

Kawasaki

KX250F



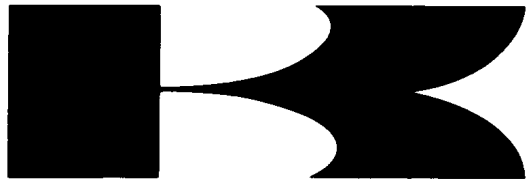
Motorcycle Service Manual

Quick Reference Guide

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

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



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Motorcycle Service Manual

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

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

LIST OF ABBREVIATIONS

A	ampere(s)	KDS	Kawasaki Diagnostic System
ABDC	after bottom dead center	km/h	kilometers per hour
AC	alternating current	L	liter(s)
Ah	ampere hour	lb	pound(s)
ATDC	after top dead center	LED	Light Emitting Diode
BBDC	before bottom dead center	m	meter(s)
BDC	bottom dead center	min	minute(s)
BTDC	before top dead center	mph	miles per hour
°C	degree(s) Celsius	N	newton(s)
cmHg	centimeters of mercury	oz	ounce(s)
cu in	cubic inch(s)	Pa	pascal(s)
DC	direct current	PS	horsepower
DFI	Digital Fuel Injection	psi	pound(s) per square inch
ECU	Electronic Control Unit	qt	quart(s)
F	farad(s)	r	revolution
°F	degree(s) Fahrenheit	rpm	revolution(s) per minute
ft	foot, feet	s	second(s)
g	gram(s)	TDC	top dead center
gal	gallon(s)	TIR	total indicator reading
h	hour(s)	V	volt(s)
HP	horsepower(s)	W	watt(s)
in.	inch(s)	Ω	ohm(s)

COUNTRY AND AREA CODES

AU	Australia	EUR	Europe
BR	Brazil	US	United States
CA	Canada		

Foreword

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

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

To get the longest life out of your vehicle:

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

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

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

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

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

General Information

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1-2 GENERAL INFORMATION

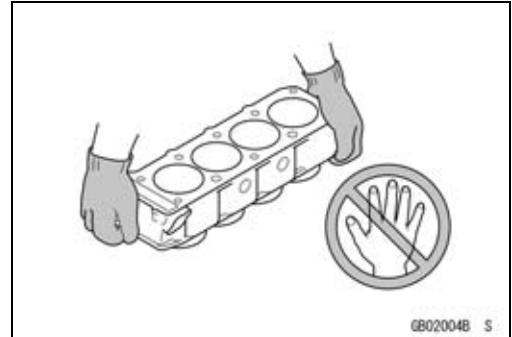
Before Servicing

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

Especially note the following:

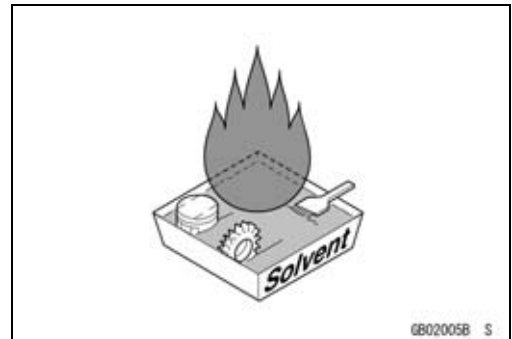
Edges of Parts

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



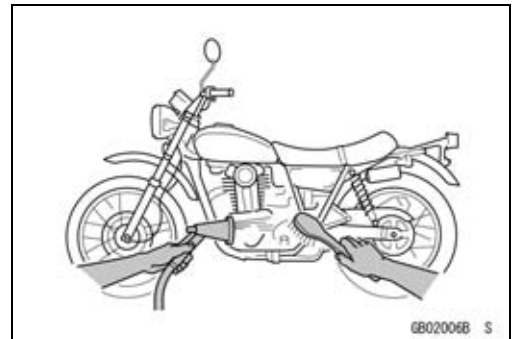
Solvent

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



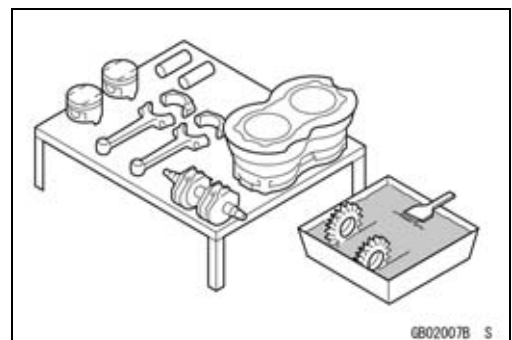
Cleaning Vehicle before Disassembly

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



Arrangement and Cleaning of Removed Parts

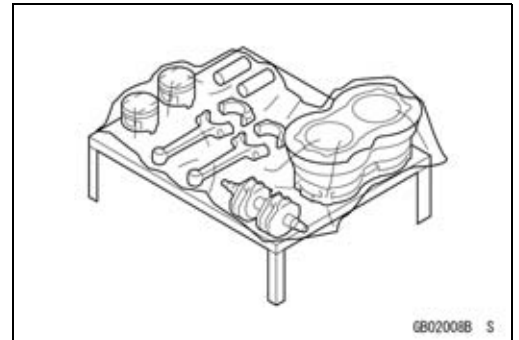
Disassembled parts are easy to confuse. Arrange the parts according to the order the parts were disassembled and clean the parts in order prior to assembly.



Before Servicing

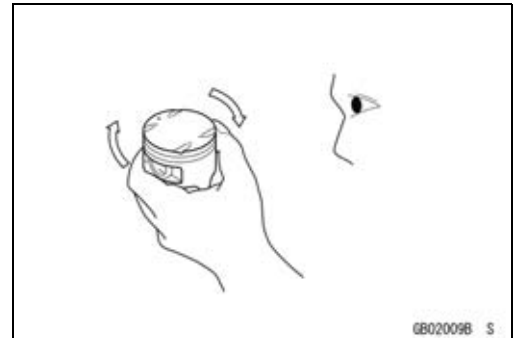
Storage of Removed Parts

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



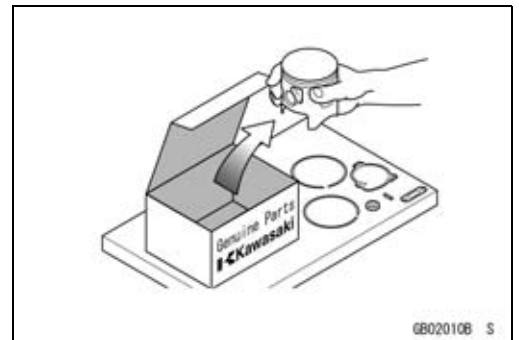
Inspection

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



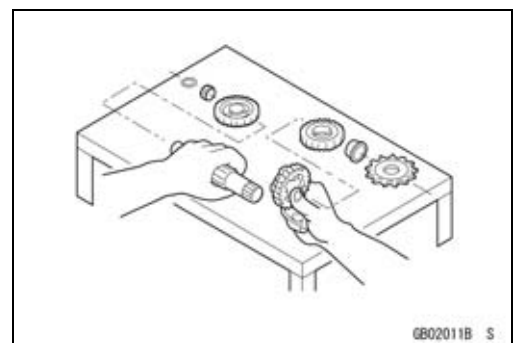
Replacement Parts

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



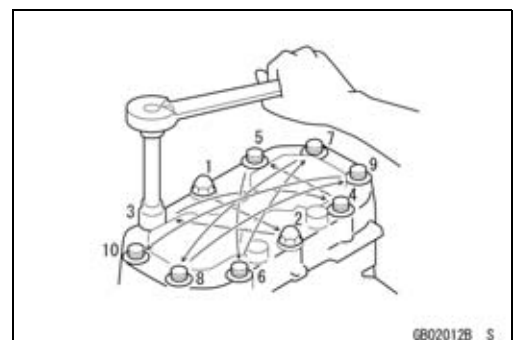
Assembly Order

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



Tightening Sequence

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

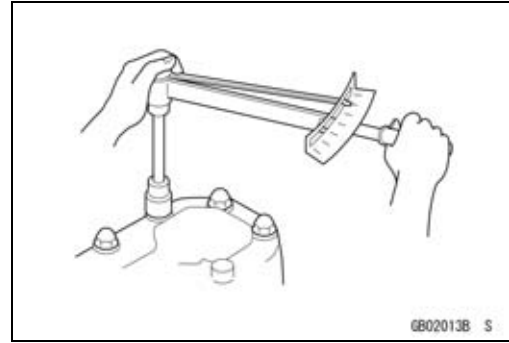


1-4 GENERAL INFORMATION

Before Servicing

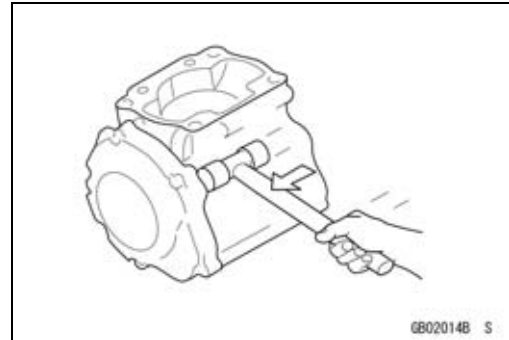
Tightening Torque

Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench. Often, the tightening sequence is followed twice-initial tightening and final tightening with torque wrench.



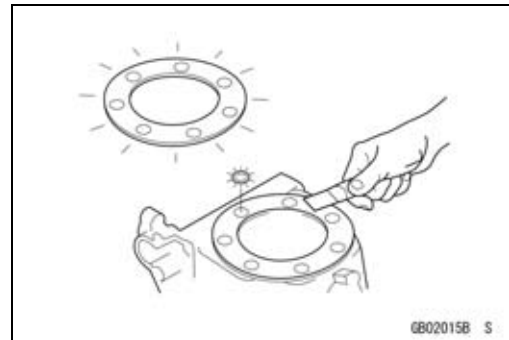
Force

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



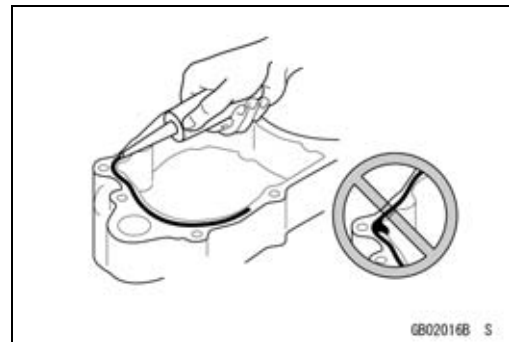
Gasket, O-ring

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



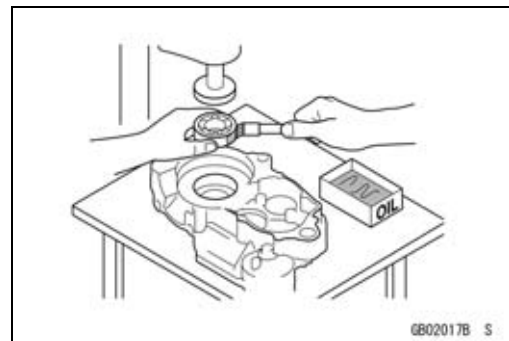
Liquid Gasket, Non-permanent Locking Agent

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



Press

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

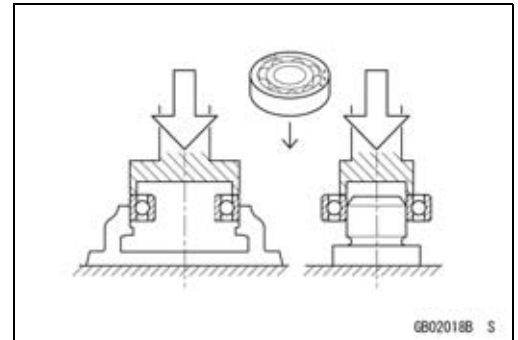


Before Servicing

Ball Bearing and Needle Bearing

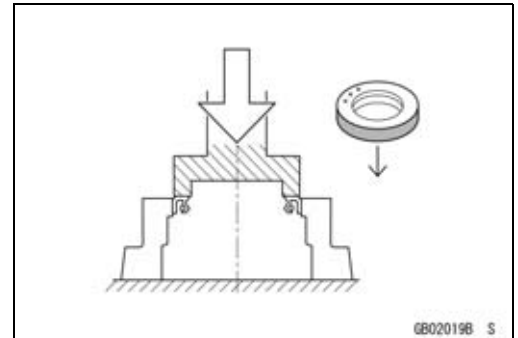
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

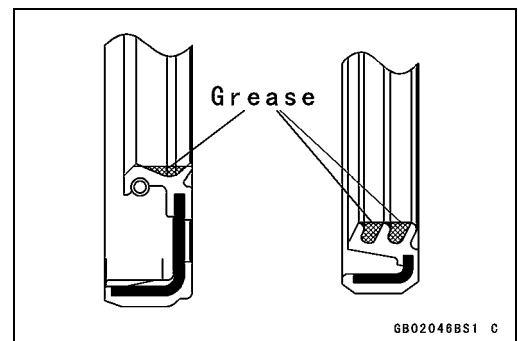


Oil Seal, Grease Seal

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

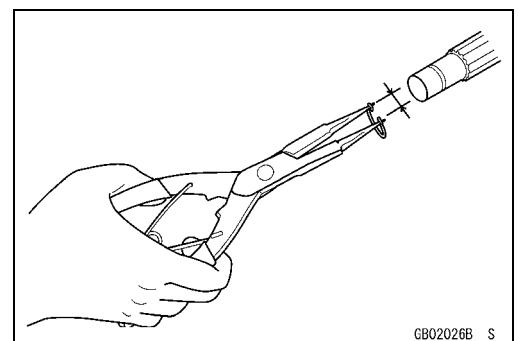


Apply specified grease to the lip of seal before installing the seal.



Circlips, Cotter Pins

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



Lubrication

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

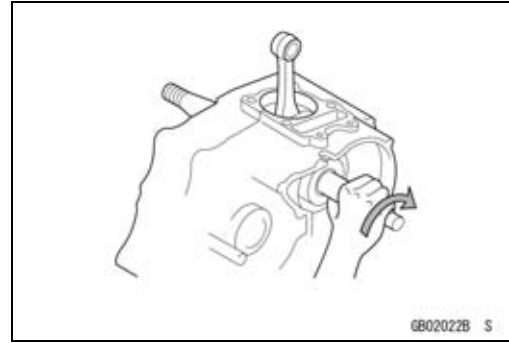


1-6 GENERAL INFORMATION

Before Servicing

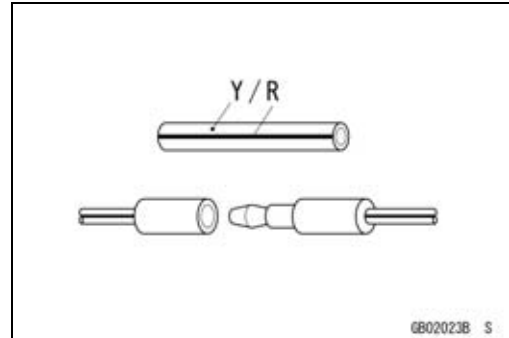
Direction of Engine Rotation

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



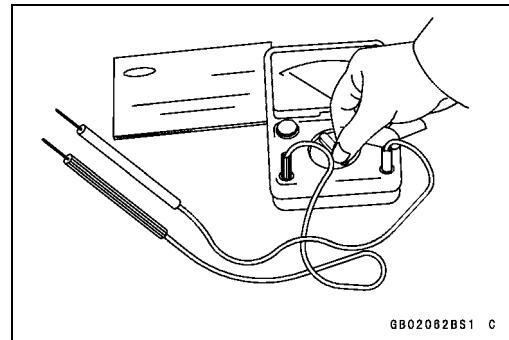
Electrical Leads

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



Instrument

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



Model Identification

KX250ZD Left Side View



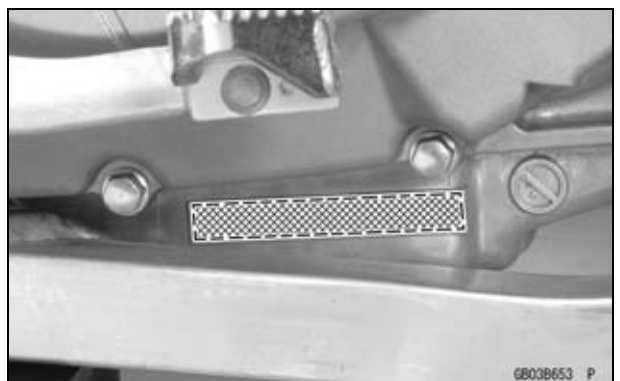
KX250ZD Right Side View



Frame Number



Engine Number



1-8 GENERAL INFORMATION

General Specifications

Items	KX250ZD
Dimensions	
Overall Length	2 170 mm (85.43 in.)
Overall Width	820 mm (32.3 in.)
Overall Height	1 270 mm (50.00 in.)
Wheelbase	1 475 mm (58.07 in.)
Road Clearance	330 mm (13.0 in.)
Seat Height	945 mm (37.2 in.)
Curb Mass:	106.2 kg (234.2 lb) (US, CA) 106.0 kg (233.7 lb)
Front:	51.7 kg (114.0 lb)
Rear:	54.5 kg (120.2 lb) (US, CA) 54.3 kg (119.7 lb)
Fuel Tank Capacity	6.1 L (1.6 US gal)
Engine	
Type	4-stroke, single cylinder, DOHC 4 valve
Cooling System	Liquid-cooled
Bore and Stroke	77.0 × 53.6 mm (3.03 × 2.11 in.)
Displacement	249 cm ³ (15.2 cu in.)
Compression Ratio	13.8:1
Fuel System	FI (Fuel Injection), KEIHIN ϕ 43
Starting System	Primary kick
Ignition System	Digital DC-CDI
Timing Advance	Electronically advanced
Ignition Timing	BTDC 4° at 2 000 r/min (rpm)
Spark Plug:	
Standard:	NGK CPR8EB-9
Terminal	Solid post
Option:	NGK CPR9EB-9
Terminal	Solid post
Valve Timing:	
Intake:	
Open	BTDC 36°
Close	ABDC 76°
Duration	292°
Exhaust:	
Open	BBDC 69°
Close	ATDC 49°
Duration	298°
Lubrication System	Forced lubrication (semi-dry sump)
Engine Oil:	
Type	API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2
Viscosity	SAE 10W-40
Capacity	1.0 L (1.1 US qt)

General Specifications

Items	KX250ZD
Drive Train	
Primary Reduction System:	
Type	Gear
Reduction Ratio	3.350 (67/20)
Clutch Type	Wet multi disc, Manual
Transmission:	
Type	5-speed, constant mesh, return shift
Gear Ratios:	
1st	2.142 (30/14)
2nd	1.750 (28/16)
3rd	1.444 (26/18)
4th	1.235 (21/17)
5th	1.045 (23/22)
Final Drive System:	
Type	Chain drive
Reduction Ratio	3.846 (50/13)
Overall Drive Ratio	13.470 at Top gear
Frame	
Type	Tubular, semi-double cradle
Steering Angle	42° to either side
Caster (Rake Angle)	28.7°
Trail	126.4 mm (4.976 in.)
Front Wheel:	
Tire Size	80/100-21 51M
Tire Make/Type	DUNLOP MX51F, Tube type
Rim Size	21 x 1.60
Rear Wheel:	
Tire Size	100/90-19 57M
Tire Make/Type	DUNLOP MX51, Tube type
Rim Size	19 x 1.85
Front Suspension:	
Type	Telescopic fork (upside down)
Wheel Travel	315 mm (12.4 in.)
Rear Suspension:	
Type	Swingarm (New Uni-trak)
Wheel Travel	310 mm (12.2 in.)
Brake Type:	
Front and Rear	Single disc
Effective Disc Diameter:	
Front	225 mm (8.86 in.)
Rear	215 mm (8.46 in.)

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

1-10 GENERAL INFORMATION

Unit Conversion Table

Prefixes for Units:

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

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

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

Units of Force:

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

Units of Length:

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

Units of Torque:

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

Units of Pressure:

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

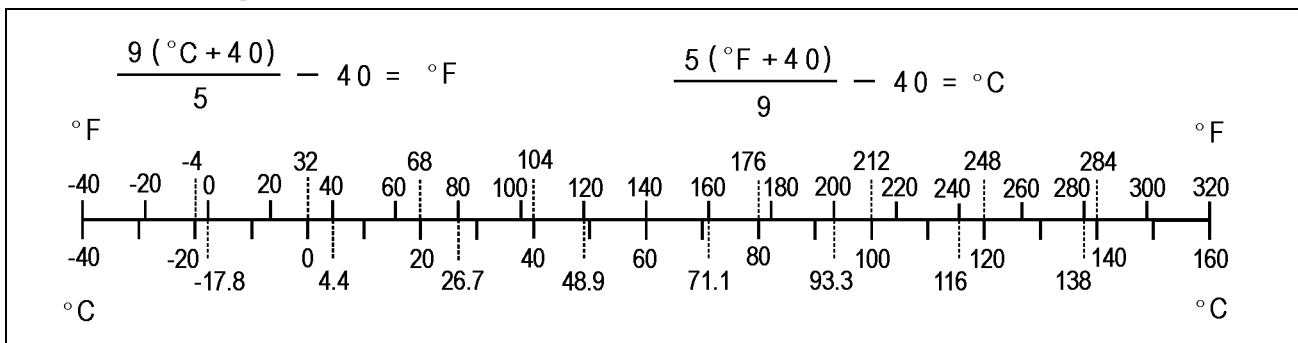
Units of Speed:

km/h	×	0.6214	=	mph
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Units of Power:

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

Units of Temperature:



Periodic Maintenance

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PERIODIC MAINTENANCE 2-3

Periodic Maintenance Chart

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

OPERATION		FREQUENCY				See Page
		Each race or 2.5 hours	Every 3 races or 7.5 hours	Every 6 races or 15 hours	Every 12 races or 30 hours	
ENGINE	Spark plug - clean and inspect †	●				2-81
	Spark plug - replace		●			2-81
	Clutch - inspect	●				2-29
	Clutch plates - inspect †	●				2-29
	Throttle cable - inspect and adjust	●				2-14
	Air cleaner element - clean	●				2-19
	Air cleaner element - replace	If damaged				2-19
	Throttle body assy - inspect and adjust	●				2-15
	Engine oil - change			●		2-30
	Piston and piston ring - replace			●		2-27
	Cylinder head, cylinder - inspect			●		2-26
	Piston pin - replace				●	2-27
	Valve clearance - inspect †			●		2-23
	Oil filter - replace			●		2-31
	Exhaust system - inspect †	●				2-27
	Silencer wool - change		●			2-28
	Kick pedal and shift pedal - clean	●				–
	Engine sprocket - inspect †	●				2-38
	Coolant level - inspect	●				2-21
	Water hoses and connections - inspect †	●				2-23
Crankshaft - inspect			●		2-33	
Breather hose - inspect	●				2-32	
CHASSIS	Brake - adjust †	●				2-39
	Brake pad wear - inspect †	●				2-43
	Brake fluid level - inspect †	●				2-40
	Brake fluid - change	Every 2 years				2-41
	Brake master cylinder cup and dust cover - replace	Every 2 years				2-43
	Brake caliper fluid seal and dust seal - replace	Every 2 years				2-44
	Brake hoses - replace	Every 4 years				2-48
	Brake hoses, connections - inspect †	●				2-48
	Spoke tightness and rim runout - inspect †	●				2-34
	Wheel bearing - inspect †	●				2-35
	Frame - inspect	●				2-80
	Drive chain wear - inspect †	●				2-35
Drive chain - inspect and adjust	●				2-36	
Drive chain - lubricate	●				2-38	

2-4 PERIODIC MAINTENANCE

Periodic Maintenance Chart

		FREQUENCY	Each race or 2.5 hours	Every 3 races or 7.5 hours	Every 6 races or 15 hours	Every 12 races or 30 hours	See Page
C H A S S I S	Wheels/tires - inspect		●				2-34
	Rear sprocket - inspect †		●				2-38
	Front fork - clean and inspect		●				2-49
	Front fork oil - change				●		2-49
	Rear shock absorber oil - change				●		2-70
	Cable - inspect		●				2-82
	Fuel hose - replace		Every 5 years				2-15
	Fuel hose, connections - inspect †		●				2-14
	Fuel system - clean			●			2-21
	Steering play - inspect †		●				2-78
	Steering stem bearing - lubricate				●		2-80
	Swingarm and Uni-Trak linkage pivots - lubricate			●			2-78
	Swingarm and Uni-Trak linkage pivots - inspect †			●			2-78
	Nuts, bolts, fasteners - inspect †		●				2-82
General lubrication - perform		●				2-81	

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

Torque and Locking Agent

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

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

Letters used in the "Remarks" column mean:

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

G: Apply grease.

L: Apply a non-permanent locking agent.

Lh: Left-hand Threads

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

S: Follow the specified tightening sequence.

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

T: First, tighten the stem nut with 39 N·m (4.0 kgf·m, 29 ft·lb) of torque, then loosen it and retighten it with 4.9 N·m (0.50 kgf·m, 43 in·lb) of torque.

2T: Apply 2-stroke oil.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System (DFI)				
Throttle Pulley Cover Bolts	3.4	0.35	30 in·lb	
Throttle Cable Bolts	3.0	0.31	27 in·lb	
Air Cleaner Duct Clamp Bolt	2.0	0.20	18 in·lb	
Throttle Case Mounting Screws	3.8	0.39	34 in·lb	
Delivery Joint Bolt	3.5	0.36	31 in·lb	L
Water Temperature Sensor	12	1.2	106 in·lb	
Gear Position Switch Screws	2.9	0.30	26 in·lb	L
Cooling System				
Water Hose Clamp Screws	3.0	0.31	27 in·lb	
Water Pipe Bolt	9.8	1.0	87 in·lb	
Water Pump Cover Bolts (L = 55 mm)	9.8	1.0	87 in·lb	L
Water Pump Impeller Bolt	7.0	0.71	62 in·lb	
Water Pump Cover Bolts (L = 30, 65 mm)	9.8	1.0	87 in·lb	
Coolant Drain Bolt	7.0	0.71	62 in·lb	
Engine Top End				
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	
Camshaft Cap Bolts	9.8	1.0	87 in·lb	MO, S
Plug	20	2.0	15	L
Cylinder Head Bolts (M10)	44	4.5	32	MO, R, S
Auto-Decompressor Bolt	12	1.2	106 in·lb	
Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
Cylinder Bolt	12	1.2	106 in·lb	S
Throttle Body Assy Clamp Screw	2.0	0.20	18 in·lb	
Throttle Body Assy Holder Clamp Screw	2.0	0.20	18 in·lb	
Lower Camshaft Chain Guide Bolt	9.8	1.0	87 in·lb	
Rear Camshaft Chain Guide Bolt	15	1.5	11	

2-6 PERIODIC MAINTENANCE

Torque and Locking Agent

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in-lb	
Clutch				
Right Engine Cover Bolts	9.8	1.0	87 in-lb	
Clutch Cover Bolts	9.8	1.0	87 in-lb	
Oil Filler Plug	3.5	0.36	31 in-lb	
Clutch Hub Nut	98	10.0	72	R
Clutch Spring Bolts	9.0	0.92	80 in-lb	
Engine Lubrication System				
Oil Filter Cap Bolts	9.8	1.0	87 in-lb	
Piston Oil Nozzle	2.9	0.30	26 in-lb	
Breather Fitting	15	1.5	11	
Oil Pump Idle Gear Shaft Screws	5.9	0.60	52 in-lb	L
Oil Pump Mounting Bolts	7.0	0.71	62 in-lb	L
Engine Oil Drain Bolt	20	2.0	15	
Engine Removal/Installation				
Upper Engine Mounting Bolts	49	5.0	36	S
Upper Engine Bracket Bolts	29	3.0	21	S
Middle Engine Bracket Nuts	29	3.0	21	R, S
Middle Engine Mounting Nut	49	5.0	36	R, S
Lower Engine Mounting Nut	49	5.0	36	R, S
Swingarm Pivot Shaft Nut	98	10.0	72	R, S
Crankshaft/Transmission				
Primary Gear Nut	98	10.0	72	Lh, R
Reed Valve Screws	7.0	0.71	62 in-lb	
Crankcase Bearing Retainer Screws	15	1.5	11	L
Piston Oil Nozzle	2.9	0.30	26 in-lb	
Crankcase Bolts (L = 50 mm)	9.8	1.0	87 in-lb	S
Crankcase Bolt (L = 65 mm)	9.8	1.0	87 in-lb	S
Crankcase Bolts (L = 70 mm)	9.8	1.0	87 in-lb	S
Crankcase Bolts (L = 60 mm)	9.8	1.0	87 in-lb	S
Kick Ratchet Guide Bolt	8.8	0.90	78 in-lb	L
Kick Pedal Bolt	25	2.5	18	L
Shift Drum Cam Bolt	24	2.4	18	L
Gear Positioning Lever Nut	8.8	0.90	78 in-lb	
Ratchet Plate Bolt	9.8	1.0	87 in-lb	L, S
Ratchet Plate Screw	15	1.5	11	L, S
Shift Pedal Bolt	9.8	1.0	87 in-lb	
Wheels/Tires				
Spoke Nipples	Not less than 2.2	Not less than 0.22	Not less than 19 in-lb	
Front Axle Nut	78	8.0	58	
Front Axle Clamp Bolts	20	2.0	15	AL, S

PERIODIC MAINTENANCE 2-7

Torque and Locking Agent

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
Rear Axle Nut	108	11.0	79.7	
Final Drive				
Rear Sprocket Nuts	34	3.5	25	R
Brakes				
Brake Hose Banjo Bolts	25	2.5	18	
Front Brake Reservoir Cap Screws	1.5	0.15	13 in-lb	
Front Master Cylinder Clamp Bolts	8.8	0.90	78 in-lb	S
Brake Lever Pivot Bolt	5.9	0.60	52 in-lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in-lb	
Front Brake Disc Mounting Bolts	9.8	1.0	87 in-lb	L
Front Brake Pad Pin	17	1.7	13	
Caliper Bleed Valves	7.8	0.80	69 in-lb	
Front Caliper Mounting Bolts	25	2.5	18	
Rear Brake Reservoir Cap Bolts	1.5	0.15	13 in-lb	
Rear Master Cylinder Mounting Bolts	9.8	1.0	87 in-lb	
Rear Master Cylinder Push Rod Locknut	17	1.7	13	
Brake Pedal Bolt	25	2.5	18	G, L
Rear Caliper Holder Shaft	27	2.8	20	Si
Rear Brake Pad Pin	17	1.7	13	
Rear Brake Pad Pin Plug	2.4	0.24	21 in-lb	
Rear Brake Disc Mounting Bolts	23	2.3	17	L
Suspension				
Air Pressure Relief Screws	1.3	0.13	12 in-lb	
Left Front Fork Base Valve Assembly	30	3.1	22	
Front Fork Clamp Bolts (Upper)	20	2.0	15	AL, L
Front Fork Clamp Bolts (Lower)	22	2.2	16	AL
Right Front Fork Spring Adjuster Unit	34	3.5	25	
Left Front Fork Cylinder Unit	34	3.5	25	
Left Front Fork Adjuster Assembly Locknut	22	2.2	16	
Left Front Fork Adjuster Assembly	69	7.0	51	L
Right Front Fork Spring Preload Adjuster	30	3.1	22	
Right Front Fork Bottom Plug Locknut	22	2.2	16	
Right Front Fork Bottom Plug	69	7.0	51	L
Rear Shock Absorber Mounting Nut (Upper)	39	4.0	29	R
Rear Shock Absorber Mounting Nut (Lower)	34	3.5	25	R
Tie-Rod Mounting Nuts	59	6.0	44	R
Swingarm Pivot Shaft Nut	98	10.0	72	R
Rocker Arm Pivot Nut	59	6.0	44	R
Gas Reservoir Damping Adjuster Assembly	29.5	3.01	21.8	
Rear Shock Absorber Spring Locknut	45	4.6	33	
Piston Rod Locknut	37	3.8	27	R

2-8 PERIODIC MAINTENANCE

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Steering				
Handlebar Clamp Bolts	25	2.5	18	AL, 2T
Steering Stem Head Nut	98	10.0	72	
Front Fork Clamp Bolts (Upper)	20	2.0	15	AL, L
Steering Stem Nut	4.9	0.50	43 in·lb	T
Handlebar Holder Nuts	34	3.5	25	R
Front Fork Clamp Bolts (Lower)	22	2.2	16	AL
Brake Hose Clamp Bolt	3.0	0.31	27 in·lb	
Frame				
Footpeg Bracket Bolts (Upper)	54	5.5	40	L
Rear Frame Mounting Bolts	34	3.5	25	
Electrical System				
Regulator/Rectifier Nuts	10	1.02	89 in·lb	R
Spark Plug	13	1.3	115 in·lb	
Flywheel Nut Cap	3.5	0.36	31 in·lb	
Magneto Cover Bolts	9.8	1.0	87 in·lb	
Timing Inspection Cap	3.5	0.36	31 in·lb	
Flywheel Nut	78.5	8.00	57.9	
Stator Coil Bolts	9.8	1.0	87 in·lb	L
Crankshaft Sensor Bolts	7.0	0.71	62 in·lb	L
Gear Position Switch Screws	2.9	0.30	26 in·lb	L

Basic Torque for General Fasteners

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

Specifications

Item	Standard	Service Limit
Fuel System (DFI)		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	---
Idle Speed	2 050 ±50 r/min (rpm)	---
Air Cleaner Element Oil	High quality foam air filter oil	---
Cooling System		
Coolant:		
Type (Recommended)	Permanent type antifreeze	---
Color	Green	---
Mixed Ratio	Soft water 50%, coolant 50%	---
Freezing Point	-35°C (-31°F)	---
Total Amount	1.2 L (1.3 US qt)	---
Engine Top End		
Valve Clearance:		
Exhaust	0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)	---
Intake	0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)	---
Cylinder Head Warp	---	0.05 mm (0.002 in.)
Cylinder Inside Diameter (see text)	77.000 ~ 77.012 mm (3.0315 ~ 3.0320 in.)	77.10 mm (3.035 in.)
Piston/Cylinder Clearance	0.041 ~ 0.068 mm (0.0016 ~ 0.0027 in.)	---
Clutch		
Clutch Lever Free Play	8 ~ 13 mm (0.3 ~ 0.5 in.)	---
Friction Plate Thickness	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)	2.5 mm (0.10 in.)
Friction Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.012 in.)
Steel Plate Warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.012 in.)
Engine Lubrication System		
Engine Oil:		
Type	Castrol "POWER1 R4 Racing" 5W-40 or API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2	---
Viscosity	SAE 10W-30, 10W-40, or 10W-50	---
Capacity	0.75 L (0.79 US qt) (when filter is not removed)	---
	0.80 L (0.85 US qt) (when filter is removed)	---
	1.00 L (1.06 US qt) (when engine is completely dry)	---
Crankshaft/Transmission		
Connecting Rod Big End Side Clearance	0.25 ~ 0.35 mm (0.0098 ~ 0.0138 in.)	0.6 mm (0.02 in.)

2-10 PERIODIC MAINTENANCE

Specifications

Item	Standard	Service Limit
Wheels/Tires		
Rim Runout (with tire installed):		
Axial	TIR 1.0 mm (0.04 in.) or less	TIR 2.0 mm (0.08 in.)
Radial	TIR 1.0 mm (0.04 in.) or less	TIR 2.0 mm (0.08 in.)
Tires Air Pressure (Front/Rear)	100 kPa (1.00 kgf/cm ² , 14 psi)	---
Standard Tire:		
Front:		
Size	80/100-21 51M	---
Make	DUNLOP	---
Type	MX51F, Tube	---
Rear:		
Size	100/90-19 57M	---
Make	DUNLOP	---
Type	MX51, Tube	---
Final Drive		
Drive Chain Slack	52 ~ 58 mm (2.0 ~ 2.3 in.)	---
Drive Chain 20-link Length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Rear Sprocket Warp (Runout)	TIR 0.4 mm (0.016 in.) or less	TIR 0.5 mm (0.020 in.)
Brakes		
Brake Lever Free Play	Adjustable (to suit rider)	---
Brake Fluid Type:		
Front	DOT3 or DOT4	---
Rear	DOT3 or DOT4	---
Brake Pad Lining Thickness:		
Front	4.0 mm (0.16 in.)	1 mm (0.04 in.)
Rear	6.4 mm (0.25 in.)	1 mm (0.04 in.)
Suspension		
Fork Oil:		
Type	SHOWA SS-19 or equivalent	---
Capacity (Left Front Fork):		
Cylinder Unit	330 mL (11.16 US oz.)	---
Cylinder Unit Oil Level	115 ~ 123 mm (4.53 ~ 4.84 in.)	---
Outer Tube	320 ±2.5 mL (10.82 ±0.085 US oz.) (EUR, BR) 300 ±2.5 mL (10.14 ±0.085 US oz.)	(Adjustable Range) 300 ~ 340 mL (10.14 ~ 11.50 US oz.)
Capacity (Right Front Fork)	235 ±2.5 mL (7.95 ±0.085 US oz.)	(Adjustable Range) 230 ~ 378 mL (7.78 ~ 12.78 US oz.)
Rear Shock Absorber Oil:		
Type	SHOWA SS-25 or equivalent	---
Capacity	approx. 380 mL (12.8 US oz.)	---

PERIODIC MAINTENANCE 2-11

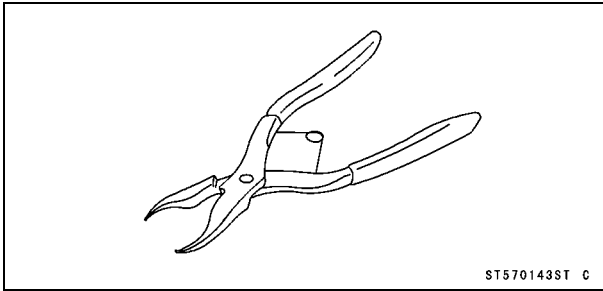
Specifications

Item	Standard	Service Limit
Electrical System Spark Plug Gap	0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)	- - -

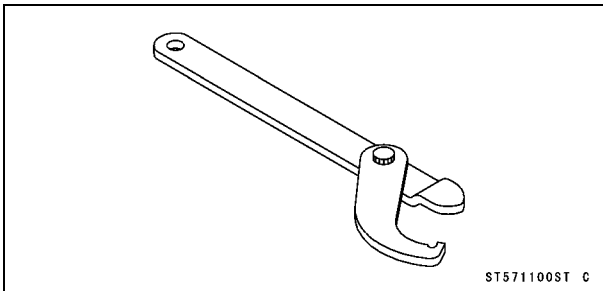
2-12 PERIODIC MAINTENANCE

Special Tools

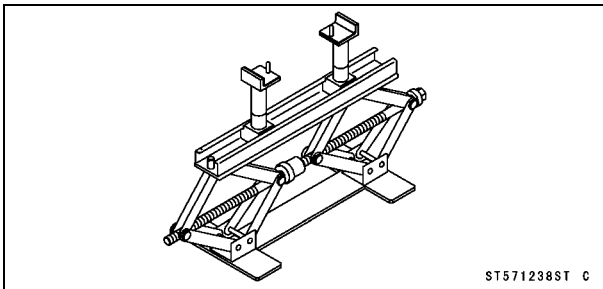
Inside Circlip Pliers:
57001-143



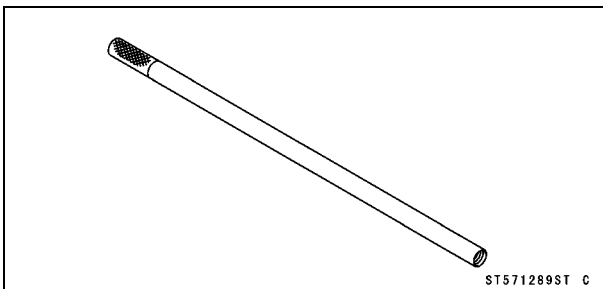
Steering Stem Nut Wrench:
57001-1100



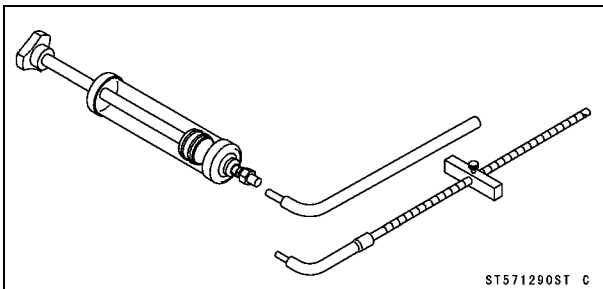
Jack:
57001-1238



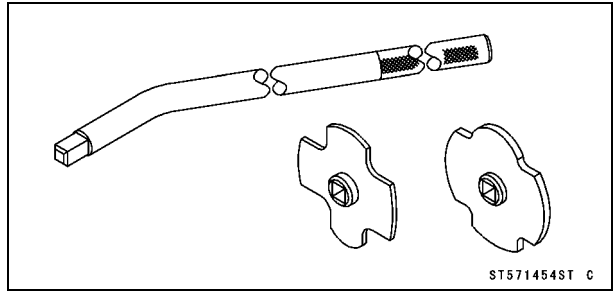
Fork Piston Rod Puller, M12 x 1.25:
57001-1289



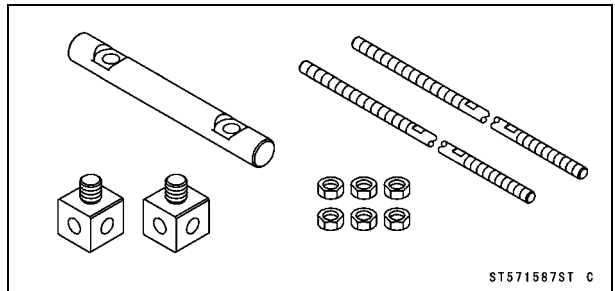
Fork Oil Level Gauge:
57001-1290



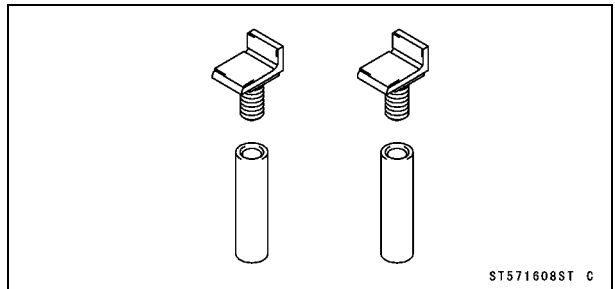
Filler Cap Driver:
57001-1454



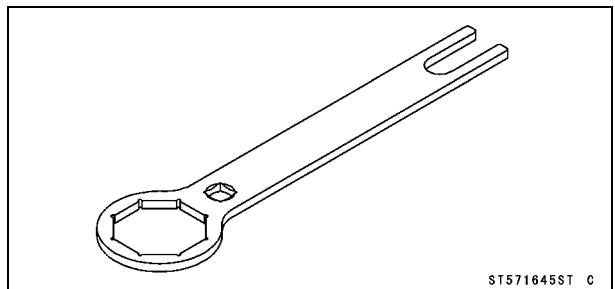
Fork Spring Compressor:
57001-1587



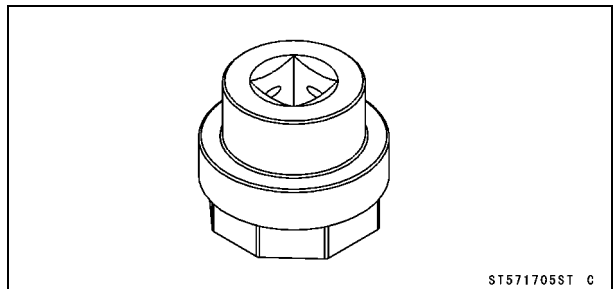
Jack Attachment:
57001-1608



Top Plug Wrench, 50 mm:
57001-1645

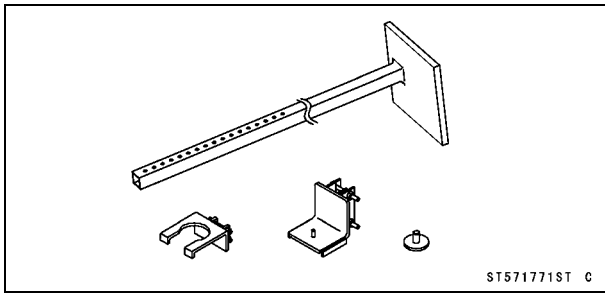


Top Plug Wrench, 36 mm:
57001-1705



Special Tools

**Fork Spring Compressor:
57001-1771**



2-14 PERIODIC MAINTENANCE

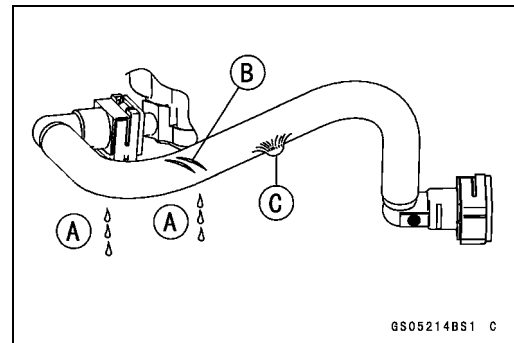
Periodic Maintenance Procedures

Fuel System (DFI)

Fuel Hose and Connections Inspection

○ If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose burst. 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.
- When installing the fuel hose, avoid sharp bending, kinking, flattening or twist, and run the fuel hose with a minimum of bending so that fuel flow will not be obstructed.
- ★ Replace the hose if it has been sharply bent or kinked.



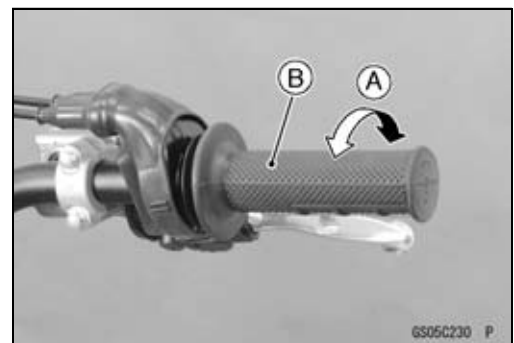
Throttle Grip (Throttle Cable) Free Play Inspection

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

Throttle Grip Free Play

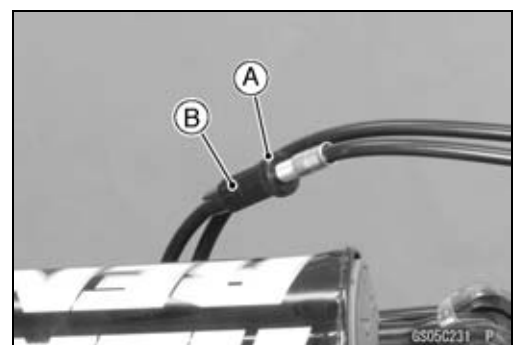
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)

- ★ If the free play is improper, adjust the throttle cable.
- Check that the throttle grip moves smoothly from full open to close, and the throttle closes quickly and completely in all steering positions by the return spring.
- ★ If the throttle grip does not return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.
- Run the engine at the idle speed, and turn the handlebars all the way to the right and left to ensure that the idle speed does not change.
- ★ If the idle speed increase, check the throttle cable free play and the cable routing.



Throttle Grip (Throttle Cable) Free Play Adjustment

- Loosen the locknut [A] at the upper end of the throttle cable.
- Screw the throttle cable adjuster [B] to give the throttle grip plenty of play.
- Tighten the locknut.



- ★ If the throttle grip free play cannot be adjusted with the adjuster, replace the throttle cables.
- Turn the handlebars from side to side while idling the engine. If idle speed varies, the throttle cable may be poorly routed or it may be damaged.

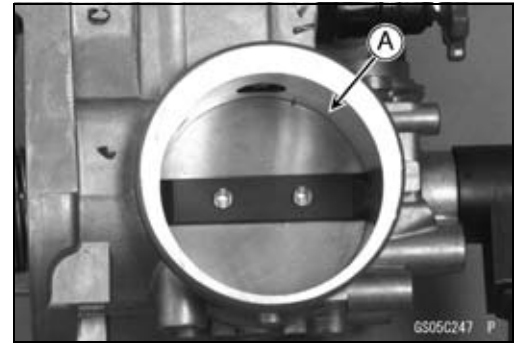
⚠ WARNING

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

Periodic Maintenance Procedures

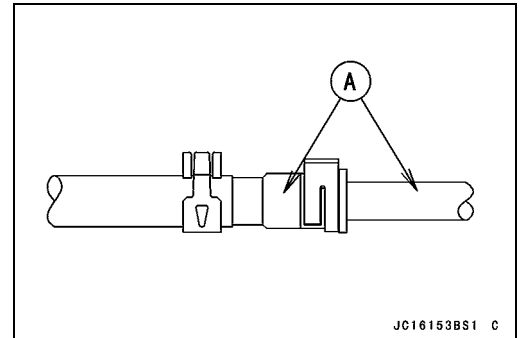
Throttle Body Cleaning

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



Fuel Hose Replacement

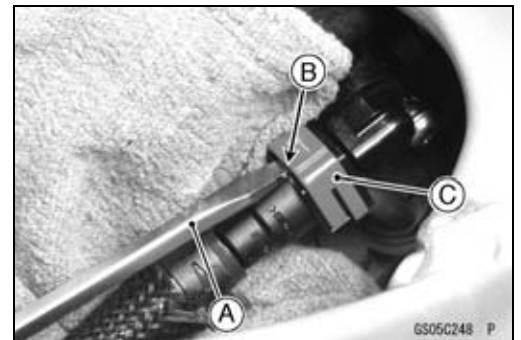
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Be sure to place a piece of cloth around each fuel hose joint.
- Wipe off the dirt of the surface [A] around the connection using a cloth or a soft brush.



Throttle Body Assy Side

When removing with standard tip screwdriver:

- Insert the standard tip screwdriver [A] into the slit [B] on the joint lock [C].
- Turn the driver to disconnect the joint lock.

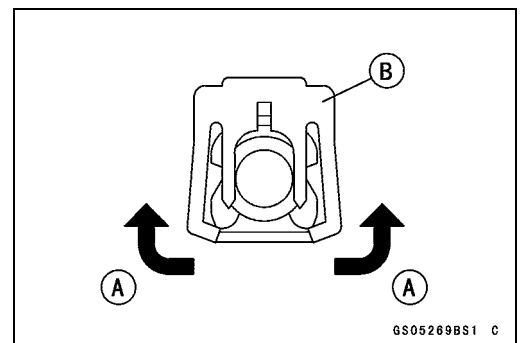


When removing with fingers:

- Open and push up [A] the joint lock [B] 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.



2-16 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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

⚠ WARNING

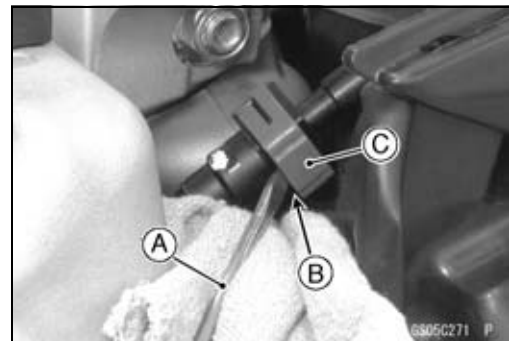
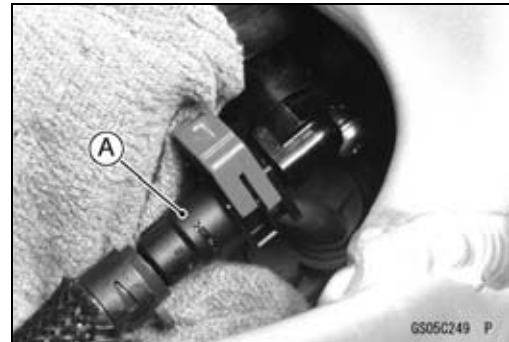
Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe. Cover the hose connection with a clean shop towel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

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

Air Cleaner Side

When removing with standard tip screwdriver:

- Insert the standard tip screwdriver [A] into the slit [B] on the joint lock [C].
- Turn the driver to disconnect the joint lock.



When removing with fingers:

- Open and push up [A] the joint lock [B] with your fingers.

NOTICE

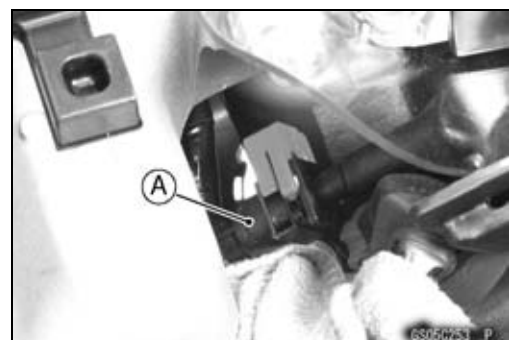
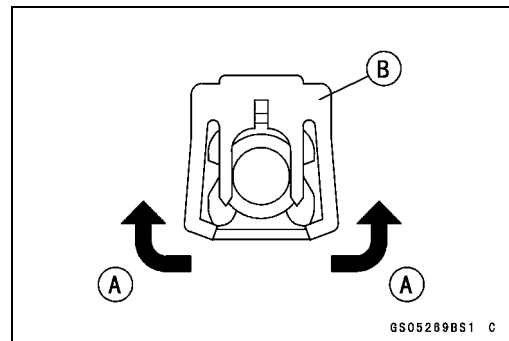
Prying or excessively widening the joint lock ends for fuel hose removal will permanently deform the joint lock, resulting in a loose or incomplete lock that may allow fuel to leak and create the potential for a fire explosion. To prevent fire or explosion from a damaged joint lock, do not pry or excessively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

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

⚠ WARNING

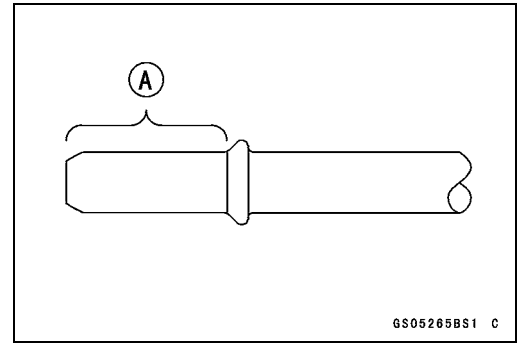
Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe. Cover the hose connection with a clean shop towel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

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

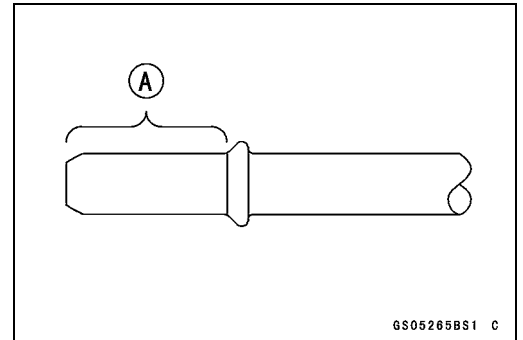


Periodic Maintenance Procedures

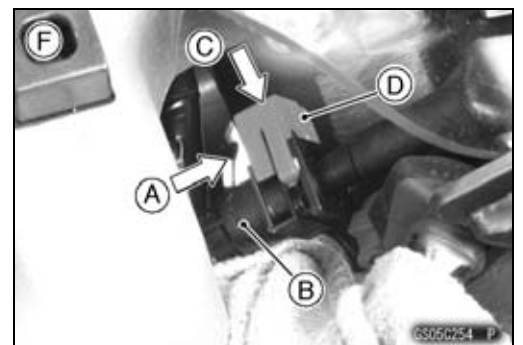
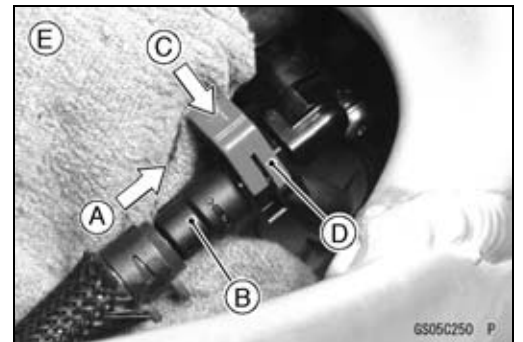
- Remove the vinyl bag on each delivery pipe.
- Check that there are no flaws, burrs, and adhesion of foreign materials on each delivery pipe [A].
- Replace the fuel hose with a new one.
- Run the fuel hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



- Apply engine oil to the fuel outlet pipe [A] lightly.



- Insert [A] the fuel hose joint [B] straight onto the delivery pipe until the hose joint clicks.
- Push [C] the joint lock [D].
Throttle Body Assy Side [E]
Air Cleaner Side [F]



2-18 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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

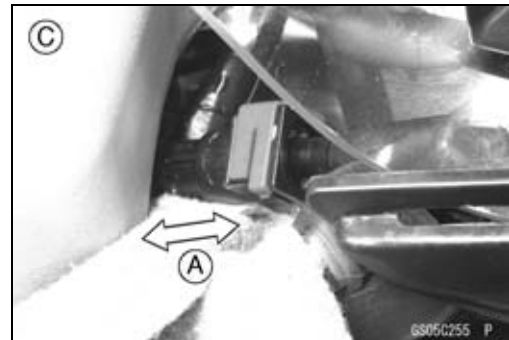
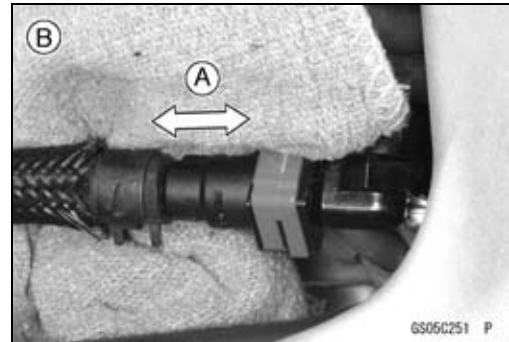
Throttle Body Assy Side [B]

Air Cleaner Side [C]

⚠ 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 fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
- Start the engine and check the fuel hose for leaks.



Idle Speed Inspection

NOTICE

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

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

⚠ WARNING

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



Periodic Maintenance Procedures

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

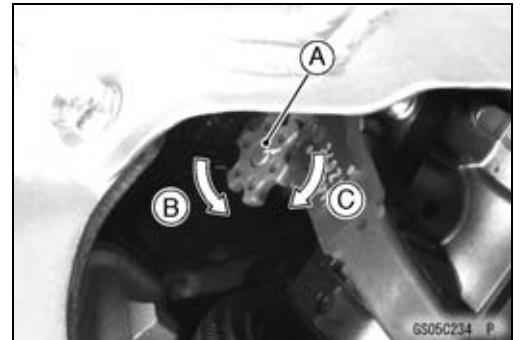
Idle Speed

Standard: 2 050 ±50 r/min (rpm)



Idle Speed Adjustment

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



Air Cleaner Element Cleaning and Inspection

NOTE

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

⚠ WARNING

Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the element in a well-ventilated area, and take care that there is no spark or flame anywhere near the working areas. Do not use gasoline or low flash-point solvents to clean the element.

2-20 PERIODIC MAINTENANCE

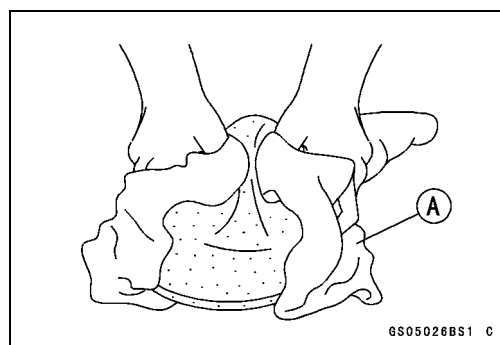
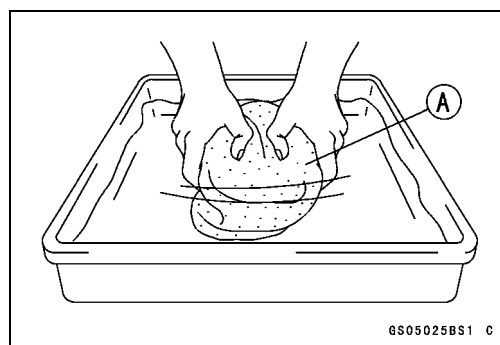
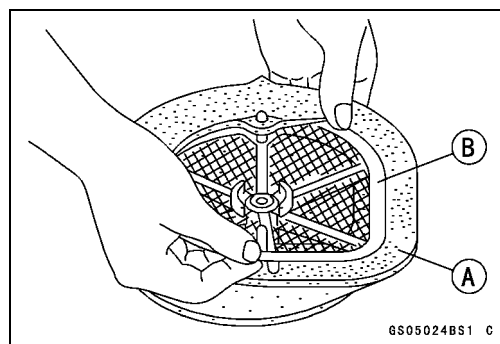
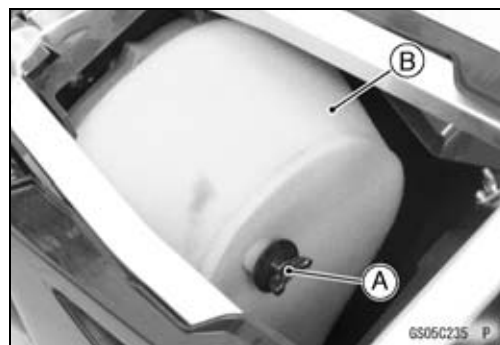
Periodic Maintenance Procedures

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

NOTICE

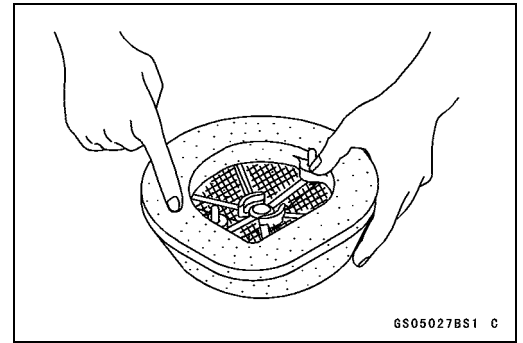
Check inside of the intake tract and throttle body assy for dirt. If dirt is present, clean the intake tract and throttle body assy thoroughly. You may also need to replace the element and seal the housing and intake tract.

- Separate the element [A] from the frame [B].
- Clean the element [A] in a bath of a high flash-point solvent using a soft bristle brush.
- Squeeze it dry in a clean towel [A]. Do not wring the element or blow it dry; the element can be damaged.
- Check all parts of the element for visible damage.
- ★ If any parts of the element are damaged, replace them.
- After cleaning, saturate the element with a high-quality foam-air-filter oil, squeeze out the excess, then wrap it in a clean towel and squeeze it as dry as possible.
- Be careful not to tear the sponge filter.
- Assemble the element.
- Remove the towel from the air cleaner duct.

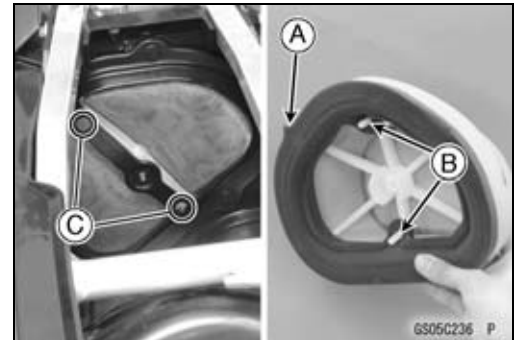


Periodic Maintenance Procedures

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



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



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

Cooling System

⚠ 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.

2-22 PERIODIC MAINTENANCE

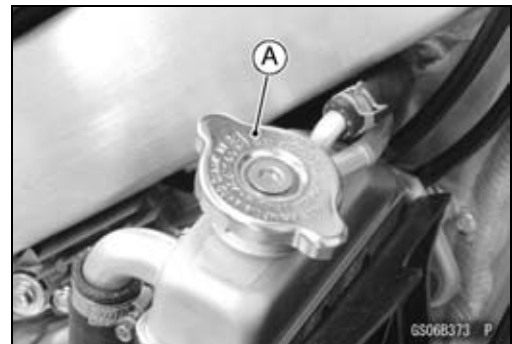
Periodic Maintenance Procedures

Coolant Level Inspection

NOTE

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

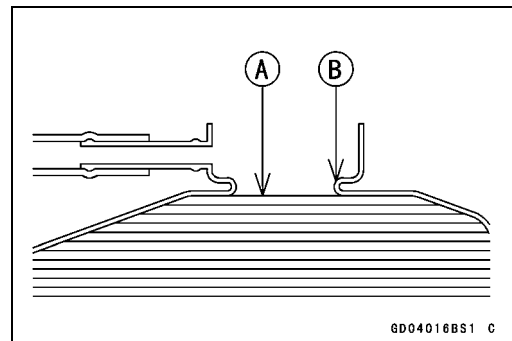
- Remove the right radiator shroud (see Radiator Shroud Removal in the Frame chapter).
- Lean the motorcycle slightly until the radiator cap is level to the ground so that the radiator cap is located uppermost in order to exhaust the air accumulated in the radiator.
- Remove the radiator cap [A].



NOTE

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

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



Recommended Coolant

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

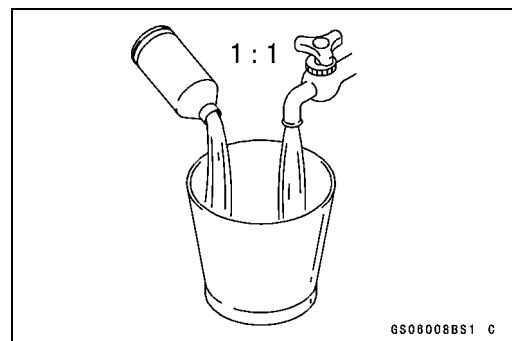
Water and Coolant Mixture Ratio

Soft Water: 50%

Coolant: 50%

Freezing Point: -35°C (-31°F)

Total Amount: 1.2 L (1.3 US qt)



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.

Periodic Maintenance Procedures

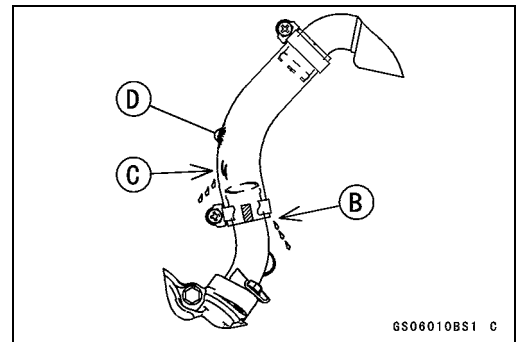
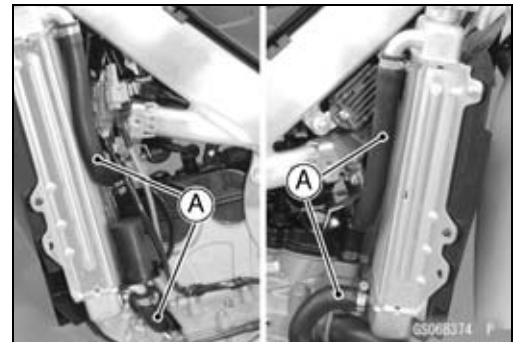
Coolant Deterioration Inspection

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

Water Hoses and Connections Inspection

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

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



Engine Top End

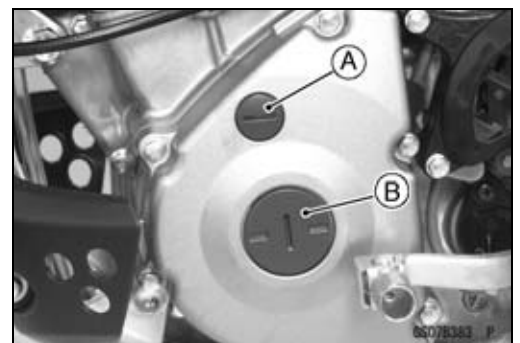
Valve Clearance Inspection

NOTE

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

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

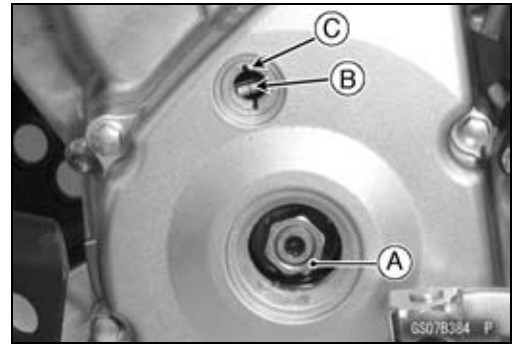
Special Tool - Filler Cap Driver: 57001-1454



2-24 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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



- Using a thickness gauge [A], measure the clearance between each cam lobe and valve lifter for all 4 valves.
- For the purpose of adjusting the valve clearances, record the measured values.



Valve Clearance

Standard:

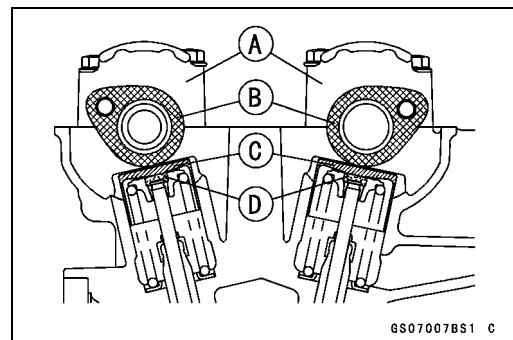
Exhaust 0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)

Intake 0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)

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

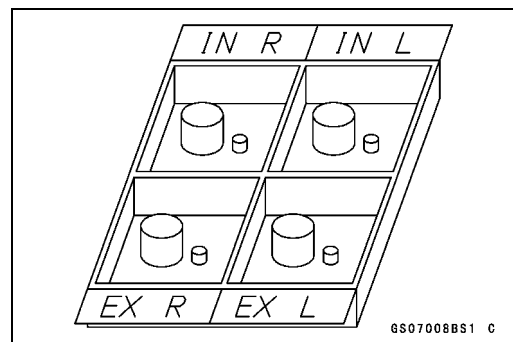
Valve Clearance Adjustment

- Remove:
 - Camshaft Cap [A] (see Camshaft Removal in the Engine Top End chapter)
 - Camshafts [B] (see Camshaft Removal in the Engine Top End chapter)
- Remove the valve lifters [C] of the applicable valve.
- Remove the shims [D].



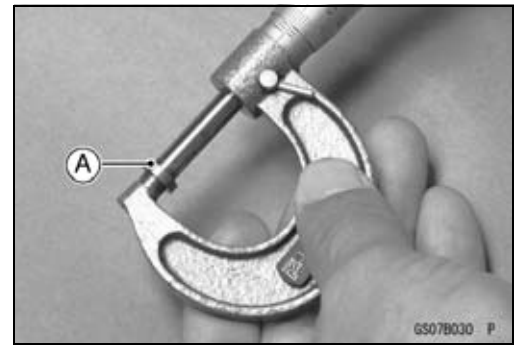
NOTE

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



Periodic Maintenance Procedures

- Clean the shim to remove any dust or oil.
- Measure the thickness of the removed shim [A].
- Select a new shim thickness calculation as follows.
 - $a + b - c = d$
 - [a] Present Shim Thickness
 - [b] Measured Valve Clearance
 - [c] Specified Valve Clearance (Mean Value)
 - Exhaust 0.195 mm
 - Intake 0.125 mm
 - [d] Replace Shim Thickness



Example (Intake):

$$2.60 + 0.31 - 0.125 = 2.785 \text{ mm}$$

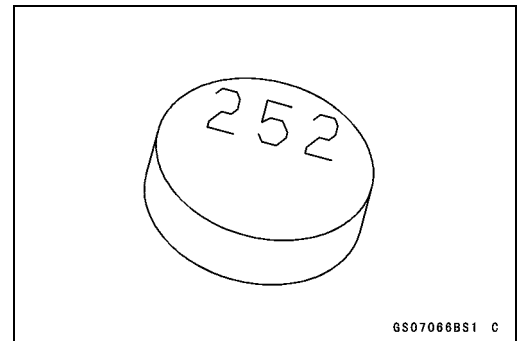
○ Exchange the shims for the 2.800 size shim.

NOTICE

Do not use the shims for another models. This could cause wear of the valve stem end and the valve stem damage.

Adjustment Shims

Thick-ness	P/No.	Mark	Thick-ness	P/No.	Mark
2.500	92180-0167	250	3.025	92180-0188	302
2.525	92180-0168	252	3.050	92180-0189	305
2.550	92180-0169	255	3.075	92180-0190	308
2.575	92180-0170	258	3.100	92180-0191	310
2.600	92180-0171	260	3.125	92180-0192	312
2.625	92180-0172	262	3.150	92180-0193	315
2.650	92180-0173	265	3.175	92180-0194	318
2.675	92180-0174	268	3.200	92180-0195	320
2.700	92180-0175	270	3.225	92180-0196	322
2.725	92180-0176	272	3.250	92180-0197	325
2.750	92180-0177	275	3.275	92180-0198	328
2.775	92180-0178	278	3.300	92180-0199	330
2.800	92180-0179	280	3.325	92180-0200	332
2.825	92180-0180	282	3.350	92180-0201	335
2.850	92180-0181	285	3.375	92180-0202	338
2.875	92180-0182	288	3.400	92180-0203	340
2.900	92180-0183	290	3.425	92180-0204	342
2.925	92180-0184	292	3.450	92180-0205	345
2.950	92180-0185	295	3.475	92180-0206	348
2.975	92180-0186	298	3.500	92180-0207	350
3.000	92180-0187	300			



NOTE

- Be sure to remeasure the clearance after selecting a shim. The clearance can be out of the specified range because of the shim tolerance.
- If there is no valve clearance, use a shim that is a few sizes smaller, and remeasure the valve clearance.

2-26 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Install the shim.
- Turn the marked side [A] to upside.
- Apply engine oil to the shim 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 [B] surface and install the lifter.
- Install:
 - Camshafts (see Camshaft Installation in the Engine Top End chapter)
 - Camshaft Cap (see Camshaft Installation in the Engine Top End chapter)
- Recheck the valve clearance and readjust if necessary.
- Install the removed parts (see appropriate chapters).

Cylinder Head Warp Inspection

- Remove the cylinder head (see Cylinder Head Removal in the Engine Top End chapter).
- Lay a straightedge [A] across the lower surface of the head at several different points, and measure warp by inserting a thickness gauge [B] between the straightedge and head.

Cylinder Head Warp

Service Limit: 0.05 mm (0.002 in.)

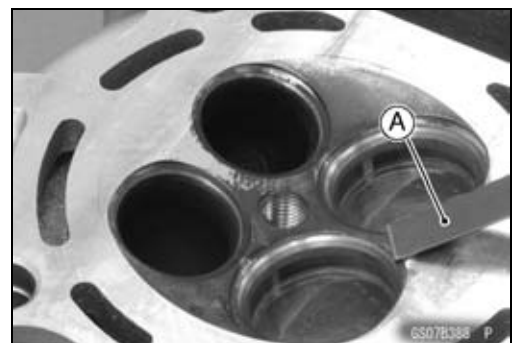
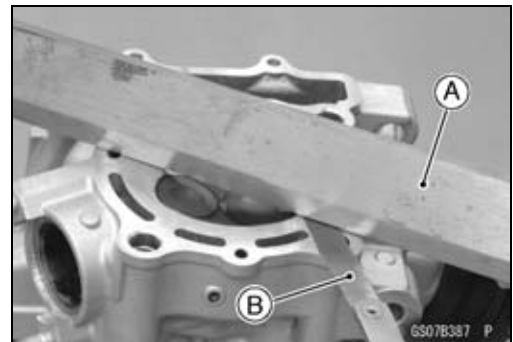
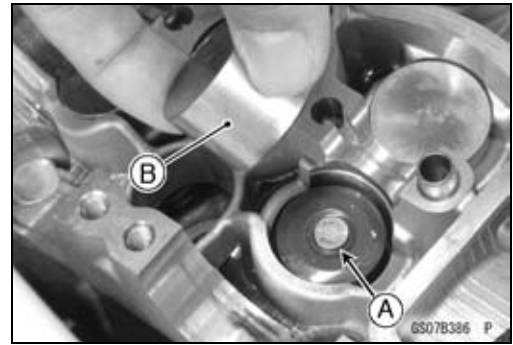
- ★ If warp exceeds the service limit, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.
- Remove the valves (see Valve Removal in the Engine Top End chapter).
- Scrape the carbon out of the combustion chamber and exhaust port with a scraper [A] or a suitable tool.
- Clean the cylinder head, using high flash-point solvent.
- Blow out any particles which may obstruct the oil passage in the cylinder head using compressed air.
- Install the valves (see Valve Installation in the Engine Top End chapter).

Cylinder Wear Inspection

NOTE

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

- Visually inspect the inside of the cylinder for scratches and abnormal wear.
- ★ If the cylinder is damaged or badly worn, replace it with a new one.



Periodic Maintenance Procedures

- Take a side-to-side and a front-to-back measurement as shown (total 6 measurements).
- The cylinder wear is uneven in different places.
 - 10 mm (0.39 in.) [A]
 - 25 mm (0.98 in.) [B]
 - 60 mm (2.36 in.) [C]

Cylinder Inside Diameter

Standard: 77.000 ~ 77.012 mm (3.0315 ~ 3.0320 in.), and less than 0.01 mm (0.0004 in.) difference between any two measurements.

Service Limit: 77.10 mm (3.035 in.), or more than 0.05 mm (0.0020 in.) difference between any two measurements.

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

Piston/Cylinder Clearance Inspection

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

If only a piston is replaced, the clearance may exceed the standard slightly. But it must be within the standard, in order to avoid piston seizure.

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

Piston/Cylinder Clearance

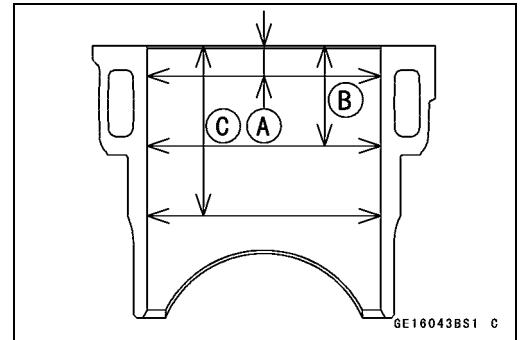
Standard: 0.041 ~ 0.068 mm (0.0016 ~ 0.0027 in.)

Piston, Piston Ring and Piston Pin Replacement

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

Exhaust System Inspection

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

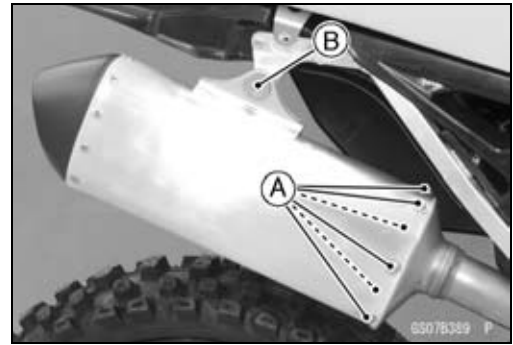


2-28 PERIODIC MAINTENANCE

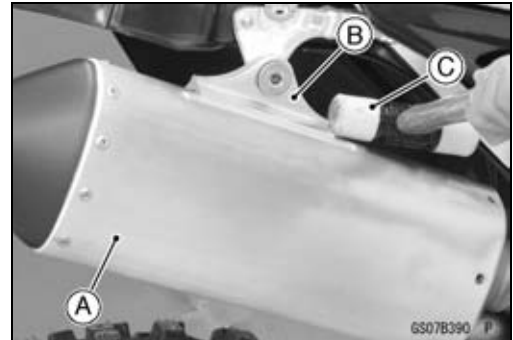
Periodic Maintenance Procedures

Silencer Wool Replacement

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



- Remove the muffler cover [A].
- Tap the bracket [B] with a plastic mallet [C] to separate the cover and pipe.
- Replace the silencer wool with a new one.
- Clean the adhered silicone sealant.



- Insert the new silencer wool [A] and muffler cover [B].
- Fit the pipe end [C] and exhaust hole of the baffle.
- Apply a non-permanent locking agent to the threads of the muffler cover bolts, and tighten them.
- Tighten the muffler mounting bolt securely.



- Using a high flash-point solvent, clean off any oil or dirt that may be on the silicone sealant coating area. Dry them with a clean cloth.
- Apply silicone sealant to the mating surface [A].
- Install the right side cover (see Side Cover Installation in the Frame chapter).



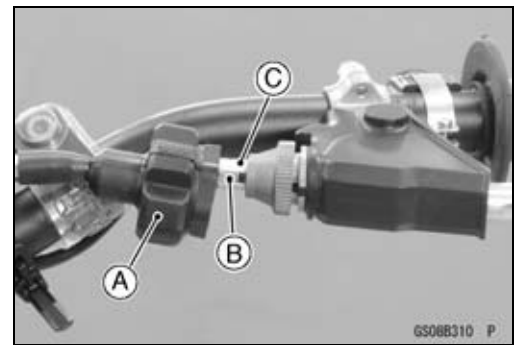
Periodic Maintenance Procedures

Clutch

Clutch Operation Inspection

Clutch Lever (Clutch Cable) Free Play Inspection

- Slide the clutch cable adjuster knob [A] out of place.
- Check that the clutch cable upper end [B] is fully seated in the adjusting bolt [C].
- Install the knob to original position.

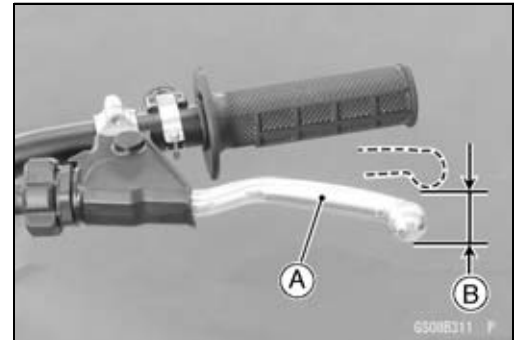


- Pull the clutch lever [A] lightly, and check the free play [B].

Clutch Lever Free Play

Standard: 8 ~ 13 mm (0.3 ~ 0.5 in.)

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



Clutch Lever (Clutch Cable) Free Play Adjustment

- Turn the clutch cable adjuster knob [A] so that the clutch lever will have **8 ~ 13 mm (0.3 ~ 0.5 in.)** of play.

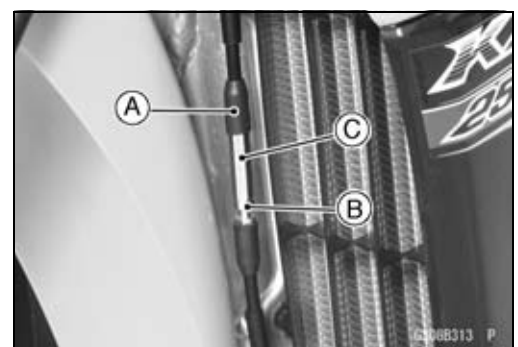
NOTICE

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



- ★ If the free play can not be adjusted with the clutch cable adjuster, use the adjusting nut.

- Slide the dust cover [A].
- Loosen the locknut [B] at the clutch cable, and turn the adjusting nut [C] so that clutch lever has **8 ~ 13 mm (0.3 ~ 0.5 in.)** of play.
- Tighten the locknut, and start the engine and check that the clutch does not slip and that it release properly.



Clutch Plates Inspection

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

2-30 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

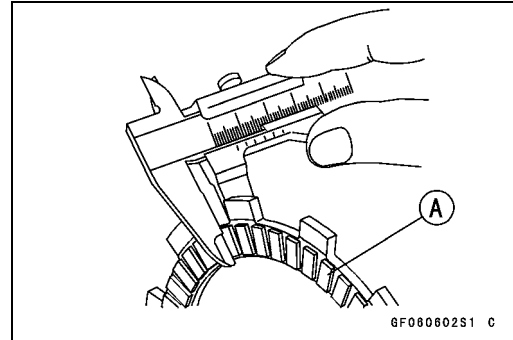
- Measure the thickness [A] of the friction and at several points with vernier calipers.

Friction Plate Thickness

Standard: 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)

Service Limit: 2.5 mm (0.10 in.)

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



- Place each friction plate or steel plate on a surface plate [A].

- Measure the gap between the surface plate and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp.

Friction and Steel Plates Warp

Standard:

Friction Plate 0.15 mm (0.0059 in.) or less

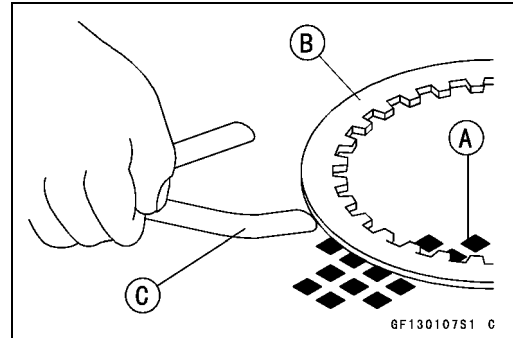
Steel Plate 0.15 mm (0.0059 in.) or less

Service Limit:

Friction Plate 0.3 mm (0.012 in.)

Steel Plate 0.3 mm (0.012 in.)

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



Engine Lubrication System

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.

Engine Oil Change

- Warm up the engine thoroughly so that the oil will pick up any sediment and drain easily. Then stop the engine.
- Place an oil pan beneath the engine.
- Remove the oil filler plug [A].

Special Tool - Filler Cap Driver: 57001-1454



Periodic Maintenance Procedures

- Remove the engine oil drain bolt [A] from the bottom of the engine, and let the oil drain completely.

NOTE

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

- Replace the drain bolt gasket with a new one.
- Install the drain bolt with the gasket.
- Tighten:

Torque - Engine Oil Drain Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)

- Pour in the specified type and amount of oil.

Recommended Engine Oil

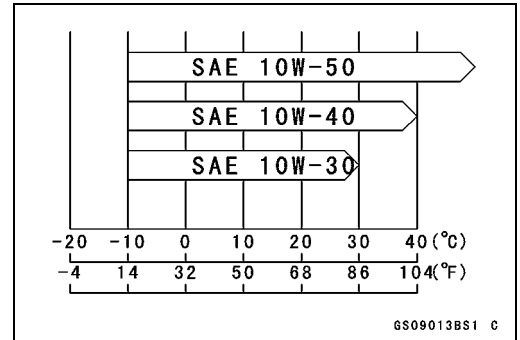
Type: Castrol "POWER1 R4 Racing" 5W-40 or API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2

Viscosity: SAE 10W-30, 10W-40, or 10W-50

Capacity: 0.75 L (0.79 US qt) (when filter is not removed)

0.80 L (0.85 US qt) (when filter is removed)

1.00 L (1.06 US qt) (when engine is completely dry)



NOTE

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

○ The oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.

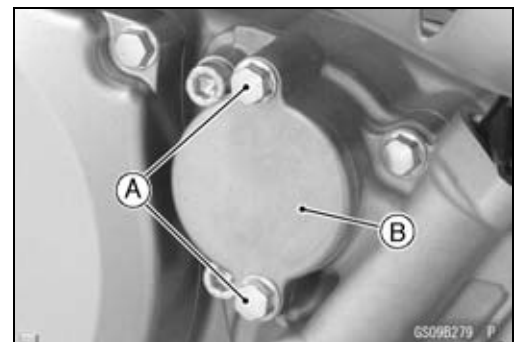
- Check the oil level (see Oil Level Inspection in the Engine Lubrication System chapter).
- Replace the oil filler plug O-ring with a new one.
- Apply grease to the O-ring.
- Tighten:

Special Tool - Filler Cap Driver: 57001-1454

Torque - Oil Filler Plug: 3.5 N·m (0.36 kgf·m, 31 in·lb)

Oil Filter Change

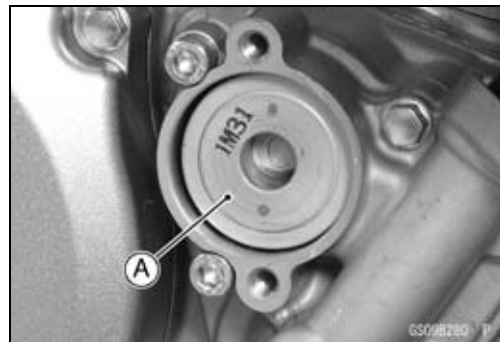
- Drain: Engine Oil (see Engine Oil Change)
- Remove: Oil Filter Cap Bolts [A]
Oil Filter Cap [B]



2-32 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

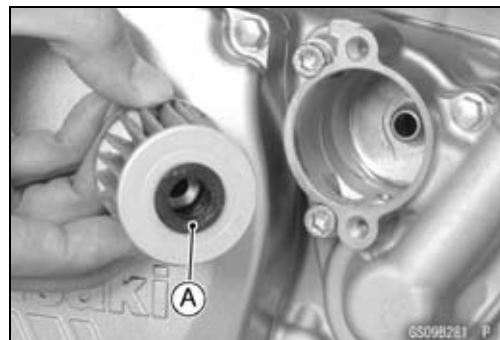
- Remove the oil filter [A].



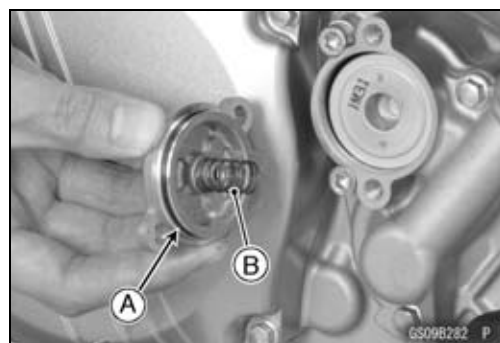
- Replace the oil filter with a new one.
- Apply grease to the grommet [A].
- Install the oil filter.
- Turn the grommet to inside.

NOTICE

Inside out installation stop oil flow, causing engine seizure.



- Replace the oil filter cap O-ring [A] with a new one.
- Apply grease to the O-ring.
- Install:
 - Spring [B]
 - Oil Filter Cap
- Tighten:
 - Torque - Oil Filter Cap Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Pour the specified engine oil (see Engine Oil Change).



Breather Hose Inspection

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

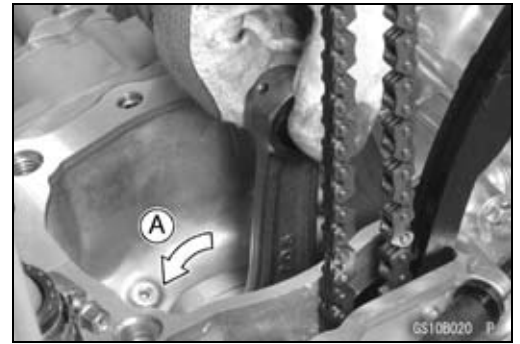


Periodic Maintenance Procedures

Crankshaft/Transmission

Crankshaft Inspection

- Remove:
 - Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
 - Cylinder (see Cylinder Removal in the Engine Top End chapter)
 - Piston (see Piston Removal in the Engine Top End chapter)
- Make sure that the crankshaft rotate [A] smoothly (in the neutral position).
- ★ If the crankshaft will not turn smoothly, check the connecting rod big end side clearance.
- ★ If the connecting rod big end side clearance is good, check the bearings (see Bearing Inspection in the Crankshaft/Transmission chapter).



Connecting Rod Big End Side Clearance

- Measure the connecting rod big end side clearance at right side of big end using a thickness gauge [A].

Connecting Rod Big End Side Clearance

Standard: 0.25 ~ 0.35 mm (0.0098 ~ 0.0138 in.)

Service Limit: 0.6 mm (0.02 in.)

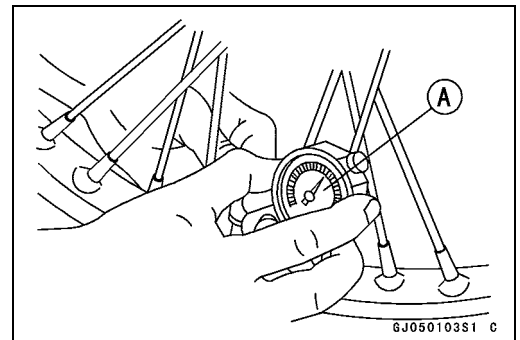
- ★ If the clearance exceeds the service limit, replace the crankshaft assembly or reassemble the crankshaft.
- Make sure that the crankshaft rotates smoothly after assembling the engine.



Wheels/Tires

Air Pressure Inspection/Adjustment

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



Track Condition	Tire Pressure
When the track is wet, muddy, sandy or slippery, reduce the tire pressure to increase the tire tread surface on the ground.	80 kPa (0.8 kgf/cm ² , 12 psi) ↑
When the track is pebbly or hard, increase the tire pressure to prevent damage or punctures, through the tires will skid more easily.	↓ 100 kPa (1.0 kgf/cm ² , 14 psi)

2-34 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Tires Inspection

- Remove any imbedded stones or other foreign particles from the tread.
- ★ Repair or replace with a new one if necessary.
- Visually inspect the tire for cracks and cuts.
- ★ Replace the tire, if any damage are noticed.
- Swelling or high spots indicate internal damage, requiring tire replacement.

⚠ 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

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

Standard Tire

Front:

Size	80/100-21 51M
Make	DUNLOP
Type	MX51F, Tube

Rear:

Size	100/90-19 57M
Make	DUNLOP
Type	MX51, Tube

Spoke Tightness Inspection

- Check that all the spokes are tightened evenly.
 - ★ If spoke tightness is uneven or loose, tighten the spoke nipples evenly.
- Torque - Spoke Nipples: 2.2 N·m (0.22 kgf·m, 19 in·lb)**
- Check the rim runout (see Rim Runout Inspection).

⚠ WARNING

A missing spoke places an additional load on the other spokes, which will eventually cause other spokes to break, creating the potential for an accident resulting in serious injury or death. Immediately replace any broken spoke(s).

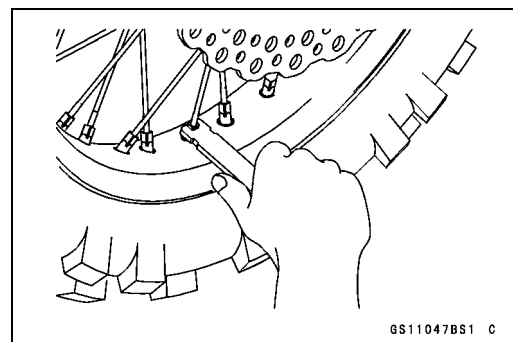
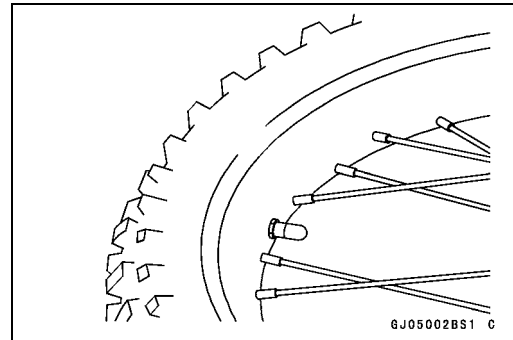
Rim Runout Inspection

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

Special Tools - Jack: 57001-1238

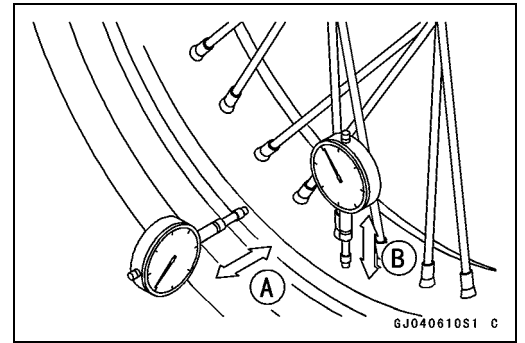
Jack Attachment: 57001-1608

- Inspect the rim for cracks, dents, bending, or warping.
- ★ If there is any damage to the rim, it must be replaced.



Periodic Maintenance Procedures

- Set a dial gauge against the side of the rim, and rotate the rim to measure the axial runout [A].
- The difference between the highest and lowest dial readings is the amount of runout.
- Set a dial gauge against the outer circumference of the rim, and rotate the rim to measure radial runout [B].



Rim Runout (with tire installed)

Standard:

Axial	TIR 1.0 mm (0.04 in.) or less
Radial	TIR 1.0 mm (0.04 in.) or less

Service Limit:

Axial	TIR 2.0 mm (0.08 in.)
Radial	TIR 2.0 mm (0.08 in.)

- ★ If rim runout exceeds the service limit, check the wheel bearings first.
- ★ If the problem is not due to the bearings, loosen some spokes and tighten others within the standard torque.

Wheel Bearing Inspection

- Raise the front/rear wheel off the ground using the jack.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Rotate [A] the wheel lightly, and check for roughness, binding or noise.
- ★ If any damage is found, replace the hub bearing.



- Turn the handlebars until the handlebars does not move to either side (front wheel).
- The wheel edge is moved [A] to one direction gripping the edge of the wheel by both hands and the play of the wheel bearing is checked.
- ★ If the play is found, replace the bearing.

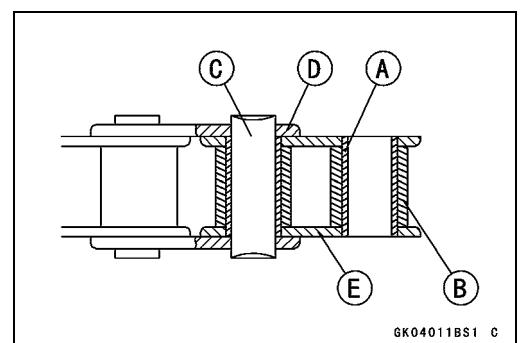


Final Drive

Drive Chain Wear Inspection

- Rotate the rear wheel to inspect the drive chain for damaged rollers, and loose pins and links.
- ★ If there is any irregularity, replace the drive chain.
- ★ Lubricate the drive chain if it appears dry.

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



2-36 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

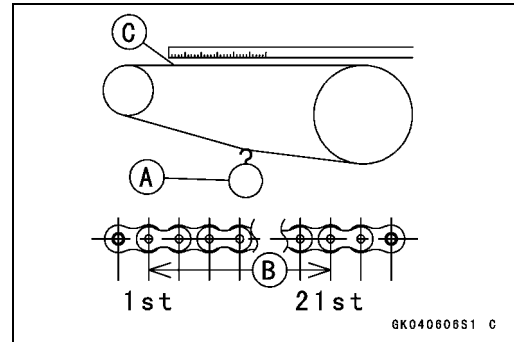
- Stretch the chain taut by hanging a 10 kg (22 lb) weight [A] on the chain.
- Measure the length of 20 links [B] on the straight part [C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.

Chain 20-link Length

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

Service Limit: 323 mm (12.7 in.)

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



⚠ WARNING

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 520DMA4

Link: 114 links

Drive Chain Slack Inspection

- Using the jack, raise the rear wheel until the rear shock absorber stretched fully.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Check the wheel alignment (see Wheel Alignment Inspection in the Final Drive chapter), and adjust it if necessary (see Wheel Alignment Adjustment in the Final Drive chapter).

NOTE

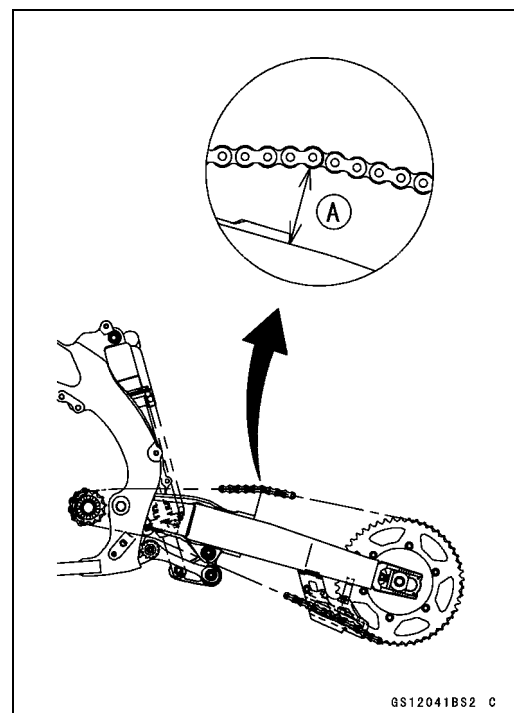
○ Clean the drive chain if it is dirty, and lubricate it if it appears dry.

- Rotate the rear wheel to find the position where the chain is tightest (because it wears unevenly).
- Measure the space (chain slack) [A] between the bottom of the chain and the rear of the chain slipper.

Chain Slack

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

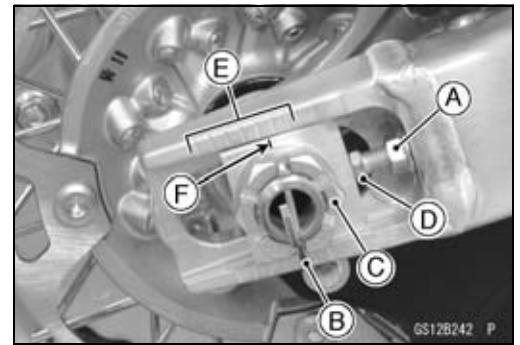
- ★ If the drive chain slack exceeds the standard, adjust it.



Periodic Maintenance Procedures

Drive Chain Slack Adjustment

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



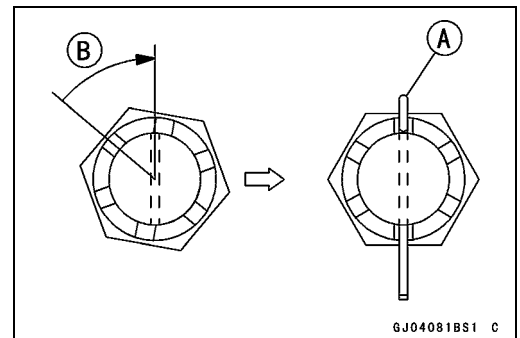
⚠ WARNING

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)**
- Rotate the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin [A].

NOTE

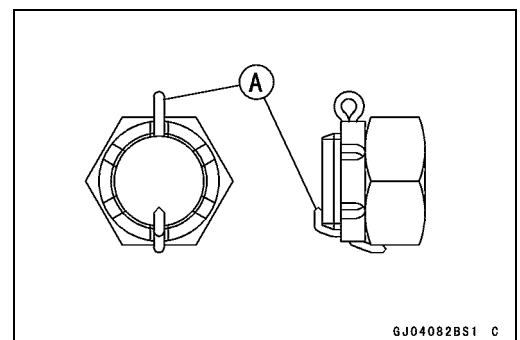
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30 degrees.
- Loosen once and tighten again when the slot goes past the nearest hole.



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

⚠ 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.



- Check the rear brake effectiveness.

NOTE

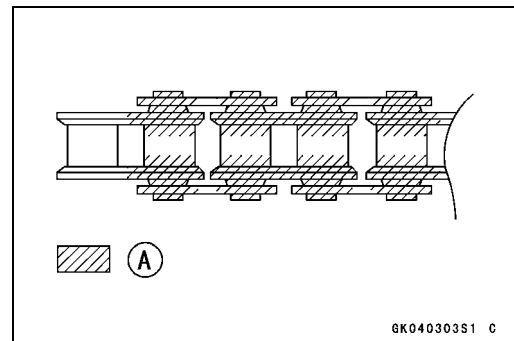
- In wet and muddy conditions, mud sticks to the chain and sprockets resulting in an overly tight chain, and the chain may break. To prevent this, adjust the chain to 62 ~ 68 mm (2.4 ~ 2.7 in.) of slack whenever necessary.

2-38 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Drive Chain Lubrication

- The chain should be lubricated with a lubricant which will both prevent the exterior from rusting and also absorb shock and reduce friction in the interior of the chain.
- ★ If the chain is especially dirty, it should be washed in diesel oil or kerosene, and afterward soaked in a heavy oil. Shake the chain while it is in the oil so that oil will penetrate into the inside of each roller.
- An effective, good quality lubricant specially formulated for chains is best for regular chain lubrication.
- If a special lubricant is not available, a heavy oil such as SAE90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.
- Apply oil to the sides of the rollers so that oil will penetrate into the rollers and bushings.
- Wipe off any excess oil.
Oil Applied Area [A]

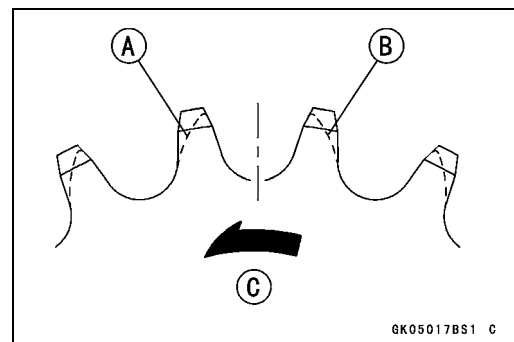


Sprocket Wear Inspection

- Visually inspect the front and rear sprocket teeth for wear and damage.
- ★ If they are worn as illustrated or damaged, replace the sprocket, and inspect the drive chain wear.
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 (Runout) Inspection

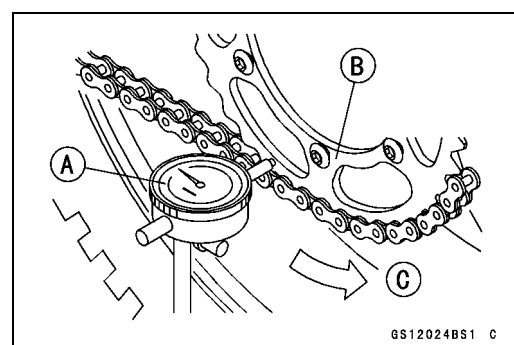
- Using the jack, raise the rear wheel off the ground.
Special Tools - Jack: 57001-1238
Jack Attachment: 57001-1608
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown.
- Rotate [C] the rear wheel slowly to measure the sprocket warp (runout).
- The difference between the highest and lowest dial gauge readings is the amount of warp (runout).

Rear Sprocket Warp (Runout)

Standard: TIR 0.4 mm (0.016 in.) or less

Service Limit: TIR 0.5 mm (0.020 in.)

- ★ If the runout exceeds the service limit, replace the rear sprocket.



Periodic Maintenance Procedures

Brakes

Brake Lever and Pedal Adjustment

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

⚠ WARNING

An improperly adjusted brake could drag and cause the brake to overheat, damaging the brake assembly and possibly locking the rear wheel, resulting in loss of control. Always maintain the proper brake adjustment.

NOTE

○ Usually it is not necessary to adjust the pedal position, but always adjust it when the master cylinder is disassembled or pedal position is incorrect.

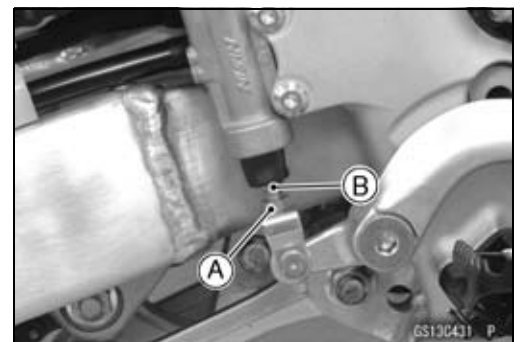
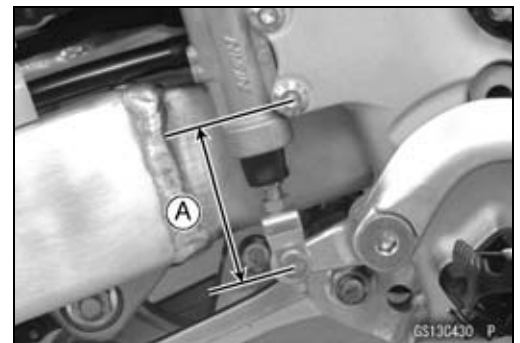
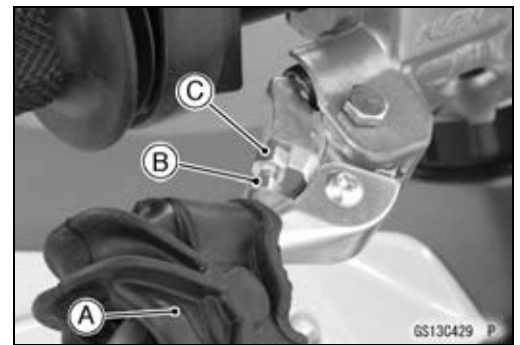
- Measure the length [A].

Rear Master Cylinder Push Rod Length
Standard: 68.5 ±1 mm (2.70 ±0.04 in.)

- ★ If it is not within the standard, adjust the push rod in the master cylinder as follows.

- Loosen the push rod locknut [A].
- Turn the adjusting bolt [B] to obtain the specified length.
- Tighten the locknut.

Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 13 ft·lb)



2-40 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Brake Fluid Level Inspection

- Check the brake fluid level in the front or rear brake reservoir [A] and the front or rear reservoir must be kept above the lower level line [B].

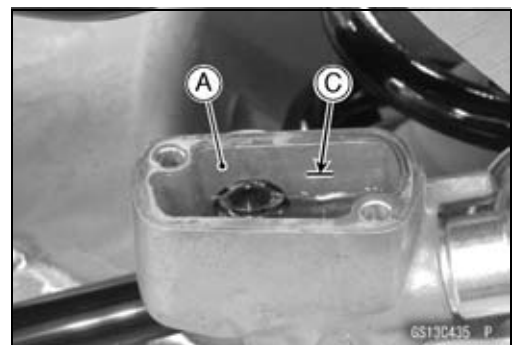
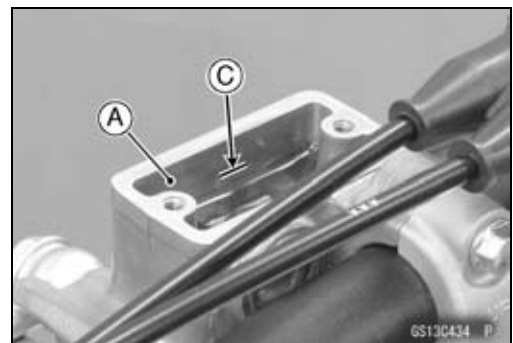
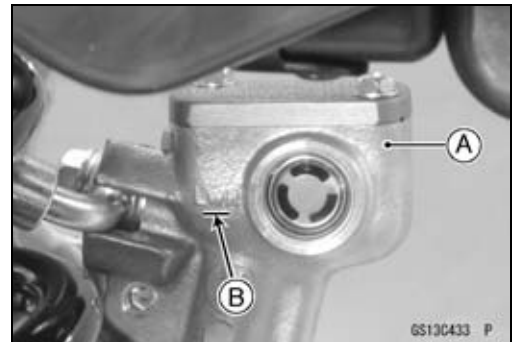
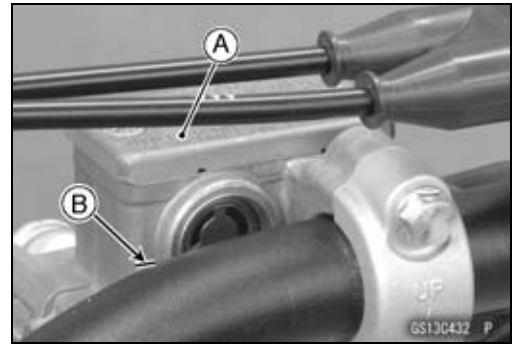
NOTE

○ Hold the reservoir horizontal when checking brake fluid level.

- ★ If the fluid level in front or rear reservoir is lower than the lower level line, fill the reservoir to the upper level line.
- Inside the reservoir is stopped end showing 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.



Periodic Maintenance Procedures

Brake Fluid Change** WARNING**

When working with the disc brake, observe the precautions listed below.

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the AIR MUST BE BLED FROM THE BRAKE LINE.

Recommended Disc Brake Fluid

Type:

Front and Rear

DOT3 or DOT4

2-42 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

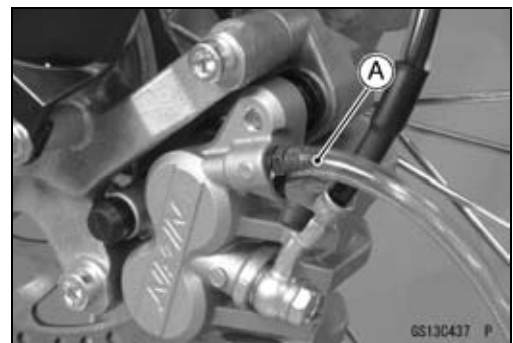
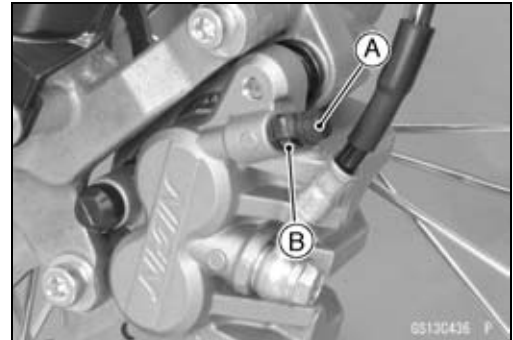
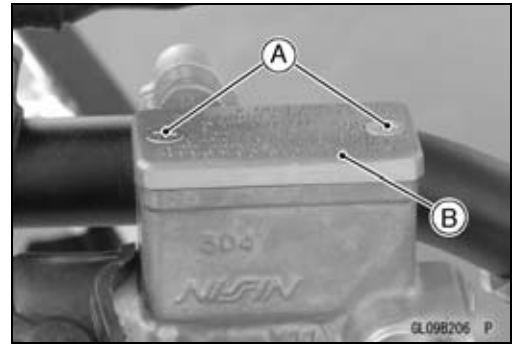
NOTE

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

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

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

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



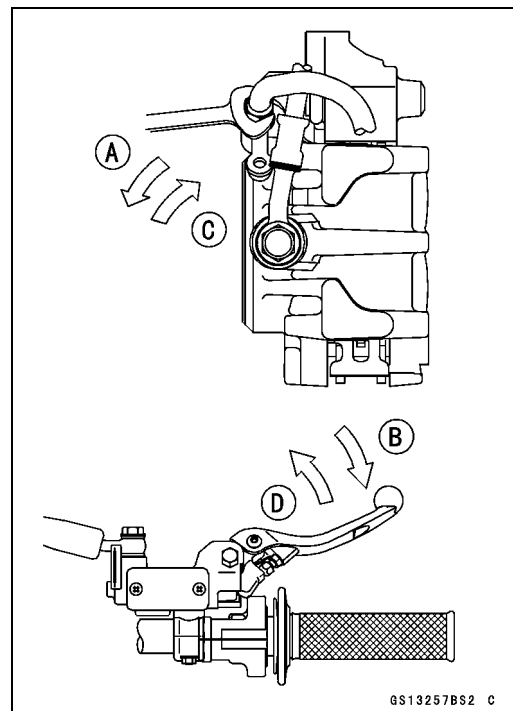
- Change the brake fluid as follows:
 - Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
 - 1. Open the bleed valve [A].
 - 2. Apply the brake and hold it [B].
 - 3. Close the bleed valve [C].
 - 4. Release the brake [D].

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.

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.



Periodic Maintenance Procedures

- Remove the clear plastic hose.
- Install the diaphragm and reservoir cap.
- Tighten:
 - Torque - Front Brake Reservoir Cap Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)**
- Tighten the bleed valve, and install the rubber cap.
 - Torque - Caliper Bleed Valve: 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 (see Brake Line Bleeding in the Brakes chapter).

Brake Pad Wear Inspection

- Check the lining thickness and condition of the brake pads in each caliper.

NOTE

○ It is able to check with the pads installed.

- ★ If either pad is damaged, replace both pads in the caliper as a set.

Brake Pad Lining Thickness

Standard:

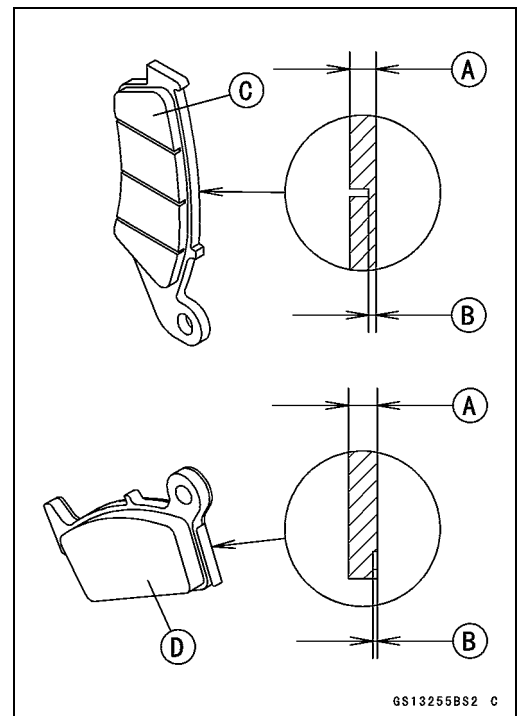
Front	4.0 mm (0.16 in.)
Rear	6.4 mm (0.25 in.)

Service Limit:

Front	1 mm (0.04 in.)
Rear	1 mm (0.04 in.)

- ★ If the lining thickness [A] of either pad is less than the service limit [B], replace both pads in the caliper as a set.

Front Pad [C]
Rear Pad [D]



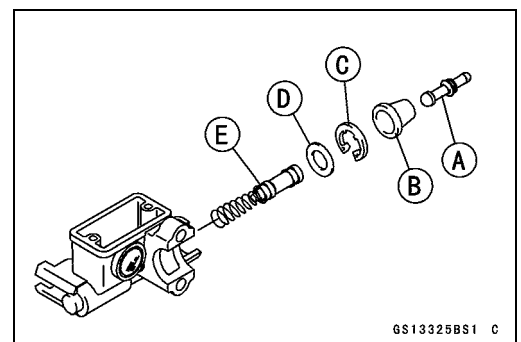
GS13255BS2 C

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

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

Special Tool - Inside Circlip Pliers: 57001-143

- Remove the washer [D].
- Remove the piston assy [E] (include primary and secondary cups).



GS13325BS1 C

2-44 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Rear Master Cylinder Disassembly

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

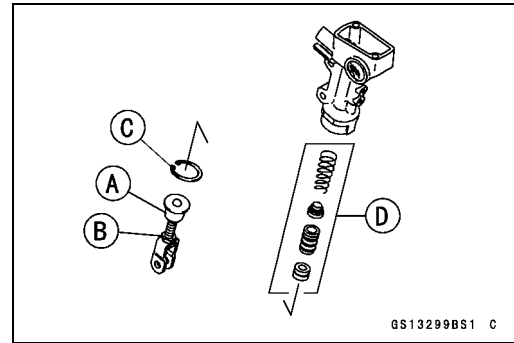
NOTE

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

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

Special Tool - Inside Circlip Pliers: 57001-143

- Pull out the push rod.
- Remove the piston assy [D] (include primary and secondary cups).



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

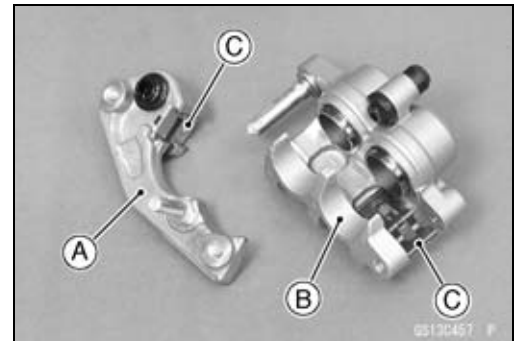
- Apply brake fluid to the removed parts and to the inner wall of the cylinder.
- Take care not to scratch the piston assy and the inner wall of the cylinder.
- Apply silicone grease (ex. PBC grease) to the following parts:
 - Brake Lever Pivot Bolt (Front)
 - Brake Lever Contact (Front)
 - Push Rod Contact
 - Dust Covers
- Tighten:
 - Torque - Brake Lever Pivot Bolt: 5.9 N-m (0.60 kgf-m, 52 in-lb)
 - Brake Lever Pivot Bolt Locknut: 5.9 N-m (0.60 kgf-m, 52 in-lb)

Periodic Maintenance Procedures

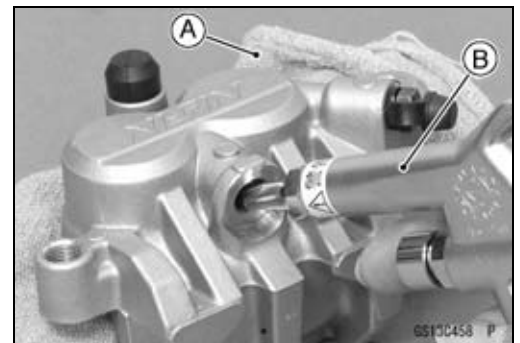
Caliper Rubber Parts Replacement

Front Caliper Disassembly

- Remove:
 - Front Caliper (see Caliper Removal in the Brakes chapter)
 - Brake Pads (see Brake Pad Removal in the Brakes chapter)
- Separate the caliper holder [A] from the caliper [B].
- Remove the anti-rattle springs [C].



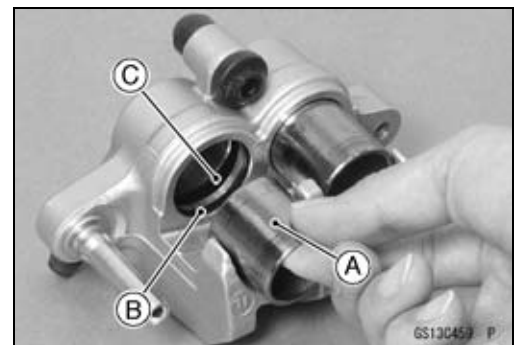
- Using compressed air, remove the pistons. One way to remove the pistons is as follows.
 - Cover the caliper opening with a clean heavy cloth [A].
 - Remove the pistons by lightly applying compressed air [B] to the hose joint opening.



⚠ 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 [A] by hand.
- Remove the dust seal [B] and fluid seal [C] on each cylinder.



NOTE

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

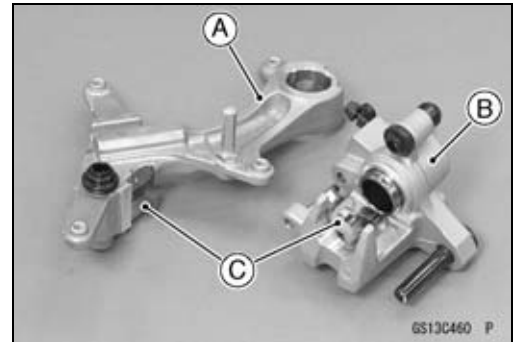
Rear Caliper Disassembly

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

2-46 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

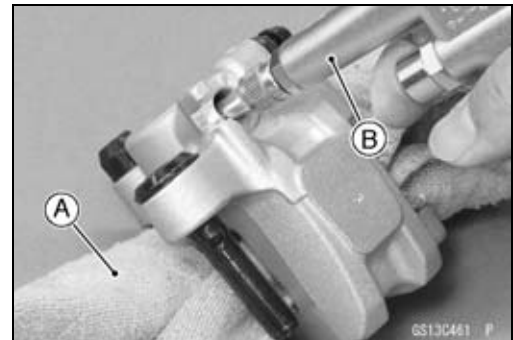
- Separate the caliper holder [A] from the caliper [B].
- Remove the anti-rattle springs [C].



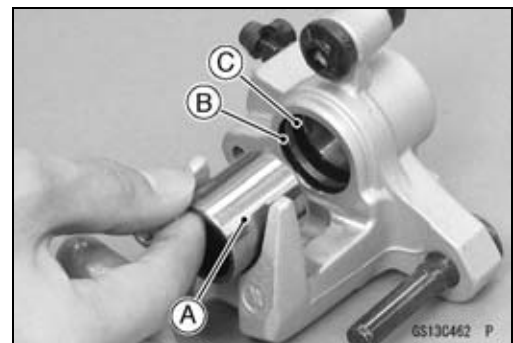
- Using compressed air, remove the piston.
- Cover the caliper opening with a clean heavy cloth [A].
- Remove the piston by lightly applying compressed air [B] to the hose joint opening.

⚠ 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 piston [A] by hand.
- Remove the dust seal [B] and fluid seal [C].



Caliper Assembly

- Clean the caliper parts except for the pads.

NOTICE

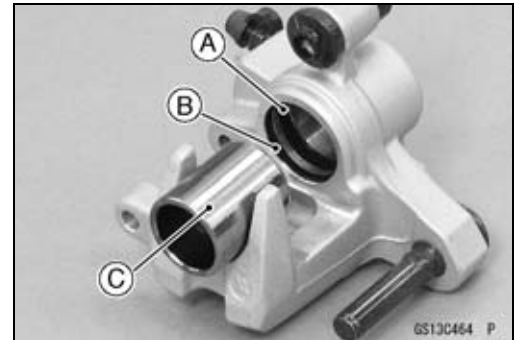
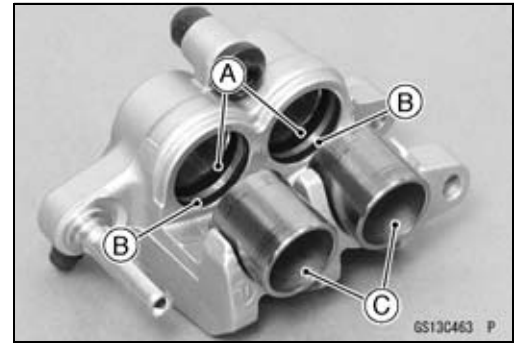
For cleaning of the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.

- ★ If you removed the bleed valve, install the bleed valve and rubber cap.

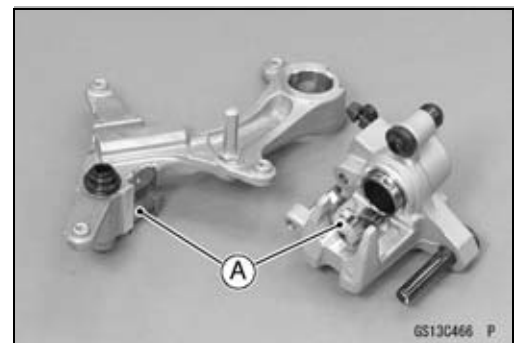
Torque - Caliper Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)

Periodic Maintenance Procedures

- Replace the fluid seal(s) [A] with new ones.
- Apply silicone grease to the fluid seal(s), and install them into the cylinder(s) by hand.
- Replace the dust seal(s) [B] with new ones.
- Apply brake fluid to the dust seal(s), and install them into the cylinder(s) by hand.
- Apply brake fluid to the outside of the piston(s) [C], and push them into each cylinder by hand.



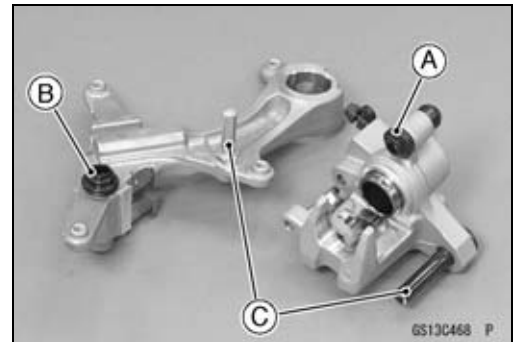
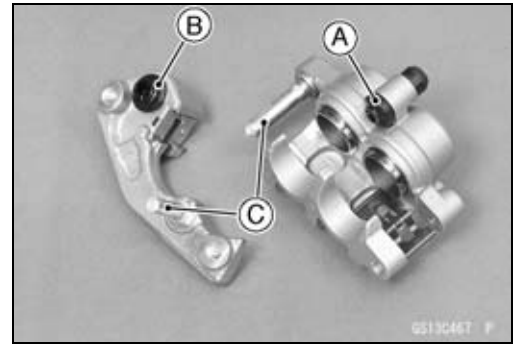
- Install the anti-rattle springs [A].



2-48 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

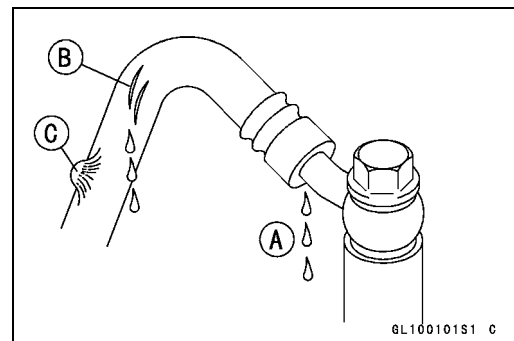
- Replace the friction boot [A] and dust boot [B] if they are damaged.
- Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts [C] and holder holes (PBC is a special high-temperature, water-resistance grease).
- Assemble the caliper and caliper holder.



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

Brake Hoses and Connections Inspection

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



Brake Hose Replacement

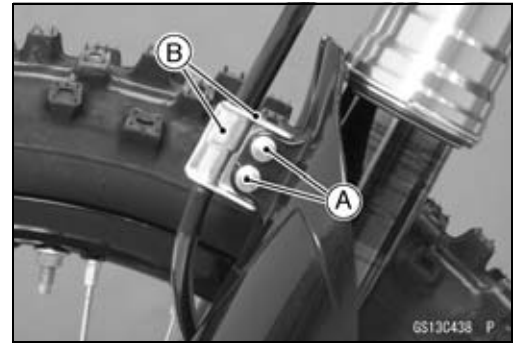
NOTICE

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

Periodic Maintenance Procedures

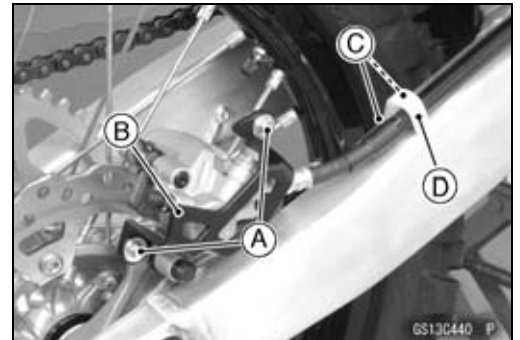
Front Brake Hose

- Remove:
 - Brake Hose Clamp Bolts [A]
 - Brake Hose Clamps [B]

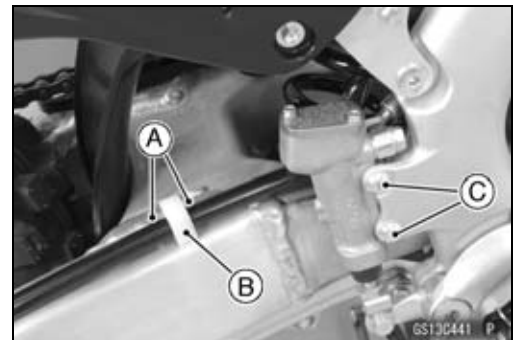


Rear Brake Hose

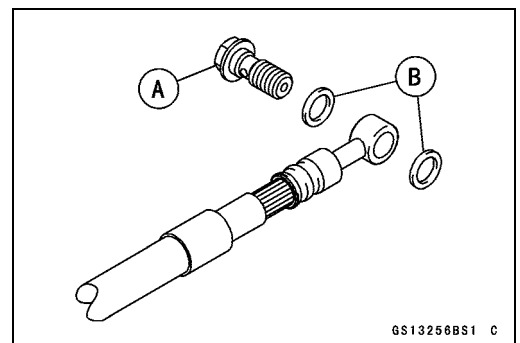
- Remove:
 - Bolts [A]
 - Caliper Guard [B]
 - Screws [C]
 - Brake Hose Clamp [D]



- Remove:
 - Screws [A]
 - Brake Hose Clamp [B]
 - Rear Master Cylinder Mounting Bolts [C]



- Remove the front/rear brake hose banjo bolts [A] and washers [B].
- Replace the washers with new ones.
- When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
- When removing the brake hose, temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.



- When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Tighten:
 - Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the removed parts (see appropriate chapters).
- Bleed the brake line after installing the brake hose (see Brake Line Bleeding in the Brakes chapter).

2-50 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

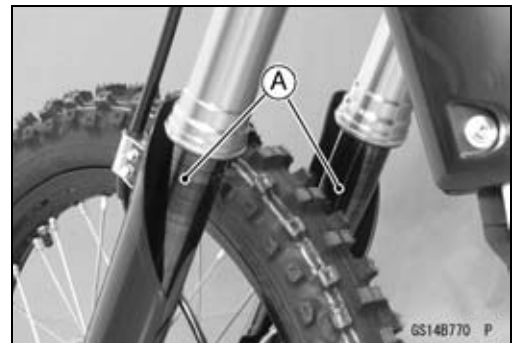
Suspension

Front Fork Inspection

- Visually inspect the front fork for oil leakage, scoring or scratches on the outer surface of the inner tubes [A].
- Holding the brake lever, pump the front fork down and up manually to check for smooth operation.
- ★ If the fork shows damages or oil leak, replace the damaged parts.
- ★ If the fork rattles, inspect the oil level or tightening torque.

NOTICE

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



Front Fork Oil Change

- Remove the number plate (see Number Plate Removal in the Frame chapter).
- Loosen the front fork clamp bolts (upper) [A].
- Loosen the cylinder unit (left front fork) [B]/spring adjuster unit (right front fork) using the top plug wrench [C].

Special Tool - Top Plug Wrench, 50 mm: 57001-1645

- Remove the front forks (see Front Fork Removal in the Suspension chapter).
- Thoroughly clean the fork before disassembly.



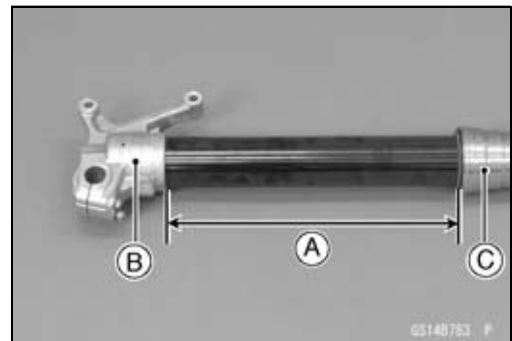
NOTICE

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

- Measure the length [A] between the top surface of the axle holder [B] and under surface of the outer tube [C].
- Record the length before disassembling the fork.

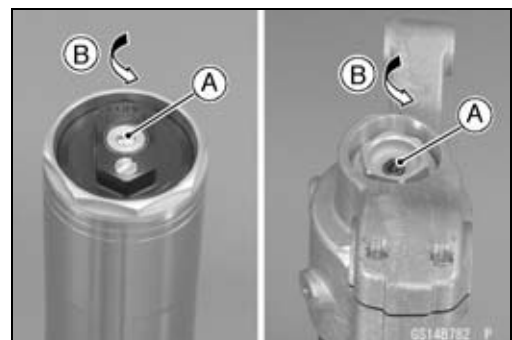
Length

Standard: 314 ±2 mm (12.4 ±0.08 in.)



Left Front Fork

- Record the position of each damping adjuster [A] and then turn [B] them to the softest position.

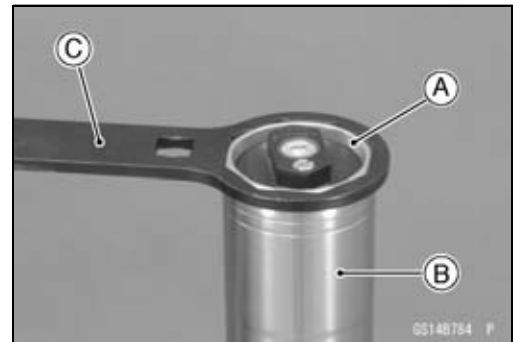


Periodic Maintenance Procedures

- Unscrew the left front fork cylinder unit [A] from the outer tube [B].

Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645

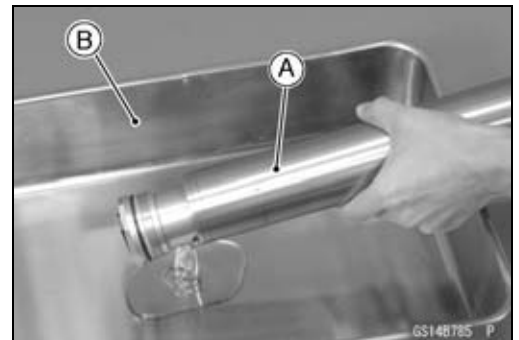
- Slowly slide down the outer tube.



- Hold the left front fork tube [A] upside down over a clean container [B] and drain the oil.

NOTE

○ Pump the outer tube up and down to discharge the fork oil.



- Temporarily install the left front fork cylinder unit [A] to the outer tube [B].

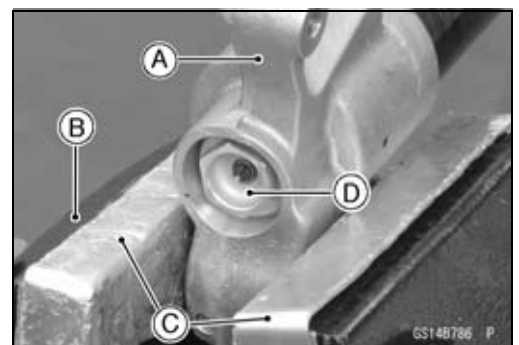
Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645



- Hold the axle holder part [A] with a vise [B].
- Protect the axle holder part with a soft jaws [C] or heavy cloth when using a vise.

⚠ WARNING

If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.



- Unscrew the adjuster assembly [D] completely.

NOTICE

When removing the adjuster assembly, do not force to unscrew it at once using an impact wrench.

2-52 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Compress the outer tube by hands and remove the adjuster assembly from the axle holder part so that the locknut appear about 20 ~ 30 mm (0.79 ~ 1.2 in.).
- Hold the locknut [A] with a wrench [B] and remove the left front fork adjuster assembly [C].

NOTE

○ Do not remove the locknut from the piston rod. The piston rod may slide into the inner tube.

NOTICE

When loosening the locknut, the threads of the axle holder do not touch the push rod. If the push rod is scratched, it is possible to the damage in the cylinder unit.

- Remove the push rod [A].

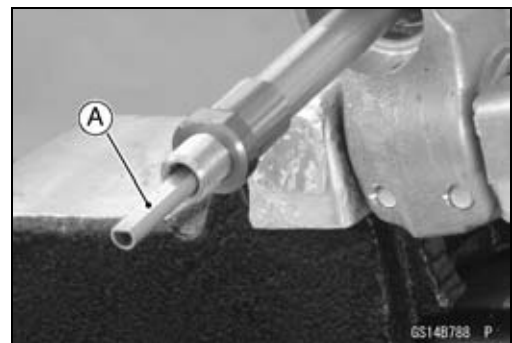
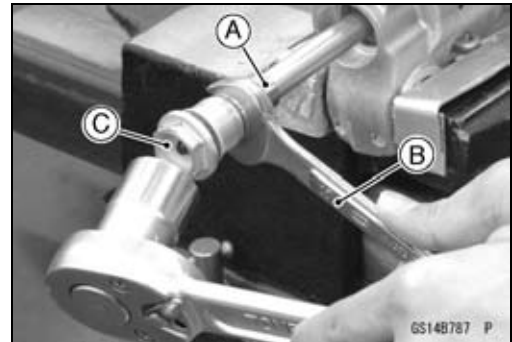
NOTICE

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

- Remove the fork leg from the vise.
- Unscrew the left front fork cylinder unit [A] from the outer tube [B].

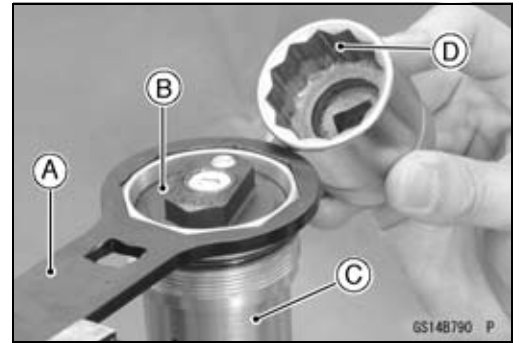
Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645

- Remove the left front fork cylinder unit [A] from the outer tube [B].

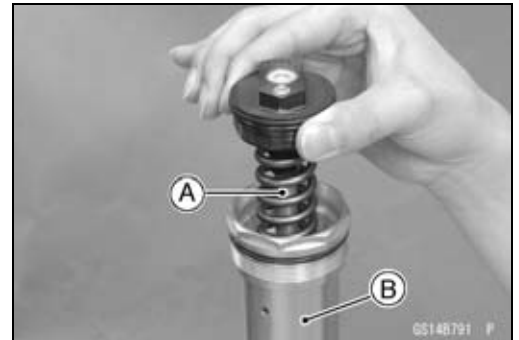


Periodic Maintenance Procedures

- Holding the top plug wrench [A] with a vise, unscrew the left front fork base valve assembly [B] on the fork cylinder unit [C].
 - Use a box wrench [D].
- Special Tool - Top Plug Wrench, 50 mm: 57001-1645**



- Pull out the left front fork base valve assembly [A] from the fork cylinder unit [B].
- Slowly compress the piston rod until it stops so that the left front fork base valve assembly can be removed easily.



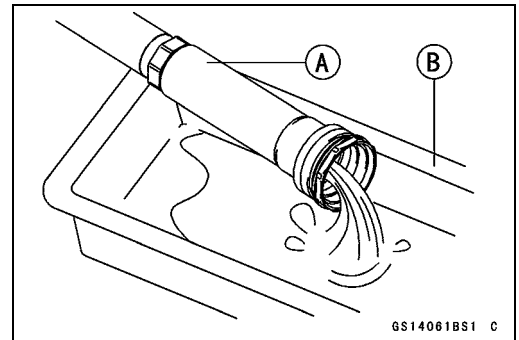
NOTICE

Be careful not to damage the bushing of the left front fork base valve assembly. Disassembling the left front fork base valve assembly can lead to trouble. Do not disassemble the left front fork base valve assembly.

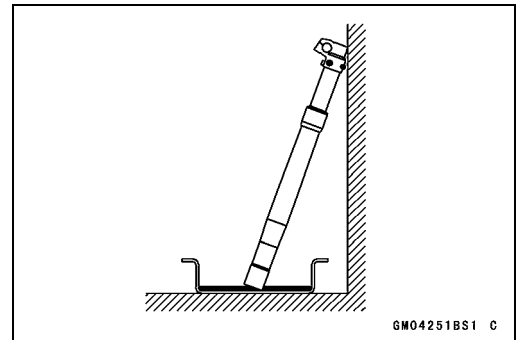
- Hold the left front fork cylinder unit [A] upside down over a clean container [B] and drain the oil.

NOTE

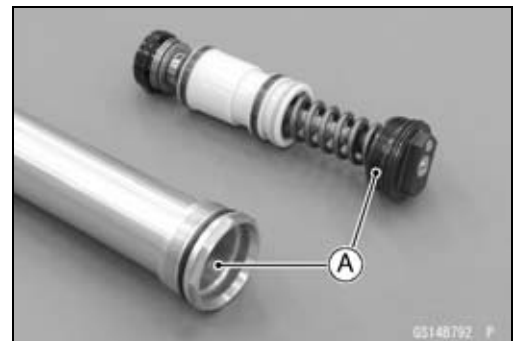
- Pump the piston rod up and down to discharge the fork oil.



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



- Clean the threads [A] of the left front fork cylinder unit and left front fork base valve assembly.



2-54 PERIODIC MAINTENANCE

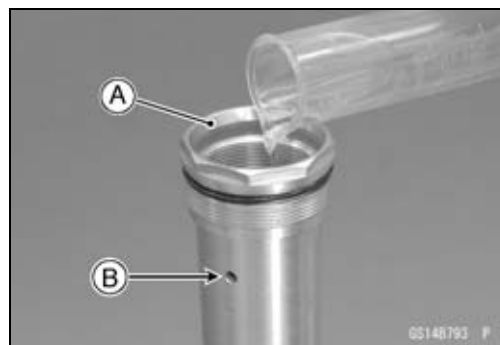
Periodic Maintenance Procedures

- Hold the left front fork cylinder unit [A] upright with the piston rod fully stretched.
- Plug the oil hole [B] on the left front fork cylinder unit with finger.
- Pour the specified oil.

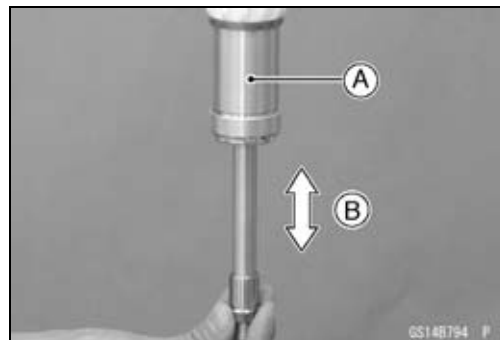
Suspension Oil - SHOWA SS-19 (1 L) : 44091-0009

Cylinder Unit Oil Capacity

Standard: 330 mL (11.16 US oz.)



- Apply specified fork oil to the sliding surface of the piston rod.
- Purge the air from the fork cylinder [A] by gently moving [B] the piston rod up and down several times.



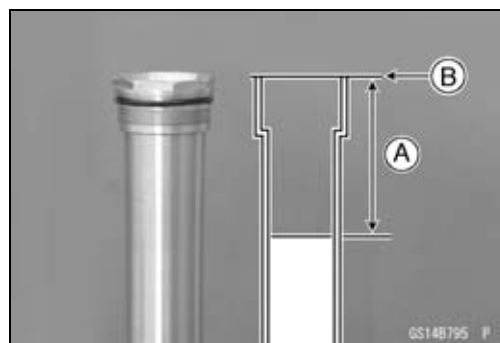
- With the piston rod fully stretched, check the oil level in the left front fork cylinder unit.
- Measure the oil level [A] from the top surface [B] in the left front fork cylinder unit using a suitable gauge.

Fork Cylinder Unit Oil Level

Standard: 115 ~ 123 mm (4.53 ~ 4.84 in.)

NOTE

○ Fork oil level may also be measured using the fork oil level gauge.

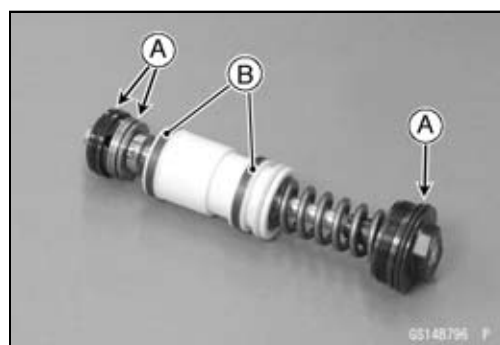


Special Tool - Fork Oil Level Gauge: 57001-1290

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

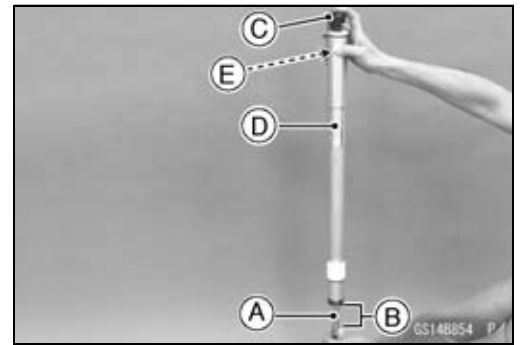
NOTICE

Do not damage the bushings when assembling the left front fork base valve.



Periodic Maintenance Procedures

- With the piston rod [A] appear about 20 mm (0.79 in.) [B] from fully compressed, gently install the left front fork base valve assembly [C] slowly to the left front fork cylinder unit [D].



NOTE

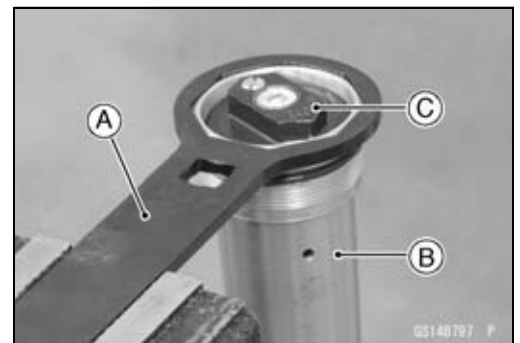
- Plug the oil hole [E] on the left front fork cylinder unit with finger.
- While pulling the piston rod, install the base valve assembly slowly and pushing down it fully.
- If there is difficulty in assembling the base valve, it may be because the oil level is too high. Check the oil level in the left front fork cylinder unit.

- Hold the top plug wrench [A] with a vise.
- Hold the left front fork cylinder unit [B] with the top plug wrench.

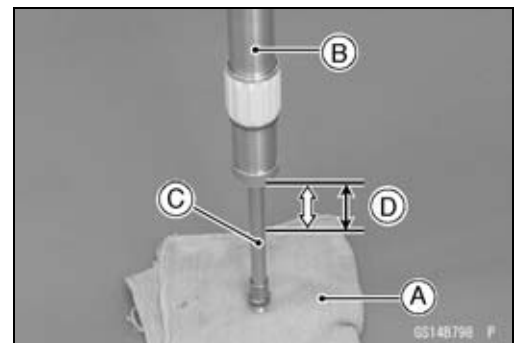
Special Tool - Top Plug Wrench, 50 mm: 57001-1645

- Tighten the left front fork base valve assembly [C].

Torque - Left Front Fork Base Valve Assembly: 30 N·m (3.1 kgf·m, 22 ft·lb)



- Turn the locknut fully in.
- Apply specified fork oil to the piston rod sliding surface.
- Protect the piston rod end with a heavy cloth [A] to prevent thread damage.
- Hold the left front fork cylinder unit [B] at the upright position.
- Slowly pump the piston rod [C] several times about 100 mm (3.94 in.) [D].



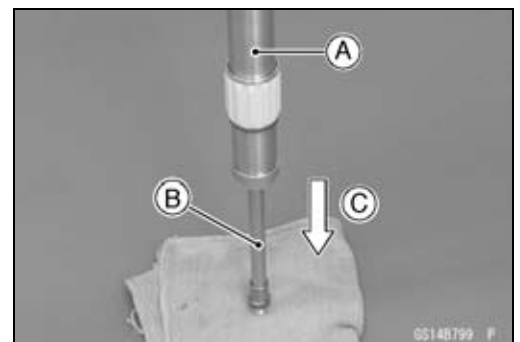
NOTICE

Take care not to bent or damage the piston rod.

- Discharge the extra oil off the left front fork cylinder unit [A] by pumping the piston rod [B] to full stroke [C].

NOTICE

Service carefully because oil flies out from the oil hole of the left front fork cylinder unit.



2-56 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Check the compression damping force setting to the softest.
- Check the piston rod sliding surface for damage.
- Drain the extra oil from the left front fork cylinder unit oil hole [A].
- Blow out the extra oil from the oil hole of the left front fork cylinder unit with the compressed air [B] blow to the oil hole.
- Wipe the oil off completely from the cylinder unit.

NOTE

○ If you cannot use compressed air, remove the air pressure relief screw of the left front fork base valve assembly. Upside down the fork damper for 10 minutes and drain the oil from the left front fork cylinder unit.

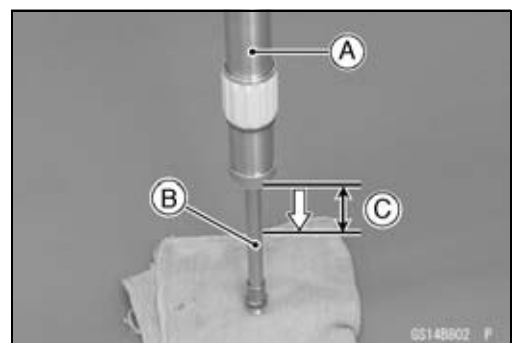
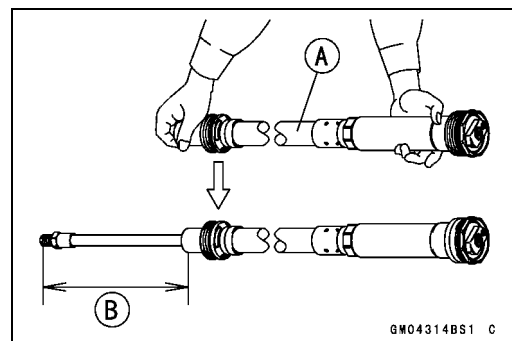
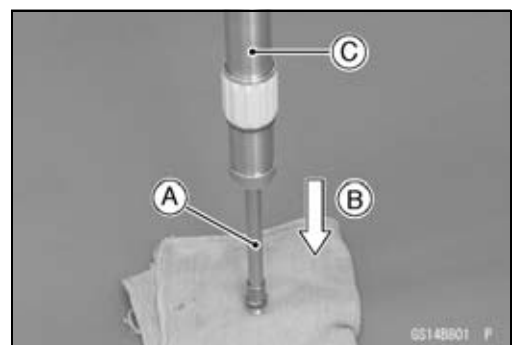
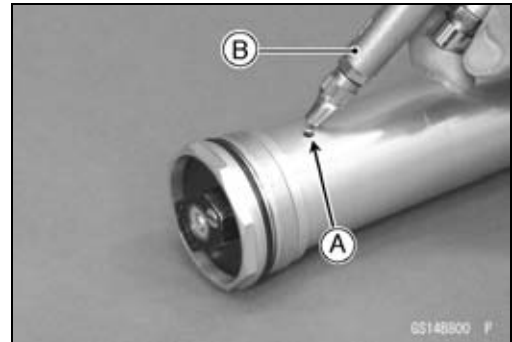
- Protect the piston rod end with a heavy cloth to prevent damage.
- Check the piston rod for smooth operation.
- Pump the piston rod [A] to full stroke [B] by pushing down the left front fork cylinder unit [C].
- ★ If the piston rod operation is not smooth, check the piston rod for bend or damage.

- Hold the fork cylinder unit on level ground [A] while piston rod is full stroked by your hand.
- Release the piston rod, then check that the piston rod extends to maximum [B].
- ★ If the piston rod does not extend to maximum, bleed the left front fork cylinder unit again.

NOTICE

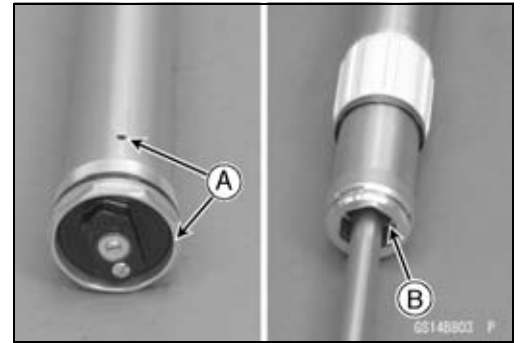
Take care not to bend or damage the piston rod.

- Wipe the fork oil off completely from the left front fork cylinder unit [A].
- Compress the piston rod [B] to **200 ~ 250 mm (7.87 ~ 9.84 in.)** [C] and hold the left front fork cylinder unit upright position for 10 minutes.

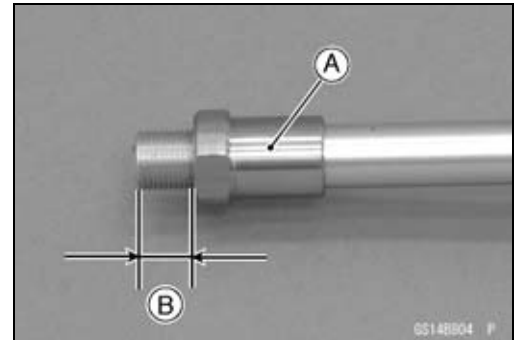


Periodic Maintenance Procedures

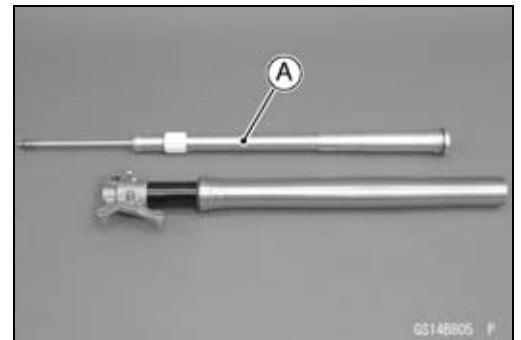
- There should be no oil leak from the base valve assembly part [A] or bottom of the cylinder [B].
- ★ If oil leaks from the base valve assembly part or bottom of the cylinder, replace the cylinder unit.
- Hold the left front fork cylinder unit on level ground.
- Release the piston rod, then check that the piston rod extends to maximum.



- Tighten the locknut [A] fully so that the piston rod thread protrudes 10 ~ 12 mm (0.39 ~ 0.47 in.) [B].



- Wipe the fork oil off completely from the left front fork cylinder unit [A].
- Install the left front fork cylinder unit into the fork.



- Temporarily tighten the left front fork cylinder unit using the top plug wrench.

Special Tool - Top Plug Wrench, 50 mm: 57001-1645

- Hold the axle holder part with a vise.
- Protect the axle holder part with a soft jaws or heavy cloth when using a vise.

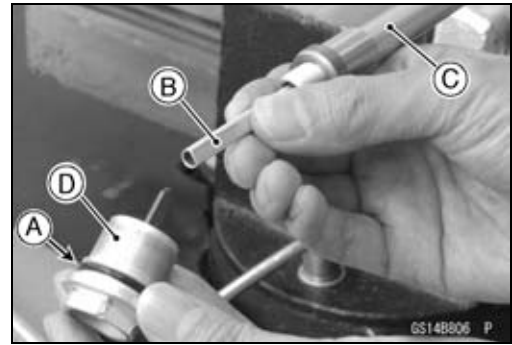
⚠ WARNING

If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.

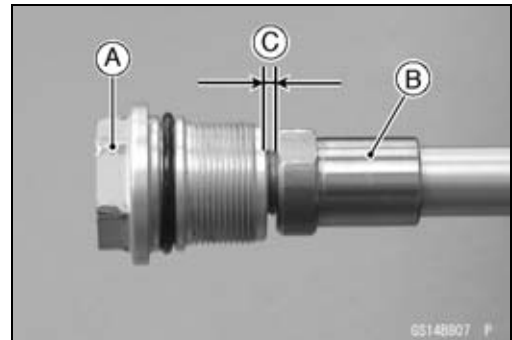
2-58 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Replace the left front fork adjuster assembly O-ring [A] with a new one and apply specified fork oil to it.
- Insert the push rod [B] into the piston rod [C].
- Install the left front fork adjuster assembly [D] to the push rod.

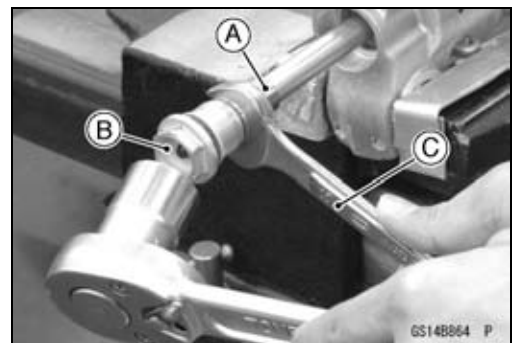


- Slowly turn the left front fork adjuster assembly [A] clockwise until resistance is felt.
- Check the clearance between the locknut [B] and left front fork adjuster assembly for more than **1 mm (0.04 in.)** [C].



- Turn the locknut [A] counterclockwise until it contacts with the left front fork adjuster assembly [B].
- With the locknut held immovable using a wrench [C], tighten the left front fork adjuster assembly locknut.

Torque - Left Front Fork Adjuster Assembly Locknut: 22 N-m (2.2 kgf-m, 16 ft-lb)



NOTICE

When tightening the locknut, the threads of the axle holder do not touch the push rod. If the push rod is scratched, it is possible to the damage in the cylinder unit.

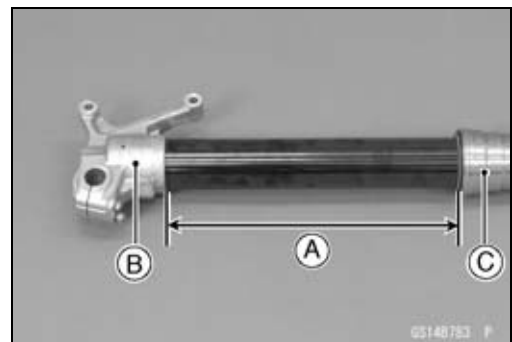
- Apply a non-permanent locking agent to the left front fork adjuster assembly.
- Tighten:

Torque - Left Front Fork Adjuster Assembly: 69 N-m (7.0 kgf-m, 51 ft-lb)

- Compare the length [A] at assembly and at disassembly.
 - There should be same length.
- ★ If the length at assembly is longer than at disassembly, check the left front fork adjuster assembly and locknut installation.
 - Axle Holder [B]
 - Outer Tube [C]

Length

Standard: 314 ±2 mm (12.4 ±0.08 in.)



NOTE

- Keep the length while tighten the left front fork cylinder unit.

Periodic Maintenance Procedures

- Using the top plug wrench, unscrew the left front fork cylinder unit from the outer tube [A].
- Slowly slide down the outer tube.
- Pour the specified fork oil into the left front fork outer tube.

Suspension Oil - SHOWA SS-19 (1 L) : 44091-0009

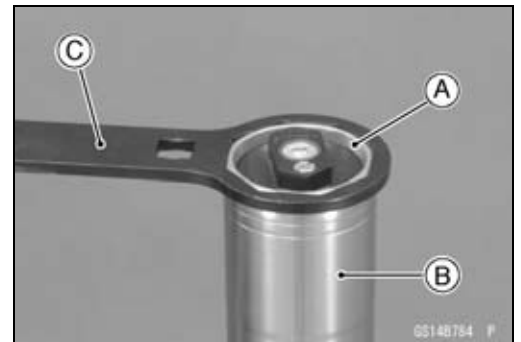
Outer Tube Oil Capacity

Standard: 320 ±2.5 mL (10.82 ±0.085 US oz.)
(EUR, BR) 300 ±2.5 mL (10.14 ±0.085 US oz.)

Adjustable Range: 300 ~ 340 mL (10.14 ~ 11.50 US oz.)

- Replace the O-ring on the left front fork cylinder unit with a new one and specified fork oil to the O-ring.
- Temporarily install the left front fork cylinder unit [A] to the outer tube [B] using the top plug wrench [C].

Special Tool - Top Plug Wrench, 50 mm: 57001-1645

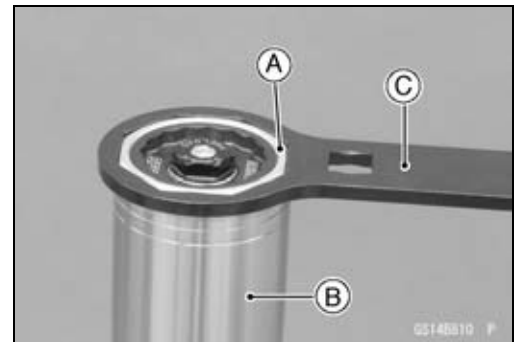


Right Front Fork

- Unscrew the right front fork spring adjuster unit [A] from the outer tube [B].

Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645

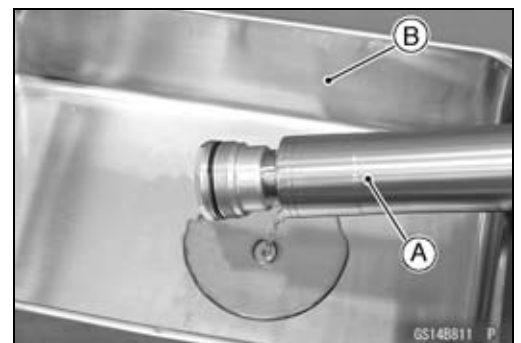
- Slowly slide down the outer tube.



- Hold the right front fork tube [A] upside down over a clean container [B] and drain the oil.

NOTE

○ Pump the outer tube up and down to discharge the fork oil.

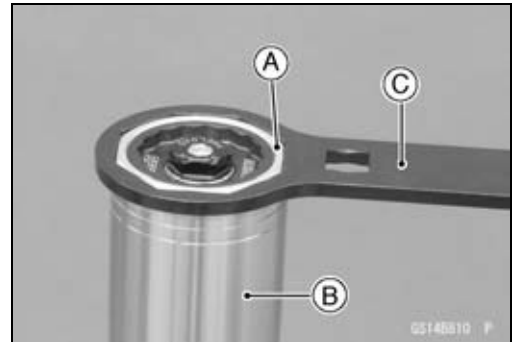


2-60 PERIODIC MAINTENANCE

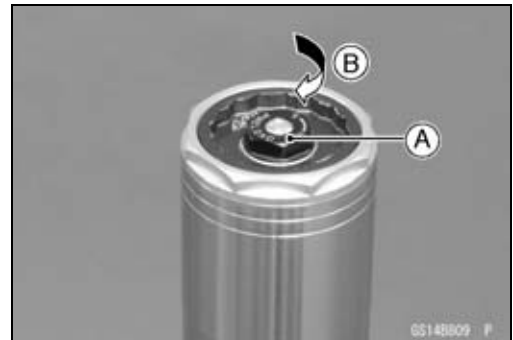
Periodic Maintenance Procedures

- Temporarily install the right front fork spring adjuster unit [A] to the outer tube [B].

Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645



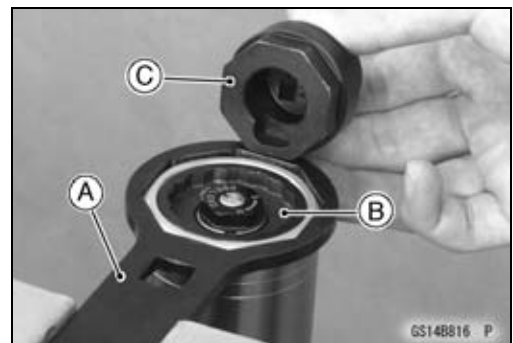
- Record the position of spring preload adjuster [A] and then turn [B] it to the hardest position.



- Holding the top plug wrench [A] with a vise, unscrew the right front fork spring preload adjuster [B] on the spring adjuster unit with a top plug wrench [C].

Special Tools - Top Plug Wrench, 50 mm: 57001-1645

Top Plug Wrench, 36 mm: 57001-1705



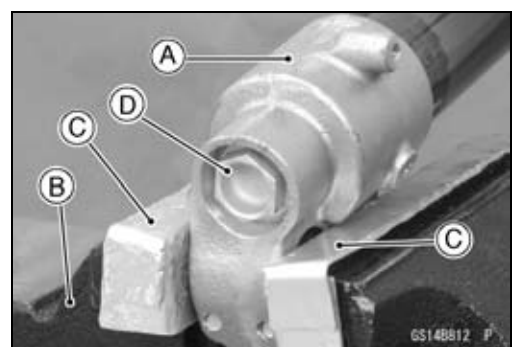
- Hold the front fork at the inverted position to allow the fork oil to drain.

- Hold the axle holder part [A] with a vise [B].

- Protect the axle holder part with soft jaws [C] or heavy cloth when using a vise.

⚠ WARNING

If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.



- Unscrew the right front fork bottom plug [D] completely.

NOTICE

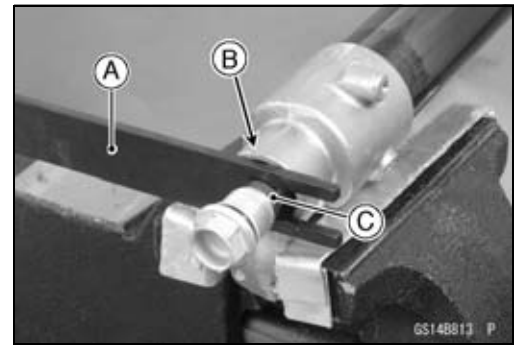
When removing the right front fork bottom plug, do not force to unscrew it at once using an impact wrench.

Periodic Maintenance Procedures

When not using the Fork Spring Compressor (Special Tool: 57001-1771):

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

Special Tool - Top Plug Wrench, 50 mm: 57001-1645



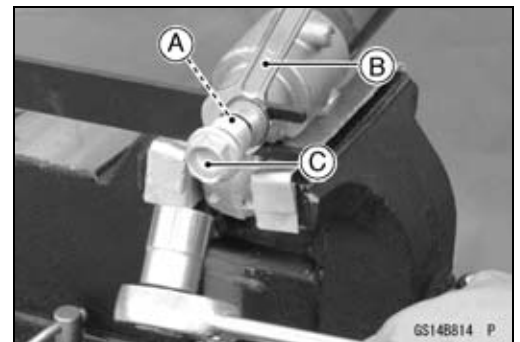
⚠ WARNING

The fork spring applies pressure to the adjuster assembly and can eject the special tool with substantial force if the tool is not properly and securely placed. Be sure the tool is fully in place as shown in the photo, and keep fingers away to avoid getting them pinched between the tool, adjuster assembly and axle holder.

- Hold the locknut [A] with a wrench [B] and remove the right front fork bottom plug [C].

NOTE

○ Do not remove the locknut from the piston rod. The piston rod may slide into the inner tube.



NOTICE

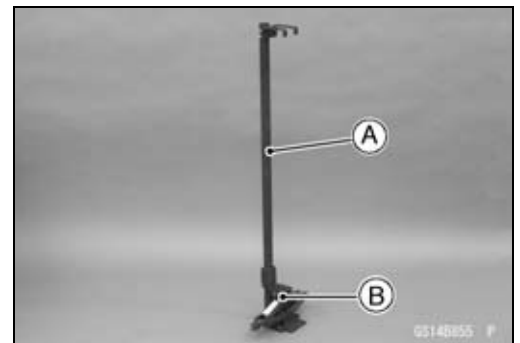
When loosening the locknut, the threads of the axle holder do not touch the push rod. If the push rod is scratched, it is possible to the damage in the cylinder unit.

- Compress the outer tube by hands and remove the top plug wrench.

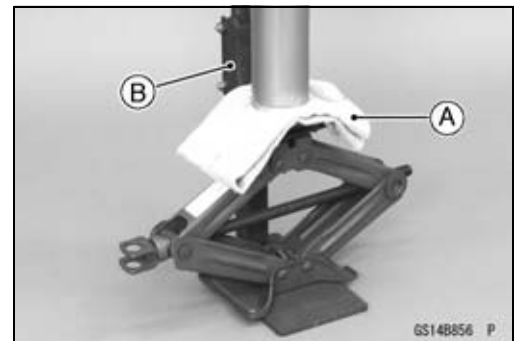
When using the Fork Spring Compressor (Special Tool: 57001-1771):

- Set the fork spring compressor [A] and a suitable jack [B].

Special Tool - Fork Spring Compressor: 57001-1771



- Put the heavy cloth [A] on the fork spring compressor [B].
- Set the front fork, with its upper side facing downward, on the fork spring compressor.

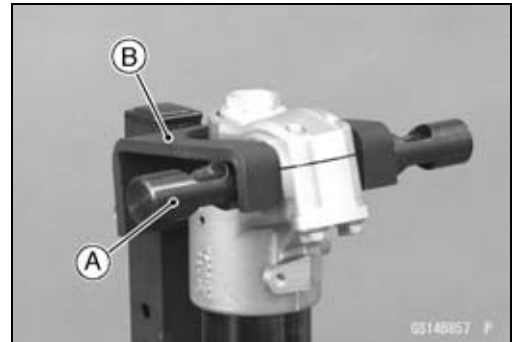


2-62 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

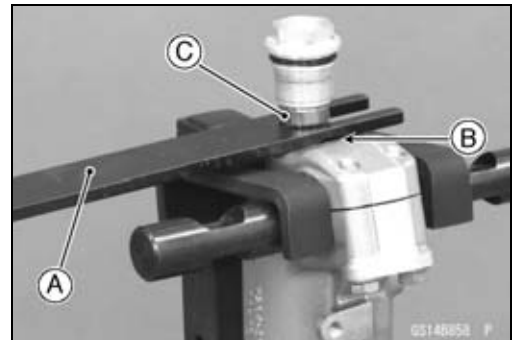
- Insert the holder bar [A] of the fork spring compressor (special tool: 57001-1587) to the axle hole and secure it with the holder [B] of the fork spring compressor (special tool: 57001-1771).

Special Tools - Fork Spring Compressor: 57001-1587
Fork Spring Compressor: 57001-1771



- Compress the outer tube with a suitable jack while keeping the front fork upright, and install the top plug wrench [A] between the axle holder bottom [B] and locknut [C].

Special Tool - Top Plug Wrench, 50 mm: 57001-1645



⚠ WARNING

The fork spring applies pressure to the adjuster assembly and can eject the special tool with substantial force if the tool is not properly and securely placed. Be sure the tool is fully in place as shown in the photo, and keep fingers away to avoid getting them pinched between the tool, adjuster assembly and axle holder.

- Remove the front fork from the fork spring compressor with care not to drop the top plug wrench, and hold the axle holder with a vise.

NOTE

○Protect the axle holder with a soft jaws or heavy cloth when using a vise.

⚠ WARNING

If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.

Periodic Maintenance Procedures

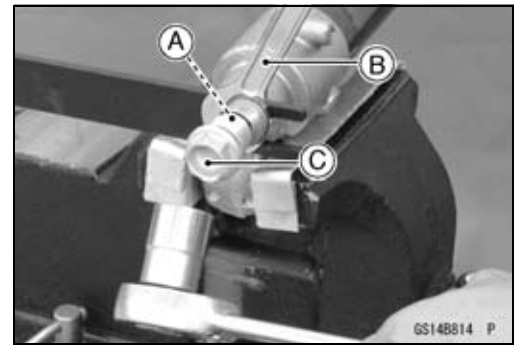
- Hold the locknut [A] with a wrench [B] and remove the right front fork bottom plug [C].

NOTE

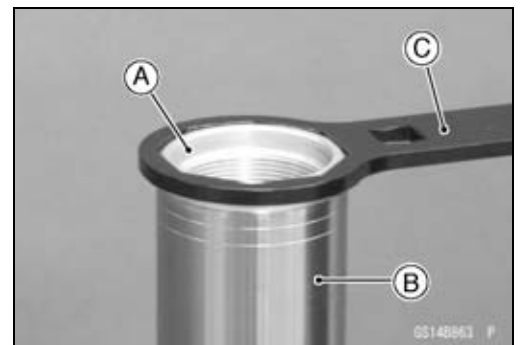
○ Do not remove the locknut from the piston rod. The piston rod may slide into the inner tube.

NOTICE

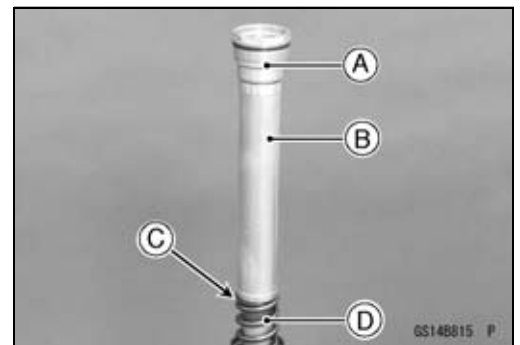
When loosening the locknut, the threads of the axle holder do not touch the push rod. If the push rod is scratched, it is possible to the damage in the cylinder unit.



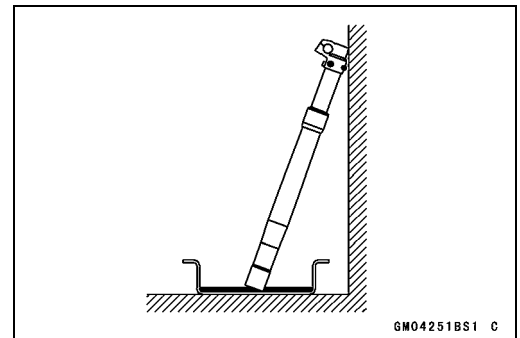
- Reset the front fork on the fork spring compressor with care not to drop the top plug wrench.
- Compress the outer tube with a suitable jack while keeping the front fork upright, and remove the top plug wrench.
- Remove the front fork from the fork spring compressor.
- Unscrew the right front fork spring adjuster unit [A] from the outer tube [B].
Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645
- Slowly slide down the outer tube.



- Remove the following parts from the outer tube.
Right Front Fork Spring Adjuster Unit [A]
Collar [B]
Spring Seat [C]
Fork Spring [D]



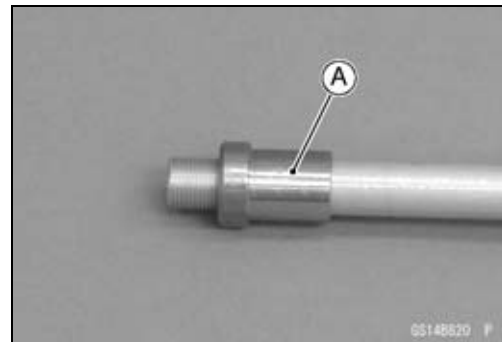
- Hold the front fork at the inverted position for more than 20 minutes to allow the fork oil to fully drain.



2-64 PERIODIC MAINTENANCE

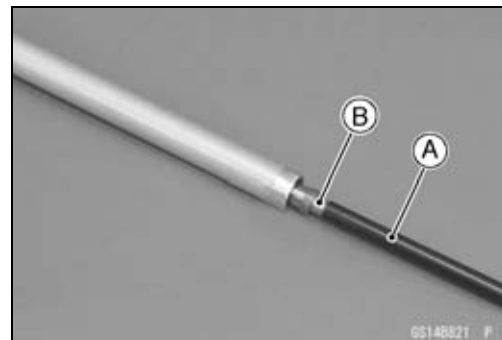
Periodic Maintenance Procedures

- Tighten the locknut [A] fully.

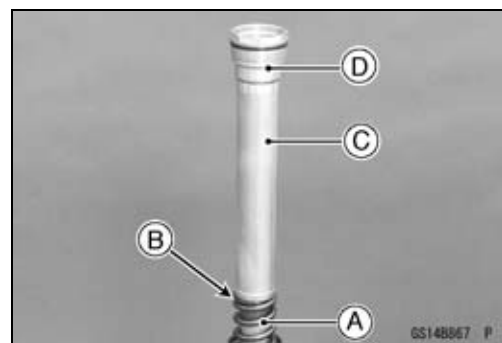


- Install the piston rod puller [A] to the threads on the piston rod end [B].

Special Tool - Fork Piston Rod Puller, M12 x 1.25: 57001-1289



- Install the following parts in the outer tube.
 - Fork Spring [A]
 - Spring Seat [B]
 - Collar [C]
 - Right Front Fork Spring Adjuster Unit [D]



- Temporarily install the right front fork spring adjuster unit [A] to the outer tube [B].

Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645



Periodic Maintenance Procedures

When not using the Fork Spring Compressor (Special Tool: 57001-1771):

- Hold the axle holder part with a vise.
- Protect the axle holder part with soft jaws or heavy cloth when using a vise.

⚠ WARNING

If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.

- Compress the outer tube by hands and install the top plug wrench [A] between the axle holder bottom and locknut.
- Special Tool - Top Plug Wrench, 50 mm: 57001-1645

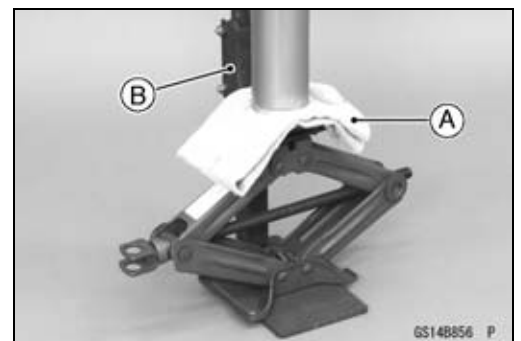
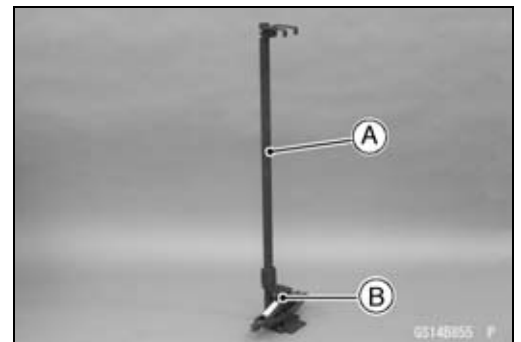
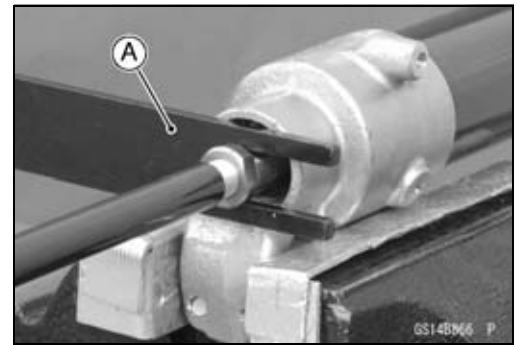
⚠ WARNING

The fork spring applies pressure to the adjuster assembly and can eject the special tool with substantial force if the tool is not properly and securely placed. Be sure the tool is fully in place as shown in the photo, and keep fingers away to avoid getting them pinched between the tool, adjuster assembly and axle holder.

When using the Fork Spring Compressor (Special Tool: 57001-1771):

- Set the fork spring compressor [A] and a suitable jack [B].
- Special Tool - Fork Spring Compressor: 57001-1771

- Put the heavy cloth [A] on the fork spring compressor [B].
- Set the front fork, with its upper side facing downward, on the fork spring compressor.

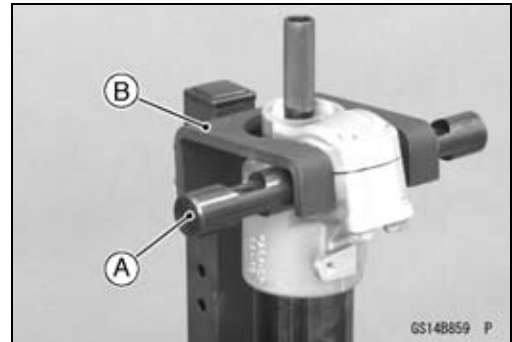


2-66 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

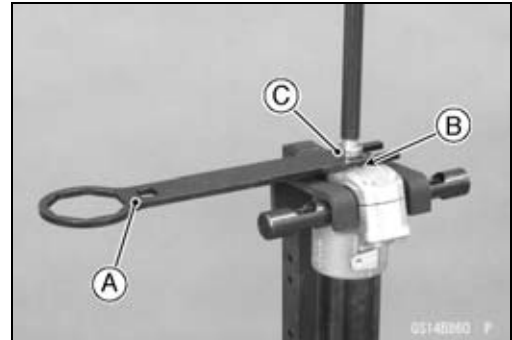
- Insert the holder bar [A] of the fork spring compressor (special tool: 57001-1587) to the axle hole and secure it with the holder [B] of the fork spring compressor (special tool: 57001-1771).

Special Tools - Fork Spring Compressor: 57001-1587
Fork Spring Compressor: 57001-1771



- Compress the outer tube with a suitable jack while keeping the front fork upright, and install the top plug wrench [A] between the axle holder bottom [B] and locknut [C].

Special Tool - Top Plug Wrench, 50 mm: 57001-1645



⚠ WARNING

The fork spring applies pressure to the adjuster assembly and can eject the special tool with substantial force if the tool is not properly and securely placed. Be sure the tool is fully in place as shown in the photo, and keep fingers away to avoid getting them pinched between the tool, adjuster assembly and axle holder.

- Remove the front fork from the fork spring compressor with care not to drop the top plug wrench, and hold the axle holder with a vise.

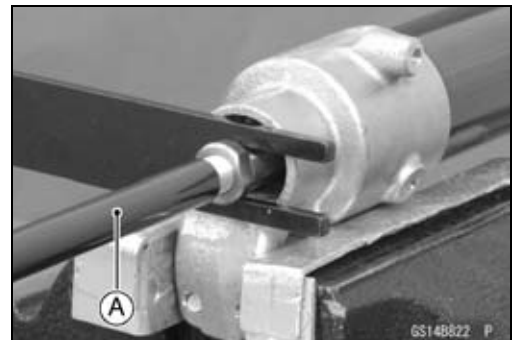
NOTE

○Protect the axle holder with a soft jaws or heavy cloth when using a vise.

⚠ WARNING

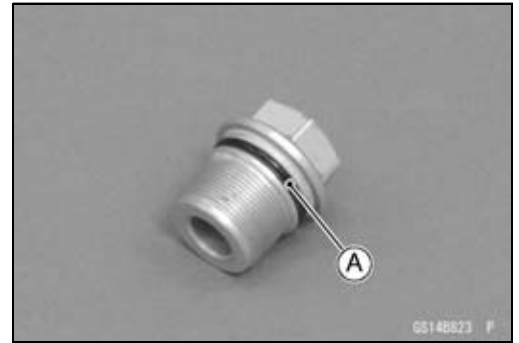
If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.

- Remove the piston rod puller [A].

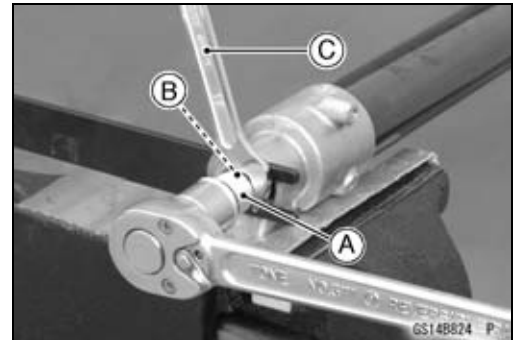


Periodic Maintenance Procedures

- Replace the O-ring [A] on the right front fork bottom plug with a new one and apply specified fork oil to it.



- Slowly turn the right front fork bottom plug [A] clockwise until resistance is felt. Check the clearance between the locknut [B] and right front fork bottom plug for more than 1 mm (0.04 in.).
- Turn the locknut counterclockwise until it contacts with the right front fork bottom plug.
- Hold the right front fork bottom plug with a wrench [C] and tighten the locknut.



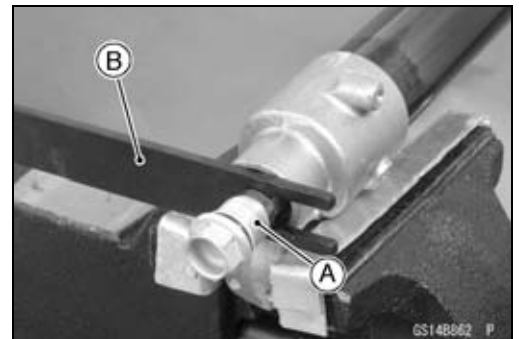
Torque - Right Front Fork Bottom Plug Locknut: 22 N-m (2.2 kgf-m, 16 ft-lb)

NOTICE

When tightening the locknut, the threads of the axle holder do not touch the push rod. If the push rod is scratched, it is possible to the damage in the cylinder unit.

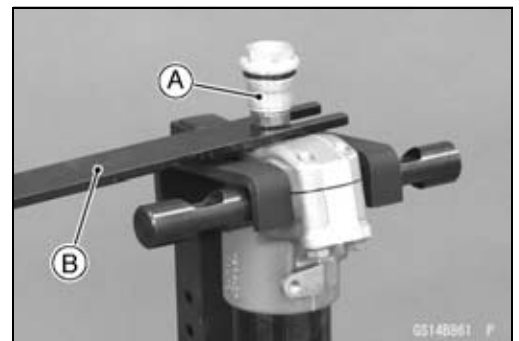
When not using the Fork Spring Compressor (Special Tool: 57001-1771):

- Apply a non-permanent locking agent to the threads of the right front fork bottom plug [A].
- Compress the outer tube by hands and remove the top plug wrench [B].



When using the Fork Spring Compressor (Special Tool: 57001-1771):

- Reset the front fork on the fork spring compressor with care not to drop the top plug wrench.
- Apply a non-permanent locking agent to the threads of the right front fork bottom plug [A].
- Compress the outer tube with a suitable jack while keeping the front fork upright, and remove the top plug wrench [B].
- Remove the front fork from the fork spring compressor.



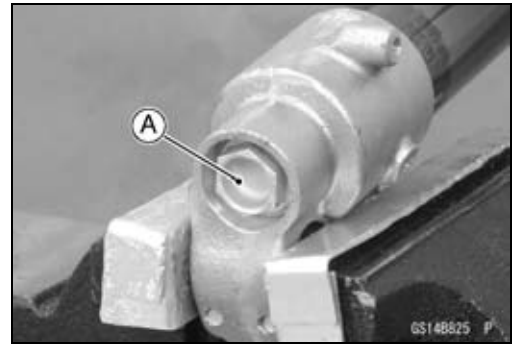
2-68 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

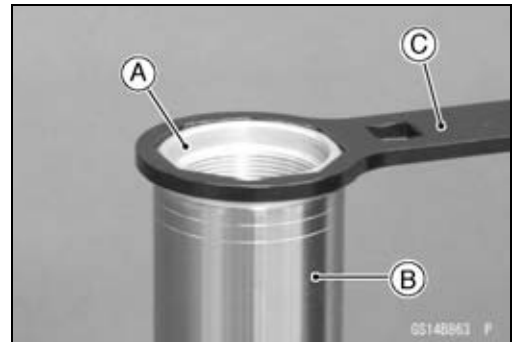
- Hold the axle holder part with a vise.
- Protect the axle holder part with soft jaws or heavy cloth when using a vise.

⚠ WARNING

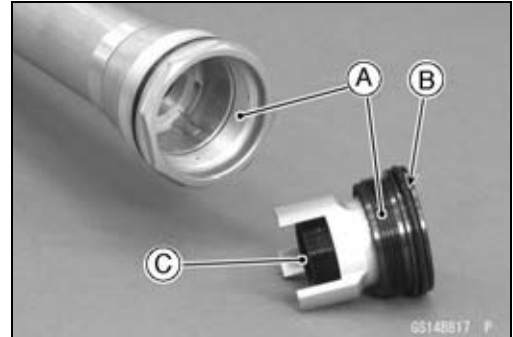
If the axle holder is not securely clamped, the front fork assembly may come out of the vise when compressed, which could cause an accident resulting in injury. However, clamping the axle holder too tightly can damage it which will affect riding stability. Use protective aluminum covers on the jaws of the vise and do not tighten the vise excessively.



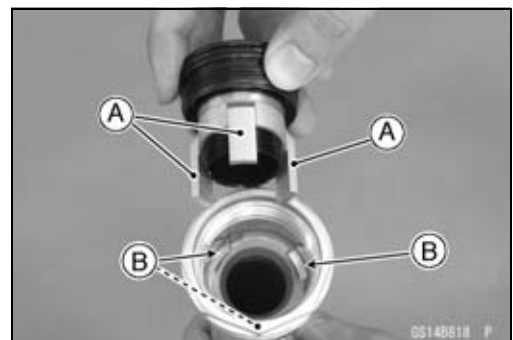
- Tighten the right front fork bottom plug [A].
Torque - Right Front Fork Bottom Plug: 69 N·m (7.0 kgf·m, 51 ft·lb)
- Unscrew the right front fork spring adjuster unit [A] from the outer tube [B].
Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645
- Slowly slide down the outer tube.



- Clean the threads [A] of the right front fork spring adjuster unit and right front fork spring preload adjuster.
- Replace the O-ring [B] on the right front fork spring preload adjuster [C] with a new one.
- Turn the right front fork spring preload adjuster counterclockwise to the softest position.
- Apply specified fork oil to the O-ring.



- Install the right front fork spring preload adjuster so that the projections [A] align to the holes [B] on the right front fork spring adjuster unit.



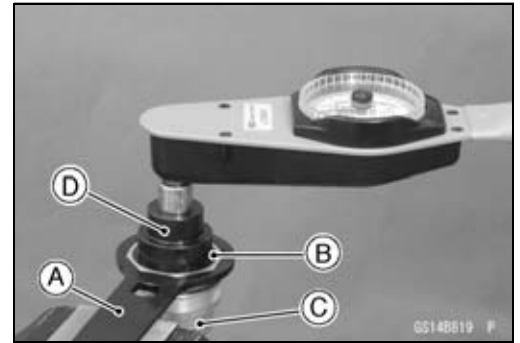
Periodic Maintenance Procedures

- Holding the top plug wrench [A] with a vise, tighten the right front fork spring preload adjuster [B] on the right front fork spring adjuster unit [C] with a top plug wrench [D].

Special Tools - Top Plug Wrench, 50 mm: 57001-1645

Top Plug Wrench, 36 mm: 57001-1705

**Torque - Right Front Fork Spring Preload Adjuster: 30 N·m
(3.1 kgf·m, 22 ft·lb)**



- Pour the specified fork oil [A] into the right front fork outer tube [B].

Suspension Oil - SHOWA SS-19 (1 L) : 44091-0009

Fork Oil Capacity

Standard: 235 ±2.5 mL (7.95 ±0.085 US oz.)

Adjustable Range: 230 ~ 378 mL (7.78 ~ 12.78 US oz.)



- Replace the O-ring on the right front fork spring adjuster unit with a new one.
- Apply specified fork oil to the O-ring.
- Temporarily install the right front fork spring adjuster unit [A] to the outer tube [B].

Special Tool - Top Plug Wrench, 50 mm [C]: 57001-1645

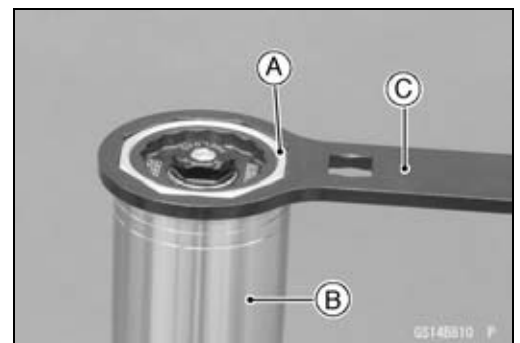
- Compare the length at assembly and at disassembly.

○ There should be same length.

- ★ If the length at assembly is longer than at disassembly, check the right front fork bottom plug and locknut installation.

Length

Standard: 314 ±2 mm (12.4 ±0.08 in.)



- Install the front forks to the motorcycle (see Front Fork Installation in the Suspension chapter).
- Remove the front fork clamp bolts (upper).
- After installing the front fork, tighten the cylinder unit (left front fork) [A]/spring adjuster unit (right front fork).

Special Tool - Top Plug Wrench, 50 mm [B]: 57001-1645



2-70 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

The torque of left front fork cylinder unit and right front fork spring adjuster unit are specified to 34 N·m (3.5 kgf·m, 25 ft·lb), however, when you use the top plug wrench [A], reduce the torque to 90% of the specified value [31 N·m (3.1 kgf·m, 23 ft·lb)] due to the distance [B] between the center of the square hole, where the torque wrench is fitted, and that of the octagonal hole of the wrench.

This torque value [31 N·m (3.1 kgf·m, 23 ft·lb)] is applicable when you use a torque wrench whose length gives leverage of approximately 310 mm (12.2 in.) between the grip point to the center of the coupling square.

○ Apply a non-permanent locking agent to the threads of the front fork clamp bolts (upper).

Torque - Left Front Fork Cylinder Unit: 34 N·m (3.5 kgf·m, 25 ft·lb)

Right Front Fork Spring Adjuster Unit: 34 N·m (3.5 kgf·m, 25 ft·lb)

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

● Install the removed parts (see appropriate chapters).

Rear Shock Absorber Oil Change

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

The disassembly procedure is included in the oil change procedure.

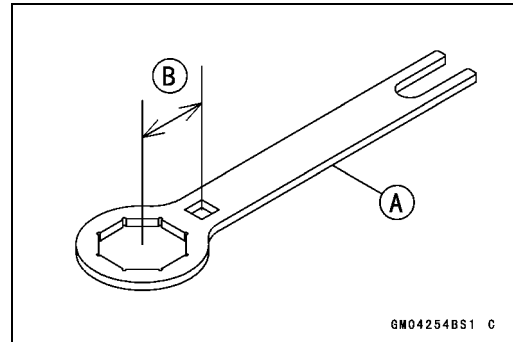
Disassembly for Oil Change

● Remove the rear shock absorber (see Rear Shock Absorber Removal in the Suspension chapter).

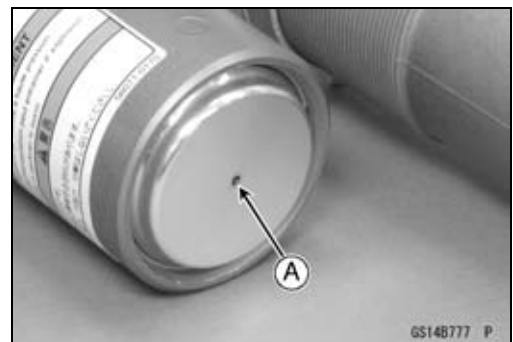
● Remove the shock absorber spring (see Spring Replacement in the Suspension chapter).

● Insert a suitable tool to center [A] of the reservoir cap, and release the nitrogen gas completely (keep the suitable tool inserted).

○ For instructions on how to use the tool, follow the operation manual provided by the manufacturer.

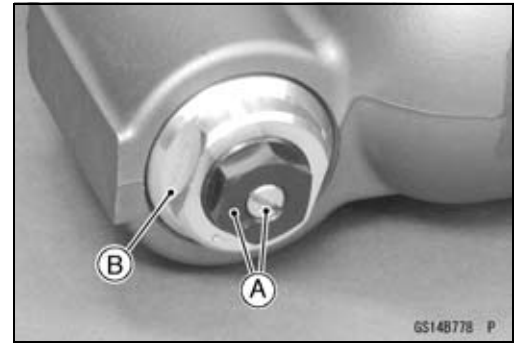


⚠ WARNING
<p>The shock contains high-pressure nitrogen gas that when suddenly released can eject oil and internal shock parts at high velocity, causing serious injury. To avoid injury, do not point a suitable tool toward your face or body when releasing nitrogen gas pressure since an oil mist is often released with the nitrogen. Always release nitrogen gas pressure before disassembling the rear shock absorber to prevent explosive separation of parts.</p>

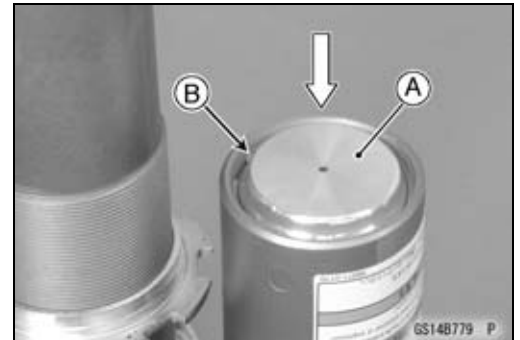


Periodic Maintenance Procedures

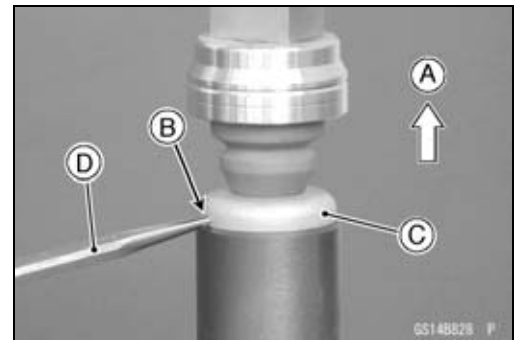
- Adjust the gas reservoir damping adjusters [A] to the softest position.
- Remove the adjuster assembly [B] and pump the rear shock to drain the oil.



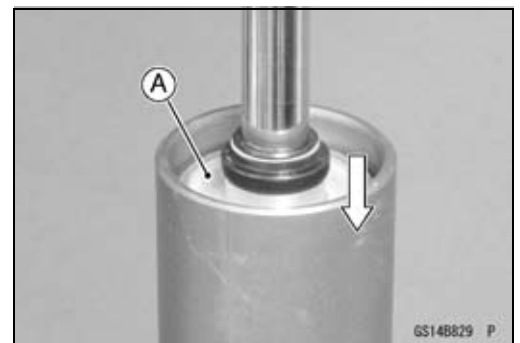
- Using the hand press, push the reservoir cap [A].
- Remove:
 - Circlip [B]
 - Reservoir Cap



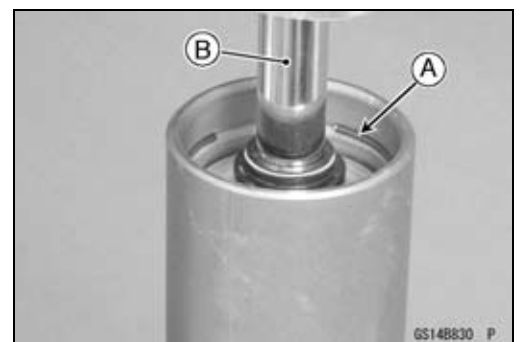
- Tap [A] the hole [B] in the stopper [C] with suitable tools [D] to free the stopper from the rear shock body.



- Slide up the stopper of the piston rod, then lightly tap around the seal with a suitable rod and mallet, and push the seal assembly [A] 10 mm (0.39 in.) down.



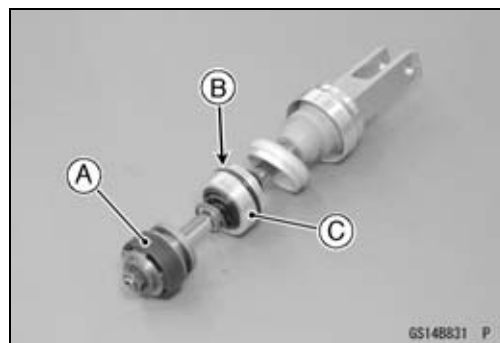
- Remove the circlip [A].
- Wrap a heavy cloth around the rear shock body and piston rod to prevent the oil diffusion.
- Lightly move the piston rod [B] back and forth, and pull out the piston rod assembly.
- Drain the remains oil.



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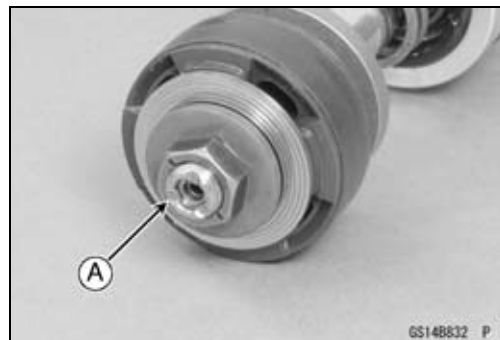
Periodic Maintenance Procedures

- Visually inspect the piston [A], O-ring [B], and oil seal assembly [C].
- ★ If the piston, O-ring and oil seal assembly are badly scored, rusty or damaged, replace them.



Piston Rod Assembly Disassembly/Assembly

- ★ If necessary, disassembly and assembly the piston rod assembly as follows.
- Using the grinder, shave off the stake portions [A] of the piston rod.



- Hold the lower of the piston rod assembly in a vise with soft jaws or heavy cloth.
- Remove the locknut [A] and discard it.

NOTICE

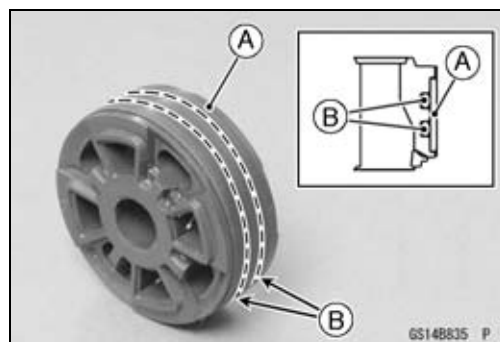
Do not tighten the rebound damping adjuster of the piston rod.



- Remove the piston rod assembly from the vise.
- Remove the piston assembly [A].
 - Be careful not to disassemble it.
 - Stick a suitable rod into the piston assembly and leave it until being reinstalled.

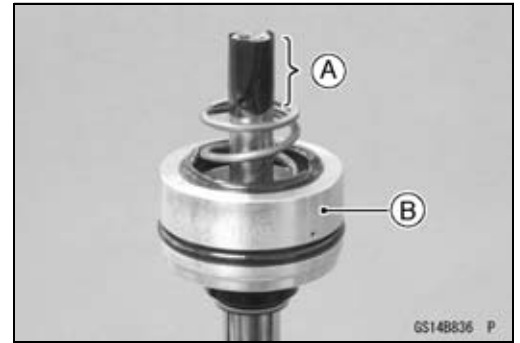


- Inspect the slide bushing [A].
 - ★ If the bushing is damaged, replace it.
 - Cut the slide bushing.
- Replace the O-rings [B] with new ones.
- Install the O-rings and a new bushing on the piston.

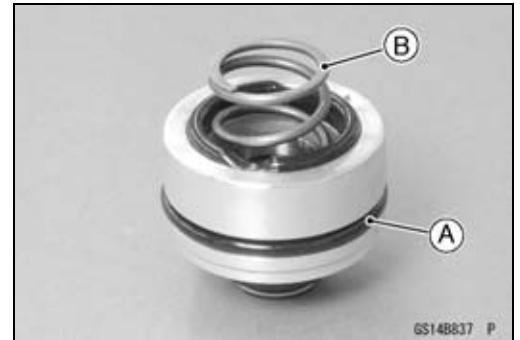


Periodic Maintenance Procedures

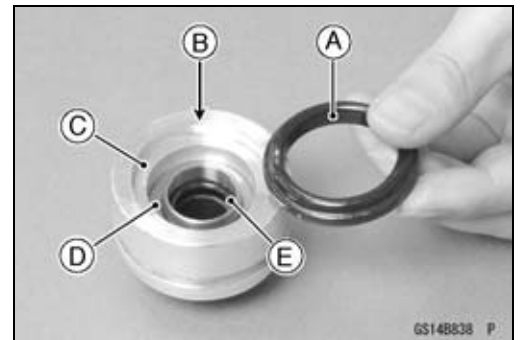
- Wrap the threads [A] of the piston rod with tape.
- Remove the oil seal assembly [B].



- Remove the O-ring [A] and spring [B].



- Remove the rebound rubber [A] out of its groove [B].
- Remove:
 - Collar [C]
 - Spring Holder [D]
 - Oil Seal [E]



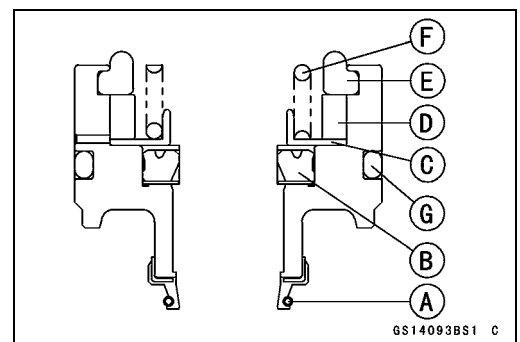
- Remove:
 - Oil Seal [A]

NOTICE

To avoid damage to the surfaces of the oil seal assembly body [B], cover the screwdriver [C] with the cloth [D].



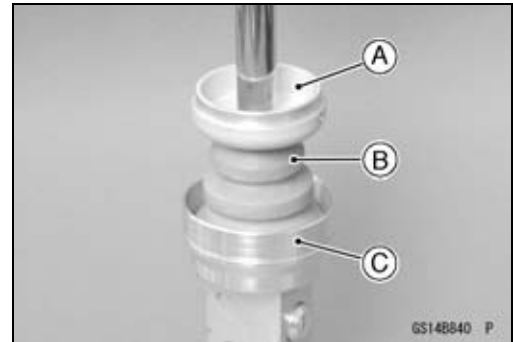
- Replace the following with new ones.
 - Oil Seals
 - Rebound Rubber (if damaged)
 - O-ring
- Install each parts direction as shown.
 - Oil Seal [A]
 - Oil Seal [B]
 - Spring Holder [C]
 - Collar [D]
 - Rebound Rubber [E]
 - Spring [F]
 - O-ring [G]



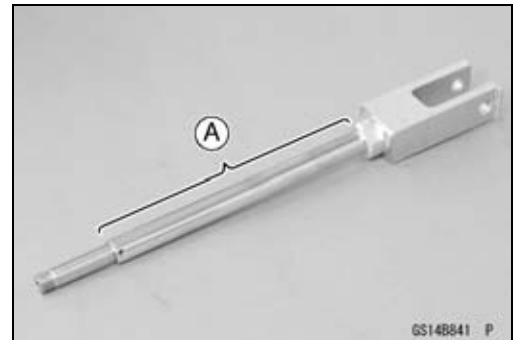
2-74 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

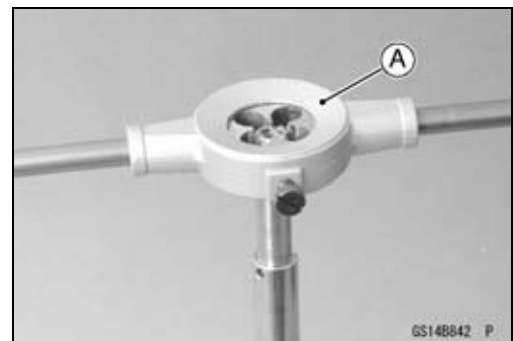
- Remove:
 - Stopper [A]
 - Damper [B]
 - Damper Holder [C]



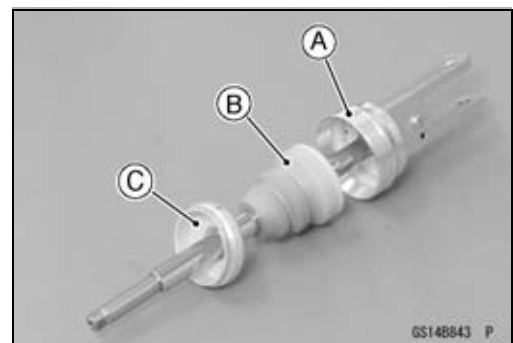
- Inspect the piston rod sliding surface [A].
- ★ If the sliding surface is scratches or distortion, replace it.



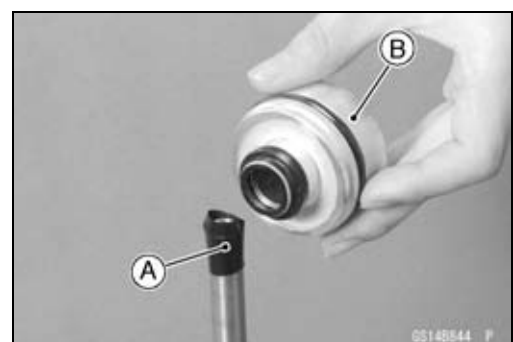
- Hold the lower of the piston rod assembly in a vise with soft jaws or heavy cloth.
- Make the threads of the piston rod end using the die [A].
Die: $\phi 12 \times 1.25$ mm
- Clean all parts with solvent and dry them with compressed air.



- Install:
 - Damper Holder [A]
 - Damper [B]
 - Stopper [C]



- Wrap the threads of the piston rod with tape [A].
- Apply thin coat of rear shock oil to the sliding surface of the piston rod.
- Insert the oil seal assembly [B].



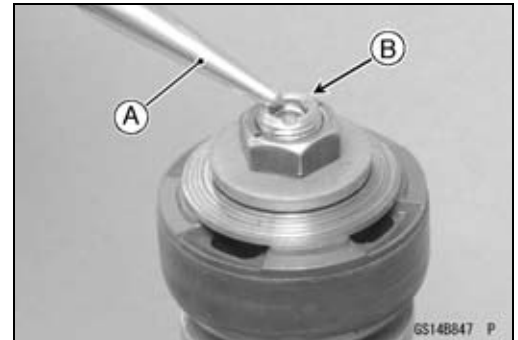
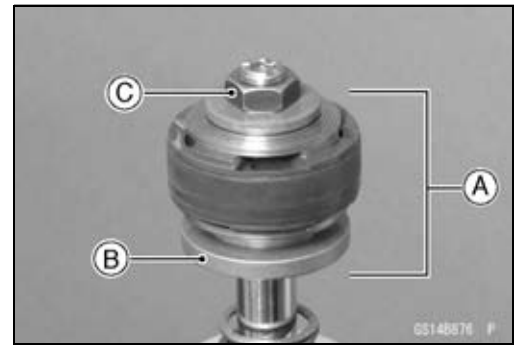
Periodic Maintenance Procedures

- Remove the tape from piston rod.
- Install the piston assembly [A] so that the thick side of the stopper [B] faces downward.

NOTE

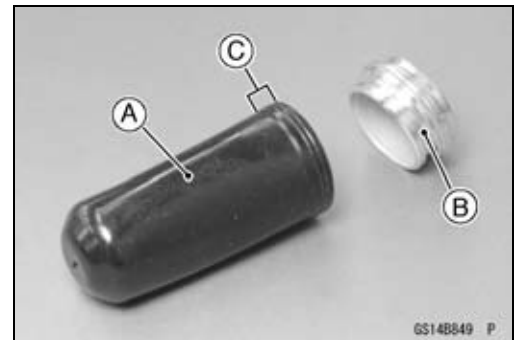
○ *Be careful not to change the original positions.*

- Install the new piston rod locknut [C].
- Tighten:
Torque - Piston Rod Locknut: 37 N·m (3.8 kgf·m, 27 ft·lb)
- Stake the end of the piston rod with the chisel [A] in three place [B].
- Check the oil seal assembly moving smoothly on the rod.



Assembly for Oil Change

- Check that the bladder [A] on the gas reservoir cap is not partially collapsed.
- ★ If it is, push down the valve core with a screwdriver.
- Check the bladder for sign of damage or crack.
- ★ If necessary, replace it with a new one.



NOTICE

Do not use a damaged or partially collapsed bladder, because it may burst, gently reducing rear shock performance.

- Replace the gas reservoir cap [B] with a new one.
- Apply grease to the lip [C] of the bladder and install the reservoir cap.
- Push the bladder into the gas reservoir slowly until it just clears the circlip groove. Wipe out any spilled oil.
- Replace the circlip with a new one.

⚠ WARNING

Pressurized nitrogen gas can explode out of the shock reservoir cap if a weakened, deformed or flawed circlip is used, allowing oil and internal parts to burst out of the reservoir with great force and cause serious injury. To avoid injury, always use a new circlip whenever the shock is reassembled.

- Mount the circlip in the groove in the gas reservoir.

2-76 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Pull up the gas reservoir cap [A] against the circlip. 2.6 mm (0.1 in.) [B]

⚠ WARNING

Pressurized nitrogen gas can explode out of the shock reservoir cap if the circlip is not properly installed, allowing oil and internal parts to burst out of the reservoir with great force and cause serious injury. To avoid injury, be sure to install a new circlip in the proper position. If the end of the gas reservoir cap and the end of the gas reservoir are not aligned, the circlip is not correctly fitted in the groove in the gas reservoir or the circlip is deformed and should be replaced with a new one.

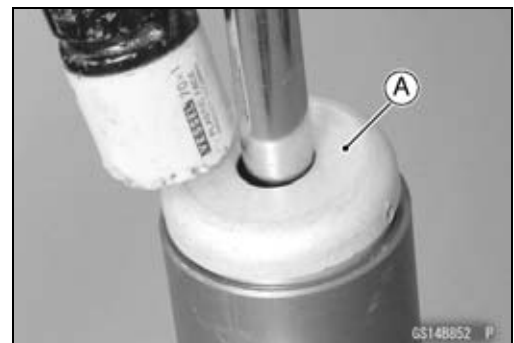
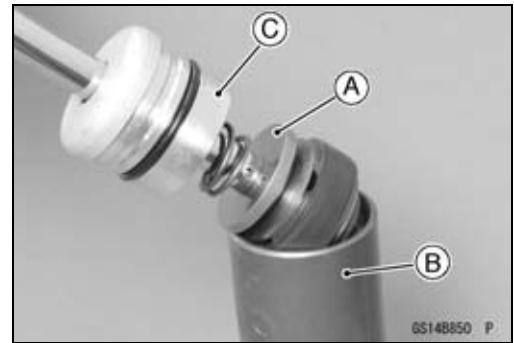
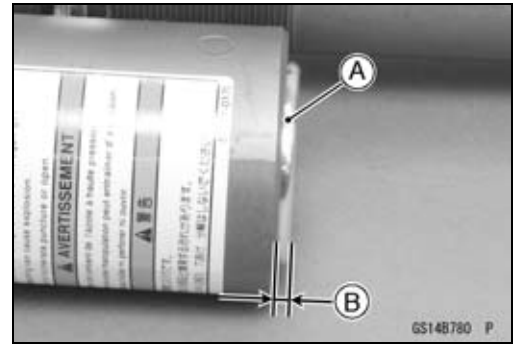
- Hold the upper portion of the rear shock absorber in a vise with soft jaws or heavy cloth.
- Apply shock absorber oil to the bushing and O-ring of the piston rod assembly.
- Insert the piston end [A] of the piston rod assembly into the rear shock body [B] slowly. Do not insert the seal assembly [C] yet.

- Push the seal assembly into the rear shock body until it just clears the circlip groove.
- Replace the circlip with a new one.
- Fit the circlip [A] into the groove in the rear shock body [B].
- Pull up the piston rod assembly [C] against the circlip.

NOTICE

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

- Force the stopper [A] into the rear shock body by lightly tapping around the edge of the stopper with a plastic mallet.
- Fully extend the piston rod assembly.



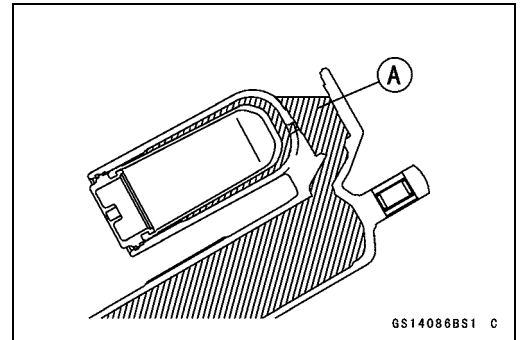
Periodic Maintenance Procedures

- Remount the upper portion of the shock absorber in a vise with soft jaws or heavy cloth.
- Fill the specified oil [A] into the damping adjuster assembly hole.

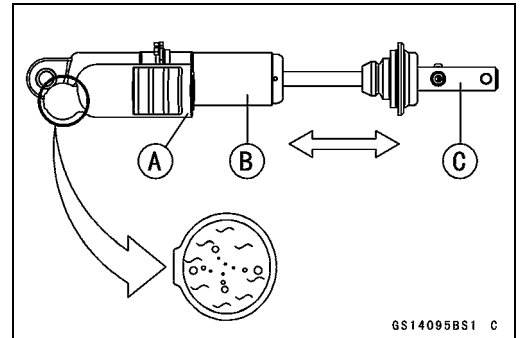
Suspension Oil - SHOWA SS-25 (1 L) : 45024-0001

Rear Shock Absorber Oil Capacity

Standard: approx. 380 mL (12.8 US oz.)



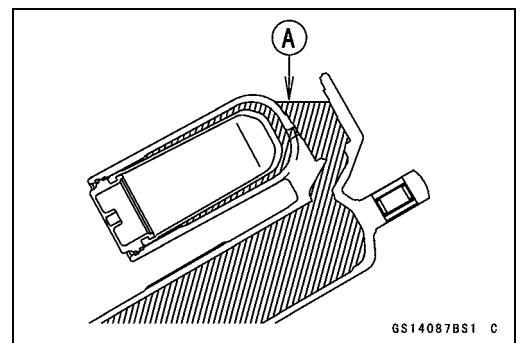
- Purge the air from between the gas reservoir [A] and rear shock body [B] by slowly pumping the piston rod [C] in and out.



- Add the specified oil up to the damping adjuster assembly hole neck [A].

NOTE

○ Hold the adjuster assembly hole facing up and turn the shock absorber to bleed the air from the reservoir completely.

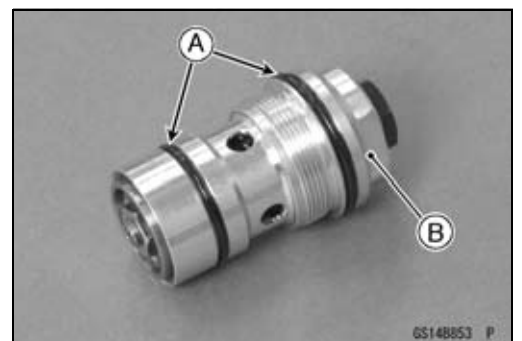


- Fully extend the piston rod assembly.
- Inject the nitrogen gas to a pressure of **50 kPa (0.5 kgf/cm², 7 psi)** through the valve on the gas reservoir.
- Check the rear shock body and gas reservoir for oil and gas leaks.
- ★ If there are leaks, reassemble the related parts.

- Replace the O-rings [A] with new ones and apply shock absorber oil.
- Install the gas reservoir damping adjuster assembly [B] slowly.
- Tighten:

Torque - Gas Reservoir Damping Adjuster Assembly: 29.5 N·m (3.01 kgf·m, 21.8 ft·lb)

- Wipe off all oil from the shock absorber body and piston rod.



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Periodic Maintenance Procedures

- Inject the nitrogen gas up to the **980 kPa (10.0 kgf/cm², 142 psi)** pressure.

⚠ WARNING

High pressure gas is dangerous and can explode, causing serious injury. To avoid injury, have a qualified mechanic pressurize the shock reservoir with nitrogen gas only. Do not use air or other gases, since they may cause premature wear, rust, fire hazard or substandard performance.

- Install the spring (see Rear Shock Absorber Spring Replacement).
- Install the rear shock absorber (see Rear Shock Absorber Installation in the Suspension chapter).
- Adjust the spring preload (see Spring Preload Adjustment in the Suspension chapter).
- Install the removed parts (see appropriate chapters).

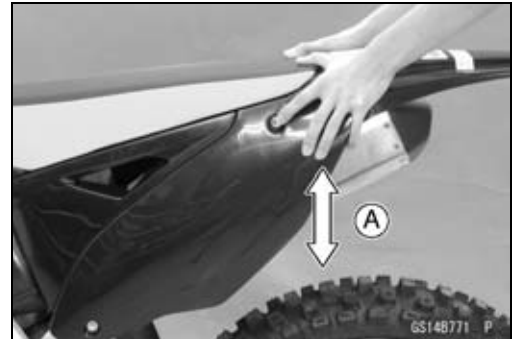
Swingarm and Uni-Trak Linkage Inspection

- Check the uni-trak component parts for wear periodically, or whenever excessive play is suspected.
- Using the jack under the frame, raise the rear wheel off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Pump the seat down and up [A] 4 or 5 times, and inspect the smooth stroke.
- ★ If the uni-trak linkage does not smooth stroke or noise is found, inspect the uni-trak linkage bearings.



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



Swingarm and Uni-Trak Linkage Pivot Lubrication

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

Periodic Maintenance Procedures

Steering

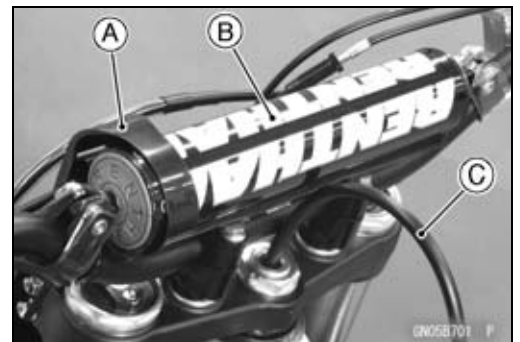
Steering Inspection

- Using the jack, raise the front wheel off the ground.
 - Special Tools - Jack: 57001-1238**
 - Jack Attachment: 57001-1608**
- With the front wheel pointing straight ahead, alternately nudge each end of the handlebars.
 - The front wheel should swing fully to left and right from the force of gravity until the fork hits the stop.
 - ★ If the steering binds or catches before the stop, check the routing of the cables, hoses, and harnesses.
 - ★ If the steering feels tight, adjust or lubricate the steering.
- Feel for steering looseness by pushing and pulling [A] the forks.
 - ★ If you feel looseness, adjust the steering.

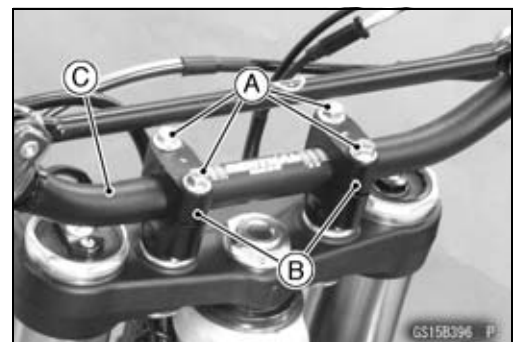


Steering Adjustment

- Using the jack, raise the front wheel off the ground.
 - Special Tools - Jack: 57001-1238**
 - Jack Attachment: 57001-1608**
- Remove:
 - Number Plate [A] (see Number Plate Removal in the Frame chapter)
 - Handlebar Pad [B]
 - Fuel Tank Breather Hose [C]



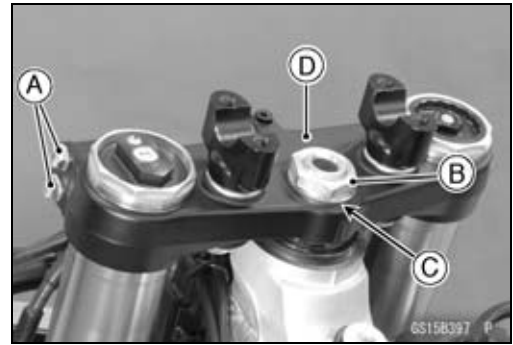
- Remove:
 - Handlebar Clamp Bolts [A]
 - Handlebar Clamps [B]
 - Handlebars [C]



2-80 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

- Loosen the front fork clamp bolts (upper) [A] on both sides.
- Remove the steering stem head nut [B] and washer [C].
- Remove the steering stem head [D].

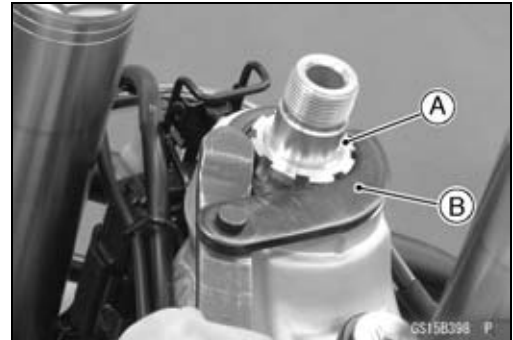


- Turn the steering stem nut [A] with the steering stem nut wrench [B] to obtain the proper adjustment.
- ★ If the steering is too tight, loosen the stem nut a fraction of a turn; if the steering is too loose, tighten the nut a fraction of a turn.

Special Tool - Steering Stem Nut Wrench: 57001-1100

NOTE

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



- Install the steering stem head and washer.
- Apply a non-permanent locking agent to the front fork clamp bolts (upper).
- Tighten:

Torque - Steering Stem Head Nut: 98 N·m (10.0 kgf·m, 72 ft·lb)

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

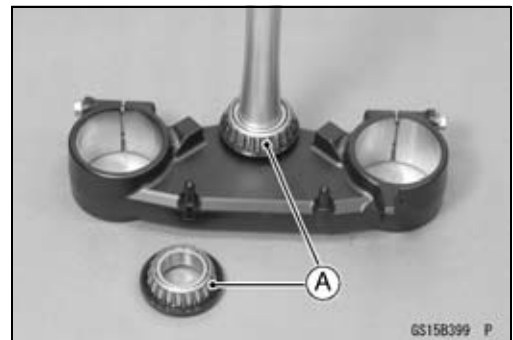
NOTE

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

- Check the steering again.
- ★ If the steering is too tight or too loose, repeat the adjustment as mentioned above.
- Install the removed parts (see appropriate chapters).

Steering Stem Bearing Lubrication

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



Periodic Maintenance Procedures

Frame

Frame Inspection

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

 WARNING
<p>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.</p>

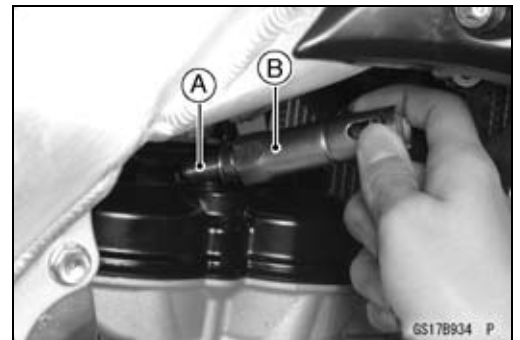
Electrical System

Spark Plug Cleaning and Inspection

- Remove the ignition coil (see Ignition Coil Removal in the Electrical System chapter).
- Clean the plug hole, using the compressed air [A].



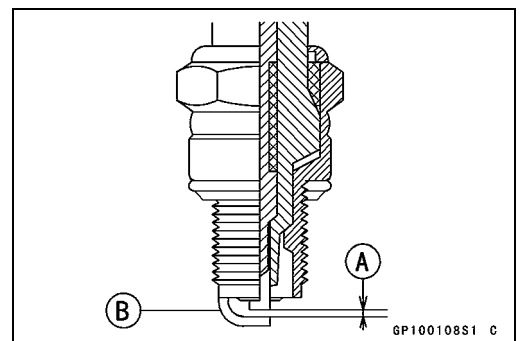
- Remove the spark plug [A] using a suitable 16 mm (0.63 in.) plug wrench [B].
- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool.
- ★ If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug.



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

Spark Plug Gap

Standard: 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)



- Insert the spark plug into the suitable 16 mm (0.63 in.) plug wrench, and finger-tighten it first.
- Tighten:

Torque - Spark Plug: 13 N·m (1.3 kgf·m, 115 in·lb)

- Install the ignition coil (see Ignition Coil Installation in the Electrical System chapter).

Spark Plug Replacement

- Refer to the Spark Plug Cleaning and Inspection.

2-82 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

General Lubrication and Cable Inspection

Lubrication

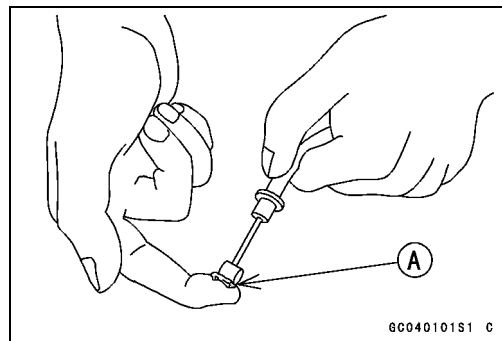
- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

NOTE

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

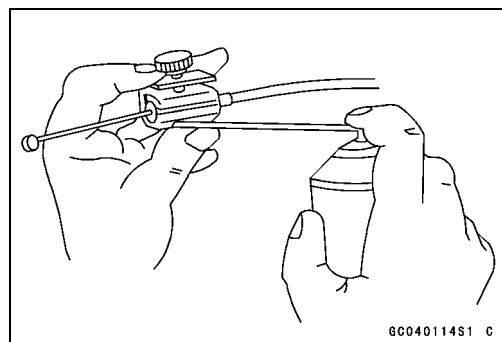
Points: Lubricate with Grease.

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



Cables: Lubricate with Rust Inhibitor.

Throttle Inner Cables
Clutch Inner Cable



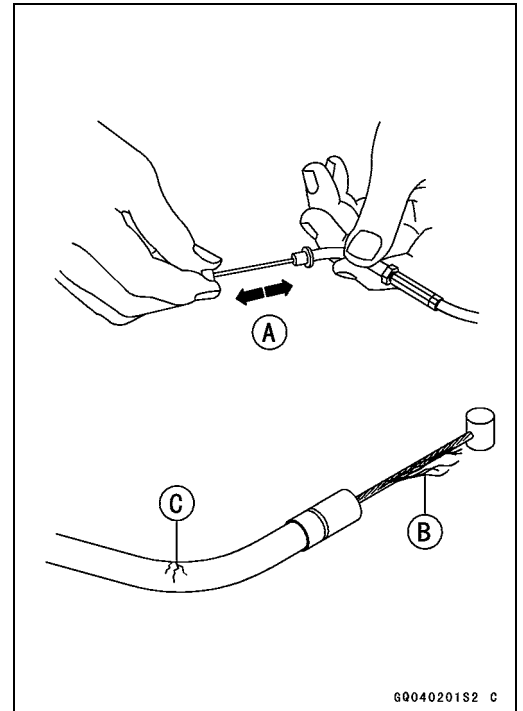
Pivots: Lubricate with engine oil.

Rear Master Cylinder Joint Pin

Periodic Maintenance Procedures

Cable Inspection

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



Nut, Bolt, and Fastener Tightness Inspection

Tightness Inspection

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

NOTE

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

2-84 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

★ If there are loose fasteners, retighten them to the specified torque following the specified tightening sequence. Refer to the Torque and Locking Agent section in this chapter for torque specifications. For each fastener, first loosen it by 1/2 turn, then tighten it.

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

Nut, Bolt and Fastener to be checked

Wheels:

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

Final Drive:

- Chain Adjuster Locknut
- Rear Sprocket Nuts

Brakes:

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

Suspension:

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

Steering:

- Steering Stem Head Nut
- Handlebar Clamp Bolts

Engine:

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

Others:

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

Fuel System (DFI)

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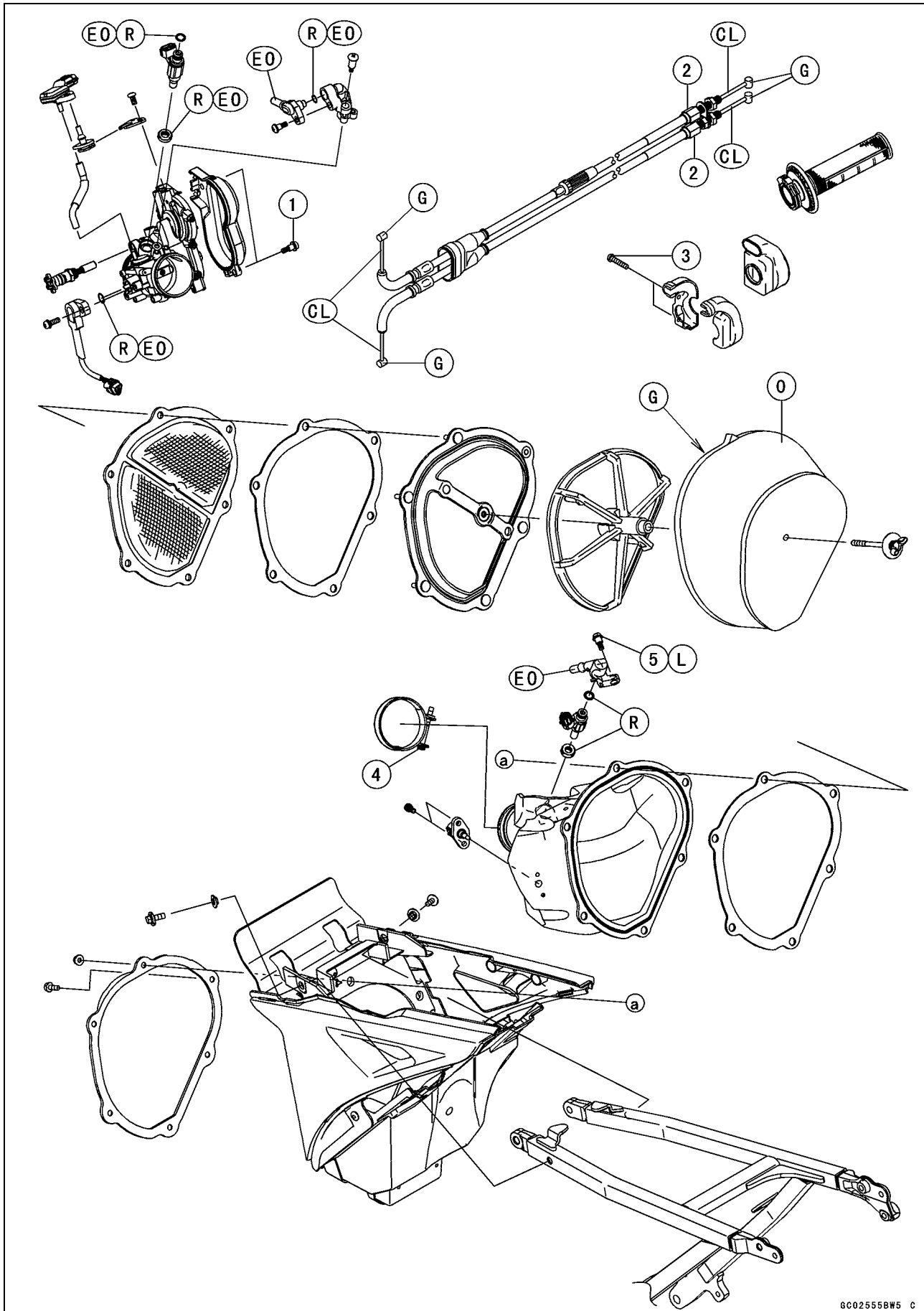
3-2 FUEL SYSTEM (DFI)

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3-4 FUEL SYSTEM (DFI)

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle Pulley Cover Bolts	3.4	0.35	30 in·lb	
2	Throttle Cable Bolts	3.0	0.31	27 in·lb	
3	Throttle Case Mounting Screws	3.8	0.39	34 in·lb	
4	Air Cleaner Duct Clamp Bolt	2.0	0.20	18 in·lb	
5	Delivery Joint Bolt	3.5	0.36	31 in·lb	L

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

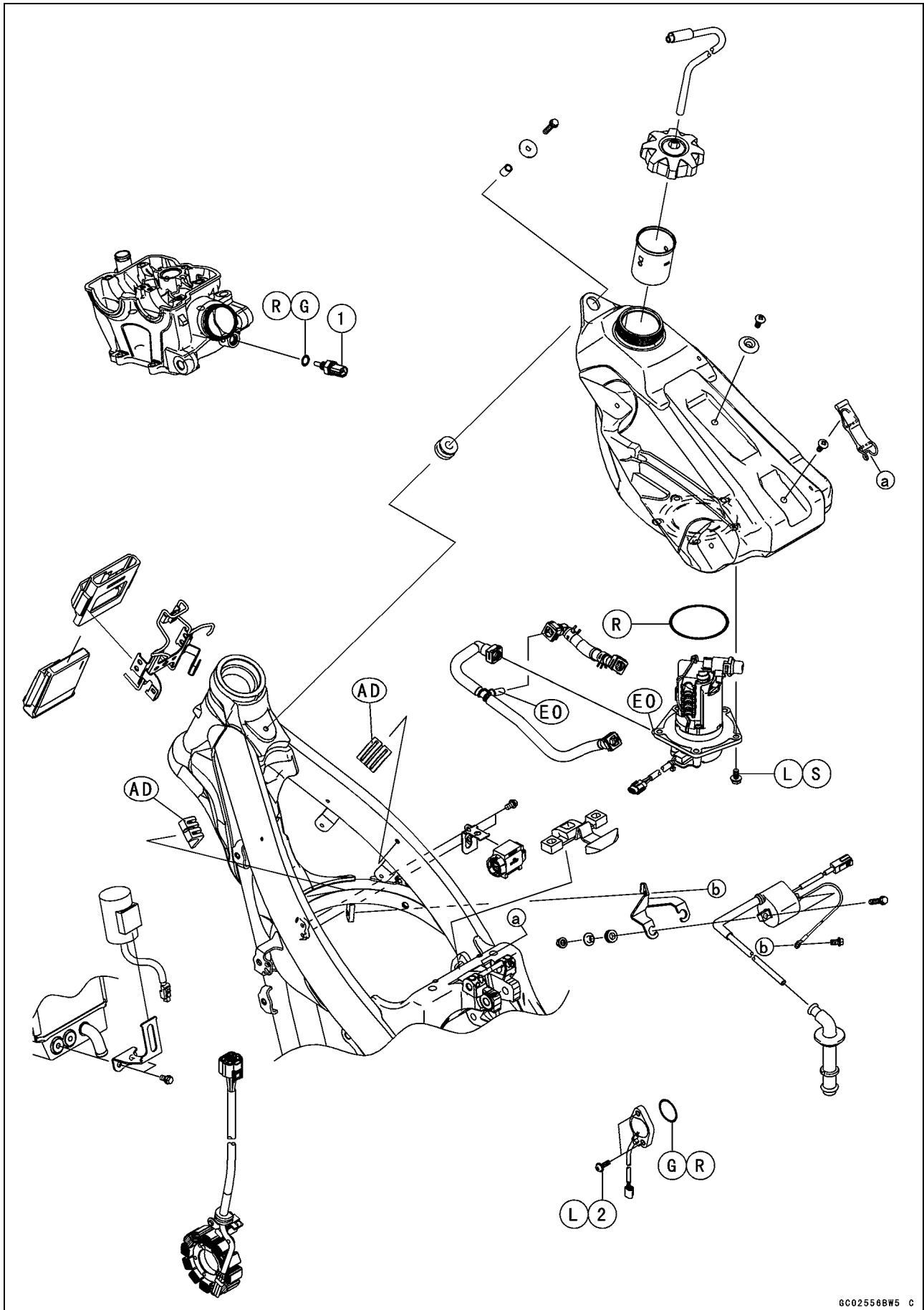
L: Apply a non-permanent locking agent.

O: Apply high-quality foam air filter oil.

R: Replacement Parts

3-6 FUEL SYSTEM (DFI)

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Water Temperature Sensor	12	1.2	106 in-lb	
2	Gear Position Switch Screws	2.9	0.30	26 in-lb	L

AD: Apply adhesive.

EO: Apply engine oil.

G: Apply grease.

S: Follow the specified tightening sequence.

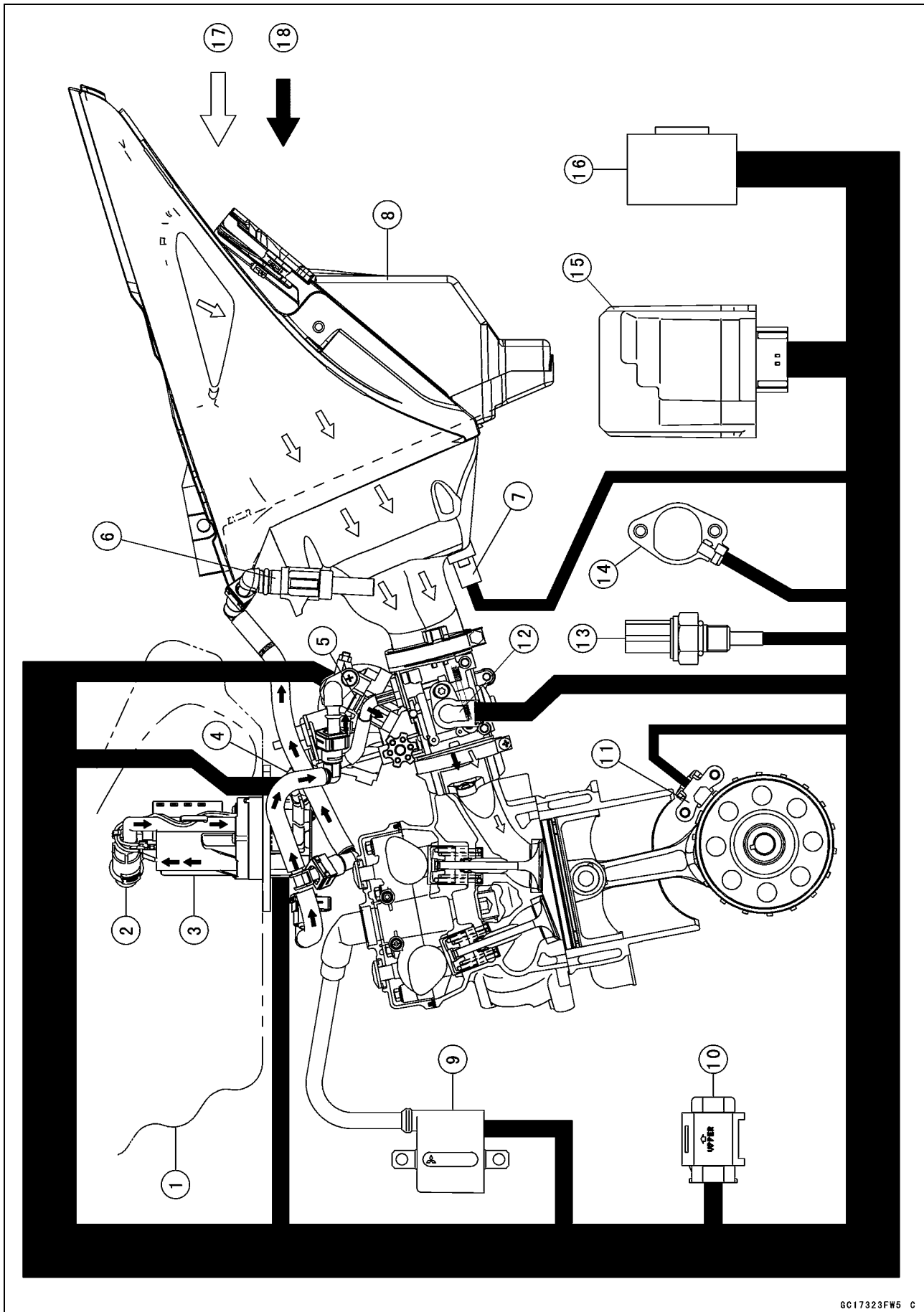
L: Apply a non-permanent locking agent.

R: Replacement Parts

3-8 FUEL SYSTEM (DFI)

DFI System

DFI System



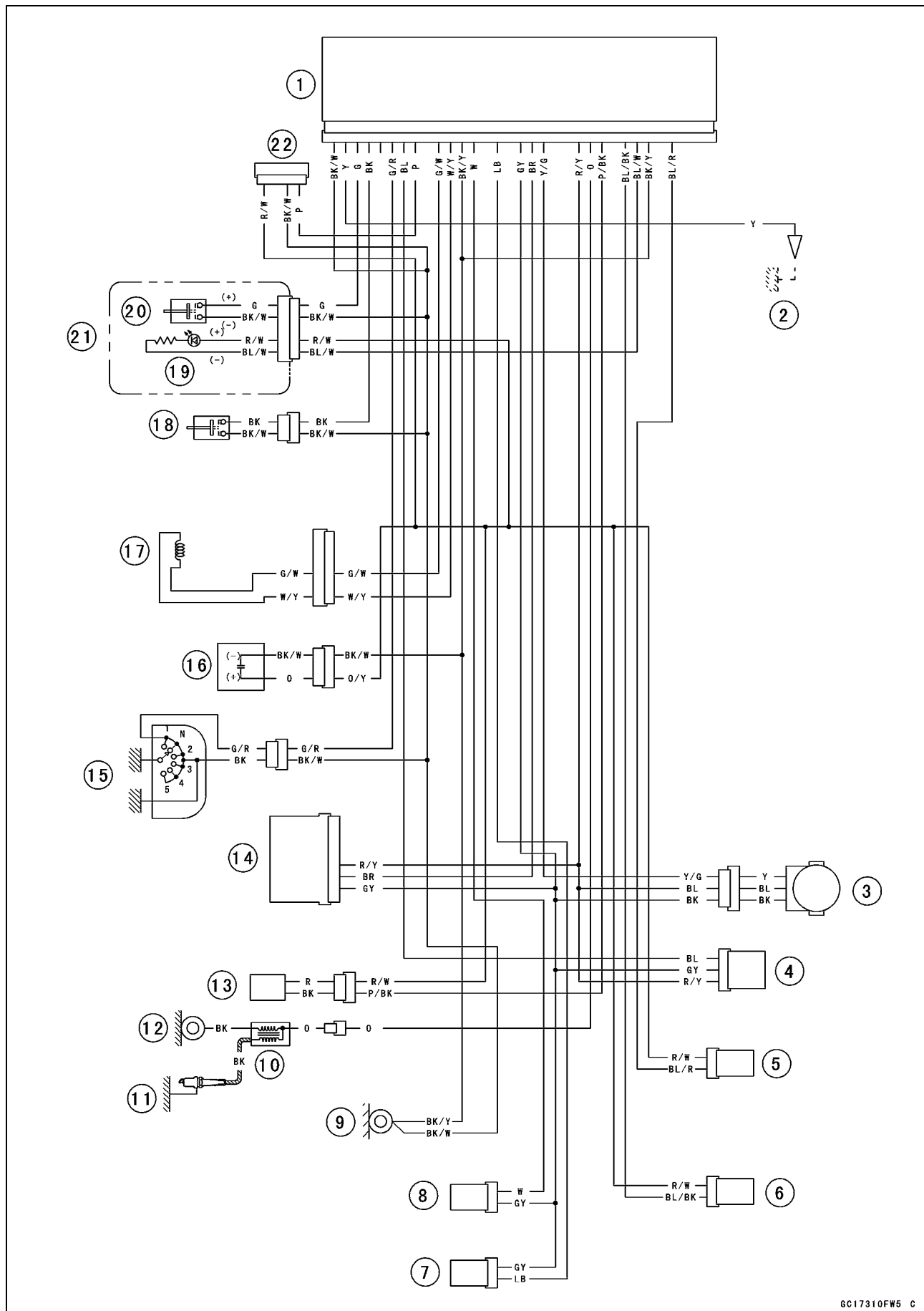
DFI System

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

3-10 FUEL SYSTEM (DFI)

DFI System

DFI System Wiring Diagram



DFI System

Part Names

1. ECU
2. Self-diagnosis Terminal
3. Throttle Sensor
4. Intake Air Pressure Sensor
5. Downstream Injector
6. Upstream Injector
7. Intake Air Temperature Sensor
8. Water Temperature Sensor
9. Frame Ground 1
10. Ignition Coil
11. Spark Plug
12. Frame Ground 2
13. Fuel Pump
14. Vehicle-down Sensor
15. Gear Position Switch
16. Capacitor
17. Crankshaft Sensor
18. Engine Stop Switch
19. Orange FI Warning Indicator Light (LED)
20. Not Used
21. FI Warning Indicator Light Assy (Option)
22. Kawasaki Diagnostic System Connector

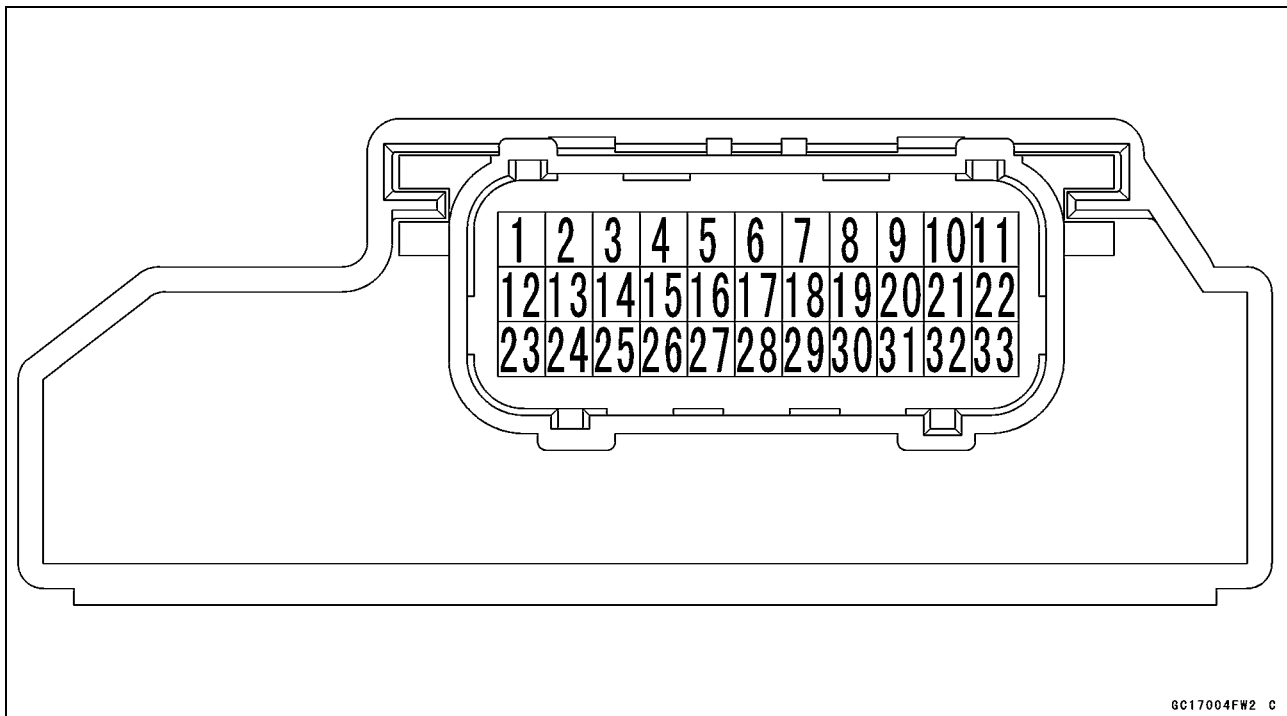
○Color Codes:

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

3-12 FUEL SYSTEM (DFI)

DFI System

Terminal Numbers of ECU Connectors

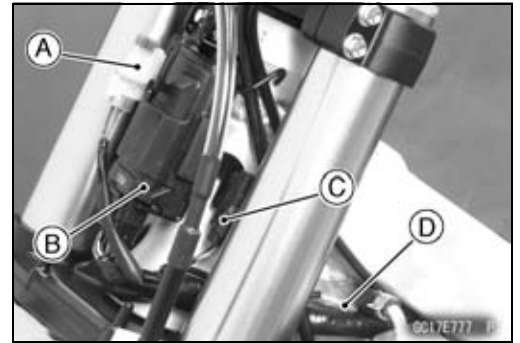


Terminal Names

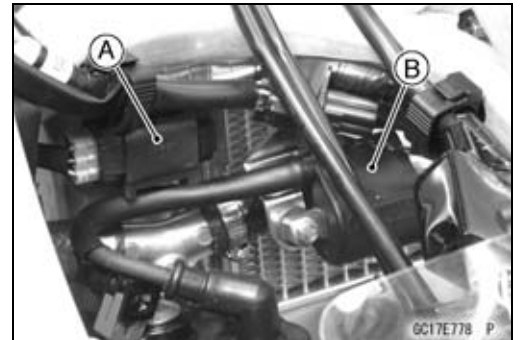
- | | |
|---------------------------------------|---|
| 1. Power Supply to ECU: R/W | 19. Intake Air Temperature Sensor: LB |
| 2. Unused | 20. Unused |
| 3. DFI Setting Data Selection 1: W/BL | 21. Water Temperature Sensor: W |
| 4. Downstream Injector: BL/R | 22. Ground for ECU: BK/Y |
| 5. Unused | 23. Crankshaft Sensor (-): W/Y |
| 6. Ground for ECU: BK/Y | 24. Crankshaft Sensor (+): G/W |
| 7. FI Warning Indicator Light: BL/W | 25. Unused |
| 8. Upstream Injector: BL/BK | 26. External Communication Line (*KDS): P |
| 9. Unused | 27. Intake Air Pressure Sensor: BL |
| 10. Fuel Pump: P/BK | 28. Gear Position Switch: G/R |
| 11. Ignition Coil: O | 29. DFI Setting Data Selection 2: W/R |
| 12. Power Supply to Sensors: R/Y | 30. Engine Stop Switch: BK |
| 13. External Communication Line: Y/R | 31. Unused |
| 14. External Communication Line: Y/BK | 32. Self-diagnosis Terminal: Y |
| 15. Throttle Sensor: Y/G | 33. Ground for Control System: BK/W |
| 16. Vehicle-down Sensor: BR | *: KDS (Kawasaki Diagnostic System) |
| 17. Ground for Sensors: GY | |
| 18. Unused | |

DFI Parts Location

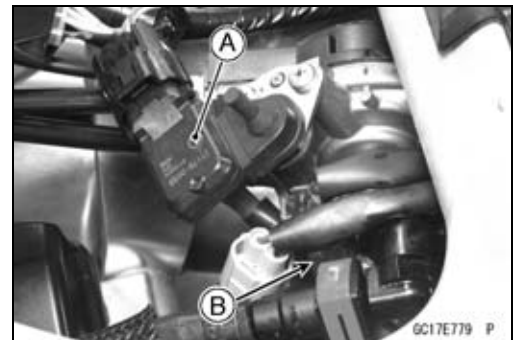
Kawasaki Diagnostic System Connector [A]
 ECU [B]
 FI Warning Indicator Light Harness Connector [C]
 Self-diagnosis Terminal [D]



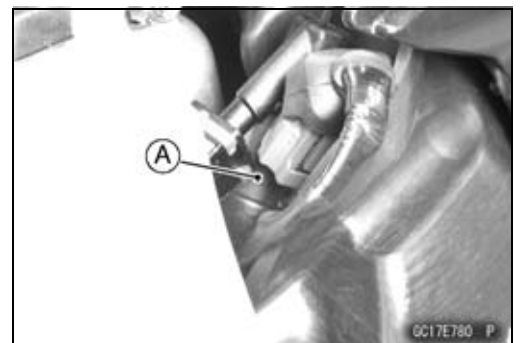
Vehicle-down Sensor [A]
 Ignition Coil [B]



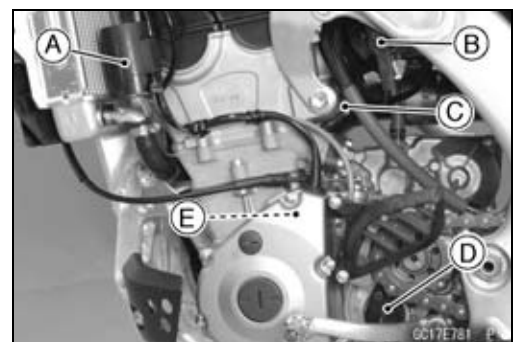
Intake Air Pressure Sensor [A]
 Downstream Injector [B]



Upstream Injector [A]



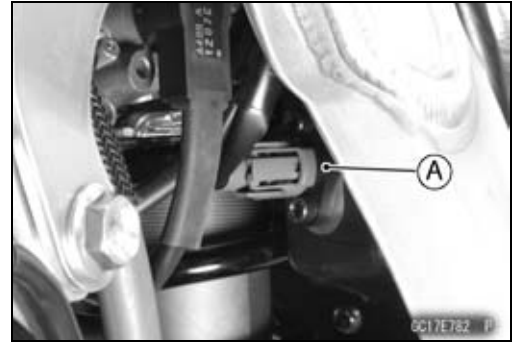
Capacitor [A]
 Throttle Sensor [B]
 Water Temperature Sensor [C]
 Gear Position Switch [D]
 Crankshaft Sensor [E]



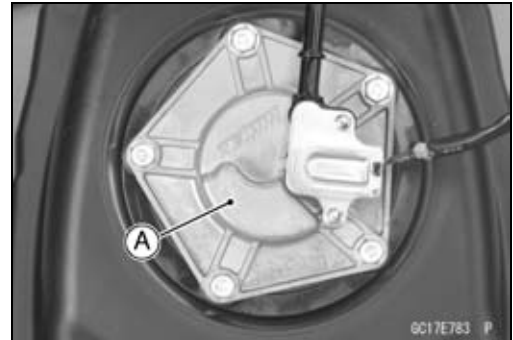
3-14 FUEL SYSTEM (DFI)

DFI Parts Location

Intake Air Temperature Sensor [A]



Fuel Pump [A]



Specifications

Item	Standard
Digital Fuel Injection System	
Idle Speed	2 050 ±50 r/min (rpm)
Throttle Body Assy:	
Throttle Valve	Single throttle valve
Bore	φ43 mm (1.69 in.)
ECU:	
Make	KEIHIN
Type	Digital memory type, with built in IC igniter, sealed with resin
Fuel Pressure	294 kPa (3.0 kgf/cm ² , 43 psi) with engine idling
Fuel Pump:	
Type	Wesco pump
Discharge	40 mL (1.4 US oz.) or more for 5 seconds
Dual Injectors:	
Downstream Injector:	
Type	EAT291
Nozzle Type	Fine atomizing type with 4 holes
Resistance	About 11.7 ~ 12.3 Ω at 20°C (68°F)
Upstream Injector:	
Type	EAT812
Nozzle Type	Fine atomizing type with 4 holes
Resistance	About 11.7 ~ 12.3 Ω at 20°C (68°F)
Throttle Sensor:	
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	DC 0.58 ~ 0.62 V at idle throttle opening
Resistance	DC 3.65 ~ 3.85 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 (see text for details)
Intake Air Temperature Sensor:	
Output Voltage	About DC 2.28 ~ 3.43 V at intake air temperature 20°C (68°F)
Resistance	909 ~ 1 363 Ω at 40°C (104°F)
Resistance	124 ~ 186 Ω at 100°C (212°F)
Water Temperature Sensor:	
Output Voltage	About DC 2.80 ~ 2.97 V at water temperature 20°C (68°F)
Resistance	see text
Gear Position Switch:	
Resistance	see text
Vehicle-down Sensor:	
Detection Angle	More than 55 ~ 75° for each bank
Input Voltage	DC 4.75 ~ 5.25 V
Output Voltage	With sensor tilted 55 ~ 75° or more right or left: DC 3.7 ~ 4.4 V
Output Voltage	With sensor arrow mark pointed up: DC 0.4 ~ 1.4 V

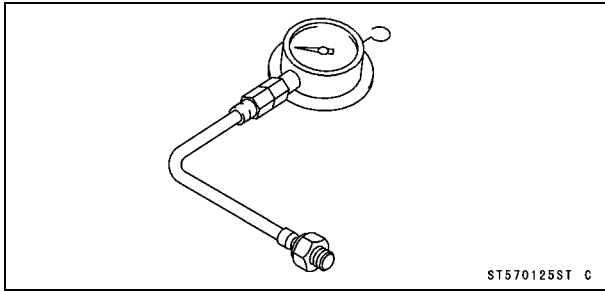
3-16 FUEL SYSTEM (DFI)

Specifications

Item	Standard
Throttle Grip and Cables Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)

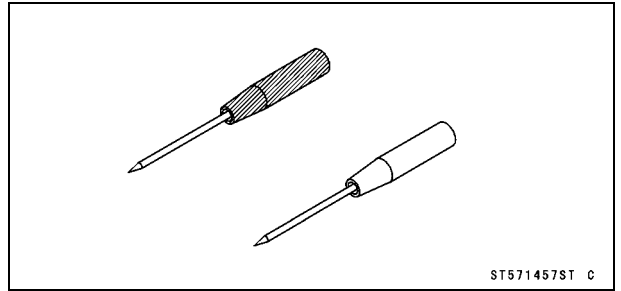
Special Tools and Sealant

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



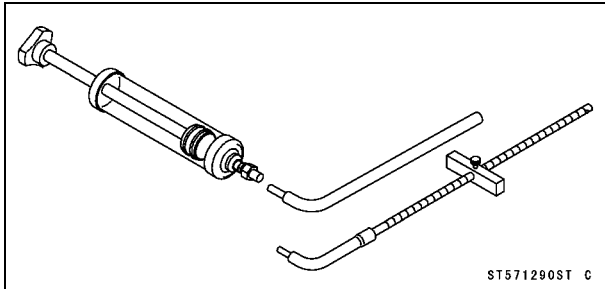
ST570125ST C

Needle Adapter Set:
57001-1457



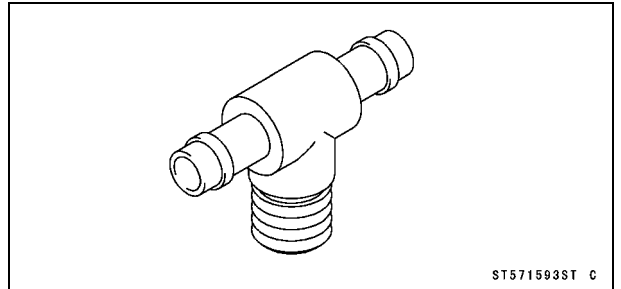
ST571457ST C

Fork Oil Level Gauge:
57001-1290



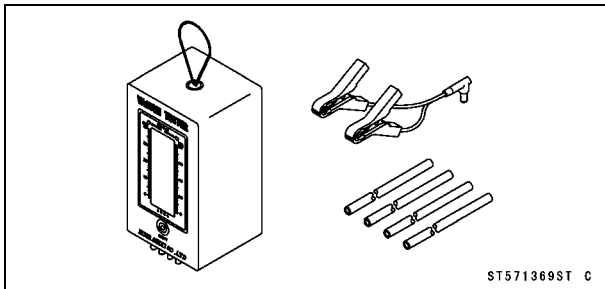
ST571290ST C

Fuel Pressure Gauge Adapter:
57001-1593



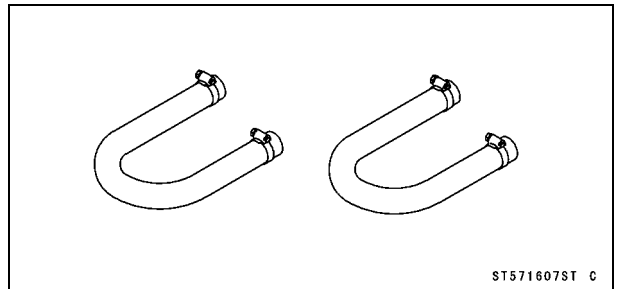
ST571593ST C

Vacuum Gauge:
57001-1369



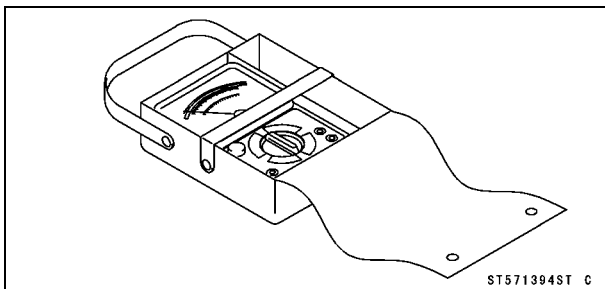
ST571369ST C

Fuel Hose:
57001-1607



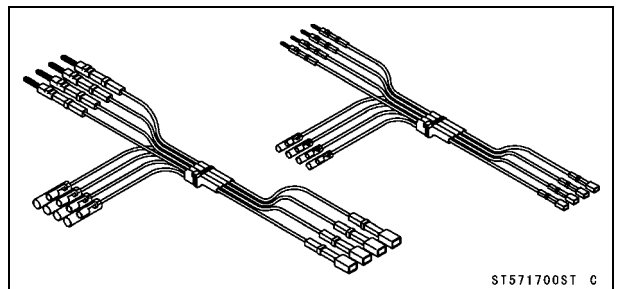
ST571607ST C

Hand Tester:
57001-1394



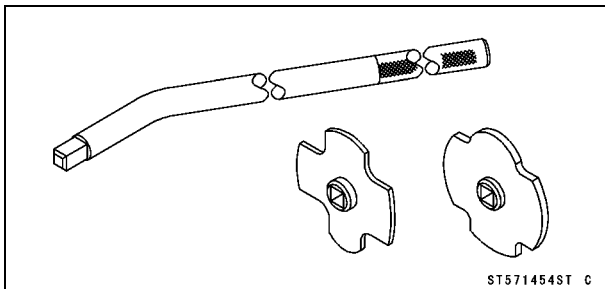
ST571394ST C

Measuring Adapter:
57001-1700



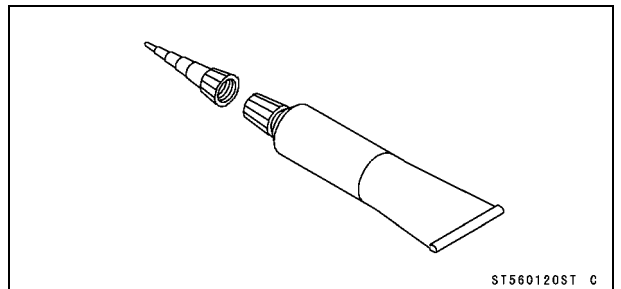
ST571700ST C

Filler Cap Driver:
57001-1454



ST571454ST C

Liquid Gasket, TB1211:
56019-120



ST560120ST C

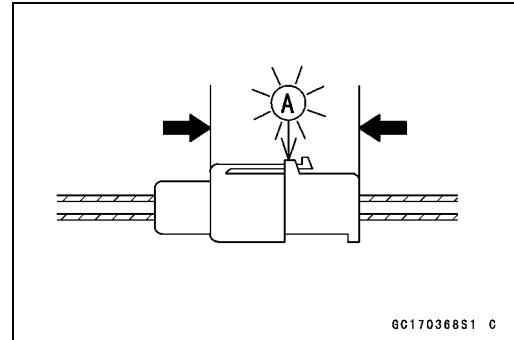
3-18 FUEL SYSTEM (DFI)

DFI Servicing Precautions

DFI Servicing Precautions

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

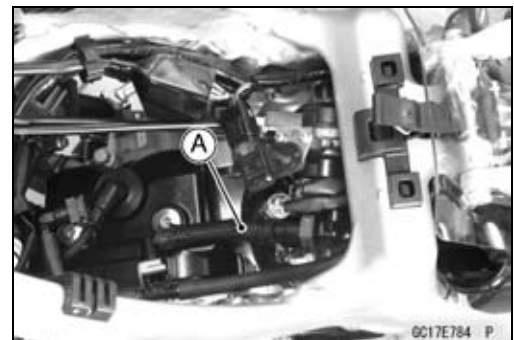
- Connect these connectors until they click [A].
- Never any of the DFI electrical connectors are disconnected. The ECU memorizes service codes.



- Do not spray water on the electrical parts, DFI parts, connectors, leads and wiring.
- When any fuel hose is disconnected, do not start the engine. The fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if it 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 to fuel.

○ 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 hoses [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.

Special Tool - Filler Cap Driver: 57001-1454

Torque - Oil Filler Plug: 3.5 N·m (0.36 kgf·m, 31 in·lb)



Troubleshooting the DFI System

Outline

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

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

● First, conduct a self-diagnosis inspection and then a non-self-diagnosis inspection. The non-self-diagnosis items are not indicated by the orange FI warning indicator light (LED). Don't rely solely on the DFI self-diagnosis function, use common sense.

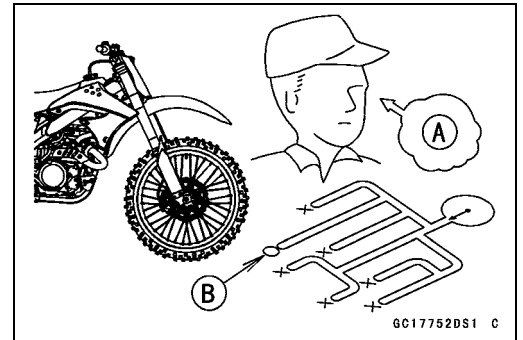
★ If the orange FI warning indicator light (LED) goes on by kicking the kick pedal about 10 times, these parts are broken.

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

When the orange FI warning indicator light (LED) goes on and the motorcycle is brought in for repair, check the service codes.

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

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.



3-20 FUEL SYSTEM (DFI)

Troubleshooting the DFI System

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

Special Tool - Needle Adapter Set: 57001-1457

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.
- Connect the power supply harness (option P/No. 26011-0246) and the battery to the capacitor lead connector, and measure the voltage with the connector joined.

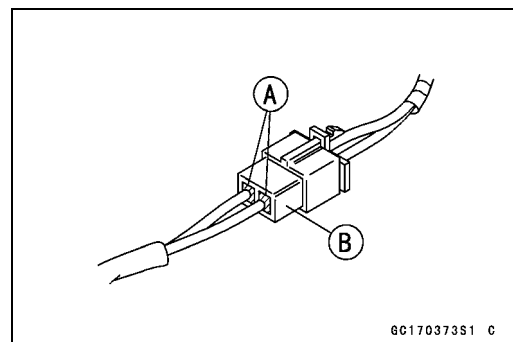
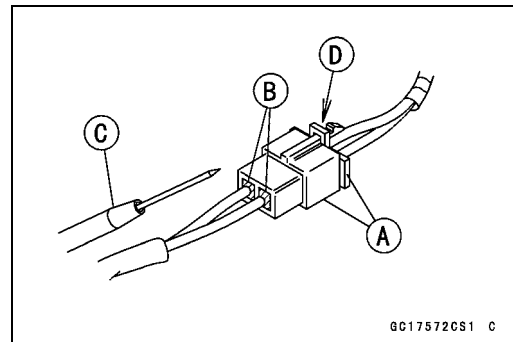
NOTICE

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

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

Sealant - Liquid Gasket, TB1211: 56019-120

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



Troubleshooting the DFI System

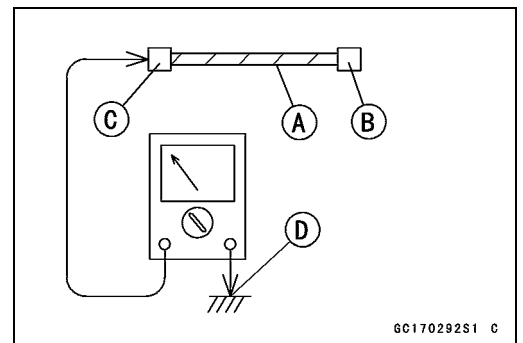
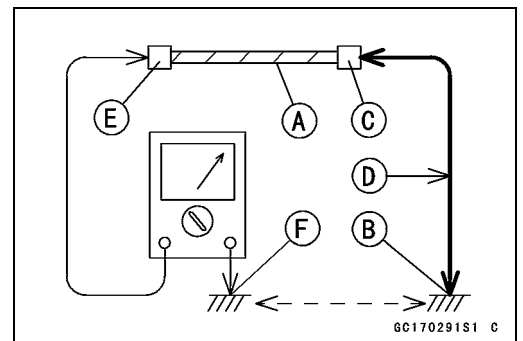
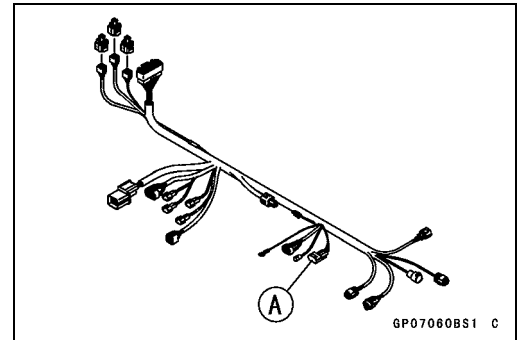
- Pull each connectors [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect them securely.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which is suspected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

Special Tool - Hand Tester: 57001-1394

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

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

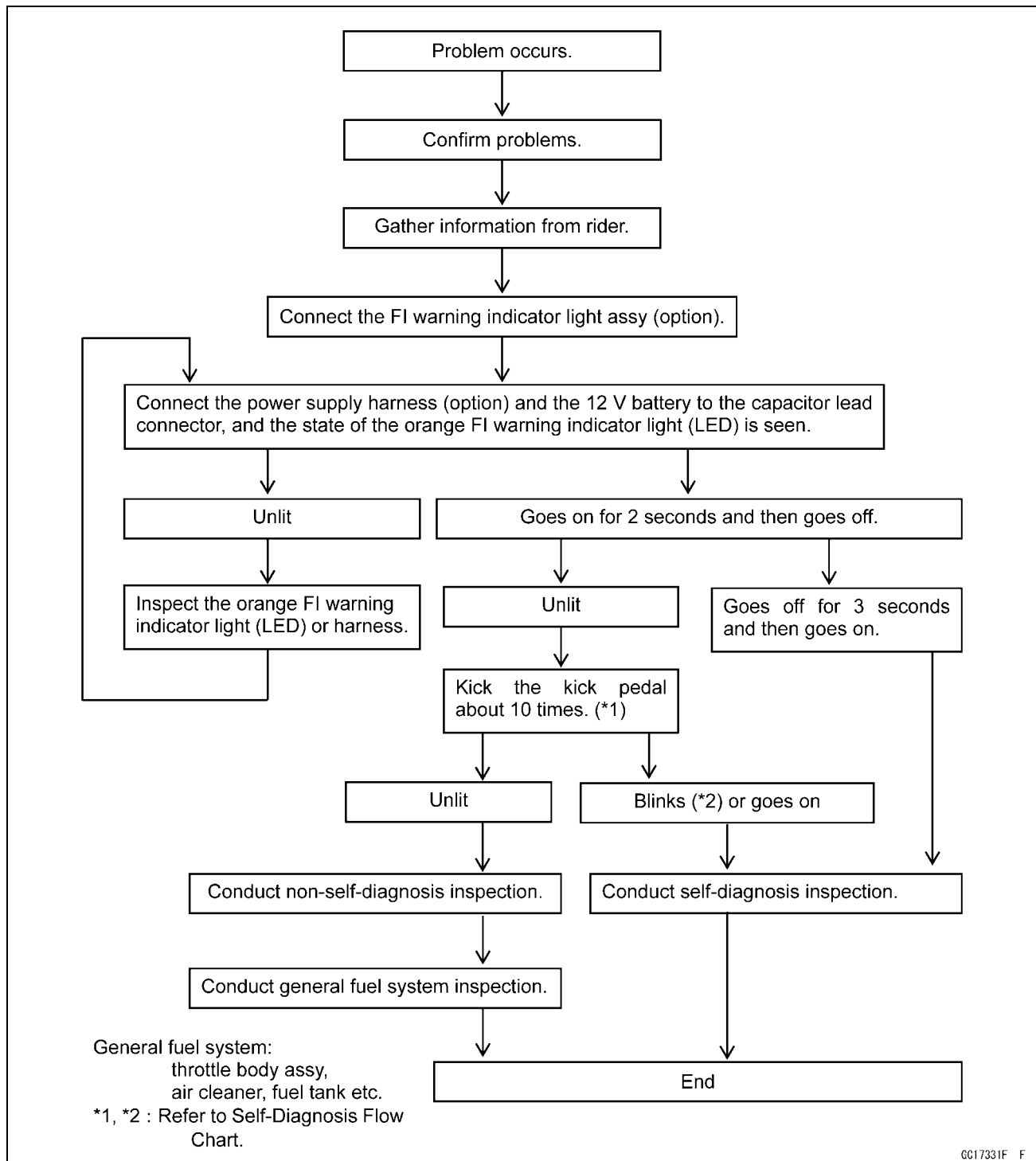
- Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.
- ★ If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.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



3-22 FUEL SYSTEM (DFI)

Troubleshooting the DFI System

DFI Diagnosis Flow Chart



Inquiries to Rider

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

Troubleshooting the DFI System

Sample Diagnosis Sheet

Rider name		Model	
Engine No.		Frame No.	
Date problem occurred			
Environment when problem occurred.			
Weather	<input type="checkbox"/> fine, <input type="checkbox"/> cloudy, <input type="checkbox"/> rain, <input type="checkbox"/> snow, <input type="checkbox"/> always, <input type="checkbox"/> other:		
Temperature	<input type="checkbox"/> hot, <input type="checkbox"/> warm, <input type="checkbox"/> cold, <input type="checkbox"/> very cold, <input type="checkbox"/> always		
Problem frequency	<input type="checkbox"/> chronic, <input type="checkbox"/> often, <input type="checkbox"/> once		
Altitude	<input type="checkbox"/> normal, <input type="checkbox"/> high (about 1 000 m or more)		
Motorcycle conditions when problem occurred.			
Orange FI warning indicator light (LED) (Option)	<input type="checkbox"/> lights up immediately after starting the engine, and goes off after 2 seconds (with engine running) (normal).		
	<input type="checkbox"/> lights up for 2 seconds immediately after starting the engine, and goes off for 3 seconds, and then keeps going on. (with engine running) (DFI problem)		
	<input type="checkbox"/> unlights (light, ECU or its wiring fault).		
	<input type="checkbox"/> sometimes lights up (probably wiring fault).		
Starting difficulty	<input type="checkbox"/> no cranking.		<input type="checkbox"/> no spark.
	<input type="checkbox"/> no fuel flow (<input type="checkbox"/> no fuel in tank, <input type="checkbox"/> no fuel pump sound).		
	<input type="checkbox"/> engine flooded (do not crank engine with throttle opened, which promotes engine flooding).		
	<input type="checkbox"/> other:		
Engine stops	<input type="checkbox"/> right after starting.		<input type="checkbox"/> when moving off.
	<input type="checkbox"/> when opening throttle grip.		<input type="checkbox"/> when stopping the motorcycle.
	<input type="checkbox"/> when closing throttle grip.		<input type="checkbox"/> when cruising.
	<input type="checkbox"/> other:		
Poor running at low speed	<input type="checkbox"/> very low fast idle speed.		
	<input type="checkbox"/> very low idle speed, <input type="checkbox"/> very high idle speed, <input type="checkbox"/> rough idle speed.		
	<input type="checkbox"/> spark plug loose (tighten it).		
	<input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (adjust it).		
	<input type="checkbox"/> backfiring.		<input type="checkbox"/> afterfiring.
	<input type="checkbox"/> hesitation when acceleration.		<input type="checkbox"/> engine oil viscosity too high.
	<input type="checkbox"/> brake dragging.		<input type="checkbox"/> clutch slipping.
	<input type="checkbox"/> engine overheating.		
Poor running or no power at high speed	<input type="checkbox"/> spark plug loose (tighten it).		<input type="checkbox"/> spark plug incorrect (replace it).
	<input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (remedy it).		
	<input type="checkbox"/> knocking (fuel poor quality or incorrect).		<input type="checkbox"/> engine overheating.
	<input type="checkbox"/> brake dragging.		<input type="checkbox"/> engine oil level too high.
	<input type="checkbox"/> clutch slipping.		<input type="checkbox"/> engine oil viscosity too high.
	<input type="checkbox"/> other:		

3-24 FUEL SYSTEM (DFI)

DFI System Troubleshooting Guide

NOTE

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

Engine Won't Turn Over

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

Poor Running at Low Speed

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

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DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
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).
Upstream/downstream 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).
Throttle sensor 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).
After fire:	
Spark plug burned or gap maladjusted	Replace (see chapter 16).
Upstream/downstream 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).

Poor Running or No Power at High Speed

Symptoms or Possible Causes	Actions (chapter)
Firing incorrect:	
Ignition coil shorted or not in good contact	Inspect or Reinstall (see chapter 16).
Ignition coil trouble	Inspect (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Inspect and replace (see chapter 2).
Spark plug incorrect	Replace it with correct plug (see chapter 2).
ECU trouble	Inspect (see chapter 3, 16).
Fuel/air mixture incorrect:	
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 3).
Air cleaner housing loose	Reinstall (see chapter 3).
Throttle body assy holder loose	Reinstall (see chapter 3).
Upstream/downstream injector dust seal damage	Replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Upstream/downstream injector O-ring damage	Replace (see chapter 3).
Upstream/downstream injector clogged	Inspect and repair (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pump 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).
Throttle sensor 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 correct plug (see chapter 2).
Ignition coil trouble	Inspect (see chapter 16).
ECU trouble	Inspect (see chapter 3, 16).
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:	
Throttle valve will not fully open	Inspect throttle cables and lever linkage (see chapter 3).
Engine overheating - Water temperature sensor or crankshaft sensor trouble	(see Overheating of Troubleshooting Guide in chapter 17)
Exhaust Smokes Excessively:	
(Black smokes)	
Air cleaner element clogged	Clean element (see chapter 3).
Fuel pressure too high	Inspect (see chapter 3).
Upstream/downstream 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 cleaner housing 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).

3-28 FUEL SYSTEM (DFI)

Self-Diagnosis

Self-diagnosis Outline

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

User Mode

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

Dealer Mode 1

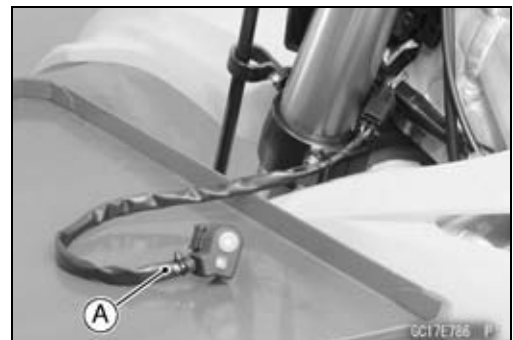
The orange FI warning indicator light (LED) emits service code(s) to show the problem(s) which the DFI system, and ignition system has at the moment of diagnosis.

Dealer Mode 2

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

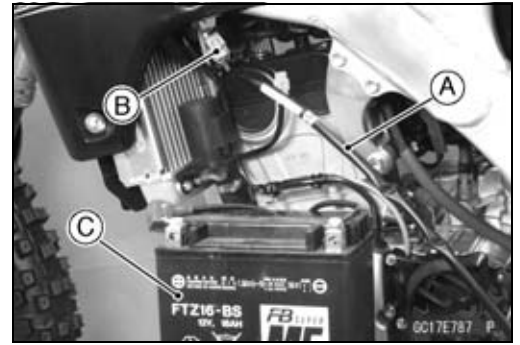
Self-diagnosis Procedures

- Disconnect the connector [A].
- Connect the FI warning indicator light assy (option) [A].
- Disconnect the capacitor lead connector [A].



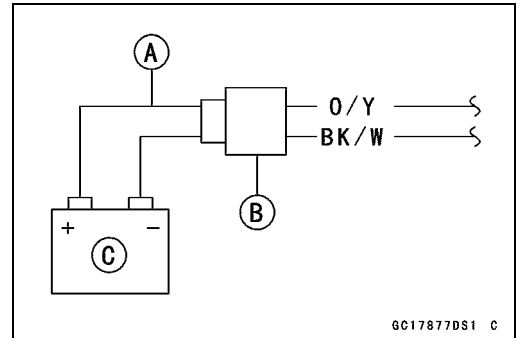
Self-Diagnosis

- Connect the power supply harness (option P/No. 26011-0246) [A] to the capacitor lead connector [B] of the main harness.
- Connect the power supply harness (option P/No. 26011-0246) to the 12 V battery [C].
- The orange FI warning indicator light (LED) will go on for 2 seconds for bulb inspection when the ECU activates.
- ★ If the orange FI warning indicator light (LED) does not go on, inspect the harness or replace the FI warning indicator light assy.



NOTE

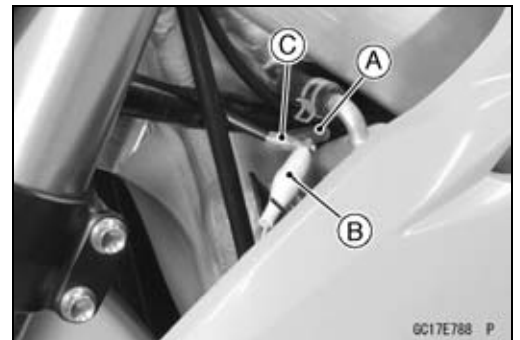
○ Use a fully charged battery when conducting self-diagnosis. Otherwise, the light blinks very slowly or doesn't blink.



- Disconnect the self-diagnosis connector [A] and connect an auxiliary lead [B] for grounding to the self-diagnosis terminal [C].

NOTE

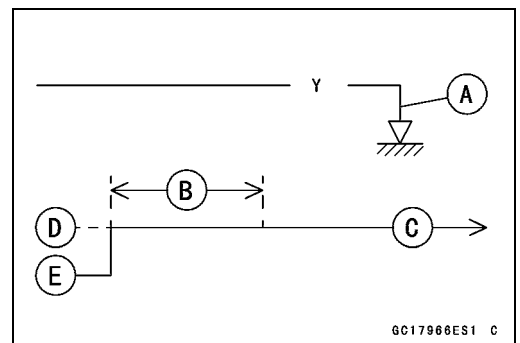
○ Keep the self-diagnosis terminal grounded during self-diagnosis.



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

Ground [D]
Open [E]

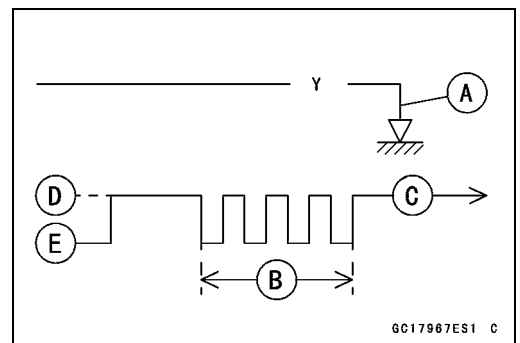
- Count the blinks of the light to read the service code.
- Keep the lead ground until you finish reading the service code.



- To enter the self-diagnosis dealer mode 2, ground the self-diagnosis terminal [A] and open it, and then ground the self-diagnosis terminal more than 3 times within 3 seconds [B], and then keep it grounded continuously [C].

Ground [D]
Open [E]

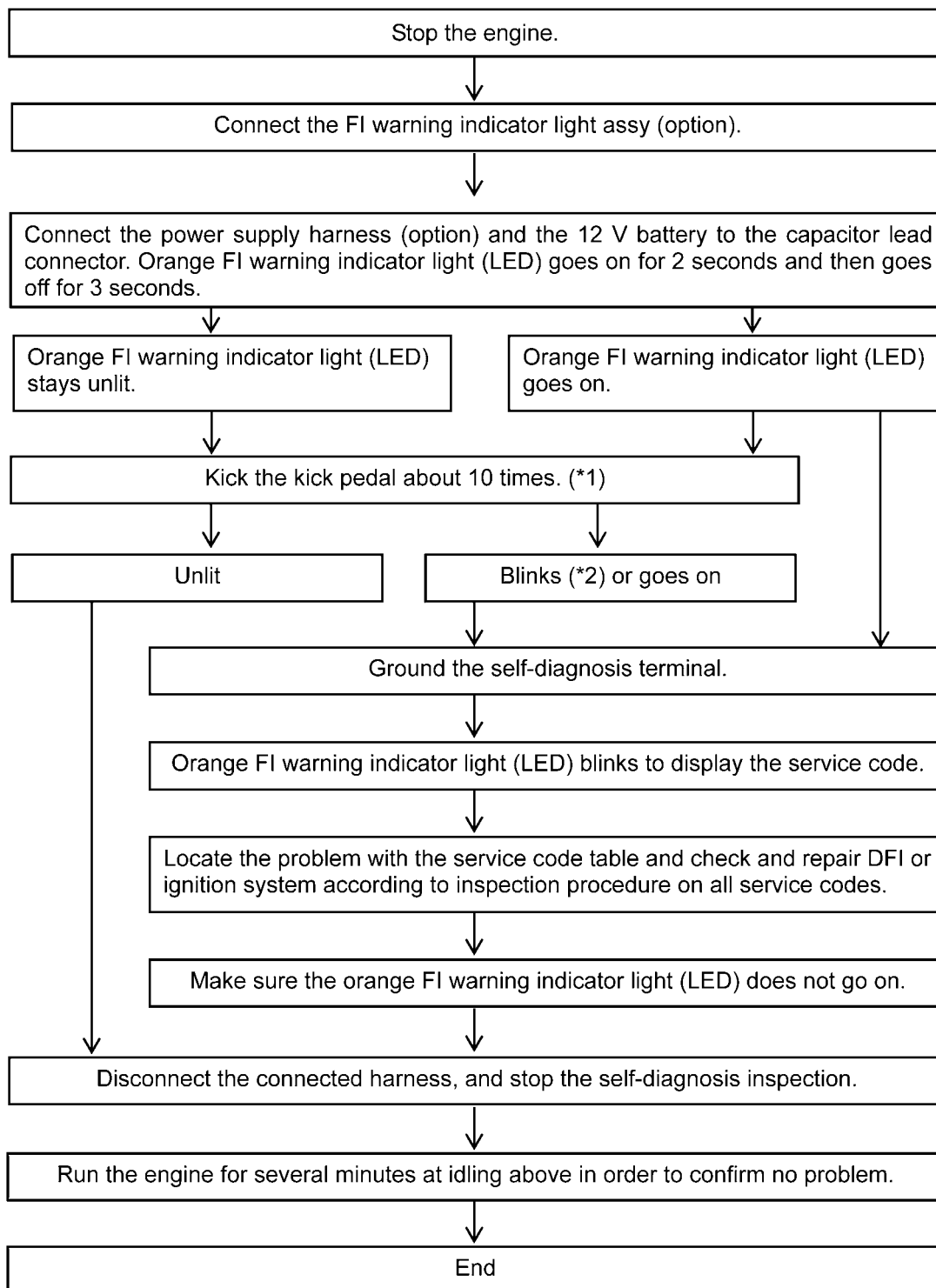
- Count the blinks of the light to read the service code.
- Keep the lead ground until you finish reading the service code.



3-30 FUEL SYSTEM (DFI)

Self-Diagnosis

Self-Diagnosis Flow Chart



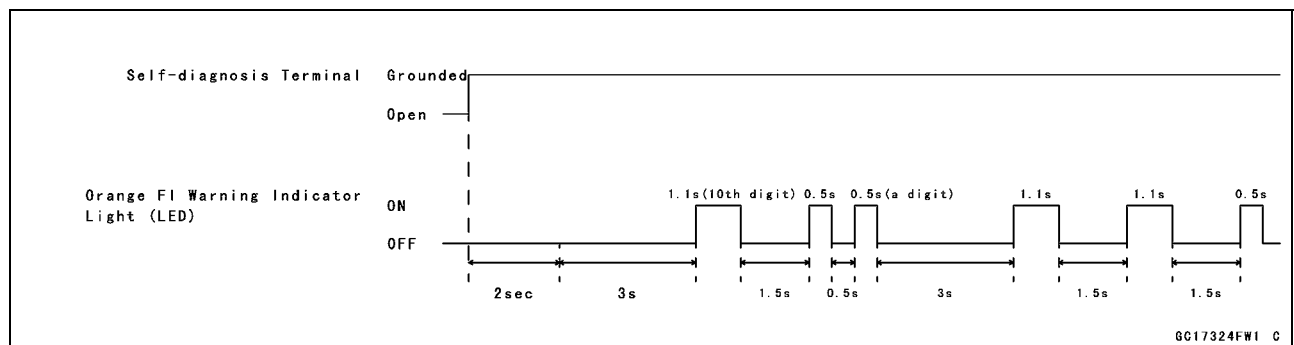
*1: When the engine is rotated, there are parts (crankshaft sensor, upstream/downstream injector and ignition coil) by which ECU recognizes the fault. Kick for that.

*2: The blink (0.16 seconds cycle) is warning of impossible starting. The warning of impossible starting displays when connecting the battery and kicked. The starting becomes impossible when the crankshaft sensor, upstream/downstream injector, ignition coil, fuel pump and vehicle-down sensor are fault.

Self-Diagnosis

How to Read Service Codes

- Service codes are shown by a series of long and short blinks of the orange FI warning indicator light (LED) as shown below.
- Read 10th digit and unit digit as the orange FI warning indicator light (LED) blinks.
- When there are a number of problems, all the service codes can be stored and the display will begin starting from the lowest number service code in the numerical order. Then after completing all codes, the display is repeated until the self-diagnosis terminal is open. When the self-diagnosis terminal is opened, the orange FI warning indicator light (LED) will go on in one second.
- If there is no problem no code and the orange FI warning indicator light (LED) blinks with cycle of 0.5 seconds.
- For example, if two problems occurred in the order of 21, 12, the service codes are displayed from the lowest number in the order listed.
(12 → 21) → (12 → 21) → . . . (repeated)



- If the problem is with the following parts, the ECU cannot memorize these problems, the orange FI warning indicator light (LED) doesn't go on, and no service codes can be displayed.
ECU Power Source Wiring and Ground Wiring (see ECU Power Supply Inspection)








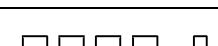
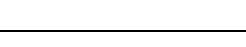
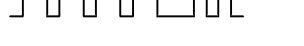

How to Erase Service Codes

- Even if the battery or the ECU are disconnected, or the problem is solved, all service codes remain in the ECU.
- In this model, the problem history cannot be erased. However, the past service code can be erased using the KDS 3 version kit.

3-32 FUEL SYSTEM (DFI)

Self-Diagnosis

Service Code Table

Service Codes	Orange FI Warning Indicator Light (LED)	Problems
11	 ON OFF	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
25		Gear position switch malfunction, wiring open or short
31		Vehicle-down sensor, malfunction, wiring open or short
41		Downstream injector malfunction, wiring open or short
42		Upstream injector malfunction, wiring open or short
46		Fuel pump malfunction, wiring open or short
51		Ignition coil malfunction, wiring open or short

Notes:

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

Self-Diagnosis

Backups

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Throttle Sensor	Throttle Sensor Output Voltage 0.58 ~ 3.85 V	If the throttle sensor system fails (the signal is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method (1). Also, the 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.
12	Intake Air Pressure Sensor	Intake Air Pressure (Absolute) Pv = 20 ~ 106.7 kPa	If the intake air pressure sensor system fails (the signal Pv is out of the usable range, wiring short or open), the ECU sets the DFI in the α -N method. Conduct ignition and injection operations whenever crank rotates by 360 degrees.
13	Intake Air Temperature Sensor	Intake Air Temperature -30 ~ +120°C	ECU sets Ta at 26°C.
14	Water Temperature Sensor	Water Temperature -30 ~ +120°C	ECU sets Tw at 80°C.
21	Crankshaft Sensor	Crankshaft sensor must send 18 signals (output signal) to the ECU at the one cranking.	If crankshaft sensor generates other than 18 signals, the engine stops by itself.
25	Gear Position Switch	Gear Position Switch 0.469 ~ 4.727 V	If the gear position switch fails, set the low gear position.
31	Vehicle-down Sensor	Vehicle-down Sensor Output Voltage 0.4 ~ 4.4 V	If the vehicle-down sensor system has failures, the ECU shuts off the fuel system and the ignition system. ECU does not backup.
41	Downstream Injector	In succession pulse is output from ECU.	If the downstream injector break down, wiring short or open, the ECU stops the signal output to both injectors and the fuel delivery is stopped.
42	Upstream Injector	In succession pulse is output from ECU.	If the upstream injector break down, wiring short or open, the ECU stops the signal output to both injectors and the fuel delivery is stopped.
46	Fuel Pump	Supply Voltage 6 ~ 15 V	If the pump fails, wiring short or open, the ECU stops the pump operations.
51	Ignition Coil	ECU sends signals (output voltage) continuously to the ignition coil.	If the ignition coil fails, the ECU shuts off the signal to the ignition coil.

3-34 FUEL SYSTEM (DFI)

Self-Diagnosis

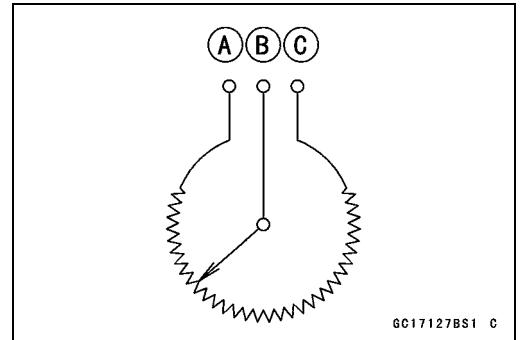
Note:

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

Throttle Sensor (Service Code 11)

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

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



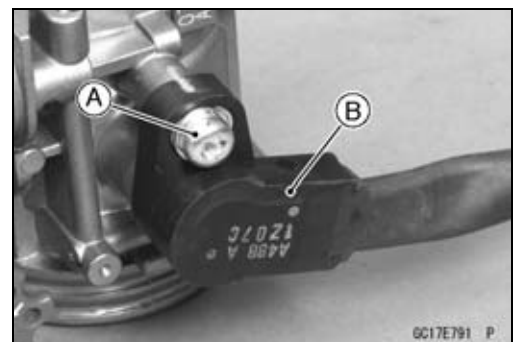
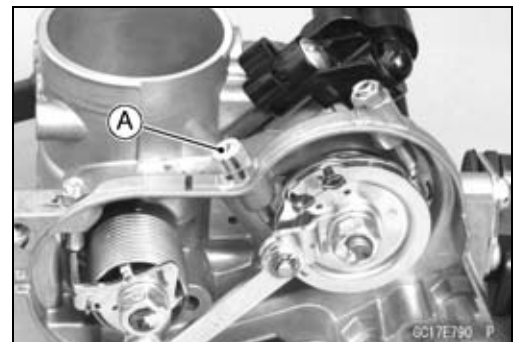
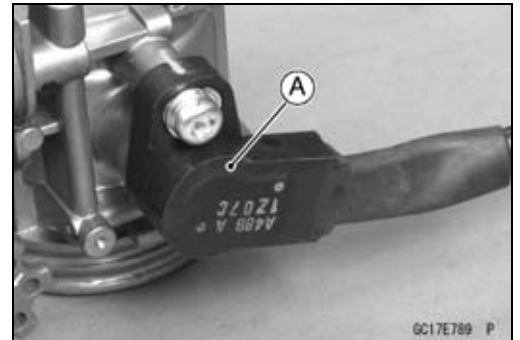
Throttle Sensor Replacement

NOTICE

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

NOTE

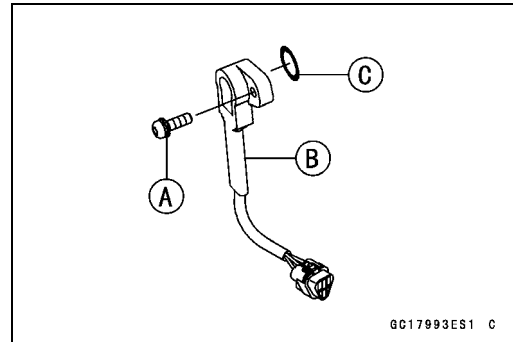
- These procedures are explained on the assumption that the intake and exhaust systems of the engine are in good condition.
- When adjusting the throttle sensor, use a digital voltage meter which can be read the third decimal place. The DC voltage accuracy must be less than $\pm 0.05\%$ reading and ± 4 digits at DC 1 V.
- Read the manufacture's instructions thoroughly before using the meter, incorrect values may cause improper adjustments.
- Remove the throttle body assy (see Throttle Body Assy Removal).
- Check the paint on the stop screw [A] and make sure that the stop screw has not been adjusted. If stop screw has been adjusted, throttle body assy has to be replaced. Don't tamper with stop screw.
- Remove:
 - Throttle Sensor Screw [A]
 - Throttle Sensor [B]



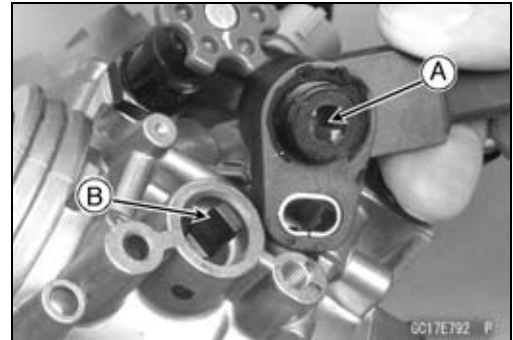
3-36 FUEL SYSTEM (DFI)

Throttle Sensor (Service Code 11)

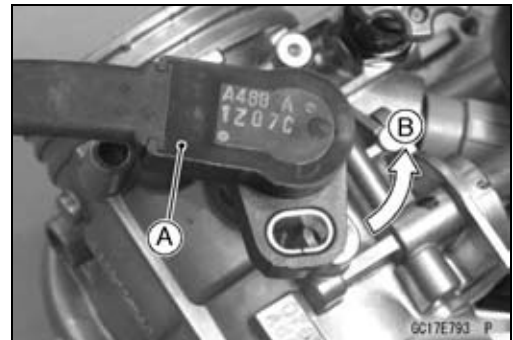
- Replace:
 - Throttle Sensor Screw [A]
 - Throttle Sensor [B]
 - O-ring [C]
- Apply engine oil to the new O-ring, and install it to the new throttle sensor.



- Engage the inner rotor groove [A] with the throttle shaft [B].



- Insert the throttle sensor [A] into the throttle body.
- Set the throttle sensor to the throttle body assy.
- Turn the throttle sensor counterclockwise [B] until the mounting holes align.
- Tighten the throttle sensor screw lightly.



- Connect the measuring adapter [A] between the main harness [B] and throttle sensor [C].

Special Tool - Measuring Adapter: 57001-1700

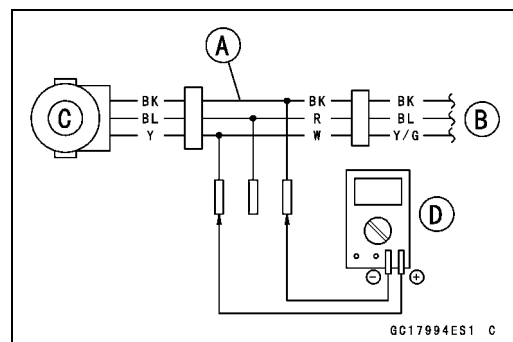
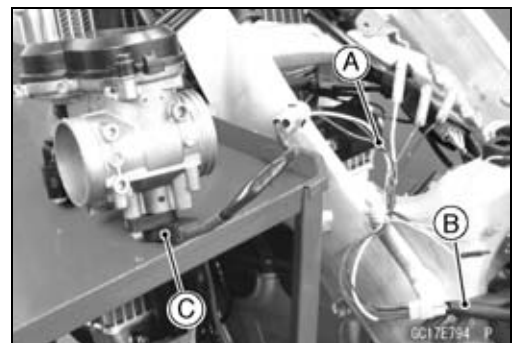
- Connect a digital meter [D] to the measuring adapter leads.

Throttle Sensor Output Voltage

Connections to Adapter:

Digital Meter (+) → W (sensor Y) lead

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



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.

Throttle Sensor (Service Code 11)

- Adjust the sensor position so that the output voltage is within the specified voltage range.

Throttle Sensor Output Voltage

Standard: DC 0.58 ~ 0.62 V

- ★ If the input voltage reading shows other than 5 V, calculate a valid output voltage range as follows:

Example:

In the case of an input voltage of 4.75 V

$$0.58 \times 4.75 \div 5.00 = 0.55 \text{ V}$$

$$0.62 \times 4.75 \div 5.00 = 0.59 \text{ V}$$

Thus, the valid range is 0.55 ~ 0.59 V.

- Once the sensor is properly adjusted, tighten the throttle sensor screw.

NOTE

○ Take care not to vary the output voltage when tightening the throttle sensor screw.

- Turn the throttle from closed to full open more than 2 times, and measure the output voltage.
- ★ If the output voltage is not within the specified range, readjust the sensor.
- Install the throttle body assy (see Throttle Body Assy Installation).

Throttle Sensor Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Remove:
 - Rear Frame with Air Cleaner Housing (see Rear Frame Removal in the Frame chapter)
- Disconnect the throttle sensor connector and connect the measuring adapter [A] between these connectors.
 - Main Harness [B]
 - Throttle Sensor [C]

Special Tool - Measuring Adapter: 57001-1700

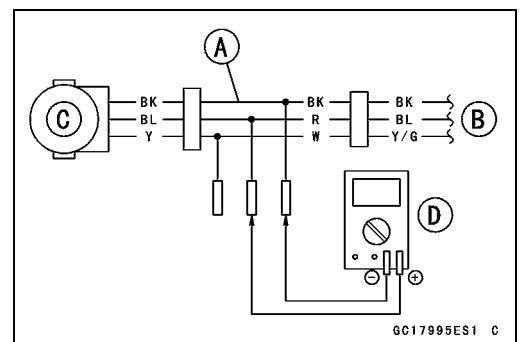
- Connect a digital meter [D] to the measuring adapter leads.

Throttle Sensor Input Voltage

Connections to Adapter:

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

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



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.

3-38 FUEL SYSTEM (DFI)

Throttle Sensor (Service Code 11)

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

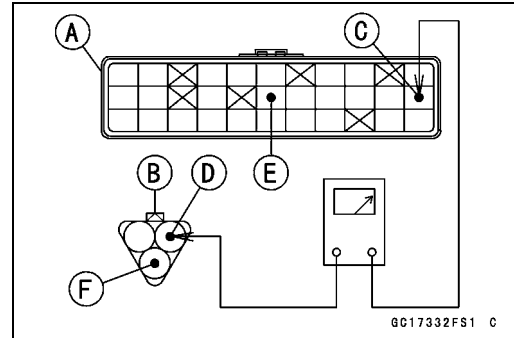
ECU Connector [A] ↔

Throttle Sensor Connector [B]

R/Y lead [C] (ECU terminal 12) ↔ BL lead [D]

GY lead [E] (ECU terminal 17) ↔ BK lead [F]

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



Throttle Sensor Output Voltage Inspection

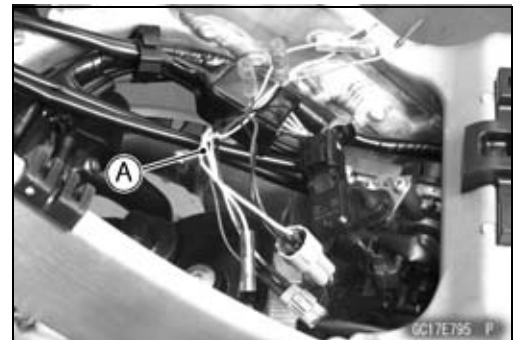
- Measure the throttle sensor output voltage in the same way as input voltage inspection.
- Disconnect the throttle sensor connector and connect the measuring adapter [A] between these connectors.

Main Harness [B]

Throttle Sensor [C]

Digital Meter [D]

Special Tool - Measuring Adapter: 57001-1700



Throttle Sensor Output Voltage

Connections to Adapter:

Digital Meter (+) → W (sensor Y) lead

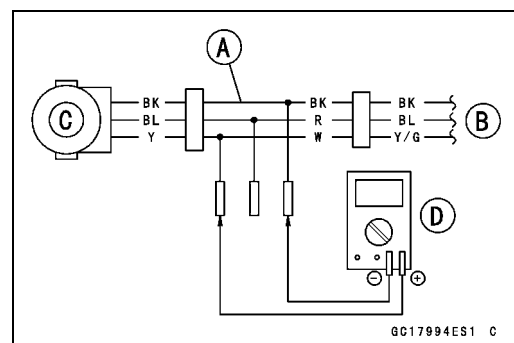
Digital Meter (-) → BK (sensor BK) lead

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

Idle Speed

Standard: 2 050 ±50 r/min (rpm)

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



Throttle Sensor (Service Code 11)

- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the output voltage with the engine stopped, and with the connector joined.

Output Voltage

Standard: DC 0.58 ~ 0.62 V at idle throttle opening

DC 3.65 ~ 3.85 V at full throttle opening (for reference)

NOTE

- Open the throttle, confirm the output voltage will be rise.
- 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.

$$0.58 \times 4.75 \div 5.00 = 0.55 \text{ V}$$

$$0.62 \times 4.75 \div 5.00 = 0.59 \text{ V}$$

Thus, the valid range is 0.55 ~ 0.59 V

- Disconnect the power supply harness.
- ★ If the reading is out of the standard, check the throttle sensor resistance (see Throttle Sensor Resistance Inspection).
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between the main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

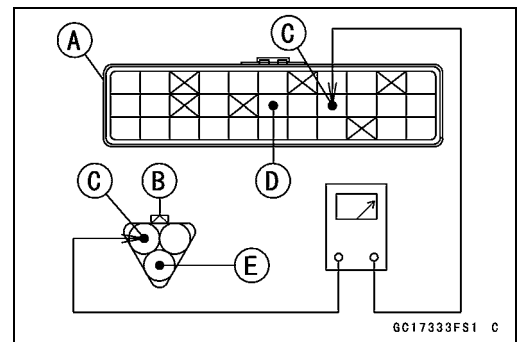
ECU Connector [A] ↔

Throttle Sensor Connector [B]

Y/G lead [C] (ECU terminal 15)

GY lead [D] (ECU terminal 17) ↔ BK lead [E]

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



3-40 FUEL SYSTEM (DFI)

Throttle Sensor (Service Code 11)

Throttle Sensor Resistance Inspection

- Disconnect the throttle sensor connector.
- Connect a digital meter [A] to the throttle sensor connector [B].
- Measure the throttle sensor resistance.

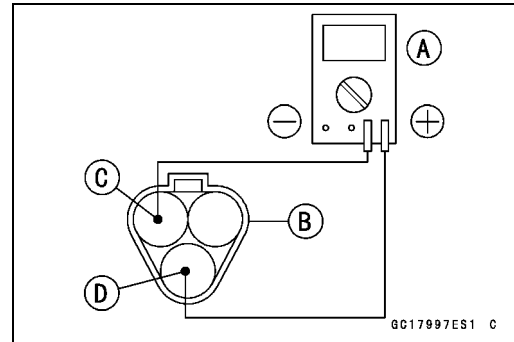
Throttle Sensor Resistance

Connections:

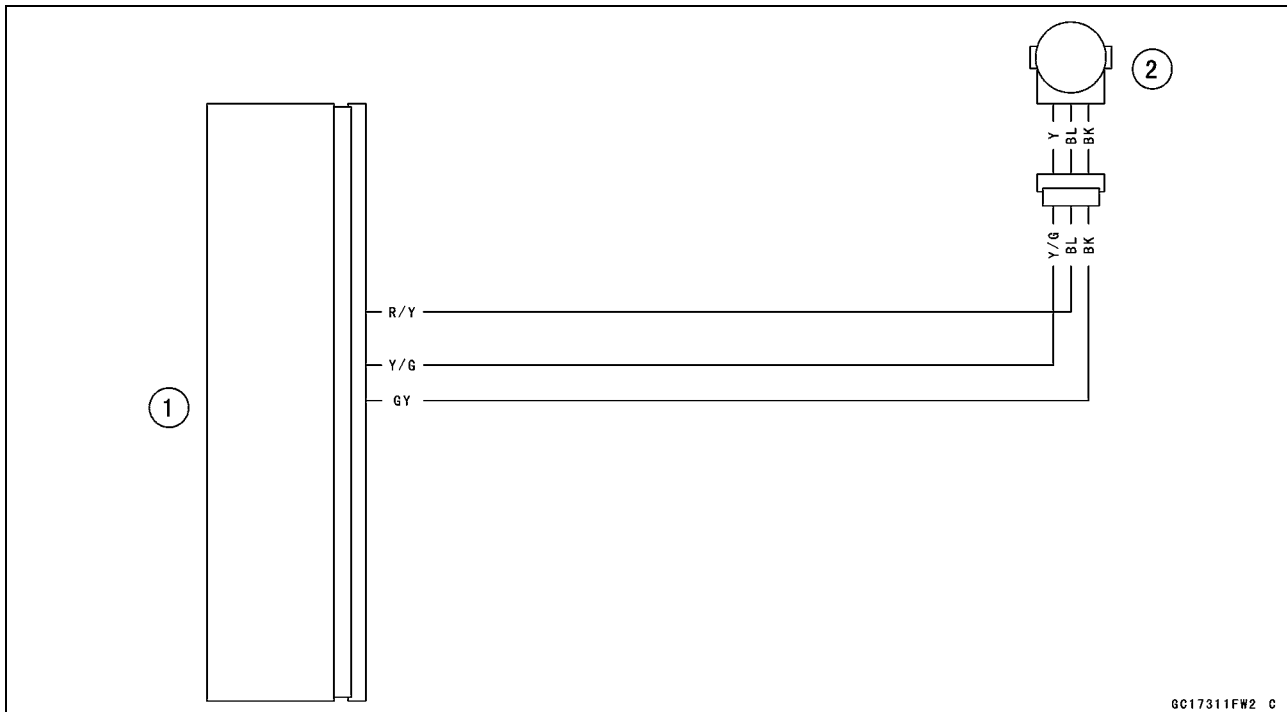
BL lead [C] ← → BK lead [D]

Standard: 4 ~ 6 kΩ

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



Throttle Sensor Circuit



1. ECU
2. Throttle Sensor

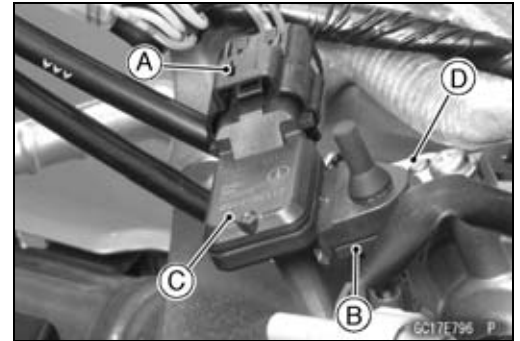
Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Removal

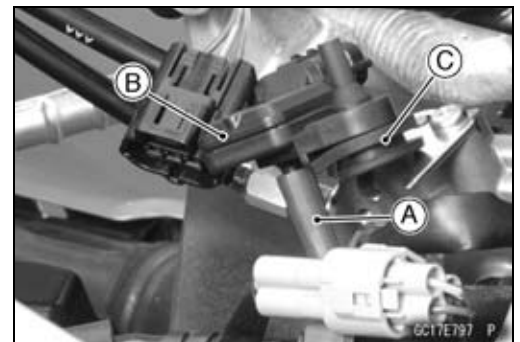
NOTICE

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

- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
 - Intake Air Pressure Sensor Connector [A]
- Slide the rubber damper [B] to outside and remove it with the intake air pressure sensor [C] from the plate [D].

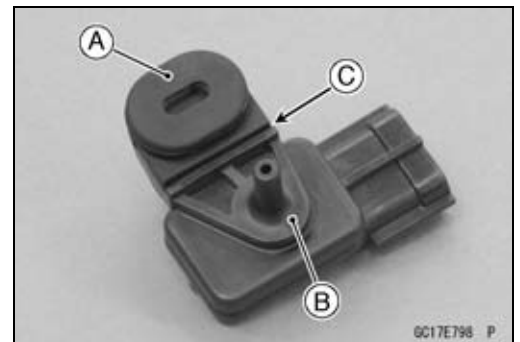


- Remove the vacuum hose [A] from the throttle body assy.
- Remove the intake air pressure sensor [B] from the rubber damper [C].

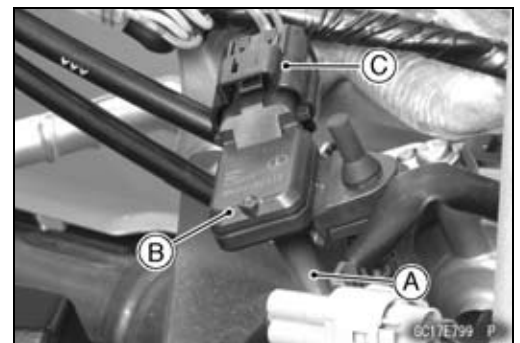


Intake Air Pressure Sensor Installation

- Assemble the rubber damper [A] to the intake air pressure sensor [B].
 - Fit the straight edges [C].



- Install the vacuum hose [A].
- Install the intake air pressure sensor [B].
- Connect the intake air pressure sensor connector [C].



3-42 FUEL SYSTEM (DFI)

Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Input Voltage Inspection

NOTE

○Be sure the battery is fully charged.

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

Main Harness [B]

Intake Air Pressure Sensor [C]

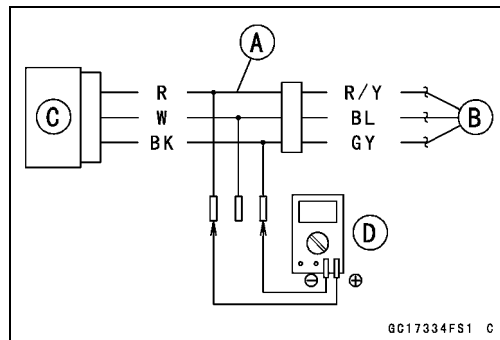
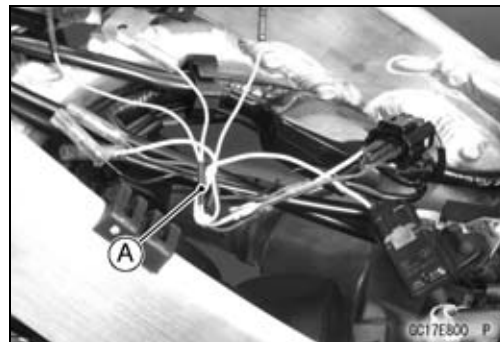
Special Tool - Measuring Adapter: 57001-1700

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

Intake Air Pressure Sensor Input Voltage Connections to Adapter:

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

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



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the input voltage with the engine stopped and with the connector joined.

Input Voltage

Standard: DC 4.75 ~ 5.25 V

- Disconnect the power supply harness.
- ★ 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 the main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

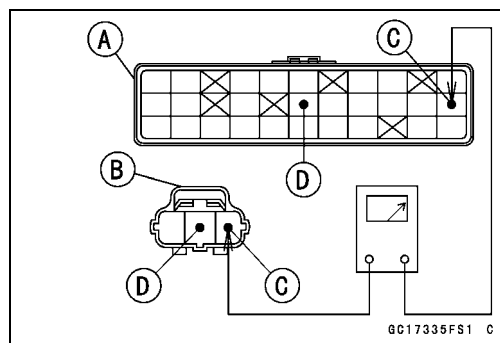
ECU Connector [A] ↔

Intake Air Pressure Sensor Connector [B]

R/Y lead [C] (ECU terminal 12)

GY lead [D] (ECU terminal 17)

- ★ 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)

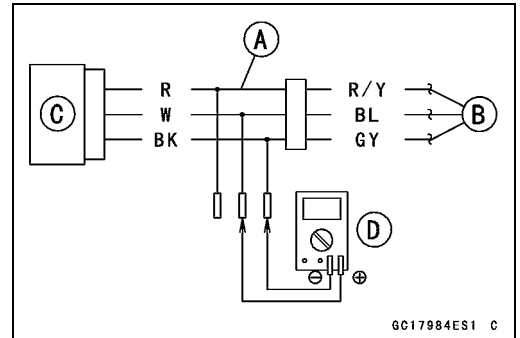
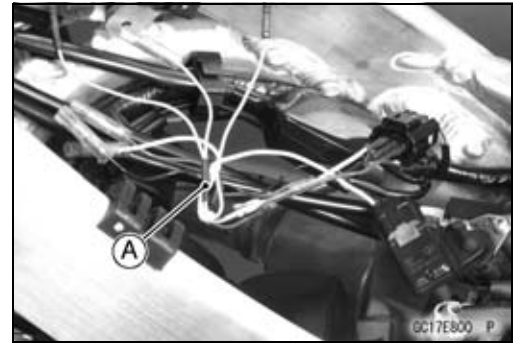
Intake Air Pressure Sensor Output Voltage Inspection

- Measure the intake air pressure sensor output voltage in the same way as input voltage inspection.
- 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 (+) → W (sensor BL) lead
- Digital Meter (-) → BK (sensor GY) lead



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the output voltage with the engine stopped and with the connector joined.

Output Voltage

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

NOTE

- The output voltage changes according to local atmospheric pressure.
- Disconnect the power supply harness.
- ★ If the reading is out of the usable range, replace the sensor.
- ★ If the reading is within the usable range, remove the ECU and check the wiring for continuity between the main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

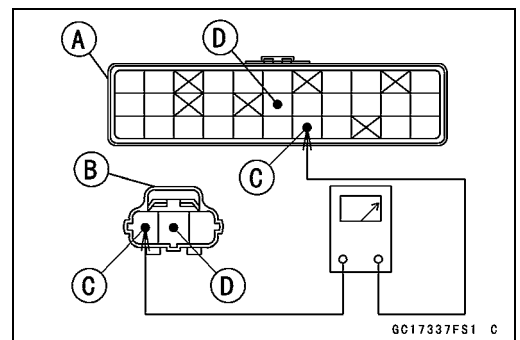
Wiring Continuity Inspection

ECU Connector [A] ↔

Intake Air Pressure Sensor Connector [B]

BL lead [C] (ECU terminal 27)

GY lead [D] (ECU terminal 17)



3-44 FUEL SYSTEM (DFI)

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

- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- 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
PI: Local Atmospheric Pressure (Absolute) measured by a barometer
Pv: Vacuum Pressure (Absolute) of Throttle Body
Vv: Sensor Output Voltage (V)

then

$$Pv = PI - Pg$$

For example, suppose the following data is obtained:

Pg = 8 cmHg (Vacuum Gauge Reading)

PI = 70 cmHg (Barometer Reading)

Vv = 3.2 V (Digital Meter Reading)

then

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

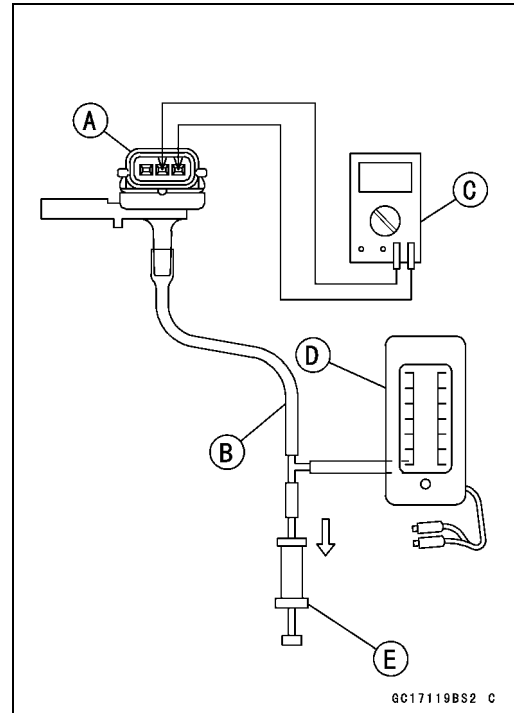
Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.

Usable range = 3.08 ~ 3.48 V

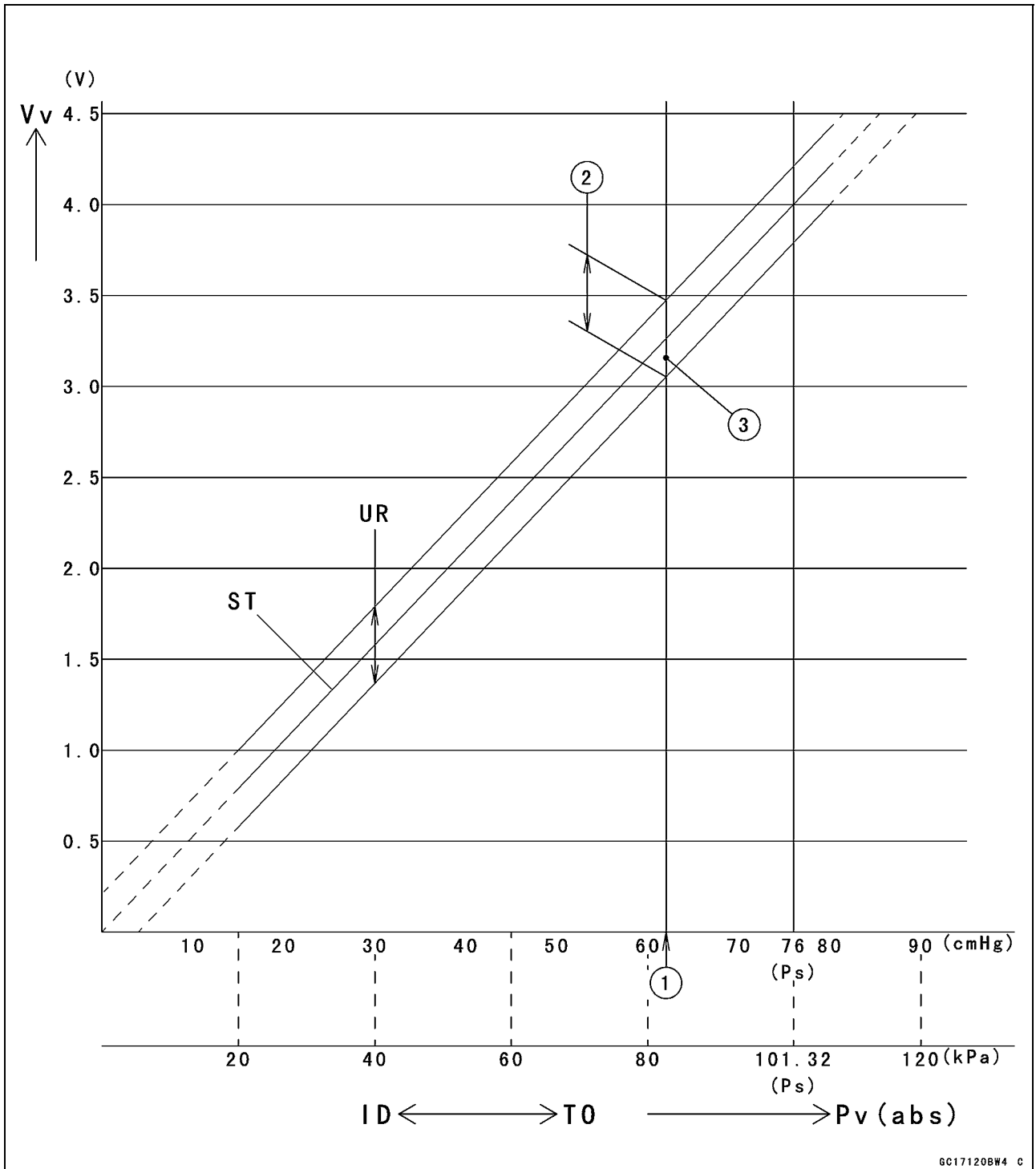
Plot Vv (3.2 V) on the vertical line. → Point [3].

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.
- ★ 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

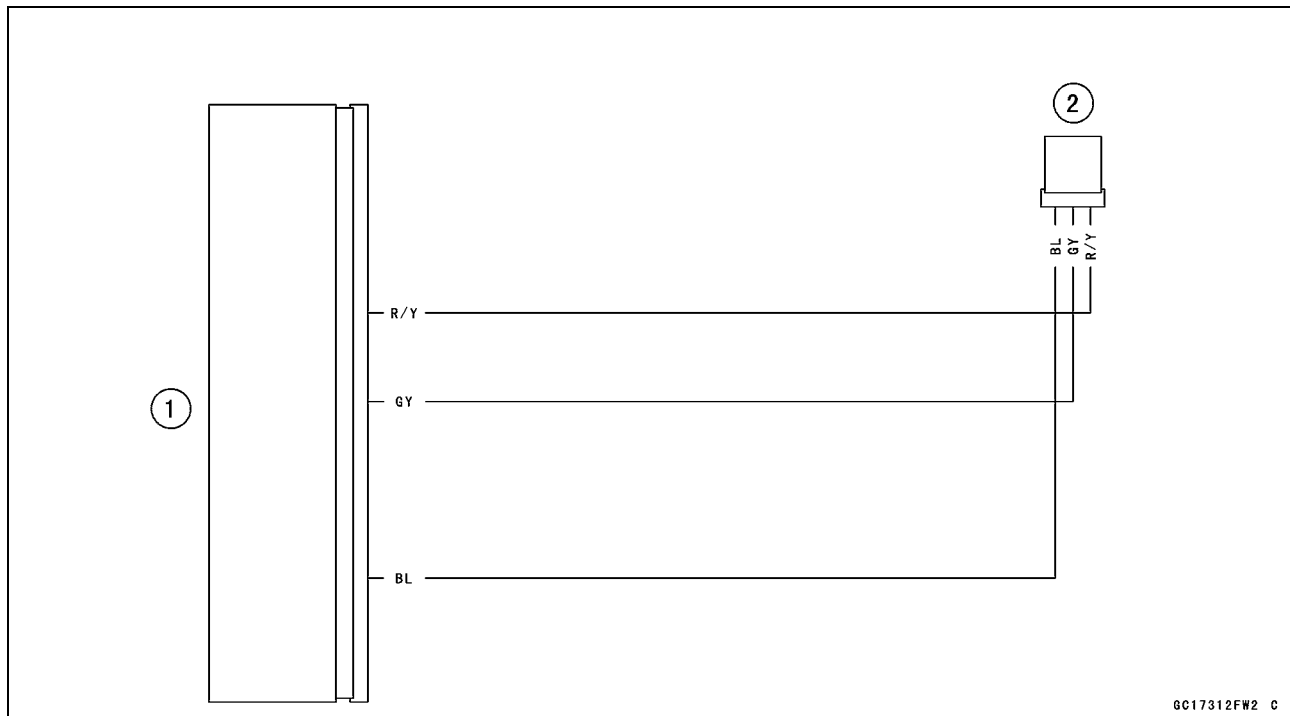
UR: Usable Range of Sensor Output Voltage (V)

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

3-46 FUEL SYSTEM (DFI)

Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Circuit



1. ECU

2. Intake Air Pressure Sensor

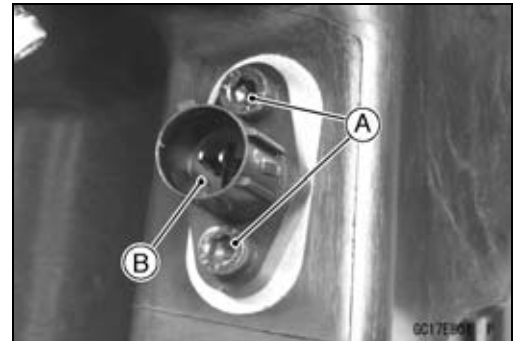
Intake Air Temperature Sensor (Service Code 13)

Intake Air Temperature Sensor Removal/Installation

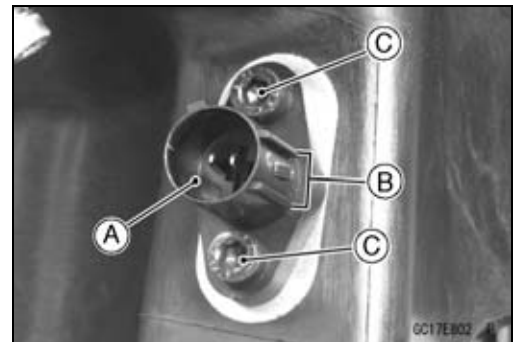
NOTICE

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

- Remove the rear frame with air cleaner housing (see Rear Frame Removal in the Frame chapter).
- Remove the bolts [A].
- Pull out the intake air temperature sensor [B].



- Put the intake air temperature sensor [A] into the air cleaner housing.
- Face the locks [B] to left side.
- Tighten the bolts [C] securely.
- Install the removed parts (see appropriate chapters).

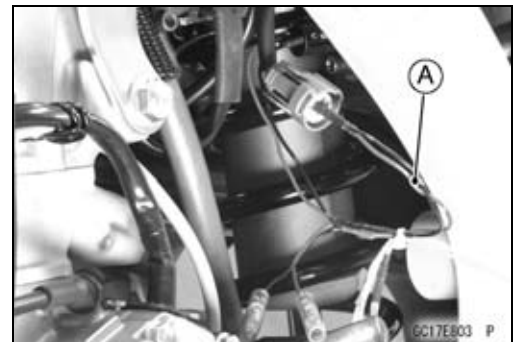


Intake Air Temperature Sensor Output Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Disconnect the intake air temperature sensor connector and connect the measuring adapter [A] between these connectors.
Main Harness [B]
Intake Air Temperature Sensor [C]

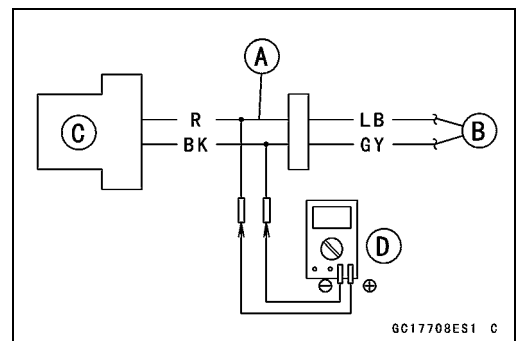


Special Tool - Measuring Adapter: 57001-1700

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

Intake Air Temperature Sensor Output Voltage Connections to Adapter:

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



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.

3-48 FUEL SYSTEM (DFI)

Intake Air Temperature Sensor (Service Code 13)

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

Output Voltage

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

NOTE

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

- Disconnect the power supply harness.
- ★ 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 the main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ←→

Intake Air Temperature Sensor Connector [B]

LB lead [C] (ECU terminal 19)

GY lead [D] (ECU terminal 17)

- ★ 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 portions [C] located in almost the same depth.

NOTE

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

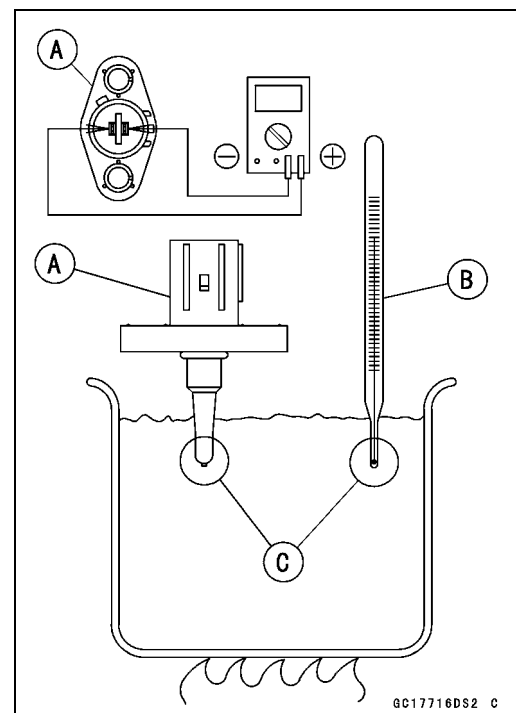
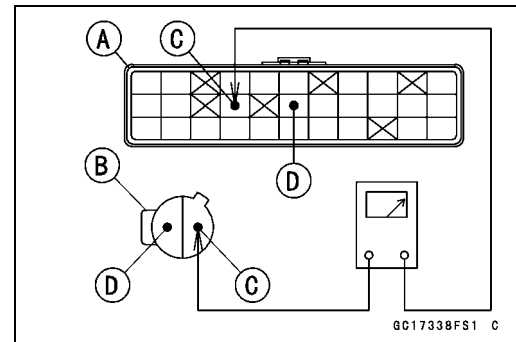
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor.

Intake Air Temperature Sensor Resistance

Standard: 909 ~ 1 363 Ω at 40°C (104°F)

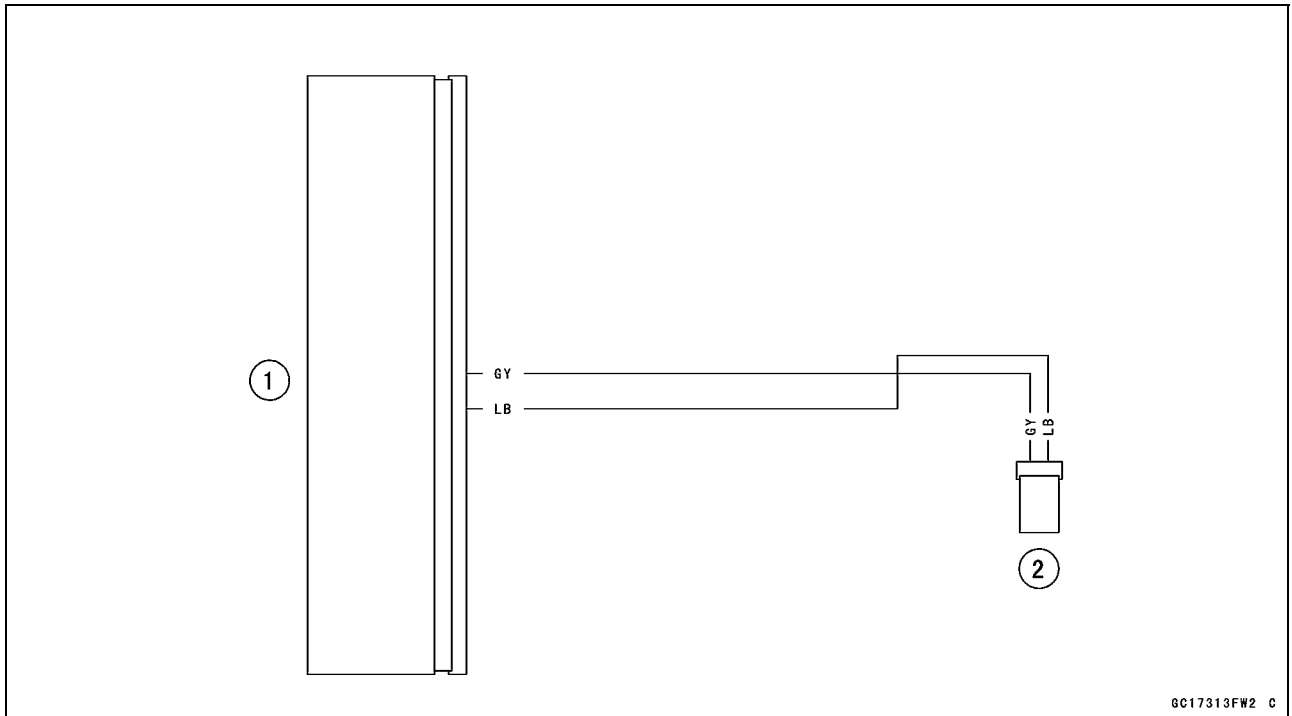
124 ~ 186 Ω at 100°C (212°F)

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



Intake Air Temperature Sensor (Service Code 13)

Intake Air Temperature Sensor Circuit



GC17313FW2 C

- 1. ECU
- 2. Intake Air Temperature Sensor

3-50 FUEL SYSTEM (DFI)

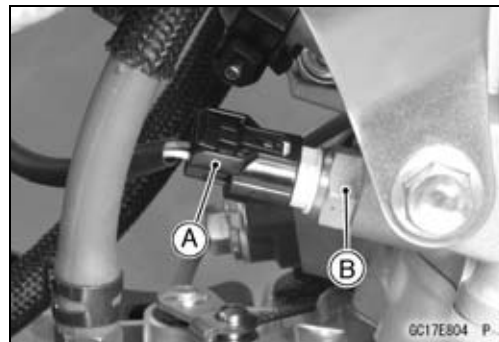
Water Temperature Sensor (Service Code 14)

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 Draining in the Cooling System chapter).
- Remove:
 - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
 - Connector [A]
 - Water Temperature Sensor [B]
- Replace the O-ring with a new one, and apply grease to it.
- Install the new O-ring to the water temperature sensor.
- 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 Filling in the Cooling System chapter).
- Install the removed parts (see appropriate chapters).



Water Temperature Sensor Output Voltage Inspection

NOTE

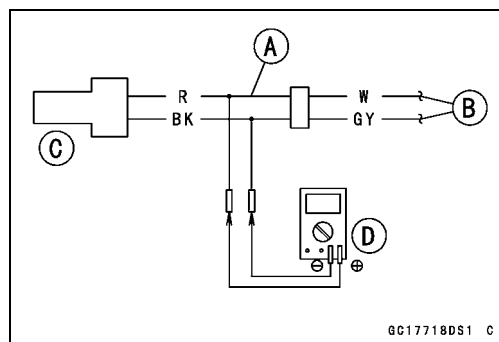
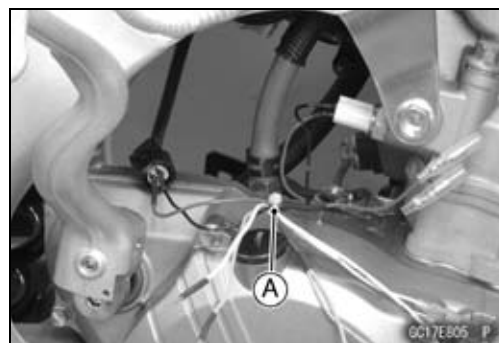
○Be sure the battery is fully charged.

- Disconnect the water temperature sensor connector and connect the measuring adapter [A] between these connectors.
 - Main Harness [B]
 - Water Temperature Sensor [C]
- Connect a digital meter [D] to the measuring adapter leads.

Water Temperature Sensor Output Voltage Connections to Adapter:

Digital Meter (+) → R (sensor W) lead

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



Water Temperature Sensor (Service Code 14)

- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the output voltage with the engine stopped and the connector joined.

Output Voltage

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

NOTE

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

- Disconnect the power supply harness.
- ★ 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 the main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

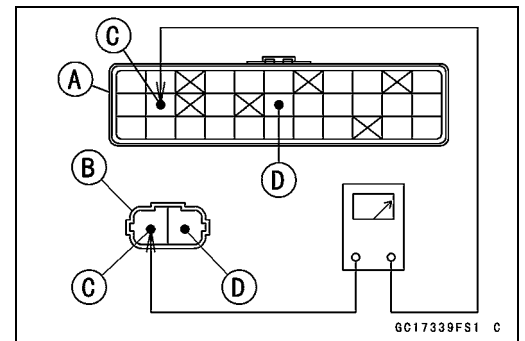
ECU Connector [A] ↔

Water Temperature Sensor Connector [B]

W lead [C] (ECU terminal 21)

GY lead [D] (ECU terminal 17)

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



3-52 FUEL SYSTEM (DFI)

Water Temperature Sensor (Service Code 14)

Water Temperature Sensor Inspection

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

NOTE

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

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using the hand tester, measure the internal resistance of the sensor.

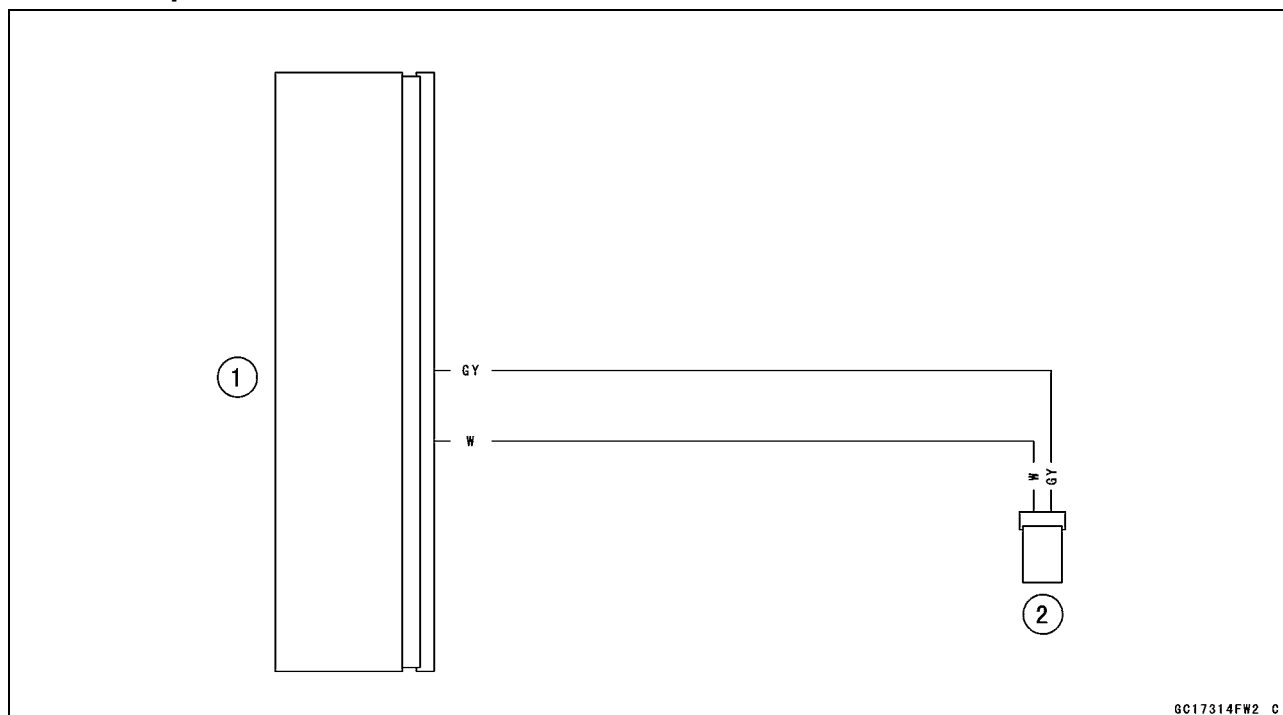
Water Temperature Sensor Resistance

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

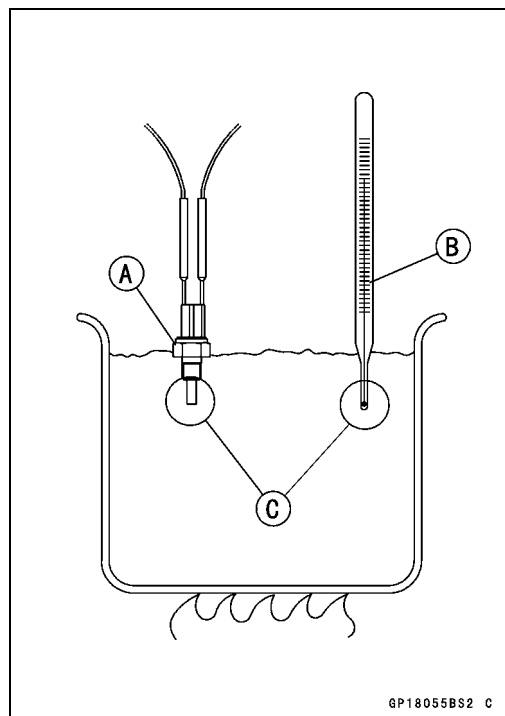
*: Reference Information

- ★ If the measurement is out of the range, replace the sensor.
- ★ 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 Stator Coil Removal/Installation in the Electrical System chapter.

Crankshaft Sensor Resistance Inspection

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

Crankshaft Sensor Peak Voltage Inspection

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

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

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

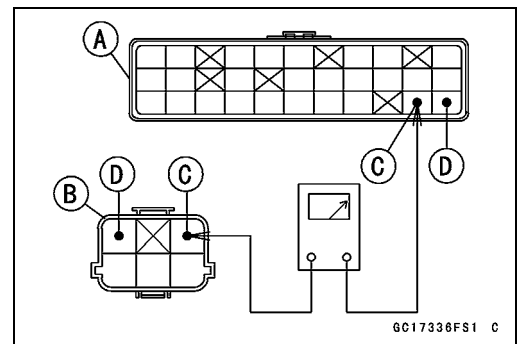
ECU Connector [A] ↔

Crankshaft Sensor Connector [B]

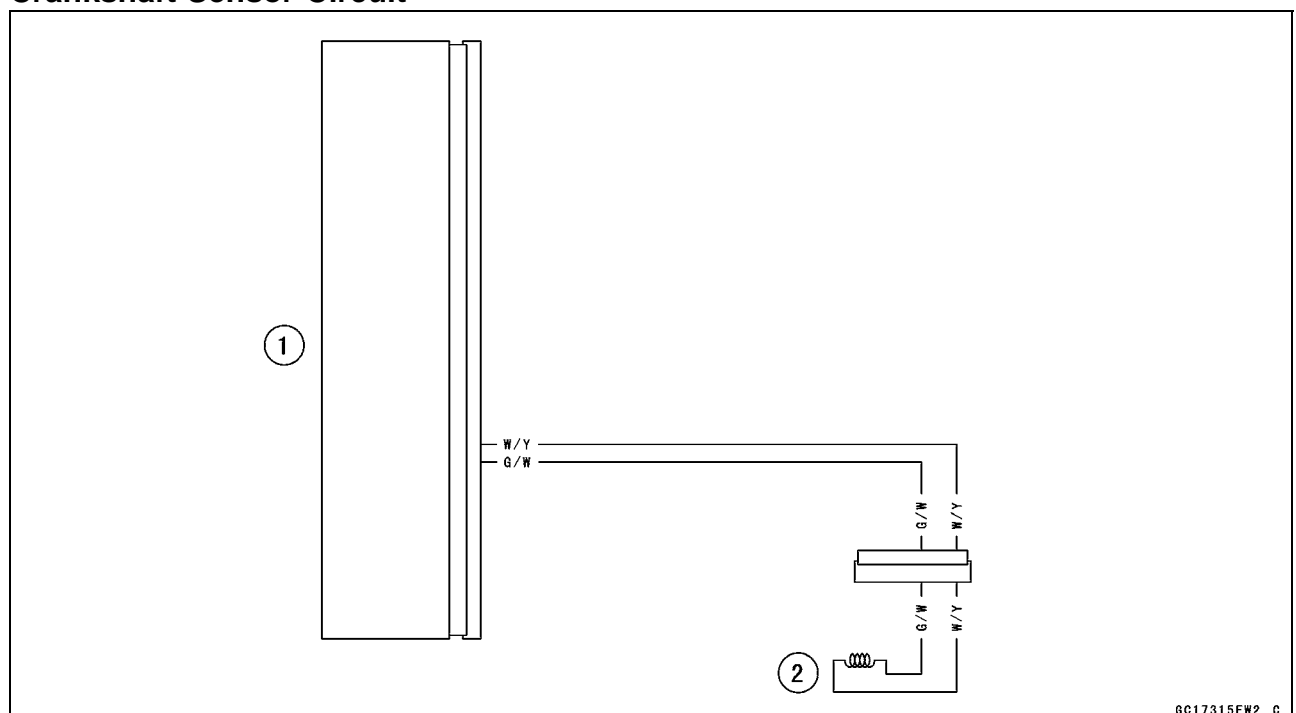
G/W lead [C] (ECU terminal 24)

W/Y lead [D] (ECU terminal 23)

- ★ 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

3-54 FUEL SYSTEM (DFI)

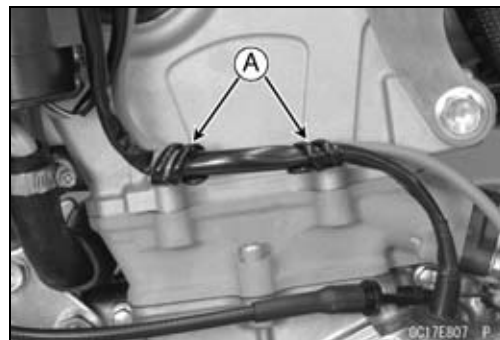
Gear Position Switch (Service Code 25)

Gear Position Switch Removal

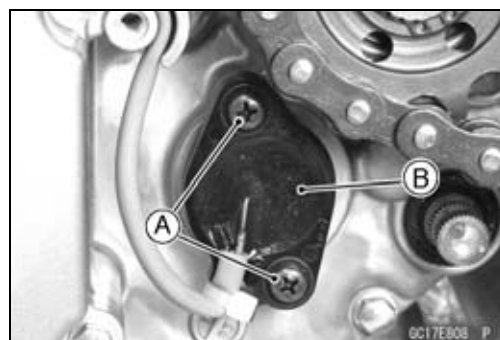
- Remove:
 - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
 - Shift Pedal (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
 - Engine Sprocket Cover and Drive Chain Guide (see Engine Sprocket Removal in the Final Drive chapter)
 - Gear Position Switch Connector [A]



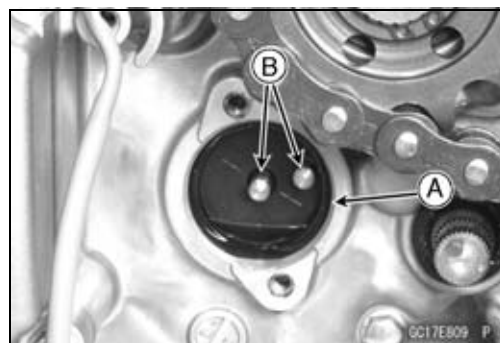
- Open the clamps [A].



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



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

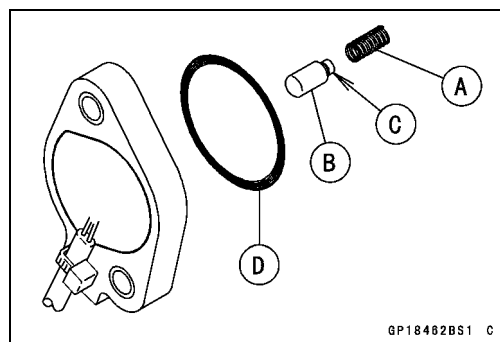


Gear Position Switch Installation

- Install the spring [A] on the switch finger [B].
- Insert the switch finger so that the small diameter [C] is toward the shift drum.
- Replace the O-ring [D] with a new one, and apply grease to it.
- Clean the contact points on the position switch.
- Apply a non-permanent locking agent to the gear position switch screws.
- Tighten:

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

- Install the removed parts (see appropriate chapters).



Gear Position Switch (Service Code 25)

Gear Position Switch Inspection

NOTE

○ Be sure the transmission mechanism is good condition.

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



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

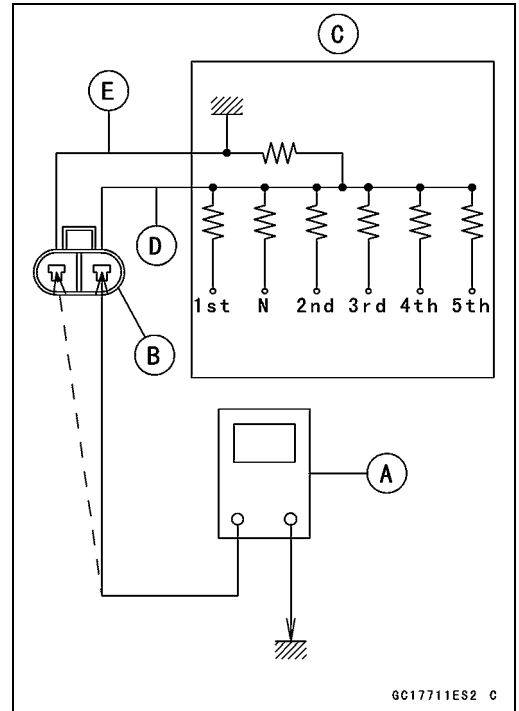
Internal Circuit [C]

Special Tool - Hand Tester: 57001-1394

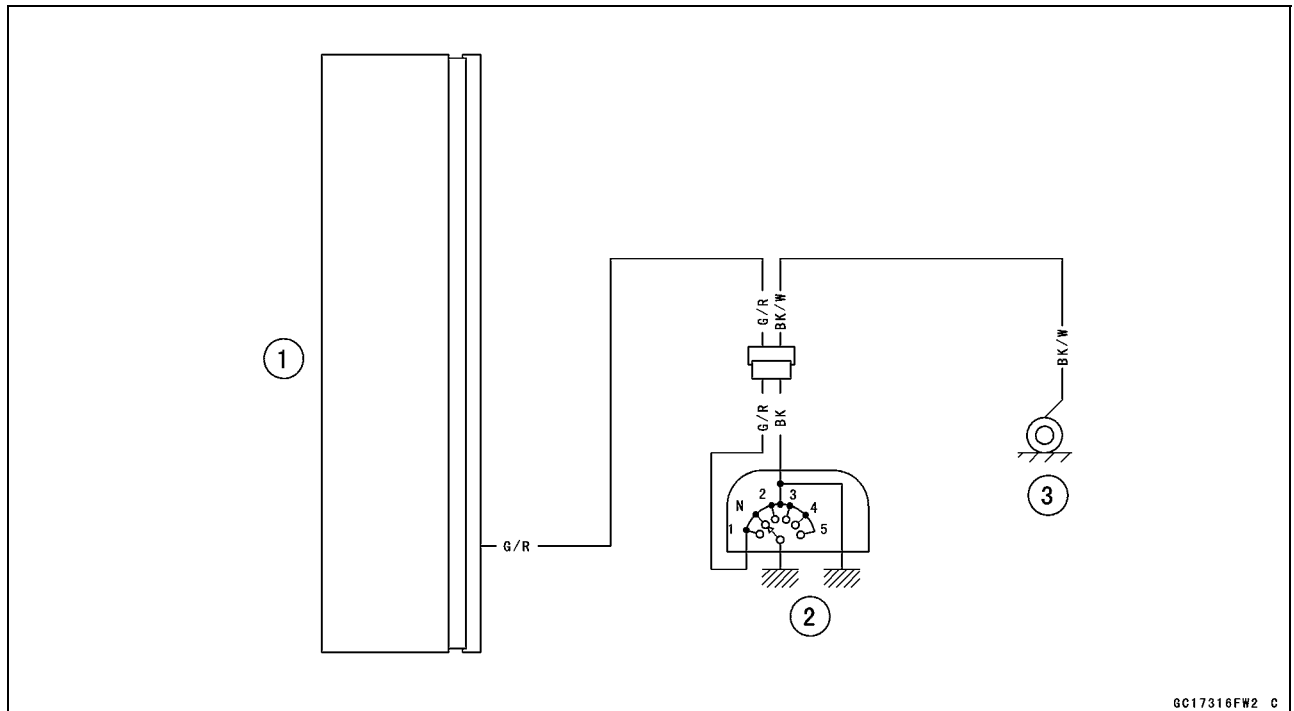
Gear Position Switch Resistance

Gear Position	Connections	
	G/R Lead [D] - Ground	BK Lead [E] - Ground
Neutral	1.43 ~ 1.58 k Ω	about 0 Ω
1st	2.23 ~ 2.46 k Ω	about 0 Ω
2nd	0.95 ~ 1.06 k Ω	about 0 Ω
3rd	644 ~ 711 Ω	about 0 Ω
4th	410 ~ 453 Ω	about 0 Ω
5th	241 ~ 266 Ω	about 0 Ω

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



Gear Position Switch Circuit



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

3-56 FUEL SYSTEM (DFI)

Vehicle-down Sensor (Service Code 31)

When the motorcycle is down, the engine stops according to the condition of the below table.

Engine Speed	Time	Engine Condition
2 500 rpm or less	After 30 seconds	Stop
2 500 rpm or more	After 3 seconds	Stop

When the vehicle-down sensor is broken, the engine will stop at 3 seconds after the engine starts.

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.

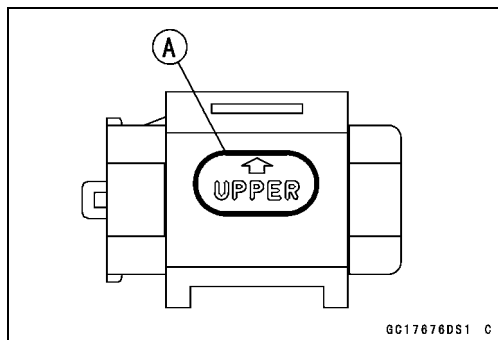
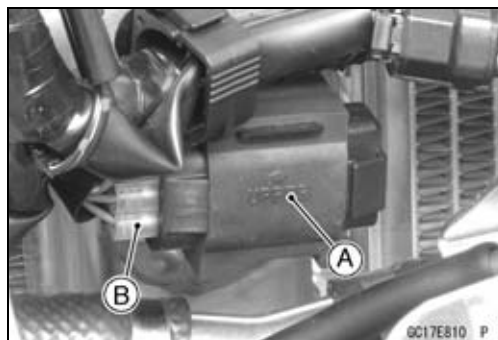
- Remove the fuel tank (see Fuel Tank Removal).
- Pull the vehicle-down sensor [A] from the bracket.
- Disconnect the connector [B].

Vehicle-down Sensor Installation

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

WARNING

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



Vehicle-down Sensor Input Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

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

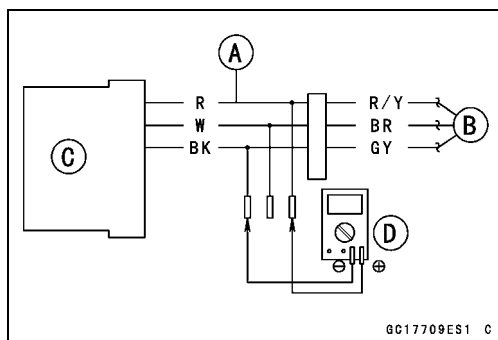
Main Harness [B]
Vehicle-down Sensor [C]

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 R/Y) lead
Digital Meter (-) → BK (sensor GY) lead



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.

Vehicle-down Sensor (Service Code 31)

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

Input Voltage

Standard: DC 4.75 ~ 5.25 V

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

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

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

ECU Connector [A] ↔

Vehicle-down Sensor Connector [B]

R/Y lead [C] (ECU terminal 12)

GY lead [D] (ECU terminal 17)

- ★ 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, and connect the measuring adapter [A].

Special Tool - Measuring Adapter: 57001-1700

Main Harness [B]

Vehicle-down Sensor [C]

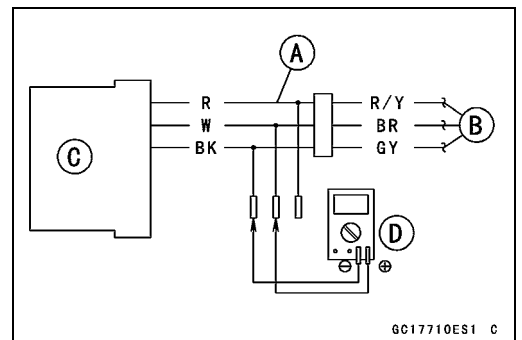
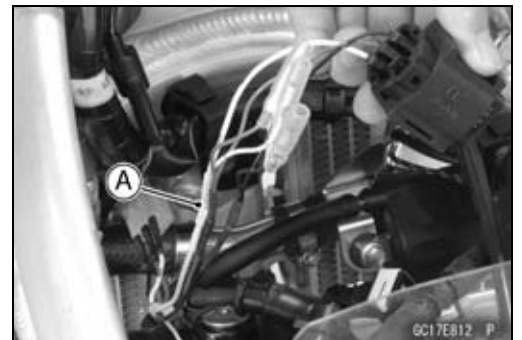
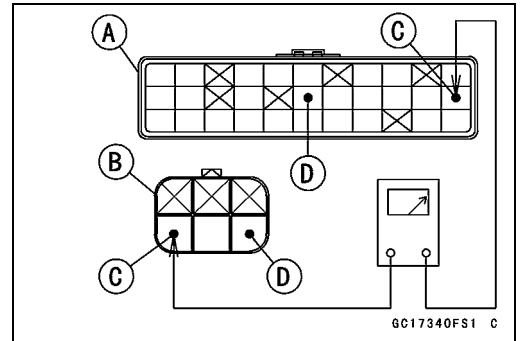
- Connect a digital meter [D] to the measuring adapter leads.

Vehicle-down Sensor Output Voltage

Connections to Adapter:

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

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



3-58 FUEL SYSTEM (DFI)

Vehicle-down Sensor (Service Code 31)

- Hold the sensor vertically.
- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the output voltage with the engine stopped and with the connector joined.
- Tilt the sensor 55 ~ 75° or more [A] right or left, then hold the sensor almost vertical with the arrow mark [B] pointed up [C].

Output Voltage

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

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

- ★ 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 the main harness connectors.

Special Tool - Hand Tester: 57001-1394

- Disconnect the ECU and sensor connectors.

Wiring Continuity Inspection

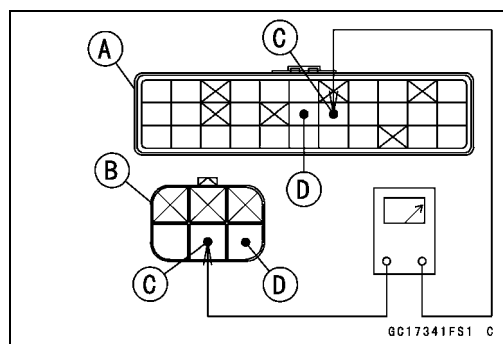
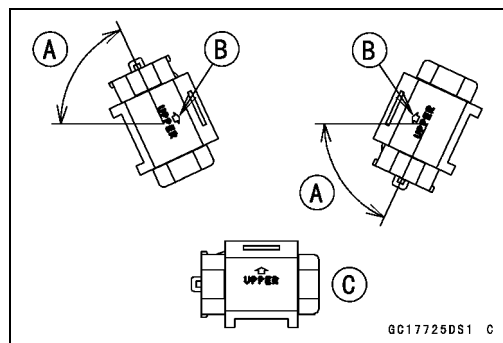
ECU Connector [A] ←→

Vehicle-down Sensor Connector [B]

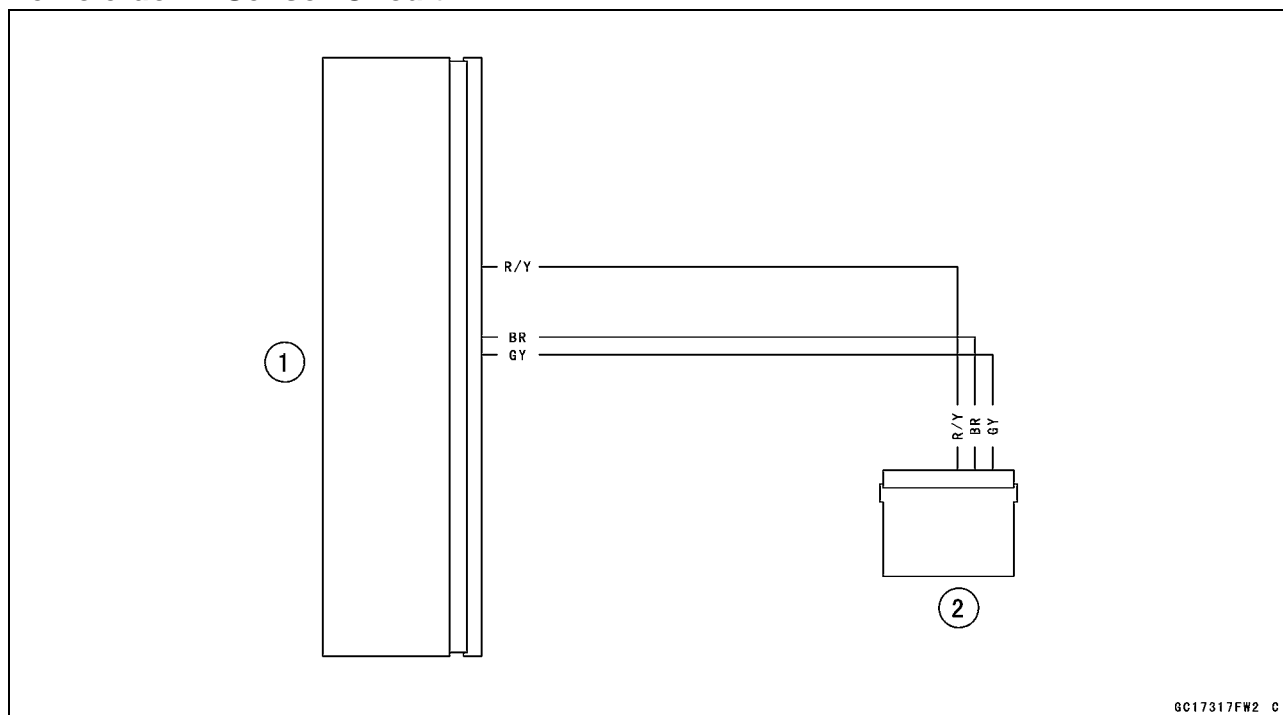
BR lead [C] (ECU terminal 16)

GY lead [D] (ECU terminal 17)

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



Vehicle-down Sensor Circuit



1. ECU

2. Vehicle-down Sensor

Downstream Injector (Service Code 41)

NOTICE

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

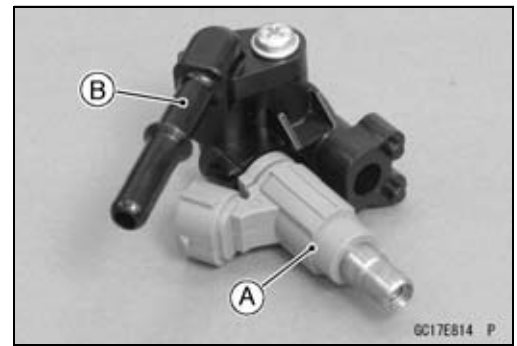
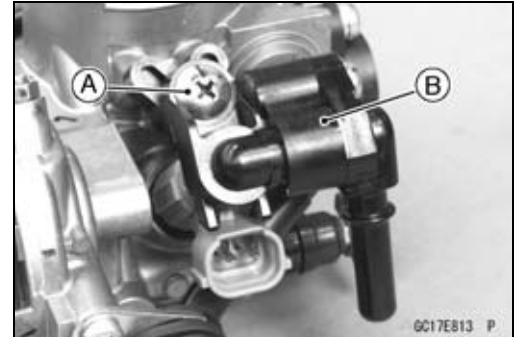
Downstream Injector Removal

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Remove the delivery pipe mounting screw [A].
- Remove the delivery pipe [B] together with the downstream injector.

NOTE

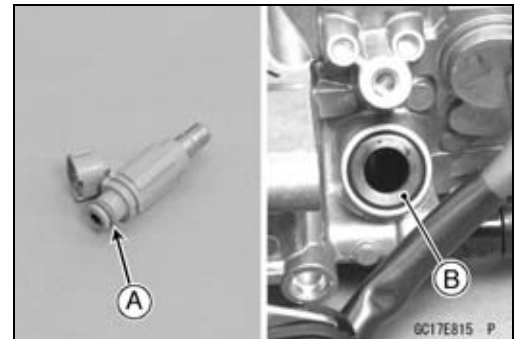
○ Do not damage the insertion portions of the downstream injector when they are pulled out from the throttle body.

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

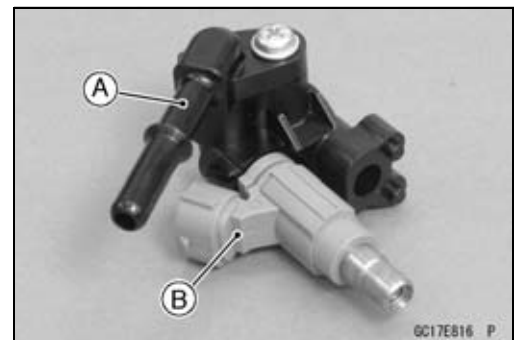


Downstream Injector Installation

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



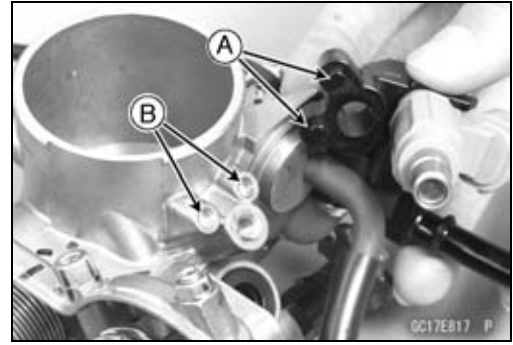
- Assemble the delivery pipe [A] and downstream injector [B].



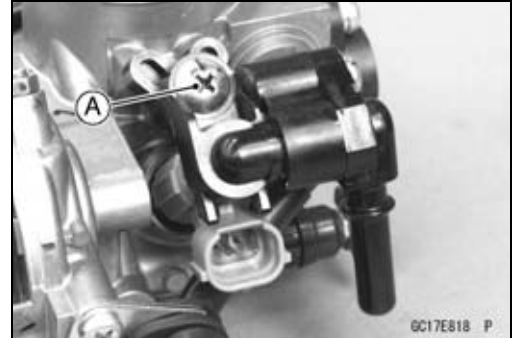
3-60 FUEL SYSTEM (DFI)

Downstream Injector (Service Code 41)

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

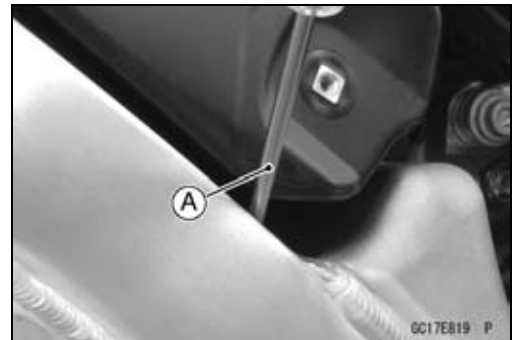


- Tighten the delivery pipe mounting screw [A].
- Install the removed parts (see appropriate chapters).



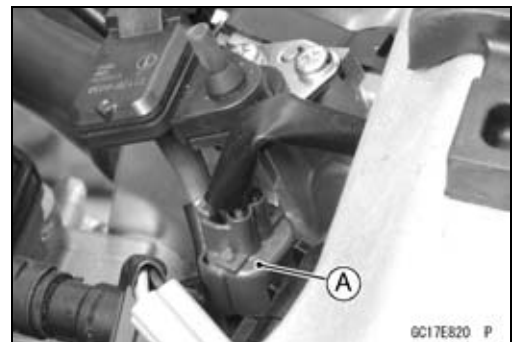
Downstream Injector Audible Inspection

- Remove:
 - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
- Start the engine, and let it idle.
- Apply the standard tip screwdriver [A] to the downstream injector.
- Put the grip end into your ear, and listen whether the downstream injector is clicking or not.
- A sound scope can also be used.
- The click interval becomes shorter as the engine speed rises.
- ★ If the downstream injector click at a regular intervals, the downstream injector is normal.
- Stop the engine.
- ★ If downstream injector does not click, check the downstream injector resistance (see Downstream Injector Resistance Inspection).



Downstream Injector Resistance Inspection

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



Downstream Injector (Service Code 41)

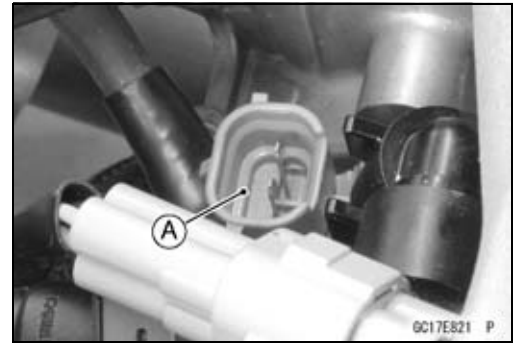
- Connect a digital meter to the terminals in downstream injector [A].
- Measure the downstream injector resistance.

Downstream Injector Resistance

Connections: R/W terminal ↔ BL/R terminal

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

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



Downstream Injector Power Supply Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Disconnect the downstream injector connector and connect the measuring adapter [A] between these connectors.

Main Harness [B]

Downstream Injector [C]

Special Tool - Measuring Adapter: 57001-1700

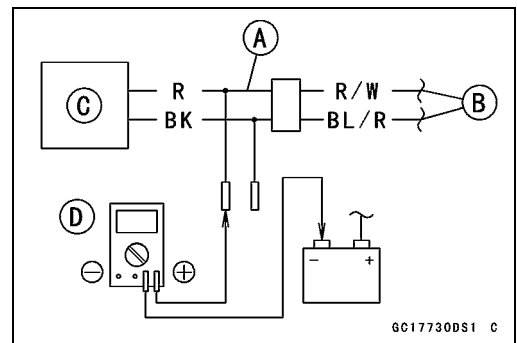
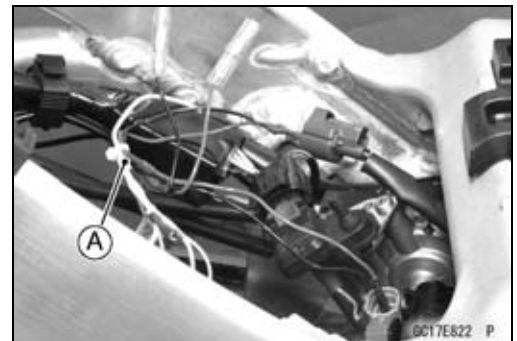
- Connect a digital meter [D] to the measuring adapter lead.

Downstream Injector Power Supply Voltage

Connections the Adapter:

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

Digital Meter (-) → Battery (-) Terminal



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the power supply voltage with the engine stopped.

Power Supply Voltage

Standard: Battery Voltage

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

3-62 FUEL SYSTEM (DFI)

Downstream Injector (Service Code 41)

Downstream Injector Output Voltage Inspection

NOTE

○Be sure the battery is fully charged.

- Remove the ECU (see ECU Removal).
- Do not disconnect the ECU connector.
- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Using the needle adapter set and connect a digital meter [A] to the ECU connector [B].

Special Tool - Needle Adapter Set: 57001-1457

Downstream Injector Output Voltage

Connections to ECU Connector:

Digital Meter (+) → BL/R lead (ECU terminal 4)

Digital Meter (-) → Battery (-) Terminal

- Measure the output voltage with the engine stopped with the connector jointed.

Output Voltage

Standard: Battery Voltage

- Disconnect the power supply harness.
- ★ 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 the main harness connectors.

Special Tool - Hand Tester: 57001-1394

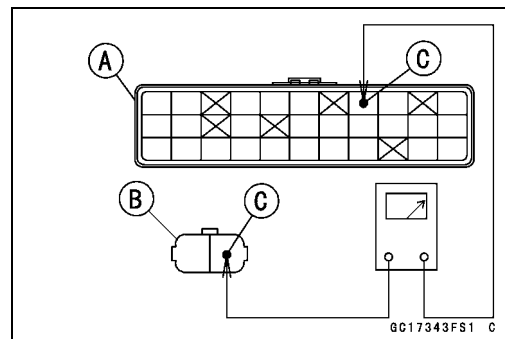
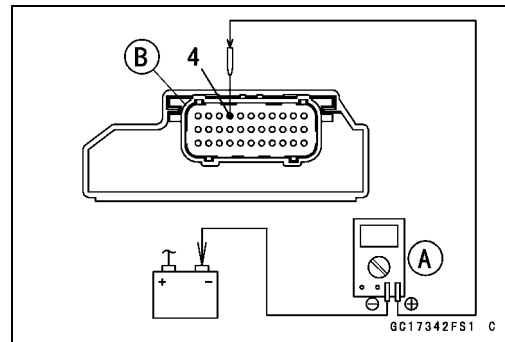
- Disconnect the ECU and downstream injector connector.

Wiring Continuity Inspection

ECU Connector [A] ← → Downstream Injector Connector [B]

BL/R lead [C] (ECU terminal 4)

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



Downstream Injector (Service Code 41)

Downstream Fuel Line Inspection

- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Place a piece of cloth around the fuel outlet pipe of fuel pump and delivery pipe of throttle body assy.
- Check the downstream injector fuel line for leakage as follows:
 - Apply engine oil to the delivery pipe lightly.
 - Connect a commercially available vacuum/pressure pump [A] to the delivery pipe [B] with the fuel hose [C].
 - Hold both ends with the clamps [D].
 - Apply a soap and water solution to the areas [E].
 - Watching the pressure gauge, squeeze the pump lever [F], and build up the pressure until the pressure reaches the maximum pressure.

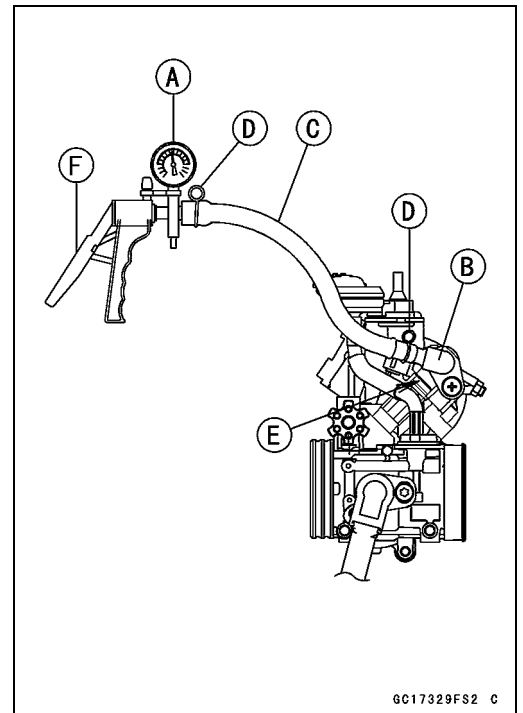
Fuel Line Maximum Pressure

Standard: 300 kPa (3.06 kgf/cm², 44 psi)

NOTICE

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

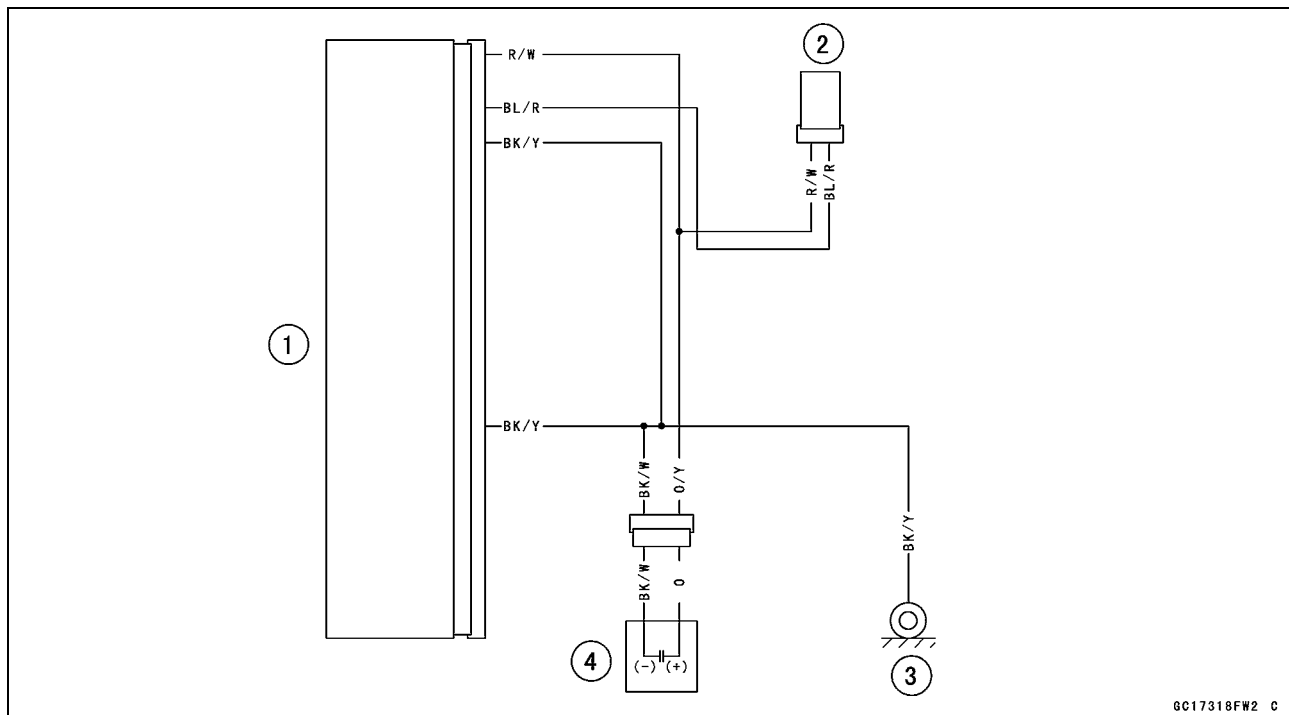
- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the fuel line is good.
- ★ If the pressure drops at once, or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, downstream injector and related parts.
- Repeat the leak test, and check 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, check the fuel leakage.



3-64 FUEL SYSTEM (DFI)

Downstream Injector (Service Code 41)

Downstream Injector Circuit



1. ECU
2. Downstream Injector
3. Frame Ground 1
4. Capacitor

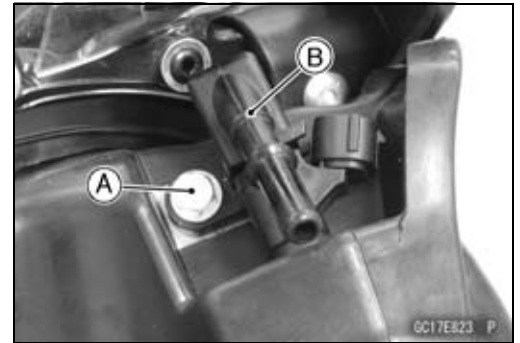
Upstream Injector (Service Code 42)

NOTICE

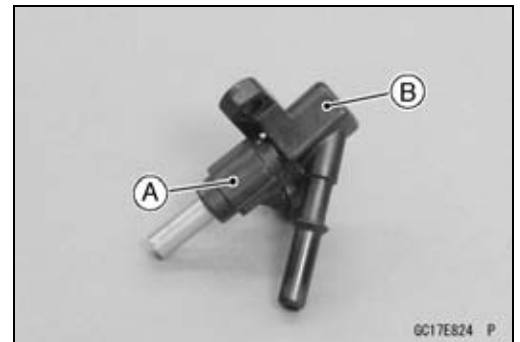
Never drop the upstream injector, especially on a hard surface. Such a shock to the upstream injector can damage it.

Upstream Injector Removal

- Remove:
 - Rear Frame with Air Cleaner Housing (see Rear Frame Removal in the Frame chapter)
- Remove the delivery joint bolt [A].
- Remove the delivery pipe [B] together with the upstream injector.

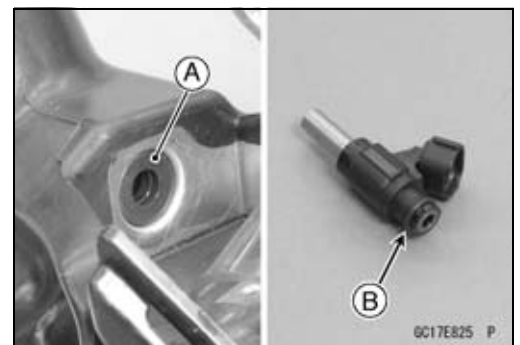


- Separate the upstream injector [A] from the delivery pipe [B].

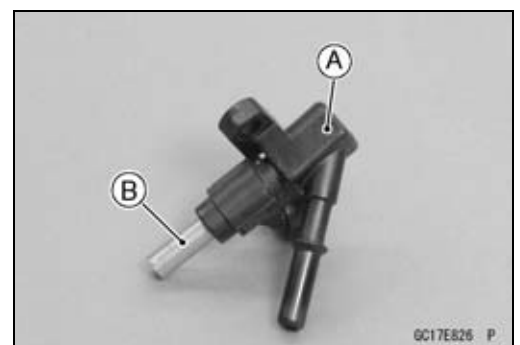


Upstream Injector Installation

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



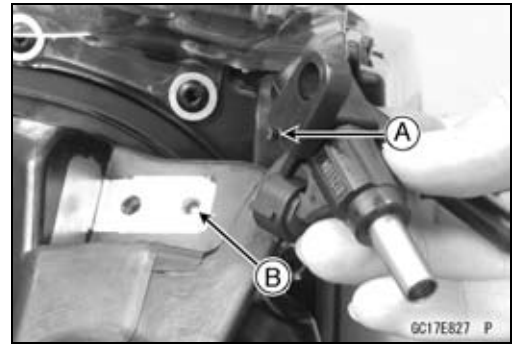
- Assemble the delivery pipe [A] and upstream injector [B].



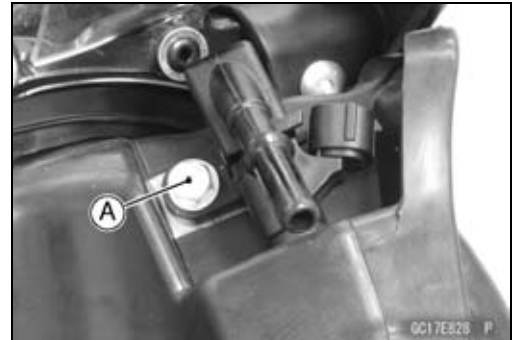
3-66 FUEL SYSTEM (DFI)

Upstream Injector (Service Code 42)

- Fit the projection [A] on the delivery pipe to the hollow [B] of the air cleaner housing.
- Face the connector side to left side.



- Apply a non-permanent locking agent to the threads of the delivery joint bolt [A].
- Tighten:
Torque - Delivery Joint Bolt: 3.5 N·m (0.36 kgf·m, 31 in·lb)
- Install the removed parts (see appropriate chapters).



Upstream Injector Resistance Inspection

- Remove:
 - Seat (see Seat Removal in the Frame chapter)
 - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
 - Upstream Injector Connector [A]



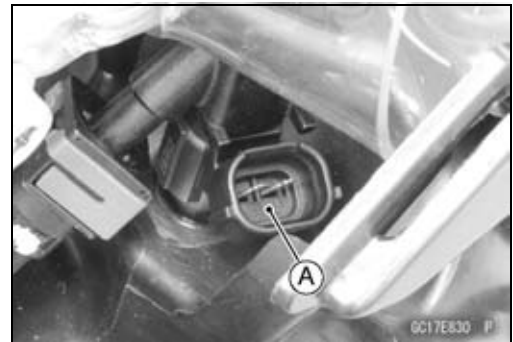
- Connect a digital meter to the terminals in upstream injector [A].
- Measure the upstream injector resistance.

Upstream Injector Resistance

Connections: R/W terminal ↔ BL/BK terminal

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

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



Upstream Injector (Service Code 42)

Upstream Injector Power Supply Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

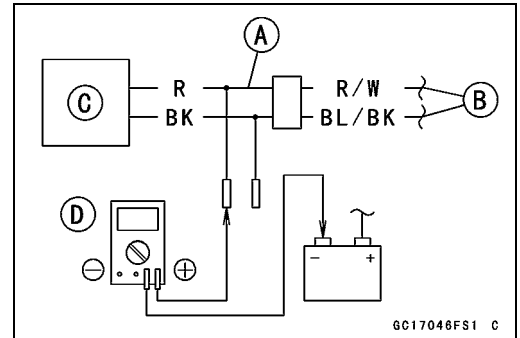
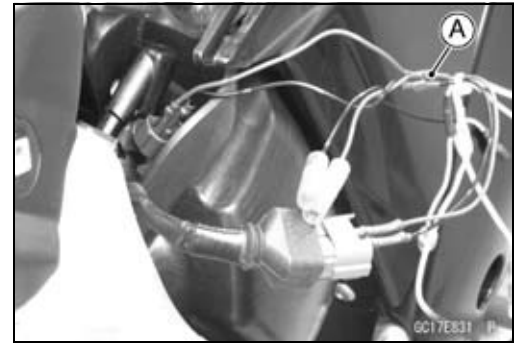
- Disconnect the upstream injector connector and connect the measuring adapter [A] between these connectors.
Main Harness [B]
Upstream Injector [C]

Special Tool - Measuring Adapter: 57001-1700

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

Upstream Injector Power Supply Voltage Connections the Adapter:

- Digital Meter (+) → R (Upstream Injector R/W) lead
- Digital Meter (-) → Battery (-) Terminal



- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Measure the power supply voltage with the engine stopped.

Power Supply Voltage

Standard: Battery Voltage

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

3-68 FUEL SYSTEM (DFI)

Upstream Injector (Service Code 42)

Upstream Injector Output Voltage Inspection

NOTE

○ Be sure the battery is fully charged.

- Remove the ECU (see ECU Removal).
- Do not disconnect the ECU connector.
- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Using the needle adapter set and connect a digital meter [A] to the ECU connector [B].

Special Tool - Needle Adapter Set: 57001-1457

Upstream Injector Output Voltage

Connections to ECU Connector:

Digital Meter (+) → BL/BK lead (ECU terminal 8)

Digital Meter (-) → Battery (-) Terminal

- Measure the output voltage with the engine stopped with the connector jointed.

Output Voltage

Standard: Battery Voltage

- Disconnect the power supply harness.
- ★ 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 the main harness connectors.

Special Tool - Hand Tester: 57001-1394

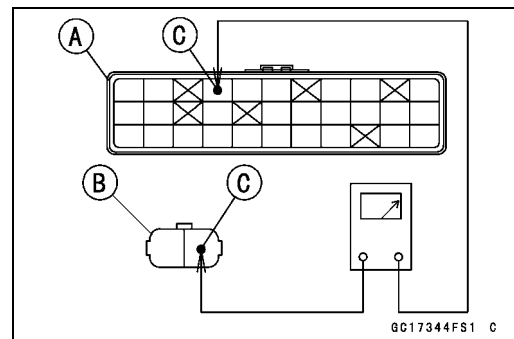
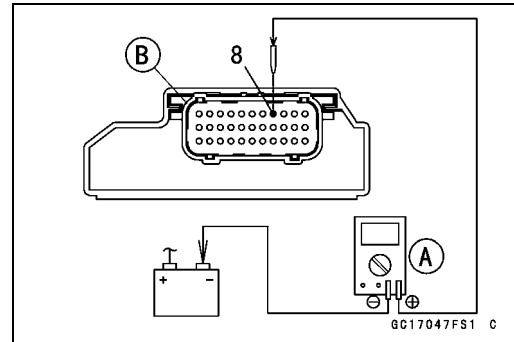
- Disconnect the ECU and upstream injector connector.

Wiring Continuity Inspection

ECU Connector [A] ← → Upstream Injector Connector [B]

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

- ★ If the wiring good, check the ECU ground and power supply (see ECU Power Supply Inspection).
- ★ If the ground and power supply good, replace the ECU (see ECU Removal/Installation).
- Install the removed parts (see appropriate chapters).
- Install the upstream injector connector boot so that notch side faces inside.



Upstream Injector (Service Code 42)

Upstream Injector Fuel Line Inspection

- Remove:
 - Fuel Hose (see Rear Frame Removal in the Frame chapter)
- Place a piece of cloth around the delivery pipe of air cleaner housing.
- Check the upstream injector fuel line for leakage as follows:
 - Apply engine oil to the delivery pipe lightly.
 - Connect a commercially available vacuum/pressure pump [A] to the delivery pipe [B] with the fuel hose [C].
 - Hold both ends with the clamps [D].
 - Apply a soap and water solution to the areas [E].
 - Watching the pressure gauge, squeeze the pump lever [F], and build up the pressure until the pressure reaches the maximum pressure.

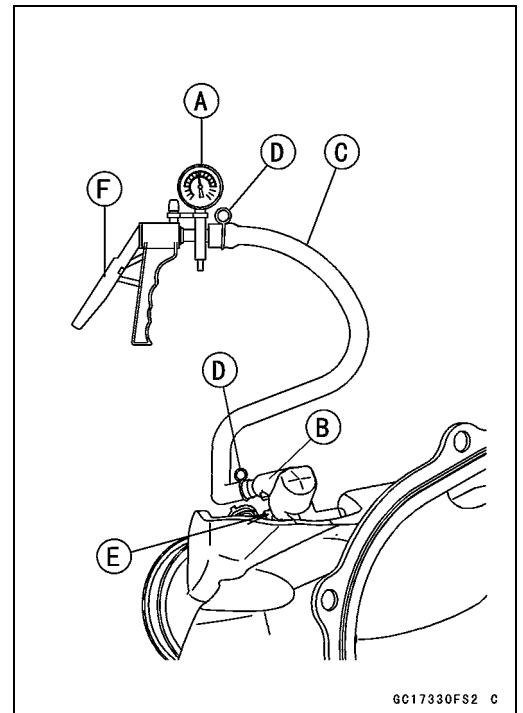
Fuel Line Maximum Pressure

Standard: 300 kPa (3.06 kgf/cm², 44 psi)

NOTICE

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

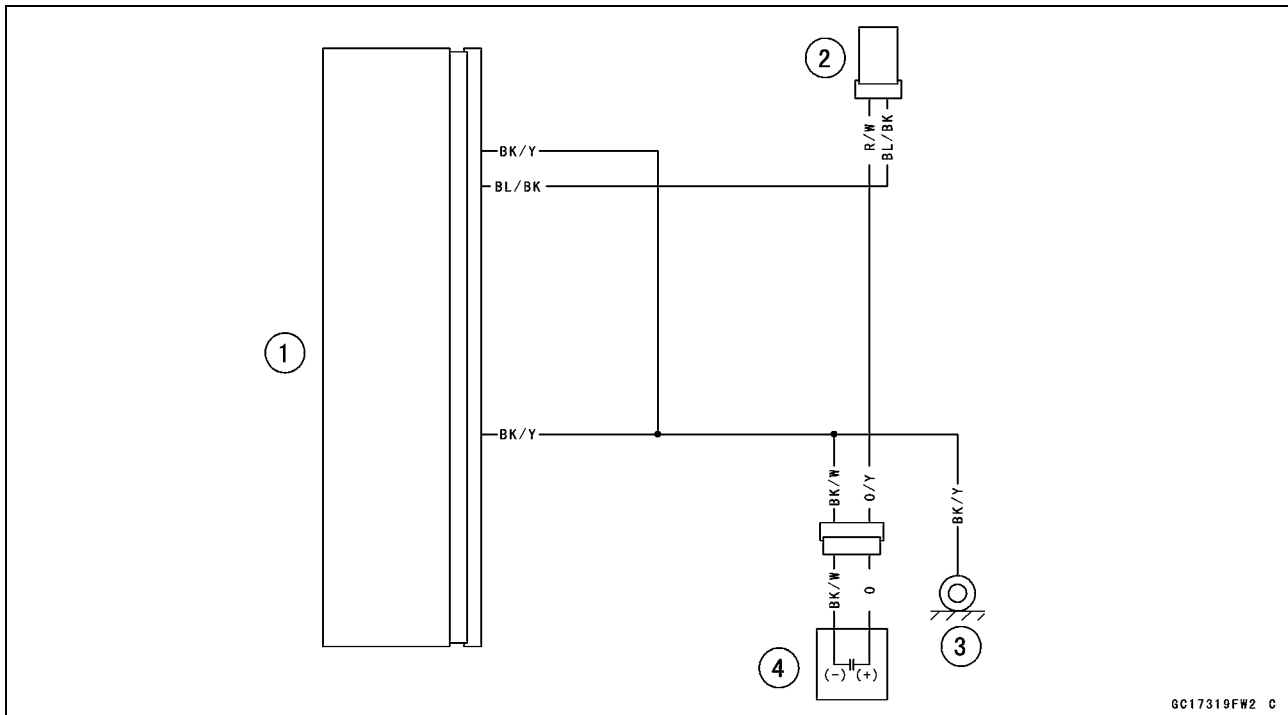
- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the fuel line is good.
- ★ If the pressure drops at once, or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, upstream injector and related parts.
- Repeat the leak test, and check the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



3-70 FUEL SYSTEM (DFI)

Upstream Injector (Service Code 42)

Upstream Injector Circuit



1. ECU
2. Upstream Injector
3. Frame Ground 1
4. Capacitor

Fuel Pump (Service Code 46)

Fuel Pump Removal

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Always stop the engine and 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

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

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

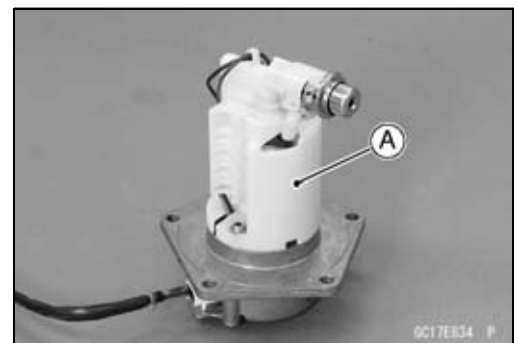
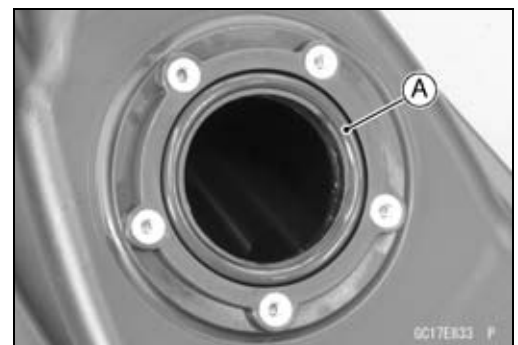
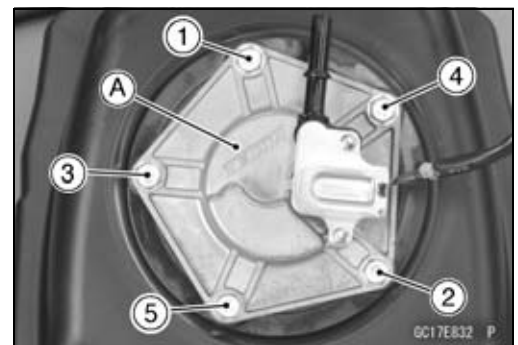
NOTICE

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 Installation

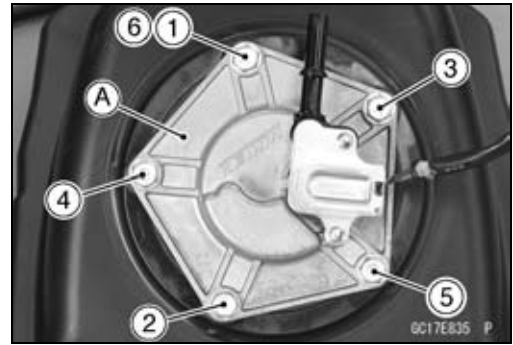
- Remove the dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.



3-72 FUEL SYSTEM (DFI)

Fuel Pump (Service Code 46)

- Install the fuel pump [A] to the fuel tank.
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Gradually tighten the fuel pump bolts evenly following the specified tightening sequence [1 ~ 6].
- Install the removed parts (see appropriate chapters).



Fuel Pump Operation Inspection

NOTE

○Be sure the battery is fully charged.

- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Make sure that the fuel pump operates (make light sounds) for 5 seconds, and then stops.
- Disconnect the power supply harness.
- ★ 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.

- Remove the radiator shrouds (see Radiator Shroud Removal in the Frame chapter).
- Remove the fuel tank bolt and band.
- Lift the fuel tank and hold it.
- Disconnect the fuel pump lead connector and connect the measuring adapter [A] between these connectors.
Main Harness [B]
Fuel Pump [C]

Special Tool - Measuring Adapter: 57001-1700

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

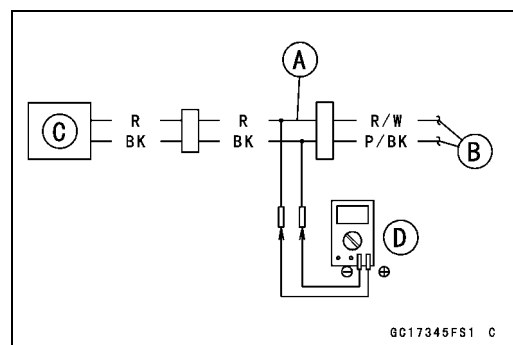
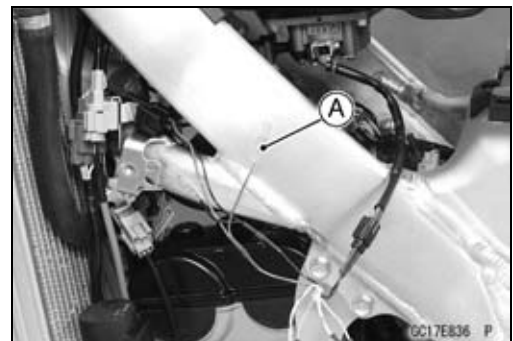
Fuel Pump Operating Voltage

Connections to Adapter:

Digital Meter (+) → R (pump R) lead

Digital Meter (-) → BK (pump BK) lead

- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.



Fuel Pump (Service Code 46)

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

Operating Voltage

Standard: Battery Voltage

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

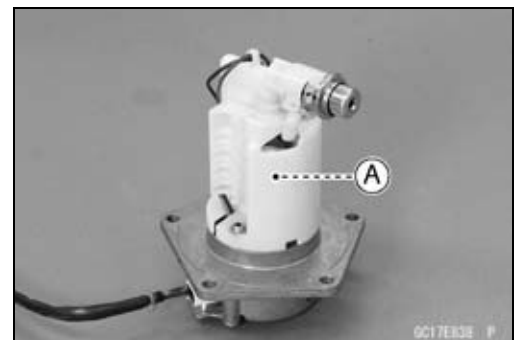
Pressure Regulator Removal

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



Fuel Filter Cleaning

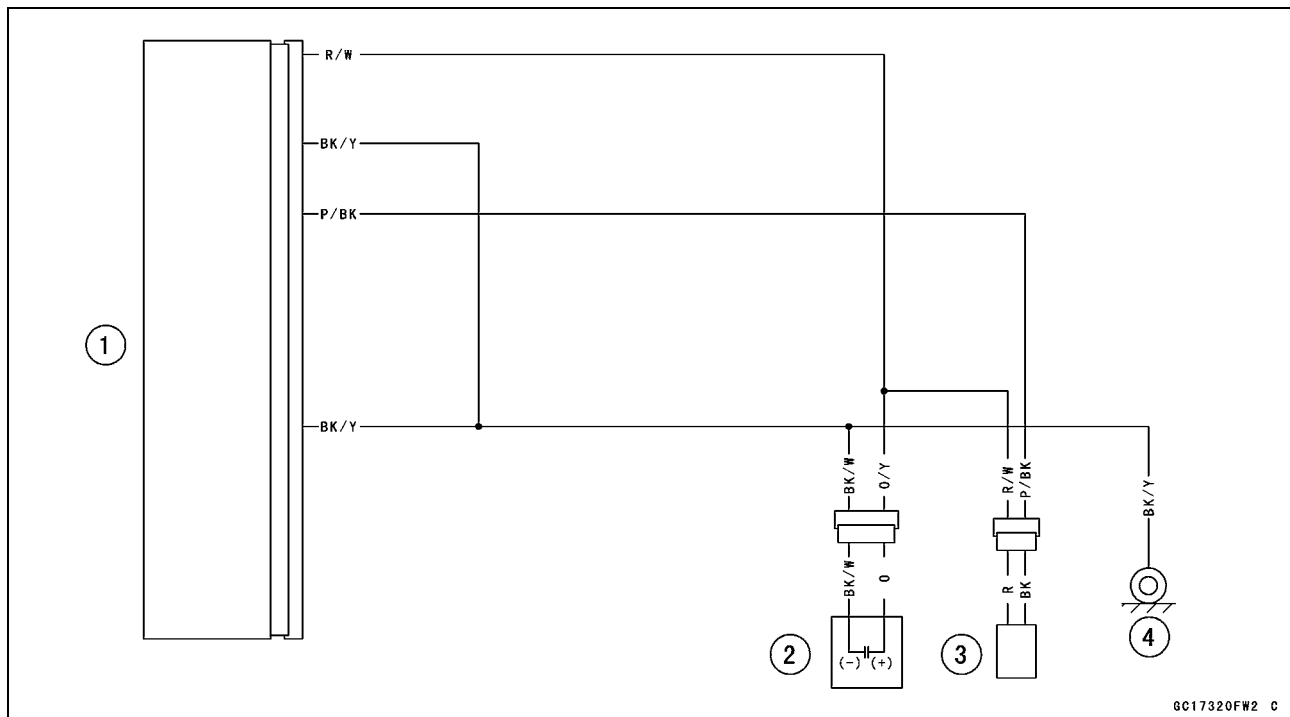
- The fuel filter [A] is built into the pump and can not be cleaned or checked.
- ★ If the fuel filter is suspected of clogging or being damaged, replace it with the fuel pump as a set.



3-74 FUEL SYSTEM (DFI)

Fuel Pump (Service Code 46)

Fuel Pump Circuit



1. ECU
2. Capacitor
3. Fuel Pump
4. Frame Ground 1

Ignition Coil (Service Code 51)

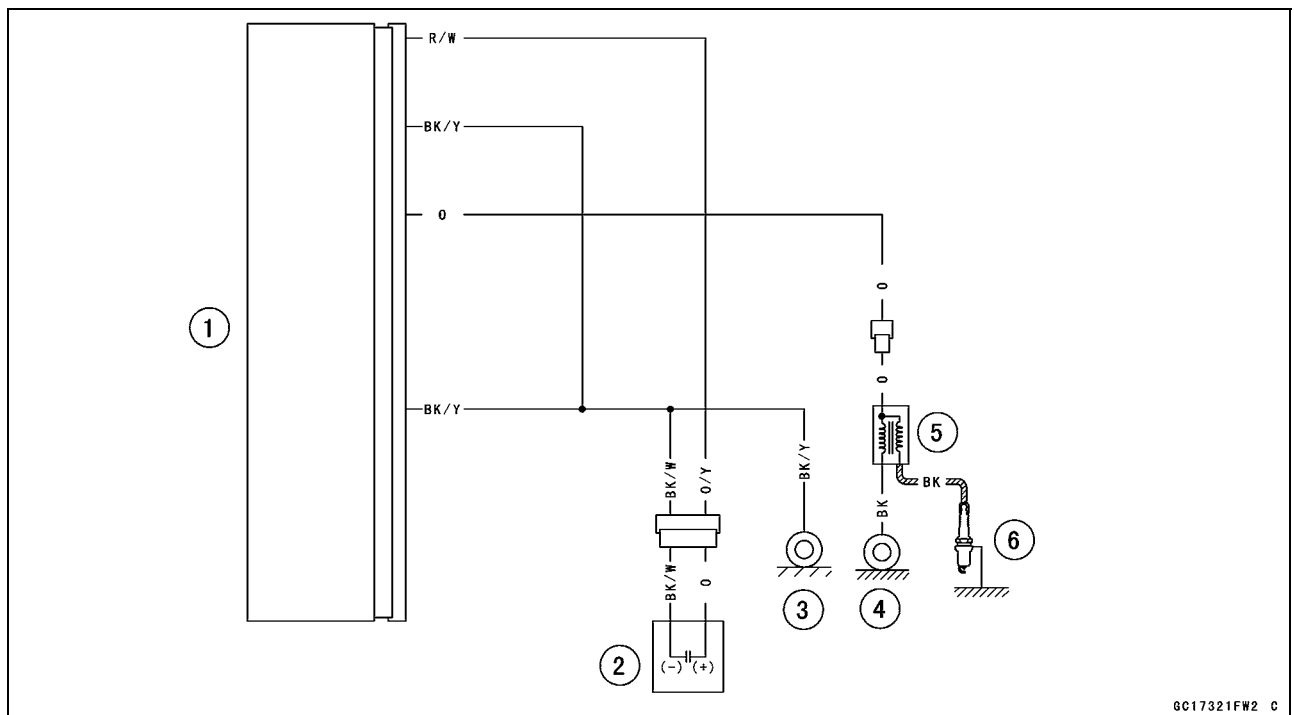
Ignition Coil Removal/Installation

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

Ignition Coil Primary Peak Voltage Inspection

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

Ignition Coil Circuit



GC17321FW2 C

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

3-76 FUEL SYSTEM (DFI)

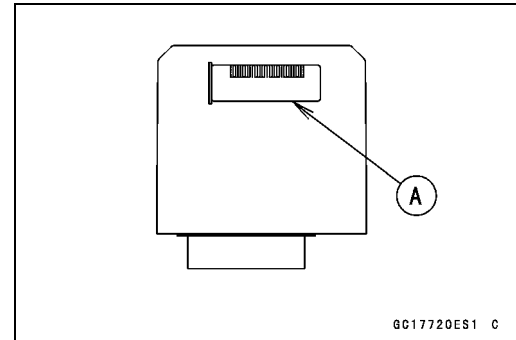
ECU

ECU Identification

○ Most countries have their own regulations, so each ECU has different characteristics. So, do not confuse ECU with each other and use only the ECU for your model. Otherwise, the motorcycle cannot clear the regulation.

ECU Identification

Part Number [A]	Specification
21175-0782	US, CA
21175-0792	AU, EUR
21175-0800	BR

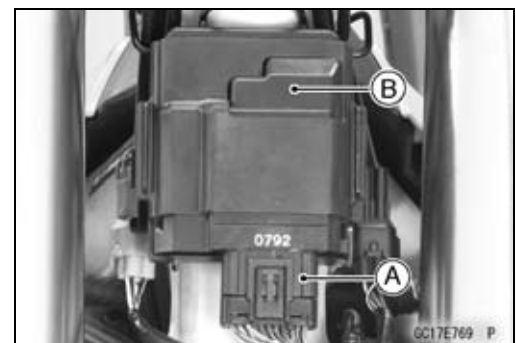
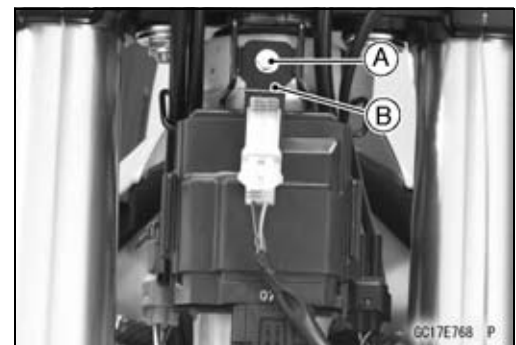


ECU Removal

NOTICE

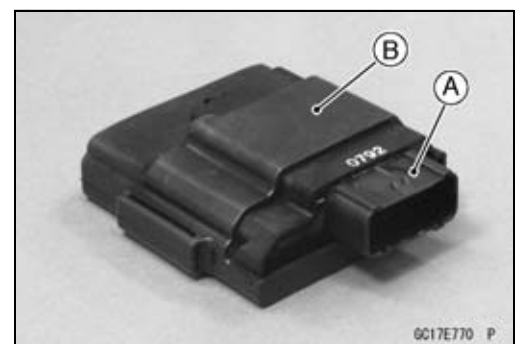
Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.

- Remove:
 - Number Plate (see Number Plate Removal in the Frame chapter)
 - Bolt [A]
 - Connector Bracket [B]
- Disconnect the ECU connector [A].
- Pull the ECU [B] together with rubber protector.



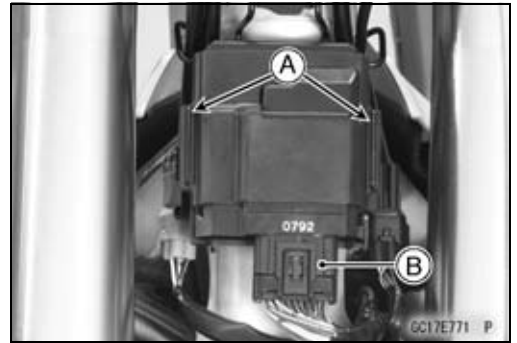
ECU Installation

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



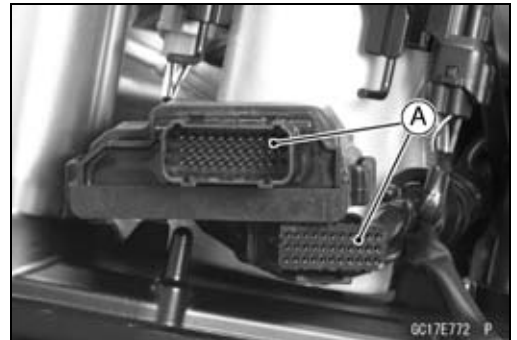
ECU

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



ECU Power Supply Inspection

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



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

Special Tool - Hand Tester: 57001-1394

ECU Grounding Inspection

Capacitor Connector [B] (BK/W lead) \longleftrightarrow

ECU Connector [C]

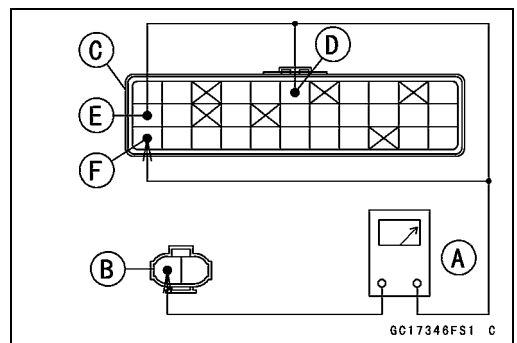
BK/Y lead [D] (ECU terminal 6)

BK/Y lead [E] (ECU terminal 22)

BK/W lead [F] (ECU terminal 33)

Criteria: 0 Ω

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



NOTE

○ Be sure the battery is fully charged.

- Connect the ECU connector.
- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.

3-78 FUEL SYSTEM (DFI)

ECU

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

Special Tool - Needle Adapter Set: 57001-1457

ECU Power Supply Inspection

Connections:

Digital Meter (+) → R/W lead (ECU terminal 1)

Digital Meter (-) → Battery (-) Terminal

Standard:

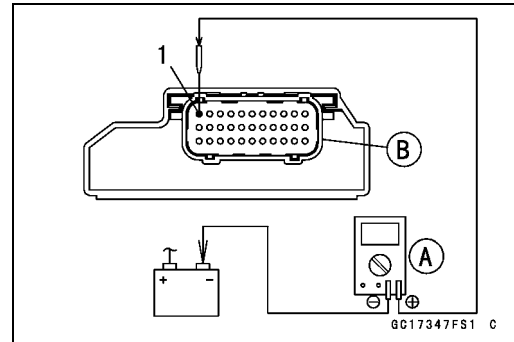
When battery is not connected: DC 0 V

When battery is connected: Battery Voltage

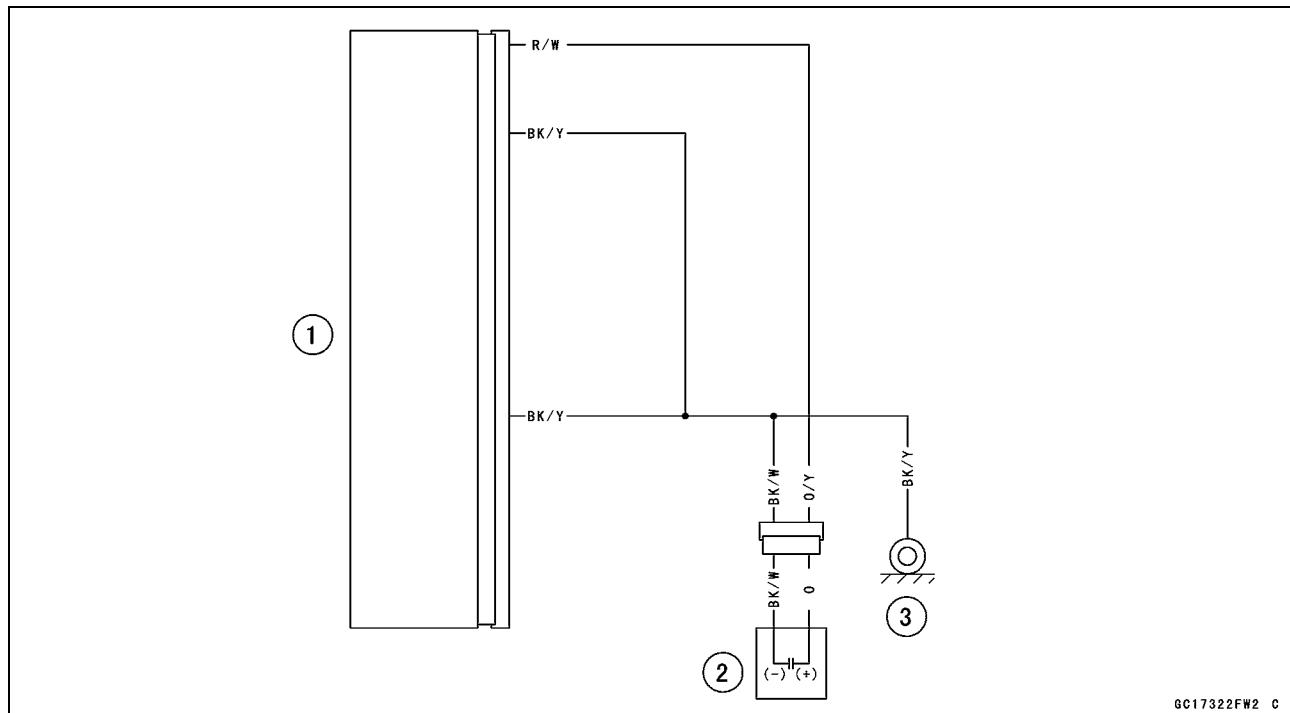
- ★ If the reading is out of the specification, check the following.

Power Supply Wiring (see ECU Power Supply Circuit)

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



ECU Power Supply Circuit



1. ECU
2. Capacitor
3. Frame Ground 1

Fuel Line

Fuel Pressure Inspection

NOTE

○ Be sure the battery is fully charged.

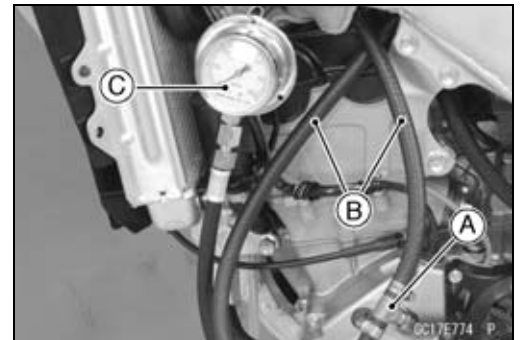
- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

⚠ 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 pump and throttle body assy.
- 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.
- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.

NOTE

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

NOTICE

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

3-80 FUEL SYSTEM (DFI)

Fuel Line

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

Fuel Pressure

Standard: 294 kPa (3.0 kgf/cm², 43 psi) with engine idling

NOTE

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

- Stop the engine.
- ★ If the fuel pressure is much higher than specified, replace the fuel pump because the fuel pressure regulator in the fuel pump have been clogged or stuck.
- ★ If the fuel pressure is much lower than specified, check the following.
 - Fuel Line Leakage (see Downstream/Upstream 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 the removed parts (see appropriate chapters).
- Start the engine and check for fuel leakage.

Fuel Flow Rate Inspection

WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Always stop the engine and 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.

NOTE

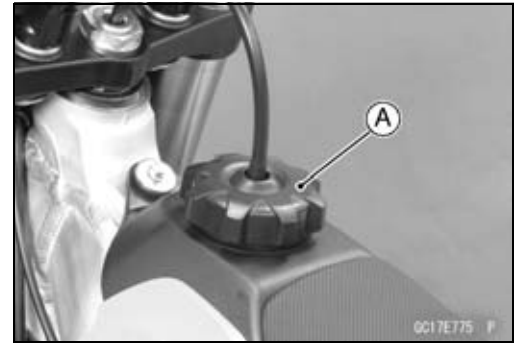
○ *Be sure the battery is fully charged.*

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

Special Tool - Fuel Hose: 57001-1607
- Remove the radiator shrouds (see Radiator Shroud Removal in the Frame chapter).
- Remove the fuel tank bolt and band (see Fuel Tank Removal).

Fuel Line

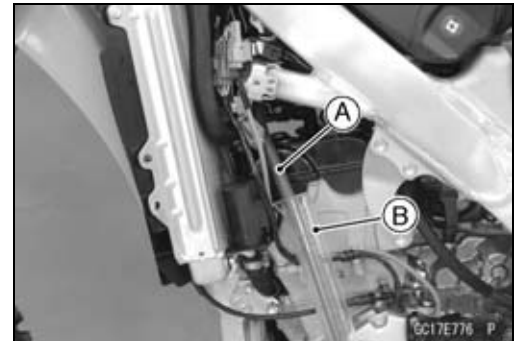
- Open the fuel tank cap [A] to lower the pressure in the tank.
- Remove the fuel hose from the fuel pump (see Fuel Tank Removal).
- Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.



⚠ WARNING

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.
- Refer to the Self-diagnosis Procedures, connect the 12 V battery to the main harness.
- Then the fuel pump operates and fuel is discharged.

NOTICE

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

- Measure the discharge for 5 seconds.
- Repeat this operation several times.

Amount of Fuel Flow

Standard: 40 mL (1.4 US oz.) or more for 5 seconds

- ★ If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).
- Install the fuel tank (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

3-82 FUEL SYSTEM (DFI)

Throttle Grip and Cable

If the throttle grip has excessive free play due to cable stretch or misadjustment, there will be a delay in throttle response. Also, the throttle valve may not open fully at full throttle. On the other hand, if the throttle grip has no play, the throttle will be hard to control, and the idle speed will be erratic. Check the throttle grip play periodically in accordance with the Periodic Maintenance Chart, and adjust the play if necessary.

The throttle cable routing is shown in Cable, Wire, and Hose Routing section in the Appendix chapter.

Throttle Grip (Throttle Cable) Free Play Inspection

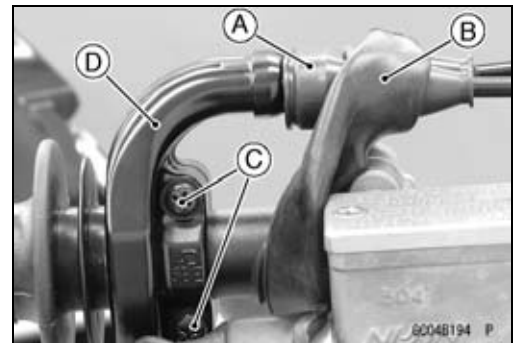
- Refer to the Throttle Grip Free Play Inspection in the Periodic Maintenance chapter.

Throttle Grip (Throttle Cable) Free Play Adjustment

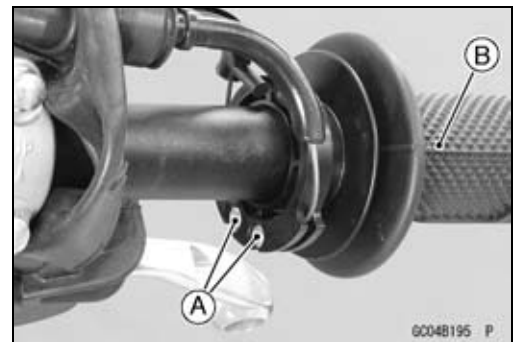
- Refer to the Throttle Grip Free Play Adjustment in the Periodic Maintenance chapter.

Throttle Cable Replacement

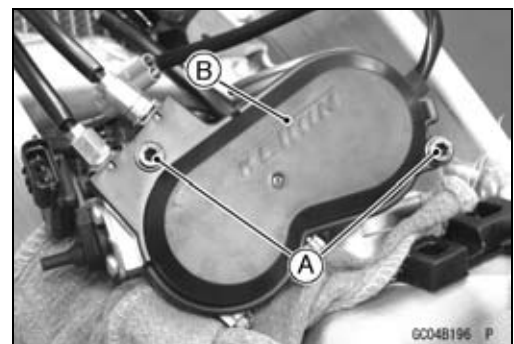
- Slide out the dust cover [A] and cable housing dust cover [B].
- Remove the screws [C].
- Separate the throttle cable housing [D].



- Free the tips [A] from the grip [B].

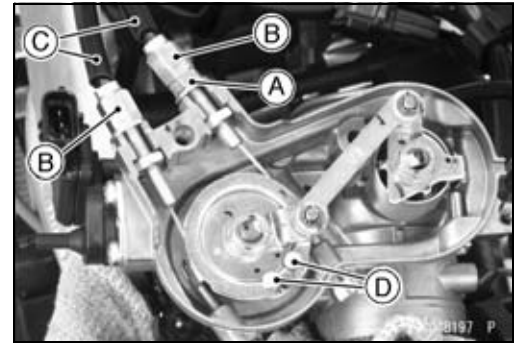


- Remove:
 - Throttle Body Assy (see Throttle Body Assy Removal)
 - Throttle Pulley Cover Bolts [A]
 - Throttle Pulley Cover [B]

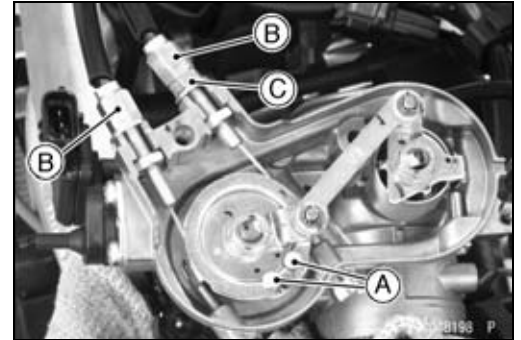


Throttle Grip and Cable

- Loosen the locknut [A] and bolts [B].
- Remove the cables [C] from the throttle body assy.
- Free the tips [D] from the pulley.
- Pull out the cables from the frame.



- Lubricate the throttle cables (see Lubrication in the Periodic Maintenance chapter).
- Apply grease to the throttle cable tips.
- Install the throttle cable tips [A].
- Install the bolts [B].
- The accelerator cable has washer, the bent side faces inside.
- While holding the decelerator cable bolt, tighten the throttle cable locknut [C] securely.



Torque - Throttle Cable Bolts: 3.0 N·m (0.31 kgf·m, 27 in·lb)

- Install the throttle pulley cover.
- Fit the projection [A] to the groove [B].
- Tighten:

Torque - Throttle Pulley Cover Bolts: 3.4 N·m (0.35 kgf·m, 30 in·lb)

- Install the removed parts (see appropriate chapters).

Torque - Throttle Case Mounting Screws: 3.8 N·m (0.39 kgf·m, 34 in·lb)



- Install the throttle cables in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- After the installation, adjust each cable properly (see Throttle Grip Free Play Adjustment in the Periodic Maintenance chapter).

⚠ WARNING

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

Throttle Cable Lubrication

- Whenever the throttle cable is removed or in accordance with the Periodic Maintenance Chart, lubricate these cables (see Lubrication in the Periodic Maintenance chapter).
- Apply a thin coating of grease to the cable upper end.
- Use a commercially available pressure cable lubricator to lubricate these cables.

Throttle Cable Inspection

- Refer to the Cable Inspection in the Periodic Maintenance chapter.

3-84 FUEL SYSTEM (DFI)

Throttle Body Assy

Idle Speed Inspection

- Refer to the Idle Speed Inspection in the Periodic Maintenance chapter.

Throttle Bore Cleaning

- Refer to the Throttle Body Cleaning in the Periodic Maintenance chapter.

Throttle Body Assy Removal

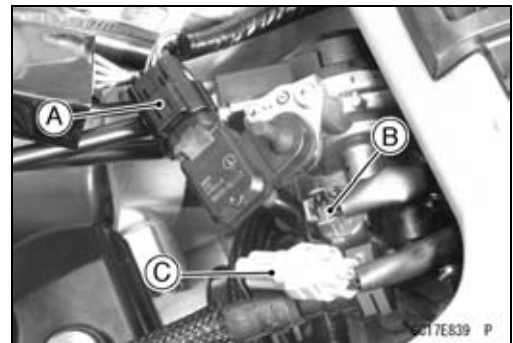
⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Always stop the engine and 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

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

- Remove:
 - Fuel Tank (see Fuel Tank Removal)
 - Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
 - Air Cleaner Housing with Rear Frame (see Rear Frame Removal in the Frame chapter)
- Disconnect:
 - Intake Air Pressure Sensor Connector [A]
 - Downstream Injector Connector [B]
 - Throttle Sensor Connector [C]
- Loosen the clamp screw [A].
- Pull the throttle body assy backward.
- Remove the throttle cable lower ends (see Throttle Cable Replacement).

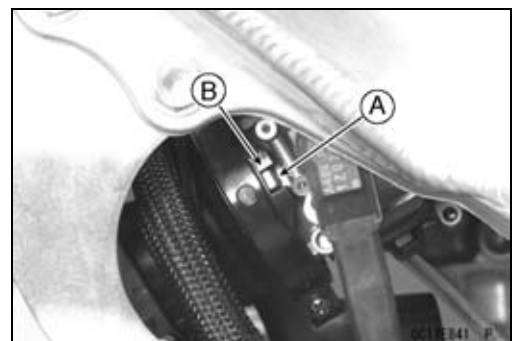


Throttle Body Assy Installation

- Install the throttle body assy so that fit the projection [A] on throttle body assy and groove [B] of the throttle body holder.
- Install the removed parts (see appropriate chapters).

NOTE

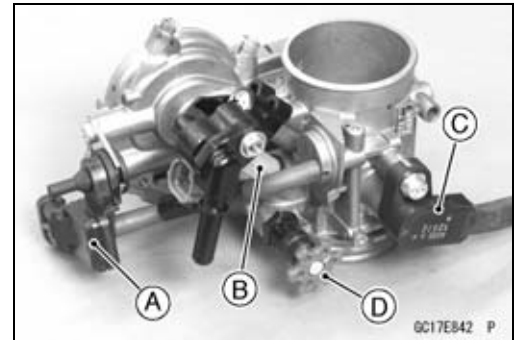
- For easily starting the engine, connect the 12 V battery to the main harness (see Self-diagnosis Procedures).
- When the battery is connected, the fuel pump is driven and the pressure of the fuel line increases.



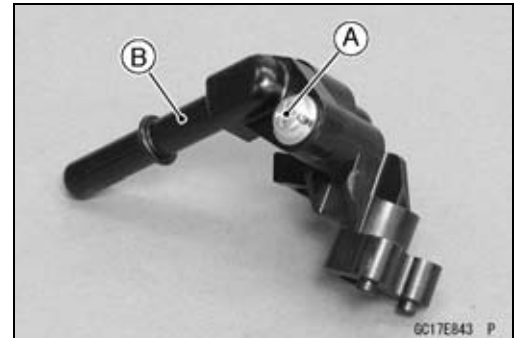
Throttle Body Assy

Throttle Body Assy Disassembly

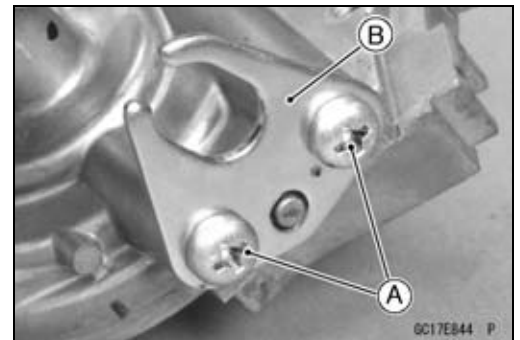
- Remove:
 - Throttle Body Assy (see Throttle Body Assy Removal)
 - Intake Air Pressure Sensor [A] (see Intake Air Pressure Sensor Removal)
 - Downstream Injector [B] (see Downstream Injector Removal)
 - Throttle Sensor [C] (see Throttle Sensor Replacement)
 - Idle Adjusting Screw Assy [D]



- Remove:
 - Screw [A]
 - Delivery Pipe [B]

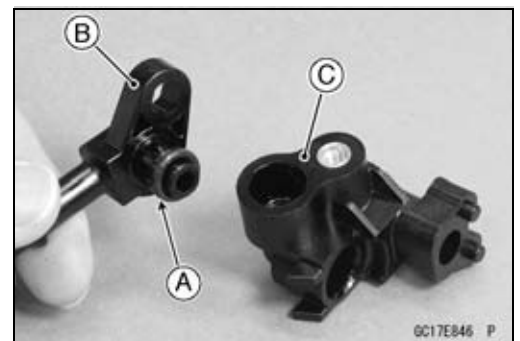


- Remove:
 - Screws [A]
 - Plate [B]

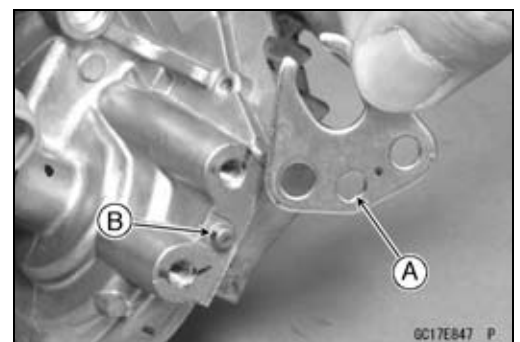


Throttle Body Assy Assembly

- Replace the O-ring [A] of delivery pipe [B] with a new one.
- Apply engine oil to the new O-ring.
- Install the delivery pipe in the joint [C], and tighten the screw securely.



- Install the plate so that fit the hollow [A] on the plate and projection [B] on the throttle body assy.
- Tighten the screws securely.
- Install the removed parts (see appropriate chapters).

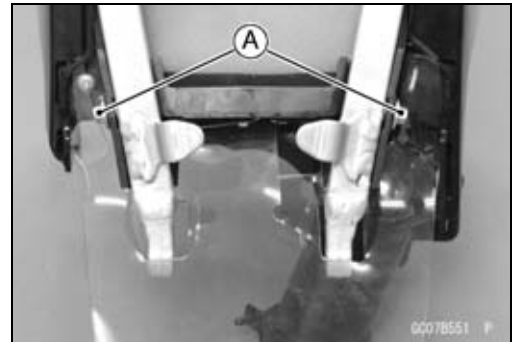


3-86 FUEL SYSTEM (DFI)

Air Cleaner

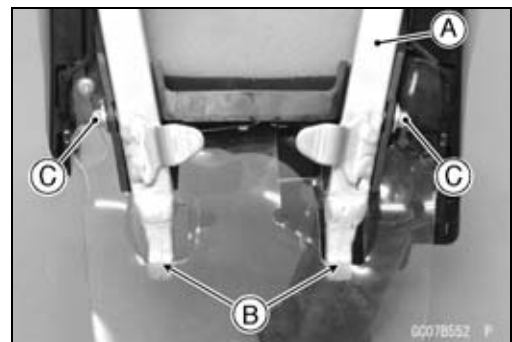
Air Cleaner Housing Removal

- Remove the rear frame (see Rear Frame Removal in the Frame chapter).
- Remove the air cleaner housing bolts [A].
- Take the air cleaner housing off the rear frame.



Air Cleaner Housing Installation

- Assemble the air cleaner housing (see Exploded View section).
- Install the air cleaner element (see Air Cleaner Element Installation in the Periodic Maintenance chapter).
- Install the air cleaner housing to the rear frame.
- Insert the rear frame [A] to the holes [B] of the guard.
- Tighten the bolts [C] securely.
- Install the rear frame (see Rear Frame Installation in the Frame chapter).



Element Removal/Installation

- Refer to the Air Cleaner Element Cleaning and Inspection in the Periodic Maintenance chapter.

Element Cleaning and Inspection

- Refer to the Air Cleaner Element Cleaning and Inspection in the Periodic Maintenance chapter.

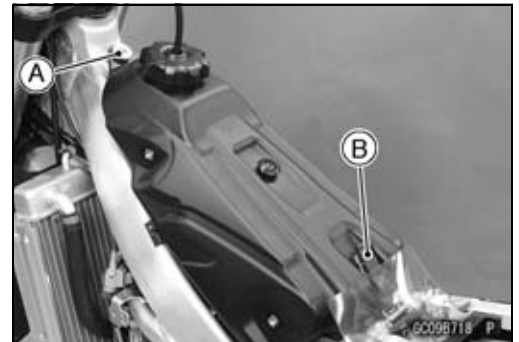
Fuel Tank

Fuel Tank Removal

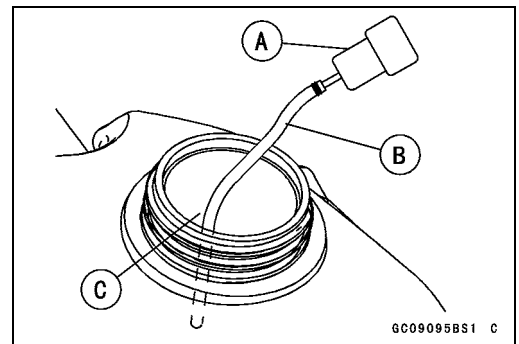
⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Always stop the engine and 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.

- Remove:
 - Seat (see Seat Removal in the Frame chapter)
 - Radiator Shrouds (see Radiator Shroud Removal in the Frame chapter)
 - Fuel Tank Bolt [A]
 - Band [B]



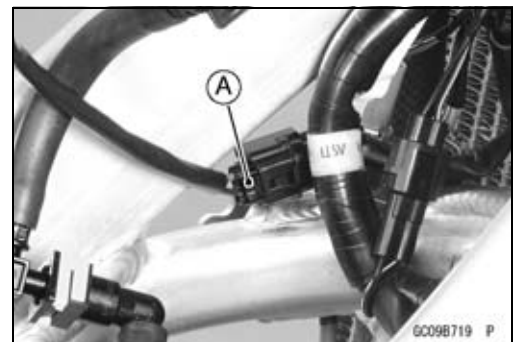
- Draw the fuel out from the fuel tank with a commercially available pump [A].
- Use a soft plastic hose [B] as a pump intake hose in order to insert the hose smoothly.
- Put the hose through the fill opening [C] into the tank and draw the fuel out.



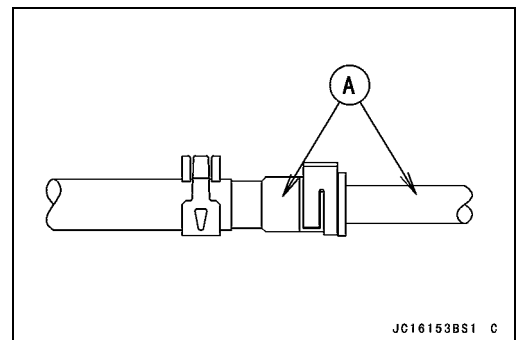
⚠ WARNING

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.

- Lift up the fuel tank, and disconnect the fuel pump lead connector [A].



- 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.

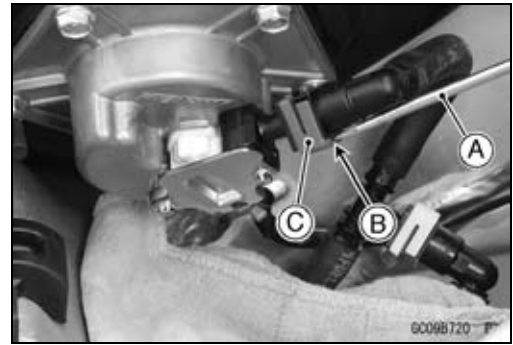


3-88 FUEL SYSTEM (DFI)

Fuel Tank

When removing with standard tip screwdriver:

- Insert the standard tip screwdriver [A] into the slit [B] on the joint lock [C].
- Turn the driver to disconnect the joint lock.

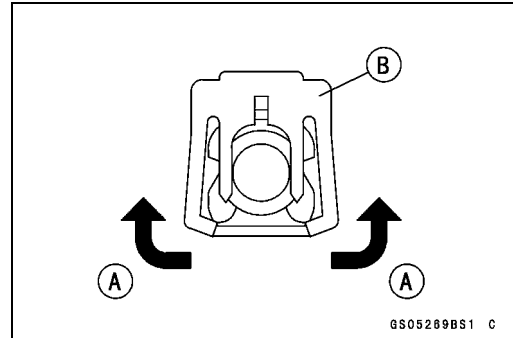


When removing with fingers:

- Open and push up [A] the joint lock [B] with your fingers.

NOTICE

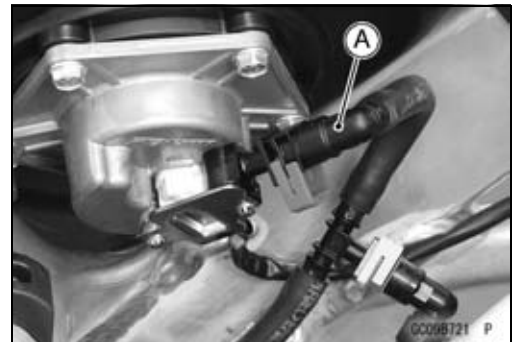
Prying or excessively widening the joint lock ends for fuel hose removal will permanently deform the joint lock, resulting in a loose or incomplete lock that may allow fuel to leak and create the potential for a fire explosion. To prevent fire or explosion from a damaged joint lock, do not pry or excessively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



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



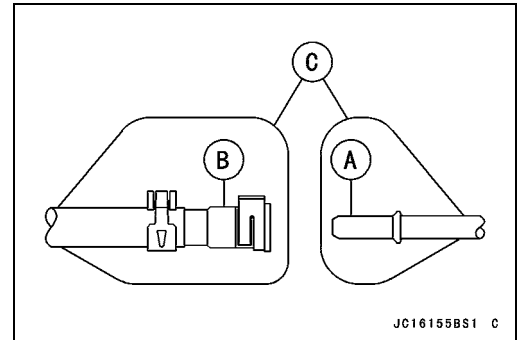
- Close the fuel tank cap.
- Remove the fuel tank, and place it on a flat surface.
- Do not apply the load to the fuel outlet pipe of the fuel pump.

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Store the fuel tank in an area which is well-ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.

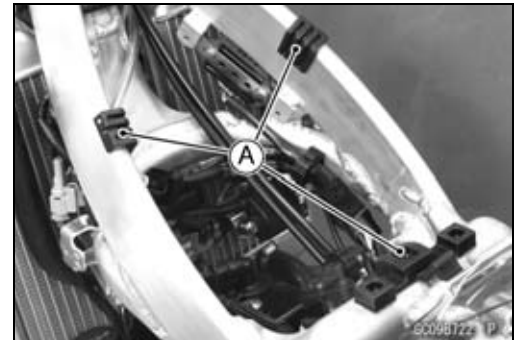
Fuel Tank

- Clean the pipe [A].
- Cover the pipe and hose joint [B] with the vinyl bags [C] to keep them clean.

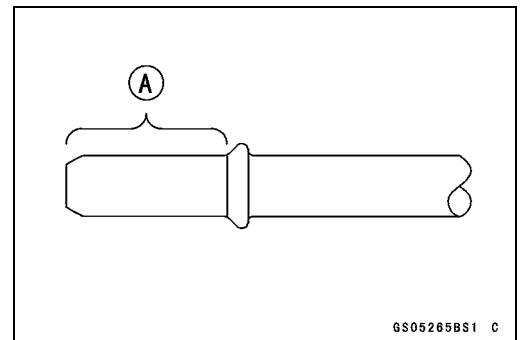
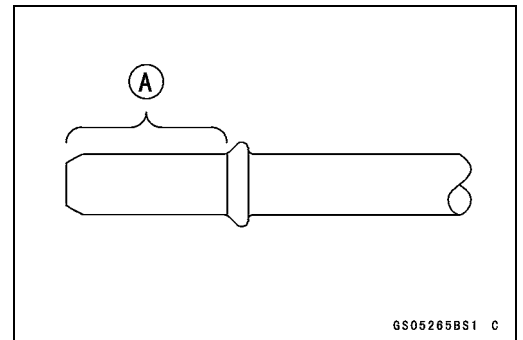


Fuel Tank Installation

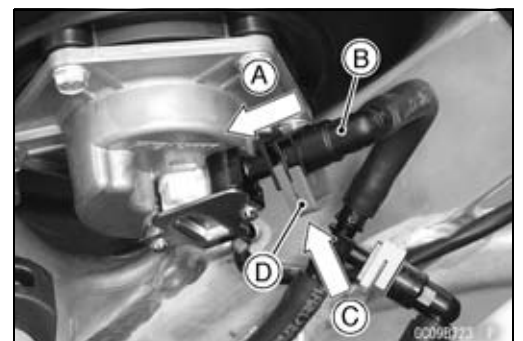
- Note the above WARNING (see Fuel Tank Removal).
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Check that the dampers [A] are in place on the frame.
- ★ If the dampers are damaged or deteriorated, replace it.
- Using a high flash-point solvent, clean any oil or dirt that may be on the adhesive cement coating area. Dry them with a clean cloth.
- ★ If necessary, apply adhesive cement to the underside of the dampers, and stick them.
- Remove the vinyl bags on the pipe and hose joint.
- Check that there are no flaws, burrs, and adhesion of foreign materials on fuel outlet pipe [A].
- Check the joint lock for deformation and wear.
- If the joint lock is deformed, replace the fuel hose with a new one.



- Apply engine oil to the fuel outlet pipe [A] lightly.



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



3-90 FUEL SYSTEM (DFI)

Fuel Tank

- Push and pull [A] the fuel hose joint 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 by sliding the joint.

- ★ If it comes off, reinstall the hose joint.
- Connect the fuel pump lead connector.
- Hook the band to the fuel tank.
- Tighten the fuel tank bolt.
- After installing the fuel tank, make sure that both throttle cables [A] (outer) move slightly by pulling them back and forth in the upper space of the right side of the fuel tank [B]. Check that both throttle cables run under the frame (right side) [C].

NOTE

○ Check the fuel hose position. If the fuel hose interferes with the cylinder head cover, move the fuel hose upward.

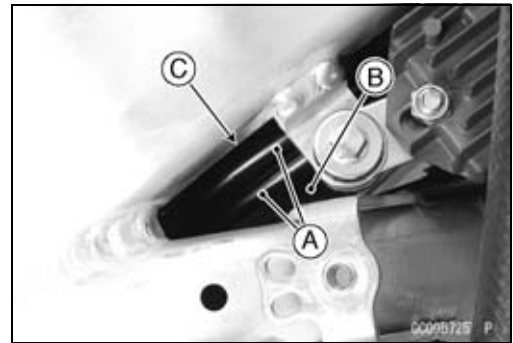
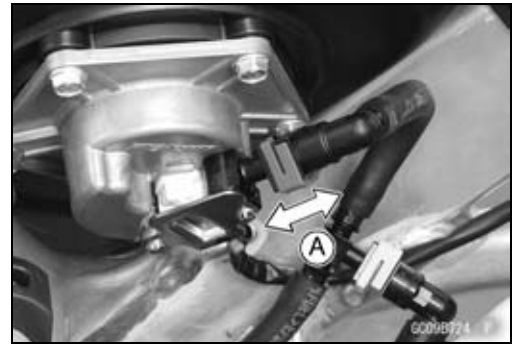
- Install the removed parts (see appropriate chapters).
- Insert the fuel tank breather hose into the steering stem hole.

NOTE

○ For easily starting the engine, connect the 12 V battery to the main harness (see Self-diagnosis Procedures).
○ When the battery is connected, the fuel pump is driven and the pressure of the fuel line increases.

Fuel Tank Cleaning

- Refer to the Fuel Tank Cleaning in the Periodic Maintenance chapter.



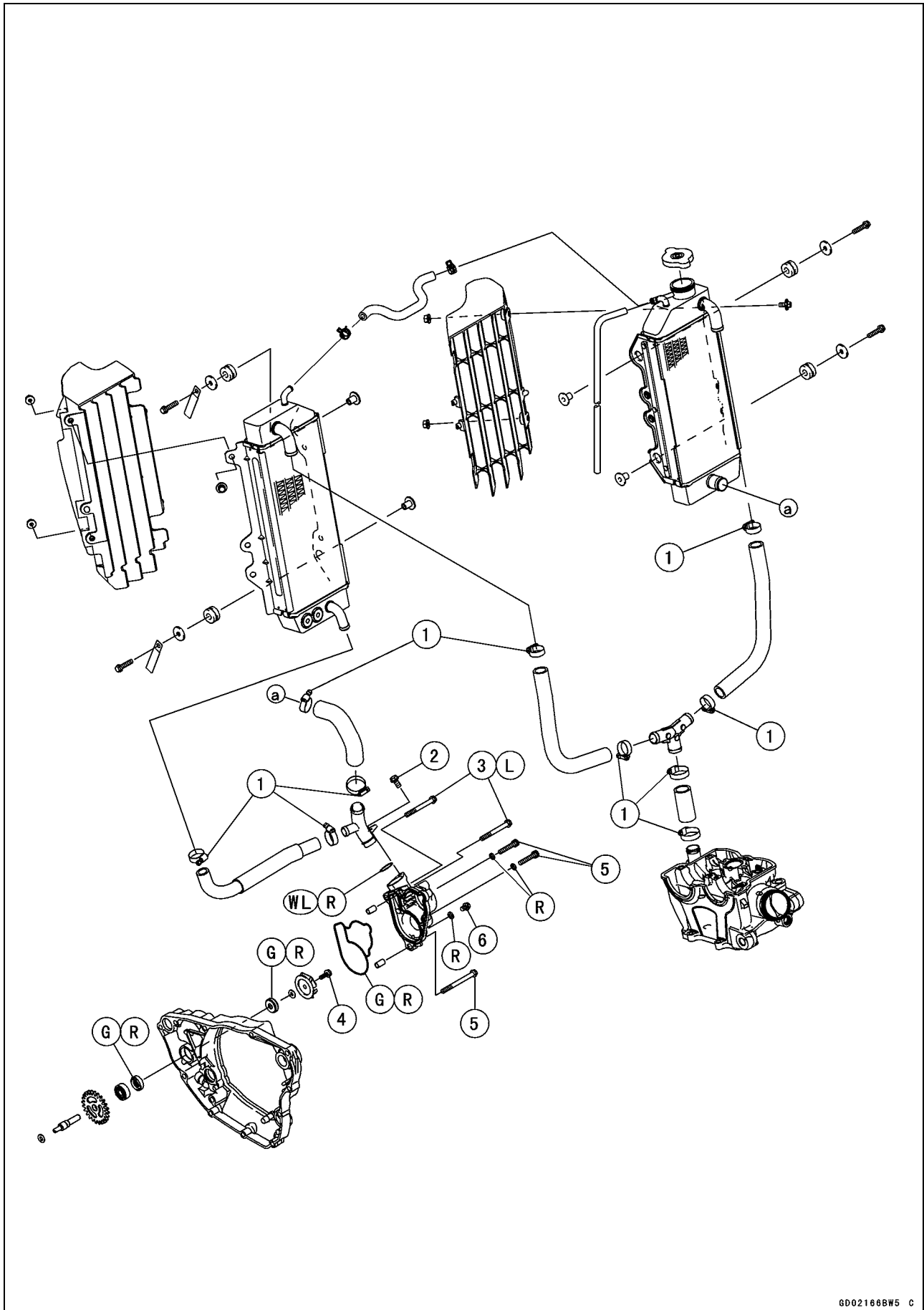
Cooling System

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4-2 COOLING SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Hose Clamp Screws	3.0	0.31	27 in·lb	
2	Water Pipe Bolt	9.8	1.0	87 in·lb	
3	Water Pump Cover Bolts (L = 55 mm)	9.8	1.0	87 in·lb	L
4	Water Pump Impeller Bolt	7.0	0.71	62 in·lb	
5	Water Pump Cover Bolts (L = 30, 65 mm)	9.8	1.0	87 in·lb	
6	Coolant Drain Bolt	7.0	0.71	62 in·lb	

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

WL: Apply soap and water solution.

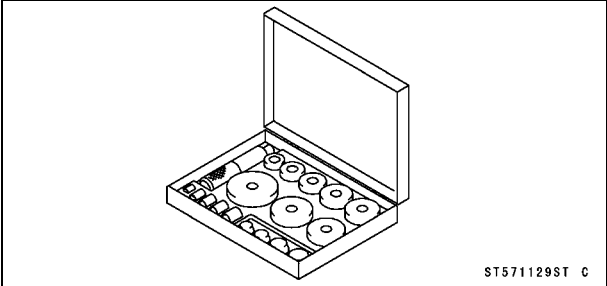
4-4 COOLING SYSTEM

Specifications

Item	Standard
Recommended Coolant Type Color Mixed Ratio Freezing Point Total Amount	Permanent type antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators) Green Soft water 50%, coolant 50% -35°C (-31°F) 1.2 L (1.3 US qt)
Radiator Radiator Cap Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm ² , 13 ~ 18 psi)

Special Tool

Bearing Driver Set:
57001-1129



4-6 COOLING SYSTEM

Coolant

Coolant Level Inspection

- Refer to the Coolant Level Inspection in the Periodic Maintenance chapter.

Coolant Deterioration Inspection

- Refer to the Coolant Deterioration Inspection in the Periodic Maintenance chapter.

Coolant Draining

⚠ WARNING

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.

NOTICE

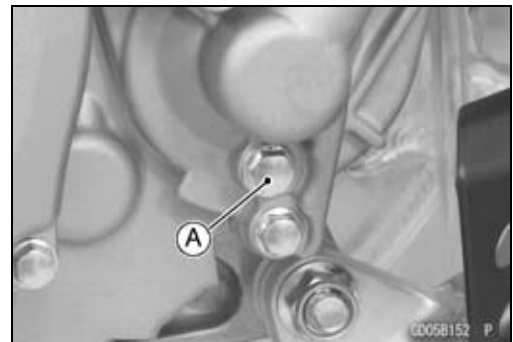
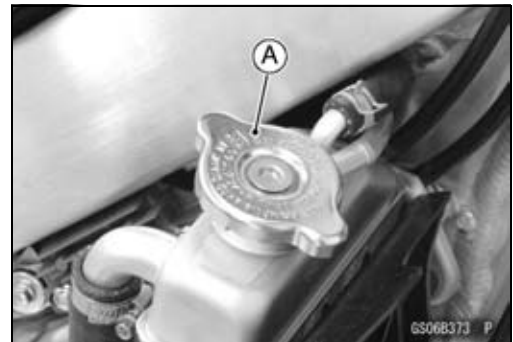
The coolant should be changed periodically to ensure long engine life.

- Remove:
 - Right Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
 - Radiator Cap [A]

NOTE

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

- Place a container under the coolant drain bolt [A].
- Remove the drain bolt to drain the coolant.
- Inspect the old coolant (see Coolant Deterioration Inspection in the Periodic Maintenance chapter).



Coolant

Coolant Filling

NOTICE

Use coolant containing corrosion inhibitors made specifically for aluminum engines and radiators in accordance with the instruction of the manufacturer's. Soft or distilled water must be used with the antifreeze (see below for antifreeze) in the cooling system. If hard water is used in the system, it causes scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system.

Recommended Coolant

- Type: Permanent type antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
- Color: Green
- Mixed Ratio: Soft water 50%, coolant 50%
- Freezing Point: -35°C (-31°F)
- Total Amount: 1.2 L (1.3 US qt)

- Replace the drain bolt gasket with a new one.
- Tighten:

Torque - Coolant Drain Bolt: 7.0 N·m (0.71 kgf·m, 62 in·lb)

- Fill the radiator up to the bottom of the radiator filler neck [A] with coolant [B], and install the cap.
- Lean the motorcycle slightly so that the filler neck is located uppermost in order to exhaust the air accumulated in the radiator.

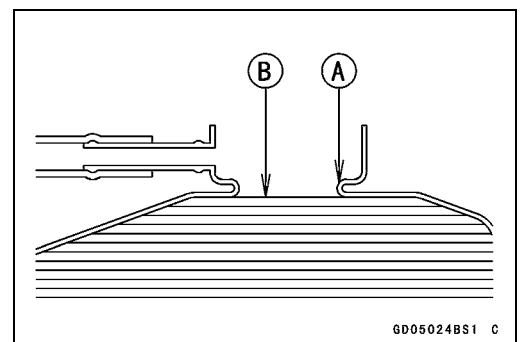
NOTE

- Pour in the coolant slowly so that it can expel the air from the engine and radiator.
- The radiator cap must be installed in two steps. First turn the cap clockwise to the first stop. Then push down on it and turn it the rest of the way.

- Check the cooling system for leaks.

Air Bleeding

- Start the engine, warm up the engine thoroughly, and then stop the engine.
- Wait until the engine cools down.
- Remove the radiator cap.
- Check the coolant level (see Coolant Level Inspection in the Periodic Maintenance chapter).
- ★ If the coolant level is low, add coolant up to the bottom of the filler neck.
- Install the radiator cap.
- Check the cooling system for leaks.



4-8 COOLING SYSTEM

Coolant

Cooling System Pressure Testing

NOTICE

During pressure testing, do not exceed the pressure for which the system is designed to work. The maximum pressure is 123 kPa (1.25 kgf/cm², 18 psi).

- Remove the radiator cap, and install a cooling system pressure tester [A] and adapter [B] on the radiator filler neck [C].

NOTE

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

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm², 18 psi).
- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the cooling system is all right.
- ★ If the pressure drops and no external source is found, check for internal leaks. Check the cylinder head gasket for leaks.
- Remove the pressure tester, replenish the coolant, and install the radiator cap.

Cooling System Flushing

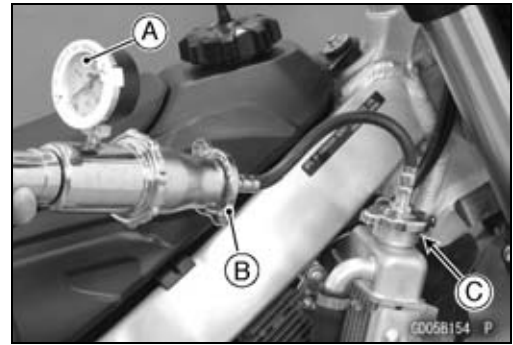
Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passages and considerably reduce the efficiency of the cooling system.

- Drain the cooling system (see Coolant Draining).
- Fill the cooling system with fresh water mixed with a flushing compound.

NOTICE

Avoid the use of a flushing compound which is harmful to the aluminum engine and radiators. Carefully follow the instructions supplied by the manufacture of the cleaning product.

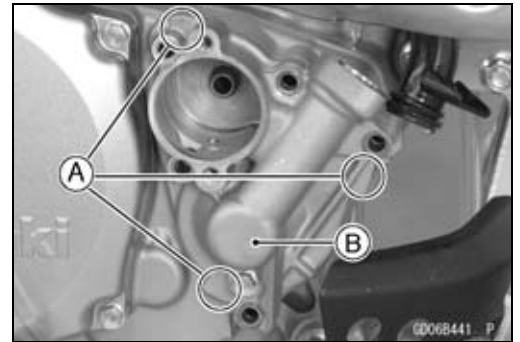
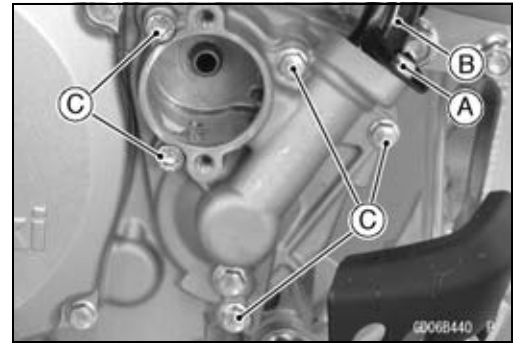
- Warm up the engine, and run it at normal operating temperature for about 10 minutes.
- Stop the engine, and drain the cooling system after the coolant cools down.
- Fill the system with fresh water.
- Warm up the engine and drain the system after the coolant cools down.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant, and bleed the air from the system (see Air Bleeding).



Water Pump

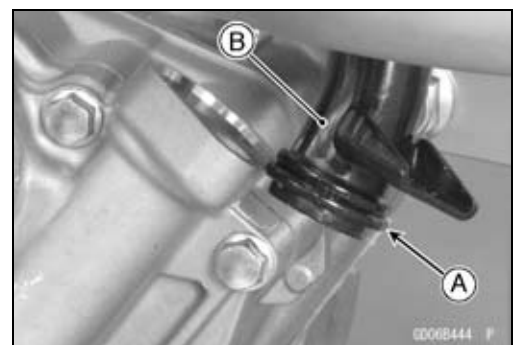
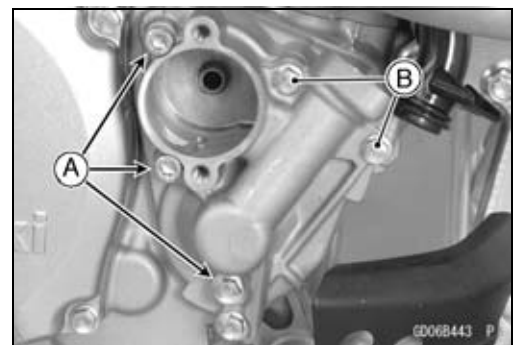
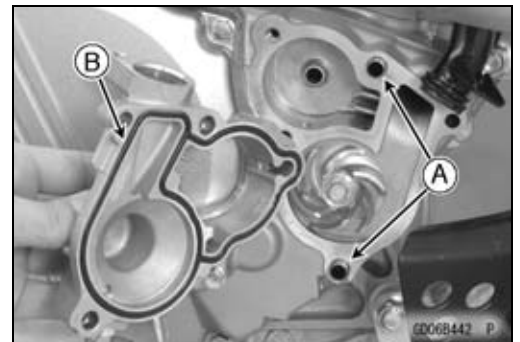
Water Pump Cover Removal

- Remove the oil filter (see Oil Filter Change in the Periodic Maintenance chapter).
 - Drain the engine oil from the water pump cover.
 - Drain the coolant (see Coolant Draining).
 - Remove the water pipe bolt [A], and disconnect the water pipe [B].
 - Remove the water pump cover bolts [C].
-
- Using the pry points [A], remove the pump cover [B].



Water Pump Cover Installation

- Install:
 - Dowel Pins [A]
 - Replace the pump cover gasket [B] with a new one.
 - Apply grease to the pump cover gasket.
-
- Install the water pump cover.
 - Replace the washers [A] with new ones.
 - Apply a non-permanent locking agent to the 55 mm (2.2 in.) bolts [B].
 - Tighten:
 - Torque - Water Pump Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
 - Coolant Drain Bolt: 7.0 N·m (0.71 kgf·m, 62 in·lb)**
-
- Replace the water pipe O-ring [A] with a new one.
 - Apply soap and water solution to the new O-ring.
 - Insert the water pipe [B] straightly into the hole of the water pump cover.
 - Tighten:
 - Torque - Water Pipe Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
 - Install the oil filter (see Oil Filter Change in the Periodic Maintenance chapter).
 - Fill the coolant (see Coolant Filling).
 - Bleed the air from the cooling system (see Air Bleeding).
 - Check the engine oil level and add the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).

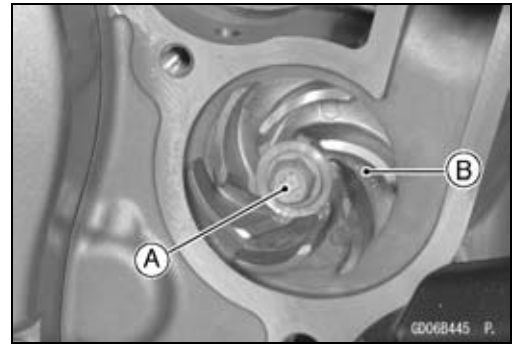


4-10 COOLING SYSTEM

Water Pump

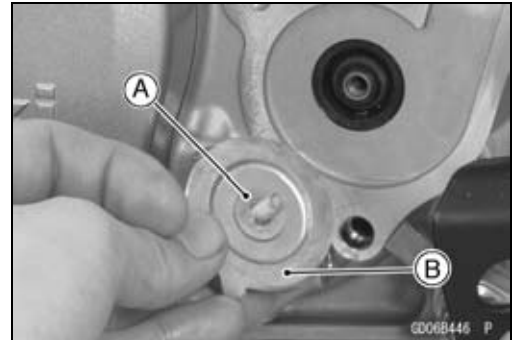
Impeller Removal

- Remove:
 - Water Pump Cover (see Water Pump Cover Removal)
- Remove the impeller bolt [A] and take out the impeller [B] and washer.



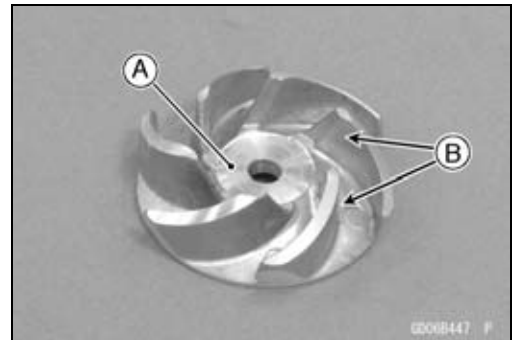
Impeller Installation

- Install the washer [A] and impeller [B].
- Tighten:
 - Torque - Water Pump Impeller Bolt: 7.0 N-m (0.71 kgf-m, 62 in-lb)
- Install the water pump cover (see Water Pump Cover Installation).



Water Pump Inspection

- Visually check the impeller [A].
- ★ If the surface is corroded, or if the blades [B] are damaged, replace the impeller.



- Check the drainage outlet passage [A] at the bottom of the right engine cover for coolant leaks.
- ★ If the oil seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the oil seals.



Water Pump Gear Removal

- Remove:
 - Water Pump Cover (see Water Pump Cover Removal)
 - Impeller (see Impeller Removal)
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
- Pull out the water pump gear [A] together with shaft.



Water Pump

Water Pump Gear Installation

- Press in the water pump gear shaft [A] to the gear [B] until it is bottomed.
- Apply grease to the water pump gear shaft.
- Install the gear shaft from bearing side [C].

NOTICE

Be sure to apply grease to the water pump shaft when installing. If it is installed dry, the seals may wear excessively.

- Install the impeller and check to see that the impeller turn freely.

Oil Seal and Bearing Removal

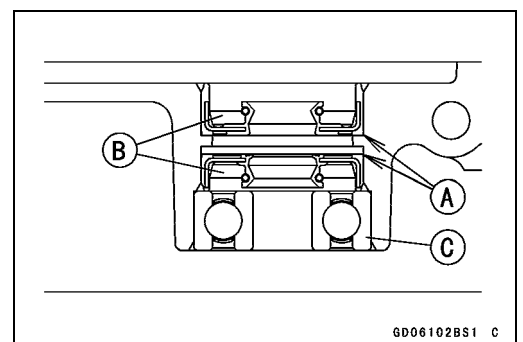
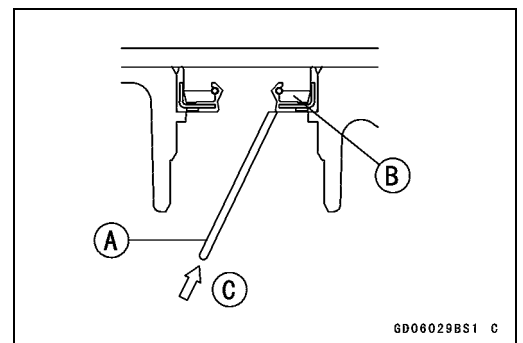
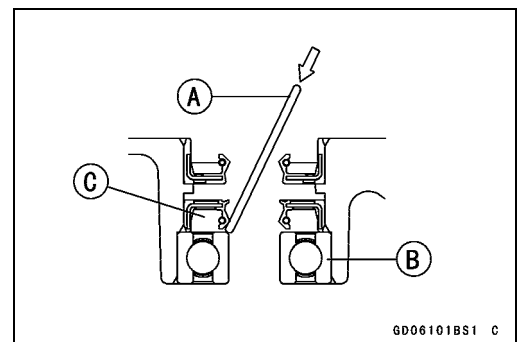
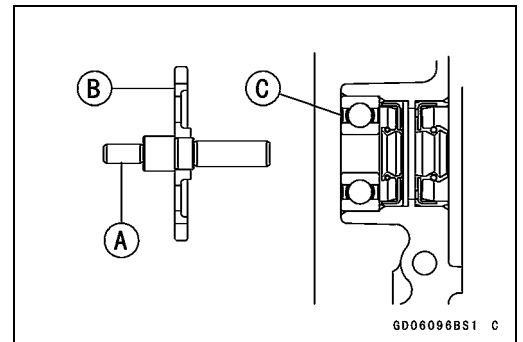
- Remove:
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
 - Water Pump Gear (see Water Pump Gear Removal)
- Insert a bar [A] into the water pump shaft hole from the outside.
- Tapping evenly around the inner race to remove the ball bearing [B].
- Remove the oil seal [C] from the right engine cover in the same way as ball bearing removal.
- Insert a bar [A] into the water pump shaft hole from the inside.
- Remove the oil seal [B] by tapping [C] evenly around the seal lips.

Oil Seal and Bearing Installation

NOTICE

If the oil seal or ball bearing is removed, replace all of them with new ones at the same time.

- Replace the oil seals with new ones.
- Apply plenty of grease to the oil seal lips.
- Press in the oil seals direction as shown.
- Press in the oil seal using a bearing driver set so that the seal surface is flush with the surface of the right engine cover.
 - Flat Side [A]
 - Water Pump Oil Seals [B]
- Special Tool - Bearing Driver Set: 57001-1129**
- Press the ball bearing [C] into the hole until the face of the bearing is even with the end of the hole.
 - Special Tool - Bearing Driver Set: 57001-1129**
- Install the removed parts (see appropriate chapters).

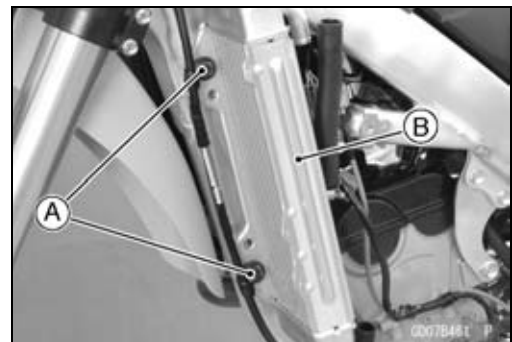
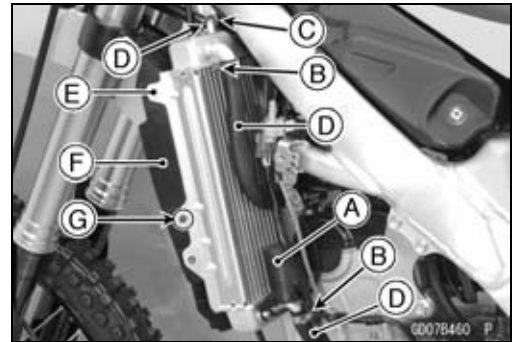


4-12 COOLING SYSTEM

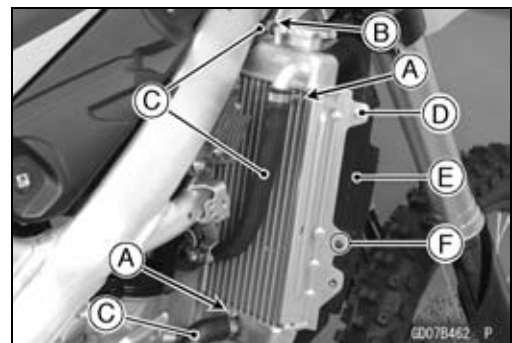
Radiator

Radiator Removal

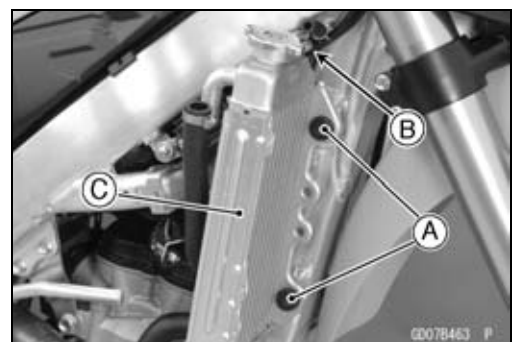
- Drain the coolant (see Coolant Draining).
- Remove:
 - Radiator Shrouds (see Radiator Shroud Removal in the Frame chapter)
- Remove the capacitor [A] (see Capacitor Removal in the Electrical System chapter).
- Loosen:
 - Water Hose Clamp Screws [B]
- Slide the clamp [C].
- Pull the water hoses [D] off the radiator.
- Remove:
 - Radiator Screen Bolt [E]
 - Left Radiator Screen [F]
- Clear the projection [G] from the hole.
- Remove:
 - Radiator Mounting Bolts [A], Clamps and Washers
 - Left Radiator [B]



- Loosen:
 - Water Hose Clamp Screws [A]
- Slide the clamp [B].
- Pull the water hoses [C] off the radiator.
- Remove:
 - Radiator Screen Bolt [D]
 - Right Radiator Screen [E]
- Clear the projection [F] from the hole.



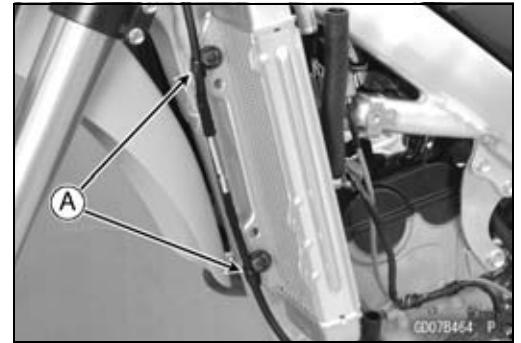
- Remove:
 - Radiator Mounting Bolts [A] and Washers
 - Overflow Hose [B]
 - Right Radiator [C]



Radiator

Radiator Installation

- Install:
 - Radiators
 - Washers
 - Clutch Cable Clamps [A] (Left Side)
- Tighten the radiator mounting bolts securely.
- Run the overflow hose and water hoses correctly (see 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 radiator screens on both sides.
 - Fit the projections [A] and holes [B].
- Tighten the radiator screen bolts securely.
- Fill the coolant (see Coolant Filling).
- Install the removed parts (see appropriate chapters).

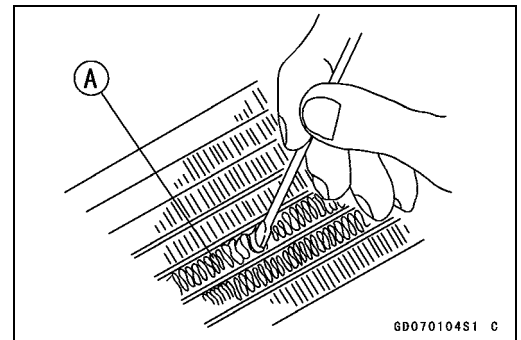


Radiator Inspection

- Check the radiator core.
 - ★ If there are obstructions to air flow, remove them.
 - ★ If the corrugated fins [A] are deformed, carefully straighten them with the standard tip screwdriver.

NOTICE

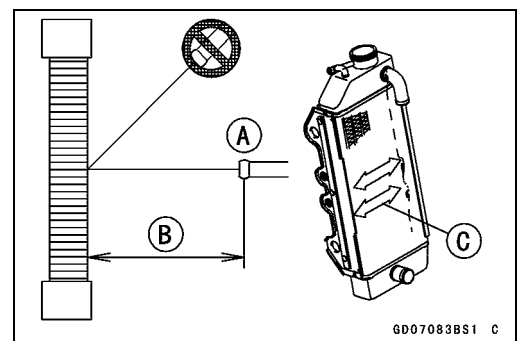
Do not tear the radiator tubes while straightening the fins.



- ★ If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.

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 (1.64 ft) [B] from the radiator core. Hold the steam gun perpendicular to the core surface. Run the steam gun following the core fin direction [C].

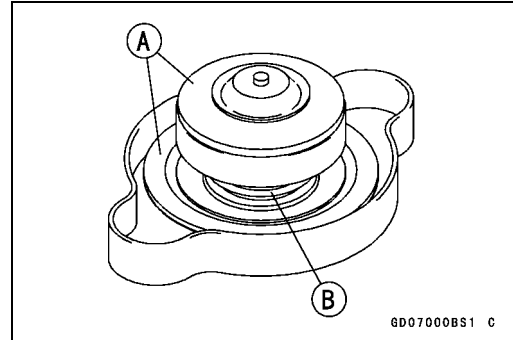


4-14 COOLING SYSTEM

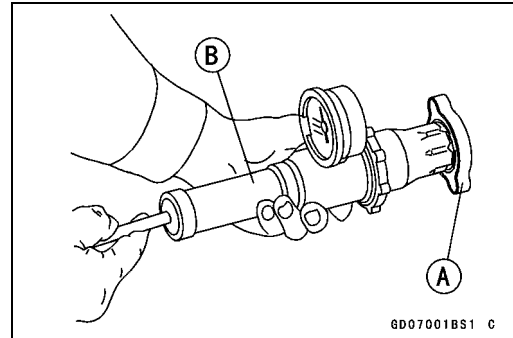
Radiator

Radiator Cap Inspection

- Check the top and bottom valve seals [A] of the radiator cap, and the condition of the valve spring [B].
- ★ If any one of them shows visible damage, replace the cap.



- Wet the top and bottom valve seals with water or coolant to prevent pressure leaks.
- Install the cap [A] on a cooling system pressure tester [B].
- Watching the pressure gauge, slowly pump the pressure tester to build up the pressure. The gauge hand must remain within the relief pressure range in the table below at least 6 seconds. Continue to pump the tester until the relief valve opens, indicated by the gauge hand flicking downward. The relief valve must open within the specified range.



Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi)

- ★ If the cap cannot hold the pressure, or if the relief pressure is too high or too low, replace the cap with a new one.

Filler Neck Inspection

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



Water Hoses and Overflow Hose Inspection

- Refer to the Water Hoses and Connections Inspection in the Periodic Maintenance chapter.

Water Hoses and Overflow Hose Installation

- Install the water hoses or overflow hose being careful to follow the performed bends (see Cable, Wire, and Hose Routing section in the Appendix chapter). Avoid sharp bending, kinking, flattening, or twisting.
- Tighten the hose clamps securely.

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

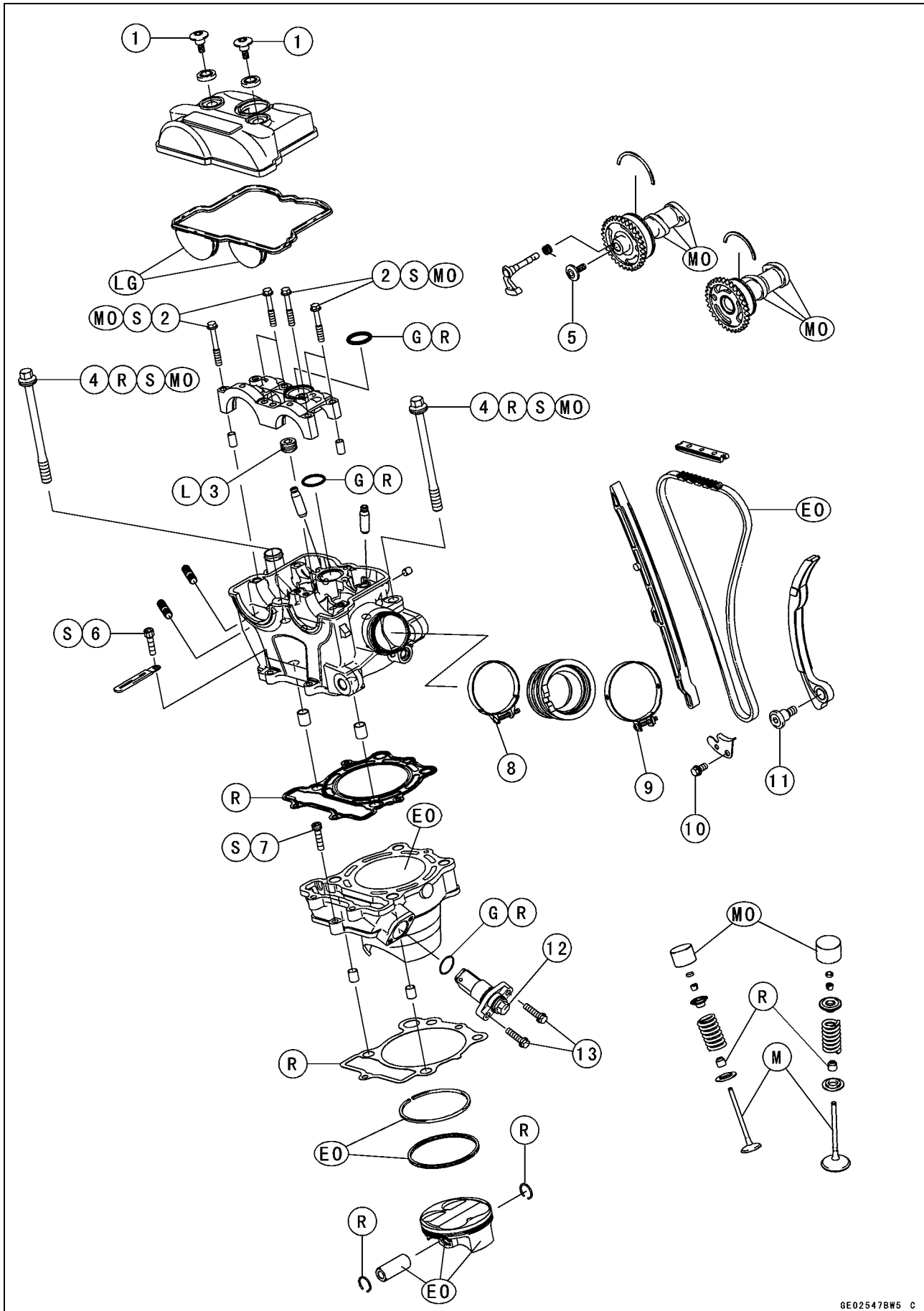
Engine Top End

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5-2 ENGINE TOP END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	
2	Camshaft Cap Bolts	9.8	1.0	87 in·lb	MO, S
3	Plug	20	2.0	15	L
4	Cylinder Head Bolts (M10)	44	4.5	32	MO, R, S
5	Auto-Decompressor Bolt	12	1.2	106 in·lb	
6	Cylinder Head Bolts (M6)	12	1.2	106 in·lb	S
7	Cylinder Bolt	12	1.2	106 in·lb	S
8	Throttle Body Assy Holder Clamp Screw	2.0	0.20	18 in·lb	
9	Throttle Body Assy Clamp Screw	2.0	0.20	18 in·lb	
10	Lower Camshaft Chain Guide Bolt	9.8	1.0	87 in·lb	
11	Rear Camshaft Chain Guide Bolt	15	1.5	11	
12	Camshaft Chain Tensioner Cap Bolt	20	2.0	15	
13	Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in·lb	

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.

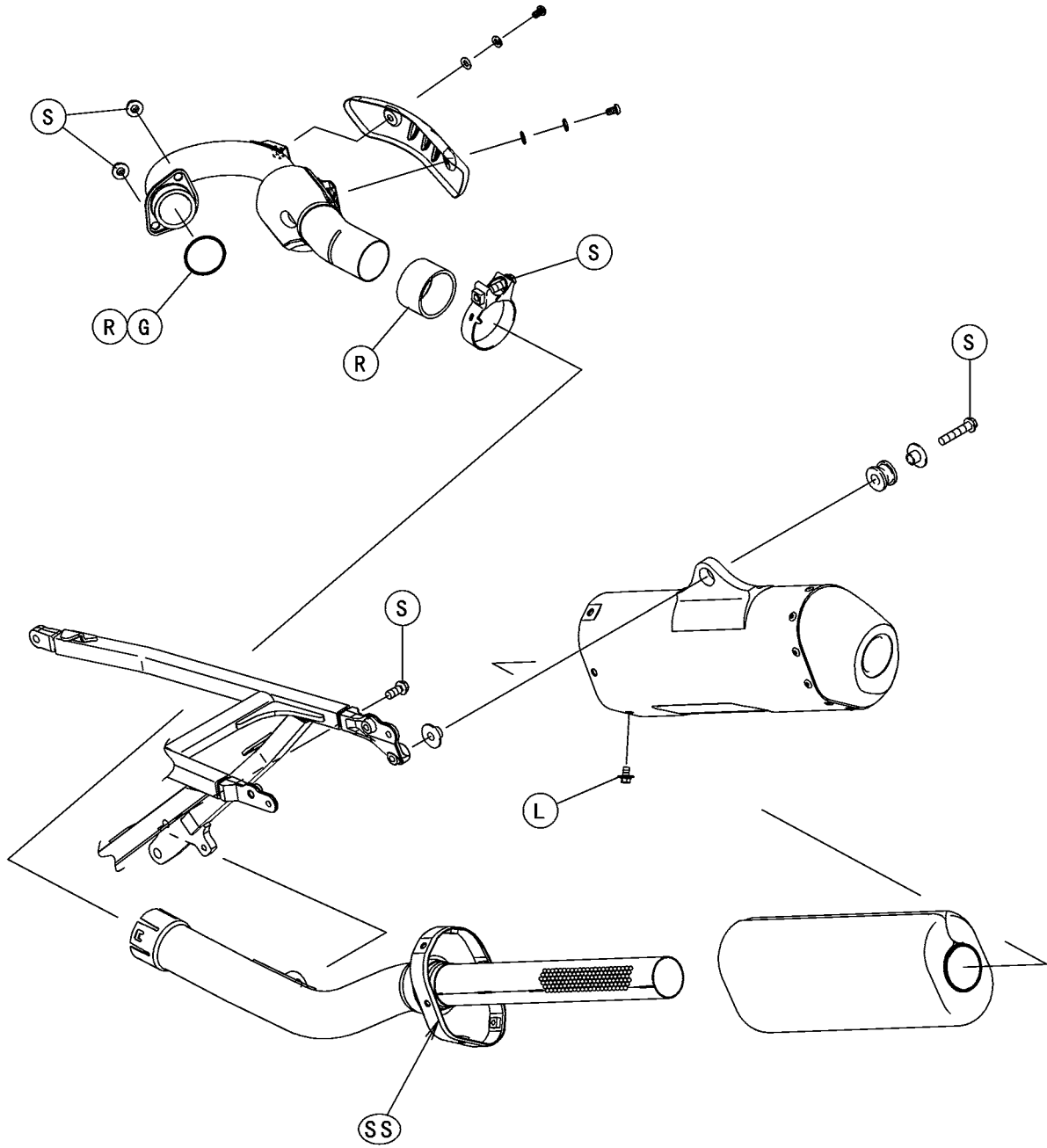
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)

R: Replacement Parts

S: Follow the specified tightening sequence.

5-4 ENGINE TOP END

Exploded View



Exploded View

- G: Apply grease.
- L: Apply a non-permanent locking agent.
- R: Replacement Parts
- S: Follow the specified tightening sequence.
- SS: Apply silicone sealant.

5-6 ENGINE TOP END

Specifications

Item	Standard	Service Limit
Camshafts		
Cam Height:		
Exhaust	33.943 ~ 34.057 mm (1.3363 ~ 1.3408 in.)	33.84 mm (1.332 in.)
Intake	35.243 ~ 35.357 mm (1.3875 ~ 1.3920 in.)	35.14 mm (1.383 in.)
Camshaft Journal/Camshaft Cap Clearance	0.020 ~ 0.062 mm (0.0008 ~ 0.0024 in.)	0.15 mm (0.0059 in.)
Camshaft Journal Diameter	21.959 ~ 21.980 mm (0.8645 ~ 0.8654 in.)	21.93 mm (0.8634 in.)
Camshaft Bearing Inside Diameter	22.000 ~ 22.021 mm (0.8661 ~ 0.8670 in.)	22.08 mm (0.8693 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) 427 ~ 708 kPa (4.4 ~ 7.2 kgf/cm ² , 62 ~ 103 psi) at 5 times	— — —
Cylinder Head Warp	— — —	0.05 mm (0.002 in.)
Valves		
Valve Clearance:		
Exhaust	0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)	— — —
Intake	0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)	— — —
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	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	0.07 ~ 0.13 mm (0.0028 ~ 0.0051 in.)	0.30 mm (0.012 in.)
Intake	0.02 ~ 0.09 mm (0.0008 ~ 0.0035 in.)	0.22 mm (0.009 in.)
Valve Seat Cutting Angle	32°, 45°, 60°	— — —

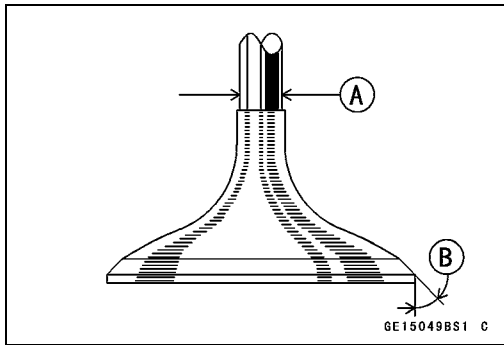
Specifications

Item	Standard	Service Limit
Valve Seating Surface:		
Outside Diameter:		
Exhaust	24.6 ~ 24.8 mm (0.969 ~ 0.976 in.)	---
Intake	30.6 ~ 30.8 mm (1.205 ~ 1.213 in.)	---
Width:		
Exhaust	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	---
Intake	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	---
Valve Spring Free Length:		
Exhaust	37.88 mm (1.491 in.)	36.5 mm (1.44 in.)
Intake	36.20 mm (1.425 in.)	34.7 mm (1.37 in.)
Cylinder, Piston		
Cylinder Inside Diameter	77.000 ~ 77.012 mm (3.0315 ~ 3.0320 in.)	77.10 mm (3.035 in.)
Piston Diameter	76.948 ~ 76.963 mm (3.0294 ~ 3.0300 in.)	76.80 mm (3.024 in.)
Piston/Cylinder Clearance	0.041 ~ 0.068 mm (0.0016 ~ 0.0027 in.)	---
Piston Ring/Ring Groove Clearance:		
Top	0.04 ~ 0.08 mm (0.002 ~ 0.003 in.)	0.18 mm (0.0071 in.)
Piston Ring Groove Width:		
Top	0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)	0.93 mm (0.037 in.)
Piston Ring Thickness:		
Top	0.77 ~ 0.79 mm (0.030 ~ 0.031 in.)	0.70 mm (0.028 in.)
Piston Ring End Gap:		
Top	0.15 ~ 0.25 mm (0.0059 ~ 0.0098 in.)	0.6 mm (0.02 in.)
Oil	0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)	1.0 mm (0.04 in.)
Piston Pin Diameter	15.991 ~ 16.000 mm (0.62957 ~ 0.62992 in.)	15.96 mm (0.6283 in.)
Piston Pin Hole Diameter	16.004 ~ 16.010 mm (0.63008 ~ 0.63031 in.)	16.08 mm (0.6331 in.)
Connecting Rod Small End Inside Diameter	16.010 ~ 16.018 mm (0.63031 ~ 0.63063 in.)	16.05 mm (0.6319 in.)

5-8 ENGINE TOP END

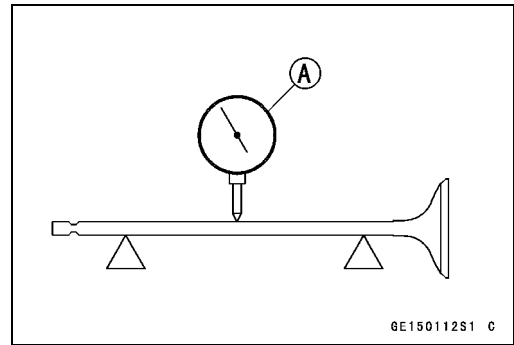
Specifications

Valve Stem Diameter



Valve Stem Diameter [A]
45° [B]

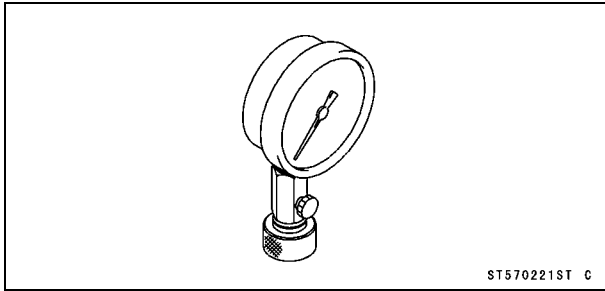
Valve Stem Bend



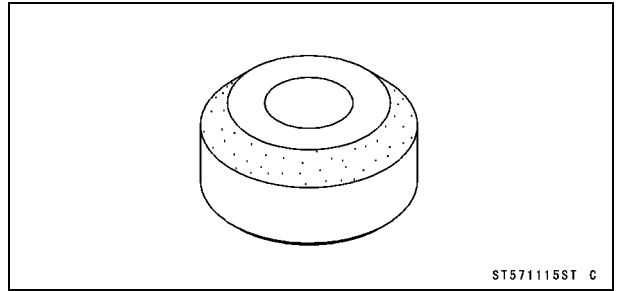
Dial Gauge [A]

Special Tools and Sealant

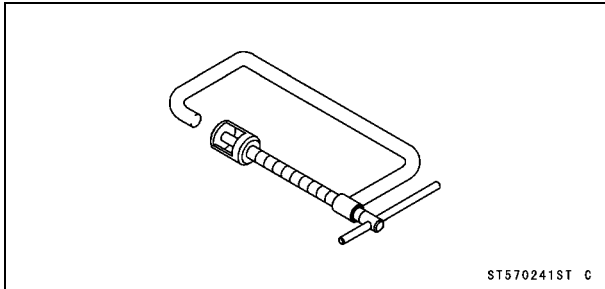
Compression Gauge, 20 kgf/cm²:
57001-221



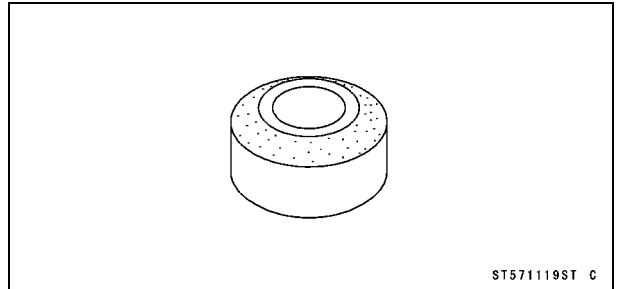
Valve Seat Cutter, 45° - ϕ 32:
57001-1115



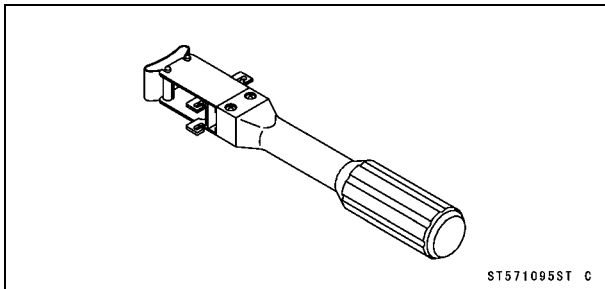
Valve Spring Compressor Assembly:
57001-241



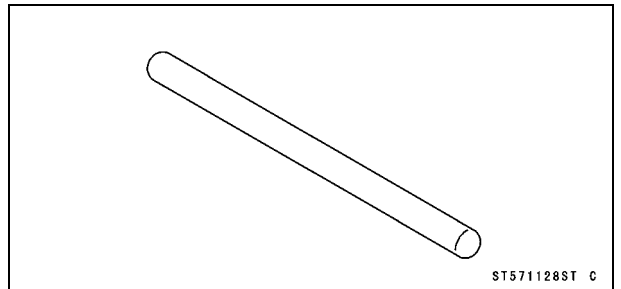
Valve Seat Cutter, 32° - ϕ 28:
57001-1119



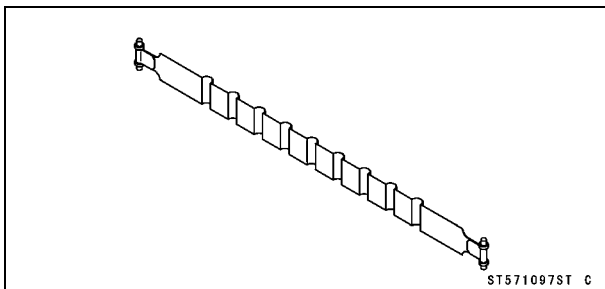
Piston Ring Compressor Grip:
57001-1095



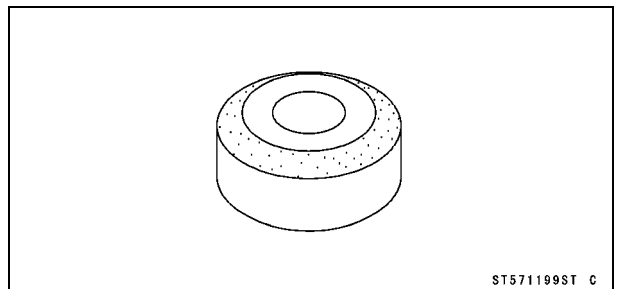
Valve Seat Cutter Holder Bar:
57001-1128



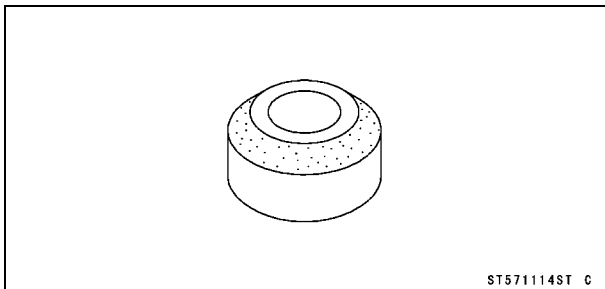
Piston Ring Compressor Belt, ϕ 67 ~ ϕ 79:
57001-1097



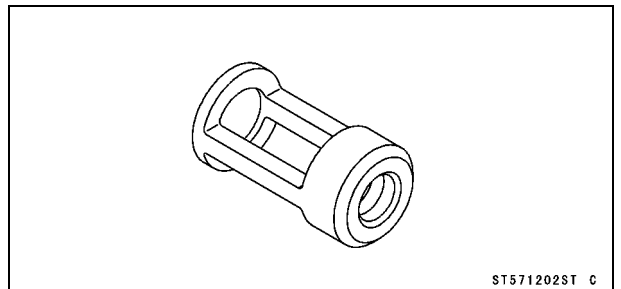
Valve Seat Cutter, 32° - ϕ 33:
57001-1199



Valve Seat Cutter, 45° - ϕ 27.5:
57001-1114



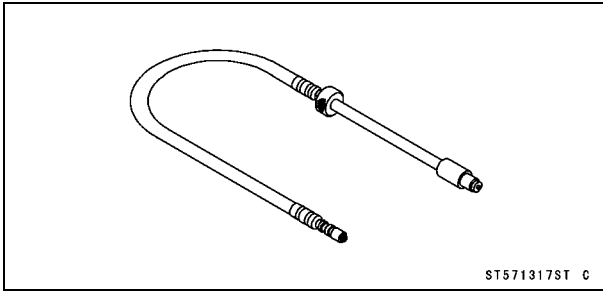
Valve Spring Compressor Adapter, ϕ 22:
57001-1202



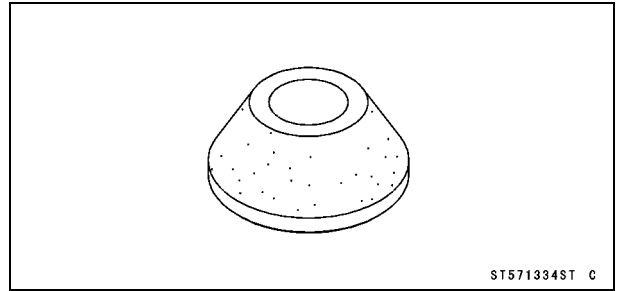
5-10 ENGINE TOP END

Special Tools and Sealant

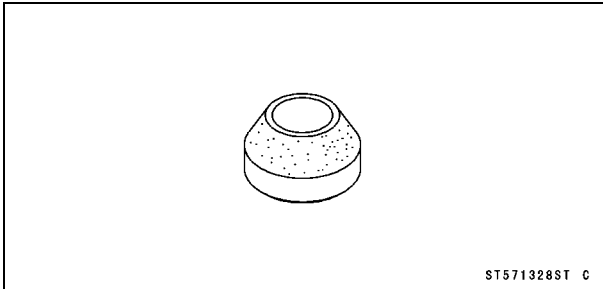
Compression Gauge Adapter, M10 x 1.0:
57001-1317



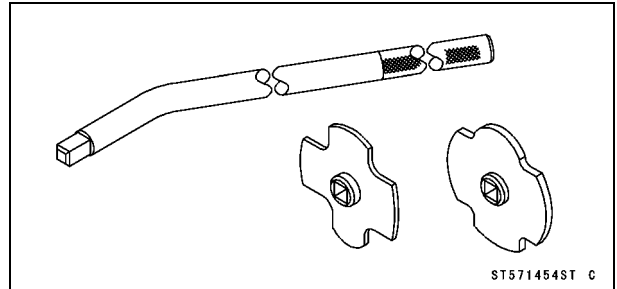
Valve Seat Cutter, 60° - ϕ 33:
57001-1334



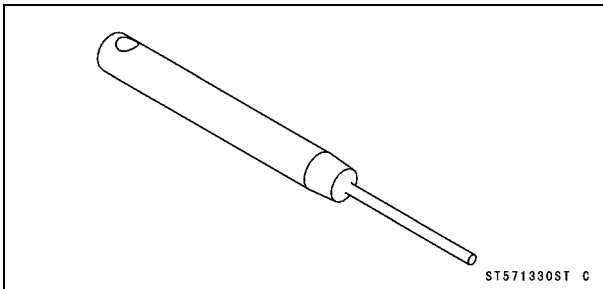
Valve Seat Cutter, 60° - ϕ 25:
57001-1328



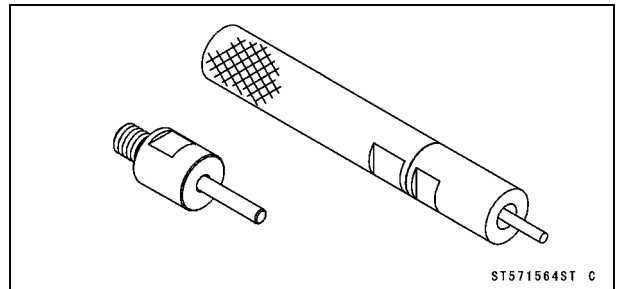
Filler Cap Driver:
57001-1454



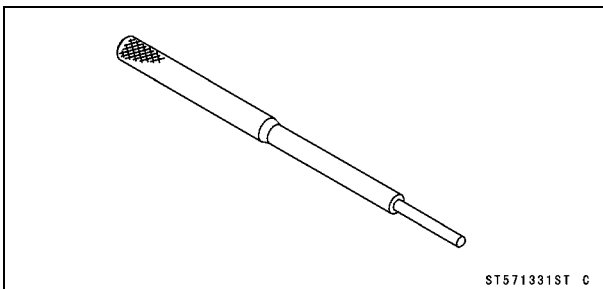
Valve Seat Cutter Holder, ϕ 4.5:
57001-1330



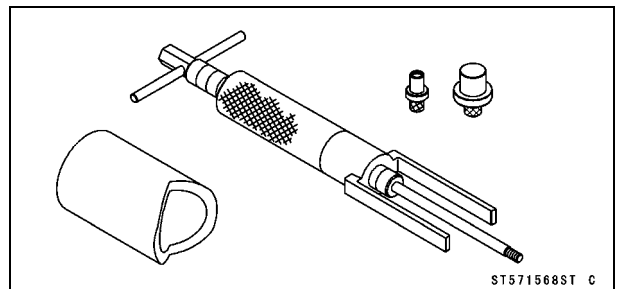
Valve Guide Driver:
57001-1564



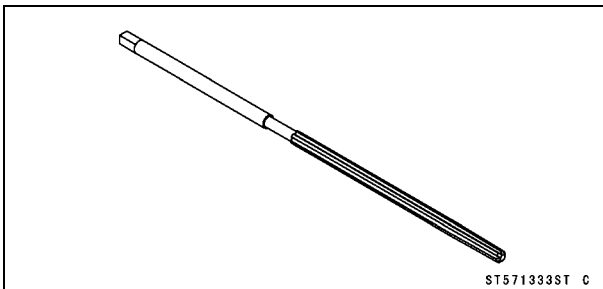
Valve Guide Arbor, ϕ 4.5:
57001-1331



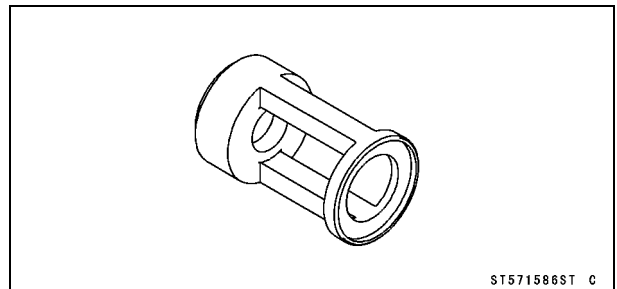
Piston Pin Puller:
57001-1568



Valve Guide Reamer, ϕ 4.5:
57001-1333

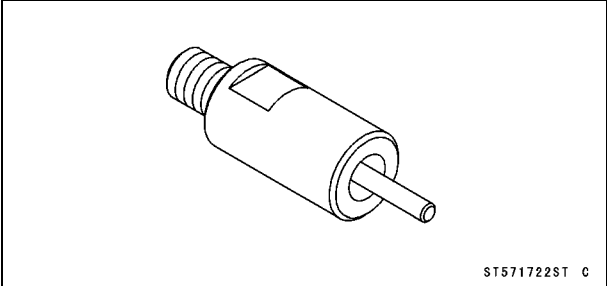


Valve Spring Compressor Adapter, ϕ 24:
57001-1586

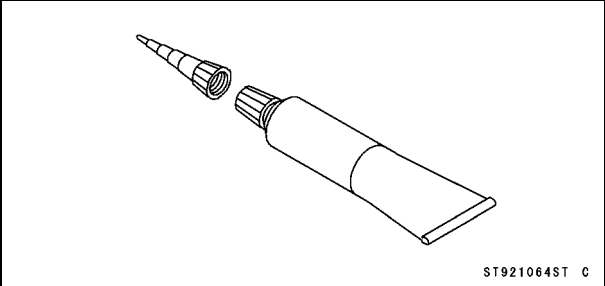


Special Tools and Sealant

**Valve Guide Driver Attachment, F:
57001-1722**



**Liquid Gasket, TB1216B:
92104-1064**

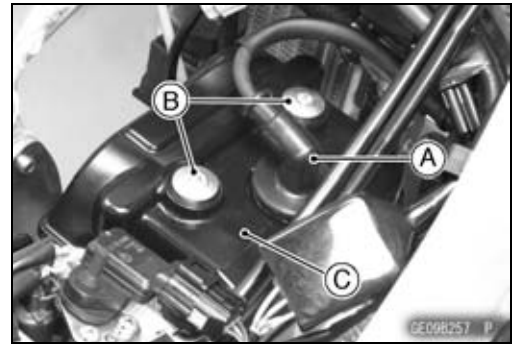


5-12 ENGINE TOP END

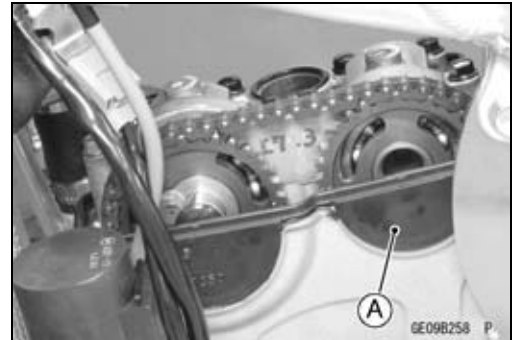
Cylinder Head Cover

Cylinder Head Cover Removal

- Remove:
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
 - Spark Plug Cap [A]
 - Cylinder Head Cover Bolts [B] and Washers
 - Cylinder Head Cover [C]



- Remove the cylinder head cover gasket [A].

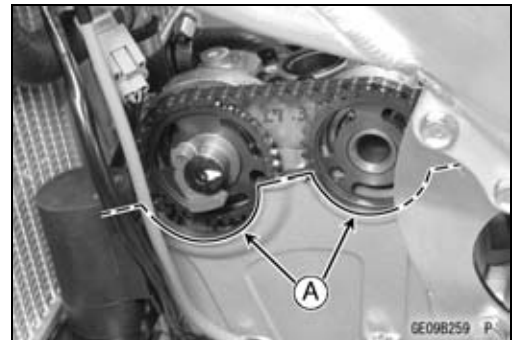


Cylinder Head Cover Installation

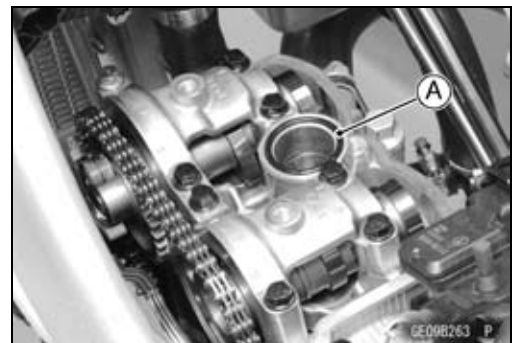
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the cylinder head.
 - Sealant - Liquid Gasket, TB1216B: 92104-1064

NOTE

○ Make the application finish within 20 minutes when the liquid gasket (TB1216B) to the mating surface of the cylinder head cover is applied.



- Replace the spark plug hole gasket [A] with a new one, and install it.

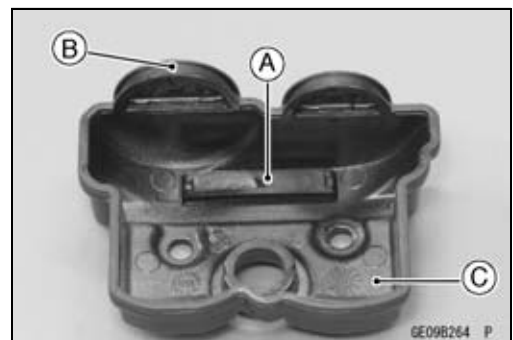


- Make sure that the upper chain guide [A] is bottomed.

NOTICE

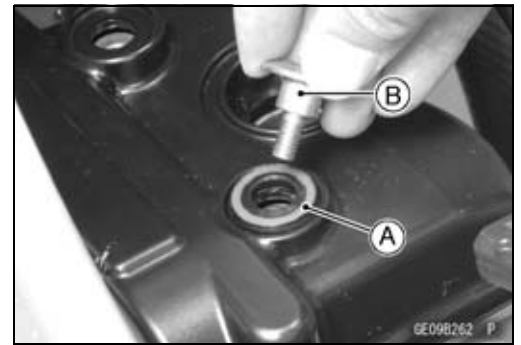
Unless the upper chain guide is bottomed, the camshaft chain could push the cylinder head cover upward, leading to an oil leak.

- Replace the cylinder head cover gasket with a new one.
- Install the new cylinder head cover gasket [B] on the cylinder head cover [C].
- Install the cylinder head cover.



Cylinder Head Cover

- Install the cylinder head cover bolt washers with the metal side [A] upwards.
- Tighten:
Torque - Cylinder Head Cover Bolts [B]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Install the removed parts (see appropriate chapters).



5-14 ENGINE TOP END

Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

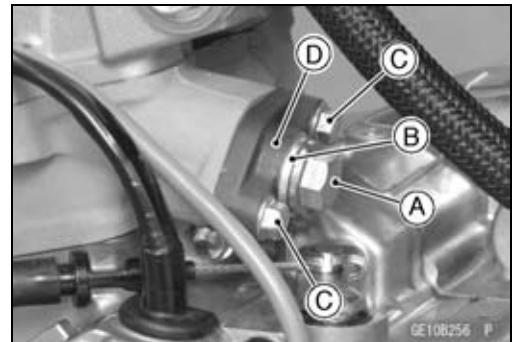
NOTICE

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".

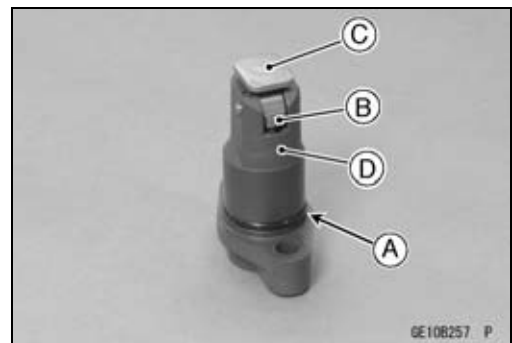
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing and damage the valves.

- Remove:
 - Cap Bolt [A]
 - Washer [B]
 - Spring
 - Rod
- Remove the mounting bolts [C] and take off the camshaft chain tensioner body [D].

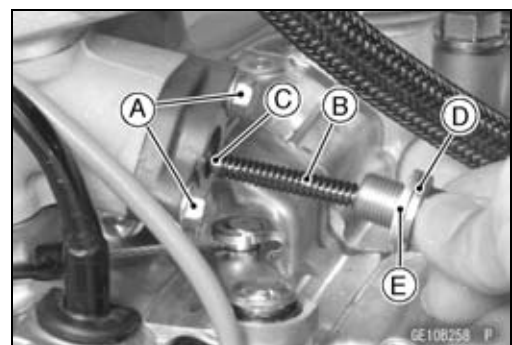


Camshaft Chain Tensioner Installation

- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Release the stopper [B] and push the push rod [C] into the tensioner body [D] fully.
- Install the tensioner body so that the stopper faces upward.
- Turn the stopper to right side of the motorcycle.



- Tighten:
 - Torque - Camshaft Chain Tensioner Mounting Bolts [A]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the spring [B] and rod [C].
- Tighten the cap bolt [D] together with the washer [E].
 - Torque - Camshaft Chain Tensioner Cap Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**

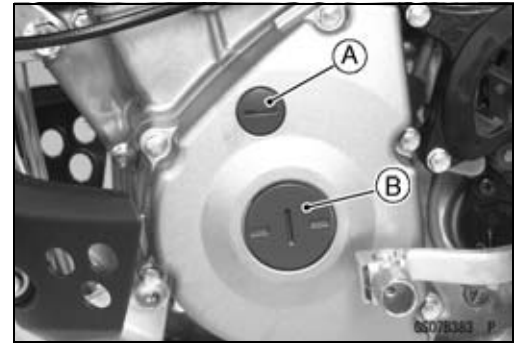


Camshafts

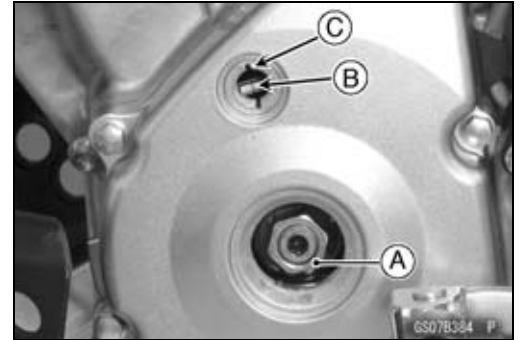
Camshaft Removal

- Remove:
 - Cylinder Head Cover (see Cylinder Head Cover Removal)
 - Timing Inspection Cap [A]
 - Flywheel Nut Cap [B]

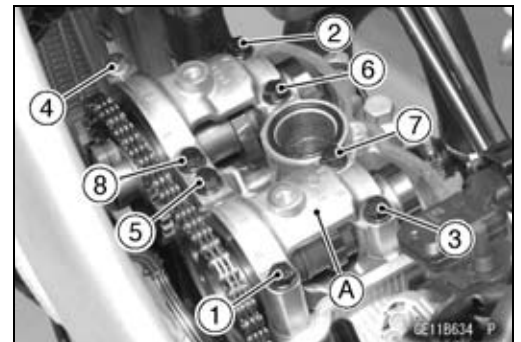
Special Tool - Filler Cap Driver: 57001-1454



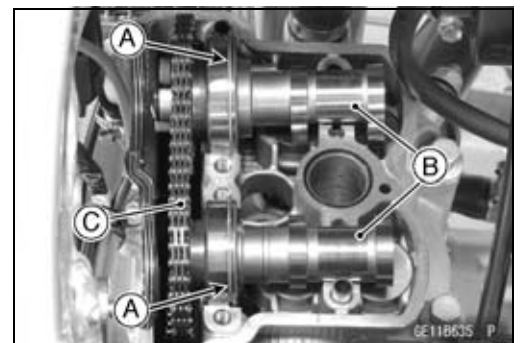
- Bring the piston to the TDC of the compression stroke.
- Place a wrench over the flywheel nut [A] and turn it counterclockwise to align the TDC mark [B] with the center of the groove [C] of the inspection hole.



- Remove:
 - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
 - Camshaft Cap Bolts [1 ~ 8] (sequence numbers)
 - Camshaft Cap [A]



- Remove:
 - Positioning Rings [A]
- Disengage the camshafts [B] from camshaft chain [C].



- Staff a clean cloth into the camshaft chain tunnel to keep any parts from dropping into the crankcase.

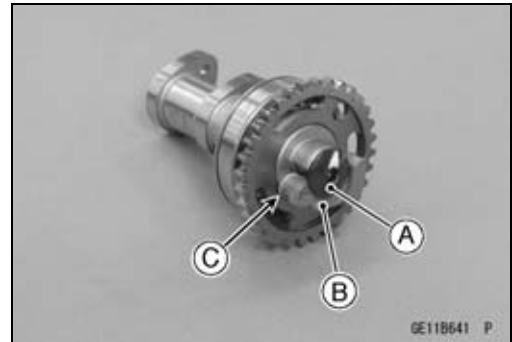
NOTICE

Always strain the camshaft chain while turning the crankshaft when the camshafts removed. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

5-16 ENGINE TOP END

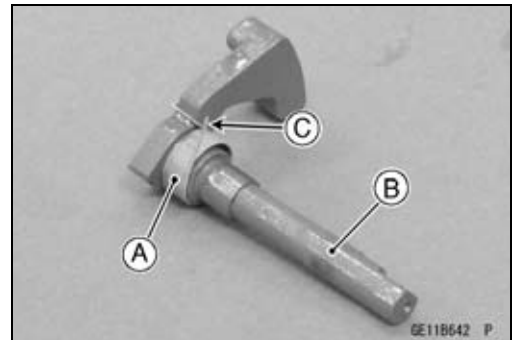
Camshafts

- Remove:
 - Bolt [A]
 - Auto-Decompressor [B]
 - Spring [C]

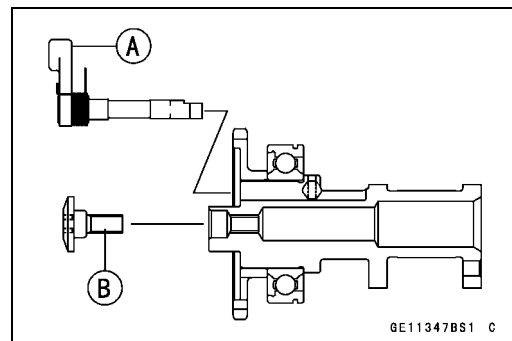


Camshaft Installation

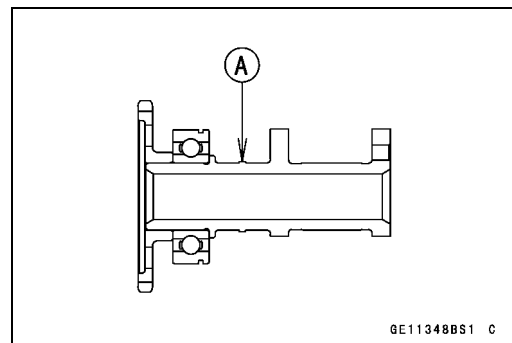
- When installing the spring [A] on the auto-decompressor [B], put the spring end [C] onto the outside coil.



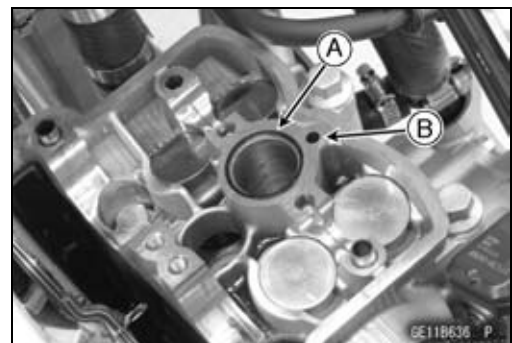
- Install the auto-decompressor [A] in the exhaust camshaft.
- Tighten:
 - Torque - Auto-Decompressor Bolt [B]: 12 N·m (1.2 kgf·m, 106 in·lb)**



○The intake camshaft has projection [A].

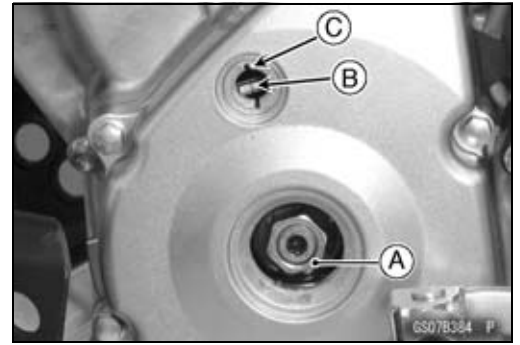


- Replace the O-ring [A] with a new one, and apply grease it.
- Fill the oil passage [B] of the cylinder head with engine oil.
- Apply molybdenum disulfide oil solution to the ball bearing, all cam and journal surfaces of the camshafts.
- ★ If the new camshaft is installed, apply a thin coat of molybdenum disulfide grease to the cam and journal surfaces of the camshaft.



Camshafts

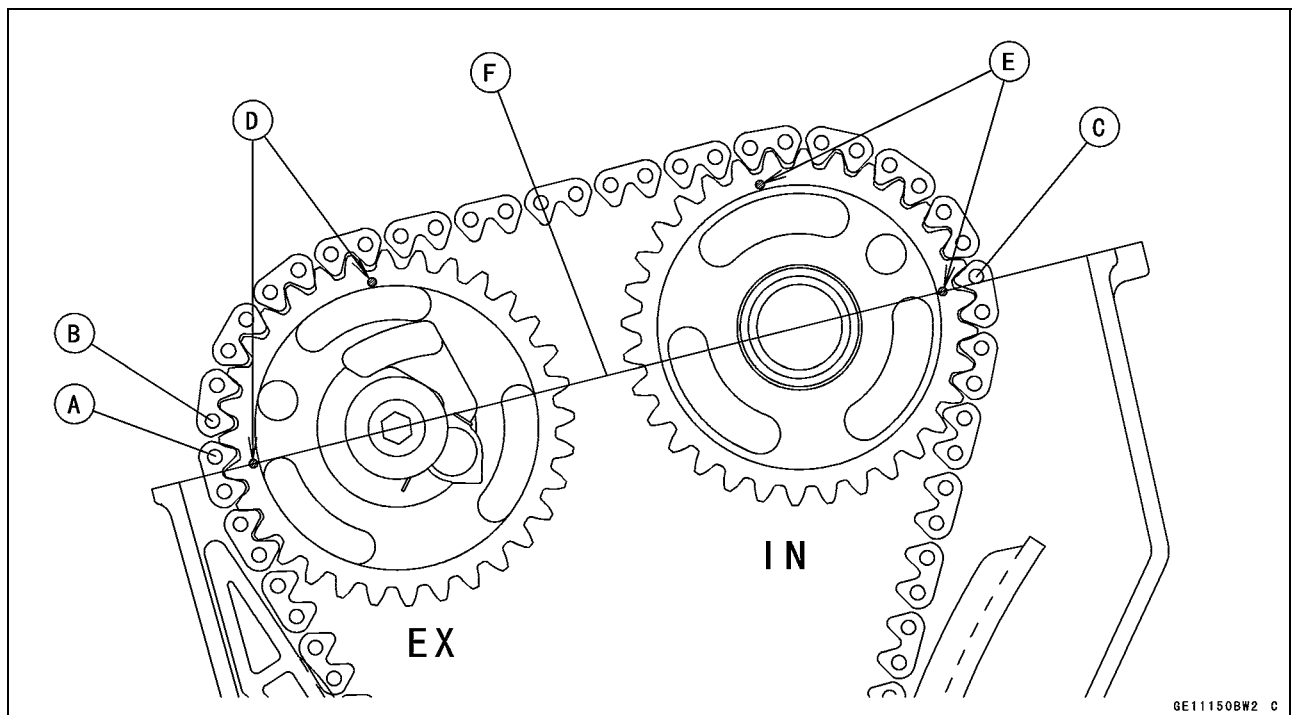
- Bring the piston to the TDC.
- Place a wrench over the flywheel nut [A] and turn it counterclockwise to align the TDC mark [B] with the center of the groove [C] of the inspection hole.



- Engage the camshaft chain with the camshaft sprockets.
- Align the timing marks on the sprockets with the cylinder head upper surface.
- Starting with the timing mark on the front of the exhaust sprocket, count to the 1st pin. Feed the exhaust camshaft through the chain and align the 28th pin with the timing mark on the intake camshaft sprocket.

NOTE

- Strain the exhaust-side of the chain while installing the camshaft.



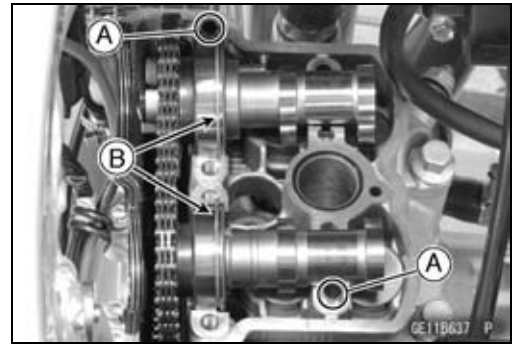
1st Pin [A]
2nd Pin [B]
28th Pin [C]

Punch Marks (Exhaust) [D]
Punch Marks (Intake) [E]
Cylinder Head Upper Surface [F]

5-18 ENGINE TOP END

Camshafts

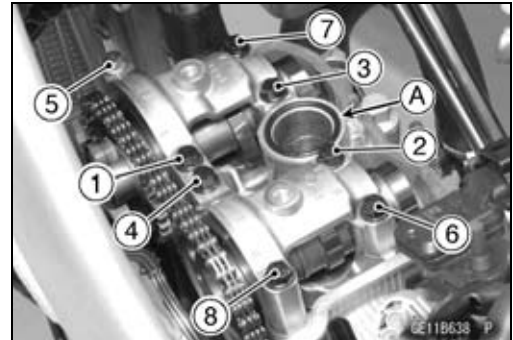
- Install the dowel pins [A] and positioning rings [B].



- Apply molybdenum disulfide oil solution to the threads and seating surface of the camshaft cap bolts.
- Tighten all camshaft cap bolts evenly and lightly, and then tighten them with specified torque.
- Follow the numbers [1 ~ 8] of tightening sequence on the camshaft cap.
- Bolt [5] is long.

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

- Replace the O-ring [A] with a new one, and apply grease it.
- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Check the camshaft chain timing.
 - Confirm the timing mark and punch mark align with the cylinder head upper surface.
 - ★ If the timing mark and punch mark do not align with the cylinder head upper surface, reinstall the camshafts.
 - Turn the crankshaft slowly.
 - ★ If the crankshaft does not turn smoothly, the timing is different. Stop turning immediately.



NOTICE

The improper camshaft chain timing may damage the valves.

- Install:
 - Cylinder Head Cover (see Cylinder Head Cover Installation)
- Replace the timing inspection cap and flywheel nut cap O-rings with new ones, and apply grease them.
- Tighten:

Special Tool - Filler Cap Driver: 57001-1454

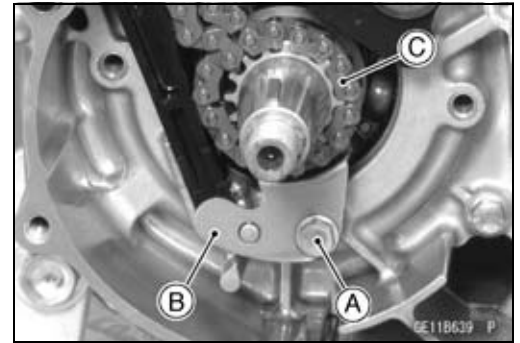
Torque - Timing Inspection Cap: 3.5 N·m (0.36 kgf·m, 31 in·lb)

Flywheel Nut Cap: 3.5 N·m (0.36 kgf·m, 31 in·lb)

Camshafts

Camshaft Chain Removal

- Remove:
 - Camshafts (see Camshaft Removal)
 - Flywheel (see Flywheel Removal in the Electrical System chapter)
 - Lower Camshaft Chain Guide Bolt [A]
 - Lower Camshaft Chain Guide [B]
- Disengage the camshaft chain [C] from the crankshaft.



Camshaft Chain Installation

- Engage the camshaft chain to the crankshaft.
- Install the lower camshaft chain guide.
- Tighten:
 - Torque - Lower Camshaft Chain Guide Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install:
 - Flywheel (see Flywheel Installation in the Electrical System chapter)
 - Camshafts (see Camshaft Installation)

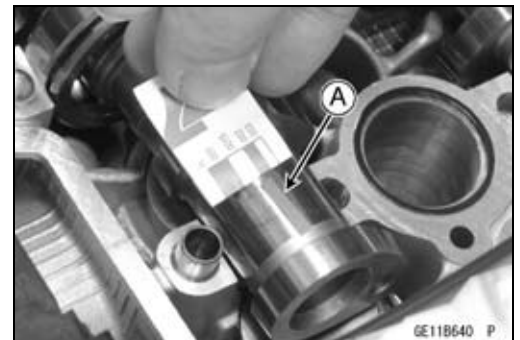
Camshaft and Camshaft Cap Wear Inspection

- Measure each clearance between the camshaft journal and camshaft cap using plastigage (press gauge) [A].
- Tighten the camshaft cap bolts after applying molybdenum disulfide oil to the seat and thread of them.

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

NOTE

- Do not turn the camshaft when the plastigage is between the journal and camshaft cap.



Camshaft Journal/Camshaft Cap Clearance

Standard: 0.020 ~ 0.062 mm (0.0008 ~ 0.0024 in.)

Service Limit: 0.15 mm (0.0059 in.)

- ★ If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

Camshaft Journal Diameter

Standard: 21.959 ~ 21.980 mm (0.8645 ~ 0.8654 in.)

Service Limit: 21.93 mm (0.8634 in.)

- ★ If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one, and measure the clearance again.
- ★ If the clearance still remains out of the service limit, replace the cylinder head unit.

5-20 ENGINE TOP END

Camshafts

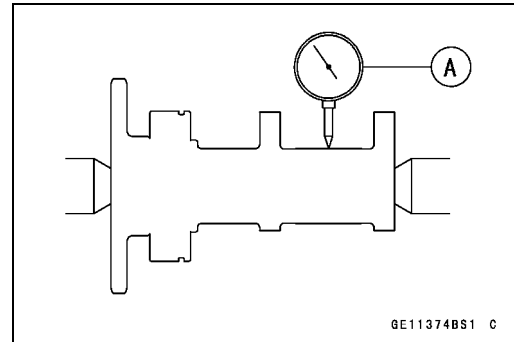
Camshaft Runout Inspection

- Remove the camshafts (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure the runout with a dial gauge [A] at the specified place.
- ★ If the runout exceeds the service limit, replace the camshaft.

Camshaft Runout

Standard: TIR 0.02 mm (0.0008 in.) or less

Service Limit: TIR 0.1 mm (0.004 in.)



Cam Wear Inspection

- Remove the camshafts (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.

Cam Height

Standard:

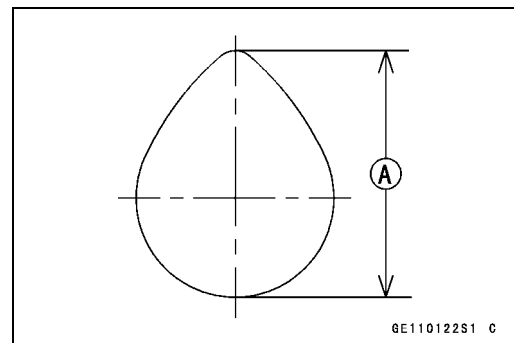
Exhaust 33.943 ~ 34.057 mm (1.3363 ~ 1.3408 in.)

Intake 35.243 ~ 35.357 mm (1.3875 ~ 1.3920 in.)

Service Limit:

Exhaust 33.84 mm (1.332 in.)

Intake 35.14 mm (1.383 in.)



- ★ If the cams are worn down past the service limit, replace the camshaft.

Cylinder Head

Cylinder Compression Measurement

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Spark Plug (see Spark Plug Cleaning and Inspection in the Periodic Maintenance chapter)
- Attach the compression gauge [A] and compression gauge adapter [B] firmly into the spark plug hole.
- Measure the compression pressure.
- With the throttle fully open, turn the engine over sharply with the kickstarter several times until the compression gauge stops rising; the compression is the highest reading obtainable.

Special Tools - Compression Gauge, 20 kgf/cm²: 57001-221
Compression Gauge Adapter, M10 × 1.0: 57001-1317



Cylinder Compression

Usable Range: 427 ~ 708 kPa (4.4 ~ 7.2 kgf/cm², 62 ~ 103 psi) at 5 times

- Install the removed parts (see appropriate chapters).
- ★ If the compression pressure is not within the usable range, check the following table.

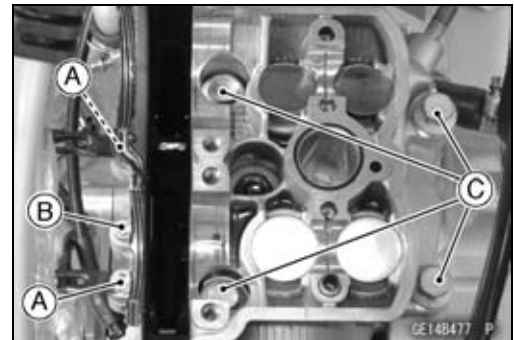
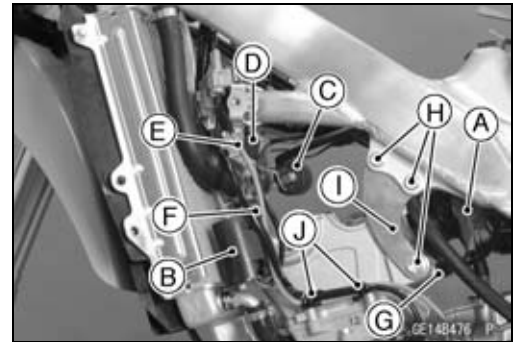
Problem	Diagnosis	Remedy (Action)
The cylinder compression is higher than the usable range.	Carbon accumulation on piston and in cylinder head (combustion chamber) is suspected due to damaged valve stem or piston oil rings.	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket thickness	Replace the gasket with a standard one.
	Damaged auto-decompressor spring or decompressor do not move smoothly.	Replace the spring or auto-decompressor.
The cylinder compression is lower than the usable range.	Exhaust gas leakage around cylinder head.	Replace the damaged gasket and inspect cylinder head warp.
	Incorrect seating surface of valve	Repair seating surface if possible.
	Valve clearance is too narrow.	Adjust the valve clearance.
	Piston/cylinder clearance is too wide.	Replace the piston and/or cylinder.
	Piston seizure	Inspect the cylinder and piston; repair or replace them if necessary.
	Bad condition of piston ring and/or piston ring grooves.	Replace the piston and/or the piston rings.
Auto-decompressor do not move smoothly.	Replace the auto-decompressor.	

5-22 ENGINE TOP END

Cylinder Head

Cylinder Head Removal

- Drain the coolant (see Coolant Draining in the Cooling System chapter).
- Remove:
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Cylinder Head Cover (see Cylinder Head Cover Removal)
 - Camshafts (see Camshaft Removal)
 - Exhaust Pipe (see Exhaust Pipe Removal)
- Remove:
 - Throttle Body Assy [A] (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
 - Capacitor [B] (see Capacitor Removal in the Electrical System chapter)
 - Ignition Coil [C] (see Ignition Coil Removal in the Electrical System chapter)
 - Vehicle-down Sensor [D] (see Vehicle-down Sensor Removal in the Fuel System (DFI) chapter)
 - Bracket Bolt [E]
 - Water Hose [F]
 - Water Temperature Sensor Connector [G]
 - Bolts [H] and Upper Engine Bracket [I] (Both Sides)
 - Clamps [J] (Open)
- Remove the cylinder head bolts (M6) [A].
- Loosen the cylinder bolt [B].
- Remove the cylinder head bolts (M10) [C].



- Remove the cylinder head [A] upward.

NOTE

○ When do not remove the cylinder head easily, tap lightly up with a plastic mallet to separate the cylinder head from the cylinder.

- Take care not to damage the chain guides.

NOTICE

Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.



- Remove the cylinder head gasket.

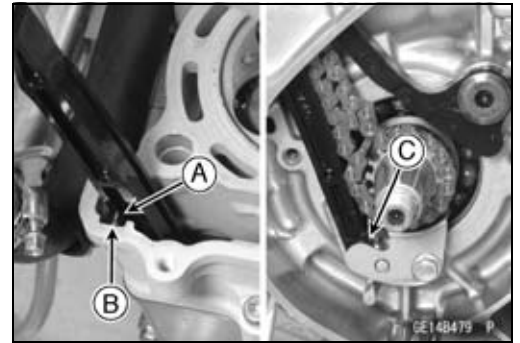
Cylinder Head

Cylinder Head Installation

- Install the front camshaft chain guide.
- Fit the projection [A] in the groove [B] of the cylinder.
- Insert the guide end [C] into the recess of the crankcase securely.

NOTE

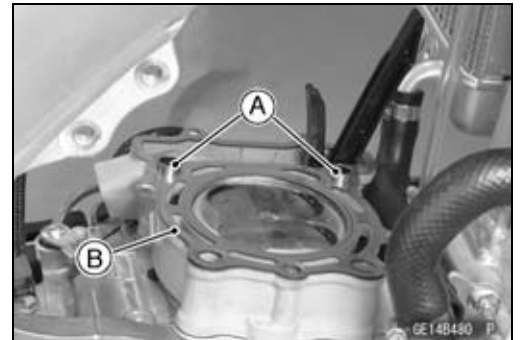
○ In this figure, the magneto cover and flywheel has been removed for clarity.



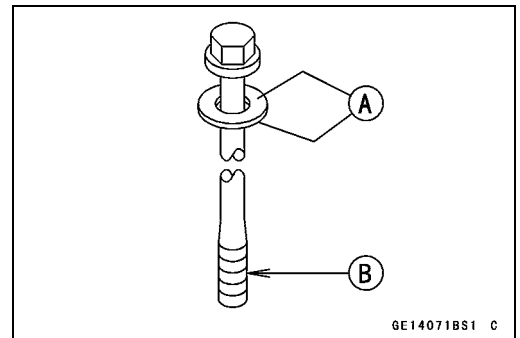
- Replace the cylinder head gasket with a new one.
- Install:
 - Dowel Pins [A]
 - New Cylinder Head Gasket [B]
- Install the cylinder head.

NOTE

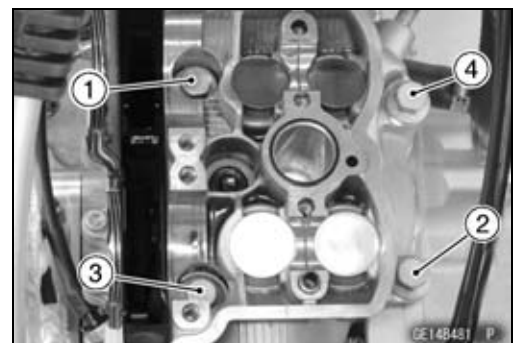
○ The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.



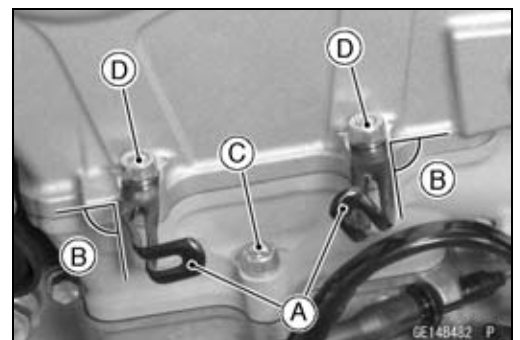
- Replace the cylinder head bolts (M10) with new ones.
- Apply molybdenum disulfide oil solution to the following areas.
 - Cylinder Head Bolt (M10) Washer (Both Sides) [A]
 - Cylinder Head Bolt (M10) Thread [B]



- Tighten the cylinder head bolts (M10) in the numbered sequence [1 ~ 4].
- Torque - Cylinder Head Bolts (M10): 44 N·m (4.5 kgf·m, 32 ft·lb)**



- Install the clamps [A].
 - 90° [B]
- Tighten:
 - Cylinder Bolt [C]
 - Cylinder Head Bolts (M6) [D]
- Torque - Cylinder Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**
- Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**



- Install the removed parts (see appropriate chapters).

Cylinder Head Cleaning

- Refer to the Cylinder Head Warp Inspection in the Periodic Maintenance chapter.

5-24 ENGINE TOP END

Cylinder Head

Cylinder Head Warp Inspection

- Refer to the Cylinder Head Warp Inspection in the Periodic Maintenance chapter.

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 the cylinder head (see Cylinder Head Removal).
- Remove the valve lifter and shim.

NOTE

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

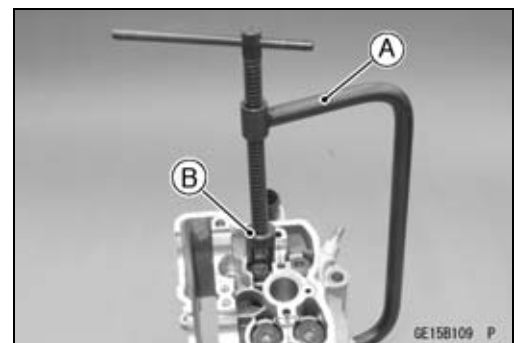
- Using the valve spring compressor assembly [A] and adapter [B], compress the valve spring and then remove the split keepers.

Special Tools - Valve Spring Compressor Assembly: 57001-241

Valve Spring Compressor Adapter, ϕ 22: 57001-1202

Valve Spring Compressor Adapter, ϕ 24: 57001-1586

- Remove:
 - Spring Retainer
 - Valve Spring
 - Valve
 - Oil Seal
 - Spring Seat



5-26 ENGINE TOP END

Valves

Valve Installation

NOTICE

Do not lap the valve to the valve seat, using the grinding compound. It will come off oxide film treated surface of the valve.

- Visually inspect the valve surface.
- ★ If the surface is damaged, replace the valve.
- Replace the oil seal [A] with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem [B] and install the valve.
- Check to make sure that the valve moves up and down smoothly.
- Check to make sure that the valve and valve seat are making proper contact.
- Install:
 - Oil Seal
 - Spring Seat [C]
 - Valve Spring [D]
- Turn the painted side of the valve spring to the spring retainer [E].
 - Exhaust - White Paint
 - Intake - Pink Paint

NOTE

○ The flange thicknesses of the spring seats are different in the exhaust and intake side. Take care not to install them oppositely.

Exhaust Valve Spring Seat [F]
Intake Valve Spring Seat [G]

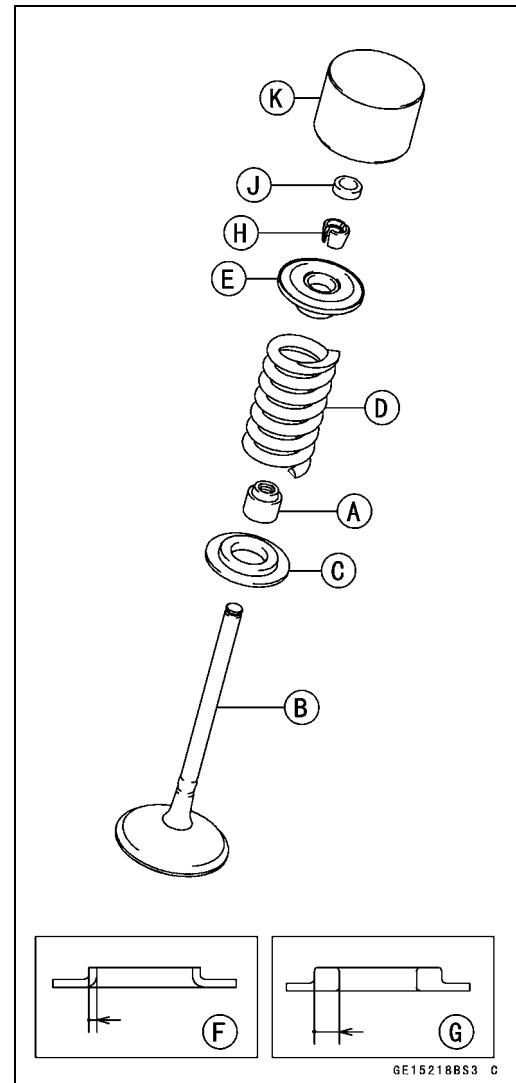
- Install the spring retainer.
- Compress the valve spring to install the split keepers [H] in order to secure the spring retainer in place.

Special Tools - Valve Spring Compressor Assembly: 57001-241

Valve Spring Compressor Adapter, $\phi 22$: 57001-1202

Valve Spring Compressor Adapter, $\phi 24$: 57001-1586

- Install the shim to original position.
- The shim [J] must be installed with its thickness indication facing up towards the retainer.
- Apply engine oil to the valve lifter [K] surface, and install the lifter.



Valves

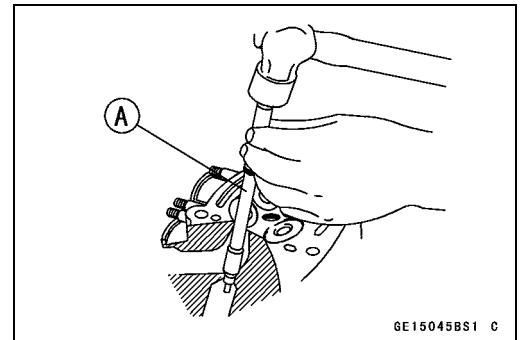
Valve Guide Removal

- Remove:
 - Valve (see Valve Removal)
 - Oil Seal
 - Spring Seat
- Heat the area around the valve guide up to 120 ~ 150°C (248 ~ 302°F).

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.

- Hammer lightly on the valve guide arbor [A] to remove the guide.
 - Special Tool - Valve Guide Arbor, $\phi 4.5$: 57001-1331



Valve Guide Installation

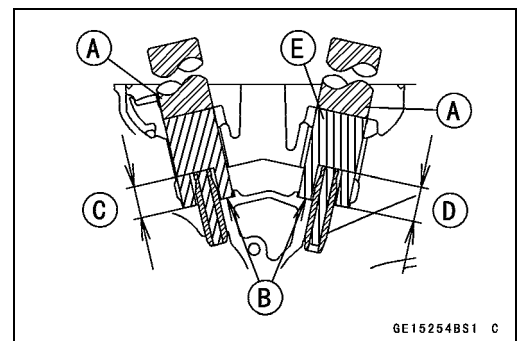
- Apply a thin coat of engine oil to the outer surface of the valve guide.
- Heat the area around the valve guide up to 120 ~ 150°C (248 ~ 302°F).

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.

- Using the valve guide driver [A] and attachment, press and insert the valve guide in until the attachment bottom surface touches the cylinder head surface [B].
 - Exhaust: 13.8 ~ 14.0 mm (0.543 ~ 0.551 in.) [C]
 - Intake: 15.3 ~ 15.5 mm (0.602 ~ 0.610 in.) [D]

Special Tools - Valve Guide Driver: 57001-1564
 Valve Guide Driver Attachment, F [E]: 57001-1722

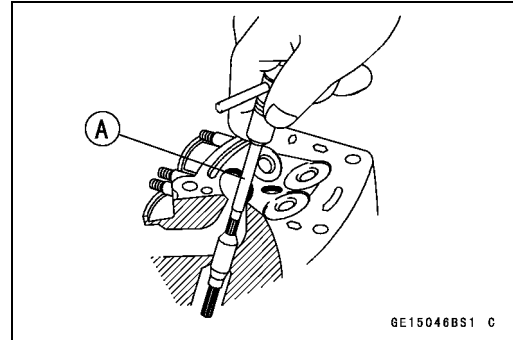


5-28 ENGINE TOP END

Valves

- Ream the valve guide with valve guide reamer [A], even if the old guide is reused.
- Always rotate the reamer clockwise.

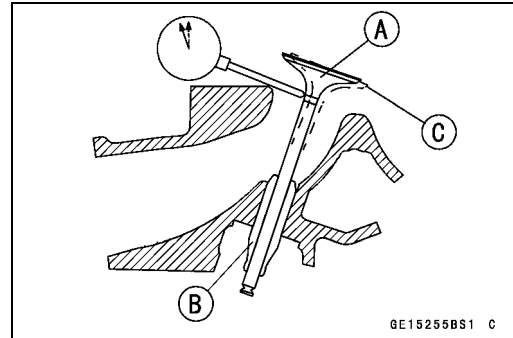
Special Tool - Valve Guide Reamer, ϕ 4.5: 57001-1333



Valve/Valve Guide Clearance Measurement (Wobble Method)

If a small bore gauge is not available, inspect the valve guide wear by measuring the valve/valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
 - Move the stem back and forth [C] to measure the valve/valve guide clearance.
- Repeat the measurement in a direction at a 90° angle to the first measurement.
- ★ If the reading exceeds the service limit, replace the guide.



NOTE

- The reading is greater than the actual valve/valve guide clearance because the measurement is taken outside of the guide.

Valve/Valve Guide Clearance (Wobble Method)

Standard:

Exhaust	0.07 ~ 0.13 mm (0.0028 ~ 0.0051 in.)
Intake	0.02 ~ 0.09 mm (0.0008 ~ 0.0035 in.)

Service Limit:

Exhaust	0.30 mm (0.012 in.)
Intake	0.22 mm (0.009 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 Seat Repair).

Valve Seating Surface Outside Diameter

Standard:

Exhaust	24.6 ~ 24.8 mm (0.969 ~ 0.976 in.)
Intake	30.6 ~ 30.8 mm (1.205 ~ 1.213 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	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)
Intake	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)

Valve Seat Repair

- For the instructions on how to use the valve seat cutter [A], follow the operation manual provided by the tool manufacturer.

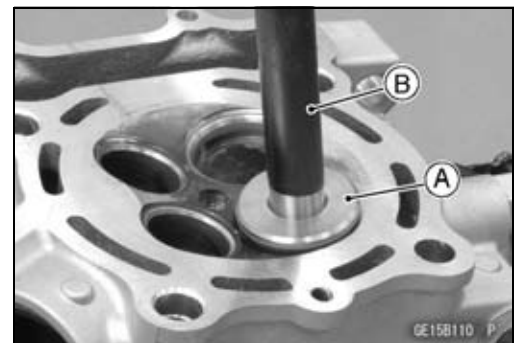
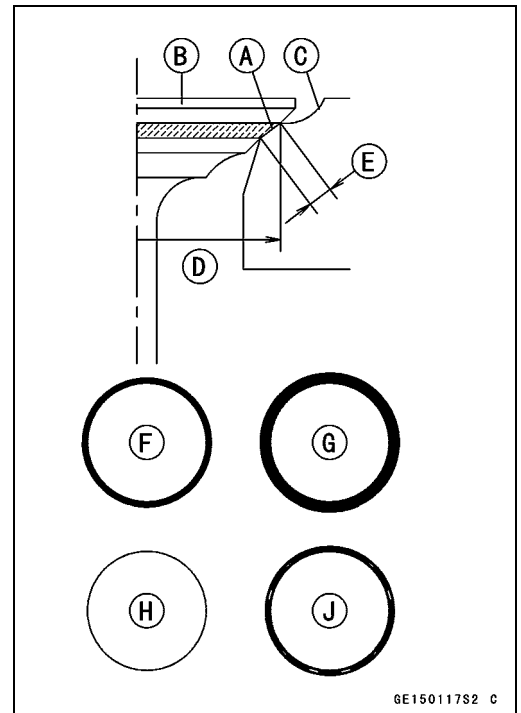
Special Tools - Valve Seat Cutter Holder, ϕ 4.5 [B]: 57001-1330

Valve Seat Cutter Holder Bar: 57001-1128

Exhaust: Valve Seat Cutter, 45° - ϕ 27.5: 57001-1114
Valve Seat Cutter, 32° - ϕ 28: 57001-1119
Valve Seat Cutter, 60° - ϕ 25: 57001-1328

Intake: Valve Seat Cutter, 45° - ϕ 32: 57001-1115
Valve Seat Cutter, 32° - ϕ 33: 57001-1199
Valve Seat Cutter, 60° - ϕ 33: 57001-1334

- ★ If the tool manufacturer's instructions are not available, operate in accordance with the following procedure.



5-30 ENGINE TOP END

Valves

Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

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.

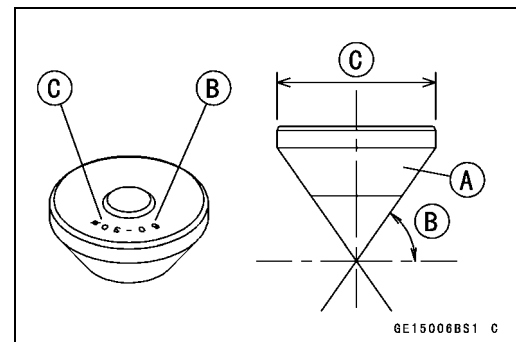
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter

The marks stamped on the back of the cutter [A] represent the following.

60° Cutter Angle [B]

37.5φ Cutter Outer Diameter [C]



Repair Operating Procedures

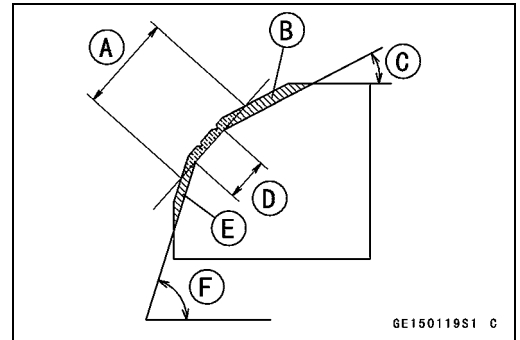
- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

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

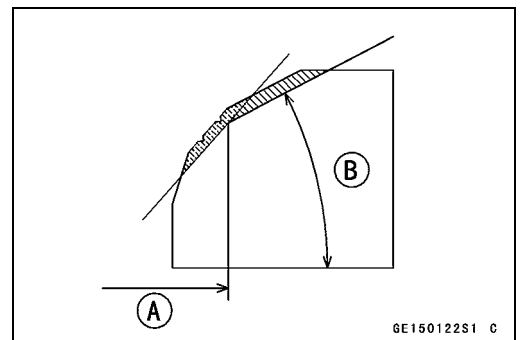
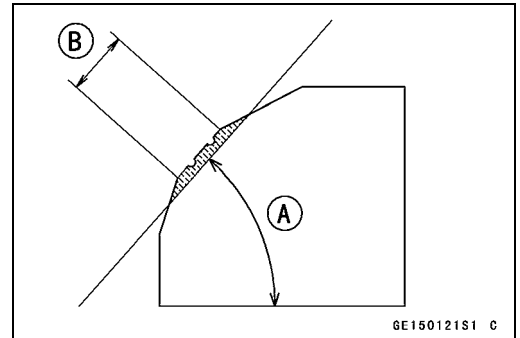
- Widened Width [A] of engagement by machining with 45° cutter
- Ground Volume [B] by 32° cutter
- 32° [C]
- Correct Width [D]
- Ground Volume [E] by 60° cutter
- 60° [F]



- Measure the outside diameter of the seating surface with a vernier caliper.
 - ★ If the outside diameter of the seating surface is too small, repeat the 45° [A] grind 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° 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° [B] 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 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.

5-32 ENGINE TOP END

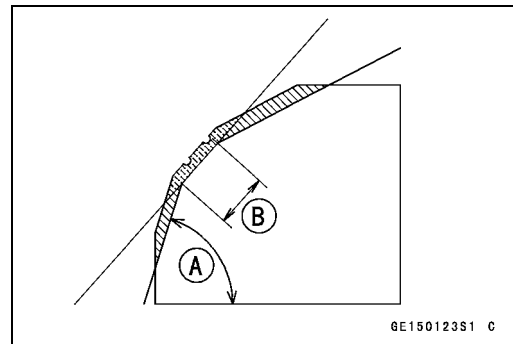
Valves

- ★ If the seat width is too wide, make the 60° [A] grind described below.
- ★ If the seat width is within the specified range, lap the valve to the seat as described below.
- Grind the seat at a 60° angle until the seat width is within the specified range [B].
- To make the 60° grind, fit a 60° cutter into the holder, and slide it into the valve guide.
- Turn the holder, while pressing down lightly.
- After making the 60° grind, return to the seat width measurement step above.

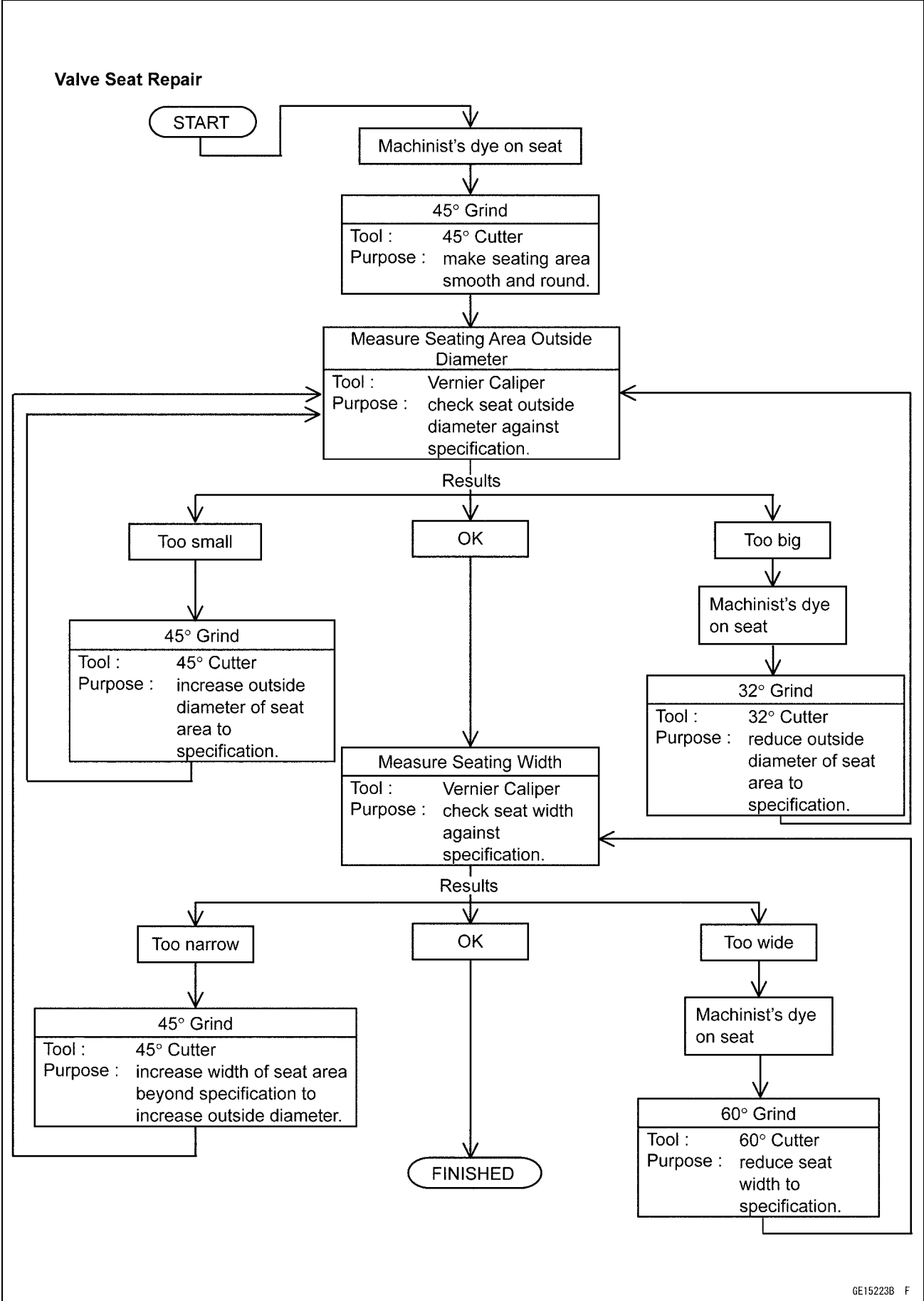
NOTICE

Do not lap the valve to the valve seat, using the grinding compound. It will come off oxide film treated surface of the valve.

- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment in the Periodic Maintenance chapter).



Valves

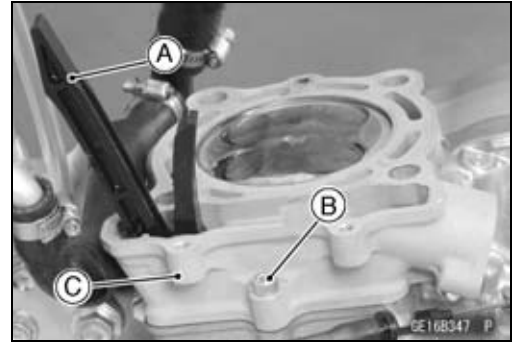


5-34 ENGINE TOP END

Cylinder and Piston

Cylinder Removal

- Remove:
 - Cylinder Head (see Cylinder Head Removal)
 - Front Camshaft Chain Guide [A]
 - Cylinder Bolt [B]
- Tap lightly up with a plastic mallet to separate the cylinder [C] from the crankcase.
- Remove the cylinder base gasket.

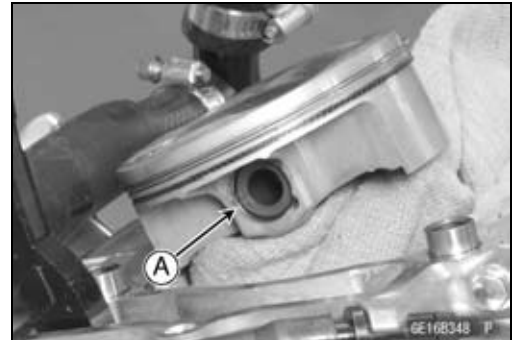


Piston Removal

- Remove the cylinder (see Cylinder Removal).
- Remove the piston pin snap ring [A].

NOTE

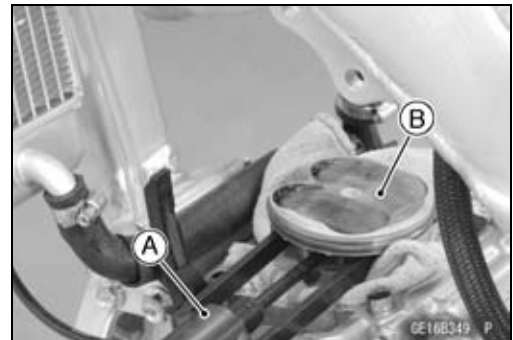
○ Lay a clean cloth under the piston, to prevent dropping dirt or parts into the crankcase.



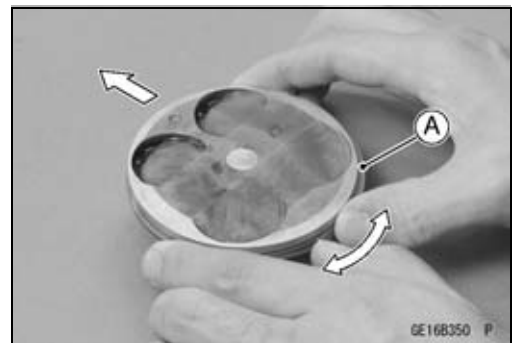
- Remove the piston pin, using a piston pin puller [A].

Special Tool - Piston Pin Puller: 57001-1568

- Remove the piston [B].



- Carefully spread the piston ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the oil ring in the same procedure.



Cylinder and Piston Installation

NOTE

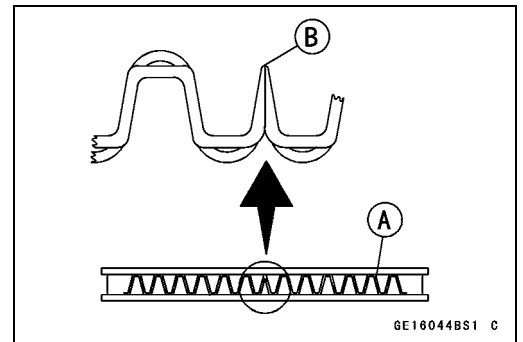
○ If a new piston or cylinder is used, check piston/cylinder clearance (see Piston/Cylinder Clearance Inspection in the Periodic Maintenance chapter), and use new piston rings.

Cylinder and Piston

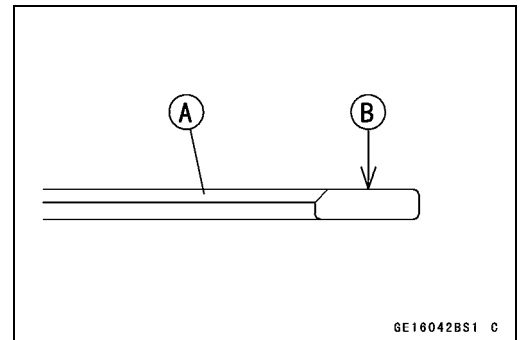
NOTE

○The oil ring rails have no “top” or “bottom”.

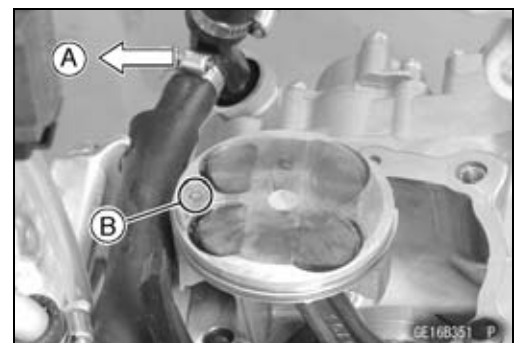
- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails on both sides of the oil ring expander.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston ring groove.



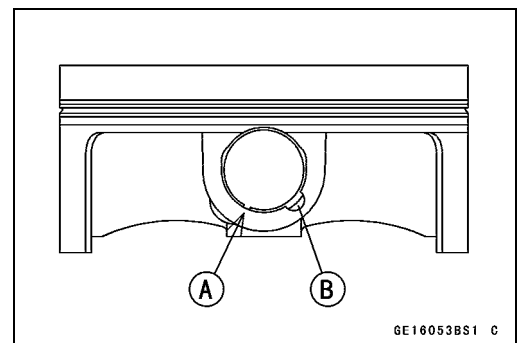
- Install the top ring [A] so that the “R” mark [B] faces up.



- Apply engine oil to the piston pin and inside wall of the connecting rod small end.
- Install the piston.
 - Front [A]
 - Circle Mark [B]
- Install the piston pin.



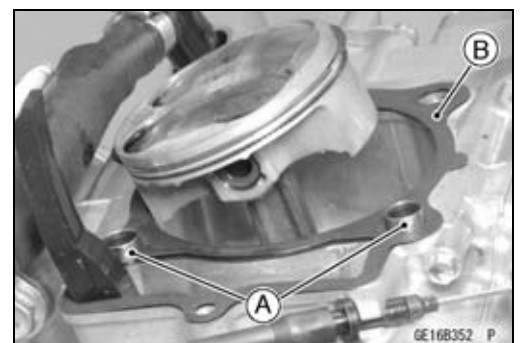
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- When installing the piston pin snap ring, compress it only enough to install it and no more.



NOTICE

Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.

- Replace the cylinder base gasket with a new one.
- Install:
 - Dowel Pins [A]
 - New Cylinder Base Gasket [B]

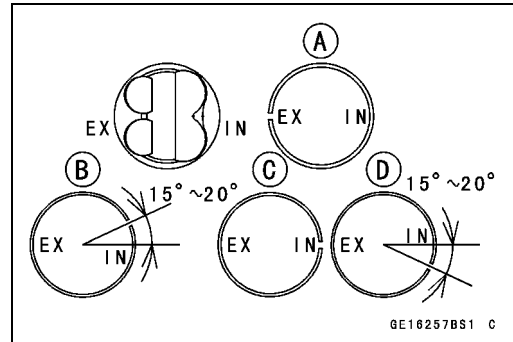


5-36 ENGINE TOP END

Cylinder and Piston

- The piston ring openings must be positioned as shown. The openings of the oil ring steel rails must be 15 ~ 20° of angle from the opening of the oil ring expander.

Top Ring [A]
Upper Oil Ring Steel Rail [B]
Oil Ring Expander [C]
Lower Oil Ring Steel Rail [D]



- Apply engine oil to the cylinder bore and piston side wall.
- Install the cylinder while compressing the piston rings with your fingers or the special tool [A].
- Upturn the chamfering side of the belt.

Special Tools - Piston Ring Compressor Grip: 57001-1095
Piston Ring Compressor Belt, $\phi 67 \sim \phi 79$: 57001-1097

- Install the removed parts (see appropriate chapters).



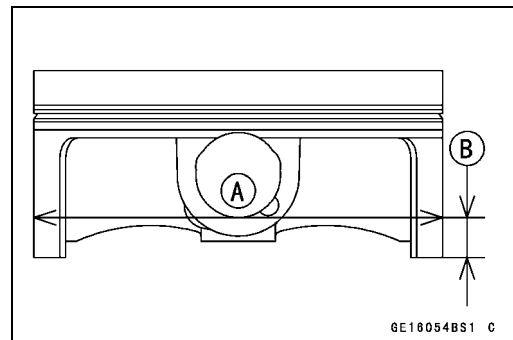
Cylinder Wear Inspection

- Refer to the Cylinder Wear Inspection in the Periodic Maintenance chapter.

Piston Wear Inspection

- Using a micrometer, measure the outside diameter [A] of the piston 6 mm (0.24 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.
- ★ If the piston outside diameter is smaller than the service limit, replace the piston.

Piston Diameter
Standard: 76.948 ~ 76.963 mm (3.0294 ~ 3.0300 in.)
Service Limit: 76.80 mm (3.024 in.)



Piston/Cylinder Clearance Inspection

- Refer to the Piston/Cylinder Clearance in the Periodic Maintenance chapter.

Piston Ring/Ring Groove Clearance Inspection

- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all piston rings.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

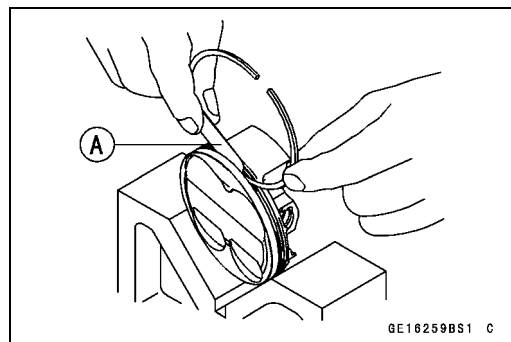
Piston Ring/Ring Groove Clearance
Standard:

Top 0.04 ~ 0.08 mm (0.002 ~ 0.003 in.)

Service Limit:

Top 0.18 mm (0.0071 in.)

- ★ If the piston ring groove clearance is greater than the service limit, measure the ring thickness and groove width as follows to decide whether to replace the rings, the piston or both.



Cylinder and Piston

Piston Ring Groove Width Inspection

- Measure the groove width at several points around the piston with a vernier caliper.

Piston Ring Groove Width

Standard:

Top **0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)**

Service Limit:

Top **0.93 mm (0.037 in.)**

- ★ If any of the groove widths exceeds the service limit, replace the piston.

Piston Ring Thickness Inspection

- Measure the thickness at several points around the ring with a micrometer.

Piston Ring Thickness

Standard:

Top **0.77 ~ 0.79 mm (0.030 ~ 0.031 in.)**

Service Limit:

Top **0.70 mm (0.028 in.)**

- ★ If any of the measurements is less than the service limit, replace all rings.

NOTE

- When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.

Piston Ring End Gap Measurement

- 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 **0.15 ~ 0.25 mm (0.0059 ~ 0.0098 in.)**

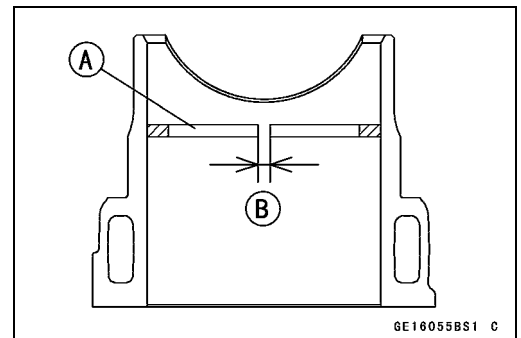
Oil **0.20 ~ 0.70 mm (0.0079 ~ 0.0276 in.)**

Service Limit:

Top **0.6 mm (0.02 in.)**

Oil **1.0 mm (0.04 in.)**

- ★ If the ring end gap exceeds the service limit, replace all rings.



5-38 ENGINE TOP END

Cylinder and Piston

Piston, Piston Pin, Connecting Rod Wear Inspection

- Visually inspect the snap rings [A] still fitted in place.
- ★ If the ring shows weakness or deformation, replace the ring. Also if the pin hole groove shows excessive wear, replace the piston.
- Measure the diameter of the piston pin [B] with a micrometer.

Piston Pin Diameter

Standard: 15.991 ~ 16.000 mm (0.62957 ~ 0.62992 in.)

Service Limit: 15.96 mm (0.6283 in.)

- ★ If the piston pin diameter is less than the service limit at any point, replace the piston pin.
- Using a cylinder gauge, measure the diameter of both piston pin holes [C] in the piston and the inside diameter of the connecting rod small end [D].

Piston Pin Hole Diameter

Standard: 16.004 ~ 16.010 mm (0.63008 ~ 0.63031 in.)

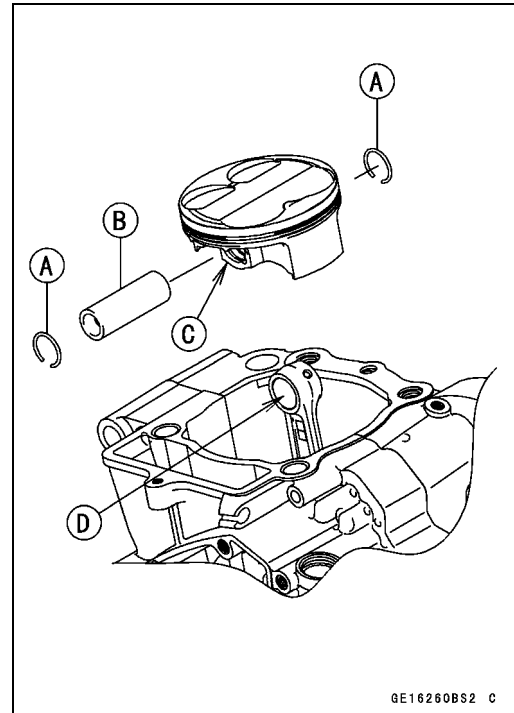
Service Limit: 16.08 mm (0.6331 in.)

Connecting Rod Small End Inside Diameter

Standard: 16.010 ~ 16.018 mm (0.63031 ~ 0.63063 in.)

Service Limit: 16.05 mm (0.6319 in.)

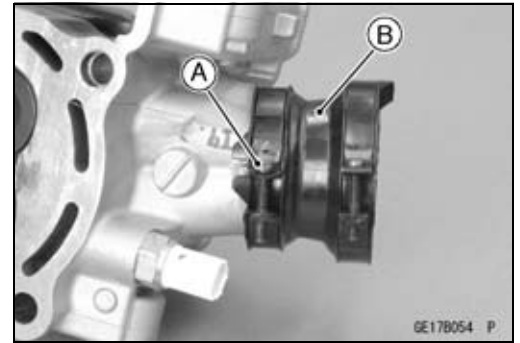
- ★ If either piston pin hole diameter exceeds the service limit, replace the piston.
- ★ If the connecting rod small end inside diameter exceeds the service limit, replace the connecting rod.



Throttle Body Assy Holder

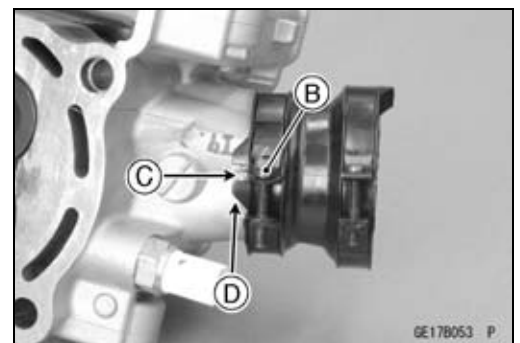
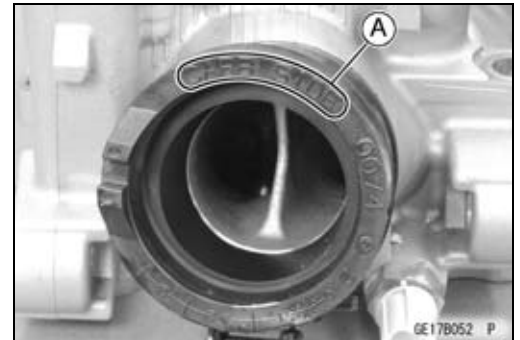
Throttle Body Assy Holder Removal

- Remove:
 - Cylinder Head (see Cylinder Head Removal)
 - Throttle Body Assy Holder Clamp Screw [A] (Loosen)
 - Throttle Body Assy Holder [B] and Holder Clamp



Throttle Body Assy Holder Installation

- Install:
 - Throttle Body Assy Holder
 - Throttle Body Assy Holder Clamp
- Turn the mark [A] to the throttle body assy.
- Turn the screw head [B] to the engine left side.
- Fit the projection [C] of the cylinder head and the recess [D] of the holder.
- Tighten:
 - Torque - Throttle Body Holder Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)
- Install the removed parts (see appropriate chapters).



5-40 ENGINE TOP END

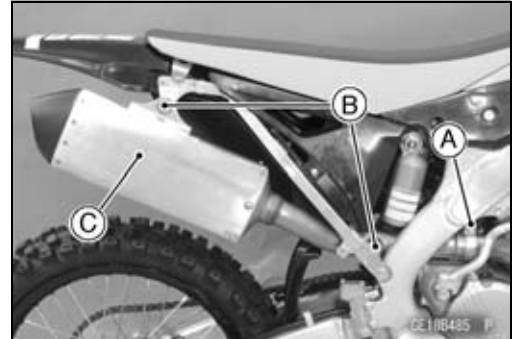
Muffler

⚠ WARNING

The muffler can become extremely hot during normal operation and cause severe burns. Do not remove the muffler while it is hot.

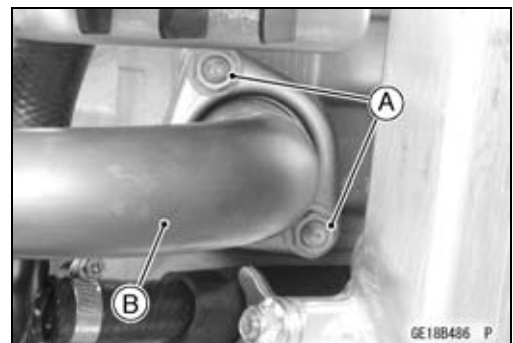
Muffler Body Removal

- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Loosen the muffler clamp bolt [A].
- Remove the mounting bolts [B], and pull out the muffler body [C] backward.



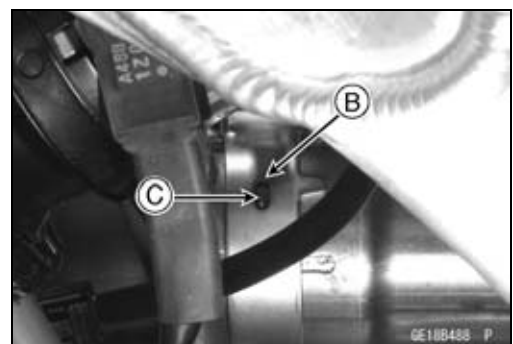
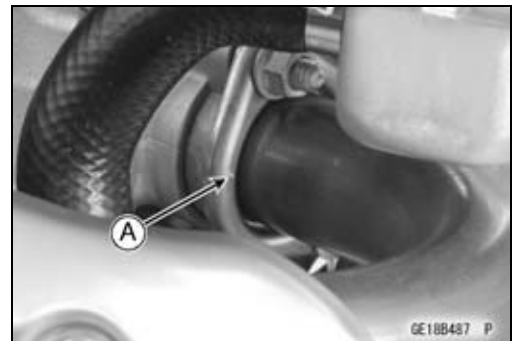
Exhaust Pipe Removal

- Remove:
 - Muffler Body (see Muffler Body Removal)
 - Exhaust Pipe Holder Nuts [A]
 - Exhaust Pipe [B]



Muffler Installation

- Replace the exhaust pipe gasket and muffler pipe gasket with new ones.
- Apply grease to the exhaust pipe gasket, and install it to the engine.
- Install the gasket to the muffler pipe until it is bottomed.
- Install the exhaust pipe, muffler body and muffler clamp temporary.
- Turn the punch mark [A] of the exhaust pipe holder to right side of the motorcycle.
- Tighten the exhaust pipe holder nuts first, and then the muffler mounting bolt (rear).
- Tighten the muffler mounting bolts securely.
- Tighten the front bolt first, and then the rear bolt.
- Tighten the exhaust pipe holder nuts securely.
- Uprturn the muffler clamp opening and fit the hole [B] of the muffler clamp to the projection [C] of the muffler body.
- Tighten the muffler clamp bolt securely.
- Thoroughly warm up the engine, wait until the engine cools down, and then retighten all bolts and nuts.



Silencer Wool Replacement

- Refer to the Silencer Wool Replacement in the Periodic Maintenance chapter.

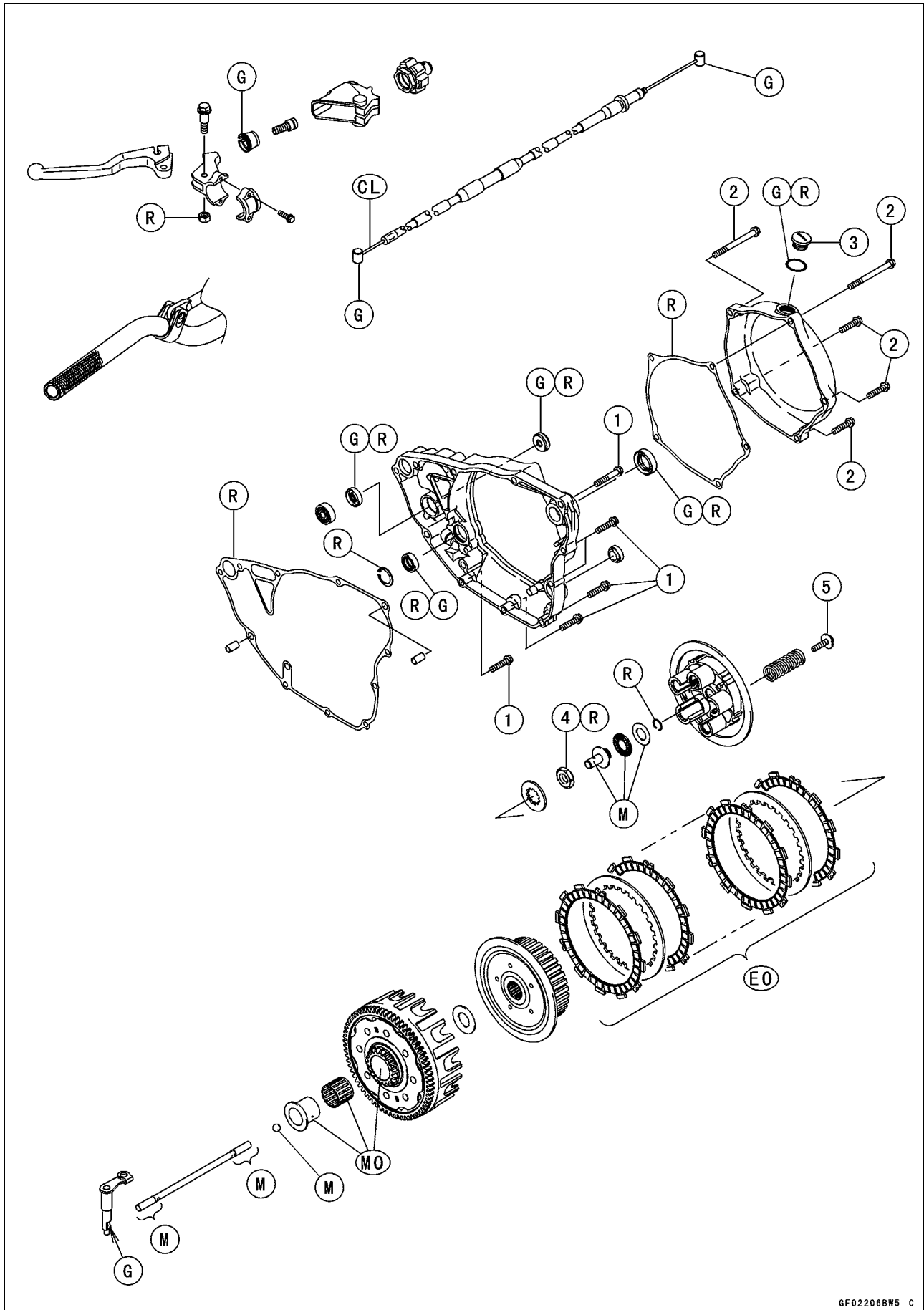
Clutch

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6-2 CLUTCH

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Right Engine Cover Bolts	9.8	1.0	87 in·lb	
2	Clutch Cover Bolts	9.8	1.0	87 in·lb	
3	Oil Filler Plug	3.5	0.36	31 in·lb	
4	Clutch Hub Nut	98	10.0	72	R
5	Clutch Spring Bolts	9.0	0.92	80 in·lb	

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

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

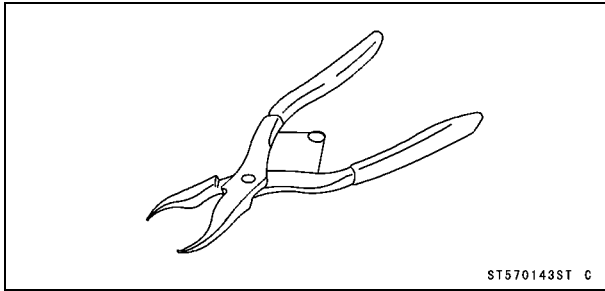
6-4 CLUTCH

Specifications

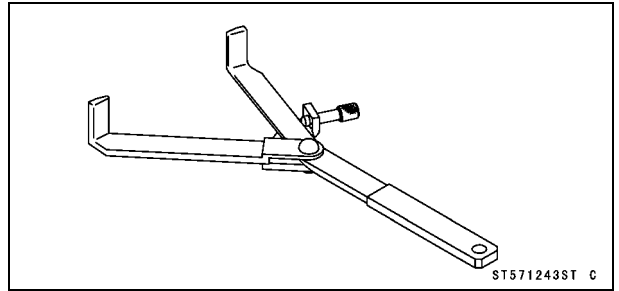
Item	Standard	Service Limit
Clutch Lever Clutch Lever Free Play	8 ~ 13 mm (0.3 ~ 0.5 in.)	— — —
Clutch Friction Plate Thickness Friction Plate Warp Steel Plate Warp Clutch Spring Free Length Friction Plate/Clutch Housing Clearance	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.) 0.15 mm (0.0059 in.) or less 0.15 mm (0.0059 in.) or less 45.82 mm (1.804 in.) 0.04 ~ 0.55 mm (0.002 ~ 0.022 in.)	2.5 mm (0.10 in.) 0.3 mm (0.012 in.) 0.3 mm (0.012 in.) 43.9 mm (1.73 in.) 0.6 mm (0.02 in.)

Special Tools

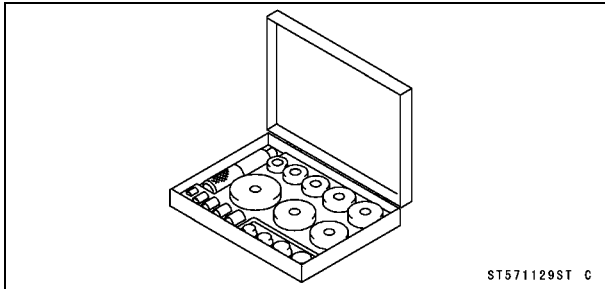
Inside Circlip Pliers:
57001-143



Clutch Holder:
57001-1243



Bearing Driver Set:
57001-1129



6-6 CLUTCH

Clutch Lever and Cable

Due to friction plate wear and clutch cable stretch over a long period of use, the clutch must be adjusted in accordance with the Periodic Maintenance Chart.

⚠ WARNING

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.

Clutch Lever (Clutch Cable) Free Play Inspection

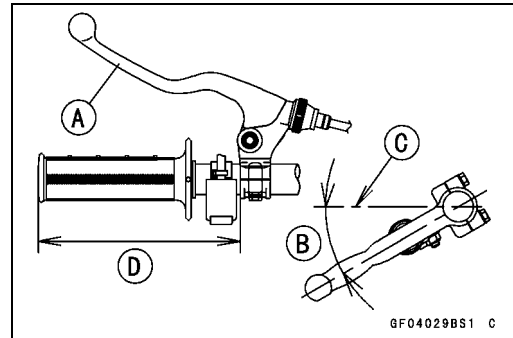
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

Clutch Lever (Clutch Cable) Free Play Adjustment

- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

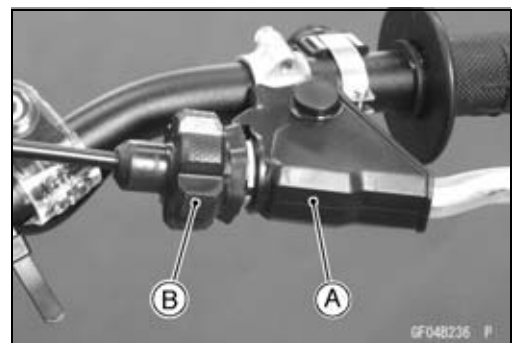
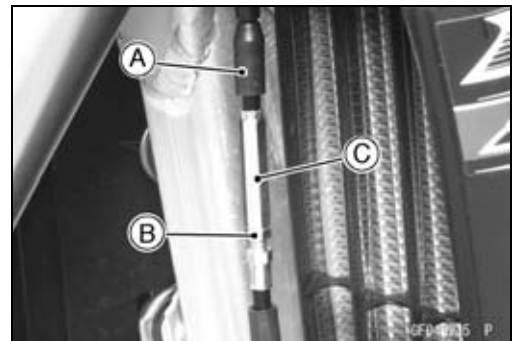
Clutch Lever Installation

- Install the clutch lever assembly [A].
25 ~ 35° [B]
Horizontal Line of Frame [C]
160.5 mm (6.32 in.) [D]



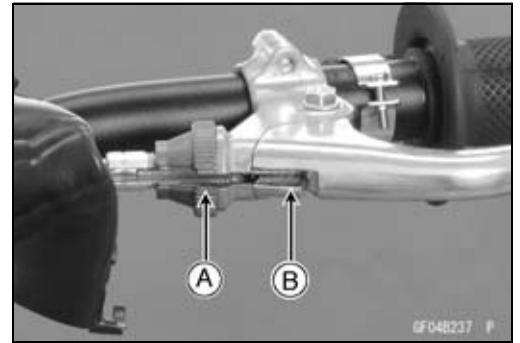
Clutch Cable Removal

- Remove:
 - Number Plate (see Number Plate Removal in the Frame chapter)
 - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
 - Left Radiator Screen (see Radiator Removal in the Cooling System chapter)
- Slide the dust cover [A].
- Loosen the locknut [B] and screw in the adjuster [C] fully.
- Slide the dust cover [A] and knob [B] out of place.



Clutch Lever and Cable

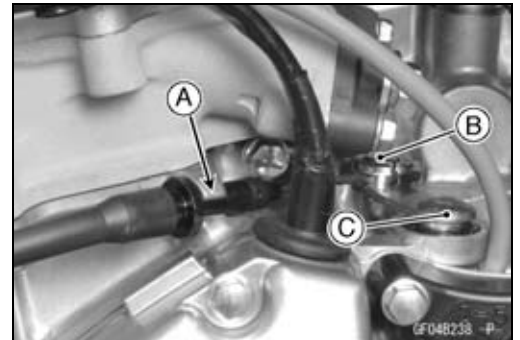
- Align the slit [A] of the adjusting nut to the slit [B] of the clutch lever.
- Free the clutch cable upper end from the clutch lever.



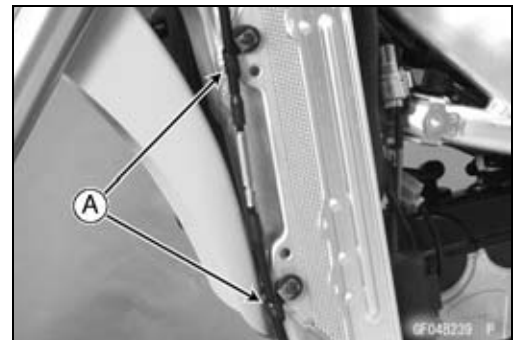
- Take the cable off the cable holder [A].
- Take the cable lower end [B] off the clutch release lever [C].

NOTICE

Do not remove the clutch release shaft unless it is absolutely necessary. If removed, release shaft oil seal must be replaced with a new one.

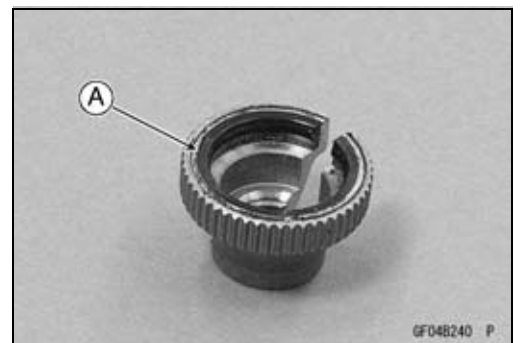


- Open the clamps [A].
- Pull the clutch cable out of the frame.



Clutch Cable Installation

- Apply grease to the lips [A] of adjusting nut.
- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).
- Install the removed parts (see appropriate chapters).



Clutch Cable Inspection and Lubrication

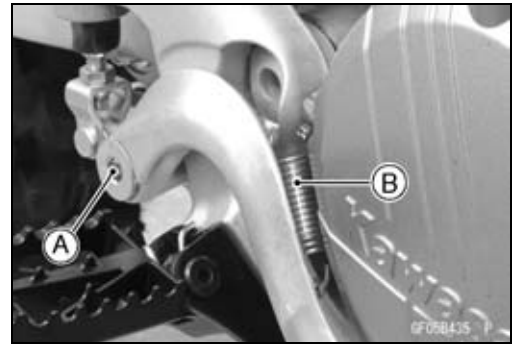
- During a periodic inspection or when the cable has been removed, inspect and lubricate the cable (see General Lubrication and Cable Inspection section in the Periodic Maintenance chapter).

6-8 CLUTCH

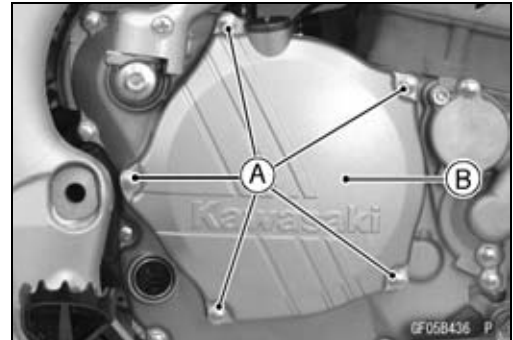
Clutch Cover and Right Engine Cover

Clutch Cover Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
 - Brake Pedal Bolt [A]
 - Brake Pedal Return Spring [B]

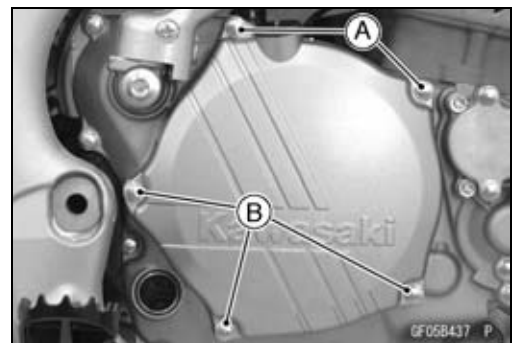


- Remove the clutch cover bolts [A] and clutch cover [B].



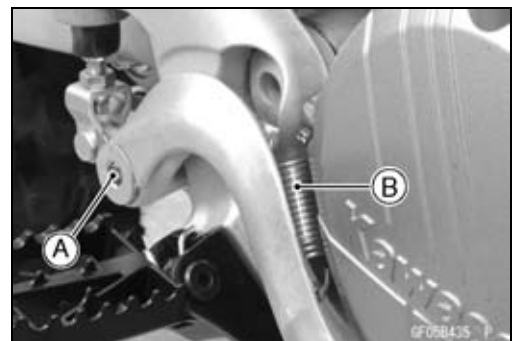
Clutch Cover Installation

- Replace the clutch cover gasket with a new one.
 - Install the clutch cover and new cover gasket.
 - Tighten:
 - L = 65 mm (2.6 in.) [A]
 - L = 25 mm (1.0 in.) [B]
- Torque - Clutch Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



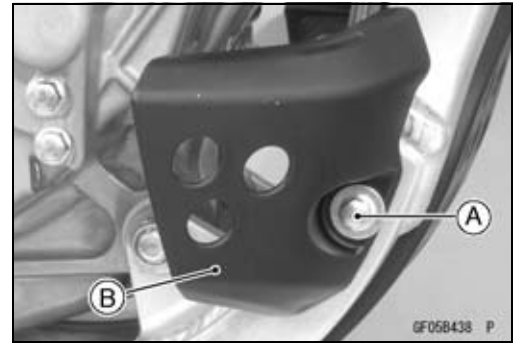
Right Engine Cover Removal

- Drain:
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
 - Coolant (see Coolant Draining in the Cooling System chapter)
- Remove:
 - Kick Pedal (see Kick Pedal Removal in the Crankshaft/Transmission chapter)
 - Oil Filter (see Oil Filter Change in the Periodic Maintenance chapter)
 - Brake Pedal Bolt [A]
 - Brake Pedal Return Spring [B]



Clutch Cover and Right Engine Cover

- Remove:
 - Bolt [A]
 - Right Engine Guard [B]

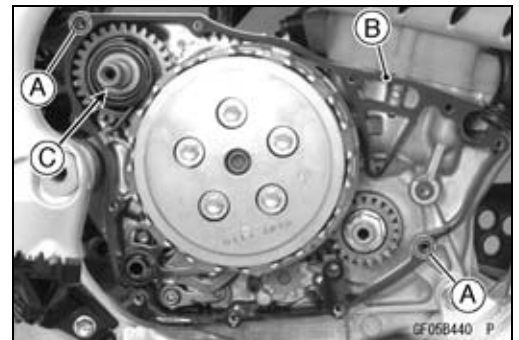


- Remove:
 - Water Pump Cover (see Water Pump Cover Removal in the Cooling System chapter)
 - Clutch Cover Bolts [A]
 - Right Engine Cover Bolts [B]
 - Right Engine Cover [C]

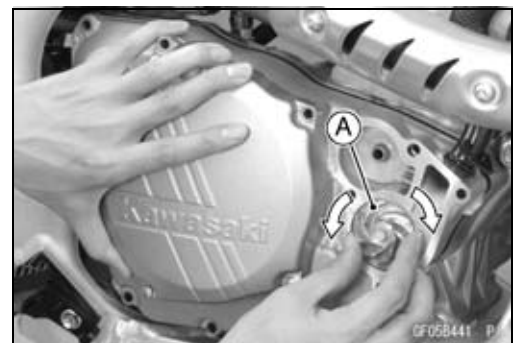


Right Engine Cover Installation

- Install the dowel pins [A].
- Replace the right engine cover gasket [B] with a new one.
- Wrap the spline [C] of the kick shaft with the vinyl tape to prevent damage.
- Apply grease to the kick shaft oil seal lip.



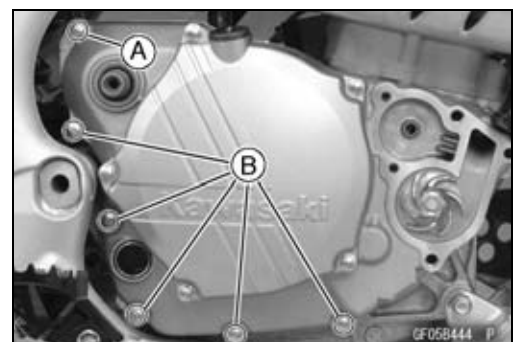
- When installing the cover does not go well, the cover is installed according to the following procedures.
 - Install the cover while turning the impeller [A].



- Tighten:
 - L = 35 mm (1.4 in.) [A]
 - L = 25 mm (1.0 in.) [B]

Torque - Right Engine Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

Clutch Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



6-10 CLUTCH

Clutch Cover and Right Engine Cover

- Remove the vinyl tape from the kick shaft.
- Install:
 - Water Pump Cover (see Water Pump Cover Installation in the Cooling System chapter)
 - Brake Pedal (see Brake Pedal Installation in the Brakes chapter)
 - Oil Filter (see Oil Filter Change in the Periodic Maintenance chapter)
 - Kick Pedal (see Kick Pedal Installation in the Crankshaft/Transmission chapter)
- Pour:
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
 - Coolant (see Coolant Filling in the Cooling System chapter)
- Check the rear brake effectiveness (see Brakes section in the Periodic Maintenance chapter).

Right Engine Cover Assembly

- Refer to the Oil Seal and Bearing Installation in the Cooling System chapter for water pump oil seals and bearing installation.
- Replace the removed oil seal and circlip with new ones.
- Press in the oil seals direction as shown.

Special Tool - Bearing Driver Set: 57001-1129

- Press in the new oil seal using a press and suitable tools so that the seal surface is flush with the surface of the right engine cover.

Flat Side [A]

Kick Shaft Oil Seal [B]

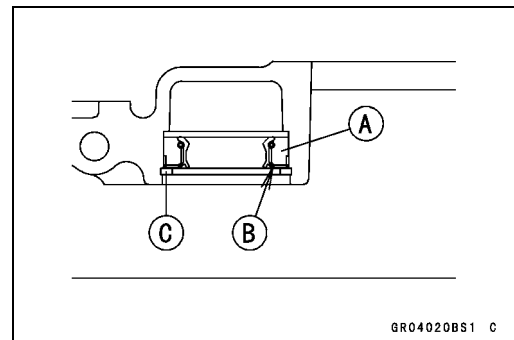
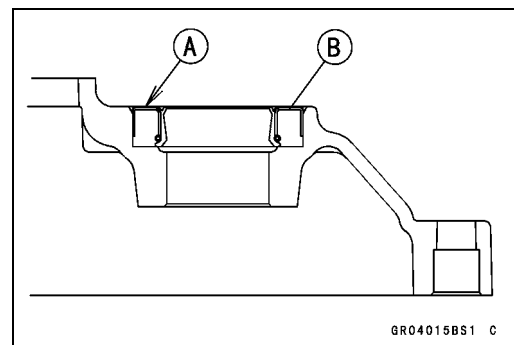
- Press the new crankshaft oil passage oil seal [A] so that the seal surface is flush with the surface of the right engine cover.

Flat Side [B]

- Install the new circlip [C].

Special Tool - Inside Circlip Pliers: 57001-143

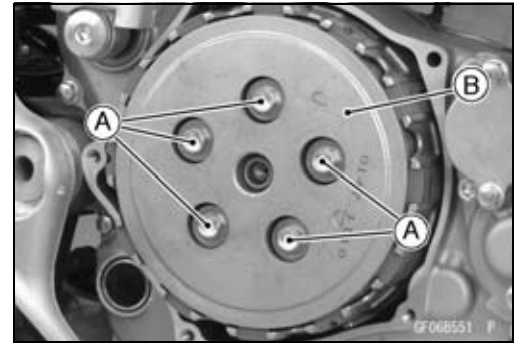
- Apply grease to the oil seal lips.



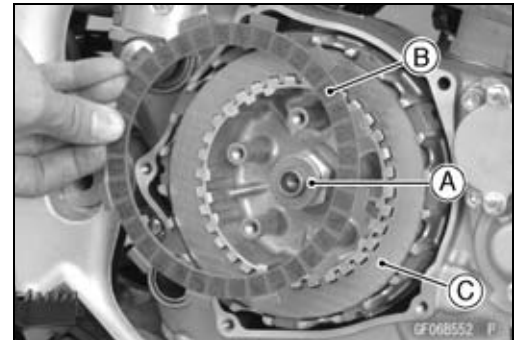
Clutch

Clutch Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
 - Clutch Cover (see Clutch Cover Removal)
 - Clutch Spring Bolts [A]
 - Clutch Springs
 - Clutch Spring Plate [B]

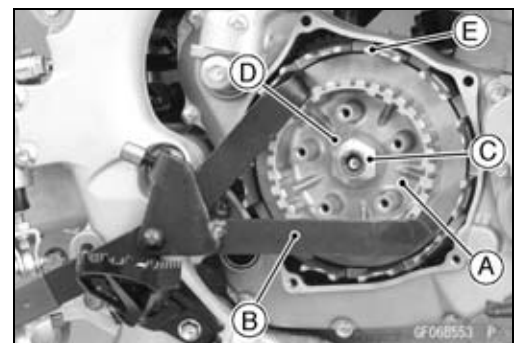


- Remove:
 - Push Rod Holder Assembly [A]
 - Steel Ball
 - Friction Plates [B]
 - Steel Plates [C]

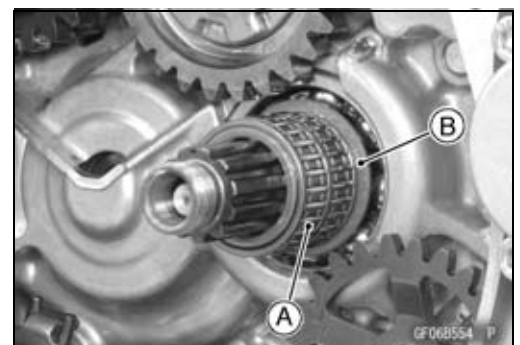


- Hold the clutch hub [A] with the clutch holder [B].
- Special Tool - Clutch Holder: 57001-1243**

- Remove:
 - Clutch Hub Nut [C]
 - Toothed Washer [D]
 - Clutch Hub
 - Thrust Washer
 - Clutch Housing [E]

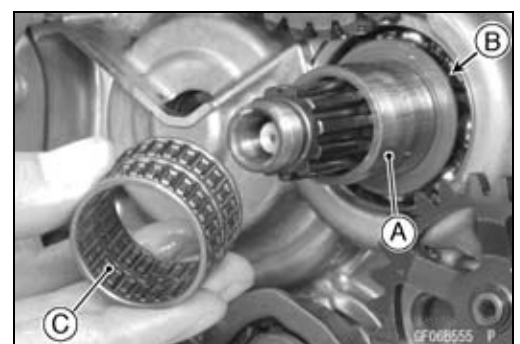


- Remove:
 - Needle Bearing [A]
 - Sleeve [B]



Clutch Installation

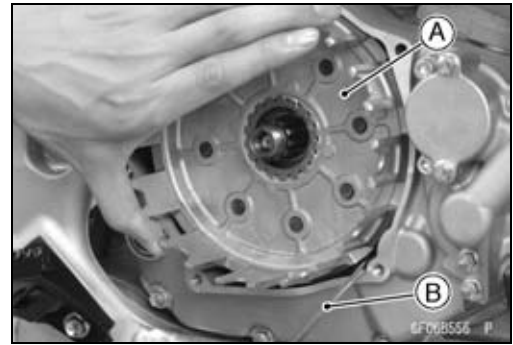
- Apply molybdenum disulfide oil solution to the outside of the sleeve [A].
- Install the sleeve so that the flange [B] faces inside.
- Install the needle bearing [C].



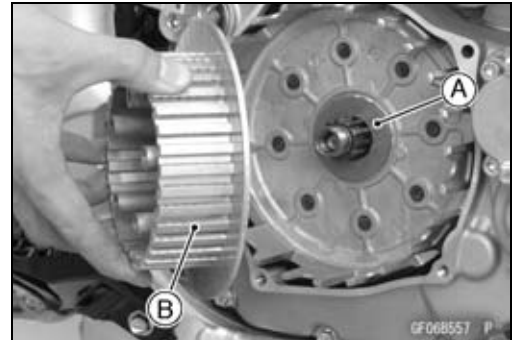
6-12 CLUTCH

Clutch

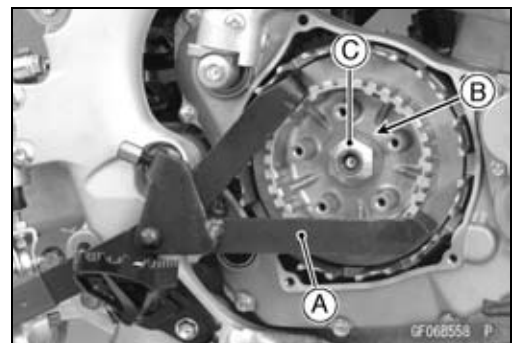
- Install the clutch housing [A].
- Turn the kickstarter idle gear and oil pump idle gear with a suitable tool [B] to fit in the clutch housing.



- Install:
 - Thrust Washer [A]
 - Clutch Hub [B]



- Hold the clutch hub with the clutch holder [A].
 - Special Tool - Clutch Holder: 57001-1243**
- Install the toothed washer [B].
- Replace the clutch hub nut [C] with a new one.
- Turn the large chamfering side of the clutch hub nut to outside.
- Tighten:
 - Torque - Clutch Hub Nut: 98 N·m (10.0 kgf·m, 72 ft·lb)**

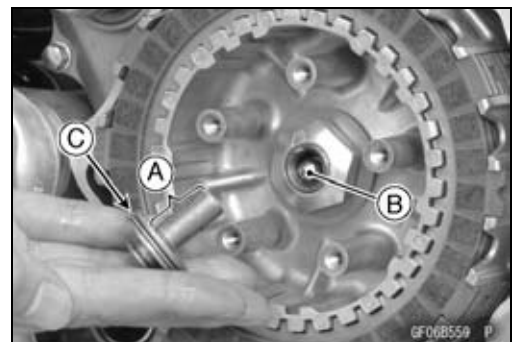


- Install the friction plates and steel plates alternately.
- Install the friction plate first.

NOTICE

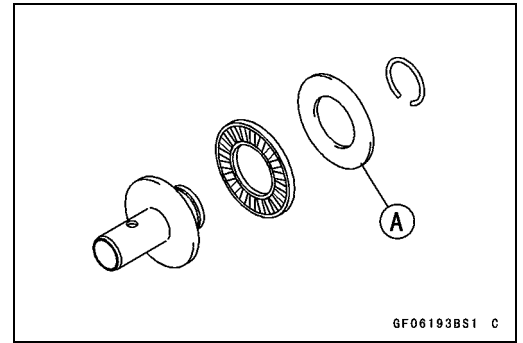
If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.

- Apply molybdenum disulfide grease to the rubbing portion [A] of push rod holder, steel ball [B] and washers [C].
- Install the steel ball and push rod holder assembly.



Clutch

- If a clutch part was replaced, install the standard adjusting washer (1.5 mm thickness) [A] of the push rod holder assembly, and check the release lever position as explained later procedure.



- Install the clutch spring plate and clutch springs.
- Tighten the clutch spring bolts while holding the clutch housing with the hand.

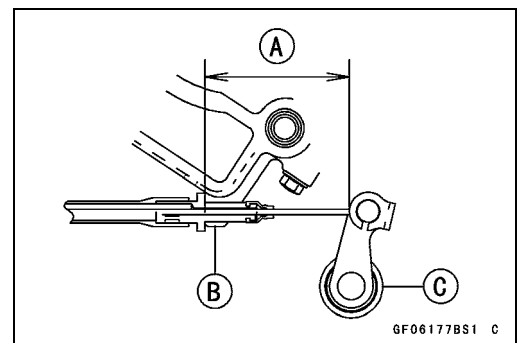
Torque - Clutch Spring Bolts: 9.0 N·m (0.92 kgf·m, 80 in·lb)

- Check the release shaft lever position [A].
Cable Holder [B]
Lever [C]

Release Shaft Lever Position

Standard: 49.2 ~ 56.5 mm (1.94 ~ 2.22 in.)

- ★ If the lever position is not within the standard, select the correct thickness of adjusting washer(s) according to the tables shown.



Adjusting Washers

Thickness	Part Number
1.5 mm (0.06 in.)	92200-1548
1.0 mm (0.04 in.)	92200-0045

Release Shaft Lever Position and Adjusting Washer Selection

Position Distance	Judgment	Washers Thickness	Qty
49.2 ~ 56.5 mm (1.94 ~ 2.22 in.)	Standard	1.5 mm (0.06 in.)	1
More than 56.5 mm (2.22 in.)	Too big	1.0 mm (0.04 in.)	1
Less than 49.2 mm (1.94 in.)	Too small	1.0 mm (0.04 in.)	2

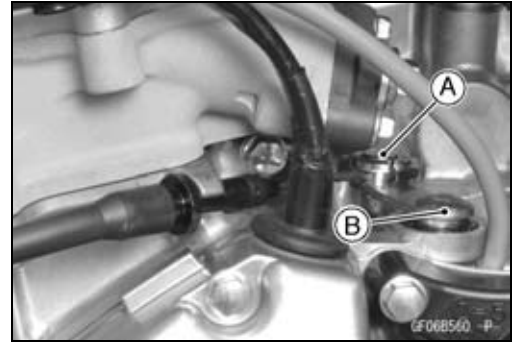
- ★ Remove the push rod holder assembly as necessary and reinstall the clutch.

6-14 CLUTCH

Clutch

Release Shaft Removal

- Remove:
 - Clutch (see Clutch Removal)
 - Clutch Cable Upper End (see Clutch Cable Removal)
- Remove the tip [A] of the clutch cable.
- Pull out the release shaft assembly [B].



Release Shaft Installation

- Apply engine oil to the needle bearings [A].
- Replace the oil seal [B] with a new one (see Crankcase Assembly in the Crankshaft/Transmission chapter).
- Apply grease to the release shaft lower end [C] and oil seal lips.
- Insert the release shaft straight into the upper hole of the crankcase.

NOTICE

When inserting the release shaft, be careful not to remove the spring of the oil seal.

- Install the removed parts (see appropriate chapters).

Clutch Plates Wear, Damage Inspection

- Refer to the Clutch Plates Inspection in the Periodic Maintenance chapter.

Clutch Plates Warp Inspection

- Refer to the Clutch Plates Inspection in the Periodic Maintenance chapter.

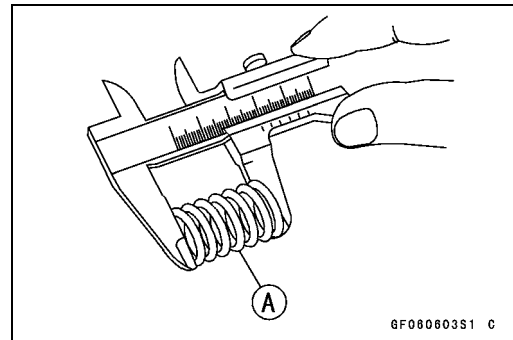
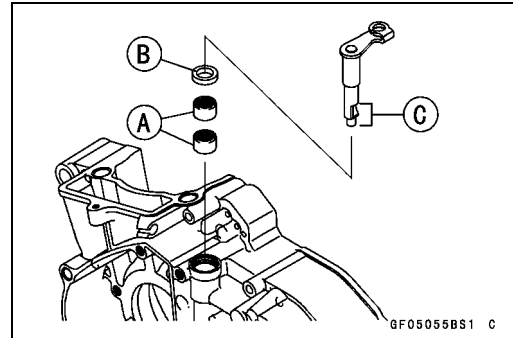
Clutch Spring Free Length Inspection

- Measure the free length [A] of the clutch springs.
- ★ If any clutch spring is shorter than the service limit, it must be replaced.

Clutch Spring Free Length

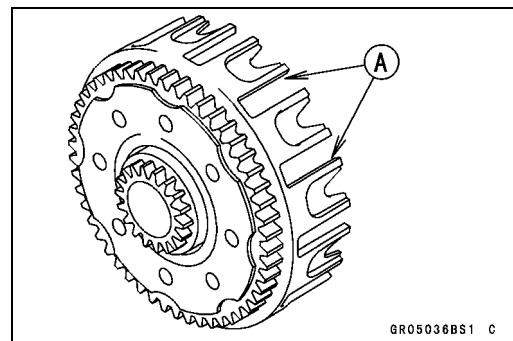
Standard: 45.82 mm (1.804 in.)

Service Limit: 43.9 mm (1.73 in.)



Clutch Housing Finger Damage Inspection

- Visually inspect the clutch housing fingers [A] that come in contact with the friction plate tangs.
- ★ If they are damaged or if there are groove cuts in the areas that come in contact with the tangs, replace the housing. Replace the friction plates if their tangs are damaged as well.



Clutch

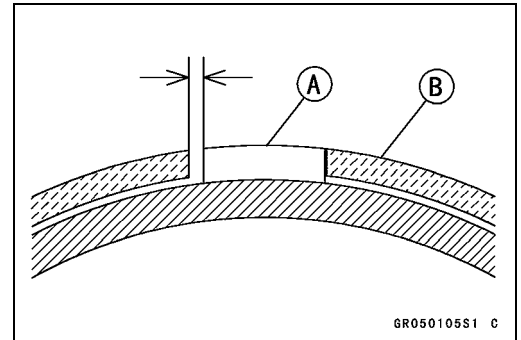
Friction Plate/Clutch Housing Clearance Inspection

- Measure the clearance between the tangs [A] on the friction plate and the fingers [B] of the clutch housing.
- ★ If this clearance is excessive, the clutch will be noisy.
- ★ If the clearance exceeds the service limit, replace the friction plates.

Friction Plate/Clutch Housing Clearance

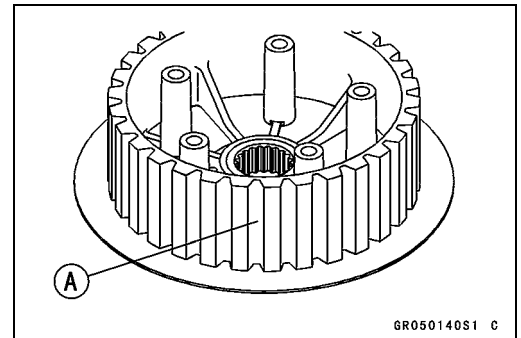
Standard: 0.04 ~ 0.55 mm (0.002 ~ 0.022 in.)

Service Limit: 0.6 mm (0.02 in.)



Clutch Hub Spline Damage Inspection

- Visually inspect the areas of the clutch hub splines that come in contact with the teeth of the steel plates.
- ★ If there are notches worn into the clutch hub splines [A], replace the clutch hub. Replace the steel plates if their teeth are damaged as well.



Engine Lubrication System

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ENGINE LUBRICATION SYSTEM 7-3

Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Oil Filter Cap Bolts	9.8	1.0	87 in-lb	
2	Piston Oil Nozzle	2.9	0.30	26 in-lb	
3	Breather Fitting	15	1.5	11	
4	Oil Pump Idle Gear Shaft Screws	5.9	0.60	52 in-lb	L
5	Oil Pump Mounting Bolts	7.0	0.71	62 in-lb	L
6	Engine Oil Drain Bolt	20	2.0	15	

EO: Apply engine oil.

G: Apply grease.

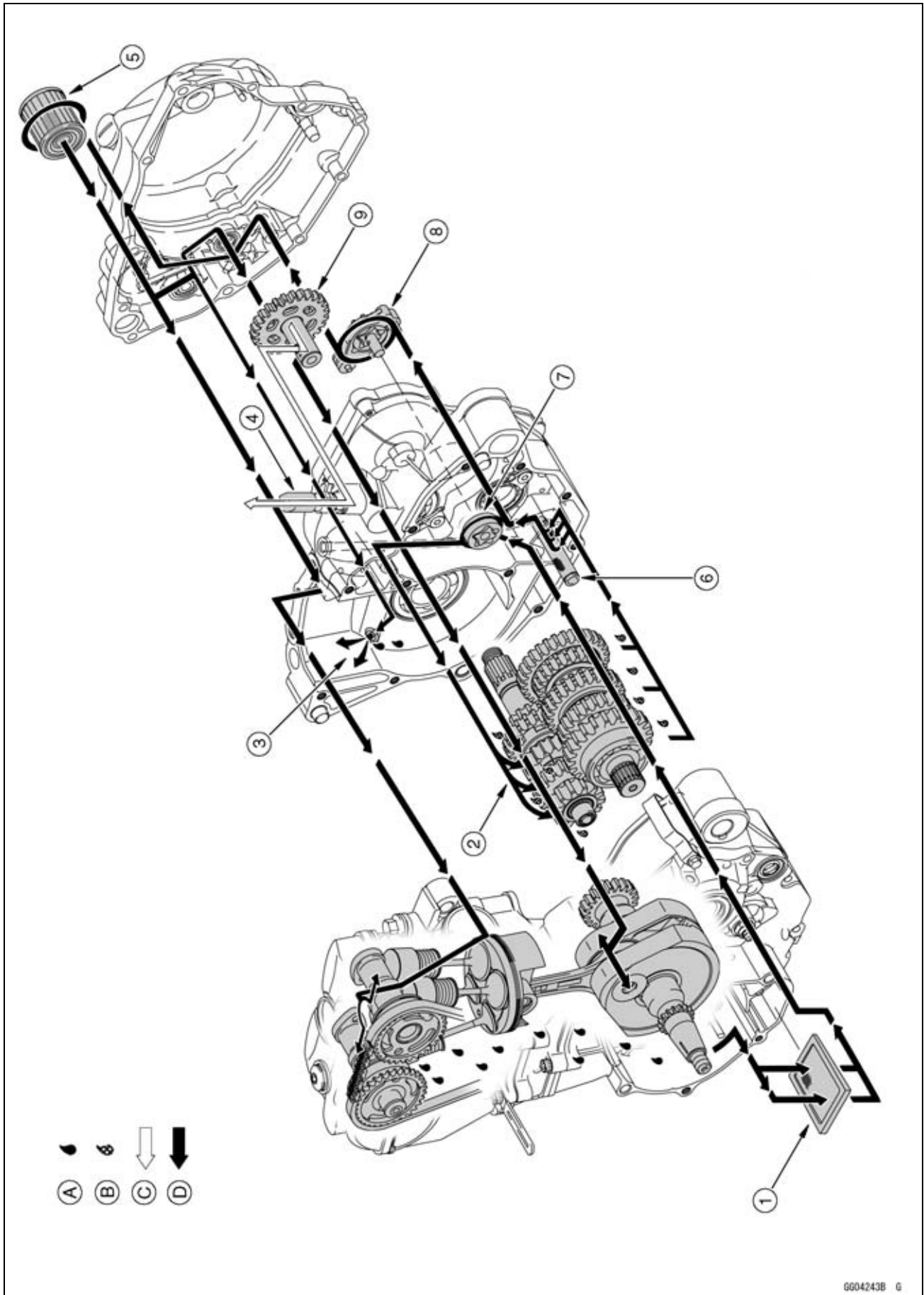
L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

7-4 ENGINE LUBRICATION SYSTEM

Lubrication System Chart



Lubrication System Chart

1. Oil Screen (Scavenge)
 2. Oil Shower to Transmission
 3. Piston Oil Nozzle
 4. Breather Hose
 5. Oil Filter
 6. Oil Screen (Feed)
 7. Oil Pump (Scavenge)
 8. Oil Pump (Feed)
 9. Kick Starter Idle Gear
- A: Crank Room Oil
B: Transmission Room Oil
C: Blowby Gas
D: Engine Oil

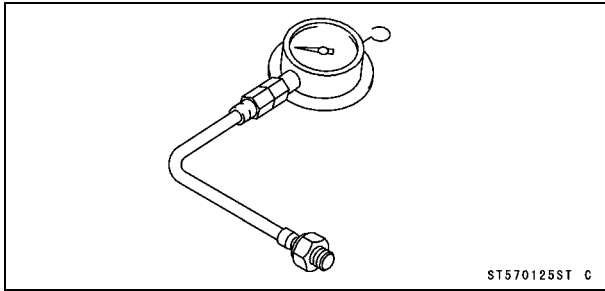
7-6 ENGINE LUBRICATION SYSTEM

Specifications

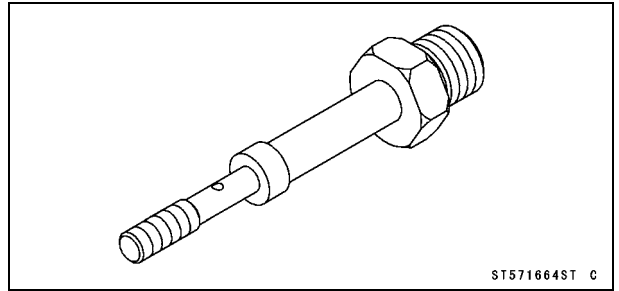
Item	Standard
Engine Oil Type Viscosity Capacity Oil Level	Castrol "POWER1 R4 Racing" 5W-40 or API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2 SAE 10W-30, 10W-40, or 10W-50 0.75 L (0.79 US qt) (when filter is not removed) 0.80 L (0.85 US qt) (when filter is removed) 1.00 L (1.06 US qt) (when engine is completely dry) Between upper and lower level lines (after warm-up or driving)
Oil Pressure Measurement Oil Pressure	About 98 kPa (1.0 kgf/cm ² , 14.2 psi) at 4 000 r/min (rpm), Oil Temperature 40°C (104°F)

Special Tools

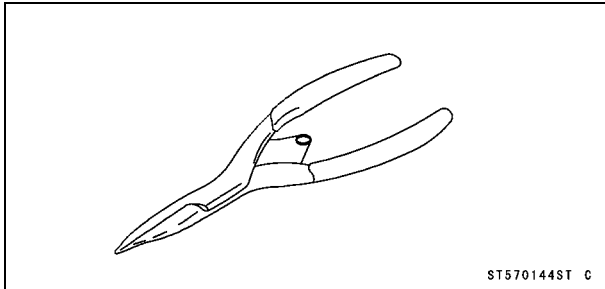
Oil Pressure Gauge, 5 kgf/cm²:
57001-125



Oil Pressure Gauge Adapter, M6 × 1.0:
57001-1664



Outside Circlip Pliers:
57001-144



7-8 ENGINE LUBRICATION SYSTEM

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.

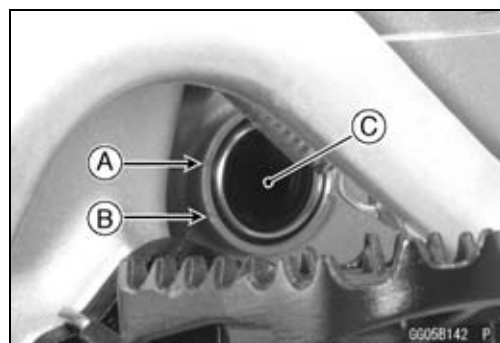
The engine oil level indicated in the oil level inspection window is very sensitive to the motorcycle's position and engine rpm at time of shut down. Because of the semi-dry sump lubrication system with separate oil chambers in the crank room and transmission room, under certain conditions oil can accumulate in the crank room and give a false low reading at the oil level inspection window, which indicates oil volume in the transmission room.

Engine Oil Level Inspection

- Situate the motorcycle so that it is vertical.
- Check that the engine oil level is between the upper [A] and lower [B] levels in the inspection window [C].

NOTE

- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- If no oil appears in the inspection window, tip the motorcycle slightly to the right until oil is visible then return to an upright position. If no oil appears even when tipped at an extreme angle, remove the drain bolt to empty any oil, reinstall the drain bolt and refill with the specified amount of oil.
- If the oil has just been changed, start the engine and run it for several minutes **at idle speed**. This fills the oil filter with oil.
- **Do not run the engine at high engine speed.** Stop the engine, then wait several minutes until the oil settles.



NOTICE

Racing the engine before the oil reaches every part can cause engine seizure.

- ★ If the oil level is too high, remove the excess oil through the filler opening, using a syringe or some other suitable device.
- ★ If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.

NOTE

- If the engine oil type and make are unknown, use any brand of the specified oil to top off the level rather than running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

Engine Oil Change

- Refer to the Engine Oil Change in the Periodic Maintenance chapter.

Engine Oil and Oil Filter

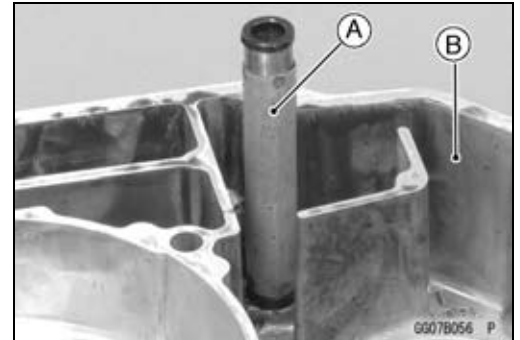
Oil Filter Replacement

- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

Oil Screen Cleaning and Inspection

Oil Screen (Feed)

- Split the crankcase (see Crankcase Disassembly in the Crankshaft/Transmission chapter).
- Remove the oil screen (feed) [A].
Left Crankcase [B]



- Clean the oil screen with a high flash-point solvent and remove any particles stuck to them.

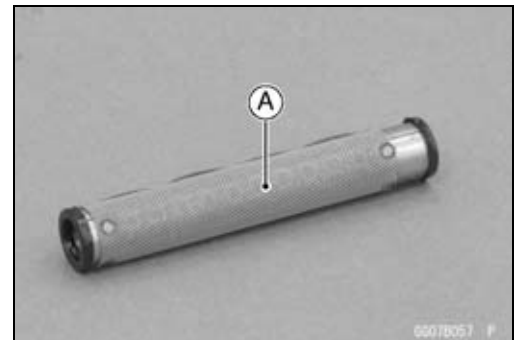
⚠ WARNING

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.

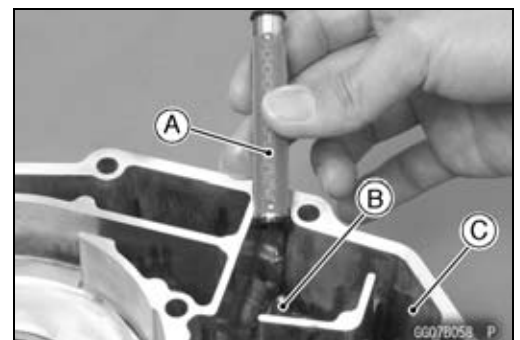
NOTE

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

- Check the screen (feed) [A] carefully for any damage, holes, broken wires or gasket pulling off.
- ★ If the screen is damaged, replace it with a new one.



- Install the oil screen (feed) [A].
Projection [B]
Left Crankcase [C]
- Assemble the crankcase (see Crankcase Assembly in the Crankshaft/Transmission chapter).

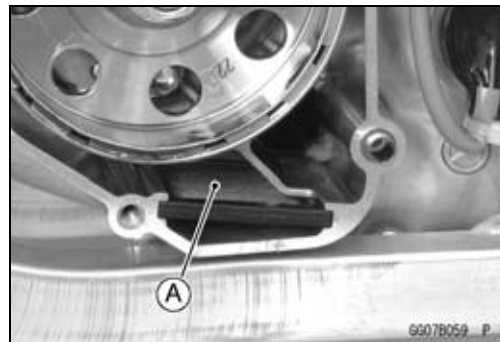


7-10 ENGINE LUBRICATION SYSTEM

Engine Oil and Oil Filter

Oil Screen (Scavenge)

- Remove the magneto cover (see Magneto Cover Removal in the Electrical System chapter).
- Remove the oil screen (scavenge) [A].



- Clean the oil screen with a high flash-point solvent and remove any particles stuck to them.

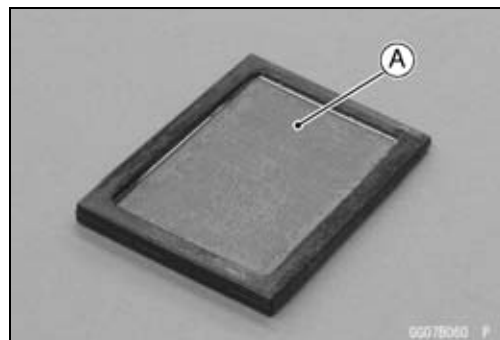
⚠ WARNING

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.

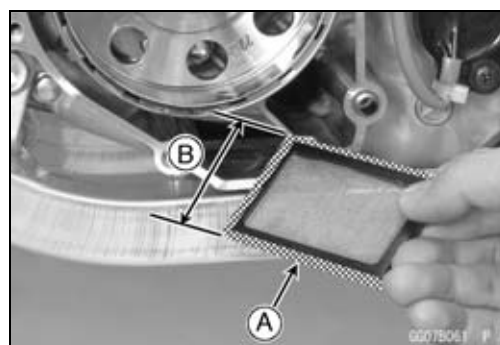
NOTE

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

- Check the oil screen (scavenge) [A] carefully for any damage, holes, broken wires or gasket pulling off.
- ★ If the screen is damaged, replace it with a new one.



- Apply engine oil to the three sides [A] of screen.
- Install the oil screen (scavenge).
Narrow Side [B]
- Install the magneto cover (see Magneto Cover Installation in the Electrical System chapter).

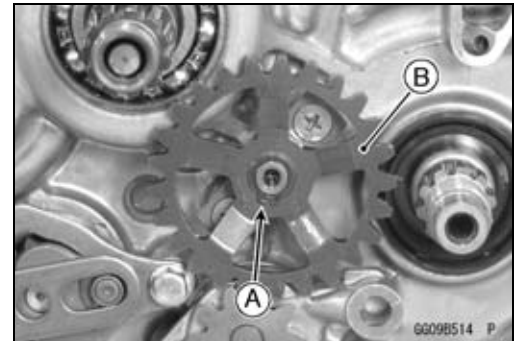


Oil Pump

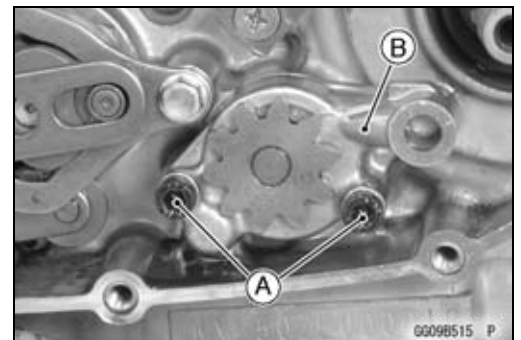
Oil Pump Removal

- Drain:
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
 - Coolant (see Coolant Draining in the Cooling System chapter)
- Remove:
 - Brake Pedal (see Brake Pedal Removal in the Brakes chapter)
 - Kick Pedal (see Kick Pedal Removal in the Crankshaft/Transmission chapter)
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Primary Gear (see Primary Gear Removal in the Crankshaft/Transmission chapter)
- Remove:
 - Circlip [A]
 - Oil Pump Idle Gear [B]

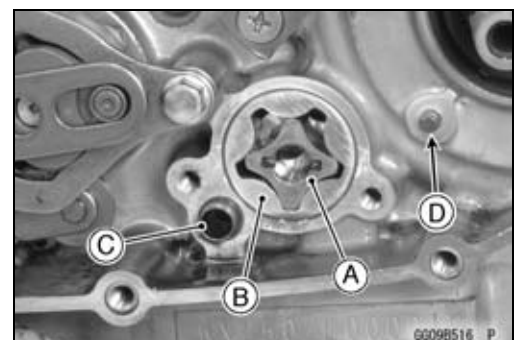
Special Tool - Outside Circlip Pliers: 57001-144



- Remove:
 - Oil Pump Mounting Bolts [A]
 - Oil Pump Assembly [B]



- Remove:
 - Inner [A] and Outer [B] Rotors (Scavenge)
 - Dowel Pin [C]
 - Pin [D]

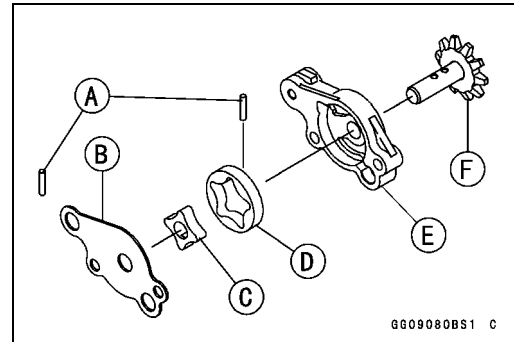


7-12 ENGINE LUBRICATION SYSTEM

Oil Pump

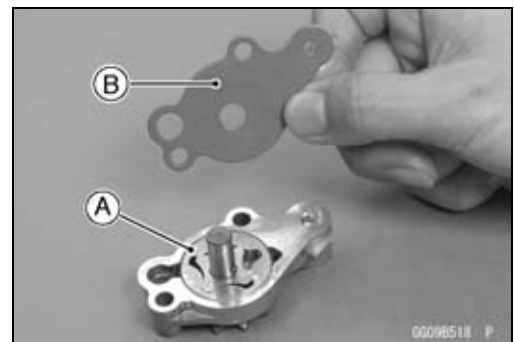
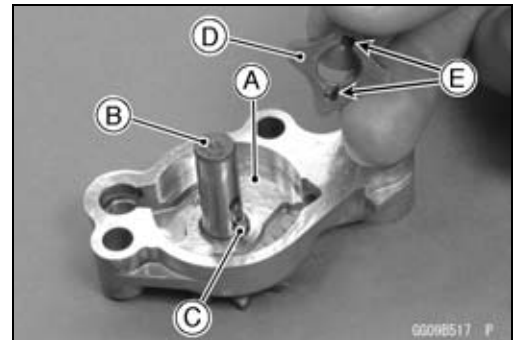
- Disassemble the oil pump assembly.

Pins [A]
Oil Pump Cover [B]
Inner [C] and Outer [D] Rotors (Feed)
Oil Pump Body [E]
Oil Pump Gear [F]

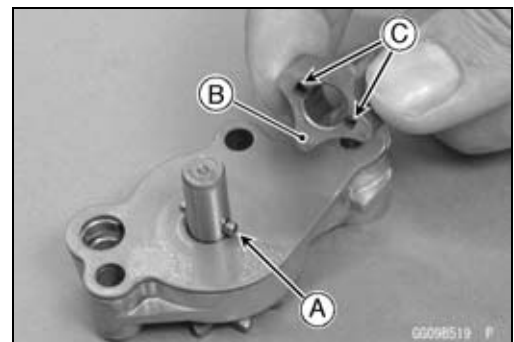


Oil Pump Installation

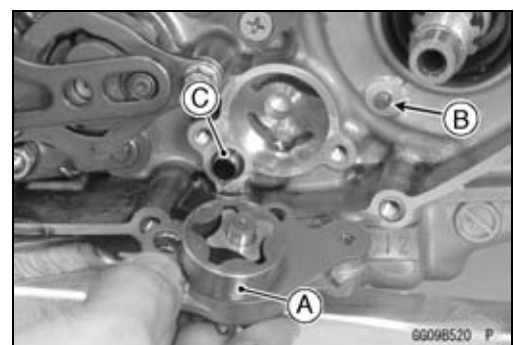
- Apply molybdenum disulfide grease to the shaft of the oil pump gear.
- Apply engine oil to the inner and outer rotors.
- Assemble:
 - Oil Pump Body [A]
 - Gear [B]
 - Pin [C]
 - Inner Rotor (Feed) [D]
- Fit the slot [E] of the inner rotor onto the pin.
- Install:
 - Outer Rotor (Feed) [A]
 - Cover [B]



- Install:
 - Pin [A]
 - Inner Rotor (Scavenge) [B]
- Fit the slot [C] of the inner rotor onto the pin.



- Install:
 - Outer Rotor (Scavenge) [A]
 - Pin [B]
 - Dowel Pin [C]
 - Oil Pump Assembly
- Apply a non-permanent locking agent to the oil pump mounting bolts.
- Tighten:
 - Torque - Oil Pump Mounting Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

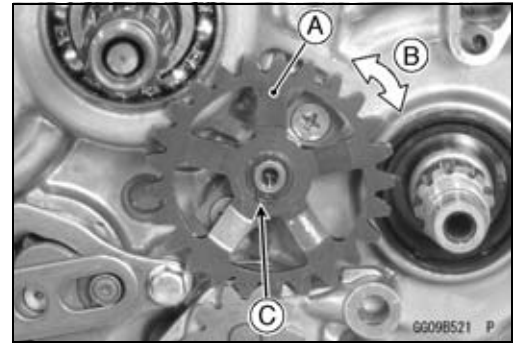


Oil Pump

- Apply engine oil to the shaft of the oil pump idle gear [A].
- Install the oil pump idle gear.
- Turn [B] the oil pump idle gear to check that the oil pump operates smoothly.
- Replace the circlip [C] with a new one.
- Install the new circlip.

Special Tool - Outside Circlip Pliers: 57001-144

- Install the removed parts (see appropriate chapters).



Oil Pump Inspection

- Disassemble the oil pump assembly (see Oil Pump Removal).
- Visually inspect the oil pump body, outer rotors and the inner rotors.
- ★ If the oil pump is any damage or uneven wear, replace the rotors, cover, body, or the crankcase.

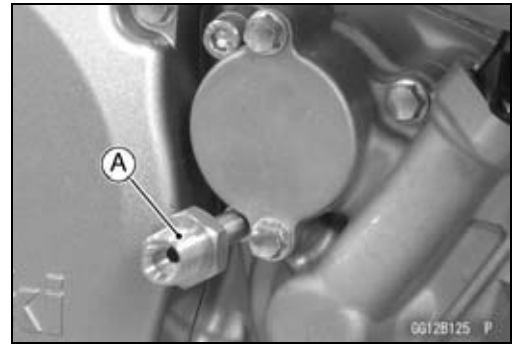
7-14 ENGINE LUBRICATION SYSTEM

Oil Pressure

Oil Pressure Measurement

- Remove the water pump cover bolt.
- Install the oil pressure gauge adapter [A] to the water pump cover.

**Special Tool - Oil Pressure Gauge Adapter, M6 × 1.0:
57001-1664**



- Attach the oil pressure gauge [A].
- Special Tool - Oil Pressure Gauge, 5 kgf/cm²: 57001-125**
- Start the engine.

NOTE

○ Warm up the engine thoroughly before measuring the oil pressure.

- Run the engine at the specified speed, and read the oil pressure gauge.

Oil Pressure

**Standard: About 98 kPa (1.0 kgf/cm², 14.2 psi) at
4 000 r/min (rpm), Oil Temperature 40°C
(104°F)**

- ★ If the reading is much lower than the standard, check the feed oil pump and crankshaft oil seal.
- ★ If the reading is much higher than the standard, check the oil filter first, and oil passages for dirt or clogging.
- Stop the engine and remove the gauge and oil pressure gauge 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.

- Replace the water pump cover bolt washer with a new one.
- Install the water pump cover bolt and new washer.
- Tighten:

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

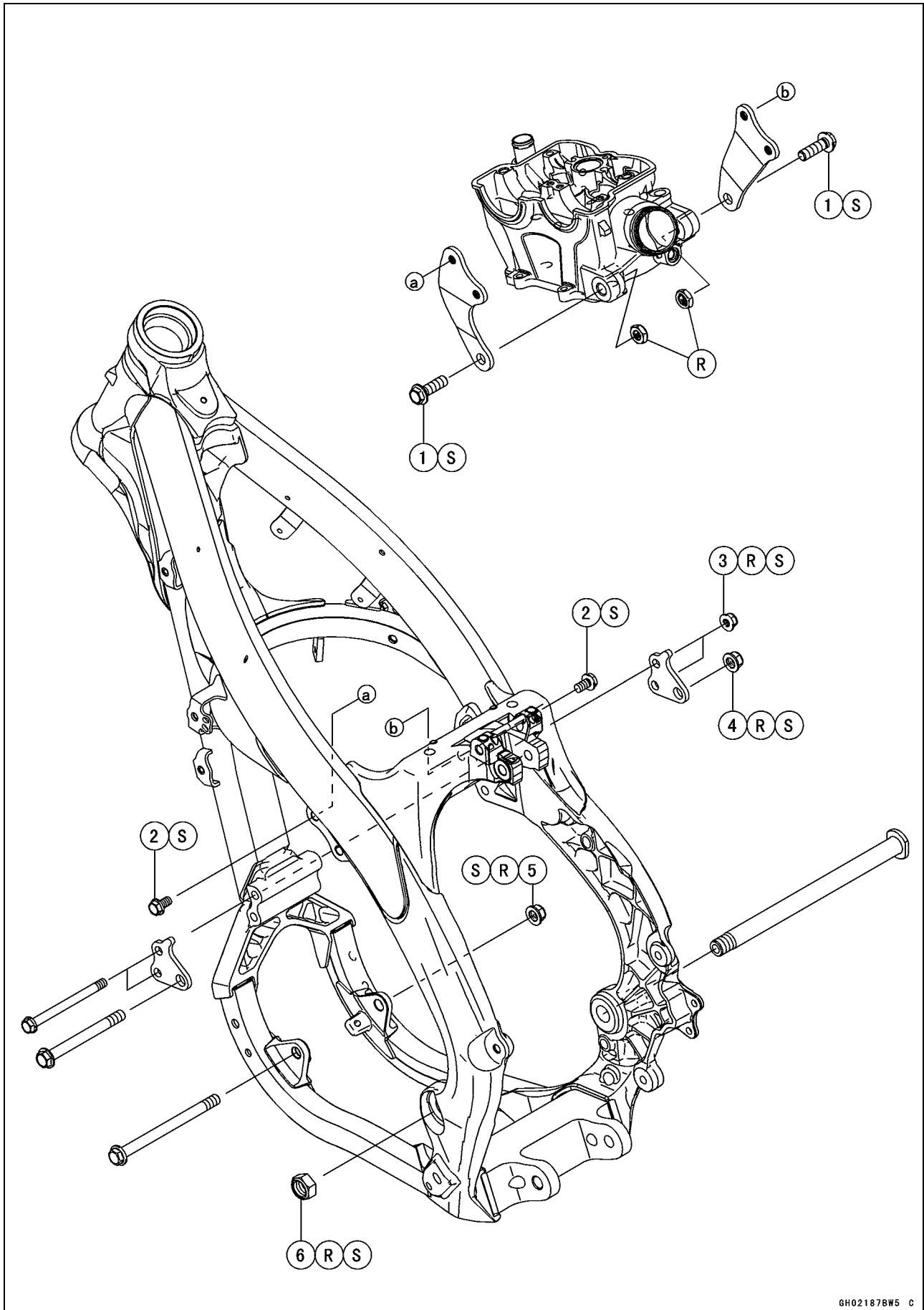
Engine Removal/Installation

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8-2 ENGINE REMOVAL/INSTALLATION

Exploded View



ENGINE REMOVAL/INSTALLATION 8-3

Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Upper Engine Mounting Bolts	49	5.0	36	S
2	Upper Engine Bracket Bolts	29	3.0	21	S
3	Middle Engine Bracket Nuts	29	3.0	21	R, S
4	Middle Engine Mounting Nut	49	5.0	36	R, S
5	Lower Engine Mounting Nut	49	5.0	36	R, S
6	Swingarm Pivot Shaft Nut	98	10.0	72	R, S

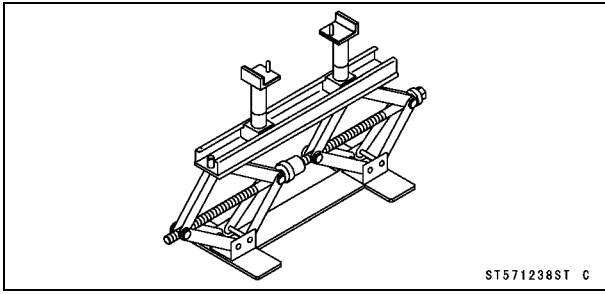
R: Replacement Parts

S: Follow the specified tightening sequence.

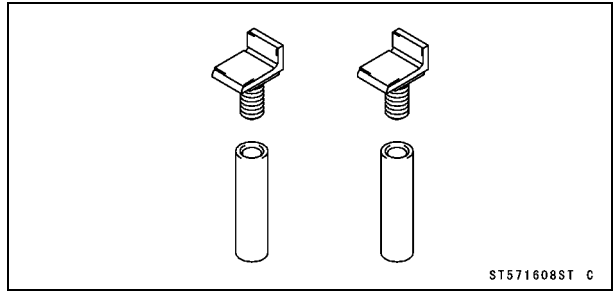
8-4 ENGINE REMOVAL/INSTALLATION

Special Tools

Jack:
57001-1238



Jack Attachment:
57001-1608



Engine Removal/Installation

Engine Removal

- Remove the engine guards.
- Place the jack under the frame to support the motorcycle.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

⚠ WARNING

When the swingarm pivot shaft is removed the swingarm and rear wheel assembly will become detached and allow the frame to fall to the floor, creating the potential for injury. Removing the engine requires the swingarm pivot to be removed, so support the bottom of the frame with a jack or other appropriate stand.

- Squeeze the brake lever slowly and hold it with a band [A].

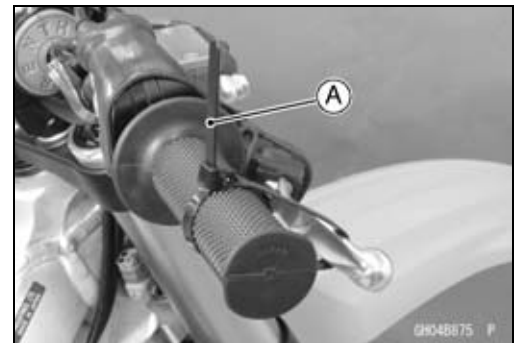
⚠ WARNING

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 Draining in the Cooling System chapter)

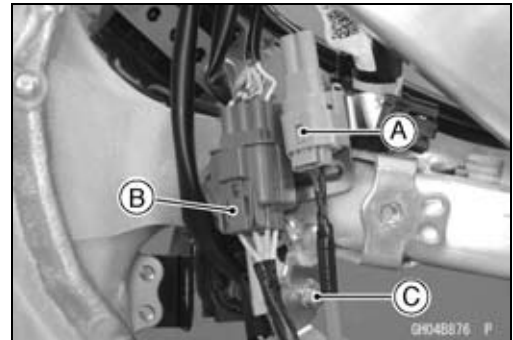


8-6 ENGINE REMOVAL/INSTALLATION

Engine Removal/Installation

- Remove:
 - Rear Frame (see Rear Frame Removal in the Frame chapter)
 - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
 - Radiators and Water Hoses (see Radiator Removal in the Cooling System chapter)
 - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
 - Ignition Coil (see Ignition Coil Removal in the Electrical System chapter)
 - Shift Pedal (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
 - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
 - Kick Pedal (see Kick Pedal Removal in the Crankshaft/Transmission chapter)
 - Clutch Cable Lower End (see Clutch Cable Removal in the Clutch chapter)
 - Brake Pedal Bolt and Return Spring (see Brake Pedal Removal in the Brakes chapter)

- Disconnect:
 - Gear Position Switch Lead Connector [A]
 - Magneto Lead Connector [B]
- Remove the bolt [C].

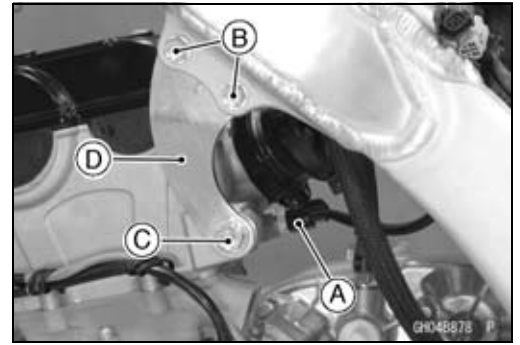


- Remove the vehicle-down sensor bracket bolts [A].

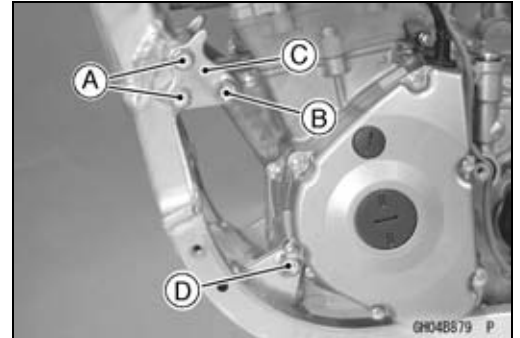


Engine Removal/Installation

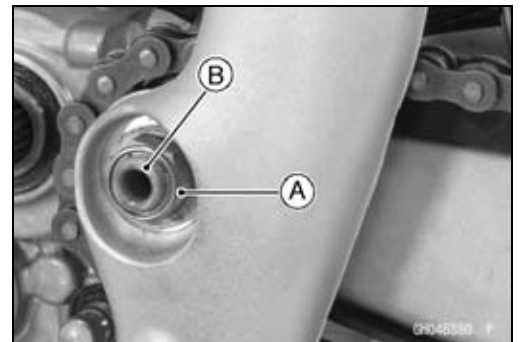
- Disconnect the water temperature sensor connector [A].
- Remove the following parts on both sides:
 - Upper Engine Bracket Bolts [B]
 - Upper Engine Mounting Bolts [C] and Nuts
 - Upper Engine Brackets [D]



- Remove:
 - Middle Engine Bracket Bolts [A] and Nuts
 - Middle Engine Mounting Bolt [B] and Nut
 - Middle Engine Bracket [C] (Both Sides)
 - Lower Engine Mounting Bolt [D] and Nut



- Remove:
 - Swingarm Pivot Shaft Nut [A]
 - Swingarm Pivot Shaft [B]



- Remove the engine from the motorcycle to right side.
- Clear the engine rear portion from the swingarm and then remove the engine.

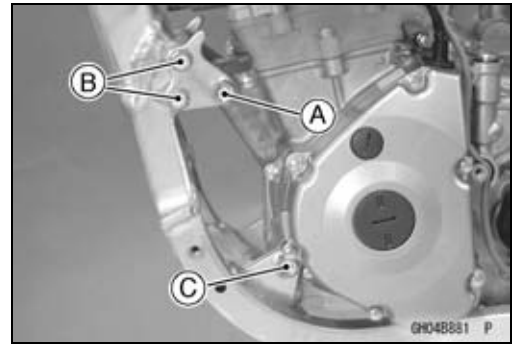
Engine Installation

- Replace with new ones:
 - Upper Engine Mounting Nuts
 - Middle Engine Mounting Nut
 - Middle Engine Bracket Nuts
 - Lower Engine Mounting Nut
 - Swingarm Pivot Shaft Nut
- Install the engine.
 - First, insert the front portion of the engine from the right side, and then install the rear portion.
 - Second, fit the rear portion of the engine to the swingarm.

8-8 ENGINE REMOVAL/INSTALLATION

Engine Removal/Installation

- Insert the swingarm pivot shaft from the right side.
- Install all engine brackets, bolts and nuts temporarily.
- Insert the following bolts from left side:
 - Middle Engine Mounting Bolt [A]
 - Middle Engine Bracket Bolts [B]
 - Lower Engine Mounting Bolt [C]



- Install the swingarm pivot shaft nut with the washer.
- Tighten the bolts and nuts in the numbered sequence [1 ~ 6].

Torque - Swingarm Pivot Shaft Nut [1]: 98 N·m (10.0 kgf·m, 72 ft·lb)

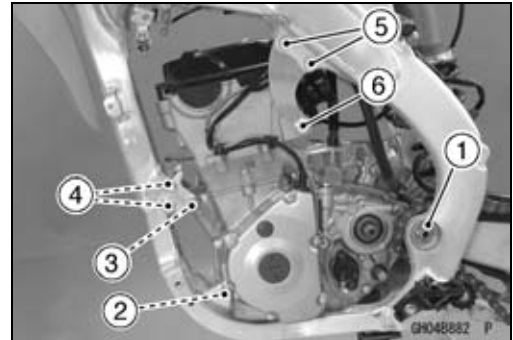
Lower Engine Mounting Nut [2]: 49 N·m (5.0 kgf·m, 36 ft·lb)

Middle Engine Mounting Nut [3]: 49 N·m (5.0 kgf·m, 36 ft·lb)

Middle Engine Bracket Nuts [4]: 29 N·m (3.0 kgf·m, 21 ft·lb)

Upper Engine Bracket Bolts [5]: 29 N·m (3.0 kgf·m, 21 ft·lb)

Upper Engine Mounting Bolts [6]: 49 N·m (5.0 kgf·m, 36 ft·lb)



- Install the removed parts (see appropriate chapters).
- Run the cables, hoses, and leads according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Pour:
 - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
 - Coolant (see Coolant Filling in the Cooling System chapter)
- Adjust:
 - Throttle Cable (see Throttle Grip Free Play Adjustment in the Periodic Maintenance chapter)
 - Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)
 - Drive Chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter)
 - Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)
- Check the brake effectiveness.

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.

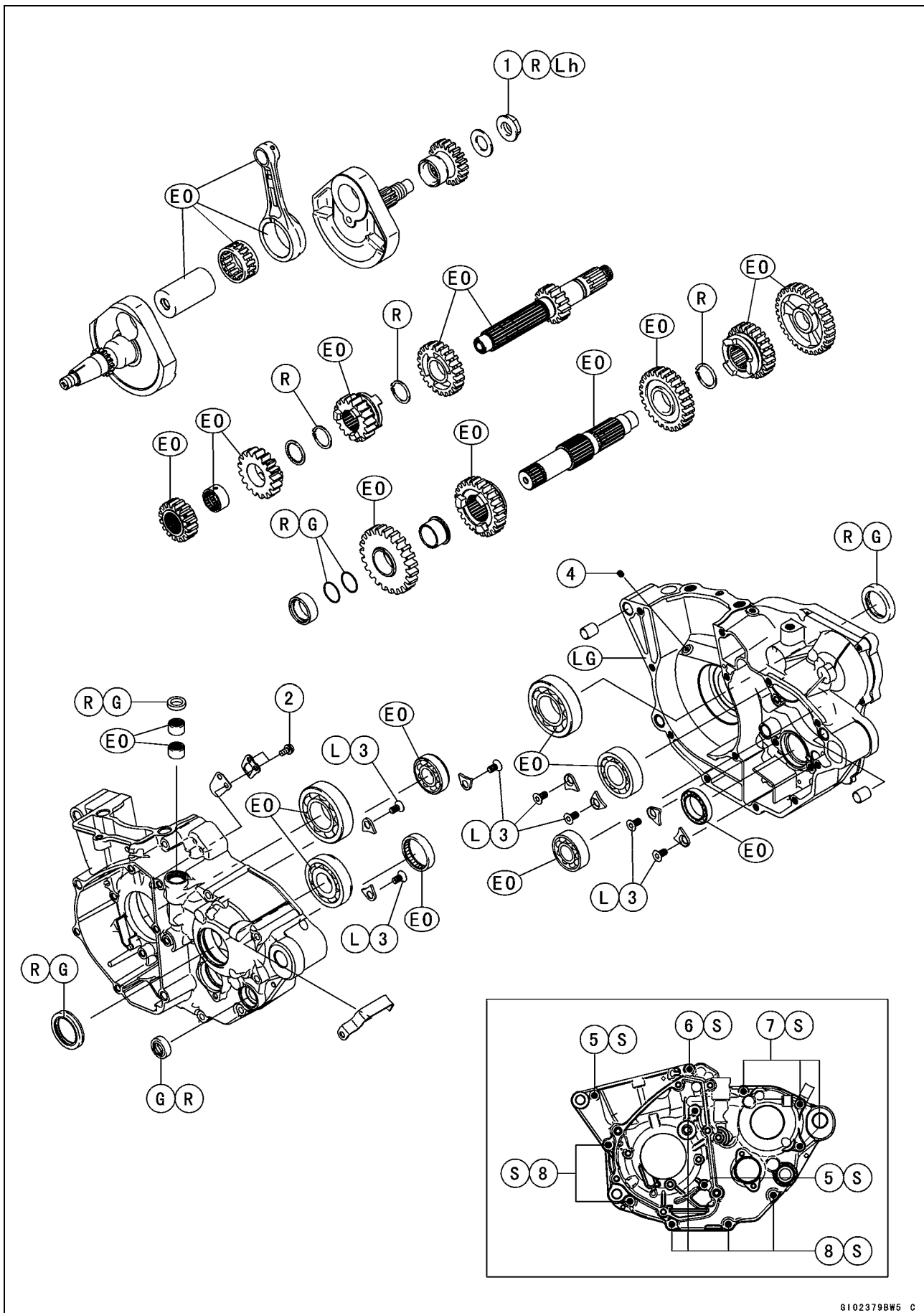
Crankshaft/Transmission

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9-2 CRANKSHAFT/TRANSMISSION

Exploded View



CRANKSHAFT/TRANSMISSION 9-3

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Primary Gear Nut	98	10.0	72	Lh, R
2	Reed Valve Screws	7.0	0.71	62 in·lb	
3	Crankcase Bearing Retainer Screws	15	1.5	11	L
4	Piston Oil Nozzle	2.9	0.30	26 in·lb	
5	Crankcase Bolts (L = 50 mm)	9.8	1.0	87 in·lb	S
6	Crankcase Bolt (L = 65 mm)	9.8	1.0	87 in·lb	S
7	Crankcase Bolts (L = 70 mm)	9.8	1.0	87 in·lb	S
8	Crankcase Bolts (L = 60 mm)	9.8	1.0	87 in·lb	S

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

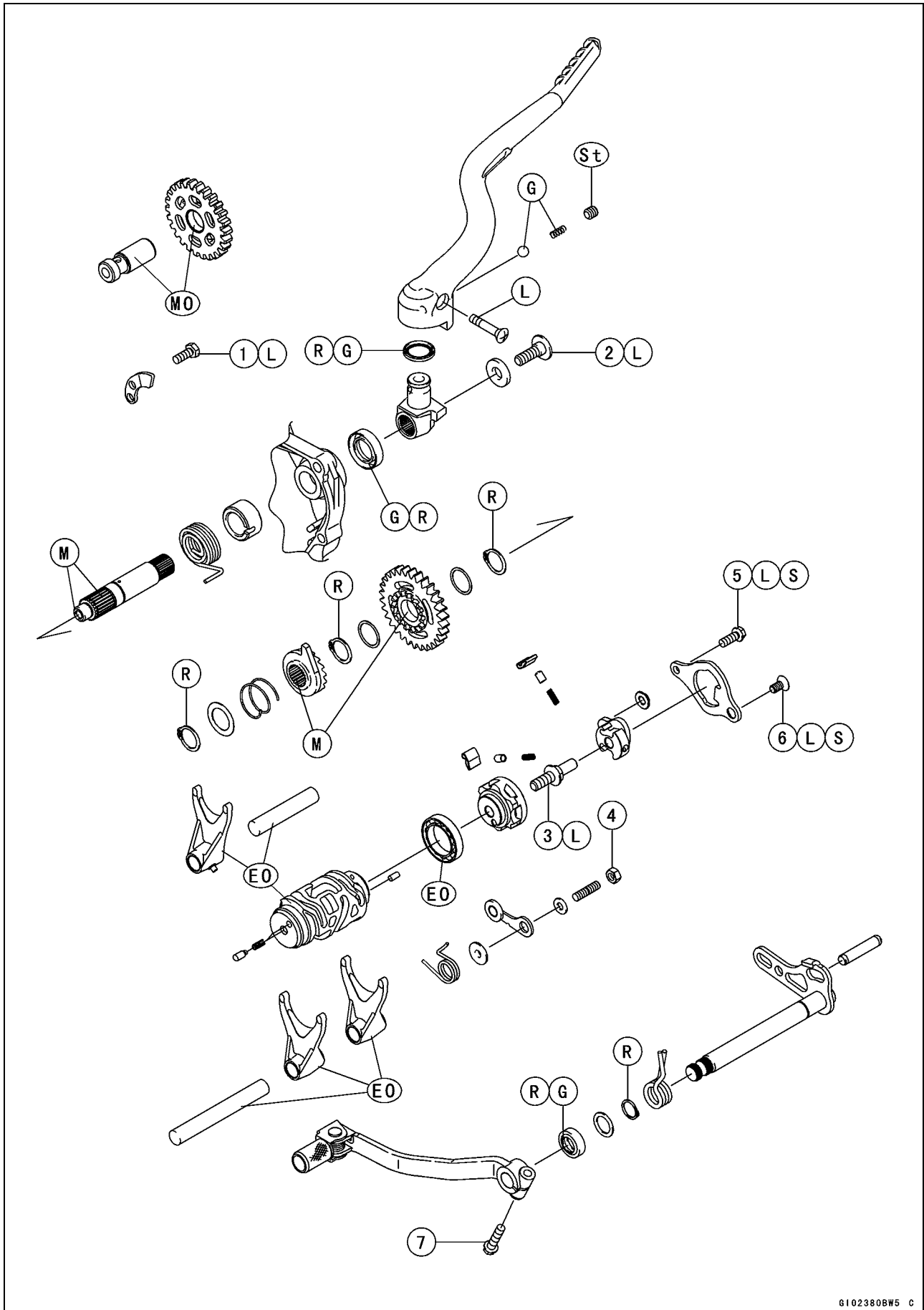
Lh: Left-hand Threads

R: Replacement Parts

S: Follow the specified tightening sequence.

9-4 CRANKSHAFT/TRANSMISSION

Exploded View



CRANKSHAFT/TRANSMISSION 9-5

Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Kick Ratchet Guide Bolt	8.8	0.90	78 in-lb	L
2	Kick Pedal Bolt	25	2.5	18	L
3	Shift Drum Cam Bolt	24	2.4	18	L
4	Gear Positioning Lever Nut	8.8	0.90	78 in-lb	
5	Ratchet Plate Bolt	9.8	1.0	87 in-lb	L, S
6	Ratchet Plate Screw	15	1.5	11	L, S
7	Shift Pedal Bolt	9.8	1.0	87 in-lb	

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

S: Follow the specified tightening sequence.

St: Stake the fasteners to prevent loosening.

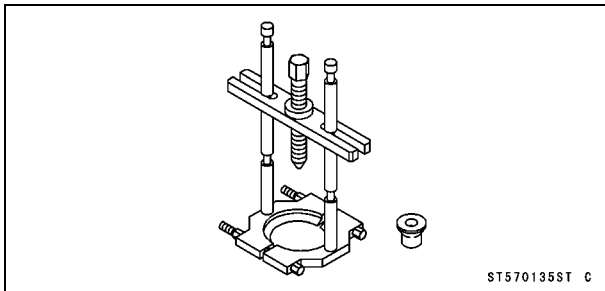
9-6 CRANKSHAFT/TRANSMISSION

Specifications

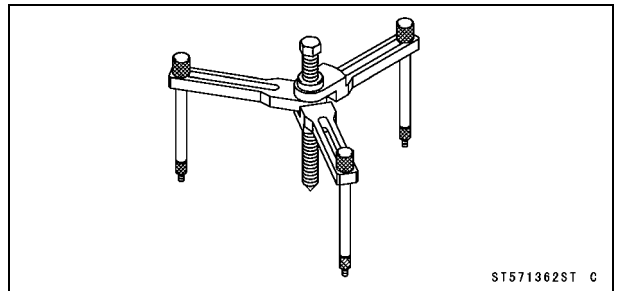
Item	Standard	Service Limit
Crankshaft, Connecting Rod		
Connecting Rod Big End: Radial Clearance	0.002 ~ 0.014 mm (0.00008 ~ 0.00055 in.)	0.06 mm (0.0024 in.)
Side Clearance	0.25 ~ 0.35 mm (0.0098 ~ 0.0138 in.)	0.6 mm (0.02 in.)
Crankshaft Runout	TIR 0.03 mm (0.001 in.) or less	TIR 0.08 mm (0.003 in.)
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.)
Transmission		
Shift Fork Ear Thickness	4.9 ~ 5.0 mm (0.193 ~ 0.197 in.)	4.8 mm (0.189 in.)
Gear Groove Width	5.05 ~ 5.15 mm (0.199 ~ 0.203 in.)	5.3 mm (0.209 in.)
Shift Fork Guide Pin Diameter	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Shift Drum Groove Width	6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)	6.3 mm (0.25 in.)

Special Tools and Sealant

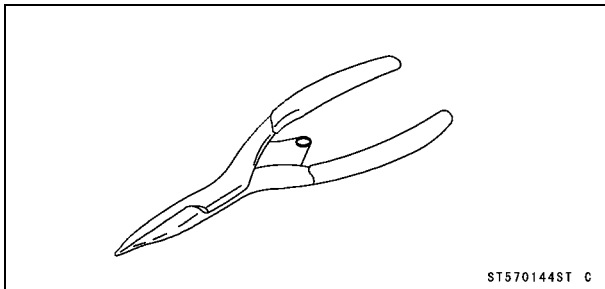
Bearing Puller:
57001-135



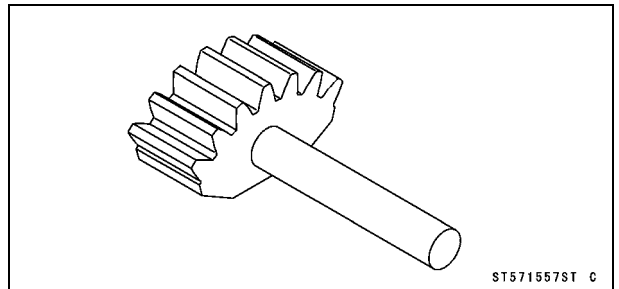
Crankcase Splitting Tool Assembly:
57001-1362



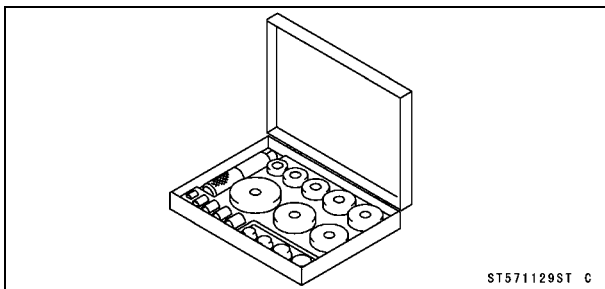
Outside Circlip Pliers:
57001-144



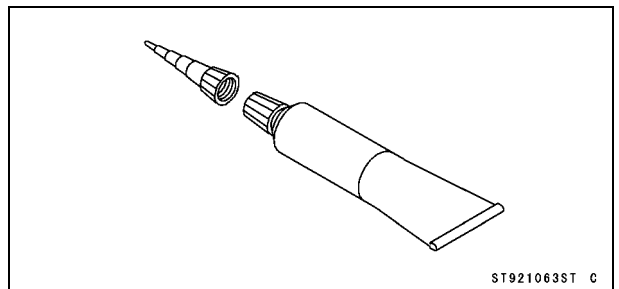
Gear Holder, m2.0:
57001-1557



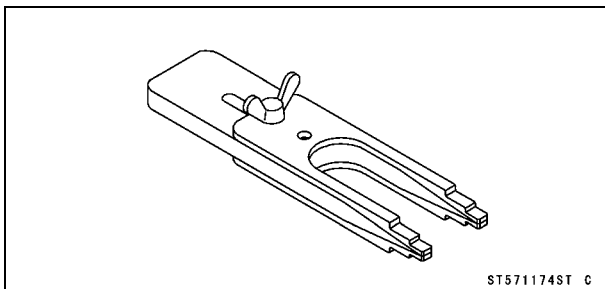
Bearing Driver Set:
57001-1129



Liquid Gasket, TB1216:
92104-1063



Crankshaft Jig:
57001-1174

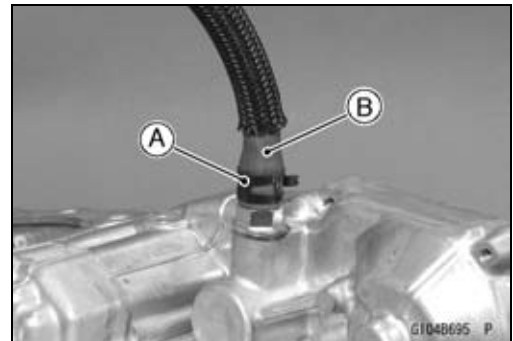


9-8 CRANKSHAFT/TRANSMISSION

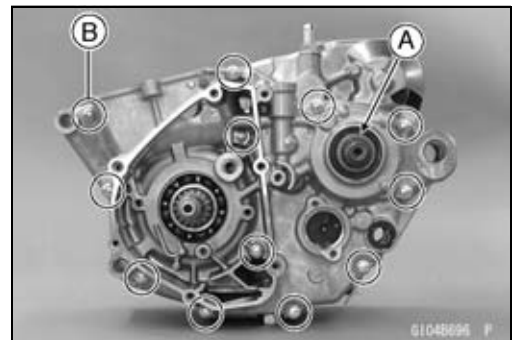
Crankcase

Crankcase Disassembly

- Remove the engine from the frame (see Engine Removal in the Engine Removal/Installation chapter).
- Set the engine on clean surface while parts are being removed.
- Remove:
 - Piston (see Piston Removal in the Engine Top End chapter)
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Primary Gear (see Primary Gear Removal)
 - Oil Pumps (see Oil Pump Removal in the Engine Lubrication System chapter)
 - Kick Shaft (see Kick Shaft Removal)
 - External Shift Mechanism (see External Shift Mechanism Removal)
 - Flywheel (see Flywheel Removal in the Electrical System chapter)
 - Gear Position Switch (see Gear Position Switch Removal in the Fuel System (DFI) chapter)
- Slide out the clamp [A], and remove the breather hose [B].

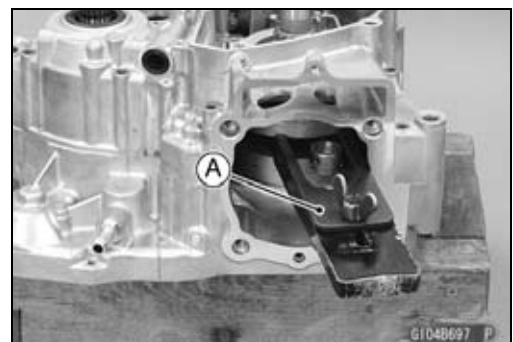


- Remove the output shaft collar [A] and O-rings.
- Remove the crankcase bolts [B].



- Position the connecting rod in BDC.
- Install the crankshaft jig [A] between the crankshaft flywheels.

Special Tool - Crankshaft Jig: 57001-1174

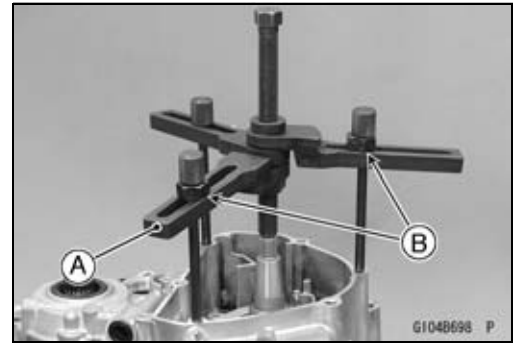


Crankcase

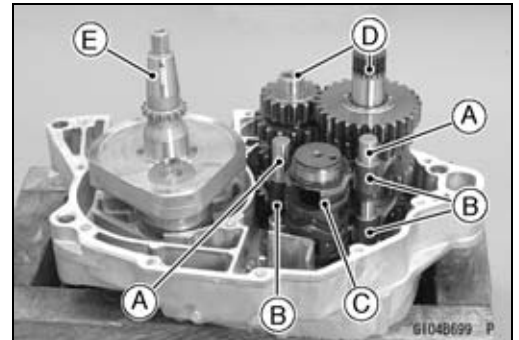
- Attach the crankcase splitting tool [A] to the left crankcase.
- Adjust the gap with suitable collars or nuts [B].

Special Tool - Crankcase Splitting Tool Assembly: 57001-1362

- Tighten the center bolt to split the crankcase halves.
- The front and rear portion of the crankcase must be pulled apart evenly.



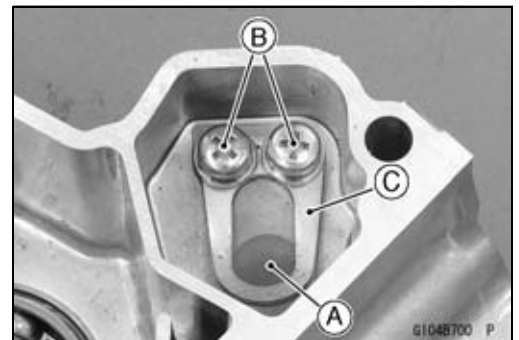
- Remove:
 - Oil Screen (Feed) (see Oil Screen Cleaning and Inspection in the Engine Lubrication System chapter)
 - Shift Rods [A]
 - Shift Forks [B]
 - Shift Drum [C] (see Transmission Shaft Removal)
 - Transmission Shafts [D] (see Transmission Shaft Removal)
 - Crankshaft [E] (see Crankshaft Removal)



NOTICE

Do not remove the bearings and the oil seals unless it is necessary. Removal may damage them.

- Remove the reed valve [A] from the left crankcase half.
- Unscrew the screws [B] and remove the guide [C].



Crankcase Assembly

NOTICE

Right and left crankcase halves are machined at the factory in the assembled state, so if replaced, they must be replaced as a set.

- Remove the old gasket from the mating surfaces of the crankcase halves and clean them off with a high flash-point solvent.
- Using compressed air, blow out the oil passages in the crankcase halves.

⚠ WARNING

Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the engine parts in a well-ventilated area, and take care that there is no spark or flame anywhere near the working areas. Do not use gasoline or low flash-point solvents to clean parts.

9-10 CRANKSHAFT/TRANSMISSION

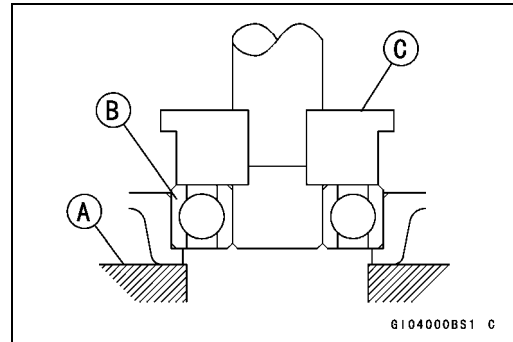
Crankcase

- Support the crankcase bearing boss with a suitable retainer [A].
- Install the new bearing [B] with a press and the bearing driver set [C].

Special Tool - Bearing Driver Set: 57001-1129

NOTICE

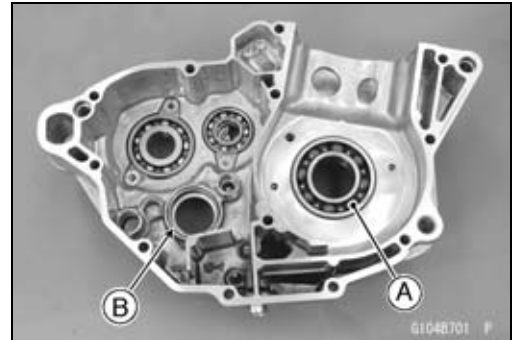
Support the crankcase bearing boss when the bearing is pressed, or the crankcase could be damaged.



Left Crankcase

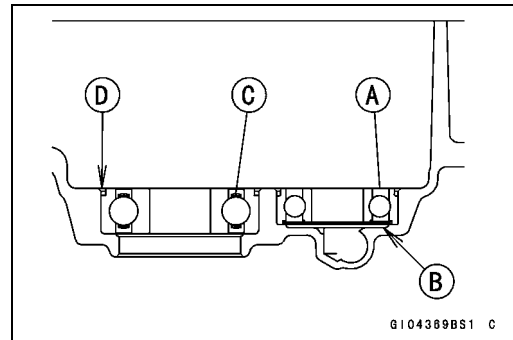
- Press the new crankshaft bearing [A] until it bottoms out.
- Press the new shift drum needle bearing [B] so that the bearing surface is flush with the crankcase surface.

Special Tool - Bearing Driver Set: 57001-1129



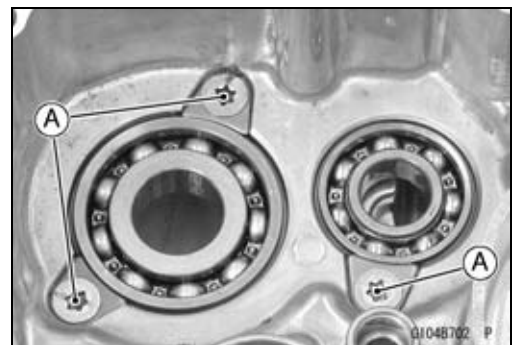
- Press the new drive shaft bearing [A] so that the sealed side [B] faces outside of the engine.
- Press the new output shaft bearing [C] so that the stepped side [D] faces inside of the engine.

Special Tool - Bearing Driver Set: 57001-1129



- Install the left crankcase bearing retainers.
- The left crankcase bearing retainers are smaller than right ones.
- Apply a non-permanent locking agent to the crankcase bearing retainer screws [A].
- Tighten:

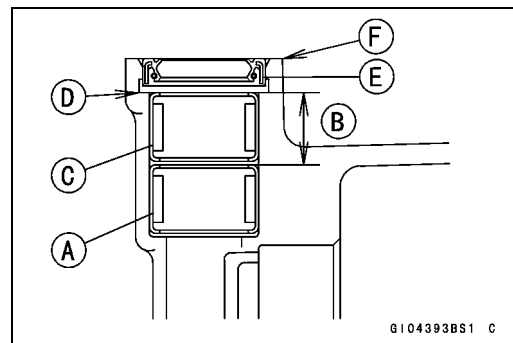
Torque - Crankcase Bearing Retainer Screws: 15 N·m (1.5 kgf·m, 11 ft·lb)



- Press the new release shaft needle bearing (lower) [A] so that the marked side faces upward and the distance from the engine surface to the bearing end is 10 ~ 10.5 mm (0.394 ~ 0.413 in.) [B].
- Press the new release shaft needle bearing (upper) [C] so that the bearing surface is flush with the crankcase surface [D] and the marked side faces upward.
- Press the new release shaft oil seal [E] so that the oil seal surface is flush with the crankcase surface [F].
- Turn the flat side of the oil seal to upside.

Special Tool - Bearing Driver Set: 57001-1129

- Apply grease to the oil seal lip.

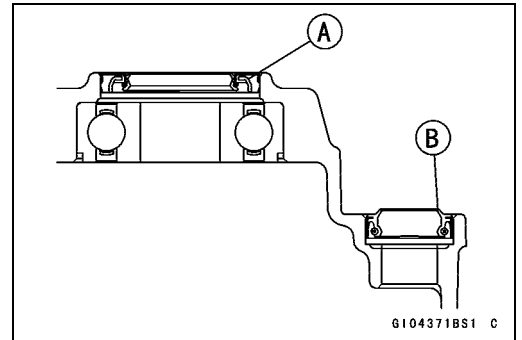


Crankcase

- Press the new output shaft oil seal [A] so that the oil seal surface is flush with the crankcase surface.
- Turn the metal side to outside of the engine.
- Press the new shift shaft oil seal [B] so that the oil seal surface is flush with the crankcase surface.

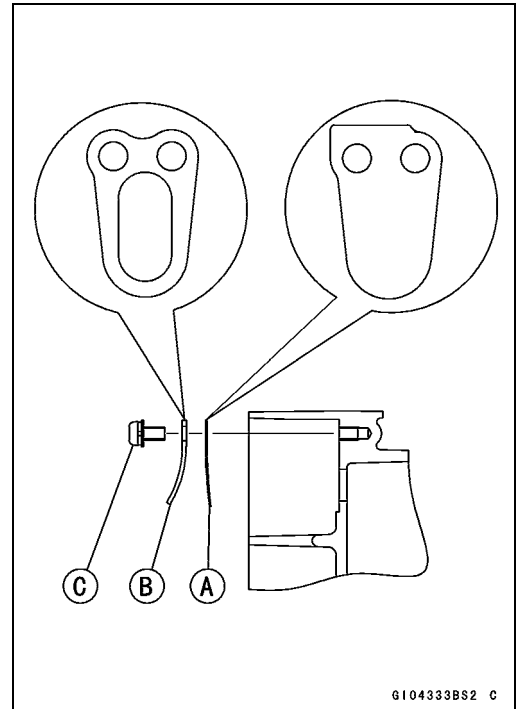
Special Tool - Bearing Driver Set: 57001-1129

- Apply grease to the oil seal lip.



- Install the reed valve [A] and guide [B].
- Tighten:

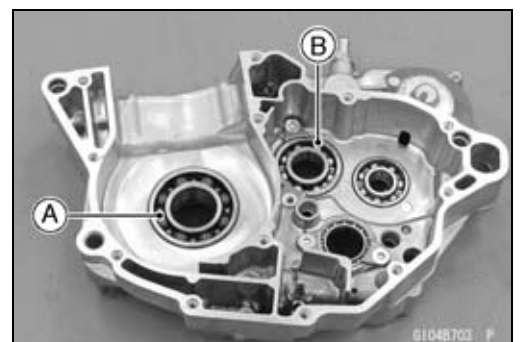
Torque - Reed Valve Screws [C]: 7.0 N-m (0.71 kgf-m, 62 in-lb)



Right Crankcase

- Press the new crankshaft bearing [A] and new drive shaft bearing [B] until they bottom out.

Special Tool - Bearing Driver Set: 57001-1129

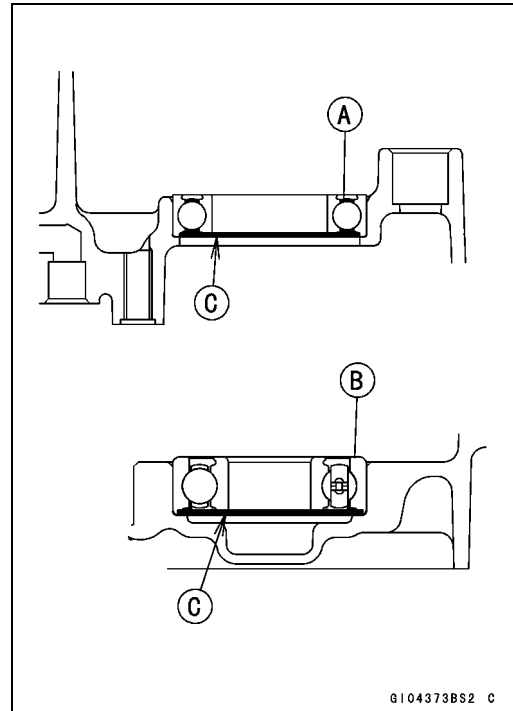


9-12 CRANKSHAFT/TRANSMISSION

Crankcase

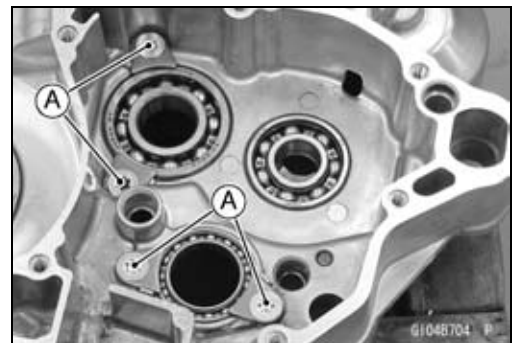
- Press the new shift drum ball bearing [A] and new output shaft bearing [B] so that the sealed side [C] faces outside of the engine.

Special Tool - Bearing Driver Set: 57001-1129



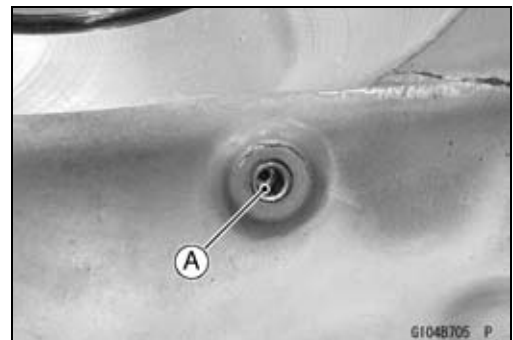
- Install the right crankcase bearing retainers.
- The right crankcase bearing retainers are larger than left ones.
- Apply a non-permanent locking agent to the crankcase bearing retainer screws [A].
- Tighten:

Torque - Crankcase Bearing Retainer Screws: 15 N·m (1.5 kgf·m, 11 ft·lb)



- Tighten:

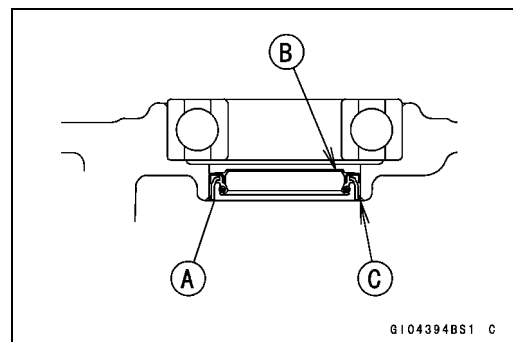
Torque - Piston Oil Nozzle [A]: 2.9 N·m (0.30 kgf·m, 26 in·lb)



- Press the new crankshaft oil seal [A] so that the flat side [B] faces inside of the engine.
- Press the oil seal from the outside (clutch cover side) so that the oil seal end is flush with the crankcase surface [C].

Special Tool - Bearing Driver Set: 57001-1129

- Apply grease to the oil seal lip.



Crankcase

- Install:
 - Crankshaft (see Crankshaft Installation)
 - Transmission Shafts (see Transmission Shaft Installation)
- Install the oil screen (feed) [A] so that the shorter pipe side faces upward.
- Position the connecting rod in BDC.
- Install the crankshaft jig [B] between the crankshaft flywheels.

Special Tool - Crankshaft Jig: 57001-1174

- Check to see that the dowel pins [C] are in place in the mating surfaces of the crankcase halves.
- 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 mating surface [A] of the left crankcase half.

Sealant - Liquid Gasket, TB1216: 92104-1063

NOTE

- Especially, apply liquid gasket so that it shall be filled up on the groove.
- Make the application finish within 20 minutes when the liquid gasket to the mating surface of the left crankcase half is applied.
- Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.

- Assemble the crankcase halves evenly, while maintaining the mating surfaces of them constantly parallel.

NOTE

- Press the crankcase rear portion [A], and tap the area around the crankshaft with a plastic hammer [B].
- Constantly check the alignment of the crankcase halves, and the position of the transmission shafts and shift drum.

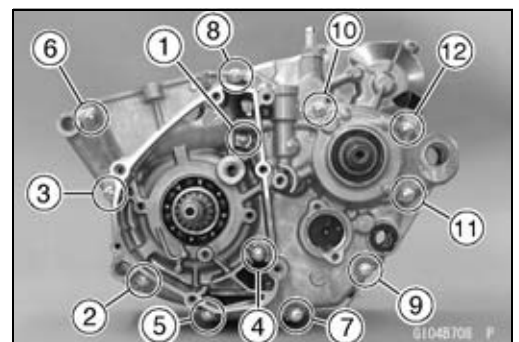
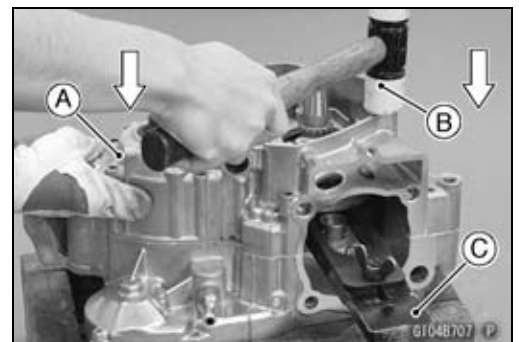
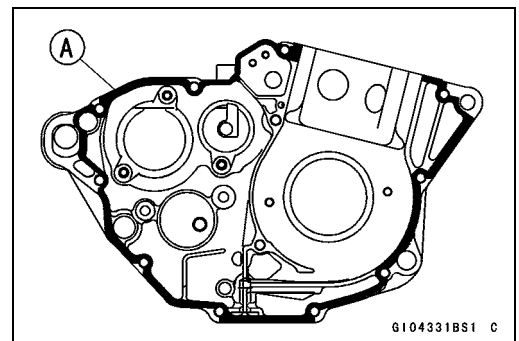
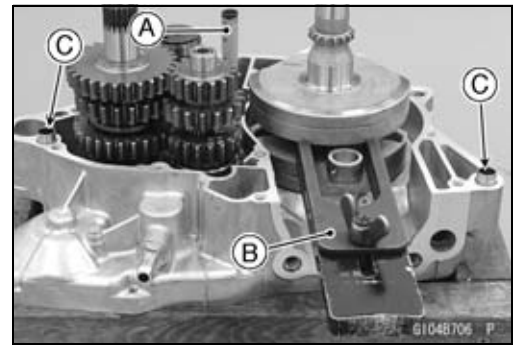
- Remove the crankshaft jig [C].
- Tighten the crankcase bolts, starting with the around of the crankshaft, then outward.
- Tighten the [12] bolt together with the clamp.

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

NOTE

- After tightening the crankcase bolts, wipe up the liquid gasket seeping out around the mating surface, especially around the area.

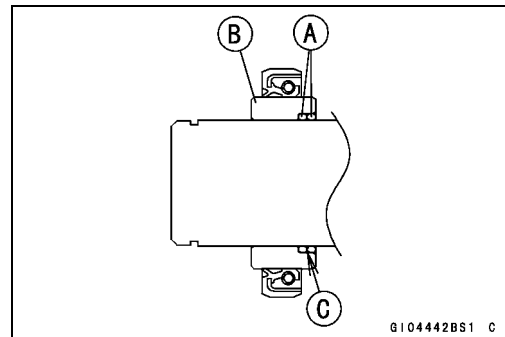
- Make sure that the crankshaft, drive shaft, and output shaft, rotate smoothly (in the neutral position).
- ★ If the crankshaft will not turn, probably the crankshaft is not centered; tap the mount portion of the engine with a plastic hammer to reposition it. If it does not free up, split the crankcase again and find the cause.



9-14 CRANKSHAFT/TRANSMISSION

Crankcase

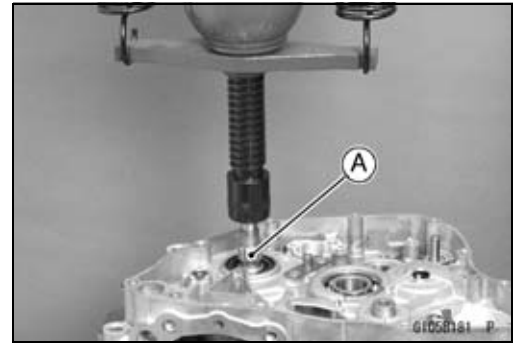
- Install the gear positioning lever and shift drum cam (see External Shift Mechanism Installation).
- Check to see that gears shift smoothly from 1st to 5th gear, and 5th to 1st while spinning the output shaft.
- Set the shift drum in the neutral position.
- Replace the O-rings [A] on the output shaft with new ones.
- Apply grease to the O-rings.
- Install the O-rings on the output shaft while expanding the O-ring.
- Insert the collar [B] with the groove [C] faces inside.
- Install the removed parts (see appropriate chapters).



Crankshaft

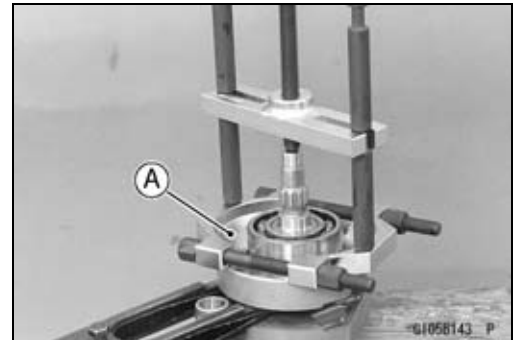
Crankshaft Removal

- Split the crankcase (see Crankcase Disassembly).
- Remove the transmission shafts and shift drum (see Transmission Shaft Removal).
- Using a press, remove the crankshaft [A] from the right crankcase.



- ★ If the bearing stay on the crankshaft when splitting the crankcase, or removing the crankshaft from the right crankcase, remove the bearings from the crankshaft with a bearing puller [A].

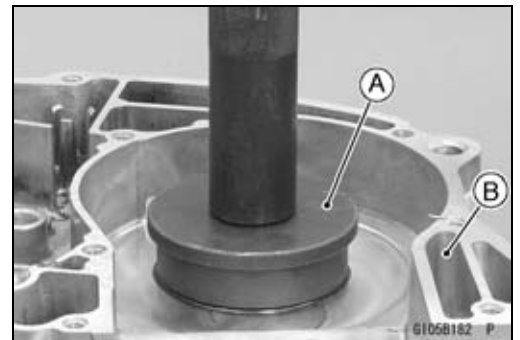
Special Tool - Bearing Puller: 57001-135



Crankshaft Installation

- Apply engine oil to the outer side of the crankshaft bearing and use the bearing driver set [A] and a press to drive the bearing to the bottom of the crankcase [B]. While driving the bearing in, make sure to use a holder to support the boss area.

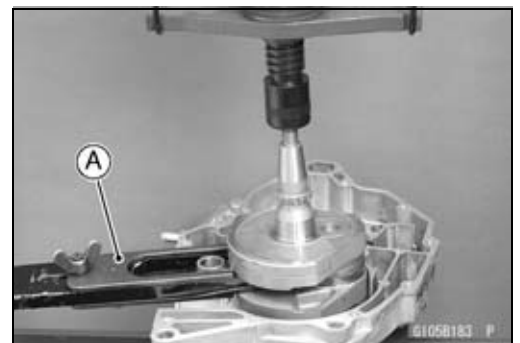
Special Tool - Bearing Driver Set: 57001-1129



- Insert the crankshaft jig [A] between the crankshaft flywheels to protect flywheel alignment, and press the crankshaft into the right crankcase.
- When pressing, position the jig in the crankcase opening so the jig does not hit the crankcase.

Special Tool - Crankshaft Jig: 57001-1174

- Apply engine oil to the connecting rod big end bearing.



Crankshaft Disassembly

Since the assembly of the crankshaft demands exacting tolerances, the disassembly and reassembly of the crankshaft can only be done by a shop having the necessary tools and equipment.

- ★ If it should be necessary to disassemble the crankshaft, use a press to remove the crankpin.

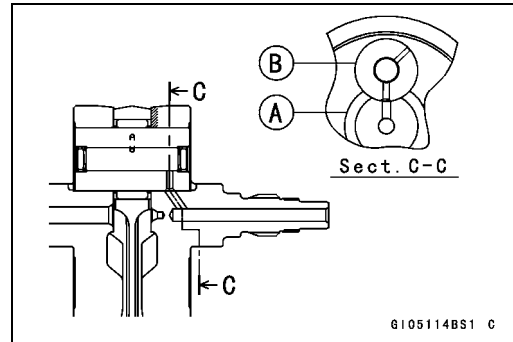
Crankshaft Assembly

Since the assembly of the crankshaft demands exacting tolerances, the disassembly and reassembly of the crankshaft can only be done by a shop having the necessary tools and equipment.

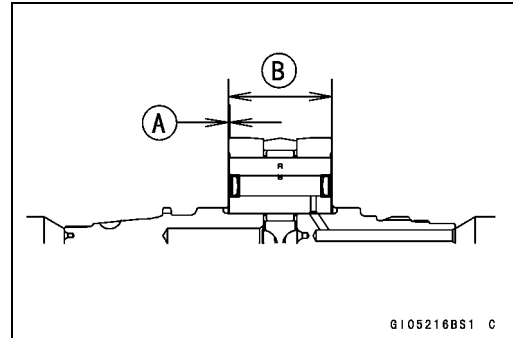
9-16 CRANKSHAFT/TRANSMISSION

Crankshaft

- Carefully align the oil passage hole in the right flywheel [A] with the one in the crankpin [B] at rebuilding of the crankshaft.



- Reassemble the crankshaft according to the standard tolerances in Specifications.
- Connecting rod bend, twist (see Connecting Rod Bend Inspection, Connecting Rod Twist Inspection)
- Connecting rod big end radial clearance (see Crankshaft Inspection)
- Cold-fitting tolerance between crankpin and flywheels
0.4 ~ 0.8 mm (0.02 ~ 0.03 in.) [A]
57.25 mm (2.254 in.) [B]
- Side clearance between the connecting rod big end and one of flywheels (see Crankshaft Inspection)
- Crankshaft runout (see Crankshaft Inspection)



Crankshaft Inspection

Connecting Rod Big End Radial Clearance Inspection

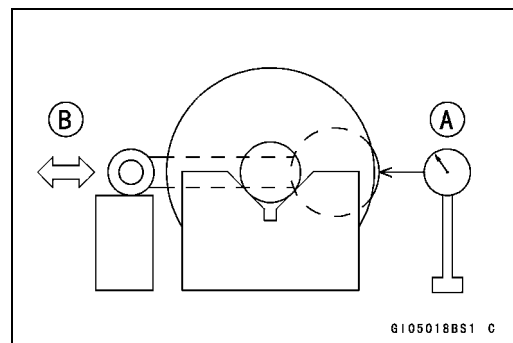
- Set the crankshaft on V blocks, and place a dial gauge [A] against the connecting rod big end.
- Push [B] the connecting rod first towards the gauge and then in the opposite direction. The difference between two gauge readings is the radial clearance.

Connecting Rod Big End Radial Clearance

Standard: 0.002 ~ 0.014 mm (0.00008 ~ 0.00055 in.)

Service Limit: 0.06 mm (0.0024 in.)

- ★ If the radial clearance exceeds the service limit, crankshaft should be either replaced or disassembled and crankpin, needle bearing, and connecting rod big end should be examined for wear.



Connecting Rod Big End Side Clearance Inspection

- Refer to the Crankshaft Inspection in the Periodic Maintenance chapter.

Crankshaft Runout Inspection

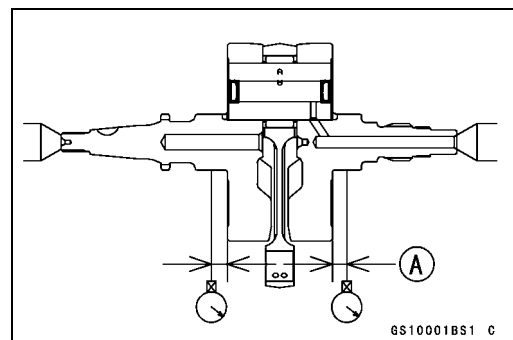
- Set the crankshaft in a flywheel alignment jig or on V blocks, and place a dial gauge and turn the crankshaft slowly. The maximum difference in gauge reading is the crankshaft runout.
8 mm (0.3 in.) [A]

Crankshaft Runout

Standard: TIR 0.03 mm (0.001 in.) or less

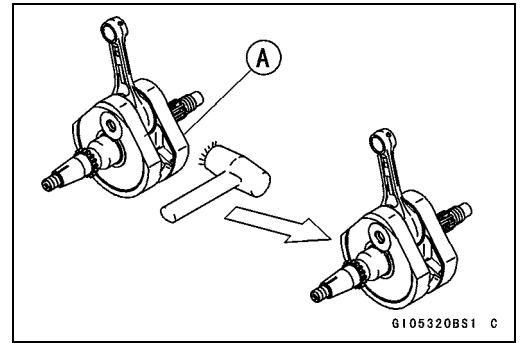
Service Limit: TIR 0.08 mm (0.003 in.)

- ★ If the runout at either point exceeds the service limit, replace the crankshaft assembly with a new one or align the crankshaft so that the runout falls within the service limit.



Crankshaft

- First correct the horizontal misalignment by striking the projecting crank half [A] with a plastic, soft lead, or brass hammer.
- Recheck the runout with a dial gauge and repeat the process until the runout falls within the service limit.

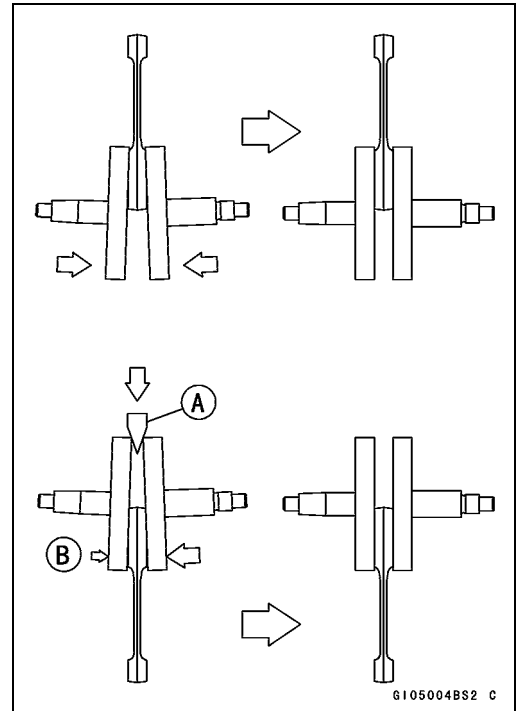


- Next, correct the vertical misalignment by either driving a wedge [A] in between the crank halves or by squeezing them in a vise, depending on the nature of the misalignment.

NOTICE

Do not hammer the crank half at the point [B].

- ★ If flywheel misalignment cannot be corrected by the above method, replace the crankpin or the crankshaft itself.



Connecting Rod Big End Seizure Inspection

- ★ In case of serious seizure with damaged flywheels, the crankshaft must be replaced.
- ★ In case of less serious damage, disassemble the crankshaft and replace the crankpin, needle bearing, and connecting rod.

9-18 CRANKSHAFT/TRANSMISSION

Crankshaft

Connecting Rod Bend Inspection

- Remove the connecting rod.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor [B] of the same diameter as the piston pin and more than 105 mm (4.13 in.) long, and insert the arbor through the connecting rod small end.
- On a surface plate, set the big-end arbor on a V block [C].
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.
- ★ If connecting rod bend exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Bend

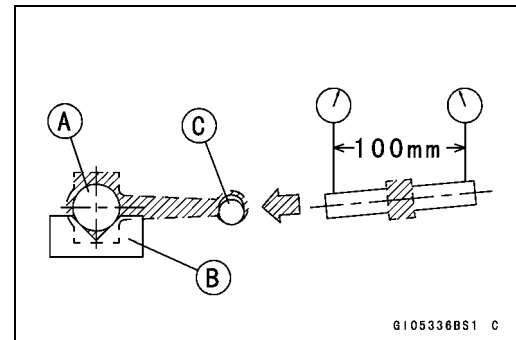
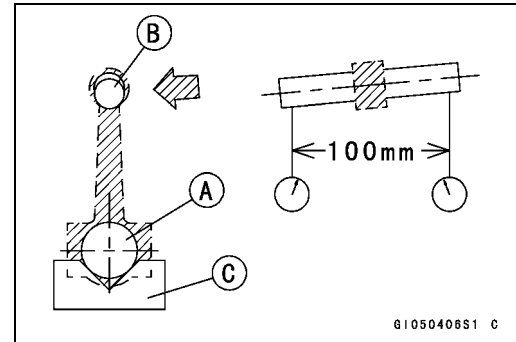
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

Connecting Rod Twist Inspection

- With the big-end arbor [A] still on the V block [B], hold the connecting rod horizontally and measure the amount that the arbor [C] varies from being parallel with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.
- ★ If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist

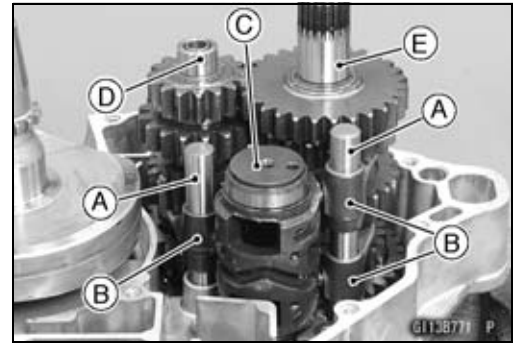
Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)



Transmission

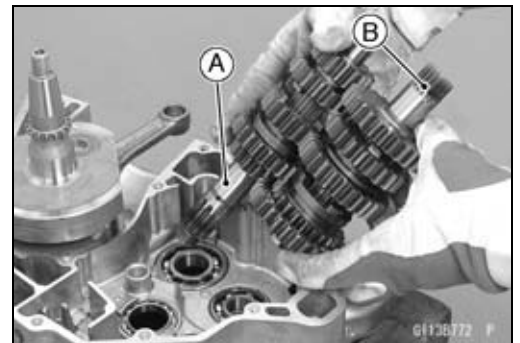
Transmission Shaft Removal

- Split the crankcase (see Crankcase Disassembly).
- Pull out the shift rods [A], and remove the shift forks [B].
- Remove the shift drum [C].
- Pull out the drive shaft [D] and output shaft [E] together.

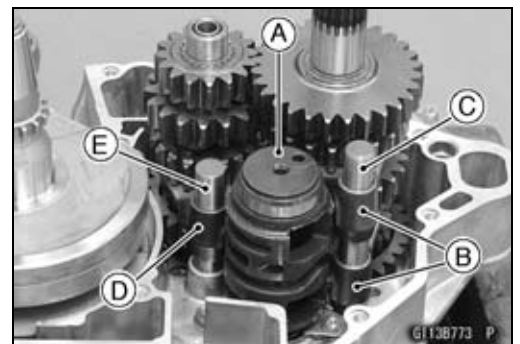


Transmission Shaft Installation

- Apply engine oil to the following parts:
 - Transmission Shafts
 - Transmission Gears
 - Ball Bearings
 - Shift Drum
 - Shift Forks
- Install the drive shaft [A] and output shaft [B] in the right crankcase with their gears meshed.



- Install the shift drum [A].
- Fit the output shaft shift forks [B] into the proper gear grooves.
- Upturn the "057" mark of shift forks.
- Insert the shift rod [C] temporary.
- Fit the shift fork guide pin into the proper shift drum grooves.
- Install the shift rod securely.
- Fit the drive shaft shift fork [D] into the proper position.
- Upturn the "056" mark of shift fork.
- Install the shift rod [E] securely.
- Check that each shaft moves smoothly.
- Assemble the crankcase (see Crankcase Assembly).



Transmission Shaft Disassembly

- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, washers, then gears.

Special Tool - Outside Circlip Pliers: 57001-144

NOTE

○ Do not reuse the removed circlips.

9-20 CRANKSHAFT/TRANSMISSION

Transmission

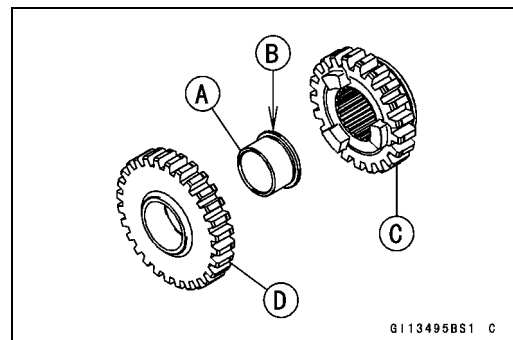
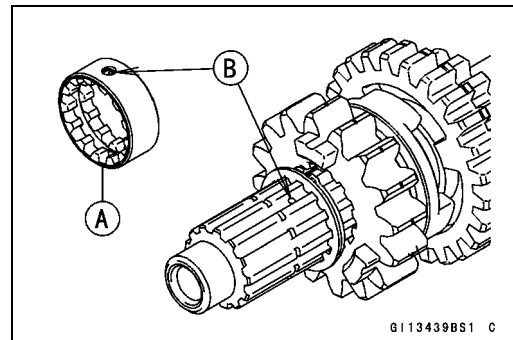
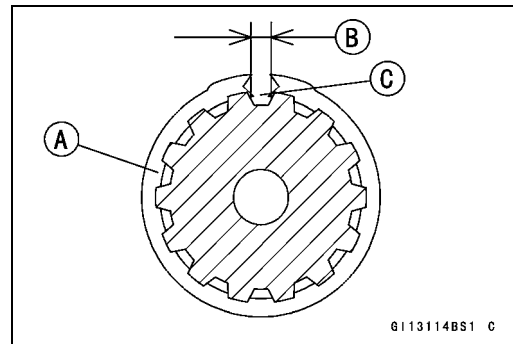
Transmission Shaft Assembly

- Apply engine oil liberally to the transmission shaft, gears and bearings.
- Replace any circlips that were removed with new ones.
- Always install the circlips [A] so that the opening [B] is aligned with a spline groove [C], and install toothed washers. To install a circlip without damage, first fit the circlip onto the shaft expanding it just enough to install it, and then use a suitable gear to push the circlip into place.

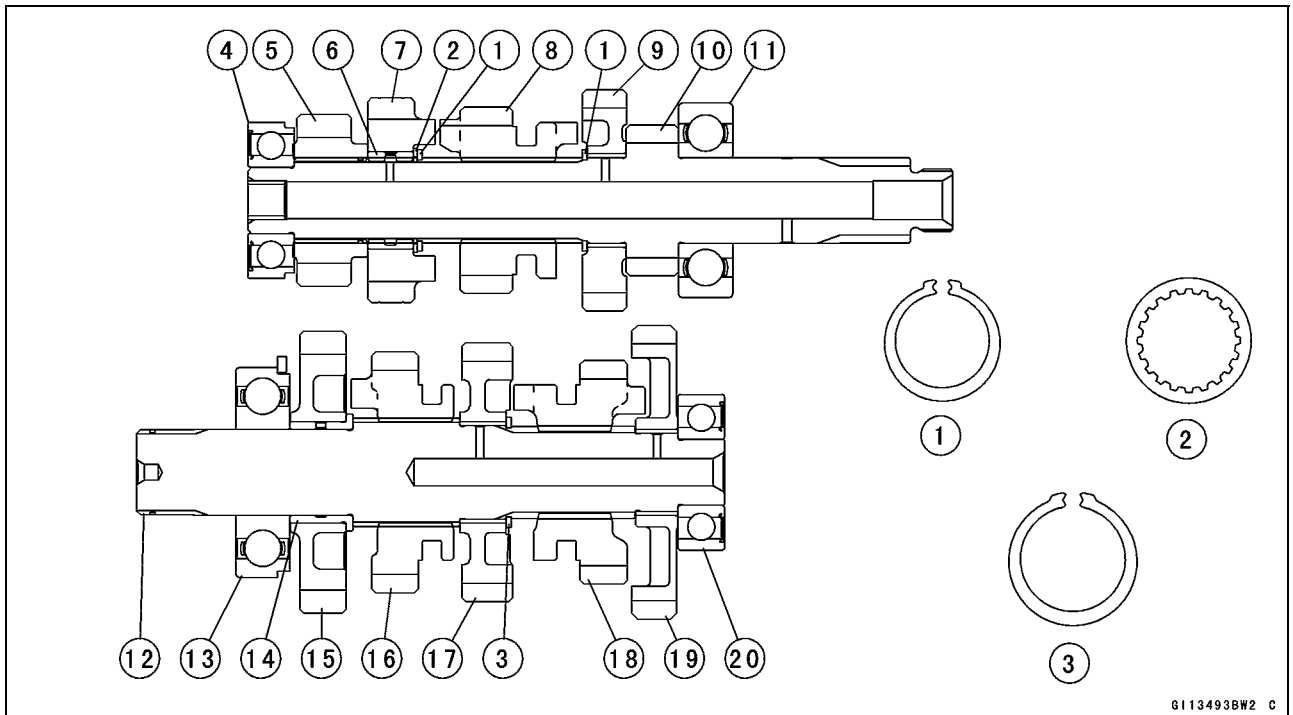
Special Tool - Outside Circlip Pliers: 57001-144

- The drive shaft gears can be identified by size; the smallest diameter gear is 1st gear, and the largest is 5th. Be sure that all parts are put back in the correct sequence, facing the proper direction, and that all circlips and washer are properly in place.
- When install the bushing (for 4th) [A] to the drive shaft, align the oil passage holes [B] each other.

- The output shaft gears can be identified by size; the largest diameter gear is 1st gear, and the smallest is 5th. Be sure that all parts are put back in the correct sequence, facing the proper direction, and that the circlip is properly in place.
- Install the collar [A] with the flange [B] facing toward the 4th gear [C] side.
2nd Gear [D]



Transmission

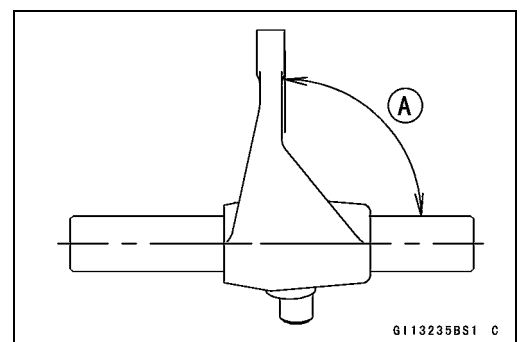


- | | |
|---|---|
| 1. Circlip (Small) | 11. Ball Bearing (Right Crankcase) |
| 2. Toothed Washer | 12. Output Shaft |
| 3. Circlip (Large) | 13. Ball Bearing (Left Crankcase) |
| 4. Ball Bearing (Left Crankcase, One side sealed) | 14. Collar |
| 5. 2nd Gear (16T) | 15. 2nd Gear (28T) |
| 6. Bushing | 16. 4th Gear (21T) |
| 7. 4th Gear (17T) | 17. 3rd Gear (26T) |
| 8. 3rd Gear (18T) | 18. 5th Gear (23T) |
| 9. 5th Gear (22T) | 19. 1st Gear (30T) |
| 10. Drive Shaft (1st Gear, 14T) | 20. Ball Bearing (Right Crankcase, One side sealed) |

- Check that each gear spins or slides freely on the transmission shaft without binding after assembly.

Shift Fork Bending Inspection

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power. 90° [A]



9-22 CRANKSHAFT/TRANSMISSION

Transmission

Shift Fork/Gear Groove Wear Inspection

- Measure the thickness [A] of the shift fork ears, and measure the width [B] of the gear grooves (with which the fork engages).

Shift Fork Ear Thickness

Standard: 4.9 ~ 5.0 mm (0.193 ~ 0.197 in.)

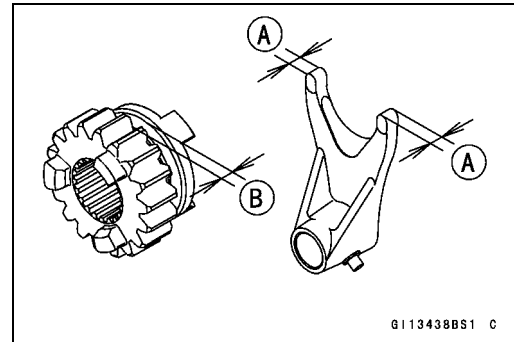
Service Limit: 4.8 mm (0.189 in.)

Gear Groove Width

Standard: 5.05 ~ 5.15 mm (0.199 ~ 0.203 in.)

Service Limit: 5.3 mm (0.209 in.)

- ★ If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.
- ★ If the gear groove is worn exceeding the service limit, the gear must be replaced.



Shift Fork Guide Pin/Shift Drum Groove Wear Inspection

- Measure the diameter [A] of each shift fork guide pin, and measure the width [B] of each shift drum groove.

Shift Fork Guide Pin Diameter

Standard: 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)

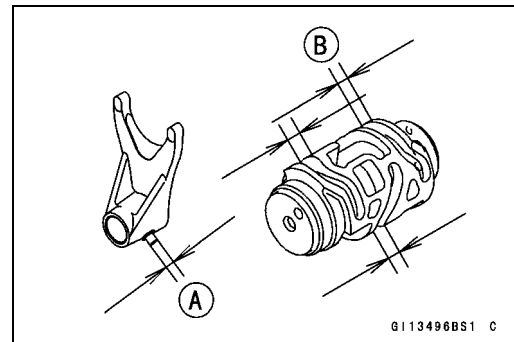
Service Limit: 5.8 mm (0.228 in.)

Shift Drum Groove Width

Standard: 6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)

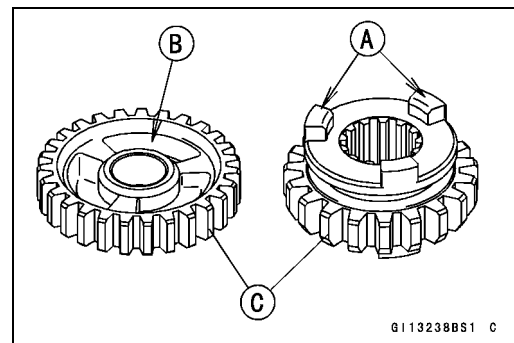
Service Limit: 6.3 mm (0.25 in.)

- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.
- ★ If any shift drum groove is worn exceeding the service limit, the drum must be replaced.



Gear Damage Inspection

- Visually inspect the gear dogs [A] and gear dog holes [B].
- ★ Replace any damaged gears or gears with excessively worn dogs or dog holes.
- Visually inspect the gear teeth [C] on the transmission gears.
- ★ Replace lightly damaged gear teeth with an oilstone. The gear must be replaced if the teeth are badly damaged.
- ★ When gear is repaired or replaced, the driving gear should also be inspected and repaired or replaced if necessary.



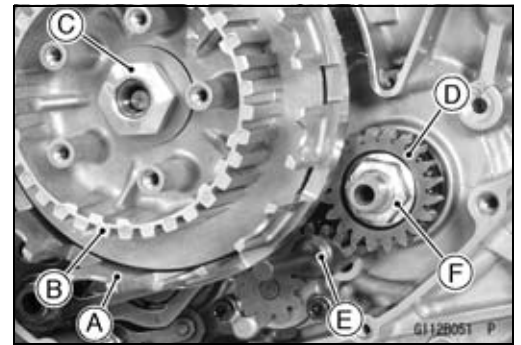
Primary Gear

Primary Gear Removal

- Remove:
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
 - Clutch (see Clutch Removal in the Clutch chapter)
- Temporarily install the clutch housing [A], clutch hub [B], toothed washer and clutch hub nut [C].
- Hold the primary gear [D] with the gear holder [E].
- Pull out the clutch housing a little so that the gear holder can be fit.

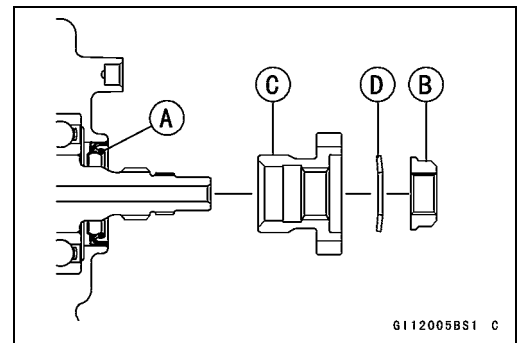
Special Tool - Gear Holder, m2.0: 57001-1557

- Remove the primary gear nut [F] and washer.
- The primary gear nut is left-hand threads.
- Remove:
 - Clutch Housing
 - Primary Gear



Primary Gear Installation

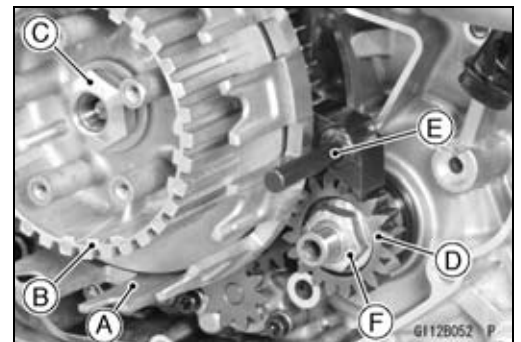
- Apply grease to the oil seal lip [A].
- Replace the primary gear nut [B] with a new one.
- Install:
 - Primary Gear [C]
 - Washer [D]
 - Primary Gear Nut
- Turn the inner rim of washer to outside.
- The primary gear nut is left-hand threads.



- Temporarily install the clutch housing [A], clutch hub [B], toothed washer and clutch hub nut [C].
- Hold the primary gear [D] with the gear holder [E].
- Pull out the clutch housing a little so that the gear holder can be fit.

Special Tool - Gear Holder, m2.0: 57001-1557

- Tighten:
 - **Torque - Primary Gear Nut [F]: 98 N·m (10.0 kgf·m, 72 ft·lb)**
- Install the removed parts (see appropriate chapters).

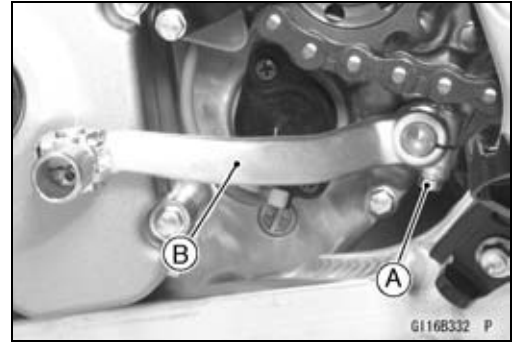


9-24 CRANKSHAFT/TRANSMISSION

External Shift Mechanism

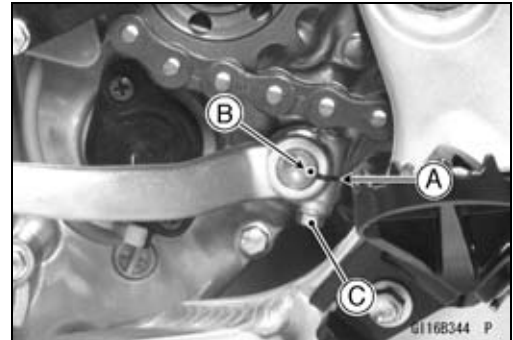
Shift Pedal Removal

- Remove:
 - Shift Pedal Bolt [A]
 - Shift Pedal [B]



Shift Pedal Installation

- Install the shift pedal so that the slit [A] on the pedal aligns with the punch mark [B] on the shift shaft.
- Tighten:
 - Torque - Shift Pedal Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)

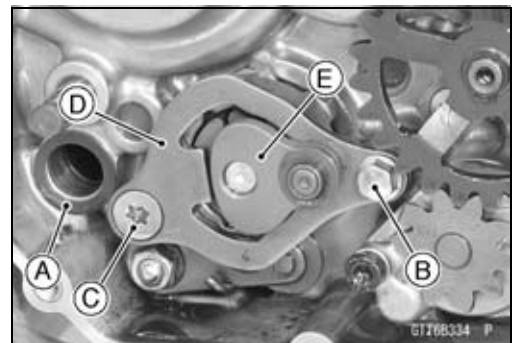


External Shift Mechanism Removal

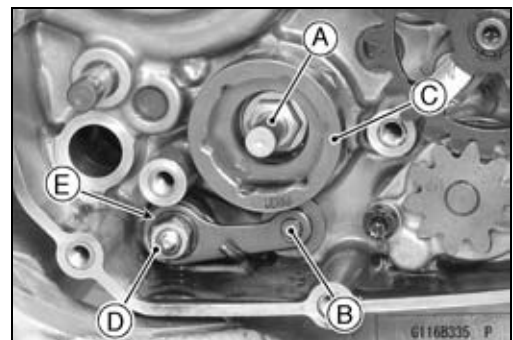
- Remove:
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Shift Pedal (see Shift Pedal Removal)
- Pull out the shift shaft [A].



- Remove:
 - Washer [A]
 - Ratchet Plate Bolt [B]
 - Ratchet Plate Screw [C]
 - Ratchet Plate [D]
 - Shift Ratchet Assembly [E]

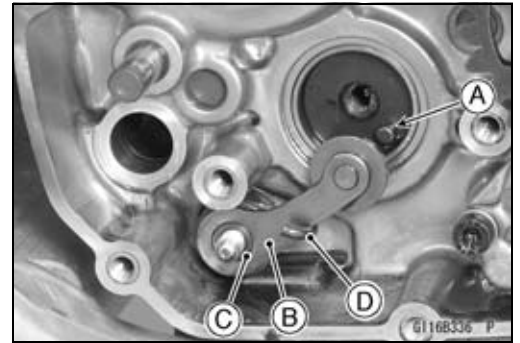


- Remove the shift drum cam bolt [A].
- Hold the gear positioning lever [B] with suitable tool, and remove the shift drum cam [C].
- Remove:
 - Gear Positioning Lever Nut [D] and Washer [E]



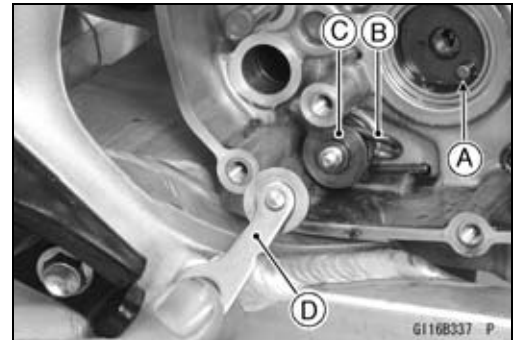
External Shift Mechanism

- Remove:
 - Pin [A]
 - Gear Positioning Lever [B]
 - Collar [C]
 - Spring [D]

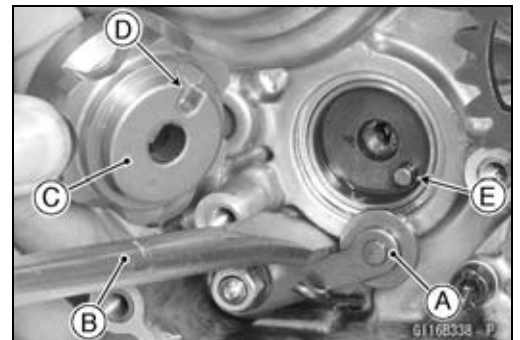


External Shift Mechanism Installation

- Install:
 - Pin [A]
 - Spring [B]
 - Collar [C]
 - Gear Positioning Lever [D]
 - Washer
- Tighten:
 - Torque - Gear Positioning Lever Nut: 8.8 N-m (0.90 kgf-m, 78 in-lb)**



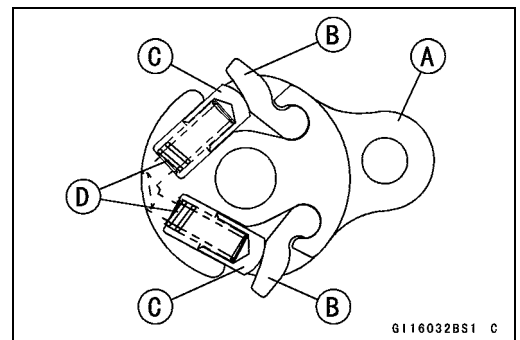
- Hold the gear positioning lever [A] with the suitable tool [B], and install the shift drum cam [C].
- Fit the groove [D] on the pin [E].
- Apply a non-permanent locking agent to the shift drum cam bolt.
- Tighten:
 - Torque - Shift Drum Cam Bolt: 24 N-m (2.4 kgf-m, 18 ft-lb)**
- Align the roller of the gear positioning lever with the slot of the shift drum cam.



- Fit the spring end [A] to the notch of the gear positioning lever.
- Turn the input shaft to check that the shift changes smoothly.



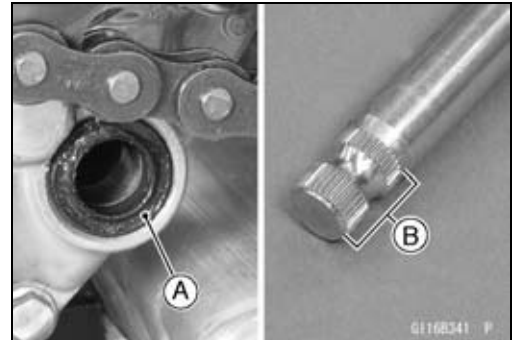
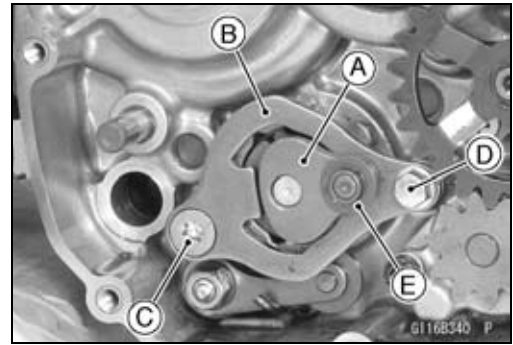
- Set up the shift ratchet assembly.
 - Ratchet [A]
 - Pawls [B]
 - Pins [C]
 - Springs [D]



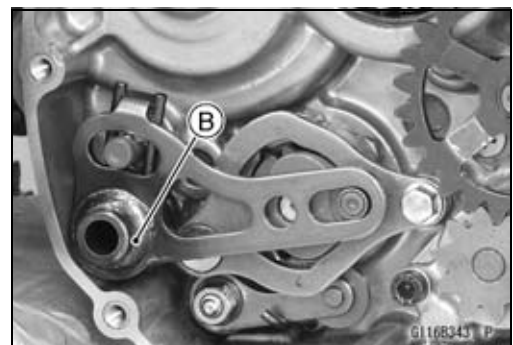
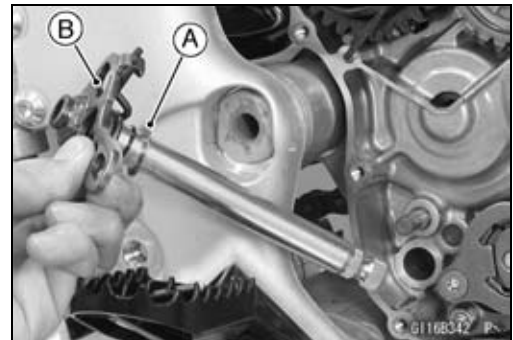
9-26 CRANKSHAFT/TRANSMISSION

External Shift Mechanism

- Install the shift ratchet assembly [A] and ratchet plate [B] as a set.
 - Apply a non-permanent locking agent to the ratchet plate screw and bolt.
 - Tighten:
 - Torque - Ratchet Plate Screw [C]: 15 N·m (1.5 kgf·m, 11 ft·lb)
 - Ratchet Plate Bolt [D]: 9.8 N·m (1.0 kgf·m, 87 in·lb)
 - Tighten the screw first.
 - Install the collar [E].
-
- Apply grease to the oil seal lips [A] and shift shaft splines [B].

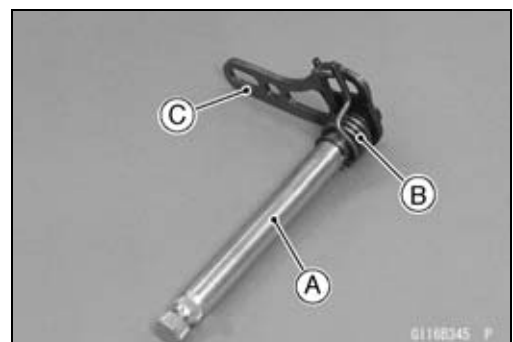


- Install the washer [A] on the shift shaft [B].
- Insert the shift shaft.
- Take care not to damage the oil seal when inserting the shift shaft.
- Install the removed parts (see appropriate chapters).



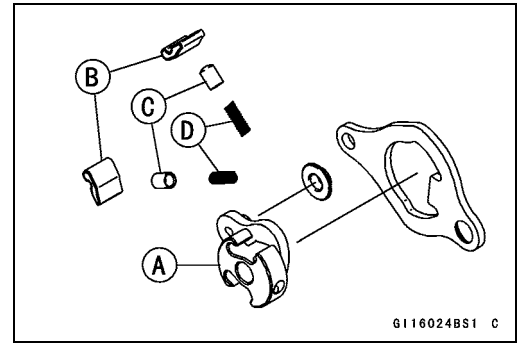
External Shift Mechanism Inspection

- Remove the shift shaft (see External Shift Mechanism Removal).
- Check the shift shaft [A] for bending or damage to the splines.
- ★ If the shaft is bent, straighten or replace it. If the splines are damaged, replace the shift shaft.
- Check the return spring [B] for cracks or distortion.
- ★ If the spring is damaged in any way, replace it.
- Check the shift lever [C] for distortion.
- ★ If the shift lever is damaged in any way, replace the shift shaft.

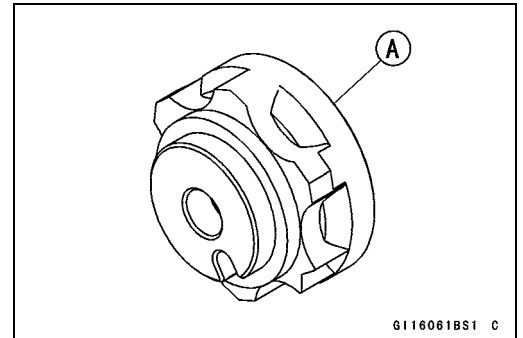


External Shift Mechanism

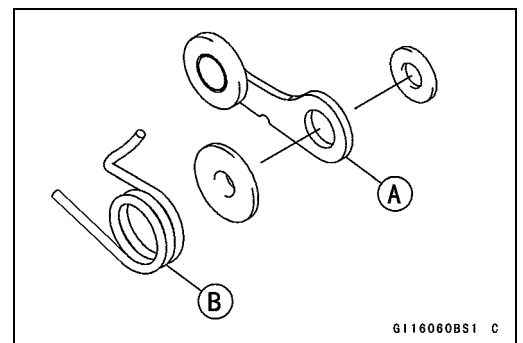
- Check the shift ratchet assembly for any damage.
- ★ If the ratchet [A], pawls [B], pins [C] or springs [D] are damaged in any way, replace them.



- Visually inspect the shift drum cam [A].
- ★ If it is badly worn or if it shows any damage, replace it.



- Check the gear positioning lever [A] and its spring [B] for breaks or distortion.
- ★ If the lever or spring is damaged in any way, replace them.

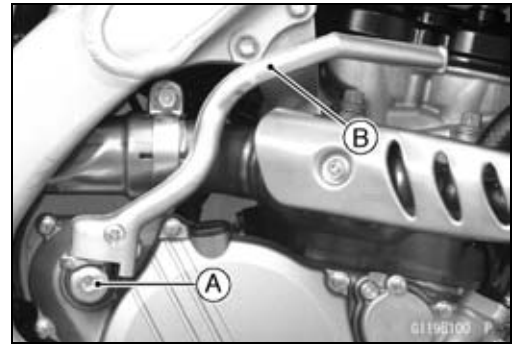


9-28 CRANKSHAFT/TRANSMISSION

Kickstarter

Kick Pedal Removal

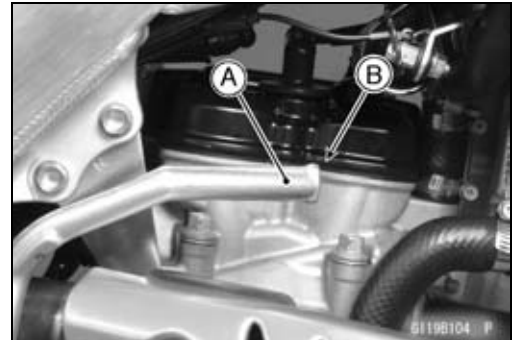
- Remove:
 - Kick Pedal Bolt [A] and Washer
 - Kick Pedal Assy [B]



Kick Pedal Installation

- Install the kick pedal assy.
- Put the pedal end [A] near the cylinder head cover mating surface [B].
- Apply a non-permanent locking agent to the threads of the kick pedal bolt.
- Install the washer and tighten the kick pedal bolt.

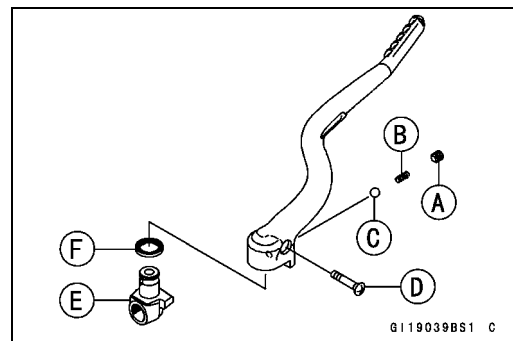
Torque - Kick Pedal Bolt: 25 N-m (2.5 kgf-m, 18 ft-lb)



Kick Pedal Disassembly

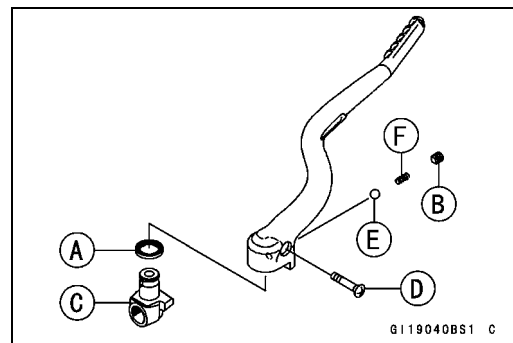
- Remove the kick pedal assy (see Kick Pedal Removal).

- Remove:
 - Plug Screw [A]
 - Spring [B]
 - Steel Ball [C]
 - Detent Screw [D]
 - Boss [E]
 - Oil Seal [F]



Kick Pedal Assembly

- Replace the oil seal [A] and plug screw [B] with a new one.
- Apply grease to the steel ball, oil seal lip, spring, and the sliding portion of the pedal.
- Install:
 - Oil Seal
 - Boss [C]
 - Detent Screw [D]
 - Steel Ball [E]
 - Spring [F]
 - Plug Screw
- Tighten the detent screw and plug screw.
- After tightening the plug screw, stake it with a punch.

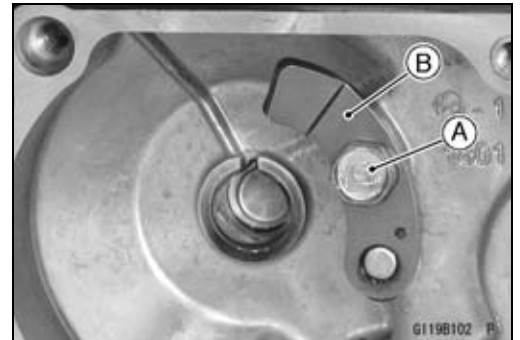
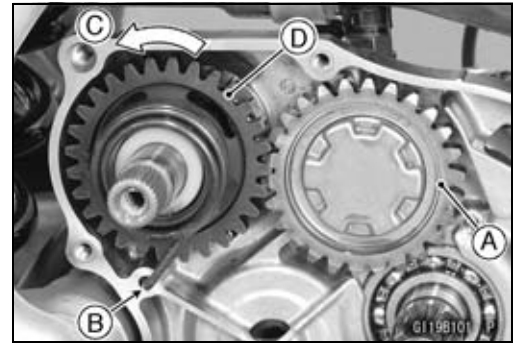


Kickstarter

Kick Shaft Removal

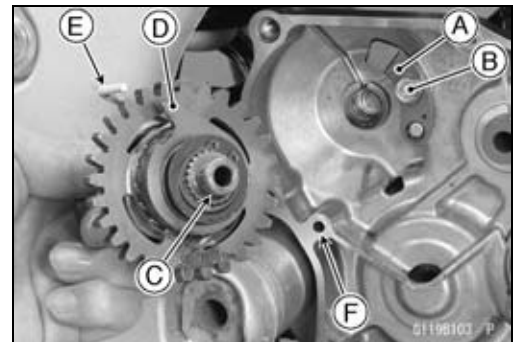
- Remove:
 - Right Engine Cover (see Right Engine Cover Removal in the Clutch chapter)
 - Clutch (see Clutch Removal in the Clutch chapter)
 - Kickstarter Idle Gear [A]
- Pull the spring end [B] out of the hole.
- Turn the kick shaft counterclockwise [C] and pull out the kickstarter assembly [D].

- Remove the bolt [A], and take off the ratchet guide [B].



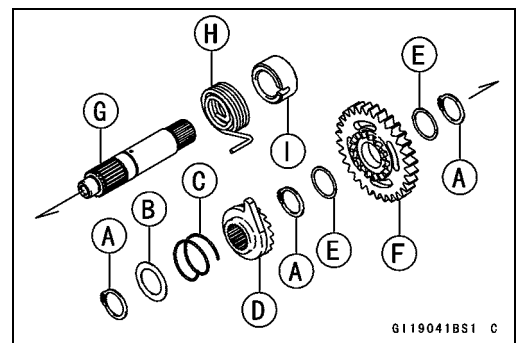
Kick Shaft Installation

- Apply a non-permanent locking agent to the threads of the kick ratchet guide bolt.
- Install the ratchet guide [A], and tighten the bolt.
 - Torque - Kick Ratchet Guide Bolt [B]: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Apply molybdenum disulfide grease to the kick shaft end [C].
- Insert the kick shaft assembly into the crankcase.
- Securely engage the stopper portion [D] of the ratchet gear with the guide.
- Insert the spring end [E] into the hole [F].
- Apply molybdenum disulfide oil solution to the idle shaft.
- Install the removed parts (see appropriate chapters).



Kick Shaft Assembly Disassembly/Assembly

- The kick shaft assembly consists of the following parts.
 - Circlips [A]
 - Washer ($\phi 27.5 \times \phi 18.3$) [B]
 - Spring [C]
 - Ratchet Gear [D]
 - Washer ($\phi 22 \times \phi 18.3$) [E]
 - Kick Gear [F]
 - Kick Shaft [G]
 - Kick Spring [H]
 - Spring Guide [I]
- Check the kick shaft assembly parts for damage. Any damaged parts should be replaced with new ones.

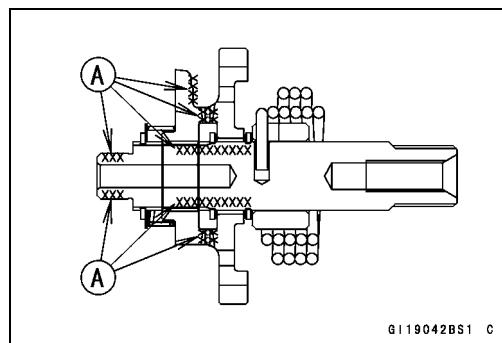


9-30 CRANKSHAFT/TRANSMISSION

Kickstarter

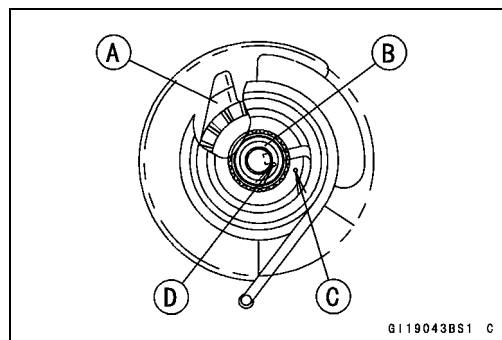
- Apply molybdenum disulfide grease [A] to the kick gear, ratchet gear and kick shaft.
- Replace the circlips that were removed with new ones.

Special Tool - Outside Circlip Pliers: 57001-144

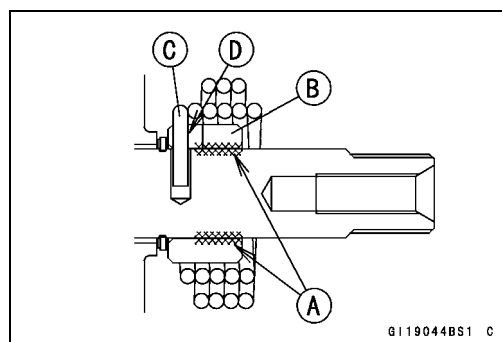


NOTE

- When assembling the ratchet gear [A] onto the kick shaft [B], align the punch mark [C] on the ratchet gear with the punch mark [D] on the kick shaft.



- Apply grease [A] to the inside of the spring guide [B].
- Fit the spring end [C] and hollow [D] on the spring guide.



Bearings/Oil Seals

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

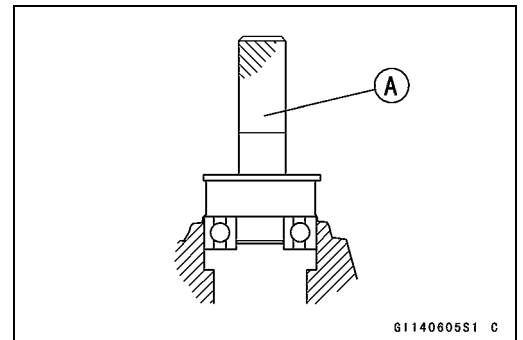
○ *In the absence of the above mentioned tools, satisfactory results may be obtained by heating the case to approximately 93°C (200°F) max, and tapping the bearing in or out.*

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

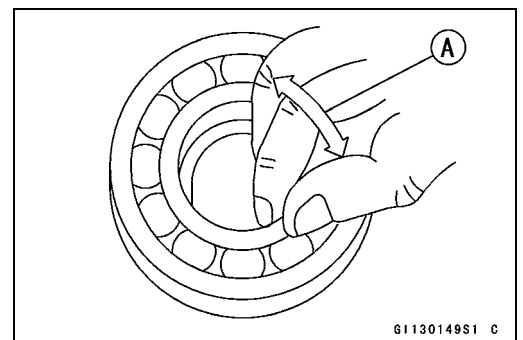


Bearing Wear Inspection

NOTICE

Do not remove the bearings for inspection. Removal may damage them.

- Inspect the ball bearings.
- Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement.
- Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
- Spin [A] the bearing by hand to check its condition.
- ★ If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.



9-32 CRANKSHAFT/TRANSMISSION

Bearings/Oil Seals

- Inspect 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 the oil seal if the lips are deformed, discolored (indicating that the rubber has deteriorated), hardened or otherwise damaged.

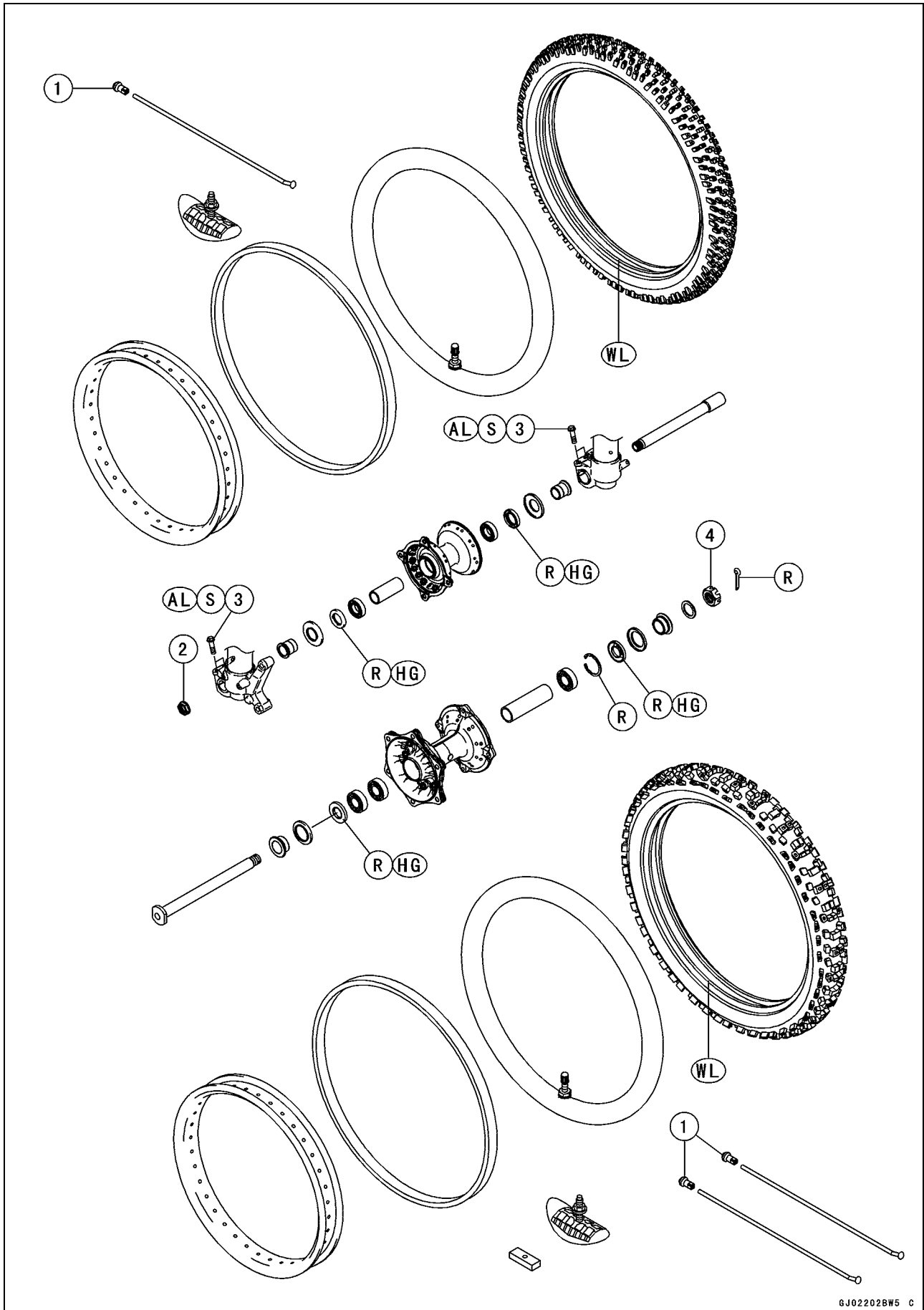
Wheels/Tires

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10-2 WHEELS/TIRES

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Spoke Nipples	Not less than 2.2	Not less than 0.22	Not less than 19 in-lb	
2	Front Axle Nut	78	8.0	58	
3	Front Axle Clamp Bolts	20	2.0	15	AL, S
4	Rear Axle Nut	108	11.0	79.7	

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

HG: Apply high-temperature grease.

R: Replacement Parts

S: Follow the specified tightening sequence.

WL: Apply soap and water solution or rubber lubricant.

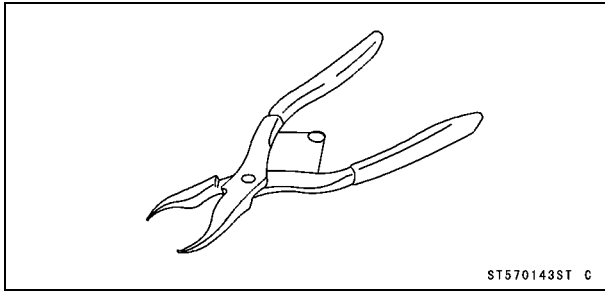
10-4 WHEELS/TIRES

Specifications

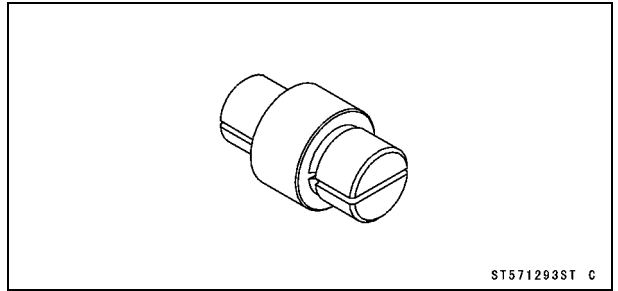
Item	Standard	Service Limit
Wheels (Rims)		
Rim Size:		
Front	21 x 1.60	---
Rear	19 x 1.85	---
Rim Runout:		
Axial	TIR 1.0 mm (0.04 in.) or less	TIR 2.0 mm (0.08 in.)
Radial	TIR 1.0 mm (0.04 in.) or less	TIR 2.0 mm (0.08 in.)
Axle Runout/100 mm (3.94 in.)	TIR 0.03 mm (0.001 in.) or less	TIR 0.2 mm (0.008 in.)
Tires		
Air Pressure (when cold):		
Front/Rear	100 kPa (1.00 kgf/cm ² , 14 psi)	---
Standard Tire:		
Front:		
Size	80/100-21 51M	---
Make	DUNLOP	---
Type	MX51F, Tube	---
Rear:		
Size	100/90-19 57M	---
Make	DUNLOP	---
Type	MX51, Tube	---

Special Tools

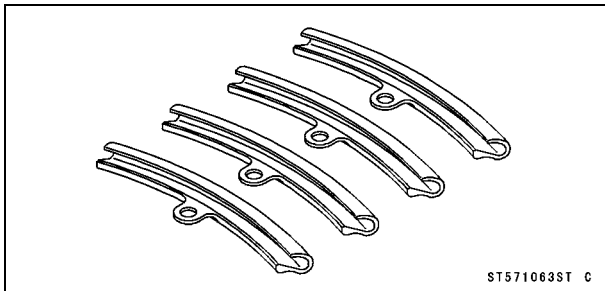
Inside Circlip Pliers:
57001-143



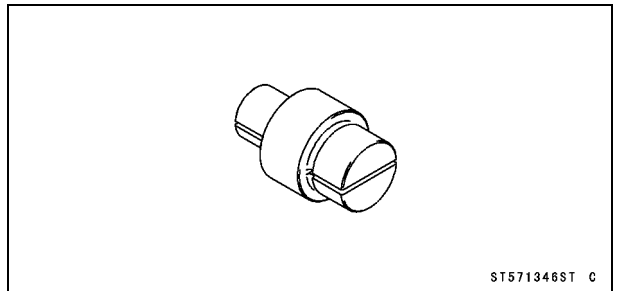
Bearing Remover Head, $\phi 20 \times \phi 22$:
57001-1293



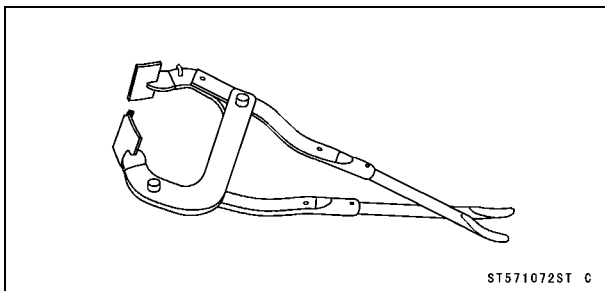
Rim Protector:
57001-1063



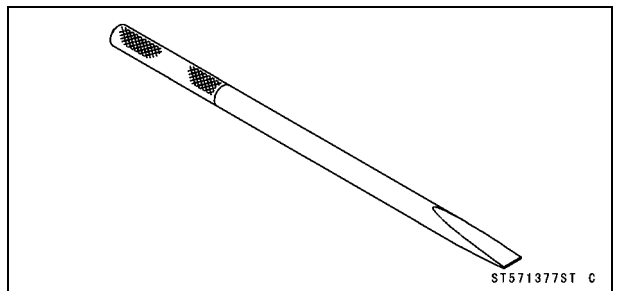
Bearing Remover Head, $\phi 25 \times \phi 28$:
57001-1346



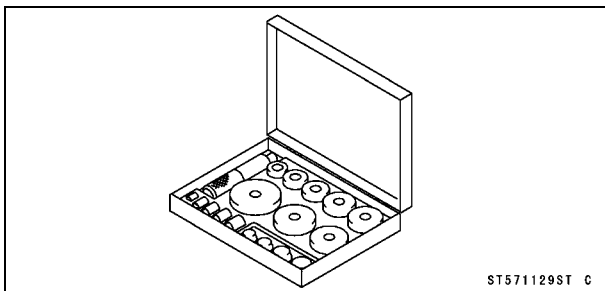
Bead Breaker Assembly:
57001-1072



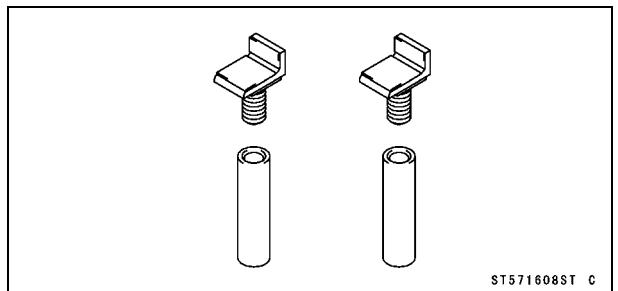
Bearing Remover Shaft, $\phi 13$:
57001-1377



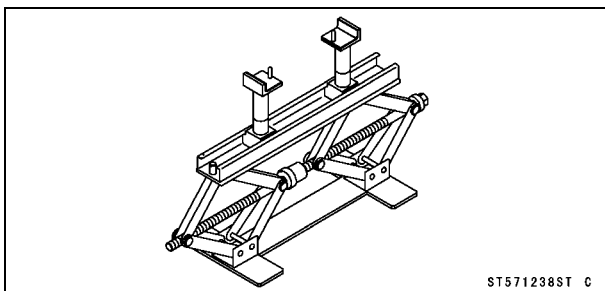
Bearing Driver Set:
57001-1129



Jack Attachment:
57001-1608



Jack:
57001-1238



10-6 WHEELS/TIRES

Wheels (Rims)

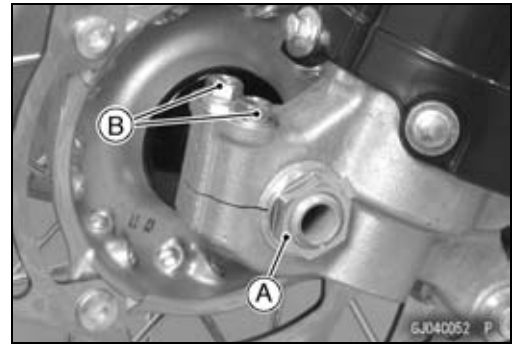
Front Wheel Removal

- Remove the axle nut [A].
- Loosen the axle clamp bolts [B] on both sides.
- Raise the front wheel off the ground with jack.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

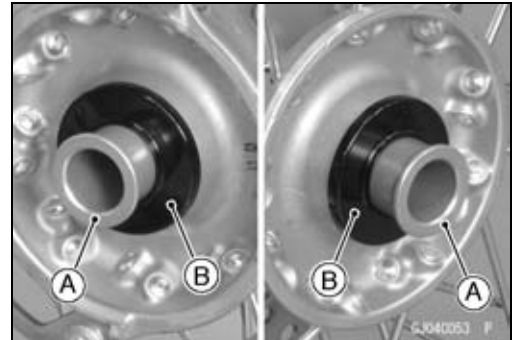
- Pull out the axle and remove the wheel.



- Remove the collars [A] with caps [B] on both sides.

NOTICE

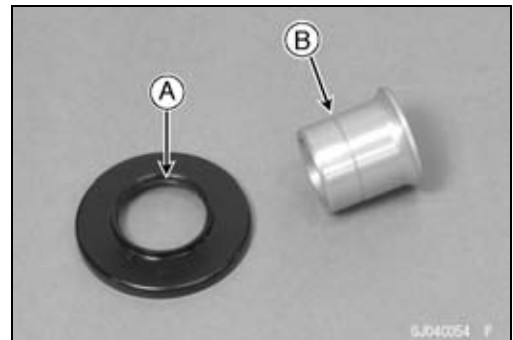
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.



- Insert a wood wedge between the brake pads.
- This prevents them from being moved out of their proper position, should the brake lever be squeezed accidentally.

Front Wheel Installation

- Apply high-temperature grease to the grease seal lips.
- Install the caps and collars to the hub on both sides.
- Fit the projection [A] and groove [B].
- Install the front wheel.



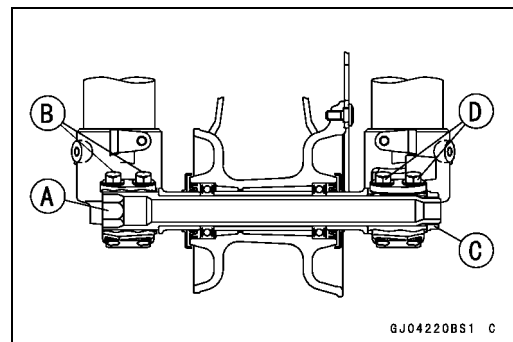
- Insert the axle [A] from right side.
- Screw the front axle clamp bolts (right) [B] temporarily.
- Tighten:

Torque - Front Axle Nut [C]: 78 N·m (8.0 kgf·m, 58 ft·lb)

Front Axle Clamp Bolts (Left) [D]: 20 N·m (2.0 kgf·m, 15 ft·lb)

NOTE

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



- Loosen the front axle clamp bolts (right).
- Remove the jack.

Wheels (Rims)

- Pump the front fork up and down [A] 4 or 5 times to align both fork positions.

NOTE

- Put a block [B] in front of the wheel to stop moving.
- Do not apply the front brake.

- Tighten:

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

NOTE

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

- Check the front brake for good braking power and no brake drag.



⚠ WARNING

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.

Rear Wheel Removal

- Using the jack under the frame so that the rear wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

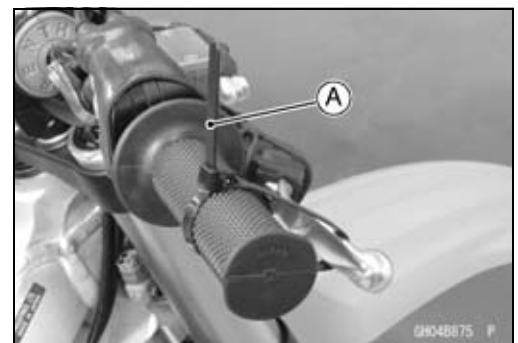
- Squeeze the front brake lever, and hold it with a band [A] to prevent the motorcycle from running forward.

⚠ WARNING

Motorcycle may fall over unexpectedly resulting in an accident or injury. Be sure to hold the front brake when removing the rear wheel.

NOTICE

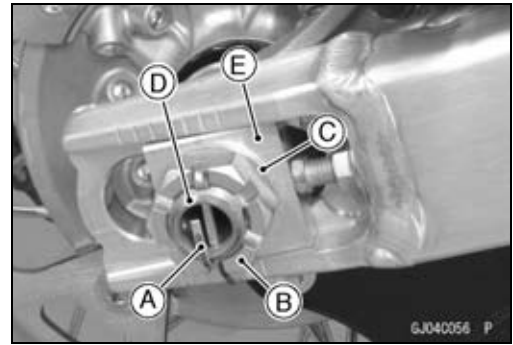
Be sure to hold the front brake when removing the rear wheel, or the motorcycle may fall over. The rear wheel or the motorcycle could be damaged.



10-8 WHEELS/TIRES

Wheels (Rims)

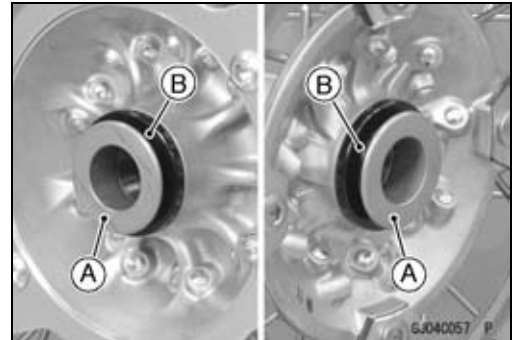
- Remove the cotter pin [A], rear axle nut [B] and washer [C].
- Pull out the axle [D], and remove the chain adjuster [E] on both sides.
- Disengage the drive chain from the rear sprocket.
- Remove the rear wheel.



- Remove the collars [A] with caps [B] on both sides.

NOTICE

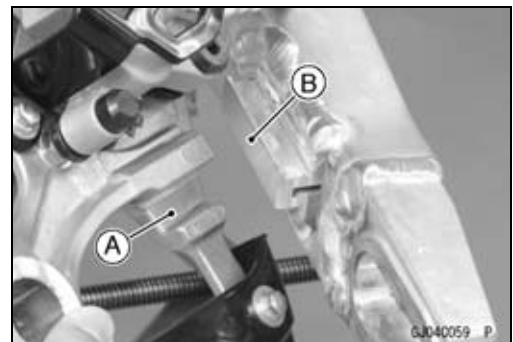
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.



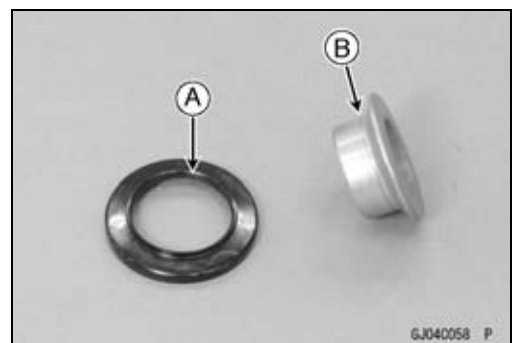
- Insert a wood wedge between the brake pads.
- This prevents them from being moved out of their proper position, should the brake pedal be squeezed accidentally.

Rear Wheel Installation

- Fit the groove [A] of the caliper holder and swingarm rib [B].



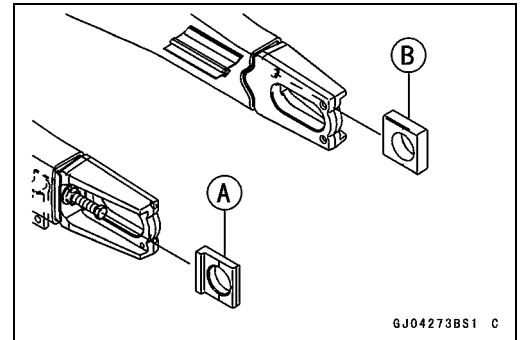
- Apply high-temperature grease to the grease seal lips.
- Install the caps and collars to the hub on both sides.
- Fit the projection [A] and groove [B].



Wheels (Rims)

- Install the rear wheel.
- Engage the drive chain with the rear sprocket.
- Install the chain adjusters on the swingarm.
 - Adjuster [A] (Left Side)
 - Flat Adjuster [B] (Right Side)
- Insert the axle from left side, and tighten the axle nut.

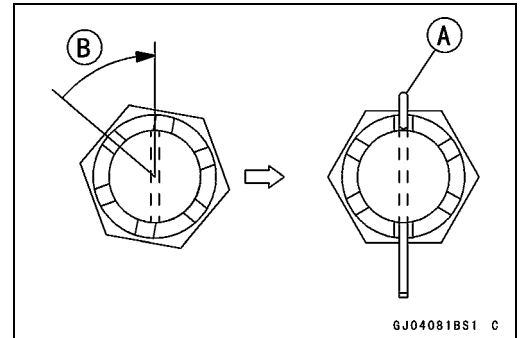
Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)



- Insert a new cotter pin [A].

NOTE

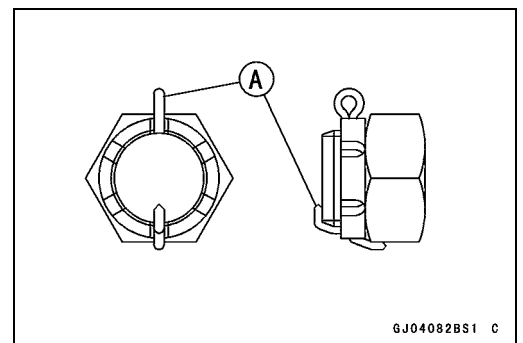
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30 degrees.
- Loosen once and tighten again when the slot goes past the nearest hole.



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

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.



- Adjust the drive chain slack (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
- Check the rear brake for good braking power and no brake drag.

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.

Wheels Inspection

- Refer to the Wheel Bearing Inspection in the Periodic Maintenance chapter.

Spoke Tightness Inspection

- Refer to the Spoke Tightness Inspection in the Periodic Maintenance chapter.

Rim Runout Inspection

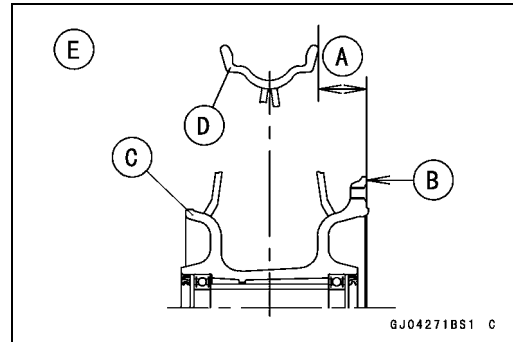
- Refer to the Rim Runout Inspection in the Periodic Maintenance chapter.

10-10 WHEELS/TIRES

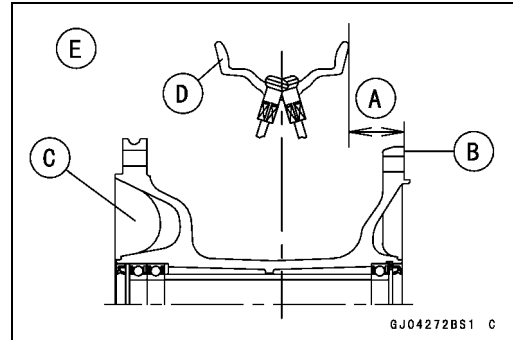
Wheels (Rims)

Rim Installation Position

- When installing the rim, set the rim following position.
- The distance [A] from the brake disc seating surface [B] of the front hub [C] to left end of the front rim [D] should be as follows.
View from Front [E]
Distance: 26.8 ±0.5 mm (1.06 ±0.020 in.)



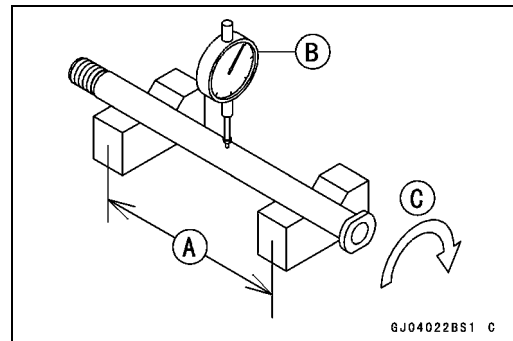
- The distance [A] from the brake disc seating surface [B] of the rear hub [C] to right end of the rear rim [D] should be as follows.
View from Rear [E]
Distance: 32.8 ±0.5 mm (1.29 ±0.020 in.)



- Check the rim runout (see Rim Runout Inspection in the Periodic Maintenance chapter).

Axle Inspection

- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle on 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.



Axle Runout/100 mm (3.94 in.)

Standard: TIR 0.03 mm (0.001 in.) or less

Service Limit: TIR 0.2 mm (0.008 in.)

- ★ If the runout exceeds the service limit, replace the axle.

Tires

Air Pressure Inspection/Adjustment

- Refer to the Air Pressure Inspection/Adjustment in the Periodic Maintenance chapter.

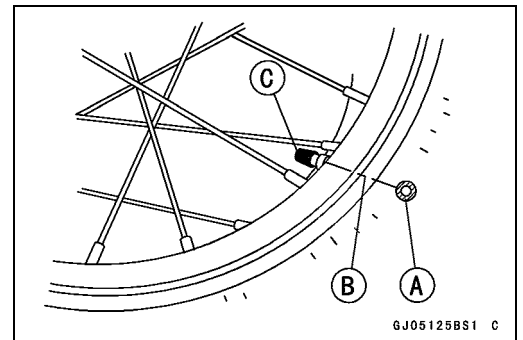
Tire Removal

- Remove the wheel (see Front/Rear Wheel Removal).

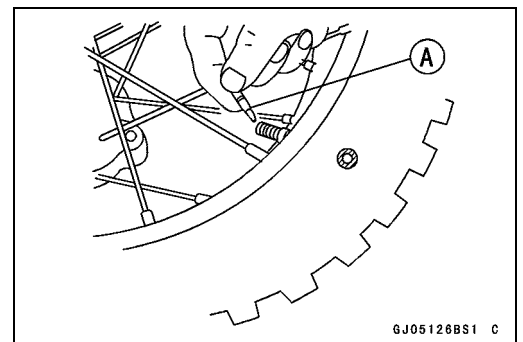
NOTICE

Do not lay the wheel directly on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

- To maintain wheel balance, mark [A] the air valve position on the tire with chalk so that the tire can be reinstalled in the same position.
Align [B]
- Remove the air valve cap [C].



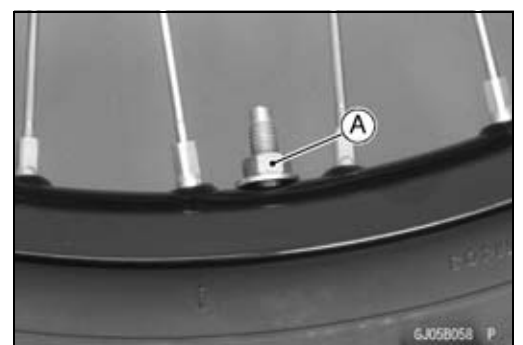
- Take out the valve core [A] to let out the air.
- Remove the air valve nut.



- Loosen the bead protector nut [A].
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

NOTICE

Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.

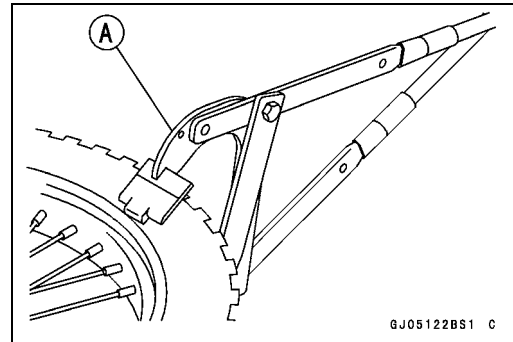


10-12 WHEELS/TIRES

Tires

- Break the beads away from both sides of the rim with the bead breaker [A].

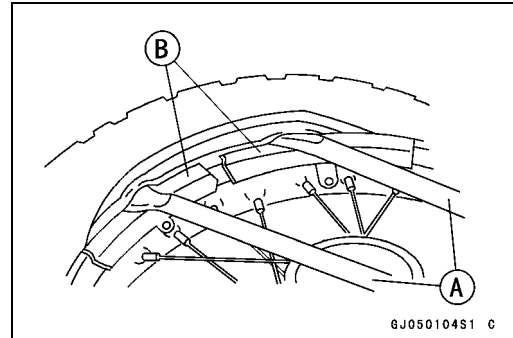
Special Tool - Bead Breaker Assembly: 57001-1072



- Lubricate the tire irons [A] (included in Bead Breaker Assembly: 57001-1072) and rim protectors [B] with soap and water solution or rubber lubricant.

Special Tool - Rim Protector: 57001-1063

- Step on the side of the tire opposite air valve, and pry the tire off the rim with the tire irons of the bead breaker protecting the rim with rim protectors.



NOTICE

Take care not to insert the tire irons so deeply that the tube gets damaged.

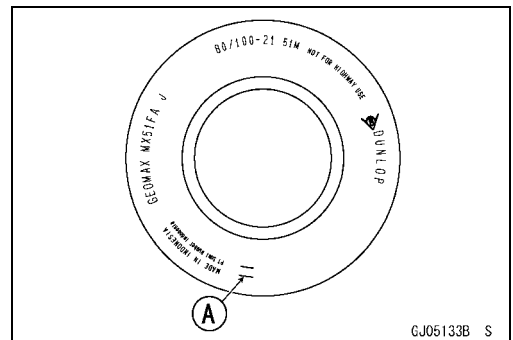
- Remove the tube and bead protector when one side of the tire is pried off.
- Pry the other side of the tire off the rim.

Tire Installation

NOTE

○ The tires should be installed so that the ID serial NO. [A] faces to left side.

- Inspect the rim and tire before installing the tire, and replace them if necessary.
- Install the tube band onto the rim.
- Apply a soap and water solution or rubber lubricant to both the tire bead and rim flange.

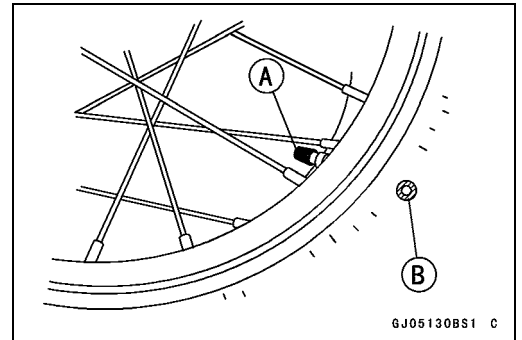


Tires

- Position the tire on the rim so that the air valve [A] is at the tire balance mark [B] (the chalk mark made during removal).
- The new tire is no marked.
- Insert the valve stem into the rim, and screw the nut on loosely.
- Fit the rim protectors and use tire irons to install the tire bead.

Special Tools - Rim Protector: 57001-1063

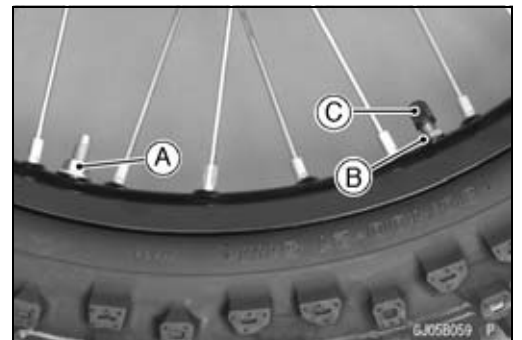
Bead Breaker Assembly: 57001-1072



NOTICE

To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.

- Install the tire on the rim from the opposite side of the air valve.
- Fit the rim protectors and insert the tire irons so deeply that the tube is not damaged.
- Install the bead protector onto the rim.
- Similarly, slip the tire bead over the rim on the other side.
- Check that the tube is not pinched between the tire and rim.
- Tighten the bead protector nut [A], air valve nut [B] and air valve cap [C].
- Adjust the tire air pressure to the specified pressure (see Air Pressure Inspection/Adjustment in the Periodic Maintenance chapter).

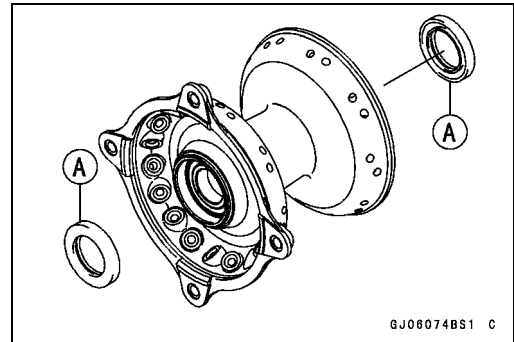


10-14 WHEELS/TIRES

Hub Bearing

Front Hub Bearing Removal

- Remove:
 - Front Wheel (see Front Wheel Removal)
 - Grease Seals [A]

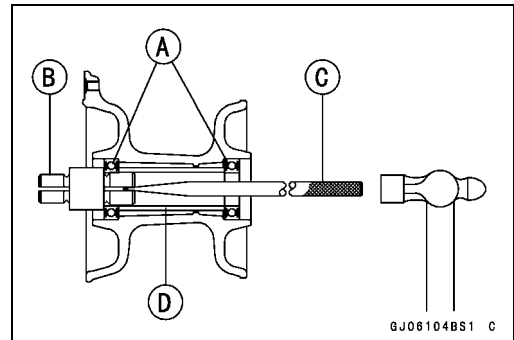


- Use the bearing remover to remove the hub bearings [A].

NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.

- Special Tools - Bearing Remover Head, $\phi 20 \times \phi 22$ [B]: 57001-1293
- Bearing Remover Shaft, $\phi 13$ [C]: 57001-1377

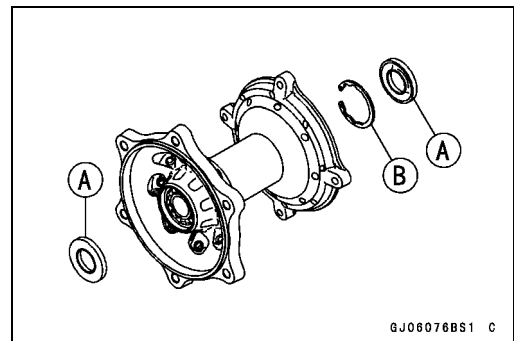


- Remove the collar [D].

Rear Hub Bearing Removal

- Remove:
 - Rear Wheel (see Rear Wheel Removal)
 - Grease Seals [A]
 - Circlip [B]

- Special Tool - Inside Circlip Pliers: 57001-143

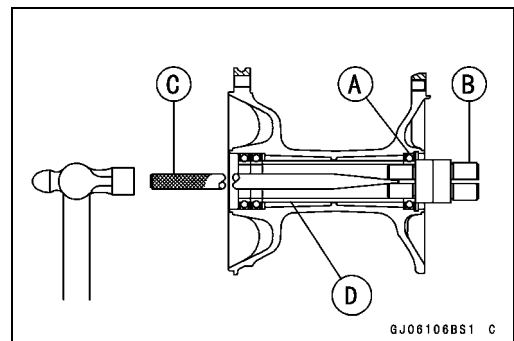


- Use the bearing remover to remove the right hub bearing [A].

NOTICE

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.

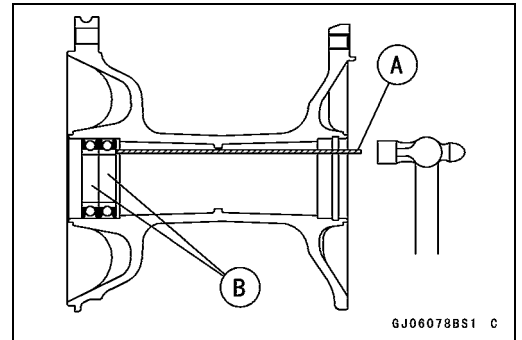
- Special Tools - Bearing Remover Head, $\phi 25 \times \phi 28$ [B]: 57001-1346
- Bearing Remover Shaft, $\phi 13$ [C]: 57001-1377



- Remove the collar [D].

Hub Bearing

- Using a suitable bar [A], tap the around of the bearing inner race evenly to remove the bearings [B].



Hub Bearing Installation

- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.

NOTE

○ Install the bearings so that the marked side or sealed side faces out.

- Install the front hub bearings in the following sequence.
 - Press in the left side bearing [A] until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

- Insert the collar [B] in the front hub [C].
- Press in the right side bearing [D] until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

- Install the rear hub bearings in the following sequence.
 - Press in the right side bearing until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129

- Insert the collar in the rear hub.
- Press in the left side bearings until it is bottomed.

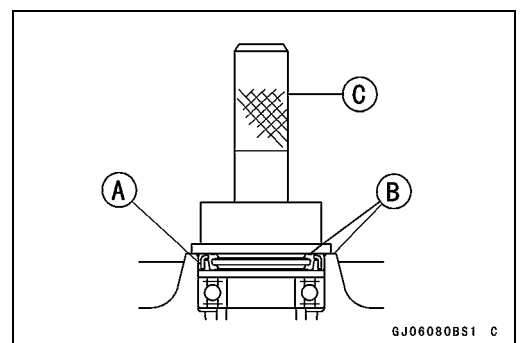
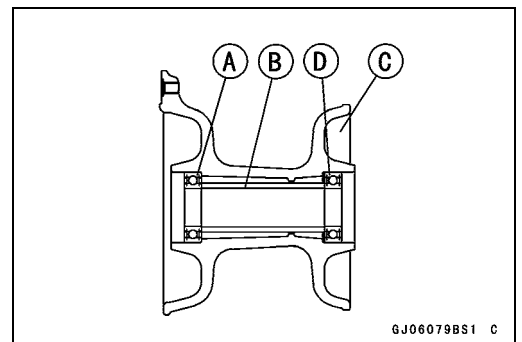
Special Tool - Bearing Driver Set: 57001-1129

- Replace the circlip with a new one and install a new circlip.

Special Tool - Inside Circlip Pliers: 57001-143

- Replace the grease seal [A] with a new one.
- Press in the grease seal so that the seal surface is flush [B] with the end of the hole.
- Apply high-temperature grease to the grease seal lip.

Special Tool - Bearing Driver Set [C]: 57001-1129



10-16 WHEELS/TIRES

Hub Bearing

Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance cannot normally be measured.

NOTE

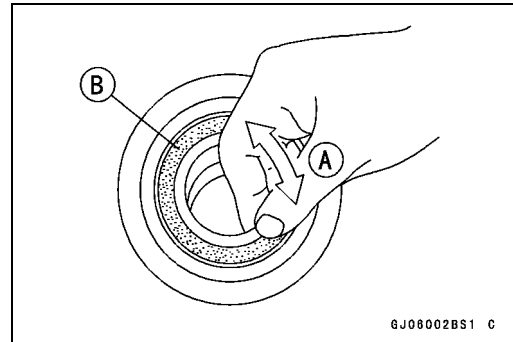
○ Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.

- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.

Hub Bearing Lubrication

NOTE

○ Since the hub bearings are packed with grease and sealed, lubrication is not required.



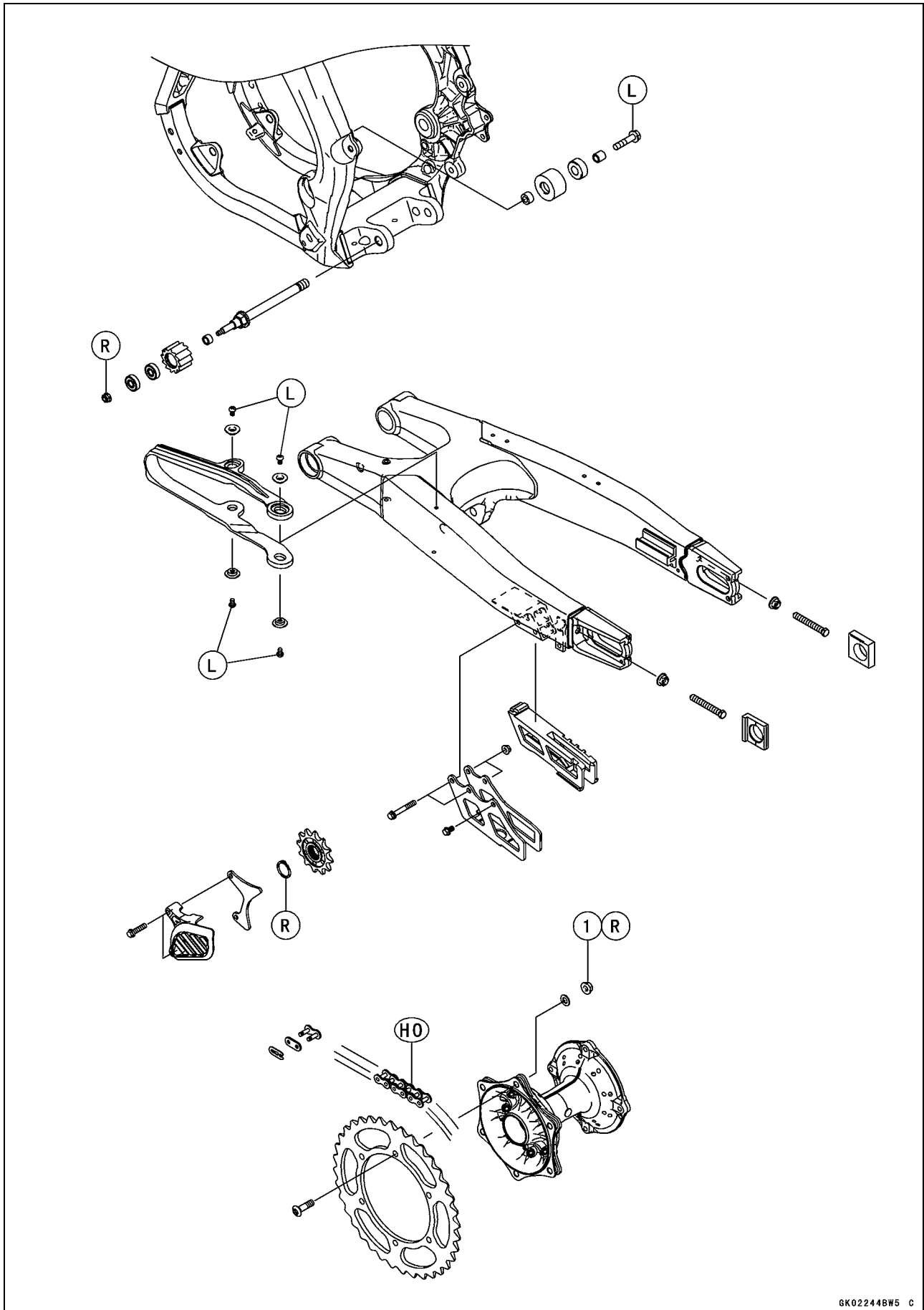
Final Drive

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11-2 FINAL DRIVE

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Sprocket Nuts	34	3.5	25	R

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

R: Replacement Parts

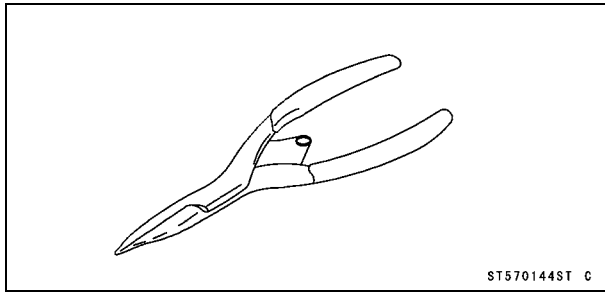
11-4 FINAL DRIVE

Specifications

Item	Standard	Service Limit
Drive Chain		
Chain Slack	52 ~ 58 mm (2.0 ~ 2.3 in.)	— — —
Chain 20-link Length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	DAIDO	— — —
Type	DID 520DMA4	— — —
Link	114 links	— — —
Sprocket		
Rear Sprocket Warp	TIR 0.4 mm (0.016 in.) or less	TIR 0.5 mm (0.020 in.)

Special Tool

Outside Circlip Pliers:
57001-144



11-6 FINAL DRIVE

Drive Chain

Drive Chain Slack Inspection

- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

Drive Chain Slack Adjustment

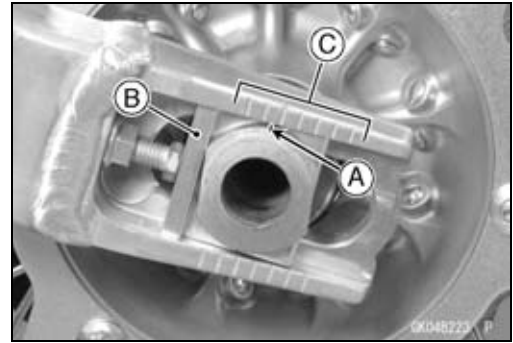
- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

Wheel Alignment Inspection

- Check that the notch [A] of the chain adjuster [B] aligns with the same swingarm mark [C] as the other side one.

⚠ 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.



Wheel Alignment Adjustment

- This procedure is the same as Drive Chain Slack Adjustment (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

Drive Chain Wear Inspection

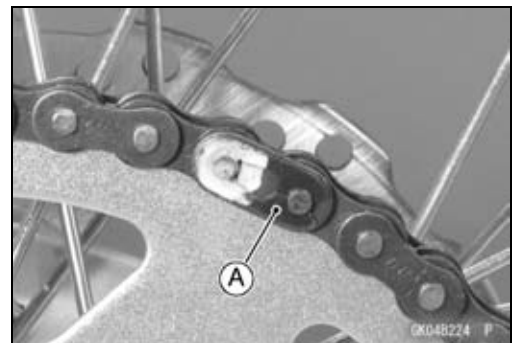
- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

Drive Chain Lubrication

- Refer to the Drive Chain Lubrication in the Periodic Maintenance chapter.

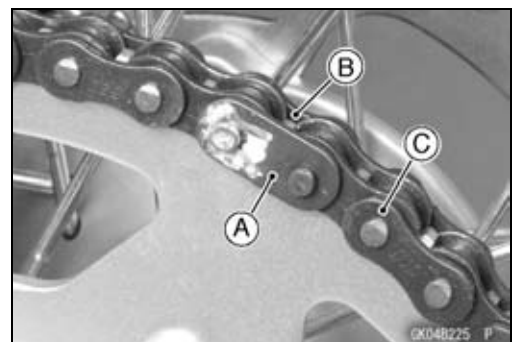
Drive Chain Removal

- Remove the engine sprocket cover (see Engine Sprocket Removal).
- Remove the clip [A] from the master link with pliers.



- Remove:

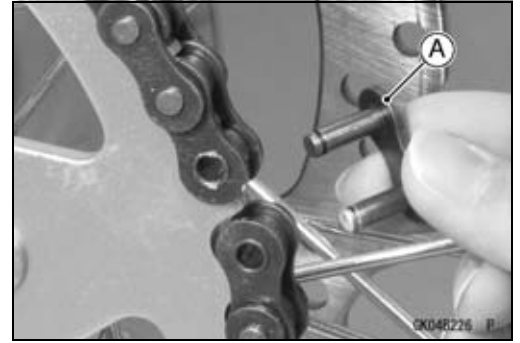
Link Plate [A]
Master Link [B]
Drive Chain [C]



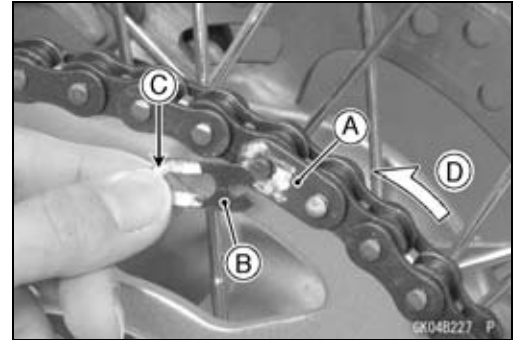
Drive Chain

Drive Chain Installation

- Fit the drive chain onto the sprockets.
- Place the drive chain ends on the rear sprocket.
- Install the master link [A] from the wheel side.



- Install the link plate [A] so that the mark faces out.
- Install the clip [B] so that the closed end [C] of the “U” pointed in the direction of chain rotation [D].
- Adjust the drive chain slack (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Install the engine sprocket cover (see Engine Sprocket Installation).



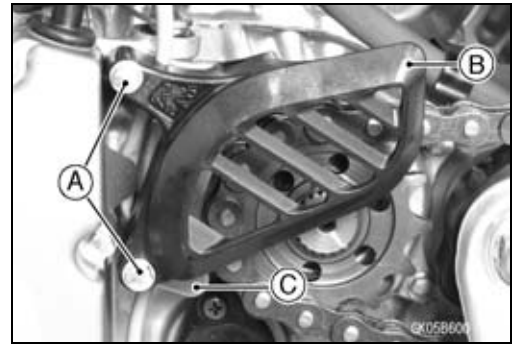
11-8 FINAL DRIVE

Sprockets

Engine Sprocket Removal

- Remove:

- Engine Sprocket Cover Bolts [A]
- Engine Sprocket Cover [B]
- Drive Chain Guide [C]

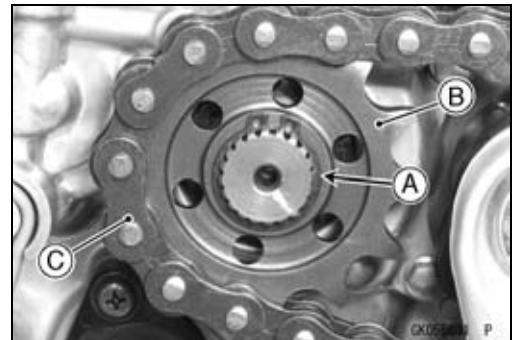


- Remove:

- Circlip [A]

Special Tool - Outside Circlip Pliers: 57001-144

- Remove the engine sprocket [B] from the drive chain [C].



Engine Sprocket Installation

- Engage the drive chain [A] to the engine sprocket [B] and install the engine sprocket on the output shaft.

- Replace the circlip with a new one.

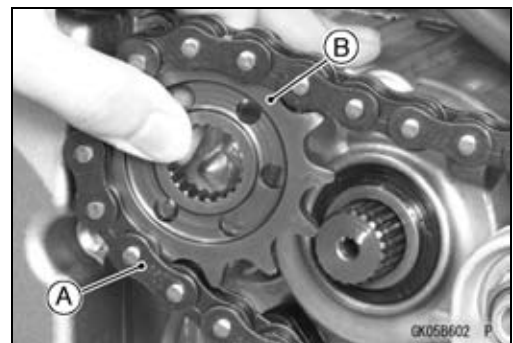
- Install the new circlip on the groove of the output shaft.

Special Tool - Outside Circlip Pliers: 57001-144

- Run the gear position switch lead properly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Install the drive chain guide and engine sprocket cover, and then tighten the bolts.

- Do not pinch the gear position switch lead.



Rear Sprocket Removal

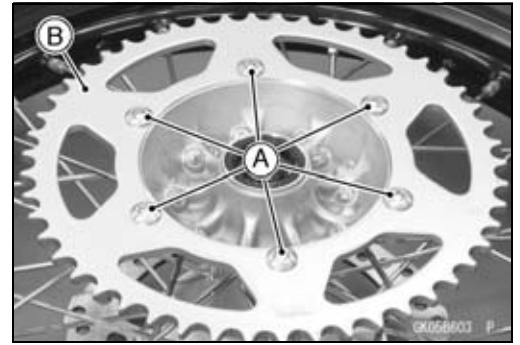
- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

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.

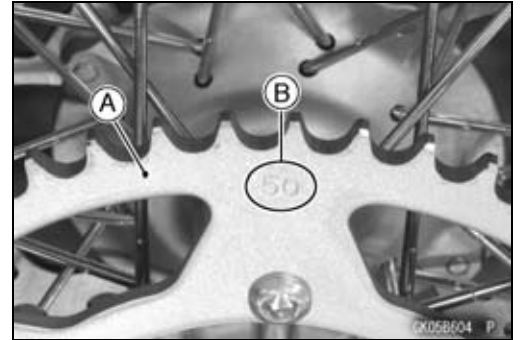
Sprockets

- Remove:
 - Rear Sprocket Bolts [A] and Nuts
 - Washers
 - Rear Sprocket [B]



Rear Sprocket Installation

- Replace the rear sprocket nuts with new ones.
- Install the rear sprocket [A] so that the marked side [B] faces out.
- Install the rear sprocket bolts and washers.
- Tighten:
 - Torque - Rear Sprocket Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)**



Sprocket Wear Inspection

- Refer to the Sprocket Wear Inspection in the Periodic Maintenance chapter.

Rear Sprocket Warp (Runout) Inspection

- Refer to the Rear Sprocket Warp (Runout) Inspection in the Periodic Maintenance chapter.

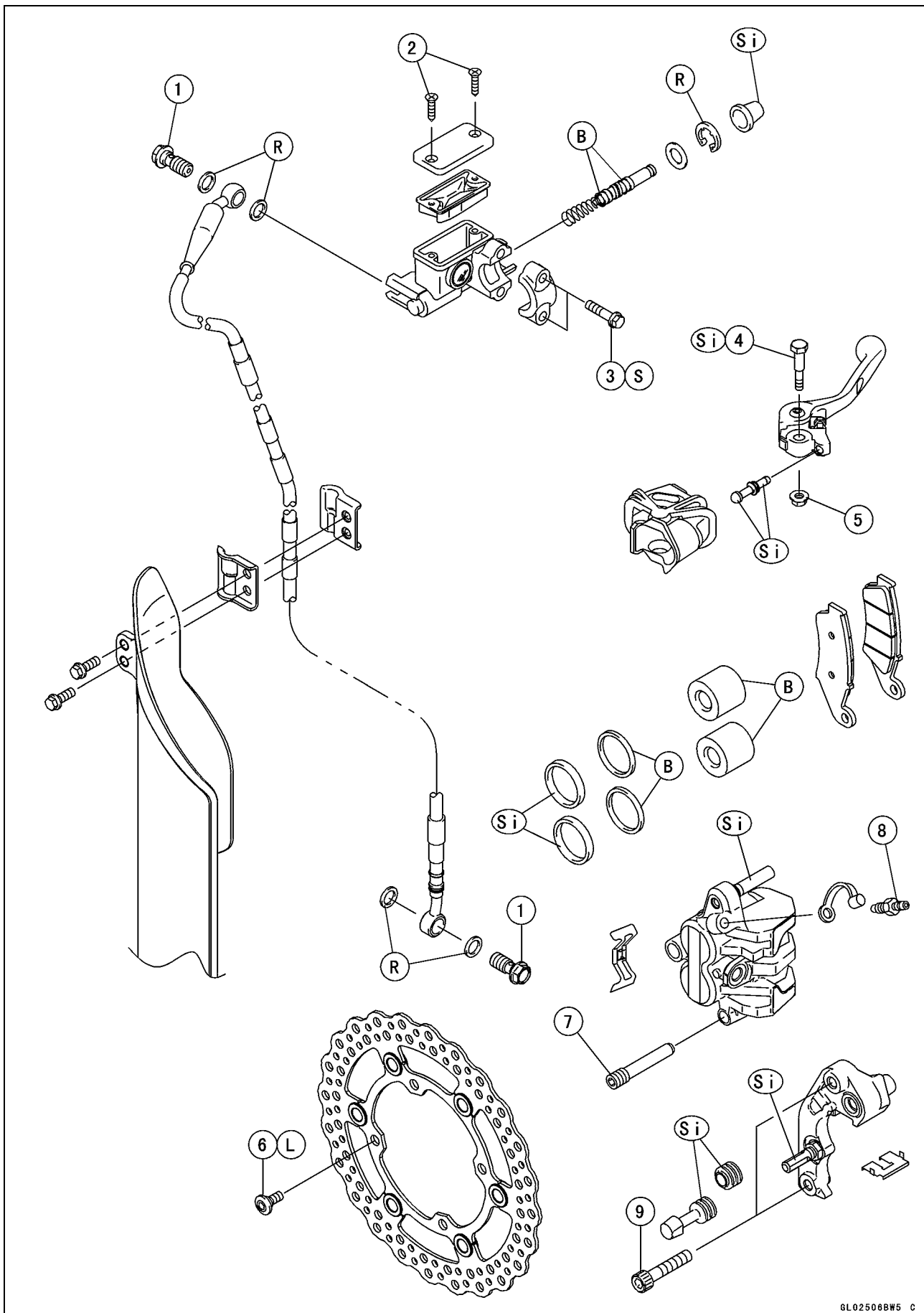
Brakes

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12-2 BRAKES

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Hose Banjo Bolts	25	2.5	18	
2	Front Brake Reservoir Cap Screws	1.5	0.15	13 in·lb	
3	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
4	Brake Lever Pivot Bolt	5.9	0.60	52 in·lb	Si
5	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
6	Front Brake Disc Mounting Bolts	9.8	1.0	87 in·lb	L
7	Front Brake Pad Pin	17	1.7	13	
8	Caliper Bleed Valve	7.8	0.80	69 in·lb	
9	Front Caliper Mounting Bolts	25	2.5	18	

B: Apply brake fluid.

L: Apply a non-permanent locking agent.

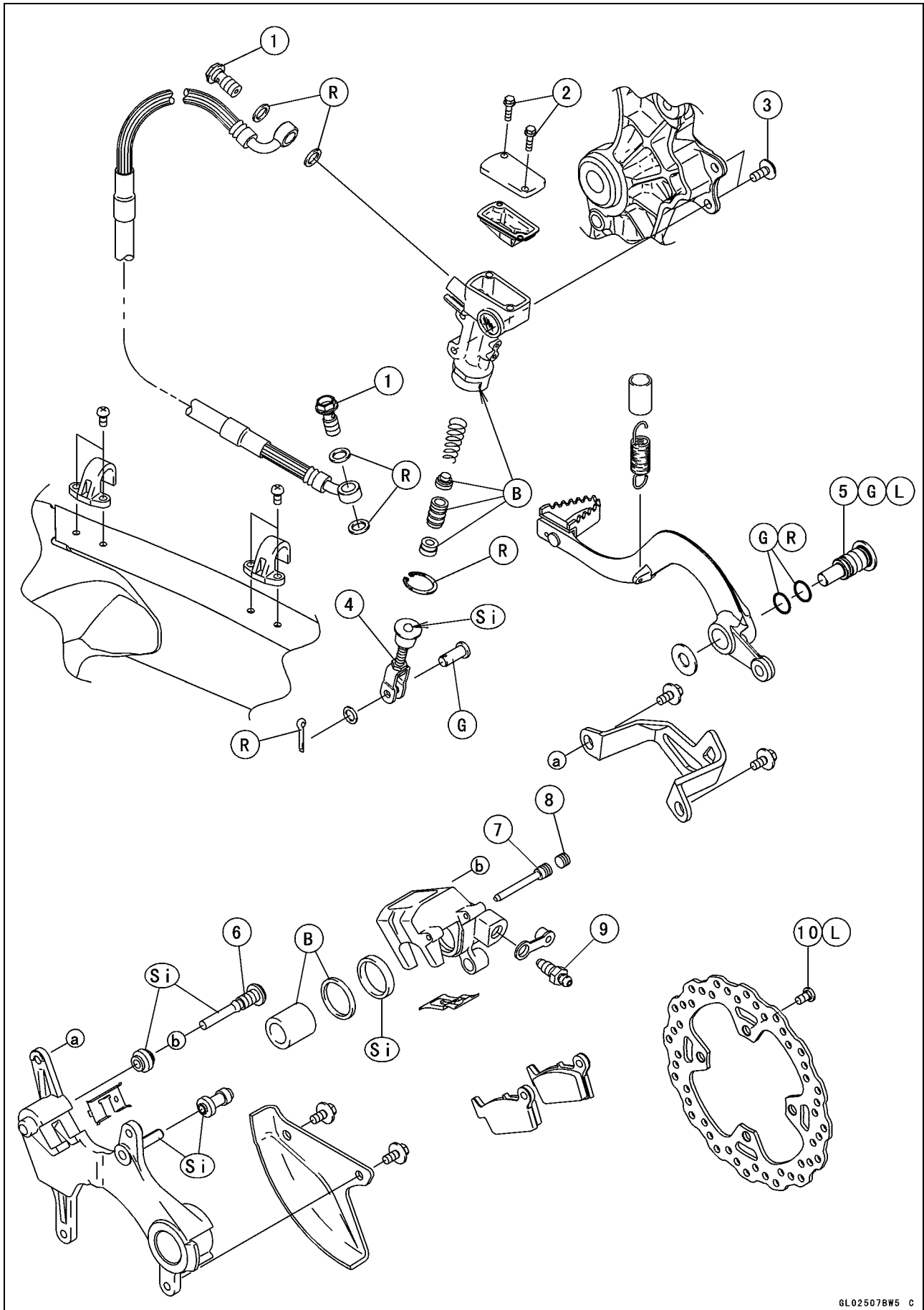
R: Replacement Parts

S: Follow the specified tightening sequence.

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

12-4 BRAKES

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Hose Banjo Bolts	25	2.5	18	
2	Rear Brake Reservoir Cap Bolts	1.5	0.15	13 in·lb	
3	Rear Master Cylinder Mounting Bolts	9.8	1.0	87 in·lb	
4	Rear Master Cylinder Push Rod Locknut	17	1.7	13	
5	Brake Pedal Bolt	25	2.5	18	G, L
6	Rear Caliper Holder Shaft	27	2.8	20	Si
7	Rear Brake Pad Pin	17	1.7	13	
8	Rear Brake Pad Pin Plug	2.4	0.24	21 in·lb	
9	Caliper Bleed Valve	7.8	0.80	69 in·lb	
10	Rear Brake Disc Mounting Bolts	23	2.3	17	L

B: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

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

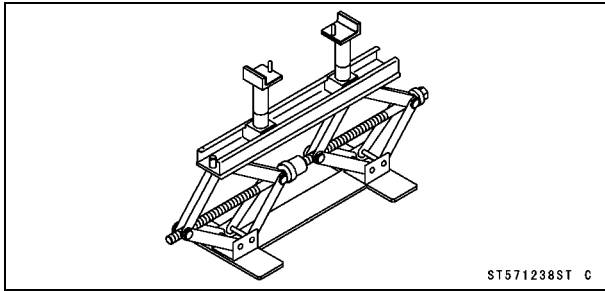
12-6 BRAKES

Specifications

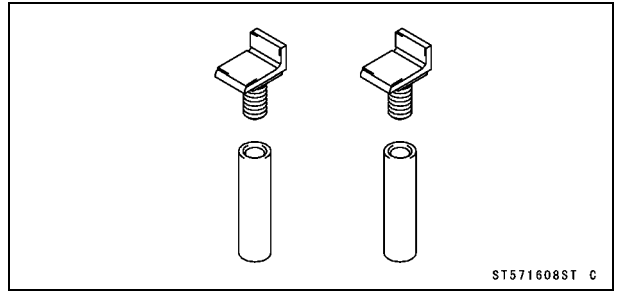
Item	Standard	Service Limit
Brake Lever Lever Free Play	Adjustable (to suit rider)	— — —
Brake Fluid Grade: Front Rear	DOT3 or DOT4 DOT3 or DOT4	— — — — — —
Brake Pads Lining Thickness: Front Rear	4.0 mm (0.16 in.) 6.4 mm (0.25 in.)	1 mm (0.04 in.) 1 mm (0.04 in.)
Brake Discs Thickness: Front Rear Runout	2.85 ~ 3.15 mm (0.112 ~ 0.124 in.) 3.85 ~ 4.15 mm (0.152 ~ 0.163 in.) TIR 0.25 mm (0.010 in.) or less	2.5 mm (0.10 in.) 3.5 mm (0.14 in.) TIR 0.3 mm (0.01 in.)

Special Tools

Jack:
57001-1238



Jack Attachment:
57001-1608



12-8 BRAKES

Brake Lever, Brake Pedal

Brake Lever Play Adjustment

- Refer to the Brake Lever and Pedal Adjustment in the Periodic Maintenance chapter.

Brake Pedal Position Adjustment

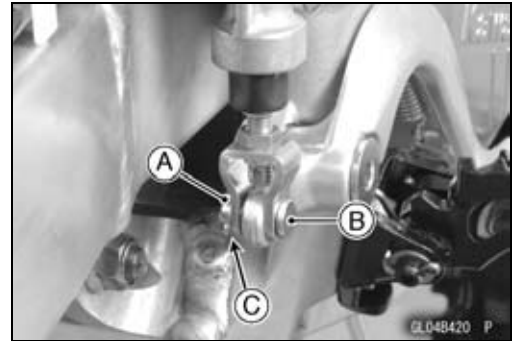
- Refer to the Brake Lever and Pedal Adjustment in the Periodic Maintenance chapter.

Brake Pedal Removal

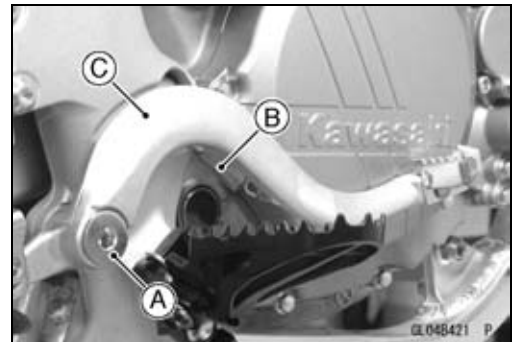
- Remove:
 - Cotter Pin [A]
 - Joint Pin [B]
 - Washer [C]

NOTE

- Pull off the joint pin while pressing down the brake pedal.

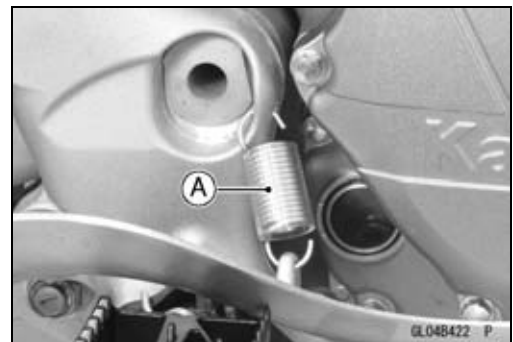


- Remove:
 - Brake Pedal Bolt [A]
 - Brake Pedal Return Spring [B]
 - Brake Pedal [C] and Washer



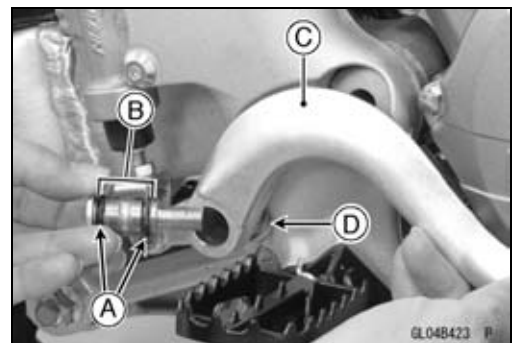
Brake Pedal Installation

- Install the return spring [A].



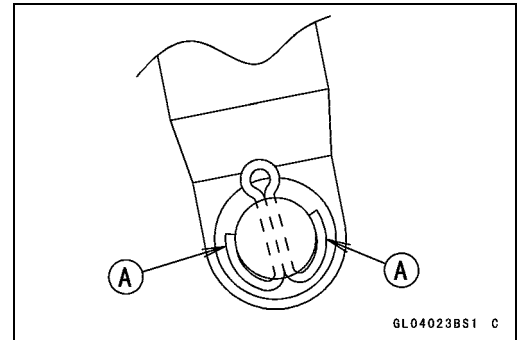
- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings and shaft portion [B] of the brake pedal bolt.
- Apply a non-permanent locking agent to the thread of the brake pedal bolt.
- Install the brake pedal [C].
- Install the washer [D] inside the pedal.
- Tighten:

Torque - Brake Pedal Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)



Brake Lever, Brake Pedal

- Replace the cotter pin with a new one.
- Install the joint pin, washer and new cotter pin.
- Bend the ends [A] of the cotter pin.
- Check the brake pedal position (see Brake Lever and Pedal Adjustment in the Periodic Maintenance chapter).



12-10 BRAKES

Brake Fluid

WARNING

When working with the disc brake, observe the precautions listed below.

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE.**

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 Fluid

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.

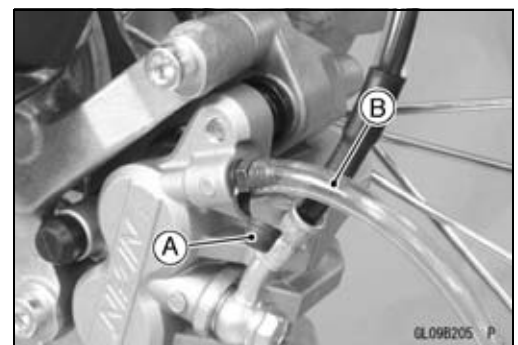
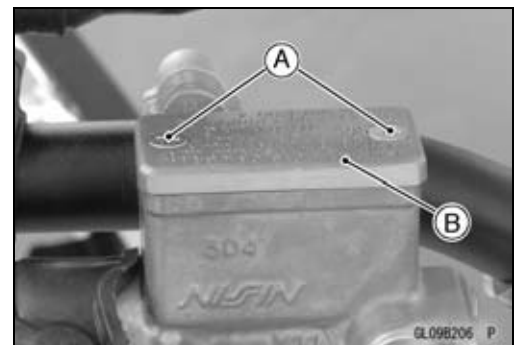
⚠ WARNING

Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If the brake lever 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.*

- Level the brake fluid reservoir.
- Remove:
 - Screws [A]
 - Reservoir Cap [B]
 - Diaphragm
- Check that there is plenty of fluid in the reservoir.
- Slowly pump the brake lever several times until no air bubbles rise up from 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 on the caliper, and run the other end of the hose into a container.



12-12 BRAKES

Brake Fluid

- Bleed the brake line and caliper as follows:
- Repeat this operation until no more air can be seen coming out into the clear plastic hose.
- 1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
- 2. Quickly open and close [B] the bleed valve while holding the brake applied.
- 3. Release the brake [C].

NOTE

- The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs almost out any time during bleeding operation, the bleeding operation must be done over again from the beginning since air will have entered the line.
- Tap the brake hose lightly from the caliper to the reservoir for easier bleeding.

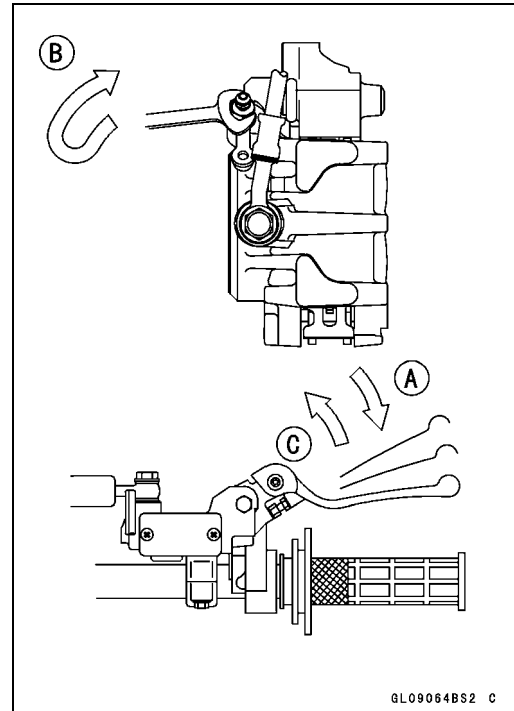
- Remove the clear plastic hose.
- Tighten the bleed valve, and install the rubber cap.

Torque - Caliper Bleed Valve: 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.
- Tighten:

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

- After bleeding is done, 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 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.

Caliper

Caliper Removal

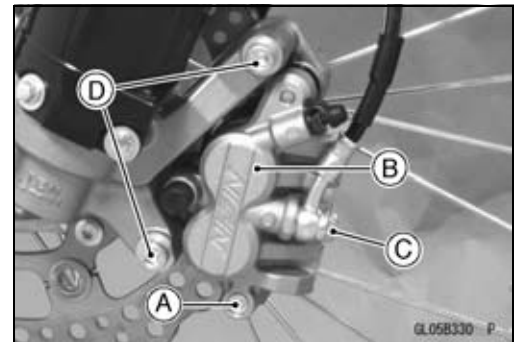
Front Brake

- Loosen the brake pad pin [A] before the caliper [B] removal if the caliper is to be disassembled.
- Loosen the banjo bolt [C] so as not to spill brake fluid.

NOTE

○ If the caliper is to be disassembled after removal and compressed air is not available, disassemble the caliper before brake hose removal (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).

- Remove:
 - Caliper Mounting Bolts [D]
 - Banjo Bolt
 - Caliper

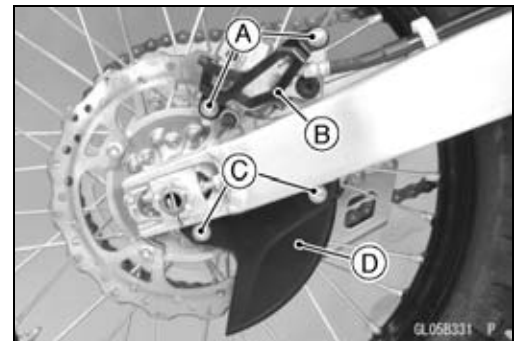


NOTICE

Immediately wipe up any brake fluid that is spilled.

Rear Brake

- Remove:
 - Caliper Guard Bolts [A]
 - Caliper Guard [B]
 - Disc Guard Bolts [C]
 - Disc Guard [D]

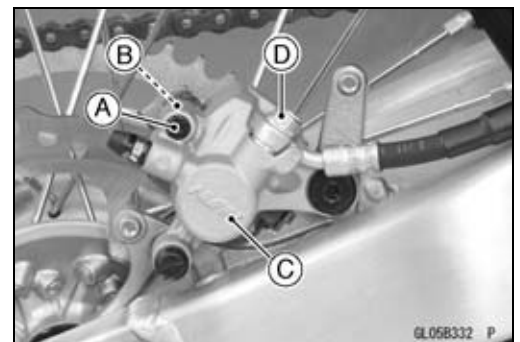


- Remove the pad pin plug [A] and loosen the pad pin [B] if the caliper [C] is to be disassembled.
- Loosen the banjo bolt [D] so as not to spill brake fluid.

NOTE

○ If the caliper is to be disassembled after removal and compressed air is not available, disassemble the caliper before brake hose removal (see Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).

- Remove:
 - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
 - Banjo Bolt
 - Caliper



NOTICE

Immediately wipe up any brake fluid that is spilled.

12-14 BRAKES

Caliper

Caliper Installation

- Install the brake pad if it was removed (see Brake Pad Installation).

Front Brake

- Install the caliper and tighten the bolts.

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

Rear Brake

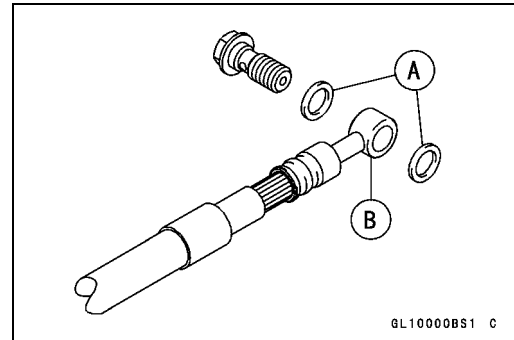
- Install the rear wheel and caliper (see Rear Wheel Installation in the Wheels/Tires chapter).

- Install the brake hose lower end.

○ Replace the washers [A] on each side of hose fitting [B] with new ones.

- Tighten:

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



- Install the removed parts (see appropriate chapters).
- 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.

Caliper Disassembly

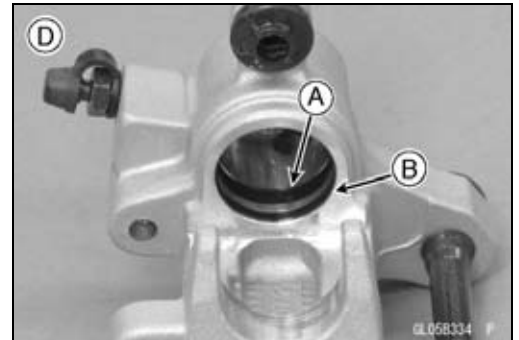
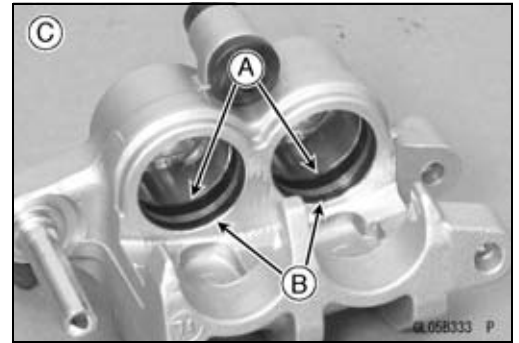
- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

Caliper

Fluid Seal Damage Inspection

The fluid seal(s) [A] around the piston maintains the proper pad/disc clearance. If this seal is not in good condition, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

- Replace the fluid seals under any of the following conditions.
 - Fluid leakage around the pad
 - Brakes overheat
 - There is a large difference in left and right pad wear.
 - The seal is stuck to the piston.
- ★ If the fluid seal(s) is replaced, replace the dust seal(s) [B] as well. Also, replace all seals every other time the pads are changed.
 - Front Caliper [C]
 - Rear Caliper [D]

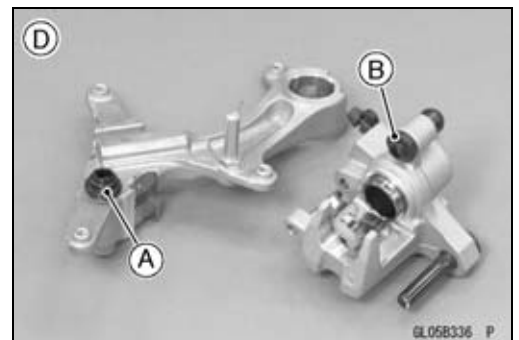
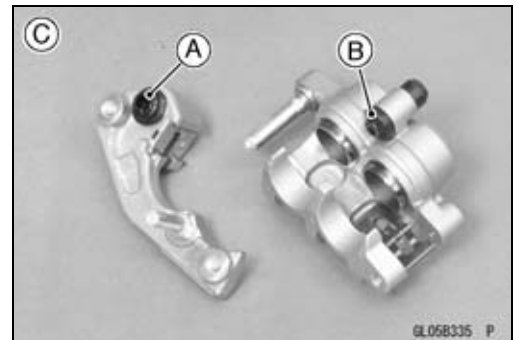


Dust Seal Damage Inspection

- Check that the dust seals are not cracked, worn, swollen, or otherwise damaged.
- ★ If they show any damage, replace them.

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]

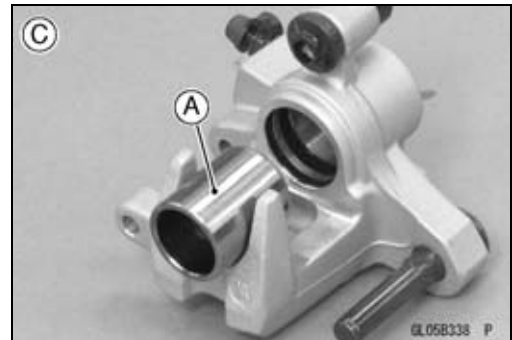


12-16 BRAKES

Caliper

Caliper Piston and Cylinder Damage Inspection

- Visually inspect the piston(s) [A] and cylinder surfaces.
- ★ Replace the caliper if the cylinder and piston are badly scored or rusty.
 - Front Caliper [B]
 - Rear Caliper [C]



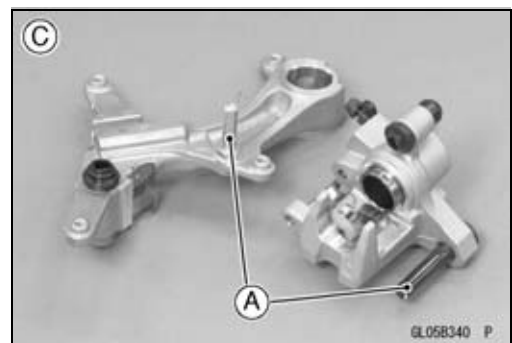
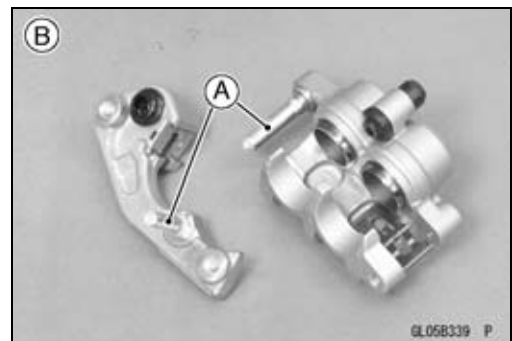
Caliper Holder Shaft Wear Inspection

The caliper body must slide smoothly on the caliper holder shafts [A]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

- Check to see that the caliper holder shafts are not badly worn or stepped, and that the friction boots are not damaged.
- ★ If the friction boot is damaged, replace the friction boot. To replace the friction boot, remove the pads and caliper bracket.
- ★ If the caliper holder shaft is damaged, replace the caliper assembly (front caliper), caliper bracket or holder shaft (rear caliper).

Torque - Rear Caliper Holder Shaft: 27 N·m (2.8 kgf·m, 20 ft·lb)

- Front Caliper [B]
- Rear Caliper [C]

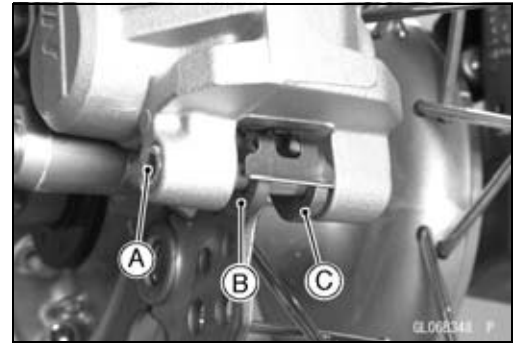


Brake Pad

Brake Pad Removal

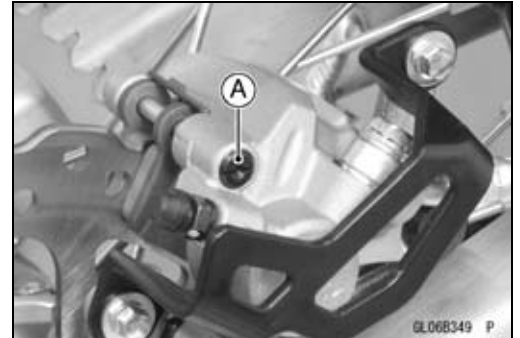
Front Brake

- Remove the pad pin [A].
- Remove the piston side pad [B].
- Push the caliper holder toward the piston, and then remove another pad [C].

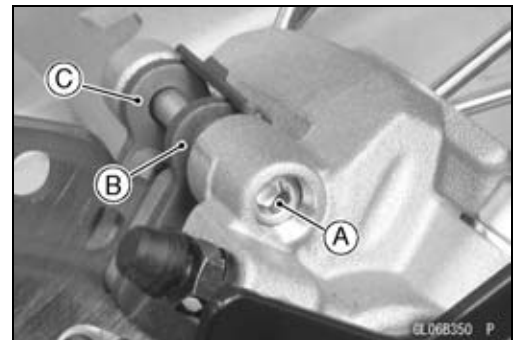


Rear Brake

- Remove:
 - Pad Pin Plug [A]

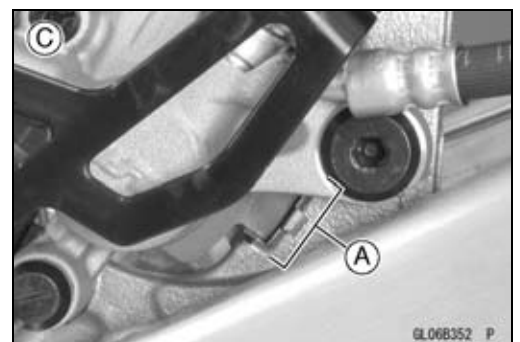
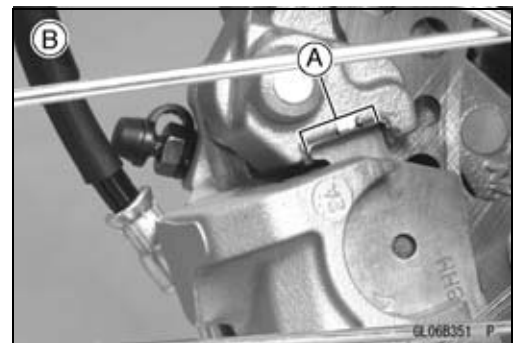


- Remove the pad pin [A].
- Remove the piston side pad [B].
- Push the caliper holder toward the piston, and then remove another pad [C].



Brake Pad Installation

- Push the caliper piston(s) in by hand as far as they will go.
- Install the piston side pad first, and then another pad.
- Fit the pad end into the groove [A] of the anti-rattle spring securely.
 - Front Brake [B]
 - Rear Brake [C]



12-18 BRAKES

Brake Pad

- Tighten the brake pad pin.
 - Torque - Brake Pad Pin: 17 N·m (1.7 kgf·m, 13 ft·lb)
 - Rear Brake Pad Pin Plug: 2.4 N·m (0.24 kgf·m, 21 in·lb)
- 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.

Brake Pad Inspection

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

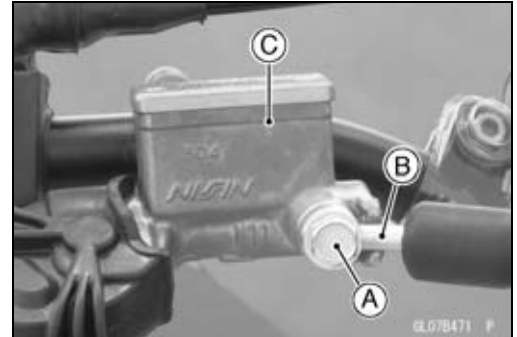
Master Cylinder

NOTICE

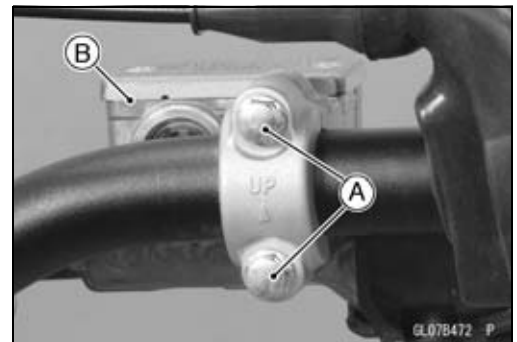
Brake fluid quickly ruins painted or plastic surfaces; any spilled fluid should be completely washed up immediately.

Front Master Cylinder Removal

- Remove the banjo bolt [A] to disconnect the brake hose upper end [B] from the master cylinder [C].
- When removing the brake hose, temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.

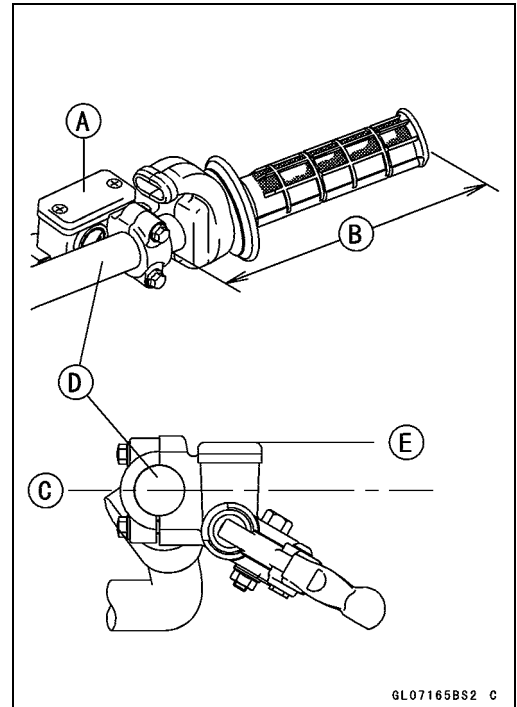


- Remove the clamp bolts [A], and take off the master cylinder [B] as an assembly with the brake lever.



Front Master Cylinder Installation

- Install the master cylinder [A].
 - 176.95 mm (6.967 in.) [B]
 - Horizontal Line of Frame [C]
 - Handlebars [D]
 - Horizontal Line of Cap Surface [E]

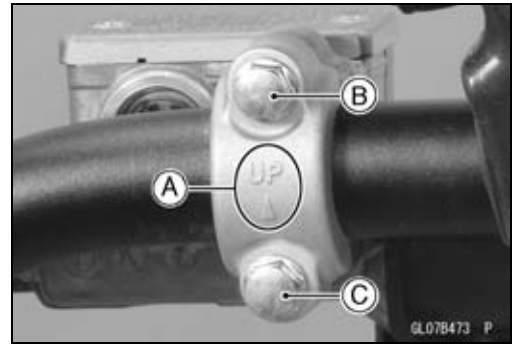


12-20 BRAKES

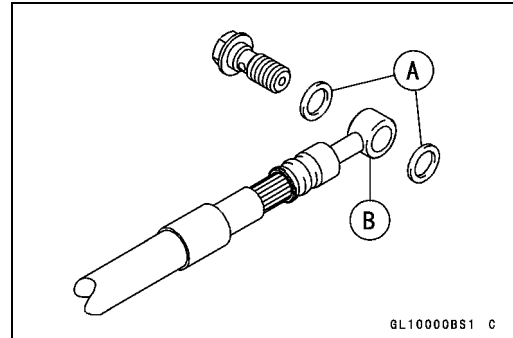
Master Cylinder

- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C].
- There will be a gap at the lower mating surface of the clamp after tightening.

Torque - Front Master Cylinder Clamp Bolts: 8.8 N-m (0.90 kgf-m, 78 in-lb)



- Install the brake hose.
- Replace the washers [A] on each side of hose fitting [B] with new ones.
- Tighten:
 - 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.



⚠ 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.

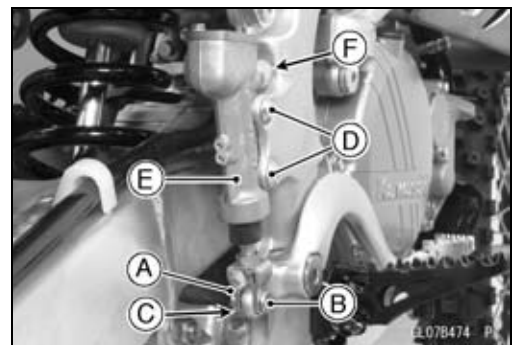
Rear Master Cylinder Removal

- Remove:
 - Cotter Pin [A]
 - Joint Pin [B]
 - Washer [C]

NOTE

○ Pull off the joint pin while pressing down the brake pedal.

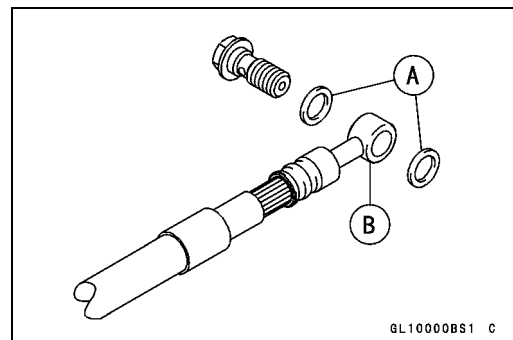
- Remove the master cylinder mounting bolts [D], and remove the master cylinder [E] backward.
- Remove the brake hose banjo bolt [F].
- When removing the brake hose, temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.



Rear Master Cylinder Installation

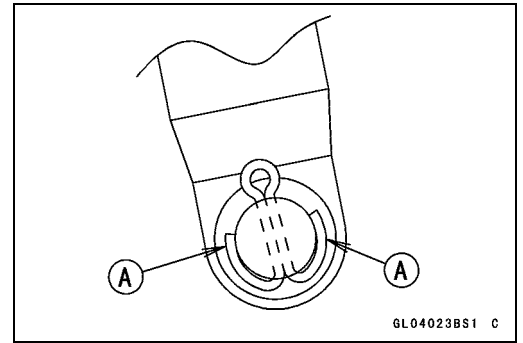
- Install the brake hose.
- Replace the washers [A] on each side of hose fitting [B] with new ones.
- Tighten:
 - Torque - Brake Hose Banjo Bolt: 25 N-m (2.5 kgf-m, 18 ft-lb)**
- Install the rear master cylinder.
- Tighten:

Torque - Rear Master Cylinder Mounting Bolts: 9.8 N-m (1.0 kgf-m, 87 in-lb)



Master Cylinder

- Replace the cotter pin with a new one.
- Install the joint pin, washer and new cotter pin.
- Bend the ends [A] of the cotter pin.



- Check the brake pedal position (see Brake Lever and Pedal Adjustment in the Periodic Maintenance chapter).
- 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 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.

Front Master Cylinder Disassembly

- Refer to the Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Rear Master Cylinder Disassembly

- Refer to the Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

Master Cylinder Assembly

- Refer to the Brake Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

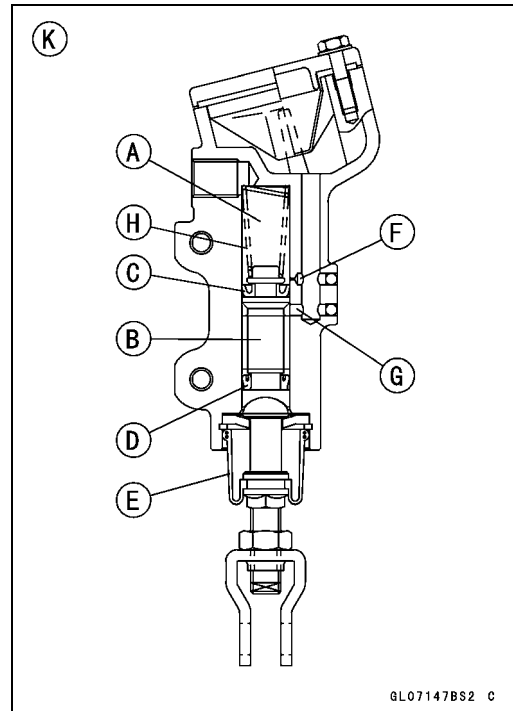
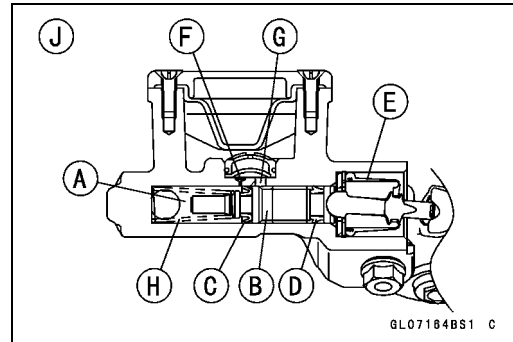
12-22 BRAKES

Master Cylinder

Master Cylinder Inspection (Visual Inspection)

- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall of each master cylinder [A] and on the outside of each piston [B].
- ★ If a master cylinder or piston shows any damage, replace them.
- Inspect the primary [C] and secondary [D] cups.
- ★ If a cup is worn, damaged, softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.
- ★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cup.
- Check the dust covers [E] for damage.
- ★ If they are damaged, replace them.
- Check that the relief [F] and supply [G] ports are not plugged.
- ★ If the small relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.
- Check the piston return springs [H] for any damage.
- ★ If a spring is damaged, replace it.

Front Master Cylinder [J]
Rear Master Cylinder [K]



Brake Disc

Brake Disc Removal

- Remove the wheels (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Remove the mounting bolts, and take off the disc.

Brake Disc Installation

- Install the brake disc on the wheel so that the marked side [A] faces out.
- Apply a non-permanent locking agent to the threads of the brake disc mounting bolts [B].
- Tighten:

Torque - Front Brake Disc Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

Rear Brake Disc Mounting Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)

Brake Disc Inspection

- Visually inspect the disc [A].
- ★ If it is scratched or damaged, replace the disc.
- Measure the thickness of each disc at the point [B] where it has worn the most.

Disc Thickness

Standard:

Front 2.85 ~ 3.15 mm (0.112 ~ 0.124 in.)

Rear 3.85 ~ 4.15 mm (0.152 ~ 0.163 in.)

Service Limit:

Front 2.5 mm (0.10 in.)

Rear 3.5 mm (0.14 in.)

- ★ Replace the disc if it has worn past the service limit.

- Place a jack under the motorcycle so that the front/rear wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

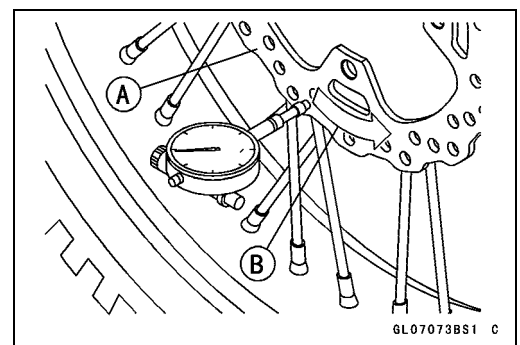
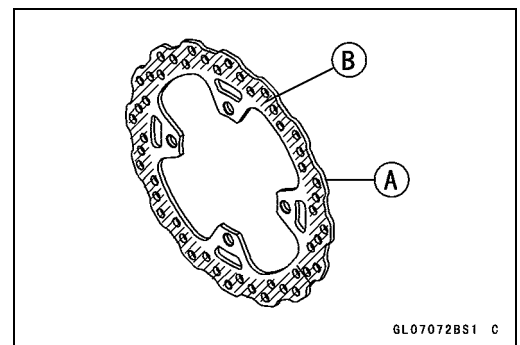
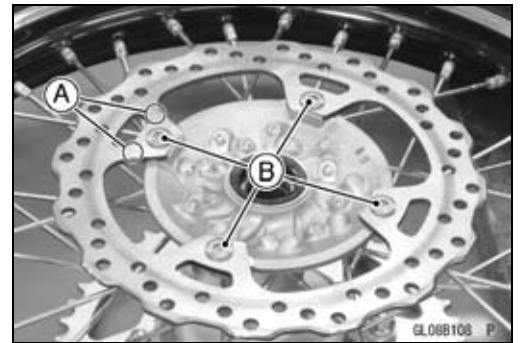
- Set up a dial gauge against the disc [A].
- For the front disc, turn the handlebars fully to one side.
- Measure the disc runout while rotating [B] the wheel slowly.

Disc Runout

Standard: TIR 0.25 mm (0.010 in.) or less

Service Limit: TIR 0.3 mm (0.01 in.)

- ★ If the runout exceeds the service limit, replace the disc.



12-24 BRAKES

Brake Hose

Brake Hose Removal/Installation

- Refer to the Brake Hose Replacement in the Periodic Maintenance chapter.

Brake Hose Inspection

- Refer to the Brake Hoses and Connections Inspection in the Periodic Maintenance chapter.

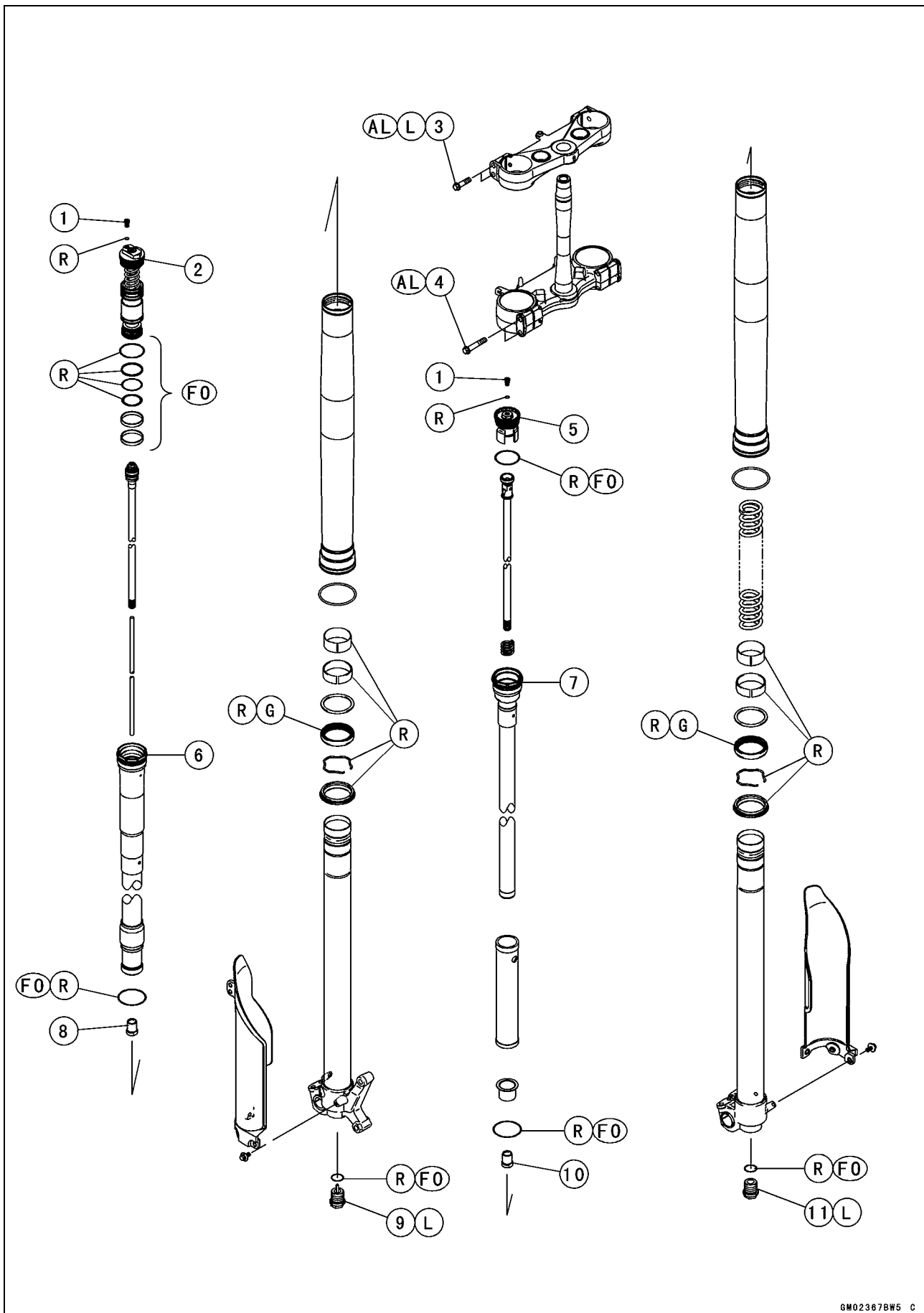
Suspension

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13-2 SUSPENSION

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Air Pressure Relief Screws	1.3	0.13	12 in-lb	
2	Left Front Fork Base Valve Assembly	30	3.1	22	
3	Front Fork Clamp Bolts (Upper)	20	2.0	15	AL, L
4	Front Fork Clamp Bolts (Lower)	22	2.2	16	AL
5	Right Front Fork Spring Preload Adjuster	30	3.1	22	
6	Left Front Fork Cylinder Unit	34	3.5	25	
7	Right Front Fork Spring Adjuster Unit	34	3.5	25	
8	Left Front Fork Adjuster Assembly Locknut	22	2.2	16	
9	Left Front Fork Adjuster Assembly	69	7.0	51	L
10	Right Front Fork Bottom Plug Locknut	22	2.2	16	
11	Right Front Fork Bottom Plug	69	7.0	51	L

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

FO: Apply front fork oil.

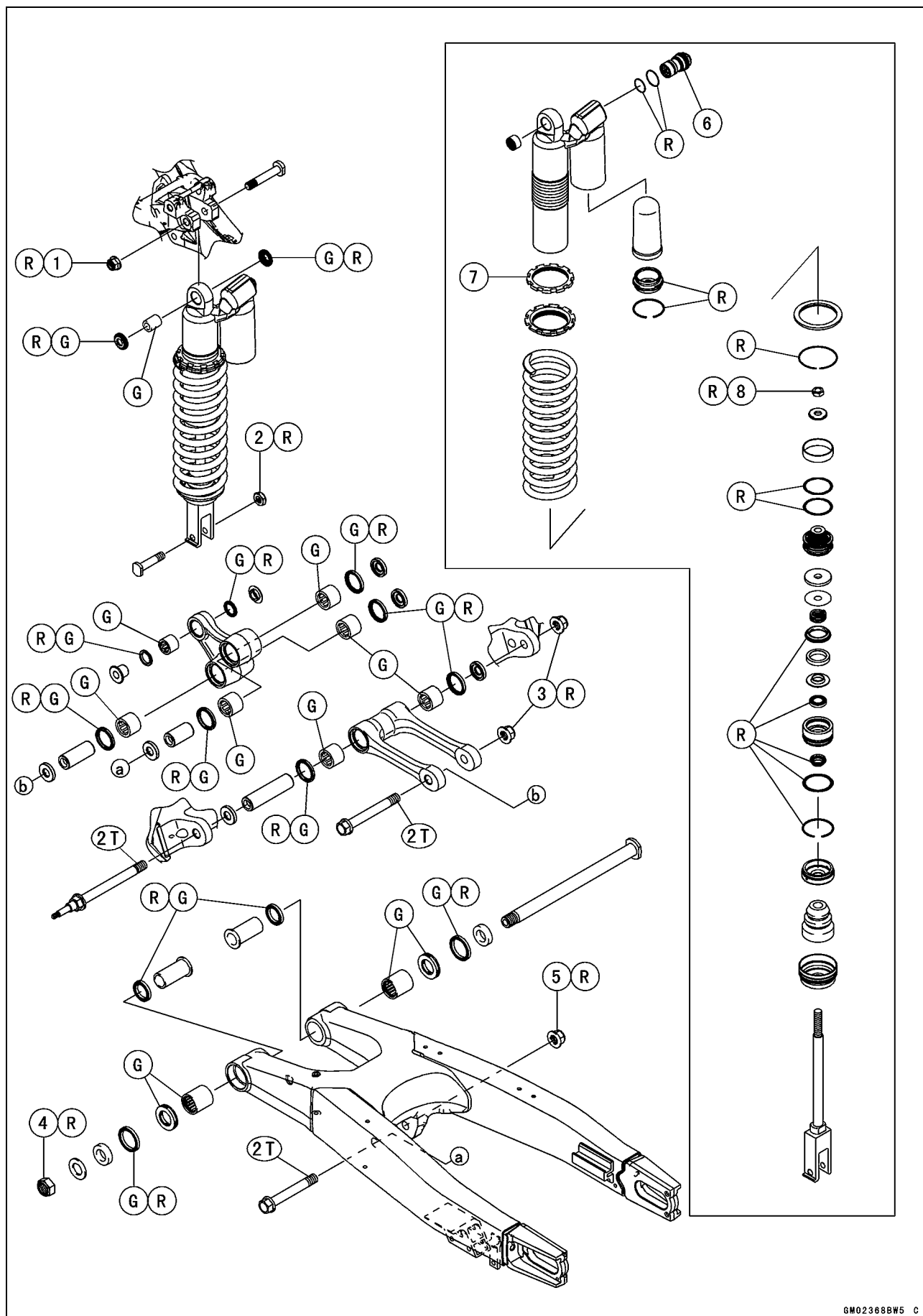
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

13-4 SUSPENSION

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Shock Absorber Mounting Nut (Upper)	39	4.0	29	R
2	Rear Shock Absorber Mounting Nut (Lower)	34	3.5	25	R
3	Tie-Rod Mounting Nuts	59	6.0	44	R
4	Swingarm Pivot Shaft Nut	98	10.0	72	R
5	Rocker Arm Pivot Nut	59	6.0	44	R
6	Gas Reservoir Damping Adjuster Assembly	29.5	3.01	21.8	
7	Rear Shock Absorber Spring Locknut	45	4.6	33	
8	Piston Rod Locknut	37	3.8	27	R

G: Apply grease.

R: Replacement Parts

2T: Apply 2-stroke oil.

13-6 SUSPENSION

Specifications

Item	Standard	Service Limit
Front Fork		
Air Pressure	Atmospheric pressure	— — —
Rebound Damping Adjustment (Left Fork only) (from the seated position adjuster turned fully clockwise)	10 clicks counterclockwise (EUR, BR) 12 clicks counterclockwise	(Adjustable Range) 20 ±4 clicks
Compression Damping Adjustment (Left Fork only) (from the seated position adjuster turned fully clockwise)	8 clicks counterclockwise (EUR, BR) 10 clicks counterclockwise	(Adjustable Range) 22 ±6 clicks
Spring Preload Adjustment (Right Fork only) (from the seated position adjuster turned fully counterclockwise)	15 clicks clockwise (EUR, BR) 7 clicks clockwise	(Adjustable Range) 40 ±6 clicks
Fork Oil:		
Type	SHOWA SS-19 or equivalent	— — —
Capacity (Left Front Fork):		
Cylinder Unit	330 mL (11.16 US oz.)	— — —
Cylinder Unit Oil Level	115 ~ 123 mm (4.53 ~ 4.84 in.)	— — —
Outer Tube	320 ±2.5 mL (10.82 ±0.085 US oz.) (EUR, BR) 300 ±2.5 mL (10.14 ±0.085 US oz.)	(Adjustable Range) 300 ~ 340 mL (10.14 ~ 11.50 US oz.)
Capacity (Right Front Fork)	235 ±2.5 mL (7.95 ±0.085 US oz.)	(Adjustable Range) 230 ~ 378 mL (7.78 ~ 12.78 US oz.)
Fork Spring Free Length (Right Fork only)	660 mm (26.0 in.)	647 mm (25.5 in.)
Rear Suspension (Uni-Trak):		
Rear Shock Absorber		
Rebound Damping Adjustment (from the seated position adjuster turned fully clockwise)	12 clicks counterclockwise	(Adjustable Range) 22 ±5 clicks
Spring Preload Adjustment (Lower surface of the adjusting nut from the center of the upper mounting hole)	127.2 mm (5.01 in.)	(Adjustable Range) 125.8 ~ 139.5 mm (4.95 ~ 5.49 in.)
Rear Shock Spring Free Length	265 mm (10.4 in.)	260 mm (10.2 in.)
Rear Shock Oil:		
Type	SHOWA SS-25 or equivalent	— — —
Capacity	approx. 380 mL (12.8 US oz.)	— — —
Gas Reservoir		
High Speed Compression Damping Adjustment (from the seated position adjuster turned fully clockwise)	2 turns out	(Adjustable Range) 4 ±1/2 turns out

Specifications

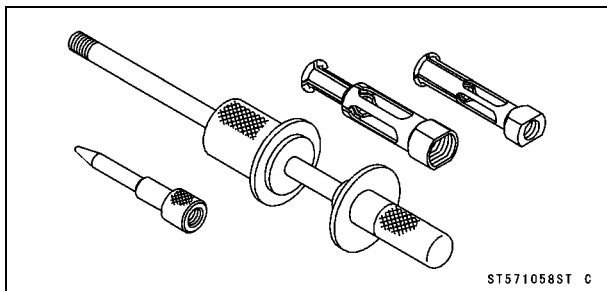
Item	Standard	Service Limit
Low Speed Compression Damping Adjustment (from the seated position adjuster turned fully clockwise)	12 clicks counterclockwise	(Adjustable Range) 19 ±6 clicks
Gas Pressure	980 kPa (10.0 kgf/cm ² , 142 psi)	- - -
Tie-Rod, Rocker Arm		
Sleeve Outside Diameter:		
Tie-Rod	19.987 ~ 20.000 mm (0.78689 ~ 0.78740 in.)	19.85 mm (0.7815 in.)
Rocker Arm:		
Large	19.987 ~ 20.000 mm (0.78689 ~ 0.78740 in.)	19.85 mm (0.7815 in.)
Small	15.950 ~ 16.000 mm (0.62795 ~ 0.62992 in.)	15.92 mm (0.6268 in.)
Rocker Arm Mounting Bolt Runout	TIR 0.1 mm (0.004 in.) or less	TIR 0.2 mm (0.008 in.)

13-8 SUSPENSION

Special Tools

Oil Seal & Bearing Remover:

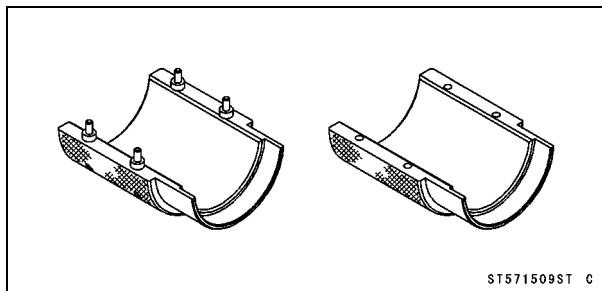
57001-1058



ST571058ST C

Fork Oil Seal Driver, ϕ 48:

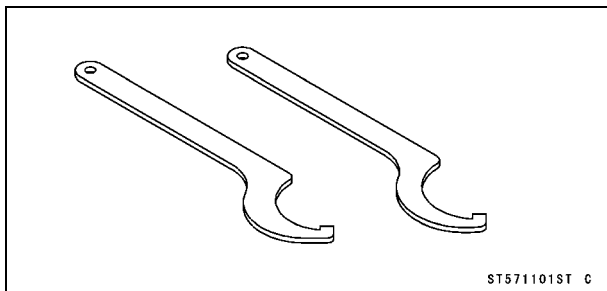
57001-1509



ST571509ST C

Hook Wrench R37.5, R42:

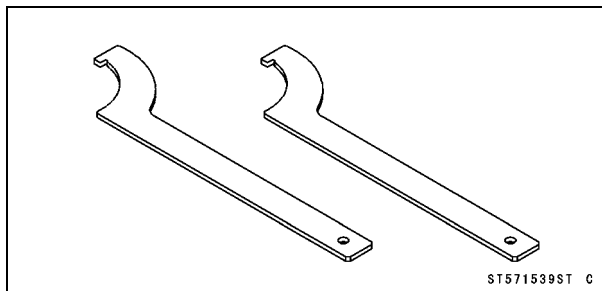
57001-1101



ST571101ST C

Hook Wrench T=3.2 R37:

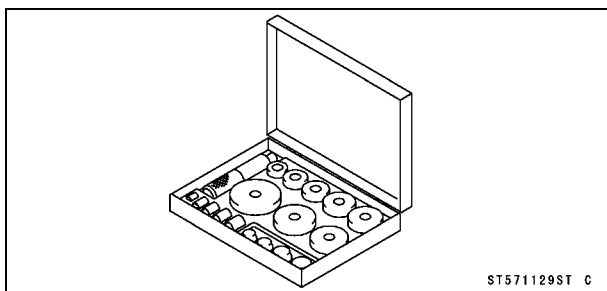
57001-1539



ST571539ST C

Bearing Driver Set:

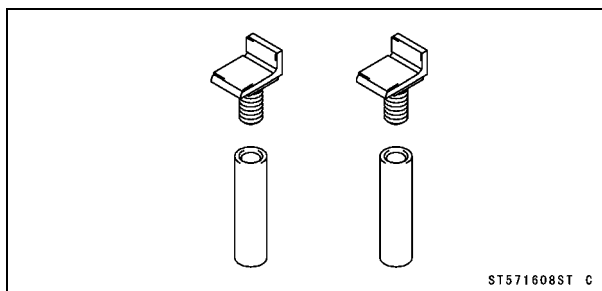
57001-1129



ST571129ST C

Jack Attachment:

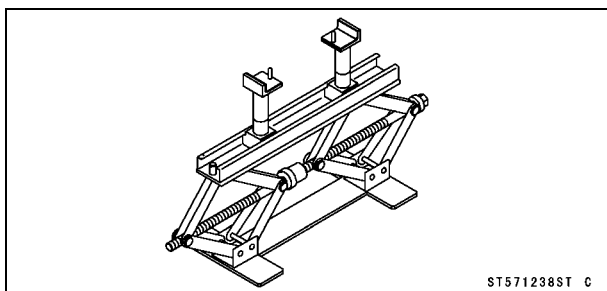
57001-1608



ST571608ST C

Jack:

57001-1238



ST571238ST C

Front Fork

Air Pressure

The standard air pressure in the front fork legs is atmospheric pressure. Air pressure in the fork legs increase with normal use, so the fork action stiffens during operation. Release air pressure prior to each race through the air pressure relief screw.

- Place the jack under the frame so that the front wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Remove the screws [A] on the base valve assembly (left front fork) [B] and spring preload adjuster (right front fork) [C] to let the air pressure equalize.

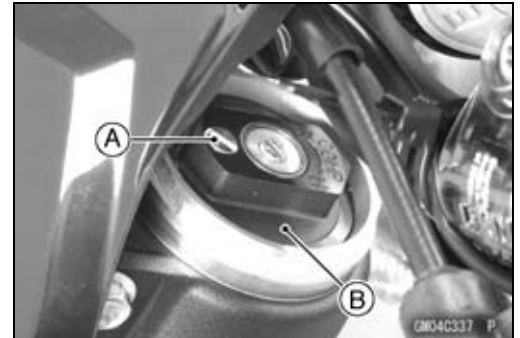
NOTE

○ Do not use the sidestand when adjusting the air pressure.

○ Adjust the air pressure when the front forks are cold.

- Replace the O-rings with new ones.
- Tighten:

Torque - Air Pressure Relief Screws: 1.3 N·m (0.13 kgf·m, 12 in·lb)



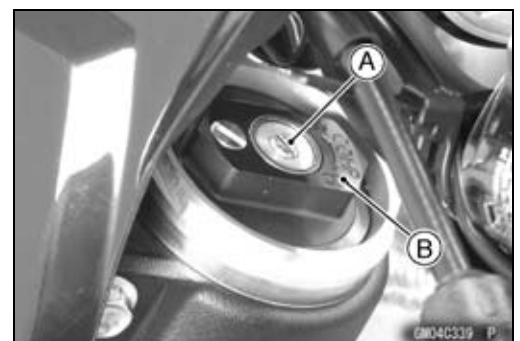
Compression Damping Adjustment (Left Fork only)

- Place the jack under the frame so that the front wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Turn the adjuster [A] on the left front fork base valve assembly [B] with a standard tip screwdriver until you feel a click. Adjust the compression damping to suit your preference under special condition.



NOTICE

Do not force the compression damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.

13-10 SUSPENSION

Front Fork

Seated position [A]: adjuster turned fully clockwise.

Compression Damping Adjuster Setting

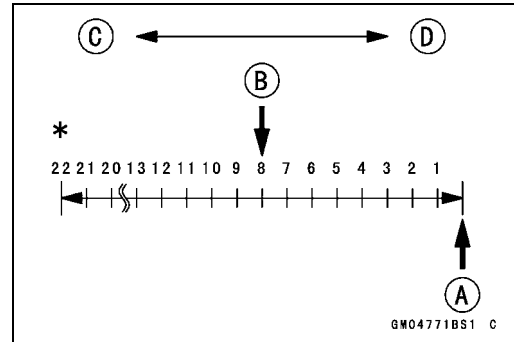
Standard: 8 clicks [B]

(EUR, BR) 10 clicks counterclockwise

Softer (Counterclockwise) [C]

Harder (Clockwise) [D]

*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.



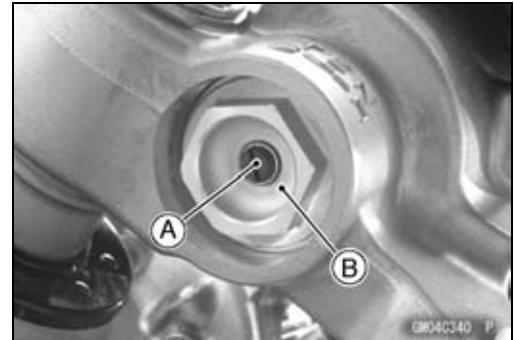
Rebound Damping Adjustment (Left Fork only)

- Place the jack under the frame so that the front wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Turn the adjuster [A] on the left front fork cylinder valve [B] with a standard tip screwdriver until you feel a click. Adjust the rebound damping to suit your preference under special condition.



NOTICE

Do not force the rebound damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.

Seated position [A]: adjuster turned fully clockwise.

Rebound Damping Adjuster Setting

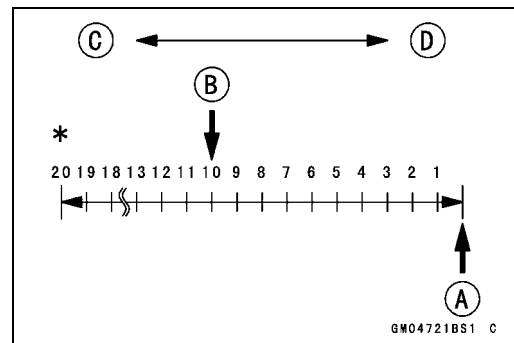
Standard: 10 clicks [B]

(EUR, BR) 12 clicks counterclockwise

Softer (Counterclockwise) [C]

Harder (Clockwise) [D]

*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.



Spring Preload Adjustment (Right Fork only)

- Place the jack under the frame so that the front wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Turn the adjuster [A] with the wrench until you feel a click. Adjust the spring preload to suit your preference under special condition.



NOTICE

Do not force the spring preload adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.

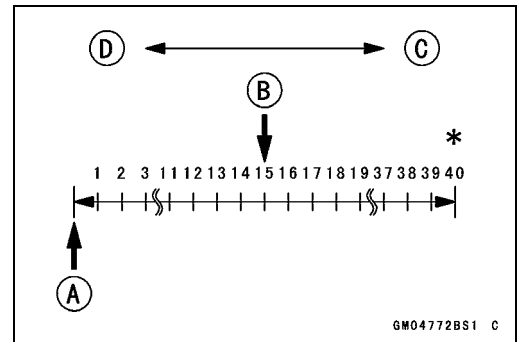
Front Fork

Seated position [A]: adjuster turned fully counterclockwise.

Spring Preload Adjuster Setting

- Standard: 15 clicks [B]
- (EUR, BR) 7 clicks clockwise
- Harder (Clockwise) [C]
- Softer (Counterclockwise) [D]

*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to spring preload, use it within the adjustable range.

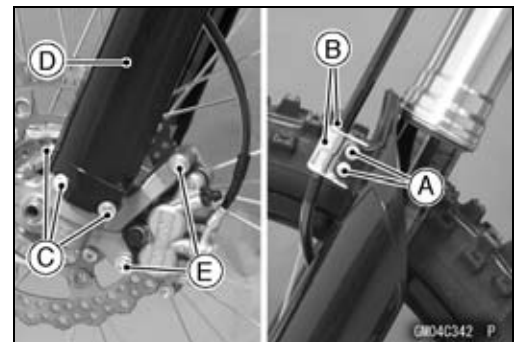


Oil Change

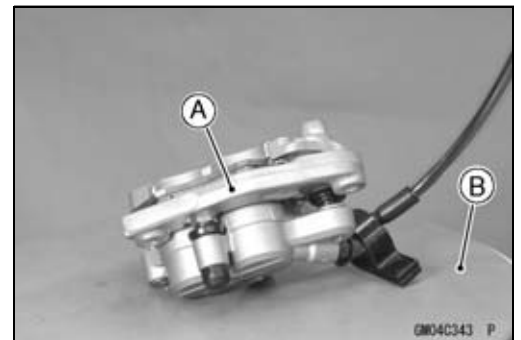
- Refer to the Front Fork Oil Change in the Periodic Maintenance chapter.

Front Fork Removal

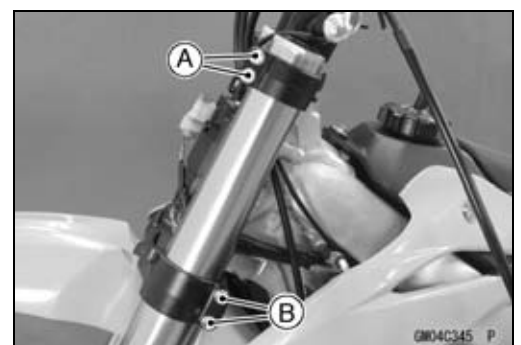
- Remove:
 - Number Plate (see Number Plate Removal in the Frame chapter)
 - Bolts [A] and Brake Hose Clamps [B]
 - Bolts [C] and Guard [D]
 - Front Caliper Mounting Bolts [E]
 - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)



- Put the caliper [A] on suitable stand [B] so that it does not dangle.



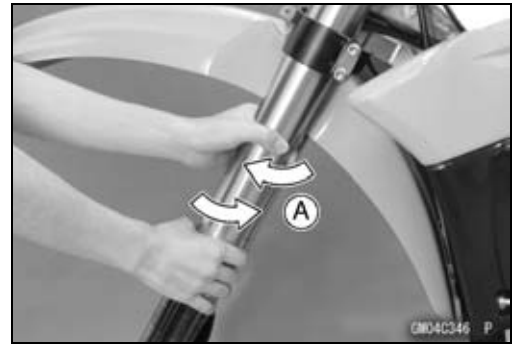
- Loosen the upper [A] and lower [B] front fork clamp bolts.



13-12 SUSPENSION

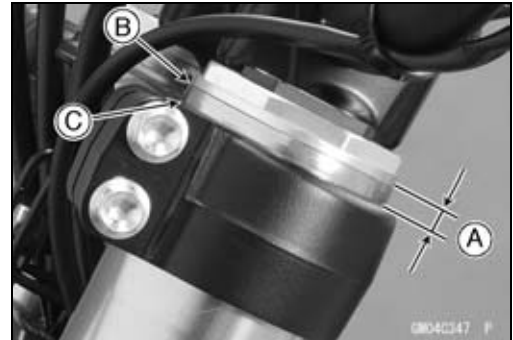
Front Fork

- Pull out the front fork downward with a twisting motion [A].

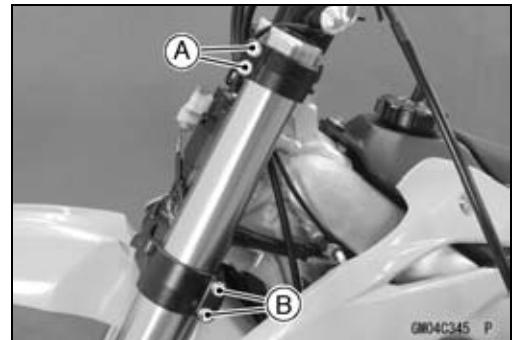


Front Fork Installation

- Install the front fork.
- The length [A] between the upper end [B] of the outer tube and steering stem head [C] is **5 mm (0.20 in.)**.



- Run the cables and hose according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Remove the front fork clamp bolts (upper) [A] and apply a non-permanent locking agent to the bolts.
- Tighten:
 - Torque - Front Fork Clamp Bolts (Upper): **20 N·m (2.0 kgf·m, 15 ft·lb)**
 - Front Fork Clamp Bolts (Lower) [B]: **22 N·m (2.2 kgf·m, 16 ft·lb)**



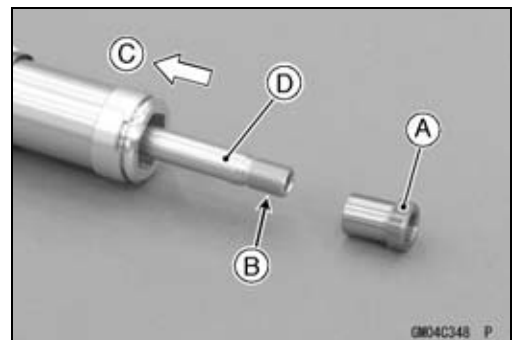
NOTE

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

- Install the removed parts (see appropriate chapters).

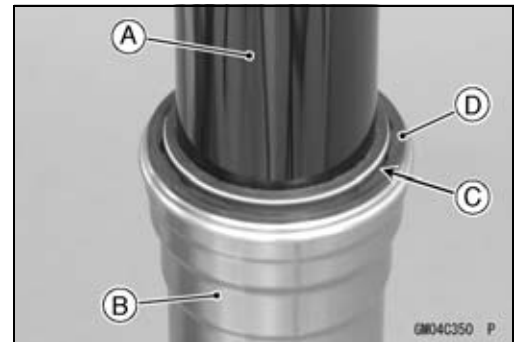
Front Fork Disassembly

- Drain the fork oil (see Front Fork Oil Change in the Periodic Maintenance chapter).
- Remove the locknut [A].
- Wrap the piston rod end [B] with a vinyl tape.
- Push out [C] the piston rod [D].

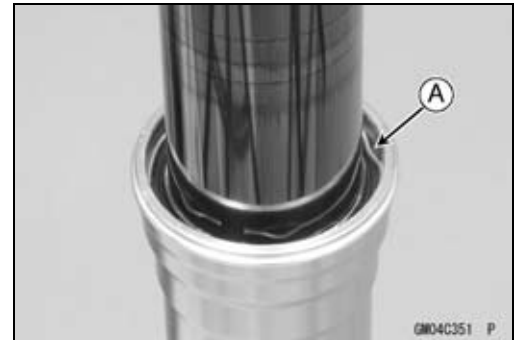


Front Fork

- Separate the inner tube [A] from the outer tube [B] as follows:
 - Slide up the spring band [C].
 - Slide up the dust seal [D].



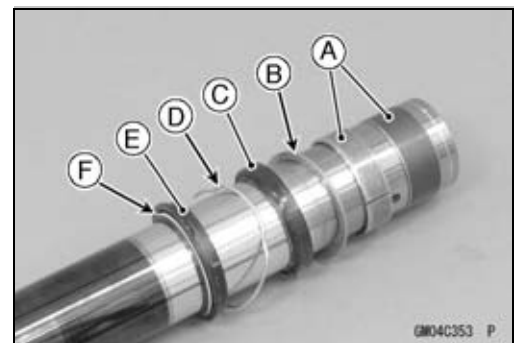
- Remove the retaining ring [A] from the outer tube.



- Grasp the tubes and stroke the inner tube up and down [A] several times. The shock to fork seal separates the inner tube from the outer tube.



- Remove:
 - Bushings [A]
 - Washer [B]
 - Oil Seal [C]
 - Retaining Ring [D]
 - Dust Seal [E]
 - Spring Band [F]
- Wipe off the oil from the removed parts.

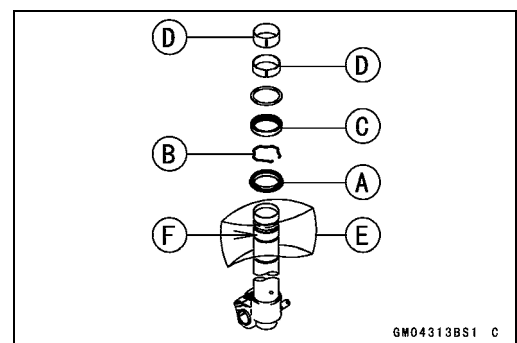


NOTE

○ Disassemble the right front fork in the same way.

Front Fork Assembly

- Replace the following parts with new ones:
 - Dust Seal [A] with Spring Band
 - Retaining Ring [B]
 - Oil Seal [C]
 - Bushings [D]
- Place an oil coated plastic bag [E] over the end of the inner tube to protect the oil seals.
- The inner tube bushings groove has a sharp edge [F] that cut out the sealing lip of the seals as they are pushed down over the inner tube.
- Apply grease to the oil seal.
- Install in order these parts on the inner tube.



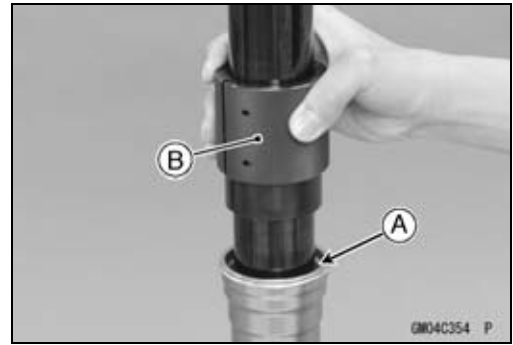
13-14 SUSPENSION

Front Fork

- When assembling the new outer tube bushings, washer and new oil seal [A], hold the oil seal against the new one, and tap the oil seal with the fork oil seal driver [B] until it stops.

Special Tool - Fork Oil Seal Driver, $\phi 48$: 57001-1509

- Install the retaining ring to the outer tube.
- Push the dust seal into the outer tube, and put the spring band on the dust seal.



- Insert the piston rod [A] into the fork cylinder [B].
 - Wrap the piston rod end with a vinyl tape.

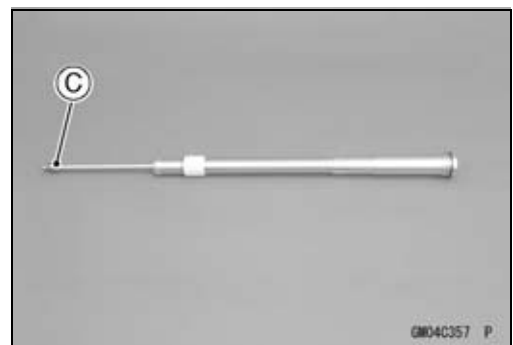
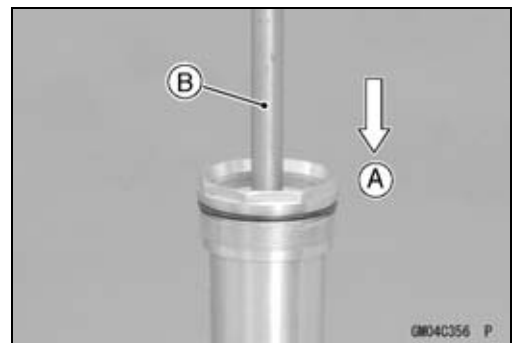


- Push in [A] the piston rod with a suitable tool [B].
- Remove a vinyl tape and install the locknut [C].

NOTE

○ Assemble the right front fork in the same way.

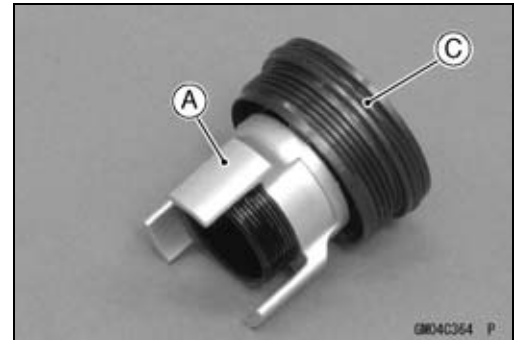
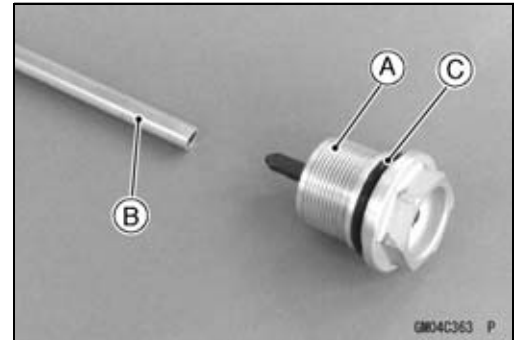
- Pour the fork oil (see Front Fork Oil Change in the Periodic Maintenance chapter).



Front Fork

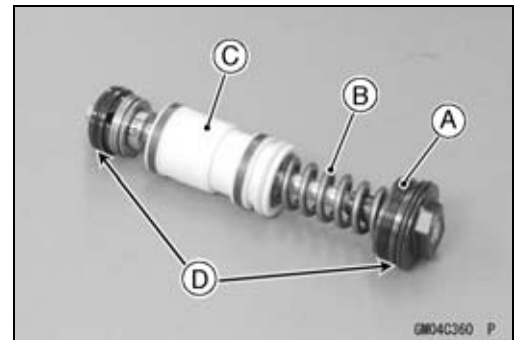
Adjuster Assembly Inspection

- Inspect the adjuster assembly [A] and push rod (left front fork only) [B] for damage.
- ★ If they are damaged, replace them with new ones.
- Replace the O-ring [C] on the adjuster assembly with a new one.



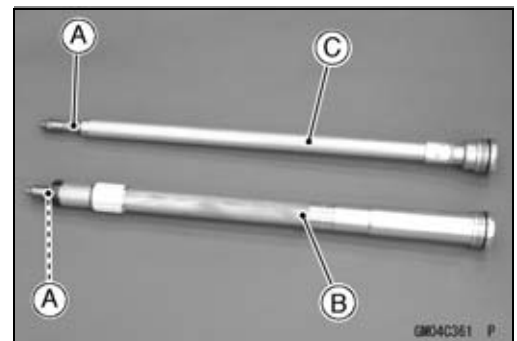
Base Valve Assembly Inspection

- Inspect the threads portion [A] and spring [B] of base valve assembly [C] for damage.
- ★ If they are damaged, replace the base valve assembly with a new one.
- Replace the O-rings [D] with new ones.



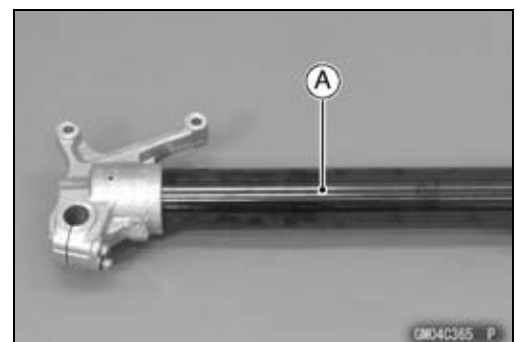
Cylinder Unit Inspection

- Inspect the piston rods [A] of the cylinder unit [B]/spring adjuster unit [C] for scratches or bending.
- ★ If it has scratches or is bent, replace the cylinder unit and/or spring adjuster unit with a new one.



Inner 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.

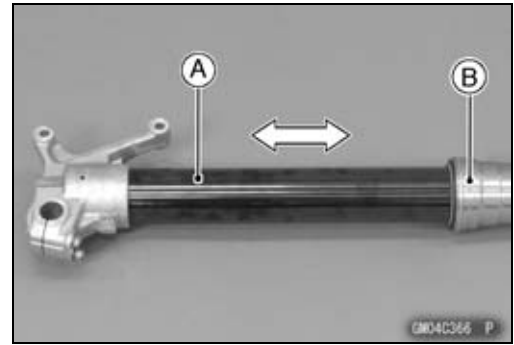
13-16 SUSPENSION

Front Fork

- Temporarily assemble the inner [A] and outer [B] tubes, and pump them back and forth manually to check for smooth operation.
- ★ If you feel binding or catching, the inner and outer tubes must be replaced.

⚠ WARNING

A straightened inner or outer fork tube 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 seal [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.

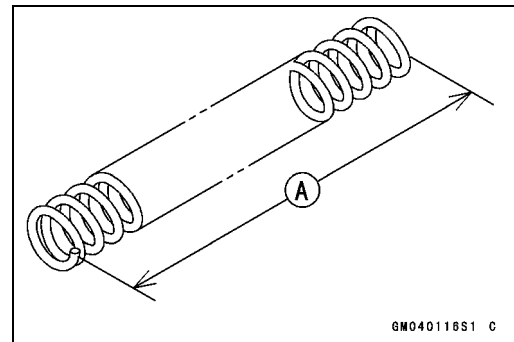


Front Fork Spring Tension Inspection (Right Fork only)

- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.
- ★ If the spring is shorter than the service limit, it must be replaced.

Fork Spring Free Length

Standard:	660 mm (26.0 in.)
Service Limit:	647 mm (25.5 in.)



Rear Shock Absorber

To suit to various riding conditions, the spring preload of the shock absorber can be adjusted or the spring can be replaced with an optional one. Also the damping force can be adjusted easily so changing oil viscosity unnecessary.

Rebound Damping Adjustment

- Turn the rebound damping adjuster [A] on the rear shock absorber lower end with a standard tip screwdriver until you feel a click.
- ★ If the damper setting feels too soft or too stiff, adjust it in accordance with the following table.

NOTICE

Do not force the rebound damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.

Seated position [A]: adjuster turned fully clockwise.

Rebound Damping Adjuster Setting

- Standard: 12 clicks [B] counterclockwise
- Softer (Counterclockwise) [C]
- Harder (Clockwise) [D]

*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.

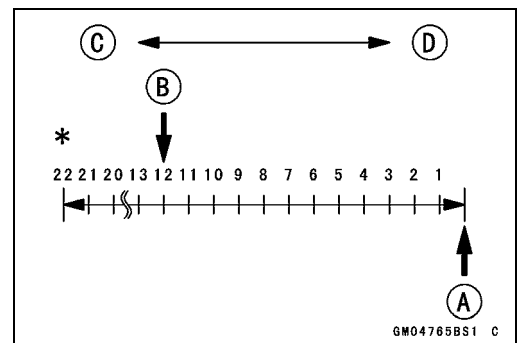
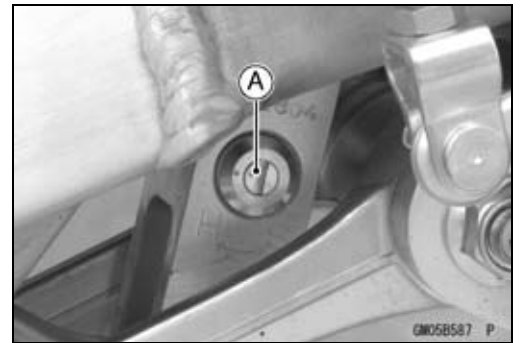
NOTE

○ Adjustment of the rebound damping adjuster for the rear suspension will slightly affect the compression damping force. Always make any damping adjustments in small steps and test their effects before using them in competition.

Compression Damping Adjustment

There are two adjustments you can make to the rear shock absorber gas reservoir.

- High Speed Compression Damping Adjuster [A]
- Low Speed Compression Damping Adjuster [B]



13-18 SUSPENSION

Rear Shock Absorber

- Adjust the high speed compression damping, turn the high speed compression damping adjuster with a wrench.
- ★ If the damping feels too soft or too stiff, adjust it in accordance with the following table.

NOTICE

Do not force the compression damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.

Seated position [A]: adjuster turned fully clockwise.

High Speed Compression Damping Adjuster Setting

Standard: 2 turns out [B]

Softer (Counterclockwise) [C]

Harder (Clockwise) [D]

*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.

- Adjust the low speed compression damping, turn the low speed compression damping adjuster with a standard tip screwdriver.

- ★ If the damping feels too soft or too stiff, adjust it in accordance with the following table.

NOTICE

Do not force the compression damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.

Seated position [A]: adjuster turned fully clockwise.

Low Speed Compression Damping Adjuster Setting

Standard: 12 clicks [B] counterclockwise

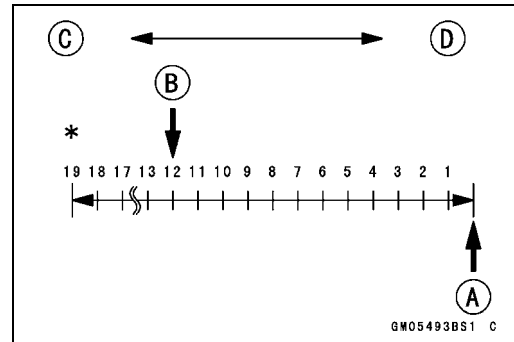
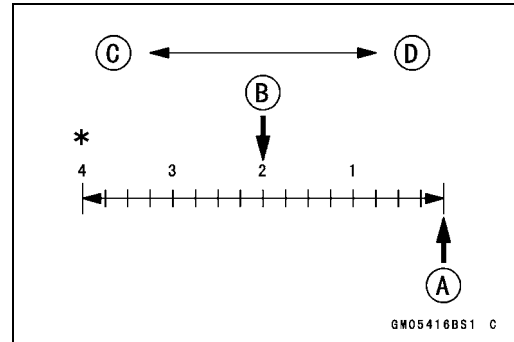
Softer (Counterclockwise) [C]

Harder (Clockwise) [D]

*: Although you can turn the adjuster beyond the adjustable range, effecting no changes to damping force, use it within the adjustable range.

NOTE

○ Adjustment of the compression damping adjusters for the rear suspension will slightly affect the rebound damping force. Always make any damping adjustments in small steps and test their effects before using them in competition.



Rear Shock Absorber

Spring Preload Adjustment

- Remove:
 - Seat (see Seat Removal in the Frame chapter)
 - Side Covers (see Side Cover Removal in the Frame chapter)
 - Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
 - Rear Frame (see Rear Frame Removal in the Frame chapter)
- Place the jack under the frame so that the rear wheel is raised off the ground.

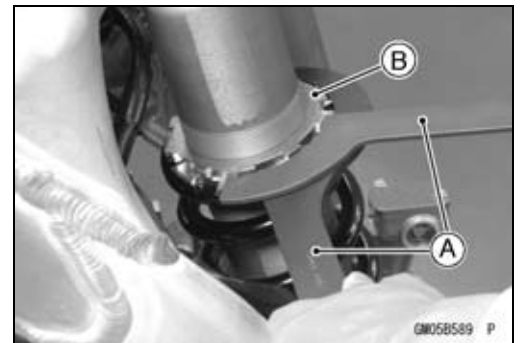
Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Using the hook wrenches [A], loosen the locknut [B].

Special Tools - Hook Wrench R37.5, R42: 57001-1101

Hook Wrench T=3.2 R37: 57001-1539



- Using the hook wrench [A], turn the adjusting nut [B] as required. Turning the adjusting nut downward marks the spring action harder and upward softer.

Special Tool - Hook Wrench R37.5, R42: 57001-1101



Spring Preload Adjustment

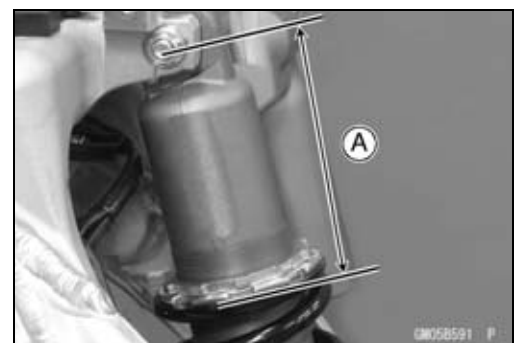
(Lower surface of the adjusting nut from the center of the upper mounting hole [A])

Standard: 127.2 mm (5.01 in.)

Adjustable 125.8 ~ 139.5 mm (4.95 ~ 5.49 in.)

Range:

- Tighten:
 - Torque - Rear Shock Absorber Spring Locknut: 45 N·m (4.6 kgf·m, 33 ft·lb)**
- After adjusting, move the spring up and down to make sure that the spring is seated.
- Install the removed parts (see appropriate chapters).



13-20 SUSPENSION

Rear Shock Absorber

Rear Shock Absorber Spring Tension Inspection

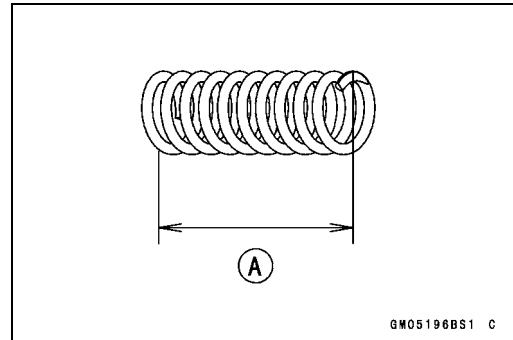
- Since the spring becomes shorter as it weakens, check its free length [A] to determine its condition.

Shock Absorber Spring Free Length

Standard: 265 mm (10.4 in.)

Service Limit: 260 mm (10.2 in.)

- ★ If the free length falls below the service limit, replace the spring.



Rear Shock Absorber Removal

- Remove:
 - Seat (see Seat Removal in the Frame chapter)
 - Side Covers (see Side Cover Removal in the Frame chapter)
 - Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
 - Rear Frame (see Rear Frame Removal in the Frame chapter)
- Place the jack under the frame so that the rear wheel is raised off the ground.

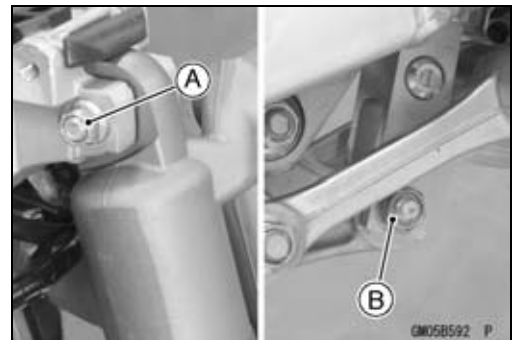
Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

NOTICE

When pulling out the mounting bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing.

- Remove the upper mounting bolt and nut [A].
- Remove the lower mounting bolt and nut [B], and take off the rear shock absorber.
- Take care not to hit the rear shock absorber to the swingarm.



Rear Shock Absorber Installation

- Replace the rear shock absorber mounting nuts with new ones.
- Apply plenty of grease to the oil seals and grease seals.
- Install the rear shock absorber.
- Tighten:
 - Torque - Rear Shock Absorber Mounting Nut (Upper):** 39 N-m (4.0 kgf-m, 29 ft-lb)
 - Rear Shock Absorber Mounting Nut (Lower):** 34 N-m (3.5 kgf-m, 25 ft-lb)
- Install the removed parts (see appropriate chapters).

Rear Shock Absorber Spring Replacement

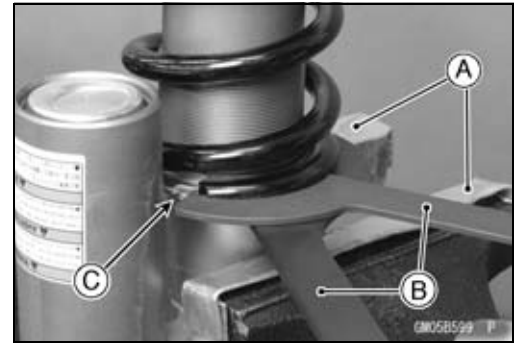
In addition to the standard spring, heavy and light springs are available. If the standard spring is improper for your purpose, select a proper one according to the rider's weight or course conditions.

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Clean the threaded portion on the upper of the rear shock absorber.

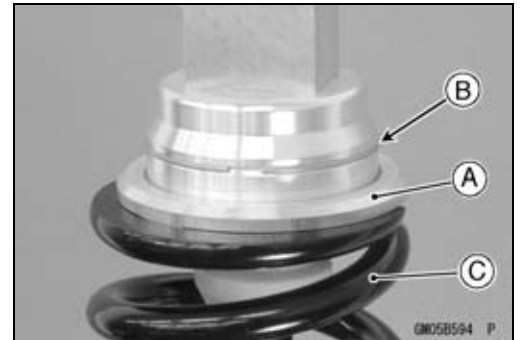
Rear Shock Absorber

- Hold the upper end of the rear shock absorber in a vise with soft jaws [A] or a heavy cloth.
- Using the hook wrenches [B], loosen the locknut [C] and turn the adjusting nut all way up.

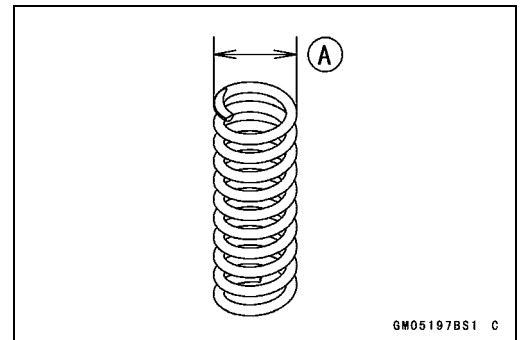
Special Tools - Hook Wrench R37.5, R42: 57001-1101
Hook Wrench T=3.2 R37: 57001-1539



- Slide the spring seat [A].
- Remove the circlip [B] from the shock absorber and lift off the spring seat and spring [C].
- Remove the rear shock absorber from the vise.



- Exchange the spring for an optional part.
- Install the spring so that large diameter end [A] faces upward.
- Replace the circlip with a new one.
- Install the spring seat and new circlip.
- Adjust the spring preload (see Spring Preload Adjustment).
- Install the rear shock absorber (see Rear Shock Absorber Installation).
- Install the removed parts (see appropriate chapters).



Rear Shock Absorber Disassembly (Oil Change)

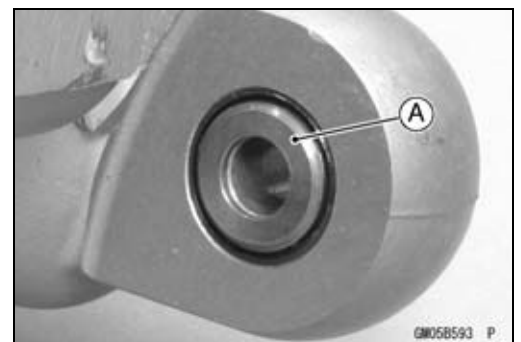
- Refer to the Rear Shock Absorber Oil Change in the Periodic Maintenance chapter.

Rear Shock Absorber Assembly

- Refer to the Rear Shock Absorber Oil Change in the Periodic Maintenance chapter.

Rear Shock Absorber Inspection

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.
 - Smooth Stroke
 - Oil Leakage
 - Crack or Dent
- ★ If there is any damage to the rear shock absorber, replace it.
- Visually inspect the oil seal [A].
- ★ If it show any signs of damage, replace it.



13-22 SUSPENSION

Rear Shock Absorber

Rear Shock Absorber Scrapping

⚠ WARNING

Pressurized nitrogen may explode when heated. The rear shock contains nitrogen gas. To avoid an explosion, do not incinerate the shock body without first releasing the nitrogen and removing the schrader valve.

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Insert a suitable tool into the gas reservoir cap hole [A] to release the nitrogen gas.

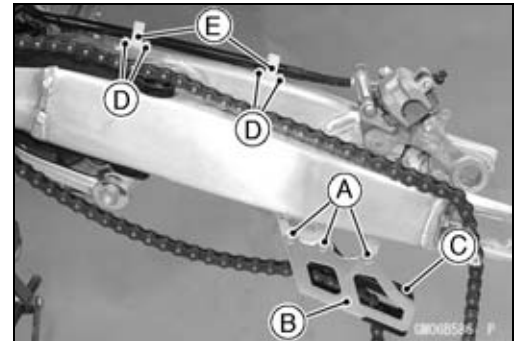


Swingarm

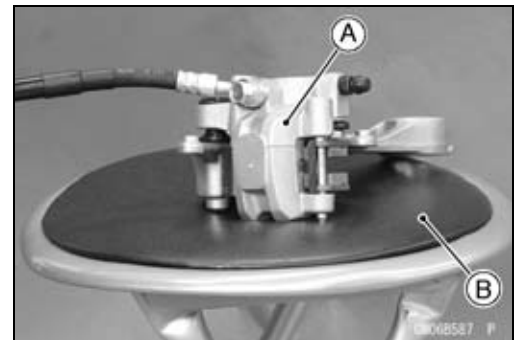
Swingarm Removal

- Remove:
 - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
 - Rear Flap (see Rear Flap Removal in the Frame chapter)
 - Brake Pedal Bolt and Return Spring (see Brake Pedal Removal in the Brakes chapter)

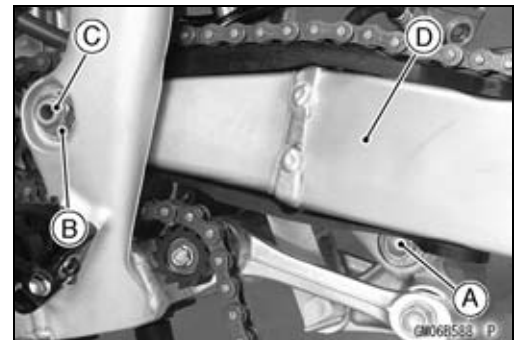
- Remove:
 - Bolts [A] and Nuts
 - Chain Guide Plate [B]
 - Chain Guide [C]
 - Screws [D] and Brake Hose Clamps [E]



- Put the caliper [A] on suitable stand [B] so that it does not dangle.



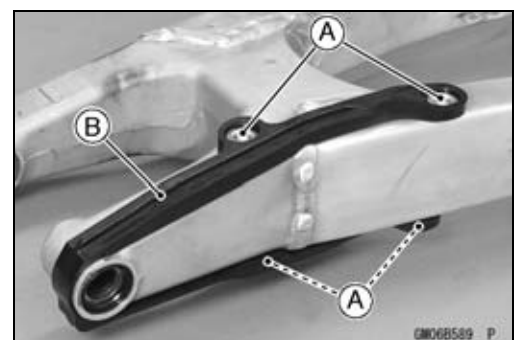
- Remove the rocker arm pivot nut and bolt [A].
- Remove the swingarm pivot shaft nut [B].
- Pull out the swingarm pivot shaft [C], and remove the swingarm [D].



NOTICE

When pulling out the mounting bolts, lift the swingarm slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing.

- Remove the screws [A].
- Remove the chain slipper [B] from the swingarm.



13-24 SUSPENSION

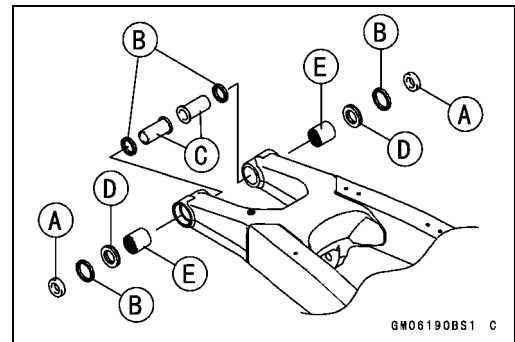
Swingarm

Swingarm Installation

- Apply plenty of grease to the inside of the needle bearings, sleeves, and grease seals.
- Apply a non-permanent locking agent to the chain slipper screws.
- Install the chain slipper, and tighten the screws.
- Replace with new ones:
 - Swingarm Pivot Shaft Nut
 - Rocker Arm Pivot Nut
- Apply 2-stroke oil to the threads of the rocker arm pivot bolt.
- Install the swingarm.
- Tighten:
 - Torque - Swingarm Pivot Shaft Nut: 98 N-m (10.0 kgf-m, 72 ft-lb)**
 - Rocker Arm Pivot Nut: 59 N-m (6.0 kgf-m, 44 ft-lb)**
- Install the removed parts (see appropriate chapters).

Swingarm Bearing Removal

- Remove:
 - Swingarm (see Swingarm Removal)
 - Collars [A]
 - Grease Seals [B]
 - Sleeves [C]
 - Needle Bearings [D]
 - Remove the needle bearings [E] using the oil seal & bearing remover.
- Special Tool - Oil Seal & Bearing Remover: 57001-1058**



Swingarm Bearing Installation

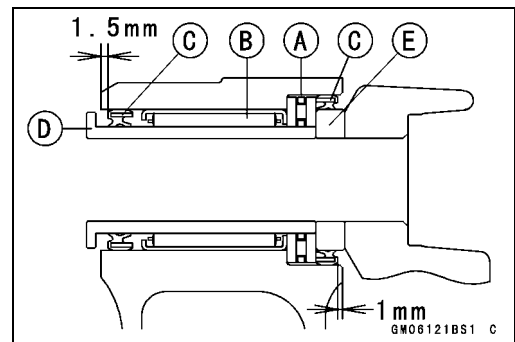
- Replace the needle bearings and grease seals with new ones.
- Apply plenty of grease to the grease seals, and needle bearings [A] [B].

NOTE

- Install the needle bearings so that the manufacturer's marks face out.
- Install the grease seals so that the deep groove side of the rip inward.

Special Tool - Bearing Driver Set: 57001-1129

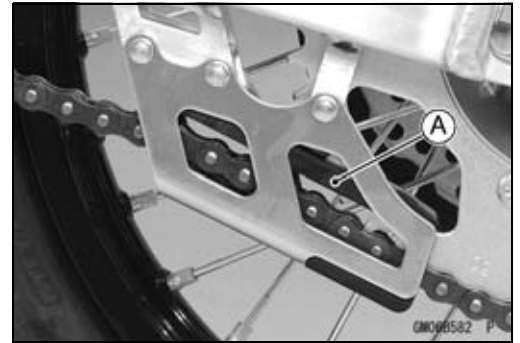
- Install the needle bearings, grease seals [C], sleeve [D] and collar [E].
- The installation procedure is the same as the counter side.



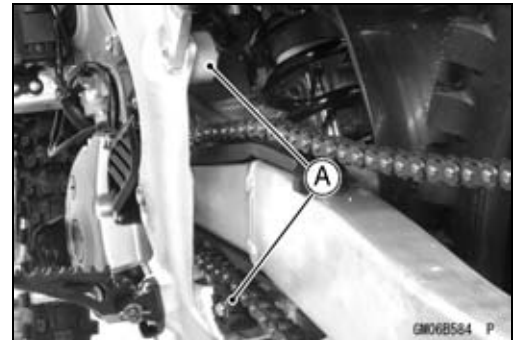
Swingarm

Drive Chain Guide, Guide Roller, Chain Slipper Wear Inspection

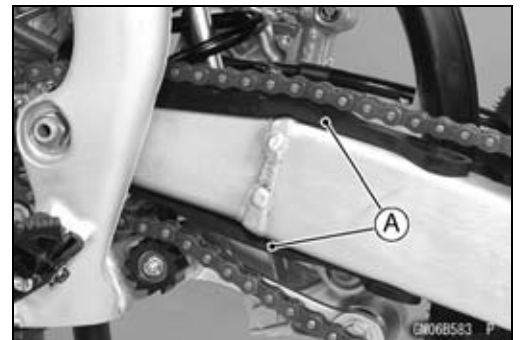
- Visually inspect the drive chain guide [A] and replace it if excessively worn or damaged.



- Visually inspect the upper and lower chain guide rollers [A] and replace them if excessively worn or damaged.



- Visually inspect the chain slipper [A] on the swingarm and replace it if excessively worn or damaged.

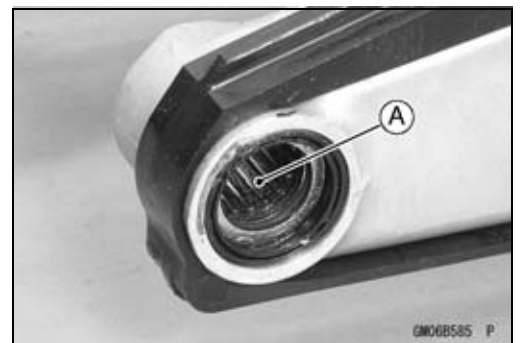


Swingarm Bearing, Sleeve Inspection

NOTICE

Do not remove the bearings for inspection. Removal may damage them.

- Inspect the needle bearing [A] installed in the swingarm.
- The rollers in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.
- ★ If the needle bearing and sleeve show any signs of abnormal wear, discoloration, or damage, replace them as a set.



13-26 SUSPENSION

Tie-Rod, Rocker Arm

Tie-Rod Removal

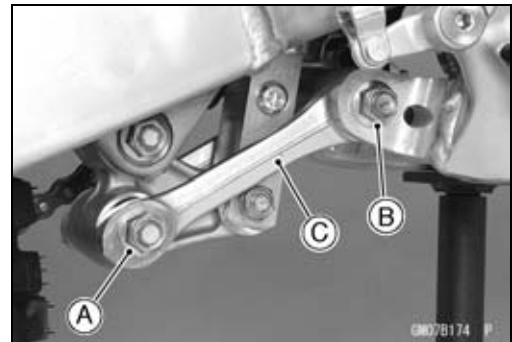
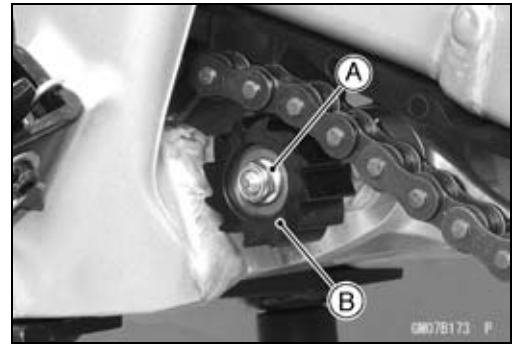
- Place the jack under the frame so that the rear wheel is raised off the ground.

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Remove:
 - Nut [A]
 - Lower Chain Guide Roller [B]

- Remove:
 - Rear Tie-Rod Mounting Bolt and Nut [A]
 - Front Tie-Rod Mounting Bolt and Nut [B]
 - Tie-Rod [C]



NOTICE

When pulling out the mounting bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing.

Tie-Rod Installation

- Replace with new ones:
 - Tie-Rod Mounting Nuts
 - Lower Chain Guide Roller Nut
- Apply plenty of grease to the oil seals.
- Install:
 - Collars
 - Tie-Rod
- Apply 2-stroke oil to the threads of the tie-rod mounting bolts.
- Tighten:
 - Torque - Tie-Rod Mounting Nuts: 59 N-m (6.0 kgf-m, 44 ft-lb)**
- Install the lower chain guide roller, and tighten the nut.

Rocker Arm Removal

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

Special Tools - Jack: 57001-1238

Jack Attachment: 57001-1608

- Remove the rear tie-rod mounting bolt and nut [A].

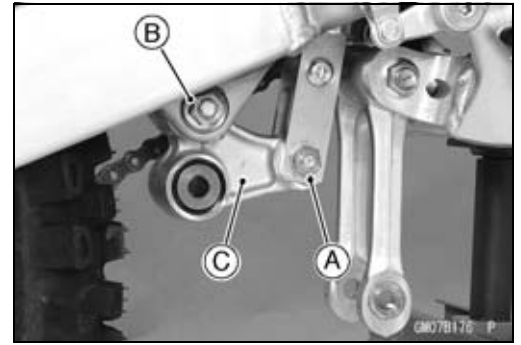
NOTICE

When pulling out the mounting bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt, sleeve, and bearing.



Tie-Rod, Rocker Arm

- Remove:
 - Rear Shock Absorber Bolt and Nut (Lower) [A]
 - Rocker Arm Pivot Bolt and Nut [B]
 - Rocker Arm [C]

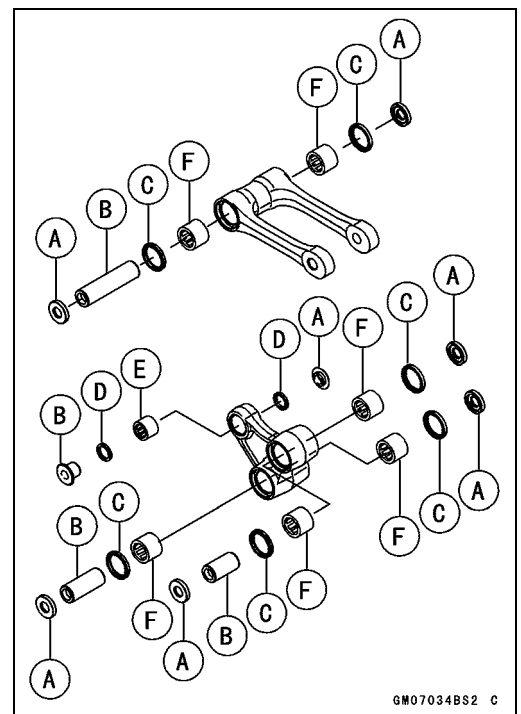


Rocker Arm Installation

- Replace with new ones:
 - Rear Shock Absorber Mounting Nut (Lower)
 - Rocker Arm Pivot Nut
 - Tie-Rod Mounting Nut
- Apply plenty of grease to the needle bearings, oil seals and grease seals.
- Install:
 - Collars and Sleeve
 - Rocker Arm
- Apply 2-stroke oil to the threads of the rocker arm pivot bolt and tie-rod mounting bolt.
- Tighten:
 - Torque - Rear Shock Absorber Mounting Nut (Lower): 34 N-m (3.5 kgf-m, 25 ft-lb)**
 - Rocker Arm Pivot Nut: 59 N-m (6.0 kgf-m, 44 ft-lb)**
 - Tie-Rod Mounting Nut: 59 N-m (6.0 kgf-m, 44 ft-lb)**

Tie-Rod and Rocker Arm Bearing Removal

- Remove:
 - Tie-Rod (see Tie-Rod Removal)
 - Rocker Arm (see Rocker Arm Removal)
 - Collars [A]
 - Sleeves [B]
 - Oil Seals [C]
 - Grease Seals [D]
 - Remove the needle bearing [E], using the bearing driver set.
 - Remove the needle bearings [F], using the oil seal & bearing remover.
- Special Tools - Oil Seal & Bearing Remover: 57001-1058**
Bearing Driver Set: 57001-1129



13-28 SUSPENSION

Tie-Rod, Rocker Arm

Tie-Rod and Rocker Arm Bearing Installation

- Replace the needle bearings, oil seals and grease seals with new ones.
- Apply plenty of grease to the oil seals, grease seals and needle bearings.

NOTE

- Install the bearings so that the marked side faces out.
- Install the oil seals so that the deep groove side faces inward.
- Install the grease seals so that the groove side faces outward.

- Install the needle bearings [A] [B], oil seals [C] and grease seals [D] so that their positions are as shown.

- The other side is also the same procedures.

Front [E]

Right Side [F]

Left Side [G]

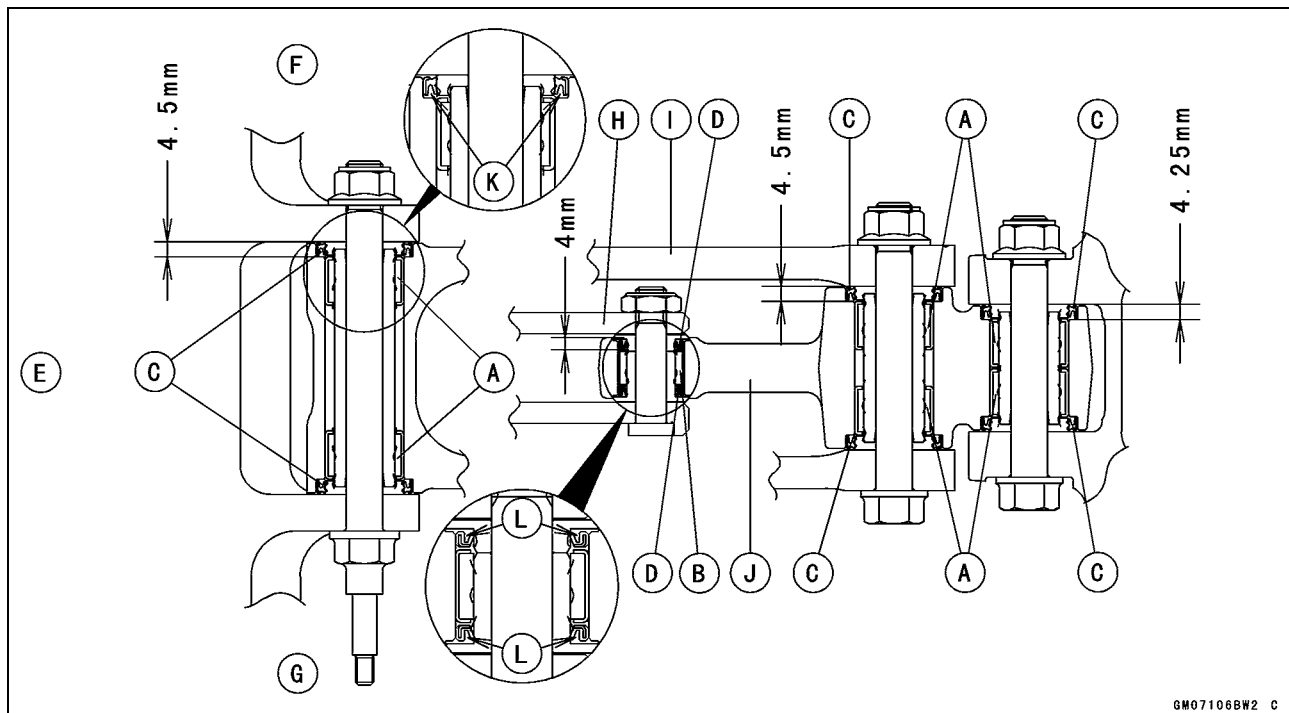
Rear Shock Absorber [H]

Tie-Rod [I]

Rocker Arm [J]

Deep Groove [K]

Groove [L]



GM071066W2 C

Tie-Rod, Rocker Arm

Needle Bearing Inspection**NOTICE**

Do not remove the bearings for inspection. Removal may damage them.

- Inspect the needle bearings installed in the tie-rod and rocker arm.
- The needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearings for abrasion, discoloration, or other damage.
- ★ If there is any doubt as to the condition of either needle bearing, replace the bearing and sleeve as a set.

13-30 SUSPENSION

Uni-Trak Maintenance

Uni-Trak Linkage Inspection

- Refer to the Swingarm and Uni-Trak Linkage Inspection in the Periodic Maintenance chapter.

Tie-Rod and Rocker Arm Sleeve Wear Inspection

- Pull out the sleeves [A] of the tie-rod and rocker arm.
- Measure the outside diameter of the sleeve.

Sleeve Outside Diameter

Standard:

Tie-Rod 19.987 ~ 20.000 mm (0.78689 ~ 0.78740 in.)

Rocker Arm:

Large 19.987 ~ 20.000 mm (0.78689 ~ 0.78740 in.)

Small 15.950 ~ 16.000 mm (0.62795 ~ 0.62992 in.)

Service Limit:

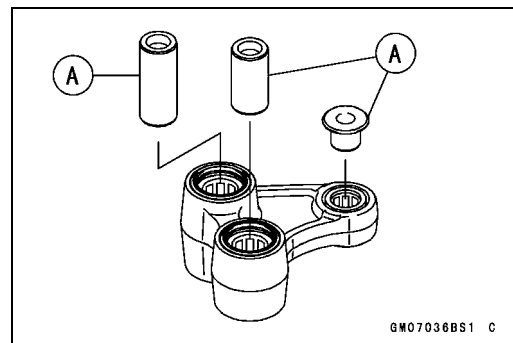
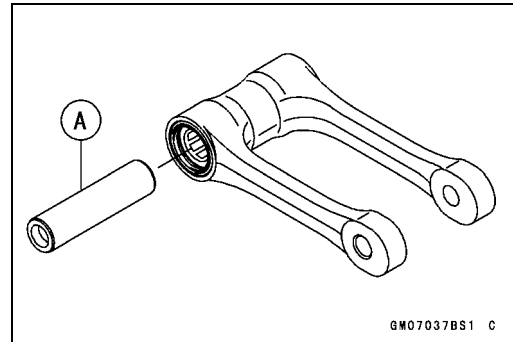
Tie-Rod 19.85 mm (0.7815 in.)

Rocker Arm:

Large 19.85 mm (0.7815 in.)

Small 15.92 mm (0.6268 in.)

- ★ If the sleeve is worn past the service limit, replace the sleeve.



Tie-Rod and Rocker Arm Mounting Bolt Bend Inspection

A bent bolt causes vibration, poor handling, and instability.

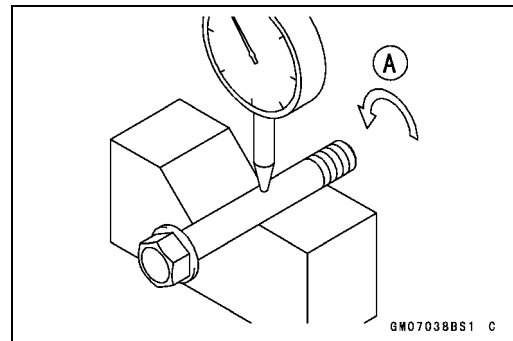
- To measure the bolt runout, remove the bolt, place it in V blocks, and set a dial gauge to the bolt at a point halfway between the blocks.
- Turn [A] the bolt to measure the runout.
- The amount of dial variation is the amount of runout.

Rocker Arm Mounting Bolt Runout

Standard: TIR 0.1 mm (0.004 in.) or less

Service Limit: TIR 0.2 mm (0.008 in.)

- ★ If runout exceeds the service limit, replace the bolt.



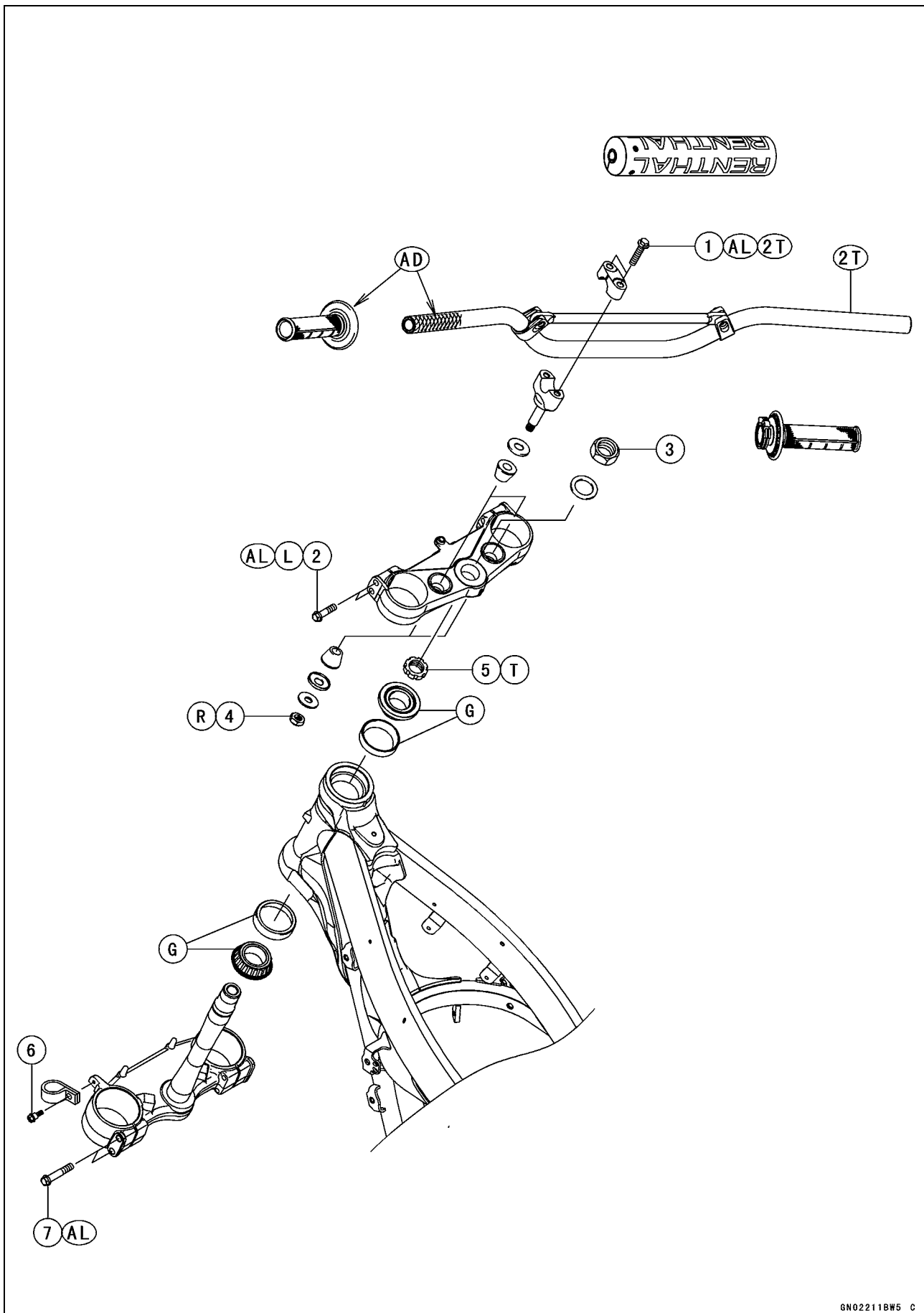
Steering

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14-2 STEERING

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Clamp Bolts	25	2.5	18	AL, 2T
2	Front Fork Clamp Bolts (Upper)	20	2.0	15	AL, L
3	Steering Stem Head Nut	98	10.0	72	
4	Handlebar Holder Nuts	34	3.5	25	R
5	Steering Stem Nut	4.9	0.50	43 in·lb	T
6	Brake Hose Clamp Bolt	3.0	0.31	27 in·lb	
7	Front Fork Clamp Bolts (Lower)	22	2.2	16	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

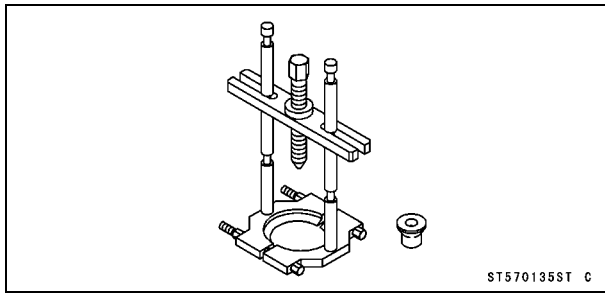
T: First, tighten the stem nut with 39 N·m (4.0 kgf·m, 29 ft·lb) of torque, then loosen it and retighten it with 4.9 N·m (0.50 kgf·m, 43 in·lb) of torque.

2T: Apply 2-stroke oil.

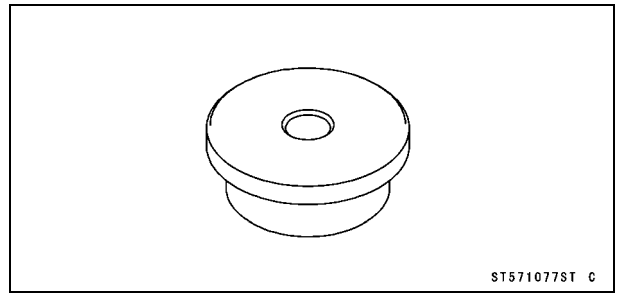
14-4 STEERING

Special Tools

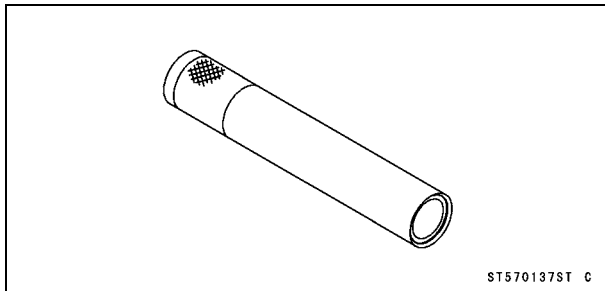
Bearing Puller:
57001-135



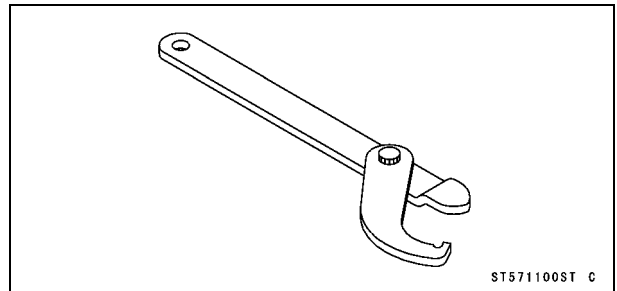
Head Pipe Outer Race Driver, $\phi 54.5$:
57001-1077



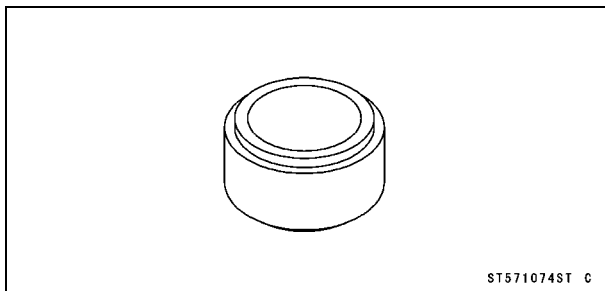
Steering Stem Bearing Driver:
57001-137



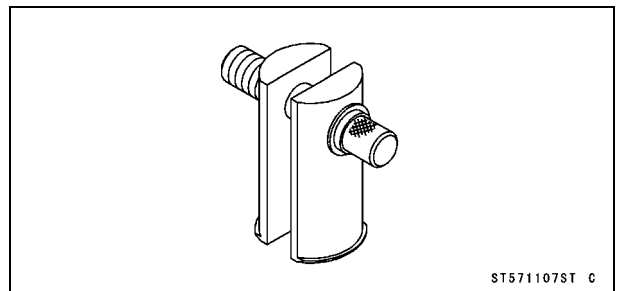
Steering Stem Nut Wrench:
57001-1100



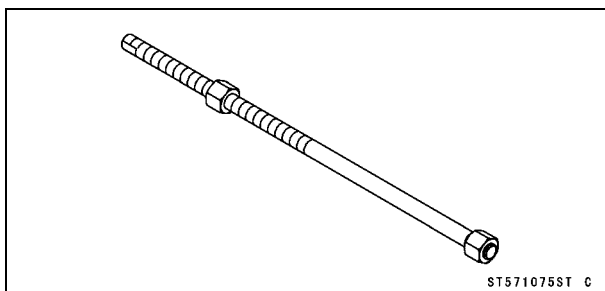
Steering Stem Bearing Driver Adapter, $\phi 34.5$:
57001-1074



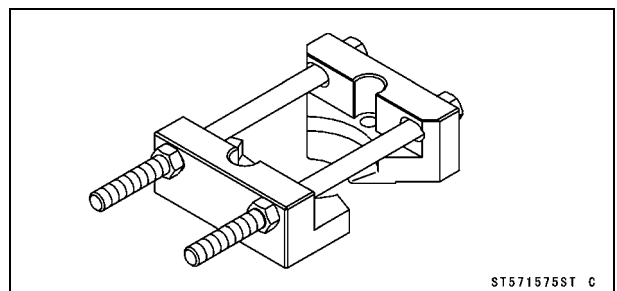
Head Pipe Outer Race Remover ID > 37 mm:
57001-1107



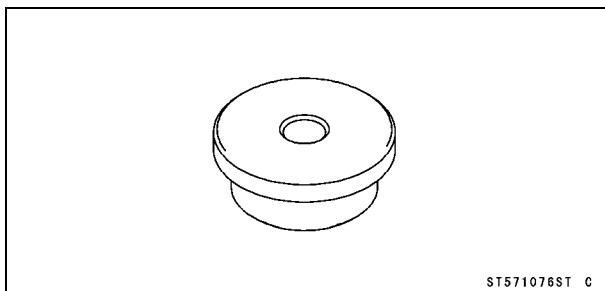
Head Pipe Outer Race Press Shaft:
57001-1075



Bearing Puller:
57001-1575



Head Pipe Outer Race Driver, $\phi 51.5$:
57001-1076



Steering

Steering Inspection

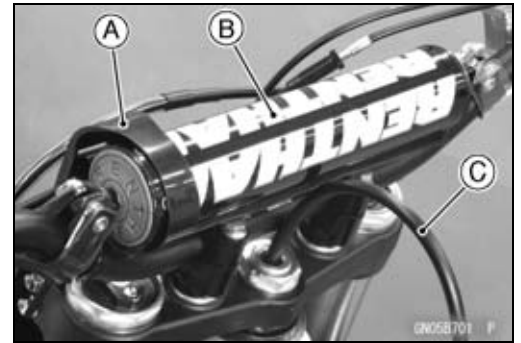
- Refer to the Steering Inspection in the Periodic Maintenance chapter.

Steering Adjustment

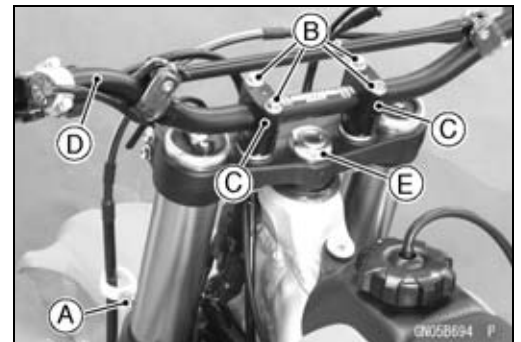
- Refer to the Steering Adjustment in the Periodic Maintenance chapter.

Steering Stem, Stem Bearing Removal

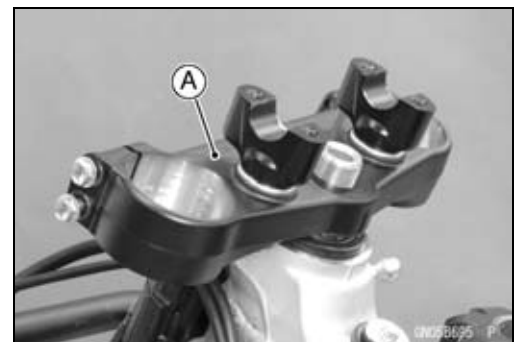
- Remove:
 - Number Plate [A] (see Number Plate Removal in the Frame chapter)
 - Handlebar Pad [B]
 - Fuel Tank Breather Hose [C]



- Remove:
 - Brake Hose Clamp Bolt [A]
 - Handlebar Clamp Bolts [B]
 - Handlebar Clamps [C]
 - Handlebars [D]
 - Steering Stem Head Nut [E] and Washer



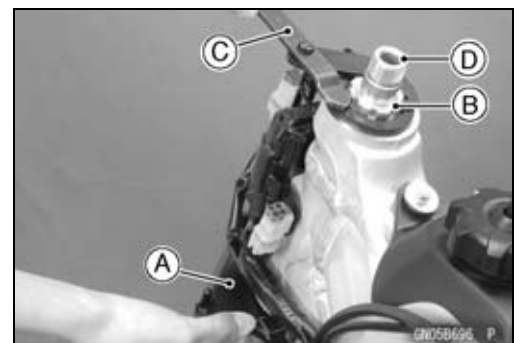
- Remove:
 - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
 - Front Fender (see Front Fender Removal in the Frame chapter)
 - Front Forks (see Front Fork Removal in the Suspension chapter)
 - Steering Stem Head [A]



- Hold the stem base [A] by hand, and remove the steering stem nut [B] with the steering stem nut wrench [C].

Special Tool - Steering Stem Nut Wrench: 57001-1100

- Remove the steering stem [D] and stem base from the head pipe.



14-6 STEERING

Steering

- Remove the upper stem bearing inner race (tapered roller bearing) [A].

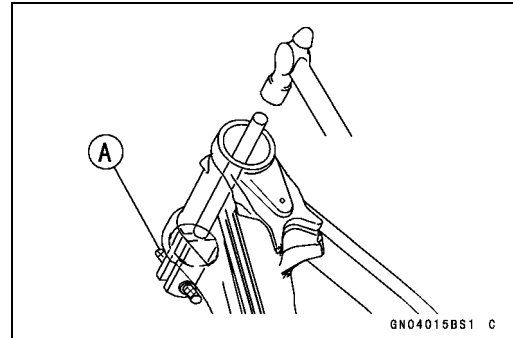


- Drive out the bearing outer races from the head pipe.
- Remove the outer races pressed into the head pipe, using the head pipe outer race remover [A], and hammer the head pipe outer race remover to drive it out.

**Special Tool - Head Pipe Outer Race Remover ID > 37 mm:
57001-1107**

NOTE

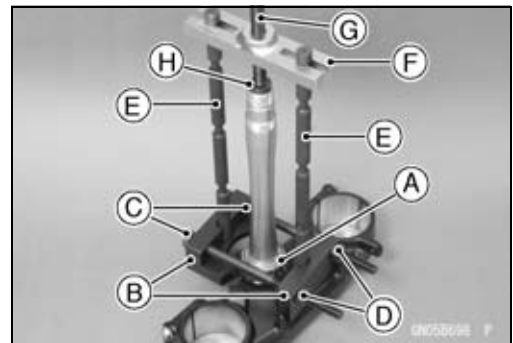
○ If either steering stem bearing is damaged, it is recommended that both the upper and lower bearing (including outer races) should be replaced with new ones.



- Remove the lower stem bearing inner race (tapered roller bearing) [A] with its grease seal from the stem using bearing pullers.

**Special Tools - Bearing Puller: 57001-135
Bearing Puller: 57001-1575**

- Assemble the bearing puller (Special Tool: 57001-1575).
- Insert the each half-split base [B] under the bottom of bearing inner race and connect the both bases by tightening the bolts [C] and nuts [D].



NOTE

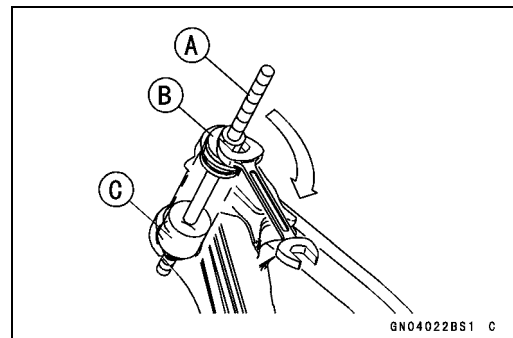
○ Tighten evenly two bases by the two stud bolts.

- Assemble the parts of the bearing puller (Special Tool: 57001-135).
 - Stud Bolts [E]
 - Arm [F]
 - Center Bolt [G]
 - Adapter [H]
- Turn the center bolt by a wrench and pull the bearing inner race.

Steering Stem, Stem Bearing Installation

- Replace the bearing outer races with new ones.
- Apply grease to the outer races.
- Drive the outer races into the head pipe at the same time with the special tools.

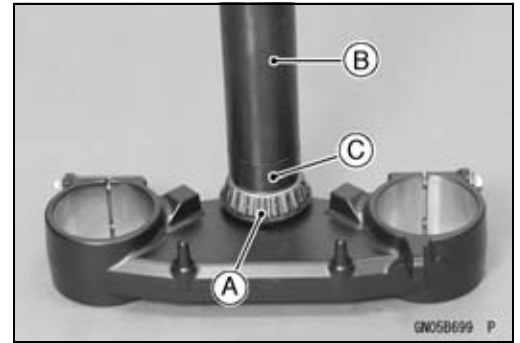
**Special Tools - Head Pipe Outer Race Press Shaft [A]:
57001-1075
Head Pipe Outer Race Driver, $\phi 51.5$ [B]:
57001-1076
Head Pipe Outer Race Driver, $\phi 54.5$ [C]:
57001-1077**



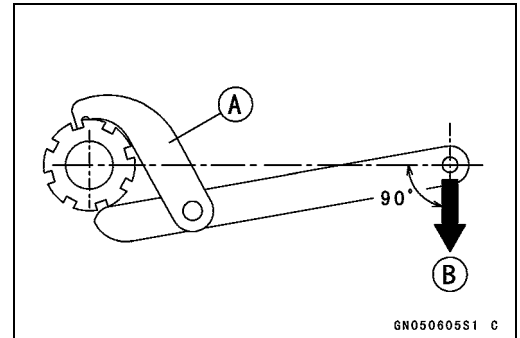
Steering

- Replace the inner races with new ones.
- Apply grease to the lower tapered roller bearing [A], and drive it onto the stem with the steering stem bearing driver [B] and adapter [C].

Special Tools - Steering Stem Bearing Driver: 57001-137
Steering Stem Bearing Driver Adapter, ϕ 34.5: 57001-1074



- Apply grease to the upper tapered roller bearing, and install it in the head pipe.
- Install the stem through the head pipe and upper bearing, and hand-tighten the stem nut while pushing up the stem base.
- Install the stem head and washer, and tighten the stem head nut lightly.
- Settle the bearing in place as follows;
 - Tighten the stem nut to **39 N·m (4.0 kgf·m, 29 ft·lb)** of torque (To tighten the steering stem nut to the specified torque, hook the wrench [A] on the stem nut, and pull the wrench at the hole by **22.2 kgf** force [B] in the direction shown.).



Special Tool - Steering Stem Nut Wrench: 57001-1100

- Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.
- Again back out the stem nut a fraction of a turn until it turns lightly.
- Turn the stem nut lightly clockwise until it just becomes hard to turn. Do not overtighten, or the steering will be too tight.

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

- Install the stem head.
- Install the washer, and temporary tighten the stem head nut.
- Install the front forks (see Front Fork Installation in the Suspension chapter).
- Apply a non-permanent locking agent to the front fork clamp bolts (upper).
- Tighten:

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

Steering Stem Head Nut: 98 N·m (10.0 kgf·m, 72 ft·lb)

Front Fork Clamp Bolts (Lower): 22 N·m (2.2 kgf·m, 16 ft·lb)

NOTE

- Tighten the fork clamp bolts (upper) first, next the stem head nut, last the fork clamp bolts (lower).
- Tighten the two clamp bolts alternately two times to ensure even tightening torque.

14-8 STEERING

Steering

- Install the removed parts (see appropriate chapters).

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

⚠ WARNING

If the handlebar does not turn to the steering stop it 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 and Adjust:
 - Steering
 - Front Brake
 - Clutch Cable
 - Throttle Cable

Stem Bearing Lubrication

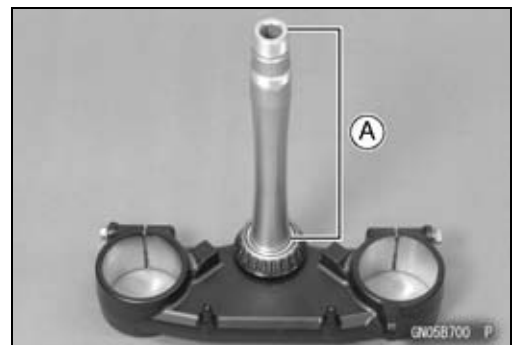
- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

Stem Bearing Wear, Damage Inspection

- Using a high flash-point solvent, wash the upper and lower tapered rollers in the cages, and wipe the upper and lower outer races, which are press-fitted into the head pipe, clean off grease and dirt.
- Visually check the outer race and the rollers.
- ★ Replace the bearing assembly if it show damage.

Stem Warp Inspection

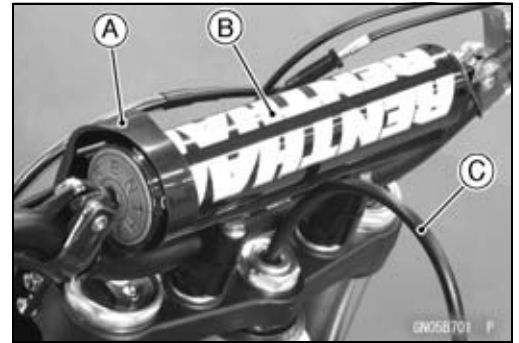
- Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem shaft [A] for straightness.
- ★ If the steering stem shaft is bent, replace the steering stem.



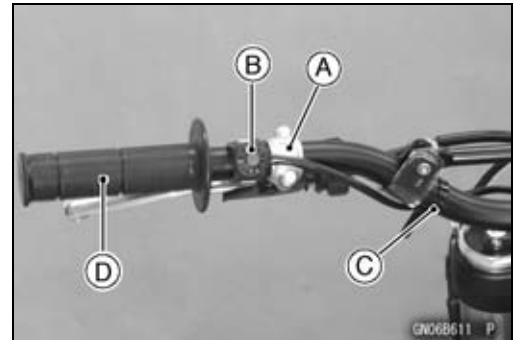
Handlebars

Handlebar Removal

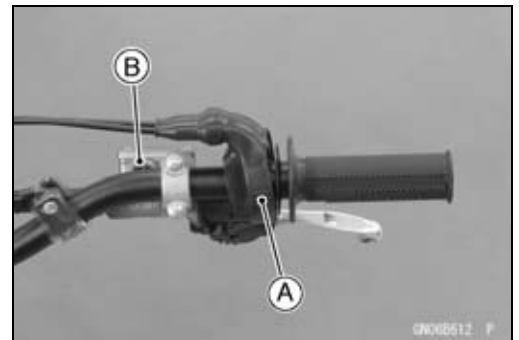
- Remove:
 - Number Plate [A] (see Number Plate Removal in the Frame chapter)
 - Handlebar Pad [B]
 - Fuel Tank Breather Hose [C]



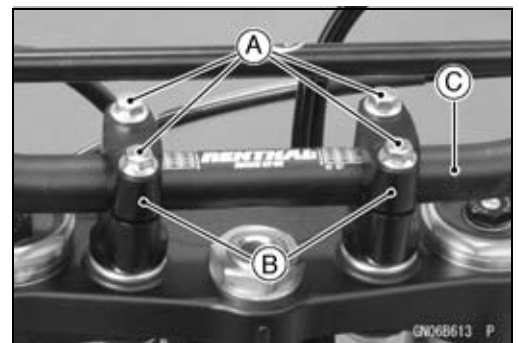
- Remove:
 - Clutch Lever Assembly [A]
 - Engine Stop Switch [B]
 - Band [C]
 - Left Handlebar Grip [D]



- Remove:
 - Throttle Grip Assy [A] (see Throttle Cable Replacement in the Fuel System (DFI) chapter)
 - Front Master Cylinder [B] (see Front Master Cylinder Removal in the Brakes chapter)



- Remove:
 - Handlebar Clamp Bolts [A]
 - Handlebar Clamps [B]
 - Handlebars [C]
- Check the handlebars for bends or cracks.
- ★ If the handlebars was bended or cracked, replace it.

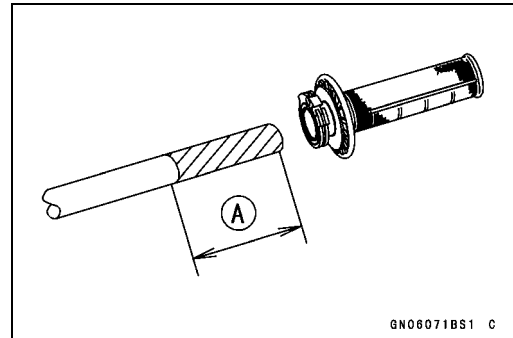
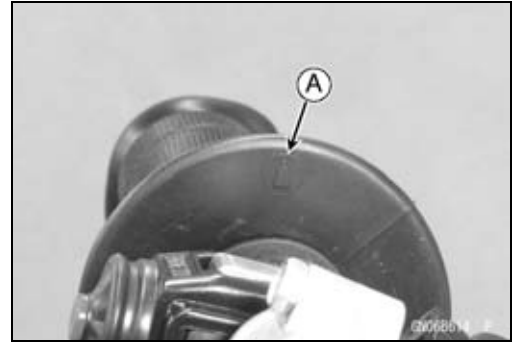


14-10 STEERING

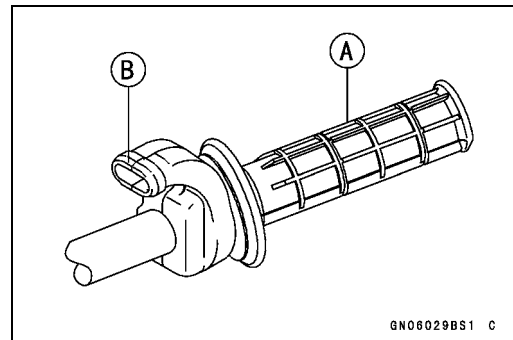
Handlebars

Handlebar Installation

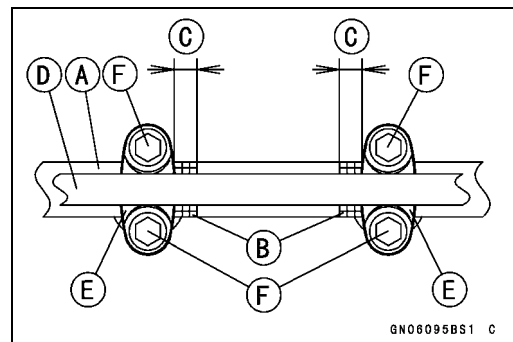
- Apply adhesive cement to the innermost area of the left handlebar grip and all-around inner surface of the left handlebar grip hole entrance and also apply it to the roulette area on the handlebars.
- The left handlebar grip must be installed with the triangle mark [A] upward.
- When installing the left handlebar grip, rotate the grip more than once first, and then remove and install the grip alternately more than three times to spread adhesive cement. Make sure that adhesive cement has been spread evenly.
- After installation, hold the left handlebar grip area at more than three points to make the left handlebar grip stick to the handlebars.
- Install the clutch lever assembly (see Clutch Lever Installation in the Clutch chapter).
- Install the engine stop switch.
- Apply grease to the throttle cable upper end and clutch cable upper end.
- Apply 2-stroke oil to the edge (slash area) of the handlebars.
120 mm (4.72 in.) [A]



- Install the throttle grip assembly so that the grip [A] is in as far as it will go.
- Position the throttle grip assembly so that the cable gateway [B] of the throttle case is above the handlebars.
- Install the front master cylinder (see Front Master Cylinder Installation in the Brakes chapter).



- Install the handlebars [A] on the steering stem head as follows.
- The handlebars angle position can be adjusted to suit your preference using the gauge marks [B].
- Position the handlebars so that the gauge marks is equal positions [C].
Bridge Bar [D]
- Apply 2-stroke oil to the handlebar clamp bolts.
- Install the handlebar clamps [E] and handlebar clamp bolts [F].



Handlebars

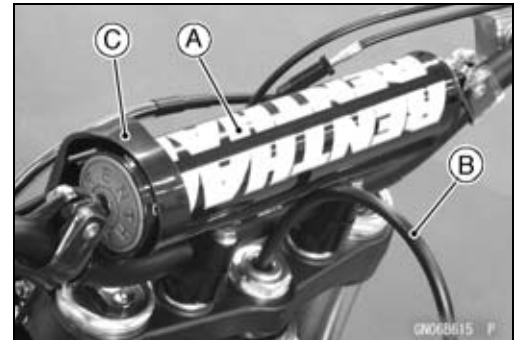
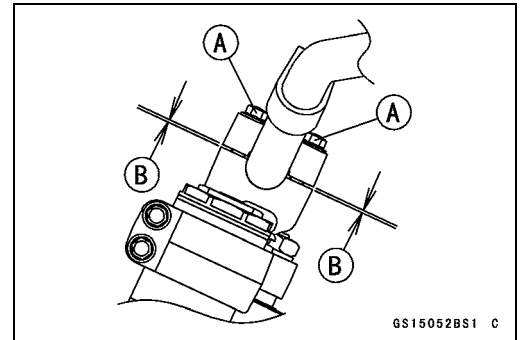
- Tighten the handlebar clamp bolts [A].
- Equalize the front and rear gaps [B].

NOTE

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

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

- Install:
 - Handlebar Pad [A]
 - Fuel Tank Breather Hose [B]
 - Number Plate [C] (see Number Plate Installation in the Frame chapter)



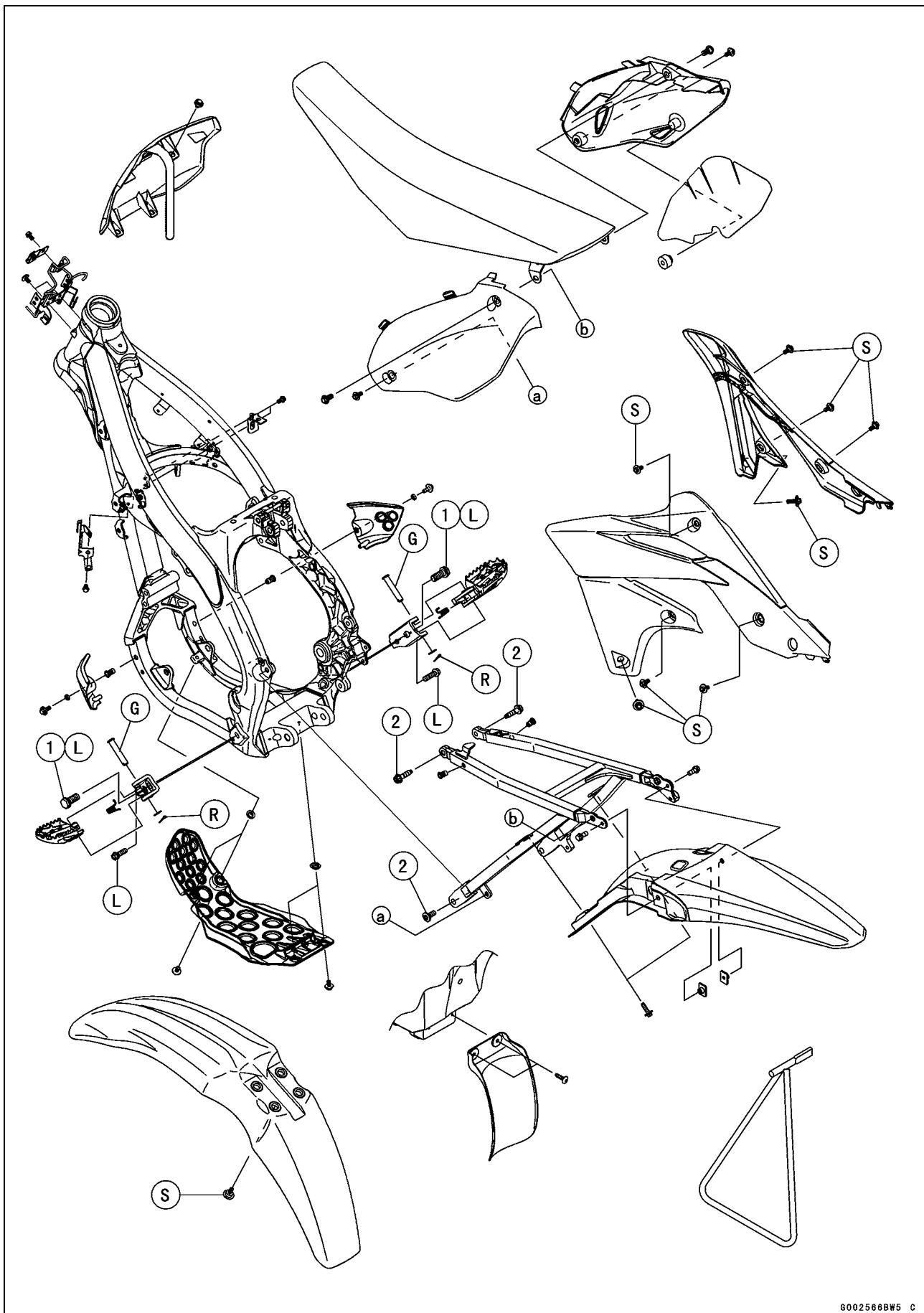
Frame

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15-2 FRAME

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Footpeg Bracket Bolts (Upper)	54	5.5	40	L
2	Rear Frame Mounting Bolts	34	3.5	25	

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

15-4 FRAME

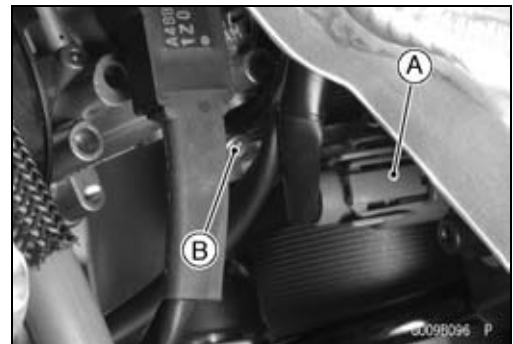
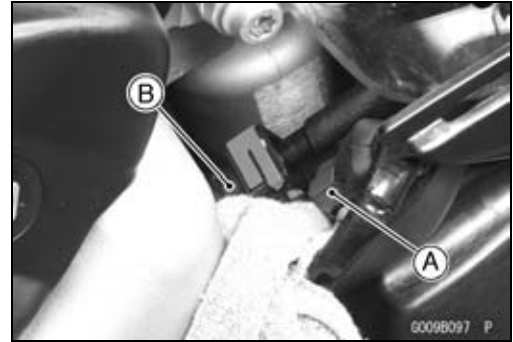
Frame

Frame Inspection

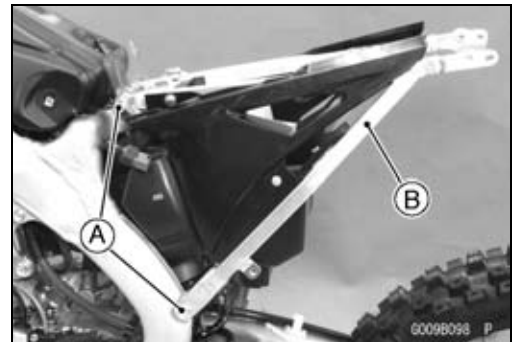
- Refer to the Frame Inspection in the Periodic Maintenance chapter.

Rear Frame Removal

- Remove:
 - Seat (see Seat Removal)
 - Side Covers (see Side Cover Removal)
 - Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
 - Rear Fender (see Rear Fender Removal)
 - Rear Flap (see Rear Flap Removal)
 - Upstream Injector Connector [A]
 - Fuel Hose [B] (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Disconnect the intake air temperature sensor connector [A].
- Loosen the air cleaner duct clamp bolt [B].

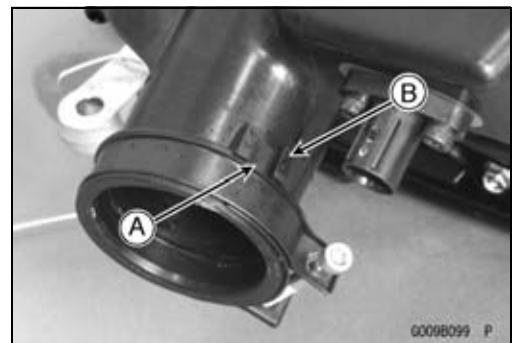


- Remove the rear frame mounting bolts [A] on both sides.
- Take off the rear frame [B] together with the air cleaner housing.
- Separate the air cleaner duct from the throttle body assy.
- Take care not to damage the frame and rear shock absorber with the air cleaner duct clamp.



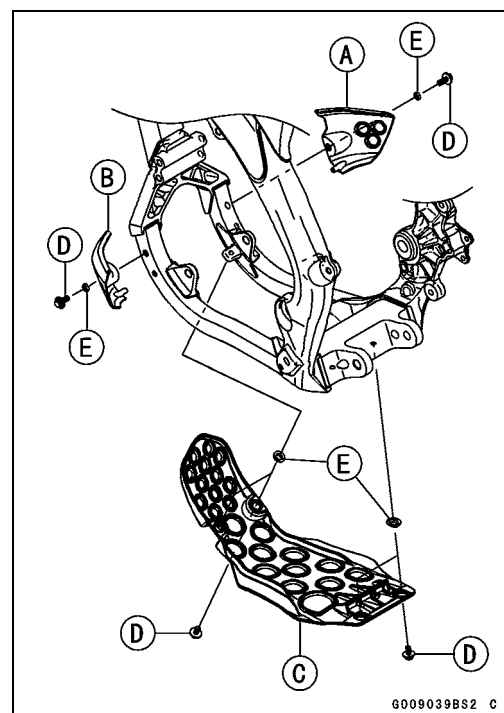
Rear Frame Installation

- Fit the claw [A] of the clamp and the groove [B] of the air cleaner duct.
- Install the rear frame.
- Insert the duct onto the throttle body assy.
- Tighten:
 - Torque - Rear Frame Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)
- Tighten the air cleaner duct clamp bolt.
- Install the removed parts (see appropriate chapters).

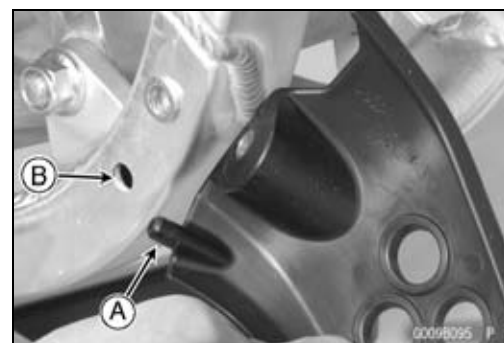


Frame**Engine Guards Removal**

- Remove the engine guards.
 - Right Engine Guard [A]
 - Left Engine Guard [B]
 - Lower Engine Guard [C]
 - Bolts [D]
 - Collars [E]

**Engine Guards Installation**

- Installation is the reverse of removal.
 - Fit the projection [A] of the right engine guard and hole [B] of the frame.
 - Fit the left engine guard similarly.

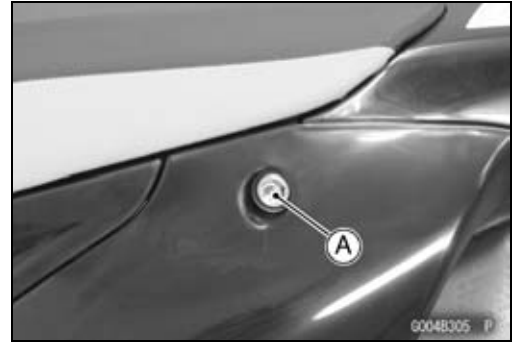


15-6 FRAME

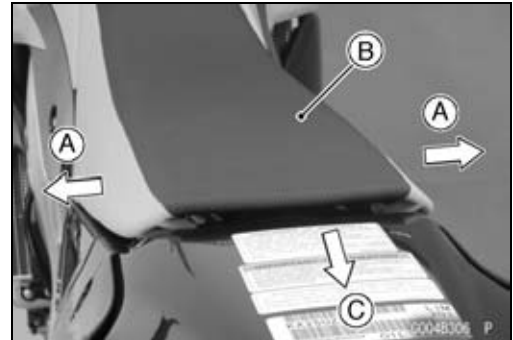
Seat

Seat Removal

- Remove the side cover bolt [A] on both sides.

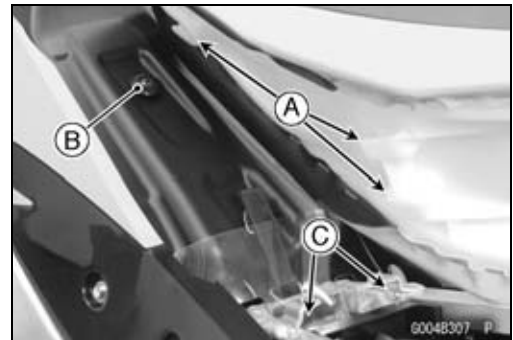


- Spread [A] the side covers lightly.
- Take off the seat [B] backward [C].



Seat Installation

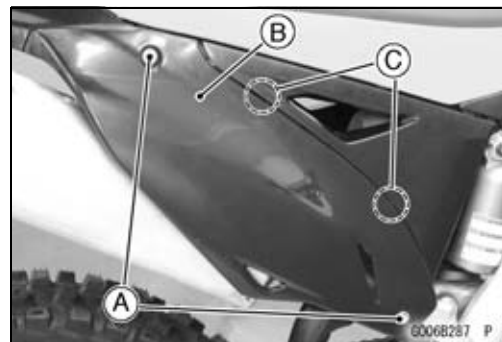
- Install the seat.
- Insert the hooks [A] of the seat under the flange collar [B] and brackets [C].
- Take care not to damage the side covers with the bracket of seat.
- Tighten the side cover bolts.



Side Covers

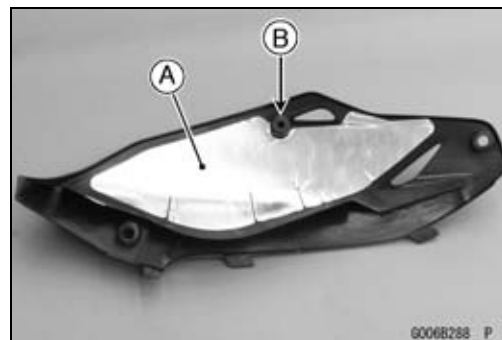
Side Cover Removal

- Remove the bolts [A] and take off the side cover [B].
- Clear the side cover tabs [C] from the air cleaner housing.

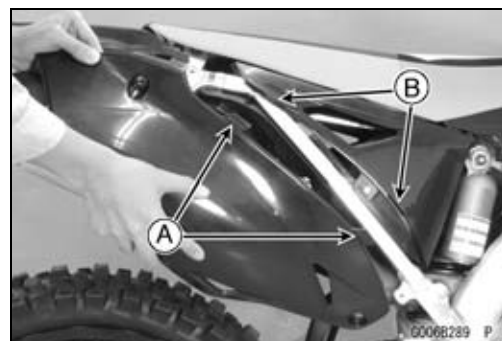


Side Cover Installation

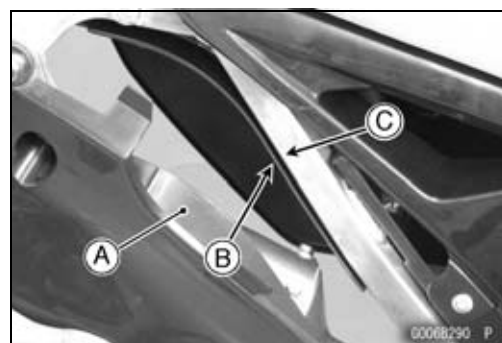
- Stick the pad [A] on the inside of the right side cover.
- Install the damper [B] securely.



- Install the side covers.
- Insert the tabs [A] of the side cover into the slots [B] of the air cleaner housing.



- Insert the side cover rib [A] between the rear fender [B] and the rear frame [C].
- Tighten the bolts.

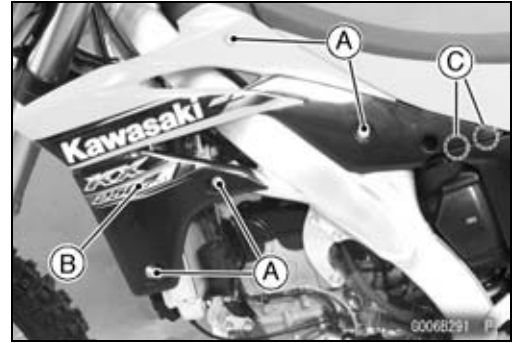


15-8 FRAME

Radiator Shroud

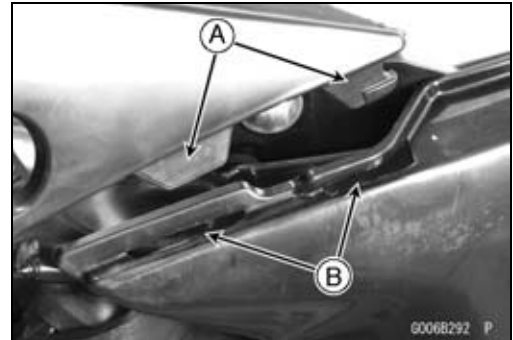
Radiator Shroud Removal

- Remove:
 - Bolts [A]
 - Radiator Shroud [B]
- Clear the radiator shroud tabs [C] from the air cleaner housing.

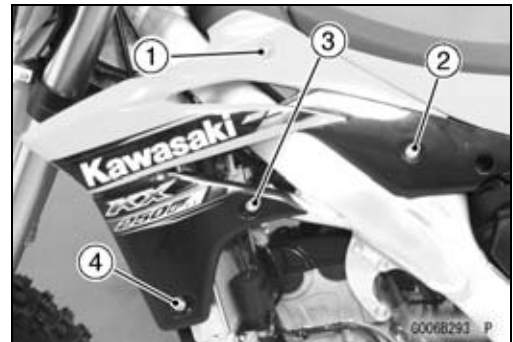


Radiator Shroud Installation

- Install the radiator shrouds.
- Insert the tabs [A] of the radiator shroud into the slots [B] of the air cleaner housing.



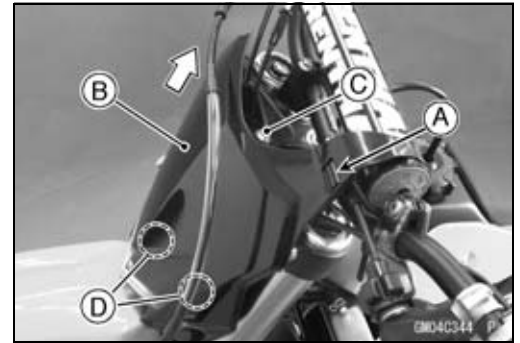
- Temporarily install the bolts as shown sequence [1 ~ 4].
 - L = 13 mm (0.51 in.) [1 ~ 3]
 - L = 20 mm (0.79 in.) [4]
- Tighten all bolts securely.



Number Plate

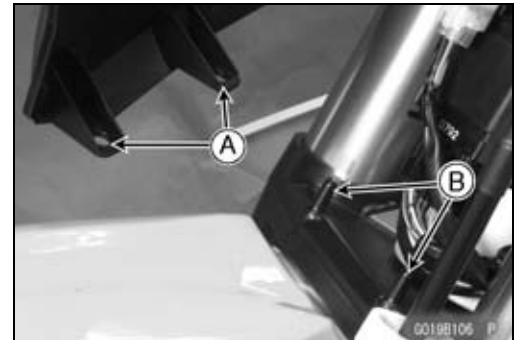
Number Plate Removal

- Unlock the band [A] of the number plate [B].
- Remove the bolt [C].
- Clear the projections [D] and remove the number plate.



Number Plate Installation

- Fit the holes [A] of the number plate and projections [B] of the steering stem base.
- Run the brake hose through the front of the number plate.
- Install the band to the handlebar pad, and tighten the bolt.

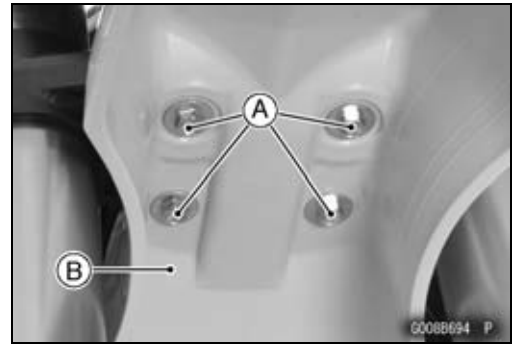


15-10 FRAME

Fender

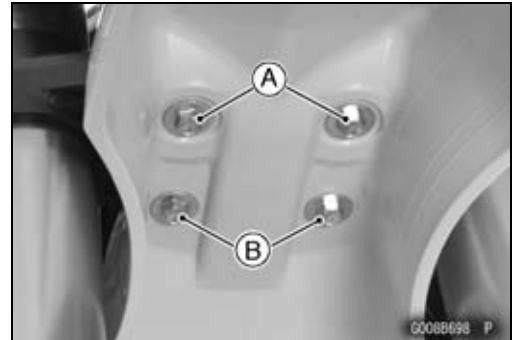
Front Fender Removal

- Remove the bolts [A] and take off the front fender [B].



Front Fender Installation

- Temporarily install the front bolts [A] first, and then the rear bolts [B].
- Tighten all bolts securely.

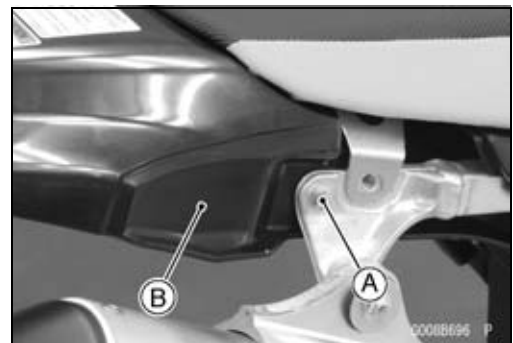


Rear Fender Removal/Installation

- Remove the side covers (see Side Cover Removal).
- Remove the bolts [A].

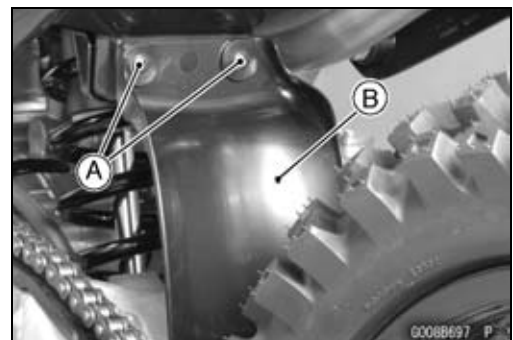


- Remove the bolt [A] on both sides, and take off the rear fender [B].
- Installation is the reverse of removal.



Rear Flap Removal/Installation

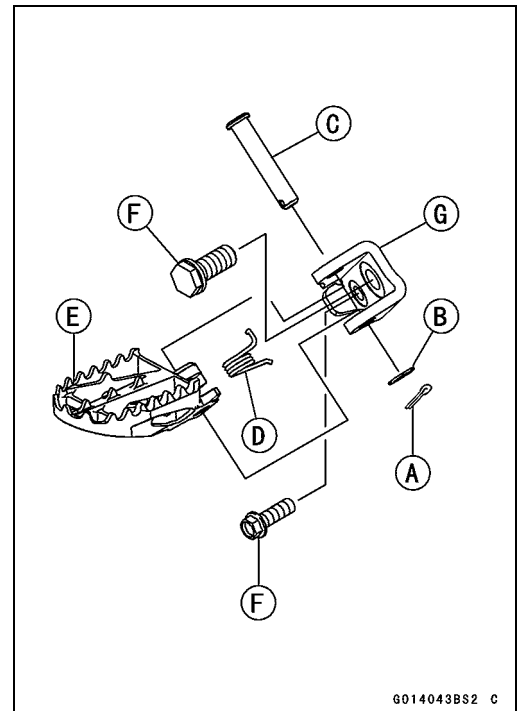
- Remove the screws [A] and take off the rear flap [B].
- Installation is the reverse of removal.



Footpegs

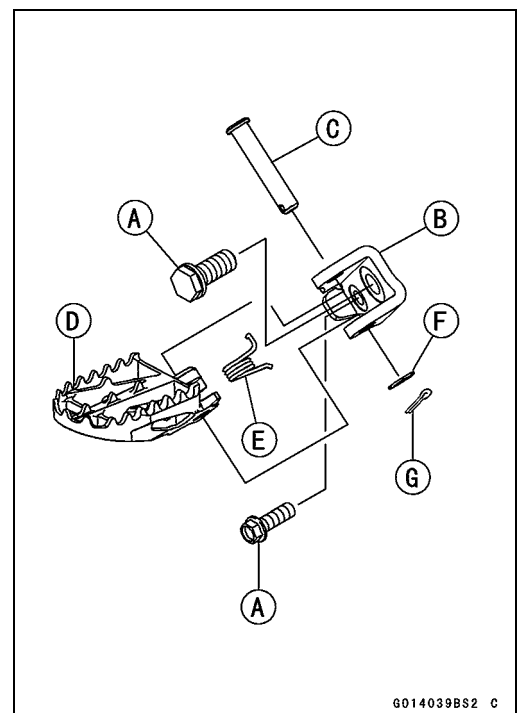
Footpeg Removal

- Remove:
 - Cotter Pin [A]
 - Washer [B]
 - Pivot Pin [C]
 - Spring [D]
 - Footpeg [E]
 - Footpeg Bracket Bolts [F]
 - Footpeg Bracket [G]

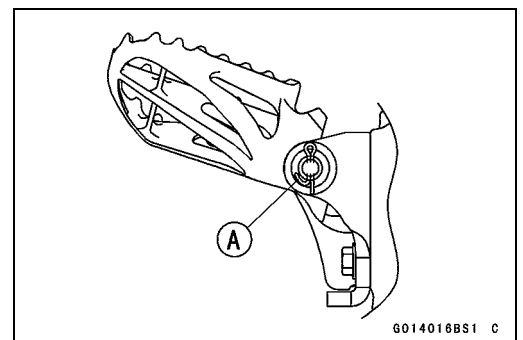


Footpeg Installation

- Replace the cotter pin with a new one.
- Apply a non-permanent locking agent to the footpeg bracket bolts [A].
- Install the footpeg bracket [B], and tighten the bolts.
- Torque - Footpeg Bracket Bolt (Upper): 54 N·m (5.5 kgf·m, 40 ft·lb)
- Apply grease to the pivot pin [C].
- Install the footpeg [D], spring [E] and pivot pin.
- Insert the pivot pin from upper side.
- Install the washer [F] and new cotter pin [G].



- Bend the longer side [A] of the cotter pin.



Electrical System

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Exploded View

No.	Fastener	Torque			Remarks
		N-m	kgf-m	ft-lb	
1	Regulator/Rectifier Nuts	10	1.02	89 in-lb	R
2	Spark Plug	13	1.3	115 in-lb	
3	Flywheel Nut Cap	3.5	0.36	31 in-lb	
4	Magneto Cover Bolts	9.8	1.0	87 in-lb	
5	Timing Inspection Cap	3.5	0.36	31 in-lb	
6	Flywheel Nut	78.5	8.00	57.9	
7	Stator Coil Bolts	9.8	1.0	87 in-lb	L
8	Crankshaft Sensor Bolts	7.0	0.71	62 in-lb	L
9	Gear Position Switch Screws	2.9	0.30	26 in-lb	L

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

Si: Apply silicone grease.

SS: Apply silicone sealant.

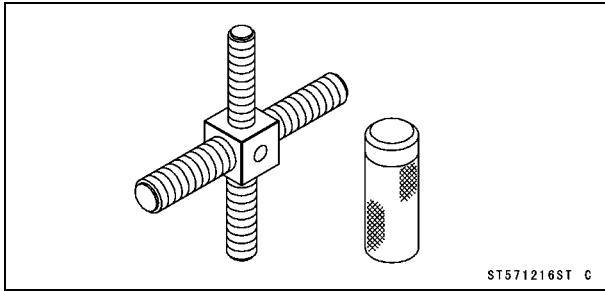
16-4 ELECTRICAL SYSTEM

Specifications

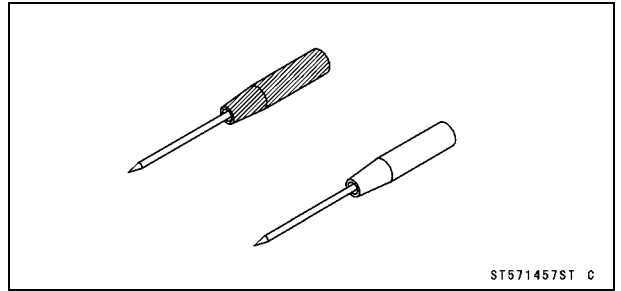
Item	Standard
Flywheel Magneto Magneto Output Voltage Stator Coil Resistance	37 V or more at 4 000 r/min (rpm) 0.4 ~ 1.1 Ω at 20°C (68°F)
Charging System Charging Voltage (Regulator/Rectifier Output Voltage) Capacitor Internal Resistance	14.0 ~ 14.5 V see text
Ignition System Ignition Timing Ignition Coil: 3 Needle Arcing Distance Primary Winding Resistance Secondary Winding Resistance Primary Peak Voltage Crankshaft Sensor Resistance Crankshaft Sensor Peak Voltage Spark Plug: Type Gap	4° BTDC at 2 000 r/min (rpm) 7 mm (0.28 in.) or more 0.28 ~ 0.38 Ω at 20°C (68°F) 7.65 ~ 10.4 k Ω at 20°C (68°F) 150 V or more 180 ~ 280 Ω at 20°C (68°F) 2.5 V or more NGK CPR8EB-9 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)

Special Tools and Sealant

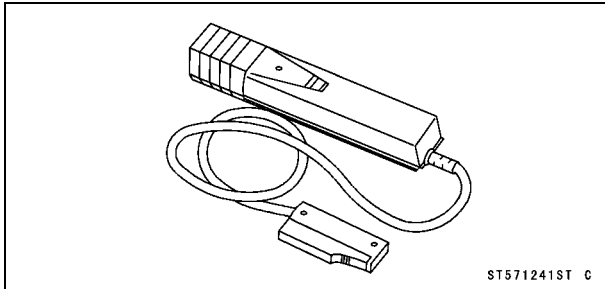
Rotor Puller, M16/M18/M20/M22 x 1.5:
57001-1216



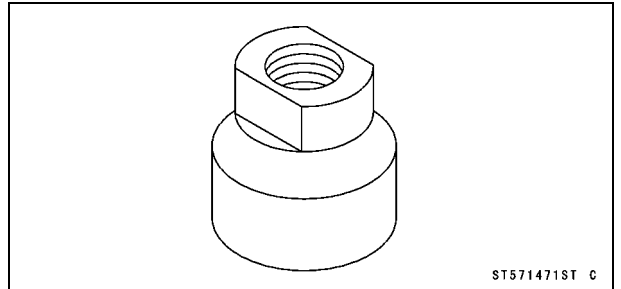
Needle Adapter Set:
57001-1457



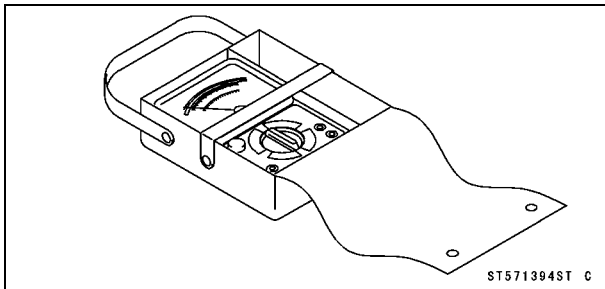
Timing Light:
57001-1241



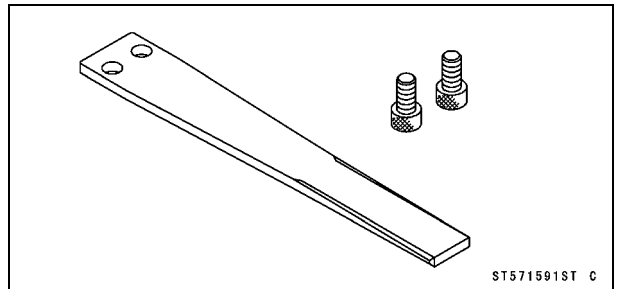
Flywheel Puller, M28 x 1.0:
57001-1471



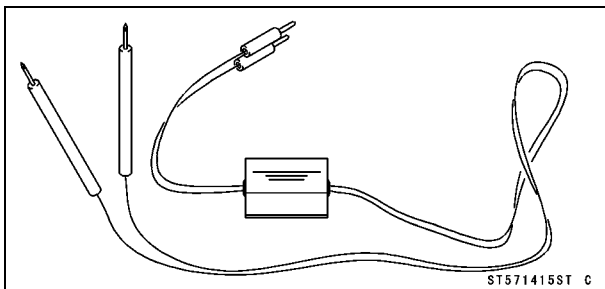
Hand Tester:
57001-1394



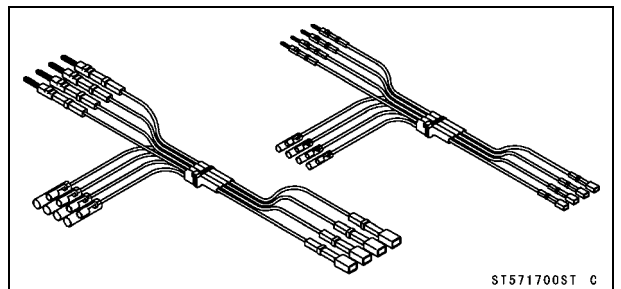
Grip:
57001-1591



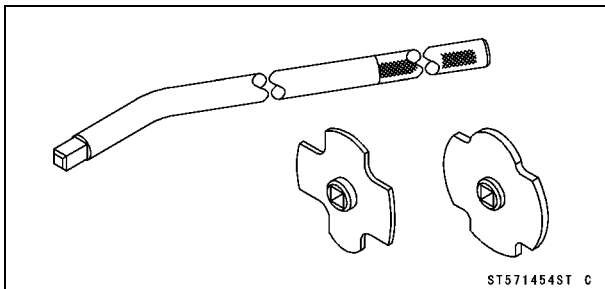
Peak Voltage Adapter:
57001-1415



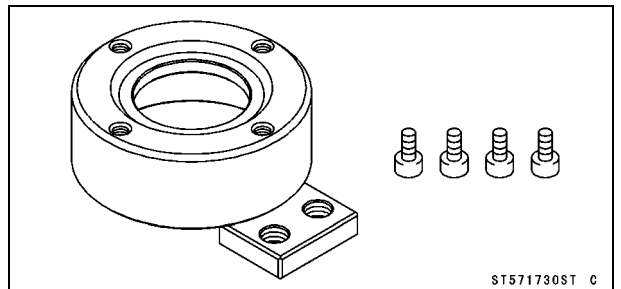
Measuring Adapter:
57001-1700



Filler Cap Driver:
57001-1454



Rotor Holder:
57001-1730

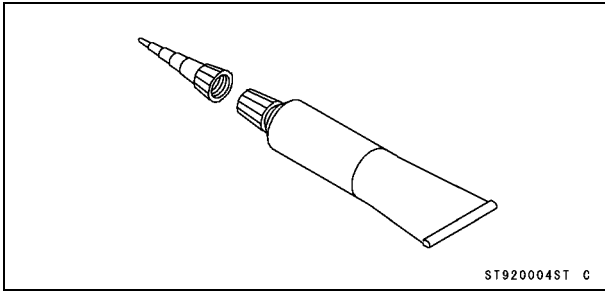


16-6 ELECTRICAL SYSTEM

Special Tools and Sealant

Liquid Gasket, TB1211F:

92104-0004

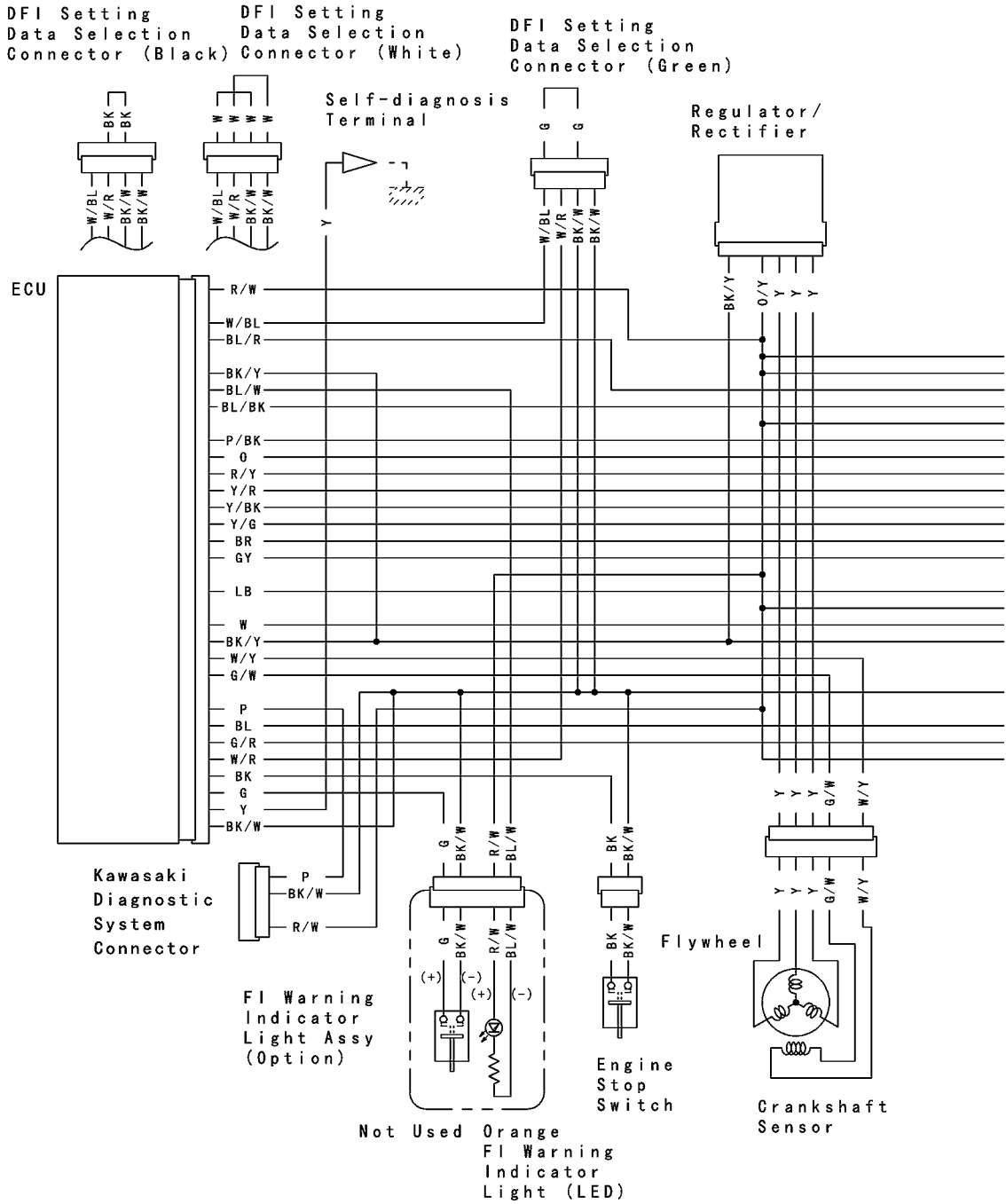


Wiring Diagram

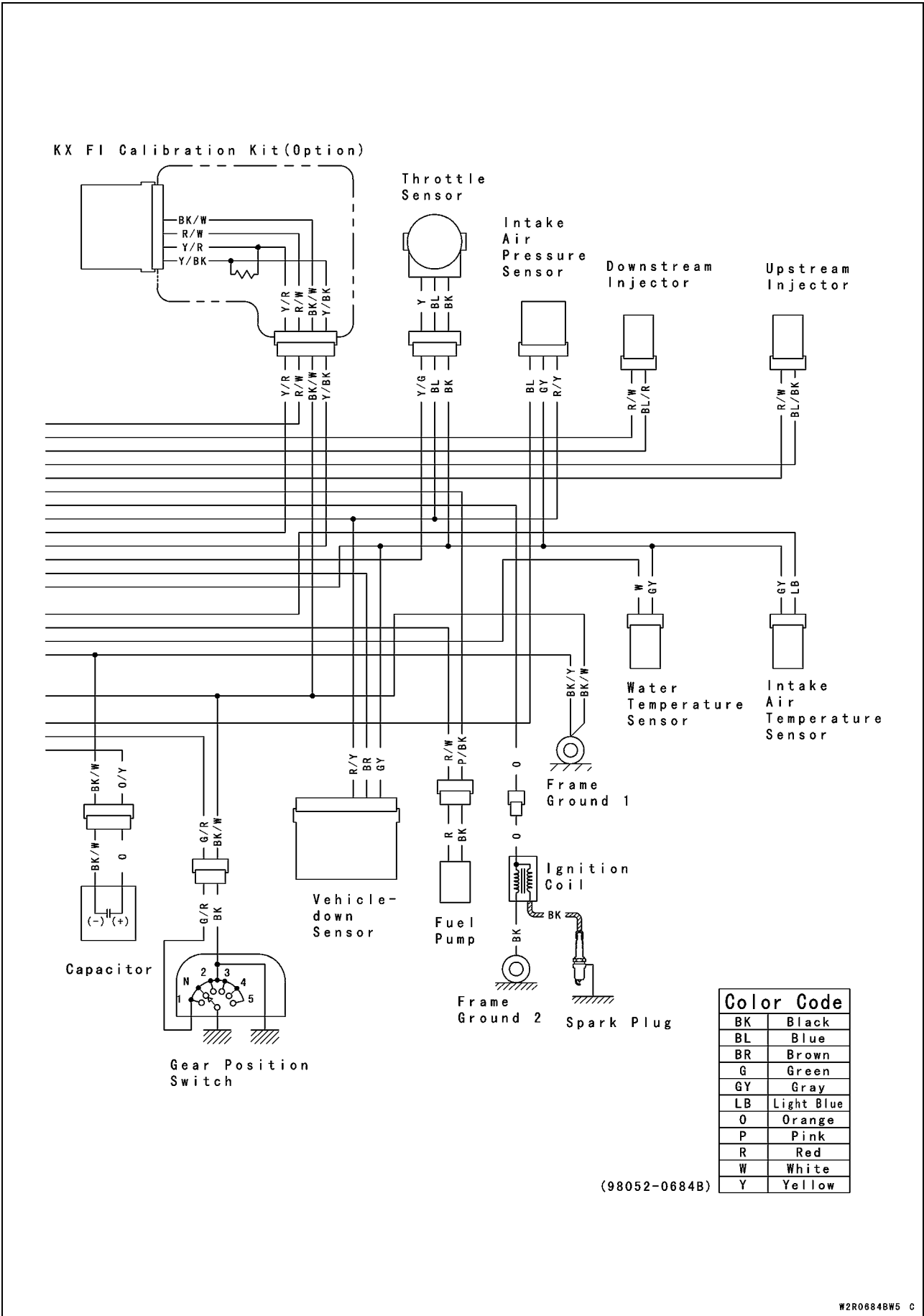
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16-8 ELECTRICAL SYSTEM

Wiring Diagram



Wiring Diagram



16-10 ELECTRICAL SYSTEM

Precautions

There are numbers of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect any electrical connections while the engine is running.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine leads for signs of burning, fraying, etc. Poor leads and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

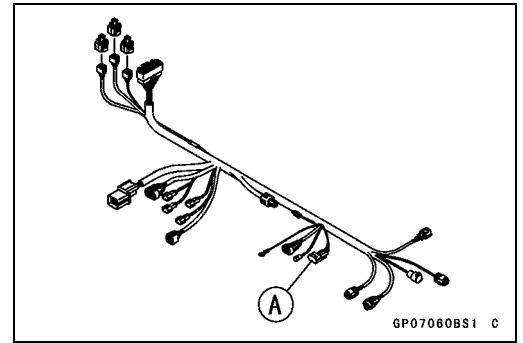
Electrical Wiring

Wiring Inspection

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

Special Tool - Hand Tester: 57001-1394

- Set the tester to the $\times 1 \Omega$ range, and read the tester.
- ★ If the tester does not read 0Ω , the lead is defective. Replace the lead or the wiring harness if necessary.

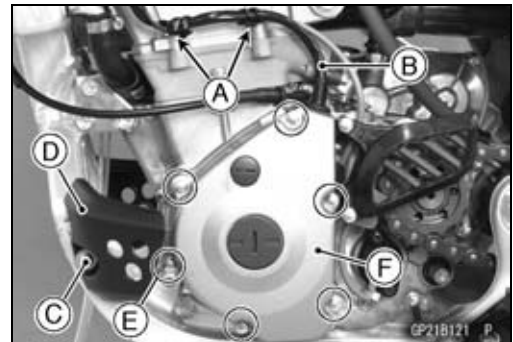
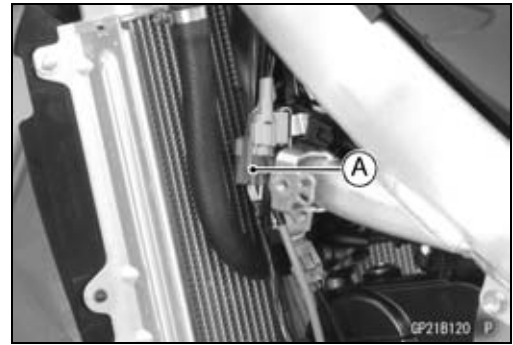


16-12 ELECTRICAL SYSTEM

Flywheel Magneto

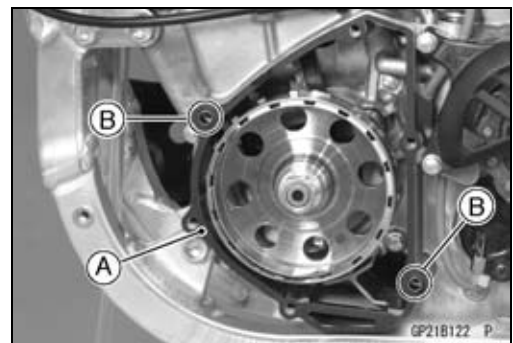
Magneto Cover Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
 - Left Radiator Shroud (see Radiator Shroud Removal in the Frame chapter)
 - Shift Pedal (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
- Disconnect the magneto lead connector [A] from the main harness.
- Open the clamps [A] then free the magneto lead [B].
- Remove:
 - Bolt [C] and Engine Guard [D]
 - Magneto Cover Bolts [E]
 - Magneto Cover [F]



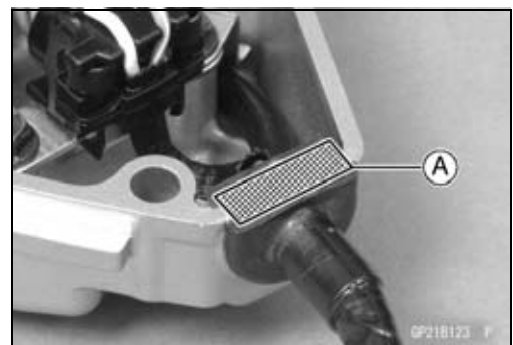
Magneto Cover Installation

- Replace the gasket [A] with a new one and install the new gasket.
- Be sure to install the dowel pins [B].

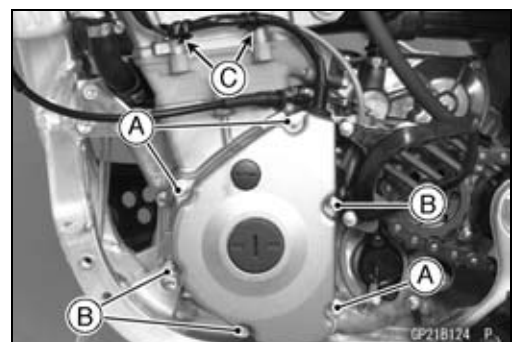


- Using a high flash-point solvent, clean off any oil or dirt that may be on the silicone sealant coating area. Dry them with a clean cloth.
- Apply silicone sealant to the area [A] to the magneto lead grommet.

Sealant - Liquid Gasket, TB1211F: 92104-0004



- Tighten:
 - L = 35 mm (1.4 in.) [A]
 - L = 30 mm (1.2 in.) [B]
- **Torque - Magneto Cover Bolts: 9.8 N-m (1.0 kgf-m, 87 in-lb)**
- Hold the magneto lead and gear position switch lead with the clamps [C] according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Connect the magneto lead connector.
- Install the removed parts (see appropriate chapters).



Flywheel Removal

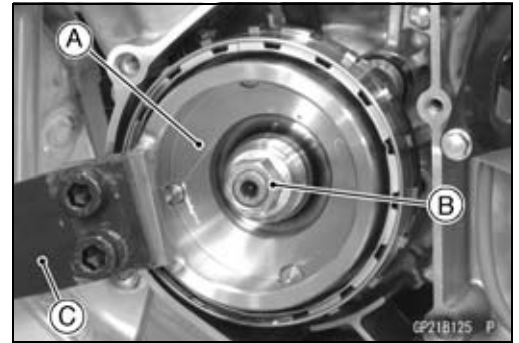
- Remove the magneto cover (see Magneto Cover Removal).

Flywheel Magneto

- Hold the flywheel steady with the rotor holder [A], and remove the flywheel nut [B].

Special Tools - Grip [C]: 57001-1591

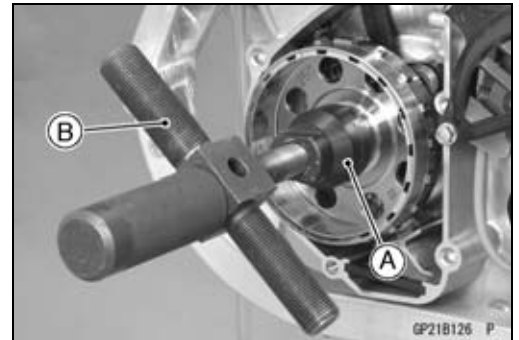
Rotor Holder: 57001-1730



- Install the flywheel puller [A] to the flywheel.
- Install the rotor puller [B] to the flywheel puller.
- Remove the flywheel from the crankshaft by turning in the rotor puller and tapping the head of the puller lightly with a hammer, while holding the puller body steady. There is a woodruff key in the crankshaft tapered portion.

Special Tools - Rotor Puller, M16/M18/M20/M22 × 1.5: 57001-1216

Flywheel Puller, M28 × 1.0: 57001-1471



NOTICE

Never strike the grab bar or the flywheel itself. Striking the bar can bond it. If the flywheel is struck, the magnets may lose their magnetism.

- Remove the woodruff key.

Flywheel Installation

- Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper [A] and in the hole [B] of the flywheel. Dry them with a clean cloth.
- Fit the woodruff key [C] securely in the slot of the crankshaft.
- Install the flywheel according to the following procedures.

NOTE

○ Confirm the flywheel fit or not to the crankshaft before tightening it with specified torque.

- Install the flywheel.
- Hold the flywheel steady with the rotor holder, and tighten the flywheel nut with 54 N·m (5.5 kgf·m, 40 ft·lb) of torque.

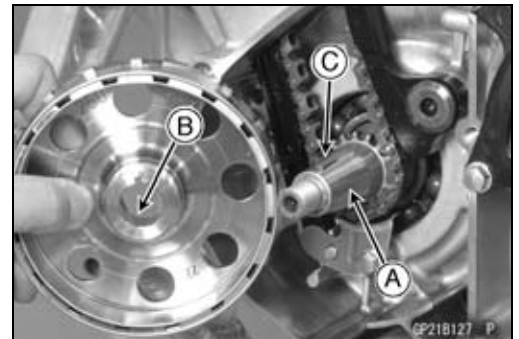
Special Tools - Grip: 57001-1591

Rotor Holder: 57001-1730

- Remove the flywheel nut.
- Check the tightening torque with rotor puller.

Special Tool - Flywheel Puller, M28 × 1.0: 57001-1471

- ★ If the flywheel is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
- ★ If the flywheel 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 flywheel tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.



16-14 ELECTRICAL SYSTEM

Flywheel Magneto

- Hold the flywheel steady with the rotor holder, and tighten the flywheel nut.

Special Tools - Grip: 57001-1591

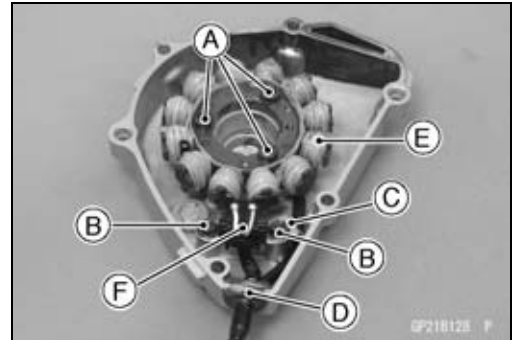
Rotor Holder: 57001-1730

Torque - Flywheel Nut: 78.5 N-m (8.00 kgf-m, 57.9 ft-lb)

- Install the magneto cover (see Magneto Cover Installation).

Stator Coil Removal

- Remove:
 - Magneto Cover (see Magneto Cover Removal)
 - Stator Coil Bolts [A]
 - Crankshaft Sensor Bolts [B]
 - Holder [C]
 - Magneto Lead Grommet [D]
- Remove the stator coil [E] and crankshaft sensor [F] as a set.



Stator Coil Installation

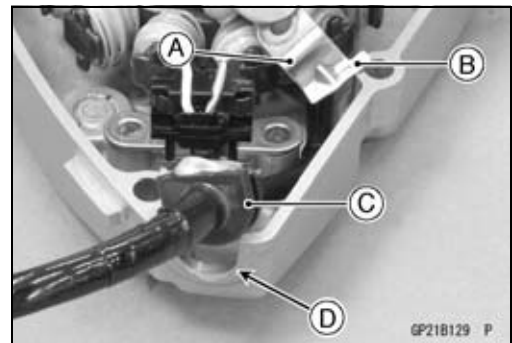
- Apply a non-permanent locking agent to the threads of the stator coil bolts.
- Install the stator coil and crankshaft sensor as a set.
- Tighten:
 - Torque - Stator Coil Bolts: 9.8 N-m (1.0 kgf-m, 87 in-lb)**
- Apply a non-permanent locking agent to the threads of the crankshaft sensor bolts.
- Install the holder [A] and tighten the crankshaft sensor bolts.
- Hold the magneto lead with the guide [B] of the holder.

Torque - Crankshaft Sensor Bolts: 7.0 N-m (0.71 kgf-m, 62 in-lb)

- Using a high flash-point solvent, clean off any oil or dirt that may be on the silicone sealant coating area. Dry them with a clean cloth.
- Apply silicone sealant to the circumference of the magneto lead grommet [C], and fit the grommet into the notch [D] of the cover securely.

Sealant - Liquid Gasket, TB1211F: 92104-0004

- Install the magneto cover (see Magneto Cover Installation).



Flywheel Magneto

Flywheel Inspection

There are three types of magneto problems: short, open (lead burned out), or loss in flywheel magnetism. A short or open in one of the coil leads will result in either a low output, or no output at all. A loss in flywheel magnetism, which may be caused by dropping or hitting the flywheel by leaving it near an electromagnetic field, or just by aging, will result in low output.

NOTE

○ Be sure the prepared battery is fully charged.

- Check the magneto output voltage, do the following procedures.
- Remove the left radiator shroud (see Radiator Shroud Removal in the Frame chapter).
- Disconnect the magneto lead connector (see Magneto Cover Removal).
- Use the engine revolution tester [A] for high accuracy.
- Connect the measuring adapter [B] between the disconnected connectors.
- Connect the hand tester [C] to the magneto lead connector.
- Main Harness [D]
- Flywheel [E]

Special Tools - Hand Tester: 57001-1394

Measuring Adapter: 57001-1700

- Refer to the Self-diagnosis Procedures in the Fuel System (DFI) chapter, connect the 12 V battery to the main harness.
- Start the engine.
- Run it at the rpm given in the table 1.
- Note the voltage readings (total 3 measurements).

Table 1 Magneto Output Voltage at 4 000 r/min (rpm)

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
AC 250 V	One yellow lead	Another yellow lead	37 V or more

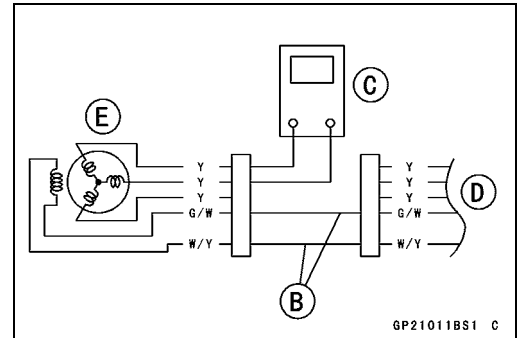
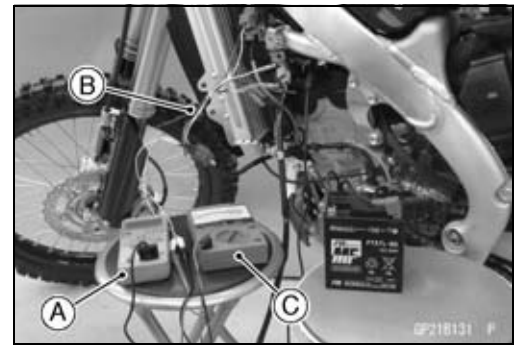
- ★ If the output voltage shows the value in the table, the magneto operates properly.
- ★ If the output voltage shows a much lower reading than that given in the table indicates that the magneto is defective.
- To check the stator coil resistance as follows.
- Stop the engine.
- Connect the hand tester as shown in the table 2.

Special Tool - Hand Tester: 57001-1394

- Note the resistance readings (total 3 measurements).

Table 2 Stator Coil Resistance at 20°C (68°F)

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
× 1 Ω	One yellow lead	Another yellow lead	0.4 ~ 1.1 Ω



16-16 ELECTRICAL SYSTEM

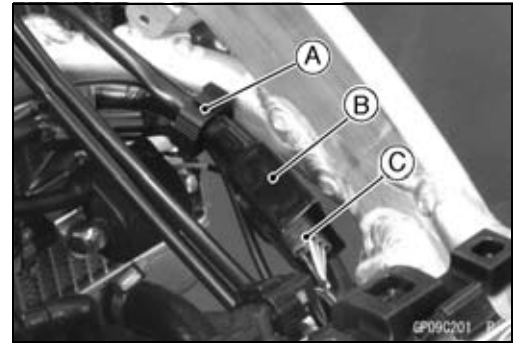
Flywheel Magneto

- ★ If there is more resistance than shown in the table, or no hand tester reading (infinity), the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
- Using the highest resistance range of the hand tester, measure the resistance between each lead and chassis ground.
- ★ Any hand tester reading less than infinity (∞) indicates a short, necessitating stator replacement.
- ★ If the stator coil has normal resistance, but the voltage check showed the magneto to be defective; then the flywheel have probably weakened, and the flywheel must be replaced.

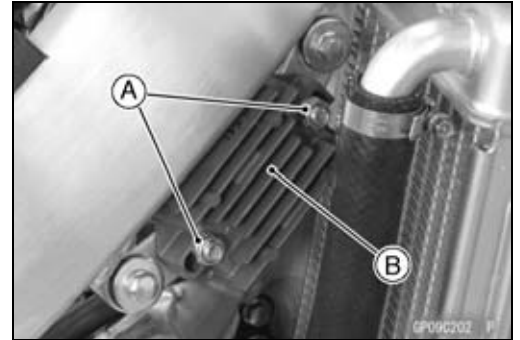
Charging System

Regulator/Rectifier Removal

- Remove:
 - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Open the clamp [A], and free the lead.
- Slide the dust cover [B].
- Disconnect the regulator/rectifier lead connector [C].



- Remove:
 - Regulator/Rectifier Nuts [A]
 - Regulator/Rectifier [B]



Regulator/Rectifier Installation

- Replace the regulator/rectifier nuts with new ones.
- Install the regulator/rectifier and tighten the nuts.
 - Torque - Regulator/Rectifier Nuts: 10 N·m (1.02 kgf·m, 89 in·lb)**
- Run the regulator/rectifier lead according to the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Connect the regulator/rectifier lead connector.
- Cover the lead connector with dust cover.
- Install the removed parts (see appropriate chapters).

Regulator/Rectifier Output Voltage Inspection

NOTE

○Be sure the prepared battery is fully charged.

16-18 ELECTRICAL SYSTEM

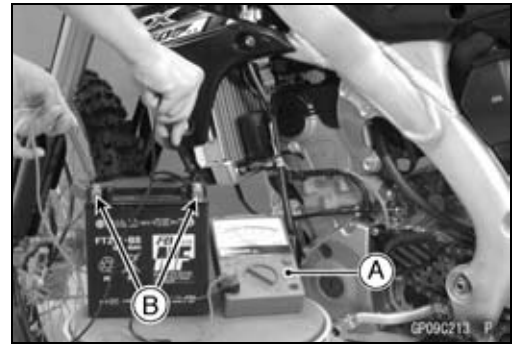
Charging System

○ Refer to the Self-diagnosis Procedures in the Fuel System (DFI) chapter, connect the 12 V battery to the main harness.

- Connect the hand tester [A] to the battery terminals [B].

Special Tool - Hand Tester: 57001-1394

- Start the engine, and note the voltage readings at various engine speeds. But they must be kept the specified voltage.



Charging Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
DC 25 V	Battery (+)	Battery (-)	14.0 ~ 14.5 V

- Stop the engine.
- ★ 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 magneto output is insufficient for the loads. Check the magneto and regulator/rectifier to determine which part is defective.

Regulator/Rectifier Inspection

- Remove:
Regulator/Rectifier (see Regulator/Rectifier Removal)
- Set the hand tester to the $\times 1$ k Ω range and make the measurements shown in the table.

Special Tool - Hand Tester: 57001-1394

- Connect the hand tester to the regulator/rectifier.
- ★ If the tester readings are not as specified, replace the regulator/rectifier.

NOTICE

**Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.
If a megger or a meter with a large capacity battery is used, the regulator/rectifier will be damaged.**

Charging System

Regulator/Rectifier Resistance (Unit: k Ω)

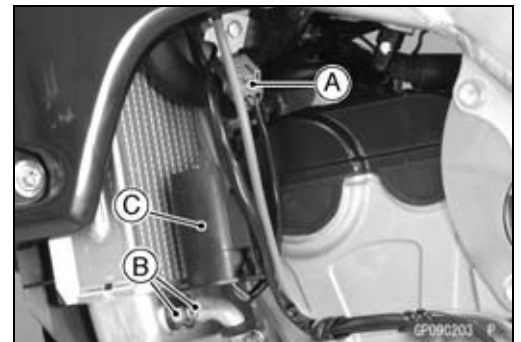
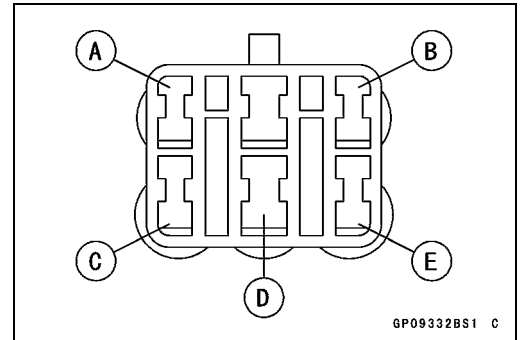
		Tester (+) Lead Connection				
Terminal		A	B	C	D	E
(-)*	A	—	∞	∞	∞	∞
	B	6 ~ 20	—	4 ~ 12	4 ~ 12	4 ~ 12
	C	4 ~ 12	∞	—	∞	∞
	D	4 ~ 12	∞	∞	—	∞
	E	4 ~ 12	∞	∞	∞	—

(-)*: Tester (-) Lead Connection

- Install the regulator/rectifier (see Regulator/Rectifier Installation).

Capacitor Removal

- Disconnect the connector [A].
- Remove the bolts [B].
- Remove the capacitor [C] from the bracket.



Capacitor Installation

- Installation is the reverse of removal.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

16-20 ELECTRICAL SYSTEM

Charging System

Capacitor Inspection

- Remove:
Capacitor (see Capacitor Removal)
- Set the hand tester to the $\times 1 \text{ k}\Omega$ range, connect the tester to the leads of the capacitor, and check the internal resistance the following table.

Special Tool - Hand Tester: 57001-1394

NOTICE

Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.

- ★ If the readings do not correspond to the table, replace the capacitor unit.

Capacitor Internal Resistance

		Tester Positive (+) Lead Connection	
Color		O	BK/W
Tester Negative (-) Lead Connection	O	—	more than 5 kΩ *1
	BK/W	Should not be inspected *2	—

*1: Check the capacitor after 2 minutes.

*2: Do not check the resistance because of opposite of the polarity.

Capacitor Capacity

10 000 μF /50 V

Ignition Timing

Ignition Timing Inspection

- Remove the timing inspection cap [A].
Special Tool - Filler Cap Driver: 57001-1454



- Attach the timing light [A] to the ignition coil lead in the manner prescribed by the manufacturer.

Special Tool - Timing Light: 57001-1241

- Start the engine and aim the timing light at the TDC mark [B] on the flywheel.
- Run the engine at the speeds specified and note the alignment of the TDC mark.



- Check the engine speed, using the engine revolution tester [A] for high accuracy.



Ignition Timing

Engine speed [r/min (rpm)]	Hole groove aligns with:
2 000	Line mark on flywheel

- ★ If the ignition timing is incorrect, check the crankshaft sensor (see Crankshaft Sensor Inspection).
- ★ If the crankshaft sensor is normal, replace the ECU.
- Replace the timing inspection cap O-ring with a new one, and apply grease it.
- Tighten:

Special Tool - Filler Cap Driver: 57001-1454

Torque - Timing Inspection Cap: 3.5 N·m (0.36 kgf·m, 31 in·lb)

16-22 ELECTRICAL SYSTEM

Ignition System

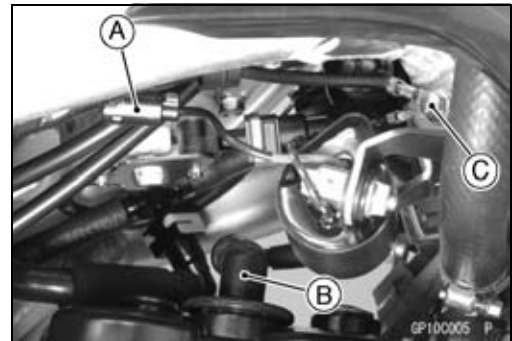
Safety Instructions

⚠ WARNING

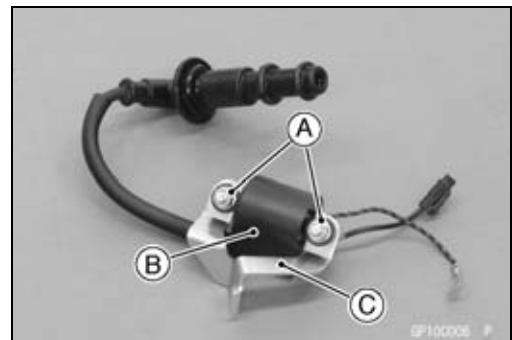
The ignition system produces extremely high voltage. Do not touch the spark plug, ignition coil or ignition coil lead while the engine is running, or you could receive a severe electrical shock.

Ignition Coil Removal

- Disconnect the primary lead connector [A].
- Pull off the spark plug cap [B].
- Remove the ignition coil bracket bolt [C] and ignition coil with bracket.

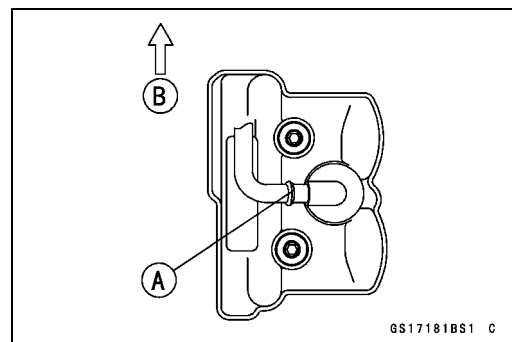


- Remove the mounting bolts and nuts [A], and separate the ignition coil [B] and its bracket [C].

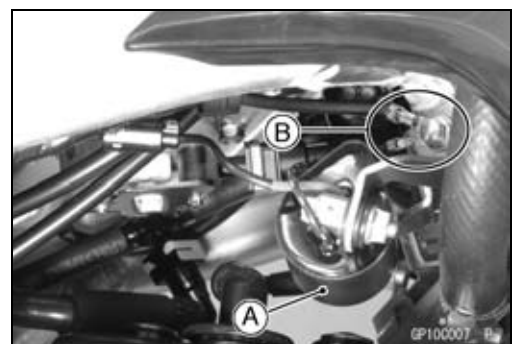


Ignition Coil Installation

- Assemble the ignition coil and its bracket, and tighten the bolts and nuts.
- Install the spark plug cap [A].
Front Side [B]
- Insert the spark plug cap to the cylinder head cover until the flange of the cap contacts the cover.



- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install:
 - Ignition Coil [A] with Bracket
 - Frame Ground Lead (Inside) and Ignition Coil Ground Lead (Outside) [B]
 - Ignition Coil Bracket Bolt
- Turn the clamp side of the ignition coil ground lead terminal and frame ground lead terminal outside.
- Connect the primary lead connector.
- Pull up the spark plug cap lightly to make sure of the installation of the spark plug cap.



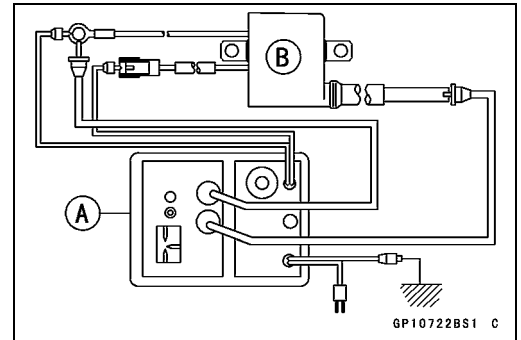
Ignition System

Ignition Coil Inspection

Measuring Arcing Distance

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance using the coil tester for the 3-needle method.

- Remove the ignition coil (see Ignition Coil Removal).
- Measure the arcing distance using the coil tester [A].
- Connect the ignition coil (with the spark plug cap left installed on the spark plug lead) [B] to the tester and measure the arcing distance.



⚠ WARNING

To avoid extremely high voltage shocks, do not touch the coil or lead.

- ★ If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.

3 Needle Arcing Distance

Standard: 7 mm (0.28 in.) or more

- To determine which part is defective, measure the arcing distance again with the spark plug cap removed from the spark plug lead.
- ★ If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug cap.

Measuring Coil Resistance

If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with the hand tester. However, the hand tester cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

Special Tool - Hand Tester: 57001-1394

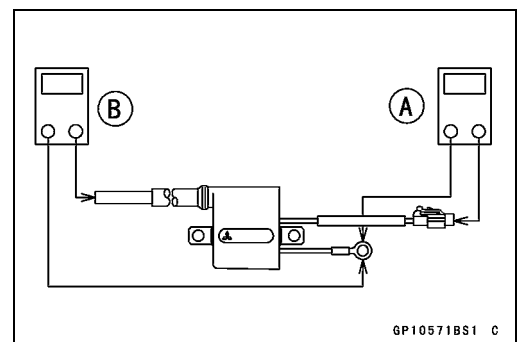
- Remove the ignition coil (see Ignition Coil Removal).
- Measure the primary winding resistance [A] as follows.
 - Connect the hand tester between the coil terminals.
 - Set the tester to the $\times 1 \Omega$ range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
 - Remove the spark plug cap from the spark plug lead.
 - Connect the hand tester between the spark plug lead and the ground lead terminal.
 - Set the tester to the $\times 1 \text{ k}\Omega$ range, and read the tester.

Ignition Coil Winding Resistance

Primary Windings: 0.28 ~ 0.38 Ω at 20°C (68°F)

Secondary Windings: 7.65 ~ 10.4 k Ω at 20°C (68°F)

- ★ If the tester does not read as specified, replace the ignition coil.
- ★ If the tester reads as specified, the ignition coil windings are probably good. However, if the ignition system still does not perform as it should after all other components have been checked, test replace the coil with one known to be good.
- Check the spark plug lead for visible damage.
- ★ If the spark plug lead is damaged, replace the ignition coil.



16-24 ELECTRICAL SYSTEM

Ignition System

Spark Plug Cleaning and Inspection

- Refer to the Spark Plug Cleaning and Inspection in the Periodic Maintenance chapter.

Spark Plug Gap Inspection

- Refer to the Spark Plug Cleaning and Inspection in the Periodic Maintenance chapter.

Ignition Coil Primary Peak Voltage Check

- Remove the spark plug cap from the spark plug, but do not remove the spark plug.
- Install the good spark plug [A] to the spark plug cap, then touch the frame with it.

NOTE

○ Measure the voltage with each lead connected correctly. The correct value may not be obtained if disconnected.

○ Maintain the correct value of compression pressure for the cylinder (Be sure to measure the voltage with the spark plug installed to the cylinder head.).

- Connect the peak voltage adapter [B] to the hand tester.

Special Tools - Hand Tester: 57001-1394

Peak Voltage Adapter: 57001-1415

Type: KEK-54-9-B

Needle Adapter Set: 57001-1457

Hand Tester Range: DC 250 V

- Connect the peak voltage adapter to the ignition coil terminal and ground.

Connections:

		Peak Voltage Adapter		Hand Tester
Ground [C]	←	R lead	→	(+)
Terminal (O Lead) [D]	←	BK lead	→	(-)

Ignition Coil [E]

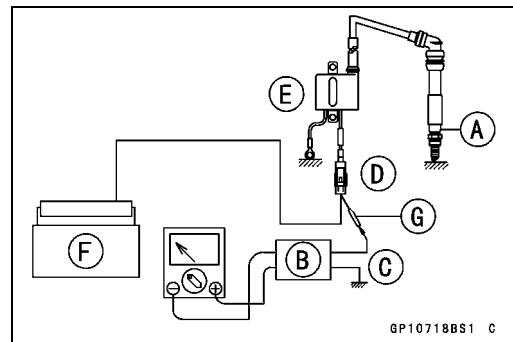
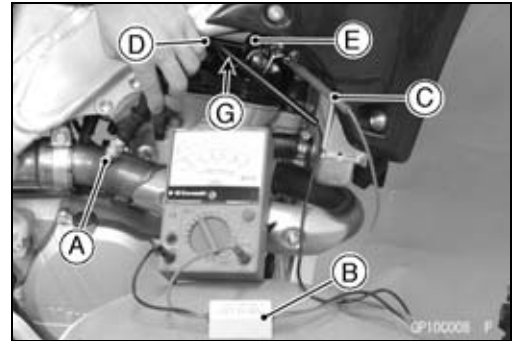
ECU [F]

Needle Adapter [G]

- Shift the gear to the neutral position.
- Crank the engine by kicking the pedal several times to measure the peak voltage of the ignition coil.

Ignition Coil Primary Peak Voltage

Standard: 150 V or more



⚠ WARNING

Electrical equipment can cause serious electrical shock. To avoid being shocked, do not touch the metal portion of the probe when measuring voltage.

- ★ If the voltage is less than the specified value, see the Troubleshooting on next page.

Ignition System

IC Igniter Inspection

○The IC igniter is built in the ECU.

●Refer to the following items.

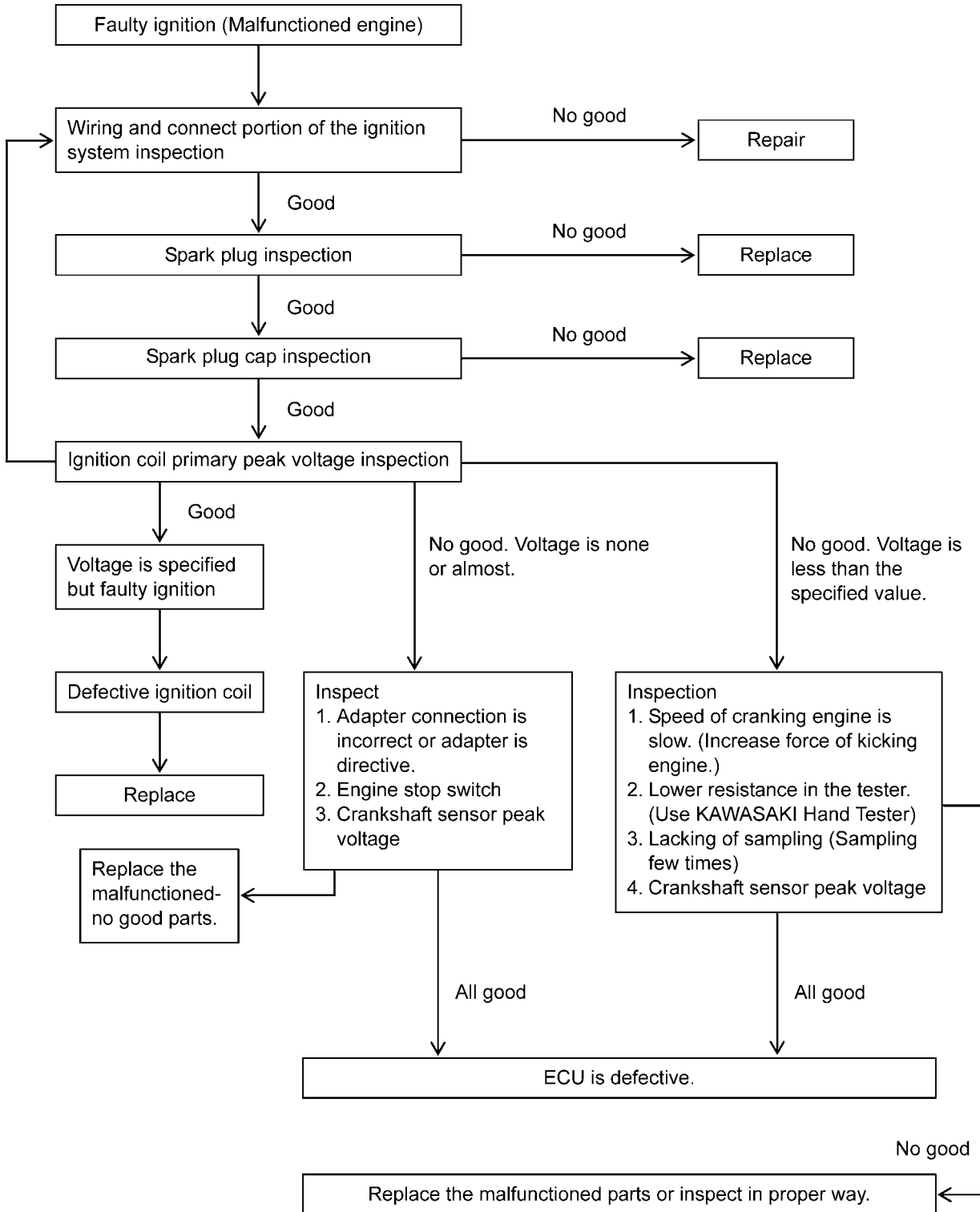
Ignition System Troubleshooting (see Ignition System section)

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

16-26 ELECTRICAL SYSTEM

Ignition System

Troubleshooting



Ignition System

Crankshaft Sensor Peak Voltage Check

- Disconnect the magneto lead connector (see Magneto Cover Removal).

NOTE

- Measure the voltage with each lead connected correctly. The correct value may not be obtained if disconnected.
- Maintain the correct value of compression pressure for the cylinder (Be sure to measure the voltage with the spark plug installed to the cylinder head.).

⚠ WARNING

Electrical equipment can cause serious electrical shock. To avoid being shocked, do not touch the metal portion of the probe when measuring voltage.

- Set the hand tester to DC 25 V range, and connect it to the peak voltage adapter [A].

Special Tools - Hand Tester: 57001-1394

Peak Voltage Adapter: 57001-1415

Type: KEK-54-9-B

- Connect the adapter to the terminals of the magneto lead connector [B].

Connections:

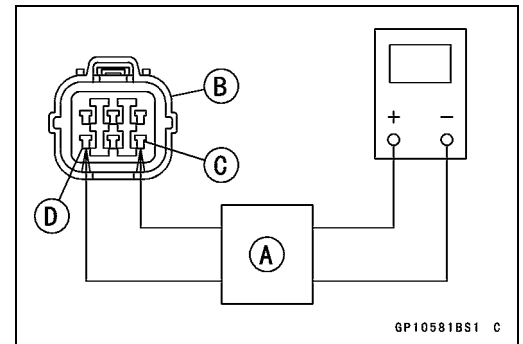
Magneto Lead Connector	Peak Voltage Adapter	Hand Tester
G/W lead [C]	← R lead →	(+)
W/Y lead [D]	← BK lead →	(-)

- Shift the gear to the neutral position.
- Crank the engine by kicking the pedal several times to measure the peak voltage of the crankshaft sensor.

Crankshaft Sensor Peak Voltage

Standard: 2.5 V or more

- ★ If the voltage is less than the specified, check the crankshaft sensor (see Crankshaft Sensor Inspection).



16-28 ELECTRICAL SYSTEM

Ignition System

Crankshaft Sensor Inspection

- Disconnect the magneto lead connector (see Magneto Cover Removal).
- Set the hand tester [A] to the $\times 10 \Omega$ range and connect it to the Green/White [B] and White/Yellow [C] leads in the connector.

Special Tool - Hand Tester: 57001-1394

Crankshaft Sensor Resistance

Standard: 180 ~ 280 Ω at 20°C (68°F)

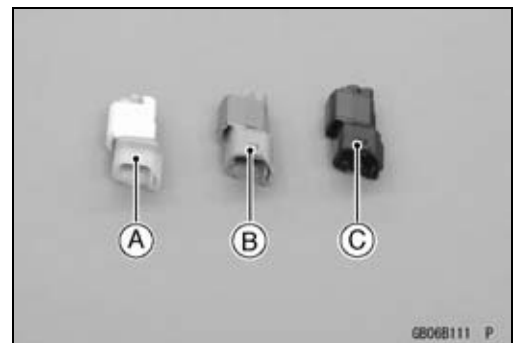
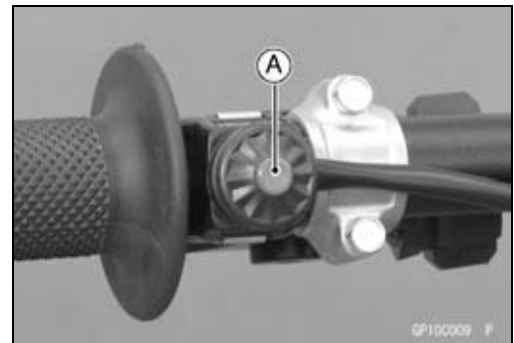
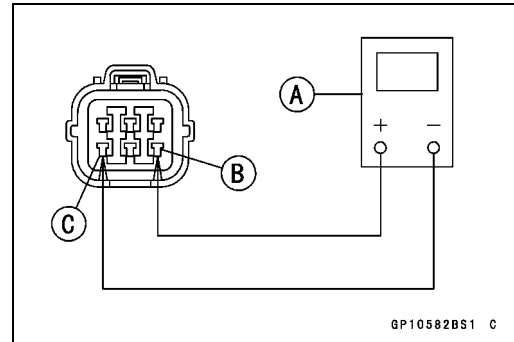
- ★ If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.
- ★ Any tester reading less than infinity (∞) indicates a short, necessitates replacement of the crankshaft sensor assembly.

Engine Stop Switch System Check

- Start the engine.
- Push the engine stop switch [A], stop the engine.
- ★ If the engine does not stop, check the engine stop switch for continuity (see Engine Stop Switch Inspection).
- ★ If the engine stop switch is good, check the wiring (see Wiring Inspection).
- ★ If the wiring is good, replace the ECU.

DFI Setting Data Selection Connector Inspection

- White Connector [A] (for Soft Track Condition)
- Green Connector [B] (for Standard)
- Black Connector [C] (for Hard Track Condition)



Ignition System

- Check the wiring for continuity between the terminals of each connector referring the connector circuit.

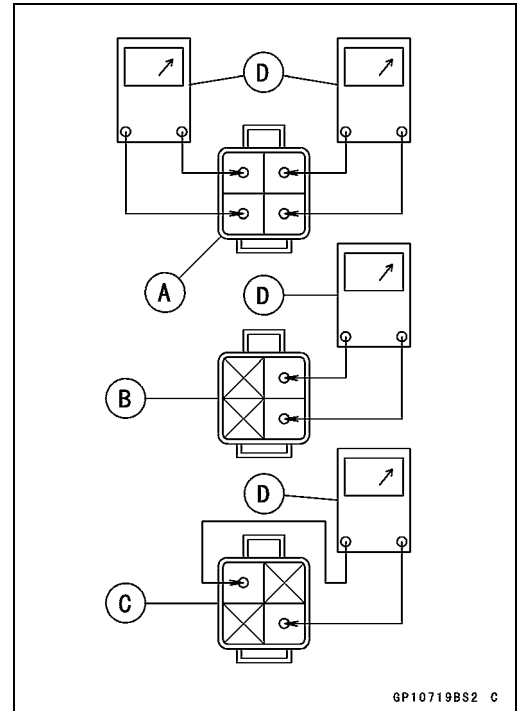
White Connector [A]

Green Connector [B]

Black Connector [C]

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

- ★ If the tester does not read 0 Ω , the connector is defective.
Replace the connector with a new one.



16-30 ELECTRICAL SYSTEM

Switches


Engine Stop Switch Inspection

- Using the hand tester, check to see that the connections shown in the table have continuity (about zero ohms).

Special Tool - Hand Tester: 57001-1394

- ★ If the switch has an open or short, replace it with a new one.

Engine Stop Switch Connection

	BK / W	BK
Push		
Release		

Gear Position Switch Removal

- Refer to the Gear Position Switch Removal in the Fuel System (DFI) chapter.

Gear Position Switch Installation

- Refer to the Gear Position Switch Installation in the Fuel System (DFI) chapter.

Gear Position Switch Inspection

- Refer to the Gear Position Switch Inspection in the Fuel System (DFI) chapter.

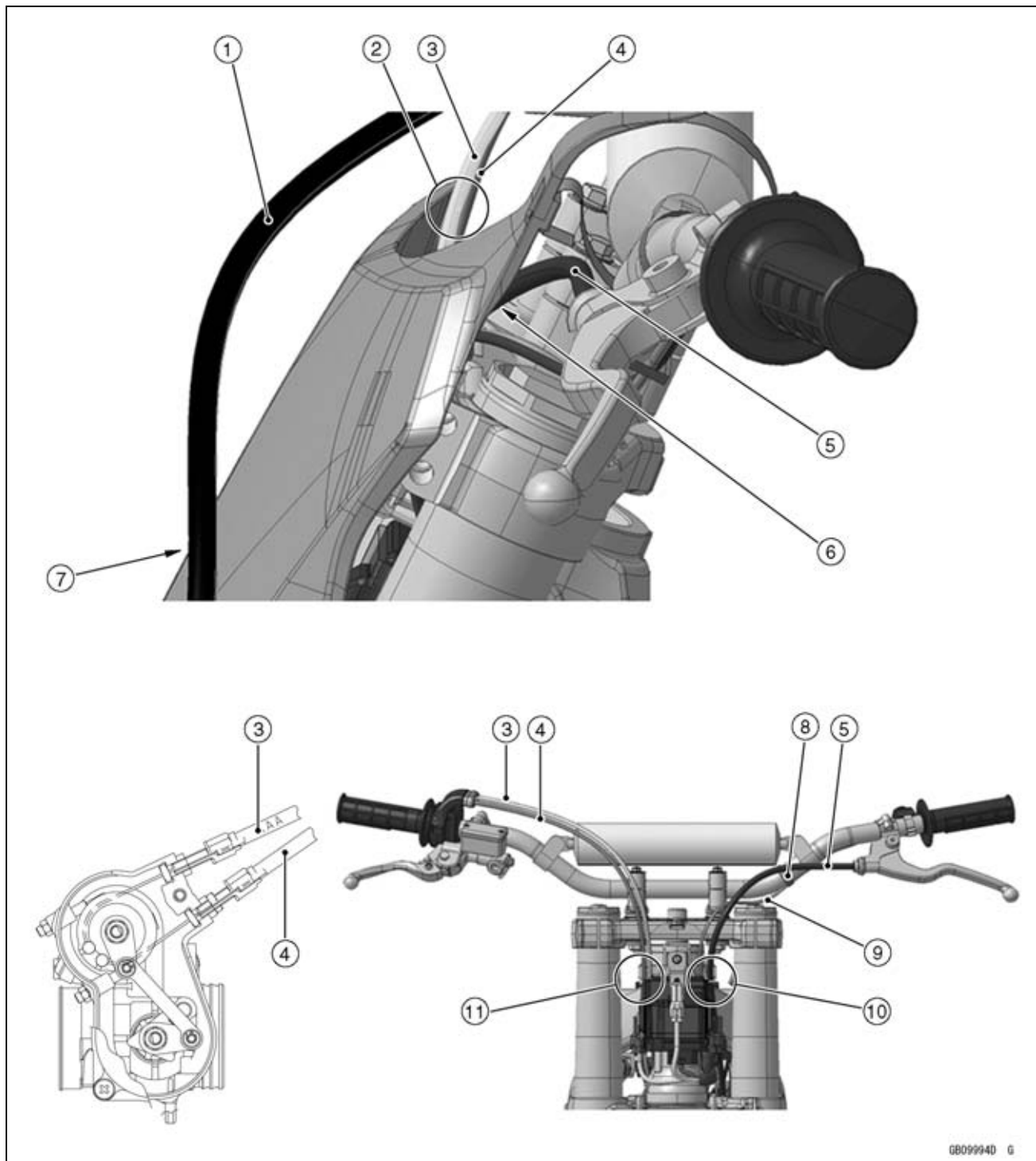
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Troubleshooting Guide	17-13

17-2 APPENDIX

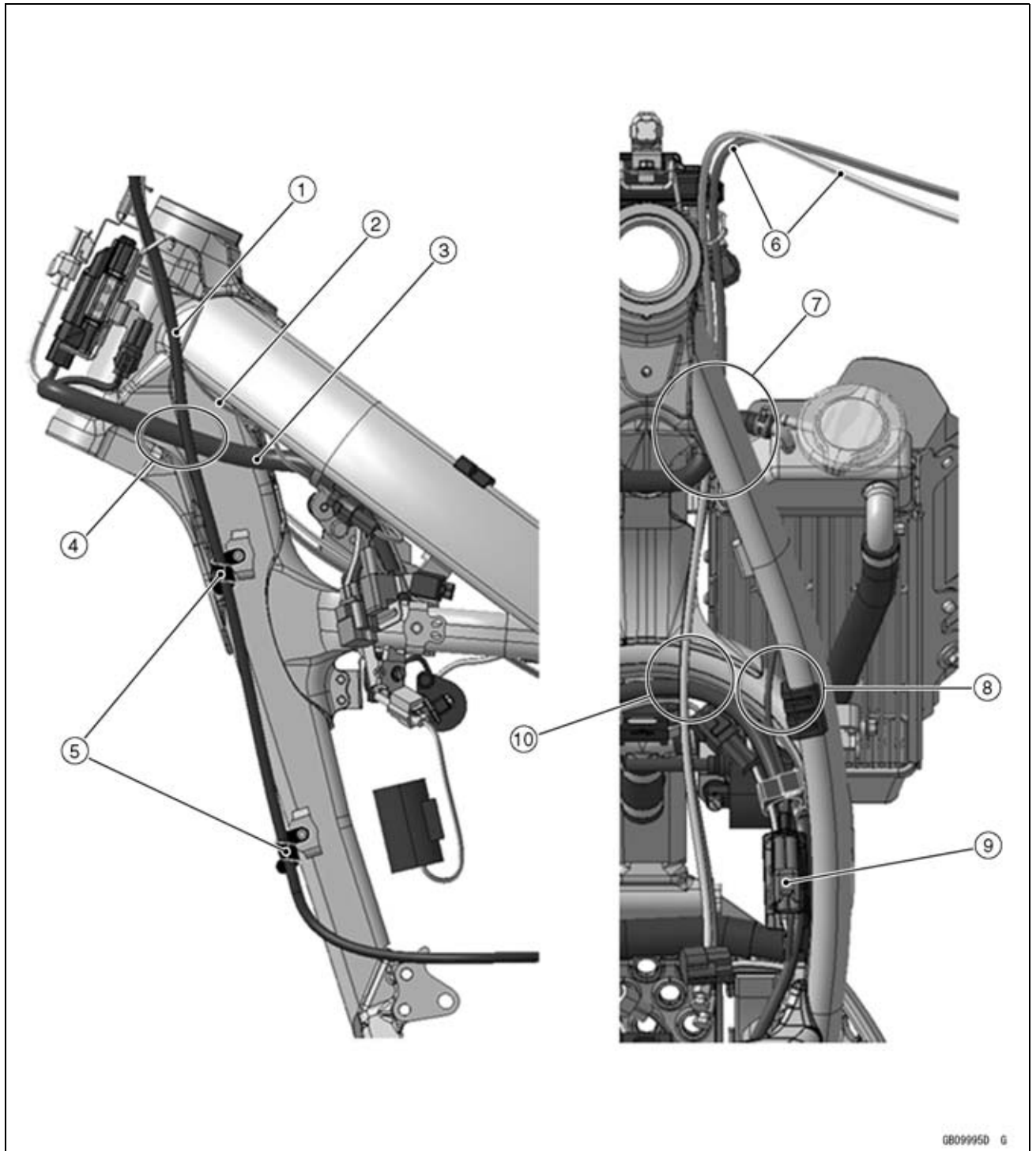
Cable, Wire, and Hose Routing



GB099940 G

1. Front Brake Hose
2. Run the throttle cables inside of the number plate.
3. Throttle Cable (Accelerator)
4. Throttle Cable (Decelerator)
5. Clutch Cable
6. Run the clutch cable inside of the number plate.
7. Run the front brake hose outside of the number plate.
8. Band (Hold the engine stop switch lead.)
9. Engine Stop Switch Lead
10. Run the engine stop switch lead and clutch cable into the guide.
11. Run the throttle cables into the guide.

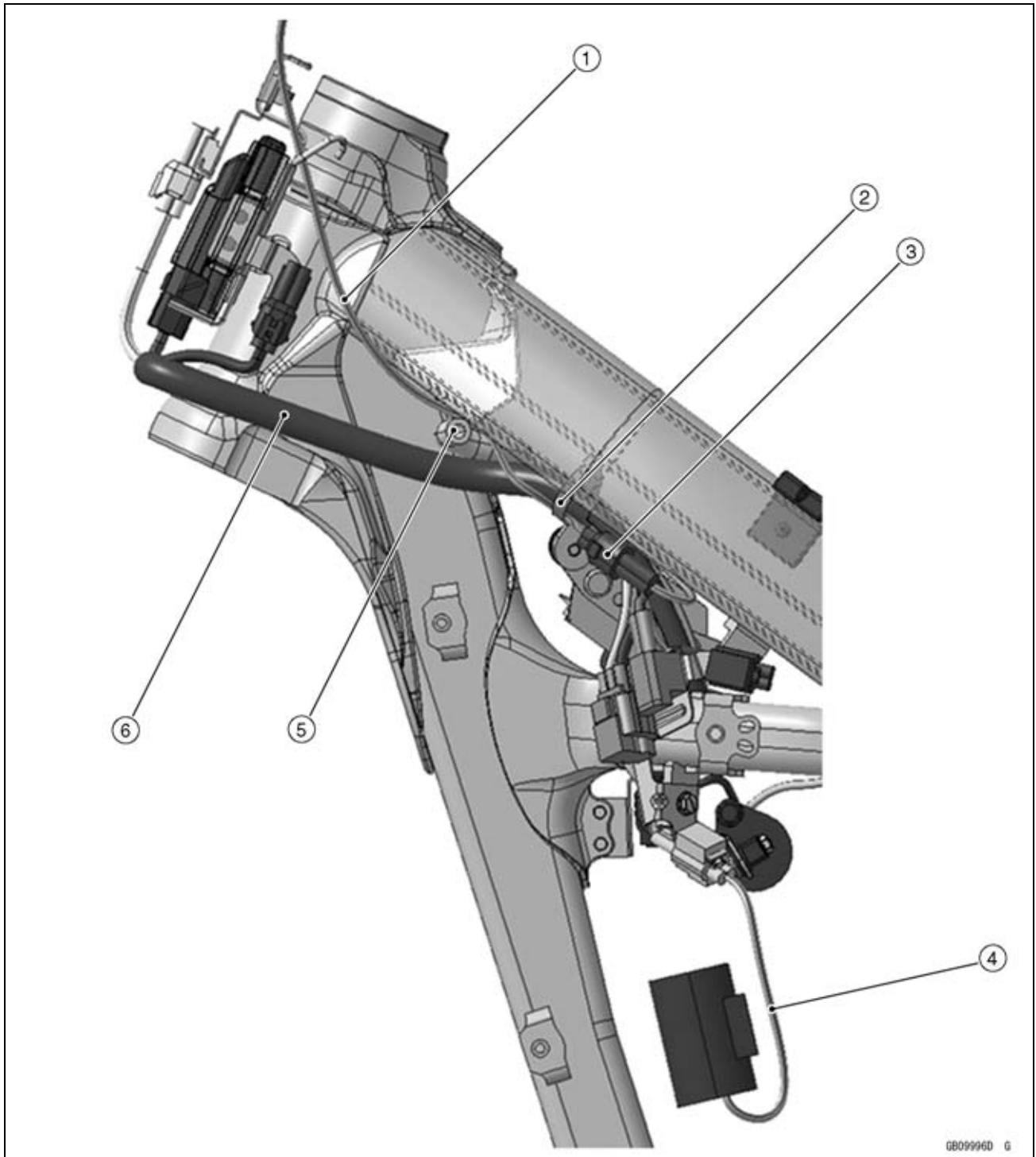
Cable, Wire, and Hose Routing



1. Clutch Cable
2. Engine Stop Switch Lead
3. Main Harness
4. Run the clutch cable outside of the main harness.
5. Clamps (Firmly twist the clamp from near bolted point around the clutch cable.)
6. Throttle Cables
7. Run the throttle cables between the joint hose and radiator overflow hose.
8. Run the regulator/rectifier lead as shown.
9. Put the regulator/rectifier lead connector on the top position.
10. Run the throttle cables over the main harness.

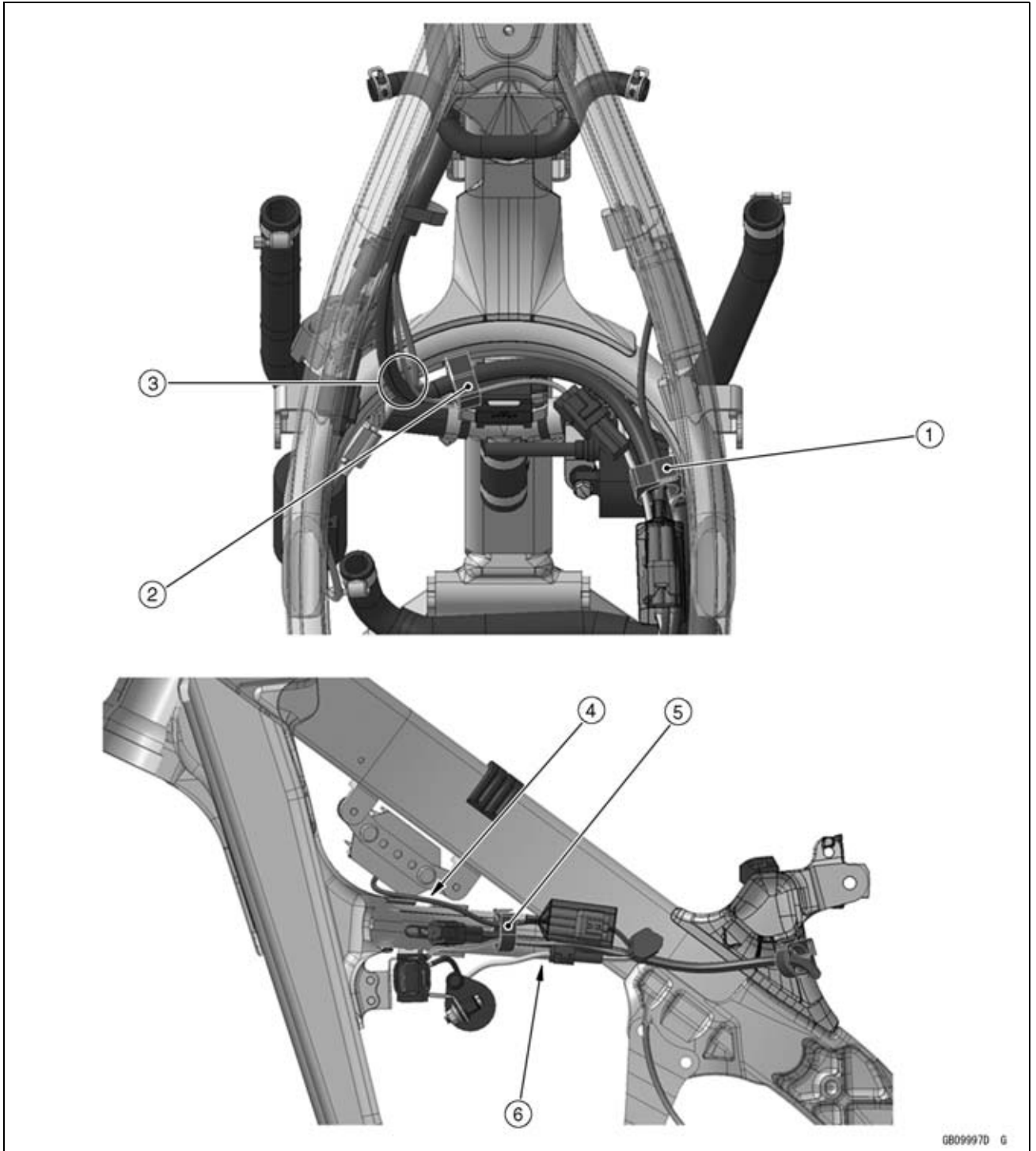
17-4 APPENDIX

Cable, Wire, and Hose Routing



1. Engine Stop Switch Lead
2. Clamp (Hold the main harness and engine stop switch lead on the main harness at the white taped position.)
3. Position the engine stop switch lead connector behind the clamp and between the main harness and frame.
4. Run the capacitor lead to the right side of the capacitor.
5. Joint Hose
6. Main Harness

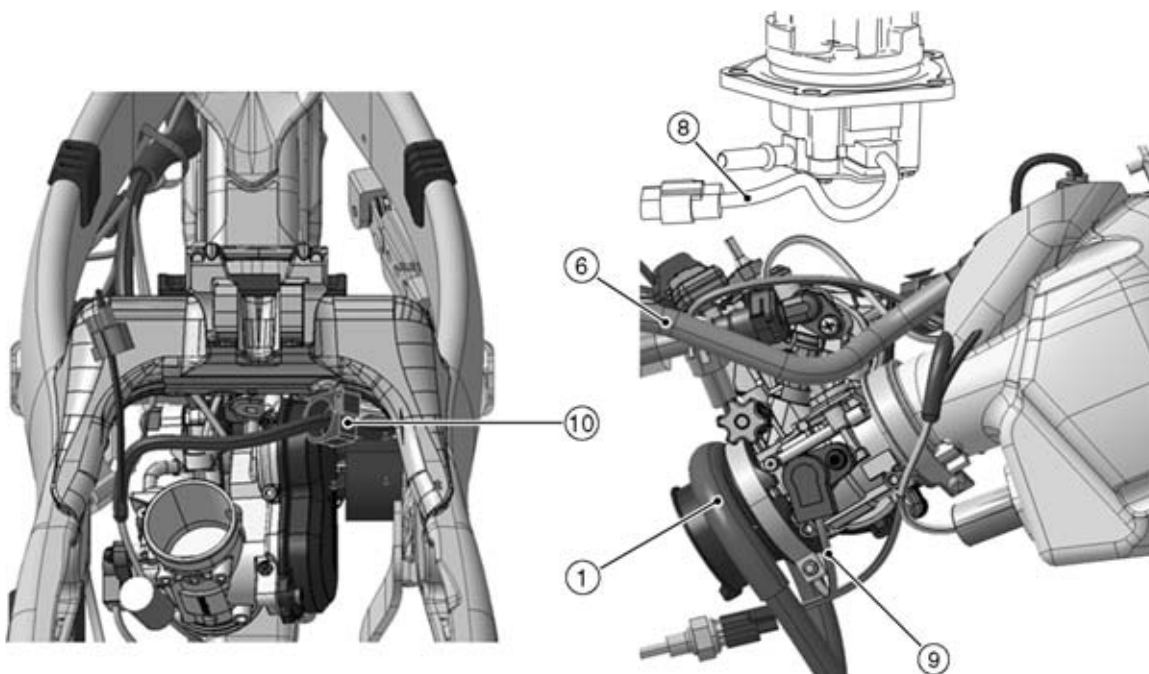
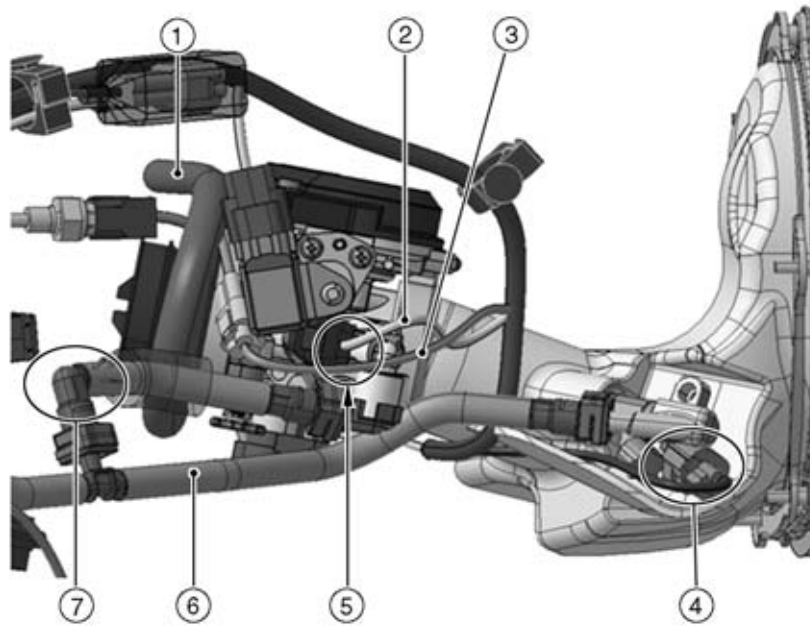
Cable, Wire, and Hose Routing



1. Clamp (Turn the lock position to upward.)
2. Clamp (Turn the lock position to upward.)
3. Run the main harness and option lead over the capacitor lead.
4. Run the regulator/rectifier lead as shown.
5. Run the regulator/rectifier lead on the top position in the clamp.
6. Run the ignition coil primary lead outside of the clamp.

17-6 APPENDIX

Cable, Wire, and Hose Routing

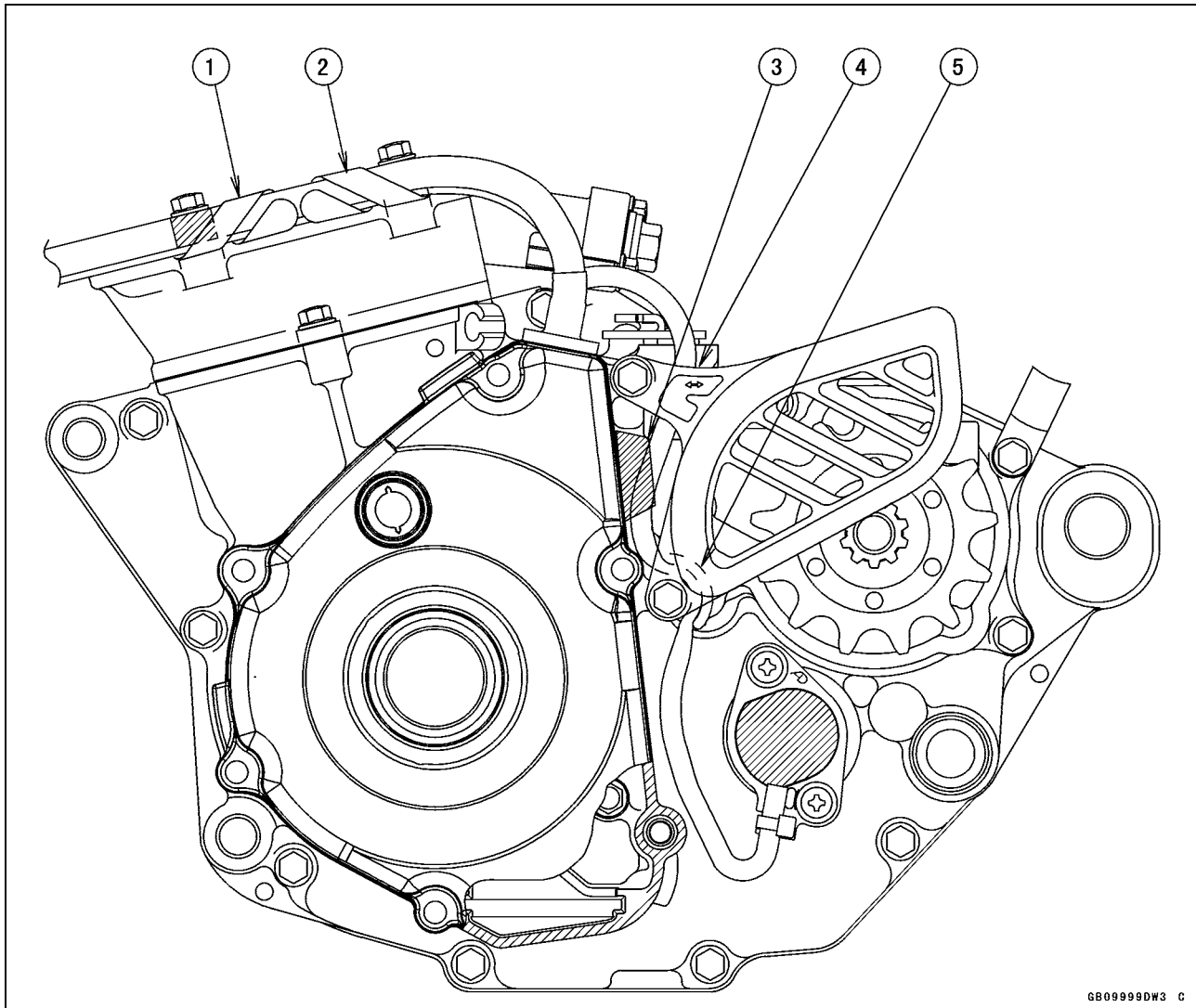


Cable, Wire, and Hose Routing

1. Breather Hose
2. Downstream Lead
3. Throttle Sensor Lead
4. Install the upstream injector connector boot so that notch side faces inside.
5. Run the downstream lead and throttle sensor lead over the throttle body assy rear side.
6. Fuel Hose
7. Check the fuel hose position. If the fuel hose interferes with the cylinder head cover, move the fuel hose upward.
8. Run the fuel pump lead over the fuel hose.
9. Run the throttle sensor lead to the front side of the throttle body assy.
10. Clamp (Hold the main harness. Turn the lock position to backward.)

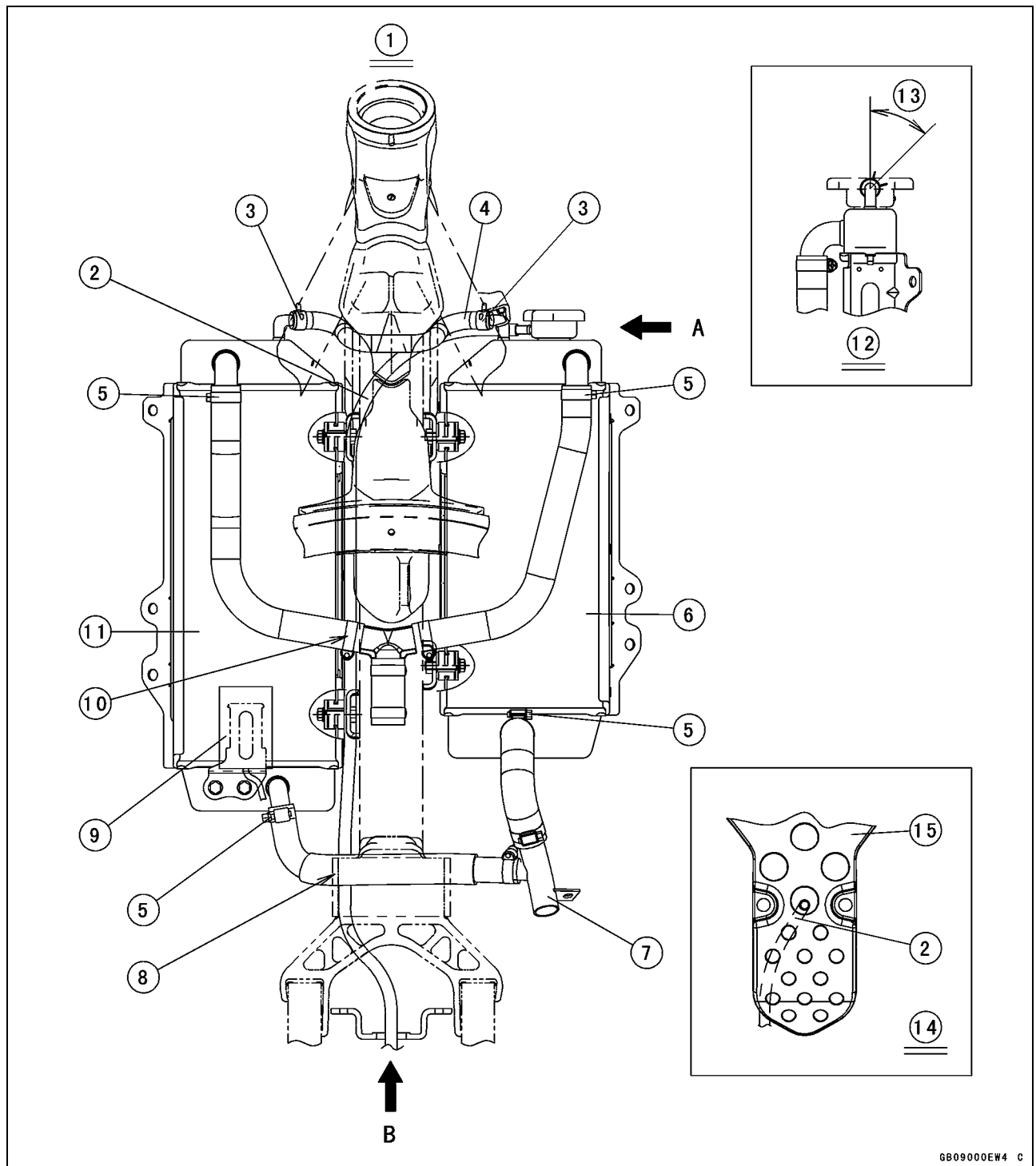
17-8 APPENDIX

Cable, Wire, and Hose Routing



1. Clamp (Twist the clamp on the magneto lead and gear position switch lead at the gray taped position.)
2. Clamp (Twist the clamp on the magneto lead and gear position switch lead.)
3. Run the gear position switch lead inside of the gasket.
4. Do not pinch the gear position switch lead.
5. Insert the gear position switch lead into the groove of the crankcase.

Cable, Wire, and Hose Routing

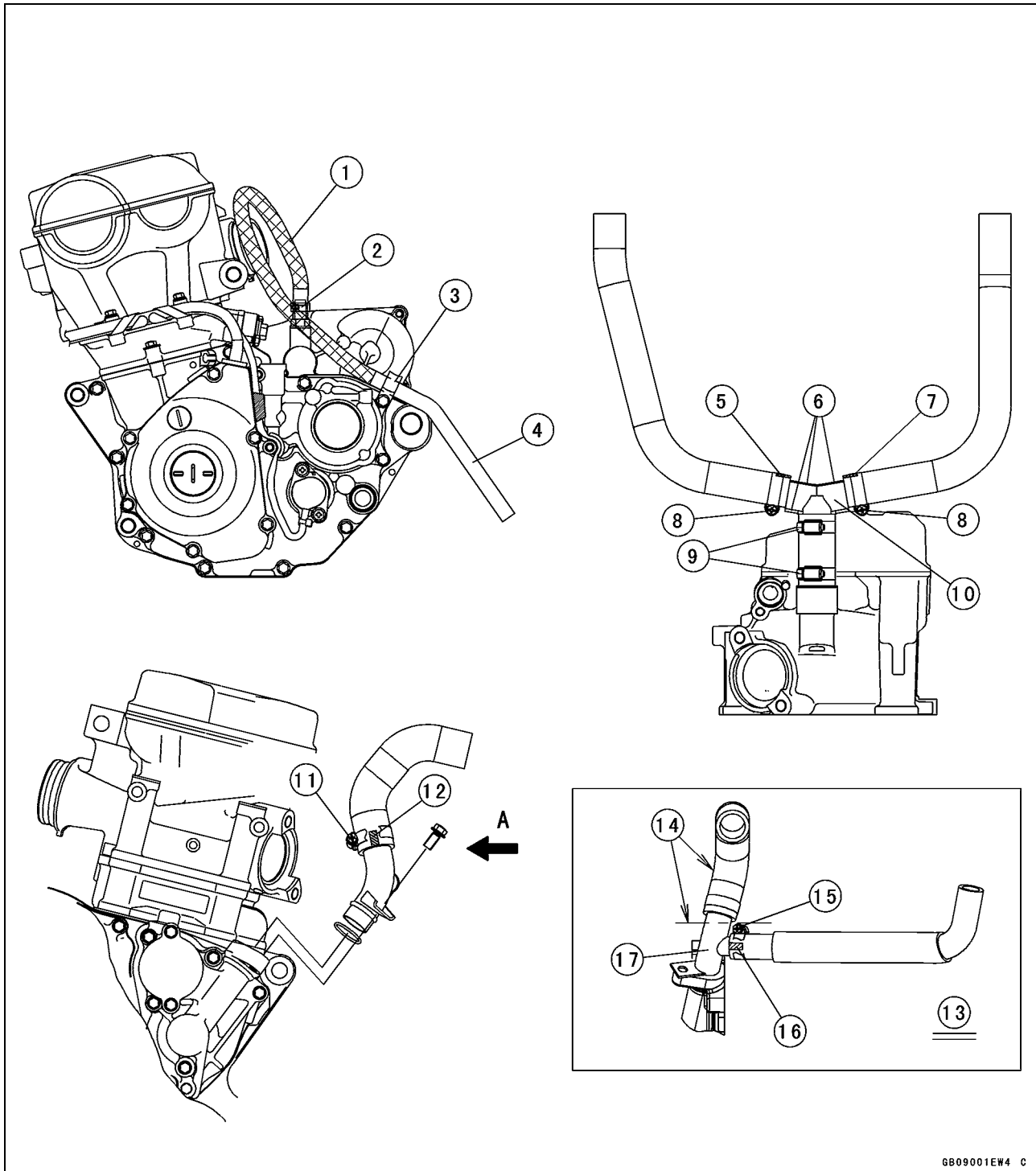


GB09000EW4 C

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Viewed Rear 2. Radiator Overflow Hose 3. Clamps 4. Joint Hose (Turn the blue paint to upside.) 5. Clamps (Turn the screw head to outside.) 6. Right Radiator 7. Water Pipe 8. Run the radiator overflow hose in the front of the water hose and between the engine brackets. | <ul style="list-style-type: none"> 9. Capacitor (Position the lead downward.) 10. Run the radiator overflow hose in the left of the frame pipe, and in the front of the water hose. 11. Left Radiator 12. Viewed A 13. 45° 14. Viewed B 15. Bottom Engine Guard |
|--|--|

17-10 APPENDIX

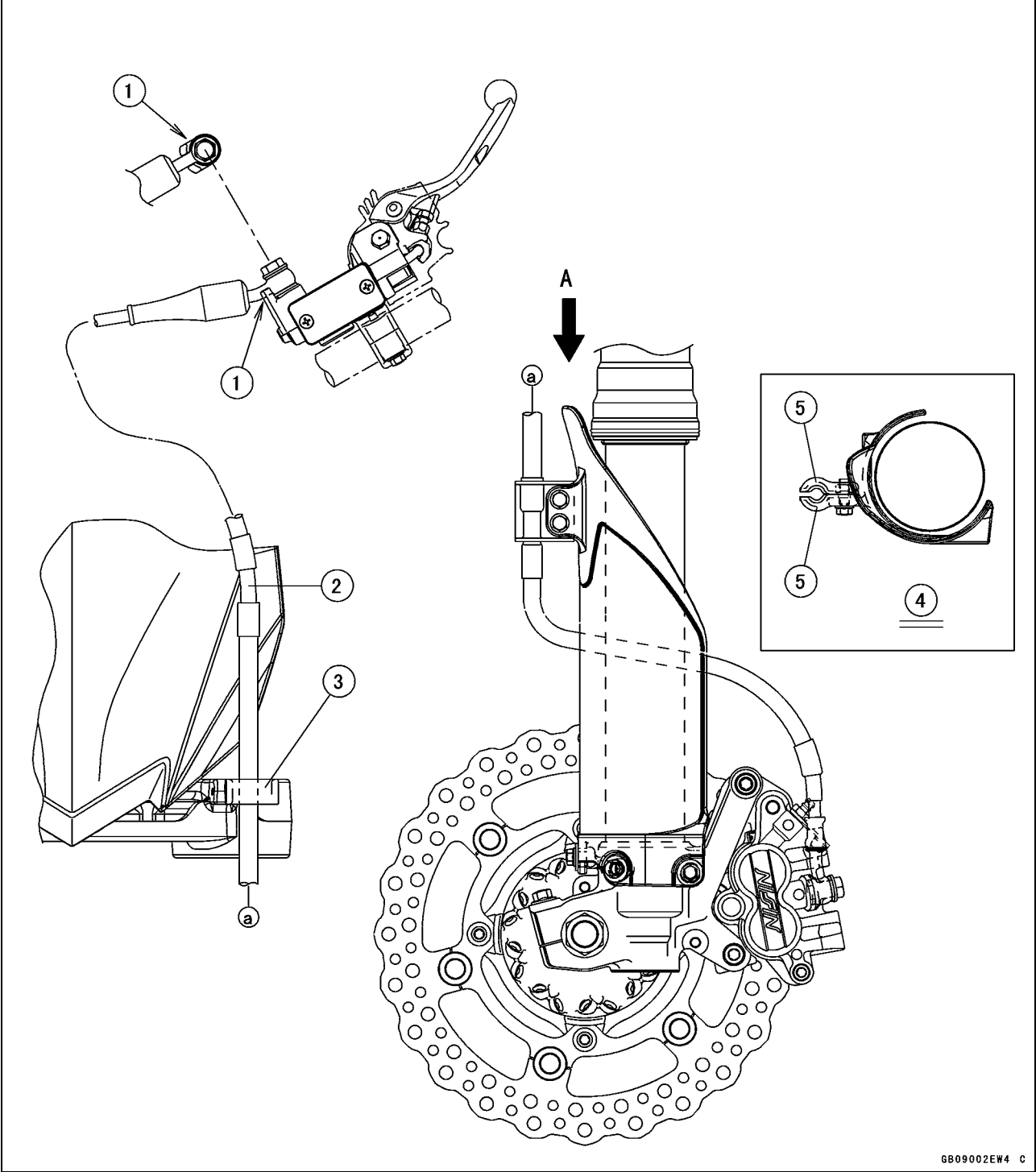
Cable, Wire, and Hose Routing



GB09001EW4 C

- 1. Install the mesh protector side of the breather hose to the engine.
- 2. Clamp (Turn the claw to the exhaust pipe side.)
- 3. Clamp (Run the breather hose into the clamp.)
- 4. Breather Hose
- 5. Align the green paint to the stopper.
- 6. Stoppers
- 7. Align the red paint to the stopper.
- 8. Clamps (Turn the screw head to front.)
- 9. Clamps (Turn the screw head to exhaust pipe side.)
- 10. Joint Pipe
- 11. Clamp (Turn the screw head to outside.)
- 12. Turn the green paint to outside.
- 13. Viewed A
- 14. Insert the water hose to the pipe up to the clamp screw.
- 15. Clamp (Turn the screw head to front.)
- 16. Turn the green paint to front.
- 17. Water Pipe

Cable, Wire, and Hose Routing

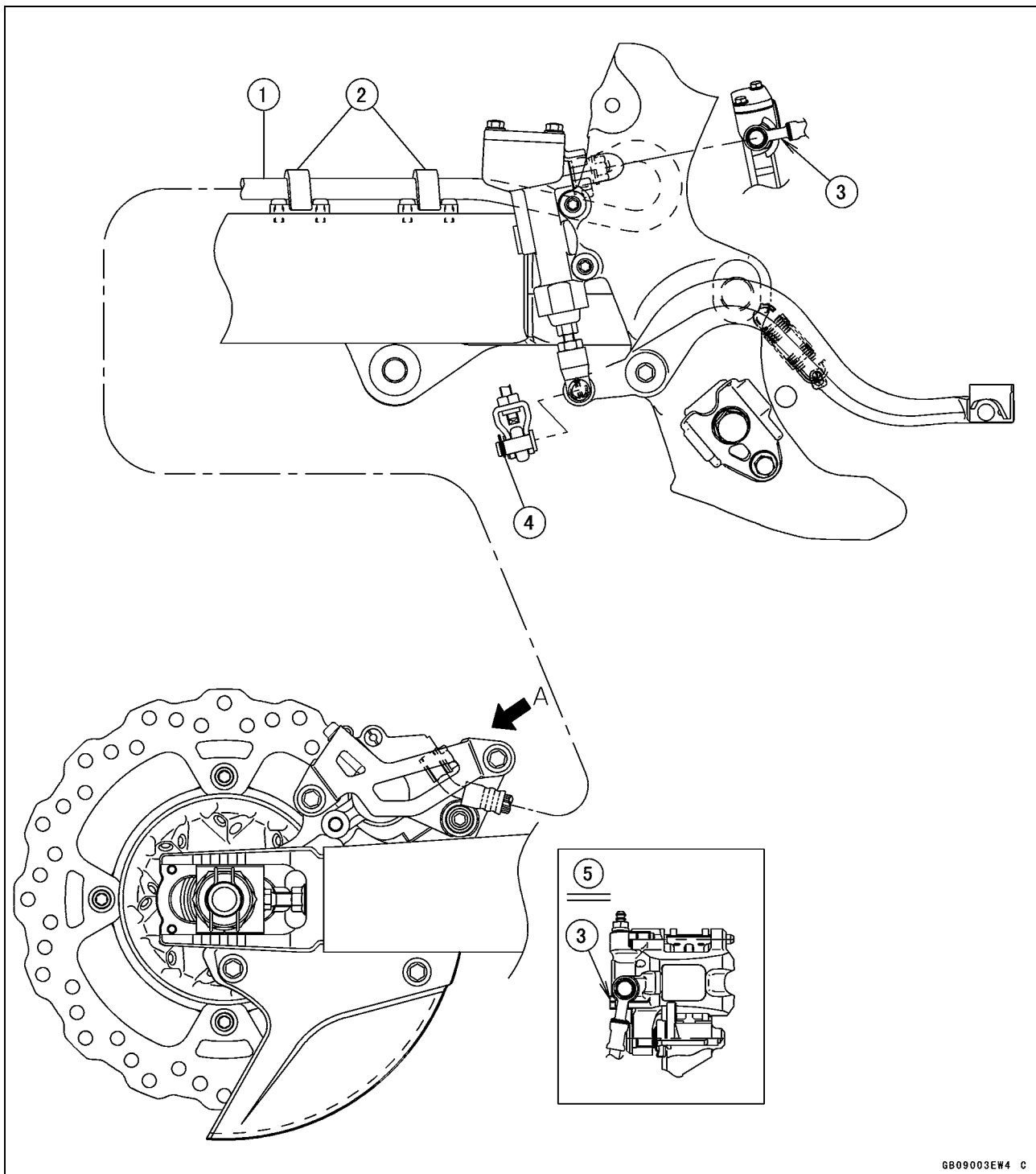


GB09002EW4 C

- 1. Touch the front brake hose fitting to the stopper.
- 2. Brake Hose
- 3. Clamp
- 4. Viewed A
- 5. Clamps

17-12 APPENDIX

Cable, Wire, and Hose Routing



1. Brake Hose
2. Clamps
3. Touch the rear brake hose fitting to the stopper.
4. Cotter Pin
5. Viewed A

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:

Engine won't turn over:

- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end, big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Kick shaft return spring broken
- Kick ratchet gear not engaging

No fuel flow:

- No fuel in fuel tank
- Fuel tank cap air vent obstructed
- Fuel line clogged
- Fuel filter clogged

Engine flooded:

- Clean spark plug and adjust plug gap
- Starting technique faulty
- (When flooded, do not crank the engine with the throttle fully opened. This promotes engine flood because more fuel is supplied automatically by DFI.)

No spark; spark weak:

- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or spark plug lead trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect heat value
- ECU trouble
- Crankshaft sensor trouble
- Ignition coil trouble
- Engine stop switch shorted
- Wiring shorted or open
- Flywheel damage

Compression Low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped

- Valve spring broken or weak
- Valve not seating properly (valve bent, deformed, worn, or carbon accumulation on the seating surface)
- Decompression trouble

Poor Running at Low Speed:

Spark weak:

- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or spark plug lead trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect heat value
- ECU trouble
- Crankshaft sensor trouble
- Flywheel damaged
- Ignition coil trouble
- Wiring connector not in good contact

Fuel/air mixture incorrect:

- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Throttle body assy holder loose
- Air cleaner duct loose

Compression low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, deformed, worn, or carbon accumulation on the seating surface)
- Decompression trouble

Other:

- ECU trouble
- Engine oil level too high
- Engine oil viscosity too high
- Brake dragging
- Drive train trouble
- Engine overheating
- Clutch slipping

Poor Running or No Power at High Speed:

Firing incorrect:

- Spark plug dirty, broken, or gap maladjusted
- Spark plug cap or spark plug lead trouble

17-14 APPENDIX

Troubleshooting Guide

Spark plug cap shorted or not in good contact

Spark plug incorrect heat value

ECU trouble

Crankshaft sensor trouble

Flywheel damage

Ignition coil trouble

Wiring connector not in good contact

Fuel/air mixture incorrect:

Air cleaner clogged, poorly sealed, or missing

Air cleaner duct loose

Water or foreign matter in fuel

Throttle body assy holder loose

Fuel to injector insufficient

Fuel tank air vent obstructed

Fuel line clogged

Fuel pump trouble

Compression low:

Spark plug loose

Cylinder head not sufficiently tightened down

No valve clearance

Cylinder, piston worn

Piston ring bad (worn, weak, broken, or sticking)

Piston ring/groove clearance excessive

Cylinder head gasket damaged

Cylinder head warped

Valve spring broken or weak

Valve not seating properly (valve bent, deformed, worn, carbon accumulation on the seating surface.)

Decompression trouble

Knocking:

Carbon built up in combustion chamber

Fuel poor quality or incorrect

Spark plug incorrect heat valve

ECU trouble

Other:

Throttle valve won't fully open

Brake dragging

Air cleaner clogged

Water or foreign matter in fuel

Clutch slipping

Overheating

Engine oil level too high

Engine oil viscosity too high

Drive train trouble

Crankshaft bearing worn or damage

Engine Overheating:

Firing incorrect:

Spark plug dirty, broken, or maladjusted

Spark plug incorrect

ECU trouble

Fuel/air mixture incorrect:

Throttle body assy holder loose

Air cleaner duct loose

Air cleaner poorly sealed, or missing

Air cleaner clogged

Compression high:

Carbon built up in combustion chamber

Engine load faulty:

Clutch slipping

Engine oil level too high

Engine oil viscosity too high

Brake dragging

Drive train trouble

Lubrication inadequate:

Engine oil level too low

Engine oil poor quality or incorrect

Coolant incorrect:

Coolant level too low

Coolant deteriorated

Cooling system component incorrect:

Radiator clogged

Radiator cap trouble

Water pump not rotating

Clutch Operation Faulty:

Clutch slipping:

No clutch lever play

Clutch cable maladjusted

Clutch inner cable sticking

Friction plate worn or warped

Steel plate worn or warped

Clutch spring broken or weak

Clutch release function trouble

Clutch hub or housing unevenly worn

Clutch not disengaging properly:

Clutch lever play excessive

Clutch spring compression uneven

Engine oil deteriorated

Engine oil viscosity too high

Engine oil level too high

Clutch housing seized

Clutch release function trouble

Clutch hub nut loose

Clutch plate warped or rough

Clutch hub spline damaged

Gear Shifting Faulty:

Doesn't go into gear; shift pedal doesn't return:

Clutch not disengaging

Shift fork bent, worn, or seized

Shift return spring pin loose

Shift return spring weak or broken

Shift shaft lever broken

Pawl guide plate broken

Shift pawl broken

Shift pawl spring tension lose

Troubleshooting Guide

Gear seized
 Gear positioning lever operation trouble
 Shift drum broken

Jumps out of gear:

Shift fork ear worn, bent
 Gear groove worn
 Gear dogs and/or dog holes worn
 Shift drum groove worn
 Gear positioning lever spring weak or broken
 Shift fork guide pin worn
 Drive shaft, output shaft, and/or gear splines worn

Overshifts:

Gear positioning lever spring weak or broken
 Pawl guide plate worn

Abnormal Engine Noise:

Knocking:

ECU trouble
 Carbon built up in combustion chamber
 Fuel poor quality or incorrect
 Spark plug incorrect heat value
 Overheating

Piston slap:

Cylinder/piston clearance excessive
 Cylinder, piston worn
 Connecting rod bent
 Piston pin, piston pin hole worn

Valve noise:

Valve clearance incorrect
 Valve spring broken or weak
 Camshaft bearing or cam face worn
 Valve lifter worn

Other noise:

Connecting rod big end, small end clearance excessive
 Piston ring worn, broken, or stuck
 Piston seizure, damage
 Cylinder head gasket leaking
 Exhaust pipe leaking at cylinder head connection
 Crankshaft runout excessive
 Engine mounts loose
 Crankshaft bearing worn
 Camshaft chain tensioner trouble
 Camshaft chain, sprocket, chain guide worn
 Primary gear worn or damaged
 Decompressor spring broken
 Magneto flywheel loose

Abnormal Drive Train Noise:

Clutch noise:

Clutch housing finger and friction plate tang worn

Clutch housing gear worn
 Metal chips jammed in clutch housing gear teeth

Transmission noise:

Bearings worn
 Transmission gears worn or chipped
 Metal chips jammed in gear teeth
 Engine oil insufficient, low viscosity
 Kick ratchet gear not properly disengaging from kick gear
 Kick shaft idle gear worn or chipped

Drive chain noise:

Drive chain maladjusted
 Drive chain worn
 Rear and/or engine sprocket worn
 Drive chain lubrication insufficient
 Rear wheel misaligned

Abnormal Frame Noise:

Front fork noise:

Oil insufficient or too thin
 Spring weak or broken
 Front fork air pressure high

Rear shock absorber noise:

Shock absorber trouble
 Spring weak or broken

Disc brake noise:

Pad surface glazed
 Disc warped
 Caliper trouble
 Pad installed incorrectly
 Master cylinder damaged

Other noise:

Bracket, nut, bolt, etc., not properly mounted or tightened

Abnormal Exhaust Color:

White smoke:

Piston oil ring worn
 Cylinder worn
 Valve oil seal damaged
 Valve guide worn
 Engine oil level too high

Black smoke:

Air cleaner element clogged

Brown smoke:

Air cleaner duct loose
 Air cleaner clogged
 Air cleaner poorly sealed or missing

Handling and/or Stability

Unsatisfactory:

Handlebars hard to turn:

Cable, hose, wire routing incorrect
 Steering stem nut too tight
 Steering stem bearing damaged

17-16 APPENDIX

Troubleshooting Guide

Steering stem bearing lubrication inadequate

Steering stem bent

Tire air pressure too low

Handlebars shakes or excessively vibrates:

Tire worn

Swingarm pivot bearings worn

Rim warped, or not balanced

Spokes loose

Wheel bearing worn

Handlebar clamp bolt loose

Steering stem head nut loose

Front, rear axle runout excessive

Handlebars pulls to one side:

Frame bent

Rear wheel misalignment

Swingarm bent or twisted

Swingarm pivot shaft bent

Steering maladjusted

Steering stem bent

Front fork bent

Suspension operation trouble:

(Too hard)

Tire air pressure too high

Front fork oil excessive

Front fork oil viscosity too high

Rear shock absorber adjustment too hard

Front fork bent

Front fork air pressure too high

(Too soft)

Front fork oil insufficient or leaking

Front fork oil viscosity too low

Rear shock absorber adjusted too soft

Front fork, rear shock absorber spring weak

Rear shock absorber oil or gas leaking

Tire air pressure too low

Brake Doesn't Hold:

Air in brake system

Pad, disc worn

Brake fluid leakage

Contaminated pad

Brake fluid deteriorated

Brake master cylinder cups damaged

Master cylinder scratched inside

Disc warped

MODEL APPLICATION

Year	Model	Beginning Frame No.
2013	KX250ZD	JKAKXMZC□DA000001 JKAKX250ZZA000001

□:This digit in the frame number changes from one machine to another.



KAWASAKI HEAVY INDUSTRIES, LTD.
Motorcycle & Engine Company

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