


















**Kawasaki**

**ZZR250**



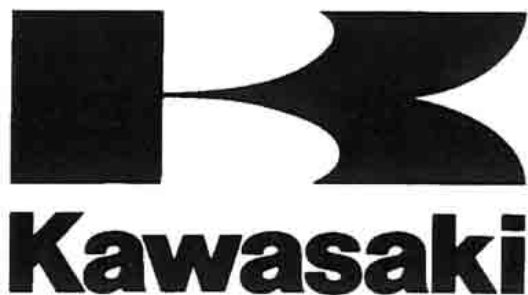
# **Motorcycle Service Manual**

# Quick Reference Guide

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

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.



# ZZR250

# Motorcycle Service Manual

---

All rights reserved. No parts of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic mechanical photocopying, recording or otherwise, without the prior written permission of Quality Assurance Department/Consumer Products & Machinery Company/Kawasaki Heavy Industries, Ltd., Japan.

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

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

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

---

## LIST OF ABBREVIATIONS

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

**Read OWNER'S MANUAL before operating.**



# Foreword

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

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

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

To get the longest life out of your vehicle:

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

## How to Use This Manual

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

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

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

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

### WARNING

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

### CAUTION

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

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

### NOTE

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

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

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

# General Information



## Table of Contents

Before Servicing .....	1-2
Model Identification.....	1-5
General Specifications.....	1-6
Unit Conversion Table .....	1-9

## 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:**

(1) Dirt

Before removal and disassembly, clean the motorcycle. Any dirt entering the engine will shorten the life of the motorcycle. For the same reason, before installing a new part, clean off any dust or metal filings.

(2) Battery Lead

Disconnect the negative (–) lead from the battery before performing any disassembly operations on the motorcycle. This prevents the engine from accidentally turning over while work is being carried out, sparks from being generated while disconnecting the leads from electrical parts, as well as damage to the electrical parts themselves. For reinstallation, first connect the positive lead to the positive (+) terminal of the battery

(3) Installation, Assembly

Generally, installation or assembly is the reverse of removal or disassembly. However, if installation or assembly sequence is given in this Service Manual, follow it. Note parts locations and cable, wire, and hose routing during removal or disassembly so they can be installed or assembled in the same way. It is preferable to mark and record the locations and routing whenever possible.

(4) 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 evenly in a cross pattern. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter turn and then remove them. Where there is a tightening sequence indication in this Service Manual, the bolts, nuts, or screws must be tightened in the order and method indicated.

(5) Torque

When torque values are given in this Service Manual, use them. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

(6) Force

Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and examine what may be causing the problem. Whenever tapping is necessary, tap lightly using a wooden or plastic-faced mallet. Use an impact driver for screws (particularly for the removing screws held by non-permanent locking agent) in order to avoid damaging the screw heads.

(7) Edges

Watch for sharp edges, especially during major engine disassembly and assembly. Protect your hands with gloves or a piece of thick cloth when lifting the engine or turning it over.

(8) High-Flash Point Solvent

A high-flash point solvent is recommended to reduce fire danger. A commercial solvent commonly available in North America is standard solvent (generic name). Always follow manufacturer and container directions regarding the use of any solvent.

(9) Gasket, O-Ring

Do not reuse a gasket or O-ring once it has been in service. The mating surfaces around the gasket should be free of foreign matter and perfectly smooth to avoid oil or compression leaks.

(10) Liquid Gasket, Non-Permanent Locking Agent

Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply them sparingly. Excessive amounts may block engine oil passages and cause serious damage. An example of a non-permanent locking agent commonly available in North America is Loctite Lock'n Seal (Blue).

(11) Press

When using a press or driver to install a part such as a wheel bearing, apply a small amount of oil to the area where the two parts come in contact to ensure a smooth fit.

## Before Servicing

### (12) Ball Bearing and Needle Bearing

Do not remove a ball bearing or a needle bearing unless it is absolutely necessary. Replace any ball or needle bearings that were removed with new ones, as removal generally damages bearings. Install bearings with the marked side facing out applying pressure evenly with a suitable driver. Only press on the race that forms the press fit with the base component to avoid damaging the bearings. This prevents severe stress on the balls or needles and races, and prevent races and balls or needles from being dented. Press a ball bearing until it stops at the stopper in the hole or on the shaft.

### (13) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals. When pressing in a seal which has manufacturer's marks, press it in with the marks facing out. Seals should be pressed into place using a suitable driver, which contacts evenly with the side of seal, until the face of the seal is even with the end of the hole. Before a shaft passes through a seal, apply a little high temperature grease on the lips to reduce rubber to metal friction.

### (14) Circlip, Retaining Ring, and Cotter Pin

Replace any circlips, retaining rings, and cotter pins that were removed with new ones, as removal weakens and deforms them. When installing circlips and retaining rings, take care to compress or expand them only enough to install them and no more.

### (15) Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the sliding surfaces have an adequate lubricative film. During assembly, make sure to apply oil to any sliding surface or bearing that has been cleaned. Old grease or dirty oil could have lost its lubricative quality and may contain foreign particles that act as abrasives; therefore, make sure to wipe it off and apply fresh grease or oil. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended.

### (16) Direction of Engine Rotation

To rotate the crankshaft manually, make sure to do so in the direction of positive rotation. Positive rotation is counterclockwise as viewed from the left side of the engine. To carry out proper adjustment, it is furthermore necessary to rotate the engine in the direction of positive rotation as well.

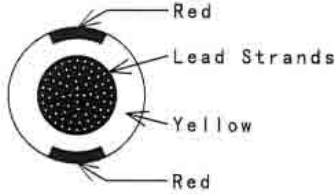

### (17) Replacement Parts

When there is a replacement instruction, replace these parts with new ones every time they are removed.

Replacement parts will be damaged or lose their original function once they are removed. Therefore, always replace these parts with new ones every time they are removed. Although the previously mentioned gasket, O-ring, ball bearing, needle bearing, grease seal, oil seal, circlip, and cotter pin have not been so designated in their respective text, they are replacement parts.

### (18) Electrical Wires

All the electrical wires are either single-color or two-color and, with only a few exceptions, must be connected to wires of the same color. On any of the two-color wires there is a greater amount of one color and a lesser amount of a second color, so a two-color wire is identified by first the primary color and then the secondary color. For example, a yellow wire with thin red stripes is referred to as a "yellow/red" wire; it would be a "red/yellow" wire if the colors were reversed to make red the main color.

Lead (cross-section)	Color Indicated on the Lead	Color Indicated on the Wiring Diagram
	Yellow/Red	

09020015W1 C

### (19) Inspection

When parts have been disassembled, visually inspect these parts for the following conditions or other damage. If there is any doubt as to the condition of them, replace them with new ones.

1-4 GENERAL INFORMATION

Before Servicing

Abrasion	Crack	Hardening	Warp
Bent	Dent	Scratch	Wear
Color change	Deterioration	Seizure	

(20) Specifications

Specification terms are defined as follows:

“Standards” show dimensions or performances which brand-new parts or systems have.

“Service Limits” indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.



**Model Identification**

**EX250-H15 Left Side View**



**EX250-H15 Right Side View**



# 1-6 GENERAL INFORMATION

## General Specifications

Items	EX250-H15 ~
<b>Dimensions</b>	
Overall Length	2 050 mm (80.7 in.)
Overall Width	700 mm (27.6 in.)
Overall Height	1 125 mm (44.3 in.)
Wheelbase	1 405 mm (55.3 in.)
Road Clearance	135 mm (5.3 in.)
Seat Height	760 mm (29.9 in.)
Dry Mass	150 kg, (AU) 146 kg
Curb Mass:	
Front	81 kg (179 lb), (AU) 80 kg (176 lb)
Rear	91 kg (201 lb), (AU) 88 kg (194 lb)
Fuel Tank Capacity	18.0 L (4.8 US gal)
<b>Performance</b>	
Minimum Turning Radius	2.8 m (9.2 ft)
<b>Engine</b>	
Type	4-stroke, DOHC, 2-cylinder
Cooling System	Liquid-cooled
Bore And Stroke	62.0× 41.2 mm (2.5 × 1.6 in.)
Displacement	248 mL (15.1 cu in.)
Compression Ratio	12.4
Maximum Horsepower	24 kW (32.6 PS) @12 500 r/min (rpm), (AU) 26.5 kW (36 PS) @12 500 r/min (rpm)
Maximum Torque	21 N·m (2.14 kg·m, 15.5 ft·lb) @9 000 r/min (rpm), (AU) 21.6 N·m (2.2 kg·m, 15.5 ft·lb) @9 000 r/min (rpm)
Carburetion System	Carburetor, Keihin CVK 30× 2
Starting System	Electric starter
Ignition System	Battery and coil (transistorized)
Timing Advance	Electronically advanced
Ignition Timing	From 10° BTDC @1 200 r/min (rpm) 42.5° BTDC @4 500 r/min (rpm) (AU) From 10° BTDC @1 200 r/min (rpm) 42° BTDC @4 500 r/min (rpm)
Spark Plug	NGK CR8HSA or ND U24FSR-U
Cylinder Numbering Method	Left to Right, 1-2
Firing Order	1-2
Valve Timing:	
Inlet	
Open	26° BTDC
Close	66° ABDC
Duration	272°
Exhaust	
Open	66° BBDC
Close	26° ATDC
Duration	272°
Lubrication System	Forced ubrication (wet sump with cooler)

## General Specifications

Items	EX250-H15 ~
Engine Oil:	
Grade	API SE, SF or SG API SH or SJ with JASO MA
Viscosity	SAE10W-40
Capacity	1.9 L (2.01 US qt)
<b>Drive Train</b>	
Primary Reduction System:	
Type	Gear
Reduction Ratio	3.086 (71/23)
Clutch Type	Wet multi disc
Transmission:	
Type	6-speed, constant mesh, return shift
Gear Ratios:	
1st	2.600 (39/15)
2nd	1.789 (34/19)
3rd	1.409 (31/22)
4th	1.160 (29/25)
5th	1.000 (27/27)
6th	0.892 (25/28)
Final Drive System:	
Type	Chain drive
Reduction Ratio	3.357 (47/14)
Overall Drive Ratio	9.252 @Top gear
<b>Frame</b>	
Type	Tubular, diamond
Caster (Rake Angle)	26.5°
Trail	88 mm (3.5 in.)
Front Tire:	
Type	Tubeless
Size	100/80-17M/C 52S
Rear Tire:	
Type	Tubeless
Size	140/70-17M/C 66S
Front suspension:	
Type	Telescopic fork
Wheel Travel	125 mm (4.9 in.)
Rear Suspension:	
Type	Swingarm (uni-trak)
Wheel Travel	110 mm (4.3 in.)
Brake Type:	
Front	Single disc
Rear	Single disc



## 1-8 GENERAL INFORMATION

### General Specifications

Items	EX250-H15 ~
<b>Electrical Equipment</b>	
Battery	12 V 6 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 60/55 W (quartz-halogen)
Tail/brake Light	12 V 5/21 W AC
Alternator:	
Type	Three-phase AC
Rated Output	16 A @10 000 r/min (rpm), 14V, (AU) 17 A @10 000 r/min (rpm), 14V

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

AU: Australia Model

US: United States

## Unit Conversion Table

### Prefixes for Units:

Prefix	Symbol	Power
mega	M	$\times 1\,000\,000$
kilo	k	$\times 1\,000$
centi	c	$\times 0.01$
milli	m	$\times 0.001$
micro	$\mu$	$\times 0.000001$

### Units of Mass:

kg	$\times$	2.205	=	lb
g	$\times$	0.03527	=	oz

### Units of Volume:

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

### Units of Force:

N	$\times$	0.1020	=	kg
N	$\times$	0.2248	=	lb
kg	$\times$	9.807	=	N
kg	$\times$	2.205	=	lb

### Units of Length:

km	$\times$	0.6214	=	mile
m	$\times$	3.281	=	ft
mm	$\times$	0.03937	=	in

### Units of Torque:

N·m	$\times$	0.1020	=	kgf·m
N·m	$\times$	0.7376	=	ft·lb
N·m	$\times$	8.851	=	in·lb
kgf·m	$\times$	9.807	=	N·m
kgf·m	$\times$	7.233	=	ft·lb
kgf·m	$\times$	86.80	=	in·lb

### Units of Pressure:

kPa	$\times$	0.01020	=	kgf/cm <sup>2</sup>
kPa	$\times$	0.1450	=	psi
kPa	$\times$	0.7501	=	cm Hg
kgf/cm <sup>2</sup>	$\times$	98.07	=	kPa
kgf/cm <sup>2</sup>	$\times$	14.22	=	psi
cm Hg	$\times$	1.333	=	kPa

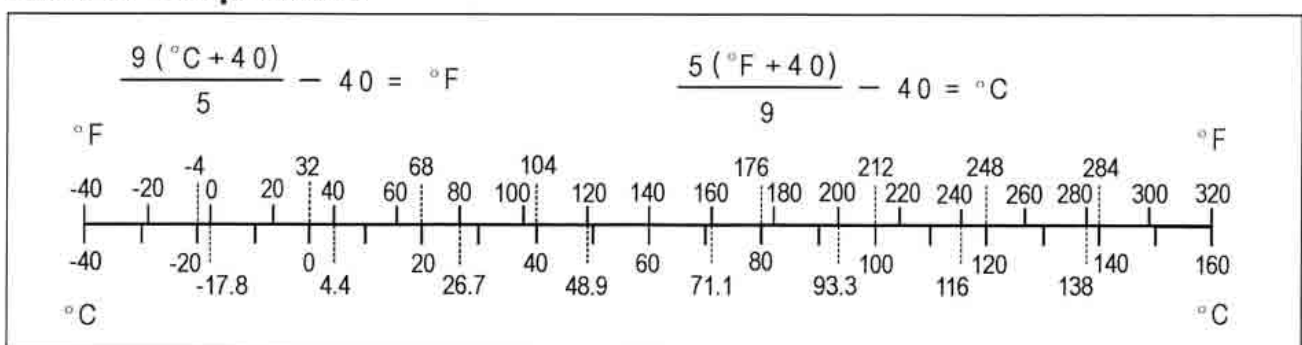
### Units of Speed:

km/h	$\times$	0.6214	=	mph
------	----------	--------	---	-----

### Units of Power:

kW	$\times$	1.360	=	PS
kW	$\times$	1.341	=	HP
PS	$\times$	0.7355	=	kW
PS	$\times$	0.9863	=	HP

### Units of Temperature:



# Periodic Maintenance

## Table of Contents

Periodic Maintenance Chart .....	2-2	Drive Chain Lubrication.....	2-24
Torque and Locking Agent.....	2-4	Brakes.....	2-24
Specifications .....	2-7	Brake Pad Wear Inspection .....	2-24
Special Tools .....	2-9	Brake Light Switch Inspection.....	2-24
Maintenance Procedure .....	2-10	Caliper Piston Seal and Dust Seal	
Fuel System .....	2-10	Replacement .....	2-25
Fuel Hose and Connection		Brake Master Cylinder Cup and	
Inspection.....	2-10	Dust Seal Replacement .....	2-26
Throttle Cable Inspection.....	2-10	Brake Fluid Level Inspection.....	2-26
Idle Speed Inspection .....	2-11	Brake Fluid Change .....	2-27
Carburetor Synchronization		Brake Hoses and Connections	
Inspection.....	2-12	Inspection.....	2-30
Air Cleaner Element Cleaning.....	2-13	Suspension .....	2-31
Coolant Filter Cleaning .....	2-13	Front Fork Oil Leak Inspection.....	2-31
Cooling System.....	2-13	Rear Shock Absorber Oil Leak	
Radiator Hoses and Connections		Inspection.....	2-31
Inspection.....	2-13	Swingarm Pivot Lubrication .....	2-31
Coolant Change .....	2-14	Uni-trak Linkage Lubrication .....	2-31
Engine Top End .....	2-16	Steering .....	2-31
Valve Clearance Inspection .....	2-16	Steering Inspection .....	2-31
Clutch.....	2-18	Steering Stem Bearing	
Clutch Adjustment.....	2-18	Lubrication.....	2-32
Engine Lubrication System.....	2-19	Electrical System .....	2-32
Engine Oil Change.....	2-19	Spark Plug Inspection.....	2-32
Oil Filter Replacement .....	2-20	General Lubrication .....	2-33
Wheels/Tires.....	2-20	Lubrication .....	2-33
Tire Wear Inspection .....	2-20	Nut, Bolt, and Fastener Tightness	
Final Drive.....	2-21	Inspection.....	2-34
Drive Chain Slack Inspection.....	2-21	Tightness Inspection .....	2-34
Drive Chain Wear Inspection .....	2-23		

## 2-2 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

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

OPERATION	FREQUENCY	* ODOMETER READING × 1 000 km (× 1 000 mile)							See Page
	Whichever comes first ↓	1	6	12	18	24	30	36	
	Every	(0.6)	(4)	(7.5)	(12)	(15)	(20)	(24)	
Fuel hoses, Connections - inspect †			●	●	●	●	●	●	2-10
Throttle cable - inspect †		●		●		●		●	2-10
Idle speed - inspect †		●		●		●		●	2-11
Carburetor synchronization - inspect †				●		●		●	2-12
Air cleaner element - clean †#				●		●		●	2-13
Radiator hoses, connections - inspect †		●							2-13
Coolant filter - clean	year								2-13
Coolant - change	2 years					●			2-14
Valve clearance - inspect †						●			2-16
Clutch - adjust		●	●	●	●	●	●	●	2-18
Engine oil - change #	year	●		●		●		●	2-19
Oil filter - replace	year	●		●		●		●	2-20
Tire wear - inspect †			●	●	●	●	●	●	2-21
Drive chain slack - inspect †#	1 000 km								2-22
Drive chain wear - inspect †#			●	●	●	●	●	●	2-23
Drive chain - lubricate #	600 km								2-24
Brake lining or pad wear - inspect †#			●	●	●	●	●	●	2-25
Brake light switch - inspect †		●	●	●	●	●	●	●	2-25
Brake master cylinder cup and dust seal - replace	4 years								2-26
Caliper piston seal and dust seal - replace	4 years								2-26
Brake fluid level - inspect †	month	●	●	●	●	●	●	●	2-27
Brake fluid - change	2 years					●			2-28
Brake hoses, connections - inspect †			●	●	●	●	●	●	2-31
Front fork oil leak - inspect †				●		●		●	2-31
Rear shock absorber oil leak - inspect †				●		●		●	2-31
Swingarm pivot, Uni-trak linkage - lubricate				●		●		●	2-31
Steering - inspect †		●	●	●	●	●	●	●	2-31
Steering stem bearing - lubricate	2 years					●			2-32
Spark plug - inspect †			●	●	●	●	●	●	2-32
General lubrication - perform				●		●		●	2-33
Nut, bolts, and fasteners tightness - inspect †		●		●		●		●	2-34

---

**Periodic Maintenance Chart**

---

- #: Service more frequently when operating in severe conditions; dusty, wet, muddy, high speed or frequent starting/stopping.
- \*: For higher odometer readings, repeat at the frequency interval established here.
- †: Replace, add, adjust, clean, or torque if necessary.

## 2-4 PERIODIC MAINTENANCE

### Torque and Locking Agent

Use a torque wrench to tighten bolts and nuts to their specified torque values. If too little torque is applied, the bolts and nuts could loosen and fall out. If too much torque is applied, the threads could be sheared off.

To tighten a bolt or a nut, or to check their torque, loosen the bolt or nut one-half turn before tightening it to the specified torque.

Letters used in the "Remarks" column mean:

L: Apply a non-permanent locking agent to the threads.

O: Apply oil to the threads and seating surface.

S: Tighten the fasteners following the specified sequence.

SS: Apply silicone sealant.

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

#### Basic Torque for General Fasteners

Threads dia. (mm)	Torque		
	N·m	kgf·m	ft·lb
5	3.4 ~ 4.9	0.35 ~ 0.50	30 ~ 43 in·lb
6	5.9 ~ 7.8	0.60 ~ 0.80	52 ~ 69 in·lb
8	14 ~ 19	1.4 ~ 1.9	10.0 ~ 13.5
10	25 ~ 34	2.6 ~ 3.5	19.0 ~ 25
12	44 ~ 61	4.5 ~ 6.2	33 ~ 45
14	73 ~ 98	7.4 ~ 10.0	54 ~ 72
16	115 ~ 155	11.5 ~ 16.0	83 ~ 115
18	165 ~ 225	17.0 ~ 23.0	125 ~ 165
20	225 ~ 325	23 ~ 33	165 ~ 240

Fastener	Torque			Remarks
	N-m	kgf-m	ft-lb	
<b>Cooling System</b>				
Drain Bolt	9.8	1.0	95 in-lb	SS
Fan Switch	18	1.8	13	
Water Temperature sensor	7.8	0.80	69 in-lb	
Radiator Hose Clamp Screw	2.0	0.20	17 in-lb	
<b>Engine Top End</b>				
Cylinder Head Cover Bolts	9.8	1.0	87 in-lb	L
Camshaft Cap Bolts	12	1.2	104 in-lb	
Camshaft Sprocket Bolts	15	1.5	11	
Rear Chain Guide Bolts:				L
Upper	25	2.5	18	
Lower	27	2.8	20	L
Chain Tensioner Mounting Bolts	11	1.1	95 in-lb	L
Valve Adjusting Screw Locknuts	20	2.0	14.5	
Cylinder Head Bolts:				
8 mm dia.	25	2.5	18	S
6 mm dia.	12	1.2	104 in-lb	S
Cylinder Head Plugs	—	—	—	L

## Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Clutch</b>				
Clutch Lever Holder Clamp Bolts	8.8	0.90	78 in·lb	
Clutch Spring Bolts	8.8	0.90	78 in·lb	
Clutch Hub Nut	132	13.5	98	
<b>Engine Lubrication System</b>				
Oil Pressure Switch	15	1.5	11	SS
Oil Hose Banjo Bolts (10 mm dia.)	20	2.0	14.5	
Oil Pipe Banjo Bolts (8 mm dia.)	12	1.2	104 in·lb	
Crankcase Oil Passage Plug	15	1.5	11	
Oil Pressure Relief Valve	15	1.5	11	L
Oil Pump Mounting Bolts	12	1.2	104 in·lb	L
Oil Drain Bolt	20	2.0	14.5	
Oil Filter Mounting Bolts	20	2.0	14.5	
<b>Engine Removal/Installation</b>				
Engine Mounting Bolt	44	4.5	33	
Engine Mounting Nuts	44	4.5	33	
Engine Mounting Bracket Bolts	25	2.5	18	
Engine Mounting Bracket Nuts	25	2.5	18	
<b>Crankshaft/Transmission</b>				
Connecting Rod Big End Cap Nuts	27	2.8	20	O
Starter Clutch Bolts	34	3.5	26	L
Shift Drum Bearing Holder Bolts	12	1.2	104 in·lb	L
Oil Breather Mounting Bolts	9.8	1.0	87 in·lb	L
Crankcase Bolts:				
8 mm dia.	27	2.8	20	S
6 mm dia.	12	1.2	104 in·lb	
Shift Drum Position Bolt	25	2.5	18	
Neutral Switch	15	1.5	11	
Shift Drum Pin Plate Bolt	8.8	0.90	78 in·lb	L
External Shift Mechanism Return Spring Pin	20	2.0	14.5	L
<b>Wheels/Tires</b>				
Front Axle Nut	88	9.0	65	
Rear Axle Nut	110	11.0	80	
Front Axle Clamp Bolts	20	2.0	14.5	
<b>Final Drive</b>				
Engine Sprocket Bolts	9.8	1.0	87 in·lb	
Rear Sprocket Nuts	74	7.5	54	
Rear Sprocket Studs	—	—	—	L
<b>Brakes</b>				
Front Brake Light Switch Screw	1.0	0.10	9 in·lb	
Brake Lever Pivot Nut	5.9	0.60	52 in·lb	
Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	
Front Master Cylinder Clamp Bolts	11	1.1	95 in·lb	S

## 2-6 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Brake Hose Banjo Bolts	25	2.5	18	L
Brake Pedal Pivot Bolt	7.8	0.80	69 in·lb	
Front Caliper Mounting Bolts	32	3.3	24	
Brake Disc Mounting Bolts	23	2.3	16.5	
Brake Pedal Pivot Bolts	8.8	0.90	78 in·lb	
Rear Master Cylinder Mounting Bolts	23	2.3	16.5	
Reservoir Mounting Bolt	6.9	0.70	61 in·lb	
Push Rod Nut	18	1.8	13	
Rear Caliper Mounting Bolts	23	2.3	16.5	
Suspension				
Front Fork Top Plugs	23	2.3	16.5	L
Front Fork Clamp Bolts				
Upper	20	2.0	14.5	
Lower	30	3.1	22	
Front Fork Bottom Allen Bolts	30	3.1	22	
Front Axle Clamp Bolts	20	2.0	14.5	
Rear Shock Absorber Mounting Nuts	59	6.0	43	
Swingarm Pivot Nut	98	10	72	
Rocker Arm Pivot Nut	44	4.5	33	
Tie-rod Nuts	44	4.5	33	
Steering				
Handlebar Holder Mounting Bolts	25	2.5	18	L
Steering Stem Head Bolt	47	4.8	35	
Steering Stem Nut	4.9	0.5	43 in·lb	
Front Fork Clamp Bolts:				
Upper	20	2.0	14.5	
Lower	30	3.1	22	
Frame				
Rear Frame Mounting Bolts	44	4.5	33	L
Rear Frame Mounting Nuts	44	4.5	33	
Side Stand Bracket Mounting Bolts	49	5.0	36	
Side Stand Switch Screws	—	—	—	
Center Stand Spring Hook Bolts	—	—	—	
Front Footpeg End Bolts	—	—	—	
Electrical System				
Spark Plugs	14	1.4	10	SS
Alternator Stator Bolts	12	1.2	104 in·lb	
Alternator Rotor Bolt	69	7.0	51	
Oil Pressure Switch	15	1.5	11	
Neutral Switch	15	1.5	11	
Starter Motor Assembly Bolts	3.5	0.36	31 in·lb	
Starter Motor Terminal Locknut	6.9	0.70	61 in·lb	



## Specifications

Item	Standard	Service Limit
<b>Fuel System</b>		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	---
Idle Speed	1 200 ±50 r/min (rpm) 1 300 ±50 r/min (rpm) (CH)	---
Carburetor Synchronization Vacuum	Less than 2.7 kPa (2 cmHg) difference between two carburetors	---
Air Cleaner Element	Polyurethane foam	---
<b>Cooling System</b>		
Coolant:		
Type (Recommended)	Permanent type antifreeze	---
Color	Green	---
Mixed Ratio	Soft water 50%, coolant 50%	---
Freezing Point	-35°C (-31°F)	---
Capacity	1.0 L (1.1 US qt)	---
<b>Engine Top End</b>		
Valve Clearance:		
Inlet	0.08 ~ 0.13 mm (0.003 ~ 0.005 in.)	---
Exhaust	0.11 ~ 0.16 mm (0.004 ~ 0.006 in.)	---
<b>Clutch</b>		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	---
<b>Engine Lubrication System</b>		
Engine Oil:		
Type	API SE, SF or SG API SH or SJ with JASO MA	---
Viscosity	SAE 10W-40	---
Capacity	1.5 L (1.6 US qt) (when filter is not removed) 1.9 L (2.0 US qt) (when filter is removed)	---
Level	Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running)	---
<b>Wheels/Tires</b>		
Tread Depth:		
Front		1 mm (0.04 in.)
Dunlop	4.0 mm (0.16 in.)	
Pirelli	4.5 mm (0.18 in.)	
Rear		2 mm (0.08 in.) up to 130 km/h (80 mph) 3 mm (0.12 in.) over 130 km/h (80 mph)
Dunlop	6.0 mm (0.24 in.)	
Pirelli	6.5 mm (0.26 in.)	
Air pressure: (when Cold)		
Front	Up to 155 kg (342 lb) load: 200 kPa (2.0 kgf/cm <sup>2</sup> , 29 psi)	---
Rear	Up to 155 kg (342 lb) load: 225 kPa (2.3 kgf/cm <sup>2</sup> , 33 psi)	---
<b>Final Drive</b>		
Drive Chain Slack	35 ~ 40 mm (1.4 ~ 1.6 in.)	---

## 2-8 PERIODIC MAINTENANCE

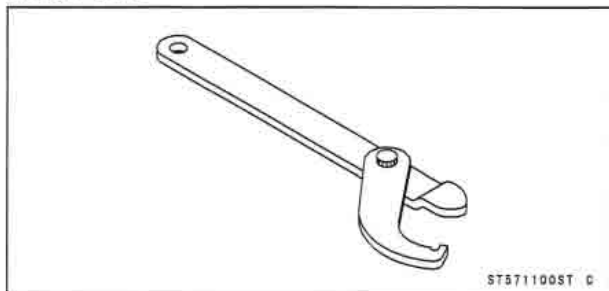
### Specifications

Item	Standard	Service Limit
Drive Chain Wear (20-link Length)	317.5 ~ 318.1 mm (12.50 ~ 12.52 in.)	323 mm (12.7 in.)
<b>Brakes</b>		
Brake Fluid:		
Grade	DOT4	---
Brake Pad Lining Thickness:	4.5 mm (0.18 in.)	1 mm (0.04 in.)
Brake Light Timing:		---
Front	ON after 5 ~ 21 mm (0.2 ~ 0.8 in) of tip of lever travel	
Rear	ON after 10 mm (0.39 in.) of pedal travel	
<b>Electrical System</b>		
Spark Plug Gap	0.6 ~ 0.7 mm (0.024 ~ 0.028 in.)	---

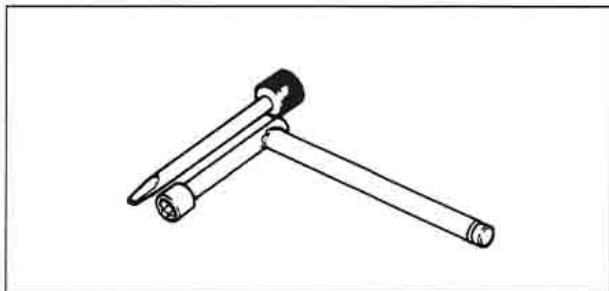
CH: Switzerland

## Special Tools

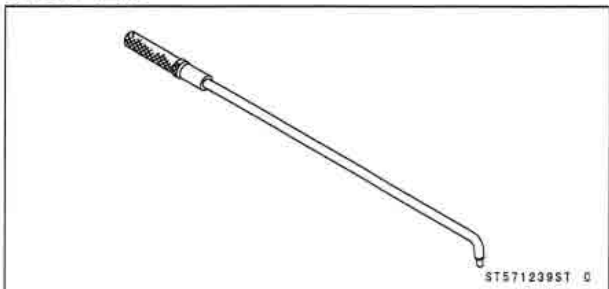
**Steering Stem Nut Wrench:**  
57001-1100



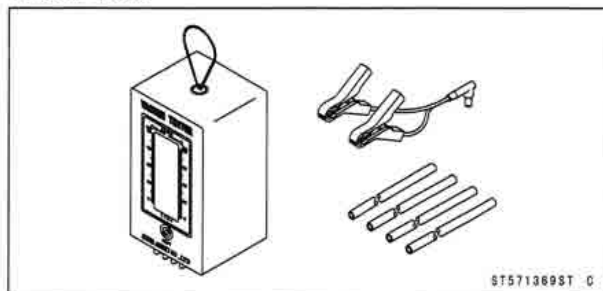
**Valve Adjuster:**  
57001-1220



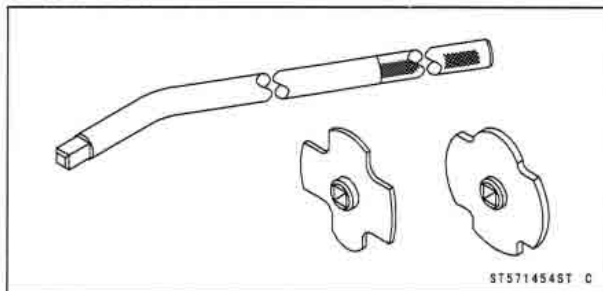
**Pilot Screw Adjuster, A:**  
57001-1239



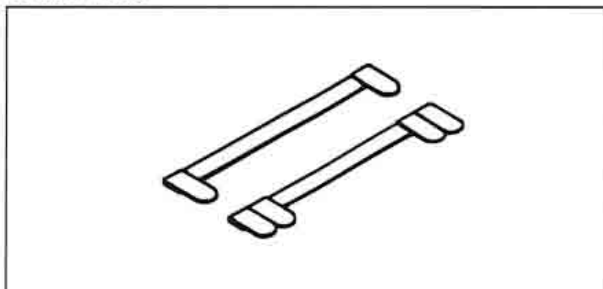
**Vacuum Gauge KEK-55-5:**  
57001-1369



**Filler Cap Driver:**  
57001-1454



**Thickness Gauge Set:**  
57001-1553



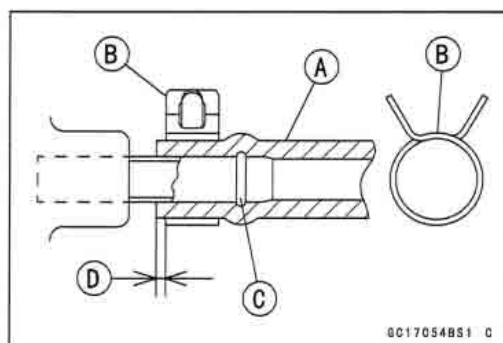
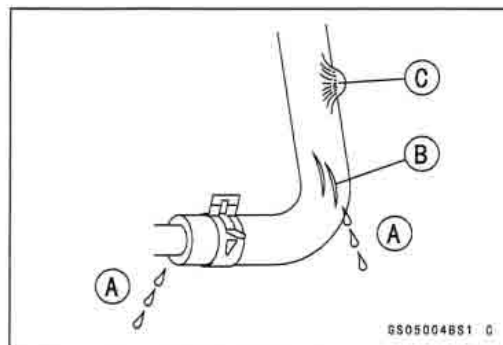
## 2-10 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Fuel System

##### Fuel Hose and Connection Inspection

- The fuel hoses are designed to be used throughout the motorcycle's life without any maintenance. However, if the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose to burst. Remove the fuel tank (see Fuel System chapter) and check the fuel hose.
- ★ Replace the fuel hose if any fraying, cracks [B] or bulges [C] are noticed.
- Check that the hose joints are securely connected.
- When installing, route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter
- When installing the fuel hose, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.
- ★ Replace the hose if it has been sharply bent or kinked.
- Fit the fuel hose [A] onto the pipe fully and install the plate clamp [B] beyond the raised rib [C].  
1 ~ 2 mm (0.04 ~ 0.08 in.) [D]



##### Throttle Cable Inspection

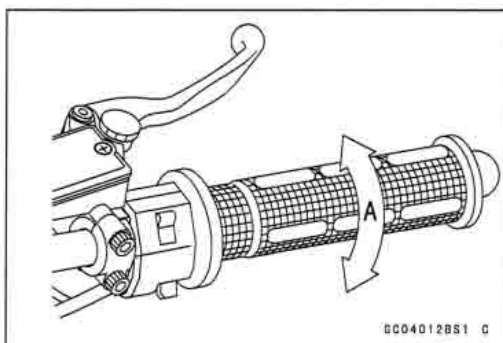
##### Throttle Grip Free Play Inspection

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

##### Throttle Grip Free Play

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

- 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 handlebar 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.



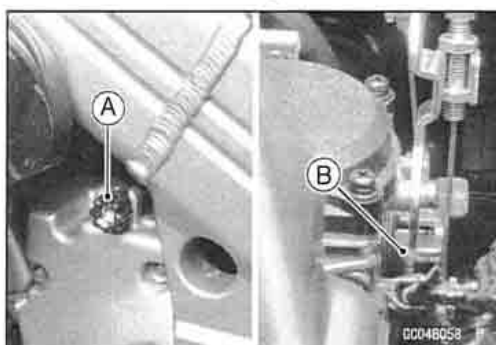
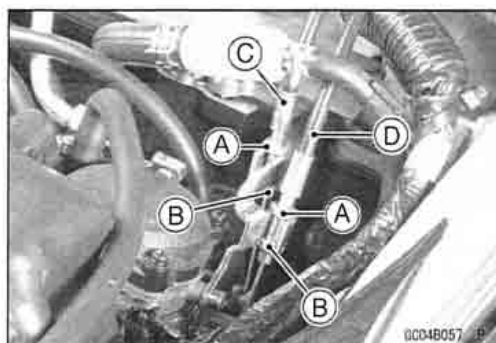
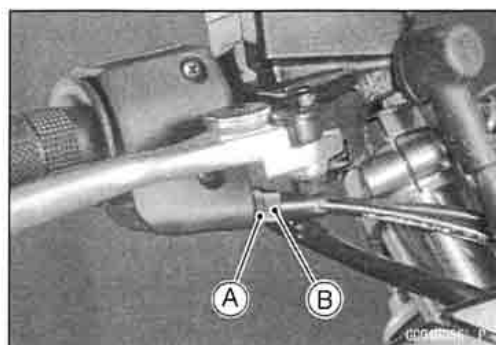
## Maintenance Procedure

### Throttle Grip Free Play Adjustment

- Remove:
  - Seat
  - Fuel Tank
- Loosen the locknut [A], and screw accelerator cable adjuster [B] in completely so as to give the throttle grip plenty of play.
- Turn the accelerator cable adjuster until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut.

★ If the throttle cables can not be adjusted by using the cable adjuster at the upper end of the throttle cable, use the cable adjusters at the lower ends of the throttle cables.

- Remove the fuel tank (see Fuel System chapter).
- Turn out both upper nuts [A] and turn in both lower nuts [B] as far as they will go so as to give the throttle grip plenty of play.
- With the throttle grip completely closed, turn out the lower nut and turn in the upper nut of the decelerator cable [C] until the inner cable just becomes tight.
- Turn out the lower nut and turn in the upper nut of the accelerator cable [D] until the correct free play is obtained.
- Check that the throttle linkage lever [B] stops against the idle adjusting screw [A] with the throttle grip closed.



### Idle Speed Inspection

#### Idle Speed Inspection

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

### ⚠ WARNING

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

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

#### Idle Speed

Standard: 1 200 ±50 r/min (rpm)

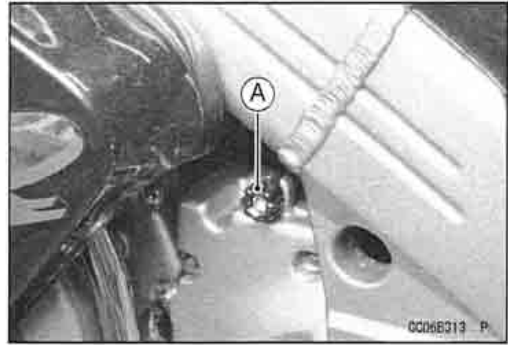
1 300 ±50 r/min (rpm) (Switzerland Model)

## 2-12 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Idle Speed Adjustment

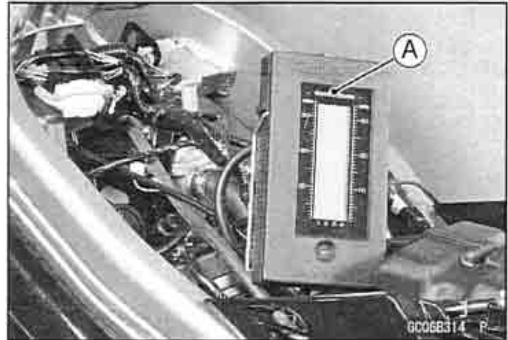
- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.
- Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.



#### Carburetor Synchronization Inspection

##### Synchronization Inspection

- Situate the motorcycle using the center stand so that it is perpendicular to the ground.
- Remove the fuel tank, and connect the sub-fuel tank to supply the fuel.
- Remove the right lower fairing.
- Warm up the engine.
- Check the idle speed and adjust if necessary.
- Pull the vacuum hoses off, and attach vacuum gauge [A] to the vacuum hose fittings on the carburetors.



**Special Tool - Vacuum Gauge KEK-55-5: 57001-1369**

- Start the engine and let it idle to measure the carburetor intake vacuum.
- ★ If the intake vacuum difference between the two cylinders exceeds the limit, adjust the synchronization.

##### Engine Vacuum Synchronization

**Less than 2.7 kPa (2 cmHg) difference between both cylinders**

#### Synchronization Adjustment

- Turn the adjusting screw [A] to synchronize the carburetor.
- ★ If the carburetor synchronization cannot be obtained by using the adjusting screw, check for dirt or blockage, and then check the pilot screw settings.
- Check the Carburetor Synchronization again.

#### NOTE

- Do not turn the pilot screws carelessly during carburetor synchronization. You may cause poor running at low engine speed.



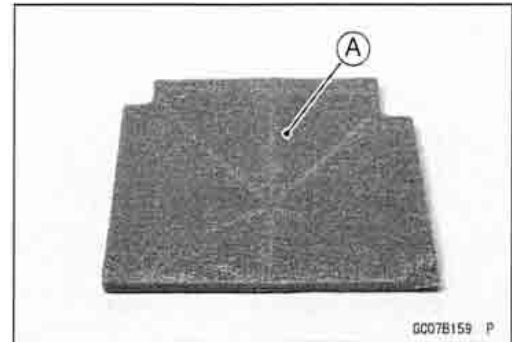
## Maintenance Procedure

### Air Cleaner Element Cleaning

#### **⚠ WARNING**

Clean the element in a well-ventilated area, and make sure that there are no sparks or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or a low flash-point solvent to clean the element.

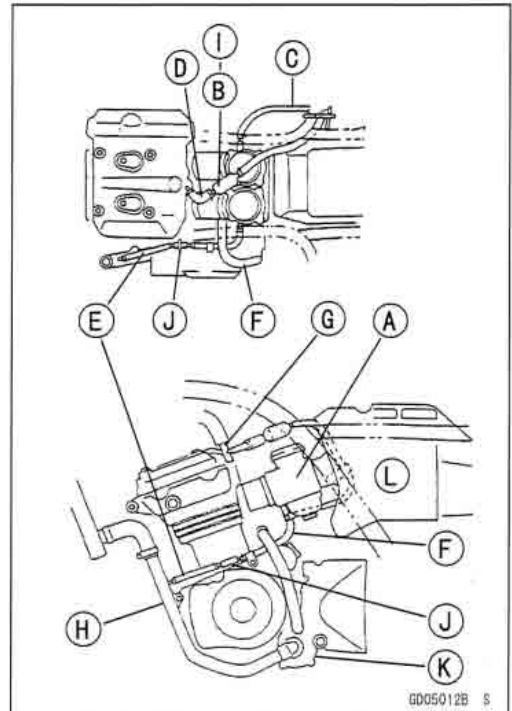
- Remove the air cleaner element [A] (see Fuel System chapter).
- Clean the element in a bath of high flash-point solvent, and then dry it with compressed air or by shaking it.
- After cleaning, saturate a clean, lint-free towel with SE, SF, or SG class SAE 30 oil and apply the oil to the element by tapping the element outside with the towel.
- Visually check the element for tears or breaks.
- ★ If the element has any tears or breaks, replace the element.



### Coolant Filter Cleaning

- Remove the fuel tank (see Fuel System chapter).
- Drain the coolant (see Cooling System chapter).
- Remove the filter [B] from the cooling hoses [D] of carburetor system.
- Blow off dirt and sediment on the filter with compressed air.

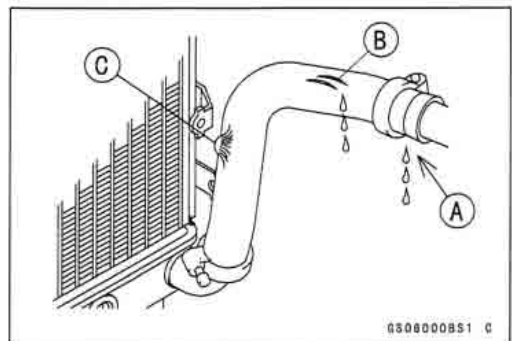
- A: Carburetor
- B: Filter Body
- C: Cooling Hose
- D: Cooling Hose
- E: Cooling Hose
- F: Cooling Hose
- G: Water Pipe
- H: Water Pipe
- I: Water Filter
- J: Coolant Valve Assy
- K: Water Pump
- L: Air Cleaner Housing



## Cooling System

### Radiator Hoses and Connections Inspection

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



**Torque - Radiator Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 17 in·lb)**



## 2-14 PERIODIC MAINTENANCE

### Maintenance Procedure

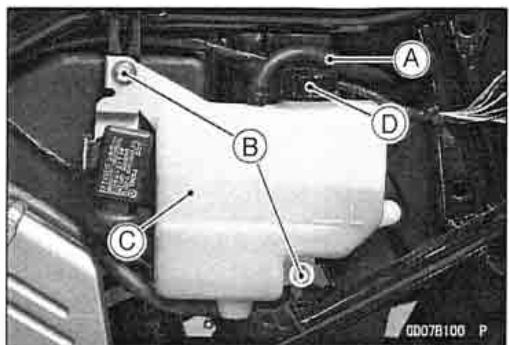
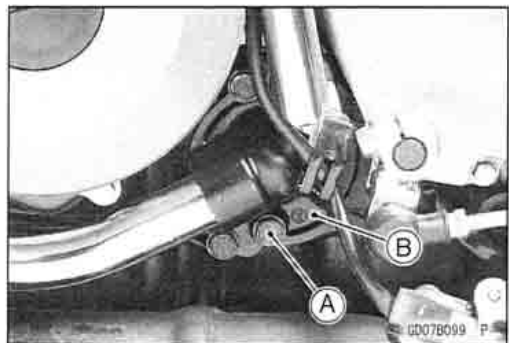
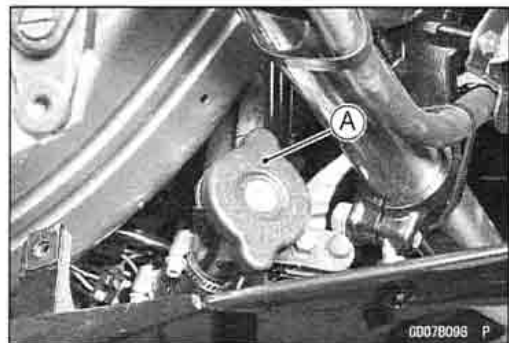
#### Coolant Change

#### **⚠ WARNING**

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

Since coolant is harmful to the human body, do not use for drinking.

- Remove:
  - Upper Cover (see Frame chapter)
  - Radiator Cap [A]
- Place a container under the drain bolt [A] at the bottom of the water pump cover and cylinder [B].
- Drain the coolant from the radiator and engine by removing the drain bolt.
- Remove:
  - Left Side Cover (see Frame chapter)
  - Hose [A]
  - Mounting Bolts [B] and Reserve Tank [C]
- Remove the cap [D] and pour the coolant of the reserve tank into the container.





## Maintenance Procedure

### Coolant Filling

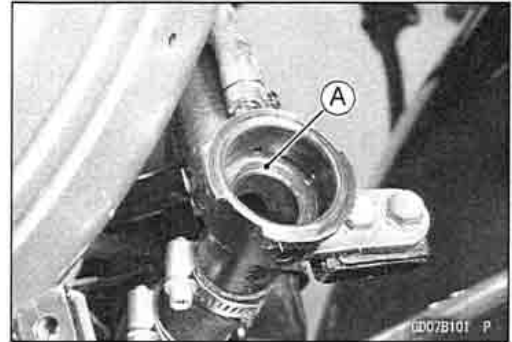
- Install:
  - Hose
  - Reserve Tank
- Tighten the drain bolt with the specified torque.
 

**Torque - Drain Bolt: 9.8 N·m (1.0 kgf·m, 95 in·lb)**
- Fill the radiator up to the radiator filler neck [A] with coolant, and install the radiator cap.

#### NOTE

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

- Fill the reserve tank up to the full level line with coolant, and install the cap.



#### CAUTION

**Soft or distilled water must be used with the antifreeze (see below for antifreeze) in the cooling system.**

**If hard water is used in the system, it causes scales accumulation in the water passages, and considerably reduces the efficiency of the cooling system.**

#### Water and Coolant Mixture Ratio (Recommended)

Soft Water:	50%
Coolant:	50%
Freezing Point:	-35°C (-31°F)
Capacity:	1.0 L (1.1 US qt)

#### NOTE

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

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



#### CAUTION

**Do not add more coolant above the full level line.**

## 2-16 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Engine Top End

##### Valve Clearance Inspection

##### Valve Clearance Inspection

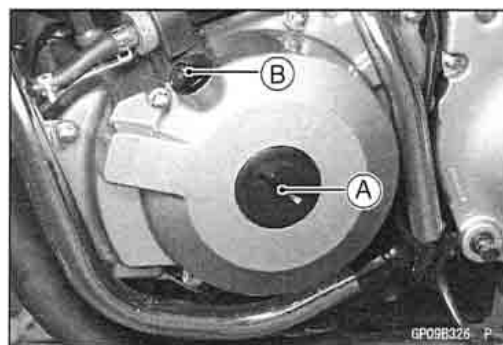
#### NOTE

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

- Drain the coolant.
- Remove:
  - Left Lower Fairings (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Radiator and Fan Motor
  - Right Hand Ignition Coil
  - Cylinder Head Cover (see Engine Top End chapter)

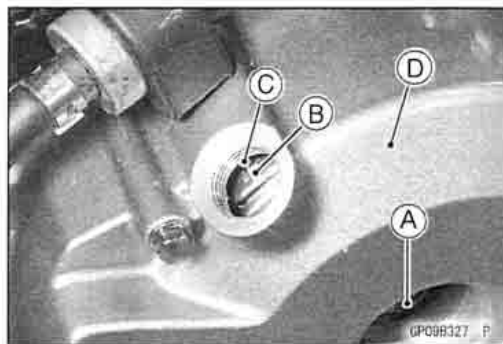
- Unscrew the two caps [A], [B] on the alternator cover.

**Special Tool - Filter Cap Driver: 57001-1454**



- Check the valve clearance when the pistons are at TDC.
  - The pistons are numbered beginning with the engine left side.

- Using a wrench on the crankshaft rotation bolt [A], turn the crankshaft counter-clockwise until the 1T or 2T mark [B] on the rotor at the end of the compression stroke is aligned with the projection [C] in the inspection window on the alternator cover [D].



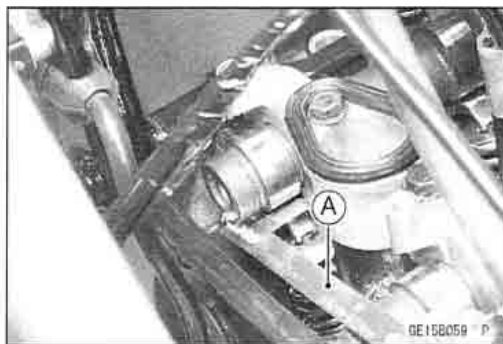
- Measure the valve clearance of #1 & #2 cylinder's valves by inserting a thickness gauge [A] (special tool) enough between the cam lobe and rocker arm.

#### Valve Clearance

##### Standard:

IN	0.08 ~ 0.13 mm (0.003 ~ 0.005 in.)
EX	0.11 ~ 0.16 mm (0.004 ~ 0.006 in.)

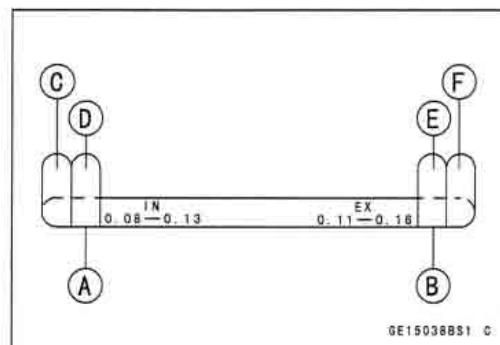
**Special Tool - Thickness Gauge (Limit Gauge): 57001-1553**



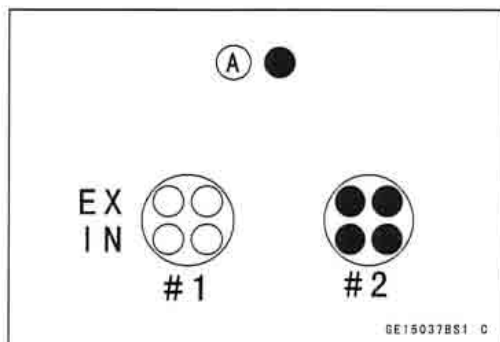
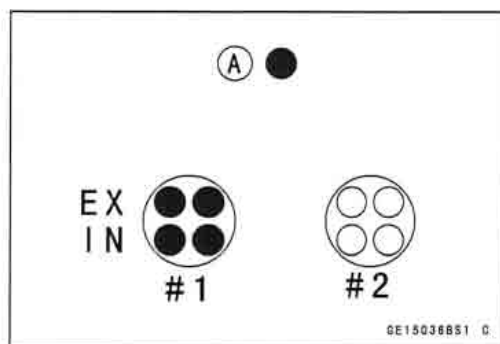
## Maintenance Procedure

- A. For Inlet Valve Inspection
- B. For Exhaust Valve Inspection
- C. GO End
- D. NO-GO End
- E. NO-GO End
- F. GO End

- When the "GO" end of the gauge will fit, but not the "NO-GO" end, the valve clearance is correct.
- After adjusting the inlet valves, measure the exhaust valves in the same manner.
- Each piston has two inlet and two exhaust valves. Measure these two inlet or exhaust valves at the same crankshaft position.
- When positioning #1 piston TDC at the end of the compression stroke, the inlet and exhaust valve clearance of #1 piston are measured.  
Measuring Valve [A]



- When positioning #2 piston TDC at the end of the compression stroke, the inlet and exhaust valve clearance of #2 piston are measured.  
Measuring Valve [A]



### NOTE

- Check the valve clearance using this method only. Checking the clearance at any other cam position may result in improper valve clearance.
- ★If the valve clearance is incorrect the valve clearance must be adjusted.

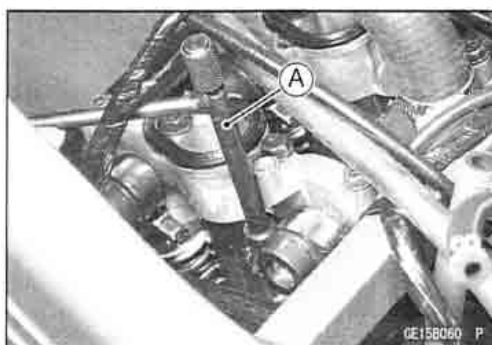
### Valve Clearance Adjustment

- Loosen the valve adjusting screw locknut by using the valve adjuster [A] (special tool).

**Special Tool - Valve Adjuster: 57001-1220**

- Using the adjust gauge (special tool), inspect the valve clearance between the cam lobe and the locker arm.
- Turn the adjusting screw until the gauge drags in the clearance.

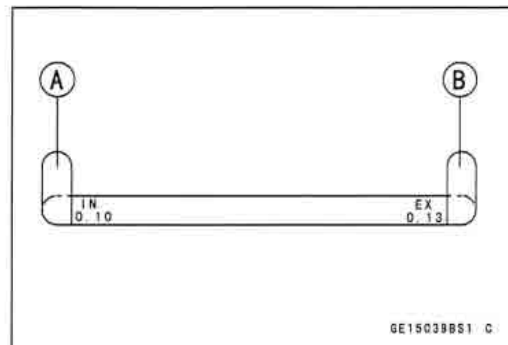
**Special Tool - Thickness Gauge Set (Adjust Gauge): 57001-1553**



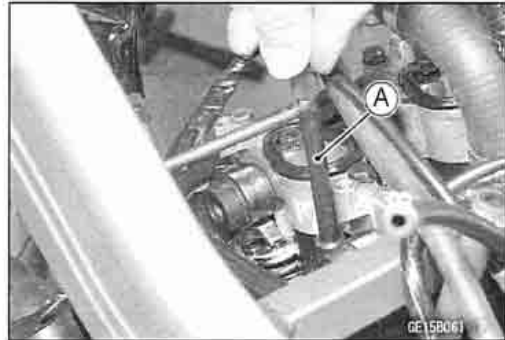
## 2-18 PERIODIC MAINTENANCE

### Maintenance Procedure

- A. For Inlet Valve Adjustment
- B. For Exhaust Valve Adjustment



- Tighten the locknut by the valve adjuster [A] temporary.
- Tighten the locknut to the specified torque (13 kg (29 lb) Force) while preventing the adjusting screw from revolving with the locknut by using a push-pull gauge.
- Install the removed parts.
- Fill the radiator up to the filler neck with coolant.



### Clutch

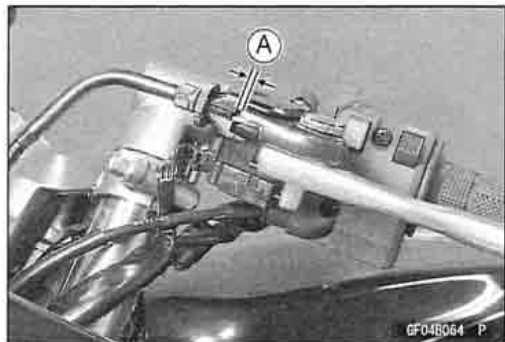
#### Clutch Adjustment

##### Clutch Lever Free Play Inspection

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

##### Clutch Lever Free Play

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

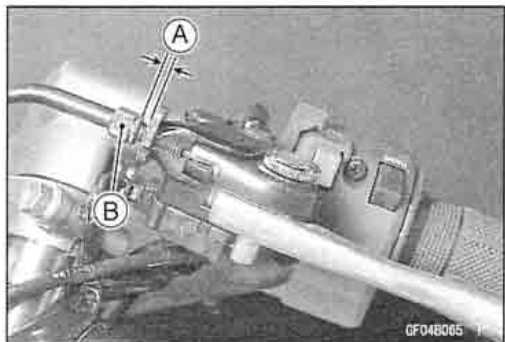


##### Clutch Lever Free Play Adjustment

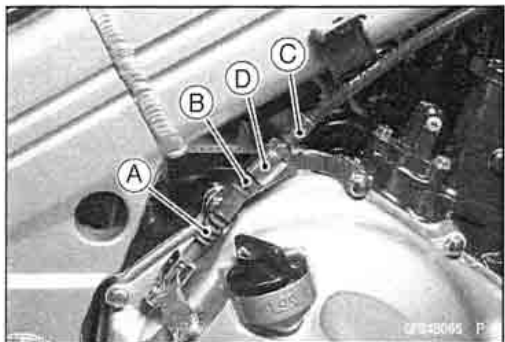
#### ⚠ WARNING

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

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



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



## Maintenance Procedure

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

### **⚠ WARNING**

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

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



## Engine Lubrication System

### Engine Oil Change

### **⚠ WARNING**

To avoid a serious burn, never touch the exhaust pipe during oil change.

- Warm up the engine sufficiently with the motorcycle standing on its center stand, and stop the engine.
- Place an oil pan under the engine and remove the drain bolt [A] to drain the oil.
- Front [B]
- Replace the drain bolt gasket with a new one if it is damaged.
- The oil in the oil filter can be drained by removing the filter.
- After draining the oil, tighten the drain bolt.

**Torque - Oil Drain Bolt: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

**Oil Filter Mounting Bolt: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

- Pour in the specified type and amount of oil.

### Recommended Engine Oil

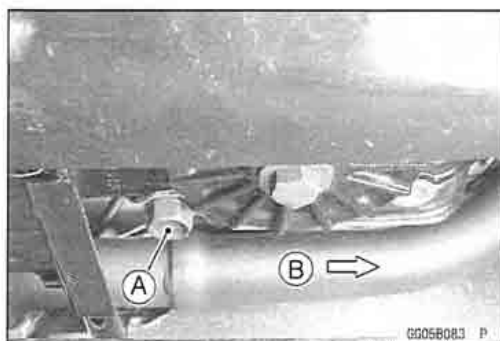
**Type:** API SE, SF or SG

API SH or SJ with JASO MA

**Viscosity:** SAE 10W - 40

**Capacity:** 1.5 L (1.6 US qt) (When filter is not removed)

1.9 L (2.0 US qt) (When filter is removed)

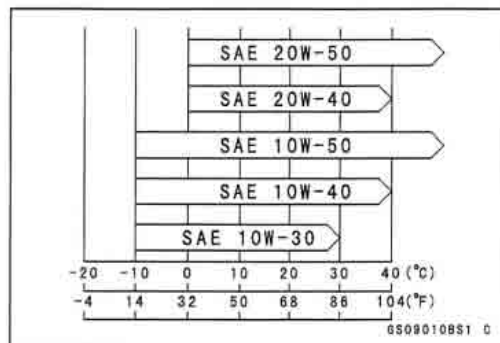


## 2-20 PERIODIC MAINTENANCE

### Maintenance Procedure

#### NOTE

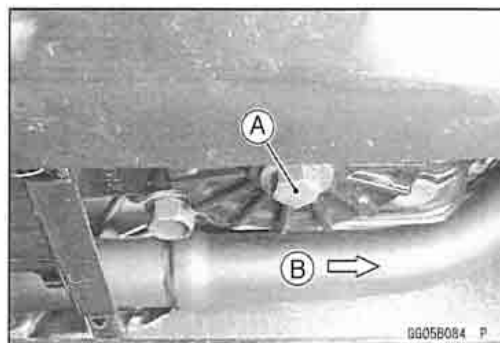
- Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.



#### Oil Filter Replacement

- Drain the engine oil (see Engine Oil change).
- Remove the left lower fairing (see Frame chapter).
- Remove the oil filter mounting bolt [A].

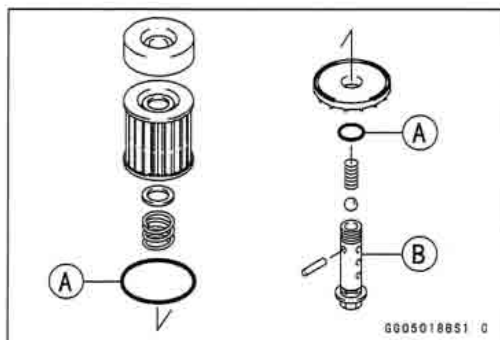
Front [B]



- Replace the oil filter with a new one.
- Apply engine oil to the O-rings [A] before installation after inspecting its damage.
- Install the oil filter mounting bolt [B] with a specified torque.

**Torque - Oil Filter Mounting Bolt: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

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



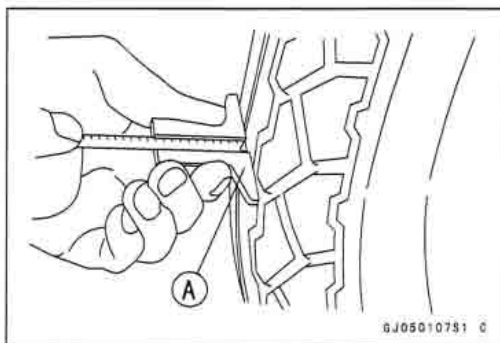
### Wheels/Tires

#### Tire Wear Inspection

##### Tire Inspection

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

- Measure the tread depth at the center of the tread with a depth gauge [A]. Since the tire may wear unevenly, take measurement at several places.
- Remove any imbedded stones or other foreign particles from the tread.
- Visually inspect the tire for cracks and cuts, replacing the tire in case of damage. Swelling or high spots indicate internal damage, requiring tire replacement.
- ★ If any measurement is less than the service limit, replace the tire.





## Maintenance Procedure

### Tread Depth

#### Standard:

Front	4.0 mm (0.16 in.) (DUNLOP),
	4.5 mm (0.18 in.) (PIRELLI)
Rear	6.0 mm (0.24 in.) (DUNLOP)
	6.5 mm (0.26 in.) (PIRELLI)

#### Service Limit:

Front	1 mm (0.04 in.)
Rear	2 mm (0.08 in.) up to 130 km/h (80 mph)
	3 mm (0.12 in.) over 130 km/h (80 mph)

### ⚠ WARNING

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

### NOTE

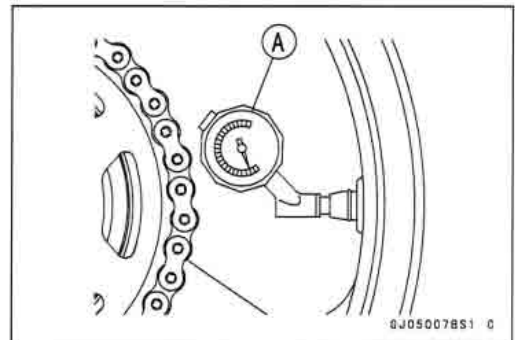
- Most countries may have their own regulations a minimum tire tread depth: be sure to follow them.
- Check and balance the wheel when a tire is replaced with a new one.

### Air Pressure Inspection/Adjustment

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

#### Air Pressure (when cold)

Front	Up to 155 kg (342 lb)	200 kPa (2.0 kg/cm <sup>2</sup> , 29 psi)
Rear	Up to 155 kg (342 lb)	225 kPa (2.3 kg/cm <sup>2</sup> , 33 psi)



### Final Drive

#### Drive Chain Slack Inspection

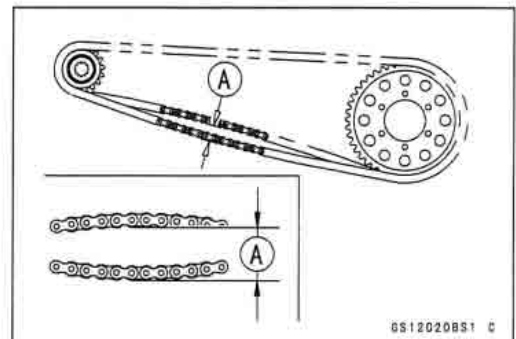
#### Drive Chain Slack Inspection

### NOTE

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

#### Chain Slack

Standard: 35 ~ 40 mm (1.4 ~ 1.6 in.)

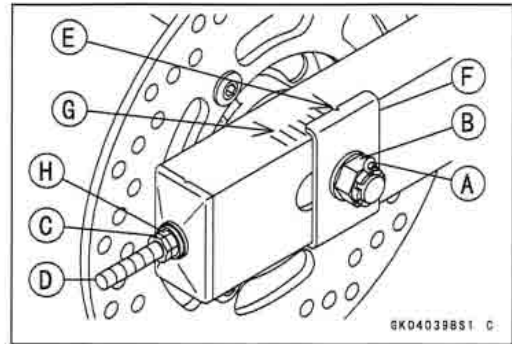


## 2-22 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Drive Chain Slack Adjustment

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



#### **⚠ WARNING**

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

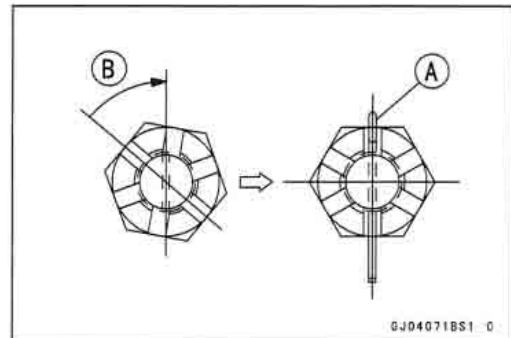
- Tighten both chain adjuster locknuts securely.
- Tighten the axle nut.

**Torque - Rear Axle Nut: 110 N·m (11 kgf·m, 80 ft·lb)**

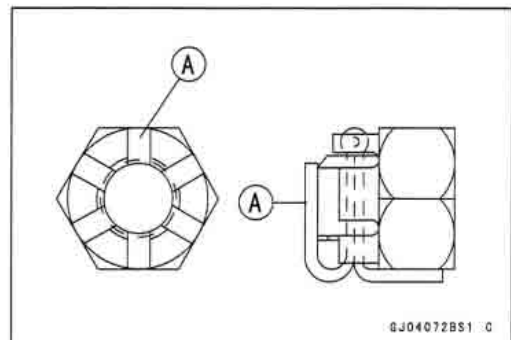
- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin [A] into the axle.

#### **NOTE**

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



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





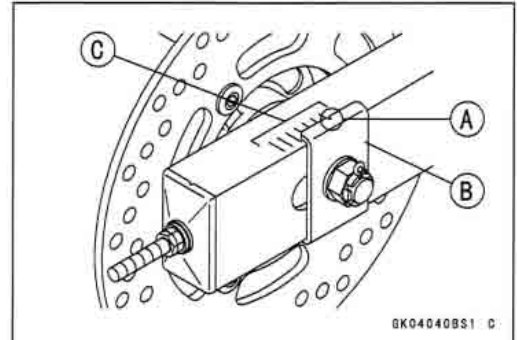
## Maintenance Procedure

### Wheel Alignment Inspection/Adjustment

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

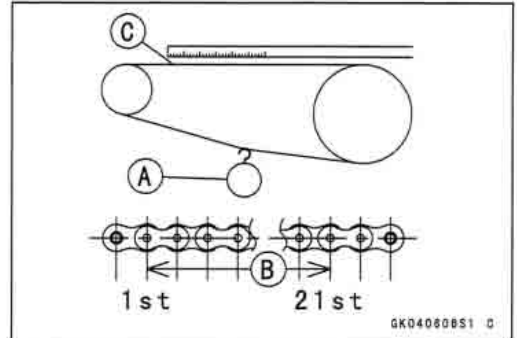
### ⚠ WARNING

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



### Drive Chain Wear Inspection

- Remove:  
Chain Cover
- Rotate the rear wheel to inspect the drive chain for damaged rollers, and loose pins and links.
- ★ If there is any irregularity, replace the drive chain.
- ★ Lubricate the drive chain if it appears dry.
- Stretch the chain taut by hanging a 10 kg (22 lb) weight [A] on the chain.



- Measure the length of 20 links [B] on the straight part [C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.
- ★ If any measurements exceed the service limit, replace the chain. Also replace the front and rear sprockets when the drive chain is replaced.

### Drive Chain 20-link Length

Standard: 317.5 ~ 318.1 mm (12.50 ~ 12.52 in.)

Service Limit: 323 mm (12.72 in.)

### ⚠ WARNING

If the drive chain wear exceeds the service limit, replace the chain or an unsafe riding condition may result. A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control. For safety, use only the standard chain. It is an endless type and should not be cut for installation.

	Standard:	Replacement:
Make	ENUMA	ENUMA
Type	Endless, EK520SR-O <sub>2</sub>	Open, EK520SR-O <sub>2</sub>
Link	108 Links	108 Links

## 2-24 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Drive Chain Lubrication

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

#### CAUTION

The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-rings and resultant loss of lubricant, observe the following rules.

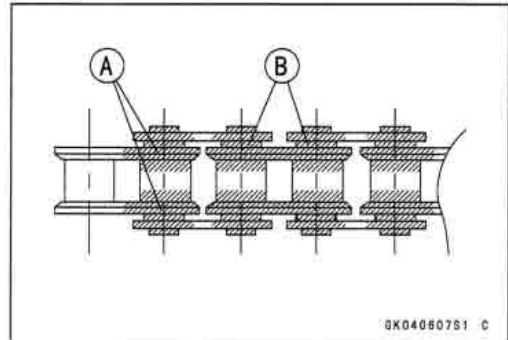
Use only kerosene or diesel fuel for cleaning an O-ring drive chain.

Any other cleaning solution such as gasoline or trichloroethylene will cause deterioration and swelling of the O-rings.

Immediately blow the chain dry with compressed air after cleaning.

Complete cleaning and drying the chain within 10 minutes.

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



### Brakes

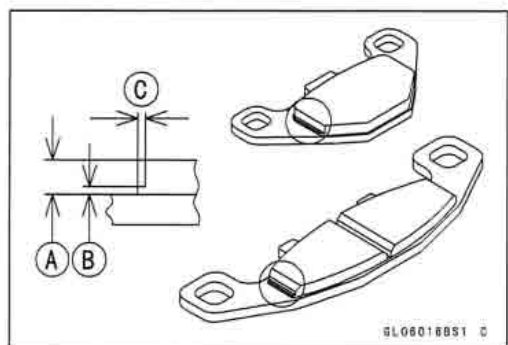
#### Brake Pad Wear Inspection

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

#### Pad Lining Thickness

Standard: 4.5 mm (0.18 in.)

Service Limit: 1 mm (0.04 in.)



#### Brake Light Switch Inspection

#### Front Brake Light Timing Inspection

- Turn on the ignition switch.
- Check the operation of the front brake light switch by grasping the brake lever.
- ★ If it does not as specified, replace the switch.

Standard: On after about 5 ~ 21 mm (0.2~0.8 in.) of tip of lever travel.

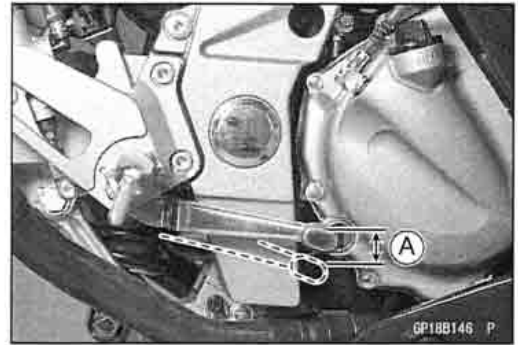
## Maintenance Procedure

### Rear Brake Light Timing Inspection

- Turn on the ignition switch.
- Check the operation of the rear brake light switch by depressing the brake pedal.
- ★ If it does not as specified, adjust the brake light timing.

#### Brake Light Timing

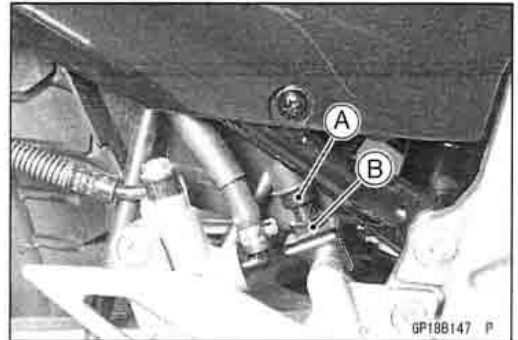
**Standard:** On after about 10 mm (0.4 in.) of pedal travel [A]



### Brake Light Timing Adjustment

Brake light timing is adjusted by changing the position of the rear brake light switch [A].

- Adjust the position of the switch so that the brake light goes on after the specified pedal travel by turning the adjusting nut [B].



### CAUTION

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

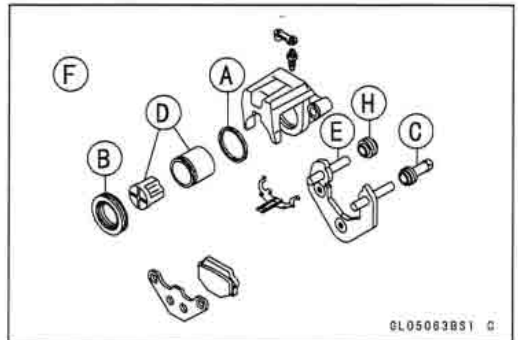
### Caliper Piston Seal and Dust Seal Replacement

#### Caliper Fluid Seal Damage

The fluid seals [A] around the piston maintain the proper pad/disc clearance. If the seals are not satisfactory, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

- Remove the calipers (see Brakes chapter).
- Replace the fluid seals under any of the following conditions: (a) fluid leakage around the pad; (b) brakes over-heat (c) there is a large difference in inner and outer pad wear; (d) the seal is stuck to the piston [D].

★ If the fluid seal is replaced, replaced the dust seal as well. Also, replace all seals every other time the pads are changed.



#### Caliper Dust Seal and Friction Boot Damage

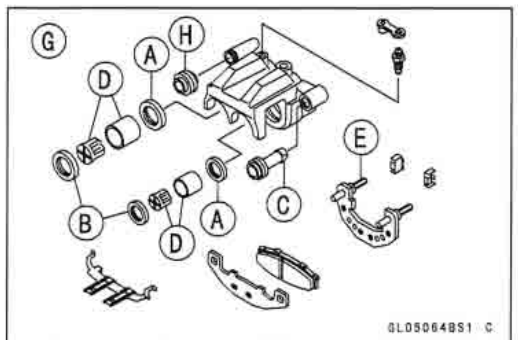
- Remove the calipers (see Brakes chapter).
- Check that the dust seal [B] and friction boots [C] are not cracked, worn, swollen, or otherwise damaged.
- ★ If they show any damage, remove the caliper bracket and replace them. But, whenever two fluid seal is replaced, the dust seal should be replaced.

Caliper Holder Shafts [E]

Front Caliper [F]

Rear Caliper [G]

Dust Boot [H]



## 2-26 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Brake Master Cylinder Cup and Dust Seal Replacement

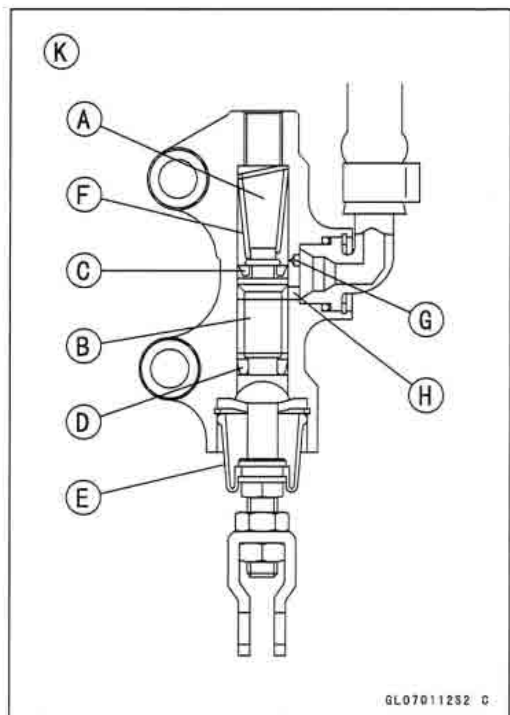
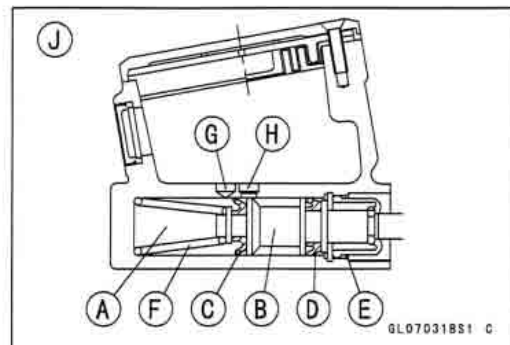
##### Master Cylinder Inspection (Visual Inspection)

- Remove the master cylinders (see Brakes chapter).
- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of the piston [B].
- ★ If a master cylinder or piston shows any damage, replace them.
- Inspect the primary [C] and secondary [D] cups.
- ★ Even if a cup is not worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.
- ★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.

##### Front Master Cylinder [J]

- Check the dust cover [E] for any damage.
- ★ If they are damaged, replace them.
- Check the piston return spring [F] for any damage.
- ★ If the springs are damaged, replace them.
- Check that relief port [G] and supply port [H] are not plugged.
- ★ If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

##### Rear Master Cylinder [K]



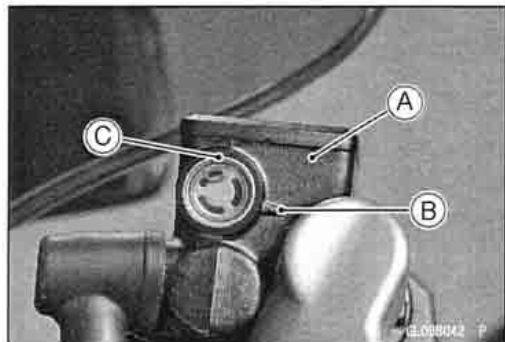
#### Brake Fluid Level Inspection

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

##### NOTE

○ Hold the reservoir parallel to the ground by turning the handlebar when checking brake fluid level.

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

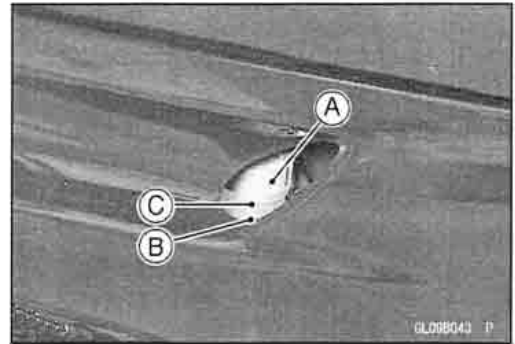


## Maintenance Procedure

- Check that the brake fluid level in the rear brake reservoir [A] is above lower level [B].
- ★ If the fluid level is lower than the lower level line, remove the seat and tool case and fill the reservoir to the upper level line [C].

### **⚠ WARNING**

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



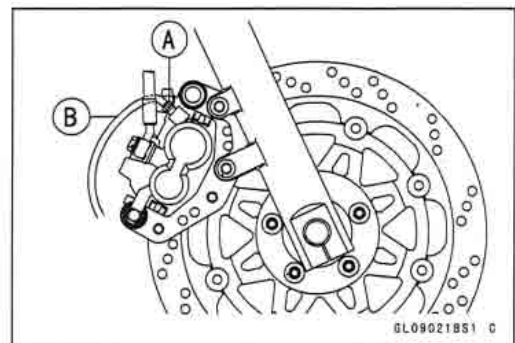
**Recommended Disc Brake FLuid**  
Grade: DOT4

### Brake Fluid Change Brake Fluid Change

#### **NOTE**

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

- Level the brake fluid reservoir.
- Remove the reservoir cap.
- Remove the rubber cap from the bleed valve [A] on the caliper.
- Attach a clear plastic hose [B] to the bleed valve of the caliper, and run the other end of the hose into a suitable container.
- Fill the reservoir with fresh brake fluid.
- Change the brake fluid.
- Repeat this operation described below until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.



## 2-28 PERIODIC MAINTENANCE

### Maintenance Procedure

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

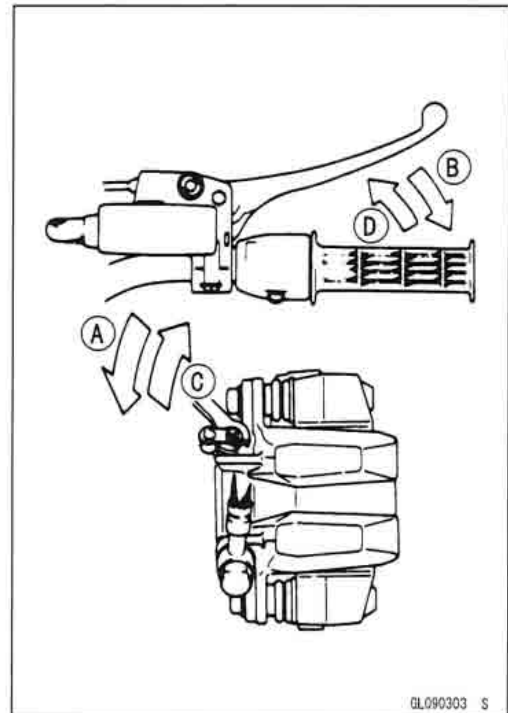
#### NOTE

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

- Remove the clear plastic hose.
- Install the reservoir cap.
- Tighten the bleed valve, and install the rubber cap.
- After changing the fluid, check the brake for fluid level, good braking power, no brake drag, and no fluid leakage.

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

★ If necessary, bleed the air from the lines.



QL090303 S

### Bleeding the Brake Line

The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

#### ⚠ WARNING

**Be sure to bleed the air from the brake line whenever brake lever or pedal action feels soft or spongy after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.**

#### NOTE

○ The procedure to bleed the front brake line is as follows. Bleeding the rear brake line is the same as for the front brake.

- Remove the reservoir cap, and fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- With the reservoir cap off, slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.
- Bleed the air completely from the master cylinder by this operation.

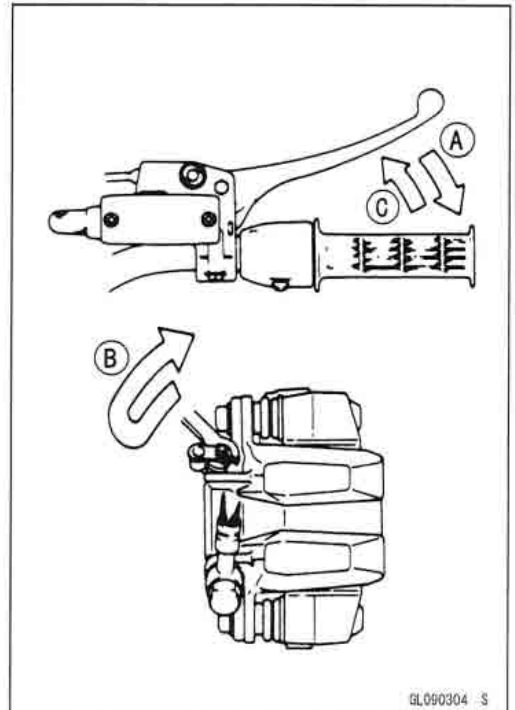
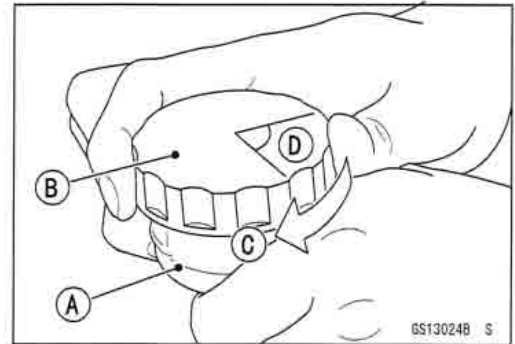


## Maintenance Procedure

- Install the reservoir cap following the procedure below to install the rear brake fluid reservoir cap correcting.
  - First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until the resistance is felt fully; then, tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir [A] body.
  - Remove the rubber cap from the bleed valve on the caliper.
  - Attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
  - Bleed the brake line and the caliper.
  - Repeat this operation until no more air can be seen coming out into the plastic hose.
1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
  2. Quickly open and close [B] the bleed valve while holding the brake applied.
  3. Release the brake [C].

### NOTE

- The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.
  - Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.
  - Remove the clear plastic hose.
  - Tighten the bleed valve, and install the rubber cap.
- Torque - Bleed Valve: 7.8 N·m (0.80 kg·m, 69 in·lb)**
- Check the fluid level.
  - After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.





## 2-30 PERIODIC MAINTENANCE

### Maintenance Procedure

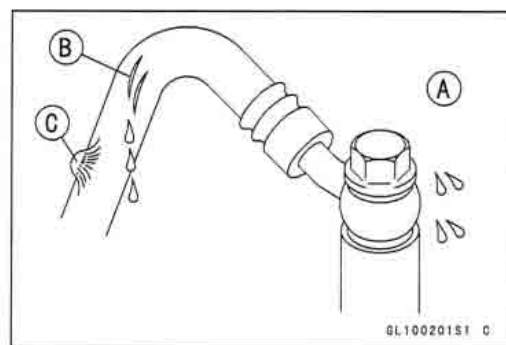
#### **⚠ WARNING**

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

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When 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 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.

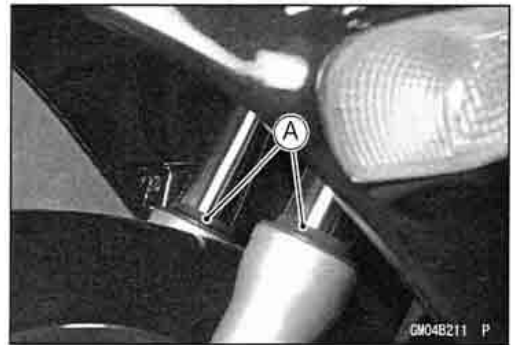


## Maintenance Procedure

### Suspension

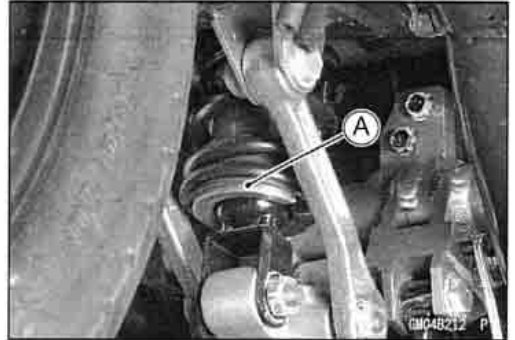
#### Front Fork Oil Leak Inspection

- Visually inspect the front forks [A] for oil leakage, scoring or scratches on the outer surface of the inner tubes.
- ★ Replace or repair any defective parts, if necessary.



#### Rear Shock Absorber Oil Leak Inspection

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



#### Swingarm Pivot Lubrication

- Remove the swingarm bearing (see Suspension chapter).
- Supply grease to the needle bearings and grease seals in accordance with the Periodic Maintenance Chart.

#### Uni-trak Linkage Lubrication

- Remove the tie-rods and rocker arm (see Suspension chapter).
- Apply grease to the O-rings, bushings, sleeves and grease seals in accordance with the Periodic Maintenance Chart.

### Steering

#### Steering Inspection

##### Steering Inspection

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



#### NOTE

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

## 2-32 PERIODIC MAINTENANCE

### Maintenance Procedure

#### Steering Adjustment

- Loosen:

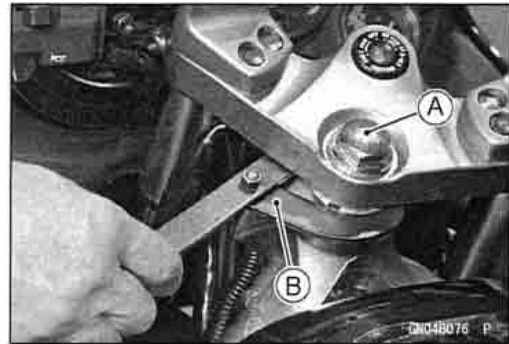
- Lower Fork Clamp Bolts (both sides)
  - Stem Head Bolt [A]

- Adjust the steering.

- ★ If the steering is too loose, tighten the stem nut a fraction of a turn using the special tool [B].

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

**Special Tool - Steering Stem Nut Wrench: 57001-1100**



#### NOTE

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

- Tighten:

**Torque - Steering Stem Head Nut: 47 N·m (4.8 kgf·m, 35 ft·lb)**

**Front Fork Lower Clamp Bolt: 29 N·m (3.0 kgf·m, 22 ft·lb)**

- Check the steering again.

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

#### Steering Stem Bearing Lubrication

- Remove the steering stem (see Steering chapter).

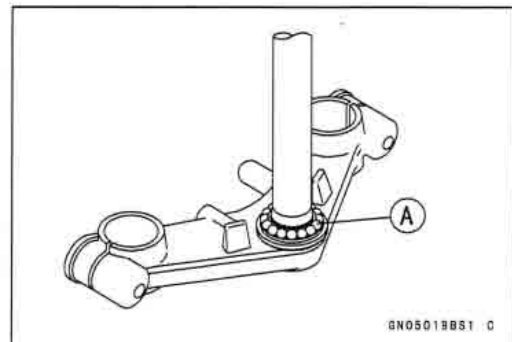
- Using a high flash-point solvent, wash the upper and lower ball bearings (A) and wipe the upper and lower outer races which are press-fitted into the frame head pipe, clean off grease and dirt.

- Visually check the outer races and the ball bearings.

- ★ Replace them if they show wear or damage.

- Apply a light coat of grease to the upper and lower ball bearings and outer races.

- Install the steering stem and adjust the steering.



## Electrical System

### Spark Plug Inspection

#### Spark Plug Cleaning and Inspection

- Remove the spark plug (see Electrical System chapter), and visually inspect.

- 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 center electrode and/or side electrode are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug or its equivalent.

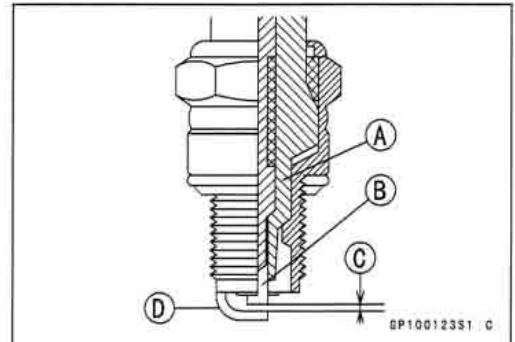
## Maintenance Procedure

### Spark Plug Gap Inspection

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

### Spark Plug Gap

Standard: 0.6 ~ 0.7 mm (0.024 ~ 0.028 in.)



### CAUTION

**Use only the recommended spark plugs. Other spark plugs will wear prematurely.**

## General Lubrication

### 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

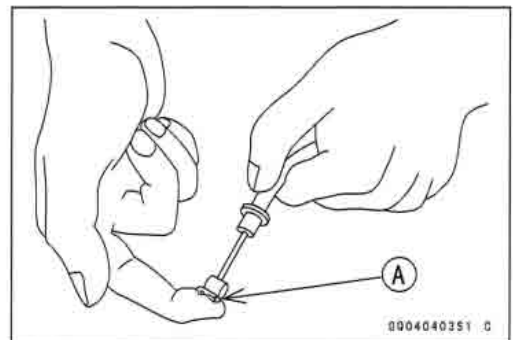
- Perform the general lubrication in accordance with the Periodic Maintenance Chart or whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray.

### Pivots: Lubricate with Motor Oil

Clutch Lever  
Brake Lever  
Brake Pedal  
Side stand  
Center stand  
Rear Brake Joint Pin

### Points: Lubricate with grease.

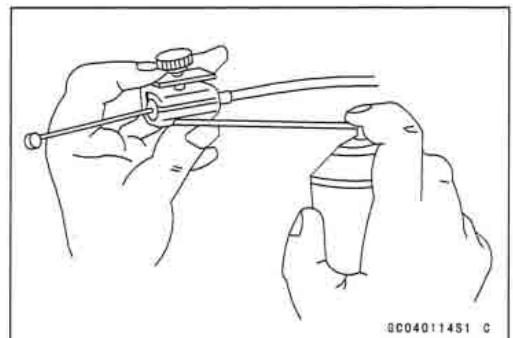
Clutch Inner Cable Upper and Lower Ends [A]  
Throttle Inner Cable Upper and Lower Ends [A]  
Choke Inner Cable Upper and Lower Ends  
Clutch Lever Pivot  
Brake Lever Pivot  
Brake Pedal Pivot  
Side Stand Pivot



### Cables: Lubricate with Rust Inhibiter

Choke Cable  
Throttle Cables  
Clutch Cable

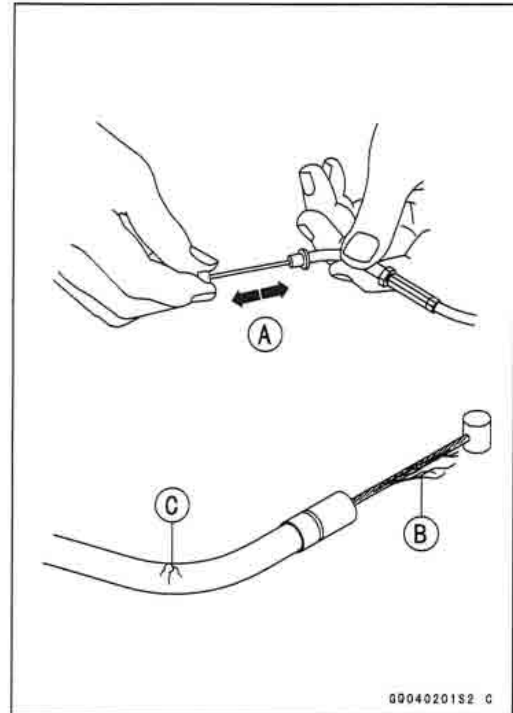
- Lubricate the cables by seeping the oil between the inner cable and cable housing.
- The cable may be lubricated by using a commercially available pressure cable lubricator with an aerosol cable lubricant.



## 2-34 PERIODIC MAINTENANCE

### Maintenance Procedure

- With the cable disconnected at the both ends, the inner cable should move freely [A] within the cable housing.
- ★ If the 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. Also, check to see that each cotter pin is in place and in good condition.

#### **NOTE**

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

- ★ If there are loose fasteners, retorque them to the specified torque following the specified tightening sequence. Refer to the Torque and Locking Agent section 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:**

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

##### **Final Drive:**

- Chain Adjusting Nuts and Locknuts

##### **Brakes:**

- Front Master Cylinder Clamp Bolts
- Brake Lever Pivot Nut
- Rear Master Cylinder Mounting Bolts
- Brake Pedal Bolt
- Brake Push Rod Clevis Cotter Pin
- Caliper Mounting Bolts

---

## Maintenance Procedure

---

### Suspension:

- Front Fork Clamp Bolts
- Rear Shock Absorber Mounting Bolts, Nuts
- Swing Arm Pivot Nut
- Rocker Arm Pivot Nut
- Tie-rod Bolts and Nuts

### Steering:

- Stem Head Bolt
- Handlebar Holder Mounting Bolts

### Frame

- Front Fender Mounting Bolts
- Grab Rail Mounting Bolts
- Rear Frame Mounting Bolts
- Center Stand Pivot Bolts
- Side Stand Pivot Nut
- Side Stand Bracket Bolts
- Footpeg Pivot Clips
- Footpeg Bracket Mounting Bolts

### Engine:

- Engine Mounting Bolts and Nuts
- Engine Mounting Bracket Bolts and Nuts
- Exhaust Pipe Holder Nuts
- Muffler Mounting Nuts
- Muffler Clamp Bolts
- Clutch Lever Holder Clamp Bolts
- Clutch Lever Pivot Nut
- Shift Pedal Bolt
- Radiator Mounting Bolts

# Fuel System

## Table of Contents

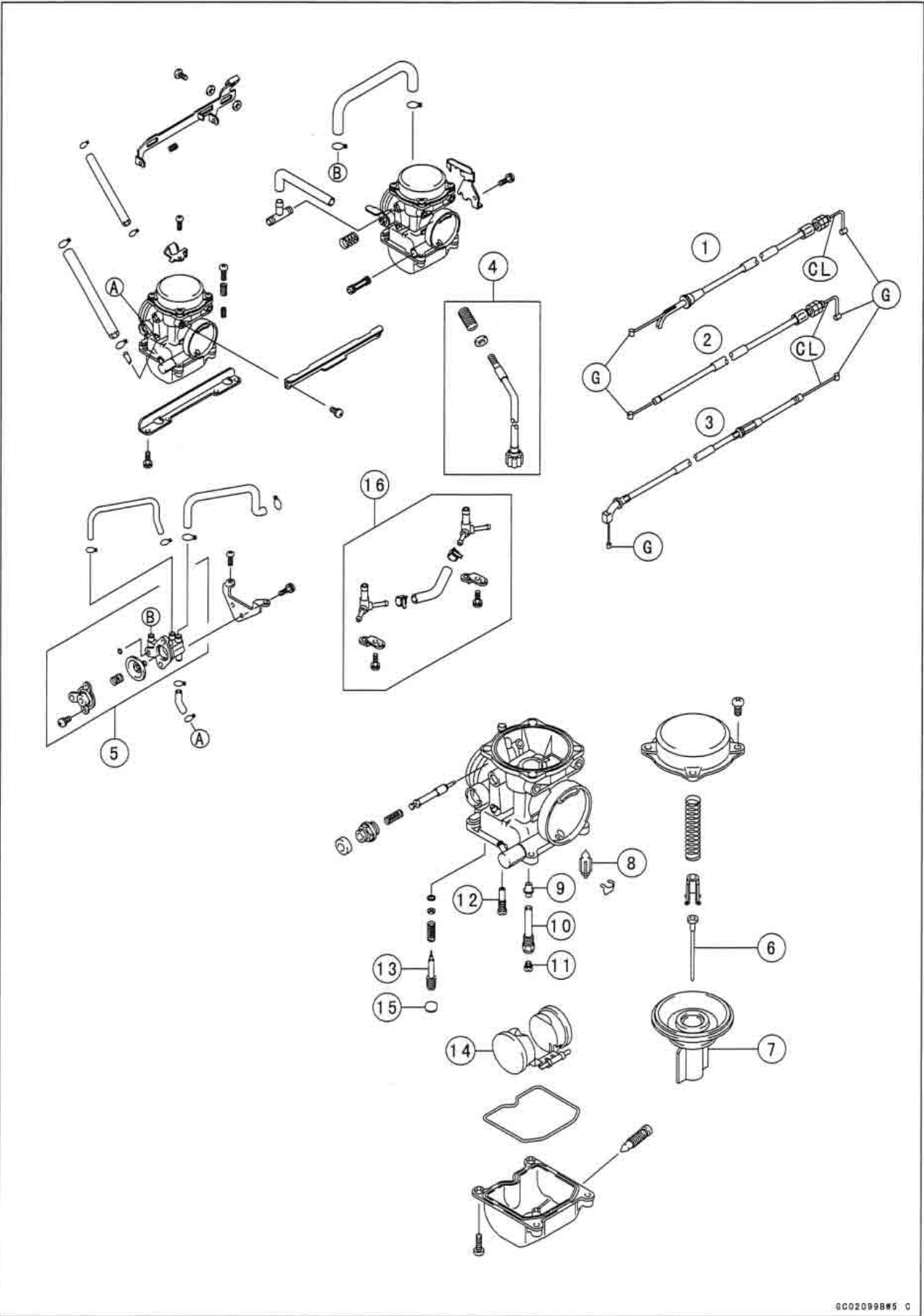
3

Exploded View .....	3-2	Fuel System Cleanliness	
Specifications .....	3-6	Inspection .....	3-14
Special Tools .....	3-7	Carburetor Removal .....	3-14
Throttle Grip and Cables .....	3-8	Carburetor Installation .....	3-15
Free Play Inspection .....	3-8	Carburetor Separation .....	3-15
Free Play Adjustment .....	3-8	Carburetor Joining .....	3-16
Throttle Cable Removal .....	3-8	Carburetor Disassembly .....	3-17
Throttle Cable Installation .....	3-8	Carburetor Assembly .....	3-17
Throttle Cable Lubrication .....	3-8	Carburetor Cleaning .....	3-18
Choke Cable .....	3-9	Carburetor Inspection .....	3-19
Free Play Inspection .....	3-9	Coolant Filter Cleaning .....	3-20
Free Play Adjustment .....	3-9	Coolant Valve Inspection .....	3-20
Choke Cable Removal .....	3-9	Air Cleaner .....	3-21
Choke Cable Installation .....	3-9	Air Cleaner Element Removal .....	3-21
Choke Cable Lubrication and		Air Cleaner Element Installation .....	3-21
Inspection .....	3-10	Air Cleaner Element Cleaning .....	3-21
Carburetors .....	3-11	Air Cleaner Housing Removal .....	3-22
Idle Speed Inspection .....	3-11	Oil Draining .....	3-22
Idle Speed Adjustment .....	3-11	Fuel Tank .....	3-23
Carburetor Synchronization		Fuel Tank Removal .....	3-23
Inspection .....	3-11	Fuel Tank Installation .....	3-23
Carburetor Synchronization		Fuel Tank and Cap Inspection .....	3-23
Adjustment .....	3-11	Fuel Tank Cleaning .....	3-24
Pilot Screw Adjustment .....	3-11	Fuel Tap Removal .....	3-24
Service Fuel Level Inspection .....	3-11	Fuel Tap Installation .....	3-24
Service Fuel Level Adjustment .....	3-13	Fuel Tap Inspection .....	3-24



3-2 FUEL SYSTEM

Exploded View



---

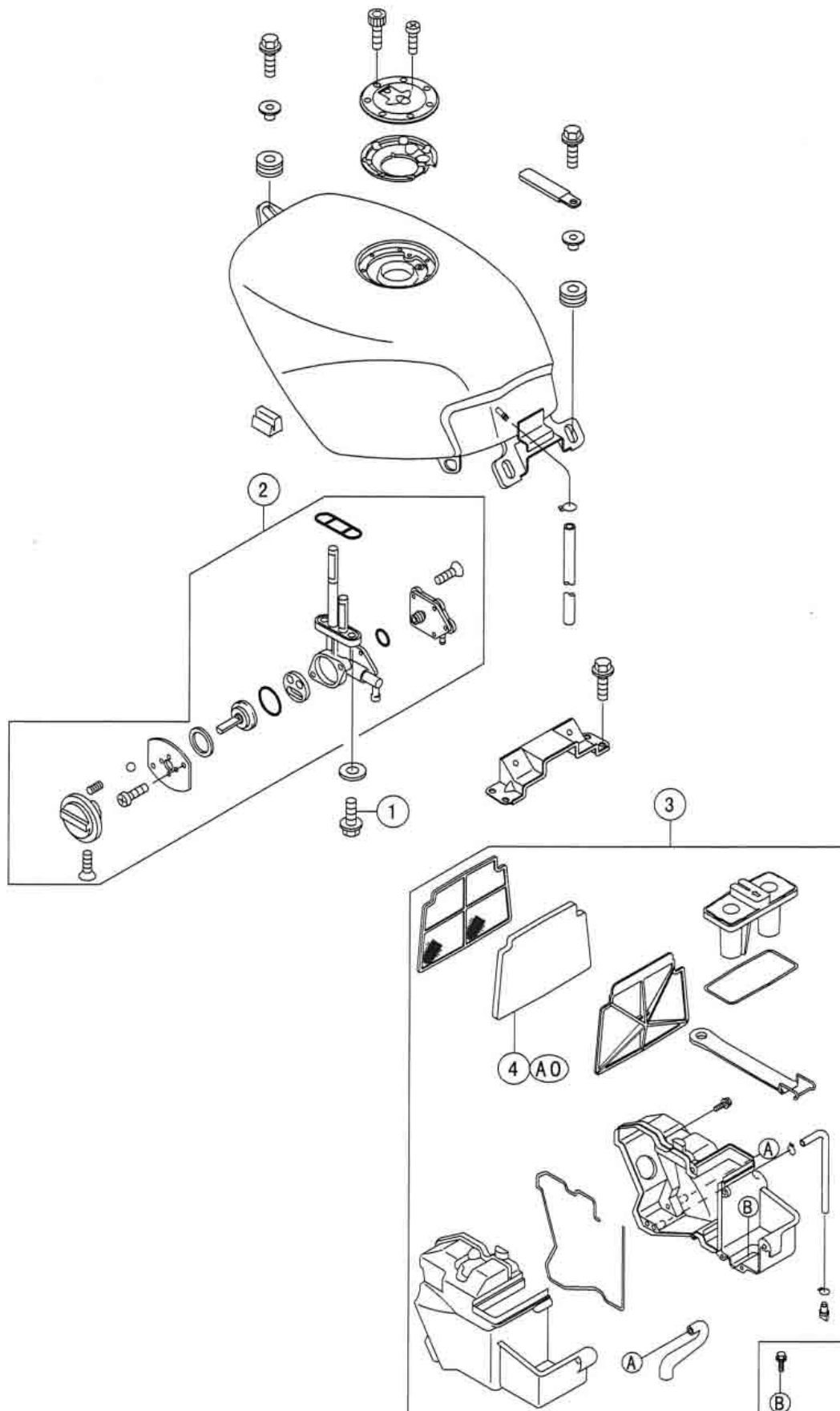
**Exploded View**

---

1. Throttle Cable (accelerator)
  2. Throttle Cable (decelerator)
  3. Choke Cable
  4. Throttle Stop Screw
  5. Air Cut Valve
  6. Jet Needle
  7. Vacuum Valve
  8. Float Valve
  9. Needle Jet
  10. Needle Jet Holder
  11. Main Jet
  12. Pilot Jet
  13. Pilot Air Screw
  14. Float
  15. Cap (Canada model)
  16. Other than Canada model
- CL: Apply cable lubricant.  
G: Apply grease.

## 3-4 FUEL SYSTEM

### Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Fuel Tap Mounting Bolts	2.5	0.25	22 in·lb	

2. Fuel Tap

3. Air Cleaner Housing

4. Air Cleaner Element

AO: Apply high-quality-foam-air-filter oil.

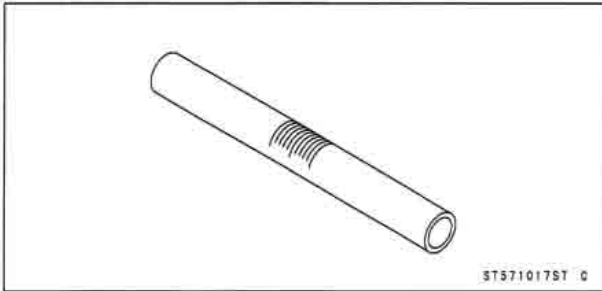
## 3-6 FUEL SYSTEM

### Specifications

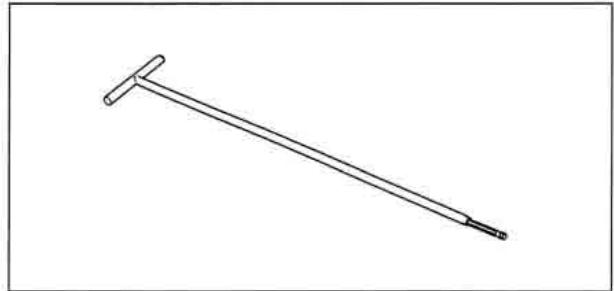
Item	Standard
<b>Choke Cable</b>	
Free Play	2 ~ 3 mm (0.08 ~ 0.12 in)
<b>Carburetor</b>	
Make, Type	Keihin, CVK30
Main Jet	#105
Optional Main Jet	#100, 102, 108, 110
Main Air Jet	#100
Jet Needle	N16W
Needle Jet	#6
Pilot Jet	#38
Pilot Air Jet	#90
Starter Jet	#48
Pilot Screw (turns out)	1 3/4 ±1/4
Throttle Valve	11° 00'
Idle Speed	1 200 ±50 r/min (rpm) 1 300 ±50 r/min (rpm) (Switzerland Model)
Carburetor Synchronization Vacuum	Less than 2.7 kPa (2 cmHg) difference between two carburetors.
Service Fuel Level	0.5 ±1 mm (0.02 ±0.04 in.) above the mating surface of carburetor float bowl.
Float Height	17 ±2 mm (0.67 ±0.08 in.)

### Special Tools

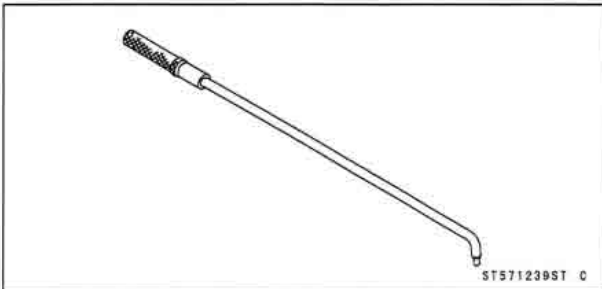
**Fuel Level Gauge:**  
**57001-1017**



**Carburetor Drain Plug Wrench, Hex 3:**  
**57001-1269**



**Pilot Screw Adjuster, A:**  
**57001-1239**



## 3-8 FUEL SYSTEM

### Throttle Grip and Cables

#### *Free Play Inspection*

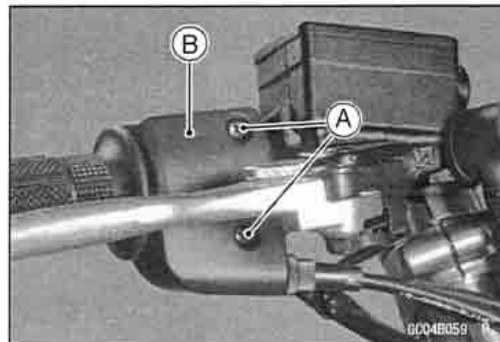
- Refer to the Fuel System in the Periodic Maintenance chapter.

#### *Free Play Adjustment*

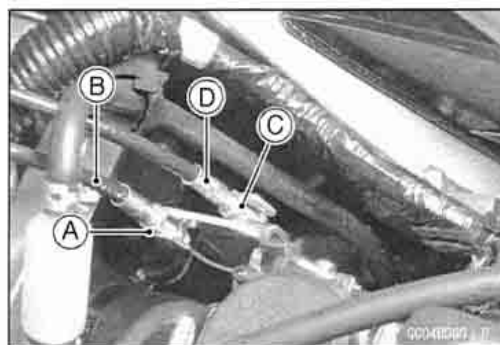
- Refer to the Fuel System in the Periodic Maintenance chapter.

#### *Throttle Cable Removal*

- Split the throttle case [B] removing the screws [A], and remove the throttle cable upper ends from the throttle grip.
- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
  - Upper Cover



- Loosen the locknut [A] and remove the lower end of the accelerator cable [B] from the pulley.
- Loosen the locknut [C] and remove the lower end of the accelerator cable [D] from the pulley.
- Pull out the throttle cables upward



#### *Throttle Cable Installation*

- Install the throttle cables in accordance with the Cable, Wire and Hose Routing in the Appendix chapter.
- Install the accelerator cable first and then decelerator cable.
- After installation, adjust each cable properly (see Fuel System in the Periodic Maintenance chapter).

#### **⚠ WARNING**

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

#### *Throttle Cable Lubrication*

- Refer to the General Lubrication Perform in the Periodic Maintenance chapter.



## Choke Cable

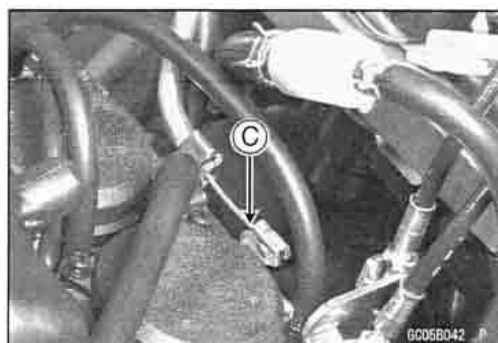
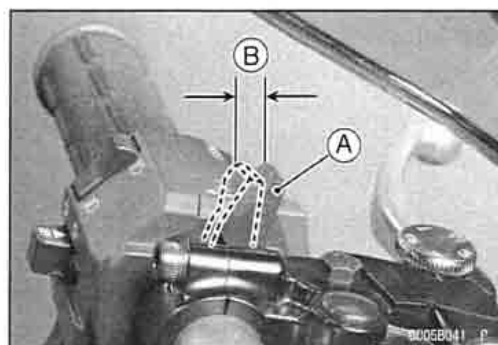
### Free Play Inspection

- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
- Push the choke lever [A] all the way to the front.
- Check choke cable free play [B].
- Determine the amount of choke cable play at the choke lever.
- ★ If the free play is incorrect, adjust the choke cable.

### Choke Cable Free Play

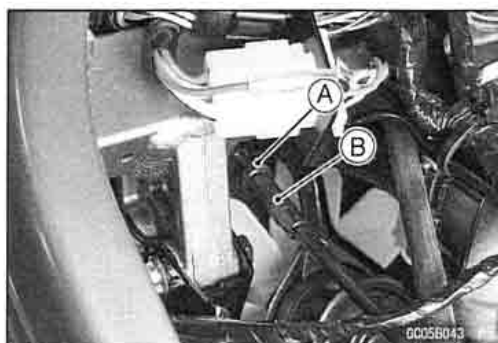
**Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)**

- Pull the choke lever pushing down lightly the lower end of choke cable [C] until you feel the tension on it.
- The amount of choke lever travel is the choke cable play.



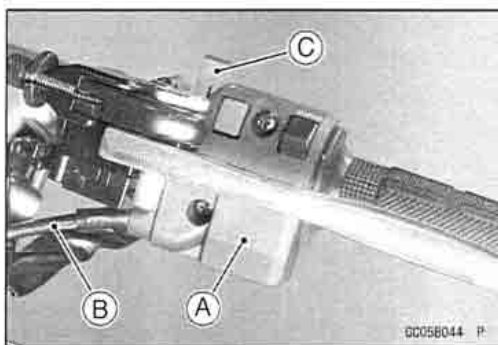
### Free Play Adjustment

- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
- Loosen the locknut [A], and turn the adjuster [B] until the cable has the proper amount of free play.
- Tighten the locknut securely.



### Choke Cable Removal

- Split the left switch housing [A], and remove the choke cable [B] upper end from the choke lever [C].
- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
- Remove the choke cable end from the cable bracket of carburetor.
- Pull out the choke cable upward.



### Choke Cable Installation

- Install the choke cable in accordance with the Cable, Wire, and Hose Routing section in Appendix chapter.
- After installation, adjust the cable properly.

## ⚠ WARNING

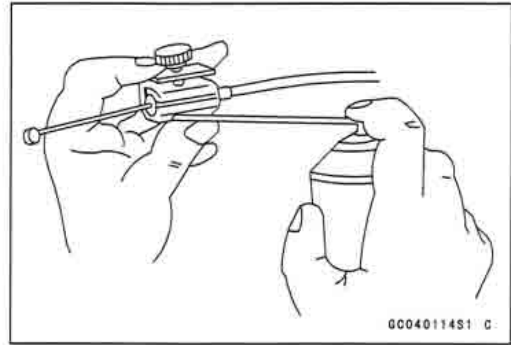
Operation with an incorrectly routed or improperly adjusted cable could result in an unsafe riding condition.

## 3-10 FUEL SYSTEM

### Choke Cable

#### *Choke Cable Lubrication and Inspection*

- Whenever the cable is removed, or in accordance with the Periodic Maintenance Chart, lubricate the choke cable (see General Lubrication in the Appendix chapter).
- Apply a thin coating of grease to the cable lower end.
- Use a commercially available pressure cable lubricator to lubricate the cable.
- With the cable disconnected at both ends, the cable should move freely in the cable housing.



## Carburetors

### *Idle Speed Inspection*

- Refer to the Fuel System in the Periodic Maintenance chapter.

### *Idle Speed Adjustment*

- Refer to the Fuel System in the Periodic Maintenance chapter.

### *Carburetor Synchronization Inspection*

- Refer to the Fuel System in the Periodic Maintenance chapter.

### *Carburetor Synchronization Adjustment*

- Refer to the Fuel System in the Periodic Maintenance chapter.

### *Pilot Screw Adjustment*

- ★ If the engine idle is still not stable, adjust the pilot screw to obtain the proper idle speed using the pilot screw adjuster [A].

**Special Tool - Pilot Screw Adjuster: 57001-1239**

- Turn in the pilot screw fully but not tightly, and then back it out the specified turns. To set the screw to its original position.

**Pilot Screw Setting: 1 3/4 ±1/4 turns out**

### **NOTE**

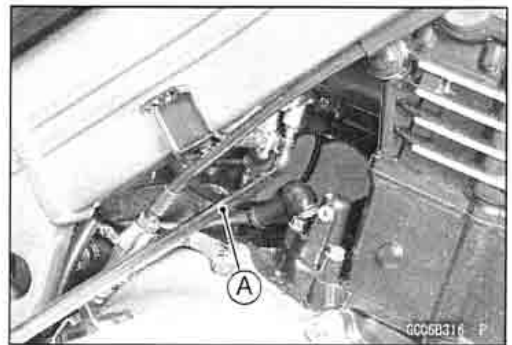
- The standard number of turns the pilot screw must be backed out varies by carburetor. The values given in the specifications should be used only when the number of the original back out turns is unavailable.

### *Service Fuel Level Inspection*

#### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Situate the motorcycle so that it is perpendicular to the ground.
- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
- Prepare an auxiliary fuel tank and connect the fuel hose to the carburetor.
- Prepare a fuel hose.

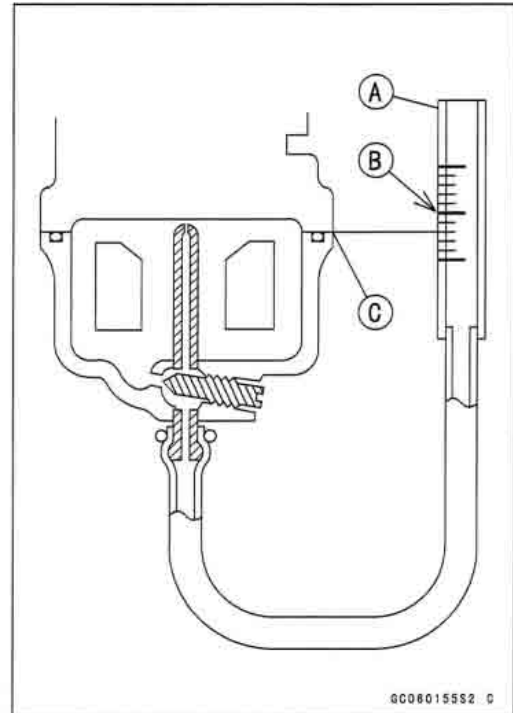


## 3-12 FUEL SYSTEM

### Carburetors

- Connect the fuel level gauge [A] to the carburetor float bowl with the fuel hose.

**Special Tool - Fuel Level Gauge: 57001-1017**



- Hold the gauge vertically against the side of the carburetor body so that the "middle" line [B] is several millimeters higher than the mating surface [C] of the carburetor float bowl.
- Feed fuel to the carburetor, then turn the carburetor drain plug out a few turns.
- Wait until the fuel level in the gauge settles.
- Keeping the gauge vertical, align the "middle" line with the mating surface.

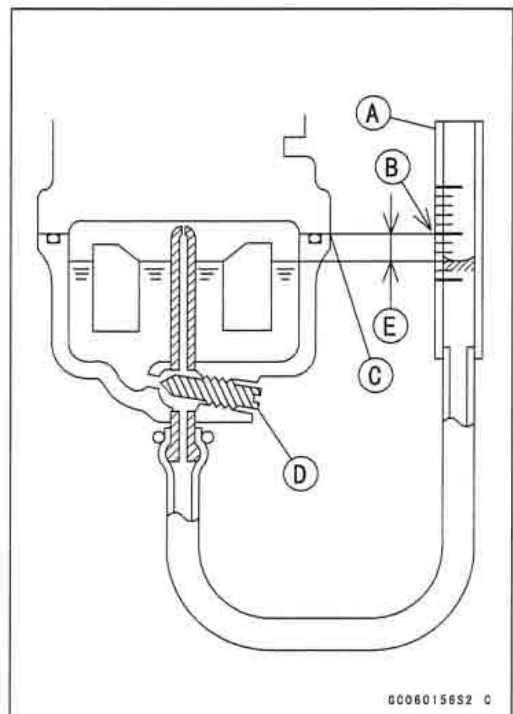
#### NOTE

○ Do not lower the "middle" line below the mating surface of the carburetor float bowl. If the gauge is lowered and then raised again, the fuel level measured shows somewhat higher than the actual fuel level. If the gauge is lowered too far, dump the fuel out of it into a suitable container and start the procedure over again.

- Read the fuel level [E] in the gauge and compare to the specification.
- Screw in the carburetor drain plug [D].
- Stop feeding and remove the fuel level gauge.
- ★ If the fuel level is incorrect, adjust it (see Service Fuel Level Adjustment).

**Service Fuel Level (above the mating surface of carburetor float bowl)**

**Standard: 0.5 mm  $\pm$  1 mm (0.02  $\pm$  0.04 in.)**



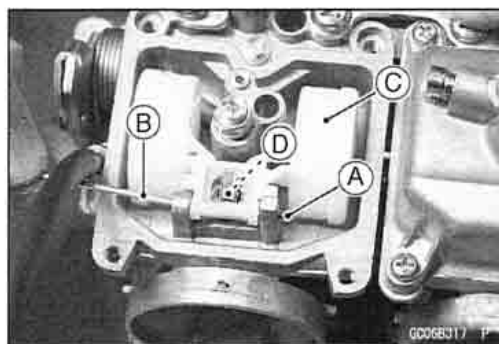
## Carburetors

### Service Fuel Level Adjustment

#### ⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

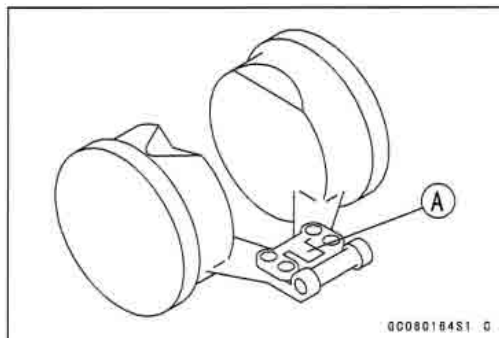
- Remove the carburetor, and drain the fuel into a suitable container.
- Remove the fittings with water hose.
- Remove the float bowl.
- Slide out the pivot pin [A] with a suitable tool [B], and remove the float [C] and float valve needle [D].



- Bend the tang [A] on the float arm very slightly to change the float height. Increasing the float height lowers the fuel level and decreasing the float height raises the fuel level.

#### Float height

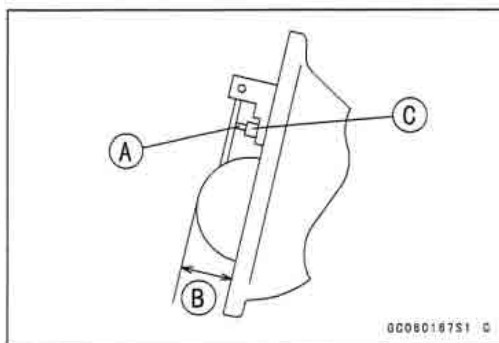
Standard: 17 ±2 mm (0.67 ±0.08 in.)



#### NOTE

○ Do not push the needle rod [A] in during the float height measurement [B].

- Assemble the carburetor, and recheck the fuel level.
- ★ If the fuel level cannot be adjusted by this method, the float or the float valve [C] is damaged.



## 3-14 FUEL SYSTEM

### Carburetors

#### Fuel System Cleanliness Inspection

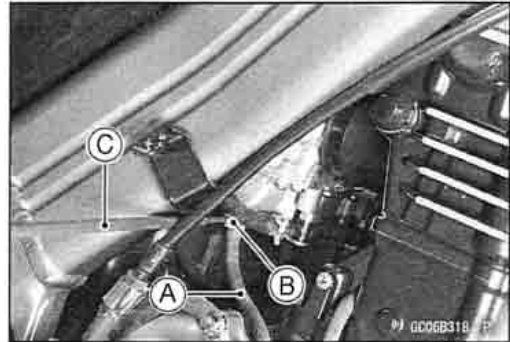
##### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Remove:
  - Right Lower Fairing (see Frame chapter)
- Connect a suitable hose [A] to the fitting at the bottom of each carburetor float bowl.
- Run the lower end of the carburetor drain hose into a suitable container.
- Turn out each drain plug [B] a few turns and drain the float bowls..

**Special Tool - Carburetor Drain Plug Wrench, Hex 3: 57001-1269 [C]**

- Check to see if water or dirt comes out.
- Tighten the drain plug.
- ★ If any water or dirt appears during the above inspection, clean the fuel system (see Carburetor Cleaning and Fuel Tank Cleaning).

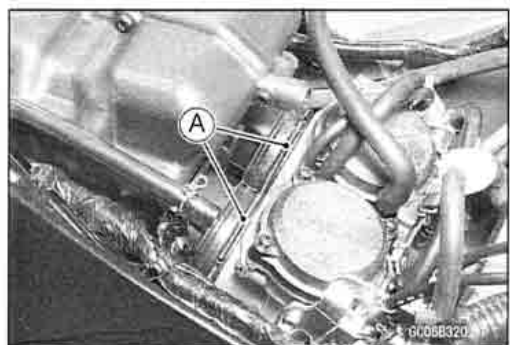
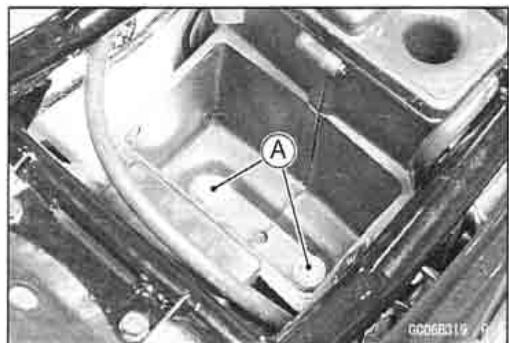


#### Carburetor Removal

##### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel Tank Removal)
  - Lower Fairings
  - Battery
  - Tool Case and Tools
- Remove the air cleaner housing mounting bolts [A].
- Slide the spring bands [A] off the air cleaner ducts.
- Pull the air cleaner housing rearward.
- Loosen the each carburetor holder clamp and slip the carburetors out.
- Disconnect the coolant hoses.
- Remove the throttle cable and choke cable (see Throttle Cable and Choke Cable Removal)
- Stuff the pieces of lint-free, clean cloths into the carburetor holder and the air cleaner duct to keep dirt out of the engine and air cleaner.



## Carburetors

### ⚠ WARNING

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

### CAUTION

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

#### Carburetor Installation

- Rout the cables, harness, and hoses correctly (see Appendix chapter).
- Tighten the clamps for the carburetor holders and slide back the spring bands for the air cleaner housing securely.
- Check fuel leakage from the carburetor.

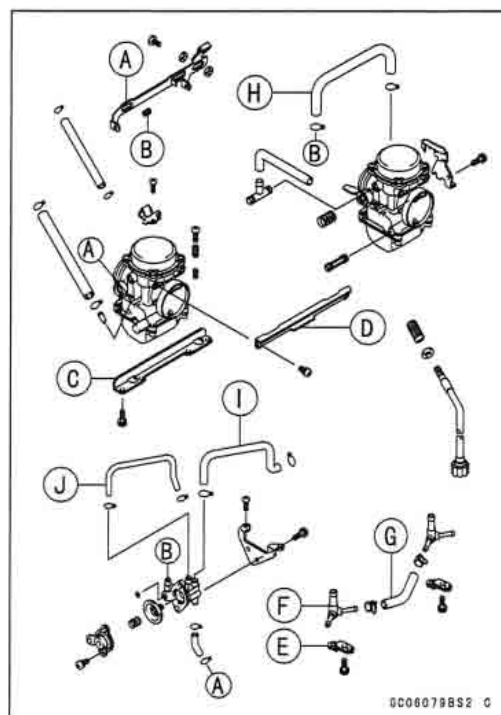
### ⚠ WARNING

Fuel spilled from the carburetor is hazardous.

- Adjust the following items if necessary.  
Idle Speed (see Fuel System in the Periodic Maintenance chapter)  
Carburetor Synchronization (see Fuel System in the Periodic Maintenance chapter)  
Throttle Cable (see Fuel System in the Periodic Maintenance chapter)  
Choke Cable

#### Carburetor Separation

- Remove the carburetor (see Carburetor Removal).
- Remove the fitting stay plates [E], and remove the fittings [F] with water hose [G].
- Pull out the air cut valve hoses [H], [I], [J] of the air cut valve.
- Remove the starter plunger lever [A], spring [B] and carburetor mounting plates [C], [D].
- Gently, separately the carburetors each other.



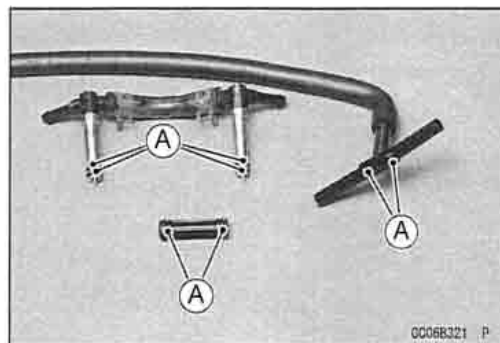


## 3-16 FUEL SYSTEM

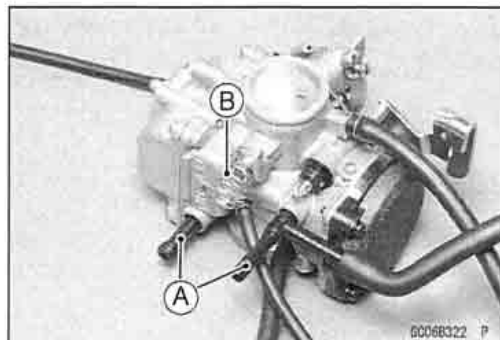
### Carburetors

#### *Carburetor Joining*

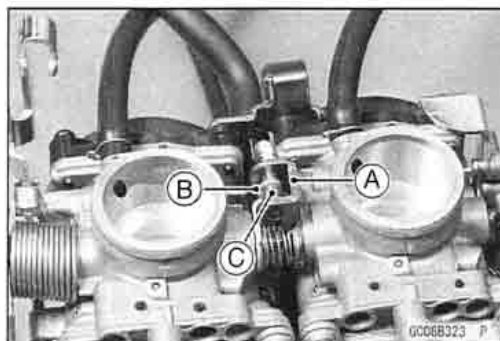
- When installing the carburetor, check to see that the O-rings [A] are in place.



- Install the fitting [A] and spring [B] as shown.



- Install the connecting plates [A] [B] and spring [C] as shown.

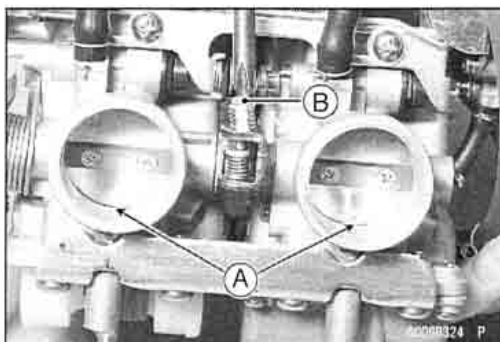


- The center lines of the carburetor bores must be parallel both horizontally and vertically. If they are not, loosen the mounting screws and align the carburetors on a flat surface. Retighten the mounting screws.
- After installing the choke mechanism, check to see that the starter plunger lever slides right to left smoothly without abnormal friction.

#### **CAUTION**

**Fuel mixture trouble could result if the starter plunger does not seat properly in its rest position after the choke lever is returned.**

- Visually synchronize the throttle (butterfly) valves.
- Check to see that all throttle valves open and close smoothly without binding when turning the pulley.
- Visually check the clearance [A] between the throttle valve and the carburetor bore in each carburetor.
- ★ If there is a difference between two carburetors, turn the balance adjusting screw [B] to obtain the same clearance.
- Install the carburetors (see Carburetor Installation).
- Adjust the synchronization (see Fuel System in the Periodic Maintenance Chapter).



## Carburetors

### Carburetor Disassembly

- Remove the carburetors (see Carburetor Removal).

#### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Turn in the pilot screw and count the number of turns until it seats fully but not tightly, and then remove the screw. This is to set the screw to its original position when assembling.

#### **CAUTION**

During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.

- Remove:
  - Spring [A]
  - Spring Seat [B]
  - Jet Needle [C]
  - Vacuum Piston [D]
  - Needle Jet [E]
  - Needle Jet Holder [F] and Main Jet [G]
  - Pilot Screw [H]

### Carburetor Assembly

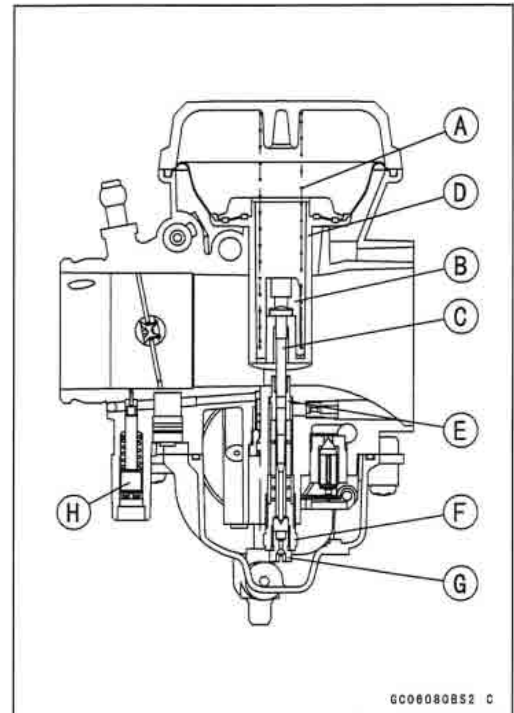
- To install the needle jet [A], turn the carburetor body up-side down, and drop the needle jet into place so that the smaller diameter end [B] of the jet goes in first.

- Carefully screw in the needle jet holder [A]. It will seat against the needle jet, pushing the end of the jet into the carburetor bore.  
Main Jet [B]

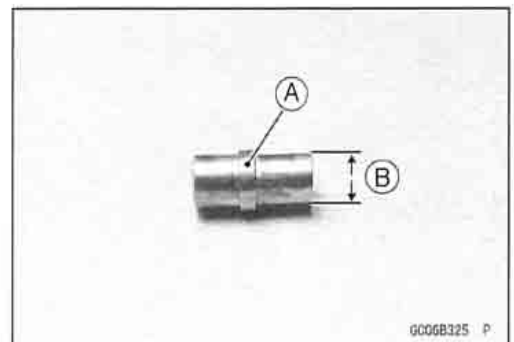
#### **CAUTION**

Do not apply force to the jet or overtighten it, as this could damage the jet or the carburetor body, requiring replacement.

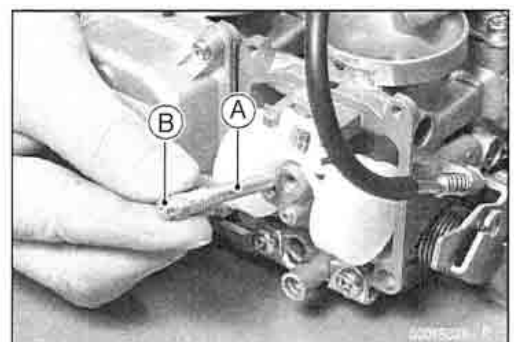
- Install the float bowl.



GC060808S2 C



GC06B325 P



GC06B325 P

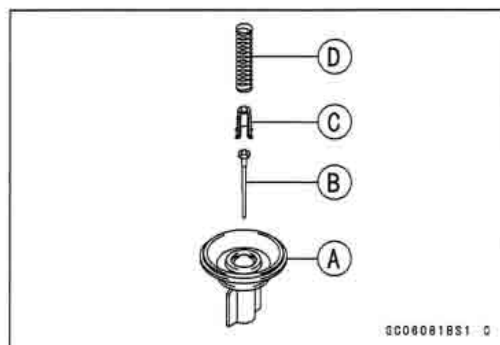
## 3-18 FUEL SYSTEM

### Carburetors

- Slip the jet needle [B] through the hole in the center of the vacuum piston, and put the spring seat [C] on the top of the needle. Turn the seat so that it does not block the hole at the bottom of the vacuum piston [A].

Spring [D]

- Install the carburetor top cover.
- Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly.

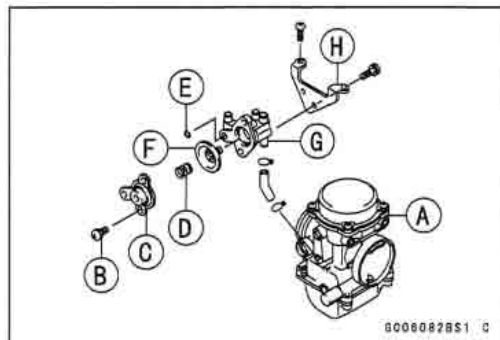


- When removing the coasting enricher system, unscrew the mounting screws [B] and remove the cover [C], spring [D], O-ring [E] and diaphragm [F].

Left Carburetor [A]

Coasting Enricher Body [G]

Enricher Mounting Plate [H]



### Carburetor Cleaning

#### ⚠ WARNING

Clean the carburetor in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area; this includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents to clean the carburetor.

#### CAUTION

Do not use compressed air on an assembled carburetor, or the floats may be crushed by the pressure, and the vacuum piston diaphragm may be damaged. Remove as many rubber or plastic parts from the carburetor as possible before cleaning the carburetor with a cleaning solution. This will prevent damage to or deterioration of the parts. The carburetor body has plastic parts that cannot be removed. Do not use a strong carburetor cleaning solution which could attack these parts; instead, use a mild high-flash point cleaning solution safe for plastic parts. Do not use wire or any other hard instrument to clean carburetor parts, especially jets, as they may be damaged.

- Disassemble the carburetor (see Carburetor Disassembly).
- Immerse all the metal parts in a carburetor cleaning solution.
- Rinse the parts in water.
- When the parts are clean, dry them with compressed air.
- Blow through the air and fuel passages with compressed air.
- Assemble the carburetor (see Carburetor Assembly).

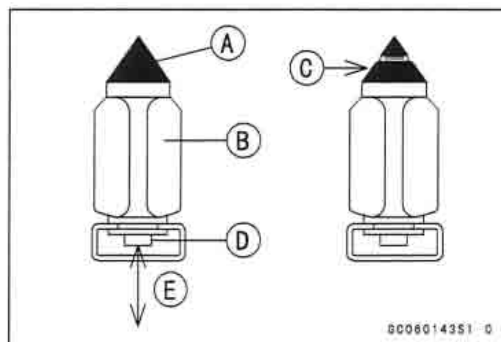
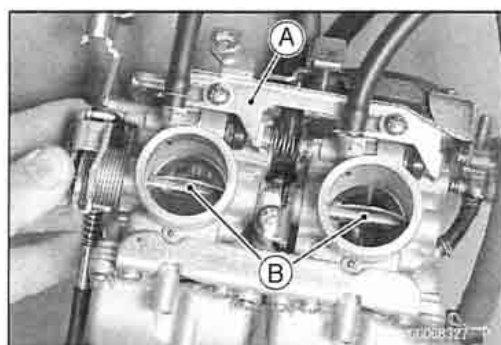
## Carburetors

### Carburetor Inspection

#### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

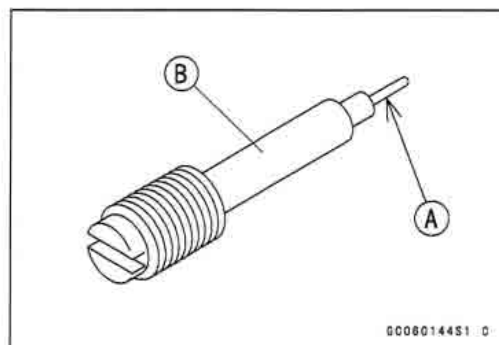
- Remove the carburetors (see Carburetor Removal).
- Before disassembling the carburetors, check the fuel level (see Fuel Level Inspection).
- ★ If the fuel level is incorrect, inspect the rest of the carburetor before correcting it.
- Slide the starter plunger lever [A] right to the left to check that the starter plungers move smoothly.
- ★ If the starter plungers do not work properly, replace the carburetors.
- Turn the throttle cable pulley to check that the throttle butterfly valves [B] move smoothly and return by spring tension.
- ★ If the throttle valves do not move smoothly, replace the carburetors.
- Disassemble the carburetors (see Carburetor Disassembly).
- Clean the carburetors (see Carburetor Cleaning).
- Check that the O-rings on the float bowl and pilot screw and the diaphragm on the vacuum piston are in good condition.
- ★ If any of the O-rings or diaphragms are not in good condition, replace them.
- Check the O-ring and diaphragm of coasting enricher system.
- ★ If any of the O-ring or diaphragm are not in good condition, replace them.
- Check the plastic tip [A] of the float valve needle [B]. It should be smooth, without any grooves, scratches, or tears.
- ★ If the plastic tip is damaged [C], replace the needle.
- Push the rod [D] in the other end of the float valve needle, and then release it [E].
- ★ If the rod does not spring out, replace the needle.



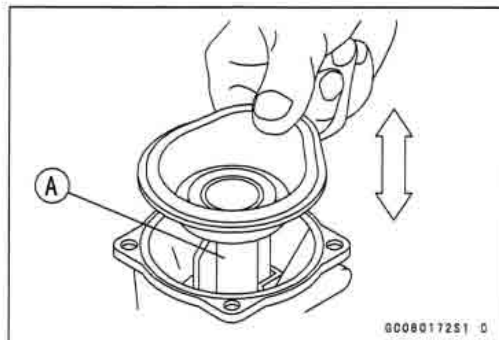
## 3-20 FUEL SYSTEM

### Carburetors

- Check the tapered portion [A] of the pilot screw [B] for wear or damage.
- ★ If the pilot screw is worn or damaged on the tapered portion, it will prevent the engine from idling smoothly. Replace it.



- Check that the vacuum piston [A] moves smoothly in the carburetor body. The surface of the piston must not be excessively worn.
- ★ If the vacuum piston does not move smoothly, or if it is very loose in carburetor body, replace the carburetor.



### Coolant Filter Cleaning

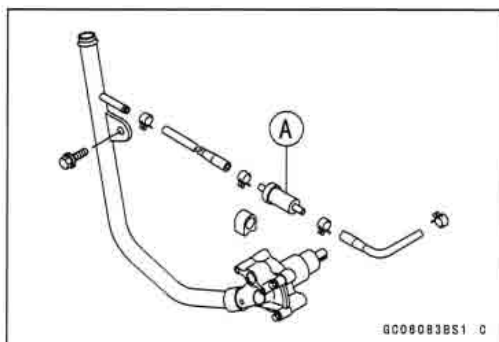
- Refer to the Fuel System in the Periodic Maintenance chapter.

### Coolant Valve Inspection

- Drain the coolant (see Coolant System in the Periodic Maintenance chapter).
- Remove the coolant valve on the engine left side.
- Inspect the coolant valve [A] at room temperature.
- ★ If the valve is closed, replace the valve with a new one.
- To check valve opening just blow through the valve.

#### Valve Closing Temperature (for reference)

Standard: 70°C (158°F) or more at 25 kPa (0.25 kg/cm<sup>2</sup>, 3.6 psi)



## Air Cleaner

### Air Cleaner Element Removal

- Remove:
  - Seat
  - Fuel Tank
  - Fuel Tank Bracket Bolts [A]
  - Rubber Band [B]

Air Cleaner Housing Cap [A]  
 Air Cleaner Element Holder [B]  
 Air Cleaner Element [C]

- Push a clean, lint-free towel on the air cleaner housing to keep dirt or other foreign material from entering.

### **⚠ WARNING**

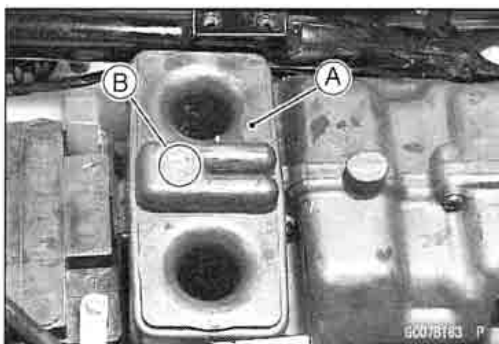
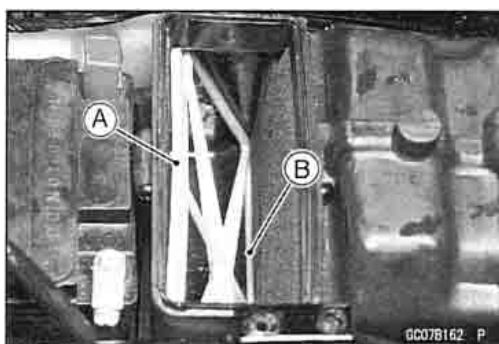
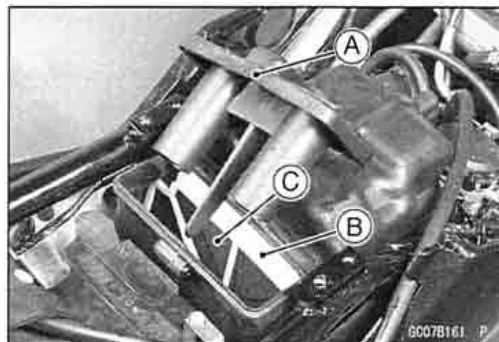
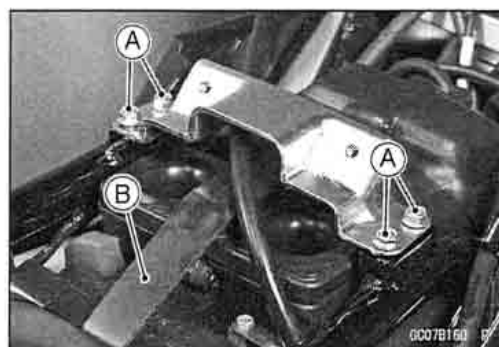
If dirt or dust is allowed to pass through into the carburetors, the butterfly valves may become stuck, possibly causing an accident.

### **CAUTION**

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

### Air Cleaner Element Installation

- Install the removed parts in reverse of removal.
- Set the element holder [A] so that the holder lower end comes to the front side of the cleaner housing bottom edge [B].
- Install the air cleaner housing cap [A] with the arrow mark [B] pointing forward.



### Air Cleaner Element Cleaning

- Refer to the Fuel System in the Periodic Maintenance chapter.



## 3-22 FUEL SYSTEM

### Air Cleaner

#### Air Cleaner Housing Removal

- Remove:
  - Seat (see Frame chapter)
  - Side Covers
  - Fuel Tank
  - Battery, Tool Case and Tools
  - Rear Fender Front Mounting Bolts
- Remove the upper rear frame mounting bolt [A] and loosen the lower rear frame mounting bolt [B].
- Remove the air cleaner housing [C] forward pushing down the rear side of the rear frame.
- Cover the carburetors intakes with a clean, lint-free towel to keep dirt or other foreign material from entering.

#### **⚠ WARNING**

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

#### **CAUTION**

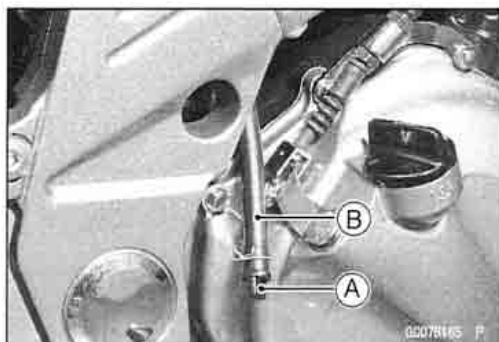
If dirt gets through into the engine, excessive engine wear and possibly engine damage will occur.

#### Oil Draining

- Remove the drain plug [A] at the lower end of the drain hose [B] and drain water or oil accumulates in the air cleaner housing.
- Be sure to install the plug firmly, or the air is drawn in through it.

#### **⚠ WARNING**

Be sure to install the plug in the drain hose after draining. Oil on tires make them slippery and can cause an accident and injury.





## Fuel Tank

### Fuel Tank Removal

#### **⚠ WARNING**

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

- Turn the fuel tap position lever to the ON or RES position.
- Remove:
  - Seat
  - Fuel Tank Mounting Bolts [A]
  - Fuel Tank
- Drain the fuel tank if necessary.
  - Arrange a suitable container under the fuel tap.
  - Turn the fuel tap position lever to the PRI position to drain the fuel into the container.



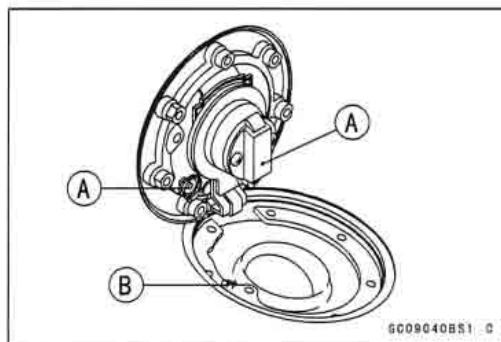
### Fuel Tank Installation

- Read the above WARNING mentioned in Fuel Tank Removal.
- Route the hose correctly.
- Be sure the hoses are clamped securely to prevent fuel leaks.
- Check the rubber dampers [A], [B] and they are installed as shown.
- ★ If any dampers is damaged or deteriorated, replace it.



### Fuel Tank and Cap Inspection

- Remove the hoses from the fuel tank, and open the tank cap.
- Check to see if the breather pipe [B] in the tank are not clogged. Check the tank cap breather also.
- ★ If they are clogged, remove the fuel tank and drain it, and then blow pipes free with compressed air.



#### **CAUTION**

Do not apply compressed air to the air vent holes [A] in the tank cap. This could cause damage and clogging of the labyrinth in the cap.

## 3-24 FUEL SYSTEM

### Fuel Tank

#### Fuel Tank Cleaning

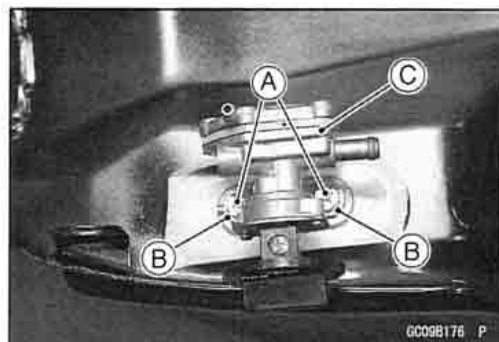
#### ⚠ WARNING

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

- Remove the fuel tank and drain it.
- Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Pour high flash-point solvent through the tap in all lever positions.
- Pour the solvent out of the tank.
- Remove the fuel tap from the tank (see Fuel Tap Removal).
- Clean the fuel tap filter screens in a high flash-point solvent.
- Dry the tank and screens with compressed air.
- Install the tank filters in the tank.
- Install the fuel tank (see Fuel Tank Installation).

#### Fuel Tap Removal

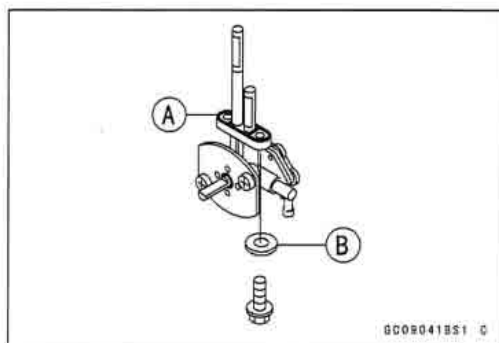
- Remove the fuel tank (see Fuel Tank Removal).
- Remove:
  - Bolts [A]
  - Nylon Flat Washers [B]
  - Fuel Tap [C]



#### Fuel Tap Installation

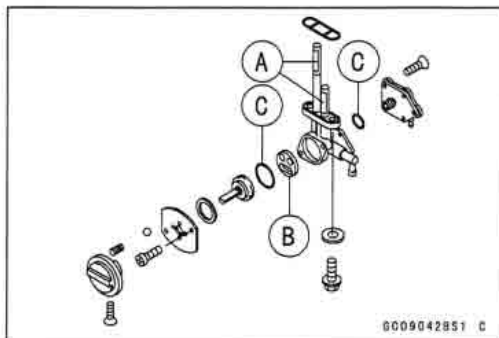
- Be sure the O-ring [A] is in good condition to prevent leaks.
- Be sure the nylon flat washer [B] are in good condition to prevent leaks.
- Do not use steel washers in place of the nylon flat washers, because they will not seal the bolts properly and fuel will leak.
- Be sure to clamp the fuel hoses to the tap to prevent leaks.

**Torque - Fuel Tap Bolts: 2.5 N·m (0.25 kg·m, 22 in·lb)**



#### Fuel Tap Inspection

- Remove the fuel tap.
- Check the fuel tap filter screens [A] for any breaks or deterioration.
- ★ If the fuel tap screens have any breaks or are deteriorated, they may allow dirt to reach the carburetor, causing poor running. Replace the fuel tap.
- ★ If the fuel tap leaks, or allows fuel to flow when it is at OFF position, replace the damaged gasket [B] or O-rings [C].



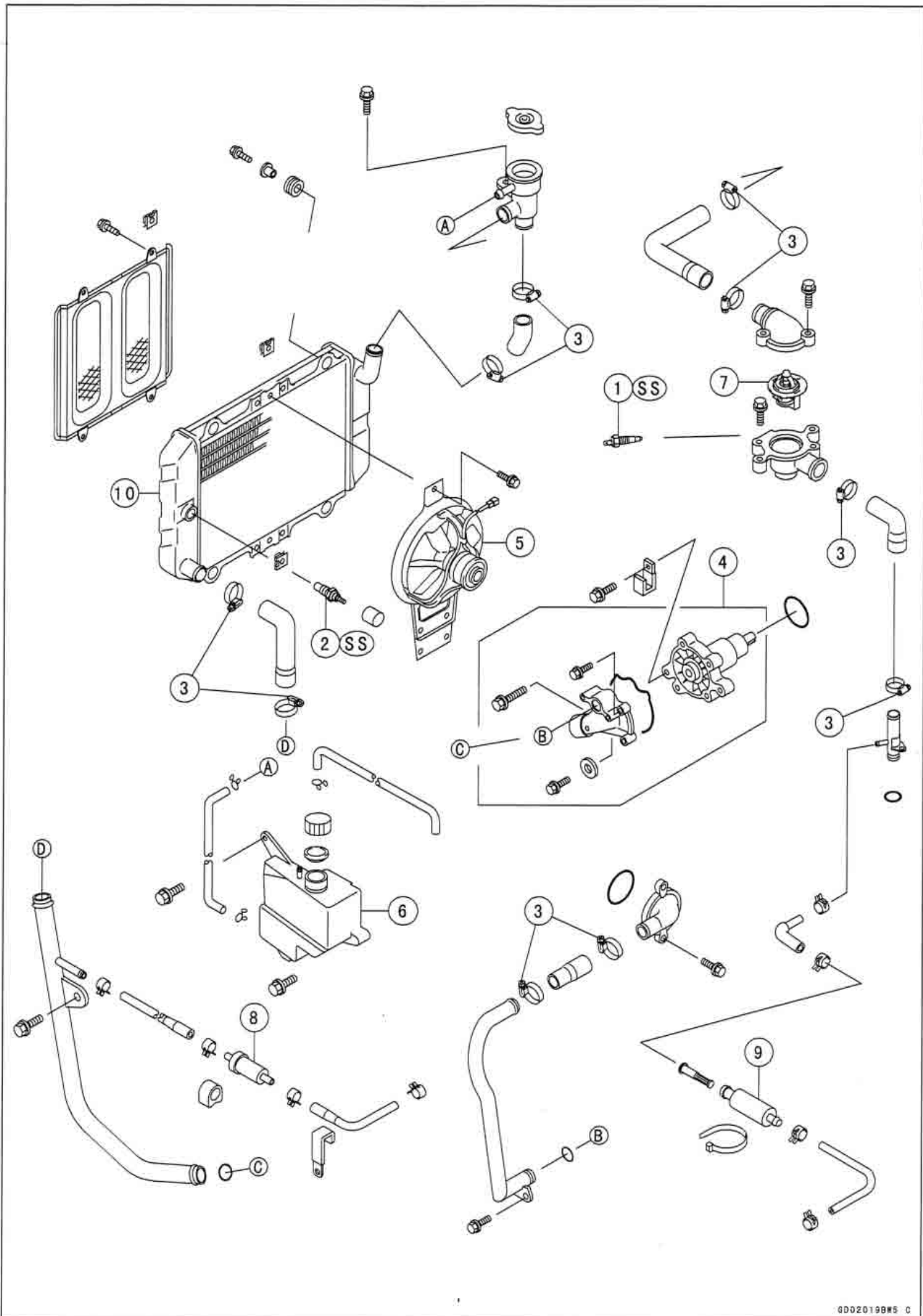
# Cooling System

## Table of Contents

Exploded View .....	4-2
Specifications .....	4-4
Sealant .....	4-5
Coolant Flow Chart .....	4-6
Coolant .....	4-8
Coolant Deterioration Inspection .....	4-8
Coolant Level Inspection .....	4-8
Coolant Draining .....	4-8
Coolant Filling .....	4-8
Pressure Testing .....	4-9
Cooling System Flushing .....	4-9
Coolant Filter Cleaning .....	4-9
Water Pump .....	4-10
Pump Cover Removal .....	4-10
Pump Cover Installation .....	4-10
Water Pump Removal .....	4-10
Water Pump Installation .....	4-10
Pump Impeller Inspection .....	4-11
Radiator, Radiator Fan .....	4-12
Radiator and Radiator Fan Removal .....	4-12
Radiator Inspection .....	4-13
Radiator Cleaning .....	4-13
Radiator Cap Inspection .....	4-13
Radiator Filler Neck Inspection .....	4-14
Thermostat .....	4-15
Thermostat Removal .....	4-15
Thermostat Installation .....	4-15
Thermostat Housing Removal .....	4-15
Thermostat Housing Installation Note .....	4-15
Thermostat Inspection .....	4-16
Hoses and Pipes .....	4-17
Hose Installation .....	4-17
Hose Inspection .....	4-17
Radiator Fan Switch, Water Temperature Sensor .....	4-18
Radiator Fan Switch, Water Temperature Sensor Removal .....	4-18
Radiator Fan Switch, Water Temperature Sensor Installation .....	4-18
Radiator Fan Switch, Water Temperature Sensor Inspection .....	4-18

## 4-2 COOLING SYSTEM

### Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Temperature Sensor	7.8	0.8	69 in·lb	SS
2	Fan Switch	18	1.8	13	
3	Radiator Hose Clamp Screws	2.0	0.2	17 in·lb	

- 4. Water Pump
  - 5. Radiator Fan
  - 6. Reservoir Tank
  - 7. Thermostat
  - 8. Coolant Valve
  - 9. Water Filter
  - 10. Radiator
- SS: Apply silicone sealant to the threads.

## 4-4 COOLING SYSTEM

### Specifications

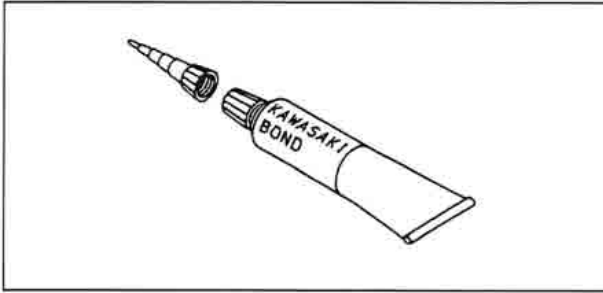
Item	Standard
<b>Coolant</b>	
Type	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Mixed Ratio	Soft water 50%, coolant 50%
Freezing Point	-35°C (-31°F)
Total Capacity	1.0 L (1.06 US qt)
<b>Radiator</b>	
Radiator Cap Relief Pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm <sup>2</sup> , 14 ~ 18 psi)
<b>Thermostat</b>	
Valve Opening Temperature	80.5 ~ 83.5°C (177 ~ 182°F)
Valve Full Opening Lift	More than 6 mm (0.24 in.) @95°C (203°F)

---

## Sealant

---

Kawasaki Bond (Silicone Sealant):  
56019-120





## 4-6 COOLING SYSTEM

### Coolant Flow Chart

---

Permanent type antifreeze is used as a coolant to protect the cooling system from rust and corrosion. When the engine starts, the water pump turns and the coolant circulates.

The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is below 80.5 ~ 83.5°C (177 ~ 182°F), the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 80.5 ~ 83.5°C (177 ~ 182°F), the thermostat opens and the coolant flows.

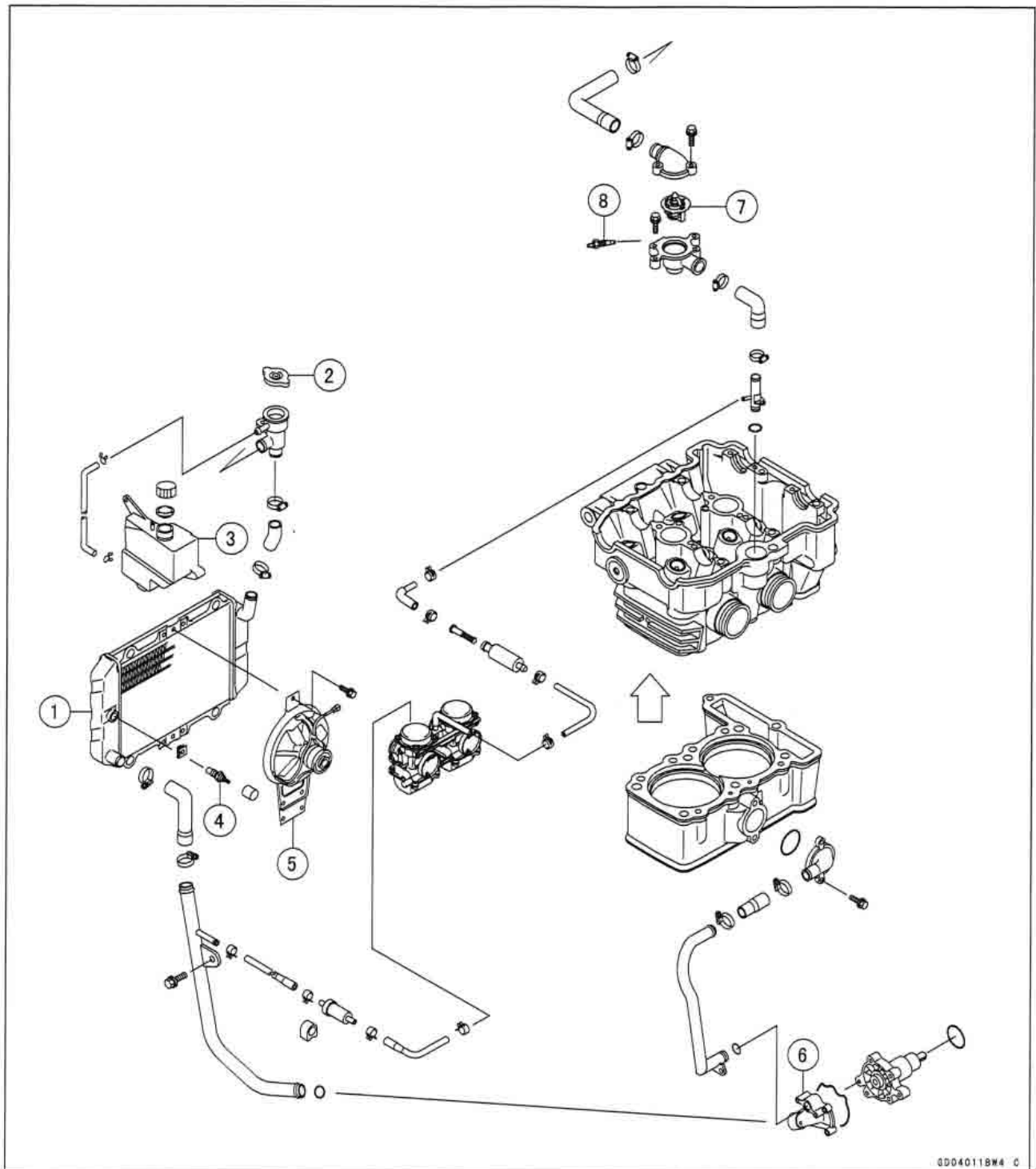
When the coolant temperature goes up beyond 98 ~ 100°C (205 ~ 212°F), the radiator fan switch conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is above 91°C (196°F), the fan switch opens and the radiator fan stops.

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

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

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kg/m<sup>2</sup>, 14 ~ 18 psi) the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kg/m<sup>2</sup>, 14 ~ 18 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

Coolant Flow Chart



1. Radiator
2. Radiator Cap
3. Radiator Reserve Tank
4. Fan Switch
5. Radiator Fan
6. Water Pump
7. Thermostat
8. Water Temperature Sensor

## 4-8 COOLING SYSTEM

### Coolant

#### *Coolant Deterioration Inspection*

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

#### *Coolant Level Inspection*

##### **NOTE**

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

- Check the coolant level in the reserve tank with the motorcycle held perpendicular.
- ★ If the coolant level is lower than the low level line [A], add coolant to the full level line [B].

##### **CAUTION**

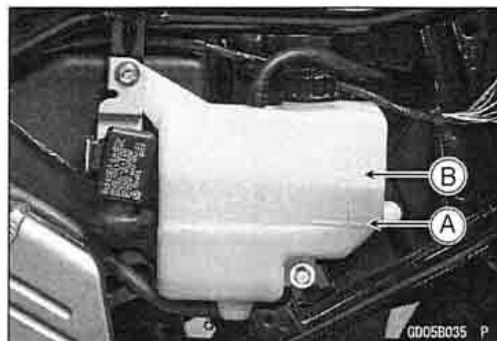
For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water alone can be added. But the diluted coolant must be returned to the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

#### *Coolant Draining*

- Refer to the Cooling System in the Periodic Maintenance chapter.

#### *Coolant Filling*

- Refer to the Cooling System in the Periodic Maintenance chapter.



## Coolant

### Pressure Testing

- Remove:
  - Right Lower Fairing (see Frame chapter)
- Remove the radiator cap, and install a cooling system pressure tester [A] on the filler neck.

#### NOTE

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

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kg/cm<sup>2</sup>, 18 psi).

#### CAUTION

**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kg/cm<sup>2</sup>, 18 psi).**

- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the system is all right.
- ★ If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the water pump.
- Remove the pressure tester, replenish the coolant, and install the radiator cap.

### Cooling System Flushing

Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passage and considerably reduce the efficiency of the cooling system.

- Drain the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Fill the cooling system with fresh water mixed with a flushing compound.

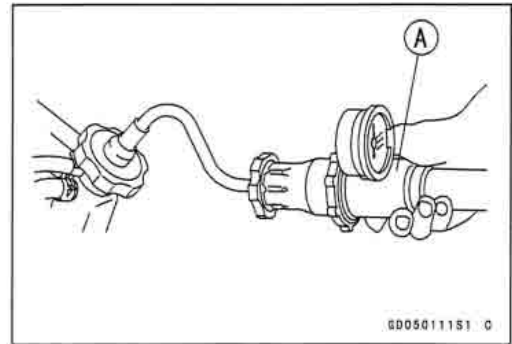
#### CAUTION

**Do not use a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning product.**

- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant and bleed the air from the system (see Coolant Change in the Periodic Maintenance chapter).

### Coolant Filter Cleaning

Refer to the Fuel System in the Periodic Maintenance chapter.

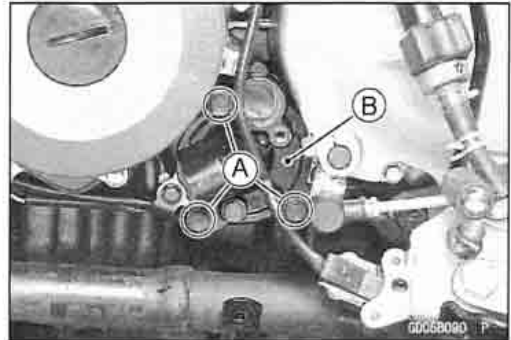
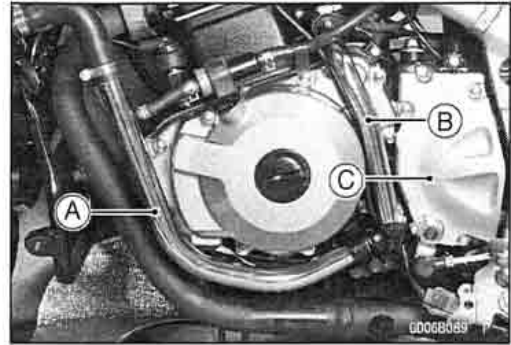


## 4-10 COOLING SYSTEM

### Water Pump

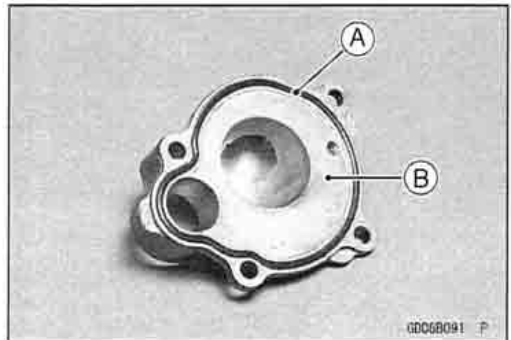
#### *Pump Cover Removal*

- Drain the coolant (see Cooling System in the Periodic Maintenance chapter).
- Remove:
  - Left Lower Fairing (see Frame chapter)
  - Coolant Pipes [A], [B]
  - Engine Sprocket Cover [C]
- Remove the water pump mounting bolts [A] and water pump cover [B].



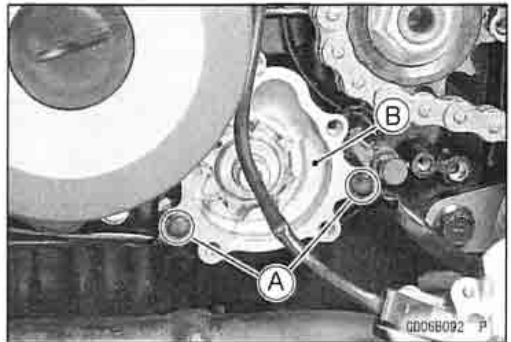
#### *Pump Cover Installation*

- Fit the O-ring [A] into the groove of the pump cover [B].
  - Install the removed parts
- Torque - Radiator Hose Clamp Screws: 2.0 N·m (0.2 kgf·m, 17 in·lb)**



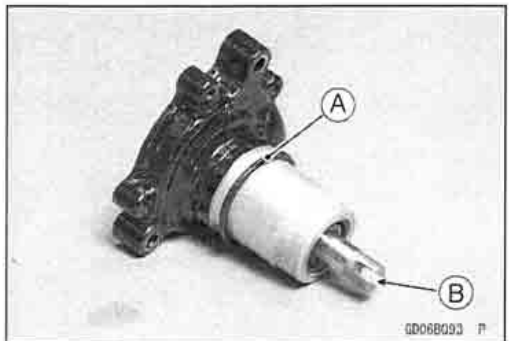
#### *Water Pump Removal*

- Remove:
  - Pump Cover (see Pump Cover Removal)
- Remove the water pump mounting bolts [A], and remove the water pump [B].



#### *Water Pump Installation*

- Check the O-ring [A] visually whether or not there is a damage on it.
- Apply engine oil on the O-ring.
- Install the water pump aligning the slit [B] of water pump shaft with the oil pump shaft.



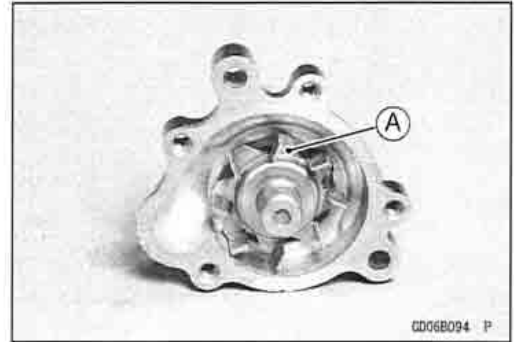
---

## Water Pump

---

### *Pump Impeller Inspection*

- Visually check the impeller [A].
- ★ If the surface is corroded or if the blades are damaged, replace the water pump unit.



## 4-12 COOLING SYSTEM

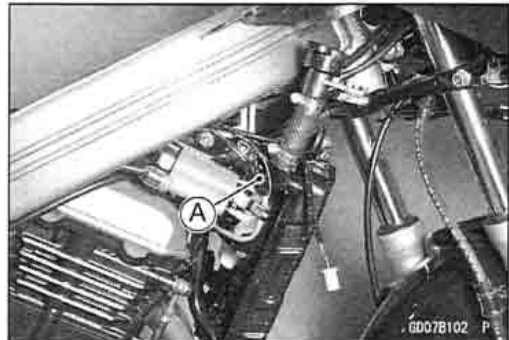
### Radiator, Radiator Fan

#### *Radiator and Radiator Fan Removal*

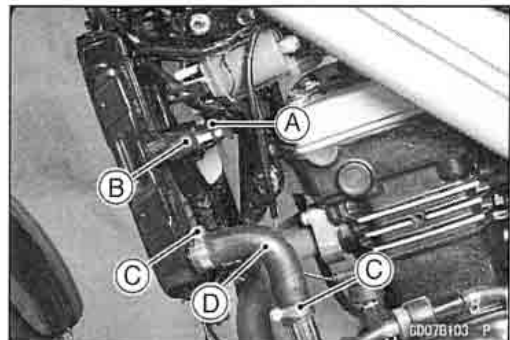
#### **⚠ WARNING**

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

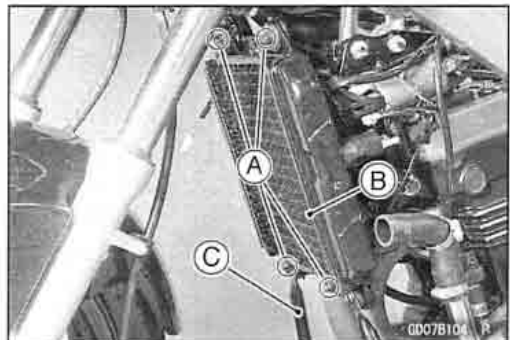
- Remove the lower fairings (see Frame chapter).
- Drain the coolant (see Coolant System in the Periodic Maintenance chapter).
- Disconnect the fan motor lead connector [A] before removal of the radiator or radiator fan.



- Disconnect the fan switch lead connector [A].  
Fan Switch [B]
- Loosen the hose clamps [C] and pull off the radiator hoses [D] on both side.



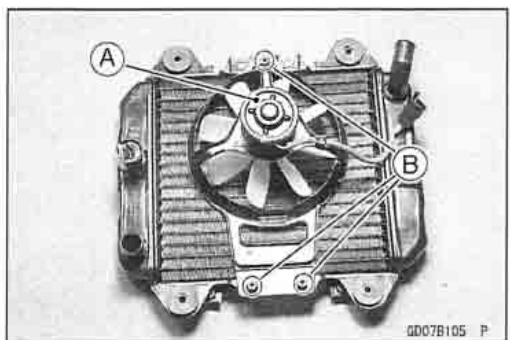
- Remove the radiator mounting bolts [A] and take the radiator [B] and the lower fairing stay [C] off the frame.



- Separate the filler and radiator hose from the radiator.
- Separate the radiator fan [A] from the radiator.  
Radiator Fan Mounting Screws [B]

#### **CAUTION**

**Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.**

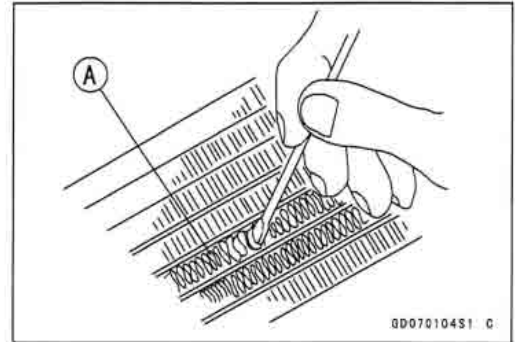




## Radiator, Radiator Fan

### Radiator Inspection

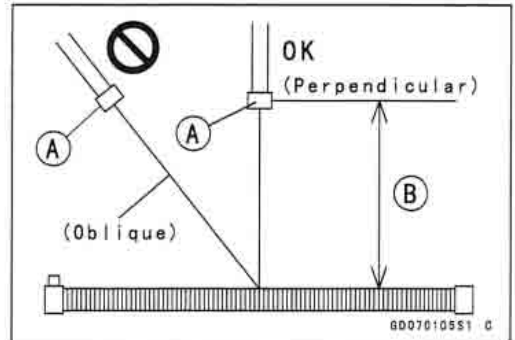
- Check the radiator core.
- ★ If there are obstructions to air flow, remove them.
- ★ If the corrugated fins [A] are deformed, carefully straighten them.
- ★ If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator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



### Radiator Cleaning

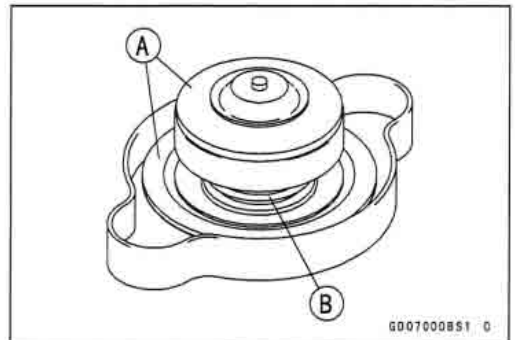
#### CAUTION

When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage. Keep the steam gun [A] away more than 0.5 m [B] from the radiator core. Hold the steam gun perpendicular to the core surface. Run the steam gun following the core fin direction.



### Radiator Cap Inspection

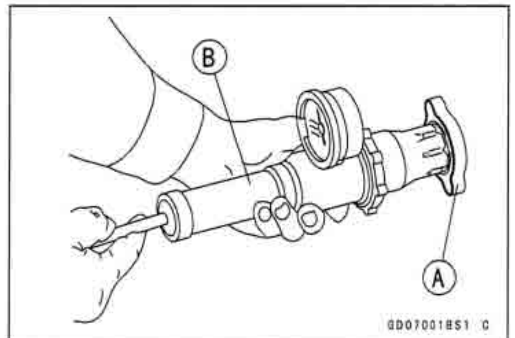
- Remove the inner fairing (see Frame chapter).
- Check the condition of the top and bottom valve seals [A] and valve spring [B].
- ★ If any one of them shows visible damage, replace the cap with a new one.



- Install the cap [A] on a cooling system pressure tester [B].

#### NOTE

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



- Watching the pressure gauge, pump the pressure tester to build up the pressure until the relief valve opens: the gauge hand flicks downward. Stop pumping and measure leak time at once. The relief valve must open within the specified range in the table below and the gauge hand must remain within the same range at least 6 seconds.

#### Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kg/cm<sup>2</sup>, 14 ~ 18 psi)

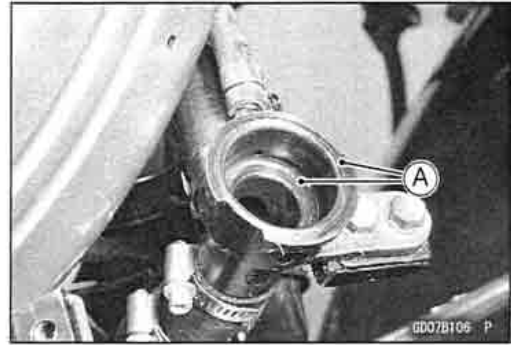
- ★ If the cap cannot hold the specified pressure, or if it holds too much pressure, replace it with a new one.

## 4-14 COOLING SYSTEM

### Radiator, Radiator Fan

#### *Radiator Filler Neck Inspection*

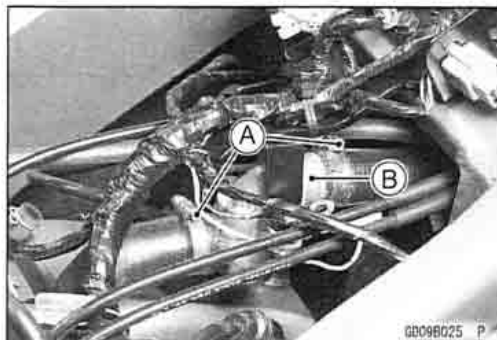
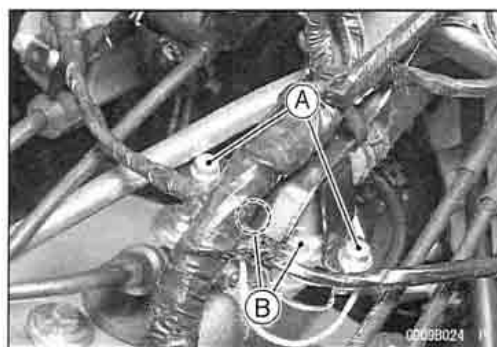
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



## Thermostat

### Thermostat Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Thermostat Housing Mounting Bolts [A]
  - Thermostat Cover Bolts [B]
- Loosen the radiator hose clamps [A].
- Remove the thermostat cover [B] and thermostat.

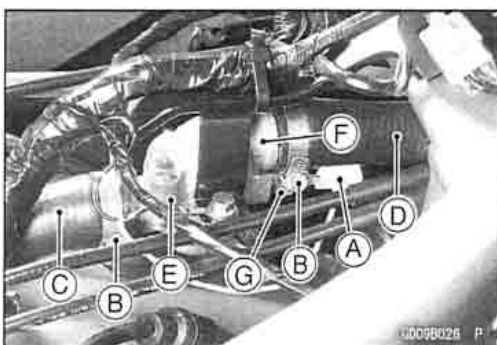


### Thermostat Installation

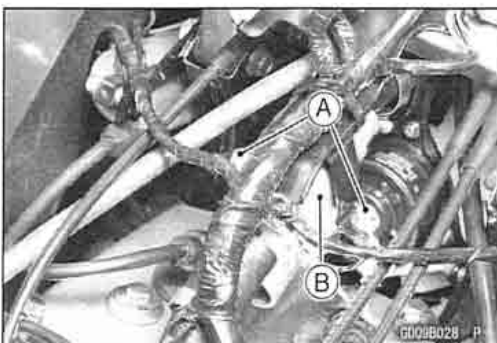
- Install the removed part in reverse of removal.
- Fill the radiator with coolant.

### Thermostat Housing Removal

- Drain the Coolant (see Cooling System in the Periodic Maintenance chapter).
- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
- Disconnect the water temperature sensor lead connector [A].
- Loosen the water hose clamps [B] and slide the hoses [C], [D] back and forth from the thermostat housing [E] and cover [F].
- Water Temperature Sensor [G]



- Remove the thermostat housing mounting bolts [A] and pull the housing [B] out of the frame.
- Remove the thermostat cover and pull out the thermostat if necessary.



### Thermostat Housing Installation Note

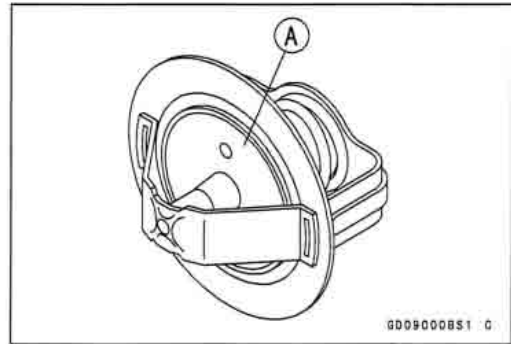
- Be sure to install the ground lead on the thermostat housing mounting bolt.

## 4-16 COOLING SYSTEM

### Thermostat

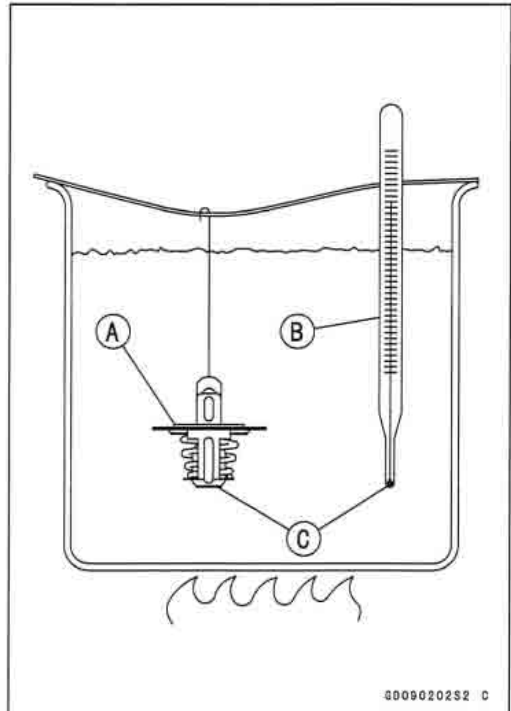
#### *Thermostat Inspection*

- Remove the thermostat, and visually inspect the thermostat valve [A] at room temperature.
- ★ If the valve is open, replace the thermostat with a new one.



- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.
- The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth. It must not touch the container, either.
- ★ If the measurement is out of the specified range, replace the thermostat with a new one.

**Thermostat Valve Opening Temperature**  
80.5 ~ 83.5°C (177 ~ 182°F)



## Hoses and Pipes

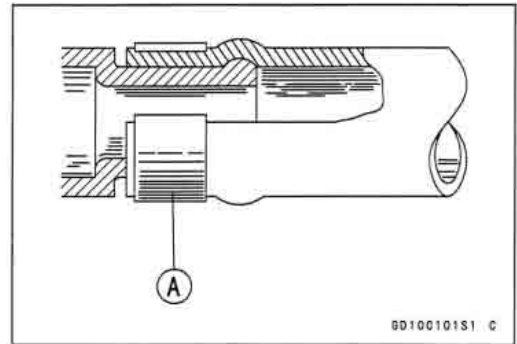
### *Hose Installation*

- Install the hoses and pipes, being careful to follow bending direction. Avoid sharp bending, kinking, flattening or twisting.
- Install the clamp [A] as near as possible to the hose end to clear the raised rib of the fitting. This will prevent the hoses from working loose.
- The clamp screws should be positioned correctly to prevent the clamps from contacting anything.

**Torque - Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 17 in·lb)**

### *Hose Inspection*

- Refer to the Cooling System in the Periodic Maintenance chapter.



## 4-18 COOLING SYSTEM

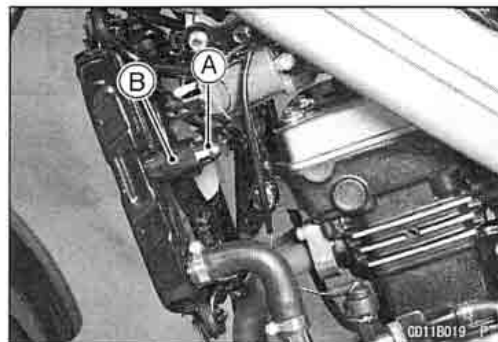
### Radiator Fan Switch, Water Temperature Sensor

#### *Radiator Fan Switch, Water Temperature Sensor Removal*

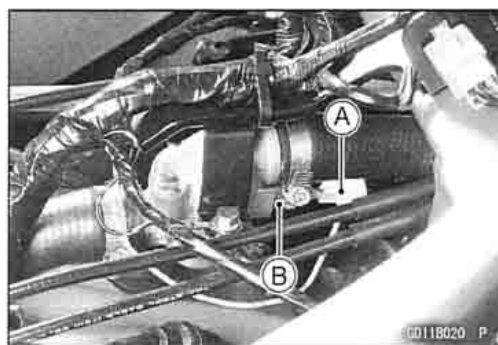
##### CAUTION

The fan switch or the water temperature sensor should never be allowed to fall on a hard surface. Such a shock to their parts can damage them.

- Drain the coolant (see Cooling System in the Periodic Maintenance chapter).
- Remove:
  - Radiator Fan Switch Lead Connector [A]
  - Radiator Fan Switch [B]



Seat (see Frame chapter)  
Fuel Tank (see Fuel System chapter)  
Water Temperature Sensor Lead Connector [A]  
Water Temperature Sensor [B]



#### *Radiator Fan Switch, Water Temperature Sensor Installation*

- Apply silicone sealant to the threads of the water temperature sensor.
  - Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**
- Tighten the fan switch and water temperature sensor.
  - Torque - Radiator Fan Switch: 18 N·m (1.8 kgf·m, 13 ft·lb)**
  - Water Temperature Sensor: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Fill the coolant and bleed the air from cooling system (see Cooling System in the Periodic Maintenance chapter).

#### *Radiator Fan Switch, Water Temperature Sensor Inspection*

- Refer to Electrical System chapter for these inspections.

# Engine Top End

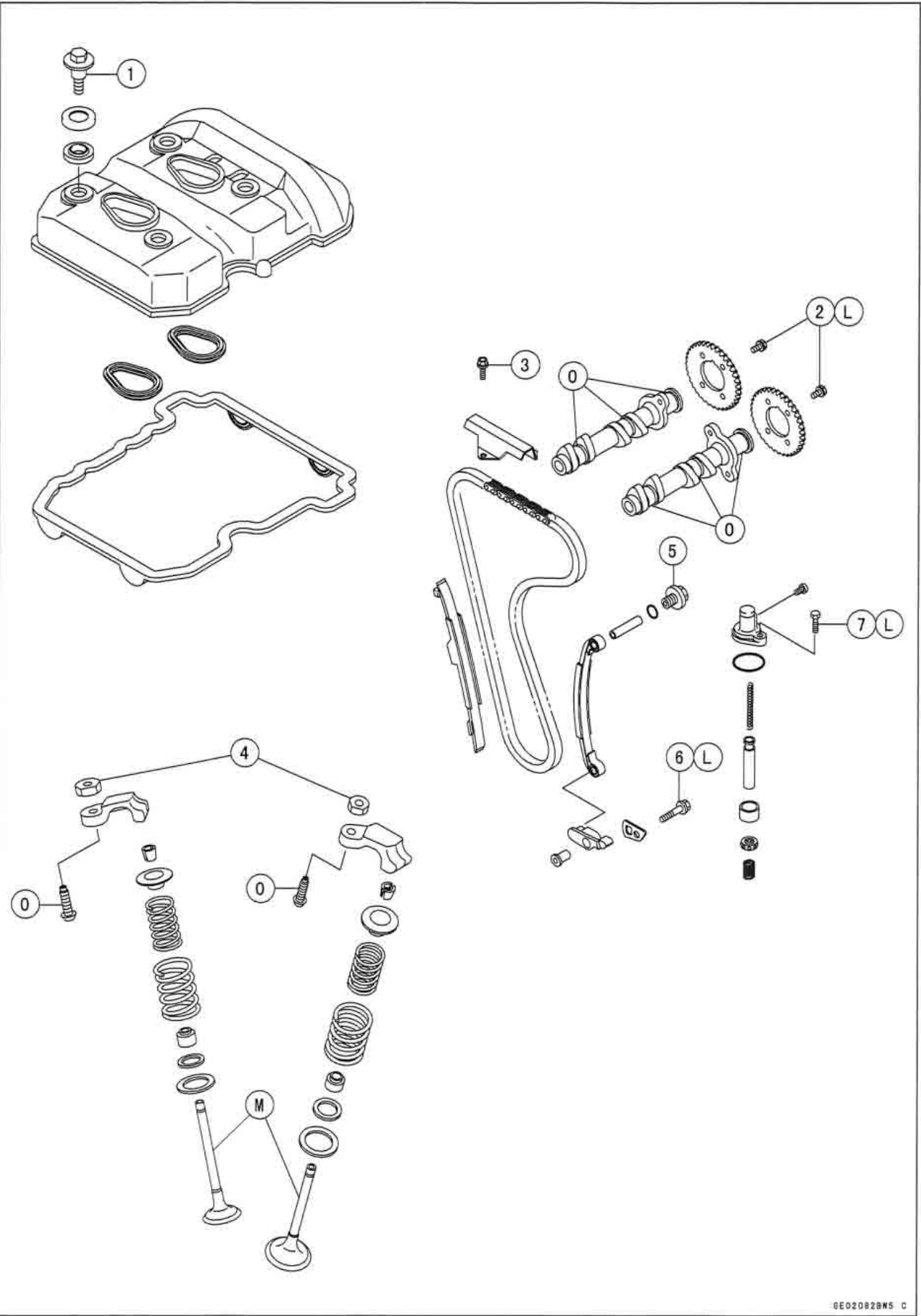
## Table of Contents

Exploded View .....	5-2	Cylinder Head Cleaning .....	5-18
Specifications .....	5-6	Valves .....	5-19
Special Tools .....	5-8	Valve Clearance Inspection .....	5-19
Cylinder Head Cover .....	5-10	Valve Clearance Adjustment .....	5-19
Cylinder Head Cover Removal ....	5-10	Valve Removal .....	5-19
Cylinder Head Cover Installation .	5-10	Valve Installation .....	5-19
Camshaft Chain Tensioner .....	5-11	Valve Guide Removal .....	5-19
Camshaft Chain Tensioner		Valve Guide Installation .....	5-19
Removal .....	5-11	Valve-to-Guide Clearance	
Camshaft Chain Tensioner		Measurement (Wobble	
Installation .....	5-11	Method) .....	5-20
Camshaft Chain Tensioner		Valve Seat Inspection .....	5-21
Disassembly .....	5-11	Valve Seat Repair .....	5-21
Camshaft Chain Tensioner		Cylinder, Pistons .....	5-26
Assembly .....	5-11	Cylinder Removal .....	5-26
Camshaft, Camshaft Chain, Rocker		Cylinder Installation .....	5-26
Arm .....	5-12	Piston Removal .....	5-27
Camshaft Removal .....	5-12	Piston Installation .....	5-27
Camshaft Installation .....	5-12	Cylinder Wear .....	5-28
Camshaft and Sprocket		Piston Wear .....	5-28
Assembly .....	5-13	Piston Ring, Piston Ring Groove	
Camshaft and Camshaft Cap		Wear .....	5-29
Wear .....	5-14	Piston Ring Groove Width .....	5-29
Camshaft Runout .....	5-14	Piston Ring Thickness .....	5-29
Cam Wear .....	5-15	Piston Ring End Gap .....	5-30
Camshaft Chain Guide Wear .....	5-15	Boring, Honing .....	5-30
Cylinder Head .....	5-16	Carburetor Holder .....	5-31
Cylinder Compression		Carburetor Holder Installation .....	5-31
Measurement .....	5-16	Muffler .....	5-32
Cylinder Head Removal .....	5-17	Muffler Removal .....	5-32
Cylinder Head Installation .....	5-17	Muffler Installation .....	5-32
Cylinder Head Warp .....	5-18	Exhaust System Inspection .....	5-33



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 Sprocket Bolts	15	1.5	11	L
3	Camshaft Chain Guide Mounting Bolts	12	1.2	104 in·lb	
4	Valve Adjusting Screw Locknuts	20	2.0	14.5	
5	Rear Chain Guide Bolt-Upper	25	2.5	18	
6	Camshaft Chain Guide Plate Mounting Bolt	27	2.8	20	L
7	Chain Tensioner Mounting Bolts	11	1.1	95 in·lb	L

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

O: Apply engine oil.

### Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Camshaft Cap Bolts	12	1.2	104 in·lb	
2	Camshaft Cap Bolts	12	1.2	104 in·lb	
3	Cylinder Head Bolt	12	1.2	104 in·lb	
4	Camshaft Cap Bolts	12	1.2	104 in·lb	
5	Cylinder Head Bolts	25	2.5	18	S
6	Cylinder Head Bolts	25	2.5	18	S

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

O: Apply engine oil.

S: Follow the specific tightening sequence.

SS: Apply silicon sealant.

## 5-6 ENGINE TOP END

### Specifications

Item	Standard	Service Limit
<b>Camshafts, Camshaft Chain, Rocker Arms</b>		
Cam Height:	30.537 ~ 30.653 mm (1.202 ~ 1.207 in.)	30.44 mm (1.198 in.)
Camshaft Journal, Camshaft Cap Clearance	0.030 ~ 0.071 mm (0.0012 ~ 0.0028 in.)	0.16 mm (0.0063 in.)
Camshaft Journal Diameter	23.950 ~ 23.970 mm (0.943 ~ 0.944 in.)	23.92 mm (0.942 in.)
Camshaft Bearing Inside Diameter	24.000 ~ 24.021 mm (0.945 ~ 0.946 in.)	24.08 mm (0.948 in.)
Camshaft Runout	— — —	0.1 mm (0.004 in.) TIR
<b>Cylinder Head</b>		
Cylinder Compression	(Usable Range) 980 ~ 1 500 kPa (10.0 ~ 15.3 kgf/cm <sup>2</sup> , 142 ~ 218 psi) @470 r/min (rpm)	— — —
Cylinder Head Warp	— — —	0.05 mm (0.002 in.)
<b>Valves</b>		
Valve Clearance:		
Inlet	0.08 ~ 0.13 mm (0.0031 ~ 0.0051 in.)	— — —
Exhaust	0.11 ~ 0.16 mm (0.0043 ~ 0.0063 in.)	— — —
Valve Head Thickness:		
Inlet	0.65 mm (0.0256 in.)	0.3 mm (0.012 in.)
Exhaust	0.70 mm (0.0276 in.)	0.5 mm (0.020 in.)
Valve Stem Bend	— — —	0.05 mm (0.002 in.) TIR
Valve Stem Diameter:		
Inlet	4.975 ~ 4.990 mm (0.1959 ~ 0.1965 in.)	4.96 mm (0.195 in.)
Exhaust	4.955 ~ 4.970 mm (0.1951 ~ 0.1957 in.)	4.94 mm (0.194 in.)
Valve Guide Inside Diameter	5.000 ~ 5.012 mm (0.1969 ~ 0.1973 in.)	5.08 mm (0.200 in.)
Valve/valve Guide Clearance (Wobble Method):		
Inlet	0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)	0.24 mm (0.009 in.)
Exhaust	0.08 ~ 0.15 mm (0.0031 ~ 0.0059 in.)	0.29 mm (0.011 in.)
Valve Seating Surface:		
Outside Diameter:		
Inlet	22.9 ~ 23.1 mm (0.9016 ~ 0.9094 in.)	— — —
Exhaust	20.3 ~ 20.5 mm (0.7992 ~ 0.8071 in.)	— — —
Width	0.5 ~ 1.0 mm (0.0197 ~ 0.0394 in.)	— — —
Valve Spring Free Length:		
Inner	30.7 mm (1.209 in.)	29.1 mm (1.15 in.)
Outer	35.0 mm (1.378 in.)	33.4 mm (1.31 in.)
Valve Seat Cutting Angle	32°, 45°, 67.5°	— — —
<b>Cylinder, Piston</b>		
Cylinder Inside Diameter	62.000 ~ 62.012 mm (2.4409 ~ 2.4414 in.)	62.10 mm (2.44 in.)
Piston Diameter	61.942 ~ 61.957 mm (2.4387 ~ 2.4392 in.)	61.80 mm (2.43 in.)
Piston/Cylinder Clearance	0.043 ~ 0.070 mm (0.0017 ~ 0.0028 in.)	— — —
Oversize Pistons and Rings	+0.5 mm (0.020 in.)	— — —

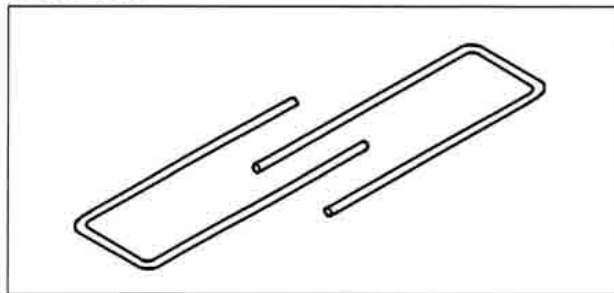
## Specifications

Item	Standard	Service Limit
Piston Ring/Groove Clearance:		
Top	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Second	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)	0.16 mm (0.0063 in.)
Piston Ring Groove Width:		
Top	0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)	0.92 mm (0.0362 in.)
Second	0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)	0.91 mm (0.0358 in.)
Oil	2.01 ~ 2.03 mm (0.0791 ~ 0.0799 in.)	2.11 mm (0.0831 in.)
Piston Ring Thickness:		
Top, Second	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.7 mm (0.028 in.)
Piston Ring End Gap:		
Top, Second	0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)	0.8 mm (0.031 in.)
Oil	0.20 ~ 0.80 mm (0.0079 ~ 0.0315 in.)	1.1 mm (0.043 in.)

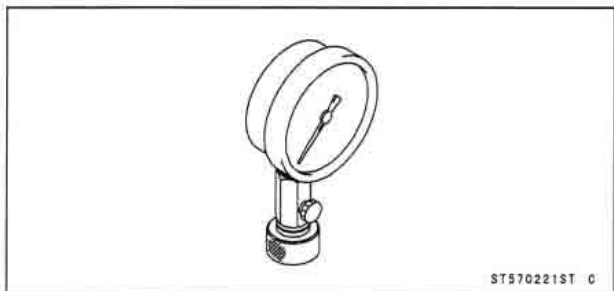
## 5-8 ENGINE TOP END

### Special Tools

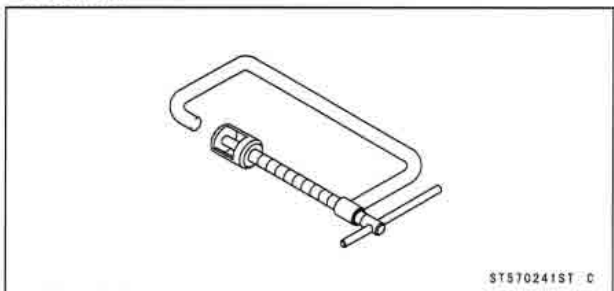
**Piston Base,  $\phi 2.3$ :**  
57001-1336



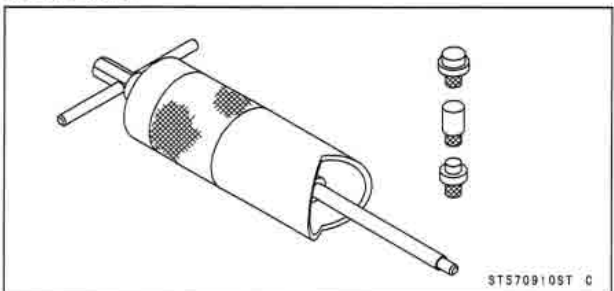
**Compression Gauge, 20 kgf/cm<sup>2</sup>:**  
57001-221



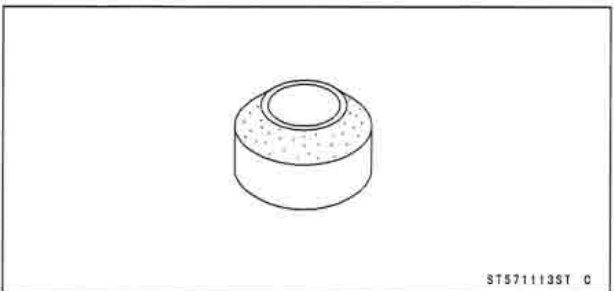
**Valve Spring Compressor Assembly:**  
57001-241



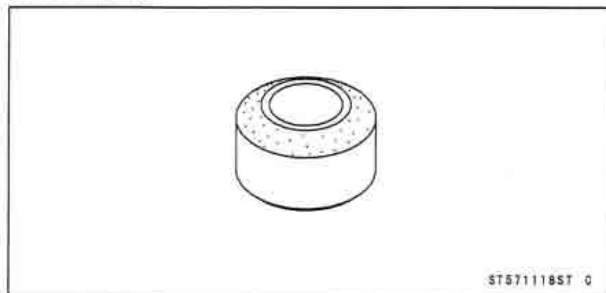
**Piston Pin Puller Assembly:**  
57001-910



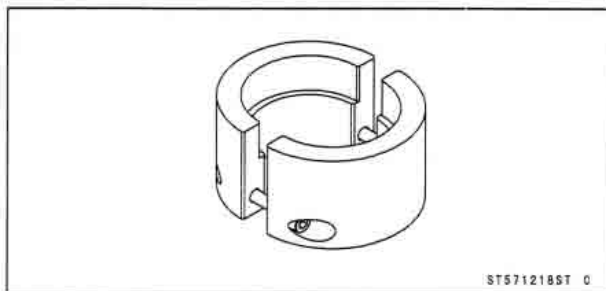
**Valve Seat Cutter, 45° -  $\phi 24.5$ :**  
57001-1113



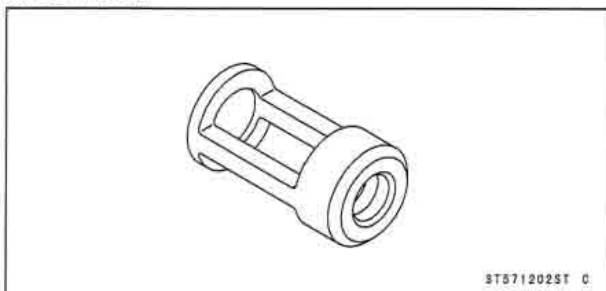
**Valve Seat Cutter, 32° -  $\phi 25$ :**  
57001-1118



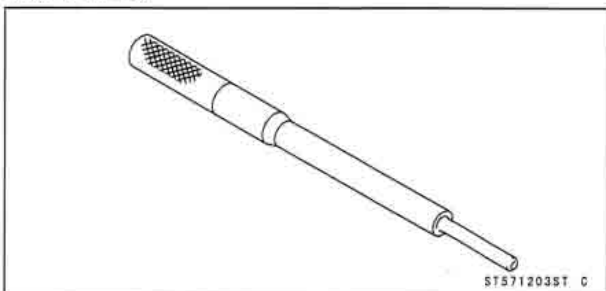
**Fork Outer Tube Weight:**  
57001-1218



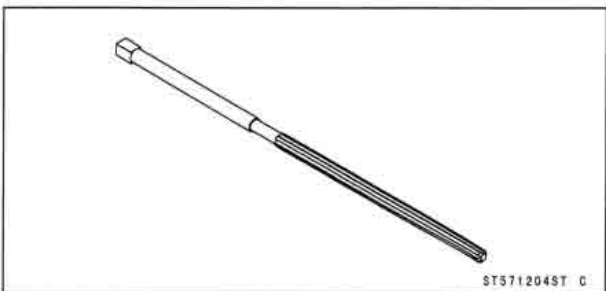
**Valve Spring Compressor Adapter,  $\phi 22$ :**  
57001-1202



**Valve Guide Arbor,  $\phi 5$ :**  
57001-1203

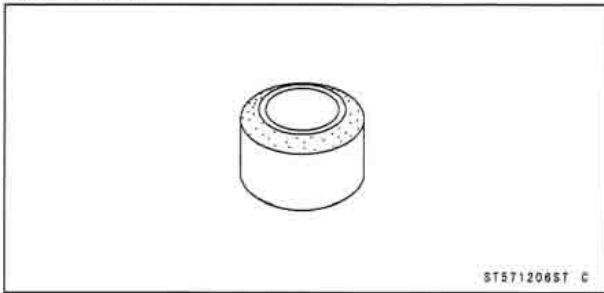


**Valve Guide Reamer,  $\phi 5$ :**  
57001-1204



**Special Tools**

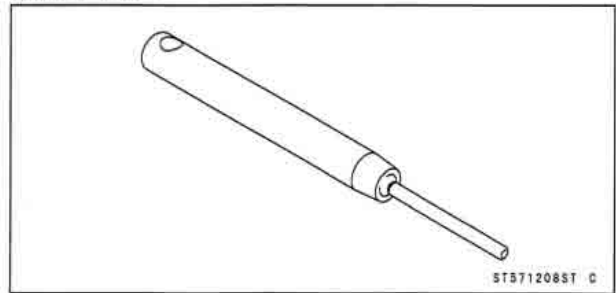
**Valve Seat Cutter, 32° -  $\phi$ 22:**  
**57001-1206**



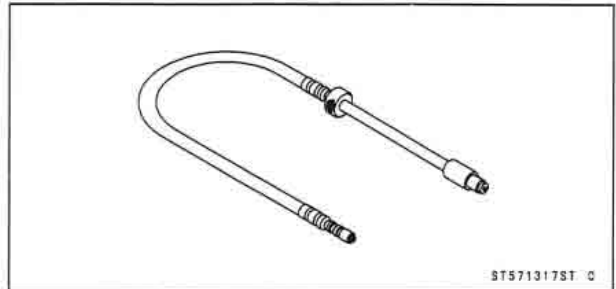
**Valve Seat Cutter, 67.5° -  $\phi$ 22:**  
**57001-1207**



**Valve Seat Cutter Holder,  $\phi$ 5:**  
**57001-1208**



**Compression Gauge Adapter, M10 × 1.0:**  
**57001-1317**



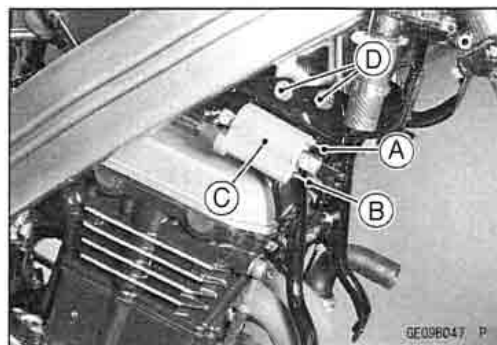


## 5-10 ENGINE TOP END

### Cylinder Head Cover

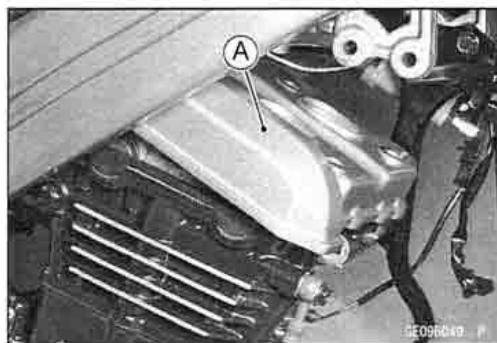
#### *Cylinder Head Cover Removal*

- Drain the Coolant (see Cooling System in the Periodic Maintenance chapter).
- Remove:
  - Spark Plug Caps
  - Radiator (see Cooling System chapter)
- Disconnect the primary lead [A] and ground lead [B] connectors of the #2(right) ignition coil [C].
- Remove the right engine bracket mounting bolts [D], and remove the engine bracket with the right ignition coil.
- Remove the cylinder head cover bolts [A].



#### *Cylinder Head Cover Installation*

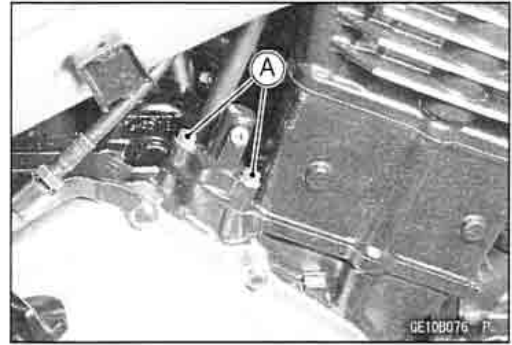
- Scrape off the old silicone sealant on the cylinder head mating surface, and apply silicone sealant on the mating surface.
- Install the new cylinder head cover gasket and install the cylinder head cover with the specified torque.  
**Torque - Cylinder Head Cover Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the removed parts.



## Camshaft Chain Tensioner

### Camshaft Chain Tensioner Removal

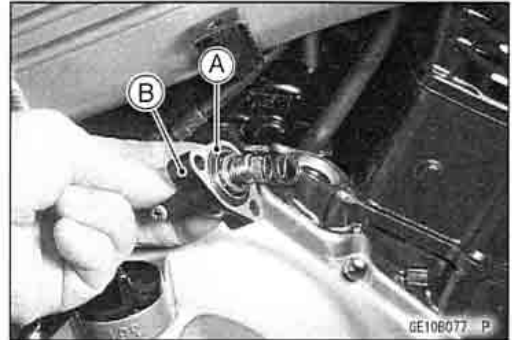
- Remove the right lower fairing.
- Remove the camshaft chain tensioner mounting bolts [A], and remove the chain tensioner.



### Camshaft Chain Tensioner Installation

- Inspect the O-ring [A] condition and fit it into the tensioner body.
- Install the chain tensioner assembly [B].
- Apply a non-permanent locking agent on the chain tensioner mounting bolts.
- Tighten the chain tensioner mounting bolts with the specified torque.

**Torque - Camshaft Chain Tensioner Mounting Bolts:** 11 N·m (1.1 kgf·m, 95 in·lb)

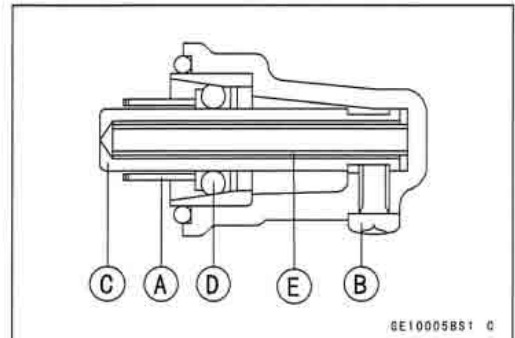


### NOTE

- Loosen the lock screw after installing the chain tensioner assembly.

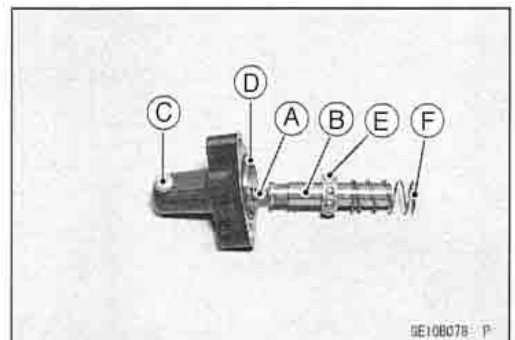
### Camshaft Chain Tensioner Disassembly

- Remove the Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal).
- Remove the long spring [A] and ball bearing [D].
- Loosen the lock screw [B] and carefully remove the push rod [C] and short spring [E] out of the tensioner body.



### Camshaft Chain Tensioner Assembly

- Slip the short spring [A] into the push rod [B] and compress it down full stroke.
- Turn in the lock screw [C] to avoid for the push rod to jump out.
- Install the retainer [D], ball bearing [E] and long spring [F] onto the tensioner body.

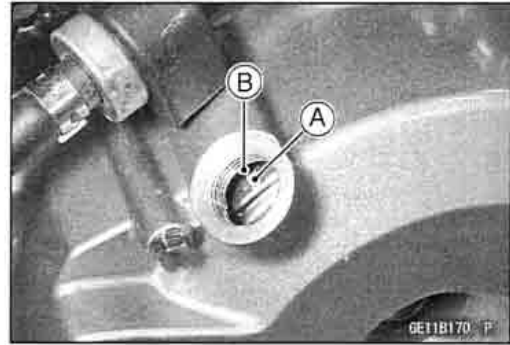


## 5-12 ENGINE TOP END

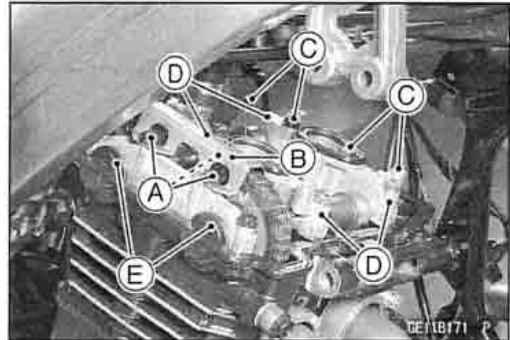
### Camshaft, Camshaft Chain, Rocker Arm

#### Camshaft Removal

- Remove the cylinder head cover (see Cylinder Head Cover Removal)
- Remove the inspection plugs on the alternator cover.
- Position the crankshaft at #2 piston TDC.
- Using a wrench on the crankshaft rotation bolts, turn the crankshaft clockwise until the "2T" mark [A] on the alternator rotor is aligned with the projection [B] in the inspection window on the alternator cover.



- Remove:
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal).
  - Camshaft Top Chain Guide Bolts [A]
  - Camshaft Top Chain Guide [B]
  - Camshaft Cap Bolts [C]
  - Camshaft Caps [D]
  - Camshafts [E]



- Stuff a clean cloth into the camshaft chain tunnel to keep any parts from dropping into the crankcase.
- Pick the rocker arms [A] off the cylinder head.
- Mark the original location of each rocker arm to keep the valve clearance correctly.

#### CAUTION

**The crankshaft may be turned while the camshafts are removed.**

**Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.**

#### Camshaft Installation

- Apply engine oil to all camshaft parts and journals.
- ★ If the camshaft(s) is replaced with a new part, apply a thin coat of molybdenum disulfide grease to the cam and journal surfaces.

#### NOTE

○ Be sure to operate from the engine left side.

- Position the crankshaft at #2 piston TDC (see Camshaft Removal).

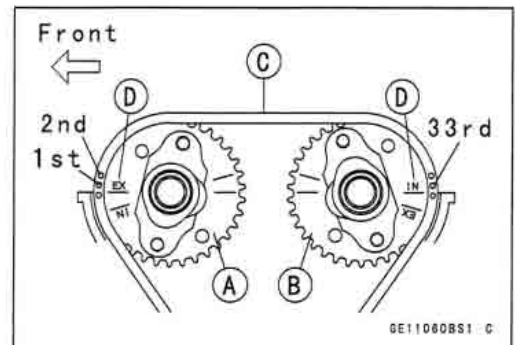
#### CAUTION

**The crankshaft may be turned while the camshafts are removed.**

**Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.**

## Camshaft, Camshaft Chain, Rocker Arm

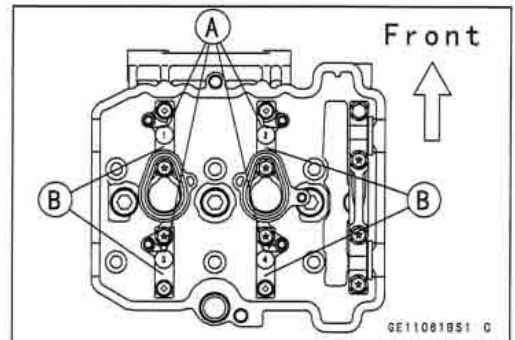
- Engage the camshaft chain [C] with the camshaft sprockets.
- Pull the tension side (exhaust side) of the chain taut to install the chain on the sprockets.
- Timing marks [D] align with the cylinder head upper surface.
- Exhaust Camshaft Sprocket [A]
- Inlet Camshaft Sprocket [B]
- Count the camshaft chain link pins as shown to verify that the sprocket are positioned correctly.



- Install the camshaft caps [B] and top chain guide in the correct locations as shown. Location numbers [A] are marked on the each cap.

### CAUTION

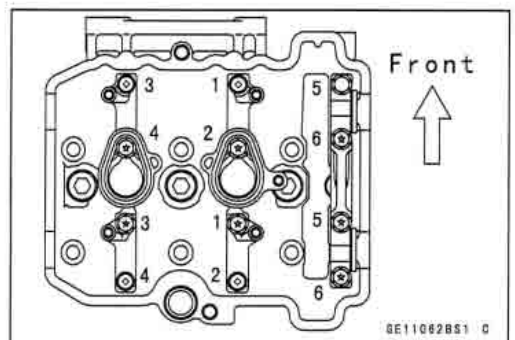
The camshaft caps are machined with the cylinder head. So, if a cap is installed in a wrong location, the camshaft may seize because of improper oil clearance in the bearings.



- First tighten down the two camshaft cap bolts (#1 and #2 bolts in the figure) evenly to seat the camshafts in place, then tighten all bolts following the specified tightening sequence.

**Torque - Camshaft Cap Bolts: 12 N·m (1.2 kg·m, 8.5 ft·lb)**

- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Check the chain timing.



### Camshaft and Sprocket Assembly

- The inlet and exhaust sprockets are identical.
- Install the sprockets so that the marked [A] ("IN" and "EX") side faces to the left side.

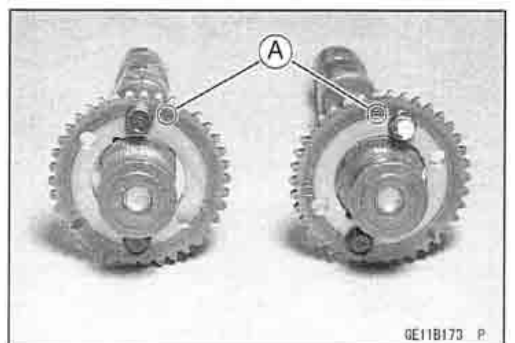
### CAUTION

Inlet sprocket must use "I" marked bolt holes.  
Exhaust sprocket must use "E" marked bolt holes.

- Apply a non-permanent locking agent to the camshaft sprocket bolts and tighten them.

**Torque - Camshaft Sprocket Bolts: 15 N·m (1.5 kg·m, 11.0 ft·lb)**

- ★ If a new camshaft is to be used, apply a thin coat of a molybdenum disulfide grease to the cam surfaces.

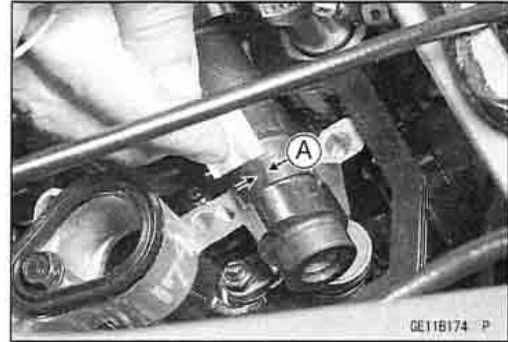


## 5-14 ENGINE TOP END

### Camshaft, Camshaft Chain, Rocker Arm

#### Camshaft and Camshaft Cap Wear

- Remove:
  - Camshaft Top Chain Guide
  - Camshaft Caps
- Cut the strips of plastigauge to journal parallel to the camshaft installed in the correct position.



- Measure each clearance between the camshaft journal and the camshaft cap using the plastigauge (press gauge) [A].
- Tighten:

**Torque - Camshaft Cap Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**

#### NOTE

○ Do not turn the camshaft when the plastigauge is between the journal and camshaft cap.

#### Camshaft Journal, Camshaft Cap Clearance

**Standard:** 0.030 ~ 0.071 mm (0.0072 ~ 0.0028 in.)

**Service Limit:** 0.16 mm (0.006 in.)

- ★ If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

#### Camshaft Journal Diameter

**Standard:** 23.950 ~ 23.970 mm (0.943 ~ 0.944 in.)

**Service Limit:** 23.92 mm (0.942 in.)

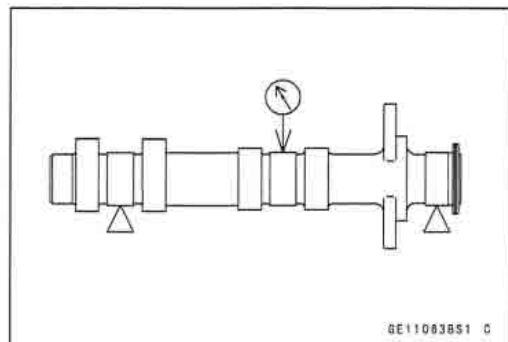
- ★ If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.
- ★ If the clearance still remains out of the service limit, replace the cylinder head unit.

#### Camshaft Runout

- Remove the camshaft.
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure the runout with a dial gauge at the specified place as shown.
- ★ If the runout exceeds the service limit, replace the shaft.

#### Camshaft Runout

**Service Limit:** TIR 0.1 mm (0.004 in.)



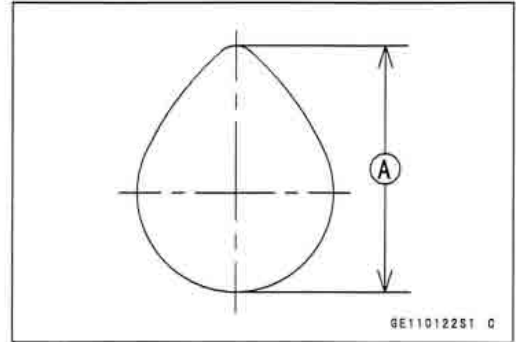
**Camshaft, Camshaft Chain, Rocker Arm***Cam Wear*

- Remove the camshaft.
- Measure the height [A] of each cam with a micrometer.
- ★ If the cams are worn down past the service limit, replace the camshaft.

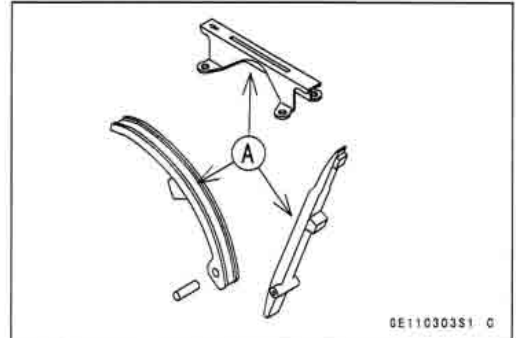
**Cam Height**

**Standard:** 30.537 ~ 30.653 mm (1.202 ~ 1.207 in.)

**Service Limit:** 30.44 mm (1.198 in.)

*Camshaft Chain Guide Wear*

- Visually inspect the rubber [A] on the guide.
- If the rubber is damaged or cut, replace the guides.



## 5-16 ENGINE TOP END

### Cylinder Head

#### Cylinder Compression Measurement

##### NOTE

○ Use the battery which is fully charged.

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Spark Plug
- Attach the compression gauge [A], adapter [B] and gasket firmly into the spark plug hole.
- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

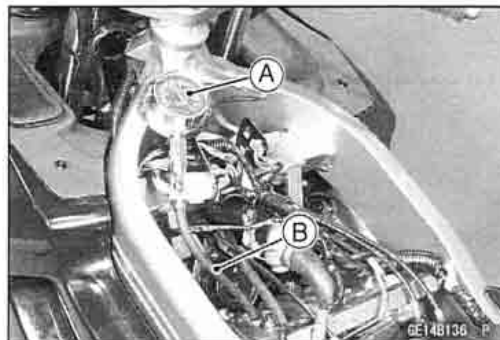
**Special Tool - Compression Gauge: 57001-221**  
**Compression Gauge Adapter M10 × 1.0:**  
**57001-1317**

#### Cylinder Compression

**Usable Range: 961 ~ 1 471 kPa (9.8 ~ 15.0 kgf/cm<sup>2</sup>, 139 ~ 213 psi) @470r/min (rpm)**

- Repeat the measurement for the other cylinder.
- Install the spark plugs.

**Torque - Spark Plug: 14 N·m (1.4 kgf·m, 10 ft·lb)**



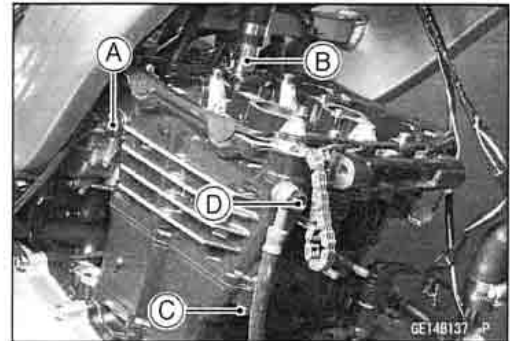
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace damaged parts if necessary.
	Incorrect cylinder head gasket thickness.	Replace the gasket with a standard part.
Cylinder compression is lower than usable range	Gas leakage around cylinder head	Replace damaged gasket and check cylinder head warp.
	Bad condition of valve seating	Repair if necessary.
	Incorrect valve clearance.	Adjust the valve clearance.
	Incorrect piston/cylinder clearance	Replace the piston and/or cylinder
	Piston seizure.	Inspect the cylinder and replace/repair the cylinder and/or piston as necessary.
	Bad condition of piston ring and/or piston ring grooves	Replace the piston and/or the piston rings.



## Cylinder Head

### Cylinder Head Removal

- Drain the coolant (see Cooling System in the Periodic Maintenance chapter).
- Remove:
  - Lower Fairing (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Radiator (see Cooling System chapter)
  - Muffler (see Muffler Removal)
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  - Left and Right Engine Bracket with Ignition Coils
- Remove:
  - Cylinder Head Cover
  - Camshafts
  - Rocker Arms
  - Rear Camshafts Chain Guide Bolt (Upper) [A] and Chain Guide
  - Front Camshaft Chain Guide
- Pull out the water pipe [B].
- Remove the 6 mm cylinder head bolt [C] first, then remove the 8 mm cylinder head bolts.
- Remove the oil hose banjo bolt [D].
- Before removing the cylinder head, hold the carburetor to the air cleaner ducts securely.



### Cylinder Head Installation

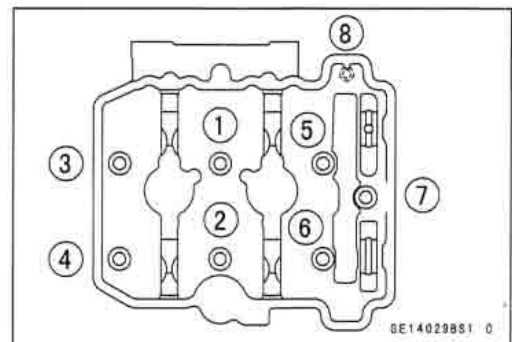
#### NOTE

- The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.

- Install the pin and new cylinder head gasket.
- Tighten the 8 mm cylinder head bolts following the tightening sequence.
- Torque - Cylinder Head Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Tighten the 6 mm cylinder head bolt.
- Torque - Cylinder Head Bolts: 12 N·m (1.2 kg·m, 104 in·lb)**
- After cylinder head installation, install the front camshaft chain guide.
- Tighten the rear camshaft chain guide bolt (upper) to the specified torque.
- Tighten the oil hose banjo bolt to the specified torque.

**Torque - Camshaft Chain Guide Bolt (upper): 25 N·m (2.5 kgf·m, 18 ft·lb)**

**Oil Hose Banjo Bolt: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**





## 5-18 ENGINE TOP END

### Cylinder Head

#### Cylinder Head Warp

- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

#### Cylinder Head Warp

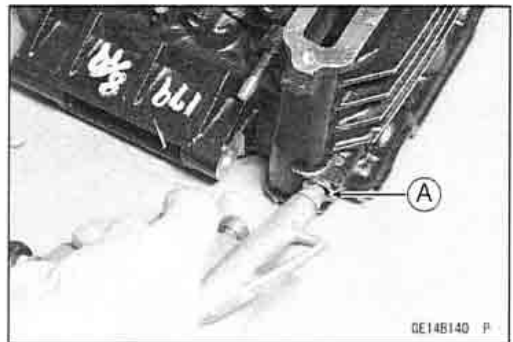
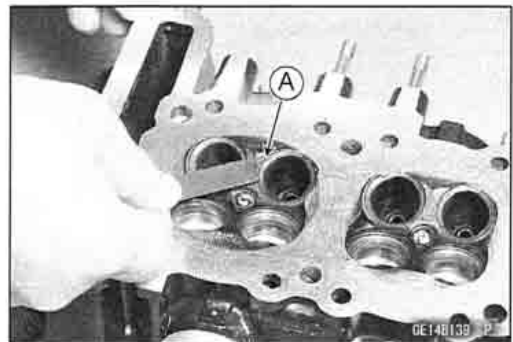
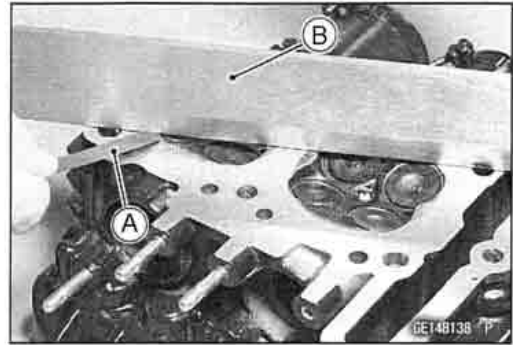
Standard: - - -

Service Limit: 0.05 mm

- ★ If the cylinder head is warped more than the service limit, replace it.
- ★ If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).

#### Cylinder Head Cleaning

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Valves (see Valve Removal)
- Scrape [A] the carbon out of the combustion chamber and exhaust port with a suitable tool.
- Wash the cylinder head with a high-flash point solvent.
- Using compressed air, blow out any particles which may obstruct the oil passage [A] in the cylinder head.
- Install the valve (see Valve Installation).
- Install the cylinder head (see Cylinder Head Installation).



## Valves

### Valve Clearance Inspection

- Refer to the Engine Top End in the Periodic Maintenance chapter.

### Valve Clearance Adjustment

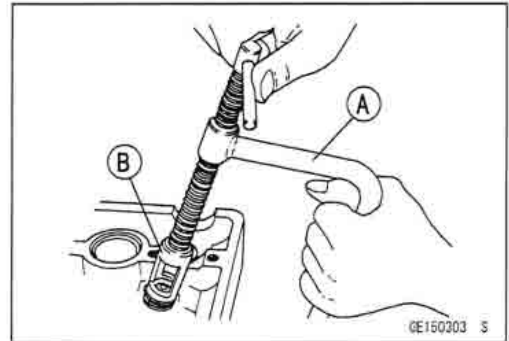
- Refer to the Engine Top End in the Periodic Maintenance chapter.

### Valve Removal

- Remove the cylinder head (see Cylinder Head Removal).
- Use the valve spring compressor assembly and the adapter to press down the valve spring retainer.

**Special Tools - Valve Spring Compressor Assembly: 57001-241 [A]**

**Valve Spring Compressor Adapter,  $\phi 22$ : 57001-1202 [B]**



### Valve Installation

- Replace the oil seal with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
- Install the spring so that the closed coil end faces downwards.

[A] Valve Stem

[B] Oil Seal

[C] Spring Seat

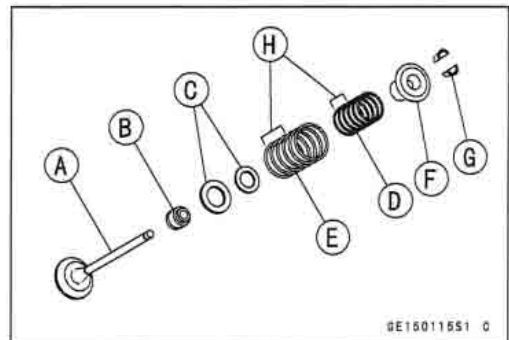
[D] Inner Spring

[E] Outer Spring

[F] Retainer

[G] Split Keepers

[H] Closed Coil End



### Valve Guide Removal

- Remove:
  - Valve (see Valve Removal)
  - Oil Seal
  - Spring Seat
- Heat the area around the valve guide to 120 ~ 150°C (248 ~ 302°F), and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

### CAUTION

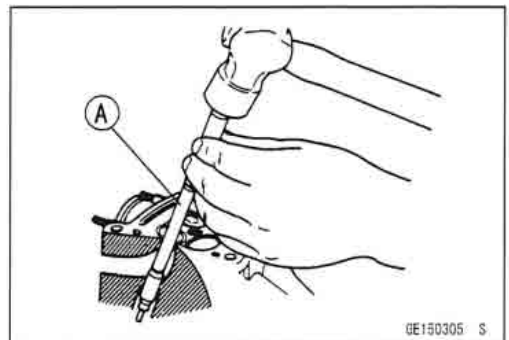
**Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head in oil and heat the oil.**

**Special Tool - Valve Guide Arbor,  $\phi 5$ : 57001-1203**

### Valve Guide Installation

- Apply oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).
- Drive the valve guide in from the top of the head using the valve guide arbor. The flange stops the guide from going in too far.

**Special Tool - Valve Guide Arbor,  $\phi 5$ : 57001-1203**

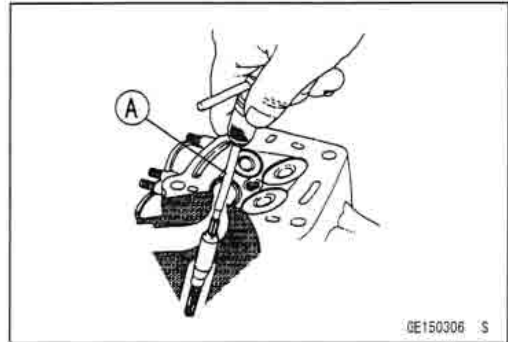


## 5-20 ENGINE TOP END

### Valves

- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.
- Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counter-clockwise or it will be dulled.
- Once the guides are reamed they must be cleaned thoroughly.

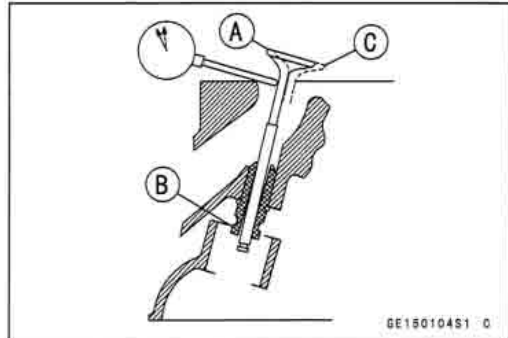
**Special Tool - Valve Guide Reamer,  $\phi 5$ : 57001-1204**



#### *Valve-to-Guide Clearance Measurement (Wobble Method)*

If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
- Move the stem back and forth [C] to measure valve/valve guide clearance.
- Repeat the measurement in a direction at a right angle to the first.
- ★ If the reading exceeds the service limit, replace the guide.



#### **NOTE**

- *The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*

#### **Valve/Valve Guide Clearance (Wobble Method)**

##### **Standard:**

Inlet	0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)
Exhaust	0.08 ~ 0.15 mm (0.0031 ~ 0.0059 in.)

##### **Service Limit:**

Inlet	0.24 mm (0.009 in.)
Exhaust	0.29 mm (0.011 in.)

## Valves

### Valve Seat Inspection

- Remove the valve (see Valve Removal).
- Check the valve seating surface [A] between the valve [B] and valve seat [C].
- Measure the outside diameter [D] of the seating pattern on the valve seat.
- ★ If the outside diameter is too large or too small, repair the seat (see Seat Repair).

#### Valve Seating Surface Outside Diameter

##### Standard:

Inlet 22.9 ~ 23.1 mm (0.902 ~ 0.909 in.)

Exhaust 20.3 ~ 20.5 mm (0.799 ~ 0.807 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.

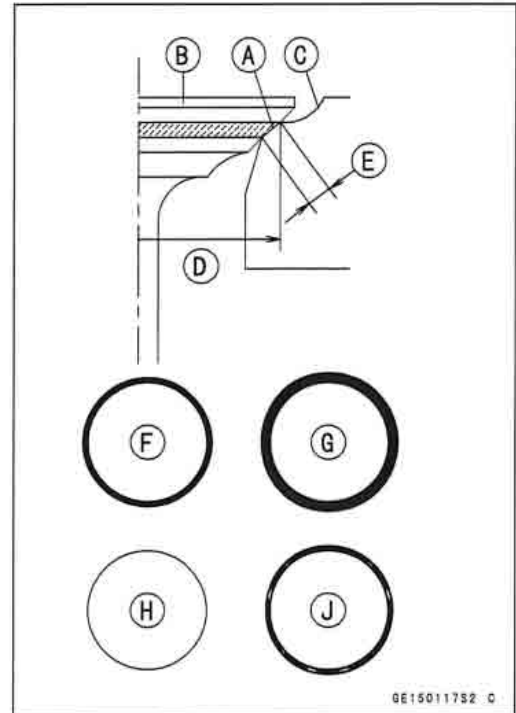
Good [F]

- ★ 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:

Inlet, Exhaust 0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)



GE150117S2 C

### Valve Seat Repair

- Repair the valve seat with the valve seat cutters [A].

Special Tools - Valve Seat Cutter Holder,  $\phi 4$ : 57001-1208 [B]

Valve Seat Cutter Holder Bar: 57001-1128 [C]

#### For Inlet Valve Seat

Valve Seat Cutter, 45° -  $\phi 24.5$ : 57001-1113

Valve Seat Cutter, 32° -  $\phi 25$ : 57001-1118

Valve Seat Cutter, 67.5° -  $\phi 22$ : 57001-1207

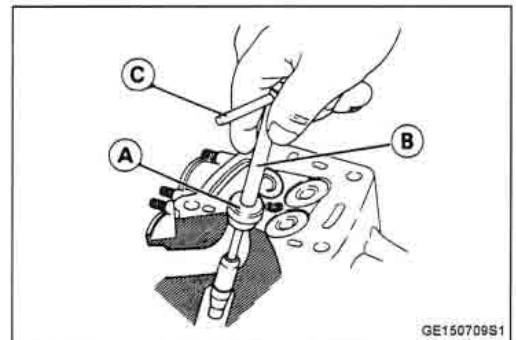
#### For Exhaust Valve Seat

Valve Seat Cutter, 45° -  $\phi 24.5$ : 57001-1113

Valve Seat Cutter, 32° -  $\phi 22$ : 57001-1206

Valve Seat Cutter, 67.5° -  $\phi 22$ : 57001-1207

- ★ If the manufacturer's instructions are not available, use the following procedure.



GE150709S1

## 5-22 ENGINE TOP END

### Valves

#### Seat Cutter Operation Cares

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

#### NOTE

○Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

#### NOTE

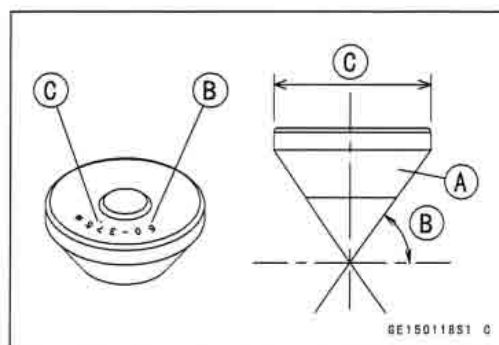
○Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.

5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

#### Marks Stamped on the Cutter

The marks stamped on the back of the cutter [A] represent the following.

- 60° ..... Cutter angle [B]  
37.5φ ..... Outer diameter of cutter [C]

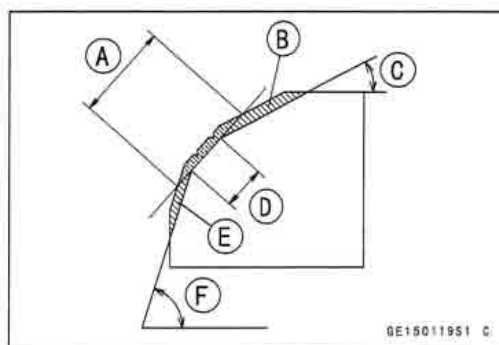


#### Operating Procedures

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

#### CAUTION

**Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.**



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 67.5° cutter

67.5° [F]

## Valves

- Measure the outside diameter (O.D.) of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

Original Seating Surface [B]

### NOTE

- Remove all pittings or flaws from 45° ground surface.
- After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 67.5° 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 of the seating surface is too large, make the 32° grind described below.

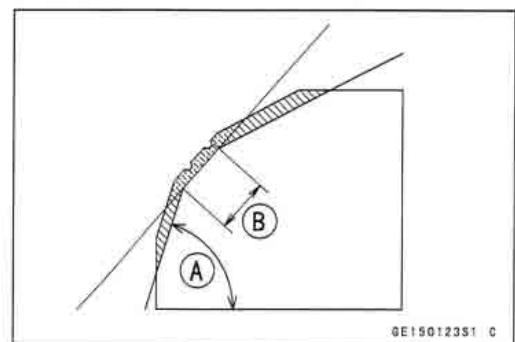
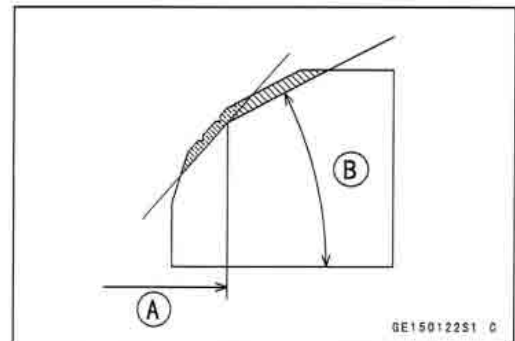
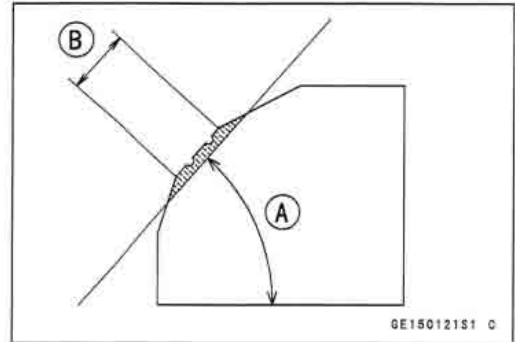
- If the outside diameter [A] of the seating surface is within the specified range, measure the seat width as described below.
- Grind the seat at a 32° angle [B] until the seat O.D. is within the specified range.
- To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.
- Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

### CAUTION

**The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.**

- After making the 32° grind, return to the seat O.D. 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 O.D. measurement step above.
- ★ If the seat width is too wide, make the 67.5° [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 67.5° angle until the seat width is within the specified range.
- To make the 67.5° grind, fit a 67.5° cutter into the holder, and slide it into the valve guide.
- Turn the holder, while pressing down lightly.
- After making the 67.5° grind, return to the seat width measurement step above.

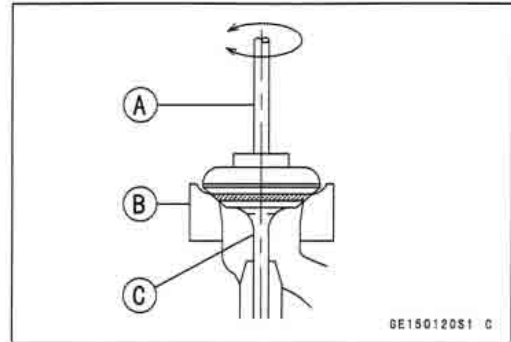
Correct Width [B]



## 5-24 ENGINE TOP END

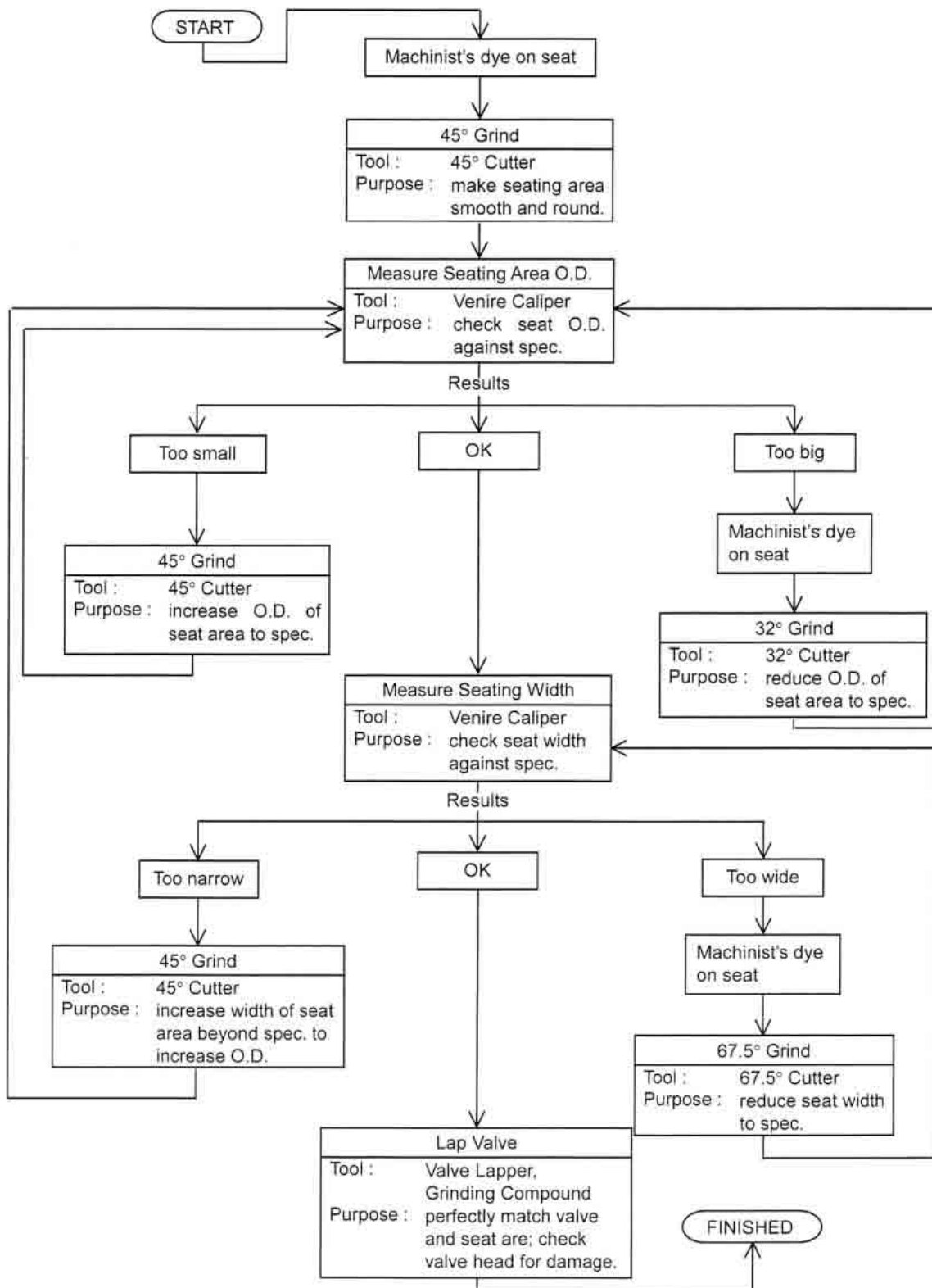
### Valves

- Lap the valve to the seat, once the seat width and O.D. are within the ranges specified above.
- Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
- Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
- Repeat the process with a fine grinding compound.
  - [A] Lapper
  - [B] Valve Seat
  - [C] Valve
- The seating area should be marked about in the middle of the valve face.
- ★ If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Engine Top End in the Periodic Maintenance chapter).



## Valves

## Valve Seat Repair



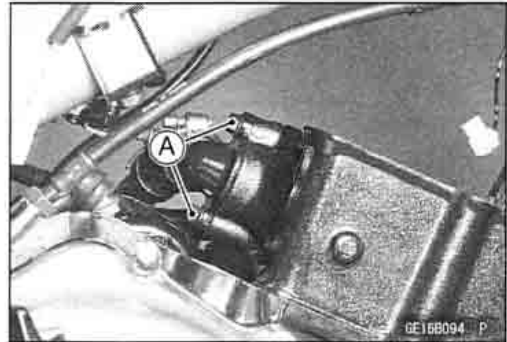


## 5-26 ENGINE TOP END

### Cylinder, Pistons

#### Cylinder Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
- Remove the water pipe mounting bolt [A], and take off the water pipe from the water pump.
- Remove the thermostat cover mounting bolts, and remove the thermostat cover together with the water pipe and water hose.
- Remove the cylinder.



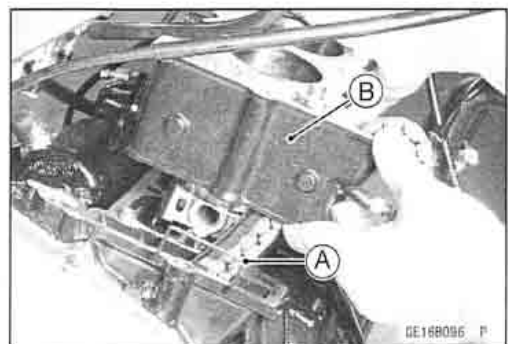
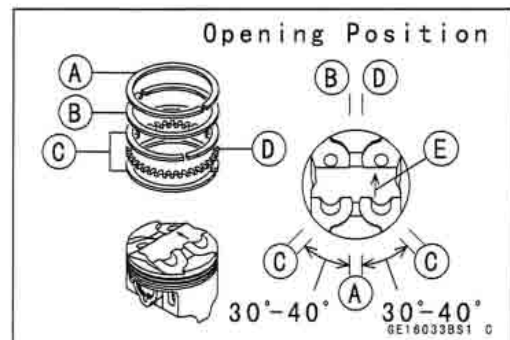
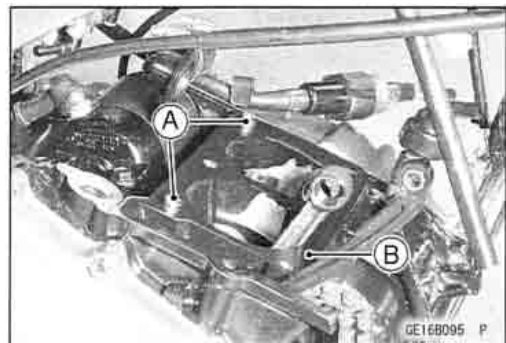
#### Cylinder Installation

##### NOTE

○ If a new cylinder is used, use a new piston ring.

- Install the pins [A] and new cylinder gasket [B].
  - Apply engine oil to the cylinder bore and piston rings.
- 
- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30-40° of angle from the opening of the top ring.

- [A] Top Ring
- [B] Second Ring
- [C] Oil Ring Steel Rails
- [D] Oil Ring Expander
- [E] Arrow Mark

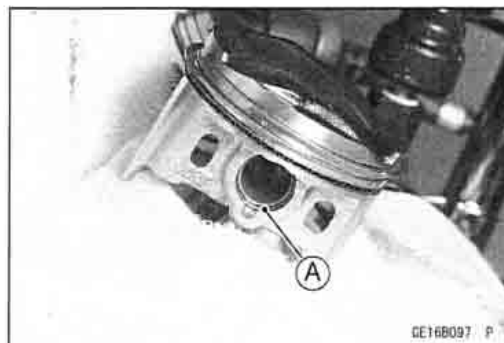


**Special Tool - Piston Base,  $\phi$ 2.3: 57001-1336**

## Cylinder, Pistons

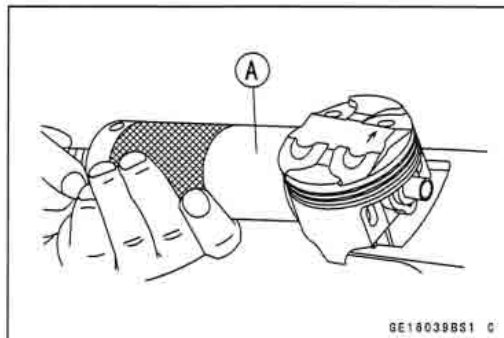
### Piston Removal

- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the pistons and remove the piston pin snap ring [A] from the outside of each piston.

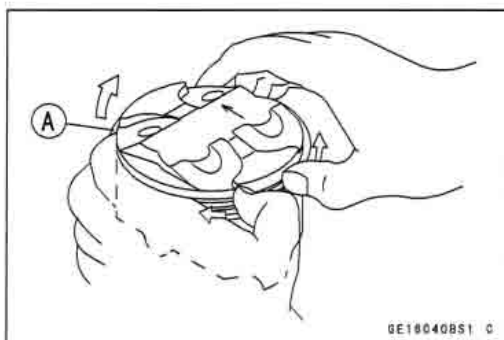


- Remove the piston pins.

**Special Tool - Piston Pin Puller Assembly: 57001-910 [A]**



- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.

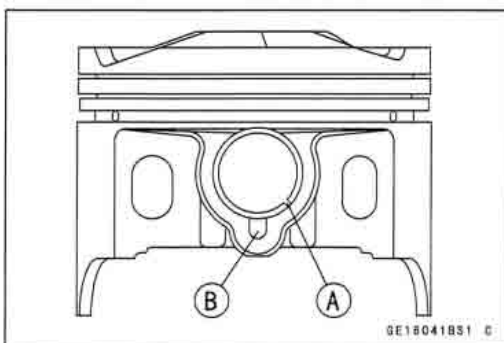


### Piston Installation

#### NOTE

○ If a new piston is used, use a new piston ring.

- Install the piston with its marking arrow facing forward.
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- When installing the piston pin snap ring, compress it only enough to install it and no more.



#### CAUTION

**Do not reuse snap rings, as removal weakens and deforms them.  
They could fall out and score the cylinder wall.**

## 5-28 ENGINE TOP END

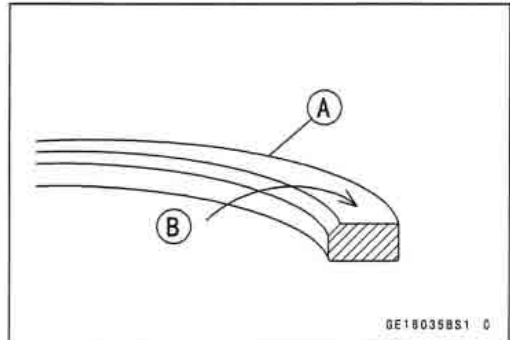
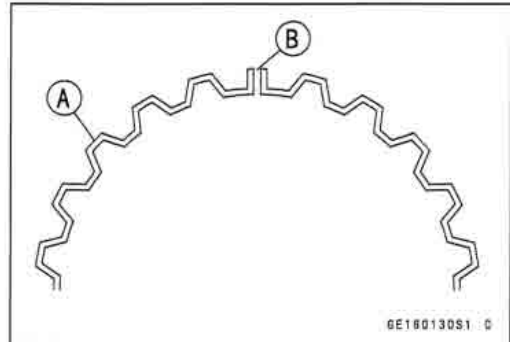
### Cylinder, Pistons

- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston ring groove.

#### NOTE

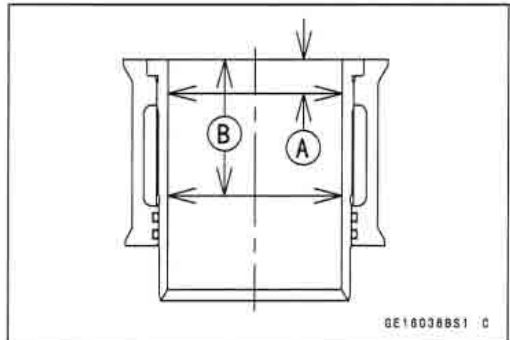
○ The oil ring rails have no "top" or "bottom".

- Install the rings [A] so that the "R" mark [B] faces up.
- The second ring and top ring are all the same



#### Cylinder Wear

- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) shown in the figure.
- ★ If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.
  - [A] 10 mm
  - [B] 60 mm



#### Cylinder Inside Diameter

Standard: 62.000 ~ 62.012 mm (2.4409 ~ 2.4414 in.)

Service Limit: 62.10 mm (2.44 in.)

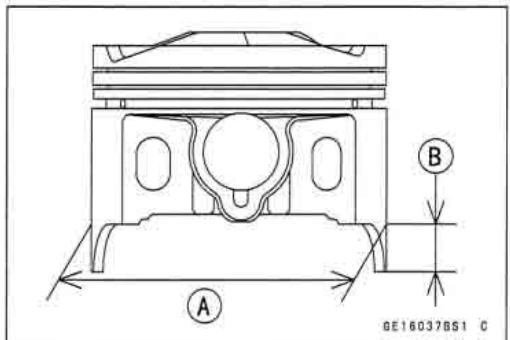
#### Piston Wear

- Measure the outside diameter [A] of each piston 5 mm [B] up from the bottom of the piston at a right angle to the direction of the piston pin.
- ★ If the measurement is under service limit, replace the piston.

#### Piston Diameter

Standard: 61.942 ~ 61.957 mm (2.4387 ~ 2.4392 in.)

Service Limit: 61.80 mm (2.43 in.)



## Cylinder, Pistons

### *Piston Ring, Piston Ring Groove Wear*

- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

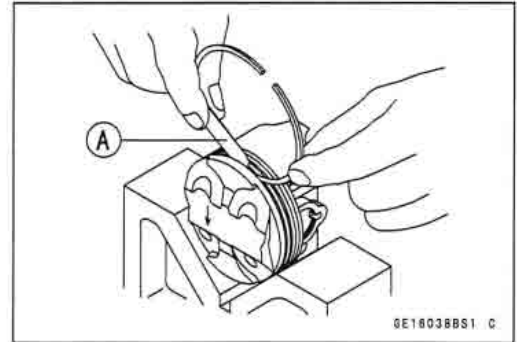
#### **Piston Ring/Groove Clearance**

##### **Standard:**

<b>Top</b>	<b>0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)</b>
<b>Second</b>	<b>0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in.)</b>

##### **Service Limit:**

<b>Top</b>	<b>0.17 mm (0.0067 in.)</b>
<b>Second</b>	<b>0.16 mm (0.0063 in.)</b>



### *Piston Ring Groove Width*

- Measure the piston ring groove width.
- Use a vernier caliper at several points around the piston.

#### **Piston Ring/Groove Width**

##### **Standard:**

<b>Top</b>	<b>0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)</b>
<b>Second</b>	<b>0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)</b>
<b>Oil</b>	<b>2.01 ~ 2.03 mm (0.0791 ~ 0.0799 in.)</b>

##### **Service Limit:**

<b>Top</b>	<b>0.92 mm (0.0362 in.)</b>
<b>Second</b>	<b>0.91 mm (0.0358 in.)</b>
<b>Oil</b>	<b>2.11 mm (0.0831 in.)</b>

- ★ If the width of any two grooves is wider than the service limit at any point, replace the piston.

### *Piston Ring Thickness*

- Measure the piston ring thickness.
- Use the micrometer to measure at several points around the ring.

#### **Piston Ring Thickness**

##### **Standard:**

<b>Top</b>	<b>0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)</b>
<b>Second</b>	<b>0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)</b>

##### **Service Limit:**

<b>Top</b>	<b>0.70 mm (0.028 in.)</b>
<b>Second</b>	<b>0.70 mm (0.028 in.)</b>

- ★ If any of the measurements is less than the service limit on either of the rings, replace all the rings.

### **NOTE**

- When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.

## 5-30 ENGINE TOP END

### Cylinder, Pistons

#### *Piston Ring End Gap*

- Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap [B] between the ends of the ring with a thickness gauge.

#### **Piston Ring End Gap**

##### **Standard:**

**Top, Second**    **0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)**

**Oil**              **0.20 ~ 0.80 mm (0.0079 ~ 0.0315 in.)**

##### **Service Limit:**

**Top, Second**    **0.8 mm (0.031 in.)**

**Oil**              **1.1 mm (0.043 in.)**

- ★ If the end gap of either ring is greater than the service limit, replace all the rings.

#### *Boring, Honing*

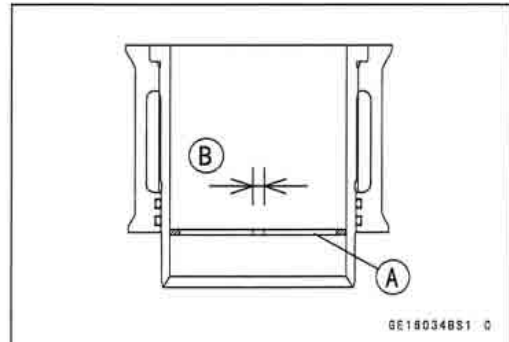
When boring and honing a cylinder, note the following:

- There is one size of oversize piston available. Oversize piston require oversize rings.

#### **Oversize Piston and Ring**

##### **0.5 mm    Oversize**

- Before boring a cylinder, first measure the exact diameter of the oversize piston, and then, according to the standard clearance in the Service Specification Section, determine the rebore diameter. However, if the amount of boring necessary would make the inside diameter greater than **0.5 mm** oversize, the cylinder block must be replaced.
- Cylinder inside diameter must not vary more than **0.01 mm** at any point.
- Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.
- In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus **0.1 mm** and the service limit for the piston is the oversize piston original diameter minus **0.15 mm**. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.
- Never separate the liner from the cylinder, because the top surface of cylinder and liner is machined at the factory as an assembly.



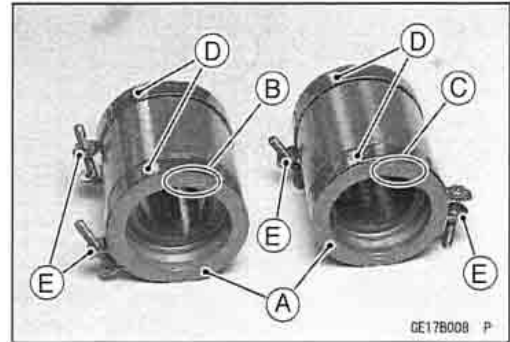
## Carburetor Holder

### *Carburetor Holder Installation*

- Install the carburetor holders [A] so that the “HEAD” marks [B] faces forward (cylinder head side), and “CARB” mark [C] faces backward (carburetor side).
- Install the holder clamps [D] as shown being careful of the screw [E] position and the screw head direction.

### **⚠ WARNING**

**Install the clamp screws horizontally. Otherwise the screws could come in contact with the vacuum adjusting screws, resulting in an unsafe riding condition.**

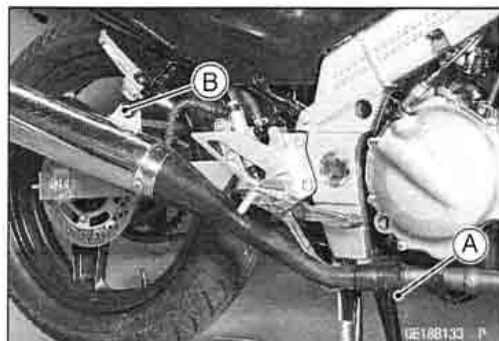


## 5-32 ENGINE TOP END

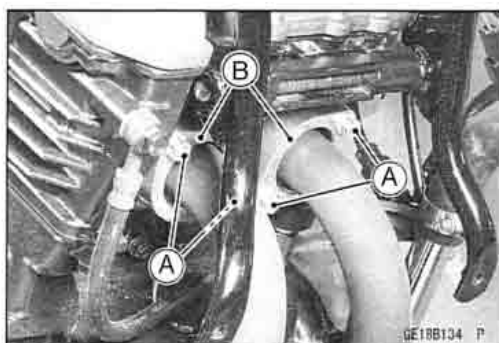
### Muffler

#### Muffler Removal

- Remove:
  - Radiator (see Cooling System chapter)
  - Lower Fairings (see Frame chapter)
  - Fairing Mounting Brackets
- Loosen the muffler clamp bolt [A] until the clamp turns freely on the mufflers..
- Remove the muffler mounting bolt [B] and nuts at the rear footpeg bracket, and take off the left and right mufflers.



- Remove the exhaust pipe holder nuts [A], and slide the holders [B] off its cylinder head studs.
- Remove the split keepers.
- Pull the exhaust pipe toward the front and remove it.
- Remove the gaskets and the exhaust pipe holders from the exhaust pipe.

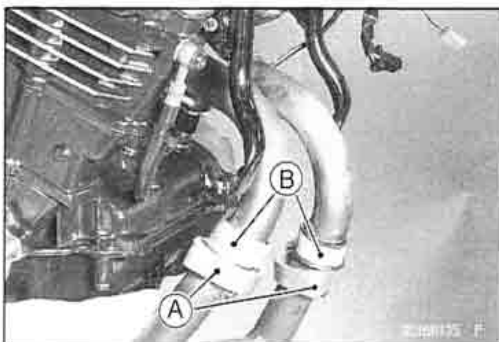


#### CAUTION

**Be careful not to touch the radiator fins during work. The fins are easily deformed.**

#### Muffler Installation

- Smear a little grease on a new exhaust pipe gasket and stick it into the exhaust port in the cylinder head.
- Slip the exhaust pipe holder over the exhaust pipe.
- Attach the exhaust pipe loosely to the cylinder head.
- Position the exhaust pipe in the exhaust port.
- Slide the holders [A] into the studs holding the split keeper [B] in place.
- Screw in the nuts loosely on the studs so that the holders does not fall down.
- Slip the muffler into place from the rear of the frame so that it fits over the exhaust pipe.
- Hold the muffler up and install the mounting bolts not to tighten them securely.
- Tighten the exhaust pipe holder nuts evenly and securely.
- Tighten the muffler mounting bolts securely.
- Tighten the muffler clamp bolts securely waving the direction of the clamp bolts.



---

## Muffler

---

### *Exhaust System Inspection*

- Before removing the exhaust system, check for signs of leakage at the exhaust pipe gasket in the cylinder head and at the muffler clamp.
- ★ If there are signs of leakage around the exhaust pipe gasket, it should be replaced. If the muffler to exhaust pipe joint leaks, tighten the clamp.
- Remove the exhaust system (see Muffler Removal).
- Inspect the gasket for damage and signs of leakage.
- ★ If the gasket is damaged or has been leaking, replace it.
- Check the exhaust pipe and muffler for dents, cracks, rust and holes.
- ★ If the exhaust pipe or muffler is damaged or has holes, it should be replaced for best performance and least noise.



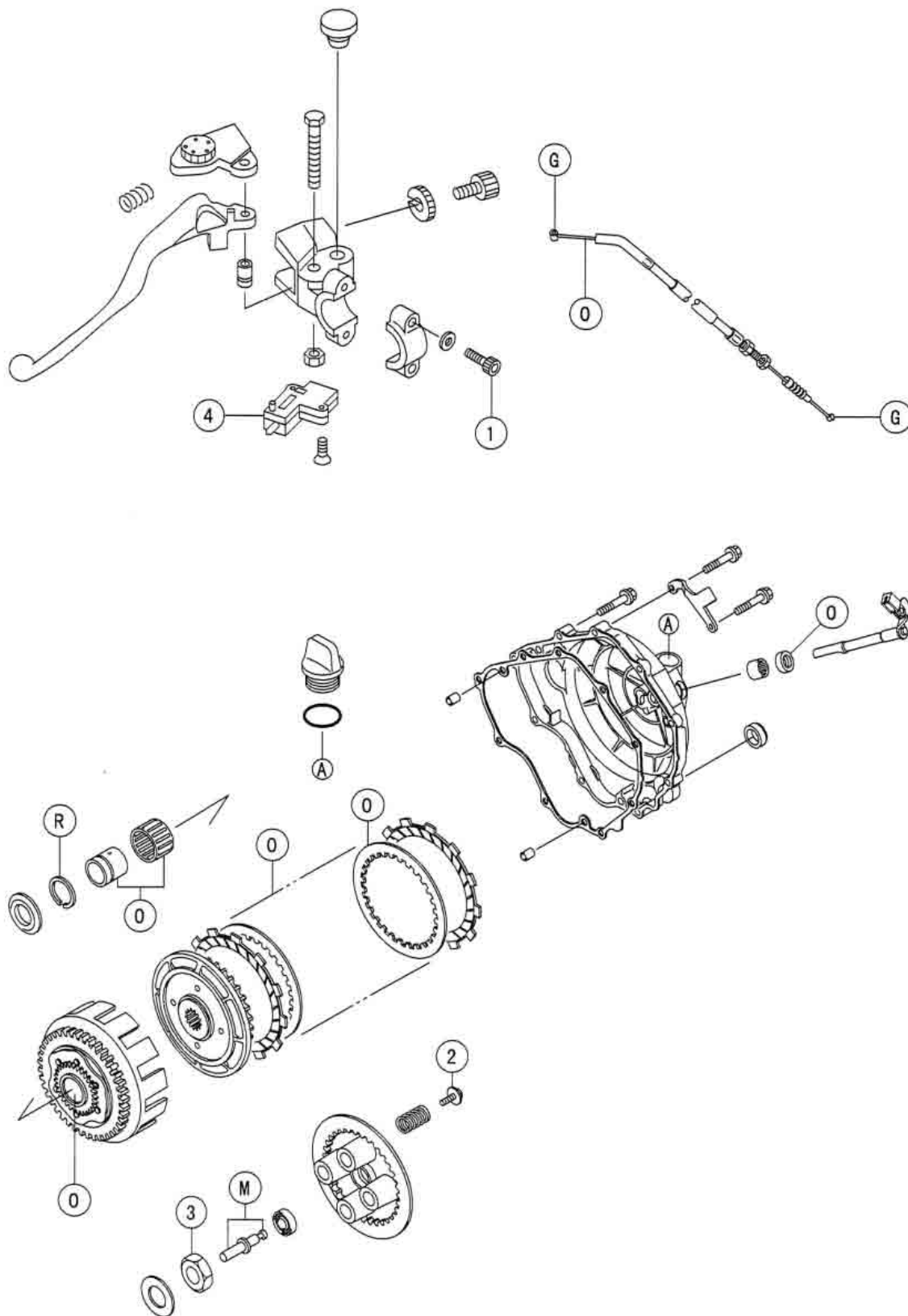
# Clutch

## Table of Contents

Exploded View .....	6-2
Specifications .....	6-4
Special Tool and Sealant .....	6-5
Clutch Lever and Cable .....	6-6
Clutch Lever Free Play Inspection .....	6-6
Clutch Lever Free Play Adjustment .....	6-6
Clutch Cable Removal .....	6-6
Clutch Cable Lubrication .....	6-6
Clutch Lever Removal .....	6-6
Clutch Cover .....	6-7
Clutch Cover Removal .....	6-7
Clutch Cover Installation Note .....	6-7
Clutch Release Shaft Removal .....	6-7
Clutch Release Shaft Installation .....	6-7
Clutch .....	6-8
Clutch Removal .....	6-8
Clutch Installation .....	6-8
Clutch Plate Wear and Damage .....	6-9
Clutch Plate Warp .....	6-9
Clutch Spring Free Length Inspection .....	6-9
Clutch Housing Finger Damage .....	6-9
Clutch Hub Spline Damage .....	6-9

## 6-2 CLUTCH

### Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Lever Holder Clamp Bolts	8.8	0.90	78 in·lb	
2	Clutch Spring Bolts	8.8	0.90	78 in·lb	
3	Clutch Hub Nut	132	13.5	98	

- 4. Starter Lockout Switch
- G: Apply grease.
- M: Apply molybdenum disulfide grease.
- O: Apply oil.
- R: Replacement Parts

6-4 CLUTCH

Specifications

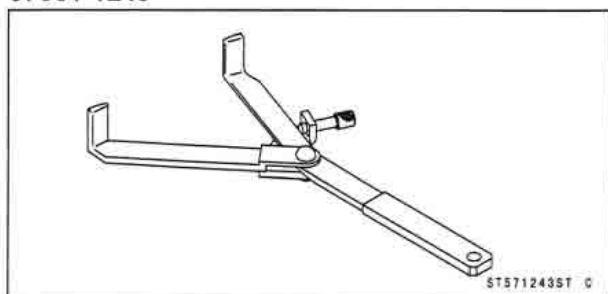
Item	Standard	Service Limit
Clutch		
Clutch Lever Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
Clutch Spring Free Play	32.6 mm (1.28 in.)	31.7 mm (1.25 in.)
Friction Plate Thickness	2.9 ~ 3.1 mm (0.11 ~ 0.12 in.)	2.8 mm (0.11 in.)
Friction and Steel Plate Warp	— — —	0.3 mm (0.012 in.)

---

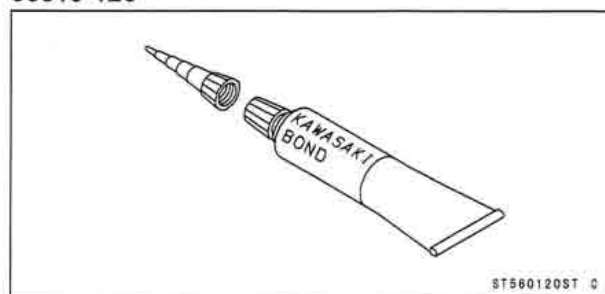
**Special Tool and Sealant**

---

**Clutch Holder:**  
**57001-1243**



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



## 6-6 CLUTCH

### Clutch Lever and Cable

#### *Clutch Lever Free Play Inspection*

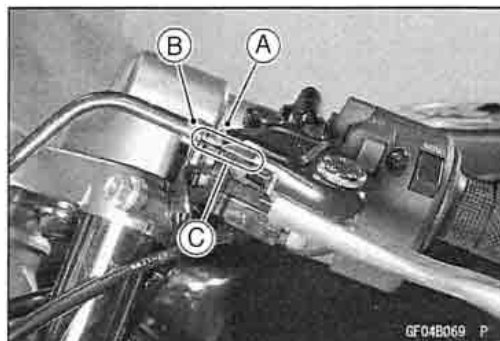
- Refer to the Clutch in the Periodic Maintenance chapter.

#### *Clutch Lever Free Play Adjustment*

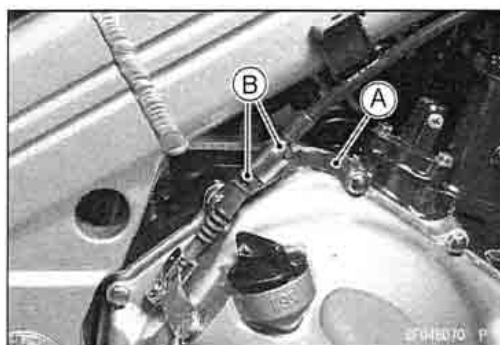
- Refer to the Clutch in the Periodic Maintenance chapter.

#### *Clutch Cable Removal*

- Remove:
  - Left Lower Fairing (see Frame chapter)
- Loosen the knurled locknut [A] at the clutch lever, and screw in the adjuster [B].
- Line up the slots [C] in the clutch lever, locknut, and adjuster and then free the cable from the lever.



- Remove the lower cable adjuster of clutch cable from the cable holder [A] loosening the cable adjuster lock nuts [B].
- Free the clutch inner cable tip from the clutch release lever.

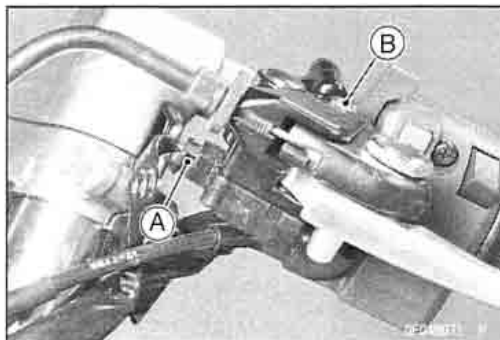


#### *Clutch Cable Lubrication*

- Refer to the General Lubrication in the Periodic Maintenance chapter.

#### *Clutch Lever Removal*

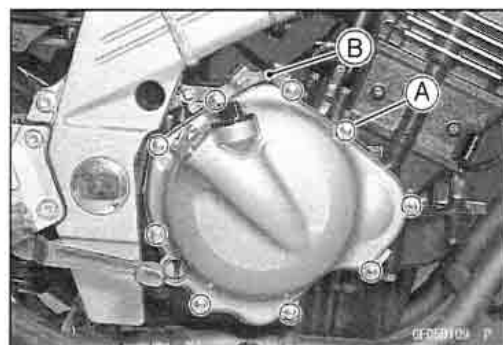
- Remove the upper end of clutch cable.
- Disconnect the starter lockout switch connector [A].
- Remove the clutch lever mounting bolt [B], and remove the clutch lever.



## Clutch Cover

### Clutch Cover Removal

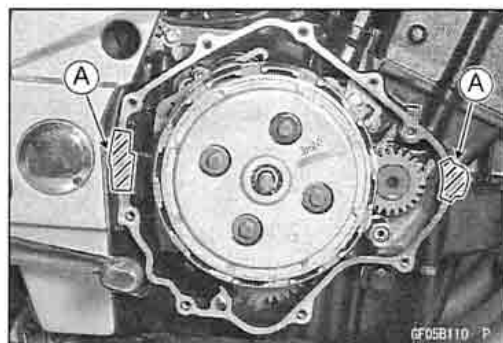
- Drain the engine oil (see Engine Lubrication System chapter).
- Remove:
  - Right Lower Fairing (see Frame chapter)
  - Clutch Cable (see Clutch Cable Removal)
- Turn the clutch release lever counterclockwise fully to release the clutch release shaft.
- Remove the clutch cover mounting bolts [A] and the clutch cable guide [B].



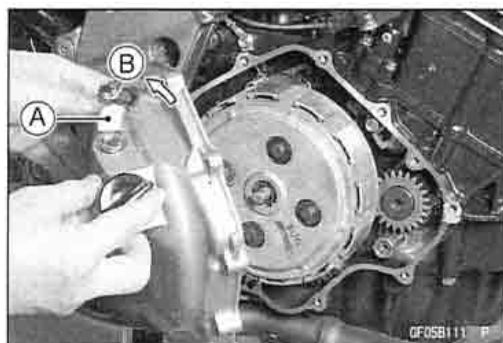
### Clutch Cover Installation Note

- Scrape the old gasket from the surface of clutch cover and crankcase, and apply silicone sealant on the mating surface [A] of the crankcases.
- Install the new clutch cover gasket.

**Special Tool - Kawasaki Bond (Silicone Sealant): 56019-120**



- Turn the clutch release lever [A] counterclockwise fully [B] and install the clutch cover.



### Clutch Release Shaft Removal

- Remove:
  - Clutch Cable (see Clutch Cable Removal)
  - Clutch Cover (see Clutch Cover Removal)
- Pull out the clutch release shaft from the clutch cover.

### NOTE

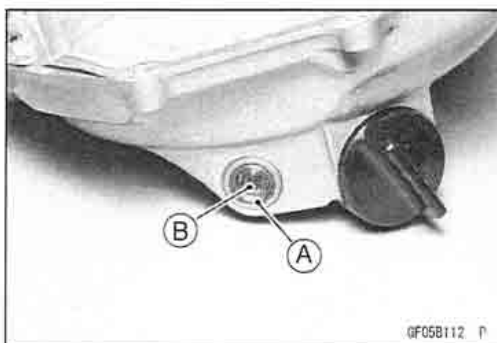
○ Do not damage the oil seal when it shall be inserted into the clutch cover hole.

### Clutch Release Shaft Installation

- Apply engine oil to the oil seal [A] and needle bearing [B].
- Insert the clutch release shaft into the clutch cover hole.
- Install:
  - Clutch Cover (see Clutch Cover Installation)
  - Clutch Cable (see Clutch Cable Installation)

### CAUTION

**When inserting the release shaft, be careful not to remove the spring of the oil seal.**

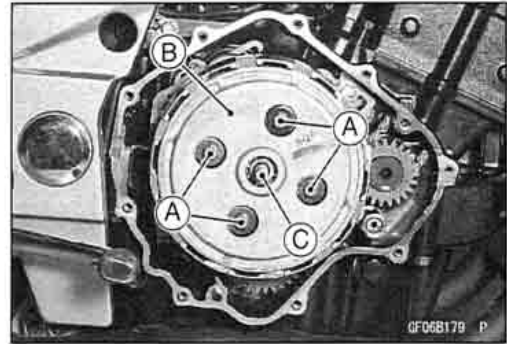


## 6-8 CLUTCH

### Clutch

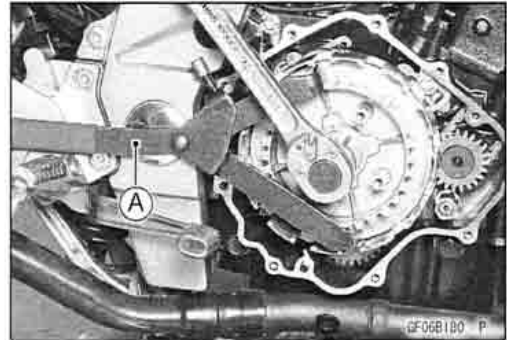
#### Clutch Removal

- Remove:
  - Clutch Cable (see Clutch Cable Removal)
  - Clutch Cover (see Clutch Cover Removal)
- Remove the clutch spring mounting bolts [A], springs, clutch operating plate [B] with the clutch push rod [C].
- Remove the clutch steel plate and friction plate.



- Remove the clutch hub nut using the special tool [A].
- Remove the washer, clutch housing, needle bearing, bushing and the thrust spacer.

**Special Tool - Clutch Holder: 57001-1243**



#### Clutch Installation

- Install the thrust spacer [A] so that the chamfer side of it faces to inside of the engine.

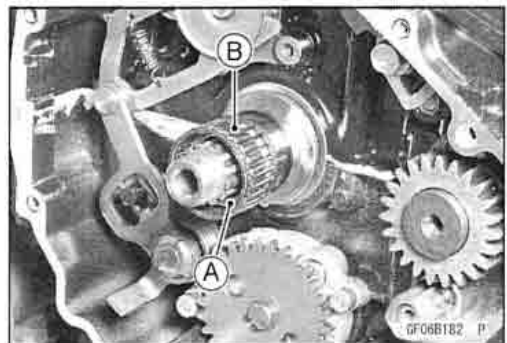


- Install the spacer bushing [A] and needle bearing [B].
- Install the clutch housing, clutch hub, washer and the clutch hub nut.
- Tighten the clutch hub nut with the specified torque.

**Special Tool - Clutch Holder: 57001-1243**

**Torque - Clutch Hub Nut: 132 N·m (13.5 kgf·m, 98 ft·lb)**

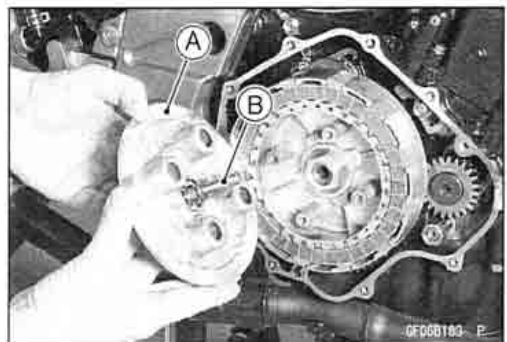
- Install the friction plate first and clutch steel plate, and afterward install them alternately.



- Install the clutch operating plate [A] with the clutch push rod [B].
- Install the springs and tighten the clutch spring bolts with specified torque.

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

- Install the clutch cover (see Clutch Cover Installation).





## Clutch

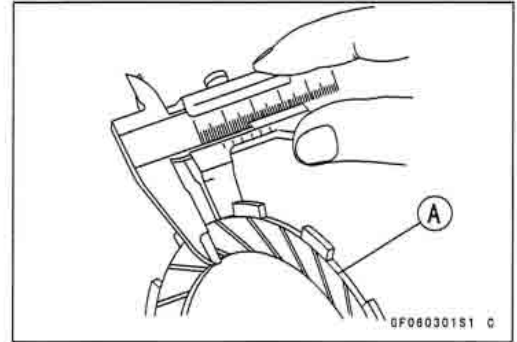
### Clutch Plate Wear and Damage

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.
- ★ If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

#### Friction Plate Thickness

**Standard:** 2.9 ~ 3.1 mm (0.11 ~ 0.12 in.)

**Service Limit:** 2.8 mm (0.11 in.)

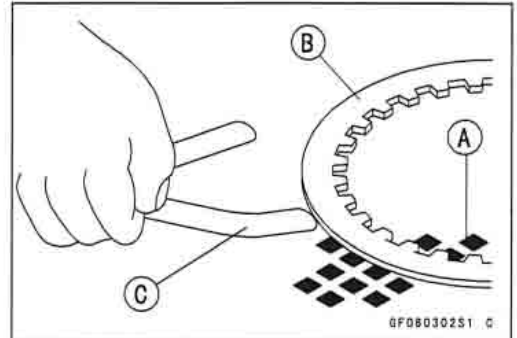


### Clutch Plate Warp

- Place each friction plate or steel plate on a surface plate and measure the gap between the surface plate [A] and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp.
- ★ If any plate is warped over the service limit, replace it with a new one.

#### Friction and Steel Plate Warp

**Service Limit:** 0.3 mm (0.012 in.)



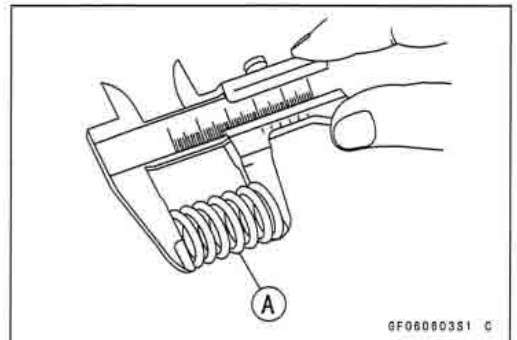
### Clutch Spring Free Length Inspection

- Measure the free length of the clutch springs [A].
- ★ If any spring is shorter than the service limit, it must be replaced.

#### Clutch Spring Free Length

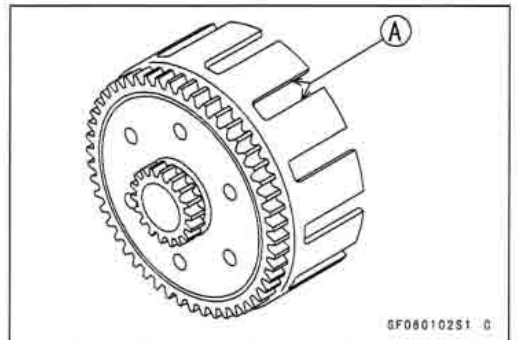
**Standard:** 32.6 mm (1.28 in.)

**Service Limit:** 31.7 mm (1.25 in.)



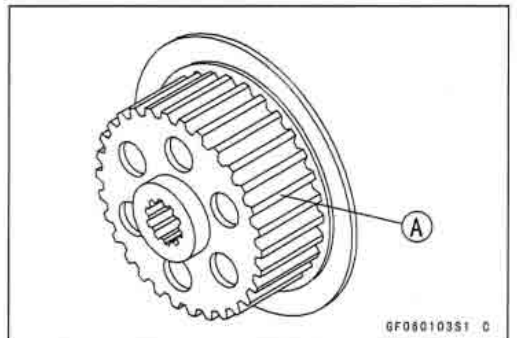
### Clutch Housing Finger Damage

- 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 Hub Spline Damage

- 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.



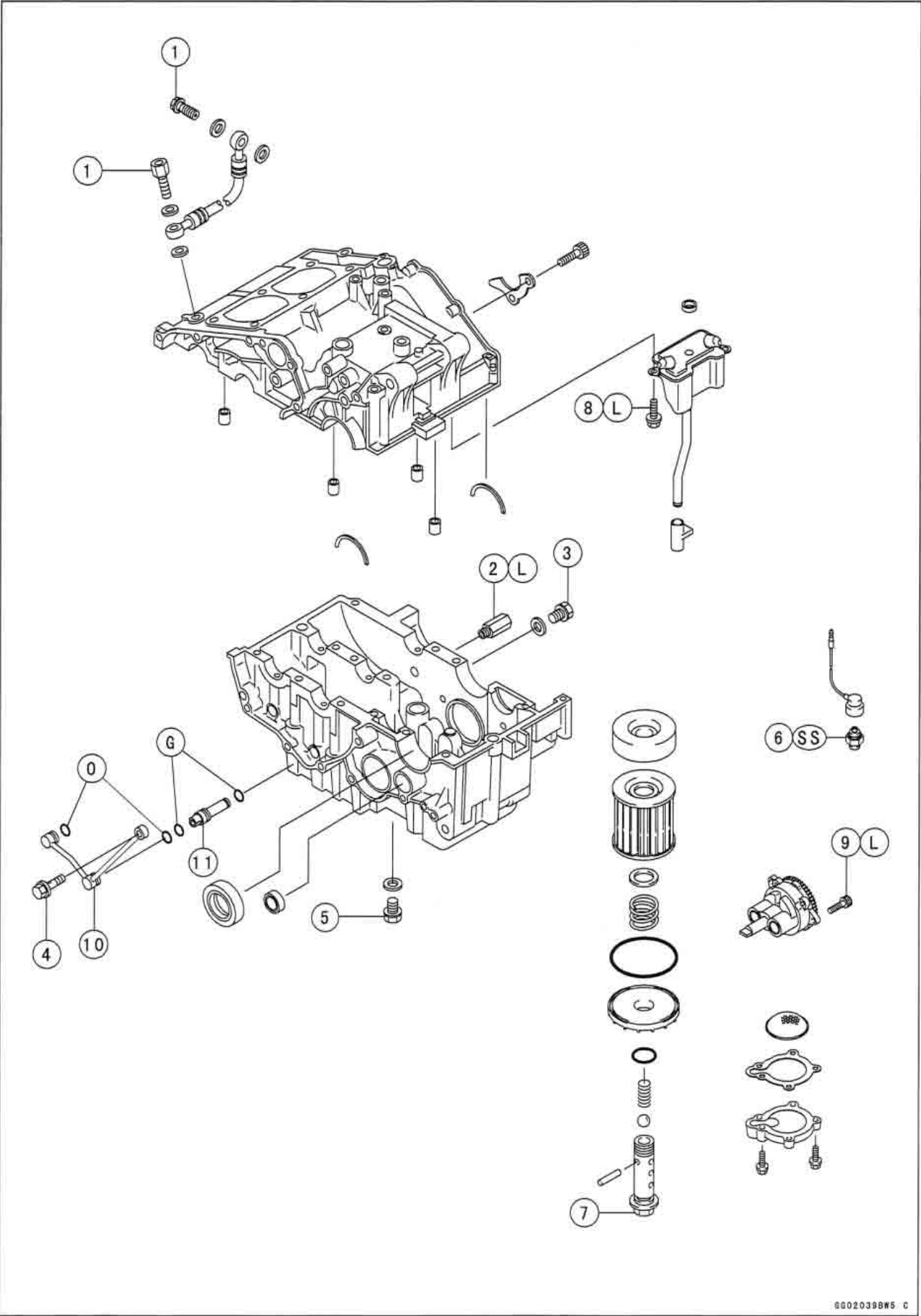
# Engine Lubrication System

## Table of Contents

Exploded View .....	7-2
Specifications .....	7-4
Special Tools and Sealant .....	7-5
Engine Oil Flow Chart.....	7-6
Engine Oil and Oil Filter.....	7-10
Oil Level Inspection.....	7-10
Engine Oil Change.....	7-10
Oil Filter Replacement .....	7-10
Bypass Valve Disassembly .....	7-11
Bypass Valve Assembly.....	7-11
Bypass Valve Cleaning and Inspection.....	7-11
Oil Screen Cleaning and Inspection.....	7-11
Oil Pressure Relief Valve.....	7-12
Oil Pressure Relief Valve Removal .....	7-12
Oil Pressure Relief Valve Installation .....	7-12
Oil Pressure Relief Valve Inspection.....	7-12
Oil Pump.....	7-13
Oil Pump Removal.....	7-13
Oil Pump Installation.....	7-13
Oil Pump Disassembly.....	7-13
Oil Pump Assembly.....	7-13
Oil Pump Inspection.....	7-13
Oil Pressure Measurement.....	7-14
Oil Pressure Measurement .....	7-14
Oil Pressure Switch .....	7-15
Oil Pressure Switch Removal .....	7-15
Oil Pressure Switch Installation .....	7-15

7-2 ENGINE LUBRICATION SYSTEM

Exploded View



## ENGINE LUBRICATION SYSTEM 7-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Hose Banjo Bolts	20	2.0	14.5	
2	Oil Pressure Relief Valve	15	1.5	11	L
3	Crankcase Oil Passage Plug	15	1.5	11	
4	Oil Pipe Banjo Bolt	12	1.2	104 in·lb	
5	Oil Drain Bolt	20	2.0	14.5	
6	Oil Pressure Switch	15	1.5	11	SS
7	Oil Filter Mounting Bolts	20	2.0	14.5	
8	Oil Breather Mounting Bolts	–	–	–	L
9	Oil Pump Mounting Bolts	12	1.2	104 in·lb	L

10. Oil Pipe

11. Oil Passage Pipe

G: Apply grease.

L: Apply a non-permanent locking agent.

O: Apply oil.

SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

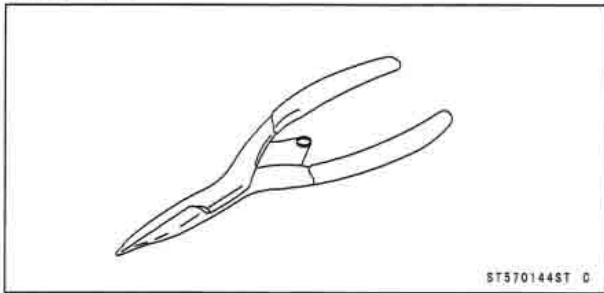
## 7-4 ENGINE LUBRICATION SYSTEM

### Specifications

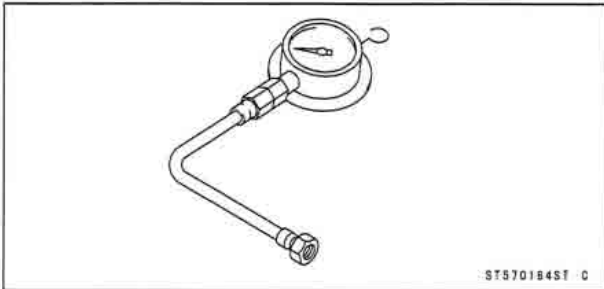
Item	Standard
<b>Engine Oil</b>	
Grade	API SE, SF or SG API SH or SJ with JASO MA
Viscosity	SAE 10W-40
Capacity	1.5 L (1.59 US qt) (when filter is not removed) 1.9 L (2.01 US qt) (when filter is removed)
<b>Oil Pressure Measurement</b>	
Relief Valve Opening Pressure	430 ~ 590 kPa (4.4 ~ 6.0 kgf/cm <sup>2</sup> , 63 ~ 85 psi)
Oil Pressure @4 000 r/min (rpm), Oil Temperature 90°C (194°F)	More than 345 kPa (3.5 kgf/cm <sup>2</sup> , 50 psi)

### Special Tools and Sealant

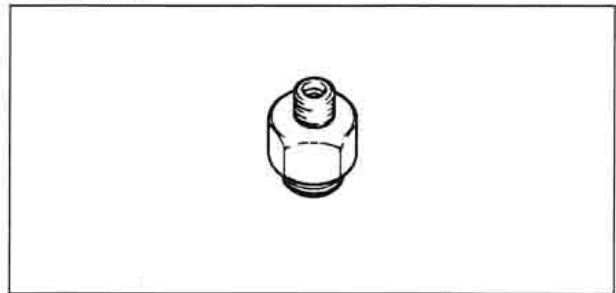
Outside Circlip Pliers:  
57001-144



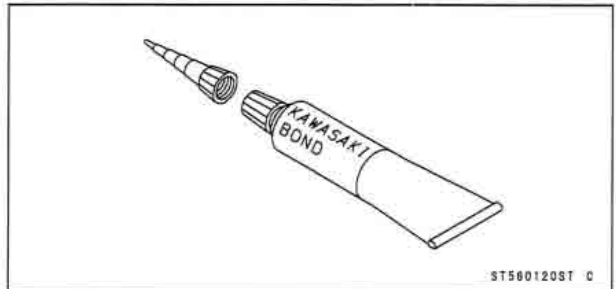
Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>:  
57001-164



Oil Pressure Gauge Adapter, M18 × 1.5:  
57001-1278

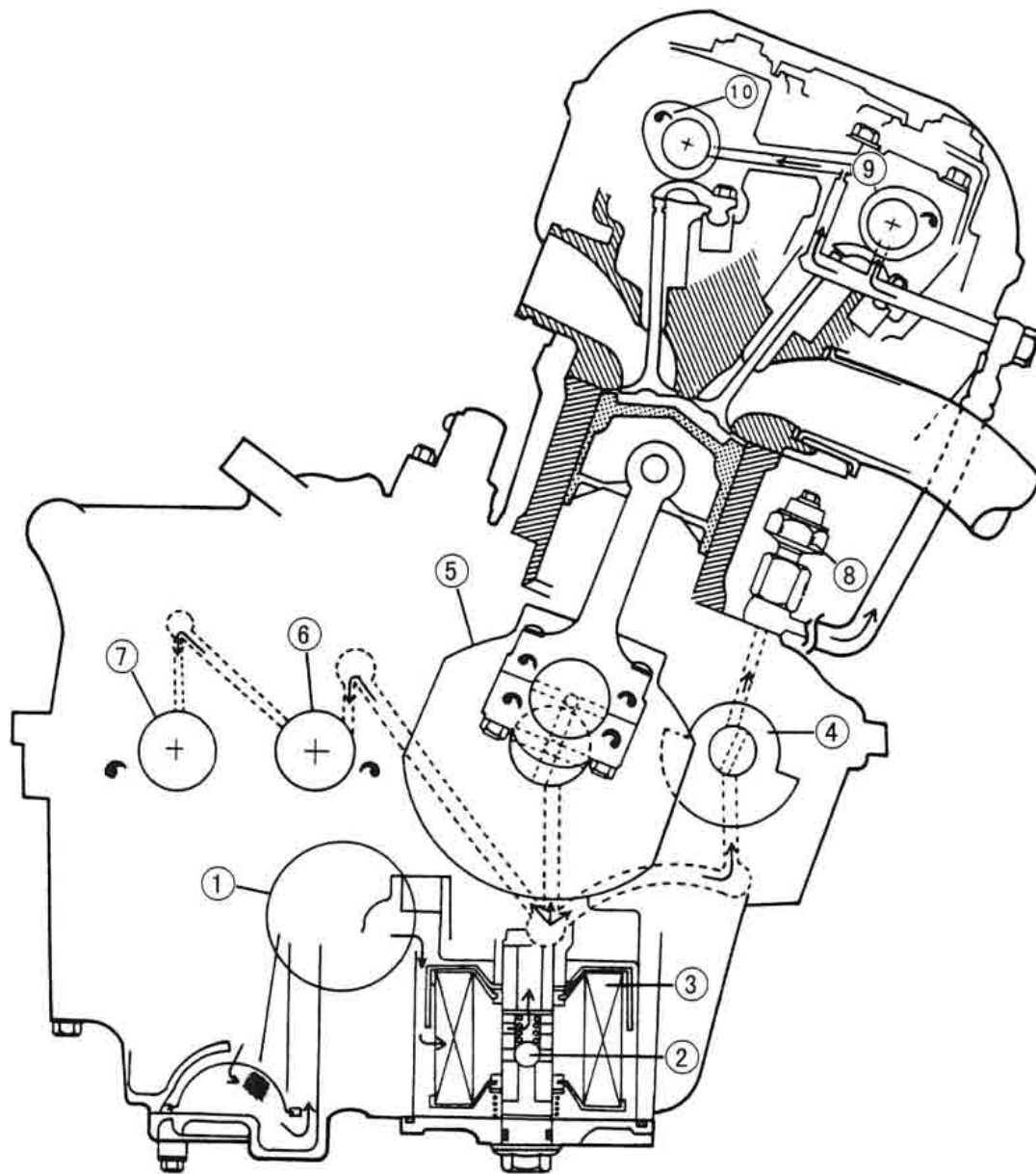


Kawasaki Bond (Silicone Sealant):  
56019-120



## 7-6 ENGINE LUBRICATION SYSTEM

### Engine Oil Flow Chart



### Engine Oil Flow Chart

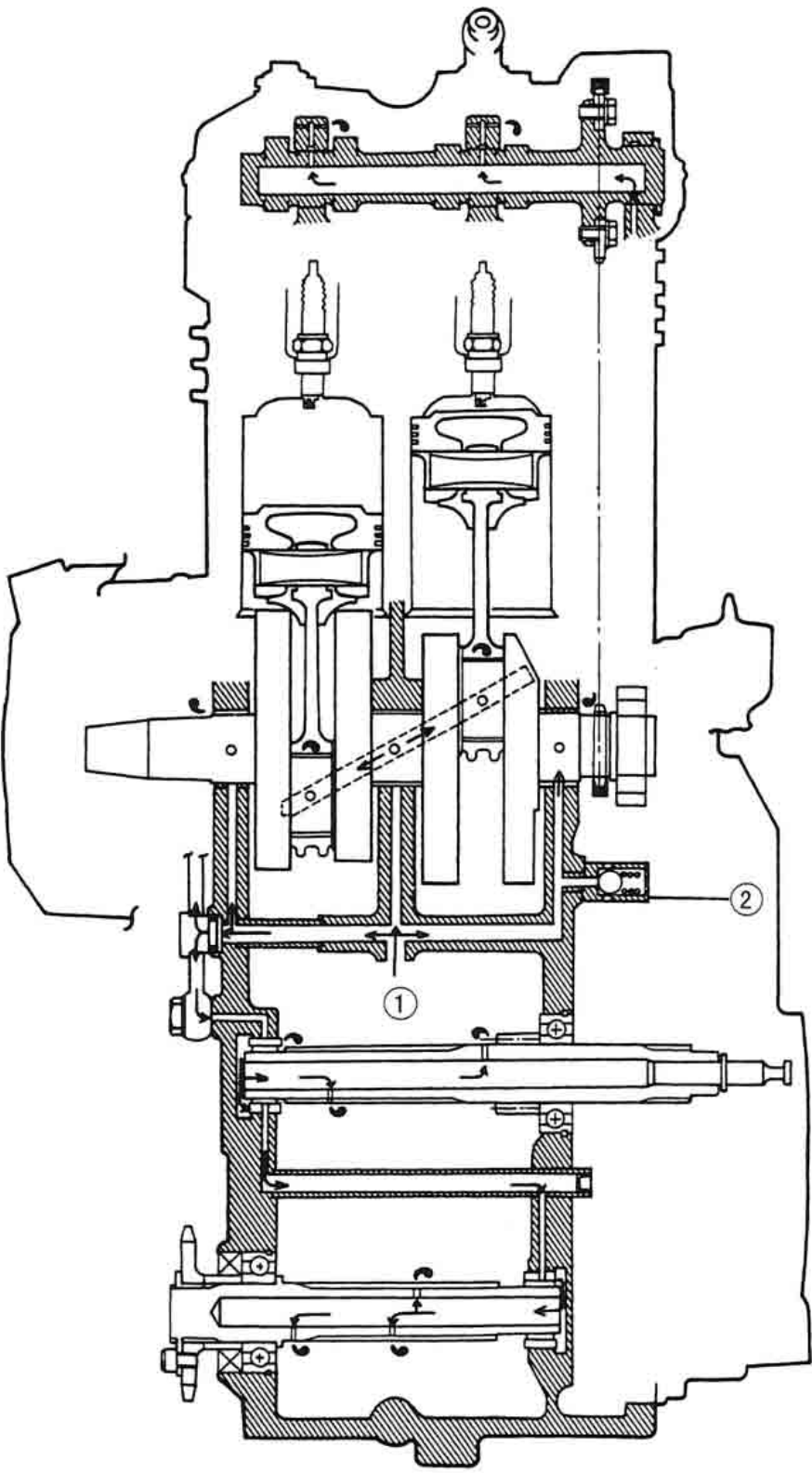
---

1. Oil Pump
2. Bypass Valve
3. Oil Filter
4. Balancer Shaft
5. Crankshaft
6. Drive Shaft
7. Output Shaft
8. Oil Pressure Switch
9. Exhaust Camshaft
10. Inlet Camshaft



7-8 ENGINE LUBRICATION SYSTEM

Engine Oil Flow Chart



### Engine Oil Flow Chart

---

1. Oil Flow from Oil Pump
2. Oil Pressure Relief Valve

## 7-10 ENGINE LUBRICATION SYSTEM

### Engine Oil and Oil Filter

#### **⚠ WARNING**

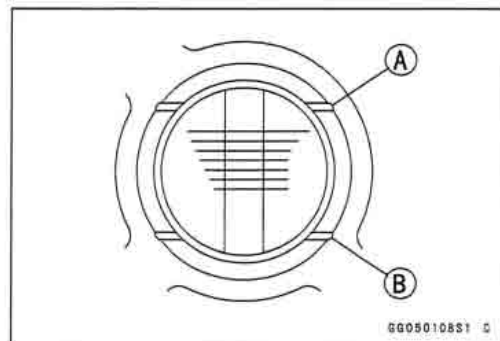
Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

#### *Oil Level Inspection*

- Check that the engine oil level is between the upper [A] and lower [B] levels in the gauge.
- ★ If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- ★ If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.

#### **NOTE**

- Situate the motorcycle so that it is perpendicular to the ground.
- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.
- If the engine oil type and make are unknown, use any brand of the specified oil to top up the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.



#### **CAUTION**

Racing the engine before the oil reaches every part can cause engine seizure.

If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

#### *Engine Oil Change*

- Refer to the Engine Lubrication System in the Periodic Maintenance chapter.

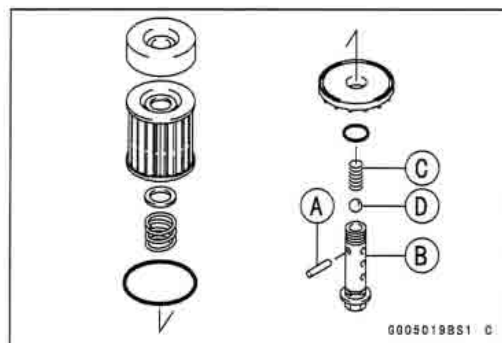
#### *Oil Filter Replacement*

- Refer to the Engine Lubrication System in the Periodic Maintenance chapter.

## Engine Oil and Oil Filter

### Bypass Valve Disassembly

- Remove the oil filter. Oil draining is not necessary, but place the oil pan under the oil filter because oil drain a little at the oil filter removal.
- Drive the retaining pin [A] out of the filter mounting bolt [B].
- Drop out the spring [C] and the bypass valve steel ball [D].



### Bypass Valve Assembly

- Drop the bypass valve steel ball into the filter mounting bolt.
- Put the spring into the mounting bolt and compress it beyond the small hole.
- Drive the retaining pin into the small hole to hold the spring.
- Install the oil filter.

### Bypass Valve Cleaning and Inspection

- Remove the oil filter.
- Disassemble the bypass valve.
- Clean the bypass valve parts in a high flash-point solvent.

### ⚠ WARNING

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

- Visually inspect the bypass valve parts.
- ★ If there is any damaged part, replace it.

### Oil Screen Cleaning and Inspection

- Remove the oil screen cover [A].
- Clean the oil pump screen [B] with high flash-point solvent and remove any particles stuck to it.

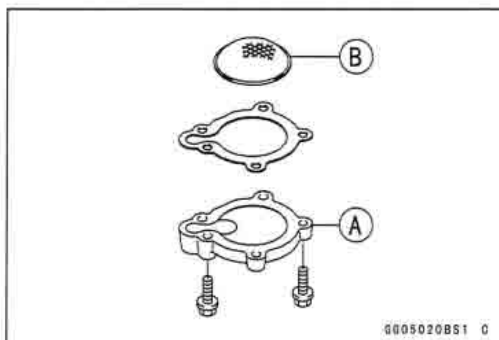
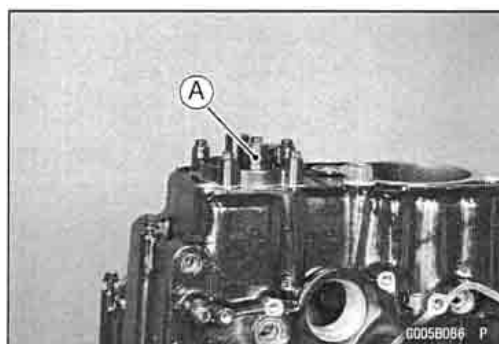
### ⚠ WARNING

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

### NOTE

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

- Check the screen carefully for any damage: holes and broken wires.
- ★ If the screen is damaged, replace the oil screen assembly.

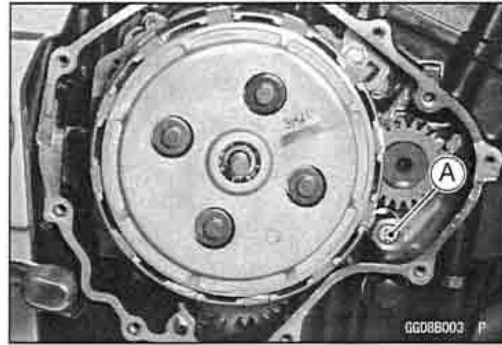


## 7-12 ENGINE LUBRICATION SYSTEM

### Oil Pressure Relief Valve

#### *Oil Pressure Relief Valve Removal*

- Remove the clutch cover (see Clutch chapter).
- Unscrew the oil pressure relief valve [A] from the crankcase.



#### *Oil Pressure Relief Valve Installation*

- Apply a non-permanent locking agent to the threads of the relief valve, and tighten it with the specified torque.

**Torque - Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)**

#### **CAUTION**

**Do not over apply a non-permanent locking agent to the threads. This may block the oil passage.**

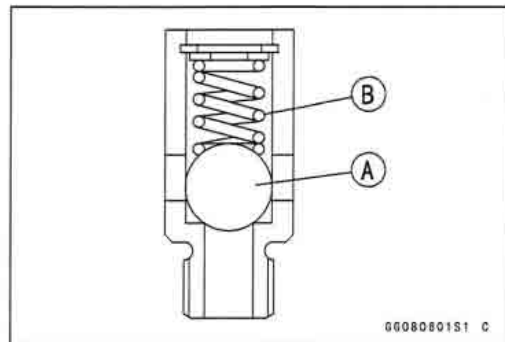
#### *Oil Pressure Relief Valve Inspection*

- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

#### **NOTE**

○ *Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

- ★ If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.



#### **⚠ WARNING**

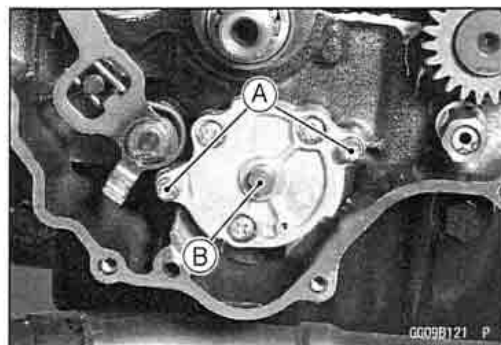
**Clean the oil pressure relief valve in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.**

- ★ If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

## Oil Pump

### Oil Pump Removal

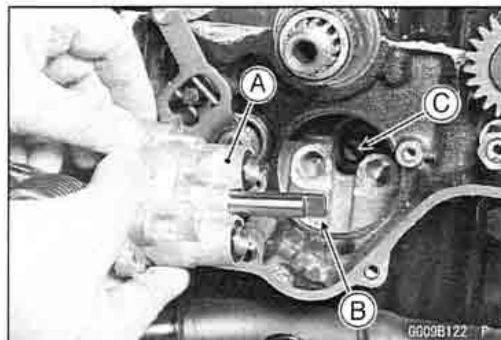
- Remove the clutch cover (see Clutch chapter).
- Remove the clutch (see Clutch chapter).
- Remove the circlip and oil pump gear.
- Remove the oil pump mounting Allen bolts [A].
- Pull the oil pump [B] off the crankcase.



### Oil Pump Installation

- Fill the oil pump with engine oil for initial lubrication.
- When installing the oil pump [A], note the position of the water pump shaft slot [C] and turn the oil pump shaft so that the projection [B] fits into the slot.
- Apply a non-permanent locking agent to the threads of the oil pump mounting Allen bolts, and tighten them securely.

**Torque - Oil Pump Mounting Allen Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**

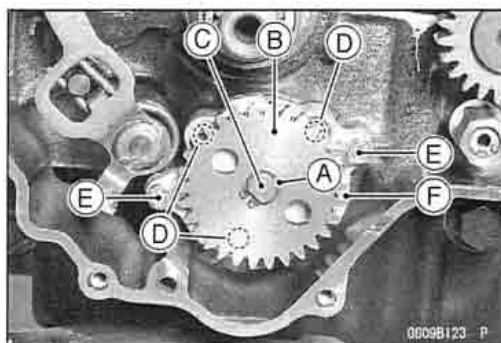


### Oil Pump Disassembly

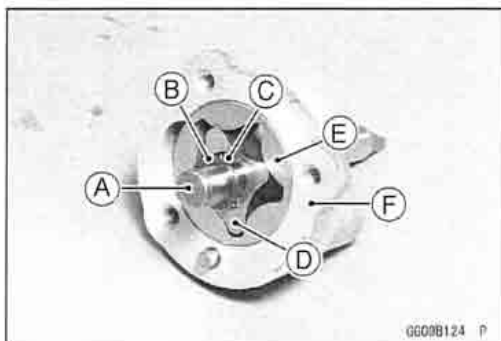
- Remove the circlip [A] with circlip pliers on the oil pump shaft end.

**Special Tool - Outside Circlip Pliers: 57001-144**

- Take off the gear [B] from the shaft [C].
- Loosen the screws [D] before removing the oil pump mounting bolts [E].
- Remove the oil pump (see Oil Pump Removal).
- Unscrew the oil pump cover screws [D] and take off the cover [F].



- Pull the oil pump shaft [A], washer [B], pins [C], inner rotor [D] and outer rotor [E] from the pump body [F].



### Oil Pump Assembly

- Oil pump assembly is the reverse of disassembly.
- After completing the oil pump assembly, check that the rotor shaft and rotor turn smoothly.

### Oil Pump Inspection

- Disassemble the oil pump (see Oil Pump Disassembly).
- Visually inspect the oil pump body, inner and outer rotors and covers.
- ★ If there is any damage or uneven wear, replace the oil pump as an assembly.

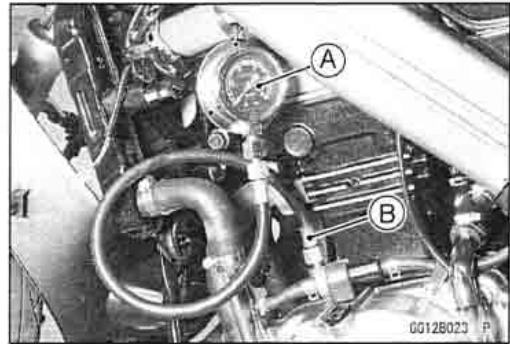
## 7-14 ENGINE LUBRICATION SYSTEM

### Oil Pressure Measurement

#### *Oil Pressure Measurement*

- Remove the lower fairing (see Frame chapter).
- Remove the oil pressure switch, and attach the adapter [B] and gauge [A] to the switch hole.

**Special Tools - Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>: 57001-164**  
**Oil Pressure Gauge Adapter, M18 × 1.5: 57001-1278**



- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.
- ★ If the oil pressure is much lower than the standard, check the oil pump and oil pump relief valve.
- ★ If the reading is much higher than the standard, check the oil passages for clogging.

#### **Oil Pressure**

**Standard: more than 345 kPa (3.5 kgf/cm<sup>2</sup>, 50 psi)**  
**@ 4 000 r/min (rpm), oil temperature 90°C (194°F)**

- Stop the engine.
- Remove the oil pressure gauge and adapter.

#### **⚠ WARNING**

**Take care against burns from hot engine oil that will drain through the oil passage when the gauge adapter is removed.**

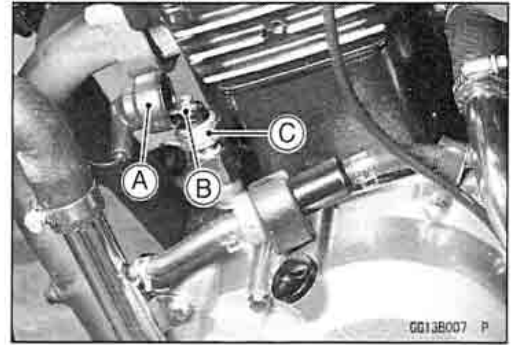
- Apply silicone sealant to the threads of the oil pressure switch, and tighten it.

**Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)**

### Oil Pressure Switch

#### *Oil Pressure Switch Removal*

- Remove:
  - Lower Fairing (see Frame chapter)
  - Switch Cover [A]
  - Switch Terminal [B]
  - Oil Pressure Switch [C]



#### *Oil Pressure Switch Installation*

- Apply silicone sealant to the threads of the oil pressure switch and tighten it.
  - Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**
  - Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)**
- Tighten the oil pressure switch terminal bolt.
- Apply grease to the terminal.



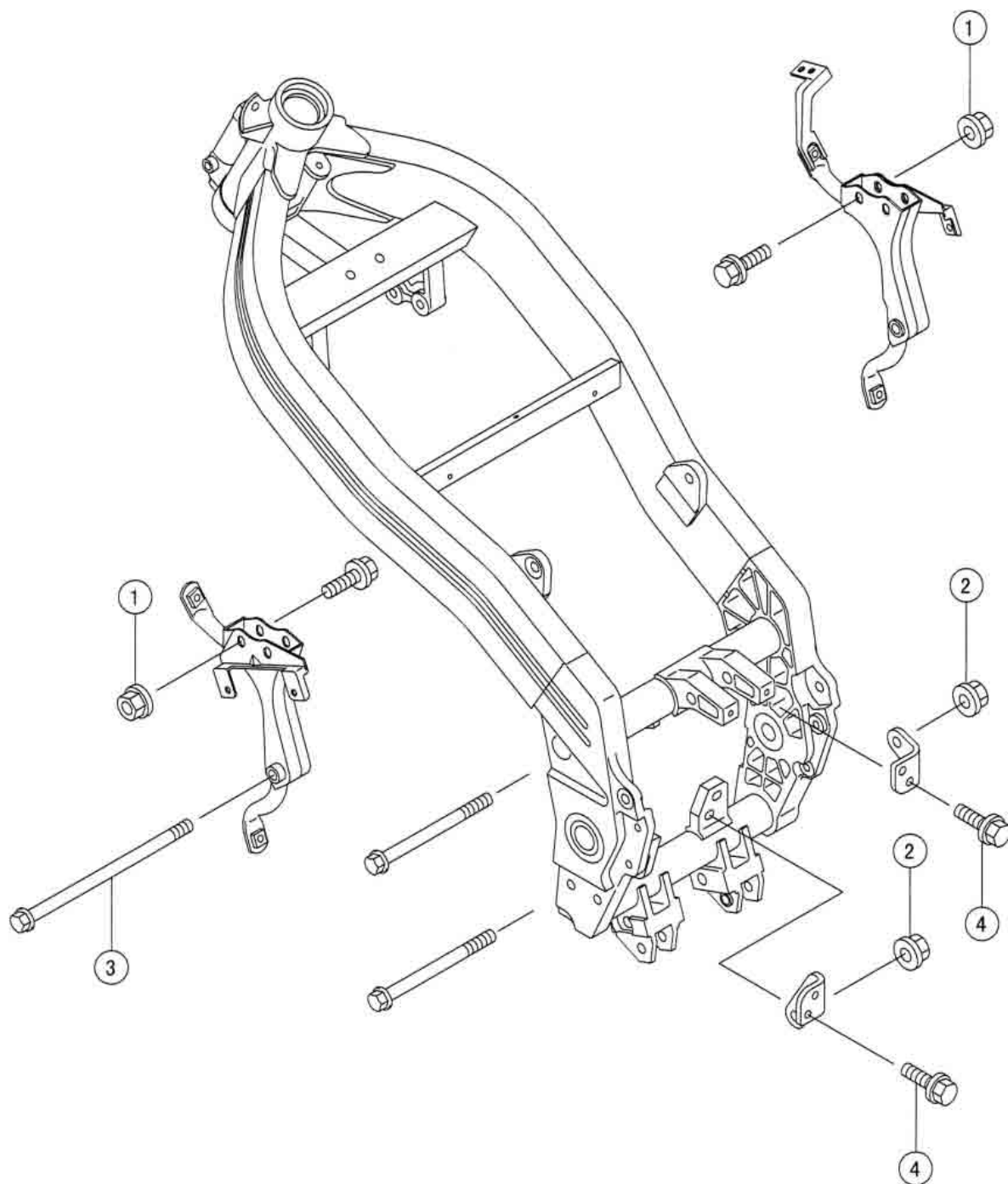
# Engine Removal/Installation

## Table of Contents

Exploded View .....	8-2
Engine Removal/Installation .....	8-4
Engine Removal.....	8-4
Engine Installation.....	8-5

## 8-2 ENGINE REMOVAL/INSTALLATION

### Exploded View



## ENGINE REMOVAL/INSTALLATION 8-3

### Exploded View

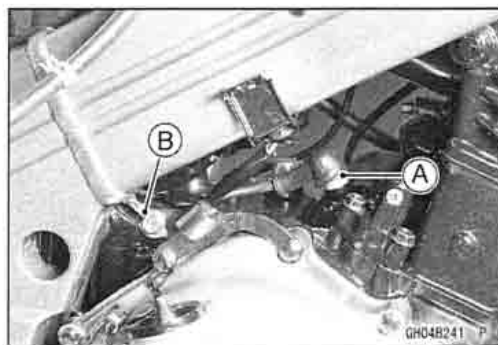
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Mounting Bracket Nuts	25	2.5	18	
2	Engine Mounting Nuts	44	4.5	33	
3	Engine Mounting Bolts	44	4.5	33	
4	Engine Mounting Bracket Bolts	25	2.5	18	

## 8-4 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

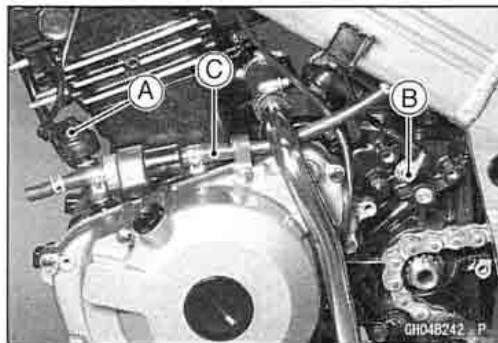
#### Engine Removal

- Drain the engine oil (see Engine Lubrication System in the Periodic Maintenance chapter).
- Drain the coolant (see Cooling System in the Periodic Maintenance chapter).
- Remove:
  - Seat
  - Side Covers
  - Fairings (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Side Stand
  - Side Stand Switch Terminal
  - Radiator with Left Side Coolant Pipe
  - Mufflers (see Engine Top End chapter)
  - Engine Sprocket (see Final Drive chapter)
  - Throttle and Choke Cable
  - Lower End of Clutch Cable
- Disconnect:
  - Starter Motor Lead Terminal [A]
  - Battery Ground Lead Terminal [B]
  - Breather Hose
  - Alternator Lead Connector
  - Crankshaft Sensor Lead Connector

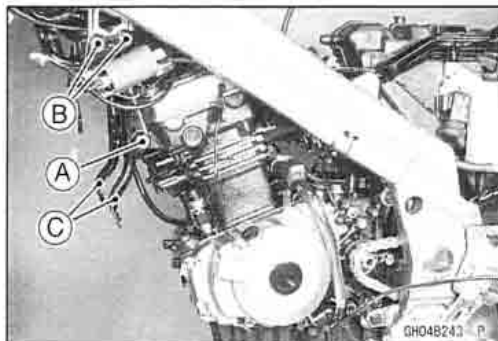


- Oil Pressure Switch Lead Connector [A]
- Neutral Switch Lead Terminal [B]

- Before removing the engine, loosen the carburetor holder clamp and hold the carburetor to the air cleaner duct.
- Remove the coolant hose [C] with coolant filter from the carburetor.

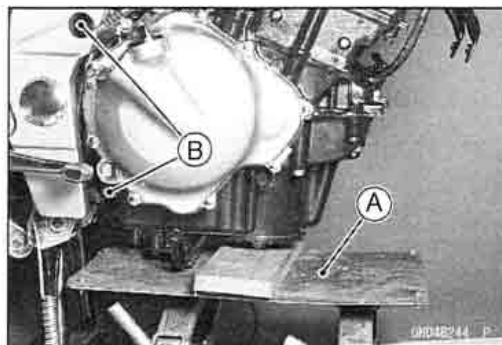


- Remove the spark plug caps.
- Remove the engine bracket mounting bolts [A], [B] and take the both brackets [C] with the ignition coils off the frame.



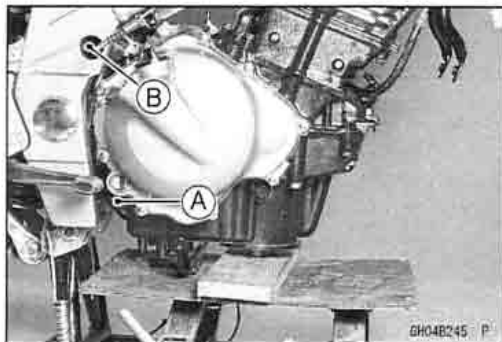
## Engine Removal/Installation

- Support the engine with a suitable stand [A] and remove the engine mounting bolts [B].



### Engine Installation

- Engine installation is the reverse of removal, and note the following point.
- Insert the lower engine mounting bolt [A] first while supporting the engine. Then insert the upper engine mounting bolt [B], and tighten the nut loosely.



- Before tightening the mounting bolts, install the engine brackets. When inserting the front engine mounting bolt, use the suitable stand under the engine to lift it.

**Torque - Engine Mounting Bracket Bolts, Nuts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

**Engine Mounting Bolts, Nuts: 44 N·m (4.5 kgf·m, 33 ft·lb)**

- Route the wiring harness correctly (see Cable, Wire and Hose Routing in the Appendix chapter).
- Adjust the following items after engine installation.
  - Throttle cable (see Fuel System in the Periodic Maintenance chapter)
  - Choke Cable (see Fuel System chapter)
  - Clutch Cable (see Clutch in the Periodic Maintenance chapter)
  - Drive Chain Slack (see Final Drive in the Periodic Maintenance chapter)
  - Carburetor Idling (see Fuel System in the Periodic Maintenance chapter)
- Fill the engine oil (see Engine Lubrication System in the Periodic Maintenance chapter).
- Fill the coolant (see Cooling System in the Periodic Maintenance chapter).

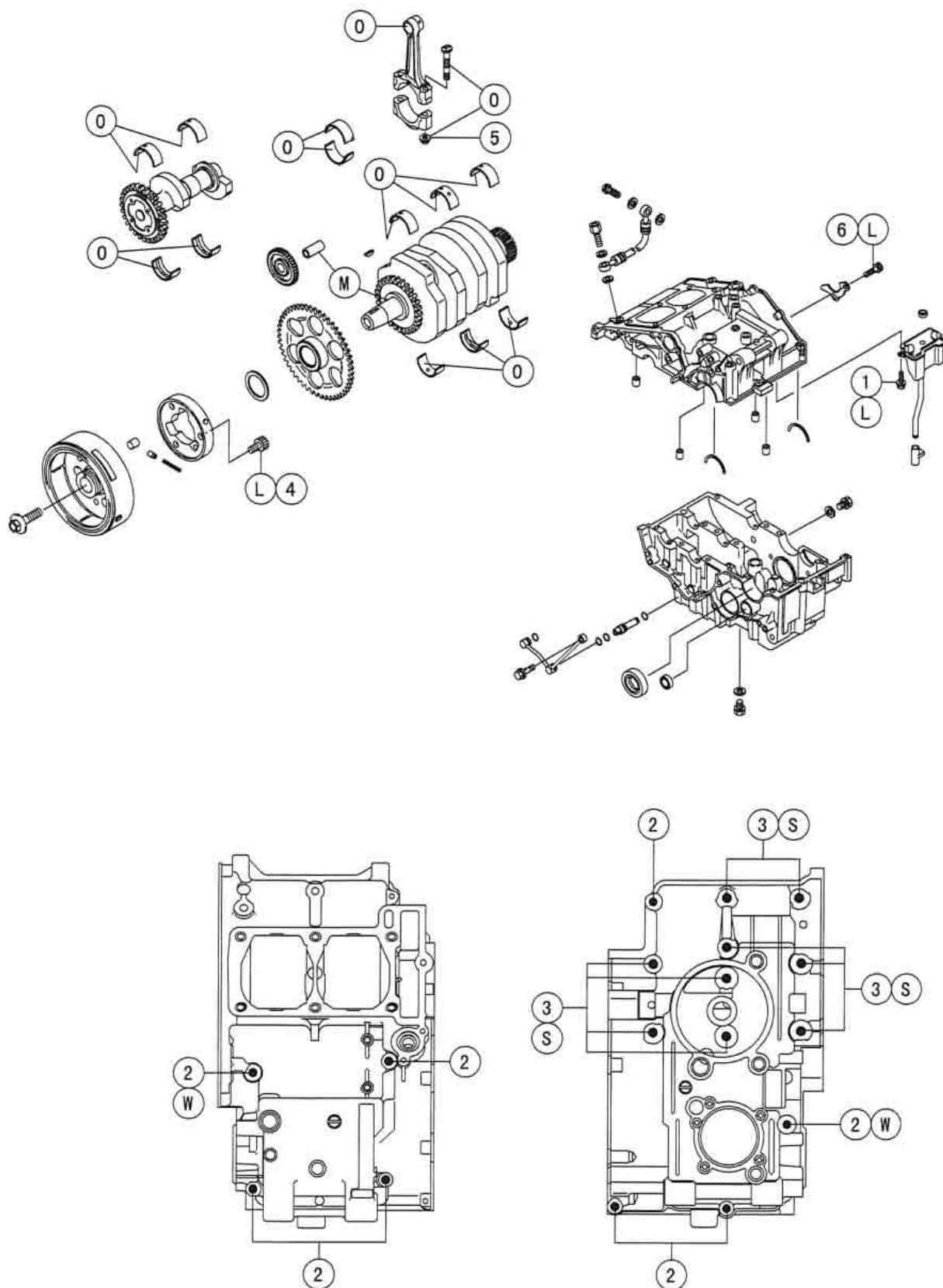
# Crankshaft/Transmission

## Table of Contents

Exploded View .....	9-2	Starter Motor Clutch Assembly ....	9-20
Specifications .....	9-6	Balancer .....	9-21
Special Tools and Sealant .....	9-9	Balancer Removal.....	9-21
Crankcase .....	9-10	Balancer Installation.....	9-21
Crankcase Splitting .....	9-10	Balancer Shaft Bearing	
Crankcase Assembly .....	9-11	Insert/Journal Wear .....	9-21
Crankcase Exchange .....	9-13	Transmission .....	9-23
Crankshaft and Connecting Rods.....	9-14	External Shift Mechanism	
Crankshaft Removal .....	9-14	Removal .....	9-23
Crankshaft Installation .....	9-14	External Shift Mechanism	
Connecting Rod Removal .....	9-14	Installation .....	9-23
Connecting Rod Installation .....	9-14	External Shift Mechanism	
Crankshaft/Connecting Rod		Inspection.....	9-23
Cleaning .....	9-15	Transmission Removal .....	9-24
Connecting Rod Bend .....	9-15	Transmission Installation .....	9-24
Connecting Rod Twist .....	9-16	Transmission Shaft Disassembly ..	9-24
Connecting Rod Big End Side		Transmission Shaft Assembly .....	9-25
Clearance .....	9-16	Shift Drum and Fork Removal.....	9-26
Connecting Rod Big End Bearing		Shift Drum and Fork Installation...	9-27
Insert/Crankpin Wear .....	9-16	Shift Drum Disassembly.....	9-27
Crankshaft Side Clearance .....	9-18	Shift Drum Assembly .....	9-27
Crankshaft Runout.....	9-18	Gear Backlash .....	9-28
Crankshaft Main Bearing		Shift Fork Bending .....	9-28
Insert/Journal Wear .....	9-18	Shift Fork/Gear Groove Wear .....	9-28
Starter Motor Clutch .....	9-20	Shift Fork Guide Pin/Drum	
Starter Motor Clutch		Groove Wear.....	9-28
Removal/Installation.....	9-20	Gear Dog and Gear Dog Hole	
Starter Motor Clutch Inspection ...	9-20	Damage.....	9-29
Starter Motor Clutch Disassembly	9-20	Ball and Needle Bearing Wear.....	9-29

## 9-2 CRANKSHAFT/TRANSMISSION

### Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Breather Mounting Bolts	9.8	1.0	87 in·lb	L
2	Crankcase Bolts $\phi 6$	12	1.2	104 in·lb	
3	Crankcase Bolts $\phi 8$	27	2.8	20	S
4	Starter Clutch Bolts	34	3.5	26	L
5	Connecting Rod Bid End Cap Nuts	27	2.8	20	O
6	Shift Drum Bearing Holder Bolt	12	1.2	104 in·lb	L

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

O: Apply oil.

S: Follow the specified tightening sequence.

W: Washer



## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Shift Drum Pin Plate Bolt	8.8	0.9	78 in·lb	L
2	Neutral Switch	15	1.5	11	
3	External Shift Mechanism Return Spring Pin	20	2.0	14.5	L
4	Shift Drum Positioning Bolt	25	2.5	18	

G: Apply grease.

L: Apply a non-permanent locking agent.

O: Apply oil.

R: Replacement Parts

## 9-6 CRANKSHAFT/TRANSMISSION

### Specifications

Item	Standard	Service Limit
<b>Crankshaft, Connecting Rods</b>		
Connecting Rod Bend	— — —	0.2/100 mm (0.008/3.94 in.)
Connecting Rod Twist	— — —	0.2/100 mm (0.008/3.94 in.)
Connecting Rod Big End Side Clearance	0.13 ~ 0.38 mm (0.005 ~ 0.015 in.)	0.50 mm (0.020 in.)
Connecting Rod Big End Bearing Insert/Crankpin Clearance	0.031 ~ 0.059 mm (0.0012 ~ 0.0023 in.)	0.10 mm (0.004 in.)
Crankpin Diameter:	29.984 ~ 30.000 (1.1805 ~ 1.1811 in.)	29.97 mm (1.18 in.)
Marking		
None	29.984 ~ 29.994 mm (1.1805 ~ 1.1809 in.)	— — —
○	29.995 ~ 30.000 (1.1809 ~ 1.1811 in.)	— — —
Connecting Rod Big End Bore Diameter	33.000 ~ 33.016 mm (1.2992 ~ 1.2998 in.)	— — —
Marking		
None	33.000 ~ 33.008 mm (1.2992 ~ 1.2995 in.)	— — —
○	33.009 ~ 33.016 mm (1.2996 ~ 1.2998 in.)	— — —
Connecting Rod Big End Bearing Insert Thickness:		
Brown	1.480 ~ 1.485 mm (0.0583 ~ 0.0585 in.)	— — —
Black	1.485 ~ 1.490 mm (0.0585 ~ 0.0587 in.)	— — —
Blue	1.489 ~ 1.494 mm (0.0586 ~ 0.0588 in.)	— — —
Crankshaft Runout	— — —	0.05 mm (0.0020 in.) TIR
Crankshaft Main Bearing Insert/Journal Clearance	0.014 ~ 0.038 mm* (0.0006 ~ 0.0015 in.)	0.08 mm (0.0031 in.)
Crankshaft Main Journal Diameter:	27.984 ~ 28.000 mm (1.1017 ~ 1.1024 in.)	27.96 mm (1.101 in.)
Marking		
None	27.984 ~ 27.992 mm (1.1017 ~ 1.1020 in.)	— — —
1	27.993 ~ 28.000 (1.1021 ~ 1.1024 in.)	— — —
Crankcase Main Bearing Bore Diameter:	31.000 ~ 31.016 mm (1.2205 ~ 1.2211 in.)	— — —
Marking		
○	31.000 ~ 31.008 mm (1.2205 ~ 1.2208 in.)	— — —

**Specifications**

Item	Standard	Service Limit
None	31.009 ~ 31.016 mm (1.2208 ~ 1.2211 in.)	— — —
Crankshaft Main Bearing Insert Thickness:		
Black	1.495 ~ 1.499 mm (0.0589 ~ 0.0590 in.)	— — —
Blue	1.499 ~ 1.503 mm (0.0590 ~ 0.0592 in.)	— — —
Yellow	1.503 ~ 1.507 mm (0.0592 ~ 0.0593 in.)	— — —
Crankshaft Side Clearance	0.05 ~ 0.20 mm (0.002 ~ 0.008 in.)	0.40 mm (0.016 in.)
<b>Balancer</b>		
Balancer Shaft Bearing Insert/Journal Clearance	0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)	0.08 mm (0.0031 in.)
Balancer Shaft Journal Diameter:	25.984 ~ 26.000 (1.0230 ~ 1.0236 in.)	25.96 mm (1.022 in.)
Marking		
None	25.984 ~ 25.994 mm (1.0230 ~ 1.0234 in.)	— — —
○	25.995 ~ 26.000 mm (1.0234 ~ 1.0236 in.)	— — —
Crankcase Balancer Shaft Bore Diameter:	29.000 ~ 29.016 mm (1.1417 ~ 1.1424 in.)	— — —
Marking		
○	29.000 ~ 29.008 mm (1.1417 ~ 1.1420 in.)	— — —
None	29.009 ~ 29.016 mm (1.1421 ~ 1.1424 in.)	— — —
Balancer Shaft Bearing Insert Thickness:		
Brown	1.495 ~ 1.499 mm (0.0589 ~ 0.0590 in.)	— — —
Black	1.499 ~ 1.503 mm (0.0590 ~ 0.0592 in.)	— — —
Blue	1.503 ~ 1.507 mm (0.0592 ~ 0.0593 in.)	— — —
<b>Transmission</b>		
Gear Backlash	0 ~ 0.17 mm (0 ~ 0.0067 in.)	0.25 mm (0.010 in.)
Gear Shift Fork Groove Width	5.05 ~ 5.15 mm (0.1988 ~ 0.2028 in.)	5.3 mm (0.209 in.)
Shift Fork Ear Thickness	4.9 ~ 5.0 mm (0.1929 ~ 0.1969 in.)	4.8 mm (0.189 in.)
Shift Fork Guide Pin Diameter	5.9 ~ 6.0 mm (0.2323 ~ 0.2362 in.)	5.8 mm (0.228 in.)
Shift Drum Groove Width	6.05 ~ 6.20 mm (0.2382 ~ 0.2441 in.)	6.3 mm (0.248 in.)

\*: Journal clearance less than 0.025 mm (0.0010 in.) can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.

## 9-8 CRANKSHAFT/TRANSMISSION

### Specifications

#### Connecting Rod Big End Bearing Insert Selection

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Parts Number
○	○	Black	92028-1493
None	None		
○	None	Blue	92028-1492
None	○	Brown	92028-1494

#### Crankshaft Main Bearing Insert Selection

Crankcase Main Bearing Bore Diameter Marking	Crankpin Main Journal Diameter Marking	Bearing Insert**		
		Size Color	Parts Number	Journal Nos.
○	1	Black	92028-1487	1, 3
			92028-1490	2
None	None	Yellow	92028-1582	1, 3
			92028-1586	2
○	None	Blue	92028-1486	1, 3
None	1		92028-1489	2

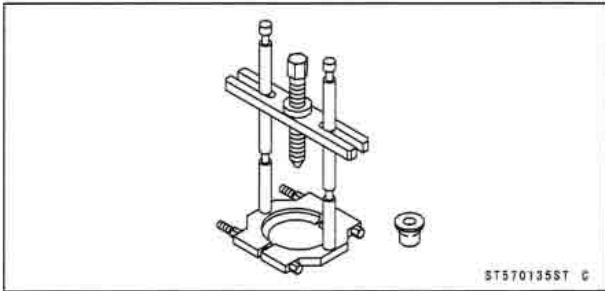
\*\*; The bearing inserts for No.2 journal have an oil groove.

#### Balancer Shaft Bearing Insert Selection

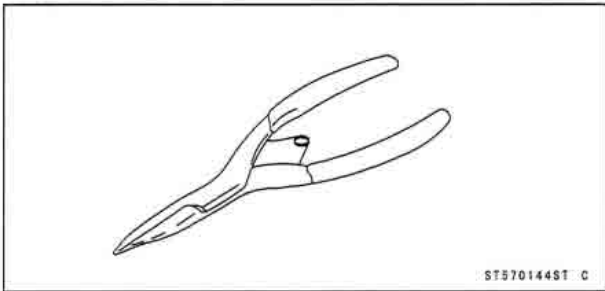
Balancer Shaft Journal Diameter Marking	Crankcase Balancer Shaft Bore Diameter Marking	Bearing Insert	
		Size Color	Parts Number
○	○	Brown	92028-1424
○	None	Black	92028-1423
None	○		
None	None	Blue	92028-1422

### Special Tools and Sealant

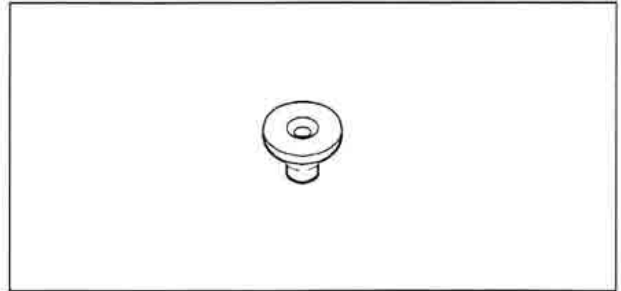
**Bearing Puller:**  
57001-135



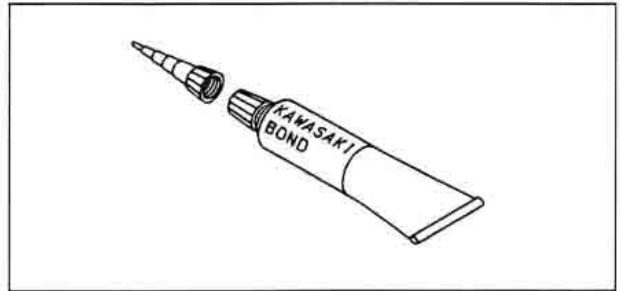
**Outside Circlip Pliers:**  
57001-144



**Bearing Puller Adapter:**  
57001-317



**Kawasaki Bond (Liquid Gasket - Black) TB1105:**  
92104-1003



## 9-10 CRANKSHAFT/TRANSMISSION

### Crankcase

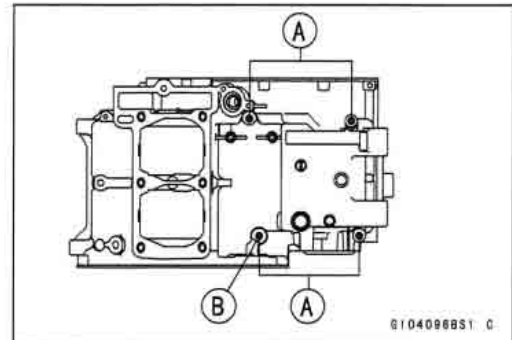
#### Crankcase Splitting

- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface or, preferably mount it on an engine stand to hold the engine steady while parts are being removed.
- Remove the water pipe and hose (cylinder rearward).

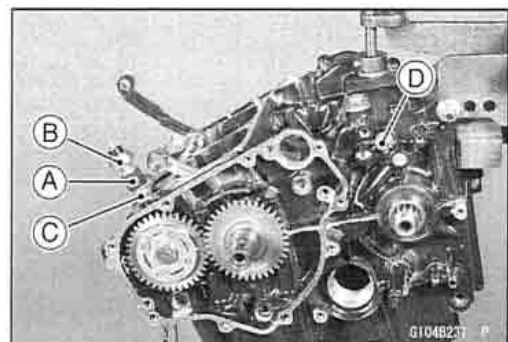
#### NOTE

○ If the engine is to be mounted on an engine stand, the upper crankcase half bolts [A] shown must be removed before mounting the engine.

Washer [B]

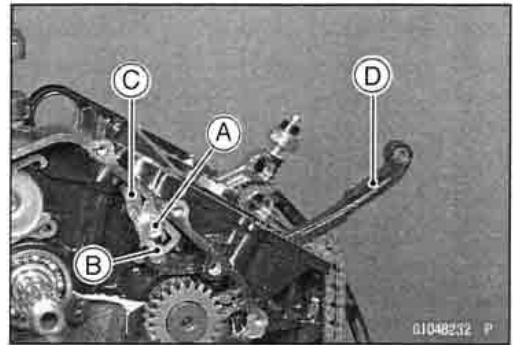


- Remove:
  - Alternator Cover
  - Water Pump, Hose and Pipe (see Cooling System chapter)
  - Starter Motor Clutch Gear
  - Oil Pipe and Banjo Bolt
  - Starter Motor
  - Oil Pump (see Lubrication System chapter)
  - Cylinder Head Cover
  - Alternator Rotor
  - One Way Clutch Gear
  - Oil Hose Banjo Bolt
  - Camshafts Chain Tensioner
  - Clutch Cover
  - Camshafts (see Engine Top End chapter)
  - Rocker Arms
  - Cylinder Head (see engine Top End chapter)
  - Cylinder (see Engine Top End chapter)
  - Pistons (see Engine Top End chapter)
- Remove the clutch only if the transmission drive shaft assembly is to be removed.
- Remove the oil pressure bolt [A] with the oil pressure switch [B] and oil hose [C].
- Remove the neutral switch [D].

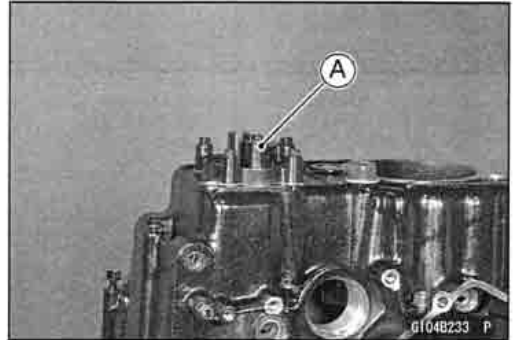


## Crankcase

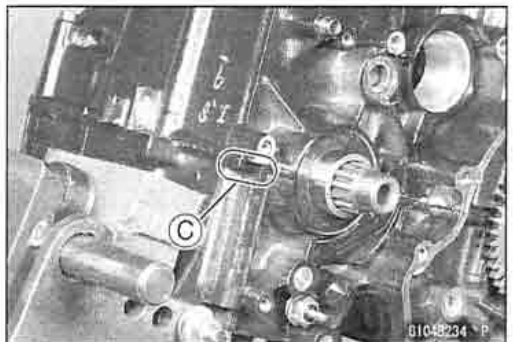
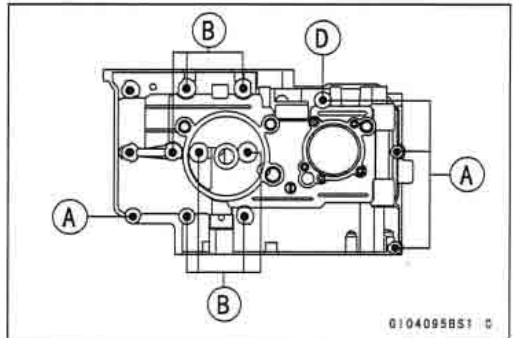
- Remove the external shift mechanism.
- Remove the chain guide lever bolt [A] and take the stopper plate [B], guide lever [C], chain guide [D], and spacer as a set.



- Remove the upper crankcase half bolt (1) (3 were removed just after engine removal).
- Turn the engine upside down.
- Remove the oil filter mounting bolt, oil filter, and large O-ring.
- Remove the oil screen cover [A] and screen.



- Remove the 6 mm [A] and 8 mm [B] lower crankcase half bolt, pry the point [C] shown to split the two crankcase halves apart, and lift off the lower crankcase half. Washer [D]

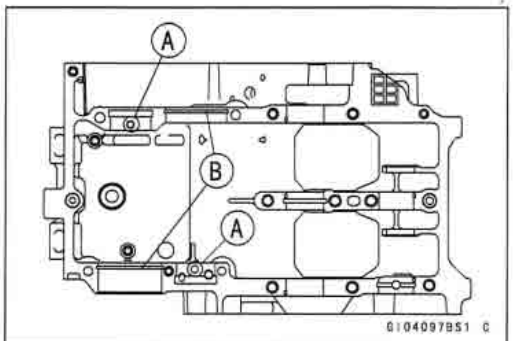


## Crankcase Assembly

### NOTE

○ The upper/lower crankcase halves are machined at the factory as an assembly, so the crankcase halves must be replaced as a set.

- Assembly is the reverse of splitting. Be careful of the following items.
- With a high flash-point solvent, clean off the mating surface of the crankcase halves and wipe dry.
- When installing the output and drive shafts, the crankcase set pins [A] must go into the holes in the needle bearing outer races, and the set rings [B] must fit into the grooves in the ball bearings.





## 9-12 CRANKSHAFT/TRANSMISSION

### Crankcase

- When the oil pressure switch is installed, apply the silicone sealant to the threads of the switch.

**Special Tool - Kawasaki Bond (Silicone Sealant): 56019-120**

#### CAUTION

**Make sure the crankcase set pins are properly aligned to avoid damage to the crankcases upon installation.**

**Don't use usual set pins because the set pins of this model are different from usual pins. They are hollow and also used to pass oil. If you use usual pins by mistake, the engine always seized.**

- Check that the knock pins (2) are in place.
- Apply a little engine oil to the transmission gears ball bearings, shift drum, and crankshaft main bearing inserts.
- Apply liquid gasket to the mating surface of the lower crankcase half.

**Special Tool - Kawasaki Bond (Liquid Gasket - Black): TB1105 92104-1003**

#### CAUTION

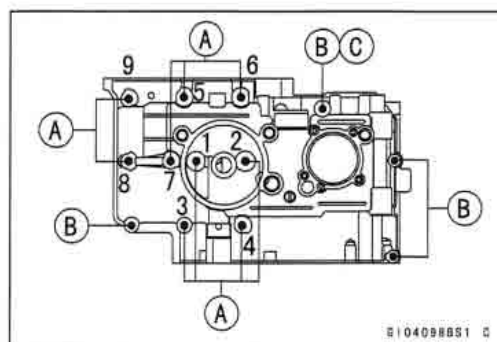
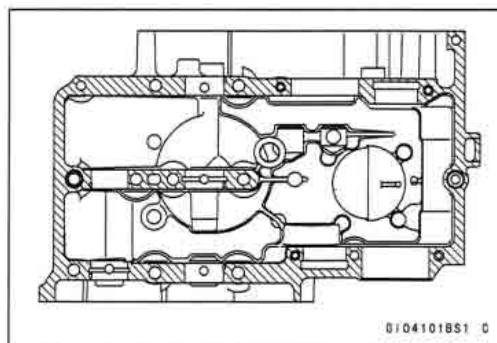
**If liquid gasket adheres to any areas not indicated, the engine oil passage may be obstructed, causing engine seizure.**

- Check to see that the shift drum is in the neutral position, that is, the projection at operating plate is seen from neutral switch hole at the upper crankcase half.
- When fitting the lower crankcase half on the upper crankcase half, each shift fork must fit in its gear groove.
- Loosely tighten all lower crankcase half bolts to a snug fit.
- Following the sequence numbers on the lower crankcase half, tighten the 8 mm bolts [A] first to about one half of the specified torque, and finally to the specified torque in the same sequence.
- Tighten the 6 mm bolts [B] on the lower crankcase half to the specified torque.

Washer [C]

**Torque - Crankcase Bolts ( $\phi 8$ ): 27 N·m (2.8 kgf·m, 20 ft·lb)**

**Crankcase Bolts ( $\phi 6$ ): 12 N·m (1.2 kgf·m, 104 in·lb)**



## Crankcase

- Tighten the 6 mm bolts [A] on the upper crankcase half to the specified torque.

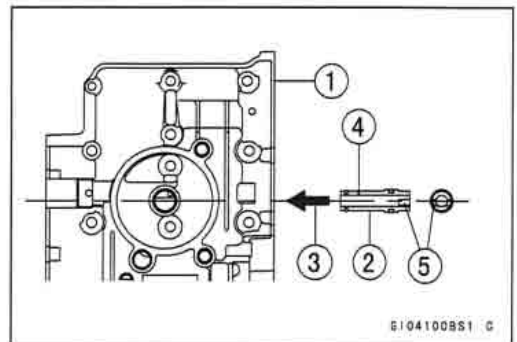
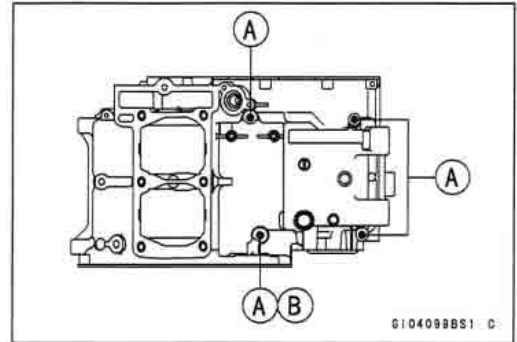
Washer [B]

**Torque - Crankcase Bolts ( $\phi 6$ ): 12 N·m (1.2 kgf·m, 104 in·lb)**

- After tightening all crankcase bolts, check the following items.
  - Drive shaft and output shaft turn freely.
  - While spinning the output shaft, shift the transmission smoothly from 1st to 6th gear, and back,
  - Unless the output shaft is turning, the transmission cannot be shifted to 2nd gear or other higher gear positions.

### Crankcase Exchange

- ★ If the crankcase is damaged, replace it with a new one.
- Remove the crankcase parts from the damaged case, and install it to the new case. Pay attention to the following items.
  - When installing the oil passage plug must be inserted as shown.
    - [1] Lower Crankcase Half
    - [2] Oil Passage Pipe
    - [3] Press
    - [4] Small Hall (Up)
    - [5] Slit (Horizontal)
  - Fit the oil passage O-ring on the breather body. Replace the O-ring with new ones, if deteriorated or damage. The flat side of the O-ring must face down.
  - Apply a non-permanent locking agent to the threads of the breather bolts, and tighten them.



## 9-14 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### Crankshaft Removal

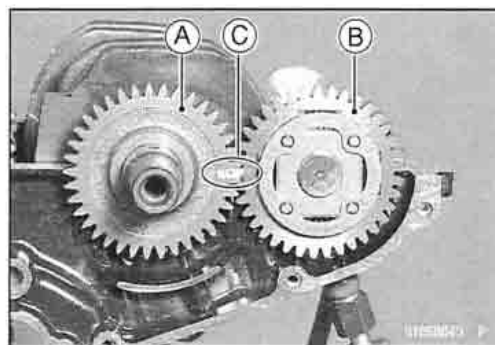
- Split the crankcase (see Crankcase Splitting).
- Take the crankshaft out of the upper crankcase.

#### Crankshaft Installation

##### CAUTION

If the crankshaft bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

- Align the timing mark [C] on the balancer drive gear [A] with the timing mark [C] on the balancer gear [B].
- Apply engine oil to the crankshaft main bearing inserts.
- Install the crankshaft.



#### Connecting Rod Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod big end cap nuts.
- Remove the crankshaft.

##### NOTE

○ Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.

- Remove the connecting rods from the crankshaft.

##### CAUTION

Discard the connecting rod bolts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

#### Connecting Rod Installation

##### CAUTION

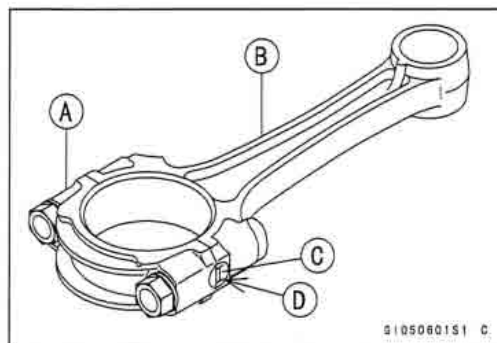
To minimize vibration, the connecting rods should have the same weight mark.

Big End Cap [A]

Connecting Rod [B]

Weight Mark, Alphabet [C]

Diameter Mark (Around Weight Mark) [D]: "O" or no mark



## Crankshaft and Connecting Rods

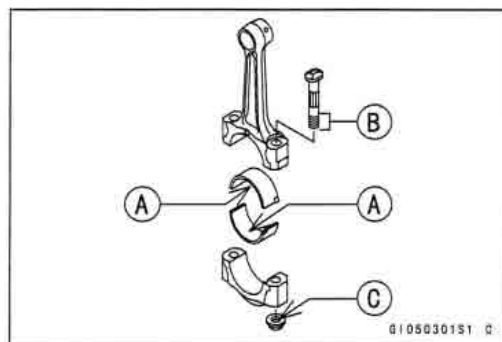
### CAUTION

If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plasti-gage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

### CAUTION

The connecting rod bolts are designed to stretch when tightened. Never reuse them.

- Replace the connecting rod big end bolts and nuts with new ones.
- Apply engine oil to the inner surface of upper and lower bearing inserts [A].
- Apply a small amount of the engine oil to the threads [B] and seating surface [C] of the connecting rod nuts.

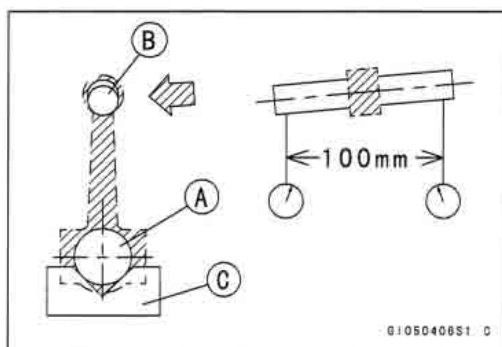


### Crankshaft/Connecting Rod Cleaning

- After removing the connecting rods from the crankshaft, clean them with a high-flash point solvent.
- Blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.

### Connecting Rod Bend

- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on V block [C].
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.
- ★ If the connecting rod bend exceeds the service limit, the connecting rod must be replaced.



### Connecting Rod Bend

Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)

## 9-16 CRANKSHAFT/TRANSMISSION

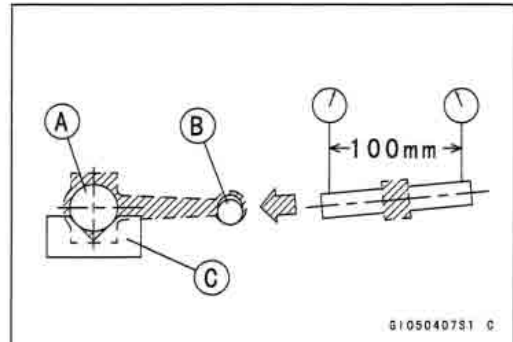
### Crankshaft and Connecting Rods

#### Connecting Rod Twist

- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.
- ★ If the connecting rod twist exceeds the service limit, the connecting rod must be replaced.

#### Connecting Rod Twist

**Service Limit:** TIR 0.2/100 mm (0.008/3.94 in.)



#### Connecting Rod Big End Side Clearance

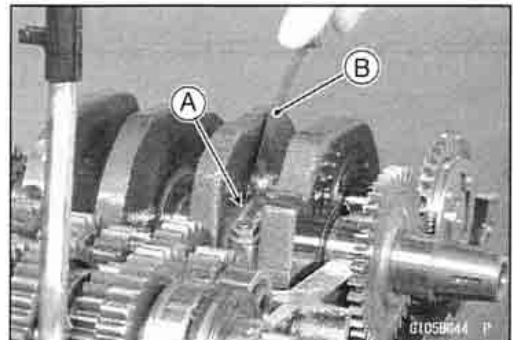
- Measure the connecting rod big end side clearance [A].
- Insert a thickness gauge [B] between the big end and either crank web to determine clearance.

#### Connecting Rod Big End Side Clearance

**Standard:** 0.13 ~ 0.38 mm (0.005 ~ 0.015 in.)

**Service Limit:** 0.5 mm (0.020 in.)

- ★ If the clearance exceeds the service limit, replace the connecting rod with new one and then check the clearance again. If the clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

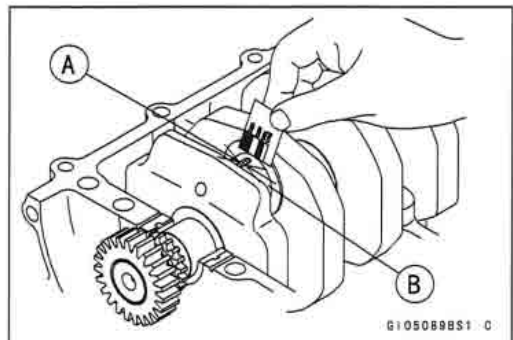


#### Connecting Rod Big End Bearing Insert/Crankpin Wear

- Measure the bearing insert/crankpin [B] clearance with plastigage [A].
- Tighten the big end nuts to the specified torque (see Connecting Rod Installation).

#### NOTE

- Do not move the connecting rod and crankshaft during clearance measurement.



#### Connecting Rod Big End Bearing Insert/Crankpin Clearance

**Standard:** 0.031 ~ 0.059 mm (0.0012 ~ 0.0023 in.)

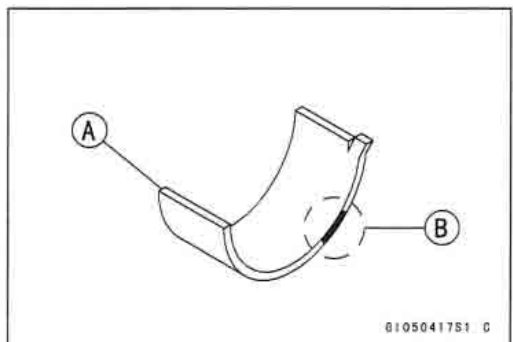
**Service Limit:** 0.10 mm (0.004 in.)

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.059 mm (0.0023 in.) and the service limit 0.10 mm (0.004 in.), replace the bearing inserts [A] with inserts painted black [B]. Check the insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit, measure the diameter of the crankpins.

#### Crankpin Diameter

**Standard:** 29.984 ~ 30.000 mm (1.1805 ~ 1.1811 in.)

**Service Limit:** 29.97 mm (1.18 in.)



## Crankshaft and Connecting Rods

- ★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

### Crankpin Diameter Marks

None: 29.984 ~ 29.994 mm (1.1805 ~ 1.1809 in.)

○: 29.995 ~ 30.000 mm (1.1809 ~ 1.1811 in.)

◇: Crankpin Diameter Marks, "○" mark or no mark.

- Measure the connecting rod big end bore diameter, and mark each connecting rod big end in accordance with the bore diameter.
- Tighten the big end nuts to the specified torque (see Connecting Rod Installation).

### NOTE

○ The mark already on the big end should almost coincide with the measurement because of little wear.

### Connecting Rod Big End Bore Diameter Marks

None: 33.000 ~ 33.008 mm (1.2992 ~ 1.2995 in.)

○: 33.009 ~ 33.016 mm (1.2996 ~ 1.2998 in.)

Big End Cap [A]

Connecting Rod [B]

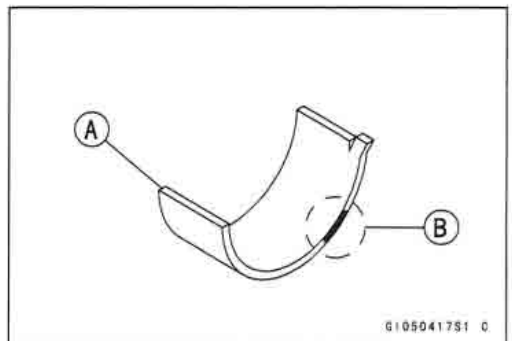
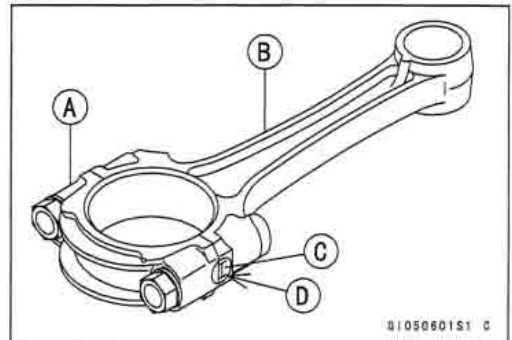
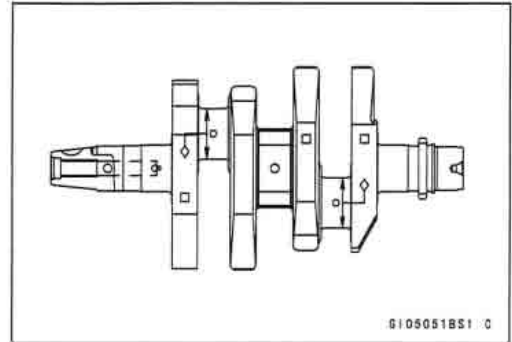
Weight Mark, Alphabet [C]

Diameter Mark (Around Weight Mark) [D]: "○" or no mark

- Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding.  
Size Color [B]

Con-rod Big End Bore Diameter	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028-1494
None	None	Black	92028-1493
○	○		
○	None	Blue	92028-1492

- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.





## 9-18 CRANKSHAFT/TRANSMISSION

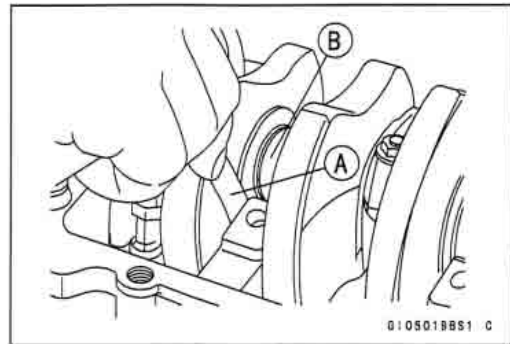
### Crankshaft and Connecting Rods

#### Crankshaft Side Clearance

- Insert a thickness gauge [A] between the crankcase main bearing and the crank web at the No. 2 journal [B] to determine clearance.
- ★ If the clearance exceeds the service limit, replace the crankcase halves as a set.

#### NOTE

- The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.



#### Crankshaft Side Clearance

**Standard:** 0.05 ~ 0.20 mm (0.002 ~ 0.008 in.)

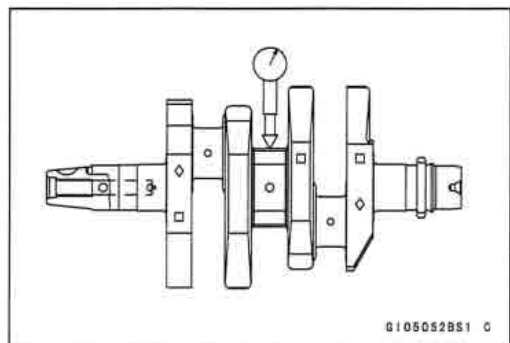
**Service Limit:** 0.40 mm (0.016 in.)

#### Crankshaft Runout

- Measure the crankshaft runout.
- ★ If the measurement exceeds the service limit, replace the crankshaft.

#### Crankshaft Runout

**Service Limit:** TIR 0.05 mm (0.002 in.)

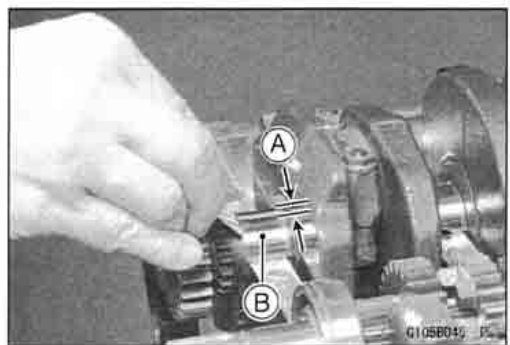


#### Crankshaft Main Bearing Insert/Journal Wear

- Using a plastigage (press gauge), measure the bearing insert/journal [B] clearance [A].

#### NOTE

- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).
- Do not turn the crankshaft during clearance measurement.
- Journal clearance less than 0.025 mm can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.

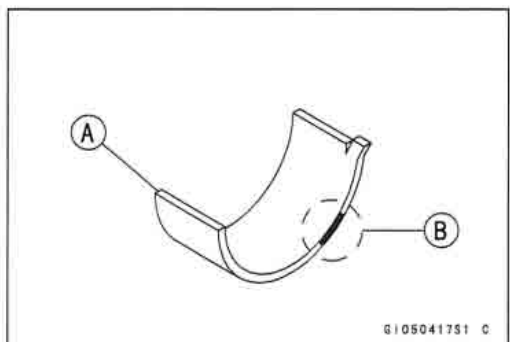


#### Crankshaft Main Bearing Insert/Journal Clearance

**Standard:** 0.014 ~ 0.038 mm (0.0006 ~ 0.0015 in.)

**Service Limit:** 0.08 mm (0.0031 in.)

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.038 mm (0.0015 in.) and the service limit 0.08 mm (0.0031 in.), replace the bearing inserts with inserts [A] painted blue [B]. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.



## Crankshaft and Connecting Rods

### Crankshaft Main Journal Diameter

**Standard:** 27.984 ~ 28.000 mm (1.1017 ~ 1.1024 in.)

**Service Limit:** 27.96 mm (1.101 in.)

- ★ If any journal has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

### Crankshaft Main Journal Diameter Marks

**None:** 27.984 ~ 27.992 mm (1.1017 ~ 1.1020 in.)

**1:** 27.993 ~ 28.000 mm (1.1021 ~ 1.1024 in.)

□: Crankshaft Main Journal Diameter Marks, "1" mark or no mark.

- Measure the main bearing bore diameter, and mark the upper crankcase half in accordance with the bore diameter.

A: Crankcase Main Bearing Bore Diameter Marks, "○" mark or no mark.

### NOTE

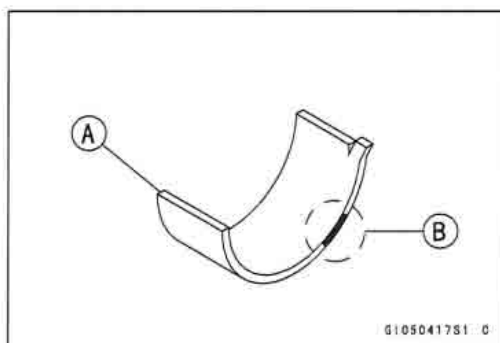
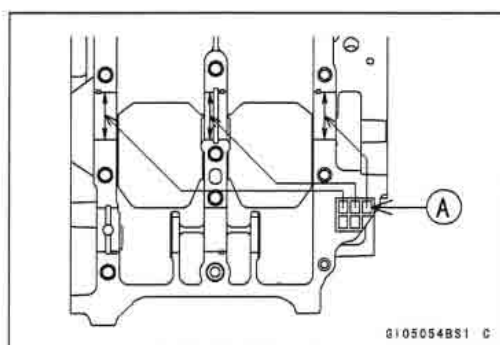
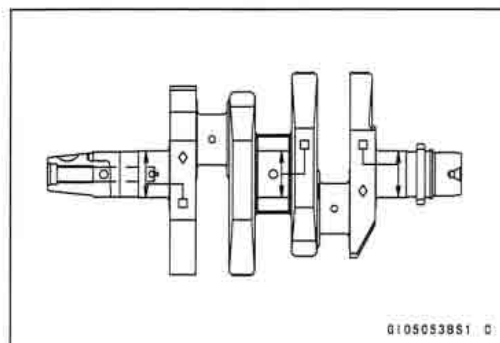
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).
- The mark already on the upper crankcase half should almost coincide with the measurement.

### Crankcase Main Bearing Bore Diameter Marks

**○:** 31.000 ~ 31.008 mm (1.2205 ~ 1.2208 in.)

**None:** 31.009 ~ 31.016 mm (1.2208 ~ 1.2211 in.)

- Select the proper bearing insert [A] in accordance with the combination of the crankcase and crankshaft coding. Size Color [B]



Crankcase Main Bearing Bore Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Black	92028-1487	1, 3
			92028-1490	2
None	1	Blue	29028-1486	1, 3
○	None		92028-1489	2
None	None	Yellow	92028-1582	1, 3
			92028-1586	2

\*The bearing insert for No.2 journal have an oil groove.

- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage.



## 9-20 CRANKSHAFT/TRANSMISSION

### Starter Motor Clutch

#### *Starter Motor Clutch Removal/Installation*

- Refer to Alternator Rotor Removal and Installation in the Electrical System chapter.

#### *Starter Motor Clutch Inspection*

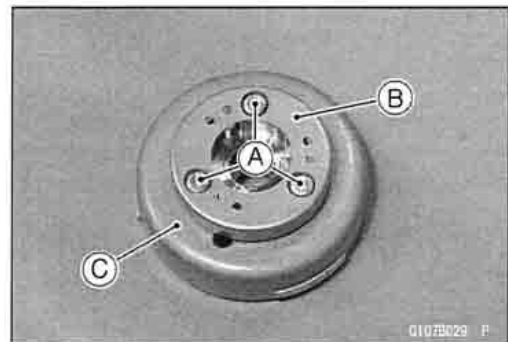
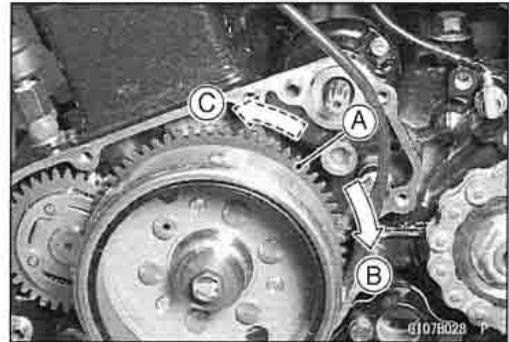
- Remove:
  - Alternator Cover (see Electrical System chapter)
  - Starter Idle Gear
- Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn clockwise [B] freely, but should not turn counterclockwise [C].
- ★ If the starter motor clutch does not operate as it should or if it makes noise, go to the next step.
- Disassemble the starter motor clutch, and visually inspect the clutch parts.
- ★ If there is any worn or damaged part, replace it.

#### **NOTE**

- Examine the starter motor clutch gear as well. Replace it if it is worn or damaged.

#### *Starter Motor Clutch Disassembly*

- Remove:
  - Alternator Rotor (see Alternator Rotor Removal)
  - Starter Motor Clutch Bolts [A] and Starter Motor Clutch [B]
  - Alternator Rotor [C]



#### *Starter Motor Clutch Assembly*

- Apply a non-permanent locking agent to the threads of the starter motor clutch bolts and tighten them.

**Torque - Starter Motor Clutch Bolts: 34 N·m (3.5 kgf·m, 26 ft·lb)**

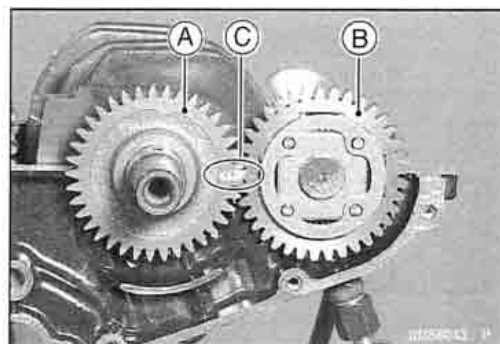
## Balancer

### Balancer Removal

- Split the crankcase (see Crankcase Splitting).
- Pull the balancer shaft with the balancer gear out of the crankcase.

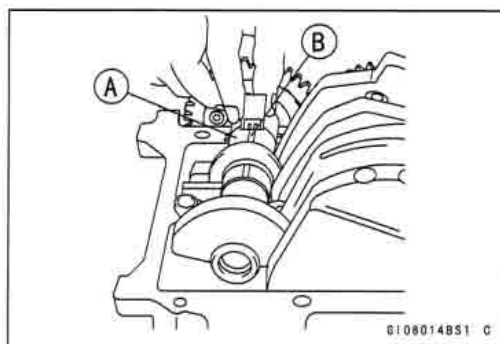
### Balancer Installation

- Balancer installation is the reverse of removal.
- Apply oil to the inside of the balancer shaft bearing insert.
- Align the timing mark [C] on the balancer gear [B] with the timing mark [C] on the balancer drive gear [A] of the crankshaft.



### Balancer Shaft Bearing Insert/Journal Wear

- Measure the bearing insert/journal clearance.
- Split the crankcase and wipe each bearing insert and journal [A] surface clean of oil.
- Cut strips of plastigage (press gauge) [B] to bearing insert width, and place a strip on each journal parallel to the balancer shaft so that the plastigage will be compressed between the journal and the bearing insert.
- Install the lower crankcase half, and tighten the case bolts to the specified torque.



**Torque - Crankcase Bolts  $\phi 8$ : 27 N·m (2.8 kgf·m, 20 ft·lb)**

**Crankcase Bolts  $\phi 6$ : 12 N·m (1.2 kgf·m, 104 in·lb)**

### NOTE

- Do not turn the balancer shaft during clearance measurement.
- Remove the lower crankcase half and measure the plastigage width to determine the bearing insert/journal clearance.

### Balancer Shaft Bearing Insert/Journal Clearance

**Standard:** 0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)

**Service Limit:** 0.08 mm (0.0031 in.)

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.044 mm and the service limit (0.08 mm), replace the bearing inserts with inserts painted blue. Check insert/journal clearance with plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit; measure the diameter of the balancer shaft journal.

### Balancer Shaft Journal Diameter

**Standard:** 25.984 ~ 26.000 (1.0230 ~ 1.0236 in.)

**Service Limit:** 25.96 mm (1.022 in.)

9-22 CRANKSHAFT/TRANSMISSION

Balancer

- ★ If either journal has worn past the service limit, replace the balancer shaft with a new one.
- ★ If the measured journal diameter is not less than the service limit, but does not coincide with the original diameter markings [A] on the balancer shaft, write new marks on it.

**Balancer Shaft Journal Diameter Marks**  
None: 25.984 ~ 25.994 (1.0230 ~ 1.0234 in.)  
○: 25.995 ~ 26.000 mm (1.0234 ~ 1.0236 in.)

- Put the lower crankcase half on the upper crankcase half without bearing inserts, and tighten the case bolts to the specified torque and sequence (see Crankcase Assembly).
- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.

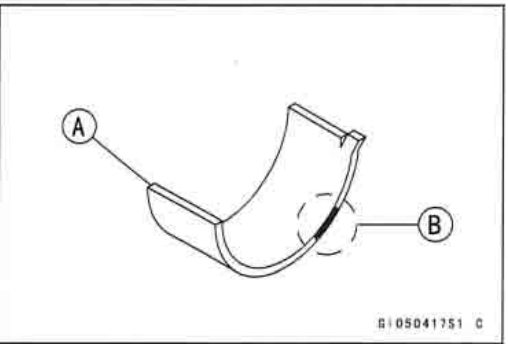
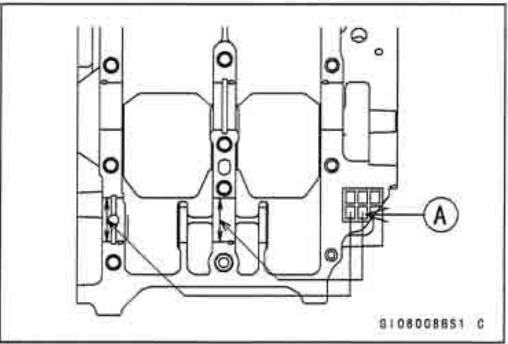
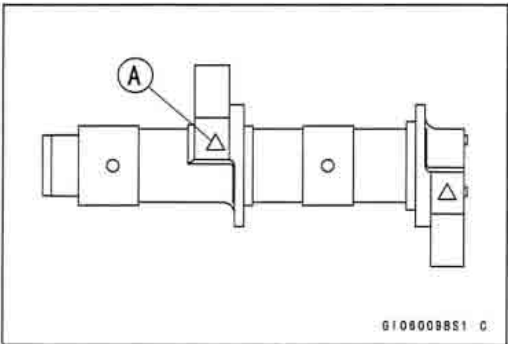
NOTE

○ The mark [A] already on the upper crankcase half should almost coincide with the measurement.

**Crankcase Bearing Inside Diameter Marks**  
○: 29.000 ~ 29.008 mm (1.1417 ~ 1.1420 in.)  
None: 29.009 ~ 29.016 mm (1.1421 ~ 1.1424 in.)

- Select the proper bearing insert [A] in accordance with the combination of the crankcase and balancer shaft coding.
  - Install the new insert in the crankcase and check insert/journal clearance with plastigage.
- Size Color [B]

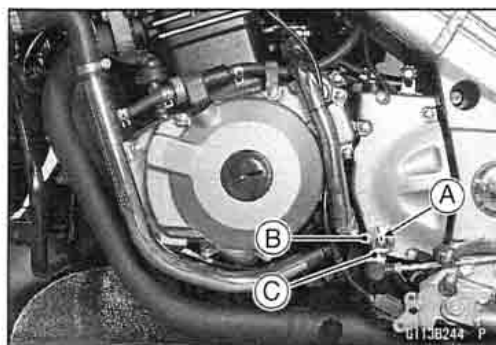
Crankcase Bearing Inside Diameter Mark	Balancer Shaft Journal Diameter Mark	Bearing Insert	
		Size Color	Part Number
○	○	Brown	92028-1424
None	None	Blue	92028-1422
○	None	Black	92028-1423
None	○		



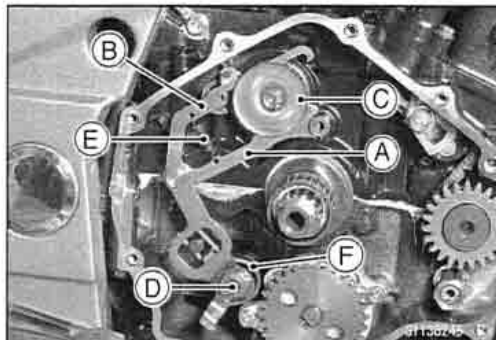
## Transmission

### External Shift Mechanism Removal

- Drain the engine oil (see Cooling System in the Periodic Maintenance chapter).
- Mark [A] the position of the shift lever link on the shift shaft so that it can be installed later in the same position.
- Remove the shift lever link bolt [B] and pull the lever link [C] off the shift shaft end.

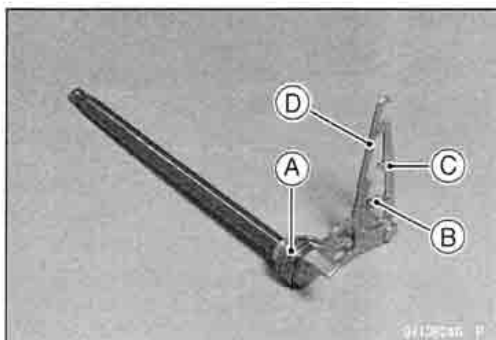


- Remove the clutch (see Clutch chapter).
- Move the shift mechanism arm [A] and over shift limiter [B] out of their positions on the end of the shift drum [C], and pull out the shift shaft [D] with the arm, pawl spring [E] and return spring [F].



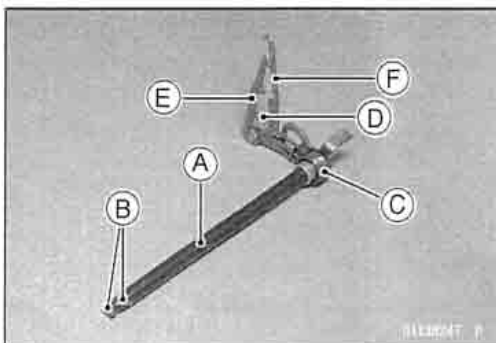
### External Shift Mechanism Installation

- Check that the return spring [A] and pawl spring [B] are properly fitted on the mechanism, install the external shift mechanism, and place the shift mechanism arm [C] and over shift limiter [D] on the shift drum pins.
- Add the engine oil (see Lubrication System in the Periodic Maintenance chapter).



### External Shift Mechanism Inspection

- Examine the shift shaft for any damage.
  - ★ If the shift shaft [A] is bent, straighten or replace it.
  - ★ If the splines [B] are damaged, replace the shaft.
  - ★ If the return spring [C] or pawl spring [D] is broken or distorted, replace them.
  - ★ If the shift mechanism arm [E] or over shift limiter [F] is distorted, replace the shift shaft.
- Check the return spring pin is not loose.
  - ★ If it is loose, unscrew it and apply a non-permanent locking agent to the threads, and tighten it.

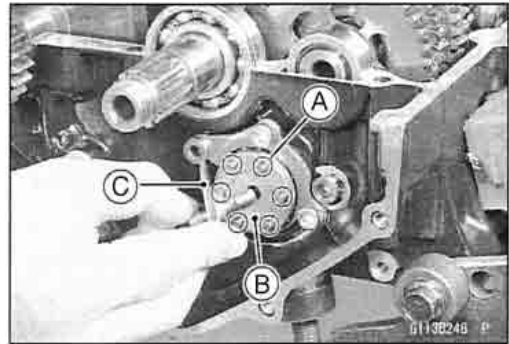


**Torque - External Shift Mechanism Return Spring Pin: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

## 9-24 CRANKSHAFT/TRANSMISSION

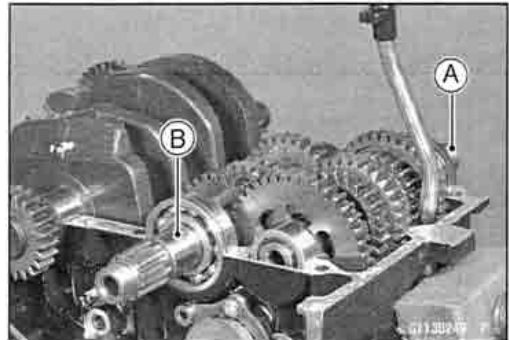
### Transmission

- Visually inspect the shift drum pins [A], pin holder [B] and pin plate [C].
- ★ If they are badly worn or if they show any damage, replace them.



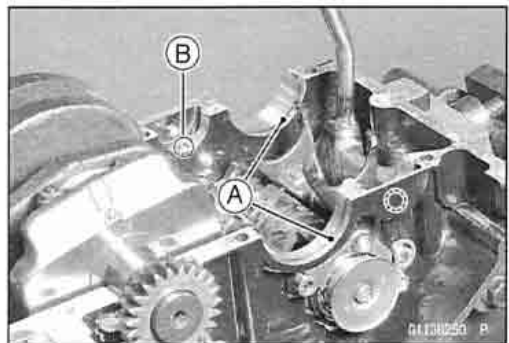
#### Transmission Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the drive shaft [A] and output shaft [B].

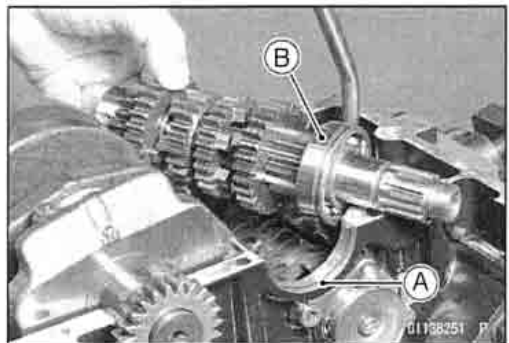


#### Transmission Installation

- With a high flash-point solvent, clean off the outer circumferences of the transmission ball bearings and needle bearing housings, and wipe dry.
- Check to see that the set rings [A] and set pins [B] are in place in the transmission bearing housings clean with compressed air.



- Install the drive shaft and output shaft into the upper crankcase half.
- Apply engine oil to the sliding surfaces of the gears and bearings.
- The bearing set pins and rings must match properly with the holes or grooves in the bearing outer races. When they are properly matched, there is no clearance between the crankcase [A] and the bearing outer races [B].
- Assemble the crankcase.

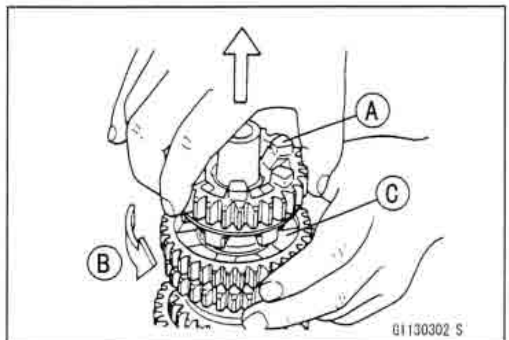


#### Transmission Shaft Disassembly

- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, disassemble the transmission shafts.

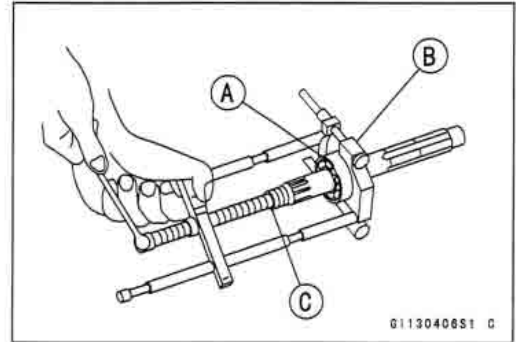
##### Special Tool - Outside Circlip Pliers: 57001-144

- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.
- Set the output shaft in a vertical position holding the 3rd gear [C].
- Spin the 5th gear quickly [B] and pull it off upward.



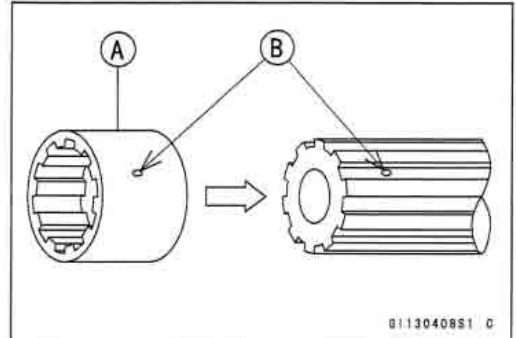
## Transmission

- Remove the ball bearing [A] from each shafts.  
**Special Tools - Bearing Puller: 57001-135 [B]**  
**Bearing Puller Adapter: 57001-317 [C]**
- Discard the bearing.

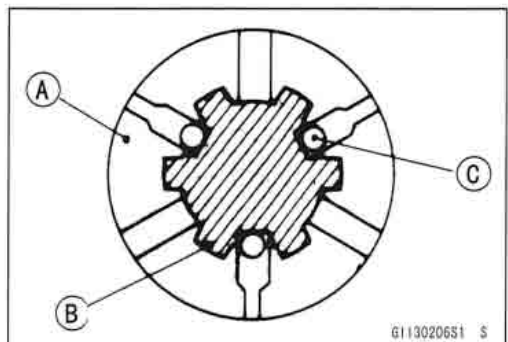


### Transmission Shaft Assembly

- Install the ball bearing on the drive shaft with the groove toward the clutch side.
- Install the gear bushing [A] on the shafts with their oil holes [B] aligned.



- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- The output shaft gears can be recognized by size: the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Fit the steel balls into the 5th gear holes in the output shaft as shown.  
 View A - A' (see CRANKSHAFT/TRANSMISSION 9-30)  
 [A] Gear (5th)  
 [B] Shaft  
 [C] Steel Balls



### CAUTION

**Do not apply grease to the steel balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.**

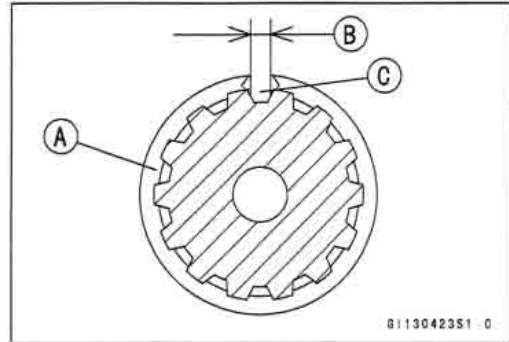
- Check the ball-locking effect that the 5th gear does not come out of the output shaft when moving it up and down by hand.



## 9-26 CRANKSHAFT/TRANSMISSION

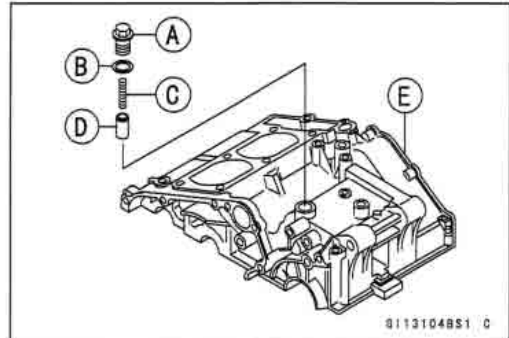
### Transmission

- Replace any circlip that were removed with new ones.
- Install the circlips [A] so that opening [B] is aligned with a spline groove [C].
- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.

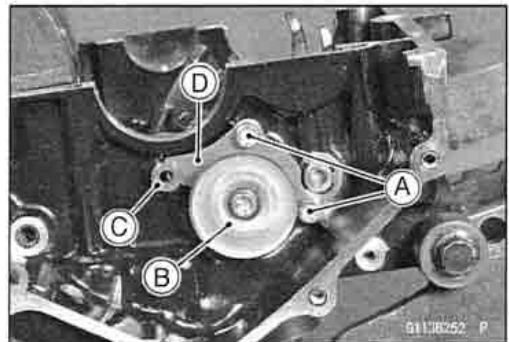


#### Shift Drum and Fork Removal

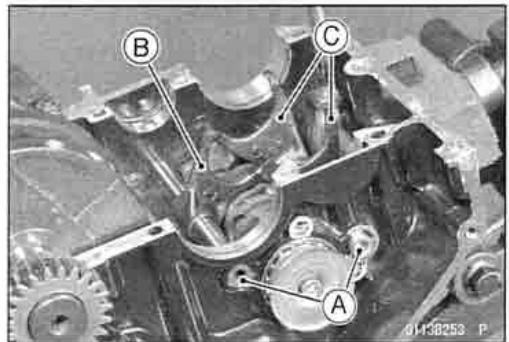
- Split the crankcase (see Crankcase Splitting).
- Remove the neutral positioning bolt [A] and take off the washer [B], spring [C] and pin [D] from the upper crankcase half [E].



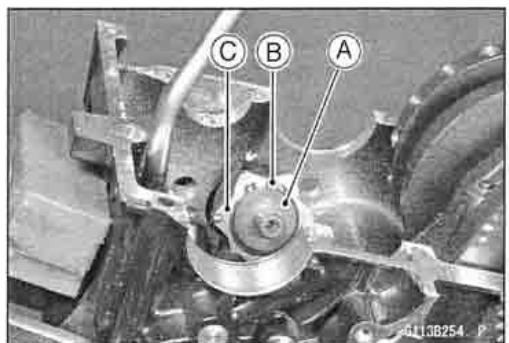
- Remove the shift drum bearing holder bolts [A] and take the holder plate [D] out of the shift drum [B] and shift rod [C].



- Pull the shift rods [A] off the right side of the upper crankcase half, and take off the drive shaft shift fork [B] and the output shaft shift forks [C].



- Pull out the shift drum [A] about half of it, and remove the circlip [B] and the operating plate [C].
- Pull out the shift drum fully from the upper crankcase.



## Transmission

### Shift Drum and Fork Installation

- Set the transmission gear in the neutral position.
- Insert the shift drum into the upper crankcase half, and install the operating plate pin [A], operating plate [B] and circlip [C].

#### NOTE

- When installing the operating plate the projection [D] faces toward the outside.

- Apply a little engine oil to the shift rods and shift fork fingers.
- Insert the shift rods [D] running them through the shift forks, fitting each shift fork guide pin into the shift drum grooves.
- Position the one with shortest ear [A] on the drive shaft and place the guide pin in the center groove in the shift drum [B].
- The two forks [C] on the output shaft are identical.

- Install the shift drum bearing holder plate [A].
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolts [B], and tighten them with the specified torque.

**Torque - Shift Drum Bearing Holder Bolts:** 12 N·m (1.2 kgf·m, 104 in·lb)

- Install the neutral positioning bolt with the specified torque to the upper crankcase.

**Torque - Shift Drum Positioning Bolt:** 25 N·m (2.5 kgf·m, 18 ft·lb)

### Shift Drum Disassembly

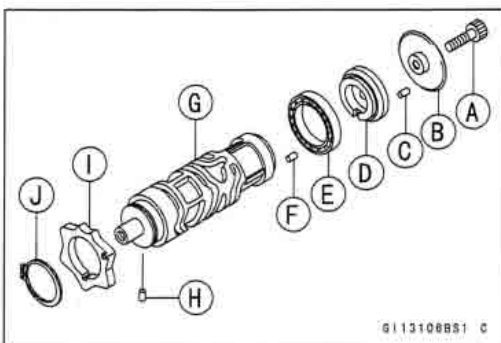
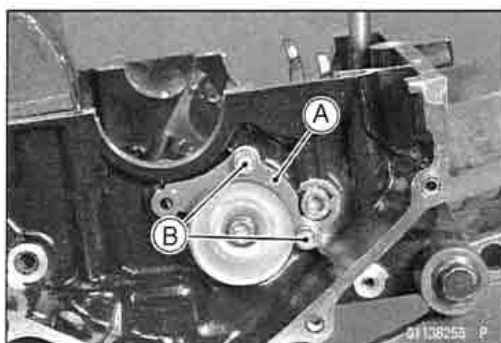
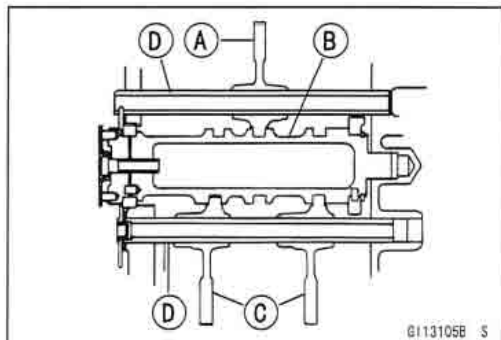
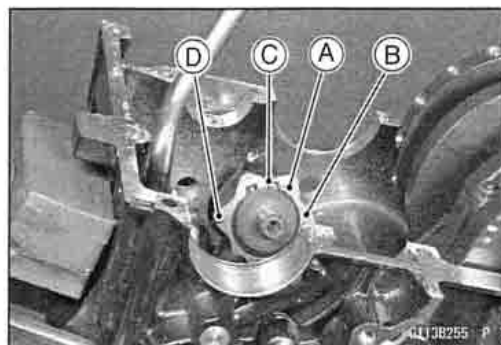
- Remove the shift drum (see Shift Drum Removal).
- When holding the shift drum with a vise, remove the shift drum pin plate bolt.

### Shift Drum Assembly

- Be sure to install the dowel pin [F].
- The shift drum pins [C] are identical.
- Apply a non-permanent locking agent to the threads of the shift drum pin plate bolt [A], and tighten it.

**Torque - Shift Drum Pin Plate Bolt:** 8.8 N·m (0.90 kgf·m, 78 in·lb)

Shift Drum Pin Plate [B]  
Shift Drum Bearing Holder [D]  
Shift Drum Bearing [E]  
Shift Drum [G]  
Operating Plate Pin [H]  
Operating Plate [I]  
Circlip [J]





## 9-28 CRANKSHAFT/TRANSMISSION

### Transmission

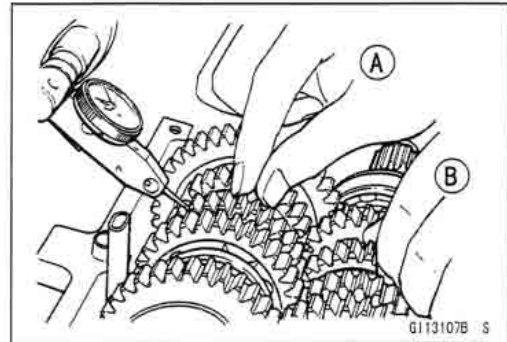
#### *Gear Backlash*

- Split the crankcase leaving the transmission in place.
- Set a dial gauge against the teeth on one gear, and move the gear back and forth [A] while holding the other gear steady [B]. The difference between the highest and the lowest gauge readings in the amount of backlash.
- ★ Replace both gears if the amount of backlash exceeds the service limit.

#### **Gear Backlash**

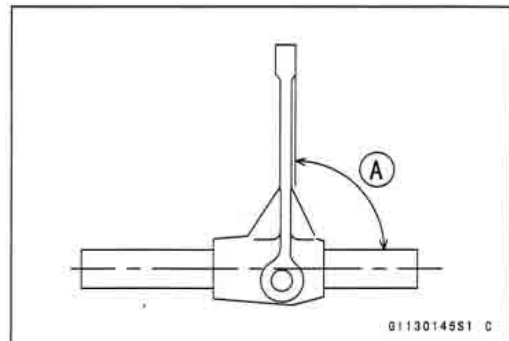
**Standard:** 0 ~ 0.17 mm (0 ~ 0.0067 in.)

**Service Limit:** 0.25 mm (0.010 in.)



#### *Shift Fork Bending*

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power. 90° [A]



#### *Shift Fork/Gear Groove Wear*

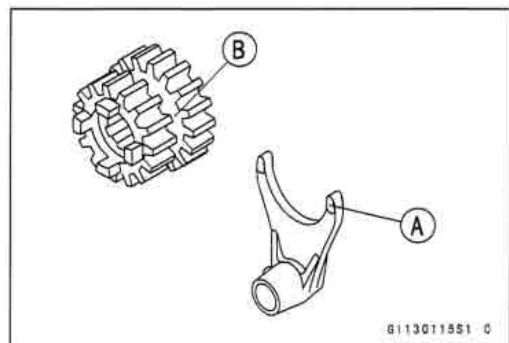
- Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves.
- ★ If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

#### **Shift Fork Ear Thickness**

**Standard:** 4.9 ~ 5.0 mm (0.1929 ~ 0.1969 in.)

**Service Limit:** 4.8 mm (0.189 in.)

- ★ If the gear groove is worn over the service limit, the gear must be replaced.



#### **Gear Groove Width**

**Standard:** 5.05 ~ 5.15 mm (0.1988 ~ 0.2028 in.)

**Service Limit:** 5.3 mm (0.209 in.)

#### *Shift Fork Guide Pin/Drum Groove Wear*

- Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.
- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

#### **Shift Fork Guide Pin Diameter**

**Standard:** 5.9 ~ 6.0 mm (0.2323 ~ 0.2362 in.)

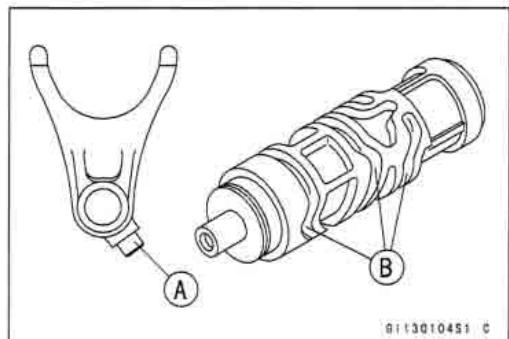
**Service Limit:** 5.8 mm (0.228 in.)

- ★ If any shift drum groove is worn over the service limit, the drum must be replaced.

#### **Shift Drum Groove Width**

**Standard:** 6.05 ~ 6.20 mm (0.2382 ~ 0.2441 in.)

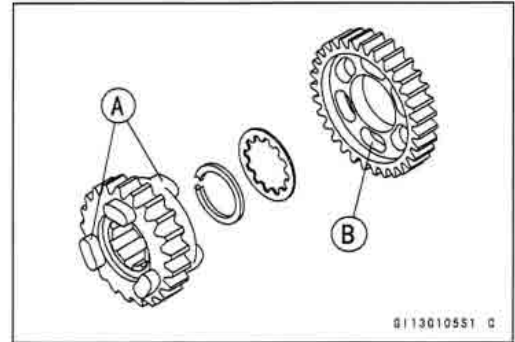
**Service Limit:** 6.3 mm (0.248 in.)



## Transmission

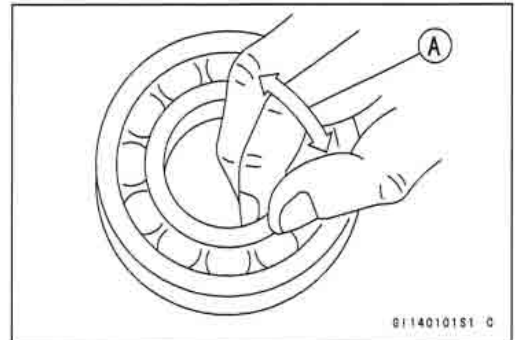
### *Gear Dog and Gear Dog Hole Damage*

- Visually inspect the gear dogs [A] and gear dog holes [B].
- ★ Replace any damaged gears or gears with excessively worn dogs or dog holes.



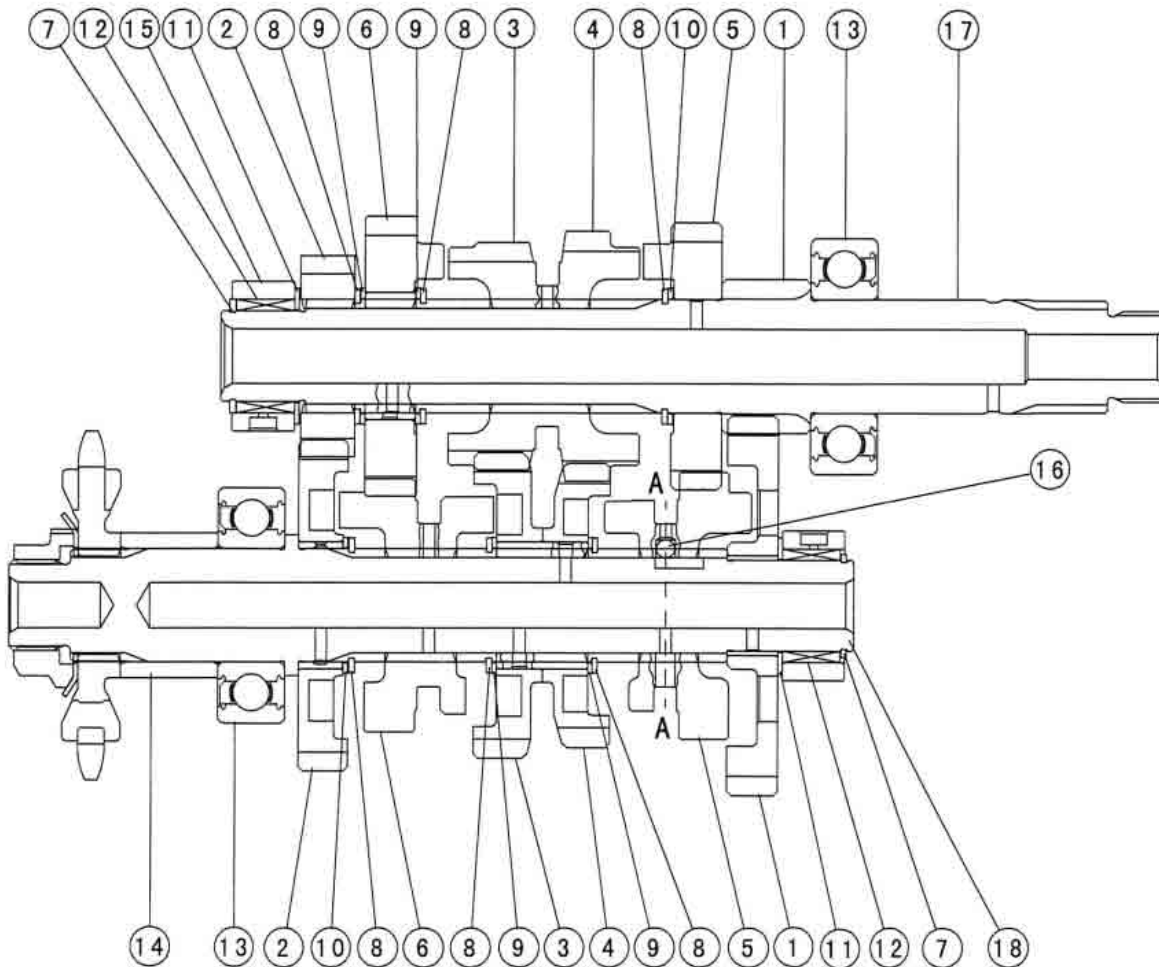
### *Ball and Needle Bearing Wear*

- Check the following ball bearings: right hand drive shaft, left hand output shaft, and right hand shift drum.
- Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
- Spin [A] the bearing by hand to check its condition.
- ★ If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.
- Check the following needle bearing: left hand drive shaft, and right hand output shaft.
- 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.



## 9-30 CRANKSHAFT/TRANSMISSION

### Transmission



Q113108BW4 C

1. 1st Gear
2. 2nd Gear
3. 3rd Gear
4. 4th Gear
5. 5th Gear
6. 6th (Top) Gear
7. Circlip
8. Circlip
9. Toothed Washer

10. Washer
11. Thrust Washer
12. Needle Bearing
13. Ball Bearing
14. Collar
15. Bearing Outer Race
16. Steel Ball
17. Drive Shaft
18. Output Shaft

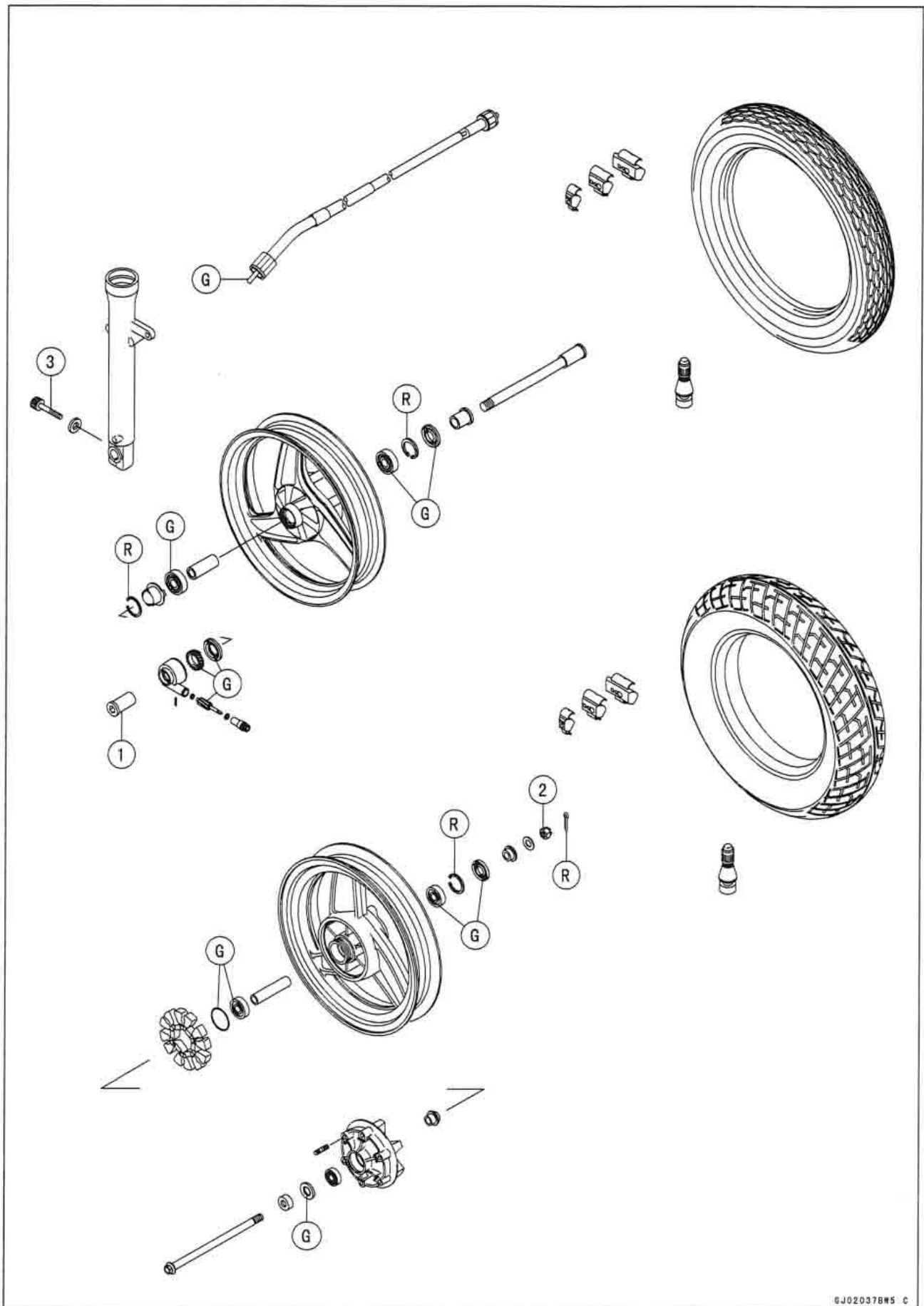
# Wheels/Tires

## Table of Contents

Exploded View .....	10-2
Specifications .....	10-4
Special Tools .....	10-5
Wheels (Rims) .....	10-6
Front Wheel Removal .....	10-6
Front Wheel Installation .....	10-6
Rear Wheel Removal .....	10-7
Rear Wheel Installation .....	10-7
Wheel Inspection .....	10-8
Axle Inspection .....	10-9
Balance Inspection .....	10-9
Balance Adjustment .....	10-9
Balance Weight Removal .....	10-10
Balance Weight Installation .....	10-10
Tires .....	10-12
Air Pressure Inspection/Adjustment .....	10-12
Tire Inspection .....	10-12
Tire Removal .....	10-12
Tire Installation .....	10-13
Tire Repair .....	10-15
Hub Bearing .....	10-16
Hub Bearing Removal .....	10-16
Hub Bearing Installation .....	10-16
Hub Bearing Inspection .....	10-17
Hub Bearing Lubrication .....	10-17
Speedometer Gear Housing .....	10-18
Speedometer Gear Housing Disassembly .....	10-18
Speedometer Gear Housing Assembly .....	10-18
Speedometer Gear Housing Lubrication .....	10-19

## 10-2 WHEELS/TIRES

### Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Axle Nut	88	9.0	65	
2	Rear Axle Nut	110	11	80	
3	Front Axle Clamp Bolts	20	2.0	14.5	

G: Apply grease.

R: Replacement Part

## 10-4 WHEELS/TIRES

### Specifications

Item	Standard	Service Limit
<b>Wheels</b>		
Rim Runout:		
Axial	---	0.5 mm (0.020 in.)
Radial	---	0.8 mm (0.031 in.)
Axle Runout/100 mm (3.9 in.)	---	0.2 mm (0.008 in.)
<b>Tires</b>		
Tire Tread Depth:		
Front	4.0 mm (0.16 in.)(Dunlop) 4.5 mm (0.18 in.)(Pirelli)	1 mm (0.039 in.)
Rear	6.0 mm (0.24 in.)(Dunlop) 6.5 mm (0.26 in.)(Pirelli)	2 mm (0.08 in.) up to 130 km/h (80 mph) 3 mm (0.12 in.) over 130 km/h (80 mph)

### Tire Air Pressure

Front	---	200 kPa (2.00 kgf/cm <sup>2</sup> , 28 psi)
Rear	Up to 155 kg (342 lb)	225 kPa (2.25 kgf/cm <sup>2</sup> , 32 psi)

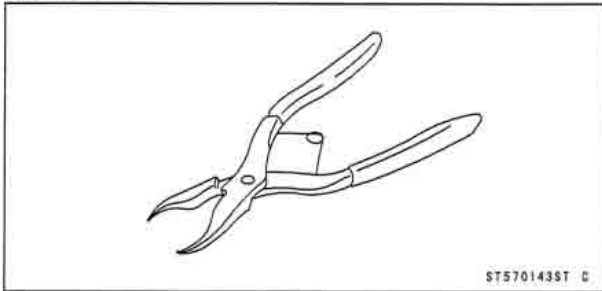
### Standard Tire

Front	1. 100/80-17M/C 52S DUNLOP K275F Tubeless 2. 100/80R17 52T DUNLOP SPORTMAX Tubeless 3. 100/80-17 52 H PIRELLI MT75 FRONT Tubeless
Rear	1. 140/70-17M/C 66S DUNLOP K275 Tubeless 2. 140/70R17 66T DUNLOP SPORTMAX Tubeless 3. 140/70-17 66H PIRELLI MT75 Tubeless

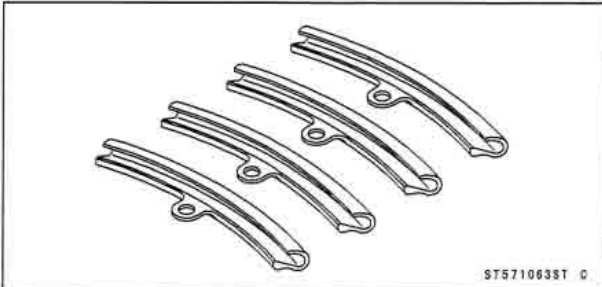
No.2, and 3 are replacement tires for Europe models.

## Special Tools

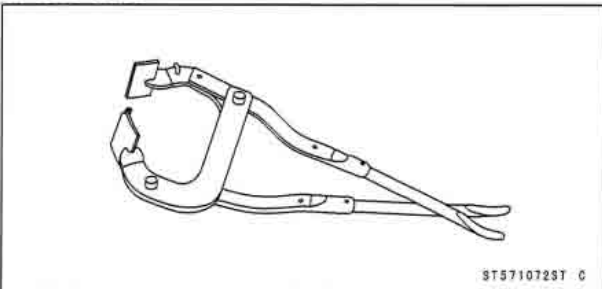
**Inside Circlip Pliers:**  
57001-143



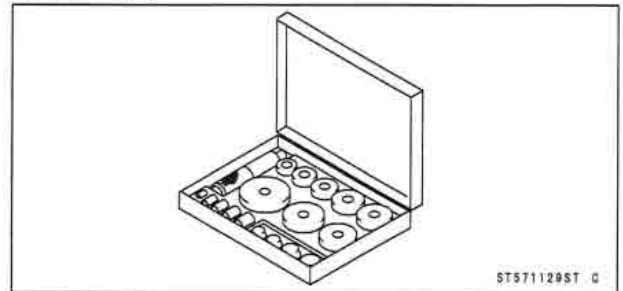
**Rim Protector:**  
57001-1063



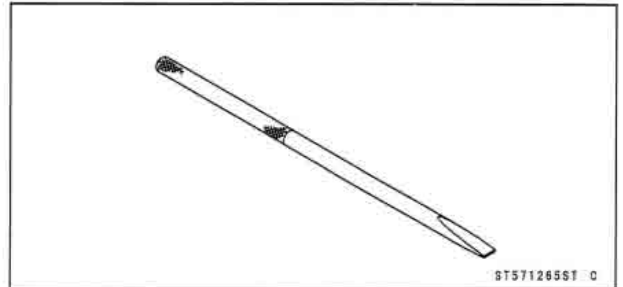
**Bead Breaker Assembly:**  
57001-1072



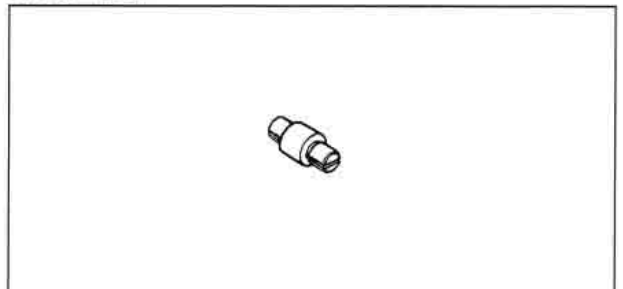
**Bearing Driver Set:**  
57001-1129



**Bearing Remover Shaft,  $\phi 9$ :**  
57001-1265



**Bearing Remover Head,  $\phi 15 \times \phi 17$ :**  
57001-1267



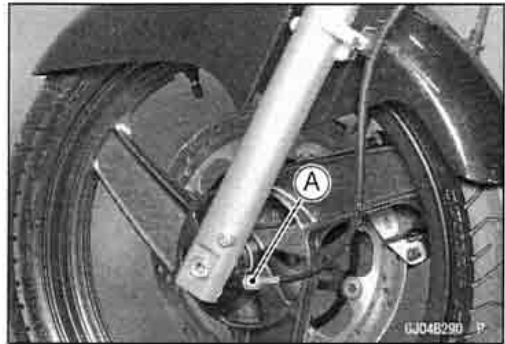


## 10-6 WHEELS/TIRES

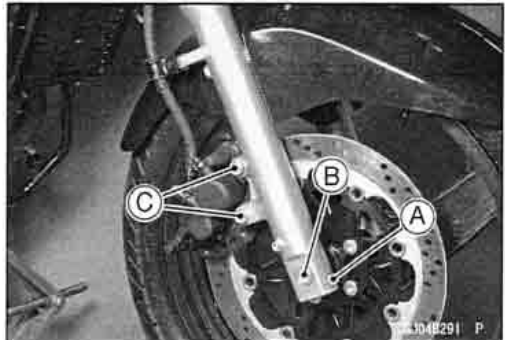
### Wheels (Rims)

#### Front Wheel Removal

- Remove:  
Speedometer Cable Lower End [A]



- Right Side Axle Clamp Bolt (Loosen) [A]
- Axle (Loosen) [B]
- Front Caliper Mounting Bolts [C]



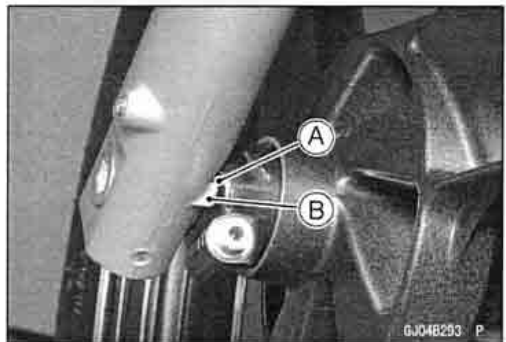
- Using a jack, raise the front wheel off the ground.
- Pull the axle and remove the front wheel.

#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

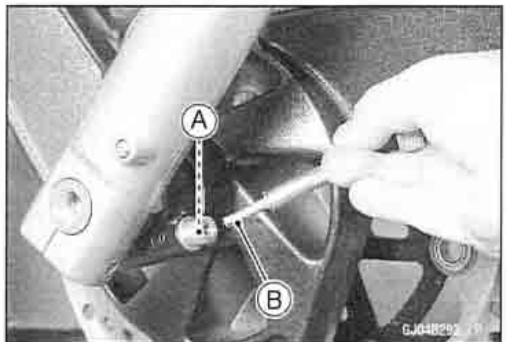
#### Front Wheel Installation

- Apply a high-temperature grease to the grease seal lips.
- Install the speedometer gear housing to the front wheel.
- Install the front wheel so that the speedometer gear housing stop [A] fit into the fork leg stops [B].



- Install the speedometer cable so that the drive notch [B] of it fits into the projection [A] of the speedometer gear in the housing.
- Tighten the front axle nut and axle clamp bolts with the specified torque.

**Torque - Front Axle Nut: 88 N·m (9.0 kgf·m, 65 ft·lb)**  
**Axle Clamp Bolts: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**



## Wheels (Rims)

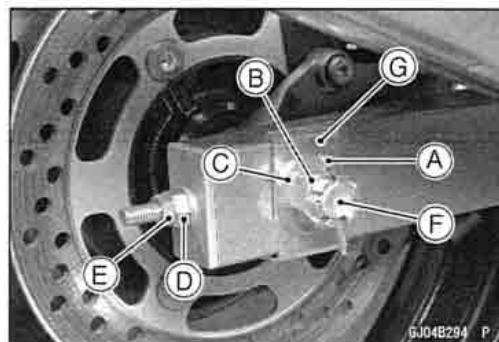
- Check the front brake effectiveness (see Brakes chapter).

### **⚠ WARNING**

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

### Rear Wheel Removal

- Remove:
  - Axle Nut Cotter Pin [A]
  - Axle Nut [B] and Washer [C]
  - Chain Adjusting Nuts [D] and Locknuts [E] (Loosen)
  - Axle [F]
  - Alignment Indicators [G]



- Free the drive chain from the rear sprocket, and remove the rear wheel.

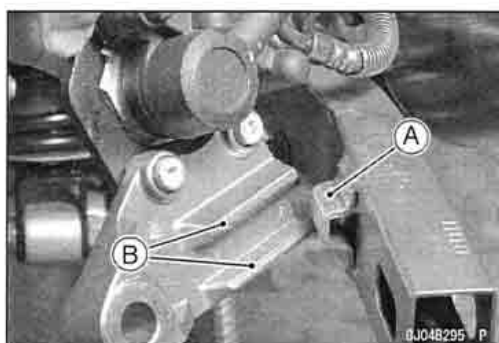
### **CAUTION**

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

### Rear Wheel Installation

- Apply a high temperature grease to the grease seal lips and coupling, wheel sliding portions.
- Fit the swingarm stop [A] into the caliper holder stops [B].
- Install:
  - Alignment Indicators
  - Axle
  - Chain Adjusting Nuts and Locknuts
  - Axle Nut and Washer
  - Axle Nut Cotter Pin

**Torque - Rear Axle Nut: 110 N·m (11 kgf·m, 80 ft·lb)**



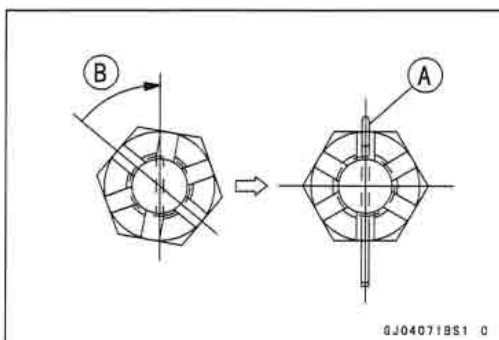
### **NOTE**

○ Insert the axle from the left side of the wheel, and tighten the axle nut.

- Install a new cotter pin.

### **NOTE**

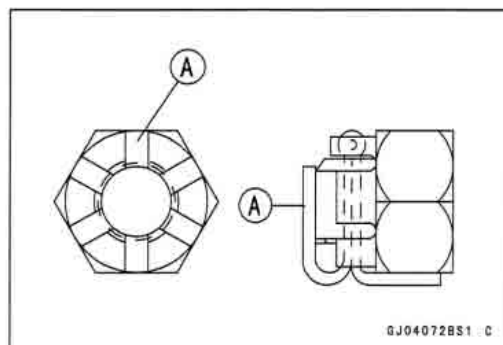
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30 degree.
- Loosen once and tighten again when the slot goes past the nearest hole.



## 10-8 WHEELS/TIRES

### Wheels (Rims)

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



- Adjust the drive chain slack (see Final Drive in the Periodic Maintenance chapter).
- Check the rear brake (see Brakes chapter).

#### **⚠ WARNING**

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

#### *Wheel Inspection*

- Raise the front/rear wheel off the ground.
- Spin the wheel lightly, and check for roughness or binding.
- ★ If the roughness or binding is found, replace the hub bearings.
- Inspect the wheel for small cracks, dents, bending, or warp.
- ★ If there is any damage to the wheel, replace the wheel.
- Remove the wheel, and support it without the tire by the axle.
- Measure the rim runout, radial [A] and axial [B], with a dial gauge.
- ★ If the rim runout exceeds the service limit, check the hub bearings.
- ★ If the problem is not due to the bearings, replace the wheel.

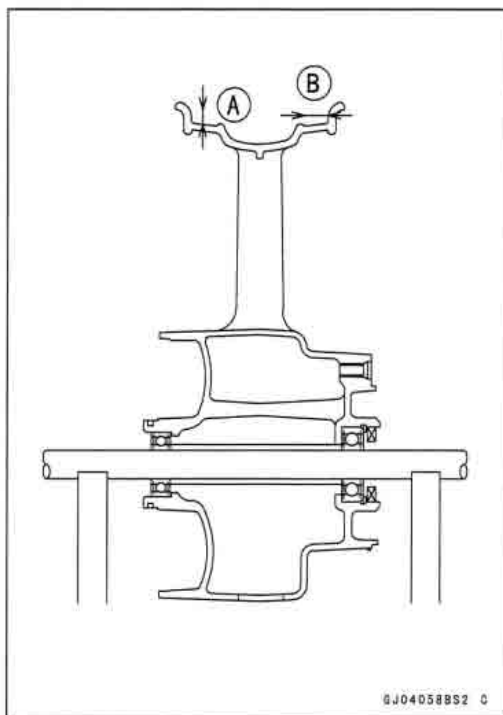
#### **Rim Runout**

##### **Service Limit:**

Axial	0.5 mm (0.02 in.)
Radial	0.8 mm (0.03 in.)

#### **⚠ WARNING**

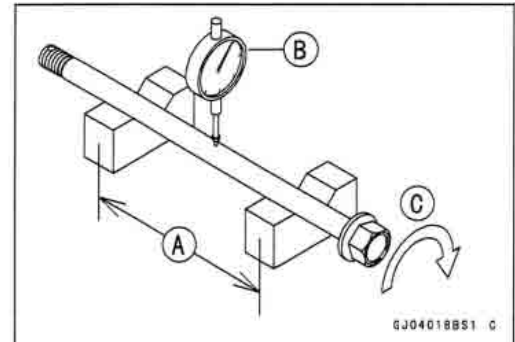
Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.



## Wheels (Rims)

### Axle Inspection

- Remove the front and rear axles.
- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the axle at a point halfway between the blocks. Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.
- ★ If the axle runout exceeds the service limit, replace the axle.



### Axle Runout/100 mm (3.94 in.)

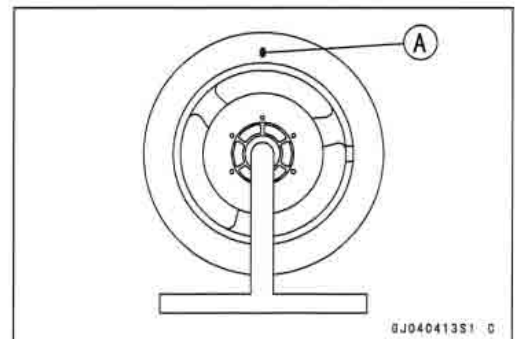
**Standard:** 0.05 mm (0.002 in.) or less

**Service Limit:** 0.2 mm (0.01 in.)

**Repair Limit:** 0.7 mm (0.03 in.)

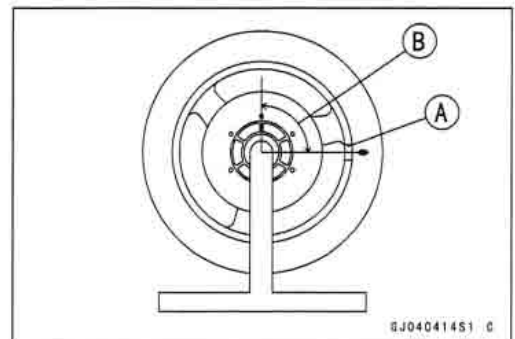
### Balance Inspection

- Remove the wheel.
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.
- ★ If the wheel always stops in one position, adjust the wheel balance.



### Balance Adjustment

- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.
- ★ If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.
- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.



## 10-10 WHEELS/TIRES

### Wheels (Rims)

#### Balance Weight Removal

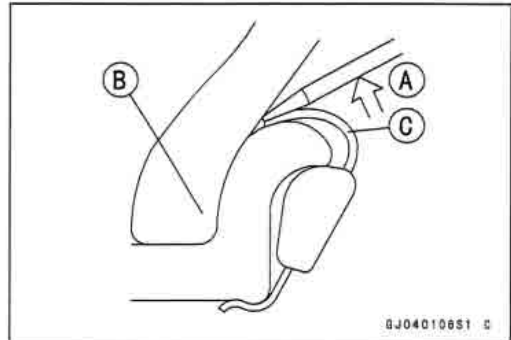
When the tire is not on the rim.

- Push [A] the blade portion toward the outside with a regular tip screw driver, and slip the weight off the rim flange.
- Discard the used balance weight.



When the tire is on the rim.

- Pry [A] the balance weight off the rim flange using a regular tip screw driver as shown in the figure.
- Insert a tip of the screw driver between the tire bead [B] and weight blade [C] until the end of the tip reaches the end of the weight blade.
- Push the driver grip toward the tire so that the balance weight slips off the rim flange.
- Discard the used balance weight.



#### Balance Weight Installation

- Check if the weight portion has any play on the blade and clip.
- ★ If it does, discard it.

#### **⚠ WARNING**

**If the balance weight has any play on the rim flange, the blade and/or clip have been stretched. Replace the loose balance weight. Do not reuse used balance weight. Unbalanced wheels can create an unsafe riding condition.**

- Lubricate the balance weight blade, tire bead, and rim flange with a soap and water solution or rubber lubricant. This helps the balance weight slip onto the rim flange.

#### **CAUTION**

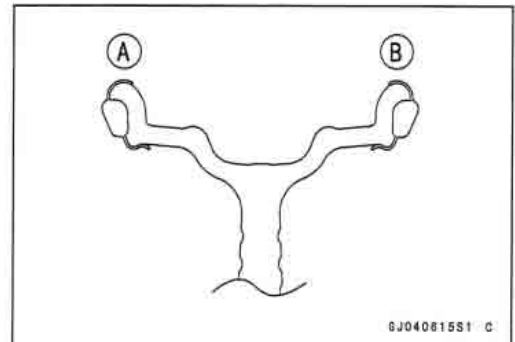
**Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.**

## Wheels (Rims)

- When required total weight exceeds 20 g, install balance weight at both sides of rim flange as shown.

Unit: (g)

Required Total Weight	Weight Selection	
	One Side [A]	Other Side [B]
20	10	10
30	20	10
40	20	20
50	30	20
60	30	30
70	20 + 20	30
80	20 + 20	20 + 20
90	20 + 30	20 + 20



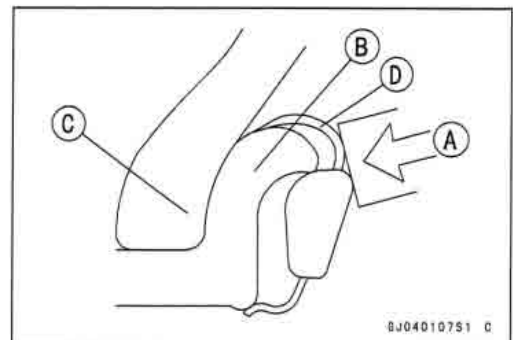
### Balance Weight

Part Number	Weight (grams)
41075-1014	10
41075-1015	20
41075-1016	30

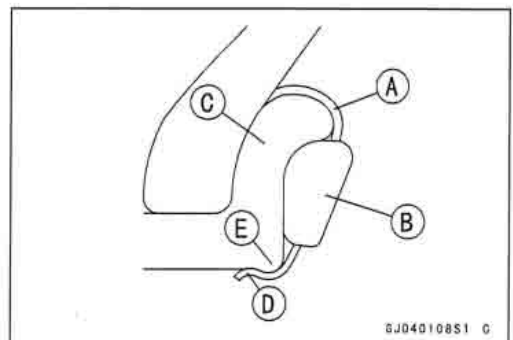
### NOTE

- Balance weights are available from Kawasaki dealers in 10, 20, and 30 gram sizes. An imbalance of less than 10 grams will not usually affect running stability.
- Do not use four or more balance weight (more than 90 gram). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.

- Install the balance weight on the rim.
- Slip the weight on the rim flange by pushing or lightly hammering the weight in the direction shown in the figure.
  - Push or hammer [A]
  - Rim Flange [B]
  - Tire Bead [C]
  - Blade [D]



- Check that the blade [A] and weight [B] seat fully on the rim flange [C], and that the clip [D] is hooked over the rim ridge [E] and reaches rim flat portion.



## 10-12 WHEELS/TIRES

### Tires

#### *Air Pressure Inspection/Adjustment*

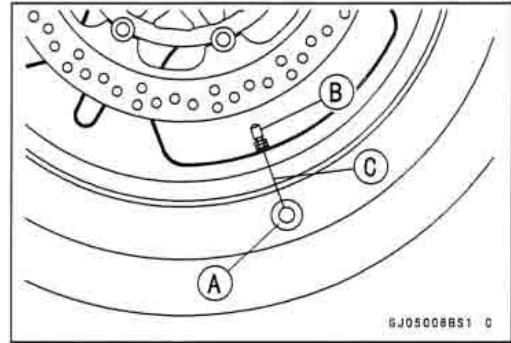
- Refer to the Wheels/Tires in the Periodic Maintenance chapter.

#### *Tire Inspection*

- Refer to the Wheels/Tires in the Periodic Maintenance chapter.

#### *Tire Removal*

- Remove:
  - Wheel (see Wheel Removal)
  - Disc
  - Valve Core (let out the air)
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
  - Chalk Mark or Yellow Mark [A]
  - Air Valve [B]
  - Align [C]
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

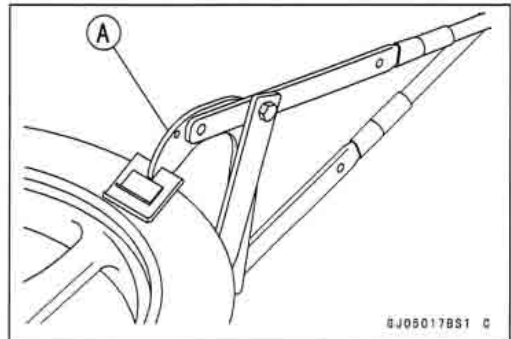


#### CAUTION

**Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.**

- Brake the beads away from both sides of the rim with the bead breaker [A].

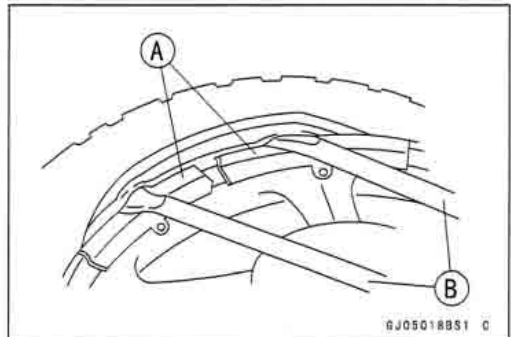
**Special Tool - Bead Breaker Assembly: 57001-1072**



- Step on the side of the tire opposite the valve stem and start prying the tire off the rim near the valve stem with tire irons.

**Special Tools - Rim Protector: 57001-1063 [A]**

**Tire Irons of the Bead Breaker Assembly:  
57001-1072 [B]**





## Tires

### NOTE

○ For easier removal, always position the tire bead opposite the valve stem in the rim well, and pry the tire bead a little at a time.

### CAUTION

**Be careful not to scratch the inner liner and air sealing surfaces of the rim and tire with the tire irons. A scratched inner liner [B] or sealing surface [A] may allow air to leak.**

- After removing the bead on one side, remove the other bead from the same side.
- Remove the rim from the tire.

### Tire Installation

### ⚠ WARNING

**Use the same manufacture's on both front and rear wheels.**

- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

### CAUTION

**Replace the air valve whenever the tire is replaced. Do not reuse the air valve.**

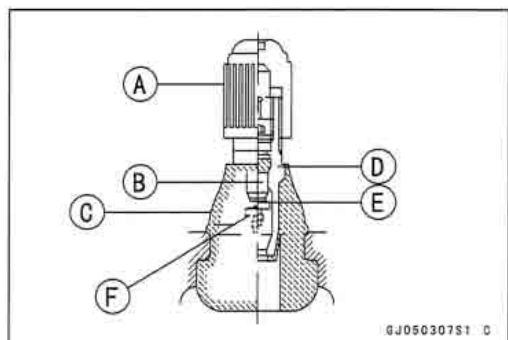
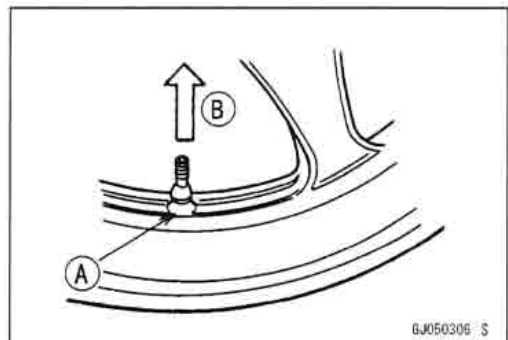
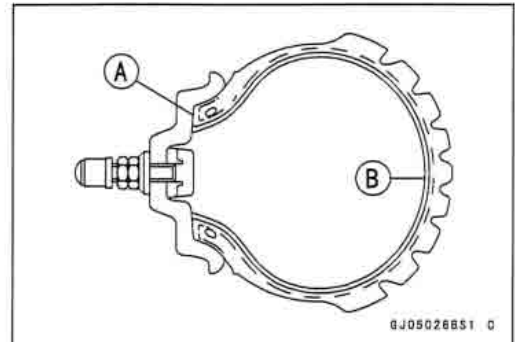
- Install a new valve in the rim.
- Remove the valve cap, lubricate the stem seal [A] with a soap and water solution or rubber lubricant, and pull the valve stem through the rim from the inside out until it snaps into place.

### CAUTION

**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**

- The air valve is shown in the figure.

- [A] Valve Cap
- [B] Valve Core
- [C] Stem Seal
- [D] Valve Stem
- [E] Valve Seat
- [F] Valve Opened





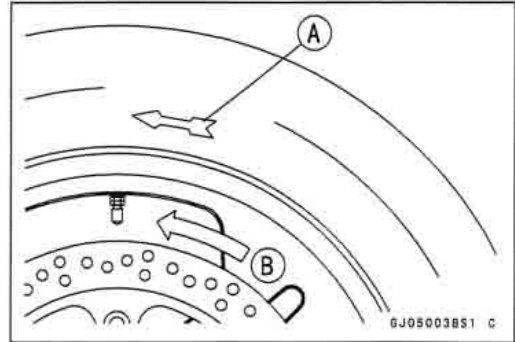
## 10-14 WHEELS/TIRES

### Tires

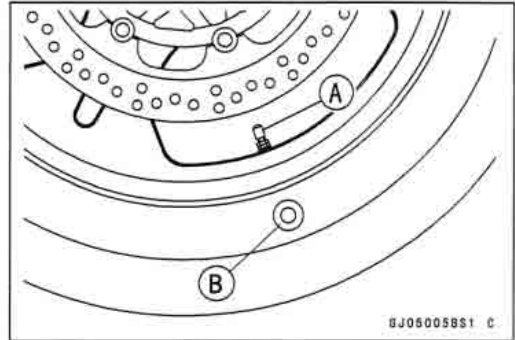
- Apply a soap and water solution, or rubber lubricant to the rim flange and tire beads.
- Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

Tire Rotation Mark [A]

Rotating Direction [B]



- Position the tire on the rim so that the valve [A] is at the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).



- By hand, slide as much as possible of the lower side of the tire bead over the rim flange, starting at the side opposite the valve.
- Fit the rim protectors and tire irons to install the remaining part of the tire bead which cannot be installed by hand. For easy tire installation, position the parts of the bead which is already over the rim flange in the rim well.

#### NOTE

○ To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.

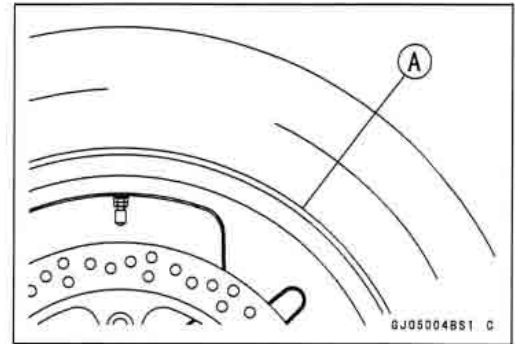
- Install the other side of the tire bead onto the rim in the same manner.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.

#### **⚠ WARNING**

Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/cm<sup>2</sup>, 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.

## Tires

- Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.
- ★ If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.
- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leakage.
- Inflate the tire slightly above standard inflation.
- Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.
- Adjust the air pressure to the specified pressure (see Wheels/Tires in the Periodic Maintenance chapter).
- Install the brake disc(s) so that the marked side faces out (see Brakes chapter).
- Adjust the wheel balance (see Balance Adjustment).



### *Tire Repair*

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

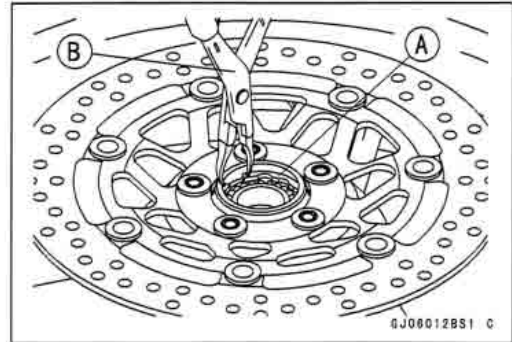
## 10-16 WHEELS/TIRES

### Hub Bearing

#### Hub Bearing Removal

- Remove the wheel, and take out the following.
  - Collars
  - Speedometer Gear Drive (out of front hub)
  - Coupling (out of rear hub)
  - Grease Seals
  - Circlips [A]

**Special Tool - Inside Circlip Pliers: 57001-143 [B]**

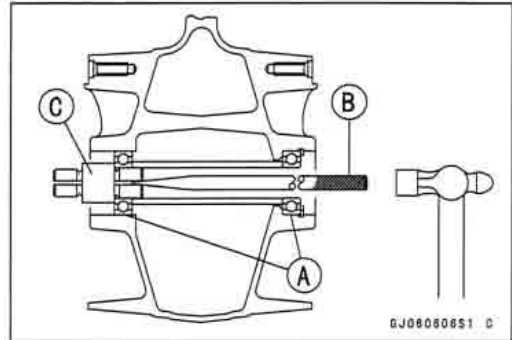


- Use the bearing remover to remove the hub bearing [A].

#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

**Special Tools - Bearing Remover Shaft,  $\phi 9$ : 57001-1265 [B]**  
**Bearing Remover Head,  $\phi 15 \times \phi 17$ : 57001-1267 [C]**



#### Hub Bearing Installation

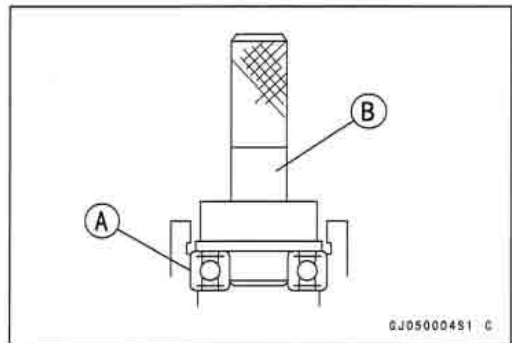
- Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.

#### NOTE

○ Install the bearings so that the marked side faces out.

- Install the bearings by using the bearing driver set which does not contact the bearing inner race.
- Press in each bearings [A] until they are bottomed.

**Special Tool - Bearing Driver Set: 57001-1129 [B]**

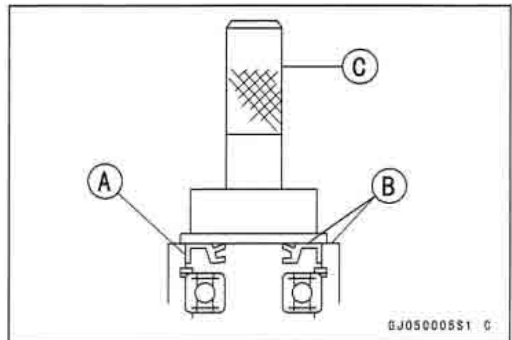


- Replace the circlips with new ones.

**Special Tool - Inside Circlip Pliers: 57001-143**

- Replace the grease seals with new ones.
- Press in the grease seals [A] so that the seal surface is flush [B] with the end of the hole.
- Apply high temperature grease to the grease seal lips.

**Special Tool - Bearing Driver Set: 57001-1129 [C]**



## Hub Bearing

### Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

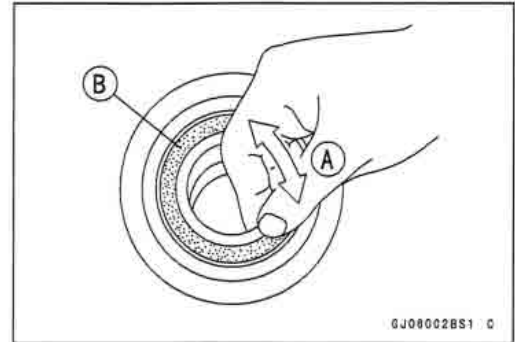
#### NOTE

- Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.
- Turn each bearing in the hub back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.

### Hub Bearing Lubrication

#### NOTE

- Since the hub bearings are packed with grease and sealed, lubrication is not required.
- Apply a little grease to the inside of the rear coupling.

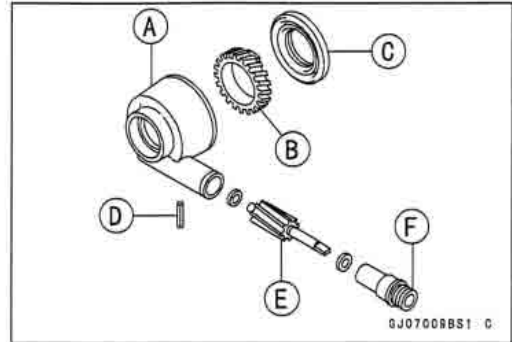


## 10-18 WHEELS/TIRES

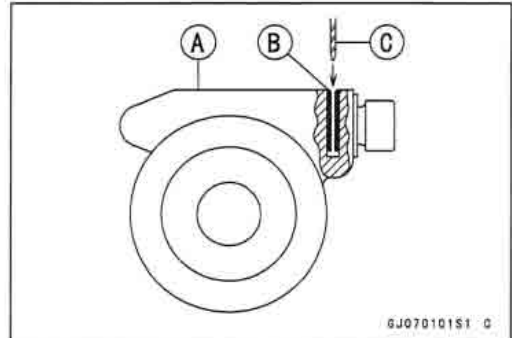
### Speedometer Gear Housing

#### Speedometer Gear Housing Disassembly

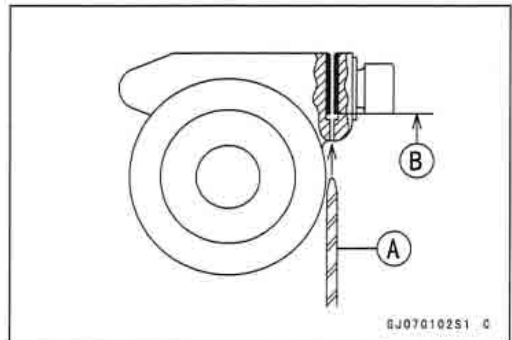
- Pull the speedometer gear housing [A] off the front wheel.
- Pull out the grease seal [C] using a hook.
- Pull out the speedometer gear [B].
- If the speedometer cable housing [F] or speedometer pinion [E] needs to be removed, work in accordance with following procedures.
  - Pin [D]



- First drill the housing [A] through the spring pin [B] using a 1.0 ~ 1.5 mm drill bit [C].



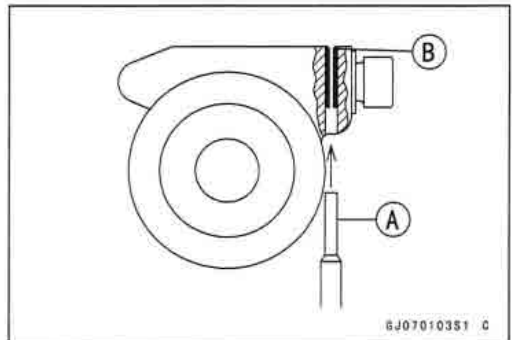
- Drill the housing from the under side to the pin end [B] using 3.0 ~ 3.5 mm drill bit [A].



- Using a 3 mm (0.12 in.) rod [A], tap out the pin [B], and then pull out the speedometer cable bushing, speedometer pinion and washers.

#### NOTE

○ It is recommended that the assembly be replaced rather than attempting to repair the components.



#### Speedometer Gear Housing Assembly

- When assembling the speedometer gear housing, be careful of the following items.
  - After inserting a new pin, stake the housing hole to secure the pin in place.
  - Replace the grease seal with a new one. Apply a little grease to the seal. Install it using a press or a suitable driver so that the face of the seal is level with the surface of the housing.
  - Regrease the speedometer gear.
  - Install the speedometer gear housing so that it fits in the speedometer gear drive notches.

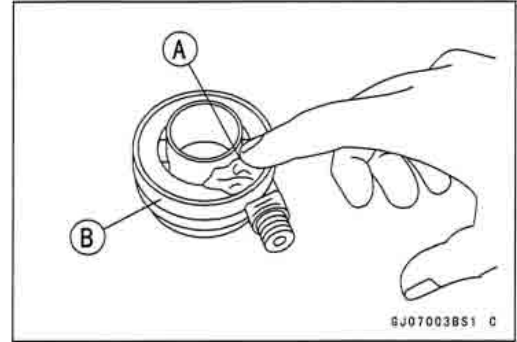
---

**Speedometer Gear Housing**

---

*Speedometer Gear Housing Lubrication*

- Clean and grease [A] the speedometer gear housing [B].



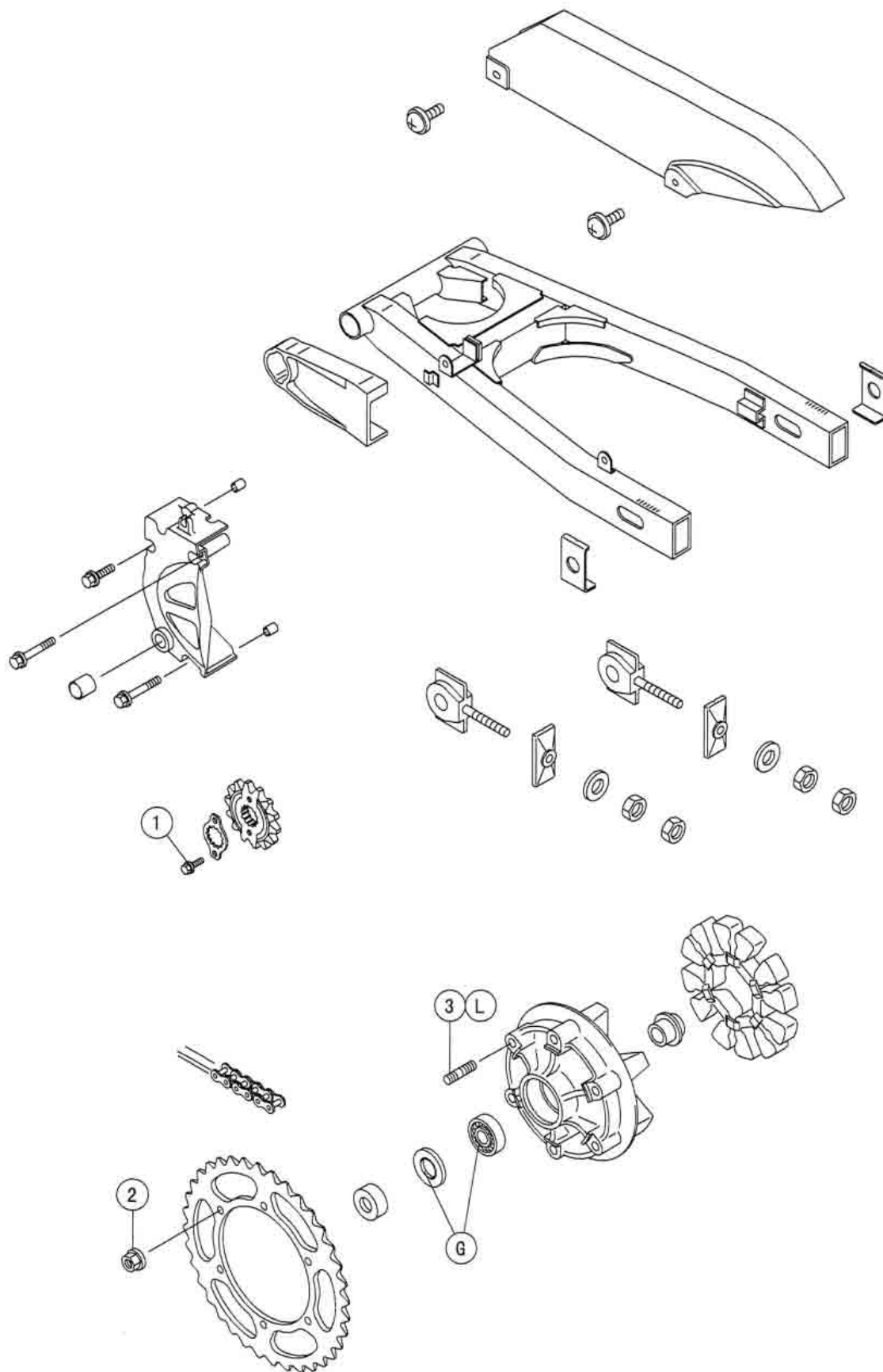
# Final Drive

## Table of Contents

Exploded View .....	11-2
Specifications .....	11-4
Special Tools .....	11-5
Drive Chain.....	11-6
Drive Chain Slack Inspection .....	11-6
Drive Chain Slack Adjustment .....	11-6
Wheel Alignment Inspection/Adjustment .....	11-6
Drive Chain Wear Inspection .....	11-6
Drive Chain Lubrication.....	11-6
Drive Chain Removal .....	11-6
Drive Chain Installation .....	11-6
Drive Chain.....	11-7
Drive Chain Replacement .....	11-7
Sprocket, Coupling .....	11-10
Engine Sprocket Removal .....	11-10
Engine Sprocket Installation .....	11-10
Rear Sprocket Removal.....	11-10
Rear Sprocket Installation.....	11-11
Coupling Installation.....	11-11
Coupling Bearing Removal .....	11-11
Coupling Bearing Installation .....	11-12
Coupling Bearing Inspection .....	11-12
Coupling Bearing Lubrication.....	11-12
Coupling Damper Inspection.....	11-12
Grease Seal Inspection and Lubrication .....	11-12
Sprocket Wear Inspection.....	11-13
Rear Sprocket Warp Inspection .....	11-13

## 11-2 FINAL DRIVE

### Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Sprocket Bolts	9.8	1.0	87 in·lb	
2	Rear Sprocket Nuts	74	7.5	54	
3	Rear Sprocket Studs	–	–	–	L

G: Apply grease.

L: Apply a non-permanent locking agent.

11-4 FINAL DRIVE

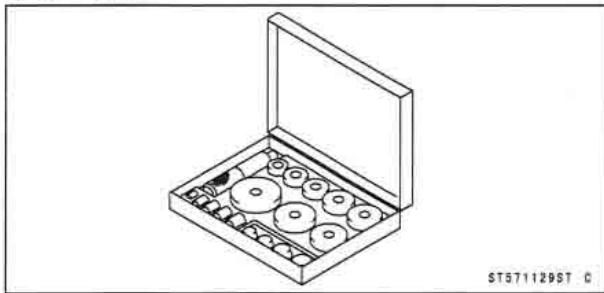
Specifications

Item	Standard	Service Limit
<b>Drive Chain</b>		
Make	Enuma	— — —
Type	EK520SR-O <sub>2</sub> , Endless	— — —
Link	108 Links	— — —
<b>Sprockets</b>		
Rear Sprocket Warp	— — —	0.5 mm (0.02 in.)

## Special Tools

---

Bearing Driver Set:  
57001-1129



## 11-6 FINAL DRIVE

### Drive Chain

#### *Drive Chain Slack Inspection*

- Refer to the Final Drive in the Periodic Maintenance chapter.

#### *Drive Chain Slack Adjustment*

- Refer to the Final Drive in the Periodic Maintenance chapter.

#### *Wheel Alignment Inspection/Adjustment*

- Refer to the Final Drive in the Periodic Maintenance chapter.

#### *Drive Chain Wear Inspection*

- Refer to the Final Drive in the Periodic Maintenance chapter.

#### *Drive Chain Lubrication*

- Refer to the Final Drive in the Periodic Maintenance chapter.

#### *Drive Chain Removal*

- Using the center stand, raise the rear wheel off the ground.
- Remove:
  - Engine Sprocket Cover
  - Drive Chain Cover
  - Rear Shock Absorber (see Suspension chapter)
  - Swingarm Pivot Shaft (see Suspension chapter)
  - Drive Chain with Engine Sprocket

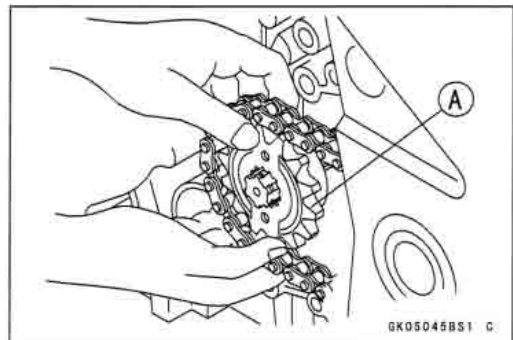
#### **NOTE**

- The swingarm may be moved with the rear wheel left installed on it.

#### *Drive Chain Installation*

- Engage the drive chain to the engine sprocket [A], and install the engine sprocket onto the shaft the protruding side of it faces in.

**Torque - Engine Sprocket Bolts:** 9.8 N·m (1.0 kgf·m, 87 in·lb)



- Install:

Swingarm (see Suspension chapter)  
Rear Shock Absorber (see Suspension chapter)  
Drive Chain Cover  
Engine Sprocket Cover

**Torque - Rear Shock Absorber Mounting Nuts:** 59 N·m (6.0 kgf·m, 43 ft·lb)

**Swingarm Pivot Nut:** 98 N·m (10 kgf·m, 72 ft·lb)

- Adjust the drive chain slack after installing the chain (see Final Drive in the Periodic Maintenance chapter).

## Drive Chain

### Drive Chain Replacement

#### CAUTION

For safety, if the drive chain shall be replaced, replace it using a recommended tool.

Recommended Tool - Type: EK JOINT Tool #50

Brand: ENUMA CHAIN

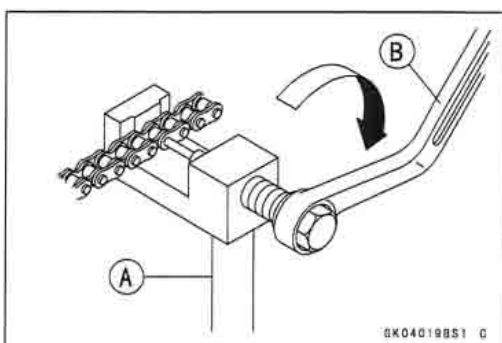
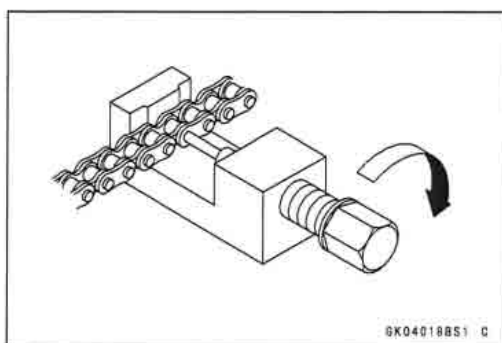
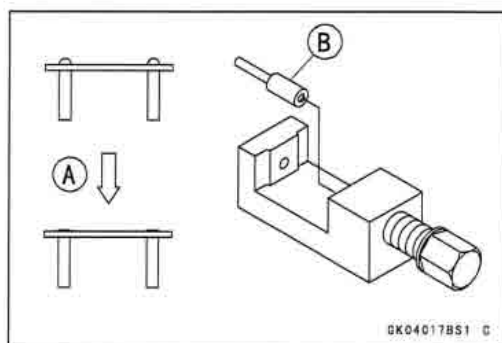
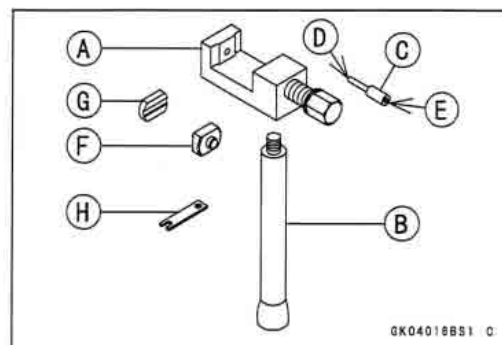
Body [A]  
 Handlebar [B]  
 Cutting and Riveting Pin [C]  
 For Cutting [D]  
 For Riveting [E]  
 Plate Holder (A) [F]  
 Plate Holder (B) [G]  
 Gauge [H]

- Remove:  
 Chain Cover (see Drive Chain Removal)  
 Engine Sprocket Cover (see Engine Sprocket Removal)

- Grind [A] the pin head to make it flat.
- Set the cutting and rivetting pin [B] as shown.

- Screw the pin holder until it touches the link pin.
- Be sure that the cutting pin hits center of the link pin.

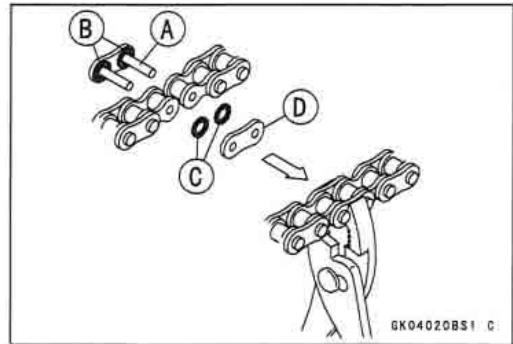
- Screw the handlebar [A] into the body.
- Turn the pin holder with the wrench [B] clockwise to extract the link pin.



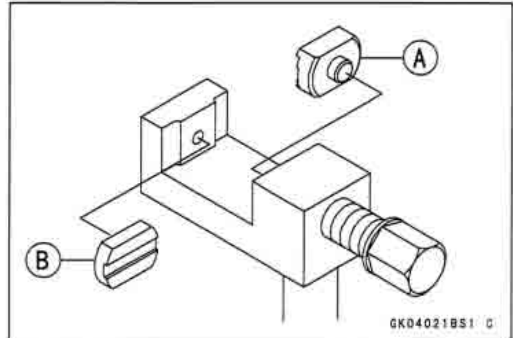
## 11-8 FINAL DRIVE

### Drive Chain

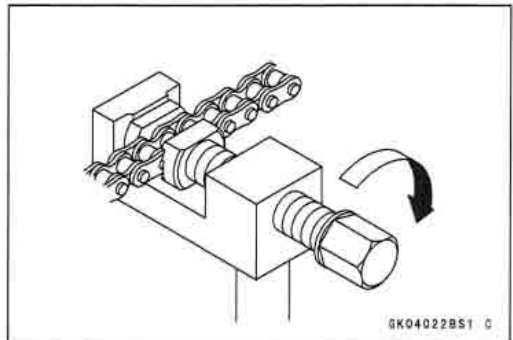
- Replace the link pin, link plate and grease seals.
- Apply grease to the link pins [A] and grease the seals [B] [C].
- Engage the drive chain on the engine and rear sprockets.
- Insert the link pins in the drive chain ends.
- Install the grease seals [C].
- Install the link plate [D] so that the mark faces out.
- Push the link plate by hand or plier to fix it.
- Be sure to set the grease seals correctly.



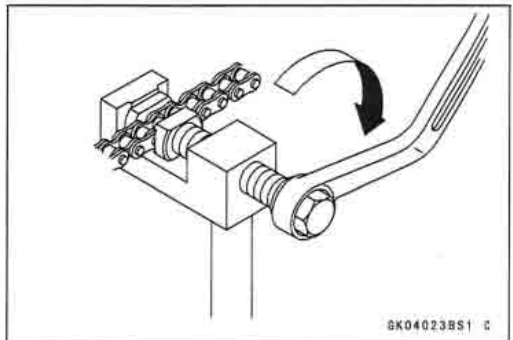
- Set the plate holder (A) [A] and plate holder (B) [B] on the body.



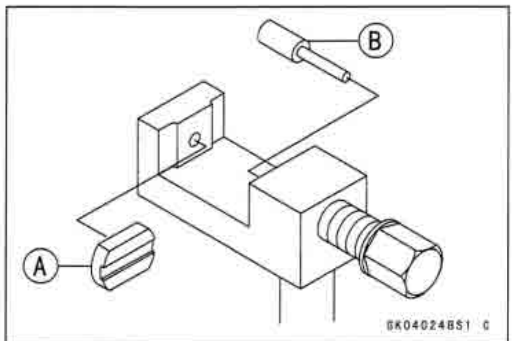
- Fit the plate holder (A) to the link plate.
- Turn the pin holder by hand until the plate holder (B) touches the other link plate.



- Turn the pin holder by a wrench clockwise until two pins of link come into groove of the plate holder (A).
- Take off the plate holder.

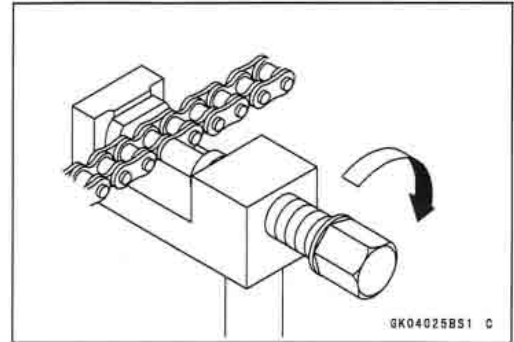


- Set the plate holder (B) [A] and the cutting and rivetting pin [B] as shown.

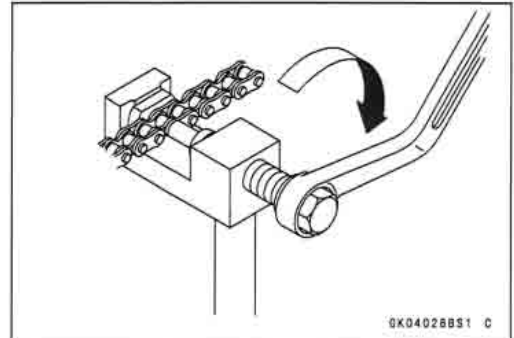


## Drive Chain

- Turn the pin holder until the rivetting pin touches the link pin.



- Turn the wrench clockwise until the tip of rivetting pin contact with the link pin.
- Rivet it.
- Repeat the same procedure for the other link pin.



- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates width [B].

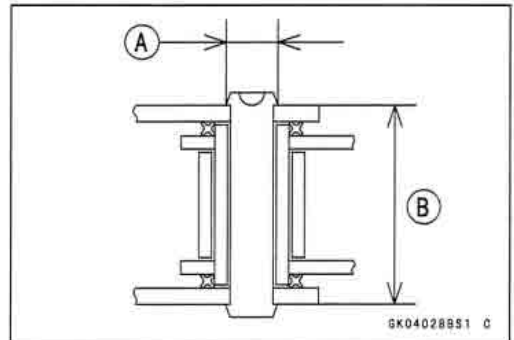
### Link Pin Outside Diameter

Standard: 5.3 ~ 5.7 mm (0.21 ~ 0.22 in.)

### Link Plates Outside Width

Standard: 17.35 ~ 17.50 mm (0.68 ~ 0.69 in.)

- ★ If the reading exceeds the specified length, cut and rejoin the chain again.
- Check:
  - Movement of the Rollers
- Adjust the drive chain slack after installing the chain.

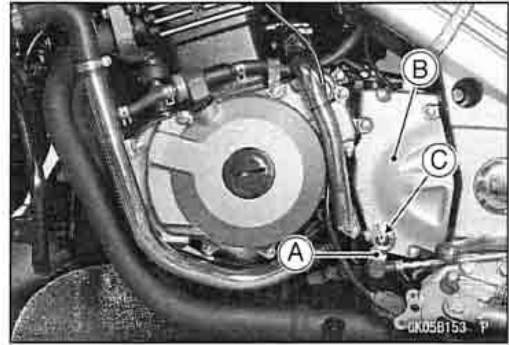


## 11-10 FINAL DRIVE

### Sprocket, Coupling

#### Engine Sprocket Removal

- Before removing the shift lever link [A] off the shift shaft, mark [C] the position of the lever on the shift shaft so that it can be installed after in the same position.
- Remove the engine sprocket cover [B].

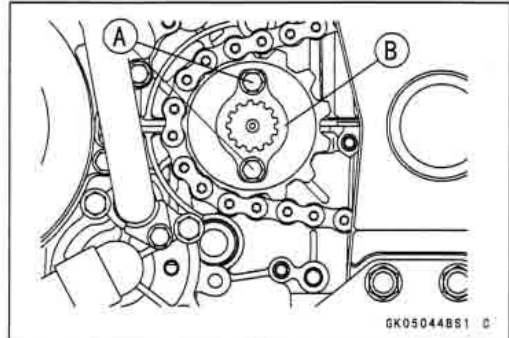


- Remove the engine sprocket bolts [A], and remove the holding plate [B].

#### NOTE

○ When loosening or tightening the engine sprocket bolts, hold the rear brake on.

- Loosen the drive chain (see Final Drive in the Periodic Maintenance chapter).
- Pull the engine sprocket off the output shaft with the drive chain, and remove the engine sprocket.

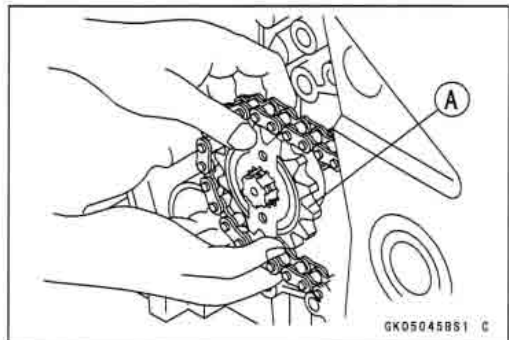


#### Engine Sprocket Installation

- Install the engine sprocket [A] onto the shaft so that the protruding side of it faces in.
- Install the holding plate and tighten the engine sprocket bolts with the specified torque.

**Torque - Engine Sprocket Bolts:** 9.8 N·m (1.0 kgf·m, 87 in·lb)

- Adjust the drive chain slack after installing the sprocket (see Final Drive in the Periodic Maintenance chapter).
- Install the new axle cotter pin, and bend the end of it surely.
- Install the engine sprocket cover.
- Install the shift lever onto the shift shaft aligning the mark which is marked before removing.



#### Rear Sprocket Removal

- Remove the rear wheel (see Wheel/Tires chapter).

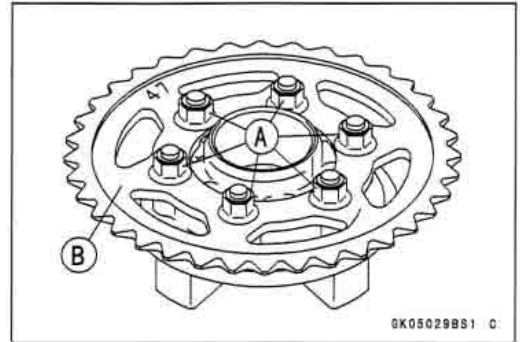
#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.



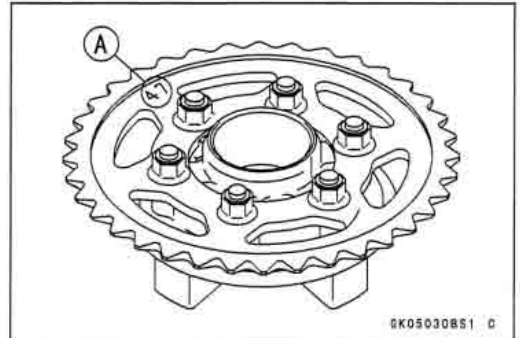
## Sprocket, Coupling

- Pull out the coupling collar from the left, and coupling sleeve from the right.
- Remove the rear sprocket nuts [A].
- Remove the rear sprocket [B].



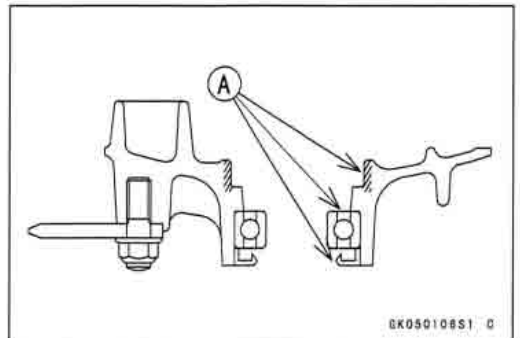
### Rear Sprocket Installation

- Install the sprocket with the tooth number marking [A] outward.
  - Install the rear sprocket nuts.
- Torque - Rear Sprocket Nuts: 74 N·m (7.5 kgf·m, 54 ft·lb)**
- Install the rear wheel (see Wheels/Tires chapter).



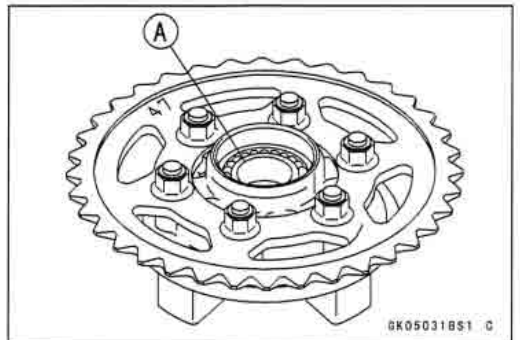
### Coupling Installation

- Grease the following and install the coupling.
  - Coupling Grease Seal [A]
  - Coupling Internal Surface [A]
  - Ball Bearing [A]

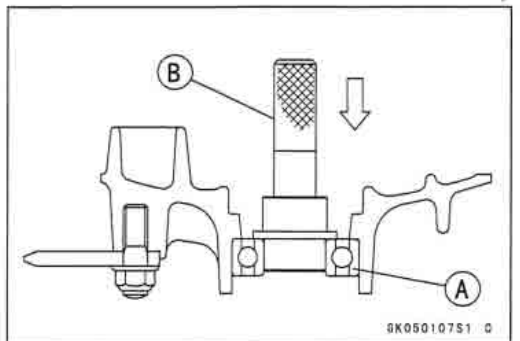


### Coupling Bearing Removal

- Remove:
  - Coupling
  - Grease Seal
  - Bearing [A]



- Remove the bearing [A] by tapping from the wheel side.
- Special Tool - Bearing Driver Set: 57001-1129 [B]**



## 11-12 FINAL DRIVE

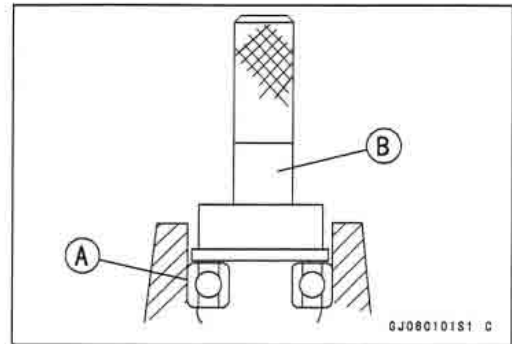
### Sprocket, Coupling

#### *Coupling Bearing Installation*

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.

**Special Tool - Bearing Driver Set: 57001-1129 [B]**

- Pack the bearing with high temperature grease.



- Replace the grease seal with a new one.
- Press in the grease seal so that the seal surface is flush with the end of the hole.
- Apply high temperature grease to the grease seal lips.

**Special Tool - Bearing Driver Set: 57001-1129**

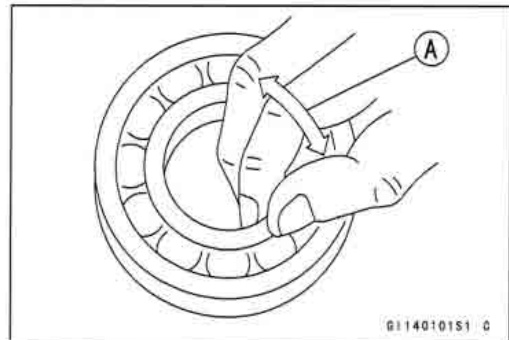
#### *Coupling Bearing Inspection*

Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

#### **NOTE**

○ It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.

- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness, or binding.
- ★ If the bearing play, roughness, or binding is found, replace the bearing.

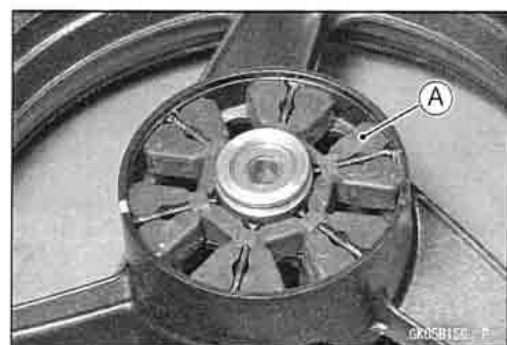


#### *Coupling Bearing Lubrication*

- Pack the bearing with high temperature grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.

#### *Coupling Damper Inspection*

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.



#### *Grease Seal Inspection and Lubrication*

If the grease seals are examined without removing the seals themselves, look for discoloration (indicating the rubber has deteriorated), hardening, damage to the internal ribbing, or other damage. If the seal or internal ribbing has hardened, the clearance between the seal and the axle sleeve will not be taken up, which will allow dirt and moisture to enter and reach the bearing. If in doubt as to its condition and whenever the seal is removed for greasing the bearing, the seal should be replaced. The seals are generally damaged upon removal.

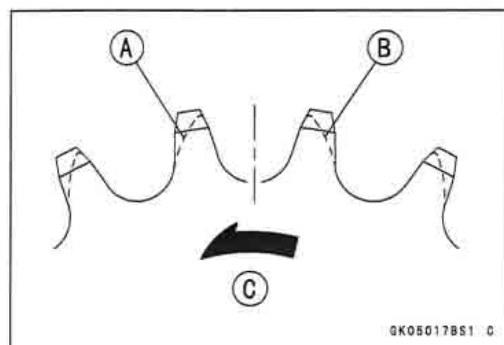
## Sprocket, Coupling

### Sprocket Wear Inspection

- Visually inspect the engine and rear sprocket teeth for wear and damage.
  - ★ If the teeth are worn as illustrated, replace the sprocket, and inspect the drive chain wear (see Drive Chain Wear Inspection).
- [A] Worn Tooth (Engine Sprocket)  
 [B] Worn Tooth (Rear Sprocket)  
 [C] Direction of Rotation

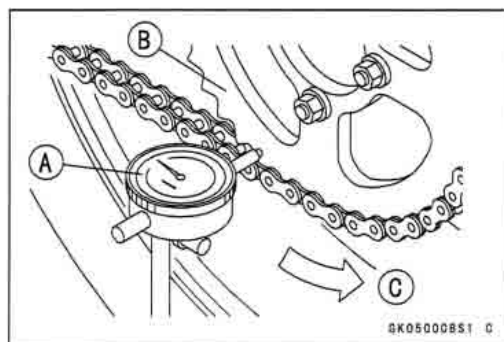
### NOTE

○ If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.



### Rear Sprocket Warp Inspection

- Raise the rear wheel off the ground using the center stand (see Wheels/Tires chapter) so that it will turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).
- ★ If the runout exceeds the service limit, replace the rear sprocket.



### Rear Sprocket Warp

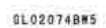
- Standard:** 0.4 mm (0.016 in.) or less  
**Service Limit:** 0.5 mm (0.02 in.)

# Brakes

## Table of Contents

Exploded View .....	12-2
Specifications .....	12-6
Special Tool .....	12-7
Brake Lever, Brake Pedal.....	12-8
Brake Lever Position Adjustment.....	12-8
Brake Pedal Position Inspection .....	12-8
Brake Pedal Position Adjustment .....	12-8
Calipers .....	12-9
Front Caliper Removal .....	12-9
Rear Caliper Removal.....	12-9
Caliper Installation .....	12-9
Caliper Disassembly .....	12-10
Caliper Assembly .....	12-10
Caliper Fluid Seal Damage .....	12-11
Caliper Dust Seal/Friction Boot Damage .....	12-11
Caliper Piston and Cylinder Damage.....	12-11
Caliper Holder Shaft Wear .....	12-12
Brake Pads.....	12-13
Brake Pad Removal .....	12-13
Brake Pad Installation .....	12-13
Brake Pad Wear Inspection .....	12-13
Master Cylinder .....	12-14
Front Master Cylinder Removal .....	12-14
Front Master Cylinder Installation .....	12-14
Rear Master Cylinder Removal.....	12-14
Rear Master Cylinder Installation.....	12-15
Rear Brake Reservoir Removal .....	12-16
Rear Brake Reservoir Installation Notes.....	12-16
Front Master Cylinder Disassembly .....	12-16
Rear Master Cylinder Disassembly.....	12-17
Master Cylinder Assembly .....	12-17
Master Cylinder Inspection (Visual Inspection) .....	12-17
Brake Disc .....	12-18
Brake Disc Removal .....	12-18
Brake Disc Installation .....	12-18
Brake Disc Wear .....	12-18
Brake Disc Warp .....	12-18
Brake Fluid .....	12-19
Brake Fluid Level Inspection.....	12-19
Brake Fluid Change .....	12-19
Bleeding the Brake Line .....	12-19
Brake Hose.....	12-20
Brake Hose Removal/Installation.....	12-20
Brake Hose Inspection.....	12-20

### Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Brake Lever Pivot Nut	5.9	0.60	52 in·lb	
2	Bleed Valve	7.8	0.80	69 in·lb	
3	Front Master Cylinder Clamp Bolts	11	1.1	95 in·lb	
4	Brake Disc Mounting Bolts	23	2.3	16.5	L
5	Brake Hose Banjo Bolts	25	2.5	18	
6	Front Caliper Mounting Bolts	32	3.3	24	
7	Front Brake Light Switch Screw	1.0	0.10	9 in·lb	
8	Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	

B: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

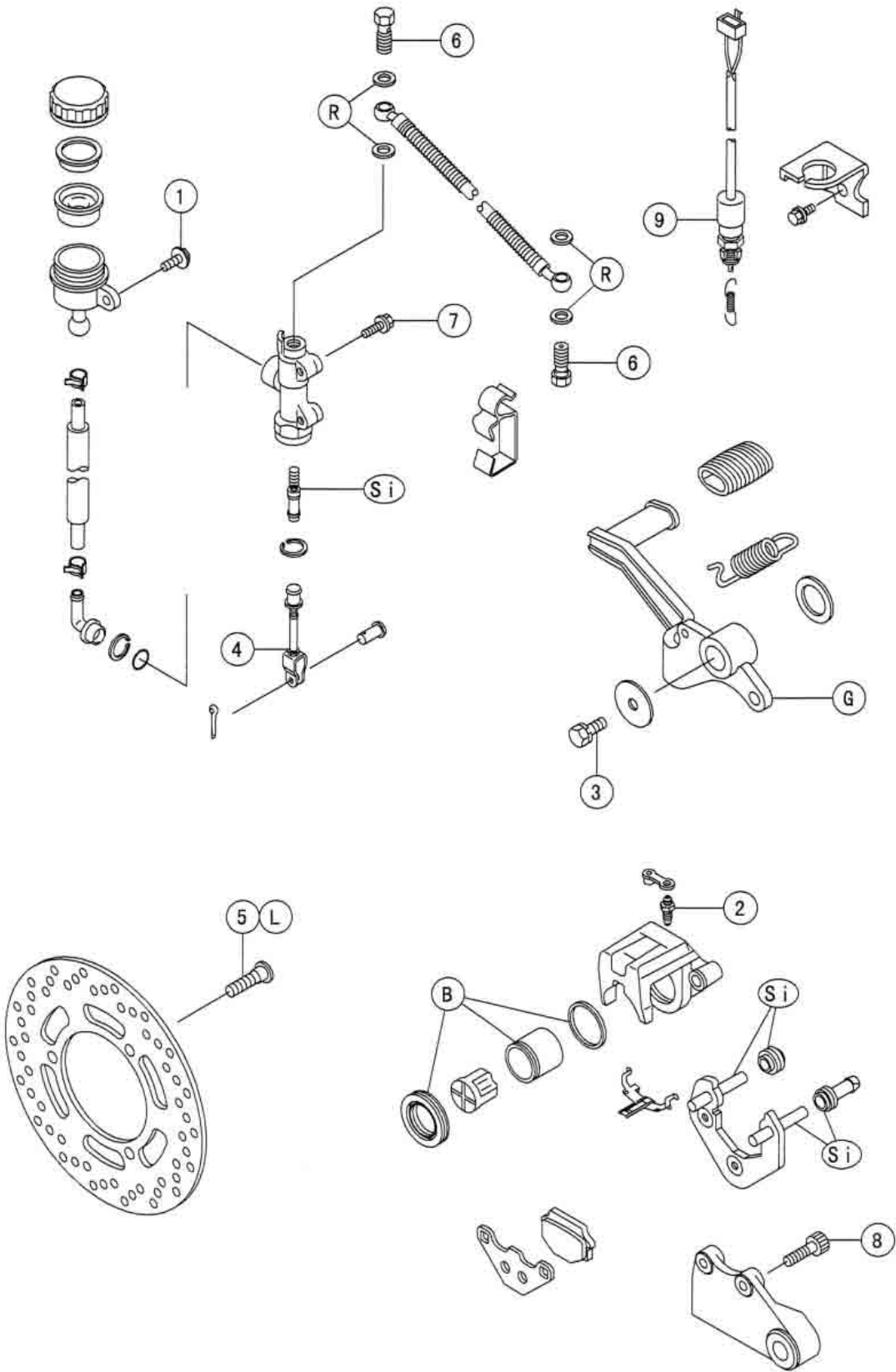
R: Replacement parts

S: Follow the specific tightening sequence.

Si: Apply silicone grease.

12-4 BRAKES

Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Reservoir Mounting Bolt	6.9	0.70	61 in·lb	
2	Bleed Valve	7.8	0.80	69 in·lb	
3	Brake Pedal Pivot Bolt	8.8	0.90	78 in·lb	
4	Push Rod Locknut	18	1.8	13	
5	Brake Disc Mounting Bolts	23	2.3	16.5	L
6	Brake Hose Banjo Bolts	25	2.5	18	
7	Rear Master Cylinder Mounting Bolts	23	2.3	16.5	
8	Rear Caliper Mounting Bolts	23	2.3	16.5	

9. Brake Light Switch

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement parts

Si: Apply silicone grease.



## 12-6 BRAKES

### Specifications

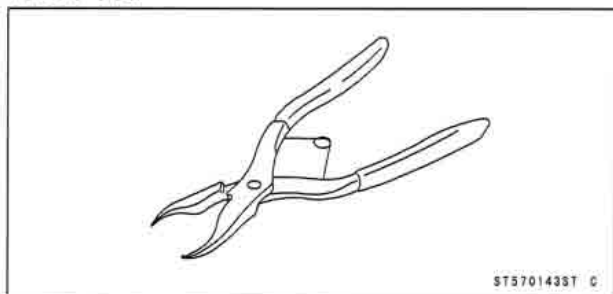
Item	Standard	Service Limit
<b>Brake Pedal</b>		(Adjustable range)
Lever Position	— — —	1 ~ 4 (EX250-H15) 1 ~ 5 (EX250-H16 ~)
Brake Pedal Position	40 mm (1.6 in.) below top of footpeg	— — —
<b>Brake Disc</b>		
Disc thickness		
Front	4.3 ~ 4.6 mm (0.17 ~ 0.18 in.)	4.0 mm (0.16 in.)
Rear	4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Disc runout	— — —	0.3 mm (0.012 in.) TIR

---

## **Special Tool**

---

**Inside Circlip Pliers:**  
**57001-143**



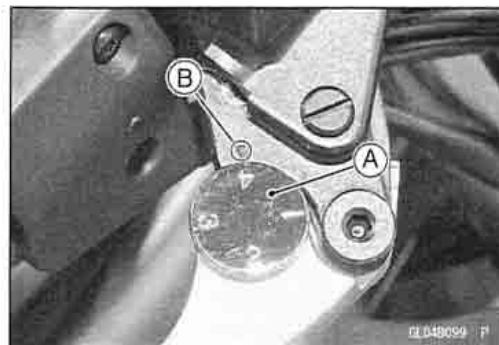
## 12-8 BRAKES

### Brake Lever, Brake Pedal

#### Brake Lever Position Adjustment

The brake lever adjuster has some positions so that the brake lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.
- The distance from the grip to the lever is minimum at number 4 and maximum at number 1 (EX250-H15).
- The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



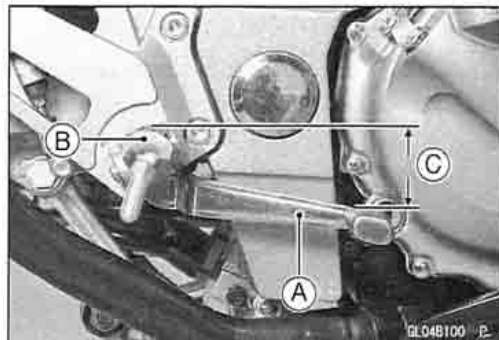
#### Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. [B] Footpeg

##### Pedal Position

**Standard:** About 40 mm (1.6 in.) [C] below top of footpeg

- ★ If it is incorrect, adjust the brake pedal position.



#### Brake Pedal Position Adjustment

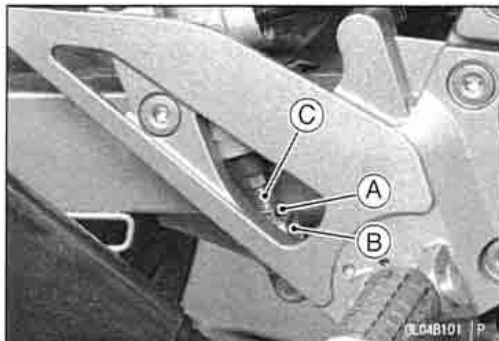
##### NOTE

- Usually it is not necessary to adjust the pedal position, but always adjust it when push rod locknut has been loosened.

- Remove the muffler.
- Loosen the locknut [A] and up or down the clevis [B] by turning the adjuster [C] to adjust the brake pedal position.
- Tighten the locknut with specified torque.

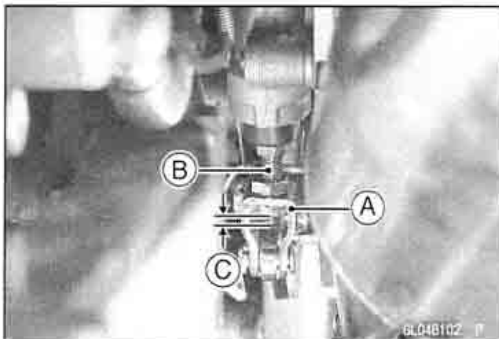
**Torque - Push Rod Locknut:** 18 N·m (1.8 kgf·m, 13 ft·lb)

- Install the muffler.



##### NOTE

- If the pedal position cannot be adjusted by turning the clevis [A], the brake pedal may be deformed or incorrectly installed.
- If the brake rod [B] protrusion is 3.5 ~ 5.5 mm (0.14 ~ 0.22 in.) [C] below the nut, the pedal position will be within the standard range (about 40 mm (1.6 in.)).
- Check the brake pedal position, and readjust it if necessary.



## Calipers

### Front Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.

#### CAUTION

**Do not loosen the caliper assembly bolts. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leakage.**

- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

**Immediately wash away any brake fluid that spills.**

#### NOTE

○ If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Front Caliper Disassembly).

### Rear Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

**Immediately wash away any brake fluid that spills.**

#### NOTE

○ If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Rear Caliper Disassembly).

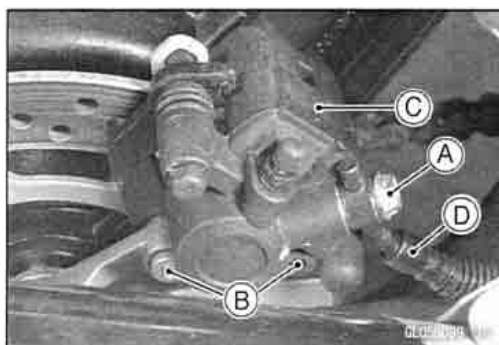
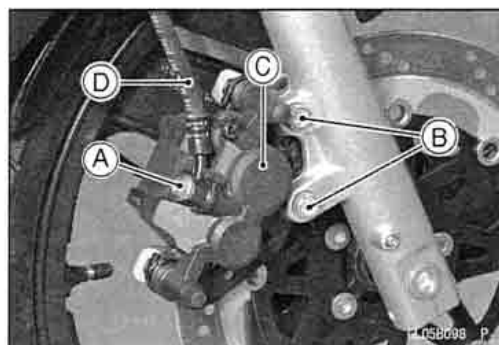
### Caliper Installation

- Install the caliper and brake hose lower end.
- Replace the washers on each side of hose fitting with new ones.
- Tighten:

**Torque - Caliper Mounting Bolts (Front): 32 N·m (3.3 kgf·m, 24 ft·lb)**

**Caliper Mounting Bolts (Rear): 23 N·m (2.3 kgf·m, 16.5 ft·lb)**

**Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**



## 12-10 BRAKES

### Calipers

- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Brakes in the Periodic Maintenance chapter).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

#### **⚠ WARNING**

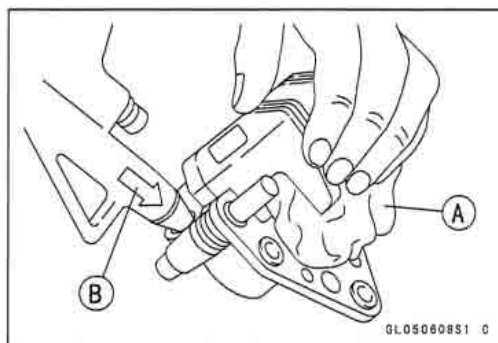
**Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal and the pads are against the disc. The brakes will not function on the first application of the lever or pedal if this is not done.**

#### *Caliper Disassembly*

- Remove a front Caliper (see Front Caliper Removal).
- Remove the pads and anti-rattle spring (see Pad Removal).
- Remove the caliper holder, shaft rubber friction boot and dust cover.
- ★ If compressed air is available, the piston may be removed using compressed air as follows.
- Insert the wooden board of 5 mm (0.2 in.) thick inside the caliper opening or cover the caliper opening with a clean, heavy cloth [A].
- Lightly apply compressed air [B] to the hose joint opening until the pistons hit the wooden board or heavy cloth.

#### **⚠ WARNING**

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



- Pull out the pistons by hand.
- Immediately wipe up any brake fluid that spills. It may ruin painted or plated surfaces.
- Remove the dust seals and fluid seals.
- Remove the bleed valve and rubber cap.

#### **NOTE**

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

#### *Caliper Assembly*

- Clean the caliper parts except for the pads.

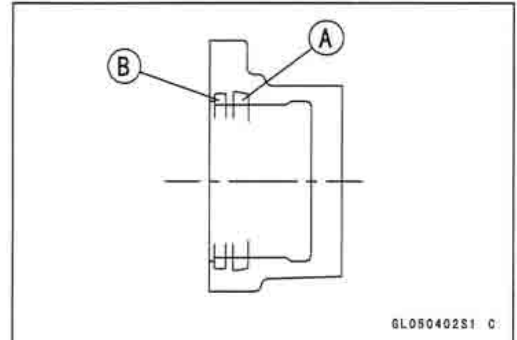
#### **CAUTION**

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

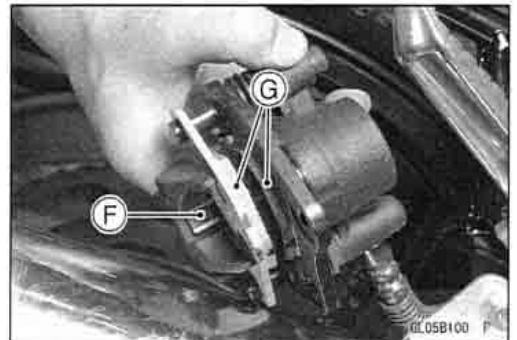
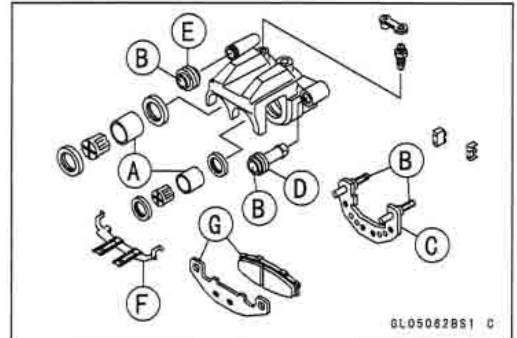
- Install the bleed valve and rubber cap.  
**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

## Calipers

- Replace the fluid seals [A] and dust seals [B] with new one.
- Apply brake fluid to the fluid seals and dust seals, and install them into the cylinder by hand.



- Apply brake fluid [A] to the outside of the pistons and push them into each cylinder by hand without scratching the cylinder and piston skirt.
- Apply silicone grease [B] to the caliper holder shaft and holder holes, and install the caliper holder [C], rubber friction boot [D] and dust cover [E].
- Install the anti-rattle spring [F] and pads [G] in the caliper (see Pad Installation).



### Caliper Fluid Seal Damage

- Refer to the Brakes in the Periodic Maintenance chapter.

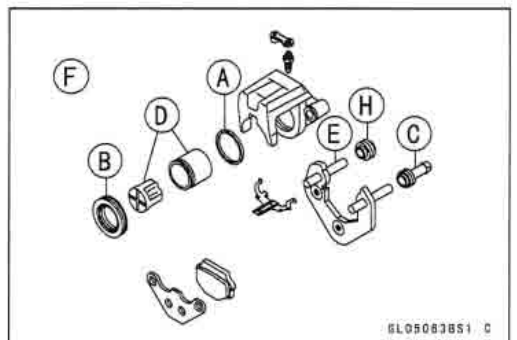
### Caliper Dust Seal/Friction Boot Damage

- Refer to the Brakes in the Periodic Maintenance chapter.

### Caliper Piston and Cylinder Damage

- Visually inspect the piston [D] and cylinder surfaces.
- ★ Replace the caliper if the cylinder and piston are badly scores or rusty.

Fluid Seal [A]  
Dust Seal [B]  
Front Caliper [F]  
Rear Caliper [G]  
Dust Boot [H]



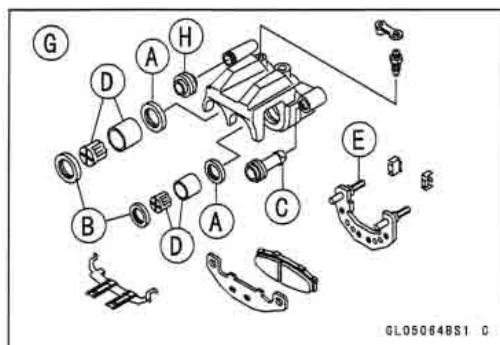
## 12-12 BRAKES

### Calipers

#### *Caliper Holder Shaft Wear*

The caliper body must slide smoothly on the caliper holder shafts [E]. 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.

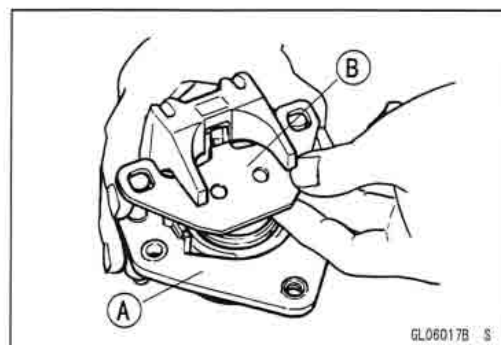
- Check to see that the caliper holder shafts are not badly worn or stepped, and that the rubber friction boots [C] are not damaged.
- ★ If the rubber friction boot is damaged, replace the rubber friction boot. To replace the friction boot, remove the pads and the caliper bracket.
- ★ If the caliper holder shaft is damage, replace the caliper bracket.



## Brake Pads

### *Brake Pad Removal*

- Remove the caliper (see Front and/or Rear Caliper Removal).
- Take off the piston side pad from the caliper holder.
- Push the caliper holder [A] to the piston side, and then remove the pad [B] from the caliper holder shaft.



### *Brake Pad Installation*

- Push the caliper pistons by hand as far as they will go.
- Install the pad to the caliper holder shaft pushing it to the piston side and then install the piston side pad.
- Install the anti-rattle spring.

### **⚠ WARNING**

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

### *Brake Pad Wear Inspection*

- Refer to the Brakes in the Periodic Maintenance chapter.



## 12-14 BRAKES

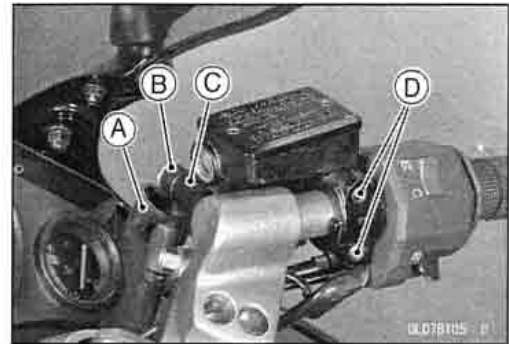
### Master Cylinder

#### Front Master Cylinder Removal

- Slide the dust cover [A], and remove the banjo bolt [B] to disconnect the upper brake hose from the master cylinder [C]. There are flat washers on each side of the hose fitting.
- Remove the front master cylinder clamp bolts [D], and take off the master cylinder.

#### CAUTION

Immediately wash away any brake fluid that spills.



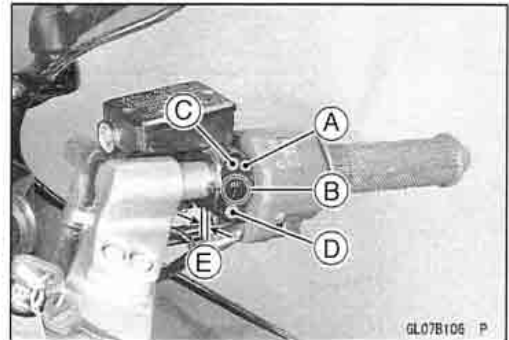
#### Front Master Cylinder Installation

- Install the master cylinder clamp [A] pointing with the arrow mark [B] upward.
- Tighten the upper clamp bolt [C] first, and then the lower clamp bolt [D] with a specified torque. There will be a gap [E] at the lower part of the clamp after tightening.
- Tighten the banjo bolt with a specified torque after installing a new flat washer on each side of the brake hose fitting.

**Torque - Front Master Cylinder Clamp Bolts:** 11 N·m (1.1 kgf·m, 95 in·lb)

**Brake Hose Banjo Bolt:** 25 N·m (2.5 kgf·m, 18 ft·lb)

- Bleed the brake line (see Brakes in the periodic Maintenance chapter).
- Check the brake for good braking power, no brake drag and no brake fluid leakage.



#### ⚠ WARNING

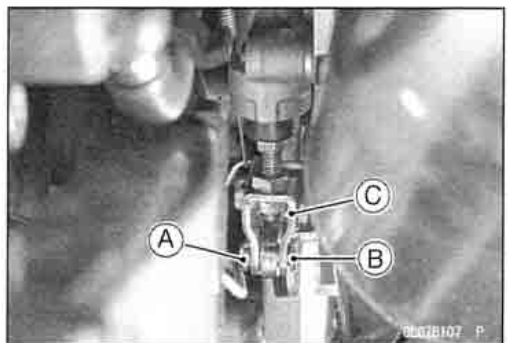
Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever and the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

#### Rear Master Cylinder Removal

- Remove the cotter pin [A] and then pull the joint pin [B] out of the push rod clevis [C] and brake pedal.

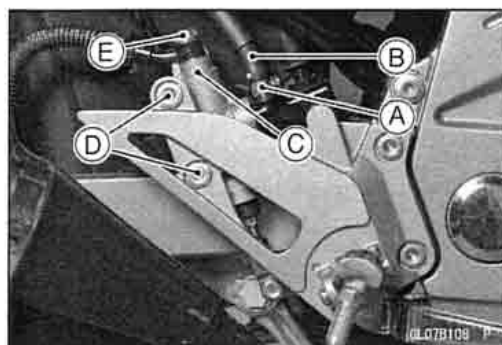
#### NOTE

○ Pull off the joint pin while pressing down the brake pedal.



## Master Cylinder

- Slide the brake hose clamp [A] out of place (see Brake Hose Removal/Installation).
- Disconnect the brake hoses [B] from the brake hose connector of the master cylinder [C], and temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum and immediately wipe up any brake fluid that spills.
- Remove the master cylinder mounting bolts [D] and take the master cylinder off the footpeg bracket.
- Remove the banjo bolt [E] to disconnect the brake hose from the master cylinder and temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum. There are flat washers on each side of the hose fitting.



### CAUTION

**Immediately wash away any brake fluid that spills.**

### Rear Master Cylinder Installation

- Tighten the banjo bolt with a specified torque after installing a new flat washer on each side of the brake hose fitting. Be sure that the metal pipe is properly fitted into the U-shaped notch in the master cylinder.

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

- Tighten the rear master cylinder mounting bolts with a specified torque.

**Torque - Rear Master Cylinder Mounting Bolts: 23 N·m (2.3 kgf·m, 16.5 ft·lb)**

- Connect the brake hose to the master cylinder and replace the brake hose clamp in place.
- Connect the push rod clevis to the brake pedal with the joint pin.
- Install the cotter pin and bend the end of it securely.
- Bleed the brake line (see Brakes in the periodic Maintenance chapter).
- Check the brake for good braking power, no brake drag and no brake fluid leakage.

### ⚠ WARNING

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

- Check the brake pedal position (see Brake Pedal Position Inspection).
- Check the rear brake light switch (see Brakes in the Periodic Maintenance chapter).

## 12-16 BRAKES

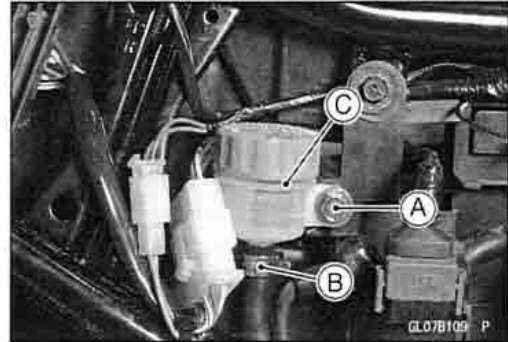
### Master Cylinder

#### Rear Brake Reservoir Removal

- Remove:
  - Right Side Cover
  - Reservoir mounting Bolt [A]
  - Brake Hose Clamp (Slide) [B]
  - Reservoir [C]

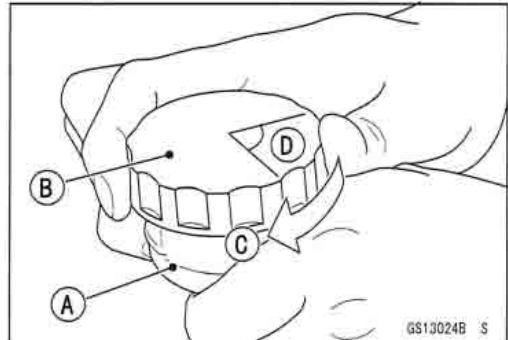
#### CAUTION

Immediately wash away any brake fluid that spills.



#### Rear Brake Reservoir Installation Notes

- Install the clamp for the brake hose end.
  - Fill the reservoir with fresh brake fluid and bleed the brake line (see Brakes in the Periodic Maintenance chapter).
  - Follow the procedure below to install the rear brake fluid reservoir cap correctly.
- First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until the resistance is felt fully; then, tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir [A] body.

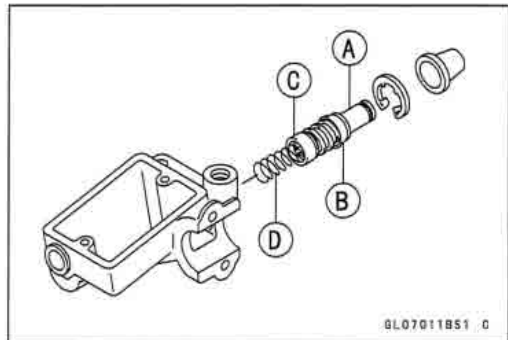


#### Front Master Cylinder Disassembly

- Remove the front master cylinder (see Front Master Cylinder Removal)
- Remove the reservoir cap and diaphragm, and pour the brake fluid into a container.
- Unscrew the pivot nut and pivot bolt, and remove the brake lever.
- Pull the dust cover out of place, and remove the circlip.

#### Special Tool - Inside Circlip Pliers: 57001-143

- Pull out the piston [A], secondary cup [B], primary cup [C], and return spring [D].



#### CAUTION

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

## Master Cylinder

### Rear Master Cylinder Disassembly

#### NOTE

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

- Remove the rear master cylinder (see Rear master Cylinder Removal).
- Remove the circlip [E].

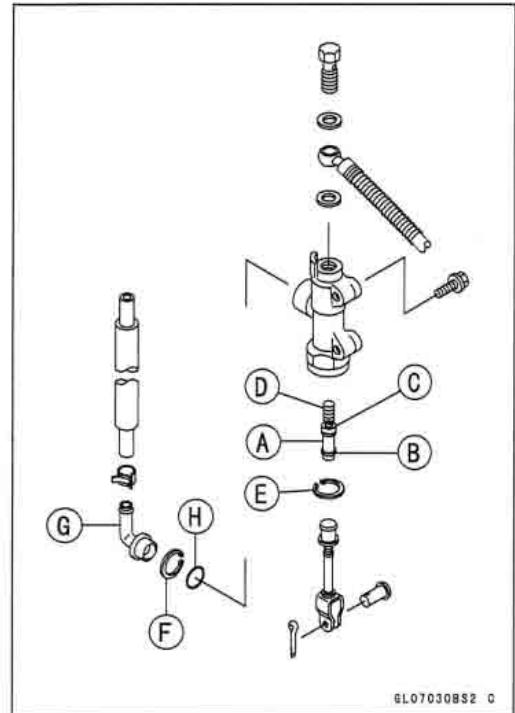
**Special Tool - Inside Circlip Pliers: 57001-143**

- Pull out the push rod with the piston stop.
- Take off the piston [A], secondary cup [B], primary cup [C], and return spring [D].
- Remove the circlip [F] and pull out the brake hose connector [G] and O-ring [H].

**Special Tool - Inside Circlip Pliers: 57001-143**

#### CAUTION

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



### Master Cylinder Assembly

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

#### CAUTION

**Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning 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 or the inner wall of the cylinder.
- Apply silicone grease (ex. PBC grease).
  - Brake Lever Pivot Bolt
  - Brake Lever Pivot Contact
  - Push Rod Contact (Rear)
  - Dust Cover
- Tighten:
  - Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 9 in·lb)**
  - Brake Lever Pivot Nut: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

### Master Cylinder Inspection (Visual Inspection)

- Refer to the Brakes in the Periodic Maintenance chapter.

## 12-18 BRAKES

### Brake Disc

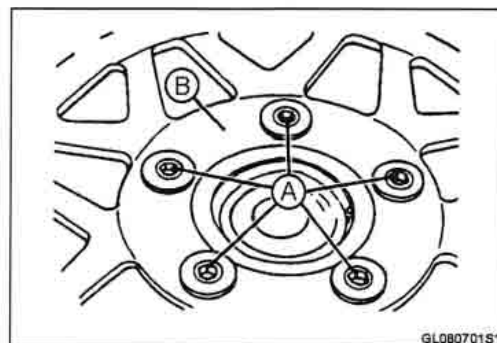
#### Brake Disc Removal

- Remove the wheel (see Wheels/Tires chapter).
- Unscrew the mounting bolts, and take off the disc.

#### Brake Disc Installation

- Install the brake disc on the wheel so that the marked side [B] faces out.
- Apply a non-permanent locking agent to the threads of the brake disc mounting bolts [A].
- Tighten:

**Torque - Brake Disc Mounting Bolts:** 23 N·m (2.3 kgf·m, 16.5ft·lb)



#### Brake Disc Wear

- Measure the thickness of each disc [A] at the point where it has worn the most.
  - ★ If the disc has worn past the service limit, replace it.
- Measuring Area [B]

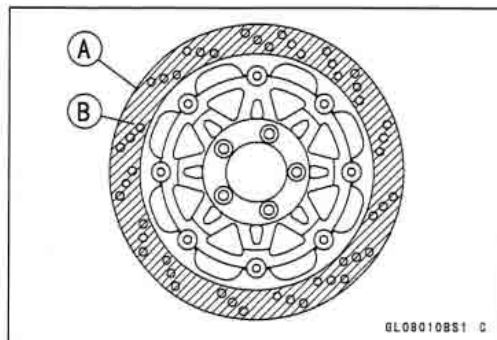
#### Disc Thickness

##### Standard:

Front	4.3 ~ 4.6 mm (0.17 ~ 0.18 in.)
Rear	4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)

##### Service Limit:

Front	4.0 mm (0.16 in.)
Rear	4.5 mm (0.18 in.)

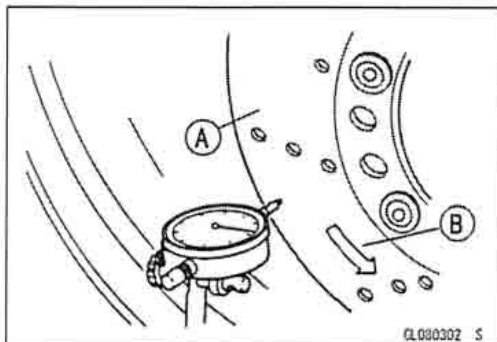


#### Brake Disc Warp

- Jack up the motorcycle so that the wheel is off the ground (see Wheels/Tires chapter).
- For front disc inspection, turn the handlebar fully to one side.
- Set up a dial gauge against the disc [A] as shown and measure the disc runout, while turning [B] the wheel by hand.
- ★ If the runout exceeds the service limit, replace the disc.

#### Disc Runout

**Service Limit:** 0.3 mm (0.01 in.) TIR



---

**Brake Fluid**

---

*Brake Fluid Level Inspection*

- Refer to the Brakes in the Periodic Maintenance chapter.

*Brake Fluid Change*

- Refer to the Brakes in the Periodic Maintenance chapter.

*Bleeding the Brake Line*

- Refer to the Brakes in the Periodic Maintenance chapter.

## 12-20 BRAKES

### Brake Hose

---

#### *Brake Hose Removal/Installation*

CAUTION
<b>Brake fluid quickly ruins painted or plastic surfaces; any spilled fluid should be completely wiped up immediately with wet cloth.</b>

- 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.
- There are washers on each side of the brake hose fitting. Replace them with new ones when installing.
- When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and route the hoses according to Cable, Wire, and Hose Routing section in Appendix chapter.
- Tighten:  
**Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Bleed the brake line after installing the brake hose (see Brakes in the Periodic Maintenance chapter).

#### *Brake Hose Inspection*

- Refer to the Brakes in the Periodic Maintenance chapter.

# Suspension

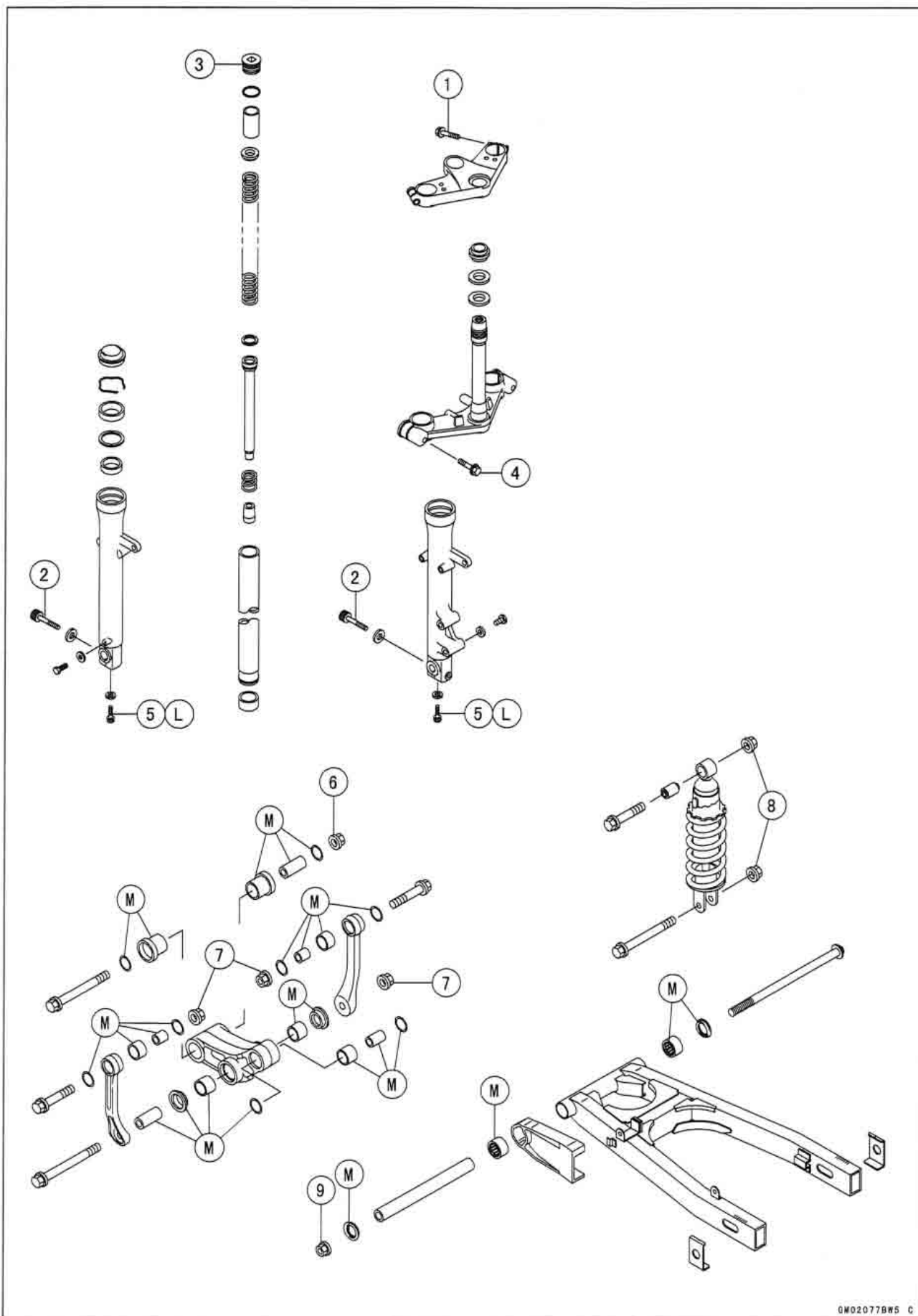
## Table of Contents

Exploded View .....	13-2
Specifications .....	13-4
Special Tools .....	13-5
Front Fork .....	13-6
Fork Oil Change .....	13-6
Front Fork Removal (each fork leg) .....	13-8
Front Fork Installation (each fork leg) .....	13-8
Front Fork Disassembly .....	13-9
Front Fork Assembly .....	13-9
Inner Tube/Outer Tube Inspection .....	13-11
Fork Spring Inspection .....	13-11
Oil Seal/Dust Seal Inspection .....	13-11
Rear Shock Absorber .....	13-12
Spring Preload Adjustment .....	13-12
Rear Shock Absorber Removal .....	13-12
Rear Shock Absorber Installation .....	13-12
Rear Shock Absorber Scrapping .....	13-13
Swingarm .....	13-14
Swingarm Removal .....	13-14
Swingarm Installation .....	13-14
Swingarm Bearing Removal .....	13-14
Swingarm Bearing Installation .....	13-15
Swingarm Bearing, Sleeve Inspection .....	13-15
Swingarm Lubrication .....	13-15
Tie-Rod, Rocker Arm .....	13-16
Tie-rods Removal .....	13-16
Tie-Rod Installation .....	13-16
Rocker Arm Removal .....	13-16
Rocker Arm Installation .....	13-16
Tie-rod , Rocker Arm Bushing Inspection .....	13-16
Tie-rod, Rocker Arm Sleeve Inspection .....	13-16
Tie-rod, Rocker Arm Lubrication .....	13-17



## 13-2 SUSPENSION

### Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fork Upper Clamp Bolts	20	2.0	14.5	
2	Front Axle Clamp Bolts	20	2.0	14.5	
3	Front Fork Top Plugs	23	2.3	16.5	
4	Front Fork Lower Clamp Bolts	30	3.1	22	
5	Front Fork Bottom Allen Bolts	30	3.1	22	L
6	Rocker Arm Pivot Nut	44	4.5	33	
7	Tie-Rod Nuts	44	4.5	33	
8	Rear Shock Absorber mounting Nuts	59	6.0	43	
9	Swingarm Pivot Nut	98	10	72	

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

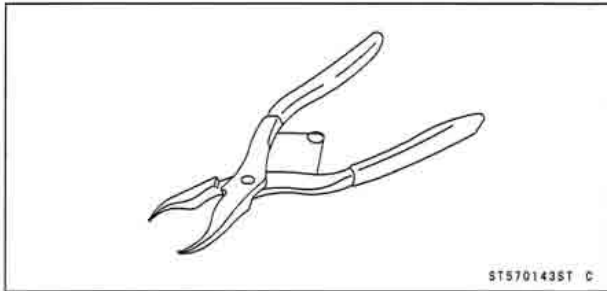
## 13-4 SUSPENSION

### Specifications

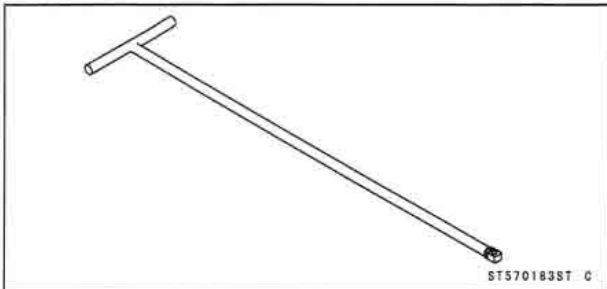
Item	Standard	Service Limit
<b>Front Fork</b>		
Fork oil:		
Viscosity	KHL34-G10 (KAYABA) or equivalent	— — —
Capacity per unit	350 ± 4 mL (11.8 ± 0.1 US oz)	— — —
	300 mL (10.1 US oz) When changing oil	— — —
Fork oil level	135 ± 2 mm (5.31 ± 0.08 in.) (Fully compressed, without spring)	— — —
Fork spring free length	415 mm (16.3 in.)	407 mm (16.0 in.)
<b>Rear Suspension</b>		
Rear shock absorber spring preload adjustment	2nd position	1 ~ 5 (Usable range)
Rear shock absorber gas pressure (non-adjustable)	980 kPa (10 kg/cm <sup>2</sup> , 142 ps)	— — —

## Special Tools

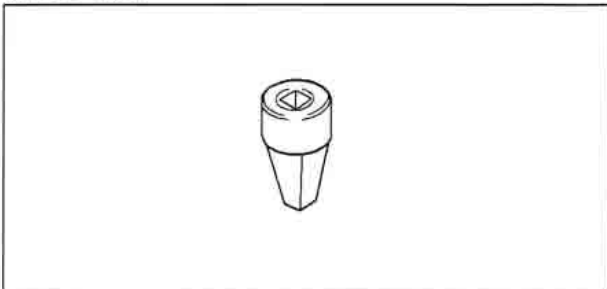
**Inside Circlip Pliers:**  
57001-143



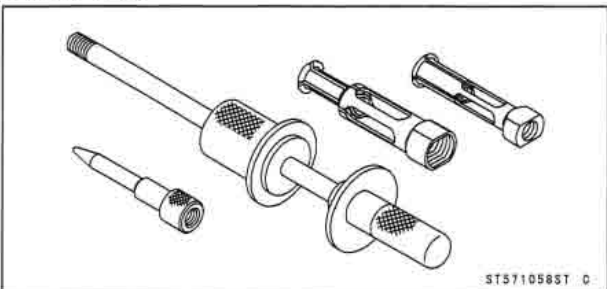
**Fork Cylinder Holder Handle:**  
57001-183



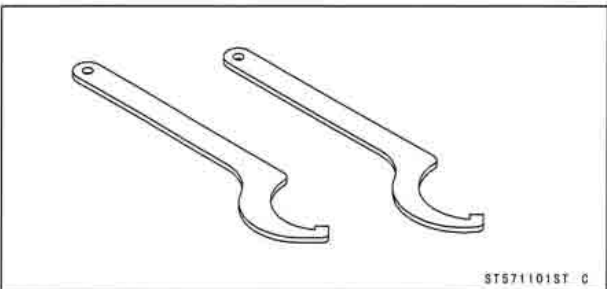
**Fork Cylinder Holder Adapter:**  
57001-1057



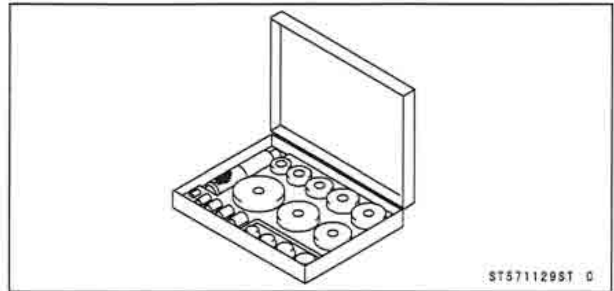
**Oil Seal & Bearing Remover:**  
57001-1058



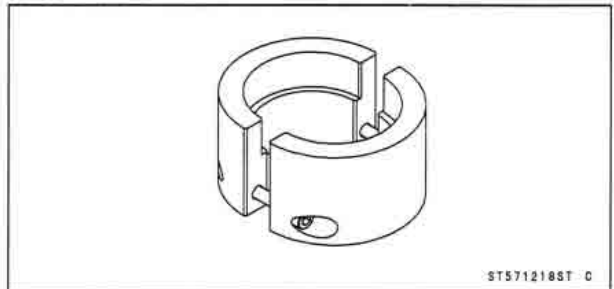
**Hook Wrench R37.5, R42:**  
57001-1101



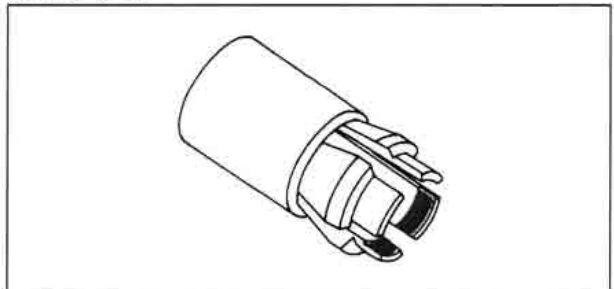
**Bearing Driver Set:**  
57001-1129



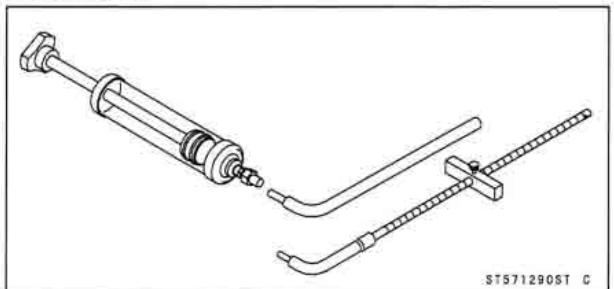
**Fork Outer Tube Weight:**  
57001-1218



**Front Fork Oil Seal Driver:**  
57001-1219



**Fork Oil Level Gauge:**  
57001-1290

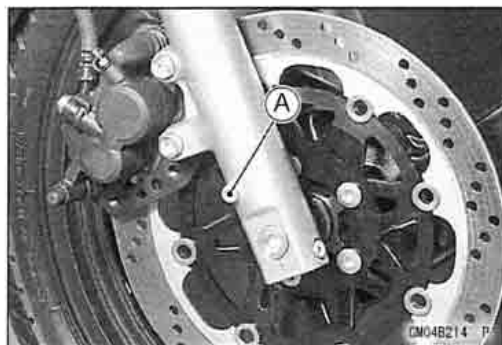


## 13-6 SUSPENSION

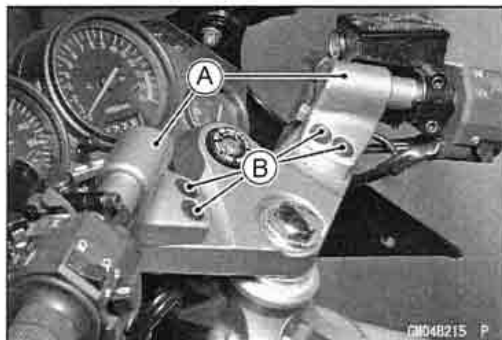
### Front Fork

#### Fork Oil Change

- Unscrew the drain screw [A] to drain the fork oil.
- Allow the oil to drain into a suitable container. If you pump the fork legs to force out the oil, be sure to catch the oil in a container as it requires out.



- Raise the front wheel off the ground using the jack.
- Remove:
  - Handlebar Holder [A]
  - Handlebar Holder Bolts [B]

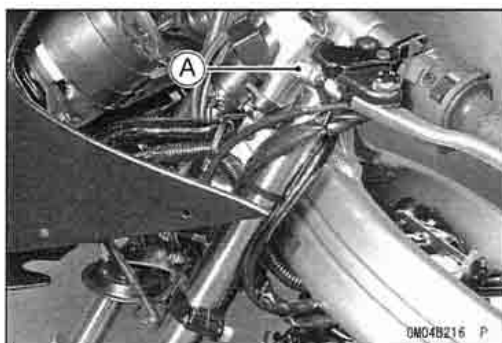


- Loosen the front fork upper clamp bolts [A] and remove the fork top plugs.

#### **⚠ WARNING**

**The top plugs are under extreme spring pressure. Take care when removing the top plugs. Wear eye and face protection.**

- Remove:
  - O-ring
  - Spacer
  - Spring Seat
  - Front Fork Spring
- Wash the drain screw threads clean using fork oil, and blow then dry.
- Apply a non-permanent locking agent to the drain screw threads.
- Install the drain screws with a new gasket.
- Pour in the type and capacity of fork oil specified.



#### Front Fork Oil

Viscosity: KHL34-G10 (KAYABA) or equivalent  
Capacity: Approx. 300 mL (10.1 US oz) when  
per side: changing oil  
350 ± 4 mL (11.8 ± 0.1 US oz) After  
disassembly and completely dry

## Front Fork

- ★ If necessary, measure the oil level as following.
- Slowly compress the front fork fully by pushing up the outer tubes using a jack or other suitable means under the front wheel.
- Wait until the oil level settles.
- Insert a tape measure or rod into the inner tube, and measure the distance from the top of the inner tube to the oil.

### Oil Level (fully compressed, without spring)

**Standard:**  $135 \pm 2$  mm ( $5.3 \pm 0.08$  in.) (from the top of the inner tube)

### NOTE

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

- The tape measure, rod, or oil syringe pipe should be in the middle of the inner tube, or the correct oil level cannot be measured.

### Special Tool - Fork Oil Level Gauge: 57001-1290 [A]

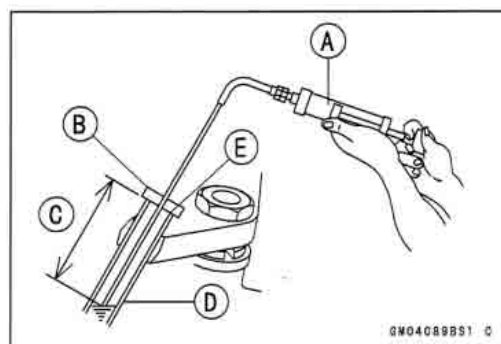
- With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [D] and position the stopper across the top end [E] of the inner tube.
- Set the gauge stopper [B] so that its lower side shows the oil level distance specified [C].
- Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
- ★ If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.

- Measure the oil level of the other fork leg in the same manner.
- Install:
  - Front Fork Spring
  - Spring Seat
  - Spacer
  - O-ring
- ★ Inspect the O-ring, and if it is damaged, replace it with a new one.
- Tighten the front fork upper clamp bolt with a specified torque.
- Tighten the front fork top plug with a specified torque.
- Tighten the handlebar holder bolts and install the handlebar holder.

**Torque - Front Fork Top Plug:** 23 N·m (2.3 kgf·m, 16.5 ft·lb)

**Front Fork Upper Clamp Bolt:** 20 N·m (2.0 kgf·m, 14.5 ft·lb)

**Handlebar Holder Bolts:** 23 N·m (2.3 kgf·m, 16.5 ft·lb)



## 13-8 SUSPENSION

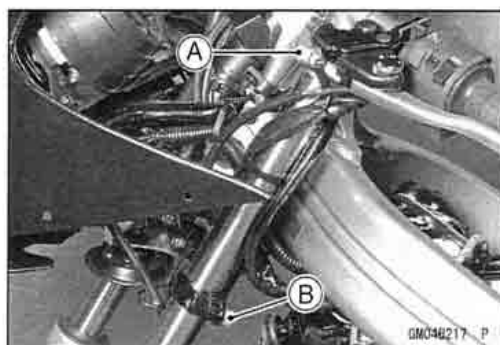
### Front Fork

#### Front Fork Removal (each fork leg)

##### NOTE

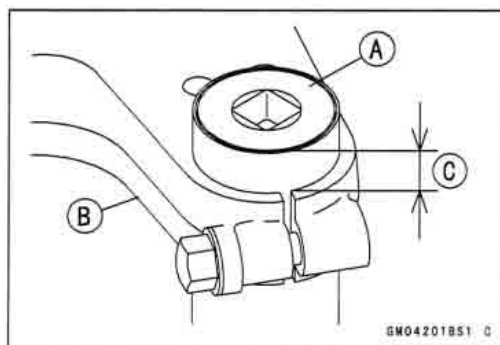
○ Remove the handlebar holder and loosen the fork top plug beforehand if the fork leg is to be disassembled.

- Remove:
  - Front Brake Caliper (see Brakes chapter)
  - Front Wheel (see Wheels/Tires chapter)
  - Front Fender (see Frame chapter)
  - Lower Fairing (see Frame chapter)
- Remove the clamps and free the wiring harness, brake hose or speedometer cable from the fork leg.
- Loosen the front fork upper [A] and lower [B] clamp bolts.
- With a twisting motion, remove the fork leg down and out.



#### Front Fork Installation (each fork leg)

- Insert the fork leg until the inner tube top hit the handlebar holder lightly, that is, the distance between the inner tube top [A] and the steering stem head surface [B] is approximate 12 mm (0.47 in.) [C].



**Torque - Front Fork Upper Clamp Bolt:** 20 N·m (2.0 kgf·m, 14.5 ft·lb)

**Front Fork Lower Clamp Bolt:** 30 N·m (3.1 kgf·m, 22 ft·lb)

**Front Fork Top Plug (if loosened):** 23 N·m (2.3 kgf·m, 16.5 ft·lb)

- Route the wiring harness, brake hose and speedometer cable and clamp them to the left fork leg.
- Install:
  - Handlebar Holder (If it is removed)
  - Front Brake Caliper (see Brakes chapter)
  - Front Wheel (see Wheels/Tires chapter)
  - Front Fender (see Frame chapter)
  - Lower Fairing (see Frame chapter)

**Torque - Handlebar Holder Bolts:** 23 N·m (2.3 kgf·m, 16.5 ft·lb)

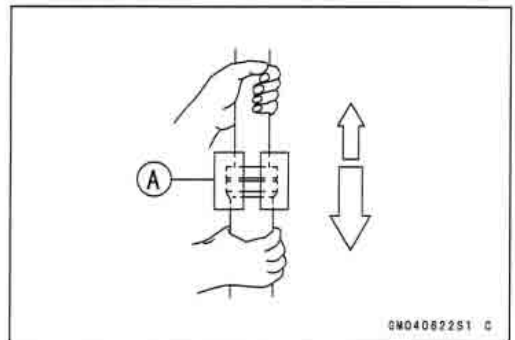
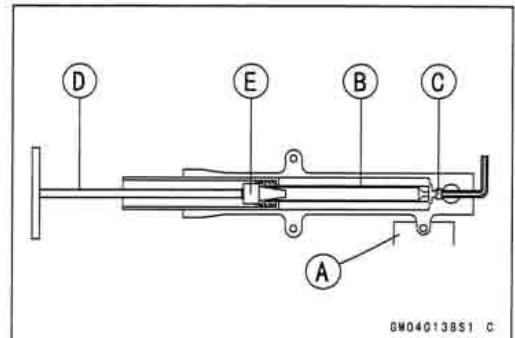
## Front Fork

### Front Fork Disassembly

- Drain the front fork oil.
- Remove:
  - Fork Leg
  - Fork Top Plug
  - O-ring
  - Spacer
  - Spring Seat
  - Spring
  - Dust seal from outer tube
  - Retaining ring from outer tube
- Hold the front fork leg horizontally in a vise [A].
- Stop the cylinder unit [B] from turning by using the special tools.
- Unscrew the front fork bottom Allen bolt [C], and then take out the bolt and gasket out of the bottom of the outer tube.
 

**Special Tools - Fork Cylinder Holder Handle: 57001-183 [D]**  
**Fork Cylinder Holder Adapter: 57001-1057 [E]**
- Take the cylinder unit out of the inner tube.
- Use the fork outer tube weight [A] to separate the inner tube from the outer tube. Holding the inner tube by hand in a vertical position, pull down the outer tube several times to pull out the inner tube.
 

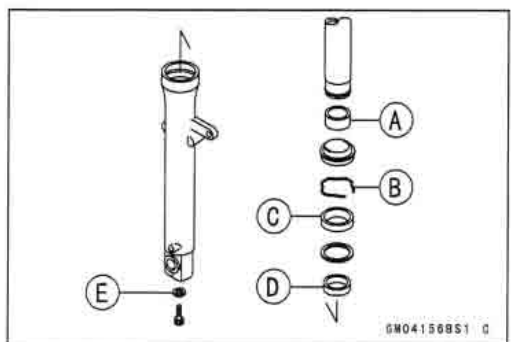
**Special Tool - Fork Outer Tuber Weight: 57001-1218**
- Take out the cylinder base from the outer tube bottom.



- Remove the inner guide pushing from the inner tube.

### Front Fork Assembly

- Check the top plug O-ring and replace it with a new one if necessary.
- Replace the following parts with new ones.
  - Inner Guide Bushing [A]
  - Retaining Ring [B]
  - Oil Seal [C]
  - Outer Guide Busing [D]
  - Bottom Allen Bolt Gasket [E]

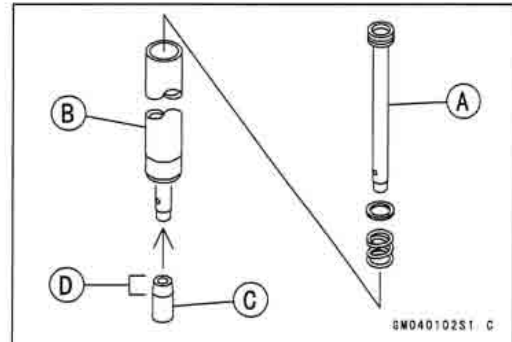




## 13-10 SUSPENSION

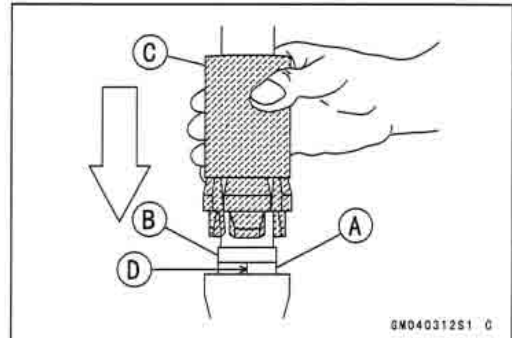
### Front Fork

- Put the cylinder unit [A] with the spring into the inner tube [B] protruding from the inner tube, and install the cylinder base [C] onto the bottom end of the cylinder unit.
- Install the cylinder base with the tapered end [D] facing upward.
- Install the inner tube, cylinder unit, and cylinder base as a set into the outer tube.



- Install the new guide bushing [A] with a use one [B] on it by tapping the use one with the fork oil seal driver [C].
- The split [D] of the bushing should face toward the side of the vehicle.

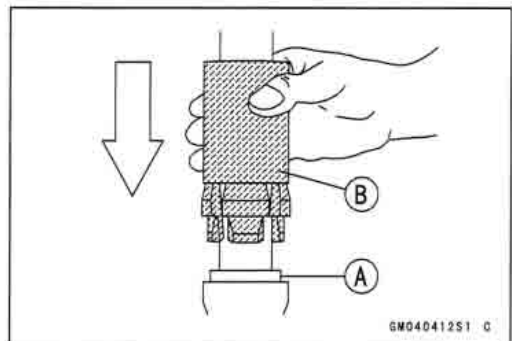
**Special Tool - Front Fork Oil Seal Driver: 57001-1219**



- Apply molybdenum disulfide grease to the oil seal lips and install the washer and the oil seal [A] into the outer tube.

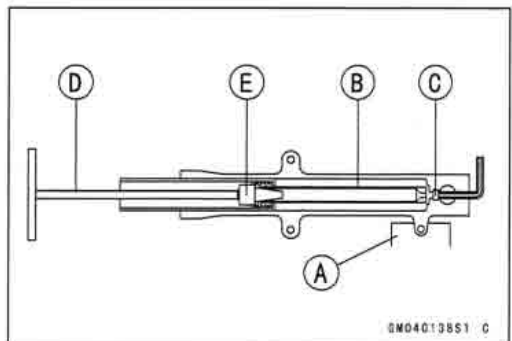
**Special Tool - Front Fork Oil Seal Driver: 57001-1219 [B]**

- Install the retaining ring on the outer tube.



- Install a new bottom Allen bolt gasket.
- Apply a non-permanent locking agent to the threads of the bottom Allen bolt and screw the Allen bolt into the bottom of the outer tube.
- Hold the outer tube in a vise [A], hold the cylinder unit [B] with the special tools, then tighten the Allen bolt [C].

**Special Tools - Fork Cylinder Holder Handle: 57001-183 [D]  
Fork Cylinder Holder Adapter: 57001-1057 [E]**



**Torque - Bottom Allen Bolt: 30 N·m (3.1 kgf·m, 22 ft·lb)**

- Fill with the specified type of oil and install the parts removed (see Fork Oil change).
- Install the dust seals.

**Fork Oil:** KHL34-G10 (KAYABA) or equivalent  
**Capacity (per one unit):** 350 ± 4 mL (11.8 ± 0.1 US oz), (after fork disassembly and completely dry)

## Front Fork

### Inner Tube/Outer Tube Inspection

- Visually inspect the inner tube [A] and repair any damage.
- Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.
- ★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replace.

### CAUTION

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

- Temporarily assemble the inner tube and outer tube [B], and pump them back and forth manually to check for smooth operation.
- ★ If it does not operate smoothly, replace both the inner tube and the outer tube.

### ⚠ WARNING

**A straightened inner or outer fork tube may fail in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.**

### Fork Spring Inspection

- Measure the free length [B] of the fork spring [A].
- ★ If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of the replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

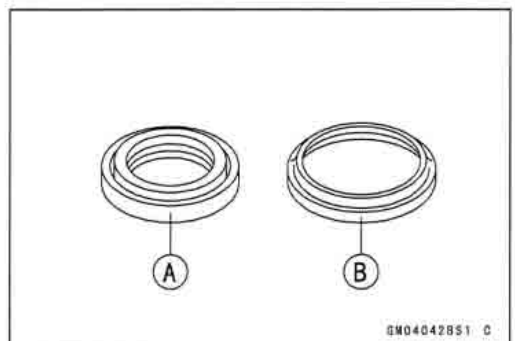
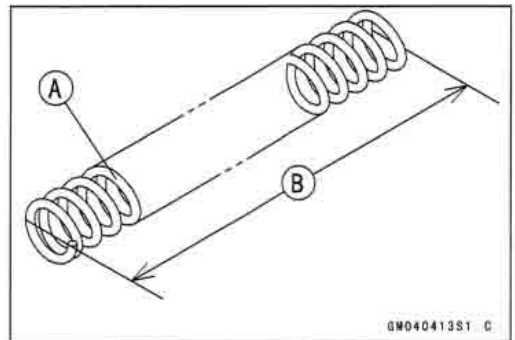
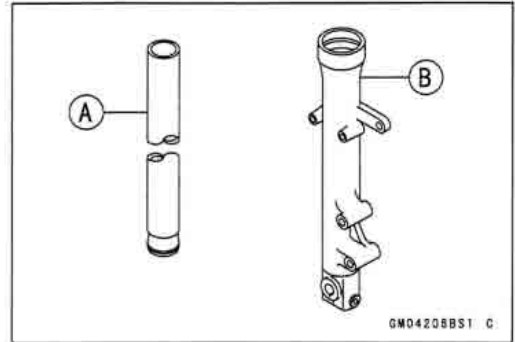
### Fork Spring Free Length

**Standard: 415 mm (16.3 in.)**

**Service Limit: 407 mm (16.0 in.)**

### Oil Seal/Dust Seal Inspection

- Inspect the oil seal [A] and dust seal [B] for any signs of deterioration or damage.
- ★ Replace it if necessary.



## 13-12 SUSPENSION

### Rear Shock Absorber

#### Spring Preload Adjustment

- Remove the rear shock absorber from the frame (see Rear Shock Absorber Removal).
- Loosen the lock nut and turn out the adjusting nut to free the spring.

**Special Tool - Steering Stem Nut Wrench: 57001-1101 [A]**

- The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

#### Spring Preload Adjustment

Adjuster Position	Spring Length	Spring Force	Setting	Load	Road	Speed
1	148.5 mm (5.8 in.)	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓	↓
5	158.5 mm (6.2 in.)	Strong	Hard	Heavy	Bad	High

- The standard adjuster setting for an average build rider of 68 kg (150 lb) with no passenger and no accessories is 2 step.

#### Rear Shock Absorber Removal

- Raise the motorcycle up on its center stand.
- Remove:
  - Seat
  - Side Covers (see Frame chapter)
  - Tie-rod Lower Nut and Bolt [A]
  - Rear Shock Absorber Nuts and Bolts [B]

- Support the rear wheel to remove the bolts.

#### CAUTION

When pulling out the bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt and sleeve.

- Remove the rear shock absorber [C].

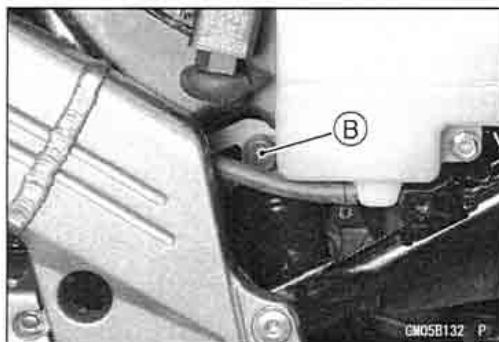
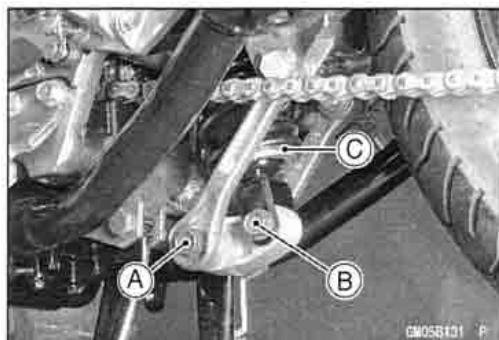
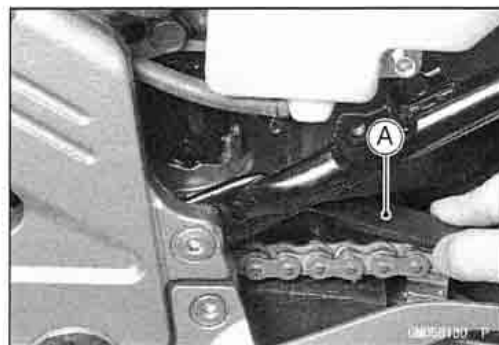
#### Rear Shock Absorber Installation

- Install the rear shock absorber.
- Tighten the tie-rod lower bolt and nut.

**Torque - Rear Shock Absorber Mounting Bolts: 59 N·m (6.0 kgf·m, 43 ft·lb)**

**Tie-rod Lower Nut: 44 N·m (4.5 kgf·m, 33 ft·lb)**

- Adjust the rear shock absorber spring preload in response to riding condition (see Spring Preload Adjustment).



## Rear Shock Absorber

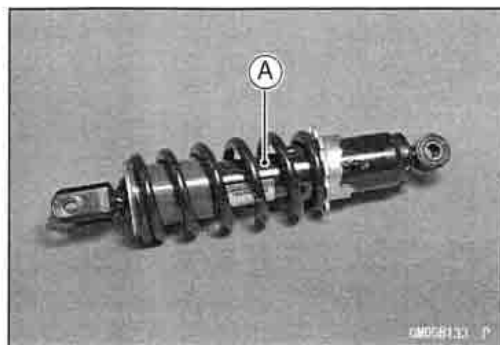
### *Rear Shock Absorber Scrapping*

#### **⚠ WARNING**

Since the rear shock absorber contains nitrogen gas, do not incinerate the rear shock absorber without first releasing the gas or it may explode.

Before a rear shock absorber is scrapped, drill a hole at the point [A] shown to release the nitrogen gas completely. Wear safety glasses when drilling the hole, as the gas may blow out bits of drilled metal when the hole opens.

- Drill the cylinder [A] of the shock absorber using about 2 mm (0.08 in.) drill bit.

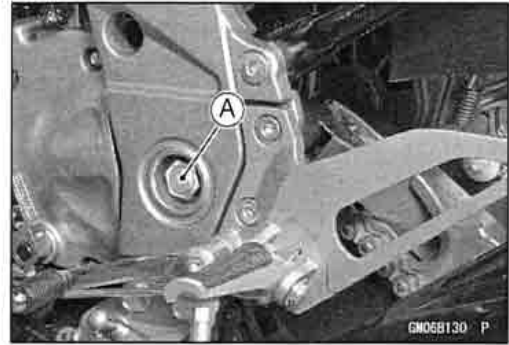


## 13-14 SUSPENSION

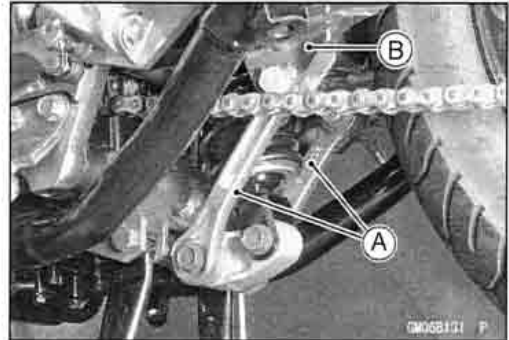
### Swingarm

#### Swingarm Removal

- Remove:
  - Rear Wheel (see Wheels/Tires chapter)
  - Rear Shock Absorber (see Rear Shock Absorber Removal)
  - Drive Chain Cover
  - Swingarm Pivot Nut [A] and Shaft
  - Swingarm.



- Remove the tie-rods [A] from the swingarm [B].

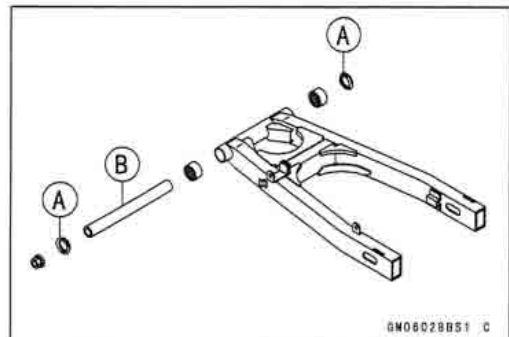


#### Swingarm Installation

- Install the tie-rods on the swingarm.
  - Torque - Tie-rod Nut: 44 N·m (4.5 kgf·m, 33 in·lb)**
- Install:
  - Swingarm
  - Drive Chain Cover
  - Rear Shock Absorber (see Rear Shock Absorber Installation)
  - Rear Wheel (see Wheels/Tires chapter)
- Torque - Swingarm Pivot Nut: 98 N·m (10 kgf·m, 72 in·lb)**
  - Rear Shock Absorber Mounting Nuts: 59 N·m (6.0 kgf·m, 43 ft·lb)**
  - Rear Axle Nut: 110 N·m (11.0 kgf·m, 80 ft·lb)**
- Adjust the drive chain after the swingarm installation (see Final Drive in the periodic Maintenance chapter).

#### Swingarm Bearing Removal

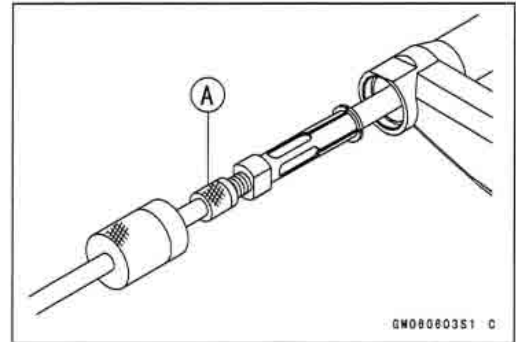
- Remove:
  - Swingarm (see Swingarm Removal)
  - Grease Seal [A]
  - Sleeve [B]
- Special Tool - Inside Circlip Pliers: 57001-143**



## Swingarm

- Remove the needle bearing.

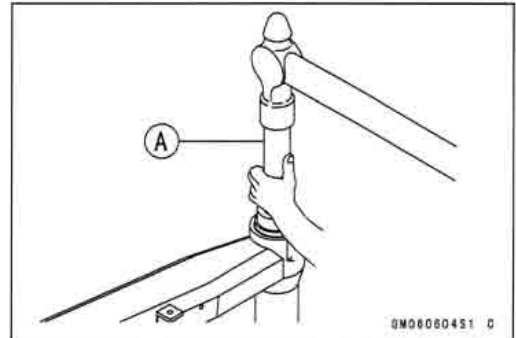
**Special Tool - Oil Seal & Bearing Remover: 57001-1058 [A]**



### *Swingarm Bearing Installation*

- Apply plenty of grease to the needle bearings.
- Install the needle bearings so that the manufacturer's marks faces out.

**Special Tool - Bearing Driver Set: 57001-1129 [A]**



### *Swingarm Bearing, Sleeve Inspection*

#### **CAUTION**

**Do not remove the bearings for inspection. Removal may damage them.**

- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing in the swingarm for abrasion, color change, or other damage.
- ★ If there is any doubt as to the condition of any of the needle bearings or sleeve, replace the sleeve, and needle bearings as a set.

### *Swingarm Lubrication*

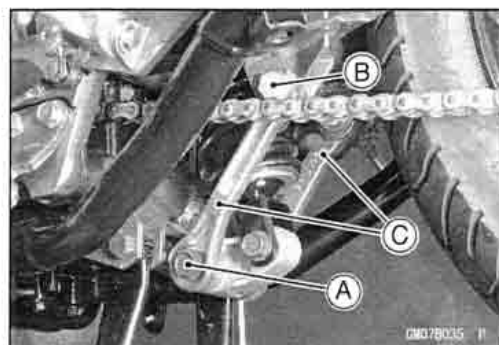
- Refer to the Suspension in the Periodic Maintenance chapter.

## 13-16 SUSPENSION

### Tie-Rod, Rocker Arm

#### *Tie-rods Removal*

- Raise the motorcycle up on its center stand.
- Remove the tie-rod lower bolt and nut [A].
- Remove the tie-rod upper bolt and nut [B], and take off the tie-rod [C].
- Remove the other tie-rod.



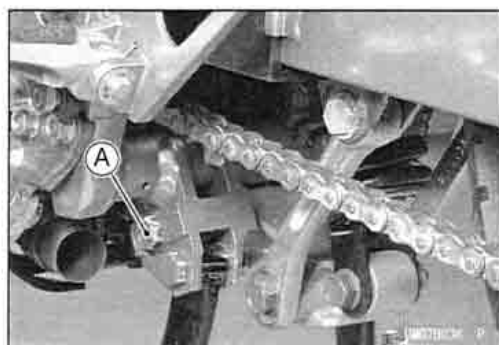
#### *Tie-Rod Installation*

- Install the tie-rod upper bolt first and then the lower bolt.

**Torque - Tie-rod Nuts: 44 N·m (4.5 kgf·m, 33 ft·lb)**

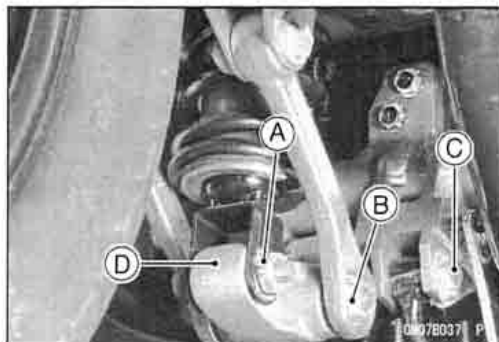
#### *Rocker Arm Removal*

- Remove the mufflers.
- Raise the motorcycle up on its center stand.
- Remove the rocker arm pivot bolt and nut [A].
- Do not remove the rocker arm pivot shaft.



- Remove:
  - Rear Shock Absorber Lower Nut [A] and Bolt
  - Tie-rod Lower Nut [B] and Bolt
  - Rocker Arm Pivot Shaft [C]
  - Rocker Arm [D]

○ Support the rear wheel to remove the bolts.



#### **CAUTION**

**When pulling out the bolts, lift the rear wheel slightly. Forcing or tapping on a bolt could damage the bolt and sleeve.**

#### *Rocker Arm Installation*

- Apply grease to all the O-ring, bushing, sleeve, grease seal.

- Tighten:

**Torque - Rocker Arm Pivot Nut: 44 N·m (4.5 kgf·m, 33 ft·lb)**

**Tie-rod Nut: 44 N·m (4.5 kgf·m, 33 ft·lb)**

**Rear Shock Absorber Mounting Nut: 59 N·m (6.0 kgf·m, 43 ft·lb)**

#### *Tie-rod, Rocker Arm Bushing Inspection*

- The bushings wear so little that the wear is difficult to measure. Instead, inspect the bushings for abrasion, color change or other damage.
- ★ If there is any doubt as to the condition of either bushings, replace the bushing with new one.

#### *Tie-rod, Rocker Arm Sleeve Inspection*

- ★ IF there is visible damage, replace the sleeve with new one.

---

**Tie-Rod, Rocker Arm**

---

*Tie-rod, Rocker Arm Lubrication*

- Refer to the Suspension in the Periodic Maintenance chapter.



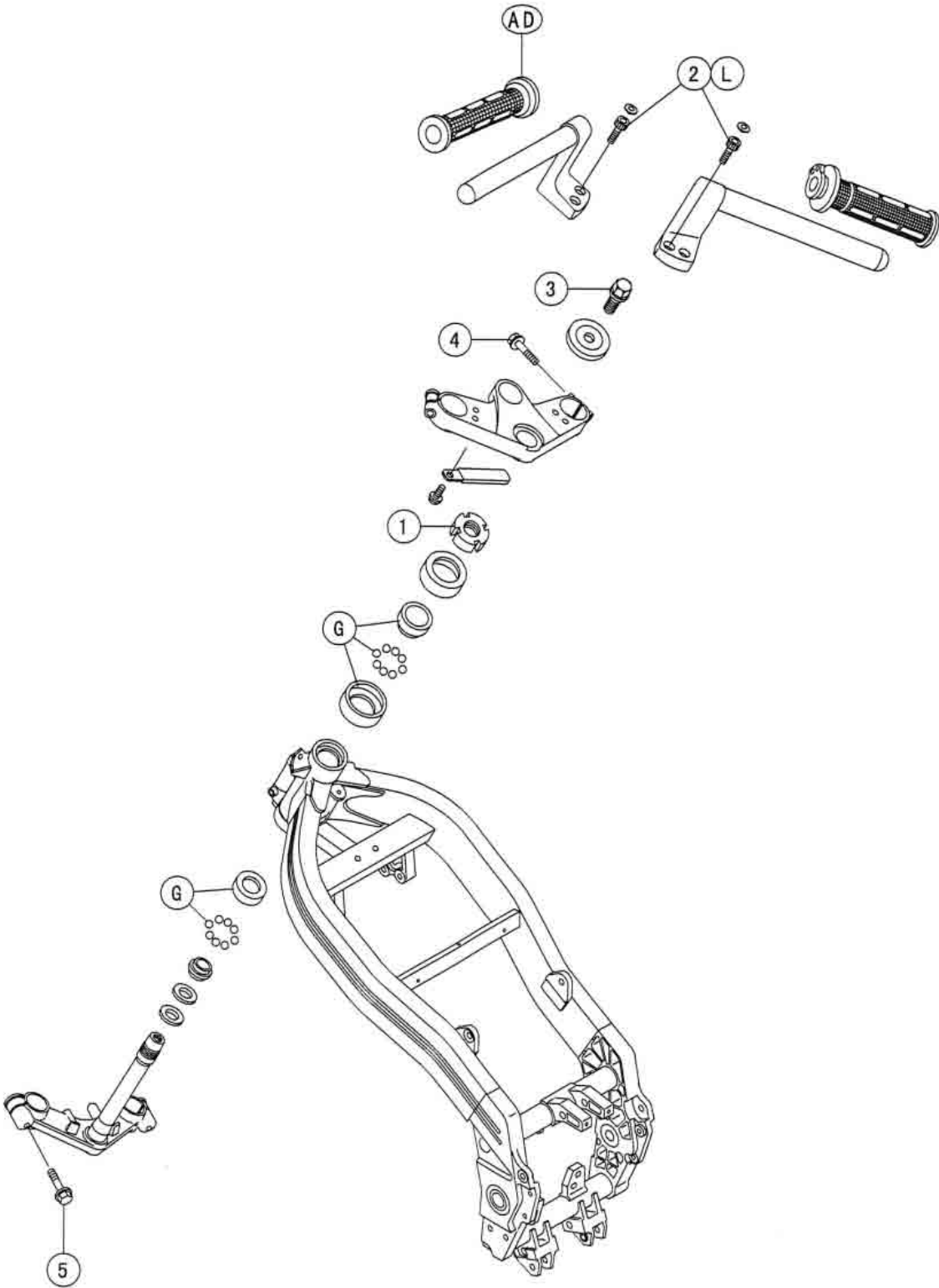
# Steering

## Table of Contents

Exploded View .....	14-2
Special Tools .....	14-4
Steering .....	14-5
Steering Inspection .....	14-5
Steering Adjustment.....	14-5
Steering Stem.....	14-6
Steering Stem, Stem Bearing Removal .....	14-6
Steering Stem, Stem Bearing Installation .....	14-7
Stem Bearing Lubrication.....	14-8
Grease Seal, Deterioration, Damage Inspection .....	14-9
Steering Stem Warp Inspection .....	14-9
Handlebars .....	14-10
Right Handlebar Removal.....	14-10
Right Handlebar Installation.....	14-10
Left Handlebar Removal .....	14-11
Left Handlebar Installation Note.....	14-11

14-2 STEERING

Exploded View



**Exploded View**

No	Item	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Steering Stem Nut	4.9	0.5	43 in·lb	
2	Handlebar Mounting Bolts	25	2.5	18	L
3	Steering Stem Head Bolt	47	4.8	35	
4	Front Fork Upper Clamp Bolts	20	2.0	14.5	
5	Front Fork Lower Clamp Bolts	30	3.1	22	

AD: Apply adhesive agent.

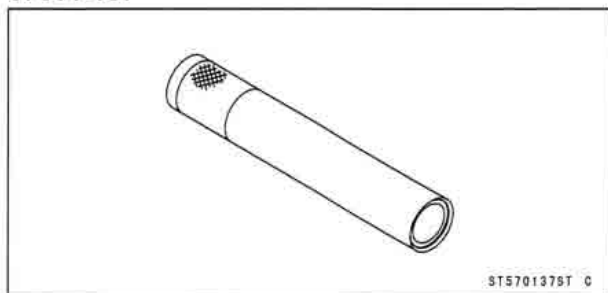
G: Apply grease.

L: Apply a non-permanent locking agent.

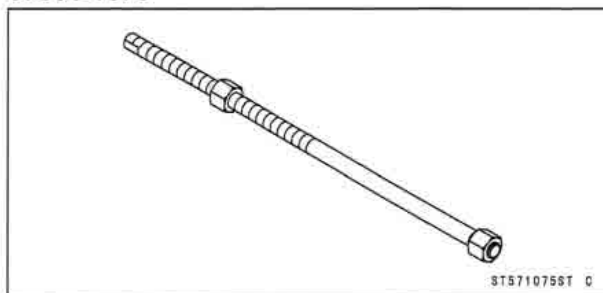
## 14-4 STEERING

### Special Tools

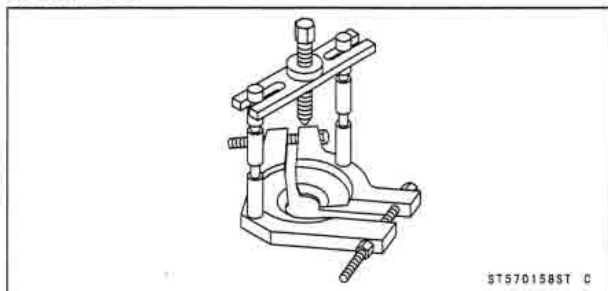
**Steering Stem Bearing Driver:**  
57001-137



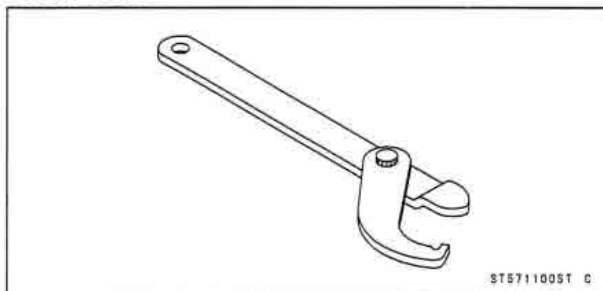
**Head Pipe Outer Race Press Shaft:**  
57001-1075



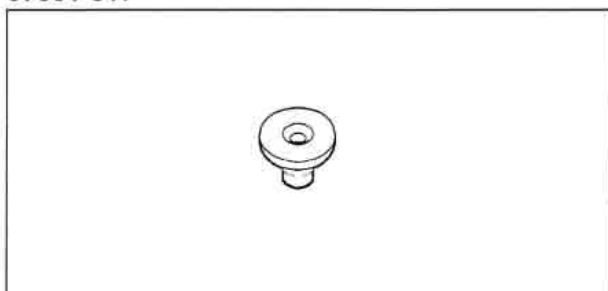
**Bearing Puller:**  
57001-158



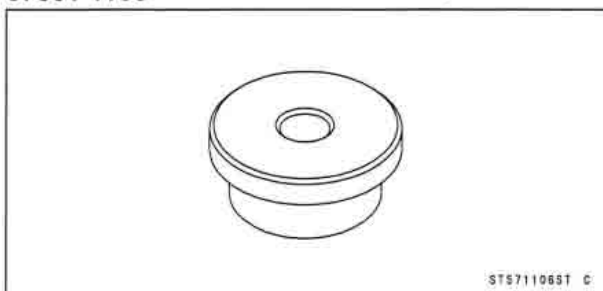
**Steering Stem Nut Wrench:**  
57001-1100



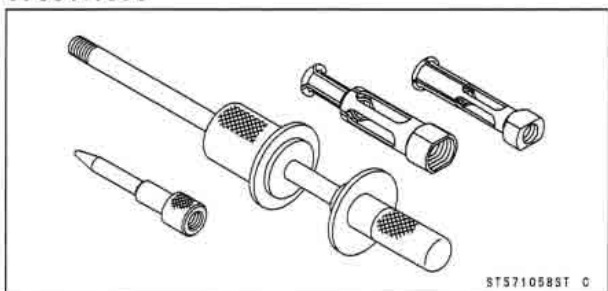
**Bearing Puller Adapter:**  
57001-317



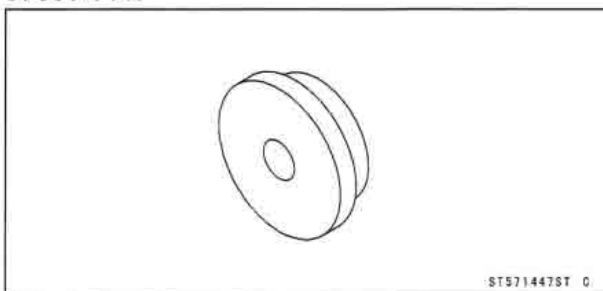
**Head Pipe Outer Race Driver,  $\phi 46.5$ :**  
57001-1106



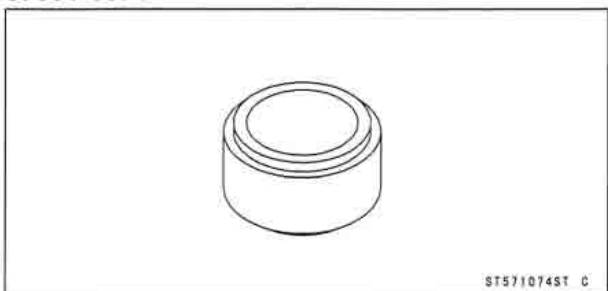
**Oil Seal & Bearing Remover:**  
57001-1058



**Head Pipe Outer Race Driver,  $\phi 47$ :**  
57001-1447



**Steering Stem Bearing Driver Adapter,  $\phi 34.5$ :**  
57001-1074



---

**Steering**

---

*Steering Inspection*

- Refer to the Steering in the Periodic Maintenance chapter.

*Steering Adjustment*

- Refer to the Steering in the Periodic Maintenance chapter.

## 14-6 STEERING

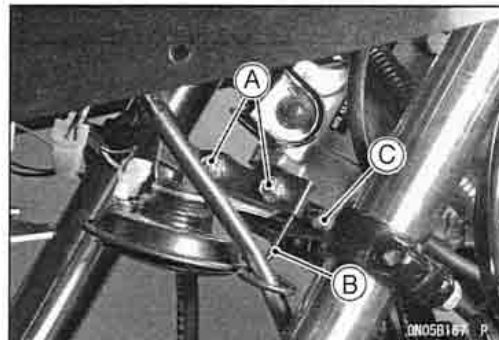
### Steering Stem

#### *Steering Stem, Stem Bearing Removal*

- Remove:

- Seat
- Fairings (see Frame chapter)
- Fuel Tank (see Fuel System chapter)
- Steering Stem Head Bolt and Washer
- Steering Stem Head with Handlebars
- Front Wheel (see Wheels/Tires chapter)
- Front Fender (see Frame chapter)
- Front Fork (see Suspension chapter)
- Horn Mounting Bolts and Horn

- Remove the mounting bolts [A], free the brake hose clamp [B] from the stem base [C], and remove the front brake assembly as a set.

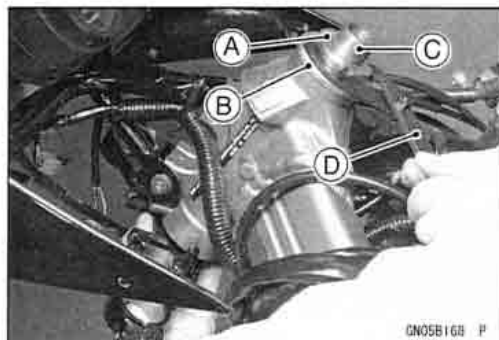


- Pushing up the stem base by the hand, and remove the steering stem nut [A], stem cap [B], and then remove the steering stem [C].

**Special Tool - Steering Stem Nut Wrench: 57001-1100[D]**

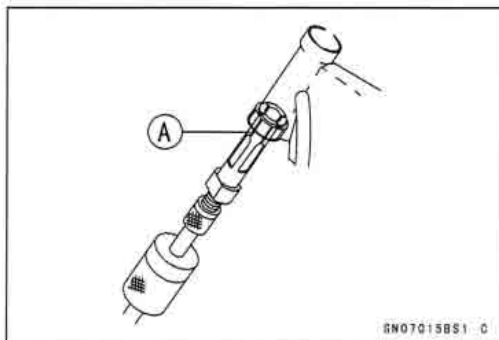
#### **NOTE**

○ Be aware of removing the steering stem so that the stem bearing steel balls are not lost.



- Remove the upper ball bearing inner race.
- Remove the upper and lower outer races using the outer race remover [A].

**Special Tool - Head Pipe Outer Race Remover: 57001-1058**



#### **NOTE**

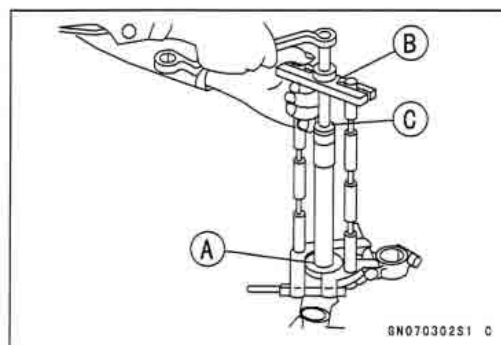
○ If either stem bearing is damaged, it is recommended that both the upper and lower bearings (including the outer races) should be replaced with new ones

## Steering Stem

- Remove the lower bearing inner race [A] (with its grease seal) which is pressed onto the steering stem using the bearing puller [B] and adapter [C].

**Special Tools - Bearing puller: 57001-158**

**Bearing Puller Adapter: 57001-317**



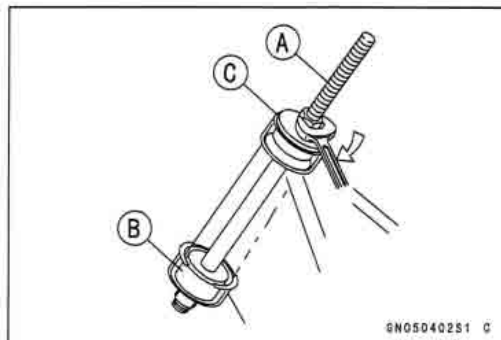
### *Steering Stem, Stem Bearing Installation*

- Replace the bearing outer race with new ones.
- Apply grease to the outer races, and drive them into the head pipe at the same time.

**Special Tools - Head Pipe Outer Race Press Shaft: 57001-1075 [A]**

**Head Pipe Outer Race Driver: 57001-1447 [B]**

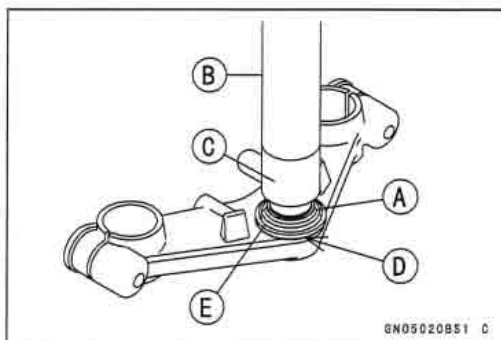
**Head Pipe Outer Race Driver: 57001-1106 [C]**



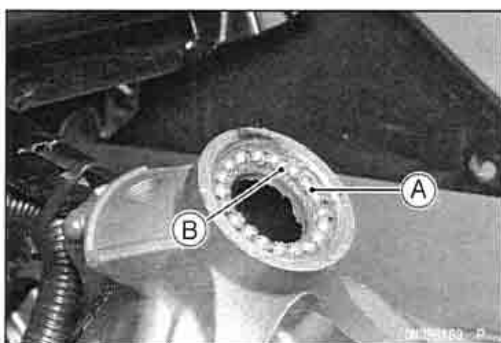
- Replace the bearing inner race with new one.
- Install the washer [D] and grease seal [E] on the steering stem, and drive the ball bearing inner race [A] applied grease onto the stem.

**Special Tools - Steering Stem Bearing Driver: 57001-137 [B]**

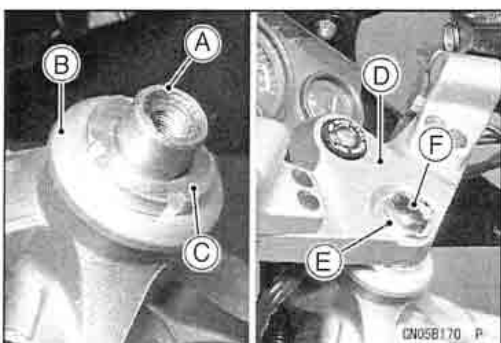
**Steering Stem Bearing Driver Adapter: 57001-1074 [C]**



- Apply grease to the lower ball bearings (20) and stem inner race and install them onto the steering stem.
- Apply grease to the upper ball bearing (19)[A] and outer race [B], and install the ball bearings onto the outer race.



- Install the steering stem [A] through the head pipe.
- Install the stem cap [B] and steering stem nut [C], and tighten it by hand.
- Install the stem head [D] with the handlebars.
- Install the washer [E], and tighten the stem head bolt [F] lightly.



## 14-8 STEERING

### Steering Stem

- Settle the bearings in place as follows:
- Tighten the steering stem nut with 15 N·m (1.5 kgf·m, 11 ft·lb) of torque first, and loosen it a fraction of a turn until it turns lightly. (To tighten the stem nut to the specified torque, hook the wrench on the stem nut, and pull the wrench at the hole by 84 N (8.3 kg)[B] force in the direction shown.) Afterward tighten it again with specified torque using a special tool [A].
- Tighten the steering stem lock nut with specified torque using a special tool [A].
- Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearing may be damaged.
- Again back out the stem lock nut a fraction of turn until it turns lightly.
- Turn the stem lock nut lightly clockwise until it just becomes hard to turn. Do not overtighten, or the steering will be too tight.

**Special Tool - Steering Stem Nut Wrench: 57001-1100 [A]**

**Torque - Steering Stem Nut: 4.9 N·m (0.5 kgf·m, 43 in·lb)**

- Adjust the steering (see Steering in the Periodic Maintenance chapter).
- Install the front fork (see Suspension chapter).

#### NOTE

- Tighten the fork upper clamp bolts first, next the stem head nut, last the fork lower clamp bolts.

**Torque - Steering Stem Head Bolt: 47 N·m (4.8 kgf·m, 35 in·lb)**

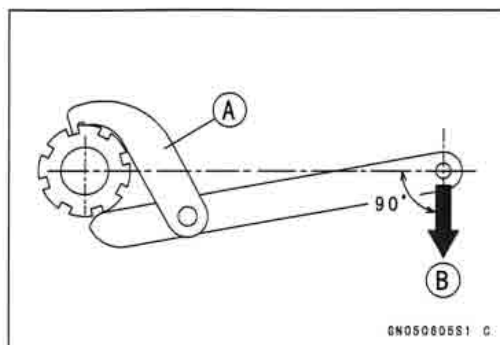
**Front Fork Clamp Bolts (Upper): 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

**Front Fork Clamp Bolts (Lower): 30 N·m (3.1 kgf·m, 22 ft·lb)**

- Install:
  - Front Fender (see Frame chapter)
  - Front Wheel (see Wheel/Tires chapter)
  - Front Brake Assembly
  - Fuel Tank (see Fuel System chapter)
  - Lower Fairings (see Frame chapter)
  - Seat
- Route the cables and harness correctly. (see Appendix chapter).

#### ⚠ WARNING

**Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly.**



- Check and adjust the following.
  - Front Brake
  - Clutch
  - Throttle Cable
  - Rear View Mirrors
  - Headlight Aim

#### Stem Bearing Lubrication

- Refer to the Steering in the Periodic Maintenance chapter.



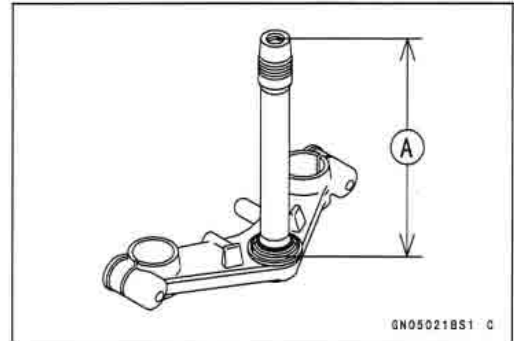
## Steering Stem

### *Grease Seal, Deterioration, Damage Inspection*

- Inspect the grease seal for any sign of deterioration or damage.
- ★ Replace the grease seal if necessary.

### *Steering Stem Warp Inspection*

- Whenever the steering stem is removed, or if the steering can not be adjusted for smooth action, check the steering stem for straightness.
- ★ If the steering stem [A] is bent, replace the steering stem.

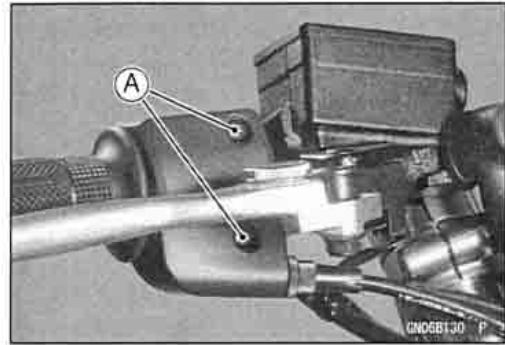


## 14-10 STEERING

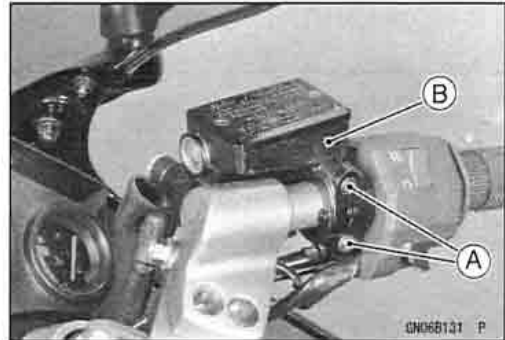
### Handlebars

#### Right Handlebar Removal

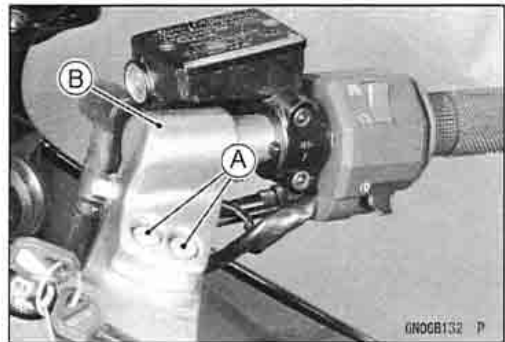
- Remove the right switch housing screws [A], and split the right switch housing.



- Remove the front master cylinder clamp bolts [A], and take off the master cylinder [B].



- Remove the cap, and remove the handlebar mounting bolts [A] and the right handlebar [B].



#### Right Handlebar Installation

- Install:
  - Right Handlebar
  - Right Switch Housing
  - Front Master Cylinder

#### NOTE

- When the master cylinder clamp shall be installed, be sure to install it so that the arrow mark on it direct upward.
- Tighten the upper clamp bolt first, and then the lower clamp bolt with a specified torque so that there will be a gap at the lower part of the clamp.
- Apply a non-permanent locking agent to the handlebar mounting bolts.

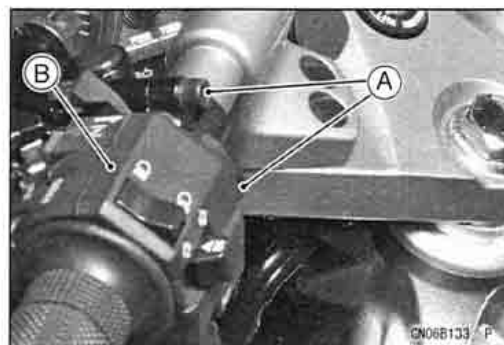
**Torque - Front Master Cylinder Clamp Bolts:** 11 N·m (1.1 kgf·m, 95 in·lb)

**Right Handlebar Mounting Bolts:** 25 N·m (2.5 kgf·m, 18 ft·lb)

## Handlebars

### *Left Handlebar Removal*

- Remove:
  - Left Switch Housing [B]
  - Clutch Lever Holder Clamp Bolts [A] and Clamp.
  - Left Handlebar



### *Left Handlebar Installation Note*

- Apply a non-permanent locking agent to the handlebar mounting bolts.

**Torque - Clutch Lever Holder Clamp Bolts:** 8.8 N·m (0.90 kgf·m, 78 in·lb)

**Left Handlebar Mounting Bolts:** 25 N·m (2.5 kgf·m, 18 in·lb)

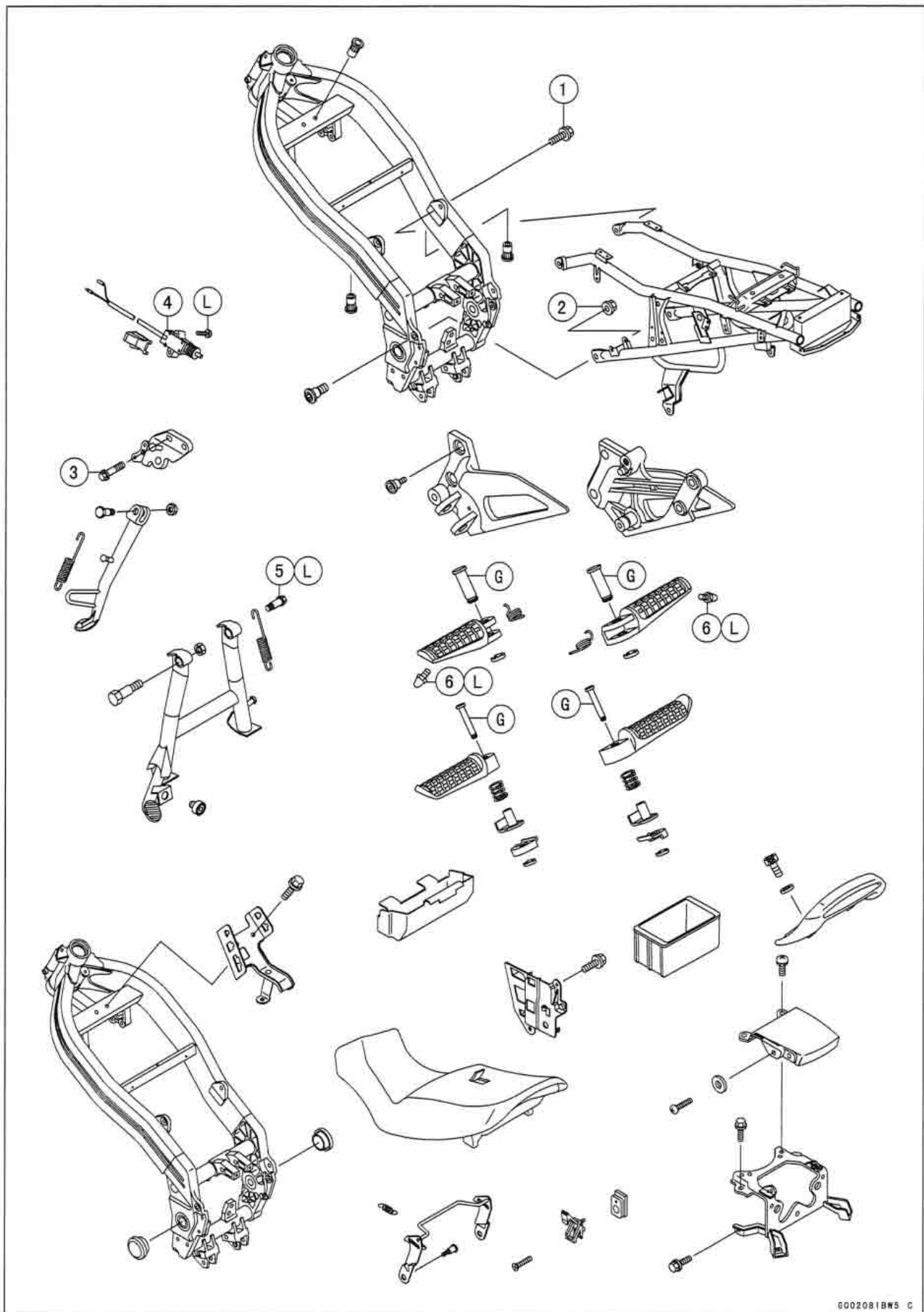
# Frame

## Table of Contents

Exploded View .....	15-2
Seat .....	15-5
Seat Removal .....	15-5
Seat Installation .....	15-5
Fairings .....	15-6
Upper Fairing Removal .....	15-6
Upper Fairing Installation .....	15-6
Upper Cover Removal .....	15-6
Upper Cover installation .....	15-6
Lower Fairing Removal .....	15-6
Lower Fairing Installation .....	15-7
Side Cover .....	15-8
Side Cover Removal .....	15-8
Fenders .....	15-9
Front Fender Removal .....	15-9
Rear Fender Removal .....	15-9
Rear Frame .....	15-10
Rear Frame Removal .....	15-10
Rear Frame Installation .....	15-10

## 15-2 FRAME

### Exploded View



**Exploded View**

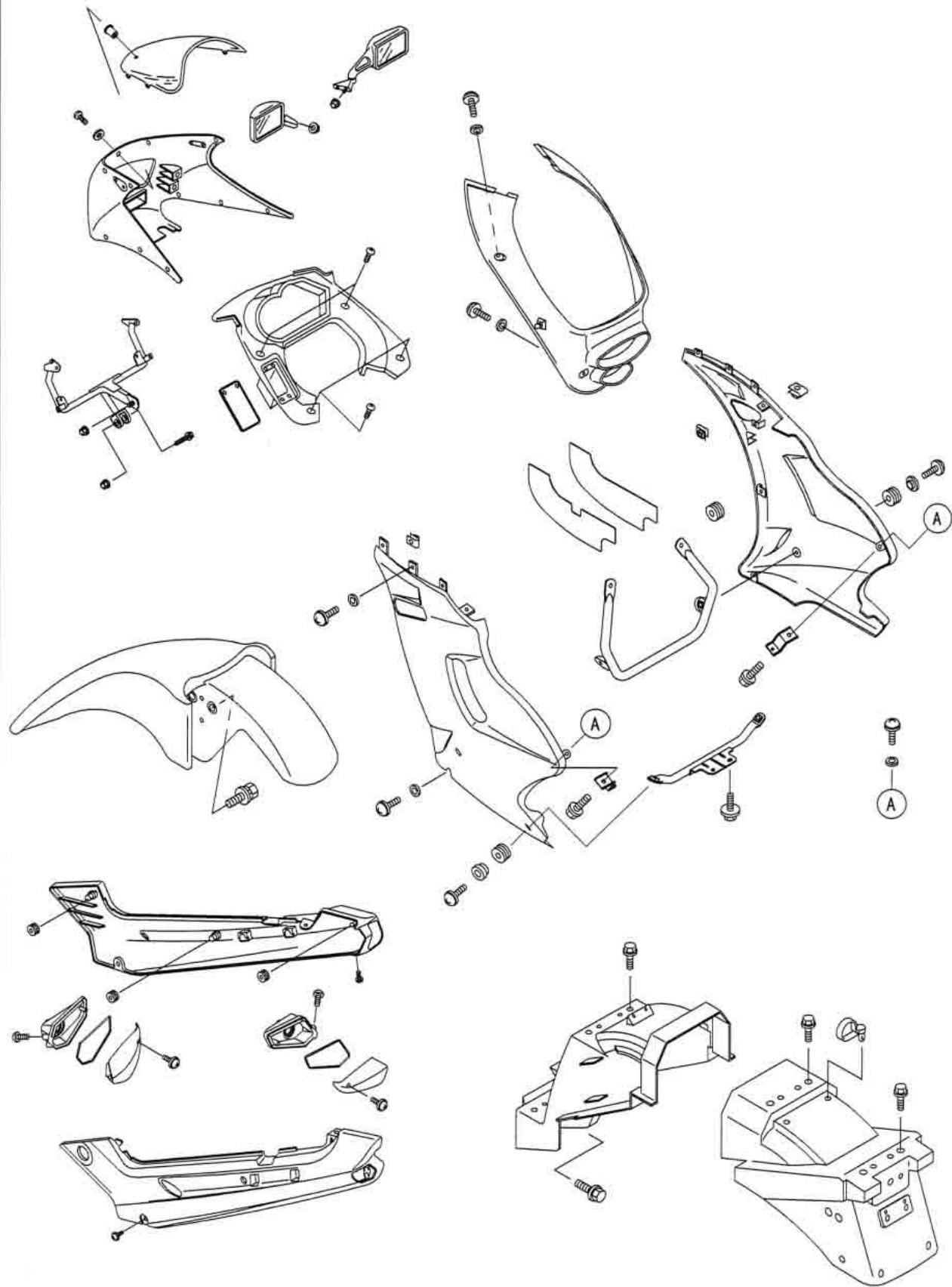
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Frame Mounting Bolts	44	4.5	33	
2	Rear Frame Mounting Nuts	44	4.5	33	
3	Side Stand Bracket Mounting Bolts	49	5.0	36	
4	Side Stand Switch Screws	—	—	—	L
5	Center Stand Spring Hook Bolt	—	—	—	L
6	Front Footpeg End Bolts	—	—	—	L

G: Apply grease.

L: Apply a non-permanent locking agent.

15-4 FRAME

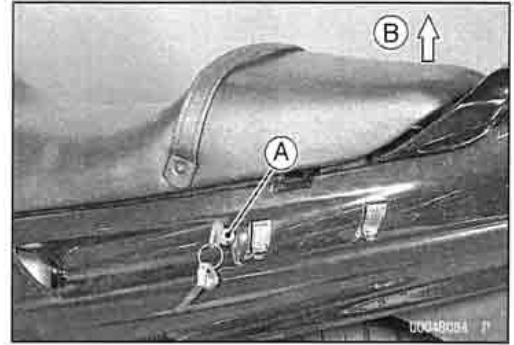
Exploded View



## Seat

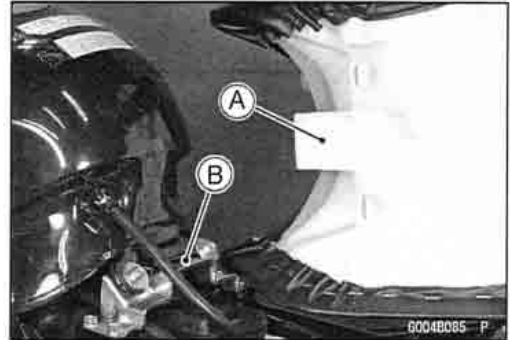
### *Seat Removal*

- Insert the ignition switch key into the seat lock [A].
- Turning the key counterclockwise, raise the rear of the seat up [B], and pull the seat backward.



### *Seat Installation*

- Slip the rear seat hook [A] into the hollow cubic bracket [B] on the frame.
- Push down the rear part of the seat until the lock clicks.



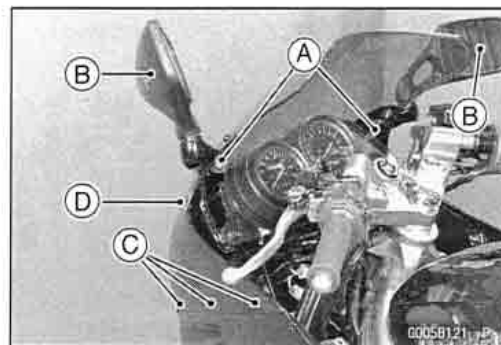


## 15-6 FRAME

### Fairings

#### Upper Fairing Removal

- Remove the nuts [A], and take off the rear view mirrors [B].
- Unscrew the upper fairing screws [C] and then remove the upper fairing [D].



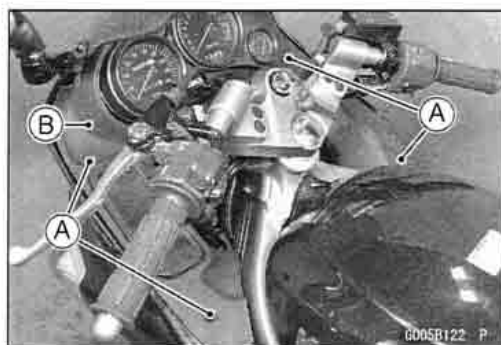
- Pull the upper fairing forward with bending the fairing outward, and free the upper fairing holes from the stopper on the bracket.

#### Upper Fairing Installation

- Align the fairing hole with the stopper on the bracket, install the upper fairing.
- Install the rear view mirrors on the fairing.

#### Upper Cover Removal

- Remove the screws [A] and take off the upper cover [B].
- Pull up the front of upper cover and turn the handlebar to right side fully to clear the handlebar and then free the right wing of upper cover.
- Take off the upper cover from the left side.

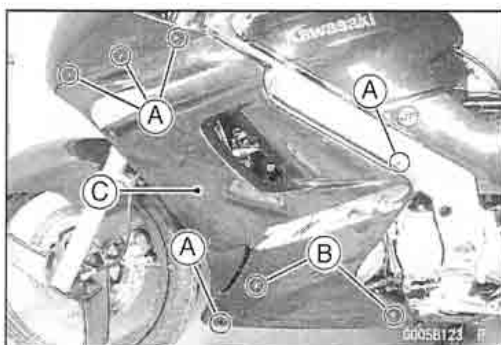


#### Upper Cover installation

- Insert the front of upper cover between the meter unit and windshield first and install the both wing of it as same procedure as removal.

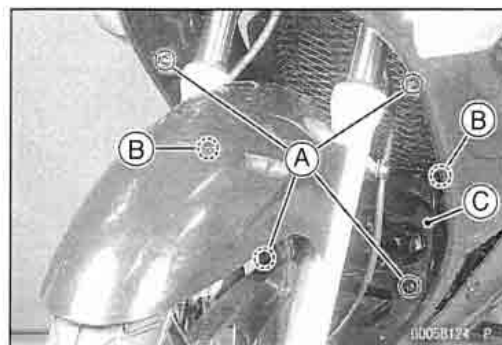
#### Lower Fairing Removal

- Remove the left and/or right lower fairing mounting screws [A], mounting Allen bolts [B], and remove the left and/or the right lower fairings [C].



## Fairings

- Remove the front lower fairing mounting screws [A] and separate the front lower fairing from the left and right lower fairings after pulling it to clear the stopper [B], and remove the front lower fairing [C].



### *Lower Fairing Installation*

- Install the left and right lower fairings and install the front lower fairing to the left and right lower fairings.

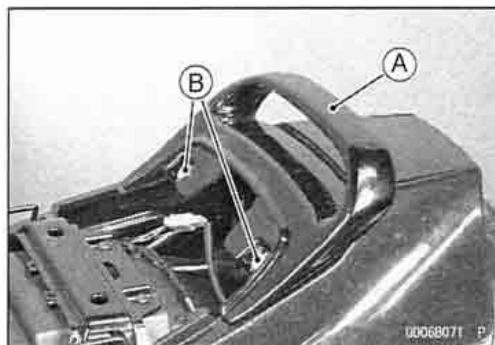
## 15-8 FRAME

### Side Cover

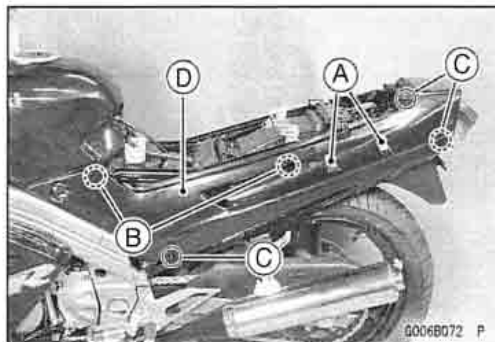
#### *Side Cover Removal*

● Remove:

- Seat (see Seat Removal)
- Passenger Grab Rail [A]
- Passenger Grab Rail Mounting Bolts [B]



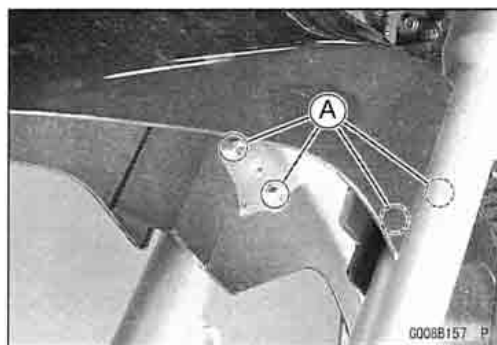
- Tying Hooks [A]
- Stopper [B]
- Side Cover Mounting Screws [C]
- Side Cover [D]



## Fenders

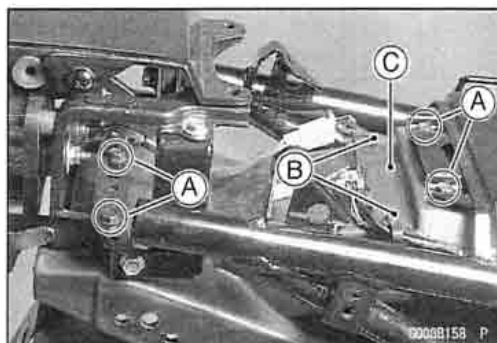
### Front Fender Removal

- Remove the front fender mounting screws [A] and pull out the front fender forward.

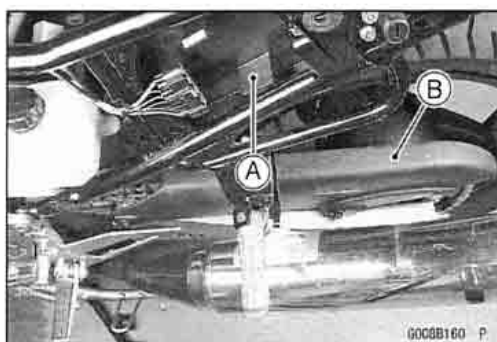


### Rear Fender Removal

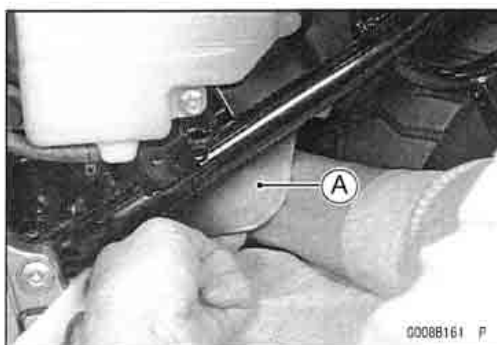
- Remove:
  - Seat (see Seat Removal)
  - Side Cover (see Side Cover Removal)
  - Tool Case and Tools
  - Battery
  - Rear Fender Rear Mounting Bolts [A]
  - Harness Clamps [B]
- Remove the rear fender rear [C].



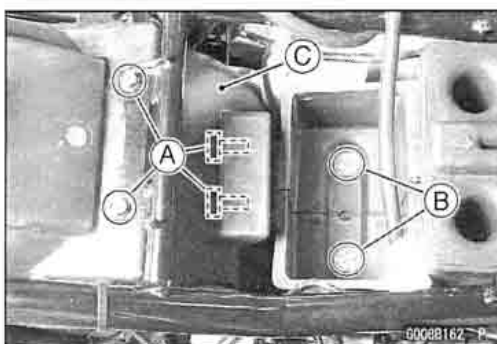
- Remove:
  - Electrical Components [A]
- Remove the drive chain cover [B] to avoid the injury when the rear fender front mounting bolts tightened underside of the fender shall be removed.



- Remove the rear fender front mounting bolts pulling the lower edge [A] of the fender to outside.



- Remove:
  - Rear Fender Front Mounting Bolts [A]
  - Air Cleaner Housing Mounting Bolts [B]
- Remove the rear fender front [C].

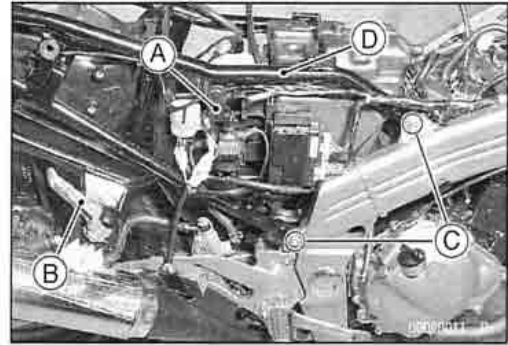


## 15-10 FRAME

### Rear Frame

#### *Rear Frame Removal*

- Remove:
  - Seat (see Seat Removal)
  - Fuel Tank (see Fuel System chapter)
  - Side Cover (see Side Cover Removal)
  - Rear Fenders (see Fender Removal)
  - Coolant Reservoir Tank
  - Electrical Components
  - Electrical Component Bracket [A]
  - Tail Cover
  - Tail Light Bracket
  - Rear Foot Peg [B]
  - Seat Lock
  - Rear Frame Mounting Bolts [C]
  - Rear Frame [D]



#### *Rear Frame Installation*

- Pushing the rear frame down, tighten the rear frame mounting bolts and nuts with the specified torque.
  - Torque - Rear Frame Mounting Bolts: 44 N·m (4.5 kg·m, 33 ft·lb)**
  - Rear Frame Mounting Nuts: 44 N·m (4.5 kg·m, 33 ft·lb)**

# Electrical System

## Table of Contents

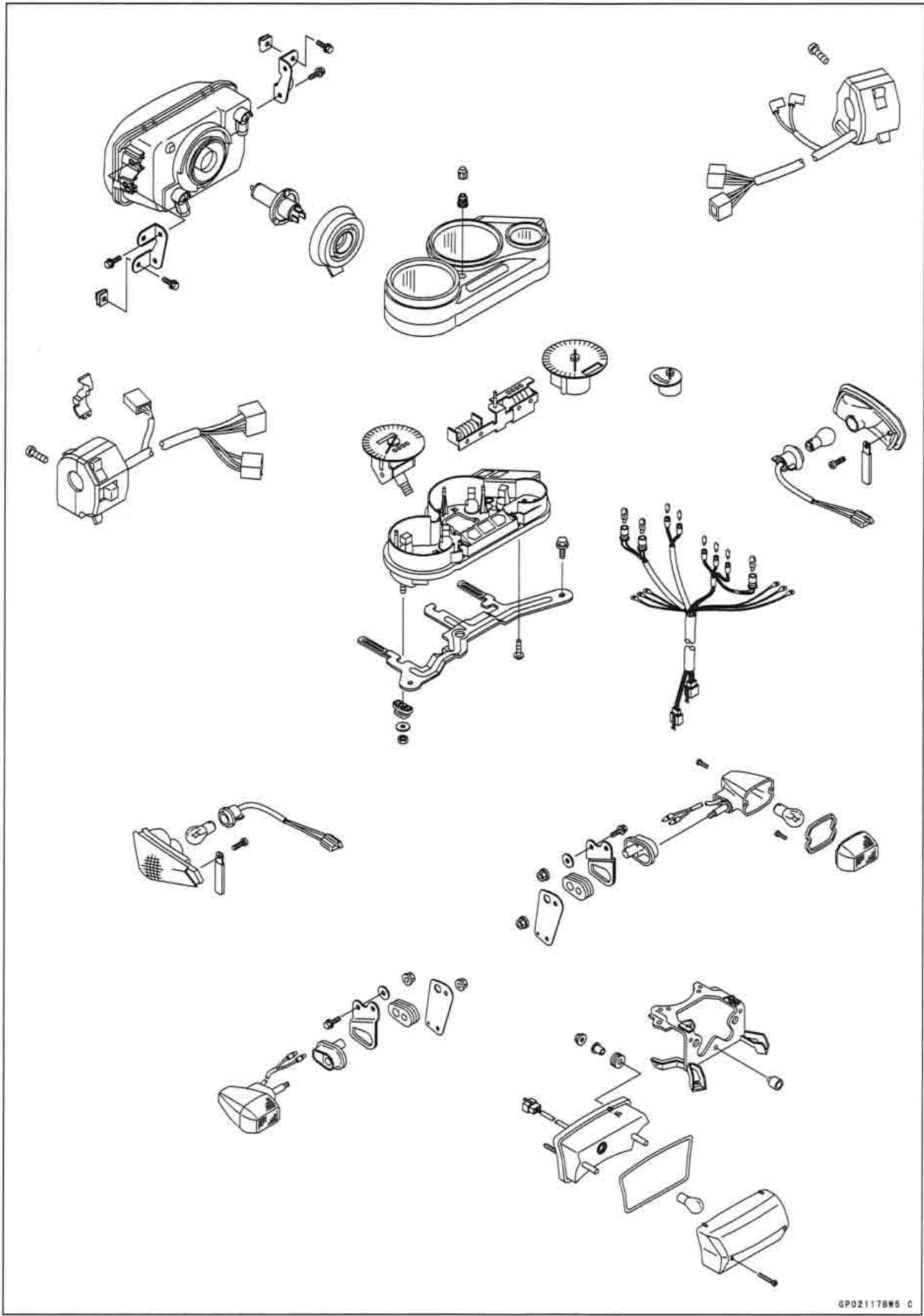
Exploded View .....	16-3	Side Stand Switch Operation	
EX250-H15 Wiring Diagram		Inspection .....	16-36
(Canada) .....	16-8	Starter Lockout Switch Operation	
EX250-H15 Wiring Diagram		Inspection .....	16-37
(Australia) .....	16-10	Electric Starter System .....	16-40
Specifications .....	16-12	Starter Motor Removal .....	16-40
Special Tools and Sealant .....	16-13	Starter Motor Installation .....	16-40
Parts Location .....	16-14	Starter Motor Disassembly .....	16-41
Precautions .....	16-15	Starter Motor Assembly .....	16-41
Electrical Wiring .....	16-17	Carbon Brush Inspection .....	16-42
Wiring Inspection .....	16-17	Commutator Inspection, Cleaning	16-42
Battery .....	16-18	Armature Inspection .....	16-42
Battery Removal .....	16-18	Starter System .....	16-43
Battery Activation .....	16-18	Brush Lead Inspection .....	16-43
Precautions .....	16-20	Terminal Bolt Inspection .....	16-43
Interchange .....	16-21	Starter Relay Inspection .....	16-43
Charging Condition Inspection .....	16-21	Lighting System .....	16-45
Refreshing Charge .....	16-21	Headlight Beam Horizontal	
Charging System .....	16-23	Adjustment .....	16-45
Alternator Cover Removal .....	16-23	Headlight Beam Vertical	
Alternator Cover Installation .....	16-23	Adjustment .....	16-45
Stator Coil Removal .....	16-23	Headlight Bulb Replacement .....	16-45
Stator Coil Installation .....	16-23	Tail/Brake Light Bulb	
Alternator Rotor Removal .....	16-24	Replacement .....	16-46
Alternator Rotor Installation .....	16-24	Front Turn Signal Light Bulb	
Alternator Inspection .....	16-25	Replacement .....	16-46
Regulator/Rectifier Inspection .....	16-26	Rear Turn Signal Light Bulb	
Charging Voltage Inspection .....	16-28	Replacement .....	16-47
Ignition System .....	16-30	Turn Signal Relay Inspection .....	16-48
Crankshaft Sensor Removal .....	16-31	Radiator Fan System .....	16-51
Crankshaft Sensor Installation .....	16-31	Fan System Circuit Inspection .....	16-51
Crankshaft Sensor Inspection .....	16-32	Fan Motor Inspection .....	16-51
Crankshaft Sensor Peak Voltage .....	16-32	Meters, Gauge and Indicator Unit .....	16-52
Ignition Coil Removal .....	16-32	Meter Unit Removal .....	16-52
Ignition Coil Inspection .....	16-33	Meter Unit Disassembly .....	16-52
Ignition Coil Primary Peak		Meter Unit Installation .....	16-52
Voltage .....	16-34	Indicator Light Replacement .....	16-53
Spark Plug Removal .....	16-34	Tachometer Inspection .....	16-53
Spark Plug Installation .....	16-35	Water Temperature Gauge	
Spark Plug Cleaning, Inspection .....	16-35	Operation Inspection .....	16-54
Spark Plug Gap Inspection .....	16-35	Switches and Sensor .....	16-55
IC Igniter Inspection .....	16-35	Brake Light Timing Inspection .....	16-55
IC Igniter Operation Inspection .....	16-35	Brake Light Timing Adjustment .....	16-55
Starter Button Operation		Switch Inspection .....	16-55
Inspection .....	16-36	Radiator Fan Switch Inspection .....	16-56

16-2 ELECTRICAL SYSTEM

---

Water Temperature Sensor		Diode Circuit Inspection .....	16-59
Inspection.....	16-56	Fuses.....	16-61
Junction Box .....	16-58	30 A Main Fuse Removal.....	16-61
Junction Box Fuse Circuit		Junction Box Fuse Removal .....	16-61
Inspection.....	16-58	Junction Box Fuse Installation .....	16-61
Starter Circuit/Headlight Relay		Fuse Inspection.....	16-61
Inspection.....	16-58		

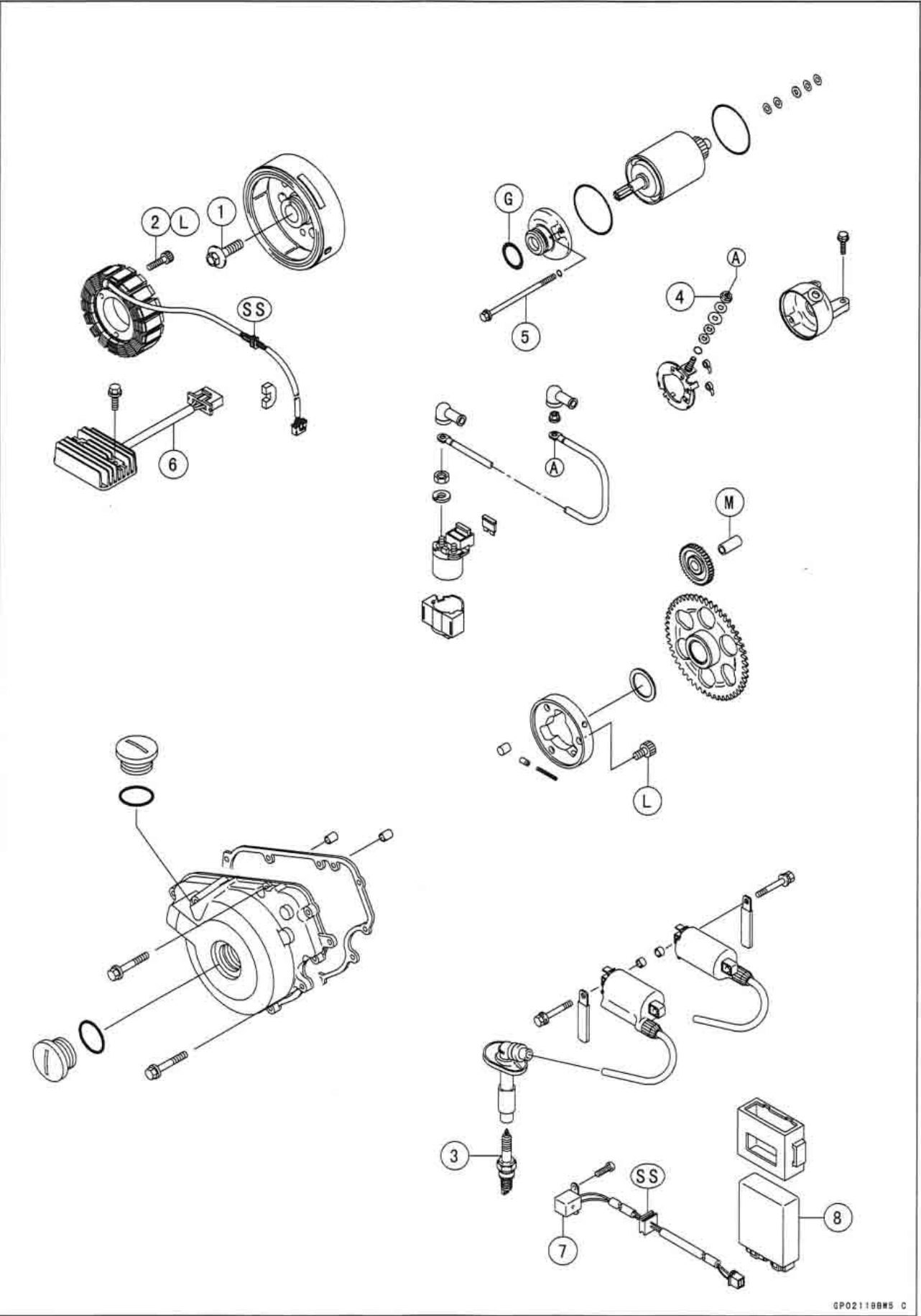
Exploded View





16-4 ELECTRICAL SYSTEM

Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Alternator Rotor Bolt	69	7.0	51	
2	Alternator Stator Bolts	12	1.2	104 in·lb	L
3	Spark Plugs	14	1.4	10	
4	Starter Motor Terminal Locknut	6.9	0.70	61 in·lb	
5	Starter Motor Assembly Bolts	3.5	0.36	31 in·lb	

6. Regulator

7. Crankshaft Sensor

8. IC Igniter

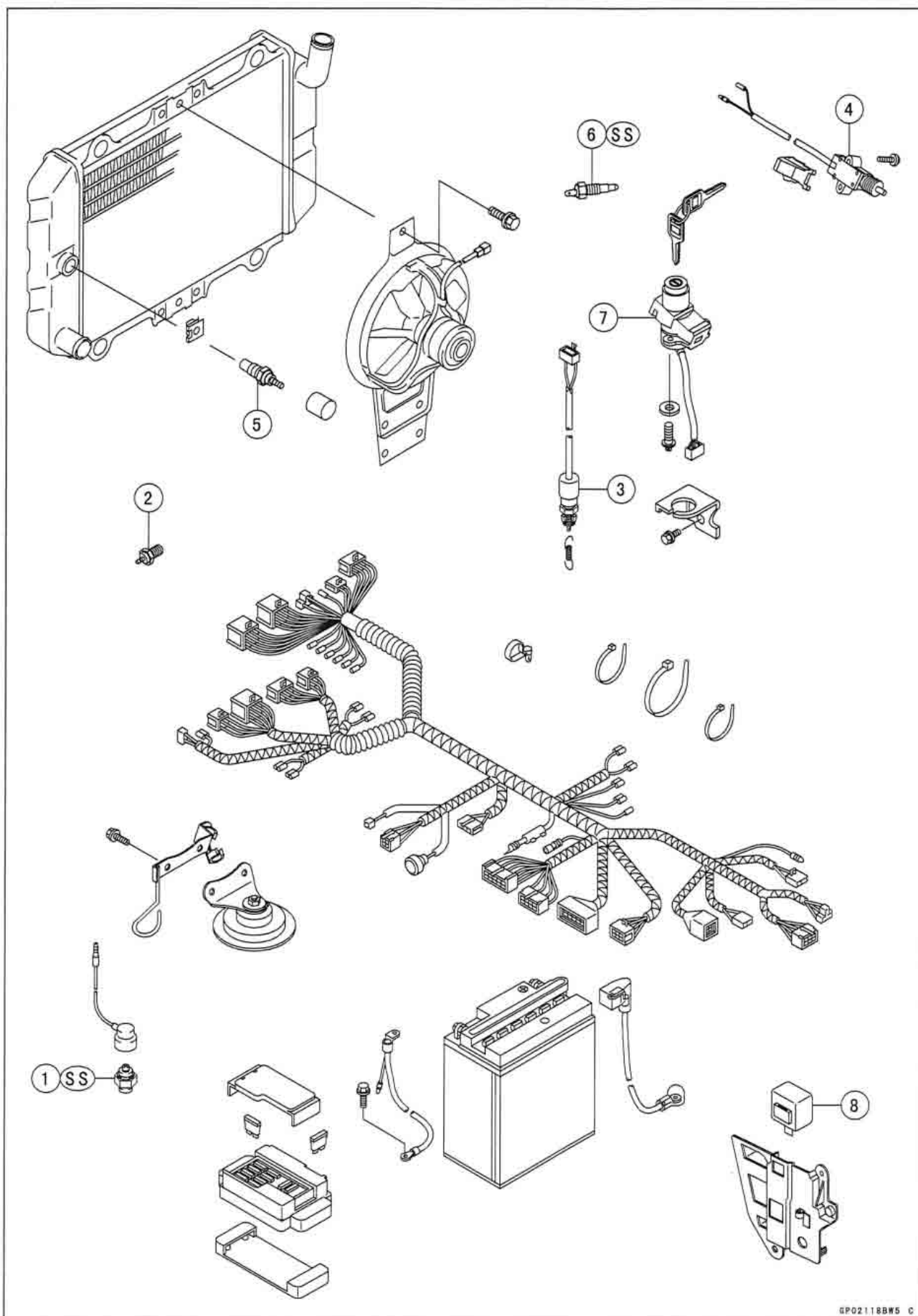
G: Apply grease.

L: Apply a non-permanent locking agent.

SS: Apply silicone grease.

## 16-6 ELECTRICAL SYSTEM

### Exploded View



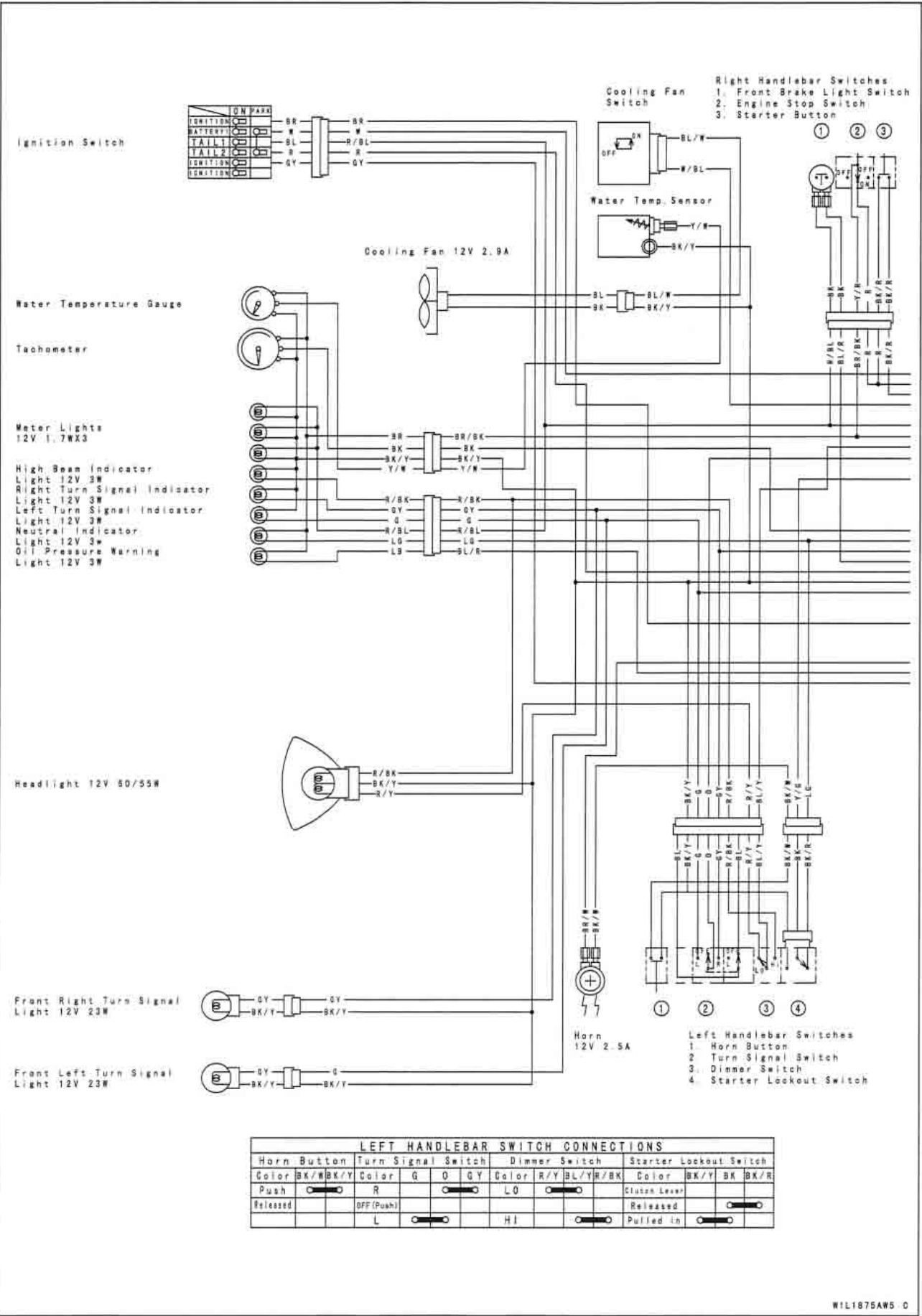
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Pressure Switch	15	1.5	11	SS
2	Neutral Switch	15	1.5	11	

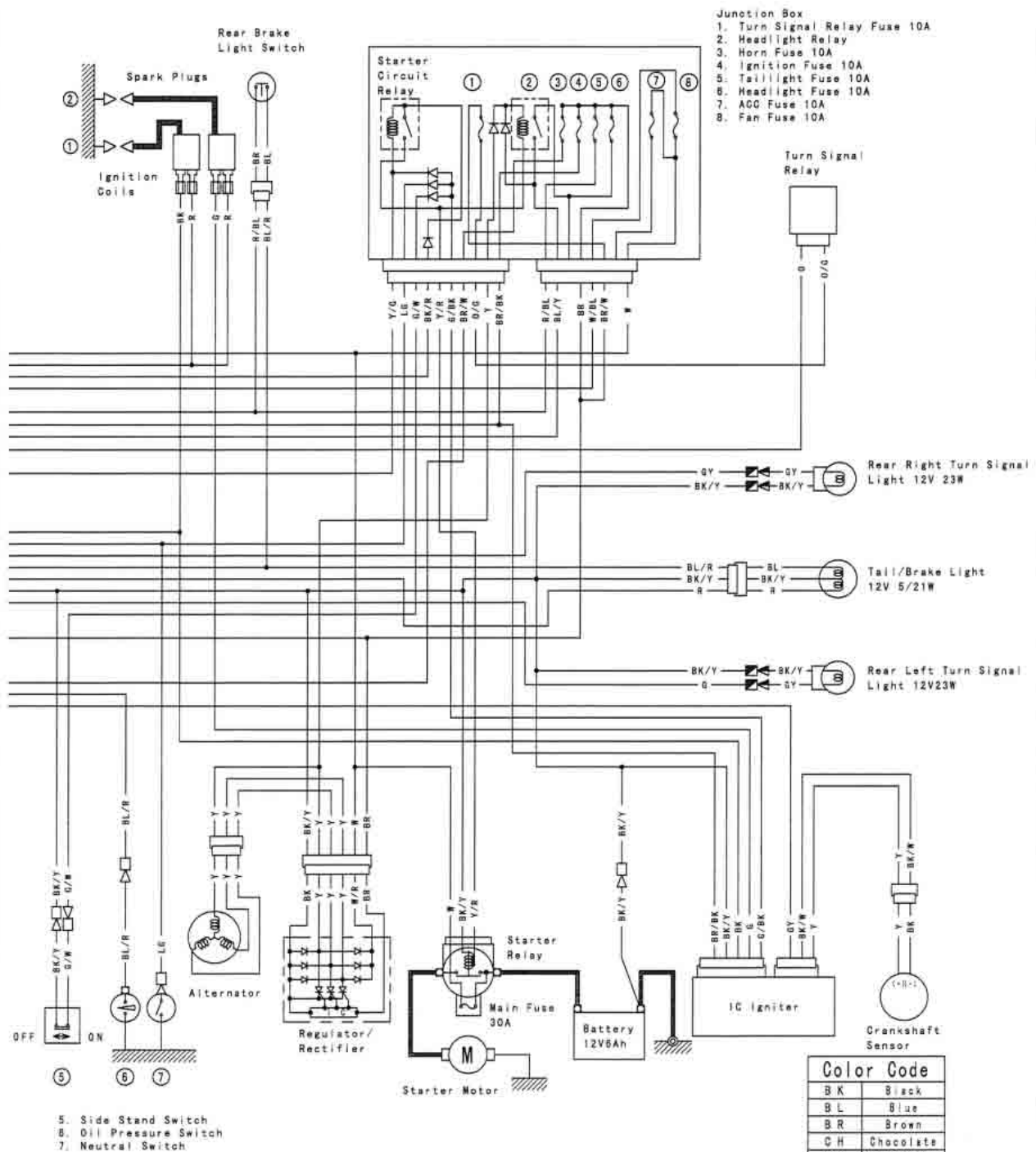
- 3. Rear Brake Light Switch
  - 4. Side Stand Switch
  - 5. Radiator Fan Switch
  - 6. Water Temperature Switch
  - 7. Ignition Switch
  - 8. Turn Signal Relay
- SS: Apply silicone grease.

16-8 ELECTRICAL SYSTEM

EX250-H15 Wiring Diagram (Canada)



## EX250-H15 Wiring Diagram (Canada)



5. Side Stand Switch  
6. Oil Pressure Switch  
7. Neutral Switch

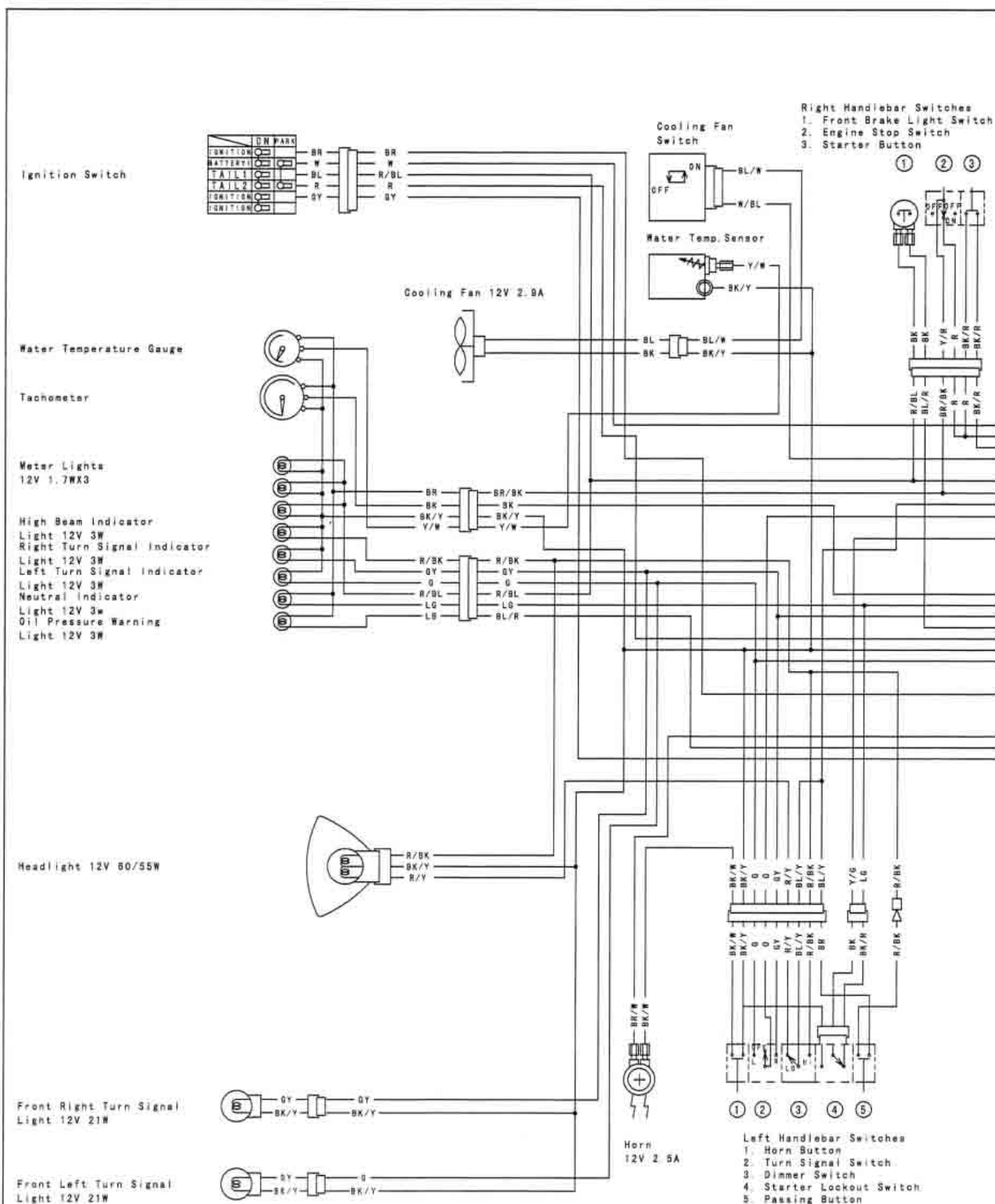
IGNITION SWITCH CONNECTIONS					
	Ignition	Battery	Ignition	Tail 1	Tail 2
Color	BR	W	GY	BL	R
OFF, LOCK					
ON					
P (PARK)					

RIGHT HANDLEBAR SWITCH CONNECTIONS					
Front Brake Light Switch			Engine Stop Switch		Starter Button
Color	BK	BK	Color	Y/R	R
Color	BK/R	BK/R	Color	BK/R	BK/R
Brake Lever			OFF		
Pulled In			RUN		Push

(98051-1875A)

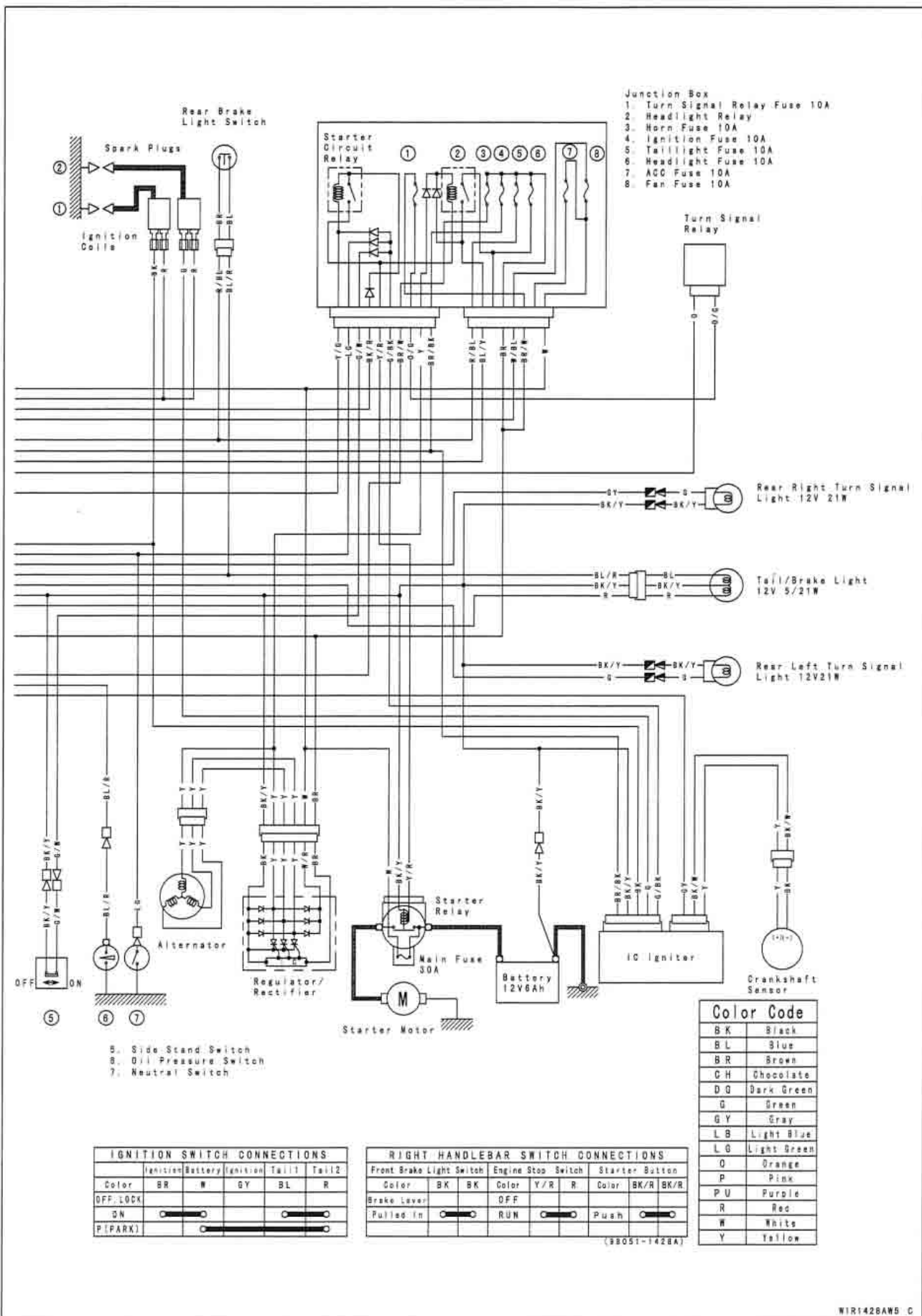
# 16-10 ELECTRICAL SYSTEM

## EX250-H15 Wiring Diagram (Australia)



LEFT HANDLEBAR SWITCH CONNECTIONS									
Horn Button	Turn Signal Switch	Dimmer Switch	Starter Lockout Switch	Passing Button					
Color: BK/WBK/Y	Color: G	Color: G	Color: R/YBL/YR/BK	Color: BK/Y BK BK/R	Color: BR R/BK				
Push	R	LO	Clutch Lever	Released	Push				
Released	OFF (Push)	HI	Released	Push					
	L		Pulled in						

## EX250-H15 Wiring Diagram (Australia)





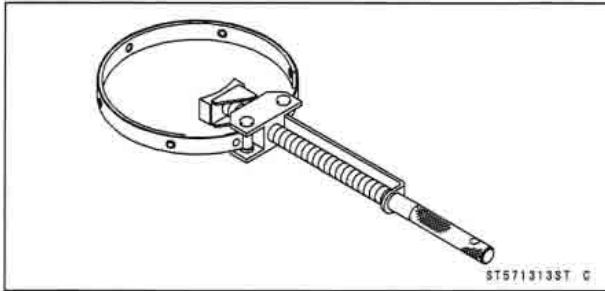
## 16-12 ELECTRICAL SYSTEM

### Specifications

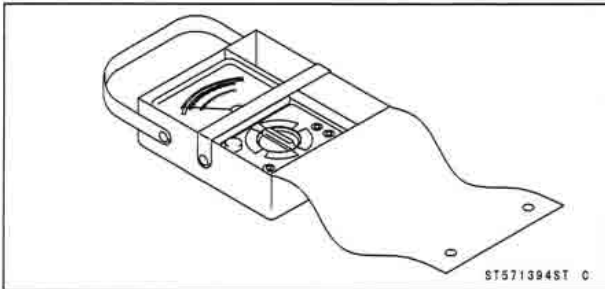
Item	Standard	Service Limit
<b>Battery</b>		
Type	12 V 6 Ah	— — —
Specific Gravity	1.320 @20°C (68°F)	— — —
<b>Charging System</b>		
Charging Voltage	14.5 V, Night @4 000 r/min (rpm)	— — —
Alternator Stator Coil Resistance	0.2 ~ 0.9 $\Omega$	— — —
<b>Ignition System</b>		
Crankshaft Sensor Air Gap	0.7 mm (0.028 in.)	— — —
Crankshaft Sensor Resistance	100 ~ 150 $\Omega$	— — —
Ignition Coil:		
3 Needle Arcing Distance	7 mm (0.28 in.) or more	— — —
Primary Winding Resistance	2.2 ~ 3.5 $\Omega$	— — —
Secondary Winding Resistance	10 ~ 16 k $\Omega$	— — —
Spark Plug:		
Standard Plug	NGK CR8HSA or ND U24FSR-U	— — —
Optional Plug	NGK CR7HSA or ND U22FSR-U	— — —
Plug Gap	0.6 ~ 0.7 mm (0.024 ~ 0.028 in.)	— — —
<b>Electrical Stater System</b>		
Starter Motor Carbon Brush Length	10 mm (0.39 in.)	5 mm (0.20 in.)
Starter Motor Commutator Diameter	28 mm (1.10 in.)	27 mm (1.06 in.)
<b>Switches and Sensors</b>		
Rear Brake Light Switch	ON after about 10 mm (0.39 in.) pedal travel	— — —
Fan Switch:		
OFF → ON	96 ~ 100°C (205 ~ 212°F)	— — —
ON → OFF	above 91°C (196°F)	— — —
Water Temperature Sensor Resistance	80°C (176°F): about 52 $\Omega$ 100°C (212°F): about 27 $\Omega$	— — —

## Special Tools and Sealant

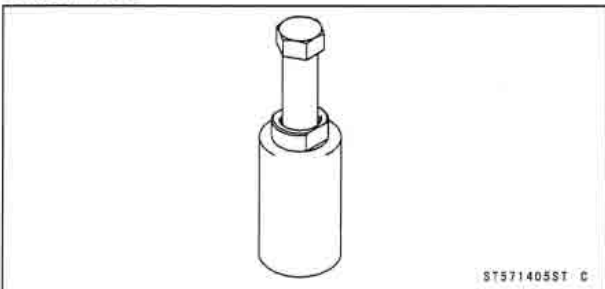
**Flywheel Holder:**  
57001-1313



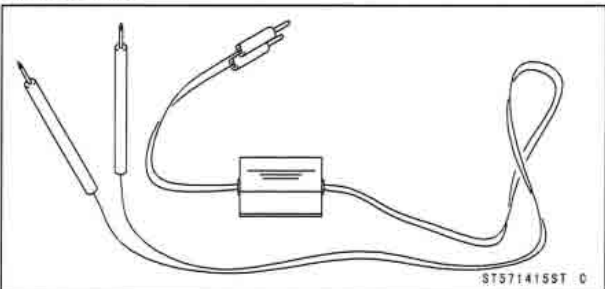
**Hand Tester:**  
57001-1394



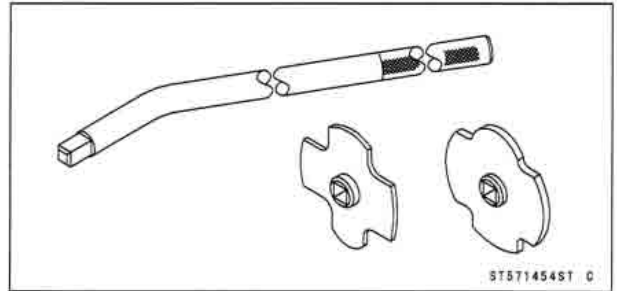
**Flywheel Puller Assembly, M38 x 1.5/M35 x 1.5:**  
57001-1405



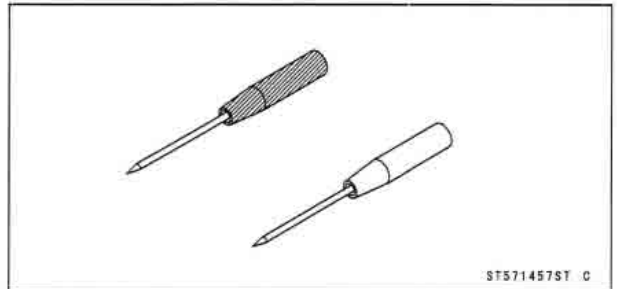
**Peak Voltage Adapter:**  
57001-1415



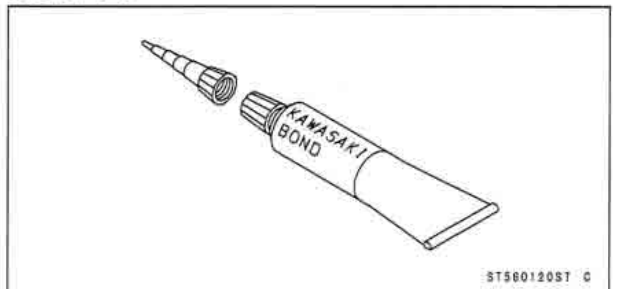
**Filler Cap Driver:**  
57001-1454



**Needle Adapter Set:**  
57001-1457

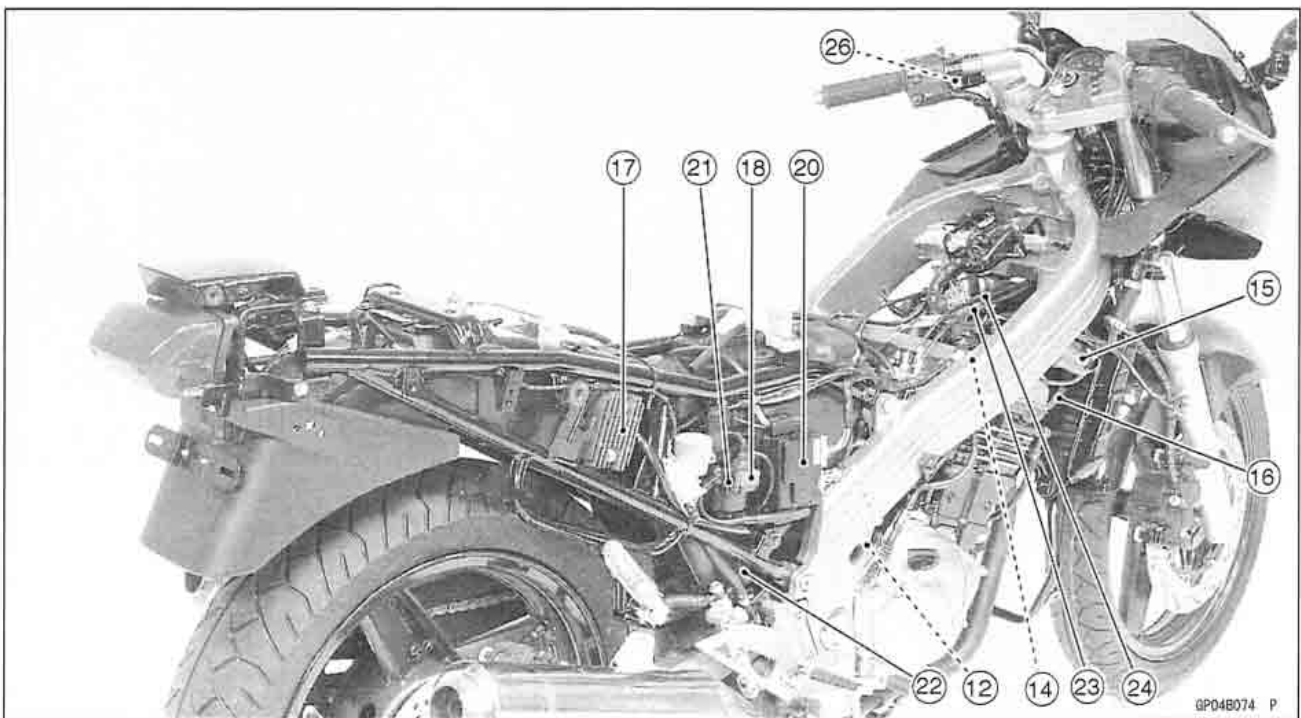
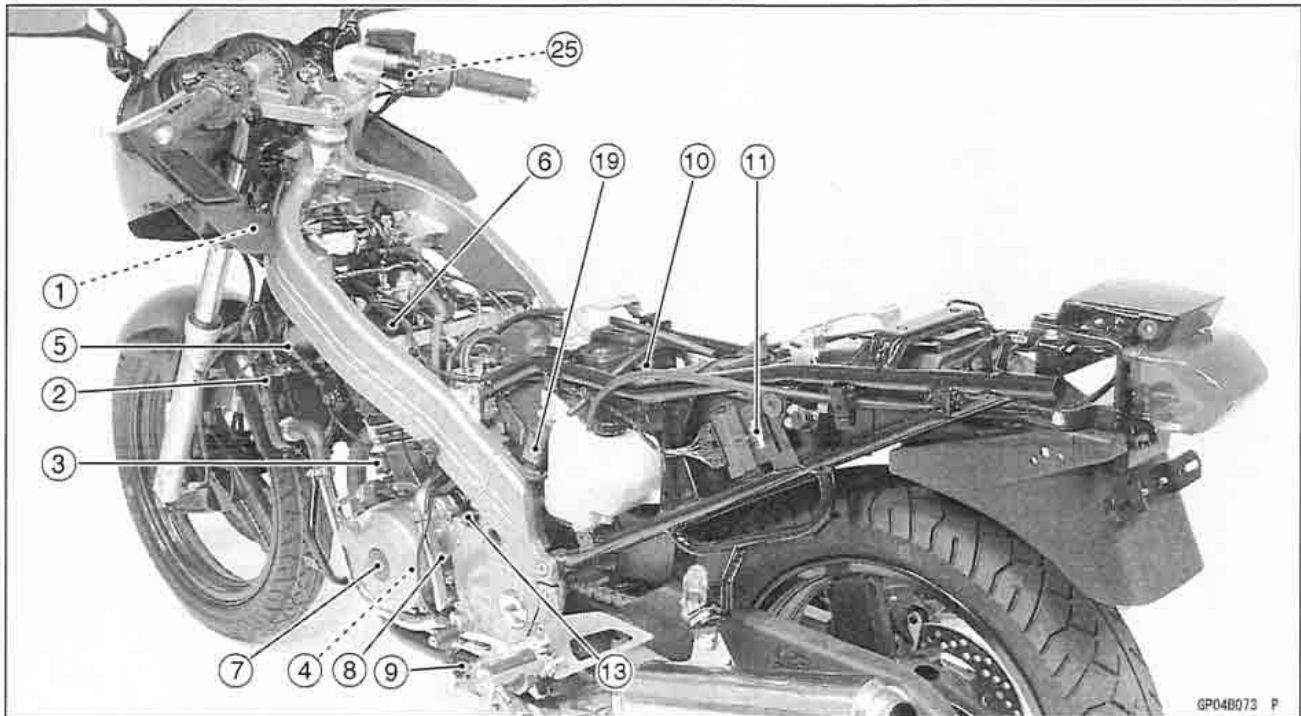


**Kawasaki Bond (Silicone Sealant):**  
56019-120



## 16-14 ELECTRICAL SYSTEM

### Parts Location



- |                        |                         |                              |
|------------------------|-------------------------|------------------------------|
| 1. Horn                | 10. Battery             | 19. Turn Signal Relay        |
| 2. Radiator Fan Switch | 11. IC Igniter          | 20. Junction Box             |
| 3. Oil Pressure Switch | 12. Ground Lead         | 21. Starter Relay            |
| 4. Crankshaft Sensor   | 13. Starter Motor       | 22. Rear Brake Light Switch  |
| 5. Ignition Coil (#1)  | 14. Spark Plug (#2)     | 23. Ground Lead              |
| 6. Spark Plug (#1)     | 15. Ignition Coil (#2)  | 24. Water Temperature Sensor |
| 7. Alternator          | 16. Radiator Fan        | 25. Front Brake Light Switch |
| 8. Neutral Switch      | 17. Regulator/rectifier | 26. Starter Lockout Switch   |
| 9. Side Stand Switch   | 18. Main Fuse (30 A)    |                              |

## Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

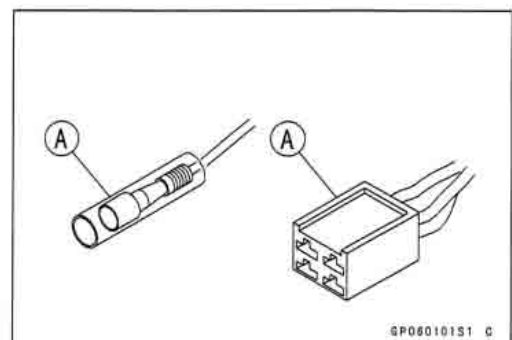
- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Do not use a meter illumination bulb rated for other than voltage or wattage specified in the wiring diagram, as the meter or gauge panel could be warped by excessive heat radiated from the bulb.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

### ○ Color Codes

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

### ○ Electrical Connectors

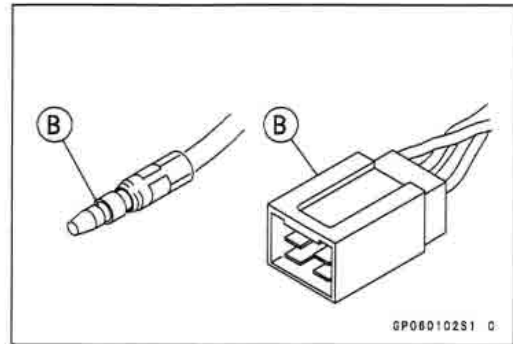
#### Female Connectors [A]



## 16-16 ELECTRICAL SYSTEM

### Precautions

Male Connectors [B]



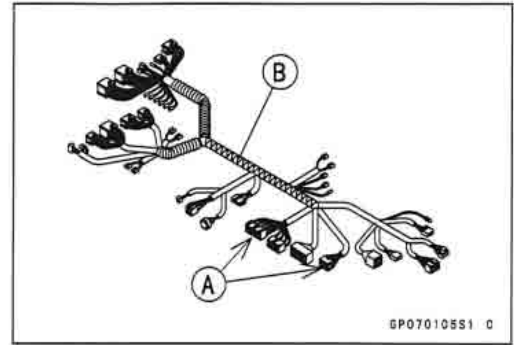
## Electrical Wiring

### Wiring Inspection

- Visually inspect the wiring for signs of burning, fraying, etc.
- ★ If any wiring is in 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 meter.
- ★ If the tester does not read  $0 \Omega$ , the lead is defective. Replace the lead or the wiring harness [B] if necessary.

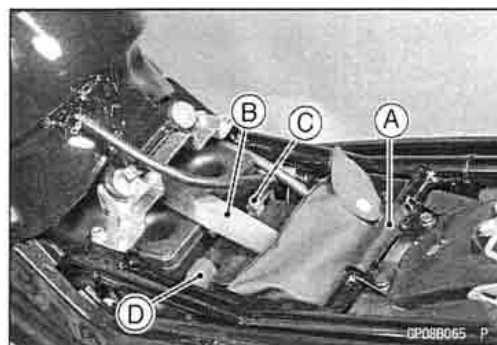


## 16-18 ELECTRICAL SYSTEM

### Battery

#### Battery Removal

- Remove:
  - Seats (see Frame chapter)
  - Tool Case [A]
- Unhook the battery band [B].
- Disconnect the negative (-) lead [C] and the positive (+) lead [D].



#### CAUTION

**Be sure to disconnect the negative (-) lead first.**

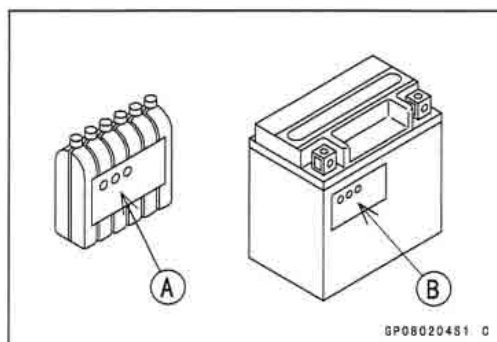
- Remove the battery.

#### Battery Activation

##### Electrolyte Filling

- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

**Battery Model Name for EX250-H15: YTX7L-BS**

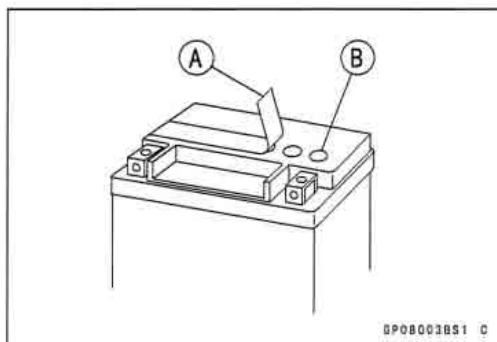


#### CAUTION

**Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.**

#### CAUTION

**Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.**



- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

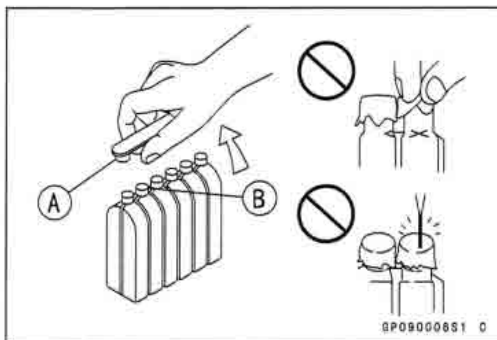
#### NOTE

○ The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.

- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.

#### NOTE

○ Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.



## Battery

- Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

### NOTE

- Do not tilt the electrolyte container

- Check the electrolyte flow.
- ★ If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.
- Keep the container in place for **20 minutes** or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.

### CAUTION

**Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.**

- Gently remove the container from the battery.
- Let the battery sit for **60 minutes** prior to charging to allow the electrolyte to permeate into the plates for optimum performance.

### NOTE

- Charging the battery immediately after filling can shorten service life. Let the battery sit for at least **60 minutes** after filling.

### Initial Charge

- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

**Standard Charge: 0.7 A × 5 ~ 10 hours**

- ★ If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

#### Kawasaki-recommended chargers

**Optimate III**

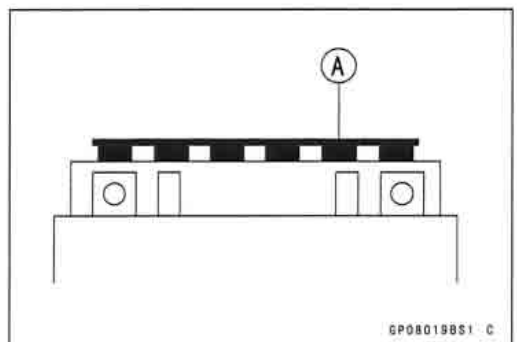
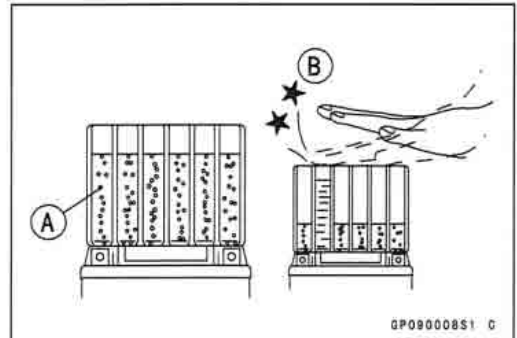
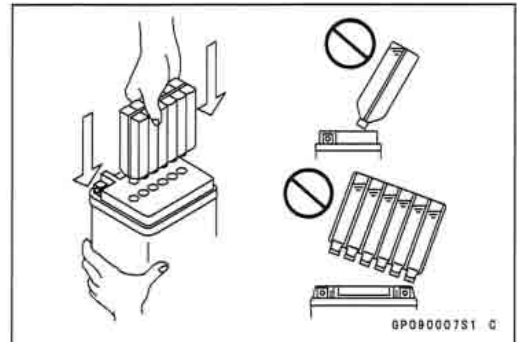
**Yuasa 1.5 Amp Automatic Charger**

**Battery Mate 150-9**

- ★ If the above chargers are not available, use equivalent one.

### NOTE

- Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.8 volts, repeat charging cycle.





## 16-20 ELECTRICAL SYSTEM

### Battery

- After charging is completed, press down firmly with both hands to seat the strip of caps [A] into the battery (don't pound or hammer). When properly installed, the strip of the caps will be level with the top of the battery.

#### CAUTION

Once the strip of the caps [A] is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.

#### NOTE

- To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds. Re-check voltage and if less than 12.8 volts repeat the charging cycle and load test. If still below 12.8 volts the battery is defective.

#### Precautions

- 1) No need of topping-up

No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.

- 2) Refreshing charge

If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see this chapter).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

#### CAUTION

**This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge.**

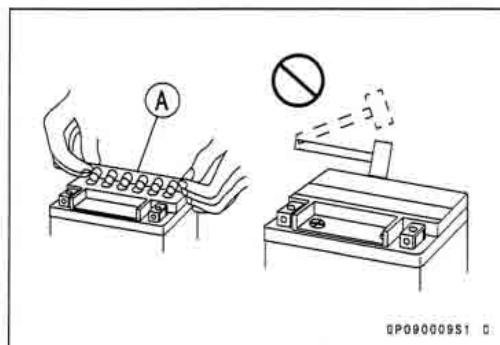
**If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.**

- 3) When you do not use the motorcycle for months:

Give a refresh charge before you store the motorcycle and store it with the negative cable removed. Give a refresh charge **once a month** during storage.

- 4) Battery life:

If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).



#### ⚠ WARNING

**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.**

**This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

**No fire should be drawn near the battery, or no terminals should have the tightening loosened.**

**The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medical attention if severe.**

## Battery

### Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

### Charging Condition Inspection

○ Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].

● Remove:

Seats (see Frame chapter)

Battery Cover

● Disconnect the battery terminals.

### CAUTION

**Be sure to disconnect the negative (–) cable first.**

● Measure the battery terminal voltage.

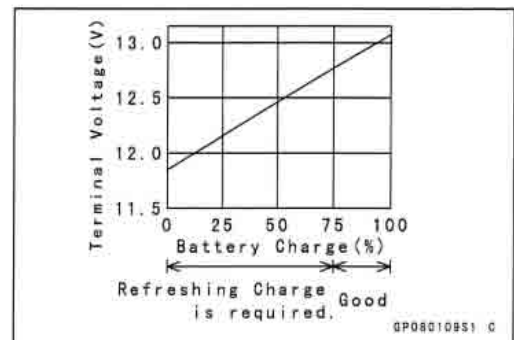
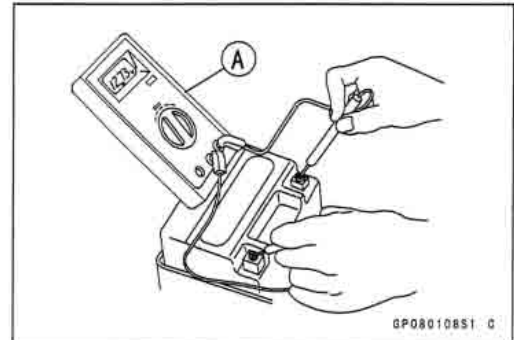
### NOTE

○ Measure with a digital voltmeter which can be read one decimal place voltage.

★ If the reading is 12.8 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

### Battery Terminal Voltage

**Standard: 12.8 V or more**

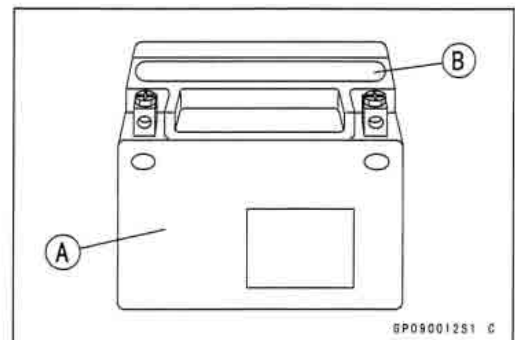


### Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

### ⚠ WARNING

**This battery is a sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.**



16-22 ELECTRICAL SYSTEM

Battery

- Terminal Voltage: 11.5 ~ less than 12.8 V
- Standard Charge: 0.7 A × 5 ~ 10 h (see following chart)
- Quick Charge: 4 A × 1 h

CAUTION

If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.

- Terminal Voltage: less than 11.5 V
- Charging Method: 0.7 A × 20 h

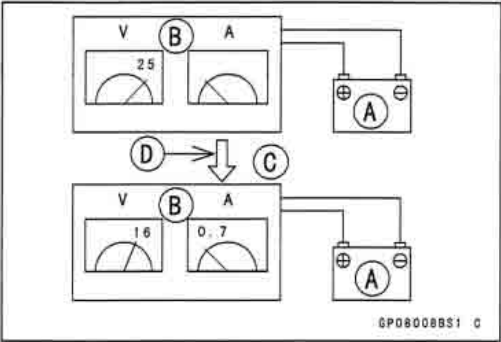
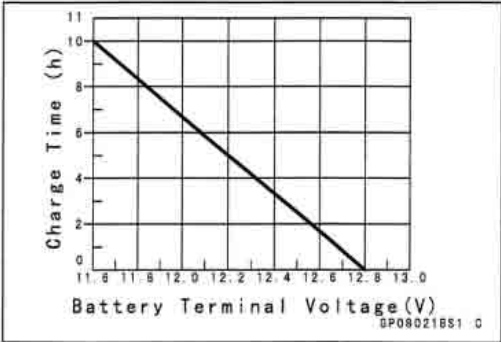
NOTE

○Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.

- Battery [A]
- Battery Charger [B]
- Standard Value [C]
- Current starts to flow [D]

- Determine the battery condition after refresh charge.
- Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

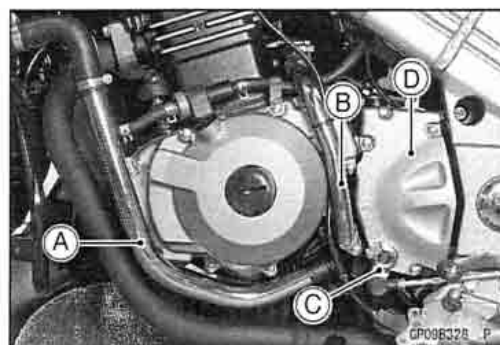
Criteria	Judgement
12.8 V or higher	Good
12.0 ~ lower than 12.8 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace



## Charging System

### Alternator Cover Removal

- Drain:
  - Engine Oil
  - Coolant
- Remove:
  - Left Lower Fairing (see Frame chapter)
  - Coolant Pipes [A], [B]
  - Shift Lever Link [C]
  - Engine Sprocket Cover [D]



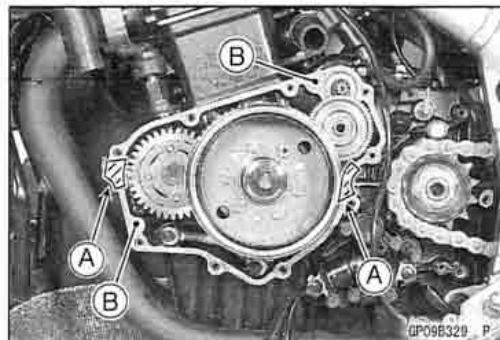
### Alternator Cover Installation

- Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear side of the cover mount.

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

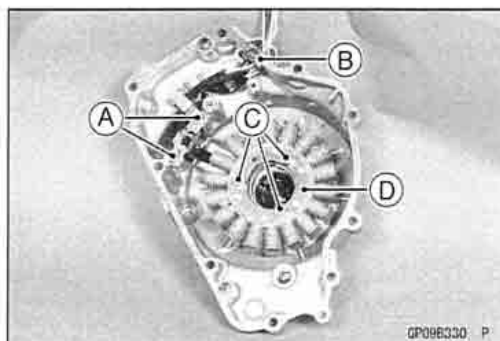
- Check that the knock pins [B] are in place on the crankcase.
- Install a new gasket and the alternator cover.

**Torque - Radiator Hose Clamp Screws: 2.0 N·m (0.2 kgf·m, 17 in·lb)**



### Stator Coil Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
  - Crankshaft Sensor Screws [A] and Clamps
  - Alternator Lead Grommet [B]
  - Stator Coil Bolts [C]
- Remove the stator coil [D] from the alternator cover.



### Stator Coil Installation

- Install the alternator leads [A] and crankshaft sensor leads [B] into the alternator cover as figure.
  - Stator Coil [C]
  - Crankshaft Sensor Coil [D]
  - Rubber Damper [E]
  - Clamp [F]
  - Grommet [G]
  - Silicone Sealant Applied Areas [H]

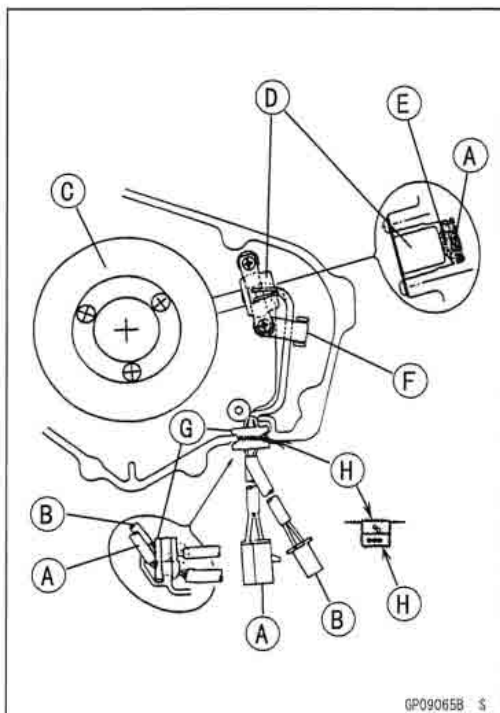
- Fit the alternator leads and crankshaft sensor leads into the grommet.

- Apply silicone sealant to the grommet, and fit it into the notch in the alternator cover.

**Special Tool - Kawasaki Bond (Silicone Sealant): 56019-120**

- Install the crankshaft sensor.
- Clamp the harness of the crankshaft sensor leads.
- Tighten the stator Allen bolts with the specified torque.

**Torque - Alternators Stator Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**



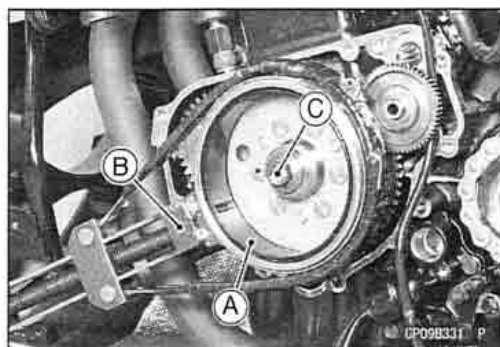
## 16-24 ELECTRICAL SYSTEM

### Charging System

#### Alternator Rotor Removal

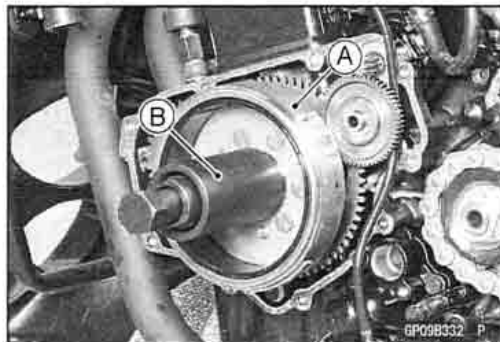
- Remove the alternator cover (see Alternator Cover Removal).
- Hold the alternator rotor [A] steady with the flywheel holder [B], and remove the rotor bolt [C].

**Special Tool - Flywheel Holder: 57001-1313**



- Remove the rotor [A] using the flywheel puller assembly [B].

**Special Tool - Flywheel Puller Assembly, M38 x 1.5/M35 x 1.5: 57001-1405**

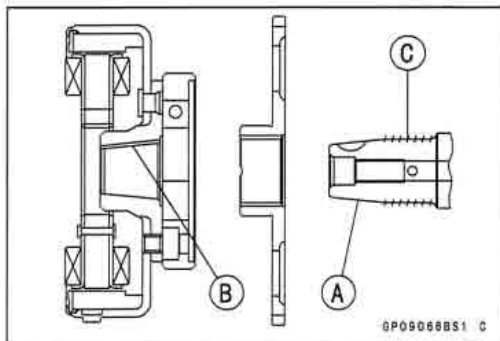


#### CAUTION

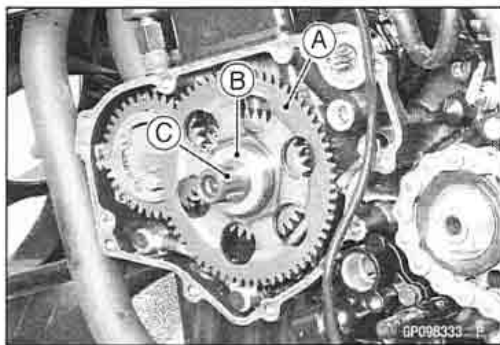
**Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.**

#### Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions, and dry them with a clean cloth.
  - Crankshaft Tapered Portion [A]
  - Alternator Rotor Tapered Portion [B]
- Apply a thin coat of molybdenum disulfide grease to the crankshaft [C].



- Install the starter gear [A] and washer [B].
- Again, clean the crankshaft tapered portion [C] and dry there.

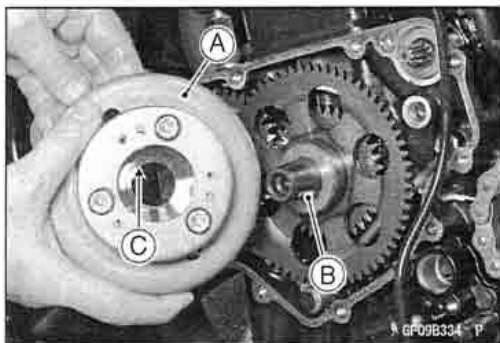


- Install the alternator rotor [A] while turning it counterclockwise to make easy to align the key [B] and key groove [C] of the rotor.

#### NOTE

○ Confirm the alternator rotor fit or not to the crankshaft before tighten it with the specified torque.

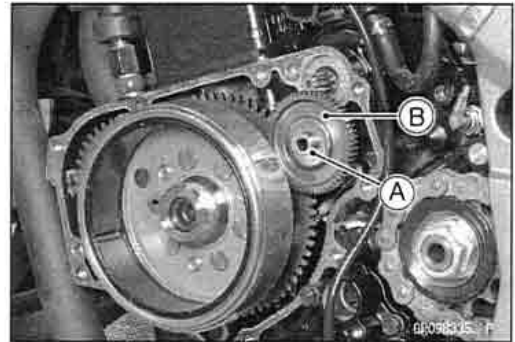
- Install the rotor bolt and tighten it with 50 N·m (5.1 kgf·m, 37 ft·lb) of torque.





## Charging System

- Remove the rotor bolt.
  - Check the tightening torque with flywheel puller.
  - ★ If the rotor is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
  - ★ If the rotor is pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.
  - Tighten the alternator rotor bolt with holding the alternator rotor steady with the flywheel holder.
- Special Tool - Flywheel Holder: 57001-1313**
- Torque - Alternator Rotor Bolt: 69 N·m (7.0 kgf·m, 52 ft·lb)**
- Apply a thin coat of molybdenum disulfide grease to the shaft [A], and install it and starter idle gear [B].
  - Install the alternator cover (see Alternator Cover Installation).



### Alternator Inspection

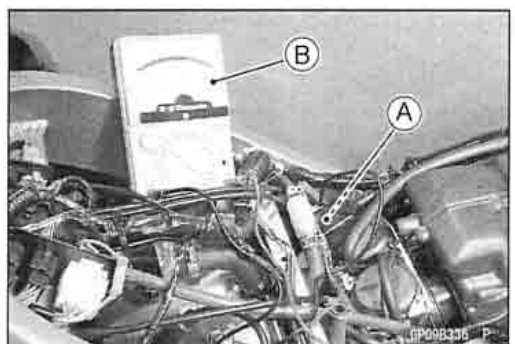
There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.

- To check the alternator output voltage, do the following procedures.
  - Turn off the ignition switch.
  - Remove the fuel tank (see Fuel System chapter).
  - Supply fuel to the carburetors with an auxiliary fuel tank.
  - Disconnect the alternator lead connector [A].
  - Connect the hand tester [B] as shown in the table 1.
  - Start the engine, and run it 4 000 rpm 5 minutes.
  - Run it at the rpm given in the table 1.
  - Note the voltage readings (total 3 measurements).

**Table 1 Alternator Output Voltage**

Tester Range	Connections		Reading @ 4 000 rpm
	Tester (+) to	Tester (–) to	
250 V AC	One Yellow lead	Another Yellow lead	about 45 V

- ★ If the output voltage shows the value in the table, the alternator operates properly.
- ★ If the output voltage shows a much higher than the value in the table, the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.



## 16-26 ELECTRICAL SYSTEM

### Charging System

- Check the stator coil resistance as follows.
- Stop the engine.
- Connect the hand tester as shown in the table 2.
- Note the readings (total 3 measurement).

**Table 2 Stator Coil Resistance**

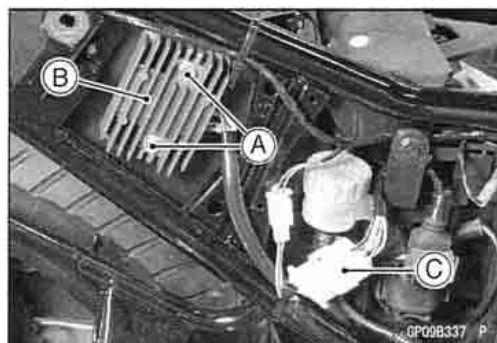
Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
$\times 1 \Omega$	One Yellow lead	Another Yellow lead	$0.2 \sim 0.9 \Omega$

- ★ If there is more resistance than shown in the table, or no hand tester reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
- Using the highest resistance range of the hand tester, measure the resistance between each of the black leads and chassis ground.
- ★ Any hand tester reading less than infinity ( $\infty$ ) indicates a short, necessitating stator replacement.
- ★ If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

**Special Tool - Hand Tester: 57001-1394**

#### Regulator/Rectifier Inspection

- Remove:
  - Seat (see Frame chapter)
  - Right Side Cover (see Frame chapter)
  - Bolts [A]
  - Regulator/Rectifier [B]



#### Rectifier Circuit Check

- Check the rectifier resistance as follows.
- Disconnect the regulator/rectifier connector [C].
- Connect the hand tester to the regulator/rectifier as shown in the table, and check the resistance in both directions of each diode in the rectifier following the table.

**Special Tool - Hand Tester: 57001-1394**

- ★ The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and the regulator/rectifier must be replaced.

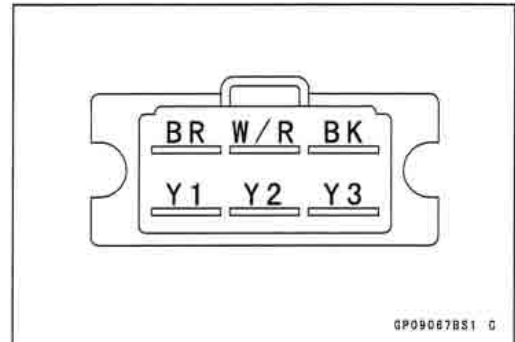
#### NOTE

- The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking the lower reading should be from zero to one half the scale.

## Charging System

### Rectifier Circuit Inspection

Tester Connection	W/R-Y1, W/R-Y2, W/R-Y3,
	BK-Y1, BK-Y2, BK-Y3



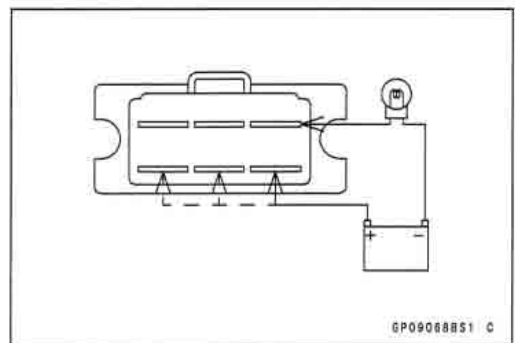
### Regulator Circuit Check

To test the regulator out of circuit, use three 12 V batteries and a test light (12 V 3 ~ 6 W bulb in a socket with leads).

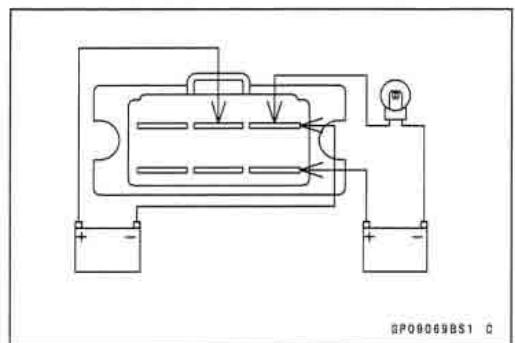
#### CAUTION

**The test light works as an indicator and also a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

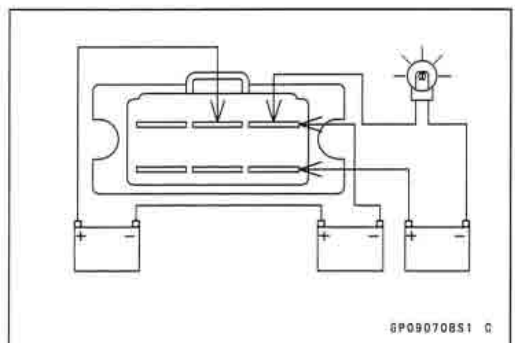
- Do the 1st step regulator circuit test.
- Connect the test light and the 12 V battery to the regulator/rectifier as shown.
- Check Y1, Y2, and Y3 terminal respectively.
- ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
- ★ If the test light does not turn on, continue the test.



- Do the 2nd step regulator circuit test.
- Connect the test light and the 12 V battery in the same manner as specified in the "1st step regulator circuit test".
- Apply 12 V to the BK terminal.
- Check Y1, Y2, and Y3 terminal respectively.
- ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
- ★ If the test light does not turn on, continue the test.



- Do the 3rd step regulator circuit test
- Connect the test light and the 12 V battery in the same manner as specified in the "1st step regulator circuit test".
- Momentarily apply 24 V to the BK terminal by adding a 12 V battery.
- Check Y1, Y2, and Y3 terminals respectively.





## 16-28 ELECTRICAL SYSTEM

### Charging System

#### CAUTION

**Do not apply more than 24 volts. If more than 24 volts is applied the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.**

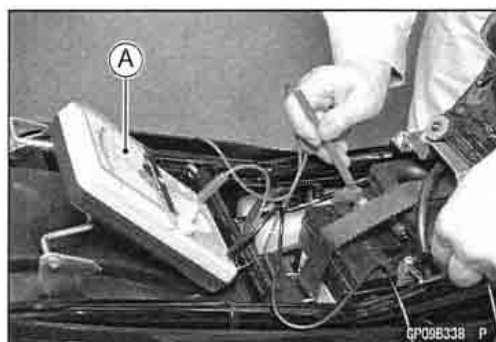
- ★ If the test light did not light when the 24 V was applied momentarily to the BK terminal, the regulator/rectifier is defective. Replace it.
- ★ If the regulator/rectifier passes all of the tests described, it may still be defective. If the charging system still does not work properly after checking all of the components and the battery, test the regulator/rectifier by replacing it with a known good unit.

#### Charging Voltage Inspection

- Check the battery condition (see Battery section).
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the seats (see Frame chapter).
- Check that the ignition switch is turned off, and connect the hand tester [A] as shown in the table.

**Special Tool - Hand Tester: 57001-1394**

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off. (To turn off the headlight, disconnect the headlight connector in the upper fairing.) The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.



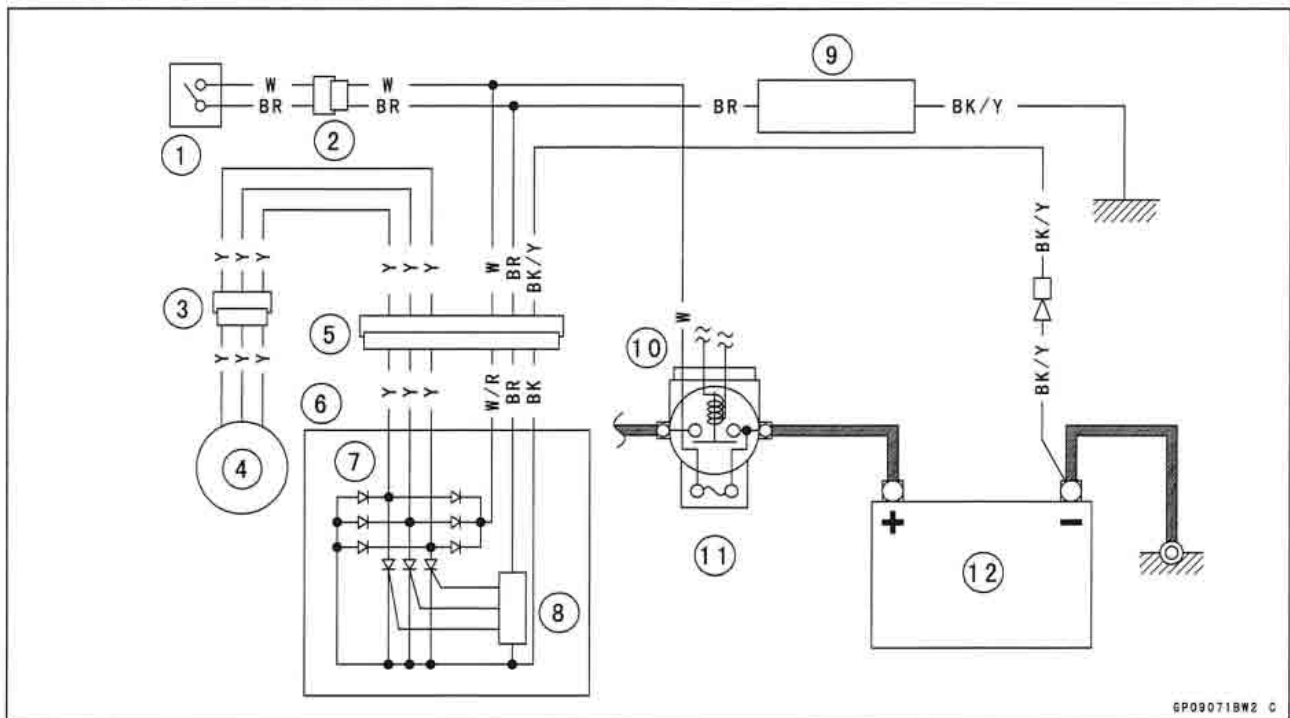
#### Charging Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
25 V DC	Battery (+)	Battery (-)	14 ~15 V

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.
- ★ If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.
- ★ If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.
- ★ If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

## Charging System

## Charging System Circuit



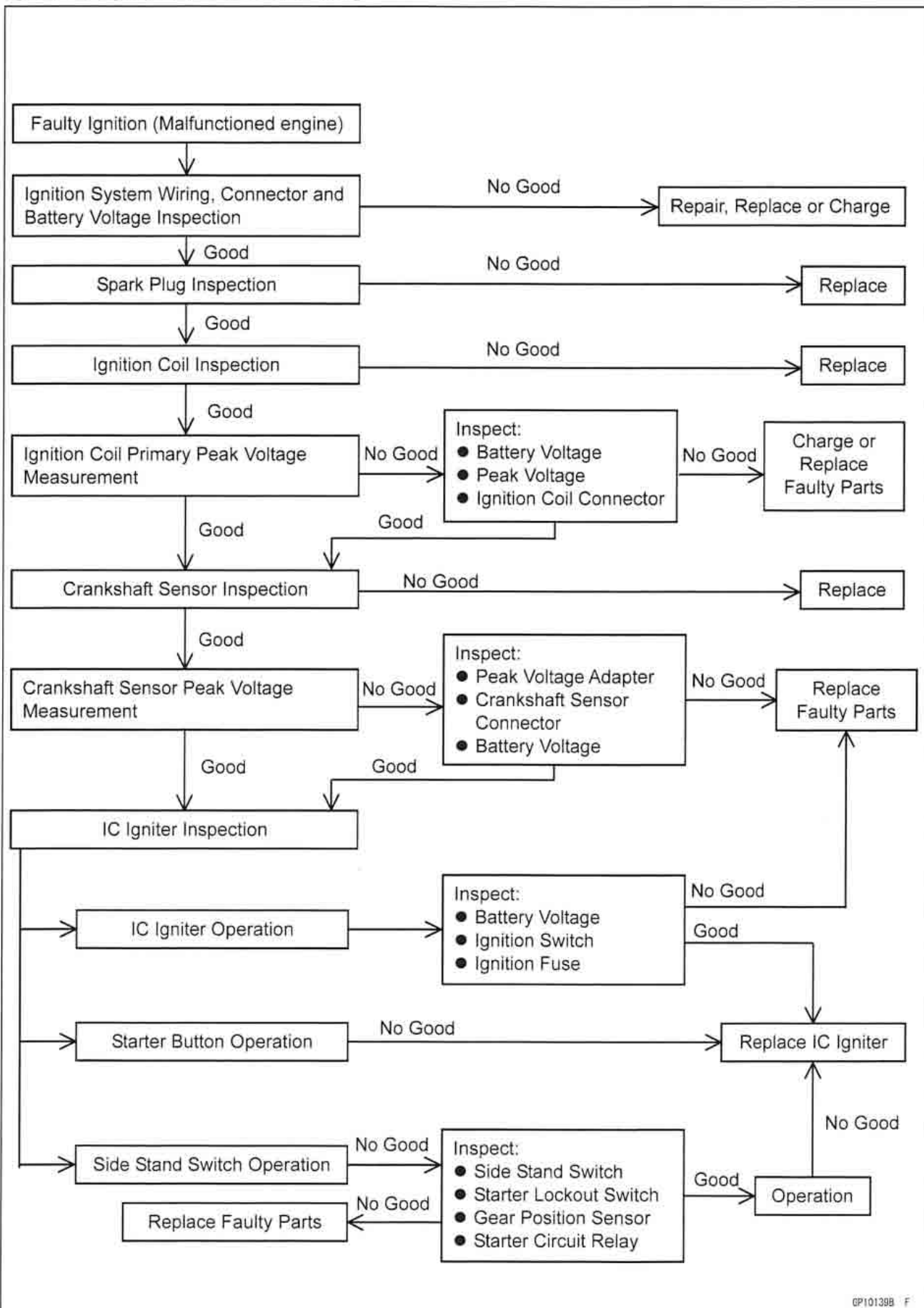
GP090718W2 C

1. Ignition Switch
2. Connector 1
3. Connector 2
4. Alternator
5. Connector 3
6. Regulator/Rectifier
7. Rectifier
8. Regulator
9. Load
10. Starter Relay
11. Main Fuse (30 A)
12. Battery

## 16-30 ELECTRICAL SYSTEM

### Ignition System

#### Ignition System Troubleshooting



## Ignition System

### **⚠ WARNING**

The ignition system produces extremely high voltage. Do not touch the spark plugs or stick coils while the engine is running, or you could receive a severe electrical shock.

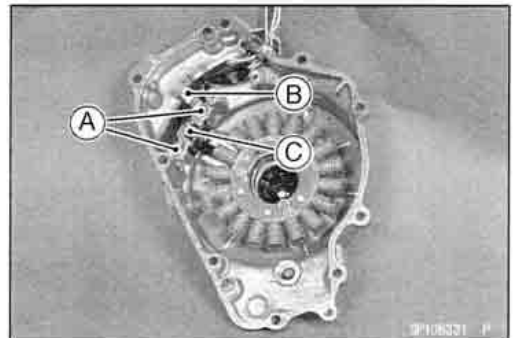
### **CAUTION**

Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC igniter damage.

Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and IC igniter.

### *Crankshaft Sensor Removal*

- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Right Side Cover (see Frame chapter)
  - Alternator Cover (see Charging System)
- Disconnect the crankshaft sensor connector [A] from near the right side of the carburetor.
- Remove the crankshaft sensor screws [A] and clamp [B], and then remove the crankshaft sensor [C].

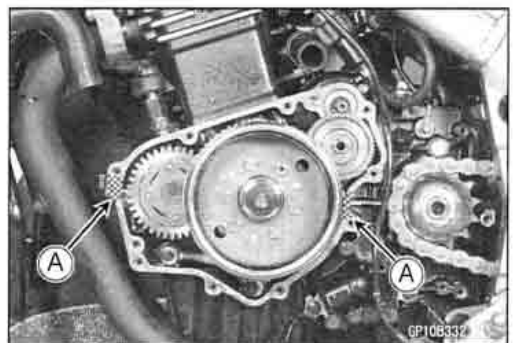


### *Crankshaft Sensor Installation*

- Apply silicone sealant to the grommet and fit it into the notch in the alternator cover.
- Install the clamp and crankshaft sensor to the alternator cover.
- Clamp the harness of crankshaft sensor leads as shown.
- Apply silicone sealant to the mating surface [A] of the crankcase.
- Install the alternator cover (see Charging System).

**Special Tool - Kawasaki Bond (Silicone Sealant): 56019**

-120



## 16-32 ELECTRICAL SYSTEM

### Ignition System

#### *Crankshaft Sensor Inspection*

- Remove the crankshaft sensor (see Crankshaft Sensor Removal).
- Disconnect the crankshaft sensor connector [A] from near the right side of the carburetor.
- Set the hand tester [B] to the  $\times 100 \Omega$  range and connect the (+) lead [C] to the black lead and (-) lead [D] to the yellow lead in the connector.

**Special Tool - Hand Tester: 57001-1394**

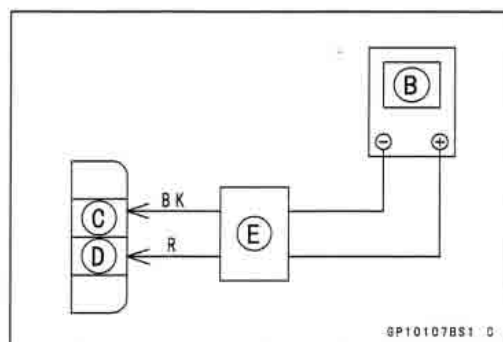
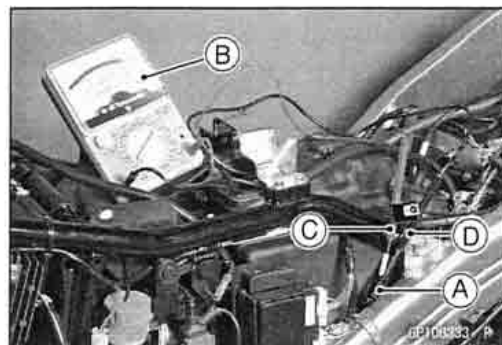
- ★ If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

**Crankshaft Sensor Resistance: 400 ~ 490  $\Omega$**

- 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 ( $\infty$ ) indicates a short, necessitating replacement of the crankshaft sensor assembly.

#### *Crankshaft Sensor Peak Voltage*

- Disconnect the crankshaft sensor connector [A].
- Set the hand tester [B] to the  $\times 25 \text{ V DC}$  range, and connect it the peak voltage adapter [E] as shown in the diagram.
- Using two auxiliary wires, connect the black lead (-) of the adapter to yellow lead [C] and red lead (+) to black lead [D] in the crankshaft sensor connector [A].
- Turn the ignition switch and engine stop switch on.



- Grasp the clutch lever and pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

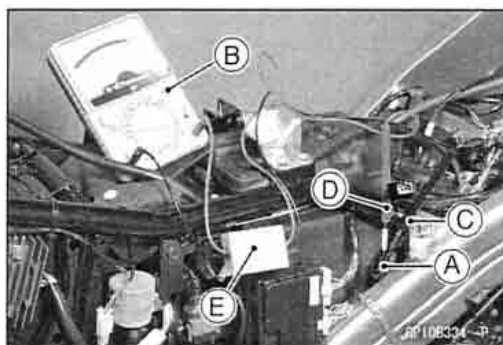
**Crankshaft Sensor Peak Voltage**

**Standard: 3.5 V or more**

**Special Tool - Hand Tester: 57001-1394**

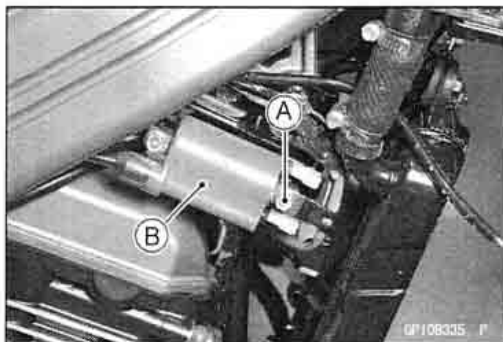
**Peak Voltage Adapter: 57001-1415**

**Type: KEK-54-9-B**



#### *Ignition Coil Removal*

- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Right or Left Lower Fairing (see Frame chapter)
- Disconnect the primary winding leads from the ignition coil.
- Pull out the spark plug cap from the spark plug.
- Remove the mounting bolt [A], and take out the ignition coil [B].



## Ignition System

### Ignition Coil Inspection

- Remove the ignition coil (see Ignition Coil Removal).
- Measure the arcing distance with the suitable commercially available coil tester [B] to check the condition of the ignition coil [A].
- Connect the ignition coil (with the spark plug cap left attached at the end of the spark plug lead) to the tester in the manner prescribed by the manufacturer and measure the arcing distance.

### ⚠ WARNING

**To avoid extremely high voltage shocks, do not touch the coil body or leads.**

- ★ If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.

### Ignition Coil 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 ignition coil. Remove the cap by turning it counterclockwise.
- ★ If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug cap.
- ★ If the coil tester is not available, the coil [C] can be checked for a broken or badly shorted winding with the hand tester (special tool).

**Special Tool - Hand Tester: 57001-1394**

### NOTE

○ The hand tester cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

- Measure the primary winding resistance [A] as follows.
  - Connect the hand tester between the coil terminal and primary winding terminal.
- Measure the secondary winding resistance [B] as follows.
  - Remove the plug cap by turning it counterclockwise.
  - Connect the tester between the spark plug lead and the coil terminal.
- ★ If the tester does not read as specified, replace the coil.

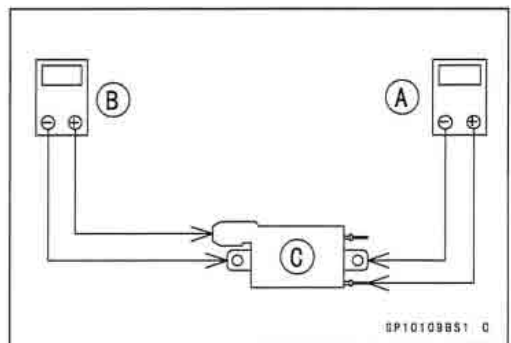
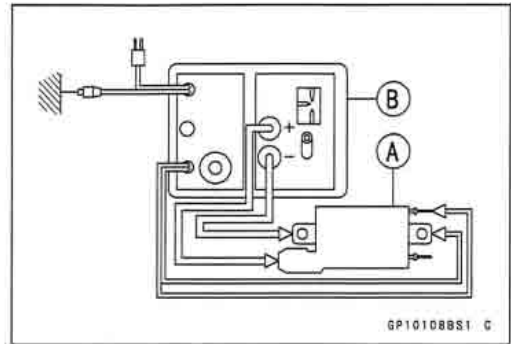
### Ignition Coil Resistance

**Standard: Primary windings  $2.1 \sim 3.2 \Omega (\times 1 \Omega)$**

**Secondary windings  $10 \sim 16 \text{ k}\Omega (\times 1 \text{ k}\Omega)$**

**Special Tool - Hand Tester: 57001-1394**

- Visually inspect the secondary winding lead.
- ★ If it is damaged, replace the ignition coil.





## 16-34 ELECTRICAL SYSTEM

### Ignition System

#### Ignition Coil Primary Peak Voltage

##### NOTE

○Be sure the battery is fully charged.

- Remove:
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Right or Left Lower Fairing (see Frame chapter)
- Remove the spark plug cap.
- Measure the ignition coil primary peak voltage as follows.
- Install the new spark plug [G] into the spark plug cap, and ground it onto the engine.
- Connect the peak voltage adapter [A] into the hand tester [B] and set it to the  $\times 250$  V DC range.

Adapter red lead → Ignition Coil Primary Lead Terminal [C]

Adapter black lead → Ignition Coil Ground Terminal

IC Igniter [D]

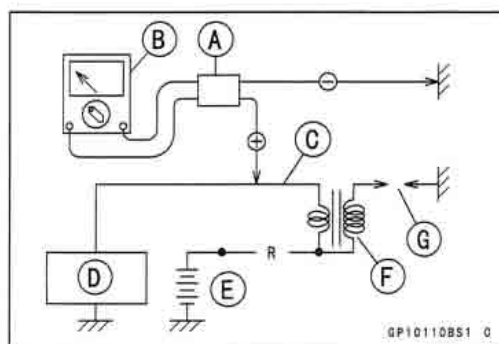
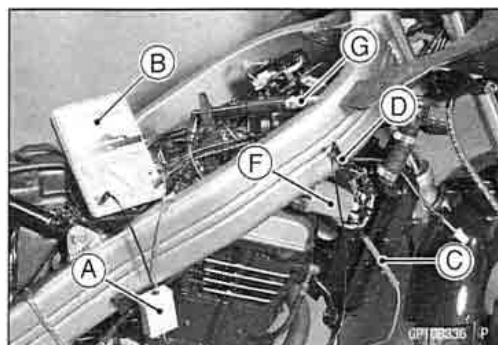
Battery [E]

Ignition Coil [F]

Special Tool - Hand Tester: 57001-1394

Peak Voltage Adapter: 57001-1415

Type: KEK-54-9-B



##### ⚠ WARNING

To avoid extremely high voltage shock, do not touch the spark plug or tester connection.

- Turn the ignition switch and engine stop switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the ignition coil primary peak voltage.
- Repeat the measurement 5 or more times.

#### Ignition Coil Primary Peak Voltage

Standard: 110 V or more

- ★ If the reading is less than the specified value, check the following:

Ignition Coil (see Ignition Coil Inspection)

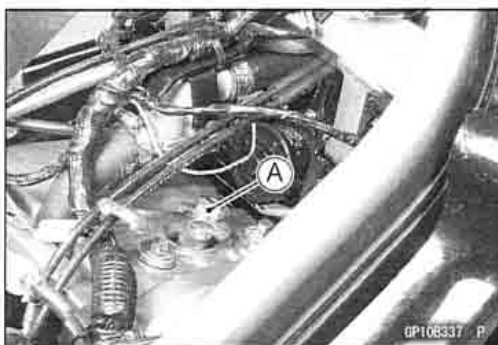
Crankshaft Sensor (see Crankshaft Sensor Inspection)

IC Igniter (see IC Igniter Inspection)

#### Spark Plug Removal

- Remove
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Spark Plug Cap
- Using the spark plug wrench (owner's tool) [A], remove the spark plug.

Owner's Tool - Spark Plug Wrench, Hex 16: 92110-1146



## Ignition System

### Spark Plug Installation

- Tighten the plug, and install the spark plug cap.
- Torque - Spark Plug: 14 N·m (1.4 kgf·m, 10 ft·lb)**
- Pull up the spark plug cap lightly to make sure of the installation condition of the spark plug cap.

### Spark Plug Cleaning, Inspection

- Refer to the Electrical System in the Periodic maintenance chapter.

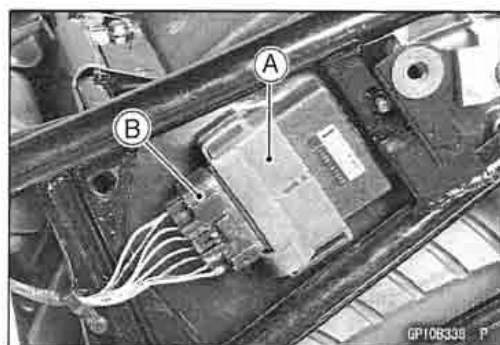
### Spark Plug Gap Inspection

- Refer to the Electrical System in the Periodic maintenance chapter.

### IC Igniter Inspection

#### CAUTION

When inspecting the IC igniter [A], observe the following to avoid damage to the IC igniter.  
Do not disconnect the IC igniter connector [B] with the ignition switch on.  
This may damage the IC igniter.  
Do not disconnect the battery leads while the engine is running. This may damage the IC igniter.



### IC Igniter Operation Inspection

- Remove the seats (see Frame chapter).  
Seat  
Left Side Cover (see Frame chapter)
- Disconnect the IC Igniter connector.
- Set the hand tester [A] to the  $\times 25$  V DC range, and connect it to the connector [B] come from harness side as follows.

Tester (+) terminal [C] → BR/BK lead

Tester (-) terminal [D] → BK/Y lead

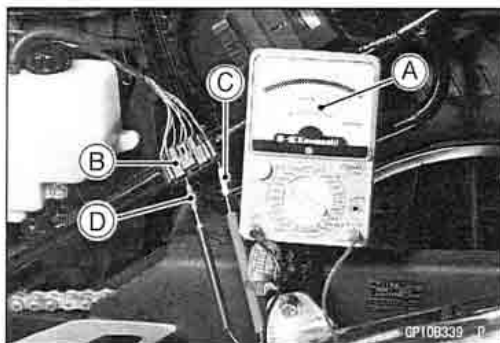
Special Tool - Hand Tester: 57001-1394

Needle Adapter Set: 57001-1457

- Turn the ignition switch on, and read the voltage.

**IC Igniter Operation Voltage: Battery Voltage**

- ★ If the tester reading is not specified one, check the battery voltage, ignition switch and ignition fuse.





## 16-36 ELECTRICAL SYSTEM

### Ignition System

#### *Starter Button Operation Inspection*

Remove:

Seat

Left Side Cover (see Frame chapter)

- Set the Hand Tester [A] to the  $\times 25$  V DC range, connect it to the igniter [B] lead as follows.

**Hand Tester (+) Terminal [C]  $\rightarrow$  BK or G Lead**

**Hand Tester (-) Terminal [D]  $\rightarrow$  Frame Ground**

**Special Tool - Hand Tester: 57001-1394**

**Needle Adapter Set: 57001-1457**

- Turn the ignition switch on and push the starter button.
- Read the voltage.

**Starter Button Operation Voltage: 8 V or more**

- ★ If the tester reading is not specified one, replace the IC igniter.

#### *Side Stand Switch Operation Inspection*

● Remove:

Seat

Left Side Cover (see Frame chapter)

- Change the transmission gear to the first position and set the side stand to "ON" position.
- Set the Hand Tester [A] to the  $\times 25$  V DC range, and connect it to the igniter [B] lead as follows.

**Hand Tester (+) Terminal [C]  $\rightarrow$  G/BK Lead**

**Hand Tester (-) Terminal [D]  $\rightarrow$  Frame Ground**

**Special Tool - Hand Tester: 57001-1394**

**Needle Adapter Set: 57001-1457**

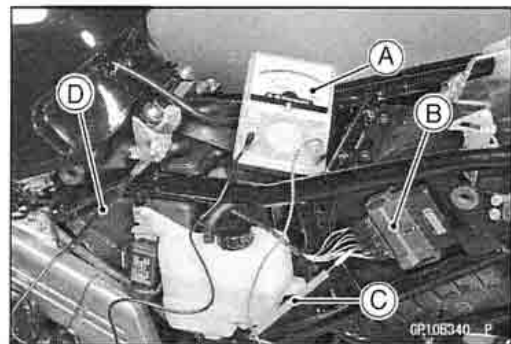
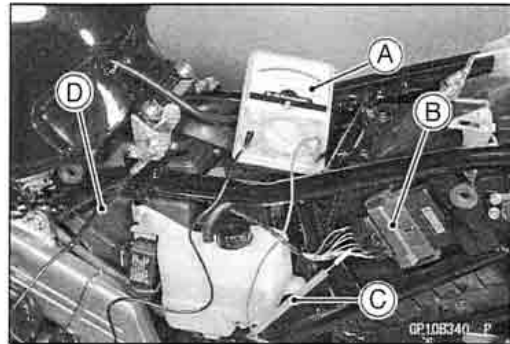
- Turn the ignition switch on and push the starter button.
- Read the voltage.

**Side Stand Switch Operation Voltage: 6 ~ 13.4 V**

- ★ If the tester reading is not specified one, check the side stand switch, starter lock out switch, gear position sensor and starter circuit relay.

- ★ If the tester reading is correct, check the following.

- Grasp the clutch lever, and start the engine.
- Side stand - "ON" position, transmission gear-first position.
- Release the clutch lever slowly.
- ★ If the engine does not stop after releasing the clutch lever fully, the IC igniter is defective.



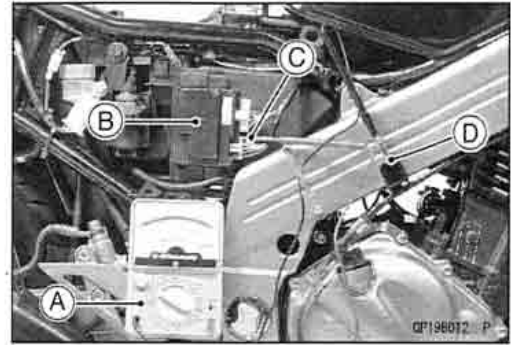
## Ignition System

### Starter Lockout Switch Operation Inspection

- Remove:
  - Seat
  - Right Side Cover (see Frame chapter)

#### First Procedure Check

- Set the hand tester [A] to 25VDC range, and connect it to the junction box [B] as follows.
  - Tester (+) terminal [C] → G/W lead
  - Tester (–) terminal [D] → Frame Ground
- Change the transmission gear to the first position, and set the side stand to "ON" position.
  - The clutch lever is released position.
- Turn on the ignition switch.
- Read the voltage.
  - Starter Lockout Switch Operation Voltage: above 4 V
- ★ If the voltage is lower than the specified one, check the side stand switch, starter lockout switch, gear position switch and junction box.
- ★ If there is not a failure on them, replace the IC igniter.
- ★ If the voltage is correct, push the starter button. If there is not a damage in the starter system circuit, the starter motor does not rotate.
- ★ If the starter motor rotate, the IC igniter is defective. Replace the IC igniter.



#### Second Procedure Check

- Set the motorcycle on its center stand.
- Check that the engine stop after finishing the following procedure.
- Change the transmission gear to the first position, and set the side stand to "ON" position.
- Grasp the clutch lever and turn on the engine.
- Release the clutch lever slowly, the engine stops.
- Change the transmission gear to the first position, and set the side stand to "ON" position.
  - The clutch lever is released position.
- Turn on the engine.
- Contact the side stand to the ground, the engine stops.
- ★ If the engine does not stop in the either condition, check the gear position switch, starter lockout switch, side stand switch and junction box.
- ★ If there is not a failure on them, replace the IC igniter.

#### NOTE

- Some inspections as to the IC igniter are operated, but the cause of troubles may be not able to clear enough. If the cause of troubles are not cleared in described inspections, replace the IC igniter with a new one.

#### CAUTION

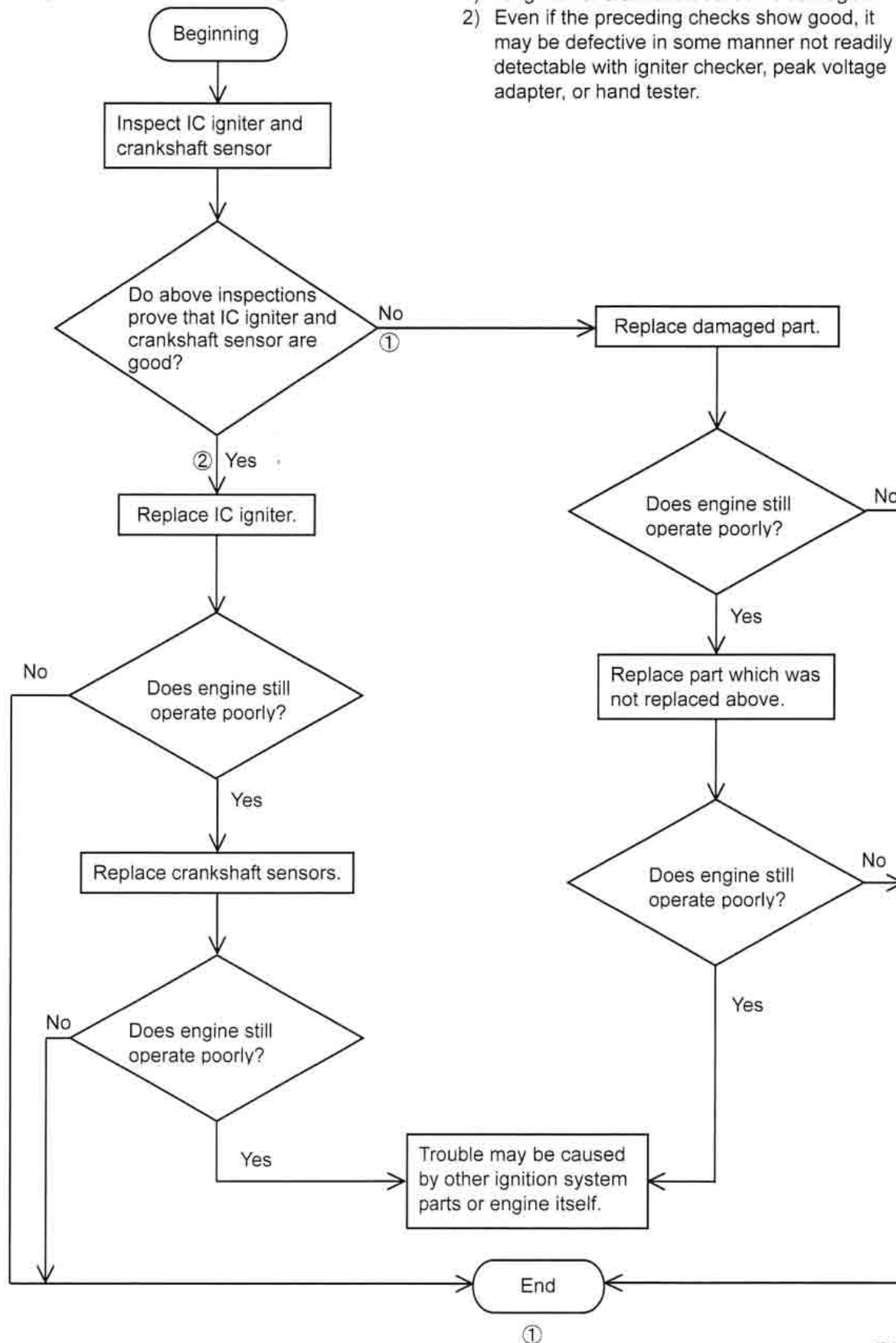
**Use only Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.**  
**If a megger or a meter with a large-capacity battery is used, the IC igniter will be damaged.**

## 16-38 ELECTRICAL SYSTEM

### Ignition System

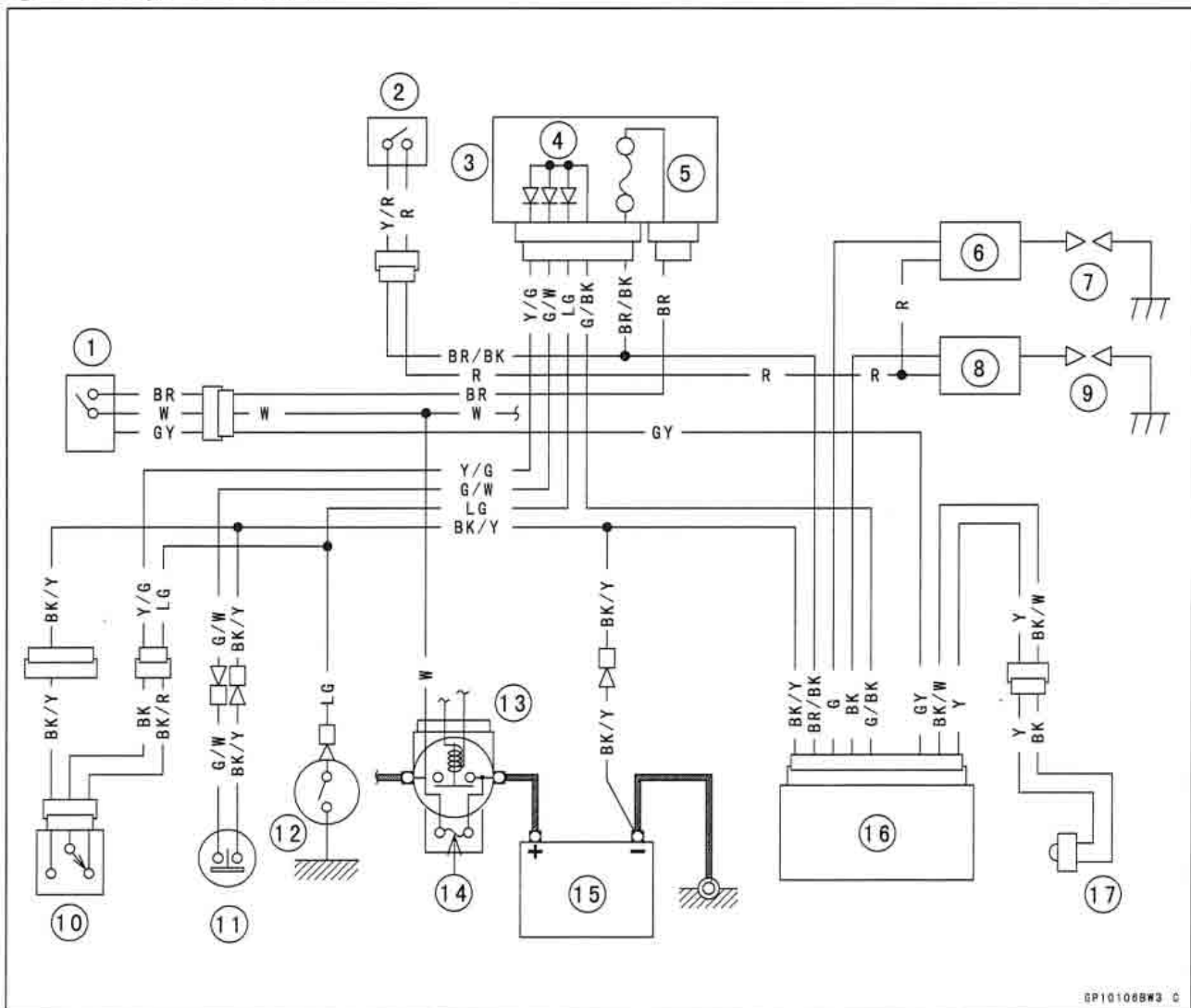
#### IC Igniter Troubleshooting

- 1) IC igniter or crankshaft sensor is damaged.
- 2) Even if the preceding checks show good, it may be defective in some manner not readily detectable with igniter checker, peak voltage adapter, or hand tester.



# Ignition System

## Ignition System Circuit



GP10106BW3 C

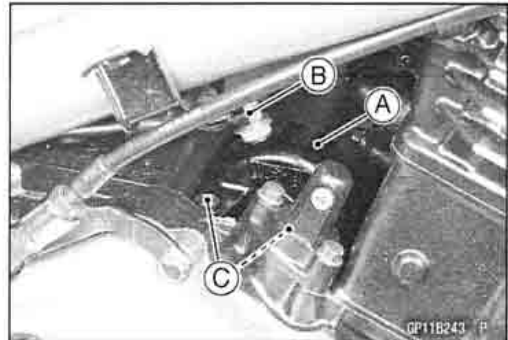
1. Ignition Switch
2. Engine Stop Switch
3. Junction Box
4. Diodes
5. Fuse (10 A)
6. Ignition Coil (#2)
7. Spark Plug (#2)
8. Ignition Coil (#1)
9. Spark Plug (#1)
10. Starter Lockout Switch
11. Sidestand Switch
12. Neutral Switch
13. Starter Relay
14. Main Fuse (30 A)
15. Battery
16. IC Igniter
17. Crankshaft Sensor

## 16-40 ELECTRICAL SYSTEM

### Electric Starter System

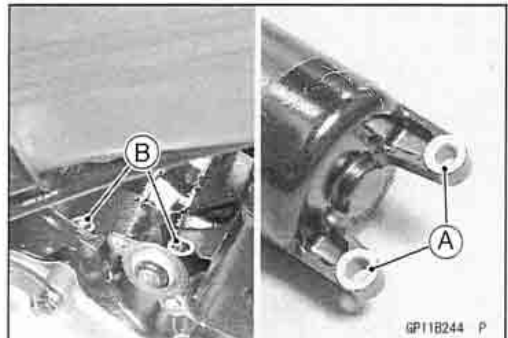
#### *Starter Motor Removal*

- Drain the engine oil (see Lubrication System chapter).
- Drain the coolant (see Cooling System chapter).
- Remove the alternator cover (see Charging chapter).
- Remove the water pipe bolts and take the pipes of the water pump.
- Remove the shift lever and the engine sprocket cover.
- Remove the alternator cover and starter idle gear with shaft.
- Remove the cam chain tensioner assy.
- Disconnect the starter motor lead [B] from the starter motor [A].
- Remove the starter bolts [C] and pull the motor toward the right side.

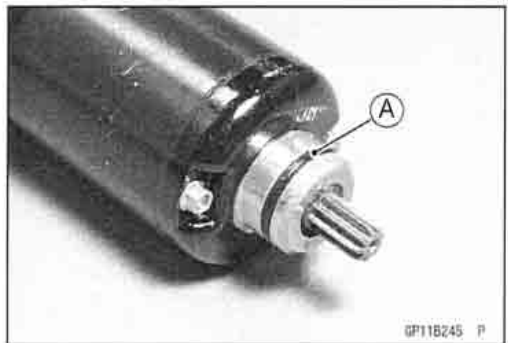


#### *Starter Motor Installation*

- Clean the starter motor lugs [A] and crank case surface [B] where the starter motor is grounded.



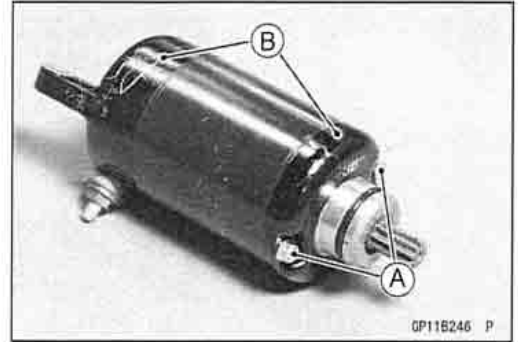
- Apply a small amount of engine oil to the O-ring [A].
- Put the starter motor on the crankcase.
- Press the part of the motor end cover and push the motor into the crankcase hole.
- Tighten the starter motor mounting bolts.
- Connect the starter motor lead to the starter motor terminal.
- Install:
  - Starter Idle Gear
  - Alternator Cover
  - Engine Sprocket Cover
  - Shift Lever
  - Water Pipes



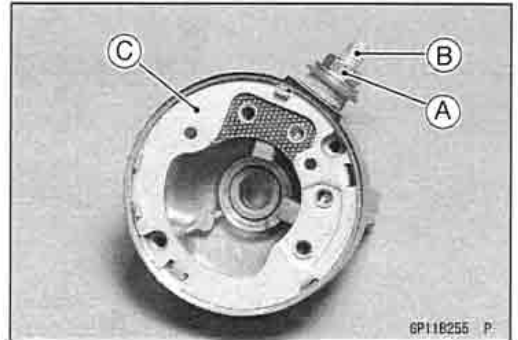
## Electric Starter System

### Starter Motor Disassembly

- Remove the starter motor (see Starter Motor Removal).
- Remove the bolts [A] and take out both end covers [B].
- Take the armature off from the pinion gear side of the yoke.

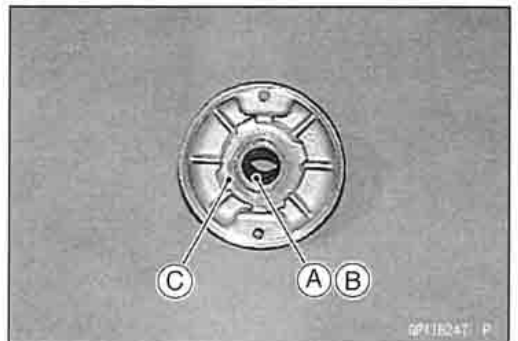


- Remove the terminal locknut [A] and terminal bolt [B], and then remove the brush with the brush plate [C] from the yoke.



### Starter Motor Assembly

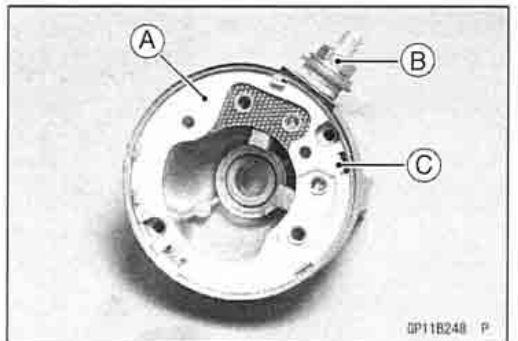
- Replace the O-rings with a new ones.
- Apply a thin coat of high-temperature grease to the oil seal [A] and needle bearing [B].
- Fit the toothed washer [C] into the end cover.



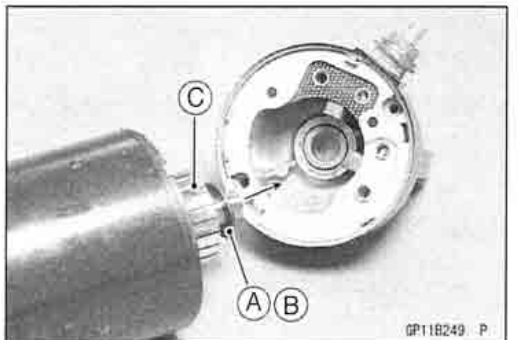
- Install the brush plate [A] and tighten the terminal locknut [B].

**Torque - Starter Motor Terminal Locknut: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

- Fit the tongue [C] on the brush plate into the end cover groove.



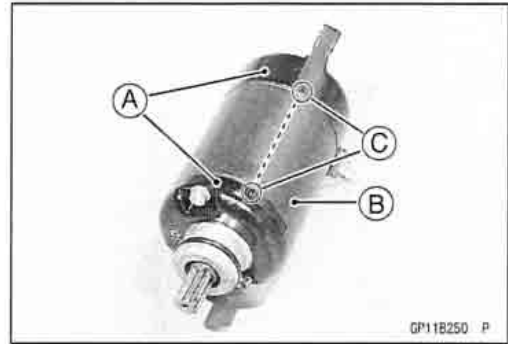
- Install the steel washer [A] and resin washer [B] into the starter shaft, and insert the armature [C] between the brushes.



## 16-42 ELECTRICAL SYSTEM

### Electric Starter System

- Align the end cover [A] with the mark [C] of the yoke [B].  
Torque - Starter Motor Assembly Bolts: 3.5 N·m (0.36 kgf·m, 31 in·lb)

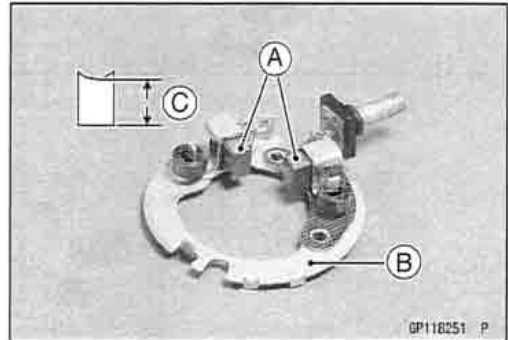


#### Carbon Brush Inspection

- Measure the length [C] of each brush [A].
- ★ If any is worn down to the service limit, replace the carbon brush holder assembly [B].

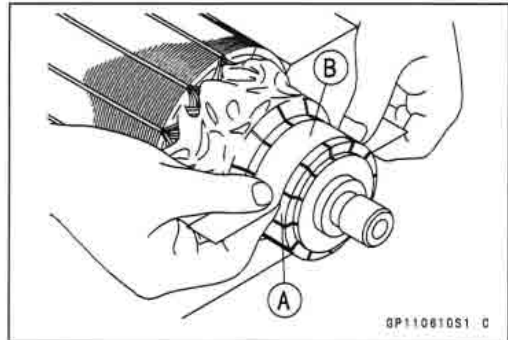
#### Carbon Brush Length

- Standard: 10 mm (0.39 in.)  
Service Limit: 5 mm (0.20 in.)



#### Commutator Inspection, Cleaning

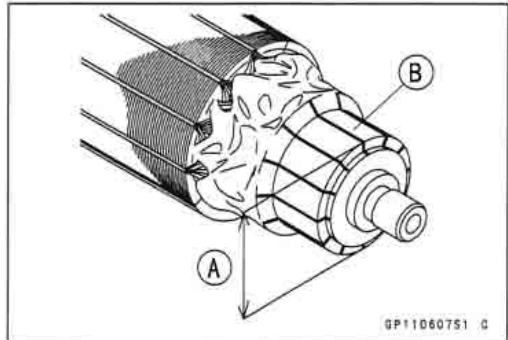
- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.



- Measure the outer diameter [A] of the commutator [B].
- ★ Replace the starter motor with a new one if the commutator diameter is less than the service limit.

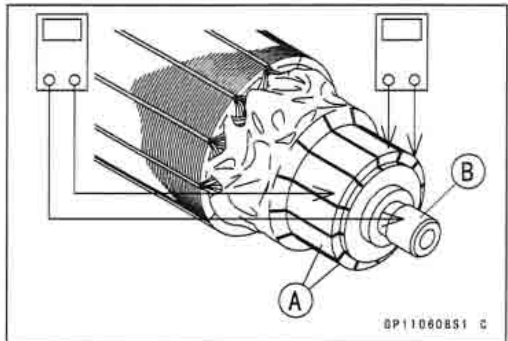
#### Commutator Diameter

- Standard: 28 mm (1.10 in.)  
Service Limit: 27 mm (1.06 in.)



#### Armature Inspection

- Using the  $\times 1 \Omega$  hand tester range, measure the resistance between any two commutator segments [A].
- ★ If there is a high resistance or no reading ( $\infty$ ) between any two segments, a winding is open and the starter motor must be replaced.
- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].





## Starter System

- ★ If there is any reading at all, the armature has a short and the starter motor must be replaced.

**Special Tool - Hand Tester: 57001-1394**

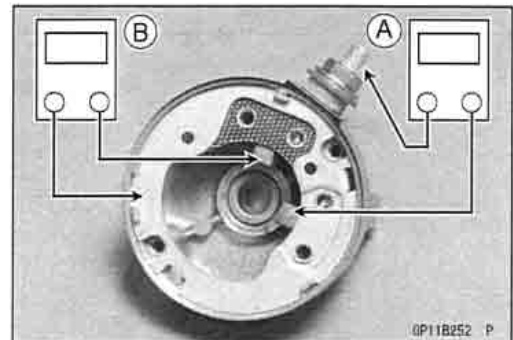
### NOTE

- Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.

### Brush Lead Inspection

- Using the  $\times 1 \Omega$  hand tester range, measure the continuity between the following:
  - Terminal Bolt and Positive (+) Brush [A]
  - Brush Plate and Negative (-) Brush [B]
- ★ If there is not close to zero ohms, the brush lead has an open. Replace the terminal bolt assembly and/or the brush holder assembly.

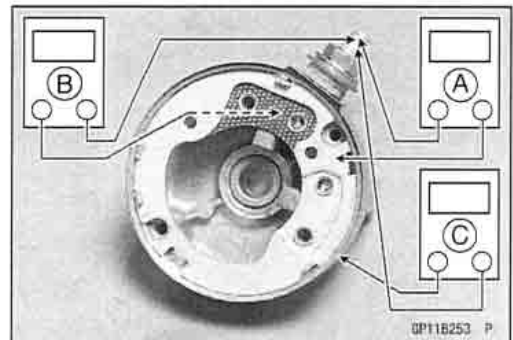
**Special Tool - Hand Tester: 57001-1394**



### Terminal Bolt Inspection

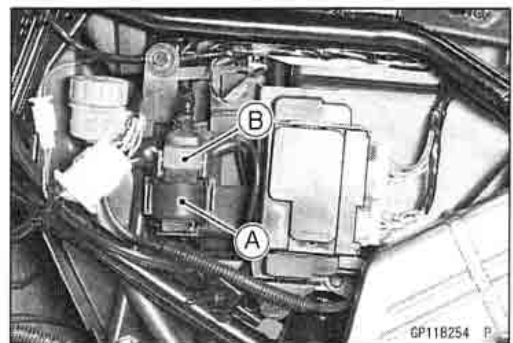
- Using the highest hand tester range, measure the resistance as shown.
  - Terminal Bolt and Brush Plate [A]
  - Terminal Bolt and Negative Brush Holder [B]
  - Terminal Bolt and Yoke [C]
- ★ If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.

**Special Tool - Hand Tester: 57001-1394**



### Starter Relay Inspection

- Remove the seat (see Frame chapter).
- Remove the right side cover (see Frame chapter) and remove the starter relay [A] with main fuse [B].



- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown.
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

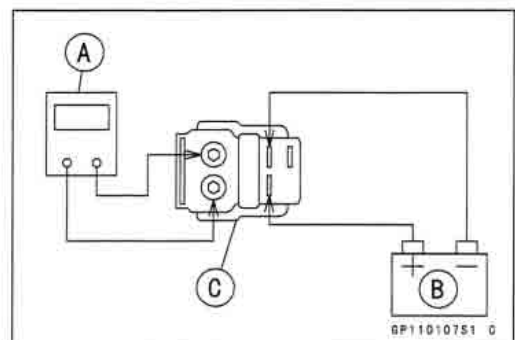
### Relay Function Test

**Tester Range:  $\times 1 \Omega$  range**

**Standard: When battery is connected  $\rightarrow 0 \Omega$**

**When battery is disconnected  $\rightarrow \infty \Omega$**

**Special Tool - Hand Tester: 57001-1394**





## Starter System

This diagram illustrates the electrical wiring for a 12V DC system, likely for a vehicle or marine application. The components and their connections are as follows:

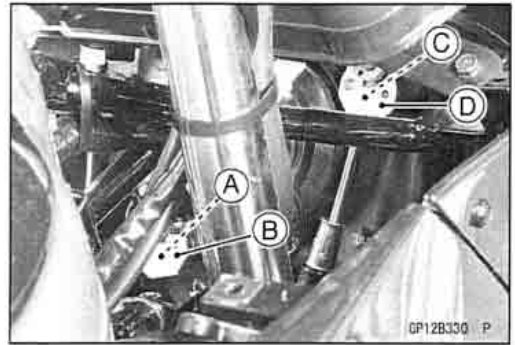
- 12V Battery (11):** The power source, with positive (+) and negative (-) terminals. The negative terminal is grounded.
- Grounding:** Multiple points are grounded, including the battery negative terminal, a chassis ground, and the negative terminal of the solenoid (10).
- Relay/Solenoid (4):** A 12V DC unit with a coil and a switch. The coil is connected to the positive battery terminal through a fuse (5) and a diode (6). The switch is connected to the positive battery terminal through a fuse (7) and a diode (8).
- Switches and Controls:**
  - 1:** A switch connected to the positive battery terminal through a fuse (2) and a diode (3).
  - 6:** A switch connected to the positive battery terminal through a fuse (7) and a diode (8).
  - 7:** A switch connected to the positive battery terminal through a fuse (8) and a diode (9).
  - 8:** A switch connected to the positive battery terminal through a fuse (9) and a diode (10).
- Wiring Labels:** Various wires are labeled with color codes: BK/Y, BK/R, Y/G, BR, W, and LG.

1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Junction Box
5. Starter Circuit Relay
6. Starter Lockout Switch
7. Neutral Switch
8. Starter Relay
9. Main Fuse (30 A)
10. Starter Motor
11. Battery

## Lighting System

### Headlight Beam Horizontal Adjustment

- Put the philips screwdriver into the horizontal adjuster guide [B] at left lower side on the back of the headlight.
- Turn the adjuster [A] in the headlight in or out until the beam points straight ahead.



### Headlight Beam Vertical Adjustment

- Put the philips screwdriver into the vertical adjuster guide [D] at right upper side on the back of the headlight.
- Turn the adjuster [C] in the headlight in or out to adjust the headlight vertically.

#### NOTE

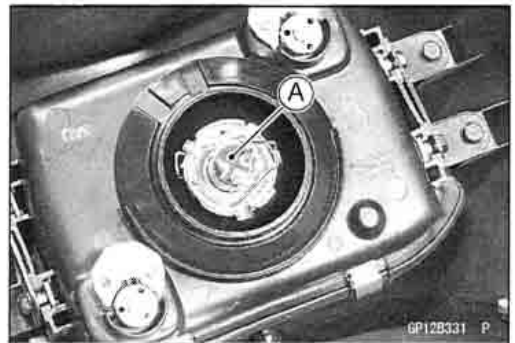
- On high beam, the brightest point should be slightly below horizontal with the motorcycle on its wheel and the rider seated. Adjust the headlight to the proper angle according to local regulations.

### Headlight Bulb Replacement

- Remove:
  - Upper Cover (see Frame chapter)
  - Headlight Connector
  - Headlight Bulb Dust Cover
  - Headlight Bulb [A]

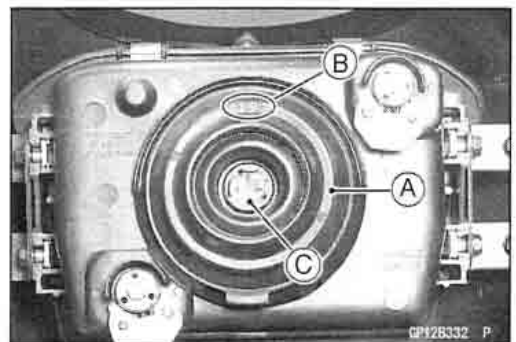
#### CAUTION

When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.



#### NOTE

- Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.
- Fit the dust cover [A] with the TOP mark [B] upward, firmly onto the bulb [C].

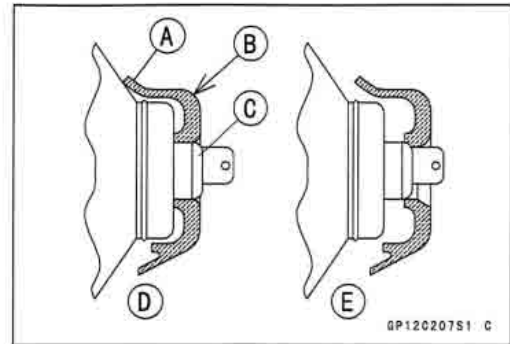


## 16-46 ELECTRICAL SYSTEM

### Lighting System

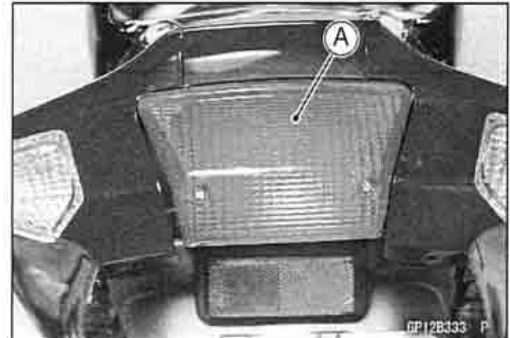
Dust Cover [A]  
Top Mark [B]  
Blub [C]  
Good [D]  
Bad [E]

- Connect the headlight connector.
- Adjust the headlight beam (see Headlight Horizontal Vertical Adjustment).

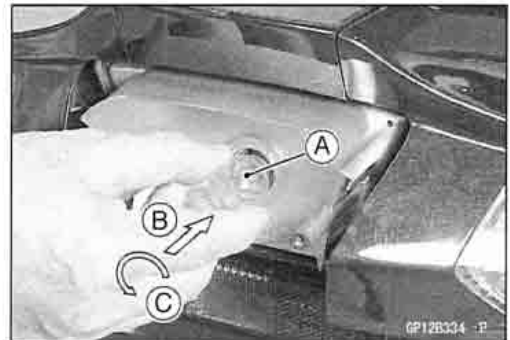


#### *Tail/Brake Light Bulb Replacement*

- Remove the tail/brake light lens [A].



- Push [B] the bulb [A] in the socket, turn it counterclockwise [C], and pull it out.

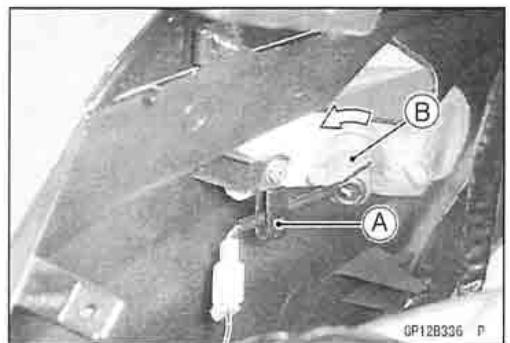


- With the front pin [A] down, insert the new bulb by aligning the front pin with the groove [B] in the walls of the socket.
- Push the bulb in and turn it clockwise, and then replace it. It should lock in position.
- Tighten the lens screws. Be careful not to overtighten them.



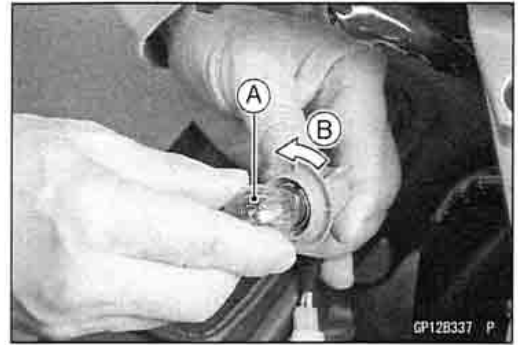
#### *Front Turn Signal Light Bulb Replacement*

- Remove the upper cover mounting screws, and pull up the end of upper cover and then remove it.
- Open the clamp [A] and turn the front turn signal light bulb socket [B] counterclockwise, and remove the bulb and socket.

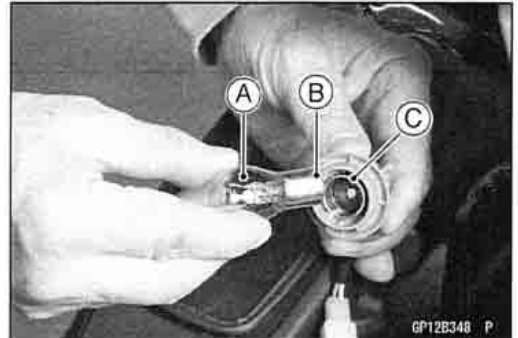


## Lighting System

- Push the bulb [A] in and turn [B] it counterclockwise and then remove it.

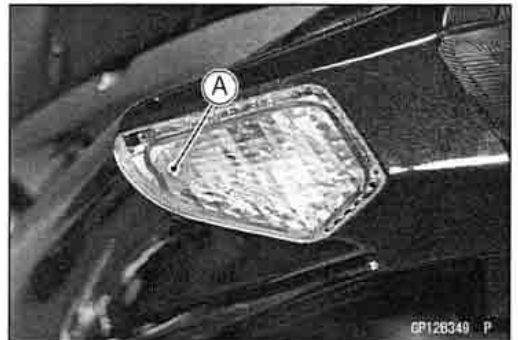


- Insert the new bulb [A] by aligning the projection [B] with the groove [C] in the socket.
- Push the bulb and turn it clockwise and then replace it. It should lock in lock position.
- Insert the socket by aligning the projection with the notch in the wall and turn the socket clockwise.

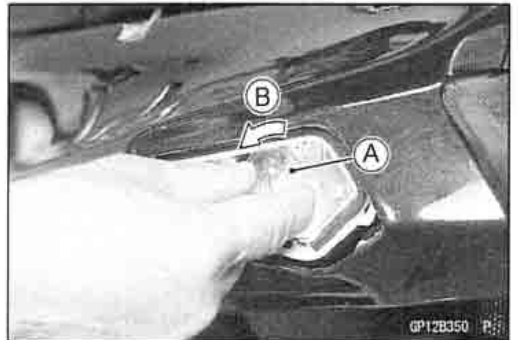


### Rear Turn Signal Light Bulb Replacement

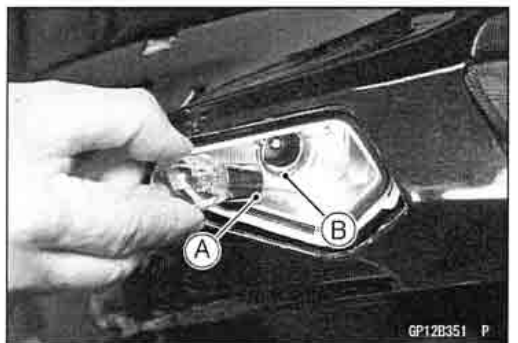
- Remove the lens mounting screw [A] and remove the lens.



- Push the bulb [A] in and turn [B] it counterclockwise, and then remove it.



- Insert the new bulb by aligning the projection [A] with the groove [B] in the wall of the socket.
- Push the bulb in and turn it clockwise and then install it. It should lock in position.
- Install the lens, and tighten the lens mounting screw. Be careful not to overtighten the lens mounting screw.

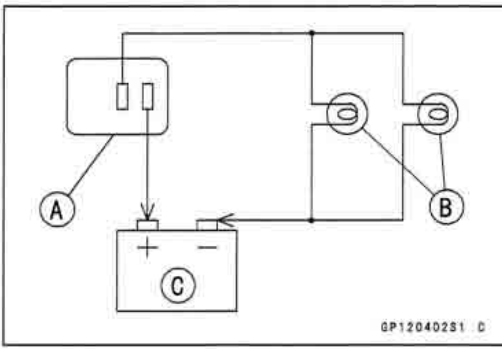
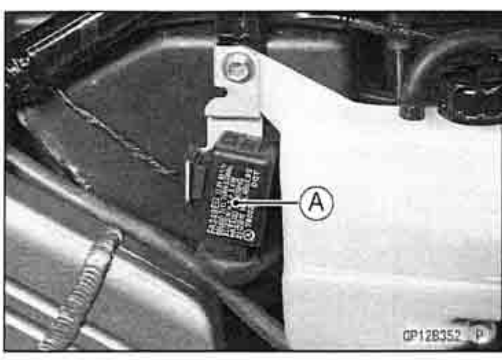


16-48 ELECTRICAL SYSTEM

Lighting System

Turn Signal Relay Inspection

- Remove:
  - Seat (see Frame chapter)
  - Left Side Cover (see Frame chapter)
  - Turn Signal Relay [A]
- Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights flash for one minute.
  - Turn Signal Relay [A]
  - Turn Signal Lights [B]
  - 12 V Battery [C]
- ★ If the lights do not flash as specified, replace the turn signal relay.



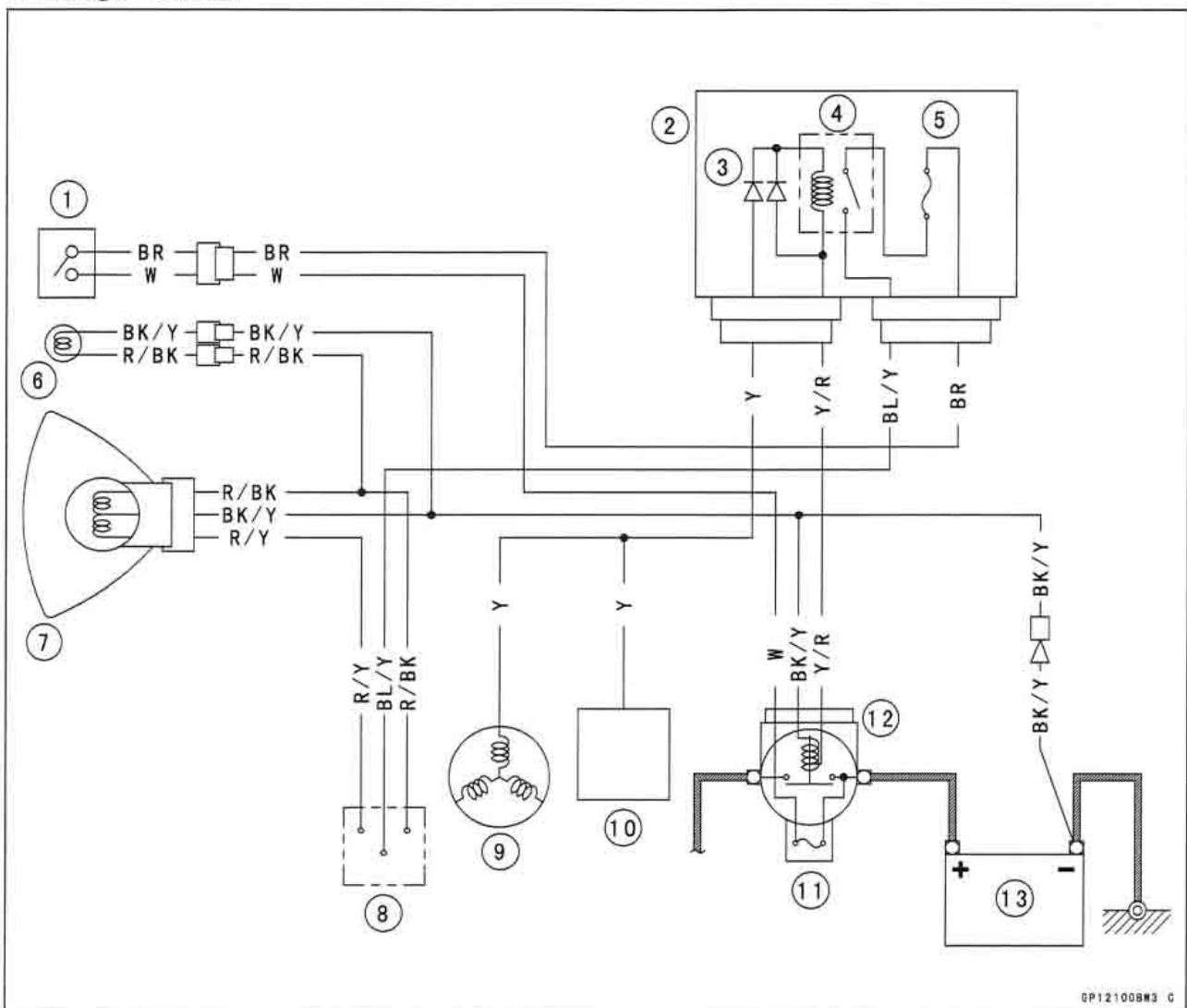
Testing Turn Signal Relay

Load		Flashing times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	21 or 23	140-250
2	42 or 46	75-95

(\*): Cycle(s) per minute  
(\*\*): Correspond to "one light burned out"

## Lighting System

## Headlight Circuit



GP121008W3 C

1. Ignition Switch
2. Junction Box
3. Diodes
4. Headlight Relay
5. Headlight Fuse 10 A
6. High Beam Indicator Light
7. Headlight
8. Dimmer Switch
9. Alternator
10. Regulator/Rectifier
11. Main Fuse 30 A
12. Starter Relay
13. Battery

## Lighting System

1. Ignition Switch
2. Junction Box
3. Turn Signal Relay Fuse 10 A
4. Turn Signal Relay
5. Right Turn Signal Indicator Light
6. Left Turn Signal Indicator Light
7. Front Right Turn Signal Light
8. Front Left Turn Signal Light
9. Rear Right Turn Signal Light
10. Rear Left Turn Signal Light
11. Turn Signal Switch
12. Main Fuse 30 A
13. Battery

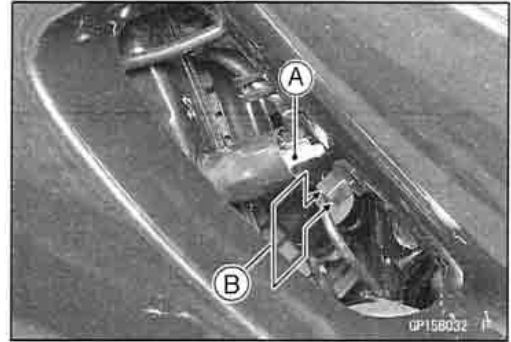
## Radiator Fan System

### ⚠ WARNING

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

#### Fan System Circuit Inspection

- Disconnect the leads from the radiator fan switch [A].
- Using an auxiliary wire [B], connect the radiator fan switch leads.
- ★ If the fan rotates, inspect the fan switch.
- ★ If the fan does not rotate, inspect the following.
  - Leads and Connectors
  - Main Fuse and Fan Fuse
  - Fan Motor



#### Fan Motor Inspection

- Remove the right lower fairing (see Frame chapter).
- Disconnect the 2-pin connector [A] in the fan motor leads.
- Using two auxiliary wires, supply battery [B] power to the fan motor.
- ★ If the fan does not rotate, the fan motor is defective and must be replaced.

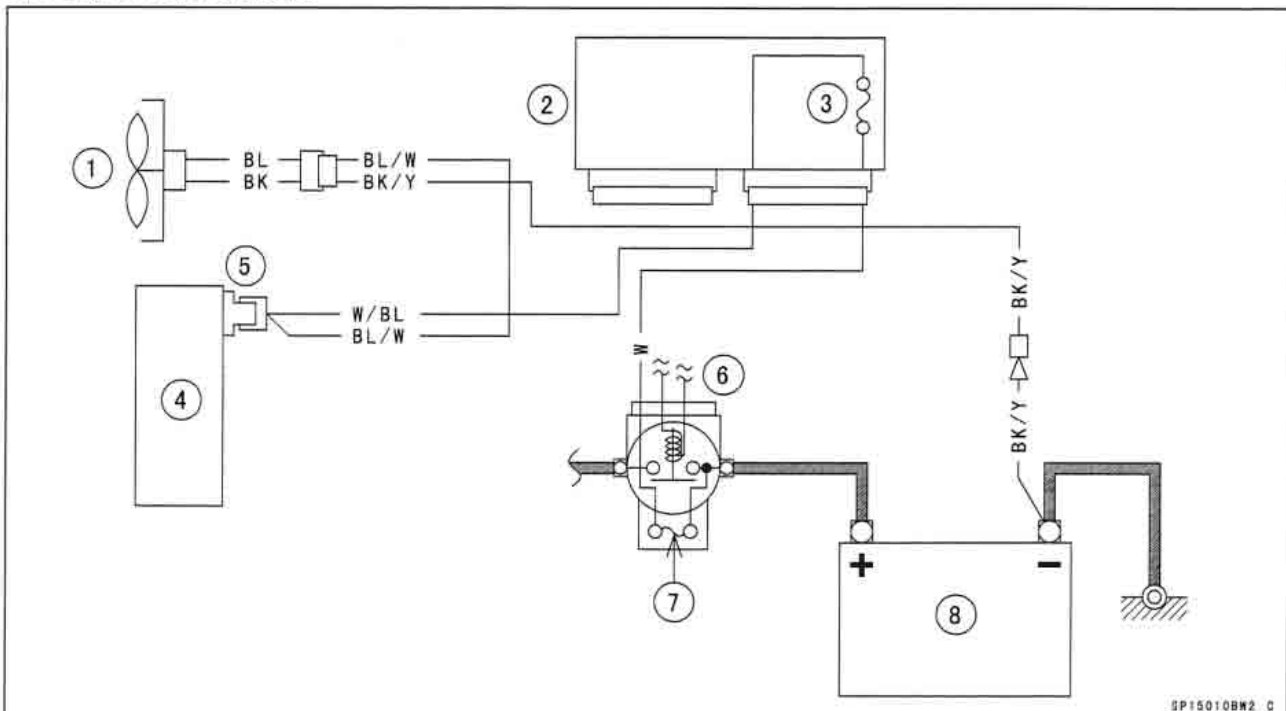


#### Lead Connections

Battery (+) → BL Lead

Battery (-) → BK Lead

## Radiator Fan Circuit



1. Radiator Fan
2. Junction Box
3. Fan Fuse 10 A

4. Radiator
5. Cooling Fan Switch
6. Starter Relay

7. Main Fuse (30 A)
8. Battery



## 16-52 ELECTRICAL SYSTEM

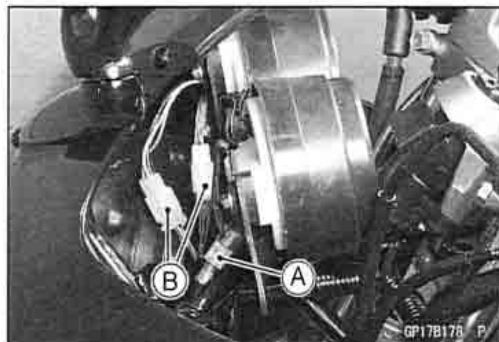
### Meters, Gauge and Indicator Unit

#### Meter Unit Removal

- Remove:
  - Upper Cover (see Frame chapter)
  - Meter Mounting Bracket Bolts [A]



- Disconnect:
  - Speedometer Cable Upper End [A]
  - Meter Lead Connectors [B]
- Remove the meter unit.

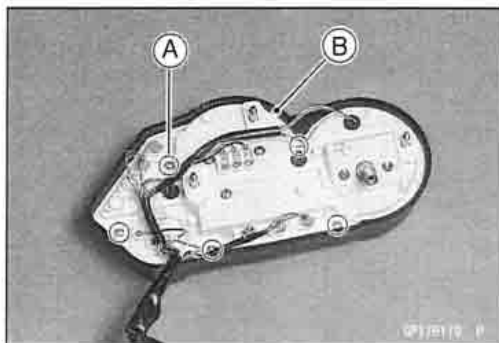


#### CAUTION

Place the meter unit so that the face is up. If a meter unit is left upside down or sideways for any length of time, it will malfunction.

#### Meter Unit Disassembly

- Remove:
  - Meter Mounting Bracket
  - Reset Knob
  - Meter Cover [A]
  - Screws [B]



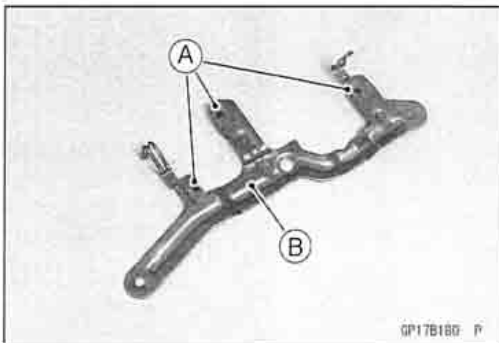
- Remove the speedometer, tachometer and/or water temperature gauge.

#### CAUTION

Do not remove a meter pointer unless the meter is to be replaced. The pointers cannot be reinstalled. The pointer mounting is different from replacement meters.

#### Meter Unit Installation

- Check to see that the rubber dampers [A] are installed on the meter mounting bracket [B].
- The installation is a reverse of the meter unit removal.



## Meters, Gauge and Indicator Unit

### Indicator Light Replacement

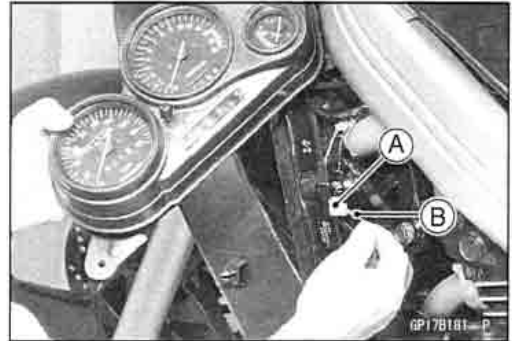
- Remove the meter unit (see Meter Unit Removal).
- To remove the wedge base type bulbs, pull out the bulb sockets and pull the bulbs off the sockets.

### CAUTION

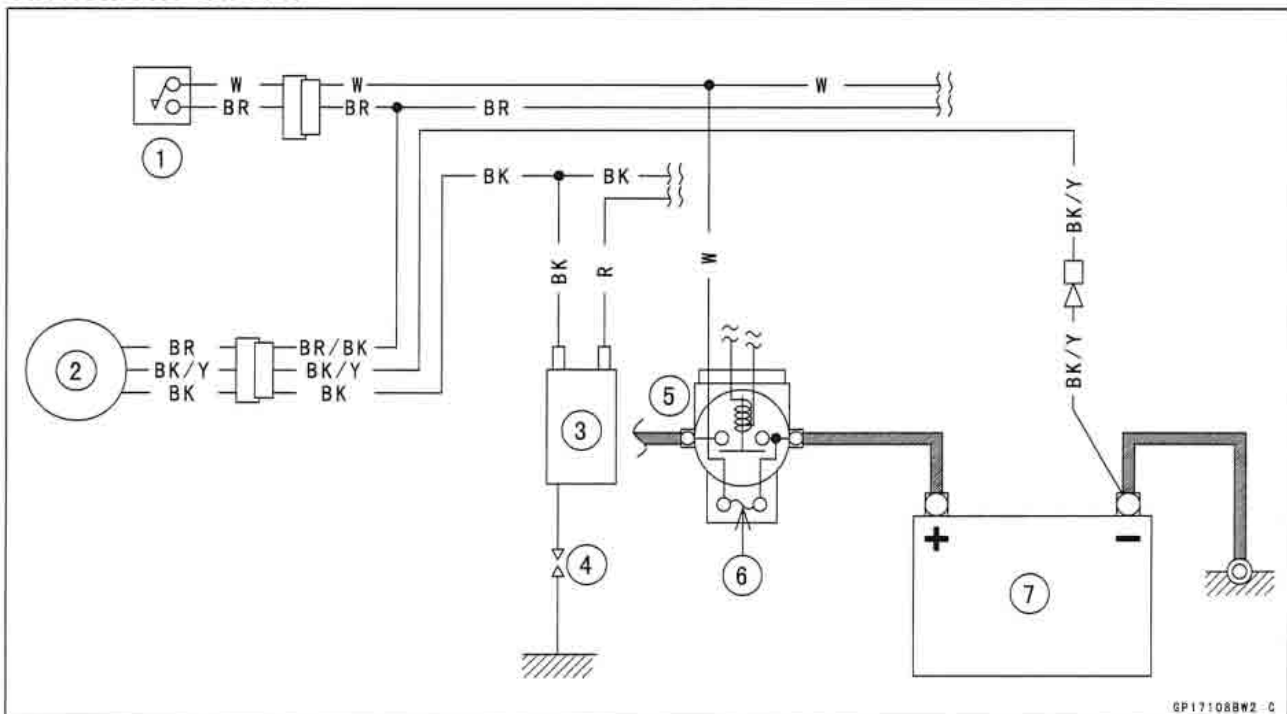
**Do not use bulbs rated for greater wattage than the specified wattage, as the meter or gauge panel could become warped by excessive heat radiated from the bulbs.**

### Tachometer Inspection

- Check the tachometer circuit wiring.
- ★ If all wiring and components other than the tachometer unit check out good, the unit is suspect. Check the unit as shown.
- Remove the following.
  - Seat
  - Left Lower Fairing
- Disconnect the BK lead from the #1 ignition coil.
- Turn the ignition switch ON.
- Open or connect the BK lead [A] to the battery positive terminal using an auxiliary lead [B]. Then the pointer should flick.
- Turn the ignition switch OFF.
- ★ If the pointer does not flick, replace the tachometer unit.



### Tachometer Circuit



1. Ignition Switch
2. Tachometer
3. Ignition Coil (#1)
4. Spark Plug (#1)
5. Starter Relay
6. Main Fuse 30 A
7. Battery

## 16-54 ELECTRICAL SYSTEM

### Meters, Gauge and Indicator Unit

#### Water Temperature Gauge Operation Inspection

- Prepare an auxiliary lead, and check the operation of the gauge.

#### Gauge Operation Check

**Wire Location:** Female of the sensor connector (disconnected).

**Results:** Gauge should read "C" when connector lead is opened.

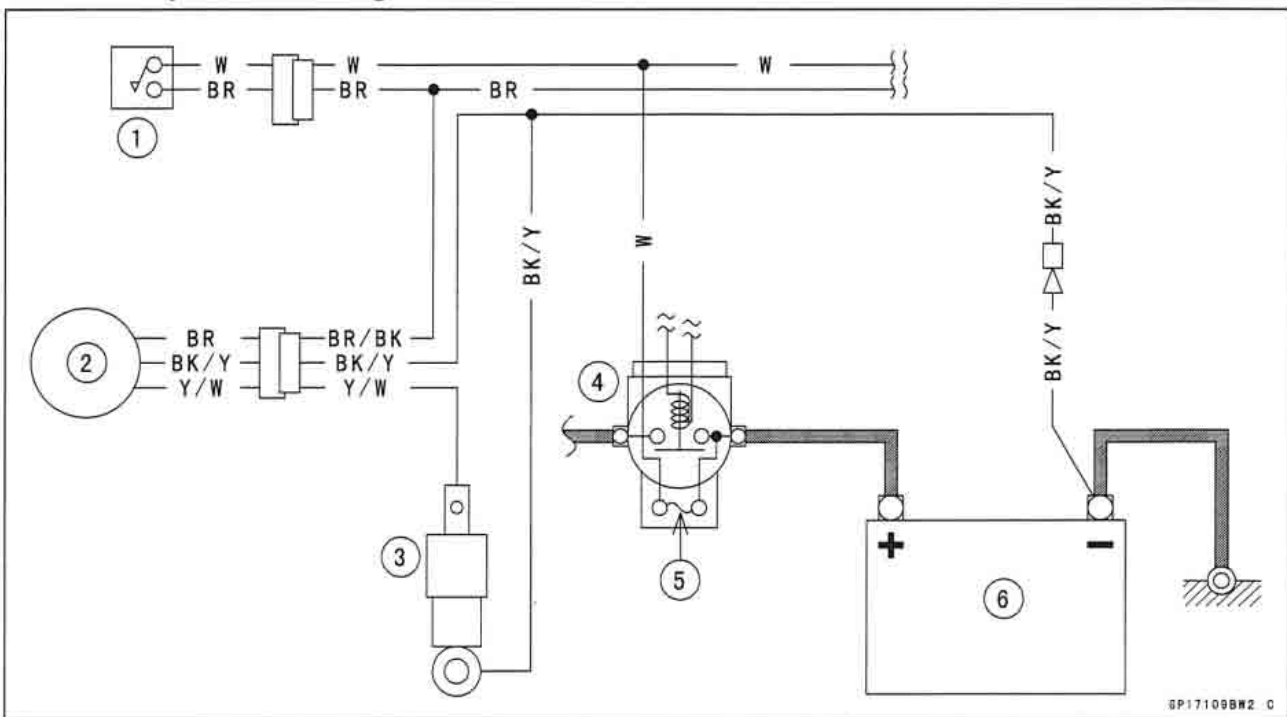
Gauge should read "H" when connector lead is grounded to engine.

#### CAUTION

Do not ground the wiring longer than necessary. After the needles swings to the "H" position, stop the test. Otherwise the gauge could be damaged.

- ★ If these readings are not correct, the trouble is with the gauged and/or wiring.
- Check the water temperature gauge circuit wiring.
- ★ If all wiring and components other than the water temperature gauge unit check out good, the unit is defective.

#### Water Temperature Gauge Circuit



1. Ignition Switch
2. Water Temperature Gauge
3. Water Temperature Sensor
4. Starter Relay
5. Main Fuse (30 A)
6. Battery

## Switches and Sensor

### Brake Light Timing Inspection

- Refer to the Brakes in the Periodic Maintenance chapter.

### Brake Light Timing Adjustment

- Refer to the Brakes in the Periodic Maintenance chapter.

### Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).
- For the handlebar switches and the ignition switch, refer to the tables in the Wiring Diagram.
- ★ If the switch has an open or short, repair it or replace it with a new one.

**Special Tool - Hand Tester: 57001-1394**

Rear Brake Light Switch Connections		
Color	BR	BL
When brake pedal is pushed down	○ — ○	
When brake pedal is released		

Side Stand Switch Connections		
Color	G/W	BK/Y
When side stand is up	○ — ○	
When side stand is down		

Neutral Switch Connections		
Color	SW. Terminal	Ground
When transmission is in neutral	○ — ○	
When transmission is not in neutral		

Oil Pressure Switch Connections *		
Color	BL/R	Ground
When engine is stopped	○ — ○	
When engine is running		

\*: Engine lubrication system is in good condition.

## 16-56 ELECTRICAL SYSTEM

### Switches and Sensor

#### Radiator Fan Switch Inspection

- Remove the fan switch (see Cooling System chapter).
- Suspend the switch [A] in a container of coolant so that the temperature-sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant so that the sensitive portions [C] are located in almost the same depth.

#### NOTE

○ The switch and thermometer must not touch the container sides or bottom.

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the switch across the terminals at the temperatures shown in the table.

**Special Tool - Hand Tester: 57001-1394**

- ★ If the hand tester does not show the specified values, replace the switch.

#### Fan Switch Resistance

##### ○ Rising temperature:

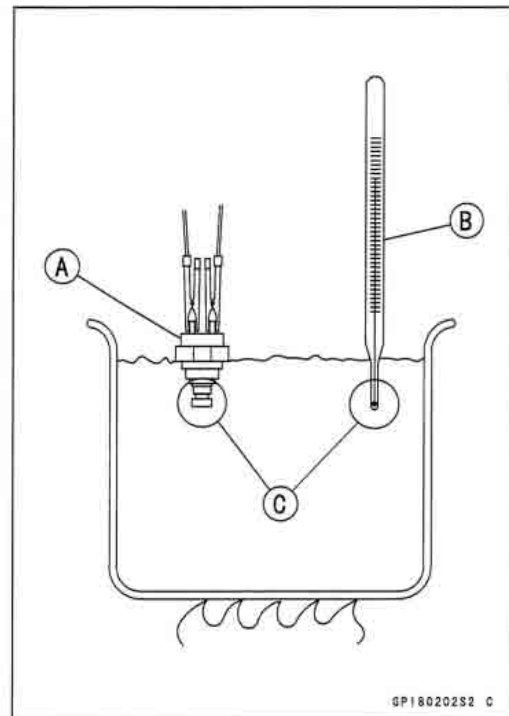
From OFF to ON at 96 ~ 100°C (205 ~ 212°F)

##### ○ Falling temperature:

From ON to OFF at above 91°C (196°F)

ON: Less than 0.5  $\Omega$

OFF: More than 1 M $\Omega$



#### Water Temperature Sensor Inspection

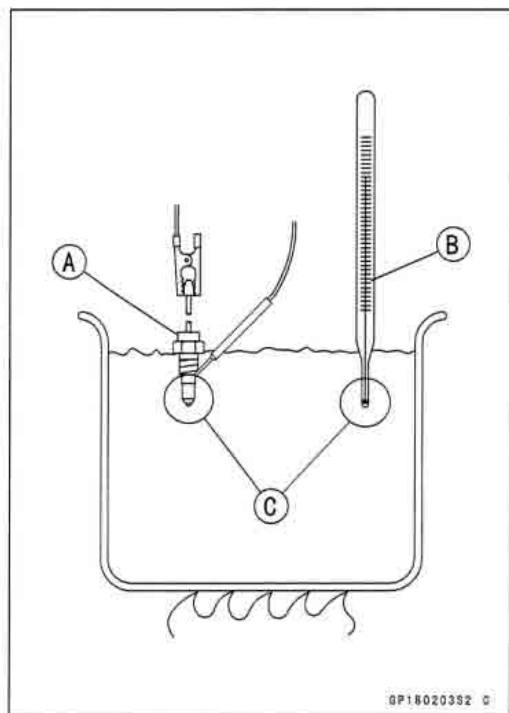
- Remove the water temperature sensor (see Cooling System chapter).
- Suspend the sensor [A] in a container of coolant so that the temperature-sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant so that the sensitive portions [C] are located in almost the same depth.

#### NOTE

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

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor across the terminal and the body at the temperatures shown in the table.

**Special Tool - Hand Tester: 57001-1394**



---

**Switches and Sensor**

---

★ If the hand tester does not show the specified values, replace the sensor.

**Water Temperature Sensor Resistance**

50°C (122°F): 154  $\Omega$

80°C (176°F): 52  $\Omega$

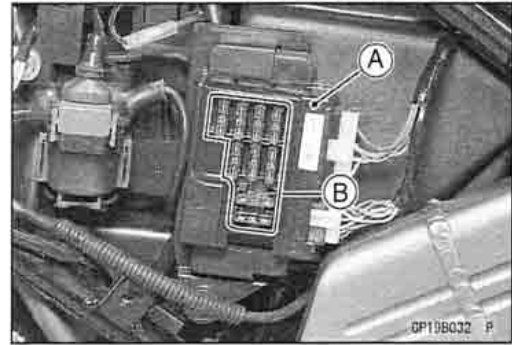
100°C (212°F): 27  $\Omega$

120°C (248°F): 16  $\Omega$

## 16-58 ELECTRICAL SYSTEM

### Junction Box

The junction box [A] has fuses [B], relays, and diodes. The relays and diodes can not be removed.



#### *Junction Box Fuse Circuit Inspection*

- Remove the seat (see Frame chapter).
- Remove the right side cover (see Frame chapter).
- Remove the junction box.
- Pull off the connectors from the junction box.
- Make sure all connector terminals are clean and tight, and none of them have been bent.
- ★ Clean the dirty terminals, and straighten slightly-bent terminals.
- Check conductivity of the numbered terminals with the hand tester.
- ★ If the tester does not read as specified, replace the junction box.

**Special Tool - Hand Tester: 57001-1394**

#### **Fuse Circuit Inspection**

Tester Connection	Tester Reading ( $\Omega$ )	Tester Connection	Tester Reading ( $\Omega$ )
1 - 1A	0	1A - 8	$\infty$
1 - 2	0	2 - 8	$\infty$
3A - 4	0	3A - 8	$\infty$
6 - 5	0	6 - 2	$\infty$
6 - 10	0	6 - 3A	$\infty$
6 - 7	0	17 - 3A	$\infty$
6 - 17	0		

#### *Starter Circuit/Headlight Relay Inspection*

- Remove the seat (see Frame chapter).
- Remove the junction box.
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the junction box as shown.
- ★ If the tester does not read as specified, replace the junction box.

**Special Tool - Hand Tester: 57001-1394**

## Junction Box

### Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading ( $\Omega$ )		Tester Connection	Tester Reading ( $\Omega$ )
Headlight Relay	7-8	$\infty$	Starter Circuit Relay	9 -11	$\infty$
	7-13	$\infty$		12 -13	$\infty$
	(+) (-) 13 -9	Not $\infty$ *		(+) (-) 13-11	$\infty$
				(+) (-) 12 -11	Not $\infty$ *

(\*): The actual reading varies with the hand tester used.

(+): Apply tester positive lead.

(-): Apply tester negative lead.

### Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (-)	Tester Connection	Tester Reading ( $\Omega$ )
Headlight Relay	9 - 13	7 - 8	0
Starter Circuit Relay	11 - 12	(+) (-) 13 - 11	Not $\infty$ *

(\*): The actual reading varies with the hand tester used.

(+): Apply tester positive lead.

(-): Apply tester negative lead.

### Diode Circuit Inspection

- Remove the seat (see Frame chapter).
- Remove the junction box.
- Check conductivity of the following pairs of terminals.

### Diode Circuit Inspection

Tester Connection	13-8, 13-9, 12-11, 12-14, 15-14, 16-14
-------------------	--

- ★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the junction box must be replaced.

### NOTE

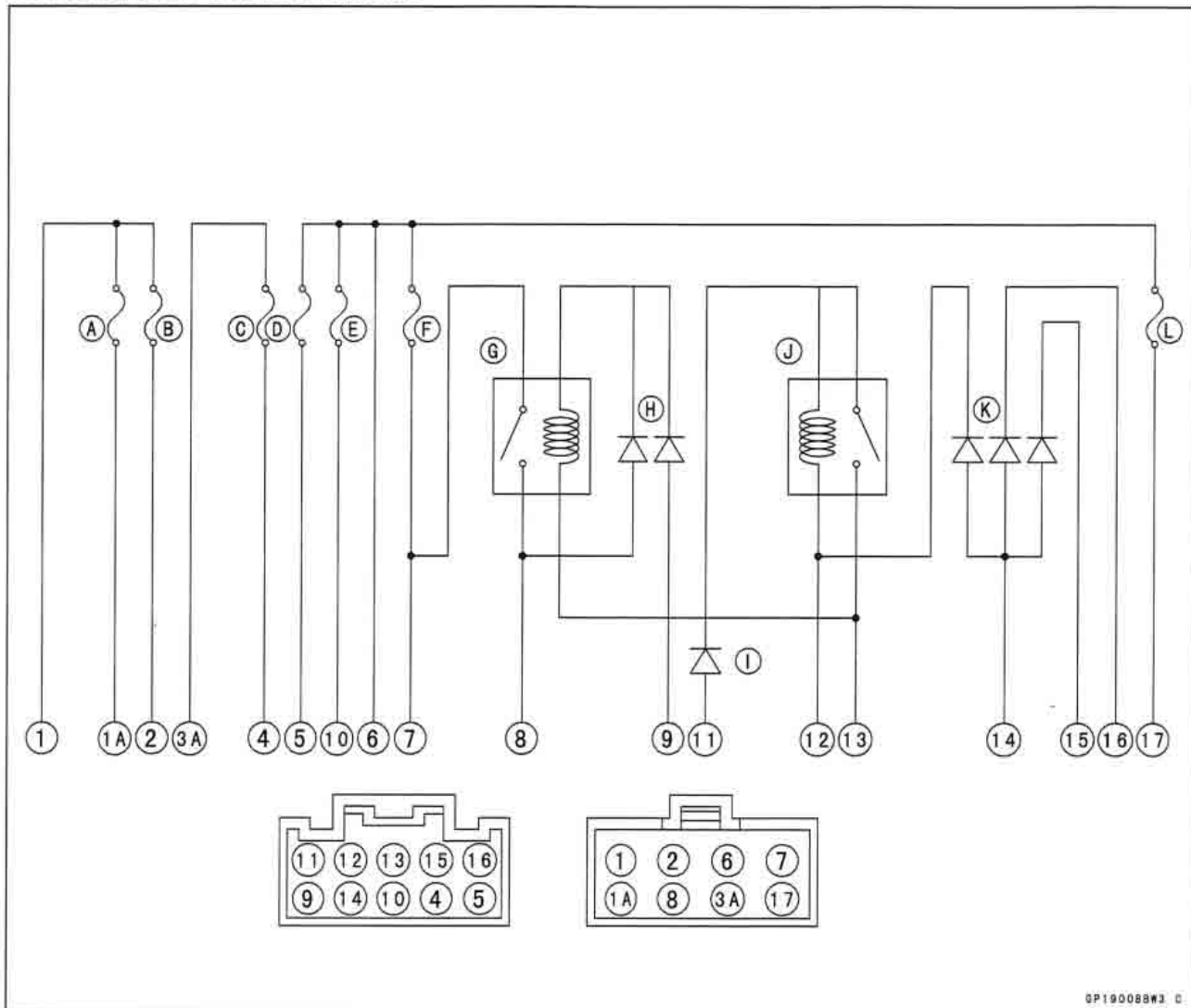
- The actual meter reading varies with the meter used and the individual diodes, but, generally speaking, the lower reading should be from zero to one half the scale.



## 16-60 ELECTRICAL SYSTEM

### Junction Box

#### Junction Box Internal Circuit

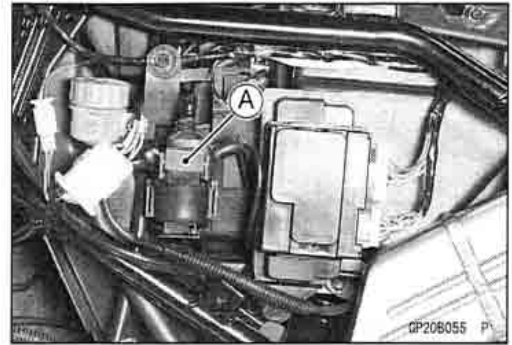


- A: Accessory Fuse 10 A
- B: Radiator Fan Fuse 10 A
- C: Turn Signal Relay Fuse 10 A
- D: Horn Fuse 10 A
- E: Ignition Fuse 10 A
- F: Headlight Fuse 10 A
- G: Headlight Relay
- H: Headlight Diodes
- I: Starter Diode
- J: Starter Circuit Relay
- K: Starter Lock Out Diodes
- L: Taillight Fuse 10 A

## Fuses

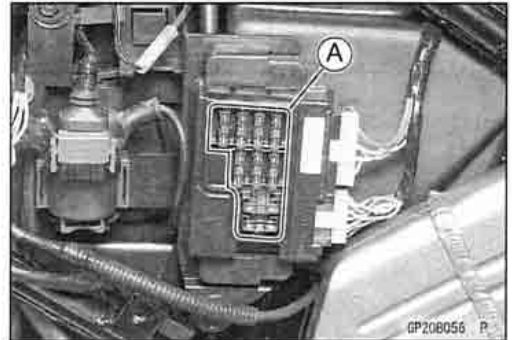
### 30 A Main Fuse Removal

- Remove the seat (see Frame chapter).
- Remove the right side cover (see Frame chapter).
- Unlock the hook to lift up the lids of the main fuse cover [A].
- Pull up the main fuse cover with the starter relay connector.



### Junction Box Fuse Removal

- Remove the seat (see Frame chapter).
- Remove the right side cover (see Frame chapter).
- Unlock the hook to lift up the lid from the junction box.
- Pull the fuses [A] straight up from the junction box with the nose plier.



### Junction Box Fuse Installation

- ★ If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.
- Install the junction box fuses on the original position as specified on the lid.

### Fuse Inspection

- Remove the fuse, and inspect the fuse element.
- ★ If the fuse element is blown, replace the fuse.

Housing [A]

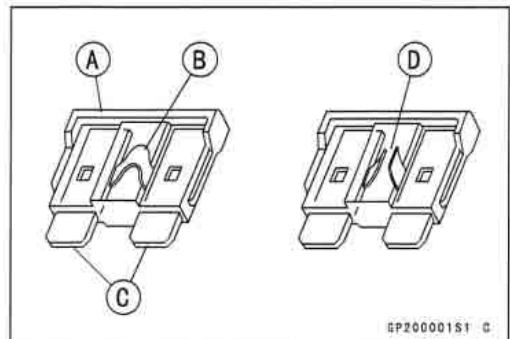
Fuse Element [B]

Terminal [C]

Blown Element [D]

### NOTE

- Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.



### CAUTION

When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components, and installation of a fuse with a lower rating may cause the fuse to be blown quickly.

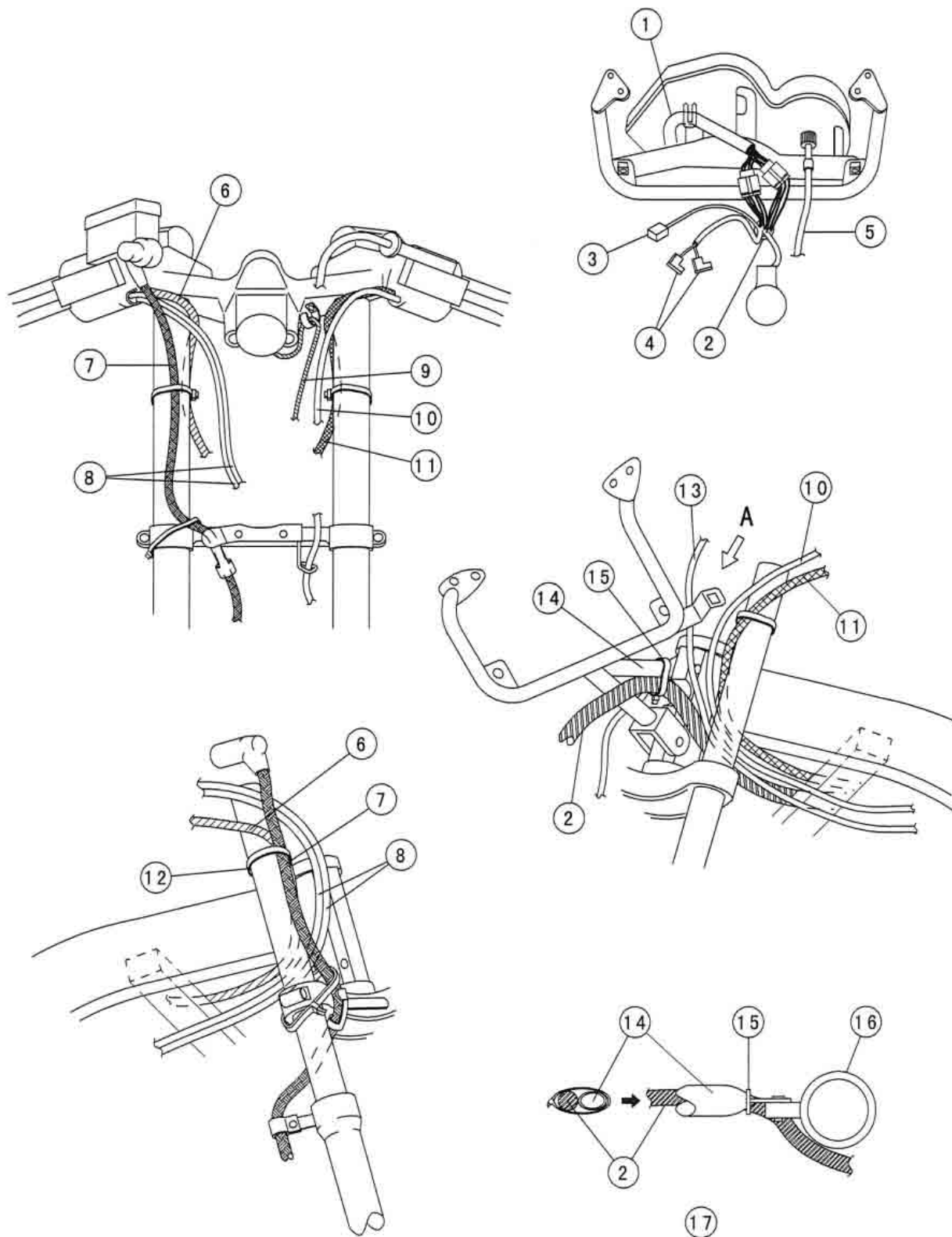
# Appendix

## Table of Contents

Cable, Wire, and Hose Routing .....	17-2
Troubleshooting Guide .....	17-10

## 17-2 APPENDIX

### Cable, Wire, and Hose Routing



---

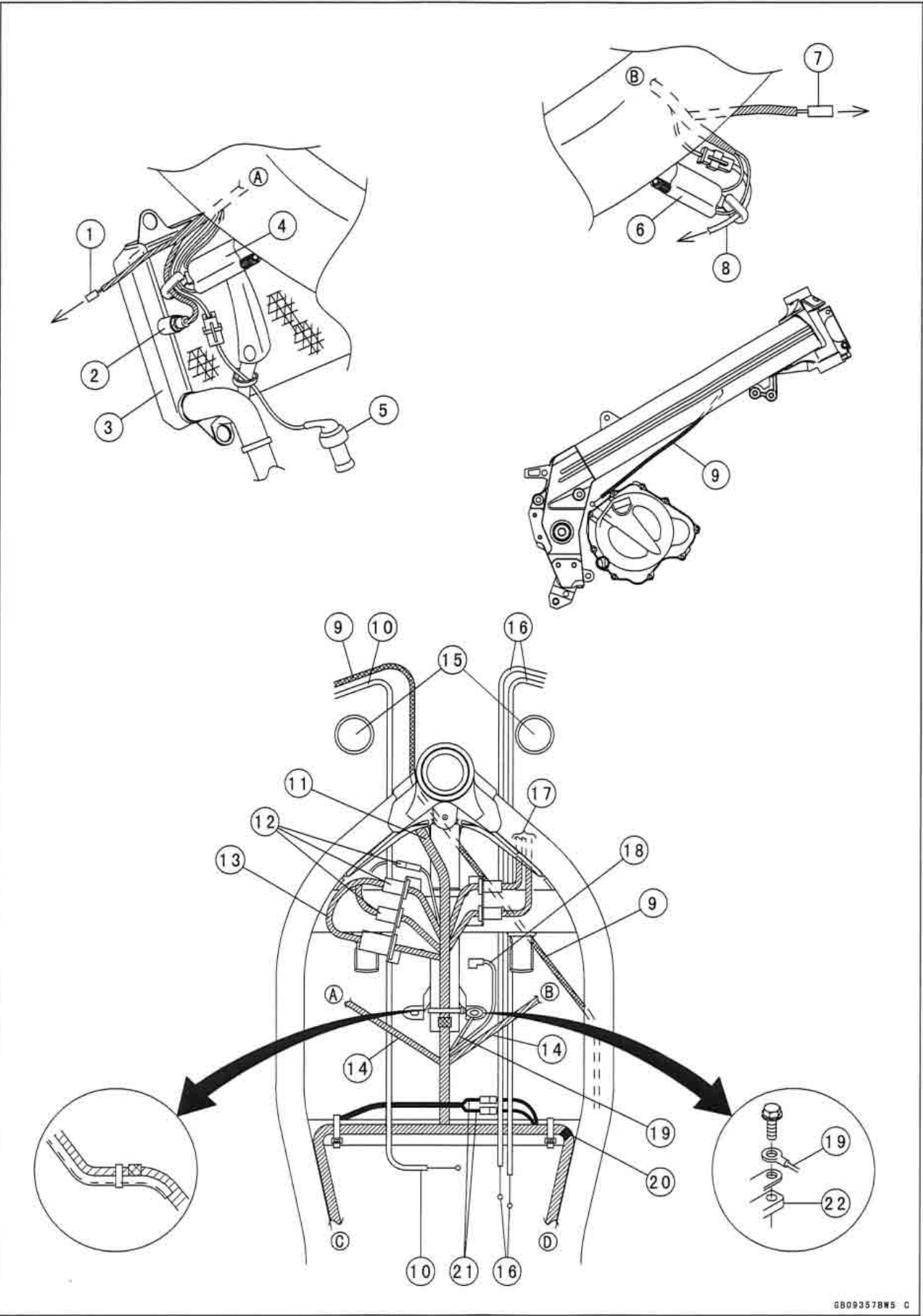
**Cable, Wire, and Hose Routing**

---

1. Meter and Gauge Leads
2. Main Harness
3. Headlight Leads
4. Horn Leads
5. Speedometer Cable
6. Right Handlebar Switch Leads
7. Route the brake hose at the front of fork leg.
8. Throttle Cables
9. Ignition Switch Leads
10. Choke Cable
11. Left Handlebar Switch Leads
12. Clamp right handlebar switch leads and brake hose together.
13. Clutch Cable
14. Headlight Bracket
15. Clamp at this position.
16. Head Pipe
17. Viewed from A

17-4 APPENDIX

Cable, Wire, and Hose Routing



---

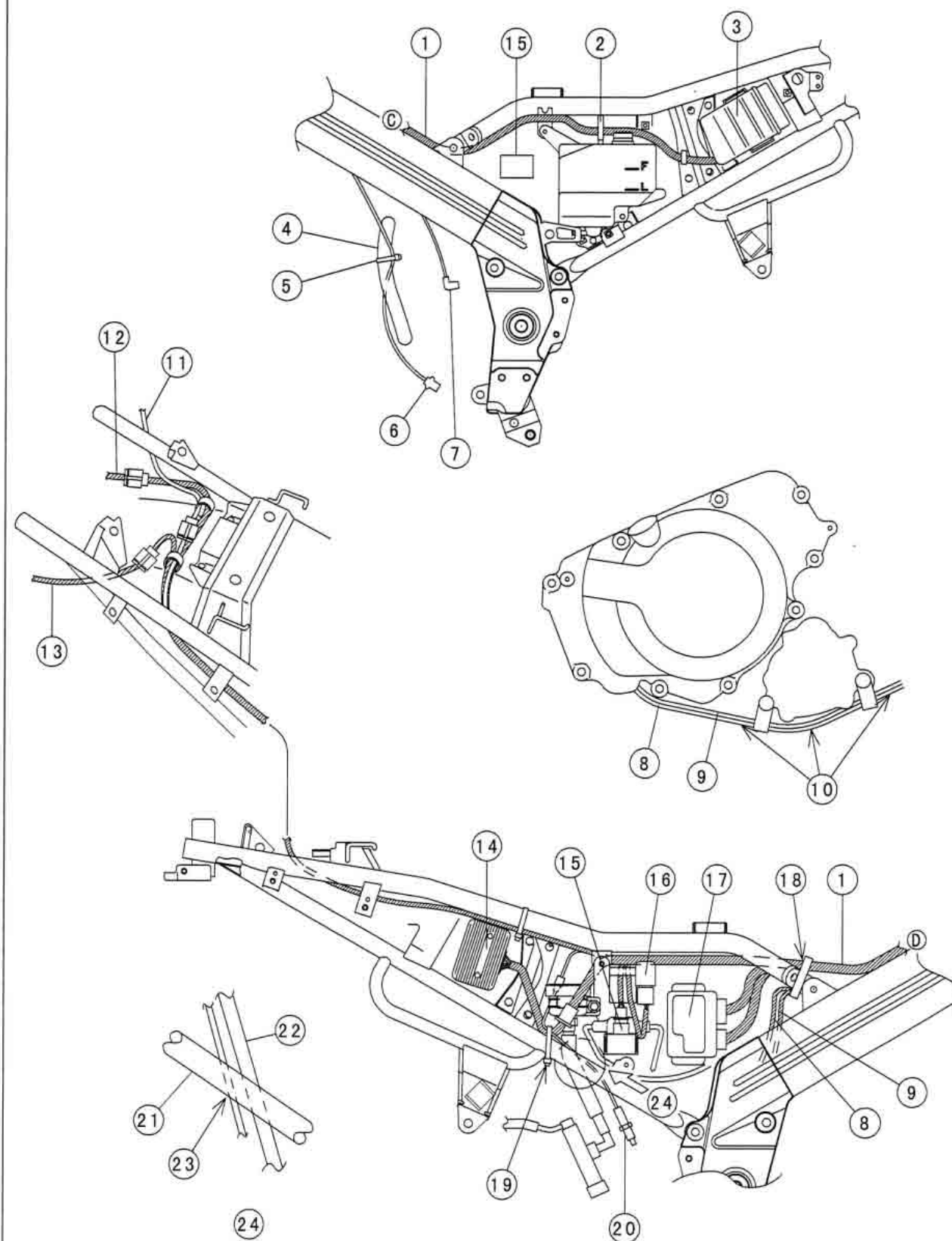
**Cable, Wire, and Hose Routing**

---

1. Left Turn Signal Leads
2. Radiator Fan Switch
3. Radiator
4. Ignition Coil (#1)
5. Oil Pressure Switch
6. Ignition Coil (#2)
7. Right Turn Signal Light Leads
8. Radiator Fan Leads
9. Clutch Cable
10. Choke Cable
11. Main Harness
12. Left Handlebar Switch Leads
13. Ignition Switch Leads
14. Route the cable beneath wiring harness.
15. Front Fork Legs
16. Throttle Cables
17. Right Handlebar Switch Leads
18. Water Temperature Sensor Lead
19. Ground Lead
20. Harness Position Mark (White Tape)
21. Side Stand Switch Leads
22. Thermostat Housing

## 17-6 APPENDIX

### Cable, Wire, and Hose Routing





---

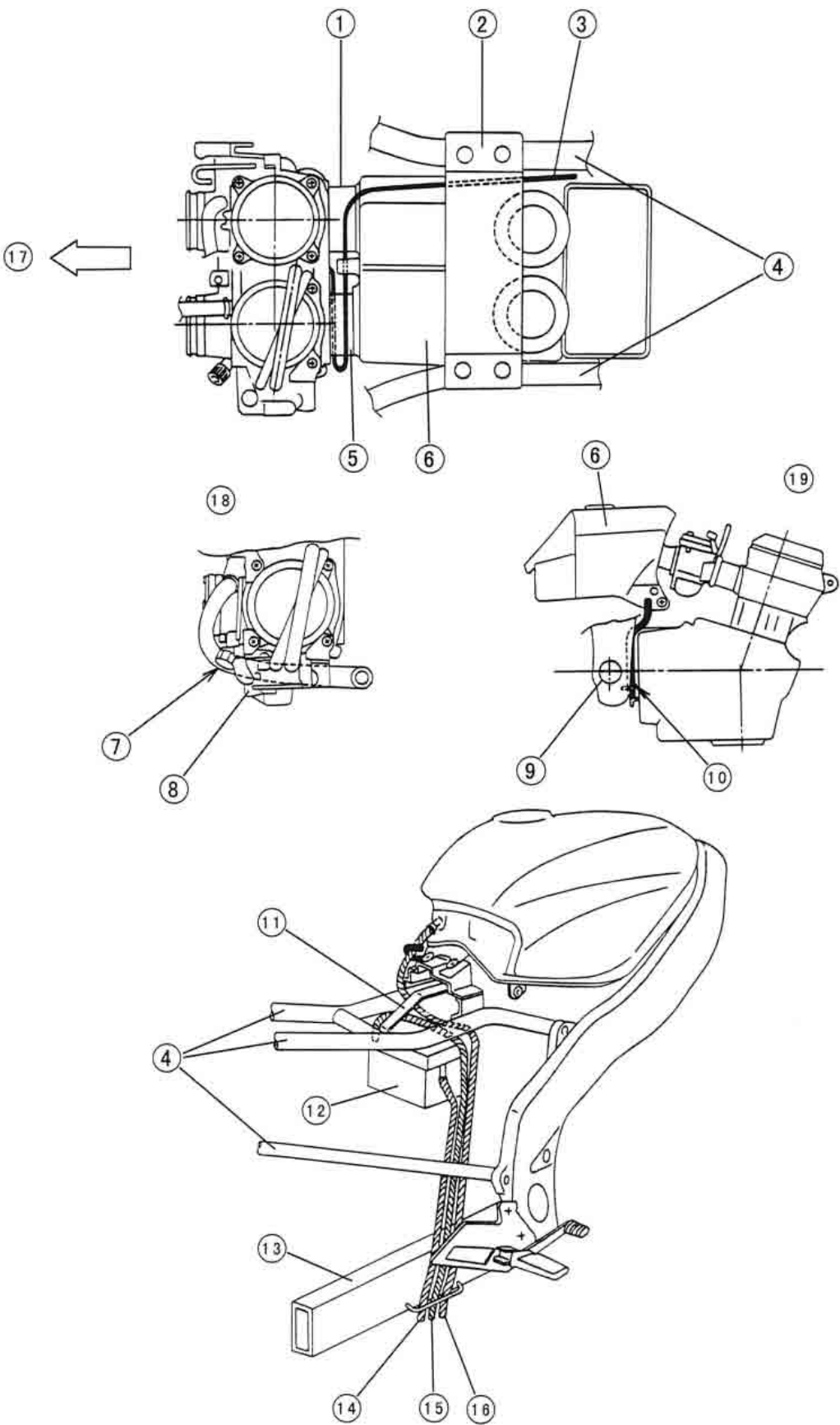
**Cable, Wire, and Hose Routing**

---

1. Main Harness
2. Coolant Reservoir Tank Vent Hose
3. IC Igniter
4. Water Pipe
5. Route the side stand switch leads inside of the water pipe.
6. Side Stand Switch
7. Neutral Switch
8. Alternator Leads
9. Crankshaft Sensor Leads
10. Do not slack the leads.
11. Left Turn Signal Light Leads.
12. Tail/Brake Light Leads
13. Right Turn Signal Light Leads
14. Regulator/Rectifier
15. Starter Relay
16. Turn Signal Relay
17. Junction Box
18. Clamp the main harness, alternator leads, and crankshaft sensor leads together.
19. Clamp regulator/rectifier leads and rear brake light switch leads together.
20. Rear Brake Light Switch
21. Rear Frame
22. Brake Hose
23. Route the rear brake light switch leads between the frame and brake hose.
24. Viewed from A

17-8 APPENDIX

Cable, Wire, and Hose Routing



---

**Cable, Wire, and Hose Routing**

---

1. Air Cleaner Duct (#2)
2. Fuel Tank Bracket
3. Carburetor Vent Hose
4. Rear Frame
5. Air Cleaner Duct (#1)
6. Air Cleaner Housing
7. Route the vacuum hose beneath coasting enricher body.
8. Coasting Enricher Body
9. Swing Arm Pivot
10. Route the drain hose between the swingarm pivot and crankcase.
11. Rubber Band
12. Battery
13. Swing Arm
14. Battery Vent Hose
15. Coolant Reservoir Tank Vent Hose
16. Fuel Tank Breather Hose
17. Front
18. Viewed from Top
19. Viewed from Right Side

## 17-10 APPENDIX

### 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.*

#### Engine Doesn't Start, Starting Difficulty:

##### Starter motor not rotating:

- Starter lockout switch or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relays not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Main fuse blown

##### Starter motor rotating but engine doesn't turn over:

- Starter motor clutch trouble

##### Engine won't turn over:

- Valve seizure
- Rocker arm seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure

##### No fuel flow:

- No fuel in fuel tank
- Fuel tap vacuum hose clogged
- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

##### Engine flooded:

- Fuel level in carburetor float bowl too high
- Float valve worn or stuck open
- Starting technique faulty  
(When flooded, crank the engine with the throttle fully opened to allow more air to reach the engine.)

##### No spark; spark weak:

- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- IC igniter trouble
- Neutral, starter lockout, or sidestand switch trouble

- Crankshaft sensor trouble

- Ignition coil trouble

- Ignition or engine stop switch shorted

- Wiring shorted or open

- Main fuse blown

##### Compression Low:

- Spark plug loose

- Cylinder head not sufficiently tightened down

- No valve clearance

- Cylinder, piston worn

- Piston ring bad (worn, weak, broken, or sticking)

- Piston ring/groove clearance excessive

- Cylinder head gasket damaged

- Cylinder head warped

- Valve spring broken or weak

- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

##### Fuel/air mixture incorrect:

- Pilot screw or idle adjusting screw maladjusted

- Pilot jet or air bleed hole clogged

- Air cleaner clogged, poorly sealed, element missing

- Starter jet clogged

#### Poor Running at Low Speed:

##### Spark weak:

- Battery voltage low

- Spark plug dirty, broken, or maladjusted

- Spark plug cap or high tension wiring trouble

- Spark plug cap shorted or not in good contact

- Spark plug incorrect

- IC igniter trouble

- Crankshaft sensor trouble

- Ignition coil trouble

##### Fuel/air mixture incorrect:

- Pilot screw maladjusted

- Pilot jet, or air passage clogged

- Air bleed pipe bleed holes clogged

- Pilot passage clogged

- Air cleaner clogged, poorly sealed, or element missing

- Starter plunger stuck open

- Fuel level in carburetor float bowl too high or too low

- Fuel tank air vent obstructed

- Carburetor holder loose

- Air cleaner duct loose

##### Compression low:

- Spark plug loose

- Cylinder head not sufficiently tightened down

## Troubleshooting Guide

No valve clearance  
 Cylinder, piston worn  
 Piston ring bad (worn, weak, broken, or sticking)  
 Piston ring/groove clearance excessive  
 Cylinder head warped  
 Cylinder head gasket damaged  
 Valve spring broken or weak  
 Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

### Other:

IC igniter trouble  
 Carburetor not synchronizing  
 Vacuum piston doesn't slide smoothly  
 Engine oil viscosity too high  
 Drive train trouble  
 Brake dragging

## Poor Running or No Power at High Speed:

### Firing incorrect:

Spark plug dirty, broken, or maladjusted  
 Spark plug cap shorted or not in good contact  
 Spark plug incorrect  
 IC igniter trouble  
 Crankshaft sensor trouble  
 Ignition coil trouble

### Fuel/air mixture incorrect:

Starter plunger stuck open  
 Main jet clogged or wrong size  
 Jet needle or needle jet worn  
 Air jet clogged  
 Fuel level in carburetor float bowl too high or too low  
 Bleed holes of needle jet holder or needle jet clogged  
 Air cleaner clogged, poorly sealed, or missing  
 Air cleaner duct poorly sealed  
 Water or foreign matter in fuel  
 Fuel to carburetor insufficient  
 Fuel tank air vent obstructed  
 Carburetor holder loose  
 Fuel tap clogged  
 Fuel line clogged

### Compression low:

Spark plug loose  
 Cylinder head not sufficiently tightened down  
 No valve clearance  
 Cylinder, piston worn  
 Piston ring bad (worn, weak, broken, or sticking)  
 Piston ring/groove clearance excessive  
 Cylinder head gasket damaged

Cylinder head warped  
 Valve spring broken or weak  
 Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

### Knocking:

Carbon built up in combustion chamber  
 Fuel poor quality or incorrect  
 Spark plug incorrect  
 IC igniter trouble

### Miscellaneous:

Throttle valve won't fully open  
 Vacuum piston doesn't slide smoothly  
 Brake dragging  
 Clutch slipping  
 Overheating  
 Engine oil level too high  
 Engine oil viscosity too high  
 Drive train trouble

## Overheating:

### Firing incorrect:

Spark plug dirty, broken, or maladjusted  
 Spark plug incorrect  
 IC Igniter trouble

### Fuel/air mixture incorrect:

Main jet clogged or wrong size  
 Fuel level in carburetor float bowl too low  
 Carburetor holder loose  
 Air cleaner poorly sealed, or missing  
 Air cleaner duct poorly sealed  
 Air cleaner clogged

### Compression high:

Carbon built up in combustion chamber

### Engine load faulty:

Clutch slipping  
 Engine oil level too high  
 Engine oil viscosity too high  
 Drive train trouble  
 Brake dragging

### Lubrication inadequate:

Engine oil level too low  
 Engine oil poor quality or incorrect

### Coolant incorrect:

Coolant level too low  
 Coolant deteriorated

### Cooling system component incorrect:

Radiator fin damaged  
 Thermostat trouble  
 Radiator cap trouble  
 Radiator fan switch trouble  
 Fan relay trouble  
 Fan motor broken  
 Fan blade damaged  
 Water pump not turning  
 Water pump impeller damaged

## 17-12 APPENDIX

### Troubleshooting Guide

---

#### Over Cooling:

##### Cooling system component incorrect:

- Radiator fan switch trouble
- Thermostat trouble

##### Gauge incorrect:

- Water temperature meter broken
- Water temperature sensor broken

#### Clutch Operation Faulty:

##### Clutch slipping:

- Friction plate worn or warped
- Steel plate worn or warped
- Clutch inner cable trouble
- No clutch lever play
- Clutch spring broken or weak
- Clutch release mechanism trouble
- Clutch hub or housing unevenly worn

##### Clutch not disengaging properly:

- Clutch plate warped or too rough
- Clutch spring compression uneven
- Engine oil deteriorated
- Engine oil viscosity too high
- Engine oil level too high
- Clutch housing frozen on drive shaft
- Clutch release mechanism trouble
- Clutch hub spline damaged
- Clutch friction plate installed wrong
- Clutch lever play excessive
- Clutch hub nut loose

#### Gear Shifting Faulty:

##### Doesn't go into gear; shift pedal doesn't return:

- Clutch not disengaging
- Shift fork bent or seized
- Gear stuck on the shaft
- Shift return spring weak or broken
- Shift return spring pin loose
- Pawl spring broken
- Shift mechanism arm broken
- Shift pawl broken

##### Jumps out of gear:

- Shift fork ear worn
- Gear groove worn
- Gear dogs and/or dog holes worn
- Shift drum groove worn
- Neutral positioning pin spring weak or broken
- Shift fork guide pin worn
- Drive shaft, output shaft, and/or gear splines worn

##### Overshifts:

- Neutral positioning lever spring weak or broken
- Pawl spring broken

#### Abnormal Engine Noise:

##### Knocking:

- IC igniter trouble
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- Overheating

##### Piston slap:

- Cylinder/piston clearance excessive
- Cylinder, piston worn
- Connecting rod bent
- Piston pin, piston pin hole worn

##### Valve noise:

- Valve clearance incorrect
- Valve spring broken or weak
- Camshaft bearing worn

##### Other noise:

- Connecting rod small end clearance excessive
- Connecting rod big end clearance excessive
- Piston ring worn, broken, or stuck
- Piston seizure, damage
- Piston ring groove worn
- Piston ring/groove clearance excessive
- 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, guide worn
- Alternator rotor loose
- Primary gear worn or broken

#### Abnormal Drive Train Noise:

##### Clutch noise:

- Weak or damaged damper
- Clutch housing/friction plate clearance excessive
- Clutch housing gear worn

##### Transmission noise:

- Bearings worn
- Transmission gears worn or chipped
- Metal chips jammed in gear teeth
- Engine oil insufficient

##### Drive line noise:

- Drive chain adjusted improperly
- Drive chain worn
- Rear and/or engine sprocket worn
- Chain lubrication insufficient
- Rear wheel misaligned

#### Abnormal Frame Noise:

##### Front fork noise:

- Oil insufficient or too thin

## Troubleshooting Guide

Spring weak or broken

### Rear shock absorber noise:

Shock absorber damaged

### Disc brake noise:

Pad installed incorrectly

Pad surface glazed

Disc warped

Caliper trouble

### Other noise:

Bracket, nut, bolt, etc. not properly mounted or tightened

## Oil Pressure Warning Light Goes On:

Engine oil pump damaged

Engine oil screen clogged

Engine oil level too low

Engine oil viscosity too low

Camshaft bearing worn

Crankshaft bearings worn

Oil pressure switch damaged

Wiring faulty

Relief valve stuck open

O-ring at the oil passage in the crankcase damaged

Engine oil filter clogged

## Exhaust Smokes Excessively:

### White smoke:

Piston oil ring worn

Cylinder worn

Valve oil seal damaged

Valve guide worn

Engine oil level too high

### Black smoke:

Air cleaner clogged

Main jet too large or fallen off

Starter plunger stuck open

Fuel level in carburetor float bowl too high

### Brown smoke:

Main jet too small

Fuel level in carburetor float bowl too low

Air cleaner duct loose

Air cleaner poorly sealed or missing

## Handling and/or Stability

### Unsatisfactory:

#### Handlebar hard to turn:

Cable routing incorrect

Hose routing incorrect

Wiring routing incorrect

Steering stem locknut too tight

Steering stem bearing damaged

Steering stem bearing lubrication inadequate

Steering stem bent

Tire air pressure too low

### Handlebar shakes or excessively vibrates:

Tire worn

Swingarm pivot bearings worn

Rim warped, or not balanced

Wheel bearing worn

Handlebar clamp bolts loose

Steering stem head nut loose

Front/rear axle runout too large

### Handlebar pulls to one side:

Frame bent

Wheel misalignment

Swingarm bent or twisted

Steering maladjusted

Front fork bent

Right and left front fork oil level uneven

### Shock absorption unsatisfactory:

(Too hard)

Front fork oil excessive

Front fork oil viscosity too high

Rear shock absorber adjustment too hard

Tire air pressure too high

Front fork bent

(Too soft)

Front fork oil insufficient and/or leaking

Front fork oil viscosity too low

Front fork, rear shock absorber spring weak

Rear shock absorber oil leaking

Rear shock absorber adjustment too soft

Tire air pressure too low

## Brake Doesn't Hold:

Air in the brake line

Pad or disc worn

Brake fluid leakage

Disc warped

Contaminated pad

Brake fluid deteriorated

Primary or secondary cup damaged

Master cylinder scratched inside

## Battery Trouble:

### Battery discharged:

Battery faulty (e.g., plates sulphated, shorted through sedimentation, electrolyte insufficient)

Battery leads making poor contact

Load excessive (e.g., bulb of excessive wattage)

Ignition switch trouble

Alternator trouble

Wiring faulty

Regulator/rectifier trouble

### Battery overcharged:

Regulator/rectifier trouble

Battery faulty



### MODEL APPLICATION

Year	Model	Beginning Frame No.
2004	EX250-H15	JKAEXMH1□4DA00001
2005	EX250-H16	JKAEXMH1□5DA01002

□:This digit in the frame number changes from one machine to another.



KAWASAKI HEAVY INDUSTRIES, LTD.  
Consumer Products & Machinery Company

Part No.99924-1331-02

Printed in Japan