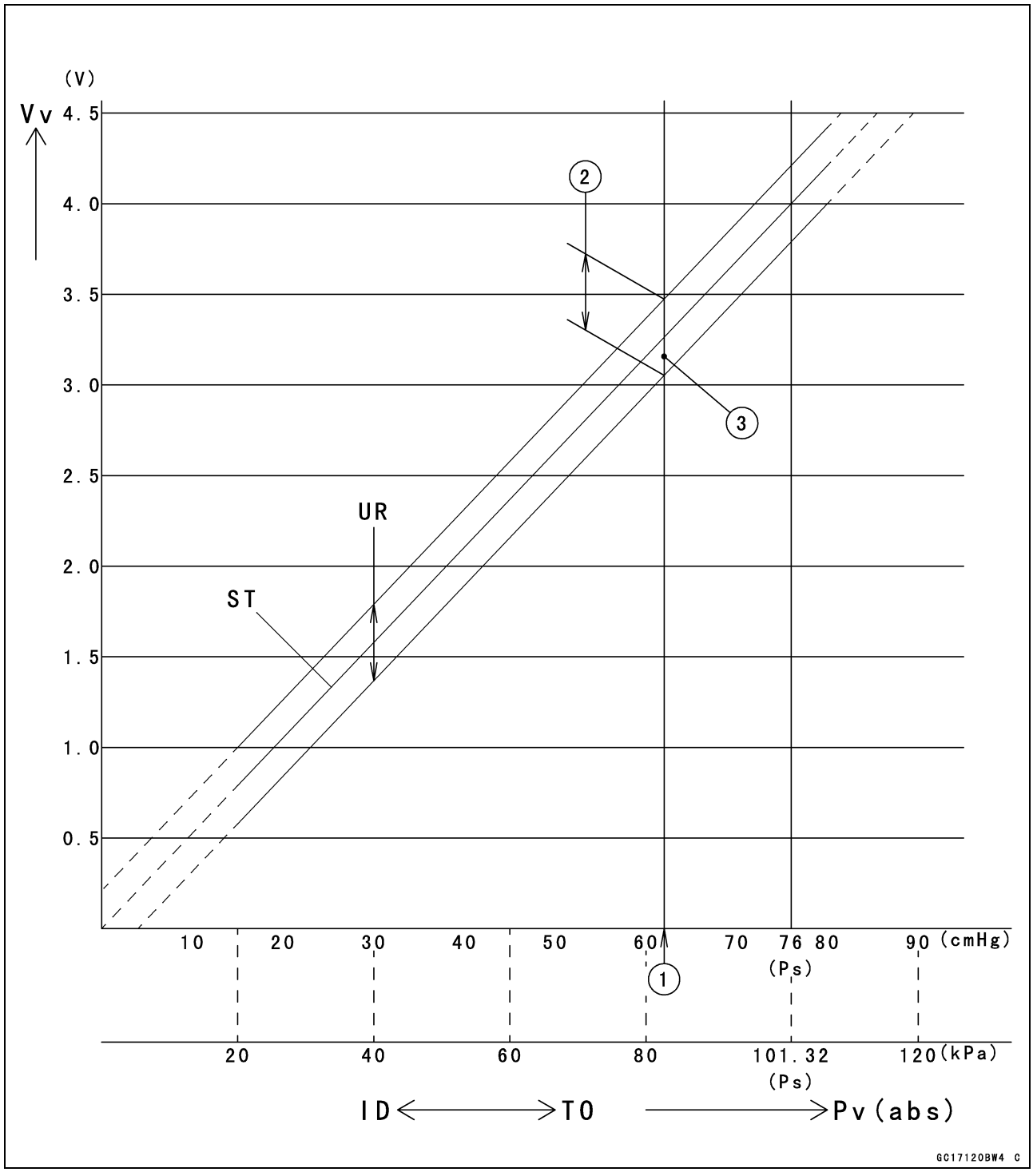
★If the reading is out of the usable range, replace the sensor (see Intake Air Pressure Sensor Removal/Installation).

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

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



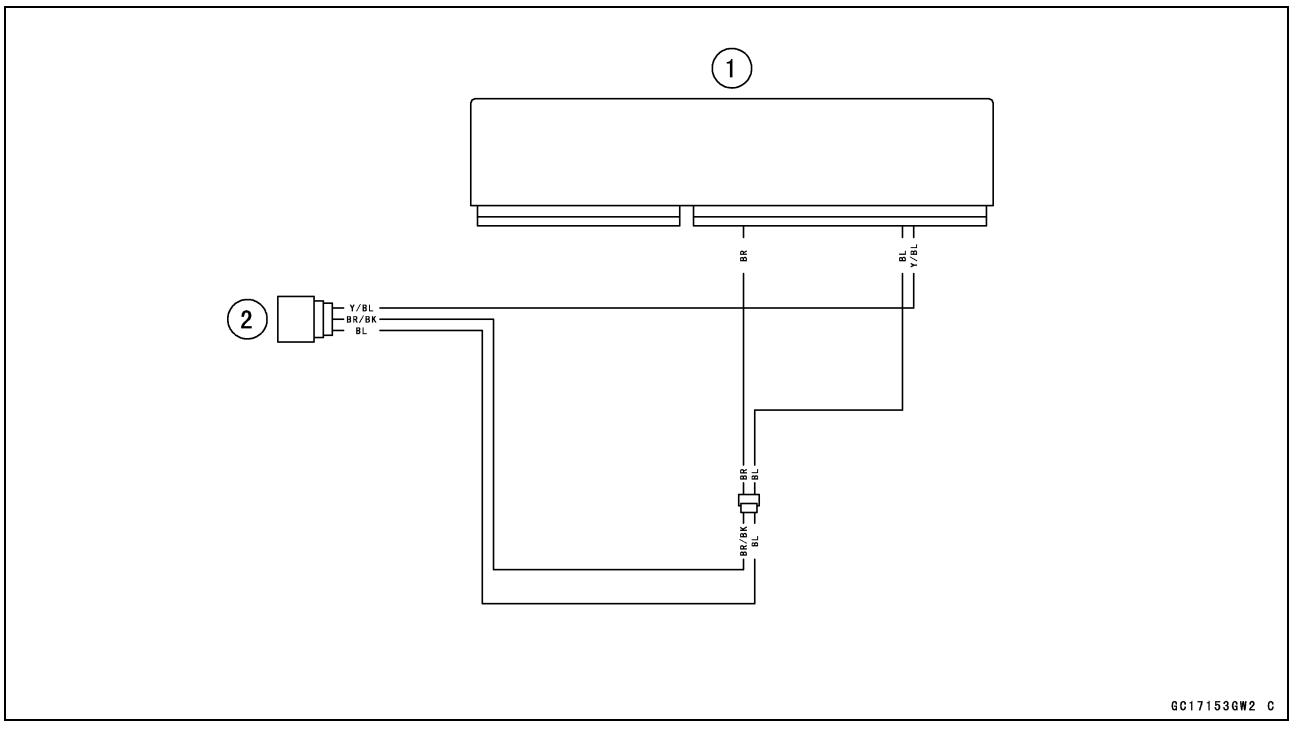
Intake Air Pressure Sensor (Service Code 12)



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

Intake Air Pressure Sensor (Service Code 12)

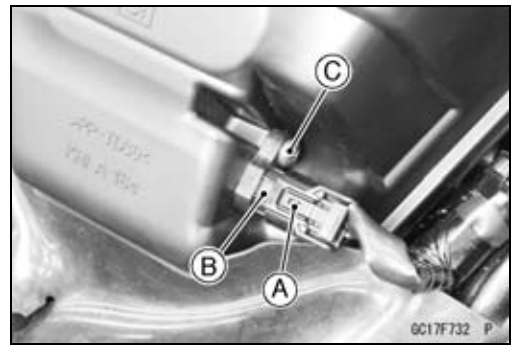
Intake Air Pressure Sensor Circuit



1. ECU
2. Intake Air Pressure Sensor

Intake Air Temperature Sensor (Service Code 13)

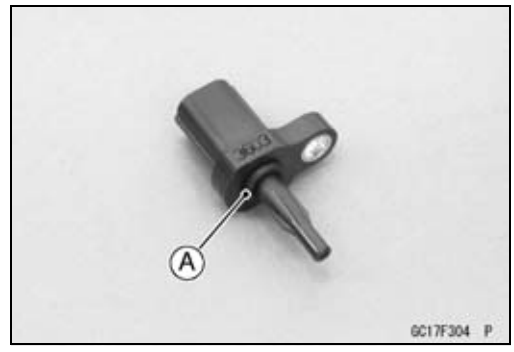
Intake Air Temperature Sensor Removal/Installation



NOTICE

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

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the connector [A] from the intake air temperature sensor [B].
- Remove:
  Intake Air Temperature Sensor Screw [C]
  Intake Air Temperature Sensor

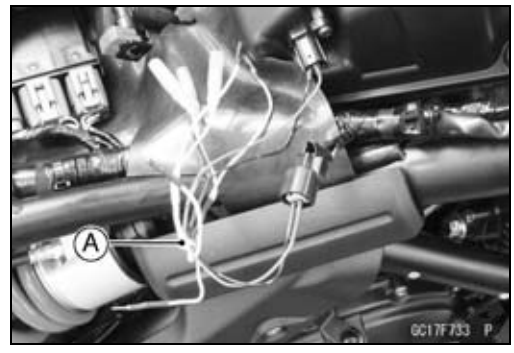


- Be sure to install the O-ring [A].
- Install the intake air temperature sensor.
- Tighten:

Torque - Intake Air Temperature Sensor Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)

- Connect the intake air temperature sensor connector.
- Install the fuel tank (see Fuel Tank Installation).

Intake Air Temperature Sensor Output Voltage Inspection

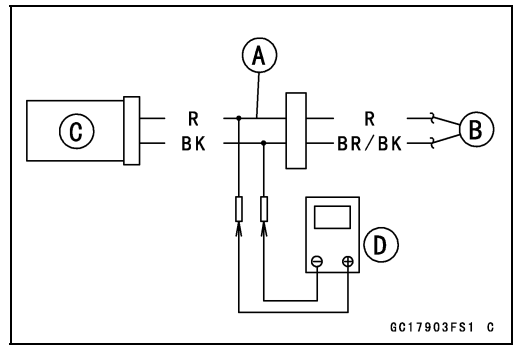


NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the intake air temperature sensor connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Intake Air Temperature Sensor [C]

Special Tool - Measuring Adapter: 57001-1700



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

Intake Air Temperature Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor R) lead
Digital Meter (–) → BK (sensor BR/BK) lead

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

Output Voltage
Standard: About DC 2.25 ~ 2.50 V @20°C (68°F)

NOTE

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

Intake Air Temperature Sensor (Service Code 13)

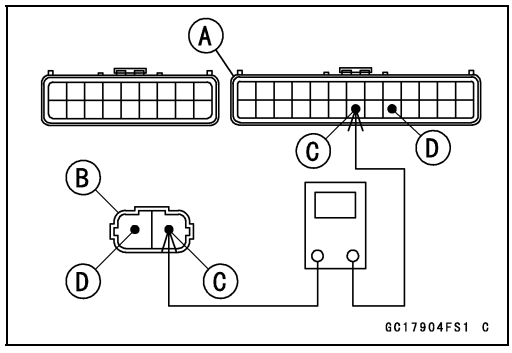
- Turn the ignition switch off.

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

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

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

○Disconnect the ECU and sensor connectors.

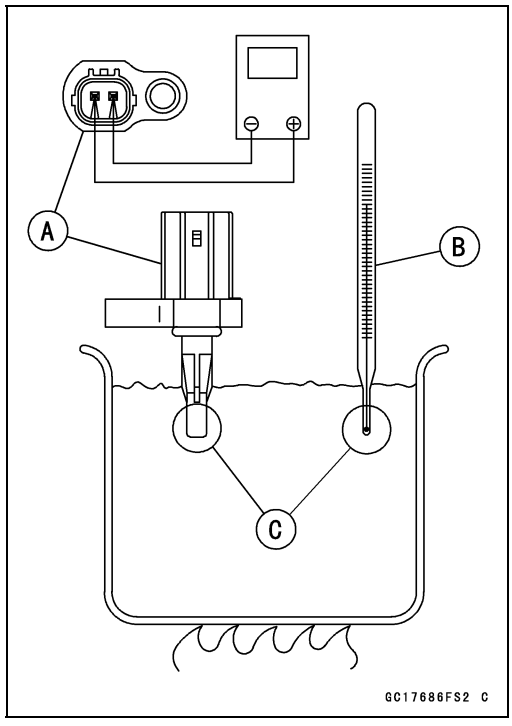


Wiring Continuity Inspection
ECU Connector [A] ←→
Intake Air Temperature Sensor Connector [B]
R lead (ECU terminal 20) [C]
BR/BK lead (ECU terminal 22) [D]

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

Intake Air Temperature Sensor Resistance Inspection

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



NOTE

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

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

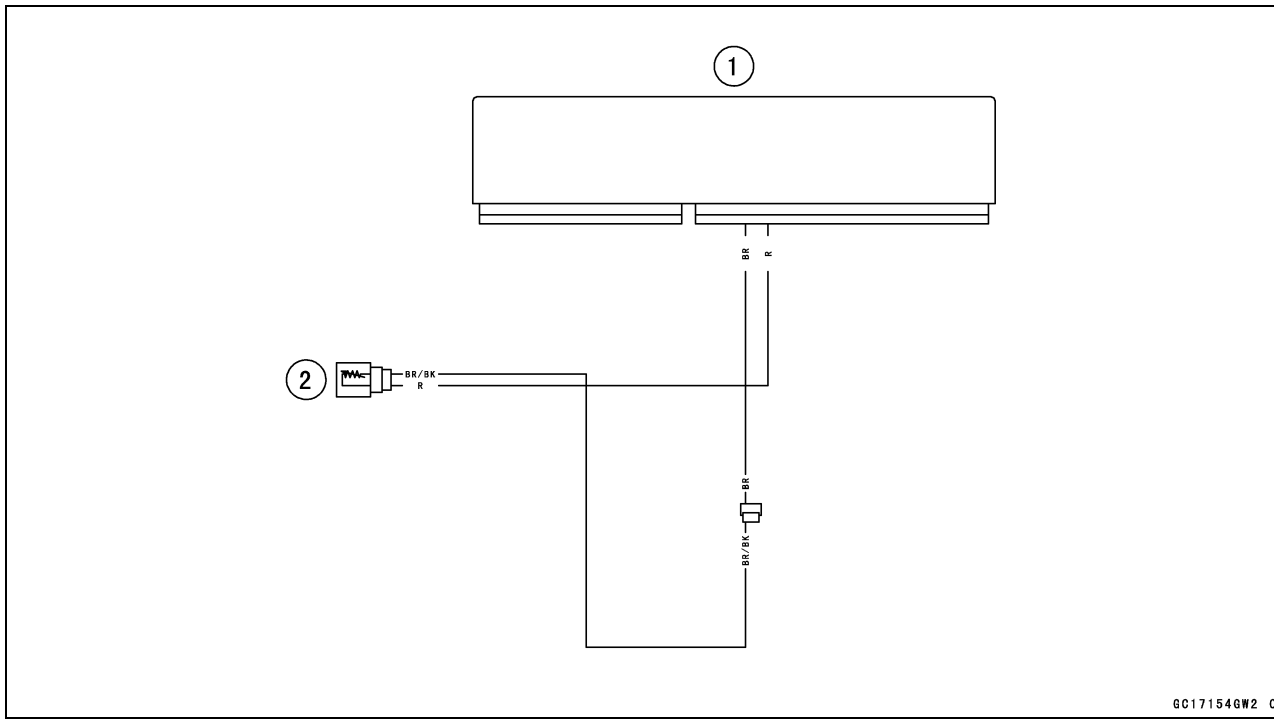
Intake Air Temperature Sensor Resistance
Standard: 5.4 ~ 6.6 kΩ @0°C (32°F)
0.290 ~ 0.390 kΩ @80°C (176°F)

★If the reading is out of the standard, replace the sensor (see Intake Air Temperature Sensor Removal/Installation).

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

Intake Air Temperature Sensor (Service Code 13)

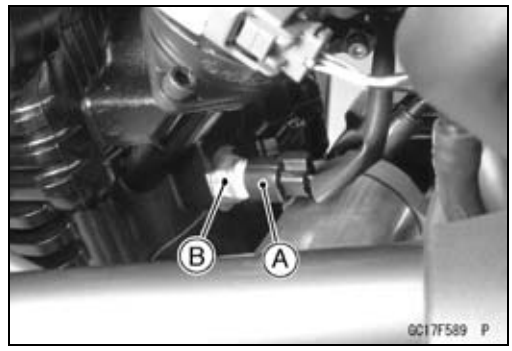
Intake Air Temperature Sensor Circuit



1. ECU
2. Intake Air Temperature Sensor

Water Temperature Sensor (Service Code 14)

Water Temperature Sensor Removal/Installation



NOTICE

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

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Disconnect:
  Water Temperature Sensor Connector [A]
- Remove:
  Water Temperature Sensor [B] with O-ring
- Replace the O-ring with a new one.
- Tighten:

Torque - Water Temperature Sensor: 12 N·m (1.2 kgf·m, 106 in·lb)

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

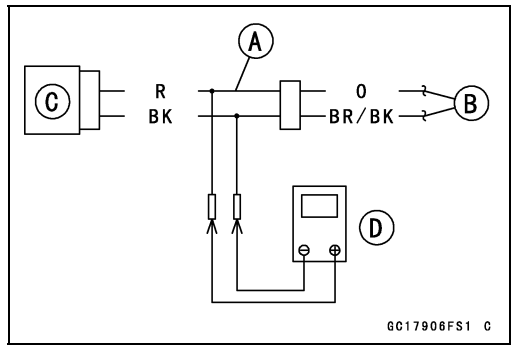
Water Temperature Sensor Output Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Disconnect the water temperature sensor connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Water Temperature Sensor [C]

Special Tool - Measuring Adapter: 57001-1700



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

Water Temperature Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor O) lead
Digital Meter (–) → BK (sensor BR/BK) lead

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

Output Voltage
Standard: About DC 2.80 ~ 2.97 V @20°C (68°F)

NOTE

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

- Turn the ignition switch off.

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

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

Water Temperature Sensor (Service Code 14)

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

○Disconnect the ECU and sensor connectors.

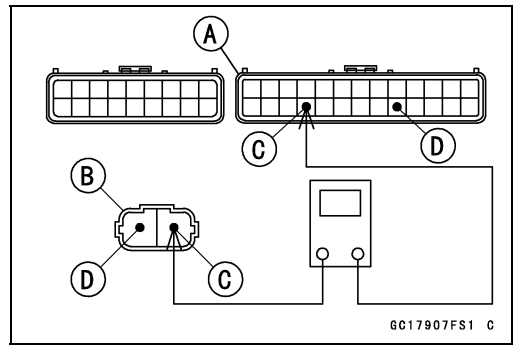
Wiring Continuity Inspection

ECU Connector [A] ←→

Water Temperature Sensor Connector [B]

O lead (ECU terminal 17) [C]

BR/BK lead (ECU terminal 22) [D]



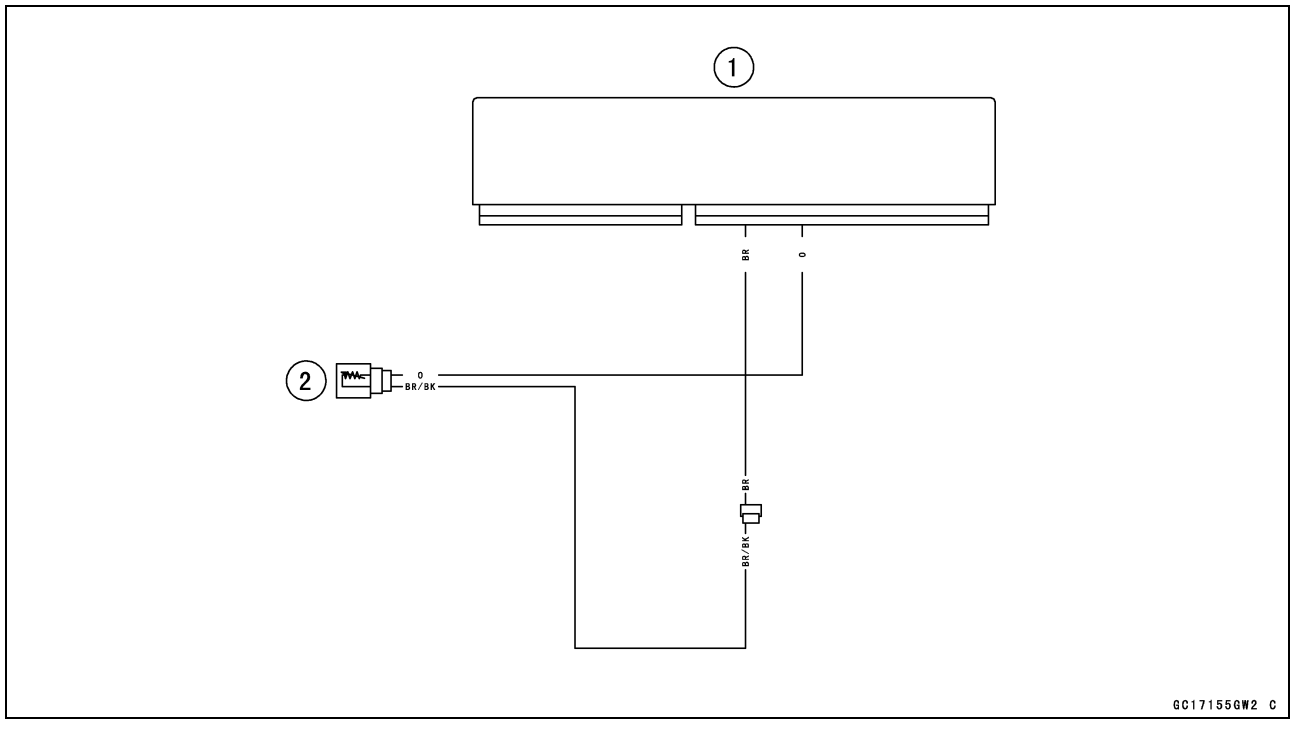
★If the wiring is good, check the water temperature sensor resistance (see Water Temperature Sensor Resistance Inspection).

Water Temperature Sensor Resistance Inspection

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

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

Water Temperature Sensor Circuit



1. ECU
2. Water Temperature Sensor

Crankshaft Sensor (Service Code 21)

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

Crankshaft Sensor Removal/Installation

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

Crankshaft Sensor Resistance Inspection

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

★If the reading is within the standard, check the peak voltage (see Crankshaft Sensor Peak Voltage Inspection).

Crankshaft Sensor Peak Voltage Inspection

- Refer to the Crankshaft Sensor Peak Voltage Inspection in the Electrical System chapter.

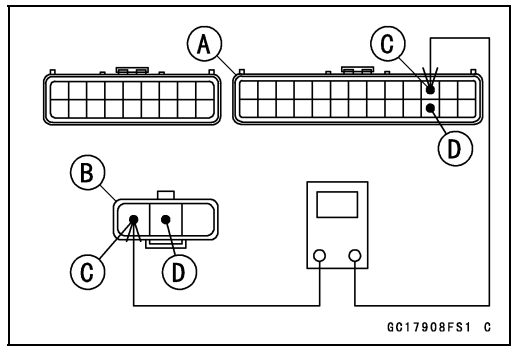
★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

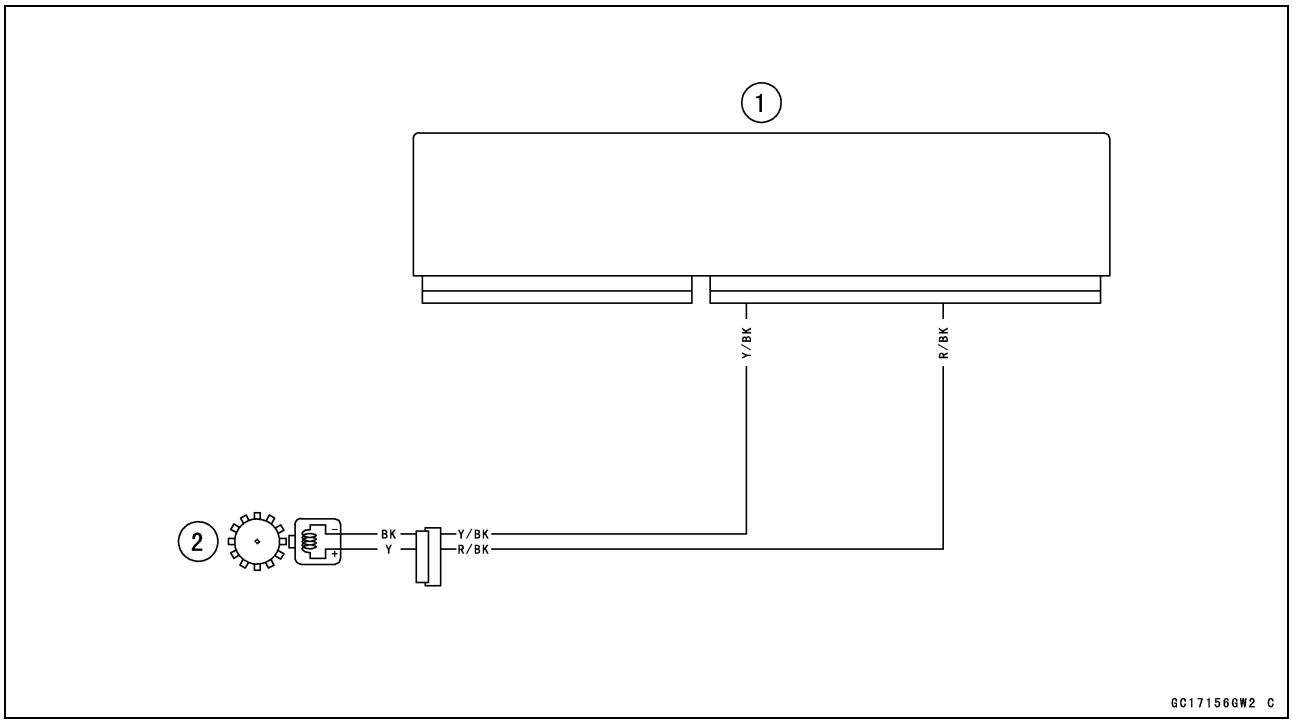
Wiring Continuity Inspection
ECU Connector [A] ←→
Crankshaft Sensor Connector [B]
R/BK lead (ECU terminal 11) [C]
Y/BK lead (ECU terminal 24) [D]

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

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



Crankshaft Sensor Circuit

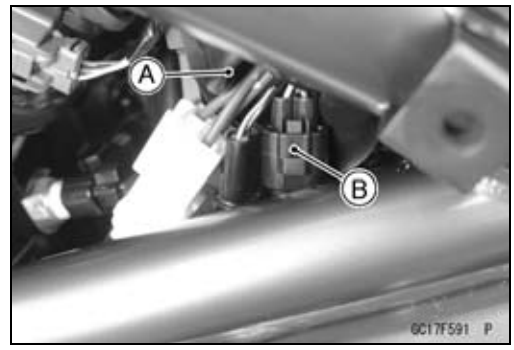


1. ECU
2. Crankshaft Sensor

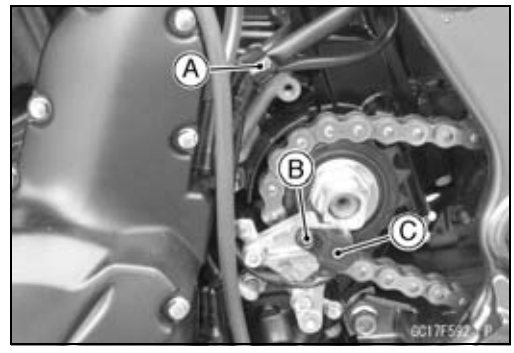
Speed Sensor (Service Code 24 or 25)

Speed Sensor Removal

- Remove:
  Left Frame Cover (see Frame Cover Removal in the Frame chapter)
  Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
- Slide the dust cover [A].
- Disconnect the speed sensor lead connector [B].



- Open the clamp [A].
- Remove:
  Speed Sensor Bolt [B]
  Speed Sensor [C]



Speed Sensor Installation

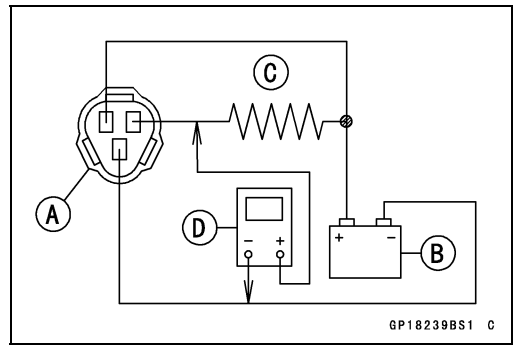
- Apply a non-permanent locking agent to the threads of the speed sensor bolt, and tighten it.

  Torque - Speed Sensor Bolt: 7.8 N·m (0.80 kgf·m, 69 in·lb)

- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

Speed Sensor Inspection

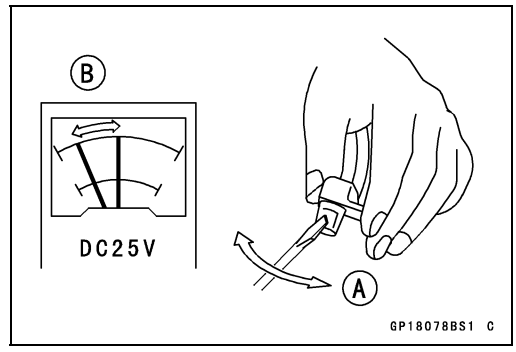
- Remove the speed sensor (see Speed Sensor Removal).
- Connect the speed sensor connector [A] with the battery [B], 10 kΩ resistor [C] and tester [D] as shown.



- Trace [A] each side of the speed sensor surface with the screwdriver.

○Then the tester indicator should flick [B].

★If the tester indicator does not flick, replace the speed sensor.



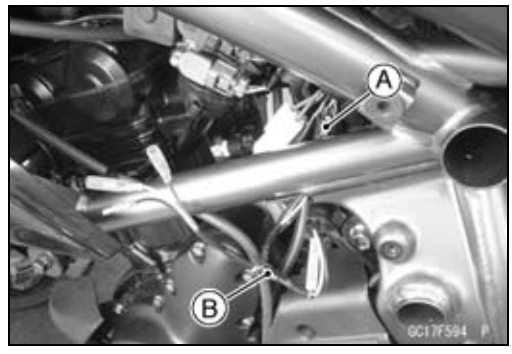
Speed Sensor (Service Code 24 or 25)

Speed Sensor Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the left frame cover (see Frame Cover Removal in the Frame chapter).
- Slide the dust cover [A].

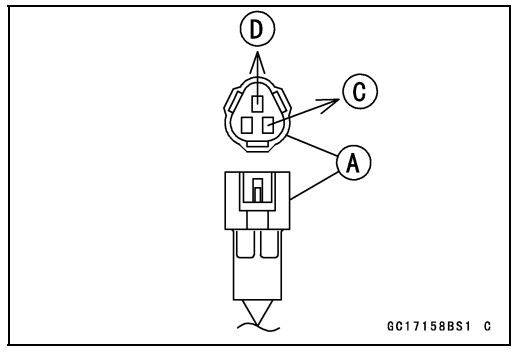


- Disconnect the speed sensor connector [A] and connect the setting adapter [B] between the harness connector and speed sensor connector.

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

- Connect a digital meter to the setting adapter leads.

Speed Sensor Input Voltage
Connections to Adapter
Meter (+) → BL (sensor P) lead [C]
Meter (−) → BK (sensor BK) lead [D]



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

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

- Turn the ignition switch off.

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

★If the reading is out of the range, check the wiring (see Speed Sensor Circuit) and meter unit (see Meter Unit Inspection in the Electrical System chapter).

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

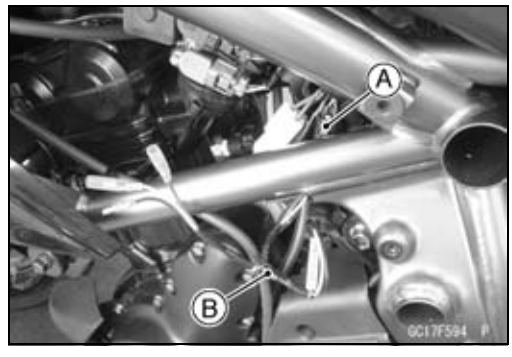
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Speed Sensor Output Voltage Inspection

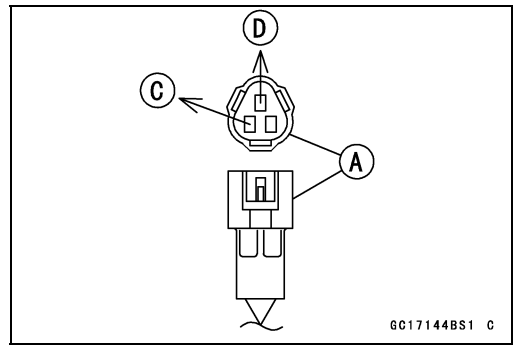
- Raise the rear wheel off the ground with the stand.
- Measure the output voltage at the speed sensor in the same way as input voltage inspection, note the following.

○Disconnect the speed sensor connector [A] and connect the setting adapter [B] between these connectors.

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



Speed Sensor (Service Code 24 or 25)



- Connect a digital meter to the harness adapter leads.

Speed Sensor Output Voltage at Sensor Connections to Adapter

Meter (+) → Y (sensor Y) lead [C]

Meter (–) → BK (sensor BK) lead [D]

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

Output Voltage

Standard: About DC 0.6 V or less, or DC 4.8 V or more

NOTE

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

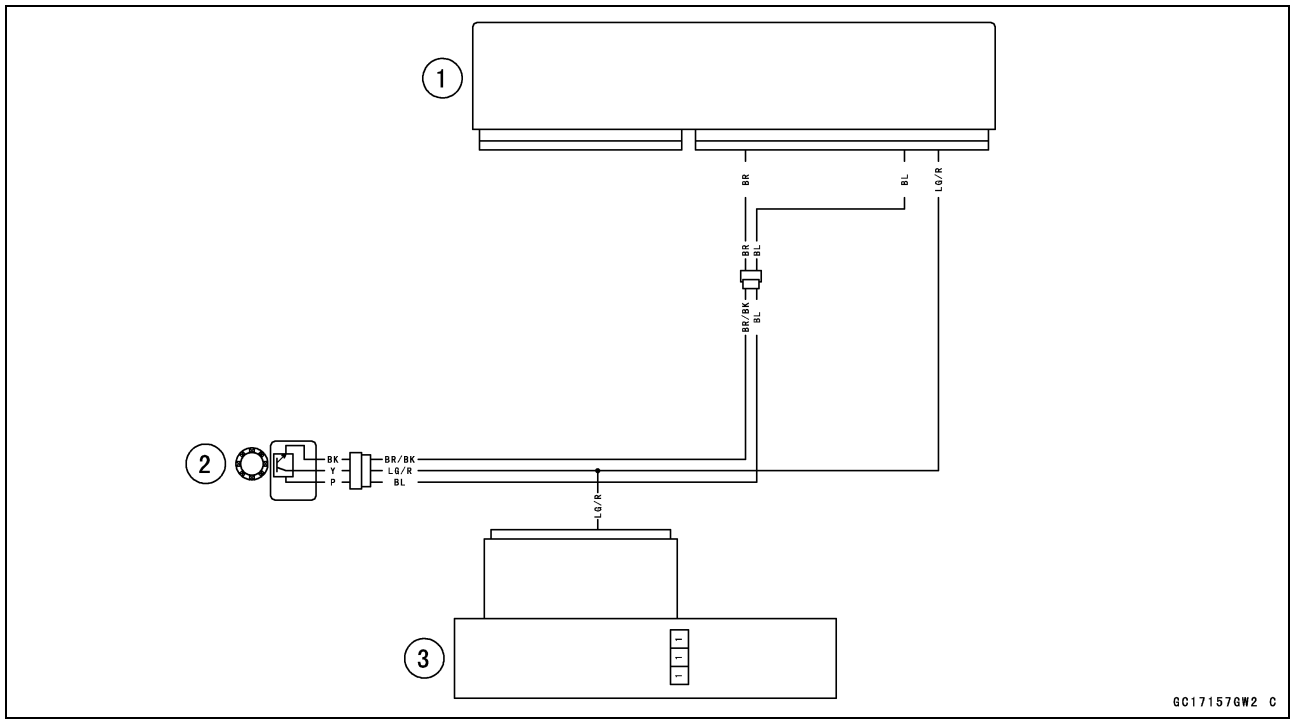
- Turn the ignition switch OFF.

★If the reading is out of the range, check the speed sensor (see Speed Sensor Inspection) and the wiring to ECU (see Speed Sensor Circuit).

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

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

Speed Sensor Circuit



1. ECU
2. Speed Sensor
3. Meter Unit

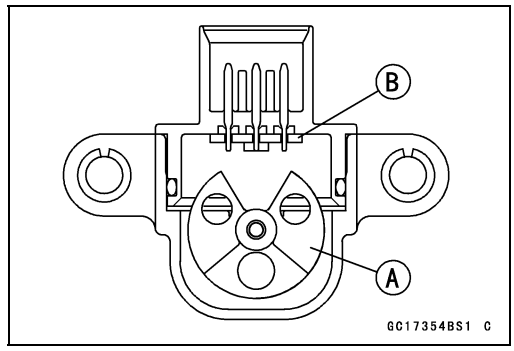
Vehicle-down Sensor (Service Code 31)

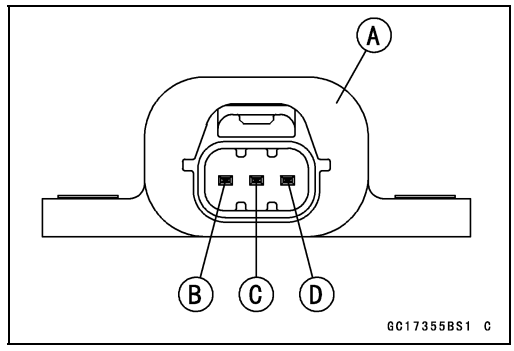
This sensor has a weight [A] with two magnets inside, and sends a signal to the ECU. But when the motorcycle banks 60 ~ 70° or more to either side (in fact falls down), the weight turns and the signal changes. The ECU senses this change, and stops the fuel pump relay, the fuel injectors and the ignition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

Hall IC [B]

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

Vehicle-down Sensor [A]
Ground Terminal [B]: BR/BK
Output Terminal [C]: Y/G
Power Source Terminal [D]: BL

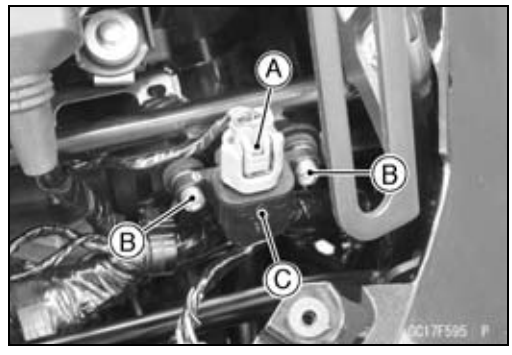




Vehicle-down Sensor Removal

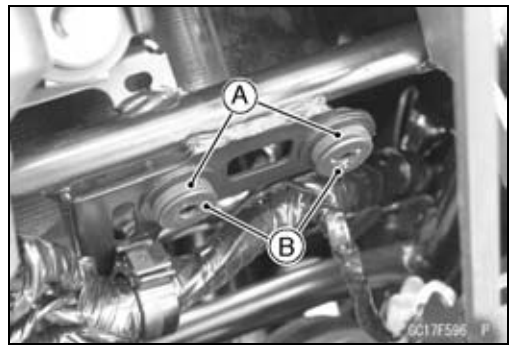
NOTICE
Never drop the vehicle-down sensor especially on a hard surface. Such a shock to the sensor can damage it.

- Remove the meter cover (see Meter Cover Removal in the Frame chapter).
- Disconnect:
  Vehicle-down Sensor Connector [A]
- Remove:
  Vehicle-down Sensor Mounting Bolts [B] and Nuts
  Vehicle-down Sensor [C]



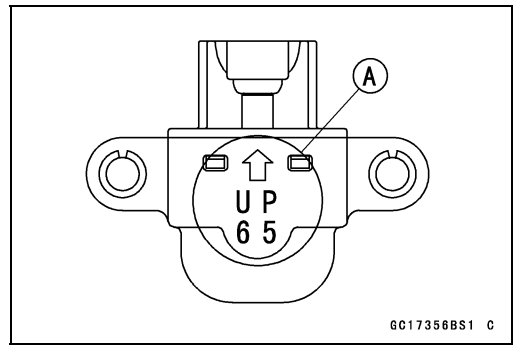
Vehicle-down Sensor Installation

- Be sure to install the rubber dampers [A] and collars [B] on the bracket.



Vehicle-down Sensor (Service Code 31)

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



⚠ WARNING

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

● Tighten:

Torque - Vehicle-down Sensor Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)

● Install the removed parts (see appropriate chapters).

Vehicle-down Sensor Input Voltage Inspection

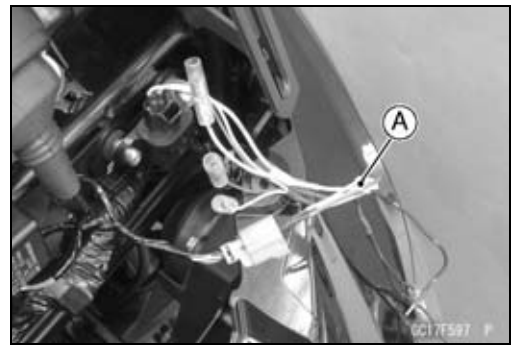
NOTE

○*Be sure the battery is fully charged.*

● Turn the ignition switch off.

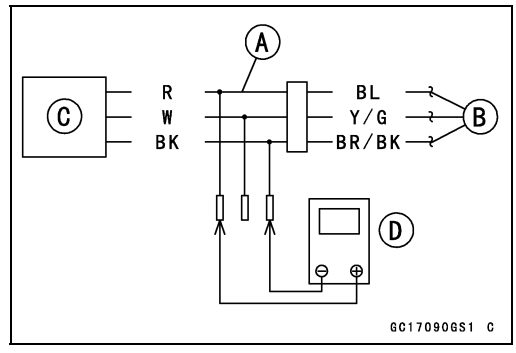
● Disconnect the vehicle-down sensor connector and connect the measuring adapter [A] between these connectors as shown.

Main Harness [B]
Vehicle-down Sensor [C]



Special Tool - Measuring Adapter: 57001-1700

● Connect a digital meter [D] to the measuring adapter leads.



Vehicle-down Sensor Input Voltage
Connections to Adapter:

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

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

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

● Turn the ignition switch on.

Input Voltage
Standard: DC 4.75 ~ 5.25 V

● Turn the ignition switch off.

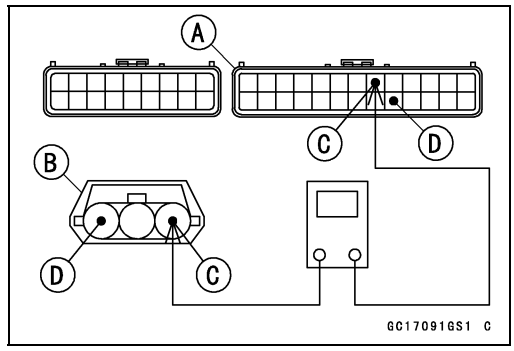
★If the reading is within the standard, check the output voltage (see Vehicle-down Sensor Output Voltage Inspection).

Vehicle-down Sensor (Service Code 31)

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

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Vehicle-down Sensor Connector [B]
BL lead (ECU terminal 8) [C]
BR/BK lead (ECU terminal 22) [D]



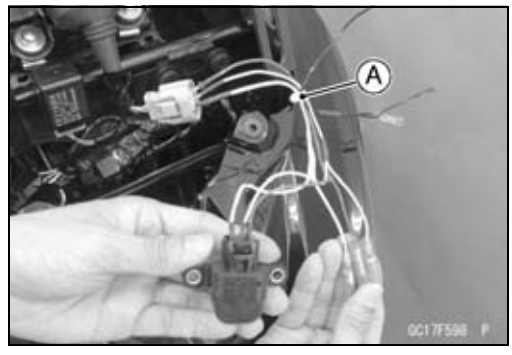
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

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

Vehicle-down Sensor Output Voltage Inspection

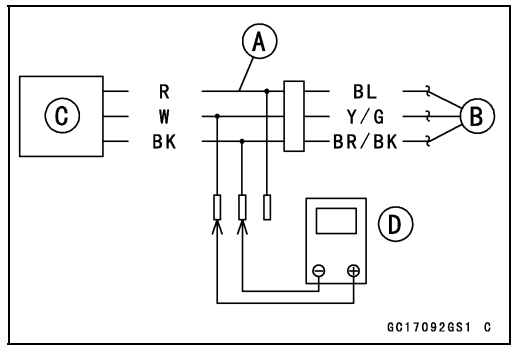
- Remove the vehicle-down sensor (see Vehicle-down Sensor Removal).
- Connect the measuring adapter [A] to the vehicle-down sensor connectors as shown.
  Main Harness [B]
  Vehicle-down Sensor [C]

Special Tool - Measuring Adapter: 57001-1700



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

Vehicle-down Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → W (sensor Y/G) lead
Digital Meter (–) → BK (sensor BR/BK) lead



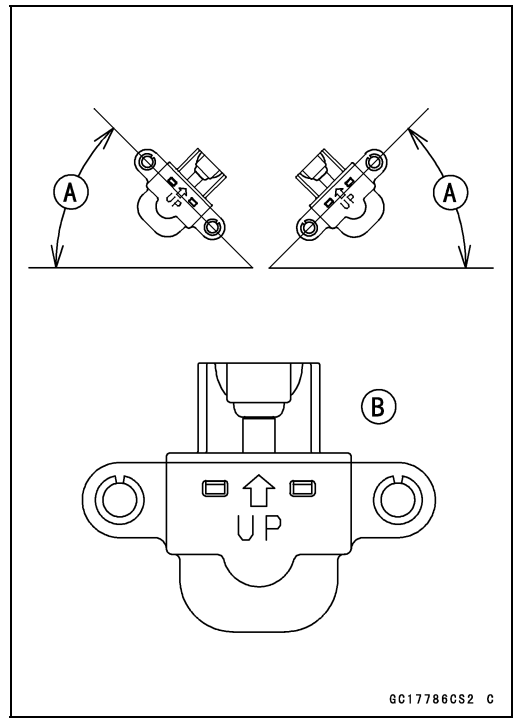
Vehicle-down Sensor (Service Code 31)

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

Output Voltage
Standard: With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V
With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V

- Turn the ignition switch off.

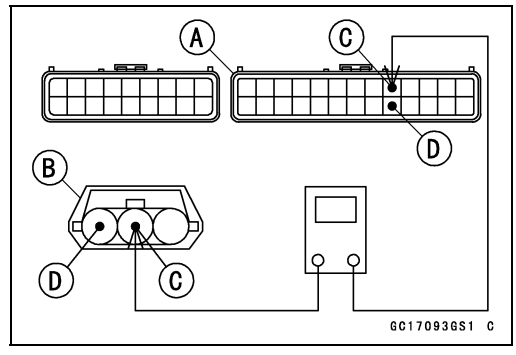
★If the reading is out of the standard, replace the sensor.



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

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Vehicle-down Sensor Connector [B]
Y/G lead (ECU terminal 9) [C]
BR/BK lead (ECU terminal 22) [D]

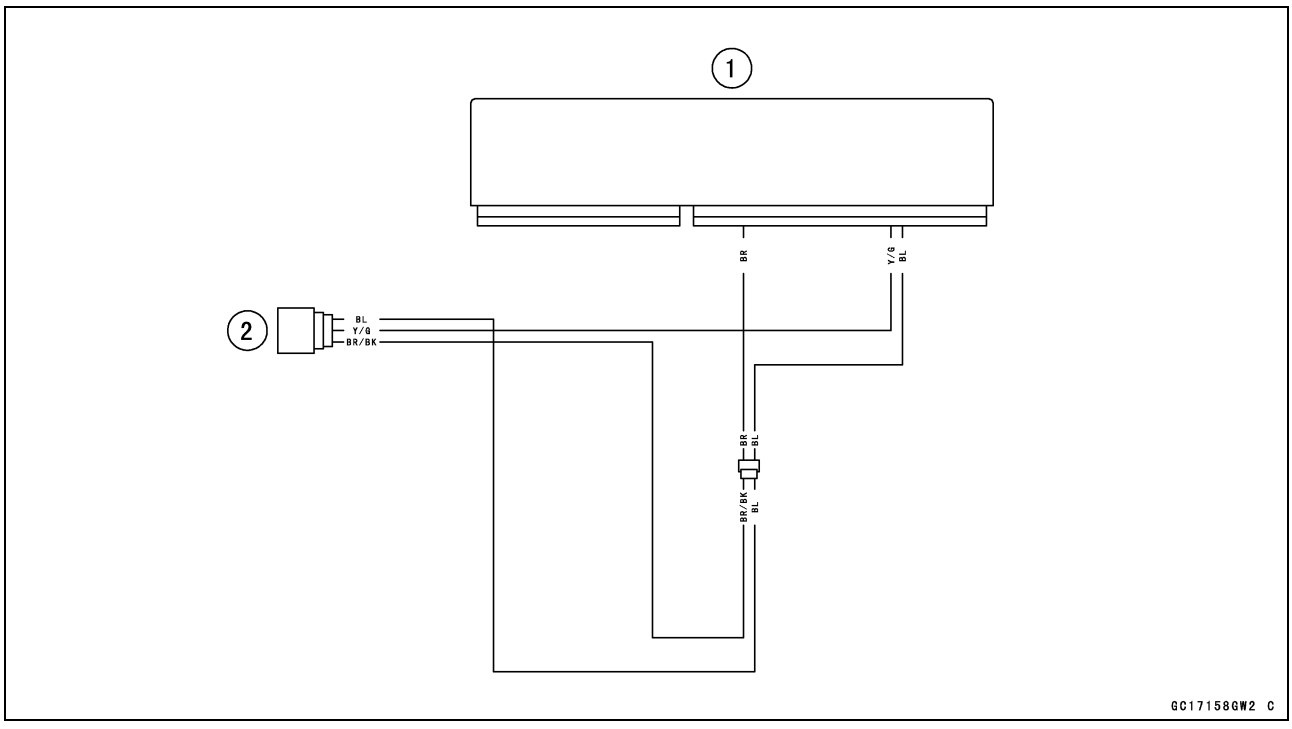


★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

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

Vehicle-down Sensor (Service Code 31)

Vehicle-down Sensor Circuit

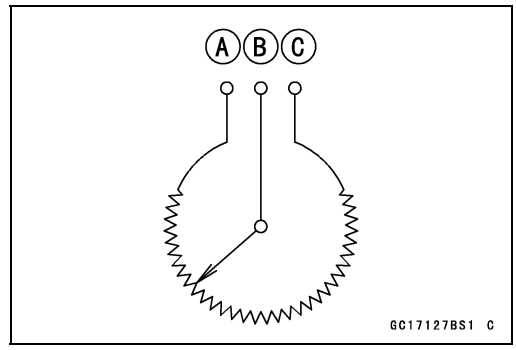


1. ECU
2. Vehicle-down Sensor

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]: BL
Output Terminal [B]: BR
Ground Terminal [C]: BR/BK



Subthrottle Sensor Removal/Adjustment

NOTICE

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

Subthrottle Sensor Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Disconnect the subthrottle sensor connector and connect the setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

- Connect a digital meter to the setting adapter leads.

Subthrottle Sensor Input Voltage
Connections to Adapter:
Digital Meter (+) → BK (sensor BL) lead
Digital Meter (–) → W (sensor BR/BK) lead

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

Input Voltage
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch off.

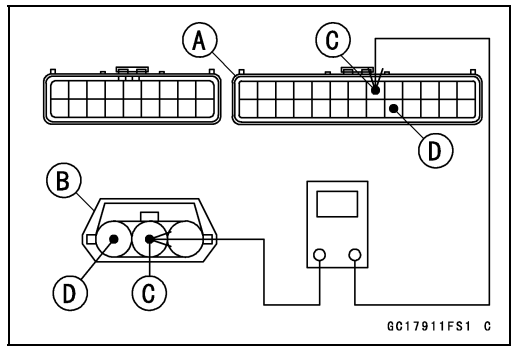
★If the reading is within the standard, check the output voltage (see Subthrottle Sensor Output Voltage Inspection).

Subthrottle Sensor (Service Code 32)

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

○Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→
Subthrottle Sensor Connector [B]
BL lead (ECU terminal 8) [C]
BR/BK lead (ECU terminal 22) [D]



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

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

Subthrottle Sensor Output Voltage Inspection

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

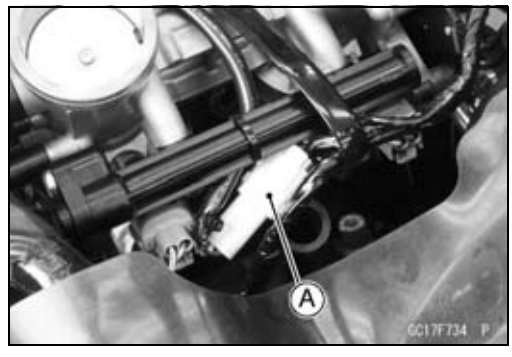
○Disconnect the subthrottle sensor connector and connect the setting adapter [A] between these connectors.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

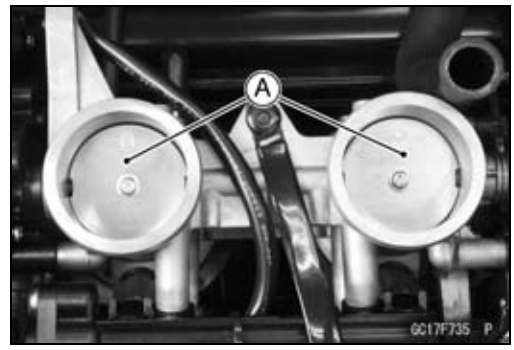
Subthrottle Sensor Output Voltage
Connections to Adapter:
Digital Meter (+) → R (sensor BR) lead
Digital Meter (–) → W (sensor BR/BK) lead

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

● Disconnect the subthrottle valve actuator connector [A].



Subthrottle Sensor (Service Code 32)



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

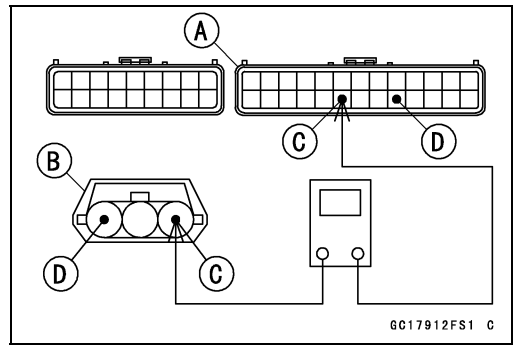
Output Voltage
Standard: DC 0.46 ~ 0.95 V at subthrottle valve full close position (for reference)
DC 4.05 ~ 4.15 V at subthrottle valve full open position

NOTE

○*Open the subthrottle valves, confirm the output voltage will be raise.*
○*The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
Example:
In the case of a input voltage of 4.75 V.
0.46 × 4.75 ÷ 5.00 = 0.437 V
0.95 × 4.75 ÷ 5.00 = 0.903 V
Thus, the valid range is 0.437 ~ 0.903 V

- Turn the ignition switch off.

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



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

Wiring Continuity Inspection
ECU Connector [A] ←→
Subthrottle Sensor Connector [B]
BR lead (ECU terminal 19) [C]
BR/BK lead (ECU terminal 22) [D]

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

Subthrottle Sensor (Service Code 32)

Subthrottle Sensor Resistance Inspection

- Turn the ignition switch off.
- Disconnect the subthrottle sensor connector.
- Connect the setting adapter [A] to the sensor connector only.

Special Tool - Throttle Sensor Setting Adapter: 57001 -1538

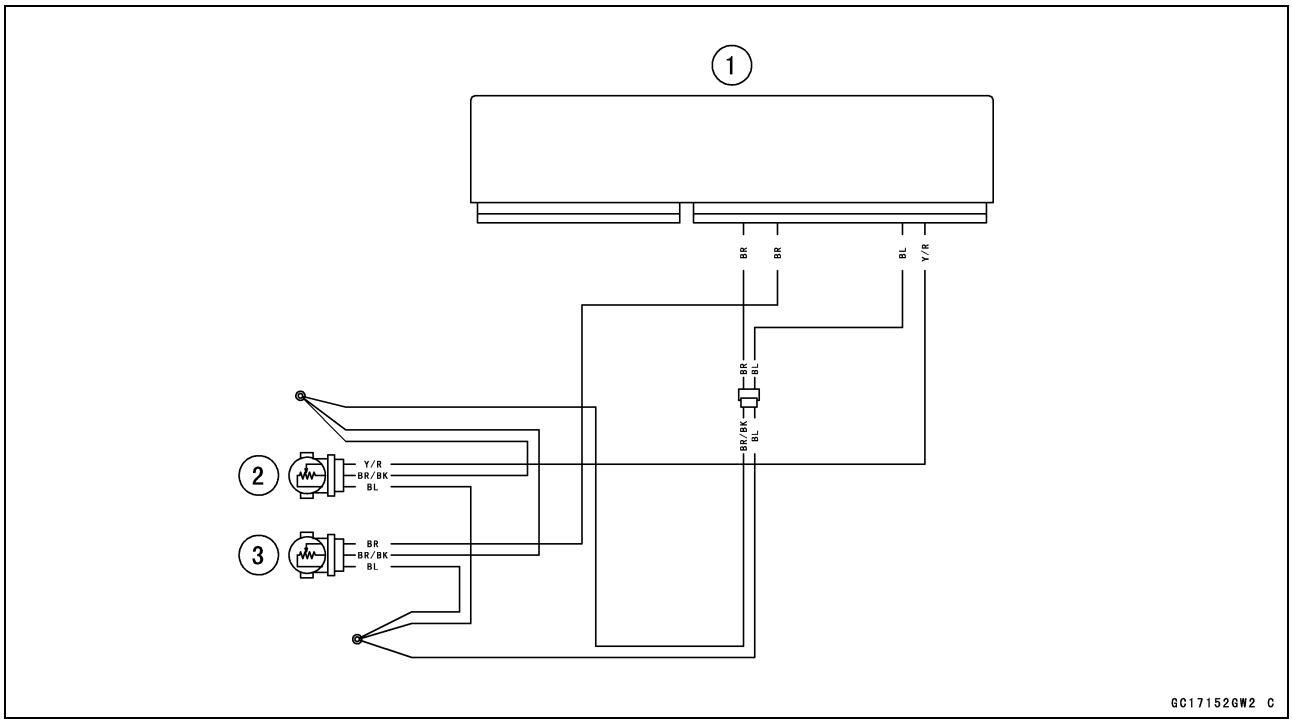
- Measure the subthrottle sensor resistance.

Subthrottle Sensor Resistance
Connections to Adapter:
Digital Meter (+) → BK (sensor BL) lead
Digital Meter (–) → W (sensor BR/BK) lead

Standard: 4 ~ 6 kΩ

★If the reading is out of the standard, replace the throttle body assy (see Throttle Body Assy Removal/Installation).
★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

Subthrottle Sensor Circuit



1. ECU
2. Main Throttle Sensor
3. Subthrottle Sensor

Oxygen Sensor - not activated (Service Code 33)

Oxygen Sensor Removal/Installation

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

Oxygen Sensor Inspection

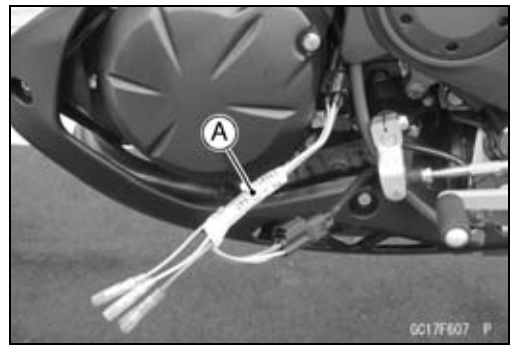
- Turn the ignition switch off.
- Remove the left middle fairing (see Middle Fairing Removal in the Frame chapter).
- Open the clamp [A].

- Disconnect the oxygen sensor lead connector and connect the measuring adapter [A] between these connectors.

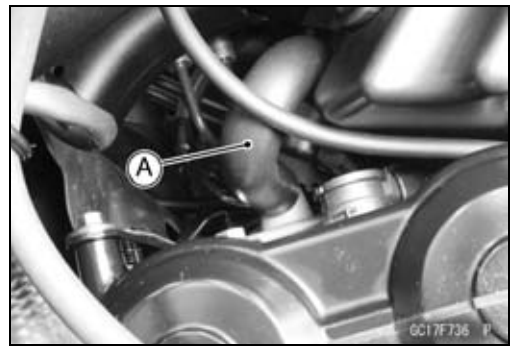
  Special Tool - Oxygen Sensor Measuring Adapter: 57001 -1682

- Connect a digital meter to the measuring adapter leads.

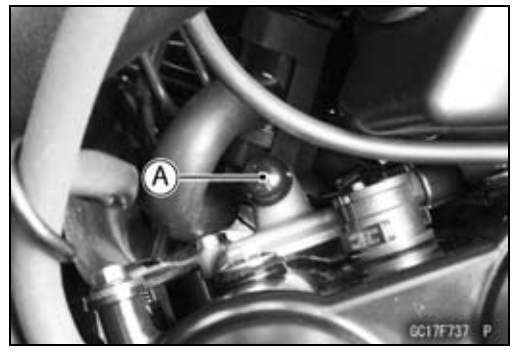
  Oxygen Sensor Output Voltage
  Connections to Adapter:
  Digital Meter (+) → BL (sensor BL) lead
  Digital Meter (−) → BR (sensor BR/BK) lead



- Disconnect the air switching valve hose [A].



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



- Warm up the engine thoroughly until the radiator fan starts.
- Measure the output voltage with the connector joined.

  Output Voltage (with Plugs, Rich)
  Standard: DC 0.5 V or more

Oxygen Sensor - not activated (Service Code 33)

- Turn the ignition switch off.
- Remove the plug from the fitting [A].

⚠ WARNING

The engine gets extremely hot during normal operation and can cause serious burns. Never touch a hot engine.

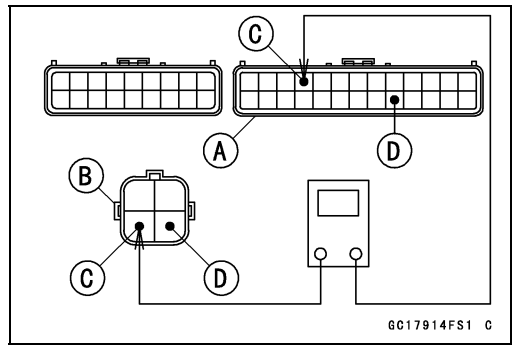
- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

Output Voltage (without Plugs, Lean)
Standard: DC 0.2 V or less

- Turn the ignition switch off.

★If the reading is out of the standard (with plugs: DC 0.5 V or more, without plugs: DC 0.2 V or less), remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.



Wiring Continuity Inspection
ECU Connectors [A] ←→
Oxygen Sensor Connector [B]
BL/Y lead (ECU terminal 4) [C]
BR/BK lead (ECU terminal 22) [D]

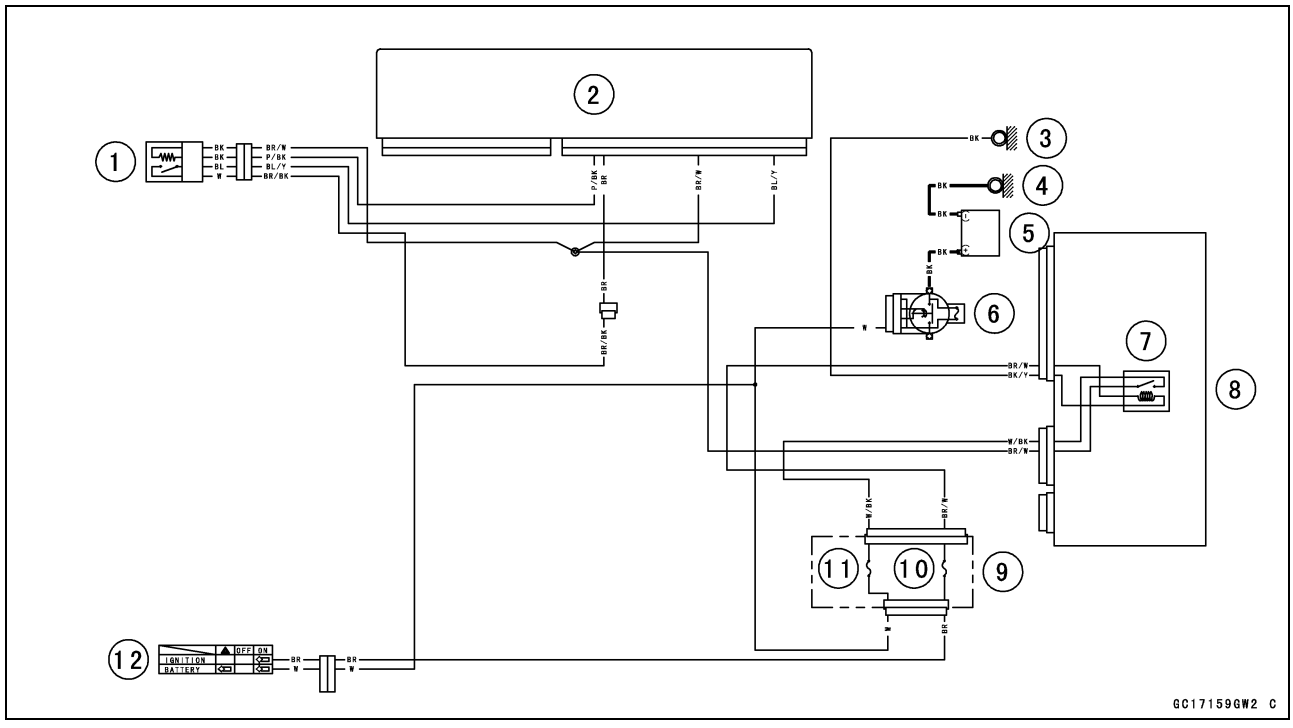
★If the wiring is good, replace the sensor (see Oxygen Sensor Removal/Installation in the Electrical System chapter).

★If the reading is within the standard (with plugs: DC 0.5 V or more, without plugs: DC 0.2 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).

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

Oxygen Sensor - not activated (Service Code 33)

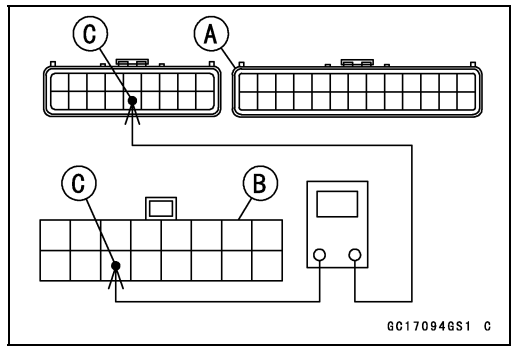
Oxygen Sensor Circuit



1. Oxygen Sensor
2. ECU
3. Frame Ground 2
4. Engine Ground
5. Battery 12 V 10 Ah
6. Main Fuse 30 A
7. ECU Main Relay
8. Relay Box
9. Fuse Box 1
10. Ignition Fuse 10 A
11. ECU Fuse 15 A
12. Ignition Switch

ECU Communication Error (Service Code 39)

ECU Communication Line Inspection

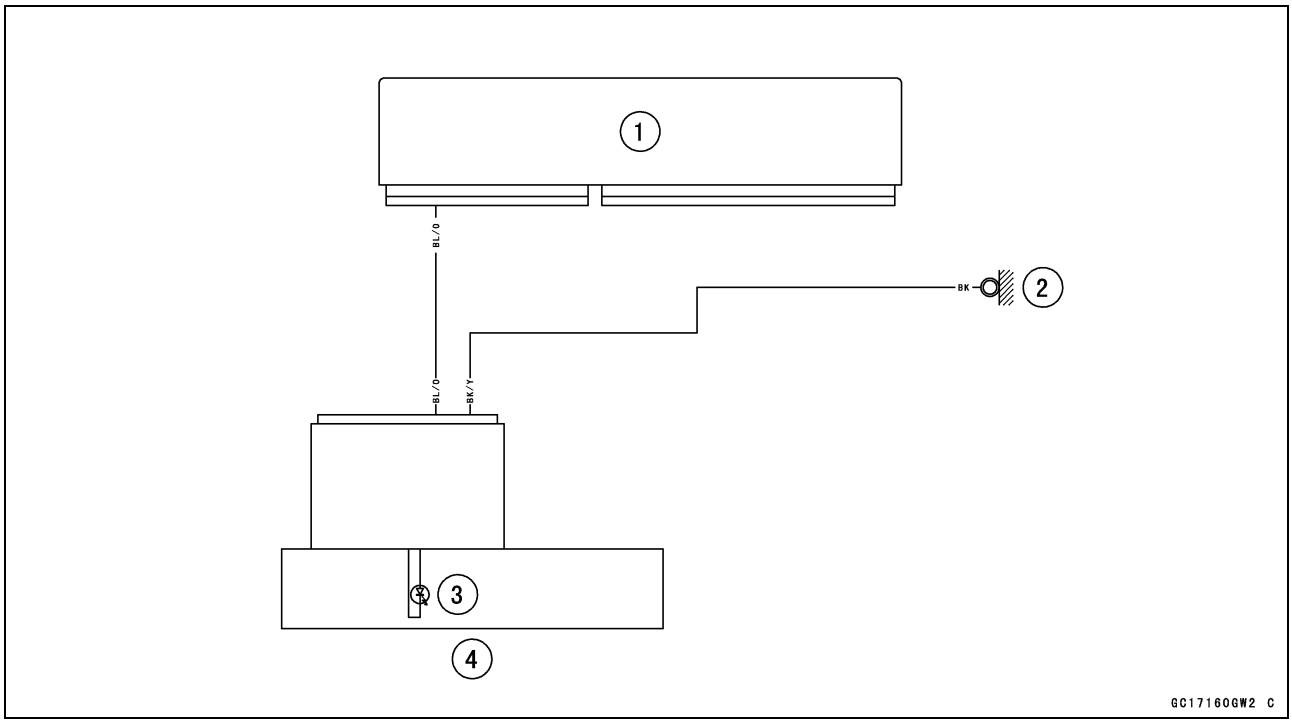


○When the data is not sent from the ECU to the meter unit for more than about 10 seconds, the service code 39 is displayed.
○The service code 39 is detected with meter unit.
● Remove the ECU and meter unit, check the wiring for continuity between main harness connectors.
○Disconnect the ECU and meter unit connectors.

Wiring Continuity Inspection
ECU Connector [A] ←→ Meter Unit Connector [B]
BL/O lead (ECU terminal 40) [C]

★If the wiring is good, check the meter unit (see Meter Unit Inspection in the Electrical System chapter).
★If the meter unit is normal, replace the ECU (see ECU Removal/Installation).

ECU Communication Line Circuit



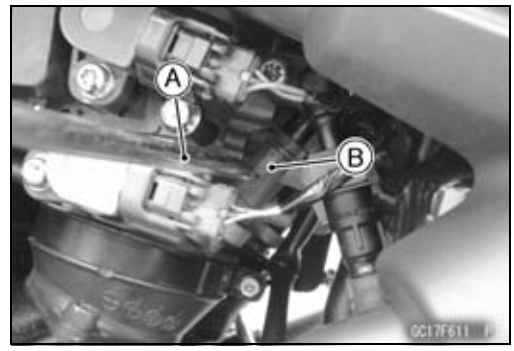
1. ECU
2. Frame Ground 5
3. Yellow Engine Warning Indicator Light (LED)
4. Meter Unit

Fuel Injectors (Service Code 41, 42)

Fuel Injector Removal/Installation

● Refer to the Throttle Body Assy Disassembly/Assembly.

Fuel Injector Audible Inspection

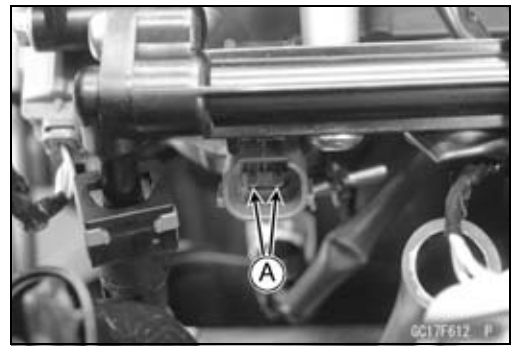


NOTE

○*Be sure the battery is fully charged.*

● Start the engine, and let it idle.
● Apply the flat tip screwdriver [A] to the fuel injector [B]. Put the grip end onto your ear, and listen whether the fuel injector is clicking or not.
○A sound scope can also be used.
○The click interval becomes shorter as the engine speed rises.
● Do the same for the other fuel injectors.
★If all the fuel injectors click at a regular intervals, the fuel injectors are normal.
● Turn the ignition switch off.
★If any fuel injector does not click, check the fuel injector resistance (see Fuel Injector Resistance Inspection).

Fuel Injector Resistance Inspection



● Remove the air cleaner housing (see Air Cleaner Housing Removal).
● Disconnect the fuel injector connector.
● Connect a digital meter to the terminals [A] of the fuel injector.
● Measure the fuel injector resistance.

Fuel Injector Resistance
Connections:

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

★If the reading is out of the standard, replace the fuel injector (see Throttle Body Assy Disassembly/Assembly).
★If the reading is within the standard, check the power source voltage (see Fuel Injector Power Source Voltage Inspection).

Fuel Injectors (Service Code 41, 42)

Fuel Injector Power Source Voltage Inspection

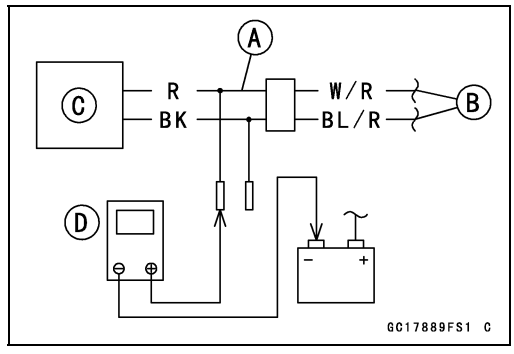
NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the fuel injector connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Fuel Injector #1 [C]

Special Tool - Measuring Adapter: 57001-1700

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



Fuel Injector Power Source Voltage
Connections to Adapter:
For Fuel Injector #1, #2
Digital Meter (+) → R (injector W/R) lead
Digital Meter (–) → Battery (–) terminal

- Measure the power source voltage with the engine stopped and with the connector joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch on.

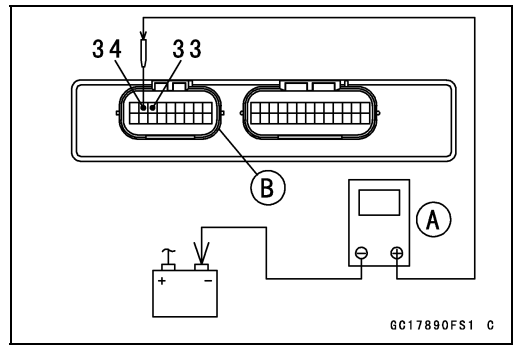
Power Source Voltage
Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch off.

★If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
★If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
★If the fuel pump relay is normal, check the power source wiring (see Fuel Injector Circuit).
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If the reading is in specification, check the output voltage (see Fuel Injector Output Voltage Inspection).

Fuel Injectors (Service Code 41, 42)

Fuel Injector Output Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Remove the ECU (see ECU Removal).

○Do not disconnect the ECU connector.

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

Special Tool - Needle Adapter Set: 57001-1457

Fuel Injector Output Voltage
Connections to ECU Connector:
For Fuel Injector #1
Digital Meter (+) → BL/R lead (ECU terminal 34)
Digital Meter (–) → Battery (–) terminal
For Fuel Injector #2
Digital Meter (+) → BL/Y lead (ECU terminal 33)
Digital Meter (–) → Battery (–) terminal

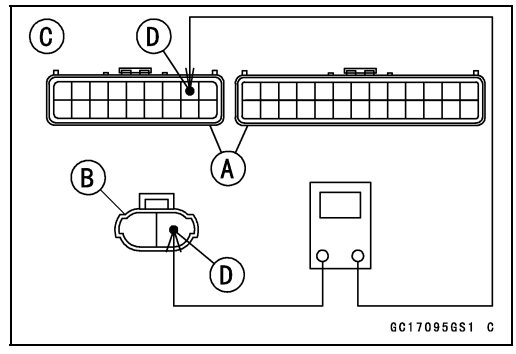
- Measure the output voltage with the engine stopped and with the connector joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch on.

Output Voltage
Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch off.

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

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



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

○Disconnect the ECU and injector connector.

Wiring Continuity Inspection
ECU Connector [A] ←→ Fuel Injector Connector [B]
For Fuel Injector #1 [C]
BL/R lead (ECU terminal 34) [D]
For Fuel Injector #2
BL/Y lead (ECU terminal 33)

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

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

Fuel Injectors (Service Code 41, 42)

Fuel Injector Fuel Line Inspection

● Remove:
Fuel Tank (see Fuel Tank Removal)
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

⚠ WARNING

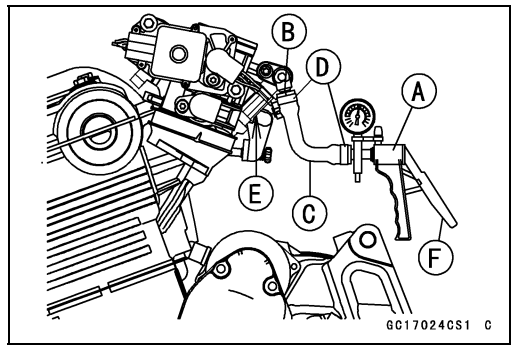
Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.

● Check the fuel injector fuel line for leakage as follows.

○Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamps [D]) as shown.

○Apply soap and water solution to the areas [E] as 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)

NOTICE

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

○Watch the gauge for at least 6 seconds.

★If the pressure holds steady, the fuel line is good.

★If the pressure drops at once or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, fuel injectors and related parts (see Throttle Body Assy Disassembly/Assembly).

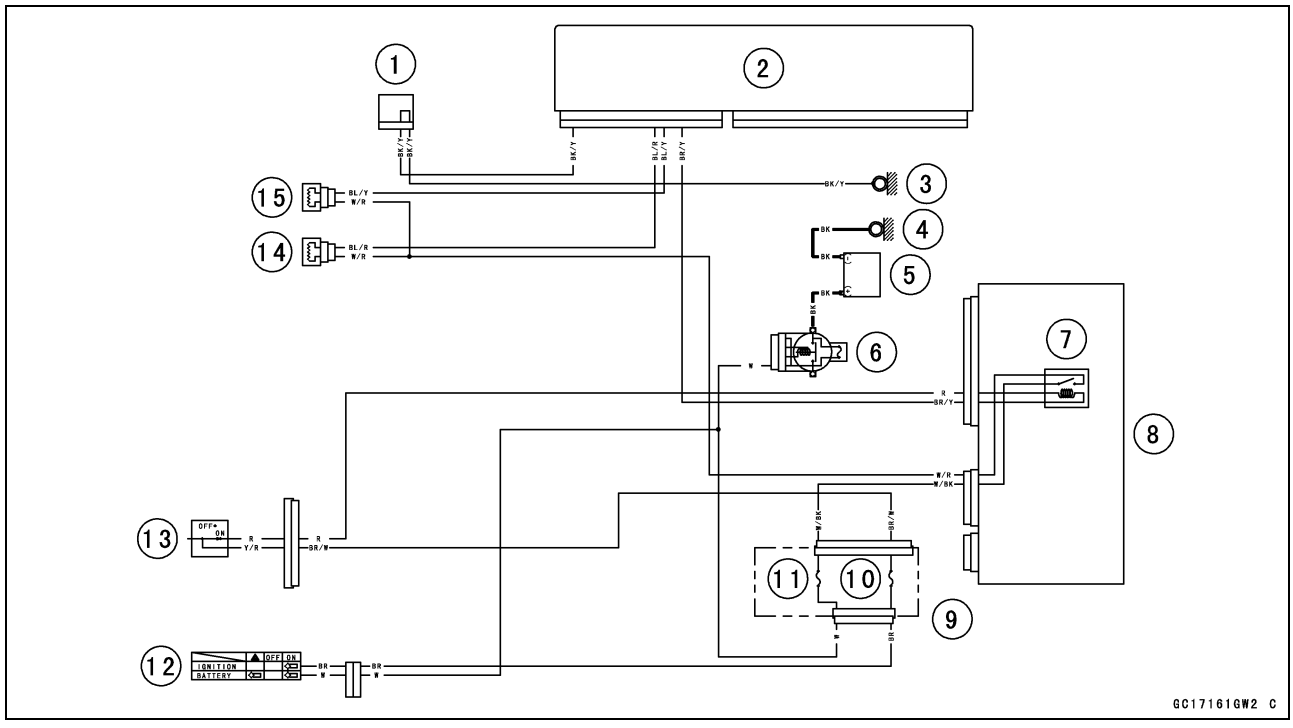
○Repeat the leak test, and check the fuel line for no leakage.

● Install:
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Fuel Tank (see Fuel Tank Installation)

● Start the engine and check for fuel leakage.

Fuel Injectors (Service Code 41, 42)

Fuel Injector Circuit



1. Joint Connector G
2. ECU
3. Frame Ground 1
4. Engine Ground
5. Battery 12 V 10 Ah
6. Main Fuse 30 A
7. Fuel Pump Relay
8. Relay Box
9. Fuse Box 1
10. Ignition Fuse 10 A
11. ECU Fuse 15 A
12. Ignition Switch
13. Engine Stop Switch
14. Fuel Injector #1
15. Fuel Injector #2

Stick Coils #1, #2 (Service Code 51, 52)

Stick Coil #1: Service Code 51
Stick Coil #2: Service Code 52

Stick Coil Removal/Installation

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

Stick Coil Primary Winding Resistance Inspection

● Refer to the Stick Coil Inspection in the Electrical System chapter.

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

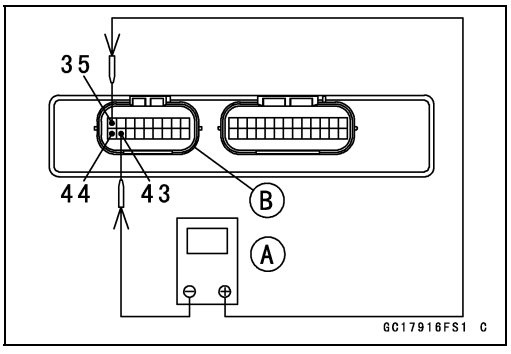
Stick Coil Input Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

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

Special Tool - Needle Adapter Set: 57001-1457



Stick Coil Input Voltage
Connections to ECU Connector:
For Stick Coil #1
Digital Meter (+) → BK lead (terminal 35)
Digital Meter (–) → BK/Y lead (terminal 43)
For Stick Coil #2
Digital Meter (+) → BK/O lead (terminal 44)
Digital Meter (–) → BK/Y lead (terminal 43)

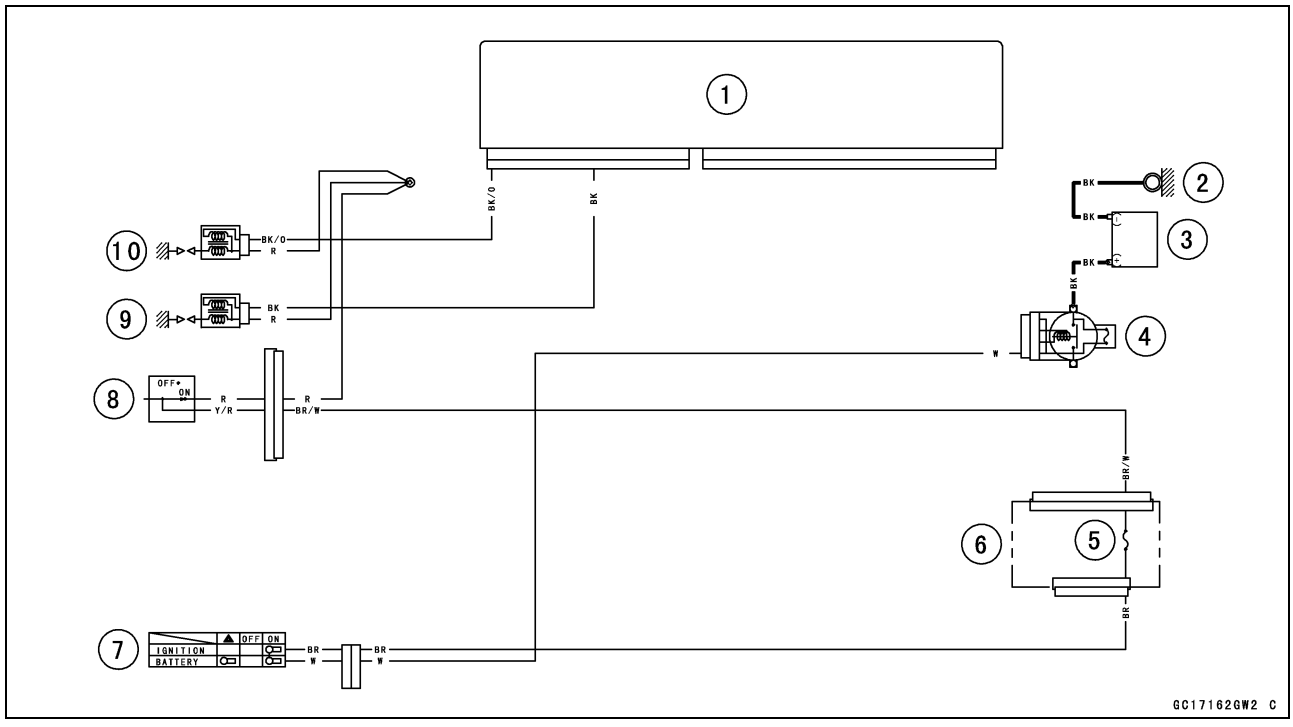
● Measure the input voltage to each primary winding of the stick coils with the engine stopped and with the connectors joined.
● Turn the engine stop switch to run position.
● Turn the ignition switch on.

Input Voltage
Standard: Battery Voltage

● Turn the ignition switch off.
★If the input voltage is out of the standard, check the wiring for continuity (see Stick Coil Circuit).
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If the input voltage is within the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

Stick Coils #1, #2 (Service Code 51, 52)

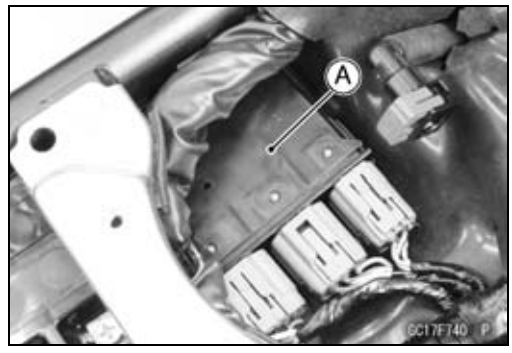
Stick Coil Circuit



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

Radiator Fan Relay (Service Code 56)

Radiator Fan Relay Removal/Installation



○The radiator fan relay is built in the relay box [A].

● Refer to the Relay Box Removal in the Electrical System chapter.

Radiator Fan Relay Inspection

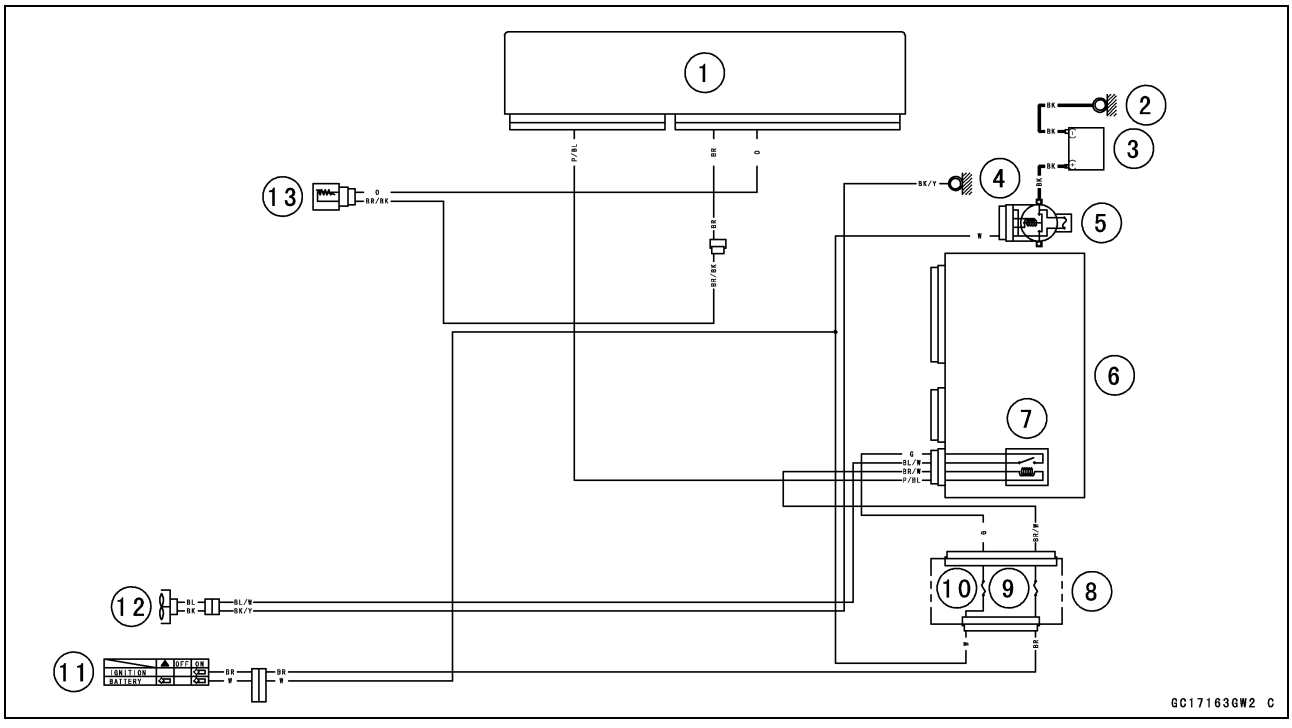
● Refer to the Relay Circuit Inspection in the Electrical System chapter.

★If the radiator fan relay is normal, check the wiring for continuity (see Radiator Fan Relay Circuit).

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

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

Radiator Fan Relay Circuit



1. ECU
2. Engine Ground
3. Battery 12 V 10 Ah
4. Frame Ground 6
5. Main Fuse 30 A
6. Relay Box
7. Radiator Fan Relay
8. Fuse Box 1
9. Ignition Fuse 10 A
10. Fan Fuse 15 A
11. Ignition Switch
12. Fan Motor
13. Water Temperature Sensor

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Removal

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

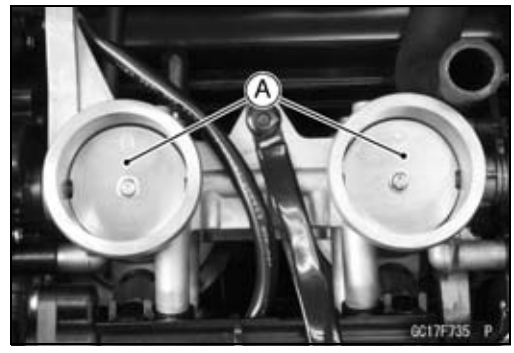
Subthrottle Valve Actuator Inspection

NOTE

○*Be sure the battery is fully charged.*

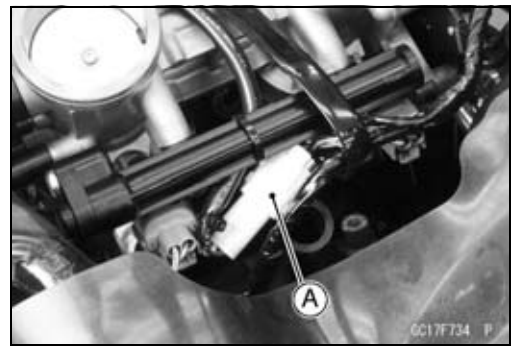
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Turn the ignition switch on.
- Check to see that all the subthrottle valves [A] open and close smoothly.
- Turn the ignition switch off.

★If the subthrottle valves do not operate, check the subthrottle valve actuator resistance (see Subthrottle Valve Actuator Resistance Inspection).



Subthrottle Valve Actuator Resistance Inspection

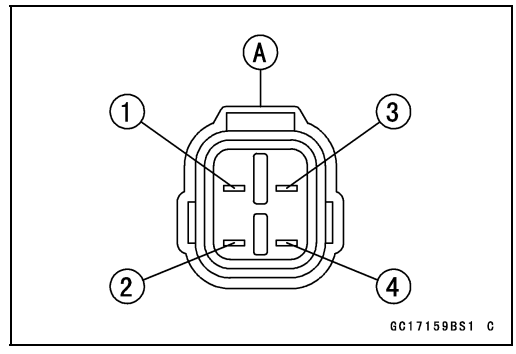
- Turn the ignition switch off.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the subthrottle valve actuator connector [A].



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

Subthrottle Valve Actuator Resistance

Connections:	**BK lead [1] ←→ P lead [2]**
	G lead [3] ←→ W/BL lead [4]
Standard:	**About 5.2 ~ 7.8 Ω**

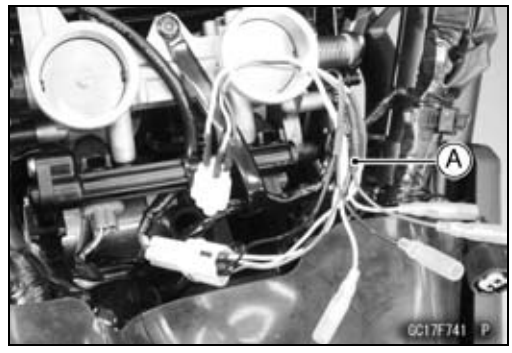


★If the reading is out of the standard, replace the throttle body assy.

★If the reading is within the standard, check the input voltage (see Subthrottle Valve Actuator Input Voltage Inspection).

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Input Voltage Inspection



NOTE

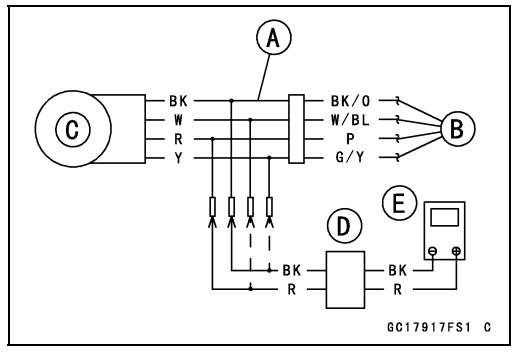
○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Disconnect the subthrottle valve actuator connector and connect the measuring adapter [A] between these connectors as shown.
  Main Harness [B]
  Subthrottle Valve Actuator [C]

Special Tool - Measuring Adapter: 57001-1700

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

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



Subthrottle Valve Actuator Input Voltage
Connections to Adapter:

(I) Digital Meter (+) → R (actuator P) lead
Digital Meter (–) → BK (actuator BK/O) lead
(II) Digital Meter (+) → Y (actuator G/Y) lead
Digital Meter (–) → W (actuator W/BL) lead

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

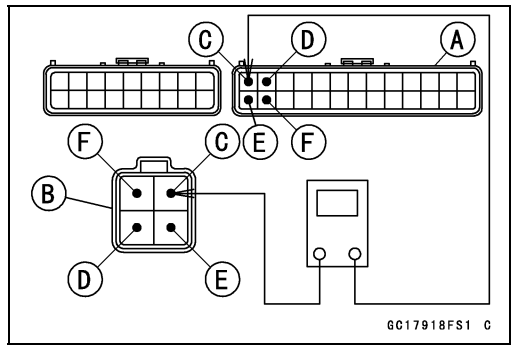
Input Voltage
Standard: About DC 8.5 ~ 10.5 V and then 0 V or
About DC 8.5 ~ 10.5 V

- Turn the ignition switch off.

★If the reading is in specification, but the actuator does not operate, replace the throttle body assy (see Throttle Body Assy Removal/Installation).

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

○Disconnect the ECU and actuator connectors.



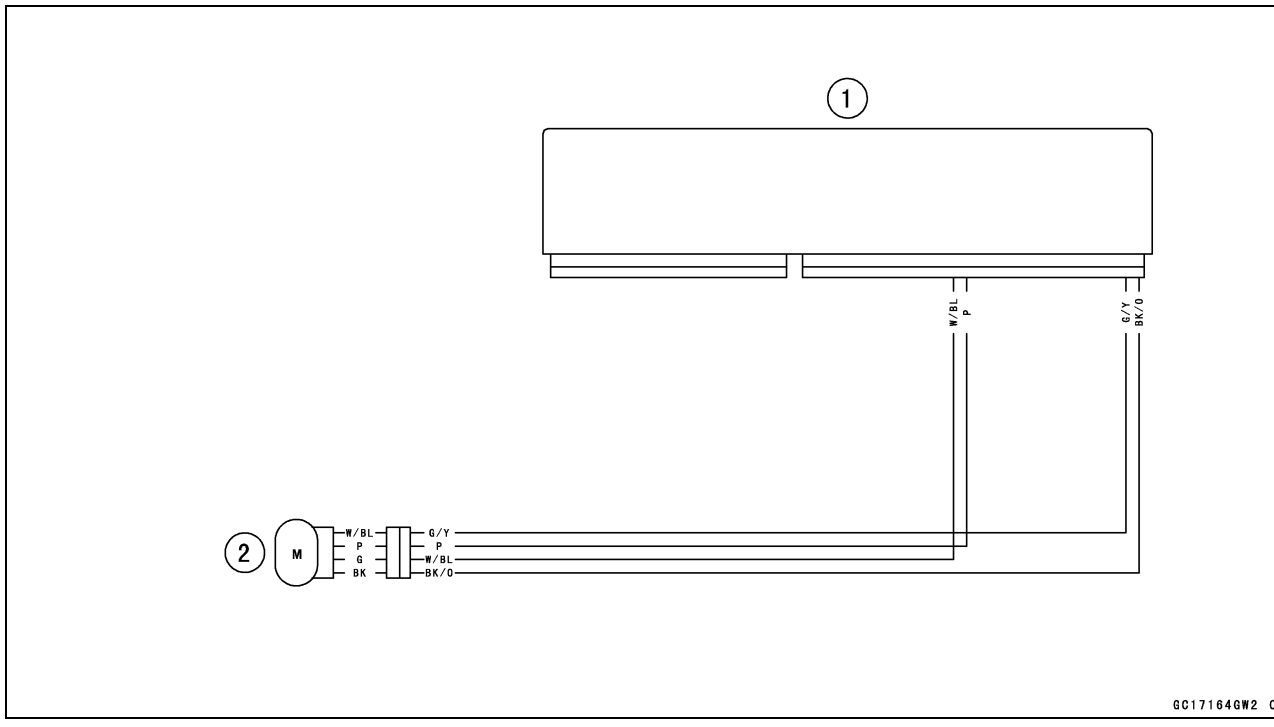
Wiring Continuity Inspection
ECU Connector [A] ←→
Subthrottle Valve Actuator Connector [B]
BK/O lead (ECU terminal 1) [C]
G/Y lead (ECU terminal 2) [D]
P lead (ECU terminal 14) [E]
W/BL lead (ECU terminal 15) [F]

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

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

Subthrottle Valve Actuator (Service Code 62)

Subthrottle Valve Actuator Circuit



1. ECU
2. Subthrottle Valve Actuator

Air Switching Valve (Service Code 64)

Air Switching Valve Removal/Installation

- Refer to the Air Switching Valve Removal/Installation in the Engine Top End chapter.

Air Switching Valve Inspection

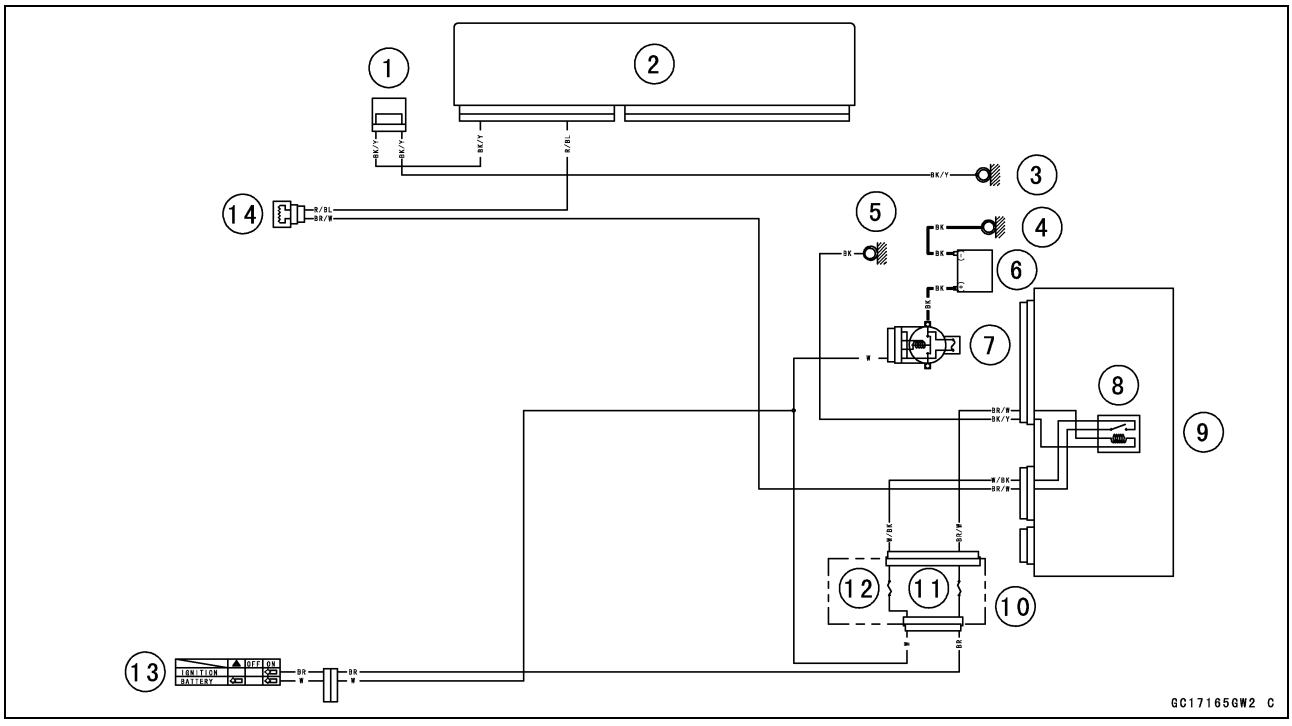
- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

★If the air switching valve is normal, check the wiring for continuity (see Air Switching Valve Circuit).

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

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

Air Switching Valve Circuit



1. Joint Connector G
2. ECU
3. Frame Ground 1
4. Engine Ground
5. Frame Ground 2
6. Battery 12 V 10 Ah
7. Main Fuse 30 A
8. ECU Main Relay
9. Relay Box
10. Fuse Box 1
11. Ignition Fuse 10 A
12. ECU Fuse 15 A
13. Ignition Switch
14. Air Switching Valve

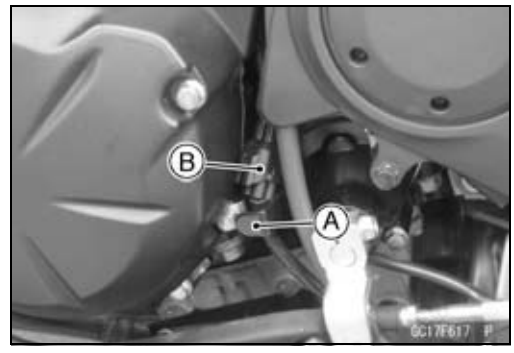
Oxygen Sensor Heater (Service Code 67)

Oxygen Sensor Heater Removal/Installation

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

Oxygen Sensor Heater Resistance Inspection

- Turn the ignition switch off.
- Open the clamp [A].
- Disconnect the oxygen sensor lead connector [B].

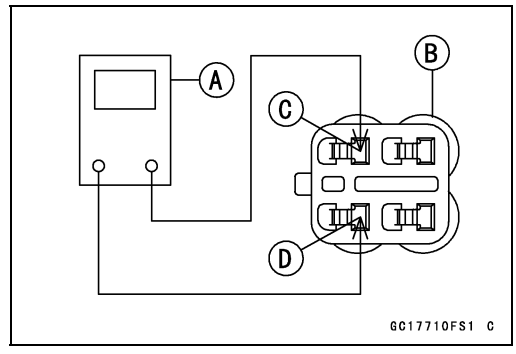


- Connect a digital meter [A] to the oxygen sensor lead connector [B].
- Measure the oxygen sensor heater resistance.

Oxygen Sensor Heaters Resistance
Connections: BK lead [C] ←→ BK lead [D]
Standard: 5.49 ~ 6.91 Ω @20° C (68°F)

★If the reading is out of the standard, replace the sensor (see Oxygen Sensor Removal/installation in the Electrical System chapter).

★If the reading is within the standard, check the power source voltage (see Oxygen Sensor Heater Power Source Voltage Inspection).



Oxygen Sensor Heater Power Source Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.
- Open the clamp [A].

Oxygen Sensor Heater (Service Code 67)

- Disconnect the oxygen sensor lead connector and connect the measuring adapter [A] between these connectors.

Special Tool - Oxygen Sensor Measuring Adapter: 57001 -1682

- Connect a digital meter to the measuring adapter lead.

Oxygen Sensor Power Source Voltage
Connections to Adapter:
Digital Meter (+) → W (main harness BR/W) lead
Digital Meter (–) → Frame Ground Terminal

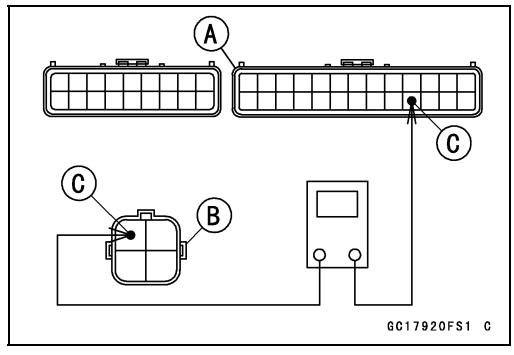
- Measure the power source voltage with the engine stopped and with the connector joined.
- Turn the ignition switch on.

Power Source Voltage
Standard: Battery Voltage

- Turn the ignition switch off.

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

★If the reading is out of the standard, check the following.
ECU Fuse (15 A) (see Fuse Inspection in the Electrical System chapter)
Power Source Wiring (see Oxygen Sensor Circuit)



★If the fuse and wiring are good, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

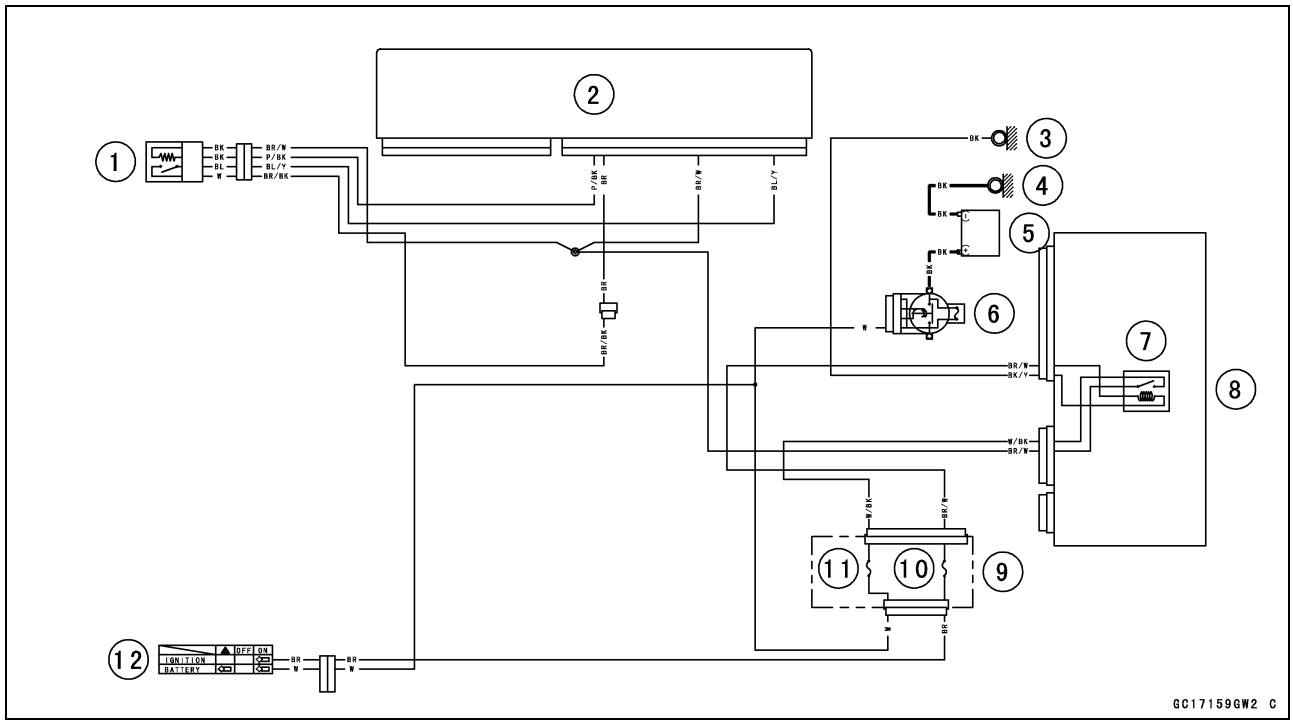
Wiring Continuity Inspection
ECU Connector [A] ←→
Oxygen Sensor Connector [B]
P/BK lead (ECU terminal 23) [C]

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

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

Oxygen Sensor Heater (Service Code 67)

Oxygen Sensor Circuit



1. Oxygen Sensor
2. ECU
3. Frame Ground 2
4. Engine Ground
5. Battery 12 V 10 Ah
6. Main Fuse 30 A
7. ECU Main Relay
8. Relay Box
9. Fuse Box 1
10. Ignition Fuse 10 A
11. ECU Fuse 15 A
12. Ignition Switch

Oxygen Sensor - Incorrect Output Voltage (Service Code 94)

Oxygen Sensor Removal/Installation

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

Oxygen Sensor Inspection

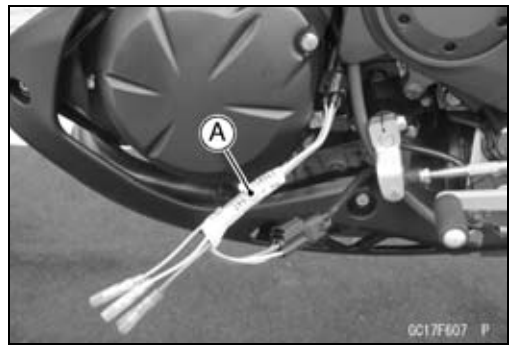
- Turn the ignition switch off.
- Remove the left middle fairing (see Middle Fairing Removal in the Frame chapter).
- Open the clamp [A].

- Disconnect the oxygen sensor lead connector and connect the measuring adapter [A] between these connectors.

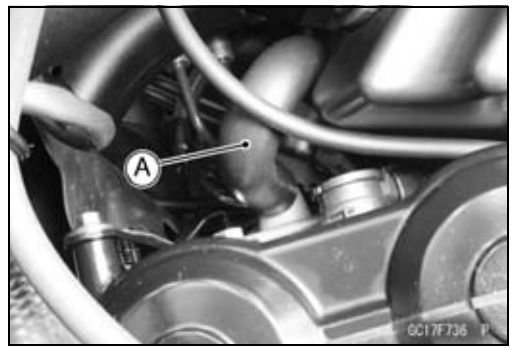
  Special Tool - Oxygen Sensor Measuring Adapter: 57001 -1682

- Connect a digital meter to the measuring adapter leads.

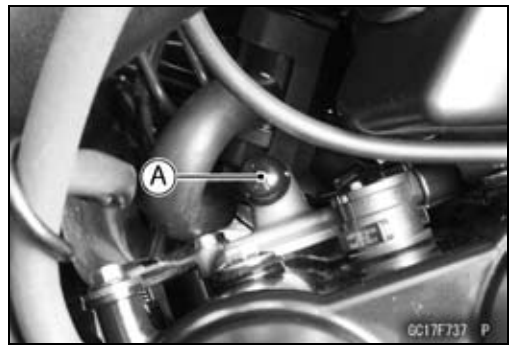
  Oxygen Sensor Output Voltage
  Connections to Adapter:
  Digital Meter (+) → BL (sensor BL) lead
  Digital Meter (−) → BR (sensor BR/BK) lead



- Disconnect the air switching valve hose [A].



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



- Warm up the engine thoroughly until the radiator fan starts.
- Measure the output voltage with the connector joined.

  Output Voltage (with Plugs, Rich)
  Standard: DC 0.5 V or more

Oxygen Sensor - Incorrect Output Voltage (Service Code 94)

- Turn the ignition switch off.
- Remove the plug from the fitting [A].

⚠ WARNING

The engine gets extremely hot during normal operation and can cause serious burns. Never touch a hot engine.

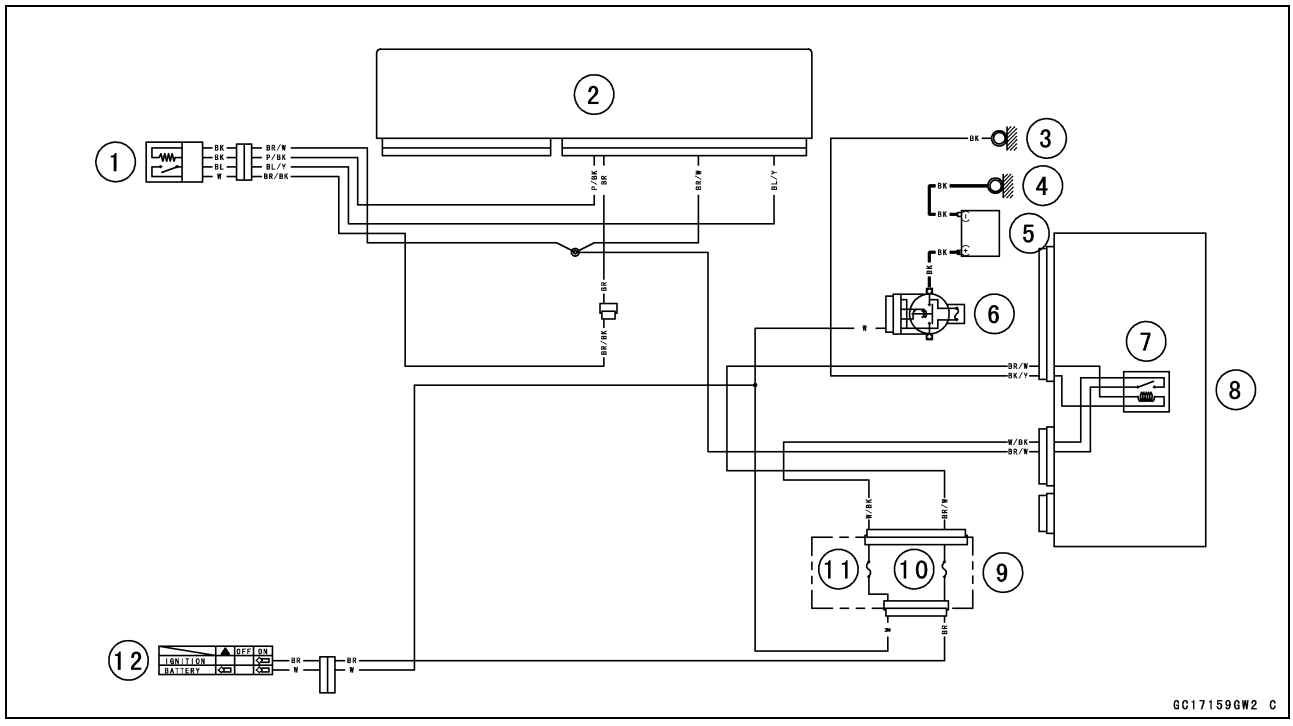
- Start the engine, and let it idle.
- Measure the output voltage with the connector joined.

Output Voltage (without Plugs, Lean)
Standard: DC 0.2 V or less

- Turn the ignition switch off.

★If the reading is out of the standard (with plugs: DC 0.5 V or more, without plugs: DC 0.2 V or less), check the following.
Fuel Pressure (see Fuel Pressure Inspection)
Fuel Injector (see Fuel Injectors section)
★If the fuel pressure and fuel injectors are good, replace the sensor (see Oxygen Sensor Removal/Installation in the Electrical System chapter).
★If the reading is within the standard (with plugs: DC 0.5 V or more, without plugs: DC 0.2 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

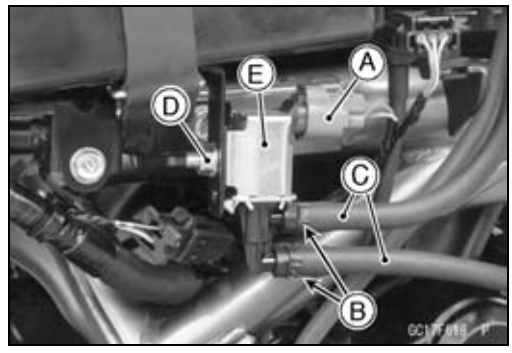
Oxygen Sensor Circuit



1. Oxygen Sensor
2. ECU
3. Frame Ground 2
4. Engine Ground
5. Battery 12 V 10 Ah
6. Main Fuse 30 A
7. ECU Main Relay
8. Relay Box
9. Fuse Box 1
10. Ignition Fuse 10 A
11. ECU Fuse 15 A
12. Ignition Switch

Purge Valve (Service Code 3A) (CAL, MY, SEA-B1, TH and CN Models)

Purge Valve Removal/Installation



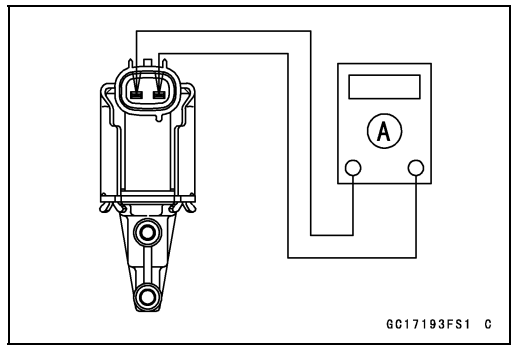
- Remove:
  Left Middle Fairing (see Middle Fairing Removal in the Frame chapter)
- Disconnect the purge valve lead connector [A].
- Slide the clamps [B].
- Disconnect the hoses [C].
- Remove the purge valve mounting nut [D].
- Remove the purge valve [E] from the bracket.
- Installation is the reverse of removal.
- Tighten:

Torque - Purge Valve Mounting Nut: 7.0 N·m (0.71 kgf·m, 62 in·lb)

- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Purge Valve Inspection

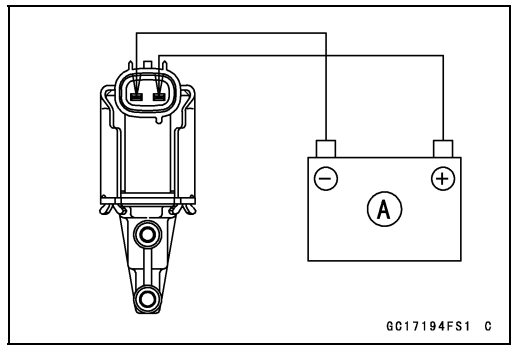
- Remove the purge valve (see Purge Valve Removal/Installation).
- Connect a digital meter [A] to the purge valve terminals as shown.



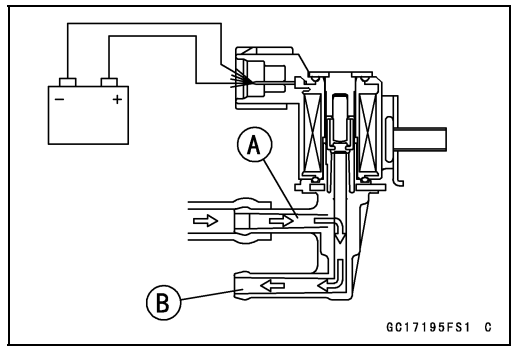
Purge Valve Resistance
Standard: 30 ~ 34 Ω at 20°C (68°F)

★If the resistance reading is out of the specified value, replace it with a new one.

- Connect the 12 V battery [A] to the purge valve terminals as shown.



- Blow the air to the intake air duct [A], and make sure that the air flows from the outlet air duct [B].



Purge Valve (Service Code 3A) (CAL, MY, SEA-B1, TH and CN Models)

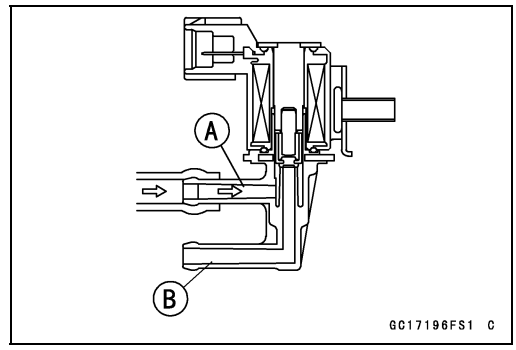
- Disconnect the 12 V battery.
- Blow the air to the intake air duct [A] again, and make sure that the air does not flow from the outlet air duct [B].

★If the purge valve dose not operate as described, replace it with a new one.

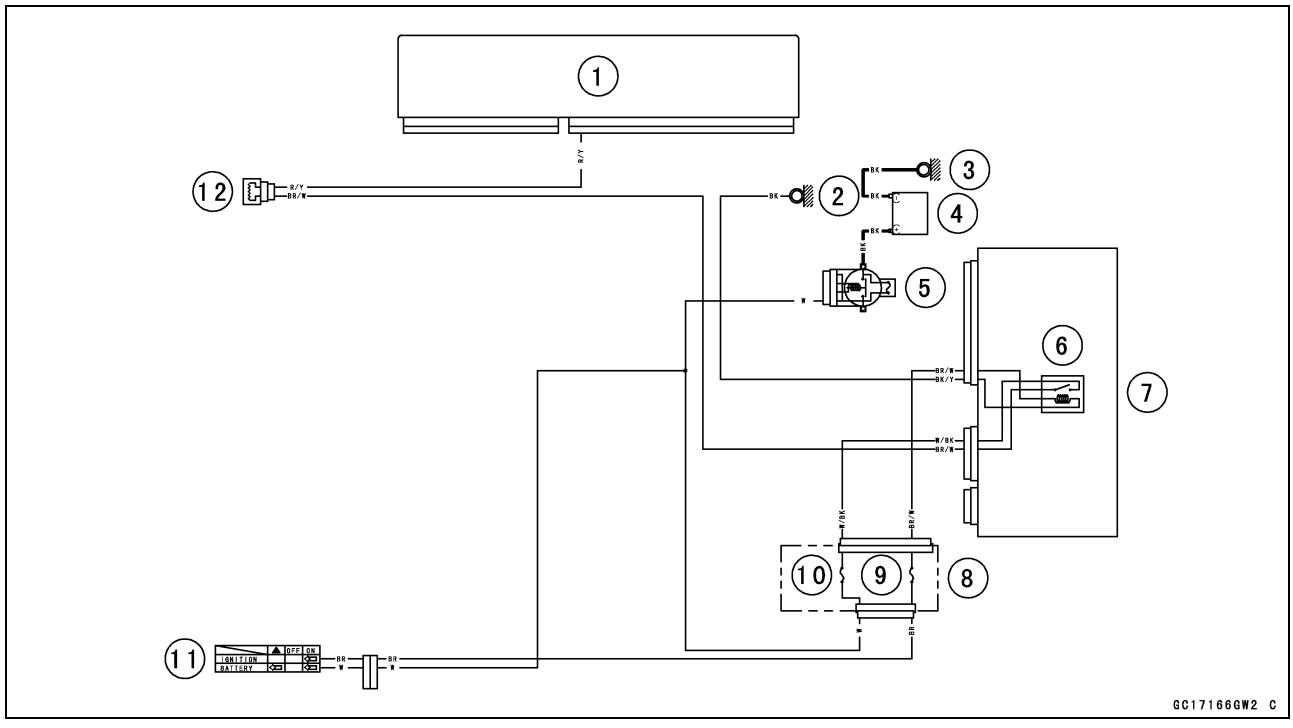
★If the purge valve is normal, check the wiring for continuity (see Purge Valve Circuit).

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

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



Purge Valve Circuit



1. ECU
2. Frame Ground 2
3. Engine Ground
4. Battery 12 V 10 Ah
5. Main Fuse 30 A
6. ECU Main Relay
7. Relay Box
8. Fuse Box 1
9. Ignition Fuse 10 A
10. ECU Fuse 15 A
11. Ignition Switch
12. Purge Valve

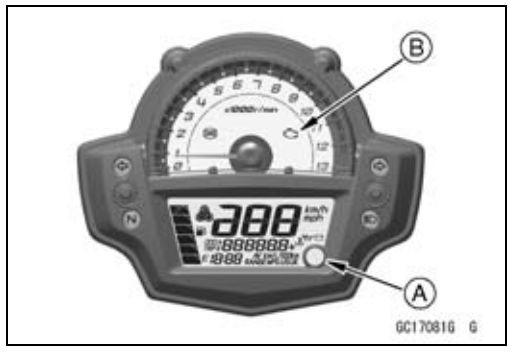
Warning Indicator Light (LED)

Yellow Engine Warning/Red Warning Indicator Light (LED) Inspection

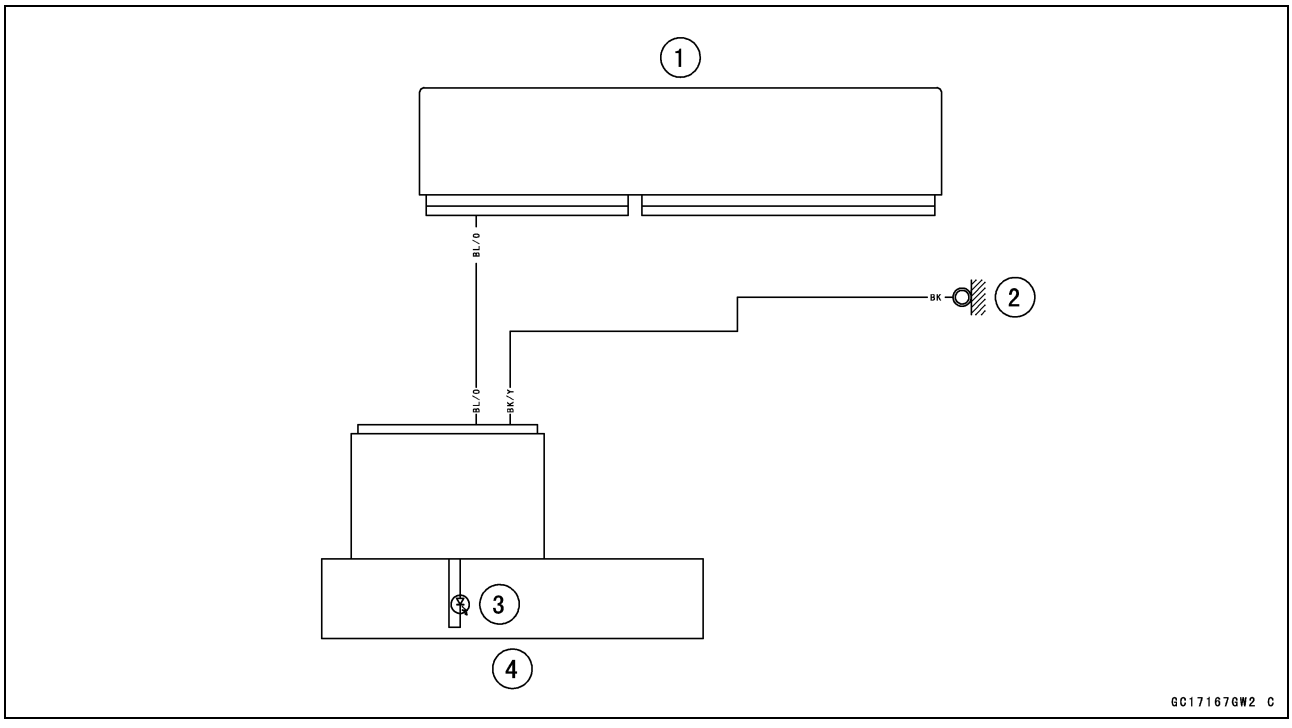
Red Warning Indicator Light (LED) [A]
Yellow Engine Warning Indicator Light (LED) [B]

○In this model, the above mentioned warning indicator lights (LED) go on or blink by the data sent from the ECU.

● Refer to the Meter Unit Inspection in the Electrical System chapter.



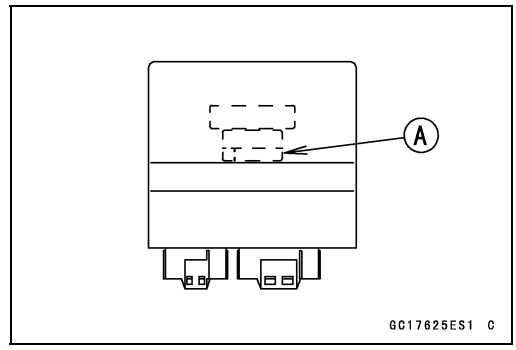
Warning Indicator (LED) Circuit



1. ECU
2. Frame Ground 5
3. Yellow Engine Warning Indicator Light (LED)
4. Meter Unit

ECU

ECU Identification



○Most countries have their own regulations, so each ECU has different characteristic. So, do not confuse ECU with each other and use only the ECU for your model. Otherwise, the motorcycle cannot clear the regulation.

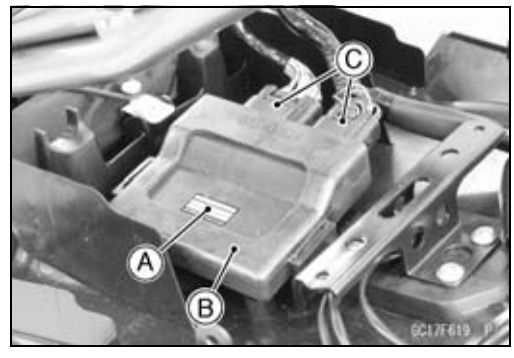
ECU Identification

Part Number [A]	Specification
21175-0924	AU
	MY
	SEA-B2
	WVTA (FULL H)
21175-0932	CN
21175-0937	CA
	US
21175-0938	CAL
21175-0940	ID
	PH
21175-0941	SEA-B1
	TH

ECU Removal

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

- Pull down the rear fender (see Rear Fender Removal in the Frame chapter).
- Lift up the ECU [A] with rubber protector [B] to clear the projections.
- Disconnect the ECU connectors [C].
- Remove:
  ECU (with Rubber Protector)

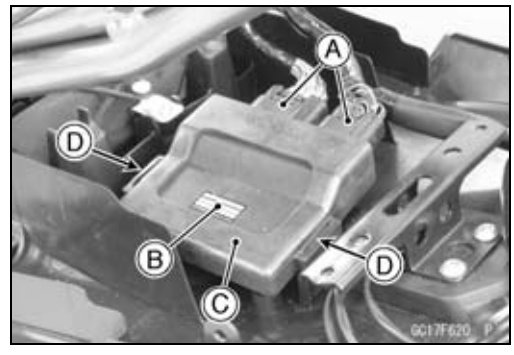


ECU Installation

- Connect the ECU connectors [A].
- Install:
  ECU [B] (with Rubber Protector [C])

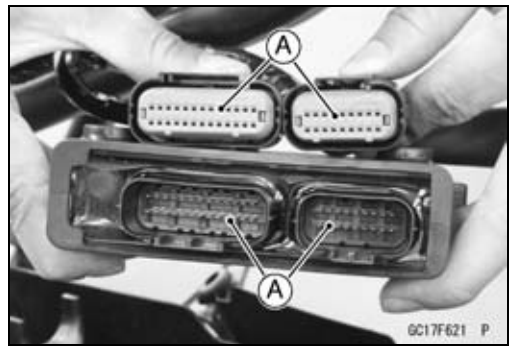
○Insert the slits of the rubber protector to the projections [D] of the rear fender.

- Install the removed parts (see appropriate chapters).



ECU

ECU Power Supply Inspection



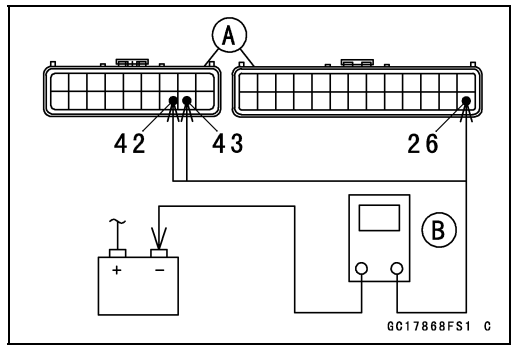
- Visually inspect the ECU connectors.

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

- Remove the ECU (see ECU Removal).
- Visually inspect the terminals [A] of the ECU and main harness connectors.

★If the terminals of the main harness connectors are damaged, replace the main harness.

★If the terminals of the ECU connectors are damaged, replace the ECU.



- Turn the ignition switch off.
- Disconnect the ECU connectors [A].
- Set a tester [B] and check the following wiring for continuity.

ECU Grounding Inspection

Connections:

(I) BK/Y leads (ECU terminal 42 or 43) ←→ Battery (–) Terminal

BK lead (ECU terminal 26)

(II) Engine Ground ←→ Battery (–) Terminal

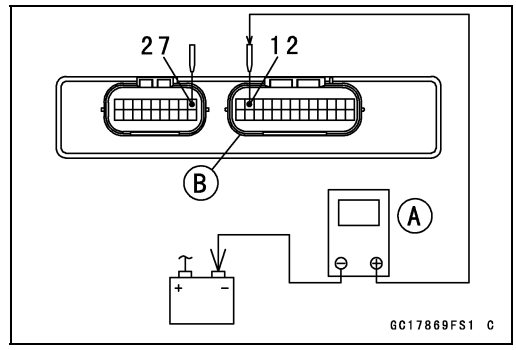
Criteria:

Both: 0 Ω

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

ECU

★If the wiring is good, check the power source voltage of the ECU.



NOTE

○*Be sure the battery is fully charged.*

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

Special Tool - Needle Adapter Set: 57001-1457

ECU Power Supply Inspection

Connections:

(I) Digital Meter (+) → Terminal 12 (BR/W)

Digital Meter (–) → Battery (–) terminal

(II) Digital Meter (+) → Terminal 27 (W/BK)

Digital Meter (–) → Battery (–) terminal

Ignition Switch off:

Terminal 12 (BR/W): 0 V

Terminal 27 (W/BK): Battery Voltage

Ignition Switch on:

Both: Battery Voltage

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

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

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

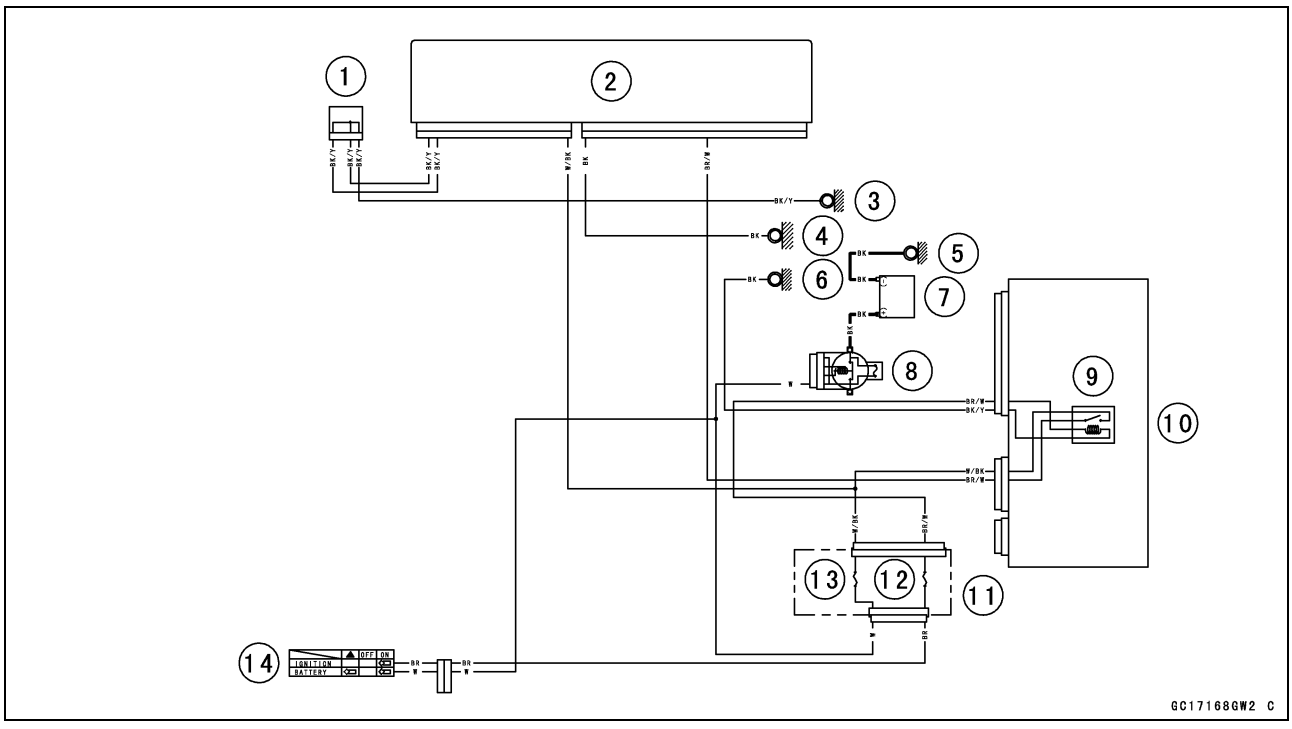
ECU Main Relay (see Relay Circuit Inspection in the Electrical System chapter)

Power Source Wiring (see wiring diagram in this section)

★If the fuse, wiring and relay are good, replace the ECU (see ECU Removal/Installation).

ECU

ECU Power Source Circuit



1. Joint Connector G
2. ECU
3. Frame Ground 1
4. Frame Ground 5
5. Engine Ground
6. Frame Ground 2
7. Battery 12 V 10 Ah
8. Main Fuse 30 A
9. ECU Main Relay
10. Relay Box
11. Fuse Box 1
12. Ignition Fuse 10 A
13. ECU Fuse 15 A
14. Ignition Switch

DFI Power Source

ECU Fuse (15 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

ECU Fuse (15 A) Installation

★If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.

- Refer to the Fuse Installation in the Electrical System chapter.

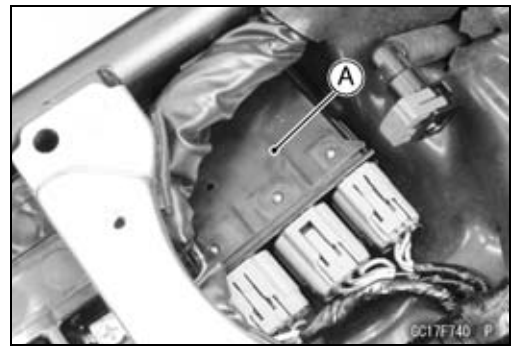
ECU Fuse (15 A) Inspection

- Refer to the Fuse Inspection in the Electrical System chapter.

ECU Main Relay Removal/Installation

○The ECU main relay is built in the relay box [A].

- Refer to the Relay Box Removal in the Electrical System chapter.



ECU Main Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.

Fuel Line

Fuel Pressure Inspection

NOTE

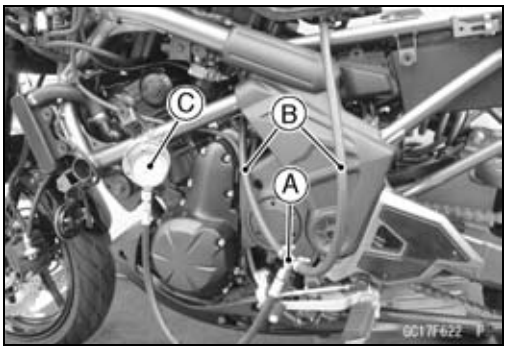
○*Be sure the battery is fully charged.*

● Remove:
Fuel Tank (see Fuel Tank Removal)
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.



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

Special Tools - Oil Pressure Gauge, 5 kgf/cm²: 57001-125
Fuel Pressure Gauge Adapter: 57001-1593
Fuel Hose: 57001-1607

⚠ WARNING

Fuel is extremely flammable and can be explosive under certain conditions resulting in serious injury or death. Do not try to start the engine with the fuel hoses disconnected.

● Connect the fuel pump lead connector.
● Turn the engine stop switch to run position.
● Turn the ignition switch on.

○The fuel pump should operate for 3 seconds, and then should stop.

NOTE

○*After turning on the engine stop switch and ignition switch, inspect the fuel leakage from the connected portion of the special tools.*

NOTICE

Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.

Fuel Line

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

Fuel Pressure (with Engine Idling)
Standard: 294 kPa (3.0 kgf/cm², 43 psi)

NOTE

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

- Turn the ignition switch off.

★If the fuel pressure is much higher than specified, replace the fuel pump because the fuel pressure regulator in the fuel pump have been clogged or stuck.

★If the fuel pressure is much lower than specified, check the following.
Fuel Line Leakage (see Fuel Injector Fuel Line Inspection)
Amount of Fuel Flow (see Fuel Flow Rate Inspection)

- After above checks, measure the fuel pressure again.
- Remove the fuel pressure gauge, hoses and adapter.
- Install:
Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Fuel Tank (see Fuel Tank Installation)
- Start the engine and check for fuel leakage.

Fuel Flow Rate Inspection

⚠ WARNING

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

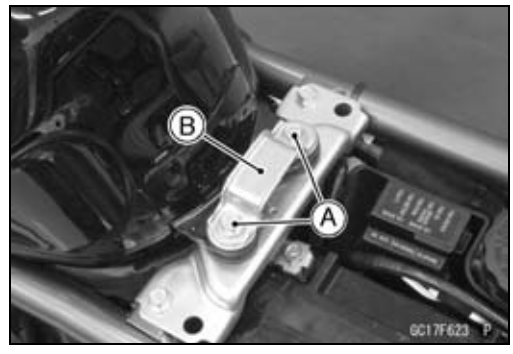
NOTE

○*Be sure the battery is fully charged.*

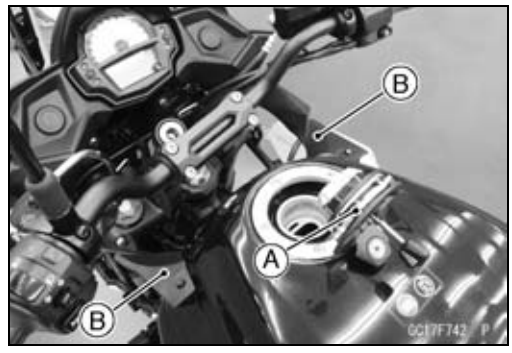
- Turn the ignition switch off.
- Wait until the engine cools down.
- Prepare a fuel hose (Special Tool: 57001-1607) and a measuring cylinder.

Special Tool - Fuel Hose: 57001-1607

- Remove:
Side Covers (see Side Cover Removal in the Frame chapter)
Fuel Tank Bolts [A]
Bracket [B]



Fuel Line

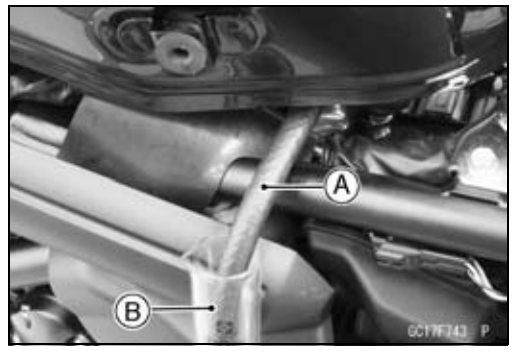


- Open the fuel tank cap [A] to lower the pressure in the tank.
- Clear the inner covers [B] from the fuel tank.
- Remove the fuel hose from the fuel pump (see Fuel Tank Removal).

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.

⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.



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

⚠ WARNING

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

- Close the fuel tank cap.
- Turn the engine stop switch to run position.
- Turn the ignition switch on.

○The fuel pump should operate for 3 seconds, and then should stop.

NOTICE

Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.

- Measure the discharge for 3 seconds.

○Repeat this operation several times.

Amount of Fuel Flow
Standard: 50 mL (1.7 US oz.) or more for 3 seconds

- Turn the ignition switch off.

★If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).

- Install the fuel tank (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

Fuel Pump

Fuel Pump Removal

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. 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 fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

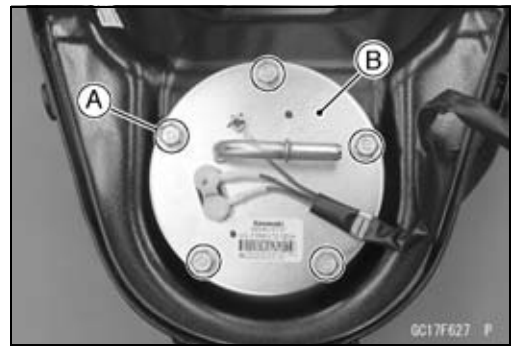
NOTICE

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

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see Fuel Tank Removal).

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

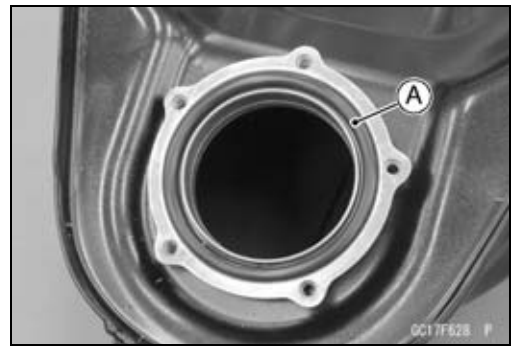
- Turn the fuel tank upside down.
- Remove the fuel pump bolts [A], and take out the fuel pump [B].



NOTICE

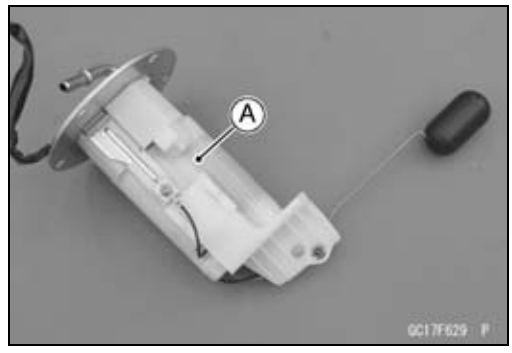
Do not pull the leads of the fuel pump. If they are pulled, the lead terminals may be damaged.

- Discard the fuel pump gasket [A].



Fuel Pump

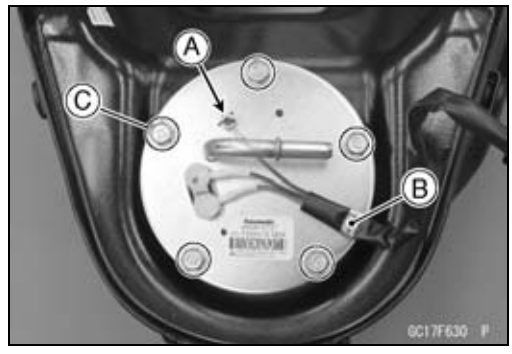
Fuel Pump Installation



- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.

NOTE

○*Be careful not to bend the fuel level sensor arm.*



- Check that the fuel pump terminal [A] and clamp [B] are in place.
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts [C] to a snug fit.
- Tighten the fuel pump bolts alternating diagonally.

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

- Tighten the pump bolts again to check the tightness.

Fuel Pump Operation Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the engine stop switch to run position.
- Turn the ignition switch on and make sure that the fuel pump operates (make light sounds) for 3 seconds, and then stops.
- Turn the ignition switch off.

★If the pump does not operate as described above, check the operating voltage (see Fuel Pump Operating Voltage Inspection).

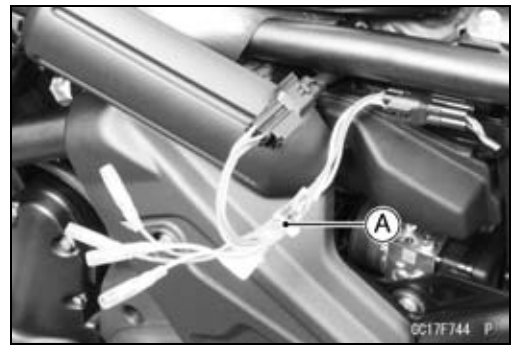
Fuel Pump Operating Voltage Inspection

NOTE

○*Be sure the battery is fully charged.*

- Turn the ignition switch off.

Fuel Pump



- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the measuring adapter [A] between these connectors as shown.

Special Tool - Oxygen Sensor Measuring Adapter: 57001 -1682

- Connect a digital meter to the measuring adapter leads.

Fuel Pump Operating Voltage
Connections to Adapter:
Digital Meter (+) → BR (pump BK/Y) lead
Digital Meter (–) → W (pump BK/W) lead

- Measure the operating voltage with engine stopped and with the connector joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch on.

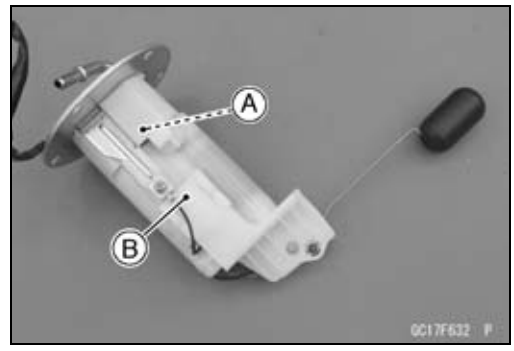
Operating Voltage
Standard: Battery Voltage for 3 seconds, and then 0 V

- Turn the ignition switch off.

★If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
★If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).
★If the fuel pump relay is normal, check the wiring for continuity (see wiring diagram in this section).
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If the reading is in specification, but the pump does not operate, replace the fuel pump (see Fuel Pump Removal/Installation).

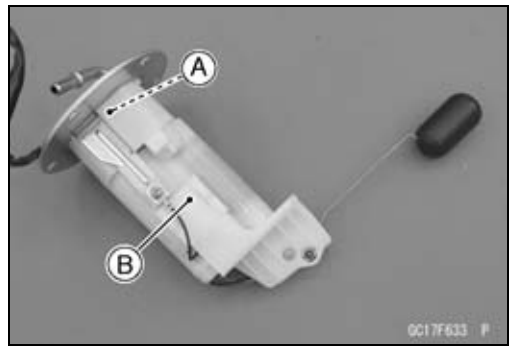
Pressure Regulator Removal

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



Fuel Pump

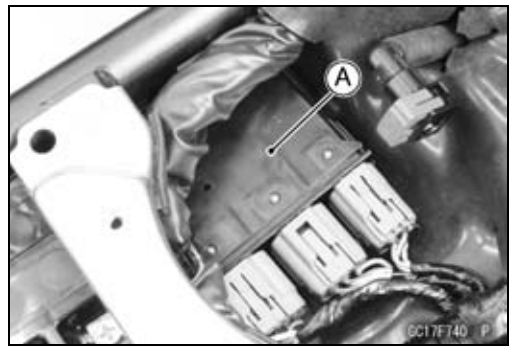
Fuel Filter Cleaning



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

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

Fuel Pump Relay Removal/Installation



○The fuel pump relay is built in the relay box [A].

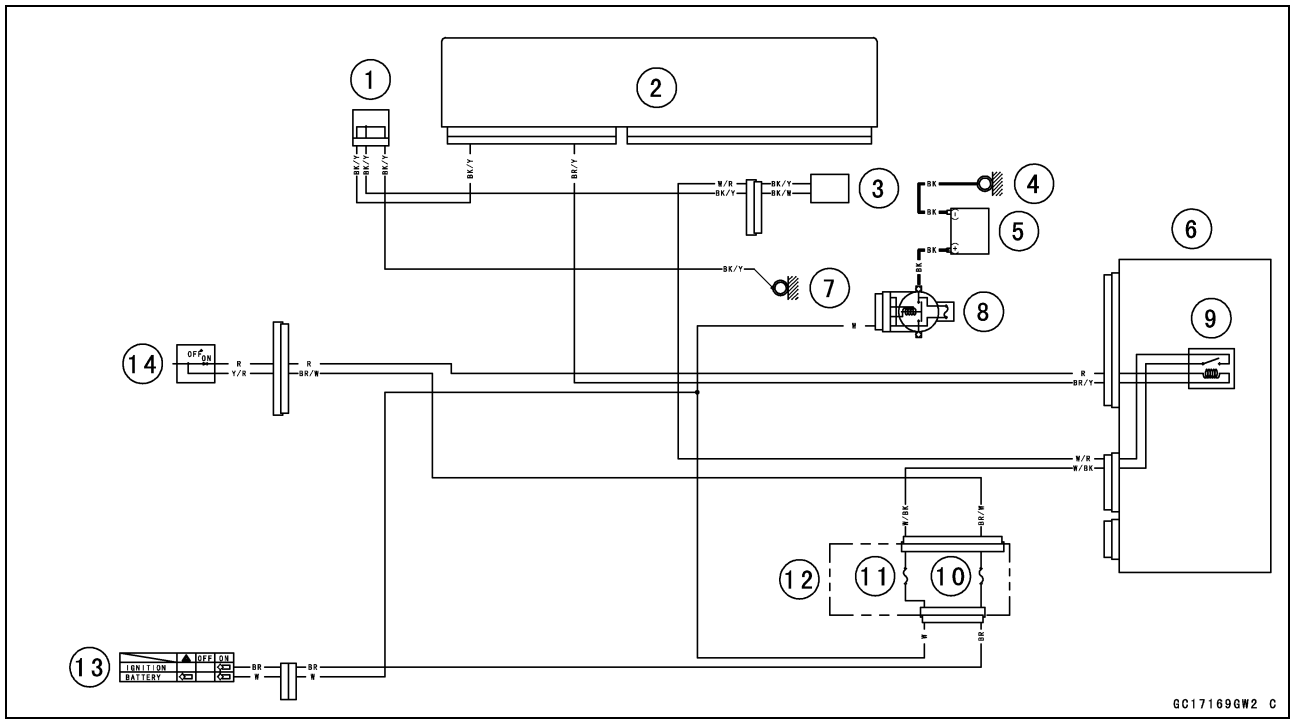
● Refer to the Relay Box Removal in the Electrical System chapter.

Fuel Pump Relay Inspection

● Refer to the Relay Circuit Inspection in the Electrical System chapter.

Fuel Pump

Fuel Pump Circuit



1. Joint Connector G
2. ECU
3. Fuel Pump
4. Engine Ground
5. Battery 12 V 10 Ah
6. Relay Box
7. Frame Ground 1
8. Main Fuse 30 A
9. Fuel Pump Relay
10. Ignition Fuse 10 A
11. ECU Fuse 15 A
12. Fuse Box 1
13. Ignition Switch
14. Engine Stop Switch

Throttle Grip and Cables

Throttle Grip Free Play Inspection

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

Throttle Grip Free Play Adjustment

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

Throttle Cable Installation

- Install the throttle cables in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the lower ends of the throttle cables in the throttle pulley on the throttle body assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly (see Throttle Control System Inspection in the Periodic Maintenance chapter).

⚠ WARNING

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

Throttle Cable Lubrication

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

Throttle Body Assy

Idle Speed Inspection/Adjustment

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

Synchronization Inspection/Adjustment

- Refer to the Engine Vacuum Synchronization Inspection in the Periodic Maintenance chapter.

Throttle Body Assy Removal

⚠ WARNING

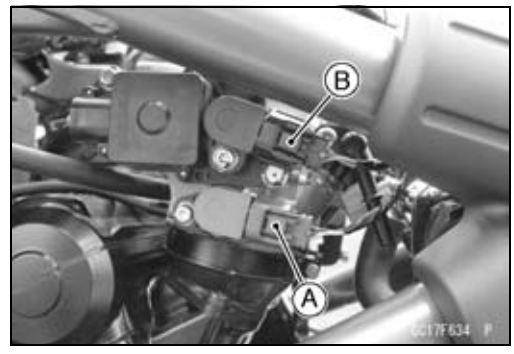
Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch off. Be prepared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

NOTICE

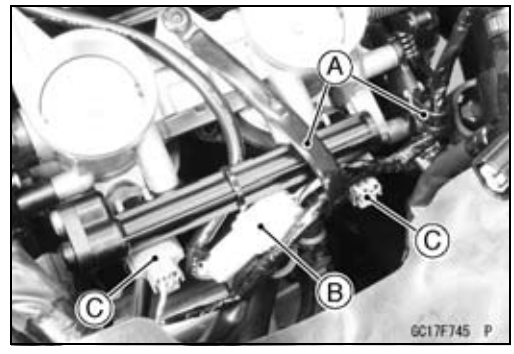
Never drop the throttle body assy especially on a hard surface. Such a shock to the body assy can damage it.

- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal)
  Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)

- Disconnect:
  Main Throttle Sensor Connector [A]
  Subthrottle Sensor Connector [B]

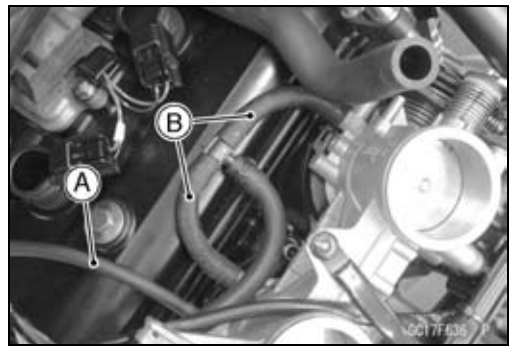


- Open the clamps [A].
- Disconnect:
  Subthrottle Valve Actuator Connector [B]
  Fuel Injector Connectors [C]

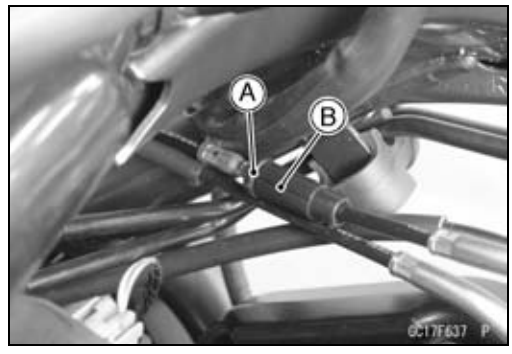


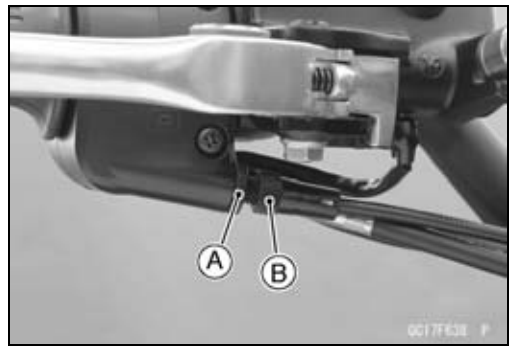
Throttle Body Assy

- Disconnect the vacuum hose [A].
- For CAL, SEA-B1, TH and CN Models, disconnect the vacuum hoses [B].

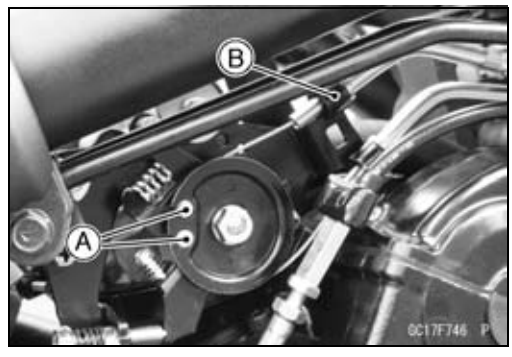


- Loosen the locknuts [A].
- Turn the adjusters [B] to give the more free play.





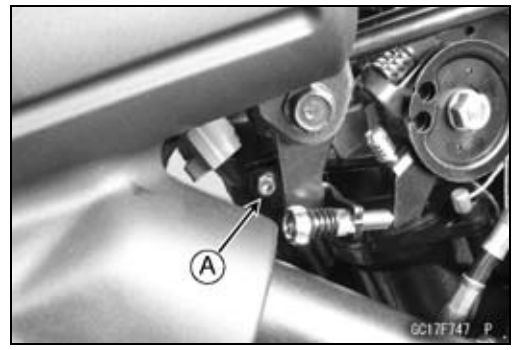
- Disconnect the throttle cable lower ends [A].
- Remove the throttle cables from the throttle cable holder [B].



Throttle Body Assy

- Loosen the throttle body assy holder clamp bolts [A].
- Remove the throttle body assy from the throttle body assy holders.
- After removing the throttle body assy, stuff pieces of lint -free, clean cloth into the throttle body assy holders.

NOTICE
If dirt gets into the engine, excessive engine wear and possible engine damage will occur.

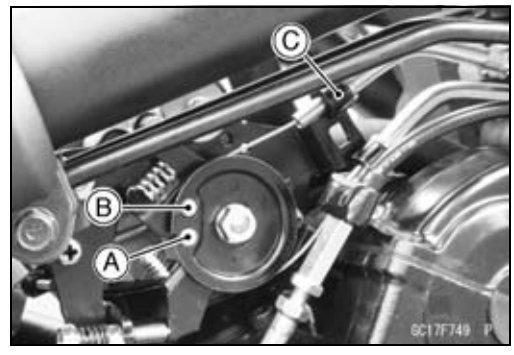


Throttle Body Assy Installation

- Be sure to position the throttle body assy holder clamp in original position (see Throttle Body Assy Holder Installation in the Engine Top End chapter).
- Install the throttle body assy to the throttle body assy holders.
- Tighten:

Torque - Throttle Body Assy Holder Clamp Bolts: 2.0 N·m (0.20 kgf·m, 18 in·lb)

- Apply a thin coat of grease to the throttle cable lower ends.
- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley.
- Install the throttle cables to the throttle cable holder [C].

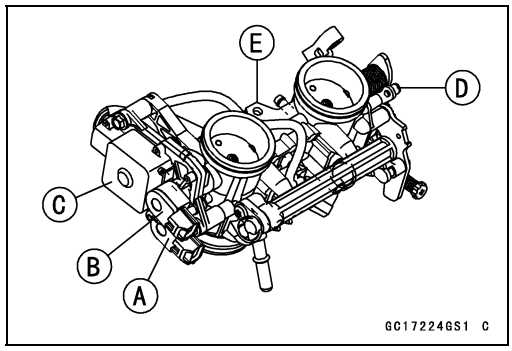


- Turn the throttle grip and make sure that the throttle pulley moves smoothly and return by spring force.
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).
- Adjust:

  Throttle Grip Free Play (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)

Throttle Body Assy

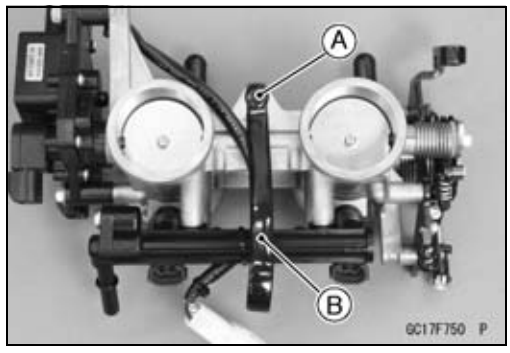
Throttle Body Assy Disassembly



NOTICE
Do not remove, disassemble or adjust the main throttle sensor [A], subthrottle sensor [B], subthrottle valve actuator [C], throttle link mechanism [D] and throttle body assy [E], because they are adjusted or set at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.

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

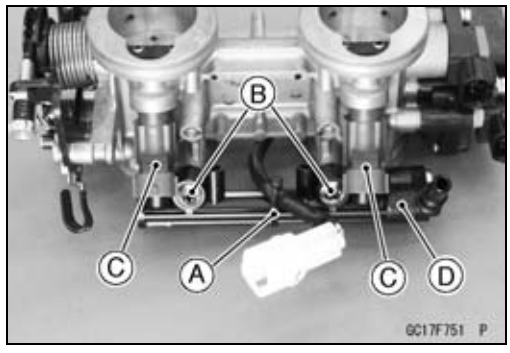
- Remove:
  Throttle Body Assy (see Throttle Body Assy Removal)
  Quick Rivet [A]
  Clamp [B]



- Cut the band [A].
- Remove the delivery pipe assy mounting screws [B] to pull out the fuel injectors [C] from the throttle body assy together with the delivery pipe [D].

NOTE

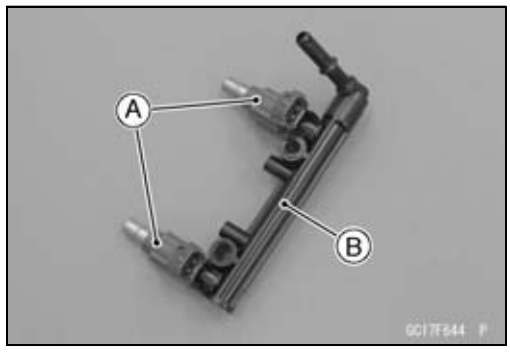
○*Do not damage the insertion portions of the injectors when they are pulled out from the throttle body.*



- Remove the fuel injectors [A] from the delivery pipe [B].

NOTE

○*Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.*



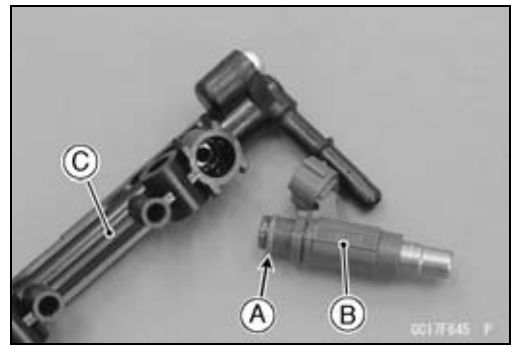
NOTICE
Never drop the fuel injector especially on a hard surface. Such a shock to the injector can damage it.

Throttle Body Assy Assembly

- Before assembling, blow away dirt or dust from the throttle body and delivery pipe by applying compressed air.

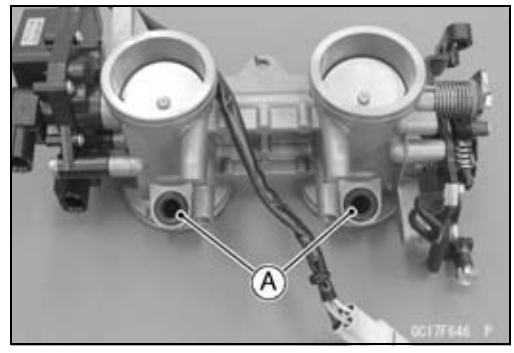
Throttle Body Assy

- Replace the O-rings [A] of each fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, insert them to the delivery pipe [C] and confirm whether the injectors turn smoothly or not.

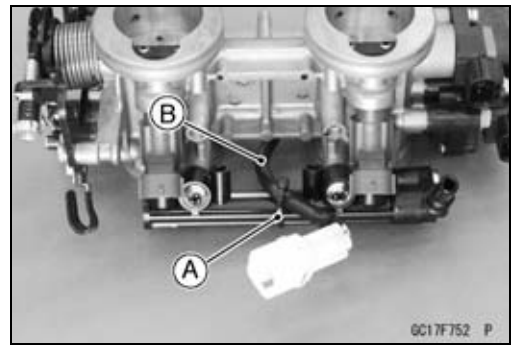


- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the fuel injectors along with the delivery pipe assy to the throttle body.
- Tighten:

Torque - Delivery Pipe Assy Mounting Screws: 3.4 N·m (0.35 kgf·m, 30 in·lb)



- Replace the band [A] with a new one.
- Hold the lead [B] with the band.
- Install the throttle body assy (see Throttle Body Assy Installation).



Air Cleaner

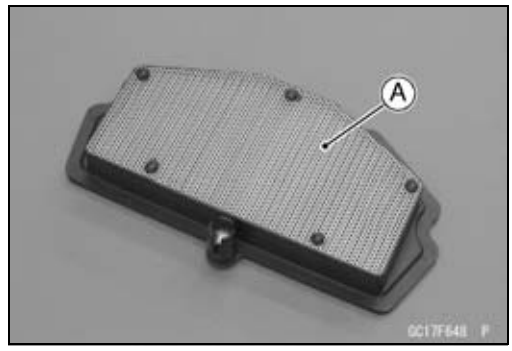
Air Cleaner Element Removal/Installation

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

Air Cleaner Element Inspection

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

★If the element has any tears or breaks, replace the element.

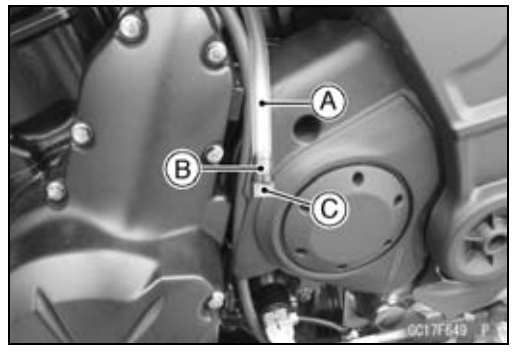


Air Cleaner Oil Draining

A drain hose is connected to the bottom of the air cleaner to drain water or oil accumulated in the cleaner part.

- Visually check the drain hose [A] , if the water or oil accumulates in the hose.

★If any water or oil accumulates in the drain hose, slide the clamp [B] and remove the plug [C] from the drain hose and drain it.



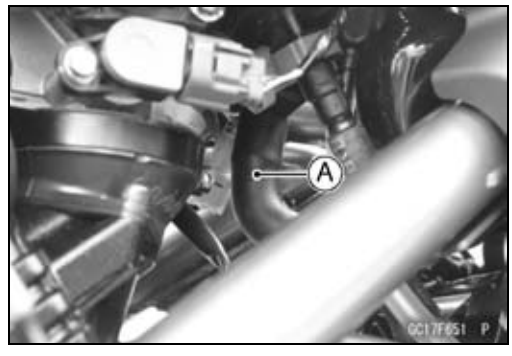
⚠ WARNING

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

Air Cleaner Housing Removal

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the intake air temperature sensor connector [A].

- Disconnect the breather hose [A].



Air Cleaner

● Loosen the air cleaner housing clamp bolt [A].

● Lift up the air cleaner housing, and disconnect the air switching valve hose [A].
● After removing the air cleaner housing, cover the clean cloth on the throttle body assy.

Air Cleaner Housing Installation

● Installation is the reverse of removal.
● Install the air cleaner housing on the throttle body assy.
○Push in the ducts touch the stopper of the throttle body assy.
● Tighten:

Torque - Air Cleaner Housing Clamp Bolt: 2.0 N·m (0.20 kgf·m, 18 in·lb)

● Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
● Install the removed parts (see appropriate chapters).

Fuel Tank

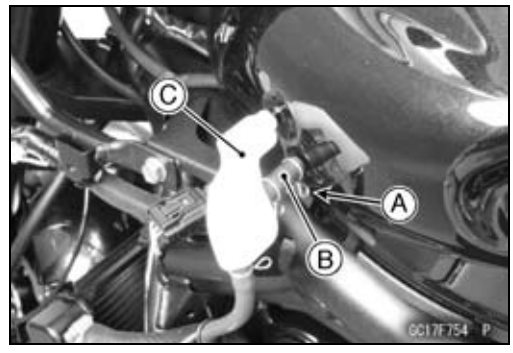
Fuel Tank Removal

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. 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 fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

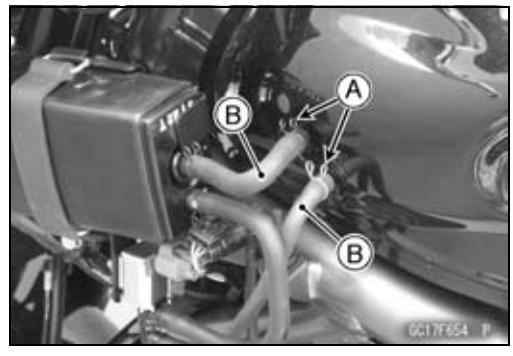
- Turn the ignition switch off.
- Wait until the engine cools down.
- Disconnect the battery (–) terminal (see Battery Removal in the Electrical System chapter).
- Remove:
  Middle Fairings (see Middle Fairing Removal in the Frame chapter)
  Side Covers (see Side Cover Removal in the Frame chapter)

- Slide the clamp [A].
- Disconnect the hose [B] and tank [C].



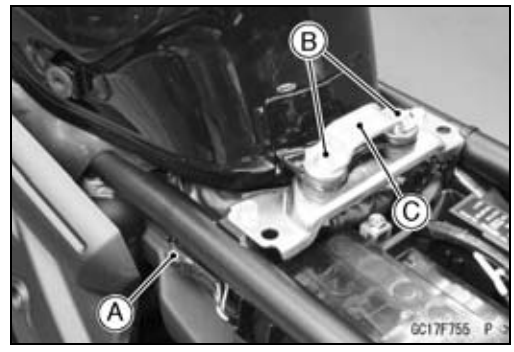
For CAL, SEA-B1, TH and CN Models

- Slide the clamps [A].
- Disconnect the hoses [B].



Fuel Tank

- Disconnect the fuel pump lead connector [A].
- Remove:
  Fuel Tank Bolts [B]
  Bracket [C]



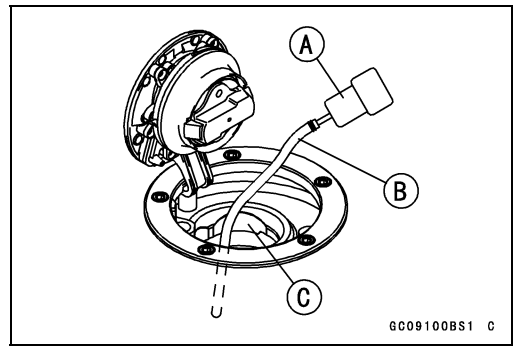
- Open the fuel tank cap [A] to lower the pressure in the tank.

○During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.

- Draw the fuel out from the fuel tank with a commercially available pump [A].

○Use a soft plastic hose [B] as a pump intake hose in order to insert the hose smoothly.

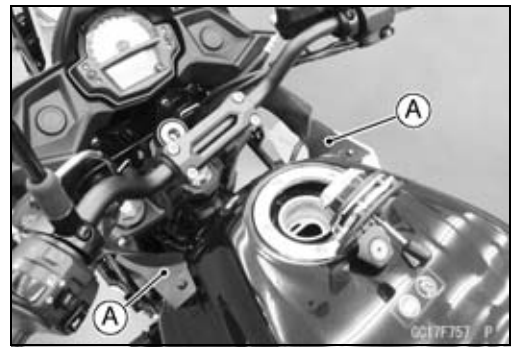
○Put the hose through the fill opening [C] into the tank and draw the fuel out.



⚠ WARNING

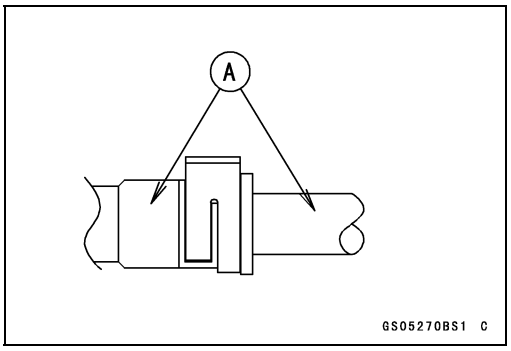
Spilled fuel is flammable and can be explosive under certain conditions. The fuel can not be removed completely from the fuel tank. Be careful for remained fuel spillage.

- Clear the inner covers [A] from the fuel tank.



Fuel Tank

- Pull up the rear of the fuel tank.
- Be sure to place a piece of cloth around the fuel hose joint.
- Wipe off the dirt of the surface [A] around the connection using a cloth or a soft brush.

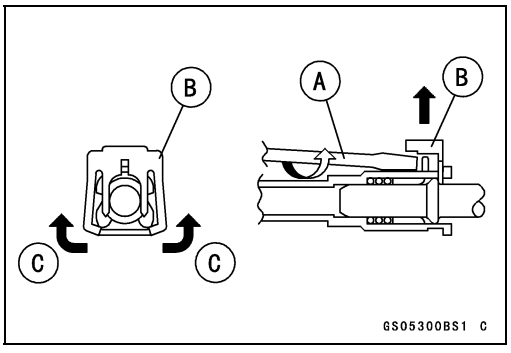


When removing with flat tip screwdriver

- Insert the flat tip screwdriver [A] into slit on the joint lock [B].
- Turn the driver to disconnect the joint lock.

When removing with fingers

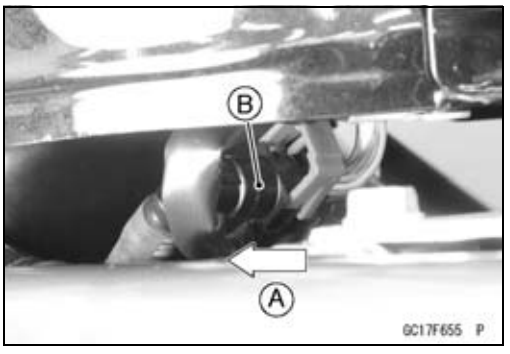
- Open and push up [C] the joint lock with your fingers.



NOTICE

Prying or excessively widening the joint lock ends for fuel hose removal will permanently deform the joint lock, resulting in a loose or incomplete lock that may allow fuel to leak and create the potential for a fire explosion. To prevent fire or explosion from a damaged joint lock, do not pry or excessively widen the joint lock ends when removing the fuel hose. The joint lock has a retaining edge that locks around the housing.

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



⚠ WARNING

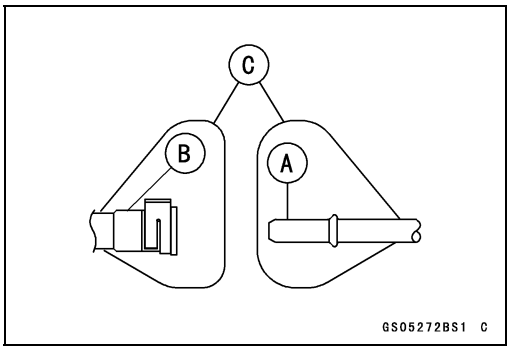
Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.

- Remove the fuel tank, and place it on a flat surface.

- Close the fuel tank cap.

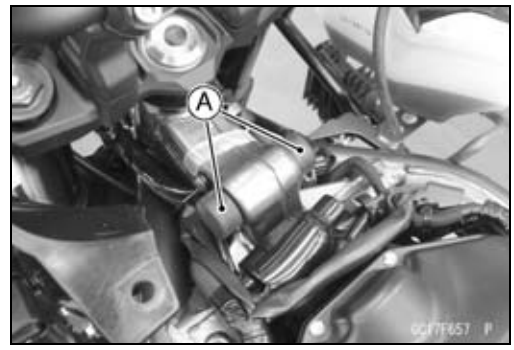
○Do not apply the load to the fuel pipe of the fuel pump.

- Clean the pipe [A].
- Cover the pipe and the hose joint [B] with the vinyl bags [C] to keep it clean.



Fuel Tank

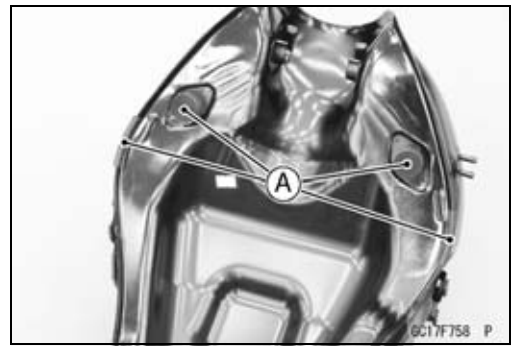
Fuel Tank Installation

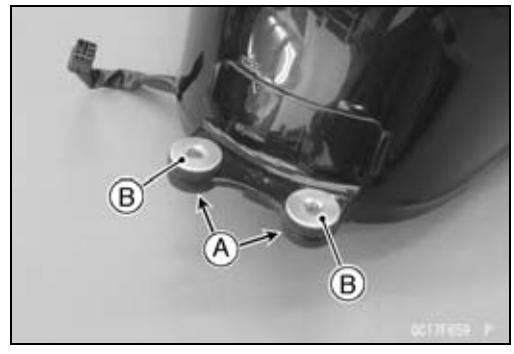


- Note the above WARNING (see Fuel Tank Removal).
- Check that the dampers [A] and collars [B] are in place on the frame and the fuel tank.

★If the dampers are damaged or deteriorated, replace them.

- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

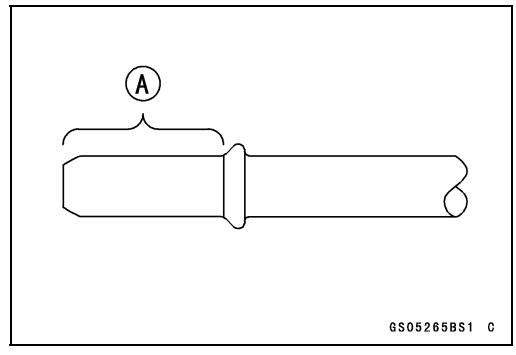




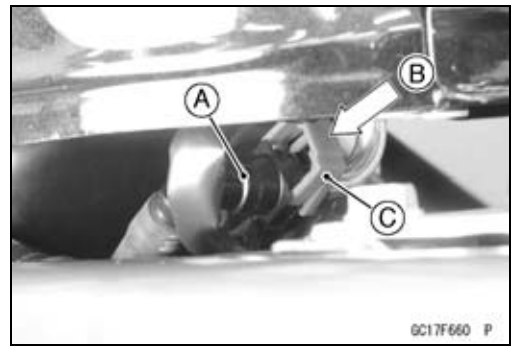
- Remove the vinyl bag on the pipe and fuel hose joint.
- Check the joint lock for deformation and wear.

★If the joint lock is deformed, replace the fuel hose with a new one.

- Check that there are no flaws, burrs, and adhesion of foreign materials on the pipe [A].
- Apply engine oil to the pipe.

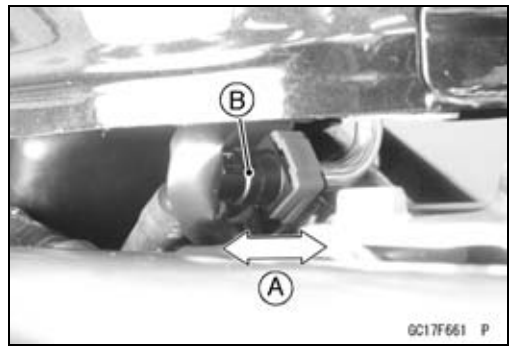


- Insert the fuel hose joint [A] straight onto the fuel outlet pipe until the hose joint clicks.
- Push [B] the joint lock [C] until the hose joint clicks.



Fuel Tank

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

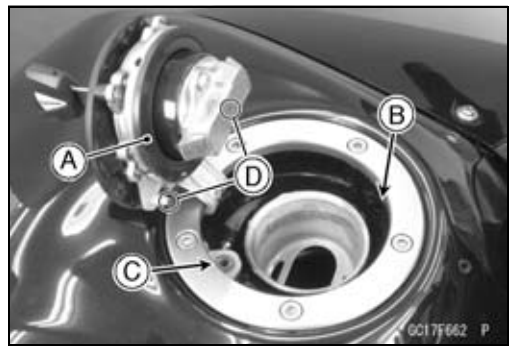


⚠ WARNING

Leaking fuel can cause a fire or explosion resulting in serious burns. Make sure the hose joint is installed correctly on the delivery pipe.

★If it comes off, reinstall the hose joint.
- Connect the fuel pump lead connector and the battery (–) terminal (see Battery Installation in the Electrical System chapter).
- Install the removed parts (see appropriate chapters).

Fuel Tank and Cap Inspection



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

★Replace the tank cap if gasket is damaged.
- Check to see if the water drain pipe [B] and fuel breather pipe [C] in the tank are not clogged. Check the tank cap breather also.

★If they are clogged, remove the tank and drain it, and then blow the breather free with compressed air.

NOTICE

Do not apply compressed air to the air vent holes [D] in the tank cap. This could cause damage and clogging of the labyrinth in the cap.

Fuel Tank Cleaning

⚠ WARNING

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

- Remove:
  Fuel Tank (see Fuel Tank Removal)
  Fuel Pump (see Fuel Pump Removal)
- Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Draw the solvent out of the fuel tank.
- Dry the tank with compressed air.
- Install:
  Fuel Pump (see Fuel Pump Installation)
  Fuel Tank (see Fuel Tank Installation)

Evaporative Emission Control System (CAL, SEA-B1, TH and CN Models)

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

Parts Removal/Installation

⚠ WARNING

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

NOTICE

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.

- Connect the hoses according to the diagram of the system (see Cable, Wire, and Hose Routing section in the Appendix chapter). Make sure they do not get pinched or kinked.

Hose Inspection

- Refer to the Evaporative Emission Control System Inspection (CAL, SEA-B1, TH and CN Models) in the Periodic Maintenance chapter.

Purge Valve Inspection

- Refer to the Purge Valve Inspection.

Canister Inspection

- Refer to the Evaporative Emission Control System Inspection (CAL, SEA-B1, TH and CN Models) in the Periodic Maintenance chapter.

Cooling System

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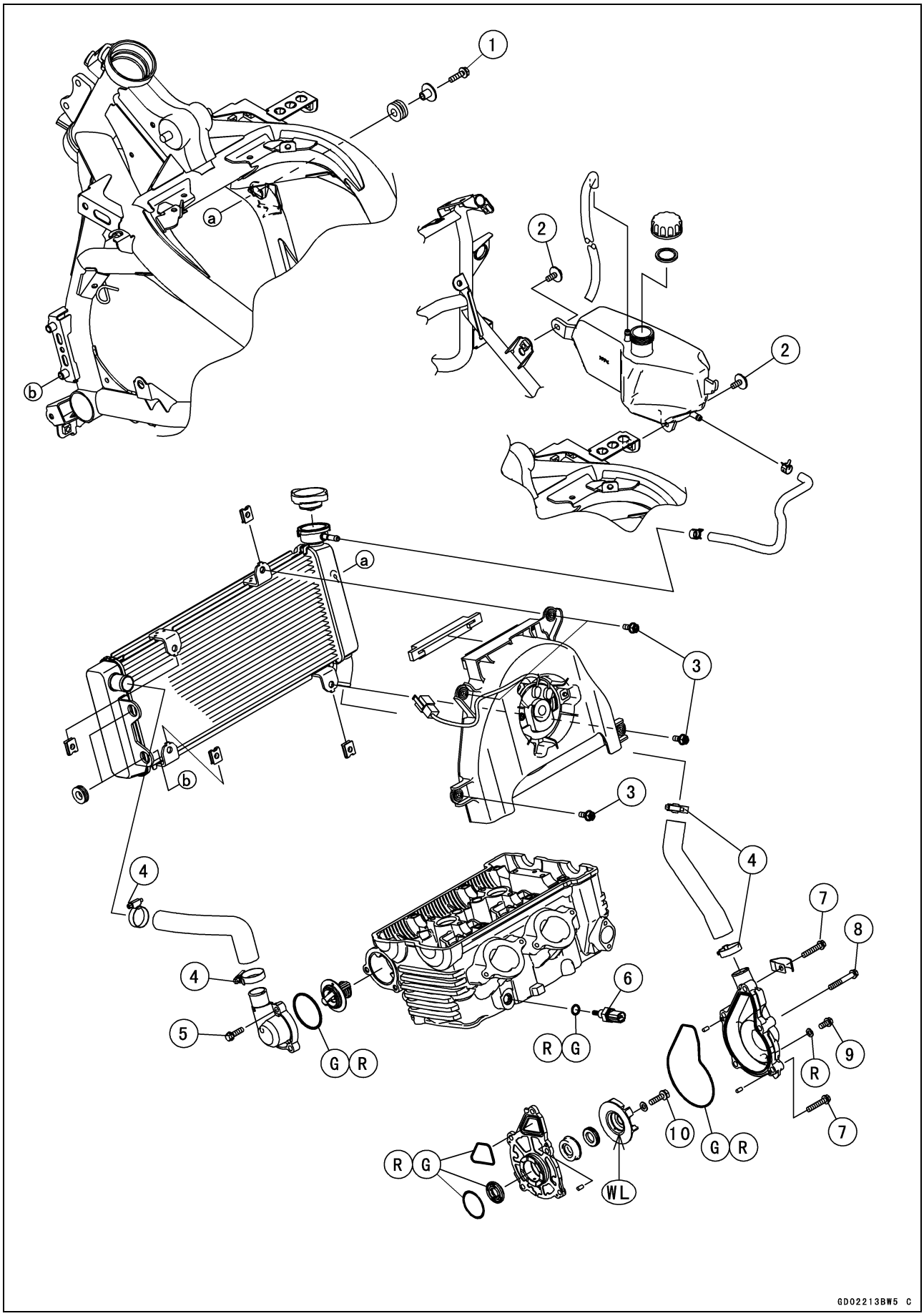
Exploded View

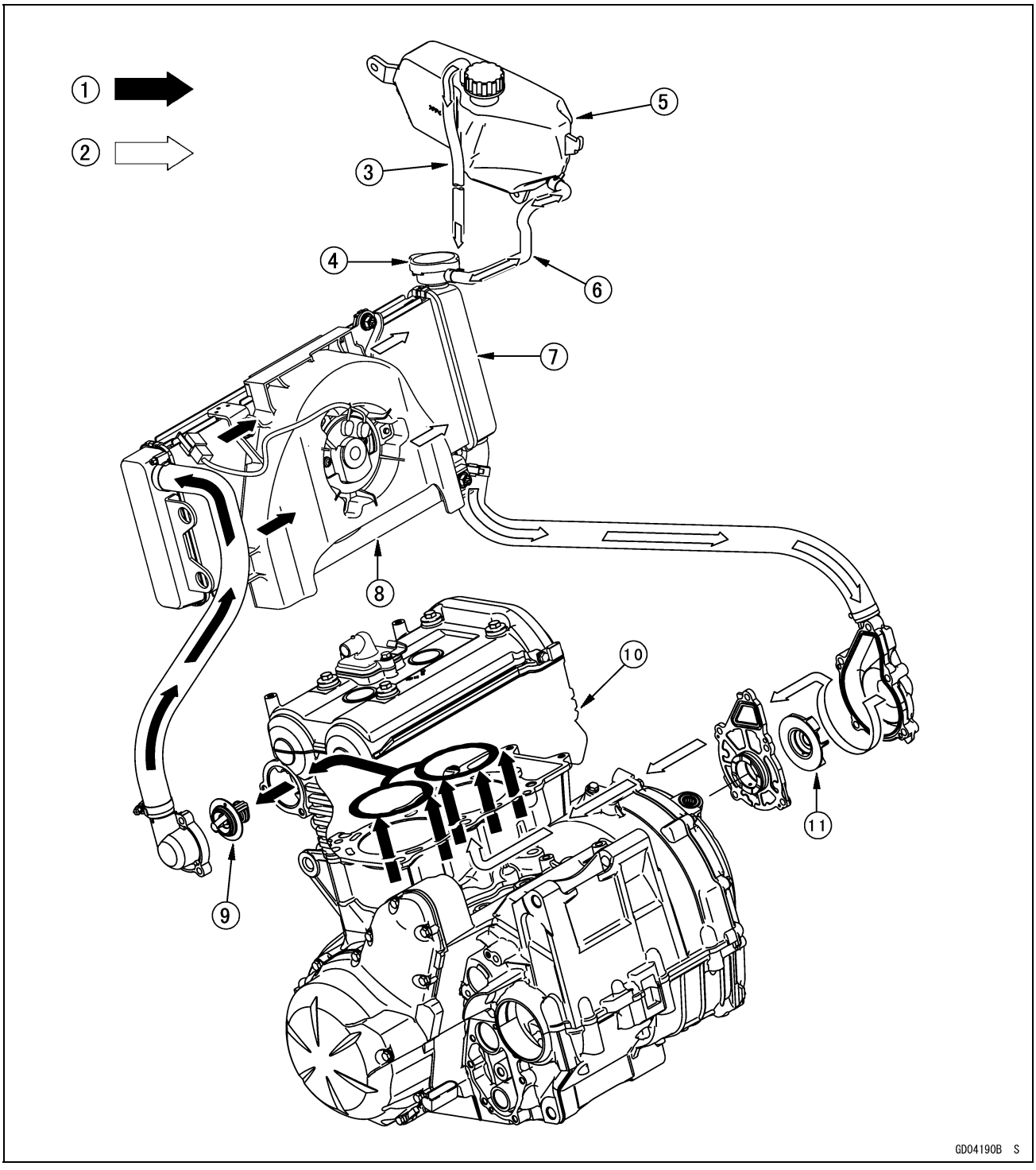


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Radiator Mounting Bolt	7.9	0.81	70 in·lb	
2	Coolant Reserve Tank Bolts	7.9	0.81	70 in·lb	
3	Radiator Fan Assembly Mounting Bolts	8.4	0.86	74 in·lb	
4	Water Hose Clamp Screws	3.0	0.31	27 in·lb	
5	Thermostat Housing Bolts	12	1.2	106 in·lb	
6	Water Temperature Sensor	12	1.2	106 in·lb	
7	Water Pump Cover Bolts, L = 30 mm (1.2 in.)	12	1.2	106 in·lb	
8	Water Pump Cover Bolts, L = 40 mm (1.6 in.)	12	1.2	106 in·lb	
9	Coolant Drain Bolt	12	1.2	106 in·lb	
10	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	

G: Apply grease.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

Coolant Flow Chart



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

Coolant Flow Chart

Permanent type antifreeze is used as a coolant to protect the cooling system from rust and corrosion. When the engine starts, the water pump turns and the coolant circulates.

The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is below 80.5 ~ 83.5°C (177 ~ 182°F), the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 80.5 ~ 83.5°C (177 ~ 182°F), the thermostat opens and the coolant flows.

When the coolant temperature goes up beyond 104°C (219°F), the radiator fan relay conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is below 99°C (210°F) ~ temperature less than ON temperature, 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 107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm², 15.6 ~ 19.9 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 107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm², 15.6 ~ 19.9 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

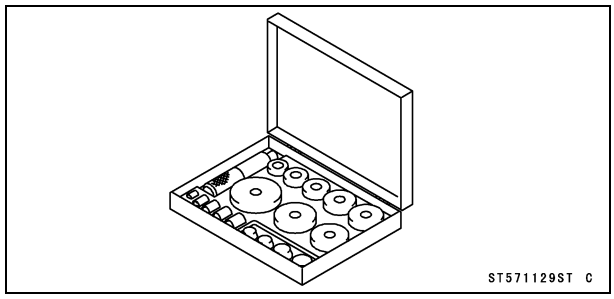
4-6 COOLING SYSTEM

Specifications

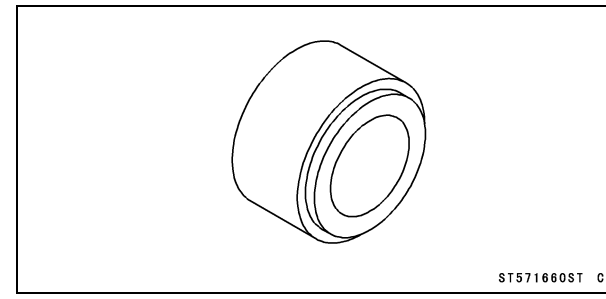
Item	Standard
Coolant Provided when Shipping	
Type (Recommended)	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Color	Green
Mixed Ratio	Soft water 50%, coolant 50%
Freezing Point	−35°C (−31°F)
Total Amount	1.2 L (1.3 US qt) (reserve tank full level, including radiator and engine)
Radiator Cap	
Relief Pressure	107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm², 15.6 ~ 19.9 psi)
Thermostat	
Valve Opening Temperature	80.5 ~ 83.5°C (177 ~ 182°F)
Valve Full Opening Lift	8 mm (0.31 in.) or more at 95°C (203°F)

Special Tools

Bearing Driver Set:
57001-1129



Oil Seal Driver ϕ37.5:
57001-1660



Coolant

Coolant Deterioration Inspection

- Remove the right middle fairing (see Middle Fairing Removal in the Frame chapter).
- Visually inspect the coolant [A] in the reserve tank.

★If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.

★If the coolant gives off an abnormal smell, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.

Coolant Level Inspection

- Refer to the Coolant Level Inspection in the Periodic Maintenance chapter.

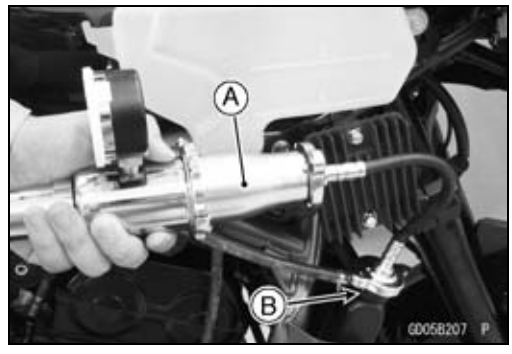
Coolant Draining

- Refer to the Coolant Change in the Periodic Maintenance chapter.

Coolant Filling

- Refer to the Coolant Change in the Periodic Maintenance chapter.

Pressure Testing



- Drain the coolant from the reserve tank.
- Remove the radiator cap (see Coolant Change in the Periodic Maintenance chapter), and install a cooling system pressure tester [A] on the filler neck [B].

NOTE

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

- Build up pressure in the system carefully until the pressure reaches 137.3 kPa (1.40 kgf/cm², 19.9 psi).

NOTICE

During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 137.3 kPa (1.40 kgf/cm², 19.9 psi).

- Watch the gauge for at least 6 seconds.

★If the pressure holds steady, the system is all right.

★If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the water pump.

- Remove the pressure tester, replenish the coolant, and install the radiator cap.

Coolant

Cooling System Flushing

Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passage and considerable reduce the efficiency of the cooling system.

- Drain the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Fill the cooling system with fresh water mixed with a flushing compound.

NOTICE
Do not use a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning product.

- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant and bleed the air from the system (see Coolant Change in the Periodic Maintenance chapter).

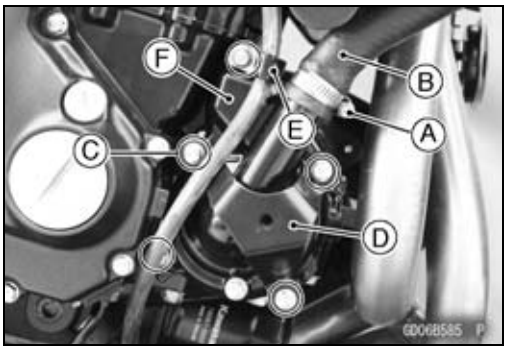
Coolant Reserve Tank Removal/Installation

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

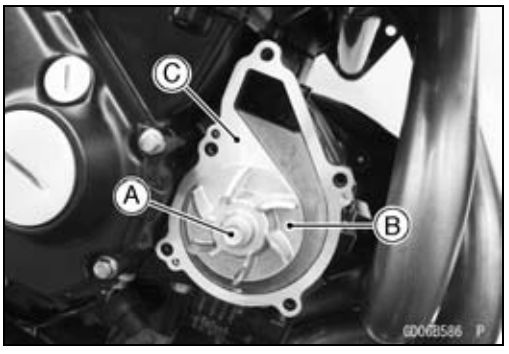
Water Pump

Water Pump Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Loosen the water hose clamp screw [A].
- Disconnect the water hose [B].
- Remove:
  Water Pump Cover Bolts [C]
  Right Lower Fairing Bracket [D]
  Clamp [E]
  Water Pump Cover [F]

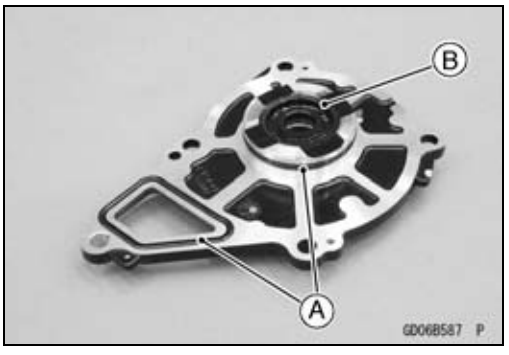


- Shift the transmission into 1st gear.
- While applying the rear brake, remove the water pump impeller bolt [A].
- Remove:
  Impeller [B]
  Water Pump Housing [C]



Water Pump Installation

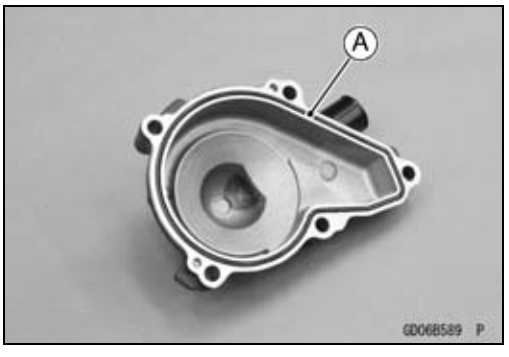
- Replace the O-rings [A] on the water pump housing with new ones and apply grease to them.
- Replace the water pump housing oil seal [B] with a new one and apply grease to the lips of the oil seal.



- Be sure that the dowel pin [A] is in position.
- Install the water pump housing.
- Apply water to the mechanical seal, and install the impeller.
- When installing the water pump impeller bolt, shift the transmission into 1st gear and apply the rear brake.
- Tighten:

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

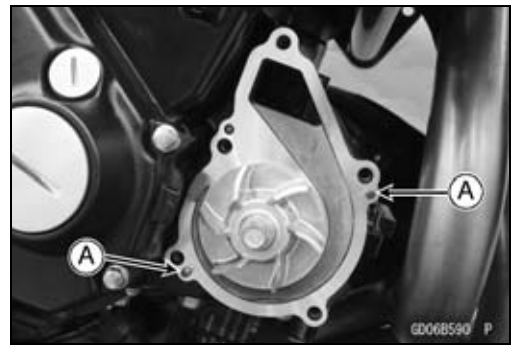
- Replace the O-ring [A] on the water pump cover with a new one and apply grease to it.



Water Pump

- Install the water pump cover, being careful of the two dowel pins [A].
- Install the right lower fairing bracket and tighten the water pump cover bolts.

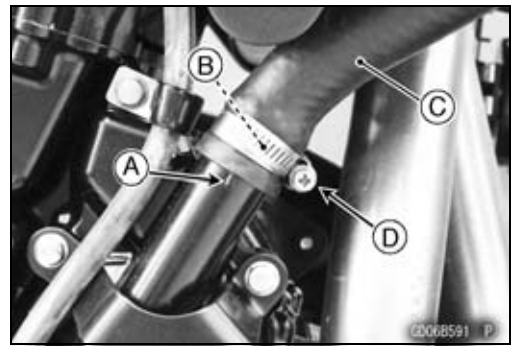
Torque - Water Pump Cover Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)



- Align the line [A] of the water pump cover with the white mark [B] of the radiator hose [C].
- Install the water hose clamp [D] as shown.
- Tighten:

Torque - Water Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)

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



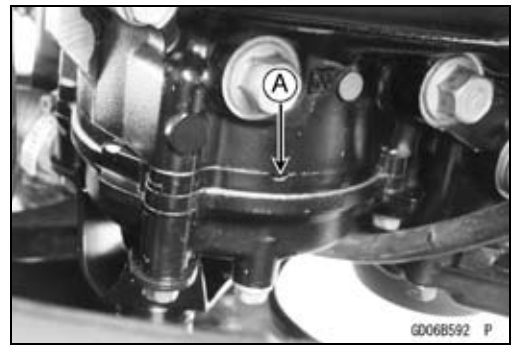
Water Pump Inspection

- Remove the lower fairing (see Lower Fairing Removal in the Frame chapter).
- Check the drainage outlet passage [A] at the bottom of the water pump housing for coolant leaks.
- If a coolant leak or ooze is found, start the engine and check if the coolant leaks continuously.

○When coolant does not continuously leak, it is normal.

★If the mechanical seal is damaged, the coolant continuously leaks through the drainage outlet passage. Replace the mechanical seal unit.

★If the oil seal is damaged, engine oil leaks through the drainage outlet passage. Replace the oil seal.



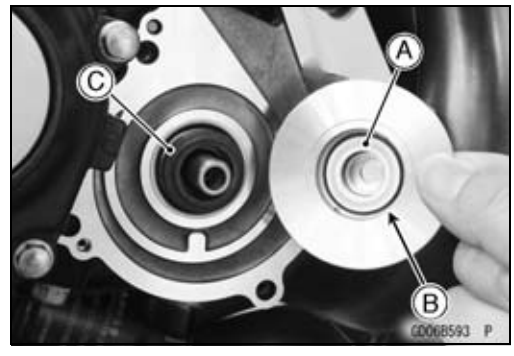
Mechanical Seal Inspection

- Remove the impeller (see Water Pump Removal).
- Visually inspect the mechanical seal.

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

○The sealing seat and rubber seal may be removed easily by hand.

Impeller Sealing Seat Surface [A]
Rubber Seal [B]
Mechanical Seal Diaphragm [C]

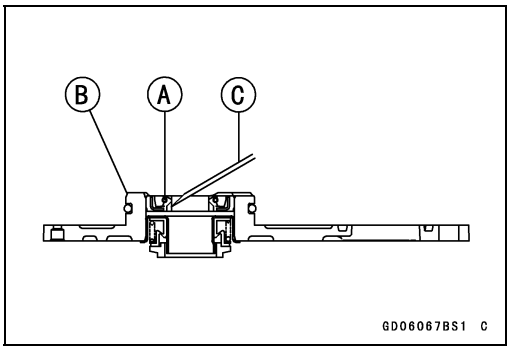


Water Pump

Water Pump Housing Disassembly

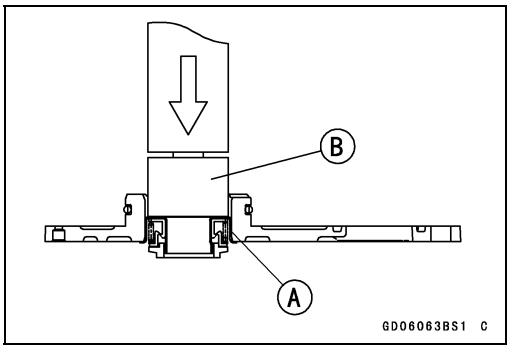
NOTICE
Be careful not to damage the sealing surface of the mechanical seal.

- Remove the water pump housing (see Water Pump Removal).
- Take the oil seal [A] out of the housing [B] with a hook [C].



- Press the mechanical seal [A] out of the housing with a bearing driver [B].

Special Tool - Bearing Driver Set: 57001-1129



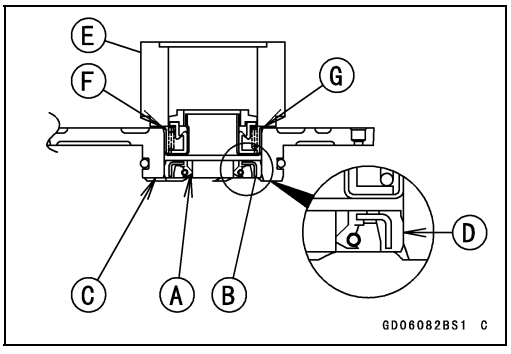
Water Pump Housing Assembly

- Apply high-temperature grease [A] to the new oil seal [B].
- Press the oil seal into the housing with a bearing driver so that the seal surface is flush [C] with the end of the hole.

○Apply a soap and water solution or rubber lubricant to the outer circumference [D] of the oil seal so that it will go into place smoothly.

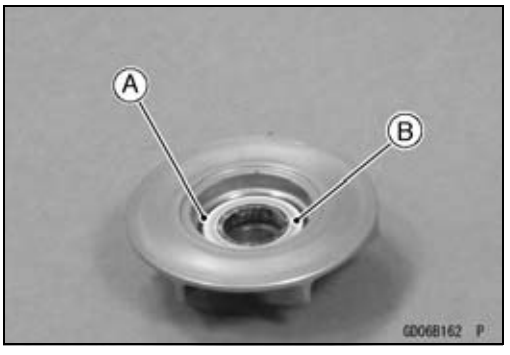
- Press the new mechanical seal into the housing with the oil seal driver [E] until its flange [F] touches the surface [G] of the housing.

Special Tool - Oil Seal Driver ϕ37.5: 57001-1660



Impeller Assembly

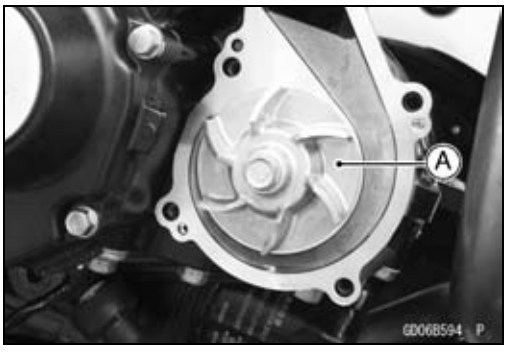
- Clean the sliding surface of the mechanical seal with a high flash-point solvent, and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.
- Apply coolant to the surfaces of the rubber seal [A] and sealing seat [B], and install the rubber seal and sealing seat into the impeller by pressing them by hand until the seat stops at the bottom of the hole.



Pump Impeller Inspection

- Remove the water pump cover (see Water Pump Removal).
- Visually check the impeller [A].

★If the surface is corroded, or if the blades are damaged, replace the impeller (see Water Pump Removal).

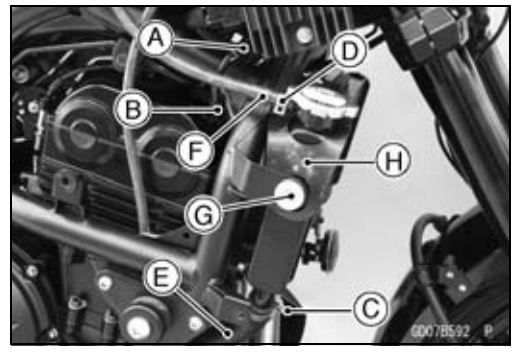


Radiator

Radiator and Radiator Fan Removal

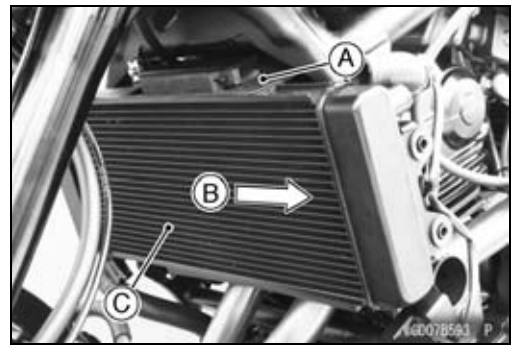
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the middle fairing (see Middle Fairing Removal in the Frame chapter).
- Loosen the water hose clamp screw [A].
- Disconnect the water hose [B].

- Disconnect the radiator fan lead connector [A] and free the radiator fan lead from the clamp [B].
- Loosen the water hose clamp screw [C].
- Slide the clamp [D].
- Disconnect:
  Water Hose [E]
  Radiator Overflow Hose [F]
- Remove the radiator mounting bolt [G].
- Turn up the heat insulation rubber plate [H].

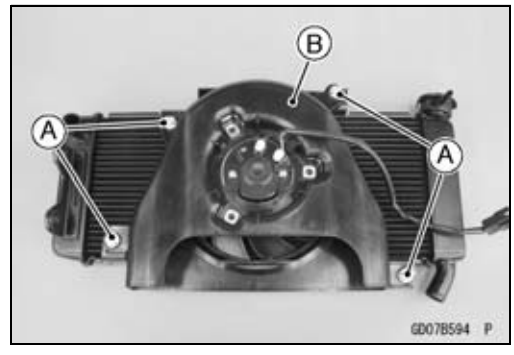


- Turn up the heat insulation rubber plate [A].
- Pull [B] the radiator [C] toward the left.

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



- Remove:
  Radiator Fan Assembly Mounting Bolts [A]
  Radiator Fan Assembly [B]



Radiator

Radiator and Radiator Fan Installation

- Install:
  Clip Nuts [A]
  Seal [B]
  Radiator Fan Assembly [C]
- Tighten:

Torque - Radiator Fan Assembly Mounting Bolts [D]: 8.4 N·m (0.86 kgf·m, 74 in·lb)

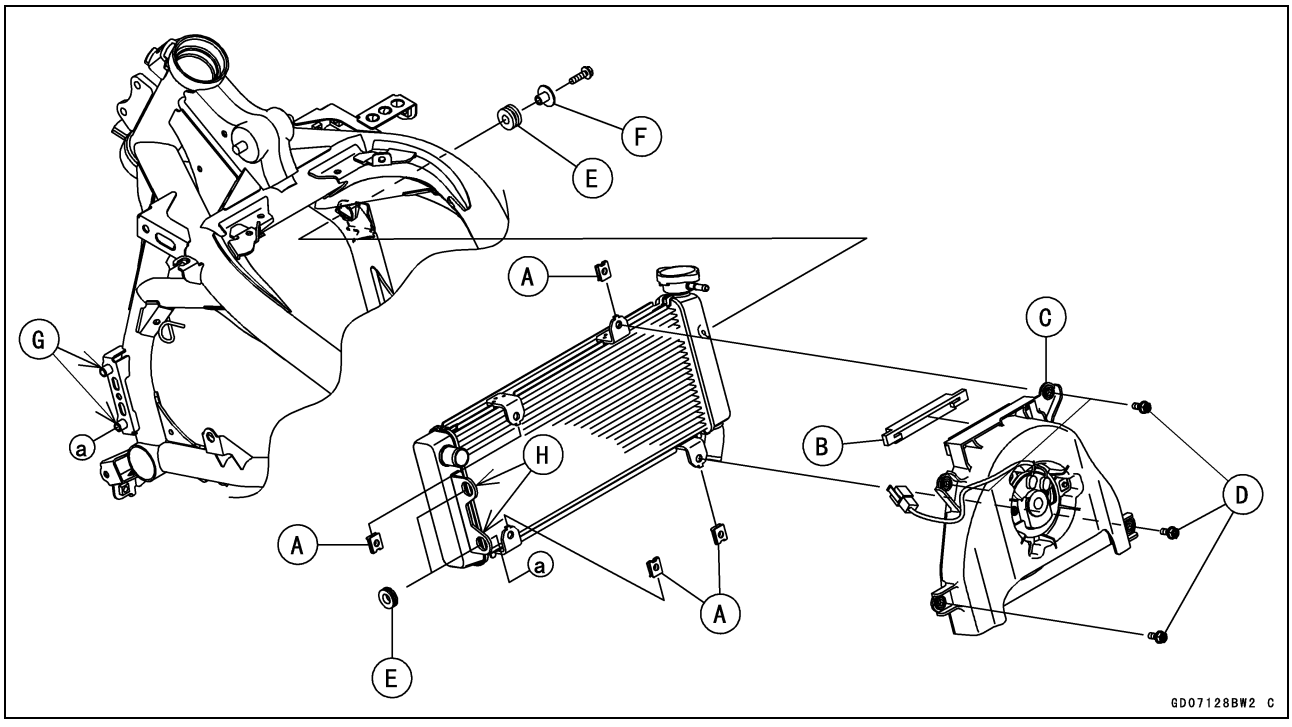
- Install the rubber dampers [E] and collar [F] to the radiator and frame.
- Align the projections [G] on the frame with the holes [H] on the dampers.
- Install the heat insulation rubber plate.
- Run the radiator fan lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

Torque - Radiator Mounting Bolt: 7.9 N·m (0.81 kgf·m, 70 in·lb)

- Install the hoses and clamps.

Torque - Water Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)

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



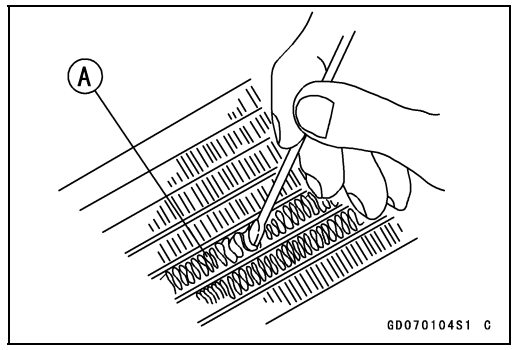
Radiator Inspection

- Remove the radiator (see Radiator and Radiator Fan Removal).
- Check the radiator core.

★If there are obstructions to air flow, remove them.

★If the corrugated fins [A] are deformed, carefully straighten them.

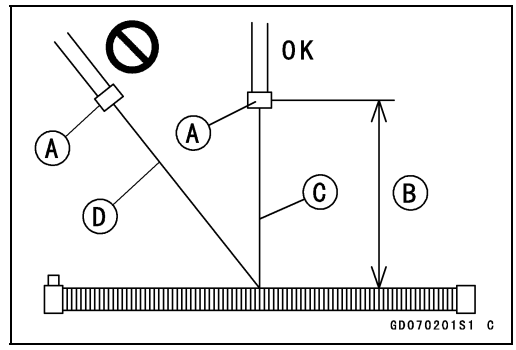
★If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.



Radiator

NOTICE

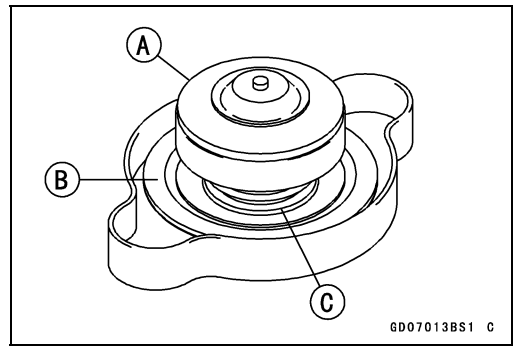
When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage:
Keep the steam gun [A] away more than 0.5 m (1.6 ft) [B] from the radiator core.
Hold the steam gun perpendicular [C] (not oblique [D]) to the core surface.
Run the steam gun, following the core fin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



Radiator Cap Inspection

- Remove the radiator cap (see Coolant Change in the Periodic Maintenance chapter).
- Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].

★If any one of them shows visible damage, replace the cap with a new one.



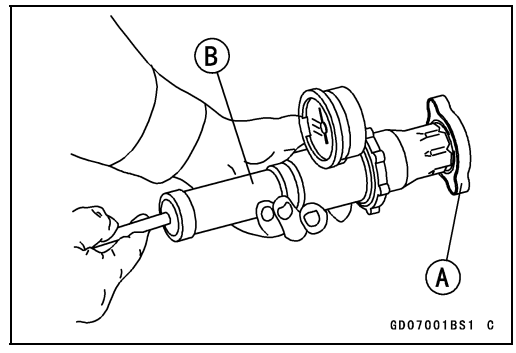
- Install the cap [A] on a cooling system pressure tester [B].

NOTE

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

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

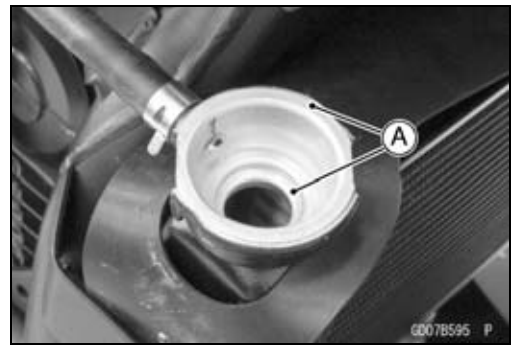
Radiator Cap Relief Pressure
Standard: 107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm², 15.6 ~ 19.9 psi)



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

Radiator Filler Neck Inspection

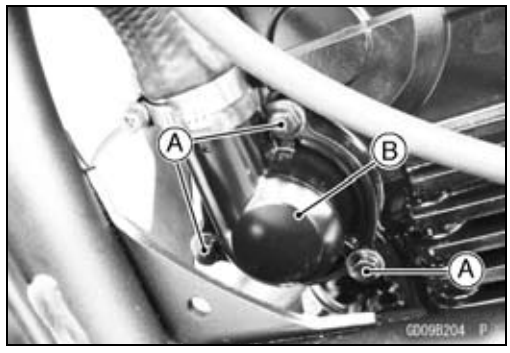
- Remove the radiator cap (see Coolant Change in the Periodic Maintenance chapter).
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



Thermostat

Thermostat Removal

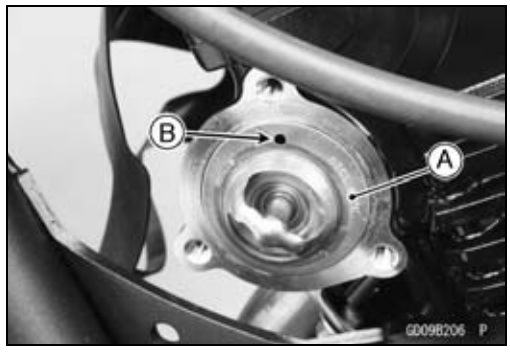
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Radiator (see Radiator and Radiator Fan Removal)
  Thermostat Housing Bolts [A]
  Thermostat Housing [B]



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

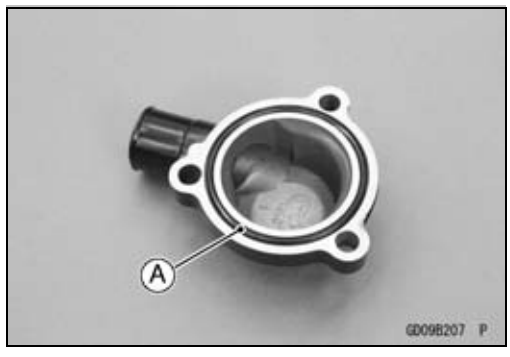
Thermostat Installation

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



- Replace the O-ring [A] with a new one.
- Install the O-ring and apply grease to it.
- Tighten:

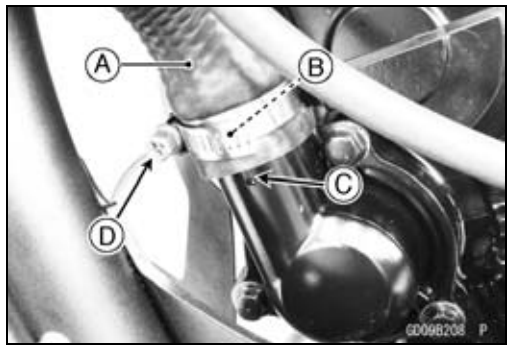
Torque - Thermostat Housing Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)



- When installing the water hose [A], align the white mark [B] of the water hose with the line [C] of thermostat housing.
- Install the water hose clamp [D] as shown.
- Tighten:

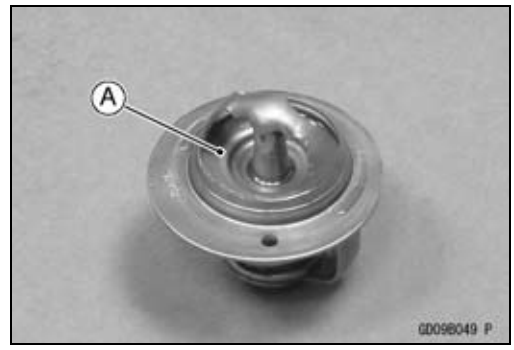
Torque - Water Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)

- Install the removed parts (see appropriate chapters).
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).



Thermostat

Thermostat Inspection



- Remove the thermostat (see Thermostat Removal), and inspect the thermostat valve [A] at room temperature.

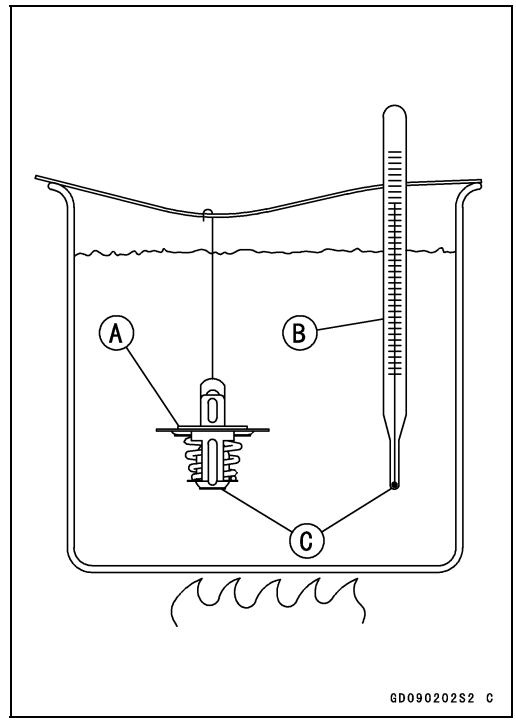
★If the valve is open, replace the thermostat with a new one.

- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.

○The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth. It must not touch the container, either.

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

Thermostat Valve Opening Temperature
80.5 ~ 83.5°C (177 ~ 182°F)



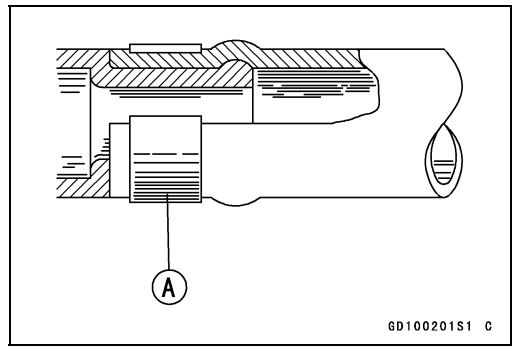
Water Hose and Pipes

Water Hose Installation

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

○The clamp screws should be positioned correctly to prevent the clamps from contacting the other parts.

Torque - Water Hose Clamp Screws: 3.0 N·m (0.31 kgf·m, 27 in·lb)



Water Hose Inspection

- Refer to the Cooling System Inspection in the Periodic Maintenance chapter.

Water Hose and O-ring Replacement

- Refer to the Water Hose and O-ring Replacement in the Periodic Maintenance chapter.

Water Temperature Sensor

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

Water Temperature Sensor Removal/Installation

- Refer to the Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter.

Water Temperature Sensor Inspection

- Refer to the Water Temperature Sensor Inspection in the Fuel System (DFI) chapter.

Engine Top End

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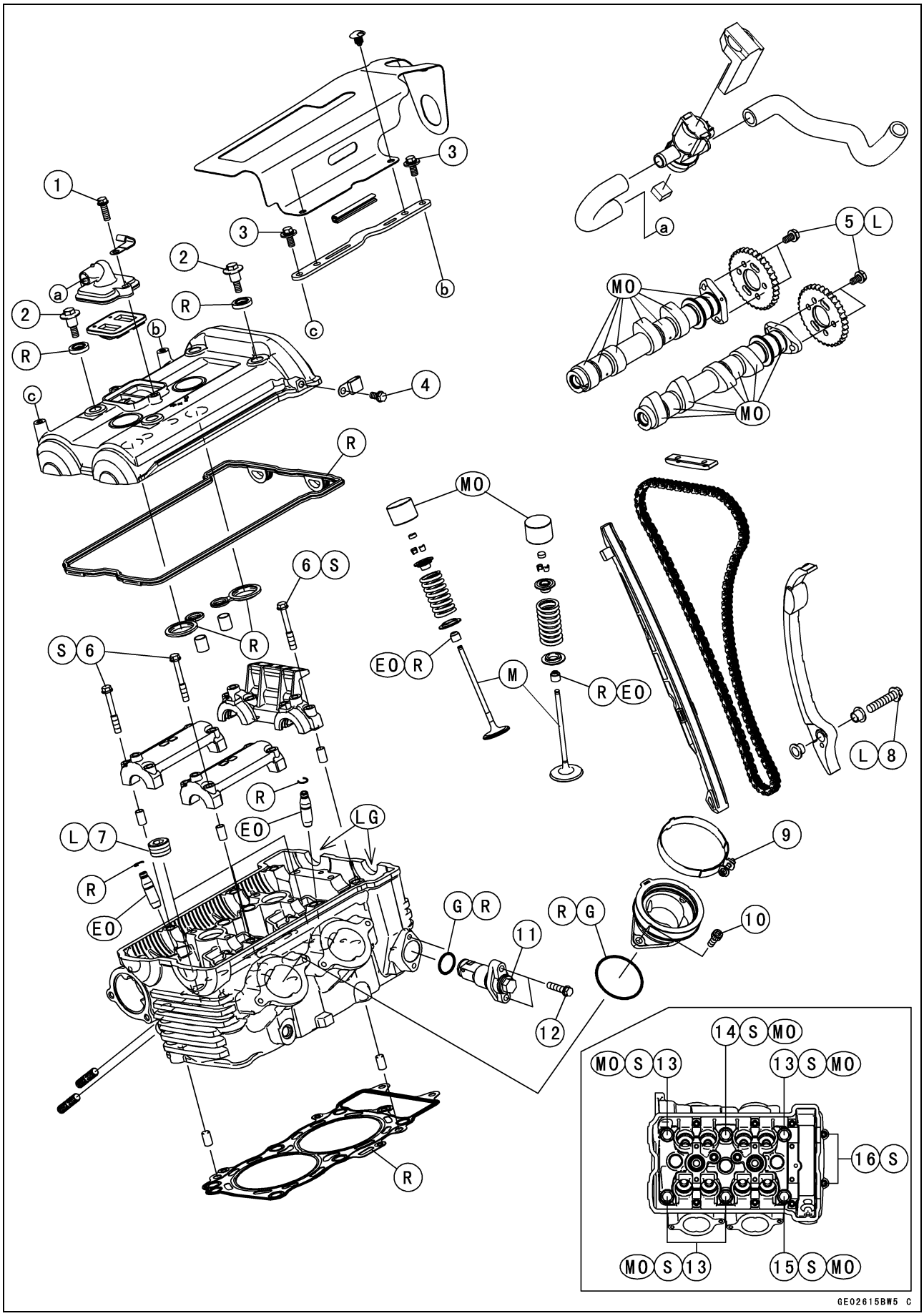
Exploded View

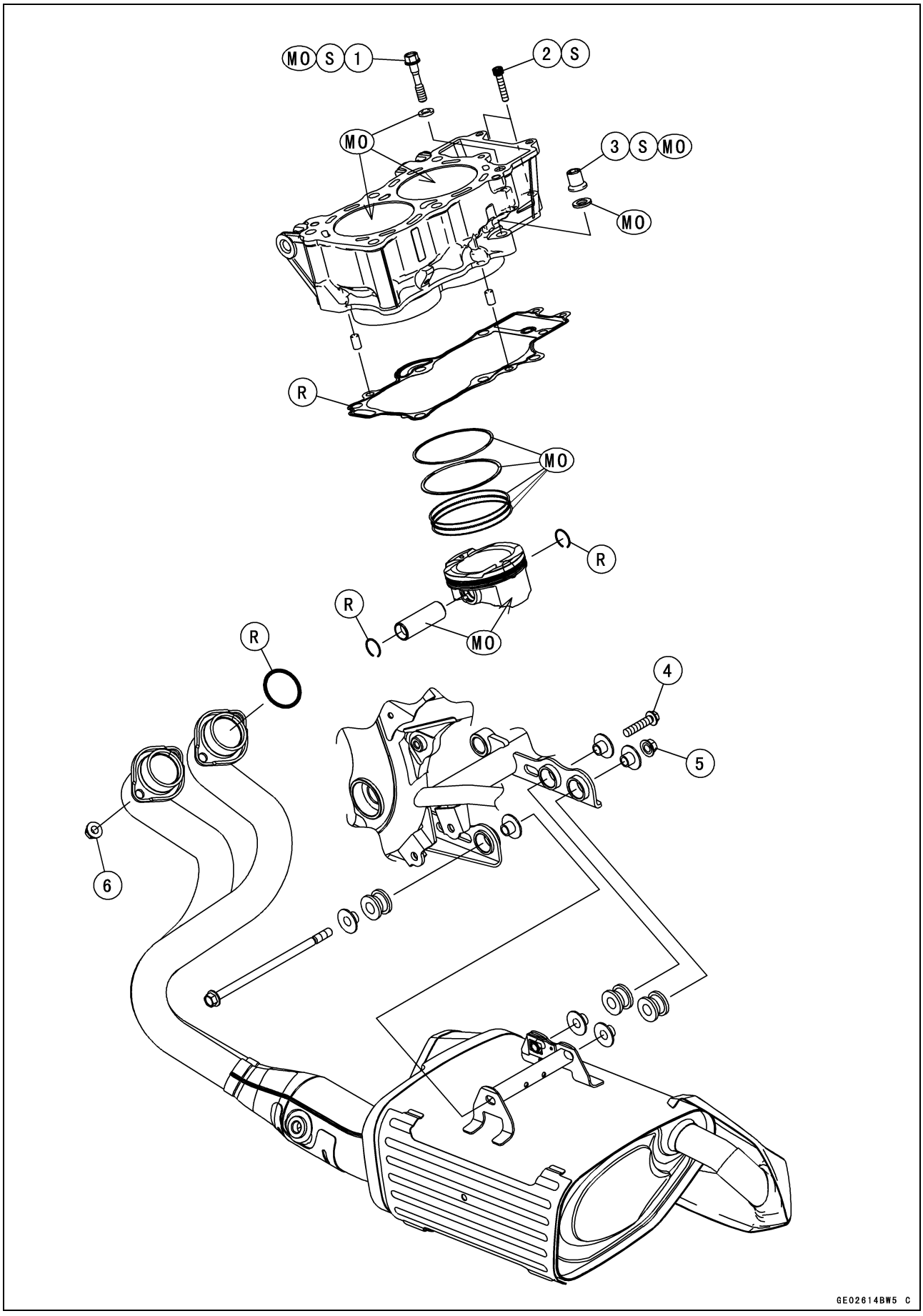


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	
2	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	
3	Bracket Mounting Bolts	6.9	0.70	61 in·lb	
4	Clamp Mounting Bolt	9.8	1.0	87 in·lb	
5	Camshaft Sprocket Bolts	15	1.5	11	L
6	Camshaft Cap Bolts	12	1.2	106 in·lb	S
7	Cylinder Head Plugs	19.6	2.00	14.5	L
8	Rear Camshaft Chain Guide Bolts	20	2.0	15	L
9	Throttle Body Assy Holder Clamp Bolts	2.0	0.20	18 in·lb	
10	Throttle Body Assy Holder Bolts	12	1.2	106 in·lb	
11	Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
12	Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in·lb	
13	Cylinder Head Bolts (M10), L = 158 mm (6.2 in.), First	25	2.5	18	MO, S
	Cylinder Head Bolts (M10), L = 158 mm (6.2 in.), Final	55.9	5.70	41.2	MO, S
14	Cylinder Head Bolts (M10), L = 176 mm (6.9 in.), First	25	2.5	18	MO, S
	Cylinder Head Bolts (M10), L = 176 mm (6.9 in.), Final	55.9	5.70	41.2	MO, S
15	Cylinder Head Bolts (M10), L = 80 mm (3.1 in.), First	25	2.5	18	MO, S
	Cylinder Head Bolts (M10), L = 80 mm (3.1 in.), Final	55.9	5.70	41.2	MO, S
16	Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cylinder Bolt (M8)	27.5	2.80	20.3	MO, S
2	Cylinder Bolts (M6)	12	1.2	106 in·lb	S
3	Cylinder Nut	49	5.0	36	MO, S
4	Muffler Body Mounting Bolt	20	2.0	15	
5	Muffler Body Mounting Nut	20	2.0	15	
6	Exhaust Pipe Holder Nuts	17	1.7	13	

MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.

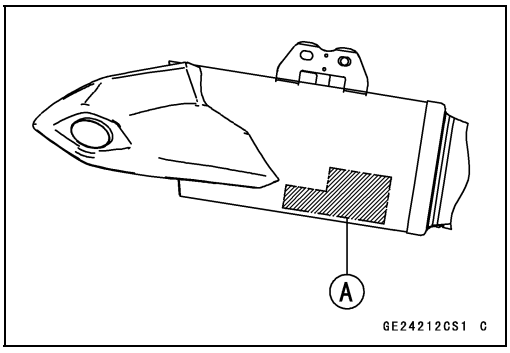
Exhaust System Identification

Exhaust System

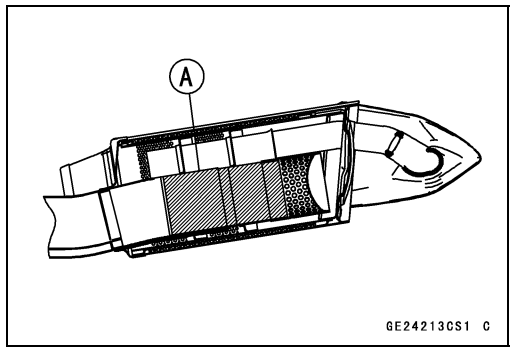
MUFFLER	SPECIFICATION	MODEL
Honeycomb Type Catalyst With Oxygen Sensor P/No. 49070-0782 Mark: KHI K 639 EPA Noise Emission Control Information	US	KLE650EF/FF
	CAL	KLE650EF/FF
	MY	KLE650EF/FF
	WVTA (FULL H)	KLE650EF/FF
	PH	KLE650EF/FF
	SEA-B2	KLE650EF/FF
	CA	KLE650FF
	IN	KLE650FF
	AU	KLE650FF
	AU LAMS	KLE650FF
	SEA-B1	KLE650FF
	TH	KLE650FF
Honeycomb Type Catalyst With Oxygen Sensor P/No. 49070-0783 Mark: KHI K 641	CN	KLE650FF

GE24211C F

Muffler Mark Position [A]

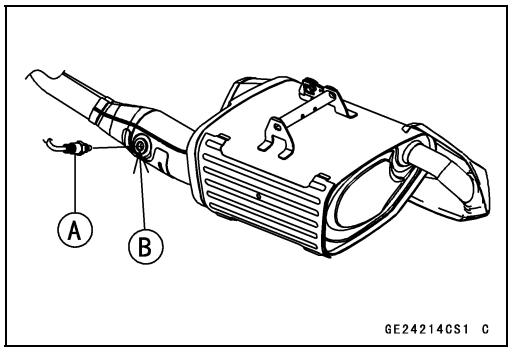


Honeycomb Type Catalyst Position [A]



Exhaust System Identification

Muffler Body with Hole [A] for Oxygen Sensor
[B]



Specifications

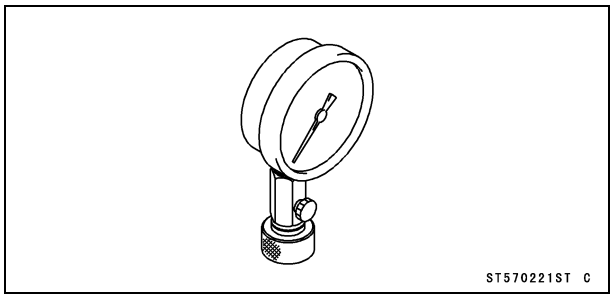
Item	Standard	Service Limit
Camshafts		
Cam Height:		
Exhaust	35.343 ~ 35.457 mm (1.3915 ~ 1.3959 in.)	35.24 mm (1.387 in.)
Intake	35.843 ~ 35.957 mm (1.4111 ~ 1.4156 in.)	35.74 mm (1.407 in.)
Camshaft Journal/Cap Clearance	0.028 ~ 0.071 mm (0.0011 ~ 0.0028 in.)	0.16 mm (0.0063 in.)
Camshaft Journal Diameter	23.950 ~ 23.972 mm (0.94291 ~ 0.94378 in.)	23.92 mm (0.9417 in.)
Camshaft Bearing Inside Diameter	24.000 ~ 24.021 mm (0.94488 ~ 0.94571 in.)	24.08 mm (0.9480 in.)
Camshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
Cylinder Head		
Cylinder Compression	(Usable Range) 1 120 ~ 1 698 kPa (11.42 ~ 17.32 kgf/cm², 162.4 ~ 246.2 psi) @400 r/min (rpm)	– – –
Cylinder Head Warp	– – –	0.05 mm (0.002 in.)
Valves		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	– – –
Intake	0.15 ~ 0.21 mm (0.0059 ~ 0.0083 in.)	– – –
Valve Head Thickness:		
Exhaust	0.8 mm (0.031 in.)	0.7 mm (0.03 in.)
Intake	0.5 mm (0.020 in.)	0.3 mm (0.01 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	4.455 ~ 4.470 mm (0.1754 ~ 0.1760 in.)	4.44 mm (0.175 in.)
Intake	4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in.)	4.46 mm (0.176 in.)
Valve Guide Inside Diameter:		
Exhaust	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.180 in.)
Intake	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.180 in.)
Valve/Valve Guide Clearance (Wobble Method):		
Exhaust	0.08 ~ 0.15 mm (0.0031 ~ 0.0059 in.)	0.34 mm (0.013 in.)
Intake	0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)	0.28 mm (0.011 in.)
Valve Seat Cutting Angle	45°, 32°, 60°	– – –
Valve Seating Surface:		
Width:		
Exhaust	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	– – –
Intake	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	– – –
Outside Diameter:		
Exhaust	27.6 ~ 27.8 mm (1.087 ~ 1.094 in.)	– – –
Intake	32.6 ~ 32.8 mm (1.283 ~ 1.291 in.)	– – –

Specifications

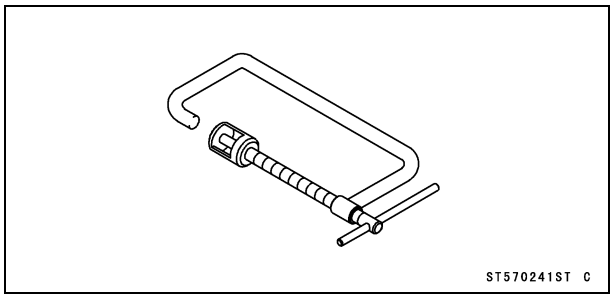
Item	Standard	Service Limit
Valve Spring Free Length:		
Exhaust	41.9 mm (1.650 in.)	40.3 mm (1.59 in.)
Intake	41.9 mm (1.650 in.)	40.3 mm (1.59 in.)
Cylinder, Pistons		
Cylinder Inside Diameter	82.994 ~ 83.006 mm (3.2675 ~ 3.2679 in.)	83.09 mm (3.271 in.)
Piston Diameter	82.969 ~ 82.984 mm (3.2665 ~ 3.2671 in.)	82.82 mm (3.261 in.)
Piston/Cylinder Clearance	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in.)	– – –
Piston Ring/Groove Clearance:		
Top	0.030 ~ 0.070 mm (0.00118 ~ 0.00276 in.)	0.17 mm (0.0067 in.)
Second	0.020 ~ 0.060 mm (0.00079 ~ 0.00236 in.)	0.16 mm (0.0063 in.)
Piston Ring Groove Width:		
Top	0.92 ~ 0.94 mm (0.0362 ~ 0.0370 in.)	1.02 mm (0.0402 in.)
Second	1.01 ~ 1.03 mm (0.0398 ~ 0.0406 in.)	1.11 mm (0.0437 in.)
Piston Ring Thickness:		
Top	0.870 ~ 0.890 mm (0.0343 ~ 0.0350 in.)	0.80 mm (0.031 in.)
Second	0.970 ~ 0.990 mm (0.0382 ~ 0.0390 in.)	0.90 mm (0.035 in.)
Piston Ring End Gap:		
Top	0.25 ~ 0.40 mm (0.0098 ~ 0.0158 in.)	0.7 mm (0.03 in.)
Second	0.40 ~ 0.55 mm (0.0158 ~ 0.0217 in.)	0.9 mm (0.04 in.)

Special Tools and Sealant

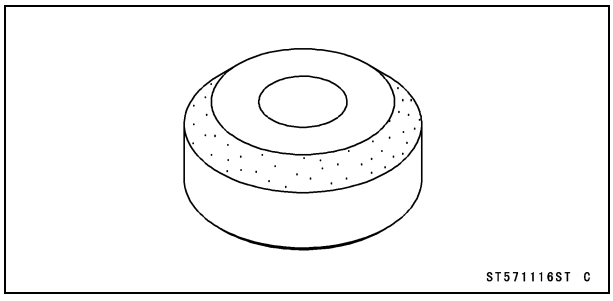
Compression Gauge, 20 kgf/cm²:
57001-221



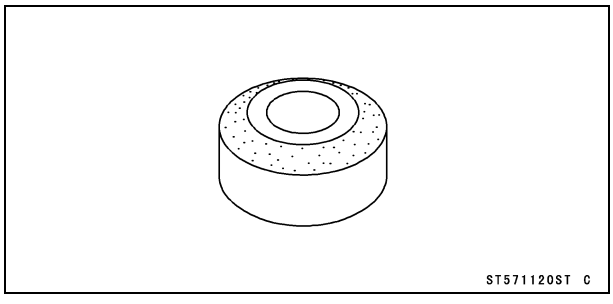
Valve Spring Compressor Assembly:
57001-241



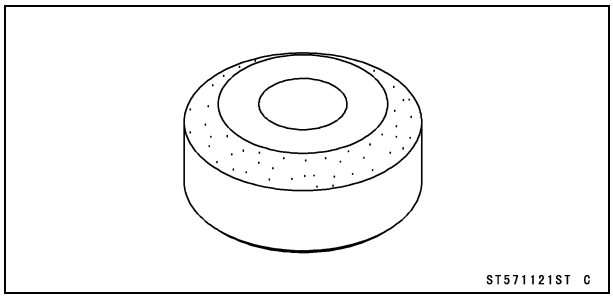
Valve Seat Cutter, 45° - ϕ35:
57001-1116



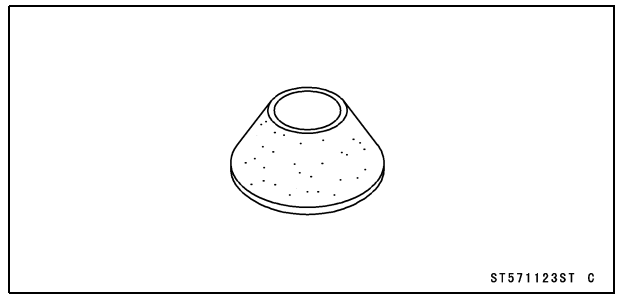
Valve Seat Cutter, 32° - ϕ30:
57001-1120



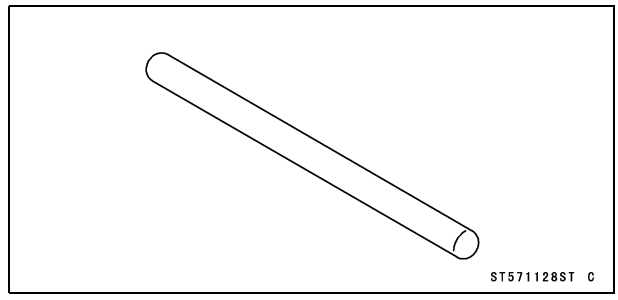
Valve Seat Cutter, 32° - ϕ35:
57001-1121



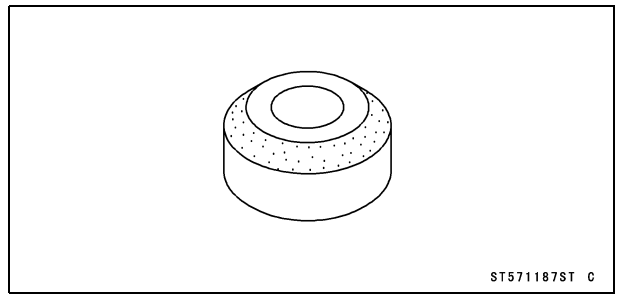
Valve Seat Cutter, 60° - ϕ30:
57001-1123



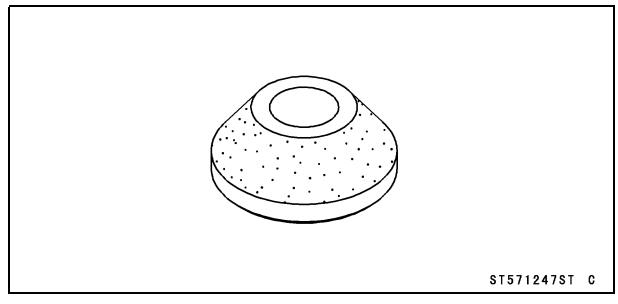
Valve Seat Cutter Holder Bar:
57001-1128



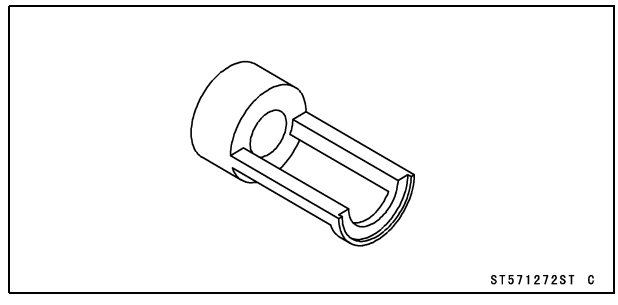
Valve Seat Cutter, 45° - ϕ30:
57001-1187



Valve Seat Cutter, 55° - ϕ35:
57001-1247

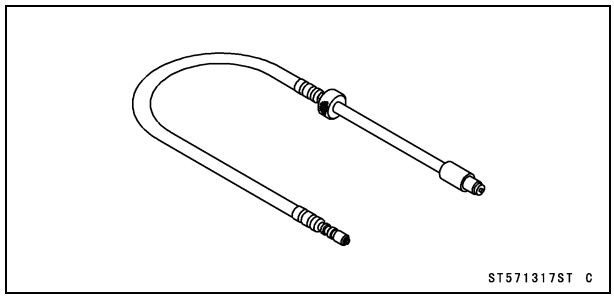


Valve Spring Compressor Adapter, ϕ21:
57001-1272

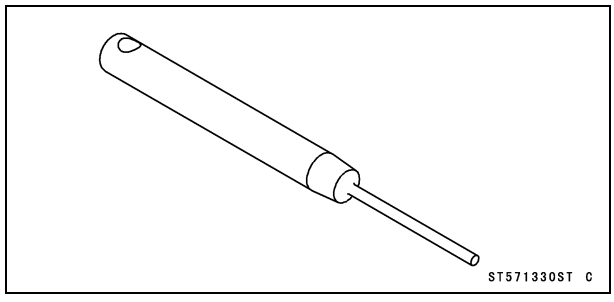


Special Tools and Sealant

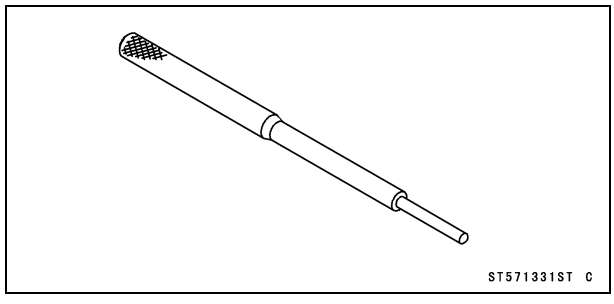
Compression Gauge Adapter, M10 × 1.0:
57001-1317



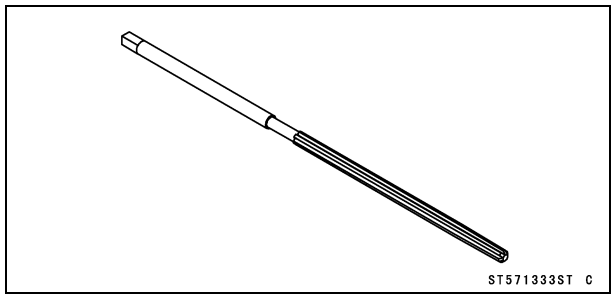
Valve Seat Cutter Holder, ϕ4.5:
57001-1330



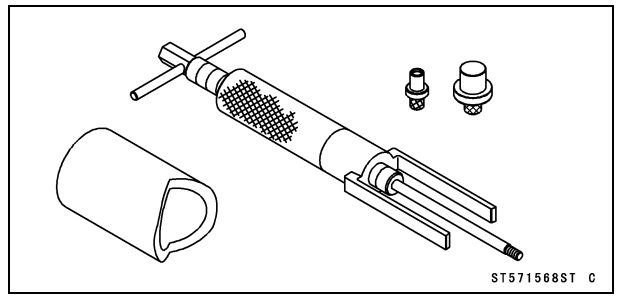
Valve Guide Arbor, ϕ4.5:
57001-1331



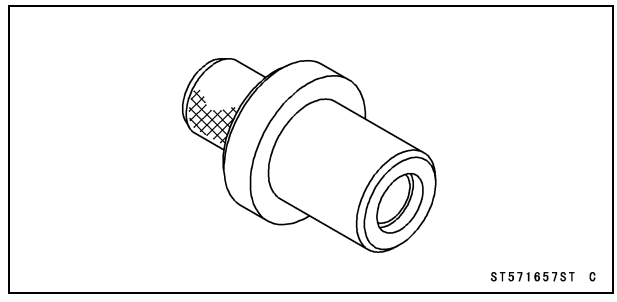
Valve Guide Reamer, ϕ4.5:
57001-1333



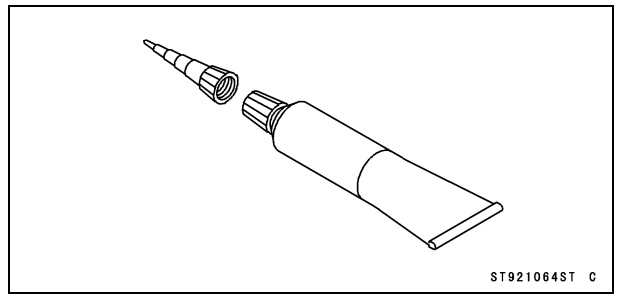
Piston Pin Puller:
57001-1568



Piston Pin Puller Adapter, ϕ12:
57001-1657



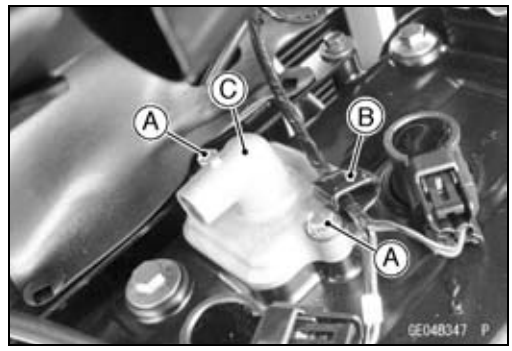
Liquid Gasket, TB1216B:
92104-1064



Clean Air System

Air Suction Valve Removal

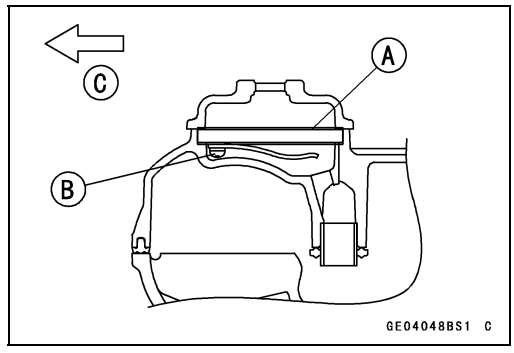
- Remove:
  Air Switching Valve (see Air Switching Valve Removal)
  Air Suction Valve Cover Bolts [A]
  Clamp [B]
  Air Suction Valve Cover [C]



- Remove the air suction valve [A].

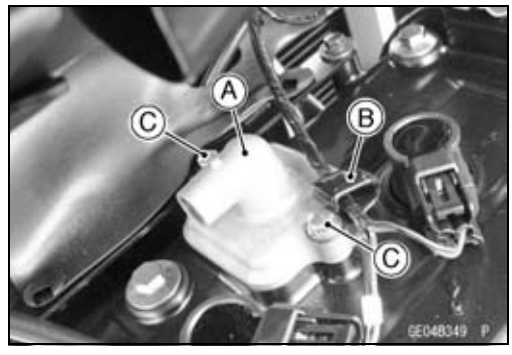
Air Suction Valve Installation

- Install the air suction valve [A] so that its side where stopper is fixed with the screws [B] faces the front [C].



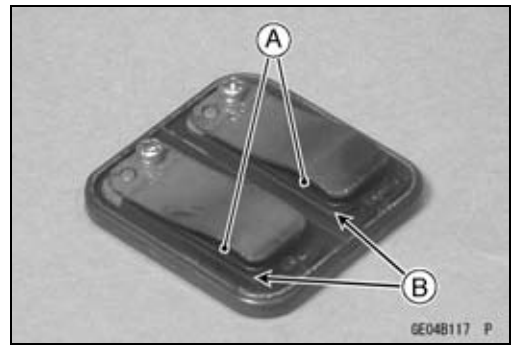
- Install the air suction valve cover [A].
- Install the clamp [B] as shown.
- Tighten:

Torque - Air Suction Valve Cover Bolts [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Clean Air System

Air Suction Valve Inspection



- Remove the air suction valve (see Air Suction Valve Removal).
- Visually inspect the reeds [A] for cracks, folds, warps, heat damage or other damage.

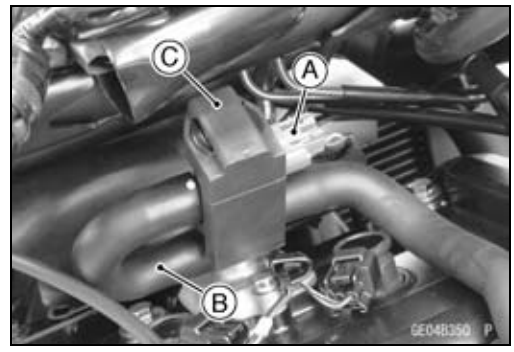
★If there is any doubt as to the condition of the reeds, replace the air suction valve as an assembly.

- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.
- If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high flash-point solvent.

NOTICE

Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.

Air Switching Valve Removal

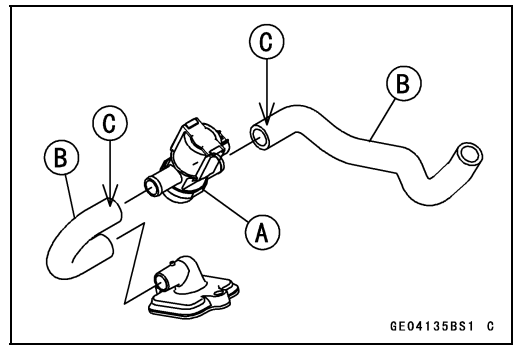


- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
- Disconnect the connector [A].
- Disconnect the air switching valve hose [B] from the air suction valve cover, and remove the air switching valve [C].

NOTICE

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

Air Switching Valve Installation



- Install the air switching valve [A] with hoses [B] as shown.
  White Paint Marks [C]
- Connect the air switching valve lead connector.

Air Switching Valve Operation Test

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Air Switching Valve Unit Test

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

Clean Air System

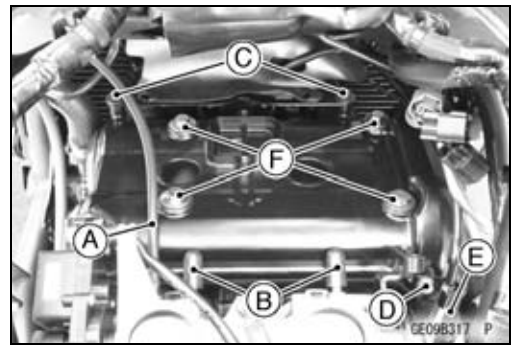
Clean Air System Hose Inspection

- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, air switching valve and air suction valve cover.

★If they are not, correct them. Replace them if they are damaged.

Cylinder Head Cover

Cylinder Head Cover Removal



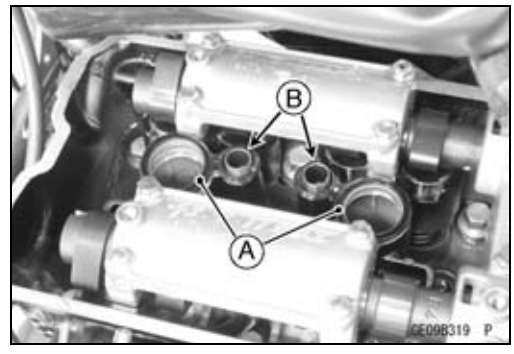
- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Air Suction Valve (see Air Suction Valve Removal)
  Stick Coils (see Stick Coil Removal in the Electrical System chapter).
  Throttle Cable Lower Ends (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
- Disconnect:
  Intake Air Pressure Sensor Hose [A]
- Remove the plug [B].

○For evaporative emission control system equipped models, disconnect the hoses.

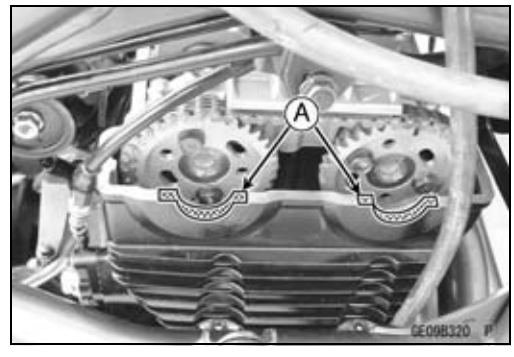
- Remove:
  Bracket Mounting Bolts [C]
  Clamp Mounting Bolt [D]
  Clamp [E]
  Cylinder Head Cover Bolts [F] with Washers

- Remove the cylinder head cover [A] backward.

Cylinder Head Cover Installation



- Replace the plug hole gaskets [A] with new ones.
- Install:
  Dowel Pins [B]
  Plug Hole Gaskets



- Replace the head cover gasket with a new one.
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the cylinder head as shown.

Sealant - Liquid Gasket, TB1216B: 92104-1064

NOTE

○*Make the application finish within 20 minutes with the liquid gasket (TB1216B) to the mating surface of the cylinder head cover is applied.*

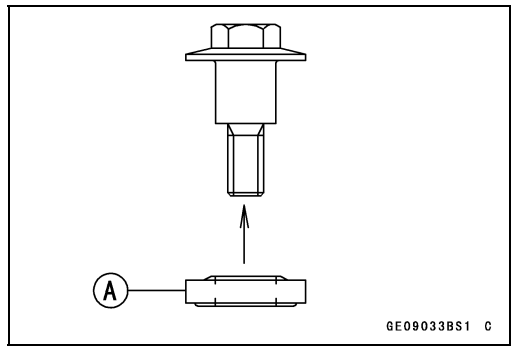
- Install:
  Head Cover Gasket
  Cylinder Head Cover

Cylinder Head Cover

- Install the washers [A] with metal side faces upward.
- Tighten:

Torque - Cylinder Head Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
Bracket Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)
Clamp Mounting Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the removed parts (see appropriate chapters).

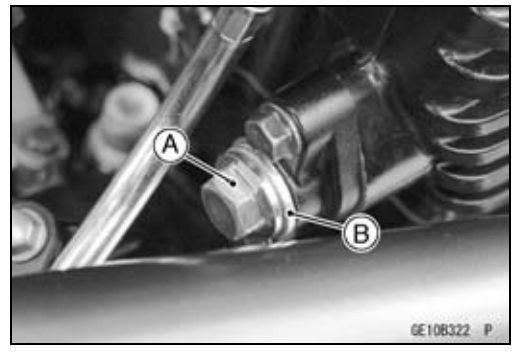


Camshaft Chain Tensioner

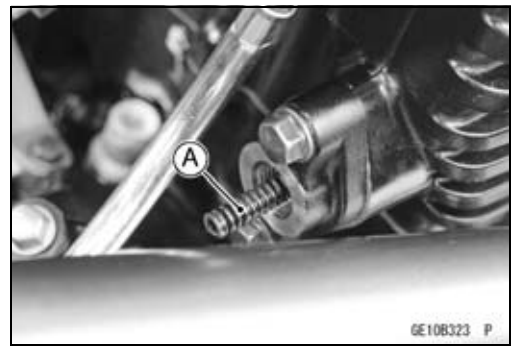
Camshaft Chain Tensioner Removal

NOTICE
This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below: **When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation."** **Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.**

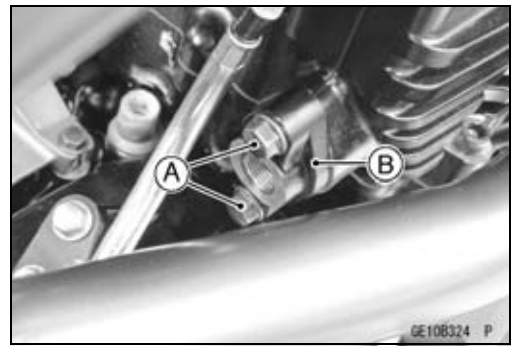
● Remove:
Camshaft Chain Tensioner Cap Bolt [A]
Washer [B]



● Remove the spring [A].

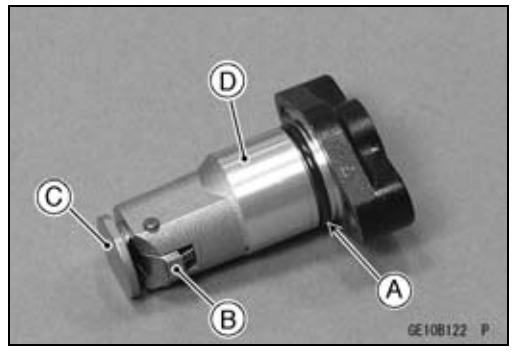


● Remove:
Camshaft Chain Tensioner Mounting Bolts [A]
Camshaft Chain Tensioner Body [B]

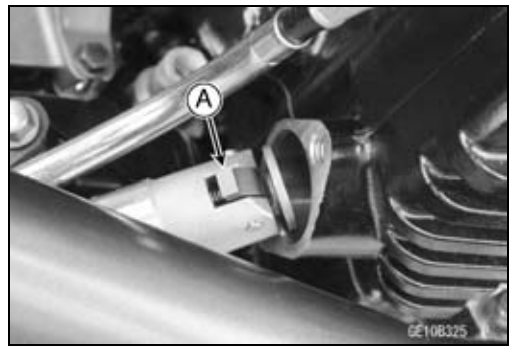


Camshaft Chain Tensioner

Camshaft Chain Tensioner Installation

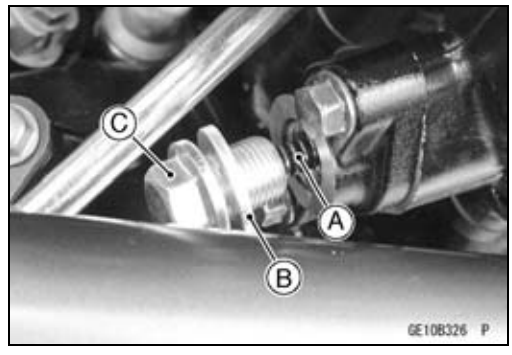


- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Release the stopper [B] and push the push rod [C] into the tensioner body [D].



- Install the tensioner body so that the stopper [A] faces upward.
- Tighten the tensioner mounting bolts.

Torque - Camshaft Chain Tensioner Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



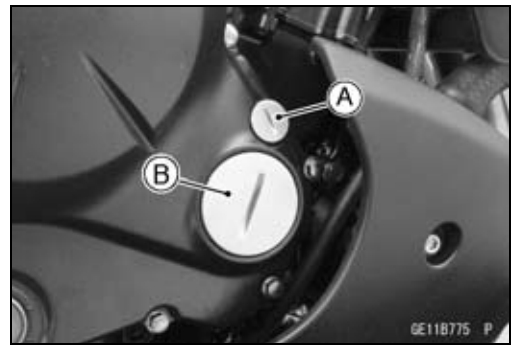
- Install:
  Spring [A]
  Washer [B]
- Tighten the cap bolt [C].

Torque - Camshaft Chain Tensioner Cap Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)

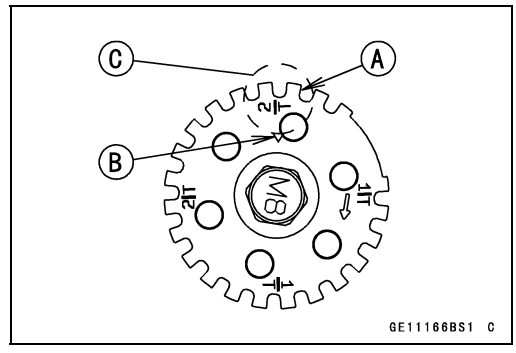
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.

Camshaft, Camshaft Chain

Camshaft Removal

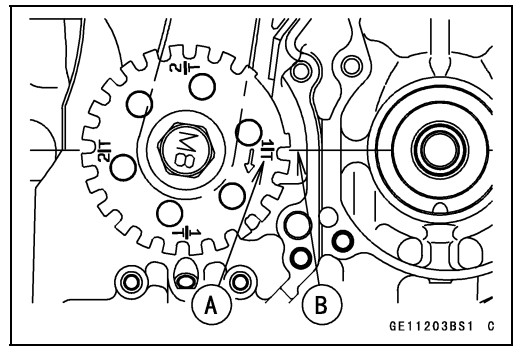


- Remove:
  Cylinder Head Cover (see Cylinder Head Cover Removal)
  Timing Inspection Cap [A]
  Timing Rotor Bolt Cap [B]



- Using a wrench on the timing rotor bolt, turn the crankshaft clockwise until the 2/T mark line [A] on the timing rotor is aligned with the notch [B] in the edge of the timing inspection hole [C] in the clutch cover.

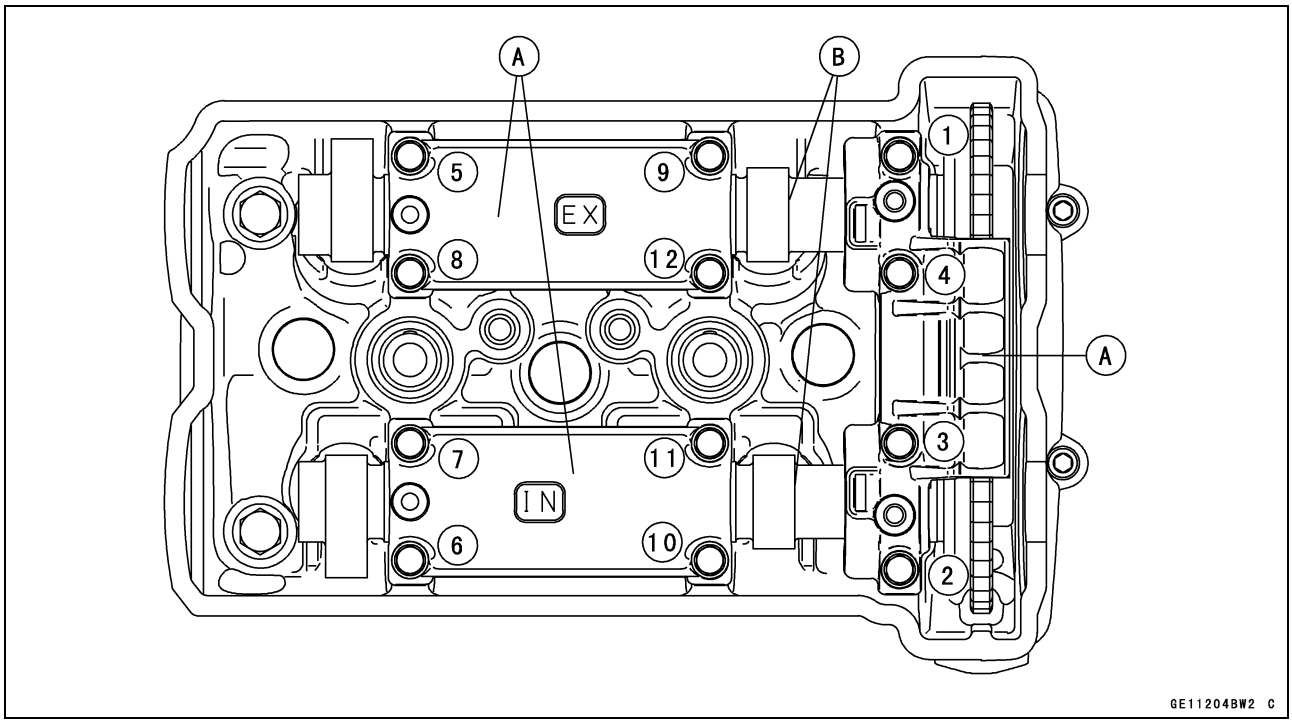
★If the clutch cover is removed, perform the next procedure.



○Using a wrench on the timing rotor bolt, turn the crankshaft clockwise until the 1/T mark line [A] on the timing rotor is aligned with the mating surface [B] of the crankcase front side.

Camshaft, Camshaft Chain

- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
- Loosen the camshaft cap bolts gradually and evenly as shown sequence [1 ~ 12], and remove them.
- Remove:
  Camshaft Caps [A]
  Camshafts [B]

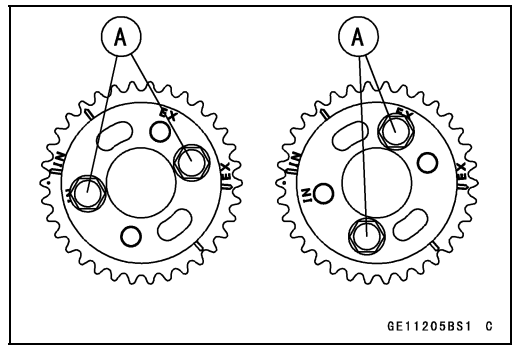


NOTICE

The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

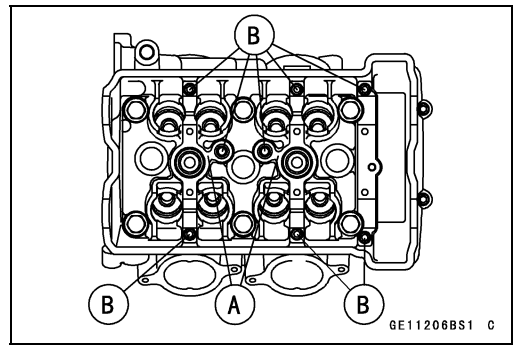
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.

- Remove the cam sprocket bolts [A].
- Remove the cam sprocket.

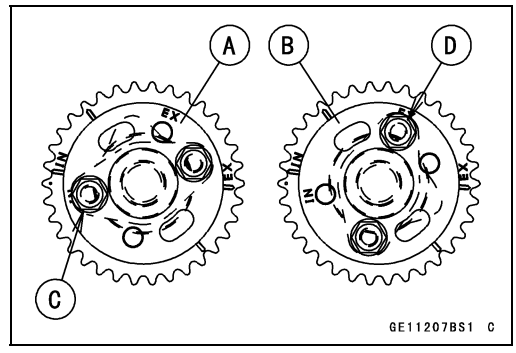


Camshaft, Camshaft Chain

Camshaft Installation



- Be sure to install the following parts.
  Plug Hole Gaskets [A]
  Dowel Pins [B]



- Install the cam sprockets so that the marked ("IN" and "EX") side faces to the outward.

○The intake [A] and exhaust cam sprockets [B] are identical.

NOTICE
intake cam sprocket must use "IN" marked bolt holes [C]. Exhaust cam sprocket must use "EX" marked bolt holes [D].

- Apply a non-permanent locking agent to the camshaft sprocket bolts and tighten them.

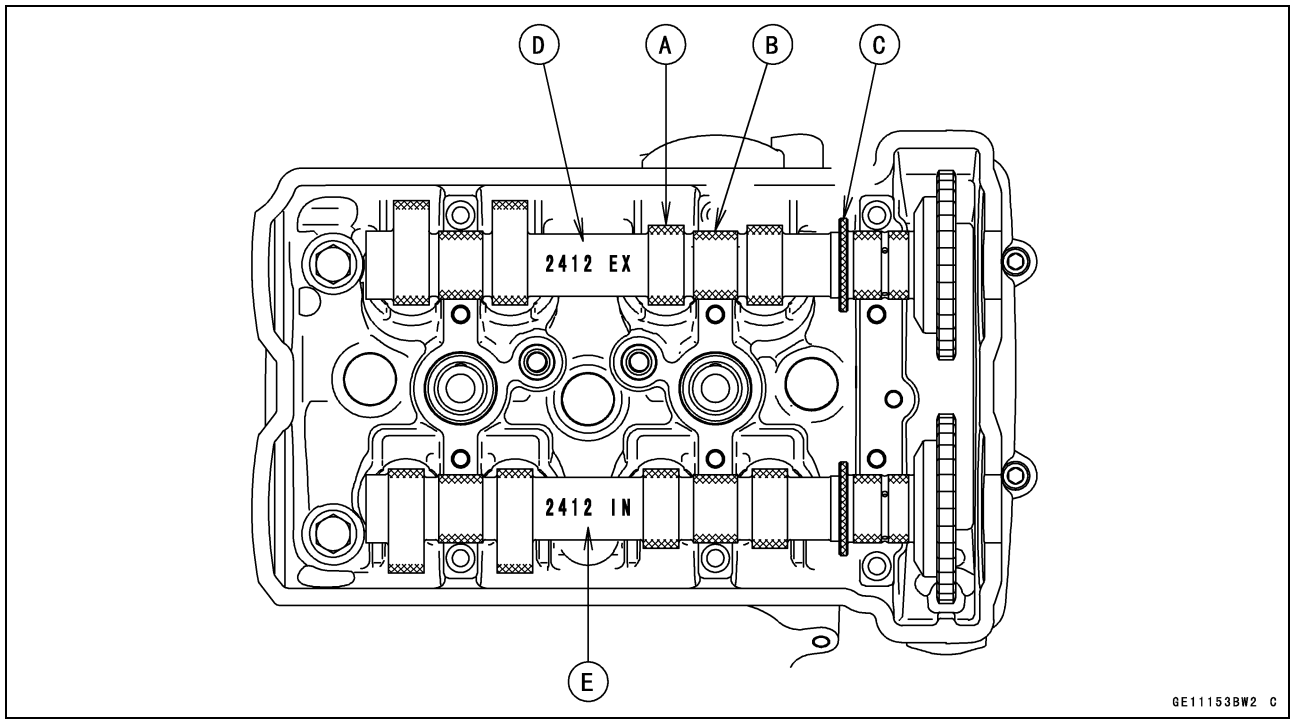
Torque - Camshaft Sprocket Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Apply molybdenum disulfide oil solution to all cams [A], journals [B] and thrust blocks [C] with × marks.

★If a new camshaft is to be used, apply a thin coat of molybdenum disulfide grease to the cam surfaces.

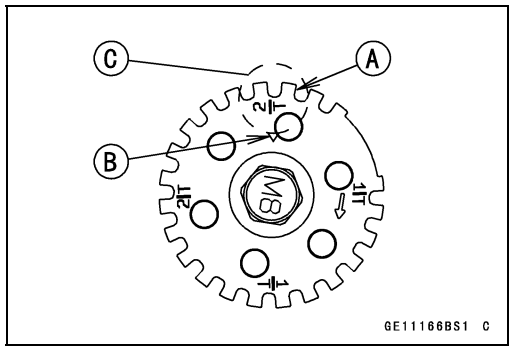
NOTE

○*The exhaust camshaft has a 2412 EX mark [D] and the intake camshaft has a 2412 IN mark [E]. Be careful not to mix up these shafts.*



Camshaft, Camshaft Chain

● Using a wrench on the timing rotor bolt, turn the crankshaft clockwise until the 2/T mark line [A] on the timing rotor is aligned with the notch [B] in the edge of the timing inspection hole [C] in the clutch cover.

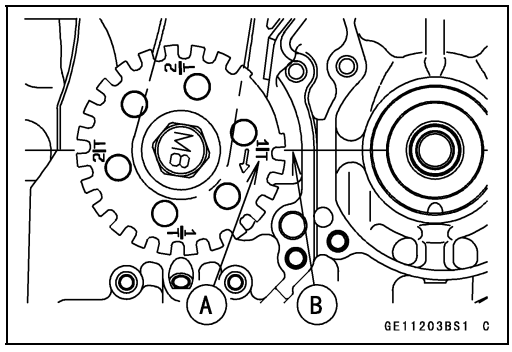


NOTICE

The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

★If the clutch cover is removed, perform the next procedure.

○Using a wrench on the bolt, turn the crankshaft clockwise until the 1/T mark line [A] on the timing rotor is aligned with the mating surface [B] of the crankcase front side.

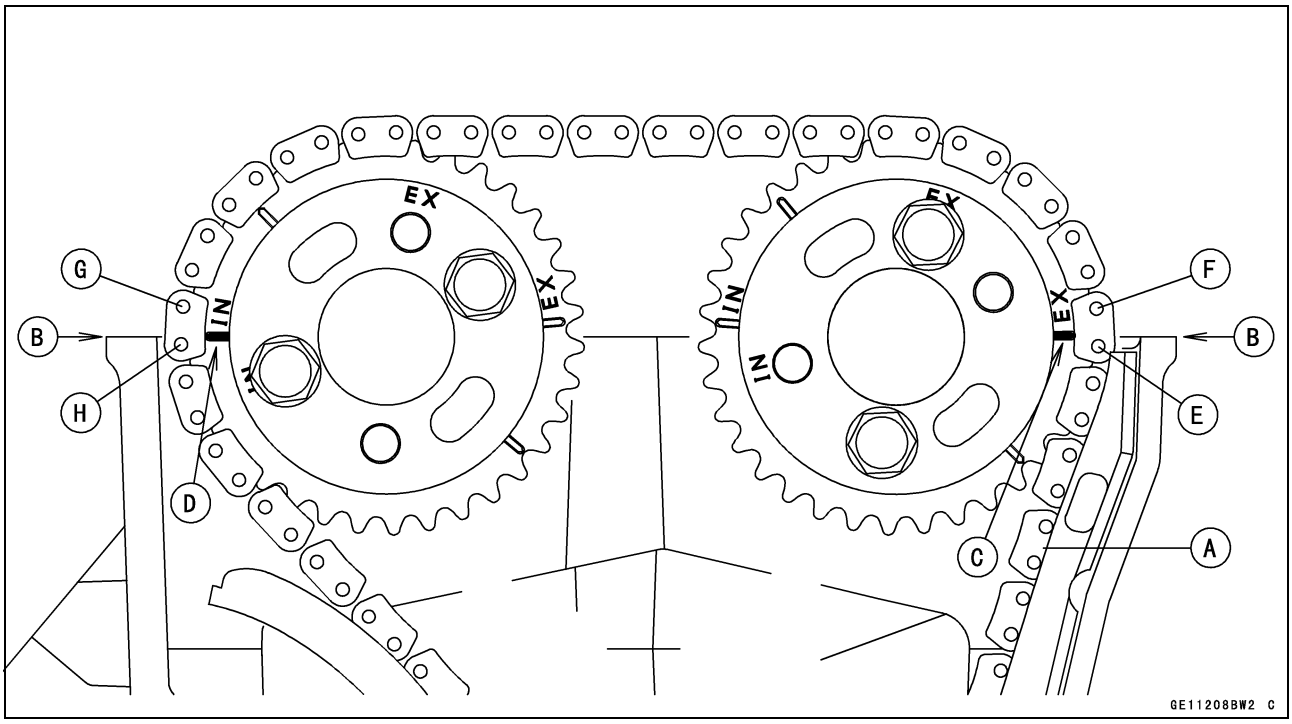


● Pull the tension side (exhaust side) [A] of the chain taut to install the chain.

● Engage the camshaft chain with the camshaft sprockets so that the timing marks on the sprockets are positioned as shown.

○The timing marks must be aligned with the cylinder head upper surface [B].

EX Mark [C] (Between #1 Pin and #2 Pin)
IN Mark [D] (Between #31 Pin and #32 Pin)
#1 Pin [E]
#2 Pin [F]
#31 Pin [G]
#32 Pin [H]



Camshaft, Camshaft Chain

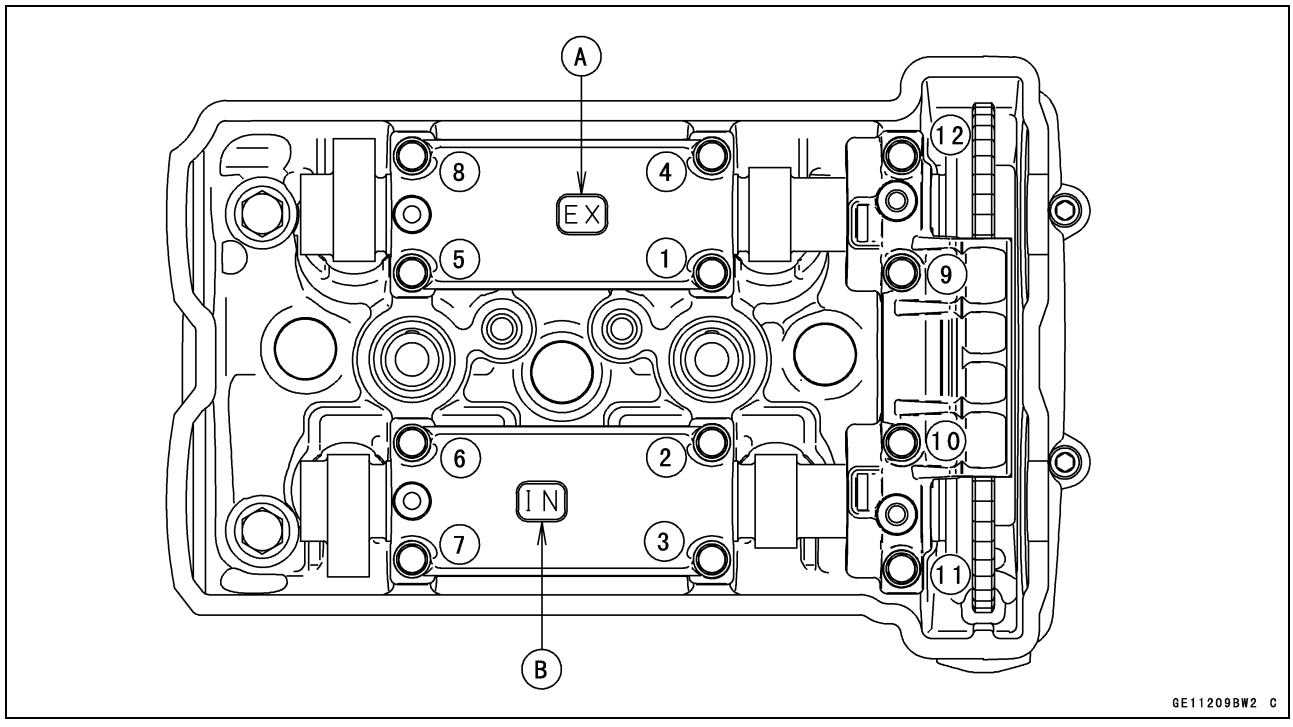
- Before installing the camshaft caps, install the camshaft chain tensioner body temporary (see Camshaft Chain Tensioner Installation).
- Install the camshaft caps as shown.

NOTE

○*The exhaust cap has a "EX" mark [A] and the intake cap has a "IN" mark [B]. Be careful not to mix up these caps.*

- First tighten the all camshaft cap bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence [1 ~ 12].

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



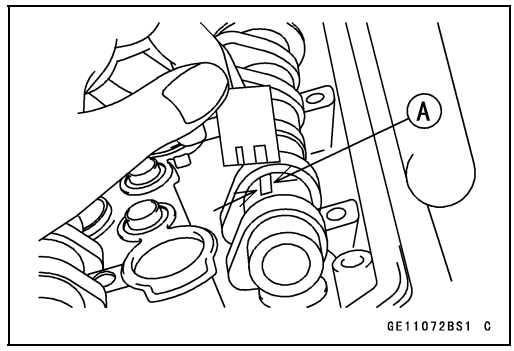
- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.
- Replace the O-ring of the timing inspection cap and timing rotor bolt cap with new ones.
- Apply grease to the new O-rings.
- Install the timing inspection cap and timing rotor bolt cap.

Torque - Timing Inspection Cap: 3.9 N·m (0.40 kgf·m, 35 in·lb)
Timing Rotor Bolt Cap: 4.9 N·m (0.50 kgf·m, 43 in·lb)

- Install the cylinder head cover (see Cylinder Head Cover Installation).

Camshaft, Camshaft Chain

Camshaft, Camshaft Cap Wear Inspection



- Remove the camshaft caps (see Camshaft Removal).
- Cut the strips of plastigage (press gauge) to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Tighten the camshaft cap bolts to the specified torque (see Camshaft Installation).

NOTE

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

- Remove the camshaft cap again, measure each clearance between the camshaft journal and the camshaft cap using plastigage [A].

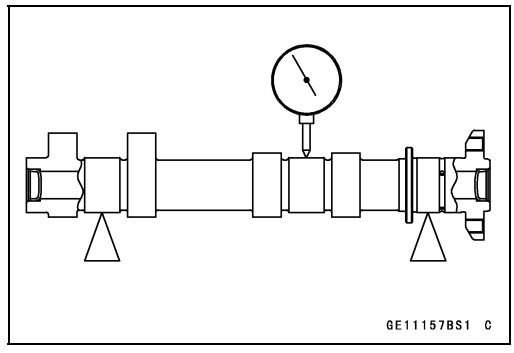
Camshaft Journal, Camshaft Cap Clearance
Standard: 0.028 ~ 0.071 mm (0.0011 ~ 0.0028 in.)
Service Limit: 0.16 mm (0.0063 in.)

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

Camshaft Journal Diameter
Standard: 23.950 ~ 23.972 mm (0.94291 ~ 0.94378 in.)
Service Limit: 23.92 mm (0.9417 in.)

★If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.
★If the clearance still remains out of the limit, replace the cylinder head unit.

Camshaft Runout Inspection



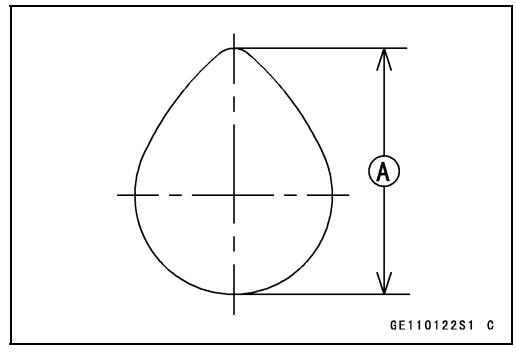
- Remove the camshaft (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure runout with a dial gauge at the specified place as shown.

★If the runout exceeds the service limit, replace the shaft.

Camshaft Runout
Standard: TIR 0.02 mm (0.0008 in.) or less
Service Limit: TIR 0.1 mm (0.004 in.)

Camshaft, Camshaft Chain

Cam Wear Inspection



- Remove the camshaft (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.

★If the cams are worn down past the service limit, replace the camshaft.

Cam Height

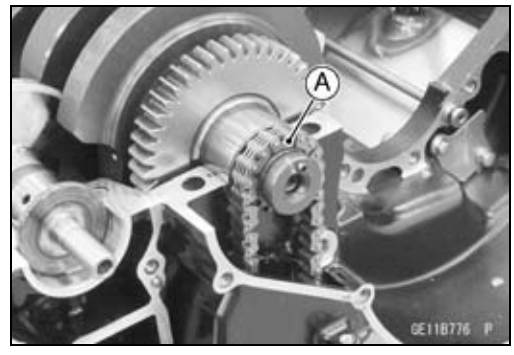
Standard:

Exhaust	**35.343 ~ 35.457 mm (1.3915 ~ 1.3959 in.)**
Intake	**35.843 ~ 35.957 mm (1.4111 ~ 1.4156 in.)**

Service Limit:

Exhaust	**35.24 mm (1.387 in.)**
Intake	**35.74 mm (1.407 in.)**

Camshaft Chain Removal



- Split the crankcase (see Crankcase Splitting in the Crankshaft/Transmission chapter).
- Remove the camshaft chain [A] from the crankshaft sprocket.

Cylinder Head

Cylinder Compression Measurement

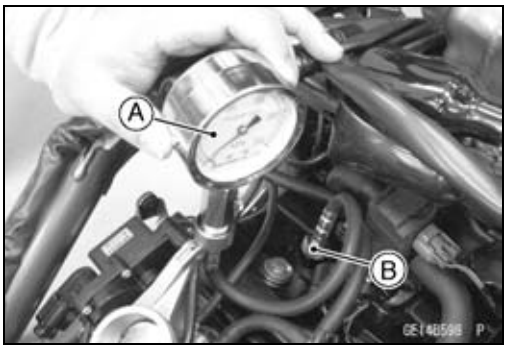
NOTE

○*Use the battery which is fully charged.*

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Stick Coils (see Stick Coil Removal in the Electrical System chapter)
  Spark Plugs (see Spark Plug Replacement in the Periodic Maintenance chapter)

- Attach the compression gauge [A] and adapter [B] firmly into the spark plug hole.

○Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.



Special Tools - Compression Gauge, 20 kgf/cm²: 57001-221
Compression Gauge Adapter, M10 × 1.0: 57001-1317

Cylinder Compression
Usable Range: 1 120 ~ 1 698 kPa (11.42 ~ 17.32 kgf/cm², 162.4 ~ 246.2 psi) @400 r/min (rpm)

- Repeat the measurement for the other cylinders.
- Install the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).

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

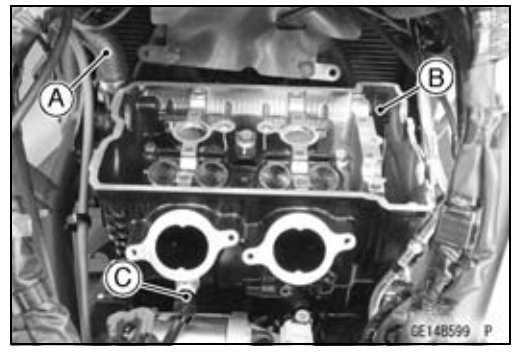
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket thickness	Replace the gasket with a standard part.
Cylinder compression is lower than usable range	Gas leakage around cylinder head	Replace damaged gasket and check cylinder head warp.
	Bad condition of valve seating	Repair if necessary.
	Incorrect valve clearance	Adjust the valve clearance.
	Incorrect piston/cylinder clearance	Replace the piston and/or cylinder.
	Piston seizure	Inspect the cylinder and replace/repair the cylinder and/or piston as necessary.
	Bad condition of piston ring and/or piston ring grooves	Replace the piston and/or the piston rings.

Cylinder Head

Cylinder Head Removal

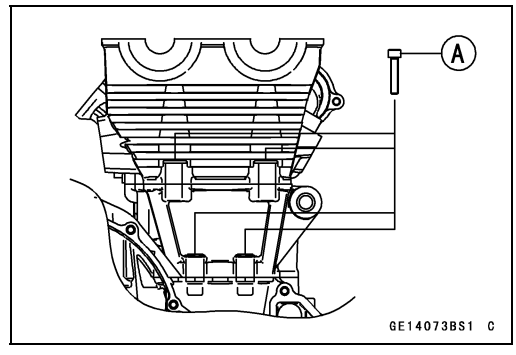
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Muffler (see Muffler Removal)
  Cylinder Head Cover (see Cylinder Head Cover Removal)
  Camshafts (see Camshaft Removal)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Throttle Body Assy Holders (see Throttle Body Assy Holder Removal)

- Disconnect:
  Water Hose [A]
- Remove:
  Front Camshaft Chain Guide [B]
  Water Temperature Sensor Connector [C]

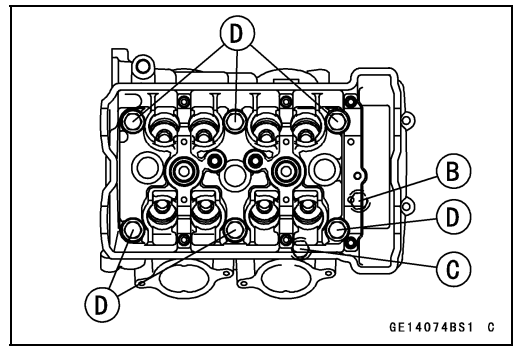


- Remove the cylinder head and cylinder bolts, following the specified sequence.

○Firstly remove the cylinder head bolts (M6) and cylinder bolts (M6) [A].



○Secondly, remove the cylinder bolts (M8) [B].
○Thirdly, remove the cylinder nut [C].
○Lastly, remove the cylinder head bolts (M10) [D].



Cylinder Head

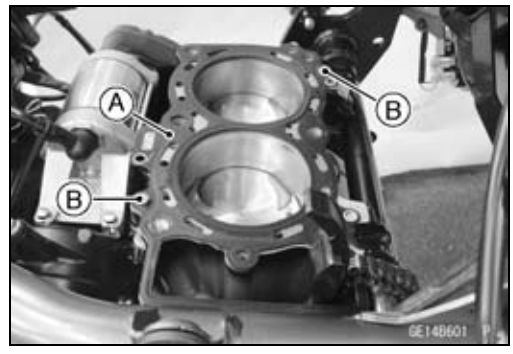
- Take off the cylinder head [A] from the space of the frame pipes.

Cylinder Head Installation

NOTE

○*The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.*

- Install a new cylinder head gasket [A] and dowel pins [B].



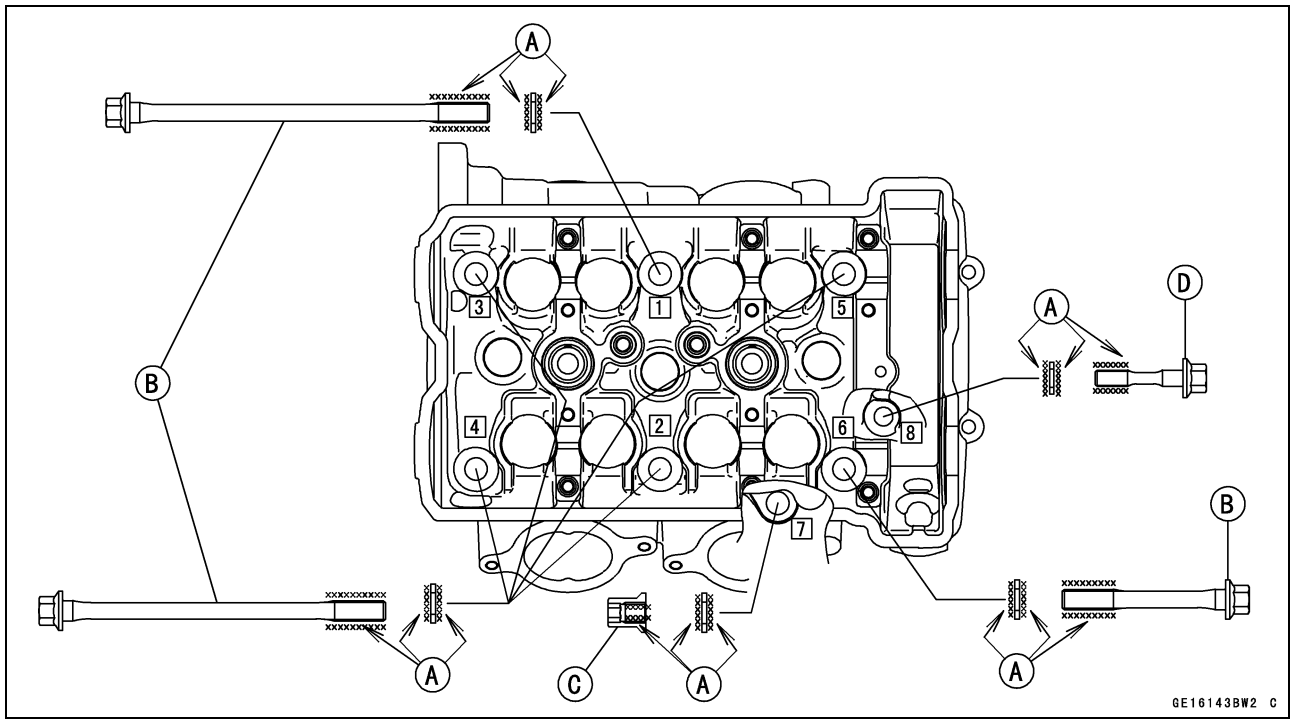
Cylinder Head

- Apply molybdenum disulfide oil solution [A] to both sides of washers and the threads of bolts and nut.
  Cylinder Head Bolts (M10) [B]
  Cylinder Nut [C]
  Cylinder Bolt (M8) [D]
- Tighten the all the bolts and nut following the tightening sequence [1 ~ 8].
  [1] L = 176 mm (6.9 in.)
  [2 ~ 5] L = 158 mm (6.2 in.)
  [6] L = 80 mm (3.1 in.)
  [8] L = 43 mm (1.7 in.)

Torque - Cylinder Head Bolts (M10):
First: 25 N·m (2.5 kgf·m, 18 ft·lb)
Final: 55.9 N·m (5.70 kgf·m, 41.2 ft·lb)
Cylinder Nut: 49 N·m (5.0 kgf·m, 36 ft·lb)
Cylinder Bolt (M8): 27.5 N·m (2.80 kgf·m, 20.3 ft·lb)

NOTE

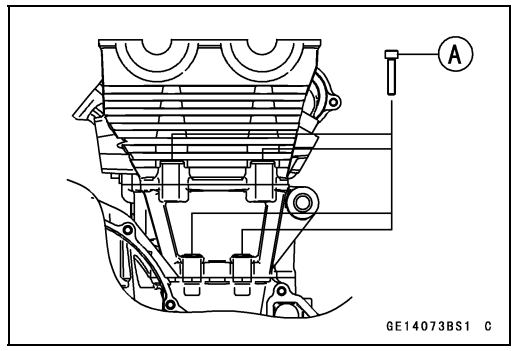
- *The tightening sequence No.1 ~ No.5 are the cylinder head bolts that are tightened between the cylinder head with the crankcase.*
- *The No.6 is the cylinder head bolt that is tightened between the cylinder head with the cylinder.*
- *The No.7 and No.8 are the cylinder nut and cylinder bolt that are tightened between the cylinder and the crankcase.*



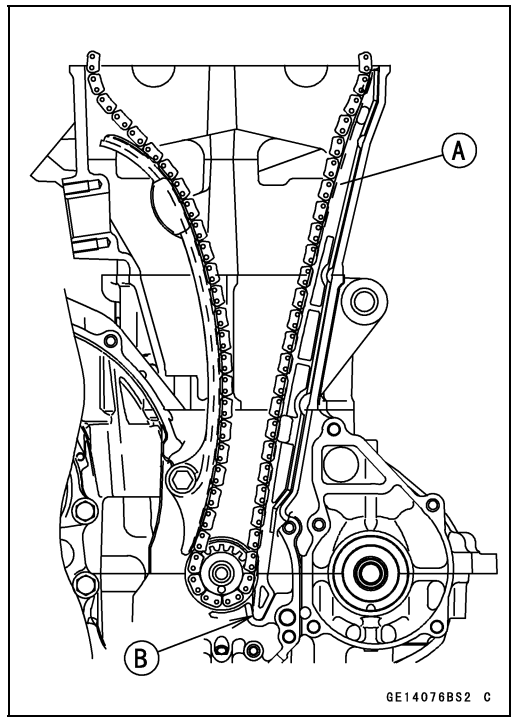
Cylinder Head

● Tighten the cylinder head bolts (M6) and cylinder bolts (M6) [A].

Torque - Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)
Cylinder Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)



● Install the front camshaft chain guide [A].
○Insert the end [B] of front camshaft chain guide into the hollow on the lower crankcase half.
● Install the removed parts (see appropriate chapters).

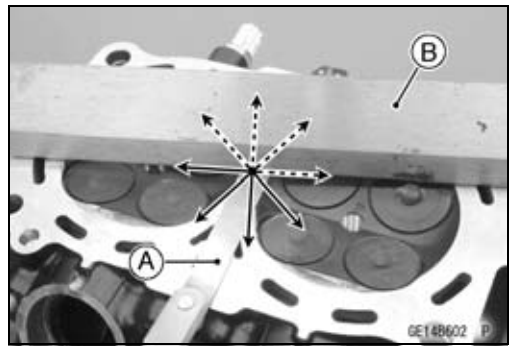


Cylinder Head Warp Inspection

● Clean the cylinder head.
● Lay a straightedge across the lower surface of the cylinder head at several positions.
● Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

Cylinder Head Warp
Standard: – – –
Service Limit: 0.05 mm (0.002 in.)

★If the cylinder head is warped more than the service limit, replace it.
★If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).



Valves

Valve Clearance Inspection

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

Valve Clearance Adjustment

● Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

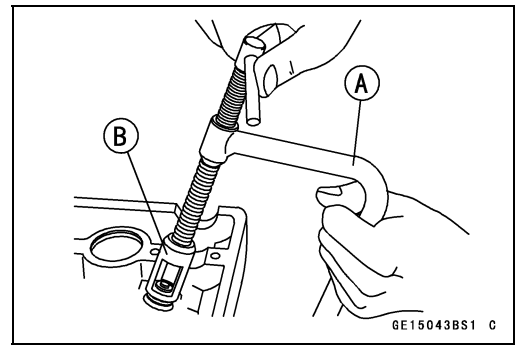
Valve Removal

● Remove:
Cylinder Head (see Cylinder Head Removal)
Valve Lifter and Shim

○Mark and record the valve lifter and shim locations so they can be installed in their original positions.

● Using the valve spring compressor assembly, remove the valve.

Special Tools - Valve Spring Compressor Assembly [A]: 57001-241
Valve Spring Compressor Adapter, ϕ21 [B]: 57001-1272



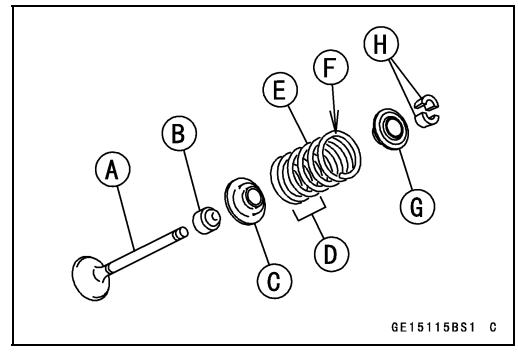
Valve Installation

● Replace the oil seal with a new one.

○Apply engine oil to the oil seal lip.

● Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.

● Install the springs so that the closed coil end faces downwards (the side painted in red faces upwards).
Valve Stem [A]
Oil Seal [B]
Spring Seat [C]
Closed Coil End [D]
Valve Spring [E]
Side Painted in Green [F]
Retainer [G]
Split Keepers [H]



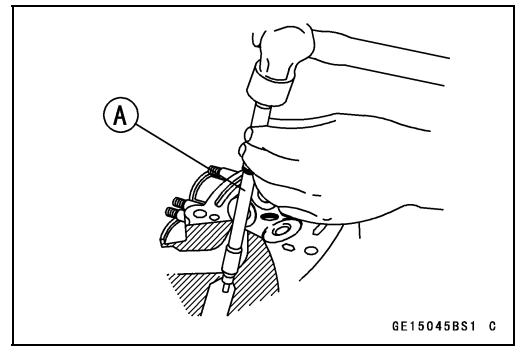
Valve Guide Removal

● Remove:
Valve (see Valve Removal)
Oil Seal
Spring Seat

● Heat the area around the valve guide to 120 ~ 150°C (248 ~ 302°F), and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

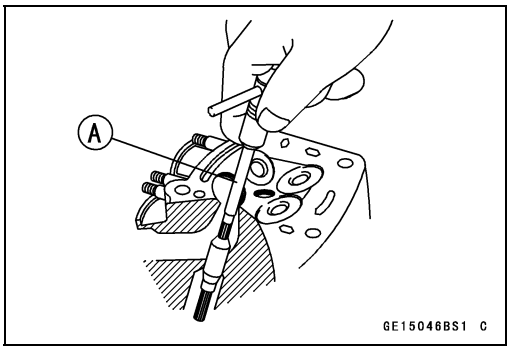
NOTICE
Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head in oil and heat the oil.

Special Tool - Valve Guide Arbor, ϕ4.5: 57001-1331



Valves

Valve Guide Installation



- Replace the snap ring of valve guide with a new one.
- 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).
- Drive the valve guide in from the top of the head using the valve guide arbor. The snap ring stops the guide from going in too far.

Special Tool - Valve Guide Arbor, ϕ4.5: 57001-1331

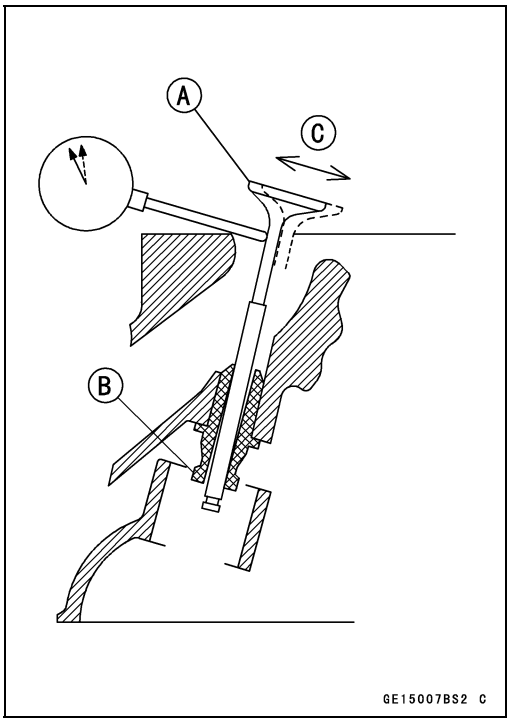
- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.

○Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counter-clockwise or it will be dulled.

○Once the guides are reamed they must be cleaned thoroughly.

Special Tool - Valve Guide Reamer, ϕ4.5: 57001-1333

Valve-to-Guide Clearance Measurement (Wobble Method)



If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
- Move the stem back and forth [C] to measure valve/valve guide clearance.
- Repeat the measurement in a direction at a right angle to the first.

★If the reading exceeds the service limit, replace the guide.

NOTE

○*The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*

Valve/Valve Guide Clearance (Wobble Method)

Standard:

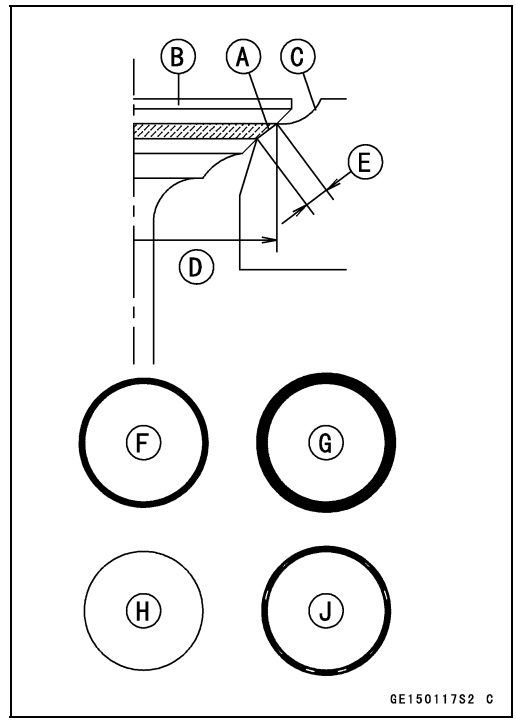
Exhaust	**0.08 ~ 0.15 mm (0.0031 ~ 0.0059 in.)**
Intake	**0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)**

Service Limit:

Exhaust	**0.34 mm (0.013 in.)**
Intake	**0.28 mm (0.011 in.)**

Valves

Valve Seat Inspection



- Remove the valve (see Valve Removal).
- Check the valve seating surface [A] between the valve [B] and valve seat [C].

○Measure the outside diameter [D] of the seating pattern on the valve seat.

★If the outside diameter is too large or too small, repair the seat (see Valve Seat Repair).

Valve Seating Surface Outside Diameter
Standard:

Exhaust	**27.6 ~ 27.8 mm (1.087 ~ 1.094 in.)**
Intake	**32.6 ~ 32.8 mm (1.283 ~ 1.291 in.)**

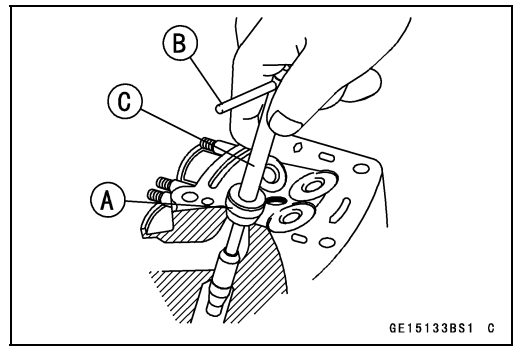
○Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.
Good [F]

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

Valve Seating Surface Width
Standard:

Exhaust	**0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)**
Intake	**0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)**

Valve Seat Repair



- Repair the valve seat with the valve seat cutters [A].

Special Tools - Valve Seat Cutter Holder Bar [B]: 57001 -1128
Valve Seat Cutter Holder, ϕ4.5 [C]: 57001 -1330

For Exhaust Valve Seat
Valve Seat Cutter, 45° - ϕ30: 57001-1187
Valve Seat Cutter, 32° - ϕ30: 57001-1120
Valve Seat Cutter, 60° - ϕ30: 57001-1123

For Intake Valve Seat
Valve Seat Cutter, 45° - ϕ35: 57001-1116
Valve Seat Cutter, 32° - ϕ35: 57001-1121
Valve Seat Cutter, 55° - ϕ35: 57001-1247

★If the manufacturer's instructions are not available, use the following procedure.

Valves

Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

NOTICE
Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

NOTE

○*Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

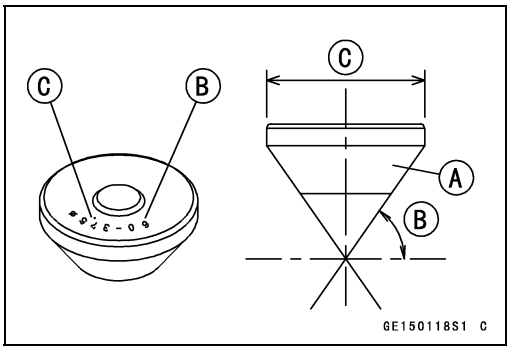
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter

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

60° ..... Cutter angle [B]

ϕ37.5 ..... Outer diameter of cutter [C]

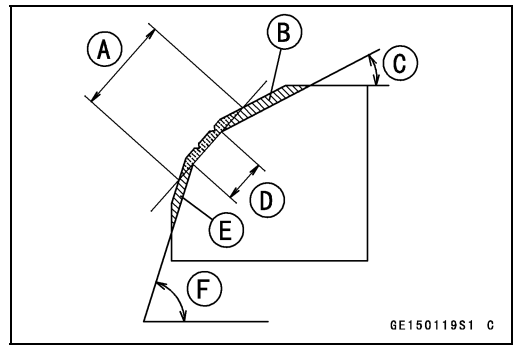


Operating Procedures

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

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

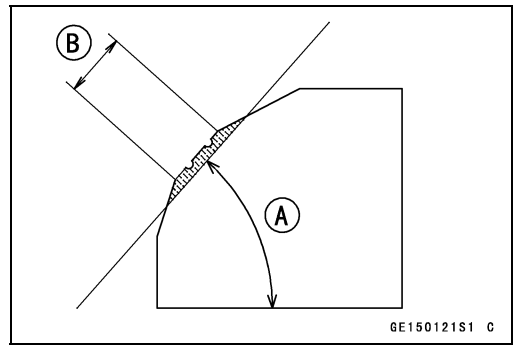
Valves



- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.

Widened Width [A] of engagement by machining with 45° cutter
Ground Volume [B] by 32° cutter
32° [C]
Correct Width [D]
Ground Volume [E] by 60° or 55° cutter
60° or 55° [F]



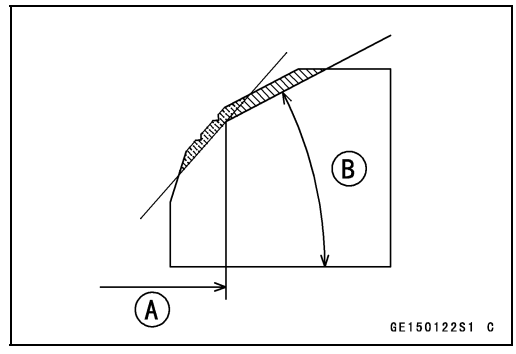
- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

Original Seating Surface [B]

NOTE

○*Remove all pittings of flaws from 45° ground surface.*
○*After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° (or 55°) grinding operation easier.*
○*When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*



★If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.

★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.

- Grind the seat at a 32° angle [B] until the seat outside diameter is within the specified range.

○To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.

○Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

NOTICE

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

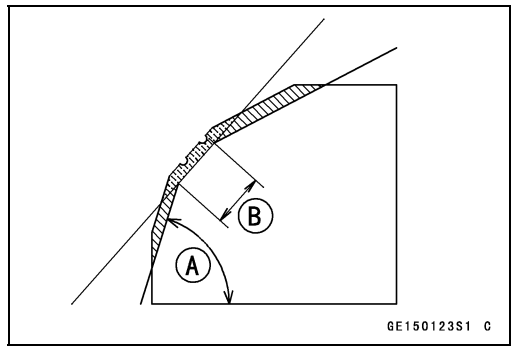
○After making the 32° grind, return to the seat outside diameter measurement step above.

- To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.

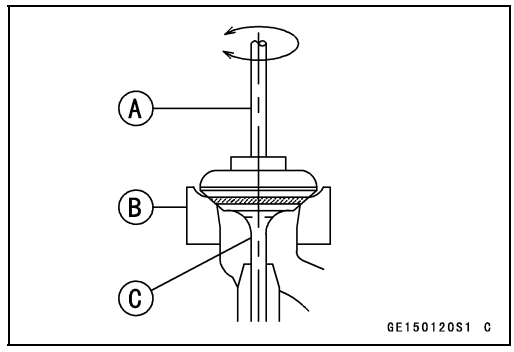
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat outside diameter measurement step above.

Valves

★If the seat width is too wide, make the 60° or 55° [A] grind described below.
★If the seat width is within the specified range, lap the valve to the seat as described below.
● Grind the seat at a 60° or 55° angle until the seat width is within the specified range.
○To make the 60° or 55° grind, fit 60° or 55° cutter into the holder, and slide it into the valve guide.
○Turn the holder, while pressing down lightly.
○After making the 60° or 55° grind, return to the seat width measurement step above.
Correct Width [B]



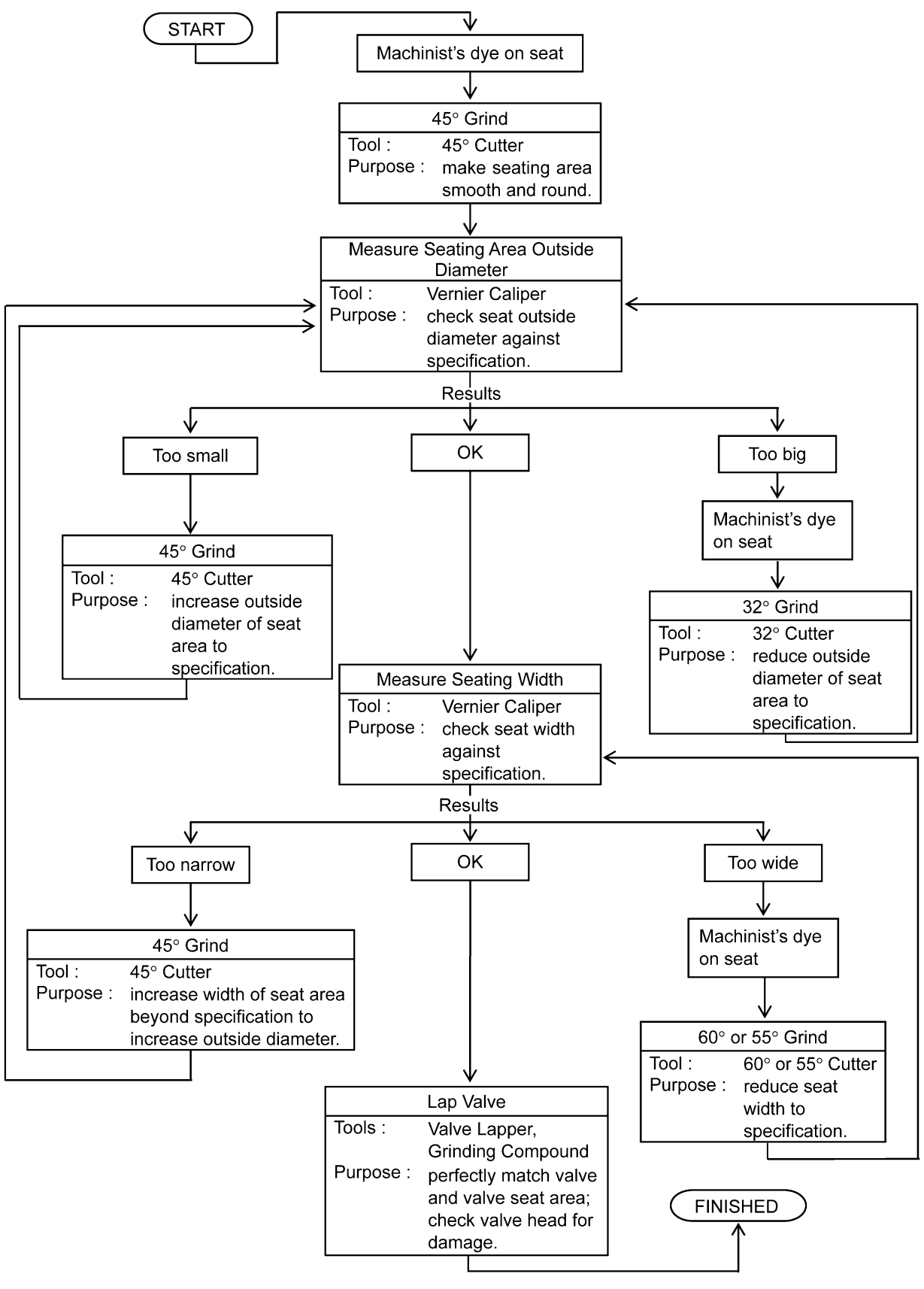
● Lap the valve to the seat, once the seat width and outside diameter are within the ranges specified above.
○Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
○Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
○Repeat the process with a fine grinding compound.
Lapper [A]
Valve Seat [B]
Valve [C]



● The seating area should be marked about in the middle of the valve face.
★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
● Be sure to remove all grinding compound before assembly.
● When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment in the Periodic Maintenance chapter).

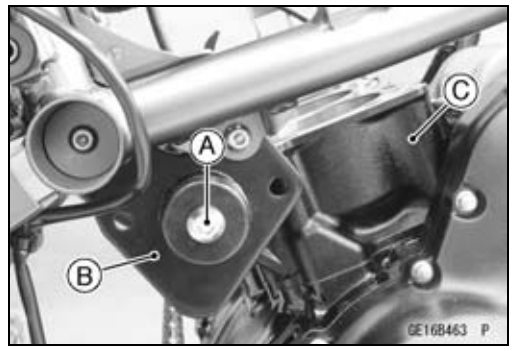
Valves

Valve Seat Repair



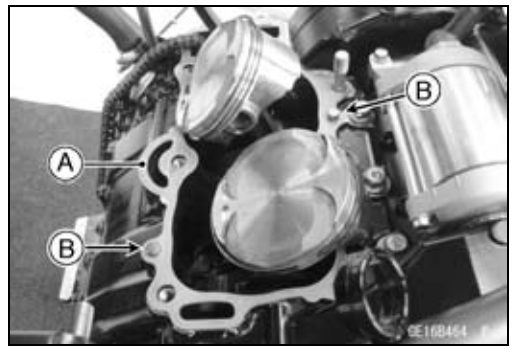
Cylinder, Pistons

Cylinder Removal



- Remove:
  Cylinder Head (see Cylinder Head Removal)
  Front Engine Mounting Bolt (Both Sides) [A] (see Engine Removal in the Engine Removal/Installation chapter)
  Front Engine Bracket (Both Sides) [B] (see Engine Removal in the Engine Removal/Installation chapter)
  Cylinder [C]

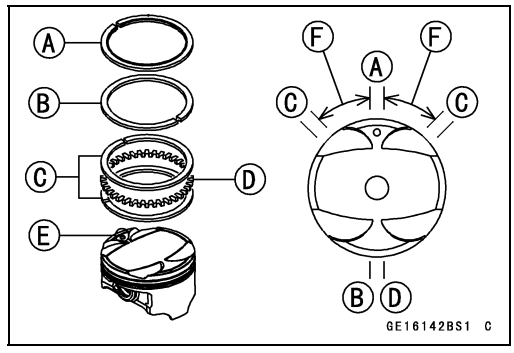
Cylinder Installation



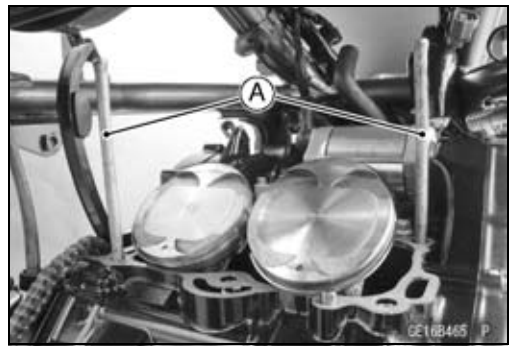
NOTE

○*If a new cylinder is used, use new piston ring.*

- Replace the cylinder gasket [A] with a new one.
- Install the dowel pins [B] and new cylinder gasket.



- The piston ring openings must be positioned as shown. The openings of the oil ring steel rails must be about 30 ~ 40° of angle from the opening of the top ring.
  Top Ring [A]
  Second Ring [B]
  Oil Ring Steel Rails [C]
  Oil Ring Expander [D]
  Dent [E]
  30 ~ 40° [F]



- Apply molybdenum disulfide oil solution to the cylinder bore, piston rings and piston skirt.
- Prepare two auxiliary head bolts with their head cut.

○Install the two bolts [A] diagonally in the crankcase.

- Position the crankshaft so that all the piston heads are almost level.
- Install the cylinder block.

○Insert the piston rings with your thumbs.

- Install the removed parts (see appropriate chapters).

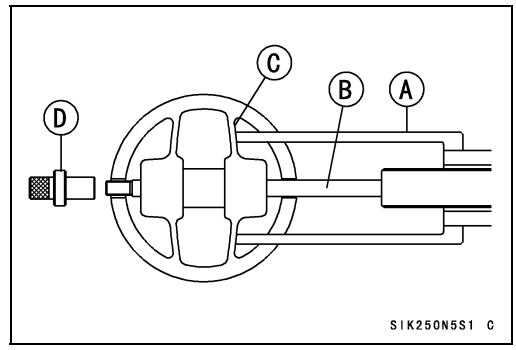
Piston Removal

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

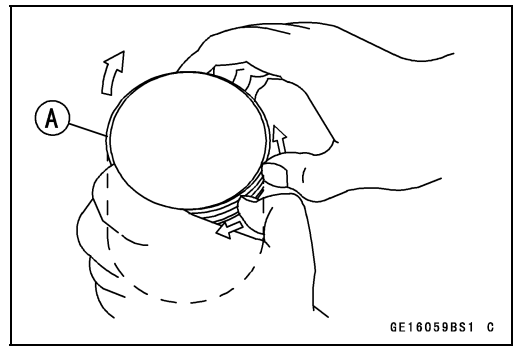
Cylinder, Pistons

- Remove the piston pins with the piston pin puller [A].
  Center Bolt [B]
  Shell of Piston [C]

  Special Tools - Piston Pin Puller: 57001-1568
  Piston Pin Puller Adapter, ϕ12 [D]: 57001 -1657
- Remove the pistons.



- 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.



Piston Installation

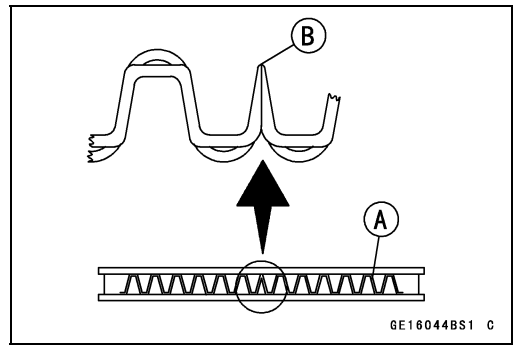
NOTE

○*If a new piston is used, use new piston ring.*

- Apply molybdenum disulfide oil solution to the oil ring expander, install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Apply molybdenum disulfide oil solution to the oil ring steel rails, and install the oil ring steel rails, one above the expander and one below it.

○Spread the rail with your thumbs, but only enough to fit the rail over the piston.

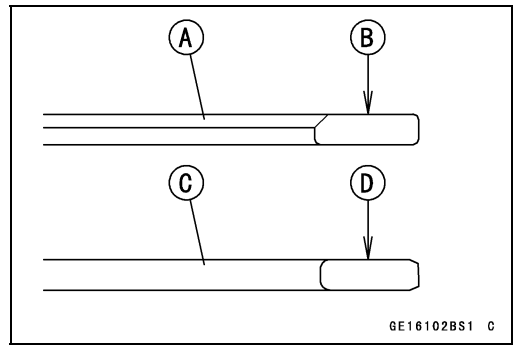
○Release the rail into the bottom piston ring groove.



NOTE

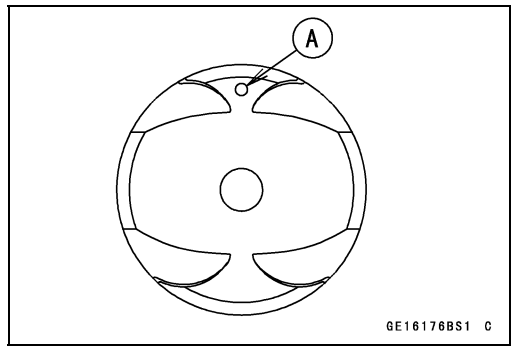
○*The oil ring rails have no “top” or “bottom”.*

- Apply molybdenum disulfide oil solution to the top and second rings.
- Do not mix up the top and second ring.
- Install the top ring [A] so that the "R" mark [B] faces up.
- Install the second ring [C] so that the "RN" mark [D] faces up.

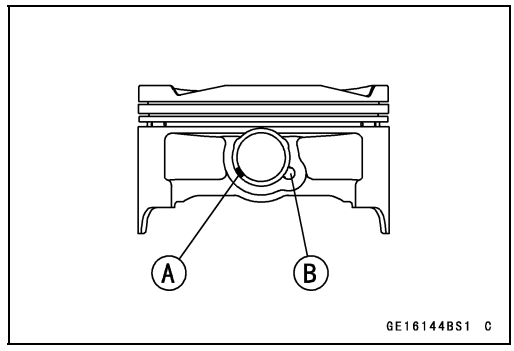


Cylinder, Pistons

● Install the piston with its dent mark [A] facing forward.



● Apply molybdenum disulfide oil solution to the piston pins and piston journals.
● Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
○When installing the piston pin snap ring, compress it only enough to install it and no more.



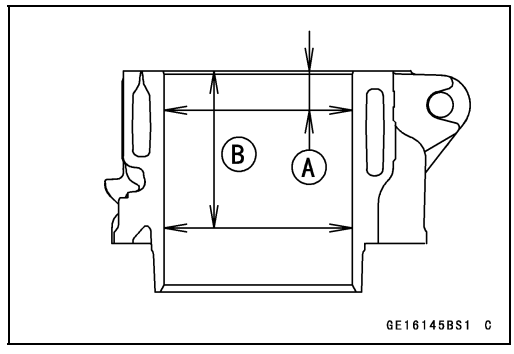
NOTICE

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

● Install the cylinder (see Cylinder Installation).

Cylinder Wear Inspection

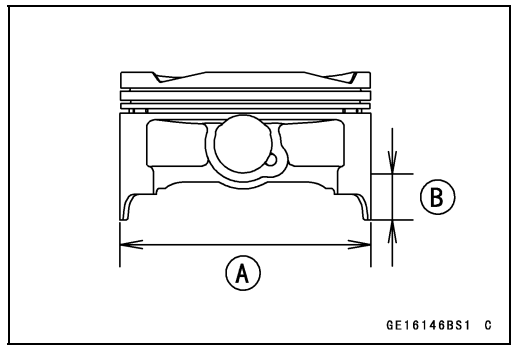
● Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) shown.
★If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.
10 mm (0.39 in.) [A]
60 mm (2.36 in.) [B]



Cylinder Inside Diameter
Standard: 82.994 ~ 83.006 mm (3.2675 ~ 3.2679 in.)
Service Limit: 83.09 mm (3.271 in.)

Piston Wear Inspection

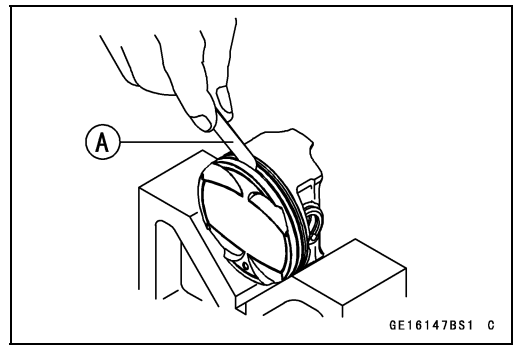
● Measure the outside diameter [A] of each piston 14 mm (0.5512 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.
★If the measurement is under service limit, replace the piston.



Piston Diameter
Standard: 82.969 ~ 82.984 mm (3.2665 ~ 3.2671 in.)
Service Limit: 82.82 mm (3.261 in.)

Cylinder, Pistons

Piston Ring, Piston Ring Groove Wear Inspection



- Check for uneven groove wear by inspecting the ring seating.

★The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

Piston Ring/Groove Clearance

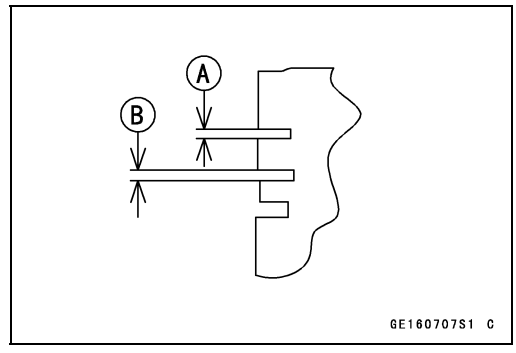
Standard:

Top	**0.030 ~ 0.070 mm (0.00118 ~ 0.00276 in.)**
Second	**0.020 ~ 0.060 mm (0.00079 ~ 0.00236 in.)**

Service Limit:

Top	**0.17 mm (0.0067 in.)**
Second	**0.16 mm (0.0063 in.)**

Piston Ring Groove Width Inspection



- Measure the piston ring groove width.

○Use a vernier caliper at several points around the piston.

Piston Ring Groove Width

Standard:

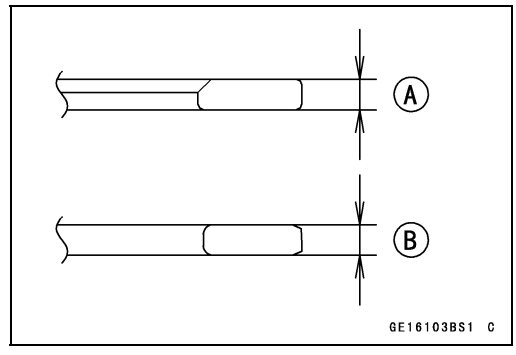
Top [A]	**0.92 ~ 0.94 mm (0.0362 ~ 0.0370 in.)**
Second [B]	**1.01 ~ 1.03 mm (0.0398 ~ 0.0406 in.)**

Service Limit:

Top	**1.02 mm (0.0402 in.)**
Second	**1.11 mm (0.0437 in.)**

★If the width of any of the two grooves is wider than the service limit at any point, replace the piston.

Piston Ring Thickness Inspection



- Measure the piston ring thickness.

○Use the micrometer to measure at several points around the ring.

Piston Ring Thickness

Standard:

Top [A]	**0.870 ~ 0.890 mm (0.0343 ~ 0.0350 in.)**
Second [B]	**0.970 ~ 0.990 mm (0.0382 ~ 0.0390 in.)**

Service Limit:

Top	**0.80 mm (0.031 in.)**
Second	**0.90 mm (0.035 in.)**

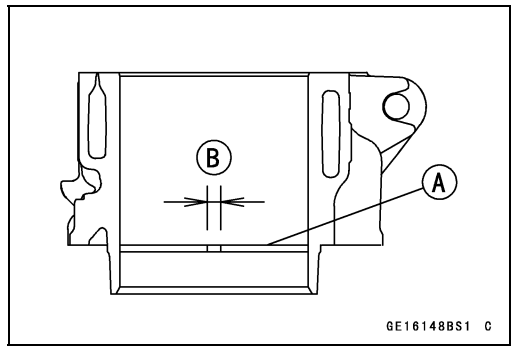
★If any of the measurements is less than the service limit on either of the rings, replace all the rings.

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.*

Cylinder, Pistons

Piston Ring End Gap Inspection



- 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 ~ 0.40 mm (0.0098 ~ 0.0158 in.)**
Second	**0.40 ~ 0.55 mm (0.0158 ~ 0.0217 in.)**

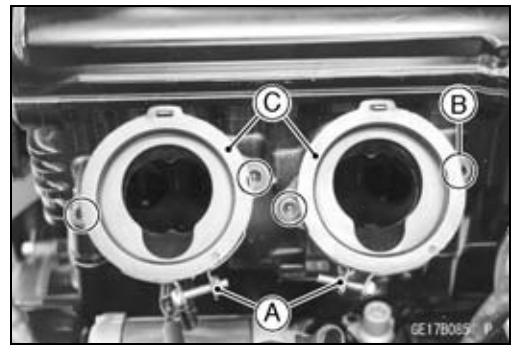
Service Limit:

Top	**0.7 mm (0.03 in.)**
Second	**0.9 mm (0.04 in.)**

★If the end gap of either ring is greater than the service limit, replace all the rings.

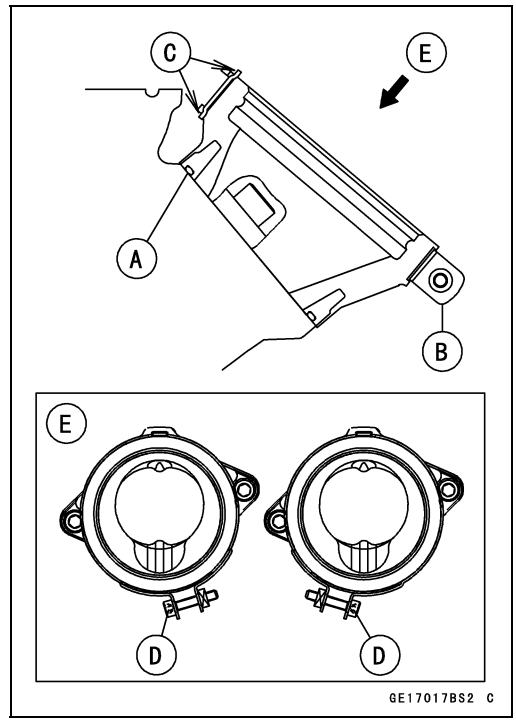
Throttle Body Assy Holder

Throttle Body Assy Holder Removal



- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Clamps [A]
  Throttle Body Assy Holder Bolts [B]
  Throttle Body Assy Holders [C]

Throttle Body Assy Holder Installation



- Be sure to install the new O-rings [A].
- Apply grease to the new O-ring.
- Tighten:

Torque - Throttle Body Assy Holder Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Install the clamps [B] so that their projections [C] fit on the holes of the holders.

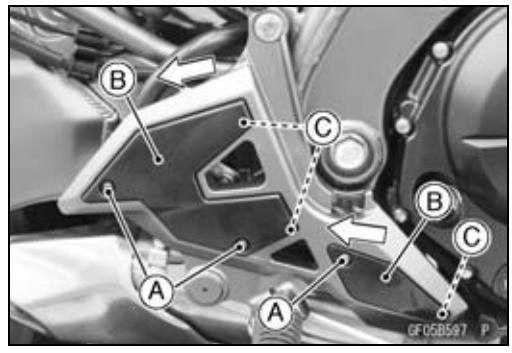
○Be sure that the clamp bolt heads [D] face outward.
Upside View [E]

Muffler

Muffler Removal

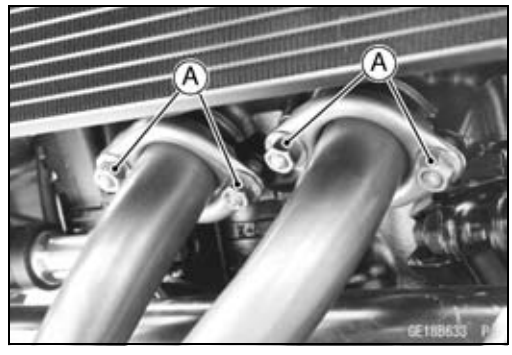
⚠ WARNING

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

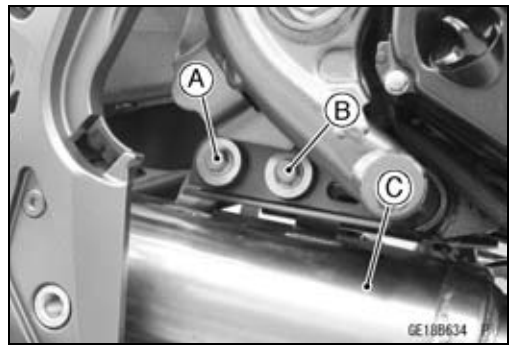


- Remove:
  Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  Lower Fairings (see Lower Fairing Removal in the Frame chapter)
- Disconnect:
  Oxygen Sensor Lead Connector (see Oxygen Sensor Removal in the Electrical System chapter)
  Bolts [A]
- Pull the covers [B] backward to clear the tabs [C].

- Remove:
  Footpeg Stay Bolts [A]



- Remove the exhaust pipe holder nuts [A].



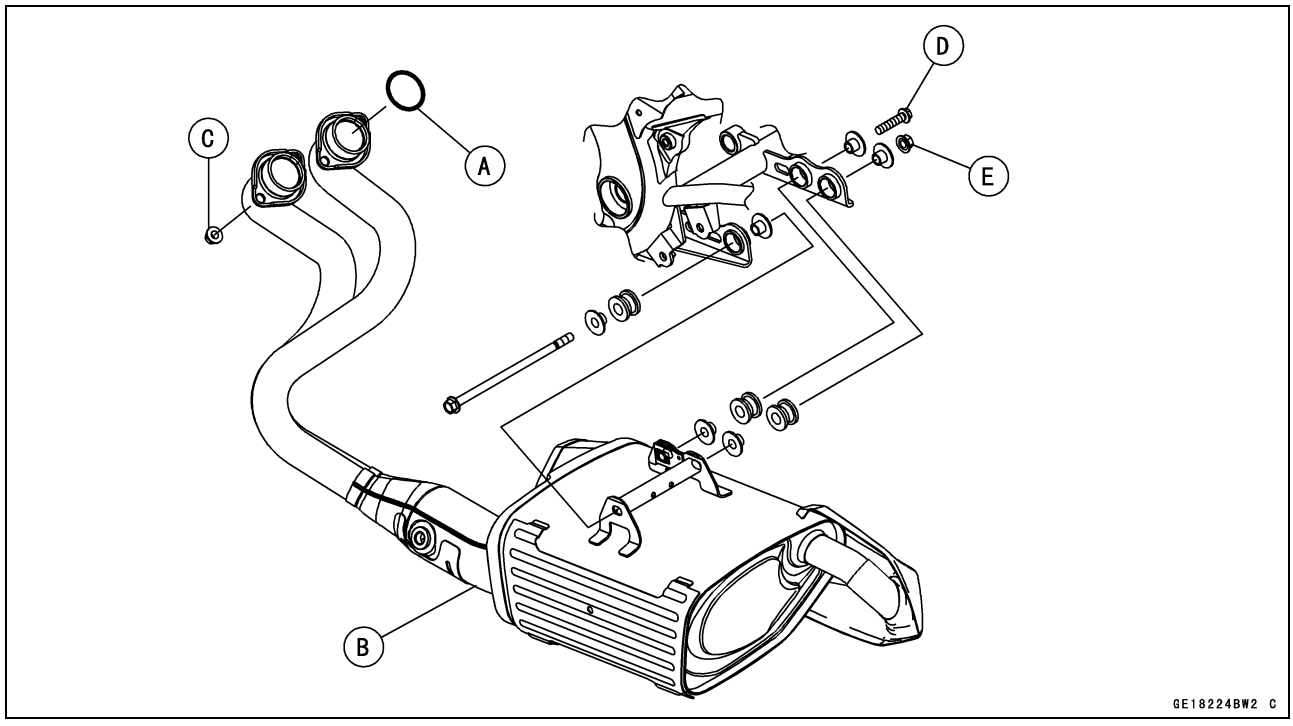
- Remove:
  Muffler Body Mounting Bolt and Nut [A]
  Muffler Boy Mounting Bolt [B]
  Muffler [C]

Muffler

Muffler Installation

- Replace the exhaust pipe gaskets [A] with new ones and install them.
- Install the muffler [B].
- Tighten:

Torque - Exhaust Pipe Holder Nuts [C]: 17 N·m (1.7 kgf·m, 13 ft·lb)
Muffler Body Mounting Bolt [D]: 20 N·m (2.0 kgf·m, 15 ft·lb)
Muffler Body Mounting Nut [E]: 20 N·m (2.0 kgf·m, 15 ft·lb)



- Install the right front footpeg stay (see Clutch Cover Installation in the Clutch chapter).
- Install the removed parts (see appropriate chapters).
- Thoroughly warm up the engine, wait until the engine cools down, and retighten all the bolts and nuts.

Clutch

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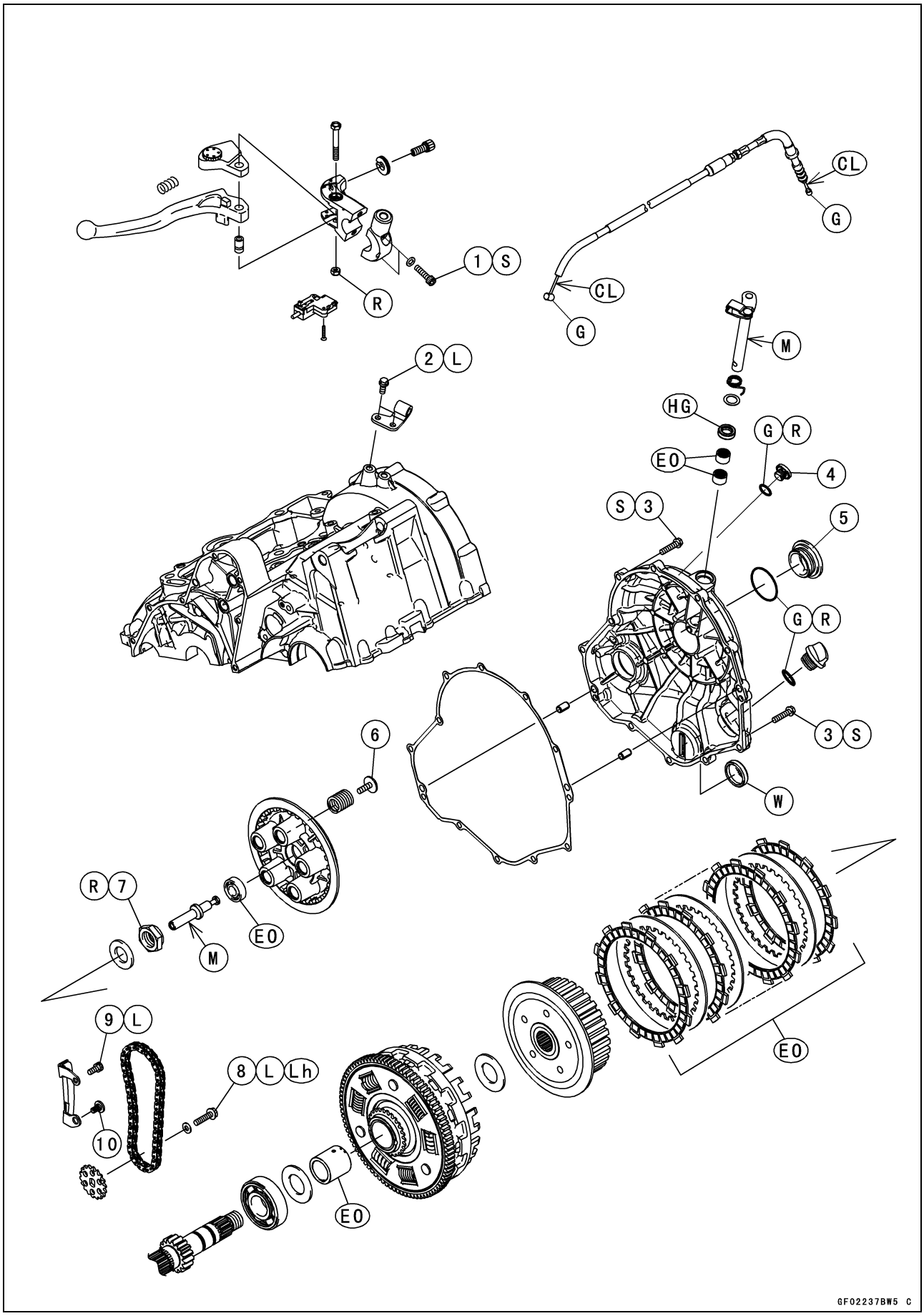
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Lever Holder Clamp Bolts	7.8	0.80	69 in·lb	S
2	Clutch Cable Holder Bolts	9.8	1.0	87 in·lb	L
3	Clutch Cover Bolts	9.8	1.0	87 in·lb	S
4	Timing Inspection Cap	3.9	0.40	35 in·lb	
5	Timing Rotor Bolt Cap	4.9	0.50	43 in·lb	
6	Clutch Spring Bolts	9.8	1.0	87 in·lb	
7	Clutch Hub Nut	200	20.4	148	R
8	Oil Pump Sprocket Bolt	12	1.2	106 in·lb	L, Lh
9	Oil Pump Chain Guide Bolt, L = 12 mm (0.47 in.)	12	1.2	106 in·lb	L
10	Oil Pump Chain Guide Bolt, L = 11 mm (0.43 in.)	12	1.2	106 in·lb	

CL: Apply cable lubricant.
EO: Apply engine oil.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
Lh: Left-hand Threads
M: Apply molybdenum disulfide grease.
R: Replacement Parts
S: Follow the specified tightening sequence.
W: Apply water.

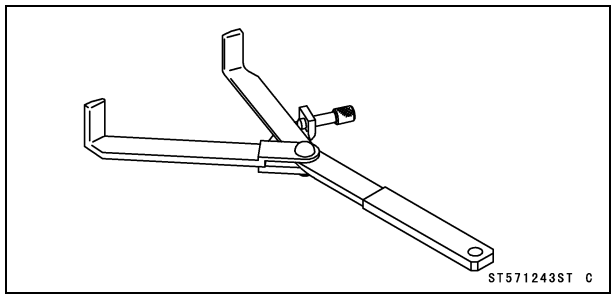
6-4 CLUTCH

Specifications

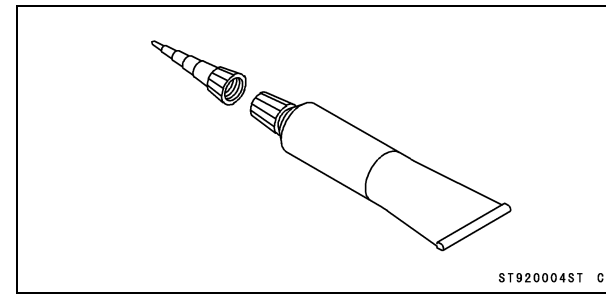
Item	Standard	Service Limit
Clutch Lever and Cable		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	– – –
Clutch		
Friction Plate Thickness	2.60 ~ 3.00 mm (0.102 ~ 0.118 in.)	2.5 mm (0.10 in.)
Friction Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.01 in.)
Steel Plate Warp	0.2 mm (0.0079 in.) or less	0.3 mm (0.01 in.)
Clutch Spring Free Length	33.6 mm (1.32 in.)	32.6 mm (1.28 in.)

Special Tool and Sealant

Clutch Holder:
57001-1243



Liquid Gasket, TB1211F:
92104-0004



Clutch Lever and Cable

Clutch Lever Free Play Inspection

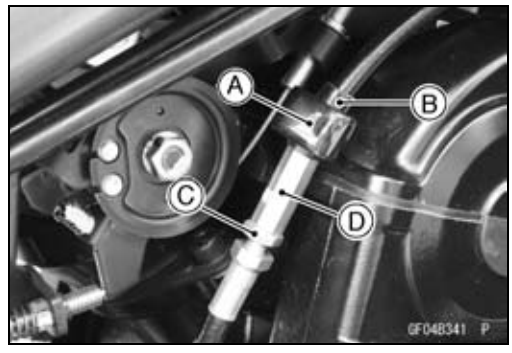
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

Clutch Lever Free Play Adjustment

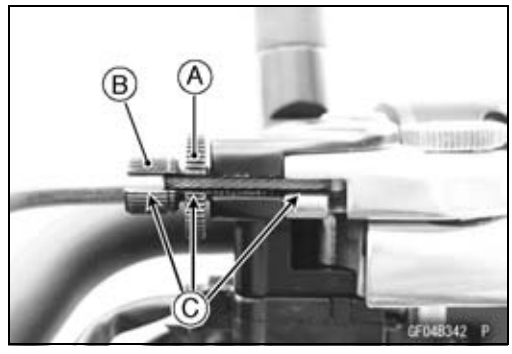
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

Clutch Cable Removal

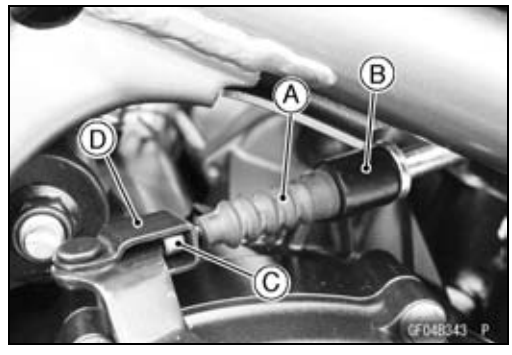
- Remove the right frame cover (see Frame Cover Removal in the Frame chapter).
- Open the clamp [A].
- Slide the dust cover [B].
- Loosen the locknut [C], and turn the adjusting nut [D] to give the cable plenty of play.



- Loosen the locknut [A].
- Screw in the adjuster [B].
- Line up the slots [C] in the clutch lever, locknut and adjuster, and then free the cable from the lever.



- Slide the dust cover [A] at the clutch cable lower end and pull the clutch cable out of the clutch cable holder [B].
- Free the clutch inner cable tip [C] from the clutch release lever [D].
- Push the release lever toward the front of the motorcycle and tape the release lever to the clutch cover to prevent the release shaft from falling out.
- Pull the clutch cable out of the frame.



Clutch Cable Installation

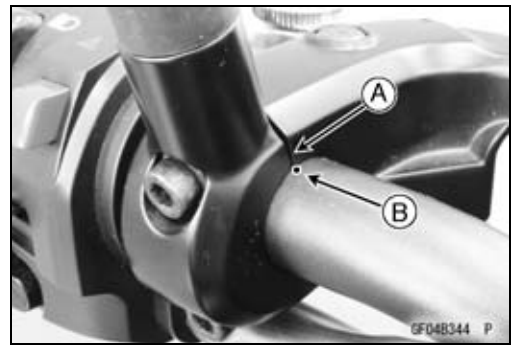
- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).

Clutch Cable Lubrication

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

Clutch Lever and Cable

Clutch Lever Assembly Installation



- Install the clutch lever holder so that the mating surface [A] of the clutch lever holder clamp is aligned with the punch mark [B].
- Tighten the upper clamp bolt first, and then the lower clamp bolt.

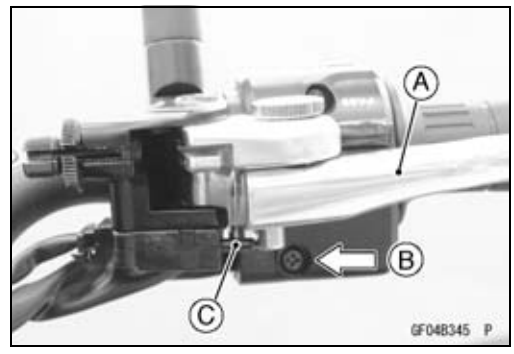
○There will be a gap at the lower part of the clamp after tightening.

Torque - Clutch Lever Holder Clamp Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)

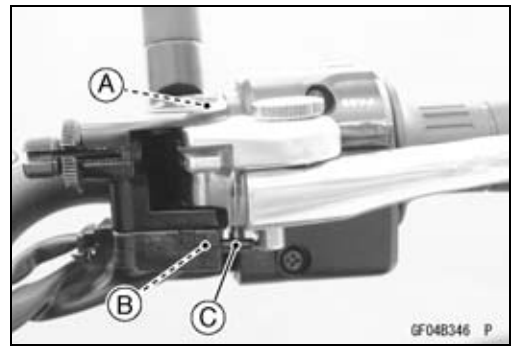
Clutch Lever Installation

⚠ WARNING

If the starter lockout switch pin has been damaged the starter lockout system will not work properly. This allows the motorcycle to be started in gear with the clutch lever released (clutch engaged), creating sudden forward movement that can result in an accident or injury. Check that the starter lockout switch operates properly when installing the clutch lever.



- Replace the locknut with a new one.
- Install the clutch lever [A] from frame left side [B] so that it may not damage a pin [C] of the starter lockout switch.



- Install the bolt [A] and tighten the locknut [B].
- Install the upper end of the clutch cable (see Clutch Cable Installation).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).
- Check that the pin [C] of the starter lockout switch moves smoothly.

⚠ WARNING

Too much cable play can prevent clutch disengagement and cause an accident resulting in serious injury or death. When adjusting the clutch or replacing the cable, be sure the upper end of the clutch outer cable is fully seated in its fitting, or it could slip into place later, creating enough cable play to prevent clutch disengagement.

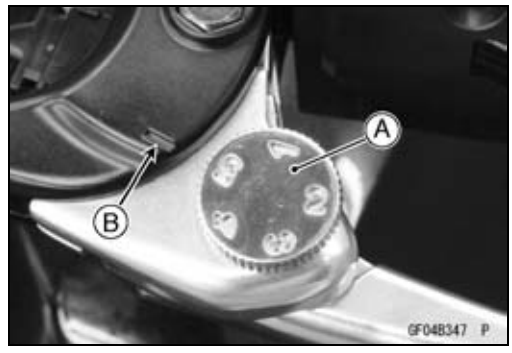
Clutch Lever and Cable

Clutch Lever Position Adjustment

The adjuster has 5 positions so that the clutch lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.

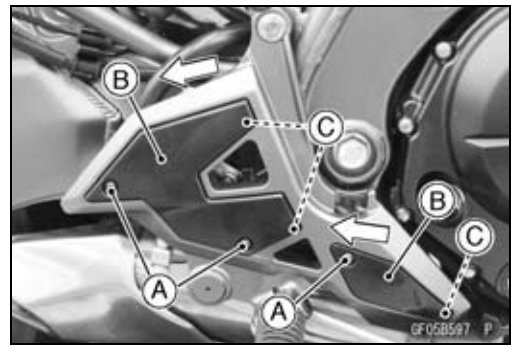
○The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



Clutch Cover

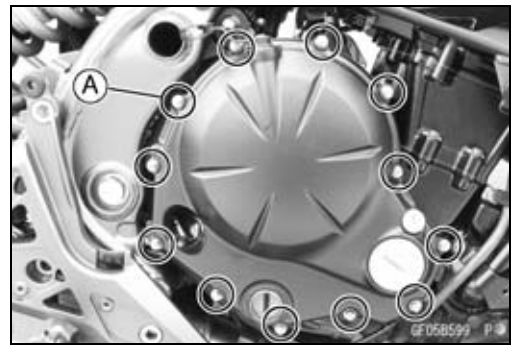
Clutch Cover Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Clutch Cable Lower End (see Clutch Cable Removal)
  Bolts [A]
- Pull the covers [B] backward to clear the tabs [C].

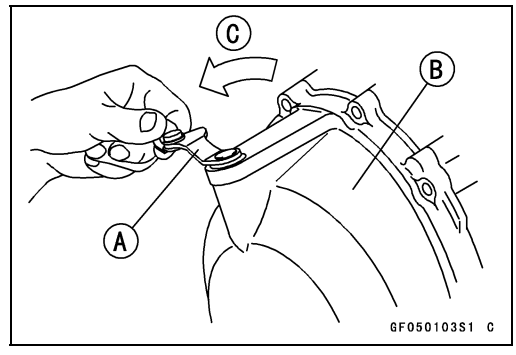


- Remove:
  Footpeg Bracket Bolts [A]

- Remove:
  Clutch Cover Bolts [A]



- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B].
  About 90° [C]

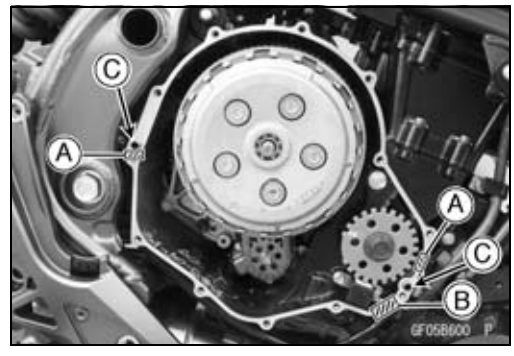


Clutch Cover Installation

- Apply liquid gasket to the areas [A] where the mating surface of the crankcase touches the clutch cover gasket and to the crankshaft sensor lead grommet [B].

  Sealant - Liquid Gasket, TB1211F: 92104-0004

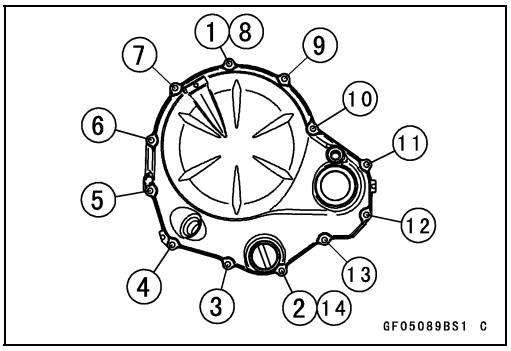
- Be sure that the dowel pins [C] are in position.
- Replace the clutch cover gasket with a new one.



Clutch Cover

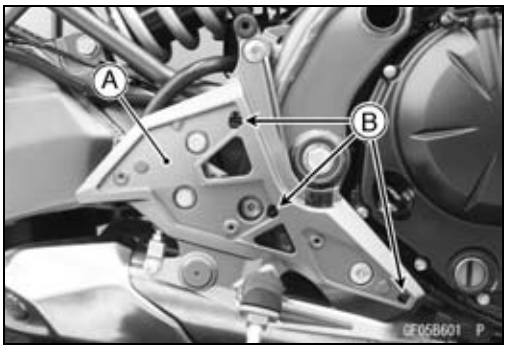
- Tighten the clutch cover bolts following the specified tightening [1 ~ 14].

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

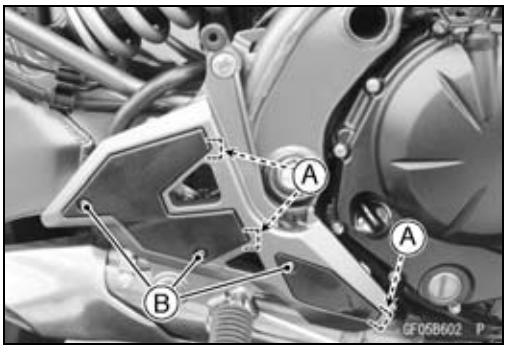


- Install the right footpeg bracket [A].
- Tighten:

Torque - Footpeg Bracket Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)



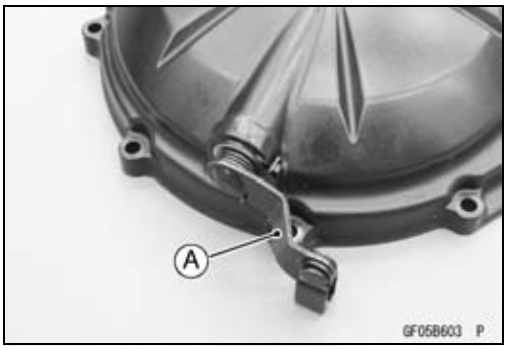
- Insert the tabs [A] of the cover into the holes of the footpeg bracket.
- Tighten the bolts [B].



Release Shaft Removal

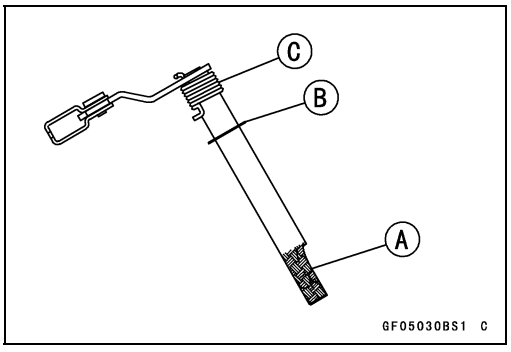
NOTICE
Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.

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



Release Shaft Installation

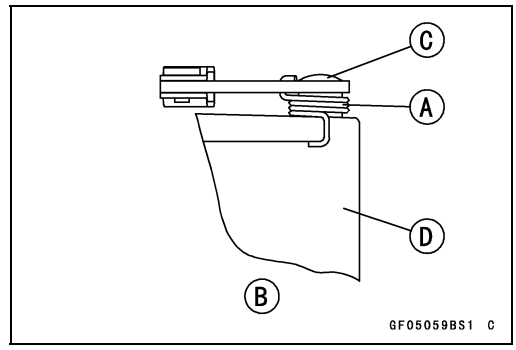
- Apply grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearings in the hole of the clutch cover.
- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Install the washer [B] and spring [C].
- Insert the release shaft straight into the upper hole of the clutch cover.



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

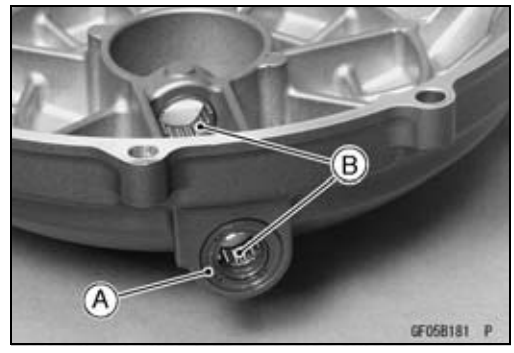
Clutch Cover

● Fit the spring [A] as shown.
Viewed from Rear [B]
Release Shaft [C]
Clutch Cover [D]

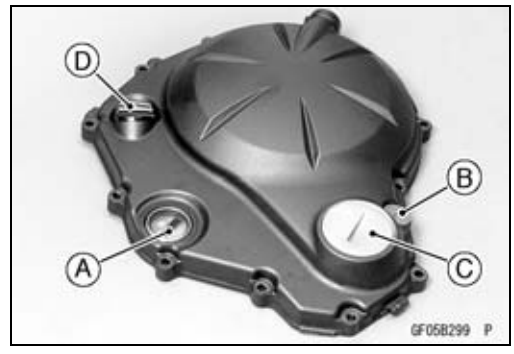


Clutch Cover Disassembly

● Remove:
Clutch Cover (see Clutch Cover Removal)
Release Lever and Shaft Assembly (see Release Shaft Removal)
Oil Seal [A]
Needle Bearings [B]



● Remove:
Oil Level Inspection Window[A]
Timing Inspection Cap [B]
Timing Rotor Bolt Cap [C]
Oil Filler Plug [D]



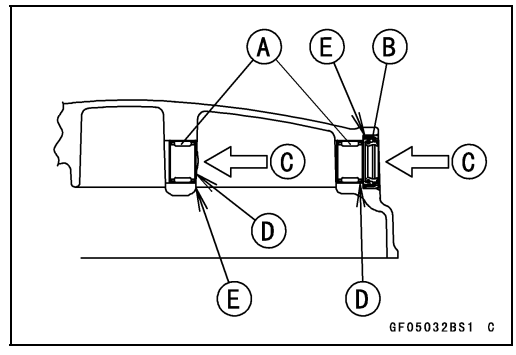
Clutch Cover Assembly

● Replace the needle bearings and oil seal with new ones.

NOTE

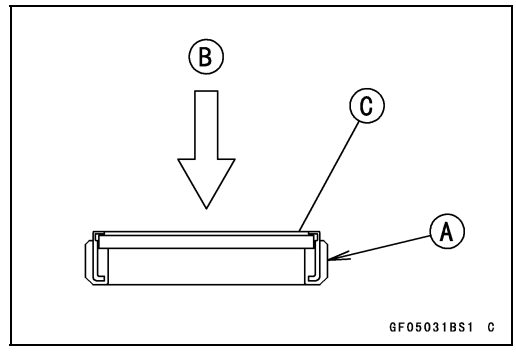
○*Install the needle bearings so that the manufacture's mark face out.*

● Install the needle bearings [A] and oil seal [B] position as shown.
○Press [C] the bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].
○Press the oil seal until it is bottomed.



● Apply water to the rubber of the oil level inspection window [A] and press [B] it so that the glass surface [C] faces outside.
● Replace the O-rings of the following parts with new ones.
Timing Inspection Cap
Timing Rotor Bolt Cap
Oil Filler Plug
● Apply grease to the new O-rings.
● Tighten:

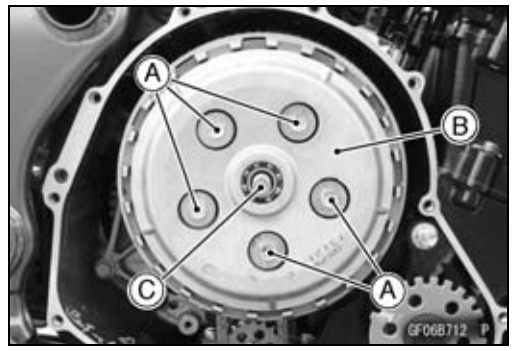
Torque - Timing Inspection Cap: 3.9 N·m (0.40 kgf·m, 35 in·lb)
Timing Rotor Bolt Cap: 4.9 N·m (0.50 kgf·m, 43 in·lb)



Clutch

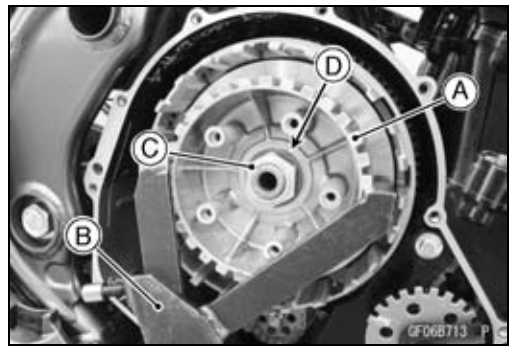
Clutch Removal

- Remove:
  Clutch Cover (see Clutch Cover Removal)
  Clutch Spring Bolts [A]
  Clutch Springs
  Clutch Spring Plate [B] (with bearing)
  Pusher [C]

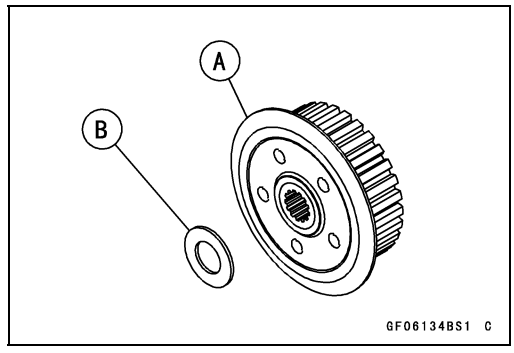


- Remove:
  Friction Plates
  Steel Plates
- Hold the clutch hub [A] steady with the clutch holder [B], and remove the clutch hub nut [C] and washer [D].

Special Tool - Clutch Holder: 57001-1243



- Remove:
  Clutch Hub [A]
  Spacer [B]

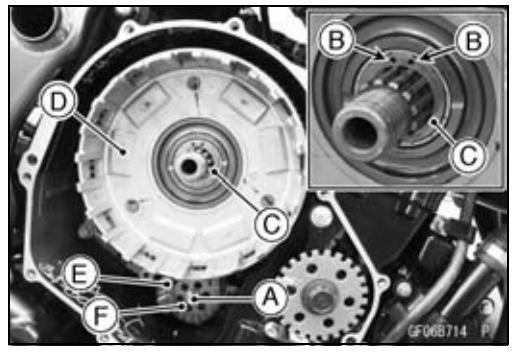


- Remove the oil pump sprocket bolt [A].

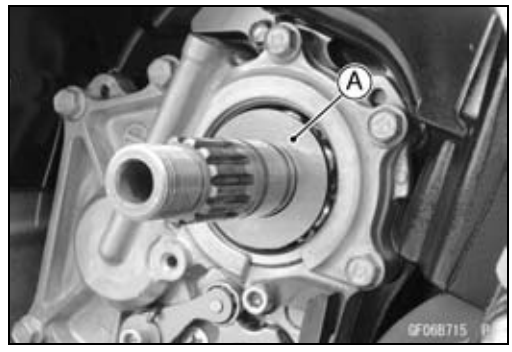
NOTE

○*The oil pump sprocket bolt has a left-hand threads.*

- Using the holes [B], pull out the sleeve [C].
- Remove the following as a set.
  Clutch Housing [D]
  Oil Pump Chain [E]
  Oil Pump Sprocket [F]



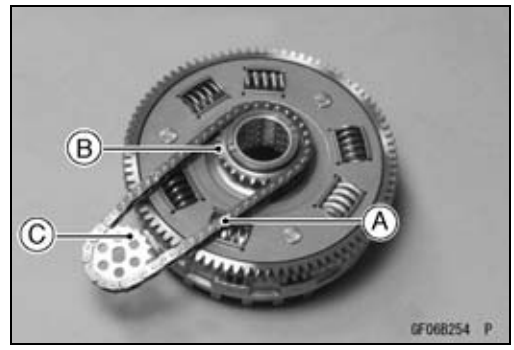
- Remove:
  Spacer [A]



Clutch

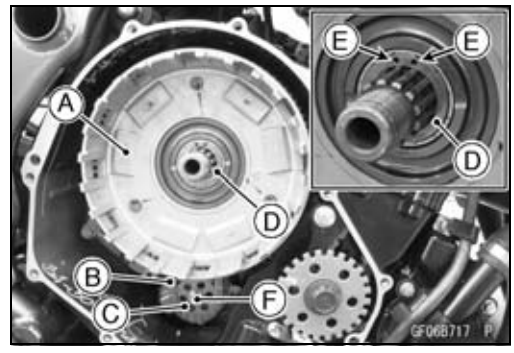
Clutch Installation

- Install the spacer on the drive shaft.
- Engage the oil pump chain [A] to the clutch housing gear [B] and the oil pump sprocket [C].



- Install the following on the drive shaft as a set.
  Clutch Housing [A]
  Oil Pump Chain [B]
  Oil Pump Sprocket [C]
- Apply molybdenum disulfide oil solution to the sleeve [D].
- Install the sleeve so that the holes [E] faces outward.
- Align the hole on the oil pump sprocket with the oil pump shaft.
- Apply a non-permanent locking agent to the oil pump sprocket bolt [F] and install the washer.
- Tighten:

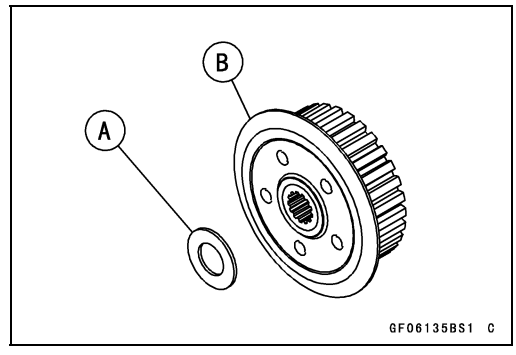
Torque - Oil Pump Sprocket Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)



NOTE

○*The oil pump sprocket bolt has a left-hand threads.*

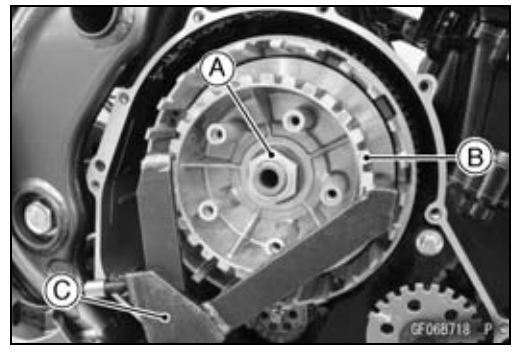
- Install the following parts on the drive shaft.
  Spacer [A]
  Clutch Hub [B]



- Install the washer so that the punch mark faces outward.
- Replace the clutch hub nut [A] with a new one.
- Hold the clutch hub [B] steady with the clutch holder [C], and tighten the clutch hub nut.

Special Tool - Clutch Holder: 57001-1243

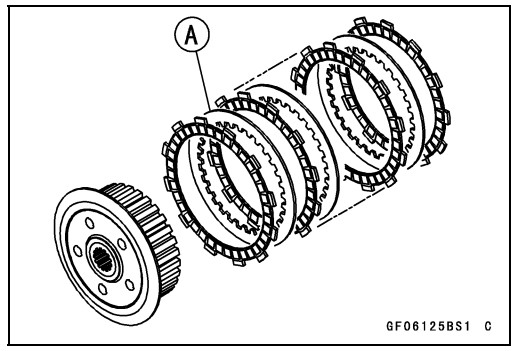
Torque - Clutch Hub Nut: 200 N·m (20.4 kgf·m, 148 ft·lb)



Clutch

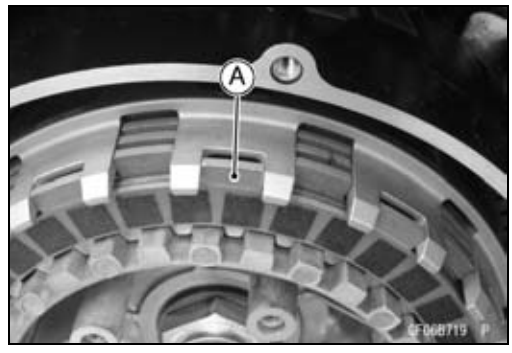
● Install the friction plates and steel plates, starting with a friction plate and alternating them.

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

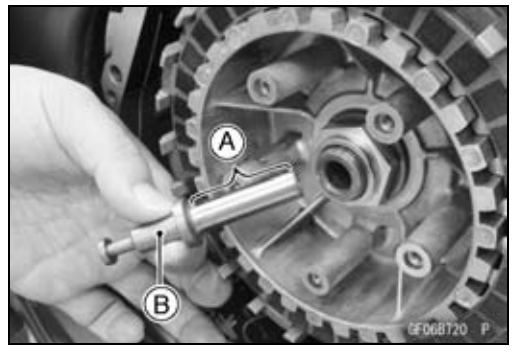


○For the first steel plate [A], its thickness is 2.6 mm (0.10 in.). The others are 2.3 mm (0.09 in.).

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



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



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

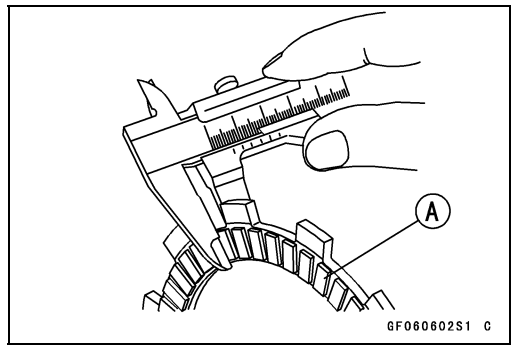
Torque - Clutch Spring Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

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

Clutch Plate, Wear, Damage Inspection

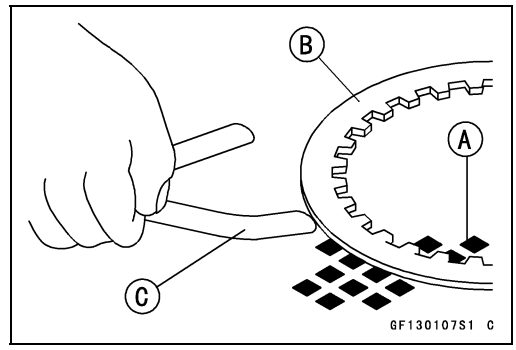
● Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
● Measure the thickness of each friction plate [A] at several points.
★If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

Friction Plate Thickness
Standard: 2.60 ~ 3.00 mm (0.102 ~ 0.118 in.)
Service Limit: 2.5 mm (0.10 in.)



Clutch

Clutch Plate Warp Inspection



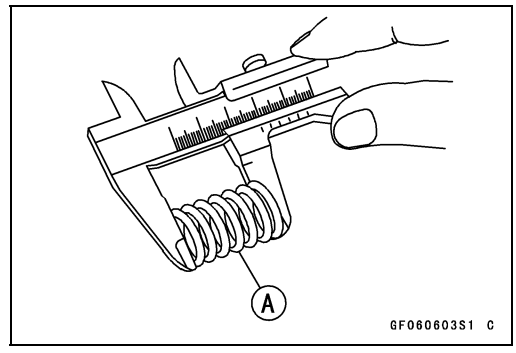
- Place each friction plate or steel plate on a surface plate and measure the gap between the surface plate [A] and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp.

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

Friction Plate Warp
Standard: 0.15 mm (0.0059 in.) or less
Service Limit: 0.3 mm (0.01 in.)

Steel Plate Warp
Standard: 0.2 mm (0.0079 in.) or less
Service Limit: 0.3 mm (0.01 in.)

Clutch Spring Free Length Measurement

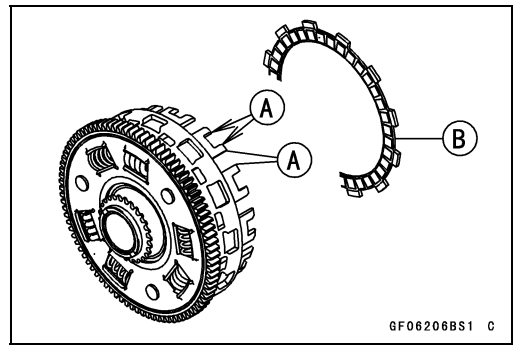


- Measure the free length of the clutch springs [A].

★If any spring is shorter than the service limit, it must be replaced.

Clutch Spring Free Length
Standard: 33.6 mm (1.32 in.)
Service Limit: 32.6 mm (1.28 in.)

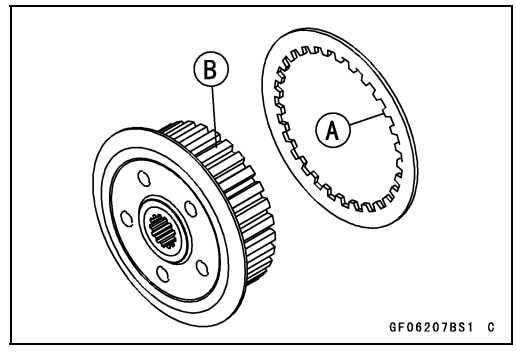
Clutch Housing Finger Inspection



- Visually inspect the clutch housing fingers [A] where the friction plate tangs [B] hit them.

★If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.

Clutch Housing Spline Inspection



- Visually inspect where the teeth [A] on the steel plates wear against the clutch hub splines [B].

★If there are notches worn into the splines, replace the clutch hub. Also, replace the steel plates if their teeth are damaged.

Engine Lubrication System

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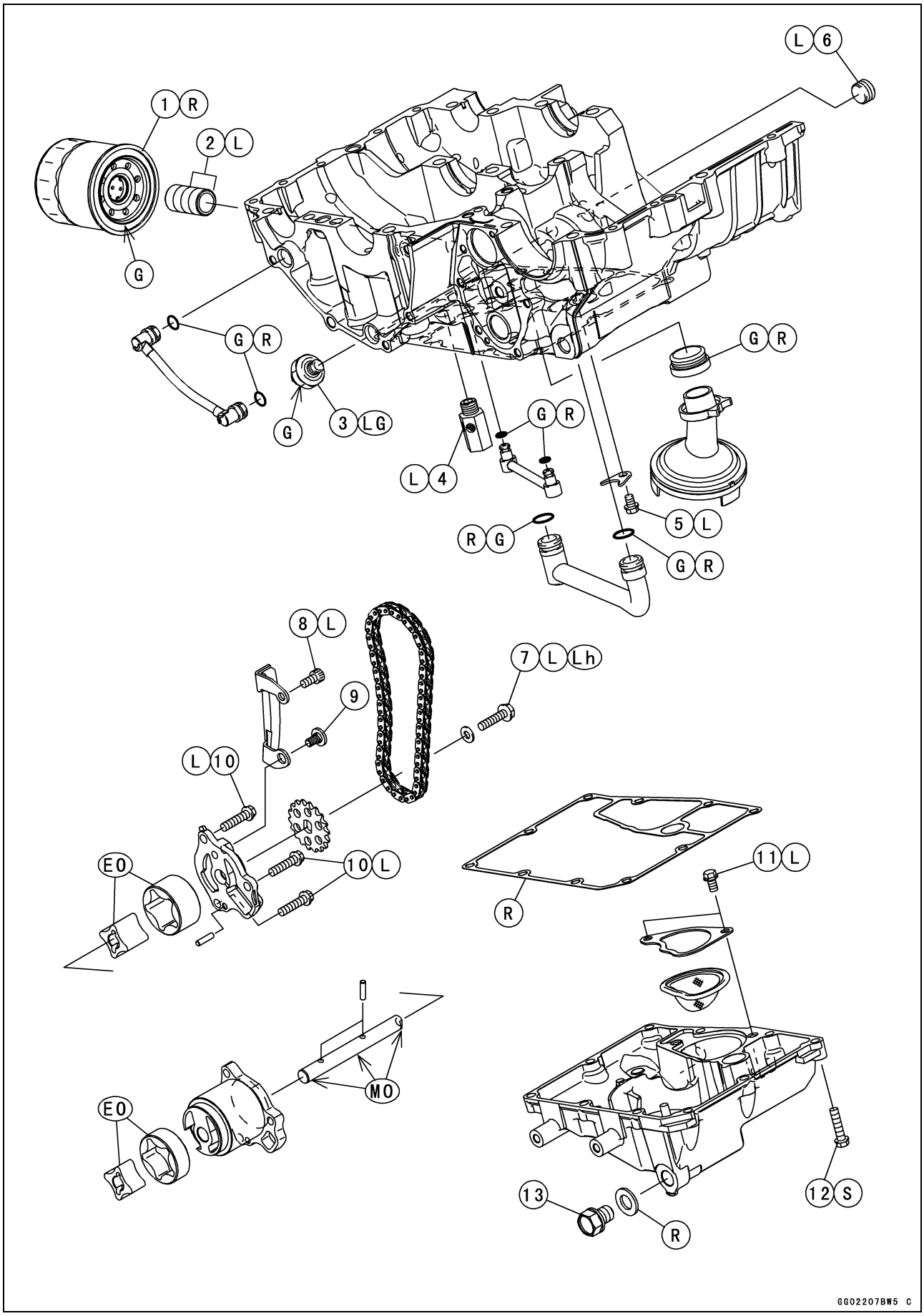
Exploded View

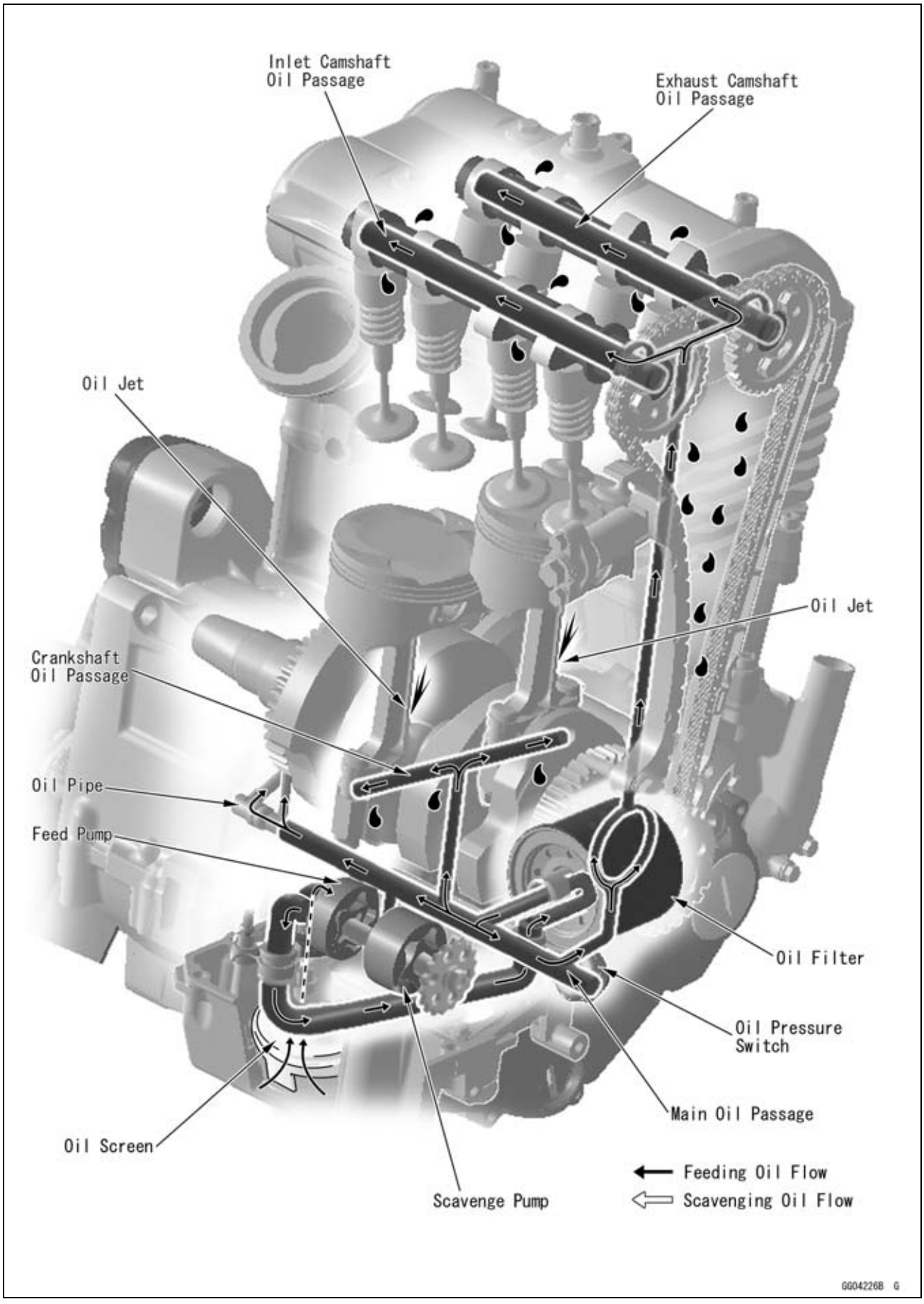


Exploded View

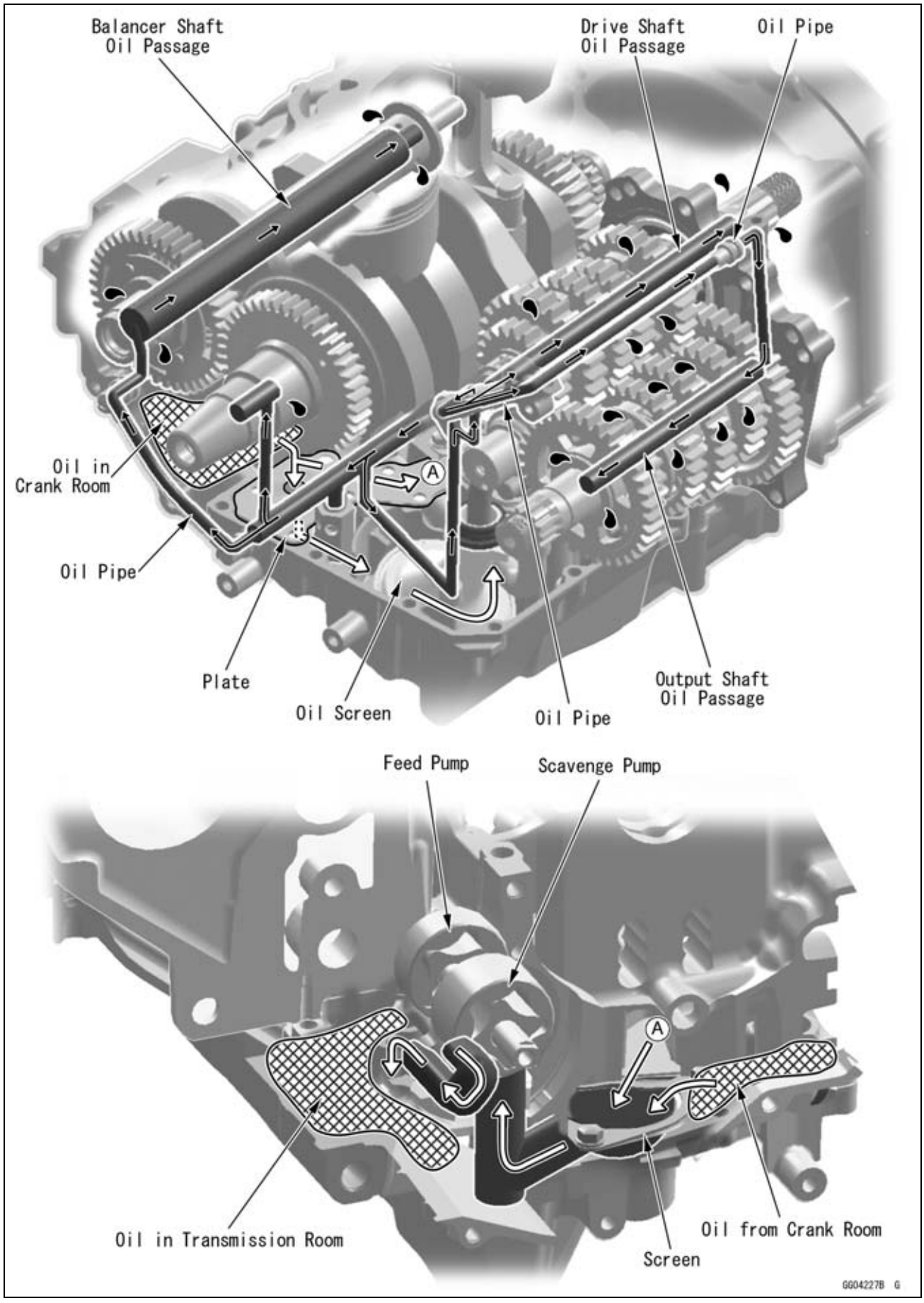
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Filter	17.5	1.78	12.9	G, R
2	Oil Filter Pipe	25	2.5	18	L
3	Oil Pressure Switch	15	1.5	11	LG
4	Oil Pressure Relief Valve	15	1.5	11	L
5	Oil Pipe Retaining Plate Bolt	9.8	1.0	87 in·lb	L
6	Oil Passage Plug (PT3/8)	20	2.0	15	L
7	Oil Pump Sprocket Bolt	12	1.2	106 in·lb	L, Lh
8	Oil Pump Chain Guide Bolt, L = 12 mm (0.47 in.)	12	1.2	106 in·lb	L
9	Oil Pump Chain Guide Bolt, L = 11 mm (0.43 in.)	12	1.2	106 in·lb	
10	Oil Pump Cover Bolts	9.8	1.0	87 in·lb	L
11	Oil Strainer Holder Bolts	9.8	1.0	87 in·lb	L
12	Oil Pan Bolts	12	1.2	106 in·lb	S
13	Engine Oil Drain Bolt	30	3.1	22	

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
Lh: Left-hand Threads
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.

Engine Oil Flow Chart



Engine Oil Flow Chart



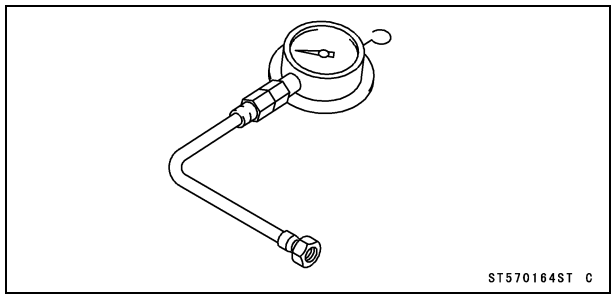
7-6 ENGINE LUBRICATION SYSTEM

Specifications

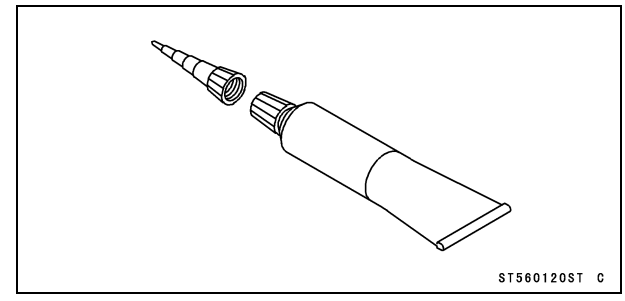
Item	Standard
Engine Oil	
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2
Viscosity	SAE 10W-40
Capacity	1.6 L (1.7 US qt) (When filter is not removed.)
	1.8 L (1.9 US qt) (When filter is removed.)
	2.3 L (2.4 US qt) (When engine is completely dry.)
Level	Between upper and lower level lines (Wait several minutes after idling or running)
Oil Pressure Measurement	
Oil Pressure	216 ~ 294 kPa (2.20 ~ 3.00 kgf/cm², 31.3 ~ 42.6 psi) @4 000 r/min (rpm), Oil Temperature 90°C (194°F)

Special Tools and Sealant

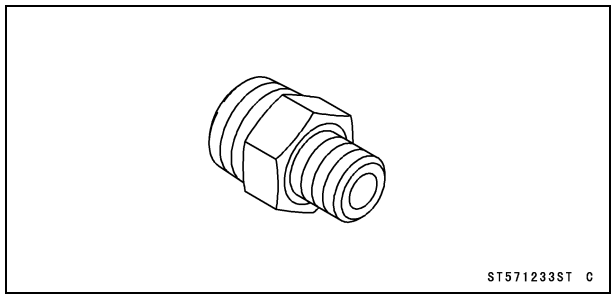
Oil Pressure Gauge, 10 kgf/cm²:
57001-164



Liquid Gasket, TB1211:
56019-120



Oil Pressure Gauge Adapter, PT3/8:
57001-1233



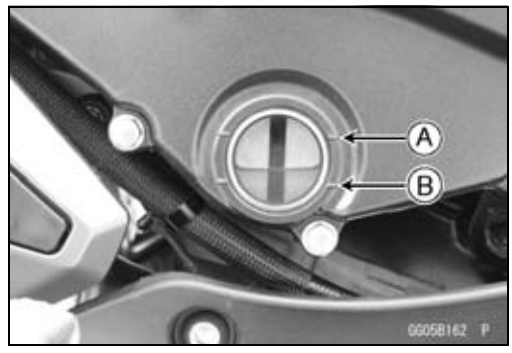
Engine Oil and Oil Filter

⚠ WARNING

Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine seizure, accident, and injury. Check the oil level before each use and change the oil and filter according to the periodic maintenance chart.

Oil Level Inspection

● Check that the engine oil level is between the upper [A] and lower [B] levels in the oil level inspection window.



NOTE

○*Situate the motorcycle so that it is perpendicular to the ground.*

○*If the motorcycle has just been used, wait several minutes for all the oil to drain down.*

○*If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.*

NOTICE

Racing the engine before the oil reaches every part can cause engine seizure.
If the 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 indicator light (LED) 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 filter opening. Use the same type and make of oil that is already in the engine.

NOTE

○*If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.*

Engine Oil Change

● Refer to the Engine Oil Change in the Periodic Maintenance chapter.

Oil Filter Replacement

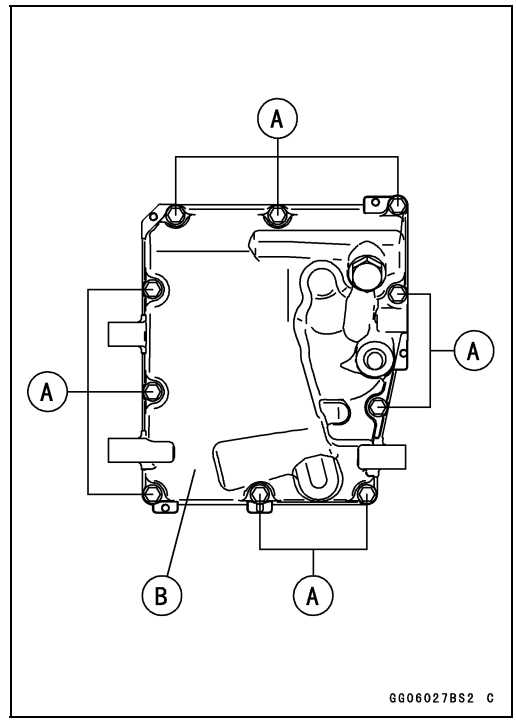
● Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

Oil Pan

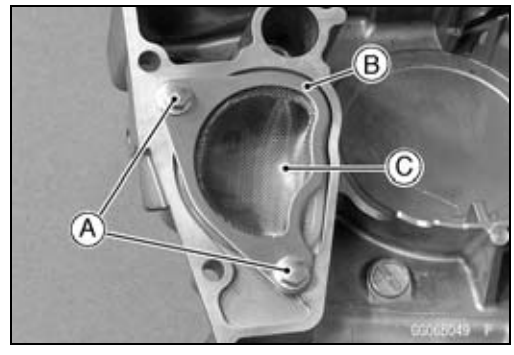
Oil Pan Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Muffler (see Muffler Removal in the Engine Top End chapter)
  Lower Fairing Bracket (see Lower Fairing Bracket Removal in the Frame chapter)

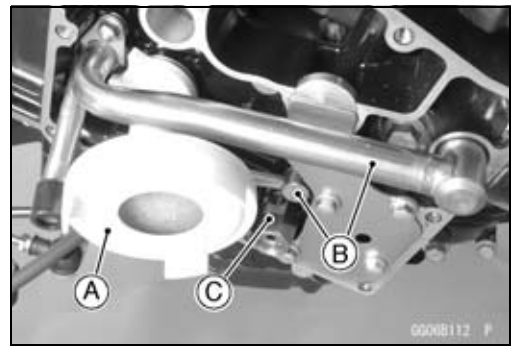
- Remove:
  Oil Pan Bolts [A]
  Oil Pan [B]



- Remove the following from the oil pan as necessary.
  Filter Plate Bolts [A]
  Filter Plate [B]
  Filter [C]



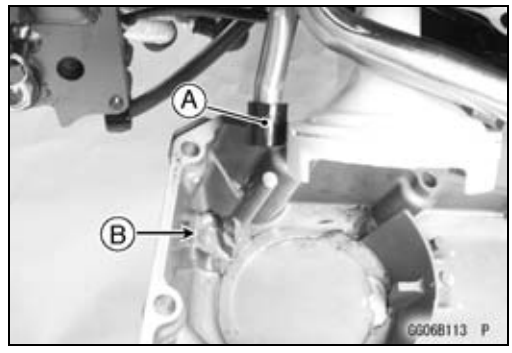
- Remove the following from the lower crankcase half as necessary.
  Oil Screen [A] (see Oil Screen Removal)
  Oil Pipes [B] (see Oil Pipe Removal)
  Oil Pressure Relief Valve [C] (see Oil Pressure Relief Valve Removal)



Oil Pan

Oil Pan Installation

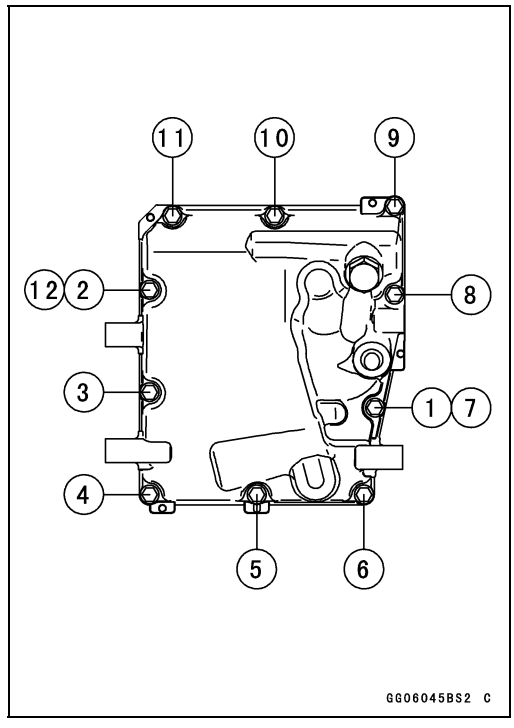
- Install the following parts if remove.
  Oil Pressure Relief Valve (see Oil Pressure Relief Valve Installation)
  Oil Pipe (see Oil Pipe Installation)
  Oil Screen (see Oil Screen Installation)
- Replace the oil pan gasket with a new one.
- When installing the oil pan, fit the damper [A] on the breather pipe into the hollow [B] of the oil pan.



- Tighten the oil pan bolts following the specified tightening sequence.

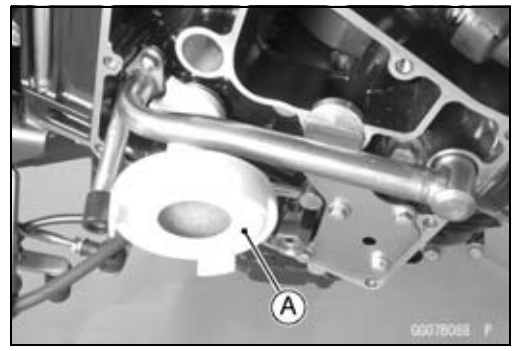
  Torque - Oil Pan Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Install the removed parts (see appropriate chapters).



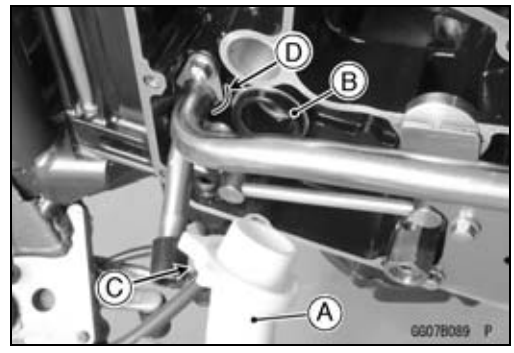
Oil Screen

Oil Screen Removal



- Remove:
  Oil Pan (see Oil Pan Removal)
  Oil Screen [A]

Oil Screen Installation



- Clean the oil screen [A] (see Oil Screen Cleaning).
- Replace the O-ring [B] with a new one, and install it.
- Apply grease to the O-ring.
- Install the oil screen so that its guide portion [C] fits the crankcase rib [D].
- Install:
  Oil Pan (see Oil Pan Installation)

Oil Screen Cleaning

- Remove the oil screen (see Oil Screen Removal).
- Clean the oil screen with a high flash-point solvent and remove the particles stuck.
- Blow away the particles by applying compressed air [A] from the inside to the outside (from the clean side to the dirty side).

⚠ WARNING

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

NOTE

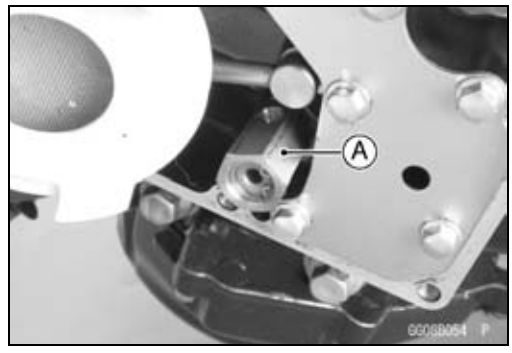
○*While cleaning the screen, check for any metal particles that might indicate internal engine damage.*

- Check the screens carefully for any damage.

★If the screen is damaged, replace the oil screen.

Oil Pressure Relief Valve

Oil Pressure Relief Valve Removal



- Remove:
  Oil Pan (see Oil Pan Removal)
  Oil Pressure Relief Valve [A]

Oil Pressure Relief Valve Installation

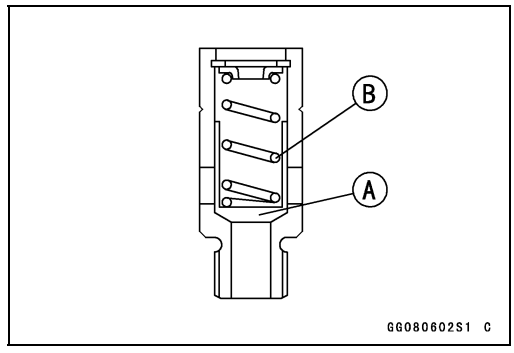
- Apply a non-permanent locking agent to the threads of the oil pressure relief valve, and tighten it.

NOTICE
Do not apply too much non-permanent locking agent to the threads. This may block the oil passage.

Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)

- Install the oil pan (see Oil Pan Installation).

Oil Pressure Relief Valve Inspection



- Remove the oil pressure relief valve (see Oil Pressure Relief Valve Removal).
- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

NOTE

○*Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

★If any rough spots are found during above inspection, wash the valve clean with a high flash-point solvent and blow out any foreign particles that may be in the valve with compressed air.

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

★If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

Oil Pumps

Oil Pump Chain and Sprocket Removal

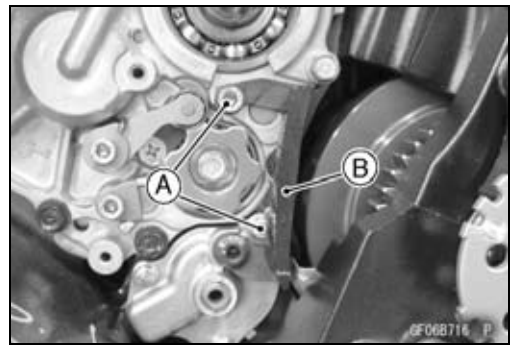
● Refer to the Clutch Removal in the Clutch chapter.

Oil Pump Chain and Sprocket Installation

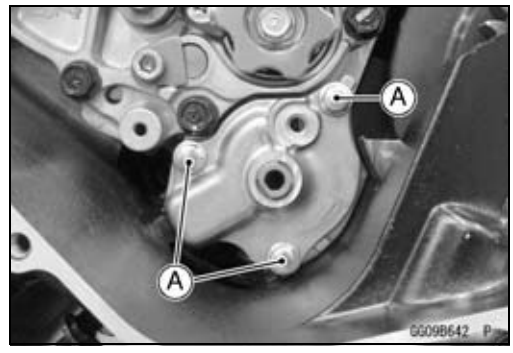
● Refer to the Clutch Installation in the Clutch chapter.

Oil Pump Removal

● Remove:
Oil Pump Chain Guide Bolts [A]
Oil Pump Chain Guide [B]



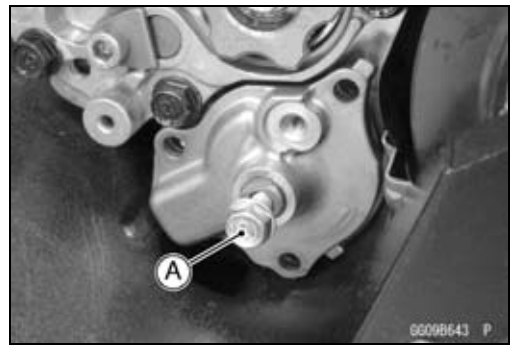
● Remove:
Clutch (see Clutch Removal in the Clutch chapter)
Oil Pump Cover Bolts [A]



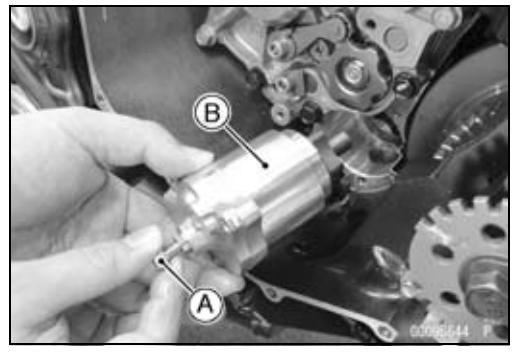
● Temporarily install the oil pump sprocket bolt [A].

NOTE

○*The oil pump sprocket bolt has a left-hand threads.*

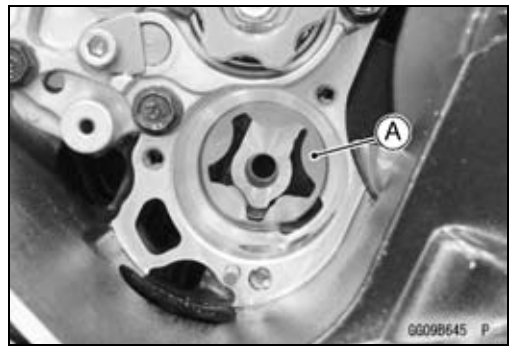


● Using the oil pump sprocket bolt [A], pull out the oil pump [B] as a assembly.

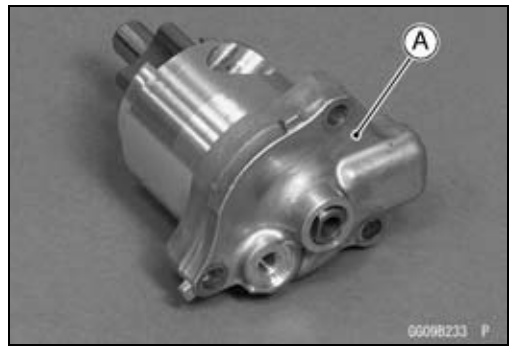


Oil Pumps

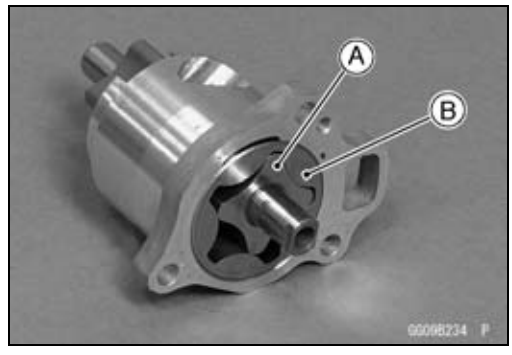
- Remove the outer rotor [A] for feed pump.



- Remove the oil pump cover [A].

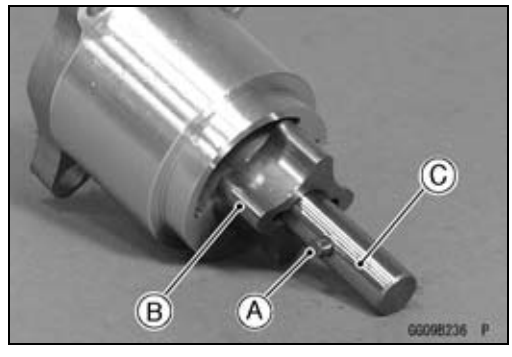


- Remove:
  Inner Rotor [A] for Scavenge Pump
  Outer Rotor [B] for Scavenge Pump



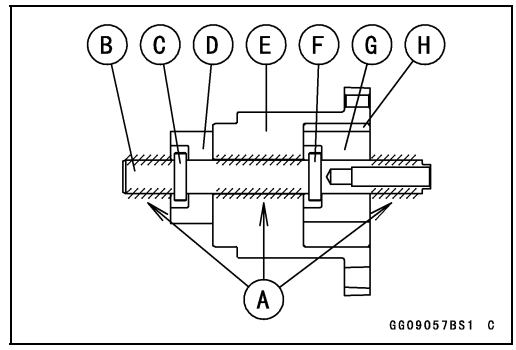
- Remove the pin [A].

- Remove:
  Pin [A]
  Inner Rotor for Feed Pump [B]
  Oil Pump Shaft [C]



Oil Pumps

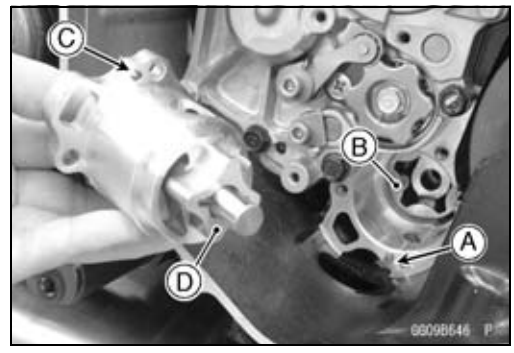
Oil Pump Installation



- Apply engine oil to the rotors.
- Apply molybdenum disulfide oil solution to the portion [A] of the oil pump shaft as shown.
- Assemble the following parts.
  Oil Pump Shaft [B]
  Pin [C]
  Inner Rotor for Feed Pump [D]
  Oil Pump Body [E]
  Pin [F]
  Inner Rotor [G] for Scavenge Pump
  Outer Rotor [H] for Scavenge Pump

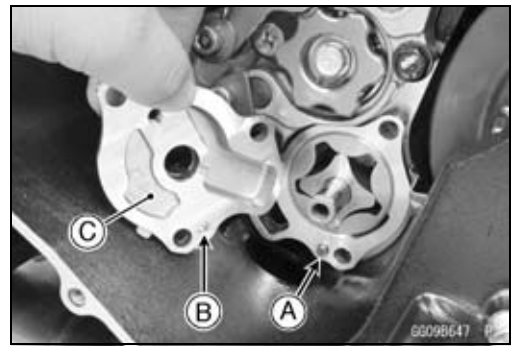
NOTE

○*The scavenge pump rotors are wider than the feed pump rotors.*



- Install:
  Dowel Pin [A]
  Outer Rotor [B] for Feed Pump
- Fit the pin of the crankcase into the hole [C] in the oil pump body.

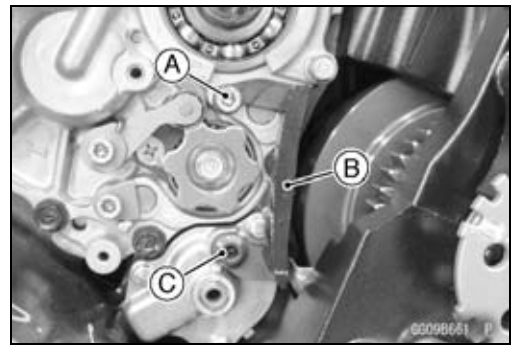
○Turn the oil pump shaft so that the inner rotor [D] fits into the outer rotor.



- Fit the pin [A] into the hole [B] on the oil pump cover [C].
- Apply a non-permanent locking agent to the oil pump cover bolts and tighten them.

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

- Check whether the oil pump turns smoothly.

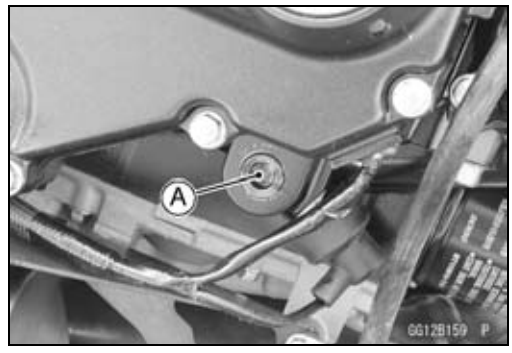


- Apply a non-permanent locking agent to the oil pump chain guide bolt, L = 12 mm (0.47 in.) [A].
- Install the oil pump chain guide [B].
- Tighten:

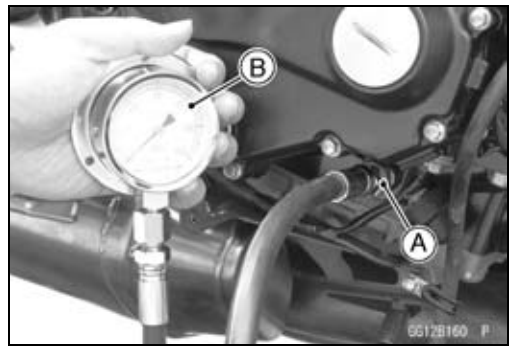
Torque - Oil Pump Chain Guide Bolt, L = 12 mm (0.47 in.): 12 N·m (1.2 kgf·m, 106 in·lb)
Oil Pump Chain Guide Bolt, L = 11 mm (0.43 in.) [C]: 12 N·m (1.2 kgf·m, 106 in·lb)

Oil Pressure Measurement

Oil Pressure Measurement



- Remove:
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Oil Passage Plug [A]



- Attach the adapter [A] and gauge [B] to the plug hole.

Special Tools - Oil Pressure Gauge, 10 kgf/cm²: 57001-164
Oil Pressure Gauge Adapter, PT3/8: 57001 -1233

- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

★If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert wear immediately.

★If the reading is much higher than the standard, check the oil passages for clogging.

Oil Pressure
Standard: 216 ~ 294 kPa (2.20 ~ 3.00 kgf/cm², 31.3 ~ 42.6 psi) @4 000 r/min (rpm), Oil Temperature 90°C (194°F)

- Stop the engine.
- Remove the oil pressure gauge and adapter.

⚠ WARNING

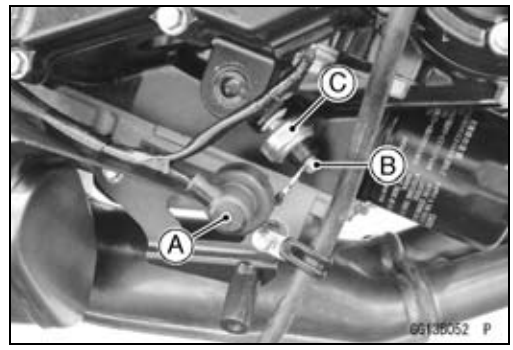
Hot oil can cause severe burns. Beware of hot engine oil that will drain through the oil passage when the gauge adapter is removed.

- Apply a non-permanent locking agent to the oil passage plug, and install it.

Torque - Oil Passage Plug (PT3/8): 20 N·m (2.0 kgf·m, 15 ft·lb)

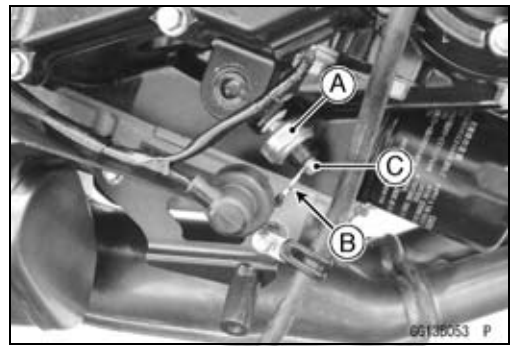
Oil Pressure Switch

Oil Pressure Switch Removal



- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Switch Cover [A]
  Switch Terminal Bolt [B]
  Oil Pressure Switch [C]

Oil Pressure Switch Installation



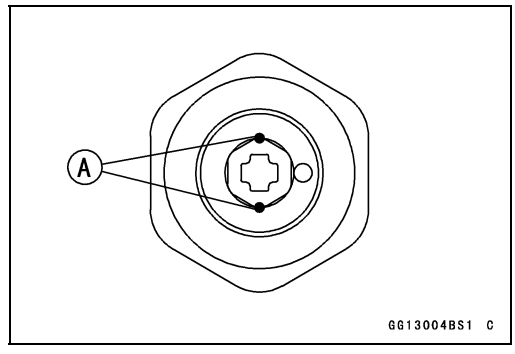
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the threads of the oil pressure switch [A] and tighten it.

  Sealant - Liquid Gasket, TB1211: 56019-120

  Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)
- Install the switch lead [B] direction downward.
- Apply grease to the terminal [C], and tighten the terminal bolt securely.

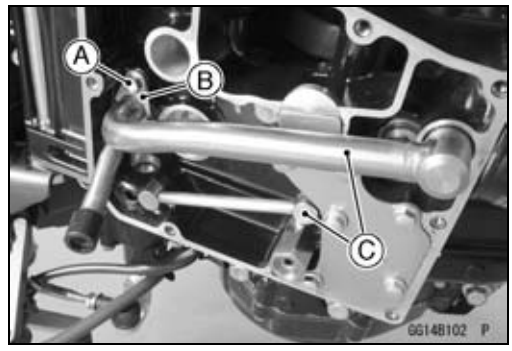
NOTE

○*Apply a small amount grease to the terminal so that grease should not close two breather holes [A] for switch diaphragm.*



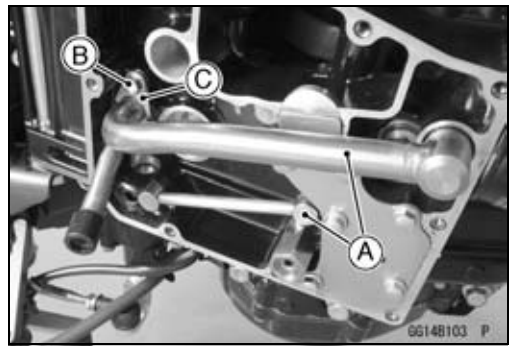
Oil Pipes

Oil Pipe Removal



- Remove:
  Oil Pan (see Oil Pan Removal)
  Oil Screen (see Oil Screen Removal)
  Oil Pipe Retaining Plate Bolt [A]
  Oil Pipe Retaining Plate [B]
  Oil Pipes [C]

Oil Pipe Installation



- Replace the O-rings with new ones.
- Apply grease to the O-rings on the oil pipes [A].
- Apply a non-permanent locking agent to the oil pipe retaining plate bolt [B].
- Install:
  Oil Pipes
  Oil Pipe Retaining Plate [C]
- Tighten:

  Torque - Oil Pipe Retaining Plate Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the removed parts (see appropriate chapters).

Engine Removal/Installation

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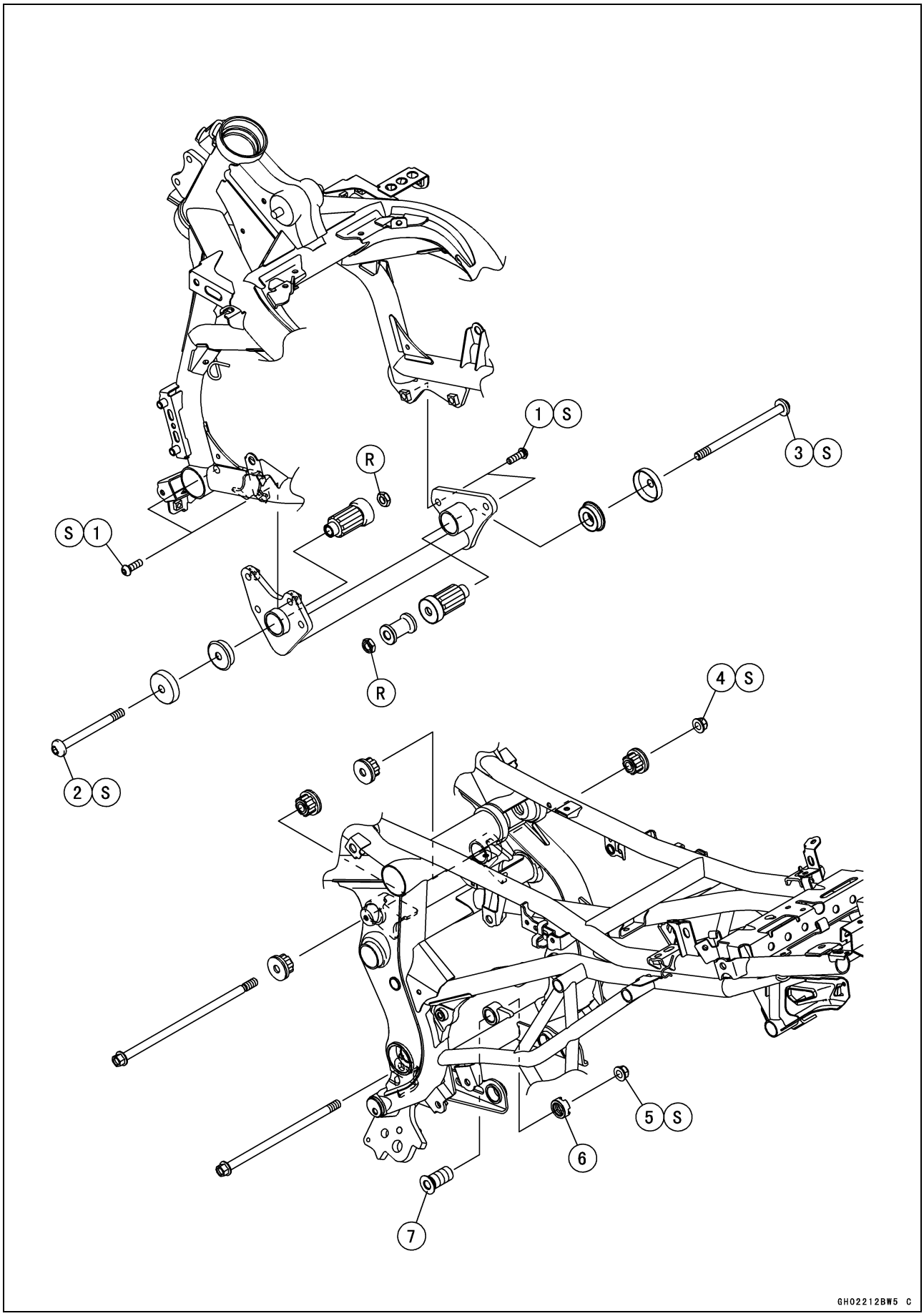
Exploded View



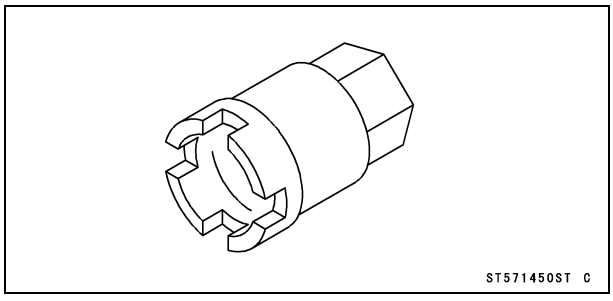
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Bracket Bolts	25	2.5	18	S
2	Front Engine Mounting Bolt, L = 110 mm (4.33 in.)	44	4.5	32	S
3	Front Engine Mounting Bolt, L = 150 mm (5.90 in.)	44	4.5	32	S
4	Upper Engine Mounting Nut	44	4.5	32	S
5	Lower Engine Mounting Nut	44	4.5	32	S
6	Adjusting Collar Locknut	49	5.0	36	
7	Adjusting Collar	9.8	1.0	87 in·lb	

R: Replacement Parts
S: Follow the specified tightening sequence.

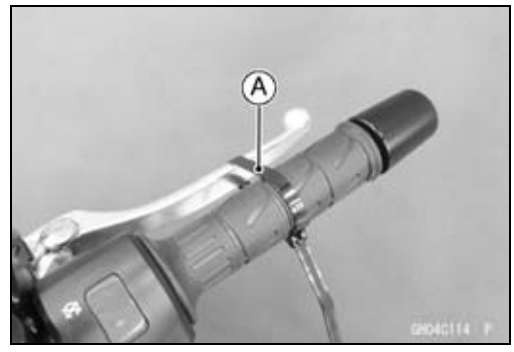
Special Tool

Engine Mount Nut Wrench:
57001-1450



Engine Removal/Installation

Engine Removal



- Support the rear part of the swingarm with a stand.
- Squeeze the brake lever slowly and hold it with a band [A].

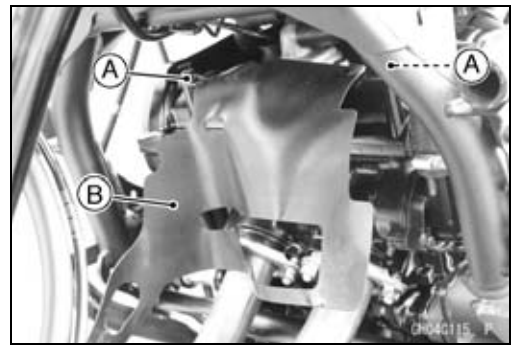
⚠ WARNING

Motorcycle may fall over unexpectedly resulting in an accident or injury. Be sure to hold the front brake when removing the engine.

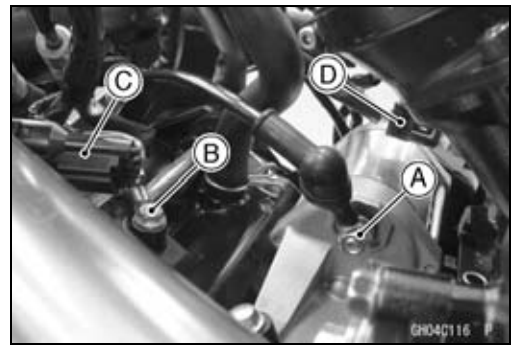
NOTICE

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.

- Drain:
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  Coolant (see Coolant Change in the Periodic Maintenance chapter)



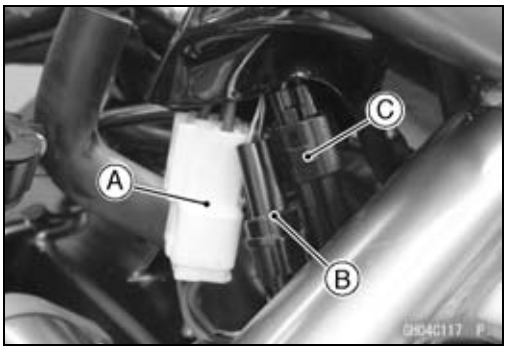
- Remove:
  Seat (see Seat Removal in the Frame chapter)
  Side Covers (see Side Cover Removal in the Frame chapter)
  Middle Fairings (see Middle Fairing Removal in the Frame chapter)
  Frame Covers (see Frame Cover Removal in the Frame chapter)
  Lower Fairings (see Lower Fairing Removal in the Frame chapter)
  Lower Fairing Brackets (see Lower Fairing Bracket Removal in the Frame chapter)
  Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  Bracket Mounting Bolts [A]
  Bracket with Heat Insulation Rubber Plate [B]



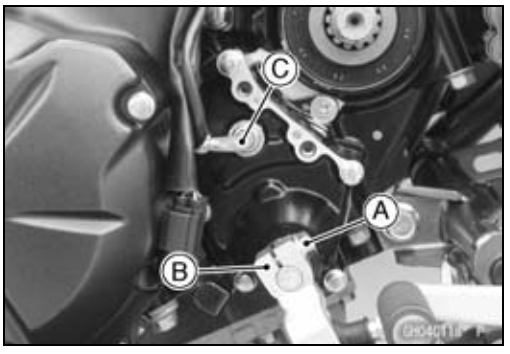
- Remove:
  Muffler (see Muffler Removal in the Engine Top End chapter)
  Clutch Cable Lower End (see Clutch Cable Removal in the Clutch chapter)
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Air Suction Valve (see Air Suction Valve Removal in the Engine Top End chapter)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Stick Coils (see Stick Coil Removal in the Electrical System chapter)
  Starter Motor Cable Terminal Nut [A]
  Engine Ground Cable Terminal Bolt [B]
  Crankshaft Sensor Lead Connector [C]
  Water Temperature Sensor Lead Connector [D]

Engine Removal/Installation

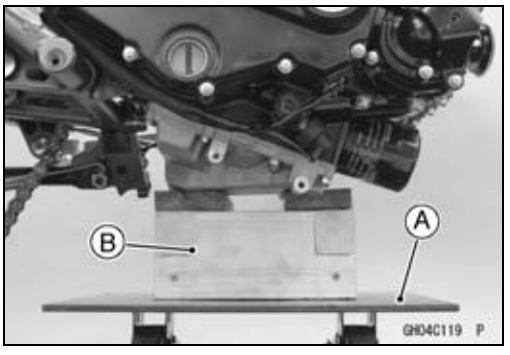
● Disconnect:
Alternator Lead Connector [A]
Side Stand Switch Lead Connector [B]
Speed Sensor Lead Connector [C]



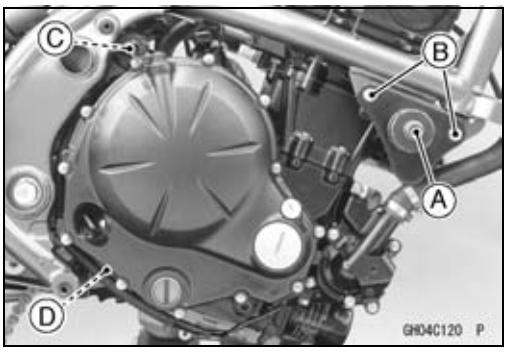
● Remove:
Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
Shift Lever Bolt [A]
Shift Lever [B]
● Disconnect the neutral switch lead connector [C].



● Support the engine with a suitable stand [A].
○Put a plank [B] onto the suitable stand for engine balance.



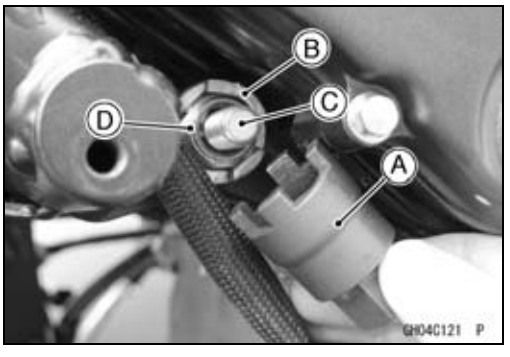
● Remove:
Front Engine Mounting Bolts [A] (Both Sides)
Engine Bracket Bolts [B] (Both Sides)
Upper Engine Mounting Nut [C] and Bolt
Lower Engine Mounting Nut [D]



● Using the nut wrench [A], loosen the lower adjusting collar locknut [B].

Special Tool - Engine Mount Nut Wrench: 57001-1450

● Remove the lower engine mounting bolt [C].
● Using the Hexagon Wrench, turn the adjusting collar [D] counterclockwise to make the gap between the engine and adjusting collar.
● Using the suitable stand, take out the engine.



Engine Installation

● Replace the front engine mounting nuts with new ones.
● Support the engine with a suitable stand.
○Put a plank onto the suitable stand for engine balance.

Engine Removal/Installation

● Install the engine mounting bolts and nuts, following the specified installing sequence.

○First, install the rubber bushings [A].

○Second, temporary tighten the adjusting collar [B].

○Third, install the engine to the frame by inserting the lower engine mounting bolt [C].

○Forth, insert the upper engine mounting bolt [D].

○Fifth, temporary tighten the adjuster collar locknut [E], lower engine mounting nut [F] and upper engine mounting nut [G].

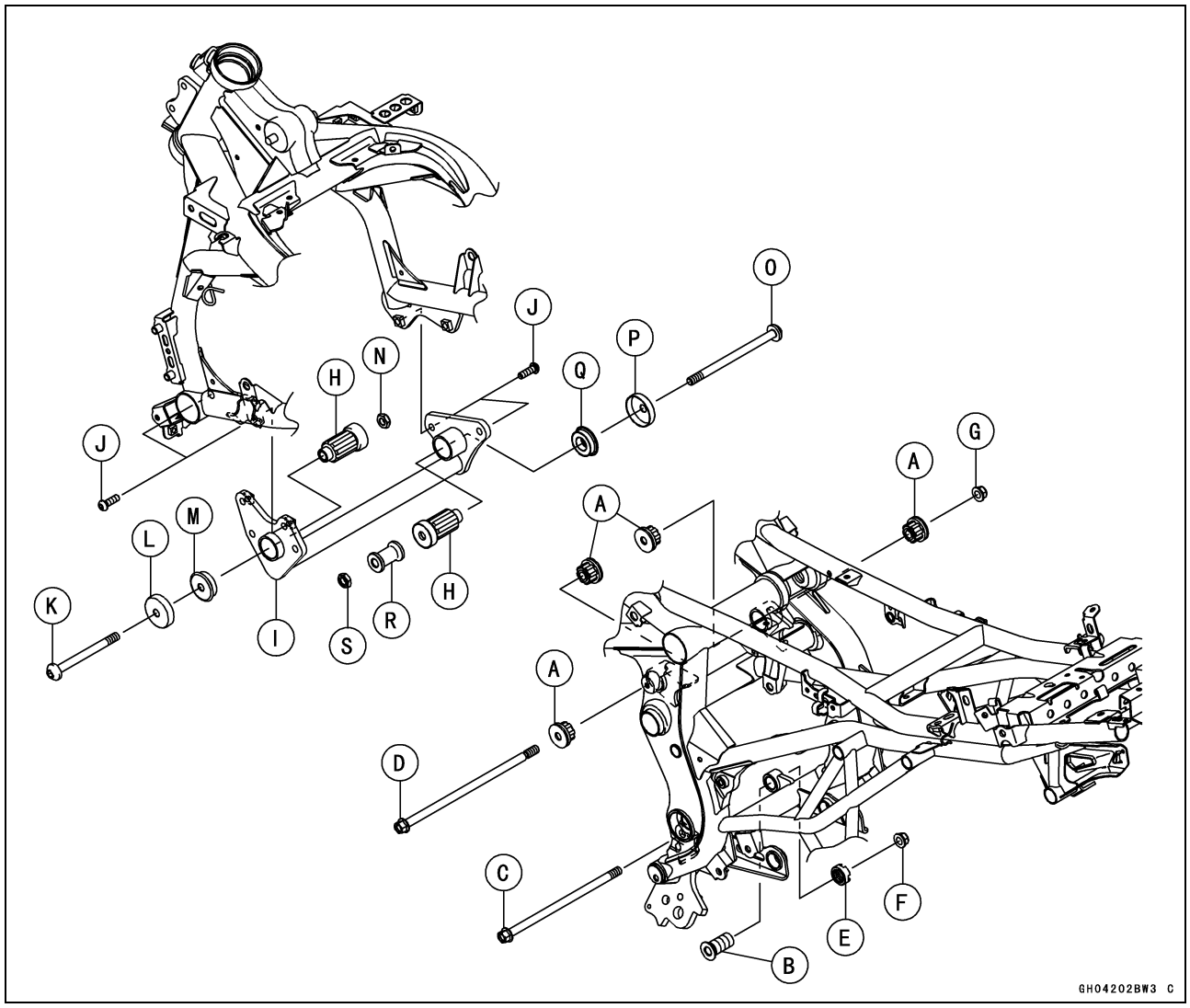
Special Tool - Engine Mount Nut Wrench: 57001-1450

○Sixth, install the dampers [H] to the engine bracket [I].

○Seventh, temporary install the engine bracket to the frame by tightening the engine bracket bolts [J].

○Eighth, temporary install the front engine mounting bolt, L = 110 mm (4.33 in.) [K], cap [L], damper [M] and nut [N].

○Ninth, temporary install the front engine mounting bolt, L = 150 mm (5.90 in.) [O], cap [P], damper [Q], collar [R] and nut [S].



Engine Removal/Installation

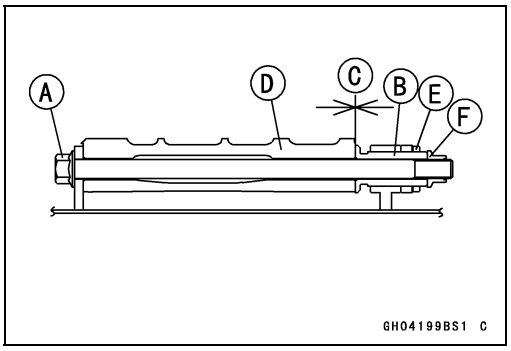
○Tenth, remove the lower engine mounting bolt [A], and tighten the adjusting collar [B] clockwise until the clearance [C] between the engine [D] and collar come to 0 mm (0 in.).

Torque - Adjusting Collar: 9.8 N·m (1.0 kgf·m, 87 in·lb)

○Eleventh, insert the lower engine mounting bolt and tighten the adjuster collar locknut [E] and lower engine mounting nut [F].

Special Tool - Engine Mount Nut Wrench: 57001-1450

Torque - Adjusting Collar Locknut: 49 N·m (5.0 kgf·m, 36 ft·lb)
Lower Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)

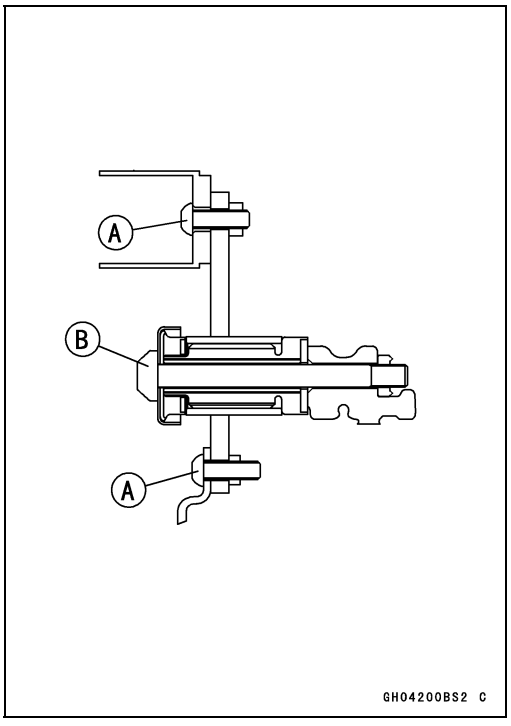


○Twelfth, tighten the upper engine mounting nut.

Torque - Upper Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)

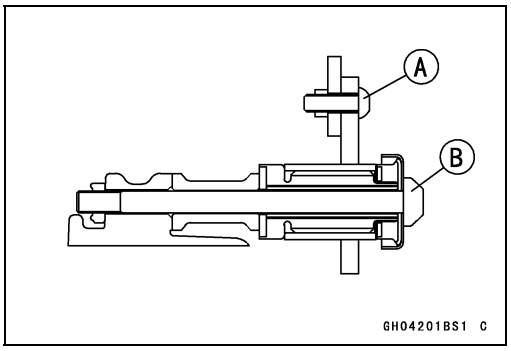
○Thirteenth, tighten the left engine bracket bolts [A] and front engine mounting bolt, L = 110 mm (4.33 in.)[B].

Torque - Engine Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Engine Mounting Bolt, L = 110 mm (4.33 in.): 44 N·m (4.5 kgf·m, 32 ft·lb)



○Lastly, tighten the right engine bracket bolts [A] and front engine mounting bolt, L = 150 mm (5.90 in.)[B].

Torque - Engine Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Front Engine Mounting Bolt, L = 150 mm (5.90 in.): 44 N·m (4.5 kgf·m, 32 ft·lb)



Engine Removal/Installation

- Run the leads, cables, and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

Torque - Engine Ground Terminal Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Install the removed parts (see appropriate chapters).
- Adjust:
  Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)
  Drive Chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter)
- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Adjust the idling (see Idle Speed Adjustment in the Periodic Maintenance chapter).

Crankshaft/Transmission

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Exploded View

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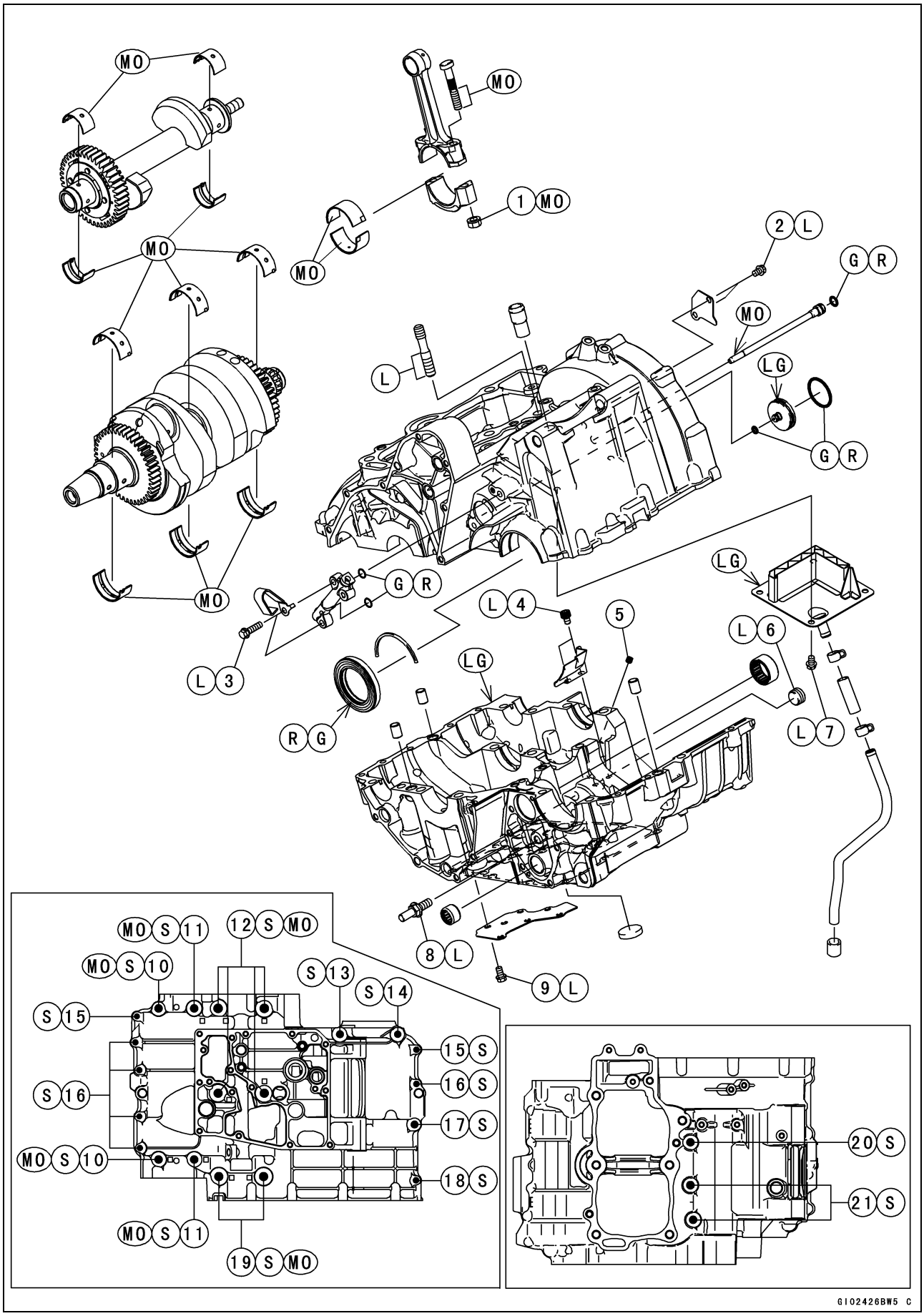
Exploded View

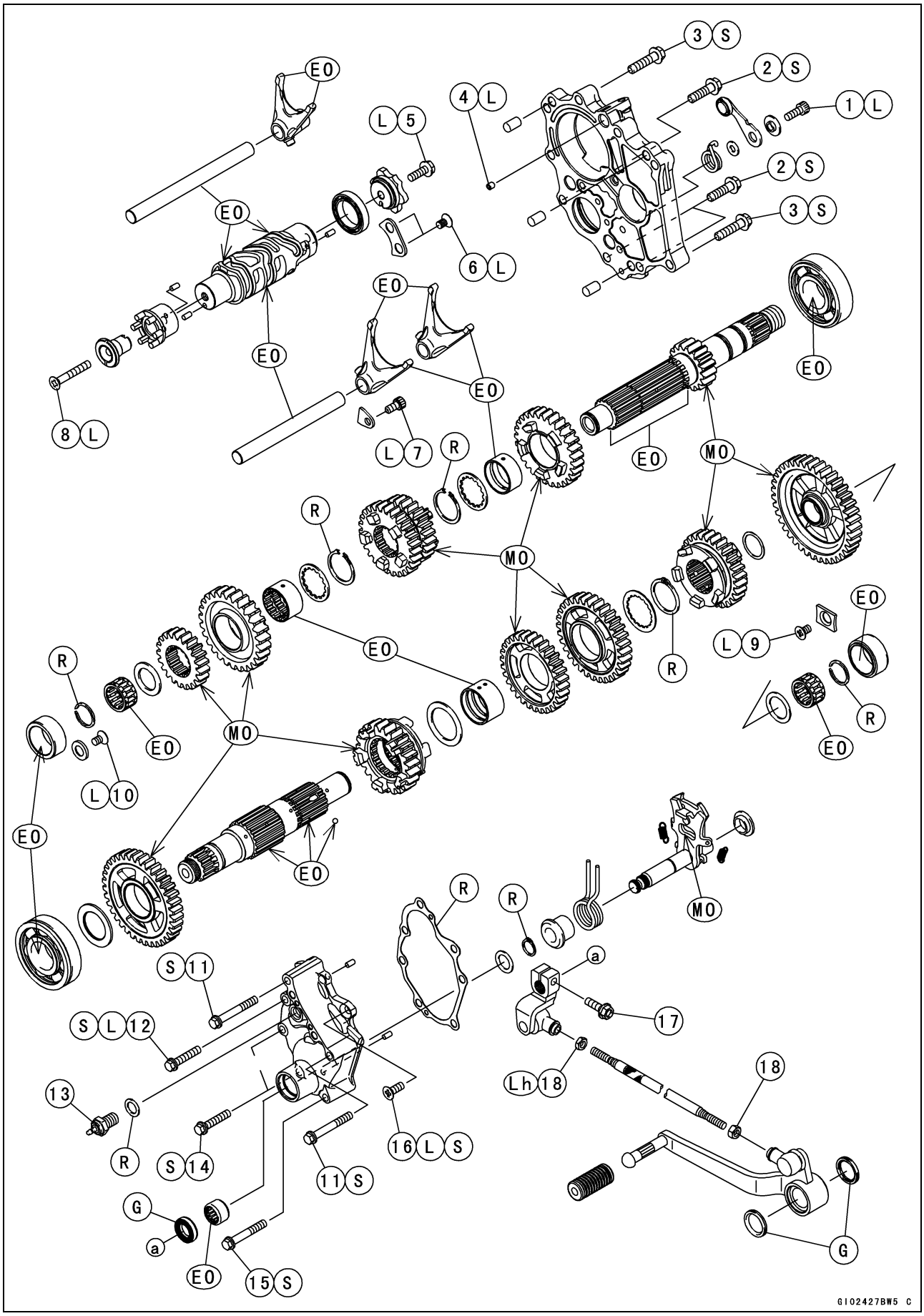


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Connecting Rod Big End Nuts	see Text	–	–	MO
2	Side Oil Plate Bolts	9.8	1.0	87 in·lb	L
3	Oil Pipe Bolts	9.8	1.0	87 in·lb	L
4	Middle Oil Plate Bolts	9.8	1.0	87 in·lb	L
5	Oil Passage Plug (M6)	3.5	0.36	31 in·lb	
6	Oil Passage Plug (PT3/8)	20	2.0	15	L
7	Breather Plate Bolts	9.8	1.0	87 in·lb	L
8	Shift Shaft Return Spring Pin	29	3.0	21	L
9	Bottom Oil Plate Bolts	9.8	1.0	87 in·lb	L
10	Crankcase Bolts (M8, Front), L = 60 mm (2.4 in.)	27.5	2.80	20.3	MO, S
11	Crankcase Bolts (M8), L = 73 mm (2.9 in.)	25.5	2.60	18.8	MO, S
12	Crankcase Bolts (M9), L = 113 mm (4.45 in.)	44.1	4.50	32.5	MO, S
13	Crankcase Bolts (M8), L = 110 mm (4.3 in.)	27.5	2.80	20.3	S
14	Crankcase Bolt (M8, Rear), L = 60 mm (2.4 in.)	27.5	2.80	20.3	S
15	Crankcase Bolts (M6) L = 45 mm (1.8 in.)	19.6	2.00	14.5	S
16	Crankcase Bolts (M6) L = 38 mm (1.5 in.)	19.6	2.00	14.5	S
17	Crankcase Bolt (M8), L = 50 mm (2.0 in.)	27.5	2.80	20.3	S
18	Crankcase Bolt (M6) L = 32 mm (1.3 in.)	19.6	2.00	14.5	S
19	Crankcase Bolts (M9), L = 83 mm (3.3 in.)	44.1	4.50	32.5	MO, S
20	Upper Crankcase Bolt (M8), L = 120 mm (4.72 in.)	27.5	2.80	20.3	S
21	Upper Crankcase Bolts (M8), L = 110 mm (4.33 in.)	27.5	2.80	20.3	S

G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Transmission Case Bolts, L = 30 mm (1.2 in.)	20	2.0	15	S
2	Transmission Case Bolts, L = 26 mm (1.0 in.)	20	2.0	15	S
3	Gear Positioning Lever Bolt	12	1.2	106 in·lb	L
4	Transmission Case Oil Nozzle	2.9	0.30	26 in·lb	L
5	Neutral Switch Holder Screw	4.9	0.50	43 in·lb	L
6	Shift Drum Cam Holder Bolt	12	1.2	106 in·lb	L
7	Shift Drum Bearing Holder Screws	4.9	0.50	43 in·lb	L
8	Shift Rod Retaining Plate Bolt	9.8	1.0	87 in·lb	L
9	Drive Shaft Bearing Holder Screw	4.9	0.50	43 in·lb	L
10	Race Holder Screw	4.9	0.50	43 in·lb	L
11	Shift Shaft Cover Bolts, L = 45 mm (1.8 in.)	9.8	1.0	87 in·lb	L, S
12	Shift Shaft Cover Bolt, L = 30 mm (1.2 in.)	9.8	1.0	87 in·lb	L, S
13	Neutral Switch	15	1.5	11	
14	Shift Shaft Cover Bolts, L = 30 mm (1.2 in.)	12	1.2	106 in·lb	S
15	Shift Shaft Cover Bolt, L = 40 mm (1.6 in.)	12	1.2	106 in·lb	S
16	Shift Shaft Cover Screw	4.9	0.50	43 in·lb	L, S
17	Shift Lever Bolt	12	1.2	106 in·lb	
18	Shift Lever Tie-rod Locknuts	9.8	1.0	87 in·lb	Lh (1)

EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
Lh: Left-hand Threads
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.

Specifications

Item	Standard	Service Limit
Crankcase, Crankshaft/Connecting Rods		
Connecting Rod Bend	– – –	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Twist	– – –	TIR 0.2/100 mm (0.008/3.94 in.)
Connecting Rod Big End Side Clearance	0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)	0.6 mm (0.02 in.)
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.017 ~ 0.041 mm (0.0007 ~ 0.0016 in.)	0.08 mm (0.0031 in.)
Crankpin Diameter:	37.984 ~ 38.000 mm (1.4954 ~ 1.4961 in.)	37.97 mm (1.495 in.)
Marking:		
None	37.984 ~ 37.992 mm (1.4954 ~ 1.49575 in.)	– – –
○	37.993 ~ 38.000 mm (1.49578 ~ 1.4961 in.)	– – –
Connecting Rod Big End Inside Diameter:	41.000 ~ 41.016 mm (1.6142 ~ 1.6148 in.)	– – –
Marking:		
None	41.000 ~ 41.008 mm (1.6142 ~ 1.61448 in.)	– – –
○	41.009 ~ 41.016 mm (1.61452 ~ 1.6148 in.)	– – –
Connecting Rod Big End Bearing Insert Thickness:		
Brown	1.475 ~ 1.480 mm (0.05807 ~ 0.05827 in.)	– – –
Black	1.480 ~ 1.485 mm (0.05827 ~ 0.05846 in.)	– – –
Blue	1.485 ~ 1.490 mm (0.05846 ~ 0.05866 in.)	– – –

Connecting Rod Big End Bearing Insert Selection:

Connecting Rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-0116
○	○	Black	92139-0115
None	None		
○	None	Blue	92139-0114

Connecting Rod Bolt Stretch:		
New Connecting Rod	(Usable Range) 0.24 ~ 0.36 mm (0.0094 ~ 0.0142 in.)	– – –
Used Connecting Rod	(Usable Range) 0.20 ~ 0.32 mm (0.0079 ~ 0.0126 in.)	– – –

Specifications

Item	Standard	Service Limit
Crankshaft Side Clearance	0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)	0.40 mm (0.0157 in.)
Crankshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.002 in.)
Crankshaft Main Bearing Insert/Journal Clearance	0.016 ~ 0.040 mm (0.0006 ~ 0.0016 in.)	0.07 mm (0.0028 in.)
Crankshaft Main Journal Diameter:	37.984 ~ 38.000 mm (1.4954 ~ 1.4961 in.)	37.96 mm (1.4945 in.)
Marking:		
None	37.984 ~ 37.992 mm (1.4954 ~ 1.49575 in.)	– – –
1	37.993 ~ 38.000 mm (1.49578 ~ 1.4961 in.)	– – –
Crankshaft Main Bearing Inside Diameter:	41.000 ~ 41.016 mm (1.6142 ~ 1.6148 in.)	– – –
Marking:		
○	41.000 ~ 41.008 mm (1.6142 ~ 1.61448 in.)	– – –
None	41.009 ~ 41.016 mm (1.61452 ~ 1.6148 in.)	– – –
Crankshaft Main Bearing Insert Thickness:		
Brown	1.490 ~ 1.494 mm (0.05866 ~ 0.05882 in.)	– – –
Black	1.494 ~ 1.498 mm (0.05882 ~ 0.05898 in.)	– – –
Blue	1.498 ~ 1.502 mm (0.05898 ~ 0.05913 in.)	– – –

Crankshaft Main Bearing Insert Selection:

Crankshaft Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*	
		Size Color	Part Number
○	1	Brown	92028-1905
○	None	Black	92028-1904
None	1		
None	None	Blue	92028-1903

*: The crankshaft main bearing inserts have an oil groove.

Balancer Shaft		
Balancer Shaft Bearing Insert/Journal Clearance	0.011 ~ 0.033 mm (0.0004 ~ 0.0013 in.)	0.06 mm (0.0024 in.)
Balancer Shaft Journal Diameter:	27.987 ~ 28.000 mm (1.1018 ~ 1.1024 in.)	27.96 mm (1.1008 in.)

Specifications

Item	Standard	Service Limit
Marking:		
None	27.987 ~ 27.993 mm (1.1018 ~ 1.10208 in.)	– – –
○	27.994 ~ 28.000 mm (1.10212 ~ 1.1024 in.)	– – –
Balancer Shaft Bearing Inside Diameter:	31.000 ~ 31.016 mm (1.2205 ~ 1.2211 in.)	– – –
Marking:		
○	31.000 ~ 31.008 mm (1.2205 ~ 1.22078 in.)	– – –
None	31.009 ~ 31.016 mm (1.22082 ~ 1.2211 in.)	– – –
Balancer Shaft Bearing Insert Thickness:		
Brown	1.490 ~ 1.494 mm (0.05866 ~ 0.05882 in.)	– – –
Black	1.494 ~ 1.498 mm (0.05882 ~ 0.05898 in.)	– – –
Blue	1.498 ~ 1.502 mm (0.05898 ~ 0.05913 in.)	– – –

Balancer Shaft Bearing Insert Selection:

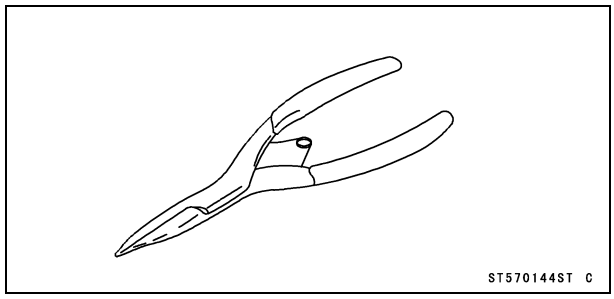
Balancer Shaft Bearing Inside Diameter Marking	Balancer Shaft Journal Diameter Marking	Bearing Insert*	
		Size Color	Part Number
○	○	Brown	92139-0119
○	None	Black	92139-0118
None	○		
None	None	Blue	92139-0117

*: The balancer shaft bearing inserts have an oil groove.

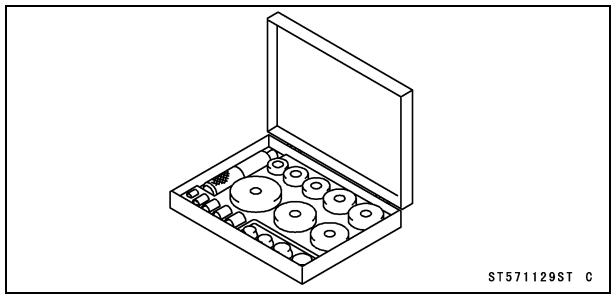
Transmission		
Shift Fork Ear Thickness	5.9 ~ 6.0 mm (0.23 ~ 0.24 in.)	5.8 mm (0.23 in.)
Transmission Gear Groove Width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.3 mm (0.25 in.)
Shift Fork Guide Pin Diameter	6.9 ~ 7.0 mm (0.27 ~ 0.28 in.)	6.8 mm (0.27 in.)
Shift Drum Groove Width	7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)	7.3 mm (0.29 in.)

Special Tools and Sealants

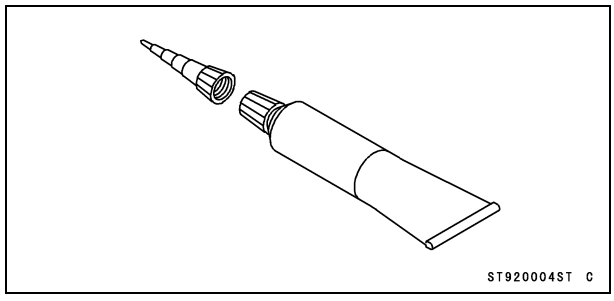
Outside Circlip Pliers:
57001-144



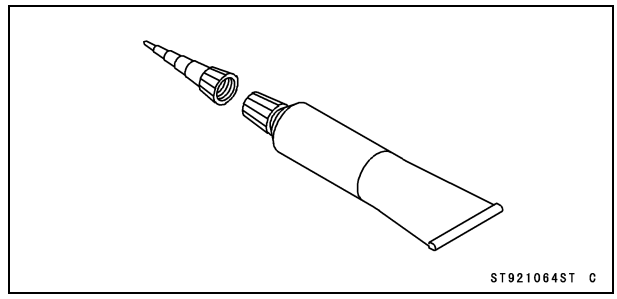
Bearing Driver Set:
57001-1129



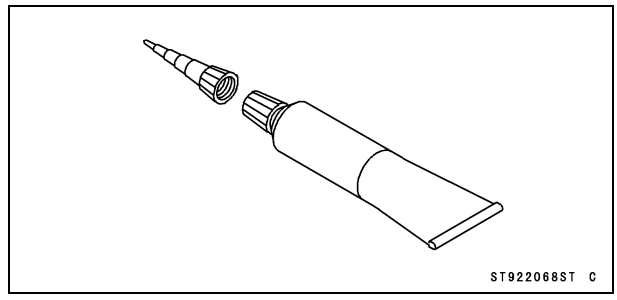
Liquid Gasket, TB1211F:
92104-0004



Liquid Gasket, TB1216B:
92104-1064



Liquid Gasket, TB1207B:
92104-2068



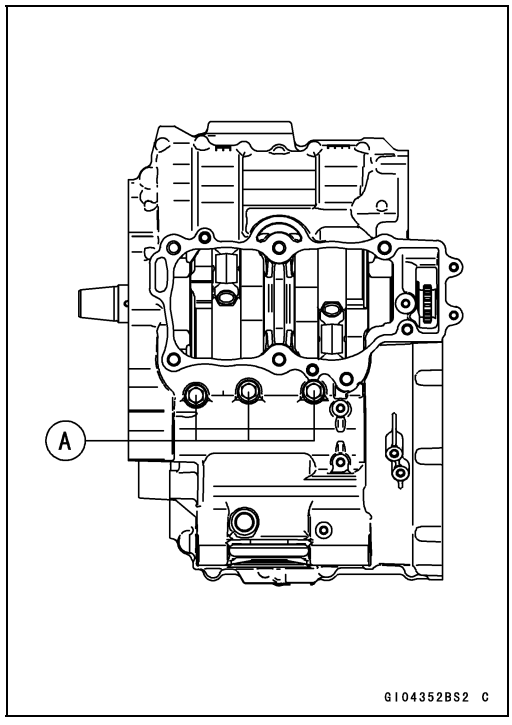
Crankcase Splitting

Crankcase Splitting

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter)
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:

  Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
  Cylinder (see Cylinder Removal in the Engine Top End chapter)
  Pistons (see Piston Removal in the Engine Top End chapter)
  Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  Crankshaft Sensor (see Crankshaft Sensor Removal in the Electrical System chapter)
  Timing Rotor (see Timing Rotor Removal in the Electrical System chapter)
  Clutch (see Clutch Removal in the Clutch chapter)
  Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
  Water Pump (see Water Pump Removal in the Cooling System chapter)
  Transmission Assy (see Transmission Assy Removal)

- Remove the upper crankcase bolts [A] and the washers.



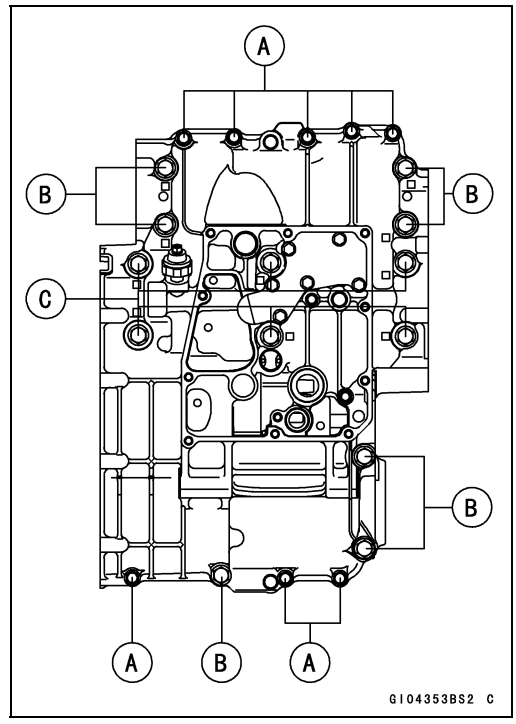
Crankcase Splitting

- Remove:
  Oil Pan (see Oil Pan Removal in the Engine Lubrication System chapter)
  Oil Screen (see Oil Screen Removal in the Engine Lubrication System chapter)
  Oil Pipes (see Oil Pipe Removal in the Engine Lubrication System chapter)
- Remove the lower crankcase bolts, following the specified sequence.

○Firstly, loosen the M6 bolts [A].
○Secondly, loosen the M8 bolts [B].
○Lastly, loosen the M9 bolts [C].

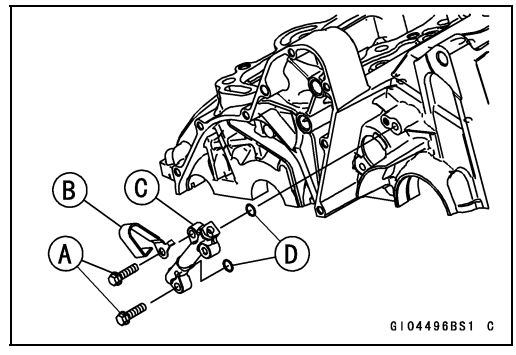
- Tap lightly around the crankcase mating surface with a plastic hammer, and split the crankcase.

○Take care not to damage the crankcase.

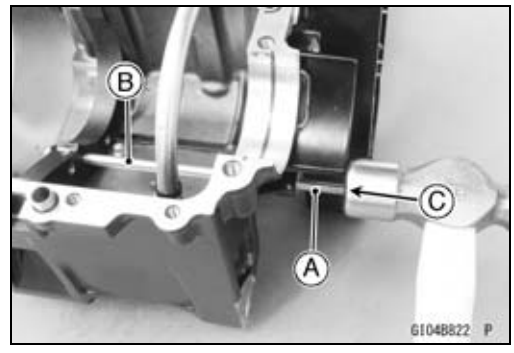


★If the oil pipe is to be removed, follow the next procedures.

- Remove:
  Bolts [A]
  Clamp [B]
  Oil Pipe [C]
  O-rings [D]

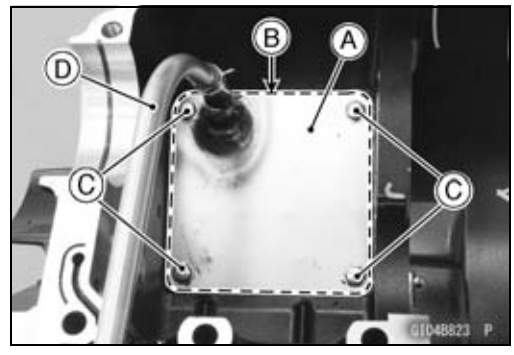


- Prepare a ϕ5 mm rod [A], and insert it to the hole of the upper crankcase half.
- Remove the oil pipe [B] by tapping [C] the rod as shown.



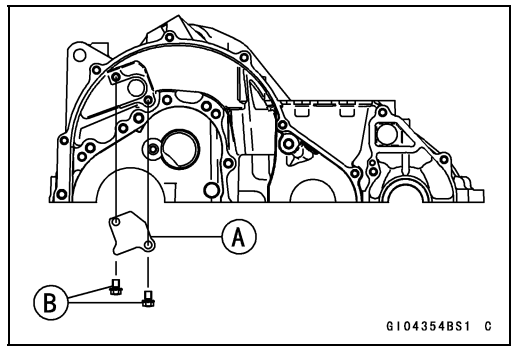
★If the breather plate [A] is to be removed, follow the next procedures.

- Remove the oil pipe (see above).
- Cut the gasket around the plate [B].
- Remove:
  Breather Plate Bolts [C]
  Breather Plate with Pipe [D]

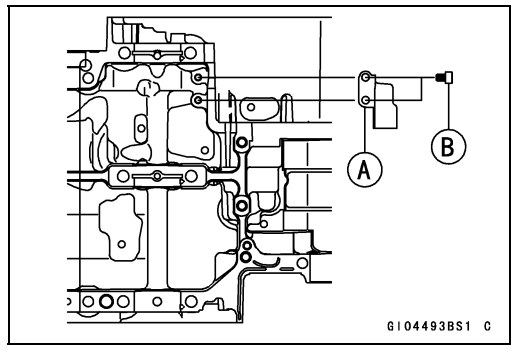


Crankcase Splitting

★If the oil plate [A] is to be removed, follow the next procedure.
- Remove:
  Oil Plate Bolts [B]
  Oil Plate



★If the oil plate [A] is to be removed, follow the next procedure.
- Remove:
  Oil Plate Bolts [B]
  Oil Plate



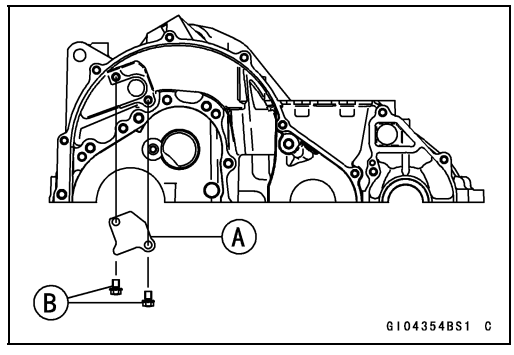
Crankcase Assembly

NOTICE
The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

- With a high flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
- Using compressed air, blow out the oil passages in the crankcase halves.

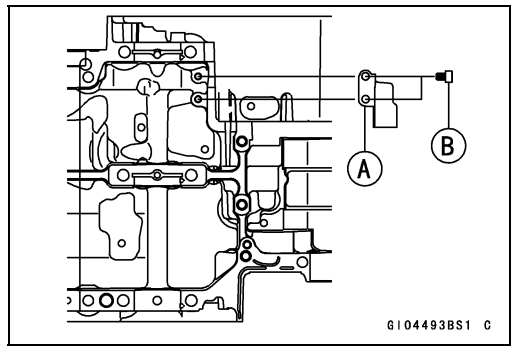
★If the side oil plate [A] on the upper crankcase half was removed, install it as shown.
- Apply a non-permanent locking agent to the side oil plate bolts and tighten them.

Torque - Side Oil Plate Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)



★If the middle oil plate [A] on the lower crankcase half was removed, install it in the following procedure.
- Apply a non-permanent locking agent to the middle oil plate bolts [B] and tighten them.

Torque - Middle Oil Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

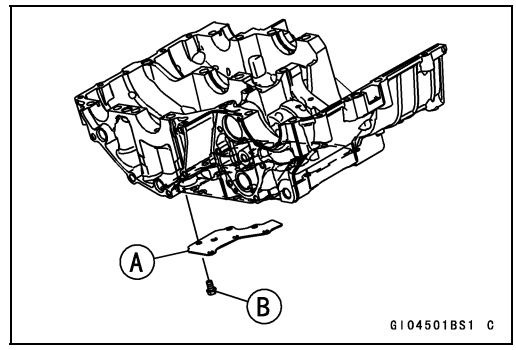


Crankcase Splitting

★If the bottom oil plate [A] on the lower crankcase half was removed, install it in the following procedure.

● Apply a non-permanent locking agent to the bottom oil plate bolts [B] and tighten them.

Torque - Bottom Oil Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



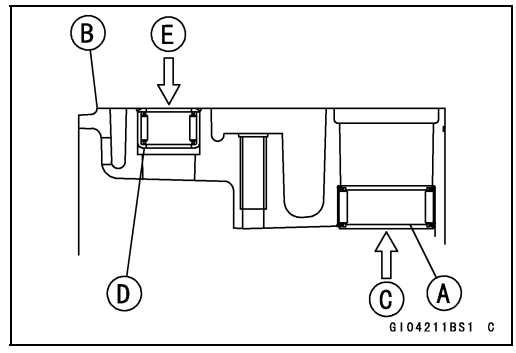
● When the new needle bearing [A] for the shift drum is installed in the lower crankcase half [B], press and insert [C] the new needle bearing until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

● When the new needle bearing [D] for the shift shaft is installed in the lower crankcase half, press and insert [E] the new needle bearing so that the bearing surface is flush with the end of hole.

○The marked side of the needle bearing faces outside of the crankcase.

Special Tool - Bearing Driver Set: 57001-1129



● Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.

● When the new oil plug [A] and new race [B] for drive shaft is installed in the upper crankcase half [C], install them using the following procedures.

● Apply grease to the new O-rings [D].

● Apply liquid gasket to the portions [E] on the upper crankcase half, and insert [F] the new oil plug until it is bottomed.

Sealant - Liquid Gasket, TB1211F: 92104-0004

● Press and insert the new race until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

NOTE

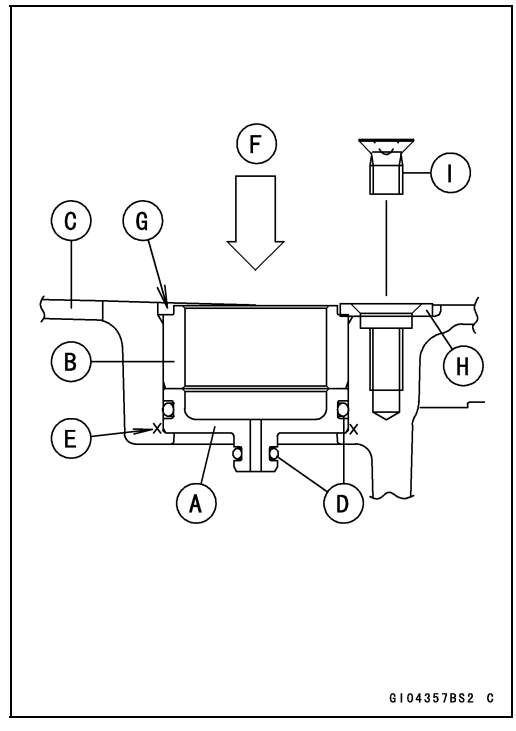
○*Install the new race so that the stepped side [G] faces inside of the crankcase.*

○*Do not apply liquid gasket to the O-ring and the oil line.*

● Install the race holder [H] direction as shown.

● Apply a non-permanent locking agent to the threads of the race holder screw [I] and tighten it.

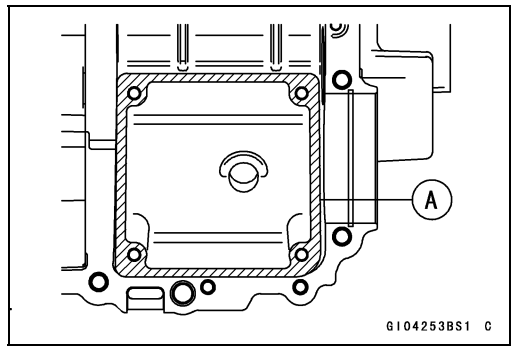
Torque - Race Holder Screw: 4.9 N·m (0.50 kgf·m, 43 in·lb)



Crankcase Splitting

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the breather plate mating surface [A] 1 mm (0.04 in.) or more thick, and then install the breather plate.

Sealant - Liquid Gasket, TB1207B: 92104-2068



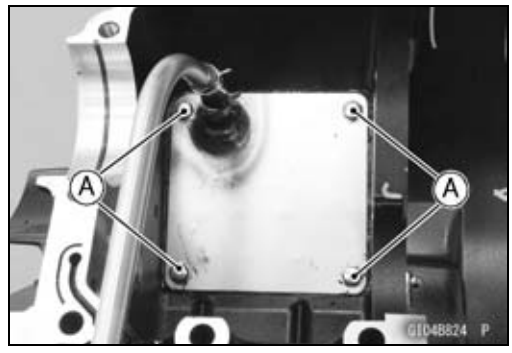
NOTE

○*Make the application finish within 7 minutes when the liquid gasket to the mating surface of the breather plate is applied.*

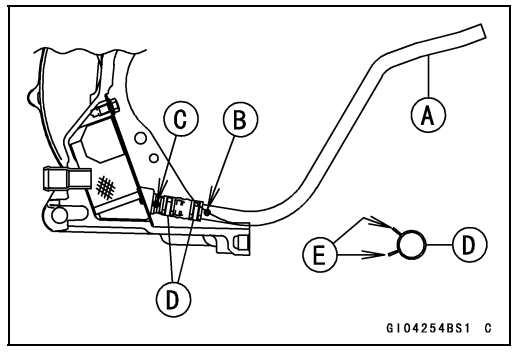
○*Moreover fit the plate and tighten the bolts just after application of the liquid gasket.*

- Apply a non-permanent locking agent to the threads and tighten the bolts [A].

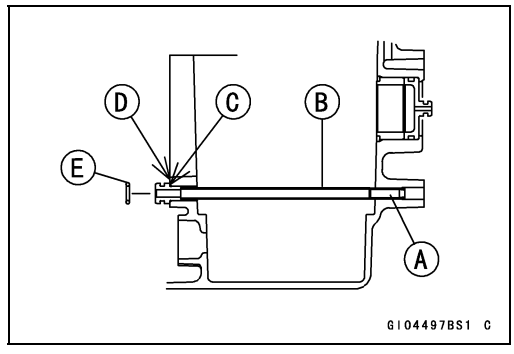
Torque - Breather Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



- When installing the breather pipe [A], follow the next procedures.
- Align the white mark [B] on the pipe with the white mark [C] on the breather fitting.
- Install the clamps [D] so that the pinch heads [E] face the white marks.



- When installing the oil pipes, follow the next procedures.
- Apply molybdenum disulfide oil solution to the edge of the oil pipe [A].
- Install the oil pipe [B] so that its flange [C] touches to the surface [D] of the upper crankcase half.
- Replace the O-ring [E] with a new one.
- Apply grease to the O-ring on the oil pipe.

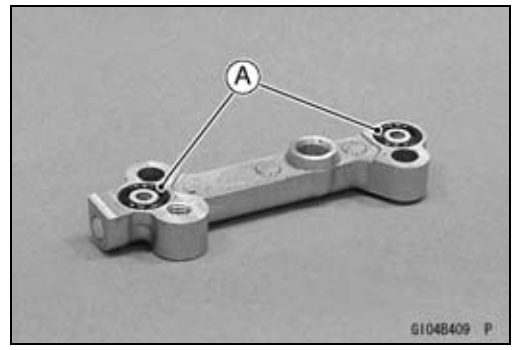


Crankcase Splitting

- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings.
- Apply a non-permanent locking agent to the threads of the oil pipe bolts and tighten them.

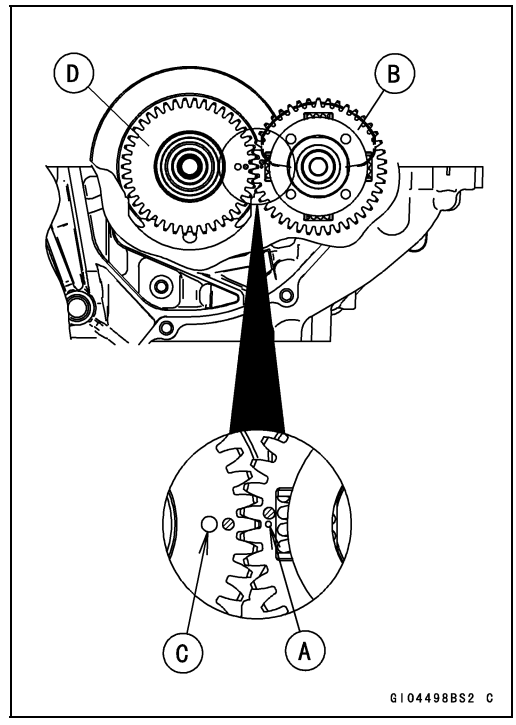
○Install the clamp with the upper oil pipe bolt.

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

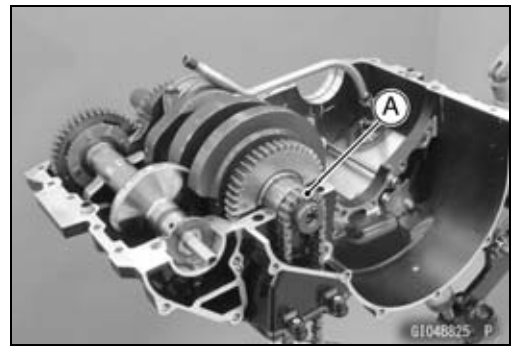


- Apply molybdenum disulfide oil solution to the following items.
  Crankshaft Main Bearing Insert
  Balancer Shaft Bearing Insert
- Install the crankshaft and the balancer shaft on the upper crankcase half.

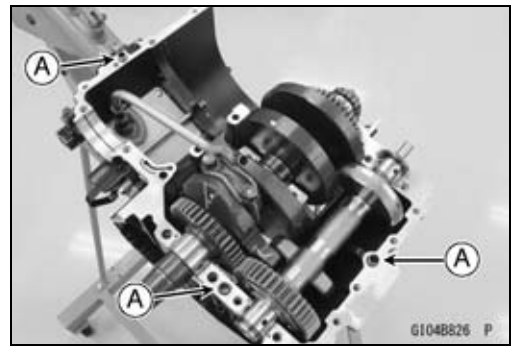
○Align the timing mark [A] on the balancer gear [B] with the timing mark [C] on the balancer drive gear [D] of the crankshaft.



- Be sure to hang the camshaft chain [A] on the crankshaft.

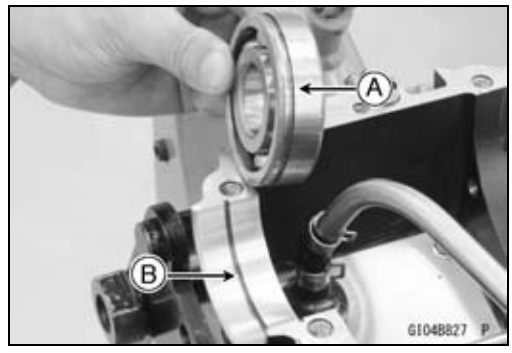


- Be sure that the dowel pins [A] are in position.



Crankcase Splitting

- Set the bearing groove [A] on the positioning ring [B] as shown.



- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the mating surface of the lower crankcase half.

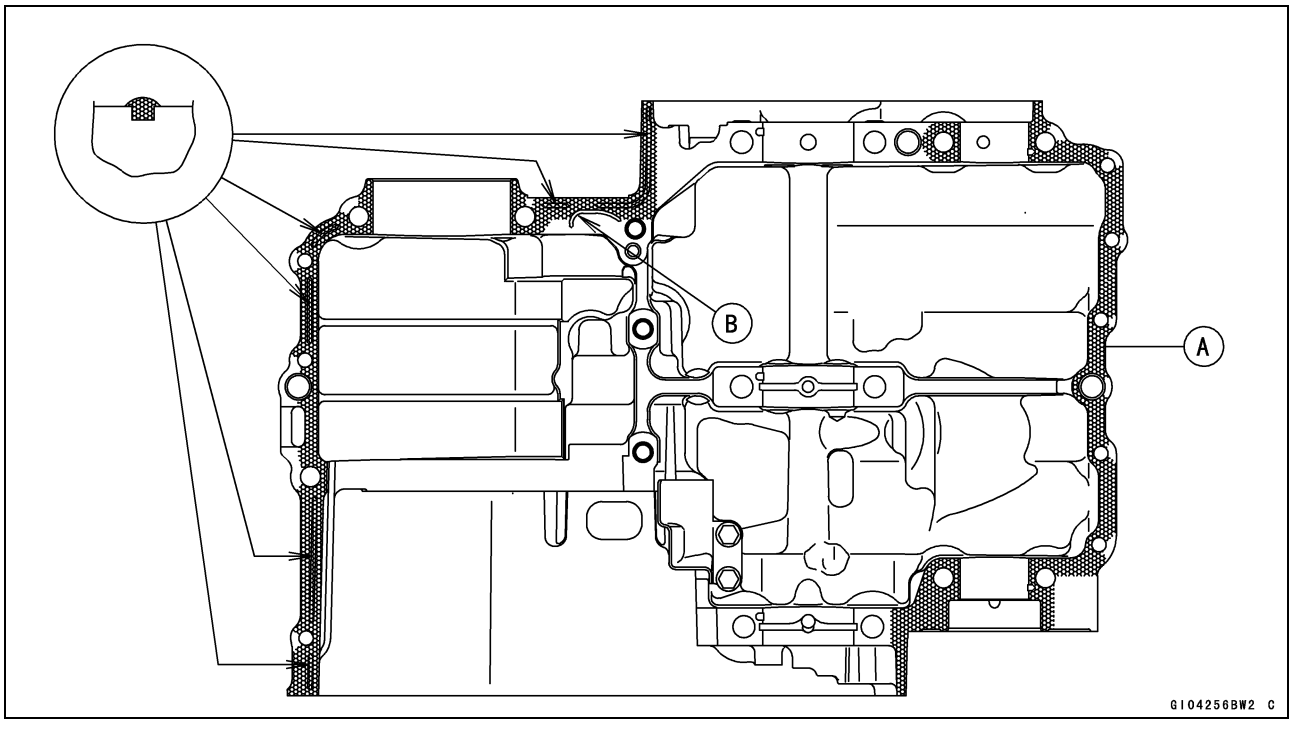
Sealant - Liquid Gasket, TB1216B: 92104-1064

NOTE

○*Especially, apply a liquid gasket carefully so that it shall be filled up on the grooves.*

NOTICE
Do not apply liquid gasket around the crankshaft main bearing inserts, and oil passage holes.

○Do not apply liquid gasket to the oil passage [B].

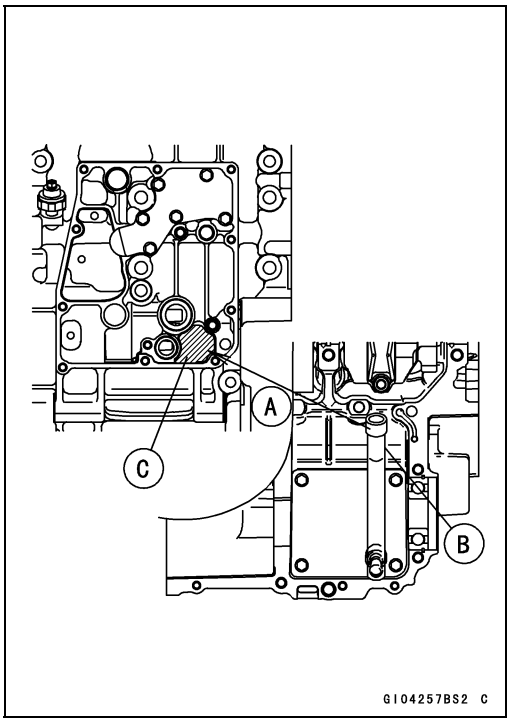


Crankcase Splitting

● Fit the lower crankcase half to the upper crankcase half.
○Insert [A] the breather pipe [B] on the upper crankcase half through the hole [C] on the lower crankcase half.

NOTE

○*Make the application finish within 20 minutes when the liquid gasket to the mating surface of the lower crankcase half is applied.*
○*Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.*



Crankcase Splitting

- Tighten the lower crankcase bolts following the sequence numbers on the lower crankcase half.
- The crankcase bolts (M9) [1 ~ 6] have copper plated washers, replace them with new ones.
- Apply molybdenum disulfide oil solution to both sides of the copper plated washers and the threads of the crankcase bolts (M9).
- Tighten:
  Crankcase Bolts (M9) [1, 2] L = 113 mm (4.45 in.) with Copper Plated Washers
  Crankcase Bolts (M9) [3, 4] L = 83 mm (3.3 in.) with Copper Plated Washers
  Crankcase Bolts (M9) [5, 6] L = 113 mm (4.45 in.) with Copper Plated Washers

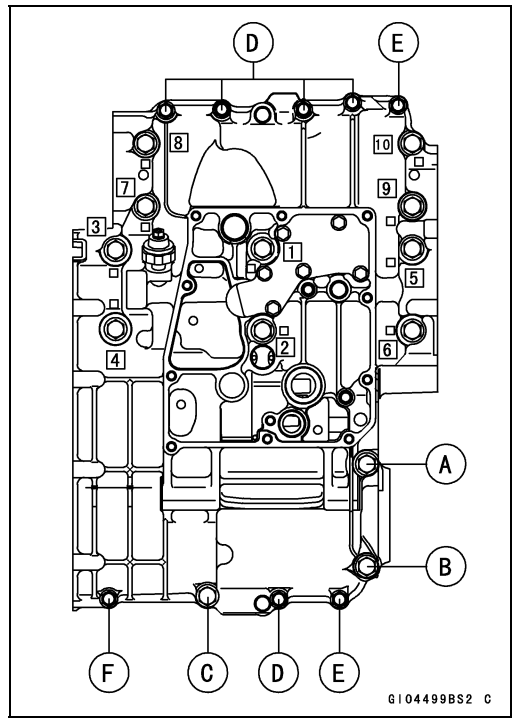
Torque - Crankcase Bolts (M9): 44.1 N·m (4.50 kgf·m, 32.5 ft·lb)

- Apply molybdenum disulfide oil solution to flange and the threads of the crankcase bolts (M8) [7 ~ 10].
- Tighten:
  Crankcase Bolts (M8) [7, 9] L = 73 mm (2.9 in.)
  Crankcase Bolts (M8, Front) [8, 10] L = 60 mm (2.4 in.)

Torque - Crankcase Bolts (M8): 25.5 N·m (2.6 kgf·m, 19 ft·lb)
Crankcase Bolts (M8, Front): 27.5 N·m (2.80 kgf·m, 20.3 ft·lb)

- Do not apply molybdenum disulfide oil solution to the crankcase bolts (M8) [A] [B] [C].
- Tighten:
  Crankcase Bolt (M8) [A] L = 110 mm (4.3 in.)
  Crankcase Bolt (M8, Rear) [B] L = 60 mm (2.4 in.)
  Crankcase Bolt (M8) [C] L = 50 mm (2.0 in.)
  Crankcase Bolts (M6) [D] L = 38 mm (1.5 in.)
  Crankcase Bolts (M6) [E] L = 45 mm (1.8 in.)
  Crankcase Bolt (M6) [F] L = 32 mm (1.3 in.)

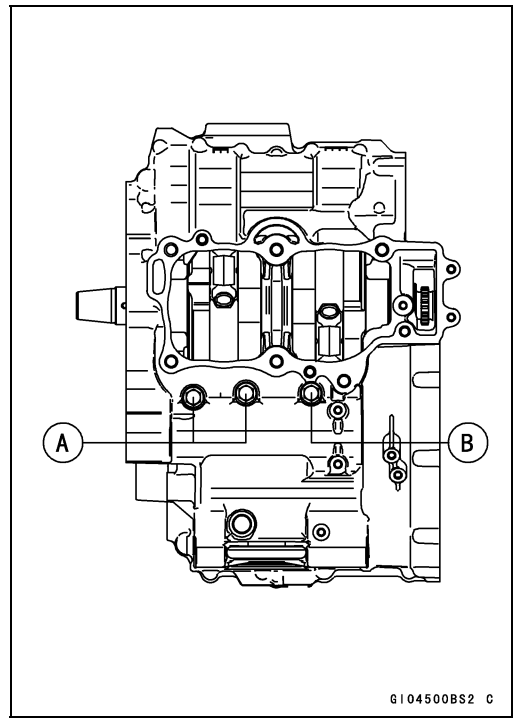
Torque - Crankcase Bolts (M8): 27.5 N·m (2.80 kgf·m, 20.3 ft·lb)
Crankcase Bolts (M6): 19.6 N·m (2.00 kgf·m, 14.5 ft·lb)



Crankcase Splitting

- The upper crankcase bolts have copper plated washers, replace them with new ones.
- Tighten the upper crankcase bolts with washers.
  Upper Crankcase Bolts [A], L = 110 mm (4.3 in.)
  Upper Crankcase Bolt [B], L = 120 mm (4.72 in.)

Torque - Upper Crankcase Bolts: 27.5 N·m (2.80 kgf·m, 20.3 ft·lb)



- After tightening all crankcase bolts, check the following items.

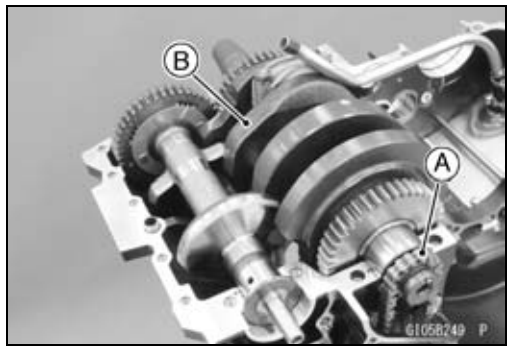
○Wipe up the liquid gasket that seeps out around the crankcase mating surface.

○Crankshaft and balancer shaft turn freely.

- Install the removed parts (see appropriate chapters).

Crankshaft and Connecting Rods

Crankshaft Removal



- Split the crankcase (see Crankcase Splitting).
- Remove:
  Camshaft Chain [A]
  Crankshaft [B]

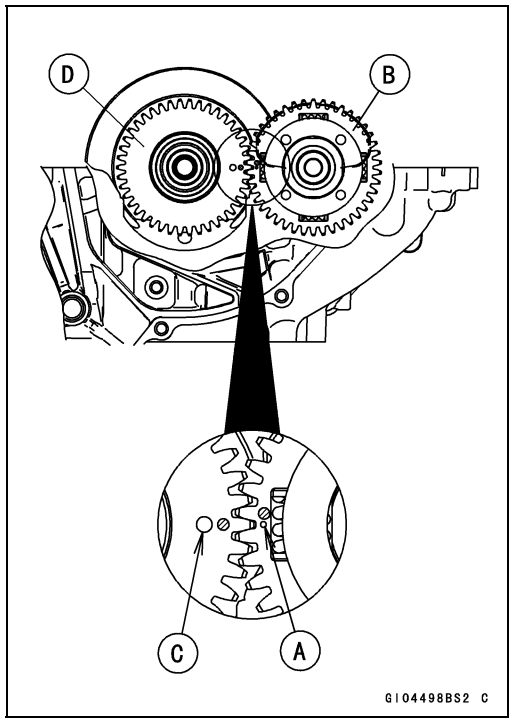
Crankshaft Installation

NOTE

○*If the crankshaft is replaced with a new one, refer to the Connecting Rod Big End Bearing/Crankshaft Main Bearing Insert Selection in the Specifications.*

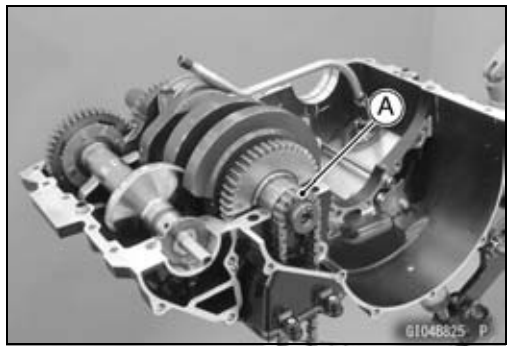
NOTICE

If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

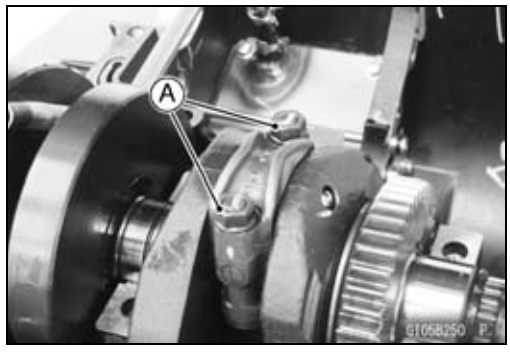


- Apply molybdenum disulfide oil solution to the crankshaft main bearing inserts.
- Align the timing mark [A] on the balancer gear [B] with the timing mark [C] on the balancer drive gear [D] of the crankshaft.

- Install the crankshaft with the camshaft chain [A] hanging on it.



Connecting Rod Removal



- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod nuts [A].

NOTE

○*Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.*

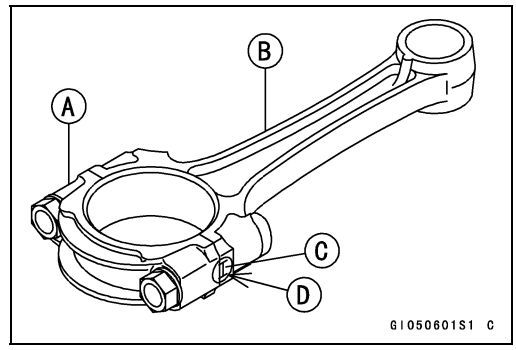
- Remove the connecting rods from the crankshaft.

NOTICE

Discard the connecting rod bolts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

Crankshaft and Connecting Rods

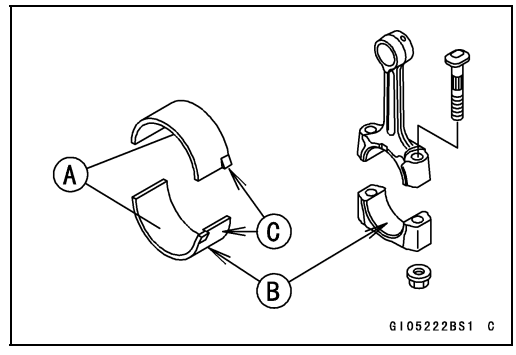
Connecting Rod Installation



NOTICE
To minimize vibration, the connecting rods should have the same weight mark.

Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark [D]: "○" or no mark

NOTICE
If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.



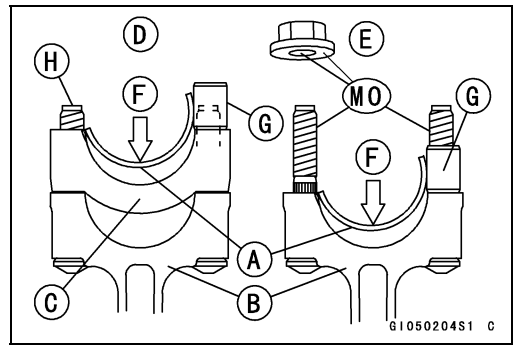
- Apply molybdenum disulfide oil solution [A] to the inner surfaces of upper and lower bearing inserts.

○Do not apply any grease or oil [B] to the cap inside and cap insert outside.

○Install the inserts so that their nails [C] are on the same side and fit them into the recess of the connecting rod and cap.

NOTICE
Wrong application of oil and grease could cause bearing damage.

○When installing the inserts [A], be careful not to damage the insert surface with the edge of the connecting rod [B] or the cap [C]. One way to install inserts is as follows.
Installation [D] to Cap
Installation [E] to Connecting Rod
Push [F]
Spare Dowel Pin [G]
Connecting Rod Bolts [H]

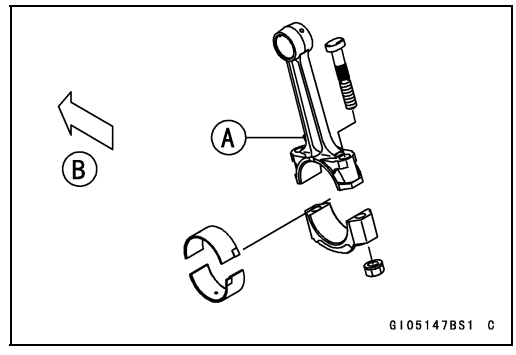


- Remove debris and clean the surface of inserts.
- Apply molybdenum disulfide oil solution [MO] to the threads and seating surfaces of the big end nuts and bolts.

- Install each connecting rod on its original crankpin.

NOTE

○*Install each connecting rod so that its oil jet [A] faces the exhaust side (the front [B]) (see Engine Oil Flow Chart in the Engine Lubrication System chapter).*



- Install the cap on the connecting rod, aligning the weight and diameter marks.

Crankshaft and Connecting Rods

○The connecting rod big end is bolted using the “plastic region fastening method”.
○This method precisely achieves the needed clamping force without exceeding it unnecessarily, allowing the use of thinner, lighter bolts further decreasing connecting rod weight.
○There are two types of the plastic region fastening. One is a bolt length measurement method and other is a rotation angle method. Observe one of the following two, but the bolt length measurement method is preferable because this is a more reliable way to tighten the big end nuts.

NOTICE

The connecting rod bolts are designed to stretch when tightened. Never reuse the connecting rod bolts. See the table below for correct bolt and nut usage.

NOTICE

Be careful not to overtighten the nuts.
The bolts must be positioned on the seating surface correctly to prevent the bolt heads from hitting the crankcase.

(1) Bolt Length Measurement Method
● Be sure to clean the bolts, nuts, and connecting rods thoroughly with a high flash-point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

⚠ WARNING

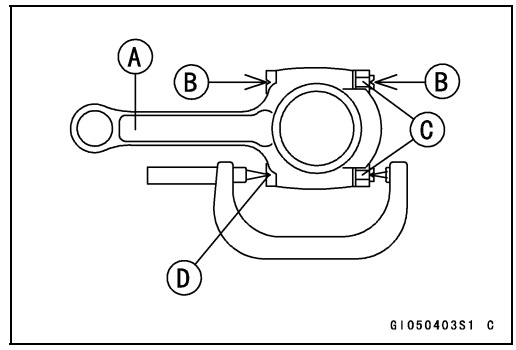
Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not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

NOTICE

Immediately dry the bolts and nuts with compressed air after cleaning.
Clean and dry the bolts and nuts completely.

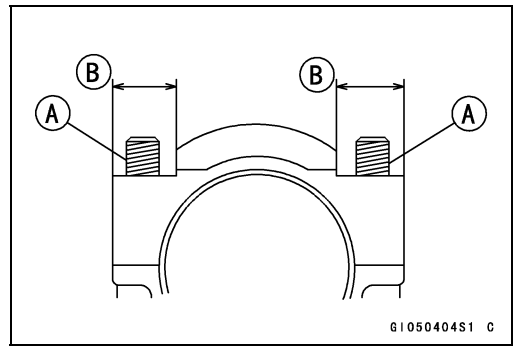
Crankshaft and Connecting Rods

- Install new bolts in reused connecting rods.
- Dent both bolt head and bolt tip with a punch as shown.
- Before tightening, use a point micrometer to measure the length of new connecting rod bolts and record the values to find the bolt stretch.
  Connecting Rod [A]
  Mark here with a punch [B].
  Nuts [C]
  Fit micrometer pins into punch marks [D].



- Apply a small amount of molybdenum disulfide oil solution to the following.
  Threads [A] of Nuts and Bolts
  Seating Surfaces [B] of Nuts and Connecting Rods
- Tighten the big end nuts until the bolt elongation reaches the length specified in the table.
- Check the length of the connecting rod bolts.

★If the stretch is more than the usable range, the bolt has stretched too much. An overelongated bolt may break in use.



Bolt Length after tightening – Bolt Length before tightening = Bolt Stretch

Connecting Rod Assy	Bolt	Nut	Usable Range of Connecting Rod Bolt Stretch
New	Use the bolts attached to new connecting rod.	Attached to new connecting rod	0.24 ~ 0.36 mm (0.0094 ~ 0.0142 in.)
		New	
Used	Replace the bolts with new ones.	Used	0.20 ~ 0.32 mm (0.0079 ~ 0.0126 in.)
		New	

(2) Rotation Angle Method

★If you don't have a point micrometer, you may tighten the nuts using the "Rotation Angle Method".

- Be sure to clean the bolts and nuts thoroughly with a high flash-point solvent, because the new bolts and nuts are treated with an anti-rust solution.

⚠ WARNING

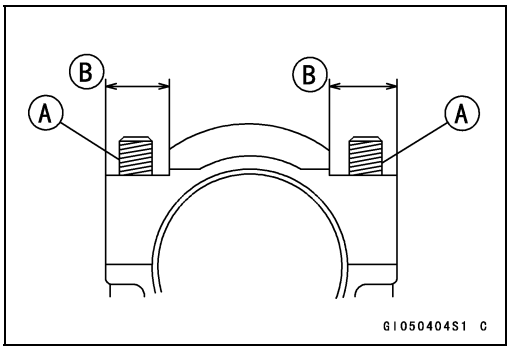
Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the bolts and nuts in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a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

NOTICE

Immediately dry the bolts and nuts with compressed air after cleaning.
Clean and dry the bolts and nuts completely.

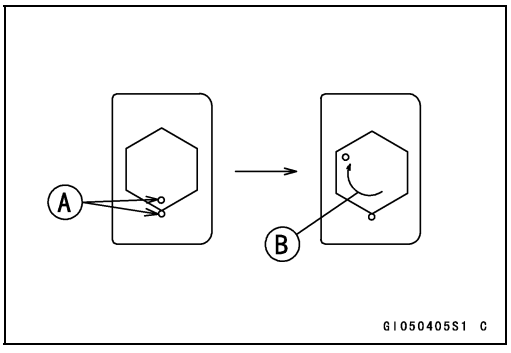
Crankshaft and Connecting Rods

- Install new bolts in reused connecting rods.
- Apply a small amount of molybdenum disulfide oil solution to the following.
  Threads [A] of Nuts and Bolts
  Seating Surfaces [B] of Nuts and Connecting Rods



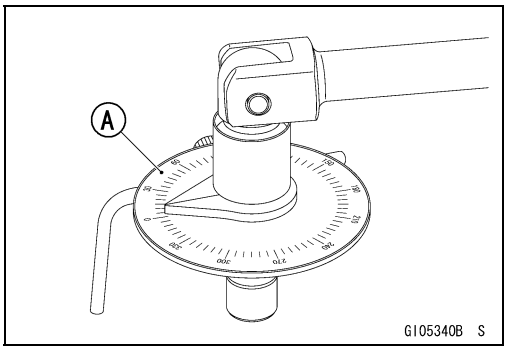
- First, tighten the nuts to the specified torque. See the table below.
- Next, tighten the nuts **120° ±5°** .

○Mark [A] the connecting rod big end caps and nuts so that nuts can be turned 120° [B] properly.



Connecting Rod Assy	Bolt	Nut	Torque + Angle N·m (kgf·m, ft·lb)
New	Use the bolts attached to new connecting rod.	Attached to new connecting rod	18 (1.8, 13.0) + 120°
		New	20 (2.0, 15) + 120°
Used	Replace the bolts with new ones.	Used	24 (2.4, 17.4) + 120°
		New	25 (2.6, 18.8) + 120°

○Using a torque angle [A], tighten the nuts specified angle.

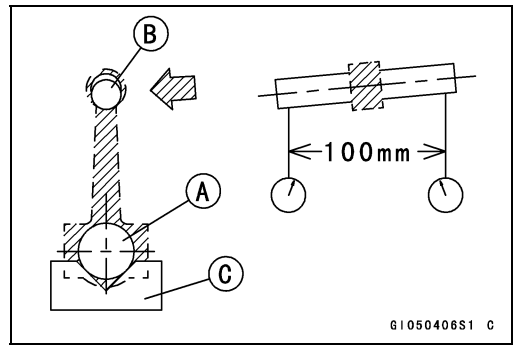


Crankshaft/Connecting Rod Cleaning

- 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.

Crankshaft and Connecting Rods

Connecting Rod Bend Inspection

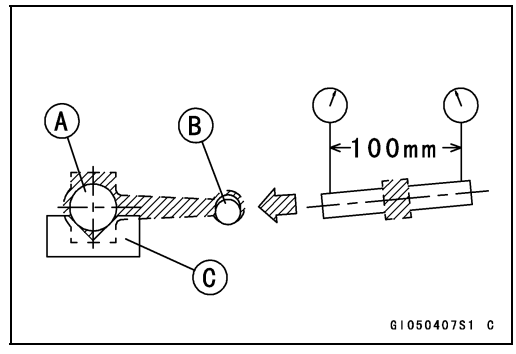


- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on V block [C].
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.

★If connecting rod bend exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Bend
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

Connecting Rod Twist Inspection

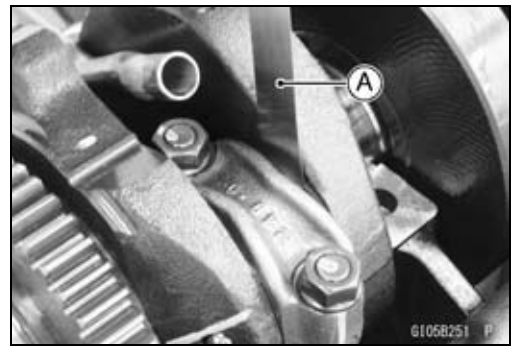


- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.

★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

Connecting Rod Big End Side Clearance Inspection



- Measure connecting rod big end side clearance.

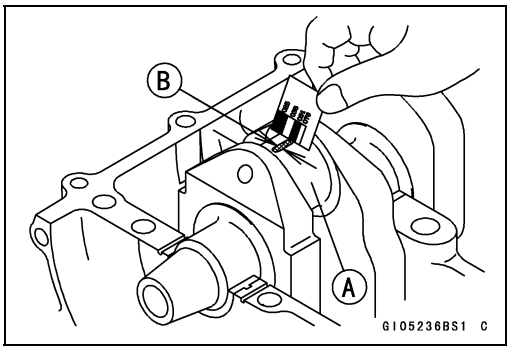
○Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

Connecting Rod Big End Side Clearance
Standard: 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)
Service Limit: 0.6 mm (0.02 in.)

★If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If the clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

Crankshaft and Connecting Rods

Connecting Rod Big End Bearing Insert/Crankpin Wear Inspection



- Measure the bearing insert/crankpin [A] clearance with plastigage [B].
- Tighten the big end nuts to the specified torque (see Connecting Rod Installation).

NOTE

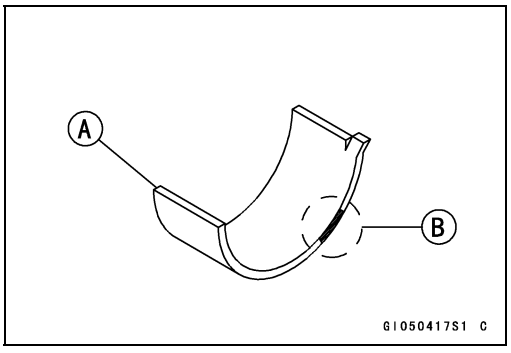
○*Do not move the connecting rod and crankshaft during clearance measurement.*

NOTICE
After measurement, replace the connecting rod bolts and nuts.

Connecting Rod Big End Bearing Insert/Crankpin Clearance

Standard: 0.017 ~ 0.041 mm (0.0007 ~ 0.0016 in.)

Service Limit: 0.08 mm (0.0031 in.)



★If the clearance is within the standard, no bearing replacement is required.

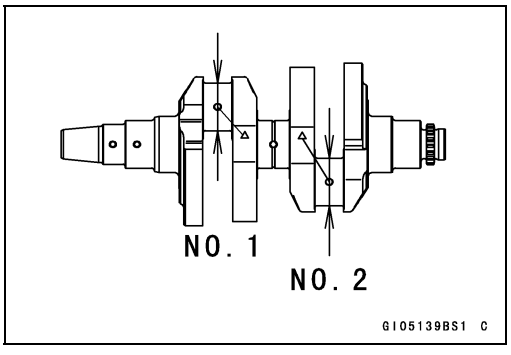
★If the clearance is between 0.042 mm (0.00165 in.) and the service limit (0.08 mm, 0.003 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★If the clearance exceeds the service limit, measure the diameter of the crankpins.

Crankpin Diameter

Standard: 37.984 ~ 38.000 mm (1.4954 ~ 1.4961 in.)

Service Limit: 37.97 mm (1.495 in.)



★If any crankpin has worn past the service limit, replace the crankshaft with a new one.

★If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankpin Diameter Marks

None 37.984 ~ 37.992 mm (1.4954 ~ 1.49575 in.)

○ 37.993 ~ 38.000 mm (1.49578 ~ 1.4961 in.)

Δ: Crankpin Diameter Marks, "○" or no mark.

- Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

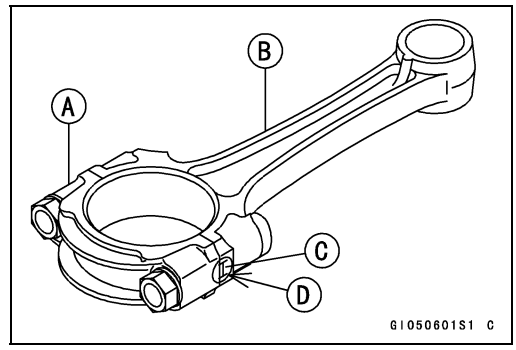
NOTE

○*The mark already on the big end should almost coincide with the measurement.*

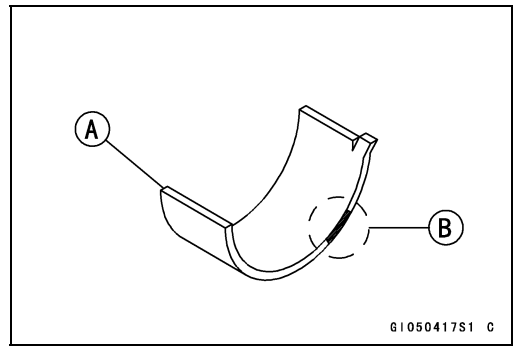
Crankshaft and Connecting Rods

Connecting Rod Big End Inside Diameter Marks
None 41.000 ~ 41.008 mm (1.6142 ~ 1.61448 in.)
○ 41.009 ~ 41.016 mm (1.61452 ~ 1.6148 in.)

Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark (Around Weight Mark) [D]: "○" or no mark



● Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding.
Size Color [B]



Connecting Rod Big End Inside Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92139-0116
None	None	Black	92139-0115
○	○		
○	None	Blue	92139-0114

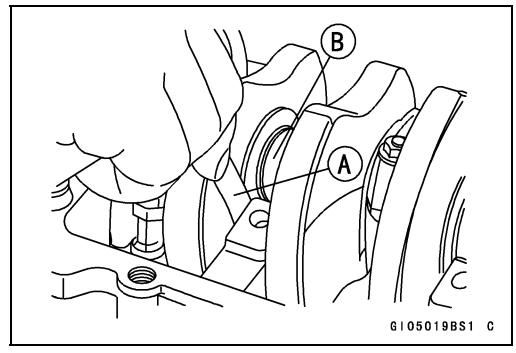
● Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

Crankshaft Side Clearance Inspection

● Insert a thickness gauge [A] between the crankcase main bearing and the crank web at the No. 2 journal [B] to determine clearance.
★If the clearance exceeds the service limit, replace the crankcase halves as a set.

NOTE

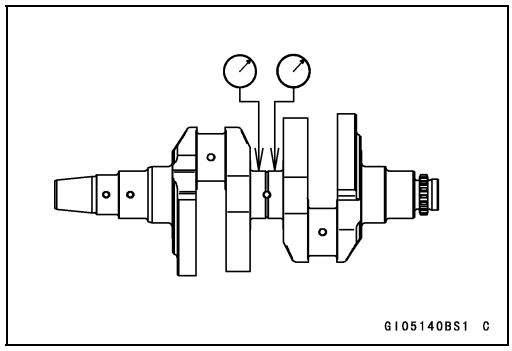
○*The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.*



Crankshaft Side Clearance
Standard: 0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)
Service Limit: 0.40 mm (0.016 in.)

Crankshaft and Connecting Rods

Crankshaft Runout Inspection



- Measure the crankshaft runout.

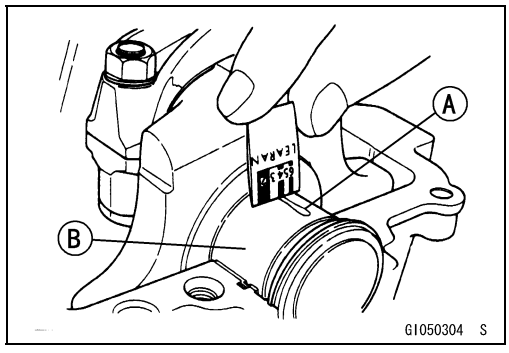
★If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

Standard: TIR 0.02 mm (0.0008 in.) or less

Service Limit: TIR 0.05 mm (0.002 in.)

Crankshaft Main Bearing Insert/Journal Wear Inspection



- Using a plastigage (press gauge) [A], measure the bearing insert/journal [B] clearance.

NOTE

○*Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).*

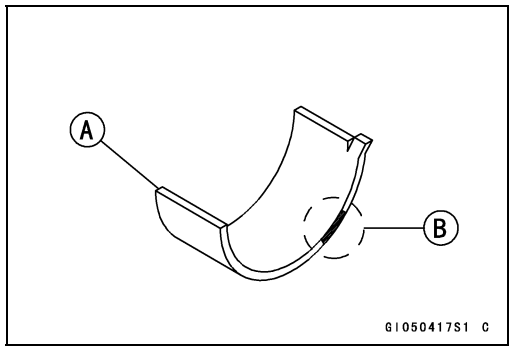
○*Do not turn the crankshaft during clearance measurement.*

○*Journal clearance less than 0.025 mm (0.00098 in.) can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.*

Crankshaft Main Bearing Insert/Journal Clearance

Standard: 0.016 ~ 0.040 mm (0.0006 ~ 0.0016 in.)

Service Limit: 0.07 mm (0.0028 in.)



★If the clearance is within the standard, no bearing replacement is required.

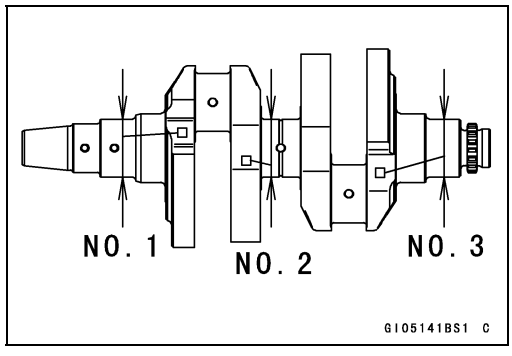
★If the clearance is between 0.037 mm (0.0015 in.) and the service limit (0.07 mm, 0.003 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

Crankshaft Main Journal Diameter

Standard: 37.984 ~ 38.000 mm (1.4954 ~ 1.4961 in.)

Service Limit: 37.96 mm (1.4945 in.)



★If any journal has worn past the service limit, replace the crankshaft with a new one.

★If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankshaft Main Journal Diameter Marks

None 37.984 ~ 37.992 mm (1.4954 ~ 1.49575 in.)

1 37.993 ~ 38.000 mm (1.49578 ~ 1.4961 in.)

□: Crankshaft Main Journal Diameter Marks, “1” or no mark.

Crankshaft and Connecting Rods

- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.
  Crankshaft Main Bearing Inside Diameter Marks: "○" or no mark.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

NOTE

○*The mark already on the upper crankcase half should almost coincide with the measurement.*

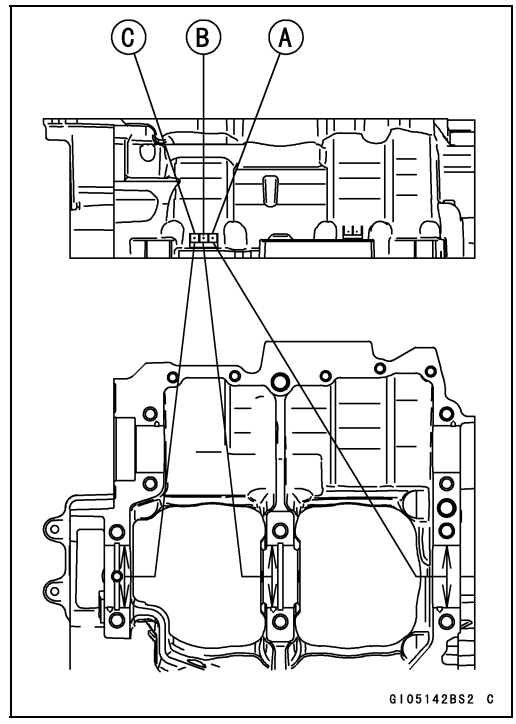
Crankcase Main Bearing Inside Diameter Marks

○ 41.000 ~ 41.008 mm (1.6142 ~ 1.61448 in.)

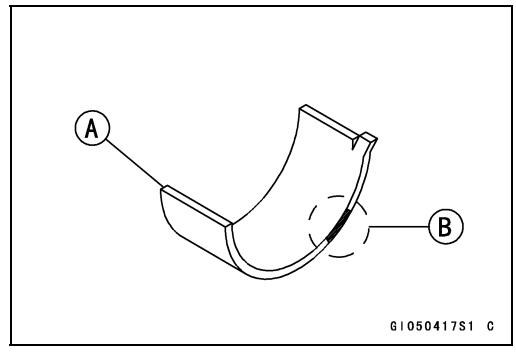
None 41.009 ~ 41.016 mm (1.61452 ~ 1.6148 in.)

□□□: Crankshaft Main Bearing Inside Diameter Marks, "○" mark or no mark

No.1 Journal [A]
No.2 Journal [B]
No.3 Journal [C]



- Select the proper bearing insert [A] in accordance with the combination of the crankcase and crankshaft coding.
  Size Color [B]



Crankshaft Main Bearing Inside Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*	
		Size Color	Part Number
○	1	Brown	92028-1905
None	1	Black	92028-1904
○	None		
None	None	Blue	92028-1903

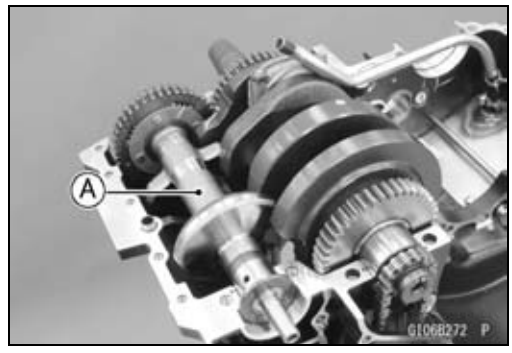
* The bearing inserts for Nos. 1, 2 and 3 journals have oil groove.

- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage.

Balancer

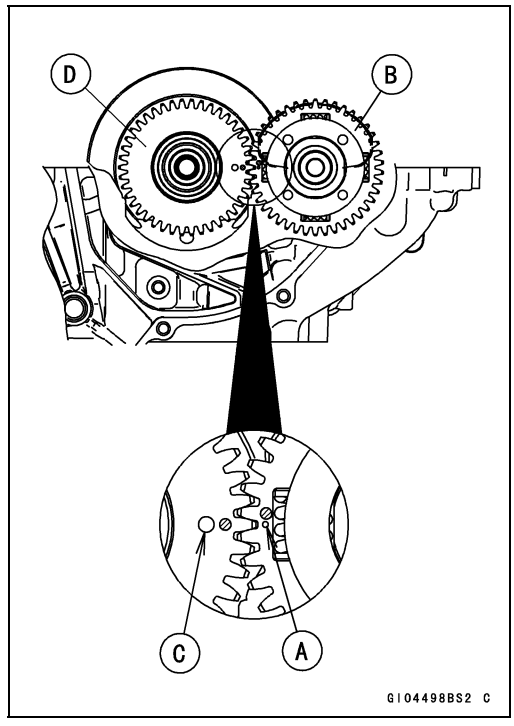
Balancer Removal

- Split the crankcase (see Crankcase Splitting).
- Pull the balancer shaft [A] with the balancer gear out of the crankcase.



Balancer Installation

- Apply molybdenum disulfide oil solution to the inside of the balancer shaft bearing insert.
- Align the timing mark [A] on the balancer gear [B] with the timing mark [C] on the balancer drive gear [D] of the crankshaft.
- Assemble the crankcase (see Crankcase Assembly).



Balancer Shaft Bearing Insert/Journal Wear Inspection

- Measure the bearing insert/journal clearance using a plastigage.

○Split the crankcase and wipe each bearing insert and journal surface clean of oil.

○Cut strips of plastigage to bearing insert width, and place a strip on each journal parallel to the balancer shaft so that the plastigage will be compressed between the journal and the bearing insert.

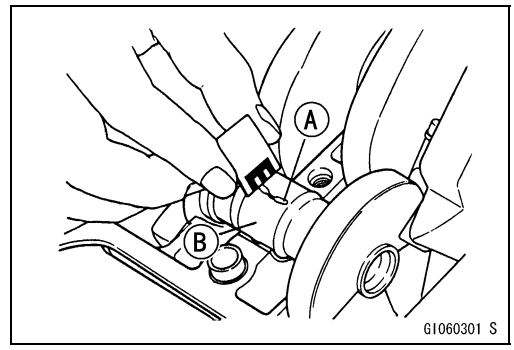
○Install the lower crankcase half, and tighten the case bolts to the specified torque (see Crankcase Assembly).

Balancer

NOTE

○*Do not turn the balancer shaft during clearance measurement.*

○Remove the lower crankcase half and measure the plastigage width [A] to determine the bearing insert/journal [B] clearance.



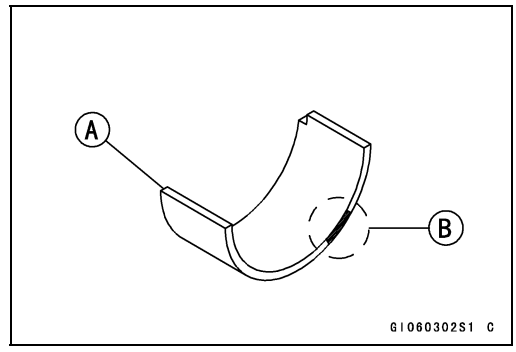
Balancer Shaft Bearing Insert/Journal Clearance

Standard: 0.011 ~ 0.033 mm (0.0004 ~ 0.0013 in.)

Service Limit: 0.06 mm (0.0024 in.)

★If the clearance is within the standard, no bearing insert replacement is required.

★If the clearance is between 0.034 mm (0.00134 in.) and the service limit (0.08 mm (0.003 in.)), replace the bearing inserts [A] with inserts painted blue [B] Check insert/journal clearance with a 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 balancer shaft journal.

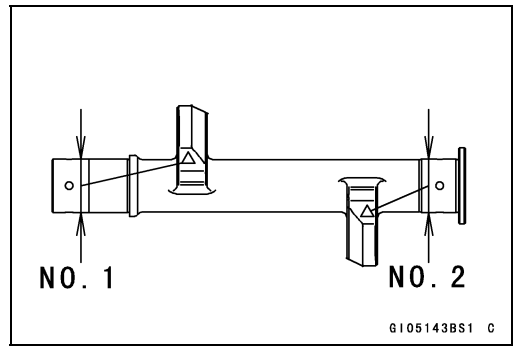
Balancer Shaft Journal Diameter

Standard: 27.987 ~ 28.000 mm (1.1018 ~ 1.1024 in.)

Service Limit: 27.96 mm (1.1008 in.)

★If either journal has worn past the service limit, replace the balancer shaft with a new one.

★If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the balancer shaft, write new marks on it.



Balancer Shaft Diameter Marks

None 27.987 ~ 27.993 mm (1.1018 ~ 1.10208 in.)

○ 27.994 ~ 28.000 mm (1.10212 ~ 1.1024 in.)

Δ: Balancer Shaft Journal Diameter Marks, "○" mark or no mark.

Balancer

- Put the lower crankcase half on the upper crankcase half without bearing inserts, and tighten the case bolts to the specified torque and sequence (see Crankcase Assembly).
- Measure the balancer shaft bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.

NOTE

○*The mark already on the upper crankcase half should almost coincide with the measurement.*

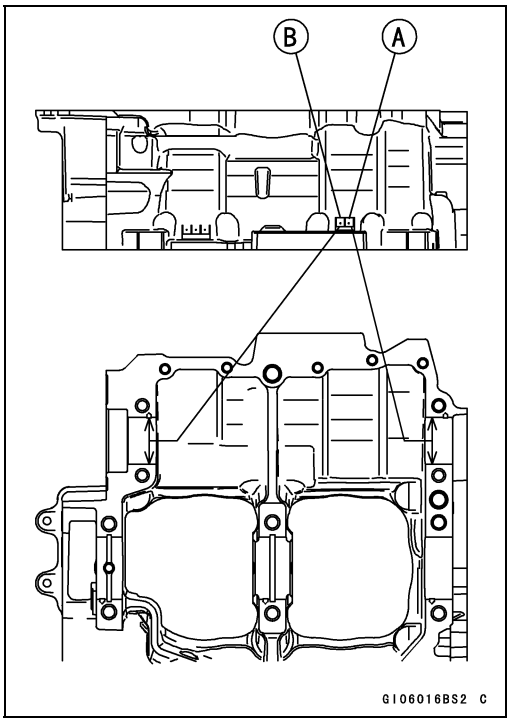
Balancer Shaft Bearing Inside Diameter Marks

○ **31.000 ~ 31.008 mm (1.2205 ~ 1.22078 in.)**

None 31.009 ~ 31.016 mm (1.22082 ~ 1.2211 in.)

□□: Balancer Shaft Bearing Inside Diameter Marking, "○" mark or no mark.

No.1 Journal [A]
No.2 Journal [B]



- Select the proper bearing insert in accordance with the combination of the crankcase and the balancer shaft coding.
- Install the new inserts in the crankcase and check insert/journal clearance with a plastigage.

Balancer Shaft Bearing Inside Diameter Marking	Balancer Shaft Journal Diameter Marking	Bearing Insert*	
		Size Color	Part Number
○	○	Brown	92139-0119
○	None	Black	92139-0118
None	○		
None	None	Blue	92139-0117

*The bearing insert for Nos. 1 and 2 journals have oil grooves.

Starter Motor Clutch

Starter Motor Clutch Removal/Installation

● Refer to the Alternator Rotor Removal/Installation in the Electrical System chapter.

Starter Motor Clutch Inspection

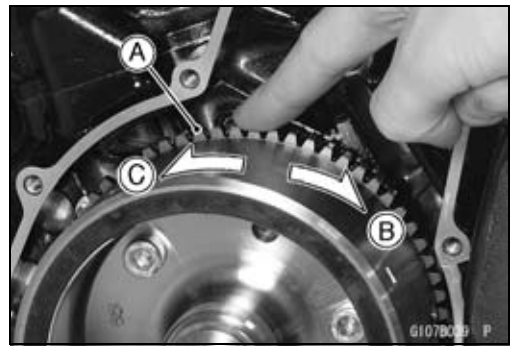
● Remove:
Alternator Cover (see Alternator Cover Removal in the Electrical System chapter)
Starter Idle Gear and Torque Limiter (see Alternator Removal in the Electrical System chapter)

● Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn clockwise [B] freely, but should not turn counterclockwise [C].

★If the starter motor clutch does not operate as it should or if it makes noise, go to the next step.

● Disassemble the starter motor clutch, and visually inspect the clutch parts.

★If there is any worn or damaged part, replace it.



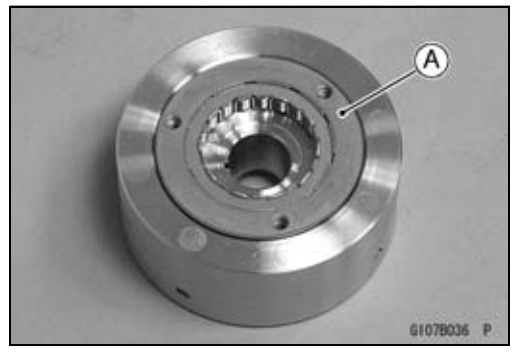
NOTE

○*Examine the starter motor clutch gear as well. Replace it if it worn or damaged.*

Starter Motor Clutch Disassembly

● Remove:
Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
Starter Motor Clutch Bolts [A]

● Remove the starter motor clutch [A].



Starter Motor Clutch Assembly

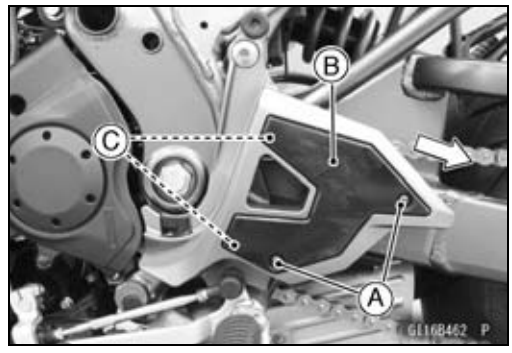
● Apply a non-permanent locking agent to the threads of the starter motor clutch bolts and tighten them.

Torque - Starter Motor Clutch Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

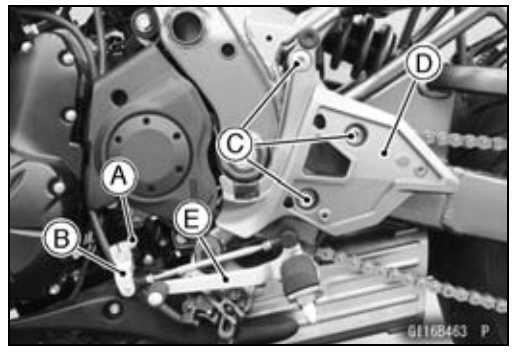
External Shift Mechanism

Shift Pedal Removal

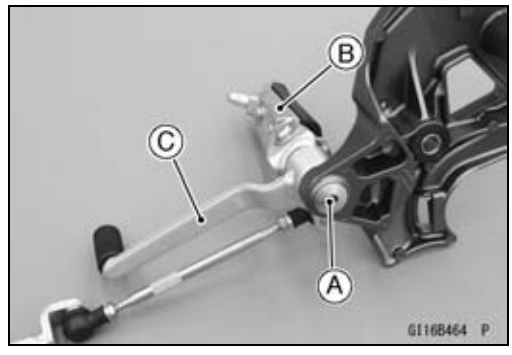
- Remove:
  Left Frame Cover (see Frame Cover Removal in the Frame chapter)
  Bolts [A]
- Pull the cover [B] backward to clear the tabs [C].



- Remove:
  Shift Lever Bolt [A]
  Shift Lever [B]
  Bolts [C]
  Footpeg Bracket [D] with Shift Pedal [E]



- Remove:
  Footpeg Holder Bolt [A]
  Footpeg [B]
  Shift Pedal [C]



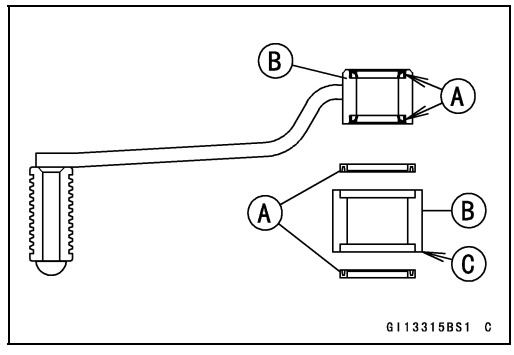
Shift Pedal Installation

- When the new oil seals [A] are installed in the shift pedal housing [B], press and insert the oil seals in the shift pedal housing so that the oil seal surfaces are flush with the housing end [C] as shown.

NOTE

○*Install the oil seals so that the oil seal rip faces the shift pedal housing.*

- Apply grease to the oil seal rip.



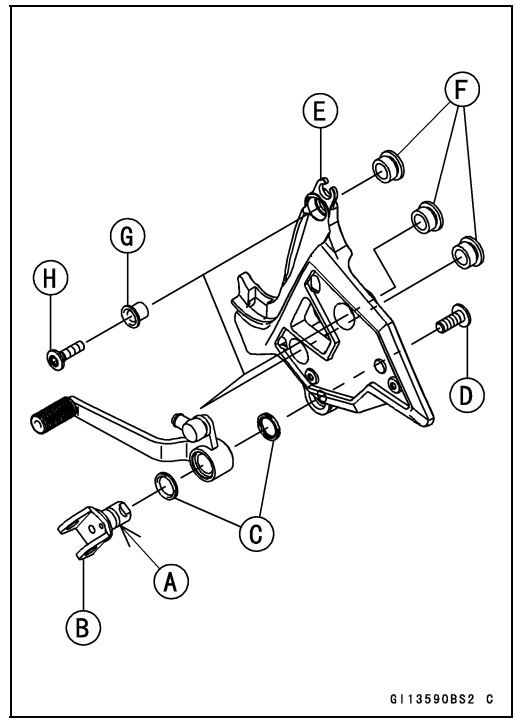
External Shift Mechanism

- Apply grease to the sliding surface [A] on the footpeg holder [B] and oil seal lips [C].
- Apply a non-permanent locking agent to the footpeg holder bolt [D].
- Tighten:

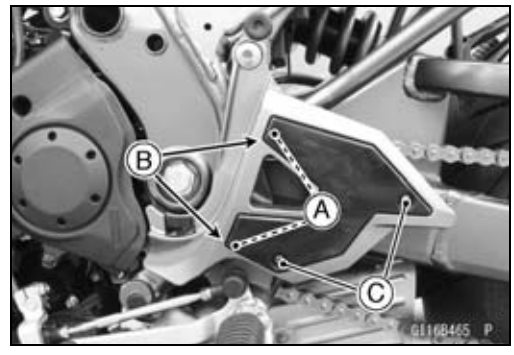
Torque - Footpeg Holder Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Install:
  Footpeg Bracket [E]
  Dampers [F]
  Collar [G]
- Tighten:

Torque - Footpeg Bracket Bolts [H]: 25 N·m (2.5 kgf·m, 18 ft·lb)

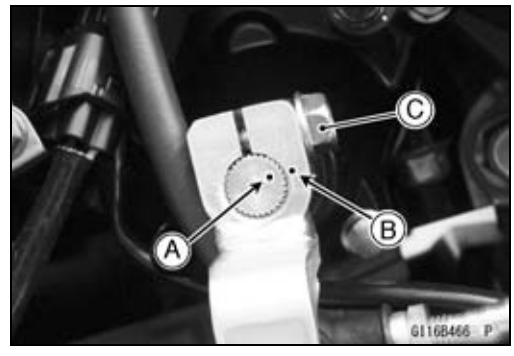


- Insert the tabs [A] of the cover into the slits [B] of the footpeg bracket.
- Tighten the bolts [C].



- Align the mark [A] on the shift shaft with the mark [B] on the shift lever.
- Tighten:

Torque - Shift Lever Bolt [C]: 12 N·m, 1,2 kgf·m, 106 in·lb)



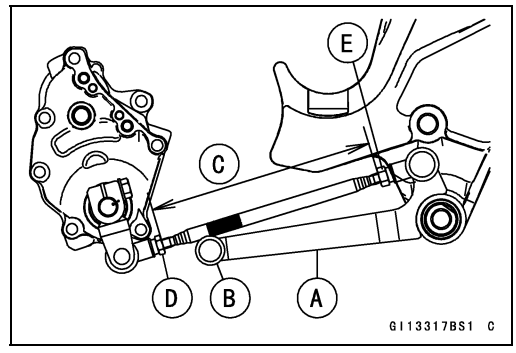
- Be sure the shift pedal [A] position is as shown.
  Shift Pedal Damper [B]
  113 ±1 mm (4.45 ±0.04 in.) [C]

○Align the lower surface of the tie-rod to the upper surface of the shift pedal damper.

○To adjust the pedal position, loosen the front locknut [D] (left-hand threads) and rear locknut [E] and then turn the tie-rod.

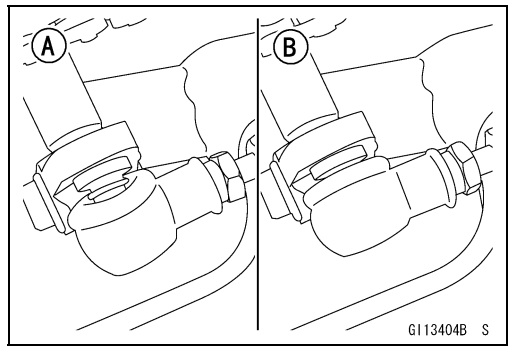
○Tighten the tie-rod locknuts.

Torque - Shift Lever Tie-rod Locknuts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



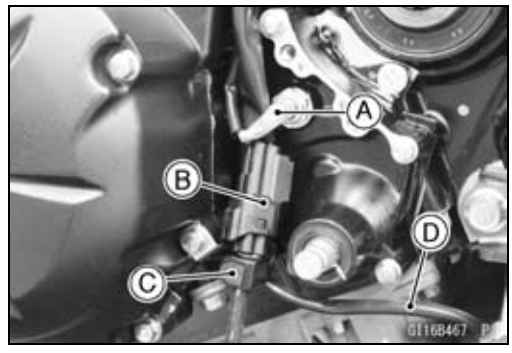
External Shift Mechanism

- Be sure the sealing lip of the rubber boot fits into the groove of the ball joint.
  [A] Incorrectly Boot Fitting Position
  [B] Correctly Boot Fitting Position

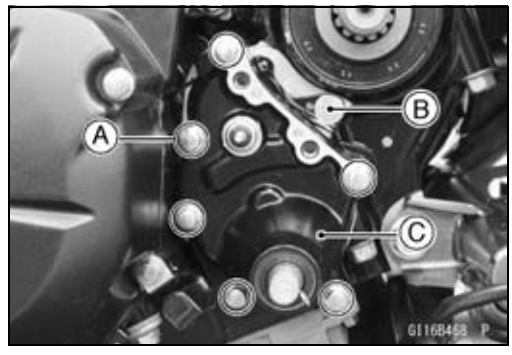


External Shift Mechanism Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
  Shift Pedal (see Shift Pedal Removal)
- Disconnect:
  Neutral Switch Lead Connector [A]
  Oxygen Sensor Lead Connector [B]
- Open the clamp [C] and free the side stand switch lead [D].



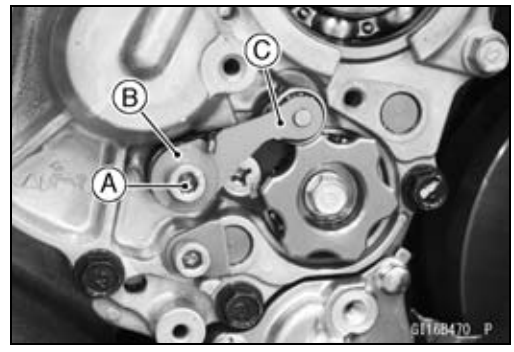
- Remove:
  Shift Shaft Cover Bolts [A]
  Shift Shaft Cover Screw [B]
  Shift Shaft Cover [C]



- Remove the shift shaft assembly [A].

External Shift Mechanism

- Remove:
  Clutch (see Clutch Removal in the Clutch chapter)
  Gear Positioning Lever Bolt [A]
  Spacer [B]
  Gear Positioning Lever [C]
  Washer and Spring



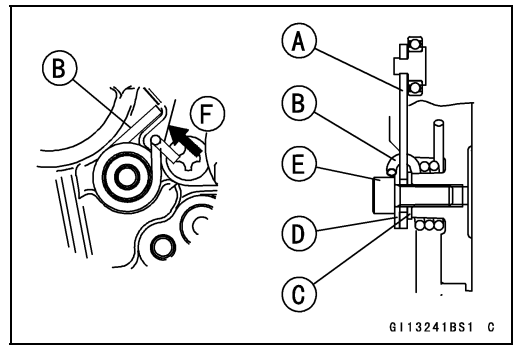
External Shift Mechanism Installation

- Install the gear positioning lever [A] as shown.
  Spring [B]
  Washer [C]
  Spacer [D]
  Bolt [E]

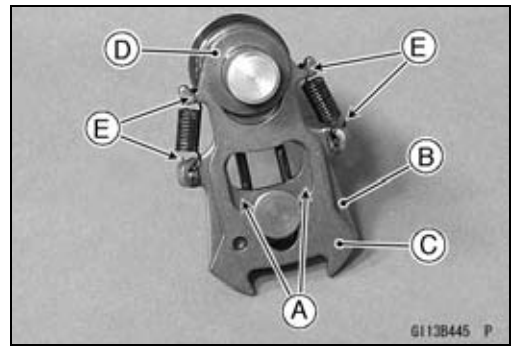
○Hook the spring at gear positioning lever, pushing up [F] the hook portion, as shown in the figure.

- Apply a non-permanent locking agent to the gear positioning lever bolt and tighten it.

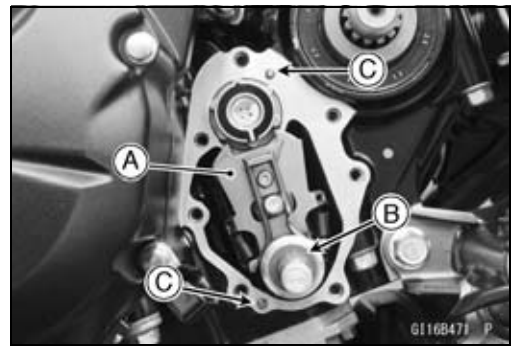
Torque - Gear Positioning Lever Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)



- Apply molybdenum disulfide oil solution to the rubbing surface [A] between the lever [B] and pawl [C], and move them two or three times up and down to lubricate them.
- Be sure that the collar [D] is on the shaft.
- Be sure that the spring hook portions [E] are as shown.



- Install the shift shaft assembly [A].
- Be sure that the washer [B] is on the shaft.
- Be sure that the dowel pins [C] are in position.



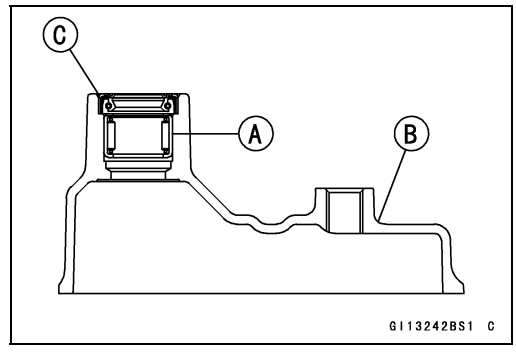
- When the new needle bearing [A] is installed in the shift shaft cover [B], press and insert the new needle bearing until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

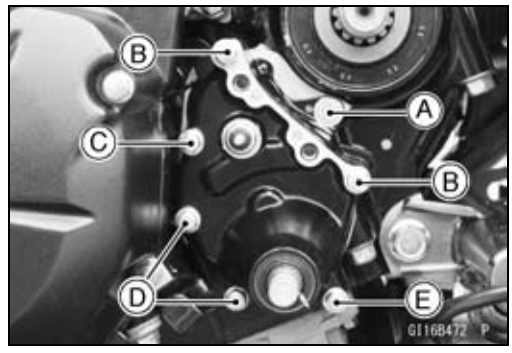
- When the new oil seal [C] is installed in the shift cover, press and insert the new oil seal so that its surface is flush with the end of the hole.

Special Tool - Bearing Driver Set: 57001-1129

- Apply engine oil to the needle bearing.
- Apply grease to the oil seal lips.



External Shift Mechanism



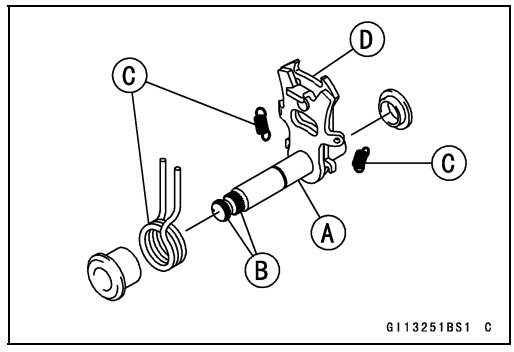
- Replace the shift shaft cover gasket with a new one.
- Install the shift shaft cover.
- Apply a non-permanent locking agent to the shift shaft cover screw [A] and bolts [B, C].

○Do not apply a non-permanent locking agent to the shift shaft cover bolts [D, E].

- First tighten the cover bolts, then tighten the cover screw.
  L = 45 mm (1.8 in.) [B]
  L = 30 mm (1.2 in.) [C, D]
  L = 40 mm (1.6 in.) [E]

Torque - Shift Shaft Cover Bolts (with Locking Agent): 9.8 N·m (1.0 kgf·m, 87 in·lb)
Shift Shaft Cover Bolts (without Locking Agent): 12 N·m (1.2 kgf·m, 106 in·lb)
Shift Shaft Cover Screw: 4.9 N·m (0.50 kgf·m, 43 in·lb)

External Shift Mechanism Inspection



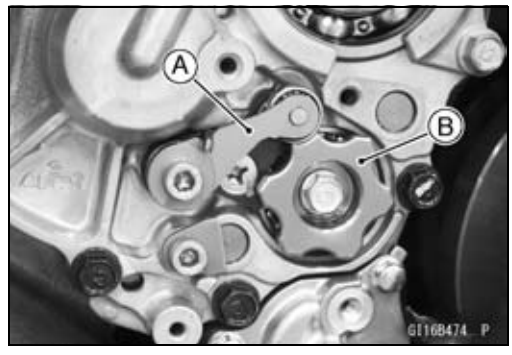
- Examine the shift shaft [A] for any damage.

★If the shaft is bent, straighten or replace it.
★If the serration [B] are damaged, replace the shaft.
★If the springs [C] are damaged in any way, replace them.
★If the shift mechanism arm [D] is damaged in any way, replace the shaft.

- Check the return spring pin [A] is not loose.

★If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

Torque - Shift Shaft Return Spring Pin: 29 N·m (3.0 kgf·m, 21 ft·lb)



- Check the gear positioning lever [A] and its spring for breaks or distortion.

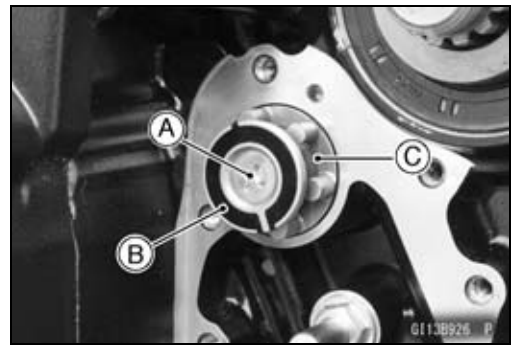
★If the lever or spring are damaged in any way, replace them.

- Visually inspect the shift drum cam [B].

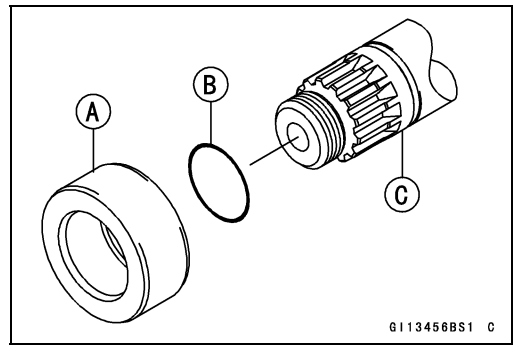
★If they are badly worn or if they show any damage, replace it.

Transmission

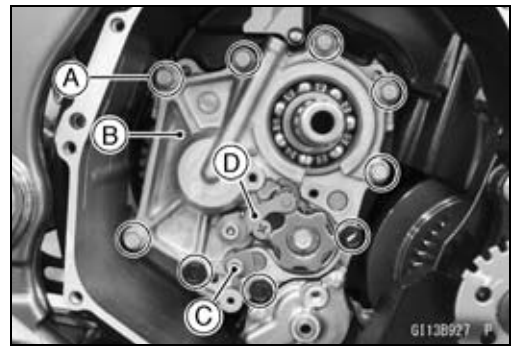
Transmission Assy Removal



- Remove:
  Shift Shaft Assembly (see External Shift Mechanism Removal)
  Neutral Switch Holder Screw [A]
  Neutral Switch Holder [B] and Pin
  Shift Drum Holder [C] and Pin



- Remove the collar [A] and the O-ring [B] from the output shaft [C].

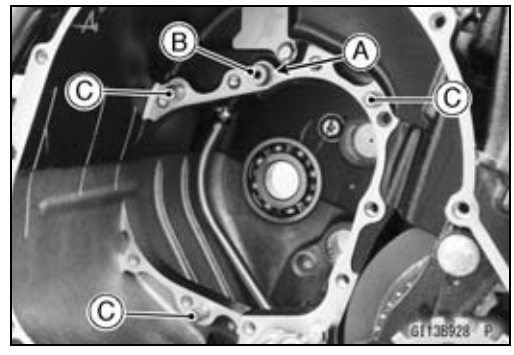


- Remove:
  Clutch (see Clutch Removal in the Clutch chapter)
  Transmission Case Bolts [A]

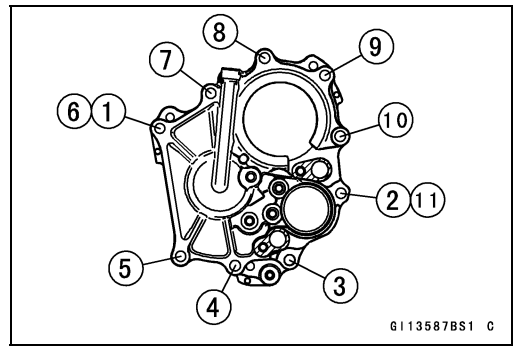
★If the transmission assy [B] is to be disassembled, remove the following.
  Shift Rod Plate Bolt [C] and Plate
  Gear Positioning Lever [D] (see External Shift Mechanism Removal)

- Pull the transmission assy out of the crankcase.

Transmission Assy Installation



- Replace the O-ring [A] on the oil pipe [B] with a new one.
- Apply grease to the O-ring.
- Be sure that the dowel pins [C] are in position.
- Install the transmission assy on the crankcase.



- Tighten the transmission case bolts following the specified tightening sequence [1 ~ 11].
  Transmission Case Bolts [1, 5, 7 ~ 10] L = 30 mm (1.2 in.)
  Transmission Case Bolts [2 ~ 4] L = 28 mm (1.0 in.)

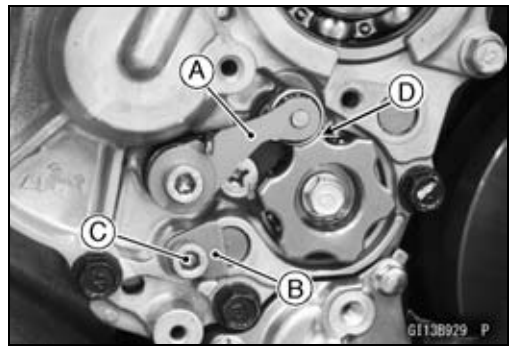
Torque - Transmission Case Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)

Transmission

★If the gear positioning lever [A] was removed, install it (see External Shift Mechanism Installation).
★If the shift rod plate [B] was removed, install it.
○Apply a non-permanent locking agent to the shift rod plate bolt, and tighten it.

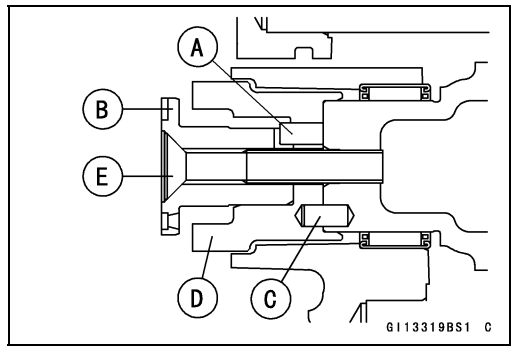
Torque - Shift Rod Plate Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Set the gear positioning lever to the neutral position [D].
- Check that the drive and output shaft turn freely.

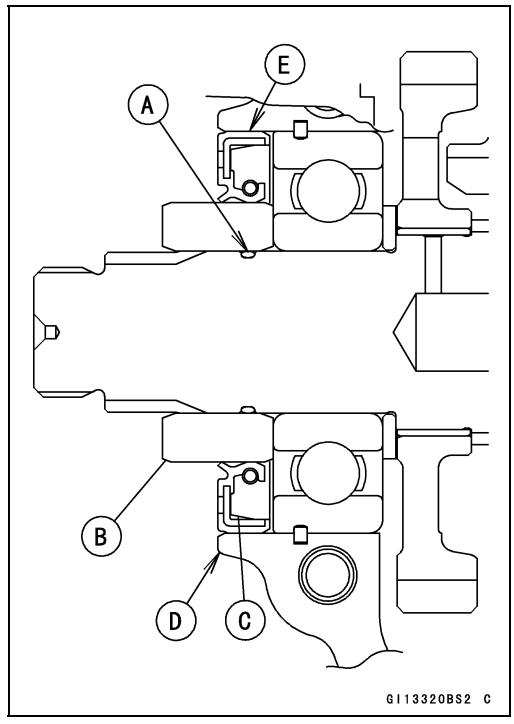


- Install:
  Pin [A]
  Shift Drum Holder [B]
  Pin [C]
  Neutral Switch Holder [D]
- Apply a non-permanent locking agent to the neutral switch holder screw [E] and tighten it.

Torque - Neutral Switch Holder Screw: 4.9 N·m (0.50 kgf·m, 43 in·lb)

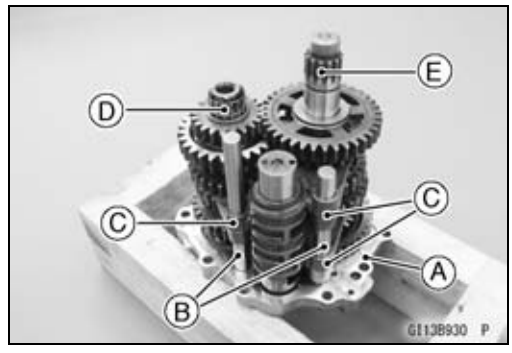


- Apply grease to the new O-ring [A], and install its position on the output shaft.
- Apply grease to the oil seal lips.
- Install the collar [B].
- When the new oil seal [C] is installed, press in it onto the collar so that the surface of the oil seal is flush with the surface [D] of the crankcase.
- Using a high flash-point solvent, clean the outer circumference [E] of the oil seal.



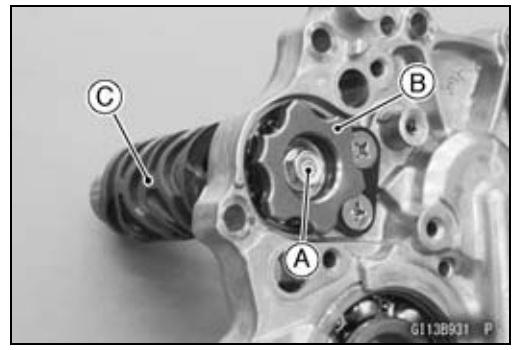
Transmission Assy Disassembly

- Remove the transmission assy (see Transmission Assy Removal).
- Remove the following from the transmission case [A].
  Shift Rods [B]
  Shift Forks [C]
  Drive Shaft [D]
  Output Shaft [E]



Transmission

- Remove:
  Shift Drum Cam Bolt [A]
  Shift Drum [B] and Pin
  Shift Drum [C]



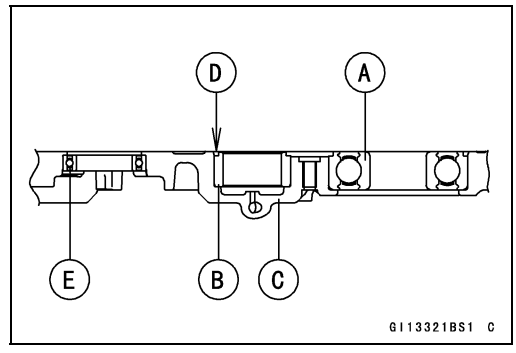
Transmission Assy Assembly

- When the new ball bearing [A] and new race [B] are installed in the transmission case [C], press and insert them until they are bottomed.

  Special Tool - Bearing Driver Set: 57001-1129

NOTE

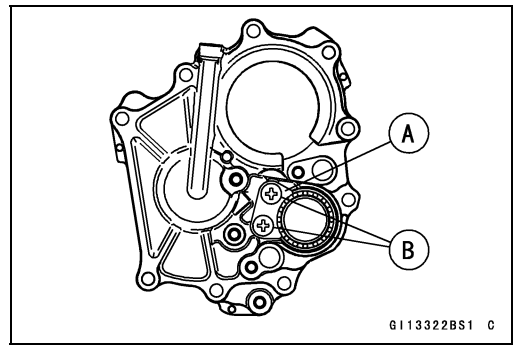
○*Install the new ball bearing and new race so that the stepped side [D] faces inside of the transmission case.*



- When the ball bearing [E] for shift drum is installed in the transmission case, insert the ball bearing until it is bottomed.

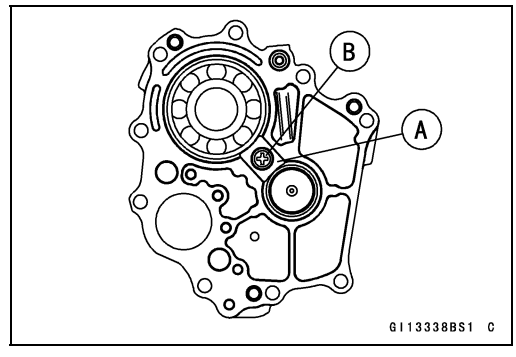
- Install the shift drum bearing holder [A].
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder screws [B], and tighten them.

  Torque - Shift Drum Bearing Holder Screws: 4.9 N·m (0.50 kgf·m, 43 in·lb)



- Install the drive shaft bearing holder [A].
- Apply a non-permanent locking agent to the threads of the drive shaft bearing holder screw [B] and tighten it.

  Torque - Drive Shaft Bearing Holder Screw: 4.9 N·m (0.50 kgf·m, 43 in·lb)



Transmission

- Apply engine oil to the shift drum groove.
- Install the following on the transmission case [A].
  Shift Drum [B]
  Pin [C]
  Shift Drum Cam [D]

○Align the pin with the hole on the shift drum cam.

- Apply a non-permanent locking agent to the shift drum cam bolt [E] and tighten it.

Torque - Shift Drum Cam Holder Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)

- Install the following as a set.
  Drive Shaft [F]
  Output Shaft [G]
- Install the shift forks as shown.

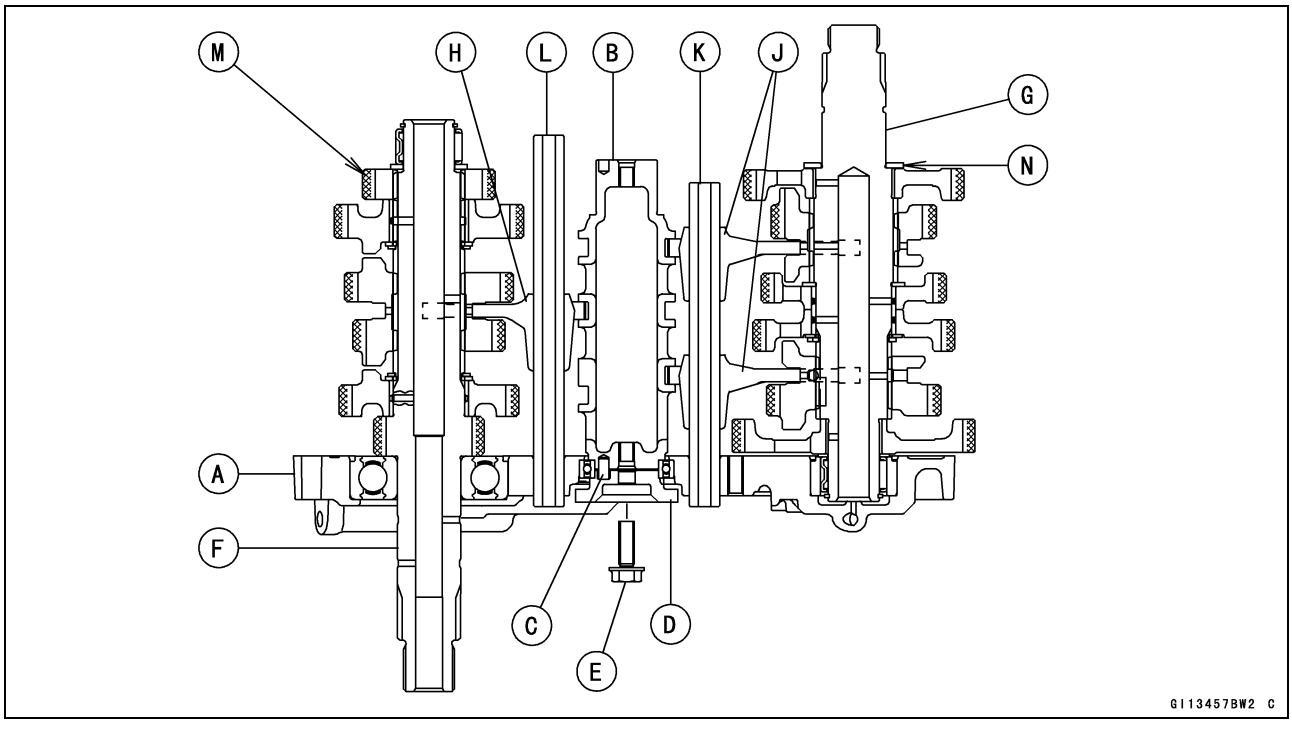
○Position the one [H] with shortest ears on the drive shaft and place the pin in the center groove in the shift drum.

○The two forks [J] on the output shaft are identical.

- Install the shift rods.

○The rod [K] length of the output shaft side is shorter than the rod [L] length of the drive shaft side.

- Apply molybdenum disulfide oil solution to the transmission gears shown with X marks [M].
- Be sure that the spacer [N] is on the output shaft.
- Install the transmission assy (see Transmission Assy Installation).



Transmission Shaft Removal

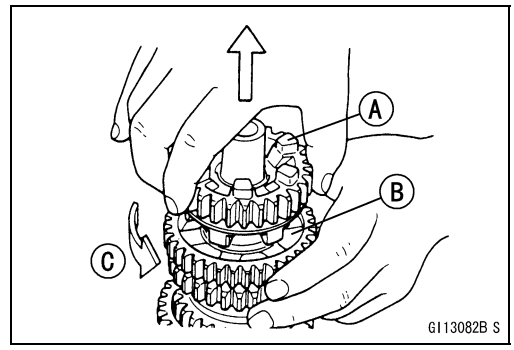
- Refer to the Transmission Assy Disassembly.

Transmission Shaft Installation

- Refer to the Transmission Assy Assembly.

Transmission

Transmission Shaft Disassembly



- Remove the transmission shafts (see Transmission Assy Disassembly).
- Remove the circlips, disassemble the transmission shafts.

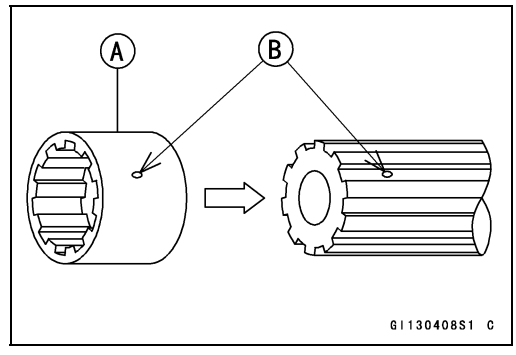
Special Tool - Outside Circlip Pliers: 57001-144

- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.

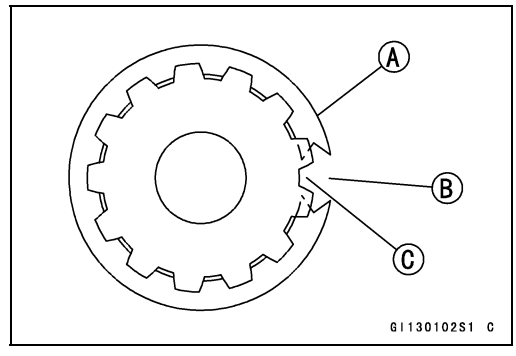
○Set the output shaft in a vertical position holding the 3rd gear [B].

○Spin the 5th gear quickly [C] and pull it off upward.

Transmission Shaft Assembly



- Apply engine oil to the bushings, needle bearings and shafts.
- Install the gear bushings [A] on the shaft with their holes [B] aligned.

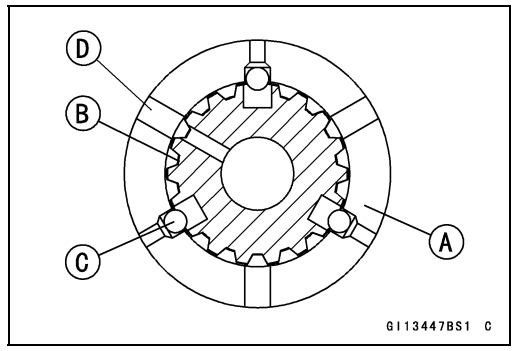


- Replace any circlips removed with new ones.
- Install the circlips [A] so that the opening [B] is aligned with a spline groove [C].

- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 3rd/4th gear onto the drive shaft with their oil holes aligned.
- Install the 6th gear bushing onto the drive shaft with their oil holes aligned.
- The output shaft gears can be recognized by size: the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 5th and 6th gears onto the output shaft with their oil holes aligned.
- Install the 3rd/4th gear bushings onto the output shaft with their oil holes aligned.

Transmission

- Fit the steel balls into the 5th gear holes in the output shaft, aligning oil hole as shown.
  5th Gear [A]
  Output Shaft [B]
  Steel Balls [C]
  Oil Hole [D]



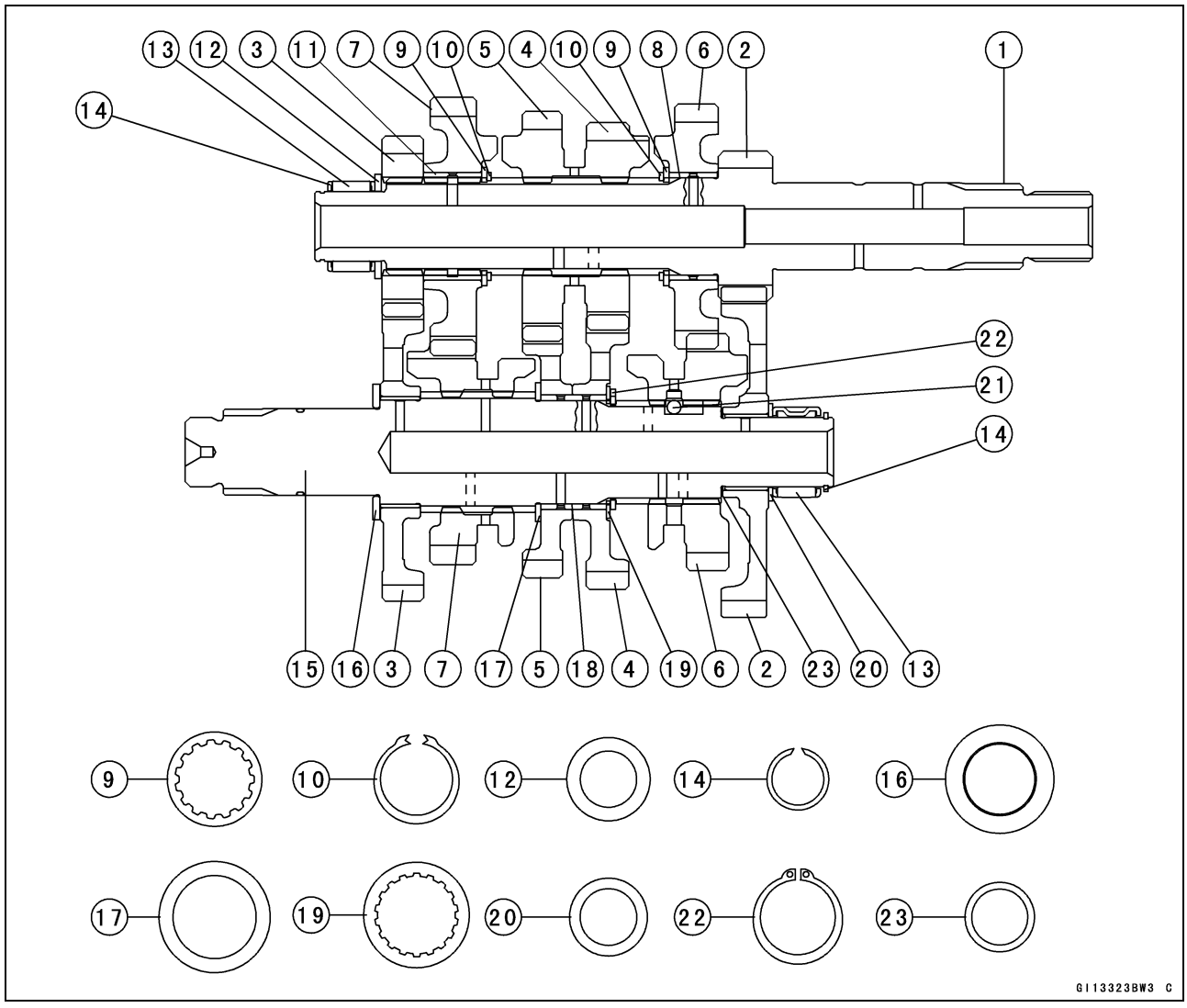
NOTICE

Do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.

○After assembling the 5th gear with steel balls in place on the output shaft, check the ball-locking effect that the 5th gear doesn't come out of the output shaft when moving it up and down by hand.

- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.

Transmission



1. Drive Shaft
2. 1st Gear
3. 2nd Gear
4. 3rd Gear
5. 4th Gear
6. 5th Gear
7. 6th (Top) Gear
8. Bushing
9. Toothed Washer, ϕ34 mm (1.34 in.)
10. Circlip
11. Bushing
12. Thrust Washer, ϕ30 mm (1.18 in.)
13. Needle Bearing
14. Circlip
15. Output Shaft
16. Spacer, ϕ39 mm (1.54 in.)
17. Washer, ϕ40 mm (1.57 in.)
18. Bushing
19. Toothed Washer, ϕ38 mm (1.50 in.)
20. Shim, ϕ28 mm (1.10 in.)
21. Steel Ball
22. Circlip, ϕ32.2 mm (1.268 in.)
23. Thrust Washer, ϕ25 mm (0.98 in.)

Transmission

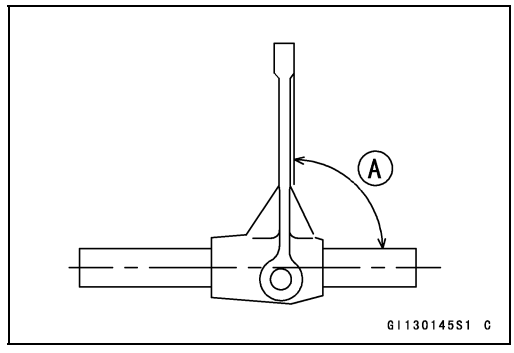
Shift Drum and Fork Removal
● Refer to the Transmission Assy Disassembly.

Shift Drum and Fork Installation
● Refer to the Transmission Assy Assembly.

Shift Drum Disassembly
● Refer to the Transmission Assy Disassembly.

Shift Drum Assembly
● Refer to the Transmission Assy Assembly.

Shift Fork Bending
● Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
90° [A]

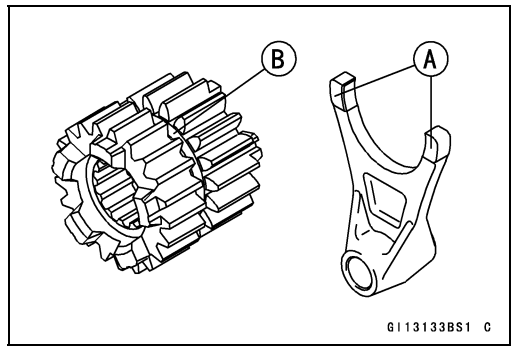


Shift Fork/Gear Groove Wear Inspection
● Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves.
★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

Shift Fork Ear Thickness
Standard: 5.9 ~ 6.0 mm (0.23 ~ 0.24 in.)
Service Limit: 5.8 mm (0.23 in.)

★If the transmission gear groove is worn over the service limit, the gear must be replaced.

Gear Groove Width
Standard: 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)
Service Limit: 6.3 mm (0.25 in.)

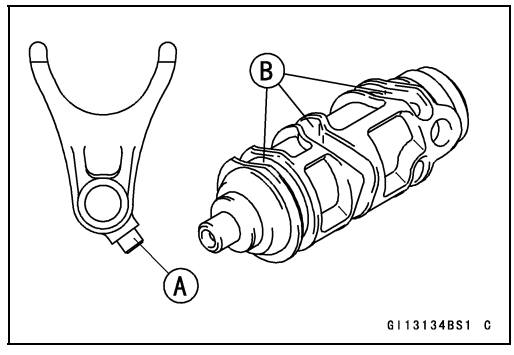


Shift Fork Guide Pin/Drum Groove Wear Inspection
● Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.
★If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

Shift Fork Guide Pin Diameter
Standard: 6.9 ~ 7.0 mm (0.27 ~ 0.28 in.)
Service Limit: 6.8 mm (0.27 in.)

★If any shift drum groove is worn over the service limit, the drum must be replaced.

Shift Drum Groove Width
Standard: 7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)
Service Limit: 7.3 mm (0.29 in.)

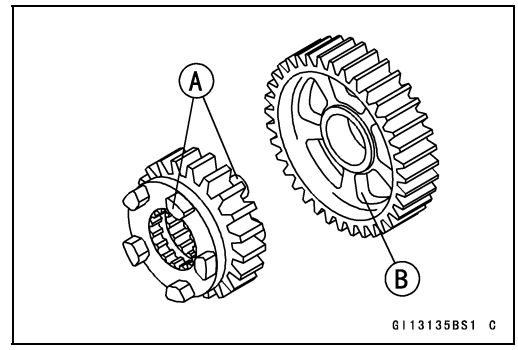


Transmission

Gear Dog and Gear Dog Hole Damage Inspection

- Visually inspect the gear dogs [A] and gear dog holes [B].

★Replace any damaged gears or gears with excessively worn dogs or dog holes.



Ball Bearing, Needle Bearing, and Oil Seal

Ball and Needle Bearing Replacement

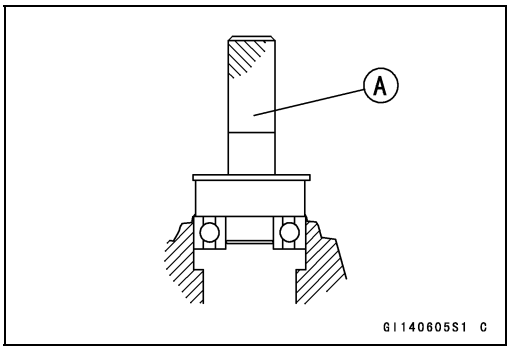
NOTICE
Do not remove the ball or needle bearings unless it is necessary. Removal may damage them.

- Using a press or puller, remove the ball bearing and/or needle bearings.

NOTE

○*In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max., and tapping the bearing in or out.*

NOTICE
Do not heat the case with a torch. This will warp the case. Soak the case in oil and heat the oil.



- Using a press and the bearing driver set [A], install the new ball bearing until it stops at the bottom of its housing.

○The new needle bearings must be pressed into the crankcase so that the end is flush with the end of the hole.

Special Tool - Bearing Driver Set: 57001-1129

Ball and Needle Bearing Wear Inspection

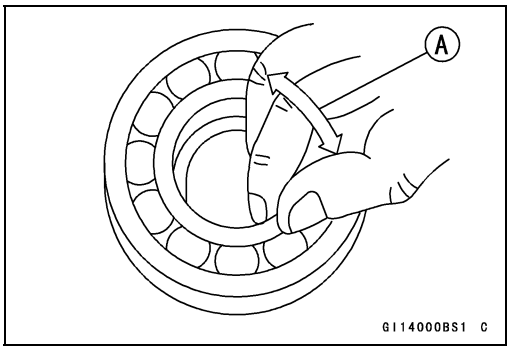
NOTICE
Do not remove the bearings for inspection. Removal may damage them.

- Check the ball bearings.

○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

○Spin [A] the bearing by hand to check its condition.

★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.



- 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.

Oil Seal Inspection

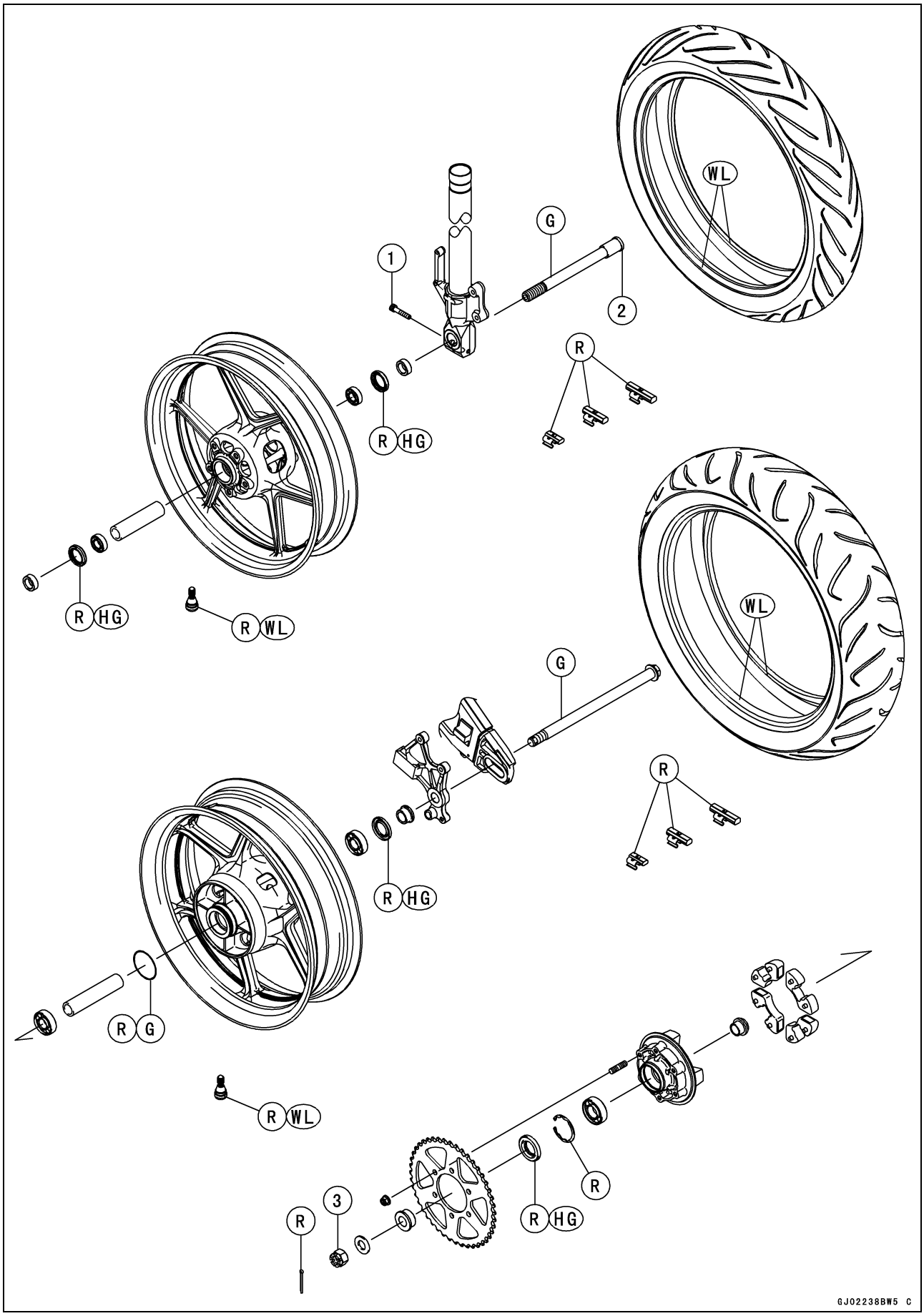
- Inspect the oil seals.

★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

Wheels/Tires

Table of Contents

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Clamp Bolts	34	3.5	25	
2	Front Axle	108	11.0	79.7	
3	Rear Axle Nut	108	11.0	79.7	

G: Apply grease.
HG: Apply high-temperature grease.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

Specifications

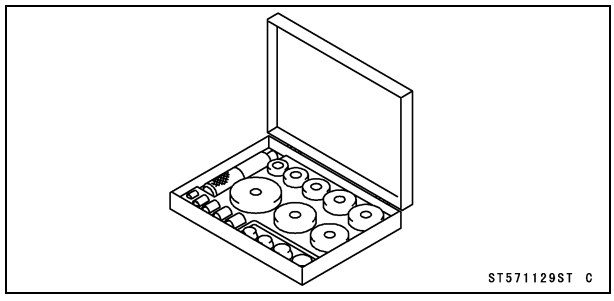
Item	Standard	Service Limit
Wheels (Rims)		
Rim Runout:		
Axial	TIR 0.5 mm (0.02 in.) or less	TIR 1.0 mm (0.04 in.)
Radial	TIR 0.8 mm (0.03 in.) or less	TIR 1.0 mm (0.04 in.)
Axle Runout/100 mm (3.94 in.):		
Front	TIR 0.03 mm (0.001 in.) or less	TIR 0.2 mm (0.008 in.)
Rear	TIR 0.03 mm (0.001 in.) or less	TIR 0.2 mm (0.008 in.)
Wheel Balance	10 g (0.35 oz.) or less	– – –
Balance Weights	10 g (0.35 oz.), 20 g (0.71 oz.), 30 g (1.06 oz.)	– – –
Rim Size:		
Front	J17M/C × MT3.50	– – –
Rear	J17M/C × MT4.50	– – –
Tires		
Air Pressure (when Cold):		
Front	225 kPa (2.25 kgf/cm², 33 psi)	– – –
Rear	Up to 150 kg (331 lb) load: 250 kPa (2.50 kgf/cm², 36 psi) 150 ~ 210 kg (331 ~ 463 lb) load: 290 kPa (2.9 kgf/cm², 42 psi)	– – –
Tread Depth:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear	6.4 mm (0.25 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Standard Tires:	Make, Type	Size
Front	DUNLOP, SPORTMAX D222F J	120/70ZR17 M/C (58 W)
Rear	DUNLOP, SPORTMAX D222 J	160/60ZR17 M/C (69 W)

⚠ WARNING

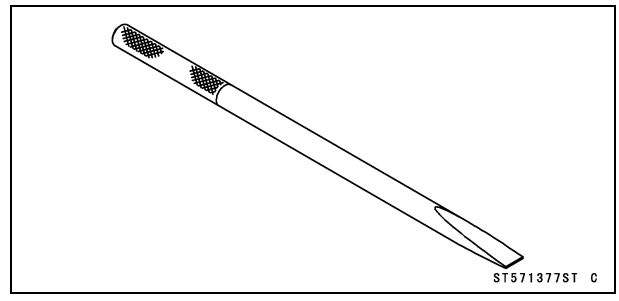
Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

Special Tools

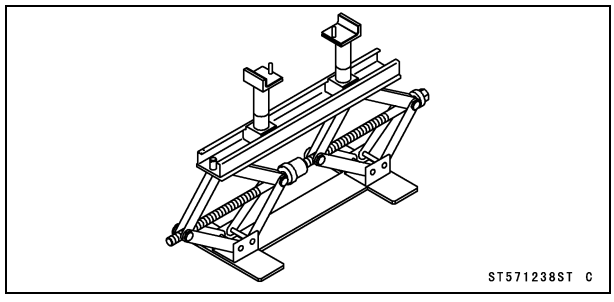
Bearing Driver Set:
57001-1129



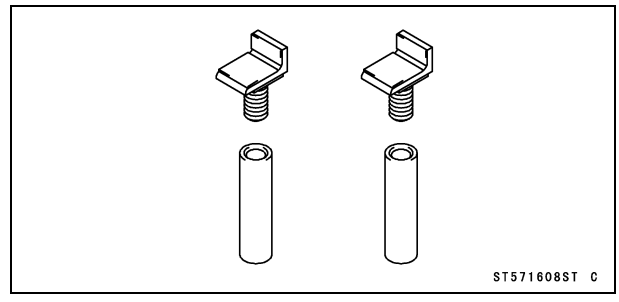
Bearing Remover Shaft, ϕ13:
57001-1377



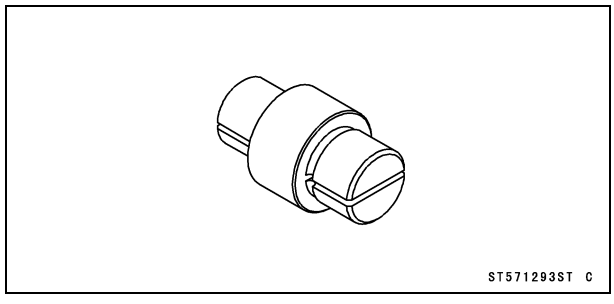
Jack:
57001-1238



Jack Attachment:
57001-1608

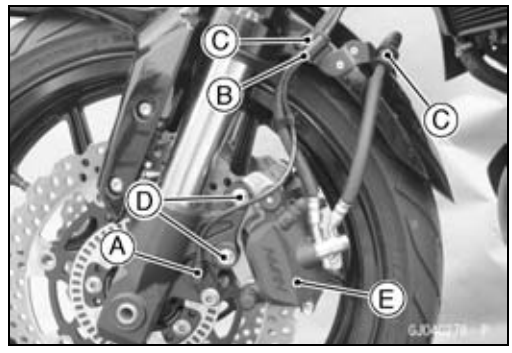


Bearing Remover Head, ϕ20 × ϕ22:
57001-1293

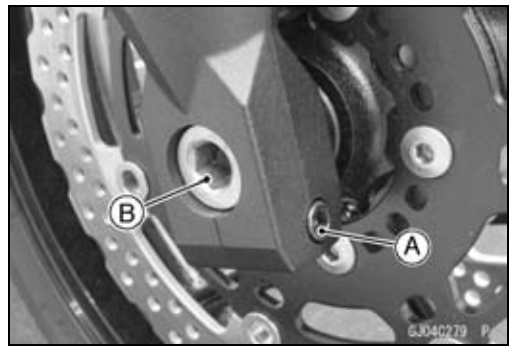


Wheels (Rims)

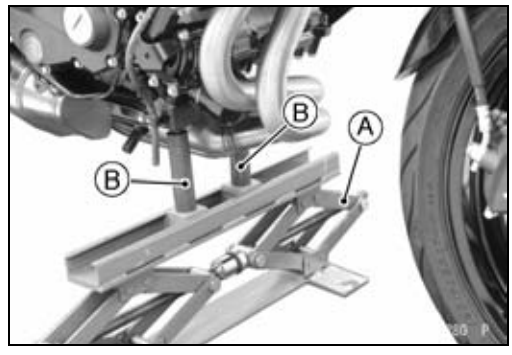
Front Wheel Removal



- For the ABS equipped models, remove the bolt and front wheel rotation sensor [A].
- For the ABS equipped models, free the wheel rotation sensor lead from the clamp [B].
- Free the brake hoses from the clamps [C] (Both Sides).
- Remove:
  Front Caliper Mounting Bolts [D] (Both Sides)
  Front Caliper [E] (Both Sides)



- Loosen:
  Front Axle Clamp Bolt [A]
  Front Axle [B]



- Remove:
  Lower Fairing (see Lower Fairing Removal in the Frame chapter)
- Raise the front wheel off the ground.

Special Tools - Jack [A]: 57001-1238
Jack Attachment [B]: 57001-1608

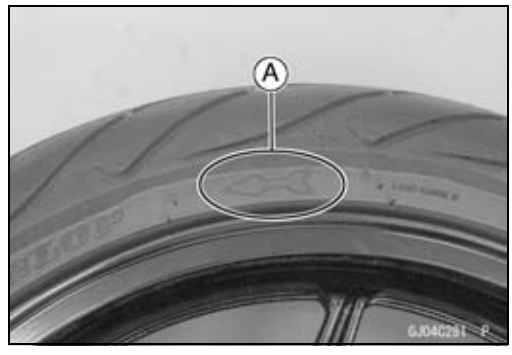
- Pull out the front axle to the right and drop the front wheel out of the front forks.

NOTICE
Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

Front Wheel Installation

NOTE

○*The direction of the tire rotation is shown by an arrow [A] on the tire.*

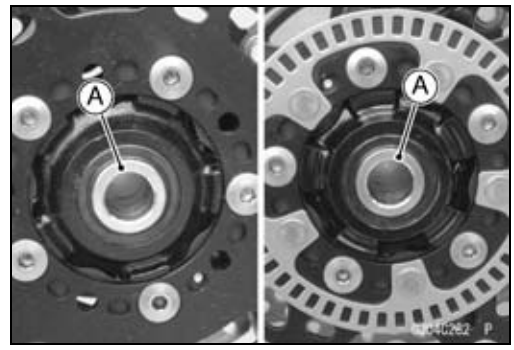


- Make sure the tire rotation direction before installing the front wheel.

Wheels (Rims)

- Apply high-temperature grease to the grease seal lips.
- Fit the collar [A] on the both sides of the hub.

○The collars are identical.

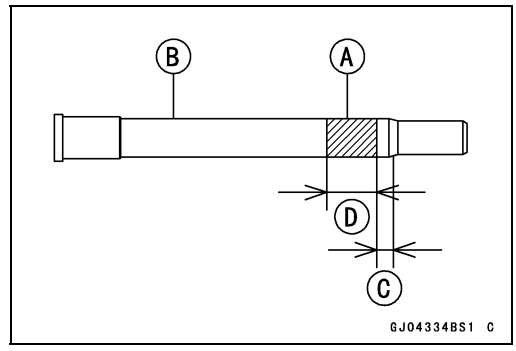


- Apply a thin coat of grease [A] to the front axle [B] for rust prevention.

  About 10 mm (0.4 in.) [C]
  About 30 mm (1.2 in.) [D]

NOTE

○*Do not apply grease to the threads of the axle.*



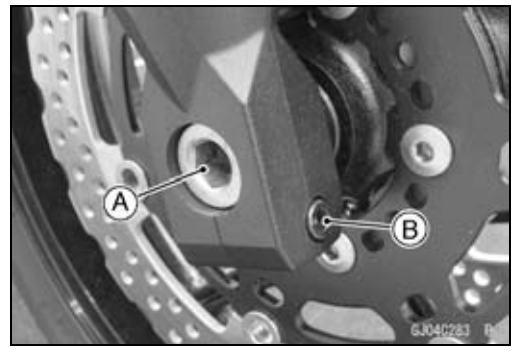
- Insert the front axle [A] from the right side.
- Wipe off excess grease if necessary.
- Tighten:

Torque - Front Axle: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

- Before tightening the front axle clamp bolt [B] on the right front fork leg, pump the front fork up and down 4 or 5 times to allow the right front fork leg to seat on the front axle.

NOTE

○*Put a block in front of the front wheel to stop moving.*



- Tighten:

Torque - Front Axle Clamp Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Install the removed parts (see appropriate chapters).
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

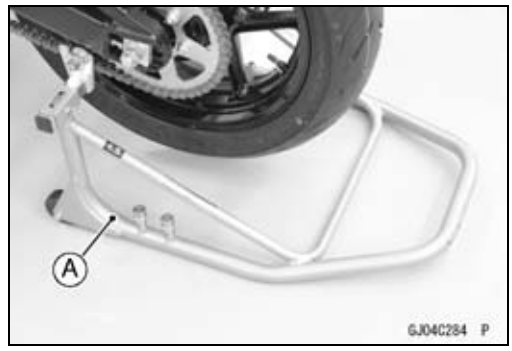
⚠ WARNING

After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.

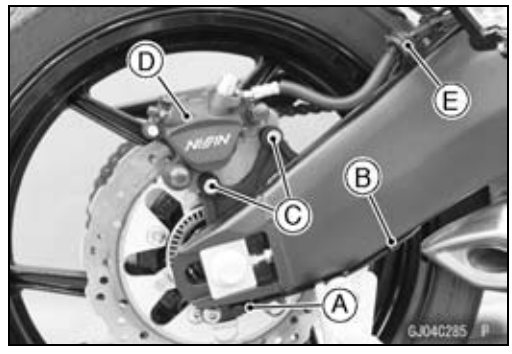
Wheels (Rims)

Rear Wheel Removal

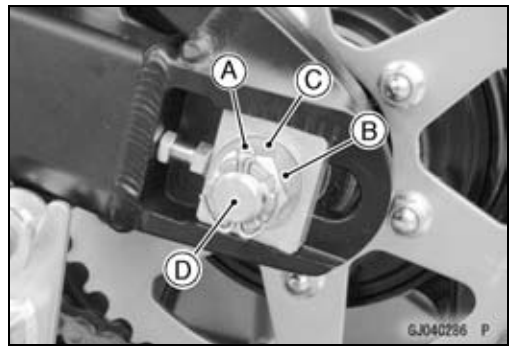
- Raise the rear wheel off the ground with the stand [A].



- For the ABS equipped models, remove the bolt and rear wheel rotation sensor [A].
- For the ABS equipped models, free the wheel rotation sensor lead from the clamp [B].
- Remove:
  Rear Caliper Mounting Bolts [C]
  Rear Caliper [D]
- Free the brake hose from the clamp [E].



- Remove:
  Cotter Pin [A]
  Axle Nut [B]
  Washer [C]
  Axle [D] (to Right Side)

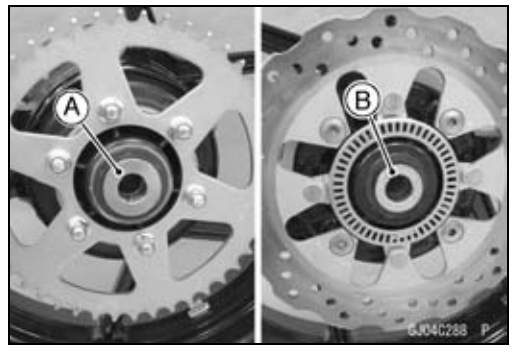


- Disengage the drive chain [A] from the rear sprocket toward the left.
- Move the rear wheel back and remove it.

NOTICE
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

Rear Wheel Installation

- Apply high-temperature grease to the grease seal lips.
- Fit the collars on the both sides of the hub.
  Left Side Collar [A] (Small Diameter)
  Right Side Collar [B] (Large Diameter)

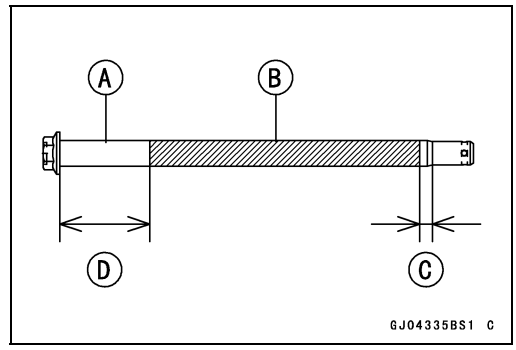


Wheels (Rims)

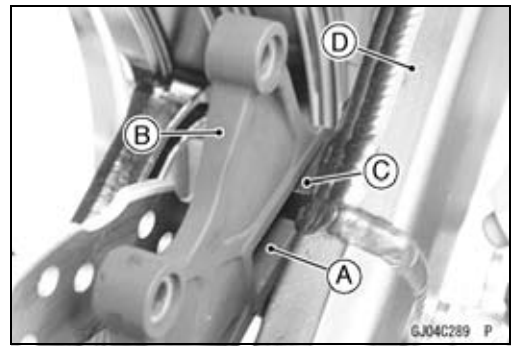
- Apply a thin coat of grease [A] to the front axle [B] for rust prevention.
  About 10 mm (0.4 in.) [C]
  About 70 mm (2.8 in.) [D]

NOTE

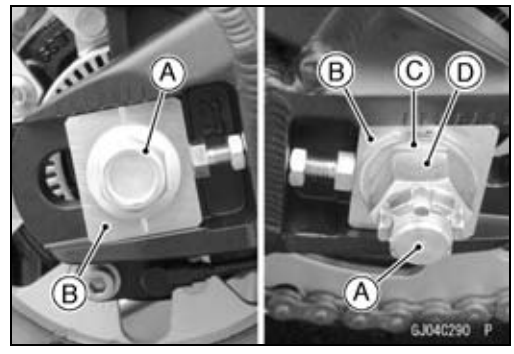
○*Do not apply grease to the threads of the axle.*



- Engage the drive chain with the rear sprocket.
- Align the groove [A] on the caliper bracket [B] with the stopper [C] on the swingarm [D].
- Install the caliper bracket between the rear wheel and swingarm.

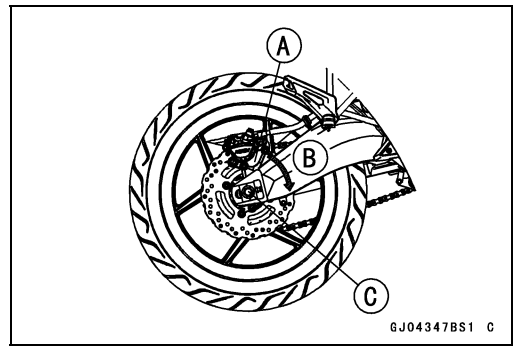


- Insert the axle [A] from the right side through the indicator plates [B].
- Install the washer [C] and rear axle nut [D] on the left side.
- Wipe off excess grease if necessary.
- Adjust the drive chain slack before tightening the axle nut (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).



- While pushing the rear caliper holder [A] to the wheel rotation direction [B], tighten the rear axle nut [C].

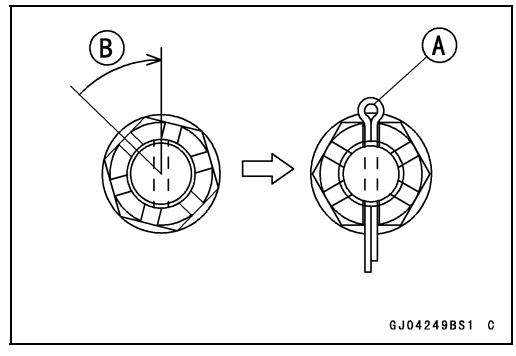
Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)



- Insert a new cotter pin [A].

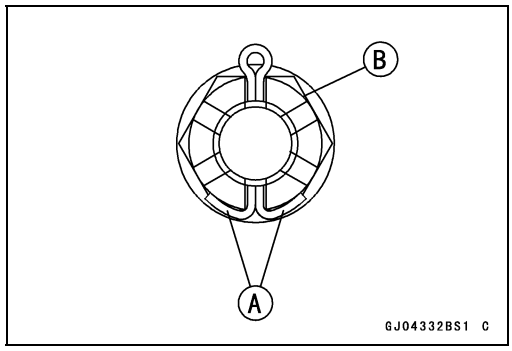
NOTE

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



Wheels (Rims)

● Bend the cotter pin ends [A] over the nut [B].



⚠ WARNING

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

● Install the removed parts (see appropriate chapters).
● Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

⚠ WARNING

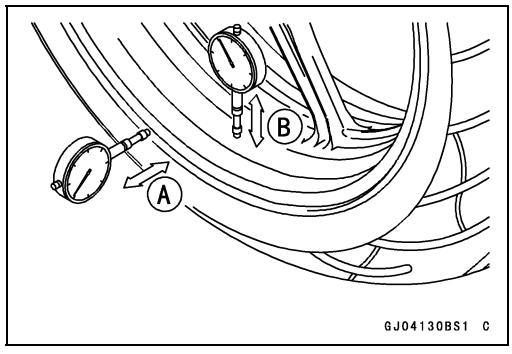
After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.

Wheel Inspection

● Raise the front/rear wheel off the ground.

Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608

● Spin the wheel lightly, and check for roughness or binding.
★If roughness or binding is found, replace the hub bearings (see Hub Bearing Removal/Installation).
● Inspect the wheel for small cracks, dents, bending, or warp.
★If there is any damage to the wheel, replace the wheel.
● Remove the wheel, and support it with the tire by the axle.
● Measure the rim runout, axial [A] and radial [B], with a dial gauge.
★If rim runout exceeds the service limit, check the hub bearings (see Hub Bearing Inspection).
★If the problem is not due to the bearings, replace the wheel.



Rim Runout (with tire installed)

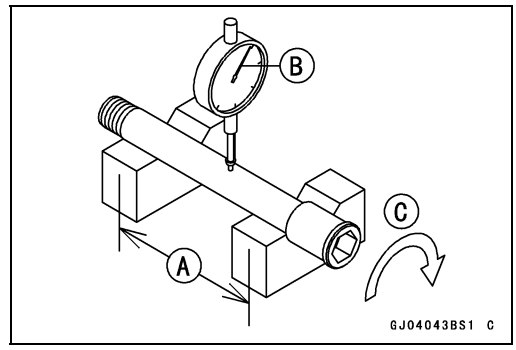
Standard:	
Axial	**TIR 0.5 mm (0.02 in.) or less**
Radial	**TIR 0.8 mm (0.03 in.) or less**
Service Limit:	
Axial	**TIR 1.0 mm (0.04 in.)**
Radial	**TIR 1.0 mm (0.04 in.)**

⚠ WARNING

Damaged wheel parts may fail and cause an accident resulting in serious injury or death. Never attempt to repair a damaged wheel part. If the wheel part is damaged, it must be replaced with a new one.

Wheels (Rims)

Axle Inspection



- Remove the front and rear axles (see Front/Rear Wheel Removal).
- Visually inspect the front and rear axle for damages.

★If the axle is damaged or bent, replace it.

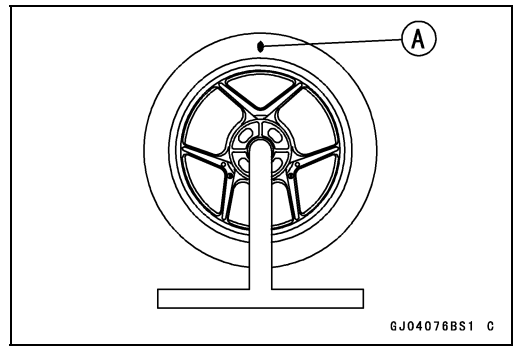
- Place the axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the axle at a point halfway between the blocks. Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.

★If axle runout exceeds the service limit, replace the axle.

Axle Runout/100 mm (3.94 in.)
Standard:

Front	**TIR 0.03 mm (0.001 in.) or less**
Rear	**TIR 0.03 mm (0.001 in.) or less**
Service Limit:	**TIR 0.2 mm (0.008 in.)**

Balance Inspection

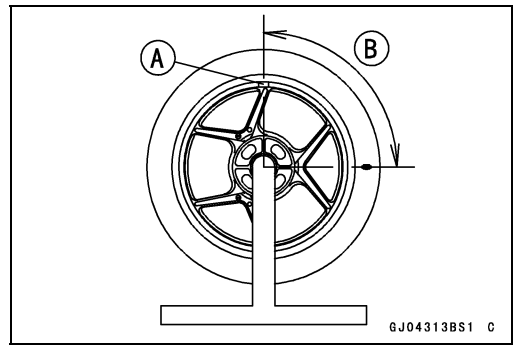


- Remove the front and rear wheels (see Front/Rear Wheel Removal).
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.

○Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.

★If the wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).

Balance Adjustment



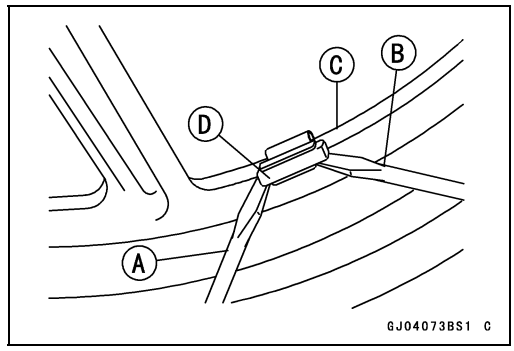
- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.

★If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.

- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.

Wheels (Rims)

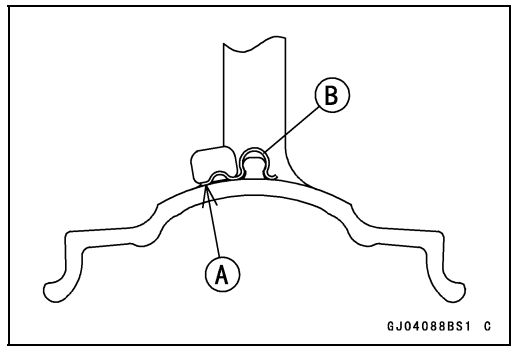
Balance Weight Removal



- Insert a flat tip screwdrivers [A] [B] between the rib [C] and weight [D] as shown.
- Pry the balance weight with two screwdrivers and remove the balance weight.
- Discard the used balance weight.

NOTICE
Do not tap the screwdrivers. The rim could be damaged.

Balance Weight Installation



- Check if the weight portion has any play on the blade [A] and clip [B].

★If it does, discard it.

⚠ WARNING
Unbalanced wheels can create an unsafe riding condition. If the balance weight has any play on the rib of the rim, the blade and/or clip have been stretched. Replace the loose balance weight. Do not reuse used balance weight.

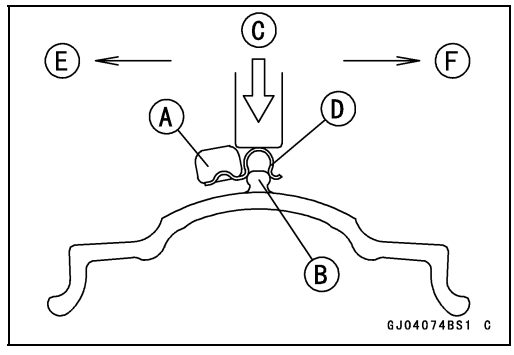
Balance Weight

Part Number	Weight
41075-0007	10 g (0.35 oz.)
41075-0008	20 g (0.71 oz.)
41075-0009	30 g (1.06 oz.)

NOTE

○*Balance weights are available from Kawasaki dealers in 10, 20 and 30 grams (0.35, 0.71 and 1.06 oz.) sizes. An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.*

○*Do not use four or more balance weight (more than 90 grams, 3.2 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.*

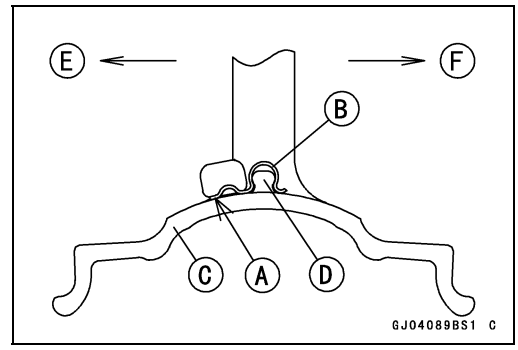


- Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].
  Left Side [E]
  Right Side [F]

Wheels (Rims)

● Be sure to install the balance weight.

○Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].
Left Side [E]
Right Side [F]



Tires

Air Pressure Inspection/Adjustment

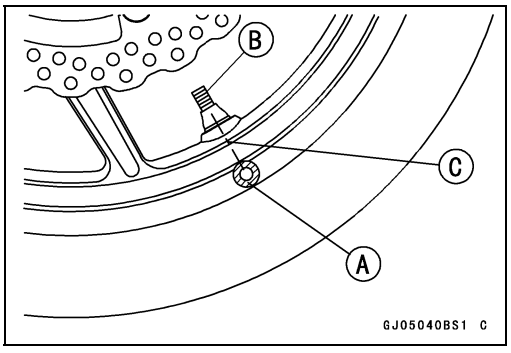
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

Tire Inspection

- Refer to the Wheels and Tires Inspection in the Periodic Maintenance chapter.

Tire Removal

- Remove:
  Wheels (see Front/Rear Wheel Removal)
  Valve Core (Let out the air)
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
  Chalk Mark or Yellow Mark [A]
  Valve Stem [B]
  Align [C]



- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

NOTICE
Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.

- Remove the tire from the rim using a suitable commercially available tire changer.

NOTE

○*The tires cannot be removed with hand tools because they fit the rims too tightly.*

Tire Installation

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

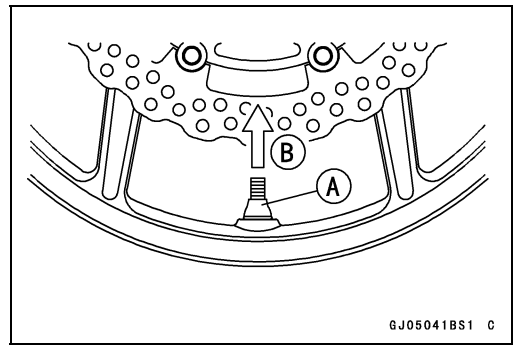
- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

NOTICE
Replace the air valve whenever the tire is replaced. Do not reuse the air valve.

Tires

● Install a new valve in the rim.

○Remove the valve cap, lubricate the stem seal [A] with a soap and water solution or rubber lubricant, and pull [B] the valve stem through the rim from the inside out until it snaps into place.

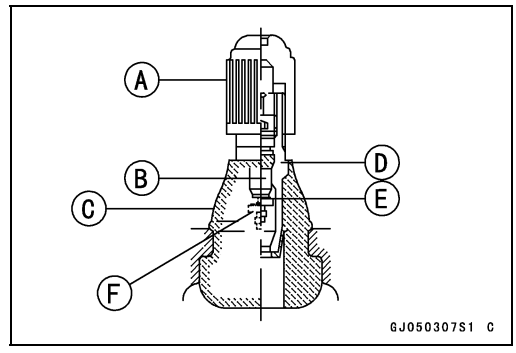


NOTICE

Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.

○The air valve is as shown.

Valve Cap [A]
Valve Core [B]
Stem Seal [C]
Valve Stem [D]
Valve Seat [E]
Valve Opened [F]

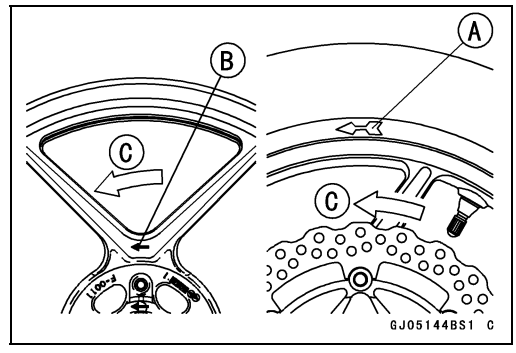


● Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

Tire Rotation Mark [A]
Wheel Rotation Mark [B] (Front Wheel)
Rotating Direction [C]

NOTE

○*On the front wheel, install the front tire so that the rotation marks on the tire and the front wheel are pointed with same directions.*

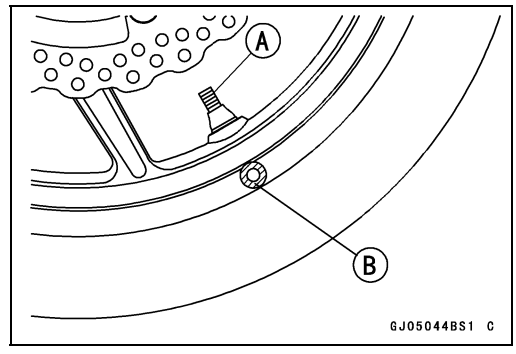


● Position the tire on the rim so that the valve [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).

● Install the tire bead over the rim flange using a suitable commercially available tire changer.

● Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.

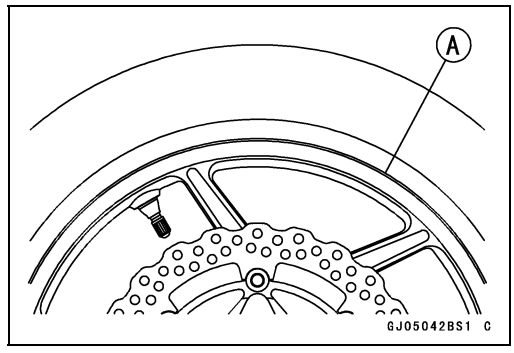
● Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.



⚠ WARNING

Overinflating a tire can cause it to explode, causing serious injury or death. Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/cm², 57 psi).

Tires



- Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.

★If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.

- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leakage.

○Inflate the tire slightly above standard inflation.

○Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.

- Adjust the air pressure to the specified pressure (see Air Pressure Inspection in the Periodic Maintenance chapter).
- Install the air valve cap.
- Adjust the wheel balance (see Balance Adjustment).

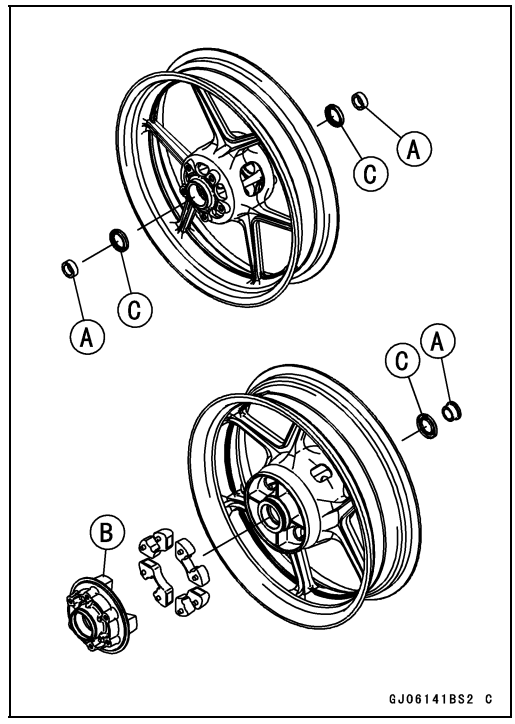
Tire Repair

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

Hub Bearing

Hub Bearing Removal

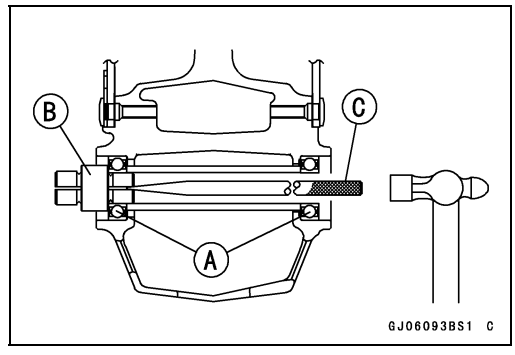
- Remove the wheels (see Front/Rear Wheel Removal), and take out the following.
  Collars [A]
  Coupling [B] (Out of rear hub)
  Grease Seals [C]



- Use the bearing remover to remove the hub bearings [A].

NOTICE
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

Special Tools - Bearing Remover Head, ϕ20 × ϕ22 [B]: 57001-1293
Bearing Remover Shaft, ϕ13 [C]: 57001-1377



Hub Bearing Installation

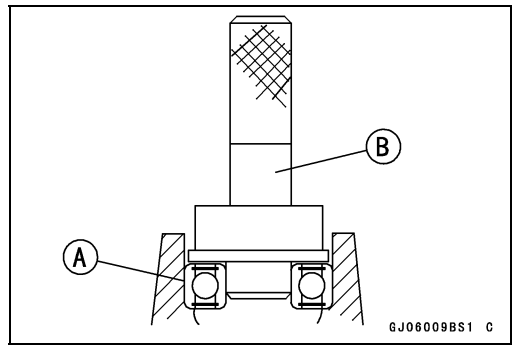
- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.
- Install the bearings by using the bearing driver set which does not contact the bearing inner race.

NOTE

○*Install the bearings so that the marked side faces out.*

- Press in each right the bearing [A] until they are bottomed.

Special Tool - Bearing Driver Set [B]: 57001-1129



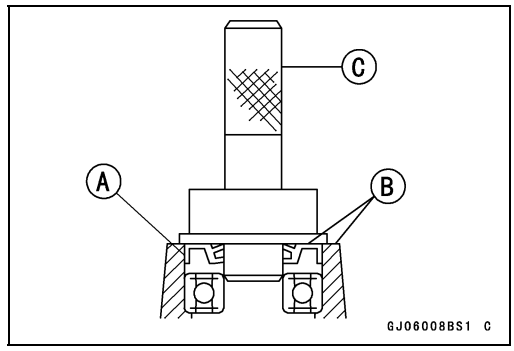
Hub Bearing

- 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

- Install the removed parts (see appropriate chapters).



Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

NOTE

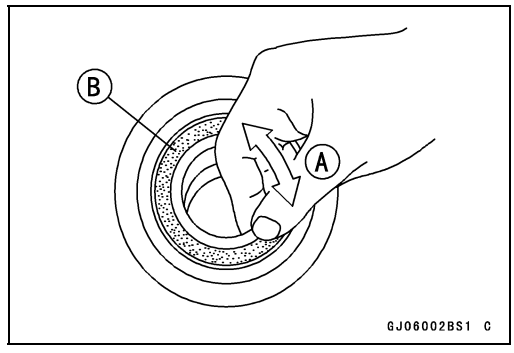
○*Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.*

- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.

★If bearing play, roughness, or binding is found, replace the bearing.

- Examine the bearing seal [B] for tears or leakage.

★If the seal is torn or is leaking, replace the bearing.



Hub Bearing Lubrication

NOTE

○*Since the hub bearings are packed with grease and sealed, lubrication is not required.*

Final Drive

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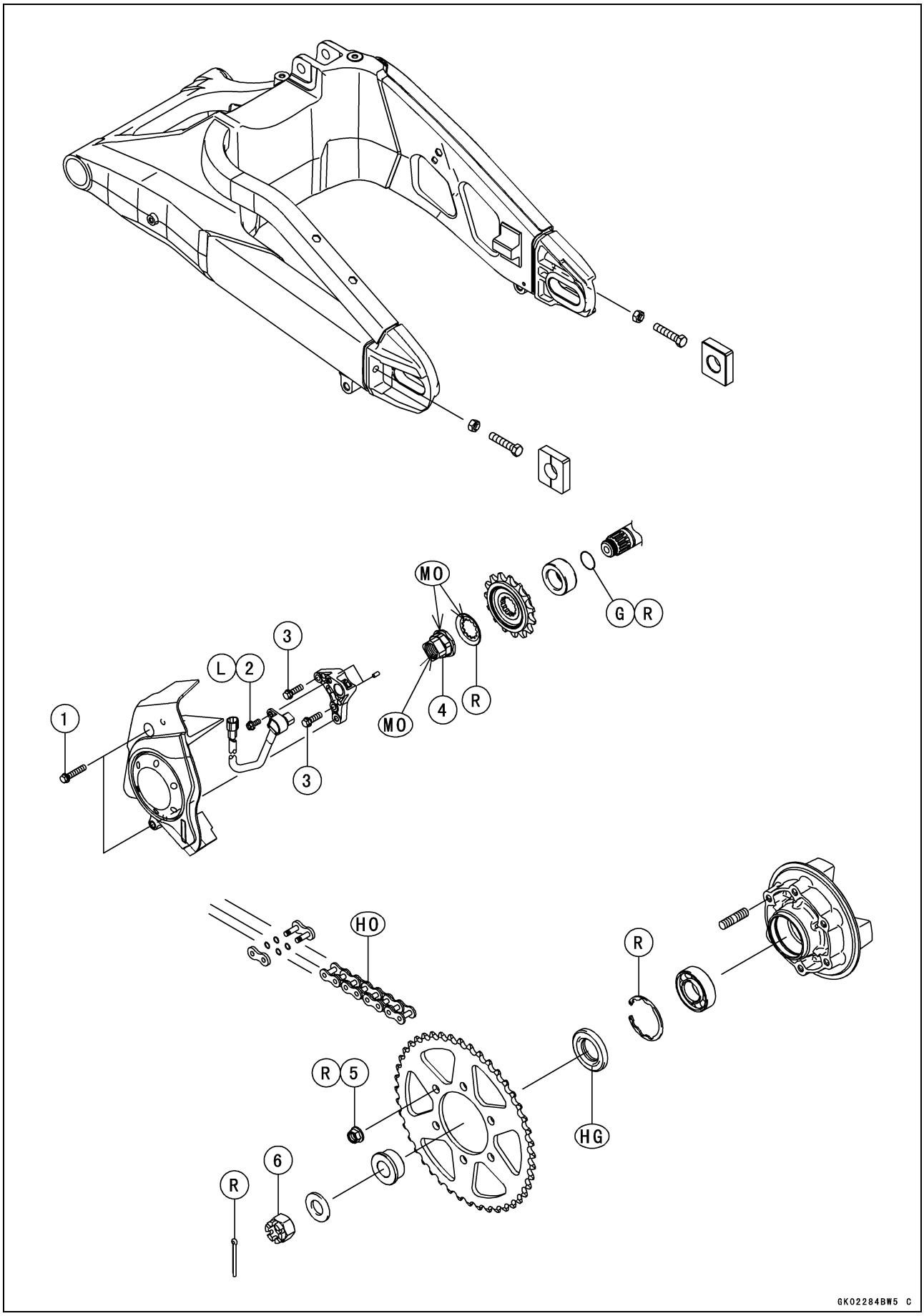
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
2	Speed Sensor Bolt	7.8	0.80	69 in·lb	L
3	Speed Sensor Bracket Bolts	9.8	1.0	87 in·lb	
4	Engine Sprocket Nut	165	16.8	122	MO
5	Rear Sprocket Nuts	59	6.0	44	R
6	Rear Axle Nut	108	11.0	79.7	

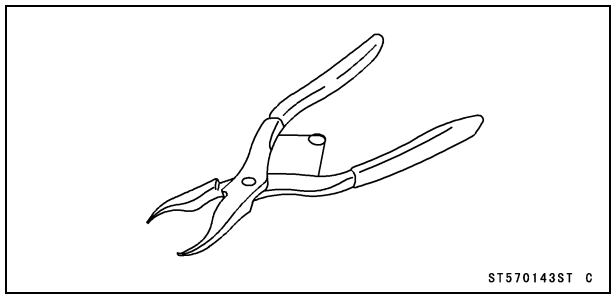
G: Apply grease.
HG: Apply high-temperature grease.
HO: Apply heavy oil.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
R: Replacement Parts

Specifications

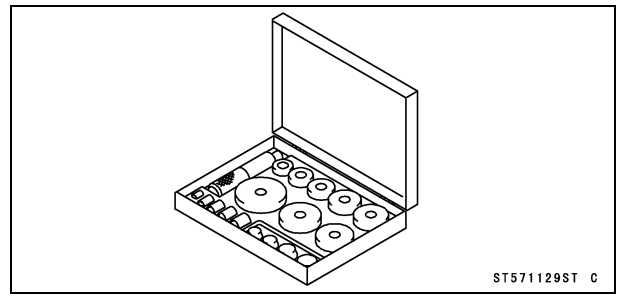
Item	Standard	Service Limit
Drive Chain		
Drive Chain Slack	25 ~ 35 mm (1.0 ~ 1.4 in.)	– – –
Drive Chain Wear (20-link Length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	319 mm (12.6 in.)
Standard Chain:		
Make	DAIDO	– – –
Type	DID 520VP2-T	– – –
Link	114 links	– – –
Link Pin Outside Diameter (When drive chain replacing)	5.4 ~ 5.8 mm (0.21 ~ 0.23 in.)	– – –
Link Pin Length (When drive chain replacing)	20.00 mm (0.7874 in.) or less	– – –
Sprockets		
Rear Sprocket Warp	TIR 0.4 mm (0.016 in.) or less	TIR 0.5 mm (0.020 in.)

Special Tools

Inside Circlip Pliers:
57001-143



Bearing Driver Set:
57001-1129



Drive Chain

Drive Chain Slack Inspection

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

Drive Chain Slack Adjustment

- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

Wheel Alignment Inspection/Adjustment

- Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

Drive Chain Wear Inspection

- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

Drive Chain Lubrication

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

Drive Chain Removal

- Refer to the Drive Chain Replacement.

Drive Chain Installation

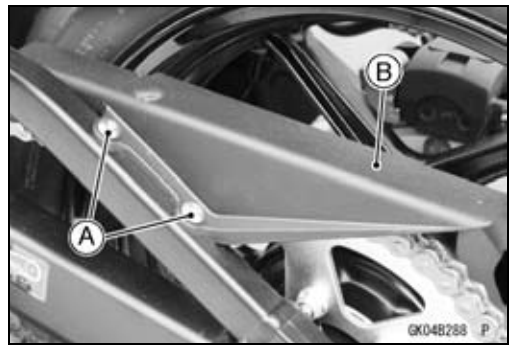
- Refer to the Drive Chain Replacement.

Drive Chain Replacement

NOTE

○*Since the drive chain is installed through the swingarm, the chain cannot be removed other than by cutting it. Prepare the new link pin, link plate, grease seals, and tools for rejoining the chain.*

- Remove:
  Engine Sprocket Cover (see Engine Sprocket Removal)
  Bolts [A]
  Chain Cover [B]



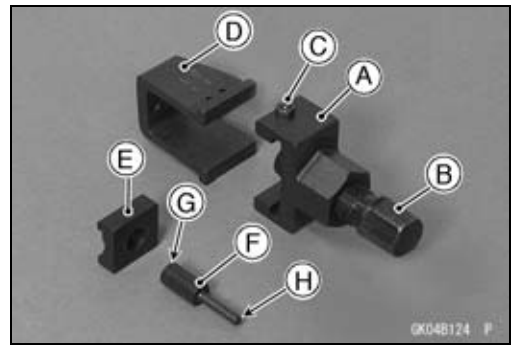
- Using a suitable tool, replace the drive chain.

Recommended Tool - DID Chain Joint "ZJ"
Make DAIDO KOGYO

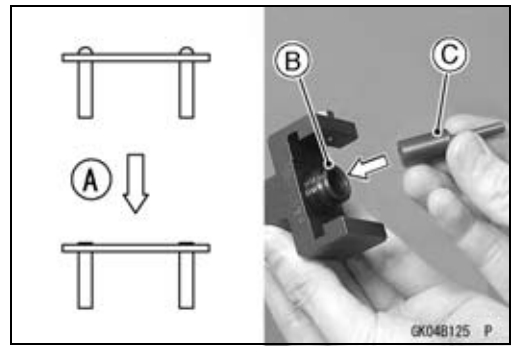
NOTICE
Read the Tool Manual before replacing the chain.

Drive Chain

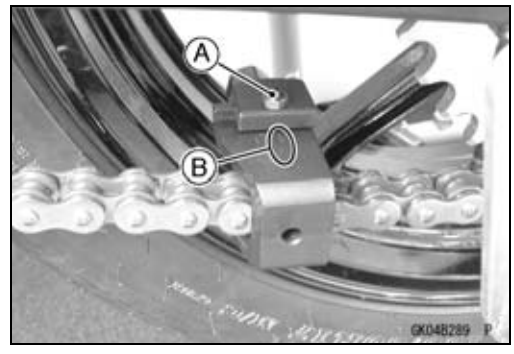
- Remove:
  Body [A]
  Pin Holder [B]
  Positioning Pin [C]
  “U” Holder [D]
  Plate Holder [E]
  Cutting and Riveting Pin [F]
  Part for Riveting [G]
  Part for Cutting [H]



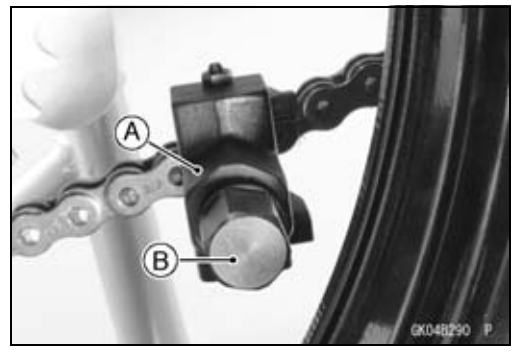
- Grind [A] the heads of the link pin to make it flat.
- Set the cutting and riveting pin [C] in the pin holder [B] as shown.



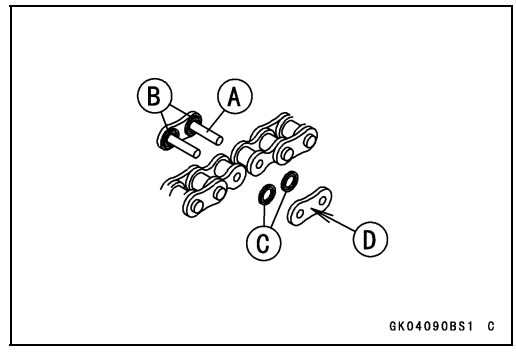
- Set the “U” holder and body, align the positioning pin [A] with the “A mark” [B].
- Tighten the pin holder by hand until the cutting and riveting pin touches the link pin.
- Be sure that the cutting and riveting pin hits center of the link pin.



- Hold the body [A] with a wrench.
- Turn the pin holder [B] clockwise with another wrench, and remove the link pin.
- Do the same procedure for removal of the other link pin.

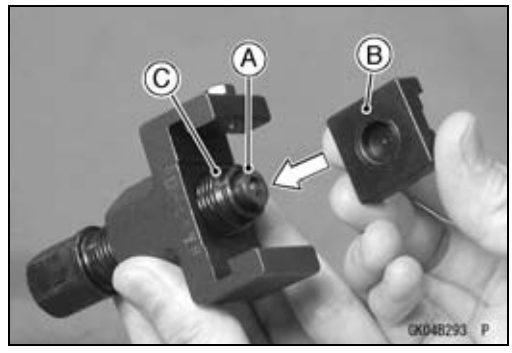


- Engage the new drive chain to the old drive chain, and change the position of the chains by pulling the old chain.
- Remove the old drive chain from the new drive chain.
- Replace the link pin [A], link plate and grease seals [B] [C] with new ones.
- Apply grease to the link pin and grease seals.
- Install the grease seals on the link pin and insert it in the ends of the drive chain.
- Install the link plate so that the mark [D] faces out.

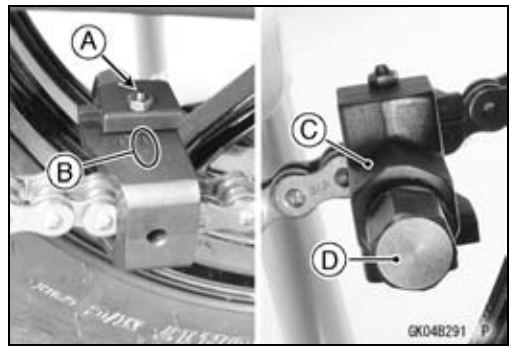


Drive Chain

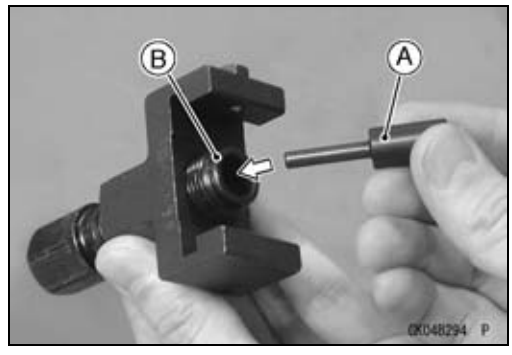
- Set the cutting and riveting pin [A] and plate holder [B] on the pin holder [C] as shown.



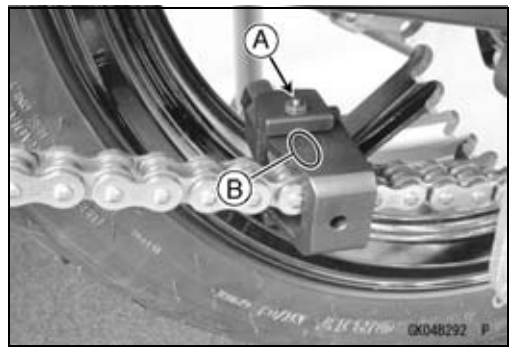
- Set the “U” holder and body, align the positioning pin [A] with the “A mark” [B].
- Hold the body [C] with a wrench.
- Turn the pin holder [D] clockwise with another wrench and press in the link plate on the link pin.
- Remove the “U” holder and body.



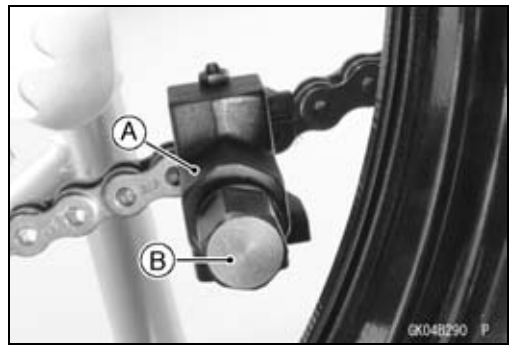
- Set the cutting and riveting pin [A] in the pin holder [B] as shown.



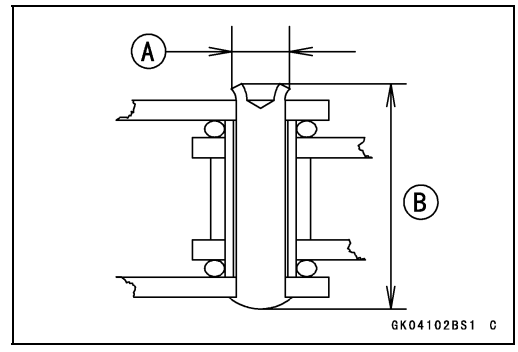
- Set the “U” holder and body, align the positioning pin [A] with the “B mark” [B].
- Tighten the pin holder by hand until the cutting and riveting pin touches the link pin.



- Hold the body [A] with a wrench.
- Turn the pin holder [B] clockwise with another wrench until the cutting and riveting pin touches the link plate.
- Do the same procedure for removal of the other link pin.



Drive Chain



- After riveting, check the ends of the riveted pins for cracks.
- Measure the outside diameter [A] and the length [B] of the link pin.

Link Pin Outside Diameter
Standard: 5.4 ~ 5.8 mm (0.21 ~ 0.23 in.)

Link Pin Length
Standard: 20.00 mm (0.7874 in.) or less

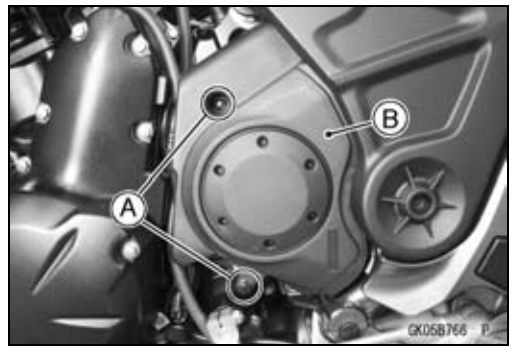
★If the reading is not within the specified range, cut and rejoin the chain again.

- Check that the rollers move smoothly.
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

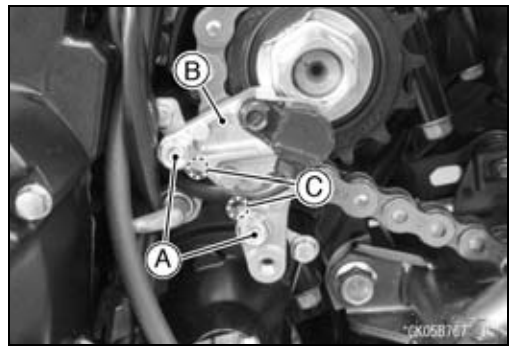
Sprocket, Coupling

Engine Sprocket Removal

- Remove:
  Engine Sprocket Cover Bolts [A]
  Engine Sprocket Cover [B]



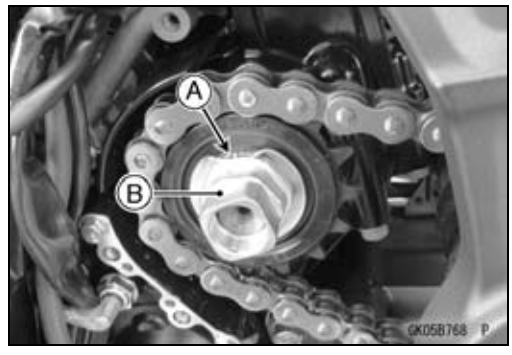
- Remove:
  Speed Sensor Bracket Bolts [A]
  Speed Sensor Bracket [B]
  Dowel Pins [C]



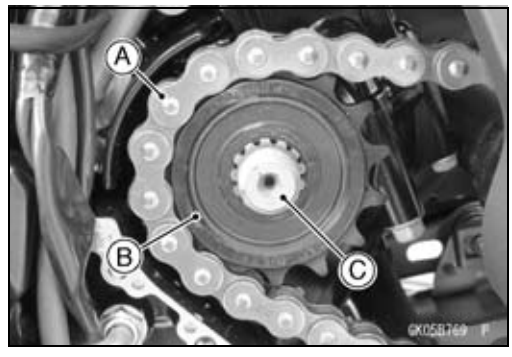
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

NOTE

○*When loosening the engine sprocket nut, hold the rear brake on.*



- Raise the rear wheel off the ground with the stand.
- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Disengage the drive chain from the rear sprocket toward the right.
- Disengage the drive chain [A] from the engine sprocket [B].
- Pull the engine sprocket off the output shaft [C].

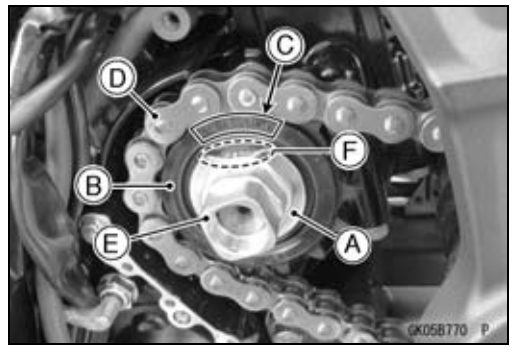


Engine Sprocket Installation

- Replace the sprocket washer [A] with a new one.
- Install the engine sprocket [B] so that “OUT SIDE” letters [C] face outward.
- Engage the drive chain [D] to the engine sprocket.
- Apply molybdenum disulfide oil solution to the threads of the output shaft and engine sprocket nut [E].
- Tighten the engine sprocket nut while applying the rear brake.

Torque - Engine Sprocket Nut: 165 N·m (16.8 kgf·m, 122 ft·lb)

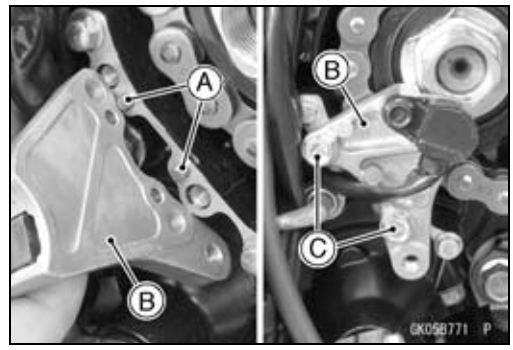
- After tightening the engine sprocket nut, bend [F] the one side of the washer over the nut.



Sprocket, Coupling

- Install the dowel pins [A] and speed sensor bracket [B].
- Tighten:

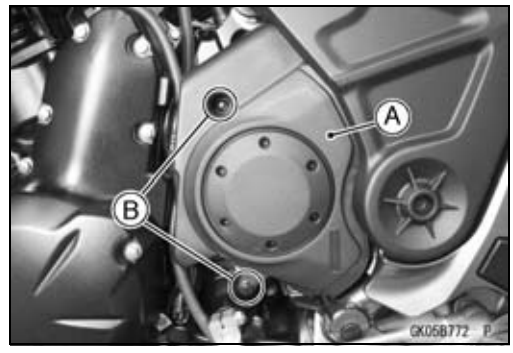
Torque - Speed Sensor Bracket Bolts [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)



- Install:
  Engine Sprocket Cover [A]
- Tighten the engine sprocket cover bolts [B].

Torque - Engine Sprocket Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Adjust the drive chain slack after installing the engine sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

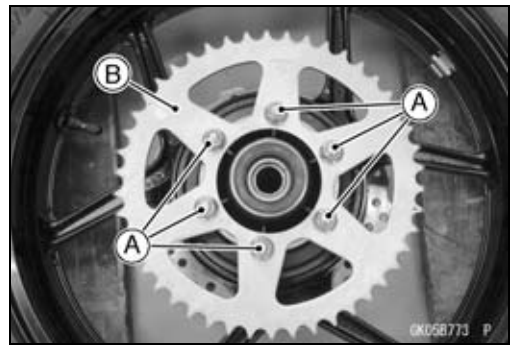


Rear Sprocket Removal

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.



- Remove:
  Rear Sprocket Nuts [A]
  Rear Sprocket [B]

Rear Sprocket Installation

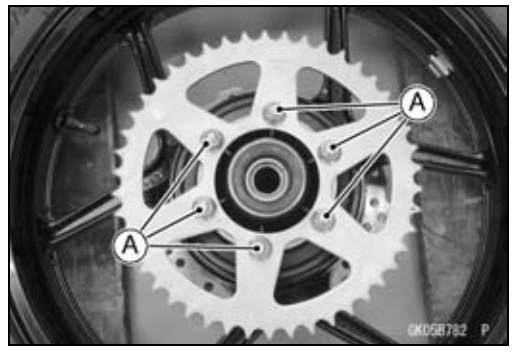
- Install the sprocket facing the tooth number marking [A] outward.

Sprocket, Coupling

- Replace the rear sprocket nuts [A] with new ones.
- Tighten the rear sprocket nuts.

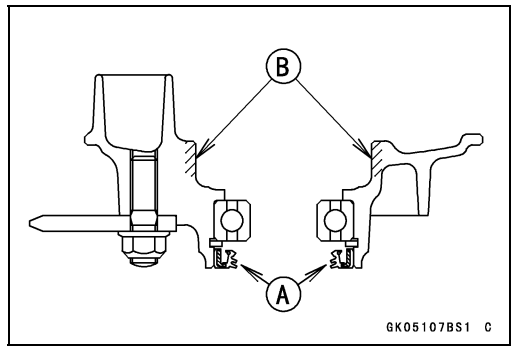
Torque - Rear Sprocket Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)

- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).

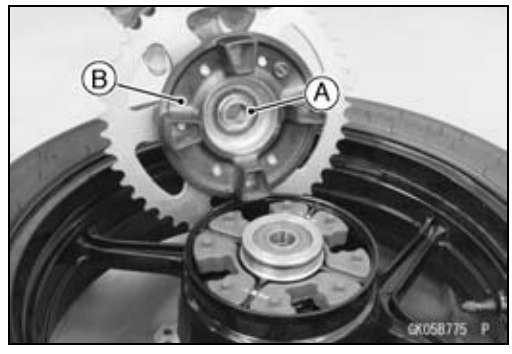


Coupling Installation

- Apply high-temperature grease to the followings.
  Coupling Grease Seal Lips [A]
  Coupling Internal Surface [B]



- Install:
  Collar [A]
  Coupling [B]



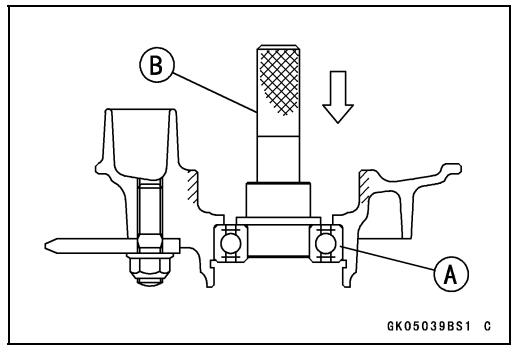
Coupling Bearing Removal

- Remove:
  Coupling
  Grease Seal
  Circlip [A]

Special Tool - Inside Circlip Pliers: 57001-143

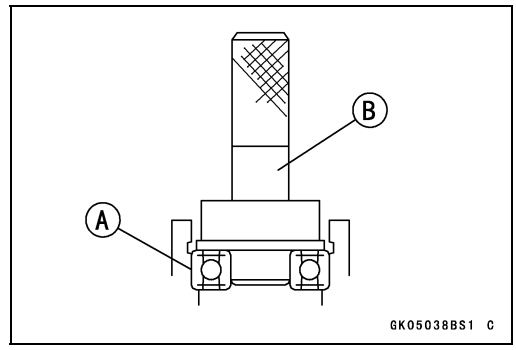
- Remove the bearing [A] by tapping from the wheel side.

Special Tool - Bearing Driver Set [B]: 57001-1129



Sprocket, Coupling

Coupling Bearing Installation



- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.

Special Tool - Bearing Driver Set [B]: 57001-1129

- Replace the circlip with a new one.

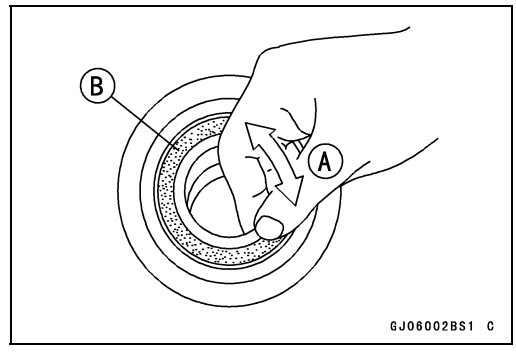
Special Tool - Inside Circlip Pliers: 57001-143

- Replace the grease seal with a new one.
- Press in the grease seal so that the seal surface is flush with the end of the hole.

○Apply high-temperature grease to the grease seal lip.

Special Tool - Bearing Driver Set: 57001-1129

Coupling Bearing Inspection



Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

NOTE

○*It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.*

- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness or binding.

★If the bearing play, roughness or binding is found, replace the bearing.

- Examine the bearing seal [B] for tears or leakage.

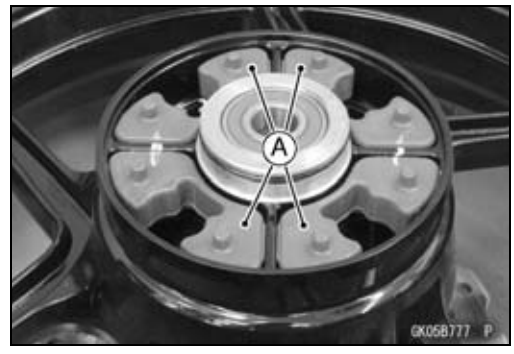
★If the seal is torn ot is leaking, replace the bearing.

Coupling Bearing Lubrication

NOTE

○*Since the coupling bearing is packed with grease and sealed, lubrication is not required.*

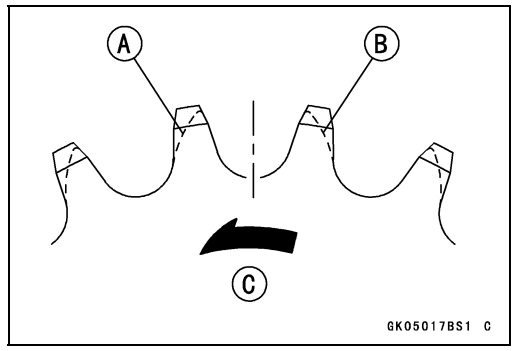
Coupling Damper Inspection



- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.

Sprocket, Coupling

Sprocket Wear Inspection



- Visually inspect the engine and rear sprocket teeth for wear and damage.

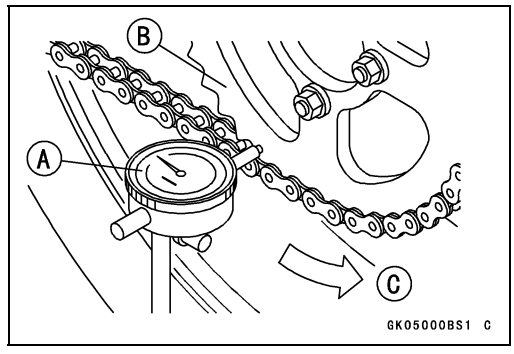
★If the teeth are worn as illustrated, replace the sprocket, and inspect the drive chain wear (see Drive Chain Wear Inspection in the Periodic Maintenance chapter).

Worn Tooth (Engine Sprocket) [A]
Worn Tooth (Rear Sprocket) [B]
Direction of Rotation [C]

NOTE

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

Rear Sprocket Warp Inspection



- Raise the rear wheel off the ground with the stand so that it will turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).

★If the runout exceeds the service limit, replace the rear sprocket.

Rear Sprocket Warp

Standard: TIR 0.4 mm (0.016 in.) or less

Service Limit: TIR 0.5 mm (0.020 in.)

Brakes

Table of Contents

Exploded View

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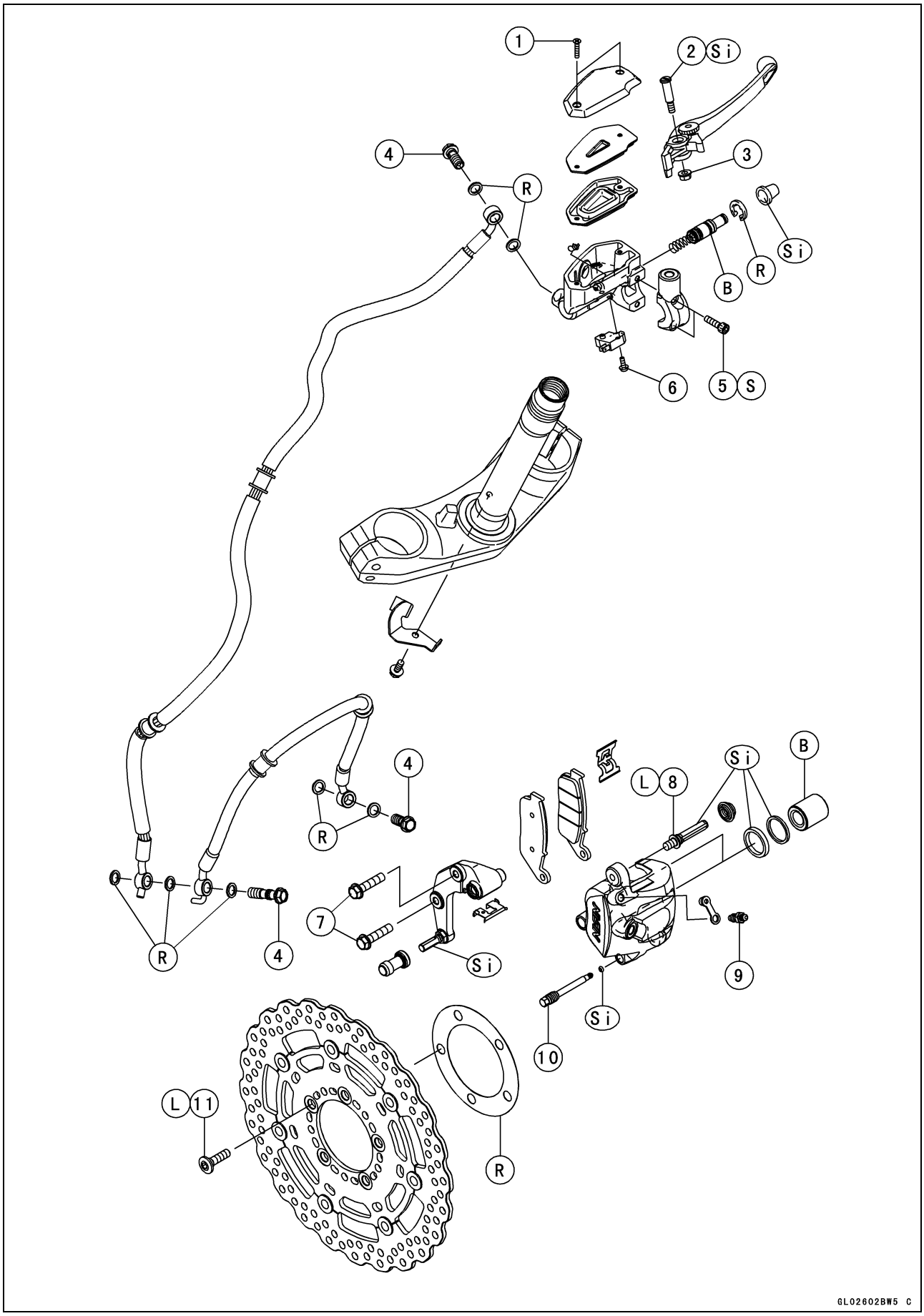
Exploded View

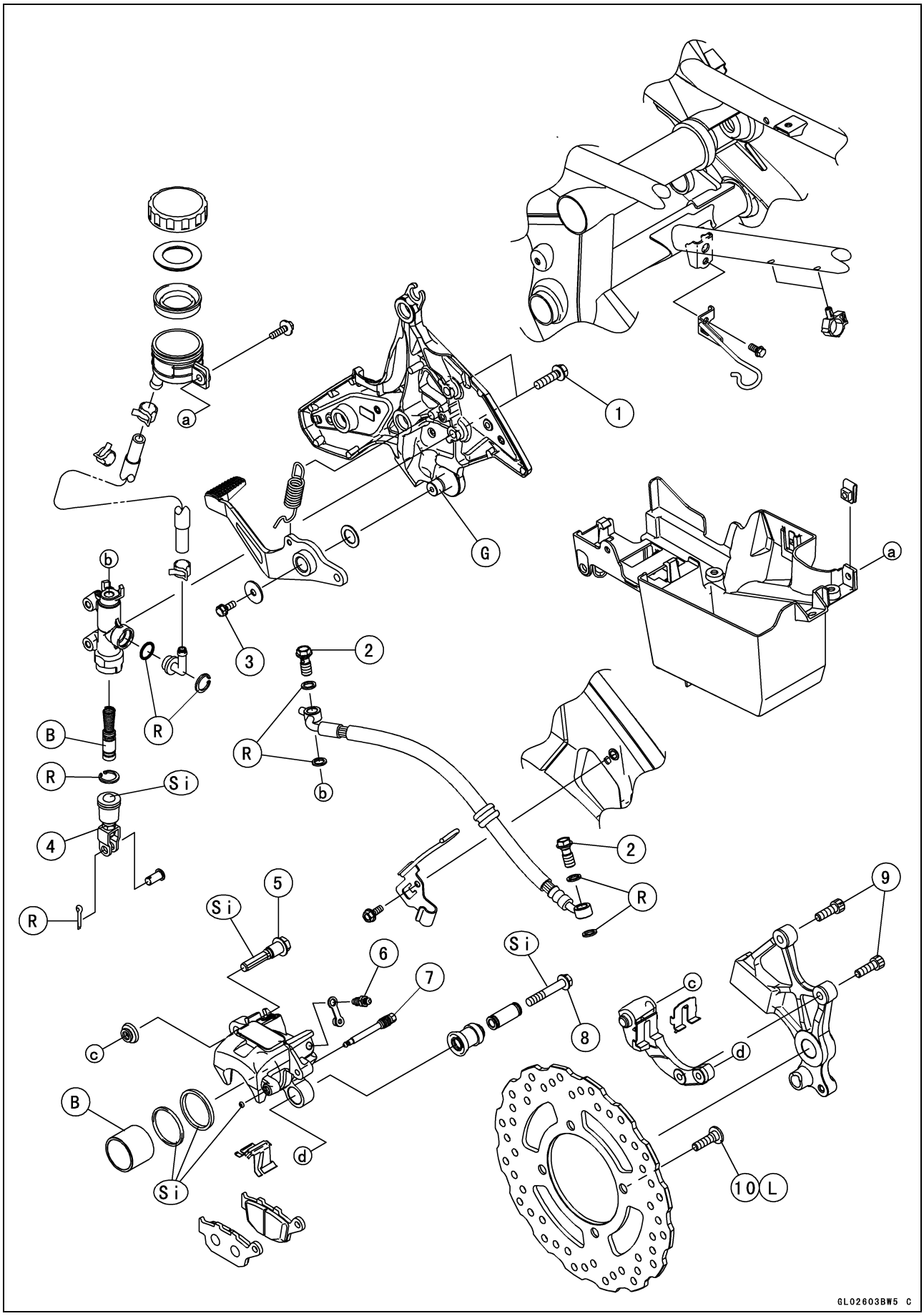


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Brake Fluid Reservoir Cap Screws	1.5	0.15	13 in·lb	
2	Brake Lever Pivot Bolt	1.0	0.10	8.9 in·lb	Si
3	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
4	Brake Hose Banjo Bolts	25	2.5	18	
5	Front Master Cylinder Clamp Bolts	11	1.1	97 in·lb	S
6	Front Brake Light Switch Screw	1.2	0.12	11 in·lb	
7	Front Caliper Mounting Bolts	25	2.5	18	
8	Front Caliper Holder Shafts	22	2.2	16	L, Si
9	Bleed Valves	7.8	0.80	69 in·lb	
10	Front Brake Pad Pins	17	1.7	13	
11	Front Brake Disc Mounting Bolts	27	2.8	20	L

B: Apply brake fluid.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.
Si: Apply silicone grease.

Exploded View



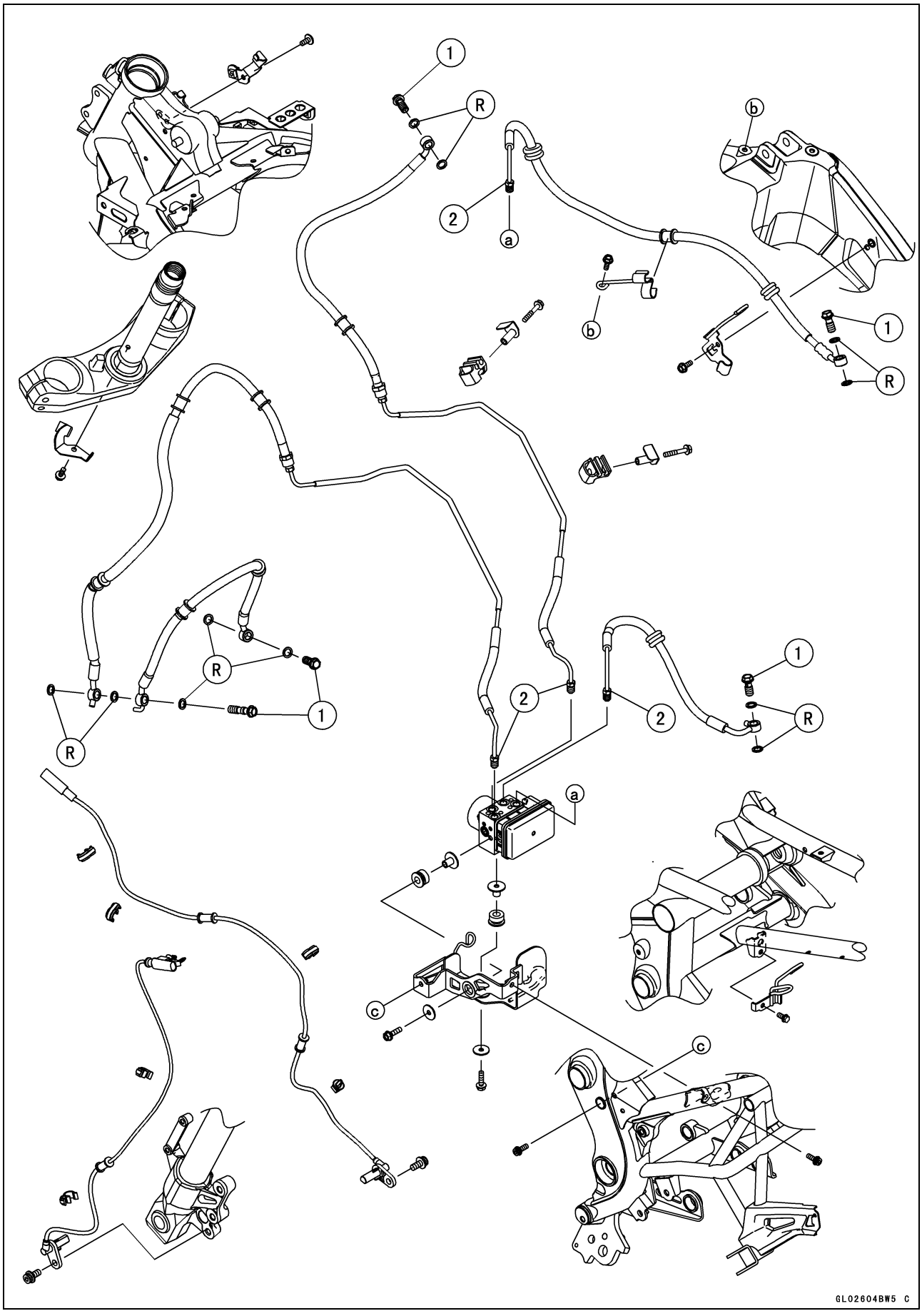
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Master Cylinder Mounting Bolts	25	2.5	18	
2	Brake Hose Banjo Bolts	25	2.5	18	
3	Brake Pedal Bolt	8.8	0.90	78 in·lb	
4	Rear Master Cylinder Push Rod Locknut	17	1.7	13	
5	Rear Caliper Holder Pin Bolt	27	2.8	20	Si
6	Bleed Valve	7.8	0.80	69 in·lb	
7	Rear Brake Pad Pin	17	1.7	13	
8	Rear Caliper Holder Bolt	22	2.2	16	Si
9	Rear Caliper Mounting Bolts	25	2.5	18	
10	Rear Brake Disc Mounting Bolts	27	2.8	20	L

B: Apply brake fluid.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
Si: Apply silicone grease.

Exploded View

ABS Equipped Models



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Hose Banjo Bolts	25	2.5	18	
2	Brake Pipe Joint Nuts	18	1.8	13	

R: Replacement Parts

NOTE

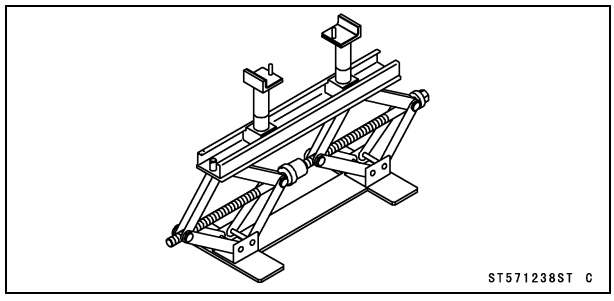
○*When disassembling the brake hose and pipe, disassemble them by the unit as shown in the exploded view.*

Specifications

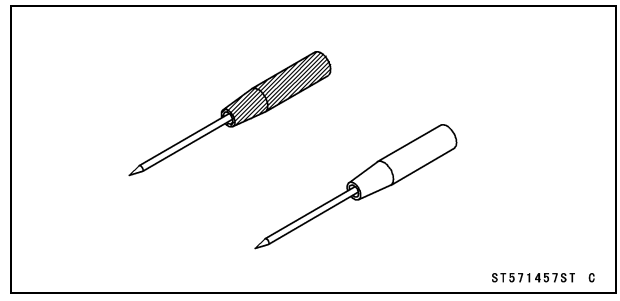
Item	Standard	Service Limit
Brake Lever, Brake Pedal		
Brake Lever Position	5-way adjustable (to suit rider)	– – –
Brake Lever Free Play	Non-adjustable	– – –
Pedal Free Play	Non-adjustable	– – –
Pedal Position	About 44 mm (1.7 in.) below footpeg top	– – –
Brake Pads		
Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
Brake Discs		
Thickness:		
Front	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Rear	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Runout:		
Front	TIR 0.10 mm (0.0039 in.) or less	TIR 0.3 mm (0.013 in.)
Rear	TIR 0.15 mm (0.0059 in.) or less	TIR 0.3 mm (0.013 in.)
Brake Fluid		
Grade	DOT4	– – –
ABS (Equipped Models)		
ABS Hydraulic Unit:		
Make	BOSCH	– – –
Wheel Rotation Sensor Air Gap:		
Front	0.3 ~ 1.7 mm (0.01 ~ 0.07 in.)	– – –
Rear	0.3 ~ 1.7 mm (0.01 ~ 0.07 in.)	– – –

Special Tools

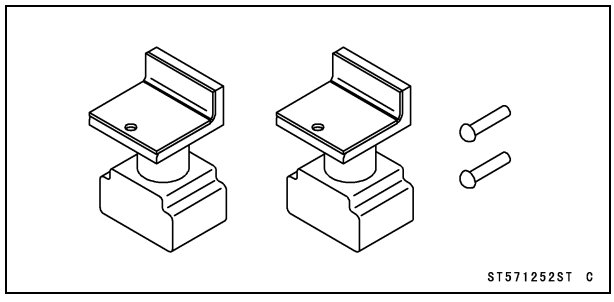
Jack:
57001-1238



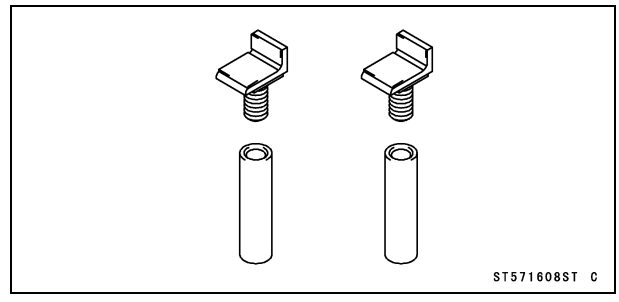
Needle Adapter Set:
57001-1457



Attachment Jack:
57001-1252



Jack Attachment:
57001-1608



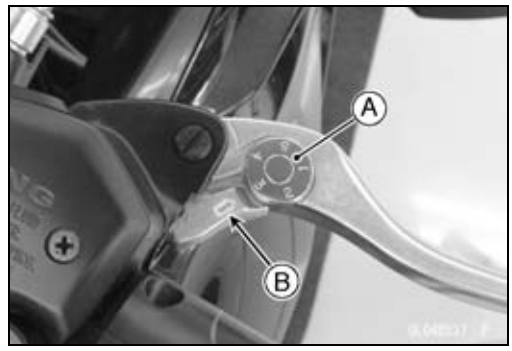
Brake Lever, Brake Pedal

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.

○The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



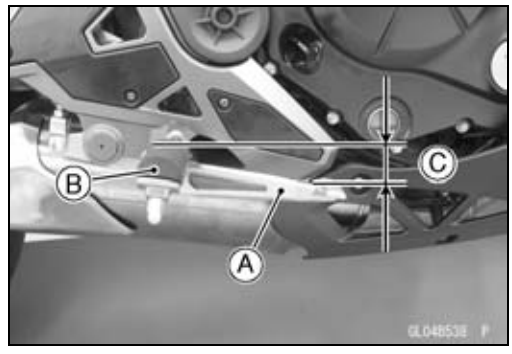
Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position.
  Footpeg [B]

Pedal Position

Standard: About 44 mm (1.7 in.) [C] below top of footpeg

★If it is incorrect, adjust the brake pedal position.



Brake Pedal Position Adjustment

NOTE

○*Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.*

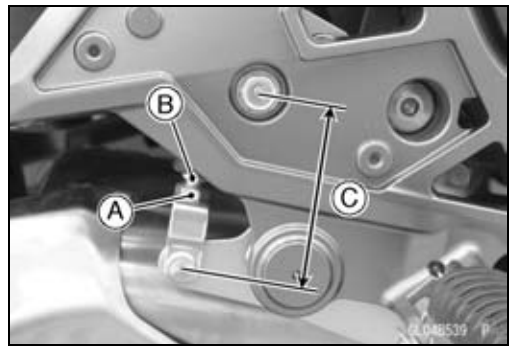
- Remove the right footpeg bracket cover (see Brake Pedal Removal).
- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.

★If the length [C] shown is **70 ±1 mm (2.8 ±0.04 in.)**, the pedal position will be within the standard range.

- Tighten:

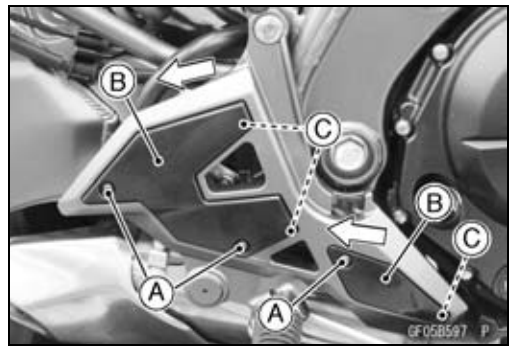
Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 13 ft·lb)

- Check the brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).



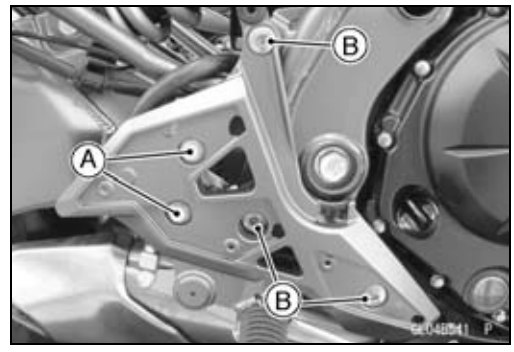
Brake Pedal Removal

- Remove the bolts [A].
- Pull the covers [B] backward to clear the tabs [C].

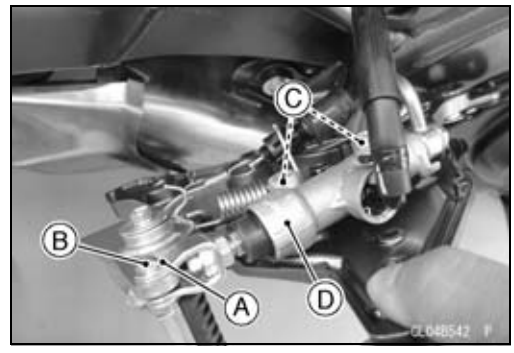


Brake Lever, Brake Pedal

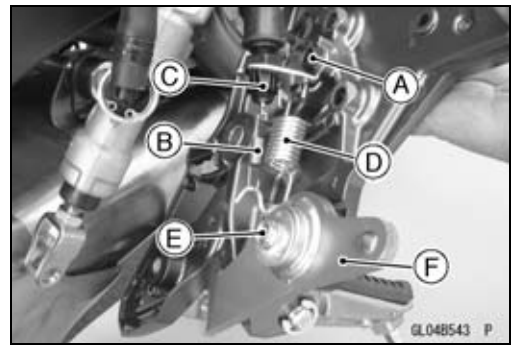
- Loosen:
  Rear Master Cylinder Mounting Bolts [A]
- Remove:
  Front Footpeg Bracket Bolts [B]



- Remove:
  Cotter Pin [A]
  Joint Pin [B]
- Remove the rear master cylinder mounting bolts [C] and free the rear master cylinder [D] from the bracket.



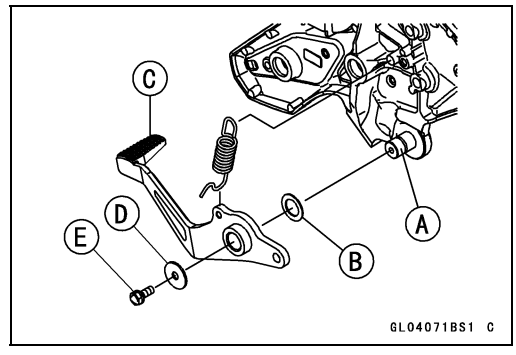
- Remove:
  Bolt [A]
  Rear Brake Light Switch Spring [B]
  Rear Brake Light Switch [C] with Bracket
  Return Spring [D]
  Brake Pedal Bolt [E]
  Brake Pedal [F]



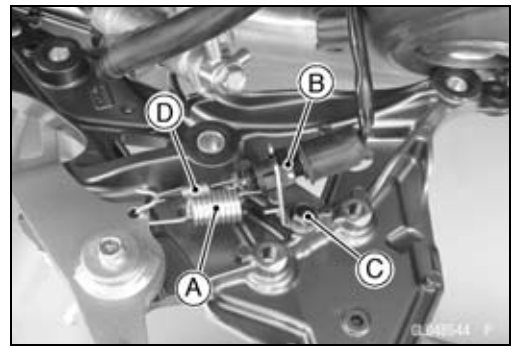
Brake Pedal Installation

- Apply grease to the pivot shaft [A] and install the washer [B].
- Install:
  Brake Pedal [C]
  Washer [D]
- Tighten:

Torque - Brake Pedal Bolt [E]: 8.8 N·m (0.90 kgf·m, 78 in·lb)

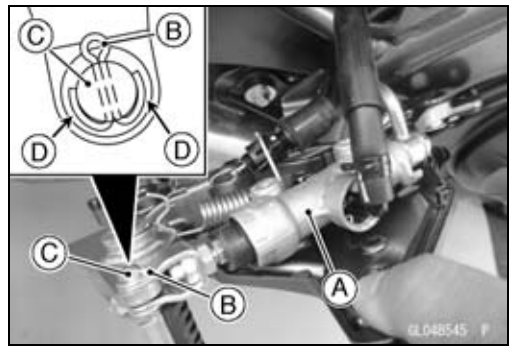


- Hook the return spring [A] between the footpeg bracket and brake pedal as shown.
- Install the rear brake light switch [B] with bracket.
- Tighten the bolt [C].
- Hook the rear brake light switch spring [D] between the switch and end of the return spring as shown.
- Bend the rear brake light switch spring ends to prevent it from coming off.



Brake Lever, Brake Pedal

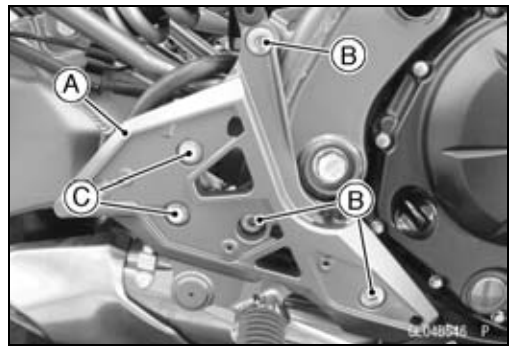
- Install the rear master cylinder [A] to the bracket and tighten the mounting bolts loosely.
- Replace the cotter pin [B] with a new one.
- Insert the cotter pin into the joint pin [C] and bend the pin ends [D].



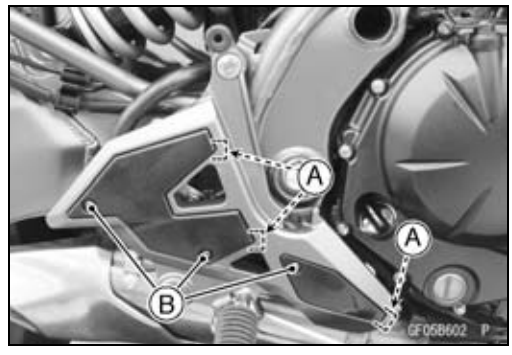
- Install:
  Right Front Footpeg Bracket [A]
- Tighten:

Torque - Front Footpeg Bracket Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Master Cylinder Mounting Bolts [C]: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Check the brake pedal position (see Brake Pedal Position Inspection).

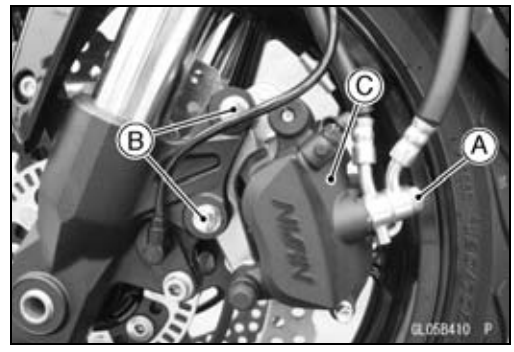


- Insert the tabs [A] of the right front footpeg bracket cover to the holes of the footpeg bracket.
- Tighten the bolts [B].



Calipers

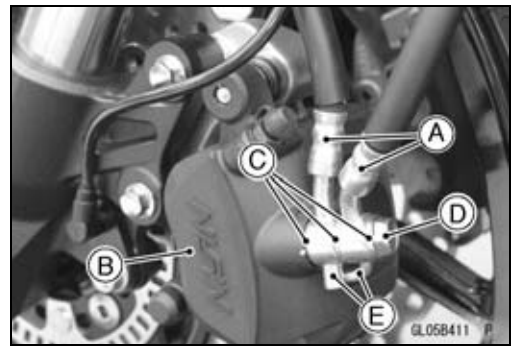
Front Caliper Removal



- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Remove:
  Front Caliper Mounting Bolts [B]
  Front Caliper [C]
- Remove the banjo bolt and disconnect the brake hose from the caliper.

NOTICE
Immediately wash away any brake fluid that spills.

Front Caliper Installation



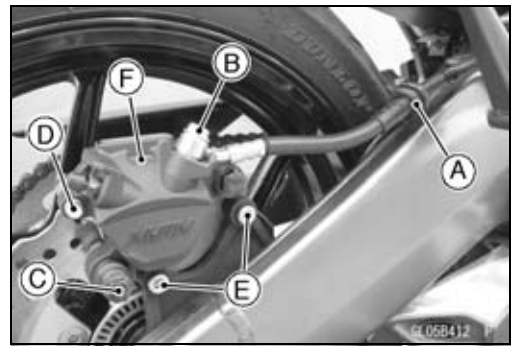
- Installation is the reverse of removal.
- Replace the washers on each side of hose fitting with new ones.
- Connect the brake hoses [A] to the caliper [B] with the new washers [C] and banjo bolt [D].
- ○Position the brake hose fitting to the stopper on the calipers.
- ○For the left caliper, fit the stoppers [E] on the brake hoses fittings against each other as shown.
- Tighten:

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

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING
After servicing, it takes several applications of the brake lever or pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever or pedal is obtained by pumping the lever or pedal until the pads are against the disc.

Rear Caliper Removal

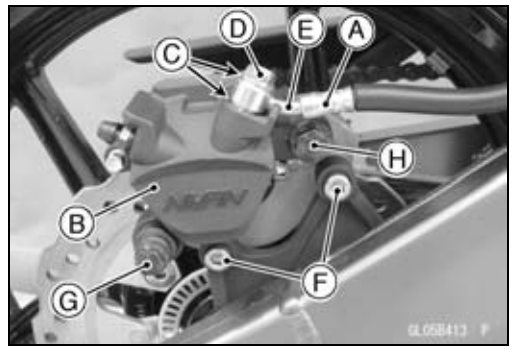


- Free the brake hose from the clamp [A].
- Loosen the banjo bolt [B] at the brake hose lower end, and tighten it loosely.
- Loosen the rear caliper holder bolt [C] and pad pin [D] if the caliper to be disassembled.
- Remove:
  Rear Caliper Mounting Bolts [E]
  Rear Caliper [F]
- Remove the banjo bolt and disconnect the brake hose from the caliper.

⚠ WARNING
Immediately wash away any brake fluid that spills.

Calipers

Rear Caliper Installation



- Replace the washers on each side of hose fitting with new ones.
- Connect the brake hose [A] to the caliper [B] with the new washers [C] and banjo bolt [D].

○Fit the brake hose fitting [E] into the groove on the caliper.

- Install the rear caliper mounting bolts [F].
- Apply silicone grease to the sliding surface of the rear caliper holder bolt [G] and rear caliper holder pin bolt [H].
- Tighten:

Torque - Rear Caliper Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Caliper Holder Bolt: 22 N·m (2.2 kgf·m, 16 ft·lb) (If removed)
Rear Caliper Holder Pin Bolt: 27 N·m (2.8 kgf·m, 20 ft·lb) (If removed)

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

After servicing, it takes several applications of the brake lever or pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever or pedal is obtained by pumping the lever or pedal until the pads are against the disc.

Front Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Front Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Calipers

Caliper Fluid Seal Damage Inspection

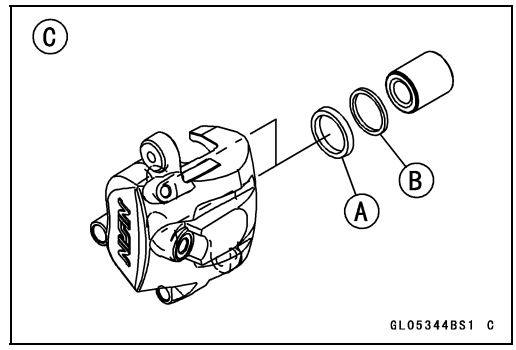
The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

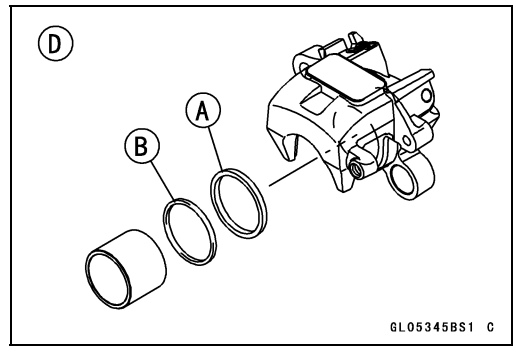
- Replace the fluid seal if it exhibits any of the conditions listed below.

○Brake fluid leakage around the pad.
○Brakes overheat.
○Considerable difference in inner and outer pad wear.
○Seal and piston are stuck together.

★If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.

Front Caliper [C]
Rear Caliper [D]



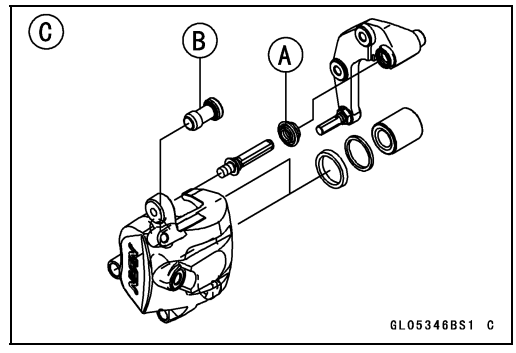


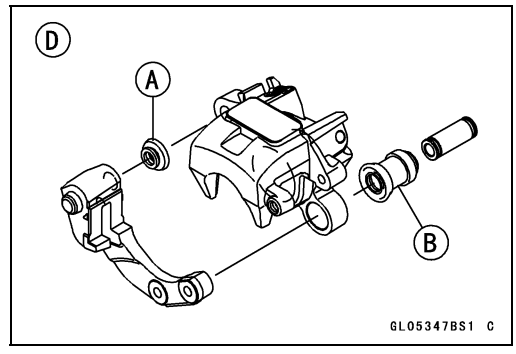
Caliper Dust Boot and Friction Boot Damage Inspection

- Check that the dust boot [A] and friction boot [B] are not cracked, worn, swollen, or otherwise damaged.

★If they show any damage, replace it.

Front Caliper [C]
Rear Caliper [D]





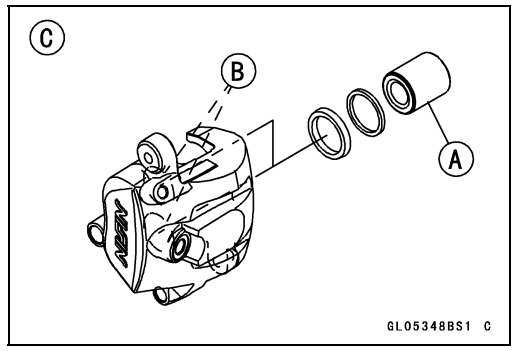
Calipers

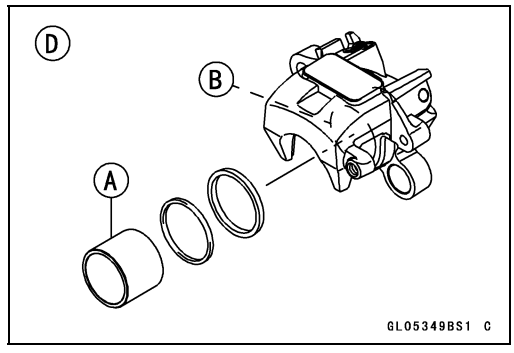
Caliper Piston and Cylinder Damage Inspection

● Visually inspect the pistons [A] and cylinder surfaces [B].

★Replace the caliper if the cylinder and piston are badly scores or rusty.

Front Caliper [C]
Rear Caliper [D]





Caliper Holder Shaft/Pin/Collar Inspection

The caliper body must slide smoothly on the front caliper holder shafts [A] and pin [B], rear caliper holder pin bolt [C] and collar [D]. If the caliper body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

● Check to see that the front caliper holder shafts, rear caliper holder pin bolt and collar are not badly worn or stepped, and that the rubber friction boots are not damaged.

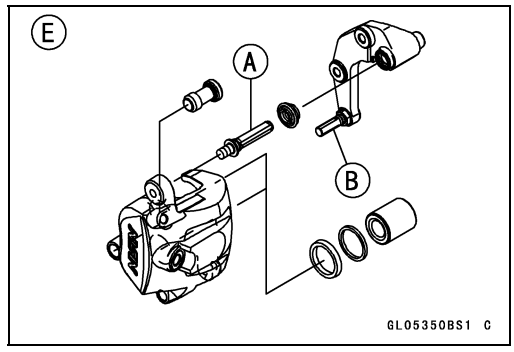
★If the rubber friction boot is damaged, replace the rubber friction boot. To replace the friction boot, remove the pads and the caliper bracket.

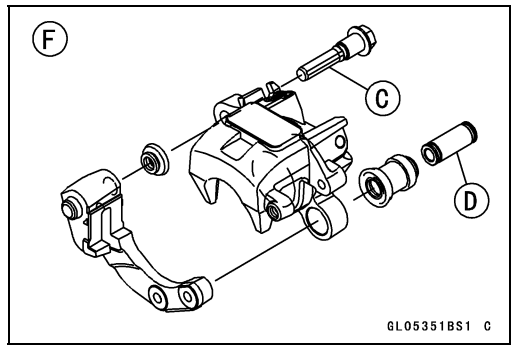
★If the front caliper holder shaft, rear caliper holder pin bolt and collar are damaged, replace them.

○Apply a non-permanent locking agent to the threads of the front caliper holder shaft.

Torque - Front Caliper Holder Shaft: 22 N·m (2.2 kgf·m, 16 ft·lb)

Front Caliper [E]
Rear Caliper [F]

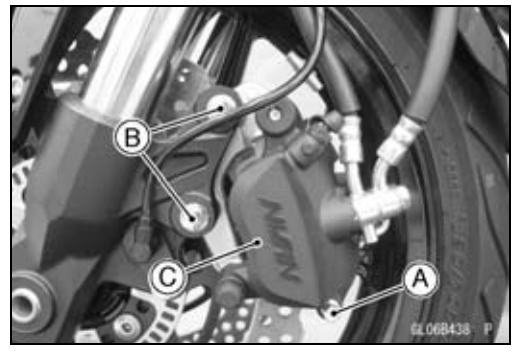




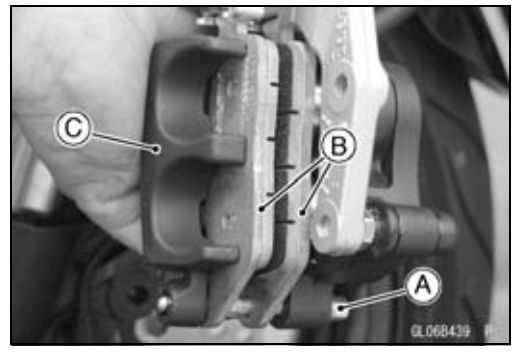
Brake Pads

Front Brake Pad Removal

- Loosen the pad pin [A].
- Remove:
  Front Caliper Mounting Bolts [B]
- Remove the front caliper [C] with the hose connected.

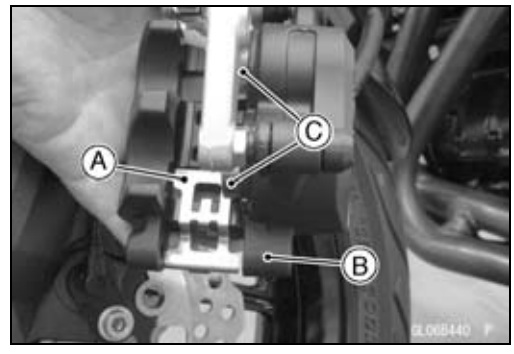


- Pull out the pad pin [A] and remove the brake pads [B] from the caliper [C].



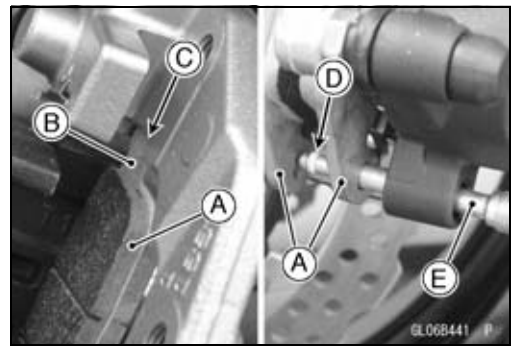
Front Brake Pad Installation

- Check that the pad spring [A] is in place on the caliper [B].
- Push the caliper pistons [C] in by hand as far as they will go.



- Install the brake pads [A] to the caliper.
- ○Fit the tabs [B] of the brake pads on the step [C] of the caliper holder.
- Apply a silicone grease to the O-ring [D] on the pad pin.
- Insert the pad pin [E] through the brake pads and tighten the pad pin temporarily.
- Install the front caliper (see Caliper Installation).
- Tighten:

Torque - Front Brake Pad Pin: 17 N·m (1.7 kgf·m, 13 ft·lb)

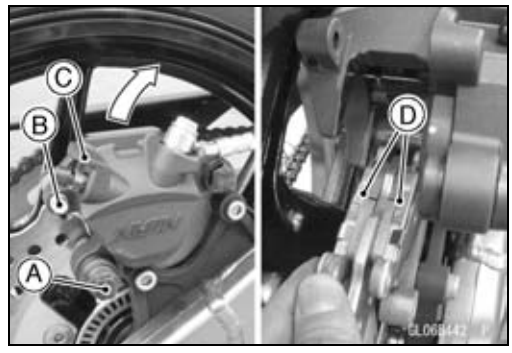


⚠ WARNING

After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.

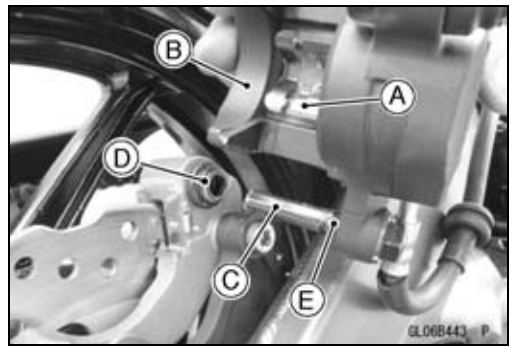
Brake Pads

Rear Brake Pad Removal

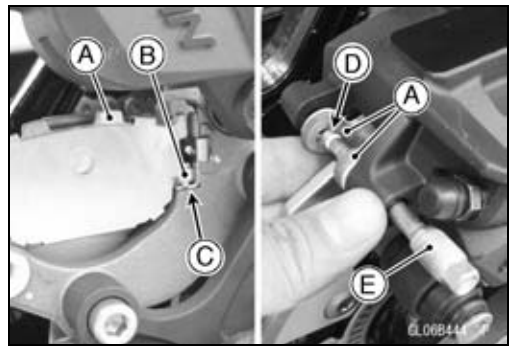


- Free the brake hose from the clamp.
- Loosen the caliper holder bolt [A] and pad pin [B] on the rear caliper [C].
- Remove the caliper holder bolt and turn the rear caliper forward.
- Remove the brake pads [D] from the rear caliper.

Rear Brake Pad Installation



- Check that the pad spring [A] is in place on the caliper [B].
- Apply a silicone grease to the sliding surface of the caliper holder pin bolt [C].
- Insert the caliper holder pin bolt into the boot [D] of the caliper holder.
- Fit the boot into the groove [E] on the caliper holder pin bolt.



- Install the brake pads [A] to the caliper.
- ○Fit the tabs [B] of the brake pads on the step [C] of the caliper holder.
- Lower the rear caliper over the brake pads.
- Apply a silicone grease to the O-ring [D] on the pad pin.
- Insert the pad pin [E] through the brake pads and tighten the pad pin temporarily.

- Tighten:

Torque - Rear Caliper Holder Bolts [A]: 22 N·m (2.2 kgf·m, 16 ft·lb)
Rear Brake Pad Pin [B]: 17 N·m (1.7 kgf·m, 13 ft·lb)

- Secure the brake hose to the clamp on the swingarm.

⚠ WARNING

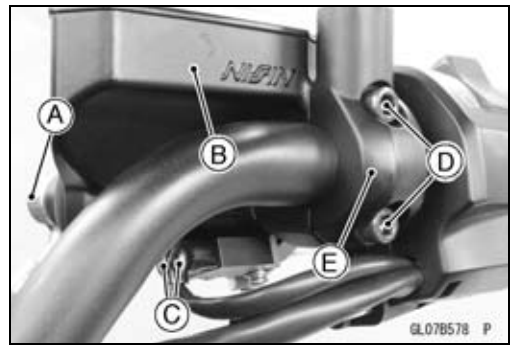
After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.

Brake Pad Wear Inspection

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

Master Cylinders

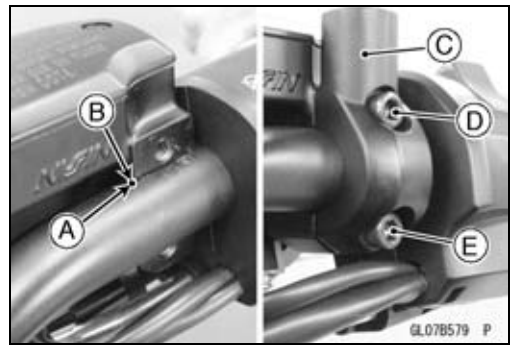
Front Master Cylinder Removal



- Remove the banjo bolt [A] to disconnect the brake hose from the master cylinder [B] (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Disconnect the front brake light switch connectors [C].
- Remove the clamp bolts [D] and front master cylinder clamp [E] to remove the master cylinder assembly.

NOTICE
Immediately wash away any brake fluid that spills.

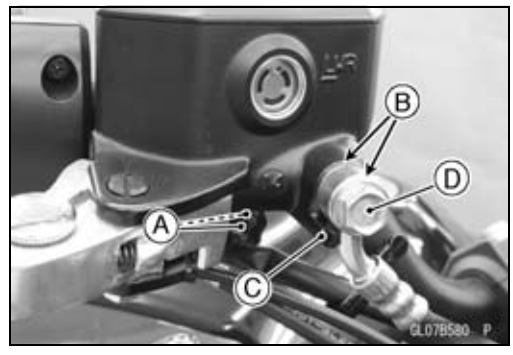
Front Master Cylinder Installation



- Install the front master cylinder so that the punch mark [A] of the handlebar is aligned with the mating surface [B] of the master cylinder and clamp.
- Install the master cylinder clamp with its mirror mount [C] facing up.
- Tighten the upper clamp bolt [D] first, and then the lower clamp bolt [E].

○There will be a gap at the lower part of the clamp after tightening.

Torque - Front Master Cylinder Clamp Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)

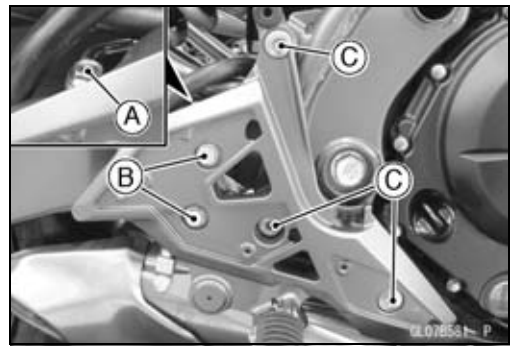


- Connect the front brake light switch connectors [A].
- Replace the washers [B] on each side of the hose fitting with new ones.
- Fit the brake hose fitting to the stopper [C] on the front master cylinder.
- Tighten the brake hose banjo bolt [D].

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

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

Rear Master Cylinder Removal



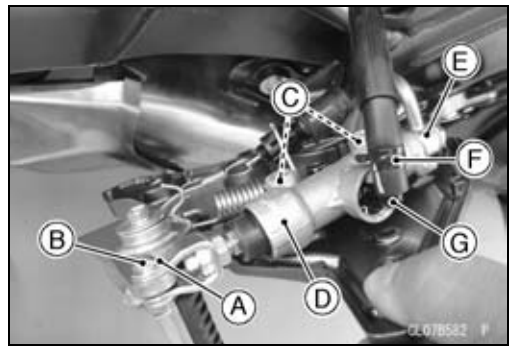
- Remove the right front footpeg bracket covers (see Brake Pedal Removal).
- Loosen:
  Brake Hose Banjo Bolt [A]
  Rear Master Cylinder Mounting Bolts [B]

NOTICE
Immediately wash away any brake fluid that spills.

- Remove:
  Front Footpeg Bracket Bolts [C]

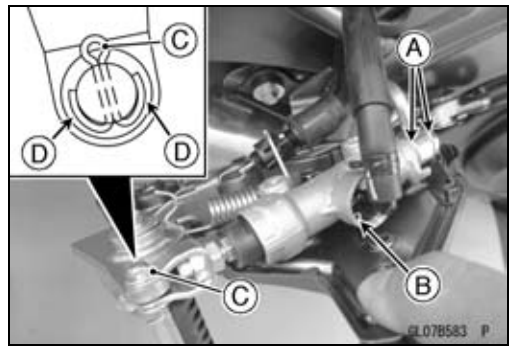
Master Cylinders

- Remove:
  Cotter Pin [A]
  Joint Pin [B]
- Remove the rear master cylinder mounting bolts [C] and free the rear master cylinder [D] from the bracket.
- Remove the brake hose banjo bolt to disconnect the brake hose [E] from the rear master cylinder.
- Slide the reservoir hose lower end clamp [F].
- Remove the reservoir hose lower end [G], and drain the brake fluid into a container.



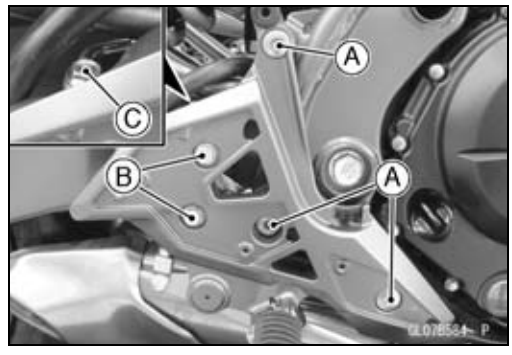
Rear Master Cylinder Installation

- Installation is the reverse of removal.
- Replace the followings:
  Washers [A] on each side of hose fitting
  Circlip [B]
  Cotter Pin [C]
- Insert the cotter pin into the joint pin and bend the pin ends [D] (see Brake Pedal Installation).



- Tighten the following bolts.
- Tighten:

Torque - Front Footpeg Bracket Bolts [A]: 25 N·m (2.5 kgf·m, 18 ft·lb)
Rear Master Cylinder Mounting Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)
Brake Hose Banjo Bolt [C]: 25 N·m (2.5 kgf·m, 18 ft·lb)



- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

Front Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Assembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinders

Master Cylinder Inspection (Visual Inspection)

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders (see Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].

★If a master cylinder or piston shows any damage, replace them.

- Inspect the primary cup [C] and secondary cup [D].

★If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.

★If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.

- Check the dust covers [E] for damage.

★If they are damaged, replace them.

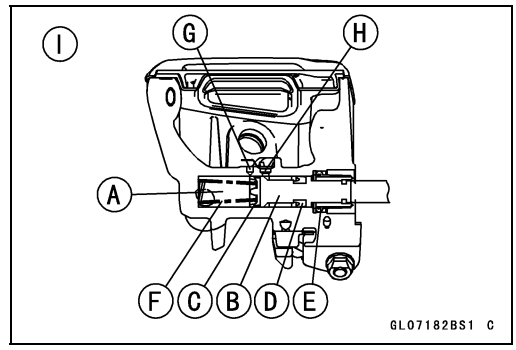
- Check the piston return springs [F] for any damage.

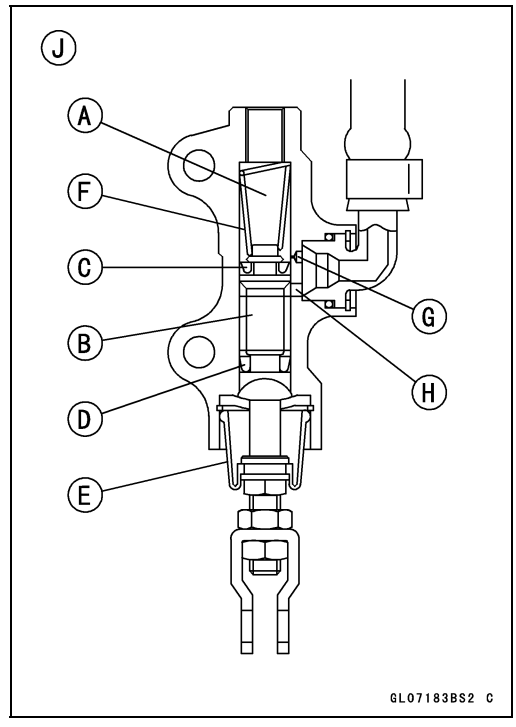
★If the springs are damaged, replace them.

- Check that relief port [G] and supply port [H] are not plugged.

★If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

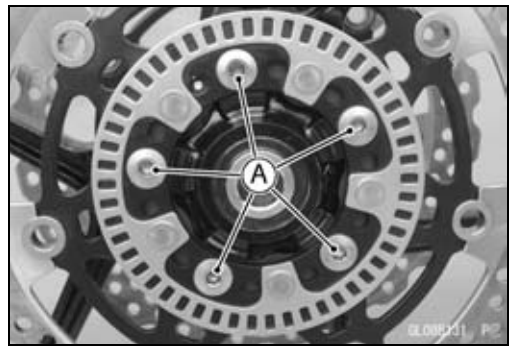
Front Master Cylinder [I]
Rear Master Cylinder [J]





Brake Discs

Brake Disc Removal

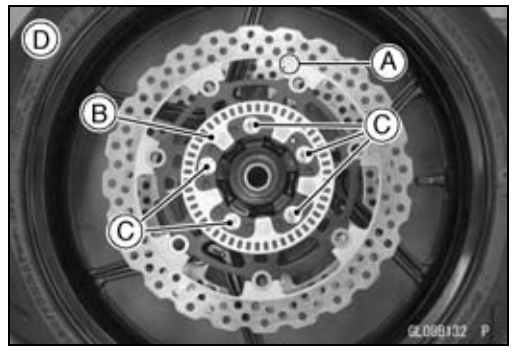


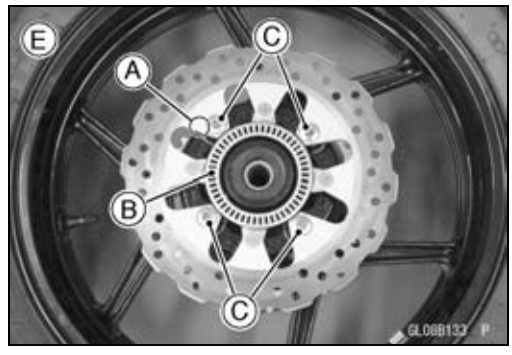
- Remove the wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Remove the brake disc mounting bolts [A] and brake disc.

NOTE

○*For the ABS equipped model, do not try to remove the wheel rotation sensor rotor.*

Brake Disc Installation

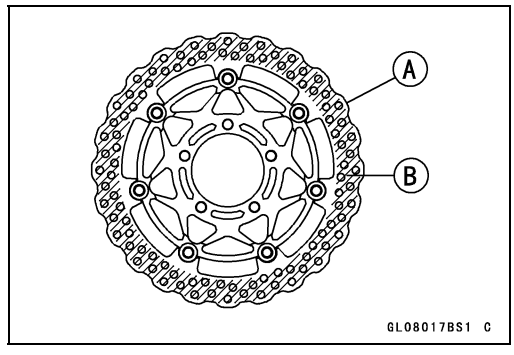




- Replace the gaskets with new ones.
- Install the brake disc on the wheel so that the marked side [A] faces out.
- For the ABS equipped model, install the front brake disc with the wheel rotation sensor rotor [B] to the left side.
- Apply a non-permanent locking agent to the threads of the front and rear brake disc mounting bolts.
- Tighten the front and rear brake disc mounting bolts [C].
  Front Brake Discs [D]
  Rear Brake Disc [E]

Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)

Brake Disc Wear Inspection



- Measure the thickness of each disc [A] at the point where it has worn the most.
  Measuring Area [B]

Brake Discs Thickness

Standard:

Front	**4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)**
Rear	**4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)**

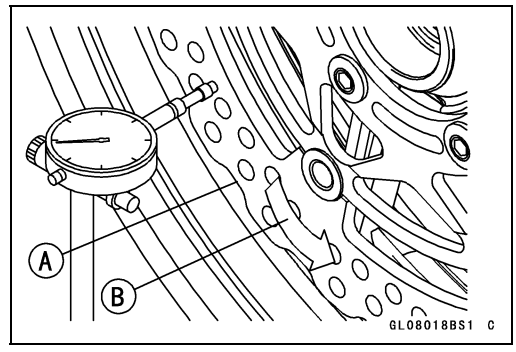
Service Limit:

Front	**4.5 mm (0.18 in.)**
Rear	**4.5 mm (0.18 in.)**

★If the disc has worn past the service limit, replace it.

Brake Discs

Brake Disc Warp Inspection



● Raise the front/rear wheel off the ground.

Special Tools - Jack: 57001-1238
Attachment Jack: 57001-1252
Jack Attachment: 57001-1608

○For front disc inspection, turn the handlebars fully to one side.

● Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.

Disc Runout
Standard:

Front	**TIR 0.10 mm (0.0039 in.) or less**
Rear	**TIR 0.15 mm (0.0059 in.) or less**

Service Limit:

Front	**TIR 0.3 mm (0.013 in.)**
Rear	**TIR 0.3 mm (0.013 in.)**

★If runout exceeds the service limit, replace the disc.

Brake Fluid

Brake Fluid Level Inspection

- Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

Brake Fluid Change

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

Brake Line Bleeding

The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

⚠ WARNING

Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If the brake lever or pedal has a soft or "spongy" feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.

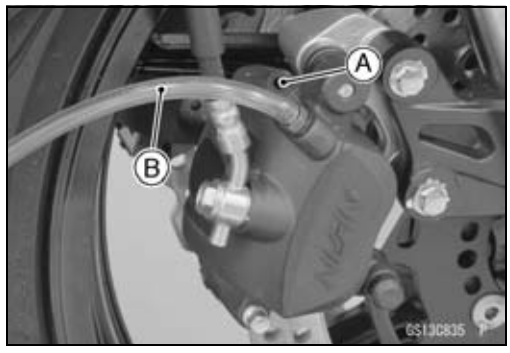
NOTE

○ *The procedure to bleed the front brake line is as follows. Bleeding the rear brake line is the same as for the front brake.*

- Remove the reservoir cap [A] and diaphragm.
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.

○ Bleed the air completely from the master cylinder by this operation.

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

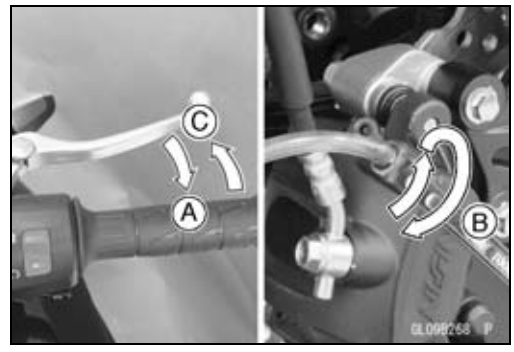


Brake Fluid

- Bleed the brake line and the master cylinder.

○Repeat this operation until no more air can be seen coming out into the plastic hose.

1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
2. Quickly open and close [B] the bleed valve while holding the brake applied.
3. Release the brake lever [C].



NOTICE

After pumping the brake lever several times, releasing it without opening and closing of the bleed valve may cause brake fluid to be blown back from the master cylinder reservoir. Brake fluid spilt on painted surfaces and plastic parts will quickly damage them. Be sure to open and close the bleed valve.

NOTE

○*The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

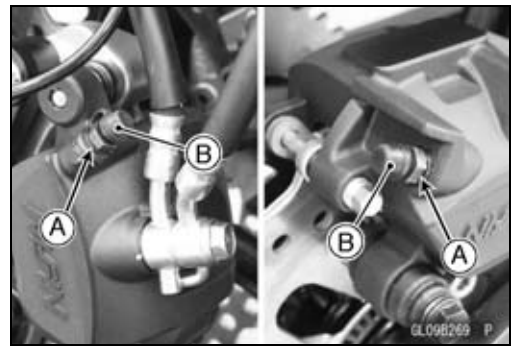
○*Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.*

○*Front Brake: First bleeding the left caliper then repeat the above steps for the right caliper.*

- Remove the clear plastic hose.
- Tighten the bleed valve [A], and install the rubber cap [B].

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

- Check the fluid level (see Brake Fluid Level Inspection in the Periodic Maintenance chapter).



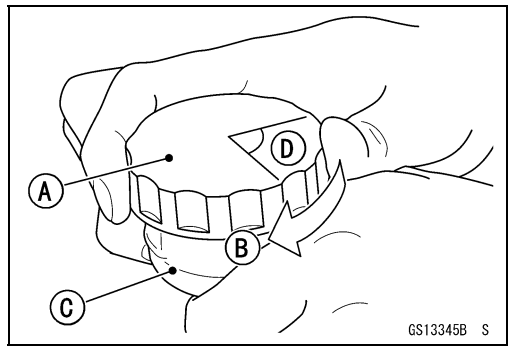
- Install the diaphragm and reservoir cap [A].
- Tighten:

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

Brake Fluid

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

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



- After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.

⚠ WARNING

When working with the disc brake, observe the precautions listed below.

- **Never reuse old brake fluid.**
- **Do not use fluid from a container that has been left unsealed or that has been open for a long time.**
- **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.**
- **Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.**
- **Don't change the fluid in the rain or when a strong wind is blowing.**
- **Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.**
- **When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.**
- **Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.**
- **If any of the brake line fittings or the bleed valve is opened at any time, the AIR MUST BE BLED FROM THE BRAKE LINE.**

Brake Hoses

Brake Hose Removal/Installation

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

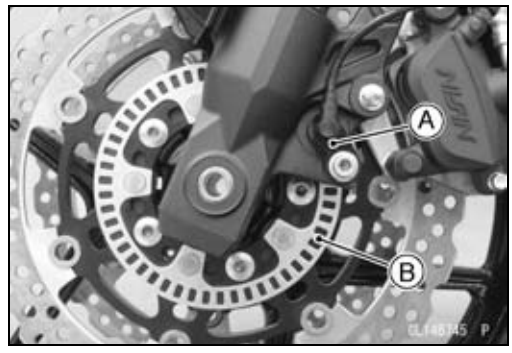
Brake Hose and Pipe Inspection

- Refer to the Brake System Inspection in the Periodic Maintenance chapter.

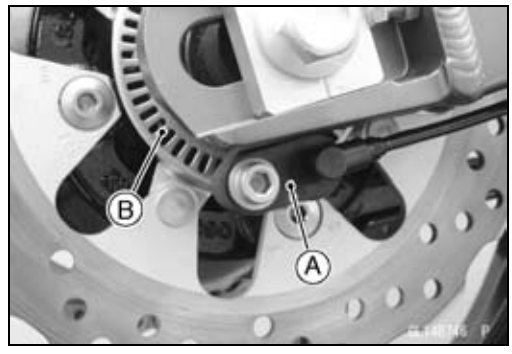
Anti-Lock Brake System (Equipped Models)

Parts Location

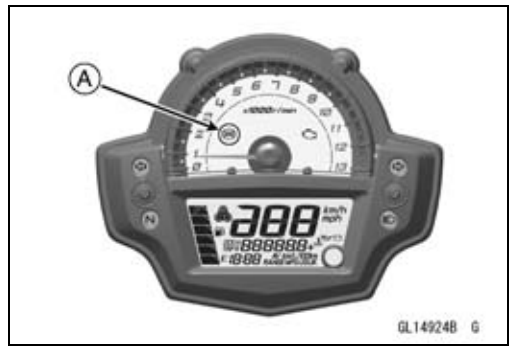
Front Wheel Rotation Sensor [A]
Front Wheel Rotation Sensor Rotor [B]



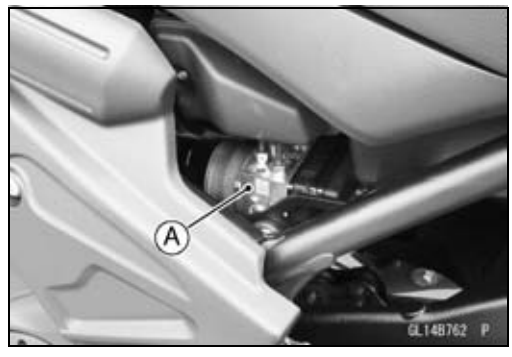
Rear Wheel Rotation Sensor [A]
Rear Wheel Rotation Sensor Rotor [B]



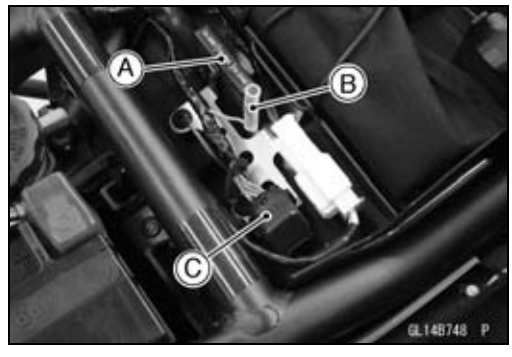
Yellow ABS Indicator Light (LED) [A]



ABS Hydraulic Unit [A]

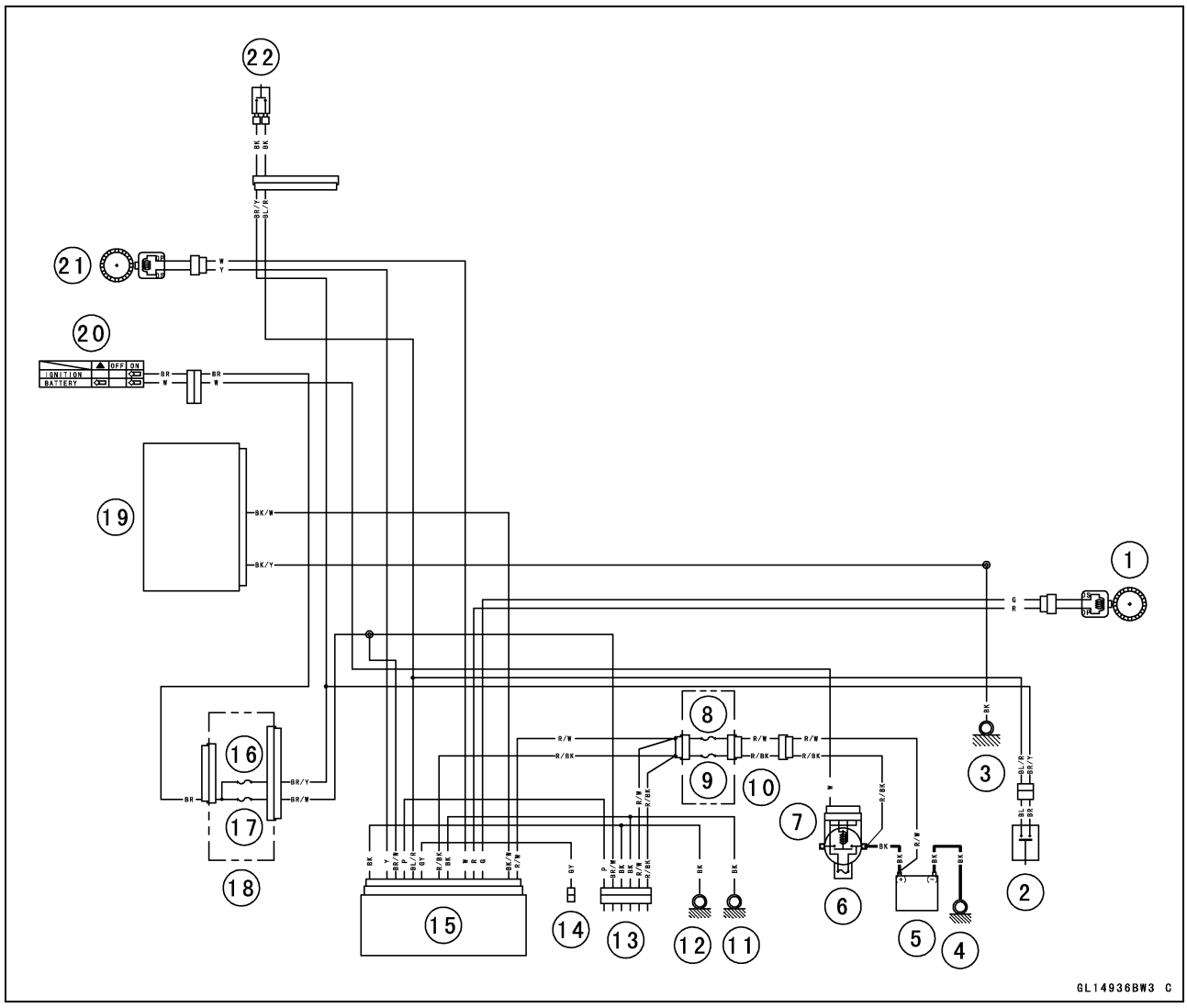


Fuse Box 3 [A]
ABS Self-diagnosis Terminal [B]
ABS Kawasaki Diagnosis System Connector [C]



Anti-Lock Brake System (Equipped Models)

ABS System Wiring Diagram



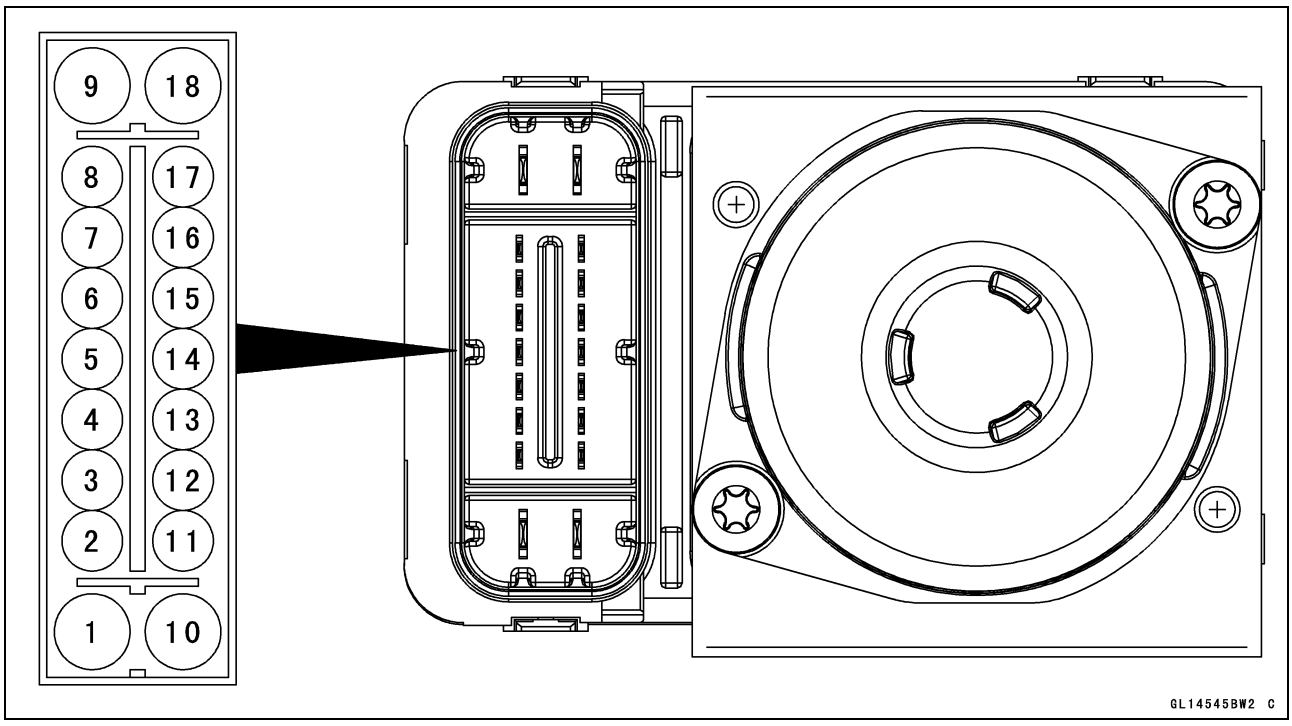
1. Rear Wheel Rotation Sensor
2. Rear Brake Light Switch
3. Frame Ground 5
4. Engine Ground
5. Battery 12 V 10 Ah
6. Main Fuse 30 A
7. Starter Relay
8. ABS Motor Relay Fuse 25 A
9. ABS Solenoid Valve Relay Fuse 15 A
10. Fuse Box 3
11. Frame Ground 4
12. Frame Ground 3
13. ABS Kawasaki Diagnosis System Connector
14. ABS Self-diagnosis Terminal
15. ABS Hydraulic Unit
16. Brake Light/Horn Fuse 10 A
17. Ignition Fuse 10 A
18. Fuse Box 1
19. Meter Unit
20. Ignition Switch
21. Front Wheel Rotation Sensor
22. Front Brake Light Switch

○Color Codes:

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

Anti-Lock Brake System (Equipped Models)

ABS Hydraulic Unit Terminal Names



1. Ground: BK
2. Unused
3. Front Wheel Rotation Sensor Signal Input: Y
4. Power Supply: BR/W
5. ABS Kawasaki Diagnosis System Terminal: P
6. Front and Rear Brake Light Switch Signal: BL/R
7. ABS Self-diagnosis Terminal: GY
8. Unused
9. Power Supply to ABS Solenoid Valve Relay: R/BK
10. Ground for Motor: BK
11. Unused
12. Power Supply to Front Wheel Rotation Sensor: W
13. Power Supply to Rear Wheel Rotation Sensor: R
14. Rear Wheel Rotation Sensor Signal Input: G
15. Unused
16. Unused
17. Yellow ABS Indicator Light (LED): BK/W
18. Power Supply to ABS Motor Relay: R/W

Anti-Lock Brake System (Equipped Models)

ABS Servicing Precautions

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

- This ABS system is designed to be used with a 12 V sealed battery as its power source. Do not use any other battery except for a 12 V sealed battery as a power source.
- Do not reverse the battery cable connections. This will damage the ABS hydraulic unit.
- To prevent damage to the ABS parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Do not turn the ignition switch on while any of the ABS electrical connectors are disconnected. The ABS hydraulic unit memorizes service codes.
- Do not spray water on the electrical parts, ABS parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the ABS system is not influenced by electric wave radiated from the antenna. Locate the antenna as far as possible away from the ABS hydraulic unit.
- Whenever the ABS electrical connections are to be disconnected, first turn off the ignition switch.
- The ABS 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.
- The ABS parts cannot be disassembled. Even if a fault is found, do not try to disassemble and repair the ABS parts, replace it.
- The ABS has many brake lines, pipes, and leads. And the ABS cannot detect problems with the conventional braking system (brake disc wear, unevenly worn brake pad, and other mechanical faults). To prevent trouble, check the brake lines and pipes for correct routing and connection, the wiring for correct routing, and the brakes for proper braking power. Be sure to check for fluid leakage, and bleed the brake line thoroughly.

Anti-Lock Brake System (Equipped Models)

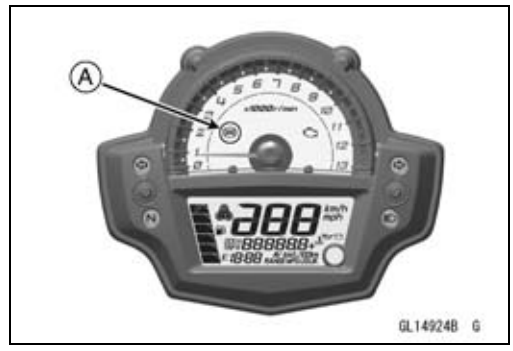
⚠ WARNING

Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If any of the brake line fittings, including the ABS hydraulic unit joint nuts, or the bleed valve is opened at any time, the air must be bled completely from the brake line. If the brake lever has a soft or "spongy" feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.

NOTICE

Do not ride the motorcycle with air in the brake line, or the ABS could malfunction.

○The yellow ABS indicator light (LED) [A] may come on if the tire pressure is incorrect, a non-recommended tire is installed, or the wheel is deformed. If the indicator light comes on, remedy the problem and clear the service code.



⚠ WARNING

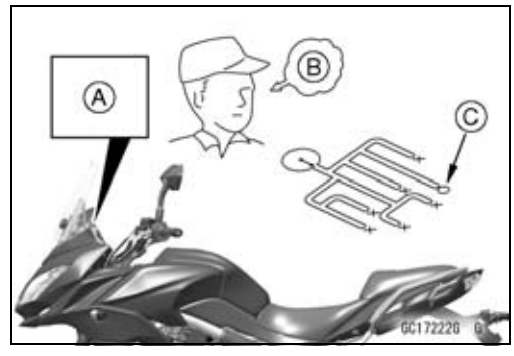
Use of non-recommended tires may cause malfunctioning of ABS and can lead to extended braking distance resulting in an accident causing serious injury or death. Always use recommended standard tires for this motorcycle.

Anti-Lock Brake System (Equipped Models)

- The yellow ABS indicator light (LED) may come on if the engine is run with the motorcycle on its stand and the transmission in gear. If the indicator light comes on, just turn the ignition switch off, then clear service code 42, which indicates a “Faulty front wheel rotation sensor.”
- When the ABS operates, the ABS makes noise and the rider feels the reaction force on the brake lever and brake pedal. This is a normal condition. It informs the rider that the ABS is operating normally.
- Service codes detected once by the ABS hydraulic unit will be memorized in the ABS hydraulic unit. Therefore, after maintenance work is finished, be sure to erase the service codes. Do not erase the service codes during troubleshooting. Wait until all the checks and repair work are finished to prevent duplication of previous service codes and unnecessary maintenance work.
- Before delivering the motorcycle to the customer, be sure to erase any service codes which might be stored in the ABS hydraulic unit. Using the self-diagnosis feature, make sure that the yellow ABS indicator light (LED) function. A fully charged battery is a must for conducting reliable self-diagnosis. Test run the motorcycle at a speed of more than 20 km/h (12 mph) to see that the yellow ABS indicator light (LED) does not come on. Finally, test run the motorcycle at a speed of more than 30 km/h (20 mph) and brake suddenly to see that the motorcycle stops without loss of steering control and the ABS operates normally (The reaction force generated is felt in the brake lever and pedal.). This completes the final inspection.

ABS Troubleshooting Outline

When an abnormality in the system occurs, the yellow ABS indicator light (LED) comes on to alert the rider. In addition, the nature of the fault is stored in the memory of the ABS hydraulic unit and when in the self-diagnosis mode, the service code [A] is indicated by the number of times the yellow ABS indicator light (LED) blinks. The service codes stored in memory are not erased until the mode has been changed to the fault erase mode after the fault has been corrected. Therefore, after correcting the problem, always erase the service codes and then run the self-diagnosis program to confirm normal signal output. When, due to a malfunction, the yellow ABS indicator light (LED) remains on, get a thorough understanding of the background before starting the repair work. Ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C]. Do not rely solely on the ABS self-diagnosis function, use common sense; check the brakes for proper braking power, and brake fluid level, search for leaks, etc.



Anti-Lock Brake System (Equipped Models)

Even when the ABS is operating normally, the yellow ABS indicator light (LED) may come on under the conditions listed below. Turn the ignition switch off to stop the indicator light. If the motorcycle runs without erasing the service code, the indicator light may come on again.

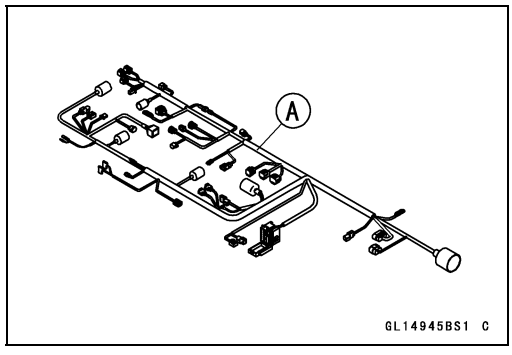
○After continuous riding on a rough road.
○When the engine is started with the stand raised and the transmission engaged, and the rear wheel turns.
○When accelerating so abruptly that the front wheel leaves the ground.
○When the ABS has been subjected to strong electrical interference.
○When tire pressure is abnormal. Adjust tire pressure.
○When a tire different in size from the standard size is being used. Replace with standard size.
○When the wheel is deformed. Replace the wheel.

Much of the ABS troubleshooting work consists of confirming continuity of the wiring. The ABS parts are assembled and adjusted by the manufacturer, so there is no need to disassemble or repair them. Replace the ABS hydraulic unit.

The basic troubleshooting procedures are listed below.

● Carry out pre-diagnosis inspections as a preliminary inspection.
● Determine the fault using the self-diagnosis function.
● Check wiring and connections from the ABS hydraulic unit connector to the suspected faulty ABS part, using a tester.

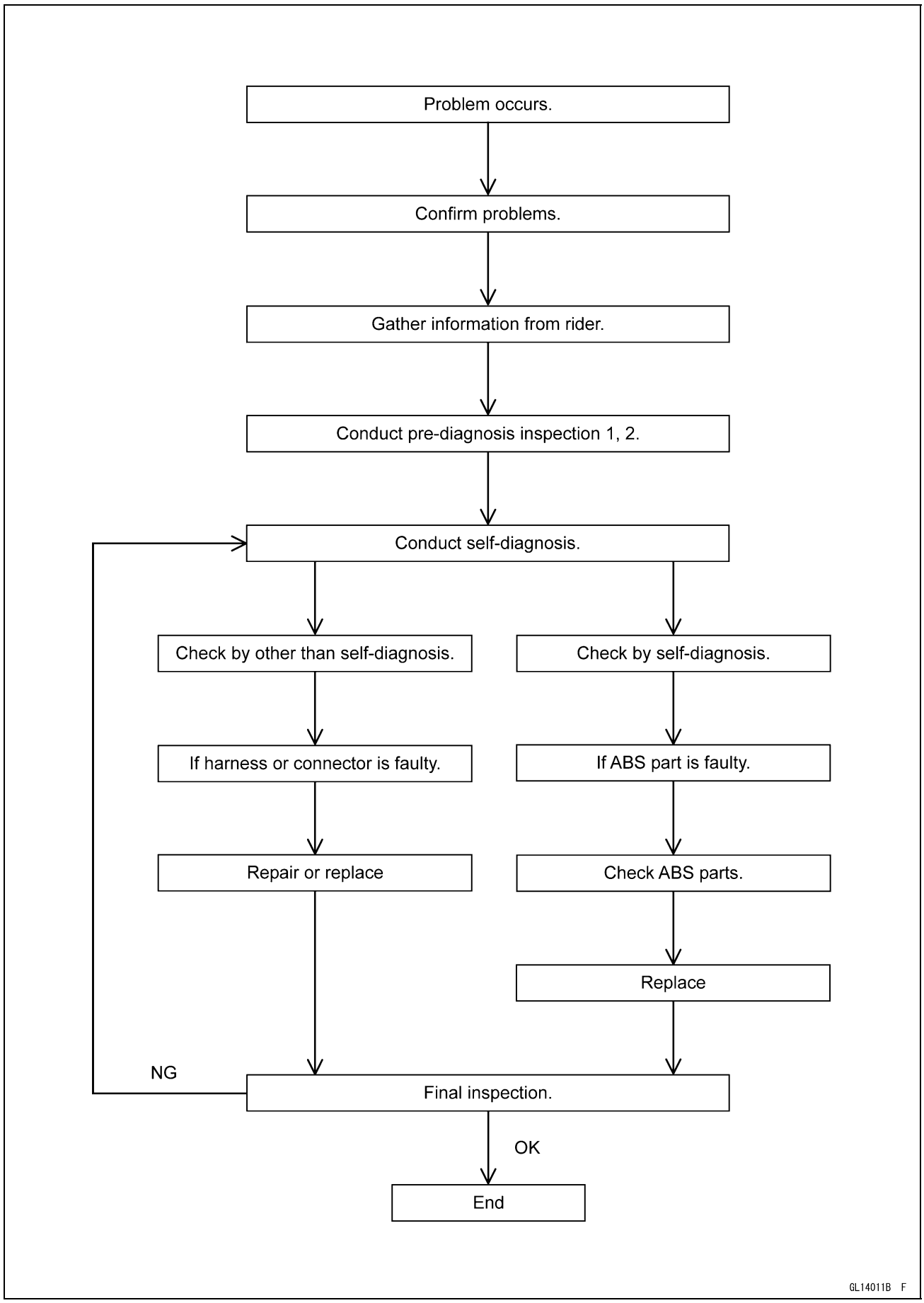
● Visually inspect the wiring for signs of burning or fraying.
★If any wiring is poor, replace the damaged wiring.
● Pull each connector apart and inspect it for corrosion, dirt and damage.
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
● Check the wiring for continuity.
○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
○Connect a tester between the ends of the leads.
★If the tester does not read about 0 Ω, the lead is defective. Replace the main harness [A] if necessary.



● Narrow down suspicious parts and close in on the faulty ABS part by repeating the continuity tests.
★If no abnormality is found in the wiring or connectors, the ABS parts are the next likely suspects. Check each part one by one.
★If an abnormality is found, replace the affected ABS part.

Anti-Lock Brake System (Equipped Models)

ABS Diagnosis Flow Chart



Anti-Lock Brake System (Equipped Models)

Inquiries to Rider

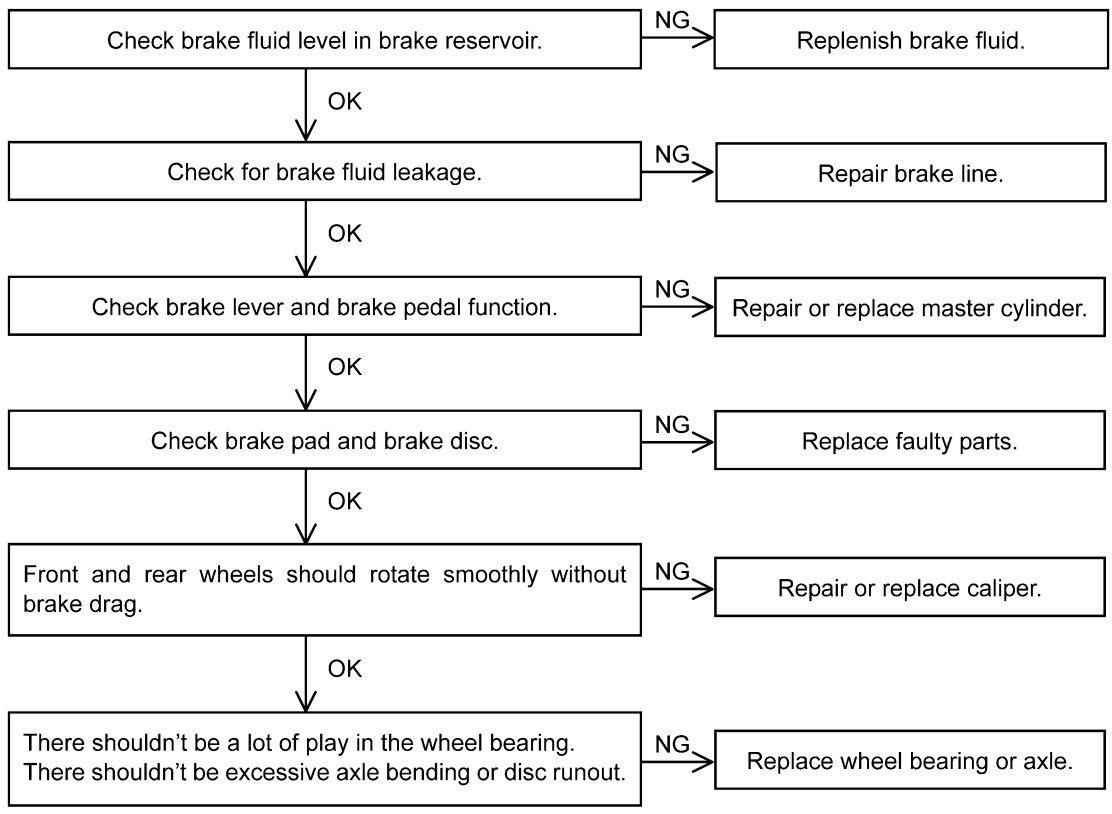
- ○Each rider reacts to problems in different ways, so it is important to confirm what kind of condition the rider is dissatisfied with.
- ○Try to find out exactly what problem occurs under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem in the shop.
- ○The diagnosis sheet will help prevent you from overlooking any keys, so always use it.

Sample Diagnosis Sheet

Rider name:		Registration No. (license plate No.):
Year of initial registration:		Model:
Engine No.:		Frame No.:
Date problem occurred:		Frequency:
Weather:		Mileage:
Phenomenon	☐ Brake lever vibration or noise ☐ Pedal vibration or noise	
	☐ Yellow ABS indicator light (LED) blinks ☐ Yellow ABS indicator light (LED) remains on	
	☐ Braking distance too long	
	☐ Abnormal brake lever movement ☐ Abnormal pedal movement	
	☐ ABS not working	
	☐ ABS works but yellow ABS indicator light (LED) doesn't come on	
	☐ ABS operating too frequently	
Engine conditions at problem	☐ At start-up ☐ After starting ☐ At 5 000 r/min (rpm) or more	
Road conditions	☐ Slippery road (☐ snow, ☐ gravel, ☐ other) ☐ Rough surface ☐ Other	
Driving conditions	☐ High-speed cornering ☐ Driving 10 km/h (6 mph) or above ☐ Driving below 10 km/h (6 mph) ☐ When stopping ☐ When turning	
Brake application	☐ Gradual ☐ Abrupt	
Other conditions	☐ Large brake lever stroke ☐ Large pedal stroke	

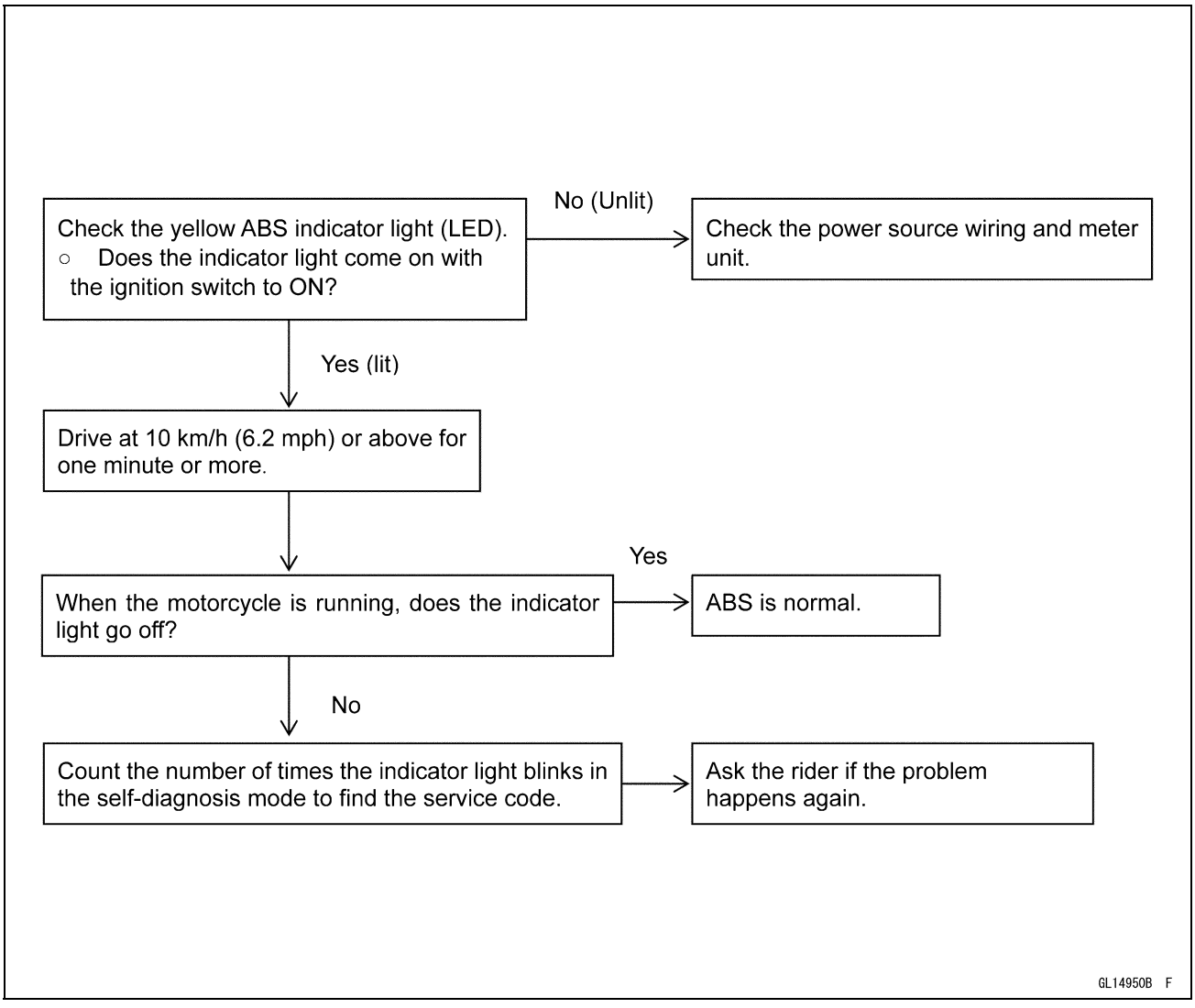
Anti-Lock Brake System (Equipped Models)

Pre-Diagnosis Inspection 1



Anti-Lock Brake System (Equipped Models)

Pre-Diagnosis Inspection 2



Self-diagnosis Outline

When the indicator light has blinked or come on, the ABS hydraulic unit memorizes and stores the service code (16 codes including “Normal Code”) for the service person to troubleshoot easily. The service code memory is powered directly by the battery and cannot be canceled by the ignition switch.

The ABS hydraulic unit can memorize up to six service codes. Further service codes are memorized after erasing the preceding six service codes. If there is no fault, only the start code 12 is shown, indicating that “The ABS is normal.”

Self-diagnosis Procedures

○When a problem occurs with the ABS system, the yellow ABS indicator light (LED) [A] come on.

NOTE

- ○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the indicator light blinks very slowly or doesn’t blink.*
- ○*The motorcycle is stopped.*
- ○*Keep the self-diagnosis terminal grounded during self -diagnosis, with an auxiliary lead.*

Anti-Lock Brake System (Equipped Models)

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Ground the self-diagnosis terminal [A] (Gray) to the battery (–) terminal, using a suitable lead.
- Turn the ignition switch on.

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

Service Code Clearing Procedures

- Start the service code erase mode with the following procedure.

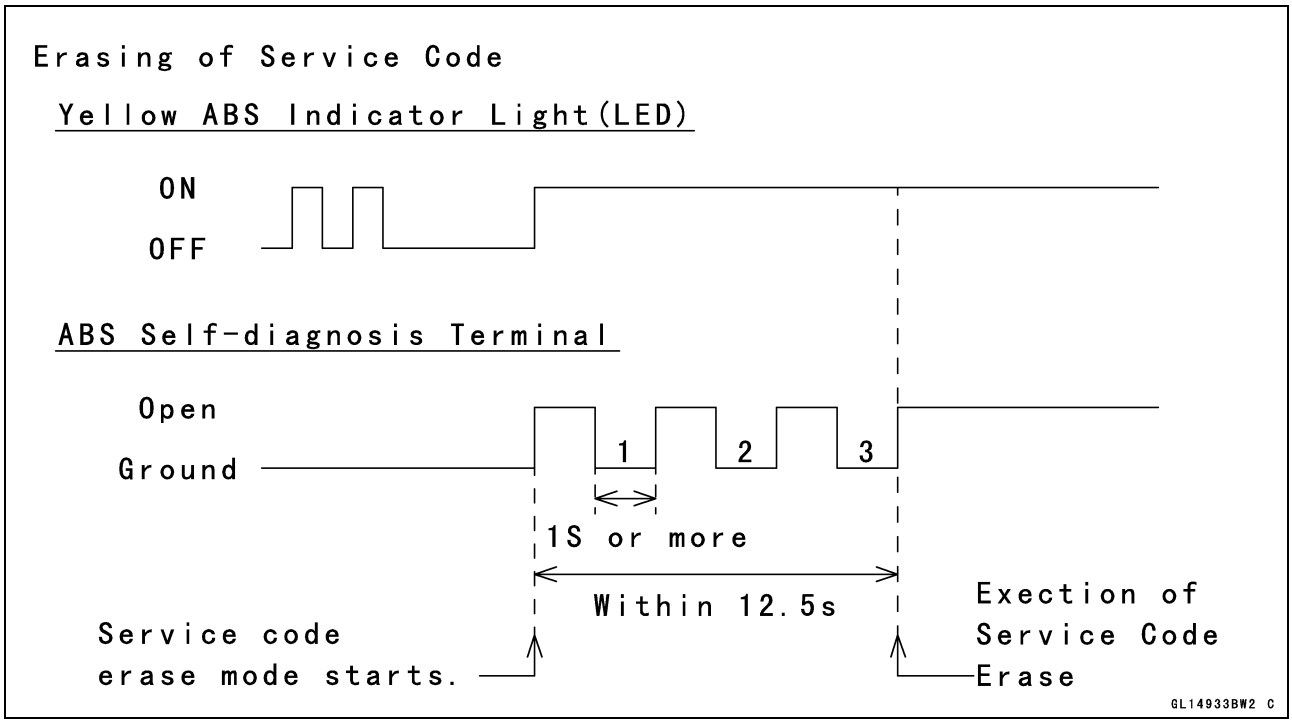
○The erase mode starts when the ABS self-diagnosis terminal is disconnected from the battery (–) terminal after starting the self-diagnosis mode.

○The service code can be erased by grounding and ungrounding (each time for at least one second) the ABS self-diagnosis terminal three times within about 12.5 seconds after starting the erase mode.

○The yellow ABS indicator light (LED) remains on during the erase mode.

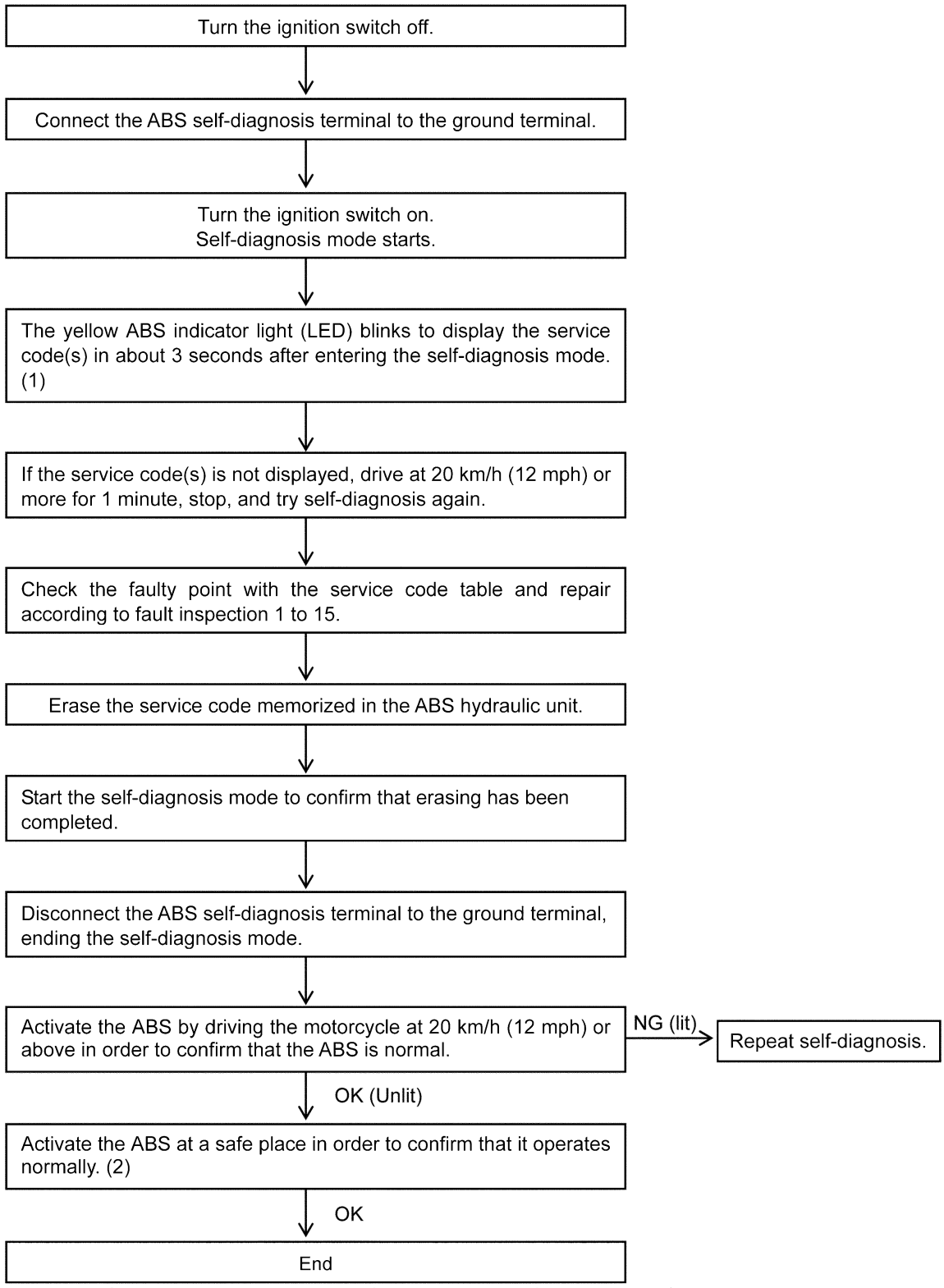
○Once erasing is finished, enter the self-diagnosis mode again to confirm that the service codes have been erased. If the ABS has been reset and all codes have been erased, only start code 12 will be shown.

Anti-Lock Brake System (Equipped Models)



Anti-Lock Brake System (Equipped Models)

Self-diagnosis Flow Chart



(1): The self-diagnosis mode continues for a maximum of 5 minutes, after which time it terminates. Self-diagnosis ends when either disconnect the ABS self-diagnosis terminal to the ground terminal after about 12.5 seconds in the self-diagnosis mode, or after executing the service code erase, or when the motorcycle is driven while in the self-diagnosis mode.

(2): Apply brake suddenly at 30 km/h (19 mph) or more to confirm that the motorcycle stops smoothly and steady with pulsation on the brake lever and pedal.

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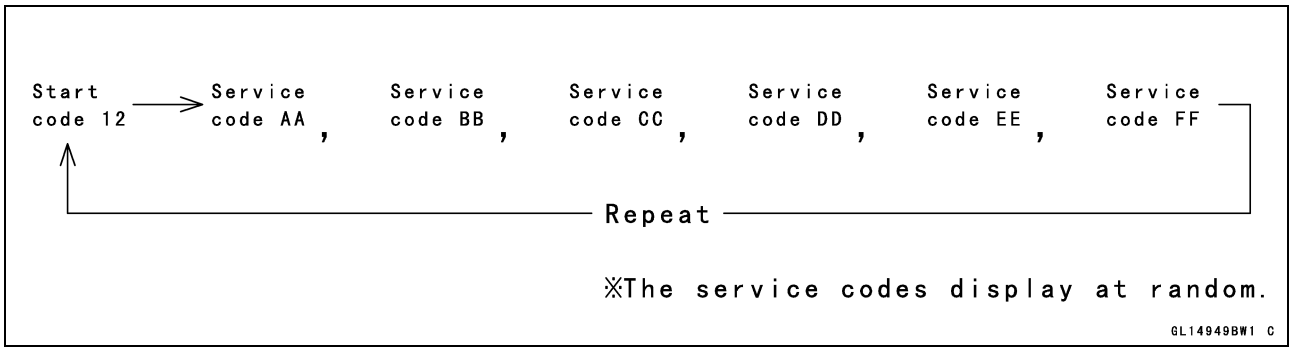
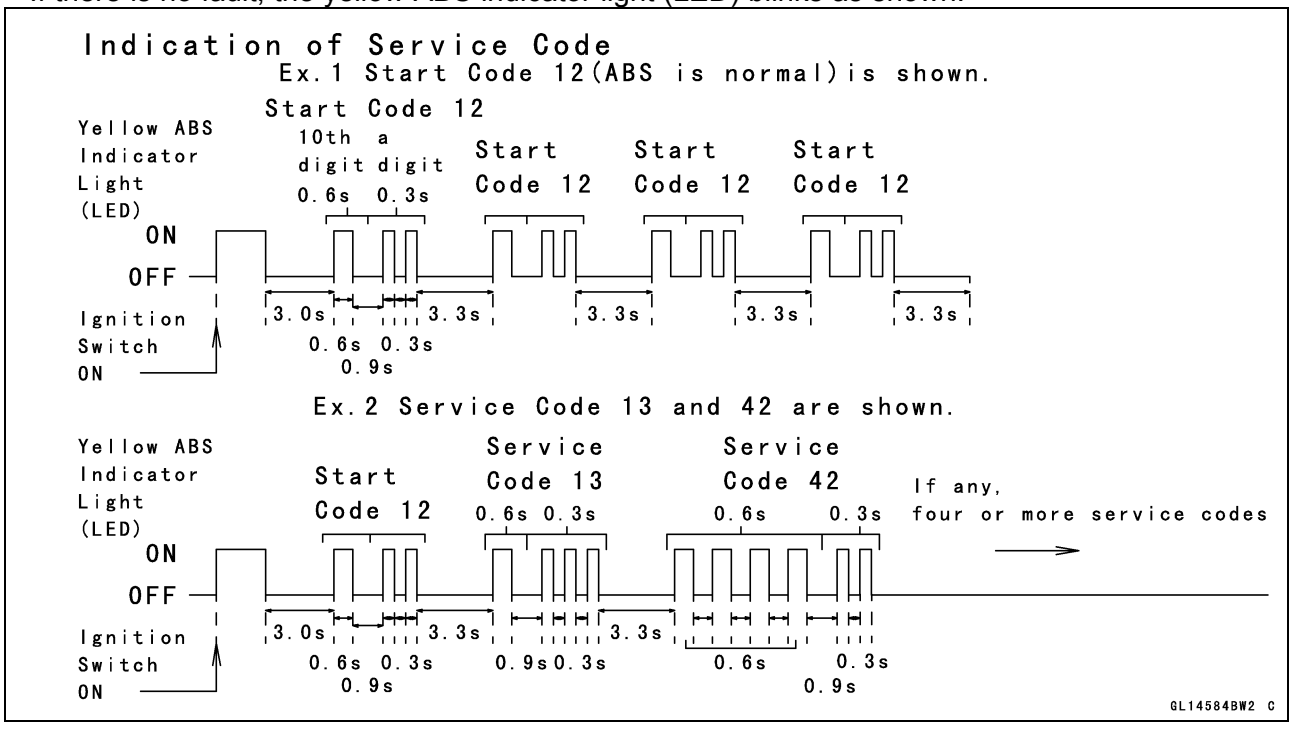
Anti-Lock Brake System (Equipped Models)

How to Read Service Codes

○Service codes are shown by a series of long and short blinks of the ABS indicator light (LED) as shown below.
○Read 10th digit and unit digit as the ABS indicator light (LED) blinks.
○When there are a number of faults, a maximum of six service codes can be stored and the display will begin starting from the largest service code.
○For the display pattern, first, the start code 12 is shown, next up to 6 service codes, then the display is repeated from the start code once again.



○If there is no fault, the yellow ABS indicator light (LED) blinks as shown.

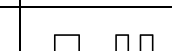
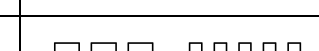
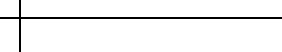
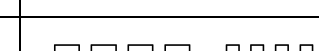
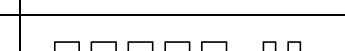
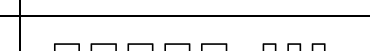
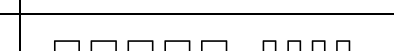


How to Erase Service Codes

○Even if the ignition switch is turned off, the battery or the ABS hydraulic unit are disconnected, all service codes remain in the ABS hydraulic unit.
○Refer to the Service Code Clearing Procedure for the service code erasure.

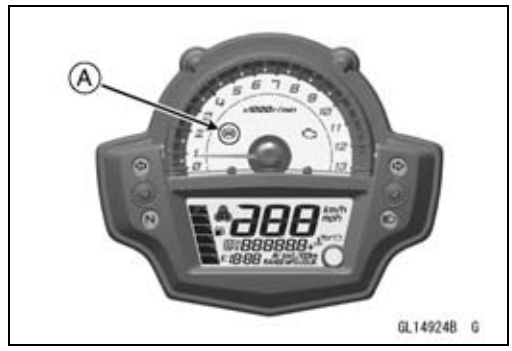
Anti-Lock Brake System (Equipped Models)

Service Code Table

Service Code	Yellow ABS Indicator Light (LED)	Problems	Light State
12		Start code (not fault)	After starts, turn off
13		Rear intake solenoid valve trouble (shorted or open, stuck valve)	ON
14		Rear outlet solenoid valve trouble (shorted or open, stuck valve)	ON
17		Front intake solenoid valve trouble (shorted or open, stuck valve)	ON
18		Front outlet solenoid valve trouble (shorted or open, stuck valve)	ON
19		ABS solenoid valve relay trouble (wiring shorted or open, stuck relay)	ON
25		Front, rear tire abnormal (substandard tire, deformation wheel, sensor rotor teeth number wrong)	ON
35		ABS motor relay trouble (wiring shorted, open or lock, stuck relay)	ON
42		Front wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)	ON
43		Front wheel rotation sensor wiring abnormal (wiring shorted or open)	ON
44		Rear wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)	ON
45		Rear wheel rotation sensor wiring abnormal (wiring shorted or open)	ON
52		Power supply voltage abnormal (low-voltage)	ON
53		Power supply voltage abnormal (over-voltage)	ON
54		ABS solenoid valve relay supply voltage (low voltage)	ON
55		ECU trouble (ECU operation abnormal)	ON

Anti-Lock Brake System (Equipped Models)

Yellow ABS Indicator Light (LED) Inspection

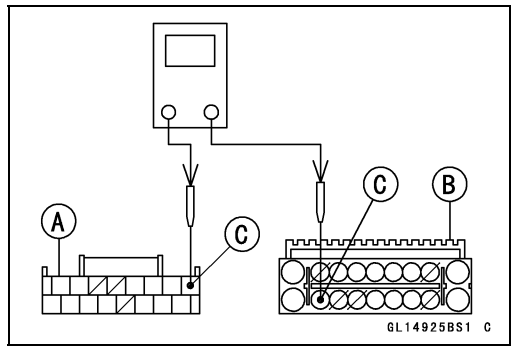


○In this model, the yellow ABS indicator light (LED) [A] goes on or blinks by the control of the ABS hydraulic unit.

● Turn the ignition switch on.

★If the yellow ABS indicator light (LED) comes on, it is normal.

★If the yellow ABS indicator light (LED) does not come on, refer to the Meter Unit Inspection in the Electrical System chapter.



★If the meter is good, check the wiring continuity of the BK/W lead in the main harness.

Special Tool - Needle Adapter Set: 57001-1457

Wiring Continuity Inspection

Meter Connector [A] ←→ ABS Hydraulic Unit Connector [B]

BK/W Lead [C]

★If there is not the continuity in the lead, replace or repair the main harness.

★If there is the continuity in the lead, replace the ABS hydraulic unit.

Solenoid Valve Inspection (Service Code 13, 14, 17, 18)

● Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the solenoid valve in the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

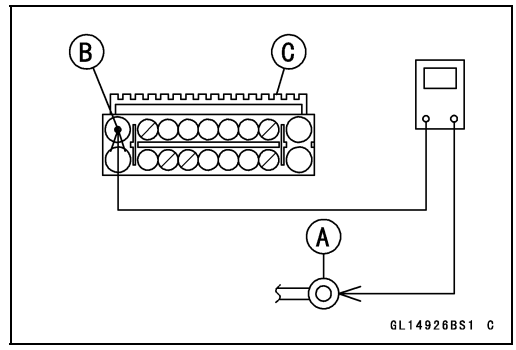
ABS Solenoid Valve Relay Inspection (Service Code 19)

● Remove:
Seat (see Seat Removal in the Frame chapter)

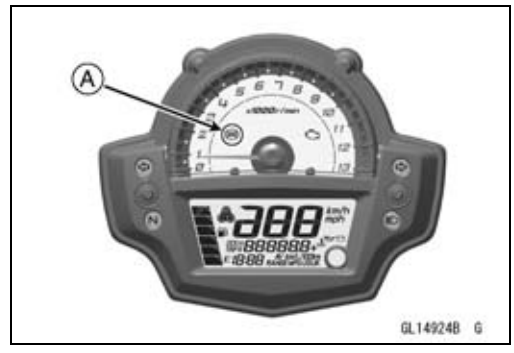
● Check the ABS solenoid valve relay fuse (15 A) [A] (see Fuse Inspection in the Electrical System chapter).

Anti-Lock Brake System (Equipped Models)

★If the fuse is good, check the wiring continuity between the positive (+) terminal [A] of the battery and R/BK lead terminal [B] in the ABS hydraulic unit lead connector [C].
★If there is not the continuity in the lead, replace or repair the main harness.
★If there is the continuity in the lead, go to next step.



● Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.
★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).



Front, Rear Wheel Rotation Difference Abnormal (Service Code 25)

● Check the following and correct the faulty part.
Incorrect Tire Pressure
Tires not recommended for the motorcycle were installed (incorrect tire size).
Deformation of Wheel or Tire
Missing Teeth and Clogging with Foreign Matter of Sensor Rotor (see Wheel Rotation Sensor Inspection)
★If the all parts correct, recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

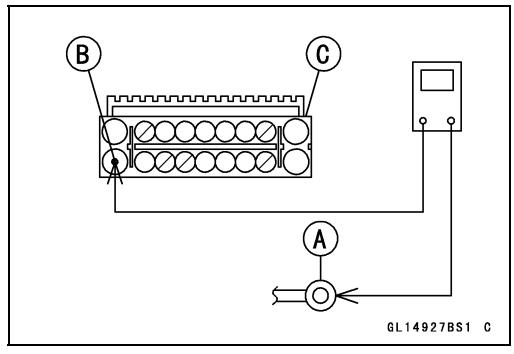
★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

Anti-Lock Brake System (Equipped Models)

ABS Motor Relay Inspection (Service Code 35)

- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Check the ABS motor relay fuse (25 A) [A] (see Fuse Inspection in the Electrical System chapter).

★If the fuse is good, check the wiring continuity between the positive (+) terminal [A] of the battery and R/W lead terminal [B] in the ABS hydraulic unit lead connector [C].
★If there is not the continuity in the lead, replace or repair the main harness.
★If there is the continuity in the lead, go to next step.



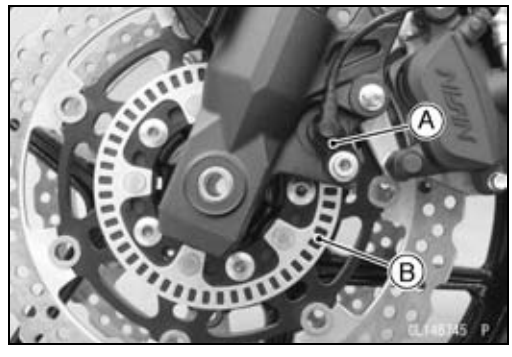
- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

Front Wheel Rotation Sensor Signal Abnormal (Service Code 42)

- Measure the air gap between the front wheel rotation sensor and sensor rotor (see Wheel Rotation Sensor Air Gap Inspection).
- Check the front wheel rotation sensor (see Wheel Rotation Sensor Inspection).

★If both inspections are good, go to next step.



- Check that there is iron or other magnetic deposits between the sensor [A] and sensor rotor [B], and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).

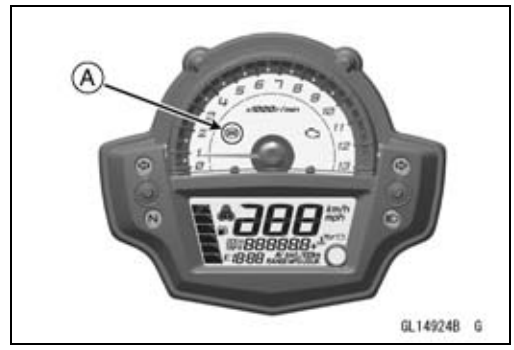
★If the sensor rotor in bad condition, remove the any deposits. Install the proper part or replace faulty part.
★If the all items are good, go to next step.

Anti-Lock Brake System (Equipped Models)

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).



Front Wheel Rotation Sensor Wiring Inspection (Service Code 43)

- Disconnect:
  ABS Hydraulic Unit Connector (see ABS Hydraulic Unit Removal)
  Front Wheel Rotation Sensor Connector (see Front Wheel Rotation Sensor Removal)

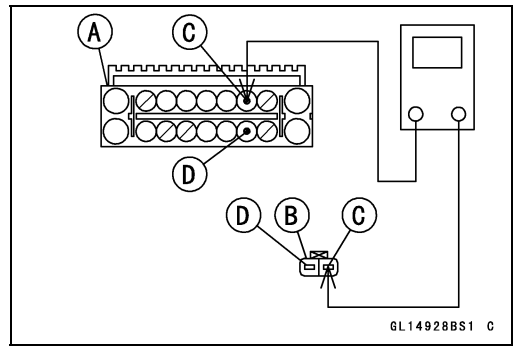
- Check the wiring continuity of the Y lead and W lead.

Wiring Continuity Inspection

ABS Hydraulic Unit Connector [A] ⟷ **Front Wheel Rotation Sensor Connector [B]**

Y Lead Terminal [C]

W Lead Terminal [D]



★If there is not the continuity in the lead, replace or repair the main harness.

★If the wiring is good, go to next step.

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, replace the front wheel rotation sensor (see Front Wheel Rotation Sensor Removal).

★Still, when it is not good, replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

Rear Wheel Rotation Sensor Signal Abnormal (Service Code 44)

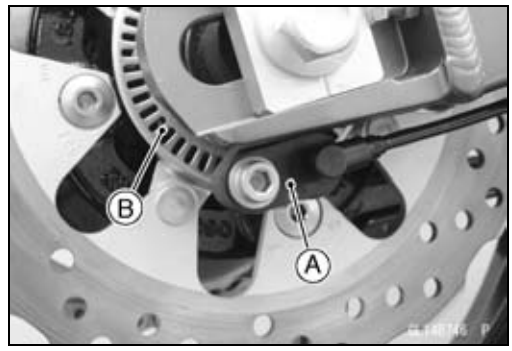
- Measure the air gap between the rear wheel rotation sensor and sensor rotor (see Wheel Rotation Sensor Air Gap Inspection).
- Check the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Inspection).

★If both inspections are good, go to next step.

Anti-Lock Brake System (Equipped Models)

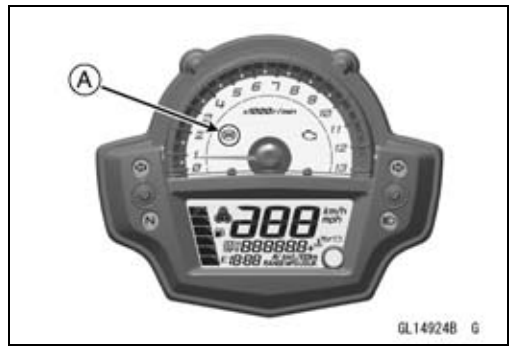
- Check that there is iron or other magnetic deposits between the sensor [A] and sensor rotor [B], and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).

★If the sensor rotor in bad condition, remove the any deposits. Install the proper part or replace faulty part.
★If the all items are good, go to next step.



- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).



Rear Wheel Rotation Sensor Wiring Inspection (Service Code 45)

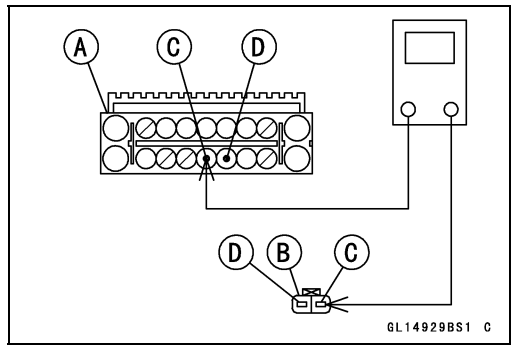
- Disconnect:
  ABS Hydraulic Unit Connector (see ABS Hydraulic Unit Removal)
  Rear Wheel Rotation Sensor Connector (see Rear Wheel Rotation Sensor Removal)

- Check the wiring continuity of the G lead and R lead.

Wiring Continuity Inspection

ABS Hydraulic Unit Connector [A]	←→	**Rear Wheel Rotation Sensor Connector [B]**
G Lead Terminal [C]		
R Lead Terminal [D]		

★If there is not the continuity in the lead, replace or repair the main harness.
★If the wiring is good, go to next step.



- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, replace the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Removal).
★Still, when it is not good, replace the ABS hydraulic unit.
★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

Power Supply Voltage Abnormal [Low-Voltage] (Service Code 52)

- Check the battery condition (see Charging Condition Inspection in the Electrical System chapter).

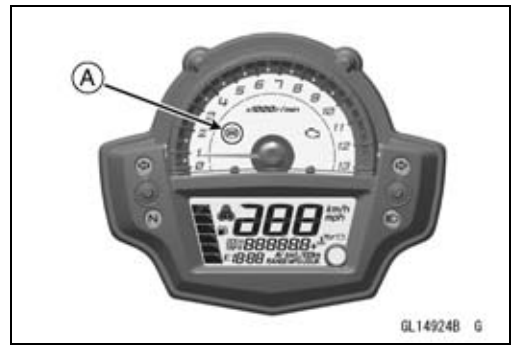
★If the battery is good condition, go to next step.

Anti-Lock Brake System (Equipped Models)

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).



Power Supply Voltage Abnormal [Over-Voltage] (Service Code 53)

- Check the charging voltage (see Charging Voltage Inspection in the Electrical System chapter).

★If the charging voltage is good, go to next step.

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

ABS Solenoid Valve Relay Supply Voltage Inspection [Low-Voltage] (Service Code 54)

- Check the charging voltage (see Charging Voltage Inspection in the Electrical System chapter).

★If the charging voltage is good, go to next step.

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

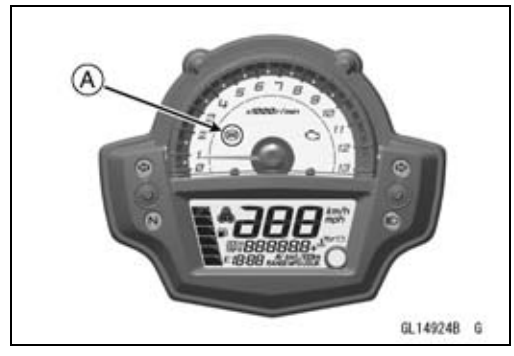
★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).

ECU Inspection (Service Code 55)

- Recheck the service code indication; erase the service code, perform the pre-diagnosis inspection 1 and 2, and retrieve the service code.

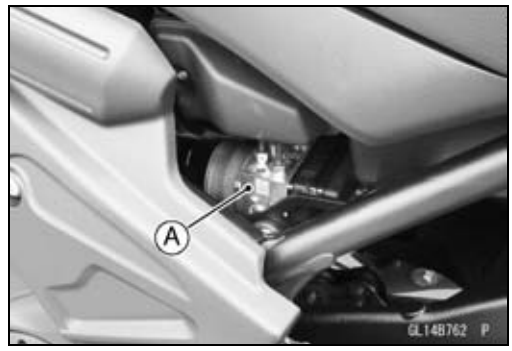
★If the yellow ABS indicator light (LED) [A] comes on, the ABS hydraulic unit has trouble. Replace the ABS hydraulic unit.

★If the yellow ABS indicator light (LED) does not come on, ABS system is normal (service code is not stored; temporary failure.).



Anti-Lock Brake System (Equipped Models)

ABS Hydraulic Unit Removal



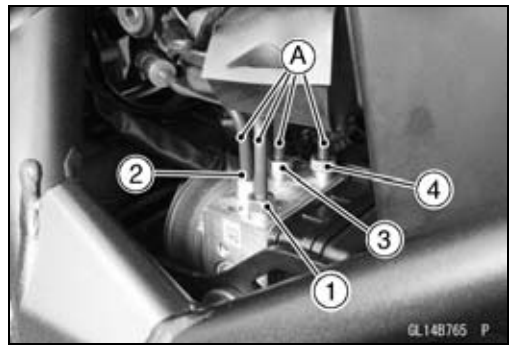
NOTICE
The ABS hydraulic unit [A] has been adjusted and set with precision at the factory. Therefore, it should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface. **Be careful not to get water or mud on the ABS hydraulic unit.**

- Drain the brake fluid from the front and rear brake lines.

○Drain the brake fluid through the bleed valve by pumping the brake lever and pedal.

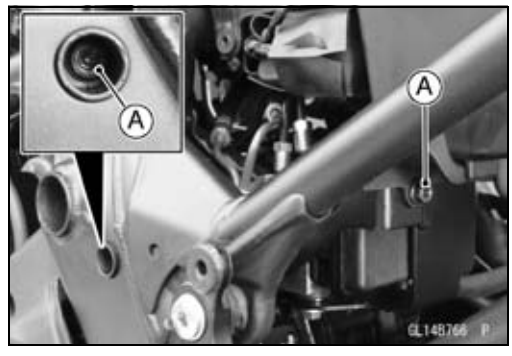
- Remove:
  Left Side Cover (see Side Cover Removal in the Frame chapter)
  Frame Covers (see Frame Cover Removal in the Frame chapter)
  Starter Relay Cover (see Starter Relay Inspection in the Electrical System chapter)
- Clean the ABS hydraulic unit thoroughly.

NOTICE
Clean all fittings on the ABS hydraulic unit and the rear master cylinder because dirt around the banjo bolts could contaminate the brake fluid in the line during removal/installation. **Spread over a shop towel around the ABS hydraulic unit before removing the brake line so that brake fluid does not leak on the parts.**



- Using the flare nut wrench, loosen the brake pipe joint nuts [1 ~ 4] fully and disconnect the brake pipes [A] in sequence numbers.

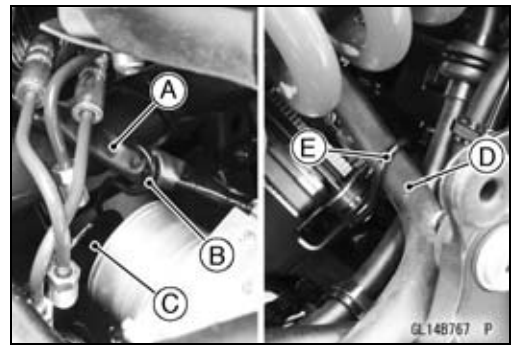
NOTICE
Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.



- Remove the ABS hydraulic unit mounting bolts [A].

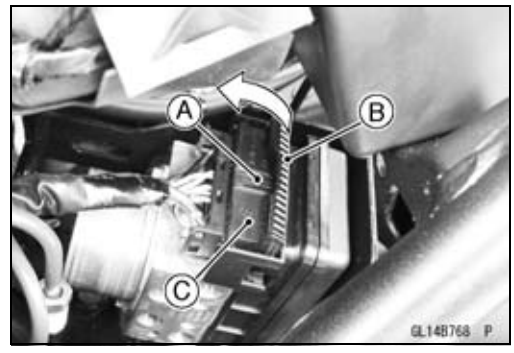
Anti-Lock Brake System (Equipped Models)

- From the left side, free the ABS hydraulic unit harness [A] from the guide [B] of the bracket [C].
- From the right side, free the brake reservoir hose [D] from the guide [E] of the bracket.



- Make sure that the ignition switch has been turned off.

NOTICE
To protect the ABS hydraulic unit from the electrical surge, always disconnect the ABS hydraulic unit connector while the ignition switch is turned off.

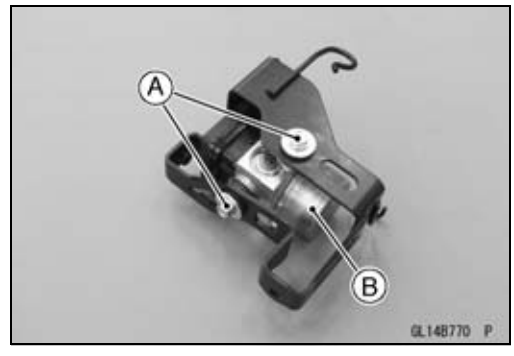


- Push the lock tab [A] and turn the connector lever [B] toward out until it stops. Then turn the connector lever fully to disconnect the ABS hydraulic unit connector [C].

- Remove the ABS hydraulic unit [A] with bracket through the space between the battery case [B] and swingarm [C] as shown.
- Plug the ports on the ABS hydraulic unit to prevent entering a foreign matter into the unit.
- Wrap the brake pipe openings with a vinyl bag to prevent brake fluid leakage and entering a foreign matter into the hydraulic system.

NOTICE
Do not allow entering a foreign matter into the hydraulic system while disconnecting the hydraulic lines.

- Remove:
  Bolts [A]
  ABS Hydraulic Unit [B]



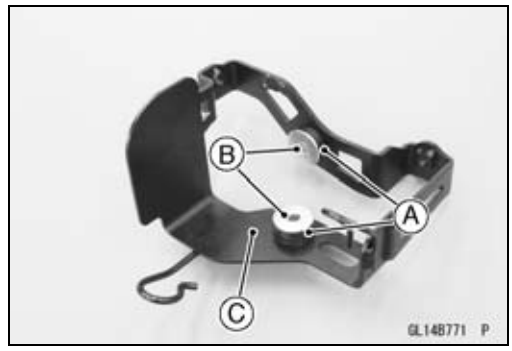
NOTICE
The ABS hydraulic unit has been adjusted and set with precision at the factory. Do not try to disassemble and repair the ABS hydraulic unit.

ABS Hydraulic Unit Installation

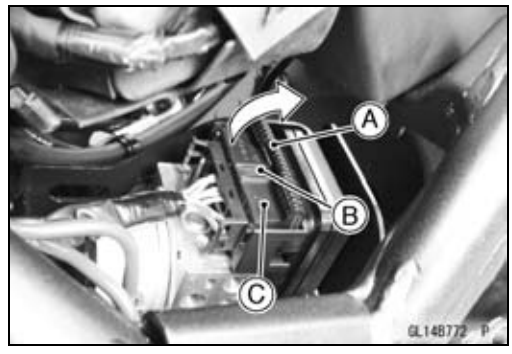
NOTICE
Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.

Anti-Lock Brake System (Equipped Models)

- Installation is the reverse of removal.
- Be sure to install the dampers [A] and flanged collars [B] on the bracket [C].

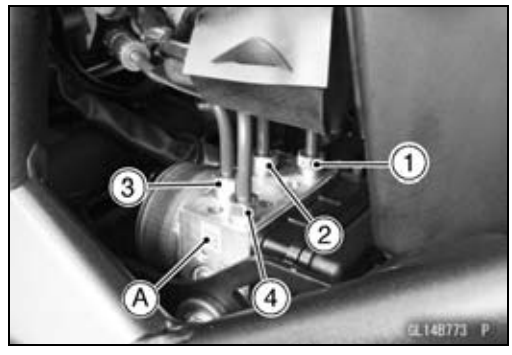


- Push the lever [A] forward until locked by the lock tab [B] to connect the ABS hydraulic unit connector [C].
- Install the ABS hydraulic unit to the frame.
- Run the brake pipes and harness correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



- Connect the brake pipes to the ABS hydraulic unit [A] and tighten the brake pipe joint nuts with the following order.
  To Rear Caliper [1]
  To Rear Master Cylinder [2]
  To Front Master Cylinder [3]
  To Front Calipers [4]

Torque - Brake Pipe Joint Nuts: 18 N·m (1.8 kgf·m, 13 ft·lb)



- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

ABS Hydraulic Unit Inspection

- Remove the ABS hydraulic unit (see ABS Hydraulic Unit Removal).
- Visually inspect the ABS hydraulic unit.

★Replace the ABS hydraulic unit if any of them are cracked, or otherwise damaged.

- Visually inspect the connector terminals [A].

★Replace the ABS hydraulic unit or main harness if either of the terminals are cracked, bent, or otherwise damaged.

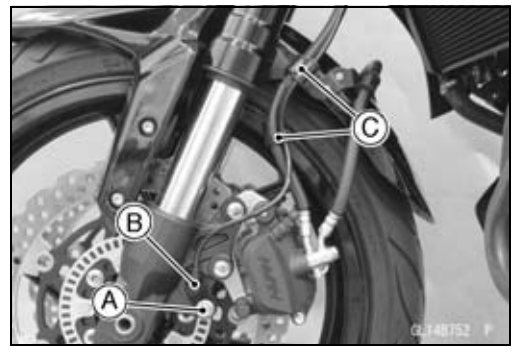
★If the ABS hydraulic unit connector is clogged with mud or dust, blow it off with compressed air.

Anti-Lock Brake System (Equipped Models)

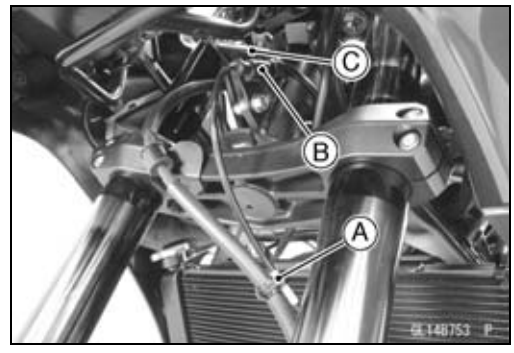
Front Wheel Rotation Sensor Removal

NOTICE
The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor. **Do not try to disassemble or repair the wheel rotation sensor.**

- Remove:
  Bolt [A]
  Front Wheel Rotation Sensor [B]
- Clear the sensor lead from the clamps [C].



- Clear the sensor lead from the clamp [A].
- Remove the front wheel rotation sensor connector [B] from the bracket [C].
- Disconnect the front wheel rotation sensor lead connector.



Front Wheel Rotation Sensor Installation

- Installation is the reverse of removal.

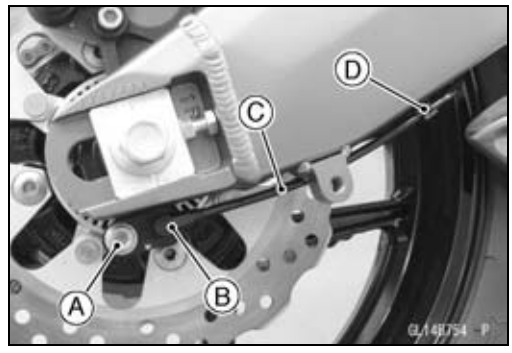
○Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Rear Wheel Rotation Sensor Removal

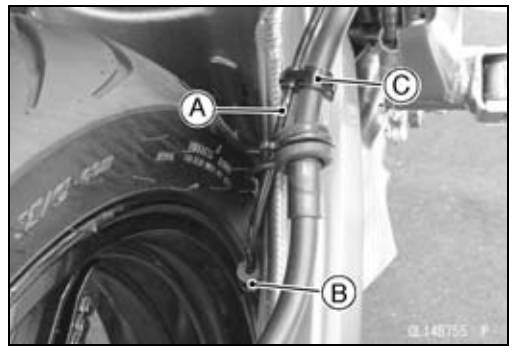
NOTICE
The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor. **Do not try to disassemble or repair the wheel rotation sensor.**

Anti-Lock Brake System (Equipped Models)

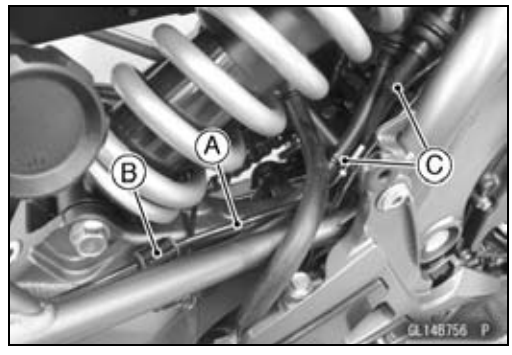
- Remove:
  Bolt [A]
  Rear Wheel Rotation Sensor [B]
- Free the sensor lead [C] from the clamp [D].



- Free the sensor lead [A] from the clamps [B] [C].



- Remove:
  Right Frame Cover (see Frame Cover Removal in the Frame chapter).
- Free the sensor lead [A] from the clamps [B] [C].



- Pull the rear wheel rotation sensor lead connector [A] forward and disconnect it.
- Remove the rear wheel rotation sensor from the frame.

Rear Wheel Rotation Sensor Installation

- Installation is the reverse of removal.

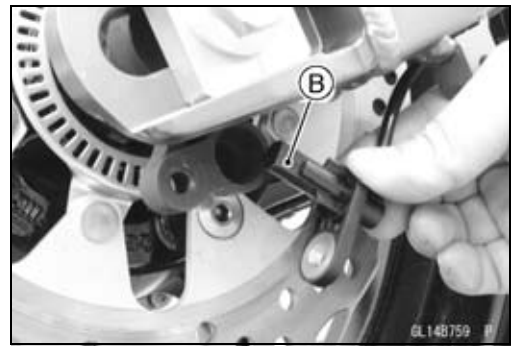
○Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Anti-Lock Brake System (Equipped Models)

Wheel Rotation Sensor Inspection

- Remove the front wheel rotation sensor [A] from the front fork.
- Remove the rear wheel rotation sensor [B] from the caliper bracket.
- Visually inspect the wheel rotation sensors.

★Replace the wheel rotation sensor if it is cracked, bent, or otherwise damaged.



Wheel Rotation Sensor Air Gap Inspection

- Raise the front/rear wheel off the ground (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Measure the air gap between the sensor and sensor rotor at several points by turning the wheel slowly.
  Thickness Gauge [A]

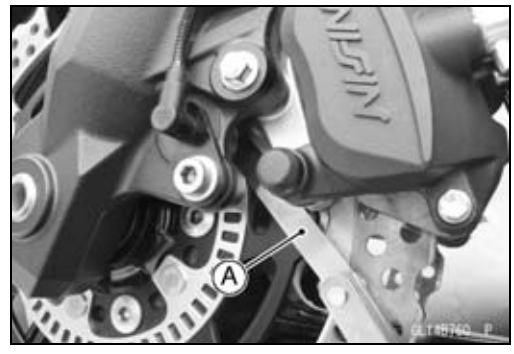
Air Gap
Standard:

Front	**0.3 ~ 1.7 mm (0.01 ~ 0.07 in.)**
Rear	**0.3 ~ 1.7 mm (0.01 ~ 0.07 in.)**

NOTE

○*The sensor air gap cannot be adjusted.*

★If the air gap is not within the specification, inspect the hub bearing (see Hub Bearing Inspection in the Wheels/Tires chapter), sensor installation condition and sensor (see Wheel Rotation Sensor Inspection).



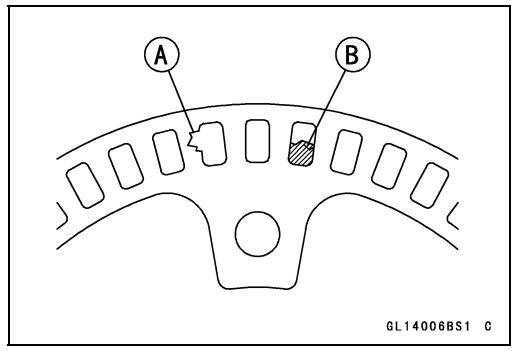
Anti-Lock Brake System (Equipped Models)

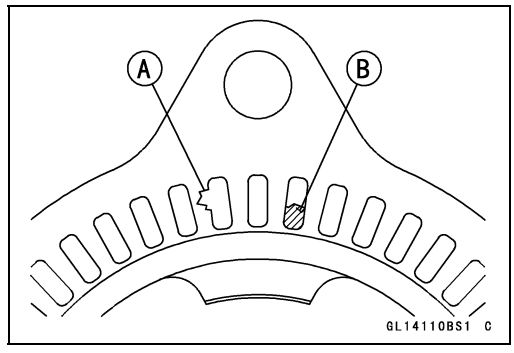
Wheel Rotation Sensor Rotor Inspection

- Remove the front/rear brake discs (see Brake Disc Removal).
- Visually inspect the wheel rotation sensor rotor.

★If the rotor is deformed or damaged (chipped teeth [A]), replace the sensor rotor with a new one.

★If there is iron or other magnetic deposits [B], remove the deposits.





ABS Solenoid Valve Relay Fuse (15 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

ABS Motor Relay Fuse (25 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

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 (see Fuse Installation in the Electrical System chapter).

Fuse Inspection

- Remove the fuses (see ABS Solenoid Valve Relay Fuse (15 A)/ABS Motor Relay Fuse (25 A) Removal).
- Refer to the Fuse Inspection in the Electrical System chapter.

Suspension

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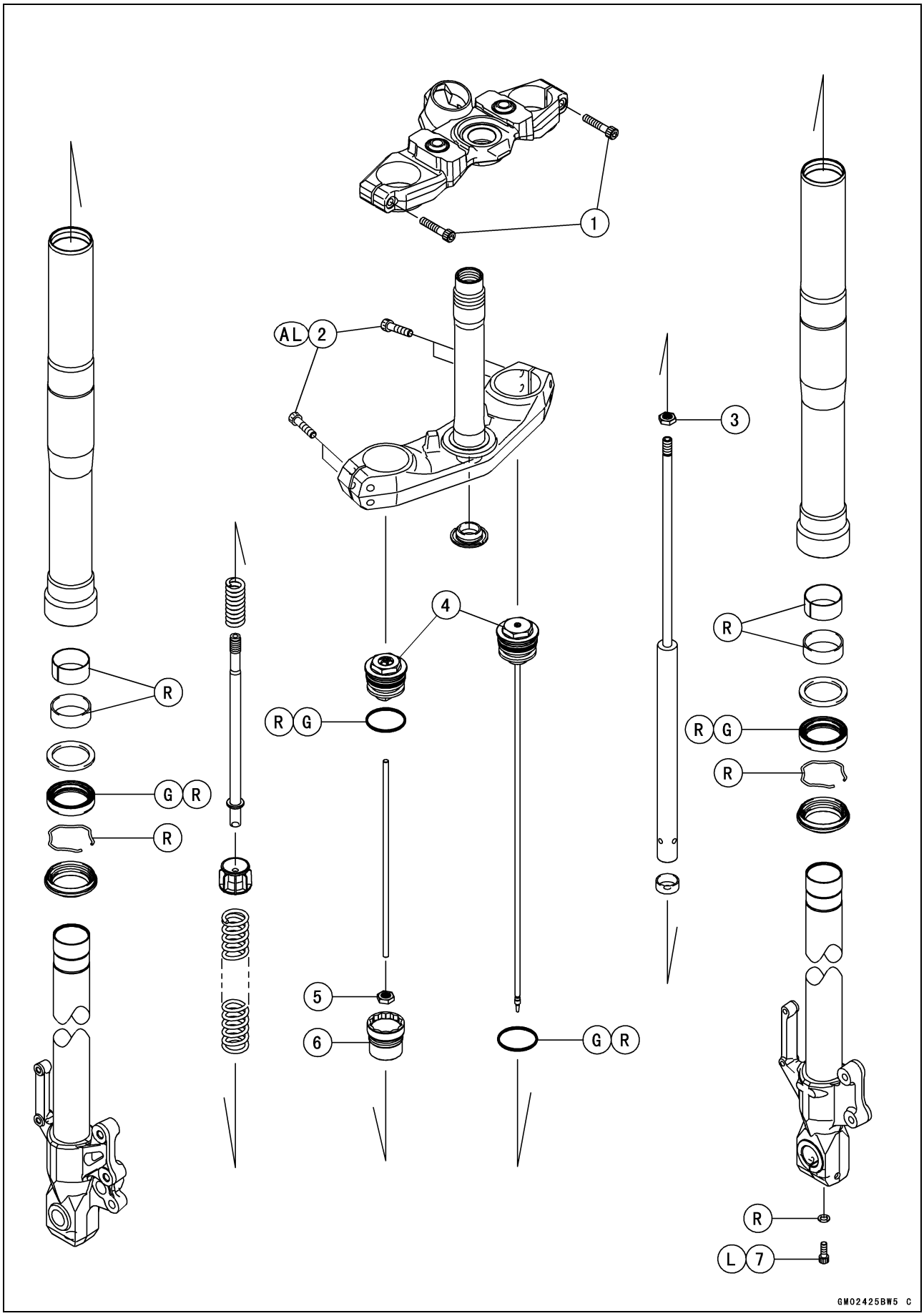
Exploded View

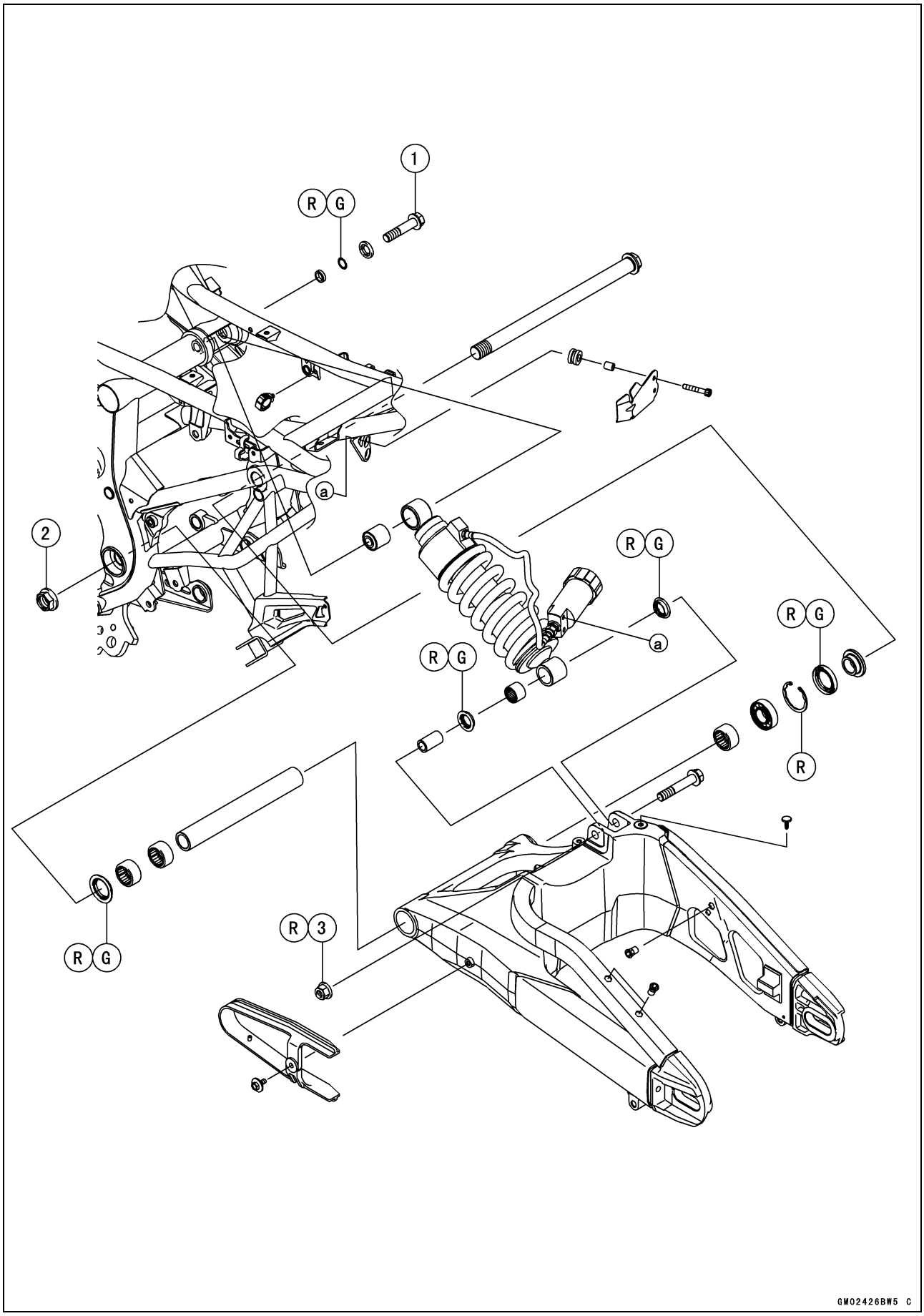


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Upper Front Fork Clamp Bolts	20	2.0	15	
2	Lower Front Fork Clamp Bolts	29	3.0	21	AL
3	Daming Adjuster Guide Rod Nut	19.5	1.99	14.4	
4	Front Fork Top Plugs	35	3.6	26	
5	Preload Adjuster Guide Rod Nut	27.5	28.0	20.3	
6	Rod Guide Case	90	9.2	66	
7	Front Fork Bottom Allen Bolt	20	2.0	15	L

AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
L: Apply a non-permanent locking agent.
G: Apply grease.
R: Replacement Parts

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Upper Rear Shock Absorber Bolt	59	6.0	44	
2	Swingarm Pivot Shaft Nut	108	11.0	79.7	
3	Lower Rear Shock Absorber Nut	59	6.0	44	R

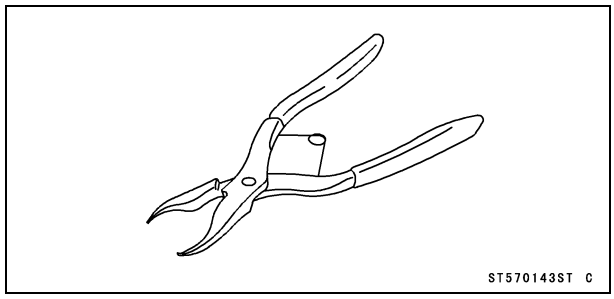
G: Apply grease.
R: Replacement Parts

Specifications

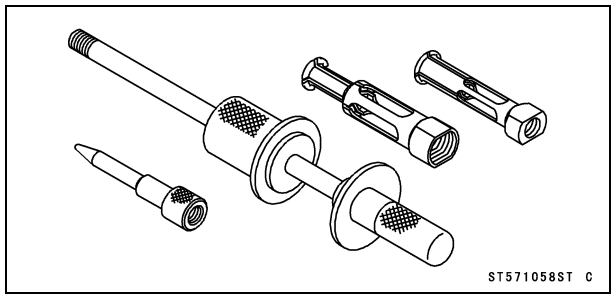
Item	Standard
Front Fork (Per One Unit)	
Fork Inner Tube Diameter	ϕ41 mm (1.6 in.)
Air Pressure	Atmospheric pressure (Non-adjustable)
Rebound Damper Setting	2 1/2 turns out from the fully clockwise position
	(Usable Range: 0 ←→ 3 turns out)
Fork Spring Preload Setting	6 1/2 turns in from the fully counterclockwise position
	(Usable Range: 0 ←→ 20 turns in)
Suspension Oil	Kawasaki SS-8 or equivalent
Amount:	
Right Front Fork	Approx. 475 mL (16.1 US oz.) (when changing oil)
	560 ±2.5 mL (18.9 ±0.08 US oz.) (after disassembly and completely dry)
Left Front Fork	Approx. 400 mL (13.5 US oz.) (when changing oil)
	473 ±2.5 mL (16.0 ±0.08 US oz.) (after disassembly and completely dry)
Oil Level:	
Right Front Fork	43 ±2 mm (1.7 ±0.08 in.) (fully compressed, below from the top of outer tube)
Left Front Fork	63 ±2 mm (2.5 ±0.08 in.) (fully compressed, below from the top of outer tube)
Fork Spring Free Length	429.3 mm (16.90 in.) (Service Limit: 421 mm (16.6 in.))
Rear Shock Absorber	
Spring Preload Setting	1 click from the fully counterclockwise position
	(Usable Range: 0 ←→ 24 clicks)
Gas Pressure	1 600 kPa (16.32 kgf/cm², 232 psi, Non-adjustable)

Special Tools

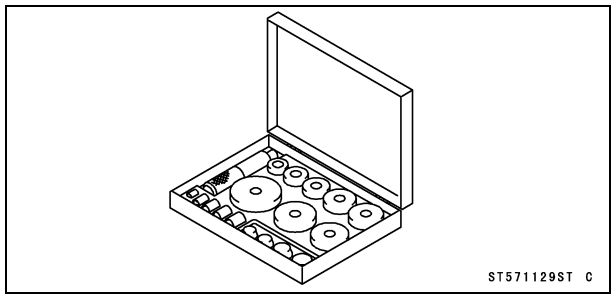
Inside Circlip Pliers:
57001-143



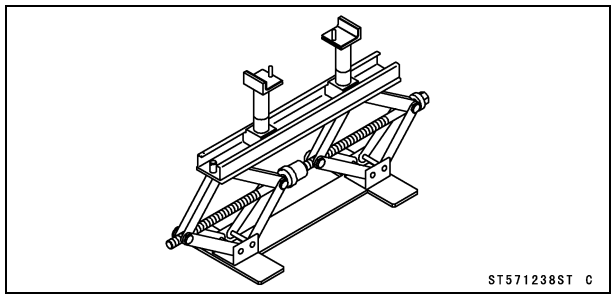
Oil Seal & Bearing Remover:
57001-1058



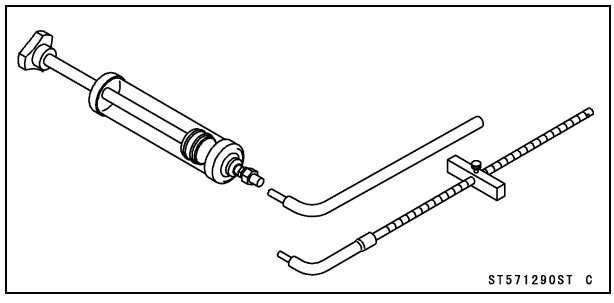
Bearing Driver Set:
57001-1129



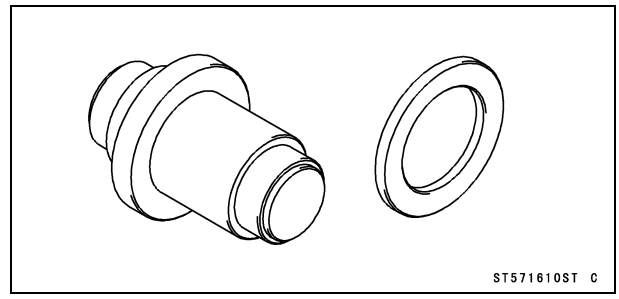
Jack:
57001-1238



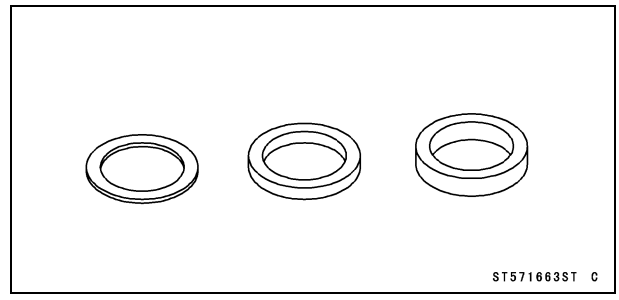
Fork Oil Level Gauge:
57001-1290



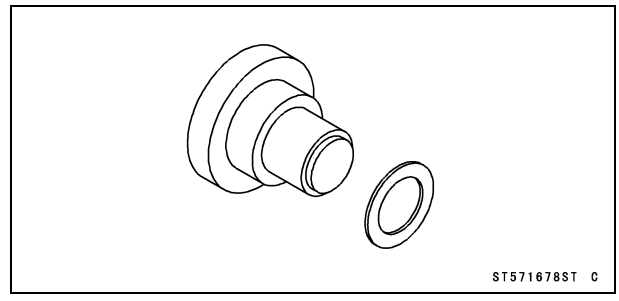
Needle Bearing Driver, ϕ28:
57001-1610



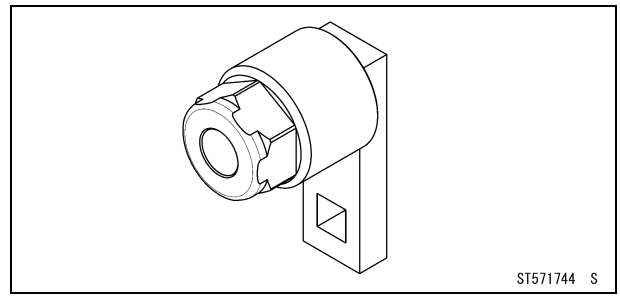
Spacerϕ28:
57001-1663



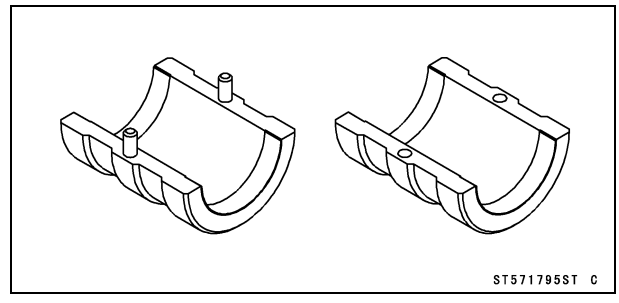
Needle Bearing Driver, ϕ20 & Spacer, ϕ28:
57001-1678



Rod Guide Case Wrench, 33 mm:
57001-1744

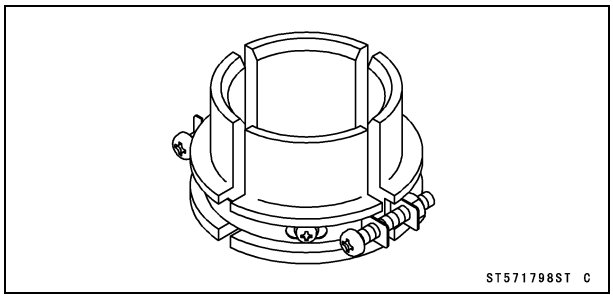


Fork Oil Seal Driver Weight, ϕ26 ~ϕ46:
57001-1795



Special Tools

Fork Oil Seal Driver Attachment, ϕ36 ~ϕ46:
57001-1798



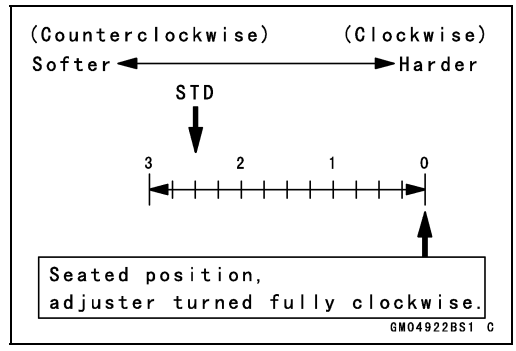
Front Fork

Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the rebound damping force adjuster [A] on the right fork leg.

○The standard adjuster setting is the **2 1/2 turns out** from the fully clockwise position.

○The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.



Rebound Damping Force Adjustment

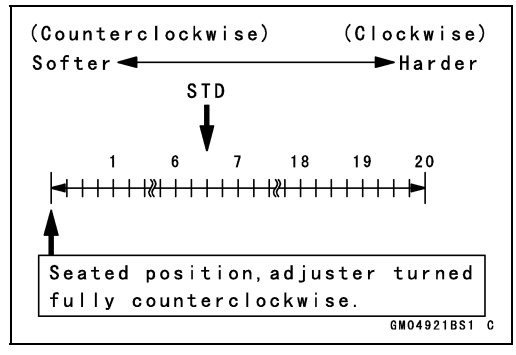
Adjuster Position	Damping Force	Setting	Load	Road	Speed
3 turns out	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High

Spring Preload Adjustment

- To adjust the spring preload, turn the spring preload adjuster [A] on the left fork leg.

○The standard adjuster setting is the **6 1/2 turns in** from the fully counterclockwise position.

○The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

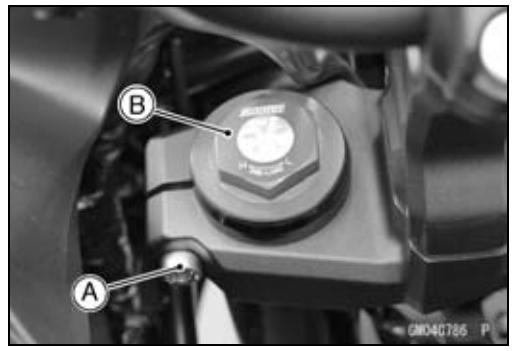


Spring Action

Adjuster Position	Damping Force	Setting	Load	Road	Speed
0	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
20 turns in	Strong	Hard	Heavy	Bad	High

Front Fork

Front Fork Removal (Each Fork Leg)



- Remove:
  Front Fender (see Front Fender Removal in the Frame chapter)
  Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)

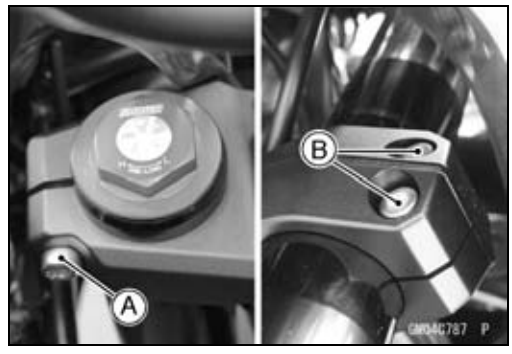
★If the fork leg is to be disassembled, record each adjuster positions before disassembly to return the front suspension to the current setting.

★Turn the spring preload adjuster into the softest position if the left fork to be disassembled.

★Loosen the upper front fork clamp bolt [A] and top plug [B] beforehand if the fork leg is to be disassembled.

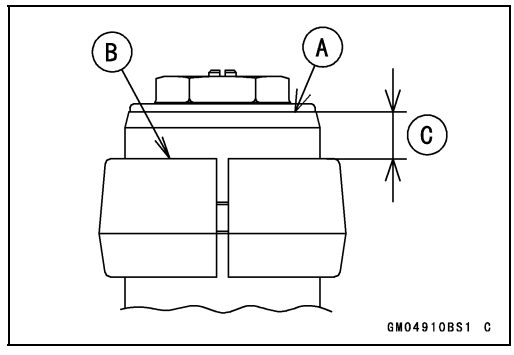
NOTE

○*Loosen the top plug after loosening the upper front fork clamp bolts.*



- Loosen the upper front fork clamp bolt [A] and lower front fork clamp bolts [B].
- With a twisting motion, work the fork leg down and out.

Front Fork Installation (Each Fork Leg)



- Install the fork so that the distance between the top end [A] of the outer tube and upper surface [B] of the steering stem head is the 12 mm (0.47 in.) [C].
- Tighten the lower front fork clamp bolts and fork top plug.

Torque - Lower Front Fork Clamp Bolts: 29 N·m (3.0 kgf·m, 21 ft·lb)
Front Fork Top Plug: 35 N·m (3.6 kgf·m, 26 ft·lb)

NOTE

○*Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.*

○*Tighten the top plug before tightening the upper front fork clamp bolts.*

- Tighten the upper front fork clamp bolt.

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

- Install the removed parts (see appropriate chapters).
- Adjust:
  Spring Preload (see Spring Preload Adjustment)
  Rebound Damping Force (see Rebound Damping Force Adjustment)

Front Fork

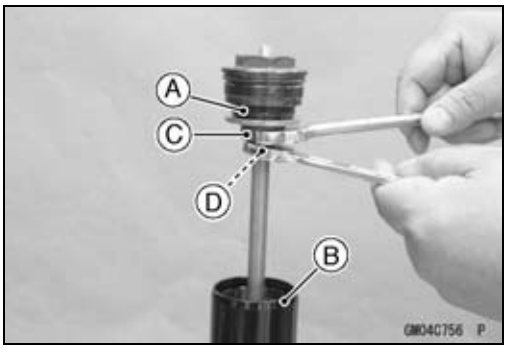
Front Fork Oil Change

Right Front Fork

- Remove the front fork (see Front Fork Removal (Each Fork Leg)).
- Hold the inner tube bottom end [A] in a vise using soft jaws.

NOTICE
To prevent the components from breaks or distortion, do not hold the front fork at the hollow portions.

- Unscrew the top plug [A] out of the outer tube [B] and lower the outer tube.
- Holding the bottom portion [C] on the top plug with a wrench, loosen the damping adjuster guide rod nut [D].



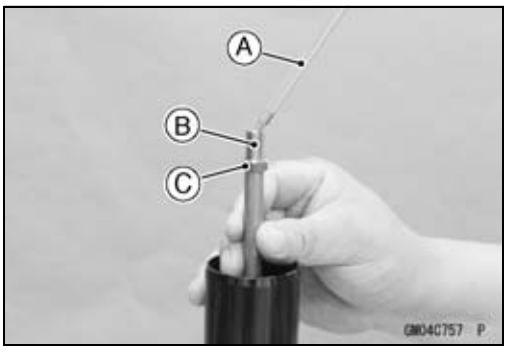
- Remove the top plug together with the damping adjuster rod [A] from the damping adjuster guide rod [B].

NOTE

○*Take care not to bend the damping adjuster rod.*

○*Do not try to remove the rebound damping adjuster rod from the top plug.*

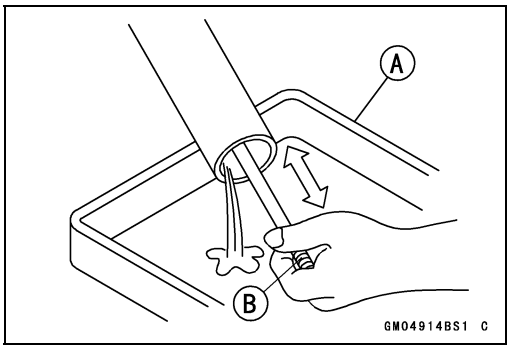
- Remove the damping adjuster guide rod nut [C].



- Drain the fork oil into a suitable container [A].

○Pump the damping adjuster guide rod [B] in and out at least 10 times to expel the oil from the fork.

○Leave the front fork with upside down on the container for more than 30 minutes to allow dripping the residual fork oil.



- Hold the fork tube upright, compress the outer tube fully.
- Pour in the type and amount of fork oil specified.

Suspension Oil - SS-8 (1 L): 44091-0007

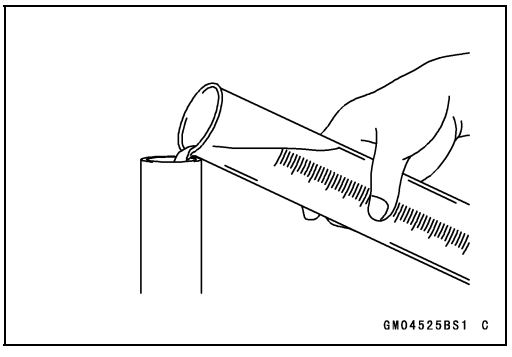
Amount:

When changing oil:

Approx. 475 mL (16.1 US oz.)

After disassembly and completely dry:

560 ±2.5 mL (18.9 ±0.08 US oz.)



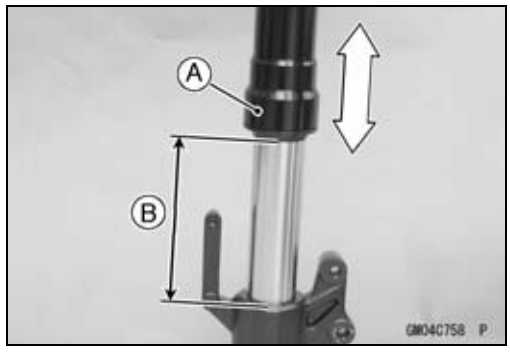
Front Fork

● Pump the outer tube [A] slowly until no air bubbles can be seen in the fork oil.

NOTE

○*Slide the outer tube within about 150 mm (5.9 in.) of the standard stroke [B].*

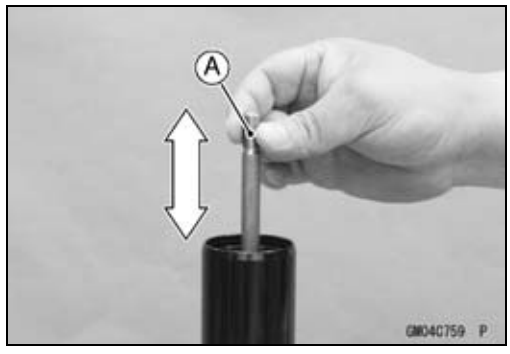
○*If slide the outer tube exceeding the standard stroke, the hole on the inner tube is exposed out from the oil seal. It causes spilling out the fork oil through the hole on the inner tube.*



● Move the damping adjuster guide rod [A] up and down more than 10 times to bleed the air from the fork oil in the guide rod.

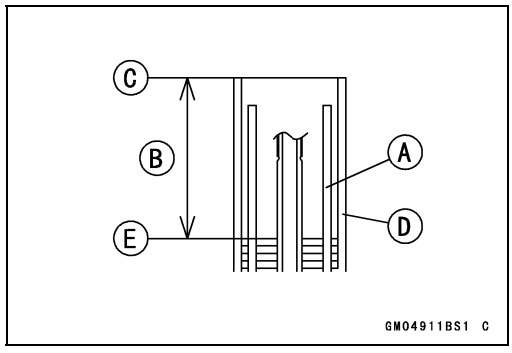
● Hold the inner tube bottom end in a vise using soft jaws.

○Wait until the oil level settles.



● With the fork fully compressed, insert a tape measure or rod into the inner tube [A], and measure the distance [B] from the top [C] of the outer tube [D] to the oil level [E] in the fork leg.

Oil Level (for right fork with fully compressed)
Standard: 43 ±2 mm (1.7 ±0.08 in.)



NOTE

○*Fork oil level may also be measured using the fork oil level gauge [A].*

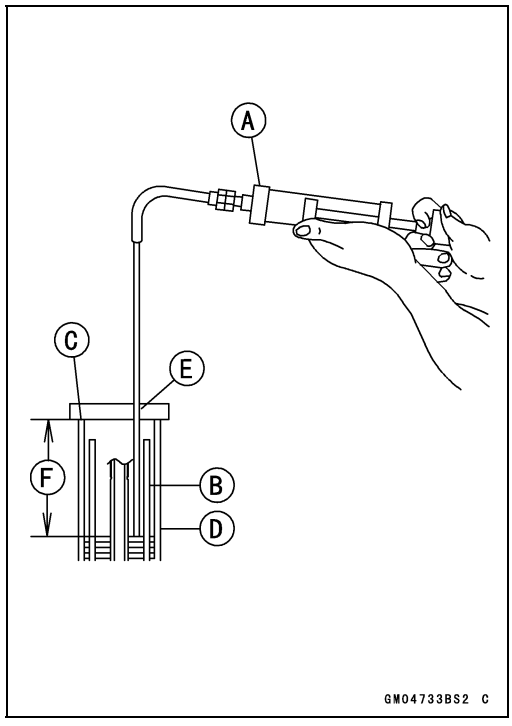
Special Tool - Fork Oil Level Gauge: 57001-1290

○With the fork fully compressed, insert the gauge tube into the inner tube [B] and position the stopper across the top end [C] of the outer tube [D].

○Set the gauge stopper [E] so that its lower side shows the oil level distance specified [F].

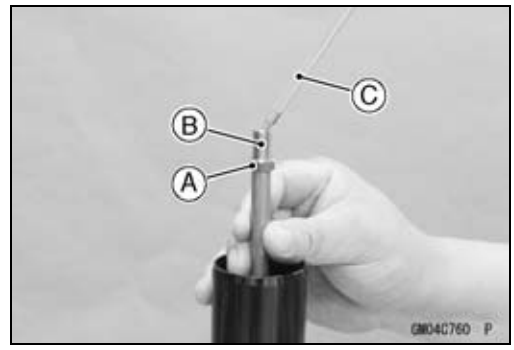
○Pull the handle slowly to pump out the excess oil until the oil no longer comes out.

★If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



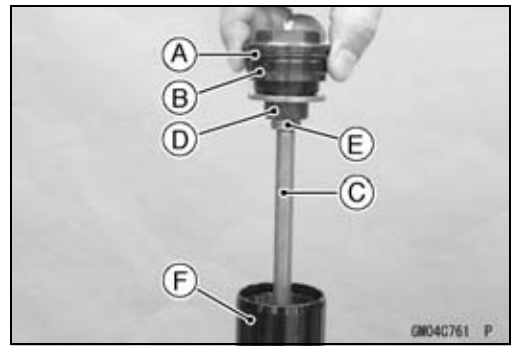
Front Fork

- Screw the damping adjuster guide rod nut [A] onto the damping adjuster guide rod [B] until it is stopped.
- Insert the rebound damping adjuster rod [C] together with the top plug into the guide rod.



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Screw the top plug [B] to the damping adjuster guide rod [C].
- Holding the flat portions [D] on the top plug with a wrench, tighten the damping adjuster guide rod nut [E] against the top plug.

Torque - Damping Adjuster Guide Rod Nut: 19.5 N·m (1.99 kgf·m, 14.4 ft·lb)



- Extend the front fork fully, pull up the outer tube [F] and screw the top plug to the outer tube.

NOTE

○*Be sure to install the top plug to the outer tube which fully extended position. If fail to this, it cause to shorten the length of the fork leg.*

- Install the front fork (see Front Fork Installation (Each Fork Leg)).
- Make sure that the fork lengths are equally by inserting the front axle through the fork legs.

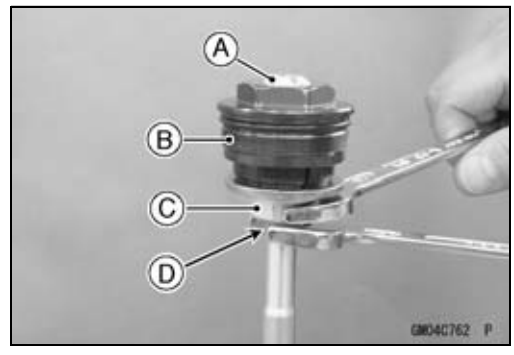
★If the right fork leg is shorter than the left fork leg, loosen the top plug on the right fork leg in order to open the pressure in the fork leg then reinstall it.

NOTE

○*After installing the front fork, adjust the rebound damping adjuster correctly.*

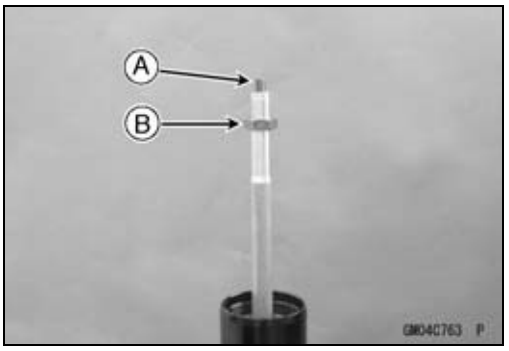
Left Front Fork

- Remove the front fork (see Front Fork Removal (Each Fork Leg)).
- Turn the spring preload adjuster [A] fully counterclockwise for removing the top plug easily.
- Hold the inner tube bottom end in a vise using soft jaws.
- Unscrew the top plug [B] out of the outer tube.
- Holding the bottom portion [C] on the top plug with a wrench, loosen the preload adjuster guide rod nut [D].



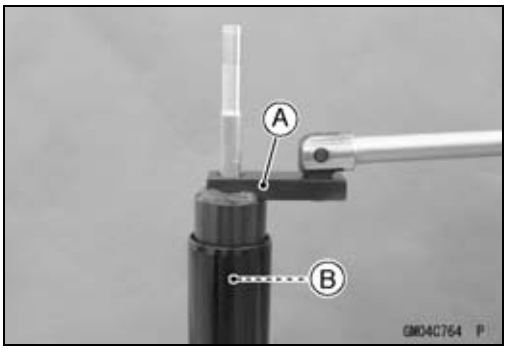
Front Fork

● Remove:
Spring Preload Adjuster Rod [A]
Preload Adjuster Guide Rod Nut [B]



● Using the rod guide case wrench [A], remove the rod guide case [B] from the inner tube.

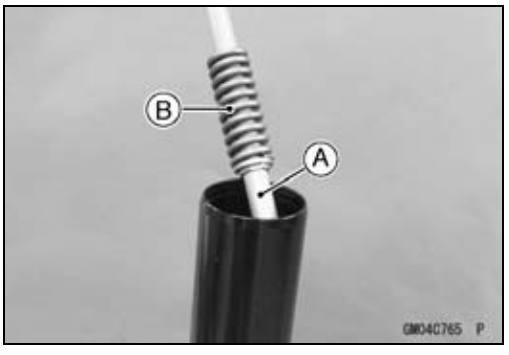
Special Tool - Rod Guide Case Wrench, 33 mm: 57001 -1744



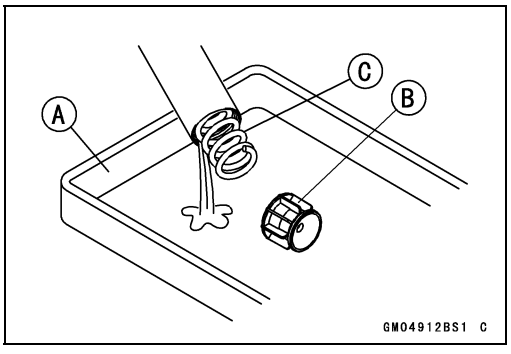
NOTICE

A socket of rod guide case is shallow (4 mm) and therefore be sure to check that the wrench (Special Tool: 57001-1744) is securely seated on the rod guide case. If the wrench is not securely seated on it, the rod guide case may cause damage when loosening the rod guide case.

● Remove the preload adjuster guide rod [A] together with the rebound spring [B].



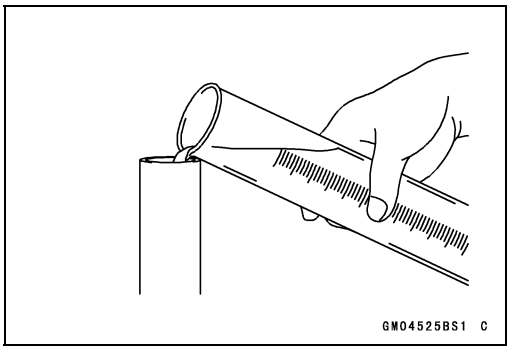
● Drain the fork oil into a suitable container [A].
● Remove the spring seat [B] and fork spring [C] from the outer tube.
○Pump the inner tube up and down at least 10 times to expel the oil from the fork.
○Leave the front fork with upside down on the container for more than 30 minutes to allow dripping the residual fork oil.



● Hold the fork tube upright, compress the outer tube fully.
● Pour in the type and amount of fork oil specified.

Suspension Oil - SS-8 (1 L): 44091-0007

Amount:
When changing oil:
Approx. 400 mL (13.5 US oz.)
After disassembly and completely dry:
473 ±2.5 mL (16.0 ±0.08 US oz.)



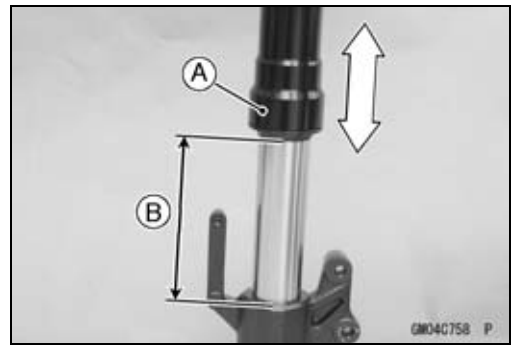
Front Fork

- Pump the outer tube [A] slowly until no air bubbles can be seen in the fork oil.

NOTE

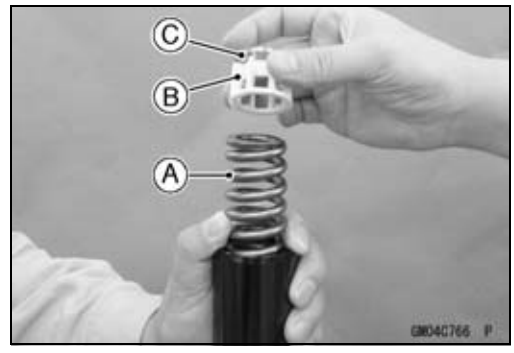
○*Slide the outer tube within about 150 mm (5.9 in.) of the standard stroke [B].*

○*If slide the outer tube exceeding the standard stroke, the hole on the inner tube is exposed out from the oil seal. It causes spilling out the fork oil through the hole on the inner tube.*

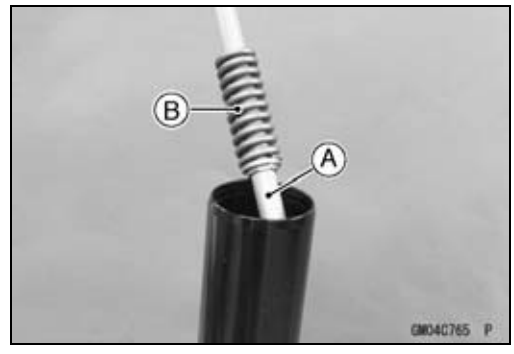


- Install:
  Fork Spring [A]
  Spring Seat [B]

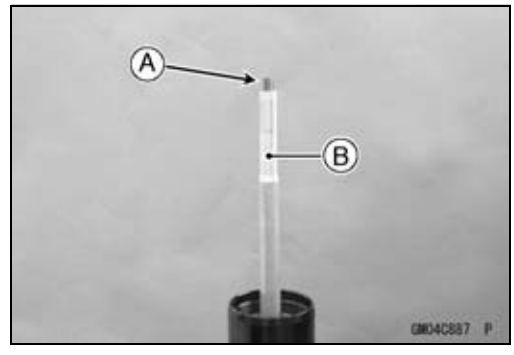
○Install the spring seat with metal side [C] facing up.



- Install the preload adjuster guide rod [A] together with the rebound spring [B].

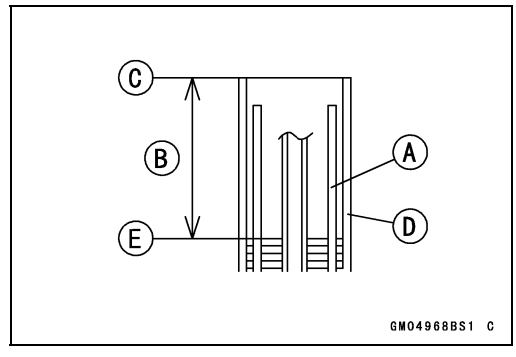


- Insert the spring preload adjuster rod [A] into the preload adjuster guide rod [B].



- With the fork fully compressed, insert a tape measure or rod into the inner tube [A], and measure the distance [B] from the top [C] of the outer tube [D] to the oil level [E] in the fork leg.

Oil Level (for left fork with fully compressed)
Standard: 63 ±2 mm (2.5 ±0.08 in.)



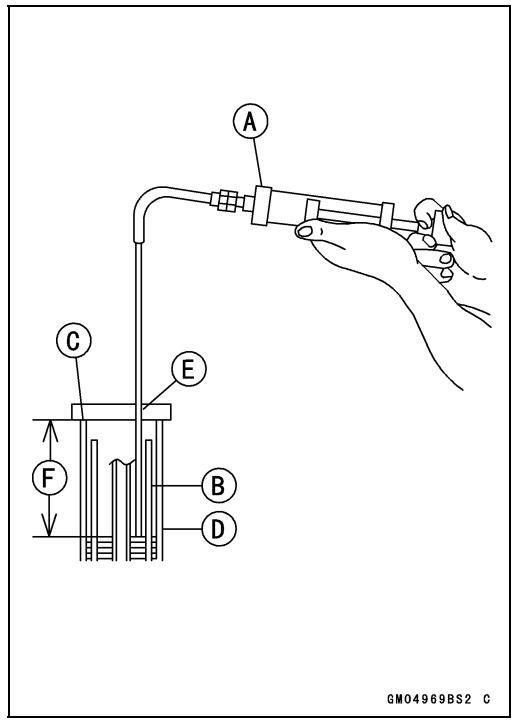
Front Fork

NOTE

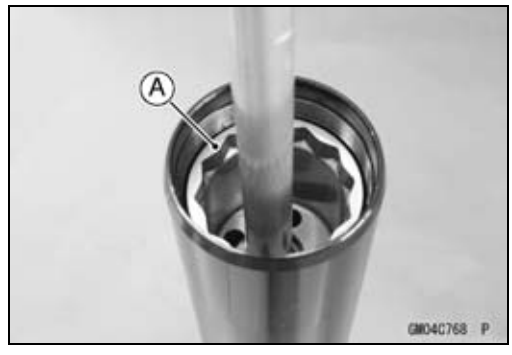
○*Fork oil level may also be measured using the fork oil level gauge [A].*

Special Tool - Fork Oil Level Gauge: 57001-1290

○With the fork fully compressed, insert the gauge tube into the inner tube [B] and position the stopper across the top end [C] of the outer tube [D].
○Set the gauge stopper [E] so that its lower side shows the oil level distance specified [F].
○Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
★If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



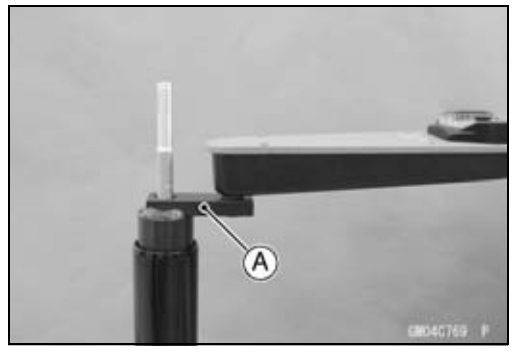
● Screw the rod guide case [A] into the inner tube.



● Hold the inner tube bottom end in a vise using soft jaws.
● Using rod guide case wrench [A], tighten the rod guide case to the inner tube.

Special Tool - Rod Guide Case Wrench, 33 mm: 57001 -1744

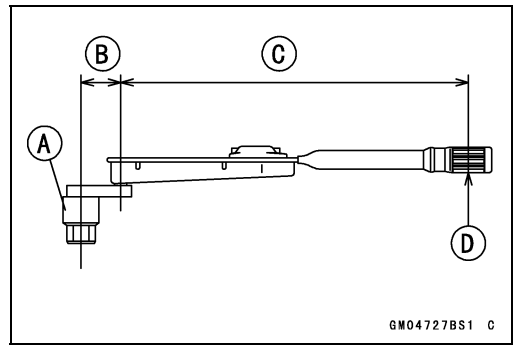
Torque - Rod Guide Case: 90 N·m (9.2 kgf·m, 66 ft·lb)



Front Fork

NOTE

- *The tightening torque of the rod guide case is specified to 90 N·m (9.2 kgf·m, 66 ft·lb), however in use of the rod guide case wrench (special tool: 57001-1744) [A] you reduce the torque to about 90% of the specified value [81 N·m (8.3 kgf·m, 60 ft·lb)] due to the offset [B] of the wrench square hole.*
- *This torque value [81 N·m (8.3 kgf·m, 60 ft·lb)] is applicable when you use a wrench whose length [C] gives leverage of approximately 450 mm (17.7 in.) between the grip point [D] to the center of the coupling square.*
- *To obtain the correct tightening torque with your torque wrench, you need to calculate as follows.*



Formula:

a × b ÷ (b + c) = d

[a] Specified torque
[b] Length from center of square hole to grip point
[c] Offset = 50 mm
[d] Tightening torque

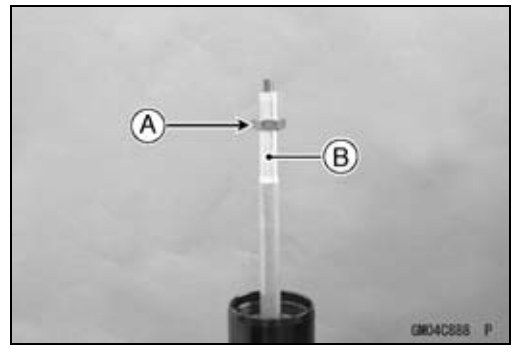
For an example:

90 N·m × 450 ÷ (450 + 50) = 81 N·m

NOTICE

A socket of rod guide case is shallow (4 mm) and therefore be sure to check that the wrench (Special Tool: 57001-1744) is securely seated on the rod guide case.
When tightening the rod guide case. If the wrench is not securely seated on it, the rod guide case may break.

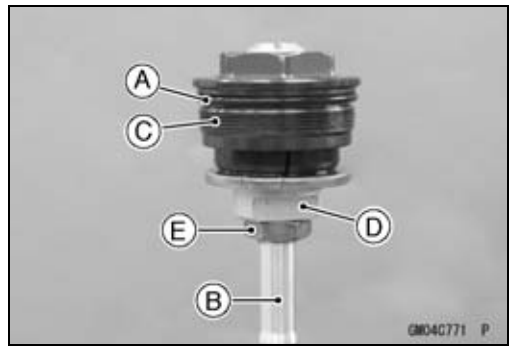
- Screw the preload adjuster guide rod nut [A] onto the preload adjuster guide rod [B] until it stopped.



Front Fork

- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- While pulling up the preload adjuster guide rod [B], screw the top plug [C] to the guide rod.
- Holding the flat portions [D] on the top plug with a wrench, tighten the preload adjuster guide rod nut [E] against the top plug.

Torque - Preload Adjuster Guide Rod Nut: 27.5 N·m (2.80 kgf·m, 20.3 ft·lb)



- Pull up the outer tube and screw the top plug to the outer tube.
- Install the front fork (see Front Fork Installation (Each Fork Leg)).

NOTE

○*After installing the front fork, adjust the spring preload adjuster correctly.*

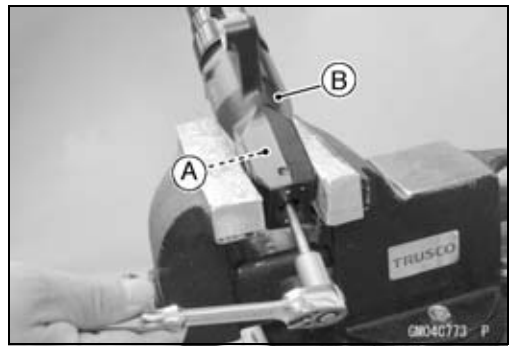
Front Fork Disassembly

Right Front Fork

- Drain the fork oil (see Front Fork Oil Change).
- Hold the inner tube bottom end in a vise using soft jaws.

NOTICE

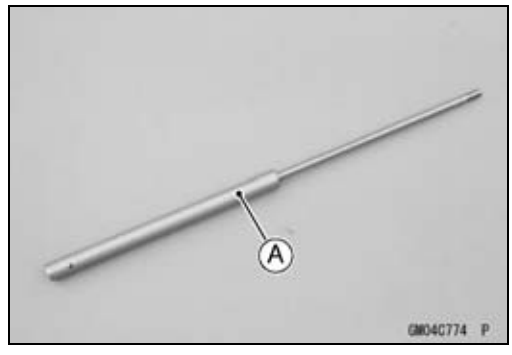
To prevent the components from breaks or distortion, do not hold the front fork at the hollow portions.



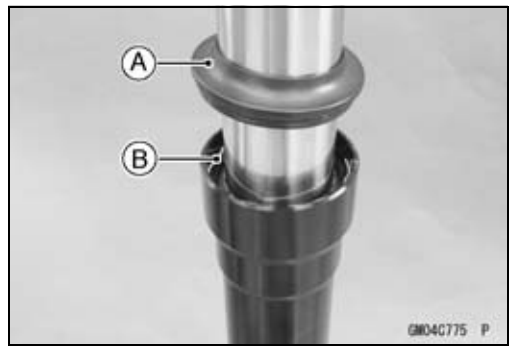
- Loosen the front fork bottom Allen bolt [A] on the inner tube [B].
- Remove the front fork bottom Allen bolt and gasket.
- Remove the guide rod/cylinder unit assembly [A] from the inner tube.

NOTE

○*Do not try to disassemble the guide rod/cylinder unit assembly.*

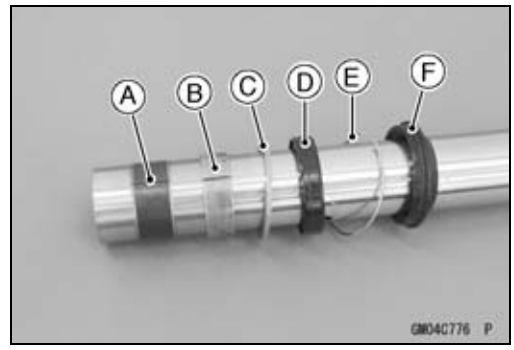


- Remove the dust seal [A] from the outer tube.
- Remove the retaining ring [B] from the outer tube.
- Holding the inner tube, pull the outer tube several times to separate the outer tube from the inner tube.



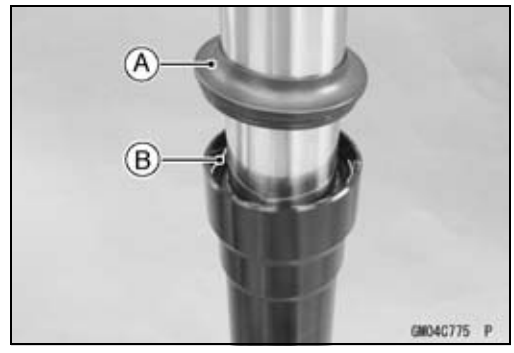
Front Fork

- Remove the following parts from the inner tube.
  Slide Bushing [A]
  Guide Bushing [B]
  Washer [C]
  Oil Seal [D]
  Retaining Ring [E]
  Dust Seal [F]

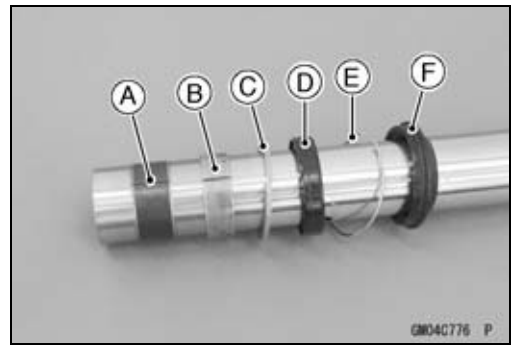


Left Front Fork

- Drain the fork oil (see Front Fork Oil Change).
- Remove the dust seal [A] from the outer tube.
- Remove the retaining ring [B] from the outer tube.
- Holding the inner tube, pull the outer tube several times to separate the outer tube from the inner tube.



- Remove the following parts from the inner tube.
  Slide Bushing [A]
  Guide Bushing [B]
  Washer [C]
  Oil Seal [D]
  Retaining Ring [E]
  Dust Seal [F]

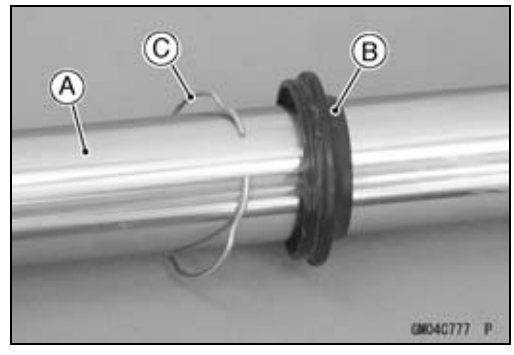


Front Fork Assembly

Right Front Fork

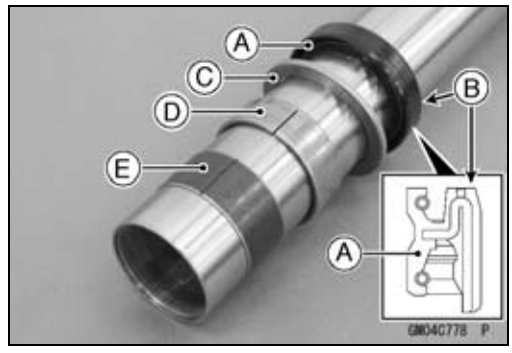
- Replace the following parts with new ones.
  Slide Bushing
  Guide Bushing
  Oil Seal
  Retaining Ring

- Install the following parts to the inner tube [A].
  Dust Seal [B]
  Retaining Ring [C]



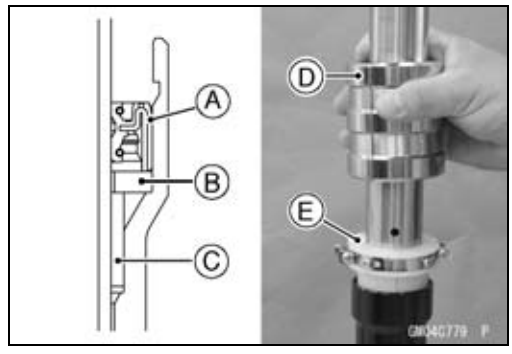
Front Fork

- Apply grease to the oil seal lips.
- Install the oil seal [A] with the marked side [B] facing lower side.
- Install:
  Washer [C]
  Guide Bushing [D]
  Slide Bushing [E]

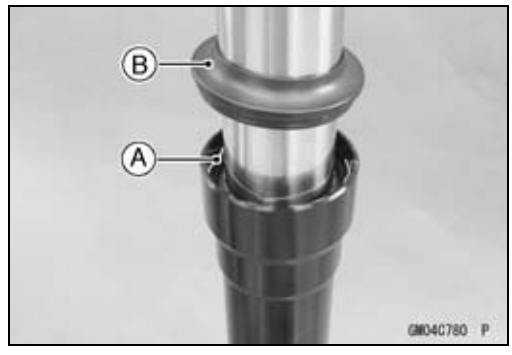


- Insert the inner tube assembly to the outer tube.
- Drive the oil seal [A], washer [B] and guide bushing [C] into the outer tube.

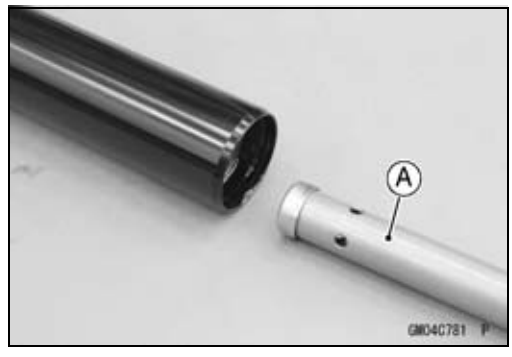
Special Tools - Fork Oil Seal Driver Weight, ϕ26 ~ ϕ46 [D]: 57001-1795
Fork Oil Seal Driver Attachment, ϕ36 ~ ϕ46 [E]: 57001-1798



- Install the retaining ring [A] and dust seal [B].



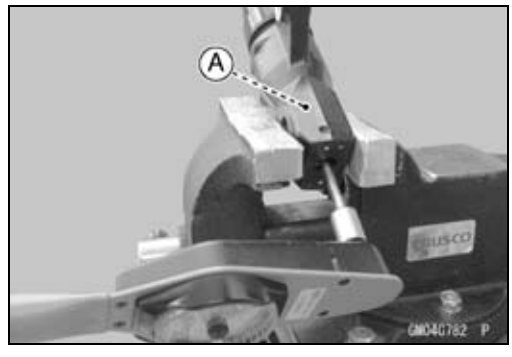
- Install the guide rod/cylinder unit assembly [A] into the inner tube.



- Hold the fork leg in a vise.
- Replace the Allen bolt gasket with a new one.
- Apply a non-permanent locking agent to the threads of the Allen bolt [A].
- Install the Allen bolt and gasket to the bottom of the inner tube and tighten the Allen bolt.

Torque - Front Fork Bottom Allen Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Pour in the specified type of oil (see Front Fork Oil Change).

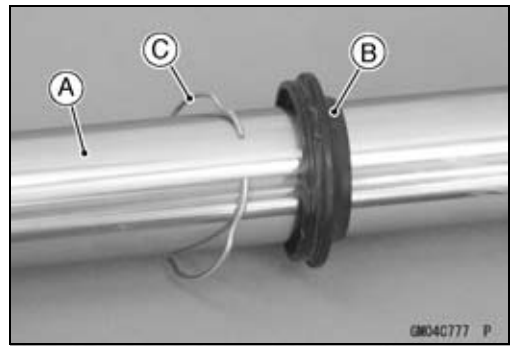


Front Fork

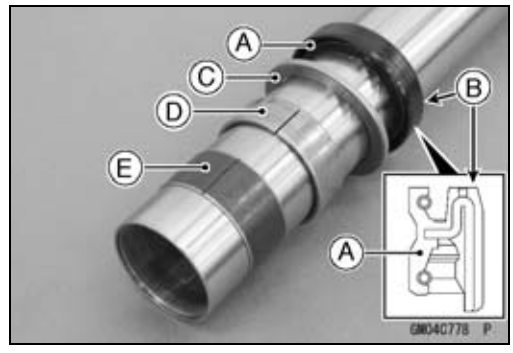
Left Front Fork

- Replace the following parts with new ones.
  Slide Bushing
  Guide Bushing
  Oil Seal
  Retaining Ring

- Install the following parts to the inner tube [A].
  Dust Seal [B]
  Retaining Ring [C]

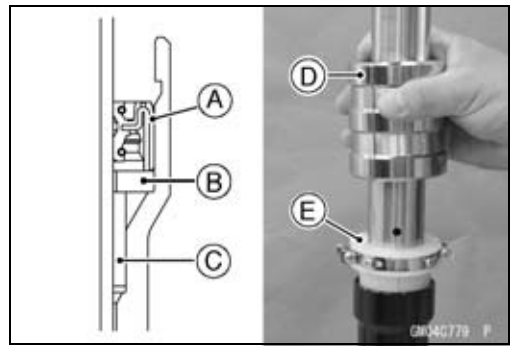


- Apply grease to the oil seal lips.
- Install the oil seal [A] with the marked side [B] facing lower side.
- Install:
  Washer [C]
  Guide Bushing [D]
  Slide Bushing [E]

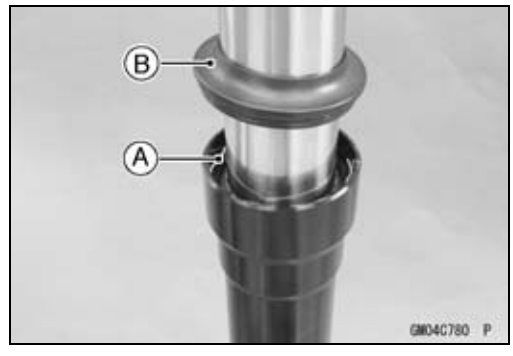


- Insert the inner tube assembly to the outer tube.
- Drive the oil seal [A], washer [B] and guide bushing [C] into the outer tube.

Special Tools - Fork Oil Seal Driver Weight, ϕ26 ~ ϕ46 [D]: 57001-1795
Fork Oil Seal Driver Attachment, ϕ36 ~ ϕ46 [E]: 57001-1798

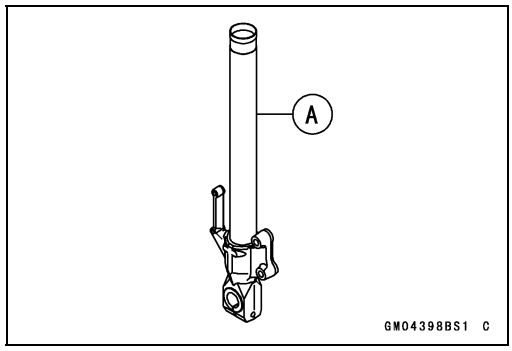


- Install the retaining ring [A] and dust seal [B].



Front Fork

Inner Tube, Outer Tube Inspection



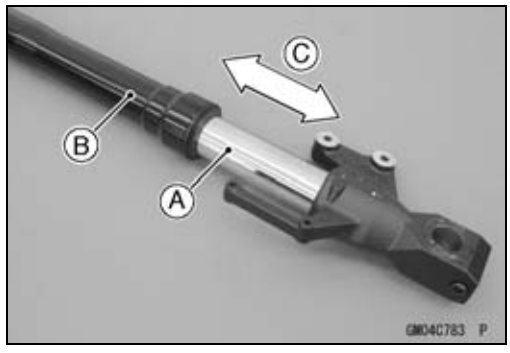
- Visually inspect the inner tube [A].

★If there is any damage, replace the inner tube. Since damage to the inner tube damages the oil seal and dust seal, replace the oil seal and dust seal whenever the inner tube is replaced.

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

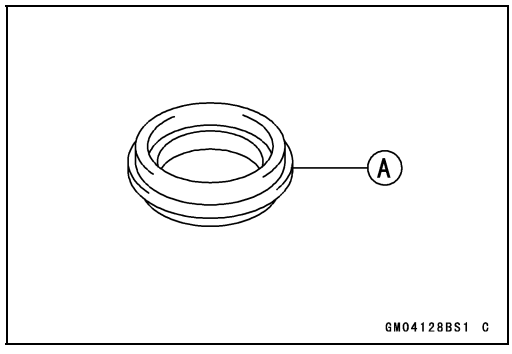
- Temporarily assemble the inner tube [A] and outer tube [B], and pump [C] them back and forth manually to check for smooth operation.

★If you feel binding or catching, the inner and outer tubes must be replaced.



⚠ WARNING
A straightened inner or outer fork tube may fall in use, possibly causing an accident resulting in serious injury or death. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.

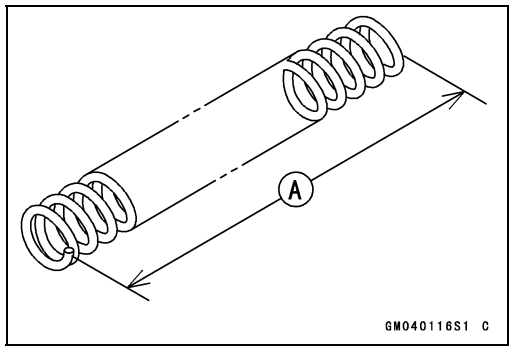
Dust Seal Inspection



- Inspect the dust seals [A] for any signs of deterioration or damage.

★Replace it if necessary.

Spring Tension Inspection



- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.

★If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

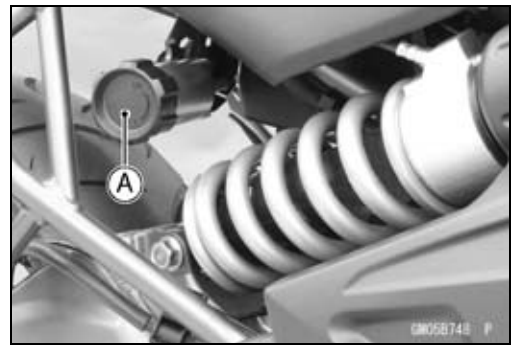
Spring Free Length

Standard: 429.3 mm (16.90 in.)

Service Limit: 421 mm (16.6 in.)

Rear Shock Absorber

Spring Preload Adjustment



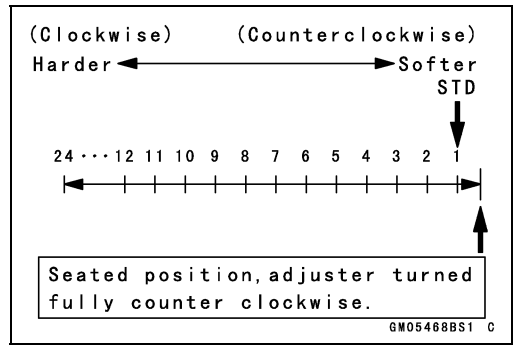
- To adjust the spring preload, turn in the adjuster [A] until you fee a click to the desired position.

○The standard adjuster setting is the **1 click** from the fully counterclockwise position.

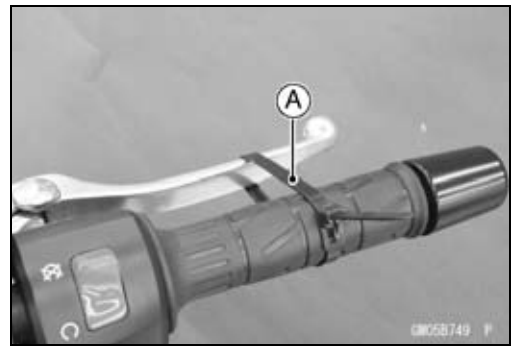
★If the spring action feels too soft, adjust it.

Spring Preload Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
0 click	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
24 clicks	Strong	Hard	Heavy	Bad	High



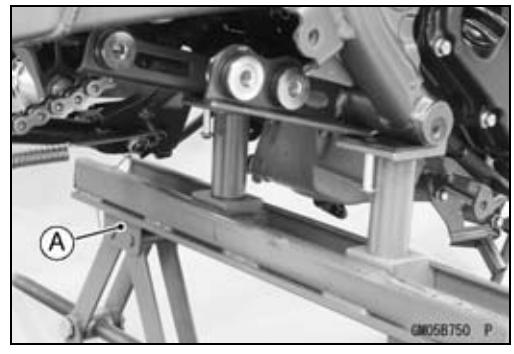
Rear Shock Absorber Removal



- Remove:
  Side Covers (see Side Cover Removal in the Frame chapter)
  Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  Rear Fender Front (see Rear Fender Front Removal in the Frame chapter)
  Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
- Squeeze the brake lever firmly and hold it with a band [A].

⚠ WARNING

When raising the rear wheel off the ground with the jack and removing part(s) from the motorcycle, be sure to hold the front brake, or the motorcycle may fall over. It could cause an accident and injury.

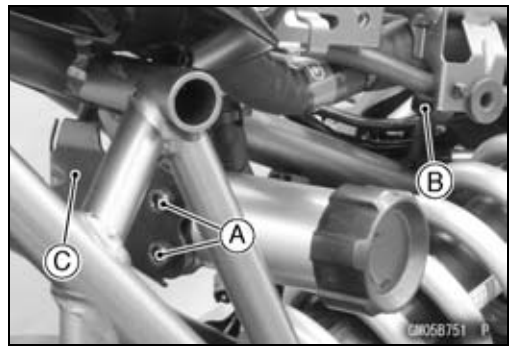


- Support the frame with the jack [A] to raise the rear wheel off the ground.

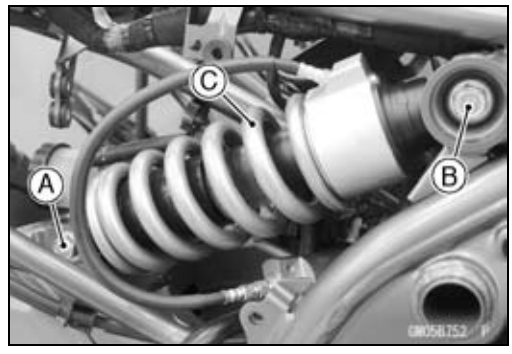
  Special Tool - Jack: 57001-1238

Rear Shock Absorber

- Remove:
  Preload Adjuster Mounting Bolts [A]
  Clamp [B]
  Guard [C]



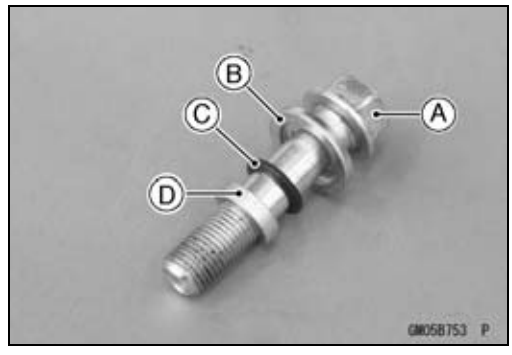
- Remove:
  Lower Rear Shock Absorber Nut and Bolt [A]
  Upper Rear Shock Absorber Bolt [B], Collar, O-ring and Washer
- Remove the rear shock absorber [C] from the frame.



Rear Shock Absorber Installation

- Replace the rear shock absorber nut (lower) with a new one.
- Install the rear shock absorber with the preload adjuster facing upward.
- Install the upper rear shock absorber bolt [A], collar [B], O-ring [C] and washer [D].

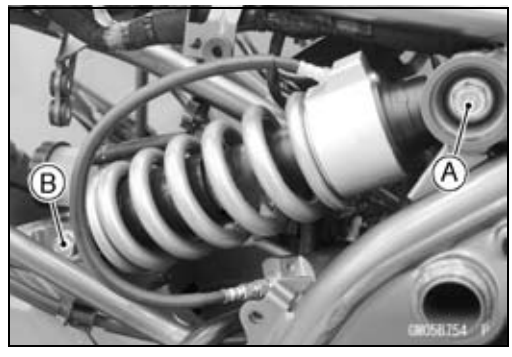
○Fit the O-ring into the stepped area in the collar.



- Tighten:

Torque - Upper Rear Shock Absorber Bolt [A]: 59 N·m (6.0 kgf·m, 44 ft·lb)
Lower Rear Shock Absorber Nut [B]: 59 N·m (6.0 kgf·m, 44 ft·lb)

- Install the removed parts (see appropriate chapters).



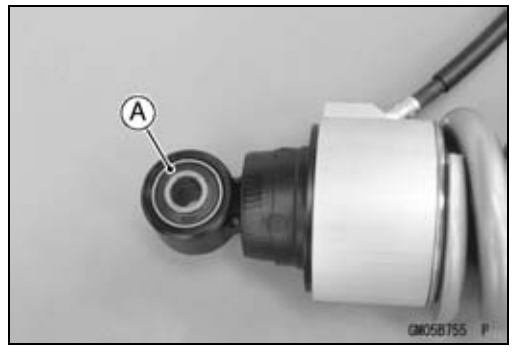
Rear Shock Absorber Inspection

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.
  Oil Leakage
  Crack or Dent

★If there is any damage to the rear shock absorber, replace it.

- Visually inspect the rubber bushing [A].

★If it show any signs of damage, replace it.

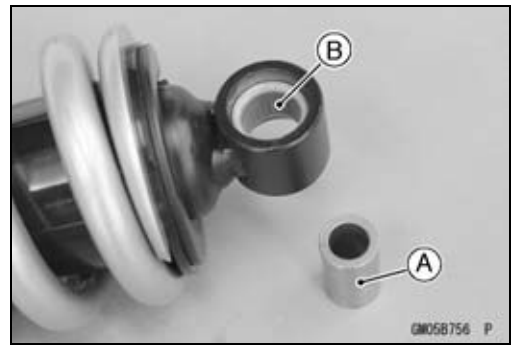


Rear Shock Absorber

- Visually inspect the shock absorber sleeve [A] and needle bearing [B].

○The roller in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing in the shock absorber for abrasion, color change, or other damage.

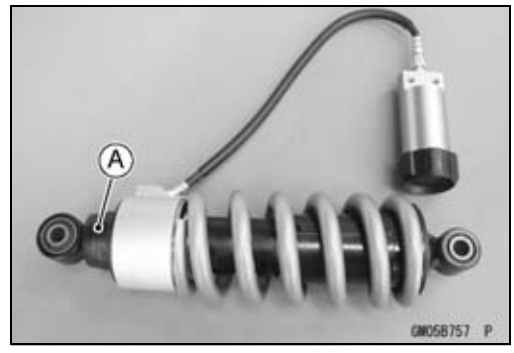
★If there is any doubt as to the condition of any of the needle bearing or sleeve, replace the sleeve, and needle bearing as a set.



Rear Shock Absorber Scrapping

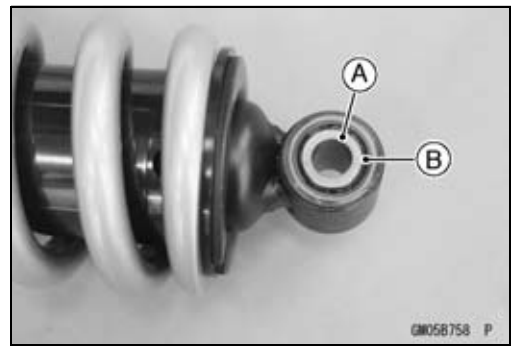
⚠ WARNING

Since the rear shock absorber contains nitrogen gas, do not incinerate the rear shock absorber without first releasing the gas or it may explode. Before a rear shock absorber is scrapped, drill a hole at the point [A] shown to release the nitrogen gas completely. Wear safety glasses when drilling the hole, as the gas may blow out bits of drilled metal when the hole opens.

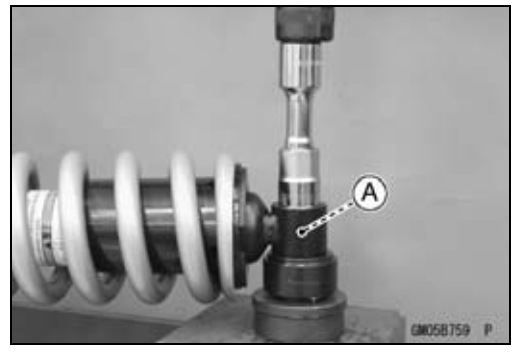


Rear Shock Absorber Bearing Removal

- Remove:
  Rear Shock Absorber (see Rear Shock Absorber Removal)
  Sleeve [A]
  Grease Seals [B]



- Remove the needle bearing [A], using a suitable tools.

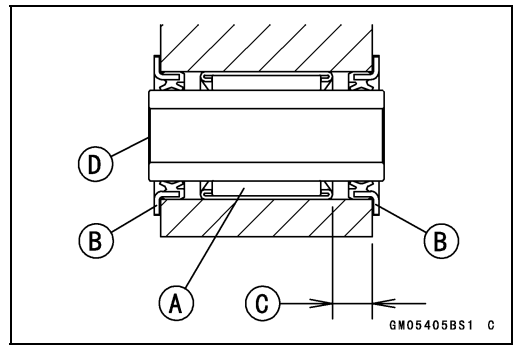


Rear Shock Absorber Bearing Installation

- Replace the needle bearing [A] and grease seals [B] with new ones.
- Apply plenty of grease to the lips of the grease seals.
- Install the needle bearing position as shown.
  [C] 5.5 mm (0.22 in.)

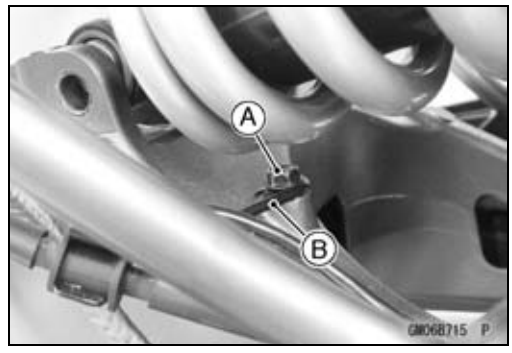
○Press the needle bearing at marked side.

- Install the grease seals and sleeve [D].



Swingarm

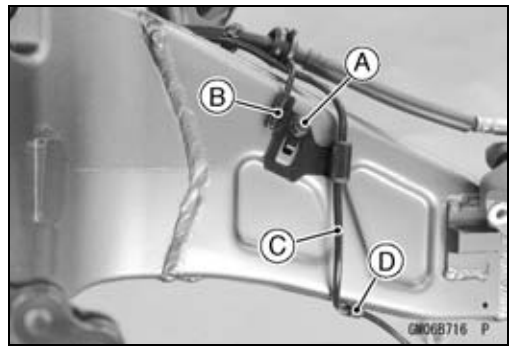
Swingarm Removal



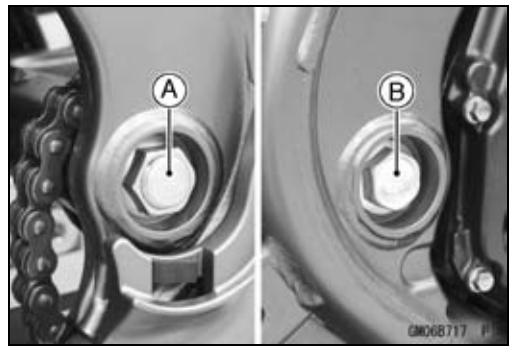
- Support the frame with the jack to raise the rear wheel off the ground.

  Special Tool - Jack: 57001-1238

- Remove:
  Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
  Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
  Rear Wheel (see Rear Wheel Removal in the Wheels/Tiers chapter)
- Remove:
  Lower Rear Shock Absorber Bolt and Nut (see Rear Shock Absorber Removal)
  Bolt [A]
  Brake Hose Clamp [B]

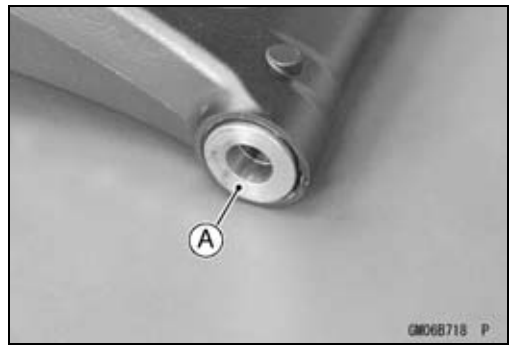


- Remove:
  Bolt [A]
  Brake Hose Clamp [B]
- For models equipped with an ABS, free the rear wheel rotation sensor lead [C] from the clamp [D].



- Unscrew the swingarm pivot shaft nut [A].
- Pull off the pivot shaft [B], and remove the swingarm.

Swingarm Installation



- Installation is the reverse of removal.
- Apply grease to the lip of the oil seals.
- Be sure to install the oil seals and collar [A] to the swingarm.
- Tighten:

  Torque - Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)

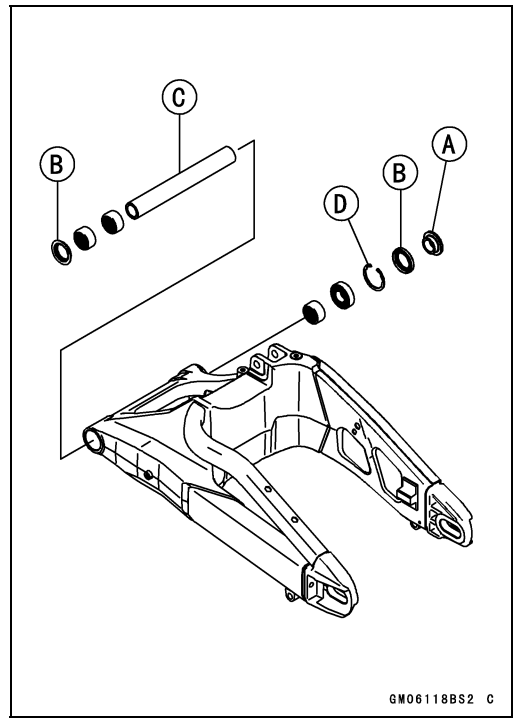
- Install the removed parts (see appropriate chapters).

Swingarm

Swingarm Bearing Removal

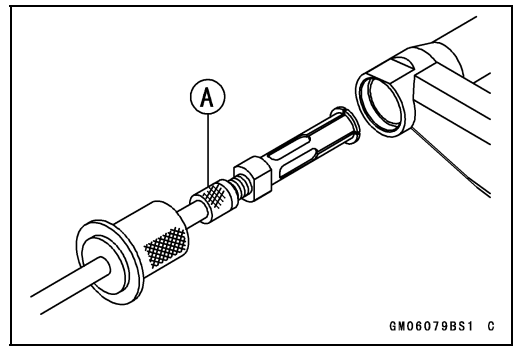
● Remove:
Swingarm (see Swingarm Removal)
Collar [A]
Oil Seals [B]
Sleeve [C]
Circlip [D]

Special Tool - Inside Circlip Pliers: 57001-143



● Remove the ball bearing and needle bearings.

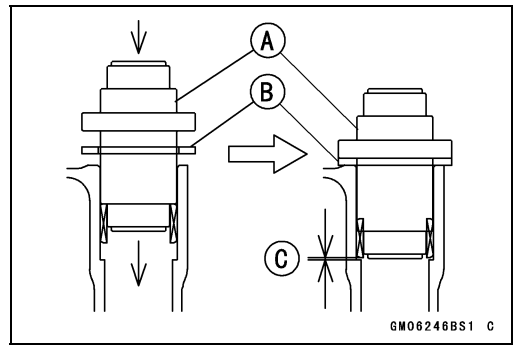
Special Tool - Oil Seal & Bearing Remover [A]: 57001-1058



Swingarm Bearing Installation

● Replace the ball and needle bearings with new ones.
● Install the ball and needle bearings so that the manufacturer's marks face out.

Special Tools - Bearing Driver Set: 57001-1129
Needle Bearing Driver, ϕ28 [A]: 57001-1610
Spacer, ϕ28: 57001-1663
Needle Bearing Driver, ϕ20 & Spacer, ϕ28: 57001-1678



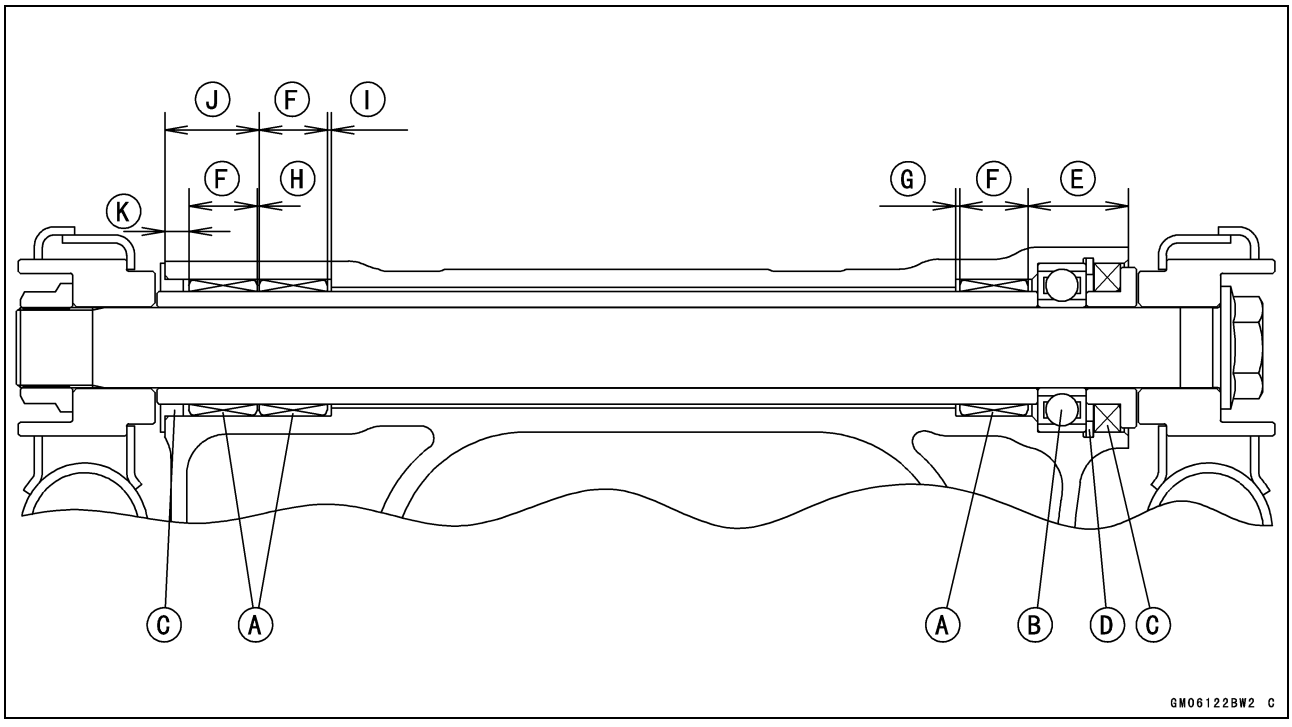
NOTE

○*Select the spacer(s) [B] to obtain the correct installation depth as described on next page.*
○*To prevent damage the needle bearing, it is necessary to keep the clearance [C] between the needle bearing and step in the swingarm.*

Swingarm

- Replace the circlip with a new one.
- Install the needle bearings [A], ball bearing [B] and oil seals [C] position as shown.

Circlip [D]
25 mm (0.98 in.) [E]
17 mm (0.67 in.) [F]
1 mm (0.04 in.) [G]
0.5 mm (0.02 in.) [H]
1 mm (0.04 in.) [I]
23.5 mm (0.93 in.) [J]
5.5 mm (0.22 in.) [K]



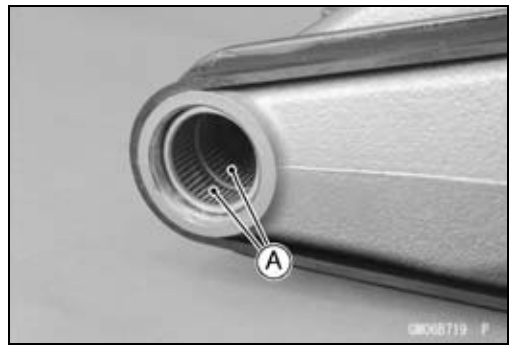
Swingarm Bearing, Sleeve Inspection

NOTICE
Do not remove the bearings for inspection. Removal may damage them.

- Inspect the needle bearings [A] and ball bearing installed in the swingarm.

○The rollers and ball in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.

★If the needle bearing and sleeve show any sings of abnormal wear, discoloration, or damage, replace them as a set.



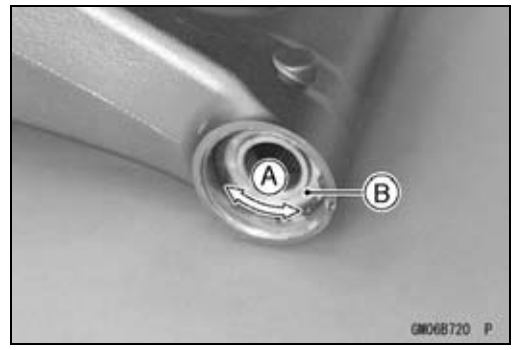
Swingarm

- Turn the bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.

★If the bearing play, roughness, or binding is found, replace the bearing.

- Examine the bearing seal [B] for tears or leakage.

★If the seal is torn or is leaking, replace the bearing.



Swingarm Bearing Lubrication

NOTE

○*Since the bearings are packed with grease and sealed, lubrication is not required.*

Chain Guide Inspection

- Refer to the Chain Guide Wear Inspection in the Periodic Maintenance chapter.

Steering

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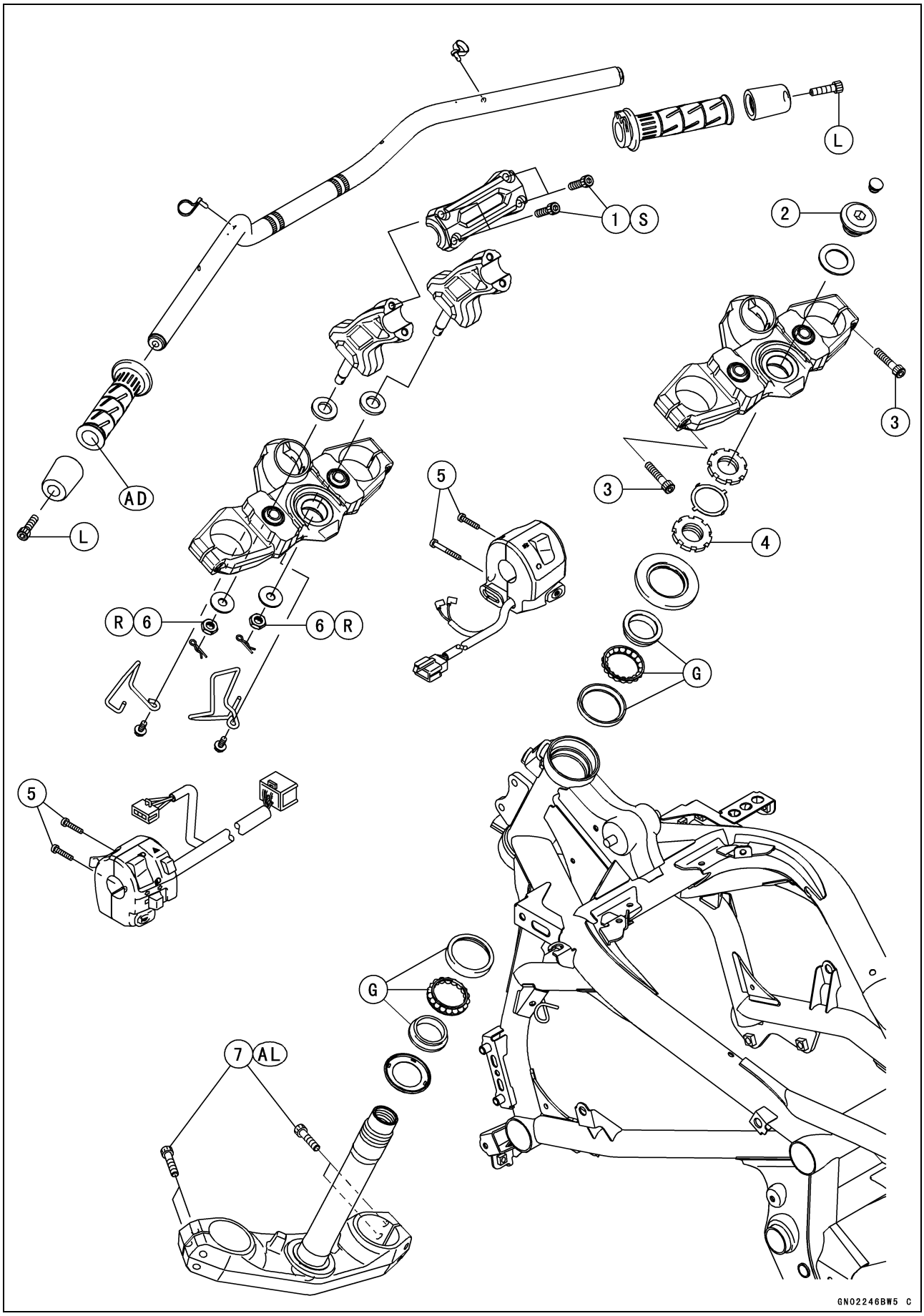
Exploded View



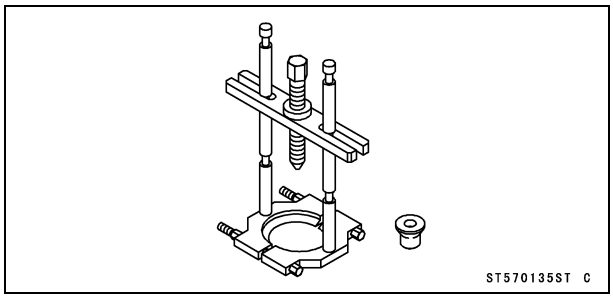
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Holder Bolts	25	2.5	18	S
2	Steering Stem Head Bolt	108	11.0	79.7	
3	Upper Front Fork Clamp Bolts	20	2.0	15	
4	Steering Stem Nut	20	2.0	15	
5	Switch Housing Screws	3.5	0.36	31 in·lb	
6	Lower Handlebar Holder Mounting Nuts	34	3.5	25	R
7	Lower Front Fork Clamp Bolts	29	3.0	21	AL

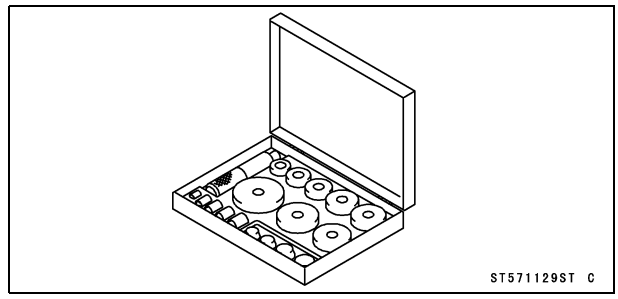
AD: Apply adhesive.
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.

Special Tools

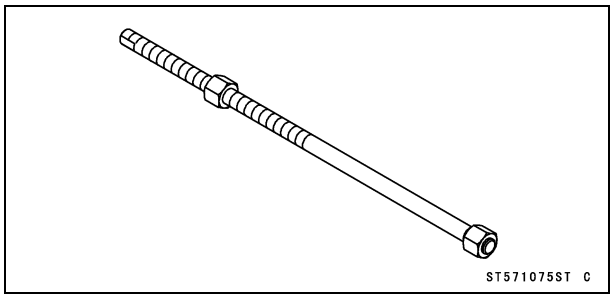
Bearing Puller:
57001-135



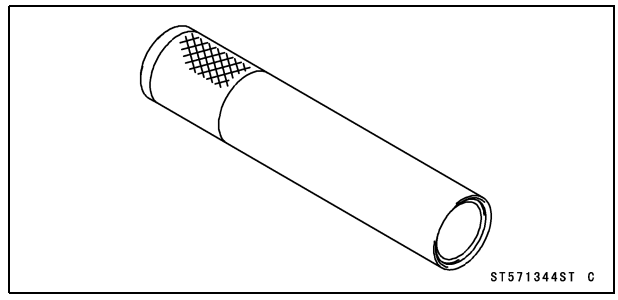
Bearing Driver Set:
57001-1129



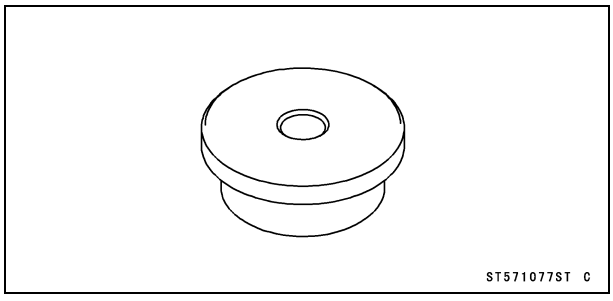
Head Pipe Outer Race Press Shaft:
57001-1075



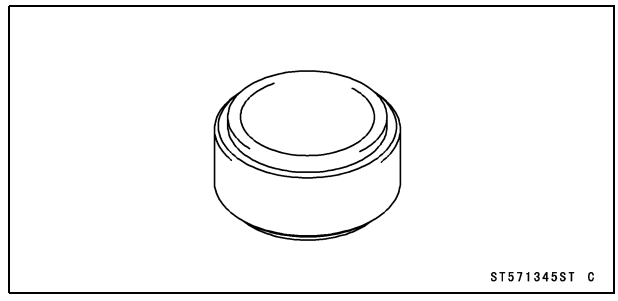
Steering Stem Bearing Driver, ϕ42.5:
57001-1344



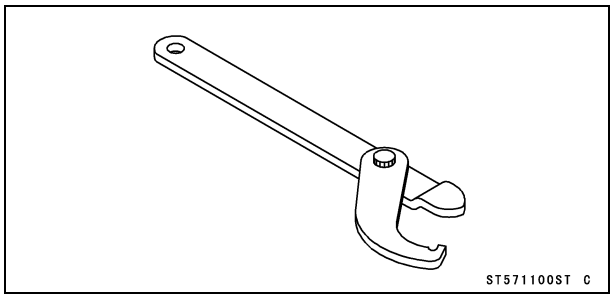
Head Pipe Outer Race Driver, ϕ54.5:
57001-1077



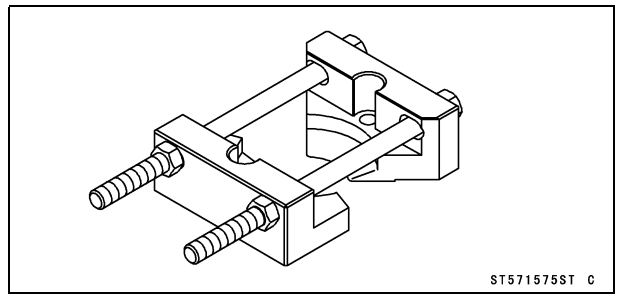
Steering Stem Bearing Driver Adapter, ϕ41.5:
57001-1345



Steering Stem Nut Wrench:
57001-1100



Bearing Puller:
57001-1575



Steering

Steering Inspection

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

Steering Adjustment

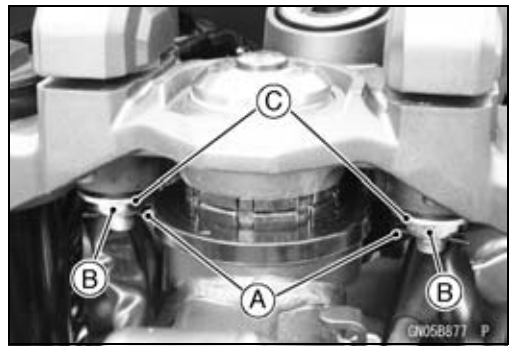
- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

Steering Stem

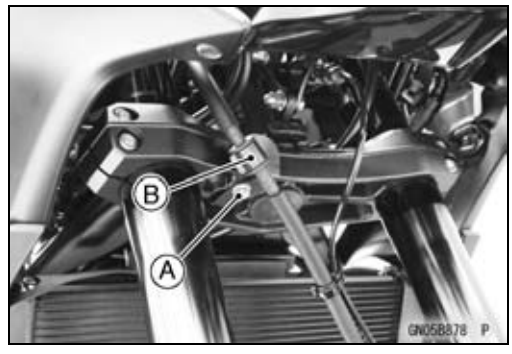
Steering Stem, Stem Bearing Removal

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Handlebars (see Handlebar Removal)
  Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  Front Fender (see Front Fender Removal in the Frame chapter)

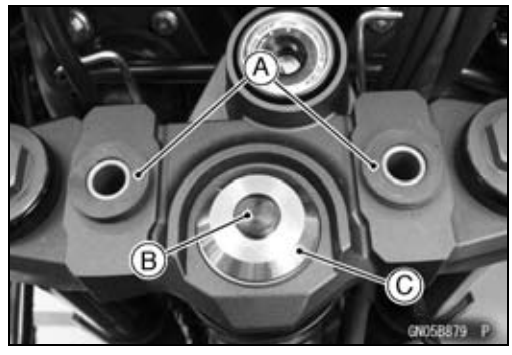
- When removing the lower handlebar holders, remove the following parts.
  Snap Pins [A]
  Lower Handlebar Holder Mounting Nuts [B]
  Washers [C]



- Remove:
  Bolts [A]
  Clamp [B]



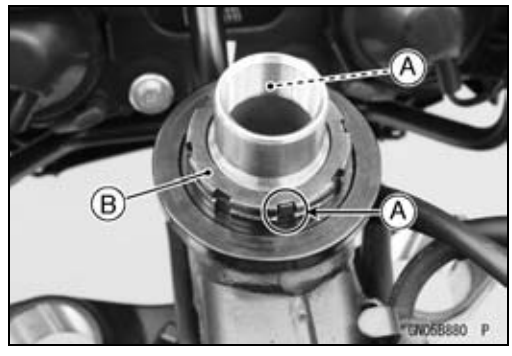
- Remove:
  Dampers [A]
  Steering Stem Head Bolt Plug [B]
  Steering Stem Head Bolt [C] and Washer



- Remove the front forks (see Front Fork Removal in the Suspension chapter).
- Straighten the claws [A] of claw washer.
- Remove the steering stem locknut [B].

  Special Tool - Steering Stem Nut Wrench: 57001-1100

- Remove the claw washer.

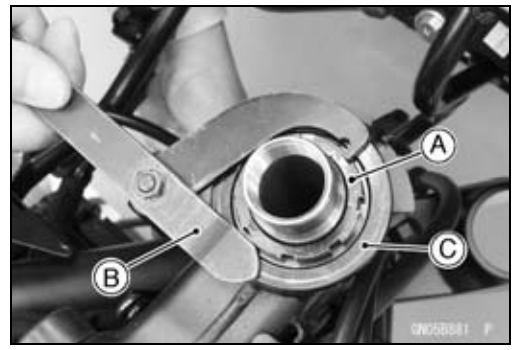


Steering Stem

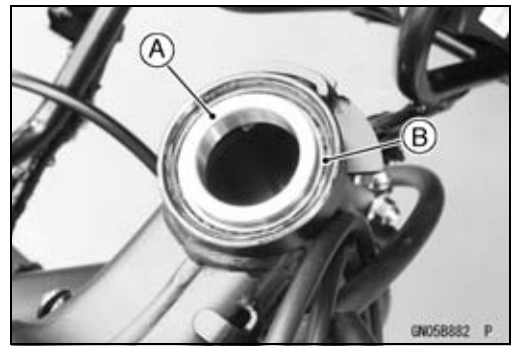
- Pushing up the stem base, and remove the steering stem nut [A].

Special Tool - Steering Stem Nut Wrench [B]: 57001-1100

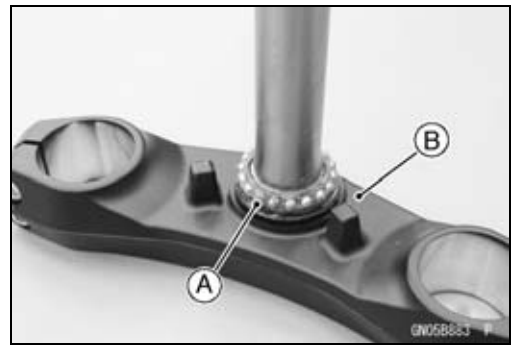
- Remove:
  Steering Stem
  Stem Cap [C]



- Remove:
  Upper Ball Bearing Inner Race [A]
  Ball Bearing [B]



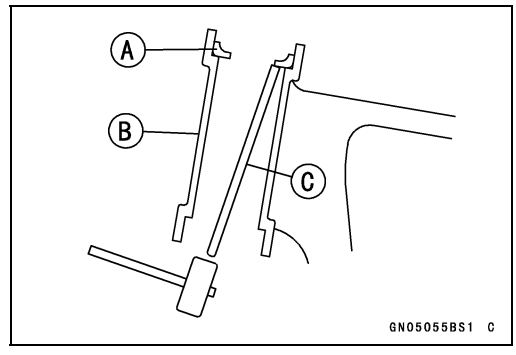
- Remove the lower ball bearing [A] from the steering stem [B].



- To remove the ball bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses of head pipe, and applying it to both recesses alternately hammer it to drive the race out.

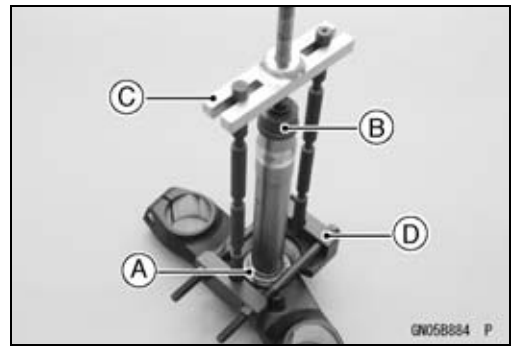
NOTE

○*If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.*



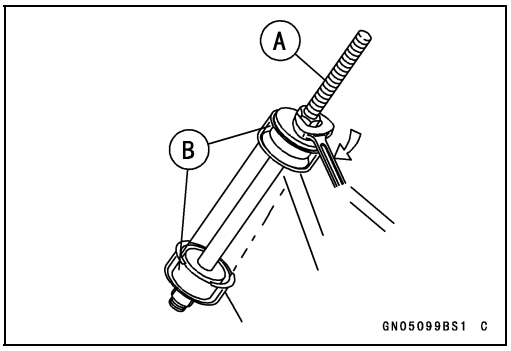
- Remove the lower ball bearing inner race (with its oil seal) [A] which is pressed onto the steering stem using the special tools.

Special Tools - Bearing Driver Set [B]: 57001-1129
Bearing Puller [C]: 57001-135
Bearing Puller [D]: 57001-1575



Steering Stem

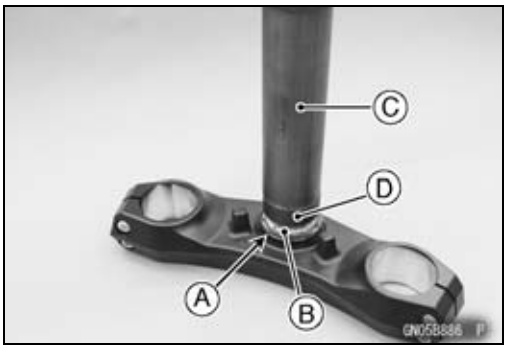
Steering Stem, Stem Bearing Installation



- Replace the bearing outer races with new ones.
- Press them into the head pipe at the same time.

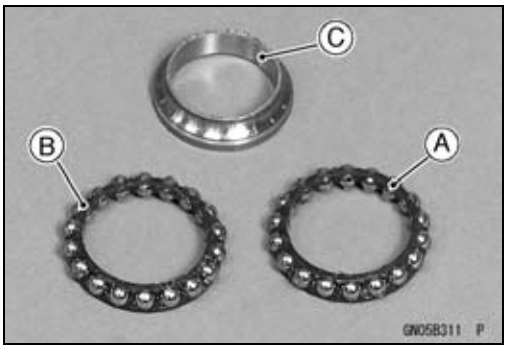
Special Tools - Head Pipe Outer Race Press Shaft [A]: 57001-1075
Head Pipe Outer Race Driver, ϕ54.5 [B]: 57001-1077 (Tow required)

- Apply grease to the outer races.



- Replace the bearing inner races and oil seal with new ones.
- Apply grease to the oil seal.
- Install the oil seal [A] on the steering stem.
- Apply grease to the stem and hammer the lower ball bearing inner race [B].

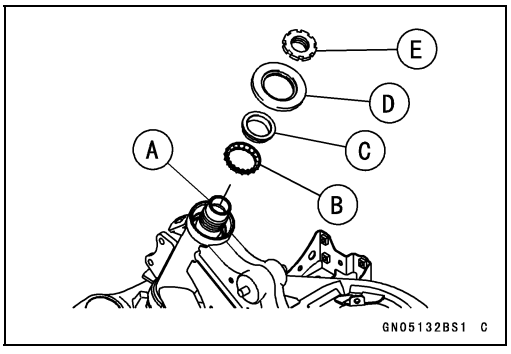
Special Tools - Steering Stem Bearing Driver, ϕ42.5 [C]: 57001-1344
Steering Stem Bearing Driver Adapter, ϕ41.5 [D]: 57001-1345



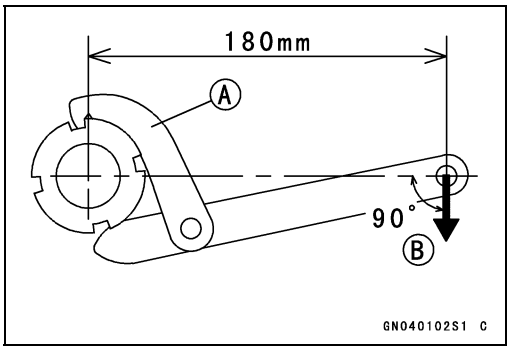
- Apply grease to the lower ball bearing [A], and install it onto the steering stem.

○The lower and upper ball bearings are identical.

- Apply grease to the upper ball bearing [B] and inner race [C].
- Install the lower ball bearing to the steering stem.



- Install the stem [A] through the head pipe and install the ball bearing [B] and inner race [C] on it.
- Install:
  Stem Cap [D]
  Steering Stem Nut [E]



- Settle the bearings in place as follows.

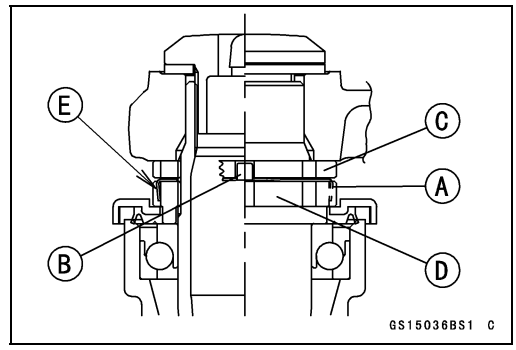
○Tighten the steering stem nut with **55 N·m (5.6 kgf·m, 41 ft·lb)** of torque first (Pull the steering stem nut wrench [A] at the hole by 306 N (31.2 kgf) force [B] in the direction shown), and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using the steering stem nut wrench.

○Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.

Special Tool - Steering Stem Nut Wrench: 57001-1100

Torque - Steering Stem Nut: 20 N·m (2.0 kgf·m, 15 ft·lb)

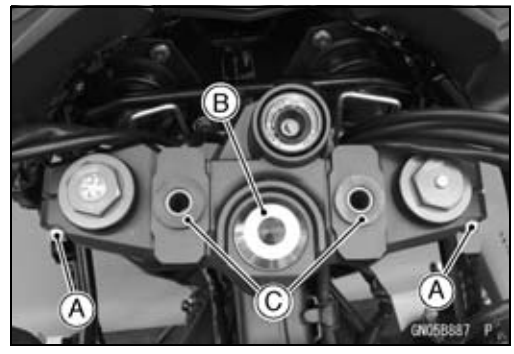
Steering Stem



- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until it touches the claw washer.
- Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].
- Install the stem head.
- Install the washer, and tighten the stem head bolt with specified torque.
- Install the front forks (see Front Fork Installation in the Suspension chapter).

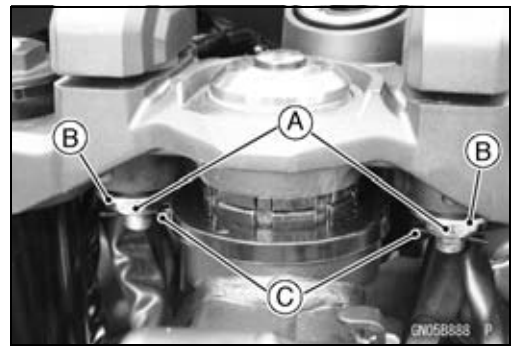
NOTE

○*Tighten the upper front fork clamp bolts [A] first, next the stem head bolt [B], last the lower front fork clamp bolts.*
○*Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.*



Torque - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)
Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 79.7 ft·lb)
Lower Front Fork Clamp Bolts: 29 N·m (3.0 kgf·m, 21 ft·lb)

- Install the dampers [C] on the bushings and install the lower handlebar holders, if removed.



- Replace the lower handlebar holder mounting nuts [A] with new ones.
- Install the washers [B] and lower handlebar holder nuts.
- Install the handlebars on the lower handlebar holders temporarily.
- Tighten:

Torque - Lower Handlebar Holder Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Insert the snap pins [C].

⚠ WARNING

If the handlebars do not turn to the steering stop, they may cause an accident resulting in injury or death. Be sure the cables, harnesses and hoses are routed properly and do not interfere with handlebar movement (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Install the removed parts (see appropriate chapters).

Steering Stem Bearing Lubrication

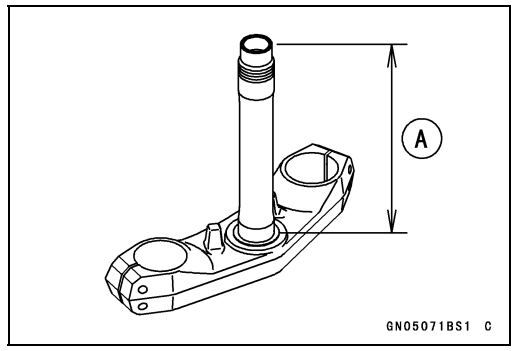
- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

Steering Stem

Steering Stem Warp Inspection

- Whenever the steering stem is removed, or if the steering can not be adjusted for smooth action, check the steering stem for straightness.

★If the steering stem [A] is bent, replace the steering stem.



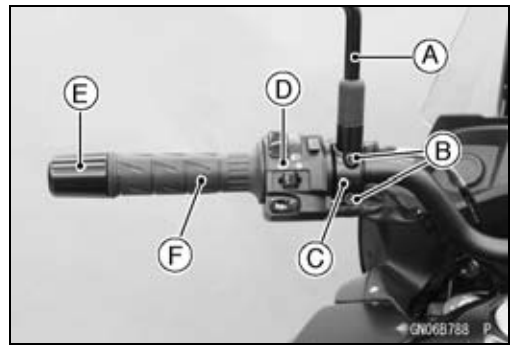
Stem Cap Deterioration, Damage Inspection

★Replace the stem cap if its oil seal [A] shows damage.

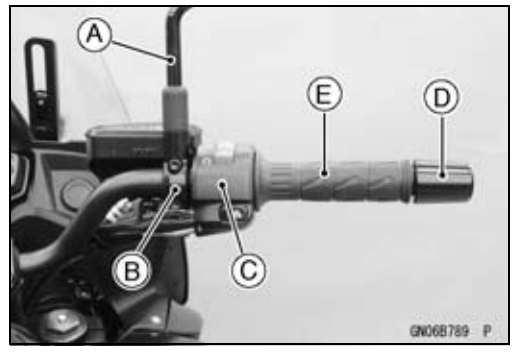
Handlebars

Handlebar Removal

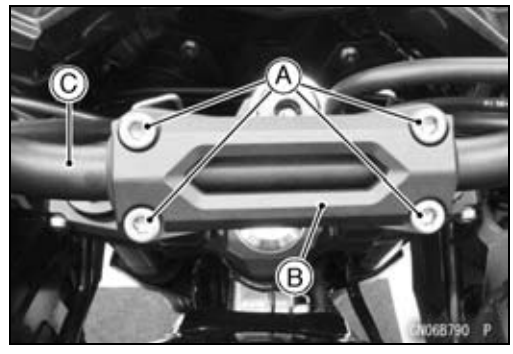
● Remove:
Rear View Mirror [A] (see Rear View Mirror Removal in the Frame chapter)
Clutch Lever Clamp Bolts [B]
Clutch Lever Assembly [C]
Left Switch Housing [D]
Handlebar Weight [E]
Left Handlebar Grip [F]



● Remove:
Rear View Mirror [A] (see Rear View Mirror Removal in the Frame chapter)
Front Master Cylinder [B] (see Front Master Cylinder Removal in the Brakes chapter)
Right Switch Housing [C]
Handlebar Weight [D]
Throttle Grip [E]

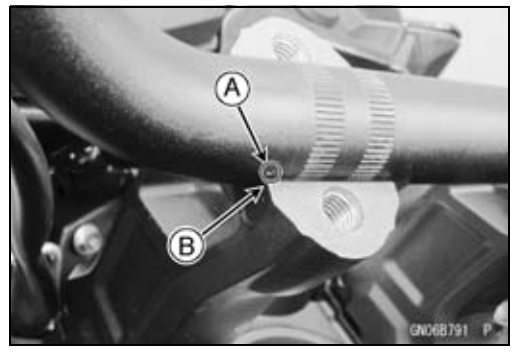


● Remove:
Handlebar Holder Bolts [A]
Handlebar Holder [B]
Handlebars [C]

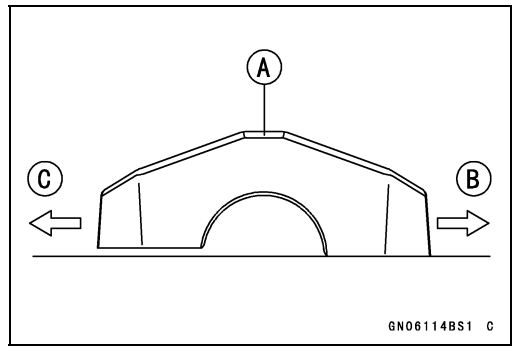


Handlebar Installation

● Align the punch mark [A] on the handlebars and the corner edge [B] on the lower handlebar holder.
○Do not place the punch mark below the corner edge on the lower handlebar holder.

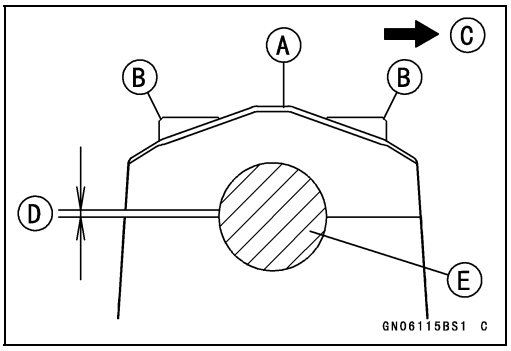


● Put the handlebar holder [A] on the flat surface to confirm the installation direction.
Front [B]
Rear [C]



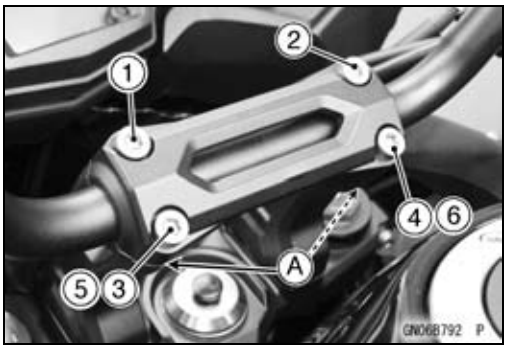
Handlebars

- Install the handlebar holder [A] and handlebar holder bolts [B] temporarily as shown.
  Front [C]
  Gap [D]
  Handlebars [E]

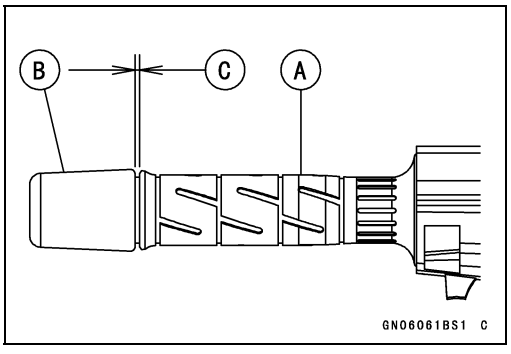


- Tighten the handlebar holder bolts following the tightening sequence [1 ~ 6].
- There will be a gap [A] at the rear part of the holder after tightening.

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



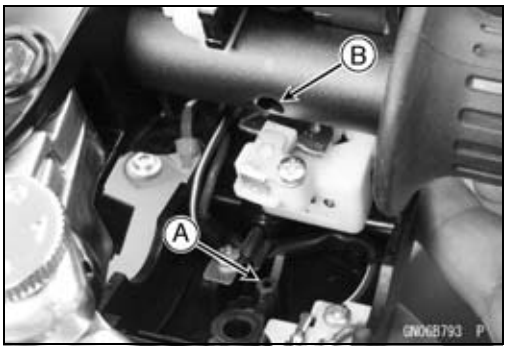
- Install the clutch lever assembly (see Clutch Lever Assembly Installation in the Clutch chapter).
- Apply adhesive cement to the inside of the left handlebar grip [A].
- Install the left handlebar grip and left handlebar weight [B] so that distance [C] between the grip and weight is the 0 to 3 mm (0.12 in.).
- Apply a non-permanent locking agent to the left handlebar weight bolt, and tighten it.



- Install the left switch housing.

○Fit the projection [A] into a small hole [B] of the handlebars.

Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)

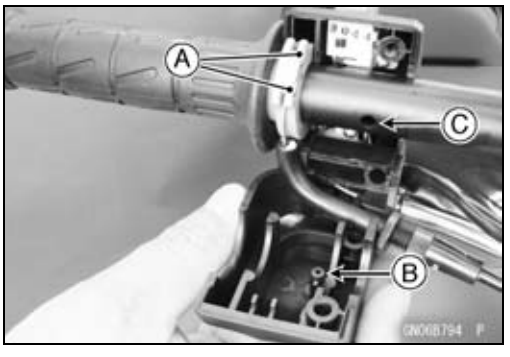


- Install:
  Throttle Grip
  Throttle Cable Tips [A]
  Right Switch Housing

○Fit the projection [B] into a small hole [C] of the handlebars.

Torque - Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)

- Apply a non-permanent locking agent to the right handlebar weight bolt, and tighten it.



- Run the leads, cables and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

Frame

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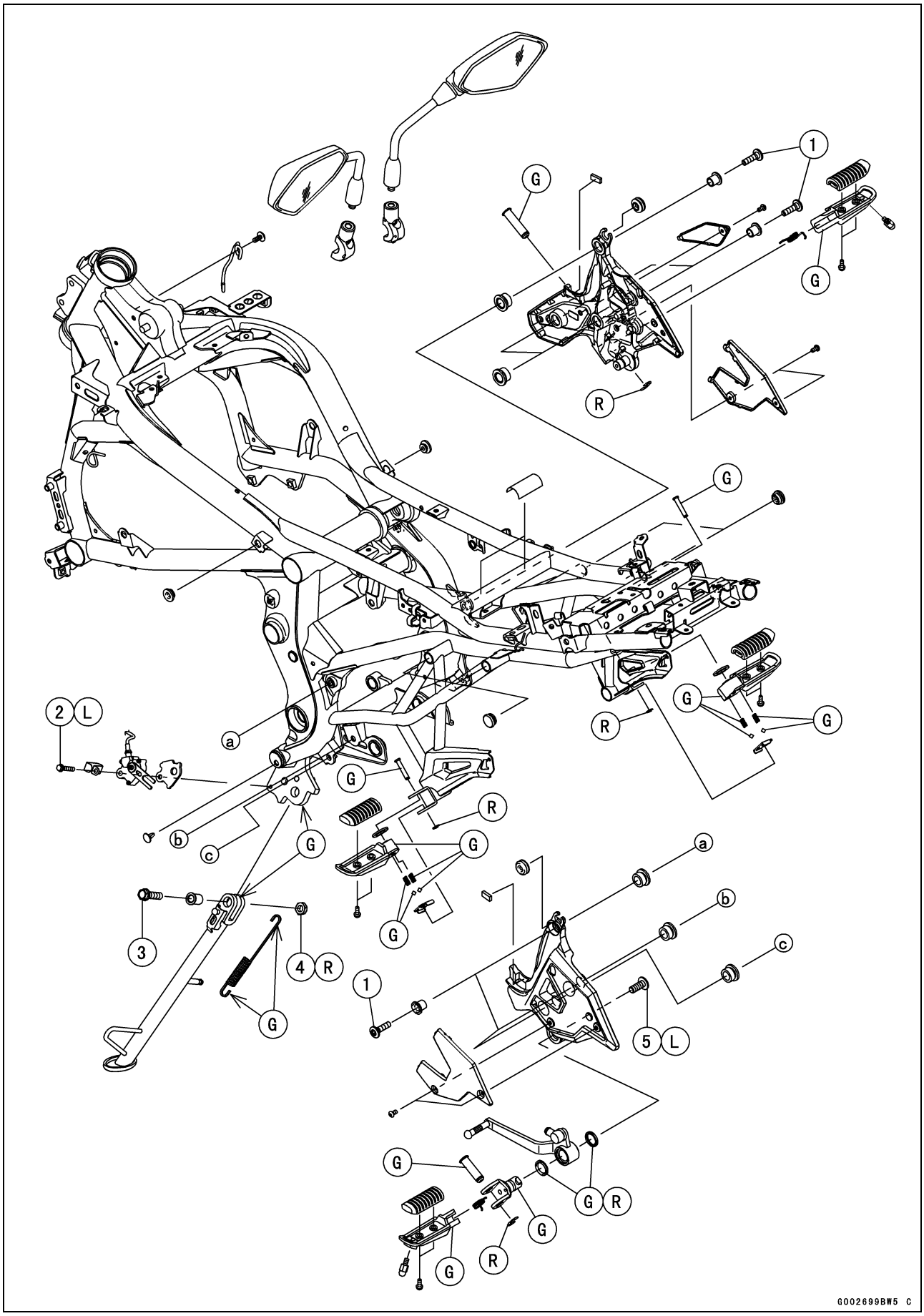
Exploded View

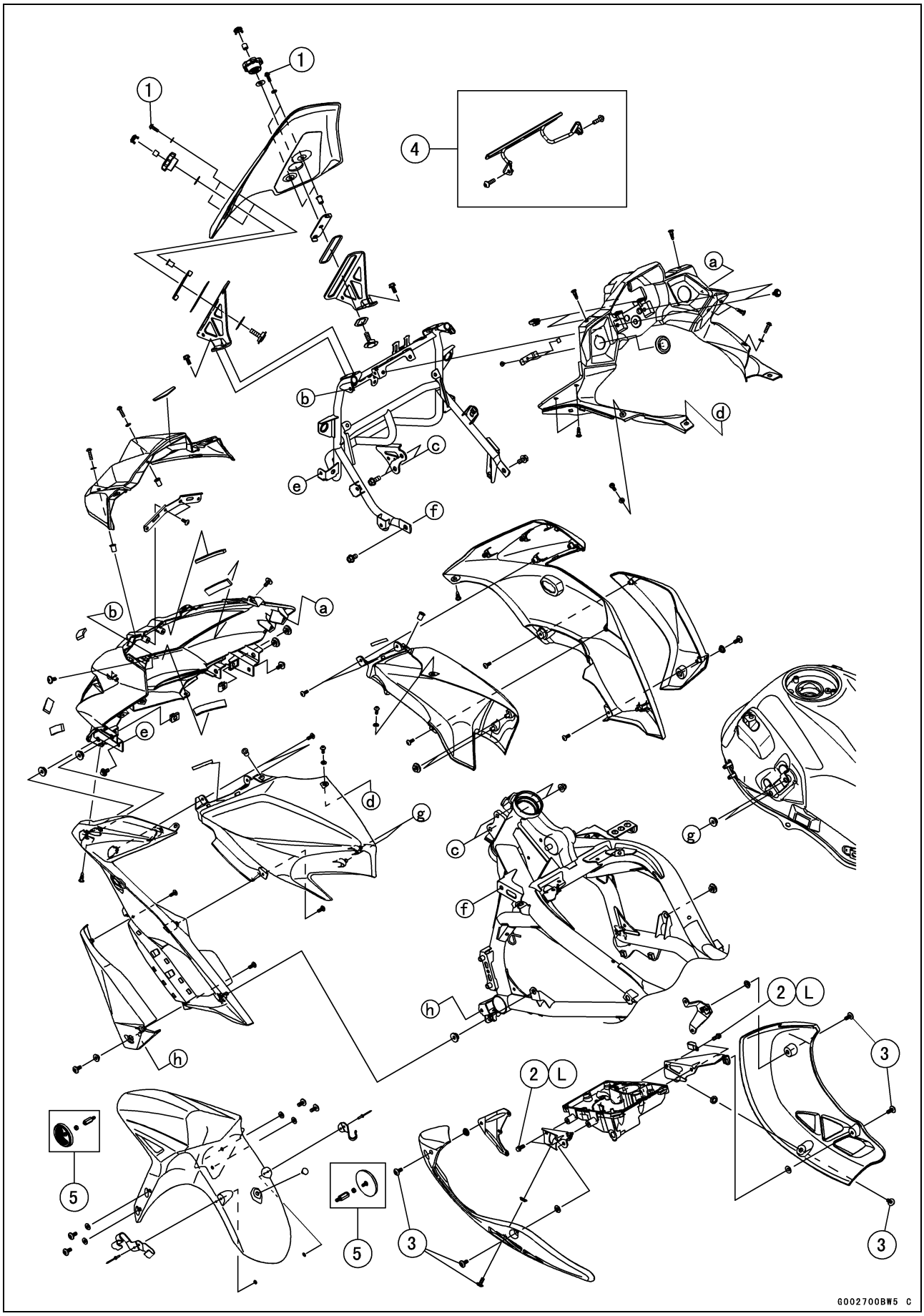


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Footpeg Bracket Bolts	25	2.5	18	
2	Side Stand Switch Bolt	8.8	0.90	78 in·lb	L
3	Side Stand Bolt	29	3.0	21	
4	Side Stand Nut	44	4.5	32	R
5	Footpeg Holder Bolt	34	3.5	25	L

G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

Exploded View



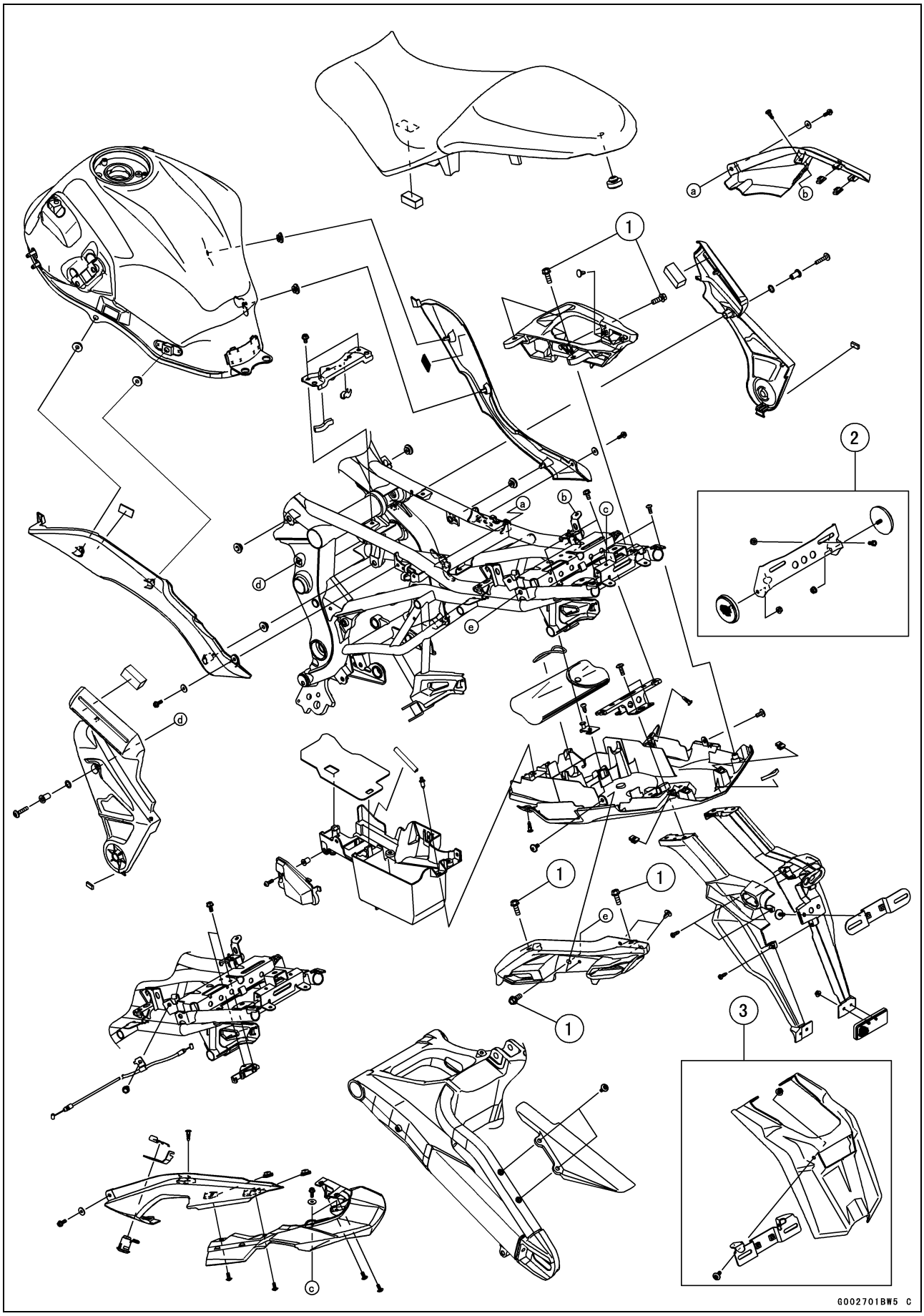
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Windshield Plate Bolts	0.43	0.044	3.8 in·lb	
2	Lower Fairing Bracket Bolts	12	1.2	106 in·lb	L
3	Lower Fairing Mounting Bolts	8.8	0.90	78 in·lb	

4. ID Model
5. US, CAL, CA, MY and AU Models

L: Apply a non-permanent locking agent.

Exploded View



Exploded View

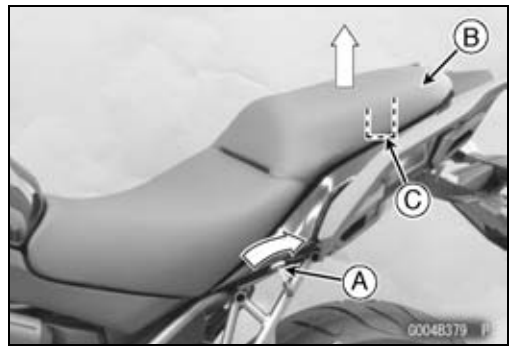
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Grab Rail Bolts	25	2.5	18	

2. US, CAL, CA and CN Models
3. AU Model

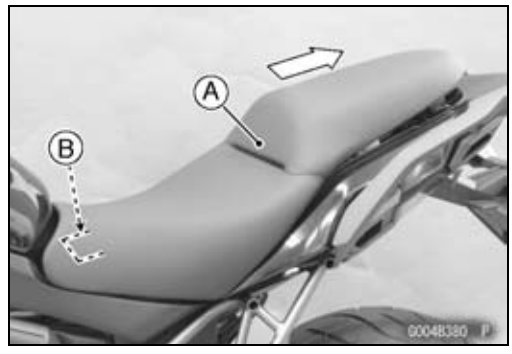
Seat

Seat Removal

- Insert the ignition key into the seat lock [A].
- While turning the key clockwise, pull the rear part of the seat [B] upward to clear the rear seat hook [C] from the latch.

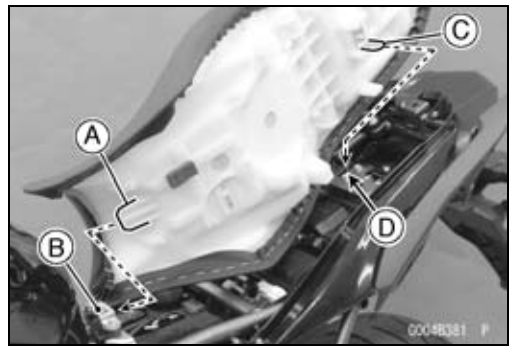


- Pull the seat [A] rearward and clear the front seat hook [B].



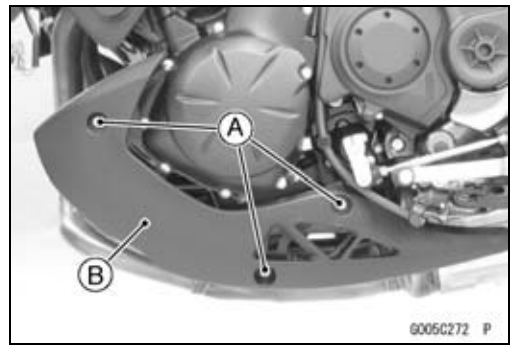
Seat Installation

- Insert the front seat hook [A] into the bracket [B] on the fuel tank.
- Insert the rear seat hook [C] into the latch hole [D] on the frame.
- Push down the rear part of the seat until the lock clicks.



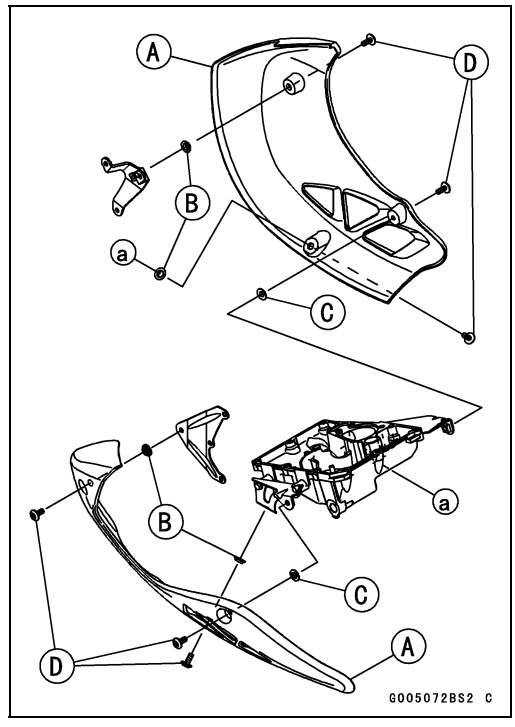
Fairings

Lower Fairing Removal



- Remove:
  Bolts [A] and Collars
  Lower Fairing [B]

Lower Fairing Installation



- Install the collars to the lower fairing [A].

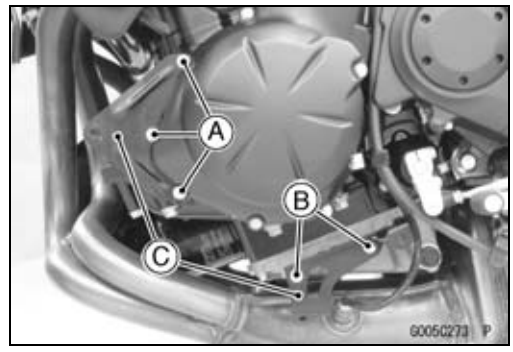
  Collar: Inside Diameter 8.8 mm (0.35 in.) [B]

  Collar: Inside Diameter 6.3 mm (0.25 in.) [C]

- Install the lower fairing.
- Tighten:

Torque - Lower Fairing Mounting Bolts [D]: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Lower Fairing Bracket Removal

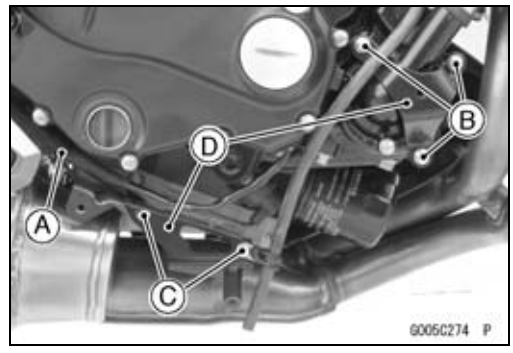


- Remove the lower fairings (see Lower Fairing Removal).

Left Side

- Remove:
  Alternator Cover Bolts [A]
  Lower Fairing Bracket Bolts [B]
  Left Lower Fairing Brackets [C]

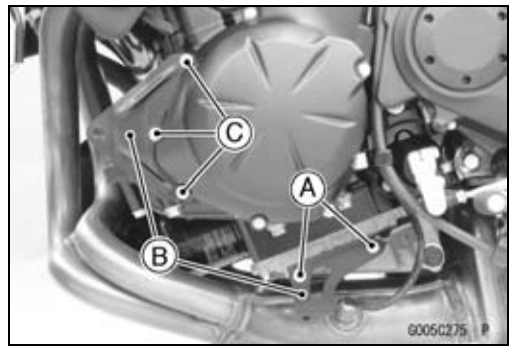
Right Side



- Remove:
  Clamp [A]
  Water Pump Cover Bolts [B]
  Lower Fairing Bracket Bolts [C]
  Right Lower Fairing Brackets [D]

Fairings

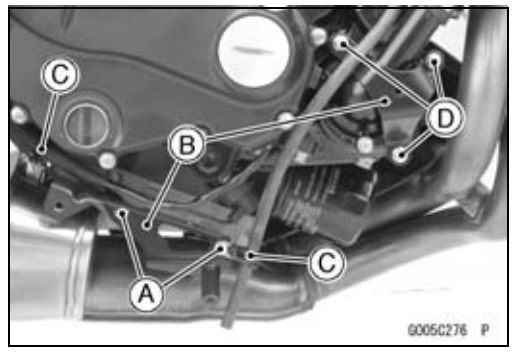
Lower Fairing Bracket Installation



Left Side

- Apply a non-permanent locking agent to the lower fairing bracket bolts [A].
- Install the lower fairing brackets [B].
- Tighten:

Torque - Alternator Cover Bolts [C]: 9.8 N·m (1.0 kgf·m, 89 in·lb)
Lower Fairing Bracket Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)



Right Side

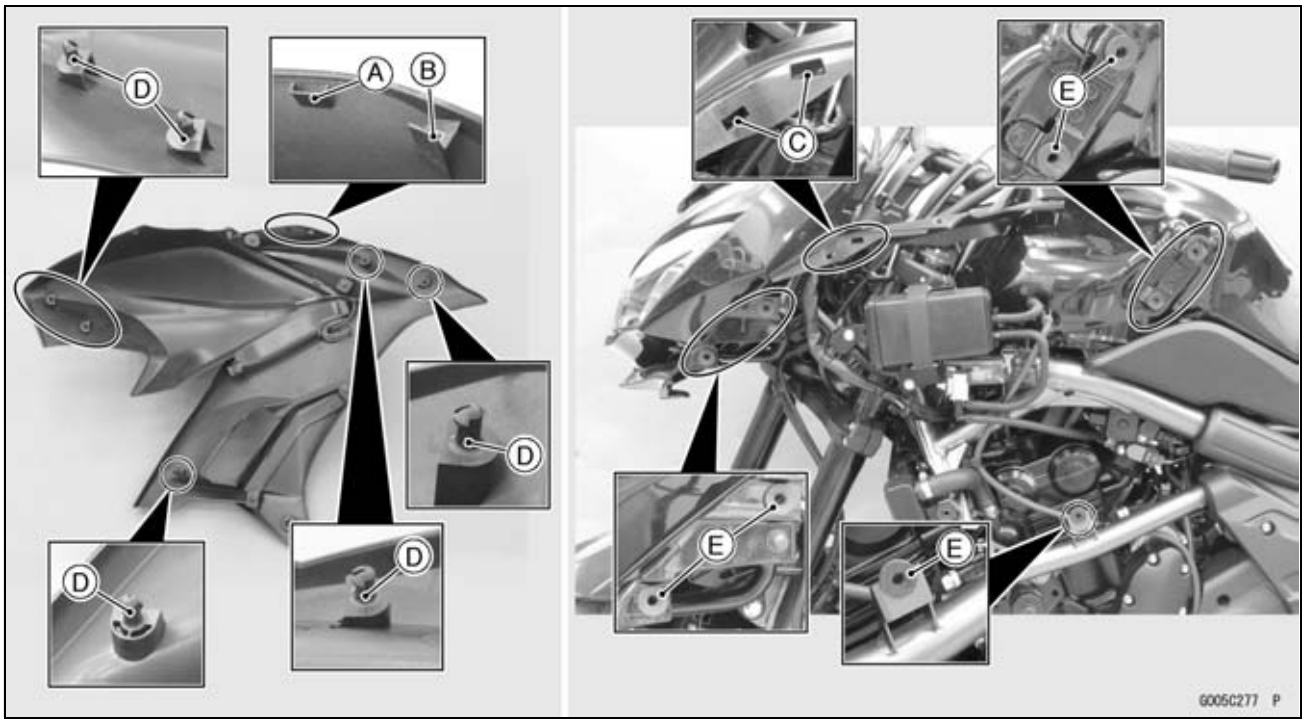
- Apply a non-permanent locking agent to the lower fairing bracket bolts [A].
- Install the lower fairing brackets [B] and the clamps [C].
- Tighten:

Torque - Water Pump Cover Bolts [D]: 9.8 N·m (1.0 kgf·m, 89 in·lb)
Lower Fairing Bracket Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

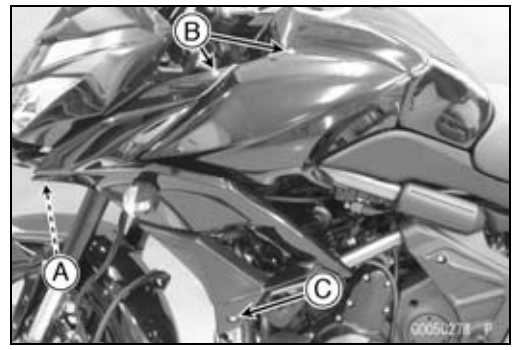
Middle Fairing Removal

Tab [A]
Hook [B]
Slots [C]
Projections [D]
Grommets [E]



Fairings

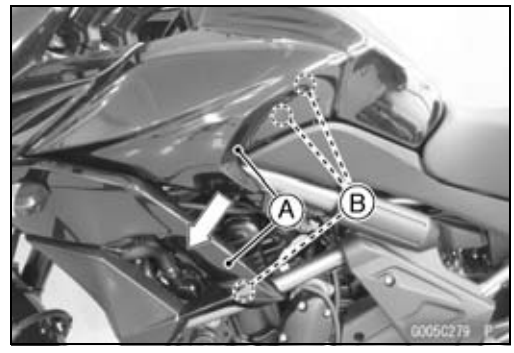
- Remove:
  Quick Rivet [A]
  M5 Bolts [B] and Washers
  M6 Bolt [C] and Collar



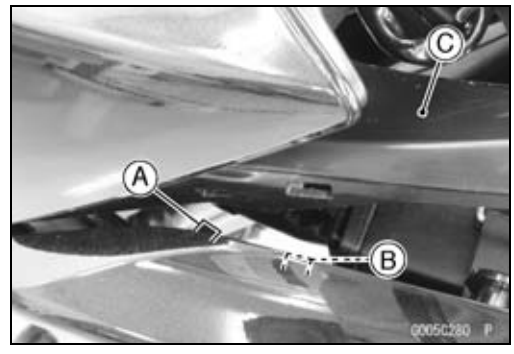
- Pull the rear part of middle fairing [A] outward to clear the projections [B].

NOTE

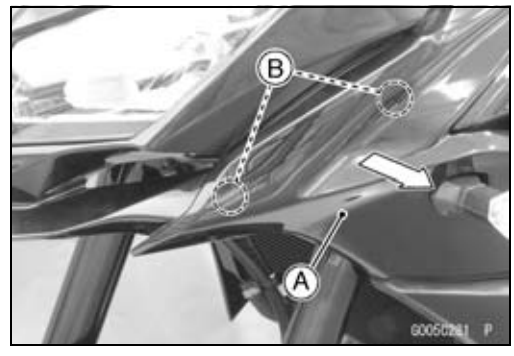
○*To protect the hook and tab, hold the middle part of middle fairing.*



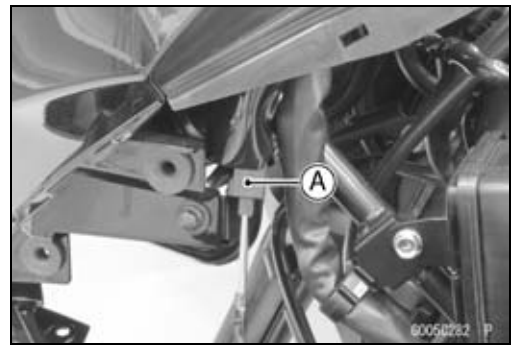
- Clear the hook [A] and tab [B] of the middle fairing from the inner cover [C].



- Pull the front part of middle fairing [A] outward to clear the projections [B].



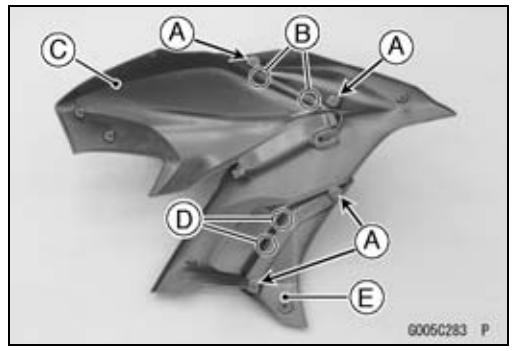
- Disconnect the turn signal light lead connector [A].
- Remove the middle fairing.



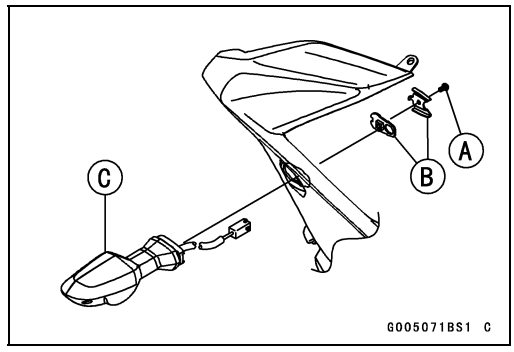
Fairings

Middle Fairing Disassembly

- Remove:
  Middle Fairing (see Middle Fairing Removal)
  Screws [A]
- Clear the tabs [B] on the middle fairing from the tank cover [C].
- Clear the hooks [D] on the radiator cover [E] from the middle fairing.

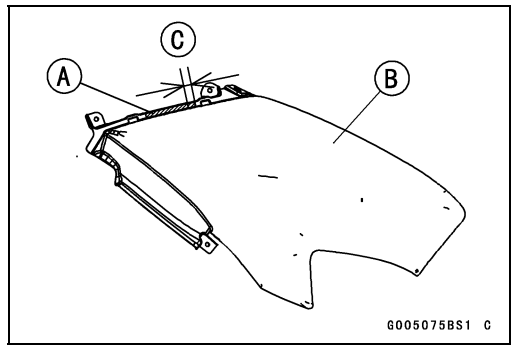


- Remove:
  Screw [A]
  Washers [B]
  Turn Signal Light [C]

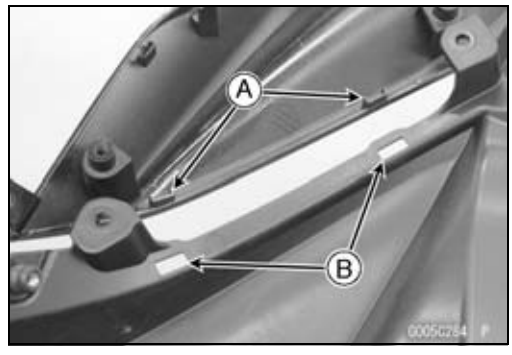


Middle Fairing Assembly

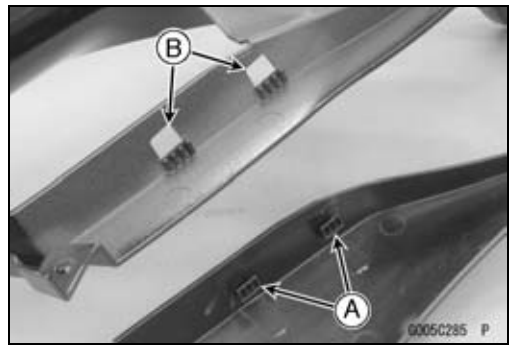
- Installation is the reverse of removal.
- Stick the pad [A] to the edge of tank cover [B] as shown.
  10 mm (0.39 in.)



- Insert the tabs [A] of middle fairing into the slots [B] on the tank cover.



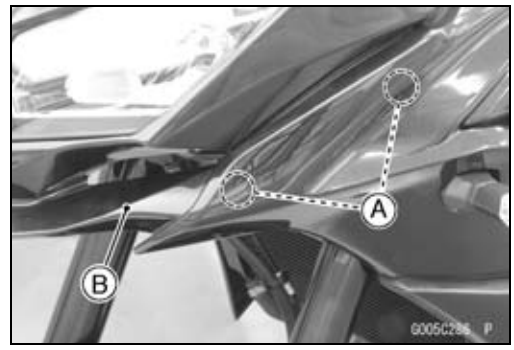
- Insert the hooks [A] of radiator cover into the slots [B] on the middle fairing.



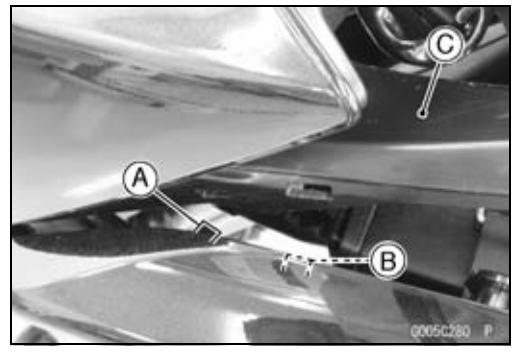
Fairings

Middle Fairing Installation

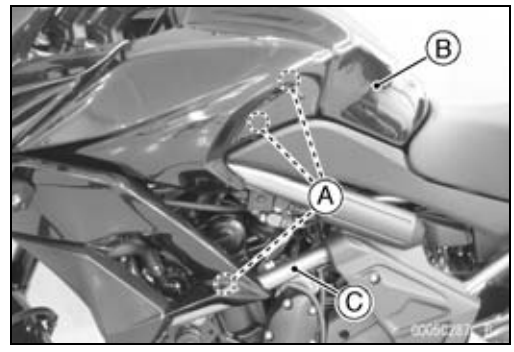
- Connect the turn signal light lead connector.
- Insert the projections [A] on the front part of middle fairing into the grommets on the upper fairing [B].



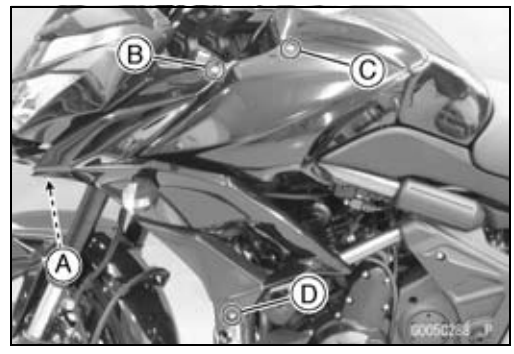
- Insert the hook [A] and tab [B] of middle fairing into the slots on the inner cover [C].



- Insert the projections [A] on the rear part of middle fairing into the grommets on the fuel tank [B] and the frame [C].



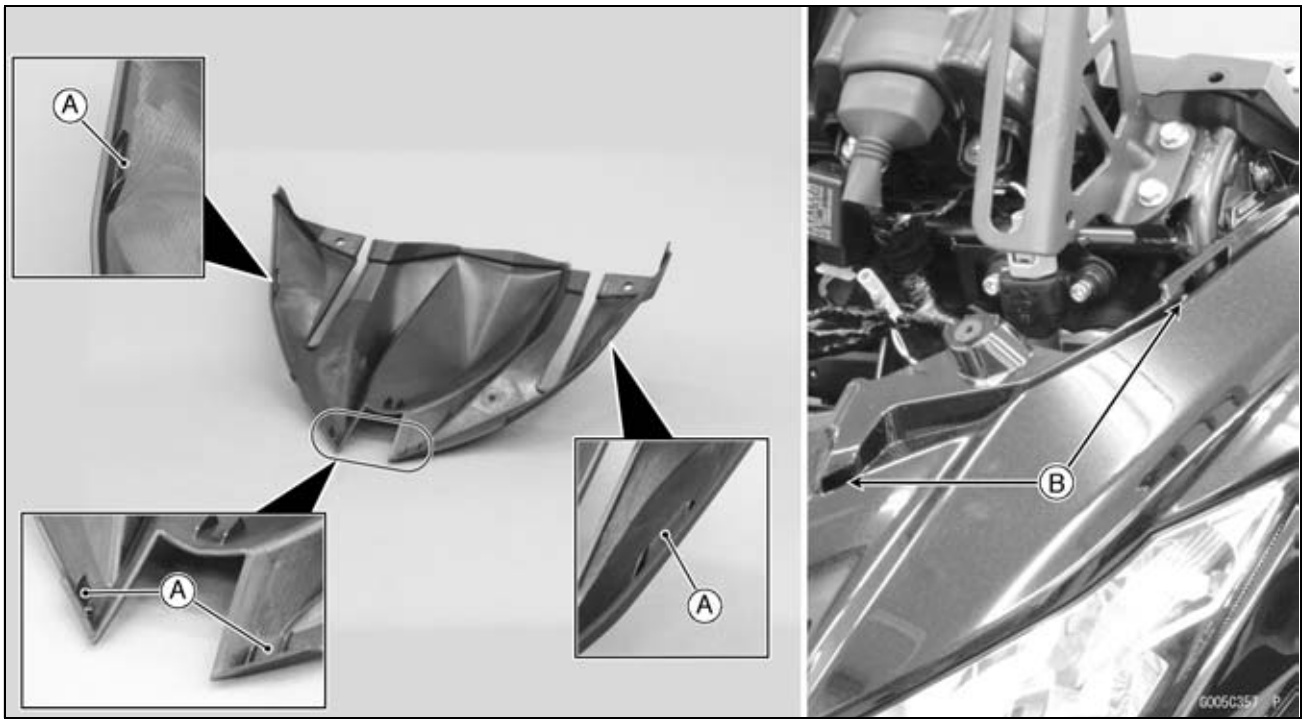
- Install:
  Quick Rivet [A]
  M5 Bolt, L = 16 mm (0.63 in.) [B] and Washer
  M5 Bolt, L = 12 mm (0.47 in.) [C] and Washer
  M6 Bolt [D] and Collar
- Tighten the bolts.



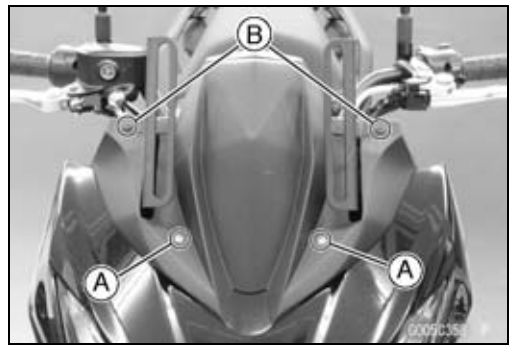
Fairings

Meter Cover Removal

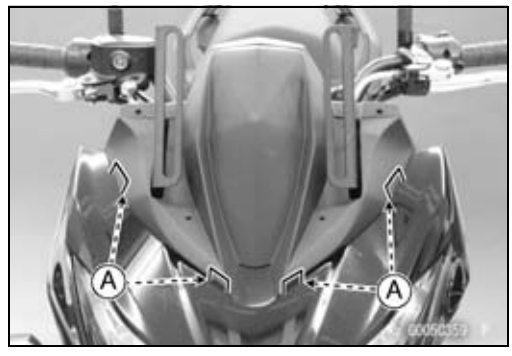
Tabs [A]
Slots [B] (Both Sides)



- Remove:
  Windshield (see Windshield Removal)
  Bolts [A] and Washers
  Quick Rivets [B]



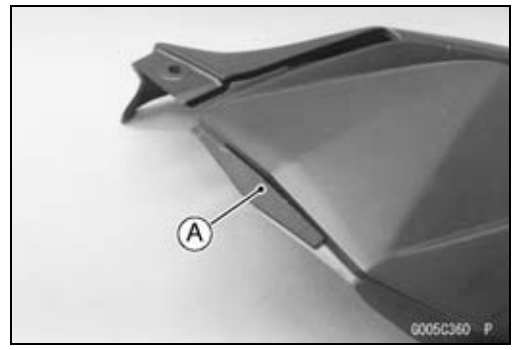
- Clear the tabs [A] on the meter cover and remove the meter cover forward.



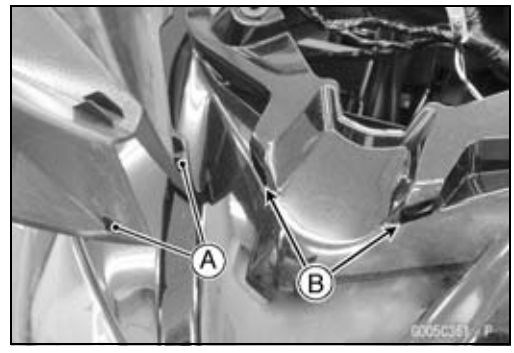
Fairings

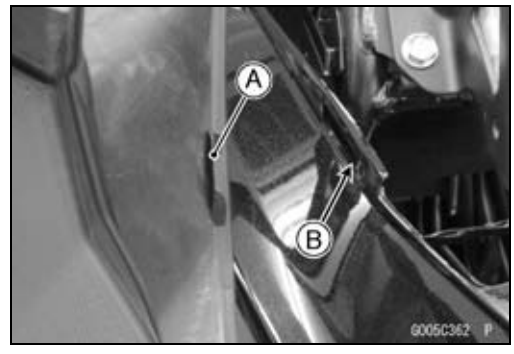
Meter Cover Installation

- Install the pad [A] to the meter cover.



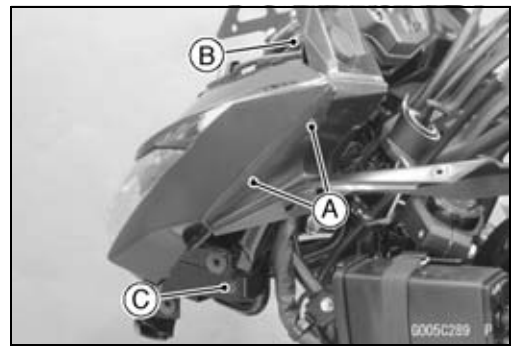
- Insert the tabs [A] of meter cover into the slots [B] on the upper fairing.
- Install the bolts and washers, and tighten them.
- Install the removed parts (see appropriate chapters).



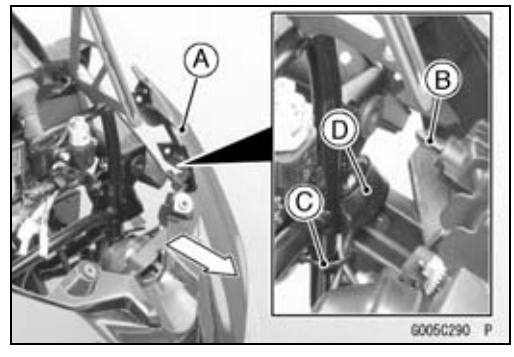


Upper Fairing Removal

- Remove:
  Middle Fairings (see Middle Fairing Removal)
  Windshield (see Windshield Removal)
  Meter Cover (see Meter Cover Removal)
  Quick Rivets [A] (Both Sides)
  Screw [B] (Both Sides)
  Bolt [C] (Both Sides)

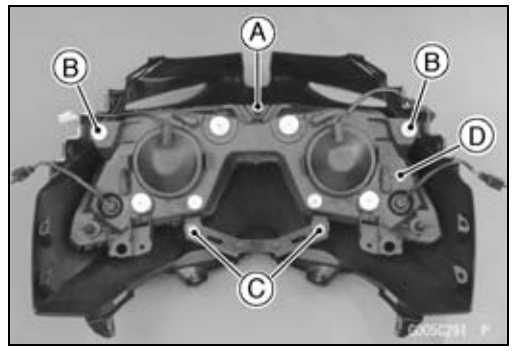


- Pull the upper fairing [A] forward to clear the projection [B] on both sides.
- Cut the band [C] on both sides.
- Slide the cover [D] and disconnect the headlight lead connector and the city light lead connector on both sides.
- Remove the upper fairing.

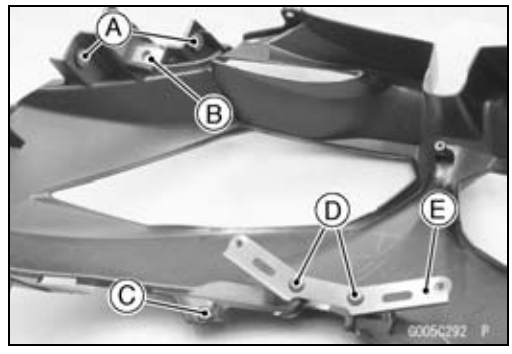


Fairings

Upper Fairing Disassembly



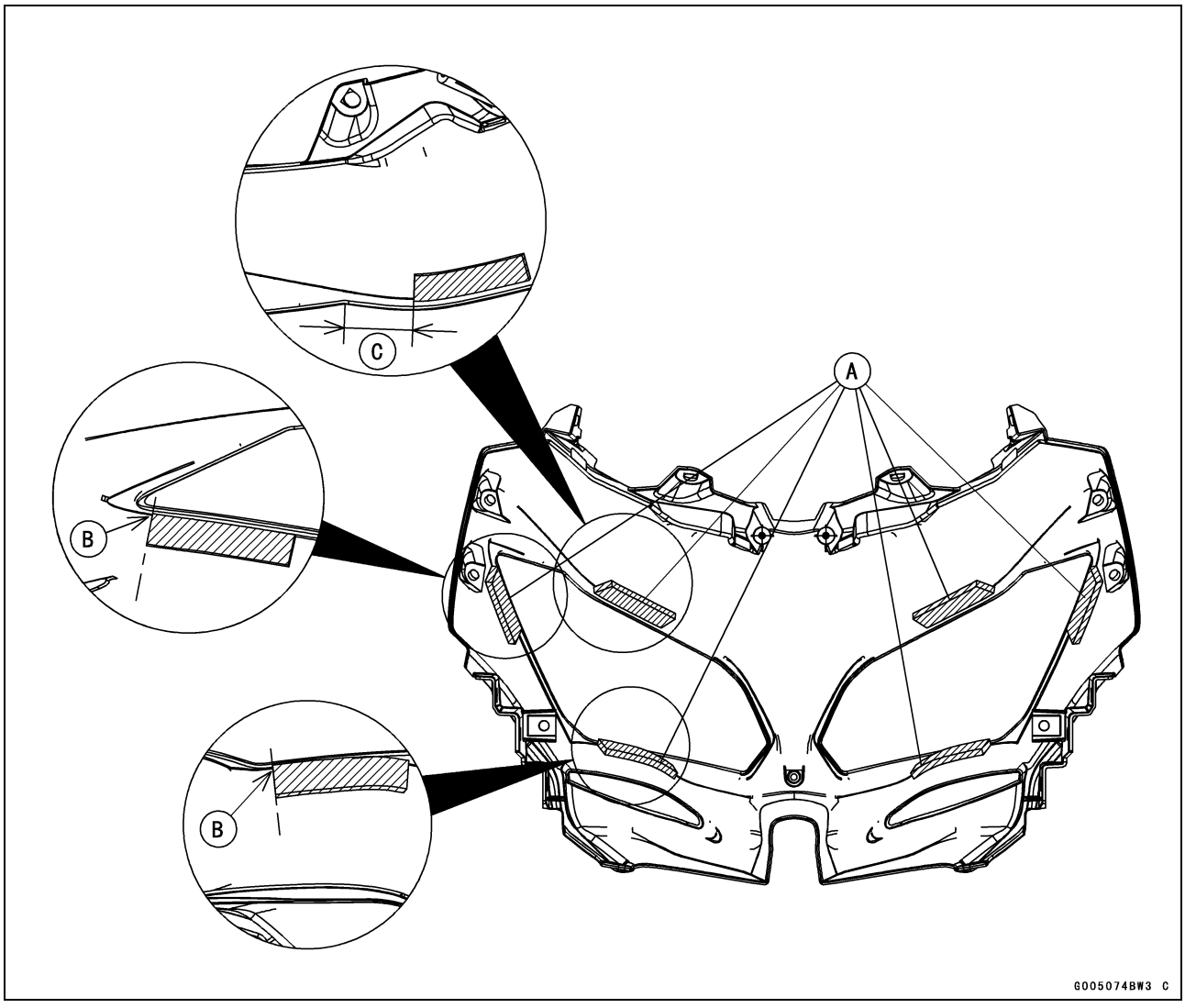
● Remove:
Upper Fairing (see Upper Fairing Removal)
Screw [A]
M6 Bolts [B] and Washers
M5 Bolts [C] and Washers
Headlight [D]



● Remove:
Grommets [A] (Both Sides)
Clip Nut [B] (Both Sides)
Wellnut [C] (Both Sides)
Screws [D]
Bracket [E]

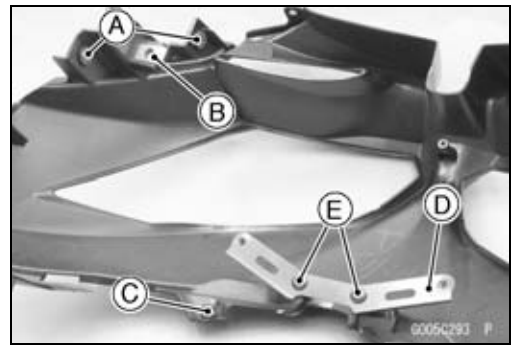
Upper Fairing Assembly

● Stick the pads [A] in back of the upper fairing.
○Align the corner of pad [B] with the curve end of the fairing.
40 mm (1.6 in.) [C]

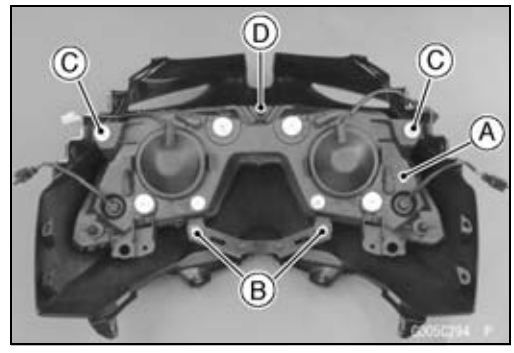


Fairings

- Install the grommets [A] on both sides.
○Face the large diameter side of the grommet outward.
- Install:
  Clip Nut [B] (Both Sides)
  Wellnut [C] (Both Sides)
  Bracket [D]
- Tighten the screws [E].

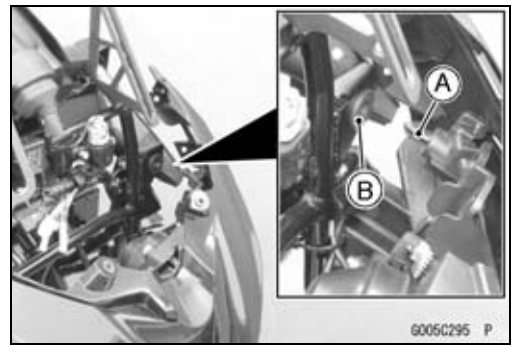


- Install:
  Headlight [A]
- Tighten:
  M5 Bolts [B] and Washers
  M6 Bolts [C] and Washers
  Screw [D]



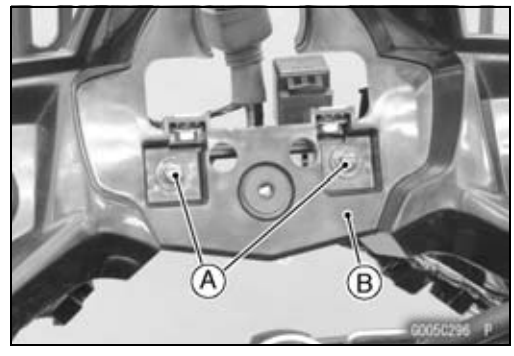
Upper Fairing Installation

- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Connect the headlight lead connectors, the city light lead connectors and the turn signal light lead connectors.
- Insert the projection [A] on the upper fairing into the grommet [B] of the upper fairing bracket on both sides.
- Tighten the bolts and screws.
- Install the removed parts (see appropriate chapters).



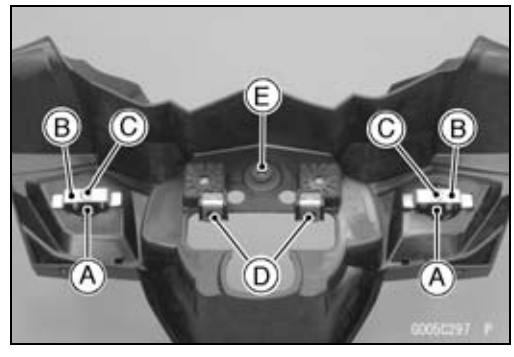
Inner Cover Removal

- Remove:
  Middle Fairings (see Middle Fairing Removal)
  Windshield (see Windshield Removal)
  Meter Cover (see Meter Cover Removal)
  Upper Fairing (see Upper Fairing Removal)
  Meter Unit (see Meter Unit Removal in the Electrical System chapter)
  Bolts [A] and Washers
  Inner Cover [B]



Inner Cover Installation

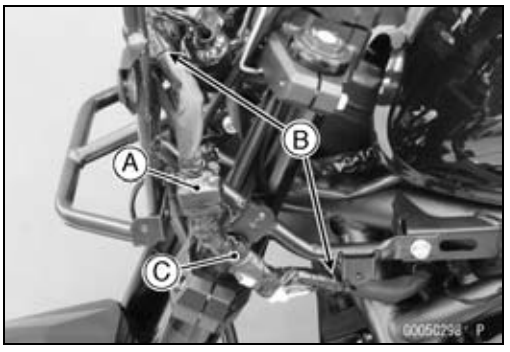
- Install:
  Caps [A]
  Holders [B]
  Screws [C]
  Clip Nuts [D]
- Install the damper [E].
○Face the small diameter side of damper to the inside of inner cover.
- Install the inner cover, bolts and washers.
- Tighten the bolts.
- Install the removed parts (see appropriate chapters).



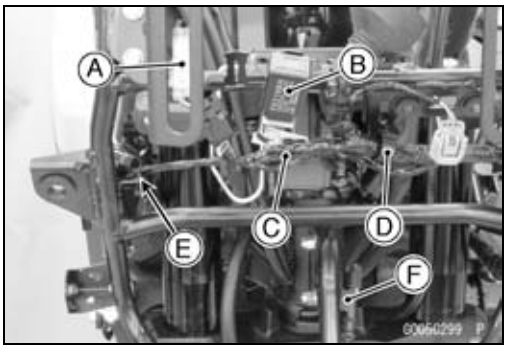
Fairings

Upper Fairing Bracket Removal

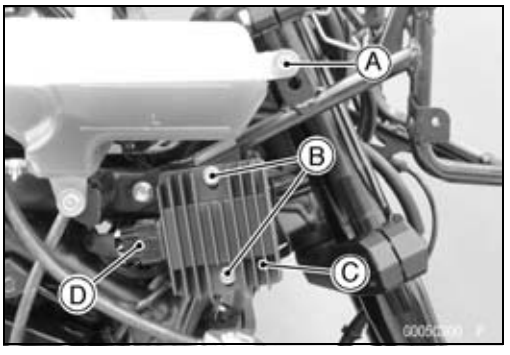
- Remove:
  Middle Fairings (see Middle Fairing Removal)
  Windshield (see Windshield Removal)
  Meter Cover (see Meter Cover Removal)
  Upper Fairing (see Upper Fairing Removal)
  Meter Unit (see Meter Unit Removal in the Electrical System chapter)
  Inner Cover (see Inner Cover Removal)
  Evaporative Emission Control System (CAL, SEA-B1, TH and CN Models, see Parts Removal/Installation in the Fuel System (DFI) chapter)
  Vehicle-down Sensor (see Vehicle-down Sensor Removal/Installation in the Fuel System (DFI) chapter)
- Free the main harness [A] from the bands [B] and the clamp [C].



- Take the accessory connector [A] and the turn signal relay [B] off the upper fairing bracket.
- Free the main harness [C] from the clamp [D] and the band [E].
- For KLE650F, take the front wheel rotation sensor lead connector [F] off the upper fairing bracket.

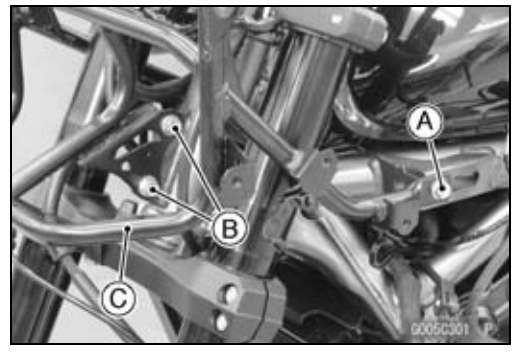


- Remove:
  Coolant Reserver Tank Bolt (Front) [A]
  Regulator/Rectifier Bolts [B]
  Regulator/Rectifier [C]
- Disconnect the regulator/rectifier connector [D].



Fairings

- Remove:
  Bolt [A] (Both Sides)
  Bolts [B] and Nuts
  Upper Fairing Bracket [C]



Upper Fairing Bracket Installation

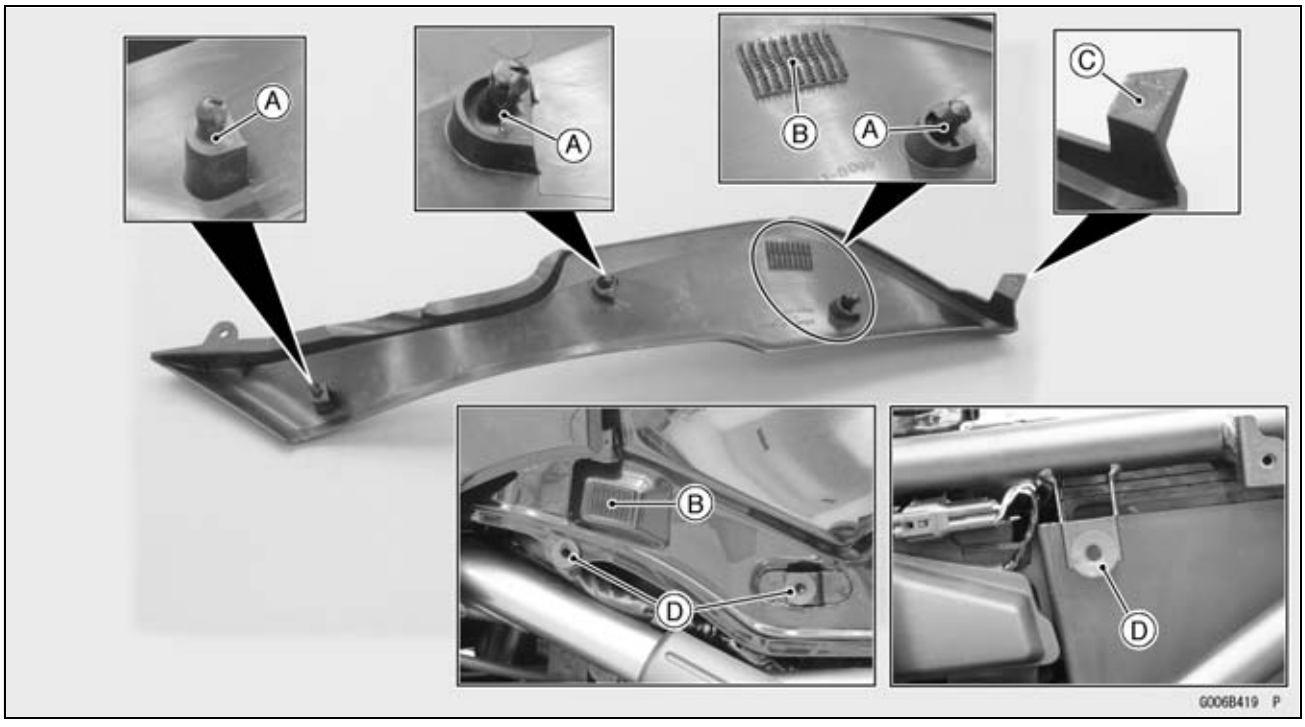
- Installation is the reverse of removal.
- Run the harness and the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

Torque - Regulator/Rectifier Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

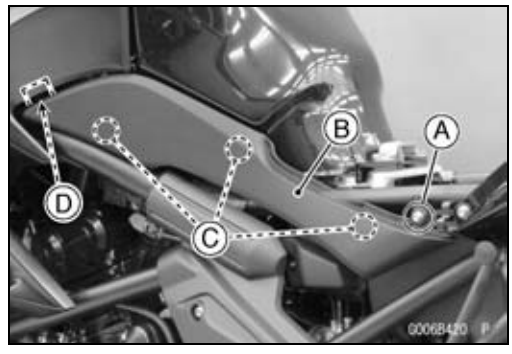
Side Covers

Side Cover Removal

Projections [A]
Hook Fasteners [B]
Tab [C]
Grommets [D]

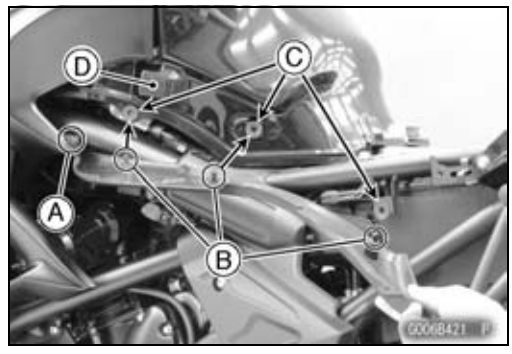


- Remove:
  Seat (see Seat Removal)
  Bolt [A] and Washer
- Pull the side cover [B] outward to clear the projections [C].
- Clear the tab [D] of the side cover from the fuel tank.



Side Cover Installation

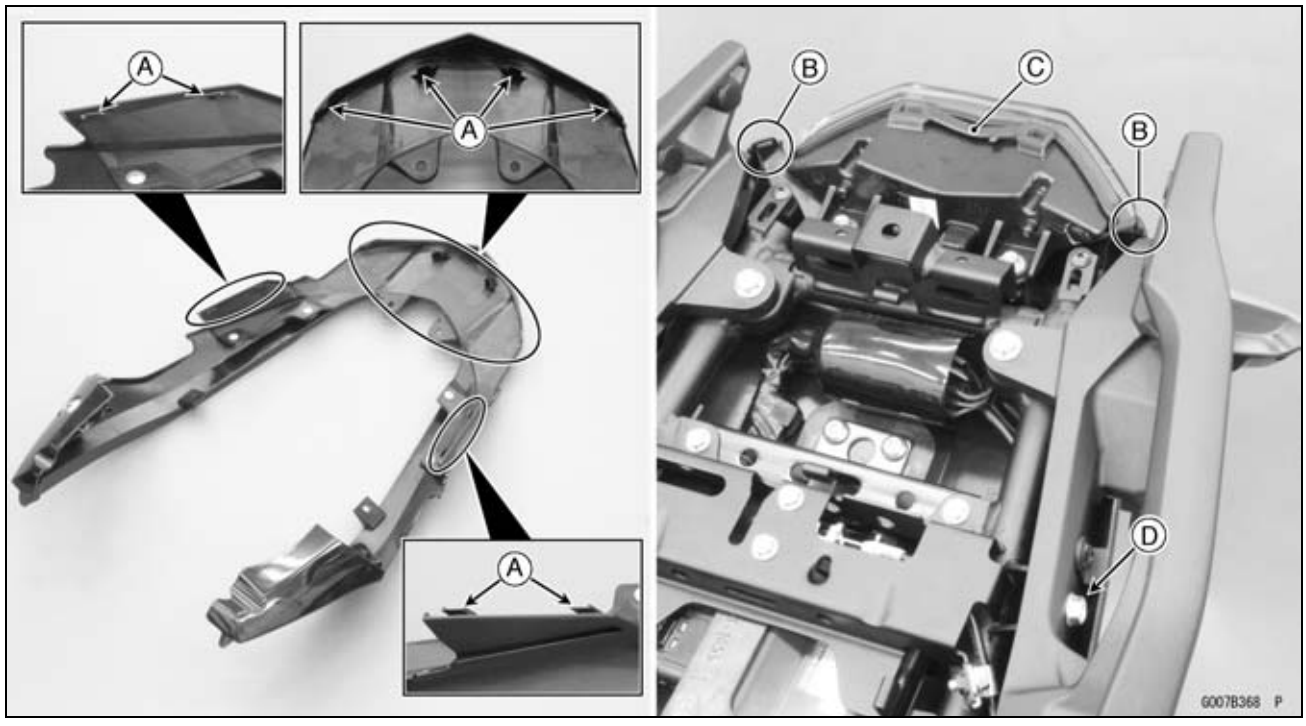
- Insert the tab [A] of the side cover under the fuel tank.
- Insert the projections [B] on the side cover into the grommets [C] on the fuel tank and the frame.
- Fit the hook fasteners [D].



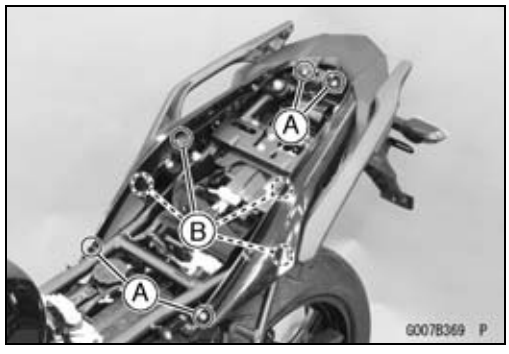
Seat Cover

Seat Cover Removal

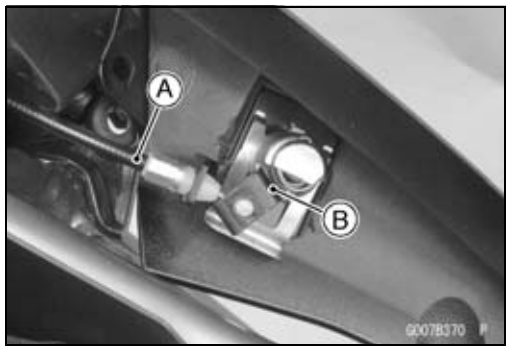
Tabs [A]
Slots [B]
Damper [C]
Inside of Rear Fender [D] (Both Sides)



- Remove:
  Seat (see Seat Removal)
  Bolts and Washers [A]
  Quick Rivets [B]



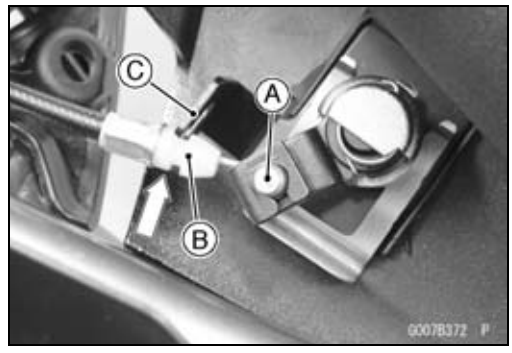
- Free the seat lock cable [A] from the key cylinder [B].
- Remove the seat cover upward.



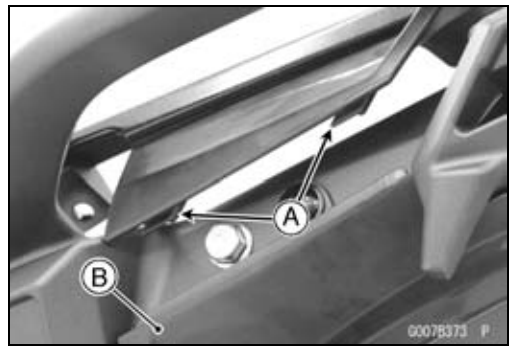
Seat Cover

Seat Cover Installation

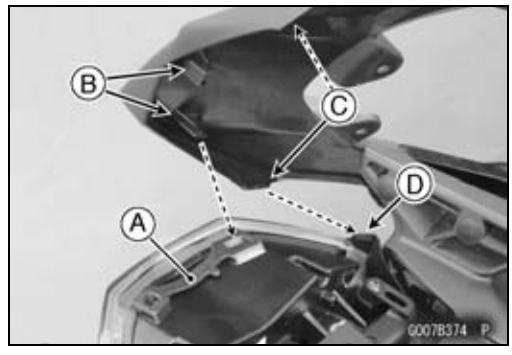
- Install the seat lock cable tip [A] to the key cylinder.
- Install the seat lock cable [B] to the bracket [C].



- Insert the tabs [A] on the seat cover to the inside of the rear fender [B] on both sides.

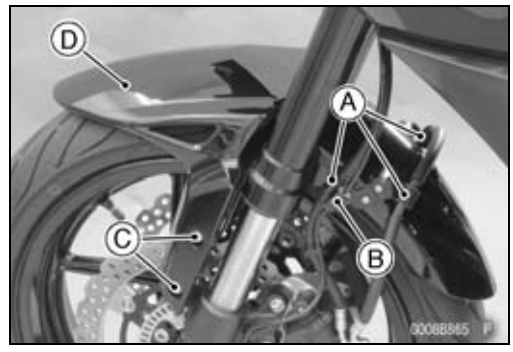


- Install the damper [A] onto the hollows of the tail/brake light.
- Put the tabs [B] on the seat cover to the damper.
- Insert the tabs [C] on the seat cover to the slot [D] (both sides).
- Install the quick rivets, washers and bolts.
- Tighten the bolts.
- Install the removed parts (see appropriate chapters).



Fenders

Front Fender Removal



- Clear the brake hoses from the clamps [A].
- For KLE650F, clear the front wheel rotation sensor lead from the clamp [B].
- Remove:
  Bolts [C] and Washers (Both Sides)
  Front Fender [D]

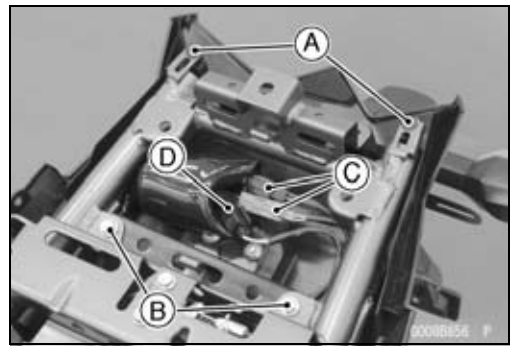
Front Fender Installation

- Install the front fender.
- Tighten the bolts.
- Run the front wheel rotation sensor lead (KLE650F) and brake hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Flap and Rear Fender Rear Removal

Rear Fender Rear Removal

- Remove:
  Seat (see Seat Removal)
  Seat Covers (see Seat Cover Removal)
  Grab Rails (see Grab Rail Removal)
  Tail/Brake Light (see Tail/Brake Light (LED) Removal in the Electrical System chapter)

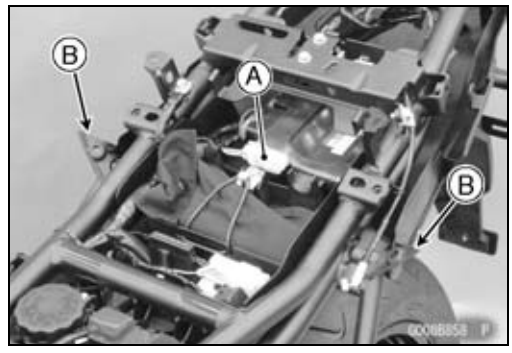


- Remove:
  Screws [A]
  Bolts [B]
- Disconnect:
  Turn Signal Light Lead Connectors [C]
  License Plate Light Lead Connector [D]

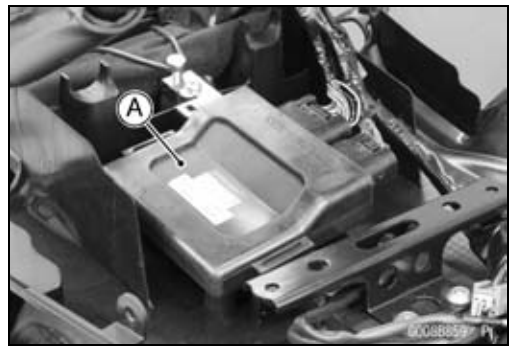
- Remove the screws [A] to free the bracket [B].
- Remove the quick rivet [C].

Fenders

- Take the Kawasaki diagnostic system connector [A] off the bracket.
- Pull the rear fender rear rearward to clear the tabs [B] from the frame.

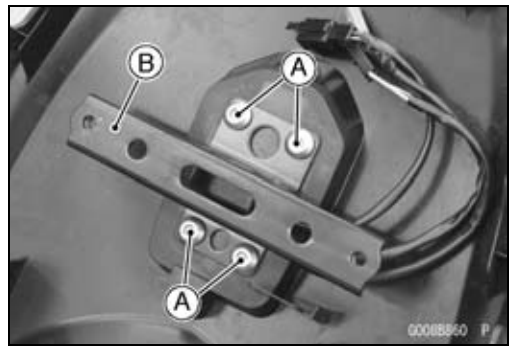


- Take the ECU [A] off the rear fender rear.
- Remove the rear fender rear with the flap.



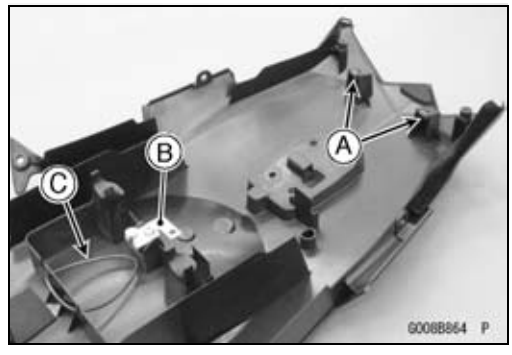
Flap Removal

- Remove:
  Bolts [A]
  Bracket [B]
  Flap



Flap and Rear Fender Rear Installation

- Install the following parts if necessary.
  Clip Nuts [A]
  Bracket [B] and Screw
  Rubber Band [C]



Flap Installation

- Installation is the reverse of removal.

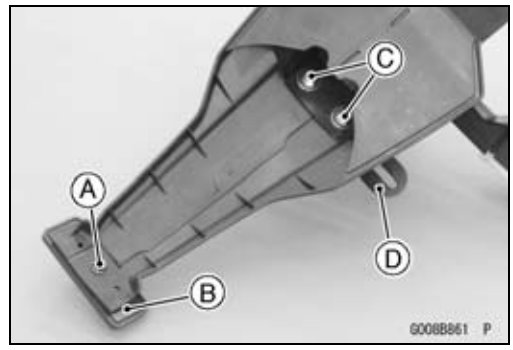
Rear Fender Rear Installation

- Installation is the reverse of removal.
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

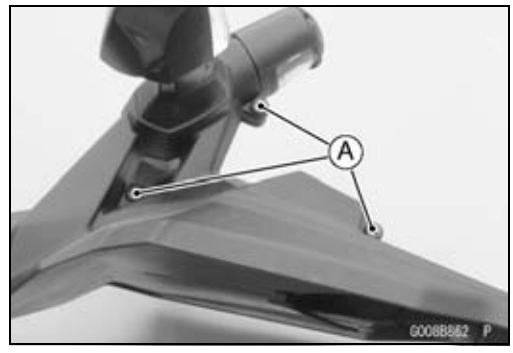
Fenders

Flap Disassembly

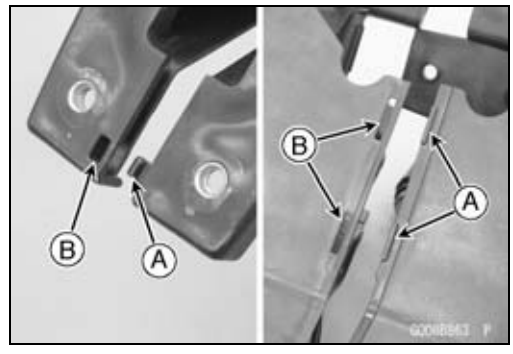
- Remove:
  Rear Fender Rear (see Flap and Rear Fender Rear Removal)
  Nut [A]
  Reflector [B]
  Bolts [C]
  License Plate Bracket [D]



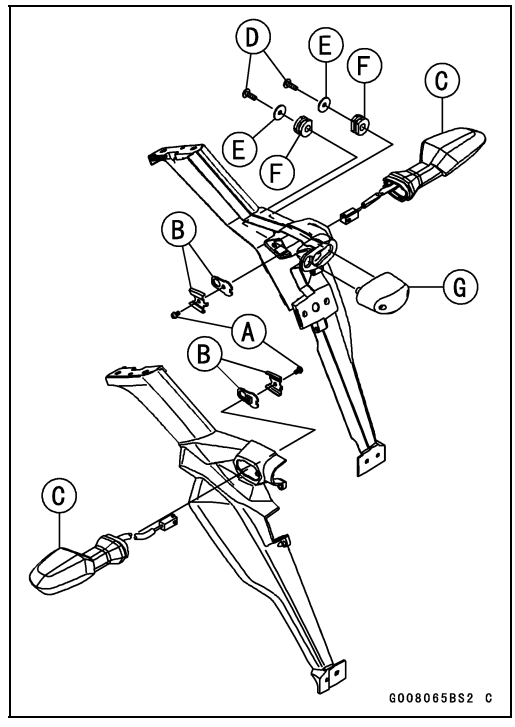
- Remove:
  Screws [A]



- Clear the tabs [A] from the slots [B] and separate the flap halves.



- Remove:
  Screws [A]
  Washers [B]
  Turn Signal Lights [C]
  Screws [D]
  Washers [E]
  Dampers [F]
  License Plate Light [G]



Fenders

Flap Assembly

- Assembly is the reverse of disassembly.
- Tighten:

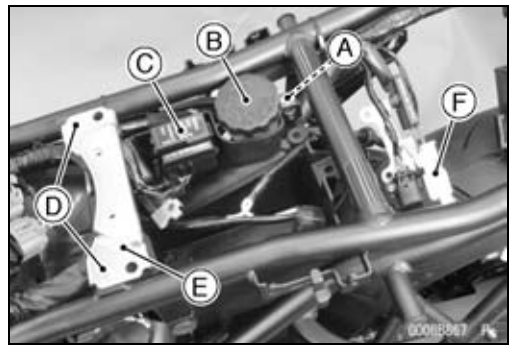
Torque - License Plate Light Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)

- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

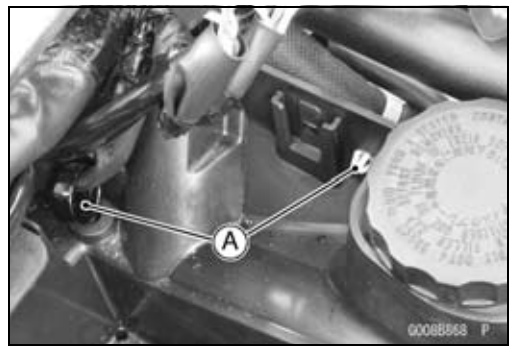
Rear Fender Front Removal

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Rear Fender Rear (see Flap and Rear Fender Rear Removal)
  Battery (see Battery Removal in the Electrical System chapter)
- Take the following parts off the rear fender front.
  Relay Box (see Relay Box Removal in the Electrical System chapter)
  Starter Relay (see Starter Relay Inspection in the Electrical System chapter)

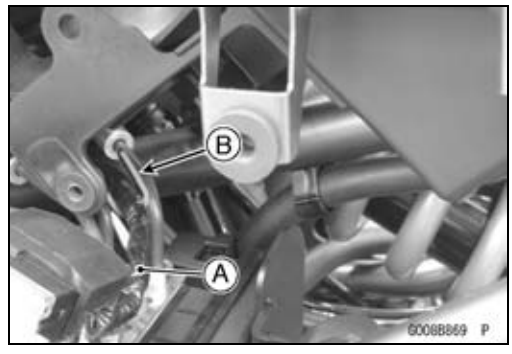
- Remove the bolt [A] to free the rear brake fluid reservoir [B].
- Take the fuse box [C] off the rear fender front.
- Remove the bolts [D] to free the fuel tank bracket [E].
- For KLE650F, disconnect the battery positive cable connector [F] for ABS system.



- Remove the clamps [A] from the rear fender front.

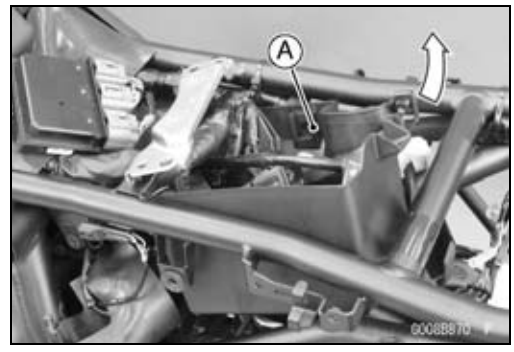


- Free the starter relay lead [A] from the hook [B] of the rear fender front.



Fenders

● Lift the rear part of the rear fender front [A] and remove it.



Rear Fender Front Installation

● Installation is the reverse of removal.
● Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
● Install the removed parts (see appropriate chapters).

Frame

Frame Inspection

- Visually inspect the frame for cracks, dents, bending, or warp.

★If there is any damage to the frame, replace it.

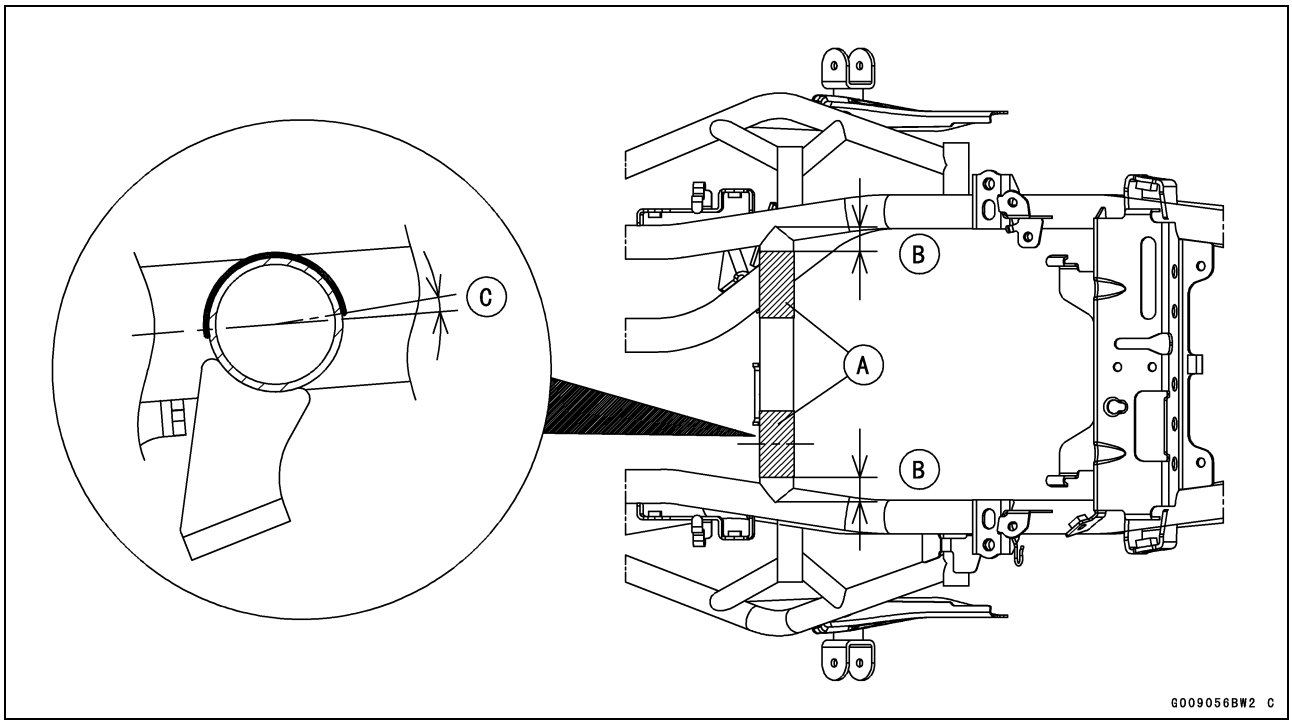
⚠ WARNING

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

- When installing the tapes [A] to the frame cross pipe, note the following.

  20 mm (0.79 in.) [B]

  About 0° ±15° [C]

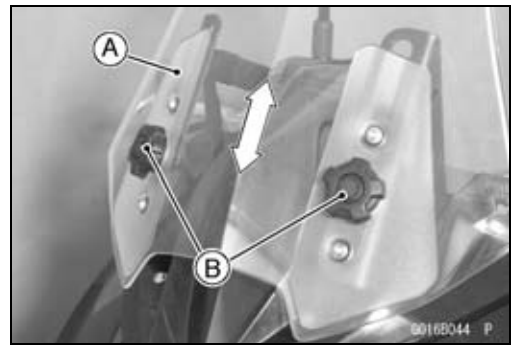


Windshield

Windshield Height Adjustment

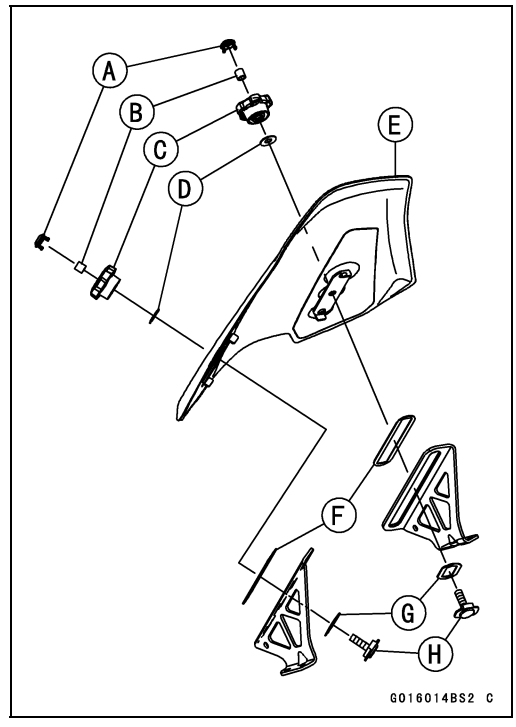
○The windshield [A] can be adjusted within 60 mm (2.4 in.) in height to suit the rider's preference.

- Loosen the adjusting knobs [B] to release the windshield.
- Adjust the windshield height.
- Tighten the adjusting knobs.
- Check that the windshield is locked securely.

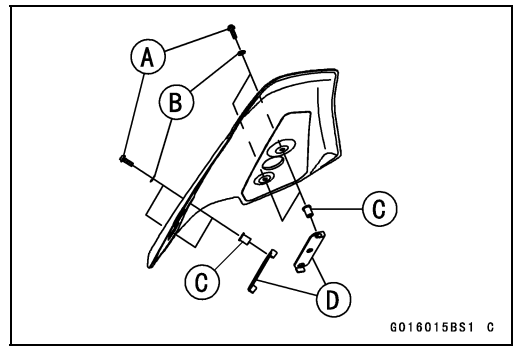


Windshield Removal

- Remove the caps [A] and the rubber caps [B] if necessary.
- Remove:
  Adjusting Knobs [C]
  Spring Washers [D]
  Windshield [E]
  Long Rectangle Washers [F]
  Short Rectangle Washers [G]
  Bolts [H]



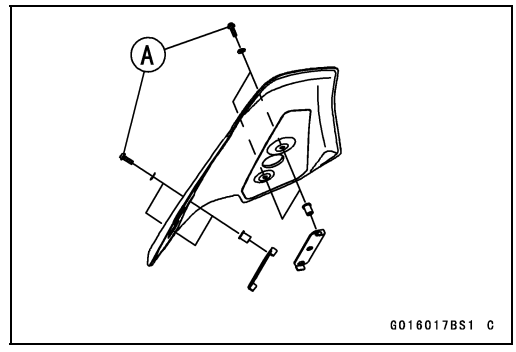
- Remove:
  Windshield Plate Bolts [A]
  Washers [B]
  Wellnuts [C]
  Plates [D]



Windshield Installation

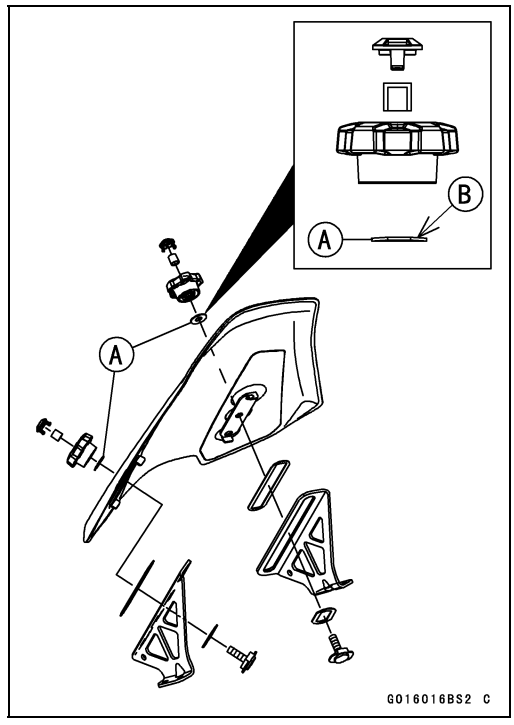
- Installation is the reverse of removal.
- Tighten:

Torque - Windshield Plate Bolts [A]: 0.43 N·m (0.044 kgf·m, 38 in·lb)



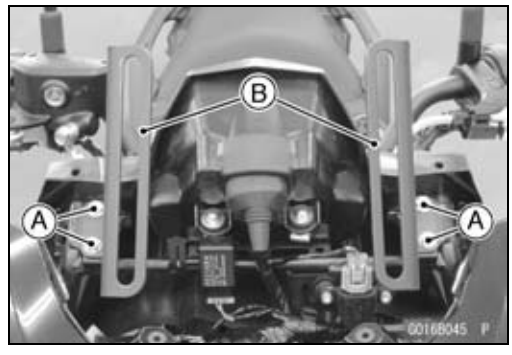
Windshield

- Install the spring washers [A] so that the tapered side [B] facing upward.



Windshield Bracket Removal

- Remove:
  Windshield (see Windshield Removal)
  Meter Cover (see Meter Cover Removal)
  Windshield Bracket Bolts [A]
  Windshield Brackets [B]

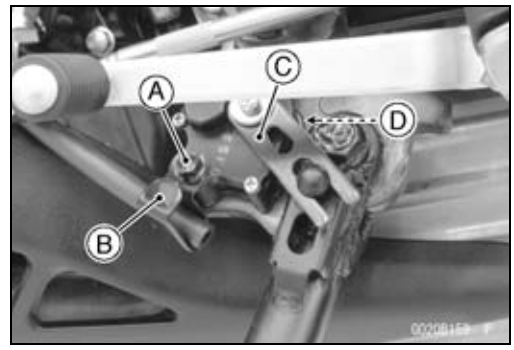


Windshield Bracket Installation

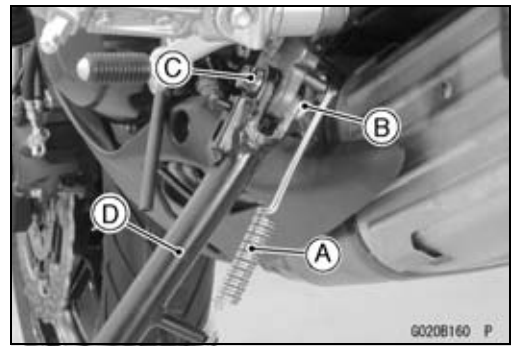
- Installation is the reverse of removal.

Side Stand

Side Stand Removal

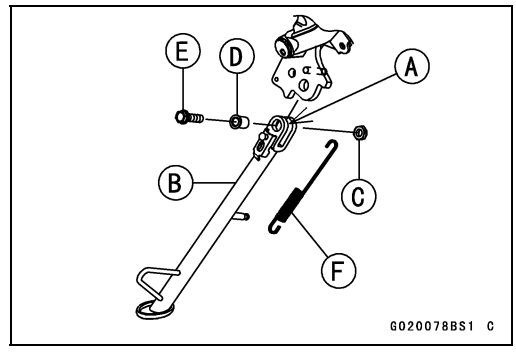


- Raise the rear wheel off the ground with a stand.
- Remove:
  Side Stand Switch Bolt [A]
  Clamp [B]
  Side Stand Switch [C]
  Spacer [D]



- Remove:
  Spring [A]
  Side Stand Nut [B]
  Side Stand Bolt [C] and Collar
  Side Stand [D]

Side Stand Installation



- Apply grease to the sliding area [A] of the side stand [B].
- Replace the side stand nut [C] with a new one.
- Install:
  Side Stand
  Collar [D]
- Tighten the side stand bolt [E] first, and then the side stand nut.

Torque - Side Stand Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)
Side Stand Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)

- Apply grease to both ends of the spring [F].
- Hook the spring.

○Face the long spring end upward so that its opening side faces forward.

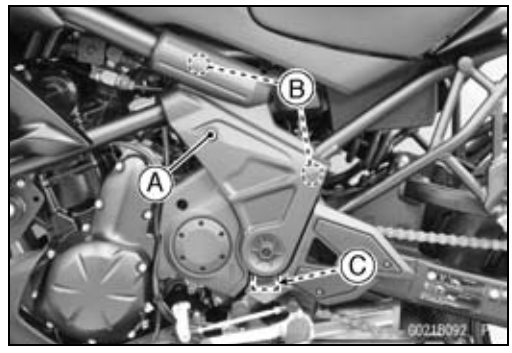
- Install:
  Spacer
  Side Stand Switch
  Clamp
- Apply a non-permanent locking agent to the threads of the side stand switch bolt, and tighten it.

Torque - Side Stand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)

Frame Covers

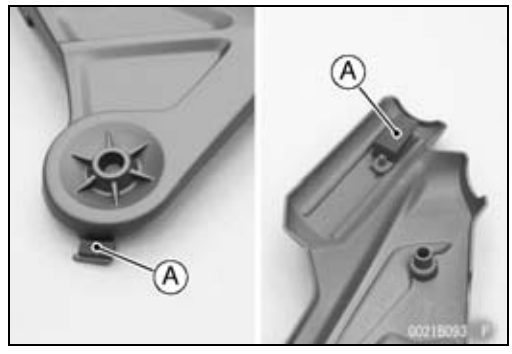
Frame Cover Removal

- Remove the bolt [A], collar and washer.
- Pull the upper part of frame cover outward to clear the projections [B].
- Clear the tab [C] on the frame cover from the frame.



Frame Cover Installation

- Install the pads [A] onto the frame cover.

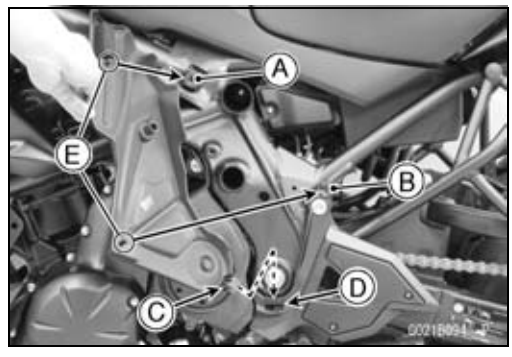


- Install the pad [A] to the footpeg bracket.

- Install the grommets.

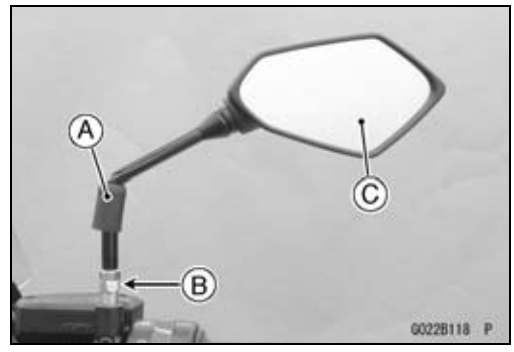
○Face the large diameter side of the grommet outward.
Grommet, ϕ = 20 mm (0.79 in.) [A]
Grommet, ϕ = 22 mm (0.87 in.) [B]

- Insert the tab [C] of frame cover into the slot [D] on the footpeg stay.
- Insert the projections [E] of frame cover into the grommets on the frame.
- Install the washer, collar and bolt.
- Tighten the bolt.



Rear View Mirrors

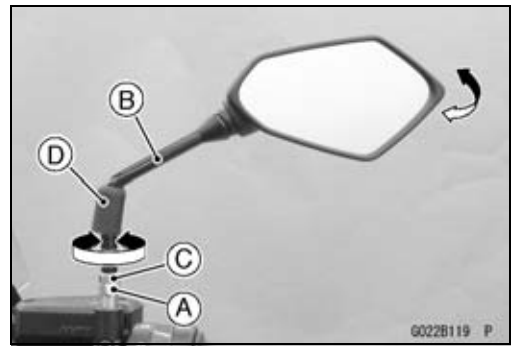
Rear View Mirror Removal



- Slide out the dust cover [A].
- Loosen the lower hexagonal area [B], and remove the rear view mirror [C] from the holder.

○The upper hexagonal area has left-hand threads.

Rear View Mirror Installation



- Screw the lower hexagonal area [A] of the rear view mirror into the holder all the way, and tighten the lower hexagonal area securely.
- Turn the stay [B] to assure the safe conditions of the rear with the rider sitting on the motorcycle by loosening the upper hexagonal area [C] clockwise.

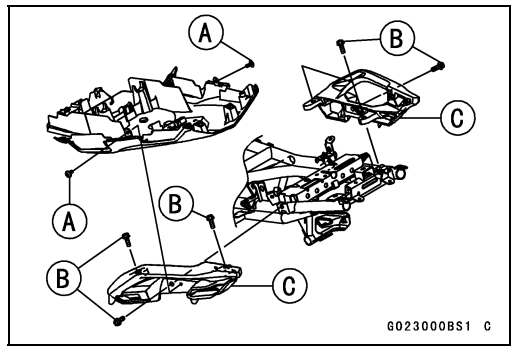
○The upper hexagonal area has left-hand threads.

- While holding the lower hexagonal area, tighten the upper hexagonal area (locknut).
- Install the dust cover [D].
- Adjust the rear view mirror [E] by slightly moving only the mirror portion of the assembly.

○Installation and adjustment of the left side mirror is common with the right side. Follow the procedure specified for the right side.

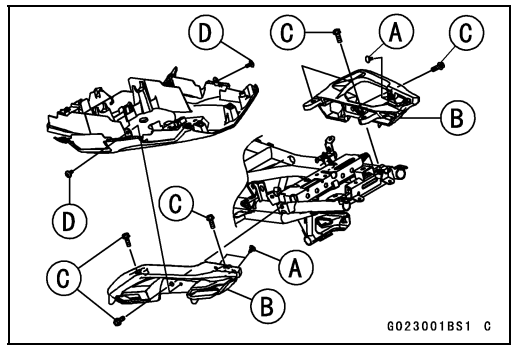
Grab Rails

Grab Rail Removal



- Remove:
  Seat Cover (see Seat Cover Removal)
  Screws [A]
  Grab Rail Bolts [B]
  Grab Rails [C]

Grab Rail Installation



- Install:
  Plugs [A]
  Grab Rails [B]
- Tighten:

Torque - Grab Rail Bolts [C]: 25 N·m (2.5 kgf·m, 18 ft·lb)

- Tighten the screws [D].
- Install the removed parts (see appropriate chapters).

Electrical System

Table of Contents

Exploded View

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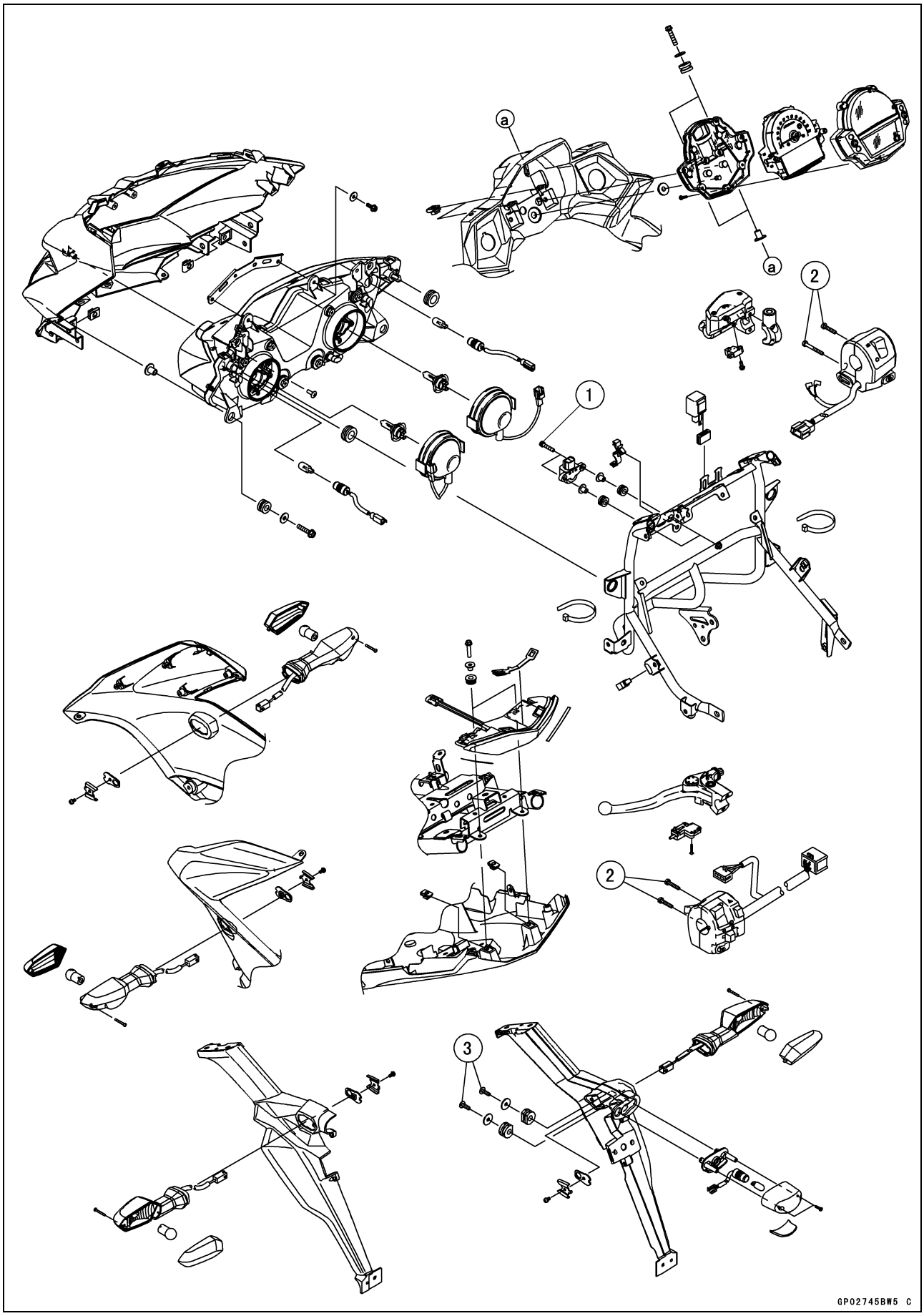
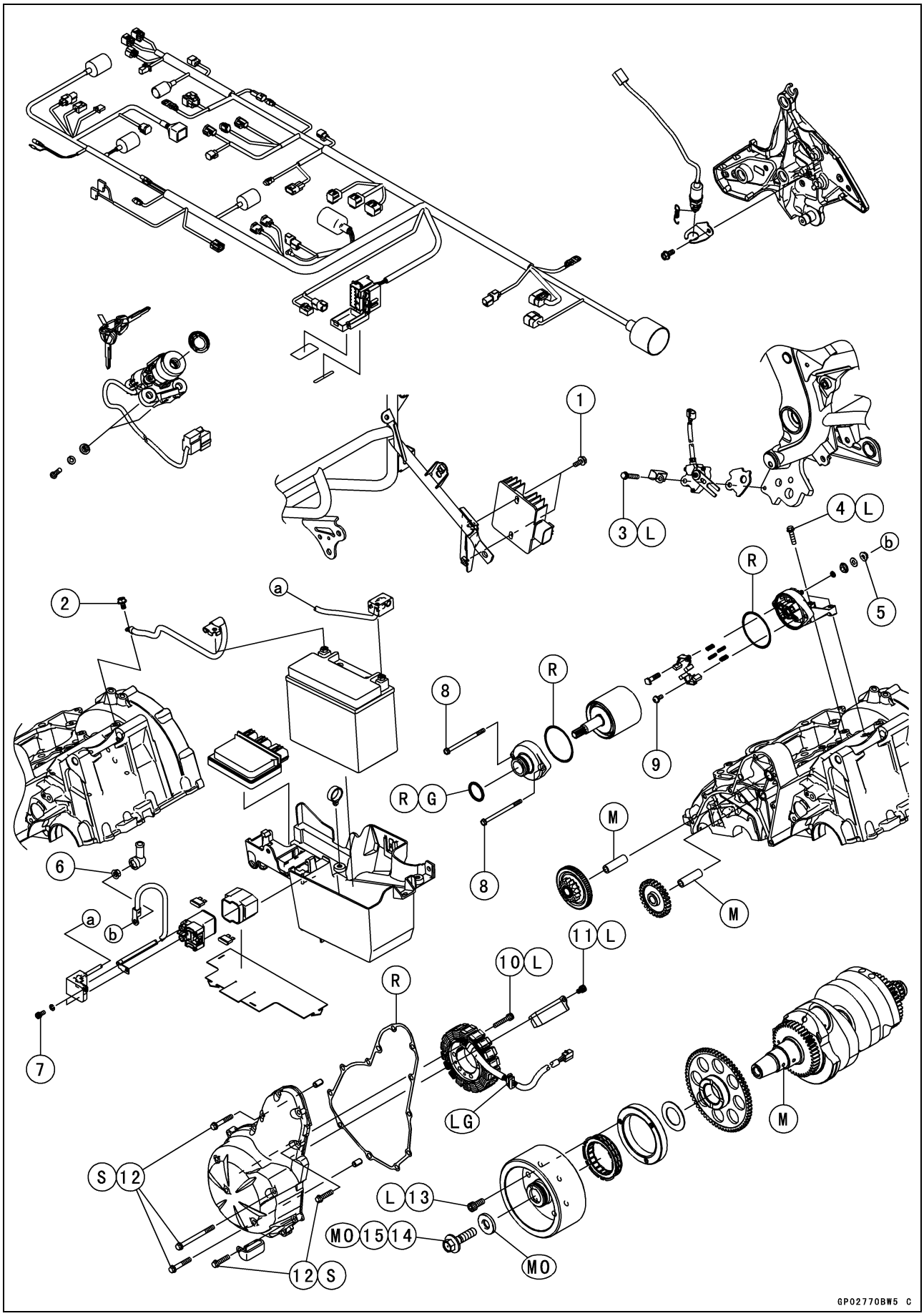
Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Vehicle-down Sensor Mounting Bolts	6.9	0.70	61 in·lb	
2	Switch Housing Screws	3.5	0.36	31 in·lb	
3	License Plate Light Screws	1.2	0.12	11 in·lb	

Exploded View

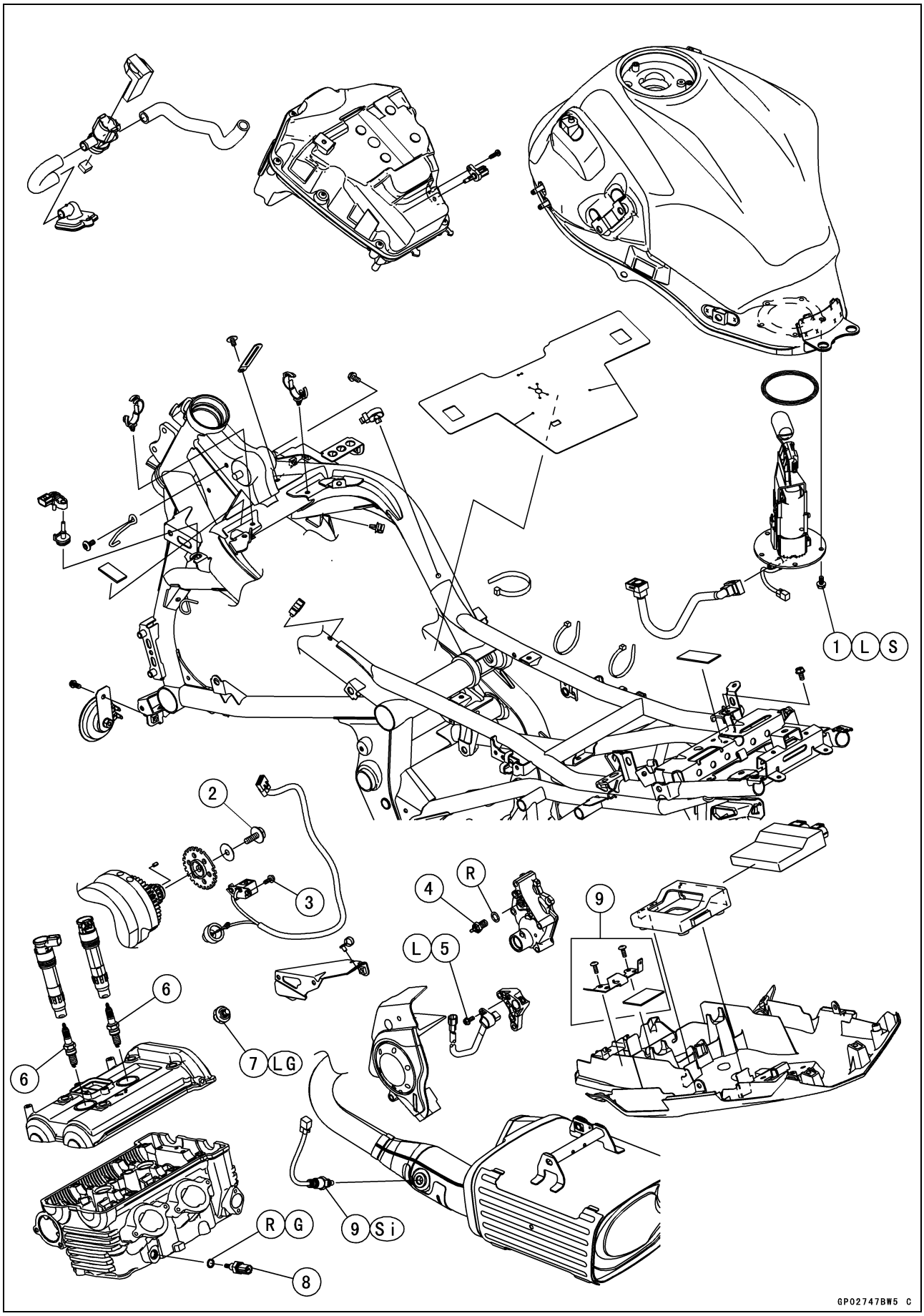


Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Regulator/Rectifier Bolts	9.8	1.0	87 in·lb	
2	Engine Ground Terminal Bolt	9.8	1.0	87 in·lb	
3	Side Stand Switch Bolt	8.8	0.90	78 in·lb	L
4	Starter Motor Mounting Bolts	9.8	1.0	87 in·lb	L
5	Starter Motor Terminal Locknut	11	1.1	97 in·lb	
6	Starter Motor Cable Terminal Nut	6.0	0.61	53 in·lb	
7	Starter Relay Terminal Bolts	3.6	0.37	32 in·lb	
8	Starter Motor Through Bolts	5.0	0.51	44 in·lb	
9	Starter Motor Brush Holder Screw	3.8	0.39	34 in·lb	
10	Stator Coil Bolts	12	1.2	106 in·lb	L
11	Alternator Lead Holding Plate Bolt	9.8	1.0	87 in·lb	L
12	Alternator Cover Bolts	12	1.2	106 in·lb	S
13	Starter Motor Clutch Bolts	34	3.5	25	L
14	Alternator Rotor Bolt (without center hole type)	155	15.8	114	MO
15	Alternator Rotor Bolt (with center hole type)	200	20.4	148	MO

G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)
R: Replacement Parts
S: Follow the specified tightening sequence.

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
2	Timing Rotor Bolt	40	4.1	30	
3	Crankshaft Sensor Bolts	6.0	0.61	53 in·lb	
4	Neutral Switch	15	1.5	11	
5	Speed Sensor Bolt	7.8	0.80	69 in·lb	L
6	Spark Plugs	15	1.5	11	
7	Oil Pressure Switch	15	1.5	11	LG
8	Water Temperature Sensor	12	1.2	106 in·lb	
9	Oxygen Sensor	25	2.5	18	Si

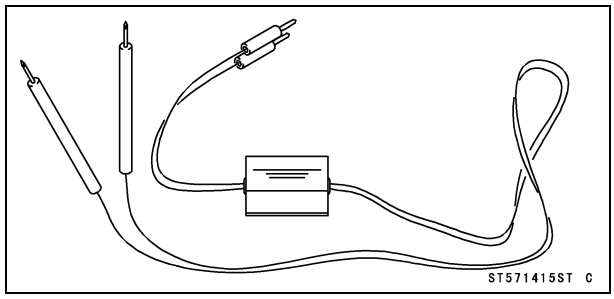
G: Apply grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
R: Replacement Parts
S: Follow the specified tightening sequence.
Si: Apply silicone grease

Specifications

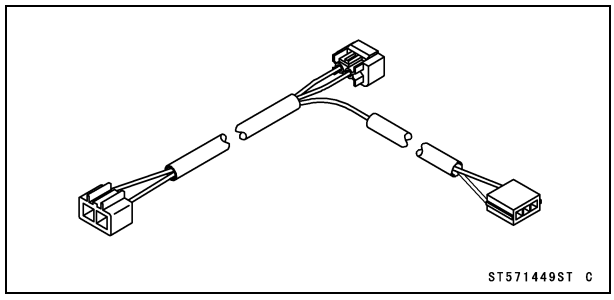
Item	Standard
Battery	
Type	Sealed Battery
Model Name	FTX12-BS
Capacity	12 V 10 Ah (10 HR)
Voltage	12.6 V or more
Gross Weight	4.2 kg (9.3 lb)
Electrolyte Volume	0.618 L (38 cu in.)
Charging System	
Alternator Type	Three-phase AC
Alternator Output Voltage (no load)	AC41 ~ 62 V @4 000 r/min (rpm)
Stator Coil Resistance	0.176 ~ 0.264 Ω @20°C (68°F)
Charging Voltage (Regulator/Rectifier Output Voltage)	14.2 ~ 14.8 V @25°C (77°F)
Ignition System	
Crankshaft Sensor:	
Resistance	376 ~ 564 Ω @20 (68°F)
Peak Voltage	3.9 V or more
Stick Coil:	
Primary Winding Resistance	1.11 ~ 1.50 Ω @20 (68°F)
Secondary Winding Resistance	6.4 ~ 9.6 kΩ @20 (68°F)
Primary Peak Voltage	117 V or more
Spark Plug:	
Type	NGK CR9EIA-9
Gap	0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)
Electric Starter System	
Starter Motor:	
Brush Length	12 mm (0.47 in.) [Service Limit: 6.5 mm (0.26 in.)]
Air Switching Valve	
Resistance	18 ~ 22 Ω @20°C (68°F)
Switches and Sensors	
Rear Brake Light Switch Timing	ON after about 12 mm (0.47 in.) of pedal travel
Engine Oil Pressure Switch Connections	When engine is stopped: ON When engine is running: OFF
Water Temperature Sensor Resistance	in the text
Fuel Level Sensor Resistance:	
Full Position	9 ~ 11 Ω
Empty Position	213 ~ 219 Ω

Special Tools and Sealant

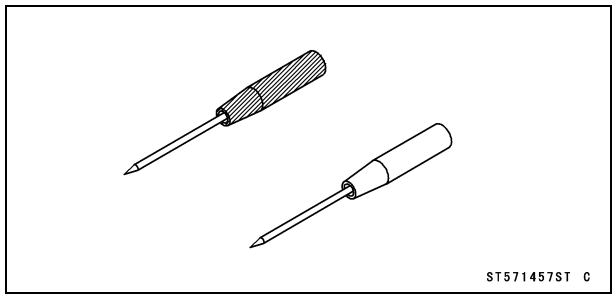
Peak Voltage Adapter:
57001-1415



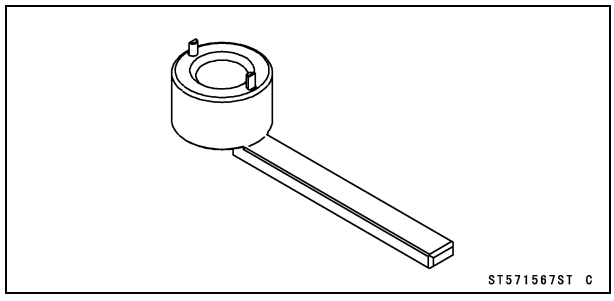
Lead Wire - Peak Voltage Adapter:
57001-1449



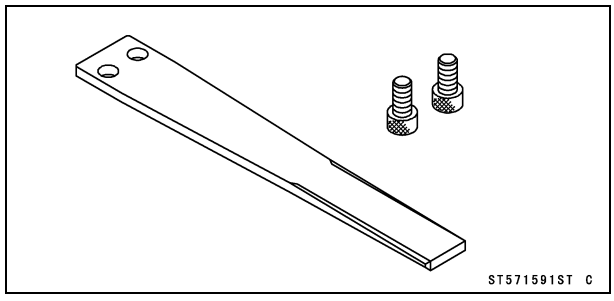
Needle Adapter Set:
57001-1457



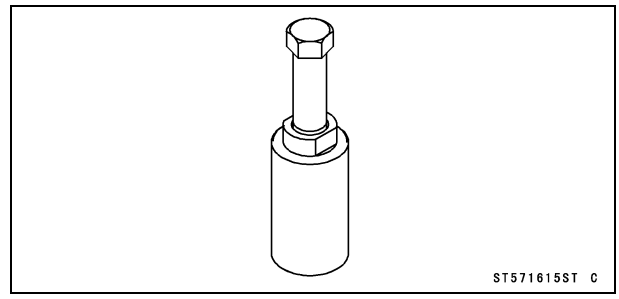
Rotor Holder:
57001-1567



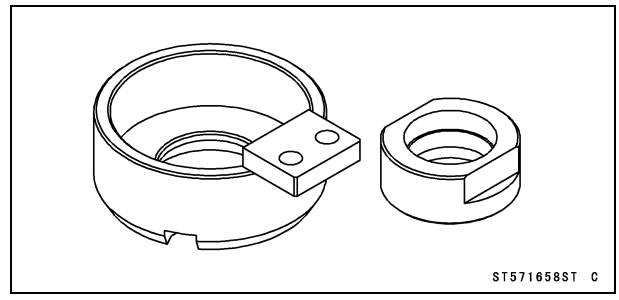
Grip:
57001-1591



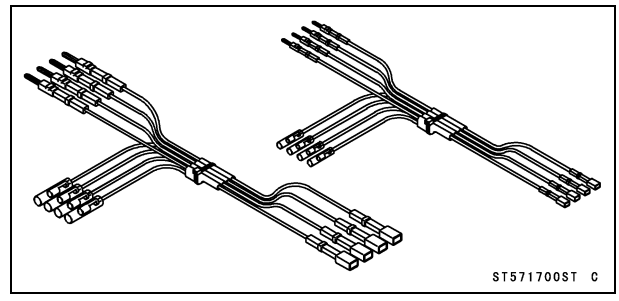
Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:
57001-1615



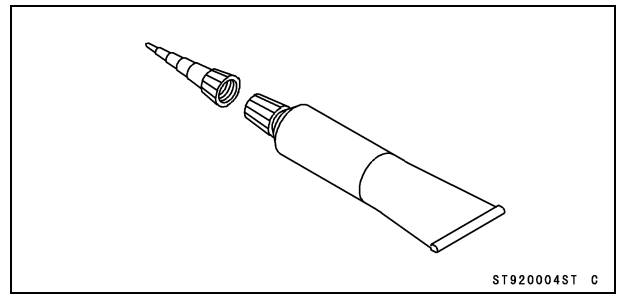
Rotor Holder:
57001-1658



Measuring Adapter:
57001-1700

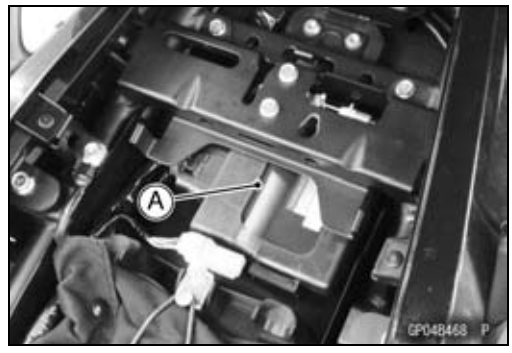


Liquid Gasket, TB1211F:
92104-0004

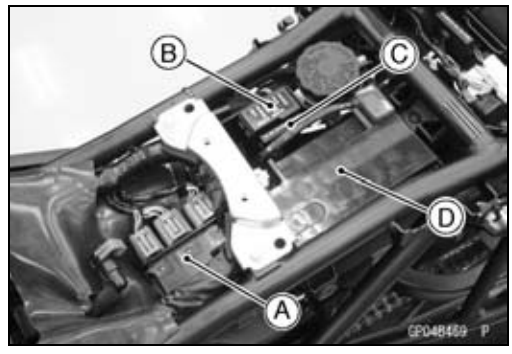


Parts Location

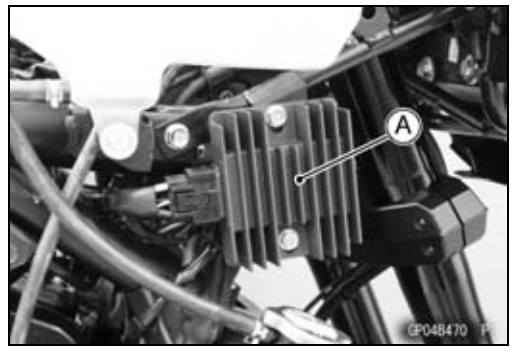
ECU [A]



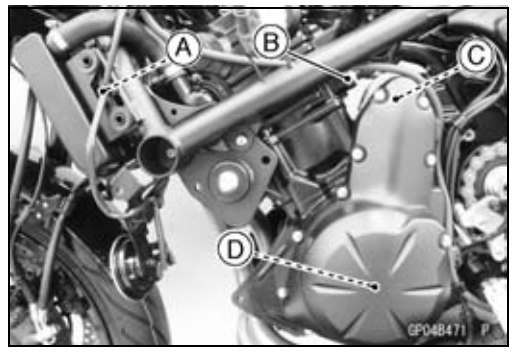
Relay Box [A]
Fuse Box 1 [B]
Fuse Box 2 [C]
Battery 12 V 10 Ah [D]



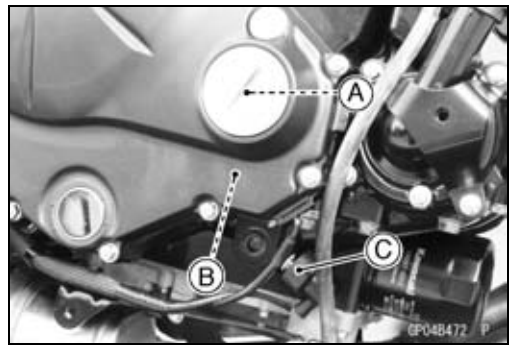
Regulator/Rectifier [A]



Radiator Fan Motor [A]
Water Temperature Sensor [B]
Starter Motor [C]
Alternator [D]

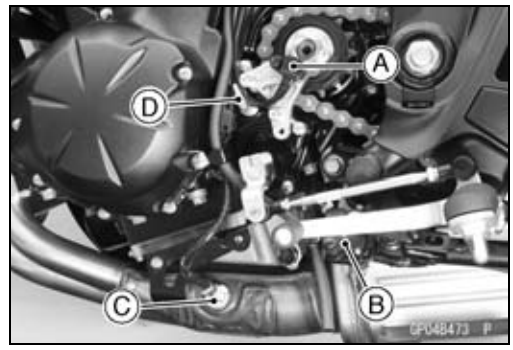


Timing Rotor [A]
Crankshaft Sensor [B]
Oil Pressure Switch [C]

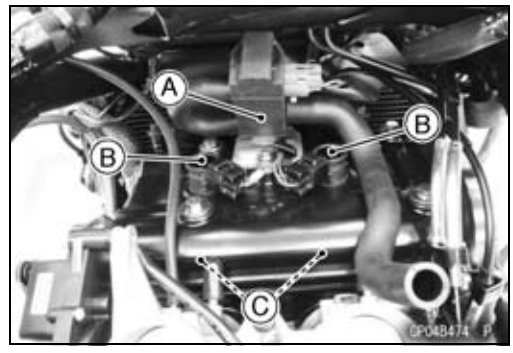


Parts Location

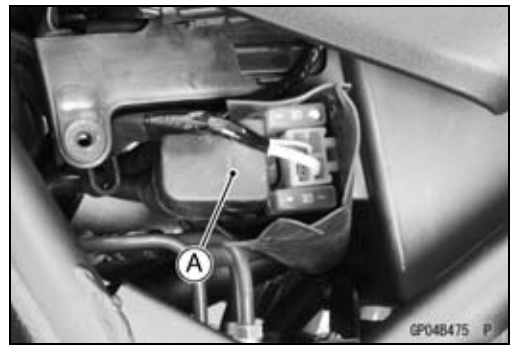
Speed Sensor [A]
Side Stand Switch [B]
Oxygen Sensor [C]
Neutral Switch [D]



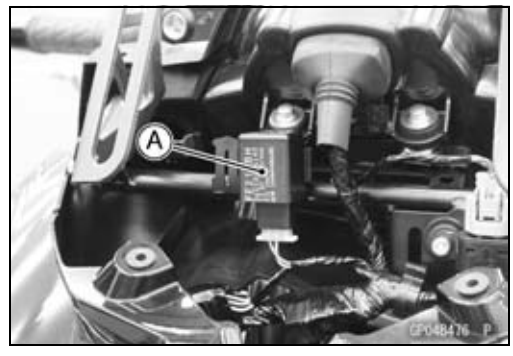
Air Switching Valve [A]
Stick Coils [B]
Spark Plugs [C]



Starter Relay [A]



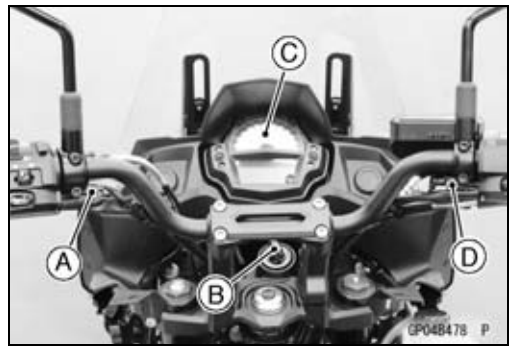
Turn Signal Relay [A]



Rear Brake Light Switch [A]

Parts Location

Starter Lockout Switch [A]
Ignition Switch [B]
Meter Unit [C]
Front Brake Light Switch [D]



Parts Location

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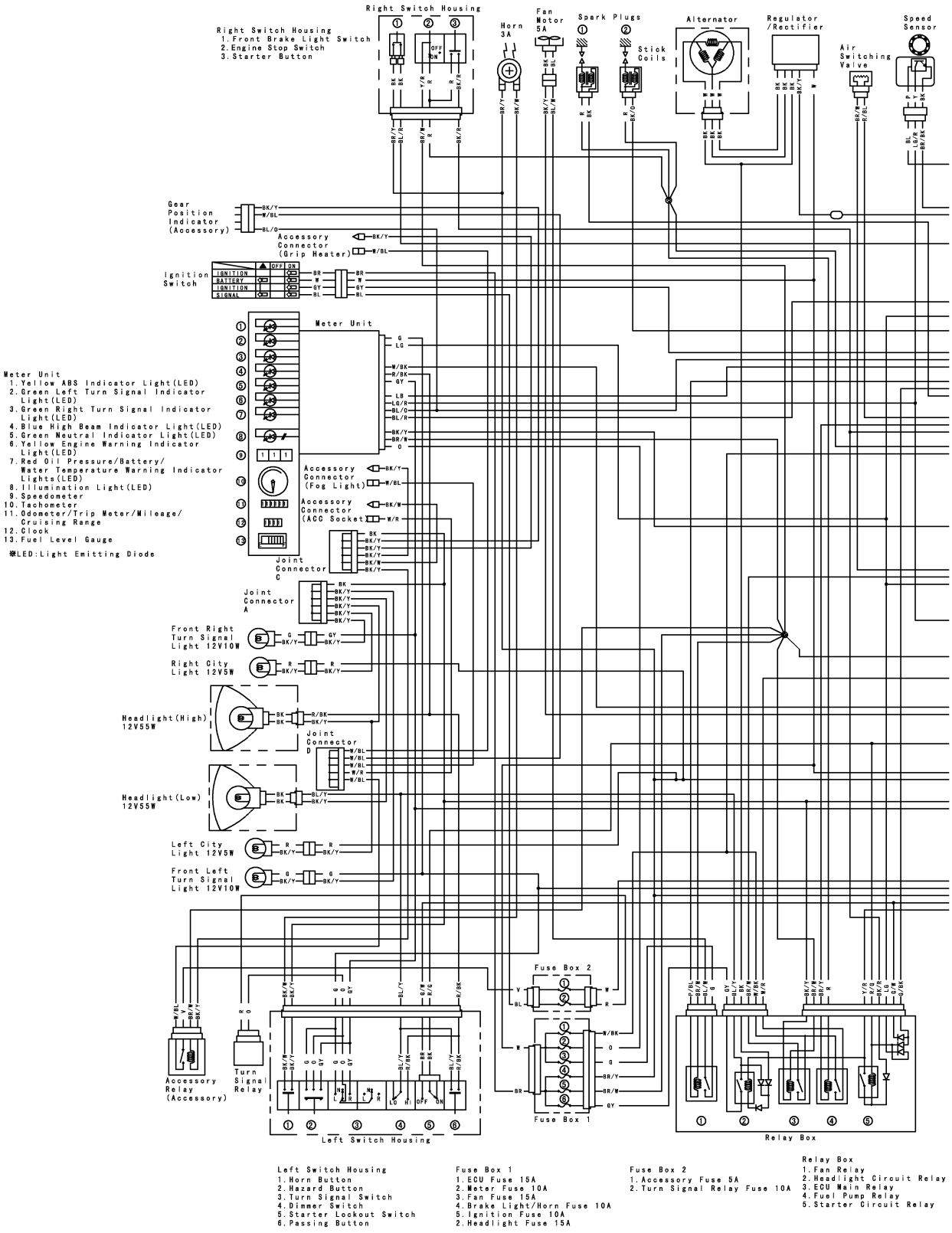
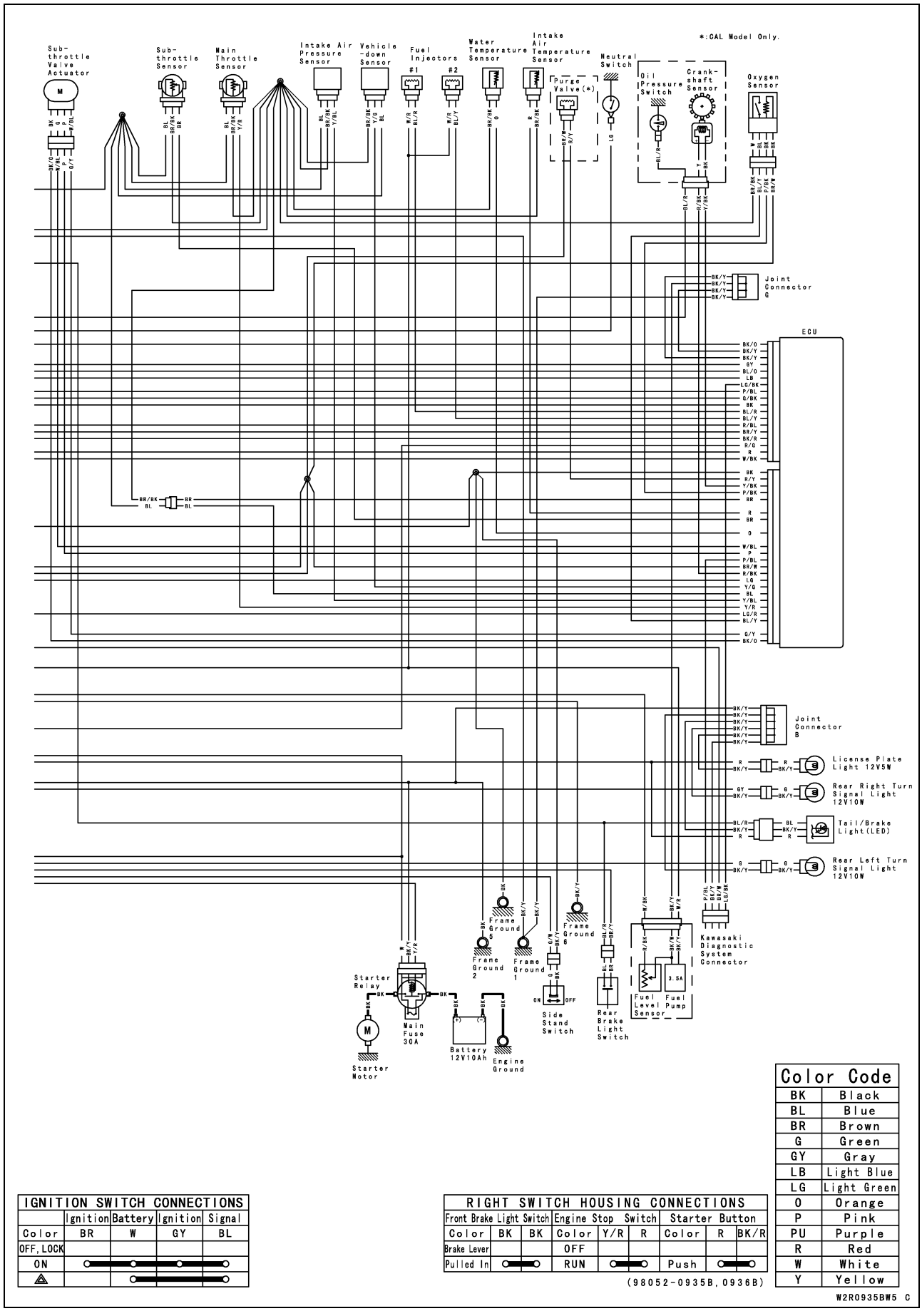
Wiring Diagram (KLE650E)



LEFT SWITCH HOUSING CONNECTIONS																		
Horn Button			Hazard Switch				Turn Signal Switch				Dimmer Switch			Starter Lockout Switch			Passing Button		
Color	BK/W	BK/Y	Color	G	O	GY	Color	G	O	GY	Color	R/BK	BL/Y	Color	BK	BR	Color	R/BK	BL/Y
Released			OFF				L	○	●		HI	●	○	Clutch Lever					
Push	●	○	ON	●	●	●	OFF(Push)							Released			Push	●	○
							R		●	●	LO			Pulled in	●	○			

W2L0935BW5 C

Wiring Diagram (KLE650E)



IGNITION SWITCH CONNECTIONS				
	Ignition	Battery	Ignition	Signal
Color	BR	W	GY	BL
OFF, LOCK				
ON	○	○	○	○
⚠		○		○

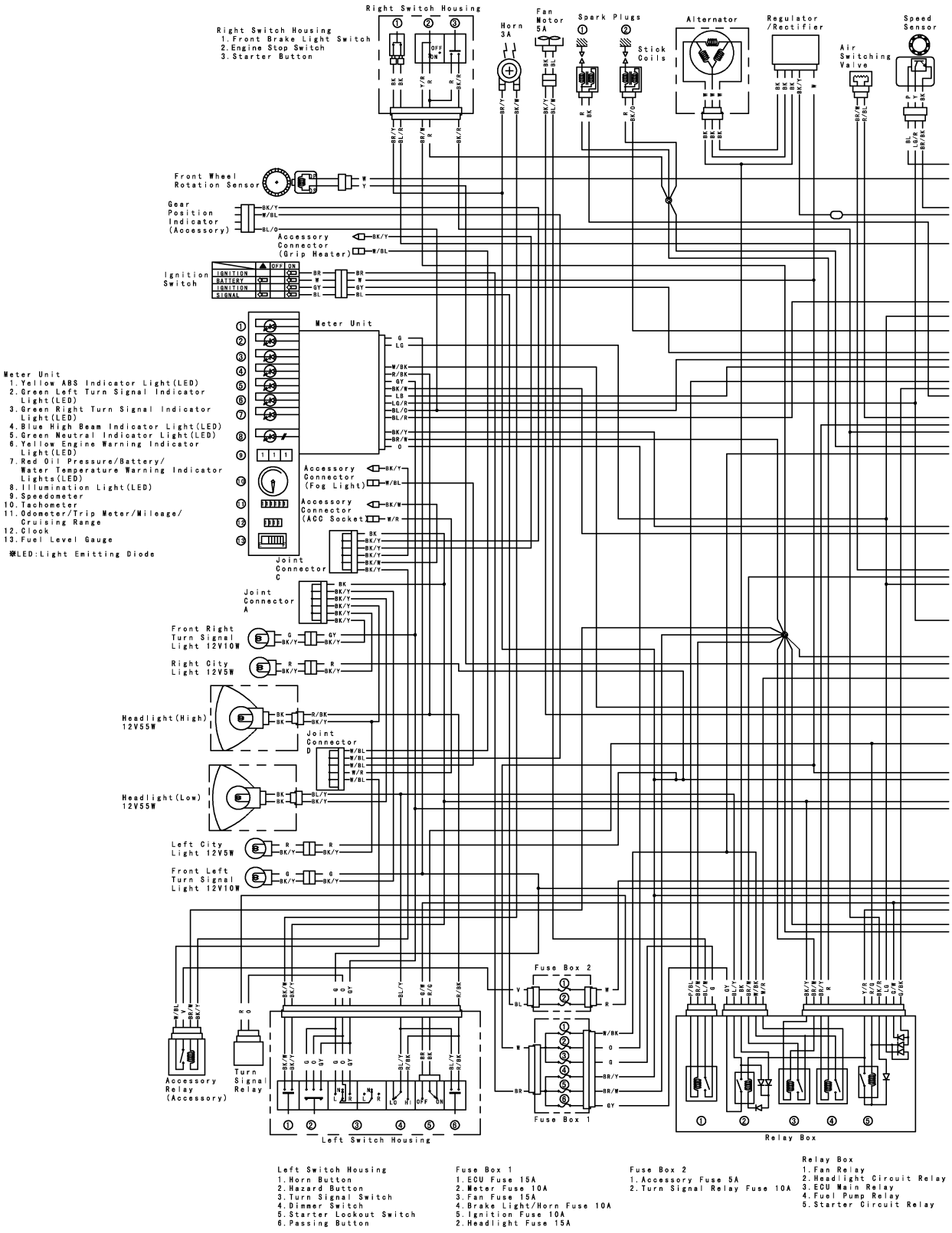
RIGHT SWITCH HOUSING CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	Y/R	R	Color	R	BK/R
Brake Lever			OFF					
Pulled In	○	○	RUN	○	○	Push	○	○

(98052-0935B, 0936B)

Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

W2R0935BW5 C

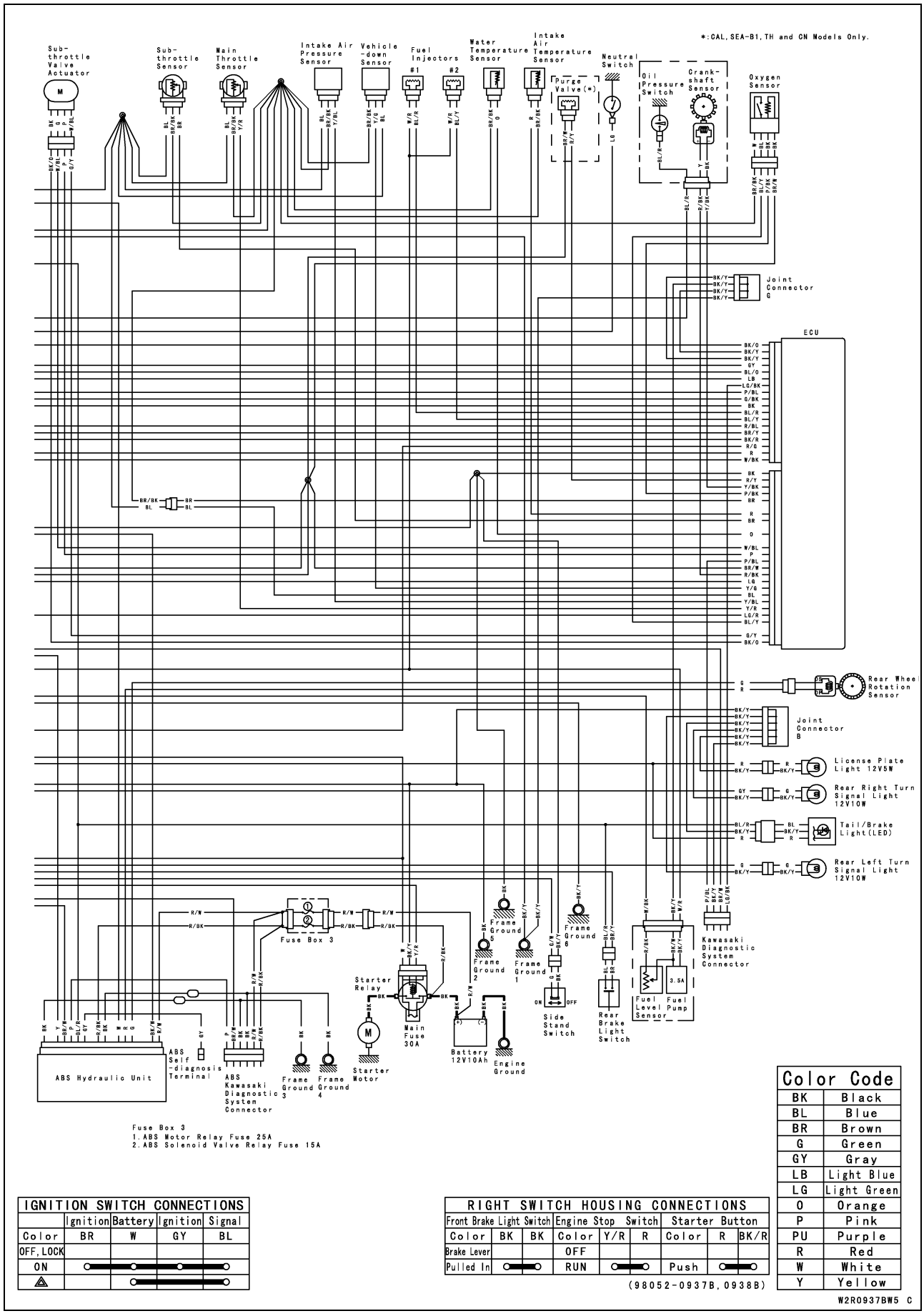
Wiring Diagram (KLE650F)



LEFT SWITCH HOUSING CONNECTIONS																		
Horn Button			Hazard Switch				Turn Signal Switch				Dimmer Switch			Starter Lockout Switch			Passing Button		
Color	BK/W	BK/Y	Color	G	O	GY	Color	G	O	GY	Color	R/BK	BL/Y	Color	BK	BR	Color	R/BK	BL/Y
Released			OFF				L	●			HI	●		Clutch Lever					
Push	●		ON	●	●	●	OFF(Push)							Released			Push	●	
							R		●	●	LO			Pulled in	●				

W2L0937BW5 C

Wiring Diagram (KLE650F)



Fuse Box 3
1. ABS Motor Relay Fuse 25A
2. ABS Solenoid Valve Relay Fuse 15A

IGNITION SWITCH CONNECTIONS				
	Ignition	Battery	Ignition	Signal
Color	BR	W	GY	BL
OFF, LOCK				
ON	○	○	○	○
⚠		○		○

RIGHT SWITCH HOUSING CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	BK	BK	Color	Y/R	R	Color	R	BK/R
Brake Lever			OFF					
Pulled In	○	○	RUN	○	○	Push	○	○

(98052-0937B, 0938B)

Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light Blue
LG	Light Green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

W2R0937BW5 C

Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Take care not to short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

Electrical Wiring

Wiring Inspection

- Visually inspect the wiring for signs of burning, fraying, etc.

★If any wiring is poor, replace the damaged wiring.

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

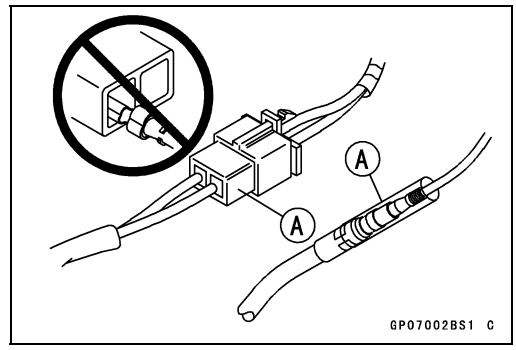
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.

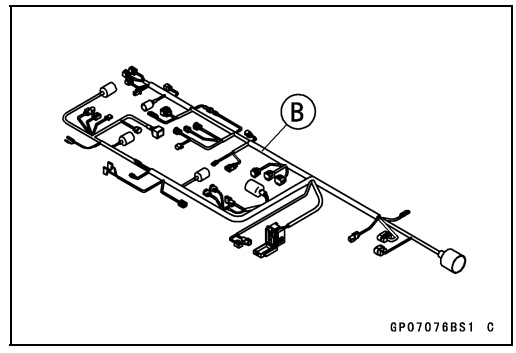
- Check the wiring for continuity.

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

○Connect a tester between the ends of the leads.

★If the tester does not read about 0 Ω, the lead is defective. Replace the lead or the wiring harness [B] if necessary.





Battery

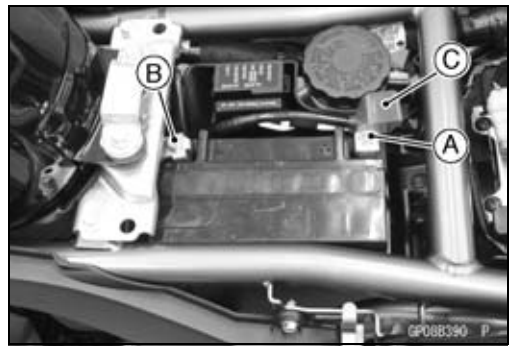
Battery Removal

- Turn the ignition switch off.
- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Disconnect the negative (–) cable [A].

NOTICE
Be sure to disconnect the negative (–) cable first.

- Slide out the positive (+) terminal cap [B] and disconnect the positive (+) cable [C].
- Remove the battery.

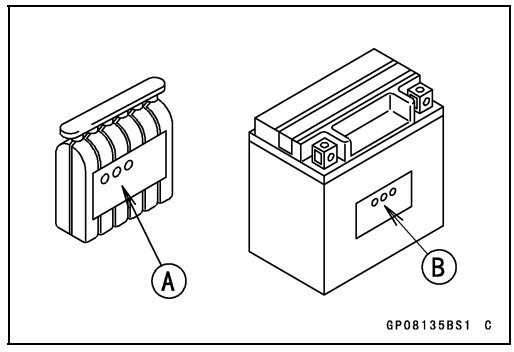
Battery Installation



- Turn the ignition switch off.
- Put the battery into the battery case.
- Install the positive (+) cable [A] first.
- Install the negative (–) cable [B].
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the positive (+) terminal with the cap [C].
- Install the seat (see Seat Installation in the Frame chapter).

Battery Activation

Electrolyte Filling



- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

Battery Model Name

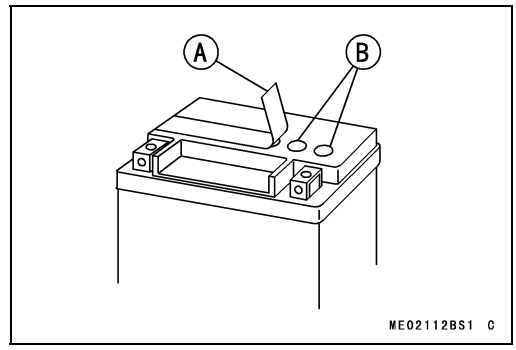
KLE650E/F: FTX12-BS

NOTICE
Each battery comes with its own specific electrolyte container; using the wrong container may overfill the battery with incorrect electrolyte, which can shorten battery life and deteriorate battery performance. 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.

Battery

NOTICE

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.



⚠ DANGER

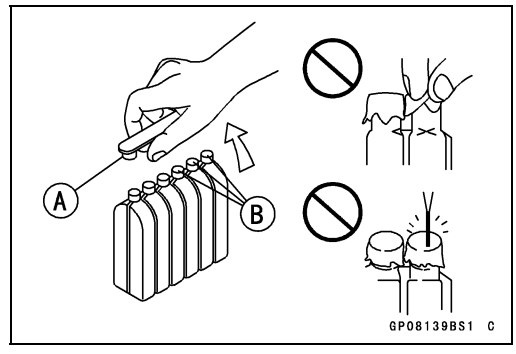
Sulfuric acid in battery electrolyte can cause severe burns. To prevent burns, wear protective clothing and safety glasses when handling electrolyte. If the electrolyte comes in contact with your skin or eyes, wash the area with liberal amounts of water and seek medical attention for more severe burns.

- 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.*

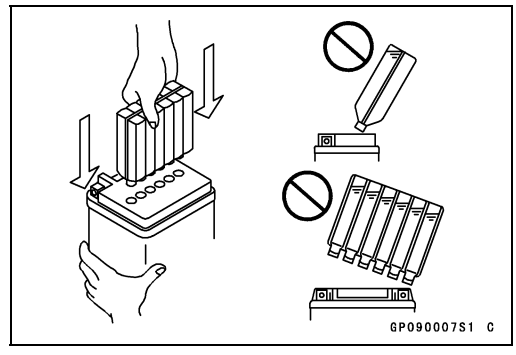
- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.



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.



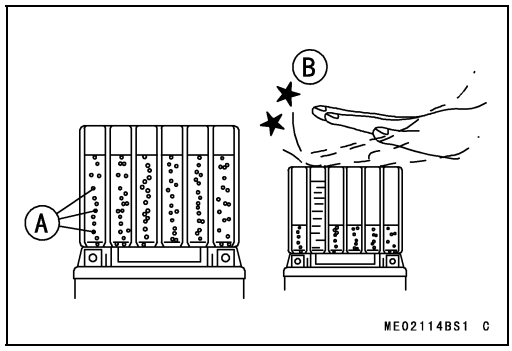
NOTE

○*Do not tilt the electrolyte container.*

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.



NOTE

○*Be careful not to have the battery fall down.*

● Keep the container in place. Don't remove the container from the battery, the battery requires all the electrolyte from the container for proper operation.

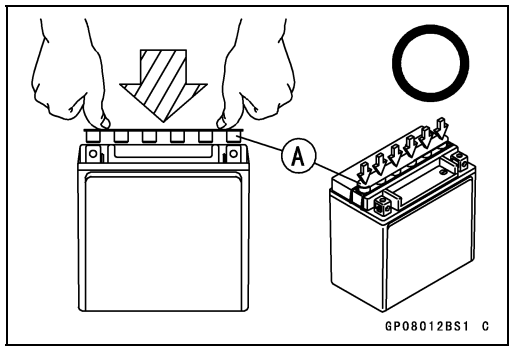
NOTICE

Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the container until it is completely empty.

● After filling, let the battery sit for 20 ~ 60 minutes with the electrolyte container kept in place, which is required for the electrolyte to fully permeate into the plates.

● Make sure that the container cells have emptied completely, and remove the container from the battery.

● Place the strip of caps [A] loosely over the filler ports, press down firmly with both hands to seat the strip of caps into the battery (don't pound or hammer). When properly installed, the strip of caps will be level with the top of the battery.

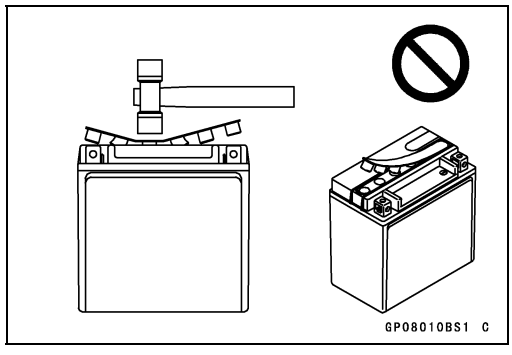


NOTICE

Once the strip of caps is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.

NOTE

○*Charging the battery immediately after filling can shorten service life.*



Battery

Initial Charge

● Newly activated sealed batteries require an initial charge.

Standard Charge: 1.2 A × 5 ~ 10 hours

★If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

Kawasaki-recommended chargers:
Battery Mate 150-9
OptiMate PRO 4-S/PRO S/PRO2
Yuasa MB-2040/2060
Christie C10122S

★If the above chargers are not available, use equivalent one.

● Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. (Voltage immediately after charging becomes temporarily high. For accurate measuring, let the battery sit for given time.)

NOTE

○*Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. If voltage is not at least 12.6 V, repeat charging cycle.*

○*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 V repeat the charging cycle and load test. If still below 12.6 V 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 Refreshing Charge).
When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

NOTICE

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).

Battery

⚠ DANGER

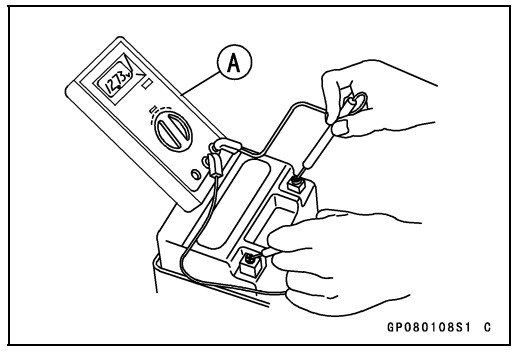
Batteries produce an explosive gas mixture of hydrogen and oxygen that can cause serious injury and burns if ignited. Keep the battery away from sparks and open flames during charging. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases. 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 and seek medial attention for more severe burns.

Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

Charging Condition Inspection



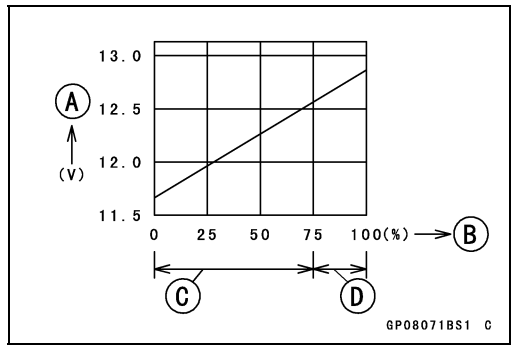
○Battery charging condition can be checked by measuring battery terminal voltage with a digital meter [A].

- Remove:
  Battery (see Battery Removal)
- Measure the battery terminal voltage.

NOTE

○*Measure with a digital voltmeter which can be read one decimal place voltage.*

★If the reading is 12.6 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.



Battery Terminal Voltage
Standard: 12.6 V or more

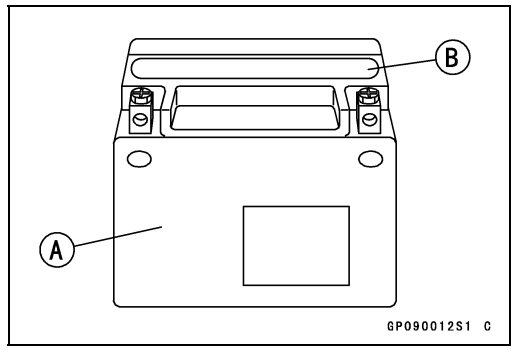
Terminal Voltage (V) [A]
Battery Charge Rate (%) [B]
Good [C]
Refresh charge is required [D]

Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

⚠ WARNING

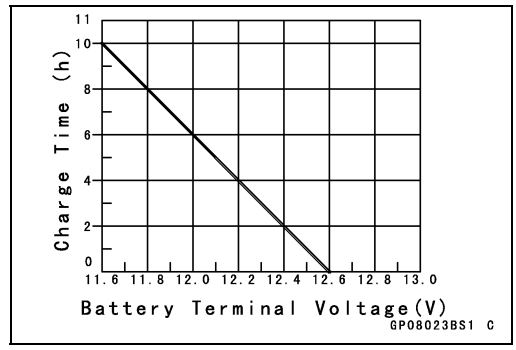
This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.



Battery

Terminal Voltage: 11.5 ~ less than 12.6 V
Standard Charge: 1.2 A × 5 ~ 10 h (see following chart)
Quick Charge: 5 A × 1 h

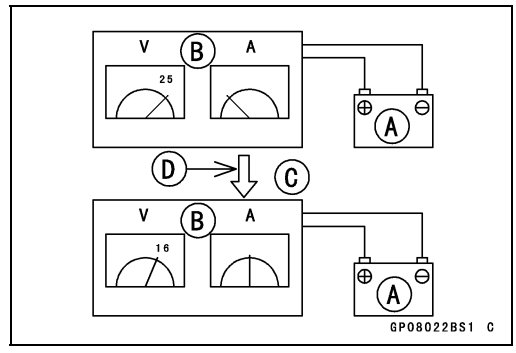
NOTICE
If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.



Terminal Voltage: less than 11.5 V
Charging Method: 1.2 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.*



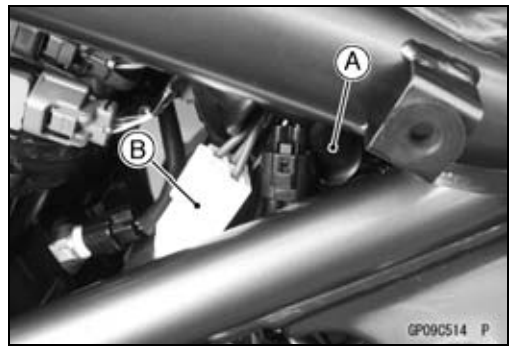
Battery [A]
Battery Charger [B]
Standard Value [C]
Current starts to flow [D]

● 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.

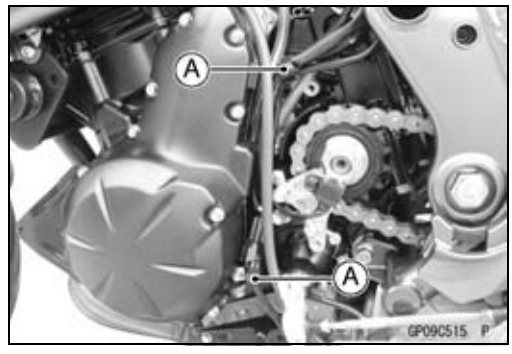
Criteria	Judgement
12.6 V or higher	Good
12.0 ~ lower than 12.6 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace

Charging System

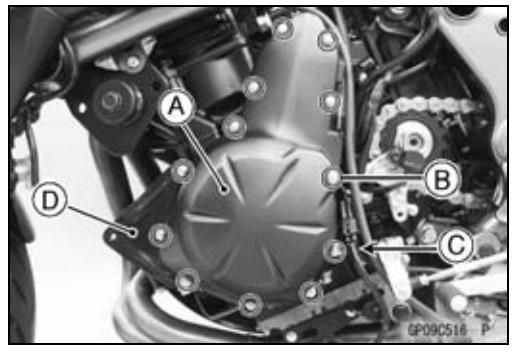
Alternator Cover Removal



- Drain:
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Left Frame Cover (see Frame Cover Removal in the Frame chapter)
  Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)
- Slide the dust cover [A].
- Disconnect the alternator lead connector [B].

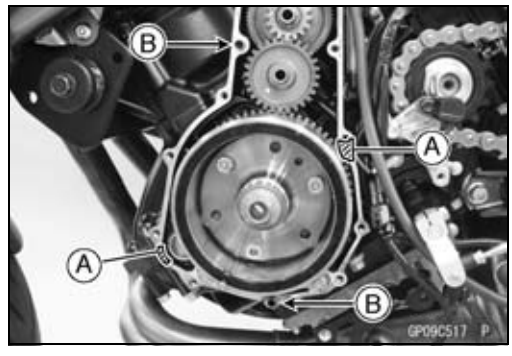


- Open the clamps [A].



- Place a suitable container under the alternator cover [A].
- Remove:
  Alternator Cover Bolts [B]
  Clamp [C]
  Bracket [D]
  Alternator Cover

Alternator Cover Installation



- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

  Sealant - Liquid Gasket, TB1211F: 92104-0004

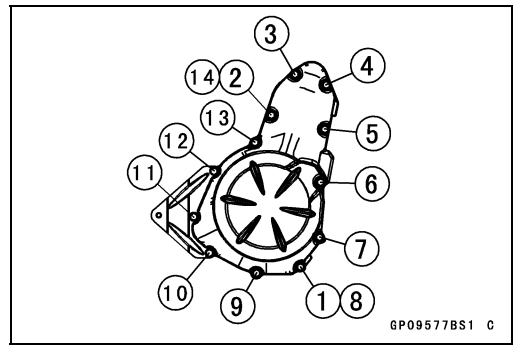
- Check that dowel pins [B] are in place on the crankcase.
- Replace the alternator cover gasket with a new one.

Charging System

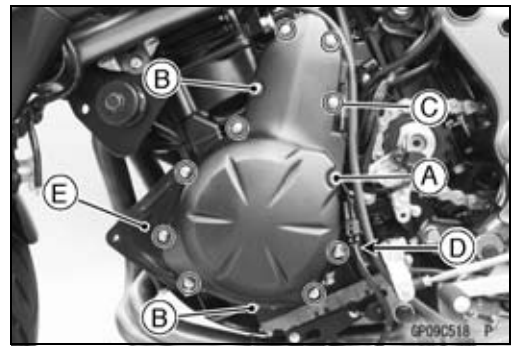
- Tighten the alternator cover bolts following the specified tighten sequence [1 ~ 14].

Torque - Alternator Cover Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

70 mm (2.8 in.) [A]
35 mm (1.4 in.) [B]
25 mm (0.98 in.) [C]
Clamp [D]
Bracket [E]

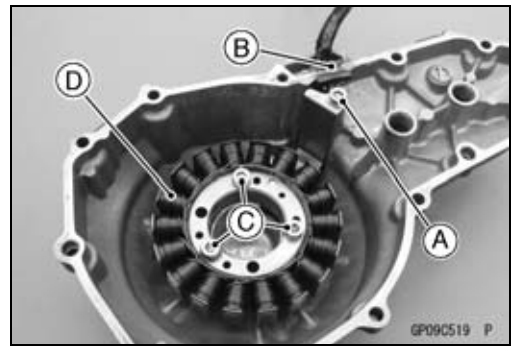


- Run the alternator lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



Stator Coil Removal

- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Alternator Lead Holding Plate Bolt [A] and Plate
  Alternator Lead Grommet [B]
  Stator Coil Bolts [C]
- Remove the stator coil [D] from the alternator cover.



Stator Coil Installation

- Apply a non-permanent locking agent to the threads of the stator coil bolts [A] and tighten them.

Torque - Stator Coil Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)

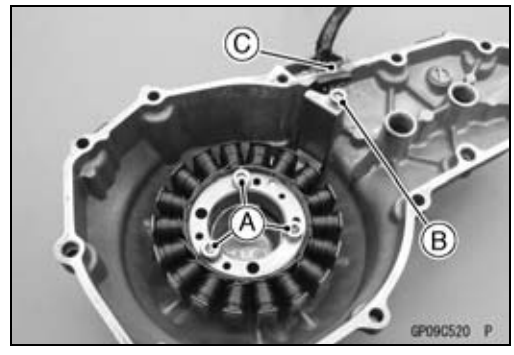
- Secure the alternator lead with a holding plate.
- Apply a non-permanent locking agent to the threads of the plate bolt [B] and tighten it.

Torque - Alternator Lead Holding Plate Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the circumference of the alternator lead grommet [C], and fit the grommet into the notch of the cover securely.

Sealant - Liquid Gasket, TB1211F: 92104-0004

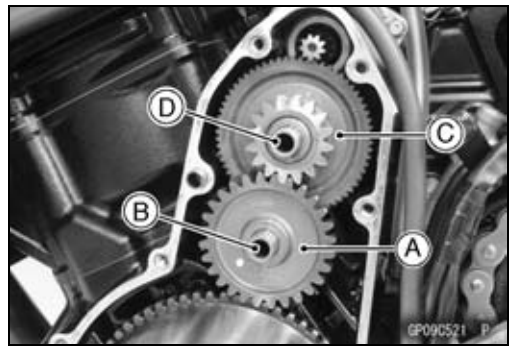
- Install the alternator cover (see Alternator Cover Installation).



Charging System

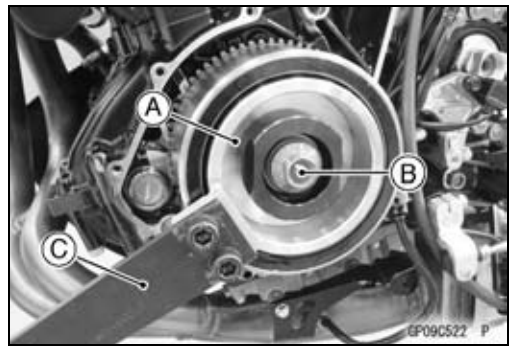
Alternator Rotor Removal

- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Starter Idle Gear [A] and Shaft [B]
  Torque Limiter [C] and Shaft [D]



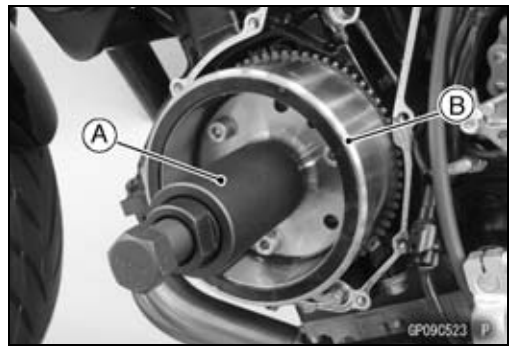
- Hold the alternator rotor steady with the rotor holder [A].
- Remove the rotor bolt [B] and washer.

Special Tools - Grip [C]: 57001-1591
Rotor Holder: 57001-1658



- Using the flywheel puller [A], remove the alternator rotor [B] from the crankshaft.

Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1615



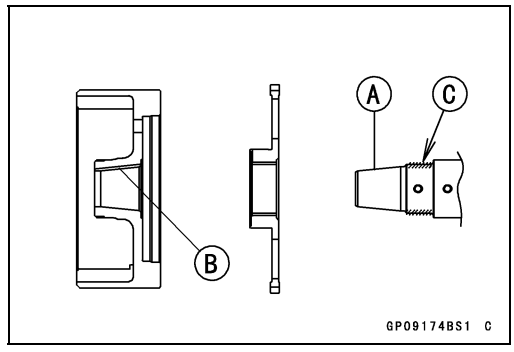
NOTICE

Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.

- Remove:
  Washer [A]
  Starter Clutch Gear [B]

Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  Crankshaft Tapered Portion [A]
  Alternator Rotor Tapered Portion [B]
- Apply a thin coat of molybdenum disulfide grease [C] to the crankshaft.



Charging System

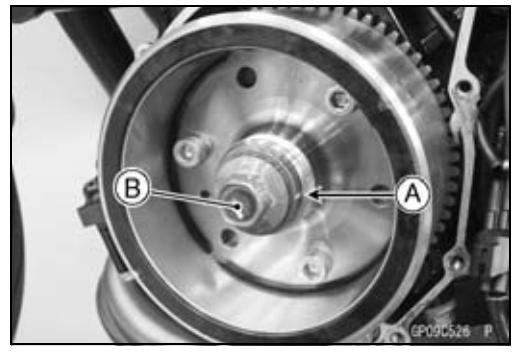
- Install the starter clutch gear [A] and washer [B].
- Again, clean the crankshaft tapered portion [C] and dry there.
- Install the alternator rotor while turning it counterclockwise.

- Install the washer [A].
- Apply molybdenum disulfide oil solution to the threads and seating surface of the rotor bolt [B].

NOTE

○*Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.*

- Install the rotor bolt and tighten it with 70 N·m (7.0 kgf·m, 52 ft·lb) of torque.

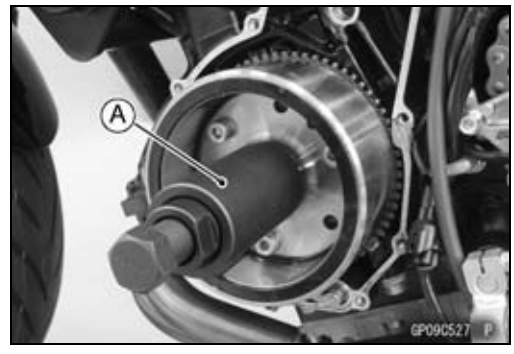


- Remove the rotor bolt and washer.
- Check the tightening torque with flywheel puller [A].

Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1615

★If the rotor is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.

★If the rotor is pulled out with under 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.

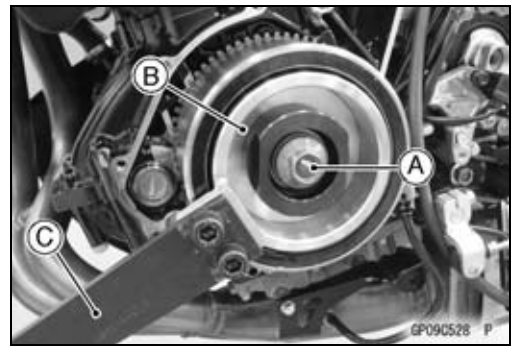


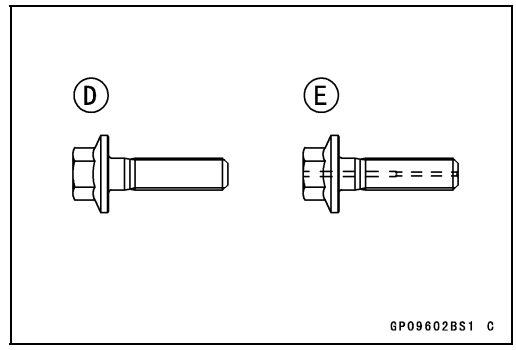
- Apply molybdenum disulfide oil solution to the threads and seating surface of the rotor bolt.
- Install the washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B].

Special Tools - Grip [C]: 57001-1591
Rotor Holder: 57001-1658

○The alternator bolt of this model, there are two types of without center hole type [D] and with center hole type [E].

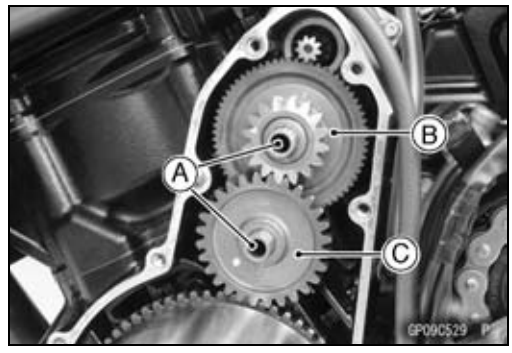
Torque - Alternator Rotor Bolt [D] (without center hole type): 155 N·m (15.8 kgf·m, 114 ft·lb)
Alternator Rotor Bolt [E] (with center hole type): 200 N·m (20.4 kgf·m, 148 ft·lb)





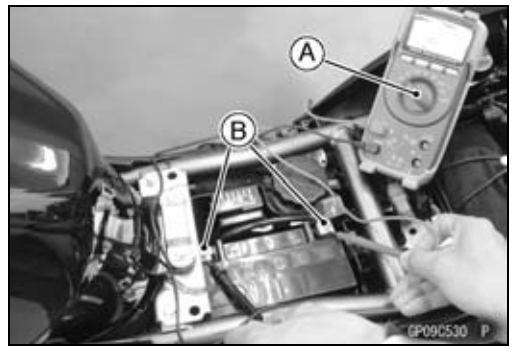
Charging System

- Apply a thin coat of molybdenum disulfide grease to the shafts [A].
- Instal:
  Shafts
  Torque Limiter [B]
  Starter Idle Gear [C]
  Alternator Cover (see Alternator Cover Installation)



Charging Voltage Inspection

- Check the battery condition (see Charging Condition Inspection).
- Warm up the engine to obtain actual alternator operating conditions.
- Check that the ignition switch is turned off, and connect a tester [A] to the battery terminals [B].
- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight, disconnect the headlight connector on the headlight unit.). The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.



Charging Voltage

Connections		Reading
Tester (+) to	Tester (–) to	
Battery (+)	Battery (–)	DC 14.2 ~ 14.8 V

- Turn off the ignition switch to stop the engine, and disconnect the tester.

★If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.

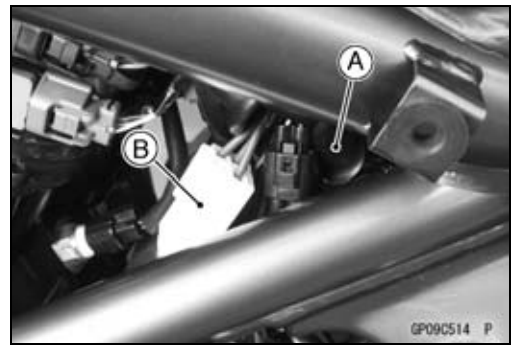
★If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.

★If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

Alternator Inspection

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.

Charging System



● To check the alternator output voltage, do the following procedures.
○Turn the ignition switch off.
○Remove the left frame cover (see Frame Cover Removal in the Frame chapter).
○Slide the dust cover [A].
○Disconnect the alternator lead connector [B].
○Connect a tester as shown in the table 1.
○Start the engine.
○Run it at the rpm given in the table 1.
○Note the voltage readings (total 3 measurements).

Table 1 Alternator Output Voltage @ 4 000 r/min (rpm)

Connections		Reading
Tester (+) to	Tester (–) to	
One White lead	Another White lead	AC 41 ~ 62 V

★If the output voltage shows the value in the table, the alternator operates properly.
★If the output voltage shows a much lower reading than that given in the table, stop the engine and inspect the stator coil resistance.
● Check the stator coil resistance as follows.
○Stop the engine.
○Connect the tester as shown in the table 2.
○Note the readings (total 3 measurements).

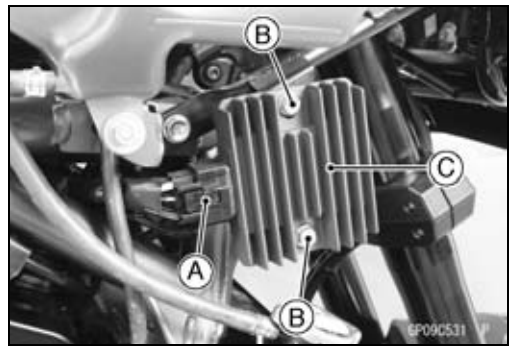
Table 2 Stator Coil Resistance @ 20°C (68°F)

Connections		Reading
Tester (+) to	Tester (–) to	
One White lead	Another White lead	0.176 ~ 0.264 Ω

★If there is more resistance than shown in the table, or no tester reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
● Measure the resistance between each of the black leads and chassis ground.
★Any tester reading less than infinity (∞) indicates a short, necessitating stator replacement.
★If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Charging System

Regulator/Rectifier Removal



- Remove:
  Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
- Disconnect the connector [A].
- Remove:
  Regulator/Rectifier Bolts [B]
  Regulator/Rectifier [C]

Regulator/Rectifier Installation

- Installation is the reverse of removal.
- Tighten:

Torque - Regulator/Rectifier Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

Regulator/Rectifier Inspection

- Refer to the Charging System Troubleshooting for the Regulator/Rectifier Inspection.

Charging System Troubleshooting

- Before inspection, remove all accessories that consume electrical power.

NOTE

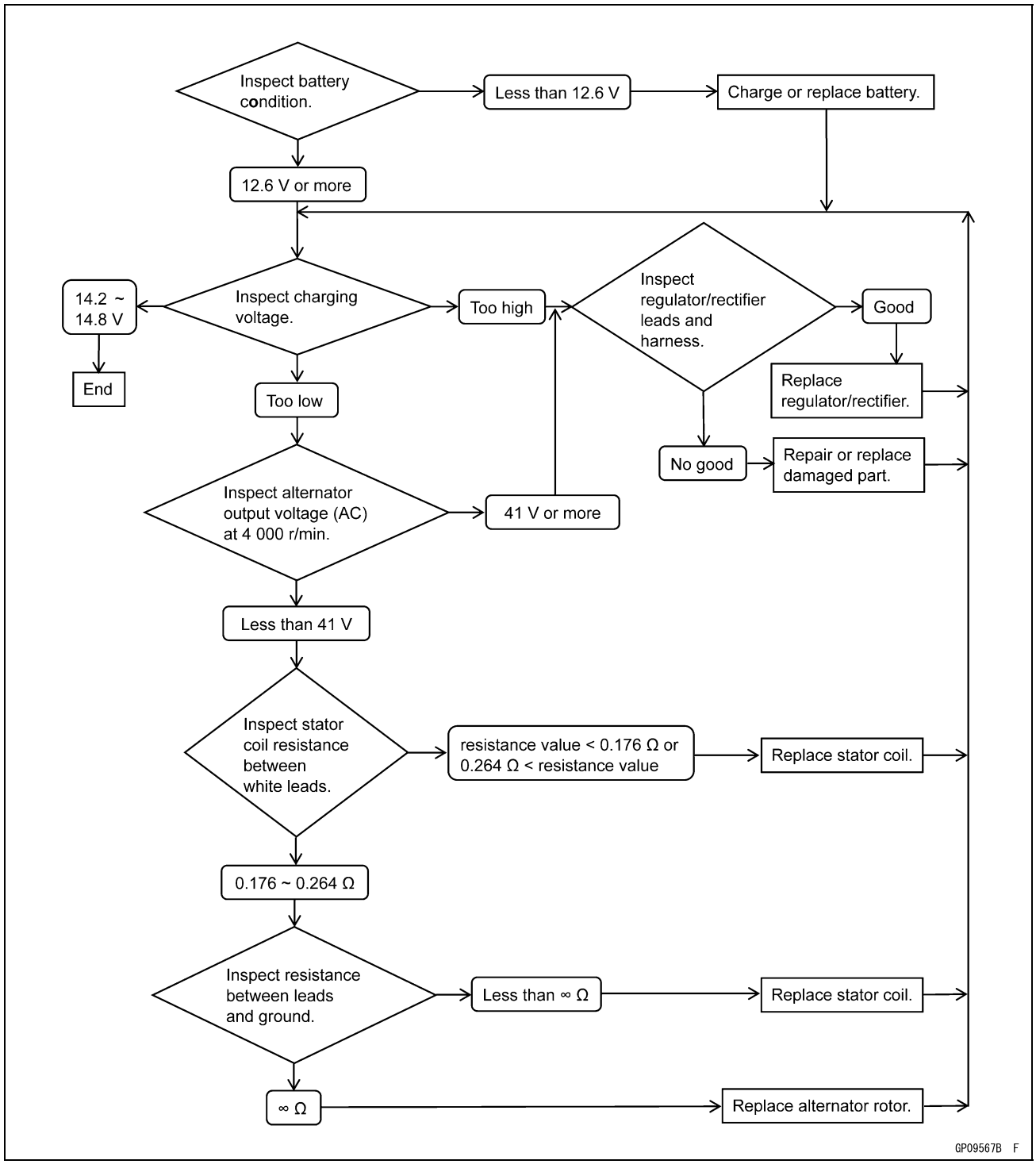
○*Even when the charging system is working properly, the battery may discharge if the motorcycle is equipped with too many accessories.*

- Pay attention to riding conditions and the customer's riding habits which could affect the charging system such as:

Frequent use at low engine speed
Frequent and unnecessary brake pedal dragging
→ Battery Discharged

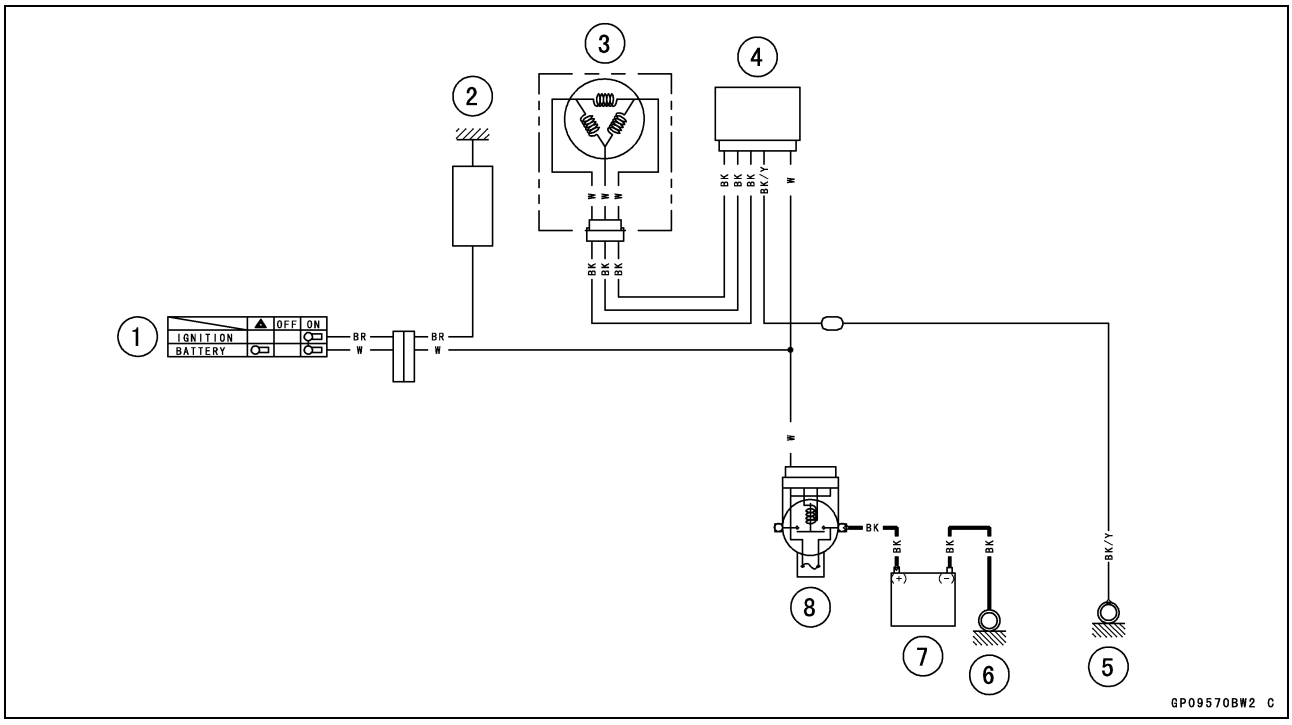
- Recharge the battery if it is discharged.

Charging System



Charging System

Charging System Circuit



1. Ignition Switch
2. Load
3. Alternator
4. Regulator/Rectifier
5. Frame Ground 1
6. Engine Ground
7. Battery 12 V 10 Ah
8. Main Fuse 30 A

Ignition System

⚠ WARNING

The ignition system produces extremely high voltage. Do not touch the spark plug, stick coil or stick coil lead while the engine is running, or you could receive a severe electrical shock.

NOTICE

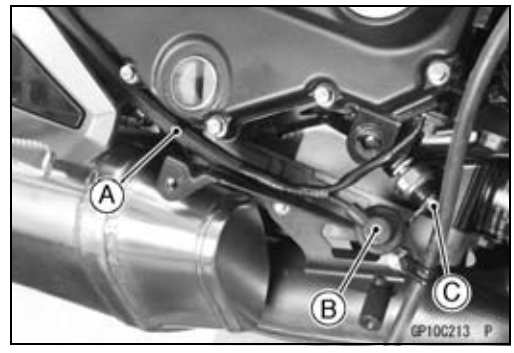
Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent ECU damage.
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.

Crankshaft Sensor Removal

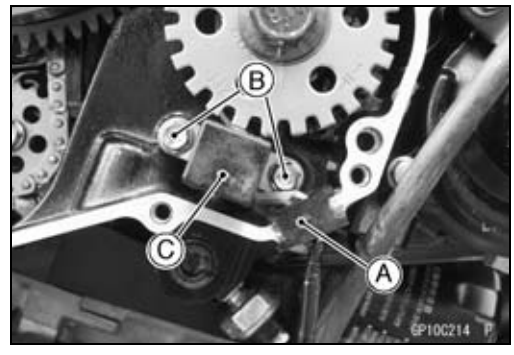
NOTICE

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

- Drain:
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Right Frame Cover (see Frame Cover Removal in the Frame chapter)
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
- Disconnect the crankshaft sensor lead connector [A].



- Clear the crankshaft sensor lead from the clamp [A].
- Slide the rubber boot [B].
- Remove the switch terminal bolt [C].
- Disconnect the oil pressure switch terminal.



- Remove the clutch cover (see Clutch Cover Removal in the Clutch chapter).
- Pull out the grommet [A].
- Remove:
  Crankshaft Sensor Bolts [B]
  Crankshaft Sensor [C]

Crankshaft Sensor Installation

- Tighten:

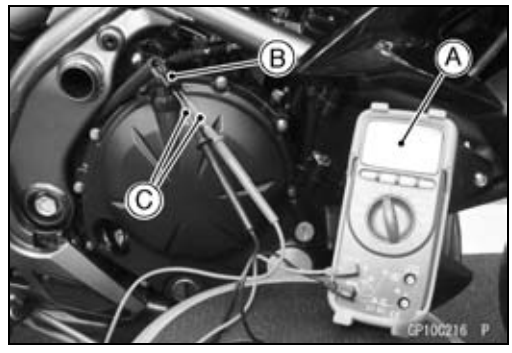
  Torque - Crankshaft Sensor Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the crankshaft sensor lead grommet.

  Sealant - Liquid Gasket, TB1211F: 92104-0004

- Run the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

Crankshaft Sensor Inspection



- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Removal).
- Set a tester [A], and connect it to the crankshaft sensor lead connector [B].

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

  Crankshaft Sensor Resistance
  Connections:
  Tester (+) → Y lead
  Tester (–) → BK lead
  Standard: 376 ~ 564 Ω

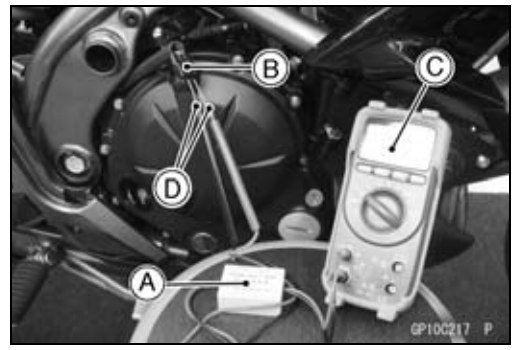
★If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

- 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.

Ignition System

Crankshaft Sensor Peak Voltage Inspection



NOTE

○*Be sure the battery is fully charged.*

○*Using the peak voltage adapter [A] is more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.*

- Disconnect the crankshaft sensor lead connector [B] (see Alternator Cover Removal).
- Set a tester [C], and connect it peak voltage adapter.

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

- Connect the adapter to the terminals of the crankshaft sensor lead connector.

Connections:

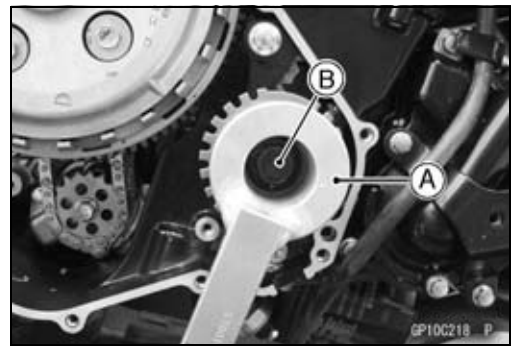
Crankshaft Sensor Lead		Peak Voltage Adapter		Tester
Y lead	←	R lead	→	(+)
BK lead	←	BK lead	→	(–)

- Turn the engine stop switch to run position.
- Turn the ignition switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

Crankshaft Sensor Peak Voltage
Standard: 3.9 V or more

★If the reading is less than the standard, inspect the crankshaft sensor (see Crankshaft Sensor Inspection).

Timing Rotor Removal

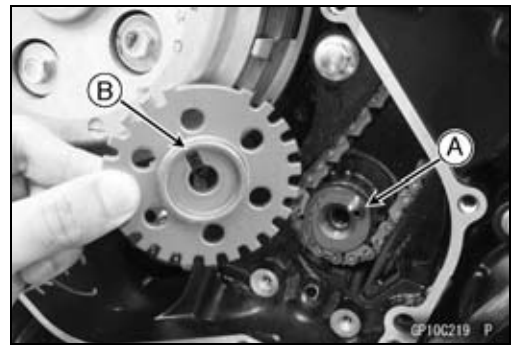


- Remove the crankshaft sensor (see Crankshaft Sensor Removal).
- Holding the timing rotor with the rotor holder [A] and remove the timing rotor bolt [B] and washer.

Special Tool - Rotor Holder: 57001-1567

- Remove the timing rotor.

Timing Rotor Installation



- Align the pin [A] of the crankshaft to the groove [B] of the timing rotor
- Holding the timing rotor with the rotor holder and tighten the timing rotor bolt with washer.

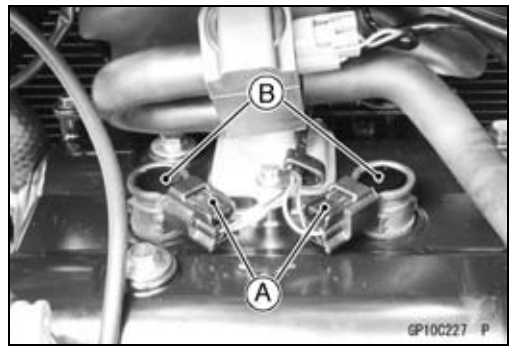
Torque - Timing Rotor Bolt: 40 N·m (4.1 kgf·m, 30 ft·lb)

Special Tool - Rotor Holder: 57001-1567

- Install the crankshaft sensor (see Crankshaft Sensor Installation).

Ignition System

Stick Coil Removal

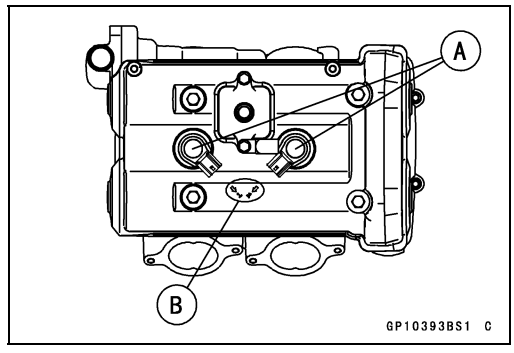


NOTICE
Never drop the stick coils, especially on a hard surface. **Such a shock to the stick coils can damage it.**

- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
- Disconnect the stick coil connectors [A].
- Remove the stick coils [B].

NOTICE
Do not pry the connector part of the coil while removing the coil.

Stick Coil Installation

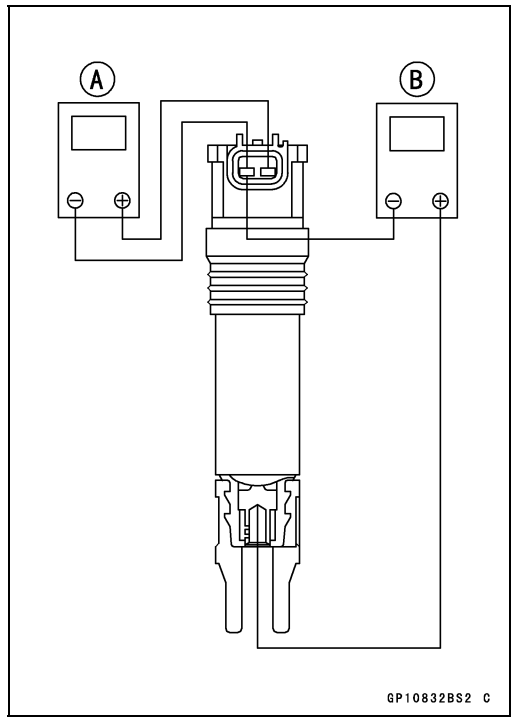


- Insert the stick coils [A] so that the coil heads faces the arrow marks [B] on the cylinder head cover.

NOTICE
Do not tap the coil head while installing the coil.

- After installation, be sure the stick coils are installed securely by pulling up them lightly.
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

Stick Coil Inspection



- Remove the stick coils (see Stick Coil Removal).
- Measure the primary winding resistance [A] as follows.

○Connect a tester between the coil terminals.

- Measure the secondary winding resistance [B] as follows.

○Connect the tester between the plug terminal and (–) coil terminal.

Stick Coil Winding Resistance

Primary Windings:	**1.11 ~ 1.50 Ω**
Secondary Windings:	**6.4 ~ 9.6 kΩ**

★If the tester does not read as specified, replace the coil.

Stick Coil Primary Peak Voltage Inspection

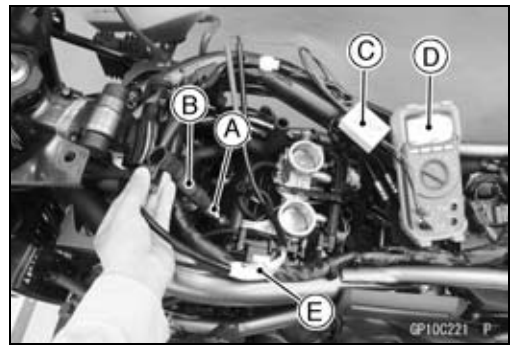
NOTE

○*Be sure the battery is fully charged.*

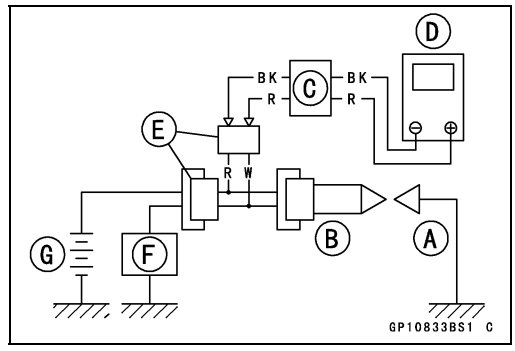
Ignition System

- Remove the stick coils (see Stick Coil Removal), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.

○Install the new spark plug [A] into each stick coil [B], and ground them onto the engine.
○Connect the peak voltage adapter [C] into a tester [D].
○Connect the adapter to the lead wire-peak voltage adapter [E] which is connected between the stick coil connector and stick coil.
ECU [F]
Battery [G]



Special Tools - Peak Voltage Adapter: 57001-1415
Type: KEK-54-9-B
Lead Wire - Peak Voltage Adapter: 57001 -1449



Primary Lead Connection
Adapter (R, +) to lead wire-peak voltage adapter (W)
Adapter (BK, –) to lead wire-peak voltage adapter (R)

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the engine stop switch to run position.
- Turn the ignition switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one stick coil.

Stick Coil Primary Peak Voltage
Standard: 117 V or more

- Repeat the test for the other stick coil.

★If the reading is less than the specified value, check the following.
Stick Coils (see Stick Coil Inspection)
Crankshaft Sensor (see Crankshaft Sensor Inspection)
ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)

Spark Plug Removal

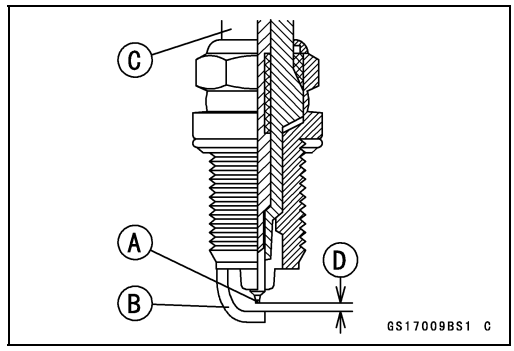
- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

Spark Plug Installation

- Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

Ignition System

Spark Plug Condition Inspection



- Remove the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).
- Visually inspect the spark plugs.

★If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug.

★If the spark plug is dirtied or the carbon is accumulated, replace the spark plug.

- Measure the gap [D] with a wire-type thickness gauge.

★If the gap is incorrect, replace the spark plug.

Spark Plug Gap: 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)

- Use the standard spark plug or its equivalent.

Spark Plug: NGK CR9EIA-9

Interlock Operation Inspection

- Raise the rear wheel off the ground with the stand.
- Turn the engine stop switch on (run position).

1st Check

- Start the engine to the following conditions.

Condition:
Transmission Gear → 1st Position
Clutch Lever → Release
Side Stand → Down or Up

○Turn the ignition switch on and push the starter button.
○Then the starter motor should not turn when the starter system circuit is normality.
★If the engine is start, inspect the starter lockout switch, neutral switch and relay box.

2nd Check

- Start the engine to the following conditions.

Condition:
Transmission Gear → 1st Position
Clutch Lever → Pulled in
Side Stand → 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, side stand switch, relay box, and starter relay.

Ignition System

3rd Check

- Inspect the engine for its secure stop after the following operations are completed.
- Run the engine to the following conditions.

Condition:

Transmission Gear → 1st Position

Clutch Lever → Release

Side Stand → Up

- Set the side stand on the ground, then the engine will stop.

★If the engine does not stop, inspect the neutral switch, side stand switch and relay box.

★If their parts are normality, replace the ECU.

IC Igniter Inspection

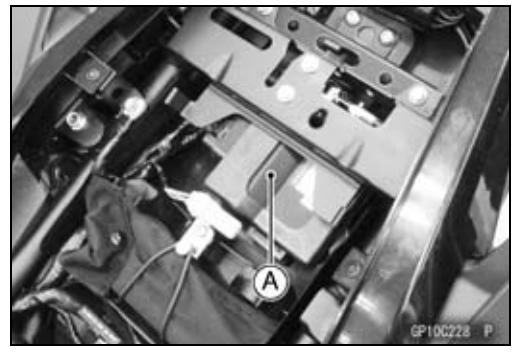
○The IC igniter is built in the ECU [A].

- Refer to the following items.

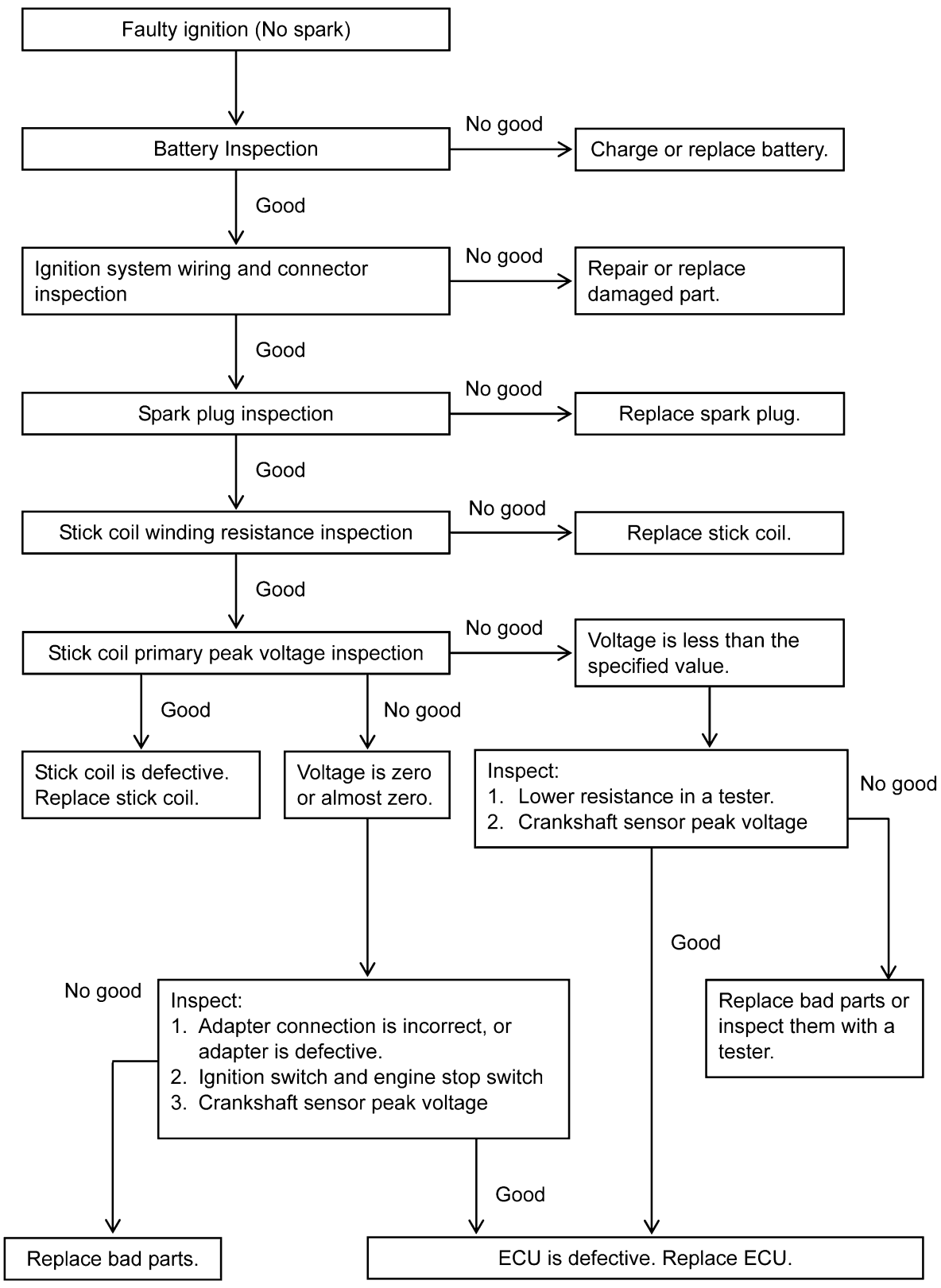
Interlock Operation Inspection (see Interlock Operation Inspection)

Ignition System Troubleshooting (see Ignition System section)

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

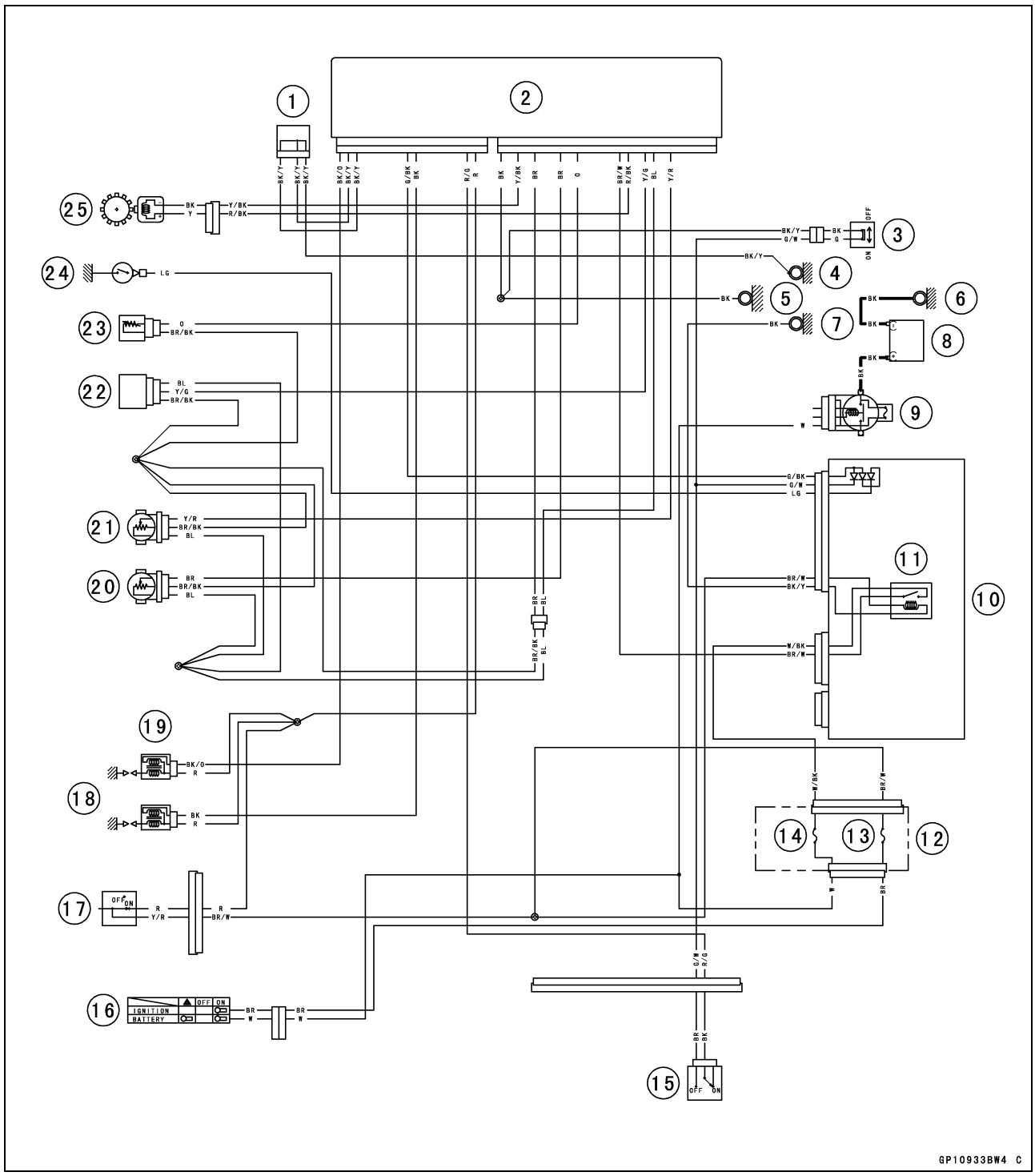


Ignition System Troubleshooting



Ignition System

Ignition System Circuit



1. Joint Connector G
2. ECU
3. Side Stand Switch
4. Frame Ground 1
5. Frame Ground 5
6. Engine Ground
7. Frame Ground 2
8. Battery 12 V 10 Ah
9. Main Fuse 30 A
10. Relay Box
11. ECU Main Relay
12. Fuse Box 1
13. Ignition Fuse 10 A
14. ECU Fuse 15 A
15. Starter Lockout Switch
16. Ignition Switch
17. Engine Stop Switch
18. Spark Plugs
19. Stick Coils
20. Subthrottle Sensor
21. Main Throttle Sensor
22. Vehicle-down Sensor
23. Water Temperature Sensor
24. Neutral Switch
25. Crankshaft Sensor

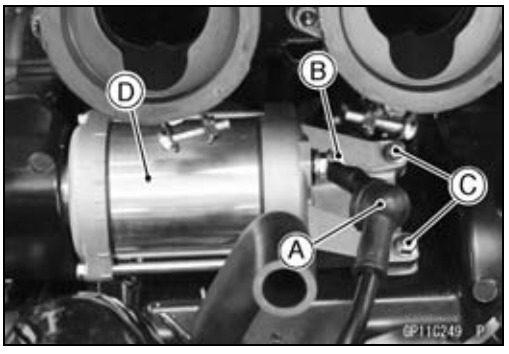
Electric Starter System

Starter Motor Removal

NOTICE
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

- Remove the throttle body assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter).
- Disconnect the water temperature sensor connector [A].

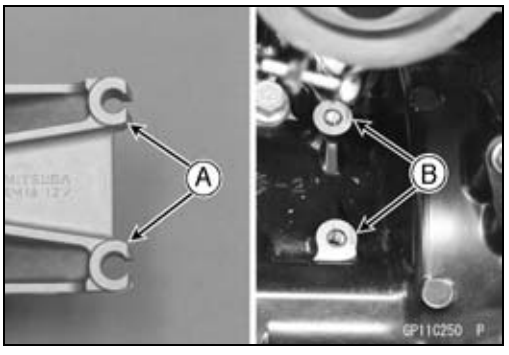
- Slide back the rubber cap [A].
- Remove the starter motor cable terminal nut [B].
- Remove the mounting bolts [C].
- Pull out the starter motor [D].



Starter Motor Installation

NOTICE
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.



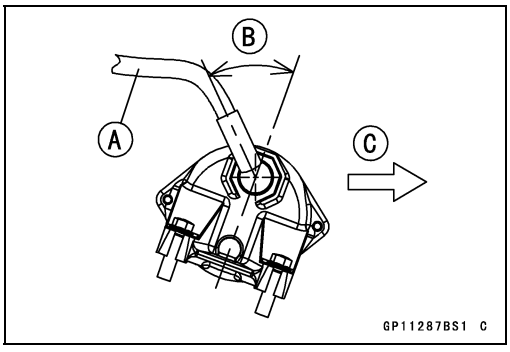
- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Apply a non-permanent locking agent to the threads of the bolts and tighten them.

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

- Position the starter motor cable [A] as shown.
  About 45° [B]
  Front [C]
- Tighten:

  Torque - Starter Motor Cable Terminal Nut: 6.0 N·m (0.61 kgf·m, 53 in·lb)

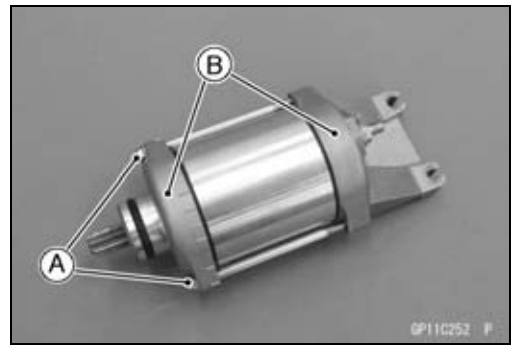
- Slide back the rubber cap to the original position.



Electric Starter System

Starter Motor Disassembly

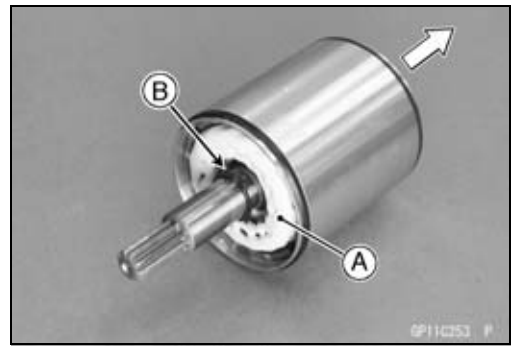
- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor through bolts [A] and remove the both end covers [B].



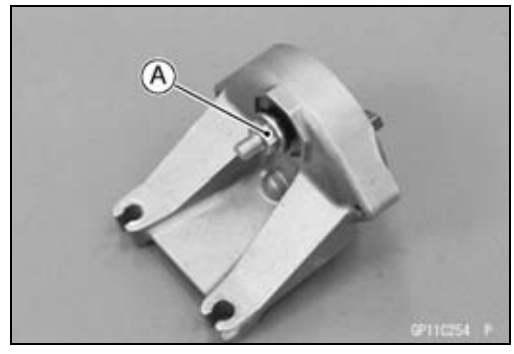
- Remove the armature [A] from the commutator side.

NOTE

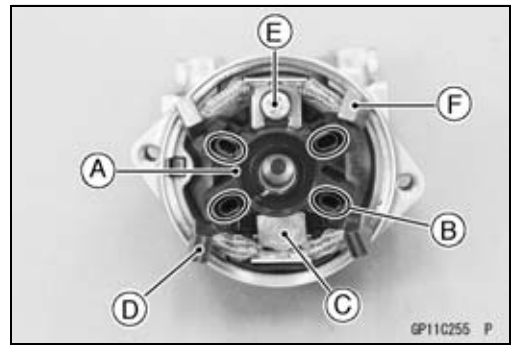
○*Do not remove the circlip [B] from the shaft.*



- Remove:
  Starter Motor Terminal Locknut [A]
  Washer
  Collar

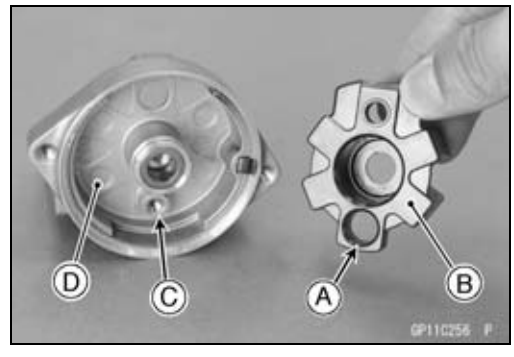


- Pull out the brushes from the brush holder [A].
- Remove:
  Brush Springs [B]
  Starter Motor Terminal [C] and O-ring
  Positive Brush Assy [D]
  Starter Motor Brush Holder Screw [E]
  Negative Brush Assy [F]
  Brush Holder



Starter Motor Assembly

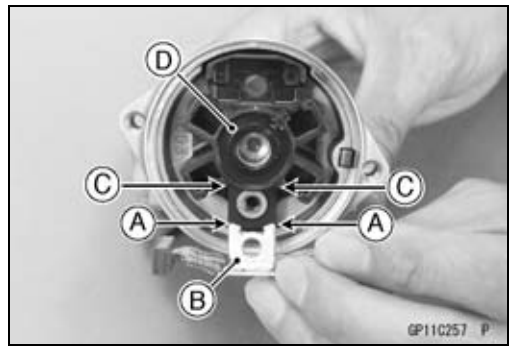
- Align the hole [A] of the brush holder [B] to the boss [C] of the right-hand end cover [D].



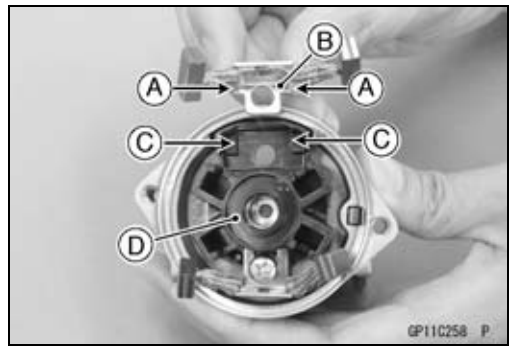
Electric Starter System

● Align the stoppers [A] of the negative brush assy [B] to the grooves [C] of the brush holder [D].
● Tighten:

Torque - Starter Motor Brush Holder Screw: 3.8 N·m (0.39 kgf·m, 34 in·lb)

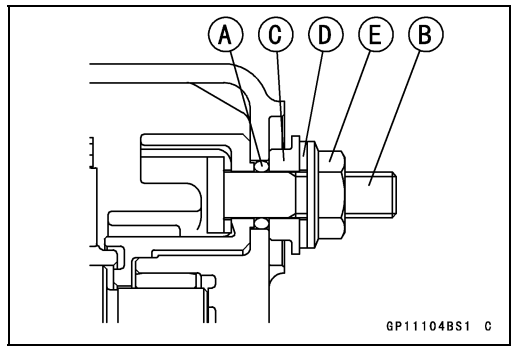


● Align the stoppers [A] of the positive brush assy [B] to the grooves [C] of the brush holder [D].
● Install the starter motor terminal.

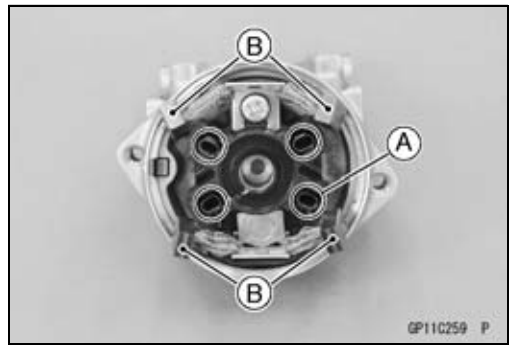


● Replace the O-ring [A] with a new one.
● Install the following parts to the starter motor terminal [B].
New O-ring
Collar [C]
Washer [D]
Starter Motor Terminal Locknut [E]
○Install the collar so that stepped side faces outward.
● Tighten:

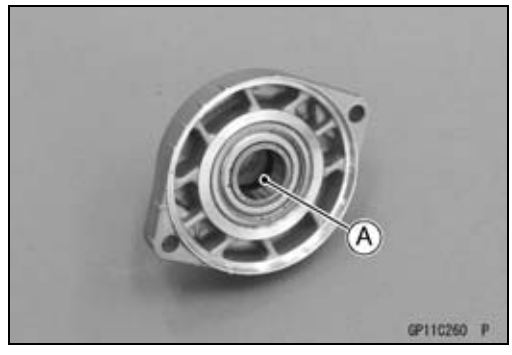
Torque - Starter Motor Terminal Locknut: 11 N·m (1.1 kgf·m, 97 in·lb)



● Install the brush springs [A] and insert the brushes [B].

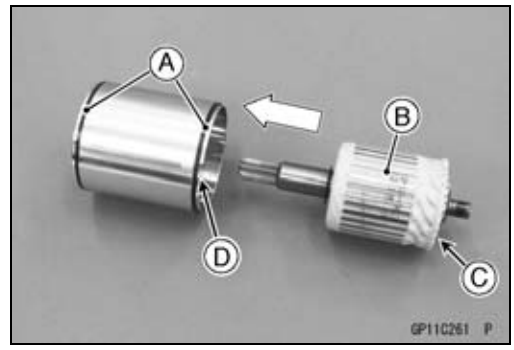


● Apply thin coat of grease to the oil seal [A].

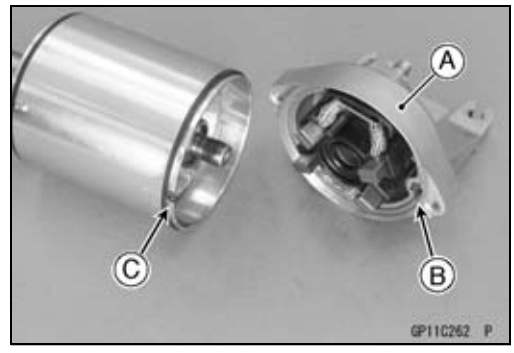


Electric Starter System

- Replace the O-rings [A] with new ones.
- Insert the armature [B] so that commutator side [C] faces hollow side [D] of the yoke.

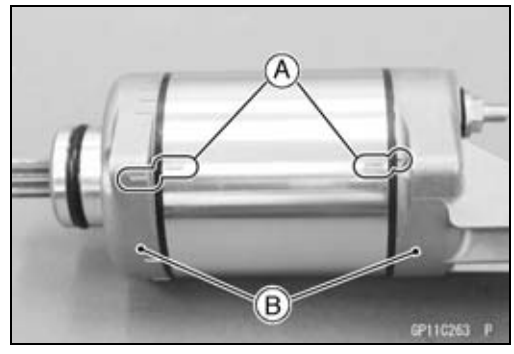


- Install the end cover [A] so that the stopper [B] is aligned with the hollow [C] of the yoke.



- Align the marks [A] to assembly the yoke and the end covers [B] as shown.
- Tighten the through bolts.

Torque - Starter Motor Through Bolts: 5.0 N·m (0.51 kgf·m, 44 in·lb)

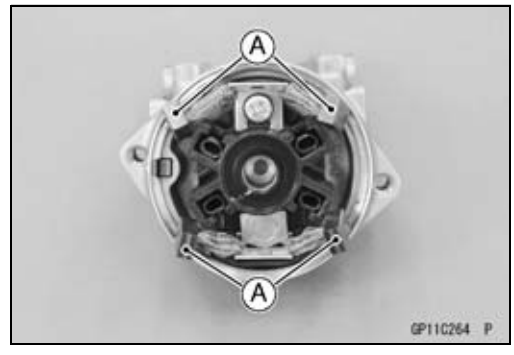


Brush Inspection

- Measure the length of each brush [A].

★If any is worn down to the service limit, replace the brush assy.

Starter Motor Brush Length
Standard: 12 mm (0.47 in.)
Service Limit: 6.5 mm (0.26 in.)



Commutator Cleaning and Inspection

- Clean the metallic debris off the between commutator segments [A].

NOTE

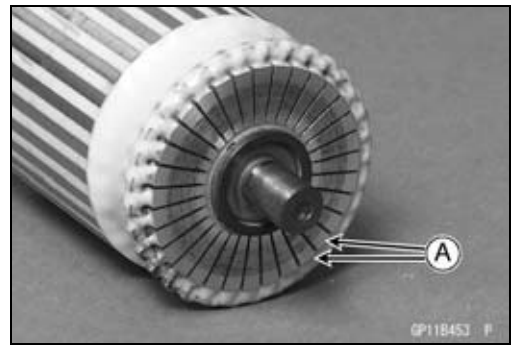
○*Do not use emery or sand paper on the commutator.*

- Check the commutator for damage or abnormal wear.

★Replace the starter motor with a new one if there is any damage or wear.

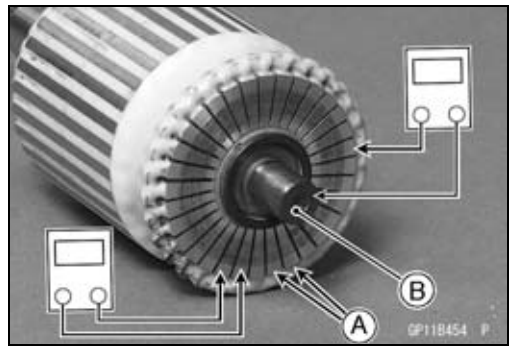
- Visually inspect the commutator segments for discoloration.

★Replace the starter motor with a new one if discoloration is noticed.



Electric Starter System

Armature Inspection



- Using a tester, 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.

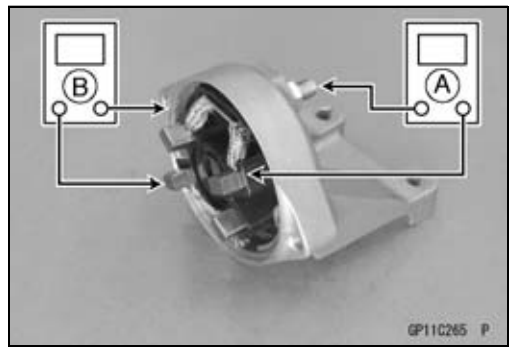
- Using the tester, measure the resistance between the segments and the shaft [B].

★If there is any reading at all, the armature has a short and the starter motor must be replaced.

NOTE

○*Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.*

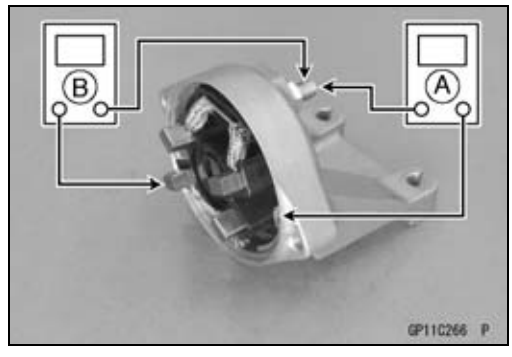
Brush Lead Inspection



- Using a tester, measure the resistance as shown.
  Terminal Bolt and Positive Brushes [A]
  Right-hand End Cover and Negative Brushes [B]

★If there is not close to zero ohms, the brush lead has an open. Replace the brush plate assy.

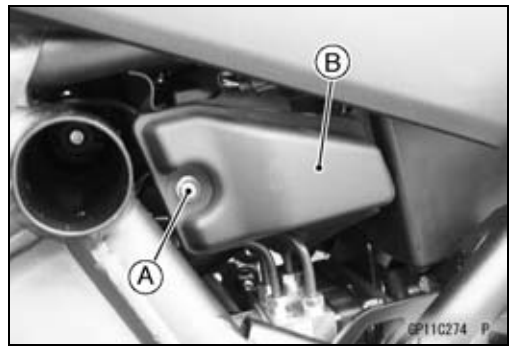
Right-hand End Cover Inspection



- Using a tester, measure the resistance as shown.
  Terminal Bolt and Right-hand End Cover [A]
  Terminal Bolt and Negative Brushes [B]

★If there is any reading, the brush assy and/or terminal bolt assy have a short. Replace the starter motor.

Starter Relay Inspection

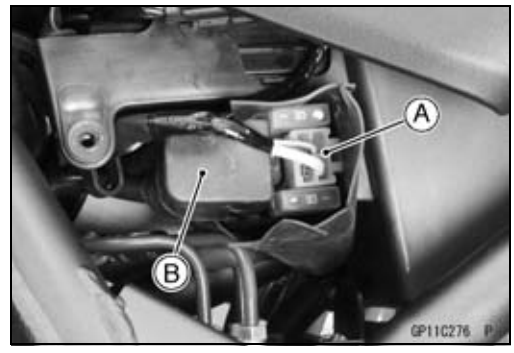


- Remove:
  Battery Negative (–) Cable (see Battery Removal)
  Left Frame Cover (see Frame Cover Removal in the Frame chapter)
  Bolt [A]
  Starter Relay Cover [B]

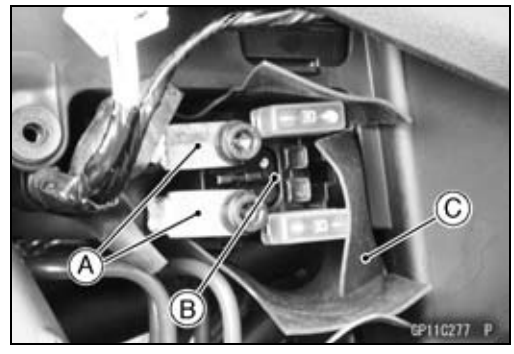
Electric Starter System

- Open the rubber cover [A].

- Disconnect the connector [A].
- Slide the dust cover [B].



- Disconnect the cable terminals [A].
- Remove:
  Starter Relay [B]
  Rubber Cover [C]

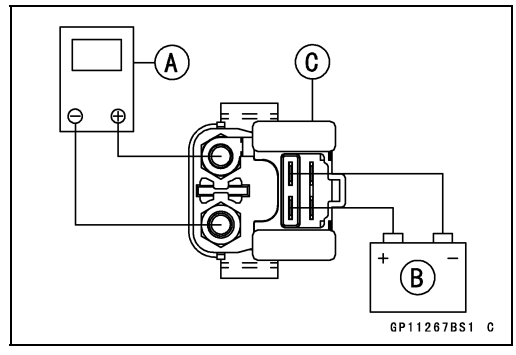


- Connect a tester [A] and 12 V battery [B] to the starter relay [C] as shown.

★If the relay does not work as specified, the relay is defective. Replace the relay.

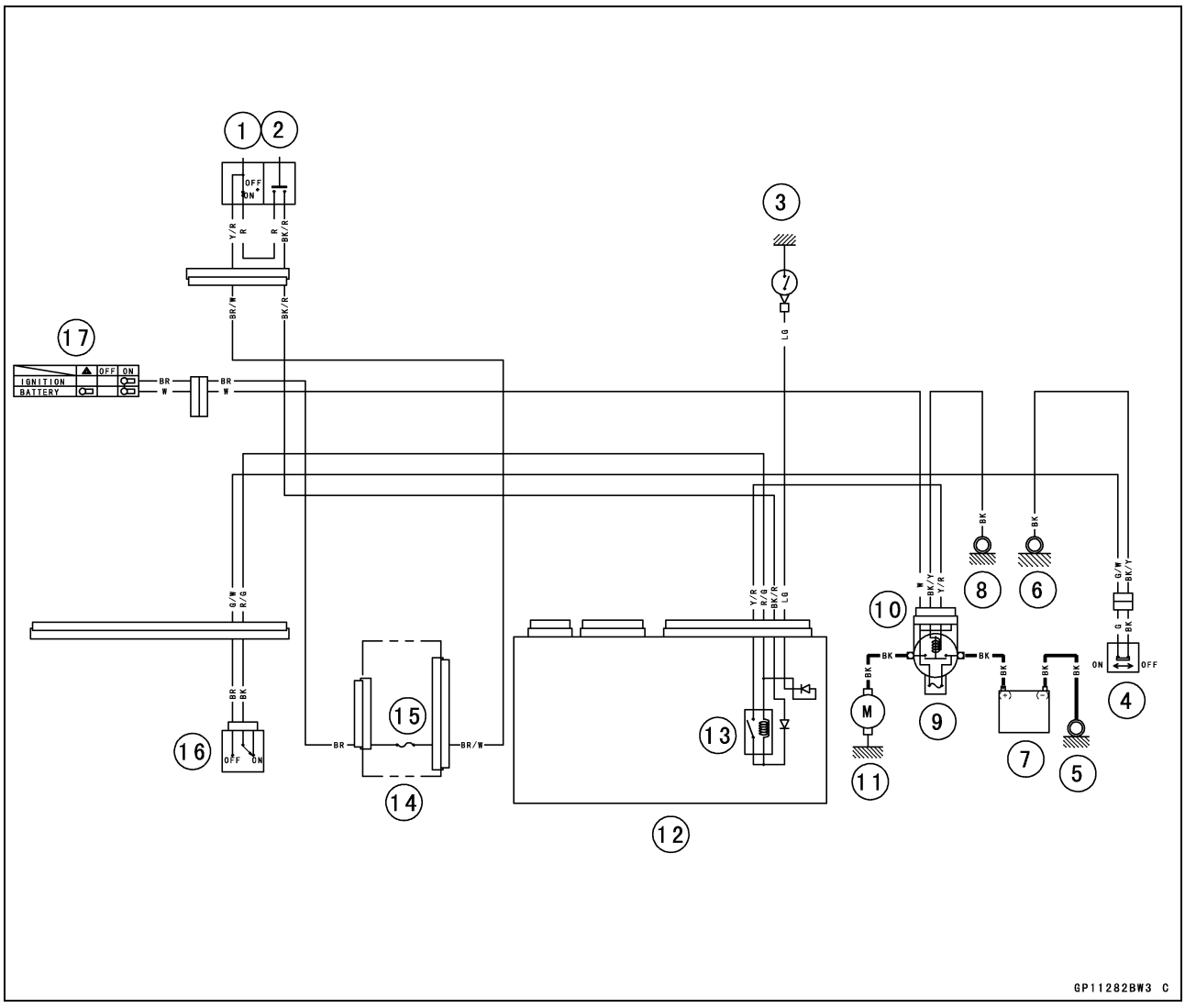
Testing Relay

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



Electric Starter System

Electric Starter Circuit



1. Engine Stop Switch
2. Starter Button
3. Neutral Switch
4. Side Stand Switch
5. Engine Ground
6. Frame Ground 5
7. Battery 12 V 10 Ah
8. Frame Ground 2
9. Main Fuse 30 A
10. Starter Relay
11. Starter Motor
12. Relay Box
13. Starter Circuit Relay
14. Fuse Box 1
15. Ignition Fuse 15 A
16. Starter Lockout Switch
17. Ignition Switch

Lighting System

This motorcycle adopt the daylight system and have a headlight relay in the relay box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

Headlight Beam Horizontal Adjustment

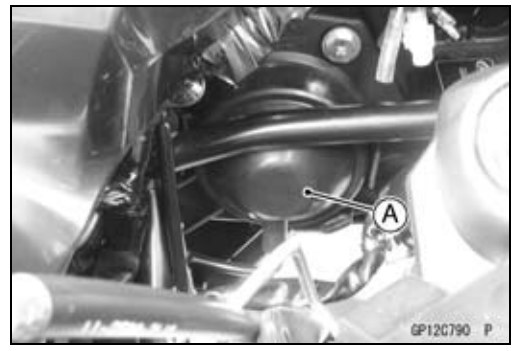
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Beam Vertical Adjustment

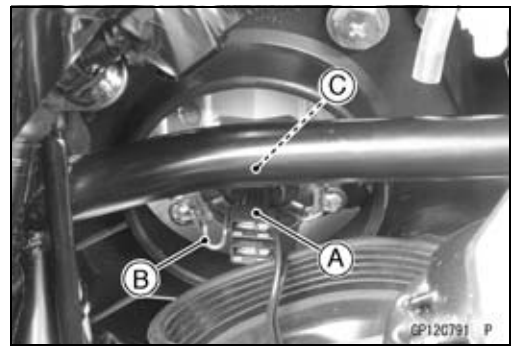
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

Headlight Bulb Replacement

- Remove the headlight bulb dust cover [A].



- Disconnect the connector [A].
- Remove:
  Hook [B]
  Headlight Bulb [C]

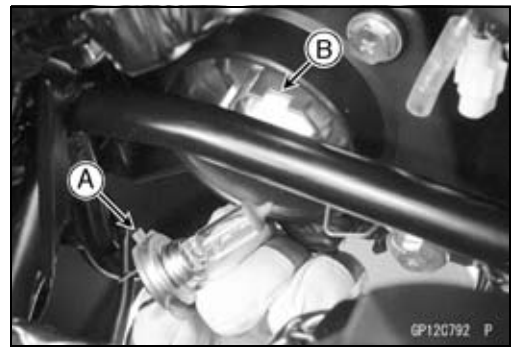


NOTICE
When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode. Use the correct type of headlight bulb with specified voltage and wattage only.

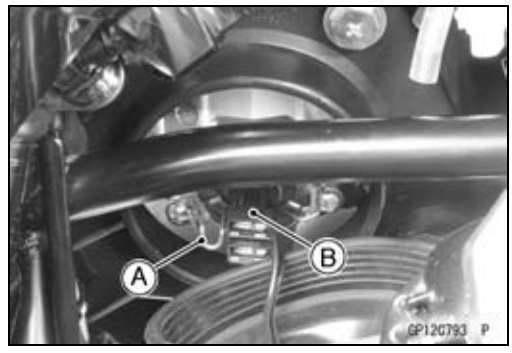
NOTE

○*Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.*

- Replace the headlight bulb.
- Fit the projection [A] on the bulb in the cutout [B] on the headlight.



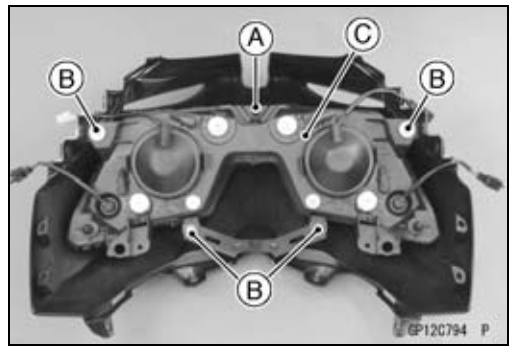
- Install the hook [A] and connect the connector [B] to the headlight bulb.



- Fit the dust cover [A] onto the headlight housing with its lead toward downward.
- After installation, adjust the headlight aim (see Headlight Aiming Inspection in the Periodic Maintenance chapter).

Headlight Removal/Installation

- Remove:
  Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  Screw [A]
  Bolts [B] and Washers
  Headlight [C]
- Installation is the reverse of removal.



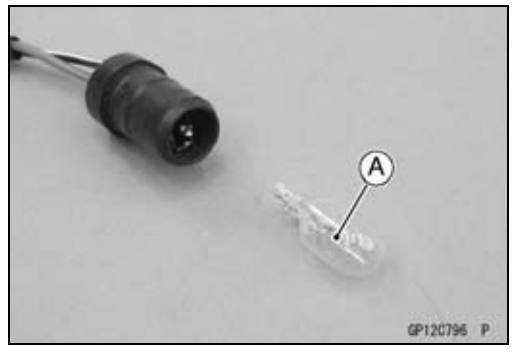
City Light Bulb Replacement

- Remove the upper fairing (see Upper Fairing Removal in the Frame chapter).
- Pull out the socket [A] from the headlight housing.

- Pull out the bulb [A] straight from the socket.

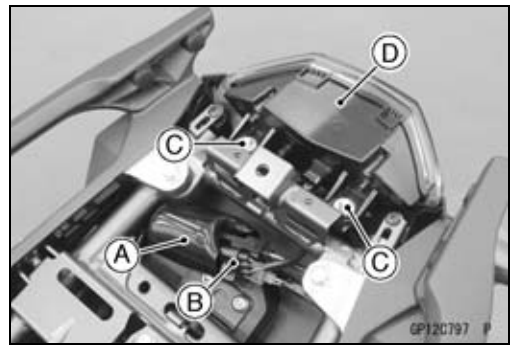
NOTICE
Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage then the specified value.

- Replace the bulb with a new one.



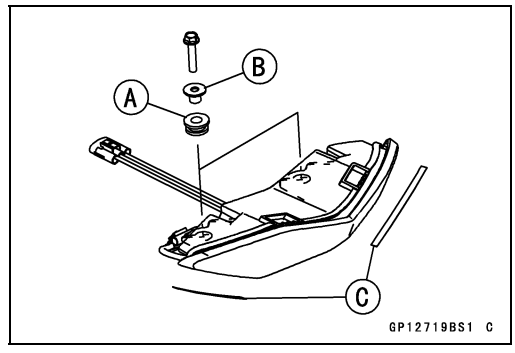
Lighting System

Tail/Brake Light (LED) Removal



- Remove the seat cover (see Seat Cover Removal in the Frame chapter).
- Slide the dust cover [A].
- Disconnect the tail/brake light lead connector [B].
- Remove:
  Bolts [C]
  Tail/Brake Light (LED) [D]

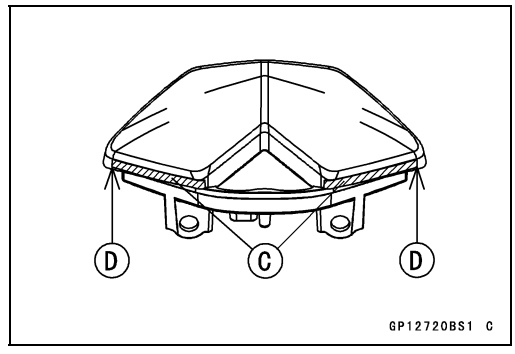
Tail/Brake Light (LED) Installation



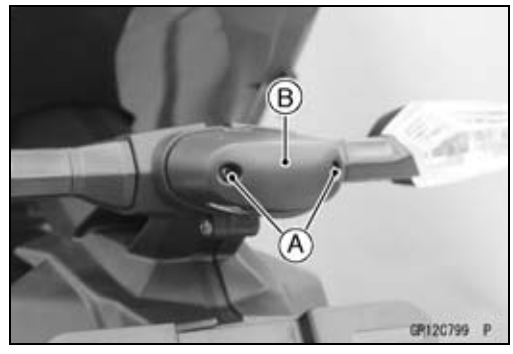
- Installation is the reverse of removal.
- Install:
  Dampers [A]
  Collars [B]
  Pads [C]

○Align the pads with the marks [D] on the tail/brake light (LED).

- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

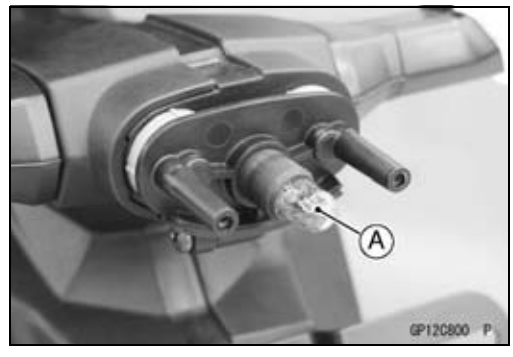


License Plate Light Bulb Replacement



- Remove:
  License Plate Light Cover Screws [A]
  License Plate Light Cover [B] and Lens

- Pull out the bulb [A] straight from the socket.

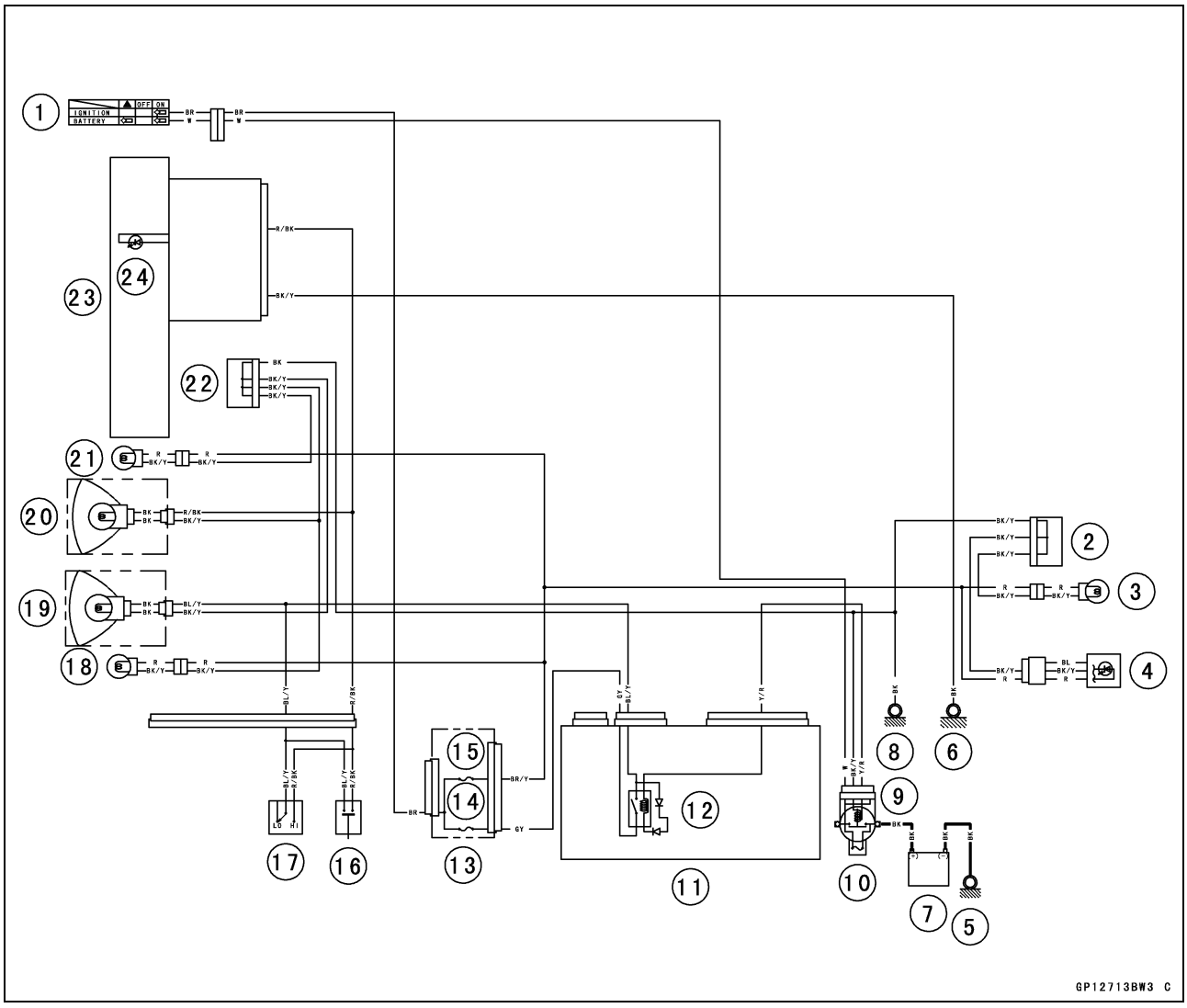


NOTICE
Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage then the specified valve.

- Replace the bulb with a new one.
- Insert the new bulb into the socket.
- Install the license plate light cover and lens.
- Tighten the license plate light cover screws.

Lighting System

Headlight/Tail Light Circuit

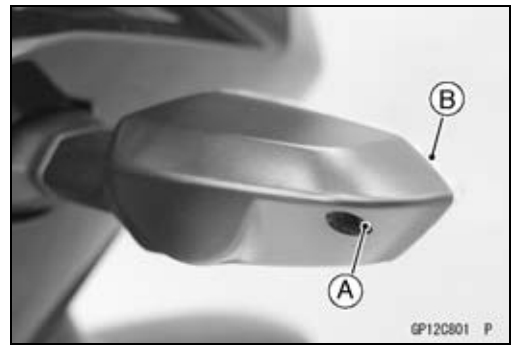


1. Ignition Switch
2. Joint Connector B
3. License Plate Light 12 V 5 W
4. Tail/Brake Light (LED)
5. Engine Ground
6. Frame Ground 5
7. Battery 12 V 10 Ah
8. Frame Ground 2
9. Starter Relay
10. Main Fuse 30 A
11. Relay Box
12. Headlight Circuit Relay
13. Fuse Box 1
14. Headlight Relay Fuse 15 A
15. Brake Light/Horn Fuse 10 A
16. Passing Button
17. Dimmer Switch
18. Left City Light 12 V 5 W
19. Headlight (Low) 12 V 5 W
20. Headlight (High) 12 V 5 W
21. Right City Light 12 V 5 W
22. Joint Connector A
23. Meter Unit
24. Blue High Beam Indicator Light (LED)

Lighting System

Turn Signal Light Bulb Replacement

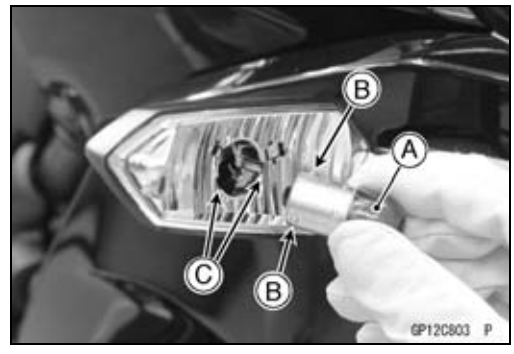
- Remove:
  Turn Signal Light Lens Screw [A]
  Turn Signal Light Lens [B]



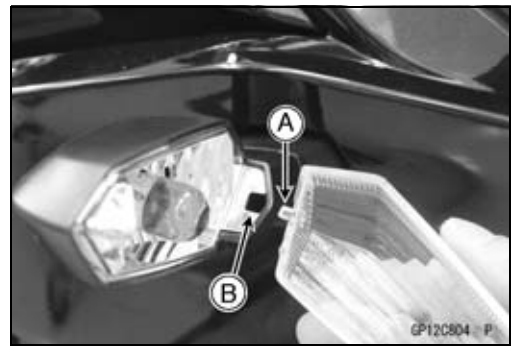
- Push and turn the bulb [A] counterclockwise and remove it.

- Insert the new bulb [A] by aligning its pins [B] with the grooves [C] in the socket, and turn the bulb clockwise.

○Turn the bulb about 15°.

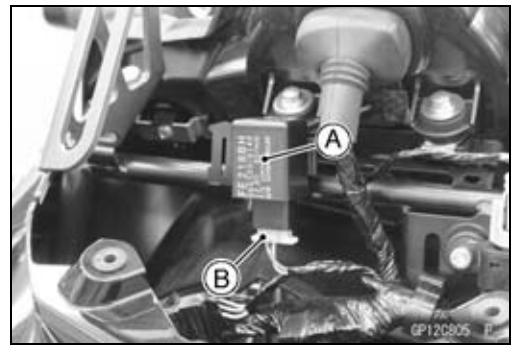


- Fit the projection [A] of the lens into the groove [B] of the turn signal light.
- Tighten the turn signal light lens screw.



Turn Signal Relay Inspection

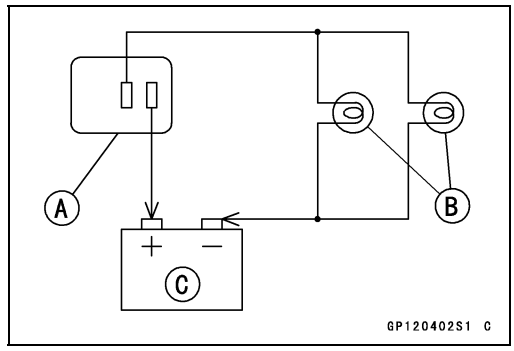
- Remove:
  Meter Cover (see Meter Cover Removal in the Frame chapter)
- Remove the turn signal relay [A].
- Disconnect the turn signal relay connector [B].



Lighting System

- Connect one 12 V battery and turn signal lights as indicated, and count how many times the lights blink for one minute.
  Turn Signal Relay [A]
  Turn Signal Lights [B]
  12 V Battery [C]

★If the lights do not blink as specified, replace the turn signal relay.



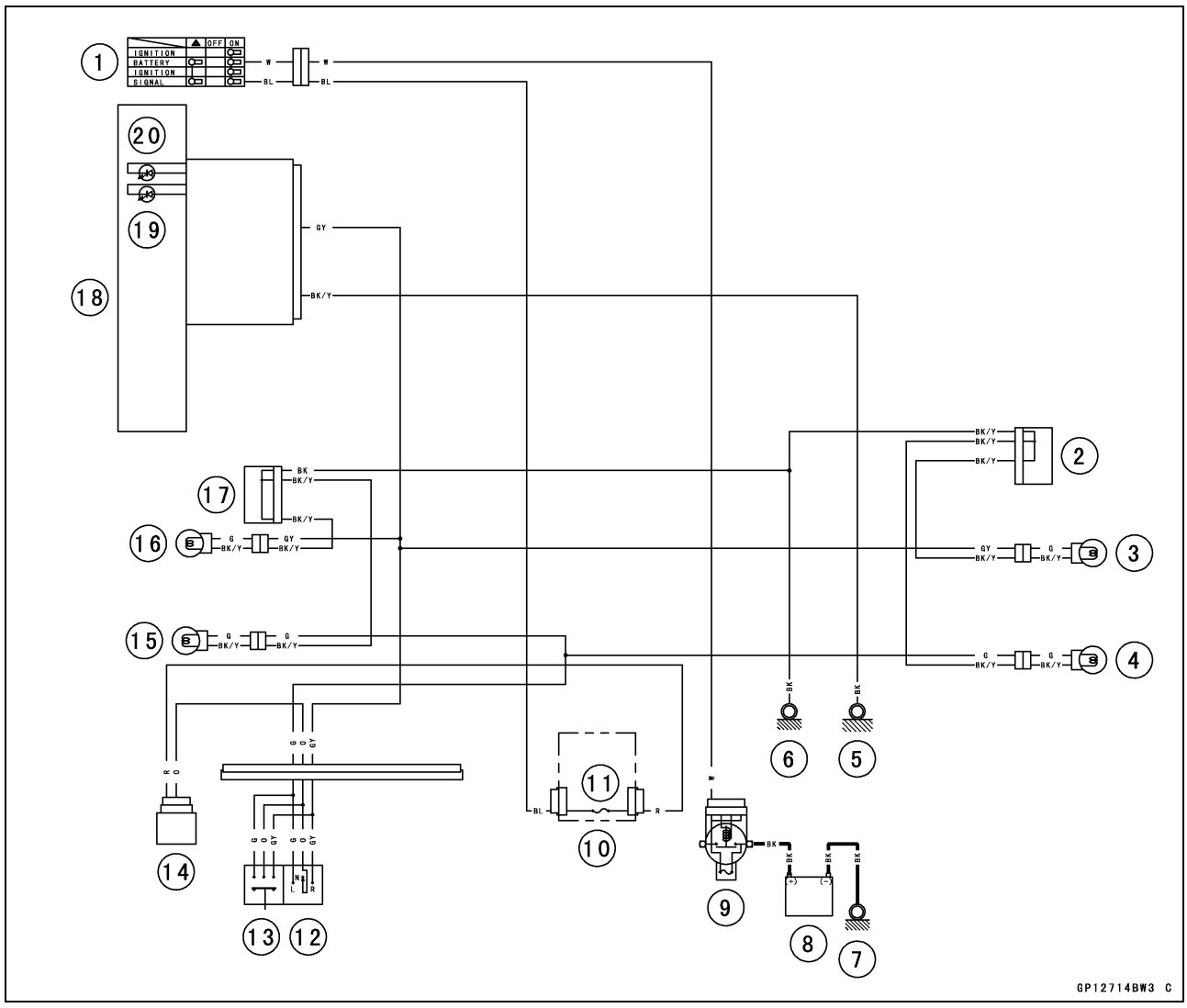
Testing Turn Signal Relay

Load		Blinking Times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	10	140 ~ 250
2	20	75 ~ 95

(*): Cycle(s) per minute
(**): Correspond to “one light burned out.”

Lighting System

Turn Signal Light Circuit



1. Ignition Switch
2. Joint Connector B
3. Rear Right Turn Signal Light 12 V 10 W
4. Rear Left Turn Signal Light 12 V 10 W
5. Frame Ground 5
6. Frame Ground 2
7. Engine Ground
8. Battery 12 V 10 Ah
9. Main Fuse 30 A
10. Fuse Box 2
11. Turn Signal Relay Fuse 10 A
12. Turn Signal Switch
13. Hazard Switch
14. Turn Signal Relay
15. Front Left Turn Signal Light 12 V 10 W
16. Front Right Turn Signal Light 12 V 10 W
17. Joint Connector A
18. Meter Unit
19. Green Right Turn Signal Indicator Light (LED)
20. Green Left Turn Signal Indicator Light (LED)

Air Switching Valve

Air Switching Valve Operation Test

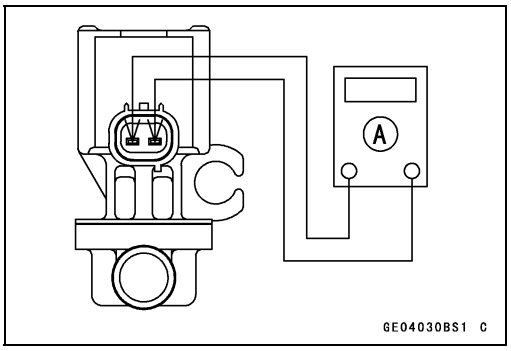
- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

Air Switching Valve Unit Test

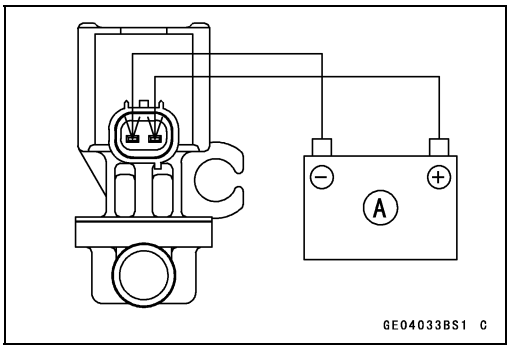
- Remove the air switching valve (see Air Switching Valve Removal in the Engine Top End chapter).
- Connect a tester [A] to the air switching valve terminals as shown.

Air Switching Valve Resistance
Standard: 18 ~ 22 Ω @20°C (68°F)

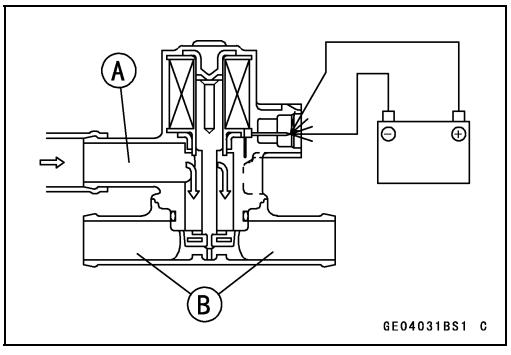
★If the resistance reading is out of the specified value, replace it with a new one.



- Connect the 12 V battery [A] to the air switching valve terminals as shown.



- Blow the air to the intake air duct [A], and make sure does not flow the blown air from the outlet air ducts [B].

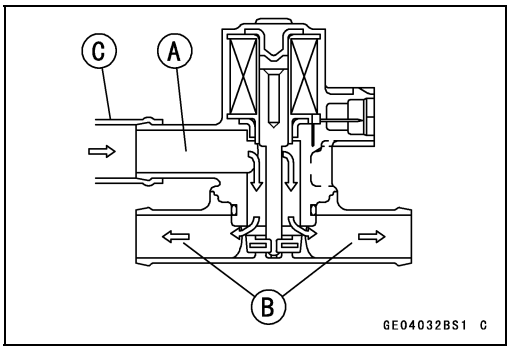


- Disconnect the 12 V battery.
- Blow the air to the intake air duct [A] again, and make sure flow the blown air from the outlet air duct [B].

★If the air switching valve does not operate as described, replace it with a new one.

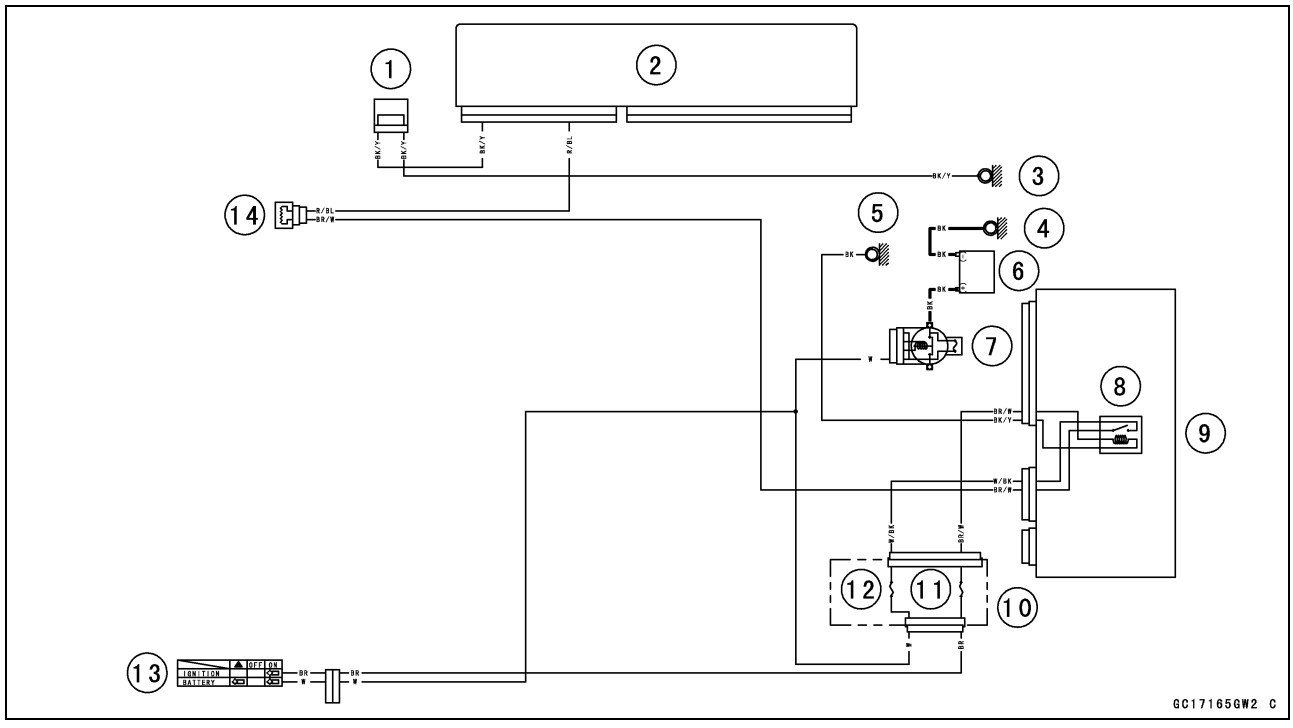
NOTE

○*To check air flow through the air switching valve, just blow through the air switching valve hose (intake side) [C].*



Air Switching Valve

Air Switching Valve Circuit



1. Joint Connector G
2. ECU
3. Frame Ground 1
4. Engine Ground
5. Frame Ground 2
6. Battery 12 V 10 Ah
7. Main Fuse 30 A
8. ECU Main Relay
9. Relay Box
10. Fuse Box 1
11. Ignition Fuse 10 A
12. ECU Fuse 15 A
13. Ignition Switch
14. Air Switching Valve

Radiator Fan System

Fan Motor Removal

- Refer to the Radiator and Radiator Fan Removal in the Cooling System chapter.

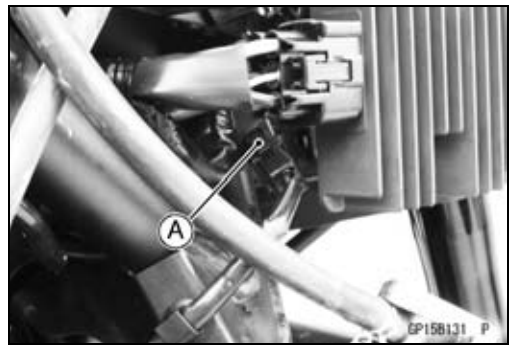
Fan Motor Installation

- Refer to the Radiator and Radiator Fan Installation in the Cooling System chapter.

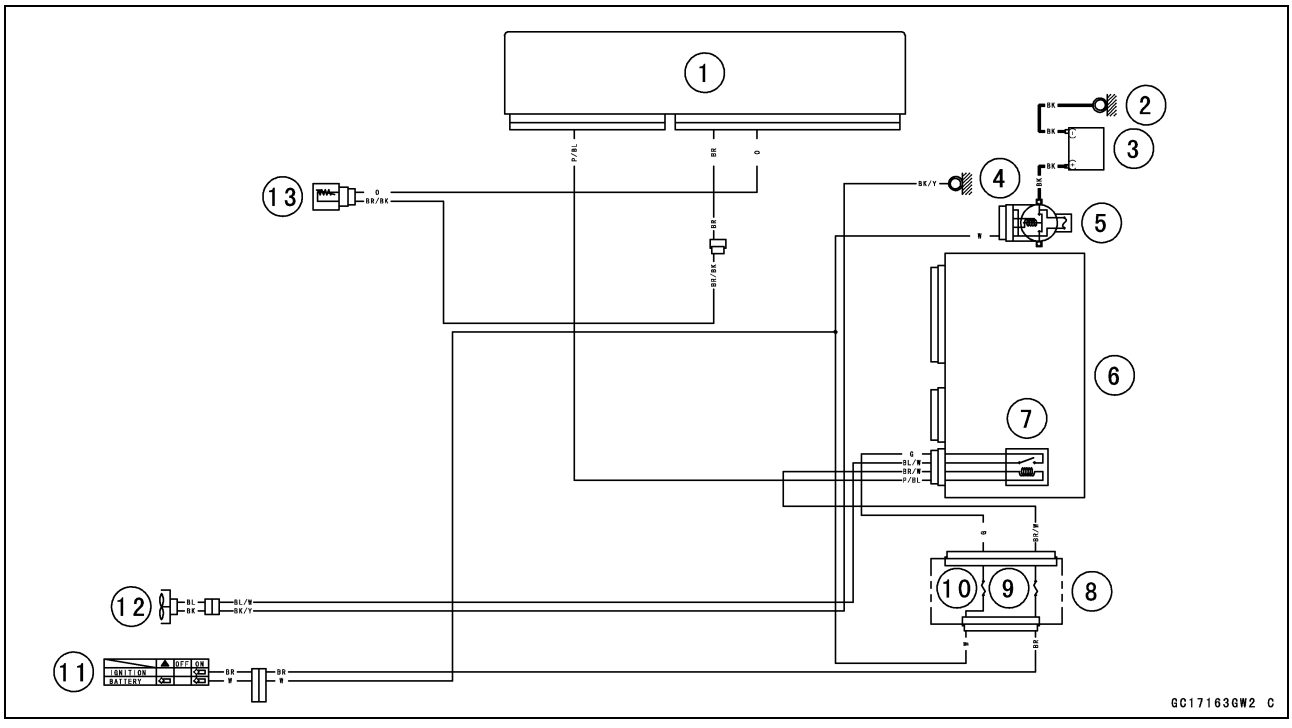
Fan Motor Inspection

- Remove the right middle fairing (see Middle Fairing Removal in the Frame chapter).
- 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.



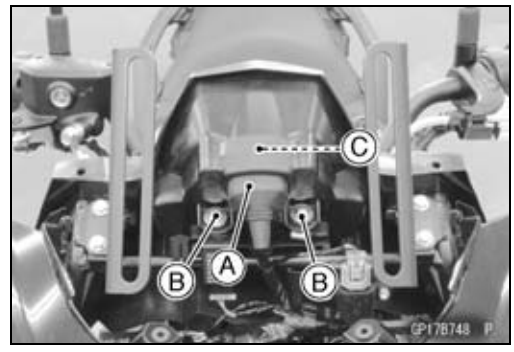
Radiator Fan Circuit



1. ECU
2. Engine Ground
3. Battery 12 V 10 Ah
4. Frame Ground 6
5. Main Fuse 30 A
6. Relay Box
7. Radiator Fan Relay
8. Fuse Box 1
9. Ignition Fuse 10 A
10. Fan Fuse 15 A
11. Ignition Switch
12. Fan Motor
13. Water Temperature Sensor

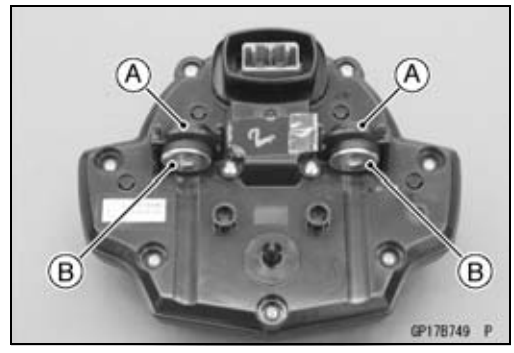
Meter, Gauge, Indicator Unit

Meter Unit Removal

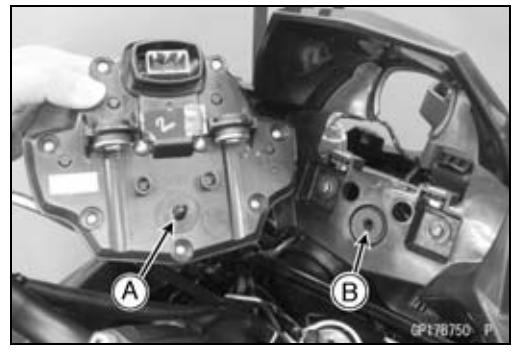


- Remove the meter cover (see Meter Cover Removal in the Frame chapter).
- Slide the dust cover [A], and disconnect the meter connector.
- Remove:
  Meter Mounting Bolts [B] and Washers
  Collars
- Clear the projection and remove the meter unit [C] rearward.

Meter Unit Installation



- Install:
  Dampers [A]
  Collars [B]



- Insert the projection [A] of the meter unit into the hole [B].
- Tighten the meter mounting bolts together with the washers.
- Connect the meter connector, and install the dust cover.
  Dampers [A]
  Collars

- Install the removed parts (see appropriate chapters).

Meter, Gauge, Indicator Unit

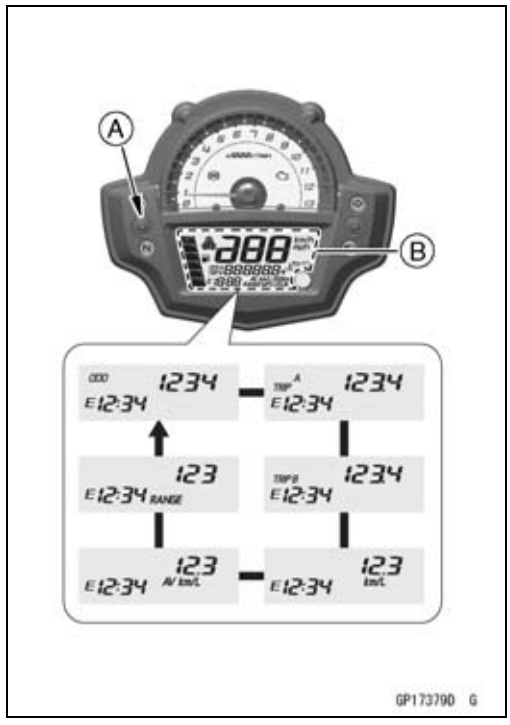
Meter Operation Inspection

Check 1: Meter Unit Switching Inspection

Display Mode Setting

- Turn the ignition switch on and check the following.
- By pushing the left meter button [A] each time, check that the display [B] changes as shown.

★If the display function does not work, replace the meter unit.



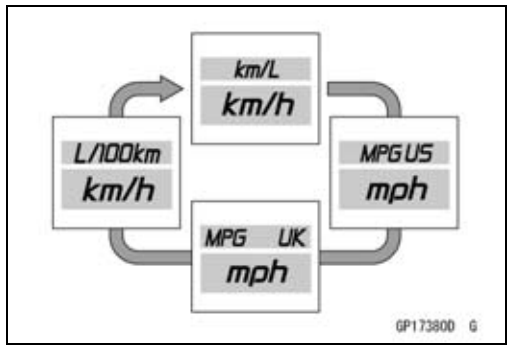
Unit Setting

- Set the ODO mode by pushing the left meter button.
- By pushing the right meter button each time while the left meter button pushed in, check that the display changes as shown.

NOTE

○*Mile/Km Display can alternate between English and metric modes (mile and km) in the digital meter. Make sure that km or mile according to local regulations is correctly displayed before riding.*

★If the display function does not work, replace the meter unit.

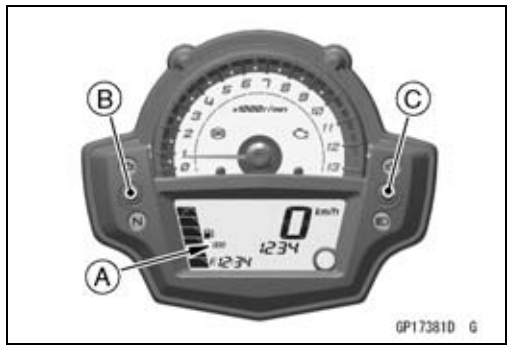


Clock Setting

- Set the ODO mode [A] by pushing the left meter button [B].
- Push the right meter button [C] for more than two seconds.

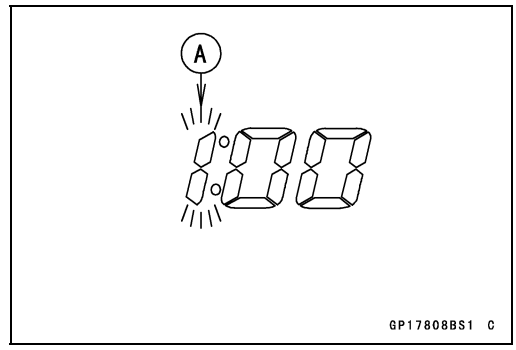
○The clock setting menu (hour and minute) should blink.

- Push the right meter button.

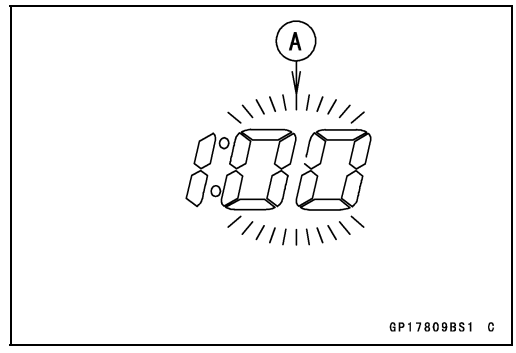


Meter, Gauge, Indicator Unit

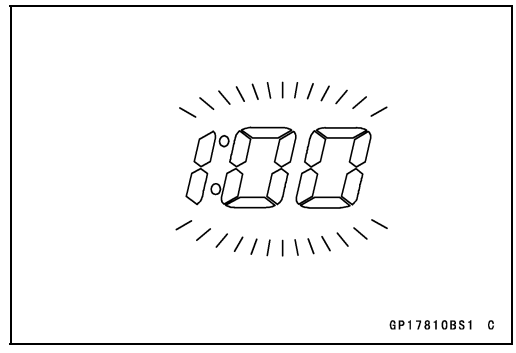
○The hour display [A] starts blinking.
● By pushing the left meter button each time, check that the hour display changes.



● By pushing the right meter button, check that the hour display decides and minute display [A] starts blinking.
● By pushing the left meter button each time, check that the minute display changes.



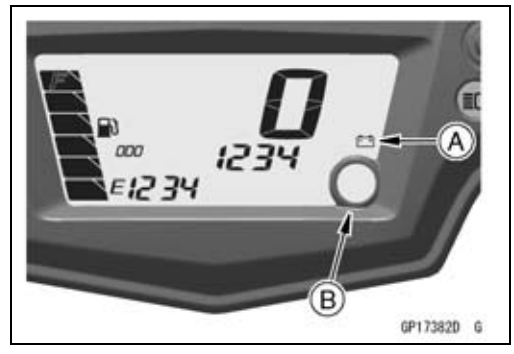
● By pushing the right meter button, check that the hour and minute display start blinking.
● By pushing the left meter button, check that the hour and minute display decide.
● When both hour and minute display is blinking, by pushing the right meter button, check that the hour display start blinking. This blinking returns the hour setting display.
★If the display function does not work, replace the meter unit.



Meter System Inspection

Check 2-1: Battery Warning Indicator Inspection

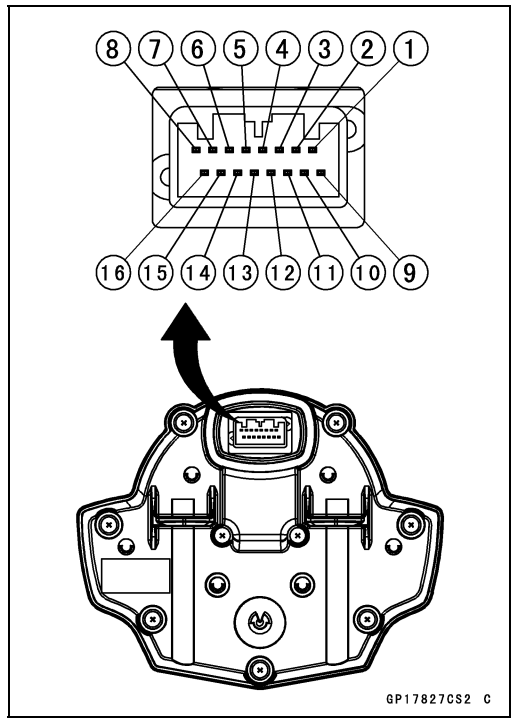
● When the battery condition is low voltage (10.8 ~ 11.2 V or less) or high voltage (15.5 ~ 16.5 V or more), the battery warning indicator [A] and red warning indicator light (LED) [B] go on.
★If the battery warning indicator and red warning indicator light (LED) go on, inspect the charging voltage (see Charging Voltage Inspection).
★If the charging voltage is good, replace the meter unit.



Meter, Gauge, Indicator Unit

Meter Unit Inspection

- Remove the meter unit (see Meter Unit Removal).



[1] Green Left Turn Signal Indicator Light (LED) (+)
[2] Green Neutral Indicator Light (LED) (–)
[3] Unused
[4] Unused
[5] Fuel Level Gauge
[6] Blue High Beam Indicator Light (LED) (+)
[7] Green Right Turn Signal Indicator Light (LED) (+)
[8] Yellow ABS Indicator Light (LED) (Equipped Models) (–)
[9] Tachometer Signal
[10] Speed Sensor Signal
[11] ECU Communication Line
[12] Red Warning Indicator Light (LED), Oil Pressure Warning (–)
[13] Unused
[14] Ground (–)
[15] Ignition (+)
[16] Battery (+)

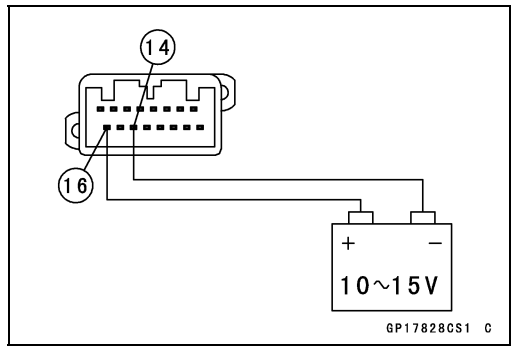
NOTICE

Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter unit is left upside down or sideways for a long time or dropped, it will malfunction. Do not short each terminals.

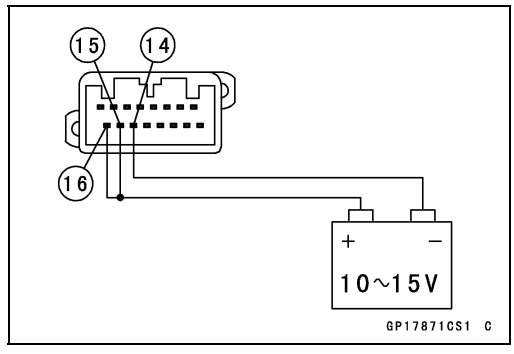
Check 3-1: Meter Unit Primary Operation Check

- Using the auxiliary leads, connect the 12 V battery to the meter unit connector as follows.

○Connect the battery positive (+) terminal to the terminal [16].
○Connect the battery negative (–) terminal to the terminal [14].

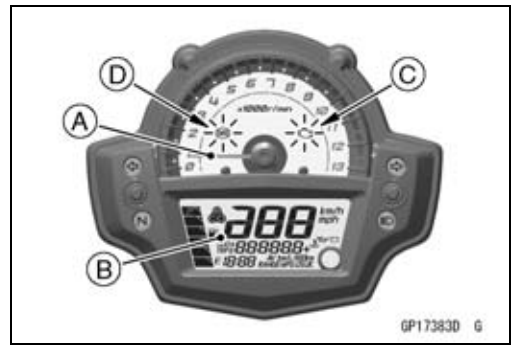


- Connect the terminal [15] to the battery (+) terminal.



Meter, Gauge, Indicator Unit

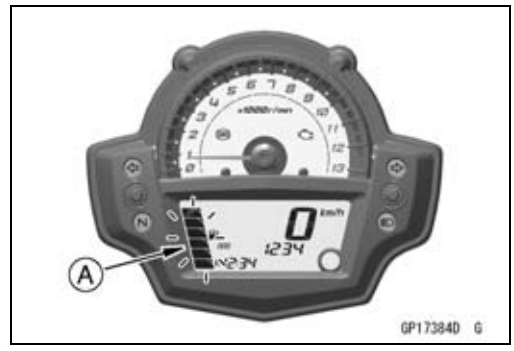
● Check the following items.
● The tachometer needle [A] sweeps to the maximum reading, then sweeps back to the minimum reading.
○All the LCD segments [B] appear for about 1 second.
○The yellow engine warning indicator light (LED) [C] goes on for about 1 second.
○The yellow ABS indicator light (LED) [D] goes on (equipped models).
★If the meter unit does not work, replace the meter unit.



○About 5 seconds after, the all fuel level gauge segments and fuel level warning indicator start blinking [A].
★If the fuel level gauge does not blink, replace the meter unit.

NOTE

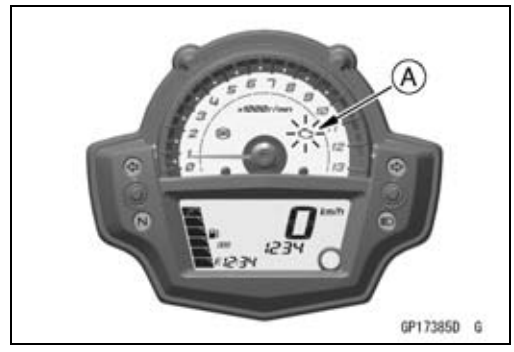
○*This meter unit has a failure detection function (for open or short) of the fuel level gauge. When the fuel level gauge is open or short, the meter unit alerts the rider by the all fuel level gauge segments blink in the display.*



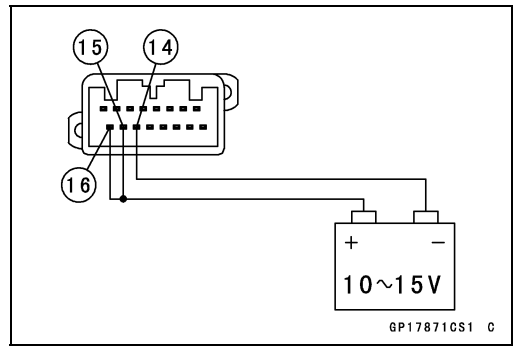
○About 10 seconds after, the yellow engine warning indicator light (LED) [A] goes on.
★If the yellow engine warning indicator light (LED) does not go on, replace the meter unit.

NOTE

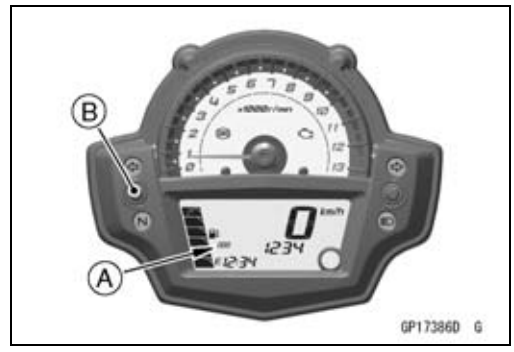
○*This meter unit has a failure detection function of the communication. When the communication error was detected, the meter unit alerts the rider by the yellow engine warning indicator light (LED) goes on.*



Check 3-2: Meter Communication Line (Service Code 39) Check
● Connect the leads in the same circuit as Check 3-1.
● After 10 seconds, the yellow engine warning indicator light (LED) goes on.

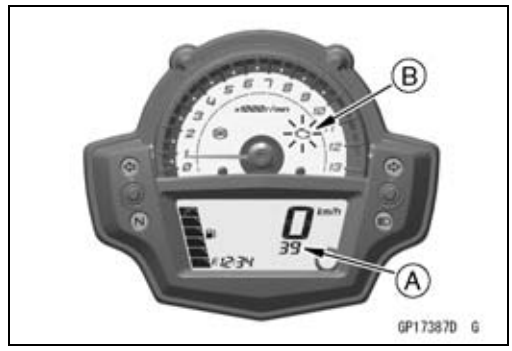


● Set the ODO mode [A] by pushing the left meter upper button [B].
● Push the left meter button for more than 2 seconds.



Meter, Gauge, Indicator Unit

● Check the following items.
○The number 39 [A] in the display appears and yellow engine warning indicator light (LED) [B] goes on.
● Push the left button for more than 2 seconds.
● Check the following items.
○The display returns ODO mode from number 39.
○The yellow engine warning indicator light (LED) goes on.
★If the meter unit does not work, replace the meter unit.

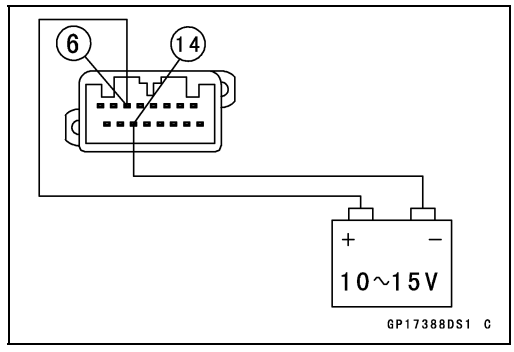


NOTE

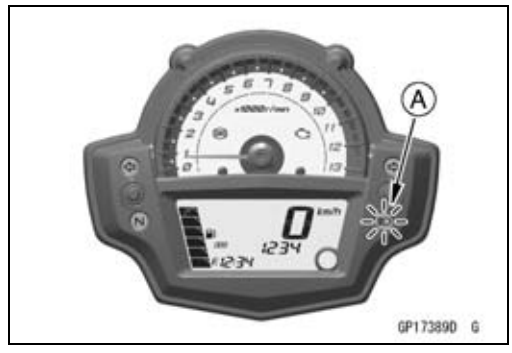
○*The number 39 is service code of Self-Diagnosis (see Fuel System (DFI) chapter). It is the service code of the meter communication line error.*
○*The number 39 in the display and yellow engine warning indicator (LED) disappear when the meter unit is connected to main harness of the normal motorcycle.*

Check 3-3: Blue High Beam Indicator light (LED) Inspection

● Connect the terminal [6] to the battery (+) terminal.
● Connect the terminal [14] to the battery (–) terminal.

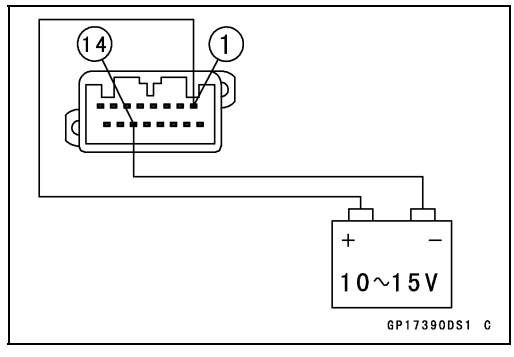


● Check that the blue high beam indicator light (LED) [A] goes on.
★If the indicator light (LED) does not go on, replace the meter unit.



Check 3-4: Green Left Turn Signal Indicator light (LED) Inspection

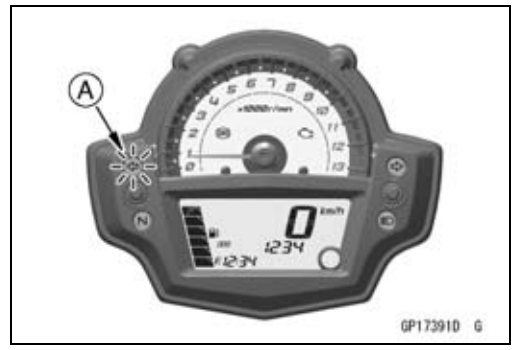
● Connect the terminal [1] to the battery (+) terminal.
● Connect the terminal [14] to the battery (–) terminal.



Meter, Gauge, Indicator Unit

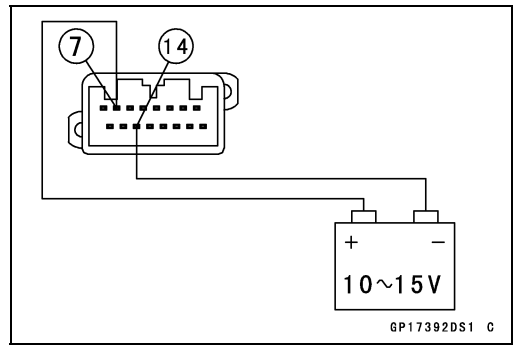
- Check that the green left turn signal indicator light (LED) [A] goes on.

★If the indicator light (LED) does not go on, replace the meter unit.



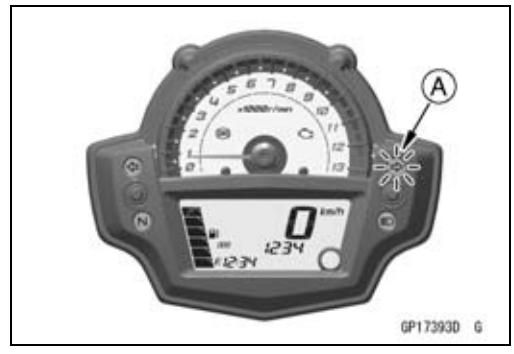
Check 3-5: Green Right Turn Signal Indicator light (LED) Inspection

- Connect the terminal [7] to the battery (+) terminal.
- Connect the terminal [14] to the battery (–) terminal.



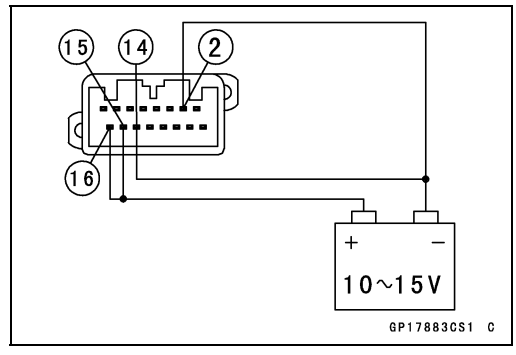
- Check that the green right turn signal indicator light (LED) [A] goes on.

★If the indicator light (LED) does not go on, replace the meter unit.



Check 3-6: Green Neutral Indicator light (LED) Inspection

- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [2] to the battery (–) terminal.



- Check that the green neutral indicator light (LED) [A] goes on.

★If the indicator light (LED) does not go on, replace the meter unit.

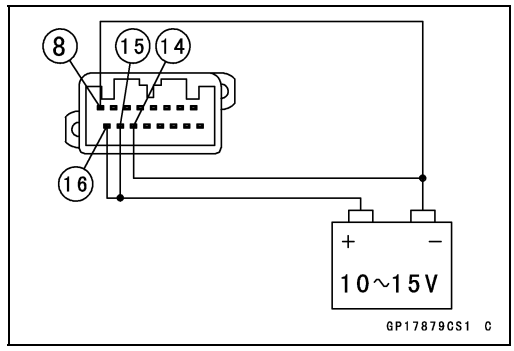
Meter, Gauge, Indicator Unit

Check 3-7: Yellow ABS Indicator light (LED) Inspection (Equipped Models)

- Connect the leads in the same circuit as Check 3-1.

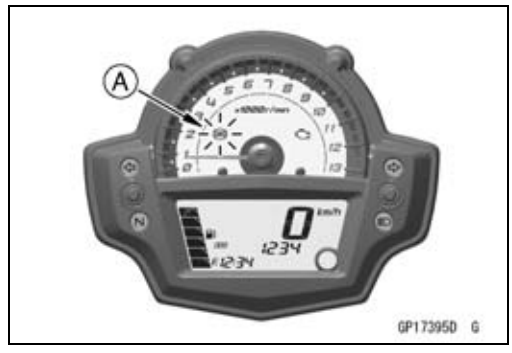
○The yellow ABS indicator light (LED) goes on.

- Connect the terminal [8] to the battery (–) terminal.



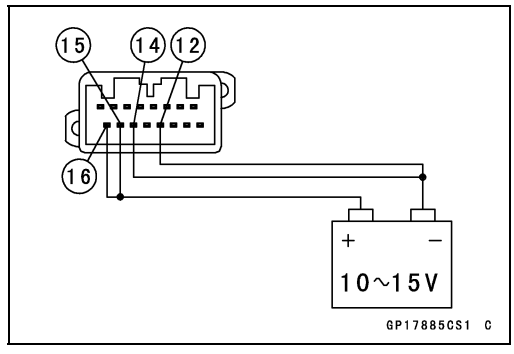
- Check that the yellow ABS indicator light (LED) [A] goes off.

★If the indicator light (LED) does not go off, replace the meter unit.



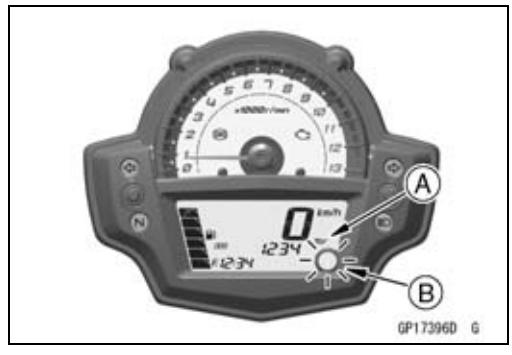
Check 3-8: Red Warning Indicator light (LED) Inspection (Oil Pressure Warning)

- Connect the leads in the same circuit as Check 3-1.
- Connect the terminal [12] to the battery (–) terminal.



- Check that the oil pressure warning indicator [A] and red warning indicator light (LED) [B] go on.

★If the oil pressure warning indicator and indicator light (LED) do not go on, replace the meter unit.

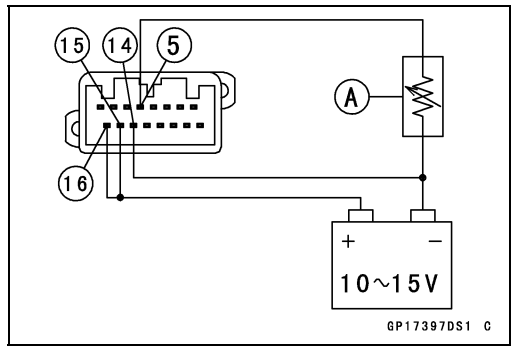


Check 3-9: Fuel Gauge Inspection

- Connect the leads in the same circuit as Check 3-1.

○The all segments of the fuel gauge in the display will blink.

- Connect the variable rheostat [A] to the terminal [5] and the battery (–) terminal.



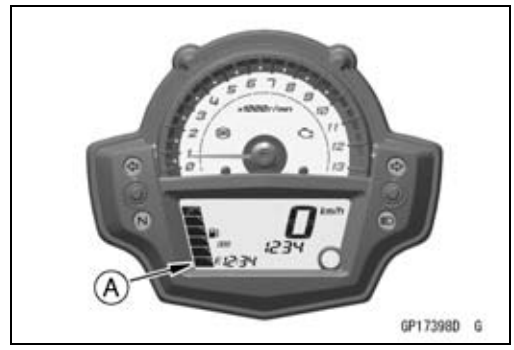
Meter, Gauge, Indicator Unit

● Check that the number of segments on the fuel level gauge [A] matches the resistance value of the variable rheostat.

○When the terminal [5] is connected, 1 segment in the fuel level gauge should appear about every 15 seconds.

Variable Rheostat Resistance (Ω)	Display Segments
15	6 segments go on
40	5 segments go on
70	4 segments go on
100	3 segments go on
140	2 segments go on
170	1 segment goes on
210	1 segment and Fuel level warning indicator blink

★If the display function does not work, replace the meter assembly.



Check 3-10: Speedometer Inspection

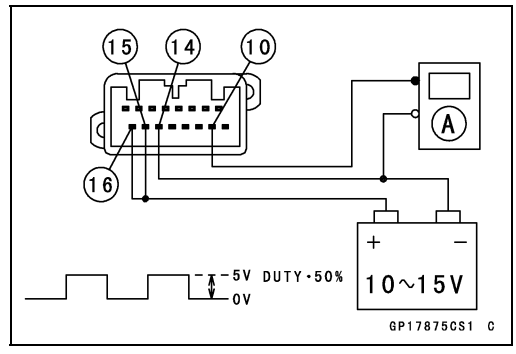
● Connect the leads in the same circuit as Check 3-1.

● The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [10].

○Indicates approximately 60 km/h if the input frequency is approximately 102 Hz.

○Indicates approximately 60 mph if the input frequency is approximately 166 Hz.

★If the meter function does not work, replace the meter unit.



NOTE

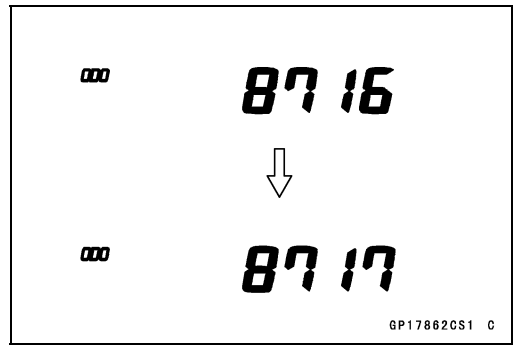
○*The input frequency of the oscillator adds the integrated value of the odometer.*

○*The integrated value of the odometer cannot be reset.*

Check 3-11: Odometer Check

● Check the odometer with the speedometer check in the same way.

★If value indicated in the odometer is not added, replace the meter unit.



NOTE

○*The data is maintained even if the battery is disconnected.*

○*When the figures come to 999999, they are stopped and locked.*

○*The integrated value of the odometer cannot be reset.*

Meter, Gauge, Indicator Unit

Check 3-12: Trip A/B Meter Check

- Check the trip meter with the speedometer in the same way.

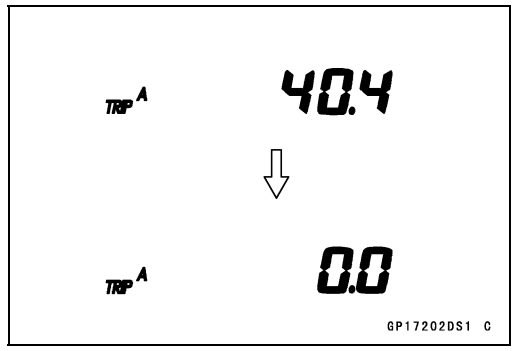
★If value indicated in the trip meter is not added, replace the meter unit.

NOTE

○*The integrated value of the odometer cannot be reset.*

- Check that when the right button is pushed for more than two seconds, the figure display turns to 0.0.

★If the figure display does not indicate 0.0, replace the meter unit.

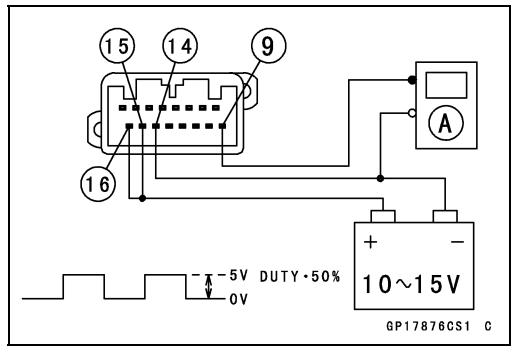


Check 3-13: Tachometer Inspection

- Connect the leads in the same circuit as Check 3-1.
- The engine speed (rpm) equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [9].

○Indicates approximately 6 000 rpm if the input frequency is approximately 200 Hz.

★If the meter function does not work, replace the meter unit.



Check 3-14: Other Inspection

○The following items are displayed while running.

AVERAGE
CURRENT
RANGE
ECO Mark

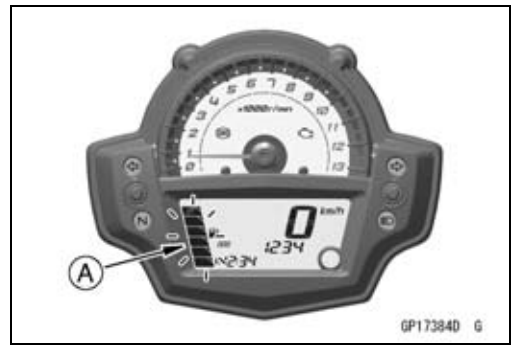
- When the above item is faulty indication check the following items.

Wiring (see Wiring Inspection)
ECU Communication Line (see ECU Communication Line Inspection in the Fuel System (DFI) chapter)
Fuel Injectors (see Fuel Injectors (Service Code 41, 42) section in the Fuel System (DFI) chapter)
Speed Sensor (see Speed Sensor (Service Code 24) section in the Fuel System (DFI) chapter)
Crankshaft Sensor (see Crankshaft Sensor Inspection)

★If the above items are good, replace the meter unit and/or ECU.

Meter, Gauge, Indicator Unit

Fuel Level Sensor Line Self-Diagnosis Mode Inspection



NOTE

○*Usually when the open or short of the fuel level sensor circuit is detected, it becomes the Fuel Level Sensor Line Self-Diagnosis Mode.*

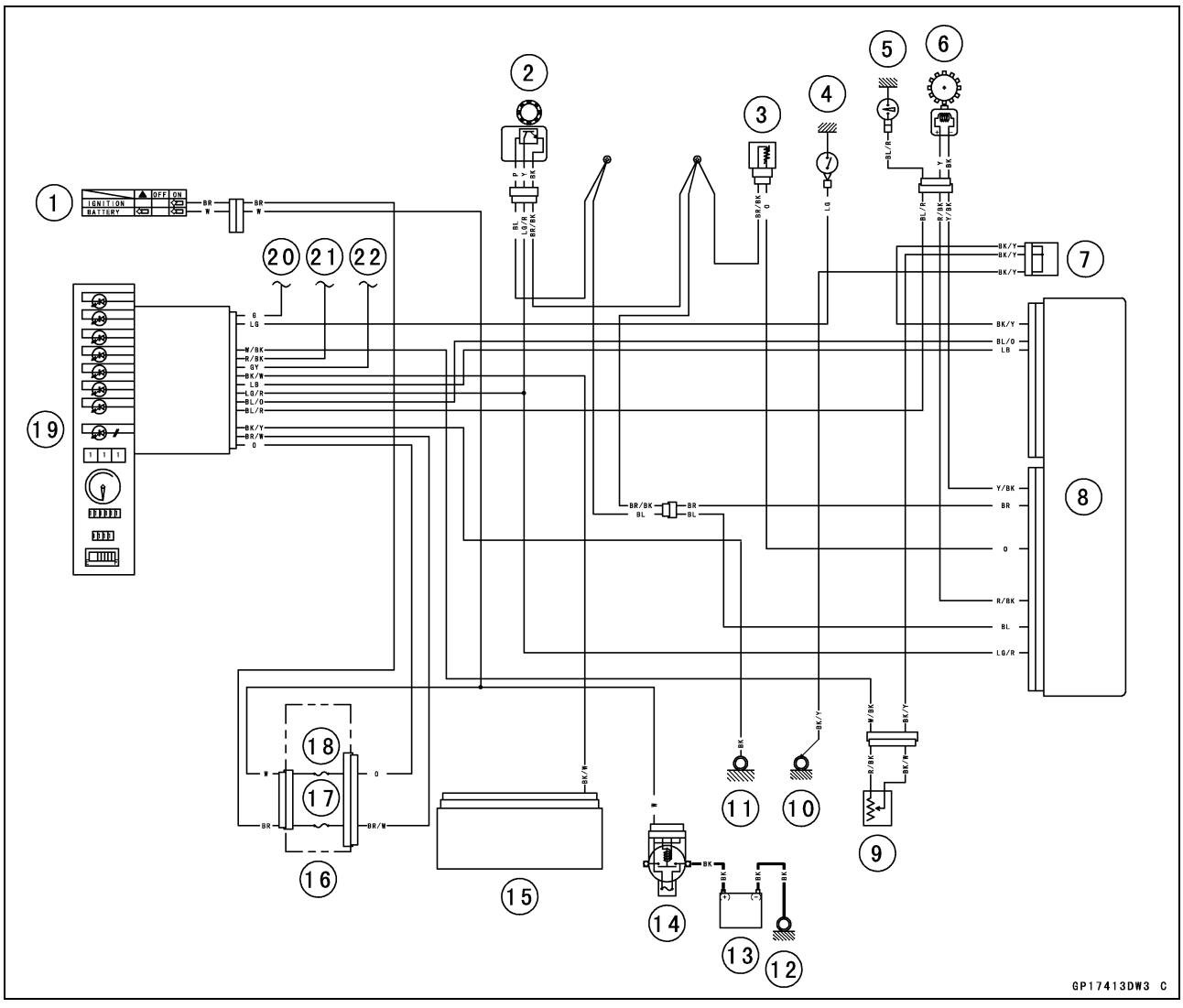
○The all segments of the fuel level gauge and fuel level warning indicator [A] in the display will blink. (This function is Fuel Level Sensor Line Self-Diagnosis Mode.)

★If the meter enters the self-diagnosis mode when the meter is installed in the motorcycle, check the fuel level sensor (see Fuel Level Sensor Inspection) and wiring.

★If the fuel level sensor and wiring are good, replace the meter unit.

Meter, Gauge, Indicator Unit

Meter Circuit



1. Ignition Switch
2. Speed Sensor
3. Water Temperature Sensor
4. Neutral Switch
5. Oil Pressure Switch
6. Crankshaft Sensor
7. Joint Connector G
8. ECU
9. Fuel Level Sensor
10. Frame Ground 1
11. Frame Ground 5
12. Engine Ground
13. Battery 12 V 10 Ah
14. Main Fuse 30 A
15. ABS Hydraulic Unit (KLE650F)
16. Fuse Box 1
17. Ignition Fuse 10 A
18. Meter Fuse 10 A
19. Meter Unit
20. to Turn Signal Switch (Left)
21. to Dimmer Switch and Passing Button
22. to Turn Signal Switch (Right)

Switches and Sensors

Brake Light Timing Inspection

● Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

Brake Light Timing Adjustment

● Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

Switch Inspection

● Using a tester, check to see that only the connections shown in the table have continuity (about zero ohms).

○For the switch housings and the ignition switch, refer to the tables in the Wiring Diagram.

★If the switch has an open or short, repair it or replace it with a new one.

Rear Brake Light Switch Connections

Rear Brake Light Switch Connections		
Color	BR	BL
When brake pedal is pushed down	○———	———○
When brake pedal is released		

Side Stand Switch Connections

Side Stand Switch Connections		
Color	BK	G
When side stand is down		
When side stand is up	○———	———○

Neutral Switch Connections

Neutral Switch Connections		
Color	SW. Terminal	Ground
When transmission is in neutral	○———	———○
When transmission is not in neutral		

Oil Pressure Switch Connections*

Oil Pressure Switch Connections *		
Color	SW. Terminal	Ground
When engine is stopped	○———	———○
When engine is running		

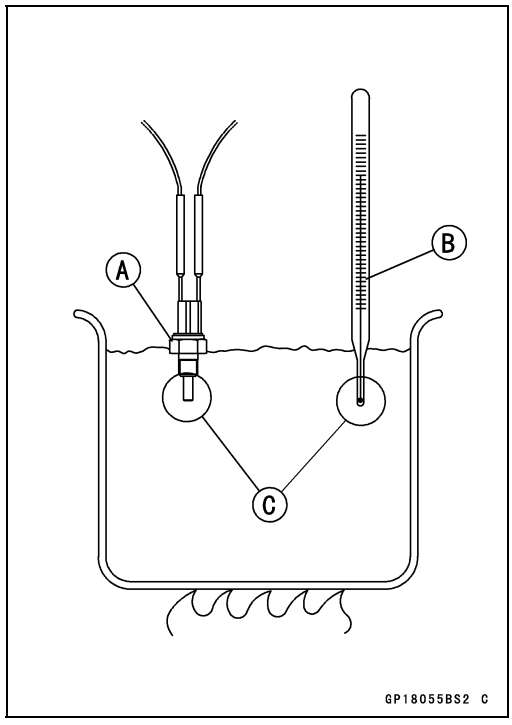
*: Engine lubrication system is in good condition.

Water Temperature Sensor Removal/Installation

● Refer to the water temperature Sensor Removal/Installation in the Fuel System (DFI) chapter.

Switches and Sensors

Water Temperature Sensor Inspection



- Remove the water temperature sensor (see Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter).
- Suspend the sensor [A] in a container of coolant so that the threaded portion is submerged.
- Suspend an accurate thermometer [B] with temperature sensing portions [C] located in almost the same depth.

NOTE

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

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using a digital meter, measure the internal resistance of the sensor.

★If the digital meter does not show the specified values, 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

Speed Sensor Removal

- Refer to the Speed Sensor Removal/Installation in the Fuel System (DFI) chapter.

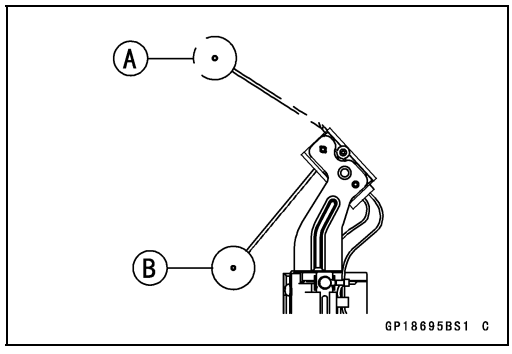
Speed Sensor Installation

- Refer to the Speed Sensor Removal/Installation in the Fuel System (DFI) chapter.

Speed Sensor Inspection

- Refer to the Speed Sensor Inspection in the Fuel System (DFI) chapter.

Fuel Level Sensor Inspection



- Remove:
  Fuel Pump (see Fuel Pump Removal in the Fuel System (DFI) chapter)
- Check that the float moves up and down smoothly without binding. It should go down under its own weight.

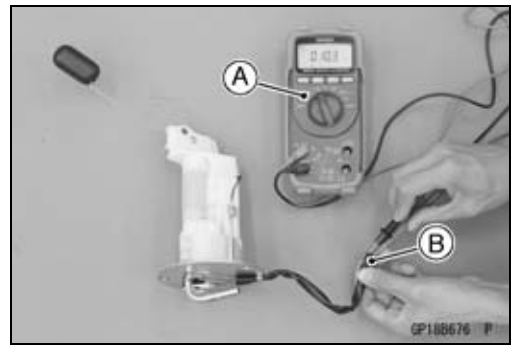
★If the float does not move smoothly, replace the fuel pump.
  Float in Full Position [A]
  Float in Empty Position [B]

Switches and Sensors

- Using a tester [A], measure the resistance across the terminals in the fuel level sensor lead connector [B].

★If the tester readings are not as specified, or do not change smoothly according as the float moves up and down, replace the fuel pump.

Fuel Level Sensor Resistance
Standard: Full position: 9 ~ 11 Ω
Empty position: 213 ~ 219 Ω

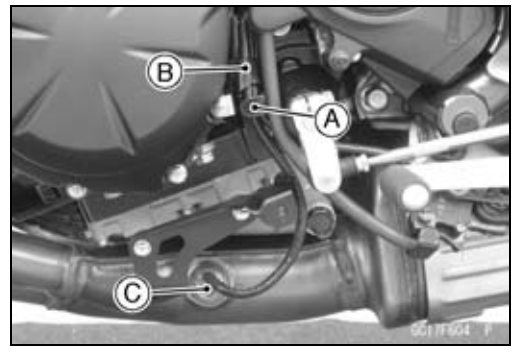


Oxygen Sensor Removal

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

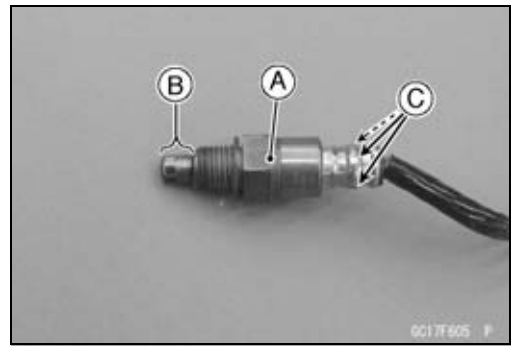
NOTICE
Do not pull strongly, twist, or bend the oxygen sensor lead. This may cause the wiring open.

- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Open the clamp [A].
- Disconnect the oxygen sensor lead connector [B].
- Remove the oxygen sensor [C].



Oxygen Sensor Installation

NOTICE
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.



- Tighten:

Torque - Oxygen Sensor: 44 N·m (4.5 kgf·m, 32 ft·lb)

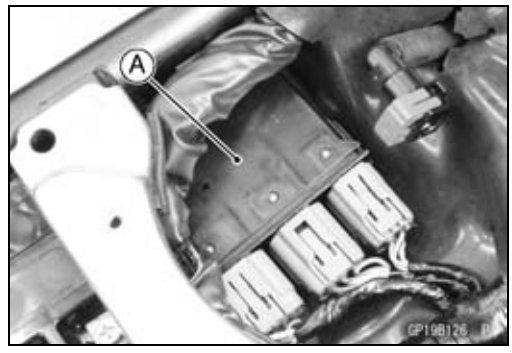
- Run the oxygen sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed (see appropriate chapters).

Oxygen Sensor Inspection

- Refer to the Oxygen Sensor Inspection in the Fuel System (DFI) chapter.

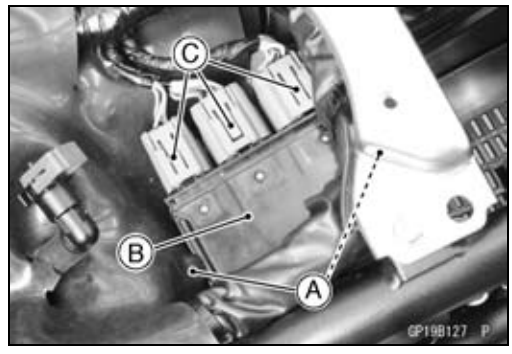
Relay Box

The relay box [A] has relays and diodes. The relays and diodes can not be removed.



Relay Box Removal

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



- Remove:
  Battery (see Battery Removal)
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Clear the hook portions [A] and take out the relay box [B].
- Disconnect the connectors [C].
- Remove the relay box.

Relay Box Installation

- Installation is the reverse of removal.

Relay Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following numbered terminals by connecting a tester and one 12 V battery to the relay box as shown (see Relay Box Internal Circuit in this section).

★If the tester does not read as specified, replace the relay box.

Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading (Ω)
Headlight Circuit Relay	1-3	∞
ECU Main Relay	7-6	∞
	4-5	Not ∞*
Fuel Pump Relay	7-8	∞
	9-10	Not ∞*
Starter Circuit Relay	11-16	∞
	11-12	∞
Fan Relay	17-20	∞
	18-19	Not ∞*

*: The actual reading varies with the tester used.

Relay Box

Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (–)	Tester Connection	Tester Reading (Ω)
Headlight Relay	2-11	1-3	0
ECU Main Relay	4-5	7-6	0
Fuel Pump Relay	9-10	7-8	0
Fan Relay	18-19	17-20	0

	Battery Connection (+) (–)	Tester Connection (+) (–)	Tester Reading (V)
Starter Circuit Relay	16-12	11-12	Battery Voltage

(+): Apply positive lead.
(–): Apply negative lead.

Diode Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit in this section).

Diode Circuit Inspection

Tester Connection	1-11, 2-11, 12-13, 12-15, 12-16, 13-14, 13-15

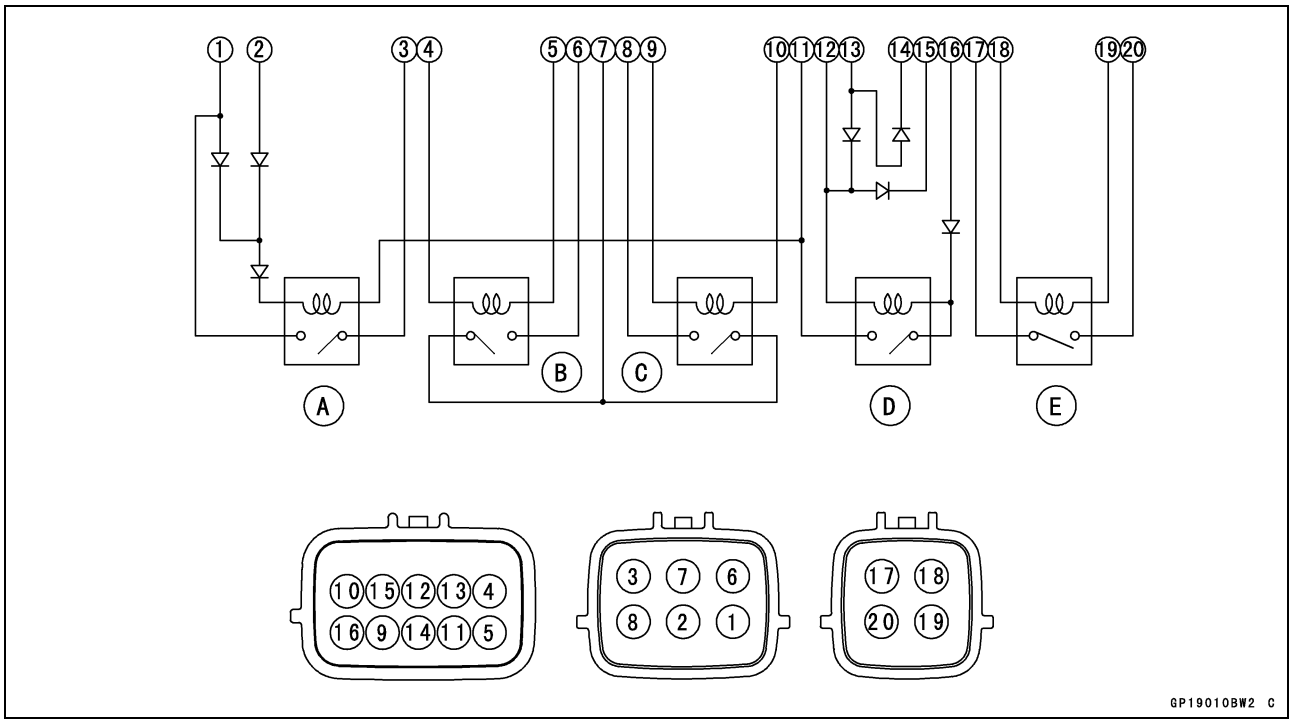
★The resistance should be low in one direction and more than 10 times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

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

Relay Box Internal Circuit

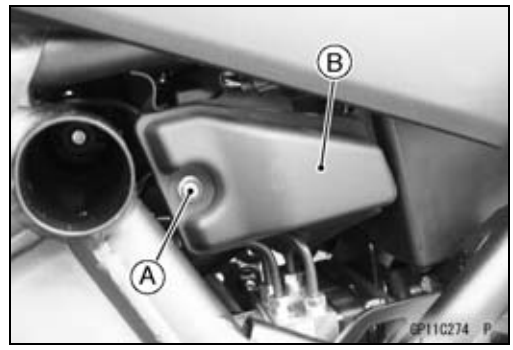


A: Headlight Circuit Relay
B: ECU Main Relay
C: Fuel Pump Relay
D: Starter Circuit Relay
E: Fan Relay

Fuses

Main Fuse (30 A) Removal

- Remove:
  Left Frame Cover (see Frame Cover Removal in the Frame chapter)
  Bolt [A]
  Starter Relay Cover [B]

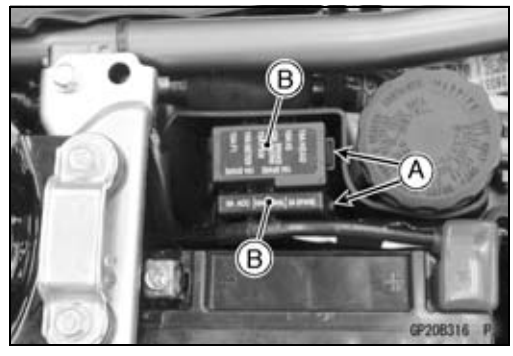


- Open the rubber cover [A].

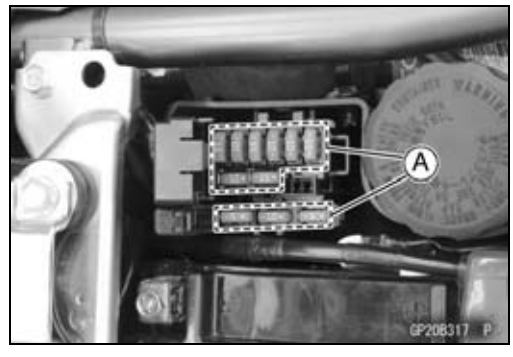
- Pull out the main fuse (30 A) [A] from the starter relay with needle nose pliers.

Fuse Box Fuse Removal

- Remove:
  Seat (see Seat Removal in the Frame chapter)
- Unlock the hook [A] to lift up the lid.
  Fuse Box 1 [B]
  Fuse Box 2 [C]



- Pull the fuses [A] straight out of the fuse box with needle nose pliers.



Fuses

Fuse Installation

★If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.

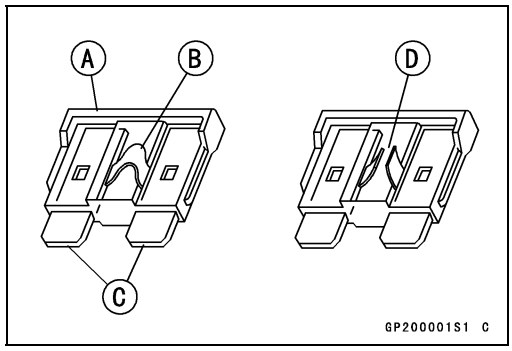
- Install the fuse box fuses on the original position as specified on the lid.

Fuse Inspection

- Remove the fuse (see Main Fuse (30 A)/Fuse Box Fuse Removal).
- Inspect the fuse element.

★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

Housing [A]
Fuse Element [B]
Terminals [C]
Blown Element [D]



NOTICE
When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.

Appendix

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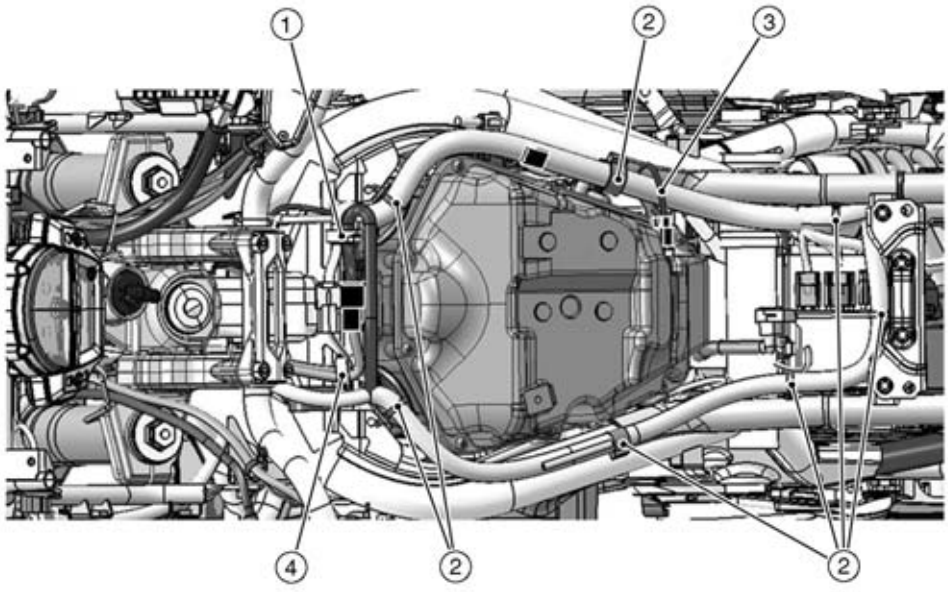
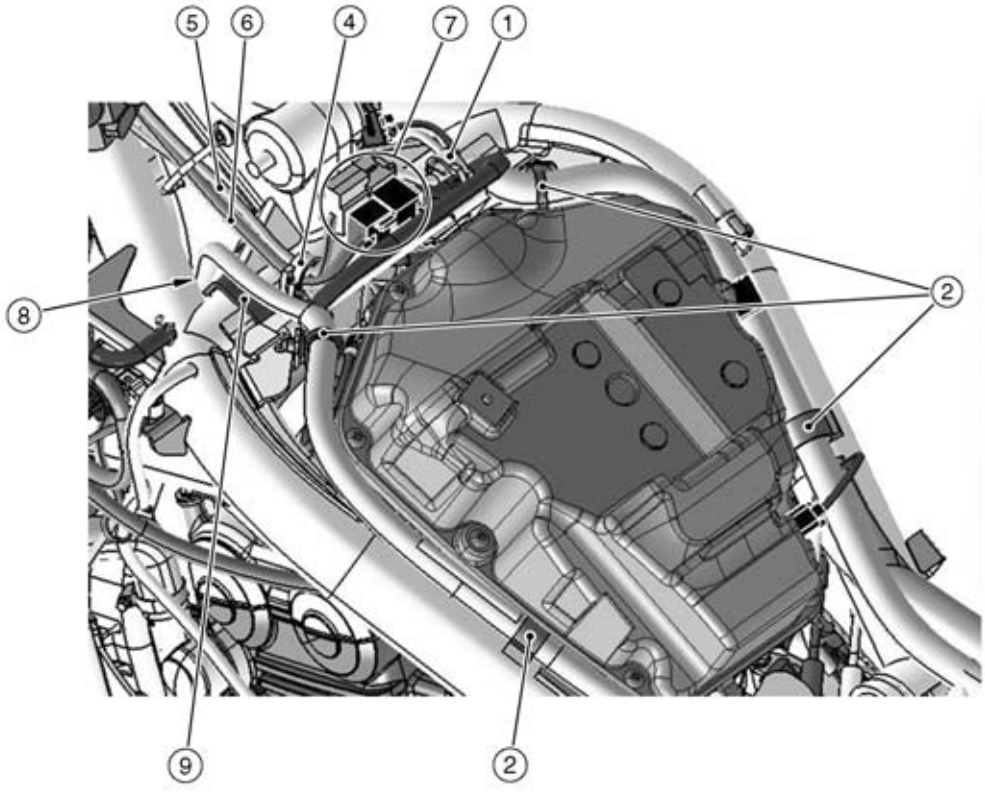
Cable, Wire, and Hose Routing





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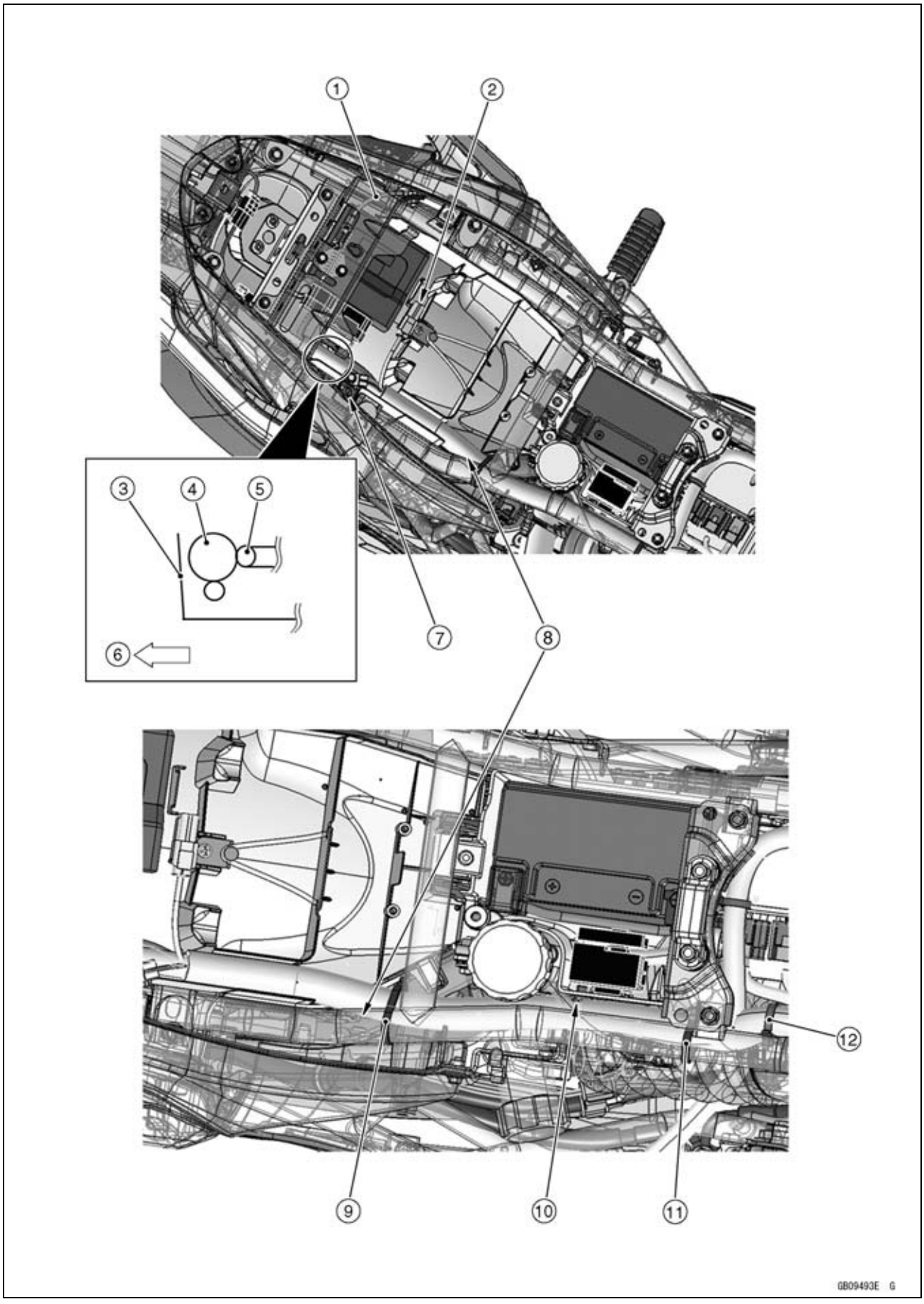
Cable, Wire, and Hose Routing

1. Clamp (Hold the dust cover on the main harness for ignition switch lead and left switch housing lead. In this illustration, the dust cover does not show for clarity.)
2. Clamps (Hold the main harness.)
3. Intake Air Temperature Sensor Lead
4. Clamp (Hold the ignition switch lead and left switch housing lead.)
5. Ignition Switch Lead
6. Left Switch Housing Lead
7. Position the ignition switch lead connector in front of the left switch housing lead connector. Place these connectors into the dust cover.
8. Run the main harness to inside of the frame pipe.
9. Pad (Run the main harness above this pad.)

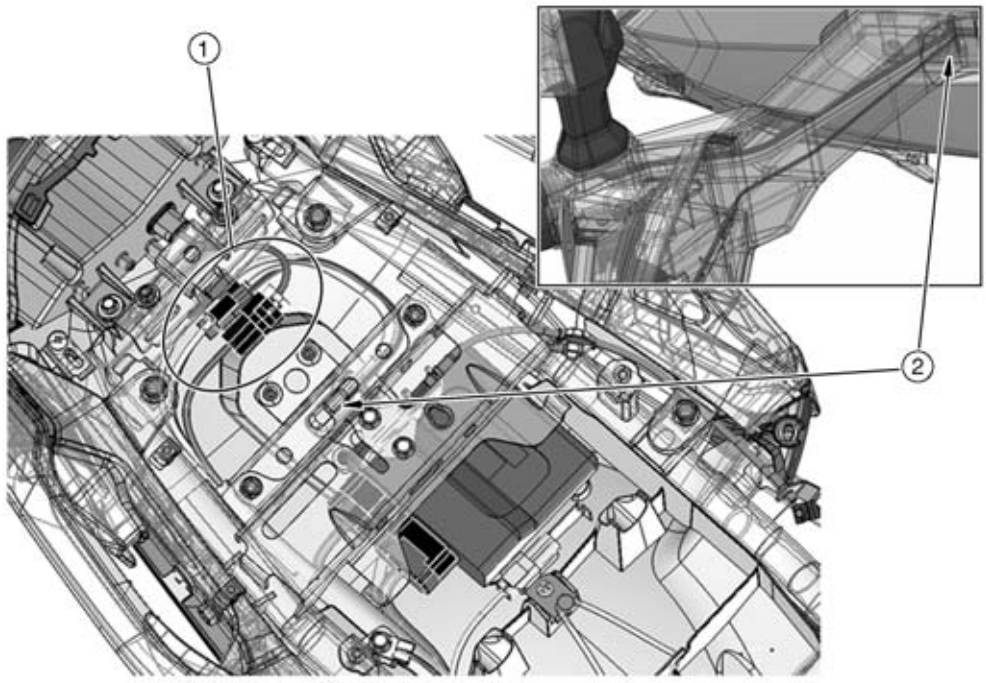
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

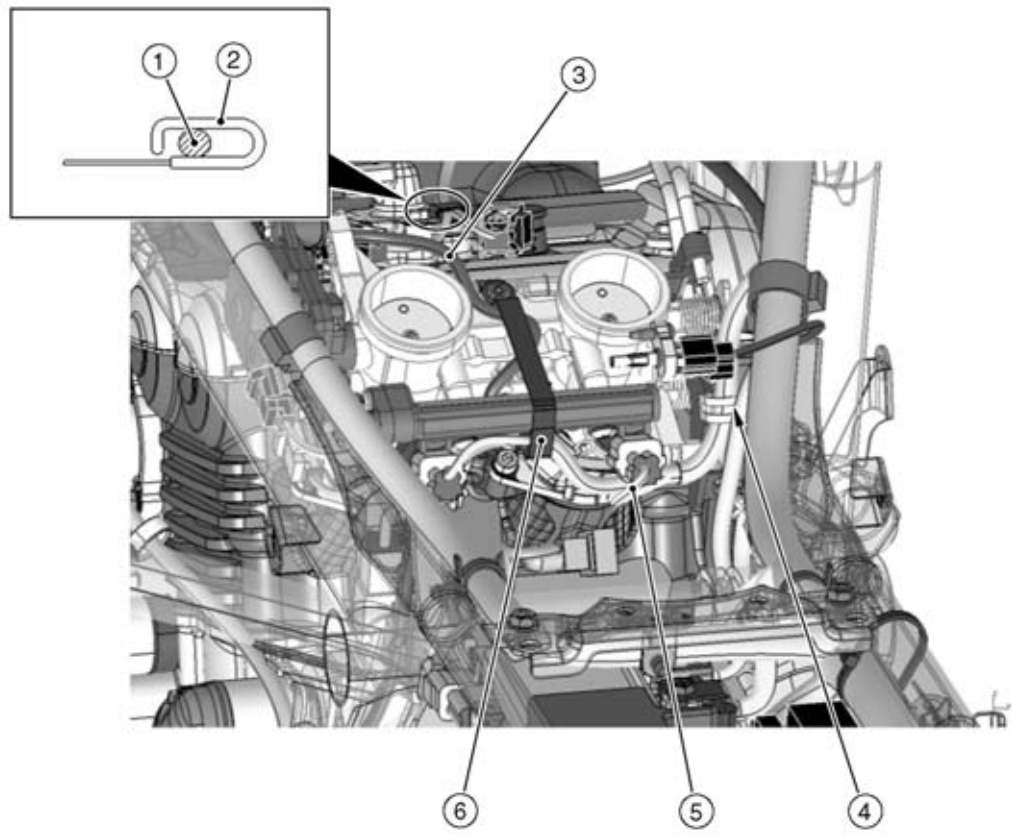
1. Seat Lock Cable
2. Fix the Kawasaki diagnostic system connector with the bracket attached to the rear fender rear.
3. Rear Fender Rear
4. Main Harness
5. ECU Lead
6. Outside of Vehicle
7. Frame Ground Terminal (The angle of ground lead is as shown.)
8. Run the main harness between the frame and rear fender.
9. Band (Hold the main harness in back of the cross pipe. Cut the extra tip of band. Face the locking portion of band to the outside of vehicle.)
10. Install the clamp to the rear fender.
11. Band (Hold the main harness under the bracket. Cut the extra tip of band. Face the locking portion of band to the outside of vehicle.)
12. Clamp (Hold the main harness. Install the clamp to the frame as shown.)

Cable, Wire, and Hose Routing



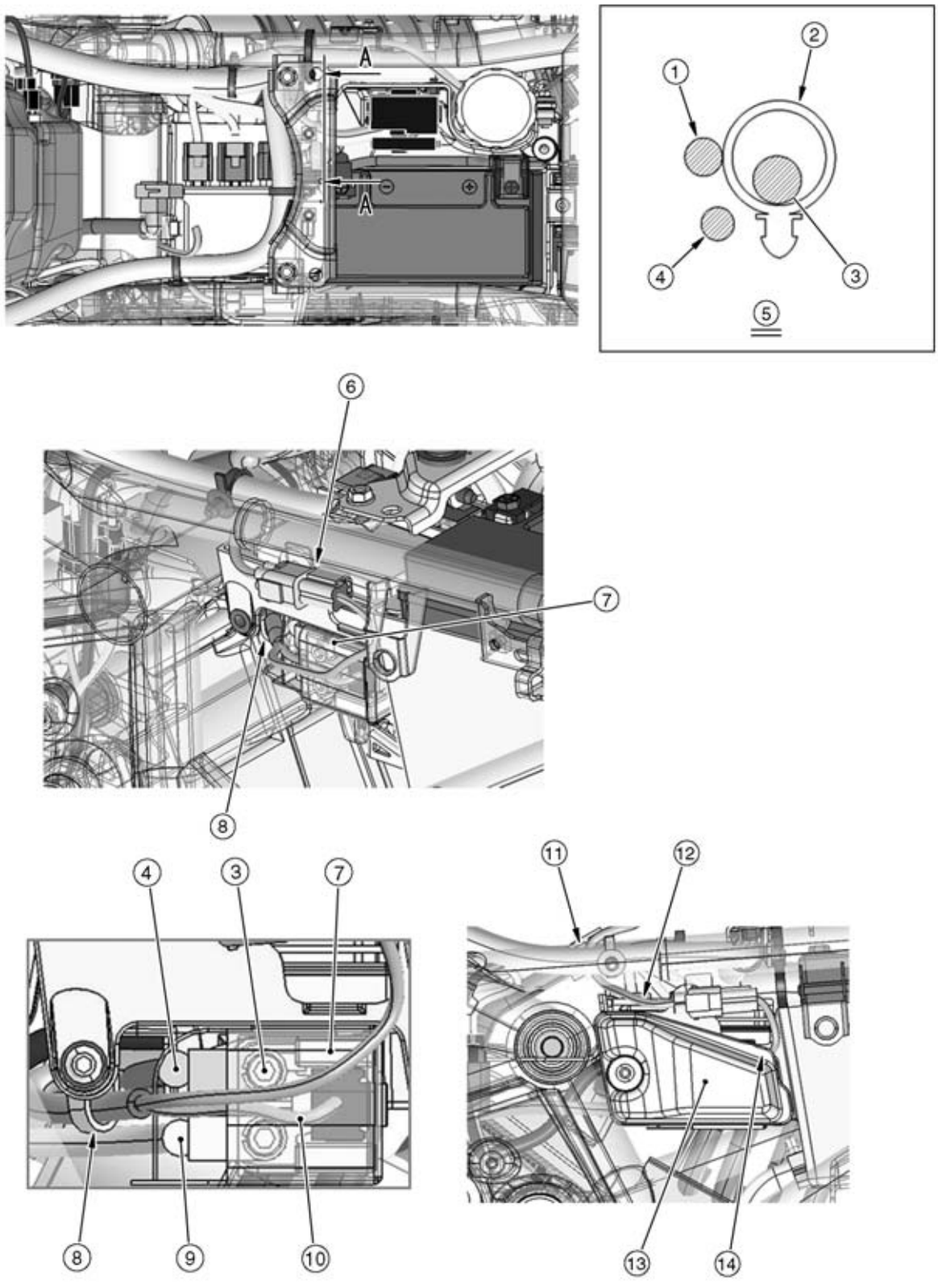
1. Place the rear turn signal light lead connectors, tail/brake light lead connector and license plate light lead connector into the dust cover.
2. Run the license plate light lead, and rear turn signal light leads through the hole of the rear fender rear.

Cable, Wire, and Hose Routing



1. Stick Coil Lead
2. Clamp (Hold the stick coil lead with the vinyl portion.)
3. Subthrottle Valve Actuator Lead
4. Clamp (Hold the fuel injector lead.)
5. Do not touch the fuel injector connector (#2) to other leads.
6. Clamp (Hold the delivery pipe, fuel injector lead and air temperature sensor lead. Run the fuel injector lead and water temperature sensor lead under the delivery pipe.)

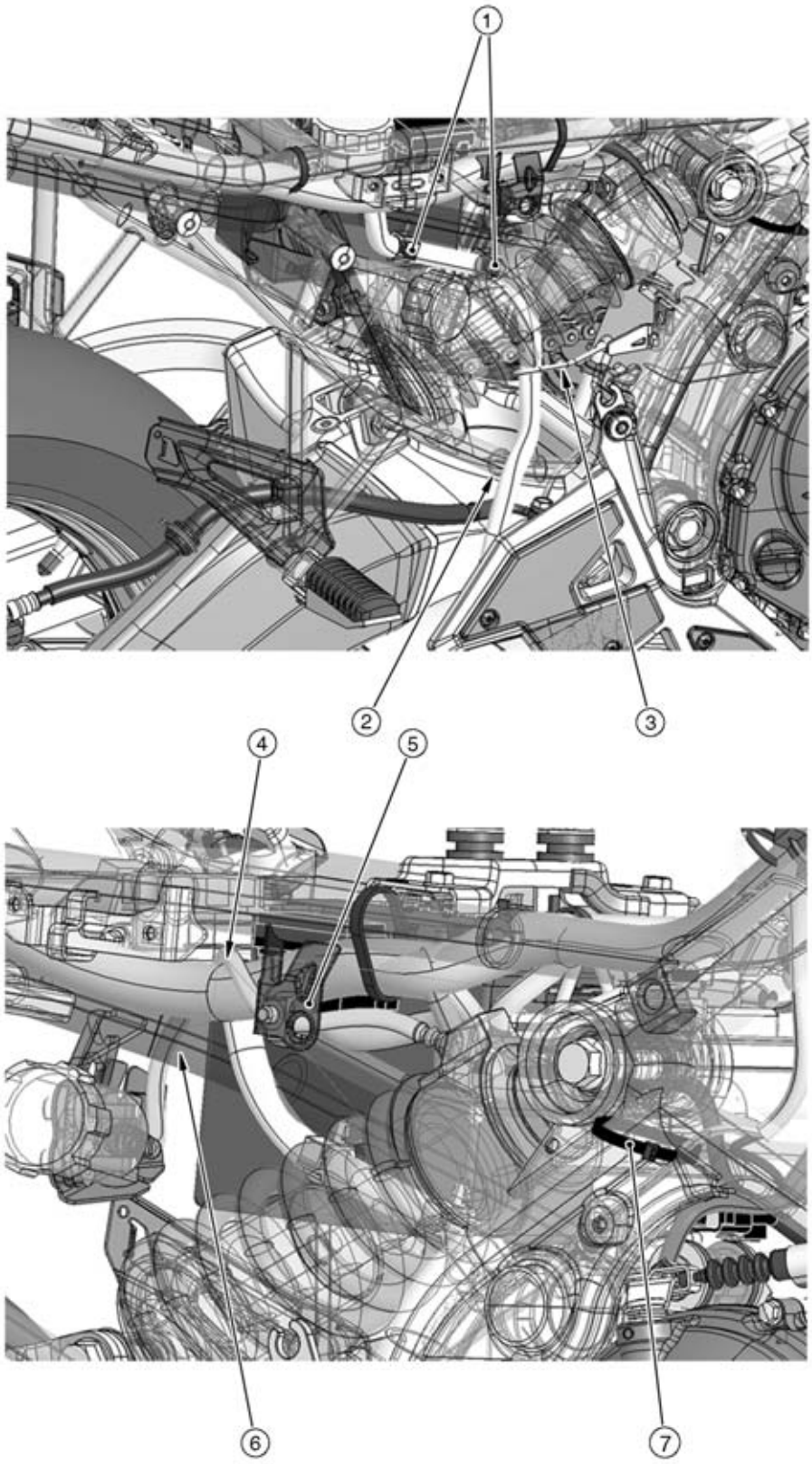
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Battery Negative (–) Cable
2. Clamp (Hold the fuel pump lead and install the clamp to the rear fender rear.)
3. Fuel Pump Lead
4. Battery Positive (+) Cable
5. Section A-A
6. Install the fuel pump lead connector to the frame bracket.
7. Rubber Cover (Wrap the starter relay, battery positive (+) cable and starter cable.)
8. Run the main harness into the hook. Do not slacken the main harness between the hook and starter relay.
9. Starter Cable
10. Starter Relay Lead (Run it to the inside of the rubber cover.)
11. Run the fuel pump lead to the inside of the main harness.
12. Fuel Pump Lead
13. Starter Relay Cover
14. Run the fuel pump lead through the slit of starter relay cover.

Cable, Wire, and Hose Routing

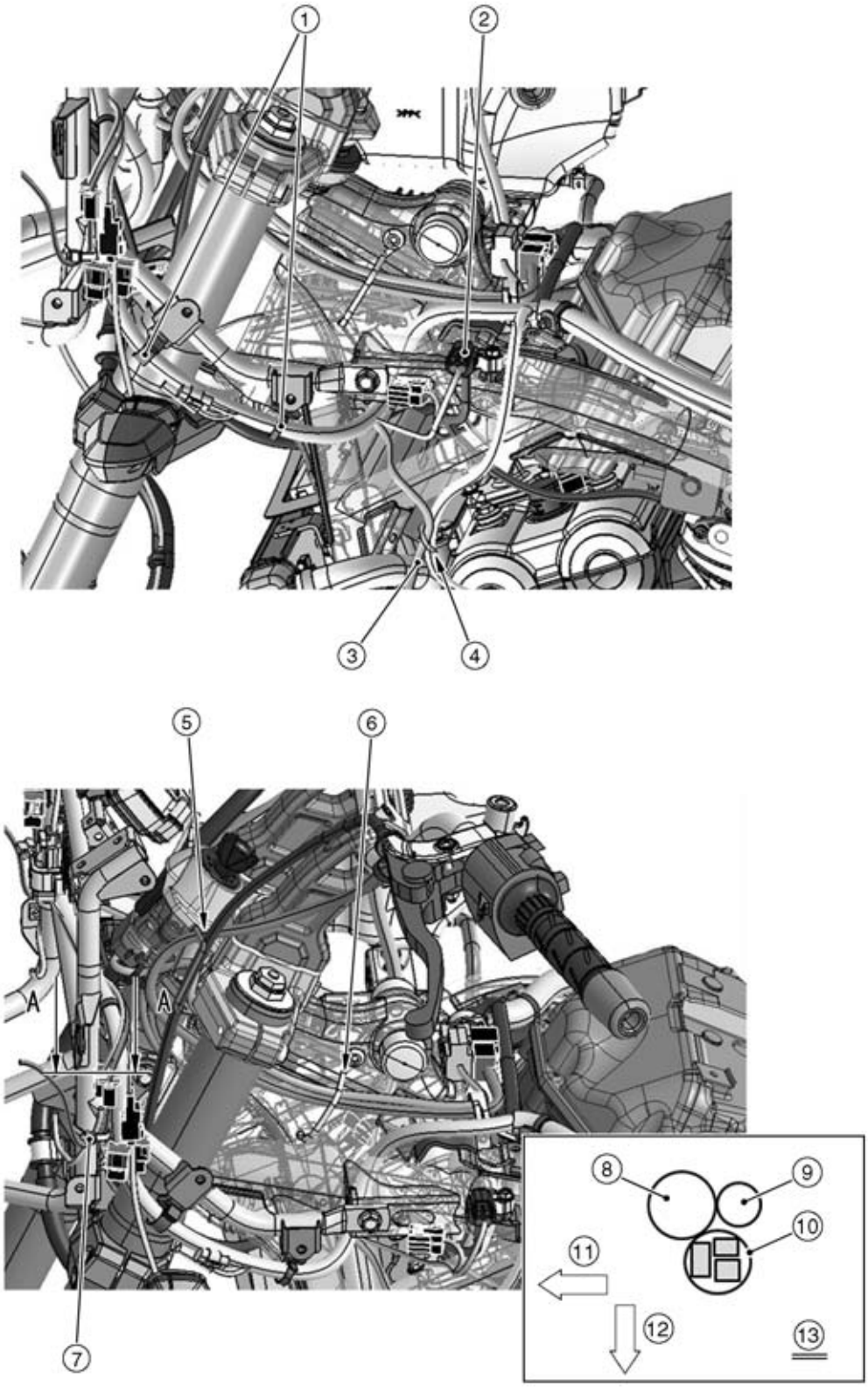


GB09497E G

Cable, Wire, and Hose Routing

1. Clamps (Hold the rear brake hose. Face the locking portion to the outside of vehicle.)
2. Run the rear brake hose to the outside of the frame.
3. Run the rear brake hose into the guide.
4. Run the rear shock absorber adjuster cable between main harness and rear brake fluid reservoir.
5. Clamp (Hold the rear shock absorber adjuster cable.)
6. Run the rear shock absorber adjuster cable to inside of the frame.
7. Band (Install it only on KLE650E. Hold the rear brake light switch lead at the white tape. Run the rear brake light switch lead to the inside of frame. Cut the extra tip of band, Face the locking portion of band to the outside of vehicle.)

Cable, Wire, and Hose Routing

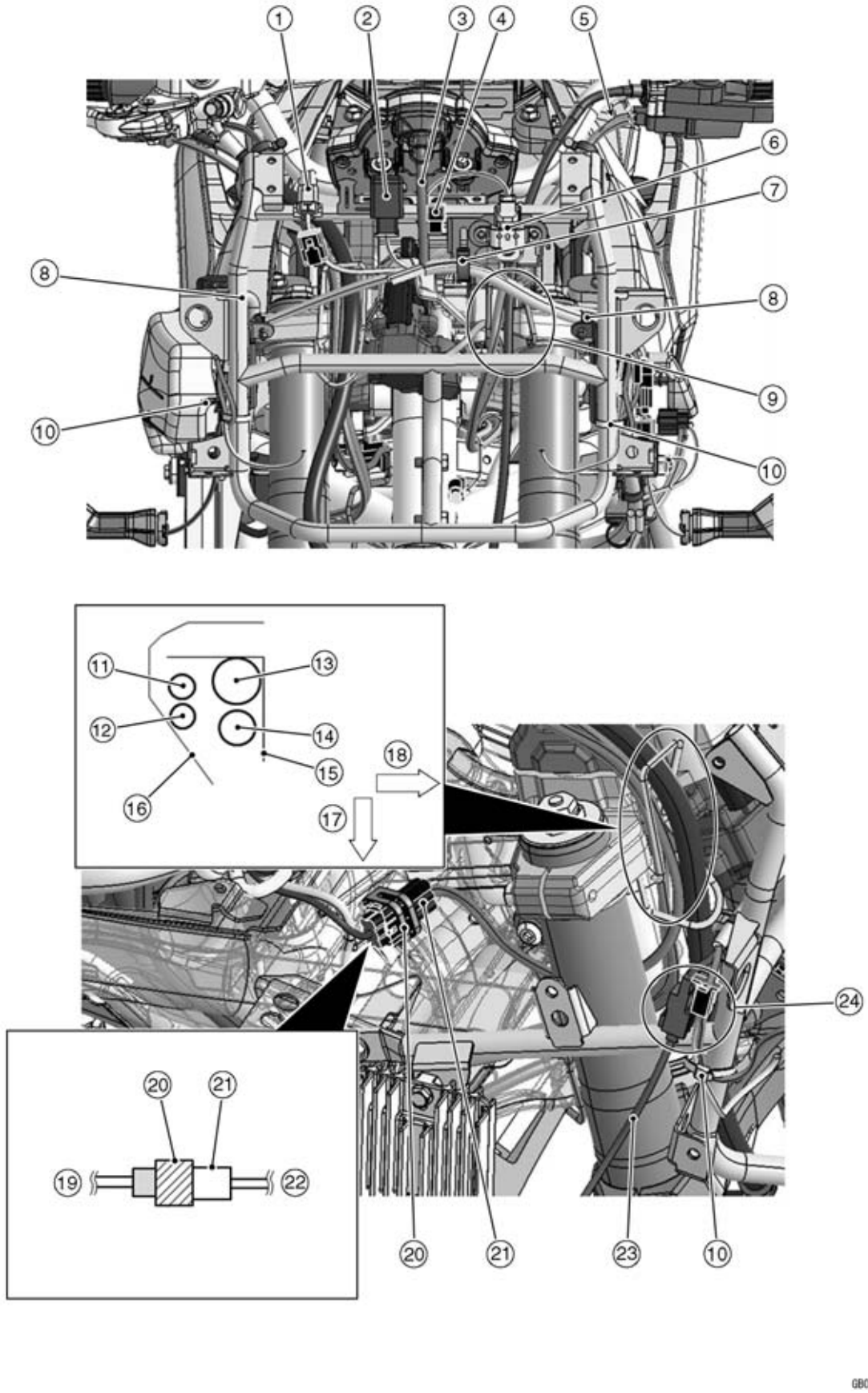


GB09498E G

Cable, Wire, and Hose Routing

1. Clamps (Hold the main harness.)
2. Intake Air Pressure Sensor
3. Run the horn lead in back of the water hose.
4. Clamp (Hold the fuel tank drain hose and horn lead.)
5. Clamp (Hold the left switch housing lead and clutch cable.)
6. Clamp (Hold the ignition switch lead and left switch housing lead.)
7. Band (Hold the city light lead and headlight lead and upper fairing bracket.)
8. Upper Fairing Bracket
9. Main Harness
10. Dust Cover (Place the headlight lead connector, city light lead connector and front left turn signal light lead.)
11. Front
12. Left Side of Vehicle
13. Section A-A

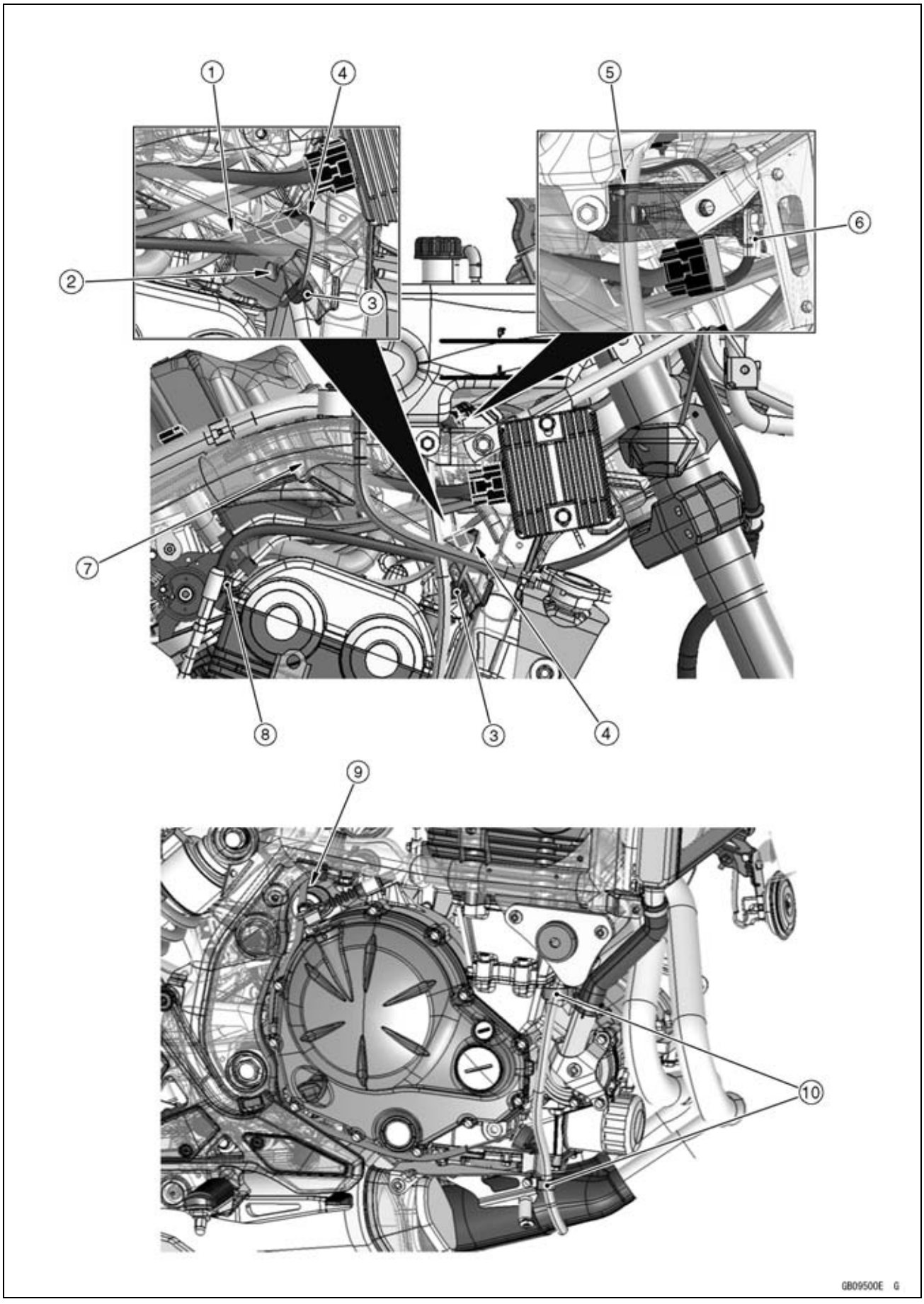
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Install the accessory connector to the upper fairing bracket.
2. Turn Signal Relay
3. Meter Lead
4. Joint Connector (This connector fixes onto the meter lead. Face it to the left side of vehicle as shown.)
5. Run the starter lockout switch lead above the left switch housing lead. Do not twist them.
6. Vehicle-down Sensor
7. Clamp (Hold the main harness and accessory connector leads.)
8. Clamps (Hold the main harness.)
9. Clamp (Hold the ignition switch lead, left switch housing lead and clutch cable.)
10. Bands (Hold the city light lead and headlight lead.)
11. Throttle Cable (Decelerator)
12. Throttle Cable (Accelerator)
13. Brake Hose
14. Right Switch Housing Lead
15. Clamp
16. Steering Stem Head
17. Front
18. Right Side of Vehicle
19. Main Harness
20. Clamp
21. Right Switch Housing Lead Connector
22. Right Switch Housing Lead
23. Front Right Turn Signal Light Lead
24. Place the city light lead connector, headlight lead connector and front right turn signal light lead connector into the dust cover. In this illustration, the dust cover does not show for clarity.

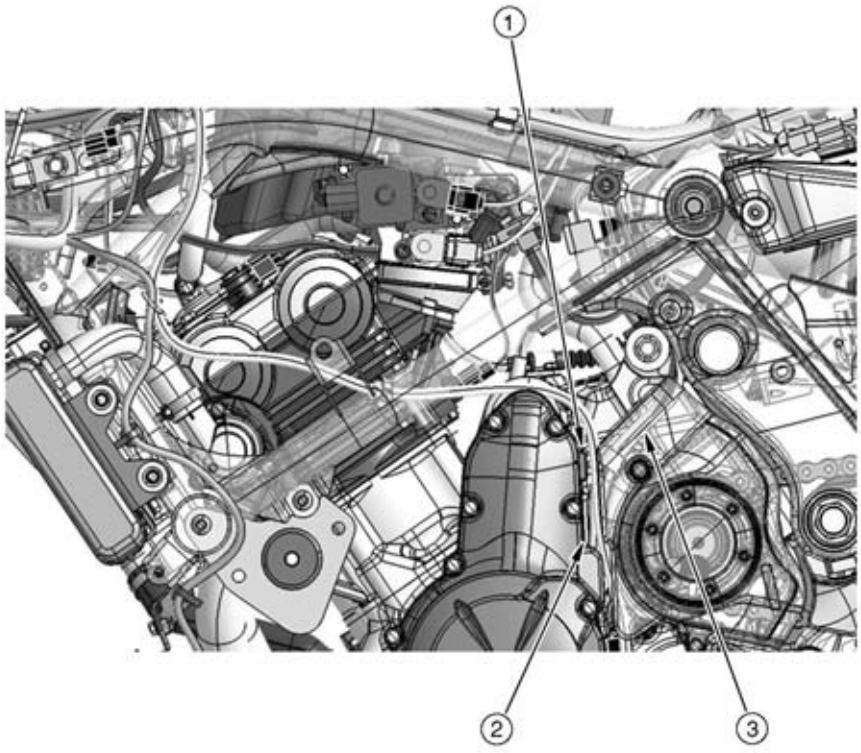
Cable, Wire, and Hose Routing

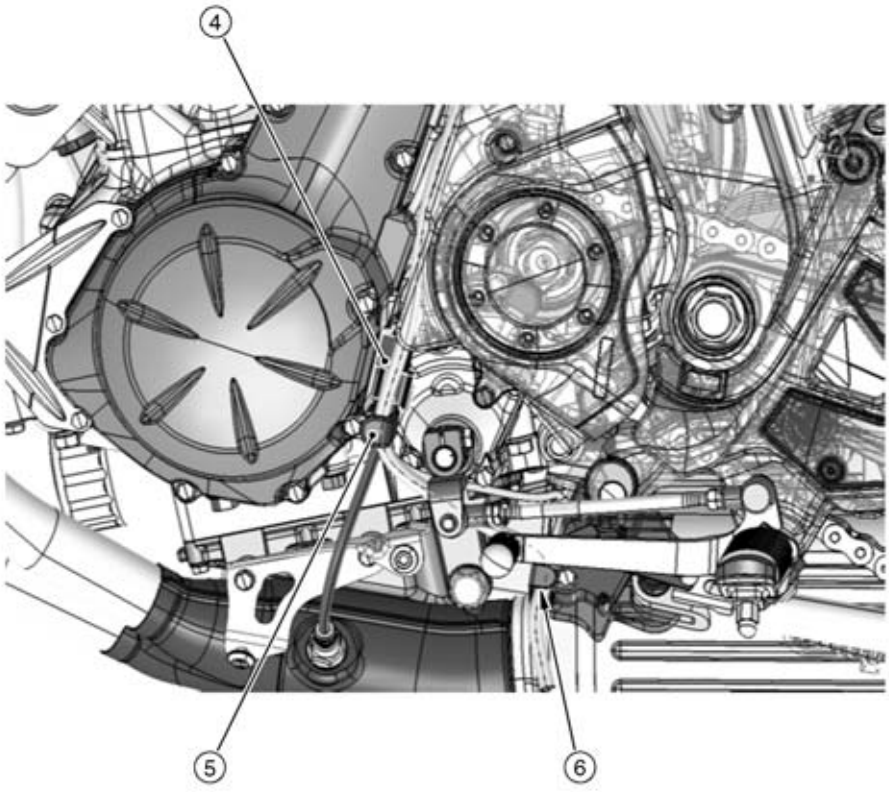


Cable, Wire, and Hose Routing

1. Run the main harness above the clutch cable.
2. Run the fan motor lead into the hole of heat insulation rubber plate.
3. Clamp (Hold the fan motor lead.)
4. Run the fan motor lead between the frame and radiator overflow hose. Place the fan motor lead connector above the frame pipe.
5. Run the radiator overflow hose into the hole of the frame.
6. Frame Ground Terminal (The angle of ground lead is as shown.)
7. Run the regulator/rectifier lead to the inside of the frame.
8. Clamp (Hold the clutch cable.)
9. Run the crankshaft sensor lead and oil pressure switch lead between the frame and engine mount bushing. Place its connector in this position.
10. Clamps (Hold the reserve tank overflow hose.)

Cable, Wire, and Hose Routing



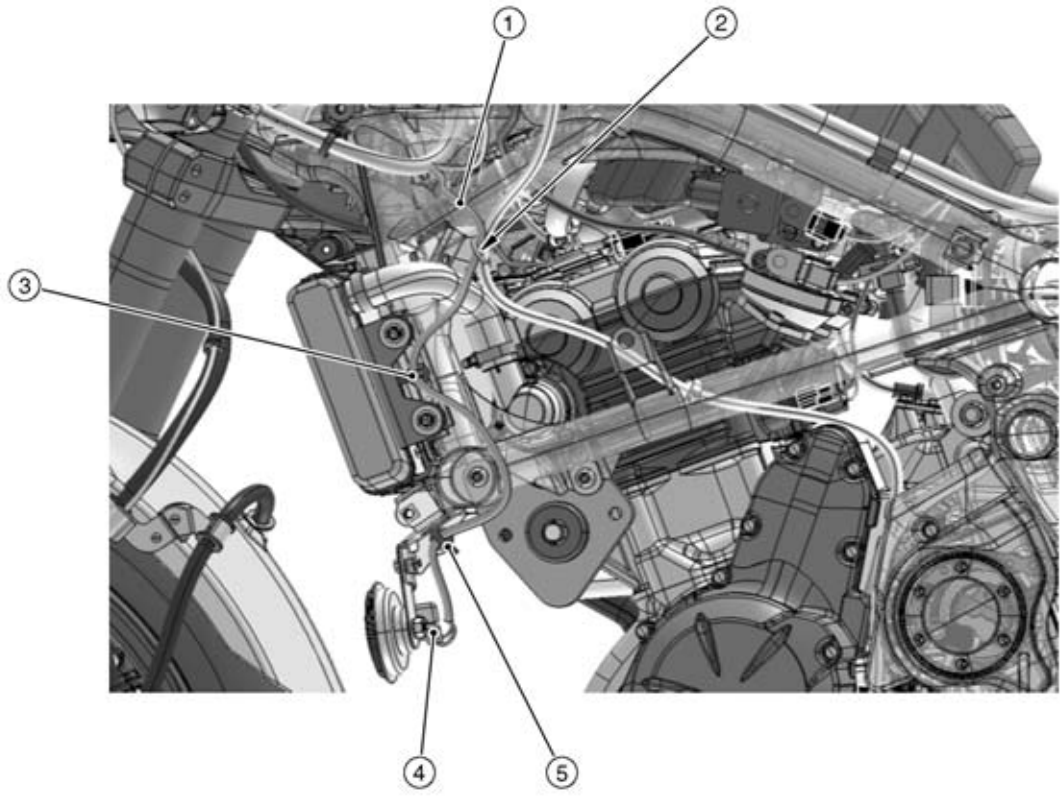


GB09501E G

Cable, Wire, and Hose Routing

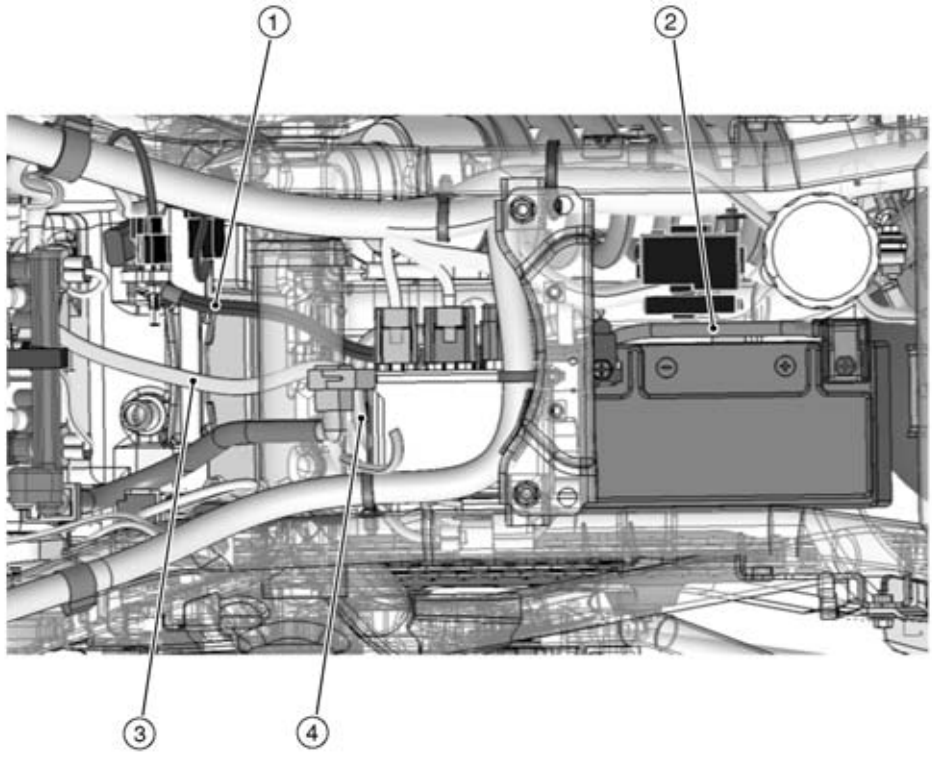
1. Clamp (Hold the fuel tank drain hose.)
2. Run the fuel tank drain hose, electrical leads and air cleaner drain hose in order from the outside of the vehicle between the alternator cover and engine sprocket cover.
3. Run the oxygen sensor lead, side stand switch lead, speed sensor lead and neutral switch lead into the upper space of the engine sprocket cover.
4. Oxygen Sensor Lead Connector
5. Clamp (Hold the fuel tank drain hose, oxygen sensor lead and side stand switch lead in order from the outside of the vehicle.)
6. Clamp (Hold the fuel tank drain hose.)

Cable, Wire, and Hose Routing



1. Run the horn lead to the outside of frame.
2. Clamp (Hold the fuel tank drain hose and horn lead.)
3. Clamp (Hold the horn lead.)
4. Connect the horn lead terminals so that the leads face downward.
5. Clamp (Hold the horn lead.)

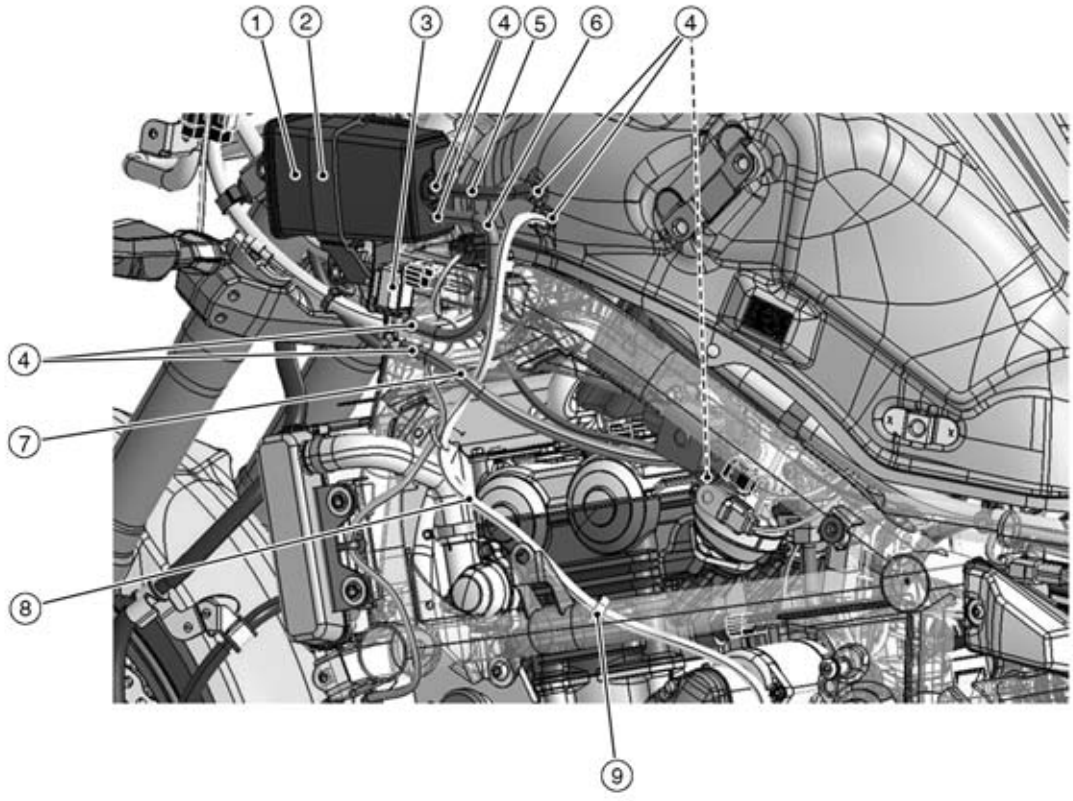
Cable, Wire, and Hose Routing



1. Battery Negative (–) Cable
2. Battery Positive (+) Cable
3. Starter Motor Cable
4. Main Harness (for Starter Relay)

Cable, Wire, and Hose Routing

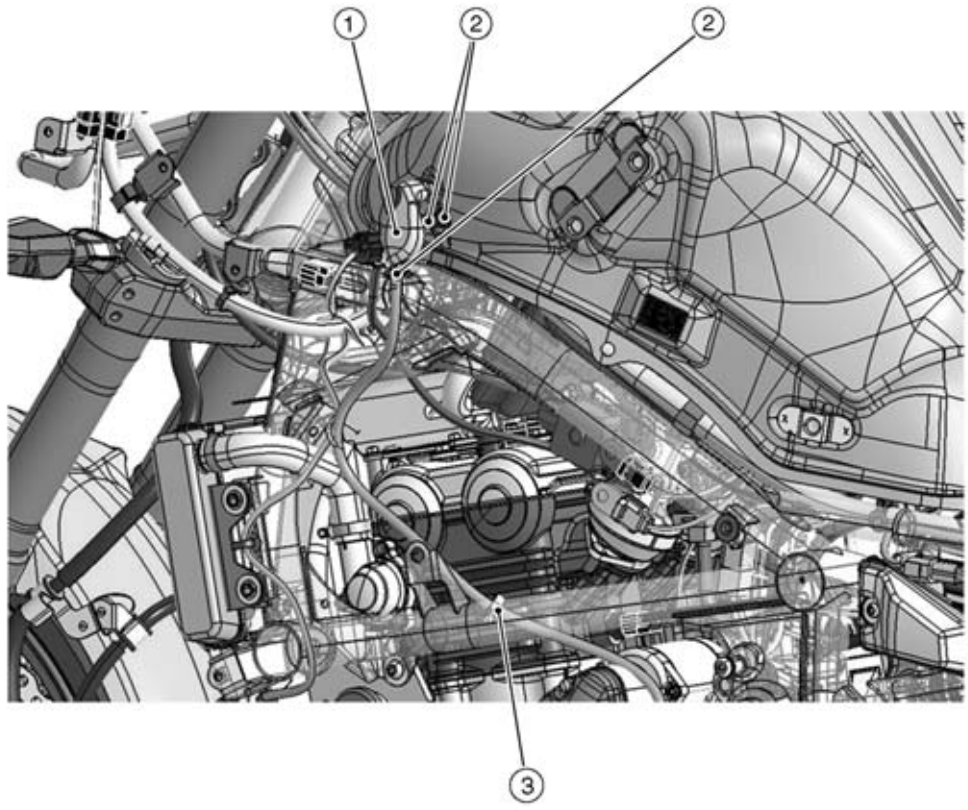
CAL, TH, CN and SEA-B1 Models



1. Canister
2. Band
3. Purge Valve
4. Clamps
5. Hose (Blue)
6. Hose (Green)
7. Hose (to Throttle Body Assy)
8. Fuel Tank Drain Hose
9. Clamp (Hold the fuel tank drain hose.)

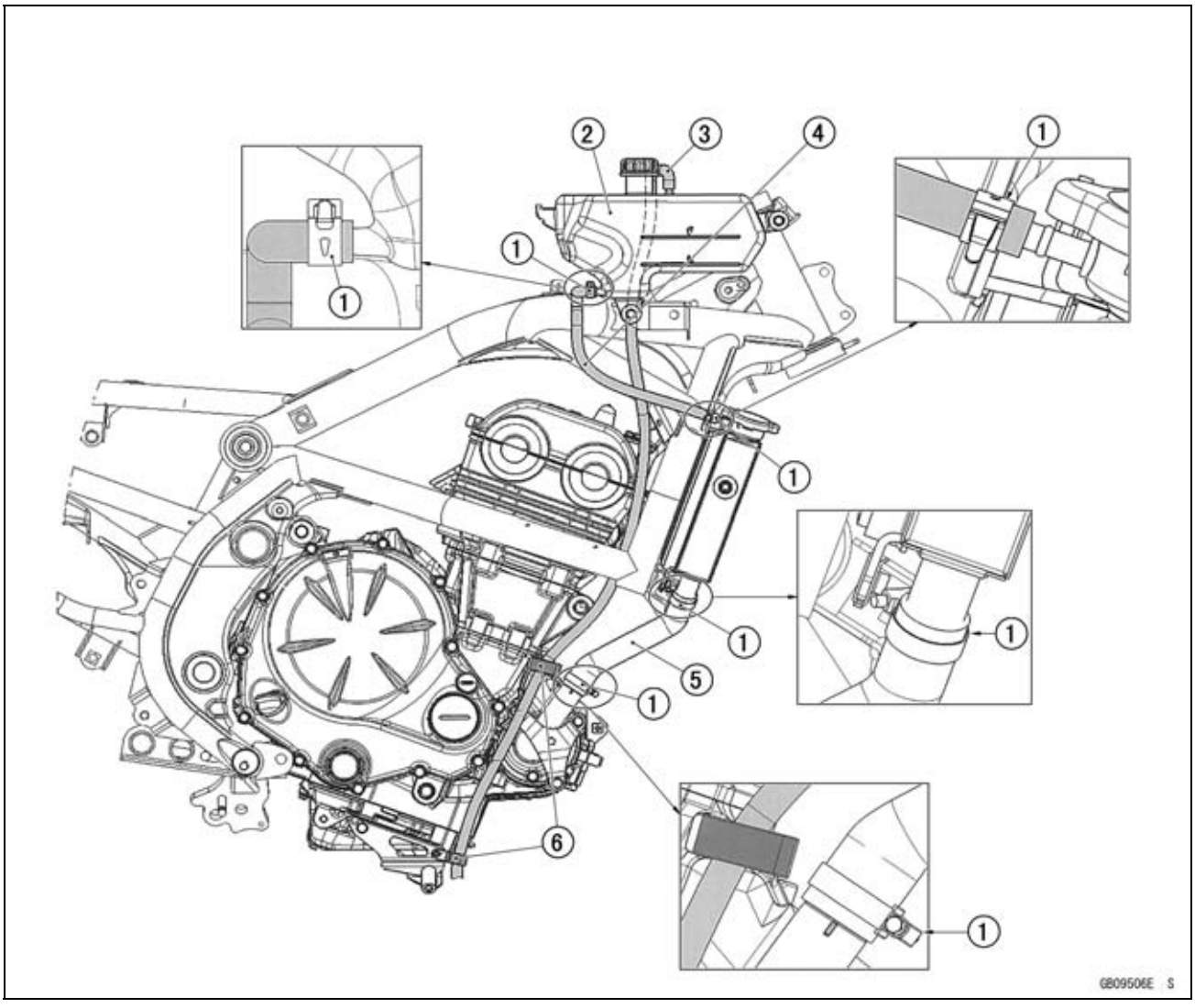
Cable, Wire, and Hose Routing

Other than CAL, TH, CN and SEA-B1 Models



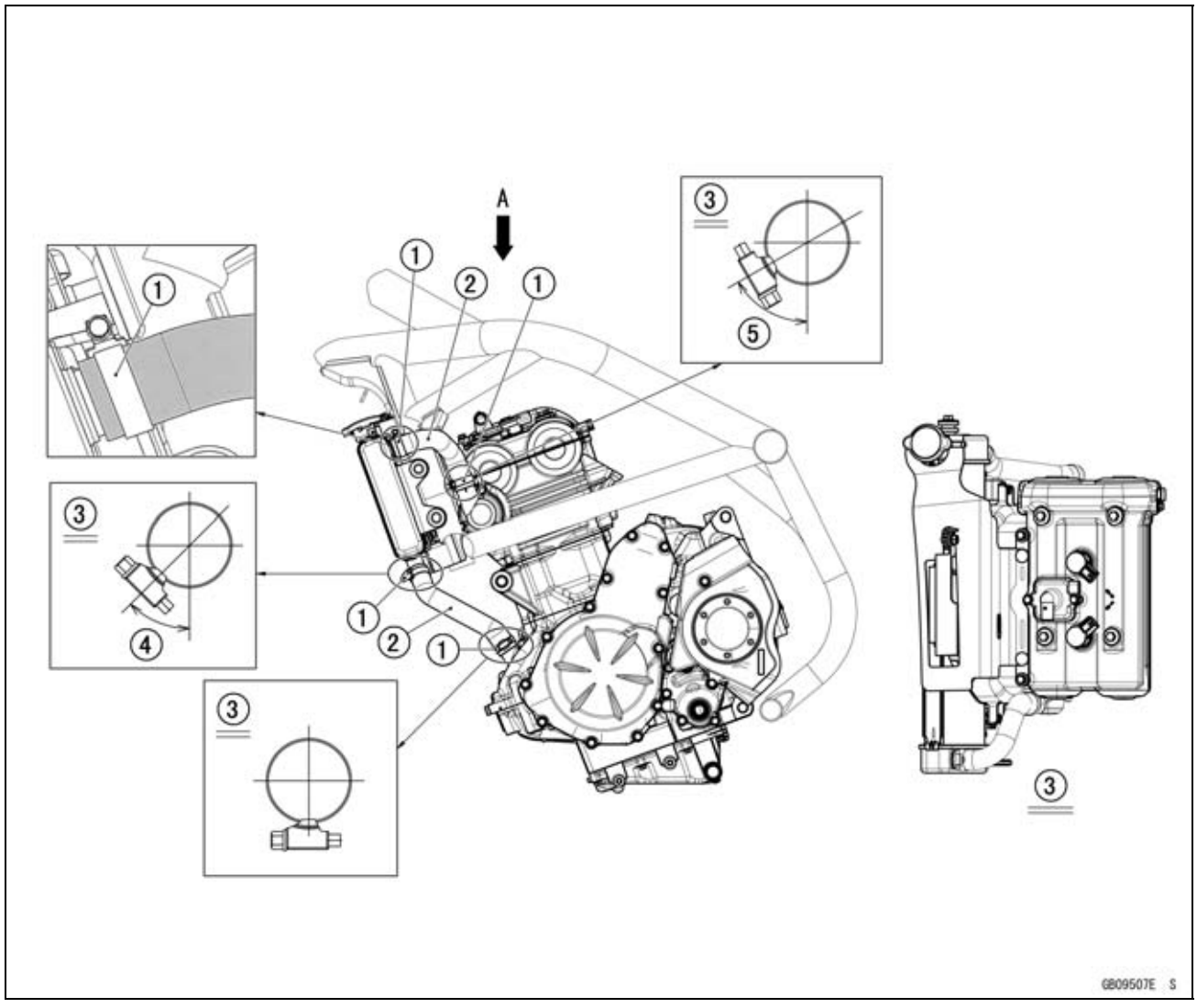
1. Breather Tank
2. Clamps
3. Clamp (Hold the fuel tank drain hose.)

Cable, Wire, and Hose Routing



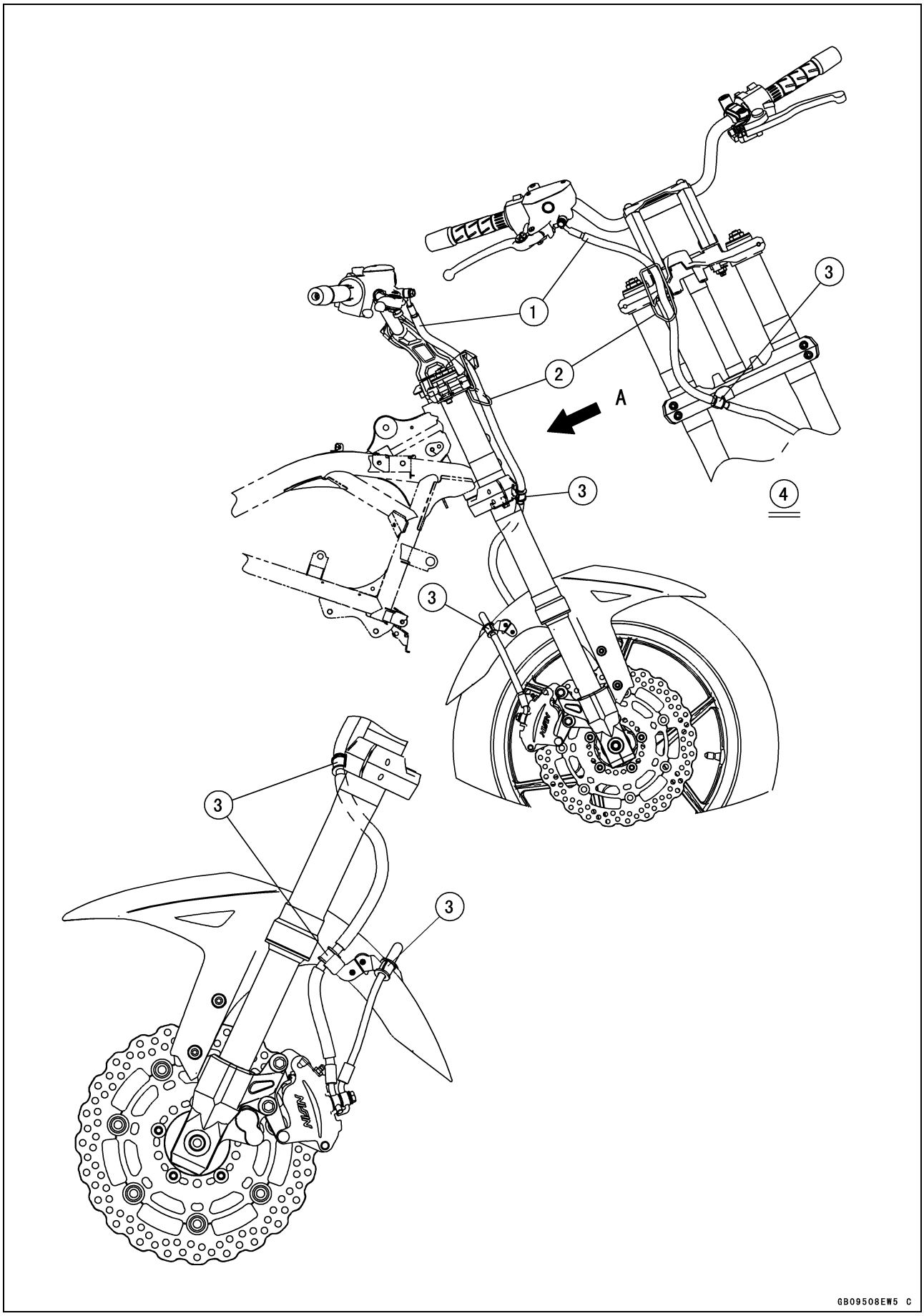
1. Install the clamps as shown.
2. Coolant Reserve Tank
3. Reserve Tank Overflow Hose (Connect the white paint mark side to the coolant reserve tank.)
4. Radiator Overflow Hose
5. Water Hose
6. Clamps (Hold the reserve tank overflow hose.)

Cable, Wire, and Hose Routing



1. Install the clamps as shown.
2. Water Hoses
3. Viewed from A
4. About 45°
5. About 60°

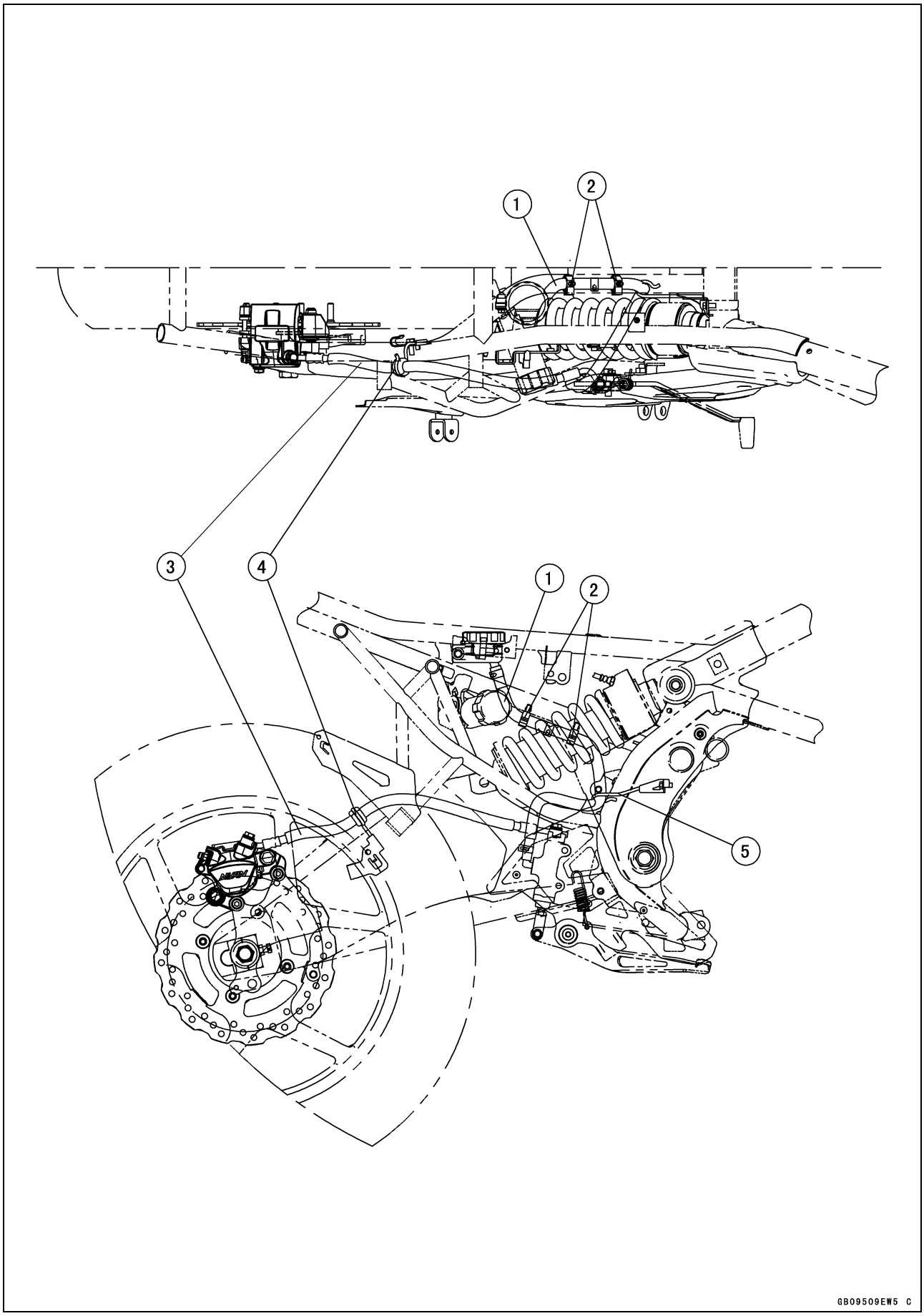
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

1. Front Brake Hose
2. Clamp (Hold the front brake hose.)
3. Clamps (Hold the front brake hose.)
4. Viewed from A

Cable, Wire, and Hose Routing

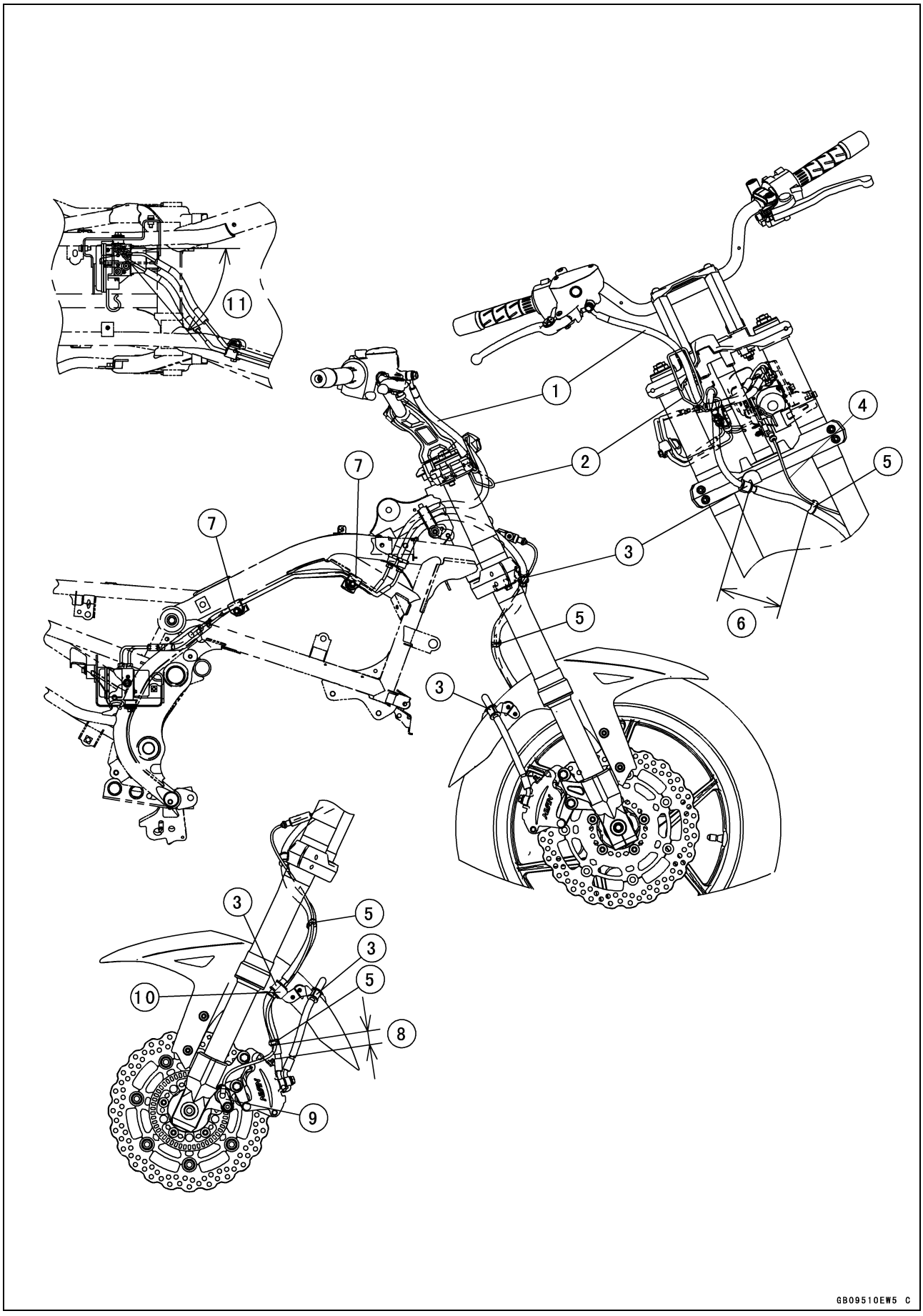


Cable, Wire, and Hose Routing

1. Rear Brake Hose
2. Clamps (Hold the rear brake hose.)
3. Rear Brake Hose
4. Clamp (Hold the rear brake hose.)
5. Clamp (Hold the rear brake hose.)

Cable, Wire, and Hose Routing

ABS Equipped Models

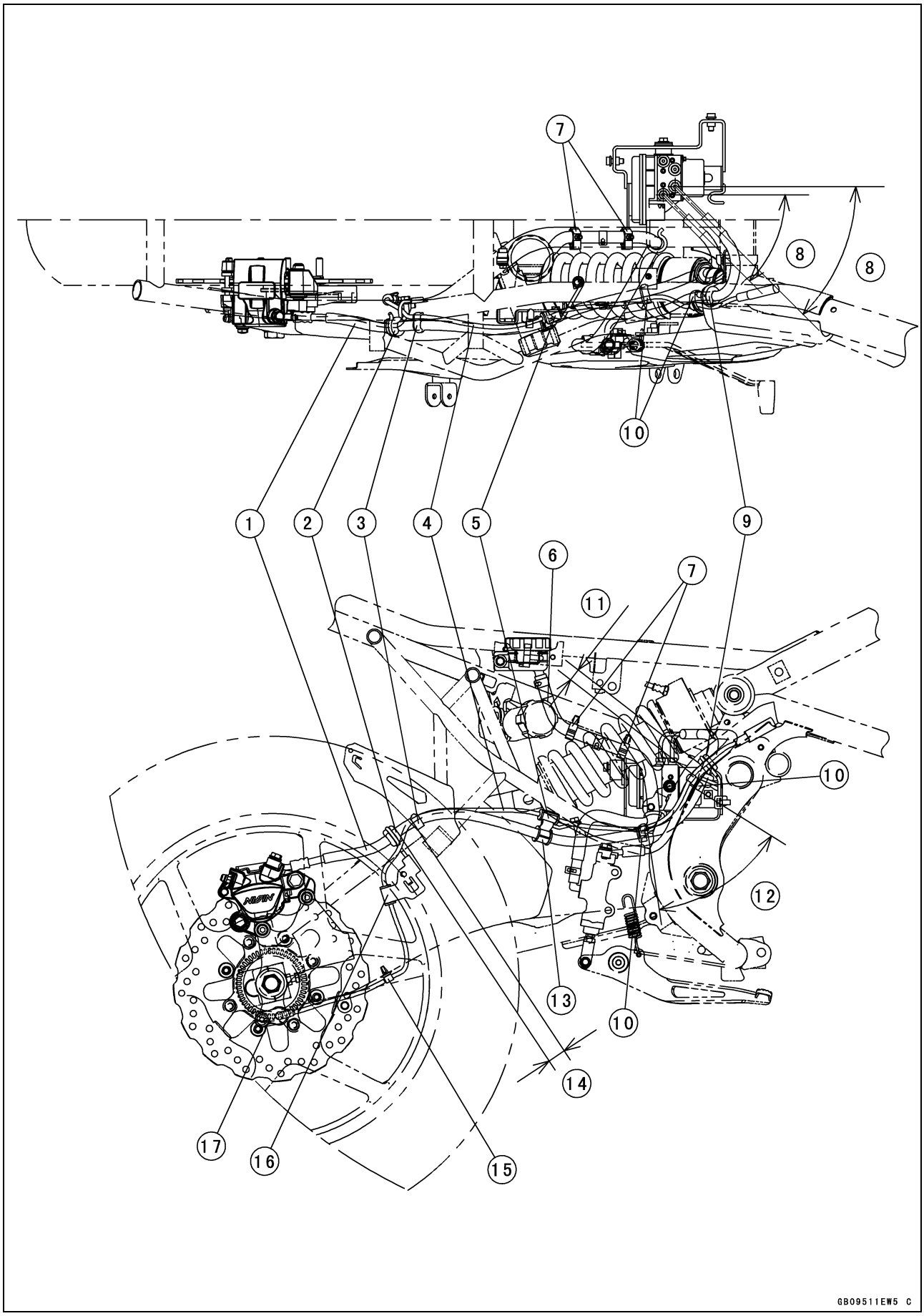


Cable, Wire, and Hose Routing

1. Front Brake Hose
2. Clamp (Hold the front brake hose.)
3. Clamps (Hold the front brake hose.)
4. Front Wheel Rotation Sensor Lead
5. Clamps (Hold the front brake hose. Hold the front wheel rotation sensor lead at the white paint mark.)
6. 100 mm (3.94 in.)
7. Clamps (Hold the brake pipes.)
8. 20 mm (0.79 in.)
9. Front Wheel Rotation Sensor
10. Clamp (Hold the front wheel rotation sensor lead.)
11. About 50°

Cable, Wire, and Hose Routing

ABS Equipped Models

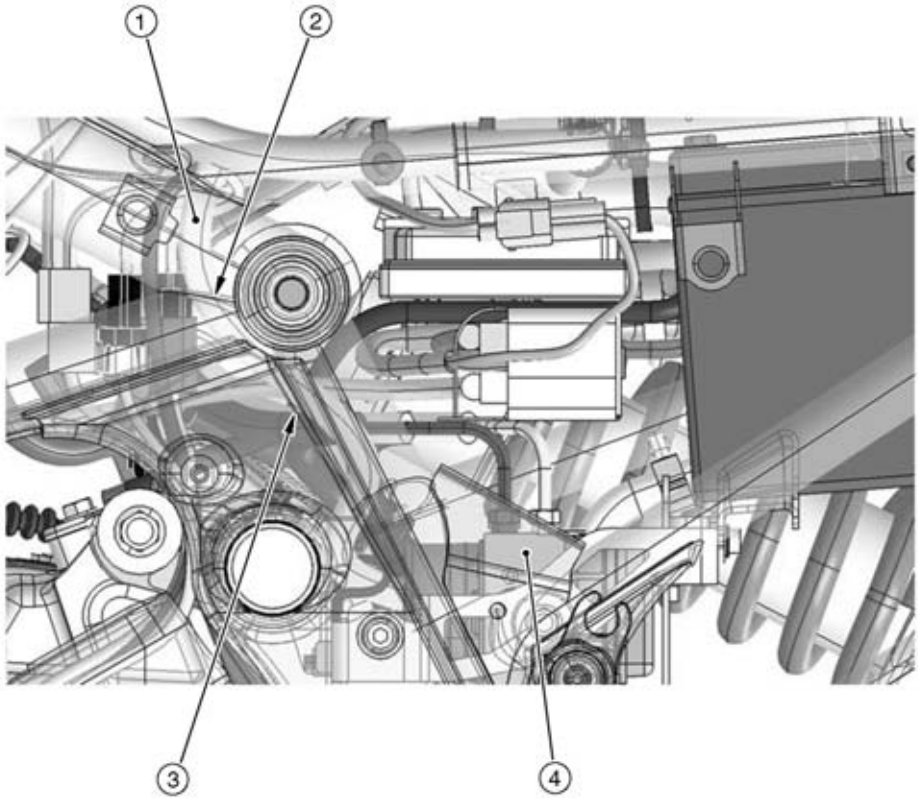


Cable, Wire, and Hose Routing

1. Rear Brake Hose
2. Clamp (Hold the rear brake hose.)
3. Clamp (Hold the rear brake hose. Hold the rear wheel rotation sensor lead at the white paint mark.)
4. Rear Wheel Rotation Sensor Lead
5. Clamp (Hold the rear wheel rotation sensor lead.)
6. Rear Brake Hose
7. Clamps (Hold the rear brake hose.)
8. About 45°
9. Clamp (Hold the rear brake hose.)
10. Clamps (Hold the rear brake hose. Hold the rear wheel rotation sensor lead at the white paint mark.)
11. 10 mm (0.39 in.)
12. 160 mm (6.30 in.)
13. Clamp (Hold the rear brake hose.)
14. 20 mm (0.79 in.)
15. Clamp (Hold the rear wheel rotation sensor lead.)
16. Clamp (Hold the rear wheel rotation sensor lead.)
17. Rear Wheel Rotation Sensor

Cable, Wire, and Hose Routing

ABS Equipped Models

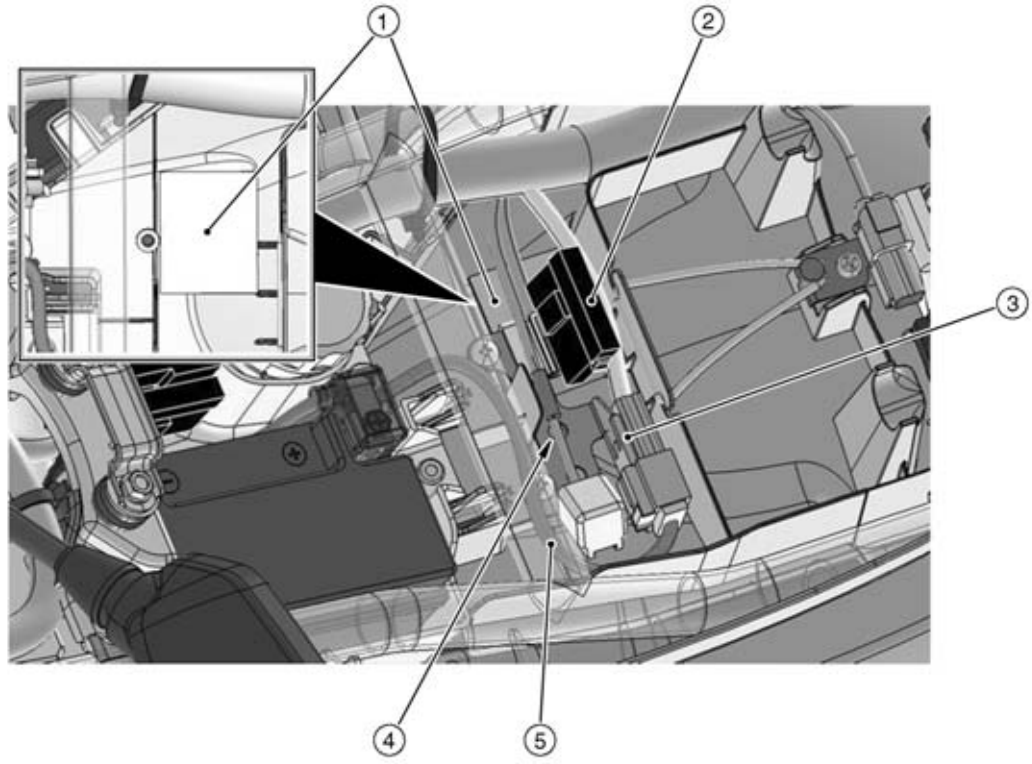


GB09512E G

1. ABS Hydraulic Unit Lead
2. Run the ABS hydraulic unit lead in front of the cross pipe.
3. Run the ABS hydraulic unit lead to the left side of starter motor cable.
4. ABS Hydraulic Unit

Cable, Wire, and Hose Routing

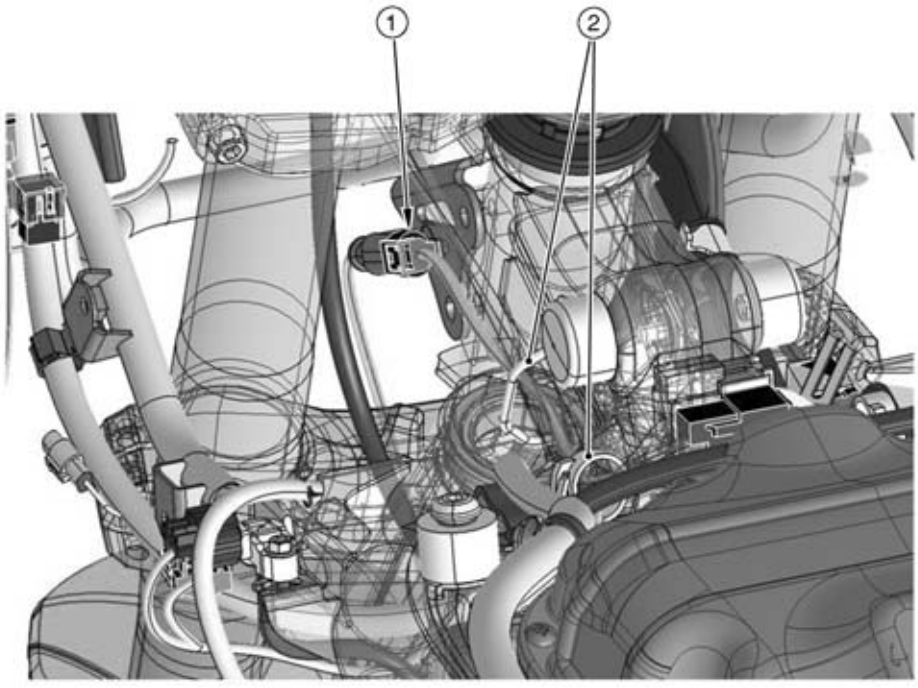
ABS Equipped Models

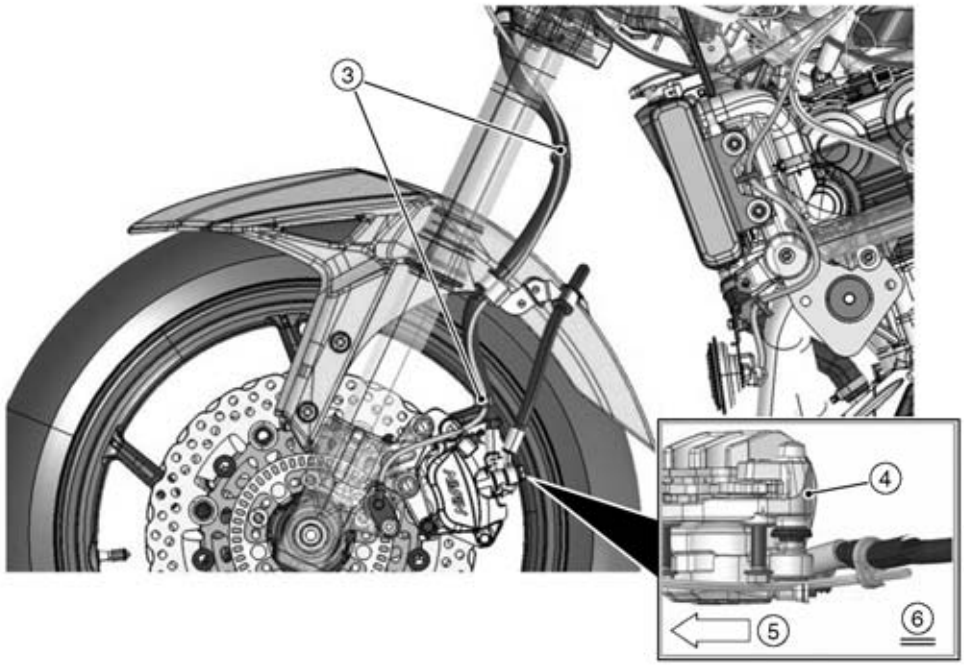


1. Stick the damper on the rear fender as shown.
2. Fuse Box 3
3. ABS Subharness Connector (Install the connector to bracket.)
4. Run the ABS Kawasaki disgnosis system connector lead above the bracket.
5. Battery Positive (+) Cable

Cable, Wire, and Hose Routing

ABS Equipped Models





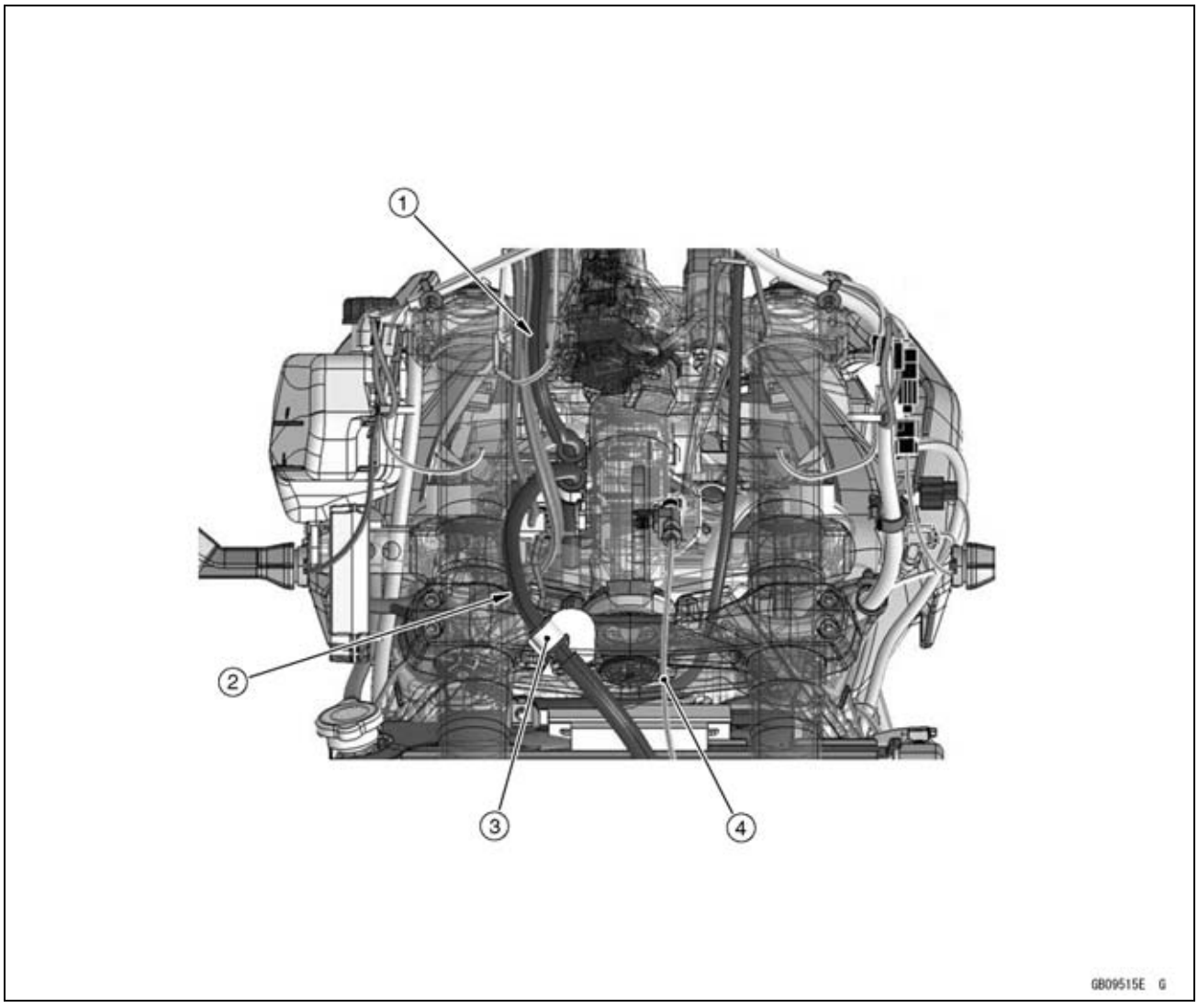
GB09514E G

Cable, Wire, and Hose Routing

1. Front Wheel Rotation Sensor Lead Connector
2. Clamps (Hold the front wheel rotation sensor lead.)
3. Clamps (Hold the front brake hose. Hold the front wheel rotation sensor lead at the white paint mark.)
4. Left Front Caliper
5. Front
6. Viewed from Top

Cable, Wire, and Hose Routing

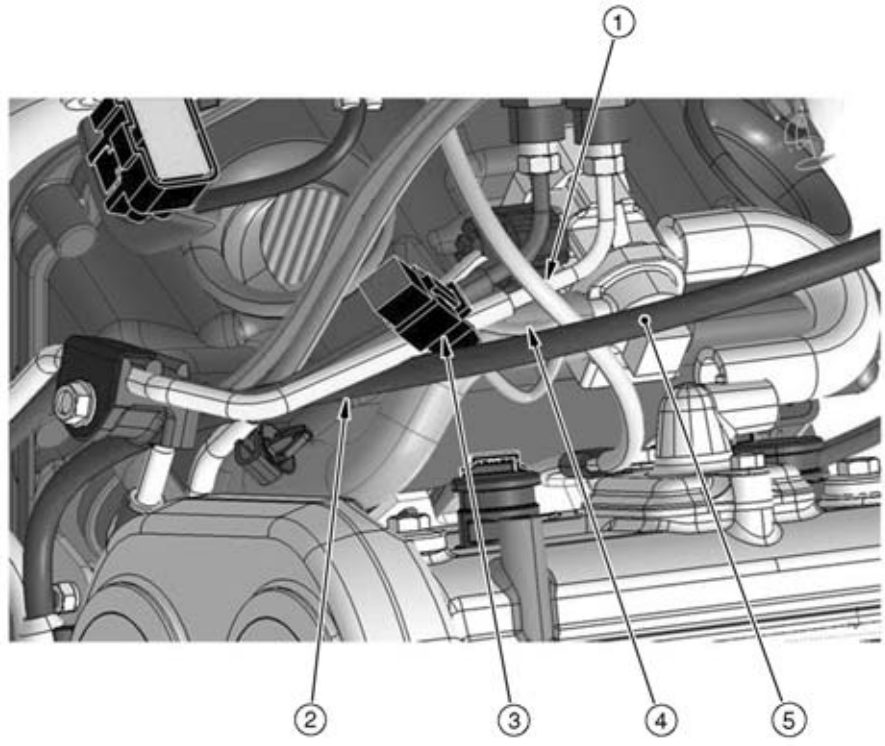
ABS Equipped Models



1. Run the front brake hose (from front master cylinder) to left side of the throttle cables.
2. Run the front brake hose (from front caliper) to right side of the throttle cables.
3. Clamp (Hold the front brake hose.)
4. Front Wheel Rotation Sensor Lead

Cable, Wire, and Hose Routing

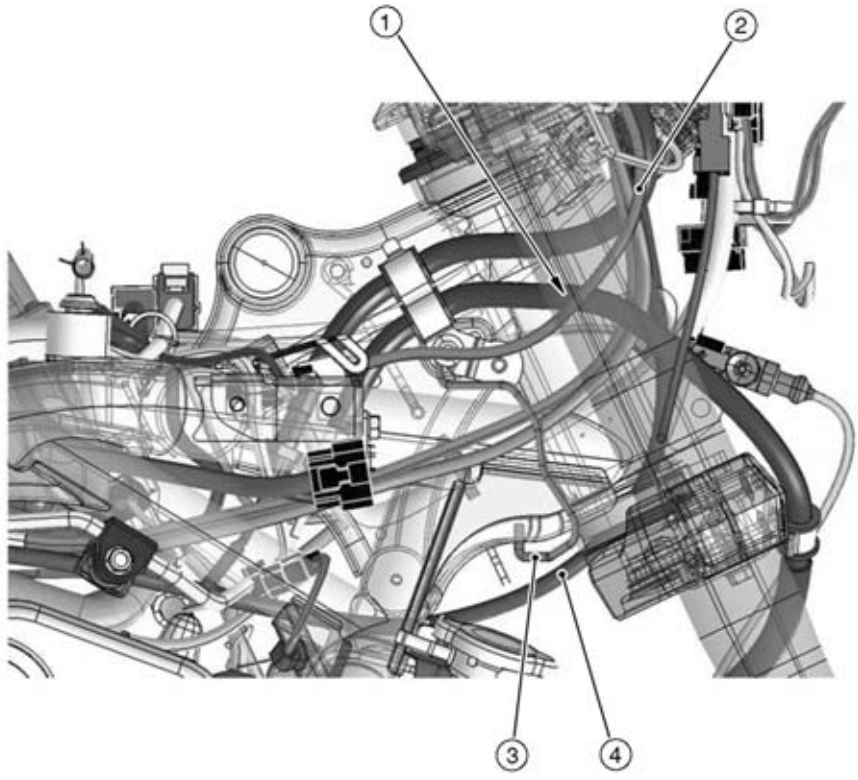
ABS Equipped Models



1. Run the stick coil lead in front of the brake pipes.
2. Run the clutch cable under the brake hose.
3. Run the fan motor lead between the brake pipes and clutch cable.
4. Run the air switching valve lead under the brake pipes.
5. Clutch Cable

Cable, Wire, and Hose Routing

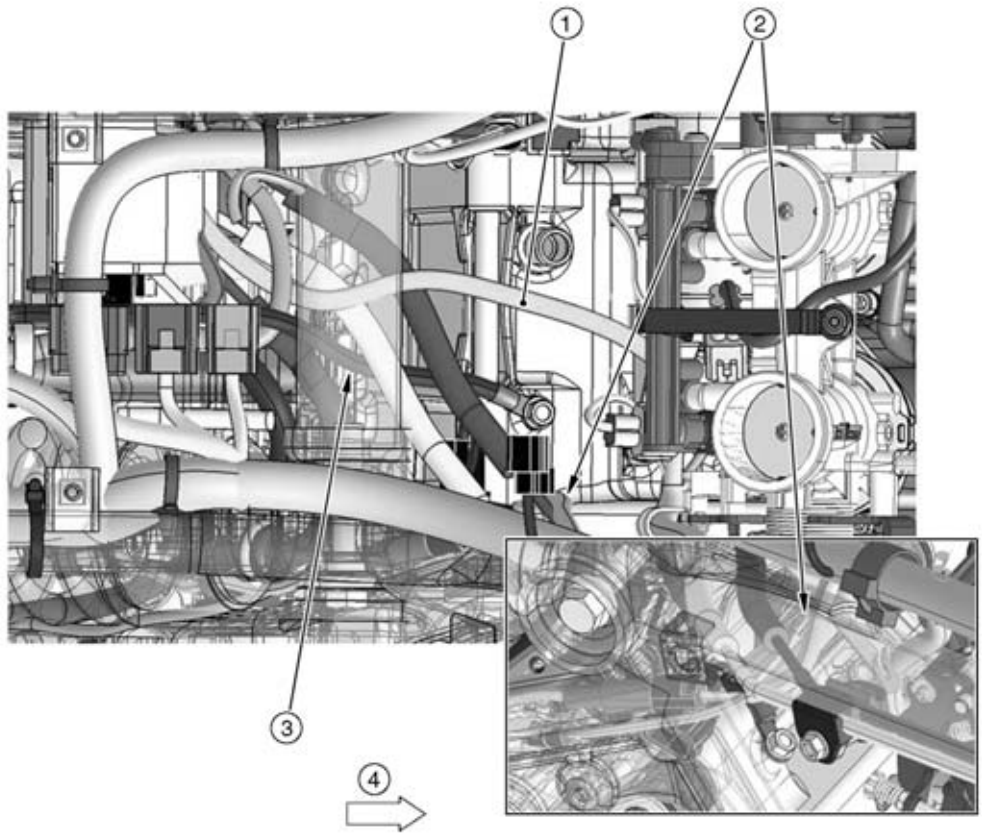
ABS Equipped Models



1. Run the right switch housing lead to right side of the brake hose.
2. Right Switch Housing Lead
3. Clamp (Hold the throttle cables.)
4. Clutch Cable

Cable, Wire, and Hose Routing

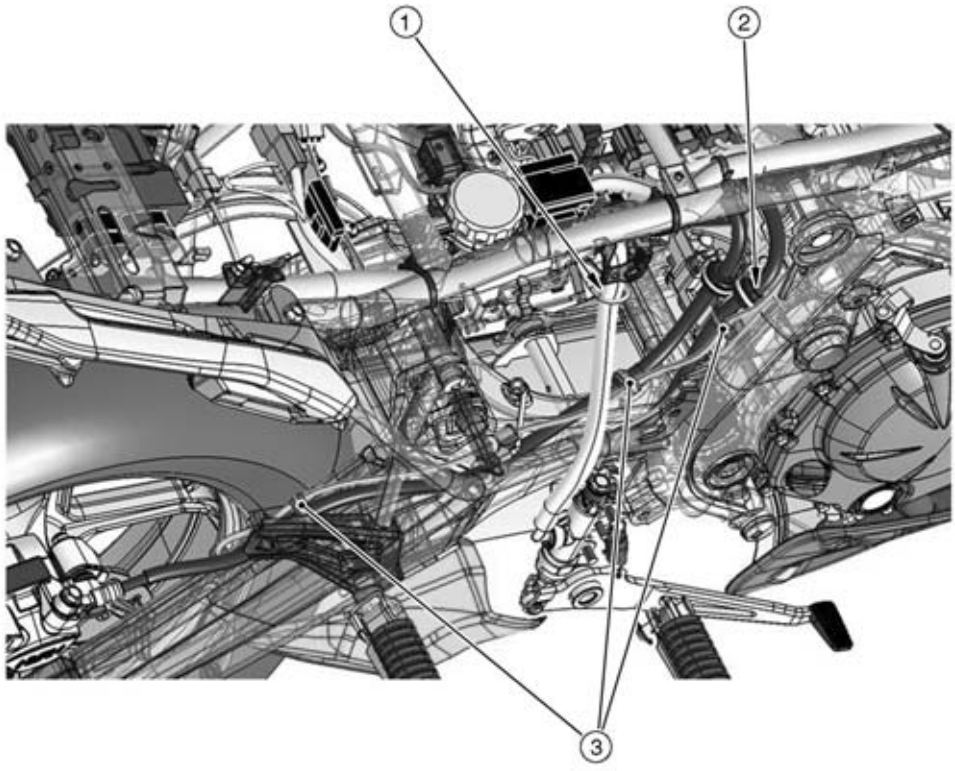
ABS Equipped Models

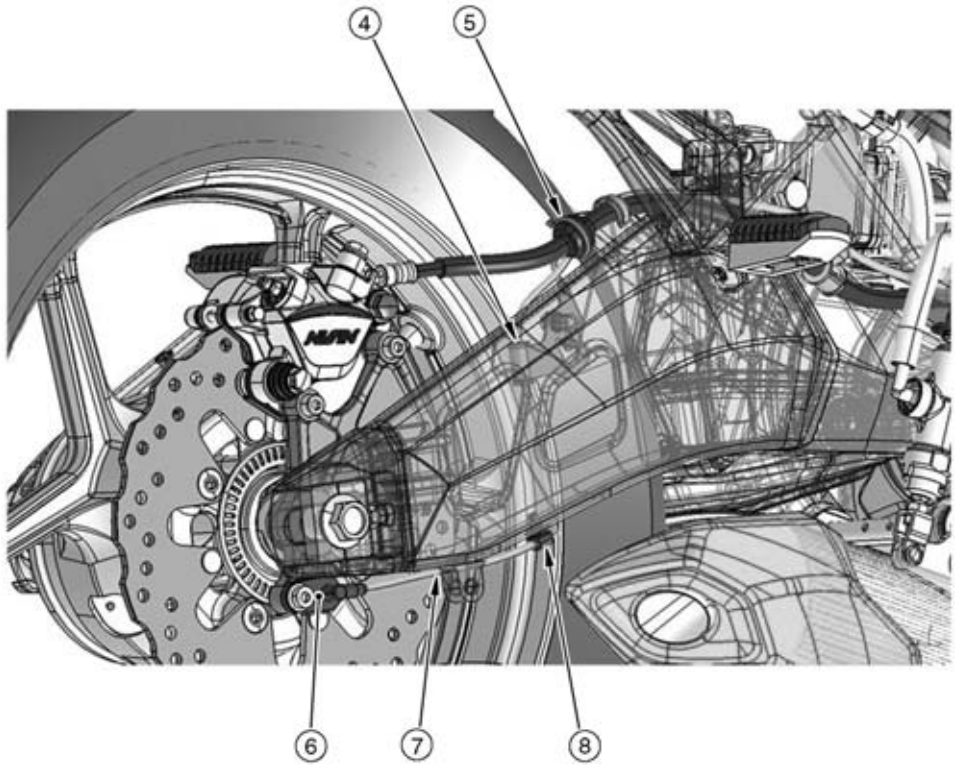


1. Run the starter motor cable above the brake hoses.
2. Run the rear brake light switch lead and rear wheel rotation sensor lead under the front brake hoses.
3. Run the battery negative (–) cable above the rear brake hoses and under front brake hoses.
4. Front

Cable, Wire, and Hose Routing

ABS Equipped Models





GB09519E G

Cable, Wire, and Hose Routing

1. Clamp (Hold the rear brake hose.)
2. Run the rear brake light switch lead under the rear wheel rotation sensor lead.
3. Clamps (Hold the rear brake hose. Hold the rear wheel rotation sensor lead at the white paint marks. Install them from upside.)
4. Clamp (Hold the rear wheel rotation sensor lead.)
5. Clamp (Hold the rear brake hose.)
6. Rear Wheel Rotation Sensor
7. Run the rear wheel rotation sensor lead inside the projection of swingarm.
8. Clamp (Hold the rear wheel rotation sensor lead.)

Troubleshooting Guide

NOTE

○*Refer to the Fuel System (DFI) chapter for most of DFI trouble shooting guide.*

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

Engine Doesn't Start, Starting Difficulty:

Starter motor not rotating:
- Ignition and engine stop switch not on
- Starter lockout switch or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relay not contacting or operating
- Starter button not contacting
- Starter system wiring shorted or open
- Ignition switch trouble
- Engine stop switch trouble
- Main 30 A or ignition fuse blown

Starter motor rotating but engine doesn't turn over:
- Vehicle-down sensor (DFI) coming off
- Starter clutch trouble
- Starter idle gear trouble

Engine won't turn over:
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure
- Balancer bearing seizure

No fuel flow:
- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

No spark; spark weak:
- Vehicle-down sensor (DFI) coming off
- Ignition switch not on
- Engine stop switch turned to stop position
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- Spark plug dirty, broken, or gap maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact
- Stick coil trouble
- ECU trouble
- Neutral, starter lockout, or side stand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine stop switch shorted
- Starter system wiring shorted or open
- Main 30 A or ignition fuse blown

Fuel/air mixture incorrect:
- Bypass screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Leak from oil filler cap, crankcase breather hose or air cleaner drain hose.

Compression Low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- No valve clearance
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed:

Spark weak:
- Battery voltage low
- Stick coil trouble
- Stick coil shorted or not in good contact
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble
- Crankshaft sensor trouble

Fuel/air mixture incorrect:
- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Fuel to injector insufficient
- Fuel line clogged
- Throttle body assy holder loose
- Air cleaner housing holder loose

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down

Troubleshooting Guide

No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
Camshaft cam worn

Run-on (dieseling):
Ignition switch trouble
Engine stop switch trouble
Fuel injector trouble
Carbon accumulating on valve seating surface
Engine overheating

Other:
ECU trouble
Throttle body assy not synchronizing
Engine oil viscosity too high
Drive train trouble
Brake dragging
Clutch slipping
Engine overheating
Air suction valve trouble
Air switching valve trouble

Poor Running or No Power at High Speed:

Firing incorrect:
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
Stick coil shorted or not in good contact trouble
Stick coil trouble
ECU trouble

Fuel/air mixture incorrect:
Air cleaner clogged, poorly sealed, or missing
Air cleaner housing holder loose
Water or foreign matter in fuel
Throttle body assy holder loose
Fuel to injector insufficient
Fuel tank air vent obstructed
Fuel line clogged
Fuel pump trouble

Compression low:
Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/groove clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking:
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
ECU trouble

Miscellaneous:
Throttle valve won't fully open
Brake dragging
Clutch slipping
Engine overheating
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Camshaft cam worn
Air suction valve trouble
Air switching valve trouble
Catalytic converter melt down due to muffler overheating (KLEEN)

Overheating:

Firing incorrect:
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
ECU trouble

Muffler overheating:
For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)
For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)
For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil
For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch on and run the engine)
ECU trouble

Fuel/air mixture incorrect:
Throttle body assy holder loose
Air cleaner housing holder loose
Air cleaner poorly sealed, or missing
Air cleaner clogged

Compression high:
Carbon built up in combustion chamber

Engine load faulty:
Clutch slipping
Engine oil level too high

Engine oil viscosity too high
Drive train trouble
Brake dragging

Lubrication inadequate:
Engine oil level too low
Engine oil poor quality or incorrect

Gauge incorrect:
Water temperature meter broken
Water temperature sensor broken

Coolant incorrect:
Coolant level too low
Coolant deteriorated
Wrong coolant mixed ratio

Cooling system component incorrect:
Radiator fin damaged
Radiator clogged
Thermostat trouble
Radiator cap trouble
Radiator fan relay trouble
Fan motor broken
Fan blade damaged
Water pump not turning
Water pump impeller damaged

Over Cooling:

Gauge incorrect:
Water temperature meter broken
Water temperature sensor broken

Cooling system component incorrect:
Thermostat trouble
Radiator fan relay trouble

Clutch Operation Faulty:

Clutch slipping:
Friction plate worn or warped
Steel plate worn or warped
Clutch spring broken or weak
Clutch hub or housing unevenly worn
No clutch lever play
Clutch inner cable trouble
Clutch release mechanism trouble

Clutch not disengaging properly:
Clutch plate warped or too rough
Clutch spring compression uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch hub nut loose
Clutch hub spline damaged
Clutch friction plate installed wrong
Clutch lever play excessive
Clutch release mechanism trouble

Gear Shifting Faulty:

Doesn't go into gear; shift pedal doesn't return:
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft
Gear positioning lever binding
Shift return spring weak or broken
Shift return spring pin loose
Shift mechanism arm spring broken
Shift mechanism arm broken
Shift pawl broken

Jumps out of gear:
Shift fork ear worn, bent
Gear groove worn
Gear dogs and/or dog holes worn
Shift drum groove worn
Gear positioning lever spring weak or broken
Shift fork guide pin worn
Drive shaft, output shaft, and/or gear splines worn

Overshifts:
Gear positioning lever spring weak or broken
Shift mechanism arm spring broken

Abnormal Engine Noise:

Knocking:
ECU trouble
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
Overheating

Piston slap:
Cylinder/piston clearance excessive
Cylinder, piston worn
Connecting rod bent
Piston pin, piston pin hole worn

Valve noise:
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn
Valve lifter worn

Other noise:
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring/groove clearance excessive
Piston ring worn, broken, or stuck
Piston ring groove worn
Piston seizure, damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive

Troubleshooting Guide

Engine mount loose
Crankshaft bearing worn
Primary gear worn or chipped
Camshaft chain tensioner trouble
Camshaft chain, sprocket, guide worn
Air suction valve damaged
Air switching valve damaged
Alternator rotor loose
Catalytic converter melt down due to muffler overheating (KLEEN)
Balancer gear worn or chipped
Balancer shaft position maladjusted
Balancer bearing worn
Balancer rubber damper damaged

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 gear worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

Drive line noise:
Drive chain adjusted improperly
Drive chain worn
Rear and/or engine sprocket worn
Chain lubrication insufficient
Rear wheel misaligned

Abnormal Frame Noise:

Front fork noise:
Oil insufficient or too thin
Spring weak or broken

Rear shock absorber noise:
Shock absorber damaged

Disc brake noise:
Pad installed incorrectly
Pad surface glazed
Disc warped
Caliper trouble

Other noise:
Bracket, nut, bolt, etc. not properly mounted or tightened

Warning Indicator (LED) (Oil Pressure Warning) Doesn't Go OFF:

Engine oil pump damaged
Engine oil screen clogged
Engine oil filter clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearing worn
Crankshaft bearing worn
Oil pressure switch damaged
Wiring faulty
Relief valve stuck open
O-ring at the oil passage in the crankcase damaged

Exhaust Smokes Excessively:

White smoke:
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Engine oil level too high

Black smoke:
Air cleaner clogged

Brown smoke:
Air cleaner housing holder loose
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory:

Handlebars 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

Handlebars shakes or excessively vibrates:
Tire worn
Swingarm pivot bearing worn
Rim warped, or not balanced
Wheel bearing worn
Handlebar holder bolt loose
Steering stem nut loose
Front, rear axle runout excessive
Engine mounting bolt loose

Handlebars pulls to one side:
Frame bent
Wheel misalignment
Swingarm bent or twisted
Swingarm pivot shaft runout excessive
Steering maladjusted
Front fork bent
Right and left front fork oil level 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 cable making poor contact
Load excessive (e.g., bulb of excessive wattage)
Ignition switch trouble
Alternator trouble
Wiring faulty
Regulator/rectifier trouble

Battery overcharged:
Alternator trouble
Regulator/rectifier trouble
Battery faulty

Part No.99924-1490-01

MODEL APPLICATION

Year	Model	Beginning Frame No.
2015	KLE650EF	JKALEEE1□FDA00001 JKALE650EEDA00001
2015	KLE650FF	JKALEEF1□FDA00001 JKALE650EFDA00001

□:This digit in the frame number changes from one machine to another.

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