Kawasaki

Ninja ZX-12R

Motorcycle Service Manual

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Quick Reference Guide

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

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

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.

EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated crankcase emission (1) and exhaust emission (2) control systems in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board. Additionally, Kawasaki has incorporated an evaporative emission control system (3) in compliance with applicable regulations of the California Air Resources Board on vehicles sold in California only.

1. Crankcase Emission Control System
   This system eliminates the release of crankcase vapors into the atmosphere. Instead, the vapors are routed through an oil separator to the intake side of the engine. While the engine is operating, the vapors are drawn into combustion chamber, where they are burned along with the fuel and air supplied by the carburetion system.
2. Exhaust Emission Control System
   This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel, ignition, and exhaust systems of this motorcycle have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels.
3. Evaporative Emission Control System
   Vapors caused by fuel evaporation in the fuel system are not vented into the atmosphere. Instead, fuel vapors are routed into the running engine to be burned, or stored in a canister when the engine is stopped. Liquid fuel is caught by a vapor separator and returned to the fuel tank.

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

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

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

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

NOTE

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

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

TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

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

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

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

Foreword

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

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

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

To get the longest life out of your vehicle:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki Motorcycle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki motorcycles are introduced by the 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 preparing this manual, we divided the product into its major systems. These systems became the manual's chapters. All information for a particular system from adjustment through disassembly and inspection is located in a single chapter.

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.

The Periodic Maintenance Chart is located in the General Information chapter. The chart gives a time schedule for required maintenance operations.

If you want spark plug information, for example, go to the Periodic Maintenance Chart first. The chart tells you how frequently to clean and gap the plug. Next, 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 Spark Plug 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.

MODEL APPLICATION

Year	Model	Beginning Frame No.
2000	ZX1200-A1	JKAZX9A1□YA000001 or JKAZXT20AAA000001 or ZXT20A-000001

□ : This digit in the frame number changes from one machine to another.

Kawasaki
KAWASAKI HEAVY INDUSTRIES, LTD.
Consumer Products & Machinery Group

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General Information

Table of Contents

Before Servicing

Before starting to service a motorcycle, careful reading of the applicable section is recommended to eliminate unnecessary work. Photographs, diagrams, notes, cautions, warnings, and detailed descriptions have been included wherever necessary. Nevertheless, even a detailed account has limitations, a certain amount of basic knowledge is also required for successful work.

Especially note the following:

(1) Dirt

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

(2) Battery Leads

Remove the ground (–) lead from the battery before performing any disassembly operations on the motorcycle. When installing, connect the positive (+) lead first, then the negative (–) lead to the battery. This prevents: (a) the possibility of accidentally turning the engine over while partially disassembled. (b) sparks at electrical connections which will occur when they are disconnected. (c) damage to electrical parts.

(3) Installation, Assembly

Generally, installation or assembly is the reverse of removal or disassembly. But if this Service Manual has installation or assembly procedures, follow them. 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 as much as 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 removal of screws held by a 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 leakage.

(10) Liquid Gasket, Non-Permanent Locking Agent

Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply 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

A part installed using a press or driver, such as a wheel bearing, should first be coated with oil on its outer or inner circumference so that it will go into place smoothly.

(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 stops 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.

Before Servicing

(14) Circlip, Retaining Ring, and Cotter Pin

Replace any circlips and 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.

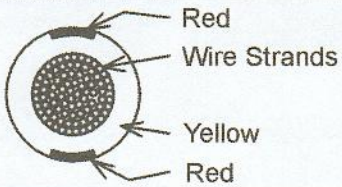
(15) Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil or grease (whichever is more suitable) should be applied to any rubbing surface which has lost its lubricative film. Old grease and dirty oil should be cleaned off. Deteriorated grease has lost its lubricative quality and may contain abrasive foreign particles.

Don't use just any oil or grease. 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. This manual makes reference to molybdenum disulfide grease (MoS_2) in the assembly of certain engine and chassis parts. Always check manufacturer recommendations before using such special lubricants.

(16) 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.

Wire (cross-section)	Name of Wire Color
	Yellow/Red

(17) Replacement Parts

When there is a replacement instruction, replace these parts with new ones every time they are removed. These replacement parts will be damaged or lose their original function once removed.

(18) 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.

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

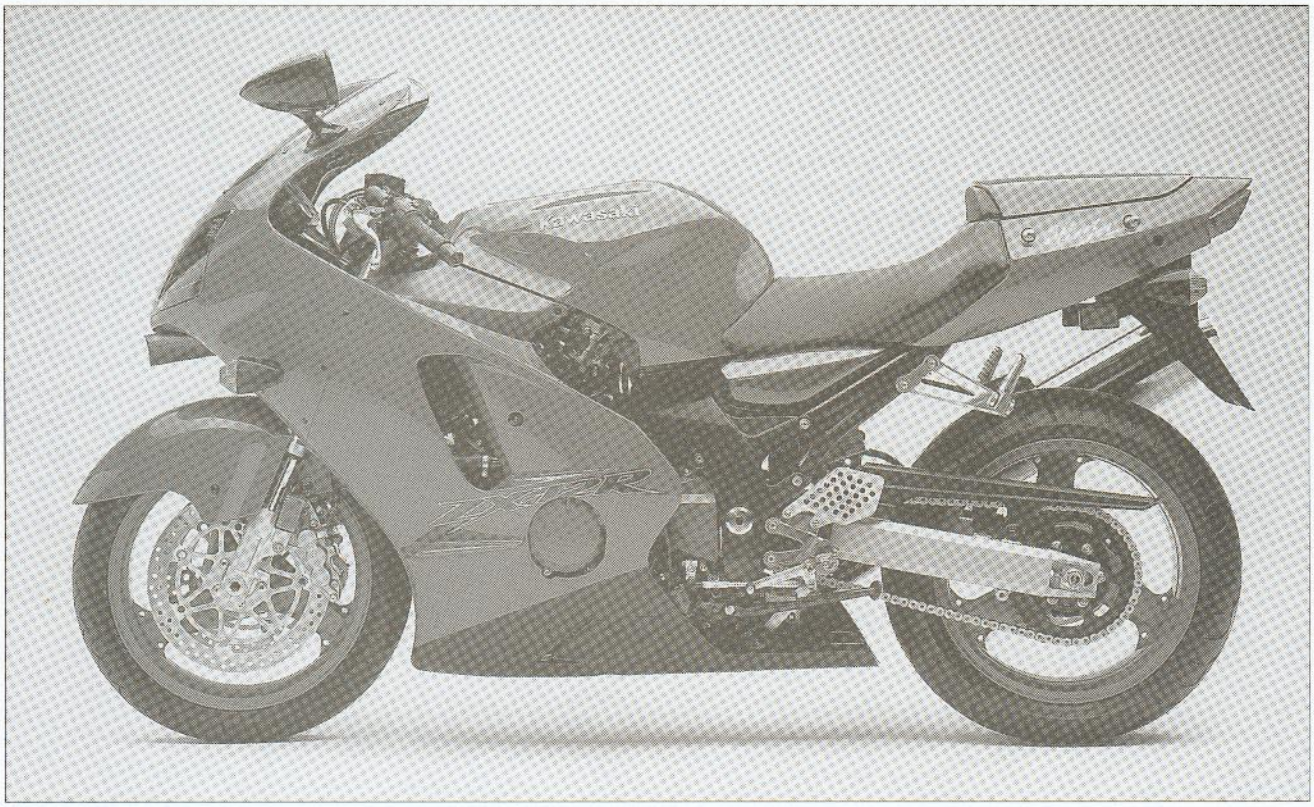
(19) Specifications

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.

ZX1200–A1 Left Side View:



ZX1200–A1 Right Side View:

General Specifications

Items		ZX1200-A1
Dimensions:		
Overall length		2 080 mm (81.89 in.), (HN) 2 180 mm (85.83 in.)
Overall width		725 mm (28.5 in.)
Overall height		1 185 mm (46.65 in.)
Wheelbase		1 440 mm (56.69 in.)
Road clearance		120 mm (4.72 in.)
Seat height		810 mm (31.9 in.)
Dry mass		210 kg (463 lb.)
Curb mass:	Front	125 kg (276 lb.)
	Rear	118 kg (260 lb.)
Fuel tank capacity		20.0 L (5.3 US gal.)
Performance:		
Minimum turning radius		3.0 m (118.1 in.)
Engine:		
Type		4-stroke, DOHC, 4-cylinder
Cooling system		Liquid-cooled
Bore and stroke		83.0 × 55.4 mm (3.27 × 2.18 in.)
Displacement		1199 mL (73.16 cu in.)
Compression ratio		12.2
Maximum horsepower		131 kW (178 PS) @10 500 r/min (rpm), (AS) 130 kW (177 PS) @10 500 r/min (rpm), (N) 133 kW (181 PS) @10 500 r/min (rpm), (HR) 78.2 kW (106.4 PS) @8 500 r/min (rpm), (CN) 131 kW (178 PS) @9 500 r/min (rpm), (MA) 133 kW (181 PS) @ 9 500 r/min (rpm), (US) - - -
Maximum torque		134 N·m (13.7 kg·m, 99 ft·lb) @7 500 r/min (rpm), (N) 135 N·m (13.8 kg·m, 100 ft·lb) @7 500 r/min (rpm), (HR) 111 N·m (11.3 kg·m, 82 ft·lb) @5 000 r/min (rpm), (CN) 136 N·m (13.9 kg·m, 101 ft·lb) @7 500 r/min (rpm), (MA) 137 N·m (14.0 kg·m, 101 ft·lb) @7 500 r/min (rpm), (US) - - -
Carburetion system		FI (Fuel Injection), MIKUNI 46 EIS × 4
Starting system		Electric starter
Ignition system		Battery and coil (transistorized)
Timing advance		Electronically advanced (digital igniter in ECU)
Ignition timing		10° BTDC @1000 r/min (rpm)
Spark plugs		NGK CR9EK PA
Cylinder numbering method		Left to right, 1-2-3-4
Firing order		1-2-4-3
Valve timing:		
Inlet	Open	46° BTDC
	Close	74° ABDC
	Duration	300°
Exhaust	Open	69° BBDC
	Close	45° ATDC
	Duration	294°
Lubrication system		Forced lubrication (wet sump with cooler)
Engine oil:		
Grade		API SE, SF or SG class
Viscosity		SAE10W-40, 10W-50, 20W-40 or 20W-50
Capacity		3.6 L (3.8 US qt.)

General Specifications

Items		ZX1200-A1
Drive Train:		
Primary reduction system:		
Type		Gear
Reduction ratio		1.596 (83/52)
Clutch type		Wet, multi disc
Transmission:		
Type		6-speed, constant mesh, return shift
Gear ratios:		
	1st	2.429 (34/14)
	2nd	1.824 (31/17)
	3rd	1.440 (36/25)
	4th	1.250 (30/24)
	5th	1.130 (26/23)
	6th	1.033 (31/30)
Final drive system:		
Type		Chain drive
Reduction ratio		2.556 (46/18)
Overall drive ratio		4.215 @Top gear
Frame:		
Type		Press backbone
Caster (rake angle)		23.5°
Trail		93 mm (3.66 in.)
Front tire:	Type	Tubeless
	Size	120/70 ZR17 (58W)
Rear tire:	Type	Tubeless
	Size	200/50 ZR17 (75W)
Front suspension:		
	Type	Telescopic fork (upside-down)
	Wheel travel	120 mm (4.72 in.)
Rear suspension:		
	Type	Swingarm (uni-trak)
	Wheel travel	140 mm (5.51 in.)
Brake Type:	Front	Dual discs
	Rear	Single disc
Electrical Equipment:		
Battery		12 V 12 Ah
Headlight:	Type	Semi-sealed beam
	Bulb	12 V 60/55 W (quartz-halogen) × 2
Tail/brake light		12 V 5/21 W × 2
Alternator:	Type	Three-phase AC
	Rated output	35 A/ 14 V @5 000 r/min (rpm)

Specifications are subject to change without notice, and may not apply to every country.
(AS): Australia Model
(US): U.S.A. Model
(CN): Canada Model
(MA): Malaysia Model
(HN): Norway Model, WVTA Approval Model, Honeycomb Catalytic Converter
(N): WVTA Approval Model, Non-Catalytic Converter (Full Power)
(HR): WVTA Approval Model, Honeycomb Catalytic Converter (Restricted Power)

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.**

FREQUENCY / OPERATION	Whichever comes first → ↓ / Every	* ODOMETER READING: 1 000 km (600 mile)	6 000 km (4 000 mile)	12 000 km (7 500 mile)	18 000 km (12 000 mile)	24 000 km (15 000 mile)	30 000 km (20 000 mile)	36 000 km (24 000 mile)
Spark plug - clean and gap †			●	●	●	●	●	●
Valve clearance - check †				●		●		●
Air suction valve - check †			●	●	●	●	●	●
Air cleaner element - clean† #				●		●		●
Throttle control system - check †		●	●	●	●	●	●	●
Idle speed - check †		●		●		●		●
Engine vacuum synchronization - check †				●		●		●
Engine oil - change #	6 months	●	●	●	●	●	●	●
Oil filter - replace		●		●		●		●
Evaporative emission control system (CA) - check †		●	●	●	●	●	●	●
Drive chain wear - check †#			●	●	●	●	●	●
Drive chain roller wear - check †#			●	●	●	●	●	●
Fuel hoses, connections - check †			●	●	●	●	●	●
Brake hoses, connections - check †			●	●	●	●	●	●
Brake pad wear - check †#			●	●	●	●	●	●
Brake light switch - check †		●	●	●	●	●	●	●
Steering - check †		●	●	●	●	●	●	●
Front fork oil - change	2 years					●		
Rear shock absorber oil leak - check †				●		●		●
Front fork oil leak - check †				●		●		●
Tire wear - check †			●	●	●	●	●	●
Swingarm pivot, Unit-trak linkage - lubricate				●		●		●
General lubtication - perform				●		●		●
Nut, bolts, and fasteners tightness - check †		●		●		●		●
Drive chain - lubricate #	600 km							
Drive chain slack - check †#	1000 km							
Brake fluid level - check †	month	●	●	●	●	●	●	●
Clutch adjust - check †		●	●	●	●	●	●	●
Radiator hoses, connections - check †		●						
Brake fluid - change	2 years					●		
Brake master cylinder cup and dust seal - replace	4 years							
Coolant - change	2 years					●		
Caliper piston seal and dust seal - replace	4 years							
Steering stem bearing - lubricate	2 years					●		

: 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.

(CA): California Model only

Technical Information – KLEEN (KAWASAKI LOW EXHAUST EMISSION SYSTEM)

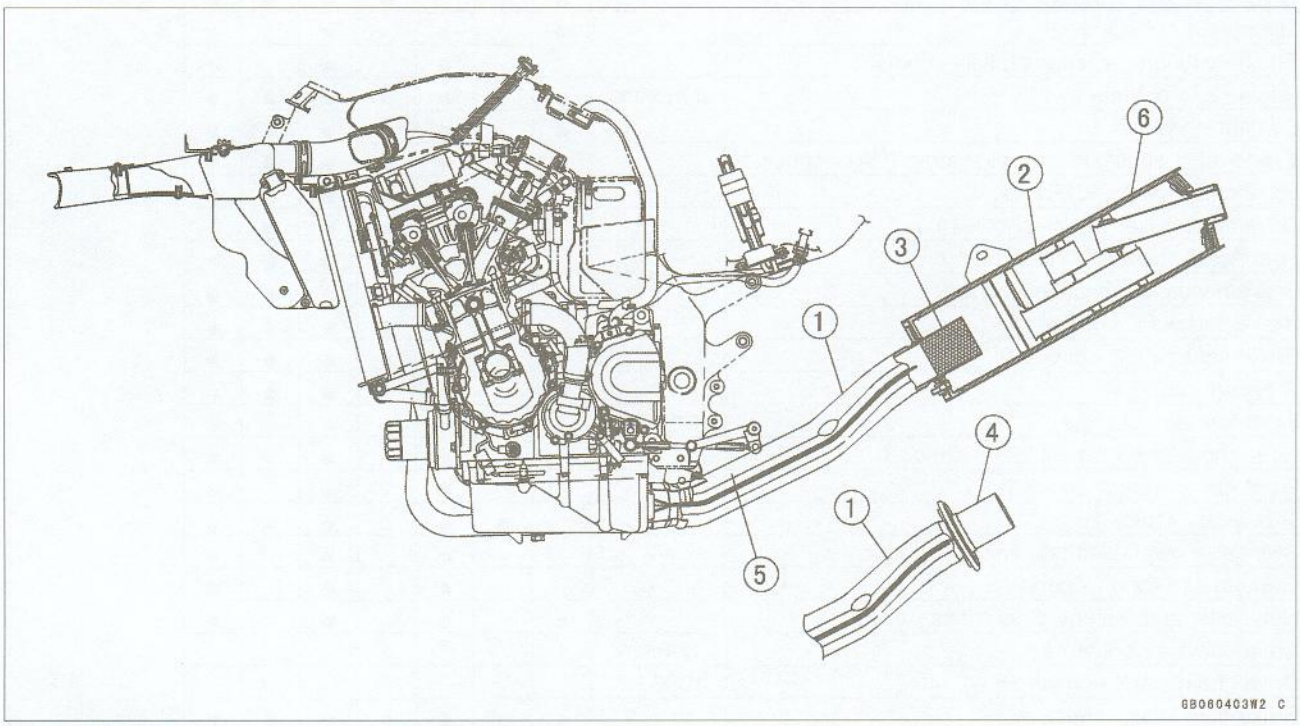
Since the emission regulations become more severe, Kawasaki has adopted a type of simplified KLEEN, which have no catalyst protection system, according to each regulation of different countries.

The muffler with built-in catalyst has the same durability as the conventional muffller, however, do not use leaded gasoline and do not coast with the ignition system OFF. Running the engine without ignition damages catalyst.

Refer to the ZX900E Service Manual (Part No. 99924-1255) for more information about the KLEEN (theory, maintenance, and handling precautions), including the secondary air injection system.

Honeycomb Type Catalytic Converter

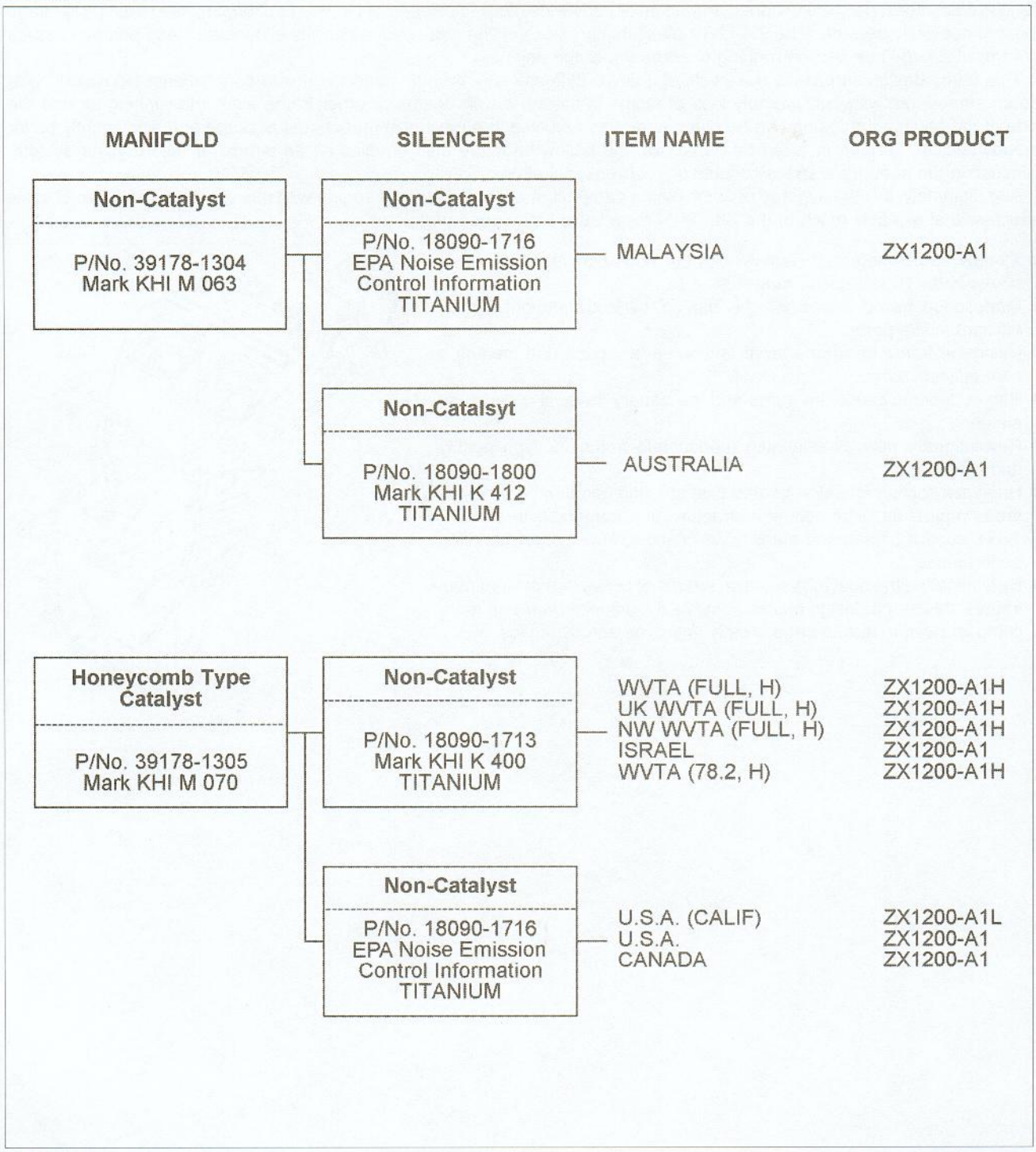
- The converter is a three-way catalytic converter, and its surface is covered with alumina upon which platinum and rhodium are applied, and has a cylindrical metalic honeycomb structure made by bending a corrugated sheet and a flat sheet of stainless steel into a spiral of increasing diameter. The honeycomb structure is convenient for the catalytic converter because it has a large surface area but small size to react effectively and has low exhaust resistance. In addition, its inherent strength helps resist vibration, and has simple structure welded directly on the silencer.
- Generally, the temperature of the exhaust gas must be higher than activation temperature, so the converters are installed in the exhaust manifold rear end where the temperature of exhaust gas is still high. And, the converters will be activated even under low load conditions.
- After the exhasut gas is diluted with the secondary air injection, the catalytic converter works well because of rich oxygen to reduce CO, HC, and NOx. Accordingly, we can keep the exhaust gas emission within regulation.
- This type of converter works more efficiently as a three-way catalytic converter to reduce CO, HC, and NOx than the pipe type catalytic converter because of its more and denser catalysts.



1. Manifold
2. Silencer
3. Honeycomb Type Catalyst
4. Non-Catalyst
5. Mark for Manifold
6. Mark for Silencer

Technical Information – KLEEN (KAWASAKI LOW EXHAUST EMISSION SYSTEM)

Exhaust System



UK: U.K. Model
NW: Norway Model
Full: Full Power
78.2: Horsepower 78.2 kW (106.3 ps)
H: Honeycomb Type Catalyst

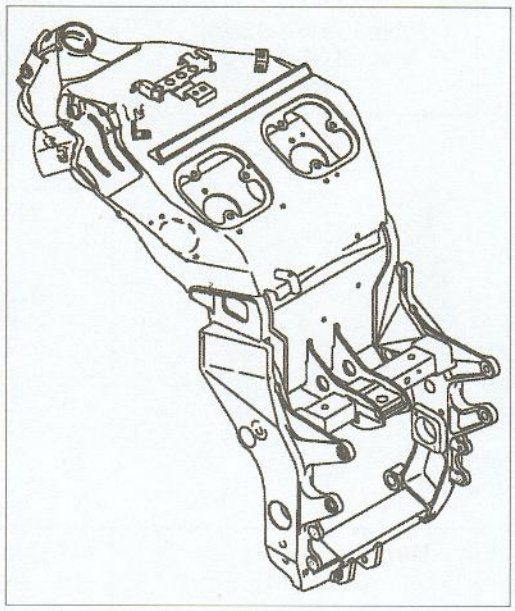
Technical Information — Monocoque Frame

Why a monocoque? Like all breakthrough innovations, the choice appears quite obvious after the fact. When large-section aluminium spars are wrapped around an already wide, large-displacement in-line Four engine, the resulting package must of necessity be wide. The ZX-12R's all-aluminium box-section monocoque chassis eliminates these perimeter spars in favor of a large box section running over the top of the engine.

This frame design surpasses the levels of chassis stiffness and strength associated with conventional aluminium twin-beam frames, but with considerably less breadth. Without the twin beams or other frame elements running around the side of the engine, the fairing can be much narrower, resulting in a much slimmer overall package and significantly better aerodynamics. Further, in a radical departure, the hollow structure also doubles as an airbox for the Ram Air system, eliminating the need for a space-consuming, conventional airbox.

And ultimately, it is the synergy of combining a compact, massively powerful engine with this super stiff and slim chassis structure that explains much of the ZX-12R's superlative high-speed performance.

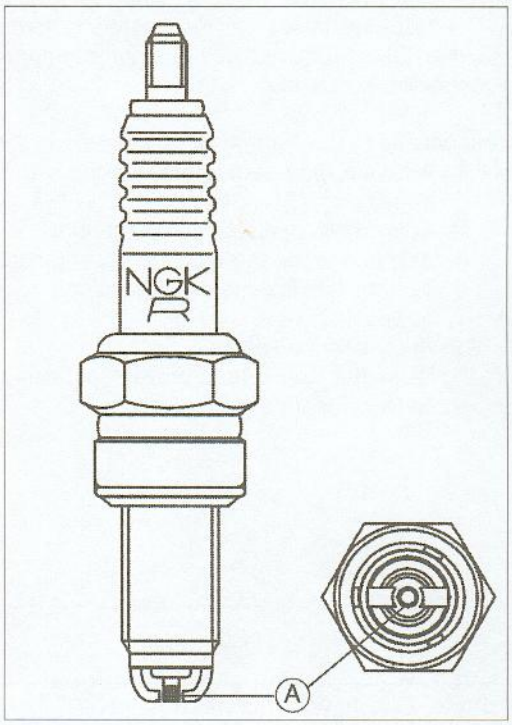
- All-new frame-integrated Ram Air system adds considerable horse-power in the higher speed ranges.
- Monocoque frame allows for the use of perfectly straight, highly efficient intake ports.
- Using the frame backbone as an airbox saves space and creates a very efficient airbox.
- Battery mounts inside the frame and the battery cover is a structural element.
- Revolutionary new all-aluminum monocoque frame for high rigidity and lightweight.
- Huge box section and heat-freated cast steering head/swingarm pivot areas realize an extremely stiff structure and contribute to the ZX-12R's superb high-speed stability and nimble, super sport handling performance.
- By eliminating the dual large-section beams of conventional aluminum frames, this frame design makes possible a much narrower and more compact overall package and greatly improves aerodynamics.



Technical Information — Spark Plug

ZX1200-A1 is equipped with the Kawasaki recommended spark plug (NGK CR9EKPA). By using the Kawasaki recommended spark plug, the idling stability, the fuel consumption improvement, and the maintenance free spark plug is planed.

This spark plug is calculated 3 or 4 times as durable as the usual one (NGK CR9EK).



Feature:

1. This spark plug is more superior to the usual one with the ignition for the ignition point protruding.
2. Further, this spark plug is superior to the usual one with the endurance for the Pt alloy [A] covering around the center electrode and for the opposed area improvement of the side electrodes.

Specification:

1. Standard Spark Plug CR9EKPA, two side electrodes, M10 threads
2. Hotter Spark Plug CR8EKPA, two side electrodes, M10 threads

CAUTION
Use only the recommender spark plug. Do not use other spark plug, even though it may fit, because it could cause the engine failure of the idling stability, etc.

Torque and Locking Agent

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

Letters used in the "Remarks" column mean:

L: Apply a non-permanent locking agent to the threads.
M: Apply molybdenum disulfide grease.
O: Apply oil to the threads and seating surface.
S: Tighten the fasteners following the specified sequwnce.
SS: Apply silicone sealant.
St: Stake the fasteners to prevent loosening.
R: Replacement parts

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	kg·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	kg·m	ft·lb	
Digital Fuel Injection System:				
Fuel Level Sensor Bolts	6.9	0.7	61 in·lb	
Fuel Pump Bolts	6.9	0.7	61 in·lb	S, L
Fuel Hose Clamp Bolts	1.5	0.15	13 in·lb	
Fuel Relief Valve	20	2.0	14	
Inlet Air Pressure Sensor Bolt	12	1.2	106 in·lb	
Inlet Air Pressure Sensor Bracket Nut	12	1.2	106 in·lb	
Atmospheric Pressure Sensor Bolts	12	1.2	106 in·lb	
Gear Position Switch Screws	4	0.4	35 in·lb	L
Crankshaft Sensor Bolts	6	0.6	53 in·lb	
Cam Sensor Bolt	12	1.2	106 in·lb	
Cam Sensor Rotor Bolt	12	1.2	106 in·lb	L
Cooling System:				
Coolant Hose Clamp Screws	2.0	0.20	17 in·lb	
Coolant Fitting Nozzles	12	1.2	106 in·lb	
Coolant Drain Plug (Water Pump)	12	1.2	106 in·lb	
Coolant Drain Plug (Cylinder)	10	1.0	87 in·lb	
Radiator Fan Switch	18	1.8	13	
Water Temperature Sensor	25	2.5	18	SS
Impeller Bolt	10	1.0	87 in·lb	
Water Pump Cover Bolts	12	1.2	106 in·lb	
Coolant Pipe Bolt	12	1.2	106 in·lb	
Thermostat Housing Cover Bolts	8	0.8	71 in·lb	
Fitting Bolts	12	1.2	106 in·lb	
Engine Top End:				
Spark Plugs	13	1.3	115 in·lb	
Air Suction Valve Cover Bolts	12.5	1.3	111 in·lb	
Baffle Plate Bolts	10.5	1.1	93 in·lb	
Cylinder Head Cover Bolts	10	1.0	87 in·lb	
Crankshaft Sensor Cover Bolts	15	1.5	11	L

Torque and Locking Agent

Fastener		Torque			Remarks
		N·m	kg·m	ft·lb	
Camshaft Chain Tensioner Mounting Bolts		12	1.2	106 in·lb	L
Camshaft Cap Bolts		12	1.2	106 in·lb	
Upper Camshaft Chain Guide Bolts		12	1.2	106 in·lb	
Front Camshaft Chain Guide Bolt (Upper)		25	2.5	18	
Front Camshaft Chain Guide Bolt (Lower)		12	1.2	106 in·lb	
Rear Camshaft Chain Guide Bolt		25	2.5	18	
Cam Sensor Bolt		12	1.2	106 in·lb	
Cam Sensor Rotor Bolt		12	1.2	106 in·lb	L
Cylinder Head Bolts:	M11 First Tighten	23	2.3	17	S, O (Washer)
	M11 Final Tighten	59	6.0	43	S, O (Washer)
	M7	20	2.0	15	S
Cylinder Head Jacket Plugs		22	2.2	16	L
Throttle Valve Holder Bolts		12	1.2	106 in·lb	
Muffler Body Connection Nuts		34	3.5	25	
Exhaust Pipe Holder Studs		–	–	–	(Stopped)
Clutch:					
Clutch Cover Bolts		15	1.5	11	L (2)
Clutch Cover Damper Plate Bolts		7	0.7	62 in·lb	L
Clutch Spring Bolts		8.8	0.9	78 in·lb	
Clutch Hub Nut		135	14	100	R
Engine Lubrication System:					
Oil Level Gauge Bolts		12	1.2	106 in·lb	
Oil Filler Plug		1.0 or Hand-Tight	0.10 or Hand-Tight	9 in·lb or Hnad-Tight	
Engine Drain Plug		20	2.0	14.5	
Oil Filter (Cartridge Type)		27	2.7	19.5	R, O
Oil Cooler Passage Bolt		78	7.8	57	O
Oil Cooler Mounting Bolts		25	2.5	18	
Oil Pan Bolts		15	1.5	11	
Oil Pipe Holder Bolts		12	1.2	106 in·lb	L
Oil Pressure Relief Valve		15	1.5	11	L
Oil Pressure Switch		15	1.5	11	SS
Oil Pressure Switch Terminal Screw		1.5	0.15	13 in·lb	
Impeller Bolt		10	1.0	87 in·lb	
Engine Removal/Installation:					
Engine Mounting Bolts and Nuts	ϕ12	59	6.0	43	
	ϕ10	44	4.5	33	
Engine Mounting Bracket Bolts	ϕ8	25	2.5	18	
Adjusting Collars		25	2.5	18	
Cranckshaft/Transmission:					
Breather Plate Bolts		10	1.0	87 in·lb	L
Breather Tube Bracket Bolts		12	1.2	106 in·lb	
Crankcase Bolts	ϕ10	45	4.5	33	M, S
	ϕ7	20	2.0	14.5	S
Upper Crankcase Bolts	ϕ8 L85	28	2.8	21	S
Lower Crankcase Bolts	ϕ8 L99	23	2.3	17	S

Torque and Locking Agent

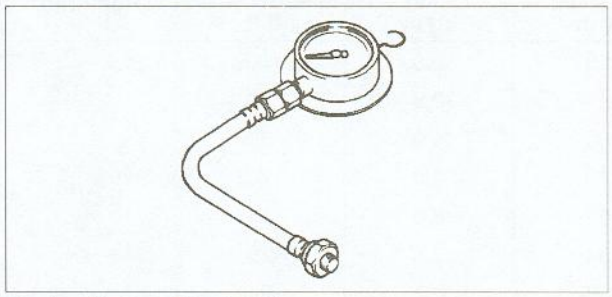
Fastener	Torque			Remarks
	N·m	kg·m	ft·lb	
Oil Passage Plugs (Each Side)	20	2.0	14.5	L
Connecting Rod Big End Nuts	in the text	←	←	←
Timing Rotor Bolt	39	4.0	29	
Starter Torquelimiter Cover Bolts	12	1.2	106 in·lb	L
Oil Pressure Switch	15	1.5	11	SS
Gear Positioning Lever Bolt	10	1.0	87 in·lb	L
Shift Shaft Return Spring Pin (Bolt)	30	3.1	22	L
Speed Sensor Bolt	12	1.2	106 in·lb	L
Shift Drum Bearing Holder Bolt	12	1.2	106 in·lb	L
Shift Drum Bearing Holder Screw	5.4	0.55	48 in·lb	L
Shift Drum Cam Bolt	12	1.2	106 in·lb	L
Balancer Shaft Clamp Lever Bolt	25	2.5	18	L
Balancer Shaft Clamp Bolt	12	1.2	106 in·lb	
Oil Pipe Holder Bolts	12	1.2	106 in·lb	L
Oil Nozzle	2.5	0.25	22 in·lb	St
Starter Clutch Shaft Bolt	25	2.5	18	L
Starter Clutch Shaft Plate Bolt	12	1.2	106 in·lb	L
Wheels/Tires:				
Front Axle Clamp Bolts	20	2.0	14.5	
Front Axle Nut	125	13	94	
Rear Axle Nut	125	13	94	
Air Valve Nut	12	1.2	106 in·lb	
Final Drive:				
Engine Sprocket Nut	127	13	94	O
Engine Sprocket Cover Bolts	12	1.2	106 in·lb	
Rear Sprocket Nuts	59	6.0	43	
Rear Sprocket Studs	–	–	–	L
Brakes:				
Bleed Valves	7.8	0.80	69 in·lb	
Brake Hose Banjo Bolts	25	2.5	18	
Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Front Reservoir Cap Screws	1.5	0.15	13 in·lb	
Front Brake Light Switch Screws	1.2	0.10	9 in·lb	
Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
Front Brake Pad Spring Bolts	2.9	0.30	26 in·lb	
Front Caliper Mounting Bolts	34	3.5	25	
Front Caliper Assembly Bolts	21	2.1	15	
Brake Disc Mounting Bolts	27	2.8	20	L
Rear Caliper Mounting Bolts	25	2.5	18	
Brake Pedal Mounting Bolt	8.8	0.90	78 in·lb	
Rear Master Cylinder Guard Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	18	1.8	13	
Suspension:				
Front Fork Clamp Bolts (Upper)	20	2.0	14.5	
Front Fork Clamp Bolts (Lower)	20	2.0	14.5	

Torque and Locking Agent

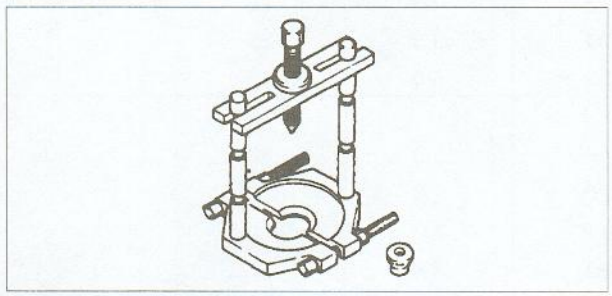
Fastener	Torque			Remarks
	N·m	kg·m	ft·lb	
Front Fork Top Plugs	23	2.3	16.5	
Piston Rod Nut	27	2.8	20	
Front Fork Bottom Allen Bolts	39	4.0	29	L
Front Axle Clamp Bolts	20	2.0	14.5	
Rear Shock Absorber Bracket Nut	59	6.0	43	
Rear Shock Absorber Nuts (Upper and Lower)	34	3.5	25	
Swingarm Pivot Shaft Nut	125	13	94	
Swingarm Pivot Shaft Lock Nut	98	10	72	
Uni-Track Rocker Arm Nut	34	3.5	25	
Tie-rod Nuts	59	6.0	43	
Steering:				
Steering Stem Head Nut	49	5.0	36	
Steering Stem Nut	20	2.0	14.5	
Steering Stem Locknut	9.8	1.0	88 in·lb	
Handlebar Bolts	34	3.5	25	L
Handlebar Weight Bolts	–	–	–	L
Handlebar Switch Housing Screws	3.4	0.35	30 in·lb	
Frame:				
Rear Frame Bolts and Nuts	44	4.5	33	
Footpeg Holder Bolts	25	2.5	18	
Rear Footpeg Bracket Bolts	34	3.5	25	
Side Stand Bracket Bolts	49	5.0	36	
Side Stand Mounting Bolt and Nut	44	4.5	33	
Side Stand Switch Bolt	8.8	0.9	77 in·lb	L
Electrical System:				
Spark Plugs	13	1.3	115 in·lb	
Alternator Rotor Bolt	110	11	80	
Stator Coil Bolts	22	2.2	16	L
Alternator Wire Holding Plate Bolts	8.6	0.88	76 in·lb	L
Engine Gound Wire Terminal Bolt	10	1.0	87 in·lb	
Alternator Cover Bolts	15	1.5	11	
Crankshaft Sensor Cover Bolts	15	1.5	11	L
Crankshaft Sensor Bolts	6	0.6	53 in·lb	
Timing Rotor Bolt	39	4.0	29	
Cam Sensor Bolt	12	1.2	106 in·lb	
Starter Motor Mounting Bolts	12	1.2	106 in·lb	
Handlebar Switch Housing Screws	3.4	0.35	30 in·lb	
Radiator Fan Switch	18	1.8	13	
Water Temperature Sensor	25	2.5	18	SS
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	
Gear Position Switch Screws	4	0.4	35 in·lb	L
Starter Lockout Switch Screws	1.0	0.10	9 in·lb	
Tail/Brake Light Assy Mounting Nuts	5.9	0.6	52 in·lb	

Special Tools and Sealant

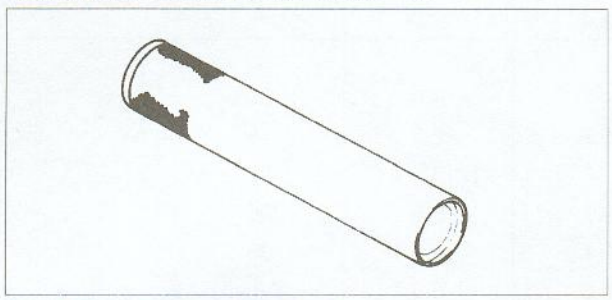
Oil Pressure Gauge, 5 kg/cm^2 : 57001–125



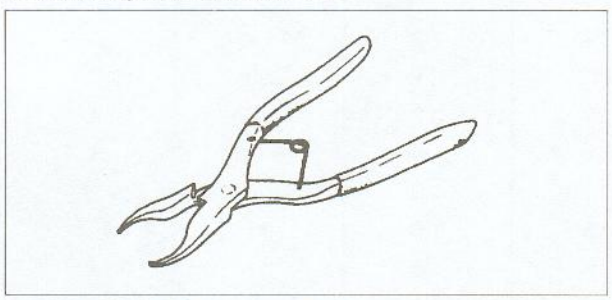
Bearing Puller : 57001–135



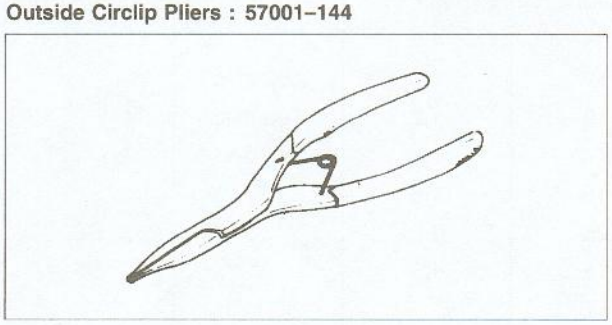
Steering Stem Bearing Driver : 57001–137



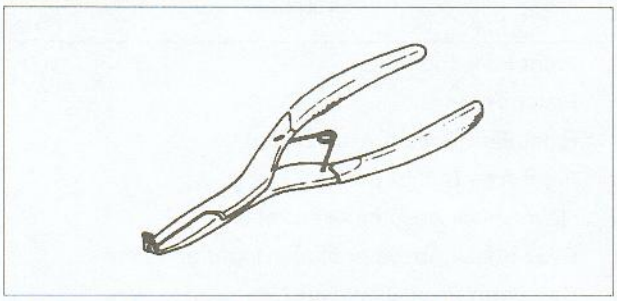
Inside Circlip Pliers : 57001–143



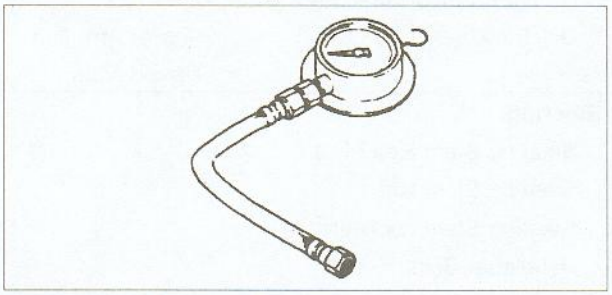
Outside Circlip Pliers : 57001–144



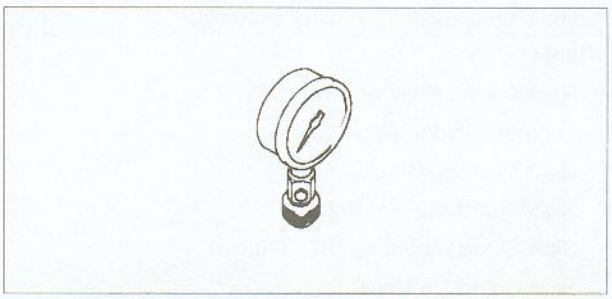
Circlip Pliers: 57001–154



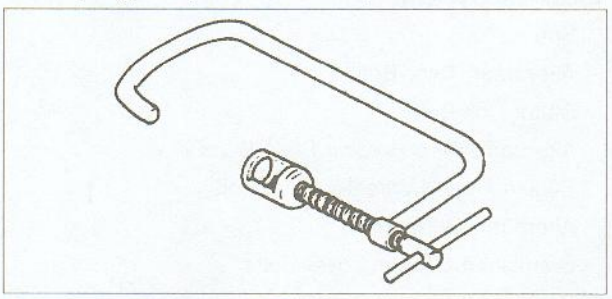
Oil Pressure Gauge, 10 kg/cm^2 : 57001–164



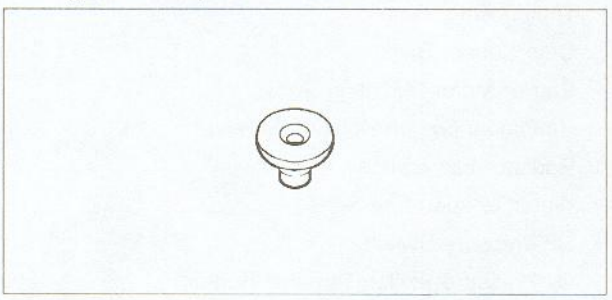
Compression Gauge : 57001–221



Valve Spring Compressor Assembly : 57001–241

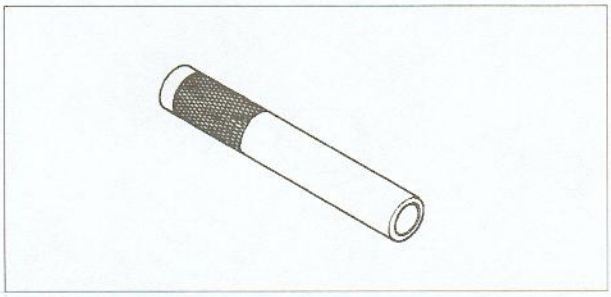


Bearing Puller Adapter : 57001–317

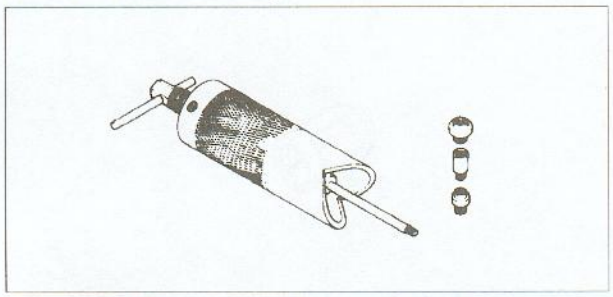


Special Tools and Sealant

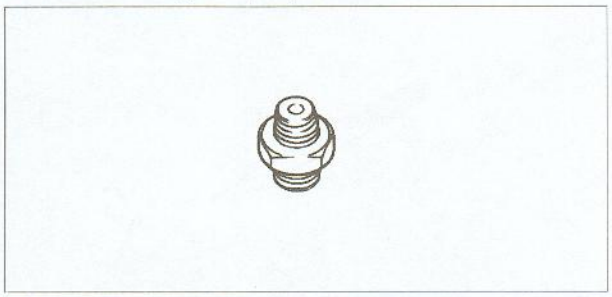
Bearing Driver : 57001–382



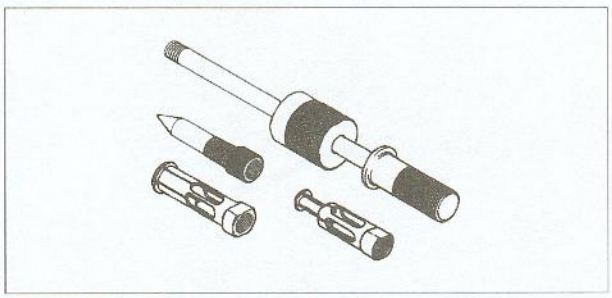
Piston Pin Puller Assembly : 57001–910



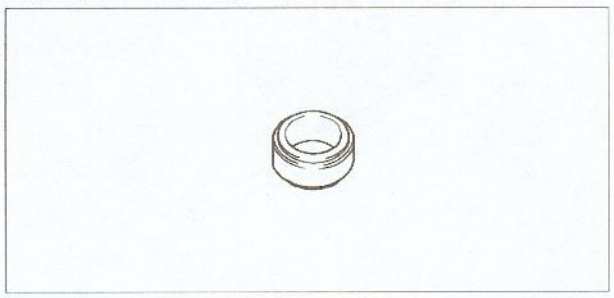
Oil Pressure Gauge Adapter, PT 1/8 : 57001–1033



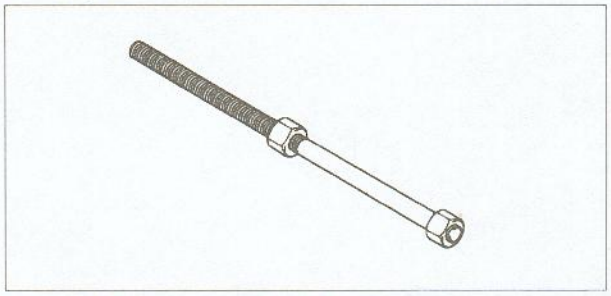
Oil Seal & Bearing Remover : 57001–1058



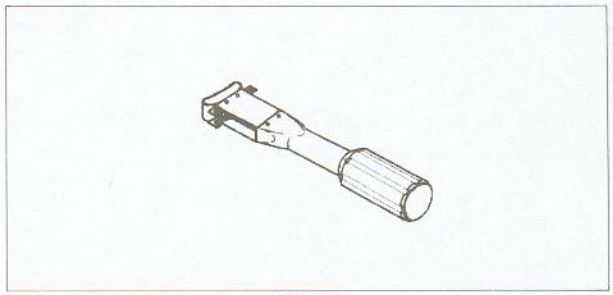
Steering Stem Bearing Driver Adapter : 57001–1074



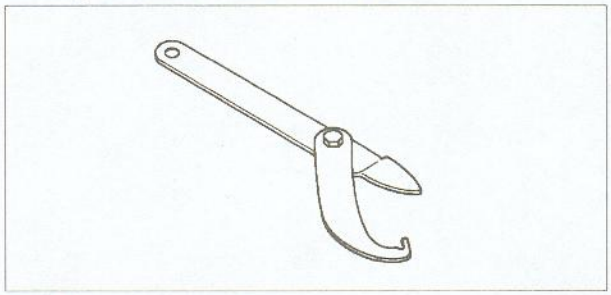
Head Pipe Outer Race Press Shaft : 57001–1075



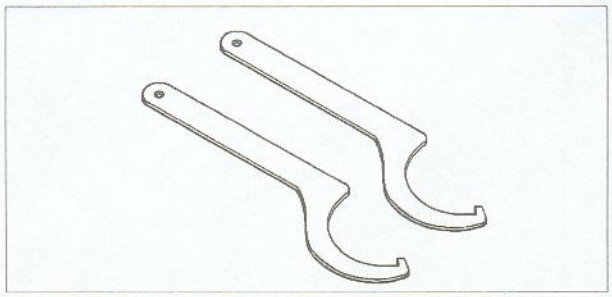
Piston Ring Compressor Grip : 57001–1095



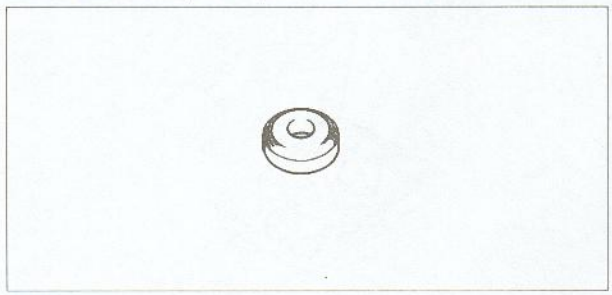
Steering Stem Nut Wrench : 57001–1100



Hook Wrench : 57001–1101

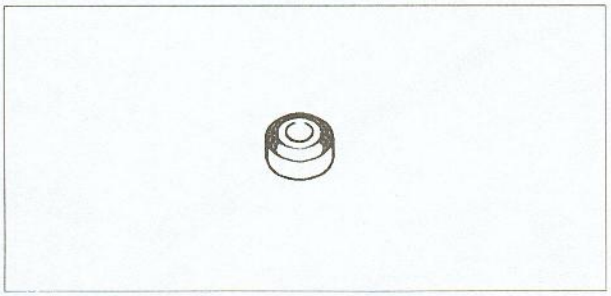


Valve Seat Cutter, 45° – φ35 : 57001–1116

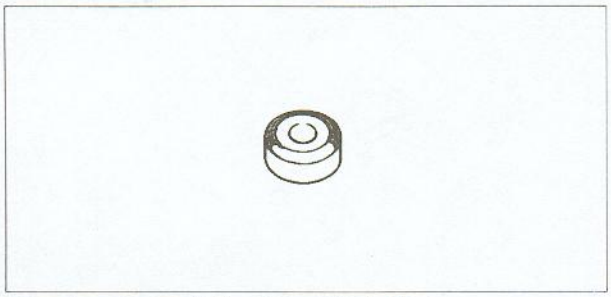


Special Tools and Sealant

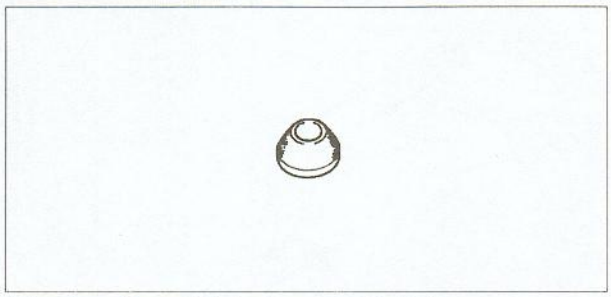
Valve Seat Cutter, 30° – φ30 : 57001–1120



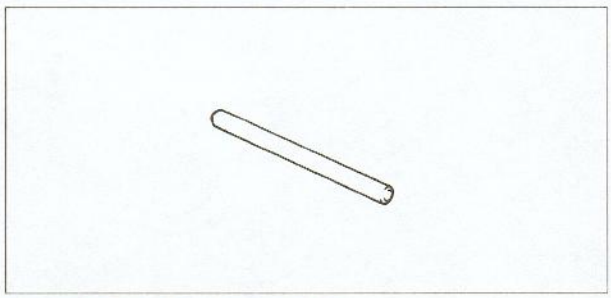
Valve Seat Cutter, 32° – φ35 : 57001–1121



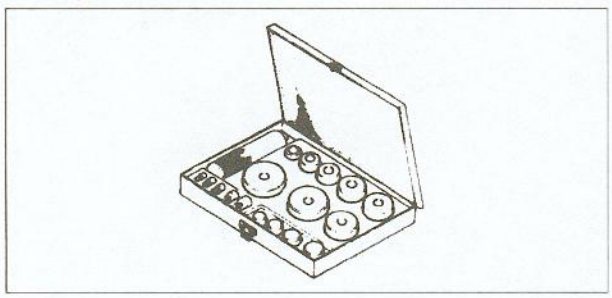
Valve Seat Cutter, 60° – φ30 : 57001–1123



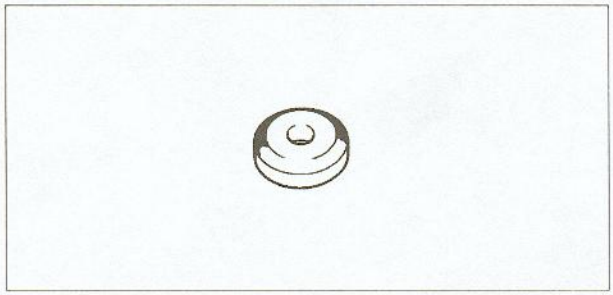
Valve Seat Cutter Holder Bar : 57001–1128



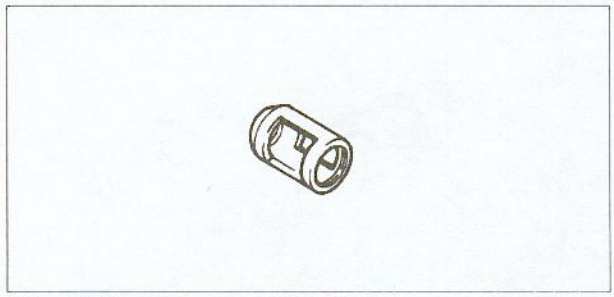
Bearing Driver Set : 57001–1129



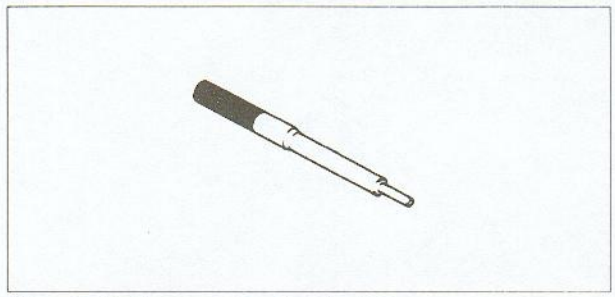
Valve Seat Cutter, 45° – φ30 : 57001–1187



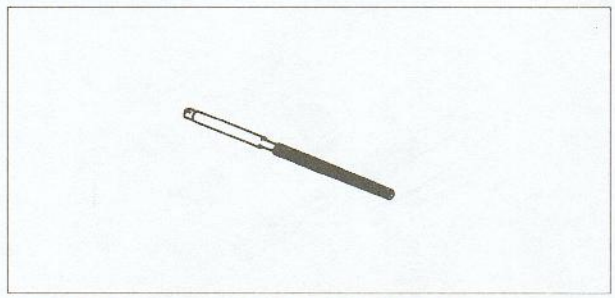
Valve Spring Compressor Adapter, φ22 : 57001–1202



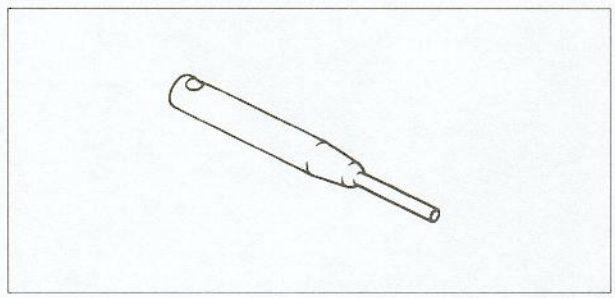
Valve Guide Arbor, φ5 : 57001–1203



Valve Guide Reamer, φ5 : 57001–1204

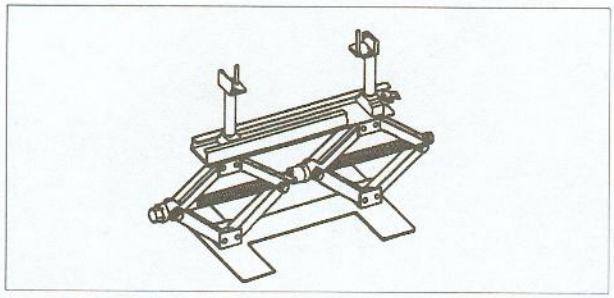


Valve Seat Cutter Holder, φ5 : 57001–1208

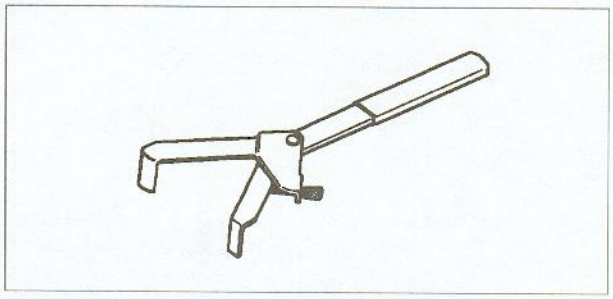


Special Tools and Sealant

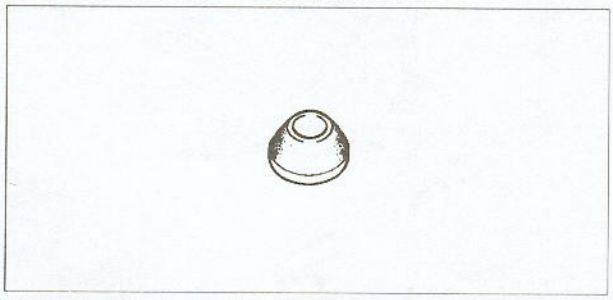
Jack : 57001–1238



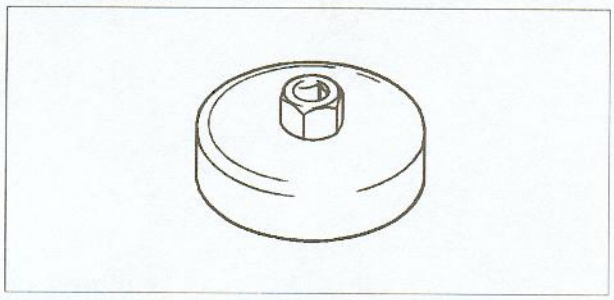
Clutch Holder : 57001–1243



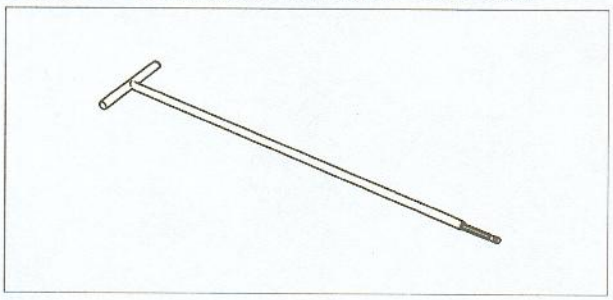
Valve Seat Cutter, 55° – φ35 : 57001–1247



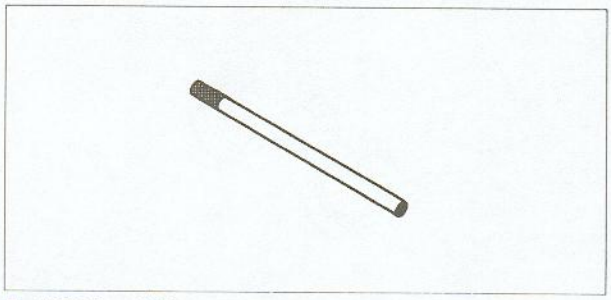
Oil Filter Wrench : 57001–1249



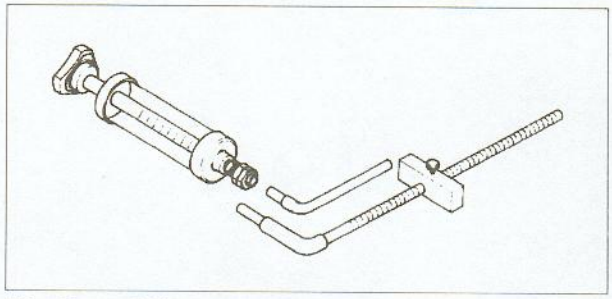
Carburetor Drain Plug Wrench, Hex 3 : 57001–1269



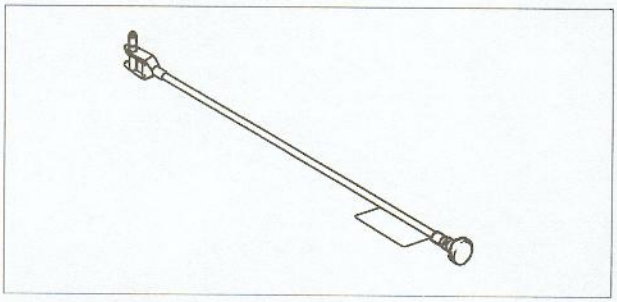
Fork Piston Rod Puller, M12 x 1.25 : 57001–1289



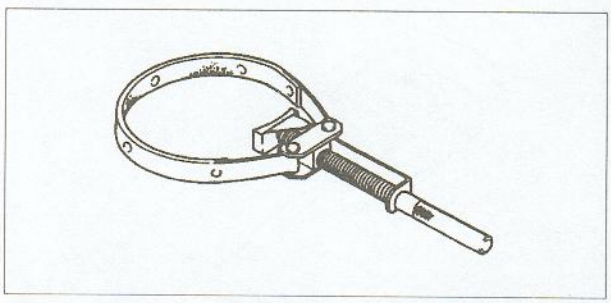
Fork Oil Level Gauge : 57001–1290



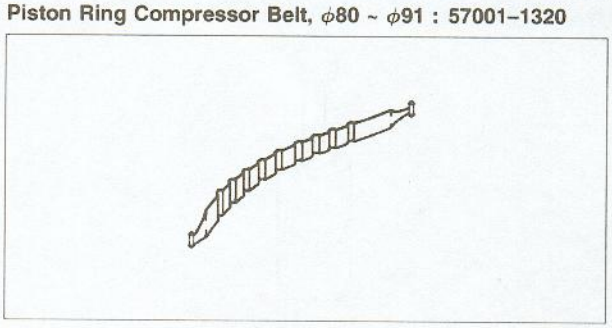
Pilot Screw Adjuster, C: 57001–1292



Flywheel Holder : 57001–1313

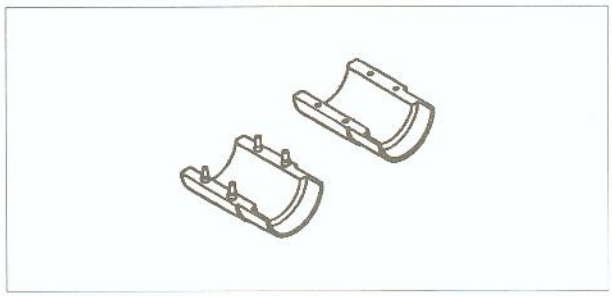


Piston Ring Compressor Belt, φ80 ~ φ91 : 57001–1320

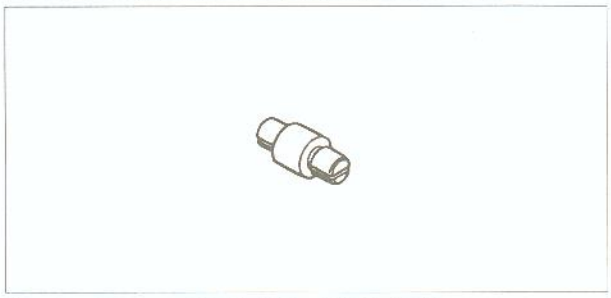


Special Tools and Sealant

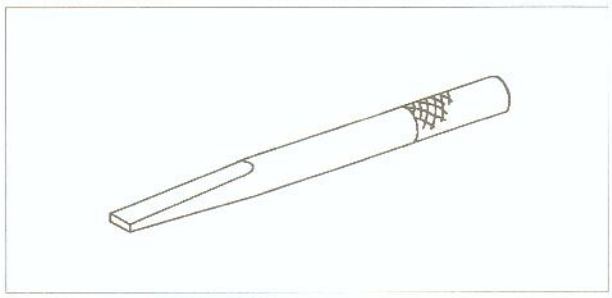
Fork Oil Seal Driver, ϕ43 : 57001–1340



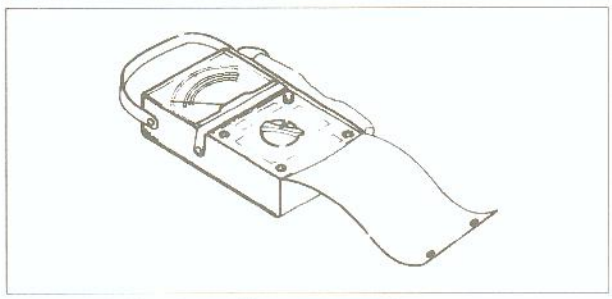
Bearing Remover Head, ϕ25 x ϕ28 : 57001–1346



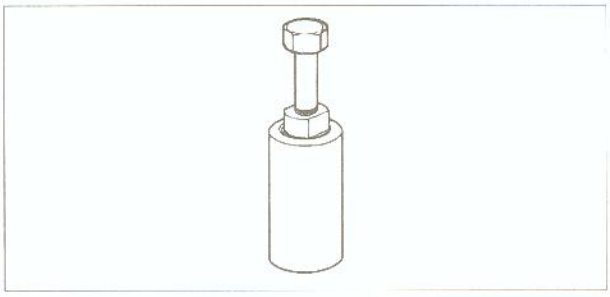
Bearing Remover Shaft, ϕ13 : 57001–1377



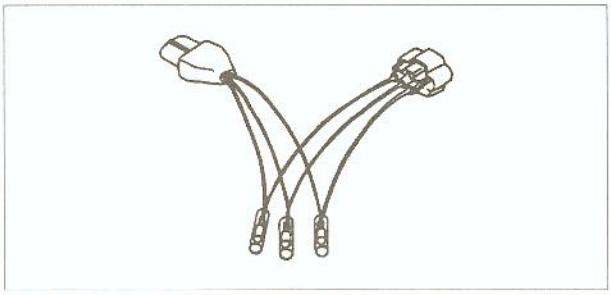
Hand Tester : 57001–1394



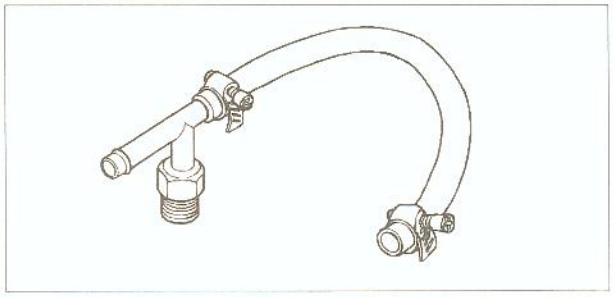
Flywheel Puller Assembly : 57001–1405



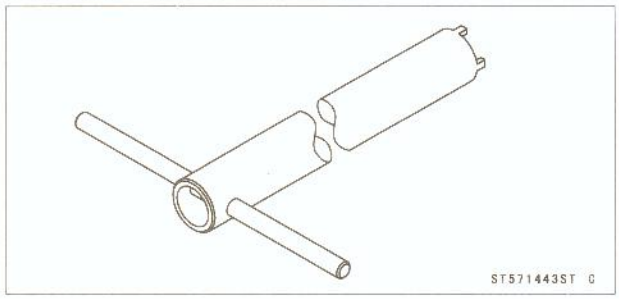
Throttle Sensor Setting Adepter #2 : 57001–1408



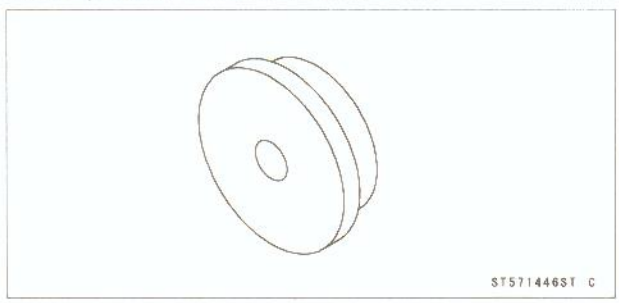
Fuel Pressure Gauge Adapter : 57001–1417



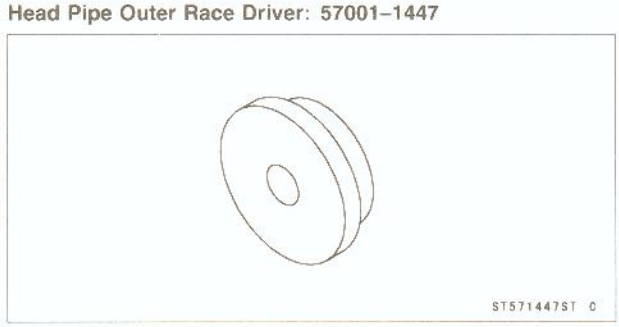
Fork Cylinder Holder: 57001–1443



Head Pipe Outer Race Driver: 57001–1446

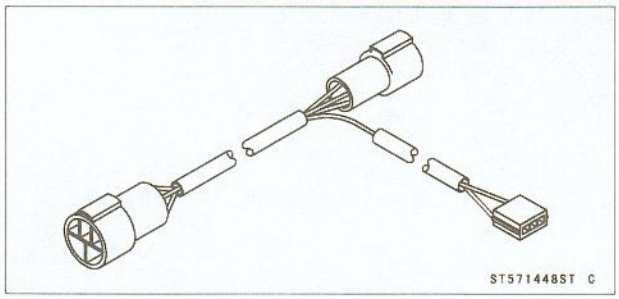


Head Pipe Outer Race Driver: 57001–1447

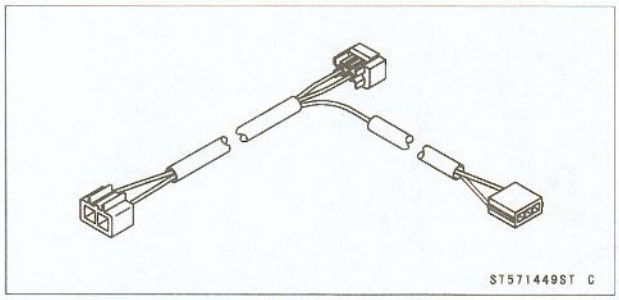


Special Tools and Sealant

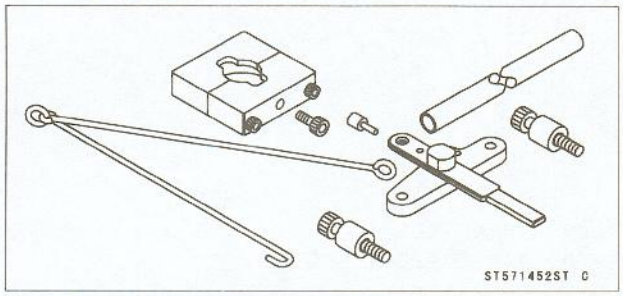
Lead Wire – Voltage Regulator Adapter: 57001–1448



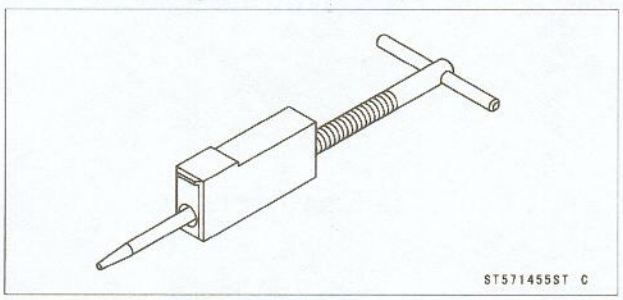
Lead Wire – Voltage Adapter: 57001–1449



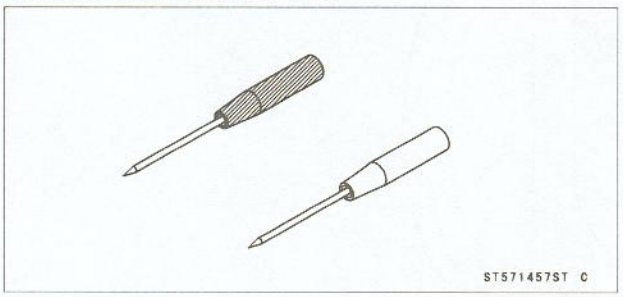
Fork Spring Compressor Set: 57001–1452



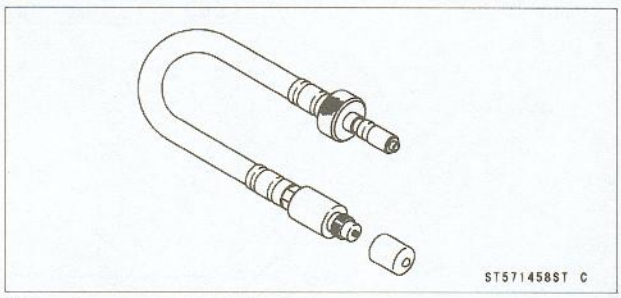
Clutch Gear Setting Screw: 57001–1455



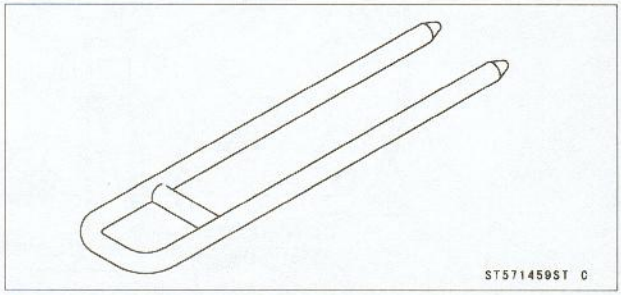
Needle Adapter Set: 57001–1457



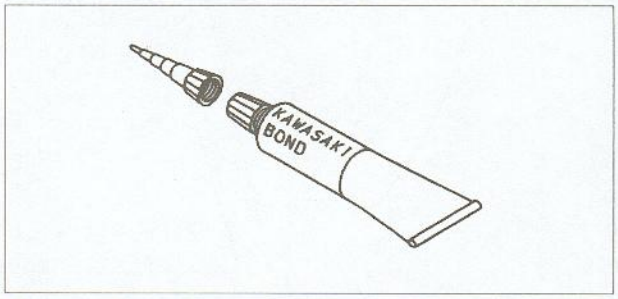
Compression Gauge Adapter: 57001–1458



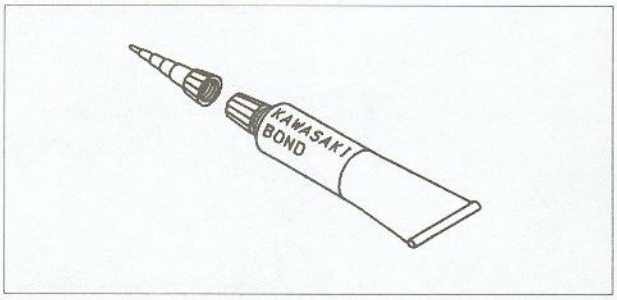
Piston Base, ϕ1.0: 57001–1459

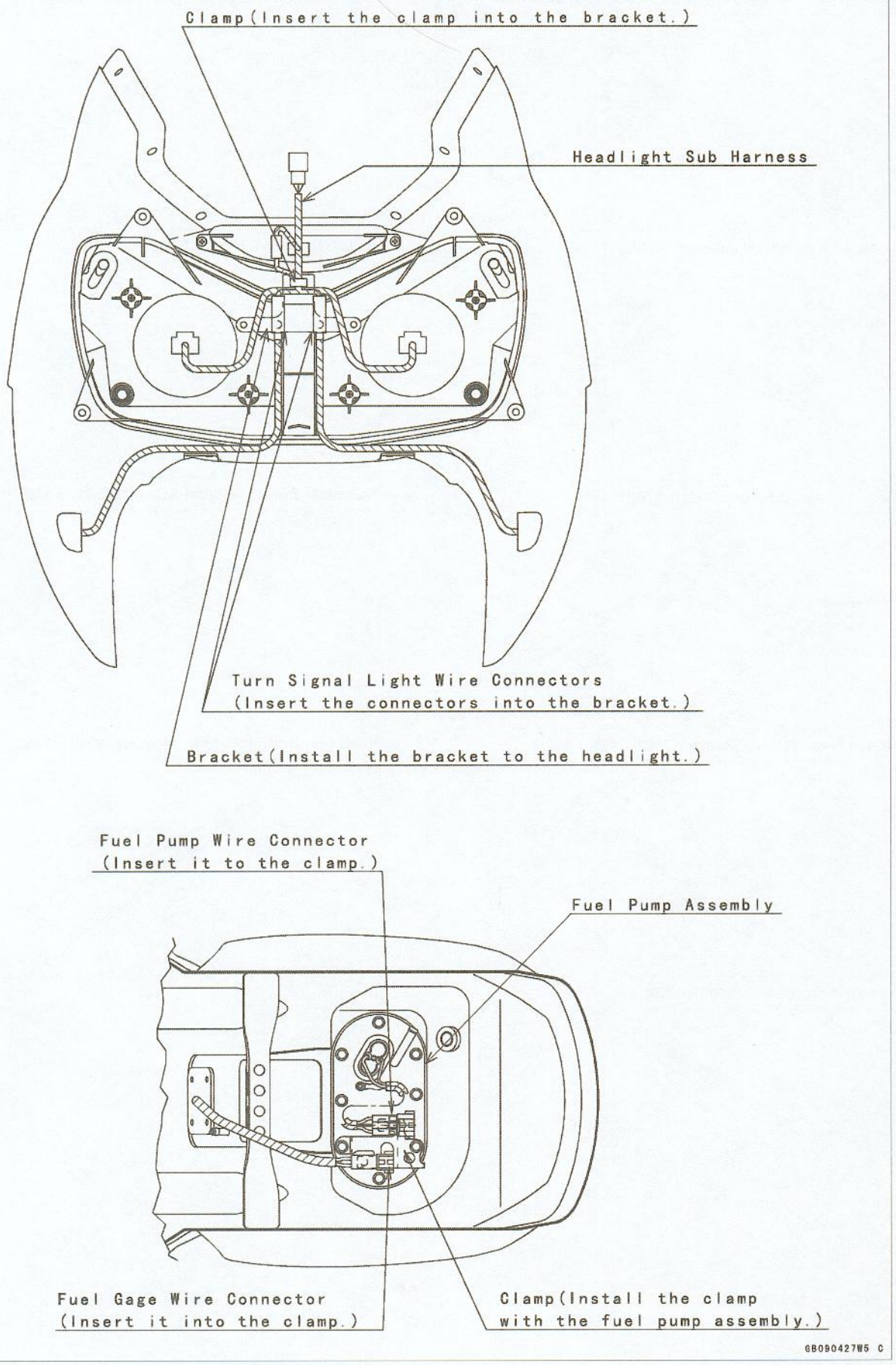


Kawasaki Bond (Silicone Sealant): 56019–120

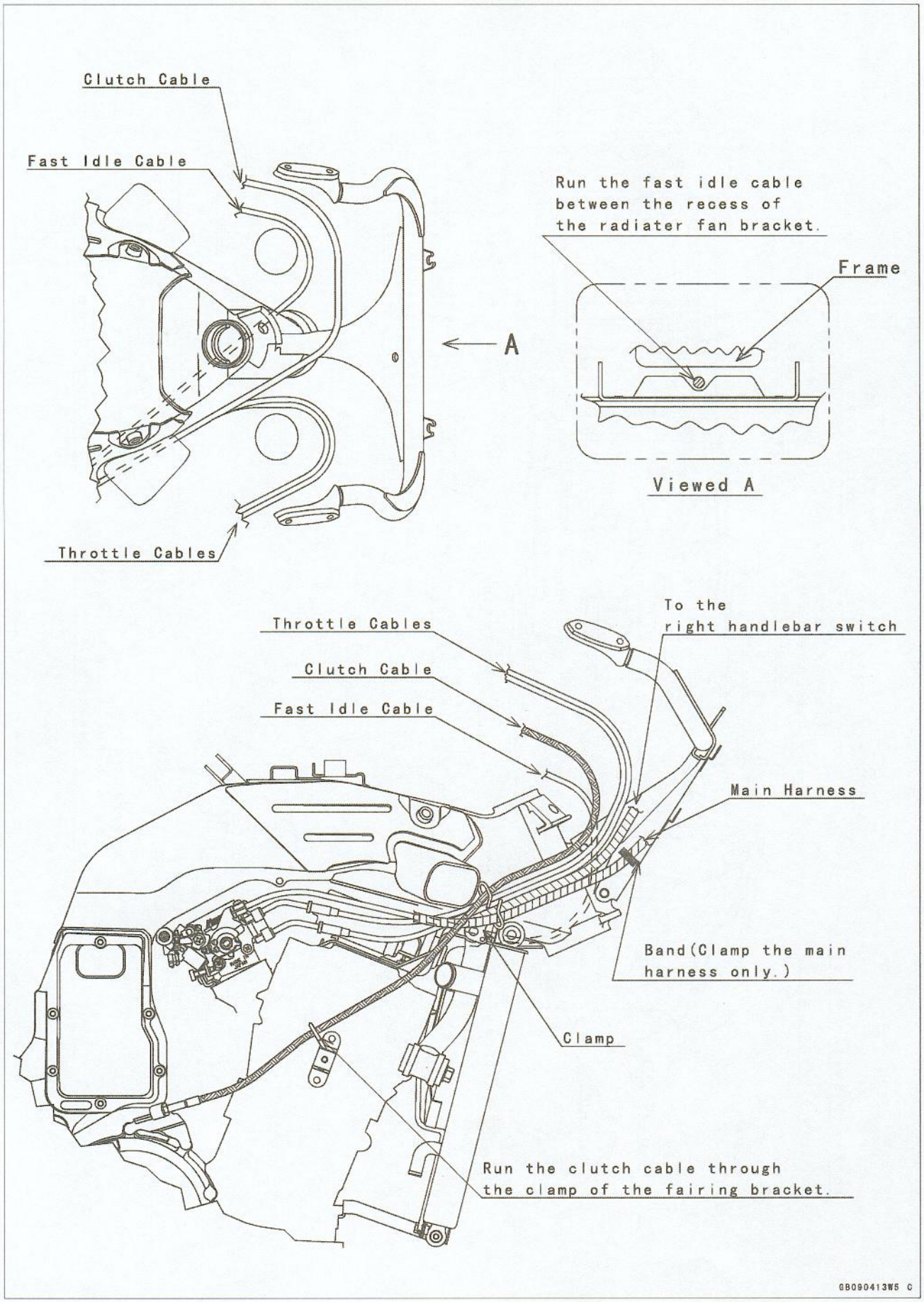


Kawasaki Bond (Silicone Sealant): 92104–1062

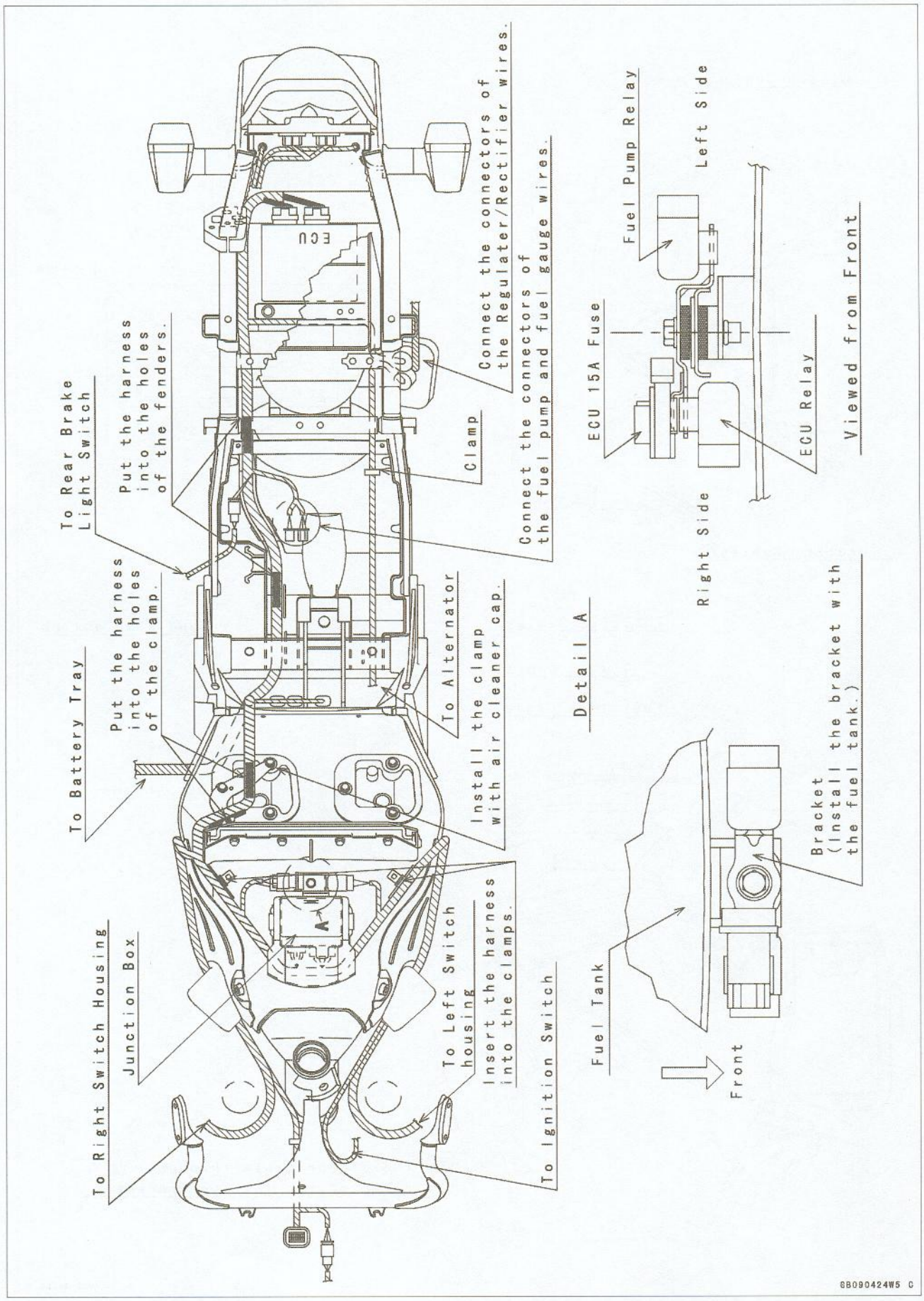



Clamp(Insert the clamp into the bracket.)
Headlight Sub Harness
Turn Signal Light Wire Connectors
(Insert the connectors into the bracket.)
Bracket(Install the bracket to the headlight.)
Fuel Pump Wire Connector
(Insert it to the clamp.)
Fuel Pump Assembly
Fuel Gage Wire Connector
(Insert it into the clamp.)
Clamp(Install the clamp
with the fuel pump assembly.)
GB090427W5 C

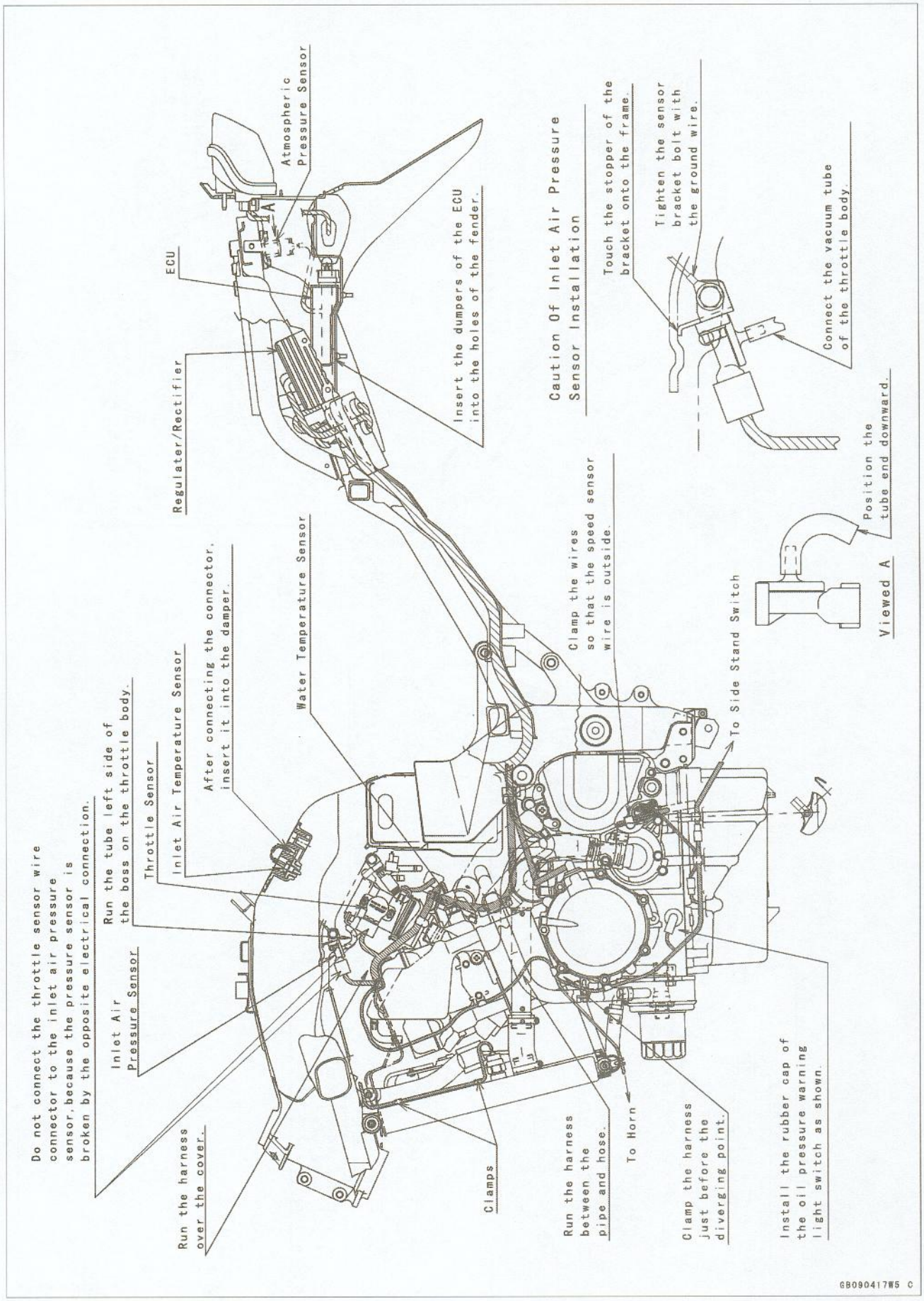
Cable, Wire, and Hose Routing



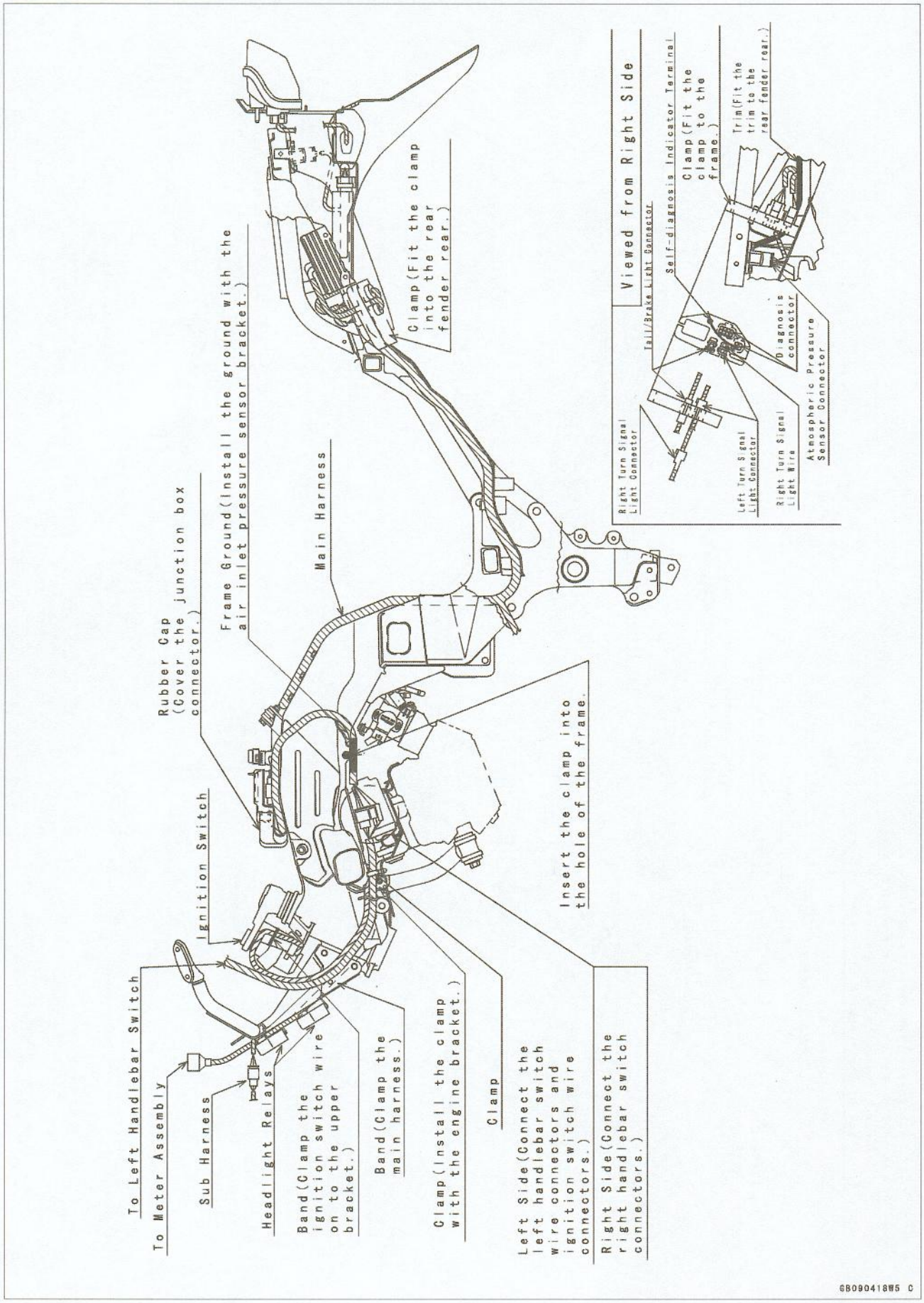
Cable, Wire, and Hose Routing



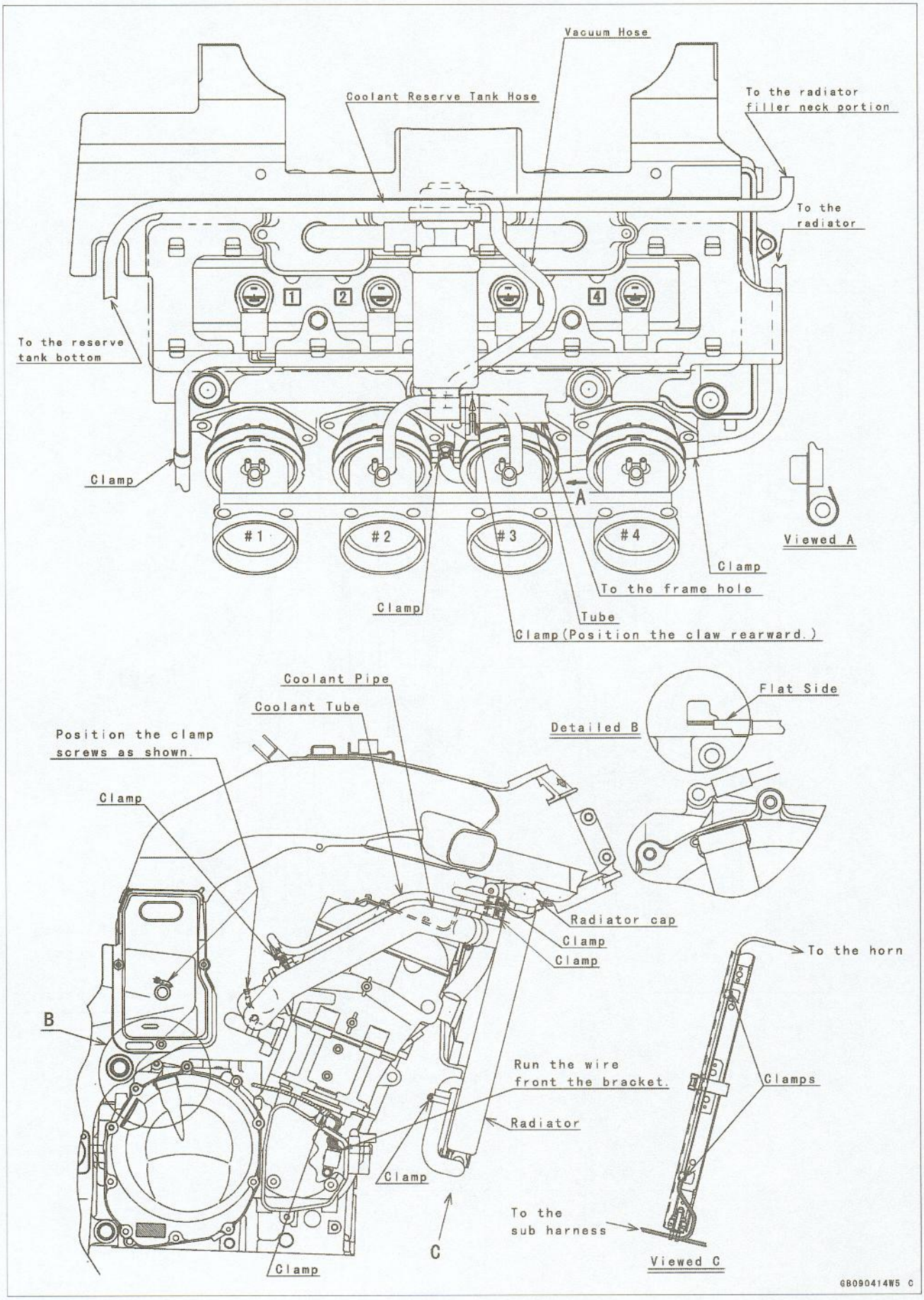
Cable, Wire, and Hose Routing

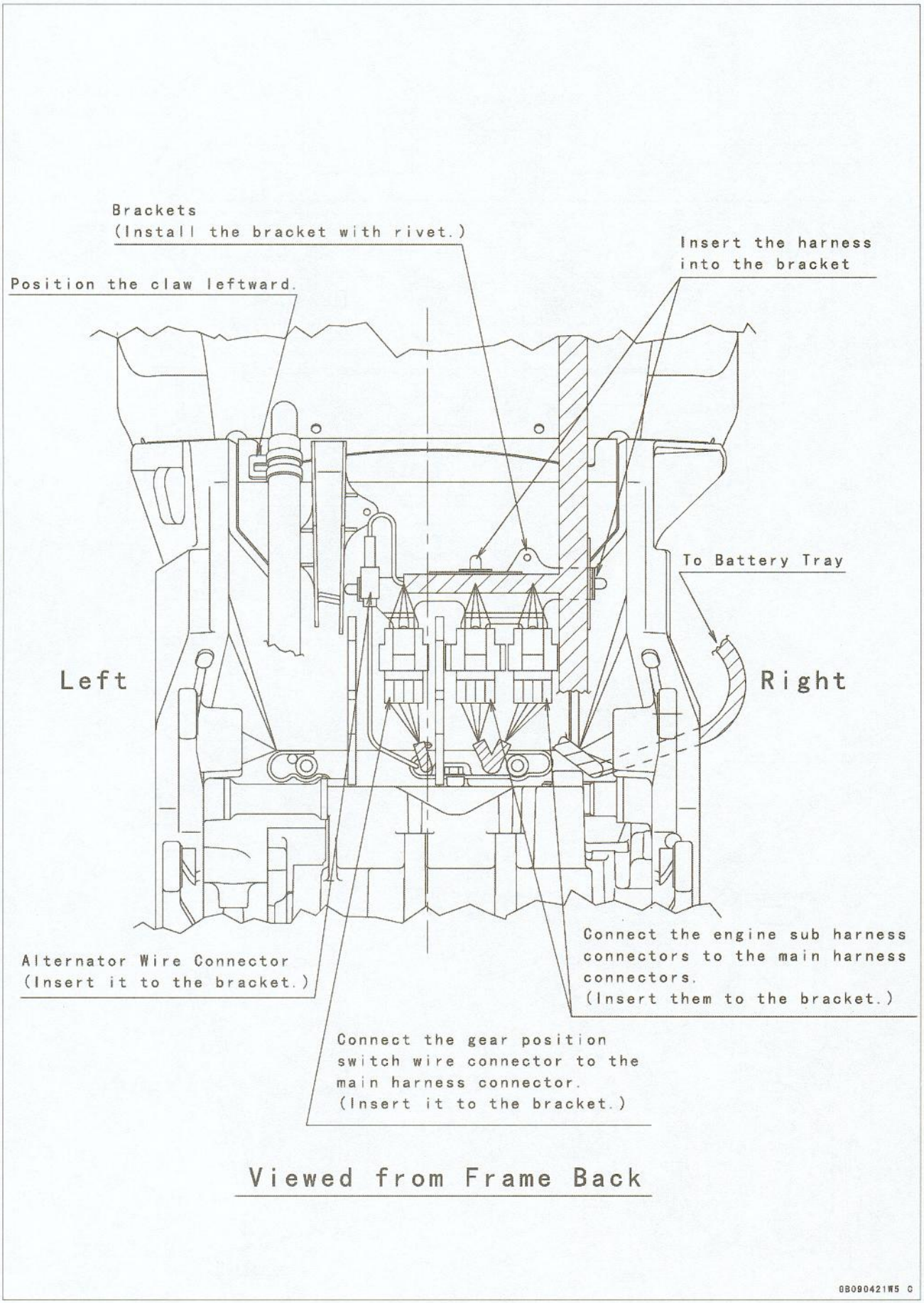


Cable, Wire, and Hose Routing

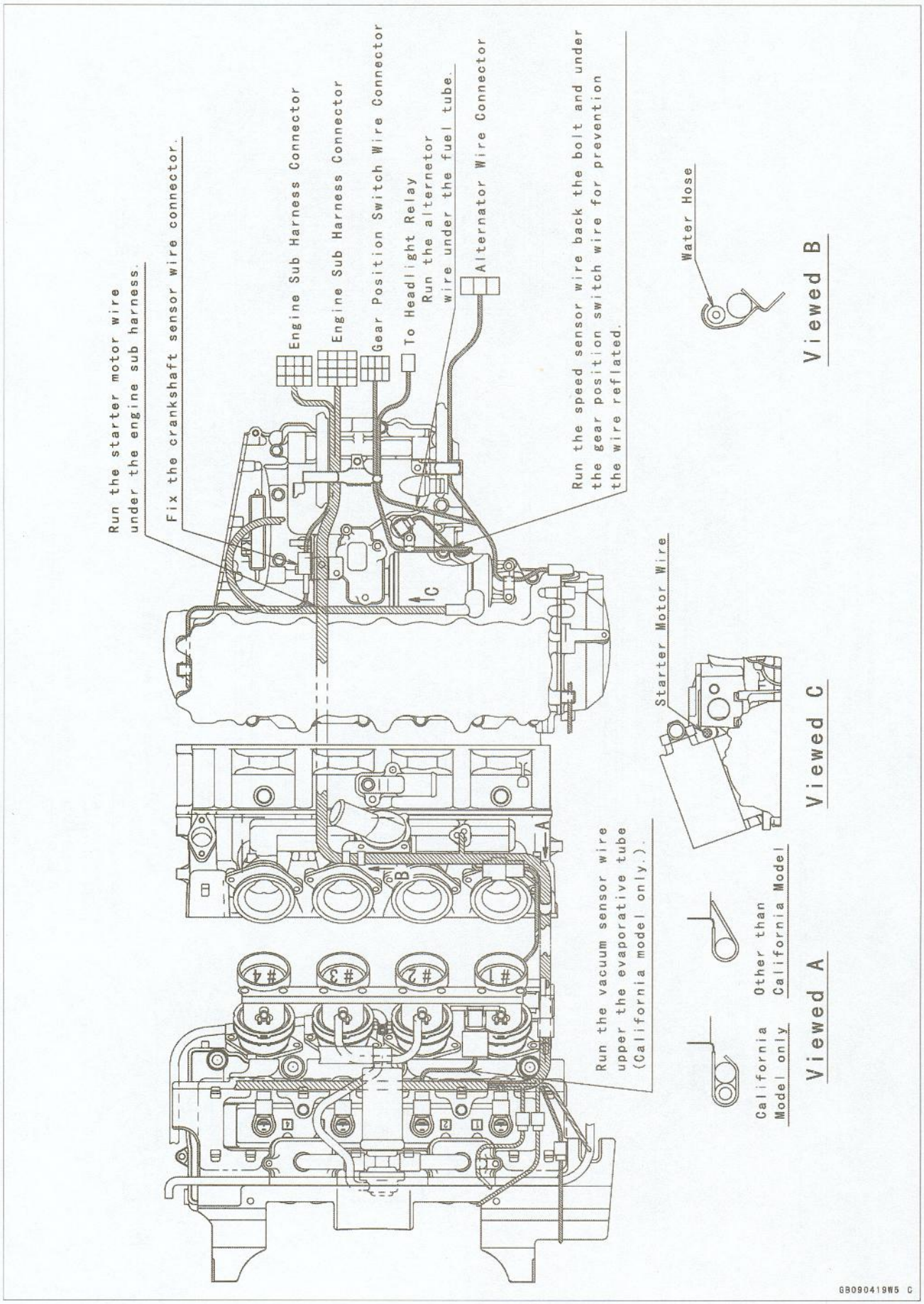


Cable, Wire, and Hose Routing

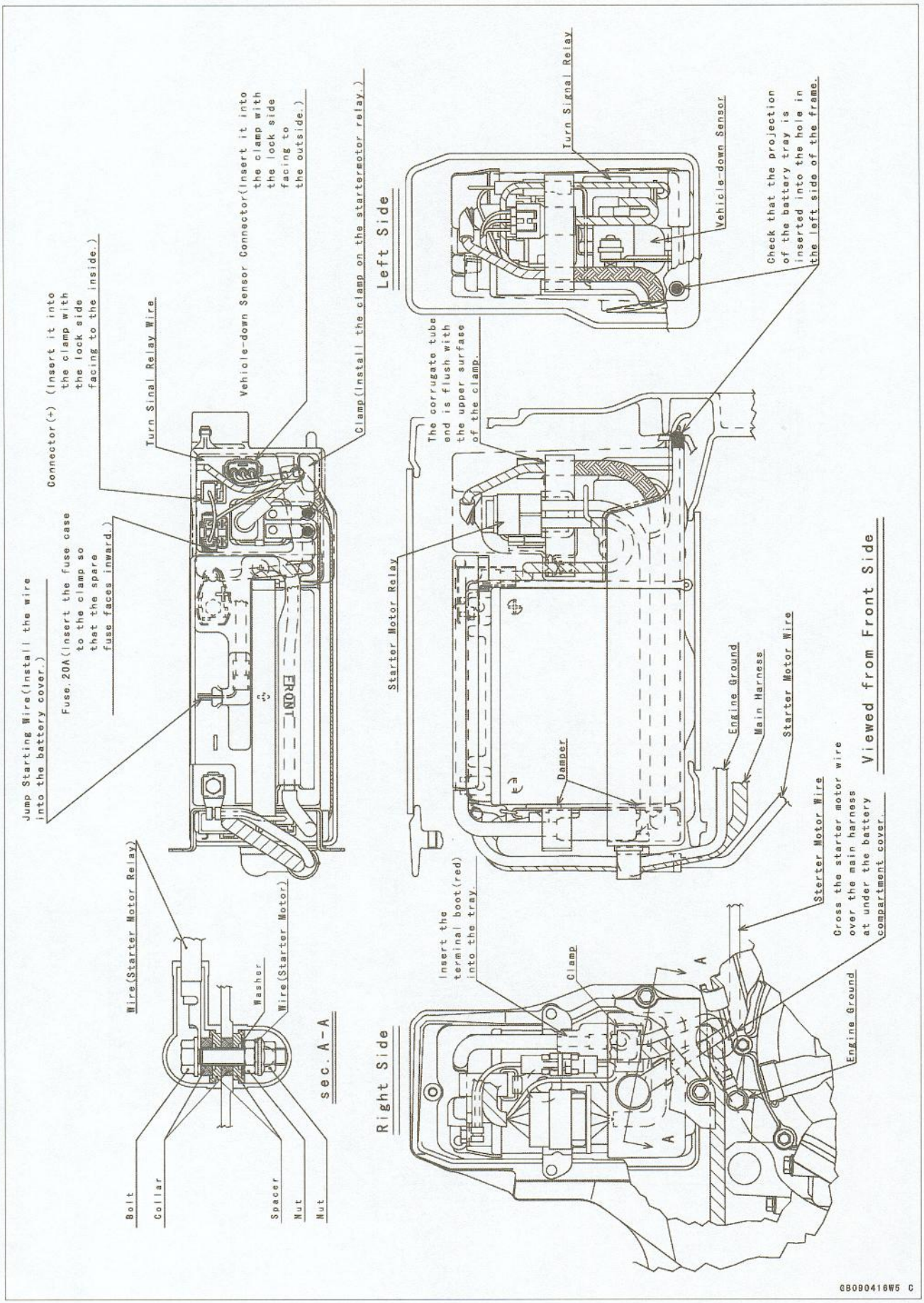



Brackets
(Install the bracket with rivet.)
Insert the harness into the bracket
Position the claw leftward.
To Battery Tray
Left
Right
Alternator Wire Connector
(Insert it to the bracket.)
Connect the engine sub harness connectors to the main harness connectors.
(Insert them to the bracket.)
Connect the gear position switch wire connector to the main harness connector.
(Insert it to the bracket.)
Viewed from Frame Back
0B090421W5 0

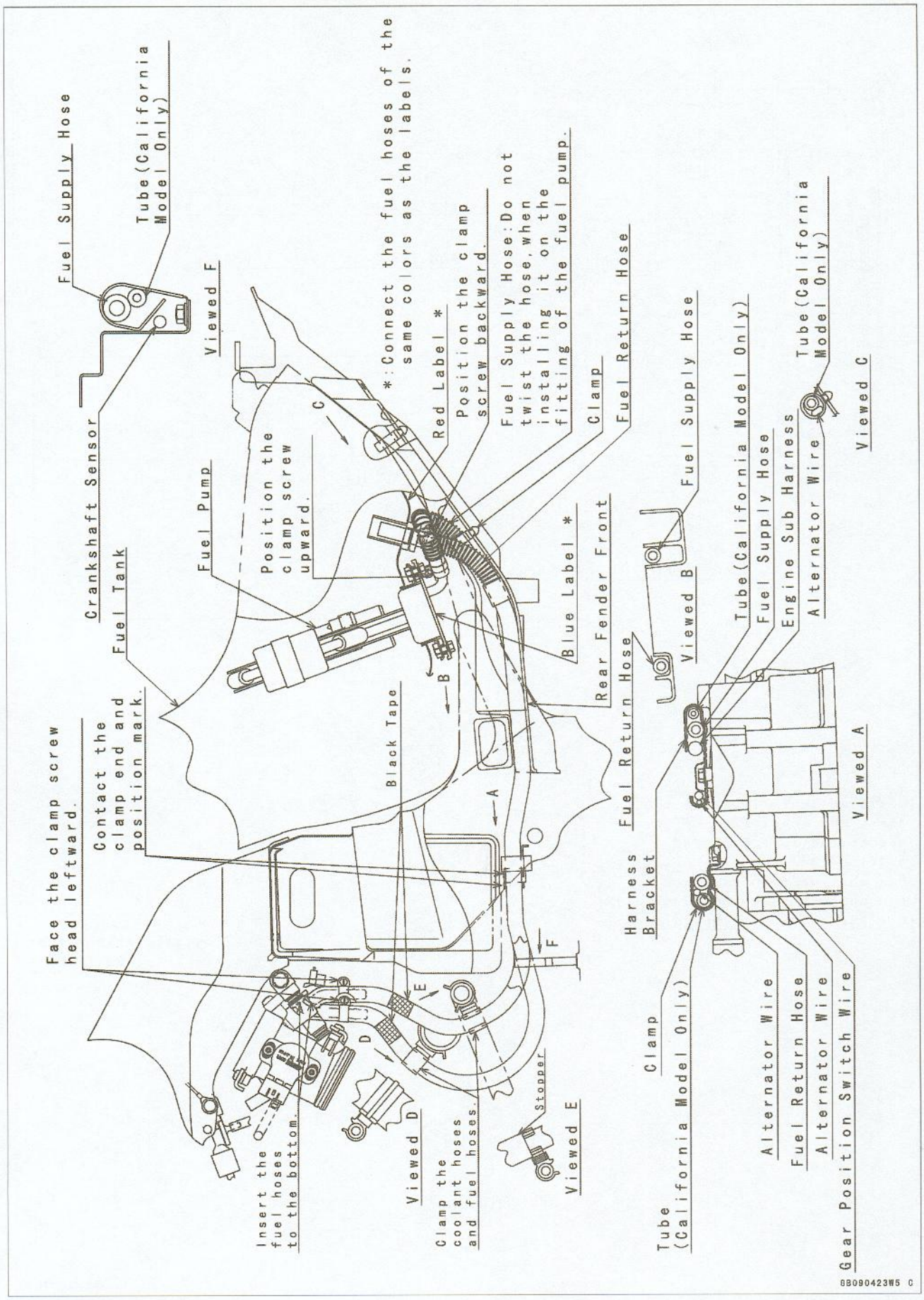
Cable, Wire, and Hose Routing



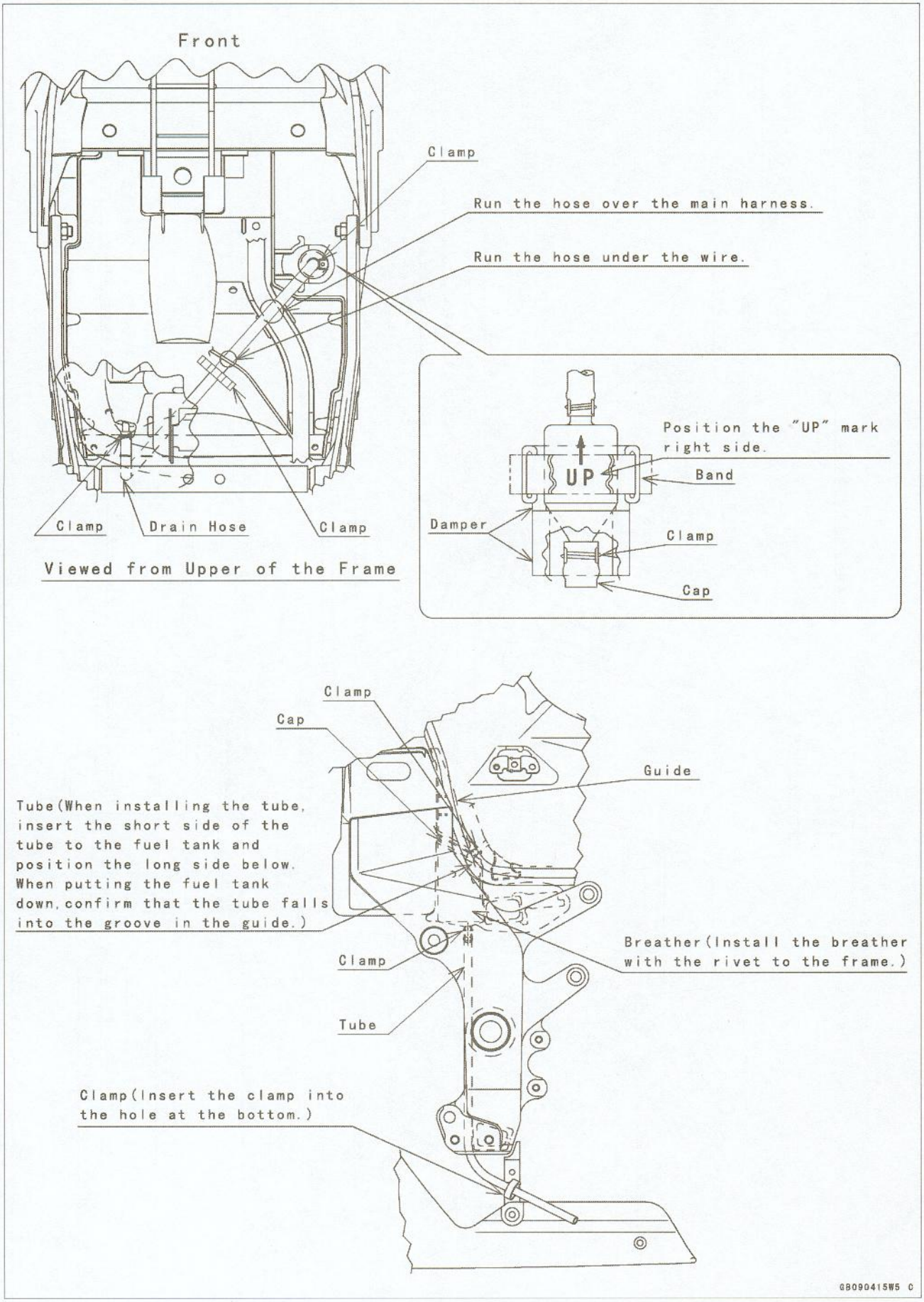
Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing

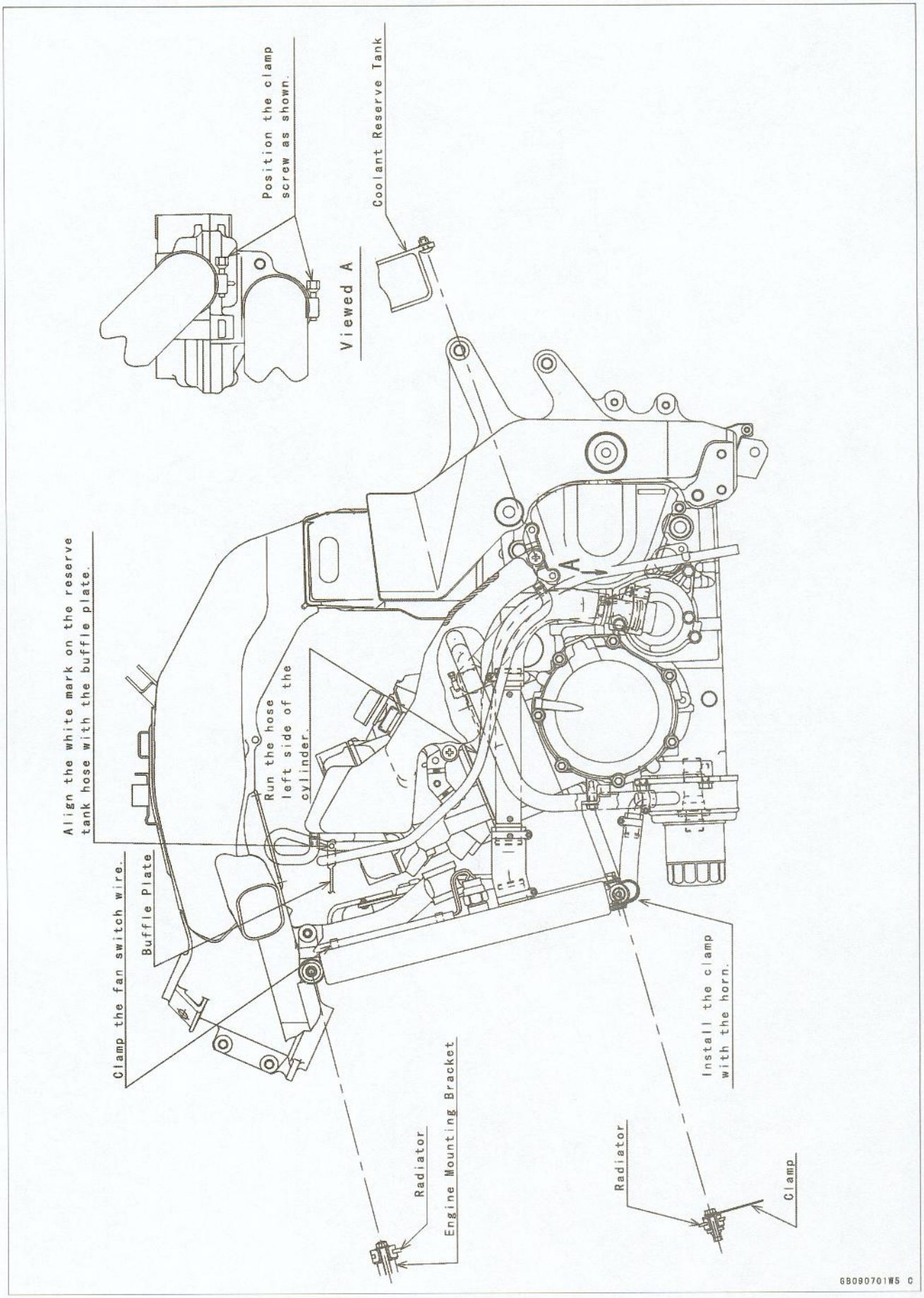


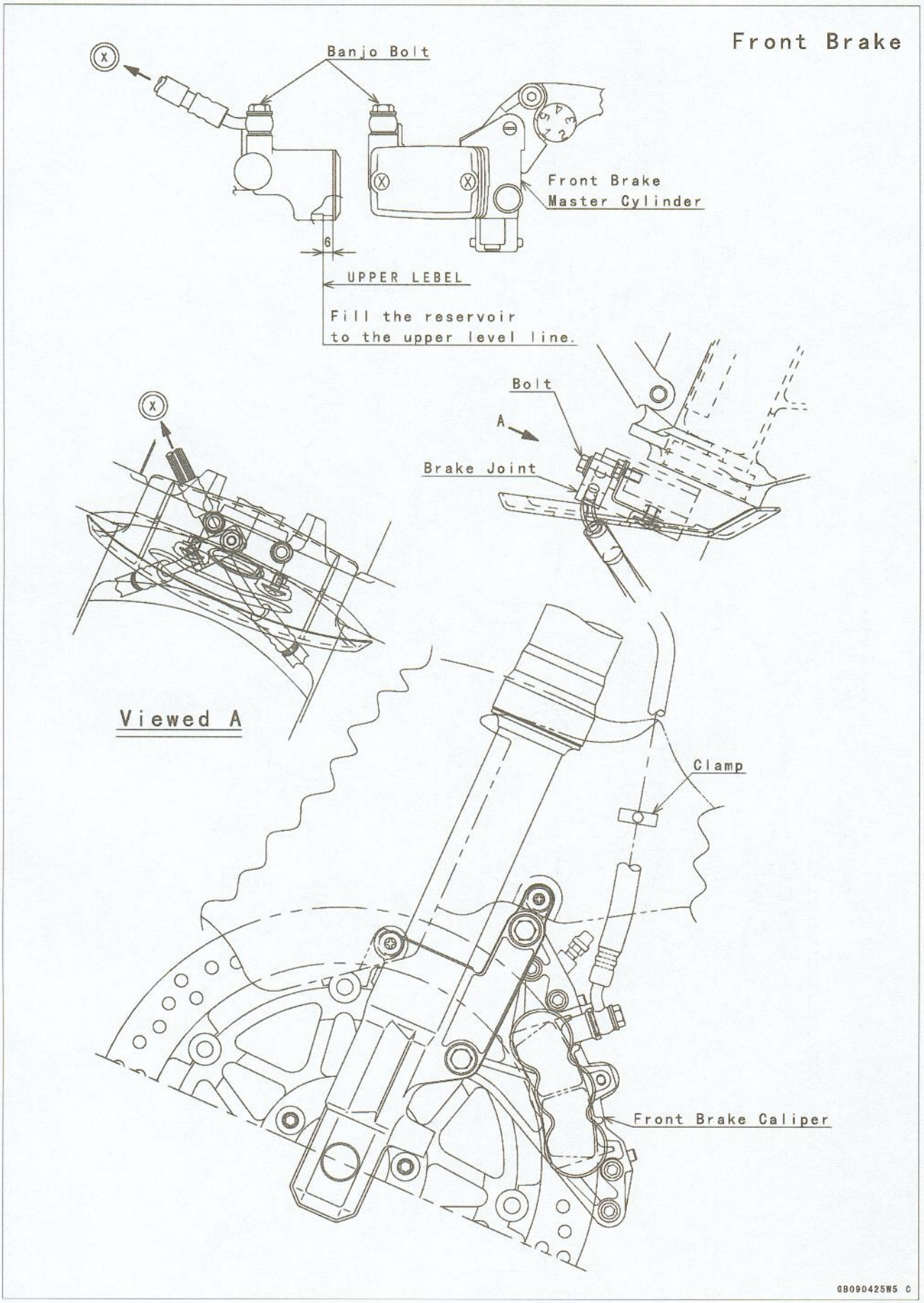
Cable, Wire, and Hose Routing



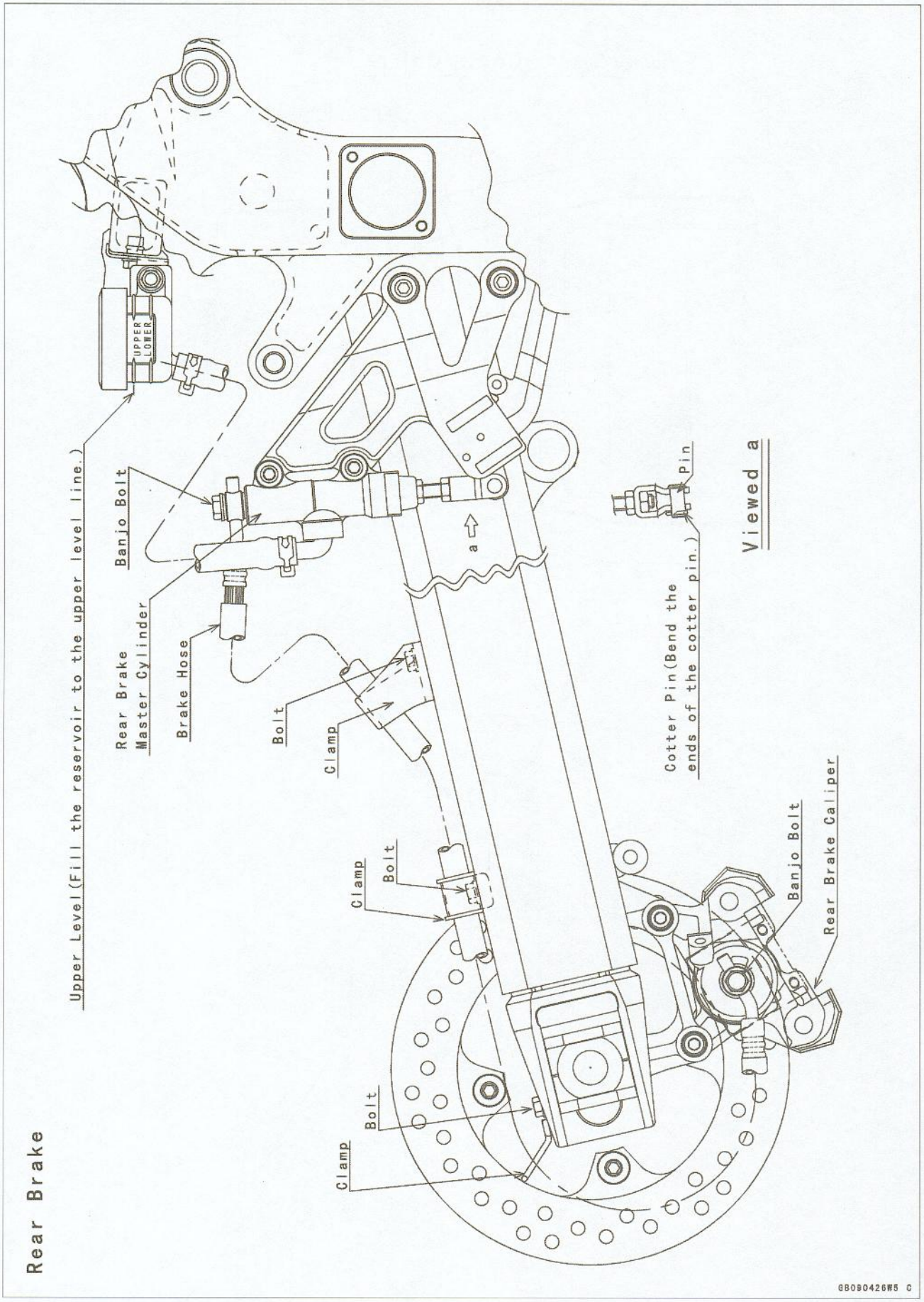
GB090415W5 C

Cable, Wire, and Hose Routing

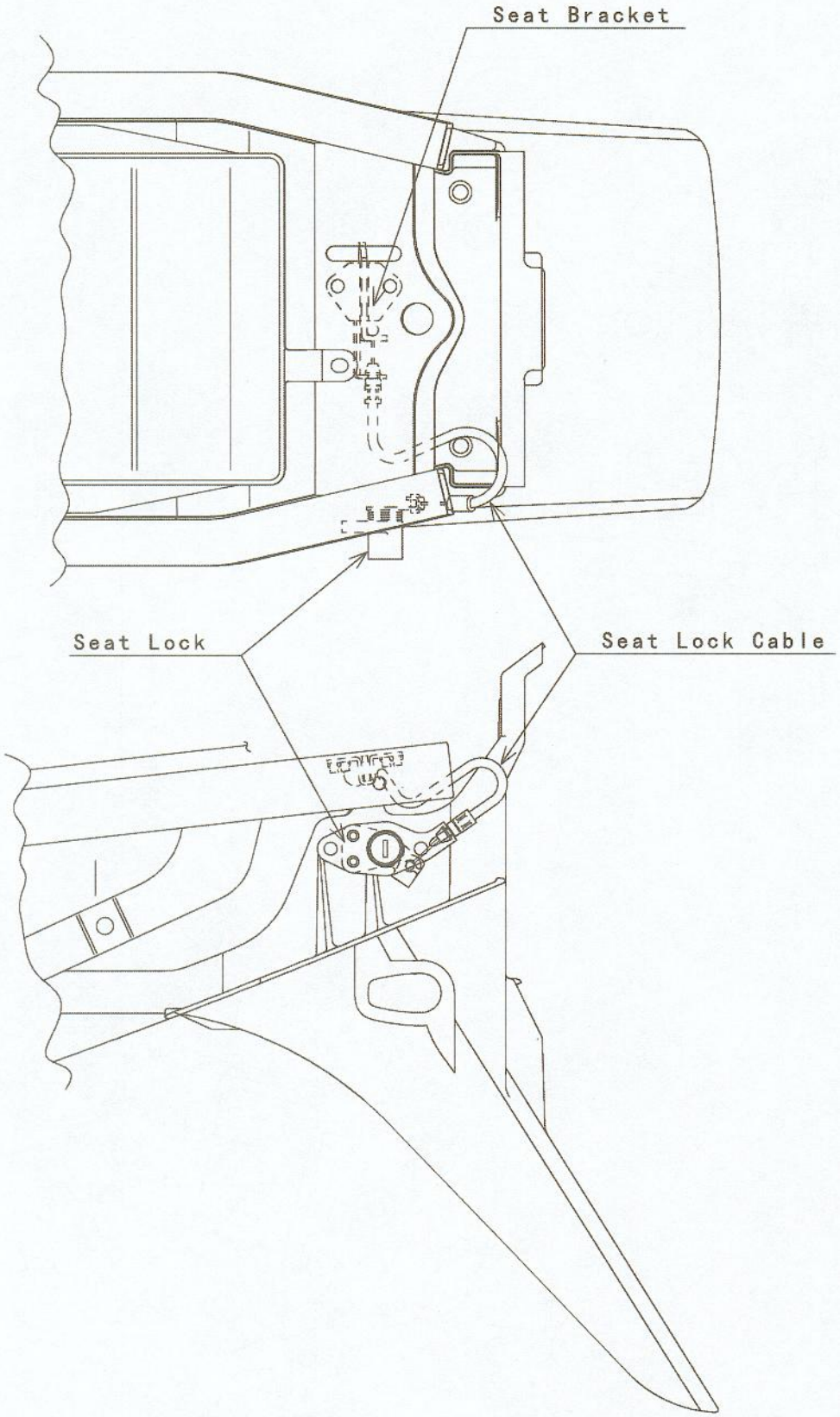



Front Brake
Banjo Bolt
Front Brake
Master Cylinder
6
UPPER LEBEL
Fill the reservoir
to the upper level line.
Bolt
A
Brake Joint
Viewed A
Clamp
Front Brake Caliper
GB090425W5 C

Cable, Wire, and Hose Routing

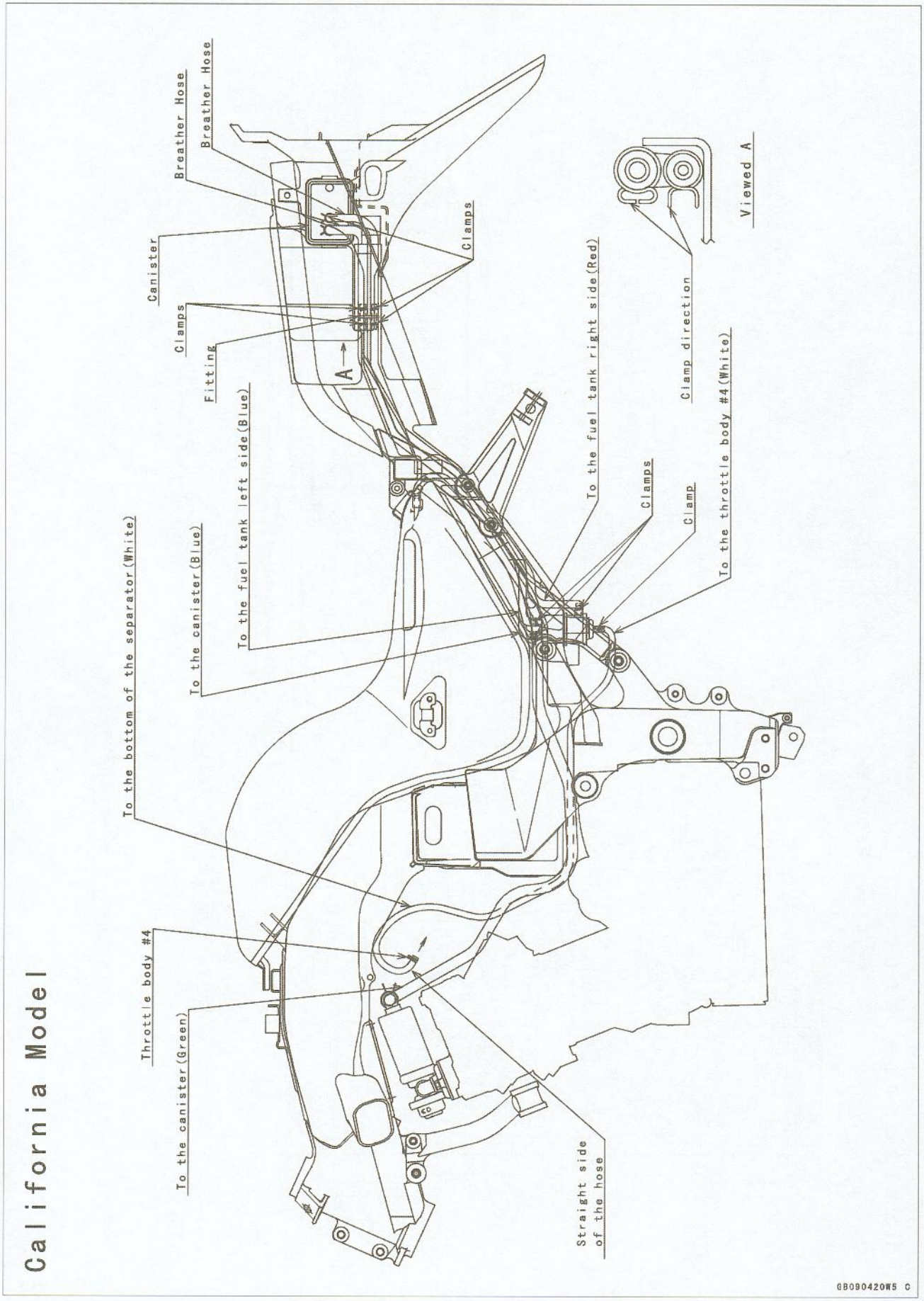


Seat Lock Cable

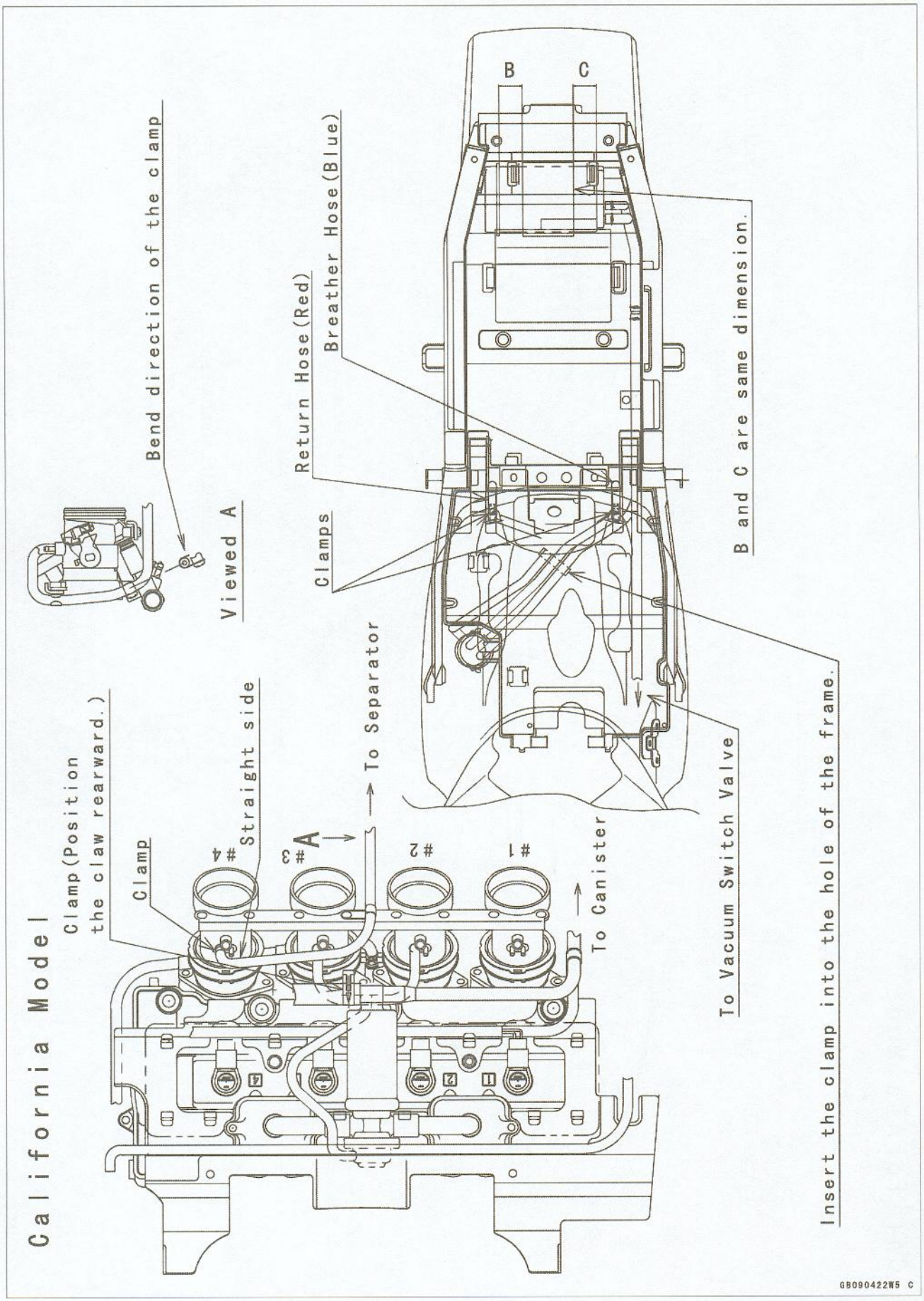


GB090702W5 C

Cable, Wire, and Hose Routing



Cable, Wire, and Hose Routing



Digital Fuel Injection (DFI) System

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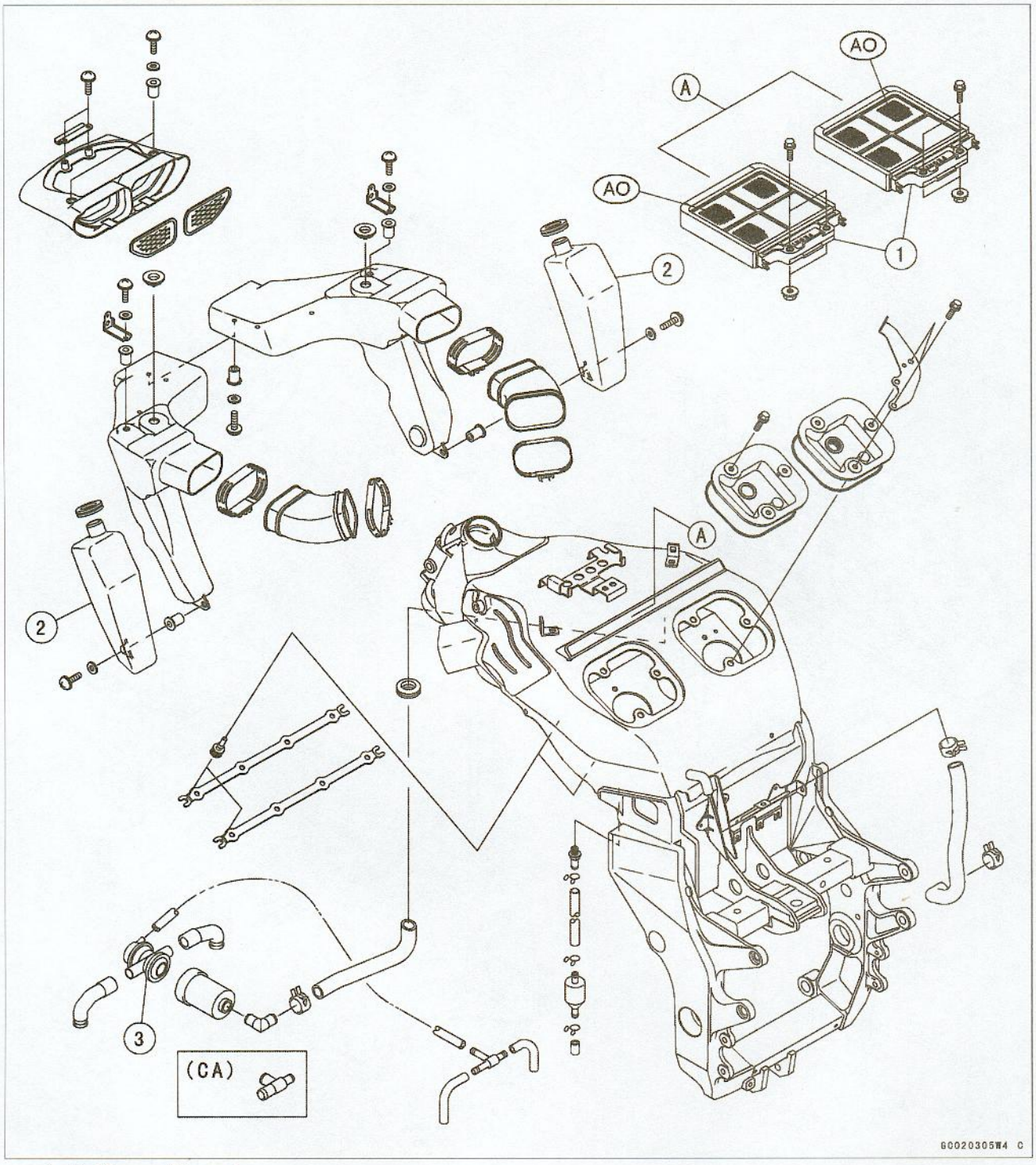
Exploded View

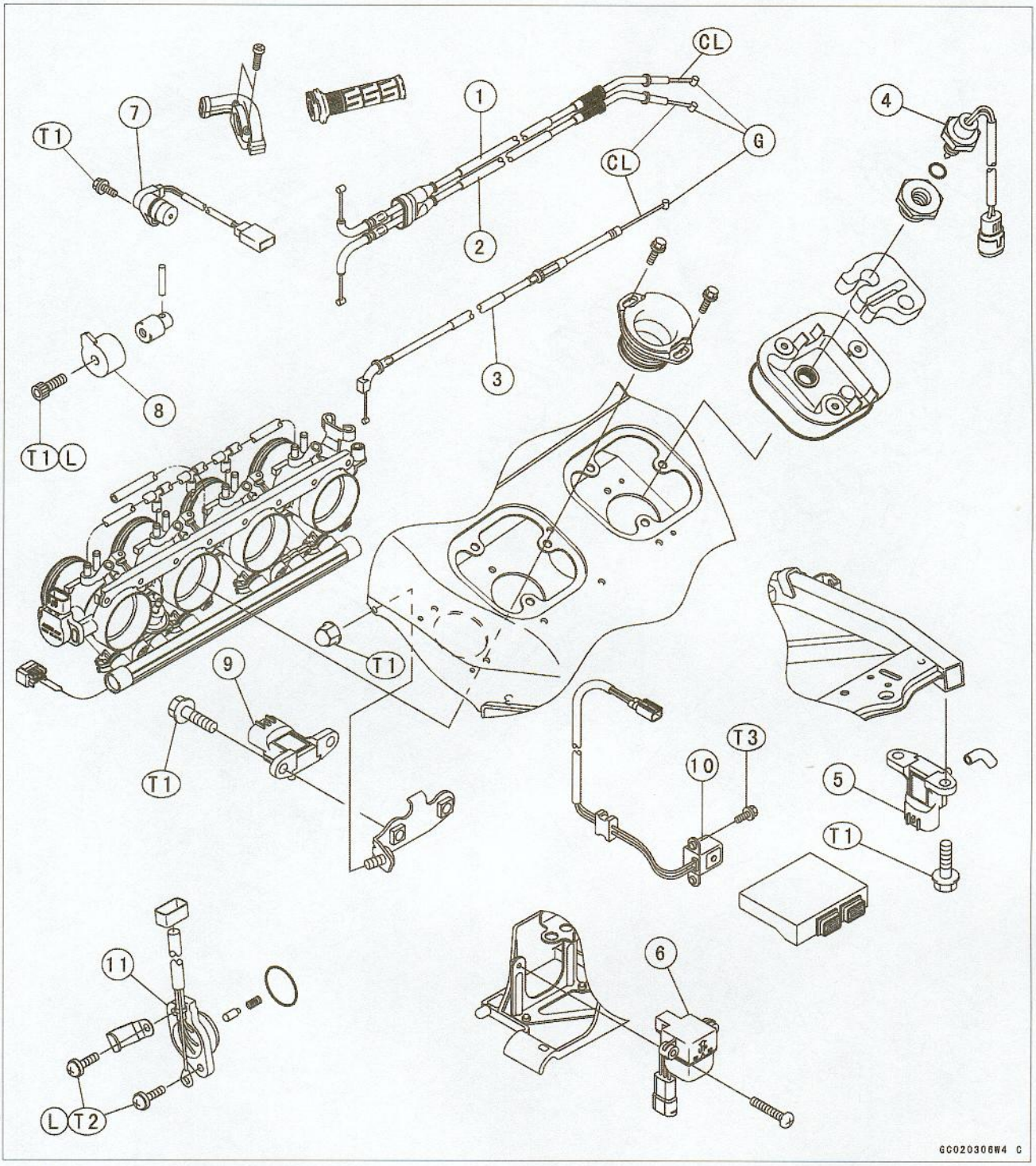


1. Air Cleaner Element
2. Resonators
3. Vacuum Switch-Valve

AO: Apply high-quality-form-air-filter oil.
CA: California

2-4 DIGITAL FUEL INJECTION (DFI) SYSTEM

Exploded View

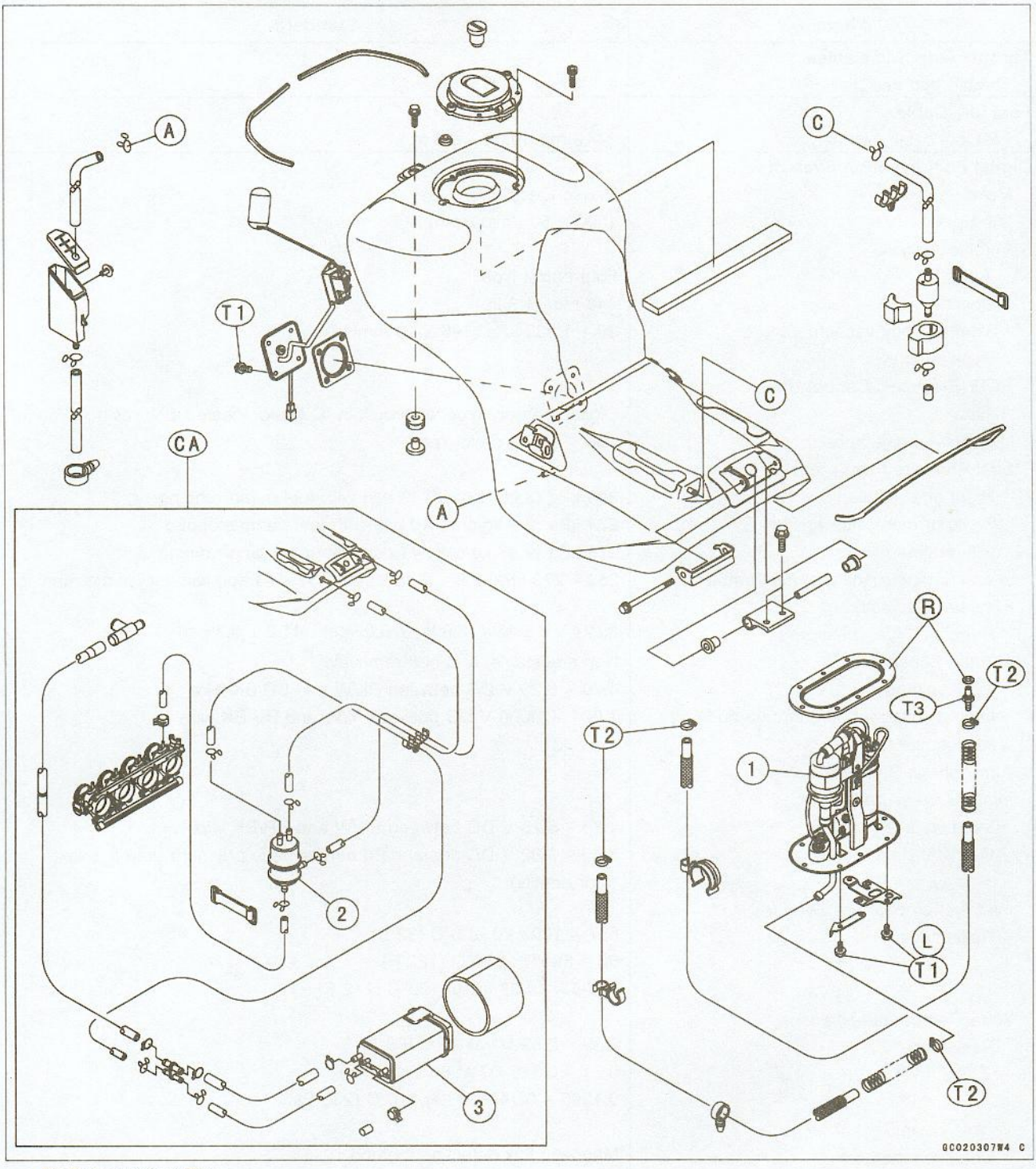


T1: 12 N·m (1.2 kg·m, 106 in·lb)
T2: 4 N·m (0.4 kg·m, 35 in·lb)
T3: 6 N·m (0.6 kg·m, 53 in·lb)

1. Throttle Cable (accelerator)
2. Throttle Cable (decelerator)
3. Fast Idle Cable
4. Inlet Air Temperature Sensor
5. Atmospheric Pressure Sensor
6. Vehicle-down Sensor
7. Cam Sensor
8. Cam Sensor Rotor
9. Inlet Air Pressure Sensor
10. Crankshaft Sensor
11. Gear Position Switch

CL: Apply cable lubricant.

Exploded View



R: Replacement Parts
T1: 6.9 N·m (0.7 kg·m, 61 in·lb)
T2: 1.5 N·m (0.15 kg·m, 13 in·lb)
T3: 20 N·m (2.0 kg·m, 14 ft·lb)
1. Fuel Pump
2. Separator
3. Canister
CA: California

2-6 DIGITAL FUEL INJECTION (DFI) SYSTEM

Specifications

Item	Standard
Throttle Grip and Cables	
Throttle grip free play	2 ~ 3 mm (0.08 ~ 0.1 in.)
Fast Idle Cable	
Fast idel cable free play	2 ~ 3 mm (0.08 ~ 0.1 in.)
Digital Fuel Injection System	
Make	Denso Electric
Idle Speed	1000 ± 50 r/min (rpm)
Throttle Assy	
Type	Four barrel type
Bore	ϕ46 mm (1.8 in.)
Throttle body vacuum	26 ± 1.333 kPa (195 ± 10 mmHg)
Bypass screws	- - -
ECU (Electronic Control Unit)	
Type	Digital memory type, with built in IC igniter, sealed with resin
Usable engine speed	100 ~ 11870 r/min (rpm)
Fuel Pressure (high pressure line)	
Right after Ignition SW ON	299 kPa (3.05 kg/cm^2, 43 psi) with fuel pump running
3 sec or more after Ignition SW ON	274 kPa (2.8 kg/cm^2, 40 psi) with fuel pump stopped
with engine idling	279 kPa (2.85 kg/cm^2, 41 psi) with fuel pump running
with engine running at full throttle	254 ~ 279 kPa (2.6 ~ 2.85 kg/cm^2, 37 ~ 41 spi) with fuel pump running
Pressure Regulator	
Regulated fuel pressure	284.4 ± 4.9 kPa (2.9 kg ± 0.05/cm^2, 41.2 ± 0.7 psi)
Throttle Sensor	Non-adjustable, and non-removale
Input voltage	4.75 ~ 5.25 V DC between BL/W and BR/BK wire
Output voltage at idle throttle opening	1.084 ~ 1.086 V DC between Y/W and BR/BK wire
Resistance	4 ~ 6 kΩ
Atmospheric Pressure Sensor/ Inlet Air Pressure Sensor:	
Input voltage	4.75 ~ 5.25 V DC between BL/W and BR/BK wire
Output voltage	3.46 ~ 3.82 V DC at standard atmospheric pressure (see this text for details)
Inlet Air Temperature Sensor	
Resistance	657 ~ 1003 kΩ at 0°C (32°F) 68 ~ 89 kΩ at 50°C (122°F) 11.95 ~ 14.37 kΩ at 100°C (212°F)
Water Temperature Sensor	
Resistance	2.32 ~ 2.59 kΩ at 20°C (68°F) 0.31 ~ 0.326 kΩ at 80°C (176°F) 0.1399 ~ 0.1435 kΩ at 110°C (230°F)
Vehicle-down Sensor	
Detection method	Magnetic flux detection method
Detection angle	More than 45° ± 5° (U.S.A. and Canada 65° ± 5°) for each bank
Detection time	Within 0.5 ~ 1.0 sec.
Output voltage	in the text
Fuel Injectors	
Type	Denso
Nozzle type	One spray type with 4 holes
Resistance	12.5 Ω at 20°C (68°F)
Fuel Pump	
Type	In-tank pump (in fuel tank), or Wesco pump (friction pump)
Discharge	83 mL or more/3 seconds at 12 V × 290 kPa (2.9 kg/cm^2, 41 psi)

Specifications

Special Tools - Needle Adapter Set: 57001–1457
Carburetor Drain Plug Wrench, Hex 3: 57001–1269
Hand Tester: 57001–1394
Pilot Screw Adjuster, C: 57001–1292
Fuel Pressure Gauge Adapter: 57001–1417
Oil Pressure Gauge: 57001–125
Throttle Sensor Harness Adapter #2: 57001–1408
Fork Oil Level Gauge: 57001–1290

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

Throttle Grip and Cables

Free Play Inspection

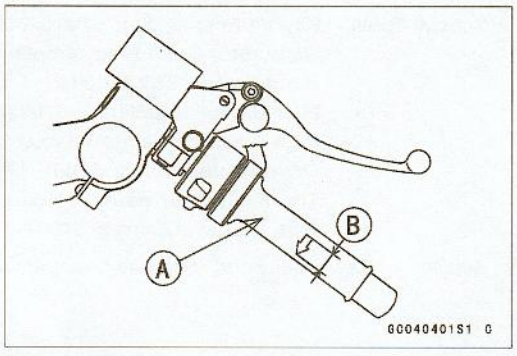
- Check that the throttle grip [A] moves smoothly from full open to close, and the throttle closes quickly and completely in all steering position by the return spring.

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

- Check the throttle grip free play [B].

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

Throttle Grip Free Play
Standard: 2 ~ 3 mm



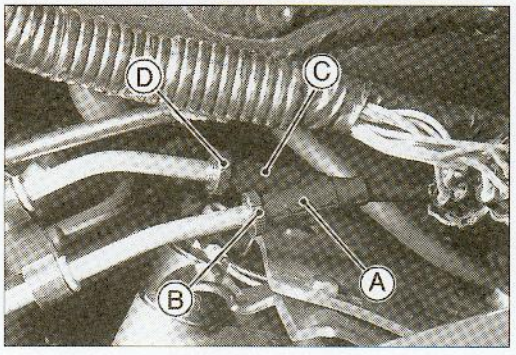
- Run the engine at the idle speed, and turn the handlebar all the way to the right and left to ensure that the idle speed does not change.

★ If the idle speed increase, check the throttle cable free play and the cable routing.

Free Play Adjustment

- Remove the right inner cover (see Frame chapter).
- Loosen the locknuts.
- Screw both throttle cable adjuster to give the throttle grip plenty of play.
- Completely close the throttle grip, turn the accelerator cable adjuster [A] to eliminate any cable free play, and tighten the adjuster locknut [B].
- Turn the decelerator cable adjuster [C] to adjust the throttle grip free paly to 2 ~ 3 mm.
- Tighten the deaccelerator cable locknut [D] securely.

★ If the free paly cannot be adjusted with the adjusters, replace the cable.



Cable Installation

- Install the throttle cables in accordance with Cable Routing section in General Information chapter.
- Install the lower ends of the throttle cables in the cable bracket on the throttle assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly.

⚠ WARNING

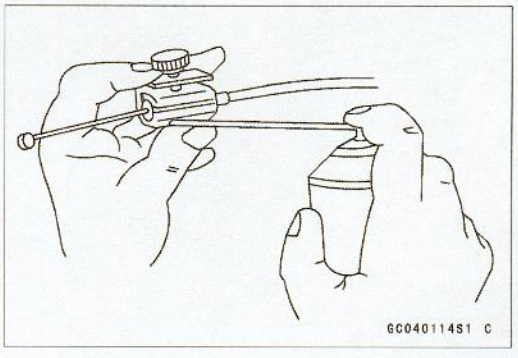
Operation with incorrectly routed or improperly adjusted cables could result in an unsafe riding condition.

Cable Lubrication

Whenever the throttle cable is removed, lubricate the cable as follows:

- Apply a thin coating of grease to the cable lower ends.
- Lubricate the cable with a penetrating rust inhibitor.

○ With the cabel disconnected at both ends, the cable should move freely in the cable housing.



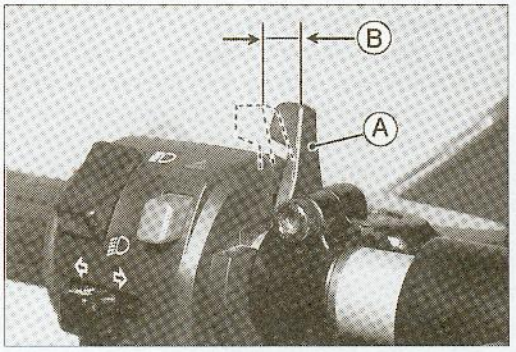
Fast Idle Cable

Free Play Inspection

- Push the fast idle lever [A] all the way to the front.
- Check fast idle cable free paly [B].

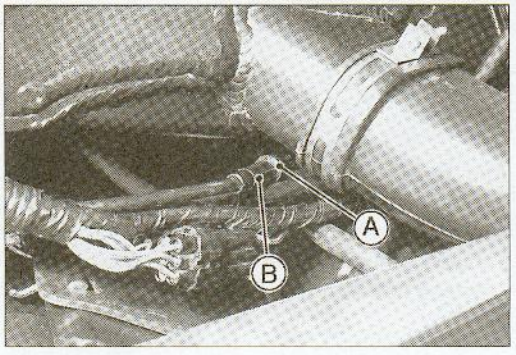
★ If the free play is incorrect, adjust the fast idle cable.

Fast Idle Cable Free Play
Standard: 2 ~ 3 mm



Free Play Adjustment

- Remove the right inner cover (see Frame chapter).
- Loosen the locknut [A], and turn the adjuster [B] until the cable has the proper amount of free play.
- Tighten the locknut securely.



Fast Idle Cable Installation

- Install the fast idle cable in accordance with Cable Routing section in General Information chapter.
- After installation, adjust the cable properly.

⚠ WARNING

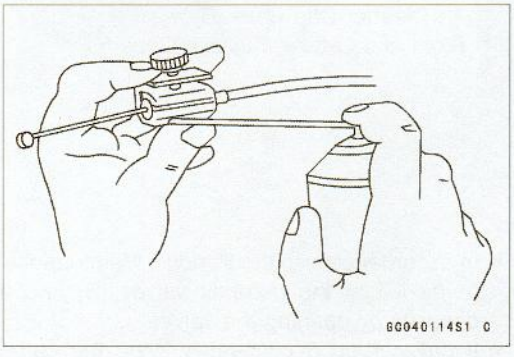
Operation with an incorrectly routed or improperly adjusted cable could result in an unsafe riding condition.

Cable Lubrication

Whenever the fast idle cable is removed, lubricate the cable as follows:

- Apply a thin coating of grease to the cable upper end.
- Lubricate the cable with a penetrating rust inhibitor.
- Check that the inner cable slides smoothly by moving the fast idle lever to the front and rear.

★ If there is any irregularity, check the fast idle cable and routing.

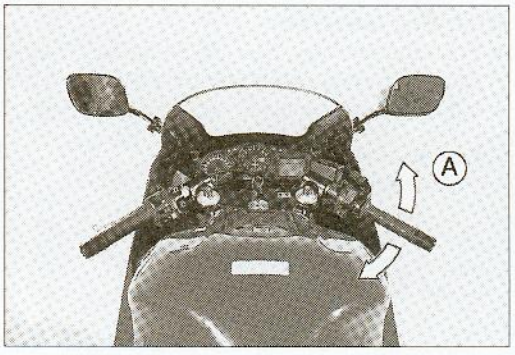


Throttle Body Assy

Idle Speed Inspection

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

★ 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 Routing Section in General Information chapter).



⚠WARNING

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

- Check idle speed.

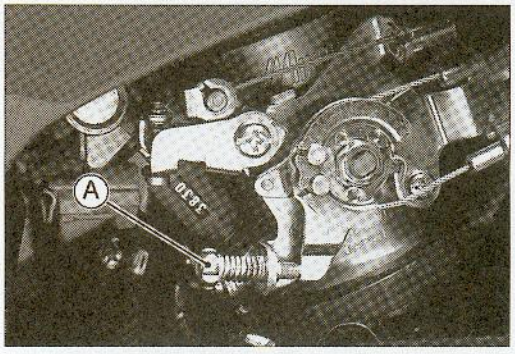
★ If the idle speed is out of specified range, adjust it.

Idle Speed
Standard: 1, 000 ± 50 r/min (rpm)

Idle Speed Adjustment

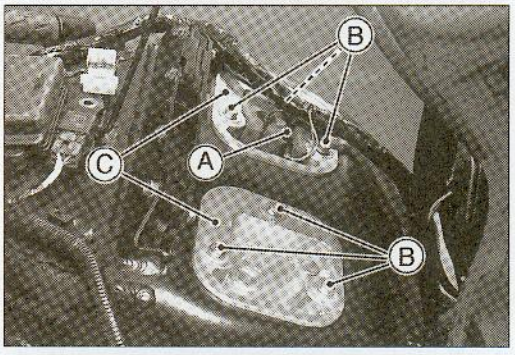
- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.

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



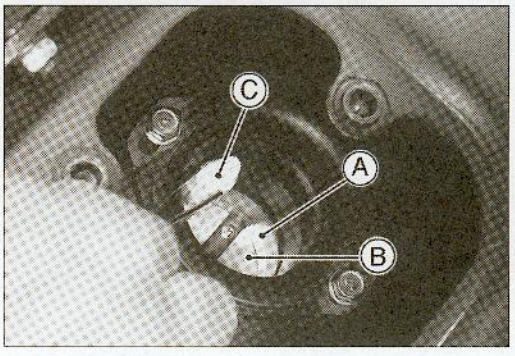
Throttle Bore Cleaning

- Set up the fuel tank (see this chapter).
- Disconnect the inlet air temperature sensor connector [A].
- Remove:
  Air Cleaner Cap Bolts [B]
  Right and Left Air Cleaner Caps [C]



- In accordance with the Periodic Maintenance Chart, check the throttle bores [A] at the butterfly valves [B] and around them for carbon deposits by opening the valves.

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



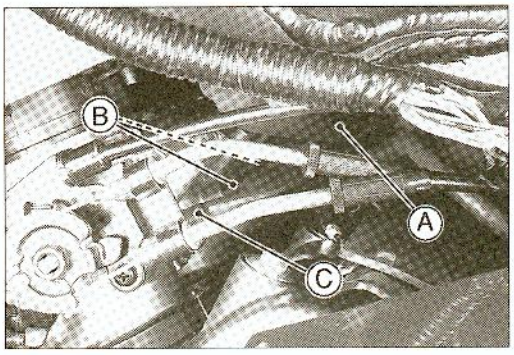
Throttle Body Assy

Synchronization Inspection

NOTE

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

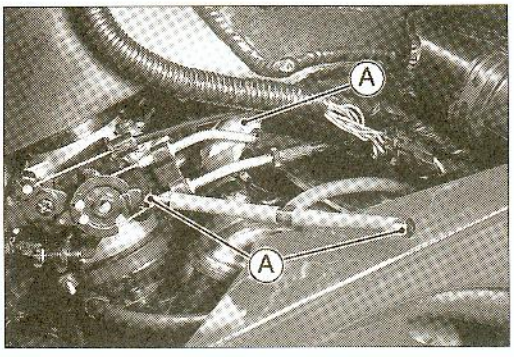
- Remove the inner covers (see Frame chapter).
- Set up the fuel tank (see this chapter).
- Pull out the vacuum switch valve hose [A] from the air cleaner.
- California model: Pull out the three vacuum hoses and rubber cap from the right fittings on the throttle bodies.
- Other than California model: Pull out the two vacuum hoses [B] and the two rubber caps [C] from the right fittings on the throttle bodies.



CAUTION

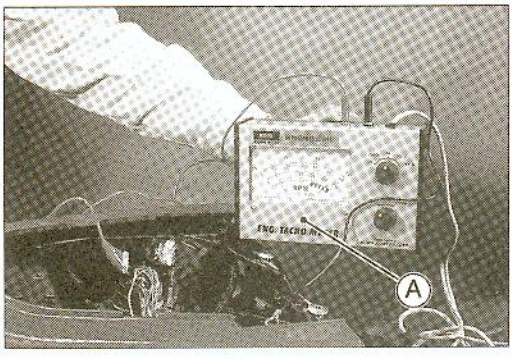
Do not remove the atmospheric pressure hose.

- Completely close the removed hoses [A] of the clean air system with the proper plugs.
- Completely close the clean air system hole of the air cleaner with the proper plug.



- Start the engine and warm it up thoroughly.
- Check the engine speed, using the engine revolution tester [A] for high accuracy.

★ If the engine speed is out of 1 000 rpm, set the engine speed to 1 000 rpm.



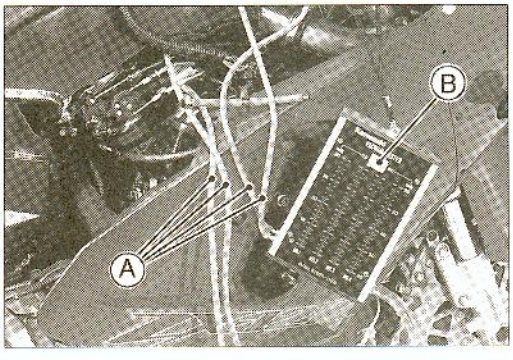
CAUTION

Do not adjust the engine speed by the tachometer in the meter unit.

- Connect the vacuum gauge hoses [A] to the right fittings on the throttle bodies.
- Connect the vacuum gauge hoses to the vacuum gauge [B].
- Start the engine and left it idle to measure the intake vacuum.

★ If the vacuum is incorrect, adjust the synchronization.

Throttle Body Vacuum
Standard: 26 ± 1.333 kPa (195 ± 10 mmHg)



Throttle Body Assy

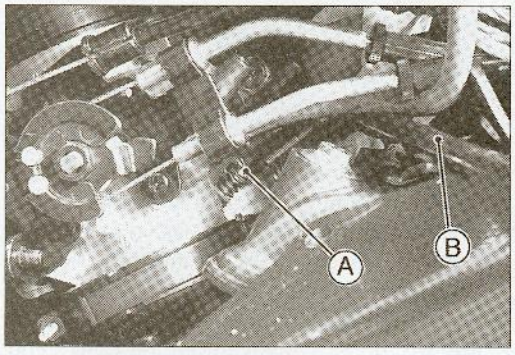
Synchronization Adjustment

- Turn the adjusting screw [A] to synchronize the throttle valves.

○ First synchronize the left two or the right two throttle valves by means of the left and right adjusting screws. Then synchronize the left two throttle valves and the right two throttle valves using the center adjusting screw.

★ If the throttle valves synchronization cannot be obtained by using the adjusting screws, check for dirt or blockage, and then check the intake parts connection.

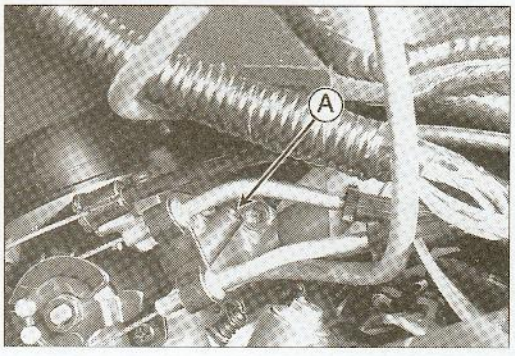
Special Tool - Pilot Screw Adjuster, C: 57001-1292 [B]



- Check the throttle valve synchronization again.

NOTE

○ *Do not turn the bypass screws [A] carelessly during throttle valve synchronization. You may cause poor running at low engine speed or irregular throttle sensor output voltage.*



- Remove the vacuum gauge hoses and install the removed parts.
- Check the idle speed.

Throttle Body Assy Removal

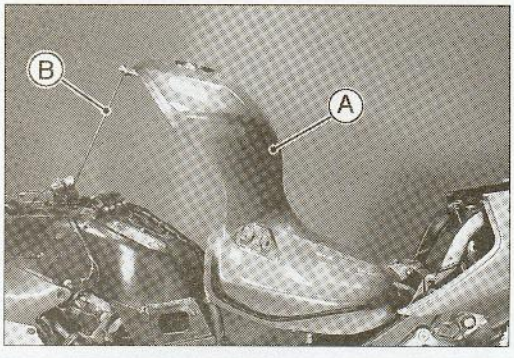
⚠ WARNING

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

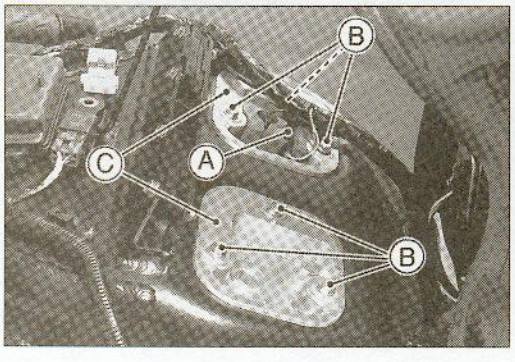
- Remove:
  Seats (see Frame chapter)
  Fuel Tank Cover (see Fuel Tank Removal)
- Set up the fuel tank [A] with the supporting rod [B].

CAUTION

Do not insert the supporting rod into the bolt hole, or the thread of the bolt hole could damaged.

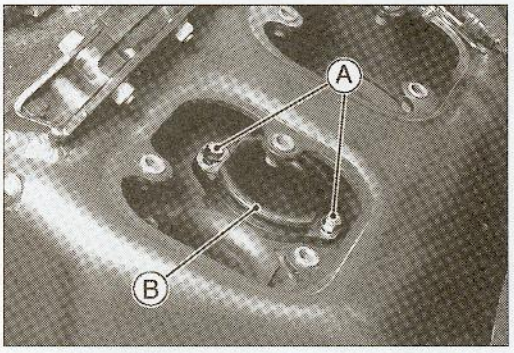


- Disconnect the inlet air temperature sensor connector [A].
- Remove:
  Air Cleaner Cap Bolts [B]
  Right and Left Air Cleaner Caps [C]

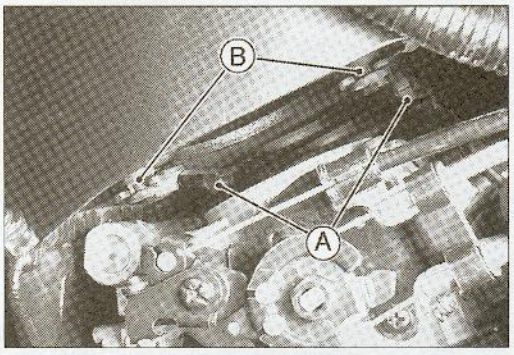


Throttle Body Assy

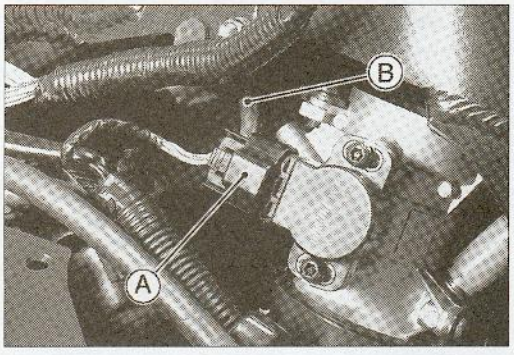
- Unscrew the duct bolts [A].
- Pull out the ducts [B] upward.



- Remove the bolt brackets [A].
- Pull out the bracket stoppers [B].



- Disconnect the throttle sensor connector [A].
- Pull out the vacuum hose [B].

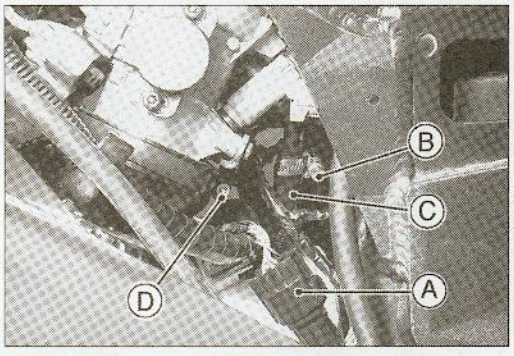


- Disconnect the injector wire connector [A].
- Be sure to place a piece of cloth around the fuel return hose pipe of the throttle body assy.
- Loosen the clamp bolts [B] and pull out the fuel hose [C].
- ○ Drain the fuel in hose into a suitable container.
- Loosen the holder clamp Allen bolts [D].

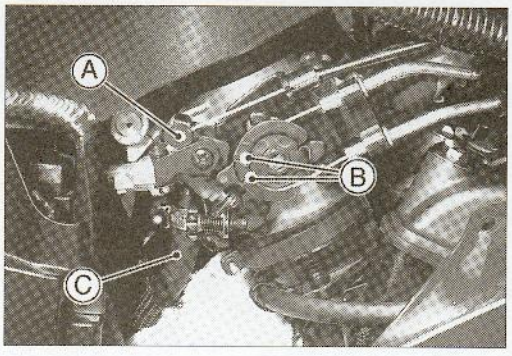
Special Tool - Carburetor Drain Plug Wrench, Hex 3: 57001–1269

⚠ WARNING

Fuel spilled from the fuel hoses are hazardous.

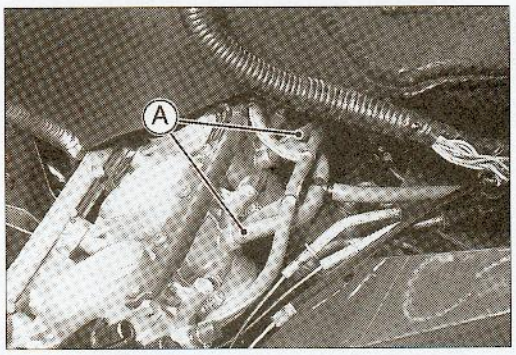


- Remove the fast idle cable lower end [A].
- Remove the throttle cable lower ends [B].
- Be sure to place a piece of cloth around the fuel supply hose pipe of the throttle body assy.
- Pull out the fuel hose [C].
- ○ Quickly plug the pipe with a plug.
- ○ Drain the fuel in hose into a suitable container.



Throttle Body Assy

- Pull the throttle body assy out of the holder, and then remove it to the right side.
- Removing the throttle body assy halfway pull out the vacuum hose [A].
- After removing the throttle body assy, stuff pieces of lint-free, clean cloths into the throttle body holders and wrap the air cleaner holes with the clean cloth.



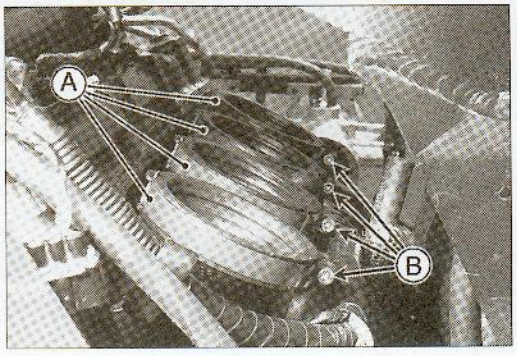
CAUTION

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

Throttle Body Assy Installation

- Install the holder clamps [A] as shown being careful of the screw position and the screw head [B] direction.

Special Tool - Carburetor Drain Plug Wrench, Hex 3: 57001–1269

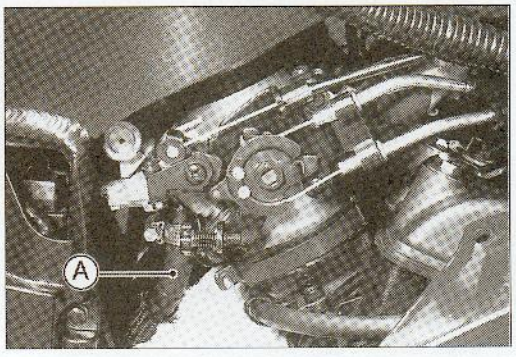


- Run the vacuum and vent hoses and fuel hoses as shown in the Cable, Wire, and Hose Routing section of the General Information chapter.
- Turn the throttle grip and make sure that the throttle linkages do not contact the holder screws or hoses.

⚠ WARNING

Be sure to install the holder clamp screws in the direction shown. Or, the screws could come in contact with the throttle linkage resulting in unsafe riding condition.

- Be sure the fuel hoses [A] are clamped securely to prevent leaks.



⚠ WARNING

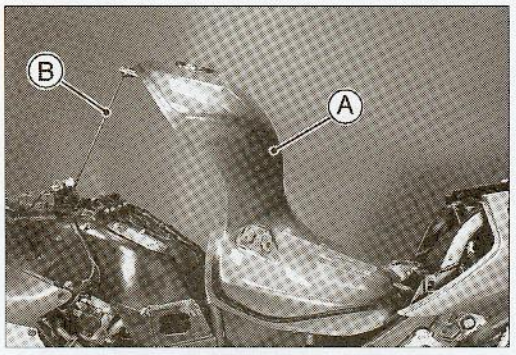
Fuel spilled from the fuel hoses are hazardous.

- Adjust:
  Throttle Grip Free Play
  Fast Idle Lever Free Play
  Idle Speed

Air Line

Element Removal

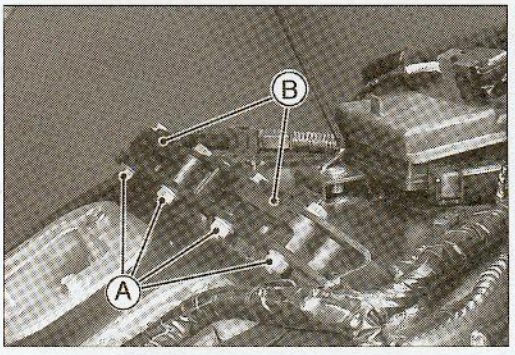
- Remove:
  Seats (see Frame chapter)
  Fuel Tank Cover (see Fuel Tank Removal)
  Supporting Rod (see Fuel Tank Removal)
- Set up the fuel tank [A] with the supporting rod [B].



CAUTION

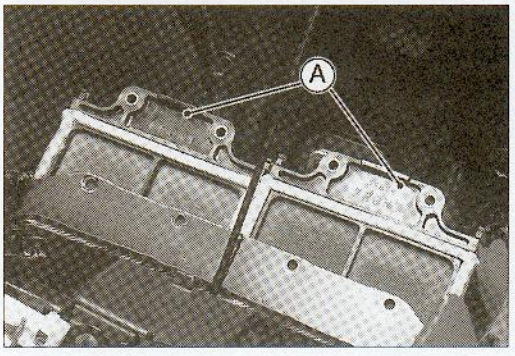
Do not insert the supporting rod into the bolt hole, or the thread of the bolt hole could be damaged.

- Unscrew the nuts [A] and remove the bolts.
- Pull out the elements [B].



Element Installation

- Install the elements [A] with the mark side (FRONT) facing front.



Air Cleaner Element Cleaning and Inspection

NOTE

- *In dusty areas, the element should be cleaned more frequently than the recommended interval.*
- *After riding through rain or on muddily roads, the element should be cleaned immediately.*

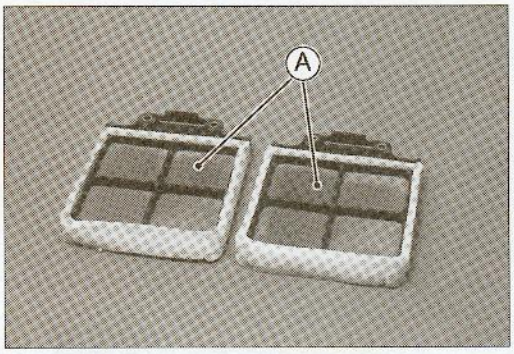
⚠ WARNING

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

Air Line

- Remove the elements [A] (see this chapter).
- Clean the element in cleaning solvent, and then dry it with compressed air or by shaking it.
- After cleaning, saturate a clean, lint-free towel with SE, SF, SG class SAE-30 oil, and apply the oil to the element by tapping the element outside with the towel.
- Inspect the element before installing it.

★ If the element is broken, or the frame is damaged or bent, replace the element.

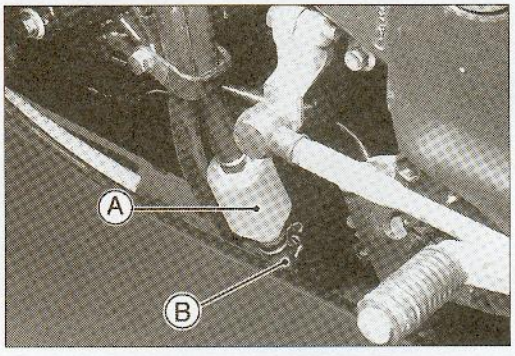


Oil Draining

A drain hose is connected to the bottom of the air cleaner part to drain water or oil accumulated in the cleaner part.

- Visually check the catch tank [A] of the drain hose if the water or oil accumulates in tank.

★ If any water or oil accumulates in the tank, drain it by taking off the drain plug [B] at the lower end of the drain hose.

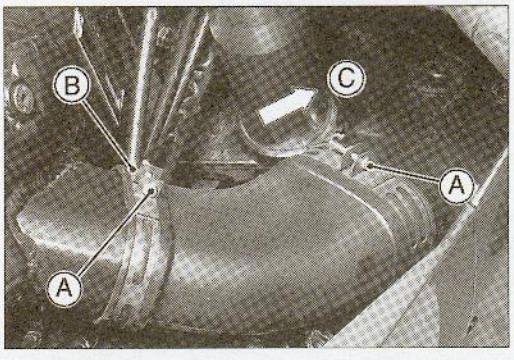


⚠ WARNING

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

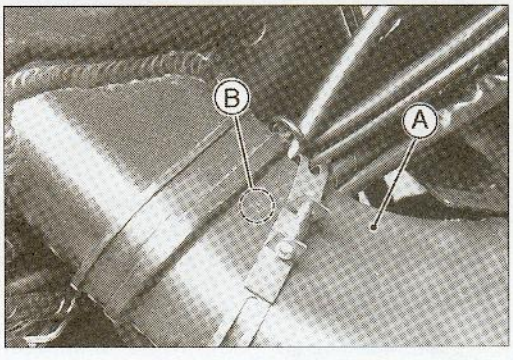
Air Intake Rubber Duct Removal

- Remove the inner cover (see Frame chapter).
- Loosen the clamp screws [A] and slide the frame side clamp [B] forward [C].
- Slide the rubber duct forward, and remove the duct.



Air Intake Rubber Duct Installation

- The left rubber duct has a L mark and the right rubber duct [A] has a R mark [B].
- First insert the rubber duct to front air intake duct and then insert the rubber duct stopped to the frame duct.
- Tighten the clamp screw securely.



Front Air Intake Duct Removal/Installation

- Refer to Air Intake Duct Removal in Frame chapter.

Fuel Tank

Fuel Tank Removal

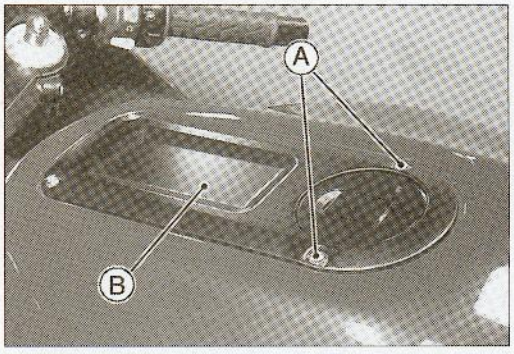
⚠ WARNING

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.

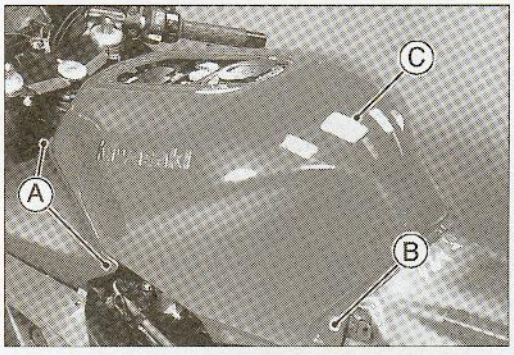
CAUTION

For California model, if gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.

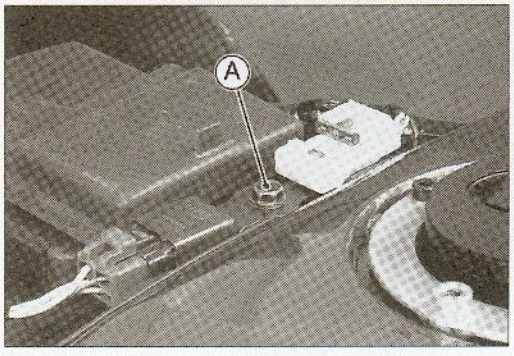
- Remove:
  Rear Seat (see Frame chapter)
  Front Seat (see Frame chapter)
  Allen Bolts [A]
  Fuel Tank Cover Plate [B]



Screws [A]
Allen Bolts [B]
Fuel Tank Cover [C]

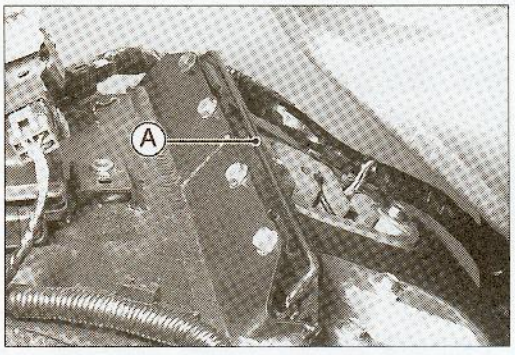


Bolt [A]



Fuel Tank

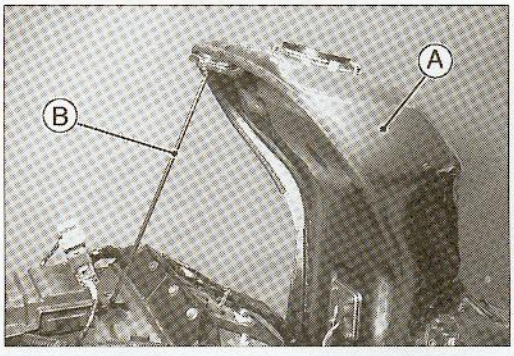
- Pull up the front portion of the fuel tank, and then, pull out the supporting rod [A].



- Lift the front portion of the fuel tank [A] and support it with the supporting rod [B].

CAUTION

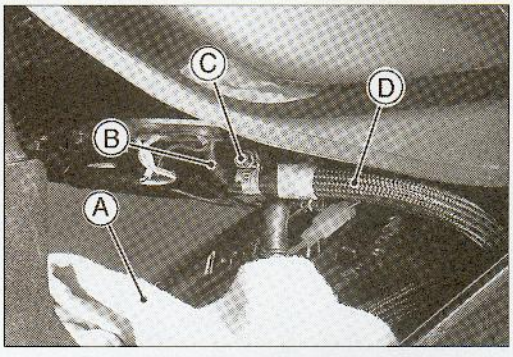
Do not insert the supporting rod into the bolt hole, or the thread of the bolt hole could be damaged.

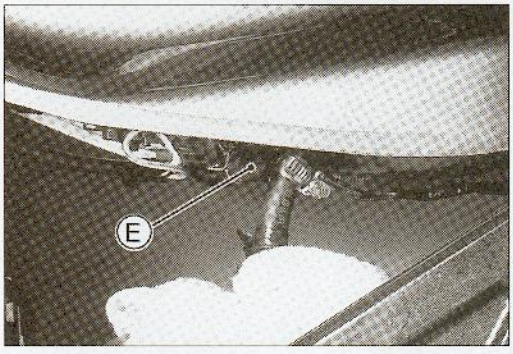


- Be sure to place a piece of cloth [A] around the fuel outlet hose pipe [B] of the fuel tank.
- Loosen the clamp bolt [C] and pull out the fuel supply hose [D] from the pipe.
- ○ Quickly plug the pipe with a plug [E].
- ○ Drain the fuel in hose into a suitable container.

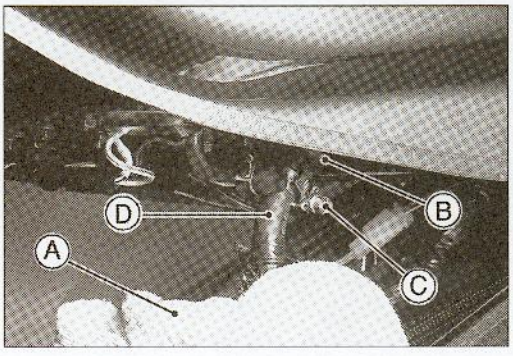
⚠ WARNING

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



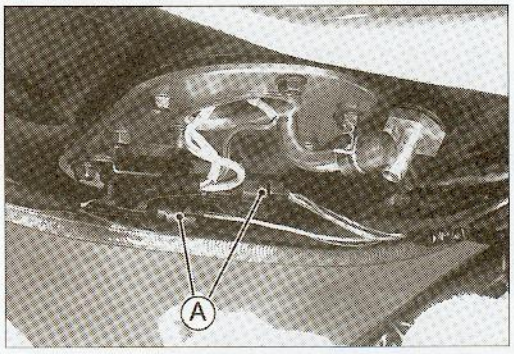


- Be sure to place a piece of cloth [A] around the fuel relief valve [B] of the fuel tank.
- Loosen the clamp bolt [C] and pull out the fuel return hose [D] from the relief valve.
- ○ Drain the fuel in hose into a suitable container.

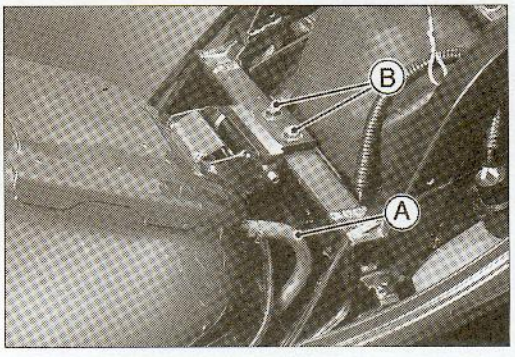


Fuel Tank

● Disconnect the connectors [A].



● Remove the supporting rod, and set the fuel tank to proper position.
○ Remove the drain hose [A].
○ California model: Pull out the return hose.



CAUTION

The fuel tank may be damaged if its bracket bolts are removed lifting the front portion of fuel tank upward.

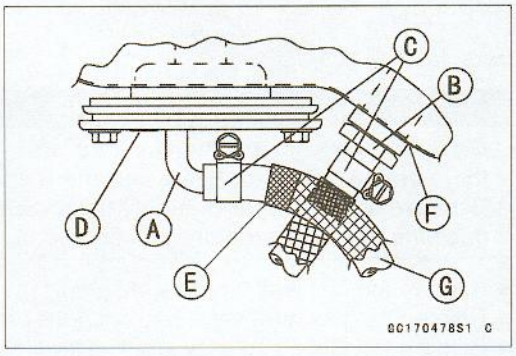
● Unscrew the bolts [B].
● Remove the fuel tank.

Fuel Tank Installation

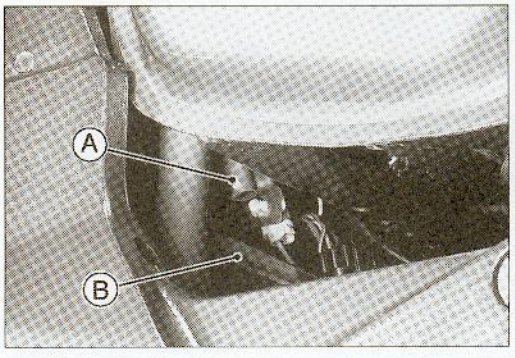
● Read the WARNING in Fuel Tank Removal section.
● Installation is the fuel tank bracket bolts first, and then install the other parts.
● Be sure the hoses are clamped securely to prevent leaks.

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

Fuel Outlet Hose Pipe Side [A]
Fuel Relief Valve Side [B]
Clamps [C]
Label (Blue) [D]
Tape (Blue) [E]
Label (Red) [F]
Tape (Red) [G]



● Route the hoses correctly.
○ Be sure to insert the drain hose [A] in the bracket [B].



Fuel Tank

Fuel Tank Inspection

- Remove the hose(s) from the fuel tank, and open the tank cap.
- Check to see if the water drain pipe [B] (also the fuel breather pipe [C] for the California model) in the tank is not clogged. Check the tank cap breather also.

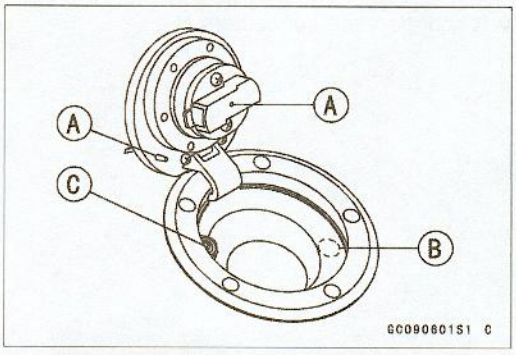
★ If they are clogged, remove the tank and drain it, and then blow the breather free with compressed air.

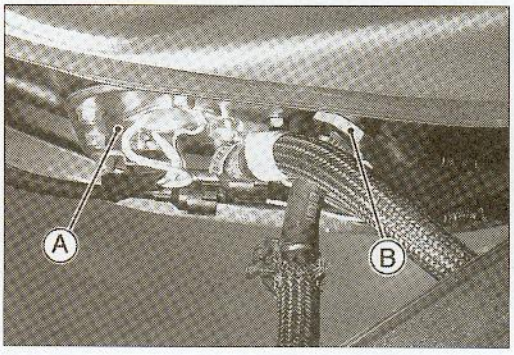
CAUTION

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.

- Visually inspect the fuel pump bracket [A], fuel relief valve [B] and fuel level sensor mounting portions for fuel leaks.

★ If they are fuel leaks, replace the gasket.





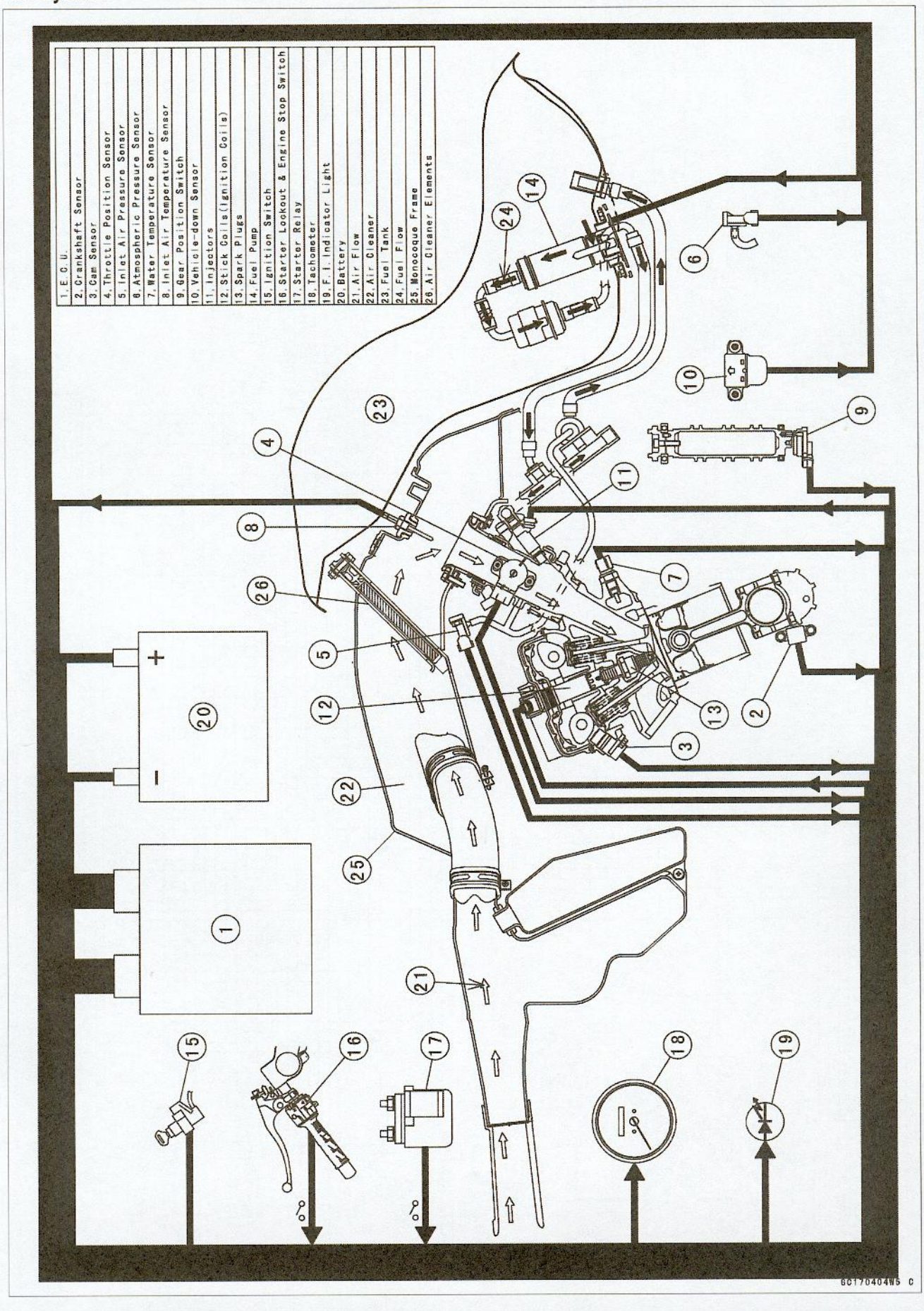
Fuel Tank Cleaning

⚠ 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 or highly flammable liquids, do not use gasoline or low flash point solvents to clean the tank.

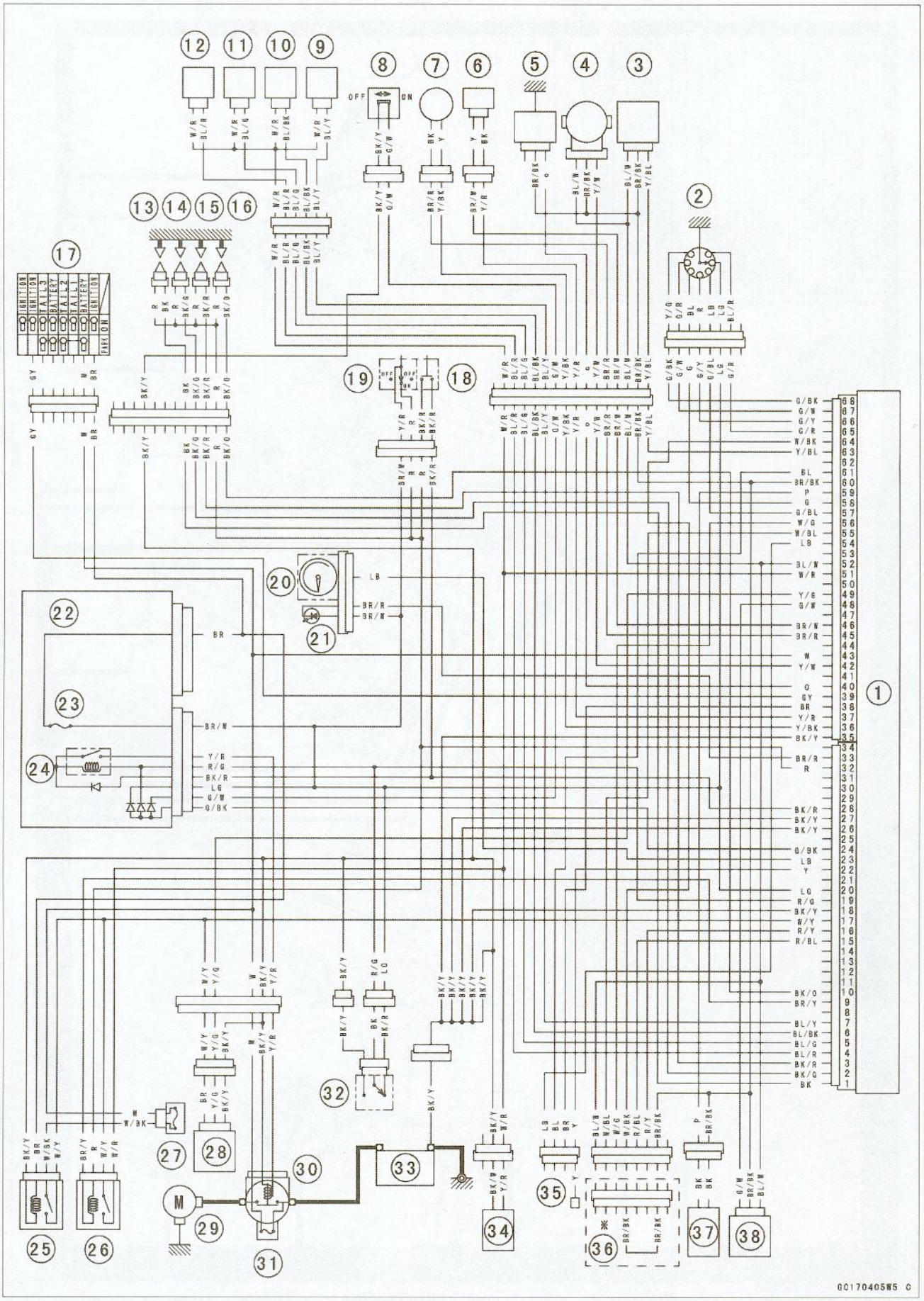
- Remove the fuel tank (see this chapter).
- Remove the fuel relief valve and drain the fuel.
- Remove the fuel pump assy and fuel lever sensor.
- Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Pour the solvent out of the tank.
- Dry the tank with compressed air.
- Install the fuel pump assy (see Fuel Pump Installation) and fuel level sensor (see Electrical System chapter) in the tank.
- Install the fuel tank (see Fuel Tank Installation).

DFI System


1. E.C.U.
2. Crankshaft Sensor
3. Cam Sensor
4. Throttle Position Sensor
5. Inlet Air Pressure Sensor
6. Atmospheric Pressure Sensor
7. Water Temperature Sensor
8. Inlet Air Temperature Sensor
9. Gear Position Switch
10. Vehicle-down Sensor
11. Injectors
12. Stick Coils(Ignition Coils)
13. Spark Plugs
14. Fuel Pump
15. Ignition Switch
16. Starter Lockout & Engine Stop Switch
17. Starter Relay
18. Tachometer
19. F.I. Indicator Light
20. Battery
21. Air Flow
22. Air Cleaner
23. Fuel Tank
24. Fuel Flow
25. Monocoque Frame
26. Air Cleaner Elements
6C170404W5 C

DFI System

DFI System Wiring Diagram



DFI System

Part Name

1. ECU (Electric Control Unit)
2. Gear Position Switch
3. Inlet Air Pressure Sensor
4. Throttle Sensor
5. Water Temperature Sensor
6. Cam Sensor
7. Crankshaft Sensor
8. Sidestand Switch
9. Injector #4
10. Injector #3
11. Injector #2
12. Injector #1
13. Stick Coil #1
14. Stick Coil #2
15. Stick Coil #3
16. Stick Coil #4
17. Ignition Switch
18. Starter Button
19. Engine Stop Switch
20. Tachometer
21. FI Indicator LED Light
22. Junction Box
23. Ignition Fuse 10A
24. Starter Circuit Relay
25. ECU Main Relay
26. Fuel Pump Relay
27. ECU Main Fuse 15A
28. Vehicle-down Sensor
29. Starter Motor
30. Starter Motor Relay
31. Main Fuse 30A
32. Starter Lockout Switch
33. Battery 12 V 12 Ah
34. Fuel Pump
35. Self-diagnosis Indicator Switch
36. Open or Short Circuit Connector*

*Do not exchange the connector. To ensure optional ignition and fuel injection timing, the ECU and connector are combined.

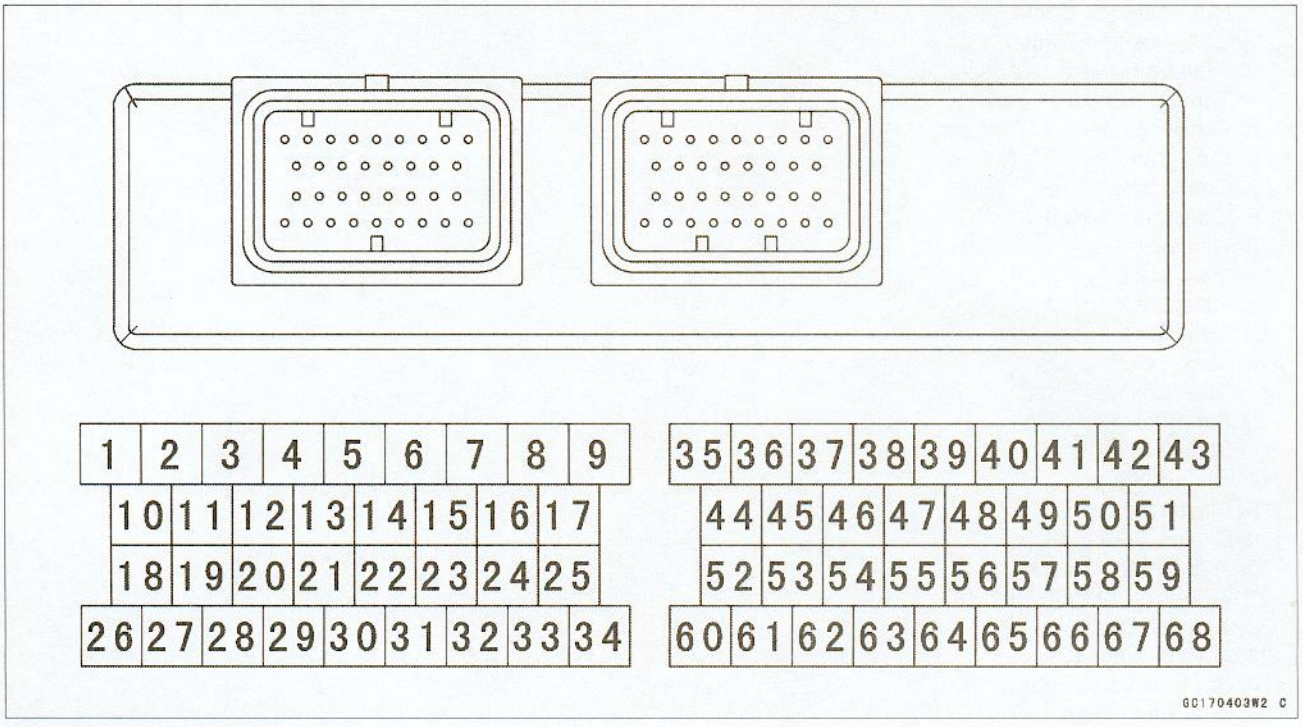
ECU and Connector Combinations

ECU Part No.	21175-1065	21175-1068	21175-1069	21175-1072	21175-1073
Open Connector	○		○		
Short Circuit Connector		○		○	○

The part number of the ECU location is label on the ECU.

37. Inlet Air Temperature Sensor
38. Atmospheric Pressure Sensor

Terminal Numbers of ECU Connectors



Terminal Names

1. Stick Coil #1 Output Signal
2. Stick Coil #2 Output Signal
3. Stick Coil #3 Output Signal
4. Injector #1 Output Signal
5. Injector #2 Output Signal
6. Injector #3 Output Signal
7. Injector #4 Output Signal
8. Unused
9. Fuel Pump Relay Output Signal
10. Stick Coil #4 Output Signal
11. Unused
12. Unused
13. Unused
14. Unused
15. Input Signal for Memory
16. Input Signal for Memory
17. Power Supply to ECU
18. Injector Power Source Circuit Ground to Battery
19. Interlock Switch Output Signal
20. Detect the Neutral Position Signal
21. Unused
22. Switch Displaying Diagnosis
23. Engine Speed Signal to Tachometer
24. Detect Interlock Function for Engine Stops
25. Unused
26. Ignition System Circuit Ground to Battery
27. Injector Power Source Circuit Ground to Battery
28. Detect the Starter Button Pushed.
29. Unused
30. Unused
31. Unused
32. Detect the Engine Stop Switch OFF
33. FI Indicator LED Light Blinking
34. Unused
35. ECU Power Source Circuit Ground to Battery
36. Crankshaft Sensor (+) Output Signal
37. Cam Sensor (+) Output Signal
38. Power Source for External Diagnosis System
39. Power Supply to ECU
40. Water Temperature Sensor Output Signal
41. Unused
42. Throttle Sensor Output Signal
43. Power Source to ECU
44. Unused
45. Crankshaft Sensor (–) Output Signal
46. Cam Sensor (–) Output Signal
47. Unused
48. Atmospheric Pressure Sensor Output Signal
49. Vehicle-down Sensor Output Signal
50. Unused
51. Power Supply to Injector and Fuel Pump
52. Power Source to Sensor System
53. Unused
54. Output Signal for External Diagnosis System
55. Input Signal for Memory
56. Input Signal for Memory
57. Detect the 2nd Gear Position Signal
58. Detect the 4th Gear Position Signal
59. Inlet Air Temperature Sensor Output Signal
60. Sensor System Circuit Ground from ECU
61. Ground for External Diagnosis System
62. Unused
63. Inlet Air Pressure Sensor Output Signal
64. Input Signal for Memory
65. Detect the 1st Gear Positino Signal
66. Detect the 3rd Gear Position Signal
67. Detect the 5th Gear Position Signal
68. Detect the 6th Gear Position Signal

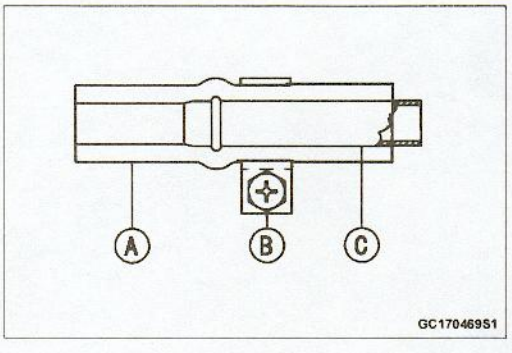
DFI Servicing Precautions

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

- This DFI system is designed to be used with a 12 V MF battery as its power source. Do not use any other battery except for a 12 V MF battery as a power source.
- Do not reverse the battery wire connections. This will damage the ECU.
- To prevent damage to the DFI parts, do not disconnect the battery wires or any other electrical connections when the ignition SW (switch) is on, or while the engine is running.
- Take care not to short the wires that are directly connected to the battery positive (+) terminal to the chassis ground.
- When charging, remove the battery from the motorcycle. This is to prevent ECU damage by excessive voltage.
- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition SW (switch). Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- Do not turn the ignition SW ON while any of the DFI electrical connectors are disconnected. The ECU memorizes fault codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads, and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the DFI system is not influenced by electric wave radiated from the antenna. Check operation of the system with the engine at idle. Locate the antenna as far as possible away from the ECU.
- When any fuel hose is disconnected, do not turn on the ignition SW. Otherwise, the fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the in-tank fuel pump if the pump is completely dry. This is to prevent pump seizure.
- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- When any fuel hose is disconnected, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- When installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.
- Route the hoses according to Cable, Wire, and Hose Routing section in the General Information chapter.

- Install the hose clamps in the position shown, and securely tighten the clamp bolts to the specified torque. Check the fuel system for leaks after hose installation.
  Fuel Hose [A]
  Clamp [B]
  Fuel Pipe [C]

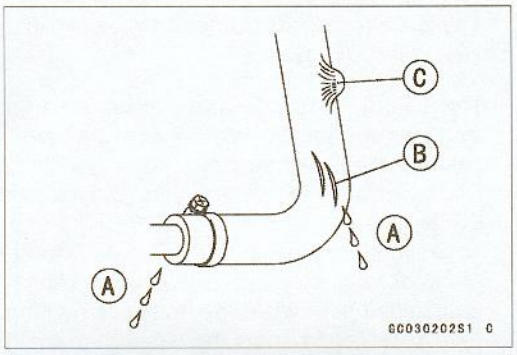
  Torque - Fuel Hose Clamp Bolts: 1.5 N·m (0.15 kg·m, 13 in·lb)
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.
- Replace the fuel hose if it has been sharply bent or kinked.



DFI Servicing Precautions

○ The fuel hoses are designed to be used through out 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. Bend and twist the fuel hose while examining it.

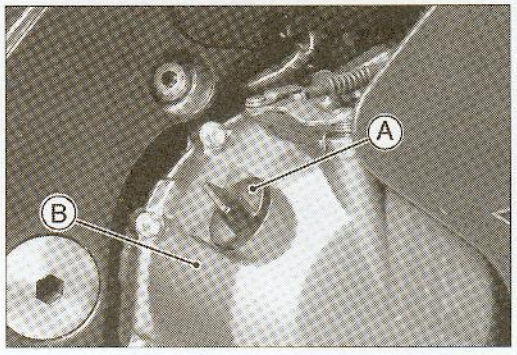
★ Replace the hose if any cracks [B] or bulges [C] are noticed.



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

Clutch Cover [B]

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

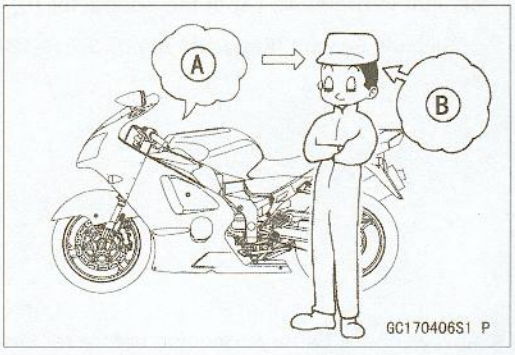


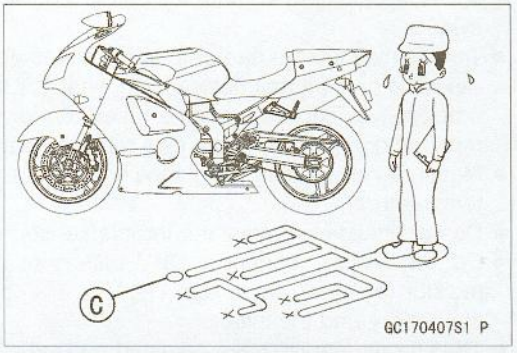
Troubleshooting the DFI System

Outline

When an abnormality in the system occurs, the FI indicator LED (Light Emitting Diode) light goes on to alert the rider on the meter panel. In addition, the condition of the problem is stored in the memory of the ECU (electronic control unit). With the engine stopped and turned in the self-diagnosis mode, the fault code [A] is indicated by the number of times the FI indicator LED light blinks.

When due to a malfunction, the FI indicator LED light remains lit, ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C]. Don't rely solely on the DFI self-diagnosis function, use common sense; first conduct a pre-diagnosis inspection, check the ECU for ground and power supply, the fuel line for no fuel leaks, and for correct pressure. The pre-diagnosis items are not indicated by the FI indicator LED light.

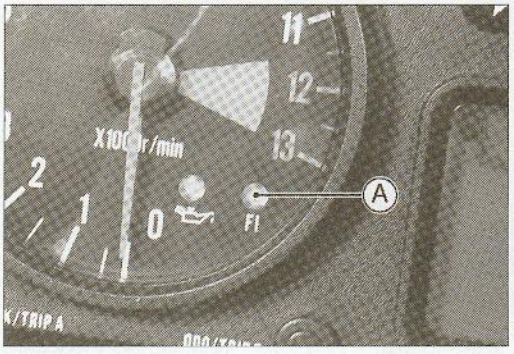




Even when the DFI system is operating normally, the FI indicator LED light [A] may light up under strong electrical interference. No remedy needed. Turn the ignition SW (switch) OFF to stop the indicator light.

When the FI indicator LED light goes on and the motorcycle is brought in for repair, check the fault codes.

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

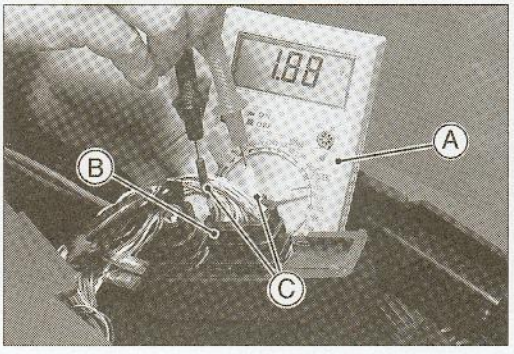


Much of the DFI system troubleshooting work consists of confirming continuity of the wiring. The DFI parts are assembled and adjusted with precision, and it is impossible to disassemble or repair them.

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

  Digital Meter [A]
  Connector [B]
  Needle Adapter Set [C]

Special Tool - Needle Adapter Set: 57001–1457

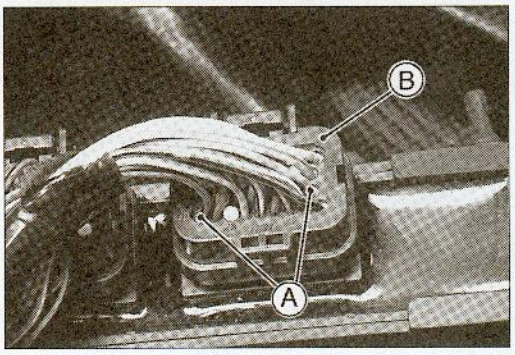


CAUTION
Tape the wires to prevent short circuit of the wires.

Troubleshooting the DFI System

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

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



- Always check battery condition before replacing the DFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.
- Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused by some other item or items, they too must be repaired or replaced, or the new replacement part will soon fail again.
- Measure coil winding resistance when the DFI part is cold (at room temperature)
- Do not adjust or remove the throttle sensor.
- Do not directly connect a 12 V battery to a fuel injector. Insert a resistor (5 ~ 7 Ω) or a bulb (12 V × 3 ~ 3.4 W) in series between the battery and the injector.
- The DFI parts have been adjusted and set with precision. Therefore, they should be handled carefully, never strike sharply, as with a hammer, or allowed to drop on a hard surface. Such a shock to the parts can damage them.
- Check wiring and connections from the ECU connector to the suspected faulty DFI parts, using the hand tester (special tool, analog tester) rather than a digital tester.

Special Tool - Hand Tester: 57001–1394

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

★ If any wiring is deteriorated, replace the wiring.

Troubleshooting the DFI System

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

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

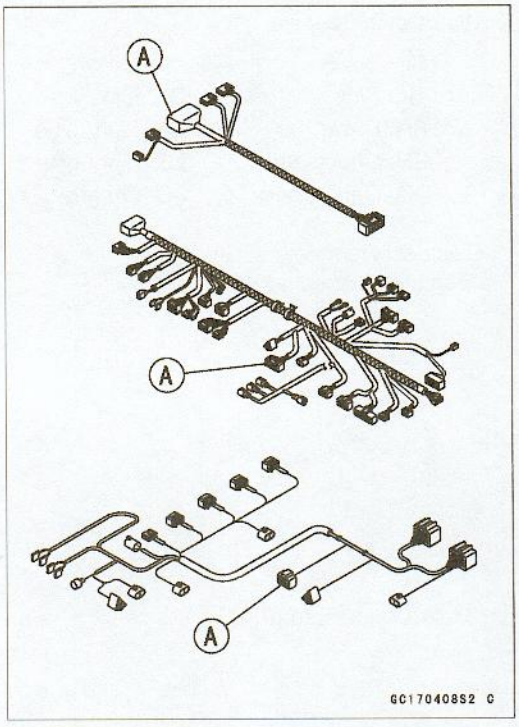
- Check the wiring for continuity.

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

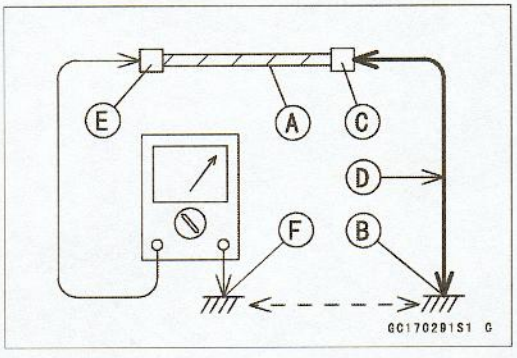
○ Connect the hand tester between the ends of the wires.

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

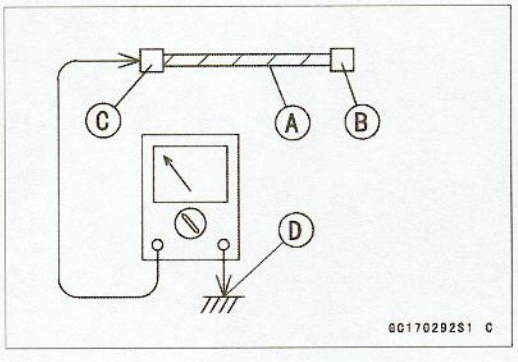
★ If the tester does not read 0 Ω, the wire is defective. Replace the wire or the main harness or the sub harness.



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



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



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

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

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

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

○ The diagnosis flow chart illustrates the above procedures.

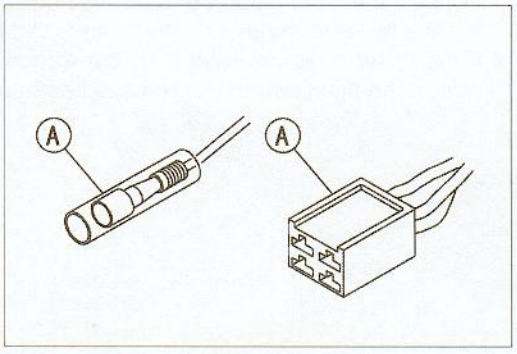
○ After inspection, be sure to connect all the DFI electrical connectors. Do not turn the ignition SW ON while the DFI electrical connectors and ignition system connectors are disconnected. Otherwise, the ECU memorizes fault codes as open circuit.

Troubleshooting the DFI System

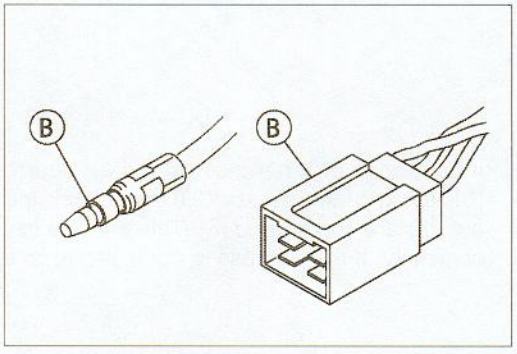
○ Wire Color Codes:

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

○ Electrical Connectors:
Female Connectors [A]

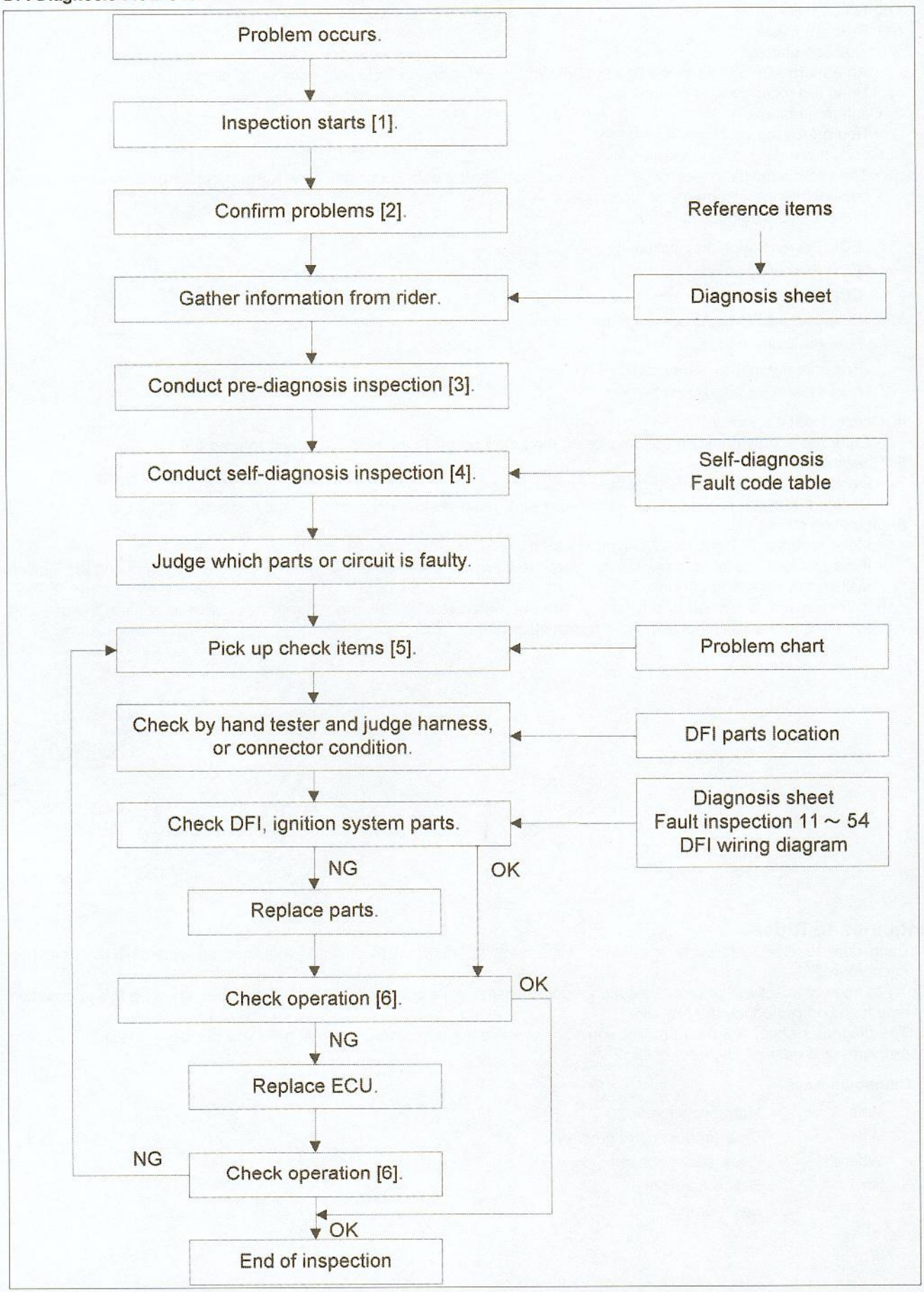


Male Connectors [B]



Troubleshooting the DFI System

DFI Diagnosis Flow Chart



Troubleshooting the DFI System

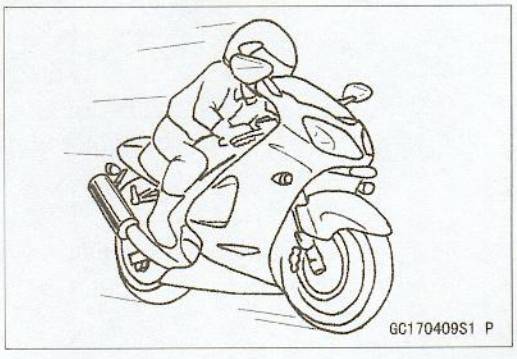
Notes:

OK: No problem.

NG: Problem exists.

1. Inspeciton starts.
   - An abnormality occurs in the DFI system, and the FI indicator LED light goes on to alert the rider.
   - Bring the motorcycle into the shop.
2. Confirm problems.
   - Reproduce the problems if possible.
3. Conduct pre-diagnosis inspection.
   - The pre-diagnosis inspection items are not handled by self-diagnosis. Check the problem before self-diagnosis, considering the symptoms of the problem.
   - Pre-diagnosis Inspection Items

     ECU Power Supply Inspection
     ECU Fuse Inspection
     ECU Main Relay Inspection
     FI Indicator LED Light Operation Inspection
     Fuel Pressure Inspection
     Pressure Regulator Inspection
     Fuel Flow Rate Inspection
4. Conduct self-diagnosis.
   - Enter the self-diagnosis mode and count the blinks of the FI indicator LED light to read the fault code.
5. Check items.
   - Decide the faulty part, refering to the problem chart.
   - Decide the check procedure for each faulty part, referring to each section (Fault Inspection 11 ~ 54).
6. Operation check.
   - Make sure the FI indicator LED light goes off.
   - If the problem is related to startability or idle stability, idle the engine to confirm that the DFI system and the ignition system are operating correctly.
   - If the problem is related to driveability, ride the motorcycle at 30 km/h (18 mph) or above to confirm that the DFI system and the ignition system are operating correctly.



Inquiries to Rider

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

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

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

Diagnosis Keys

What –	Motorcycle model
When –	Date (frequency of problem)
Where –	Road conditions, altitude
How –	Riding conditions
	Environment

Troubleshooting the DFI System

Sample Diagnosis Sheet

Rider name:	**Registration No. (license plate No.):**	**Year of initial registration:**
Model:	**Engine No.:**	**Frame No.:**
Date problem occured:		**Mileage:**
Environment when problem occurred.		
Weather	☐ fine, ☐ cloudy, ☐ rain, ☐ snow, ☐ always, ☐ other:	
Temperature	☐ hot, ☐ warm, ☐ cold, ☐ very cold, ☐ always	
Problem frequency	☐ chronic, ☐ often, ☐ once	
Road	☐ street, ☐ highway, ☐ mountain road (☐ uphill, ☐ downhill), ☐ bumpy, ☐ pebble	
Altitude	☐ normal, ☐ high (about 1000 m or more)	
Motorcycle conditions when problem occurred.		
FI indicator LED light	☐ light up immediately after ignition SW ON, and goes off after 1 ~ 2 seconds (normal).	
	☐ lights blinks immediately after ignition SW ON, and stays on (DFI problem)	
	☐ lights up immediately after ignition SW ON, but goes off after about 10 seconds (DFI problem).	
	☐ unlights (LED light, ECU or its wiring fault).	
	☐ sometimes lights up (probably wiring fault).	
Starting difficulty	☐ starter motor not rotating.	
	☐ starter motor rotating but engine doesn't turn over.	
	☐ starter motor and engine don't turn over.	
	☐ no fuel flow (☐ no fuel in tank, ☐ no fuel pump sound).	
	☐ engine flooded (do not crank engine with throttle opened, which promotes engine flooding).	
	☐ no spark.	
	☐ fast idle lever is not pulled fully when using the lever (pull it fully when using).	
	☐ other:	
Engine stalls	☐ right after starting.	
	☐ when opening throttle grip.	
	☐ when closing throttle grip.	
	☐ when moving off.	
	☐ when stopping the motorcycle.	
	☐ when cruising.	
	☐ other:	
Poor running at low speed	☐ fast idle lever pulled out fully (push it in fully).	
	☐ very low fast idle speed.	
	☐ very low idle speed, ☐ very high idle speed, ☐ rough idle speed.	
	☐ battery voltage is low (charge the battery).	
	☐ spark plug loose (tighten it).	
	☐ spark plug dirty, broken, or gap maladjusted (remedy it).	
	☐ backfiring.	
	☐ afterfiring.	
	☐ hesitation when acceleration.	
	☐ engine oil viscosity too high.	
	☐ brake dragging.	
	☐ engine overheating.	
	☐ clutch slipping.	
	☐ other:	
Poor running or no power at high speed	☐ fast idle lever pulled out fully (push it in fully).	
	☐ spark plug loose (tighten it).	
	☐ spark plug dirty, broken, or gap maladjusted (remedy it).	
	☐ spark plug incorrect (replace it).	
	☐ knocking (fuel poor quality or incorrect, → use high-octane gasoline).	
	☐ brake dragging.	
	☐ clutch slipping.	
	☐ engine overheating.	
	☐ engine oil level too high.	
	☐ engine oil viscosity too high.	
	☐ other:	

Troubleshooting the DFI System

Problem Chart

Problems*	Startability		Idling stability			Driveability							M	O
Inspection items	A	B	C	D	E	F	G	H	I	J	K	L	N	
ECU ground and power supply	1 (1)													2
Ignition SW, engine stop SW	2 (2)													2*, 15*
Spark plug #1, #2, #3, #4	3 (3)	4 (5)												15
In-tank fuel pump	4 (4)	1 (1)			1 (1)	1 (1)	1 (1)				1 (1)			2
Fuel pressure		2 (2)	2 (2)		4 (4)	3 (3)	3 (3)	2 (2)	2 (2)		2 (2)			2
Fuel injector #1, #2, #3, #4	8 (8)	3 (3)	1 (1)		2 (2)	2 (2)	2 (2)	1 (1)	1 (1)				1	2
Water tenperaure sensor		(4)	4 (3)	1 (1)	3 (3)	7 (7)	5 (5)	5 (5)	3 (3)		7 (7)	4 (4)		2
Throttle sensor						5 (5)		3 (3)			4 (4)			2
Inlet air temperature sensor			3			4 (4)	4 (4)			1 (1)	6 (6)	3 (3)		2
Atmospheric pressure sensor			5			8 (8)	6 (6)			2 (2)	8 (8)	5 (5)		2
Inlet air pressure sensor				2 (2)	7 (7)	9 (9)	8 (8)	6 (6)			9 (9)	6 (6)		2
Vehicle-down sensor	5 (5)													2
Crankshaft sensor cam shaft senosr	6 (6)	5 (6)			5 (5)						3 (3)	1 (1)		2, 15
Stick coil #1, #2, #3, #4	7 (7)				6 (6)		7 (7)			3 (3)				2, 15
Gear Position Switch						6 (6)	9 (9)	4 (4)			5 (5)	2 (2)		2

Notes:

Problems*:

The ECU often participates in these problems. So if the parts, and the circuit have been checked out good, the ECU must be replaced.

Numbers:

The numbers indicate inspection order in the chart.

ex.

1, 2, 3..... : Inspection order when engine is hot.
(1), (2), (3)..... : Inspection order when engine is cold.

2*: DFI wiring diagram in this chapter

15*: Wiring diagram in Electrical System chapter

Troubleshooting the DFI System

Startability:

(A): The starter motor rotates the engine but there is no combustion and the engine doesn't start.

(B): •There is combustion, but the engine stalls immediately.
•You need to push the starter button long to start the engine.

Idling stability:

(C): Unstable idling (rough idling)
•The idle speed fluctuates. This can be identified by engine sound or vibration.

(D): Incorrect idle speed
•The idle speed cannot be adjusted within the specified range.

(E): Lack of idling consistency
•The engine cannot maintain idling. The following two symptoms are found.

The engine stalls when closing the throttle.

The engine stalls when opening the throttle.

Driveability:

(F): Hesitation

Hesitation [A]

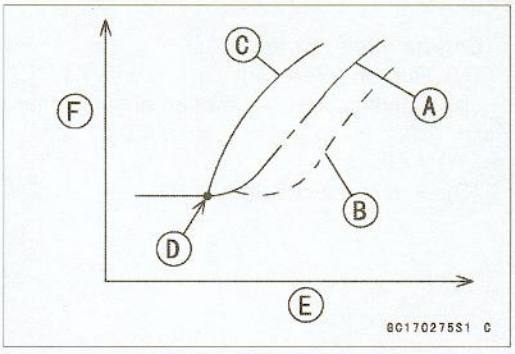
Severe Hesitation [B]

Normal [C]

Beginning [D] of Opening the Throttle

Throttle Opening [E]

Motorcycle Speed [F]



(G): Poor acceleration
The motorcycle runs smoothly, but cannot accelerate in response to throttle opening, and cannot reach maximum speed.

(H): Stumble
When the motorcycle is about to accelerate, the engine speed cannot increase in responce to throttle opening, and increases with a lag [B] at opening [C] the throttle.

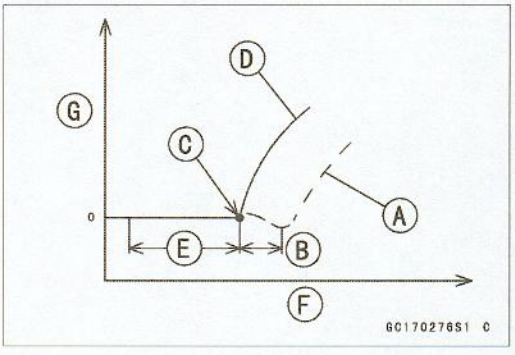
Stumble [A]

Normal [D]

Idling [E]

Opening the throttle [F]

Motorcycle Speed [G]



(I): Surge
A forward and backward, periodic movement of a motorcycle at acceleration, deceleration, or at cruising.
(J): Knock
A periodic, rattling, thumping or pounding noise caused by spontaneous ignition of the air-fuel mixture in a cylinder, leading to engine damage. Knocking can also be caused by a connecting rod bearing, uneven combustion, or incorrect fuel.
(K): Backfire
An explosion of unburned or partially burned fuel in an inlet pipe caused by incomplete combustion in the cylinder head, leaner air-fuel mixture, wrong valve timing, vacuum switch broken, or air suction trouble, mainly during decelerating.
(L): Afterfire
An explosion of gases accumulated in a muffler caused by incomplete combustion in the cylinder head, wrong plug gap, burned electrode, or richer air-fuel mixture. Also it is caused by delayed ignition during starting or during decelerating, resulting in an explosion after the end of the combustion.

Engine doesn't stop (M):
(N): Run-on (dieseling)
Continuous running of an engine when the ignition SW is turned off.

(O): Reference chapters

ECU

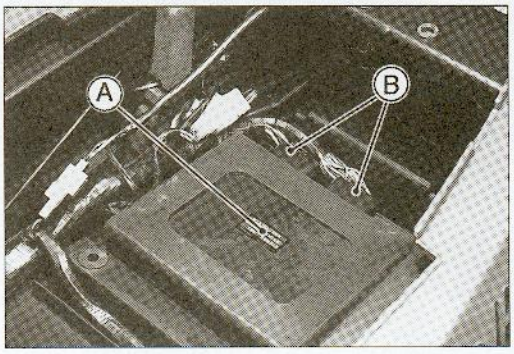
CAUTION

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

ECU Removal

- Remove:
  Rear Seat with Cover (see Frame chapter)
  Storage Box (see Frame chapter)
- Pull the ECU [A] out.

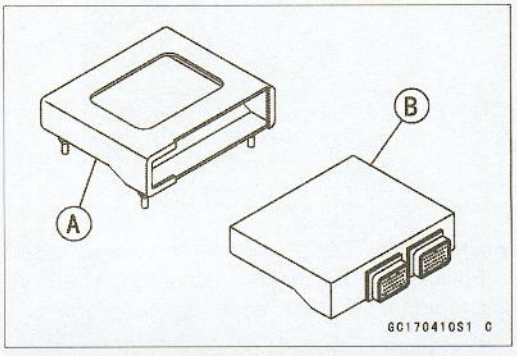
★ If necessary, disconnect the connectors [B].



ECU Installation

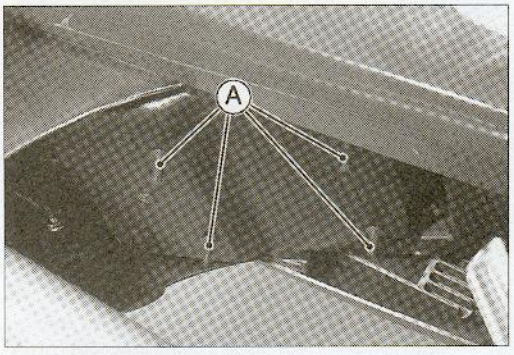
- Connect the ECU connectors.

★ If the rabber protector [A] is removed, install it.
ECU [B]



- Fit the projections of the rabber protector into the holes of the rear fender rear.

○ Pull the projections [A] of the rabber protector the opposite into the rear fender rear.



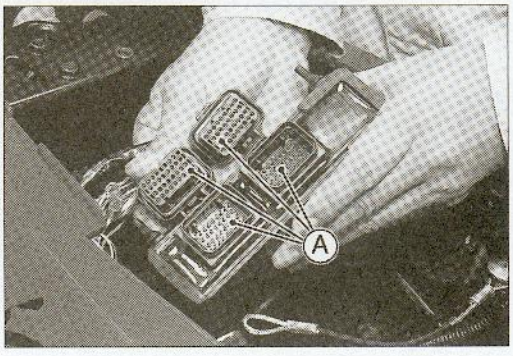
ECU Power Supply Inspection

- Visually inspect the terminals [A] of the ECU connectors.

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

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

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



ECU

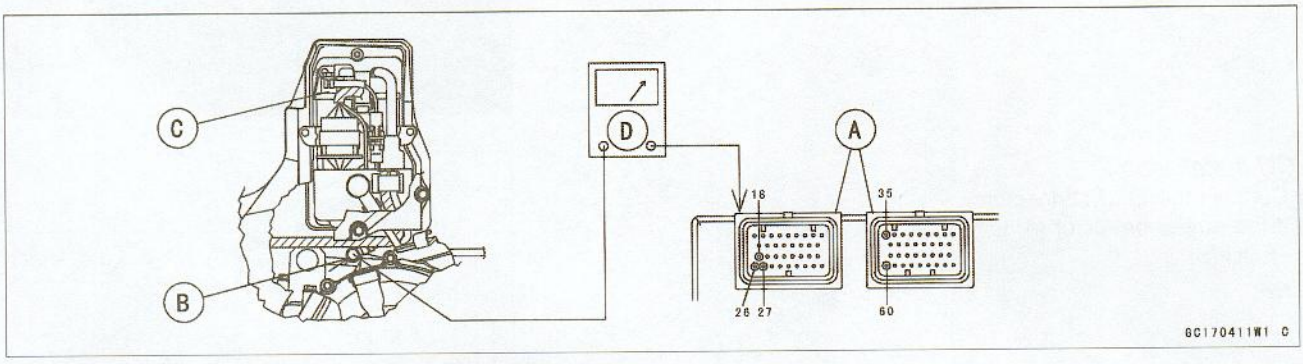
- With the ECU connectors [A] connected, check the following ground wire for continuity with the ignition SW OFF, using the hand tester.

ECU Grounding Inspection

18, 26, 27, or 35 (BK/Y) Terminal	←→	**Battery (–) Terminal: 0 Ω**
60 (BR/BK) Terminal	←→	**Battery (–) Terminal: 0 Ω**
Engine Ground Terminal [B]	←→	**Battery (–) Terminal: 0 Ω**

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

Special Tool - Hand Tester [D]: 57001–1394



- Check the ECU power source voltage with the hand tester.
- Position the terminal in accordance with terminal numbers of ECU connectors in this chapter figure.

ECU Power Source Inspection

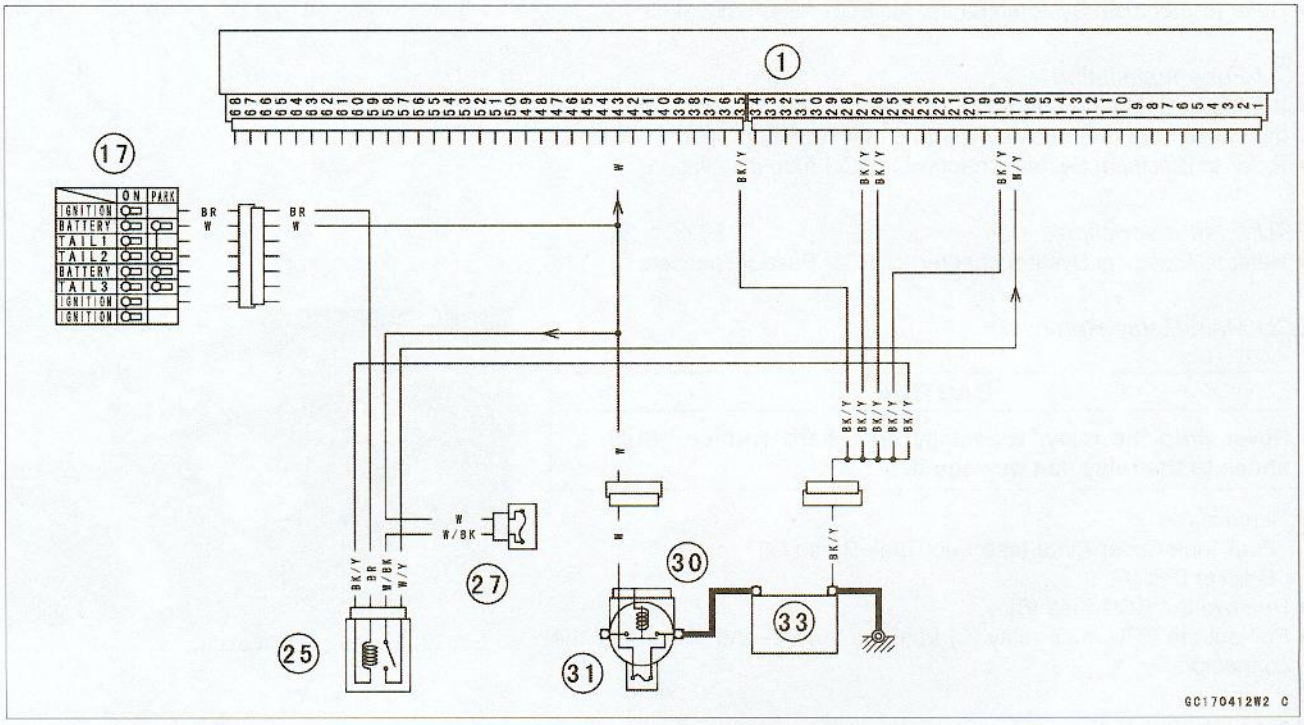
Tester Connections:	**between 17 (W/Y) Terminal and Battery (–) Terminal**
	between 43 (W) Terminal and Battery (–) Terminal
Ignition SW OFF:	**17 Terminal 0 V, 43 Terminal 12.5 V or more**
Ignition SW ON:	**Battery Voltage (12.5 V or more)**

★ If the tester does not read as specified, check the following:
Power Source Wiring (see wiring diagram below)
ECU Fuse 15 A (see DFI Power Source section)
ECU Main Relay (see DFI Power Source section)
Ignition Fuse 10 A (see Electrical System chapter)
Main Fuse 30 A (see Electrical System chapter).

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

ECU

ECU Power Source Circuit



→: Current
ECU [1]
Ignition SW [17]
Starter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]
ECU Fuse 15 A [27]
ECU Main Relay [25]

DFI Power Source

ECU Fuse Removal

- Refer to Electrical System chapter for ECU fuse removal.

ECU Fuse Installation

★If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.

- Refer to Electrical System chapter for ECU fuse installation.

ECU Fuse Inspection

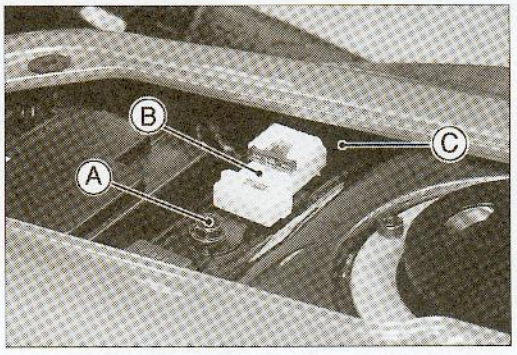
- Refer to Electrical System chapter for ECU Fuse Inspection.

ECU Main Relay Removal

CAUTION

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

- Remove:
  Fuel Tank Cover Plate (see Fuel Tank Removal)
  Bracket Bolt [A]
- Remove the ECU fuse [B].
- Pull out the ECU main relay [C] from the bracket and disconnect the connector.



ECU Main Relay Inspection

- Remove the ECU main relay (see above).
- Connect the hand tester [A] and one 12 V battery [B] to the relay connector [C] as shown.

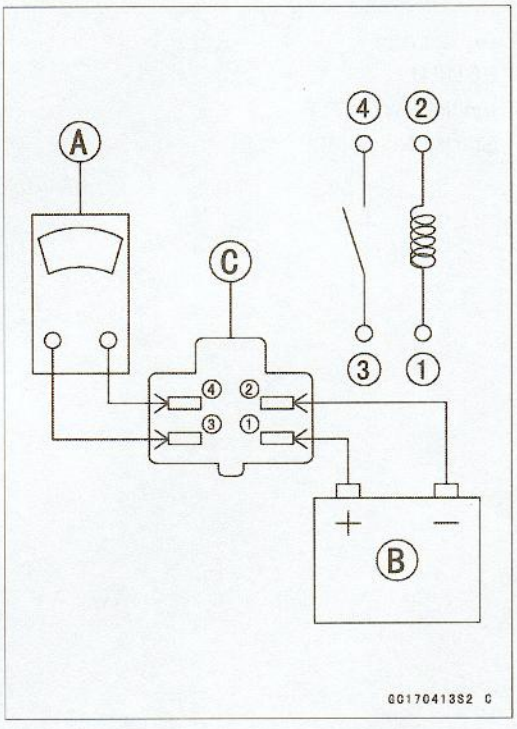
Special Tool - Hand Tester: 57001–1394

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

Testing Relay

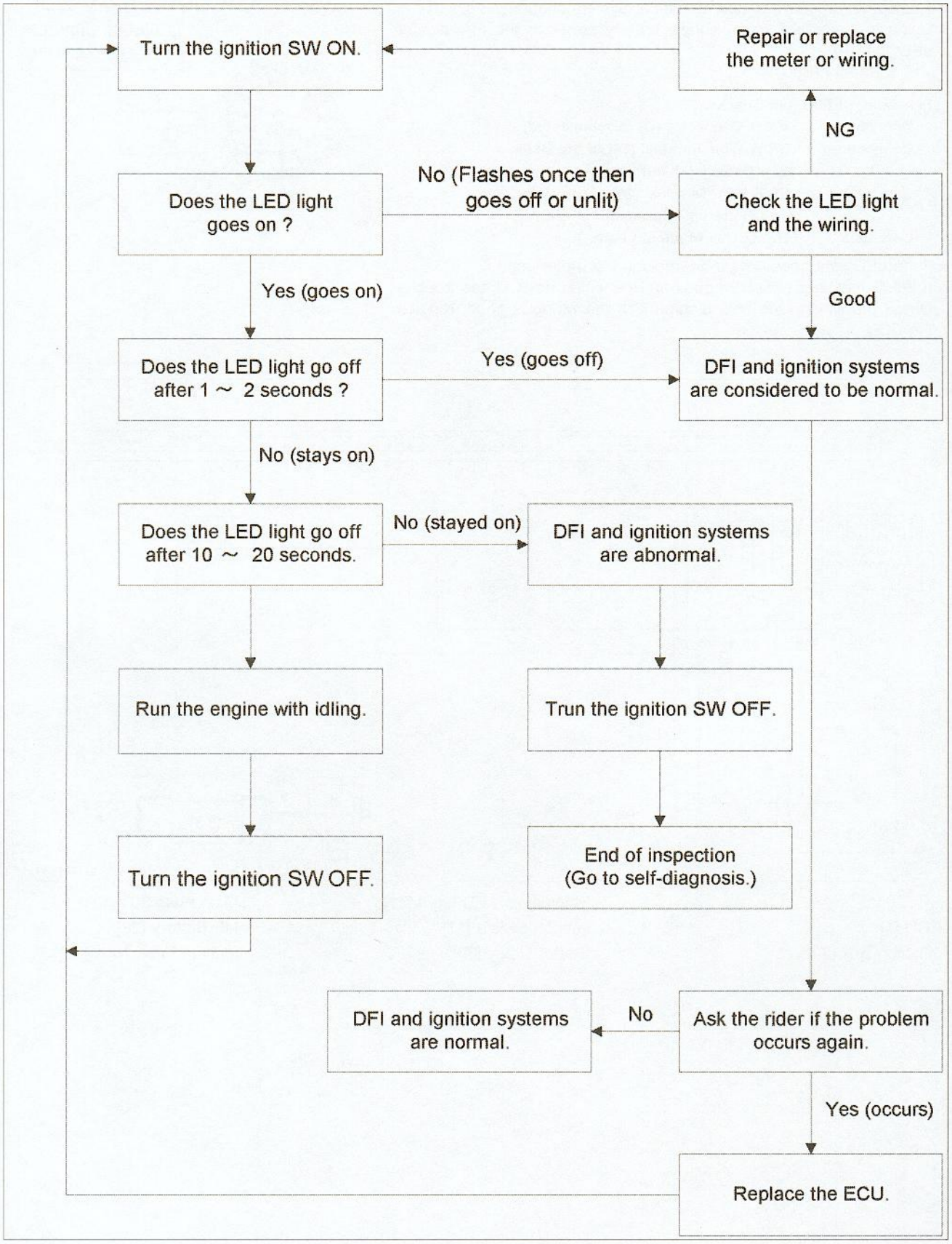
Tester range:	**1 Ω range**
Criteria:	**When battery is connected → 0 Ω**
	When battery is disconnected → ∞ Ω

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



FI Indicator LED Light

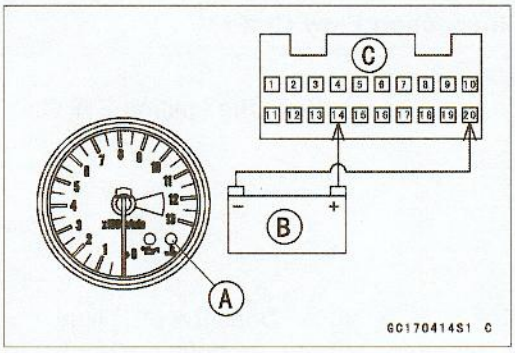
Inspection Flow Chart



FI Indicator LED Light

LED Light Inspection

- Remove the meter unit (see Electrical System chapter).
- Using two auxiliary wires, supply battery power to the FI indicator LED light [A].
  12 V Battery [B]



FI Indicator LED Light Check

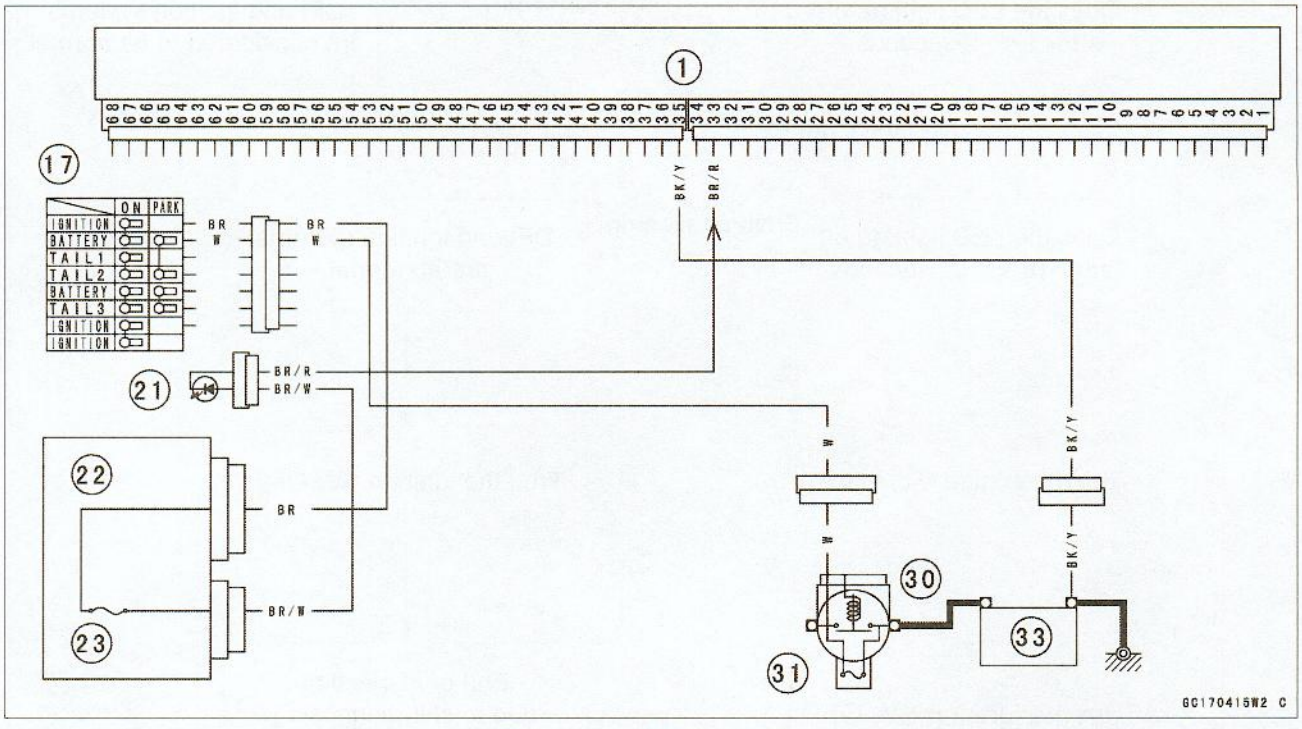
Connector: **Meter Connector [C] (disconnected)**

Connection: **BR/W Wire Terminal [14] of the Meter**
→ Battery (+) Terminal
BR/R Wire Terminal [20] of the Meter
→ Battery (–) Terminal

Criterion: **The LED light should light.**

★ If the LED light does not go on, replace the meter unit.

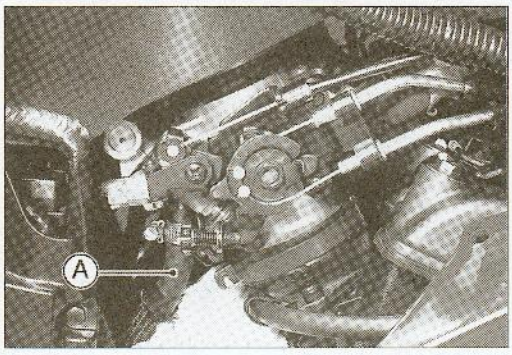
★ If the FI indicator LED light goes on, the wiring or ECU has trouble. Check the wiring (see next diagram). If the wiring is good, replace the ECU.



→: Signal
ECU [1]
Junction Box [22]
FI Indicator LED Light [21]
Ignition Switch [17]
Starter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]
Ignition Fuse 10 A [23]

Fuel Line

Fuel Pressure Inspection



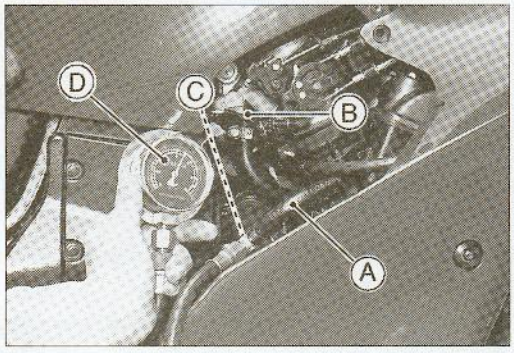
NOTE

○ *Be sure the battery is fully charged.*

● Be sure to place a piece of cloth around the fuel supply pipe of the throttle body assy.
● Loosen the clamp bolt and pull out the fuel supply hose [A].
○ Quickly plug the pipe with a plug.

⚠ WARNING

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



● Install the fuel pressure gauge adapter [A] between the fuel supply pipe [B] and the fuel supply hose [C].
● Connect the pressure gauge [D] to the fuel pressure gauge adapter.

Special Tools - Fuel Pressure Gauge Adapter: 57001–1417
Oil Pressure Gauge: 57001–125

⚠ WARNING

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

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

Fuel Pressure
right after Ignition SW ON, with pump running:
Standard: 299 kPa (3.05 kg/cm², 43 psi)
after 3 seconds from Ignition SW ON, with pump stopped:
Standard: 274 kPa (2.8 kg/cm², 40 psi)

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

Fuel Pressure (idling)
Standard: 279 kPa (2.85 kg/cm², 41 psi)

● Measure the fuel pressure with the throttle fully opened a moment.

Fuel Pressure (with throttle fully opened)
Standard: 254 ~ 279 kPa (2.6 ~ 2.85 kg/cm², 37 ~ 41 psi)

NOTE

○ *The gauge hand will fluctuate. Read the pressure at the average of the maximum and minimum indications.*

★ If the fuel pressure is much higher than the specified, check the following:
Fuel Return Hose for Sharp Bend, Kinking, or Clogging
★ If the fuel pressure is much lower than specified, check the following:
Fuel Line Leakage
Amount of Fuel Flow (see Fuel Flow Rate Inspection)
★ If the fuel pressure is much lower than specified, and if inspection above checks out good, replace the throttle body assy, or the fuel pump and measure the fuel pressure again.
● Remove the fuel pressure gauge and adapter.
● Run the fuel hoses in accordance with the Cable, Wire, and Hose Routing section in the General Information chapter.

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

Fuel Line

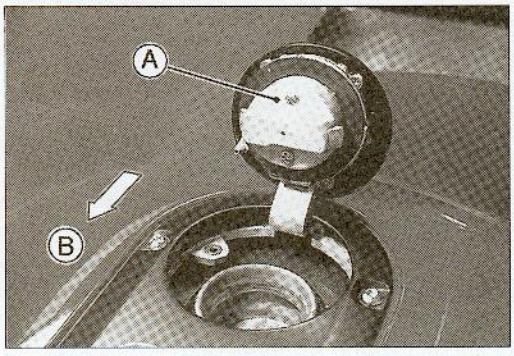
Fuel Flow Rate Inspection

NOTE

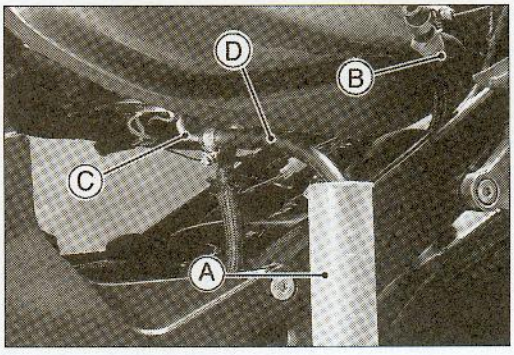
○ *Be sure the battery is fully charged.*

⚠ WARNING

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



- Turn the ignition SW, and engine stop SW OFF.
- Wait until the engine cools down.
- Set up the fuel tank (see this chpater).
- Open the fuel tank cap [A] to lower the pressure in the tank.
  Front [B]



- Prepare a measuring cylinder [A].
- Disconnect the fuel supply hose [B] from the fuel outlet pipe [C], and plug the tank inlet pipe with the rubber plug quickly.
- Connect the fuel pressure gauge adapter [D], and the measuring cylinder as shown.

Special Tool - Fuel Pressure Gauge Adapter: 57001–1417

- Close the fuel tank cap.

⚠ WARNING

Wipe off spilled out fuel immediately.
Be sure to hold the measuring cylinder vertical.

- With the engine stopped, turn the ignition SW ON. The fuel pump should operate for 3 seconds, and then should stop.
- Measure the discharge for 3 seconds.
- ○ Measure the fuel flow rate so that the adapter hose filled with fuel.

Amount of Fuel Flow
Standard: 83 mL or more for 3 seconds

★ If the fuel flow is much less than the specified, check the following:
Fuel Pump (see Fuel Pump Inspection in this chapter)
Pump Filter (see Pump Filter Cleaning in the In-tank Fuel Pump section).

- After inspection, connect the fuel hoses. (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

Fuel Relief Valve Inspection

- Remove the fuel relief valve.
- Refer to Relief Valve Inspection in Engin Lubrication System chapter for Fuel Relief Valve Inspection.

In-tank Fuel Pump

Fuel Pump Removal

CAUTION

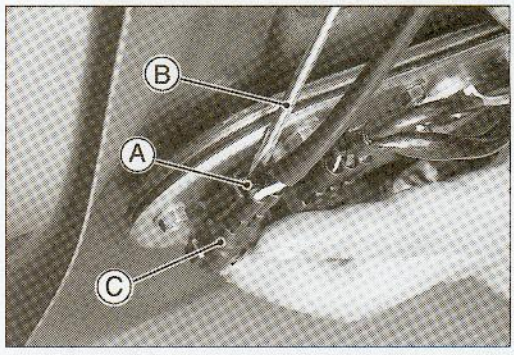
Never drop the fuel pump, especially on a hard surface. Such a shock to the pump can damage it.

⚠ WARNING

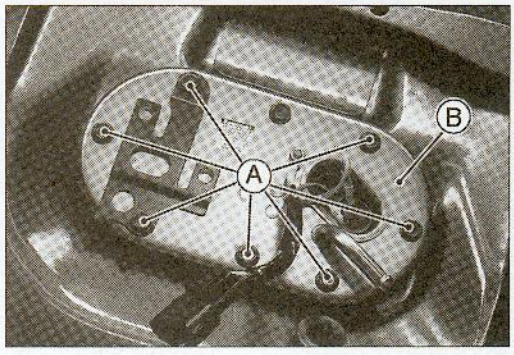
Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Disconnect the battery (–) terminal.
To make fuel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

- Draw the fuel out from the fuel tank (see Fuel Tank Removal).
- Remove the fuel tank (see this chapter).
- ○ Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump. Plug all the fuel pipes of the fuel tank.

- Push down the stopper [A], using the (–) screw driver [B].
- Remove the fuel level gage connector [C].



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



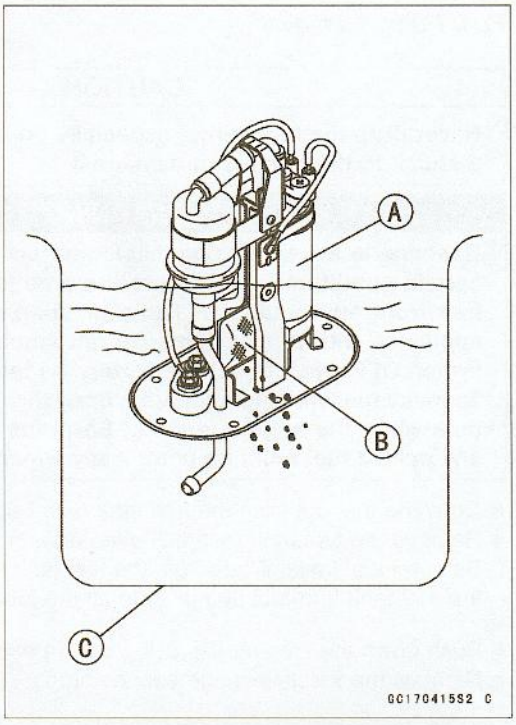
In-tank Fuel Pump

Pump Filter Cleaning

⚠ WARNING

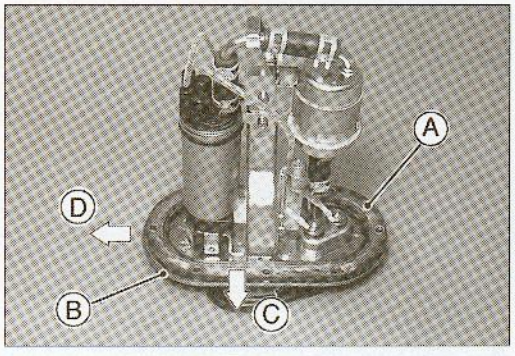
Clean the pump filter in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent to clean the pump filter.

- Remove the fuel pump [A] along with the pump filter [B].
- Prepare a container [C] filled with a high-flash point solvent.
- Dip and shake the pump in the solvent to remove dirt and fuel deposits from the pump filter.
- Dry the pump and filter by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.
- Install the fuel pump (see this section).



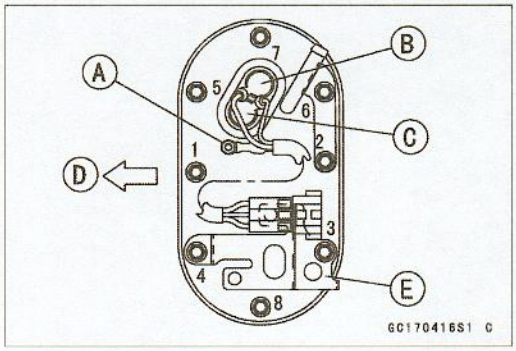
Fuel Pump Installation

- Clean the pump filter (see Pump Filter Cleaning).
- Remove dirt or dust from the fuel pump by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.
- Install a new pump gasket [A] with its tab [B] facing forward [C] and right [D].



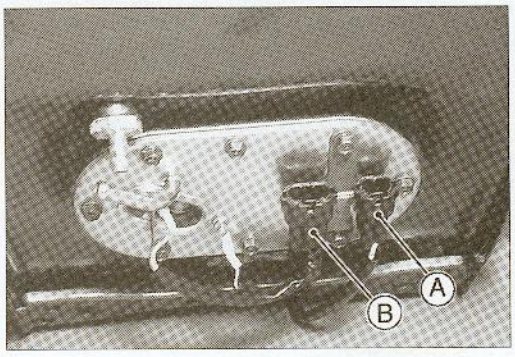
- Check that the fuel pump terminals are in place.
  Pump Motor and Fuel Reserve Switch BK/W (–) Wire [A]
  Pump Motor Y/R (+) Wire [B]
  Fuel Reserve Switch R/BK (+) Wire [C]
  Front [D]
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts to a snug fit following the tightening sequence shown.
- ○ Install the fuel pump bolts [3, 4] with the bracket [E].
- Following the tightening sequence, tighten the pump bolts to the specified torque.

  Torque - Fuel Pump Bolts: 6.9 N·m (0.7 kg·m, 61 in·lb)
- Tighten the pump bolts again to check the tightness in the order shown.



In-tank Fuel Pump

- Secure the fuel level sensor connector [A], and fuel pump connector [B] on the bracket.
- Install the fuel tank (see this chapter).



Operation Inspection

NOTE

○ *Be sure the battery is fully charged.*

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

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

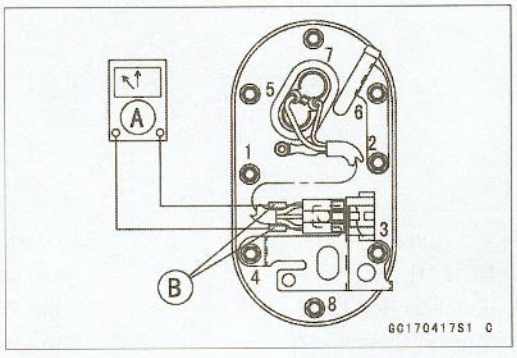
Operating Voltage Inspection

NOTE

○ *Be sure the battery is fully charged.*

- Turn the ignition SW OFF.
- Set up the fuel tank.
- Connect the hand tester [A] (25 V DC) to the connectors, using needle adapter set [B].

Special Tools - Hand Tester: 57001-1394
Needle Adatper Set: 57001–1457



○ Measure the operating voltage with the engine stopped, and with the connector joined.

- Turn the ignition SW ON.

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

Pump Operating Voltage at Pump Connections to Pump Connectors
Tester (+) → Y/R Wire
Tester (–) → BK/W Wire

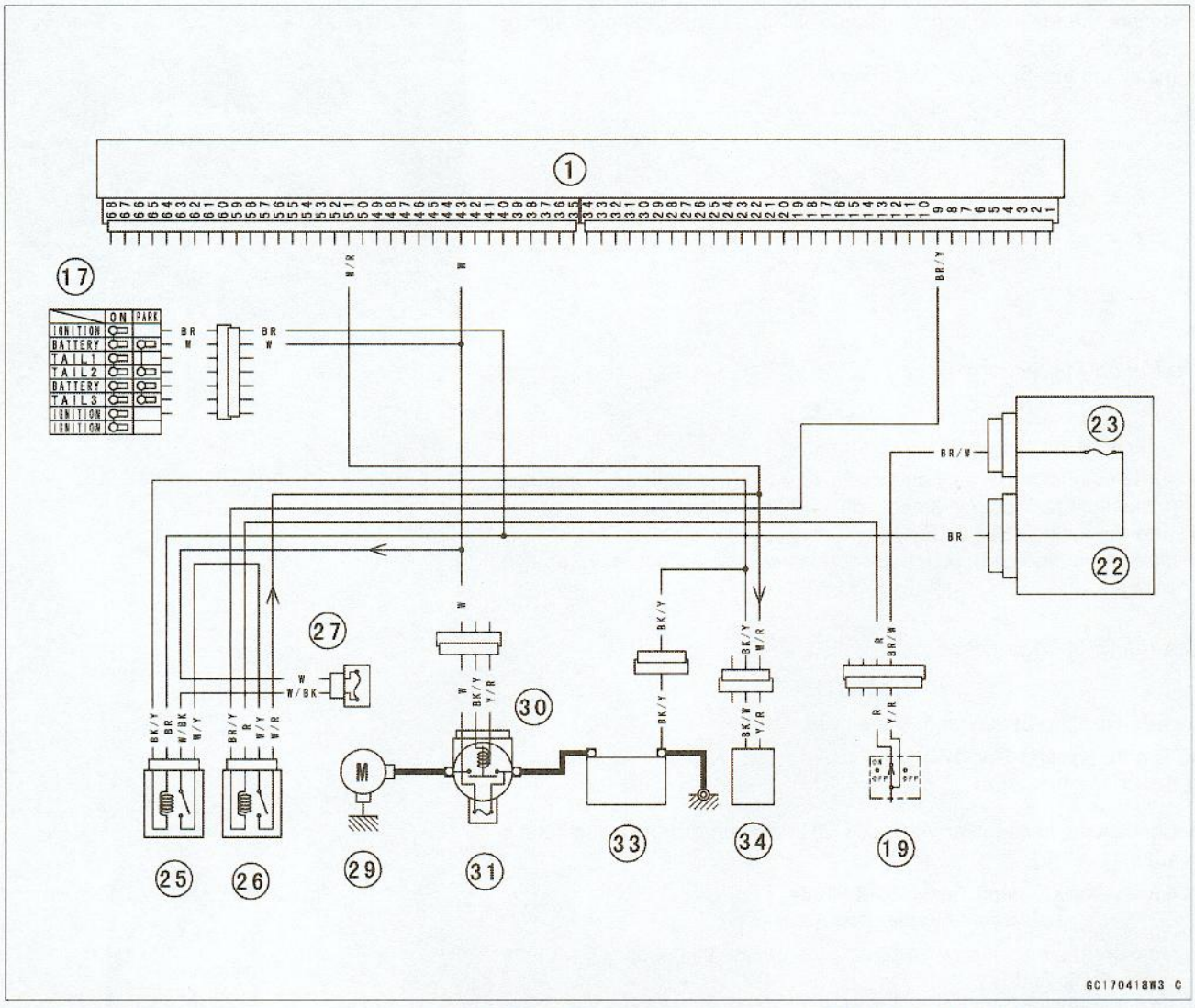
Operating Voltage at Pump Connector
Standard: Battery Voltage (12.5 V or more) for 3 seconds, and then 0 V.

★ If the reading stays on battery voltage, and never shows 0 V. Check the ECU and fuel pump relay.

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

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

In-tank Fuel Pump

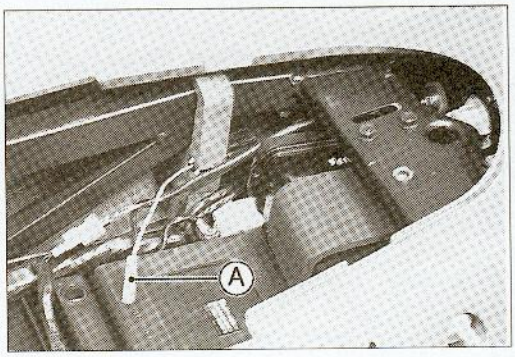


→: Current
ECU [1]
Junction Box [22]
Ignition Switch [17]
Engine Stop Switch [19]
Starter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]
In-tank Fuel Pump [34]
Starter Motor [29]
ECU Fuse 15 A [27]
Fuel Pump Relay [26]
Ignition Fuse 10 A [23]
ECU Main Relay [25]

Self-Diagnosis

Self-diagnosis Outline

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



User Mode:

The ECU notifies the rider of troubles in DFI system and ignition system by lighting the FI indicator when DFI system and ignition system parts a faulty, and initiates fail-safe function. In case of serious troubles ECU stops the injection/ignition/starter motor operation to prevent battery discharge, and notifies the rider that the engine will no start.

Dealer Mode 1:

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

Dealer Mode 2:

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

Self-diagnosis Function

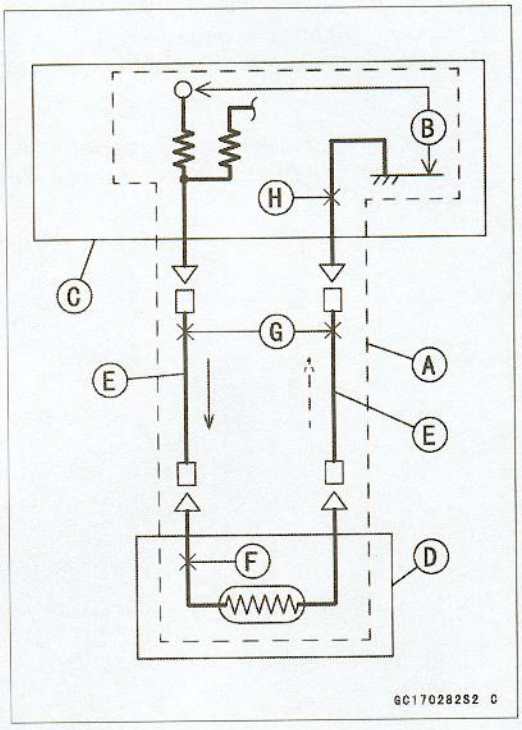
The self-diagnosis indicates problems with the parts, wiring, and ECU in the DFI system and ignition system.

The ECU [C] always monitors each DFI circuit [A] for problems by measuring the voltage [B]. This circuit includes parts [D], and wiring [E].

When the circuit is open (problem), the following are possible problems.

Disconnection [F] in the Parts
Disconnection [G] in the Wiring
Disconnection [H] in the ECU

When the FI indicator indicates a problem, the ECU has the possibility of the problem as well as the parts and the wiring outside the ECU.



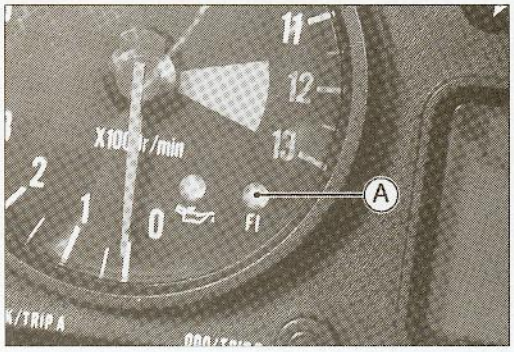
Self-diagnosis Procedures

○ When a problem occurs with the DFI system and ignition system, the DFI indicator LED light [A] goes on.

NOTE

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

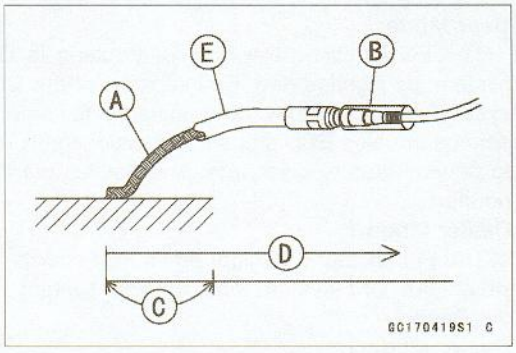
○ *Keep the display switch grounded during self-diagnosis, using a wire.*



● Remove the strage box (see Frame chapter) and pull the self-diagnosis indicator terminal.

● Enter the self-diagnosis dealer mode 1 by grounding [A] the self-diagnosis indicator terminal [B] to the ground for more than 2 seconds [C], and then keep it grounded continuously [D] using a wire [E].

○ Count the blinks of the LED light to read the fault code.

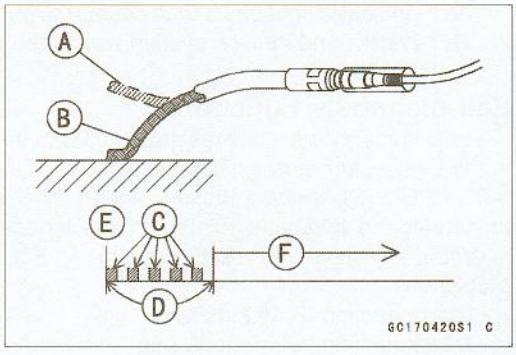


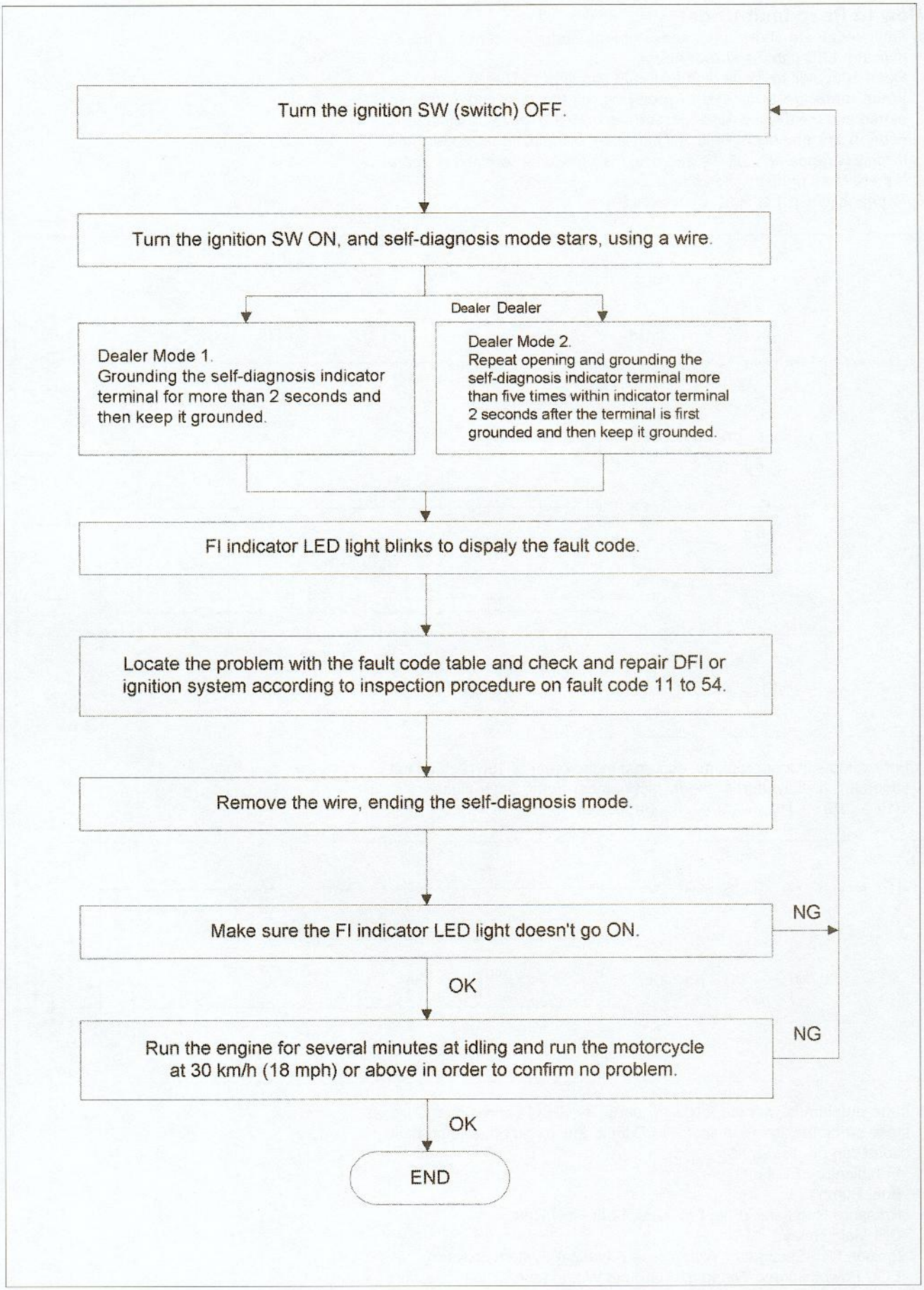
● Enter the self-diagnosis dealer mode 2 by repeat opening [A] and grounding [B] the wire more than five times [C] within 2 seconds [D] after the wire is first grounded [E], and then keep it grounded continously [F] using a wire.

○ Count the blinks of the LED light to read the fault code.

NOTE

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

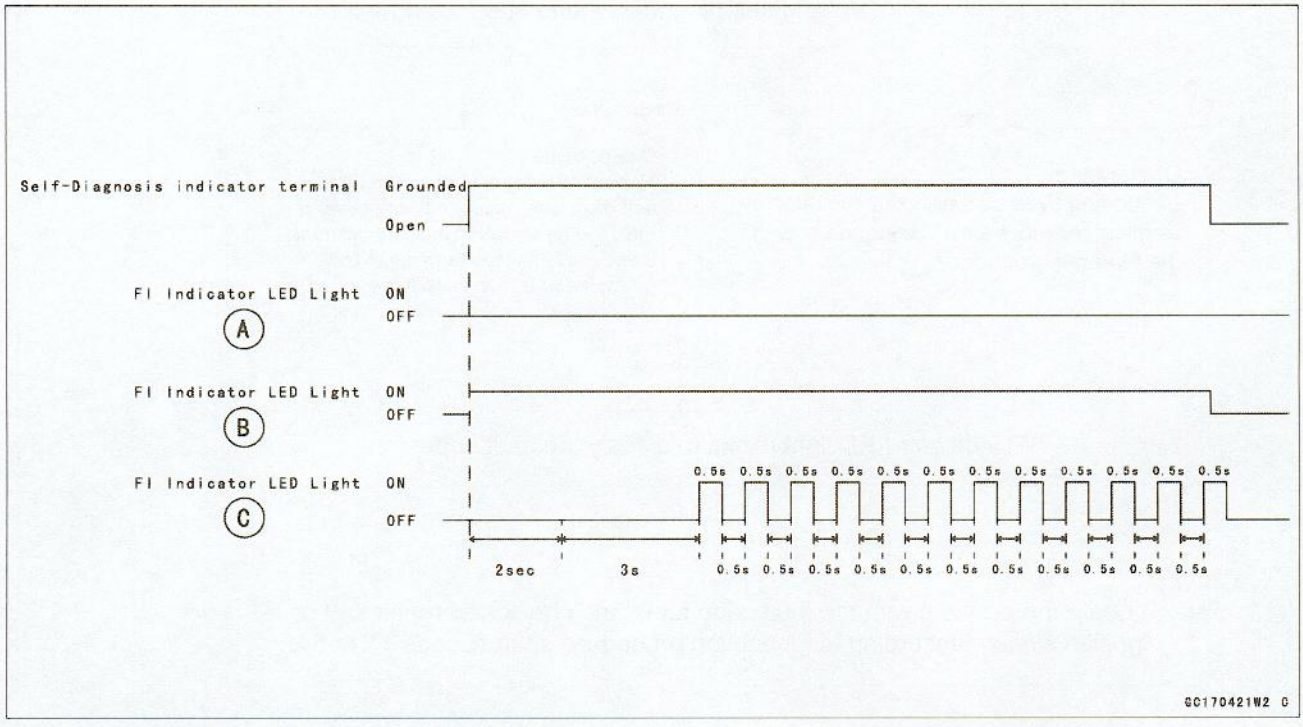



Turn the ignition SW (switch) OFF.
Turn the ignition SW ON, and self-diagnosis mode stars, using a wire.
Dealer Dealer
Dealer Mode 1.
Grounding the self-diagnosis indicator terminal for more than 2 seconds and then keep it grounded.
Dealer Mode 2.
Repeat opening and grounding the self-diagnosis indicator terminal more than five times within indicator terminal 2 seconds after the terminal is first grounded and then keep it grounded.
FI indicator LED light blinks to dispaly the fault code.
Locate the problem with the fault code table and check and repair DFI or ignition system according to inspection procedure on fault code 11 to 54.
Remove the wire, ending the self-diagnosis mode.
Make sure the FI indicator LED light doesn't go ON.
NG
OK
Run the engine for several minutes at idling and run the motorcycle at 30 km/h (18 mph) or above in order to confirm no problem.
NG
OK
END

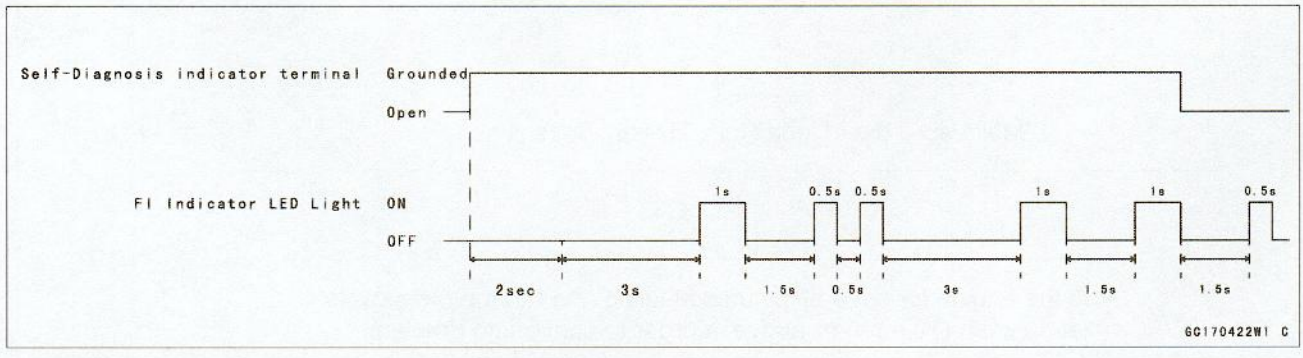
Self-Diagnosis

How to Read fault Codes

- Fault codes are shown by a series of long and short blinks of the FI indicator LED light as shown below.
- Read 10th digit and unit digit as the FI indicator LED light blinks.
- When there are a number of problems, all the fault codes can be stored and the display will begin starting from the lowest number fault code in the numerical order. Then after completing all codes, the display is repeated until the self-diagnosis indicator terminal is open.
- If there is no problem, no code is shown.
- Repeat blinks [C] or light [B], unlight [A].



- For example, if four problems occurred in the order of 15, 12, the fault codes are displayed from the lowest number in the order listed.
  (12 → 15) → (12 → 15) → · · · (repeated)



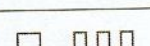
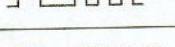
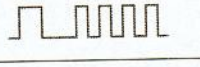
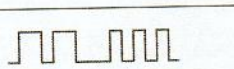
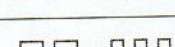
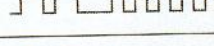
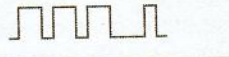
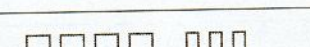
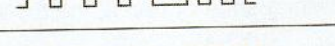
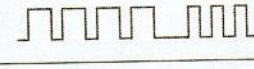
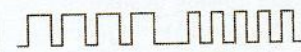
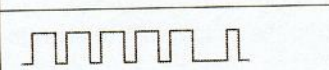
- If the problem is with the following parts, the ECU cannot memorize these problems, the FI indicator LED light doesn't go on, and no fault codes can be displayed.
  FI Indicator LED Light
  Fuel Pump
  Pressure Regulator (Fuel Pressure, Fuel Flow Rate)
  DFI Main Relay
  Ignition Coil Secondary Wiring (see Electrical System chapter)
  ECU Power Source Wiring and Ground Wiring (see ECU Inspection in this chapter)

Self-Diagnosis

How to Erase Fault Codes

○ Even if the ignition SW is turned OFF, the battery is disconnected, or the problem is solved, all fault codes vanish in the ECU.

Fault Code Table

Fault Code	FI Indicator LED Light	Problems (1)
11		Throttle sensor malfunction, wiring open or short
12		Inlet air pressure sensor malfunction, wiring open or short
13		Inlet air temperature sensor malfunction, wiring open or short
14		Water temperature sensor malfunction, wiring open or short
15		Atmospheric pressure sensor malfunction, wiring open or short
21		Crankshaft sensor malfunction, wiring open or short
23		Cam sensor malfunction, wiring open or short
25		Gear position switch malfunction, wiring open or short
31		Vehicle-down sensor, malfunction, wiring open or short
41		Injector #1 malfunction, wiring open or short
42		Injector #2 malfunction, wiring open or short
43		Injector #3 malfunction, wiring open or short
44		Injector #4 malfunction, wiring open or short
45		Fuel pump relay wiring open
46		Fuel pump relay stuck ON
51		Ignition coil #1 malfunction, wiring open or short
52		Ignition coil #2 malfunction, wiring open or short
53		Ignition coil #3 malfunction, wiring open or short
54		Ignition coil #4 malfunction, wiring open or short

Footnotes:

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

Self-Diagnosis

Backups

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

Fault Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Throttle Sensor	Throttle Valve Opening Angle θ = 6.5° ~ + 86.5°	★ If the throttle sensor system fails (the signal is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method. ★ Also, the throttle sensor system and inlet air prpessure fails, the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the α-N method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure (absolute) Pv = 100 mmHg ~ 900 mmHg	★ If the Inlet Air Pressure sensor system fails (the signal Pv is out of the usable range, wiring short or open), the ECU sets the DFI in the α - N method (1).
13	Inlet Air Temperature Sensor	Inlet Air Temperature Ta = – 47°C ~ + 178°C	★ If the inlet air temperature sensor fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 45°C.
14	Water Temperature Sensor	Water Temperature Tw = – 30C° ~ + 120°C	★ If the water temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Tw at 86°C.
15	Atmospheric Pressure Sensor	Absolute Atmospheric Pressure Pa = 100 mmHg ~ 900 mmHg	★ If the atmospheric pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pa at 760 mmHg (the standard atmospheric pressure).
21	Crankshaft Sensor	Crankshaft sensor must send signals (output voltage) 8 continuously to the ECU.	★ If crankshaft sensor generates 8 or more signals, the ECU runs the engine by the signal of the good crankshaft sensor, but neither crankshaft sensor generate signals, the engine stops by itself.
23	Cam Sensor	Cam sensor must send one signal (output signal) to the ECU at the two cranking	★ If the cam sensor system fails (the signal is missing, wiring short or open), the ECU continues to ignite cylinders in the same sequence following the last good signal.
25	Gear Position Switch	Gear Position Switch ON = Ground OFF = 5 V or more (neutral) , 5 V or less	★ If the gear position switch system fails (the signal is out of the usable range, wiring short or open), the ECU locks in 6th gear position.
31	Vehicle-down Sensor	Vehicle-down Sensor Output Voltage (signal) Vd = 0.4 V ~ 4.4 V	★ If the vehicle-down sensor system has failures (the output voltage Vd is out of the usable range, wiring short or open), the ECU shuts off the fuel pump, the fuel injectors and the ignition system.
41 *	Fuel Injector #1	The injector must send signals (output voltage) continuously to the ECU.	★ If the injector #1 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #1, though the engine keeps running.
42 *	Fuel Injector #2	The injector must send signals (output voltage) continuously to the ECU.	★ If the injector #2 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #2, though the engine keeps running.
43 *	Fuel Injector #3	The injector must send signals (output voltage) continuously to the ECU.	★ If the injector #3 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #3, though the engine keeps running.
44 *	Fuel Injector #4	The injector must send signals (output voltage) continuously to the ECU.	If the injector #4 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #4, though the engine keeps running.

Self-Diagnosis

Fault Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
51	Stick Coil #1 (Ignition Coil) *	The ignition coil primary winding must send signals (output voltage) continuously to the ECU.	* If the ignition primary winding #1 has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running.
52	Stick Coil #2 (Ignition Coil) *	The ignition coil primary winding must send signals (output voltage) continuously to the ECU.	* If the ignition primary winding #2 has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running.
53	Stick Coil #3 (Ignition Coil) *	The ignition coil primary winding must send signals (output voltage) continuously to the ECU.	If the ignition primary winding #3 has failures (no signal, wiring short or open), the ECU shuts off the injector #3 to stop fuel to the cylinder #3, though the engine keeps running.
54	Stick Coil #4 (Ignition Coil) *	The ignition coil primary winding must send signals (output voltage) continuously to the ECU.	If the ignition primary winding #4 has failures (no signal, wiring short or open), the ECU shuts off the injector #4 to stop fuel to the cylinder #4, though the engine keeps running.

Note:

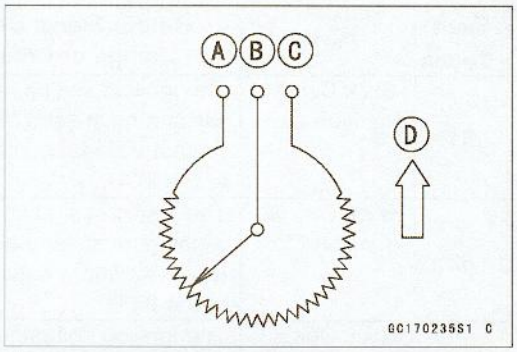
(1) α – N Method: the DFI contorl method from medium to heavy engine load. When the engine load is light like at idling or low speed, the ECU determines the injection quantity by calculating from the throttle vacuum (vacuum sensor output voltage) and engine speed (pickup coil output voltage). This method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

* This depends on the number of stopped cylinders.

Throttle Sensor (Fault Code 11)

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

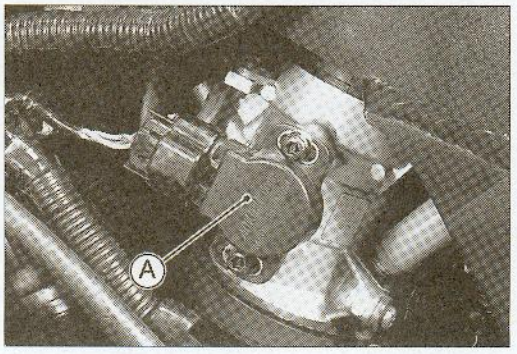
Input Terminal [A]
Output Terminal [B]
Ground Terminal [C]
Front [D]



Throttle Sensor Removal/Adjustment

CAUTION

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



Input Voltage Inspection

NOTE

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

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

Special Tool - Needle Adapter Set: 57001–1457

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

Throttle Sensor Input Voltage
Connections to ECU Connector
Meter (+) → BL/W wire (terminal 52)
Meter (–) → BR/BK wire (terminal 60)

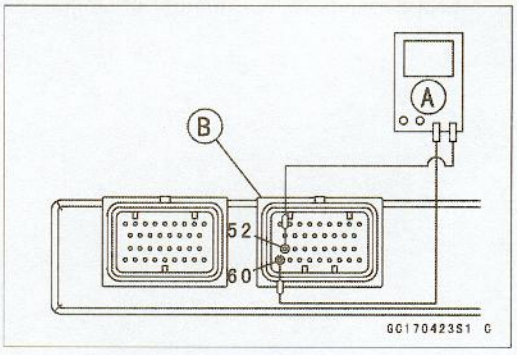
Input Voltage at ECU Connector
Standard: 4.75 ~ 5.25 V DC

- Turn the ignition SW OFF.

★ If the reading of input voltage is less than the standard, check the ECU for its ground, power supply and wiring shorted.

★ If the input voltage is within the standard range, check the input voltage at the throttle sensor connector.

- Remove the left inner cover (see Frame chapter).



Throttle Sensor (Fault Code 11)

- Disconnect the throttle sensor connector and connect the harness adapter between the sub harness connector and throttle sensor connector.
- Connect a digital meter [A] to the harness adapter wires [B].

Special Tool - Throttle Sensor Harness Adapter #2: 57001-1408

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

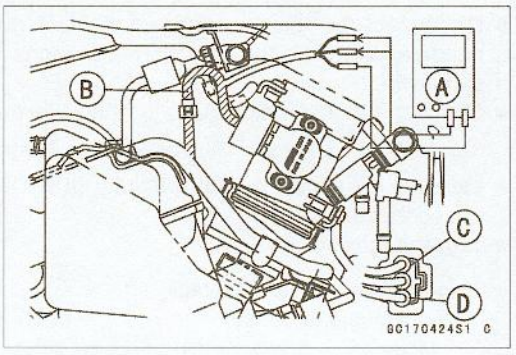
Throttle Sensor Input Voltage
Connections to Sensor
Meter (+) → BL/W wire [C]
Meter (–) → BR/BK wire [D]

Input Voltage at Sensor
Standard: 4.75 ~ 5.25 V DC

- Turn the ignition SW OFF.

★If the reading is out of the range, check the wiring (see the wiring diagram in this section).

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



Output Voltage Inspection

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

Special Tool - Needle Adapter Set: 57001–1457

- Start the engine and warm it up thoroughly.
- Check idle speed to make sure throttle opening is correct.
- ○ Check the engine speed, using the engine revolution tester for high accuracy (see Synchronization Inpection).

Idle Speed
Standard: 1000 r/min (rpm)

★If the idle speed is out of the specified range, adjust the idle speed (see this chapter).

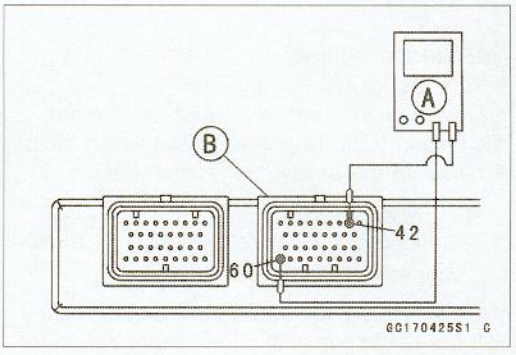
- Turn off the ignition switch.
- Measure the output voltage with the engine stopped, and with the connector joined.
- Turn the ignition SW ON.

Throttle Sensor Output Voltage
Connections to ECU
Meter (+) → Y/W wire (terminal 42)
Meter (–) → BR/BK wire (terminal 60)

Output Voltage at ECU
Standard: 1.084 ~ 1.086 V DC (at idle throttle opening)

★If the output voltage is within the standard range, check the ECU for its ground, and power supply (see this chapter). If the ground and power supply are good, replace the ECU.

★If the output voltage is far out of the standard range (e.g. when the wiring is open, the reading is 0 V), check the output voltage again at the sensor connector.



Throttle Sensor (Fault Code 11)

- Disconnect the throttle sensor connector and connect the harness adapater between the sub harness connector and throttle sensor connector.
- Connect a digital meter [A] to the harness adapter wires [B].

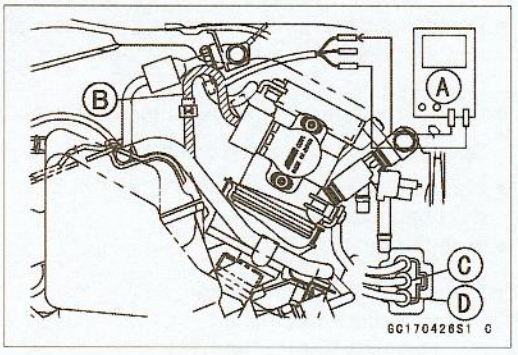
Special Tool - Throttle Sensor Harness Adapter #2: 57001–1408

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

Throttle Sensor Output Voltage
Connections to Sensor
Meter (+) → Y/W wire [C]
Meter (–) → BR/BK wire [D]

Output Voltage at Sensor
Standard: 1.084 ~ 1.086 V DC (at idle throttle opening)

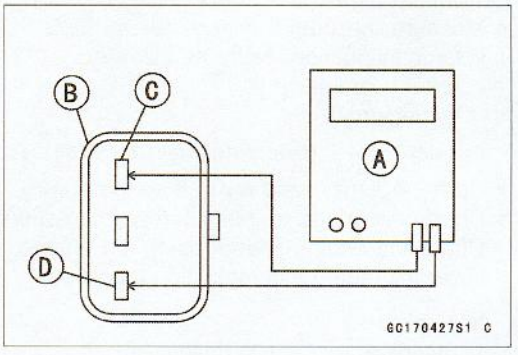
★ If the output voltage is normal, check the wiring for continuity (see next diagram).
★ If the reading is out of the standard range, inspect the throttle sensor resistance.
- After throttle sensor inspection, remove the harness adapter.

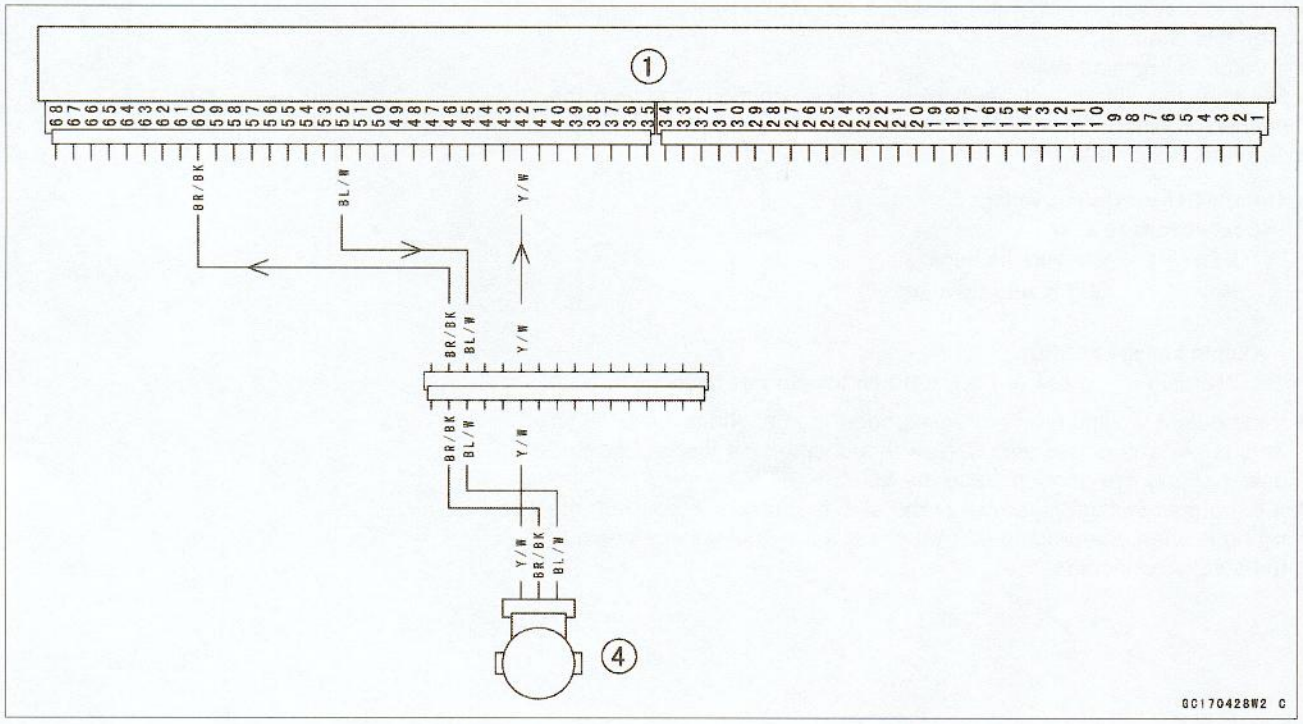


Resistance Inspection
- Turn the ignition switch OFF.
- Disconnect the throttle sensor connector.
- Connect a digital meter [A] to the throttle sensor connector [B].
- Measure the throttle sensor resistance.

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

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





→: Signal ECU [1] Throttle Sensor [4]

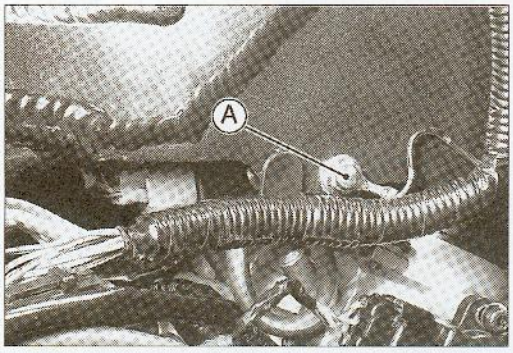
Inlet Air Pressure Sensor (Fault Code 12)

CAUTION

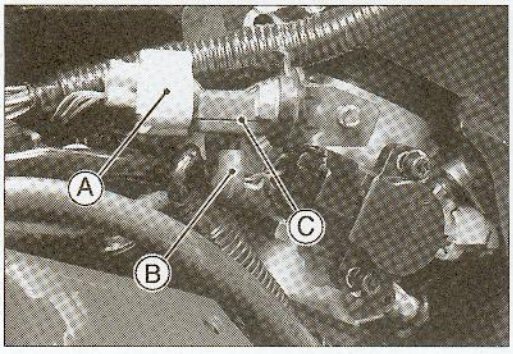
Never drop the sensor, especially on a hard surface. Such a shock to the part can damage it.

Removal

- Remove the left inner cover (see Frame chapter).
- Unscrew the inlet air pressure sensor bracket nut [A]



- Disconnect the inlet air pressure sensor connector [A].
- Disconnect the vacuum hose [B] from the joint.
- Remove the inlet air pressure sensor [C].



Installation

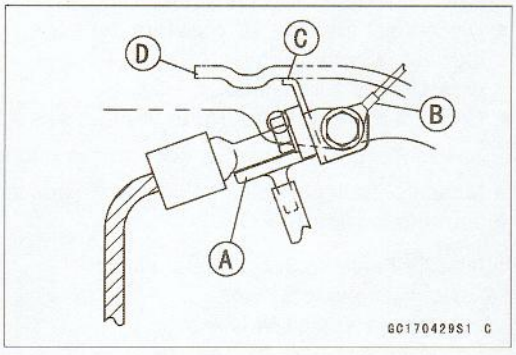
NOTE

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

- Route the vacuum hose correctly (see Cable, Wire, and Hose Routing section in the General Information chapter). Make sure they do not get pinched or kinked.
- Install:
  Inlet Air Pressure Sensor [A]
  Frame Ground [B]

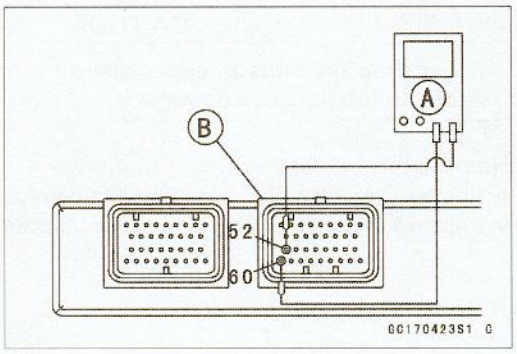
○ Hit the stopper [C] of the inlet air pressure sensor bracket on to the frame [D].

Torque - Inlet Air Pressure Sensor Bolts: 12 N·m (1.2 kg·m, 106 in·lb)
Inlet Air Pressure Sensor Bracket Nut: 12 N·m (1.2 kg·m, 106 in·lb)



Inlet Air Pressure Sensor (Fault Code 12)

Input Voltage Inspection



NOTE

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

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

○ Measure the input voltage with the engine stopped, and with the connectors joined.

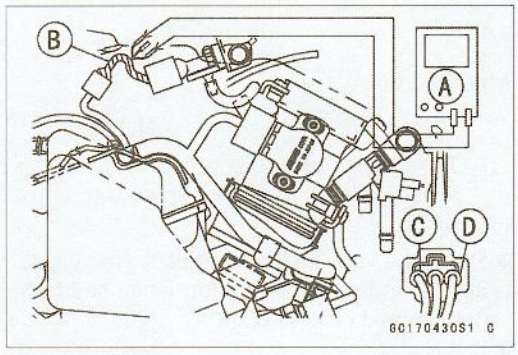
Special Tool - Needle Adapter Set: 57001–1457

- Turn the ignition SW ON.

Inlet Air Pressure Sensor Input Voltage
Connections to ECU
Meter (+) → BL/W wire (terminal 52)
Meter (–) → BR/BK wire (terminal 60)

Input Voltage at ECU
Standard: 4.75 ~ 5.25 V DC

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



★ If the reading is within the standard range, and check the input voltage again at the sensor connector.

- Disconnect the inlet air pressure sensor connector and connect the harness adapter between the sub harness connector and inlet air pressure sensor connector.
- Connect a digital meter [A] to the harness adapter wires [B].

Special Tool - Throttle Sensor Harness Adapter #2: 57001–1408

- Measure the input voltage with the engine stopped.
- Turn the ignition SW ON.

Inlet Air Pressure Sensor Input Voltage
Connections to Sensor
Meter (+) → BL/W wire [C]
Meter (–) → BR/BK wire [D]

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

★ If the reading is out of the standard range, check the wiring (see wiring diagram in this section).
★ If the reading is good, the input voltage is normal. Check the output voltage.

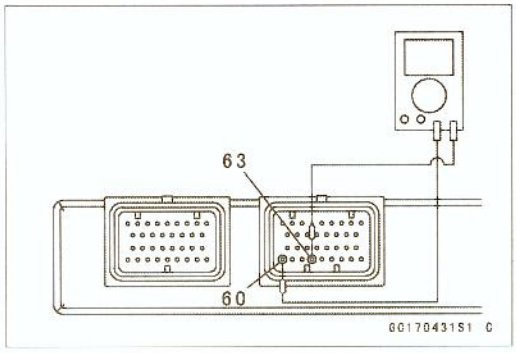
Inlet Air Pressure Sensor (Fault Code 12)

Output Voltage Inspection

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

Inlet Air Pressure Sensor Output Voltage
Connections to ECU
Meter (+) → Y/BL wire (terminal 63)
Meter (–) → BR/BK wire (terminal 60)

Output Voltage at ECU
Usable Range: 3.46 ~ 3.82 V DC at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs.)



NOTE

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

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

★ If the output voltage is within the usable range, check the ECU for its ground, and power supply (see this chapter). If the ground and power supply are good, replace the ECU.

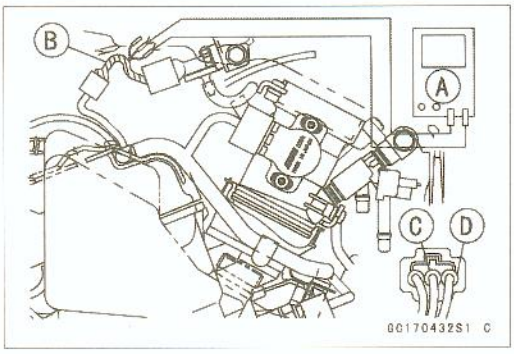
★ If the output voltage is far out of the usable range, check the output voltage again at the sensor connector (when the wire is open, the output voltage is about 1.8 V).

● Connect a digital meter [A] to the harness adapter wires [B].

Special Tool - Throttle Sensor Harness Adapter #2: 57001–1408

Inlet Air Pressure Sensor Output Voltage
Connections to Sensor
Meter (+) → Y/BL wire [C]
Meter (–) → BR/BK wire [D]

Output Voltage at Sensor Connector
Usable Range: 3.46 ~ 3.82 V DC at the standard atmospheric pressure (101.32 kPa or 76 cmHg absolute)



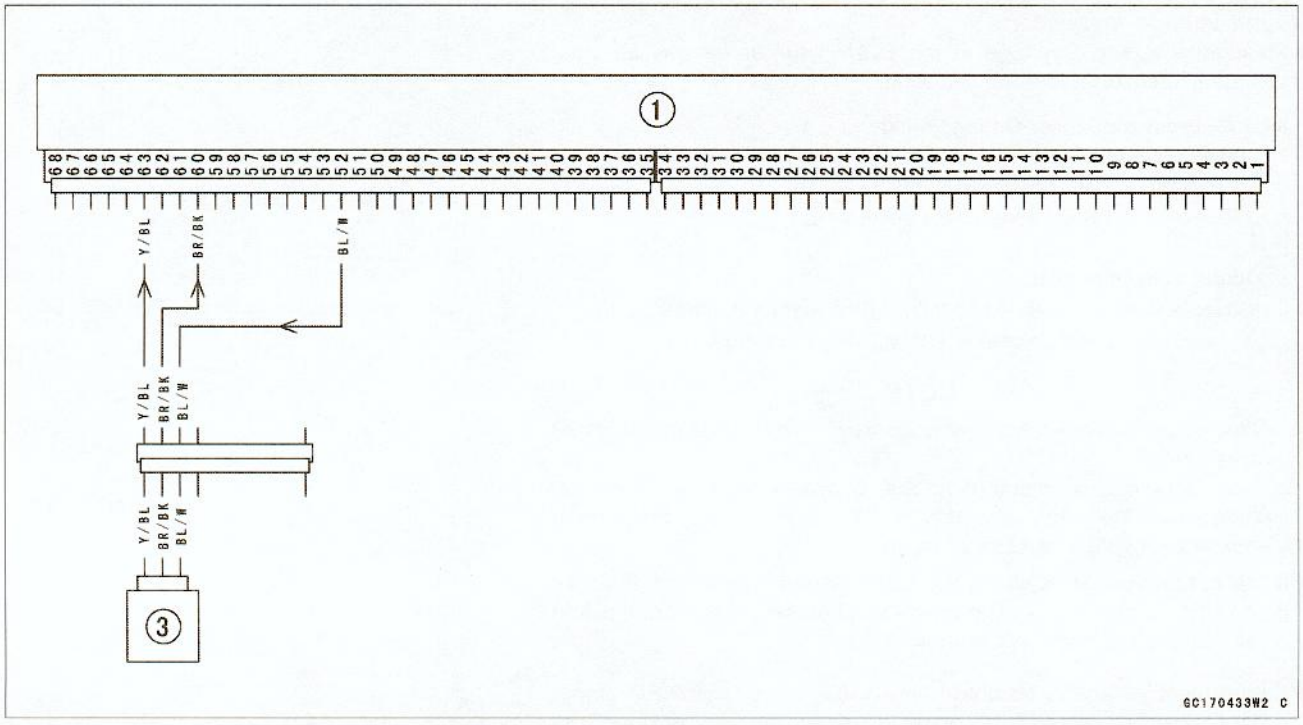
★ If the output voltage is normal, check the wiring for continuity (see next diagram).

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

● Turn the ignition SW OFF.

● Remove the throttle sensor harness adapter.

Inlet Air Pressure Sensor (Fault Code 12)



→: Signal ECU [1] Inlet Air Pressure Sensor [3]

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

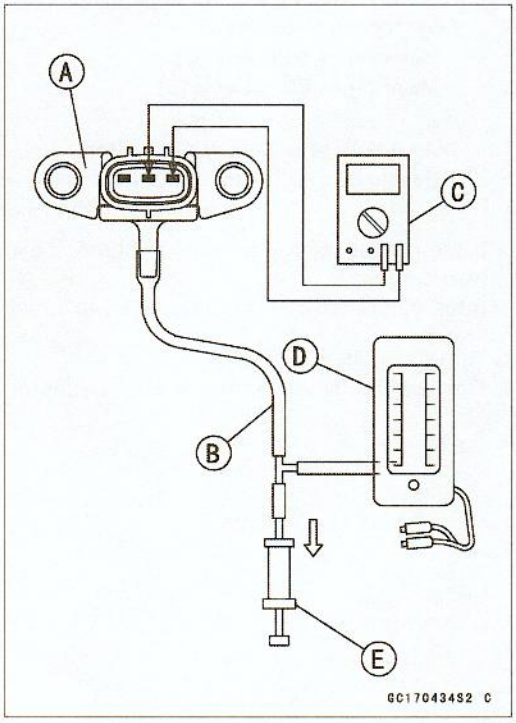
- Remove the inlet air pressure sensor [A] and disconnect the vacuum hose from the sensor.
- Do not disconnect the sensor connector.
- Connect an auxiliary hose [B] to the inlet air pressure sensor.
- Temporarily install the inlet air pressure sensor.
- Connect a commercially available digital meter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

Special Tool - Fork Oil Level Gauge: 57001-1290

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

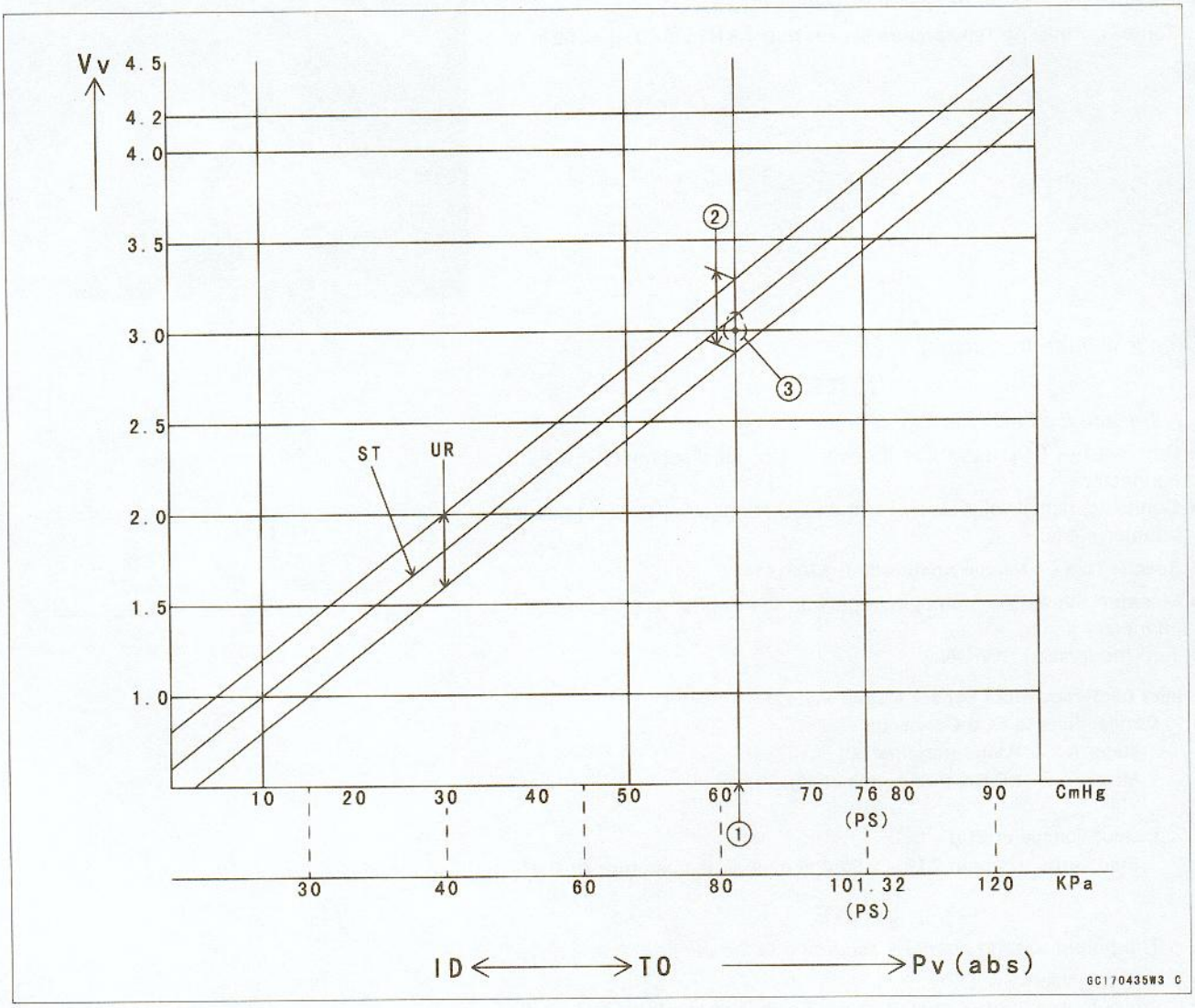
- Turn the ignition SW ON.
- Measure the inlet air pressure sensor output voltage from various vacuum readings, while pulling the handle of the fork oil level gauge.
- Check the inlet air pressure sensor output voltage, using the following formula and chart.

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



Inlet Air Pressure Sensor (Fault Code 12)

For example, suppose the following data is obtained:
Pg = 8 cmHg (vacuum gauge reading)
Pl = 70 cmHg (barometer reading)
Vv = 3.0 V (digital volt meter reading)
then
Pv = 70 – 8 = 62 cmHg (abs)
Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.
Usable range = 2.92 ~ 3.28 V
Plot Vv (3.0 V) on the vertical line. → Point [3].
Results: In the chart, Vv is within the usable range and the sensor is normal.



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

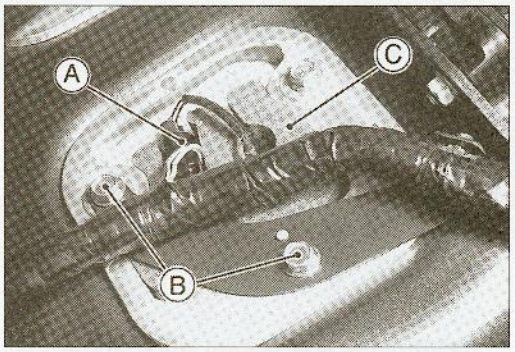
Inlet Air Temperature Sensor (Fault Code 13)

Removal/Installation

CAUTION

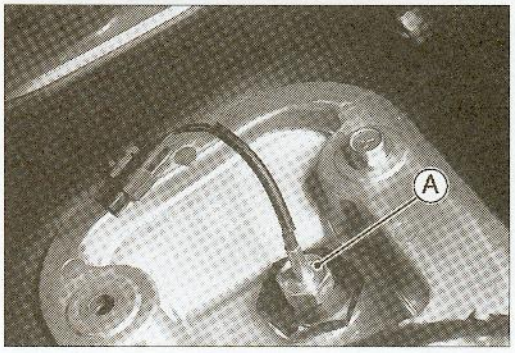
Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.

- Remove the fuel tank cover (see Fuel Tank Removal).
- Set up the fuel tank (see this chapter).
- Disconnect the connector [A] from the inlet air temperature sensor.
- Remove:
  Bolts [B]
  Damper [C]



- Remove the inlet air temperature sensor [A].

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



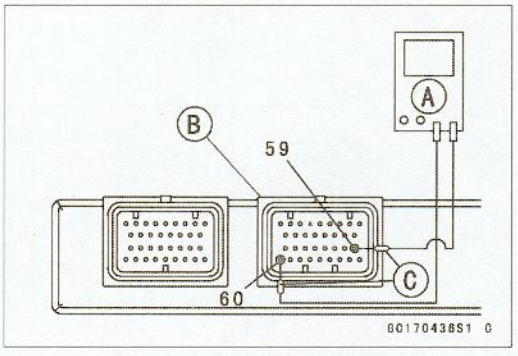
Output Voltage Inspection

NOTE

○ *Be sure the battery is fully charged.*

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

Special Tool - Needle Adapter Set: 57001-1457



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

Inlet Air Temperature Sensor Output Voltage
Connections to ECU Connector
Meter (+) → P wire (terminal 59)
Meter (–) → BR/BK wire (terminal 60)

Output Voltage at ECU
Standard: about 2.26 ~ 2.50 V at inlet air temperature 20°C

NOTE

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

- Turn the ignition SW OFF.

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

★ If the output voltage is far out of the specified (e.g. when the wiring is open, the voltage is about 4.6 V), remove the fuel tank cover, and check the wiring (see next diagram).

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

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

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

Inlet Air Temperature Sensor (Fault Code 13)

Sensor Resistance Inspection

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

NOTE

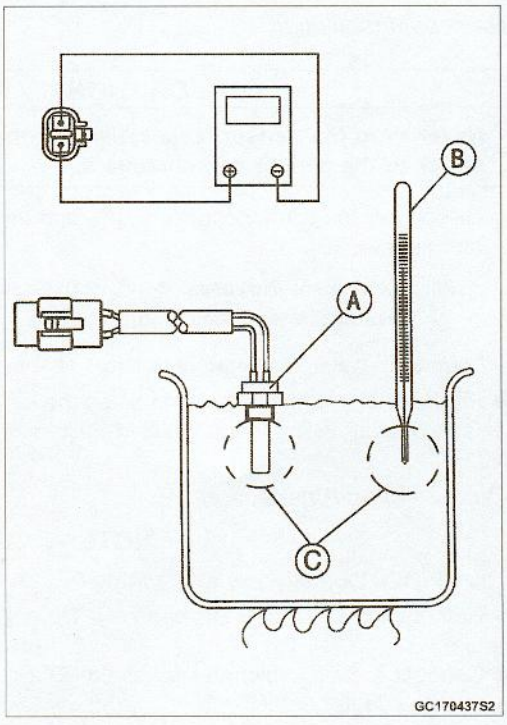
○ *The sensor and thermometer must not touch the container side or bottom.*

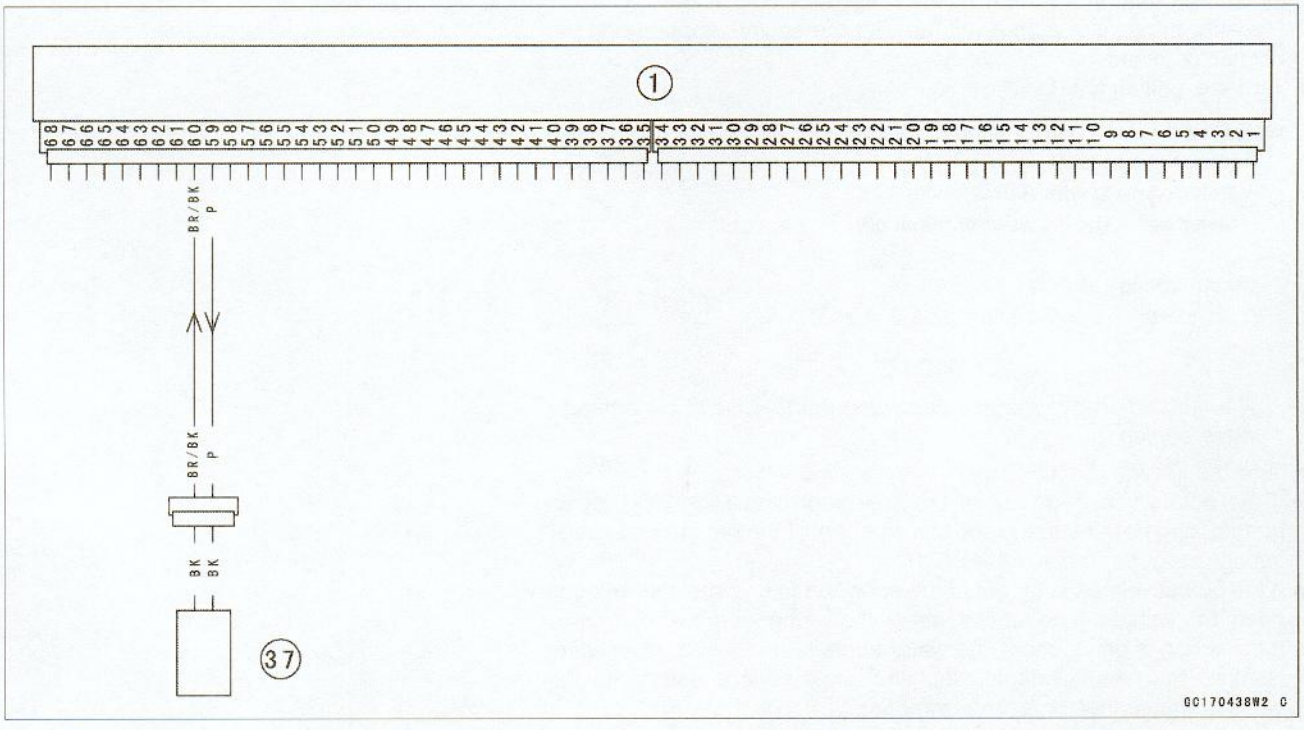
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the table.

Inlet Air Temperature Sensor Resistance

Standard: **657 ~ 1003 kΩ at 0°C (32°F)**
68 ~ 89 kΩ at 50°C (122°F)
11.95 ~ 14.37 kΩ at 100°C (212°F)

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

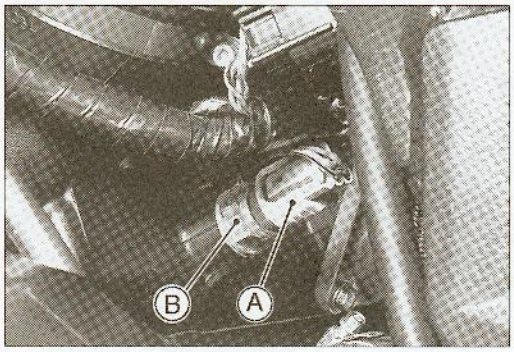




→: Signal ECU [1] Inlet Air Temperature Sensor [37]

Water Temperature Sensor (Fault Code 14)

Removal/Installation



CAUTION

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

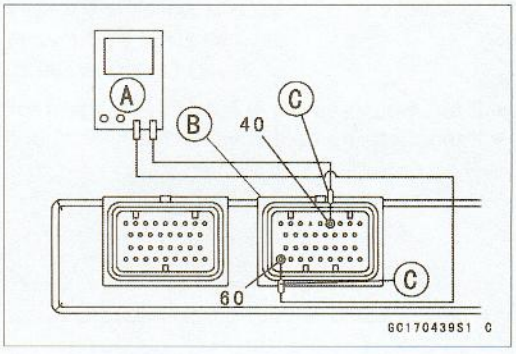
- Disconnect the sensor connector [A], and unscrew the water temperature sensor [B].

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

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

- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Filling in the Cooling System chapter).

Output Voltage Inspection



NOTE

○ *Be sure the battery is fully charged.*

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

Special Tool - Needle Adapter Set: 57001–1457

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

Water Temperature Sensor Output Voltage
Connections to ECU
Meter (+) → O wire (terminal 40)
Meter (–) → BR/BK wire (terminal 60)

Output Voltage at ECU
Standard: about 2.66 ~ 2.96 V at 20°C

NOTE

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

- Turn the ignition SW OFF.

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

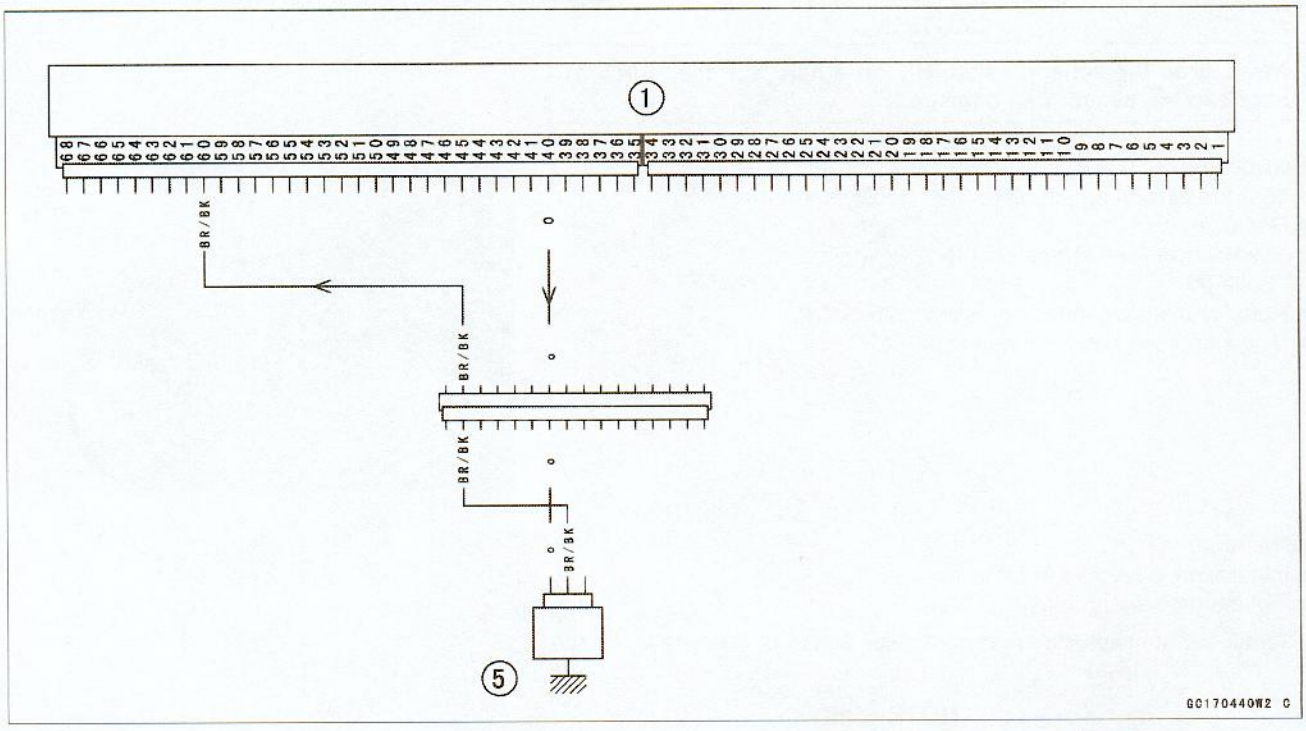
★ If the output voltage is far out of the specified (e.g. when the wiring is open, the voltage is about 5V), check the wiring (see next diagram).

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

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

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

Water Temperature Sensor (Fault Code 14)



→: Signal ECU [1] Water Temperature Sensor [5]

Sensor Resistance Inspection

- Remove the water temperature sensor (see this section).
- Refer to Electrical System chatper for water temperature sensor inspection.

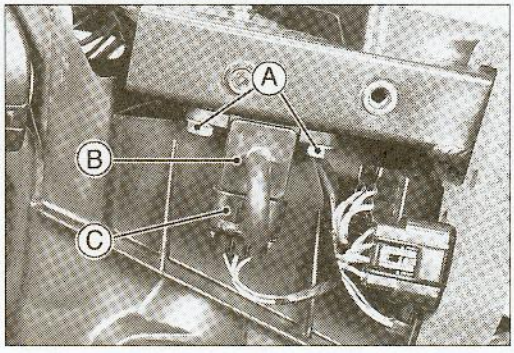
Atmospheric Pressure Sensor (Fault Code 15)

CAUTION

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

Removal

- Turn the ignition switch off.
- Remove:
  Seat Cover (see Frame chapter)
  Bolts [A]
- Remove the atmospheric pressure sensor [B].
- Disconnect the sensor connectors [C].



Installation

- Installation is reverse of removal.
- Tighten the sensor bolts.

Torque - Atmospheric Pressure Sensor Bolts: 12 N·m (1.2 kg·m, 106 in·lb)

NOTE

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

Input Voltage Inspection

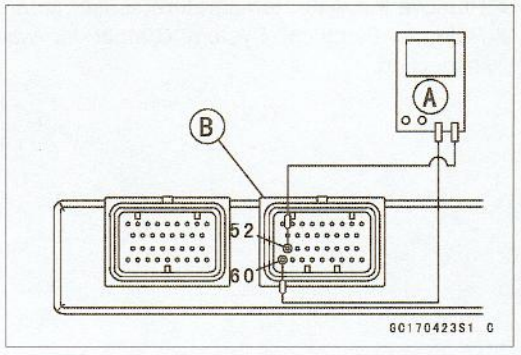
NOTE

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

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

○ Measure the input voltage with the engine stopped, and with the connectors joined.

- Turn the ignition SW ON.



Atmospheric Pressure Sensor Input Voltage
Connections to ECU
Meter (+) → BL/W wire (terminal 52)
Meter (–) → BR/BK wire (terminal 60)

Input Voltage at ECU
Standard: 4.75 ~ 5.25 V DC

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

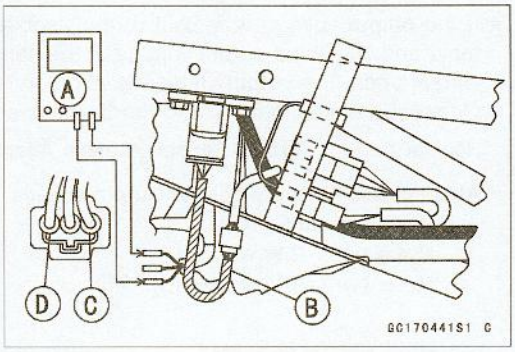
Atmospheric Pressure Sensor (Fault Code 15)

★If the reading is within the standard range, remove the seat cover, and check the input voltage again at the sensor connector.

- Disconnect the atmospheric pressure sensor connector and connect the harness adapter between the main harness connector and pressure sensor connector.
- Connect a digital meter [A] to the harness adapter wire [B].

Special Tool - Throttle Sensor Harness Adapter #2: 57001-1408

- Measure the input voltage with the engine stopped, and with the connector joined.
- Turn the ignition SW ON.



Atmospheric Pressure Sensor Input Voltage
Connections to Sensor
Meter (+) → BL/W wire [C]
Meter (–) → BR/BK wire [D]

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

★If the reading is out of the standard range, check the wiring (see wiring diagram in this section).

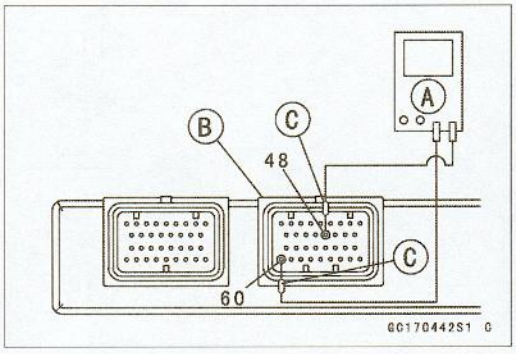
★If the reading is good, the input voltage is normal. Check the output voltage.

- Turn the ignition SW OFF.

Output Voltage Inspection

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

Digital Meter [A]
ECU Connector [B]
Needle Adapter Set [C]



Atmospheric Pressure Sensor Output Voltage
Connections to ECU
Meter (+) → G/W wire (terminal 48)
Meter (–) → BR/BK wire (terminal 60)

Output Voltage
Usable Range: 3.46 ~ 3.82 V DC at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs.)

NOTE

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

★If the output voltage is within the usable range, check the ECU for its ground, and power supply (see this chapter). If the ground and power supply are good, replace the ECU.

Atmospheric Pressure Sensor (Fault Code 15)

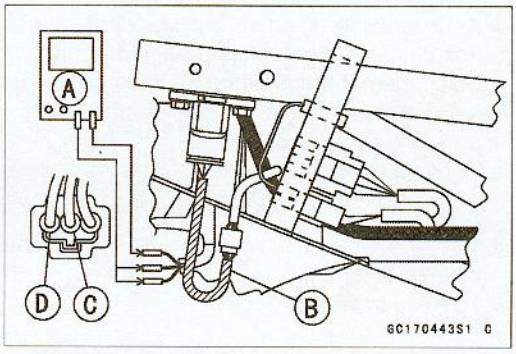
★ If the output voltage is far out of the usable range, remove the fuel tank, and check the output voltage at the sensor connector (when the wire is open, the output voltage is about 1.8 V).

● Connect a digital meter [A] to the harness adapter wires [B].

Special Tool - Throttle Sensor Harness Adapter #2: 57001–1408

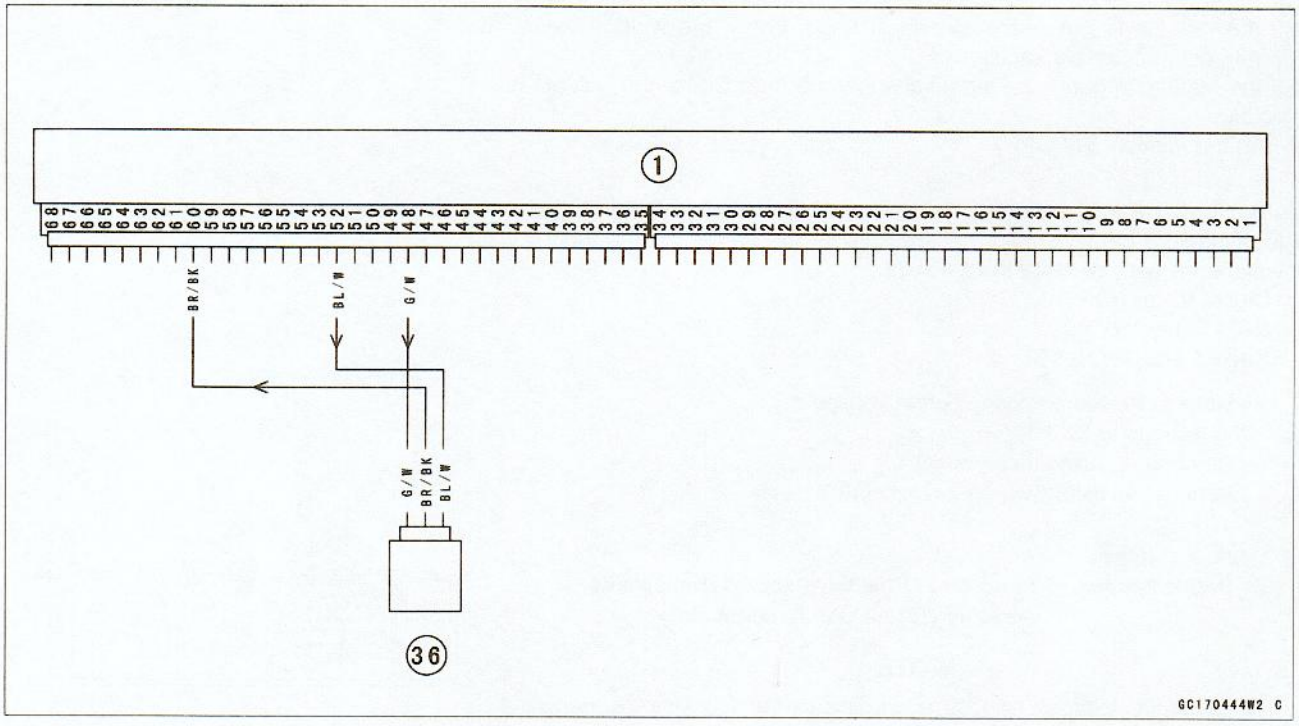
Atmospheric Pressure Sensor Output Voltage
Connections to Sensor
Meter (+) → G/W wire [C]
Meter (–) → BR/BK wire [D]

Output Voltage at Sensor
Usable Range: 3.46 ~ 3.82 V DC at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs)



★ If the output voltage is normal, check the wiring for continuity (see next diagram).

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



→: Signal ECU [1] Atmospheric Pressure Sensor [36]

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

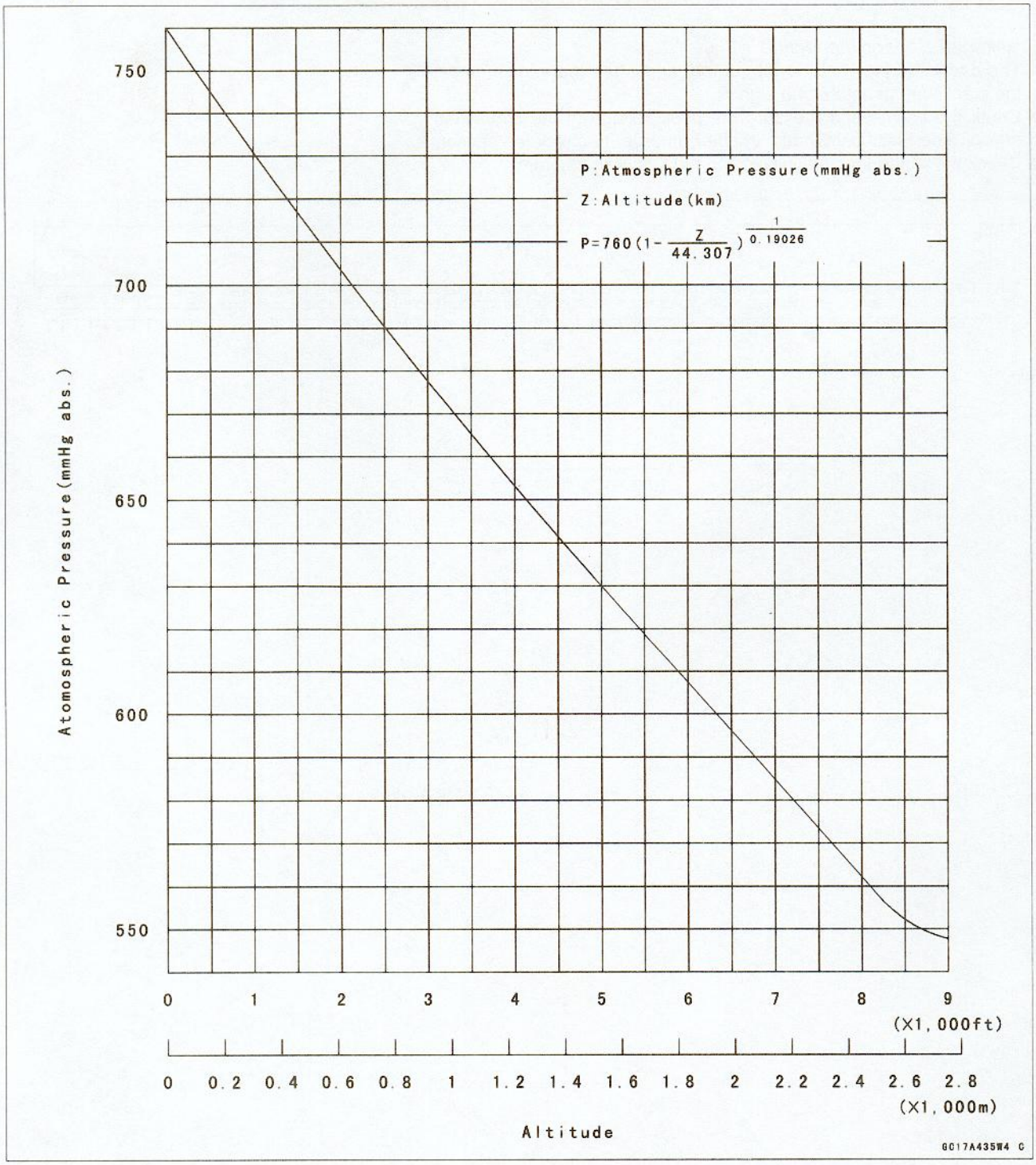
○ Determine the local altitude (elevation).

Atmospheric Pressure Sensor (Fault Code 15)

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

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

Atmospheric Pressure/Altitude Relationship



Crankshaft Sensor (Fault Code 21)

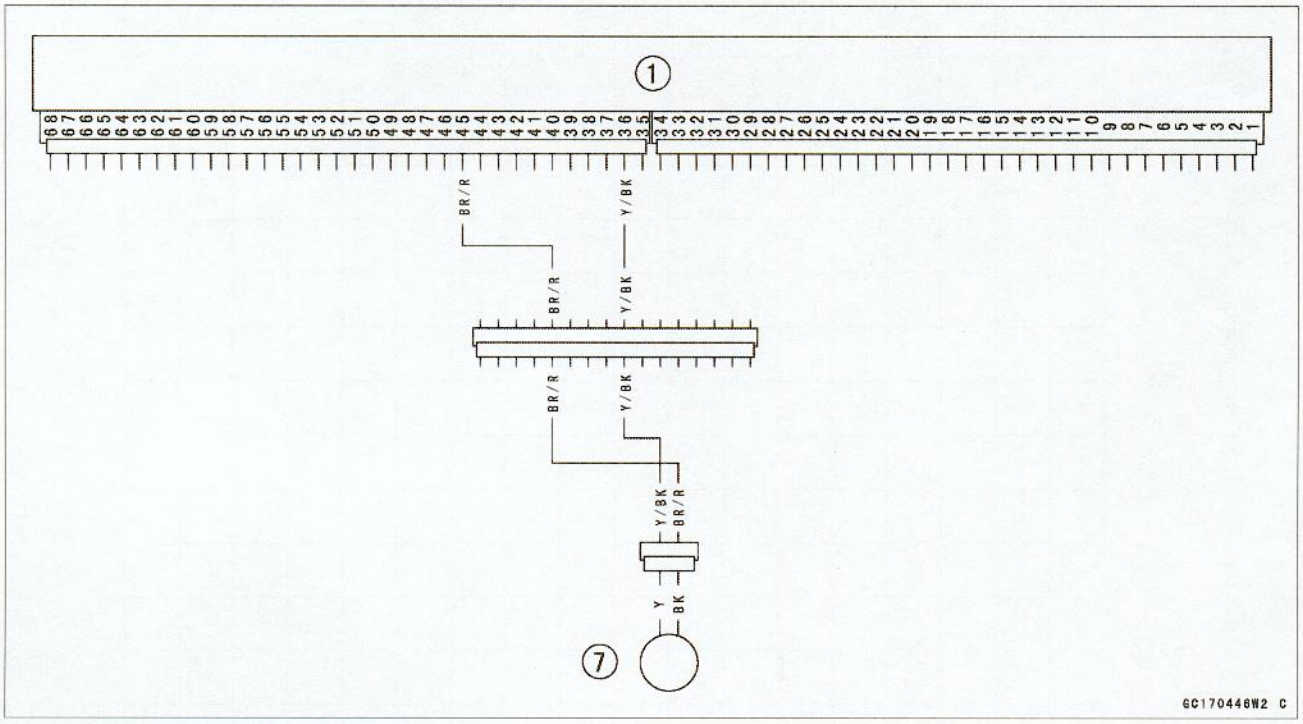
Start the engine and switch the diagnosis mode to Dealer 1 mode to know all the problem that the DFI system has at the time of self-diagnosis. If the engine cannot be started, the self-diagnosis system does not detect dynamic condition of the crankshaft sensor. In this case turn off the ignition switch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

Crankshaft Sensor Removal/Installation

- See Ignition System section in the Electrical System chapter.

Crankshaft Sensor Inspection

- The crankshaft have no power source, and when the engine stops, the crankshaft generates no signals.
- Crank the engine and measure the peak voltage of the crankshaft sensor (see Electrical System chapter) in order to check the sensor.
- Check the wiring for continuity, using the following diagram.



ECU [A]

Crankshaft Sensor [7]

Cam Sensor (Fault Code 23)

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

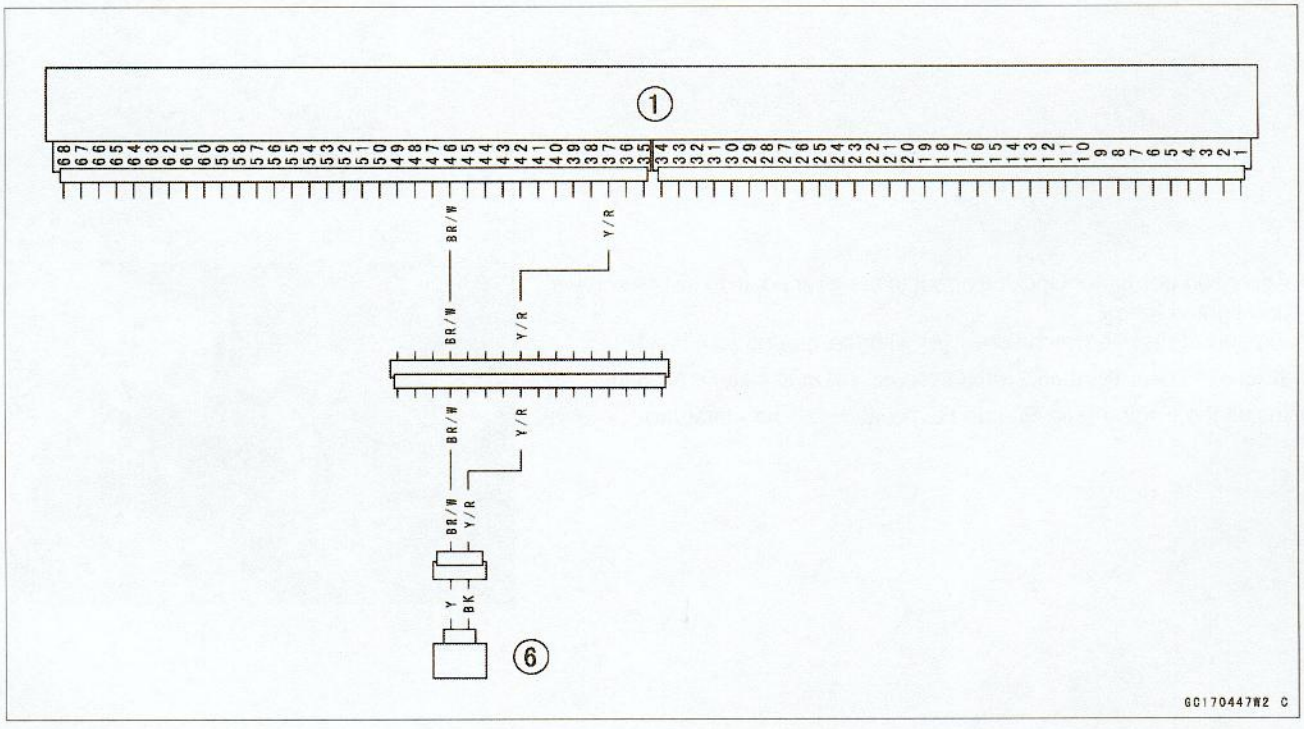
Cam Sensor Removal/Installation

The cam sensor detects the position of the camshaft, and distinguishes the cylinder.

- See Ignition system section in the Electric System chapter.

Cam Sensor Inspection

- ○ The cam sensor have no power source, and when the engine stops, the cam sensor generates no signal.
- Crank the engine and measure the peak voltage of the cam sensor (see Electrical System chapter) in order to check the sensor.
- Check the wiring for continuity, using the following diagram.



ECU [1]

Cam Sensor [6]

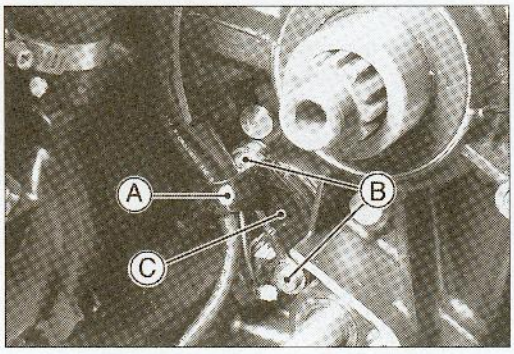
Gear Position Switch (Fault Code 25)

The gear position switch detects the gear position of the neutral and running, and sends the signal to the ECU.

The signal is used to determine the basic amount of the fuel injected.

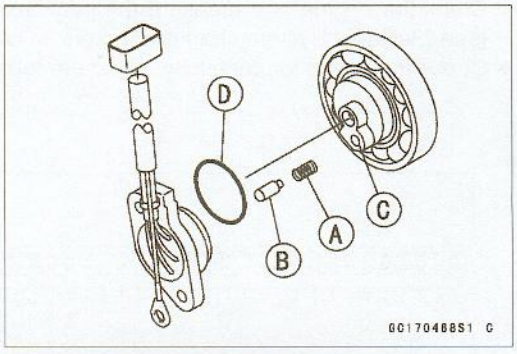
Gear Position Switch Removal

- Remove:
  Engine (see Engine Removal/Installation chapter)
- Open the clamp [A].
- Unscrew the screws [B] and remove the gear position switch [C], pin and spring.



Gear Position Switch Installation

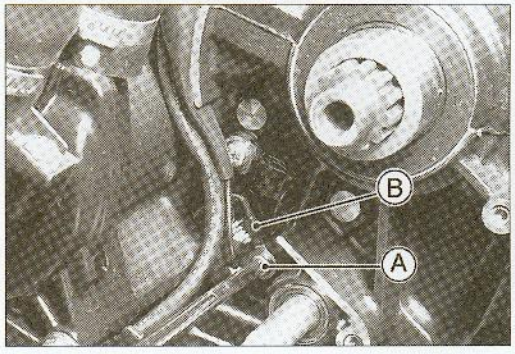
- Securely place the spring [A] and pin [B] into the hole [C] of the drum.
- Apply grease to the O-ring [D] and install the gear position switch.



- Apply non-permanent locking agent to the gear position switch screws and tighten them.
- ○ Tighten the lower switch screw [A] with the ground terminal [B].

Torque - Gear Position Switch Screws: 4 N·m (0.4 kg·m, 35 in·lb)

- Install the Engine (see Engine Removal/Installation chapter).



Gear Position Switch (Fault Code 25)

Gear Position Switch Input Voltage Inspection

NOTE

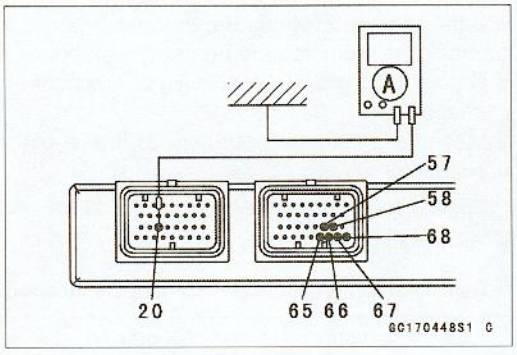
○ *Be sure the battery is fully charged.*

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

○ Mesure the input voltage with the engine stopped, and with the connectors joined.

Special Tool - Needle Adapter Set: 57001–1457

- Turn the ignition switch ON.



Gear Position Switch Input Voltage Connections to ECU

Gear Position	Tester (+)	Tester (–)
Neutral	Light Green Wire [20]	Engine Ground
1st	Green/Red Wire [65]	
2nd	Green/Blue Wire [57]	
3rd	Green/Yellow Wire [66]	
4th	Green Wire [58]	
5th	Green/White Wire [67]	
6th	Green/Black Wire [68]	

Input Voltage at ECU (Except gear position)
Standard: Neutral Battery Voltage (12.5 V or more)
Other than neutral Less than 5 V

Input Voltage at ECU (Respective gear position)
Standard: 0 V

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

Gear Position Switch (Fault Code 25)

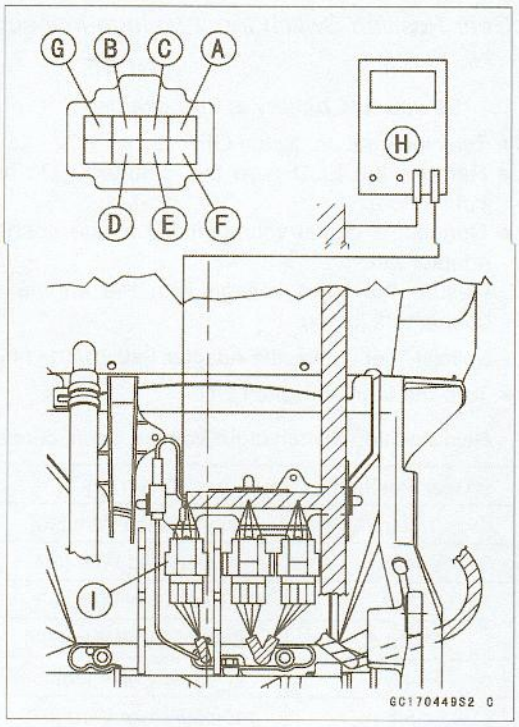
★ If the reading is within the standard range, set up the fuel tank, and check the input voltage again at the sensor connector.
- Connect a digital voltmeter [H] to the connector [I], using the needle adapter set.
- Measure the input voltage with the engine stopped, and with the connector joined.

Special Tool - Needle Adapter Set: 57001–1457

- Turn the ignition switch ON.

Gear Position Switch Input Voltage Connection to ECU

Gear Position	Tester (+)	Tester (–)
Neutral	Light Green Wire [A]	Engine Ground
1st	Blue/Red Wire [B]	
2nd	Light Blue Wire [C]	
3rd	Red Wire [D]	
4th	Blue Wire [E]	
5th	Green/Red Wire [F]	
6th	Yellow/Green Wire [G]	

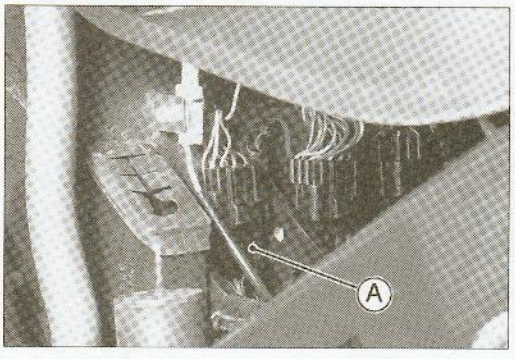


Input Voltage at Gear Position Switch Connector (Except gear position)
Standard: Neutral Battery Voltage (12.5 V or more)
Other than neutral Less than 5 V

Input Voltage at Gear Position Switch Connector (Respective gear position)
Standard: 0 V

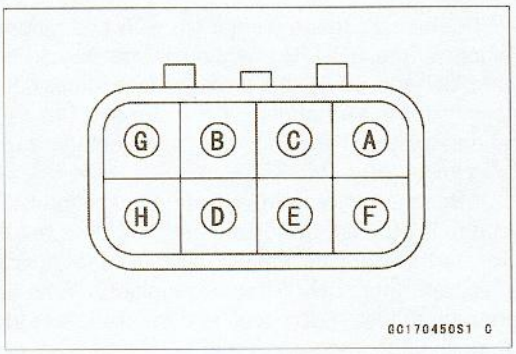
★ If the reading is out of the standard range, check the wiring (see wiring diagram in this section).
★ If the reading is good, the input voltage is normal. Check the gear position switch.
- Turn the ignition switch OFF.
- Remove the needle adapter set.

Gear Position Switch Inspection
- Set up the fuel tank.
- Disconnect the gear position switch connector [A].

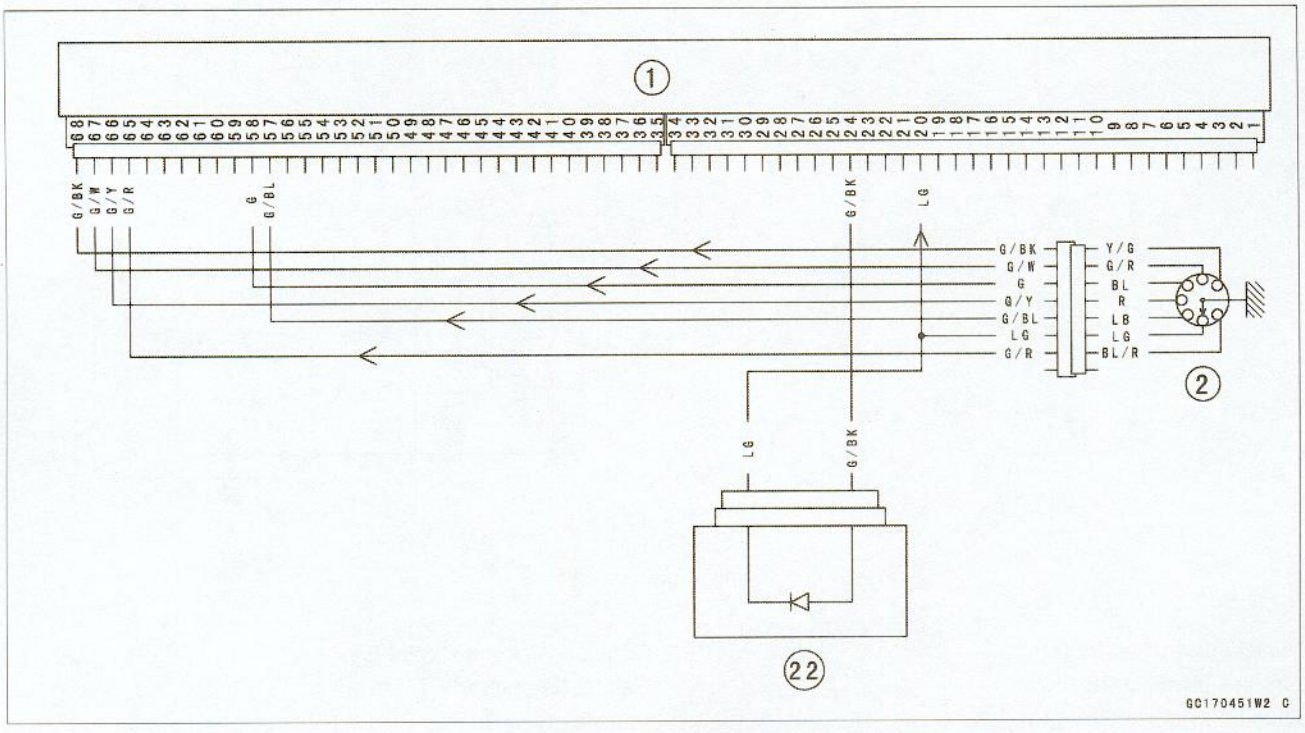


Gear Position Switch (Fault Code 25)

Gear Position	Tester (+)	Tester (–)
Neutral	Light Green Wire [A]	Engine Ground [H]
1st	Blue/Red Wire [B]	
2nd	Light Blue Wire [C]	
3rd	Red Wire [D]	
4th	Blue Wire [E]	
5th	Green/Red Wire [F]	
6th	Yellow/Green Wire [G]	



- Check the switch for continuity at the following gear positions.
- ★ The switch is normal if there is continuity in the respective gear positions.
- ★ If the switch has an open or short circuit, repair or replace it.



→: Signal

ECU [1]

Gear Position Switch [2]

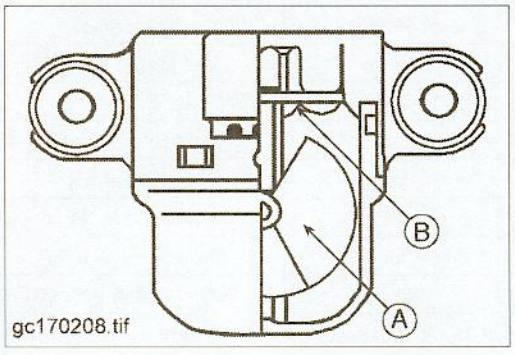
Junction Box [22]

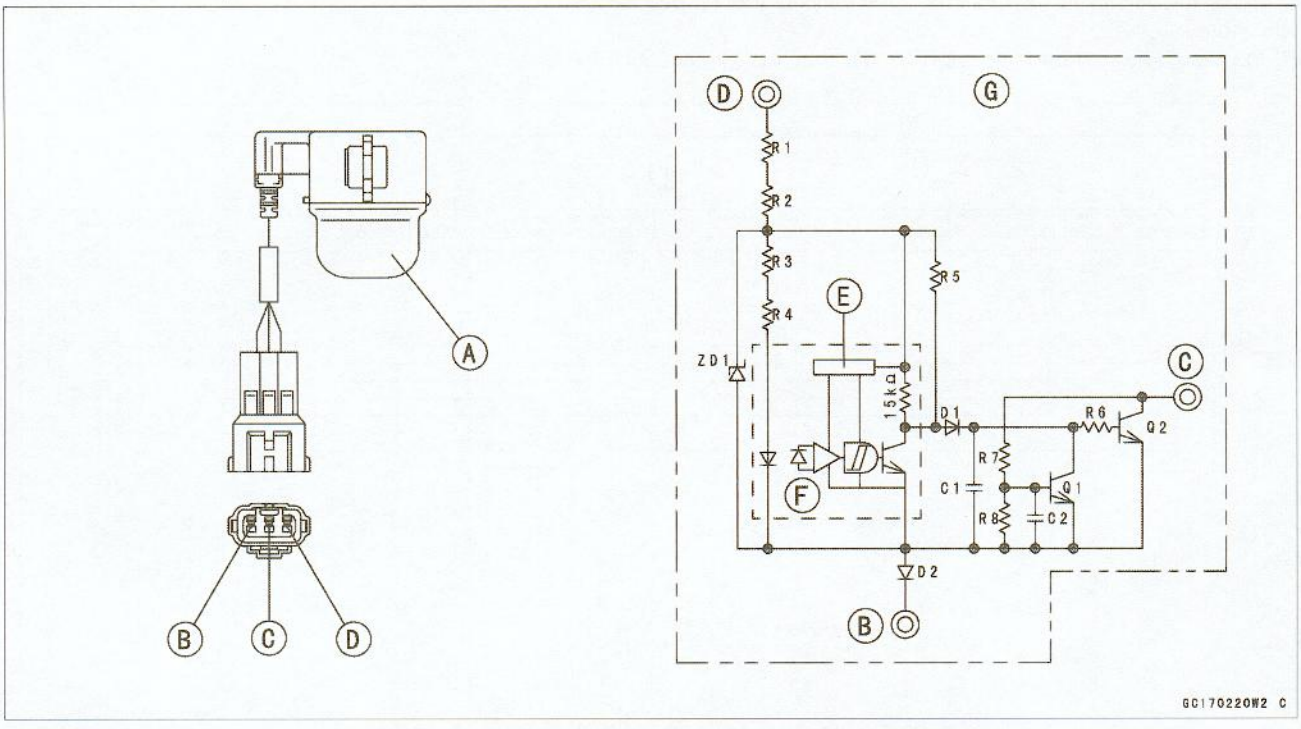
Vehicle-down Sensor (Fault Code 31)

This sensor has a weight [A] with two magnets inside, and sends a signal to the ECU. But when the motorcycle banks (40 ~ 50°, for US and Canada 60 ~ 70°) or more to either side (in fact falls down), the weight turns and shuts off the signal. The ECU senses this change, and stops the fuel pump, the fuel injectors, and the ignition system.

Hall IC [B]

When the motorcycle is down, the ignition SW is left ON. If the starter button is pushed, the electric starter turns but the engine doesn't start. To start the engine again, raise the motorcycle, turn the ignition SW OFF, and then ON. When the ignition SW is turned ON, current flows through the latch-up circuit and the transistor in the circuit is turned ON to unlock the latch-up circuit.





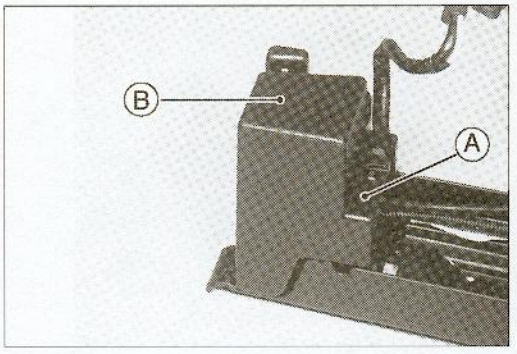
Vehicle-down Sensor [A]
Ground Terminal [B] BK/Y
Output Terminal [C] Y/G
Power Source Terminal [D] BR
Constant Voltage Circuit [E]
Hall IC (Integrated Circuit) [F]
Vehicle-down Sensor Circuit [G]

Removal

CAUTION

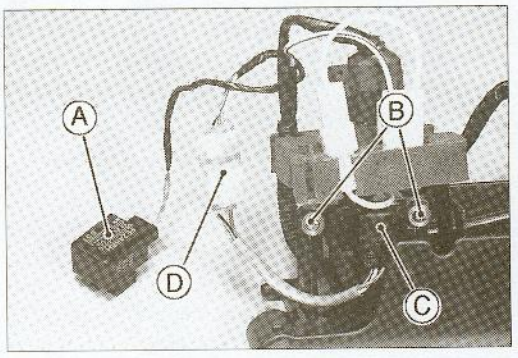
Never drop the down-sensor, especially on a hard surface. Such a shock to the sensor can damage it.

- Pull the battery tray (see Electrical System chapter).
- Remove:
  Battery (see Electrical System chapter)
  Screw [A]
  Cover [B]



Vehicle-down Sensor (Fault Code 31)

Turn Signal Relay [A]
Screws [B]
Vehicle-down Sensor [C]
● Push locks on center, and disconnect the connector [D].

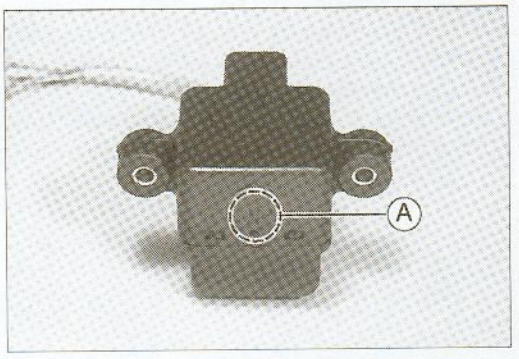


Installation

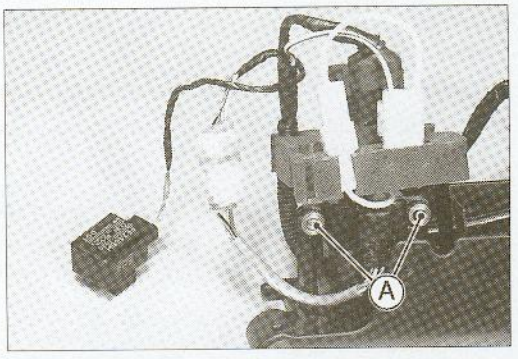
★ The UP mark [A] of the sensor should face upward.

⚠ WARNING

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



● Again, make sure the vehicle-down sensor assy is in place.
● Tighten the screws securely [A].
● Install battery tray (see Electrical System chapter).

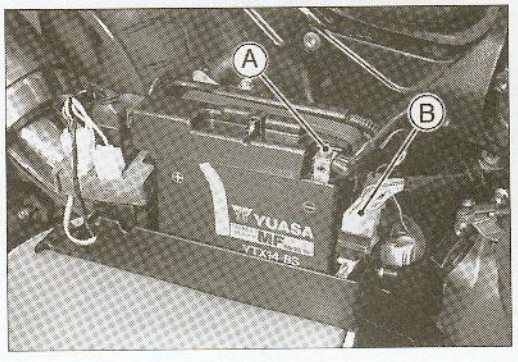


Inspection

NOTE

○ *Be sure the battery is fully charged.*

● Remove:
Battery Tray (see Electrical System chapter)
Cover (see Removal in this section)
● Connect:
Battery (–) Terminal [A]
Connectors [B]



CAUTION

Do not short the starter motor wire terminal.

Vehicle-down Sensor (Fault Code 31)

- Connect a digital volt meter [C] to the connector [B] (natural, 3P) of the vehicle-down sensor [A], using the needle adapter set [D].
- Turn the ignition SW ON, and measure the power source voltage with the connector joined.

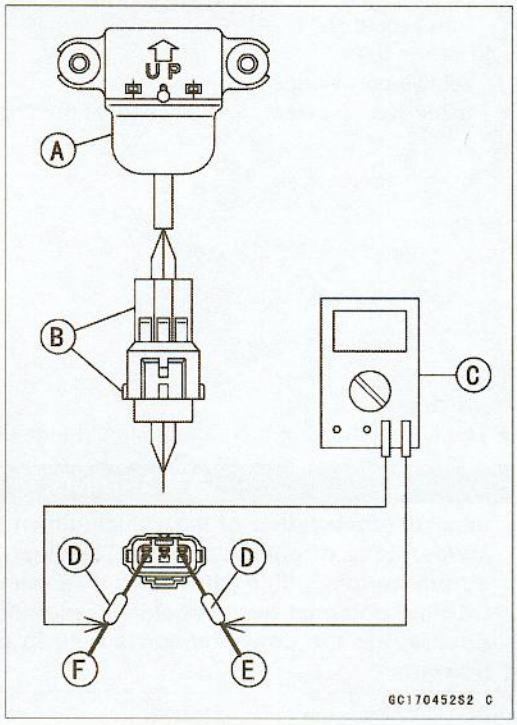
Vehicle-down Sensor Power Source Voltage
Connections to Sensor
Meter (+) → W/Y wire [E]
Meter (–) → BK/Y wire [F]

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

- Turn the ignition SW OFF.

★ If there is no battery voltage, check the following:
Battery (see Electrical System chapter)
ECU Main Fuse 15 A
Wiring for Vehicle-down Sensor Power Source (see next diagram)

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



- Connect a digital volt meter [A] to the connector (natural, 3P), using needle adapter set [B].

Special Tool - Needle Adapter Set: 57001–1457

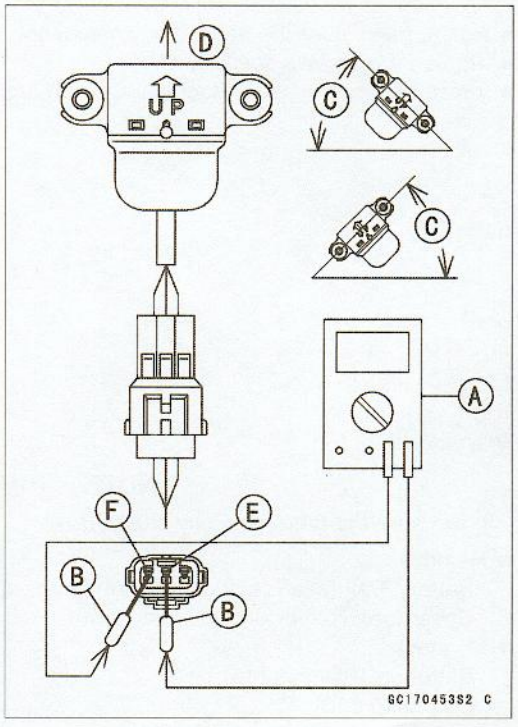
- Turn the ignition SW ON, and measure the output voltage with the connector joined.

○ Remove the sensor.

○ Tilt the sensor (40 ~ 50°, for the US and Canada 60 ~ 70°) or more [C] right or left, then hold the sensor almost vertical [D] with the arrow mark pointed up, and measure the output voltage.

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

Output Voltage at Sensor
Standard: with sensor tilted: (40 ~ 50°, for the US and Canada 60 ~ 70°) or more right or left: 3.7 ~ 4.4 V
with sensor arrow mark pointed up: 0.4 ~ 1.4 V



NOTE

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

- Turn the ignition SW OFF.
- Remove the needle adapter set, and apply silicone sealant to the seals of the connector for waterproofing.

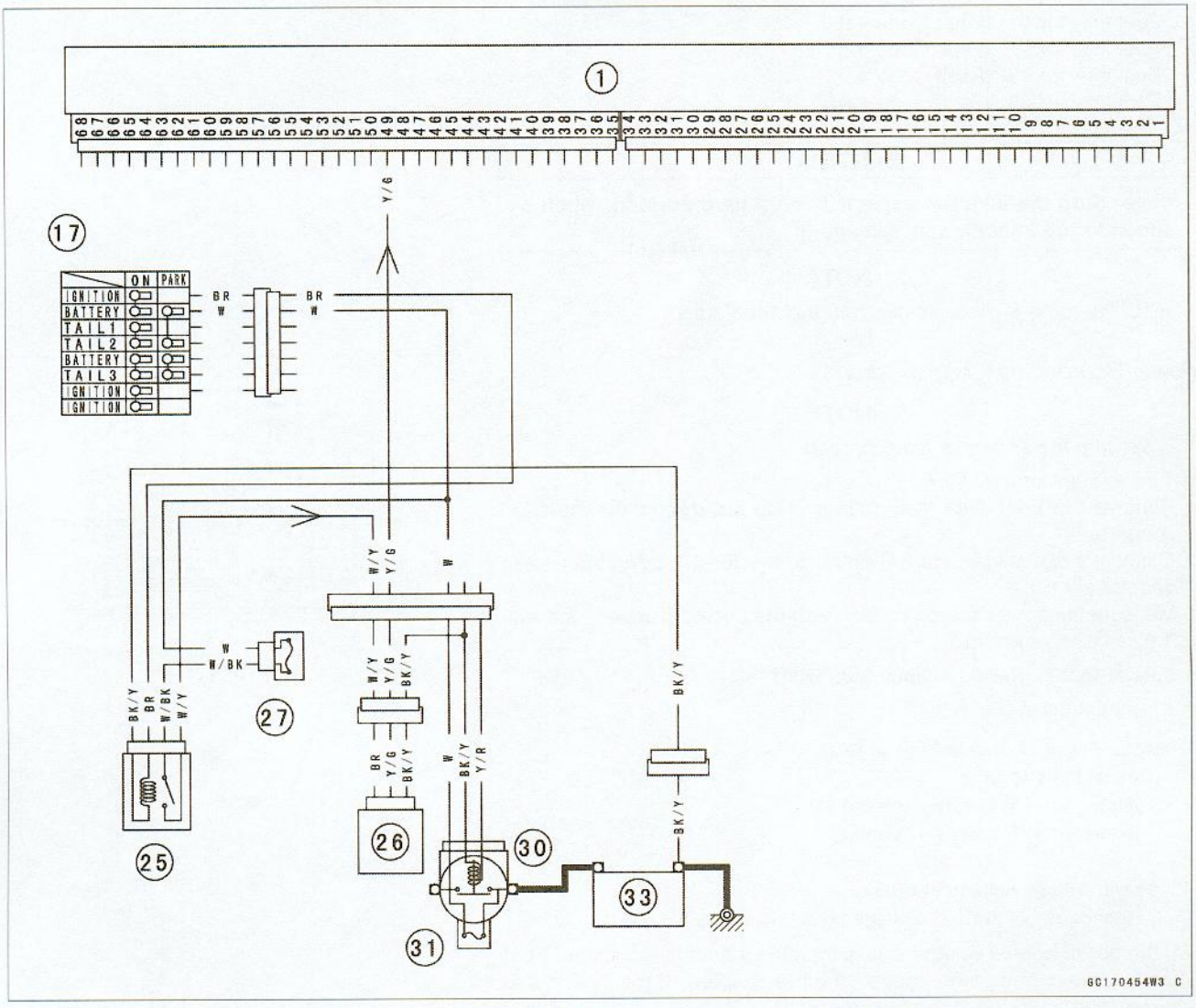
Silicone Sealant (Kawasaki Bond: 56019-120)
- Seals of Vehicle-down Sensor Connector

★ If the output voltage is normal, the wiring is suspect. Check the wiring.

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

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

Vehicle-down Sensor (Fault Code 31)



→: Signal
ECU [1]
ECU Main Relay [25]
Ignition Switch [17]
Starter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]
Vehicle-down Sensor [28]
ECU Main Fuse 15 A [27]

Fuel Injectors (#1, #2, #3, #4: Fault Code 41, 42, 43, 44)

Fuel Injector #1: (Fault Code 41)
Fuel Injector #2: (Fault Code 42)
Fuel Injector #3: (Fault Code 43)
Fuel Injector #4: (Fault Code 44)

CAUTION

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

NOTE

○ *Do not remove the injectors from the throttle bodys.*

Power Source Voltage Inspection

NOTE

○ *Be sure the battery is fully charged.*

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

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

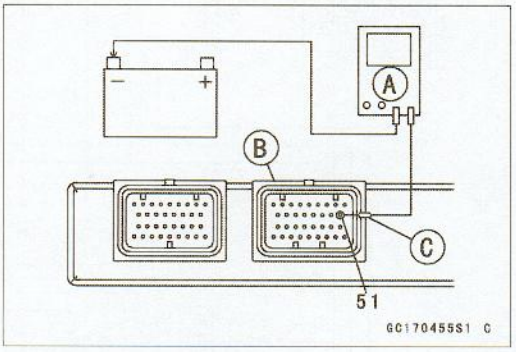
Special Tool - Needle Adapter Set: 57001-1457

- Turn the ignition SW ON.

Injector Power Source Voltage at ECU
Connections to ECU
Meter (+) → W/R wire (terminal 51)
Meter (–) → Battery (–) Terminal

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

★ If the power source voltage is less than the standard, check the ECU for its ground, and power supply (see this chapter). If the ground and power supply are good, replace the ECU.

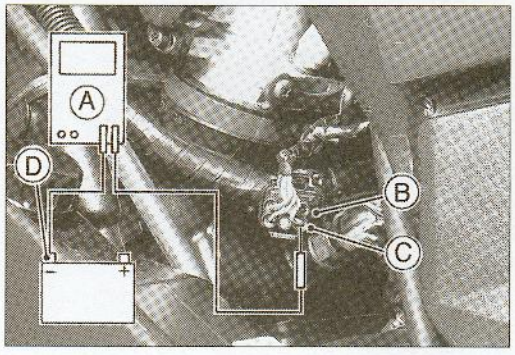


★ If the reading is normal, check the power source voltage at the injector connector [B], using a digital volt meter [A].

- Measure the power source voltage with the engine stopped, and the connector joined, using a digital meter.
- Turn the ignition SW ON.

Injector Power Source Voltage at Injector
Connections to Injector #1, #2, #3, #4
Meter (+) → W/R wire [C]
Meter (–) → Battery (–) Terminal [D]

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



- Turn the ignition SW OFF.

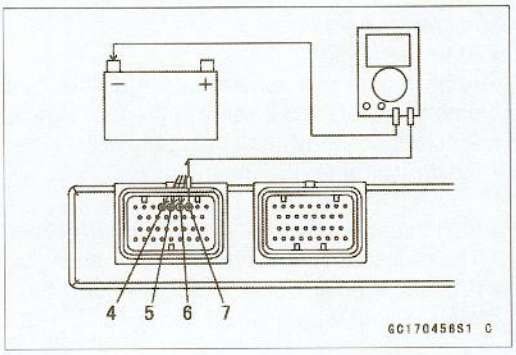
★ If the reading is out of the standard, check the wiring (see wiring diagram in this section).

★ If the reading is good, and the power source voltage is normal, check the output voltage.

Fuel Injectors (#1, #2, #3, #4: Fault Code 41, 42, 43, 44)

Output Voltage Inspection

- Measure the output voltage at the ECU connector in the same way as power source voltage inspection. Note the following.



Injector Output Voltage at ECU
Connections for Injector #1
Meter (+) → BL/R wire (terminal 4)
Meter (–) → Battery (–) Terminal

Connections for Injector #2
Meter (+) → BL/G wire (terminal 5)
Meter (–) → Battery (–) Terminal

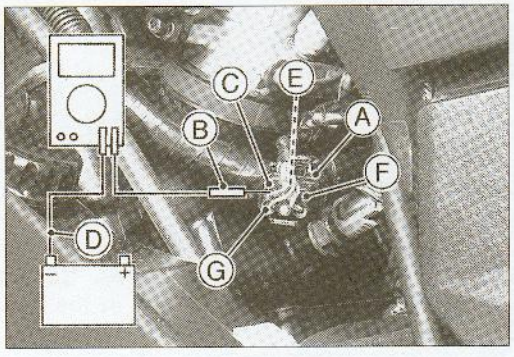
Connections for Injector #3
Meter (+) → BL/BK wire (terminal 6)
Meter (–) → Battery (–) Terminal

Connections for Injector #4
Meter (+) → BL/Y wire (terminal 7)
Meter (–) → Battery (–) Terminal

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

★ If the output voltage is normal, check the ECU for its ground, and power supply (see this chapter). If the ground and power supply are good, replace the ECU.

★ If the output voltage is out of the standard, remove the left inner cover, and check the output voltage at the injector connector [A] (when the wire is open, the output voltage is 0 V).
Needle Adapter Set [B]



Injector Output Voltage at Injector
Connections to Injector #1
Meter (+) → BL/R wire [C]
Meter (–) → Battery (–) Terminal [D]

Connections to Injector #2
Meter (+) → BL/G wire [E]
Meter (–) → Battery (–) Terminal [D]

Connections to Injector #3
Meter (+) → BL/BK wire [F]
Meter (–) → Battery (–) Terminal [D]

Connections to Injector #4
Meter (+) → BL/Y wire [G]
Meter (–) → Battery (–) Terminal [O]

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

★ If the output voltage is normal, check the wiring for continuity (see next diagram). If the wiring is good, perform "Audible Inspection" for confirmation.

★ If the output voltage is out of the standard, perform "Audible Inspection" for confirmation.

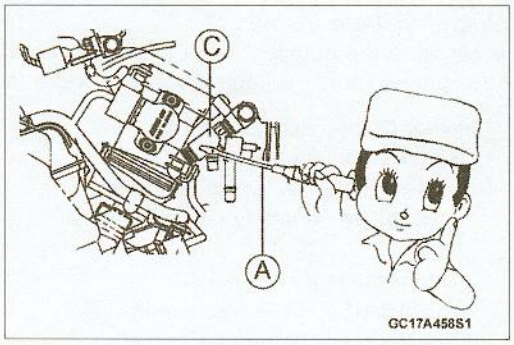
Fuel Injectors (#1, #2, #3, #4: Fault Code 41, 42, 43, 44)

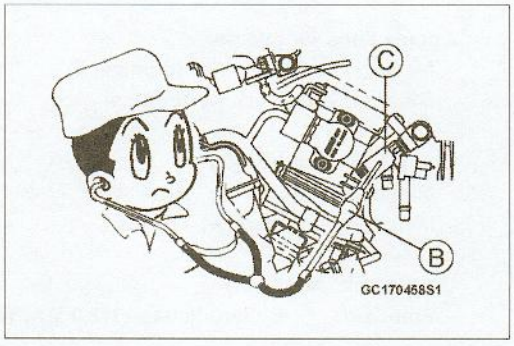
Audible Inspection

- Start the engine.
- Apply the tip of a screwdriver [A] to the injector [C]. Put the grip end onto your ear, and listen whether the injector is clicking or not.
- A sound scope [B] can also be used.
- Do the same for the other injector.

Front [D]

★ If all the injectors click at a regular intervals, the injectors are good.
○ The click interval becomes shorter as the engine speed rises.
★ If either injector doesn't click, perform the "Injector Signal Test" for injector operation.





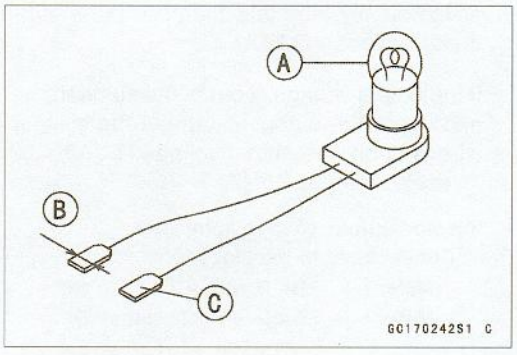
Injector Signal Test

- Prepare two test light sets with male terminals as shown.

Rating of Bulb [A]: 12 V × 3 ~ 3.4 W
Terminal Width [B]: 1.8 mm
Terminal Thickness [C]: 0.8 mm

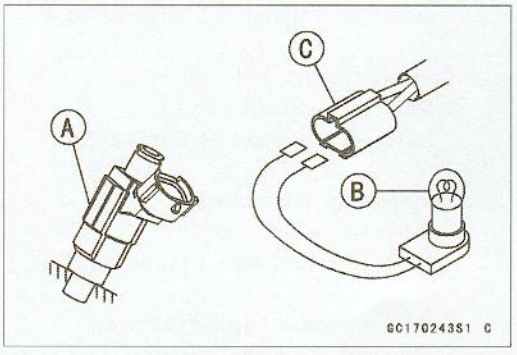
CAUTION

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



- Remove connectors for injector [A].
- Connect each test light set [B] to the injector sub harness connector [C].
- Turn the ignition switch ON.
- While cranking the engine with the starter motor, watch the test lights.

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



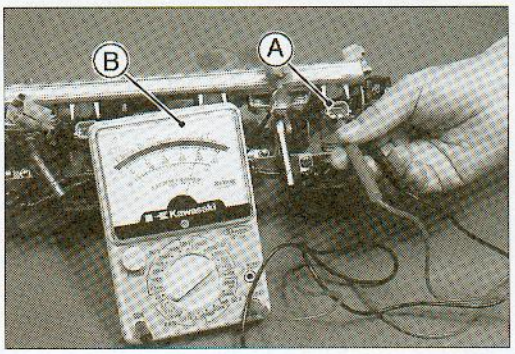
○ Injector signals can be also confirmed by connecting the hand tester (× 10 V AC) instead of the test light set to the injector main harness (female) connector. Crank the engine with the starter motor, and check to see if the hand oscillates at regular intervals.

Special Tool - Hand Tester: 57001-1394

★ If the test light doesn't flicker (or the test hand doesn't oscillates), check the wiring and connectors again. If the wiring is good, replace the ECU.

Fuel Injectors (#1, #2, #3, #4: Fault Code 41, 42, 43, 44)

Injector Resistance Inspection



- Remove the throttle body assy (see Throttle Body Assy Removal).
- Disconnect the connector from the injector [A].
- Measure the injector resistance with the hand tester [B].

Special Tool - Kawasaki Hand Tester: 57001–1394

Injector Resistance

Connections to Injector

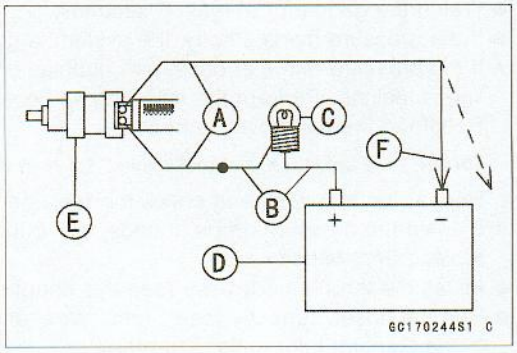
Meter (+)	Meter (–)
#1: W/R ←→	BL/R Terminal
#2: W/R ←→	BL/G Terminal
#3: W/R ←→	BL/BK Terminal
#4: W/R ←→	BL/Y Terminal

Standard: 12.5 Ω

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

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

Injector Unit Test



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

CAUTION

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

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

★ If the injector does not click, replace the throttle body assy.

★ If the injector clicks, check the wiring again. If the wiring is good, replace the ECU.

Fuel Injectors (#1, #2, #3, #4: Fault Code 41, 42, 43, 44)

Injector Fuel Line Inspection

- Remove the throttle body assy (see this chapter).
- Check the injector [A] fuel line for leakage as follows:
- ○ Connect a commercially available vacuum/pressure pump [B] to the fuel hose [C] of the delivery joint [D] as shown.
- Plug the outlet of the pressure regulator [E] with a rubber plug [F] (e.g. Plug: Part No. 92068–006).
- ○ Bind the plug with a wire [G].
- ○ Apply a soap and water solution to the areas [H] shown.
- ○ Watching the pressure gauge, squeeze the pump lever [I], and build up the pressure until the pressure reaches the maximum pressure.

Fuel Line Maximum Pressure
Standard: 299 kPa (2.95 kg/cm², 43 psi)

CAUTION

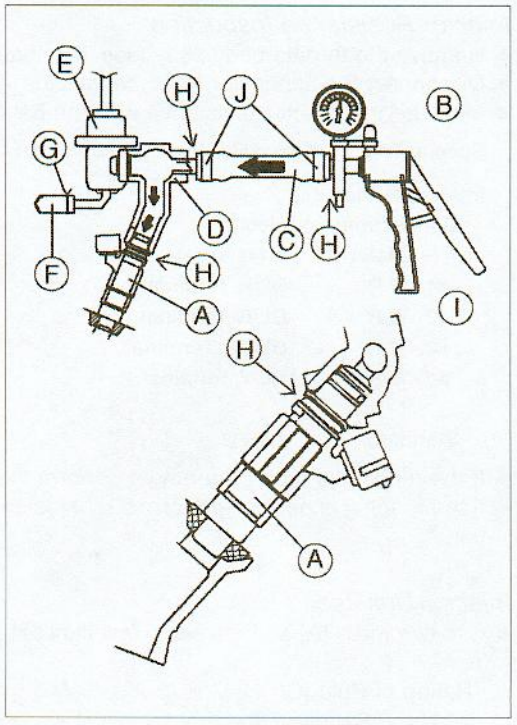
During pressure testing, do not exceed the maximum pressure for which the system is designed.

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

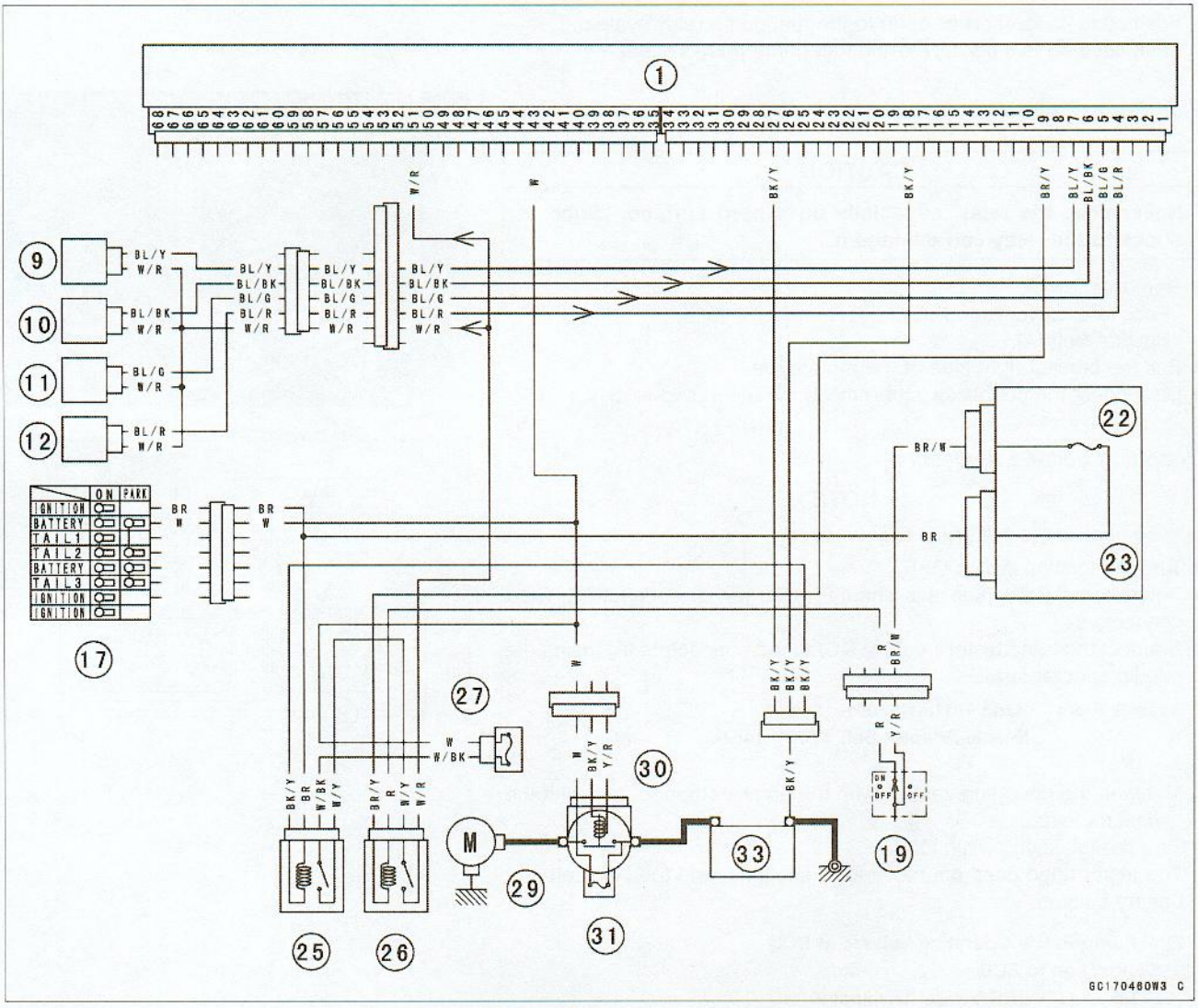
Torque - Fuel Hose Clamp Screws: 1.5 N·m (0.15 kg·m, 13 in·lb)

- ○ Repeat the leak test, and check the fuel line for no leakage.
- ★ If again the pressure drops at once, or if bubbles are found the area, replace throttle body assy.
- Install the throttle body assy (see this chapter).
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the General Information chapter).

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



Fuel Injectors (#1, #2, #3, #4: Fault Code 41, 42, 43, 44)



→: Signal
ECU [1]
Junction Box [22]
Ignition Switch [17]
Engine Stop Switch [19]
Fuel Pump Relay [26]
Starter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]
Fuel Injector #1 [12]
Fuel Injector #2 [11]
Starter Motor [29]
Fuel Injector #3 [10]
Fuel Injector #4 [9]
ECU Fuse 15 A [27]
ECU Main Relay [25]
Ignition Fuse 10 A [23]

Fuel Pump Relay (Fault Code 45, 46)

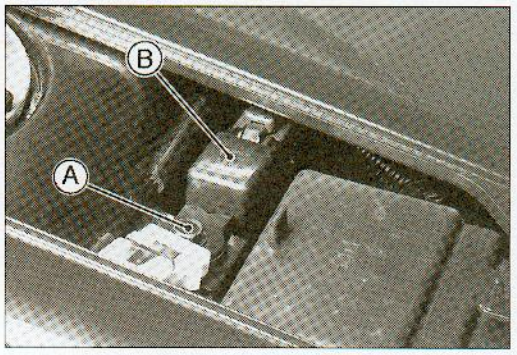
Fault code 45 is short or open to the fuel pump relay system.
Fault code 46 is stuck ON to the fuel pump relay system.

Fuel Pump Relay Removal

CAUTION

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

- Remove:
  Fuel Tank Cover (see Fuel Tank Removal)
  Bracket Bolt [A]
- Pull the bracket right side of the motorcycle.
- Disconnect the connector and remove the fuel pump relay [C] .



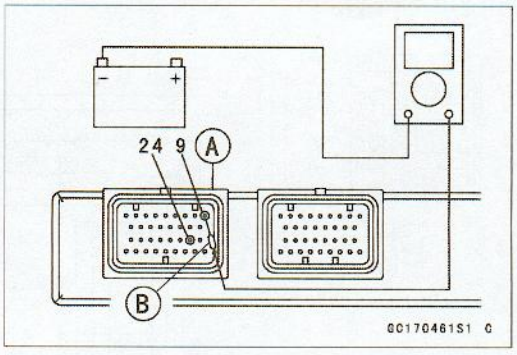
Operating Voltage Inspection

NOTE

○ *Be sure to the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the ECU (see this chapter). Do not disconnect the ECU connectors.
- Connect the hand tester (× 25 V DC) to the connectors [A], using the needle adapter set [B].

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



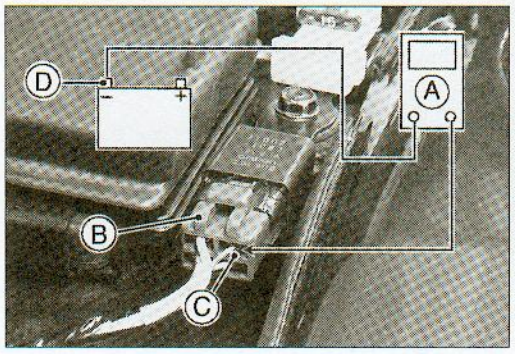
○ Measure the operating voltage with the engine stopped, and with the connector joined.
- Turn the ignitinon switch ON.
○ The tester hand does not move for 3 seconds, and then indicate the battery boltage.

Fuel Pump Relaly Operating Voltage at ECU
Connection to ECU
Tester (+) → BR/Y wire (terminal 9)
Tester (–) → Battery Ground Terminal

Operating Voltage at ECU
Standard: O V or 1 V for 3 seconds, and then battery voltage (12.5 V) or more

★ If the reading stays on 12.5 V or more, check the following.
Vehicle-down Sensor
Emergency Engine Stop Voltage (Terminal 24 ←→ Ground)
ECU for it Ground, and Power Supply
★ If the reading stays on 0 V, and never shows, battery voltage (12.5 V), check the ECU for it ground, and power supply (see this chapter).
★ If the ground and power supply are good, replace the ECU.
★ If there is no battery voltage at all, check the relay operating voltage at the relay connector as follows.

Fuel Pump Relay (Fault Code 45, 46)



- Remove the fuel tank cover. Do not disconnect the relay connector.
  Hand Tester [A]
  Fuel Pump Relay Connector [B]

Fuel Pump Relay Operating Voltage at Relay Connector
Connection to Relay Connecto
Tester (+) → R wire [C]
Tester (–) → Battery (–) Terminal [D]

Operating Voltage ar Pump Connector
Standard: Battery Voltage (12.5 V or more)

★ If the voltage is in specification, check the relay (see Electriacl System chapter) and wiring contiuity.
★ If the voltage is not specification, check the following.
Ignition Fues 10 A (see Electrical System chapter)
ECU Fuse 15 A (see this chapter)
Engine Stop Switch (see Electrical System chapter)
ECU Main Relaly (see this chapter)
Wiring for Fuel Pump Relay Operating Voltage (see next diagram)

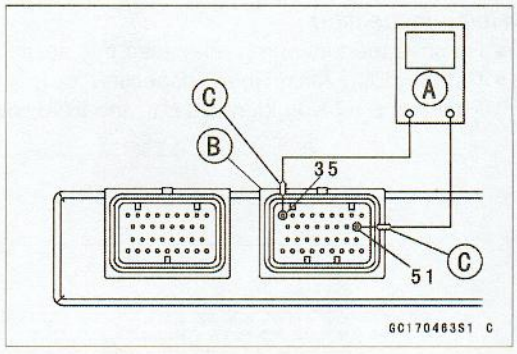
Power Source Voltage Inspection

NOTE

○ *Confirm that the operation voltage is normal before inspecting the power source voltage.*
○ *Be sure the battery is fully charged.*

- Connect the hand tester (× 25 V DC) [A] to the connector [B], using the needle adapter set [C].

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



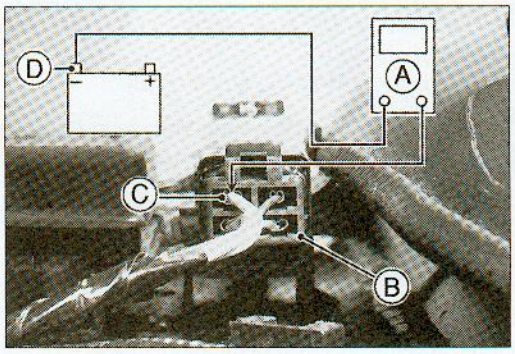
○ Measure the power source voltage with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.
○ The tester hand should indicate battery voltage for 3 seconds, and then 0 V.

Relay Power Source Voltage
Connections to ECU
Tester (+) → W/R wire (terminal 51)
Tester (–) → BK/Y wire (terminal 35)

Power Source Voltage at ECU
Standard: Battery Voltage (12.5 V or more) , and the 0 V

★ If the power source voltage is less than the standard, check the ECU for its ground, and power supply (see this chapter).
★ If the ground and power supply are good, replace the ECU.
★ If the reading stays on battery voltage, and never shows 0 V, recheck the operating voltage or check the fuel pump relay power source voltage at the relay connector.

Fuel Pump Relay (Fault Code 45, 46)



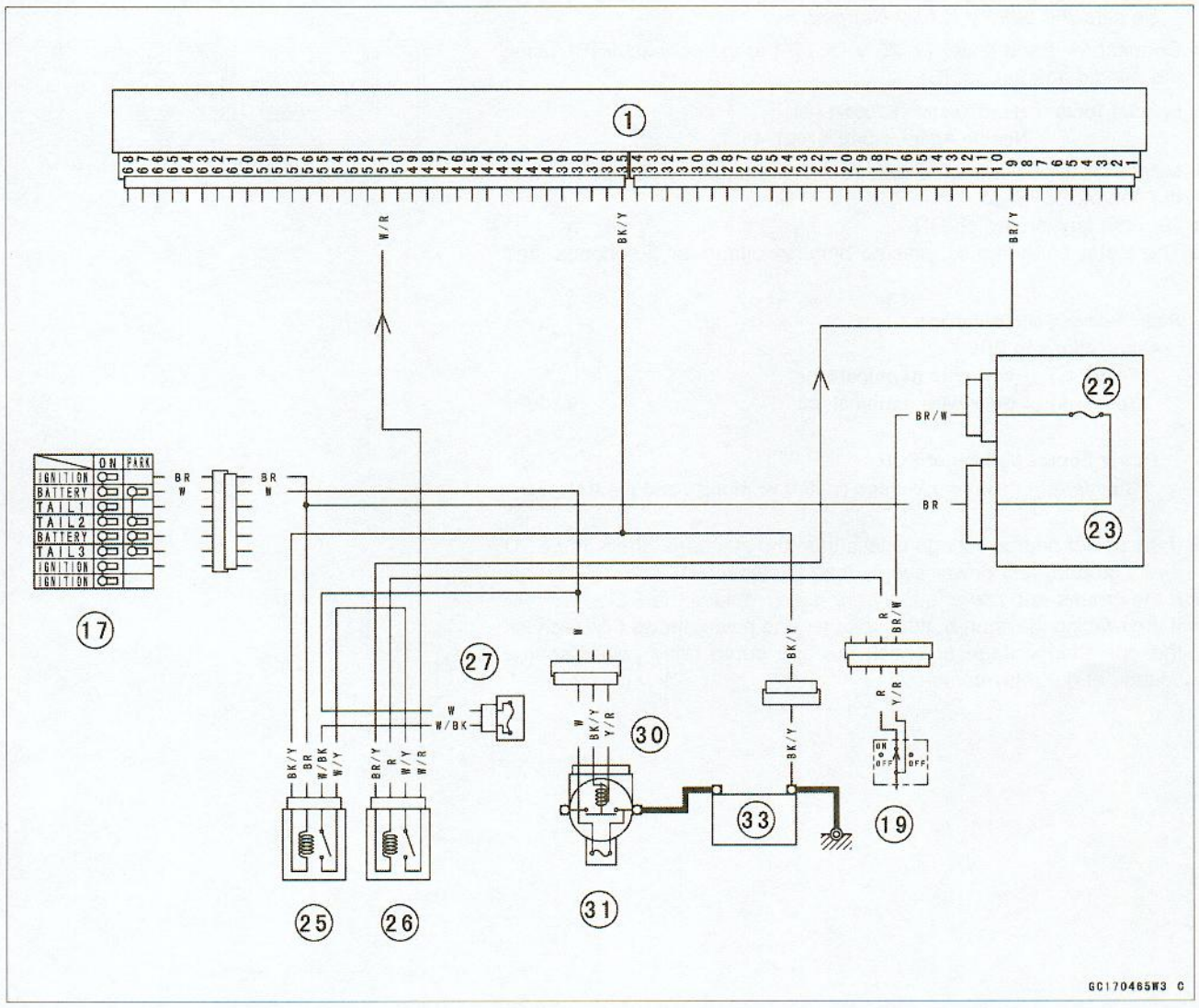
- Connect the hand tester [A] to the fuel pump relay connector [B].
- Measure the power source voltage with the engine stopped, and with the relay connector joined.
- Turn the ignition switch ON.

Fuel Pump Relay Power Source Voltage
Connections to Relay Connector
Tester (+) → W/Y wire [C]
Tester (–) → Battery (–) Terminal [D]

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

★ If the reading is good, the power source voltage is normal. Check the fuel pump relay and wiring continuity.
★ If there is no battery voltage, check the following:
ECU Fuse 15 A (see this chapter)
ECU Main Relay (see this chapter)
Wiring for Fuel Pump Relay Power Source Voltage System

Relay Inspection
- Remove the fuel pump relay (see this section).
- Refer to ECU Main Relay Inspection for fuel pump relay inspection.
- Fuel pump relay is identical part the ECU main relay.



Fuel Pump Relay (Fault Code 45, 46)

←: Signal
ECU [1]
ECU Main Relay [25]
Fuel Pump Relay [26]
ECU Fuse 15 A [27]
Junction Box [22]
Ignition Fuse [23]
Engine Stop Switch [19]
Sarter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]

Stick Coils (#1, #2, #3, #4: Fault Code 51, 52, 53, 54)

Stick Coil #1: Ignition Coil (Fault Code 51)
Stick Coil #2: Ignition Coil (Fault Code 52)
Stick Coil #3: (Fault Code 53)
Stcik Coil #4: (Fault Code 54)

Removal/Installation

CAUTION

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

- See Ignition System section in the Electrical System chapter.

Input Voltage Inspection

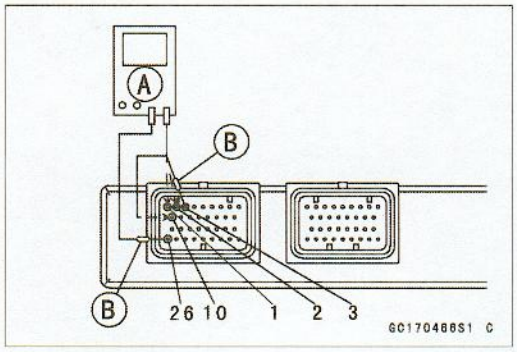
NOTE

○ *Be sure the battery is fully charged.*

- Turn the ignition SW OFF.
- Remove the ECU (see this chapter). Do not disconnect the ECU connector.
- Connect a digital voltmeter [A] as shown, using the needle adapter set [B].

○ Measure the input voltage to each primary winding of the ignition coils with the engine stopped, and with the connectors joined.

- Turn the ignition SW ON.



Stick Coil Input Voltage at ECU
Connections for Stick Coil #1
Meter (+) → BK wire (terminal 1)
Meter (–) → BK/Y wire (terminal 26)

Connections for Stick Coil #2
Meter (+) → BK/G wire (terminal 2)
Meter (–) → BK/Y wire (terminal 26)

Connections for Stick Coil #3
Meter (+) → BK/R wire (terminal 3)
Meter (–) → BK/Y wire (terminal 26)

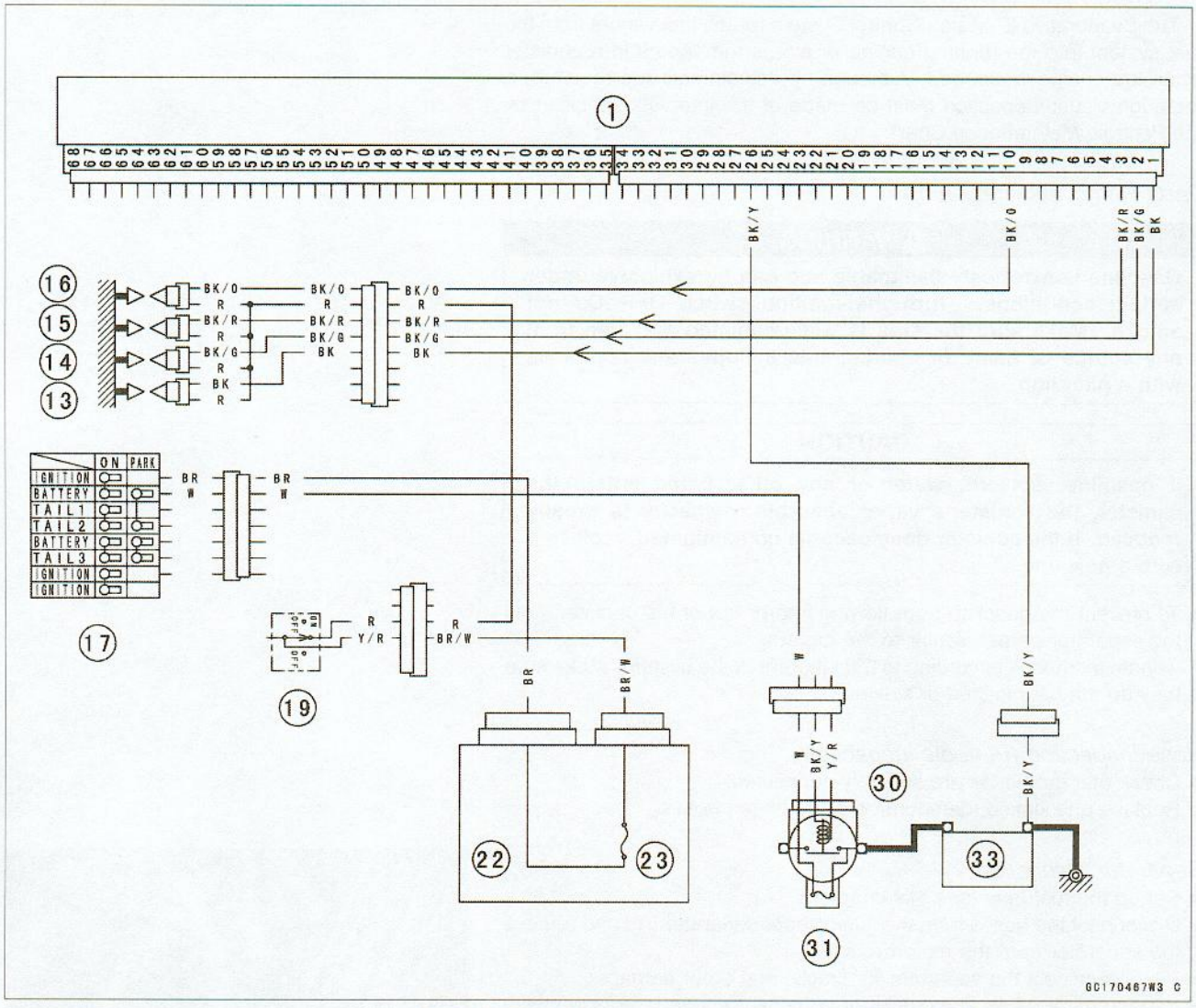
Connections for Stick Coil #4
Meter (+) → BK/O wire (terminal 10)
Meter (–) → BK/Y wire (terminal 26)

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

★ If the reading is out of the standard, check the wiring (see next wiring diagram).

★ If the reading is good, the input voltage is normal. Crank the engine, and check the peak voltage of the stick coils (see Electrical System chapter) in order to check the primary coils.

Stick Coils (#1, #2, #3, #4: Fault Code 51, 52, 53, 54)



→: Signal
ECU [1]
Engine Stop Switch [19]
Stick Coil #1 [13]
Stick Coil #2 [14]
Stick Coil #3 [15]
Stick Coil #4 [16]
Ignition Switch [17]
Starter Relay [30]
Main Fuse 30 A [31]
MF Battery [33]
Junction Box [22]
Ignition Fuse 10 A [23]

Evaporative Emission Control System (California Model Only)

The Evaporative Emission Control System routes fuel vapors from the fuel system into the running engine or stores the vapors in a canister when the engine is stopped. Although no adjustments are required, a thorough visual inepection must be made at the intervals specified by the Periodic Maintenance Chart.

Parts Removal/Installation

⚠ WARNING

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

CAUTION

If gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.

- To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
- Connet the hoses according to the diagram of the system. Make sure they do not get pinched or kinkied.

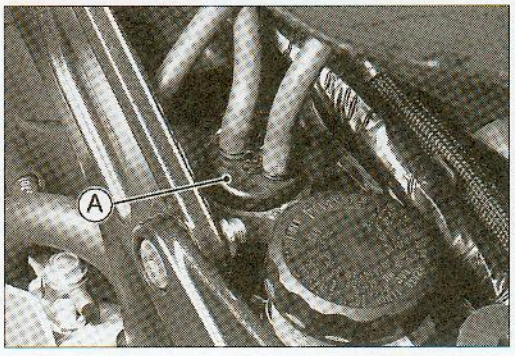
Hose Inspection (Periodic Inspection)

- Check that the hoses are securely connected.
- Replace any kinked, deteriorated or damaged hoses.

Separator Inspection

- Set up the fuel tank (see this chapter).
- Disconnect the hoses from the liquid/vapor separator [A], and remove the separator from the motorcycle.
- Visually inspect the separator for cracks and other damaged.

★ If the separator has any cracks or is badly damaged, replace it with a new one.



Evaporative Emission Control System (California Model Only)

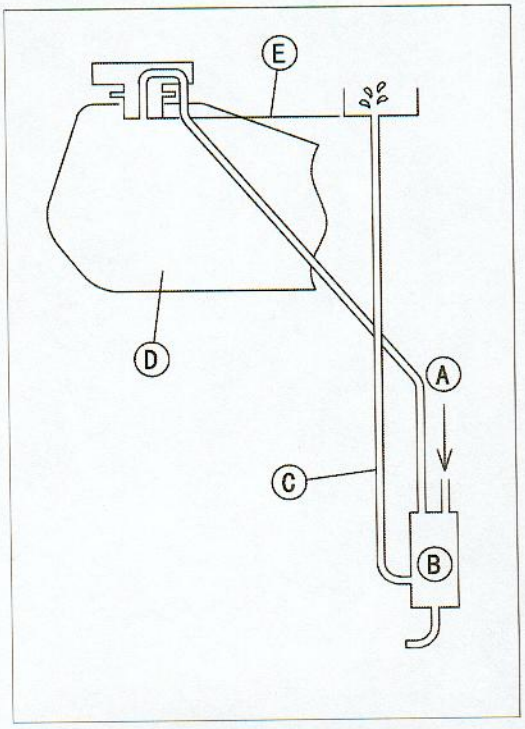
Separator Operation Test

⚠ 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.

- Connect the hoses to the separator, and install the separator on the motorcycle.
- Disconnect the breather hose from the separator, and inject about 20 mL of gasoline [A] into the separator [B] through the hose fitting.
- Disconnect the fuel return hose [C] from the fuel tank [D].
- Run the open end of the return hose into the container and hold it level with the tank top [E].
- Start the engine, and let it idle.

★ If the gasoline in the separator comes out of the hose, the separator works well. If it does not, replace the separator with a new one.



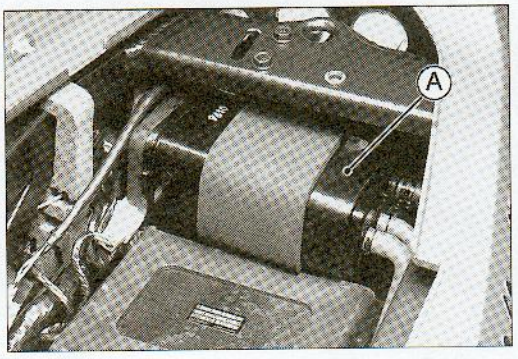
Canister Inspection (Periodic Inspection)

- Remove:
  Seats (see Frame chapter)
  Storage Box (see Frame chapter)
- Remove the canister [A], and disconnect the hoses from the canister.
- Visually inspect the canister for cracks and other damage.

★ If the canister has any cracks or bad damage, replace it with a new one.

NOTE

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



Cooling System

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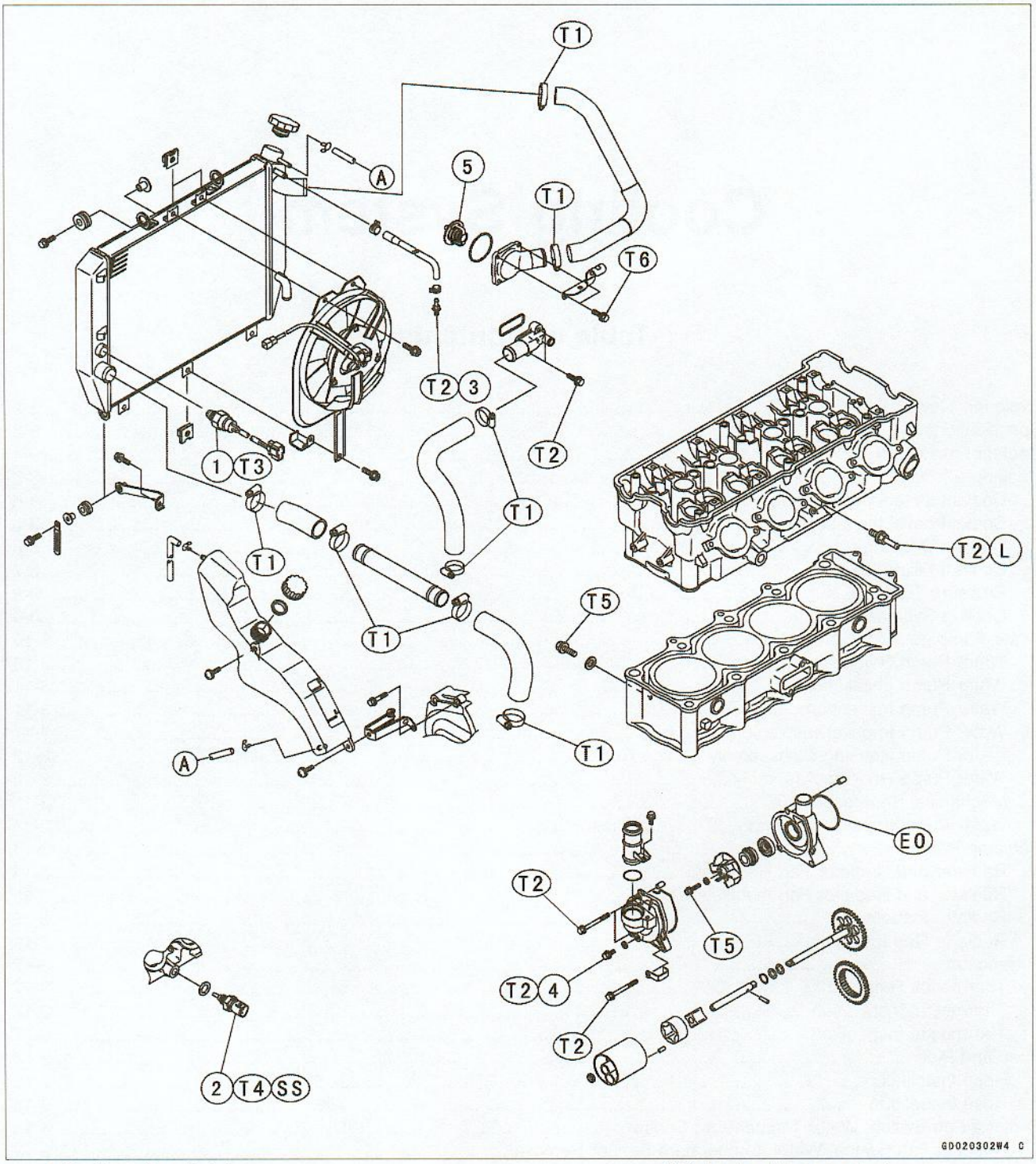
Exploded View



1. Radiator Fan Switch
2. Water Temperature Sensor
3. Coolant By-pass Fitting
4. Drain Plug
5. Thermostat

EO: Apply engine oil.
L: Apply a non-permanent locking agent.
SS: Apply silicone sealant.
T1: 2.0 N·m (0.20 kg·m, 17 in·lb)
T2: 12 N·m (1.2 kg·m, 106 in·lb)
T3: 18 N·m (1.8 kg·m, 13 ft·lb)
T4: 25 N·m (2.5 kg·m, 18 ft·lb)
T5: 10 N·m (1.0 kg·m, 87 in·lb)
T6: 8 N·m (0.8 kg·m, 71 in·lb)

Specifications

Item	Standard
Coolant provided when shipping:	
Type	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Color	Green
Mixed ratio	Soft water 50 %, Coolant 50 %
Freezing point	– 35°C (– 31°F)
Total amount	3.6 L (reserve tank full level including radiator and engine)
Radiator cap:	
Relief pressure	93 ~ 123 kPa (0.95 ~ 1.25 kg/cm^2, 14 ~ 18 psi)
Thermostat:	
Valve opening temperature	58 ~ 62°C (136 ~ 144°F)
Valve full opening lift	8 mm or more @75°C (167°F)

Special Tools - Bearing Driver Set: 57001–1129
Bearing Driver: 57001–382

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

3-4 COOLING SYSTEM

Coolant Flow Chart

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

The thermostat is a wax pellet type which opens or closes 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 58 ~ 62°C, the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 58 ~ 62°C, the thermostat opens and the coolant flows.

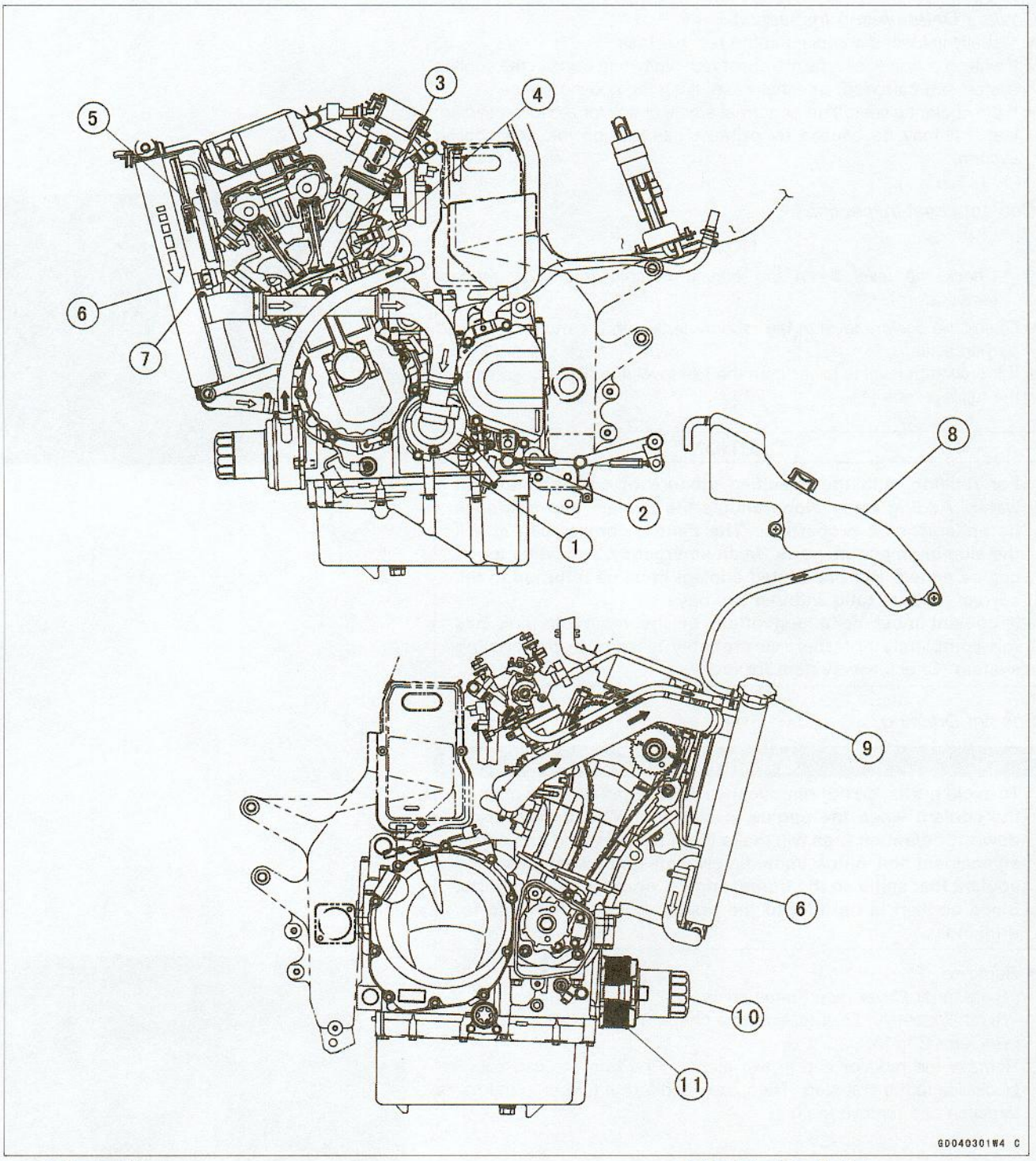
When the coolant temperature goes up beyond 100 ~ 110°C, the radiator fan switch conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is below 97 ~ 103°C, 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 0.95 ~ 1.25 kg/m^2, 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 0.95 ~ 1.25 kg/m^2. 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. Drain Bolt
2. Water Pump
3. Thermostat
4. Water Temperature Sensor
5. Radiator Fan
6. Radiator
7. Radiator Fan Switch
8. Reserver Tank
9. Radiator Cap
10. Oil Filter
11. Oil Cooler

Coolant

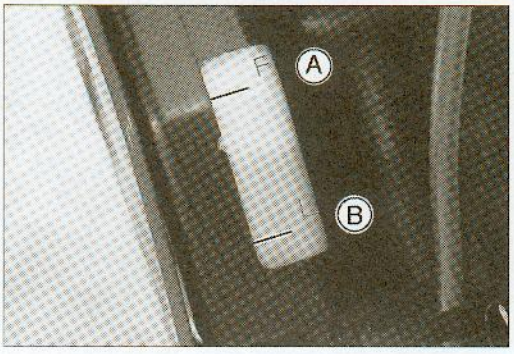
Coolant Deterioration Inspection

- Visually inspect the coolant in the reserve tank.

★ If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. 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 [B], add coolant to the full level line [A].

CAUTION

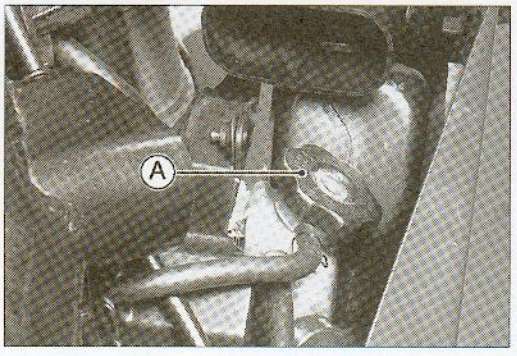
For refilling, add the specified mixture of coolant and soft water. Adding water alone dilutes the coolant and degrades its anticorrosion properties. The diluted coolant can attack the aluminum engine parts. In an emergency, soft water alone can be added. But the diluted coolant must be returned to the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

⚠ 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.

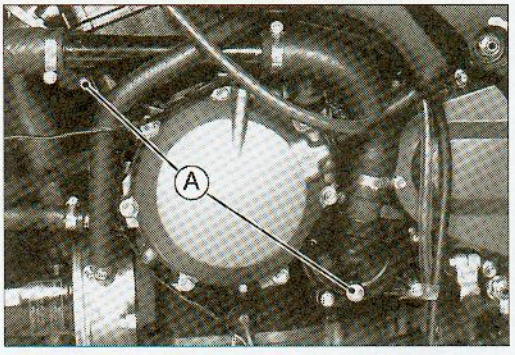
- Remove:
  Right Inner Cover (see Frame chapter)
  Right Rubber Air Duct (see Frame chapter)
  Radiator Cap [A]



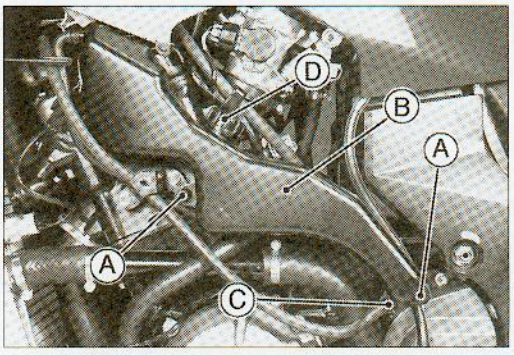
○ Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.

Coolant

- Remove:
  Left Lower Fairing (see Frame chapter)
  Left Inner Fairing (see Frame chapter)
- Place a containers under the drain plugs [A] at the bottom of the water pump cover and cylinder.
- Drain the coolant from the radiator and engine by removing the drain plugs.



- Remove:
  Mounting Screws [A] and Reserve Tank [B]
  Hose [C]
- Remove the cap [D] and pour the coolant into a container.

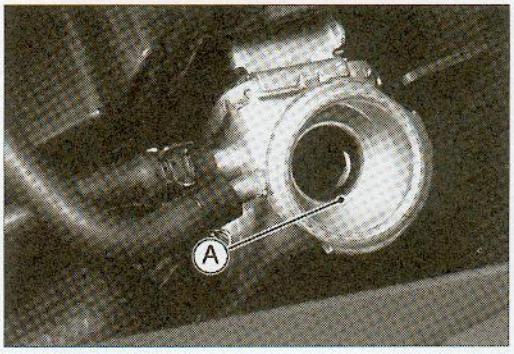


Coolant Filling

- Install the reserve tank.
- Tighten the drain plugs with the washer.

Torque - Coolant Drain Plug: 12 N·m (1.2 kg·m, 106 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)

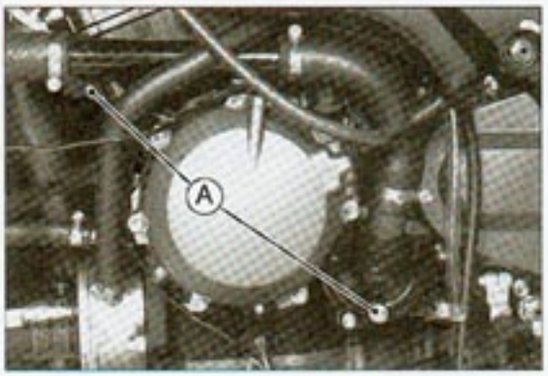
Soft Water:	**50 %**
Coolant:	**50 %**
Freezing Point:	**– 35°C (– 31°F)**
Total Amount:	**3.6 L**

NOTE

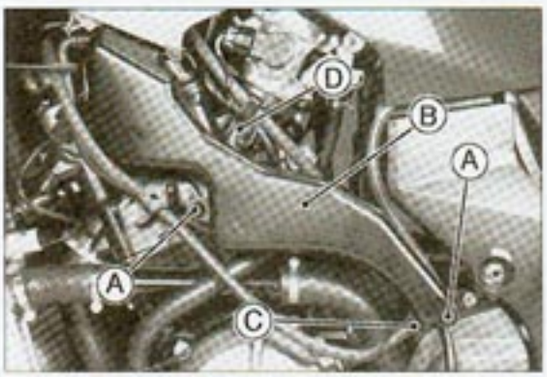
○ *Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.*

Coolant

- Remove:
  Left Lower Fairing (see Frame chapter)
  Left Inner Fairing (see Frame chapter)
- Place a containers under the drain plugs [A] at the bottom of the water pump cover and cylinder.
- Drain the coolant from the radiator and engine by removing the drain plugs.



- Remove:
  Mounting Screws [A] and Reserve Tank [B]
  Hose [C]
- Remove the cap [D] and pour the coolant into a container.



Coolant Filling

- Install the reserve tank.
- Tighten the drain plugs with the washer.

Torque - Coolant Drain Plug: 12 N·m (1.2 kg·m, 106 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)**
Total Amount:	**3.6 L**

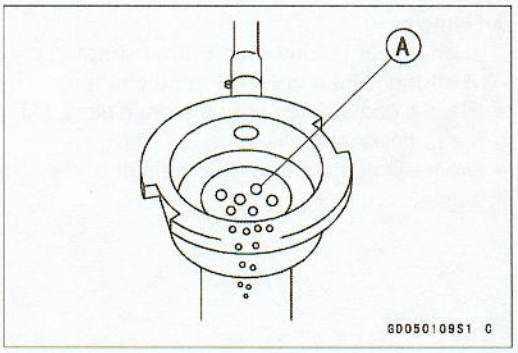
NOTE

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

Coolant

- 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.

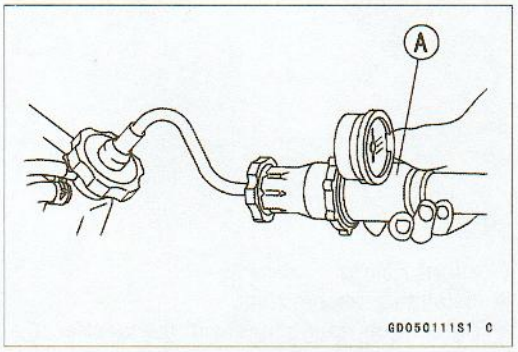
Pressure Testing

- Remove:
  Right Inner Cover (see Frame chapter)
  Right Rubber Air Duct (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^2, 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^2, 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.

Coolant

Cooling System Flushing

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

- Drain the cooling system (see Coolant Draining).
- Fill the cooling system with fresh water mixed with a flushing compound.

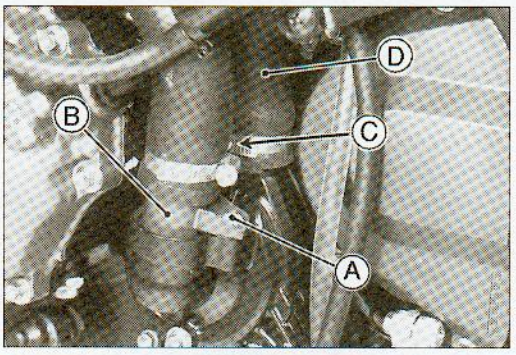
CAUTION
Do not use a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning product.

- 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 Filling).

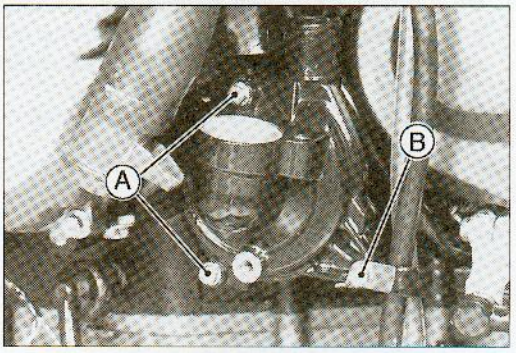
Water Pump

Water Pump Removal

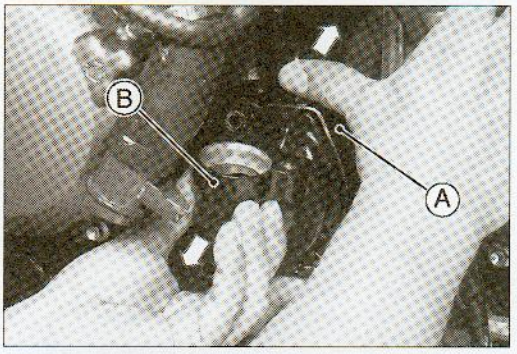
- Drain the coolant (see Coolant Draining)
- Remove:
  Right Lower Fairing (see Frame chapter)
  Coolant Pipe Bolt [A]
  Coolant Hose with Pipe [B]
- Loosen the hose clamp [C] and pull out the coolant hose [D].



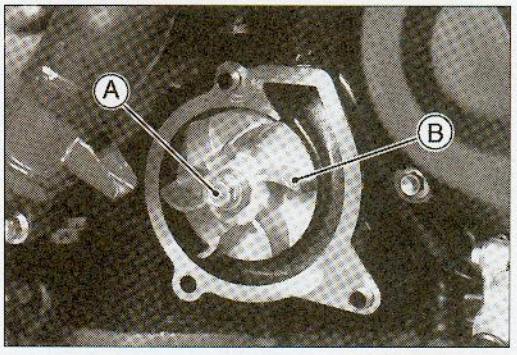
- Remove:
  Water Pump Bolts [A]
  Water Pump Bolt with the Clamp [B]



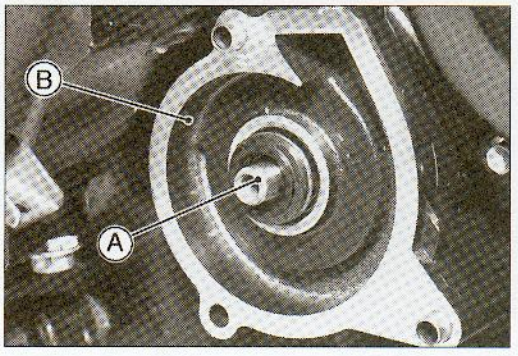
- Pushing the water pump housing [A] to the crankcase side, and then pull out the water pump cover [B].



- Shift the transmission into 1st gear position.
- Unscrew the bolt [A] and remove the inpeller [B].



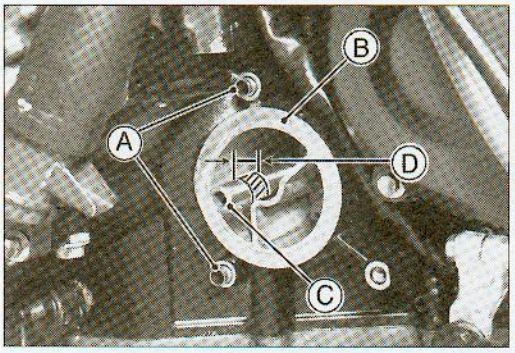
- Pushing the water (oil) pump shaft [A] to the crankcase side, and then pull out the water pump housing [B].



Water Pump

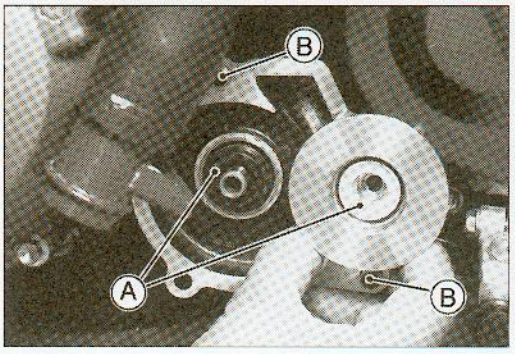
Water Pump Installation

- Check to see that the knock pins [A] and oil pump cover [B] are in place.
- Apply engine oil to the water (oil) pump shaft [C] to touch the metal portion of the water pump housing.
  about 10 mm [D]
- Install the water pump housing.



- Clean the sliding surfaces [A] of the mechanical seal and impeller with a high flash-point solvent.
- Apply a little coolant to the sliding surfaces.
- Check to see that the knock pins [B] is in place.
- Shift the transmission into 1st gear position.
- Install:
  Impeller
  Bolt

Torque - Impeller Bolt: 10 N·m (1.0 kg·m, 87 in·lb)



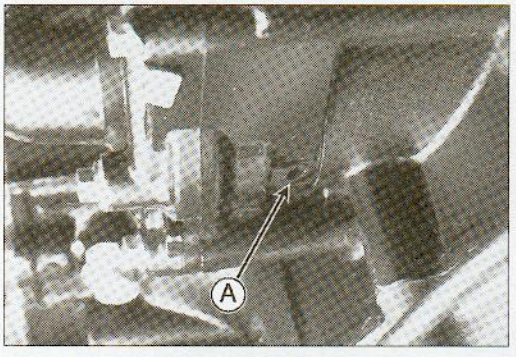
- Apply a high temperature grease to the O-ring of the coolant pipe.
- Install:
  Water Pump Cover
  Bolts
  Coolant Hoses

Torque - Water Pump Cover Bolts: 12 N·m (1.2 kg·m, 106 in·lb)
Coolant Pipe Bolt : 12 N·m (1.2 kg·m, 106 in·lb)

Water Pump Inspection

- Check the drainage outlet passage [A] at the bottom of the water pump body for coolant leaks.

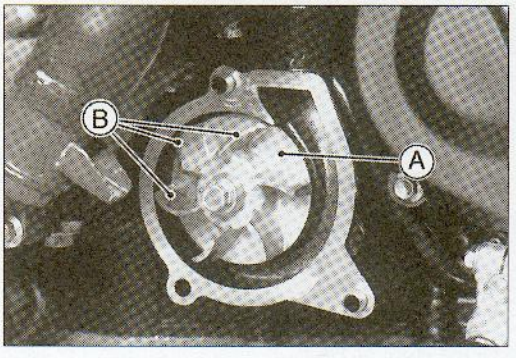
★ If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal unit.



Water Pump Impeller Inspection

- Visually inspect the impeller [A].

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



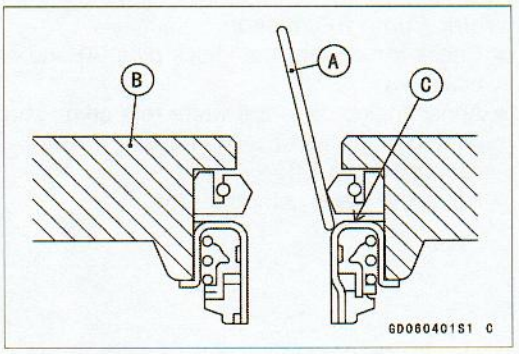
Water Pump

Water Pump Housing Disassembly

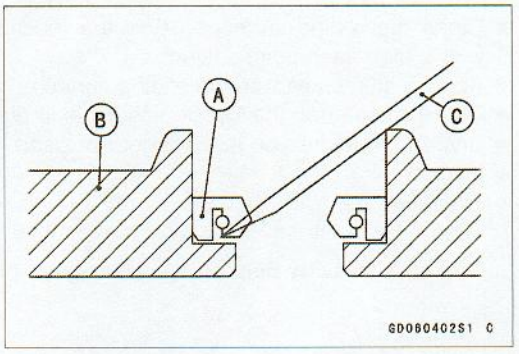
CAUTION

Do not damage the hole wall of the water pump housing.

- Insert a bar [A] into the pump housing [B], and hammer evenly around the circumference of the mechanical seal bottom [C].



- Take the oil seal [A] out of the housing [B] with a hook [C].



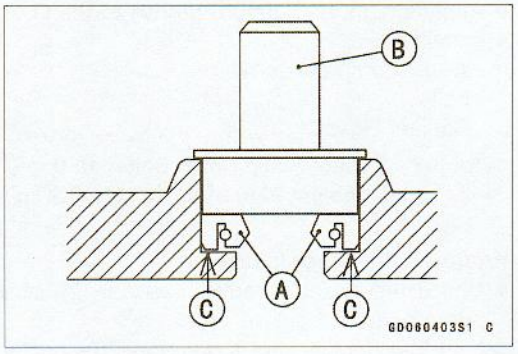
Water Pump Housing Assembly

CAUTION

Do not reuse the mechanical seal and oil seal.

- Apply a high temperature grease to the oil seal lips [A].
- Press the new oil seal into the housing with a bearing driver [B] until it stops at the bottom surface [C] of the housing.

Special Tool - Bearing Driver Set: 57001-1129

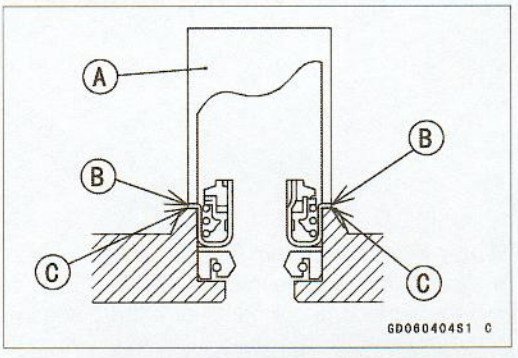


CAUTION

Be careful not to damage the sealing surface of the mechanical seal.

- Press the new mechanical seal into the housing with stem bearing driver [A] until its flange [B] touches the surface [C] of the housing.

Special Tool - Bearing Driver: 57001–382



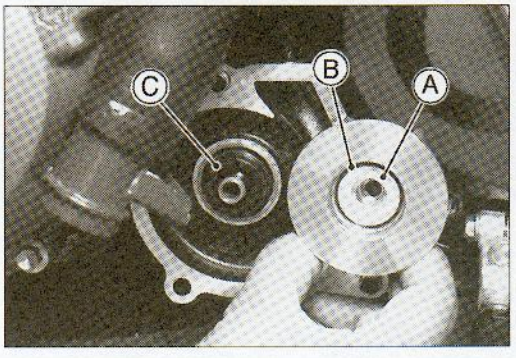
Mechanical Seal Inspection

- Visually inspect the mechanical seal.

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

○ The sealing seat and rubber seal may be removed easily by hand.

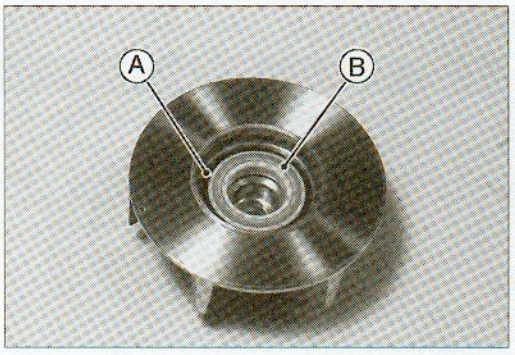
[A] Impeller Sealing Seat Surface
[B] Rubber Seal
[C] Mechanical Seal Diaphragm



Water Pump

Water Pump Impeller Assembly

- Apply coolant around the surfaces of the rubber seal and sealing seat.
- Install the rubber seal [A] and sealing seat [B] into the impeller by pressing them by hand until the seat stops at the bottom of the hole.

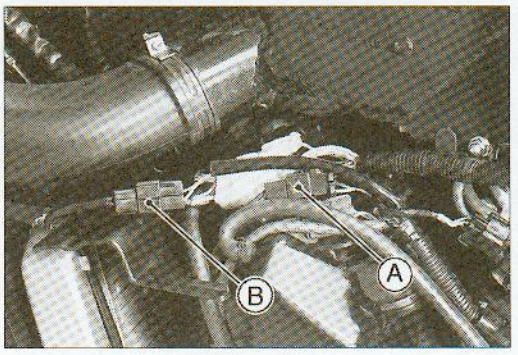


Radiator, Radiator Fan

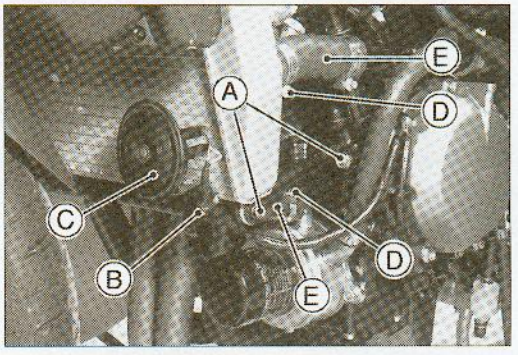
Radiator and Radiator Fan Removal

⚠ WARNING

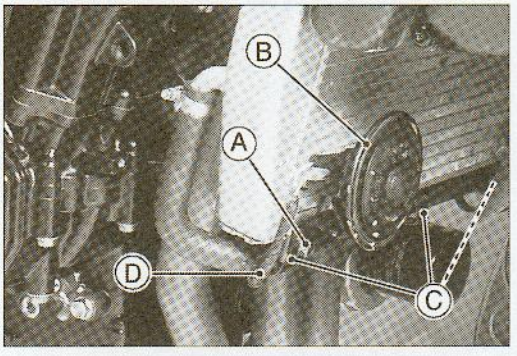
The radiator fan is connected directly to the battery. The radiator fan may start even if the ignition switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.



- Remove:
  Lower and Inner Fairings (see Frame chapter)
  Inner Covers (see Frame chapter)
  Coolant (see Coolant Draining)
  Radiator Fan Connector [A]
  Fan Switch Wire Connector [B]

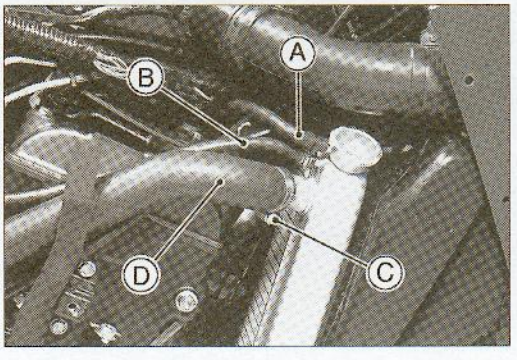


Bracket Bolts [A]
Horn Bolt [B]
Horn [C]
Radiator Coolant Hose Clamp Bolts (loosen) [D]
Radiator Coolant Hoses [E]



Horn Bolt [A]
Horn [B]

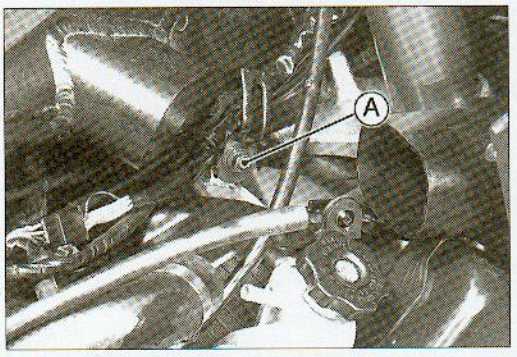
- Open the clamps [C] and remove the horn harness [D].



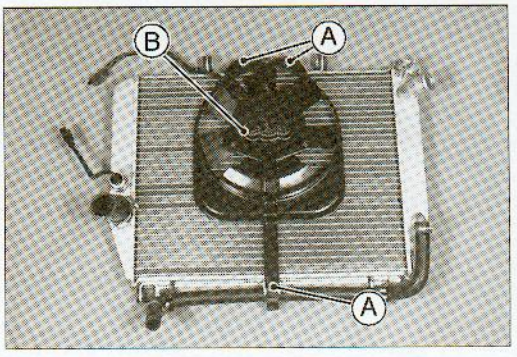
- Remove:
  Reserve Tank Hose [A]
  Bypass Hose [B]
  Radiator Coolant Hose Clamp Bolt (loosen) [C]
  Radiator Coolant Hose [D]

Radiator, Radiator Fan

Engine Bracket Bolts [A] (Right and Left)
Radiator



Radiator Fan Mounting Bolts [A]
Radiator Fan [B]

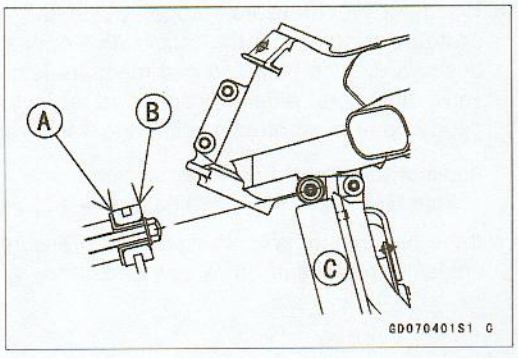


CAUTION

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

Radiator and Radiator Fan Installation

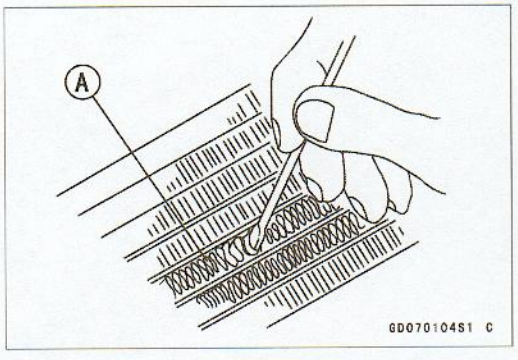
- Installation is the reverse of removal.
- Install the radiator bracket collers [A] as shown.
  Rubber Damper [B]
  Radiator [C]
- Install the coolant hoses and horn harness in accordance with Wire and Hose Routing section in General Information chapter.



Radiator Inspection

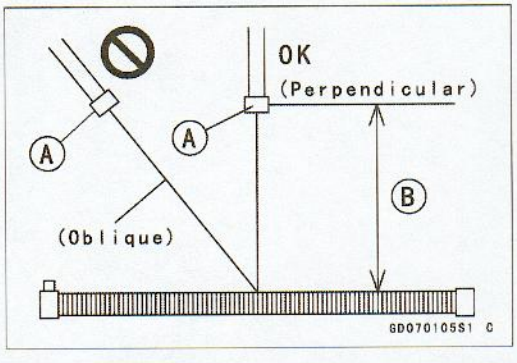
- Check the radiator core.

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



CAUTION

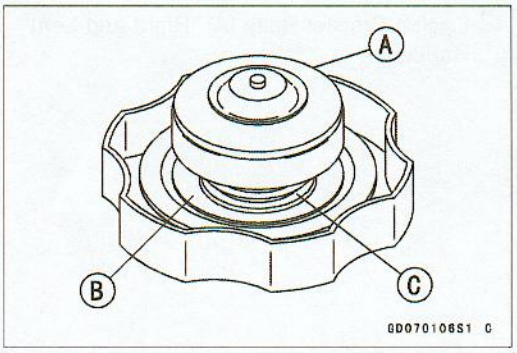
When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage.
Keep the steam gun [A] away more than 0.5 m [B] from the radiator core.
Hold the steam gun perpendicular to the core surface.
Run the steam gun following the core fin direction.



Radiator Cap Inspection

- Check the condition of the top [A] and bottom [B] valve seals and valve spring [C].

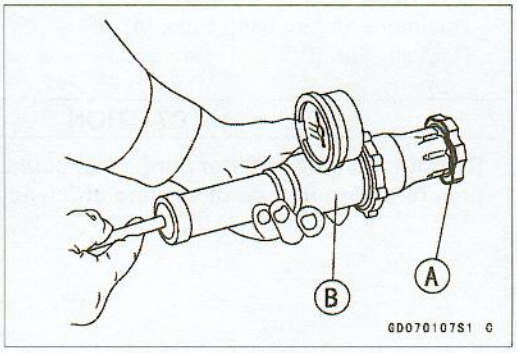
★ If any one of them shows visible damage, replace the cap with a new one.



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

NOTE

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



- Watching the pressure gauge, pump the pressure tester to build up the pressure until the relief valve opens: the gauge 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

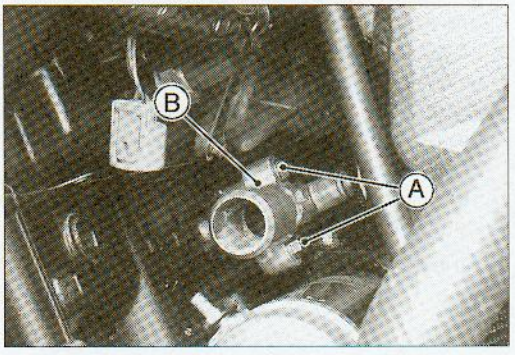
Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kg/cm^2, 14 ~ 18 psi)

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

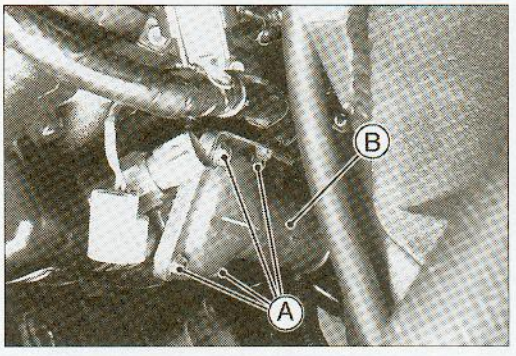
Thermostat

Thermostat Removal

- Drain:
  Coolant (Cylinder) (see Coolant Draining)
- Remove:
  Lower Fairings (see Frame chapter)
  Fuel Hoses (see Digital Fuel Injection System chapter)
  Water Temperature Sensor Connector
  Coolant Hoses
  Starter Motor Wire
  Fitting Bolts [A]
  Fitting [B]



Thermostat Housing Cover Bolts [A]
Thermostat Housing Cover [B]
Thermostat

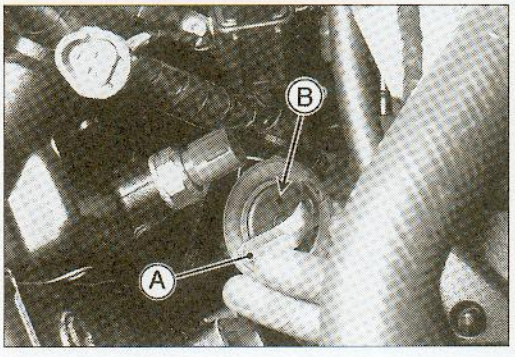


Thermostat Installation

- Install the thermostat [A] in the housing to that the air bleeder hole [B] is on top.
- Be sure to install the O-ring on the housing cover and fitting.
- Tighten the housing cover and fitting bolts.

Torque - Fitting Bolts: 12 N·m (1.2 kg·m, 106 in·lb)
Thermostat Housing Cover Bolts: 8 N·m (0.8 kg·m, 71 in·lb)

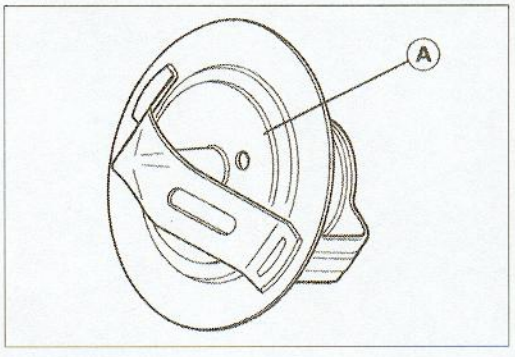
- Fill the radiator with coolant.



Thermostat Inspection

- Remove the thermostat, and inspect the thermostat valve [A] at room temperature.

★ If the valve is open, replace the thermostat with a new one.

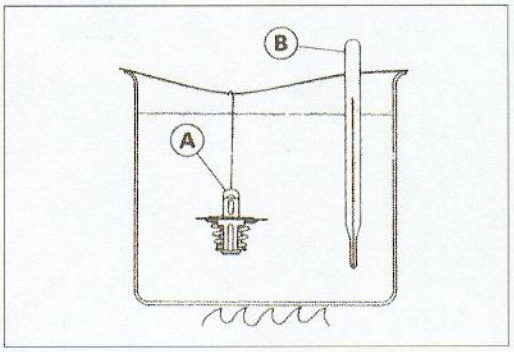


- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.

○ The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water. 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
Standard: 58 ~ 62°C (136 ~ 144°F)



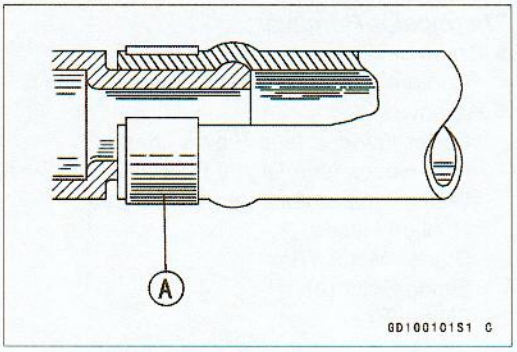
Hose and Pipes

Hose Installation

- Install the hoses and pipes being careful to follow bending direction or diameter. Avoid sharp bending, kinking, flattening, or twisting.
- Install the clamps [A] as near as possible to the hose end to clear the raised rib or 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 kg·m, 17 in·lb)



Hose Inspection

- Visually inspect the hoses for signs of deterioration. Squeeze the hoses. A hose should not be hard and brittle, nor should it be soft to swollen.
- Replace any damaged hoses.

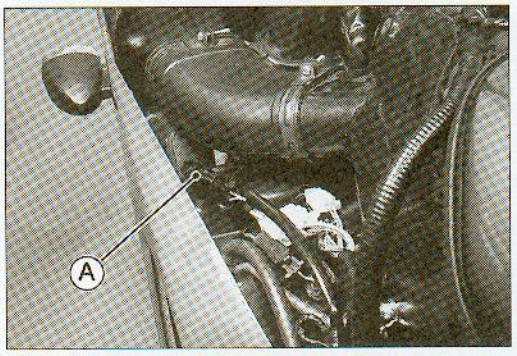
Radiator Fan Switch, Water Temperature Sensor

Radiator Fan Switch, Water Temperature Sensor Removal

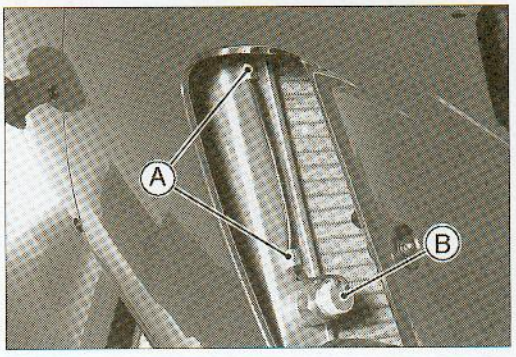
CAUTION

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 Coolant Draining).
- Remove:
  Inner Cover (see Frame chapter)
  Radiator Fan Switch Lead Connectors [A]



  Calmps (open) [A]
  Radiator Fan Switch [B]
- Refer to Digital Fuel Injection (DFI) System chapter for the water temperature sensor removal/installation.



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 kg·m, 13 ft·lb)
Water Temperature Sensor : 25 N·m (2.5 kg·m, 18 ft·lb)

- Fill the coolant and bleed the air from cooling system (see Coolant Filling in the Cooling System chapter).

Radiator Fan Switch, Water Temperature Sensor Inspection

- Refer to Electrical System chapter for the Radiator Fan Swtich Ispection.
- Refer to Digital Fuel Injection (DFI) System chapter for the water temperature sensor inspection.

Engine Top End

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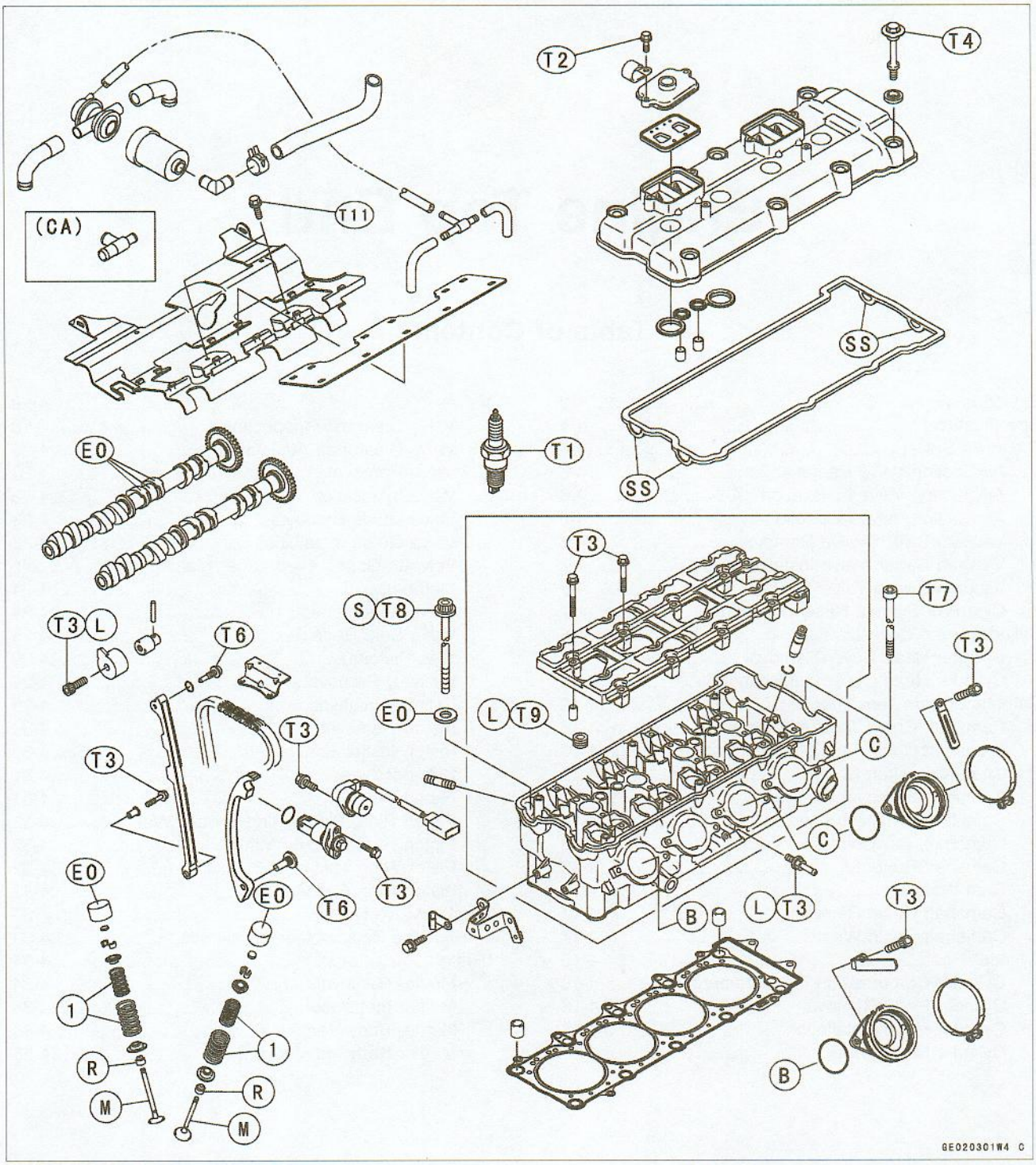
4-2 ENGINE TOP END

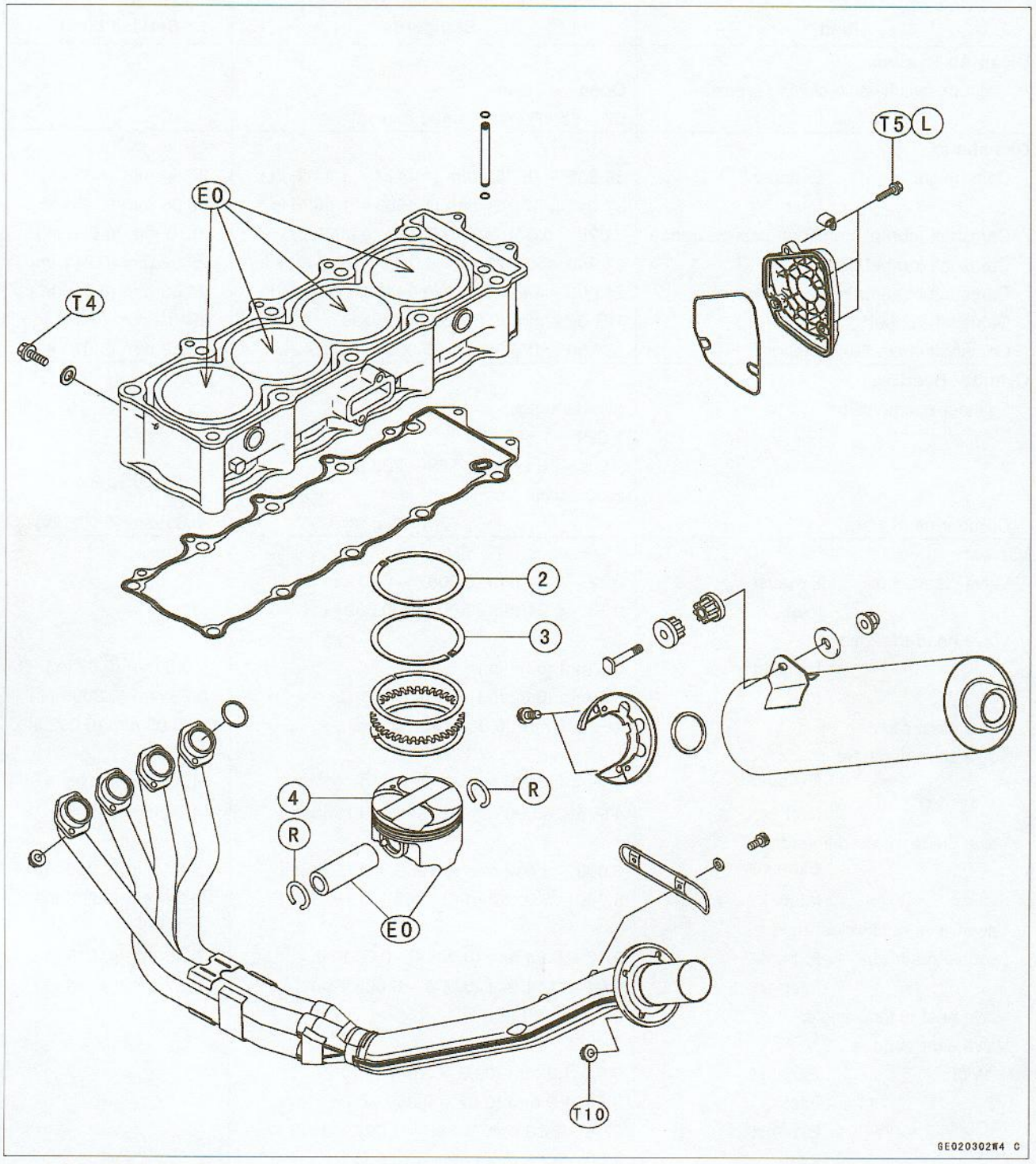
Exploded View



T1: 13 N·m (1.3 kg·m, 115 in·lb)
T2: 12.5 N·m (1.3 kg·m, 111 in·lb)
T3: 12 N·m (1.2 kg·m, 106 in·lb)
T4: 10 N·m (1.0 kg·m, 87 in·lb)
T5: 15 N·m (1.5 kg·m, 11 ft·lb)
T6: 25 N·m (2.5 kg·m, 18 ft·lb)
T7: 20 N·m (2.0 kg·m, 15 ft·lb)
T8: 59 N·m (6.0 kg·m, 43 ft·lb)
T9: 22 N·m (2.2 kg·m, 16 ft·lb)
T10: 34 N·m (3.5 kg·m, 25 ft·lb)
T11: 10.5 N·m (1.1 kg·m, 93 in·lb)

L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
EO: Apply engine oil.
SS: Apply silicone sealant.
R: Replacement Parts
S: Follow the specific tightening sequence.
1. Closed coil end faces downward.
CA: California

Exploded View



2. R marked side face up.
3. RN marked side face up.
4. A marking hollow facing forward.

Specifications

Item		Standard	Service Limit
Clean Air System:			
Vacuum switch valve closing pressure:		Open → Close 57 ~ 65 kPa (430 ~ 490 mmHg)	- - -
Camshafts			
Cam height:	Exhaust	36.645 ~ 36.753 mm (1.4427 ~ 1.4470 in.)	36.54 mm (1.439 in.)
	Inlet	37.047 ~ 37.154 mm (1.4585 ~ 1.4628 in.)	36.95 mm (1.455 in.)
Camshaft journal, camshaft cap clearance		0.028 ~ 0.071 mm (0.0011 ~ 0.0028 in.)	0.16 mm (0.006 in.)
Camshaft journal diameter		23.950 ~ 23.972 mm (0.94291 ~ 0.94377 in.)	23.92 mm (0.941 in.)
Camshaft bearing inside diameter		24.000 ~ 24.021 mm (0.94488 ~ 0.9457 in.)	24.08 mm (0.948 in.)
Camshaft runout		TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
Camshaft chain 20-link length		127.00 ~ 127.36 mm (5.0000 ~ 5.0142 in.)	128.9 mm (5.075 in.)
Cylinder Head:			
Cylinder compression		(usable range) 1 029 ~ 1 568 kPa (10.5 ~ 16 kg/cm^2, 149 ~ 228 psi) @300 r/min (rpm)	- - -
Cylinder head warp		- - -	0.05 mm (0.002 in.)
Valves:			
Valve clearance:	Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.012 in.)	- - -
	Inlet	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	- - -
Valve head thickness:			
	Exhaust	0.8 mm (0.03 in.)	0.5 mm (0.02 in.)
	Inlet	0.5 mm (0.02 in.)	0.25 mm (0.0098 in.)
Valve stem bend		TIR 0.01mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve stem diameter:			
	Exhaust	4.955 ~ 4.970 mm (0.1951 ~ 0.1957 in.)	4.94 mm (0.194 in.)
	Inlet	4.975 ~ 4.990 mm (0.1959 ~ 0.1965 in.)	4.96 mm (0.195 in.)
Valve guide inside diameter:			
	Exhaust	5.000 ~ 5.012 mm (0.1969 ~ 0.1973 in.)	5.07 mm (0.200 in.)
	Inlet	5.000 ~ 5.012 mm (0.1969 ~ 0.1973 in.)	5.07 mm (0.200 in.)
Valve/valve guide clearance			
(wobble method):	Exhaust	0.12 ~ 0.23 mm (0.0047 ~ 0.0090 in.)	0.45 mm (0.018 in.)
	Inlet	0.04 ~ 0.14 mm (0.002 ~ 0.0055 in.)	0.37 mm (0.014 in.)
Valve seat cutting angle		45°, 32°, 60°, 55°	- - -
Valve seat surface:			
Width:	Exhaust	0.8 ~ 1.2 mm (0.03 ~ 0.047 in.)	- - -
	Inlet	0.5 ~ 1.0 mm (0.02 ~ 0.039 in.)	- - -
Outside diameter:	Exhaust	27.6 ~ 27.8 mm (1.086 ~ 1.094 in.)	- - -
	Inlet	32.6 ~ 32.8 mm (1.28 ~ 1.29 in.)	- - -
Valve spring free length:			
	Exhaust (Inner)	38.08 mm (1.499 in.)	36.7 mm (1.44 in.)
	Exhaust (Outer)	45.97 mm (1.810 in.)	44.3 mm (1.74 in.)
	Inlet (Inner)	37.97 mm (1.495 in.)	36.5 mm (1.44 in.)
	Inlet (Outer)	45.78 mm (1.802 in.)	44.2 mm (1.74 in.)
Cylinder, Piston:			
Cylinder inside diameter		82.994 ~ 83.006 mm (3.2675 ~ 3.2679 in.)	83.06 mm (3.270 in.)
Piston diameter		82.969 ~ 82.984 mm (3.2665 ~ 3.2671 in.)	82.82 mm (3.261 in.)

Specifications

Item		Standard	Service Limit
Piston/cylinder clearance		0.010 ~ 0.037 mm (0.00039 ~ 0.0014 in.)	- - -
Piston ring/groove clearance:			
	Top	0.03 ~ 0.07 mm (0.001 ~ 0.003 in.)	0.17 mm (0.0067 in.)
	Second	0.02 ~ 0.06 mm (0.0008 ~ 0.002 in.)	0.16 mm (0.0063 in.)
Piston ring groove width:			
	Top	0.92 ~ 0.94 mm (0.036 ~ 0.037 in.)	1.02 mm (0.0402 in.)
	Second	1.01 ~ 1.03 mm (0.0398 ~ 0.0406 in.)	1.11 mm (0.0437 in.)
Piston ring thickness:			
	Top	0.87 ~ 0.89 mm (0.034 ~ 0.035 in.)	0.80 mm (0.031 in.)
	Second	0.97 ~ 0.99 mm (0.038 ~ 0.039 in.)	0.90 mm (0.04 in.)
Piston ring end gap:	Top	0.25 ~ 0.40 mm (0.0098 ~ 0.016 in.)	0.7 mm (0.03 in.)
	Second	0.40 ~ 0.55 mm (0.016 ~ 0.022 in.)	0.8 mm (0.031 in.)

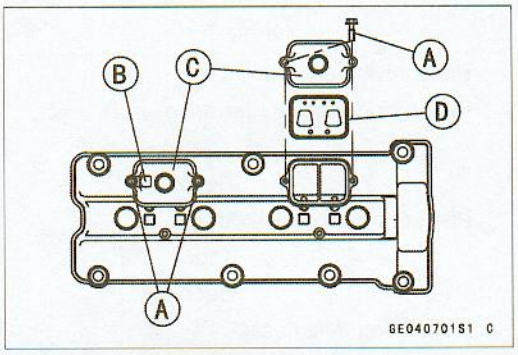
Special Tools - **Fork Oil Level Gauge: 57001-1290**
Compression Gauge: 57001-221
Compression Gauge Adapter, M10 X 1.0: 57001–1458
Valve Spring Compressor Assembly: 57001-241
Valve Spring Compressor Adapter, ϕ22: 57001-1202
Valve Guide Arbor, ϕ5.0: 57001-1203
Valve Guide Reamer, ϕ5.0: 57001-1204
Valve Seat Cutter, 45° - ϕ35: 57001-1116
Valve Seat Cutter, 32° - ϕ35: 57001-1121
Valve Seat Cutter, 55° - ϕ35: 57001-1247
Valve Seat Cutter, 45° - ϕ30: 57001-1187
Valve Seat Cutter, 32° - ϕ30: 57001-1120
Valve Seat Cutter, 60° - ϕ30: 57001-1123
Valve Seat Cutter Holder, ϕ5.0: 57001-1208
Valve Seat Cutter Holder Bar: 57001-1128
Piston Base, ϕ1.0: 57001–1459
Piston Ring Compressor Grip: 57001–1095
Piston Ring Compressor Belt, ϕ80 ~ 91: 57001–1320
Piston Pin Puller Assembly: 57001-910

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

Clean Air System

Air Suction Valve Removal

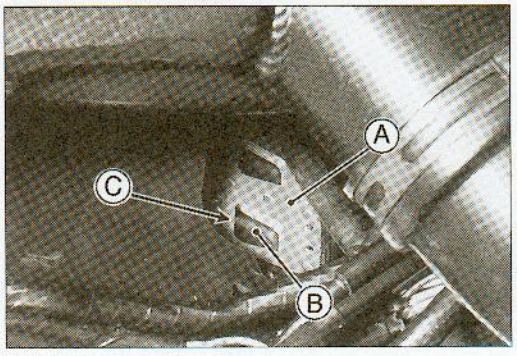
- Remove:
  Inner Covers (see Frame chapter)
  Vacuum Switch Valve Hoses
  Throttle Cable and Fast Idle Cable Lower Ends (for Right Side Air Suction Valve Removal)
  Air Suction Valve Cover Bolts [A]
  Clamp [B]
  Air Suction Valve Covers [C]
  Air Suction Valve Assembly [D]



Air Suction Valve Installation

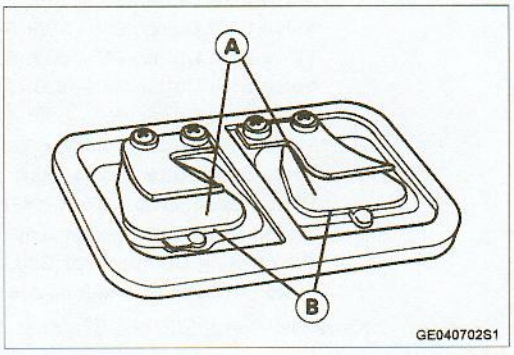
- Install the valve assembly [A] so that its reeds [B] side faces inside and it's opening [C] side faces backward.
- Install the air suction valve covers.

Torque - Air Suction Valve Cover Bolts: 12.5 N·m (1.3 kg·m, 111 in·lb)



Air Suction Valve Inspection

- Visually inspect the reeds [A] for cracks, folds, warps, heat damage, or other damage.
- ★ If there is any doubt as to the condition of the reed, replace the air suction valve as an assembly.
- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder, or heat damage.
- ★ If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- ★ If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly with a high flash-point solvent.

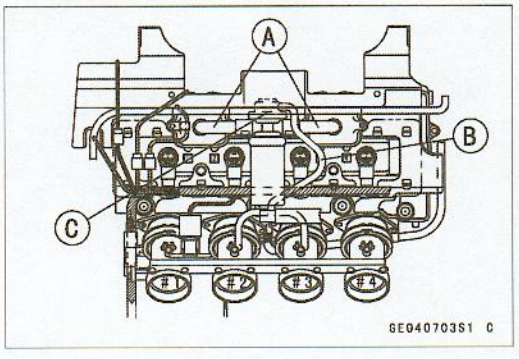


CAUTION

Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.

Vacuum Switch Valve Removal

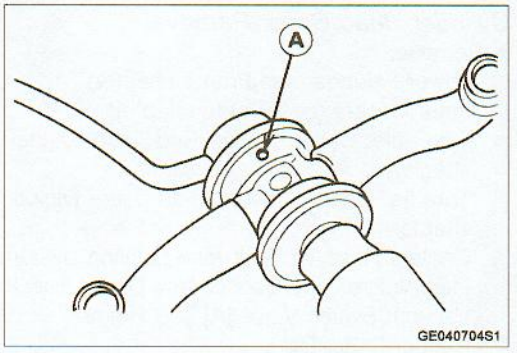
- Remove:
  Inner Covers (see Frame chapter)
- Pull off the hoses [A] and vacuum hose [B], and remove the vacuum switch valve [C].



Clean Air System

Vacuum Switch Valve Installation

- Install the vacuum switch valve so that the air hole [A] faces downwards.
- Route the hoses correctly (see General Information chapter).

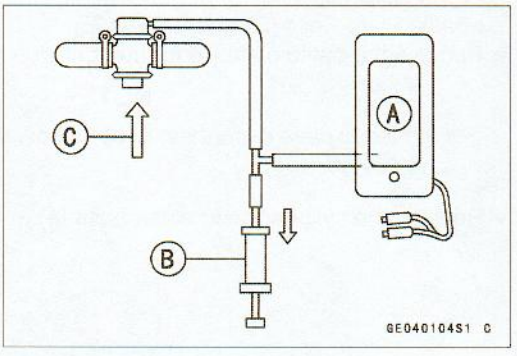


Vacuum Switch Valve Test

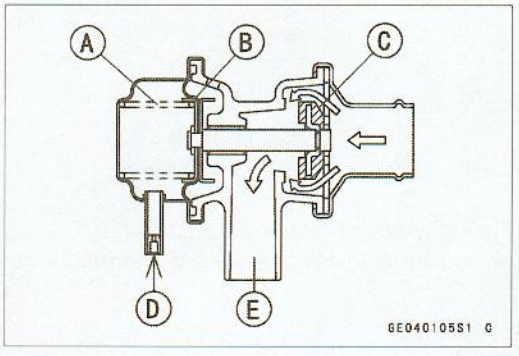
- Remove:
  Inner Covers (see Frame chapter)
  Vacuum Switch Valve (see Vacuum Switch Valve Removal)
- Connect a vacuum gauge [A] and syringe [B] or fork oil level gauge to the vacuum hoses as shown.

Special Tools - Fork Oil Level Gauge: 57001-1290

Air Flow [C]



- Gradually raise the vacuum (lower the pressure) applied to the vacuum switch valve, and check the valve operation. When the vacuum is low, the vacuum switch valve should permit air to flow. When the vacuum raises to valve closing pressure, it should stop air flow.
  Spring [A]
  Diaphragm [B]
  Valve [C]
  Low Vacuum [D]
  Secondary Air Flow [E]



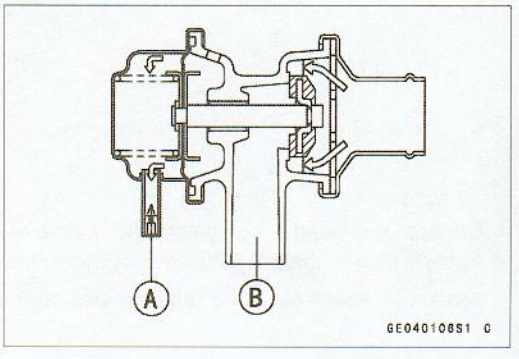
★ If the vacuum switch valve does not operate as described, replace it with a new one.

NOTE

○ *To check air flow through the vacuum switch valve, just blow through the air cleaner hose.*

Vacuum Switch Valve Closing Pressure (Open → Close)
Standard: 57 ~ 65 kPa (430 ~ 490 mmHg)

High Vacuum [A]
Secondary air cannot flow [B].



Clean Air System Hose Inspection

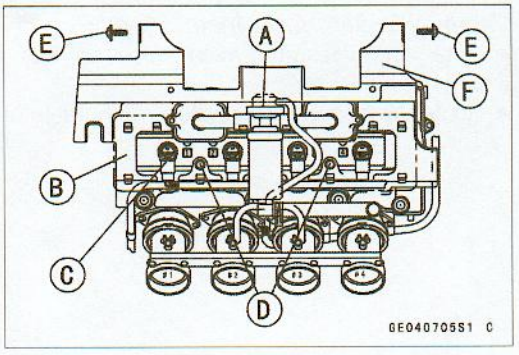
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, #2 and #3 throttle body and air suction valve covers.

★ If they are not, correct them. Replace them if they are damaged.

Cylinder Head Cover

Cylinder Head Cover Removal

- Remove:
  Lower Fairings (see Frame chapter)
  Inner Covers (see Frame chapter)
  Fast Idle Cable Lower End (see Digital Fuel Injection System chapter)
  Throttle Cable Lower Ends (see Digital Fuel Injection System chapter)
  Coolant Reserve Tank (see Cooling System chapter)
  Inelt Air Pressure Sensor (see Digital Fuel Injection System chapter)
  Vacuum Switch Valve [A] and Hoses
  Rubber Plate [B]
  Stick Coils [C]
  Baffle Plate Bolts [D] and Screws [E]

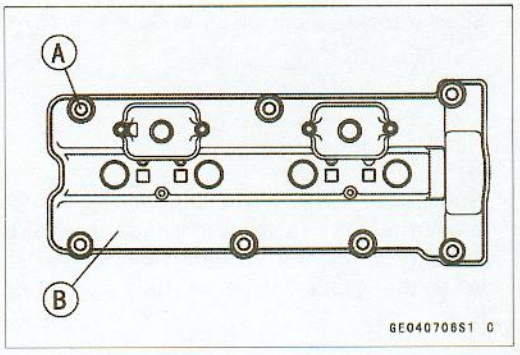


- Remove the baffle plate [F] to the right side of the motorcycle.

NOTE

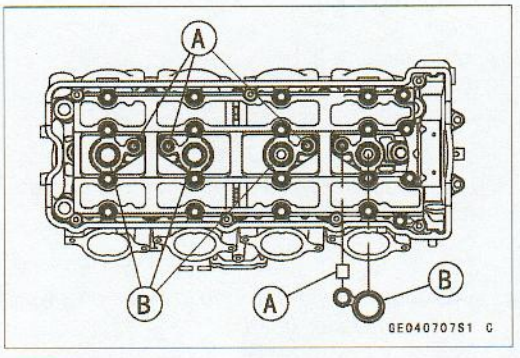
○ *If the baffle plate cannot easily be removed, remove the air suction valve covers.*

- Remove the cylinder head cover bolts [A] and take off the cover [B].



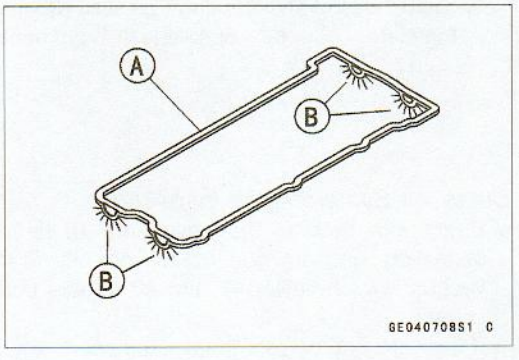
Cylinder Head Cover Installation

- Be sure to install the pins [A] and rubber gaskets [B].



- Replace the head cover gasket [A] with a new one if damaged.
- Apply silicone sealant [B] to the cylinder head as shown.

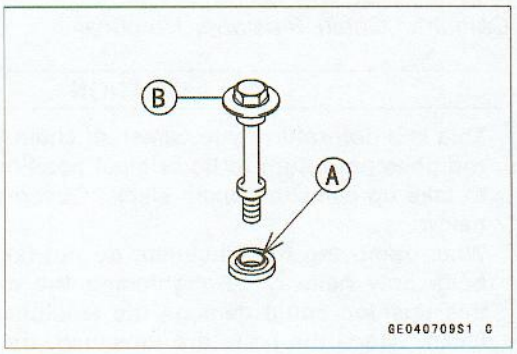
Sealant - Kawasaki Bond (Silicone Sealant): 56019-120



Cylinder Head Cover

- Install the washer with the metal side [A] faces upward.
- Tighten:

Torque - Cylinder Head Cover Bolts [B]: 10 N·m (1.0 kg·m, 87 in·lb)
Baffle Plate Bolts: 10.5 N·m (1.1 kg·m, 93 in·lb)



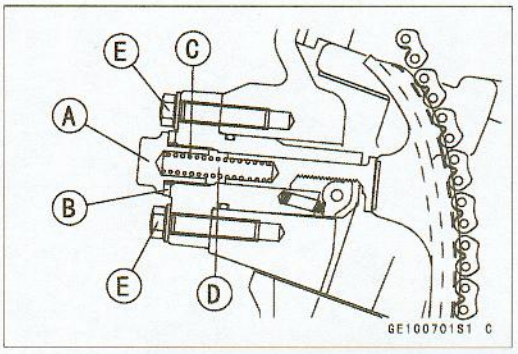
Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal

CAUTION

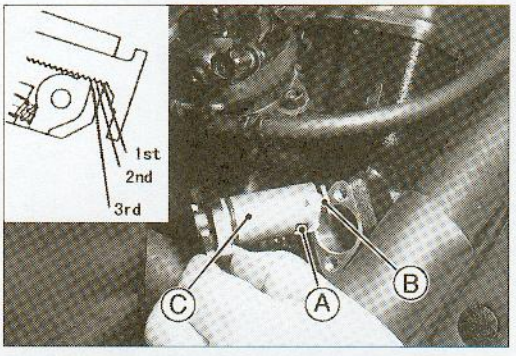
This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below:
When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation."
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.

- Remove:
  Cap Bolt [A]
  Washer [B]
  Spring [C]
  Rod [D]
- Remove the mounting bolts [E] and take off the camshaft chain tensioner.



Camshaft Chain Tensioner Installation

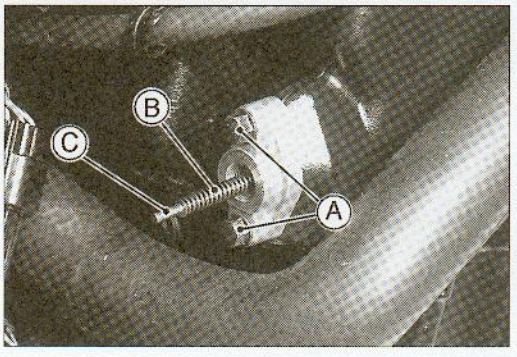
- Release the stopper [A] and push the push rod [B] into the tensioner body [C].
- ○ Insert the push rod so that the push rod teeth are leaved three (3) notches.
- Install the tensioner body so that the stopper faces downward.



- Applya non-permanent locking agent to the tensioner mouning bolts [A].
- Tighten the tensioner mounting bolts.

Torque - Camshaft Chain Tensioner Mounting Bolts: 12 N·m (1.2 kg·m, 106 in·lb)

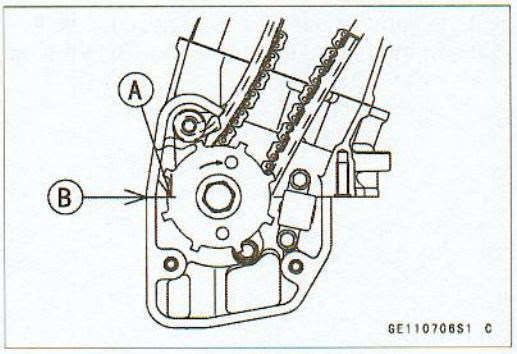
- Install the spring [B], rod [C] and washer.
- Tighten the cap bolt.



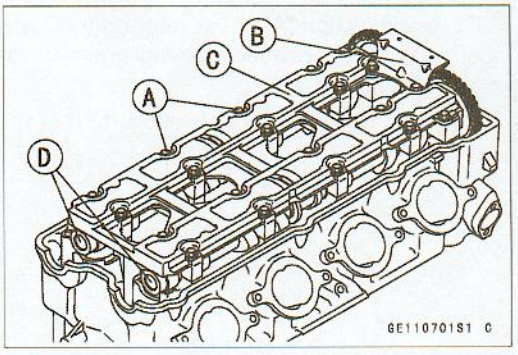
Camshaft, Camshaft Chain

Camshaft Removal

- Remove:
  Lower Fairing (see Frame chapter)
  Cylinder Head Cover (see Cylinder Head Cover Removal)
  Crankshaft Sensor Cover (see Electrical System chapter)
- Position the crankshaft at #1, #4 piston TDC.
  TDC Mark [A] for #1, #4 Pistons
  Timing Mark [B] (crankcase halves mating surface)



- Remove:
  Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  Camshaft Cap Bolts [A]
  Upper Camshaft Chain Guide [B]
  Camshaft Cap [C]
  Camshaft [D]
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.

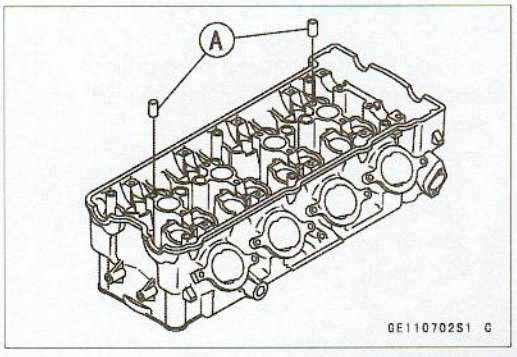


CAUTION

The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

Camshaft Installation

- Be sure to install the following parts.
  Pins [A]

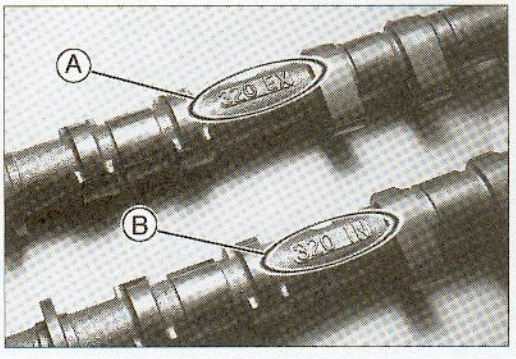


- Apply engine oil to all cam parts and journals.

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

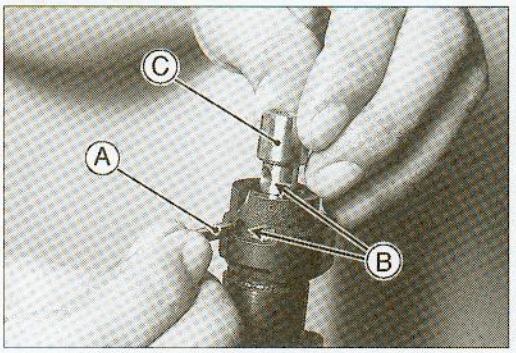
NOTE

○ *The exhaust camshaft has a 320 EX mark [A] and the inlet camshaft has a 320 IN mark [B]. Be careful not to mix up these shafts.*



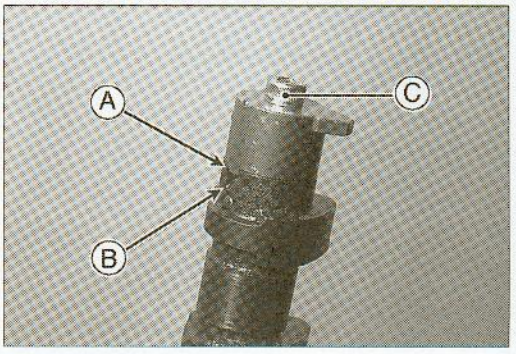
Camshaft, Camshaft Chain

★ If the cam sensor rotor is removed, install it as follows.
○ Insert the pin [A] into the holes [B] in the camshaft and boss [C].



○ Fit the projection [A] of the rotor on the camshaft recess [B].
○ Apply a non-permanent locking agent to the cam sensor rotor bolt [C], and tighten it.

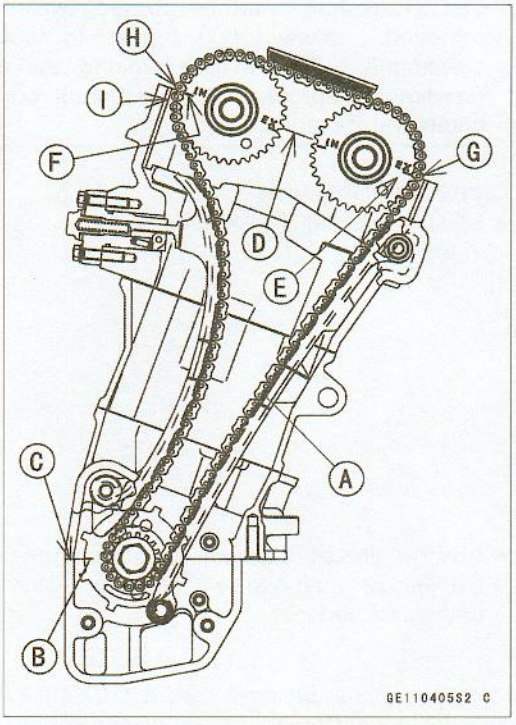
Torque - Cam Sensor Rotor Bolt: 12 N·m (1.2 kg·m, 106 in·lb)



- Position the crankshaft at #1, #4 piston TDC.
- Apply engine oil to all cam parts and journal.
- Pull the tension side (exhaust side) [A] of the chain taut to install the chain.
- Engage the camshaft chain with the camshaft sprockets so that the timing marks on the sprockets are positioned as shown.

○ The timing mark [B] of #1, #4 T must be aligned with the mating surface [C] of crankcase of rear side.
○ The timing marks must be aligned with the cylinder head upper surface [D].

EX mark [E]
IN mark [F]
#1 Pin [G]
#31 Pin [H]
#32 Pin [I]

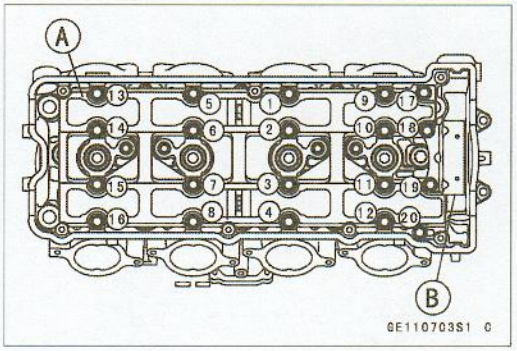


- Install the camshaft cap [A] and upper camshaft chain guide [B]. While pushing the camshaft chain, tighten all camshaft bolts and chain guide bolts.

○ First tighten the all camshaft cap and chain guide bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

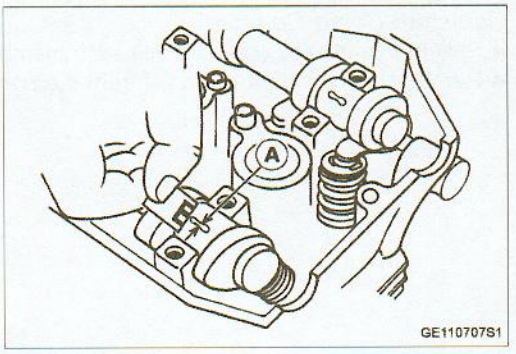
Torque - Camshaft Cap Bolts: 12 N·m (1.2 kg·m, 106 in·lb)
Upper Camshaft Chain Guide Bolts: 12 N·m (1.2 kg·m, 106 in·lb)

- Tighten the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Install the cylinder head cover (see Cylinder Head Cover Installation).



Camshaft, Camshaft Chain

Camshaft, Camshaft Cap Wear



- Cut strips of plastigage (press gauge) to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Measure each clearance between the camshaft journal and the camshaft cap using plastigage [A].
- Tighten:

Torque - Camshaft Cap Bolts: 12 N·m (1.2 kg·m, 106 in·lb)
Upper Camshaft Chain Guide Bolts: 12 N·m (1.2 kg·m, 106 in·lb)

NOTE

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

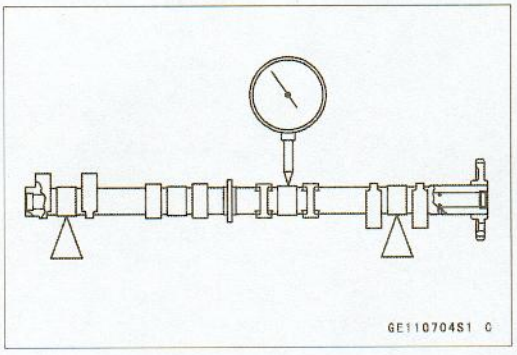
Camshaft Journal, Camshaft Cap Clearance
Standard: 0.028 ~ 0.071 mm (0.0011 ~ 0.0028 in.)
Service Limit: 0.16 mm (0.006 in.)

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

Camshaft Journal Diameter
Standard: 23.950 ~ 23.972 mm (0.94291 ~ 0.94337 in.)
Service Limit: 23.92 mm (0.941 in.)

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

Camshaft Runout

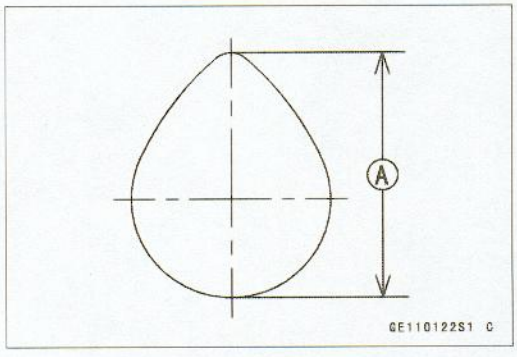


- Remove the camshaft (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure runout with a dial gauge at the specified place as shown.

★ If the runout exceeds the service limit, replace the camshaft.

Camshaft Runout
Standard: TIR 0.02 mm (0.0008 in.) or less
Service Limit TIR 0.1 mm (0.004 in.)

Cam Wear



- Remove the camshaft (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.

★ If the cams are worn down past the service limit, replace the camshaft.

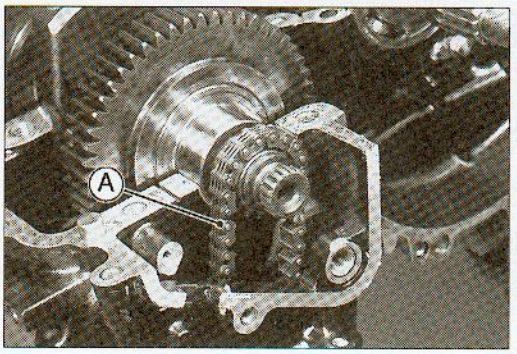
Cam Height

	Inlet	Exhaust
Standard:	37.047 ~ 37.154 mm (1.4585 ~ 1.4628 in.)	36.645 ~ 36.753 (1.4427 ~ 1.4470 in.)
Service Limit	36.95 mm (1.455 in.)	36.54 mm (1.439 in.)

Camshaft, Camshaft Chain

Camshaft Chain Removal

- Split the crankcase (see Crankshaft/Transmission chapter).
- Remove the camshaft chain [A] from the crankshaft sprocket.



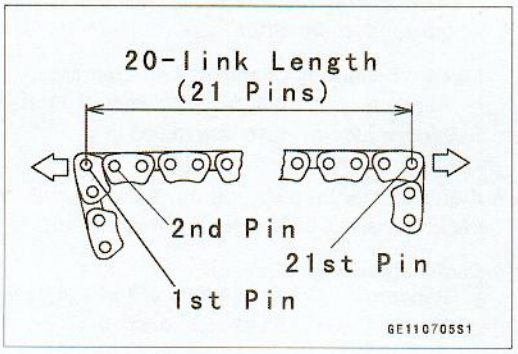
Camshaft Chain Wear

- Hold the chain taut with a force of about 49 N (5 kg, 11 lb) in some manner, and measure a 20-link length. Since the chain may wear unevenly, take measurement at several places.

★ If any measurement exceeds the service limit, replace the chain. Also, replace the camshafts and the crankshaft when the chain is replaced.

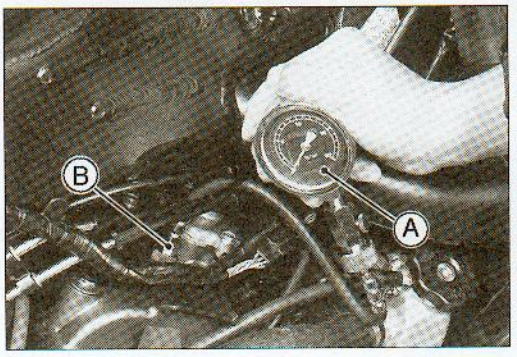
Camshaft Chain 20-link Length

Standard:	**127.00 ~ 127.36 mm (5.0000 ~ 5.0142 in.)**
Service Limit:	**128.9 mm (5.075 in.)**



Cylinder Head

Cylinder Compression Measurement



NOTE

○ *Use the battery which is fully charged.*

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
  Inner Covers (see Frame chapter)
  Rubber Damper (see Cylinder Head Cover Removal)
  Stick Coils (see Electrical System chapter)
  Spark Plugs (see Electrical System chapter)
- Attach the compression gauge [A] and adapter [B] firmly into the spark plug hole.
- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

Special Tools - Compression Gauge: 57001-221
Compression Gauge Adapter, M10 X 1.0: 57001-1458

Cylinder Compression
Usable Range: 1029 ~ 1568 kPa (10.5 ~ 16 kg/cm², 149 ~ 228 psi) @300 r/min (rpm)

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

Torque - Spark Plugs: 13 N·m (1.3 kg·m, 115 in·lb)

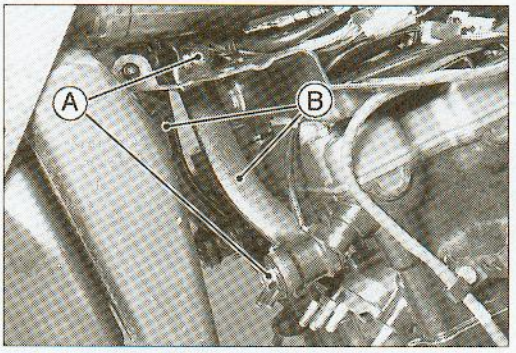
The following table should be consulted if the obtainable compression reading is not within the usabel range.

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

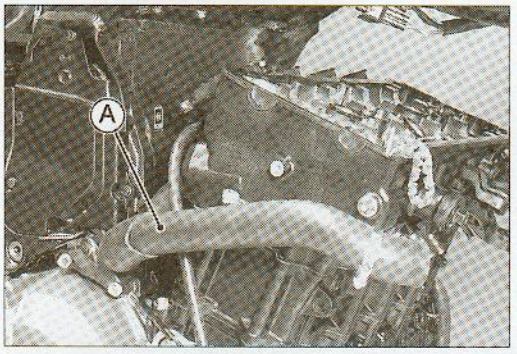
Cylinder Head

Cylinder Head Removal

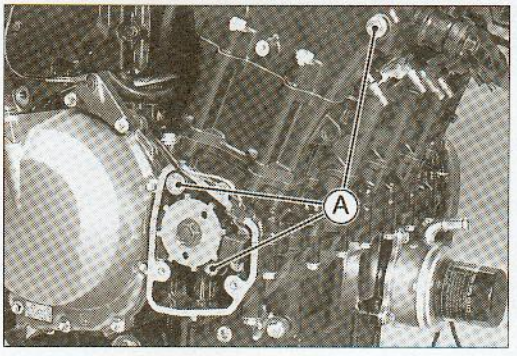
- Drain the coolant (see Cooling System chapter).
- Remove:
  Radiator (see Cooling System chapter)
  Muffler (see Muffler Removal)
  Engine Bracket Bolts [A]
  Engine Brackets [B]
  Throttle Valve Assy (see Digital Fuel Injection System chapter)
  Cylinder Head Cover (see Cylinder Head Cover Removal)
  Cam Sensor (see Electrical System chapter)
  Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  Camshafts (see Camshaft Removal)



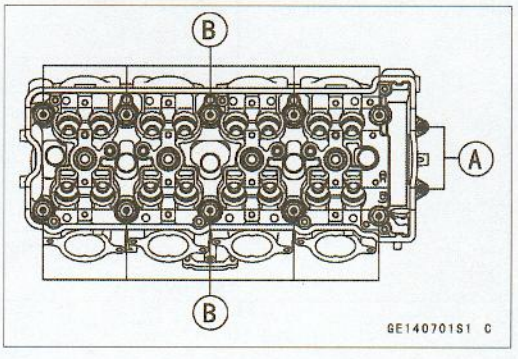
Coolant Hose [A]



- Remove:
  Chain Guide Bolts [A]
  Front and Rear Chain Guide



- Remove the 7 mm cylinder head bolts [A], and then the 11 mm cylinder head bolts [B].
- Take off the cylinder head.
- Remove the cam chain guide from the cylinder head.



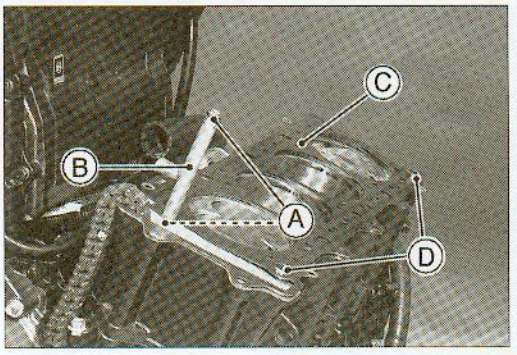
Cylinder Head

Cylinder Head Installation

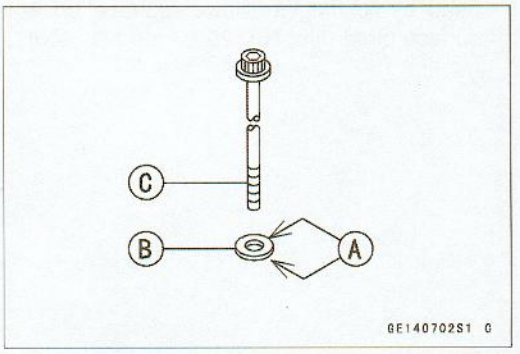
NOTE

○ *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.*

- Make sure that the O-ring [A] of the oil pipe is not damage, and apply high-temperature grease to it.
- Verify that the oil pipe [B] is installed properly.
- Install a new cylinder head gasket [C] and knock pins [D].



- Apply engine oil to both sides [A] of the cylinder head bolt washers [B] and head bolts [C].

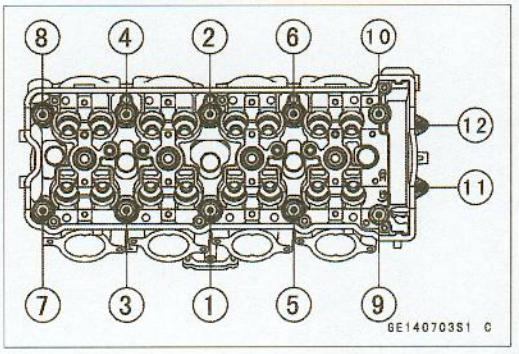


- Tighten the 11 mm cylinder head bolts following the tightening sequence [1 ~ 10].

Torque - Cylinder Head Bolts (11 mm):
First: 23 N·m (2.3 kg·m, 17 ft·lb)
Final: 59 N·m (6.0 kg·m, 43 ft·lb)

- Tighten the 7 mm cylinder head bolts [11 ~ 12].

Torque - Cylinder Head Bolts (7 mm): 20 N·m (2.0 kg·m, 15 ft·lb)



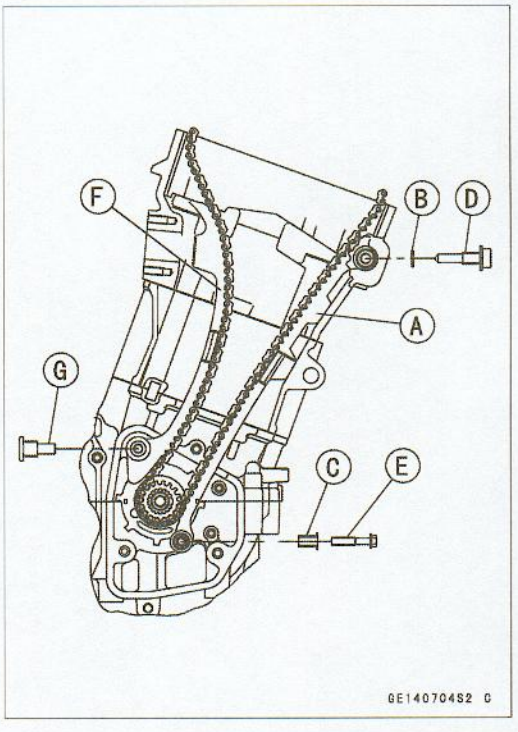
- Install:
  Front Camshaft Chain Guide [A]
  O-ring [B]
  Collar [C]
- Tighten:

Torque - Front Camshaft Chain Guide Bolt (Upper) [D]:
25 N·m (2.5 kg·m, 18 ft·lb)
Front Camshaft Chain Guide Bolt (Lower) [E]:
12 N·m (1.2 kg·m, 106 in·lb)

- Install:
  Rear Camshaft Chain Guide [F]
- Tighten:

Torque - Rear Camshaft Chain Guide Bolt [G]:
25 N·m (2.5 kg·m, 18 ft·lb)

- Install the cam shafts (see Camshaft Installation).



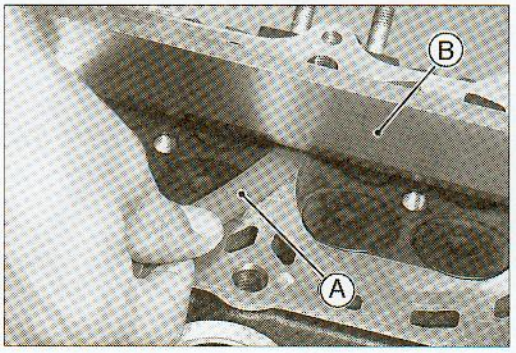
Cylinder Head

Cylinder Head Warp

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

Cylinder Head Warp
Standard: - - -
Service Limit: **0.05 mm (0.002 in.)**

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



Valves

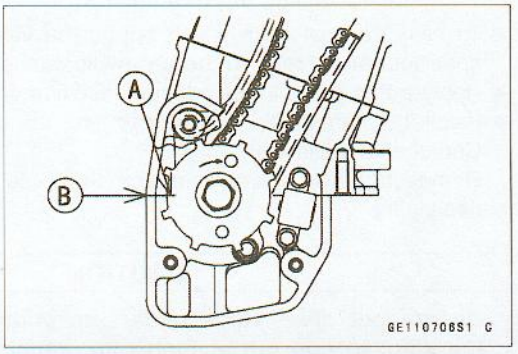
Valve Clearance Inspection

NOTE

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

- Remove:
  Lower Fairings (see Frame chapter)
  Crankshaft Sensor Cover (see Electrical System chapter)
  Cylinder Head Cover (see Cylinder Head Cover Removal)

- Position the crankshaft at #1, #4 piston TDC.
  TDC Mark [A] for #1, #4 Pistons
  Timing Mark [B] (crankcase halves mating surface)

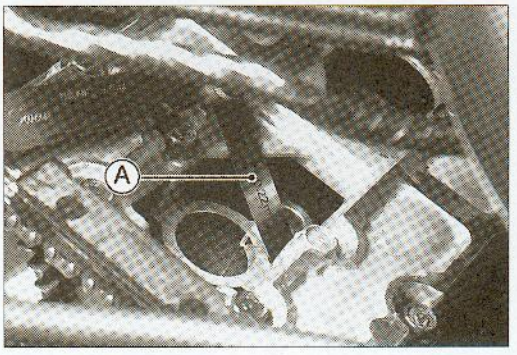


★ If just after the camshaft cap is installed, rotate the crankshaft two turns in the right direction.

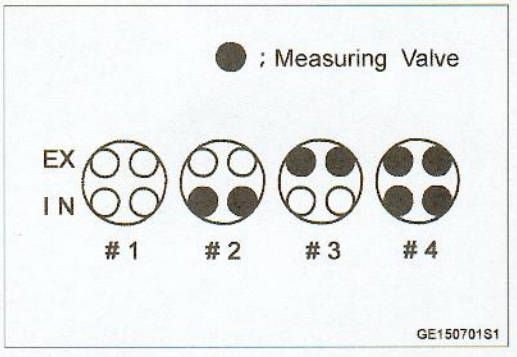
- Using a thickness gauge [A], measure the valve clearance between the cam and the valve lifter.

Valve Clearance

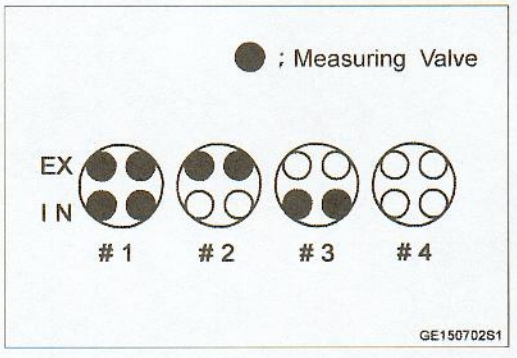
Standard:	**IN:**	**0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)**
	EX:	**0.22 ~ 0.31 mm (0.0087 ~ 0.012 in.)**



○ **When positioning #4 piston TDC at the end of the compression stroke:**
Inlet valve clearance of #2 and #4 cylinders
Exhaust valve clearance of #3 and #4 cylinders



○ **When positioning #1 piston TDC at the end of the compression stroke:**
Inlet valve clearance of #1 and #3 cylinders
Exhaust valve clearance of #1 and #2 cylinders



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

Valve Clearance Adjustment

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

NOTE

- *Mark and record the valve lifter and shim locations so they can be reinstalled in their original positions.*
- *If there is no clearance, select a shim which is several sizes smaller and then measure the clearance.*

- To select a new shim which brings the valve clearance within the specified range, refer to the Valve Clearance Adjustment Charts.
- Apply a thin coat of molybdenum disulfide grease to the valve lifters.
- Install the camshafts. Be sure to time the camshafts properly (see Camshaft Installation).
- Remeasure any valve clearance that was adjusted. Readjust if necessary.

CAUTION

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

Valves

INLET VALVE CLEARANCE ADJUSTMENT CHART

	Present Shim ← Example																				
Part No. (92025)	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890
Mark	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	00
Thickness (mm)	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00

Valve Clearance Measurement (mm) — Example

0.00 ~ 0.02	—	—	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80
0.03 ~ 0.06	—	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85
0.07 ~ 0.11	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90
0.12 ~ 0.14	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95
0.15 ~ 0.24	Specified Clearance / No Change Required																				
0.25 ~ 0.27	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	
0.28 ~ 0.32	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00		
0.33 ~ 0.37	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00			
0.38 ~ 0.42	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00				
0.43 ~ 0.47	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00					
0.48 ~ 0.52	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00						
0.53 ~ 0.57	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00							
0.58 ~ 0.62	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00								
0.63 ~ 0.67	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00									
0.68 ~ 0.72	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00										
0.73 ~ 0.77	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00											
0.78 ~ 0.82	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00												
0.83 ~ 0.87	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00													
0.88 ~ 0.92	2.70	2.75	2.80	2.85	2.90	2.95	3.00														
0.93 ~ 0.97	2.75	2.80	2.85	2.90	2.95	3.00															
0.98 ~ 1.02	2.80	2.85	2.90	2.95	3.00																
1.03 ~ 1.07	2.85	2.90	2.95	3.00																	
1.08 ~ 1.12	2.90	2.95	3.00																		
1.13 ~ 1.17	2.95	3.00																			
1.18 ~ 1.22	3.00																				

Install the shim of this thickness (mm).

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

Example: Present shim is **2.60 mm**.
Measured clearance is **0.35 mm**.
Replace **2.60 mm** shim with **2.75 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

EXHAUST VALVE CLEARANCE ADJUSTMENT CHART

	Present Shim ← Example																				
Part No. (92025)	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890
Mark	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	00
Thickness (mm)	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00

Valve Clearance Measurement (mm) (Example)																					
0.00 ~ 0.04	—	—	—	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75
0.05 ~ 0.09	—	—	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80
0.10 ~ 0.14	—	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85
0.15 ~ 0.19	—	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90
0.20 ~ 0.21	—	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95
0.22 ~ 0.31	Specified Clearance / No Change Required																				
0.32 ~ 0.34	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	
0.35 ~ 0.39	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00		
0.40 ~ 0.44	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00			
0.45 ~ 0.49	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00				
0.50 ~ 0.54	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00					
0.55 ~ 0.59	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00						
0.60 ~ 0.64	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00							
0.65 ~ 0.69	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00								
0.70 ~ 0.74	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00									
0.75 ~ 0.79	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00										
0.80 ~ 0.84	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00											
0.85 ~ 0.89	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00												
0.90 ~ 0.94	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00													
0.95 ~ 0.99	2.70	2.75	2.80	2.85	2.90	2.95	3.00														
1.00 ~ 1.04	2.75	2.80	2.85	2.90	2.95	3.00															
1.05 ~ 1.09	2.80	2.85	2.90	2.95	3.00																
1.10 ~ 1.14	2.85	2.90	2.95	3.00																	
1.15 ~ 1.19	2.90	2.95	3.00																		
1.20 ~ 1.24	2.95	3.00																			
1.25 ~ 1.29	3.00																				

Install the shim of this thickness (mm).

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

Example: Present shim is **2.65 mm**.
Measured clearance is **0.42 mm**.
Replace **2.65 mm** shim with **2.80 mm** shim.

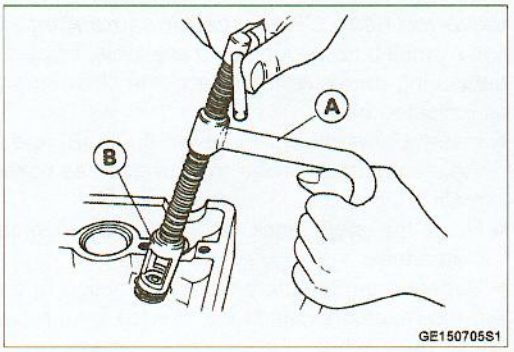
5. Remeasure the valve clearance and readjust if necessary.

Valves

Valve Removal

- Remove the cylinder head (see Cylinder Head Removal).
- Remove the valve lifter and shim.
- ○ Mark and record the valve lifter and shim locations so they can be installed in their original positions.
- Using the valve spring compressor assembly, remove the valve.

Special Tools - Valve Spring Compressor Assembly: 57001-241 [A]
Adapter, φ22: 57001-1202 [B]

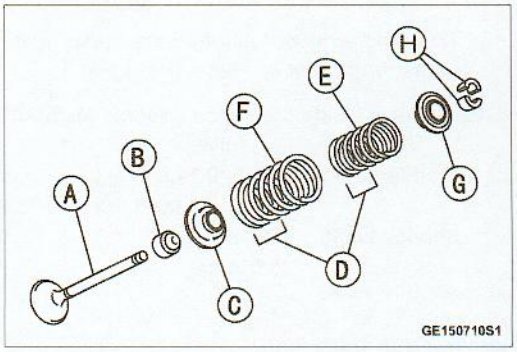


Valve Installation

- 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 springs so that the closed coil end faces downwards.

Valve Spring Paint Color: EX - White
IN - Purple

[A] Valve Stem
[B] Oil Seal
[C] Spring Seat
[D] Closed Coil End
[E] Valve Springs (Inner)
[F] Valve Springs (Outer)
[G] Retainer
[H] Split Keepers



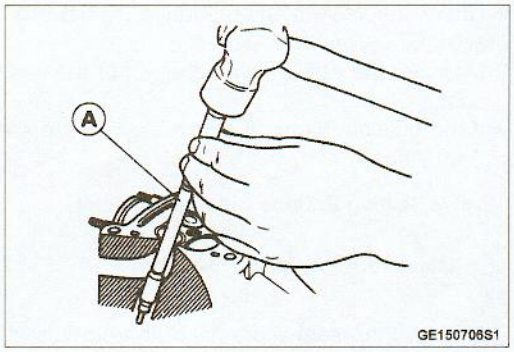
Valve Guide Removal

- 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, φ5.0: 57001-1203



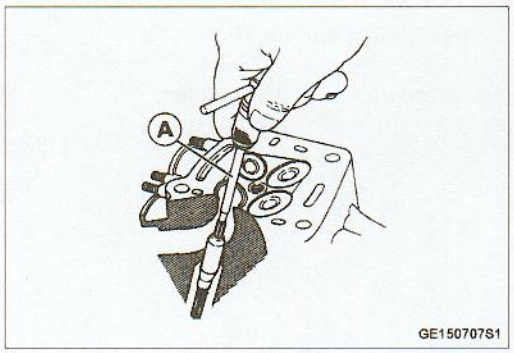
Valve Guide Installation

- 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, φ5.0: 57001-1203

- Ream the valve guide with valve guide reamer [A] even if the old guide is reused.

Special Tool - Valve Guide Reamer, φ5.0: 57001-1204

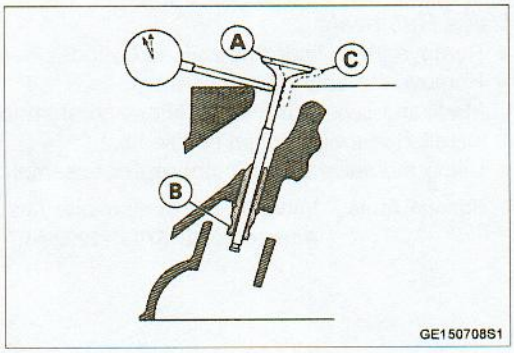


Valve-to-Guide Clearance Measurement (Wobble Method)

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)

	Inlet	Exhaust
Standard:	0.04 ~ 0.14 mm	0.12 ~ 0.23 mm
	(0.002 ~ 0.0055 in.)	(0.0047 ~ 0.0090 in.)
Service Limit:	0.37 mm	0.45 mm
	(0.014 in.)	(0.0018 in.)

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

	Inlet	Exhaust
Standard:	32.6 ~ 32.8 mm	27.6 ~ 27.8 mm
	(1.28 ~ 1.29 in.)	(1.086 ~ 1.094 in.)

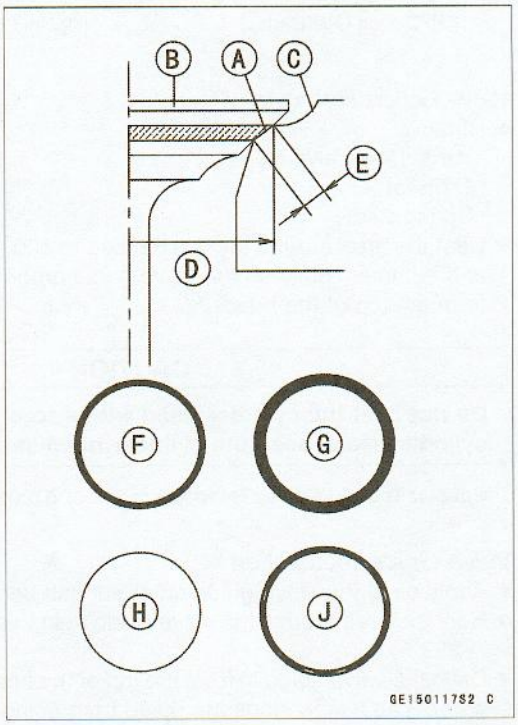
○ Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

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

	Inlet	Exhaust
Standard:	0.5 ~ 1.0 mm	0.8 ~ 1.2 mm
	(0.02 ~ 0.039 in.)	(0.03 ~ 0.047 in.)



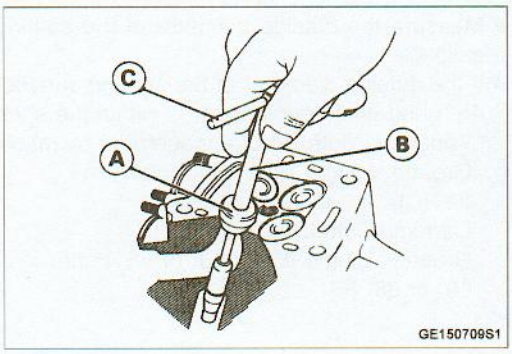
Valves

Valve Seat Repair

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

Special Tools - Valve Seat Cutter Holder, φ5.0: 57001-1208 [B]
Valve Seat Cutter Holder Bar: 57001-1128 [C]
[For Inlet Valve Seat]
Valve Seat Cutter, 45° - φ35: 57001-1116
Valve Seat Cutter, 32° - φ35: 57001-1121
Valve Seat Cutter, 55° - φ35: 57001-1247
[For Exhaust Valve Seat]
Valve Seat Cutter, 45° - φ30: 57001-1187
Valve Seat Cutter, 32° - φ30 : 57001-1120
Valve Seat Cutter, 60° - φ30: 57001-1123

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



Seat Cutter Operation Care:

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

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

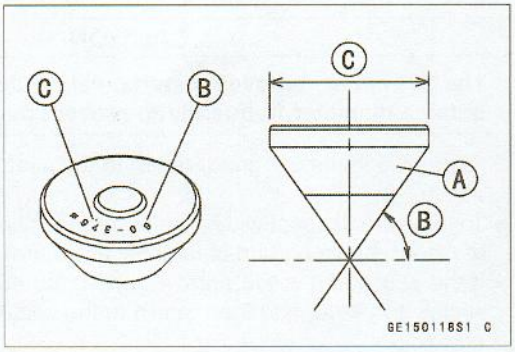
○ *Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

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:

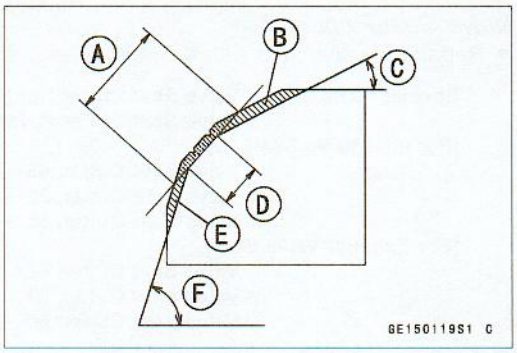
- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

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.

Valves

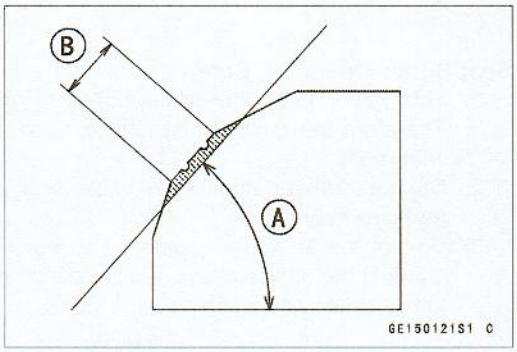
● Measure the outside diameter of the seating surface with a vernier caliper.
★ If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.
Widened Width [A] of engagement by machining with 45° cutter
Ground Volume [B] by 32° cutter
32° [C]
Correct Width [D]
Ground Volume [E] by 60° or 55° cutter
60° or 55° [F]



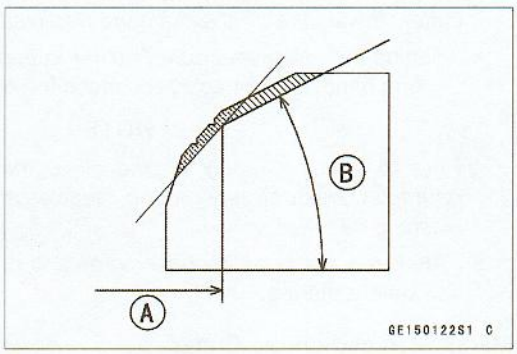
● Measure the outside diameter of the seating surface with a vernier caliper.
★ If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.
Original Seating Surface [B]

NOTE

○ *Remove all pittings of flaws from 45° ground surface.*
○ *After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.*
○ *When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*



★ If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.
★ If the outside diameter of the seating surface is within the specified range, meausre 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.



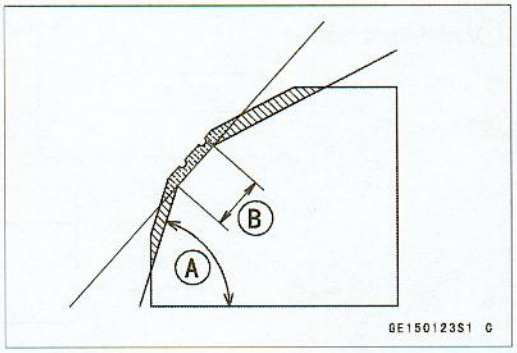
CAUTION

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

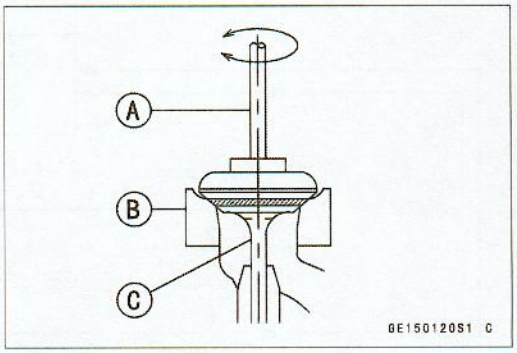
○ After making the 32° grind, return to the seat O.D. measurement step above.
● To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.
★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.

Valves

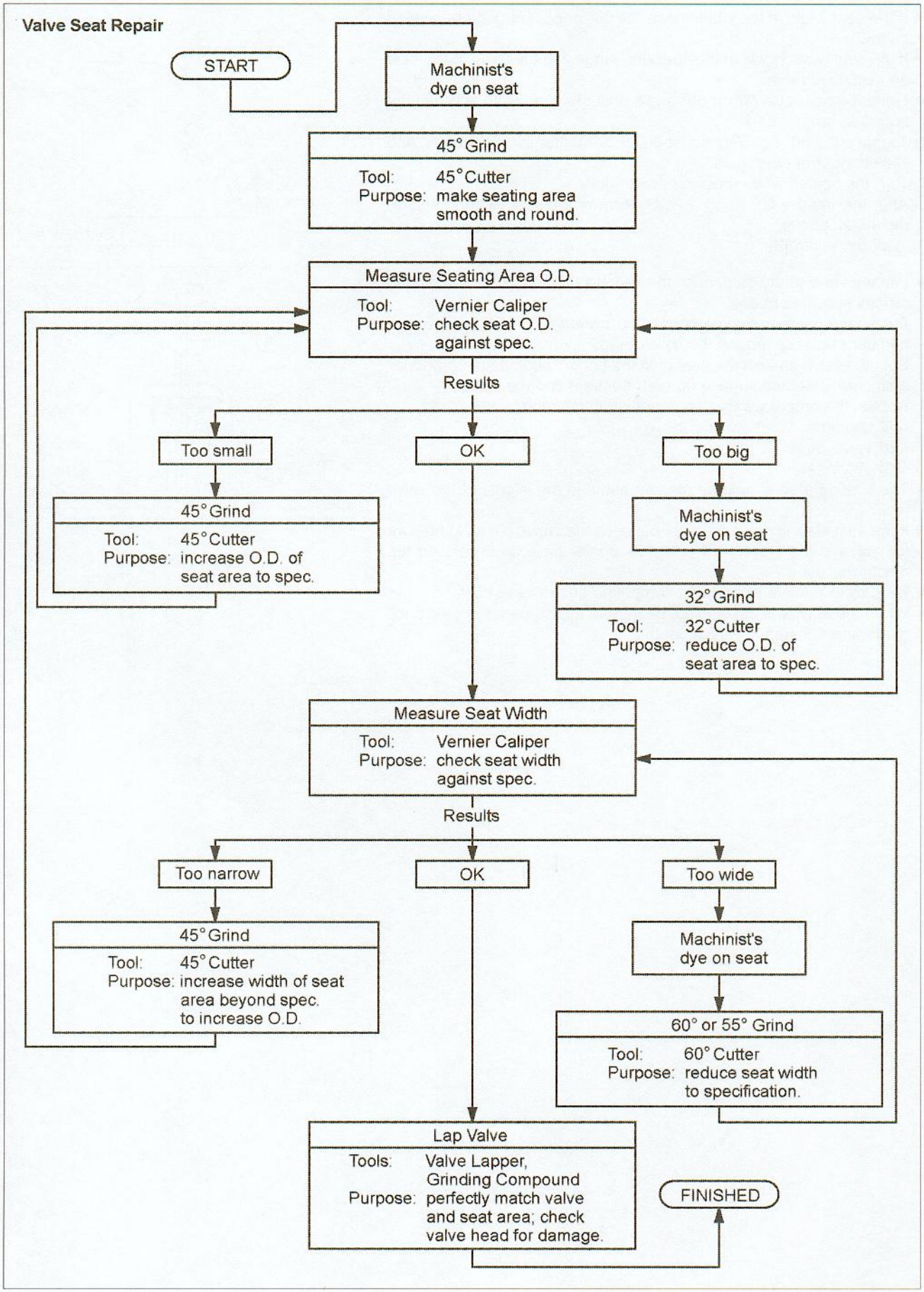
★ If the seat width is too wide, make the 60° or 55° [A] grind described below.
★ If the seat width is within the specified range, lap the valve to the seat as described below.
● Grind the seat at a 60° or 55° angle until the seat width is within the specified range.
○ To make the 60° or 55° grind, fit 60° or 55° cutter into the holder, and slide it into the valve guide.
○ Turn the holder, while pressing down lightly.
○ After making the 60° or 55° grind, return to the seat width measurement step above.
Correct Width [B]



● Lap the valve to the seat, once the seat width and 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



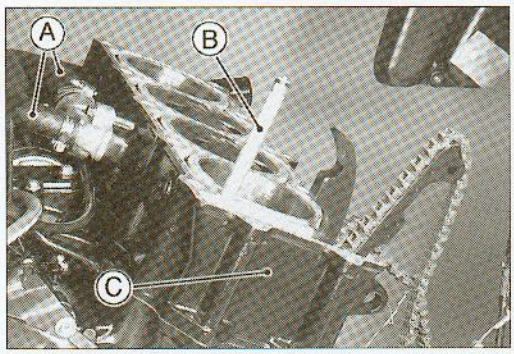
● The seating area should be marked about in the middle of the valve face.
★ If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
● Be sure to remove all grinding compound before assembly.
● When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment).


Valve Seat Repair
START
Machinist's dye on seat
45° Grind
Tool: 45° Cutter
Purpose: make seating area smooth and round.
Measure Seating Area O.D.
Tool: Vernier Caliper
Purpose: check seat O.D. against spec.
Results
Too small
OK
Too big
45° Grind
Tool: 45° Cutter
Purpose: increase O.D. of seat area to spec.
Machinist's dye on seat
32° Grind
Tool: 32° Cutter
Purpose: reduce O.D. of seat area to spec.
Measure Seat Width
Tool: Vernier Caliper
Purpose: check seat width against spec.
Results
Too narrow
OK
Too wide
45° Grind
Tool: 45° Cutter
Purpose: increase width of seat area beyond spec. to increase O.D.
Machinist's dye on seat
60° or 55° Grind
Tool: 60° Cutter
Purpose: reduce seat width to specification.
Lap Valve
Tools: Valve Lapper, Grinding Compound
Purpose: perfectly match valve and seat area; check valve head for damage.
FINISHED

Cylinder, Pistons

Cylinder Removal

- Remove:
  Cylinder Head (see Cylinder Head Removal)
  Water Hoses [A]
  Oil Pipe [B]
- Remove the cylinder [C].

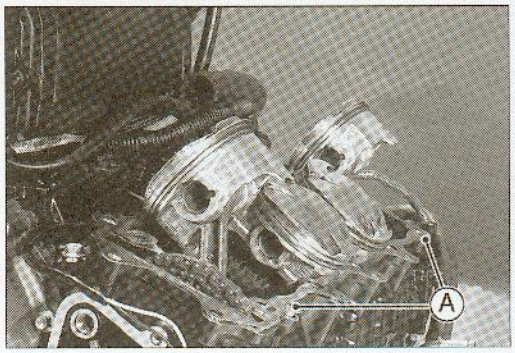


Cylinder Installation

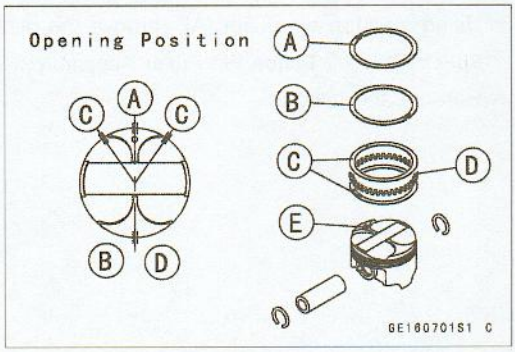
NOTE

○ *If a new cylinder is used, use new piston rings.*
○ *If new pistons and/or a new cylinder are intalled, apply a thin coat of a molybdenum disulfide grease to the new pistons and cylinder bores.*

- Install the pins [A] and new cylinder gasket.
- Apply engine oil to the cylinder bore and external of pistons.



- 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] Hollow

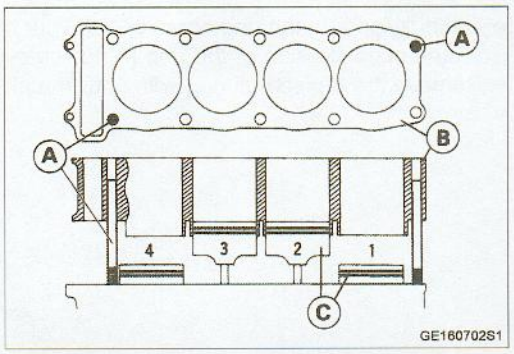


- Insert the piston in the cylinder by two methods.

With the Hand:

- Position the crankshaft at #2, #3 piston TDC.
- Install the two cylinder head bolts [A] diagonally in the crankcase.
- Install the cylinder block [B].
  Pistons [C]

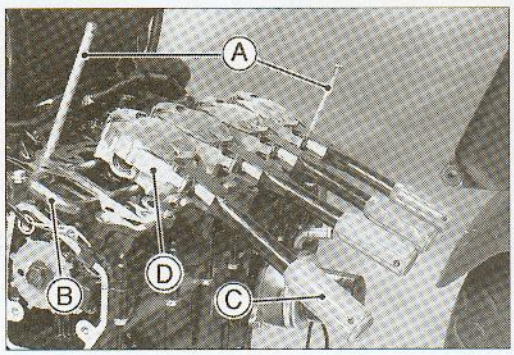
○ First insert the #2, #3 pistons, and then rotate the crankshaft at 90° angle.
○ Insert the piston rings with your thumbs or the thin (–) screw driver.



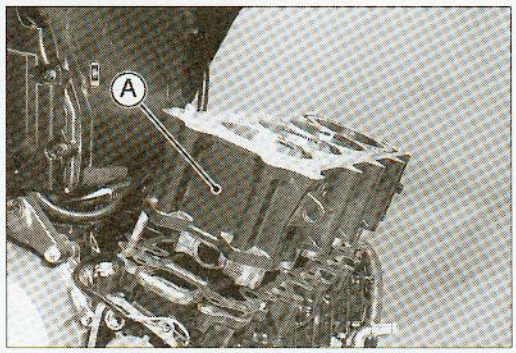
With the Special Tools:

- Install the two cylinder head bolts [A] diagonally in the crankcase.
- Slip the piston bases [B] under the pistons to hold them level.
- Compress the piston rings using the piston ring compressor grips [C] and piston ring compressor belts [D].

Special Tools - Piston Base, φ1.0: 57001–1459
Piston Ring Compressor Grip: 57001–1095
Piston Ring Compressor Belt, φ80 ~ 91: 57001–1320

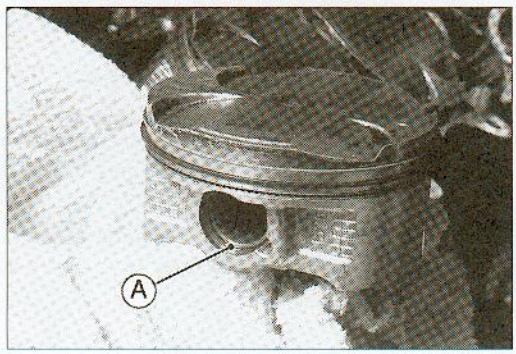


- Insert the piston rings in the cylinder, and remove the piston ring compressor belts.
- Install the cylinder [A] so that its angle aligns the piston angle.



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.



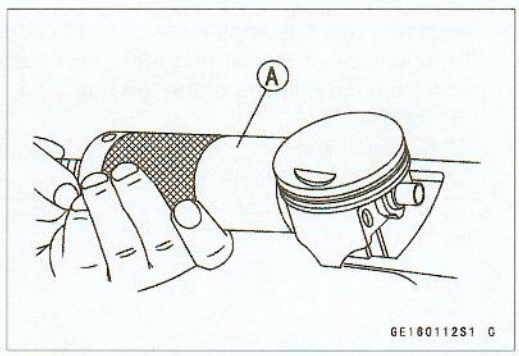
CAUTION

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

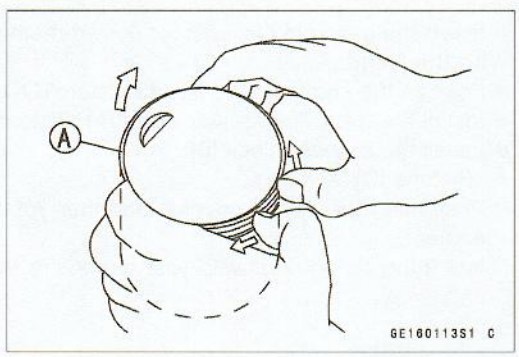
- Using a piston pin puller [A], remove the piston pins.

Special Tool - Piston Pin Puller Assembly: 57001-910

- Remove the pistons.



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

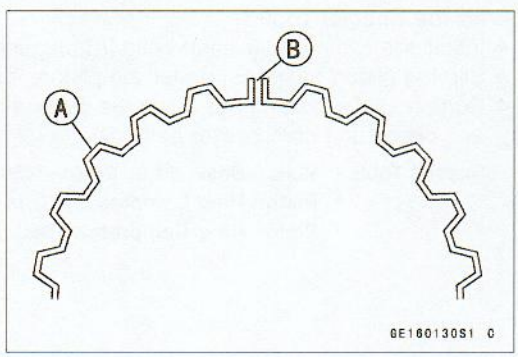


Piston Installation

- 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.

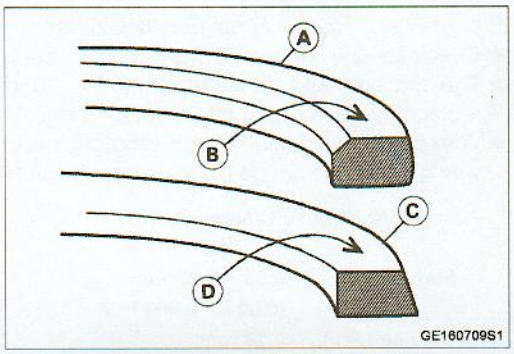
NOTE

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



Cylinder, Pistons

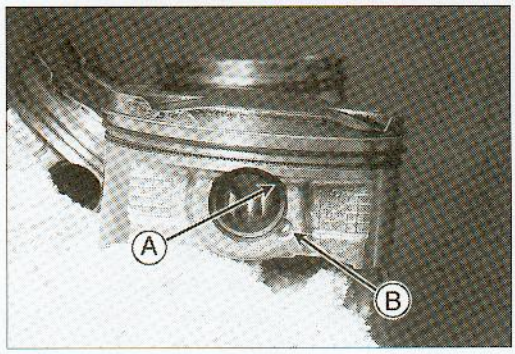
- Do not mix up the top and second ring.
- Install the top ring [A] so that the "R" mark [B] faces up.
- ○ Install the second ring [C] so that the "RN" mark [D] faces up.



NOTE

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

- Install the piston with its marking hollow 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.

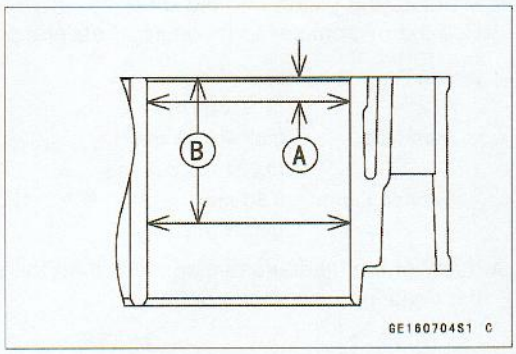
- Install the cylinder (see Cylinder Installation).

Cylinder Wear

- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the 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



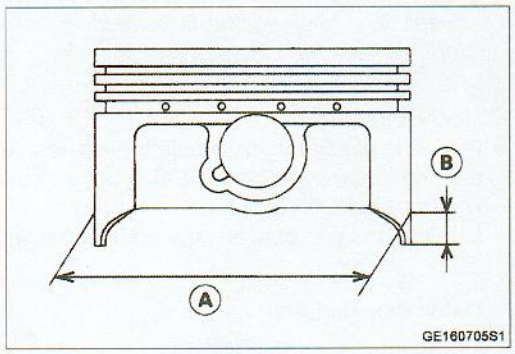
Cylinder Inside Diameter

Standard:	**82.994 ~ 83.006 mm (3.2675 ~ 3.2679 in.)**
Service Limit:	**83.06 mm (3.270 in.)**

Piston Wear

- Measure the outside diameter [A] of each piston 18 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

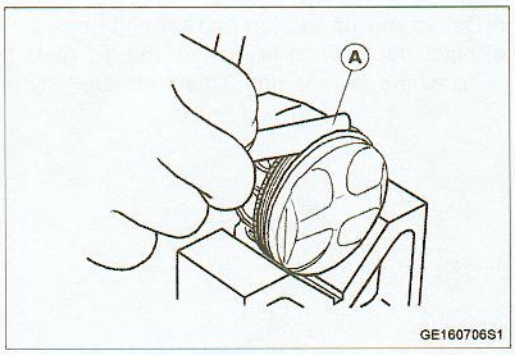
Standard:	**82.969 ~ 82.984 mm (3.2665 ~ 3.2671 in.)**
Service Limit:	**82.82 mm (3.261 in.)**

Piston Ring, Piston Ring Groove Wear

- Check for uneven groove wear by inspecting the ring seating.

★The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.



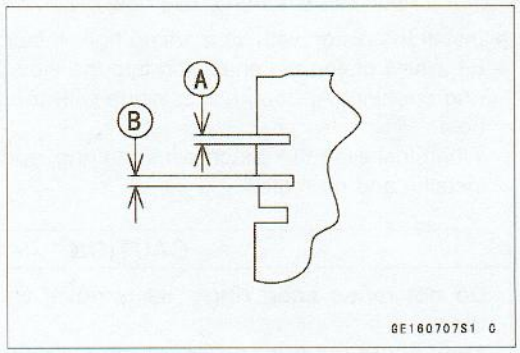
Piston Ring/Groove Clearance

	Top	Second
Standard:	0.03 ~ 0.07 mm (0.001 ~ 0.003 in.)	0.02 ~ 0.06 mm (0.0008 ~ 0.002 in.)
Service Limit:	0.17 mm (0.0067 in.)	0.16 mm (0.0063 in.)

Piston Ring Groove Width

- Measure the piston ring groove width.

○ Use a vernier caliper at several points around the piston.



Piston Ring Groove Width

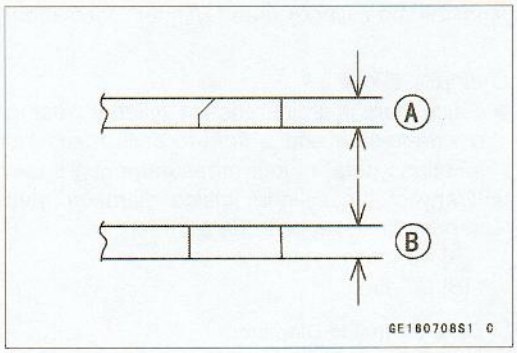
	Top [A]	Second [B]
Standard:	0.92 ~ 0.94 mm (0.036 ~ 0.037 in.)	1.01 ~ 1.03 mm (0.0398 ~ 0.0406 in.)
Service Limit:	1.02 mm (0.0402 in.)	1.11 mm (0.0437 in.)

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

Piston Ring Thickness

- Measure the piston ring thickness.

○ Use the micrometer to measure at several points around the ring.



Piston Ring Thickness

	Top [A]	Second [B]
Standard:	0.87 ~ 0.89 mm (0.034 ~ 0.035 in.)	0.97 ~ 0.99 mm (0.038 ~ 0.039 in.)
Service Limit:	0.80 mm (0.031 in.)	0.90 mm (0.04 in.)

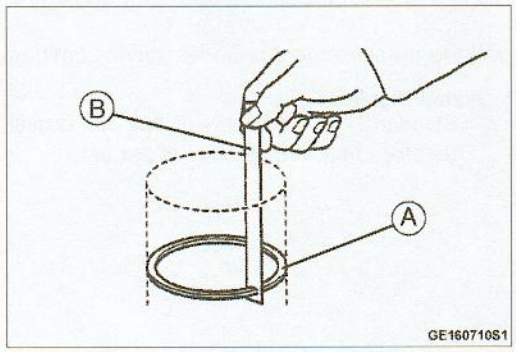
★If any of the measurements is less than the service limit on either of the rings, replace all the rings.

NOTE

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

Piston Ring End Gap

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



Piston Ring End Gap

	Top	Second
Standard:	0.25 ~ 0.40 mm (0.0098 ~ 0.016 in.)	0.40 ~ 0.55 mm (0.016 ~ 0.022 in.)
Service Limit:	0.7 mm (0.03 in.)	0.8 mm (0.031 in.)

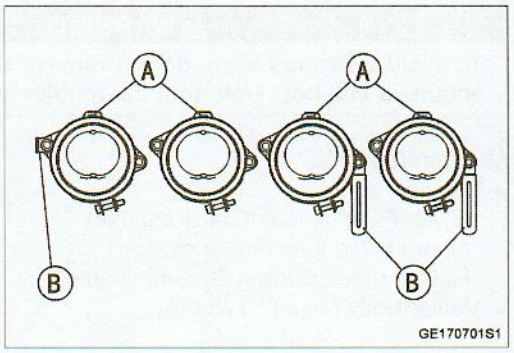
★If the end gap of either ring is greater than the service limit, replace all the rings.

Throttle Valve Holder

Throttle Body Holder Installation

- Install the throttle body holders with the holes [A] upward.
- Check to make sure that the O-ring is not damage.
- Install the clamps [B] as shown.
- Tighten the holder bolt.

Torque - Throttle Valve Holder Bolts: 12 N·m (1.2 kg·m, 106 in·lb)



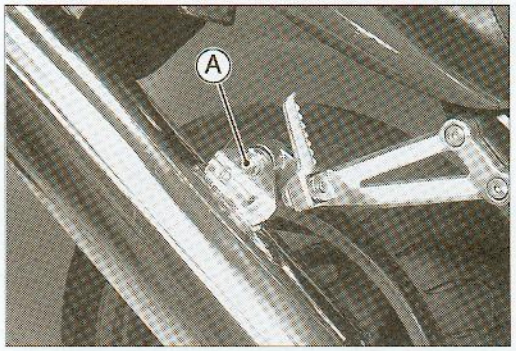
Muffler

⚠ WARNING

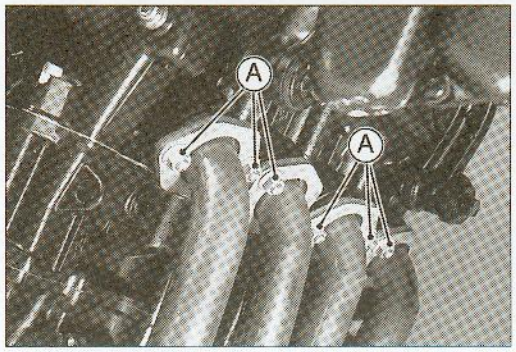
To avoid a serious burn, do not remove the muffler when the engine is still hot. Wait until the muffler cools down.

Muffler Removal

- Remove:
  Lower Fairings (see Frame chapter)
  Inner Fairing (see Frame chapter)
  Radiator (see Cooling System chapter)
- Muffler Body Mounting Nut [A]



- Remove:
  Exhaust Pipe Manifold Holder Nuts [A]
- Pull the muffler body mounting bolt and remove the muffler assembly.

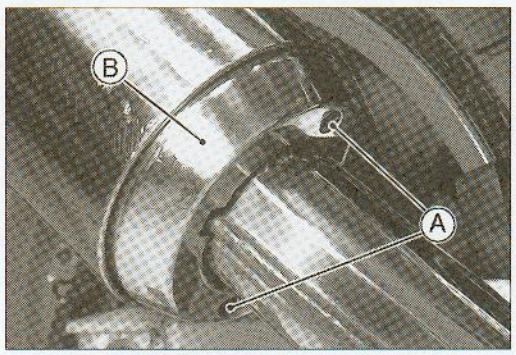


Muffler Installation

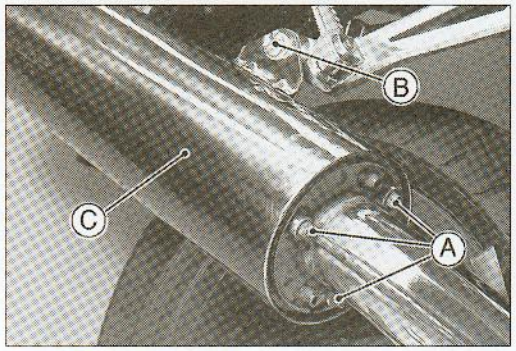
- Replace the exhaust pipe gaskets with new ones.
- Thoroughly warm up the engine, wait until the engine cools down, and retighten all the bolts and nuts.

Muffler Body Removal

- Unscrew the muffler body connection cover bolts [A] and remove the cover [B].



- Remove:
  Muffler Body Connection Nuts [A]
  Muffler Body Mounting Bolt and Nut [B]
- Pull the muffler body [C] backward.



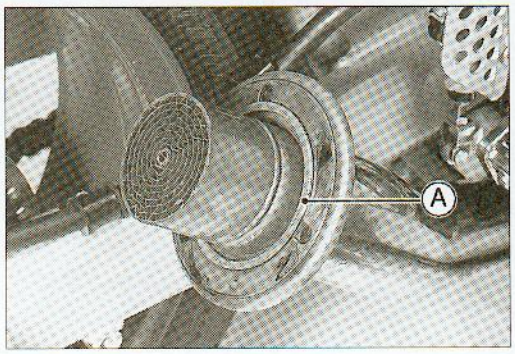
Muffler

Muffler Body Installation

- Replace the exhaust pipe connection gasket [A] with a new one.
- Insert the muffler body to the exhaust pipe end.
- Tighten:

Torque - Muffler Body Connection Nuts: 34 N·m (3.5 kg·m, 25 ft·lb)

- Tighten:
  Muffler Body Connecting Cover Bolts
  Muffler Body Mounting Bolt and Nut
- Thoroughly warm up the engine, wait until the engine cools down, and retighten all the bolts and nuts.



Clutch

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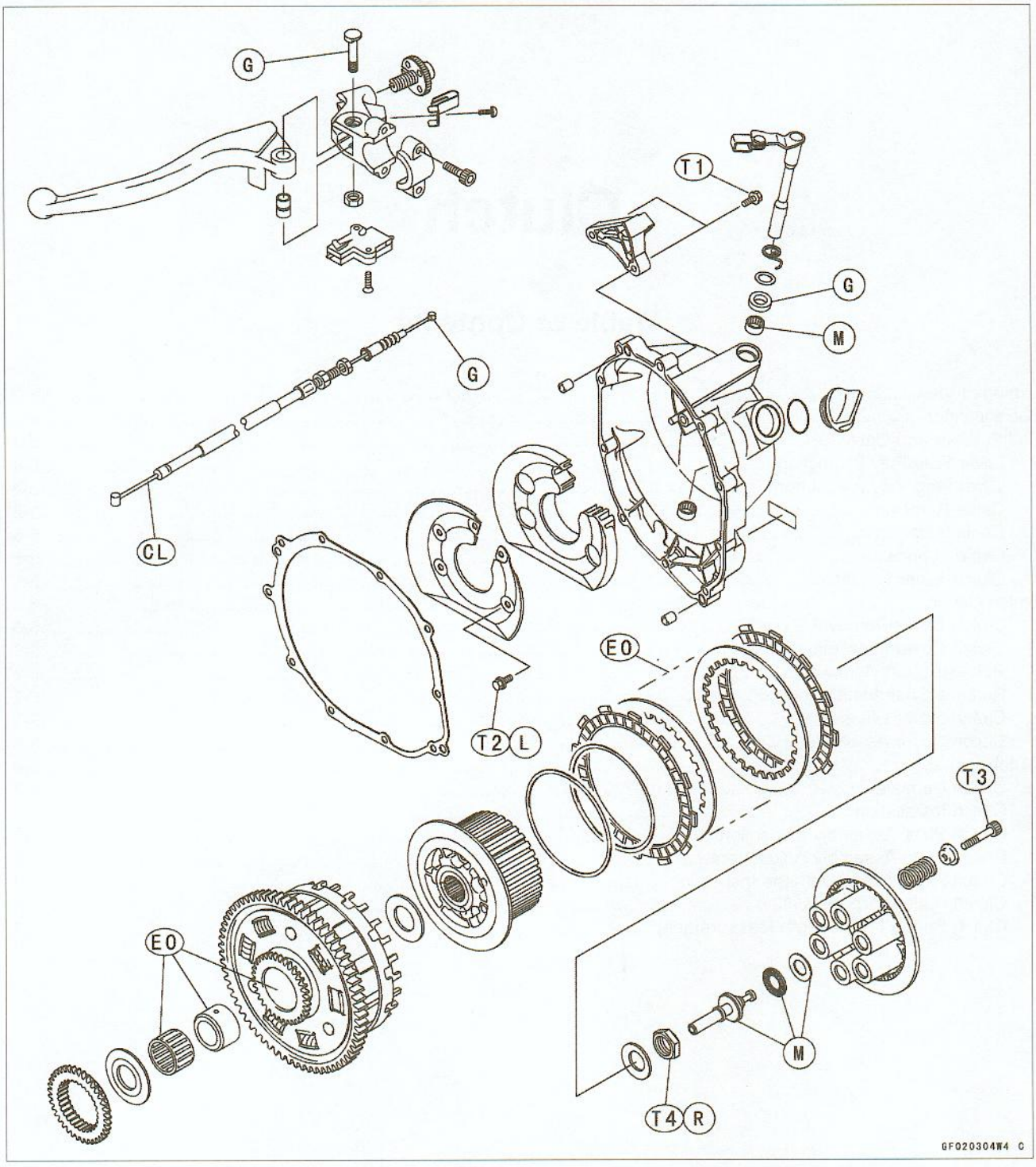
Exploded View



CL: Apply cable lubricant.
G: Apply grease.
EO: Apply engine oil.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
R: Replacement Part

T1: 15 N·m (1.5 kg·m, 11 ft·lb)
T2: 7 N·m (0.7 kg·m, 62 in·lb)
T3: 8.8 N·m (0.9 kg·m, 78 in·lb)
T4: 135 N·m (14 kg·m, 100 ft·lb)

Specifications

Item	Standard	Service Limit
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.1 in.)	- - -
Clutch:		
Friction plate thickness	3.22 ~ 3.38 mm (0.127 ~ 0.133 in.)	3.0 mm (0.1 in.)
Friction and steel plate warp	0.15 mm (0.0059 in.) or less	0.3 mm (0.01 in.)
Clutch plate assembly length	56.8 ~ 57.6 mm (2.24 ~ 2.27 in.)	– – –
Clutch spring free length	72.58 mm (2.857 in.)	69.2 mm (2.72 in.)

Special Tools - Clutch Holder: 57001-1243
Clutch Gear Setting: 57001–1455

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

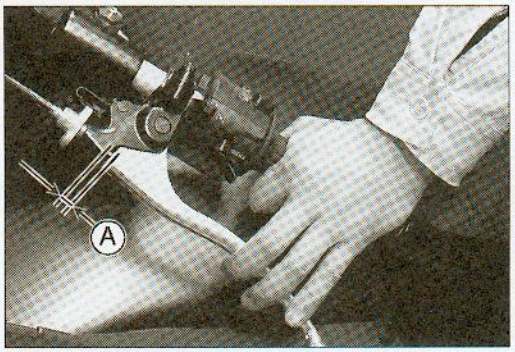
Clutch Lever and Cable

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 ~ 0.1 in.)

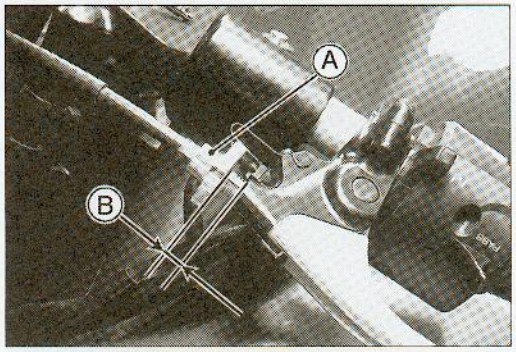


Lever Free Play Adjustment

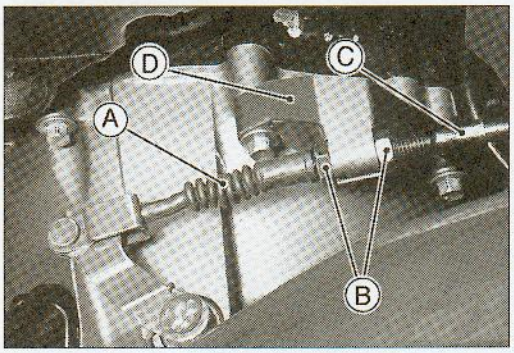
⚠ WARNING

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

- Turn the adjuster [A] so that 5 ~ 6 mm (0.2 ~ 0.24 in.) [B] of threads are visible.



- Slide the dust cover [A] at 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.



- Push the release lever [A] toward the front of the motorcycle until it becomes hard to turn.

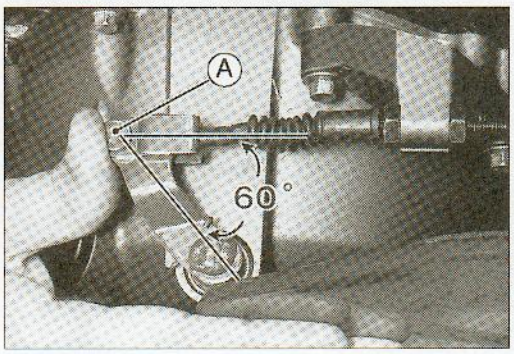
○ At this time, the release lever should have the proper angle shown.

★ If the angle is wrong, check the clutch and release parts for wear.

⚠ WARNING

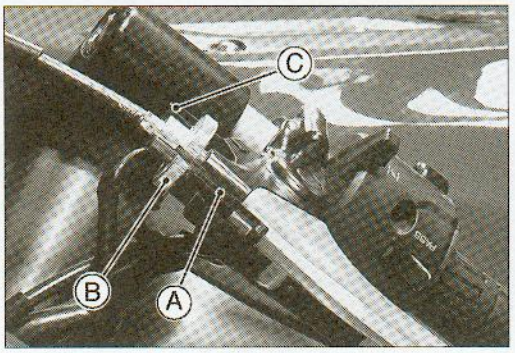
Be sure that the outer cable end at the clutch lever is fully seated in the adjuster at the clutch lever, or it could slip into place later, creating enough cable play to prevent clutch disengagement.

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



Clutch Lever and Cable

Cable Removal



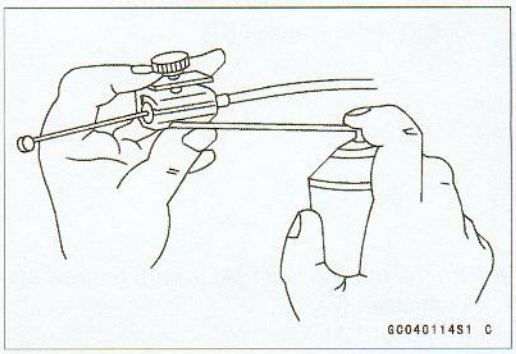
- Remove the right inner cover (see frame chapter).
- Slide the dust cover at the clutch cable lower end out of place.
- Loosen the nuts, and slide the lower end of the clutch cable to give the cable plenty of play.
- Screw in the adjuster.
- Line up the slots [A] in the clutch lever and adjuster [B], and then free the cable from the lever.
- While pushing the stopper [C], turn the adjuster.
- Free the clutch inner cable tip from the clutch release lever.
- Push the release lever toward the front of the motorcycle and tape the release lever to the clutch cover to prevent the release shaft from falling out.
- Pull the clutch cable out of the frame.

Cable Installation

- Run the clutch cable correctly (see General Information chapter).
- Adjust the clutch cable (see Lever Free Play Adjustment).

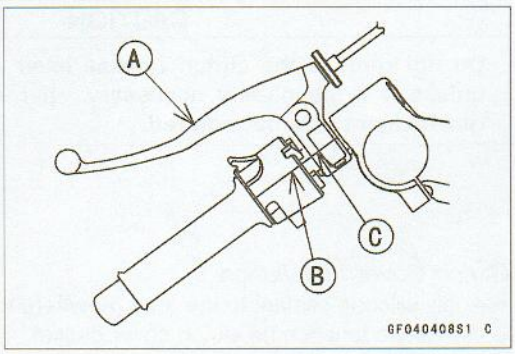
Cable Lubrication

Whenever the clutch cable is removed, lubricate the clutch cable as follows.



- Lubricate the cable with a penetrating rust inhibitor.
- The cable may be lubricated by using a commercially available pressure cable lubricator with an aerosol cable lubricant.
- Apply a thin coating of grease to the cable upper and lower ends.

Clutch Lever Installation

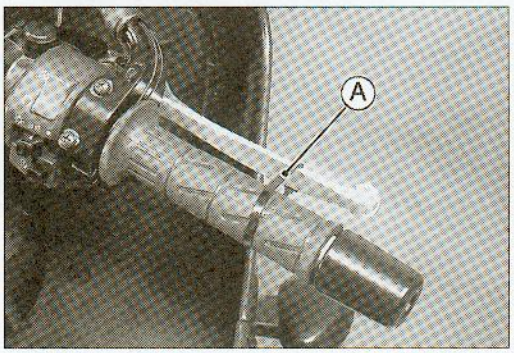


- Install the clutch lever [A] so that the mating surface [B] of the switch housing is aligned with the mating surface [C] of the clutch lever clamp.

Clutch Cover

Clutch Cover Removal

- Set the motorcycle on its side stand, squeeze the front brake lever, and hold it with a band [A] to prevent the motorcycle from running forward.



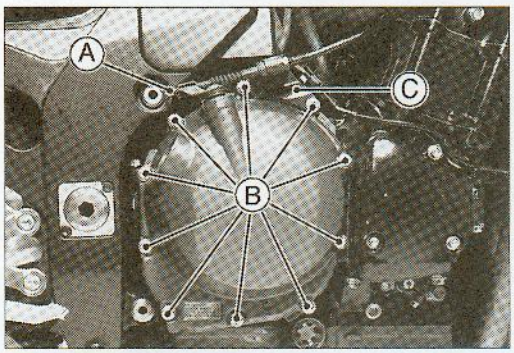
⚠ WARNING

Be sure to hold the front brake when removing the clutch, or the motorcycle may fall over. It could cause an accident and injury.

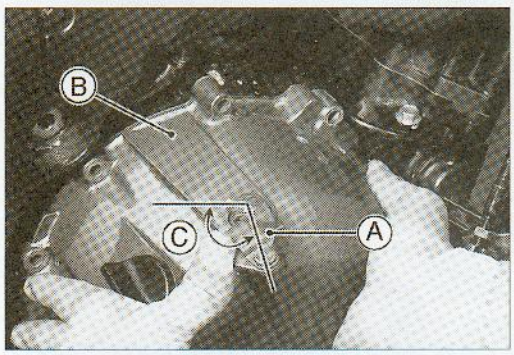
CAUTION

Be sure to hold the front brake when removing the clutch, or the motorcycle may fall over. The motorcycle could be damaged.

- Remove:
  Right Lower Fairing (see Frame chapter)
  Clutch Cable Lower End [A]
  Clutch Cover Mounting Bolts [B]
  Clutch Cable Bracket [C]



- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B].
  [C] about 120°



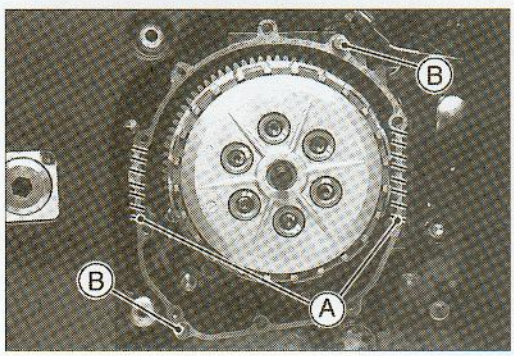
CAUTION

Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.

Clutch Cover Installation

- Apply silicone sealant to the area [A] where the mating surface of the crankcase touches he clutch cover gasket.
- Be sure to install the pins [B].

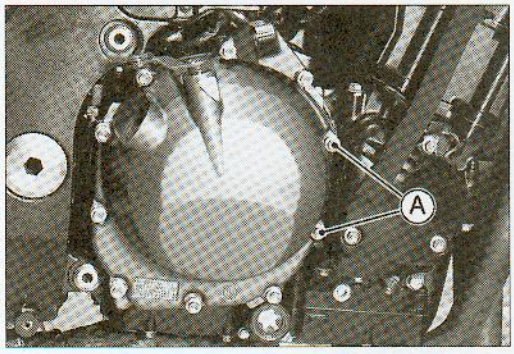
Sealant - Kawasaki Bond (Silicone Sealant): 56019-120



Clutch Cover

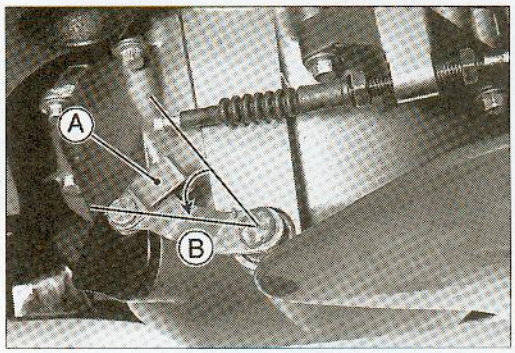
- Replace the cover gasket with a new one.
- Apply a non-permanent locking agent to the two cover bolts.
- ○ Position of the two cover bolts [A].
- Tighten the cover bolts.

Torque - Clutch Cover Bolts: 15 N·m (1.5 kg·m, 11 ft·lb)



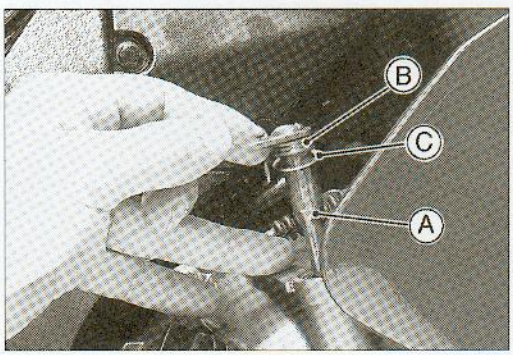
Release Shaft Removal

- Remove the clutch cable lower end (see Clutch Cable Removal).
- Turn the release lever [A] toward the rear about 45° [B] and pull the lever and shaft assembly straight out of the clutch cover.



Release Shaft Installation

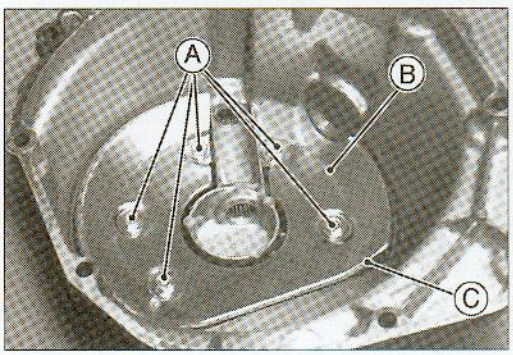
- Apply oil to the upper needle bearings in the hole of the clutch cover.
- Apply high-temperature grease to the oil seal lips on the upper ridge of the clutch cover.
- Insert the release shaft [A] straight into the upper hole of the clutch cover.
  Spring [B]
  Washer [C]



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

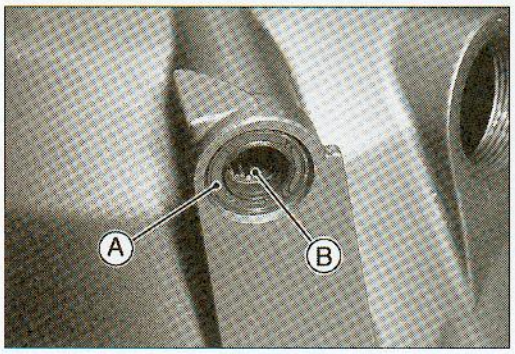
Clutch Cover Disassembly

- Remove the clutch cover (see Clutch Cover Removal).
- Pull out the release shaft (see Release Shaft Removal).
- Remove:
  Dumper Plate Bolts [A]
  Dumper Plate [B]
  Dumper [C]



Clutch Cover

Oil Seal [A]
Needle Bearings [B]



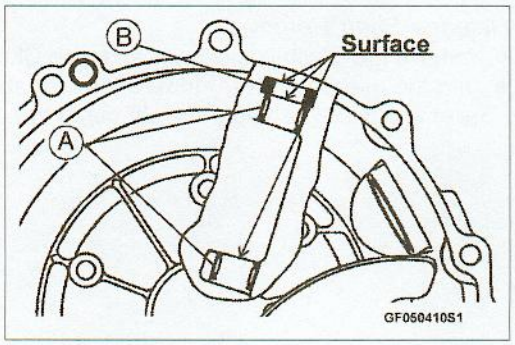
Clutch Cover Assembly

- Replace the needle bearings and oil seal with new one.

NOTE

○ *Install the needle bearings so that the manufacturer's mark face out.*

- Install the needle bearings [A] and oil seal [B] position as shown.



- Apply a non-permanent locking agent to the dumper plate bolts and tighten them.

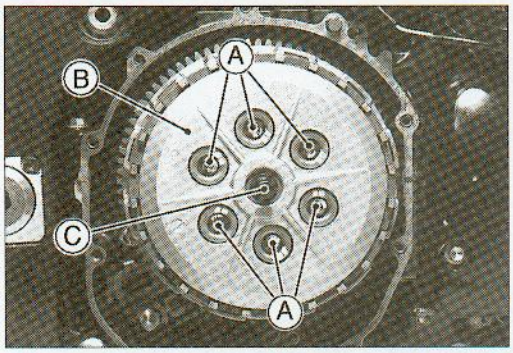
○ Confirm that the torque to fast tightened bolt.

Torque - Dumper Plate Bolts: 7 N·m (0.7 kg·m, 62 in·lb)

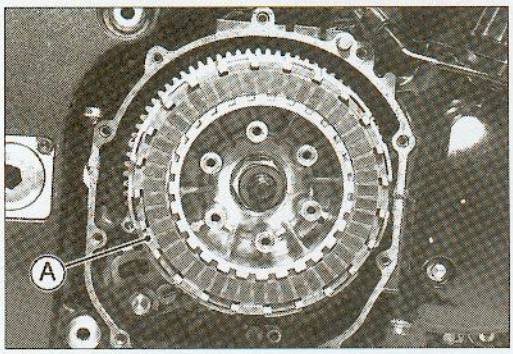
Clutch

Clutch Removal

- Remove:
  Right Lower Fairing (see Frame chapter)
  Clutch Cover (see Clutch Cover Removal)
  Clutch Spring Bolts [A]
  Clutch Springs
  Clutch Spring Plate [B] (with thrust bearing, pusher [C] and washer)

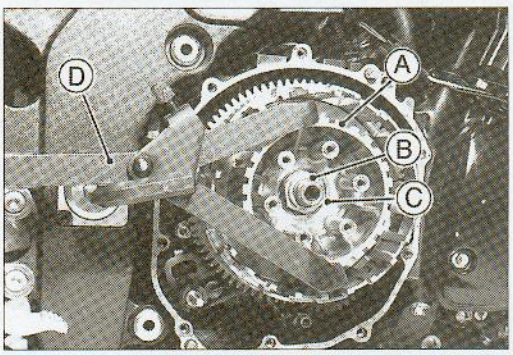


Friction Plates [A]
Steel Plates
Spring
Spring Seat

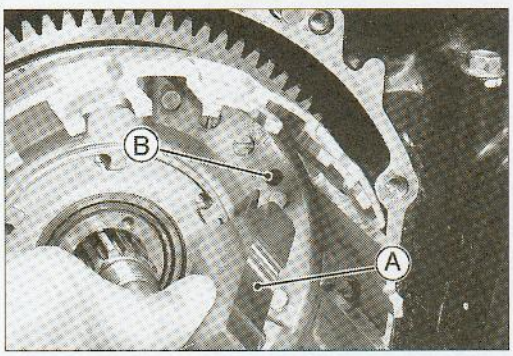


○ Holding the clutch hub [A], remove the nut [B] and washer [C]
Special Tool - Clutch Holder: 57001-1243 [D]

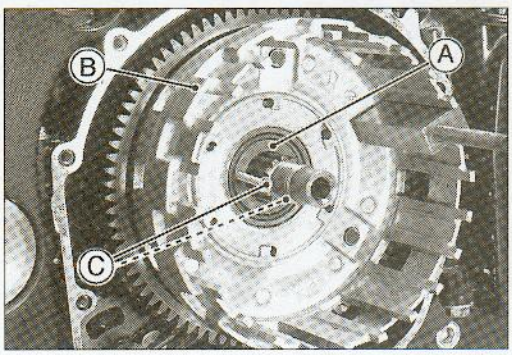
- Remove:
  Clutch Hub



- Insert the clutch gear setting [A] to the hole of the clutch housing.
○ Position the hole [B] of the clutch housing at the front side of the engine.
○ Align the teeth of the clutch housing gears by the setting.
Special Tool - Clutch Gear Setting: 57001-1455



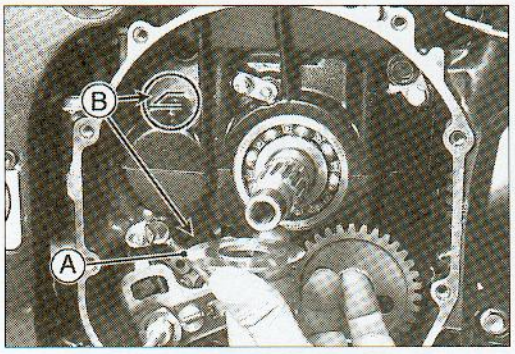
- Pull out the sleeve [A] from the clutch housing [B], and remove the housing.
○ If the sleeve does not pull out easily, insert a 4 mm bolts [C] into the threaded hole of the sleeve, and pull out the sleeve.
- Remove the thrust washer.



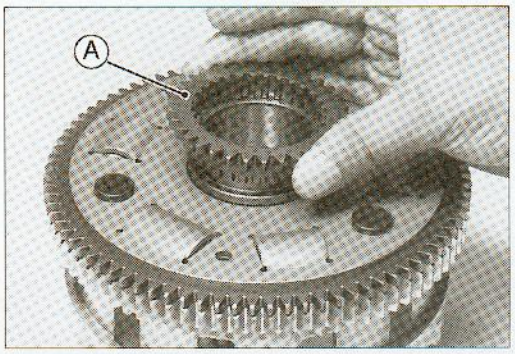
Clutch

Clutch Installation

- Install the thrust washer [A] by facing its chamfered side [B] towards the crankcase.



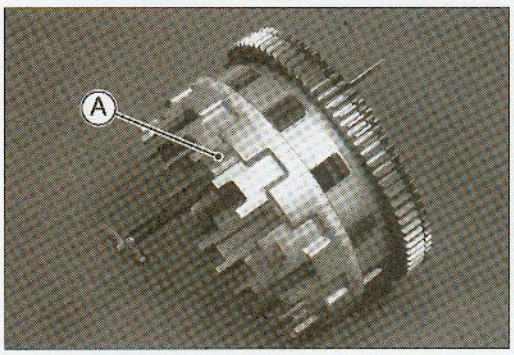
- Install the oil pump drive gear [A] on the clutch housing.



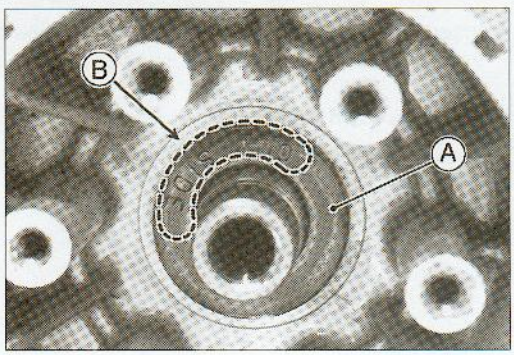
- Align the teeth of the clutch housing gears by the setting [A].
- Install the clutch housing so that the hole position forward of the engine.

Special Tool - Clutch Gear Setting: 57001-1455

- Install:
  Clutch Housing
  Needle Bearing
  Sleeve



- Install the washer [A] so that the OUT SIDE mark [B] faces outward.



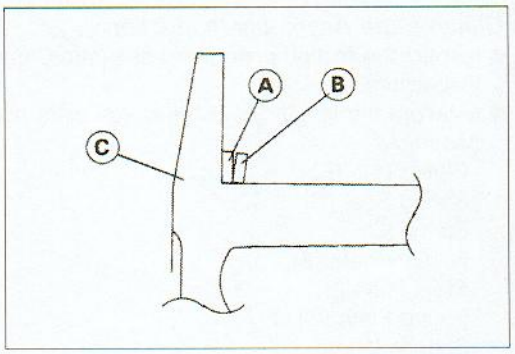
- Replace the clutch hub nut with a new one.
- Holding the clutch hub, tighten the clutch hub nut.

Special Tool - Clutch Holder: 57001-1243

Torque - Clutch Hub Nut: 135 N·m (14 kg·m, 100 ft·lb)

Clutch

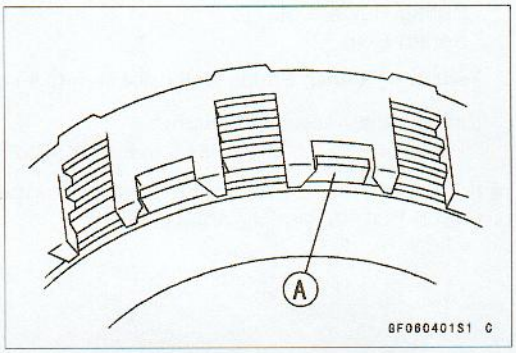
- Install the spring seat [A] and spring [B] as shown.
  [C] Clutch Hub



- When installing the friction plates and steel plates, first install the friction plate whose inside diameter is larger than the others and then start with a steel plate and alternating them.

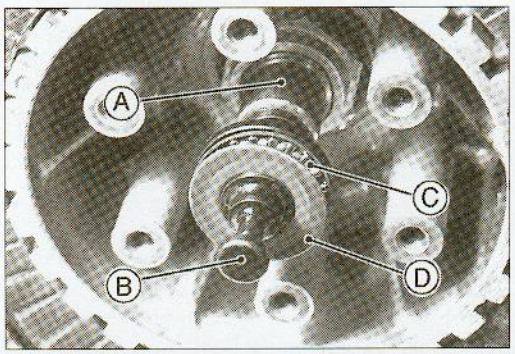
CAUTION

If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.

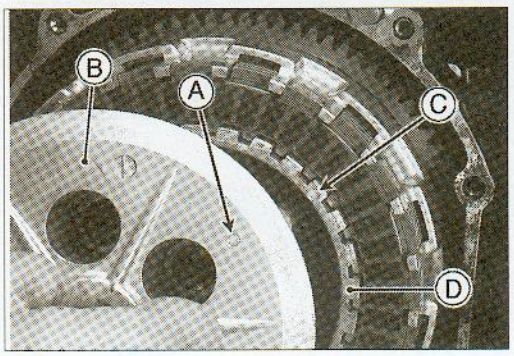


○ Install the last friction plate [A] fitting the tangs in the grooves in the housing as shown.

- Apply molybdenum disulfide grease to the pusher end [A] and install the pusher [B], needle bearing [C] and washer [D].



- Align the mark [A] of the spring plate [B] to the mark [C] of the clutch hub [D] to install the spring plate on the clutch hub.



- Install the spring, and tighten the clutch spring bolts.

  Torque - Clutch Spring Bolts: 8.8 N·m (0.9 kg·m, 78 in·lb)

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

Clutch Plate Assembly Inspection

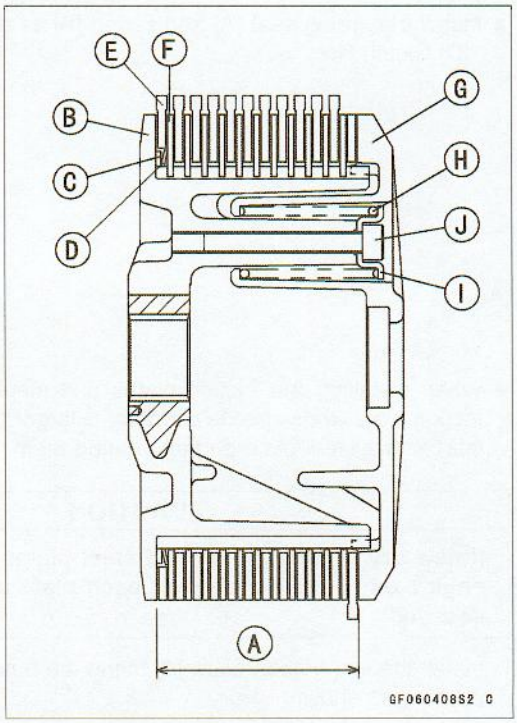
- Inspect the friction plate thickness (see Clutch Plate, Wear, Damage Inspection).
- Measure the length [A] of the clutch plate assembly as shown.

○ Assemble:
Clutch Hub [B]
Spring Seat [C]
Spring [D]
Friction Plate [E]
Steel Plate [F]
Spring Plate [G]
Springs [H]
Spring Holders [I]
Spring Bolts [J]

Torque - Clutch Spring Bolts: 8.8 N·m (0.9 kg·m, 78 in·lb)

Clutch Plate Assembly Length
Standard: 56.8 ~ 57.6 mm (2.24 ~ 2.27 in.)

★ If the length is not within the specified range, adjust the length (see Clutch Plate Assembly Adjustment).



Clutch Plate Assembly Adjustment

- Inspect the clutch plate assembly length, and then replace the steel plate(s) which brings the length within the specified range.

○ Remove:
Spring Bolts
Spring Holders
Spring Plate
Clutch Plate, Wear, Damage Inspection

○ Replace the following steel plate(s).

Part No.	Thickness
13089-1125	1.4 mm (0.055 in.)
13089-1123	1.6 mm (0.063 in.) (STD)
13089-1124	2.0 mm (0.07 in.)

NOTE

○ *Do not use the steel plate of 2.0 mm (0.07 in.) and 1.4 mm (0.063 in.) thickness at the same time.*

- Install the removed parts, and inspect the clutch plate assembly length.

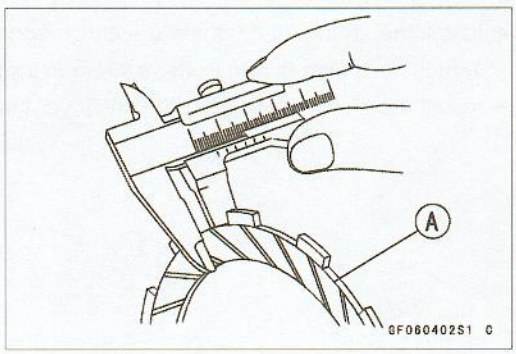
Torque - Clutch Spring Bolts: 8.8 N·m (0.9 kg·m, 78 in·lb)

Clutch Plate, Wear, Damage Inspection

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of the 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: 3.22 ~ 3.38 mm (0.127 ~ 0.133 in.)
Service Limit: 3.0 mm (0.1 in.)



Clutch

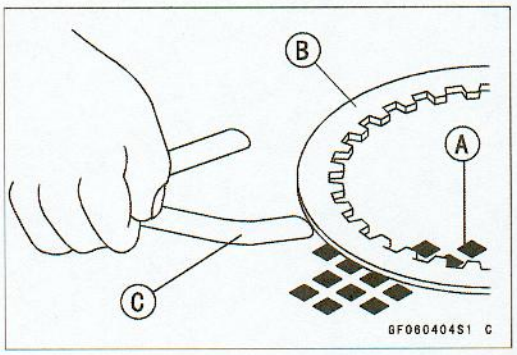
Clutch Plate Warp Inspection

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

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

Friction and Steel Plate Warp

Standard:	**0.15 mm (0.0059 in.) or less**
Service Limit:	**0.3 mm (0.01 in.)**



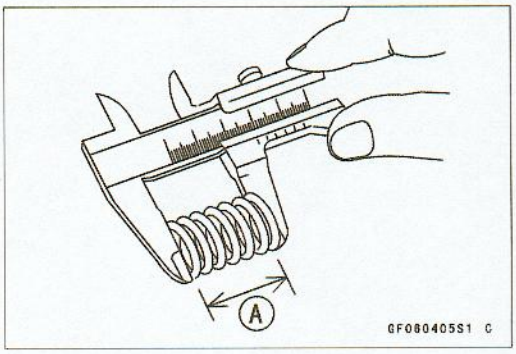
Clutch Spring Free Length Measurement

- Measure the free length [A] of the clutch springs.

★ If any spring is shorter than the service limit, it must be replaced.

Clutch Spring Free Length

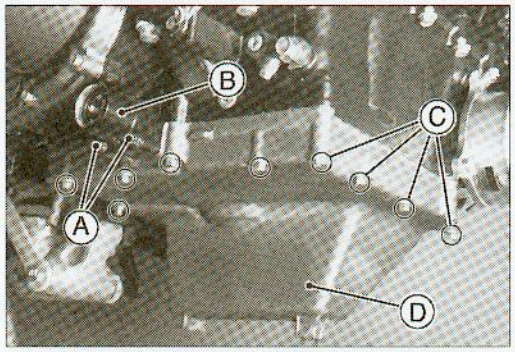
Standard:	**72.58 mm (2.857 in.)**
Service Limit:	**69.2 mm (2.72 in.)**



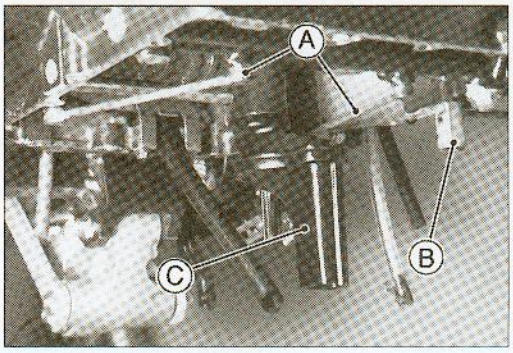
Oil Pan

Oil Pan Removal

- Remove:
  Engine Oil (drain, see Engine Oil Change)
  Muffler (see Engine Top End chapter)
- Unscrew the oil level gauge bolts [A] and pull out the level gauge [B].
- Unscrew the oil pan bolts [C] and remove the oil pan [D].



○ Remove the oil pipes [A], oil pressure relief valve [B] and oil screen [C] as necessary.

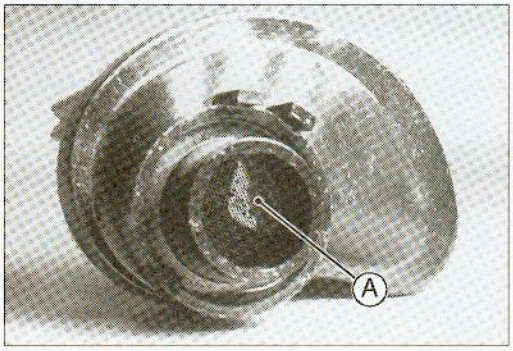


Oil Pan Installation

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

⚠WARNING

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

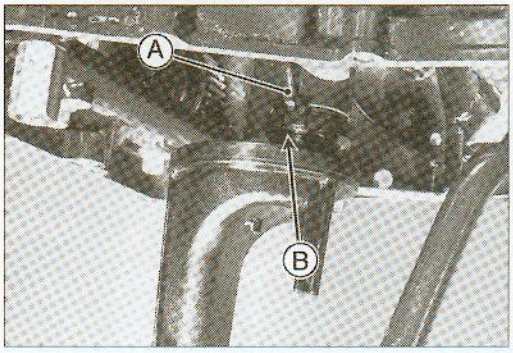


NOTE

○ *While cleaning the screen, check for any metal particles that might indicate internal engine damage.*
○ *Check the screen carefully for any damage: hole and broken wires.*

★ If the screen is damaged, replace it.

- Install the oil screen so that the crankcase rib [A] fits the slot [B] of the oil screen.



Engine Lubrication System

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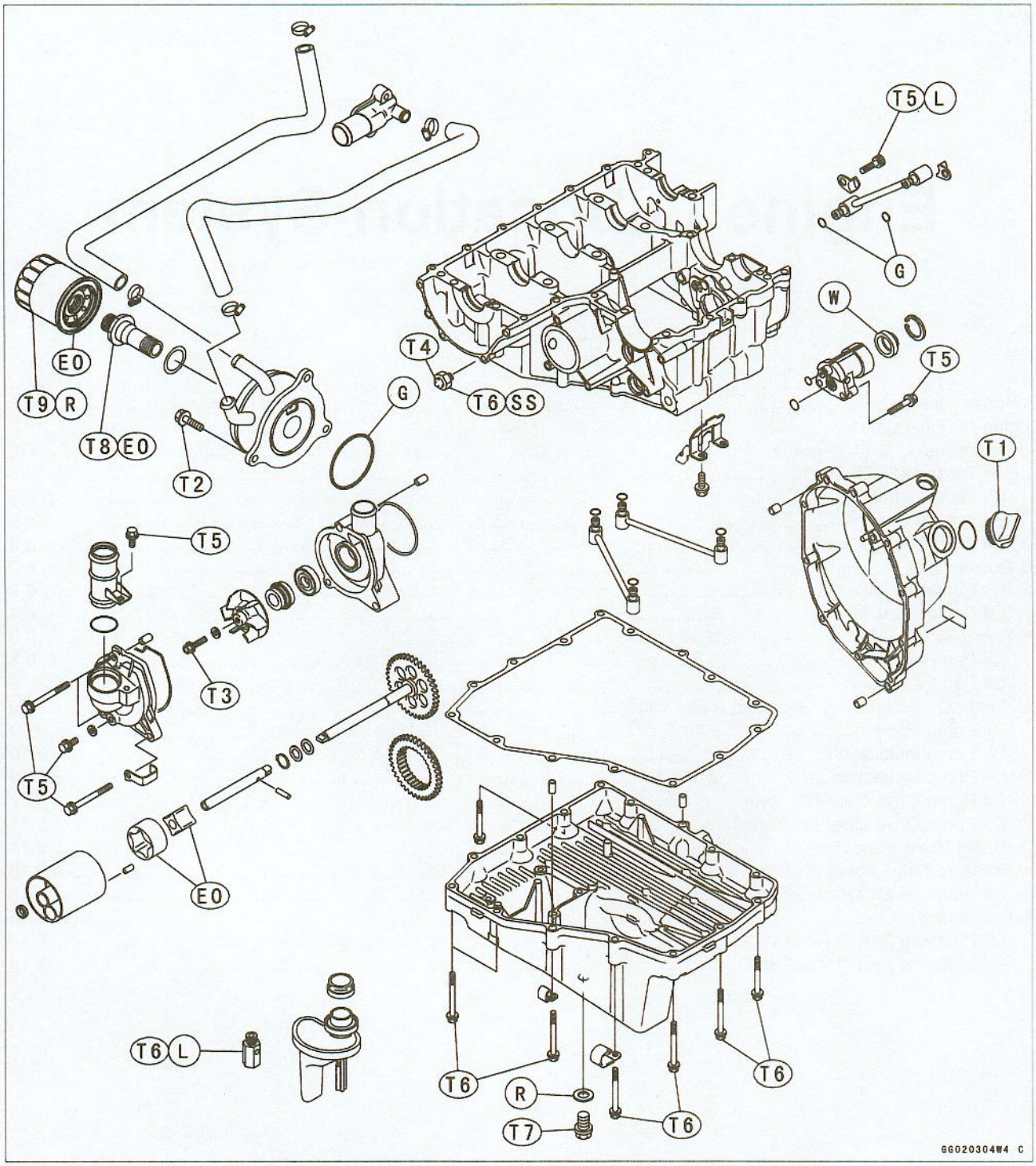
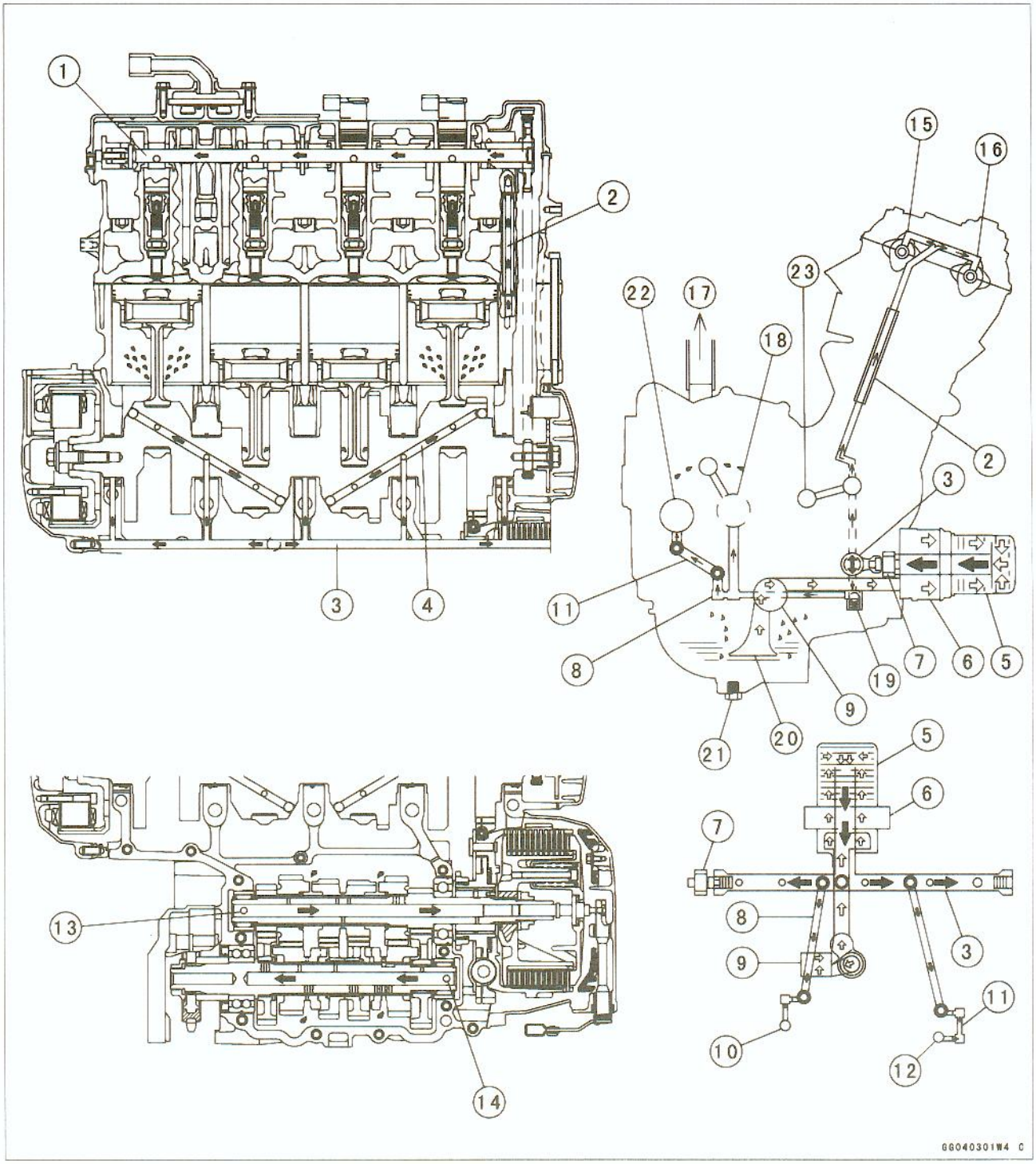
Exploded View



T1: 1.0 N·m (0.10 kg·m, 9 in·lb) or Hand-Tight
T2: 25 N·m (2.5 kg·m, 18 ft·lb)
T3: 10 N·m (1.0 kg·m, 87 in·lb)
T4: 1.5 N·m (0.15 kg·m, 13 in·lb)
T5: 12 N·m (1.2 kg·m, 106 in·lb)
T6: 15 N·m (1.5 kg·m, 11.0 ft·lb)
T7: 20 N·m (2.0 kg·m, 14.5 ft·lb)
T8: 78 N·m (7.8 kg·m, 57 ft·lb)
T9: 27 N·m (2.7 kg·m, 19.5 ft·lb)

SS: Apply silicone sealant.
L: Apply a non-permanent locking agent.
R: Replacement parts.
G: Apply grease.
EO: Apply engine oil.
W: Apply water.

Engine Oil Flow Chart



1. Cam Shaft Oil Passage
2. Oil Pipe
3. Main Oil Passage
4. Crankshaft Oil Passage
5. Oil Filter
6. Oil Cooler
7. Oil Pressure Switch
8. Oil Pipe
9. Oil Pump
10. To Drive Shaft
11. Oil Pipe
12. To Output Shaft
13. Drive Shaft Oil Passage Hole
14. Output Shaft Oil Passage Hole
15. Inlet Camshaft
16. Exhaust Camshaft
17. To Air Cleaner
18. Drive Shaft
19. Relief Valve
20. Oil Screen
21. Oil Drain Plug
22. Output Shaft
23. Stater Clutch

6-4 ENGINE LUBRICATION SYSTEM

Specifications

Item	Standard
Engine Oil:	
Grade	SE, SF, or SG class
Viscosity	SAE 10W-40, 10W-50, 20W-40, or 20W-50
Capacity	2.5 L (when filter is not removed)
	2.8 L (when filter is removed)
	3.6 L (when engine is completely dry)
Level	Between upper and lower level lines
Oil Pressure Measurement:	
Oil pressure@4,000 r/min(rpm),	
oil temp. 90°C(194°F)	160 kPa (1.6 kg/cm^2, 23 psi)

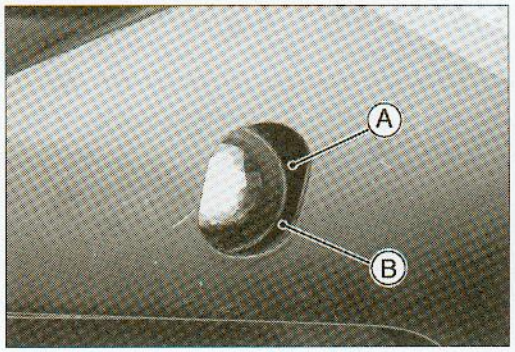
Special Tools - Oil Filter Wrench: 57001-1249
Oil Pressure Gauge, 10 kg/cm^2: 57001-164
Oil Pressure Gauge Adapter, PT 1/8: 57001-1033
Circlip Pliers: 57001-154

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

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

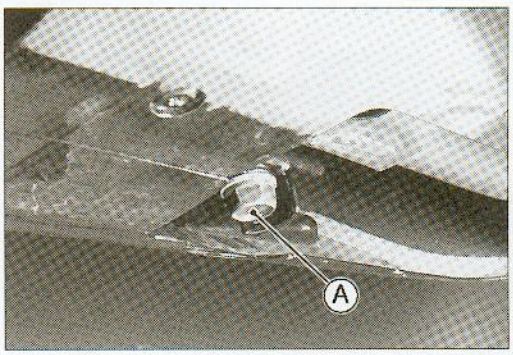
- Check that the engine oil level is between the upper [A] and lower [B] levels in the gauge.

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.*

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

- Support the motorcycle perpendicular to the ground after warming up the engine.
- Remove the engine drain plug [A] to drain the oil.
- The oil in the oil filter can be drained by removing the filter (see Oil Filter Change).
- ★ Replace the drain plug gasket with a new one if it is damaged.
- Tighten the drain plug.

Torque - Engine Drain Plug: 20 N·m (2.0 kg·m, 14.5 ft·lb)

- Pour in the specified type and amount of oil.

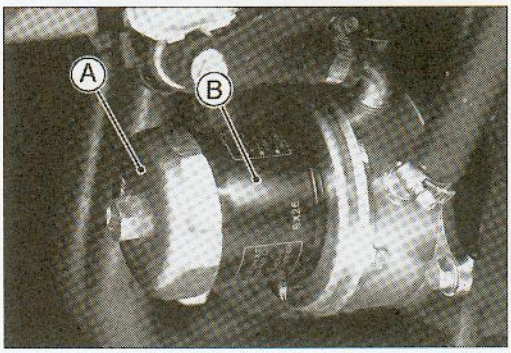
Engine Oil

Grade:	**SE, SF or SG class**
Viscosity:	**SAE 10W40, 10W50, 20W40, or 20W50**
Amount:	**2.5 L (when filter is not removed)**
	2.8 L (when filter is removed)
	3.6 L (when engine is completely dry)

Oil Filter Change

- Drain the engine oil (see Engine Oil Change).
- Remove:
  Left Lower Fairing (see Frame chapter)
- Remove the oil filter [B] with the oil filter wrench [A].

Special Tool - Oil Filter Wrench: 57001-1249

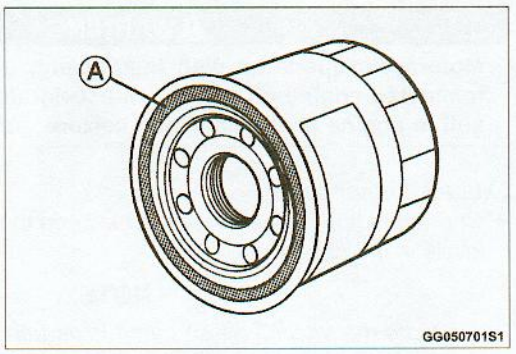


Engine Oil and Oil Filter

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

Torque - Oil Filter: 27 N·m (2.7 kg·m, 19.5 ft·lb)

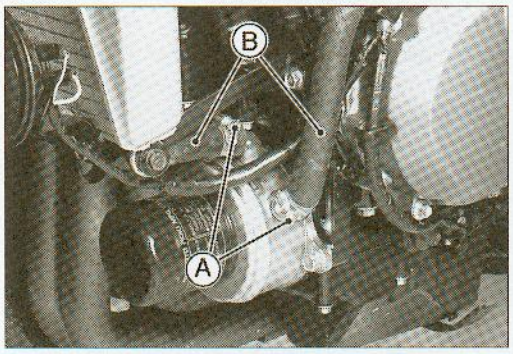
- Pour in the specified type and amount of oil (see Engine Oil Change).



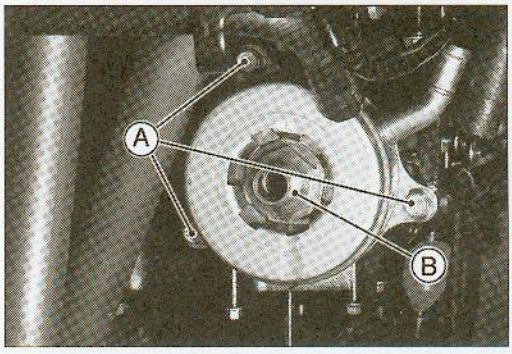
Oil Cooler

Oil Cooler Removal

- Remove:
  Left Lower Fairing (see Frame chapter)
- Drain:
  Engine Oil (see Engine Oil Change)
  Coolant (see Cooling System chapter)
- Loosen the clamp screws [A] and remove the oil cooler water hoses [B] from the oil cooler.

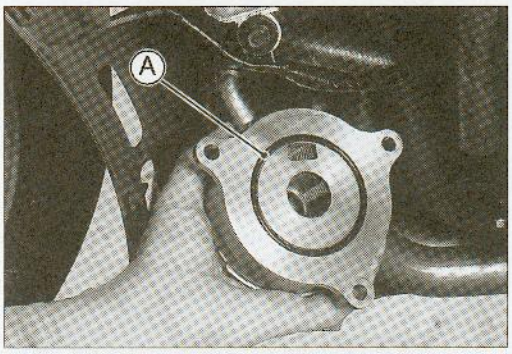


- Remove the oil filter (see this chapter).
- Unscrew the oil cooler mounting bolts [A] and oil cooler passage bolt [B] from the crankcase.
- Move the oil cooler to the left side.
- Drain the coolant and engine oil into a suitable container.



Oil Cooler Installation

- Installation is the reverse of removal. Note the following.
- Apply grease to the O-ring [A] before installation.



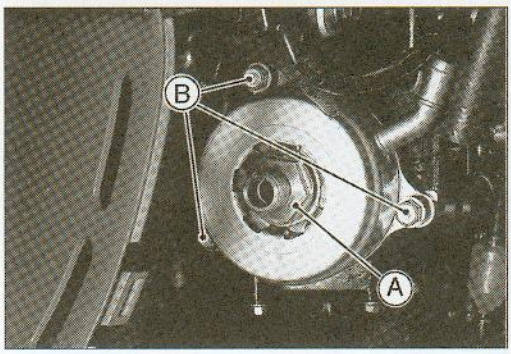
- Apply engine oil to the oil cooler passage bolt, and install the oil cooler temporarily with the bolt.
- Install the oil cooler mounting bolts evenly.
- Tighten the oil cooler passage bolt [A].

Torque - Oil Cooler Passage Bolt: 78 N·m (7.8 kg·m, 57 ft·lb)

- Tighten the oil cooler mounting bolts [B].

Torque - Oil Cooler Mounting Bolts: 25 N·m (2.5 kg·m, 18 ft·lb)

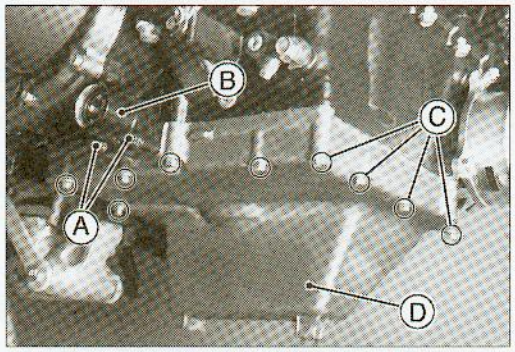
- Pour:
  Engine Oil (see Engine Oil Change)
  Coolant (see Cooling System chapter)



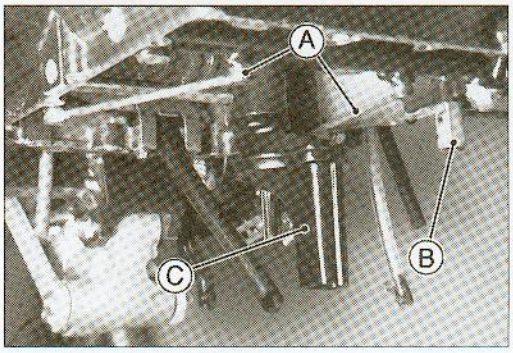
Oil Pan

Oil Pan Removal

- Remove:
  Engine Oil (drain, see Engine Oil Change)
  Muffler (see Engine Top End chapter)
- Unscrew the oil level gauge bolts [A] and pull out the level gauge [B].
- Unscrew the oil pan bolts [C] and remove the oil pan [D].



○ Remove the oil pipes [A], oil pressure relief valve [B] and oil screen [C] as necessary.

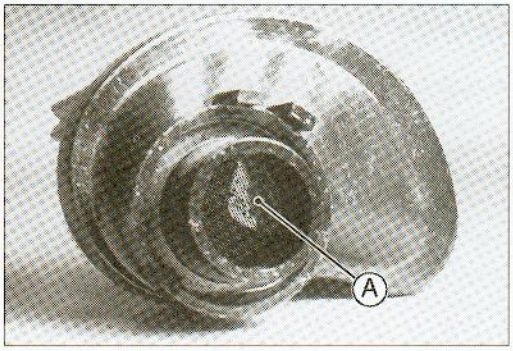


Oil Pan Installation

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

⚠WARNING

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

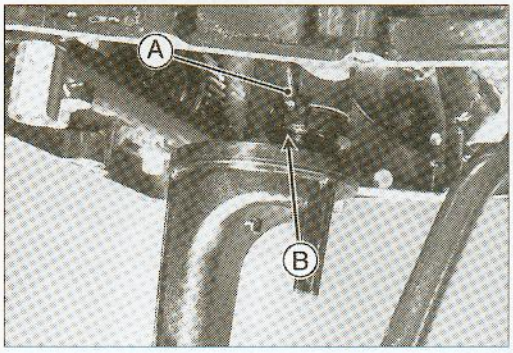


NOTE

○ *While cleaning the screen, check for any metal particles that might indicate internal engine damage.*
○ *Check the screen carefully for any damage: hole and broken wires.*

★ If the screen is damaged, replace it.

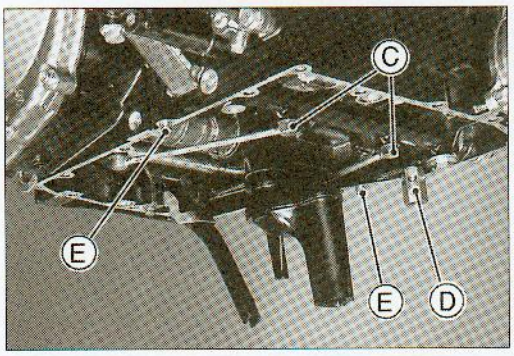
- Install the oil screen so that the crankcase rib [A] fits the slot [B] of the oil screen.



Oil Pan

- Apply grease to the O-rings on the oil pipes [C].
- Apply a non-permanent locking agent to the threads of the oil pressure relief valve [D], and tighten it.

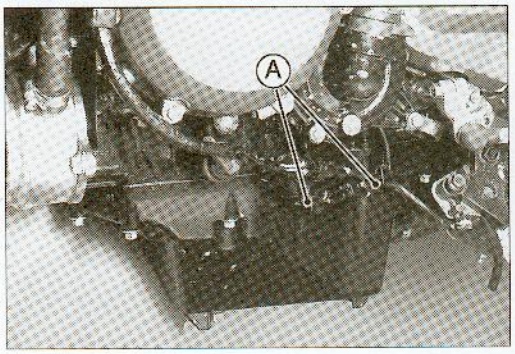
  Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kg·m, 11 ft·lb)
- Replace the oil pan gasket with a new one.
- Check that the pins [E] are in place.



- Tighten the oil pan bolts.
  Bolt with Clamp [A]

  Torque - Oil Pan Bolts: 15 N·m (1.5 kg·m, 11 ft·lb)
- Apply grease to the O-ring on the oil level gauge, and tighten it.

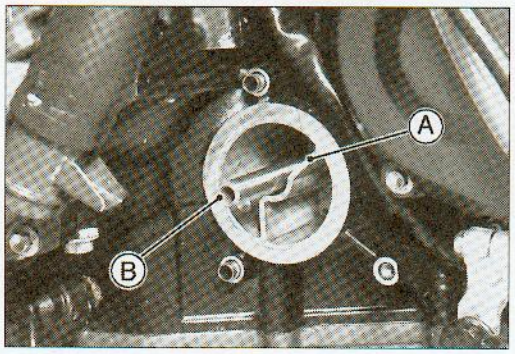
  Torque - Oil Level Gauge Bolts: 12 N·m (1.2 kg·m, 106 in·lb)



Oil Pump, Oil Pump Drive Gear and Relief Valve

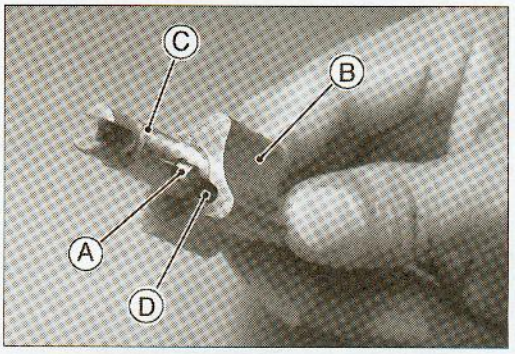
Oil Pump Removal

- Drain:
  Coolant (see Cooling System chapter)
  Engine Oil (see Engine Oil Change)
- Remove:
  Lower Fairing (see Frame chapter)
  Water Pump Cover (see Cooling System chapter)
  Impeller (see Cooling System chapter)
  Water Pump Housing (see Cooling System chapter)
- Pull out the oil pump cover [A].
- Pull out the oil (water) pump shaft [B] with inner rotor.
- Remove the outer rotor.

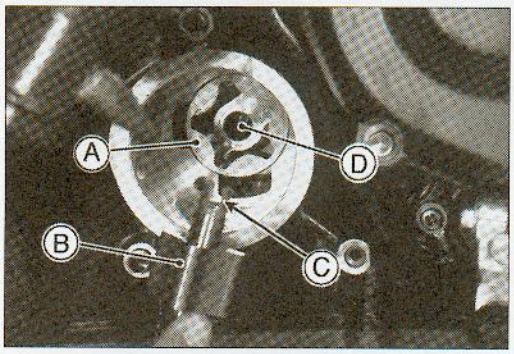


Oil Pump Installation

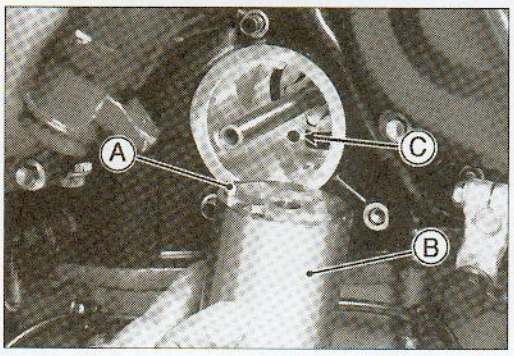
- Assemble the pin [A] , inner rotor [B] onto the oil (water) pump shaft [C].
- ○ Fit the pin into the slot [D] of the inner rotor.



- Install the outer rotor [A] into the crankcase.
- Insert the shaft assembly [B].
- ○ Turn the pump shaft so that the slot [C] in its shaft fits onto the projection [D] of the pump drive gear shaft.



- Fit the pin [A] of the oil pump cover [B] into the hole [C] in the crankcase.



- Install:
  Water Pump Housing (see Cooling System chapter)
  Impeller (see Cooling System chapter)
  Water Pump Cover (see Cooling System chapter)

Oil Pump Inspection

- Remove the oil pump parts.
- Visually inspect the oil pump outer and inner rotors and cover.

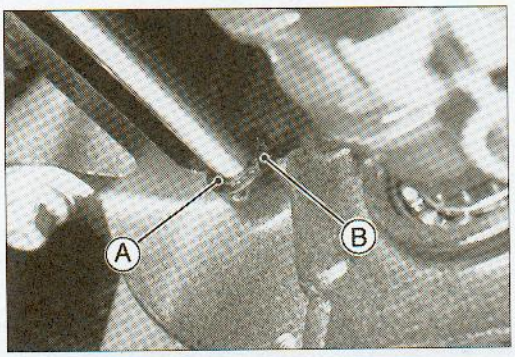
★ If there is any damage or uneven wear, replace the rotors and cover.

Oil Pump, Oil Pump Drive Gear and Relief Valve

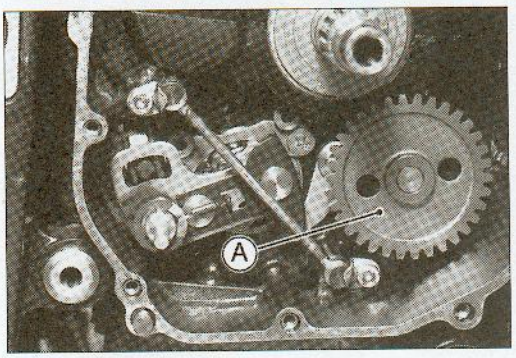
Oil Pump Drive Gear Removal

- Remove:
  Clutch (see Clutch chapter)
  Oil Pan (see Oil Pan Removal)
  Circlip [A] and Washer [B]

Special Tool - Circlip Pliers: 57001-154



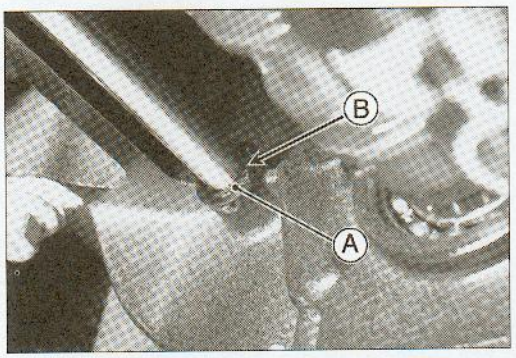
- Pull the oil pump drive gear [A] outside.



Oil Pump Drive Gear Installation

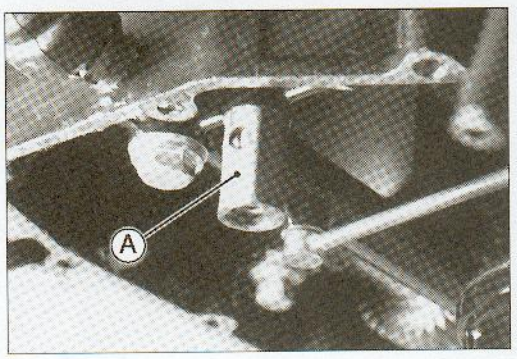
- Apply a engine oil to the oil pump gear shaft.
- Install the circlip [A] into the groove [B] of the oil pump drive gear shaft.

Special Tool - Circlip Pliers: 57001-154



Relief Valve Inspection

- Remove:
  Oil Pan (Oil Pan Removal)
  Relief Valve [A]



Oil Pump, Oil Pump Drive Gear and Relief Valve

● Check to see if the valve [A] sides 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

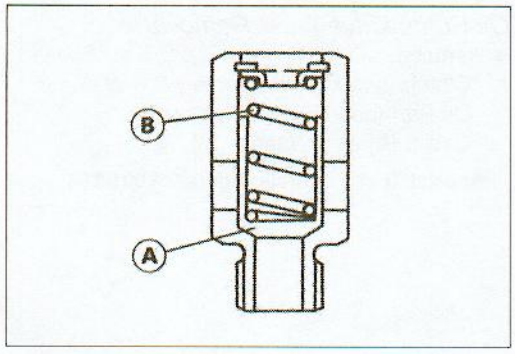
○ *Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

★ 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 relief valve in a well-ventilated area, and take care that threre 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 relief valve as an assembly. The relief valve is precision made with no allowance for replacement of individual parts.

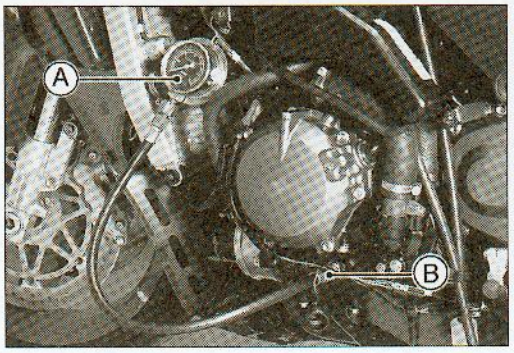


Oil Pressure Measurement

Oil Pressure Measurement

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

Special Tools - Oil Pressure Gauge, 10 kg/cm^2: 57001-164 [A]
Oil Pressure Gauge Adapter, PT 1/8: 57001-1033 [B]



- Run the engine at the specified speed, and read the oil pressure gauge.

★ If the oil pressure is significantly below the specification, inspect the oil pump and relief valve.

★ If the oil pump and relief valve are not at fault. inspect the rest of the lubrication system.

Oil Pressure
Standard: 160 kPa (1.6 kg/cm^2, 23 psi)
@4,000 r/min (rpm), oil temp. 90°C (194 °F)

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

⚠ WARNING

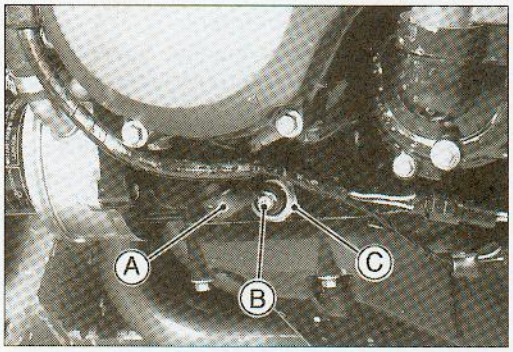
Take care against burns form hot engine oil that will drain through the oil passage when the gauge adapter is removed.

- Install the oil pressure switch (see Oil Pressure Switch Installation).

Oil Pressure Switch

Oil Pressure Switch Removal

- Remove:
  Left Lower Fairing (see Frame chapter)
  Engine Oil (drain, see Engine Oil Change)
  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.

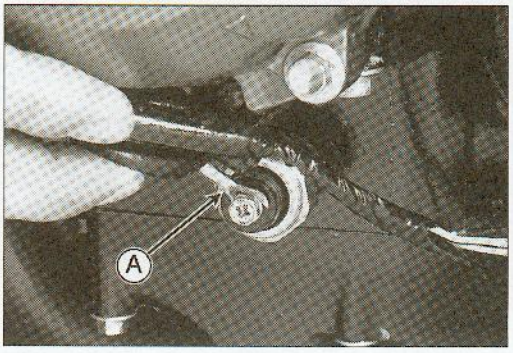
Sealant - Kawasaki Bond (Silicone Sealant): 56019-120

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

- Install the switch wire direction [A] upward.
- Tighten the terminal bolt.

Torque - Oil Pressure Switch Terminal Bolt: 1.5 N·m (0.15 kg·m, 13 in·lb)

- Apply high-temperature grease to the terminal.



Engine Removal/Installation

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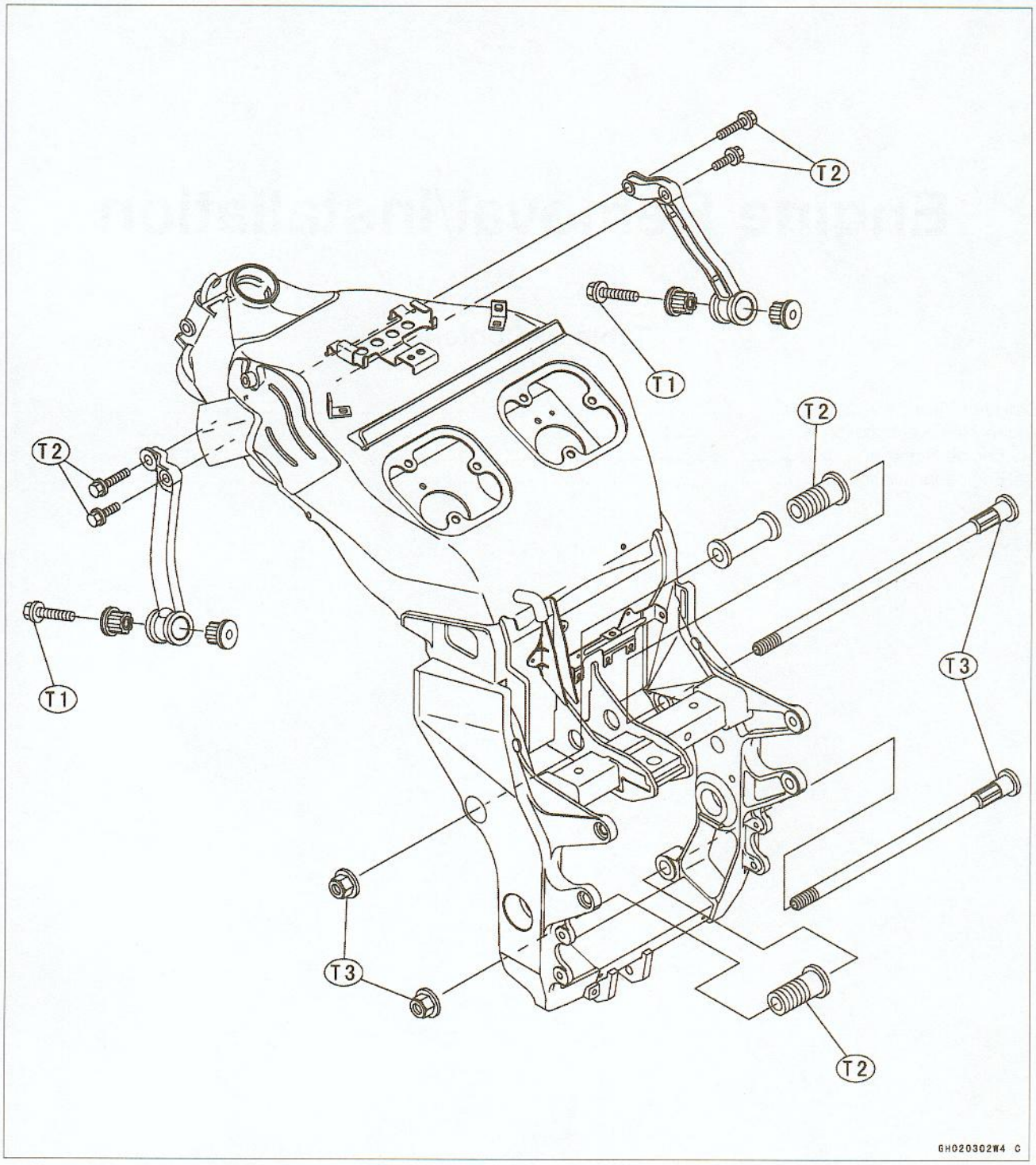
Exploded View

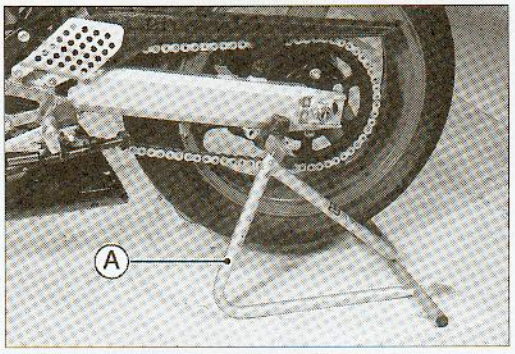


T1: 44 N·m (4.5 kg·m, 33 ft·lb)
T2: 25 N·m (2.5 kg·m, 18 ft·lb)
T3: 59 N·m (6.0 kg·m, 43 ft·lb)

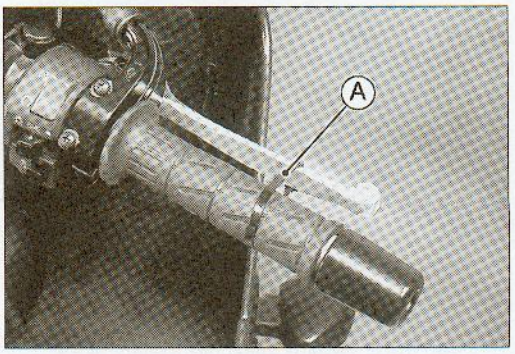
Engine Removal/Installation

Engine Removal

- Support the rear part of the swingarm with a stand [A].



- Squeeze the brake lever slowly and hold it with band [A].



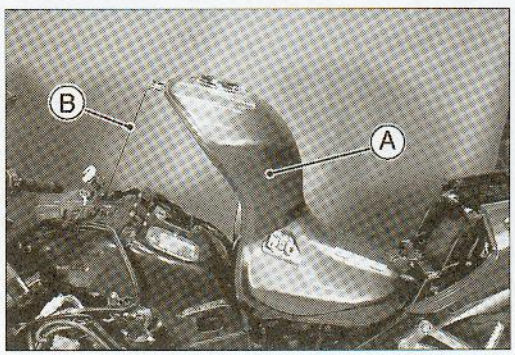
⚠ WARNING

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.

CAUTION

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damage.

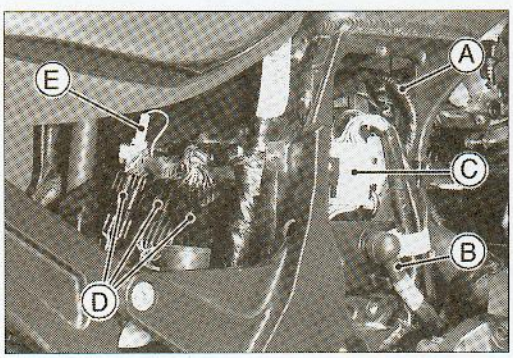
- Drain:
  Engine Oil (see Engine Lubrication System chapter)
  Coolant (see Cooling System chapter)
- Remove:
  Lower Fairings (see Frame chapter)
  Heat Protector
  Inner Fairings (see Frame chapter)
- Set up the fuel tank [A] with the supporting rod [B] (see Digital Fuel Injection System chapter).



CAUTION

Do not insert the supporting rod into the bolt hole, or the thread of the bolt hole could be damaged.

- Turn the ignition switch OFF.
- Remove:
  Battery Compartment Cover (see Electrical System chapter)
  Battery Ground Wire [A]
  Starter Motor Wire [B]
  Connector [C]
  Engine Sub Harness Connectors [D]
  Alternator Wire Connector [E]



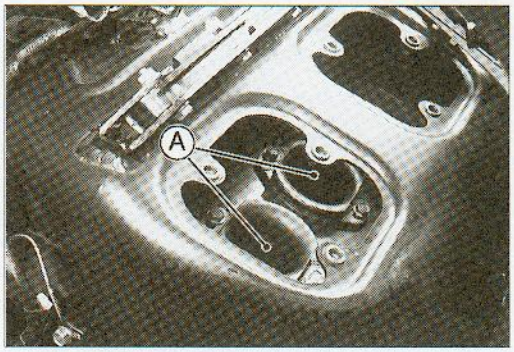
CAUTION

Do not disconnect the battery wires or any other electrical connections when the ignition switch is On, as this could damage the ECU. Never reverse the connections of the battery, as this could damage the ECU.

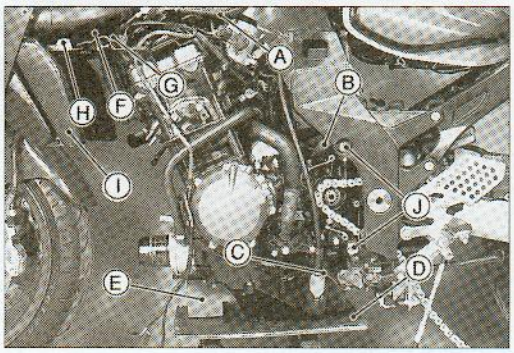
7-4 ENGINE REMOVAL/INSTALLATION

Engine Removal/Installation

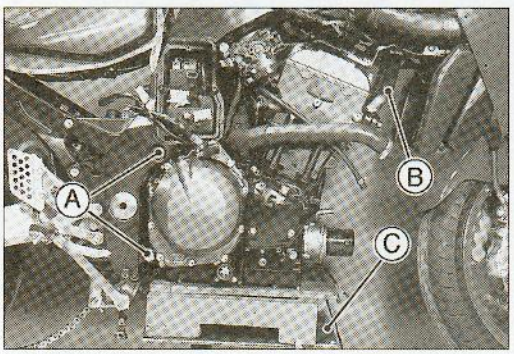
- Remove:
  Radiator (see Cooling System chapter)
  Muffler (see Engine Top End chapter)
  Fast Idle Cable Lower End
  Throttle Cable Lower Ends
  Air Cleaner Caps (see Digital Fuel Injection System chapter)
  Intake Ducts [A] (see Digital Fuel Injection System chapter)



- Remove:
  Coolant Reserve Tank (see Cooling System chapter)
  Shift Lever End
  Engine Sprocket Cover
  Engine Sprocket with Drive Chain (see Final Drive chapter)
  Fuel Supply Hose End at Fuel Tank (see Digital Fuel Injection System chapter)
  Fuel Return Hose End at Fuel Tank (see Digital Fuel Injection System chapter)
  Inlet Air Pressure Sensor [A]
  Breather Hose End [B]
  Sidestand Switch Wire Connector [C]
  Alternator Wire Connector (from Regulator Rectifier)
- ○ Be careful with the projection on the wire connector, and run it between the frame and rear fender front end.
- For California Model:
  Canister Purge Hose
  Vacuum Hose
- Support the engine with a suitable stand [D].
- ○ Put a plank [E] onto the suitable stand for engine balance.
- Remove:
  Engine Mounting Bracket Upper Bolt [F]
  Clamp [G]
  Screws [H]
  Resonator Tank [I]
  Engine Mounting Nuts [J]



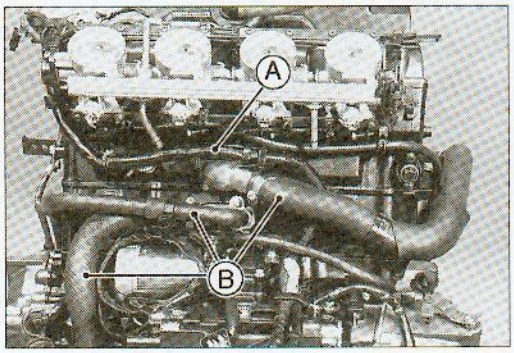
- Turn the engine mounting bolts [A] clockwise to make the gap between the engine (adjusting collar) and frame.
- Remvoe:
  Engine Mounting Bolts
  Collar
  Engine Mounting Brackets [B]
- Using the stand [C], take out the engine.



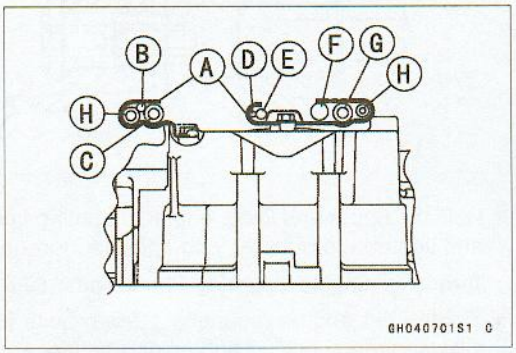
Engine Removal/Installation

Engine Installation

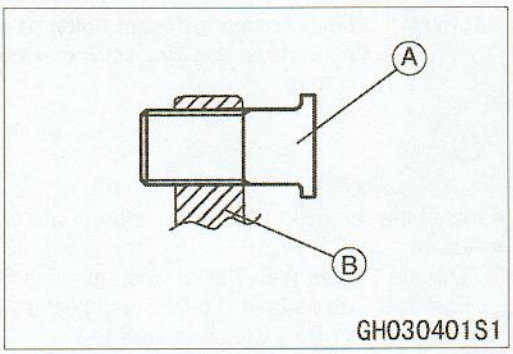
- Before the engine installing, install the following parts.
  Engine Sub Harness [A]
  Gear Position Switch
- Confirm:
  Coolant Hoses [B] Position



- Confirm the wire and hoses position as shown.
  Clamps [A]
  Alternator Wire (Black) [B]
  Fuel Return Hose [C]
  Alternator Wire (White) [D]
  Gear Position Switch Wire [E]
  Engine Sub Harness [F]
  Fuel Supply Hose [G]
  Tubes [H] (California Model)



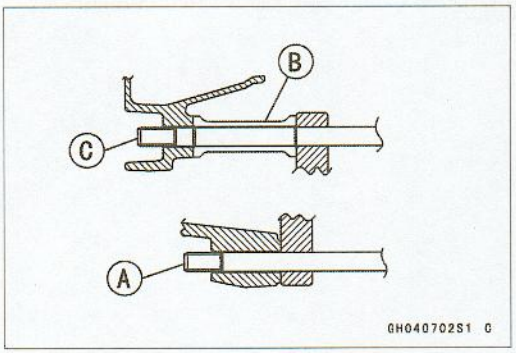
- Tighten the adjusting collars [A] fully by hand.
  Crankcase [B]



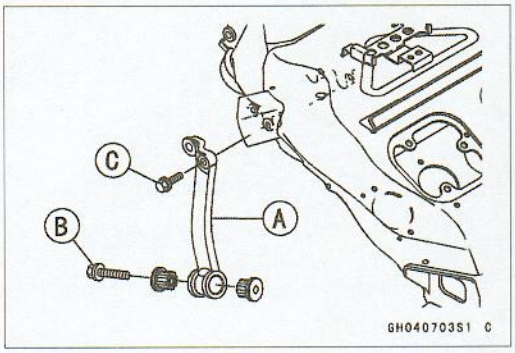
- Support the engine with a suitable stand.
- Hang the drive chain over the output shaft just before moving the engine into its final position in the frame.
- Insert the lower mounting bolt [A].
- Set the collar [B] and insert the upper mounting bolt [C].

NOTE

○ *Before inserting the engine mounting botls, verify that the fuel hoses (two hoses for california model only), alternator wire connectors, and engine sub harness connectors are clear an opening between the frame and engine.*



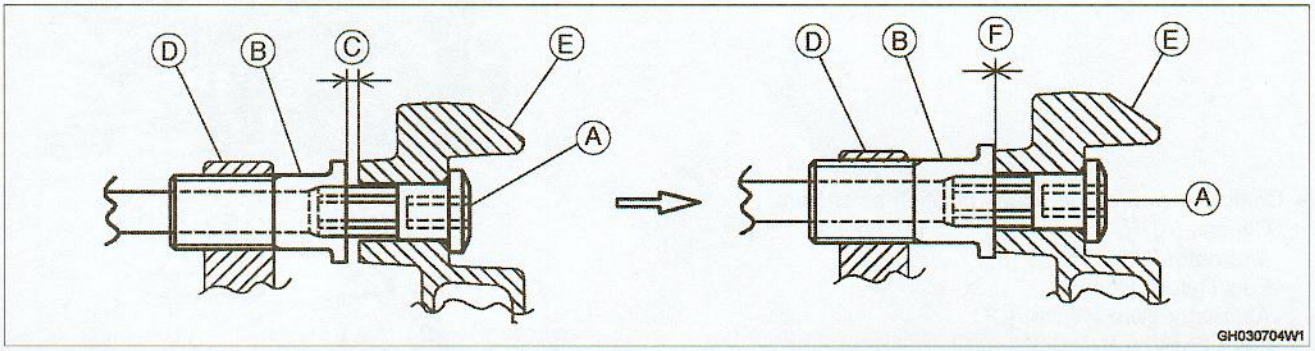
- Install the engine mounting brackets [A] temporarily.
  Engine Mounting 10 mm Bolts [B]
  Engine Mounting Bracket 8 mm Bolts [C]



Engine Removal/Installation

- Insert the mounting bolts [A] until they fit in the adjusting collars [B].
- Turn the mounting bolts counterclockwise with specified torque until the clearance [C] between the crankcase [D] and frame [E] come to zero mm [F].

Torque - Adjusting Collars: 25 N·m (2.5 kg·m, 18 ft·lb)

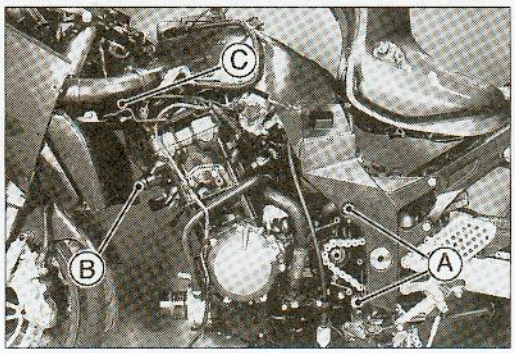


- Hold the upper and lower engine mounting bolts with an Allen wrench, and tighten the nuts [A] with specified torque.

Torque - Engine Mounting 12 mm Nuts: 59 N·m (6.0 kg·m, 43 ft·lb)

- Tighten the engine mounting 10 mm bolts [B] and bracket bolts [C] following the specified tightening sequence.

Torque - Engine Mounting 10 mm Bolts: 44 N·m (4.5 kg·m, 33 ft·lb)
Engine Mounting Bracket 8 mm Bolts 25 N·m (2.5 kg·m, 18 ft·lb)



- Install the removed parts (see appropriate chapters).
- Adjust:
  Throttle Cables (see Digital Fuel Injection System chapter)
  Fast Idle Cables (see Digital Fuel Injection System chapter)
  Clutch Cable (see Clutch chapter)
  Drive Chain (see Final Drive chapter)

Crankshaft/Transmission

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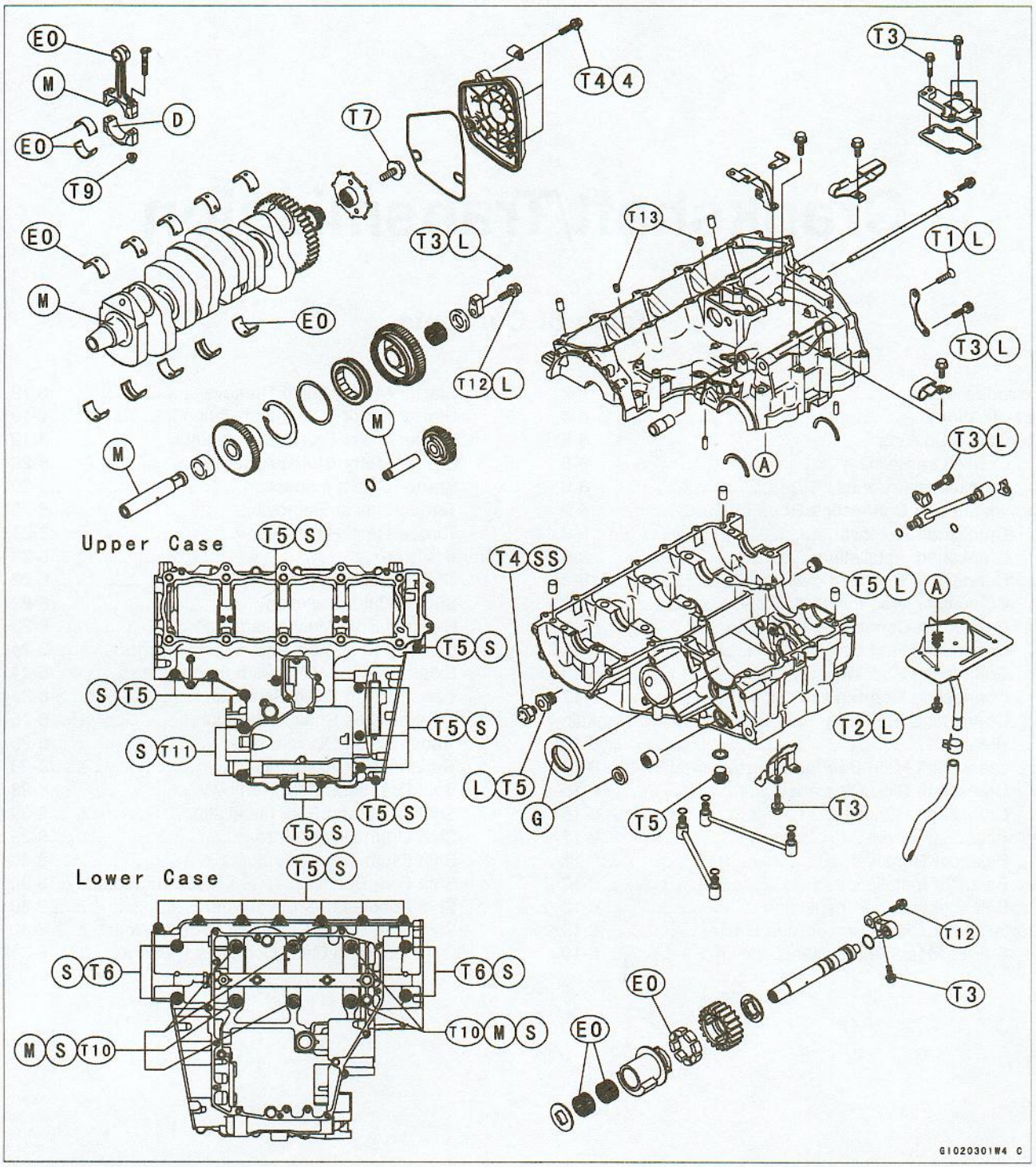
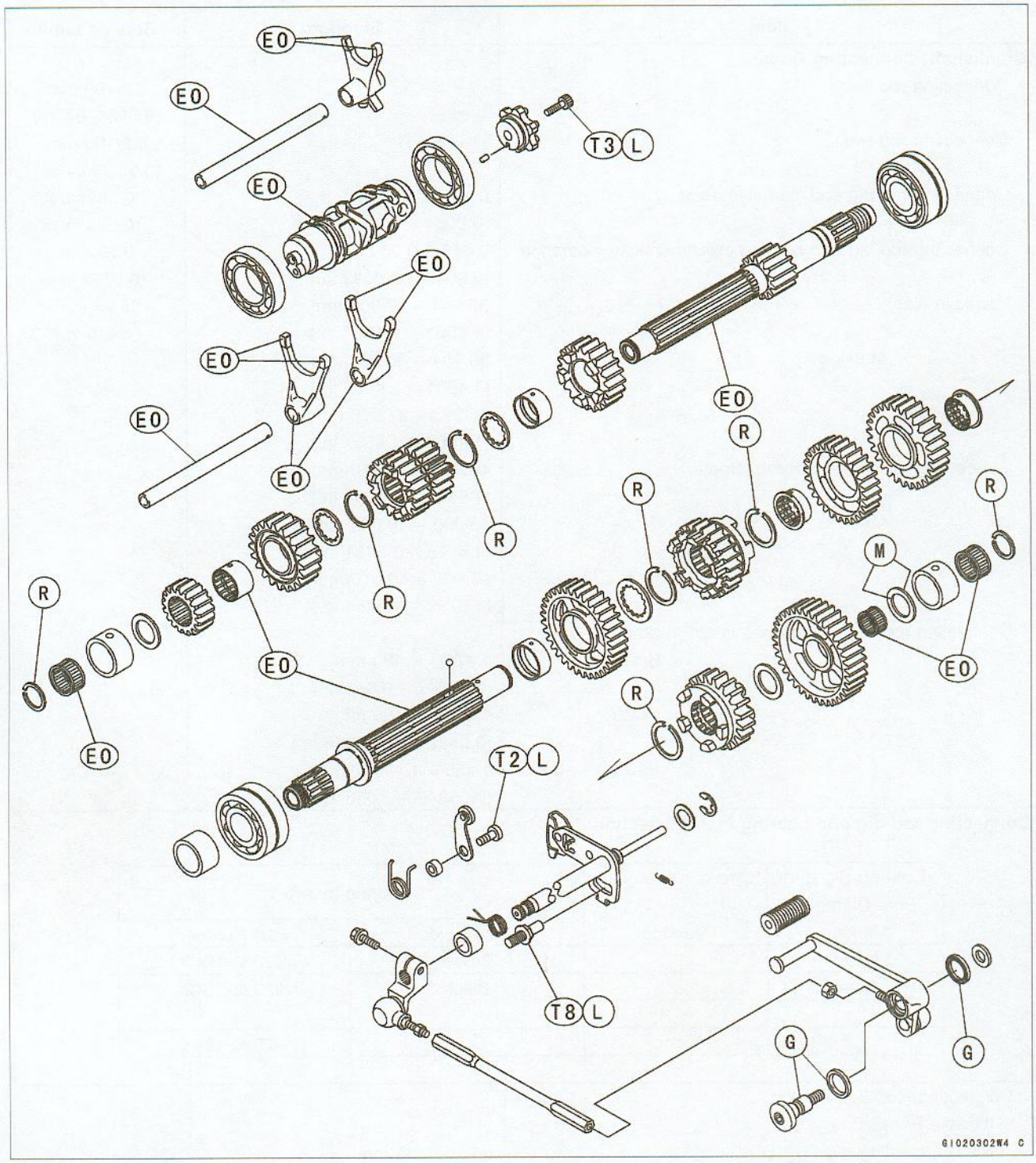


T1: 5.4 N·m (0.55 kg·m, 48 in·lb)
T2: 10 N·m (1.0 kg·m, 87 in·lb)
T3: 12 N·m (1.2 kg·m, 106 in·lb)
T4: 15 N·m (1.5 kg·m, 11 ft·lb)
T5: 20 N·m (2.0 kg·m, 14.5 ft·lb)
T6: 23 N·m (2.3 kg·m, 17 ft·lb)
T7: 39 N·m (4.0 kg·m, 29 ft·lb)
T8: 30 N·m (3.1 kg·m, 22 ft·lb)
T9: See the text.
T10: 45 N·m (4.5 kg·m, 33 ft·lb)
T11: 28 N·m (2.8 kg·m, 21 ft·lb)
T12: 25 N·m (2.5 kg·m, 18 ft·lb)
T13: 2.5 N·m (0.25 kg·m, 22 in·lb)

Exploded View



D: Do not apply any grease or oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
SS: Apply silicone sealant.
EO: Apply engine oil.
R: Replace parts.

Specifications

Item		Standard	Service Limit
Crankshaft, Connecting Rods:			
Connecting rod bend		- - -	0.2/100 mm (0.008/3.94 in.)
Connecting rod twist		- - -	0.2/100 mm (0.008/3.94 in.)
Connecting rod big end side clearance		0.13 ~ 0.38 mm (0.0051 ~ 0.015 in.)	0.58 mm (0.023 in.)
Connecting rod big end bearing insert/crankpin clearance		0.048 ~ 0.084 mm (0.0019 ~ 0.0033 in.)	0.10 mm (0.0039 in.)
Crankpin diameter:		36.984 ~ 37.000 mm (1.4561 ~ 1.4567 in.)	36.97 mm (1.456 in.)
Marking	None	36.984 ~ 36.992 mm (1.4561 ~ 1.4564 in.)	- - -
	○	36.993 ~ 37.000 mm (1.4564 ~ 1.4567 in.)	- - -
Connecting rod big end bore diameter:		40.000 ~ 40.016 mm (1.5748 ~ 1.5754 in.)	- - -
Marking	None	40.000 ~ 40.008 mm (1.5748 ~ 1.5751 in.)	- - -
	○	40.009 ~ 40.016 mm (1.5752 ~ 1.5754 in.)	- - -
Connecting rod big end bearing insert thickness:			
	Brown	1.475 ~ 1.480 mm (0.05807 ~ 0.05827 in.)	- - -
	Black	1.480 ~ 1.485 mm (0.05827 ~ 0.05846 in.)	- - -
	Blue	1.485 ~ 1.490 mm (0.05846 ~ 0.05866 in.)	- - -

Connecting rod big end bearing insert selection:

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert Size Color	Bearing Insert Part Number
None	○	Brown	92028-1943
None	None	Black	92028-1942
○	○		
○	None	Blue	92028-1941

Connecting Rod Bolt Stretch (Usable Range)		
New connecting rod	0.25 ~ 0.34 mm (0.0094 ~ 0.014 in.)	- - -
Used connecting rod	0.20 ~ 0.32 mm (0.0079 ~ 0.013 in.)	- - -
Crankshaft side clearance	0.05 ~ 0.20 mm (0.002 ~ 0.00787 in.)	0.40 mm (0.016 in.)
Crankshaft runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.002 in.)
Crankshaft main bearing insert/journal clearance	0.031 ~ 0.063 mm (0.0012 ~ 0.0025 in.)	0.07 mm (0.003 in.)

Specifications

Item		Standard	Service Limit
Crankshaft main journal diameter:		36.984 ~ 37.000 mm (1.4561 ~ 1.4567 in.)	36.96 mm (1.455 in.)
Marking	None	36.984 ~ 36.992 mm (1.4561 ~1.45637 in.)	- - -
	1	36.993 ~ 37.000 mm (1.45641 ~ 1.4567 in.)	- - -
Crankcase main bearing bore diameter:		40.000 ~ 40.016 mm (1.5748 ~ 1.5754 in.)	- - -
Marking	○	40.000 ~ 40.008 mm (1.5748 ~1.5751 in.)	- - -
	None	40.009 ~ 40.016 mm (1.57515 ~ 1.5754 in.)	- - -
Crankshaft main bearing insert thickness:			
	Brown	1.490 ~ 1.494 mm (0.05866 ~ 0.05882 in.)	- - -
	Black	1.494 ~ 1.498 mm (0.05882 ~ 0.05898 in.)	- - -
	Blue	1.498 ~ 1.502 mm (0.05898 ~ 0.05913 in.)	- - -

Crankshaft main bearing insert selection:

Crankcase Main Bearing Bore Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92028-1927	1, 5
			92028-1985	3
			92028-1933	2, 4
○	None	Black	92028-1926	1, 5
None	1		92028-1984	3
			92028-1932	2, 4
None	None	Blue	92028-1925	1, 5
			92028-1983	3
			92028-1931	2, 4

*The bearing inserts for Nos. 2, 3 and 4 journals have an oil groove, respectively.

Transmission:		
Shift fork ear thickness	5.9 ~ 6.0 mm (0.23 ~ 0.24 in.)	5.8 mm (0.23 in.)
Gear shift fork groove width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.25 mm (0.246 in.)
Shift fork guide pin diameter	6.9 ~ 7.0 mm (0.27 ~ 0.28 in.)	6.8 mm (0.27 in.)
Shift drum groove width	7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)	7.3 mm (0.29 in.)

Special Tools - Outside Circlip Pliers: 57001-144
Bearing Puller: 57001–135
Bearing Puller Adapter: 57001–317
Steering Stem Bearing Driver: 57001–137

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120
Kawasaki Bond (Silicone Sealant): 92104–1062
Three Bond 1207B

Crankcase Splitting

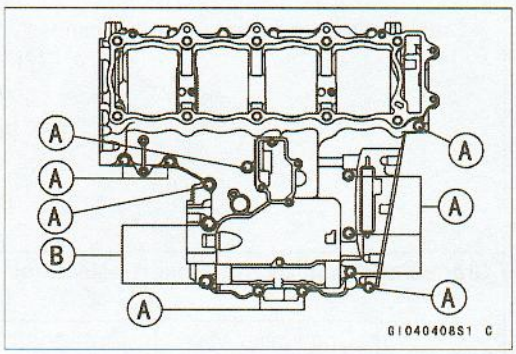
Crankcase Splitting

- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:
  Crankshaft Sensor (see Electrical System chapter)
  Clutch (see Clutch chapter)
  External Shift Mechanism (see External Shift Mechanism Removal)
  Starter Motor (see Electrical System chapter)
  Oil Pump (see Engine Lubrication System chapter)
  Alternator Rotor (see Electrical System chapter)
  Oil Filter (see Engine Lubrication System chapter)
  Oil Cooler (see Engine Lubrication System chapter)

★ If the crankshaft is to be removed, remove the pistons (see Engine Top End chapter).

- Remove the upper crankcase bolts.

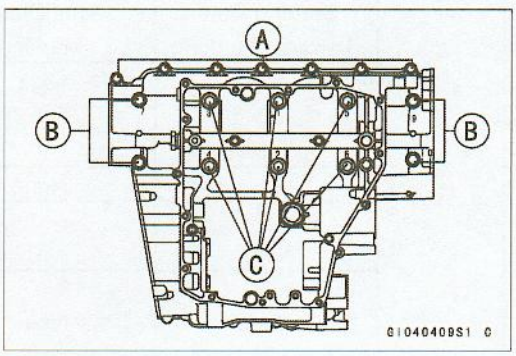
○ First loosen the 7 mm bolts.
  7 mm Bolts [A]
  8 mm Bolts [B]



- Remove the oil pan, relief valve, oil screen and oil pipes (see Engine Lubrication System chapter).
- Remove the lower crankcase bolts.

○ First loosen the 7 mm bolts.
  7 mm Bolts [A]
  8 mm Bolts [B]
  10 mm Bolts [B]

- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase. Take care not to damage the crankcase.



Crankcase Assembly

CAUTION

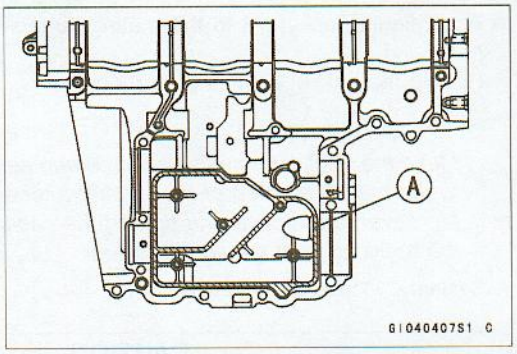
The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

- With a high-flash point solvent, clean off the mating surfaces of the crankcases halves and wipe dry.
- Using compressed air, blow out the oil passages in the crankcase halves.

Crankcase Splitting

- Apply silicone sealant to the breather plate mating surface [A] 1 to 1.5 mm thick, and then install the breather plate.

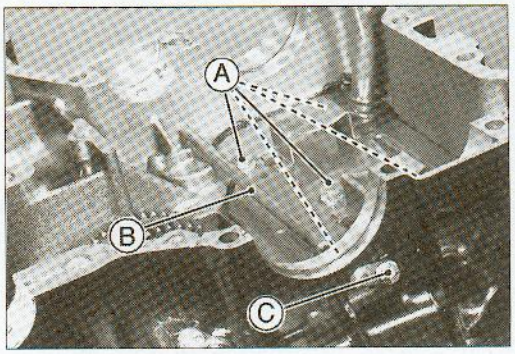
  Sealant - Kawasaki Bond (Silicone Sealant): 56019-120



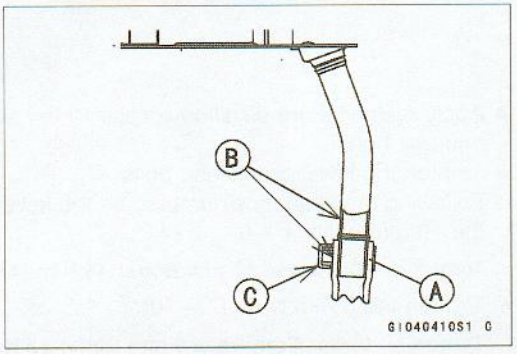
- Apply a non-permanent locking agent to the threads and tighten the bolts [A].

  Torque - Breather Plate Bolts: 10 N·m (1.0 kg·m, 87 in·lb)

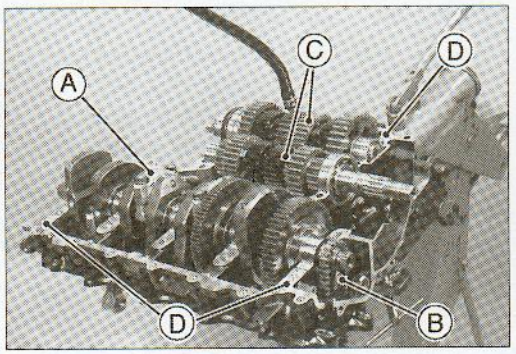
- Insert the oil pipe [B] completely and tighten the bolt [C].



- Install the breathe tube [A].
  - Align the white paint marks [B].
  - Install the clamp so that its head [C] side the inward.



- Install:
  Starter Motor Clutch (see this chapter)
  Crankshaft and Connecting Rods [A]
  Camshaft Chain [B]
  Transmission Shaft and Gears [C]
  Dowel Pins [D]
  Balancer (see this chapter)
  Shift Drum (see this chapter)
  Shift Forks and Shift Rods (see this chapter)
- Before fitting the lower case on the upper case, check the following.
  - Be sure to hang the camshaft chain on the crankshaft.
  - Check to see that the shift drum and transmission gears are in the neutral position.
  - Position the crankshaft at #1, 4 position TDC.



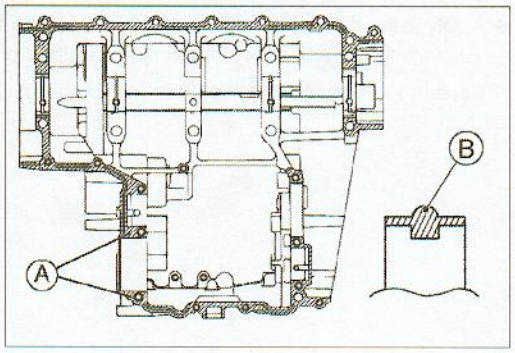
Crankcase Splitting

- Apply liquid gasket [A] to the mating surface of the lower crankcase half.
  - Pile up the gasket [B] to slot portions.

NOTE

- *Make the application finish within 5 minutes when the liquid gasket to the mating surface of the lower crankcase half is applied.*
- *Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.*

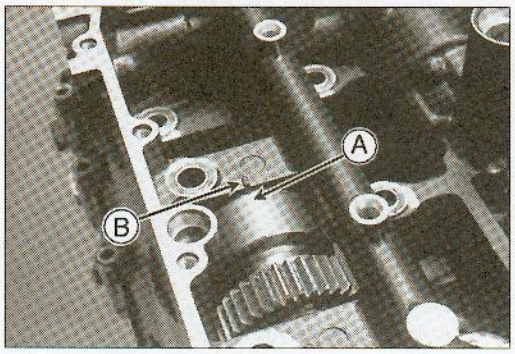
Sealant - Three Bond 1207B



CAUTION

Do not apply liquid gasket around the crankshaft main bearing inserts, and oil passage holes.

- Position the crankshaft at #1,4 position TDC (see Engine Top End chapter).
- Hold the balancer so that the punch mark [A] on the balancer weight aligns with the projection [B] of the lower crankcase.
- Fit the lower crankcase to the upper crankcase.



- Apply molybdenum disulfide grease to the seating surface of the 10 mm bolt heads.
- Tighten the lower crankcase bolts.
  - Following the sequence numbers on the lower crankcase half, tighten the 10 mm bolts [1 ~ 6].

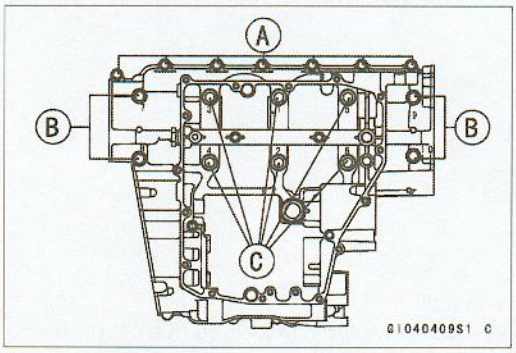
Torque - Crankcase 10 mm Bolts: 45 N·m (4.5 kg·m, 33 ft·lb)

  - Tighten the 8 mm bolts [7 ~ 10].

Torque - Lower Crankcase 8 mm Bolts: 23 N·m (2.3 kg·m, 17 ft·lb)

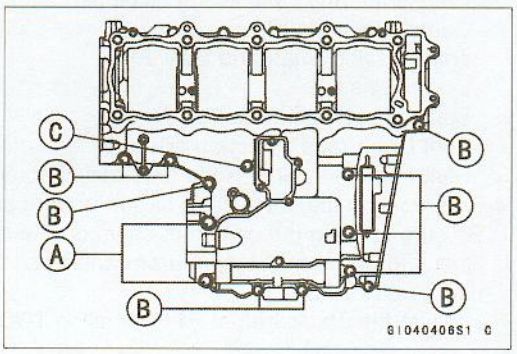
  - Tighten the 7 mm bolts [A].

Torque - Crankcase 7 mm Bolts: 20 N·m (2.0 kg·m, 14.5 ft·lb)



- Put the 8 mm bolts [A], 7 mm bolts [B], and the 7 mm bolts with the washer [C] into the upper crankcase half as shown in the figure, tighten the 8 mm bolts first, then the other bolts.

Torque - Upper Crankcase 8 mm Bolts: 28 N·m (2.8 kg·m, 21 ft·lb)
Crankcase 7 mm Bolts: 20 N·m (2.0 kg·m, 14.5 ft·lb)



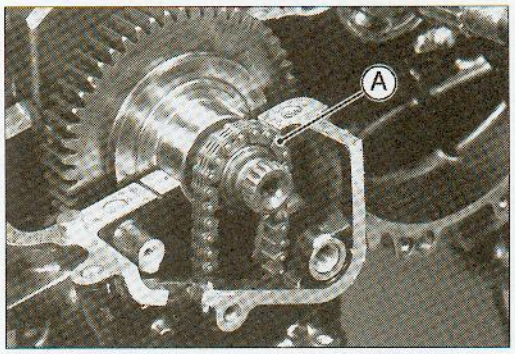
- After tightening all crankcase bolts, check the following items.
  - Crankshaft and transmission shafts turn freely.
  - While spinning the output shaft, gears shift smoothly from the 1st to 6th gear, and 6th to 1st.
  - When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.

Crankshaft and Connecting Rods

Crankshaft Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the crankshaft.

Crankshaft Installation

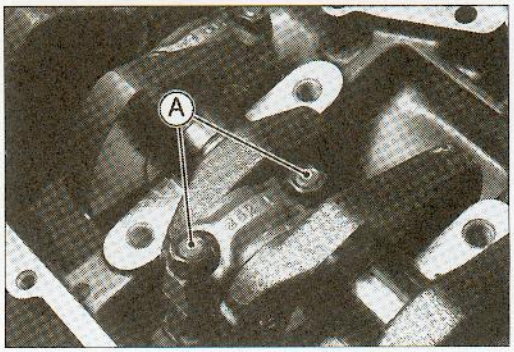


CAUTION

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

- Apply engine oil to the crankshaft main bearing inserts.
- Install the crankshaft with the camshaft chain [A] hanging on it.
- Assemble the crankcase (see Crankcase Assembly).

Connecting Rod Removal



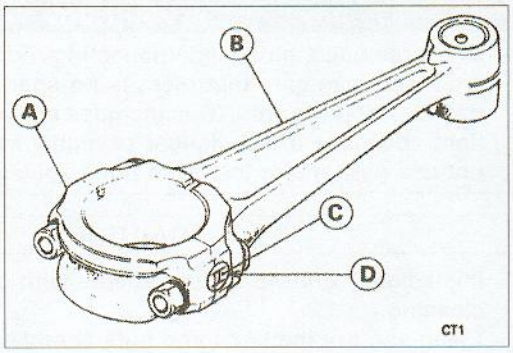
- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod nuts [A].
- Remove the crankshaft.

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.

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 [D]

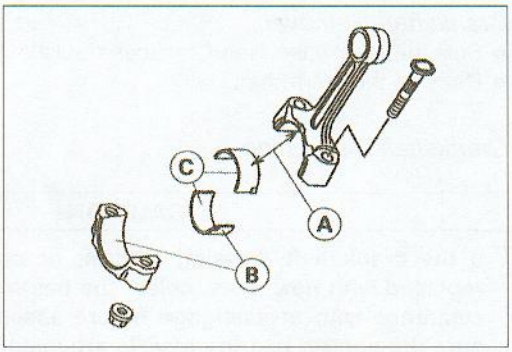
★ If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage before assembling engine to be sure the correct bearing inserts are installed.

CAUTION

The connecting rod bolts are designed to stretch when tightened. Never reuse them. See the table below for correct bolt and nut usage.

Crankshaft and Connecting Rods

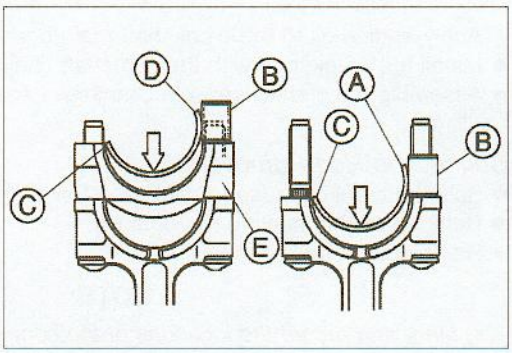
- Apply engine oil to the inner surface of upper and lower bearing inserts.
  Apply molybdenum disulfide grease [A].
  Do not apply grease and oil [B].
  Apply engine oil [C].



CAUTION

Do not apply grease to the inner surface of the upper or lower bearing inserts or to the outer surface of the lower bearing insert.

- Install the bearing insert as shown.
  Connecting Rod Side Bearing Insert [A]
  Dwel Pin [B]
  Claw Side [C]
  Cap Side Bearing Insert [D]
  Connecting Rod Cap [E]



- Replace the connecting rod big end bolts and nuts with new ones.
- Be sure to clean the bolts, nuts, and connecting rods thoroughly with high-flash point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

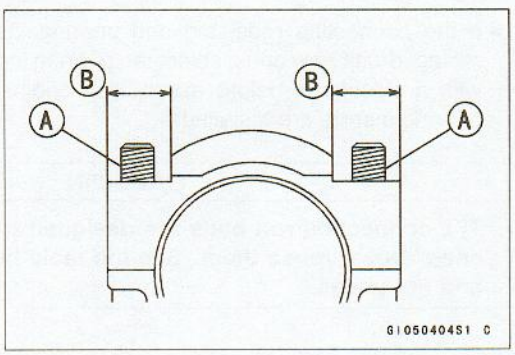
⚠ WARNING

Clean the bolts, nuts, and connecting rods 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 them.

CAUTION

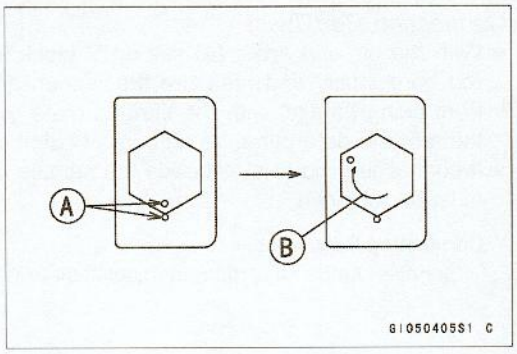
Immediately dry the bolts and nuts with compressed air after cleaning.
Clean and dry the bolts and nuts completely.

- Apply a small amount of engine oil to the threads [A] and seating surface [B] of the connecting rod nuts.



Crankshaft and Connecting Rods

- First, tighten the nuts to the specified torque. See the table below.
- Next, tighten the nuts by **120°** more.
- ○ Mark [A] the connecting rod big end caps and nuts so that nuts can be turned 120° [B] properly.
- ○ Tighten the hexagon nut by 2 corners.



Connecting Rod Assy	Bolt, Nut	Torque + Angle N·m (kg·m, ft·lb)
New	Use the bolts attached to new con-rod.	22 (2.2, 16) + 120°
	Another new bolts and nuts	22 (2.2, 16) + 120°
Used	Replace the bolts and nuts with new ones	22 (2.2, 16) + 120°

CAUTION

Since the friction force of the seating surface and thread portion of new nuts is different from that of used ones, the nut tightening torque should be changed as specified in the above table.
Be careful not to overtighten the nuts.

Crankshaft/Connecting Rod Cleaning

⚠ WARNING

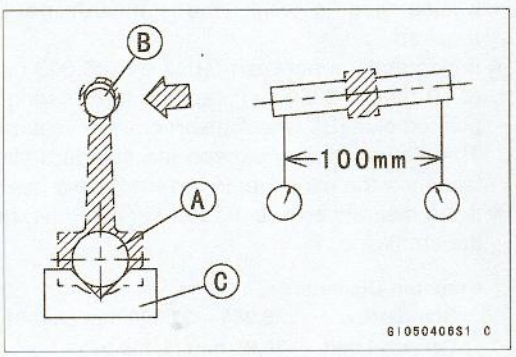
Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. This includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents to clean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

- 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 least 100 long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on V blocks [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 length to determine the amount of connecting rod bend.

★ If connecting rod bend exceeds the service limit, the connecting rod must be replaced.



Connecting Rod Bend
Service Limit: 0.2/100 mm (0.008/3.94 in.)

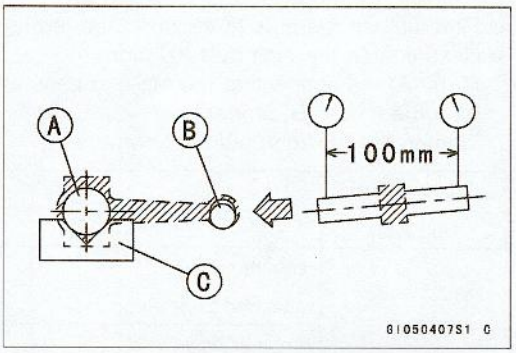
Crankshaft and Connecting Rods

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 parallel with the surface plate over a 100 mm length of the arbor to determine the amount of connecting rod twist.

★ If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist
Service Limit: 0.2/100 mm (0.008/3.94 in.)



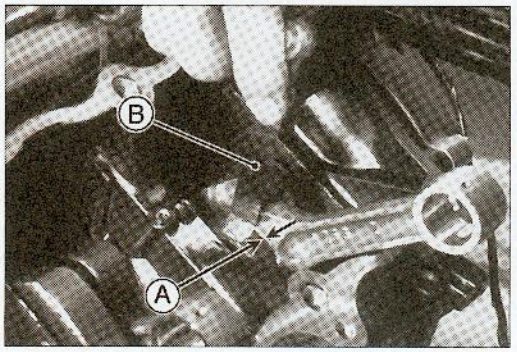
Connecting Rod Big End Side Clearance

- Measure 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 (0.0051 ~ 0.015 in.)
Service Limit: 0.58 mm (0.023 in.)

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



Connecting Rod Big End Bearing Insert/Crankpin Wear

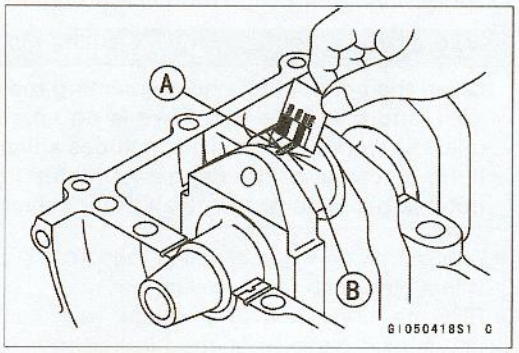
- Using a plastigage [A], measure the bearing insert/crankpin [B] clearance.

NOTE

○ *Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).*

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

Connecting Rod Big End Bearing Insert/Crankpin Clearance
Standard: 0.048 ~ 0.084 mm (0.0019 ~ 0.0033 in.)
Service Limit: 0.10 mm (0.0039 in.)

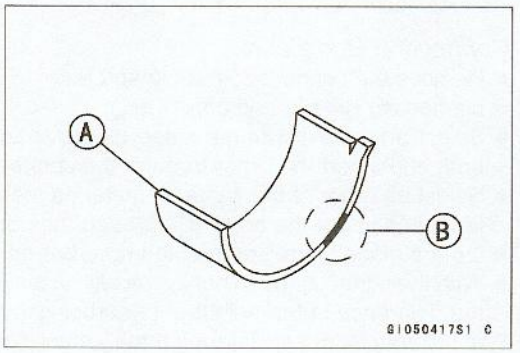


★ If clearance is within the standard, no bearing replacement is required.

★ If clearance is between 0.085 mm (0.0033 in.) and the service limit (0.10 mm, 0.0039 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★ If the clearance exceeds the service limit, measure the diameter of the crankpins.

Crankpin Diameter
Standard: 36.984 ~ 37.000 mm (1.4561 ~ 1.4567 in.)
Service Limit: 36.97 mm (1.456 in.)



Crankshaft and Connecting Rods

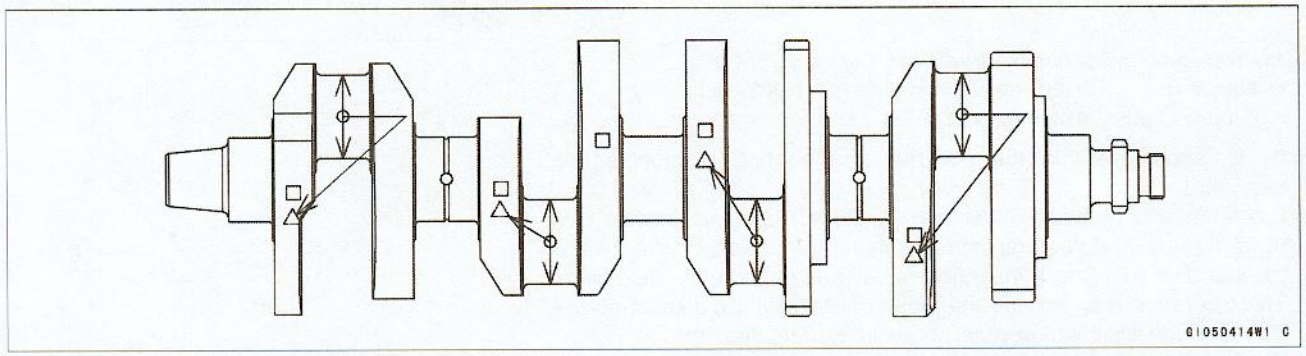
★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.

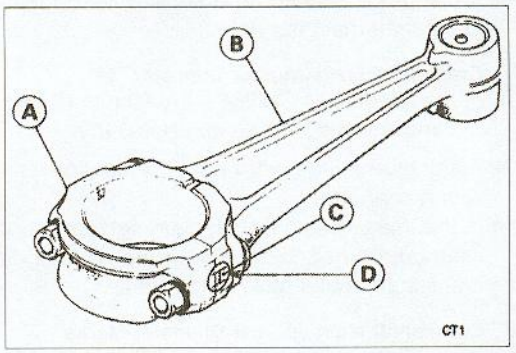
★ If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankpin Diameter Marks

None	**36.984 ~ 36.992 mm (1.4561 ~ 1.4564 in.)**
○	**36.993 ~ 37.000 mm (1.4564 ~ 1.4567 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.
  Big End Cap [A]
  Connecting Rod [B]
  Weight Mark [C]: A letter of the alphabet
  Bore Diameter Mark (Around Weight Mark) [D]: "○" or no mark.

NOTE

○ *Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).*

○ *The mark already on the big end should almost coincide with the measurement.*

Connecting Rod Big End Bore Diameter Marks

None	**40.000 mm ~ 40.008 mm (1.5748 ~ 1.5751 in.)**
○	**40.009 ~ 40.016 mm (1.5752 ~ 1.5754 in.)**

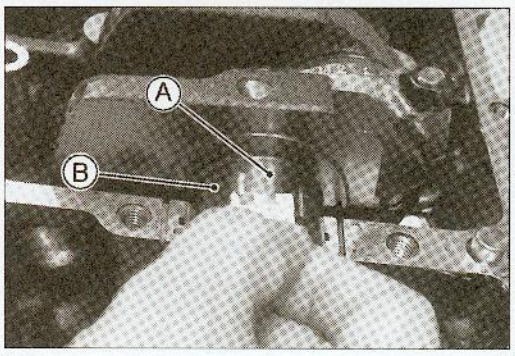
- Select the proper bearing insert in accordance with the combination of the connecting rod and crankshaft coding.
- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028–1943
None	None	Black	92028–1942
○	○		
○	None	Blue	92028–1941

Crankshaft and Connecting Rods

Crankshaft Main Bearing Insert/Journal Wear

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



NOTE

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

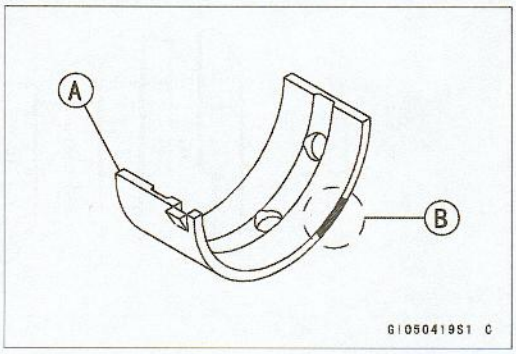
Crankshaft Main Bearing Insert/Journal Clearance

Standard:	**0.031 ~ 0.063 mm (0.0012 ~ 0.0025 in.)**
Service Limit:	**0.07 mm (0.0031 in.)**

★ If clearance is within the standard, no bearing replacement is required.

★ If clearance is between 0.064 mm (0.025 in.) and the service limit (0.07 mm, 0.0031 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★ If clearance exceeds the service limit, measure the diameter of the crankshaft main journal.



Crankshaft Main Journal Diameter

Standard:	**36.984 ~ 37.000 mm (1.4561 ~ 1.4567 in.)**
Service Limit:	**36.96 mm (1.455 in.)**

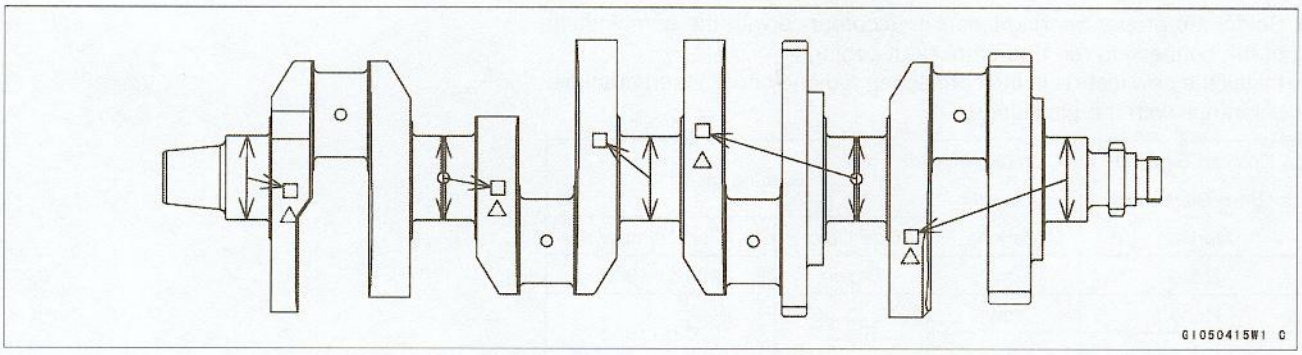
★ If any journal has worn past the service limit, replace the crankshaft with a new one.

★ 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.

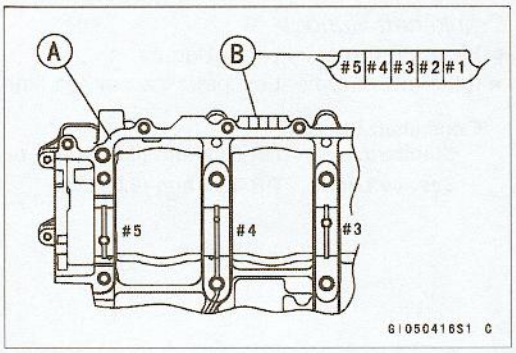
Crankshaft Main Journal Diameter Marks

None	**36.984 ~ 36.992 mm (1.4561 ~ 1.45637 in.)**
1	**36.993 ~ 37.000 mm (1.45641 ~ 1.4567 in.)**

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



Crankshaft and Connecting Rods



- Measure the main bearing bore diameter, and mark [B] the upper crankcase half [A] in accordance with the bore diameter.
  ○: 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

○	**40.000 ~ 40.008 mm (1.5748 ~ 1.5751 in.)**
None	**40.009 ~ 40.016 mm (1.57515 ~ 1.5754 in.)**

- Select the proper bearing insert in accordance with the combination of the crankcase and crankshaft coding.
- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage.

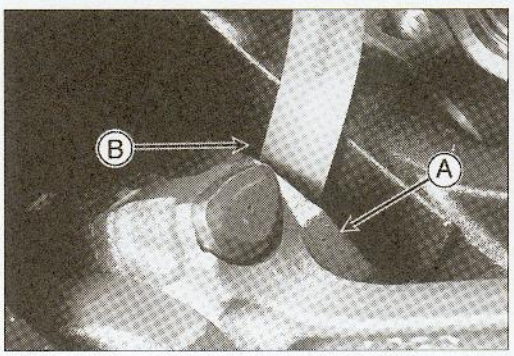
Crankcase Main Bearing Bore Diameter Marking	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92028-1927	1, 5
			92028-1985	3
			92028-1933	2, 4
○	None	Black	92028-1926	1, 5
			92028-1984	3
None	1		92028-1932	2, 4
None	None	Blue	92028-1925	1, 5
			92028-1983	3
			92028-1931	2, 4

*The bearing inserts for Nos. 2, 3 and 4 journals have an oil groove, respectively.

Crankshaft Side Clearance

- Situate the motorcycle so that it is perpendicular to the ground.
- Insert a thickness gauge between the crankcase main bearing [A] and the crank web [B] at the No. 2 journal to determine clearance.

★If the clearance exceeds the service limit, replace the crankcase halves as a set.



CAUTION

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 ~ 0.0083 in.)**

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

Crankshaft and Connecting Rods

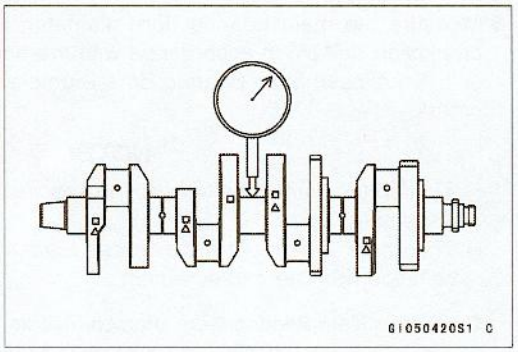
Crankshaft Runout

● Measure the crankshaft runout.

★ If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

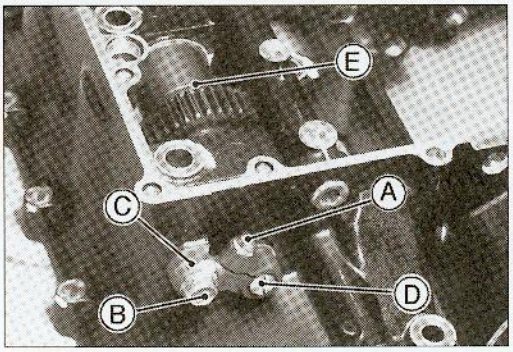
Standard:	**TIR 0.02 mm (0.0008 in.) or less**
Service Limit:	**TIR 0.05 mm (0.002 in.)**



Balancer

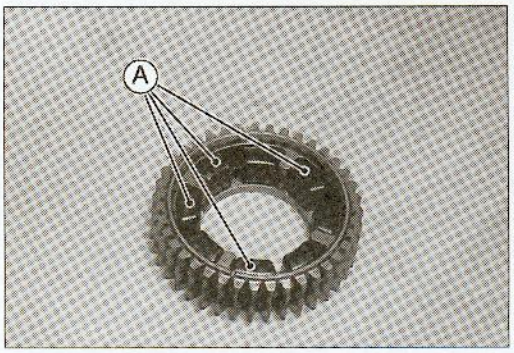
Balancer Removal

- Remove:
  Crankshaft
  Driveshaft
- Split the crankcase (see this chapter).
- Unscrew the balancer shaft clamp bolt [A], and balancer shaft clamp lever bolt [B], and pull off the clamp lever [C].
- Pull the balancer shaft [D] out of the crankcase. The balancer weight and gear assembly [E] come off with the needle bearings and copper washers.

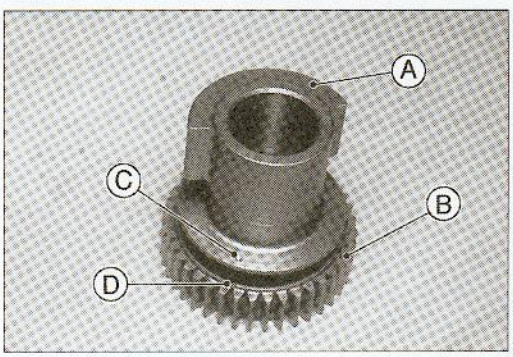


Balancer Installation

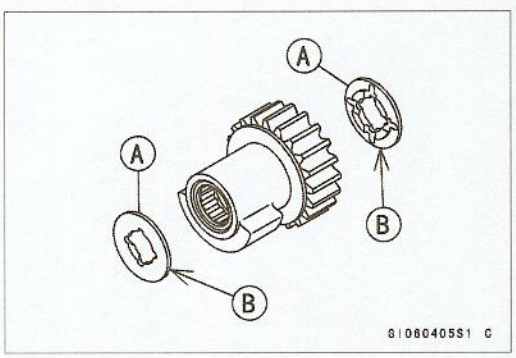
- Check that the rubber dampers [A] are in place as shown.



- Apply engine oil to the damper contact portions of the balancer weight.
- Install the balancer weight [A] into the gear [B].
- ○ Align the mark [C] of the balancer weight to the groove [D] of the gear.



- Apply engine oil to the needle bearings. Insert the needle bearings.
- Fit the copper washers [A] on both ends of the weight and gear assembly. The projected sides [B] face inward.
- Set the weight and gear assembly to the Lower Crankcase.

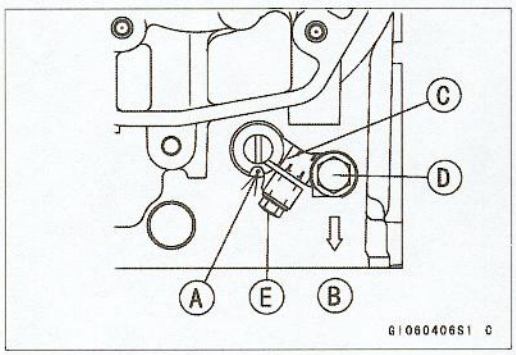


- Apply engine oil to the O-ring of the balancer shaft.
- Insert the balancer shaft.
- Turn the balancer shaft, so the punch mark [A] is toward the oil pan [B]. And then install the clamp lever [C].
- Apply a non-permanent locking agent to the threads of the balancer shaft lever bolt [D] and tighten it.

  Torque - Balancer Shaft Clamp Lever Bolt: 25 N·m (2.5 kg·m, 18 ft·lb)

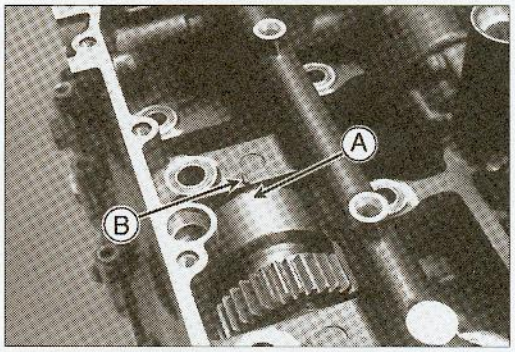
- Tighten the clamp bolt [E].

  Torque - Balancer Shaft Clamp Bolt: 12 N·m (1.2 kg·m, 106 in·lb)



Balancer

- Position the crankshaft at #1, 4 position TDC.
- Hold the balancer so that the punch mark [A] on the balancer weight aligns with the projection [B] of the lower crankcase.
- Fit the lower crankcase to the upper crankcase.



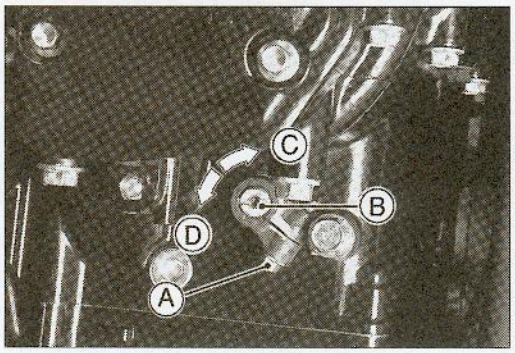
- Adjust the balancer gear backlash with the engine idling. The amount of backlash can be changed by turning the balancer shaft which has eccentric journals.

○ Start the engine and let it idle.

○ Loosen the clamp bolt [A] and turn the balancer shaft [B] clockwise [C] until the balancer gear makes a whining sound.

○ Turn the shaft counter-clockwise [D] until the balancer gear whining sound disappears and tighten the clamp bolt.

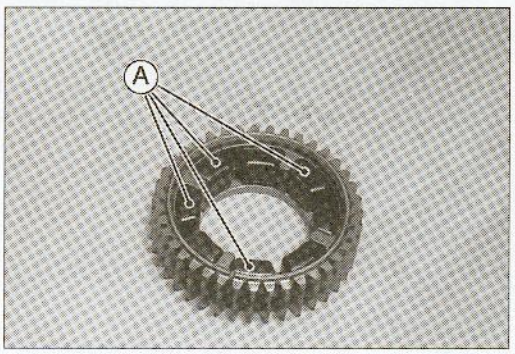
Torque - Balancer Shaft Clamp Bolt: 12 N·m (1.2 kg·m, 106 in·lb)



Balancer Damper Inspection

- Remove the balancer and disassemble the weight and gear assembly.
- Visually inspect the rubber dampers [A].

★ If they appear damaged or deteriorated, replace them.



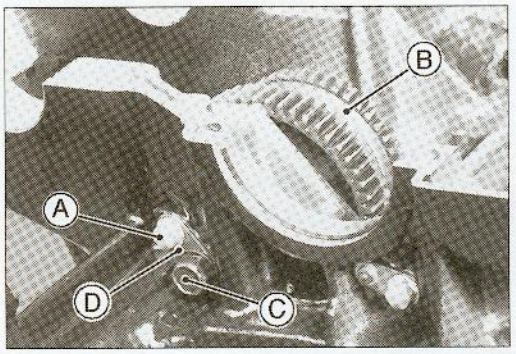
Starter Motor Clutch and Torque Limiter

Starter Motor Removal/Installation

- Refer to Alternator Rotor Removal and Installation in the Electrical System chapter.

Starter Motor Clutch Removal

- Split the crankcase (see Crankcase Splitting).
- Remove:
  Transmission Shaft
  Crankshaft
- Unscrew the starter clutch shaft plate bolt [A].
- Hold the starter clutch [B], then pull the starter clutch shaft bolt [C] with the stopper plate [D] and starter clutch shaft.
- Remove the starter clutch.



Starter Motor Clutch Installation

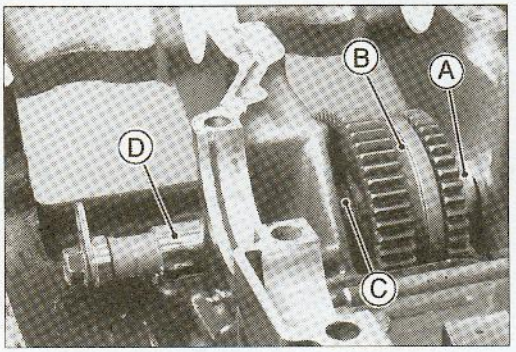
- Apply engine oil to the needle bearing.
- Install:
  Coller (Long) [A]
  Starter Motor Clutch [B]
  Coller (Short) [C]
  Starter Motor Clutch Shaft [D]
- Apply a non-permanent locking agent to the threads of the starter clutch shaft plate bolt, and tighten it.

Torque - Starter Clutch Shaft Plate Bolt: 12 N·m (1.2 kg·m, 106 in·lb)

★ If the shaft bolt removed, tighten it.

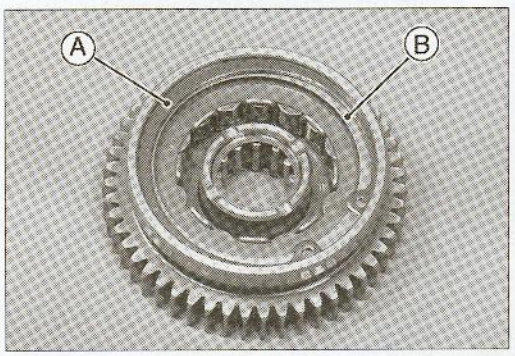
○ Apply a non-permanent locking agent to the threads of the shaft bolt.

Torque - Starter Clutch Shaft Bolt: 25 N·m (2.5 kg·m, 18 ft·lb)

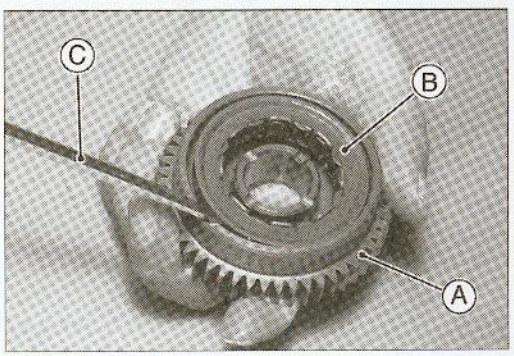


Starter Motor Clutch Disassembly

- Remove the starter motor clutch.
- Pull the driven gear out off from the drive gear.
- Remove:
  Circlip [A]
  Flat Washer [B]



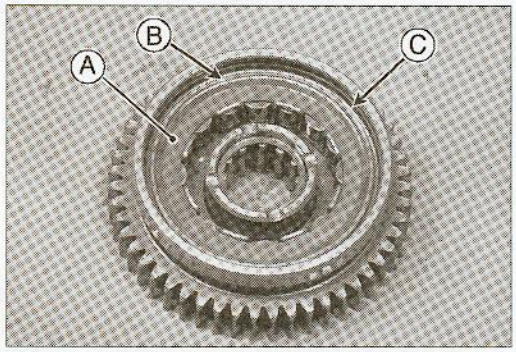
- Holding the drive gear [A] with a hand, take off the one-way clutch [B] from the gear by using the screw driver [C].



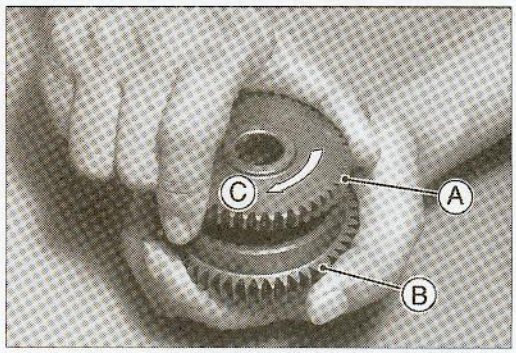
Starter Motor Clutch and Torque Limiter

Starter Motor Clutch Assembly

- Be sure to install the one-way clutch [A] so that its flange [B] fits in the holder recess [C].

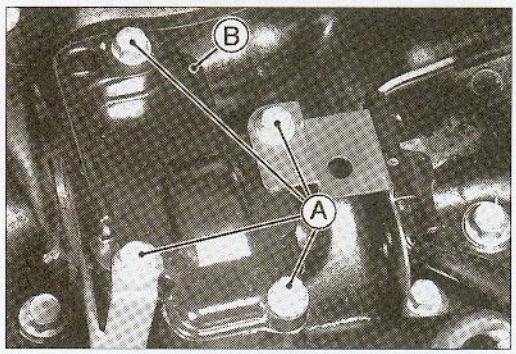


- Turn in the driven gear [A] to the drive gear [B].
  Clockwise [C]



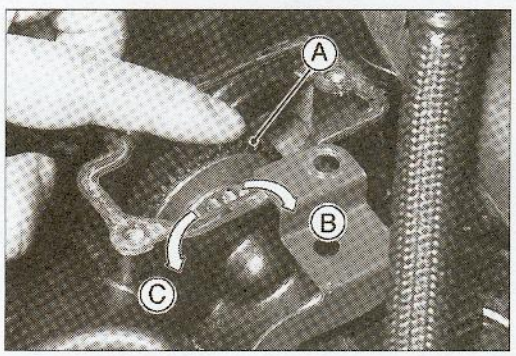
Starter Clutch Inspection

- Remove the engine (see Engine Removal/Installation chapter).
- Remove:
  Water Hose Fitting (see Cooling System chapter)
  Starter Motor (see Electrical System chapter)
  Bolts [A]
  Torque Limiter Cover [B]



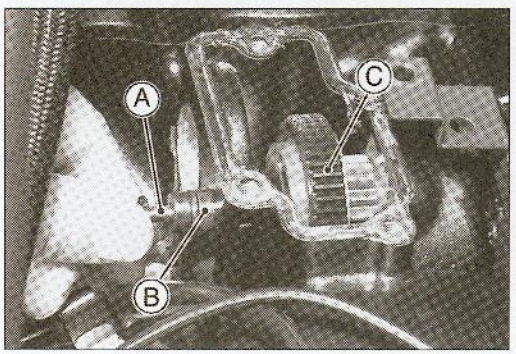
- Turn the starter idle gear [A] by hand. When viewed from the rear side of the engine, the starter idle gear should turn forward [B] freely, but should not turn backward [C].

★If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch, examine each part visually, and replace any worn or damaged parts.



Torque Limiter Removal

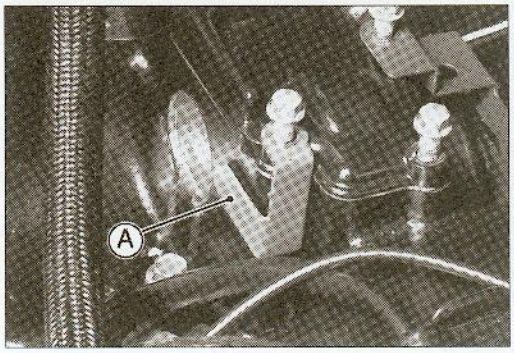
- Remove:
  Starter Motor (see Electrical System chapter)
  Torque Limiter Cover (see Starter Motor Clutch Inspection)
- Using the 5 mm bolt [A], pull out the torque limiter shaft [B].
- Remove the torque limiter [C].



Starter Motor Clutch and Torque Limiter

Torque Limiter Installation

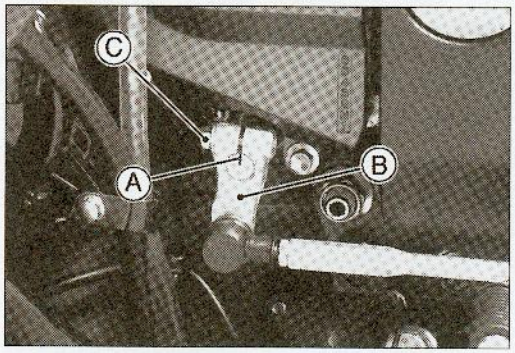
- Inspect the O-ring, and replace it if it is damaged.
- Apply engine oil to the torque limiter shaft and O-ring.
- Install the torque limiter cover bolts with clamp [A] as shwon.



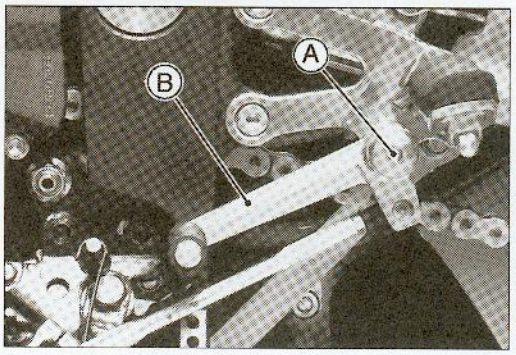
Transmission

Shift Pedal Removal

- Mark [A] the position of the shift lever [B] on the shift shaft so that it can be installed later in the same position.
- Remove:
  Bolt [C]
  Shift Lever

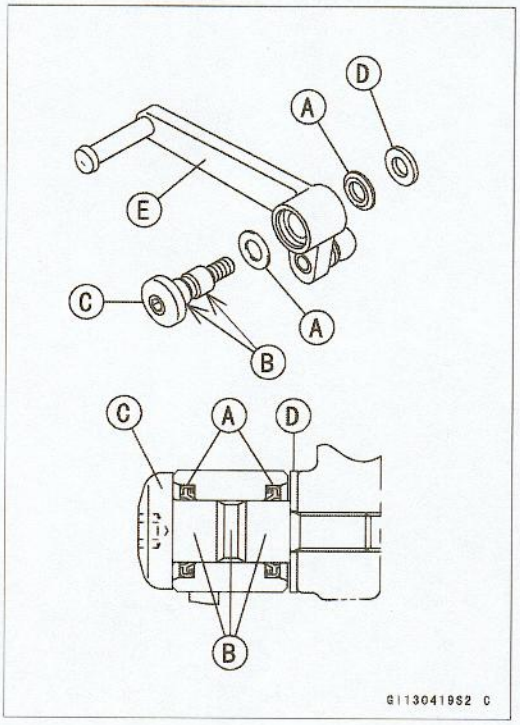


- Remove the bolt [A], and shift pedal [B].



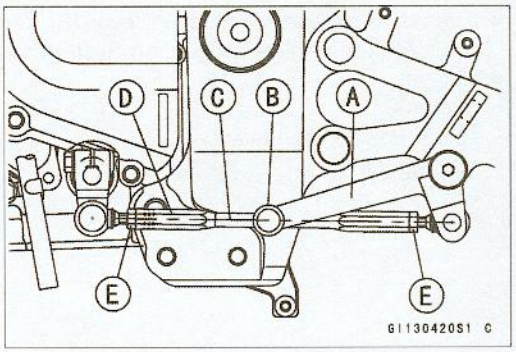
Shift Pedal Installation

- Install the oil seals [A] direction as shown.
- Apply grease [B] to the bearing portion of the shift pedal mounting bolt [C].
  Washer [D]
  Shift Pedal [E]



Transmission

- Install the shift pedal [A] so that the distance between the center of the shift pedal front end [B] and the center line [C] of the shift rod [D] is horizontal by loosening the front and rear locknuts [E] and turning the rod.



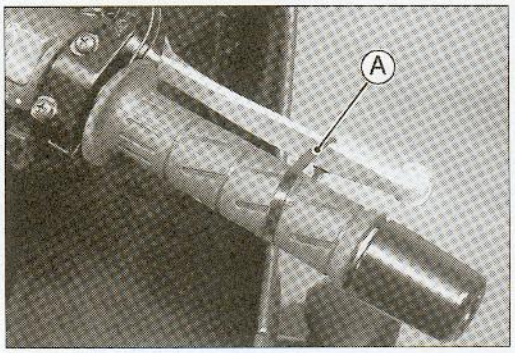
NOTE

○ *The locknut next to the knurled portion of the rod has left-hand threads.*

★ If necessary, adjust the pedal position from the standard position to suit you as follows.
- Loosen the front and rear rod locknuts.
- Turn the rod to adjust the pedal position.
- Tighten the locknuts securely.

External Shift Mechanism Removal

- Squeeze the brake lever slowly and hold it with a band [A].



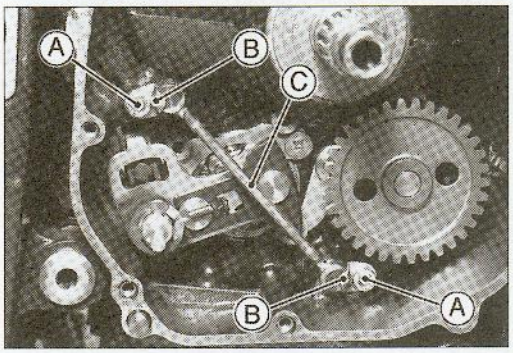
⚠ WARNING

Be sure to hold the front brake when removing the engine, or the motorcycle, may fall over. If could cause an accident and injury.

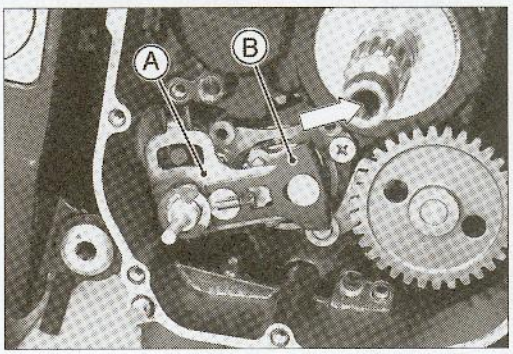
CAUTION

Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.

- Remove:
  Engine Oil (drain, see Engine Lubrication System chapter)
  Shift Pedal (see Shift Pedal Removal)
  Clutch (see Clutch chapter)
  Bolts [A], Oil Pipe Holders [B], Oil Pipe [C] with O-ring

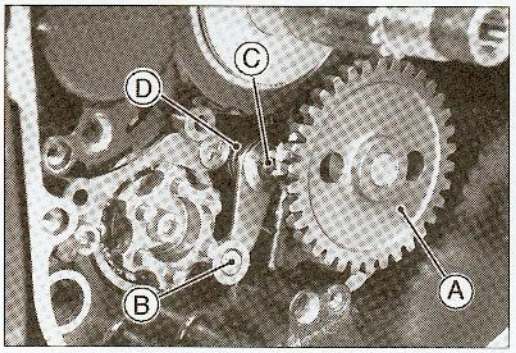


- Remove the shift shaft assembly [A] while pulling the shift mechanism arm [B].



Transmission

- If remove the gear positioning lever [B], remove the oil pump drive gear [A] (see Engine Lubrication System chapter).
- Remve:
  Bolt [C]
  Gear Positioning Lever
  Spring [D]



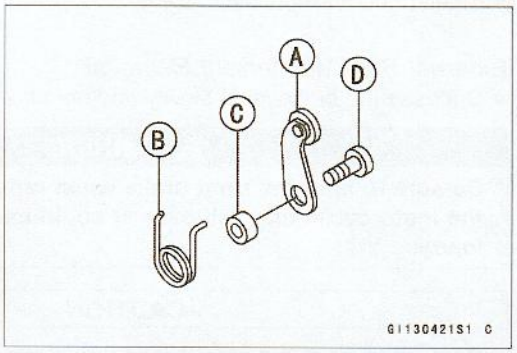
External Shift Mechanism Installation

- Install the gear positioning lever [A] as shown.
  Spring [B]
  Collar [C]
  Bolt [D]
- Apply a non-permanent locking agent to the bolt and tighten it.

Torque - Gear Positioning Lever Bolt: 10 N·m (1.0 kg·m, 87 in·lb)

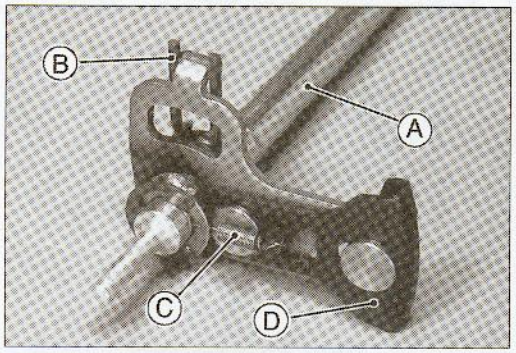
- Apply a non-permanent locking agent to the oil pipe holder bolts and tighten them.

Torque - Oil Pipe Holder Bolts: 12 N·m (1.2 kg·m, 106 in·lb)



External Shift Mechanism Inspection

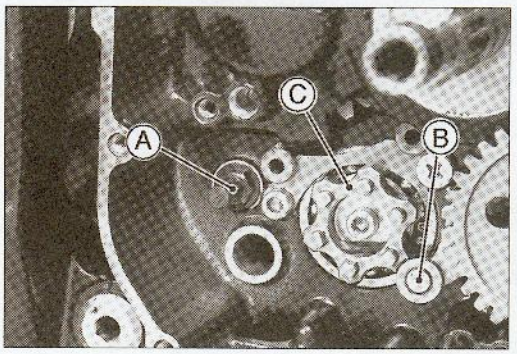
- Examine the shift shaft [A] for any damage.
★ If the shaft is bent, straighten or replace it.
★ If the serration are damaged, replace the shaft.
★ If the springs [B] [C] are damaged in any way, replace them.
★ If the shift mechanism arm [D] is damaged in any way, replace the arm.



- Check the return spring pin [A] is not loose.
★ If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

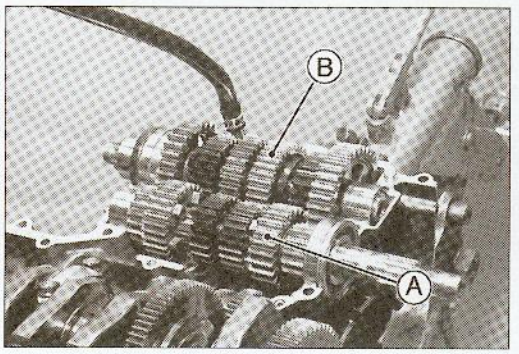
Torque - Shift Shaft Return Spring Pin: 30 N·m (3.1 kg·m, 22 ft·lb)

- Check the neutral set lever [B] and it spring for breaks or distortion.
★ If the lever or spring are damaged in any way, replace them.
- Visually inspect the shift drum cam [C].
★ If they are badly worn or if they show any damage, replace it.



Transmission Shaft Removal

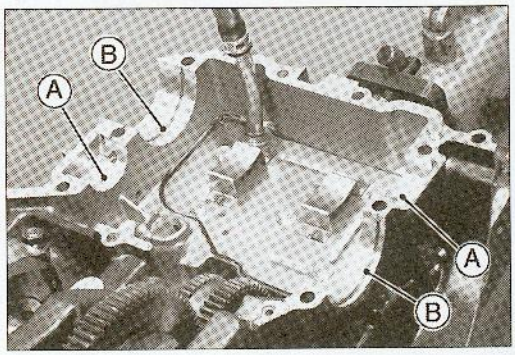
- Split the crankcase (see Crankcase Splitting).
- Remove the drive shaft [A] and output shaft [B].



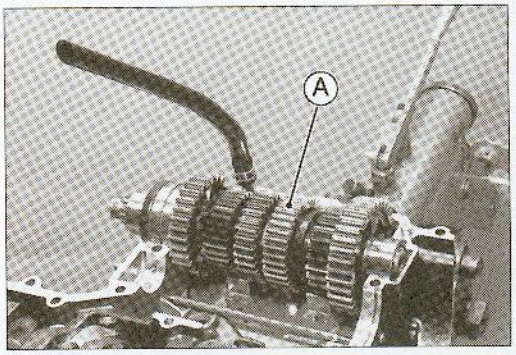
Transmission

Transmission Shaft Installation

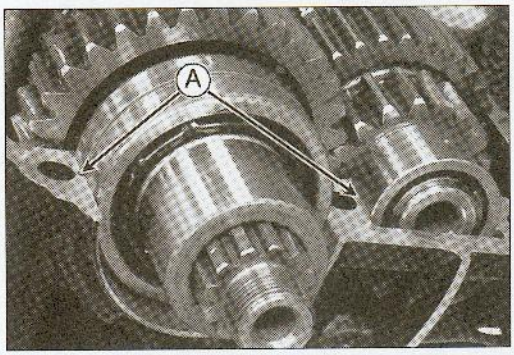
- Apply engine oil to the sliding portion of the gears and bearings.
- Check to see that the set pins [A] and set rings [B] are in place.



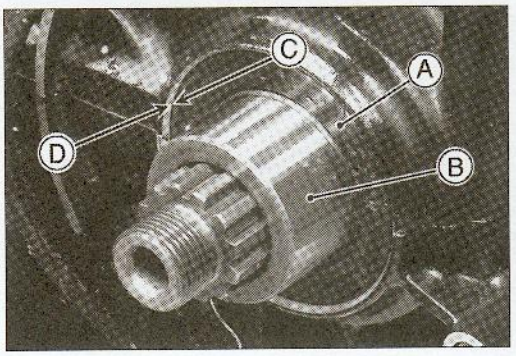
- Install the drive shaft and output shaft into the upper crankcase half.
  - Install the output shaft [A] first.



- 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 and the bearing outer races [A].



- Assemble the crankcase.
- Press in the oil seal [A] onto coller [B] so that the surface [C] of the oil seal is flush with the counterbore bottom surface [D] of the crankcase.

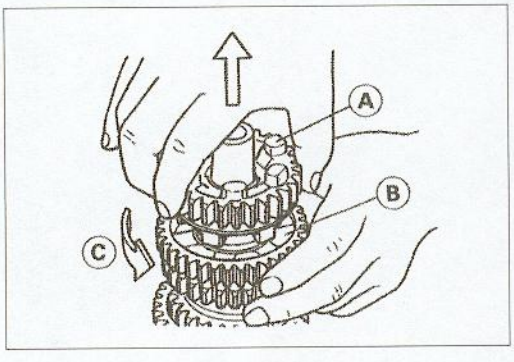


Transmission Disassembly

- 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 [B].
  - Spin the 5th gear quickly [C] and pull it off upward.

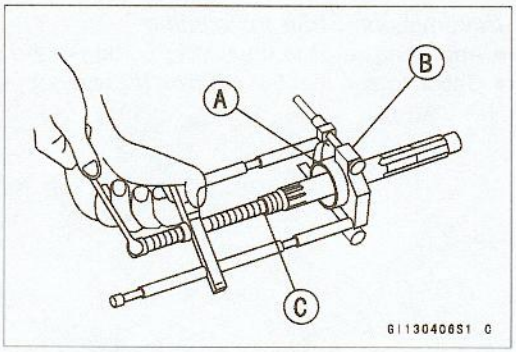


Transmission

- Remove the ball bearing [A] from each shafts.

  Special Tools - Bearing Puller: 57001-135 [B]
  Bearing Puller Adapter: 57001-317 [C]

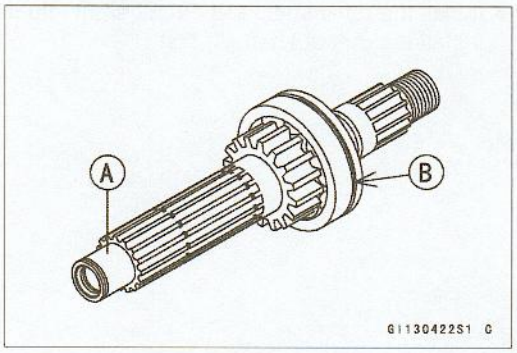
- Discard the bearing.



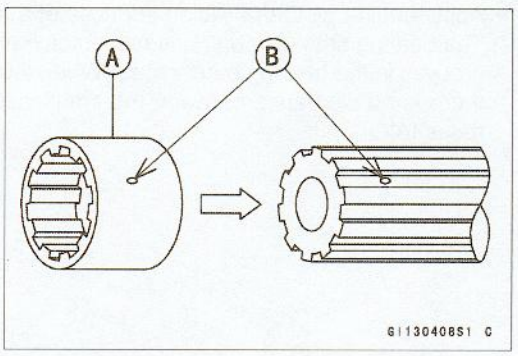
Transmission Assembly

- Apply engine oil to the ball bearing and shaft.
- Drive the ball bearing onto the drive shaft [A] with the groove [B] facing the clutch.
- Drive the ball bearing onto the output shaft.

  Special Tool - Steering Stem Bearing Driver: 57001–137



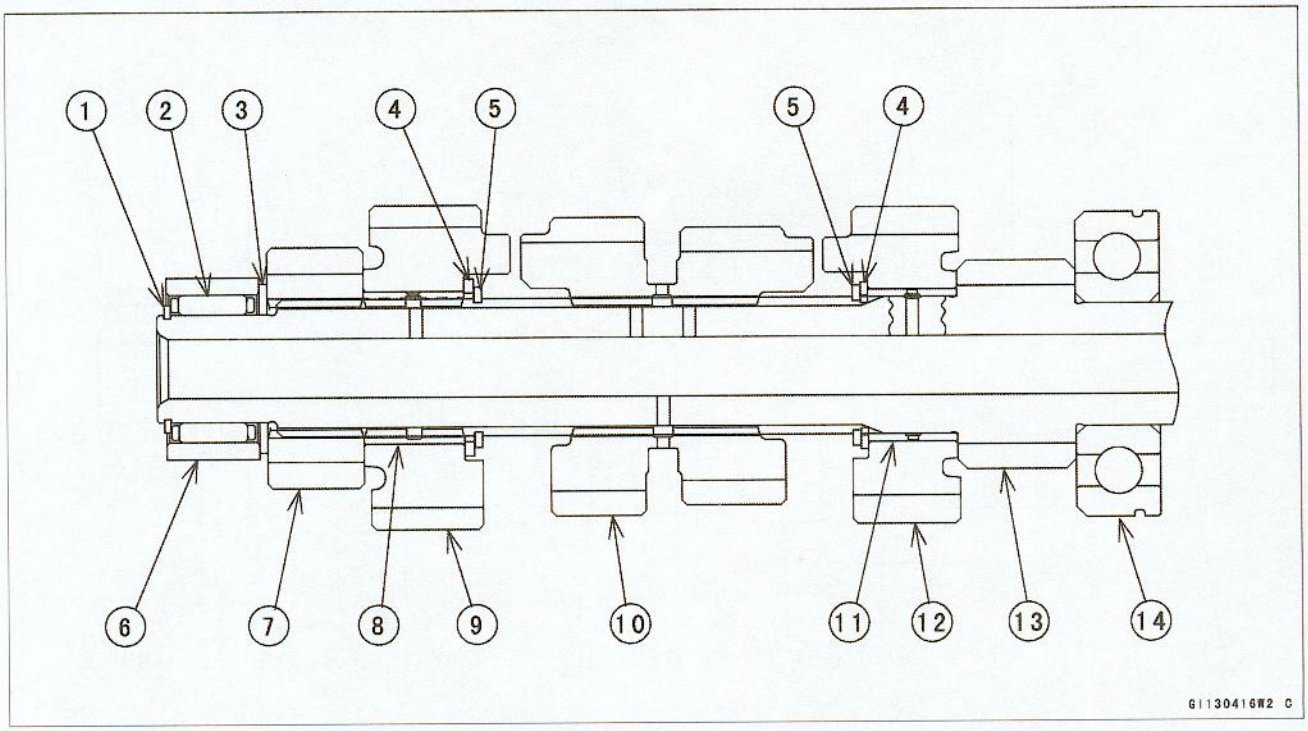
- Install the gear bushings [A] on the shaft with their oil holes [B] aligned with the shaft oil holes.



- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.

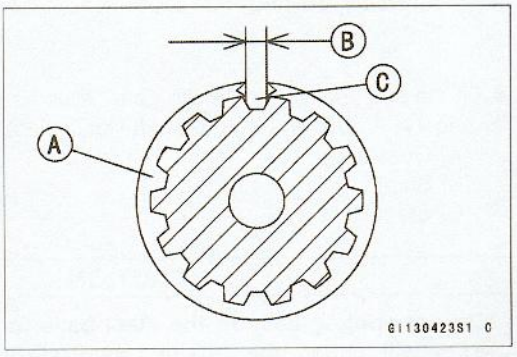
○ Install the 3rd/4th gear onto the drive shaft with their oil holes aligned.

Transmission



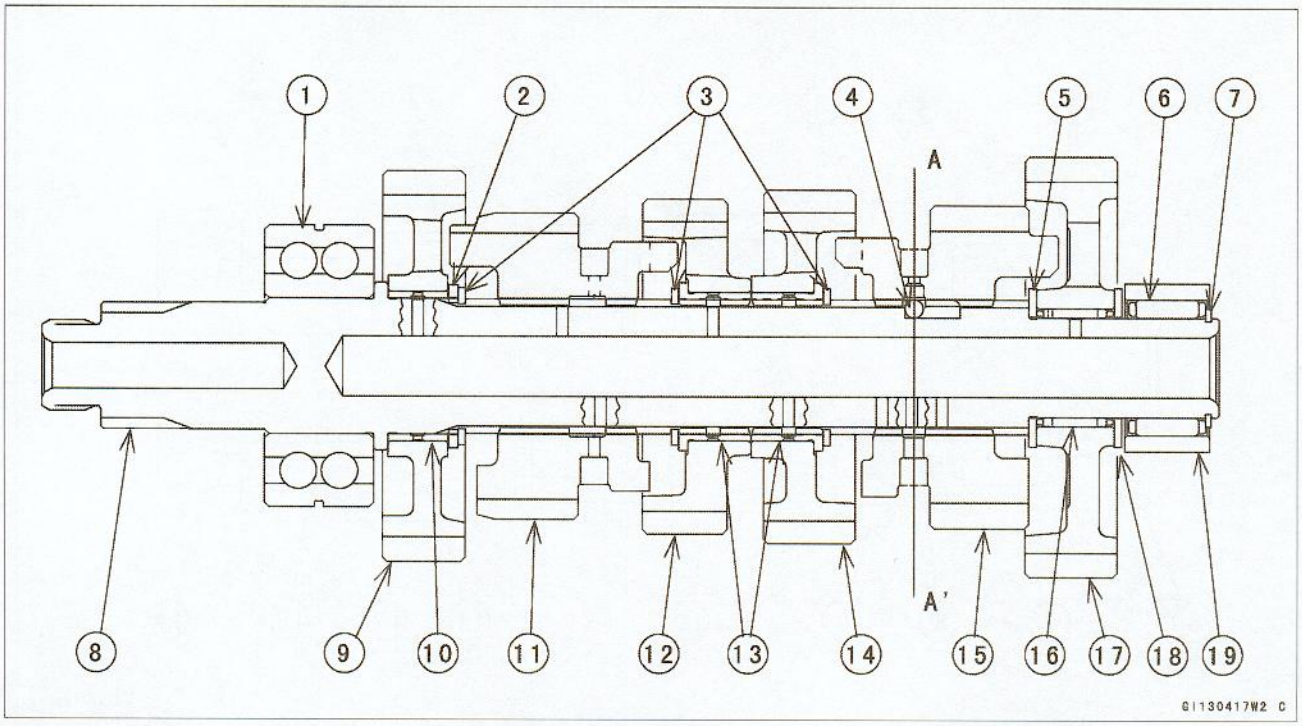
1. Circlip (small)
2. Needle Bearing
3. Washer (big)
4. Washer (small)
5. Circlip (big)
6. Outer Race
7. 2nd Gear
8. Bushing (Spline)
9. Top Gear
10. 3rd/4th Gear
11. Bushing
12. 5th Gear
13. Drive Shaft with 1st Gear
14. Ball Bearing

- Replace any circlip that were removed with new ones.
- Install the circlips [A] so that the 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.



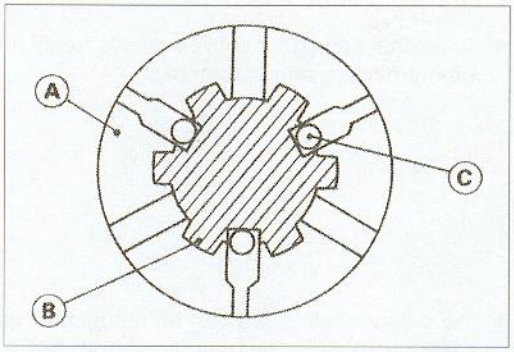
- The output shaft gears can be recognized by size: the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- ○ Install the 5th and 6th gear onto the output shaft with their oil holes aligned as shown.
- ○ Apply a molybdenum disulfied grease to both surfaces of the No.18 washers.

Transmission



1. Ball Bearing
2. Washer
3. Circlips
4. Steel Balls
5. Washer
6. Needle Bearing
7. Circlip
8. Output Shaft
9. 2nd Gear
10. Bushing
11. Top Gear
12. 4th Gear
13. Bushings
14. 3rd Gear
15. 5th Gear
16. Needle Bearing
17. 1st Gear
18. Washer
19. Outer Race

- Fit the steel balls into the 5th gear holes as shown.
  View A-A' (see the output shaft illustllation)
  [A] Gear (5th)
  [B] Shaft
  [C] Steel Balls



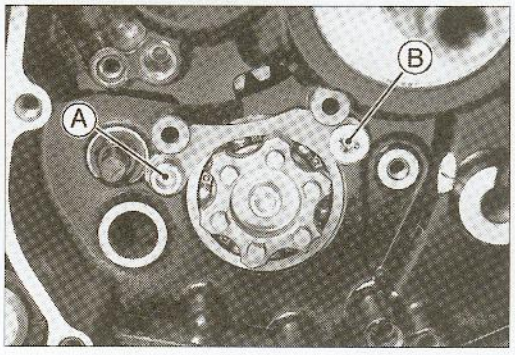
CAUTION

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.

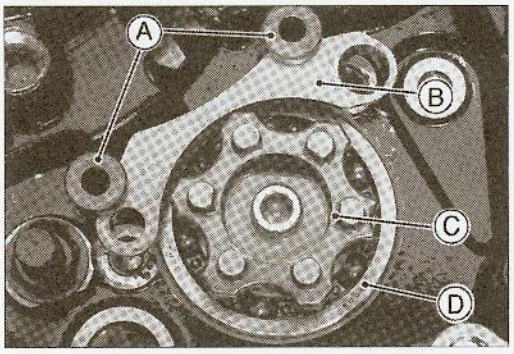
Shift Drum and Fork Removal

- Remove:
  Lower Fairings (see Frame chapter)
  Muffler (see Engine Top End chapter)
  Oil Pan (see Engine Lubrication System chapter)
  Oil Pump Drive Gear (see Engine Lubrication System chapter)
  External Shift Mechanism (see External Shift Mechanism Removal)
  Gear Position Switch (see Digital Fuel Injection System chapter)
  Gear Positioning Lever (see External Shift Mechanism Removal)
  Bolt [A] and Screw [B]



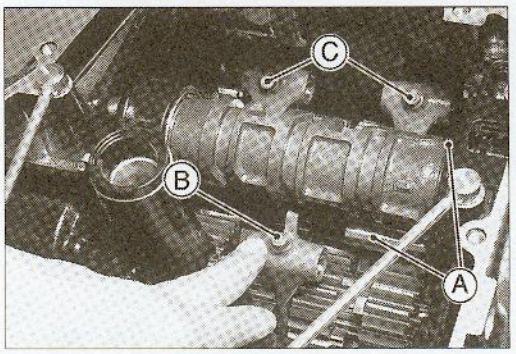
Transmission

- Pull the shift rods [A] with one's bearing holder [B] on, and take off the bearing holder and shift forks.
- Pull out the shift drum [C] with the ball bearing [D].

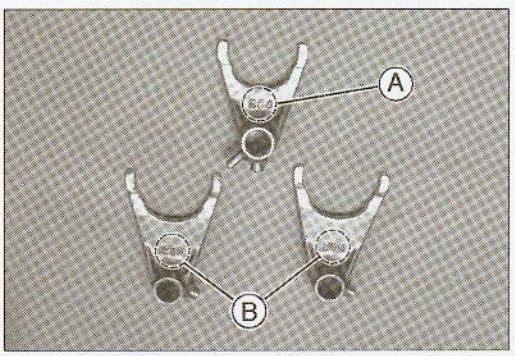


Shift Drum and Fork Installation

- Insert the shift drum.
- Install the shift forks, noting the groove position. The shift rods [A] are indentical.
  Drive Shaft Shift Fork [B]
  Output Shaft Forks with same shape and size [C]
- ○ Install each forks number marked side faces right of the engine.

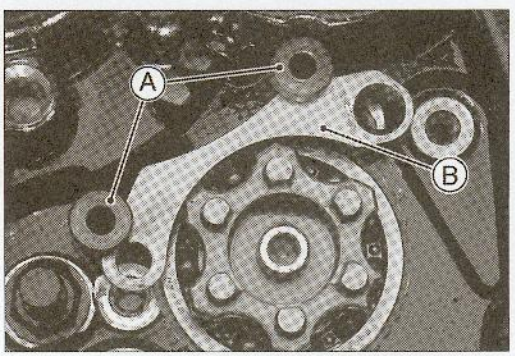


Drive Shaft Fork marked with "284" [A]
Output Shaft Forks marked with "285" [B]



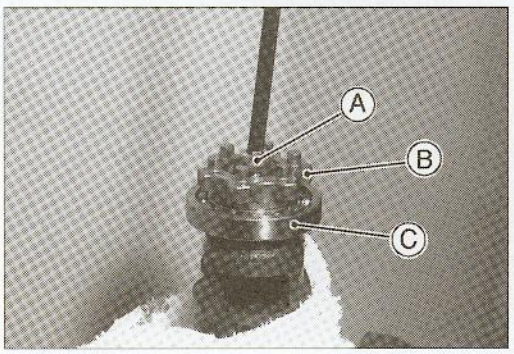
- Insert the bearing holder [B] to the shift fork rods [A] as shown.
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolt and screw, and tighten them.

Torque - Shift Drum Bearing Holder Bolt: 12 N·m (1.2 kg·m, 106 in·lb)
Shift Drum Bearing Holder Screw: 5.4 N·m (0.55 kg·m, 48 in·lb)



Shift Drum Disassembly

- Remove the shift drum (see Shift Drum and Fork Removal).
- While holding the shift drum with a vise, remove the shift drum cam holder bolt.
  Shift Drum Cam Holder Bolt [A]
  Shift Drum Cam [B]
  Ball Bearing [C]

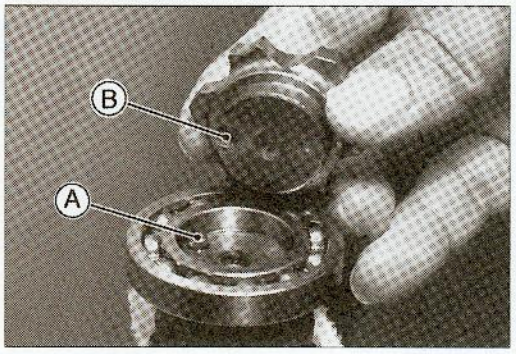


Transmission

Shift Drum Assembly

- Be sure to install the dowel pin [A].
- ○ Align the dowel pin with the hole [B] of the shift drum cam holder.
- Apply a non-permanent locking agent to the threads of the shift drum cam bolt, and tighten it.

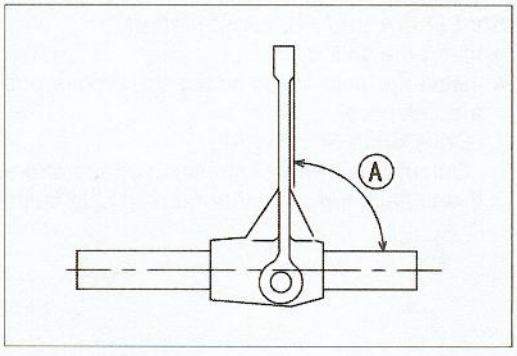
Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kg·m, 106 in·lb)



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]



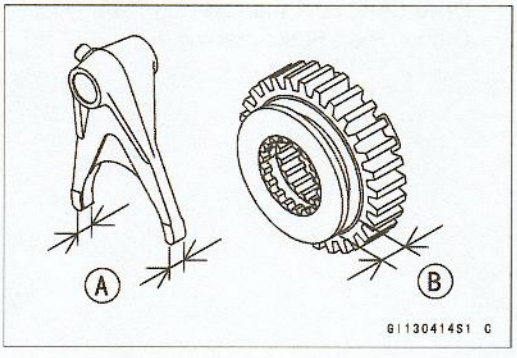
Shift Fork/Gear Groove Wear

- 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: 5.9 ~ 6.0 mm (0.23 ~ 0.24 in.)
Service Limit: 5.8 mm (0.23 in.)

- ★ If the gear groove is worn over the service limit, the gear must be replaced.

Gear Groove Width
Standard: 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)
Service Limit: 6.25 mm (0.246 in.)



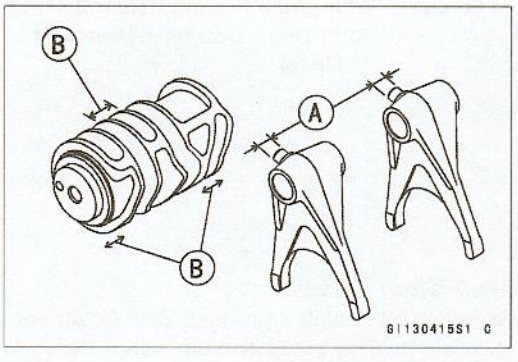
Shift Fork Guide Pin/Drum Groove Wear

- Measure the diameter of each shift fork guide pin [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 replace.

Shift Fork Guide Pin Diameter
Standard: 6.9 ~ 7.0 mm (0.27 ~ 0.28 in.)
Service Limit: 6.8 mm (0.27 in.)

- ★ If any shift drum groove is worn over the service limit, the drum must be replaced.

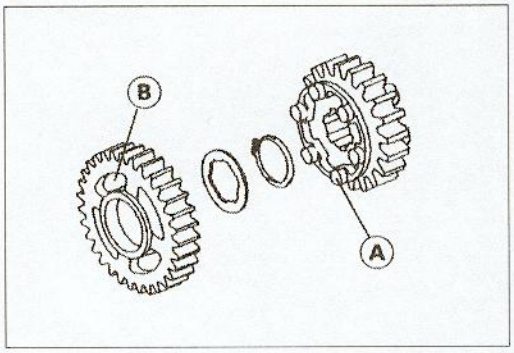
Shift Drum Groove Width
Standard: 7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)
Service Limit: 7.3 mm (0.29 in.)



Transmission

Gear Dog and Gear Dog Hole Damage

- Visually inspect the gear dogs [A] and gear dog holes [B].
- ★ Replace any damaged gears or gears with excessively worn dogs or dog holes.



Wheels/Tires

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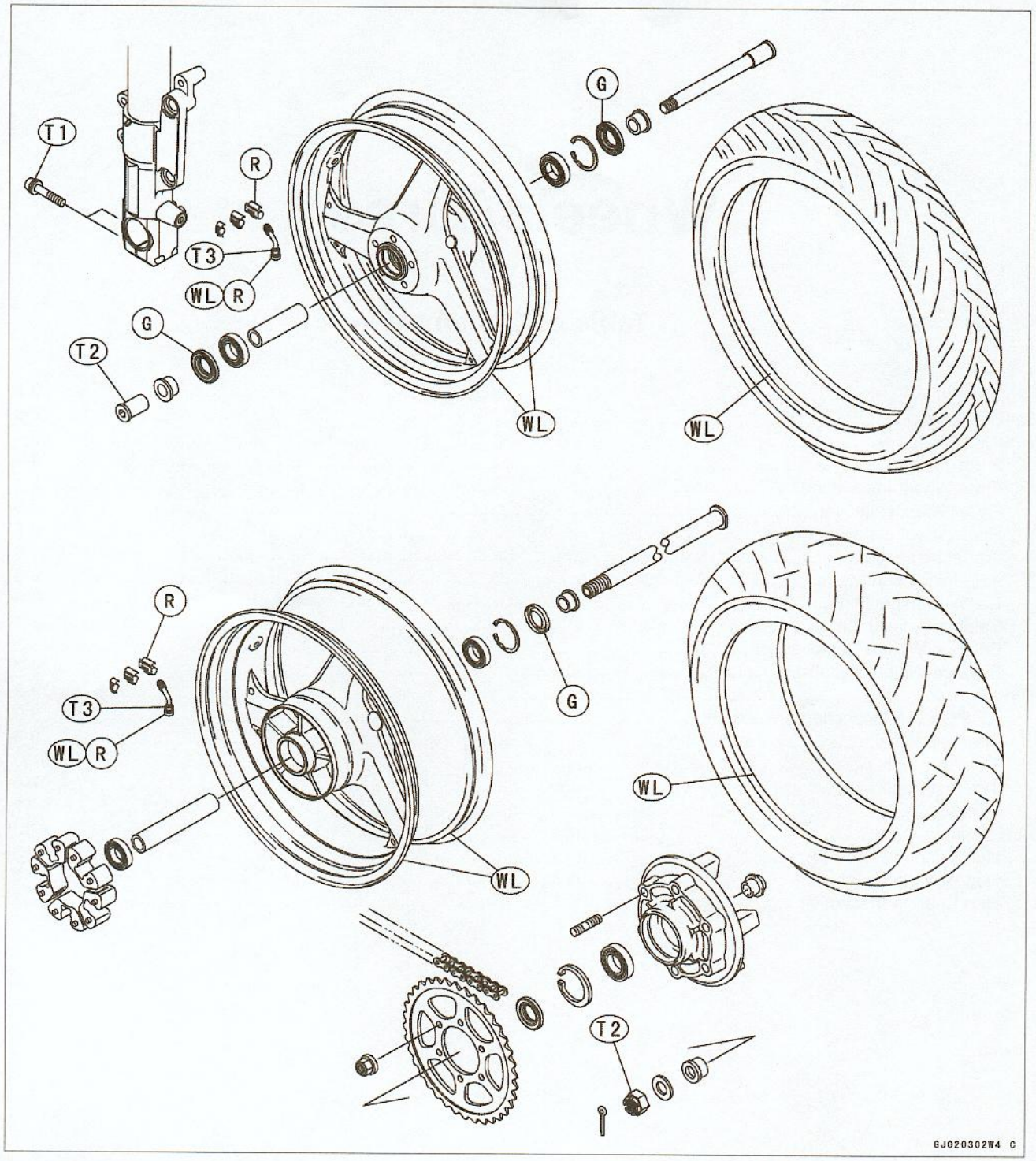
Exploded View



G: Apply grease.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

T1: 20 N·m (2.0 kg·m, 14.5 ft·lb)
T2: 125 N·m (13 kg·m, 94 ft·lb)
T3: 12 N·m (1.2 kg·m, 106 in·lb)

Specifications

Item		Standard	Service Limit
Wheels (Rims):			
Rim runout:	Axial	– – –	0.5 mm (0.02 in.)
	Radial	– – –	0.8 mm (0.03 in.)
Axle runout/100 mm		0.05 mm (0.002 in.) or less	0.2 mm (0.008 in.)
Wheel balance		10 g or less	– – –
Balance weights		10 g, 20 g, 30 g	– – –
Tires:			
Air pressure: (when cold)			
	Front	Up to 184 kg (406 lb) load: 290 kPa (2.90 kg/cm^2, 41 psi)	– – –
	Rear	Up to 184 kg (406 lb) load: 290 kPa (2.9 kg/cm^2, 41 psi)	– – –
Tread depth:			
	Front	DUNLOP: 4.0 mm (0.16 in.)	1 mm (0.04 in.) (FG, AR, ST) 1.6 mm (0.063 in.)
	Rear	DUNLOP: 5.4 mm (0.21 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.1 in.)
Standard tires:		Make, Type	Size
	Front	DUNLOP, SPORTMAX RADIAL D207FW (tubeless)	120/70 ZR17(58 W)
	Rear	DUNLOP SPORTMAX RADIAL D207 (tubeless)	200/50 ZR17(75 W)

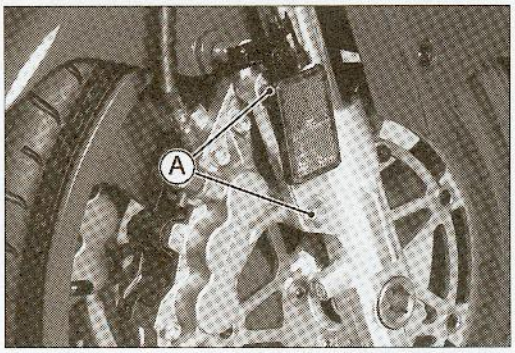
Special Tools - Jack: 57001-1238
Inside Circlip Pliers: 57001-143
Bearing Driver Set: 57001-1129
Bearing Remover Shaft, ϕ13: 57001-1377
Bearing Remover Head, ϕ25 × ϕ28: 57001-1346

FG: German Model
AR: Austrian Model
ST: Swiss Model

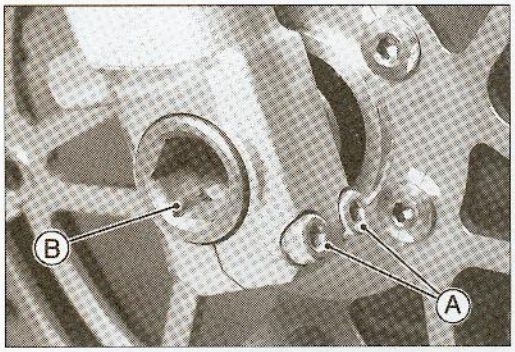
Wheels (Rims)

Front Wheel Removal

- Remove:
  Lower Fairings (see Frame chapter)
  Brake Caliper Mounting Bolts [A]



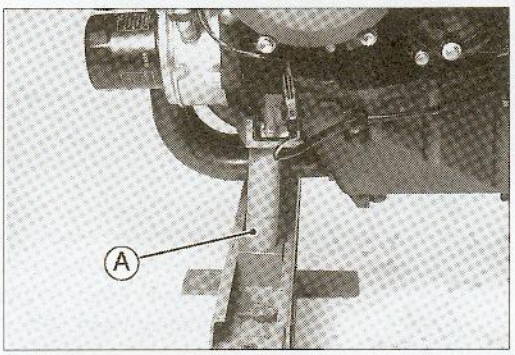
- Loosen:
  Right Side Axle Clamp Bolts [A]
  Axle [B]



- Raise the front wheel off the ground.

  Special Tool - Jack: 57001-1238 [A]

- Pull out the axle to the right and drop the front wheel out of the forks.



CAUTION

Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

Front Wheel Installation

NOTE

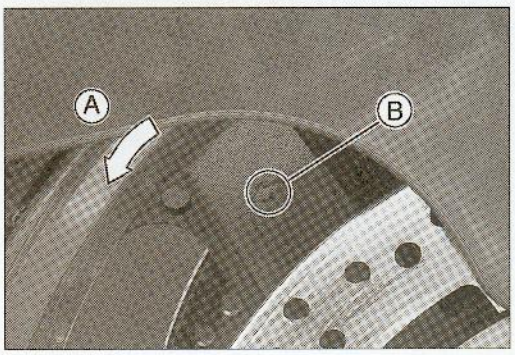
○ *The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel spoke.*

- Check the wheel rotation mark on the front wheel and install it.
- Fit the collars on the both sides of the hub.

○ The collars are identical.

- Tighten the axle nut.

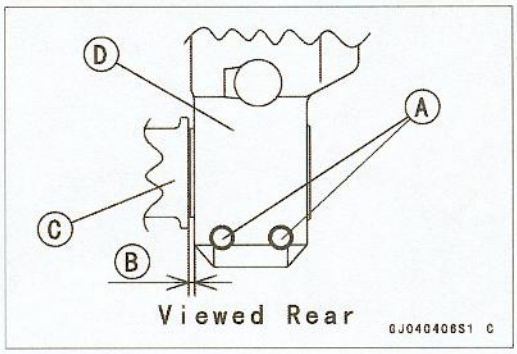
  Torque - Front Axle Nut: 125 N·m (13 kg·m, 94 ft·lb)



- Before tightening the right axle clamp bolts [A] secure the clearance (2 mm, 0.08 in.) [B] between the coller [C] and fork leg [D].
- Tighten the right axle clamp bolts first and left axle clamp bolts.

  Torque - Front Axle Clamp Bolts: 20 N·m (2.0 kg·m, 14.5 ft·lb)

- Install the front brake caliper (see Brakes chapter).
- Check the front brake.



⚠ WARNING

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

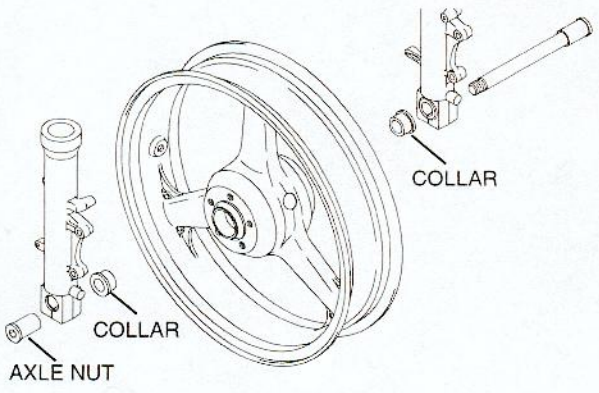
ADDENDUM

ZX1200-A1 Service Manual

This information replaces the front wheel installation section on page 9-4 of the ZX1200-A1 Service Manual (P/N 99924-1253-01).

Front Wheel Installation

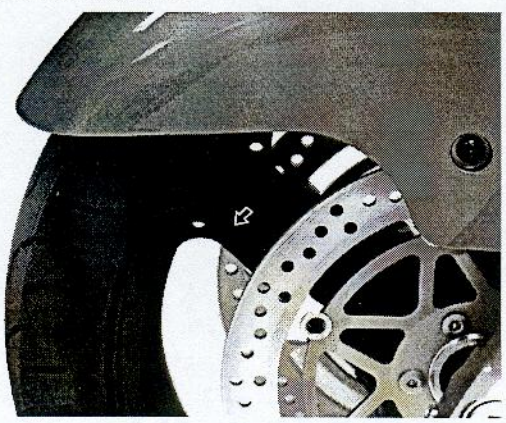
- If the axle nut in the fork leg has been removed, install it into the left fork from the left side of the axle clamp. Make sure the axle nut shoulder is seated against the fork leg.
- Fit the axle collars on both sides of the hub. The collars are identical.



- Install the front wheel between the fork legs with the front axle.

NOTE:

o *The direction of the wheel rotation is shown by an arrow on the wheel spoke. Install the wheel so that the rotation mark coincides with wheel rotational direction.*



- Tighten the axle nut to the specified torque.

  Torque - Front Axle Nut: 125 N·M (13 kg·m 94 ft·lb)

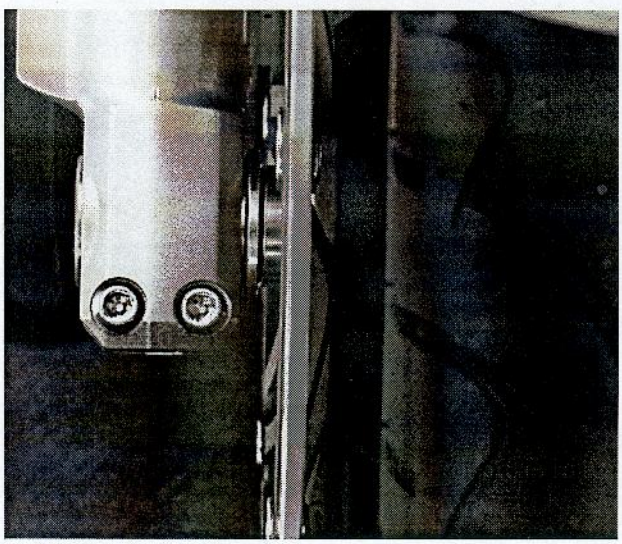
- Make sure the axle nut shoulder is seated against the fork leg by tapping the axle nut with a rubber mallet.
- Tighten the left axle clamp bolts.

  Torque - Front Axle Clamp Bolts: 20 N·M (2.0 kg·m 14.5 ft·lb)

- Install the brake calipers (see Brakes Chapter for assembly procedures).
- Before re-tightening the clamp bolts on the right fork leg, pump the fork up and down 4 or 5 times to allow the right fork leg to find a neutral position on the front axle.
- Tighten the right axle clamp bolts.

  Torque - Front Axle Clamp Bolts: 20 N·M (2.0 kg·m 14.5 ft·lb)

- Check the clearance between the front axle collar and the right axle clamp. The clearance between the front axle collar and the right axle clamp should be between 0.8-3.3mm (0.030-0.130 in).
- If the clearance is out of this range, remove the front wheel again and check the axle, wheel hub and other related parts for damage.



- Check the front brake.

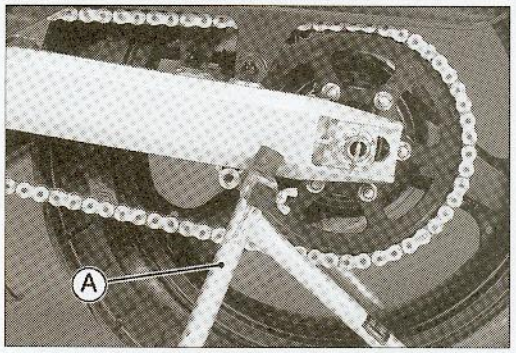
⚠ WARNING

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

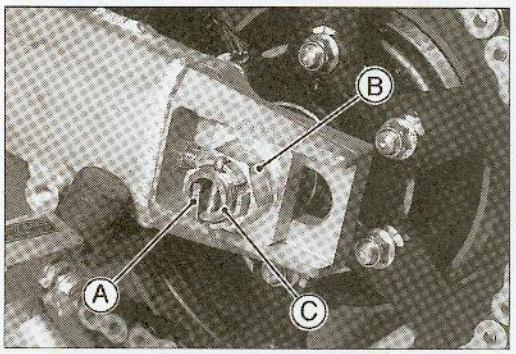
Wheels (Rims)

Rear Wheel Removal

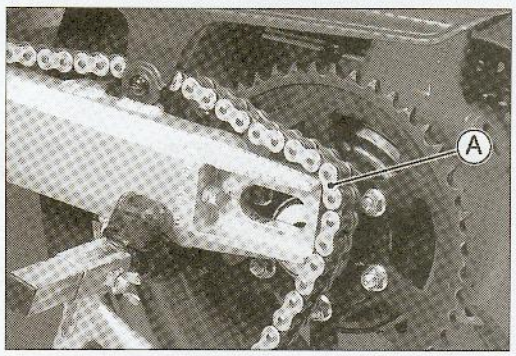
- Use the stand [A], raise the rear wheel off the ground.



- Remove:
  Cotter Pin [A]
  Axle Nut [B]
  Axle [C]



- Remove the chain [A] from the rear sprocket toward the left.
- Move the rear caliper back and remove the rear caliper from the swingarm.
- Remove the rear wheel.

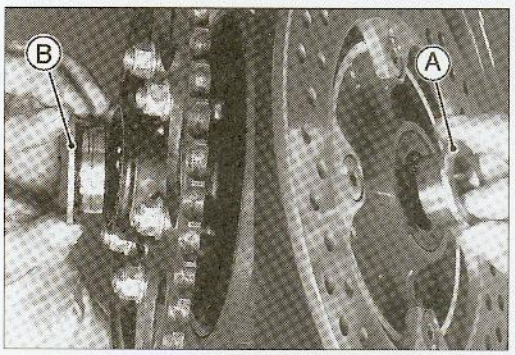


CAUTION

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.

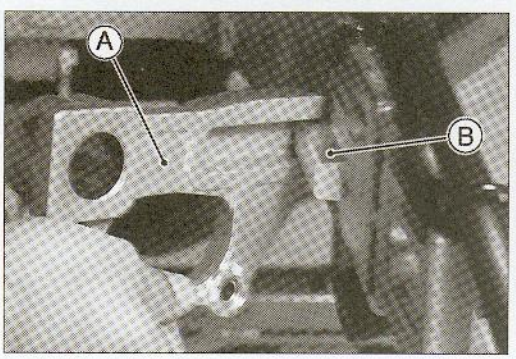
Rear Wheel Installation

- Fit the collers on the both sides of the hub.
  Right Side Coller [A]
  Left Side Coller [B]



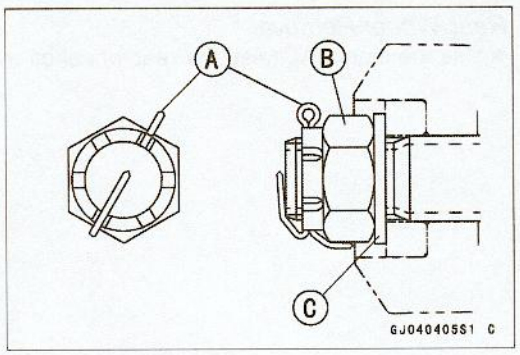
- Engage the drive chain with the rear sprocket.
- Install the caliper bracket [A] onto the swingarm stop [B].
- ○ Install the axle from the right side of the wheel, and tighten the axle nut.

Torque - Rear Axle Nut: 125 N·m (13 kg·m, 94 ft·lb)



Wheels (Rims)

- Adjust the drive chain slack after installation (see Final Drive chapter).
- Bend the axle cotter pin [A]
  Axle Nut [B]
  Washer [C]
- Check the rear brake.



⚠ WARNING

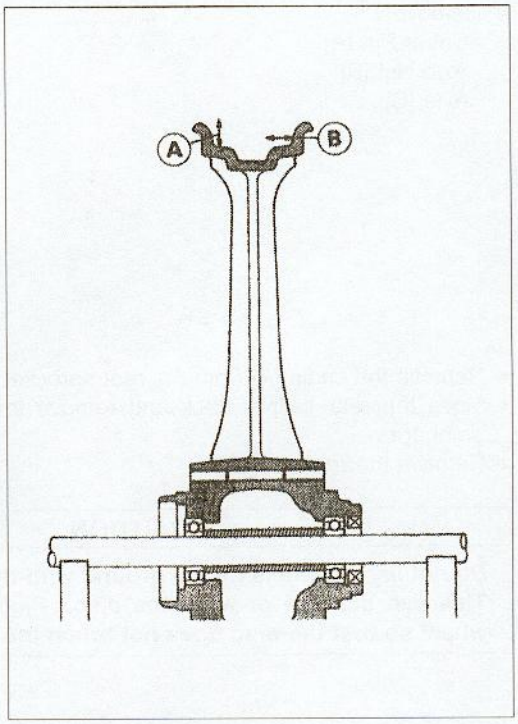
Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.

Wheel Inspection

- Raise the front/rear wheel off the ground.

Special Tool - Jack: 57001-1238

- Spin the wheel lightly, and check for roughness or binding.
★ If 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 rim runout exceeds the service limit, check the hub bearings.
★ If the problem is not due to the bearings, replace the wheel.



Rim Runout

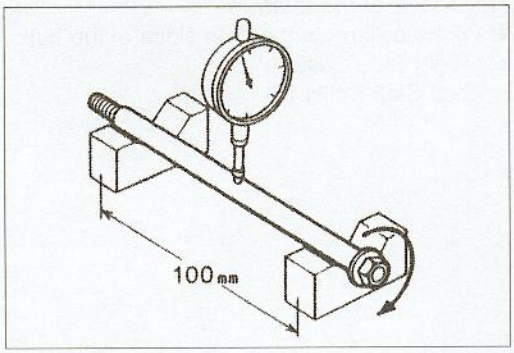
Service Limit:	**Axial**	**0.5 mm (0.02 in.)**
	Radial	**0.8 mm (0.03 in.)**

⚠ 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.

Axle Inspection

- Visually inspect the front and rear axle for damages.
★ If the axle is damaged or bent, replace it.
- Measure the axle runout with a dial gauge.
★ If axle runout exceeds the service limit, replace the axle.

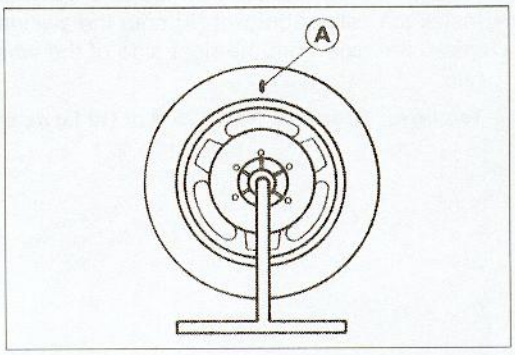


Axle Runout/100 mm

Standard:	**0.05 mm (0.002 in.) or less**
Service Limit:	**0.2 mm (0.008 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 wtops.
○ 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.



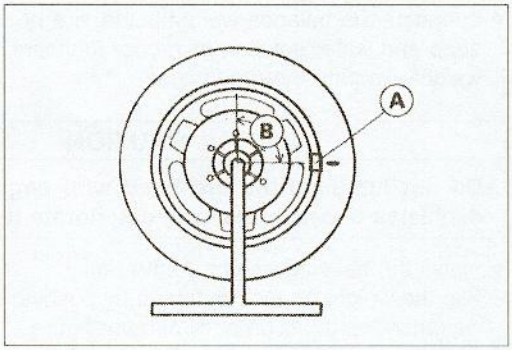
Wheels (Rims)

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.

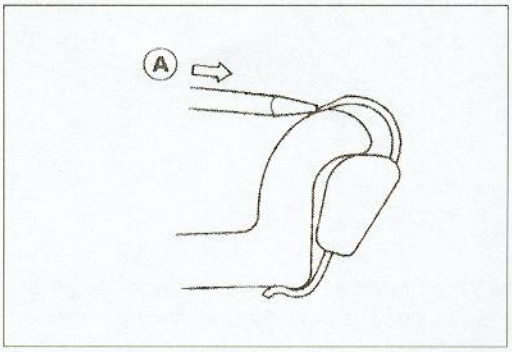
Balance Weight

Part Number	Weight (grams)
41075-1014	10
41075-1015	20
41075-1016	30

Balance Weight Removal

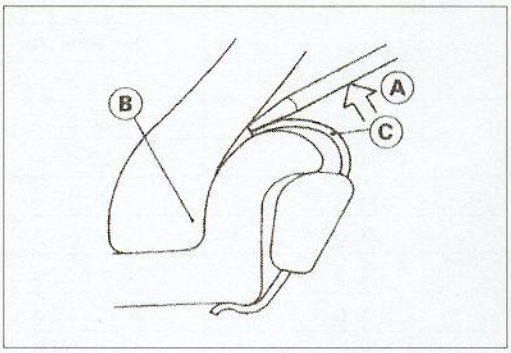
(a) When the tire is not on the rim.

- Push [A] the blade portion toward the outside with a regular tip screw driver, and slip the weight off the rim flange.
- Discard the used balance weight.



(b) When the tire is on the rim.

- Pry [A] the balance weight off the rim flange using a regular tip screw driver as shown in the figure.
- Insert a tip of the screw driver between the tire bead [B] and weight blade [C] until the end of the tip reaches the end of the weight blade.
- Push the driver grip toward the tire so that the balance weight slips off the rim flange.
- Discard the used balance weight.



Balance Weight Installation

- Check if the weight portion has any play on the brade-and-clip plate.

★ If it does, discard it.

⚠ WARNING

If the balance weight has any play on the rim flange, the blade and/or clip have been stretched. Replace the loose balance weight.
Do not reuse used balance weight.
Unbalanced wheels can create an unsafe riding condition.

Wheels (Rims)

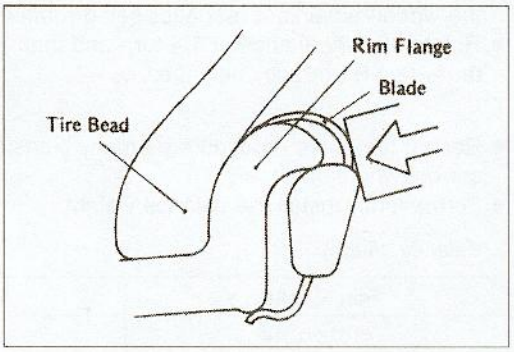
- Lubricate the balance weight blade, tire bead, and rim flange with a soap and water solution or rubber lubricant. This helps the balance weight slip onto the rim flange.

CAUTION
Do not lubricate the tire bead with engine oil or petroleum distillates because they will deteriorate the tire.

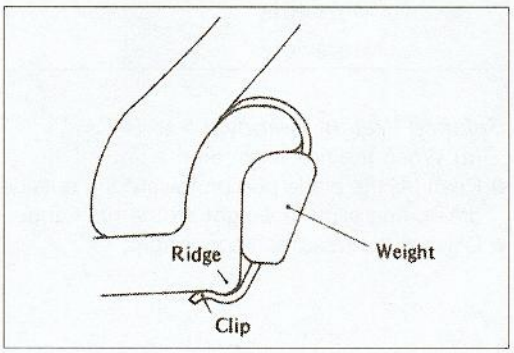
- Install the balance weight on the rim.
  - Slip the weight on the rim flange by pushing or lightly hammering the weight in the direction shown in the figure.
  - Check that the blade and weight seat fully on the rim flange, and that the clip is hooked over the rim ridge and reaches rim flat portion.

Installing Balance Weight

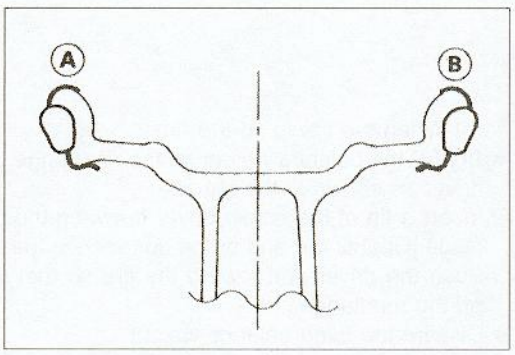
(a) Press or lightly hammer the weight in.



(b) Installation completed.



- When required total weight exceeds 20 g, install balance weight at both sides of rim flange as shown.



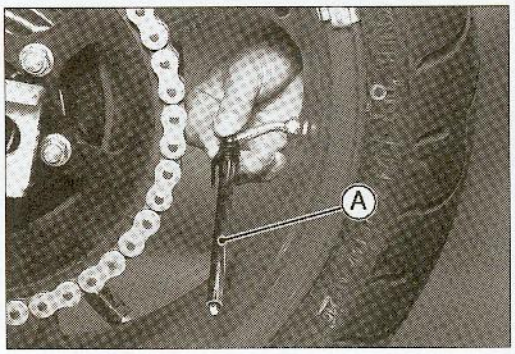
Required Total Weight	Weight Selection	
	One Side [A]	Other Side [B]
20 g	10 g	10 g
30 g	20 g	10 g
40 g	20 g	20 g
50 g	30 g	20 g
60 g	30 g	30 g
70 g	20 g + 20 g	30 g
80 g	20 g + 20 g	20 g + 20 g
90 g	20 g + 30 g	20 g + 20 g

Tires

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).

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



Air Pressure (when cold)

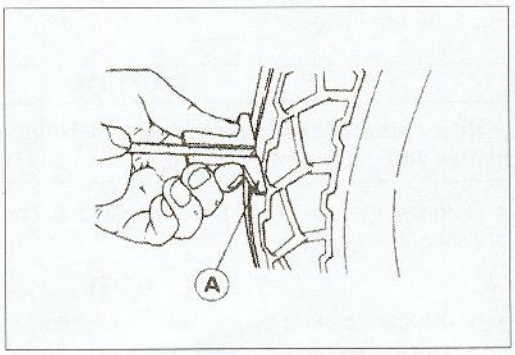
Front	Up to 184 kg (406 lb)	290 kPa (2.9 kg/cm^2, 41 psi)
Rear	Up to 184 kg (406 lb)	290 kPa (2.9 kg/cm^2, 41 psi)

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.

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

★ If any measurement is less than the service limit, replace the tire.



Tread Depth

Front:

Standard:	4.0 mm (0.16 in.) (DUNLOP)
Service Limit:	1 mm (0.04 in.) (FG, AR, ST) 1.6 mm (0.063 in.)

Rear:

Standard:	5.4 mm (0.21 in.) (DUNLOP)
Service Limit:	2 mm (0.08 in.) (Up to 130 km/h, 80 mph)
	3 mm (0.1 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.

Use the same manufacturer's tires on both front and rear wheels.

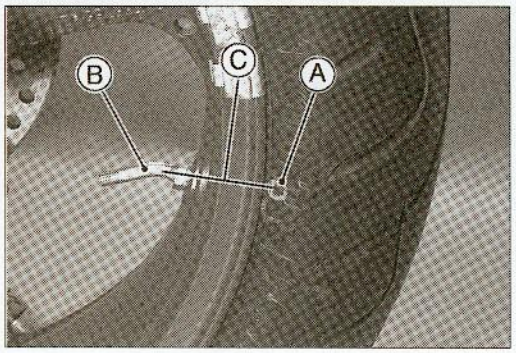
NOTE

- *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.*

Tires

Tire Removal

- Remove:
  Wheel (see Front Wheel Removal, Rear Wheel Removal)
  Disc(s)
  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.

- Remove the tire from the rim using a commercially available tire changer.

NOTE

○ *The tires cannot be removed with hand tools because they fit the rims too tightly.*

Tire Installation

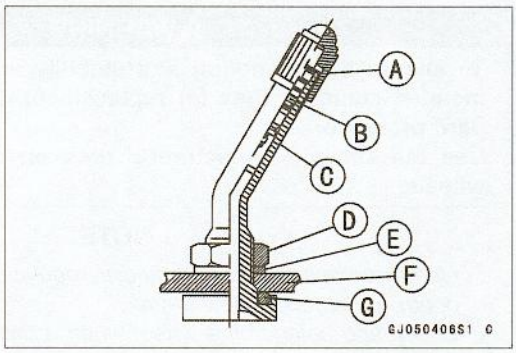
- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

CAUTION

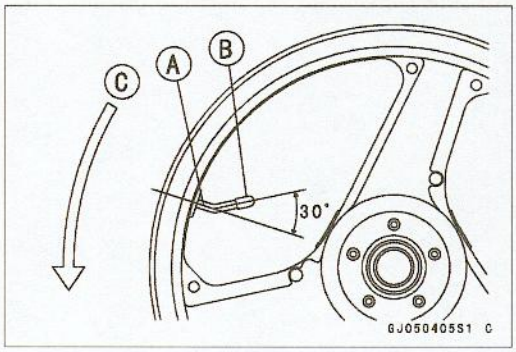
Replace the air valve whenever the tire is replaced.
Do not reuse the air valve.

- Install a new air valve in the rim.

[A] Valve Cap
[B] Valve Core
[C] Valve Body
[D] Valve Nut
[E] Valve Washer
[F] Rim
[G] Valve O-ring



○ Install the front and rear air valves [A] as shown being careful of the valve head [B] direction.
Tire Rotation [C]

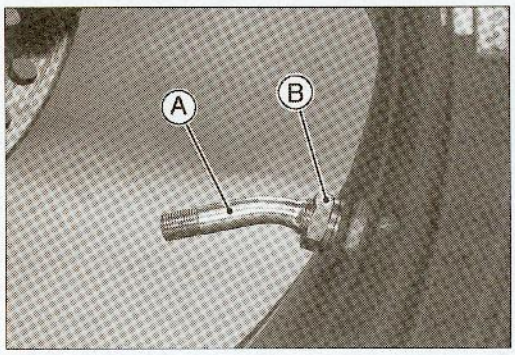


Tires

○ Remove the valve cap, and insert the valve stem [A] through the rim from the inside out.
○ Tighten the valve nut [B] secure.

Torque - Air Valve Nut: 12 N·m (1.2 kg·m, 106 in·lb)

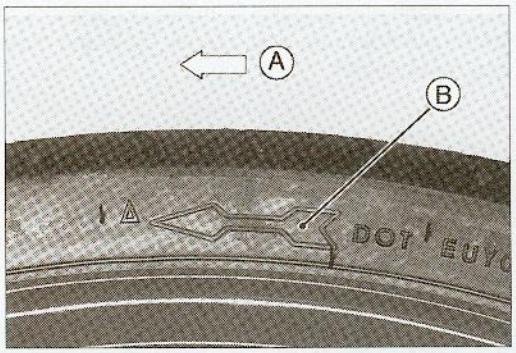
● Apply a soap and water solution, or rubber lubricant to the rim flange and tire beads.



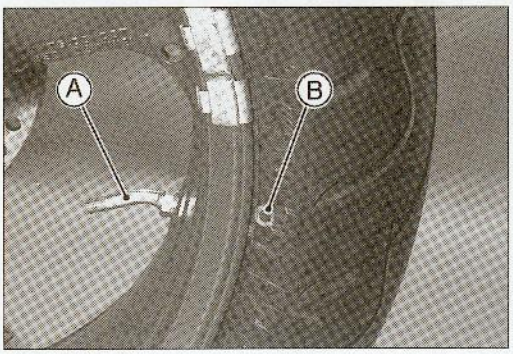
○ Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

NOTE

○ *The direction of the tire rotation [A] is shown by an arrow [B] on the tire sidewall.*



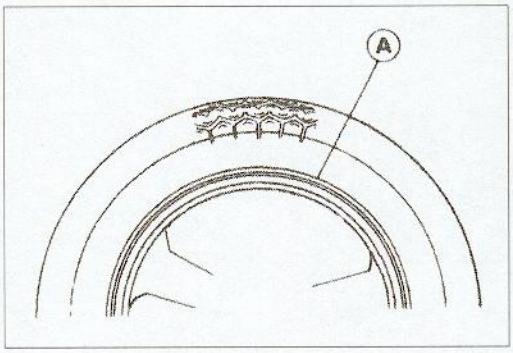
● Position the tire on the rim so that the valve [A] is at the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
● Install the tire on the rim using a suitable commercially available tire changer.
● Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
● Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.



⚠ WARNING

Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kg/cm², 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.

● Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.
★ If the rim flanges and tire sidewall 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 leaks.
○ 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.
● Install the brake disc(s) so that the disc rotation mark aligns with the tire rotation.
● Adjust the wheel balance.



Repair

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

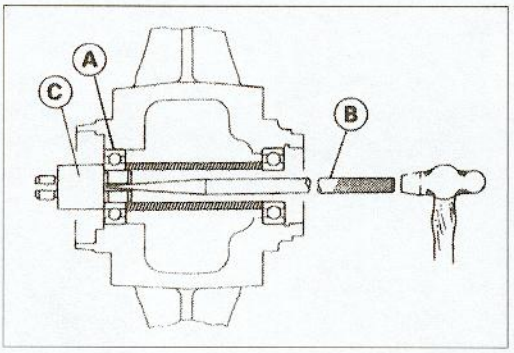
Hub Bearings

Hub Bearing Removal

- Remove the wheel, and take out the following.
  Collars
  Coupling (Out of rear hub)
  Grease Seals
  Circlip

Special Tool - Inside Circlip Pliers: 57001-143

- Take the bearings [A] out of the hub.



CAUTION

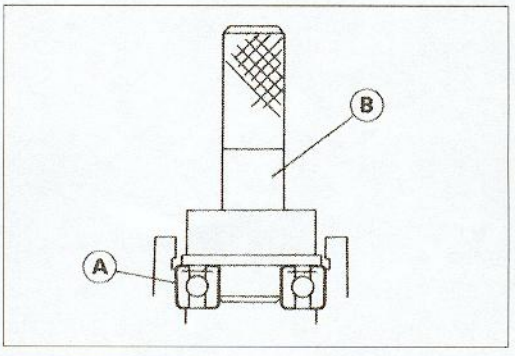
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Please blocks under the wheel so that the disc does not touch the ground.

Special Tools - Bearing Remover Shaft, ϕ13: 57001-1377 [B]
Bearing Remover Head, ϕ25 × ϕ28: 57001-1346 [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.
- ○ Press in each right the bearing [A] until they are bottomed.

Special Tool - Bearing Driver Set: 57001-1129 [B]



NOTE

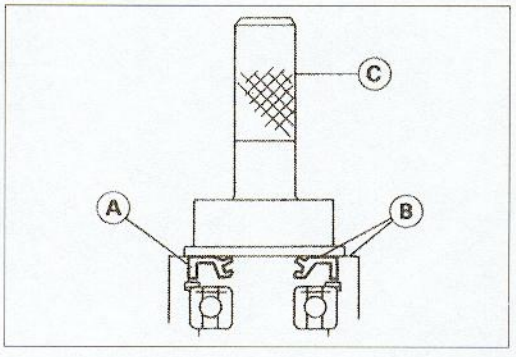
○ *Install the bearings so that the marked side faces out.*

○ 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 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]

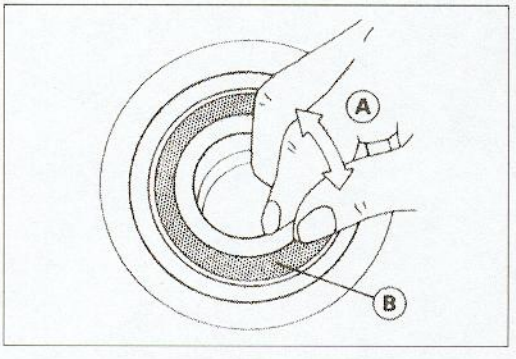


Hub Bearing Inspection

NOTE

○ *It is not necessary to remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.*

- Spin [A] it by hand to check its condition.
- ★ If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



Final Drive

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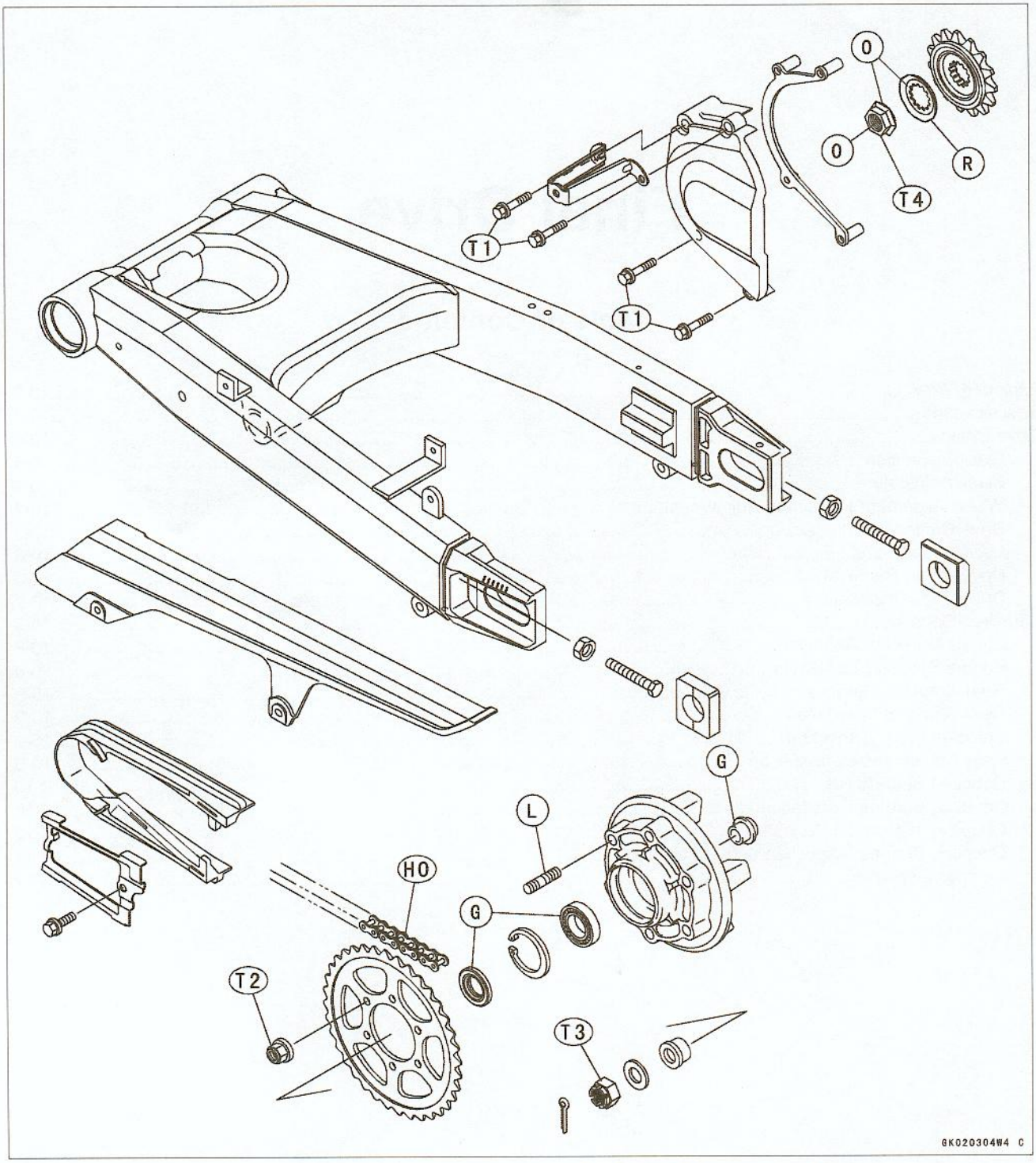
Exploded View



G: Apply grease.
HO: Apply heavy oil.
L: Apply a non-permanent locking agent.
O: Apply oil.
R: Replacement Parts

T1: 12 N·m (1.2 kg·m, 106 in·lb)
T2: 59 N·m (6.0 kg·m, 43 ft·lb)
T3: 125 N·m (13 kg·m, 94 ft·lb)
T4: 127 N·m (13 kg·m, 94 ft·lb)

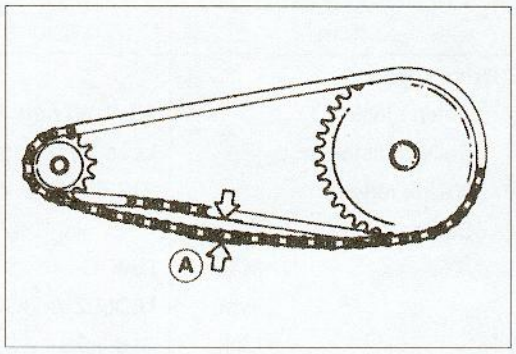
Specifications

Item		Standard	Service Limit
Drive Chain:			
Chain slack		25 ~ 35 mm (0.10 ~ 1.4 in.)	(Usable range) 25 ~ 40 mm (0.98 ~ 1.6 in.)
Rollers distance		Less than 6 mm (0.236 in.)	6.2 mm (0.244 in.)
20-link length		317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard chain			
	Make	DAIDO	– – –
	Type	DID50ZVM3GC&B, Endless	– – –
	Link	116 links	– – –
Sprockets:			
Rear sprocket warp		0.4 mm (0.02 in.) or less	0.5 mm (0.02 in.)

Special Tools - Inside Circlip Pliers: 57001-143
Bearing Driver Set: 57001-1129

Drive Chain

Slack Inspection



NOTE

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

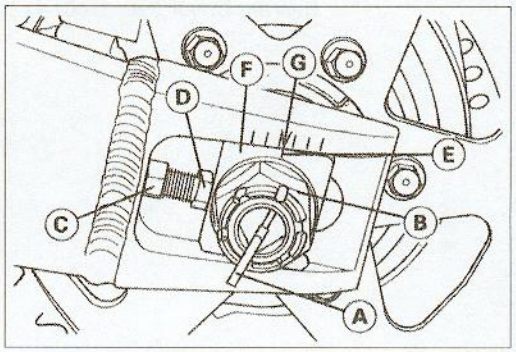
- Check the wheel alignment (see Wheel Alignment Inspection).
- Rotate the rear wheel to find the position where the chain is tightest.
- Measure the vertical movement (chain slack) [A] midway between the sprockets.

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

Chain slack

Standard:	**25 ~ 35 mm (0.10 ~ 1.4 in.)**
Usable Range:	**25 ~ 40 mm (0.98 ~ 1.6 in.)**

Slack Adjustment



- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].
- Turn the chain adjusters [D] forward or rearward until the drive chain has the correct amount of chain slack.
- The right and left notches [E] on the alignment indicators [F] should point to the same marks or positions [G] on the swingarm.

⚠ WARNING

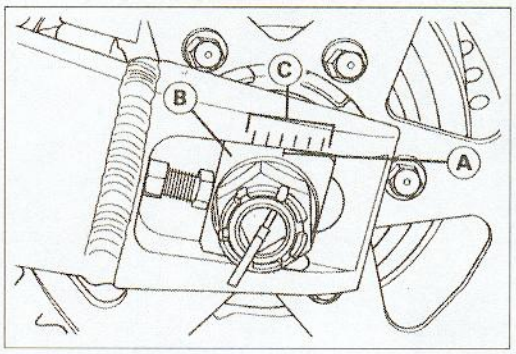
Misalignment of the wheel will result in abnormal wear and may result in an unsafe riding condition.

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

Torque - Rear Axle Nut: 125 N·m (13 kg·m, 94 ft·lb)

- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin and spread its ends.

Wheel Alignment Inspection Adjustment



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

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

NOTE

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

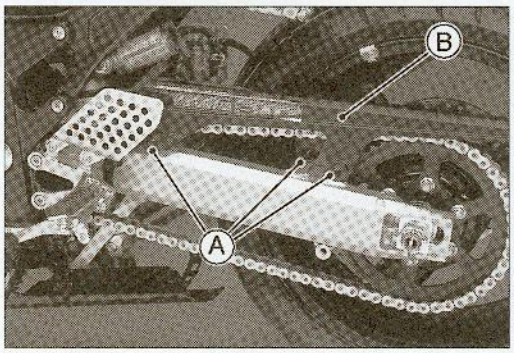
⚠ WARNING

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

Drive Chain

Drive Chain Wear Inspection

- Remove:
  Mounting Screws [A]
  Chain Cover [B]



- Rotate the rear wheel to inspect the drive chain for cracked, worn or damaged rollers, pins [F] and links [E,C]

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

Drive Chain Roller Wear:

- Measure the distance [A] between the rollers [B] in the inner link plates [C] with Vernier calipers to inspect wear between the roller and bushing. Since the roller and bushing may wear unqually, take measurements at six places.

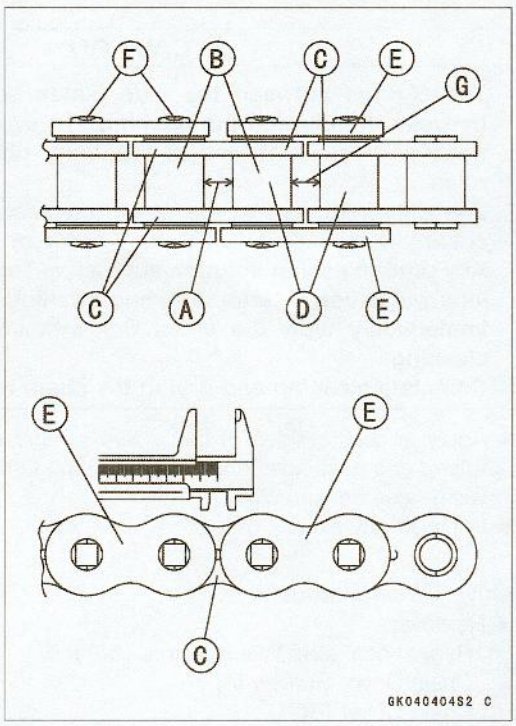
NOTE

○ *Do not measure the distance [G] between the rollers [D] in the outer link plates [E] to inspect wear between the bushing and pin [F].*

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

Rollers Distance

Standard:	**Less than 6 mm (0.236 in.)**
Service Limit:	**6.2 mm (0.244 in.)**



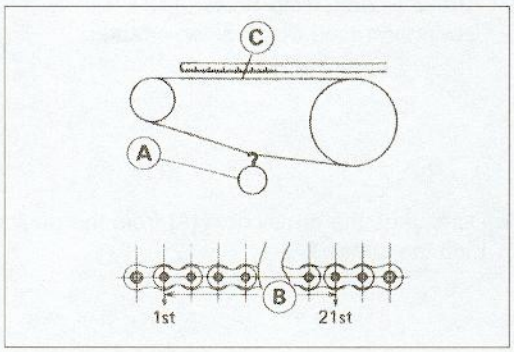
Drive Chain Wear:

- Stretch the chain taut by hanging a 98 N (10 kg, 20 lb) weight [A] on the chain.
- Measure the length of 20 links [B] on the straight part [C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.

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

Drive Chain 20-link Length

Standard:	**317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)**
Service Limit:	**323 mm (12.7 in.)**



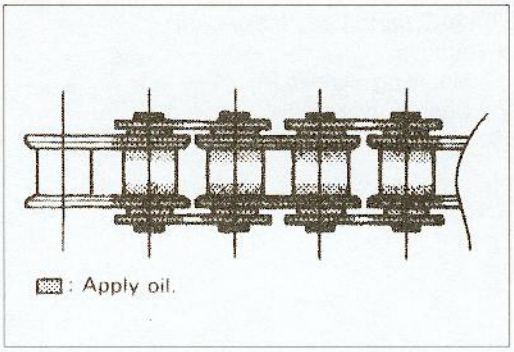
⚠ WARNING

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.

Drive Chain

Lubrication

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



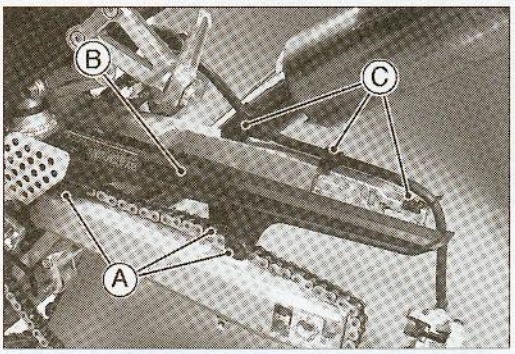
CAUTION

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 oil for cleaning an O-ring drive chain.
Any other cleaning solution such as gasoline or trichloroethylene will cause deterioration and swelling of the O-ring.
Immediately blow the chain dry with compressed air after cleaning.
Complete cleaning and drying the chain within 10 minutes.

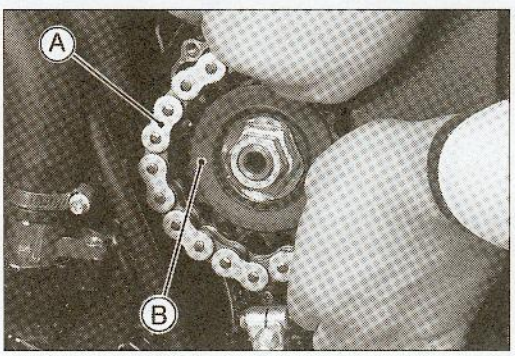
- Apply oil to the sides of the rollers so that oil will penetrate to the rollers and bushings. Apply the oil to the O-rings so that the O-rings will be coated with oil.
- Wipe off any excess oil.

Drive Chain Removal

- Remove:
  Rear Wheel (see Wheels/Tires chapter)
  Chain Cover Screws [A]
  Chain Cover [B]
  Brake Hose Clamp Screws [C]
  Swingarm (see Suspension chapter)
  Engine Sprocket Cover (see this chapter)



- Disengage the drive chain [A] from the engine sprocket [B], and take it off the chassis.



Drive Chain

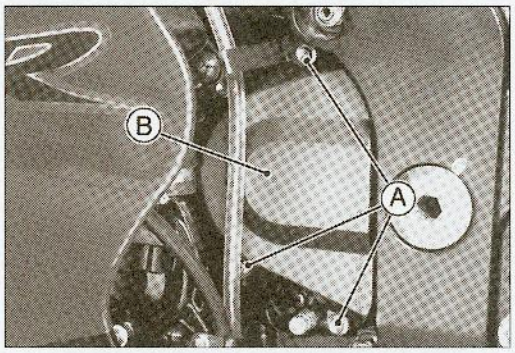
Drive Chain Installation

- Engage the drive chain to the engine sprocket.
- Install:
  Swingarm (see Suspension chapter)
  Rear Wheel (see Wheels/Tires chapter)
  Engine Sprocket Cover
  Chain Cover
- Adjust the chain slack after installing the chain (see Slack Adjustment).

Sprocket, Coupling

Engine Sprocket Removal

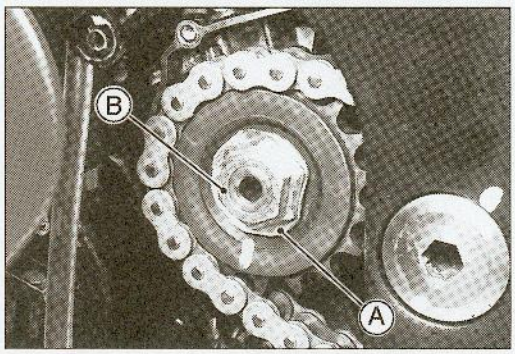
- Remove:
  Engine Sprocket Cover Bolts [A]
  Engine Sprocket Cover [B]



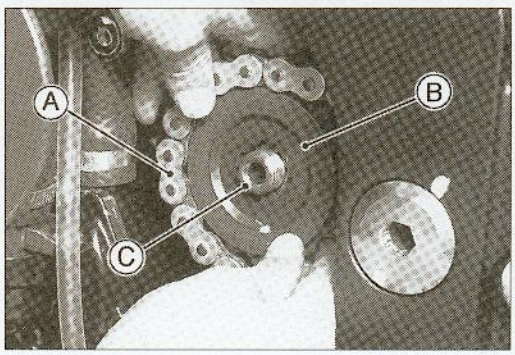
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

NOTE

○ *When loosening the engine sprocket nut, hold the rear brake on.*



- Using the stand, raise the rear wheel off the ground.
- Loosen the drive chain (see Slack Adjustment).
- Remove the drive chain from the rear sprocket toward the right.
- Disengage the drive chain [A] from the engine sprocket [B].
- Pull the engine sprocket off the output shaft [C].



Engine Sprocket Installation

- Replace the sprocket washer and axle cotter pin.
- Install the engine sprocket.
- Apply oil to the threads of the output shaft and the seating surface of the engine sprocket nut.
- After torquing the engine sprocket nut, bend the one side of the washer over the nut.

NOTE

○ *Tighten the nut while applying the rear brake.*

Torque - Engine Sprocket Cover Bolts: 12 N·m (1.2 kg·m, 106 in·lb)
Engine Sprocket Nut: 127 N·m (13 kg·m, 94 ft·lb)

- Adjust the drive chain slack after installing the sprocket (see Slack Adjustment).

Sprocket, Coupling

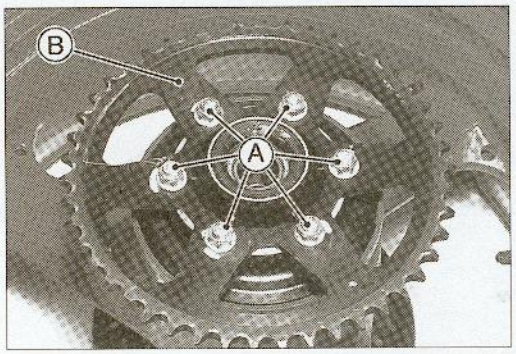
Rear Sprocket Removal

- Remove the rear wheel (see Wheels/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.

- Remove the rear sprocket nuts [A].
- Remove the rear sprocket [B].

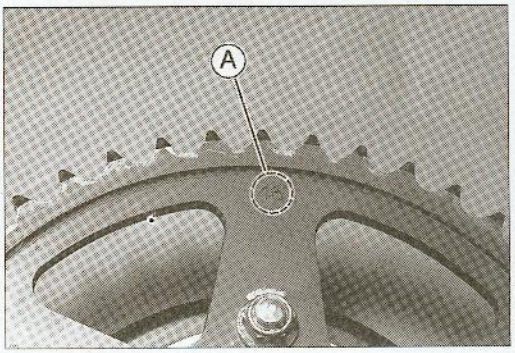


Rear Sprocket Installation

- Install the sprocket facing the tooth number marking [A] outward.
- Tighten the rear sprocket nuts.

Torque - Rear Sprocket Nuts: 59 N·m (6.0 kg·m, 43 ft·lb)

- Install the rear wheel (see Wheels/Tires chapter).

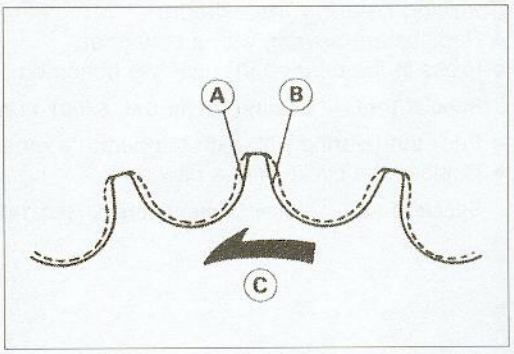


Sprocket Wear Inspection

- 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.*

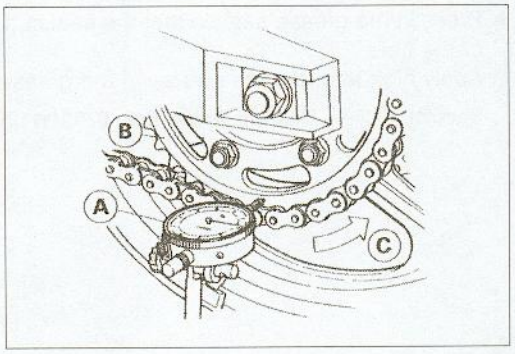
Rear Sprocket Warp Inspection

- Raise the rear wheel off the ground (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 (0.02 in.) or less**
Service Limit:	**0.5 mm (0.02 in.)**

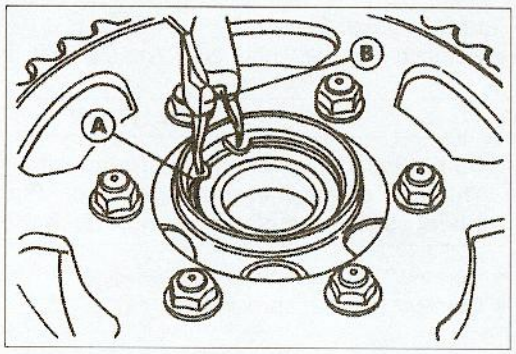


Sprocket, Coupling

Coupling Bearing Removal

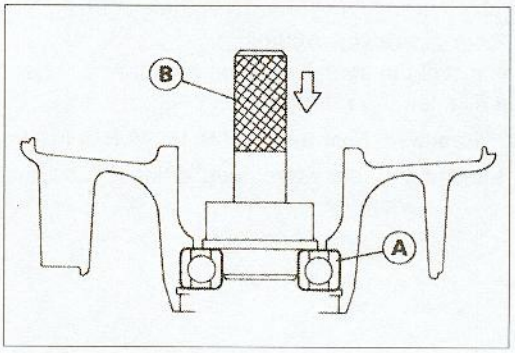
- Remove the rear wheel (see Wheels/Tires chapter).
- Remove:
  Coupling
  Grease Seal
  Circlip [A]

Special Tool - Inside Circlip Pliers: 57001-143 [B]



- Remove the bearing [A] by tapping from the wheel side.

Special Tool - Bearing Driver Set: 57001-1129 [B]



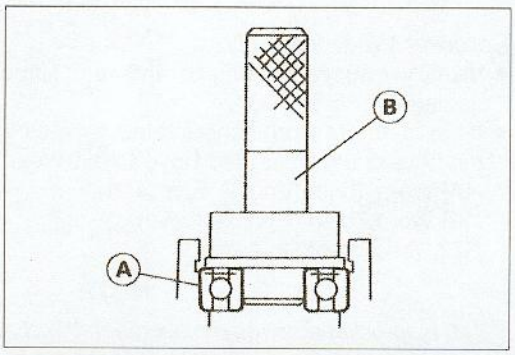
Coupling Bearing Installation

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.

Special Tool - Bearing Driver Set: 57001-1129 [B]

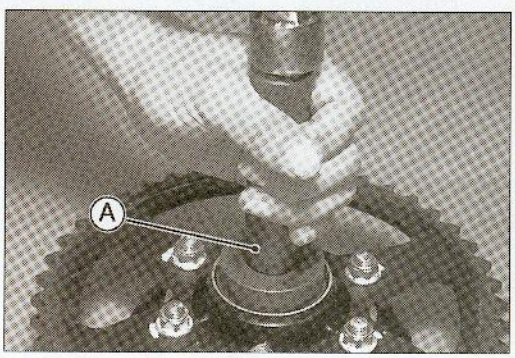
- Pack the bearing with high temperature grease.
- Replace the circlip with a new one.

Special Tool - Inside Circlip Pliers: 57001-143



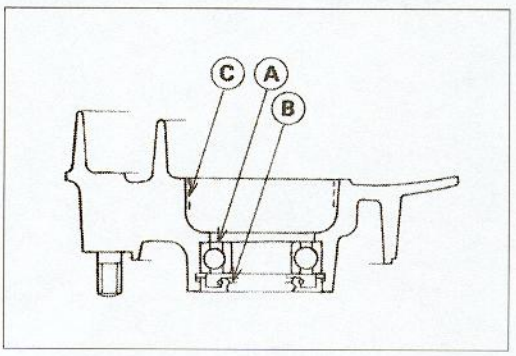
- Replace the grease seal with a new one.
- Press in the grease seal so that the seal surface is flush with the end of the hole.
- ○ Apply high temperature grease to the grease seal lips.

Special Tool - Bearing Driver Set: 57001-1129 [A]



Coupling Installation

- Grease the following and install the coupling.
  Ball Bearing [A]
  Coupling Grease Seal [B]
  Coupling Internal Surface [C]



Sprocket, Coupling

Coupling Bearing Inspection and Lubrication

NOTE

○ *It is not necessary to remove the coupling bearing for inspection and lubrication. If the bearing is removed, it will need to be replaced with a new one.*

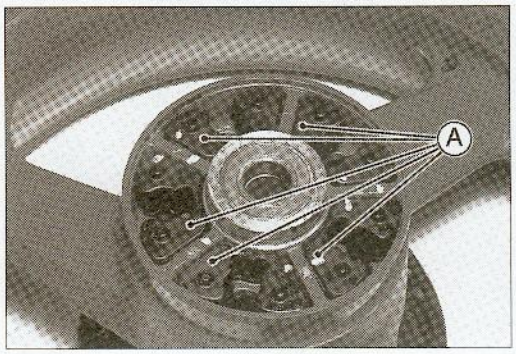
- Wash the bearing with a high flash-point solvent, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition.

★ If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced.

- Pack the bearing with good quality bearing grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.

Damper Inspection

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.



Brakes

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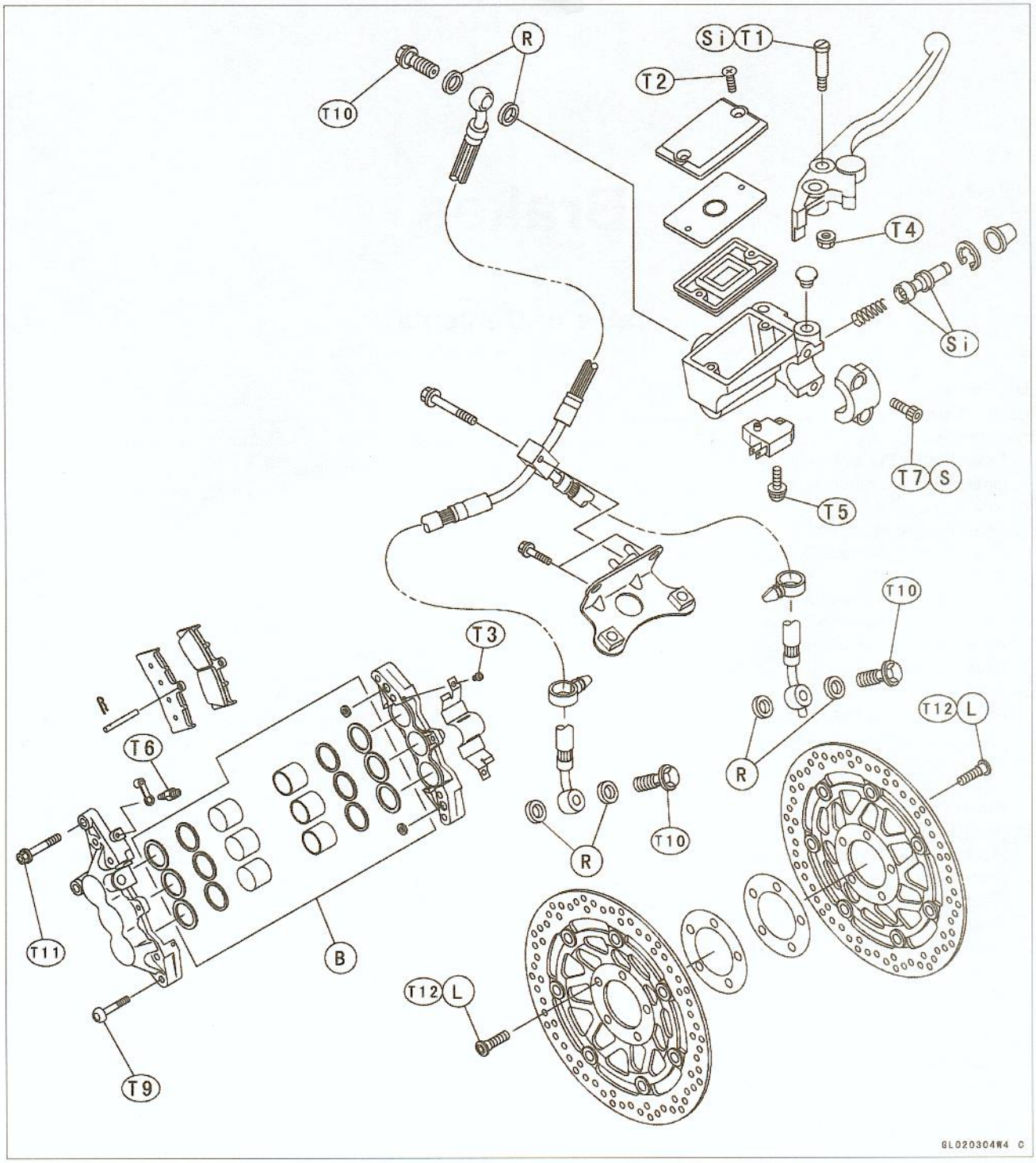
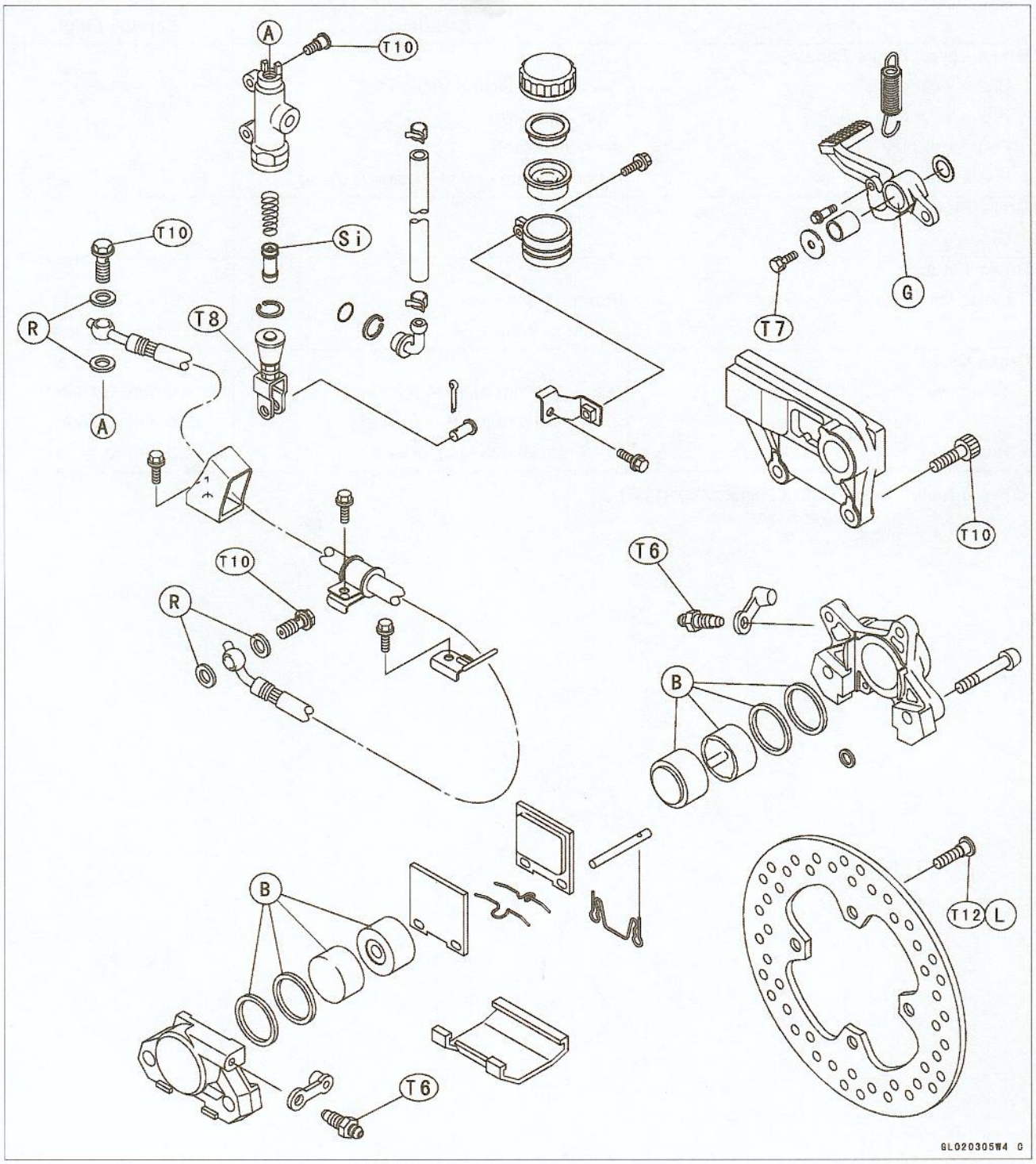
Exploded View



B: Apply brake fluid.
G: Apply grease.
R: Replacement Parts
S: Follow the specific tightening sequence.
Si: Apply silicone grease (ex. PBC grease)
L: Apply a non-permanent locking agent.
T1: 1.0 N·m (0.10 kg·m, 9 in·lb)
T2: 1.5 N·m (0.15 kg·m, 13 in·lb)
T3: 2.9 N·m (0.30 kg·m, 26 in·lb)
T4: 5.9 N·m (0.60 kg·m, 52 in·lb)
T5: 1.2 N·m (0.10 kg·m, 9 in·lb)
T6: 7.8 N·m (0.80 kg·m, 69 in·lb)
T7: 8.8 N·m (0.90 kg·m, 78 in·lb)
T8: 18 N·m (1.8 kg·m, 13 ft·lb)
T9: 21 N·m (2.1 kg·m, 15 ft·lb)
T10: 25 N·m (2.5 kg·m, 18 ft·lb)
T11: 34 N·m (3.5 kg·m, 25 ft·lb)
T12: 27 N·m (2.8 kg·m, 20 ft·lb)

Exploded View



Specifications

Item		Standard	Service Limit
Brake Lever, Brake Pedal:			
Brake lever position		5-way adjustable (to suit rider)	– – –
Brake lever free play		Non-adjustable	– – –
Pedal free play		Non-adjustable	– – –
Pedal position		About 43 mm (1.7 in.) below footpeg top	– – –
Brake Fluid:			
Grade		D.O.T.4	– – –
Brake Pads:			
Lining thickness:	Front	4 mm (0.2 in.)	1 mm (0.04 in.)
	Rear	4 mm (0.2 in.)	1 mm (0.04 in.)
Brake Discs:			
Thickness:	Front	4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
	Rear	5.8 ~ 6.0 mm (0.23 ~ 0.24 in.)	5.0 mm (0.20 in.)
Runout		0.15 mm (0.0059 in.) or less	0.3 mm (0.01 in.)

Special Tools - Inside Circlip Pliers: 57001-143
Jack: 57001-1238

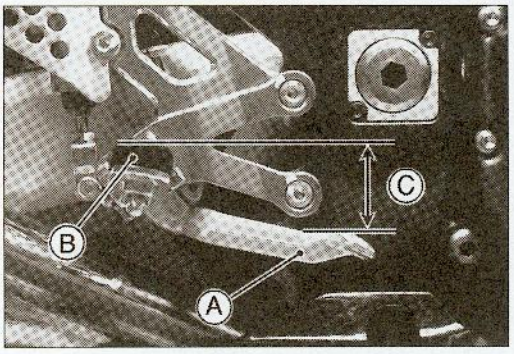
Brake Pedal

Brake Pedal Position Adjustment

- Check that the brake pedal [A] is in the correct position.
  Footpeg [B]

Pedal Position [C]
Standard: About 43 mm (1.7 in.) below top of footpeg

★ If it is incorrect, adjust the brake pedal position.

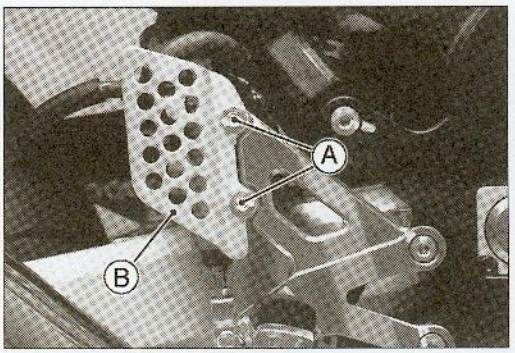


Brake Pedal Position Adjustment

NOTE

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

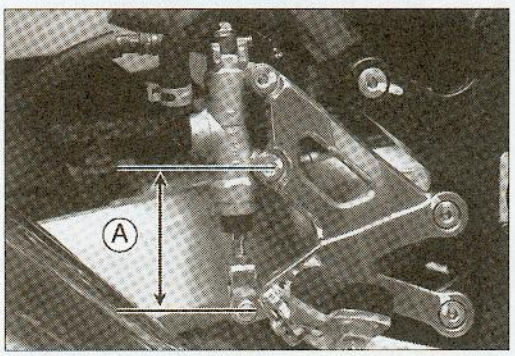
- Unscrew the bolts [A] and remove the guard bracket [B].
- Reinstall the bolts with master cylinder.



- Measure the length indicated in the figure.

Length [A]
Standard: 67 ± 1 mm (2.6 ± 0.04 in.)

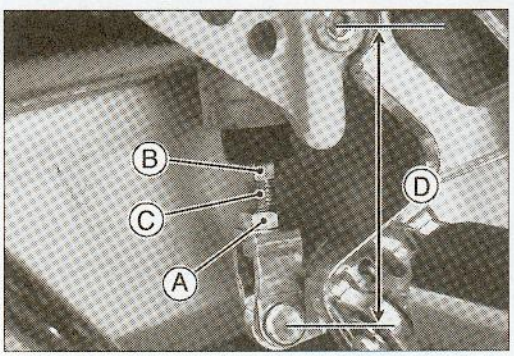
★ If it is specified length, the brake pedal may be deformed or incorrectly installed.
★ If it is not within the specified length, adjust the push rod in the master cylinder as following.



○ Loosen the push rod locknut [A].
○ Turn the hex head [B] of the push rod [C] to obtain the specified length [D].
○ Tighten the locknut.

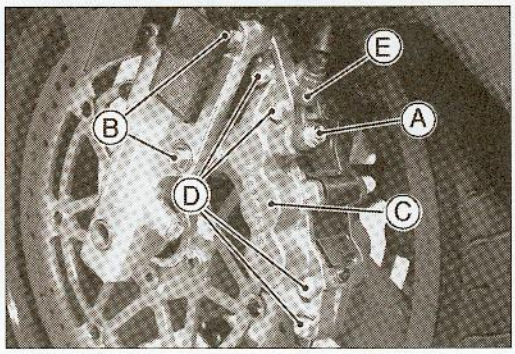
Torque - Rear Master Cylinder Push Rod Locknut: 18 N·m (1.8 kg·m, 13 ft·lb)

- Check the brake light switch operation (see Electrical System chapter).



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 [D]. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leadage.

- Unscrew the banjo bolt and remove the brake hose [E] from the caliper (see Brake Hose Removal/Installation).

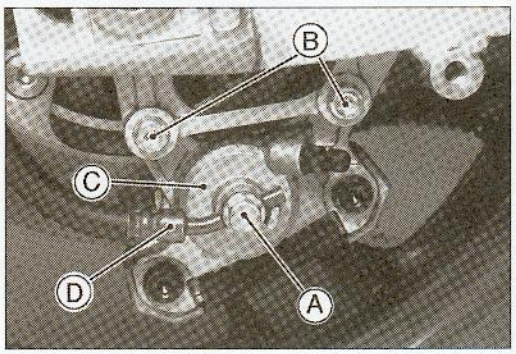
CAUTION

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 that are on each side of hose fitting with new ones.
- Tighten the caliper mounting bolts and banjo bolt.

Torque - Front Caliper Mounting Bolts: 34 N·m (3.5 kg·m, 25 ft·lb)
Rear Caliper Mounting Bolts: 25 N·m (2.5 kg·m, 18 ft·lb)
Brake Hose Banjo Bolt: 25 N·m (2.5 kg·m, 18 ft·lb)

- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

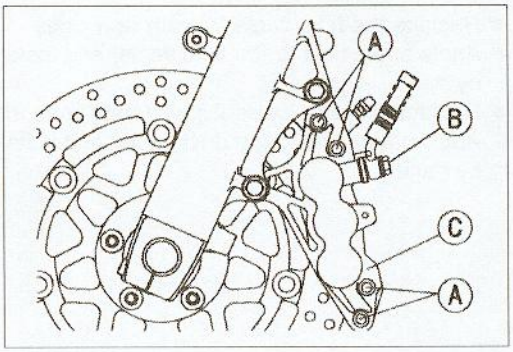
⚠ WARNING

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

Calipers

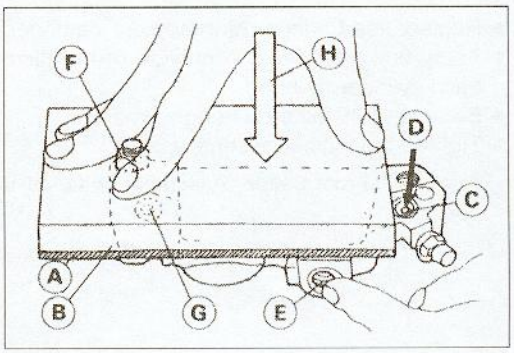
Front Caliper Disassembly

- Remove the pad spring and brake pads (see this chapter).
- Loosen the front caliper assembly bolts [A] and front caliper banjo bolt [B] and tighten them loosely.
- Remove the front caliper [C] and banjo bolt.
- Remove the front caliper assembly bolts and split the front caliper.
- Remove the O-rings.



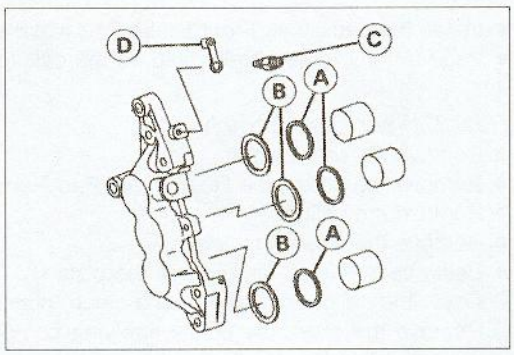
- Using compressed air, remove the pistons. One way to remove the pistons is as follows.
  - Install a rubber gasket [A] and a wooden board [B] more than 10 mm thick on the caliper half, and fasten them together with a suitable bolt and nut as shown. Leave one of the oil passages [C] open.
  - Lightly apply compressed air [D] to the oil passage until the pistons hit the rubber gasket. Block the hose joint opening [E] during this operation if the caliper half has the opening.

    Bolt and Nut [F]
    Oil Passage sealed by Rubber Gasket [G]
    Push down [H]



⚠ WARNING

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



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

NOTE

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

Front Caliper Assembly

- Clean the caliper parts except for the pads.

CAUTION

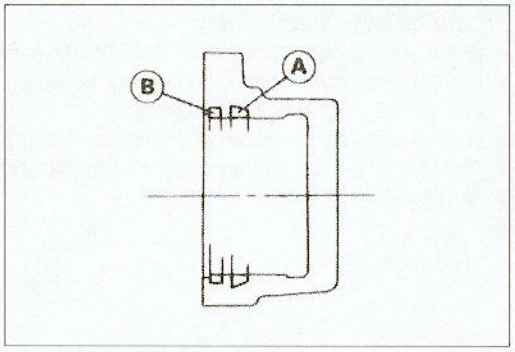
For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.

- Install the bleed valve and rubber cap.

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

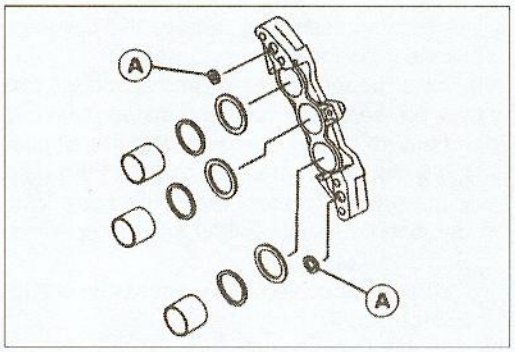
Calipers

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



- Replace the O-rings [A] if they are damaged.
- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
- Be sure to install the O-rings.
- Tighten the caliper assembly bolts.

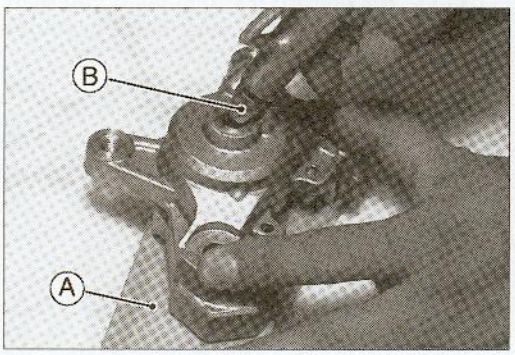
Torque - Front Caliper Assembly Bolts: 21 N·m (2.1 kg·m, 15 ft·lb)



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

Rear Caliper Disassembly

- Remove the rear caliper.
- Remove the pads (see Rear Brake Pad Removal).
- Remove the caliper.
- Remove the piston insulator.
- Using compressed air, remove the piston.
  - Cover the caliper opening with a clean, plastic plate [A].
  - Remove the piston by lightly applying compressed air [B] to where the brake line fits into the caliper.



⚠ WARNING

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

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

NOTE

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

Calipers

Rear Caliper Assembly

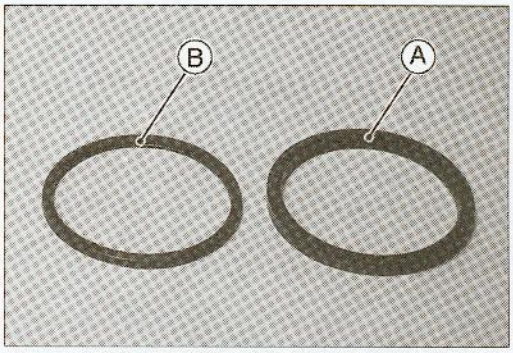
- Clean the caliper parts except for the pads.

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

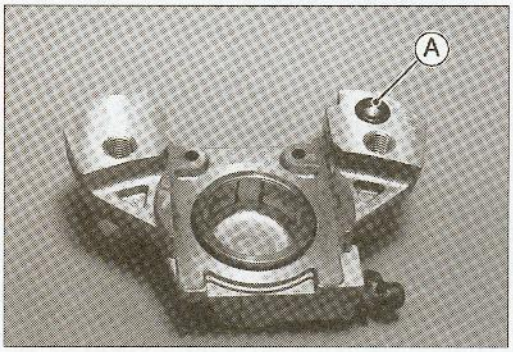
- Install the bleed valve and rubber cap.

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

- Replace the fluid seal [A] with a new one.
- Apply brake fluid to the fluid seal, and install it into the cylinder by hand.
- Replace the dust seal [B] with a new one if it is damaged.
- Apply brake fluid to the dust seal, and install it into the cylinder by hand.



- Replace the O-ring [A] if it is damaged.
- Apply brake fluid to the outside of the piston, and push it into the cylinder by hand.
- Install the piston insulator.

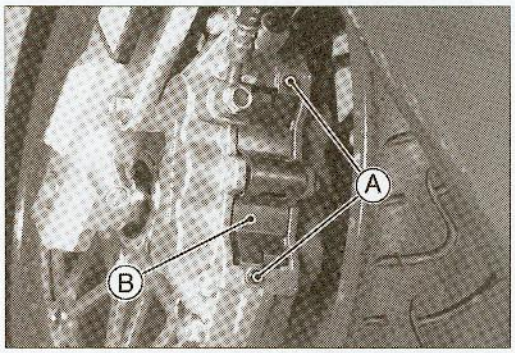


- Install the pads (see Rear Brake Pad Installation).
- Wipe up any spilled brake fluid on the caliper with wet cloth.

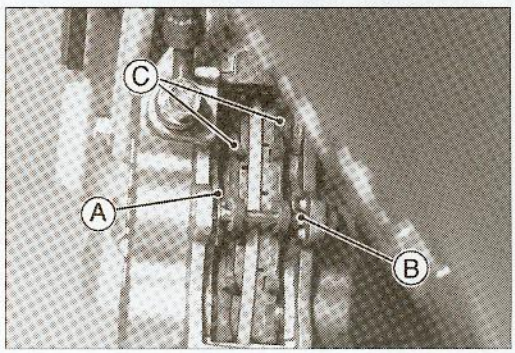
Brake Pads

Front Brake Pad Removal

- Unscrew the pad spring bolts [A], and remove the pad spring [B].



- Draw out the clip [A], and take off the pad pin [B].
- Remove the brake pads [C].



Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Install the brake pads.
- Install the pad pin and clip. The clip must be "outside" of the pads.
- Install the caliper (see Caliper Installation).

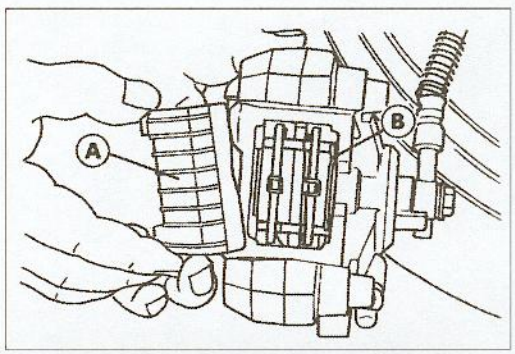
Torque - Front Brake Pad Spring Bolts: 2.9 N·m (0.30 kg·m, 26 in·lb)

⚠ WARNING

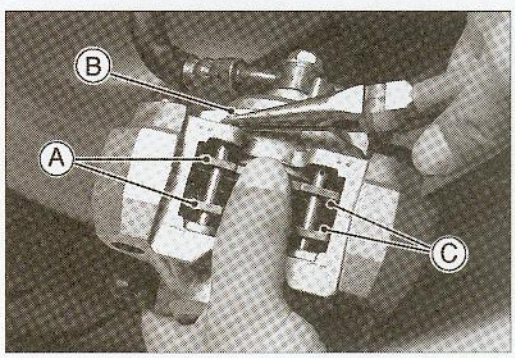
Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.

Rear Brake Pad Removal

- Unscrew the caliper mounting bolts.
- Detach the caliper from the disc.
- Remove the piston pad cover [A].
- Draw out the clip [B] upward.



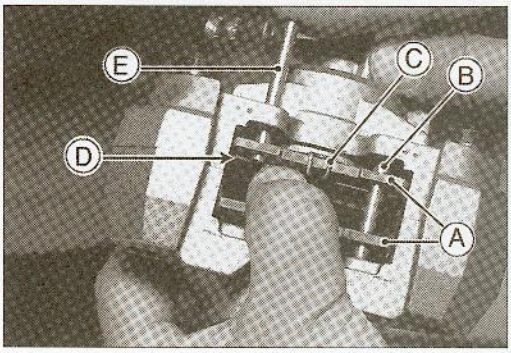
- Pushing either ends [A] of the pads lightly and then take off the push side pin [B].
- Remove the pad springs [C] and brake pads.



Brake Pads

Rear Brake Pad Installation

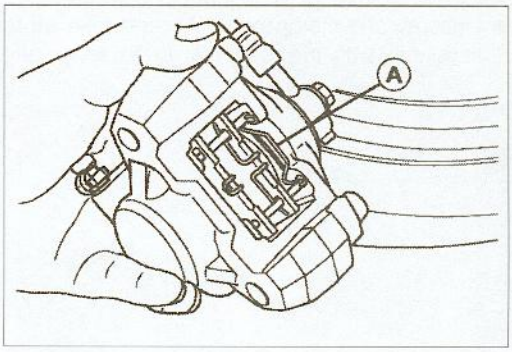
- Push the caliper piston in by hand as far as it will go.
- Put the pads [A] in the caliper, using pin [B].
- Install the anti-rattle spring [C] in place.
- ○ Push the spring end [D], and insert the pin [E].
- Install other side anti-rattle spring.



- Insert the clip [A]. The clip must be "outside" of the pads.
- Install the caliper (see Caliper Installation).

⚠ 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.

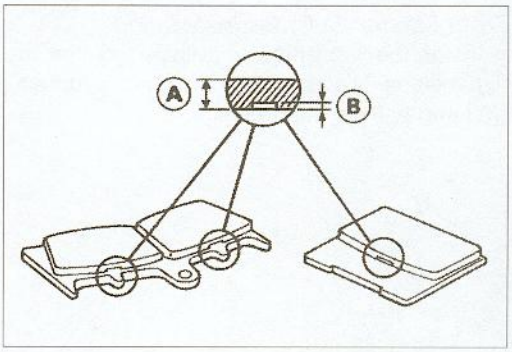


Brake Pad Lining Wear

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

Pad Lining Thickness

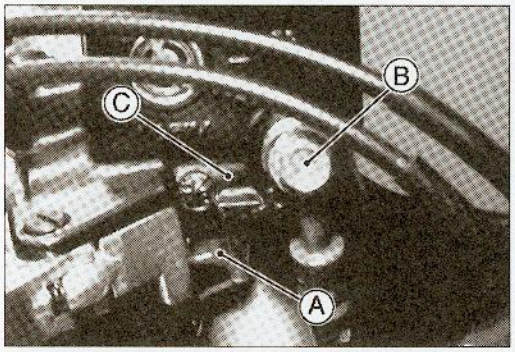
Standard:	**Front**	**4 mm (0.2 in.)**
	Rear	**4 mm (0.2 in.)**
Service Limit:		**1 mm (0.04 in.)**



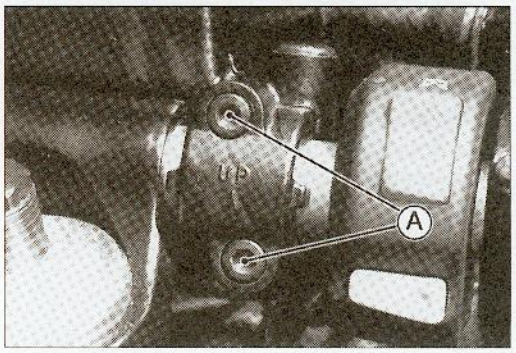
Master Cylinder

Front Master Cylinder Removal

- Disconnect the front brake light switch connectors [A].
- Remove the banjo bolt [B] to disconnect the brake hose from the master cylinder [C] (see Brake Hose Removal/Installation).

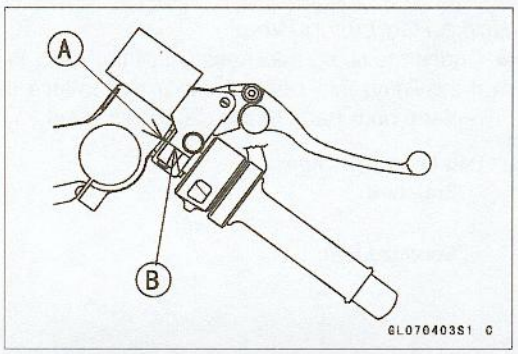


- Unscrew the clamp bolts [A], and take off the master cylinder as an assembly with the reservoir, brake lever, and brake switch installed.



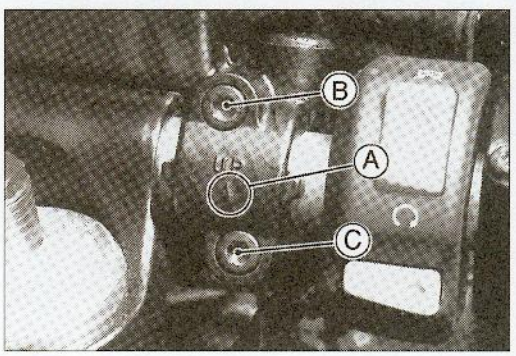
Front Master Cylinder Installation

- Install the front master cylinder so that the punch mark [A] of the handlebar is aligned with the mating surface [B] of the master cylinder clamp to level the reservoir.



- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Apply grease to the clamp bolts.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C]. There will be a gap at the lower part of the clamp after tightening.

Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kg·m, 78 in·lb)



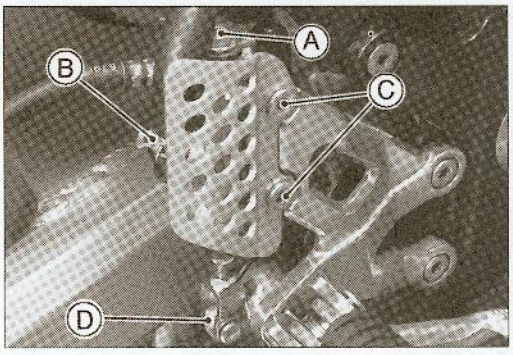
- Replace the washers that are on each side of the hose fitting with new ones.
- Tighten the brake hose banjo bolt.

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

- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

Master Cylinder

Rear Master Cylinder Removal



- Unscrew the brake hose banjo bolt [A] on the master cylinder (see Brake Hose Removal/Installation).
- Pull off the reservoir hose lower end [B], and drain the brake fluid into a container.
- Loosen the guard bolts [C] lightly.
- Remove the cotter pin [D].

NOTE

○ *Pull off the joint pin while pressing down the brak pedal.*

- Unscrew the bracket bolts, and remove the master cylinder.

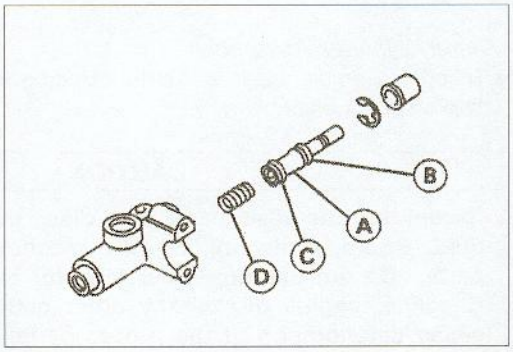
Rear Master Cylinder Installation

- Replace the cotter pin with a new one.
- Replace the washers that are on each side of hose fitting with new ones.
- Tighten the following bolts.

Torque - Rear Master Cylinder Guard Bolts: 25 N·m (2.5 kg·m, 18 ft·lb)
Brake Hose Banjo Bolt: 25 N·m (2.5 kg·m, 18 ft·lb)

- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

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 locknut 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.

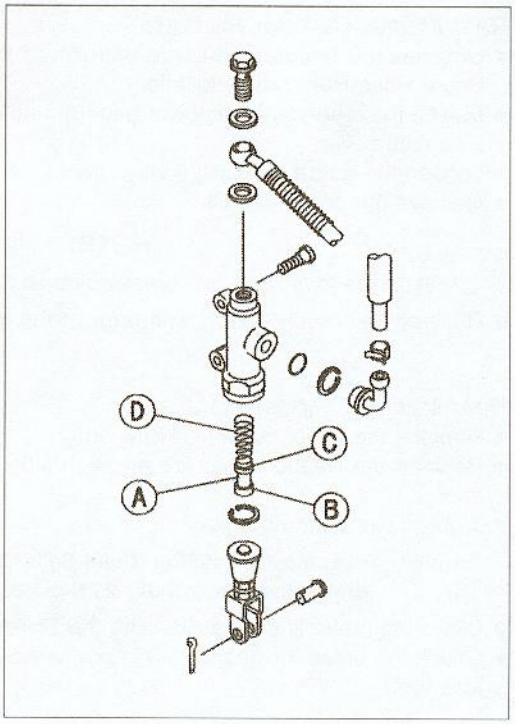
Master Cylinder

Rear Master Cylinder Disassembly

- Remove the rear master cylinder (see Rear Master Cylinder Removal).
- Slide the dust cover on the push rod out of place, and remove the circlip.

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].



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

- Apply brake fluid to the removed parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Tighten the brake lever pivot bolt and the locknut.

Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kg·m, 9 in·lb)
Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kg·m, 52 in·lb)

Master Cylinder

Master Cylinder Inspection (Visual Inspection)

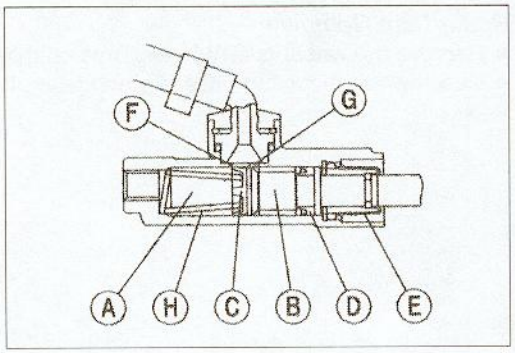
- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall of each master cylinder [A] and on the outside of each piston [B].

★ If a master cylinder or piston shows any damage, replace them.

- Inspect the primary [C] and secondary [D] cups.

★ If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.

★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.



- Check the dust covers [E] for damage.

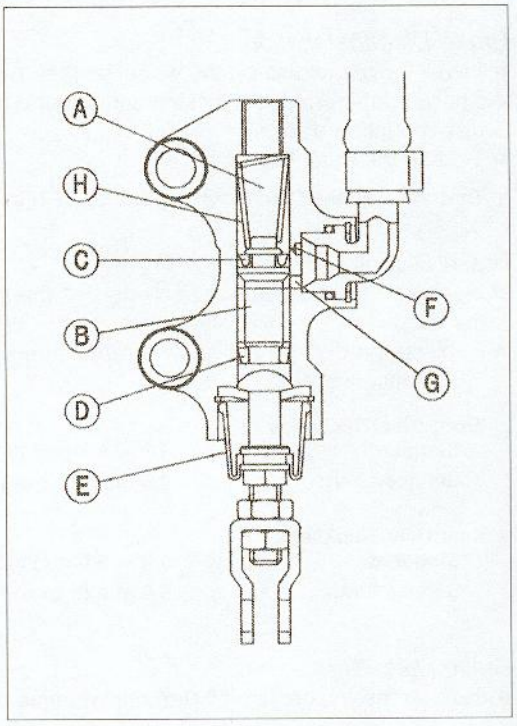
★ If they are damaged, replace them.

- Check that relief [F] and supply [G] ports are not plugged.

★ If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

- Check the piston return springs [H] for any damage.

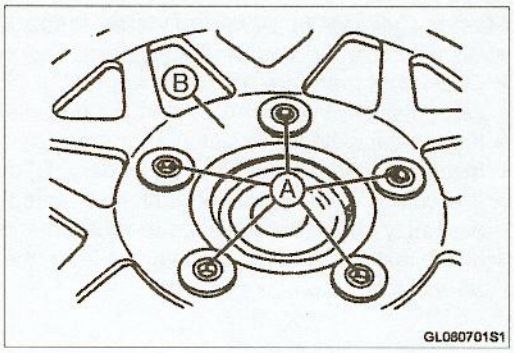
★ If the springs are damaged, replace them.



Brake Discs

Brake Disc Removal

- Remove the wheel (see Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc [B].



Brake Disc Installation

- Install the brake disc on the wheel so that the marked side faces out.
- Apply a non-permanent locking agent to the threads of the rear brake disc mounting bolts.
- Tighten the mounting bolts.

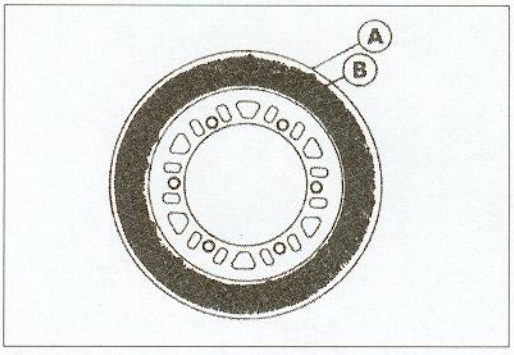
Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kg·m, 20 ft·lb)

Brake Disc Wear

- Measure the thickness of each disc at the point where it has worn the most.

★ Replace the disc [A] if it has worn past the service limit.

[B] Measuring Area



Front Disc Thickness

Standard:	**4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)**
Service Limit:	**4.5 mm (0.18 in.)**

Rear Disk Thickness

Standard:	**5.8 ~ 6.0 mm (0.23 ~ 0.24 in.)**
Service Limit:	**5.0 mm (0.20 in.)**

Brake Disc Warp

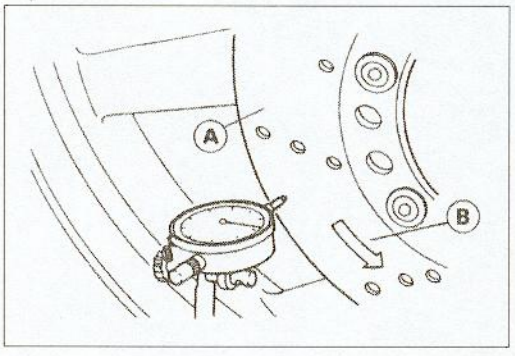
- Jack up the motorcycle so that the wheel is off the ground.

Special Tool - Jack: 57001-1238

- For front disc inspection, turn the handlebar fully to one side.
- Set up a dial gauge against the disc [A] as shown and measure disc runout.

[B] Turn the wheel by hand.

★ If runout exceeds the service limit, replace the disc.



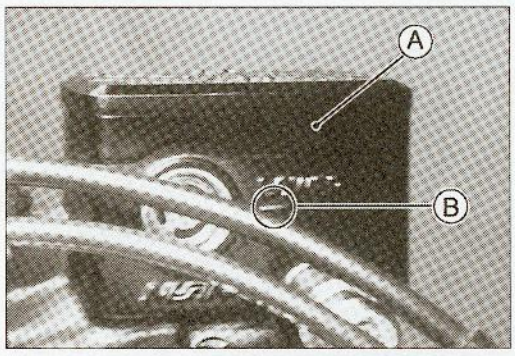
Disc Runout

Standard:	**0.15 mm (0.0059 in.) or less**
Service Limit:	**0.3 mm (0.01 in.)**

Brake Fluid

Brake Fluid Level Inspection

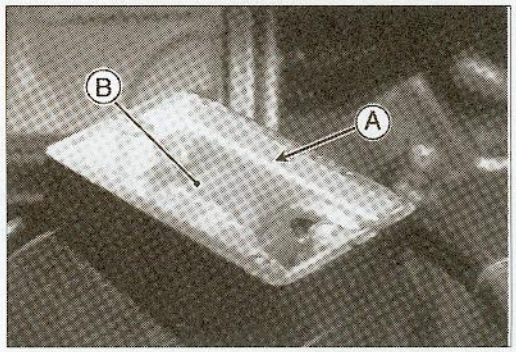
- Check that the brake fluid level in the front brake reservoir [A] is above the lower level line [B].



NOTE

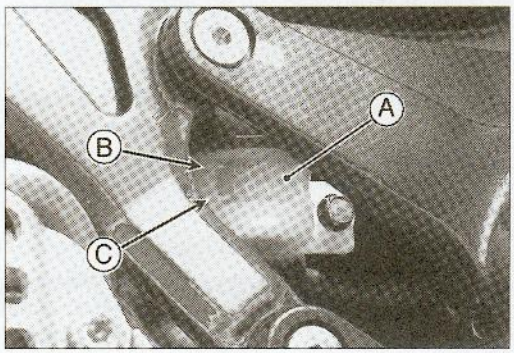
○ *Hold the reservoir horizontal by turning the handlebar when checking brake fluid level.*

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



- Check that the brake fluid level in the rear brake reservoir [A] is between the upper [B] and the lower [C] level lines.

★ If the fluid level is lower than the lower level line, remove the seats and fill the reservoir to the upper level line.



⚠ WARNING

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

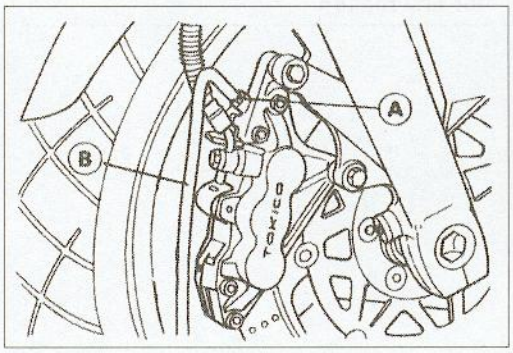
Recommended Disc Brake Fluid
Grade: **D.O.T.4**

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



Brake Fluid

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

NOTE

- ○ *The fluid level must be checked often during the changing operation and replenished with fresh brake fluid. If the fluid in the reservoir runs out any time during the changing operation, the brakes will need to be bled since air will have entered the brake line.*
- ○ *Front brake: Repeat the above steps for the other caliper.*
- ○ *Rear brake: Repeat the above steps for the other bleed valve.*

- Remove the clear plastic hose.
- Install the reservoir cap.
- Tighten the front reservoir cap screws.

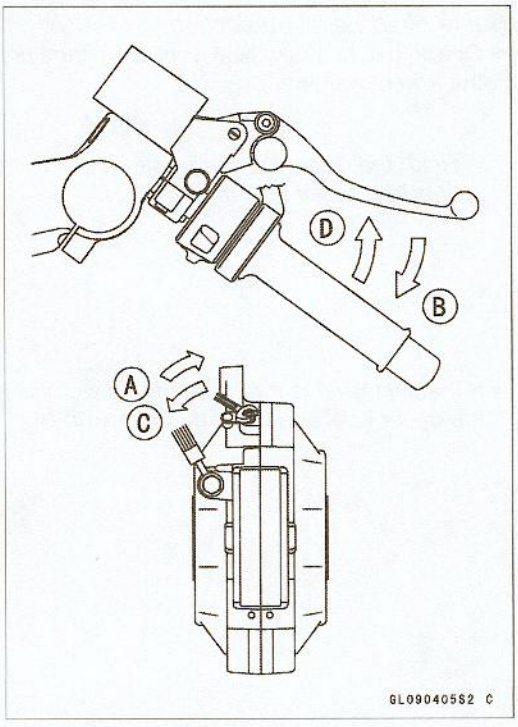
Torque - Front Reservoir Cap Screws: 1.5 N·m (0.15 kg·m, 13 in·lb)

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

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

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

★ If necessary, bleed the air from the lines.



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.

Brake Fluid

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.*

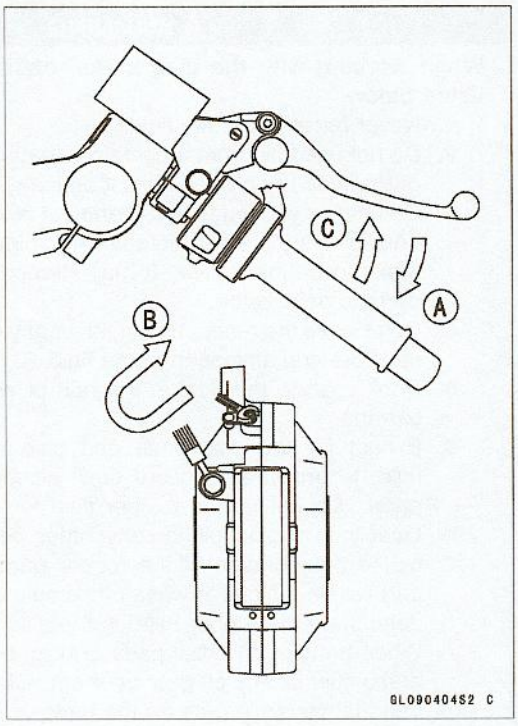
- Remove the reservoir cap, and diaphragm.
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- With the reservoir cap off, slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.

○ Bleed the air completely from the master cylinder by this operation.

- Remove the rubber cap from the bleed valve on the caliper.
- Attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Bleed the brake line and the caliper as follows:

○ Repeat this operation until no more air can be seen coming out into the plastic hose.

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.*

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

○ *Rear Brake: Repeat the above steps for the other bleed valve.*

- Remove the clear plastic hose.
- Install the reservoir cap.
- Tighten the front reservoir cap screw.

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

- 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.

Brake Fluid

⚠ WARNING

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

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

Brake Hose Removal/Installation

CAUTION
Brake fluid quickly ruins painted or plastic surfaces; any spilled fluid should be completely wiped up immediately with wet cloth.

- 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 Hose Routing section in General Information chapter.
- Tighten the banjo bolts at the hose fittings.

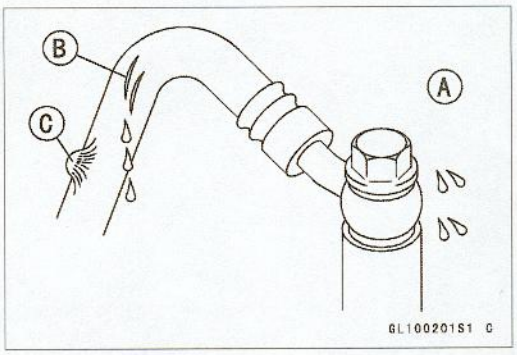
Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kg·m, 18 ft·lb)

- Bleed the brake line after installing the brake hose (see Bleeding the Brake Line).

Brake Hose Inspection

- 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 it if any cracks [B], bulges [C] or fluid lead are noticed.



Suspension

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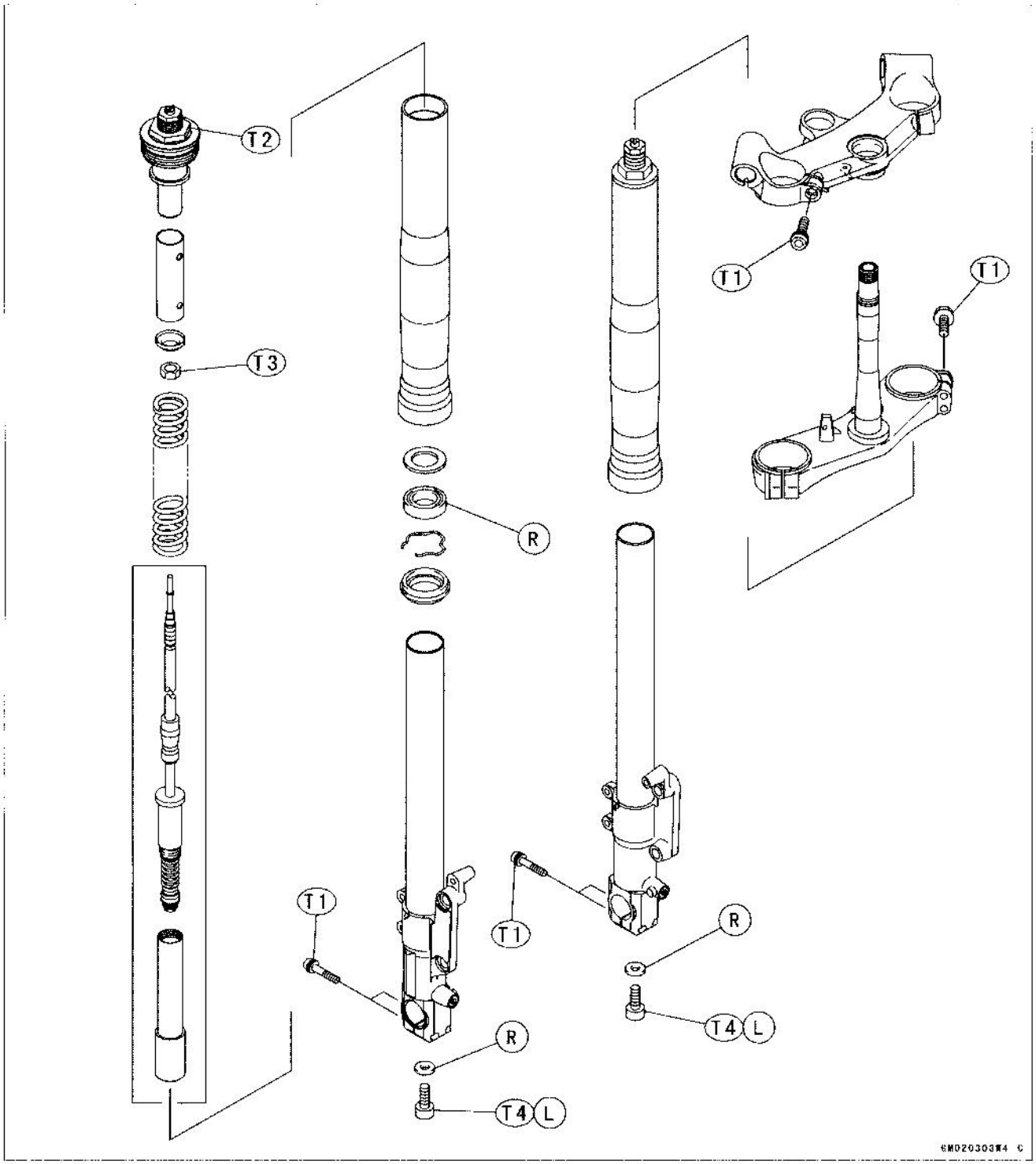
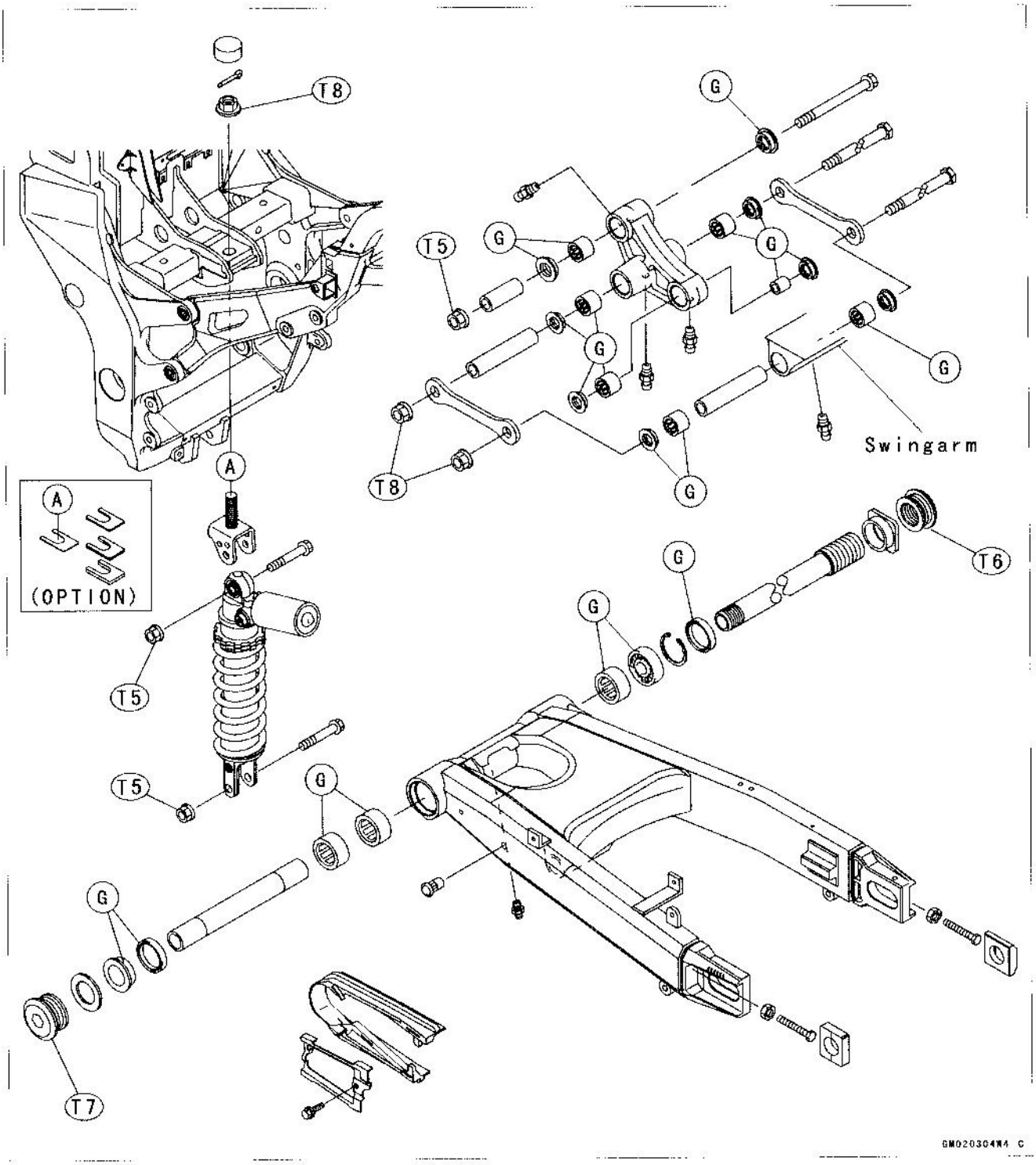
Exploded View



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

T1: 20 N·m (2.0 kg·m, 14.5 ft·lb)
T2: 23 N·m (2.3 kg·m, 16.5 ft·lb)
T3: 27 N·m (2.8 kg·m, 20 ft·lb)
T4: 39 N·m (4.0 kg·m, 29 ft·lb)

Exploded View



G: Apply grease.

T5: 34 N·m (3.5 kg·m, 25 ft·lb)
T6: 98 N·m (10 kg·m, 72 ft·lb)
T7: 125 N·m (13 kg·m, 94 ft·lb)
T8: 59 N·m (6.0 kg·m, 43 ft·lb)

Specifications

Item	Standard
Front Fork (per one unit):	
Fork inner tube outside diameter	ϕ43 mm (1.7 in.)
Air Pressure	Atmospheric pressure (Non-adjustable)
Rebound damper setting	7th click from the first click of the fully clockwise position (Usable Range: 1 ←→ 12 clicks)
Compression damper setting	7th click from the first click of the fully clockwise position (Usable Range: 1 ←→ 12 clicks)
Fork spring preload setting	Adjuster protrusion is 14 mm (0.55 in.) (Usable Range: 4 ~ 19 mm (0.2 ~ 0.75 in.))
Fork oil viscosity	KAYABA KHL15-10 (SAE10W)
Fork oil capacity	484 ± 4 mL (completely dry) approx. 410 mL (when changing oil)
Fork oil level	Fully compressed, without fork spring, below from outer tube top 101 ± 2 mm (3.98 ± 0.08 in.)
Fork spring free length	251.5 mm (9.902 in.) (Service limit 246 mm (9.69 in.))
Rear Shock Absorber:	
Rebound damper set	10th click from the first click of the fully clockwise position (Usable Range: 1 ←→ 18 clicks)
Compression damper set	10th click from the first click of the fully clockwise position (Usable Range: 1 ←→ 20 clicks)
Spring setting position	
Standard	Spring length 174.5 mm (6.77 in.)
Usable range	Spring length 170 mm (6.69 in.) to 190 mm (7.48 in.) (weaker to stronger)
Gas pressure	980 kPa (10 kg/cm^2, 142 psi, Non-adjustable)

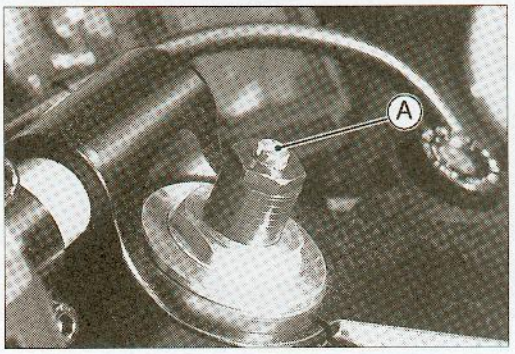
Special Tools - Fork Piston Rod Puller, M12 × 1.25: 57001-1289
Fork Oil Level Gauge: 57001-1290
Fork Cylinder Holder: 57001-1443
Front Fork Oil Seal Driver: 57001-1340
Hook Wrench: 57001-1101
Oil Seal & Bearing Remover: 57001-1058
Bearing Driver Set: 57001-1129
Inside Circlip Pliers: 57001-143
Jack: 57001-1238
Fork Spring Compressor Set: 57001-1452

Front Fork

Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the rebound damping adjuster [A] until you feel a click.

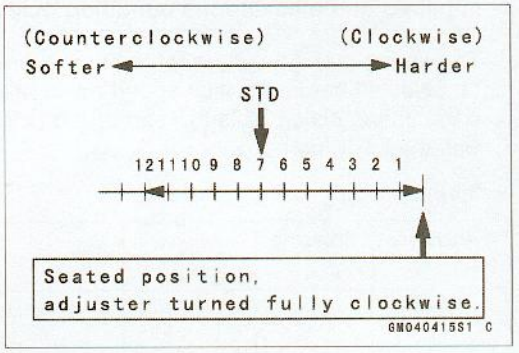
○ The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **7th click** from the 1st click of the fully clockwise position.



⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

○ The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.



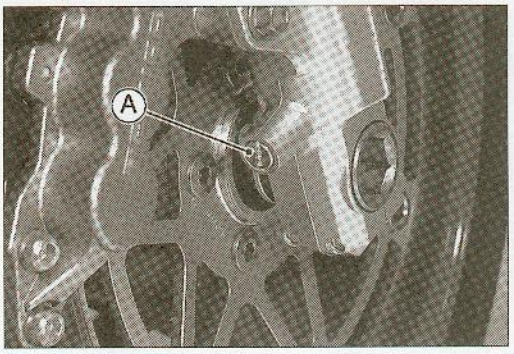
Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
12	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
1	Strong	Hard	Heavy	Bad	High

Compression Damping Force Adjustment

- To adjust the compression damping force, turn the compression damping adjuster [A] until you feel a click.

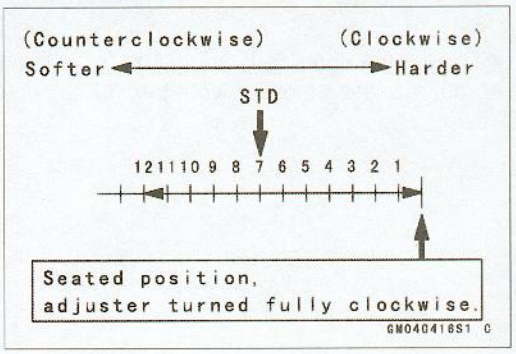
○ The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **7th click** from the 1st click of the fully clockwise position.



⚠ WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

○ The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.



Compression Damping Force Adjustment

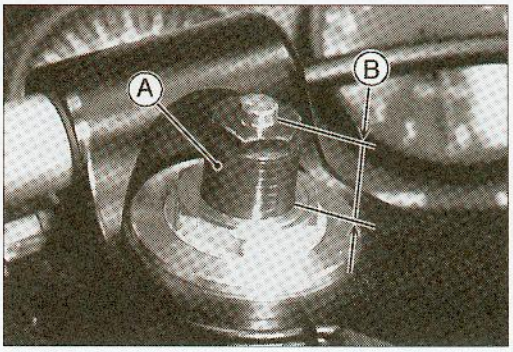
Adjuster Position	Damping Force	Setting	Load	Road	Speed
12	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
1	Strong	Hard	Heavy	Bad	High

Front Fork

Spring Preload Adjustment

● Turn the spring preload adjuster [A] to change spring preload setting.

○ The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the 14 mm [B] from top as shown.



Adjuster Protrusion (from top)

Standard:	**14 mm**
Usable Range:	**4 ~ 19 mm**

⚠WARNING

If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.

○ The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

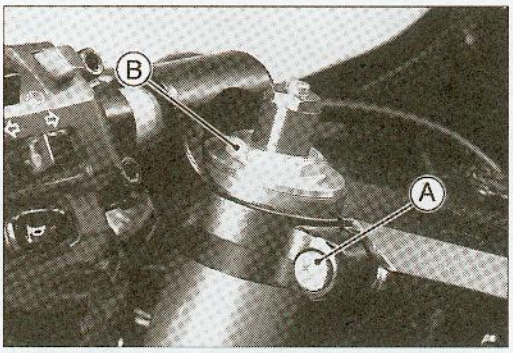
Spring Action

Adjuster Position	Damping Force	Setting	Load	Road	Speed
19 mm	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
4mm	Strong	Hard	Heavy	Bad	High

Front Fork Removal (each fork leg)

● Remove:
Front Wheel (see Wheels/Tires chapter)
Front Fender (see Frame chapter)

★ Loosen the upper fork clamp bolt [A] and fork top plug [B] beforehand if the fork leg is to be disassembled.

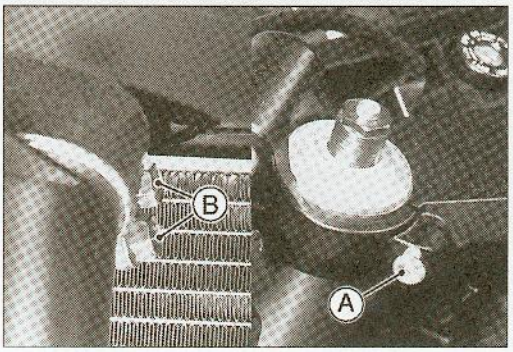


NOTE

○ *Loosen the top plug after loosening the upper fork clamp bolt.*

● Loosen the upper fork clamp bolt [A] and lower fork clamp bolts [B].

● With a twisting motion, work the fork leg down and out.



Front Fork

Front Fork Installation

- Install the fork so that the top end [A] of the outer tube is flush with the upper surface [B] of the steering stem head bracket.
- Tighten the lower fork clamp bolts and fork top bolt.

Torque - Front Fork Clamp Bolt (Lower): 20 N·m (2.0 kg·m, 14.5 ft·lb)
Front Fork Top Plug: 23 N·m (2.3 kg·m, 16.5 ft·lb)

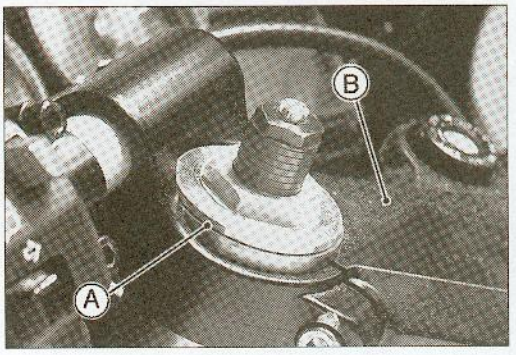
- Tighten the upper fork clamp bolt.

Torque - Front Fork Clamp Bolt (Upper): 20 N·m (2.0 kg·m, 14.5 ft·lb)

NOTE

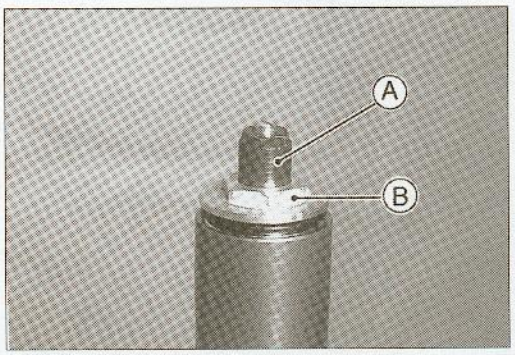
○ *Tighten the top plug before tightening the upper fork clamp bolt.*

- Install the removed parts (see appropriate chapters).
- Adjust the spring preload and the damping force.



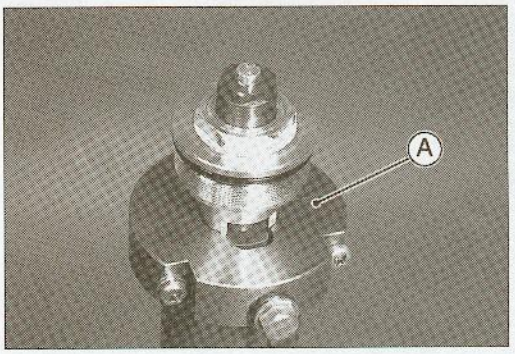
Fork Oil Change

- Remove the front fork (see Front Fork Removal).
- ○ Turn the spring preload adjuster [A] counterclockwise until the fully position.
- Unscrew the top plug [B] out of the inner tube.

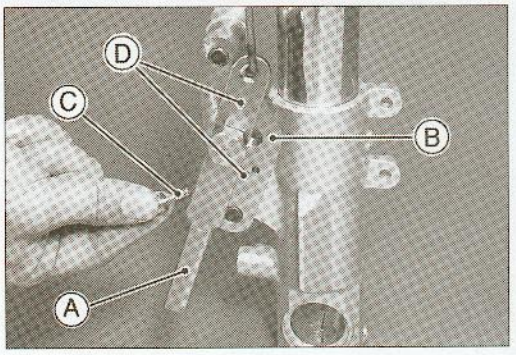


- Hold the collar and outer tube end by using the fork spring compressor set [A].

Special Tool - Fork Spring Compressor Set: 57001-1452

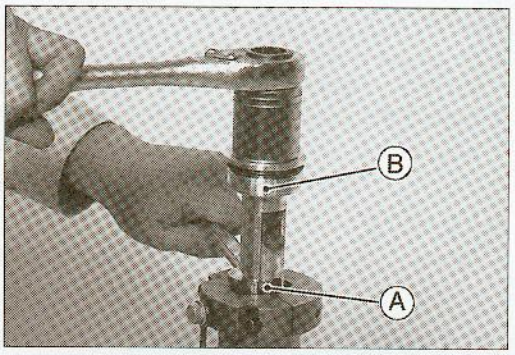


○ By using the compressor set, compress the spring till the hole of the compressor set lever [A] fits the hole of the lever holder [B], and insert the stopper [C] into the two holes at when these holes align [D].

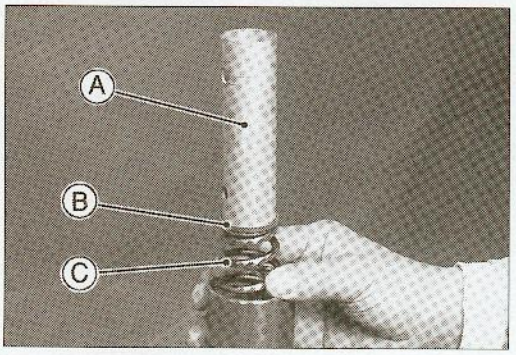


Front Fork

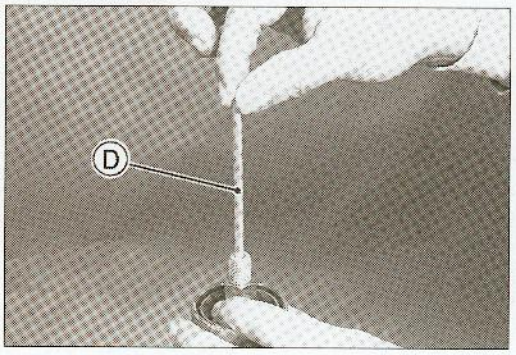
- Use the wrenches on the rod nut [A] and top plug [B] loosen the push rod nut.
- Remove the top plug from the push rod.
- Remove the fork spring compressor set.



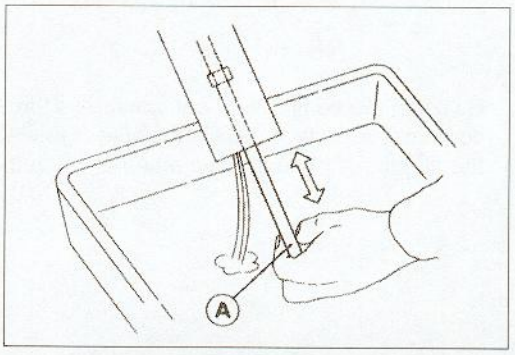
- Remove:
  Collar [A]
  Spring Seat [B]
  Fork Spring [C]



Rebound Damping Adjuster Rod [D]

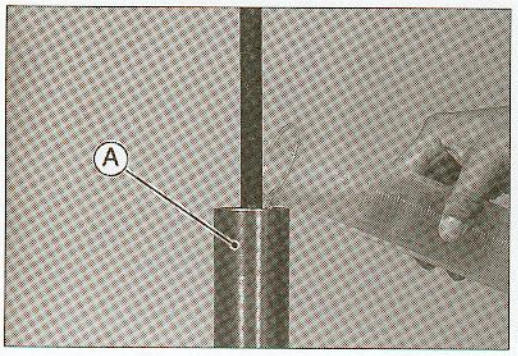


- Drain the fork oil into a suitable container.
- ○ Pump the piston rod [A] up and down at least ten times to expel the oil from the fork.



- Hold the fork tube upright, press the outer tube [A] and the piston rod all the way down.
- Pour in the type and amount of fork oil specified.

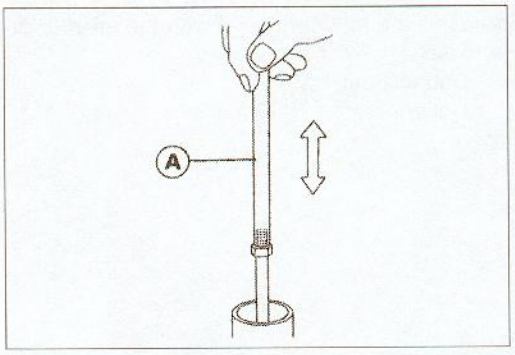
Fork Oil	
Viscosity:	**KAYABA KHL 15-10 (SAE 10W)**
Amount (per side)	
When changing oil:	**approx. 410 mL**
After disassembly and completely dry:	**484 ± 4 mL**



Front Fork

★ If necessary, measure the oil level as follows.
○ Hold the inner tube vertically in a vise.
○ Using the piston rod puller [A], move the piston rod up and down more than ten times in order to expel all the air from the fork oil.

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



○ Pump the inner tube several times to expel air bubbles.
○ Wait until the oil level settles.
○ With the fork fully compressed and the piston rod fully pushed in, insert a tape measure or rod into the inner tube, and measure the distance from the top of the outer tube to the oil.

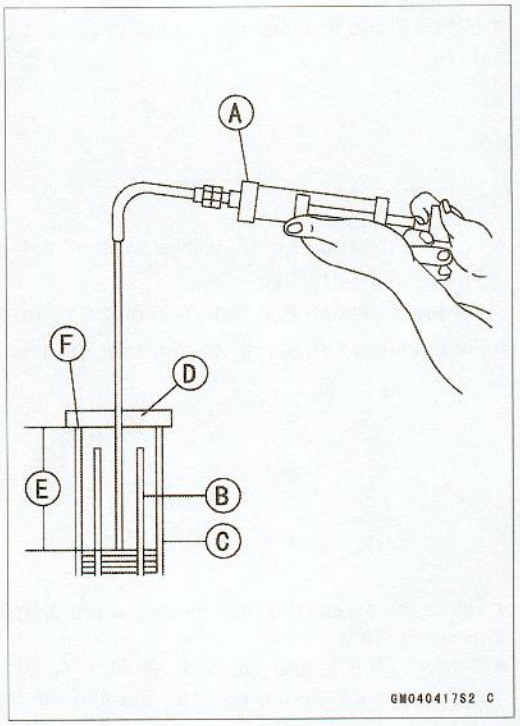
Oil Level (fully compressed, without spring)
Standard: 101 ± 2 mm (3.98 ± 0.08 in.)
(from the top of the outer tube)

NOTE

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

Special Tool - Fork Oil Level Gauge: 57001-1290 [A]

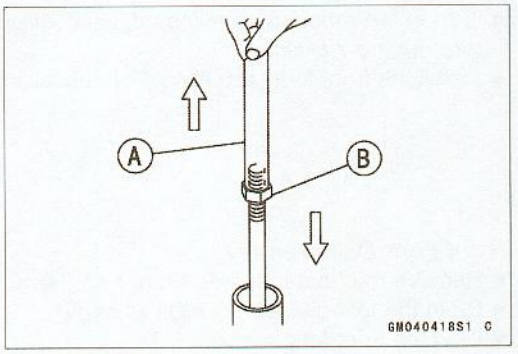
○ With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [B] and position the stopper across the top end [F] of the outer tube [C].
○ Set the gauge stopper [D] so that its lower side shows the oil level distance specified [E].
○ Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
★ If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



● Screw the fork piston rod puller [A] onto the end of the rod.

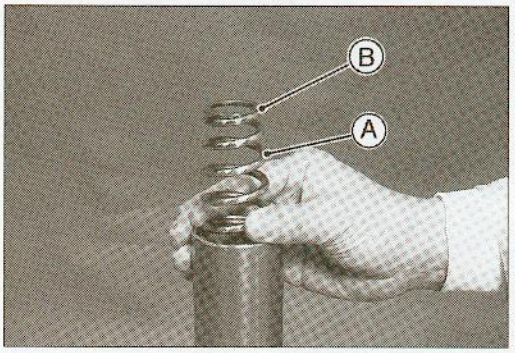
Special Tool - Fork Piston Rod Puller, M12 × 1.25: 57001-1289

● Pull the puller up above the inner tube top.
● Remove the fork piston rod puller.
● Screw the rod nut [B] stoped on to the piston rod.
● Insert the rebound damping adjuster rod into the piston rod.



Front Fork

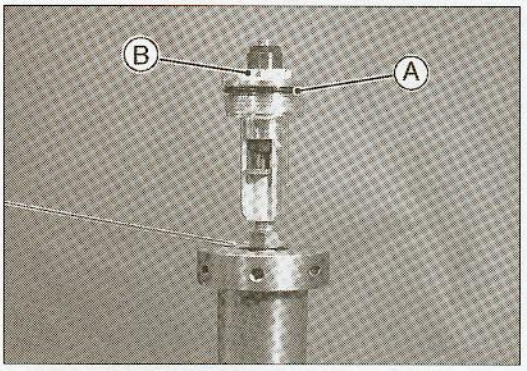
- Install the fork spring [A] with the smaller end facing upward [B].
- Install:
  Spring Seat
  Collar



- Hold the collar and outer tube with the fork spring compressor set to compress it.

  Special Tool - Fork Spring Compressor Set: 57001-1452

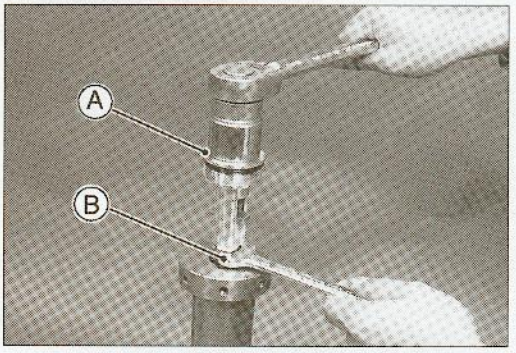
- Check the O-ring [A] on the top plug and replace it with a new one if damaged.
- Screw in the top plug [B] stoped onto the piston rod.



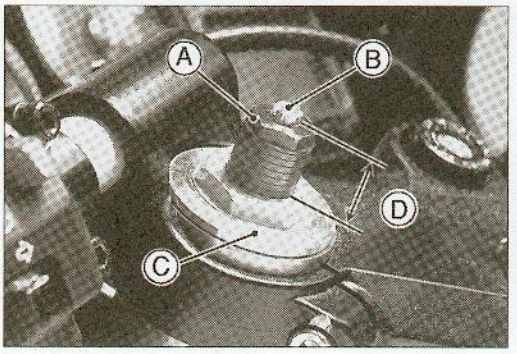
- Holding the top plug [A] with a wrench, tighten the piston rod nut [B] against the top plug.

  Torque - Piston Rod Nut: 27 N·m (2.8 kg·m, 20 ft·lb)

- Remove the fork spring compressor set.



- Raise the outer tube and screw the top plug into it and install it to the steering stem.
- Screw in the spring preload adjuster [A] of the top plug so that the distance between the adjuster top and the top plug surface [C] is 14 mm [D].
- Turn in the rebound damping adjuster [B] until the fully position and turn out the 7 click.
- Install the front fork (see Front Fork Installation).

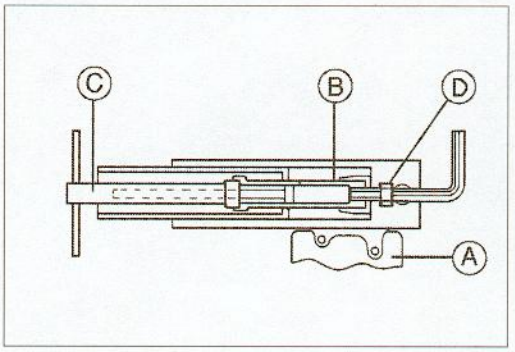


Front Fork Disassembly

- Remove the front fork (see Front Fork Removal).
- Drain the fork oil (see Fork Oil Change).
- Hold the front fork in a vise [A].
- Stop the cylinder [B] from turning by using the fork cylinder holder [C].

  Special Tool - Fork Cylinder Holder: 57001-1443

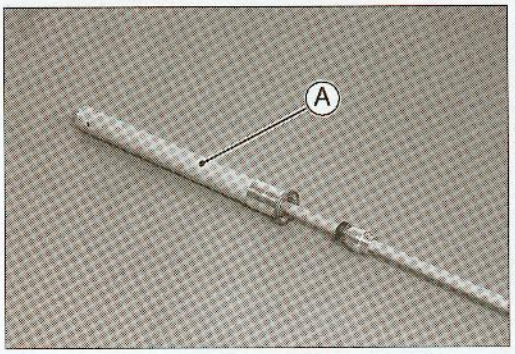
- Unscrew the Allen bolt [D], then take the bolt and gasket out of the bottom of the inner tube.



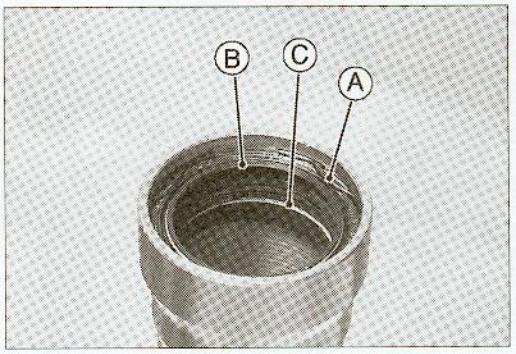
Front Fork

- Take the cylinder unit [A].

○ Do not disassemble the cylinder unit.



- Separate the outer tube from the inner tube.
- Pull out the dust seal.
- Remove the retaining ring [A] from the outer tube.
- Remove the oil seal [B] and washer [C].



Front Fork Assembly

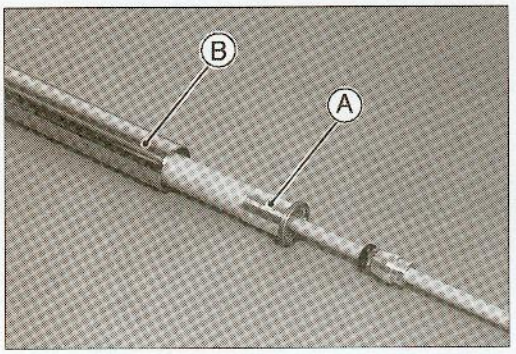
- Replace the following part with new one.
  Oil Seal
  Bottom Allen Bolt Gasket

- Insert the cylinder unit [A] into the inner tube [B].
- Replace the bottom Allen bolt gasket with a new one.
- Stop the cylinder from turning by using the fork cylinder holder.

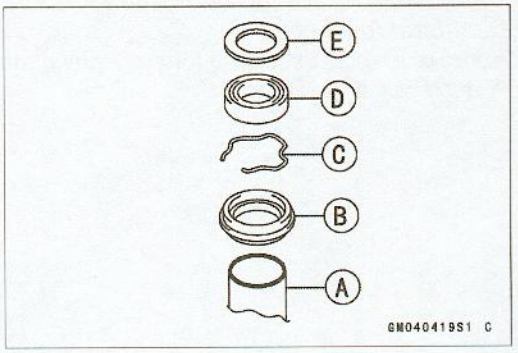
Special Tool - Fork Cylinder Holder: 57001-1443

- Apply a non-permanent locking agent to the Allen bolt and tighten it.

Torque - Front Fork Bottom Allen Bolt: 39 N·m (4.0 kg·m, 29 ft·lb)



- Install the following parts into the inner tube [A].
  Dust Seal [B]
  Circlip [C]
  Oil Seal [D]
  Washer [E]

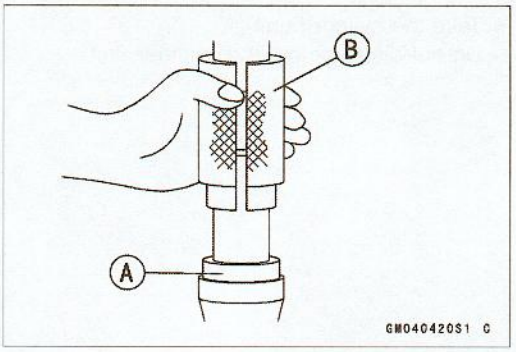


Front Fork

- Insert the inner tube to the outer tube.
- After installing the washer, install the oil seal [A] by using the fork oil seal driver [B].

Special Tool - Front Fork Oil Seal Driver: 57001-1340

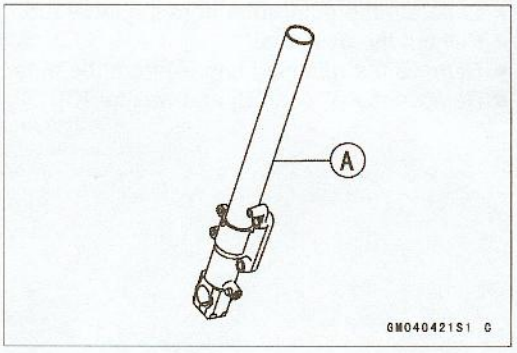
- Install the circlip and dust seal.
- Pour in the specified type of oil (see Fork Oil Change).



Inner Tube Inspection

- Visually inspect the inner tube [A], and repair any damage.
- Nicks or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.

★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.



CAUTION

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

- Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.
- If you feel binding or catching, the inner and outer tubes must be replaced.

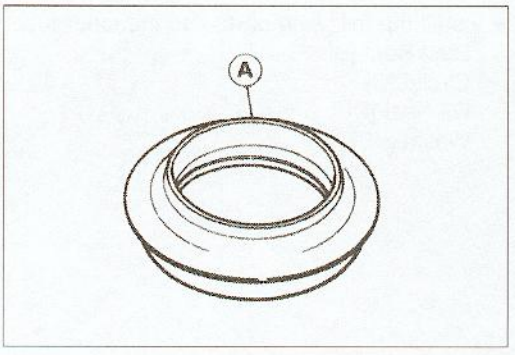
⚠ WARNING

A straightened inner or outer fork tube may fall in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.

Dust Seal Inspection

- Inspect the dust seals [A] for any signs of deterioration or damage.

★ Replace it if necessary.

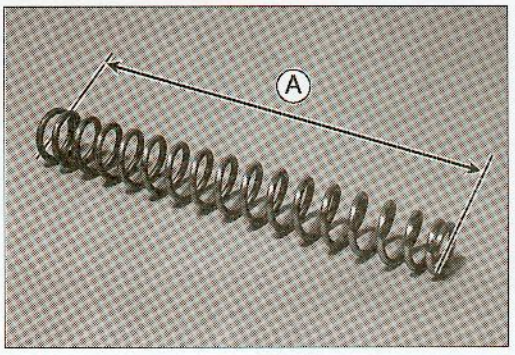


Front Fork

Spring Tension

- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.

★ If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.



Spring Free Length

Standard:	**251.5 mm (9.902 in.)**
Service Limit:	**246 mm (9.69 in.)**

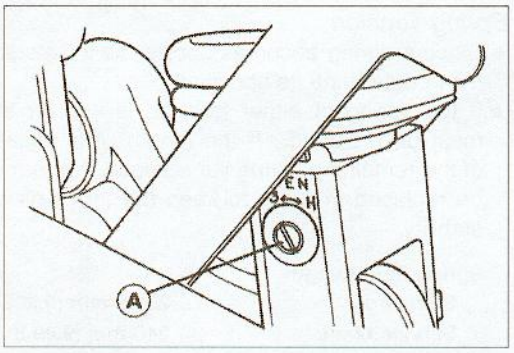
Rear Shock Absorber

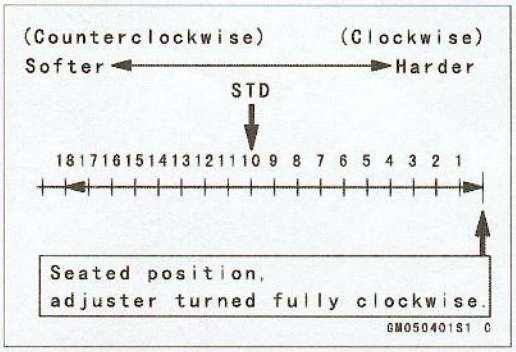
Rebound Damping Force Adjustment

- To adjust the rebound damping force, turn the rebound damping adjuster [A] until you feel a click.
- The standard adjuster setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **10th click** from the 1st click of the fully clockwise position.
- ★ If the damping feels too soft or too stiff, adjust it.

Rebound Damping Force Adjustment

Adjuster Positionr	Damping Force	Setting	Load	Road	Speed
18	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
1	Strong	Hard	Heavy	Bad	High



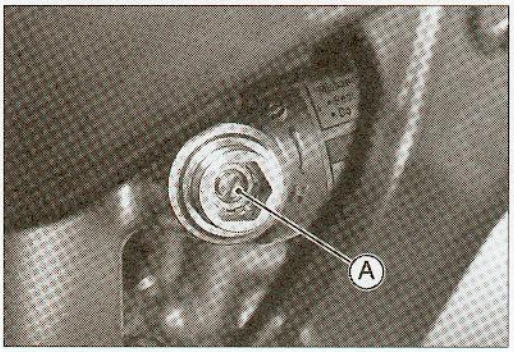


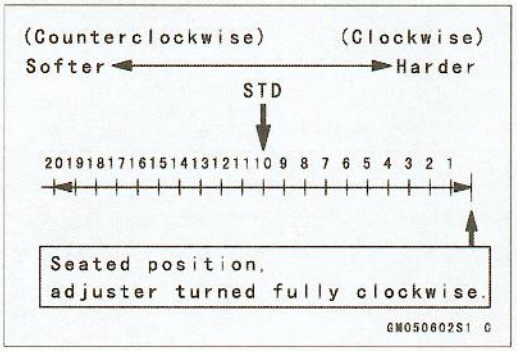
Compression Damping Force Adjustment

- To adjust the compression damping force, turn the compression damping adjuster [A] on the gas reservoir until you feel a click.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **10th click** from the 1st click of the fully clockwise position.
- The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

Compression Damping Force Adjustment

Adjuster Positionr	Damping Force	Setting	Load	Road	Speed
20	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
1	Strong	Hard	Heavy	Bad	High





Spring Preload Adjustment

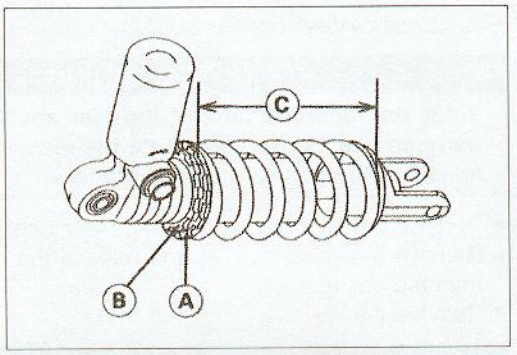
- Remove the rear shock absorber from the frame (see Rear Shock Absorber Removal).
- Loosen the locknut and turn out the adjusting nut to free the spring.

Special Tool - Steering Stem Nut Wrenches: 57001-1100 (2)

- Measure the spring free length.

Spring Free Length
Standard: 191.5 mm (7.539 in.)

Rear Shock Absorber



- To adjust the spring preload, turn in the adjusting nut [A] to the desired position and tighten the locknut [B].
  [C] Spring Length

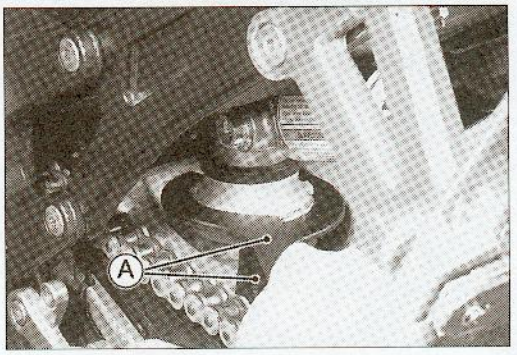
Spring Preload Setting

Standard:	**Spring length 174.5 mm (6.77 in.)**
Usable Range:	**Spring length 190 (7.48 in.) to 170 mm (6.69 in.) (weaker to stronger)**

○ The standard adjusting nut setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is 174.5 mm (6.77 in.) spring length.

★ If the spring action feels too soft or too stiff, adjust it.

Special Tool - Hook Wrench: 57001-1101 [A]



Spring Adjustment

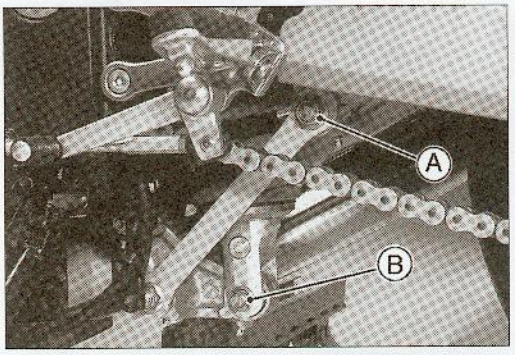
Adjuster Positionr	Damping Force	Setting	Load	Road	Speed
190 mm (7.48 in.)	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
170 mm (6.69 in.)	Strong	Hard	Heavy	Bad	High

Rear Shock Absorber Removal

- Remove the lower fairings (see Frame chapter).
- Using the jack, raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

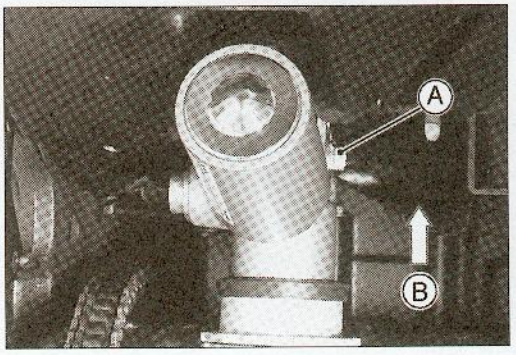
- Remove:
  Upper Tie-Rod Nut and Bolt [A]
  Lower Shock Absorber Nut and Bolt [B]



- Remove:
  Upper Shock Absorber Nut
  Upper Shock Absorber Bolt [A]

○ Lift up [B] the rear fender front with a suitable bar or your hand, and then pull out the absorber Bolt.

- Remove the shock absorber from under.



Rear Shock Absorber Installation

- Pack the rocker arm needle bearings with grease.
- Tighten the following nuts:

Torque - Rear Shock Absorber Nuts: 34 N·m (3.5 kg·m, 25 ft·lb)
Tie-Rod Nuts: 59 N·m (6.0 kg·m, 43 ft·lb)

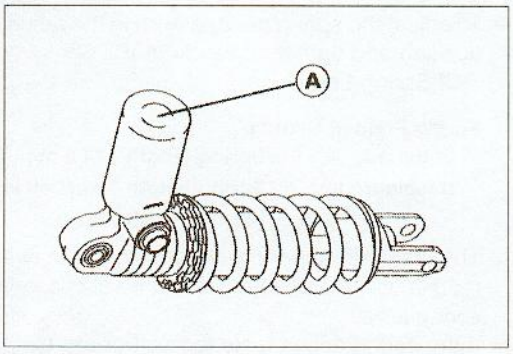
Rear Shock Absorber

Rear Shock Absorber Scrapping

⚠ WARNING

Since the reservoir tank of the rear shock absorber contains nitrogen gas, do not incinerate the reservoir tank without first releasing the gas or it may explode.

- Remove the shock absorber (see Rear Shock Absorber Removal).
- Remove the valve cap [A] and release the nitrogen gas completely from the gas reservoir.
- Remove the valve.



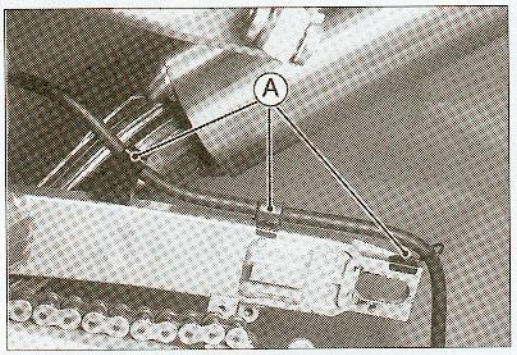
⚠ WARNING

Since the high pressure gas is dangerous, do not point the valve toward your face or body.

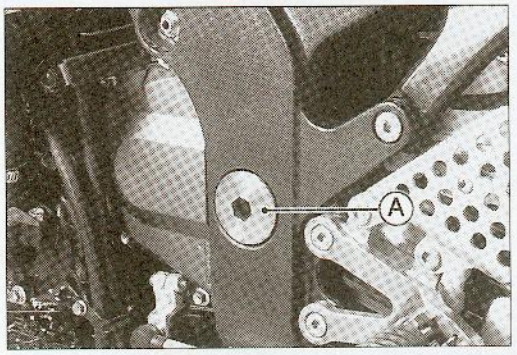
Swingarm

Swingarm Removal

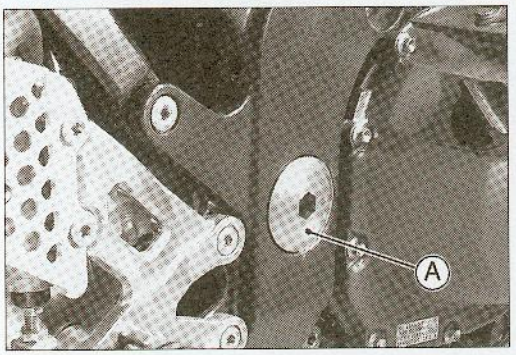
- Remove the lower fairings (see Frame chapter).
- Using the jack, raise the rear wheel of the ground.
- Remove:
  Rear Wheel (see Wheels/Tires chapter)
  Chain Cover (see Final Drive chapter)
  Rear Shock Absorber (see this chapter)
  Brake Hose Clamps [A]



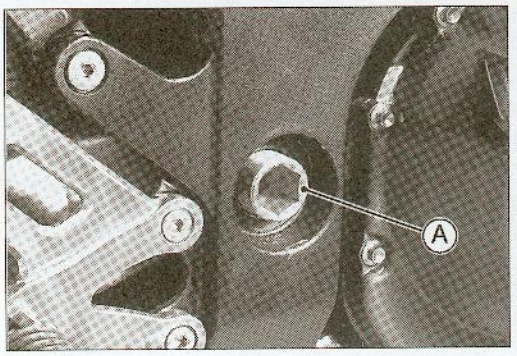
- Unscrew the swingarm pivot shaft locknut [A].



- Unscrew the swingarm pivot shaft nut [A].

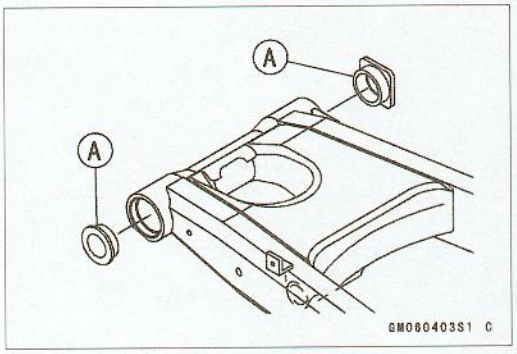


- Unscrew the swingarm pivot shaft [A].
- Pull off the pivot shaft and remove the swingarm.



Swingarm Installation

- Apply plenty of grease to the ball bearing, needle bearings and grease seals.
- Install the collars [A].



Swingarm

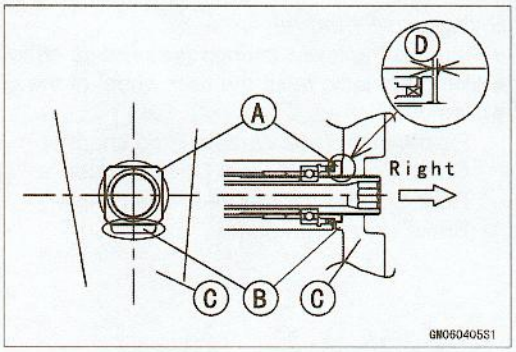
○ Place the right collar [A] on the stopper [B] inside the frame [C].
- Insert the pivot shaft into the frame from the right side.
- Tighten the pivot shaft so that the clearance between the collar and the frame come to zero mm [D].
- Tighten the pivot nut.

Torque - Swingarm Pivot Shaft Nut: 125 N·m (13 kg·m, 94 ft·lb)

- Tighten the pivot locknut.

Torque - Swingarm Pivot Shaft Locknut: 98 N·m (10 kg·m, 72 ft·lb)

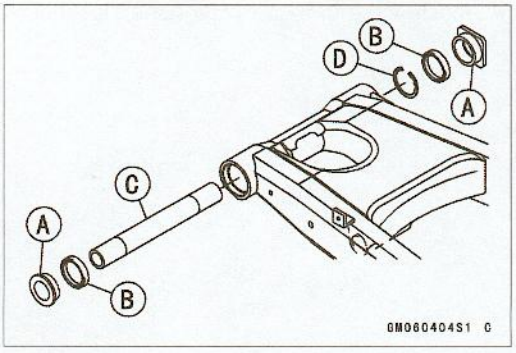
- Install the removed parts (see appropriate chapters).



Swingarm Bearing Removal

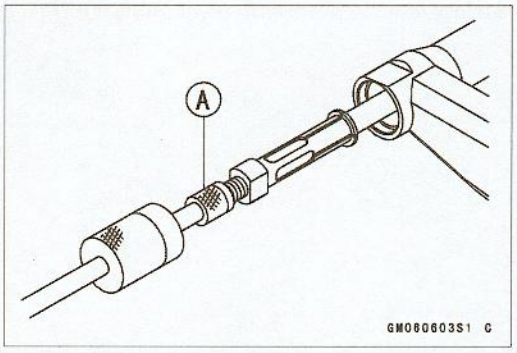
- Remove:
  Swingarm
  Collars [A]
  Grease Seals [B]
  Sleeve [C]
  Circlip (right side) [D]

Special Tool - Inside Circlip Pliers: 57001-143



- Remove the ball bearing and needle bearings using the oil seal & bearing remover [A].

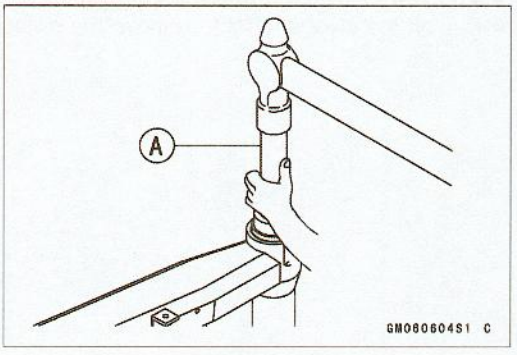
Special Tool - Oil Seal & Bearing Remover: 57001-1058



Swingarm Bearing Installation

- Apply plenty of grease to the ball bearing and needle bearings.
- Install the needle bearings so that the manufacturer's marks face out.
- Install the ball bearing so that the manufacturer's marks faces out.

Special Tool - Bearing Driver Set: 57001-1129 [A]



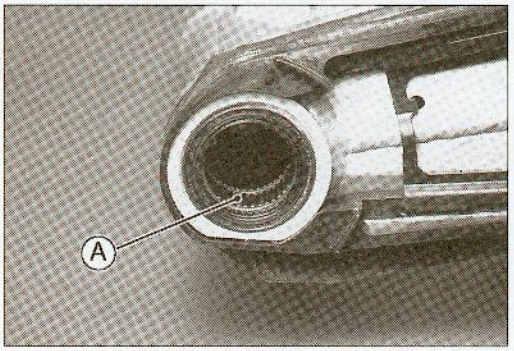
Swingarm

Swingarm Bearing, Sleeve Inspection and Lubrication

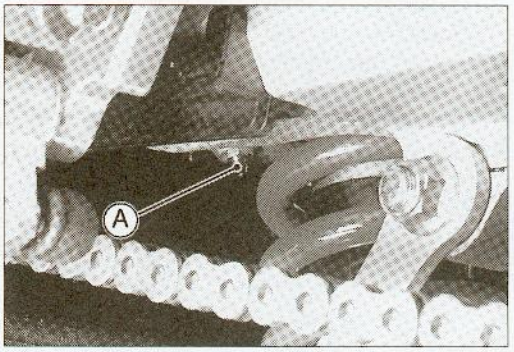
CAUTION

Do not remove the bearings for inspection. Removal may damage them.

- Inspect the needle bearings [A] installed in the swingarm.
- ○ The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.
- ★ If the needle bearing, ball bearing, and sleeve show any sings of abnormal wear, discoloration, or damage, replace them as a set.

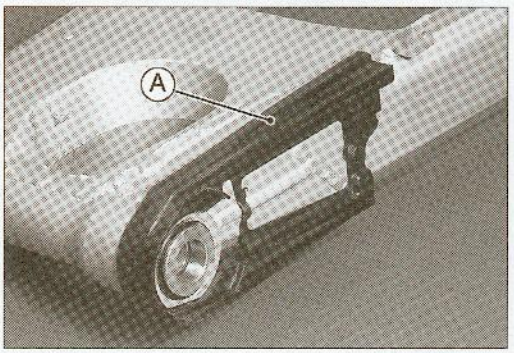


- For the swingarm bearing, it is grease nipple [A] on the swingarm for lubrication. Force grease into the nipple until it comes out at both sides of the swingarm, and wipe off any excess.



Chain Slider Inspection

- Visually inspect the chain slider [A].
- ★ Replace the chain slider if it shows any signs of abnormal wear or damage.



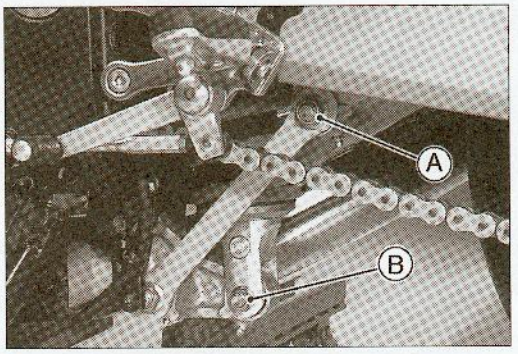
Tie-Rod, Rocker Arm

Tie-Rod Removal

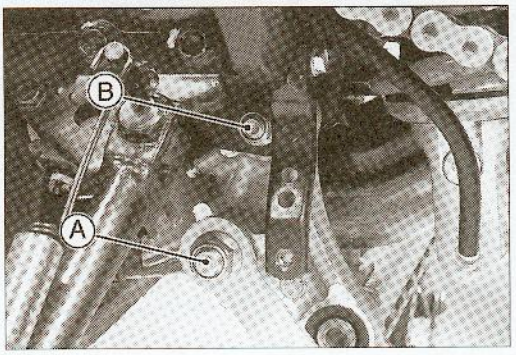
- Remove the lower firings (see Frame chapter).
- Using the jack, raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

- Remove:
  Upper Tie-Rod Bolts and Nut [A]
  Lower Rear Shock Absorber Bolt and Nut [B]



  Lower Tie-Rod Nut [A]
  Rocker Arm nut [B]
- Remove the muffler body mounting bolt (see Engine Top End chapter).
- Remove the rocker arm bolt so that the muffler is pulling up.
- Pull out the lower tie-rod bolt from the rocker arm.



Tie-Rod Installation

- Apply grease to the inside of the needle bearings and oil seals.
- Install the tie-rods so that the marked side faces outer side.
- Tighten each bolts.

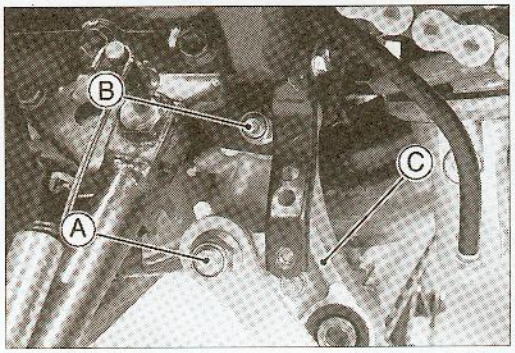
Torque - Rocker Arm Nut: 34 N·m (3.5 kg·m, 25 ft·lb)
Tie-Rod Nuts: 59 N·m (6.0 kg·m, 43 ft·lb)
Lower Rear Shock Absorber Nut: 34 N·m (3.5 kg·m, 25 ft·lb)

Rocker Arm Removal

- Remove the lower firing (see Frame chapter).
- Using the jack, raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

- Remove:
  Upper Tie-Rod Bolt and Nut
  Lower Rear Shock Absorber Bolt and Nut
  Muffler Body Mounting Bolt
  Lower Tie-Rod Nut [A]
  Rocker Arm Bolt and Nut [B]
  Rocker Arm [C]



○ Remove the rocker arm bolt so that the muffler is pulling up.

Rocker Arm Installation

- Apply grease to the inside of the needle bearings and oil seal lips, and add grease to the grease nipple.
- Tighten the rocker arm nut, tie-rod nut and shock absorber lower nut.

Torque - Rocker Arm Nut: 34 N·m (3.5 kg·m, 25 ft·lb)
Tie-Rod Nuts: 59 N·m (6.0 kg·m, 43 ft·lb)
Lower Rear Shock Absorber Nut: 34 N·m (3.5 kg·m, 25 ft·lb)

Needle Bearing Inspection

★ If there is any doubt as to the condition of either needle bearing, replace the bearing and sleeve as a set, and/or add grease to the grease nipple.

Tie-Rod, Rocker Arm

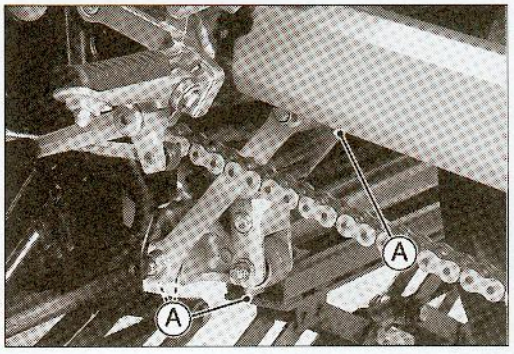
Tie-Rod, Rocker Arm Sleeve Inspection

★ If there is visible damage, replace the sleeve and needle bearing as a set.

Tie-Rod, Rocker Arm Needle Bearing Lubrication (Periodic Maintenance)

In order for the tie-rod and rocker arm to function sefely and wear slowly, it should be lubricated in accordance with the Periodic Maintenance Chart.

● For the rocker arm and tie-rod needle bearings, there are grease nipples [A] on the rocker arm and swingarm for lubrication. Force grease into the nipples until it comes out at both sides of the rocker arm and tie-rod, and wipe off any excess.



Steering

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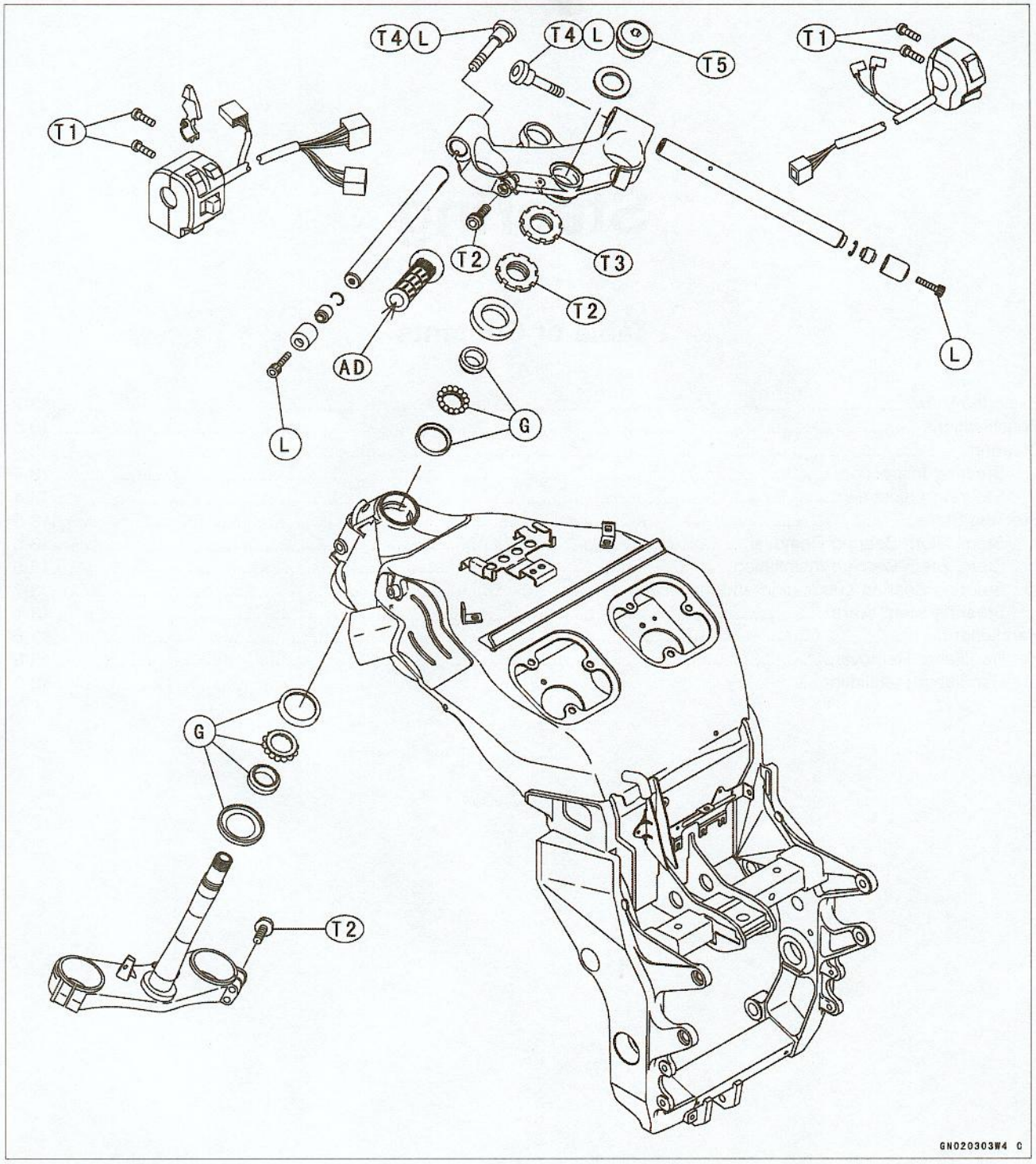
Exploded View



AD: Apply adhesive.
G: Apply grease.
L: Apply a non-permanent locking agent.

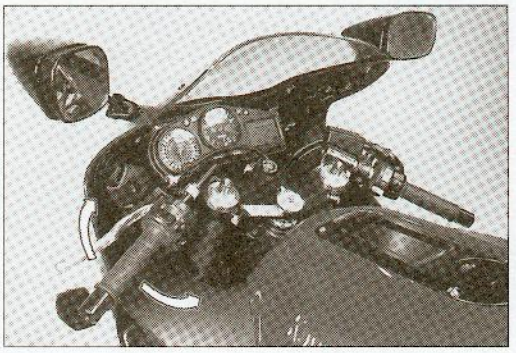
T1: 3.4 N·m (0.35 kg·m, 30 in·lb)
T2: 20 N·m (2.0 kg·m, 14.5 ft·lb)
T3: 9.8 N·m (1.0 kg·m, 88 in·lb)
T4: 34 N·m (3.5 kg·m, 25 ft·lb)
T5: 49 N·m (5.0 kg·m, 36 ft·lb)

Specifications

Special Tools - Steering Stem Nut Wrench: 57001-1100
Head Pipe Outer Race Press Shaft: 57001-1075
Head Pipe Outer Race Driver ϕ47: 57001-1447
Head Pipe Outer Race Driver ϕ55: 57001-1446
Steering Stem Bearing Driver: 57001-137
Steering Stem Bearing Driver Adapter: 57001-1074
Jack: 57001-1238

Steering

Steering Inspection



- Remove:
  Lower Fairings (see Frame chapter)
- Check the steering.
- ○ Lift the front wheel off the ground using the jack.

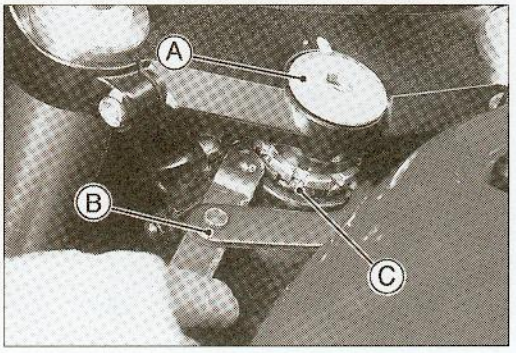
Special Tool - Jack: 57001-1238

- ○ 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 is too loose.

NOTE

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

Steering Adjustment



- Remove:
  Lower Fairings (see Frame chapter)
- Loosen:
  Lower Fork Clamp Bolts (see Suspension chapter)
  Stem Head Nut [A]
- Lift the front wheel off the ground using the jack.

Special Tool - Jack: 57001-1238

- Adjust the steering.

Special Tool - Steering Stem Nut Wrench: 57001-1100 [B]

- ★ If the steering is too tight, loosen the stem nut [C] a fraction of a turn.
- ★ If the steering is too loose, tighten the nut a fraction of a turn.

NOTE

- ○ *Turn the stem nut 1/8 turn at a time maximum.*
- Tighten the head nut and lower fork clamp bolts.

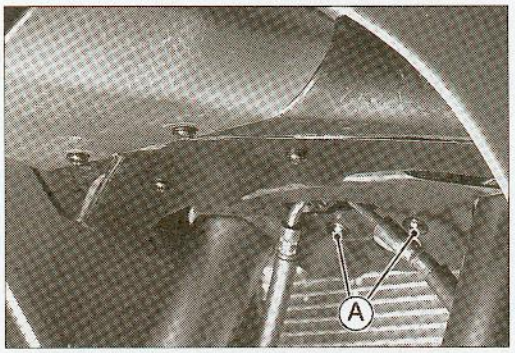
Torque - Steering Stem Head Nut: 49 N·m (5.0 kg·m, 36 ft·lb)
Front Fork Clamp Bolts (Lower): 20 N·m (2.0 kg·m, 14.5 ft·lb)

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

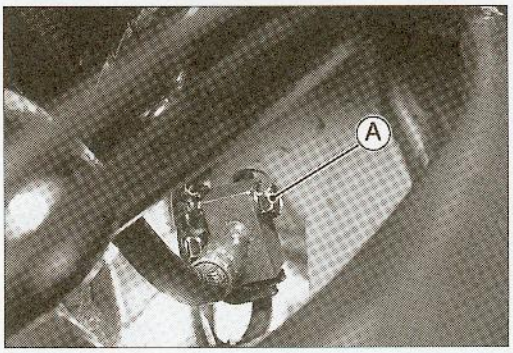
Steering Stem

Stem, Stem Bearing Removal

- Remove:
  Brake Hose Joint Cover Screws [A]
  Front Wheel (see Wheels/Tires chapter)
  Front Fork (see Suspension chapter)
  Steering Stem Head Nut and Washer
  Steering Stem Head with Handlebars



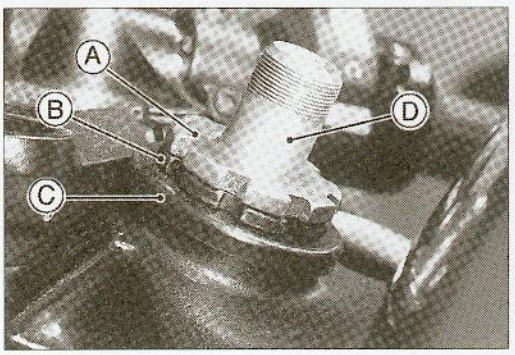
- Remove the brake hose joint bolt [A].



- Pushing up the stem base, and remove the steering stem locknut [A], steering stem nut [B], stem cap [C], then remove the steering stem [D].

  Special Tool - Steering Stem Nut Wrench: 57001-1100

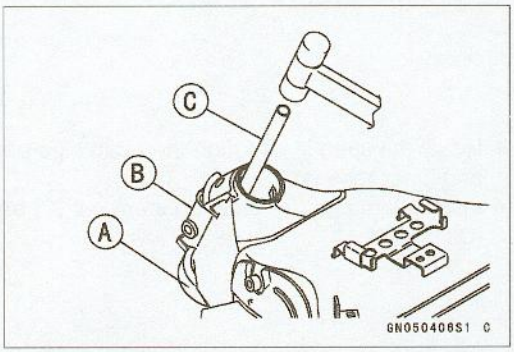
- Remove the upper stem bearing inner race and ball bearing assy.

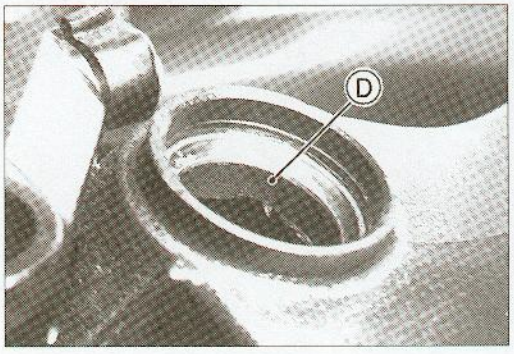


- To remove the bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recess [D] of head pipe, and hammer applying it to opposite recess alternately to drive the race out.

NOTE

○ *If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.*





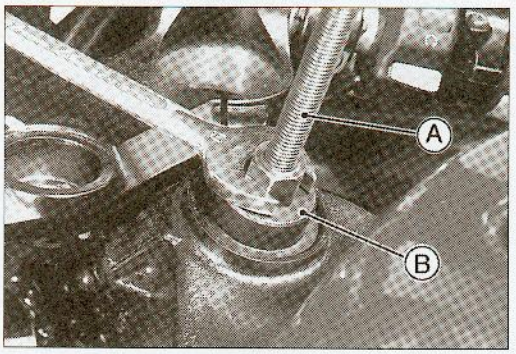
Steering Stem

- Remove the lower stem bearing (with its grease seal) which is pressed onto the steering stem with a suitable commercially available bearing puller.

Stem, Stem Bearing Installation

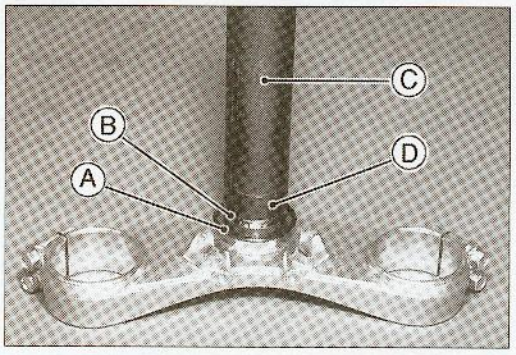
- Apply grease to the outer races, and drive them into the head pipe at the same time.

Special Tools - Head Pipe Outer Race Press Shaft: 57001-1075 [A]
Head Pipe Outer Race Driver ϕ47: 57001-1447 [B]
Head Pipe Outer Race Driver ϕ55: 57001-1446

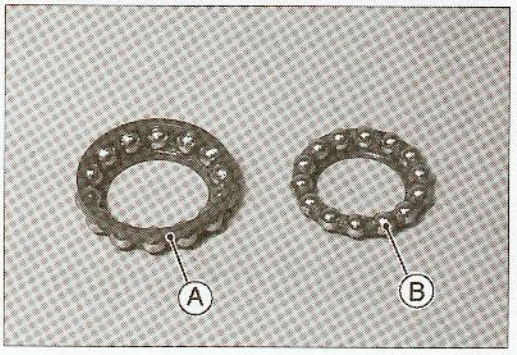


- Install the oil seal [A] on the steering stem, and drive the lower ball bearing inner race [B] applied the grease on to the stem.

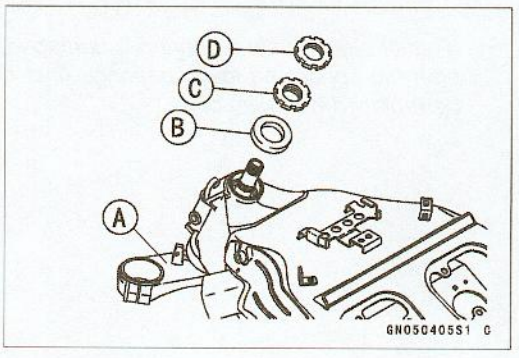
Special Tools - Steering Stem Bearing Driver: 57001-137 [C]
Steering Stem Bearing Driver Adapter: 57001-1074 [D]



- Install the lower ball bearing [A] onto the stem.
- Apply grease to the lower and upper ball bearings [B] and outer races.



- Install the stem [A] through the head pipe and install the ball bearing and inner race on it.
- Install stem cap [B], steering stem nut [C] and steering stem locknut [D].



Steering Stem

- Install the stem head.
- Install the washer, and tighten the stem head nut lightly.
- Settle the inner races in place as follows:

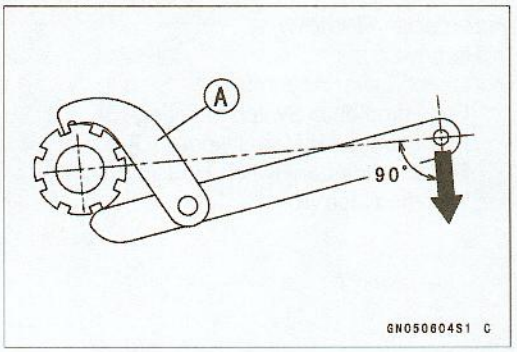
○ Tighten the steering stem nut with 20 N·m (2.0 kg·m, 14 ft·lb) of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using the stem nut wrench [A].

○ Tighten the steering stem locknut with specified torque using a special tool.

○ Check that there is no play and the steering stem turns smoothly without rattles. If not, the bearings on the inner races may be damaged.

○ Again back out the stem locknut a fraction of turn until it turns lightly.

- Turn the stem locknut 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

Torque - Steering Stem Nut: 20 N·m (2.0 kg·m, 14.5 ft·lb)
Steering Stem Locknut: 9.8 N·m (1.0 kg·m, 88 in·lb)

- 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 Nut: 49 N·m (5.0 kg·m, 36 ft·lb)
Front Fork Clamp Bolts (Upper): 20 N·m (2.0 kg·m, 14.5 ft·lb)
Front Fork Clamp Bolts (Lower): 20 N·m (2.0 kg·m, 14.5 ft·lb)

- Install the removed parts (see appropriate chapters).

⚠ WARNING

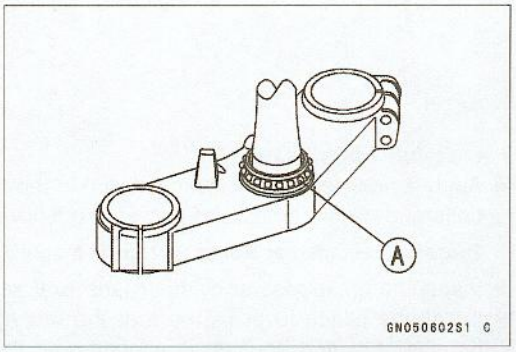
Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly (see General Information chapter).

Steering Bearing Lubrication and Inspection

- Remove the steering stem.
- Using a high flash-point solvent, wash the upper and lower ball bearings in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean off old grease and dirt.
- Visually check the outer races and the ball bearings.

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

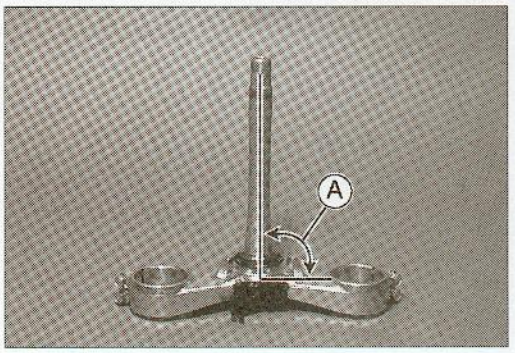
- Pack the upper and lower ball bearings [A] in the cages with grease, and apply a light coat of grease to the upper and lower outer races.
- Install the steering stem, and adjust the steering.



Steering Stem Warp

- Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness [A].

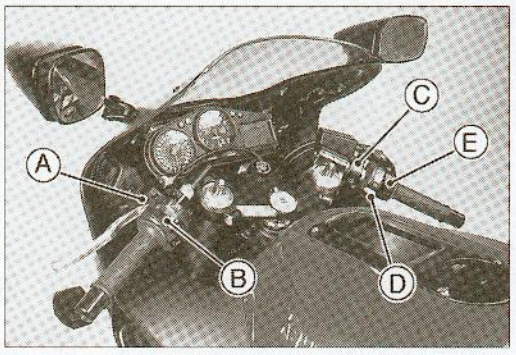
★ If the steering stem shaft is bent, replace the steering stem.



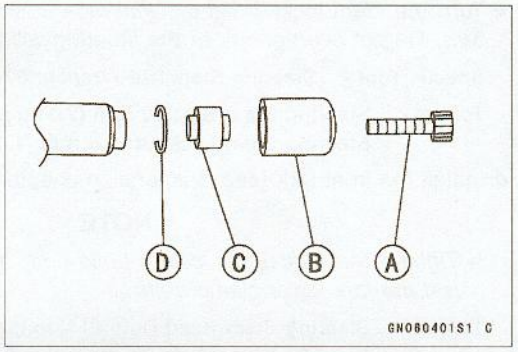
Handlebar

Handlebar Removal

- Remove:
  Clutch Lever Assembly [A]
  Left Handlebar Switch Housing [B]
  Front Brake Master Cylinder [C]
  Right handlebar Switch Housing [D]
  Throttle Case [E]

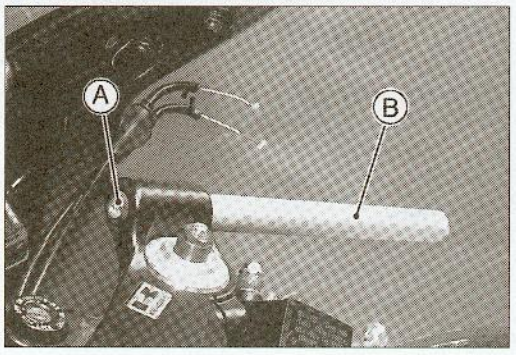


Weight Bolts [A]
Handlebar Weight [B]
Fitting [C]
Clip [D]



Throttle Grip
Handlebar Bolts [A]

- Pull out the handlebars [B].

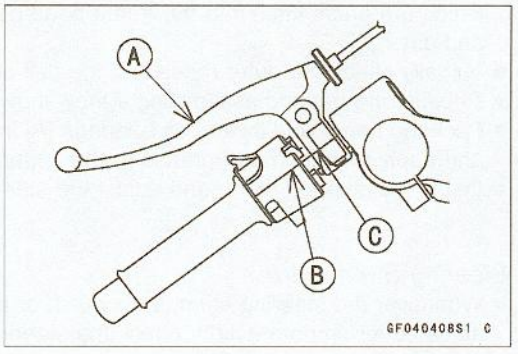


Handlebar Installation

- Apply a non-permanent locking agent to the threads of the handlebar bolts and weight bolts, and tighten the following bolts.

Torque - Handlebar Bolts: 34 N·m (3.5 kg·m, 25 ft·lb)

- Install the brake master cylinder (see Brakes chapter).
- Install the clutch lever [A] so that the mating surface [B] of the left handlebar switch housing is aligned with the mating surface [C] of the clutch lever clamp.
- Install the removed parts (see appropriate chapters).



Frame

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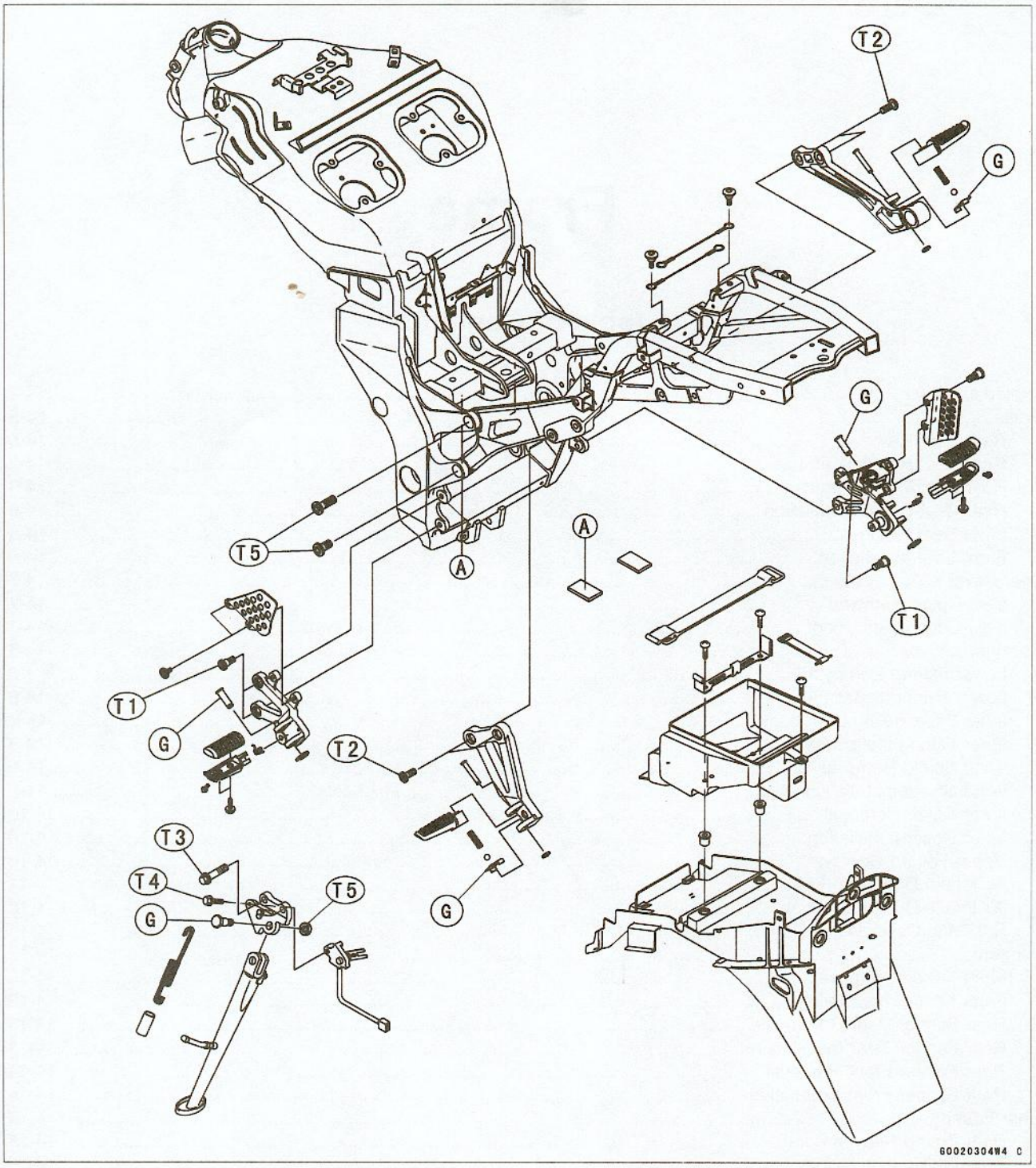
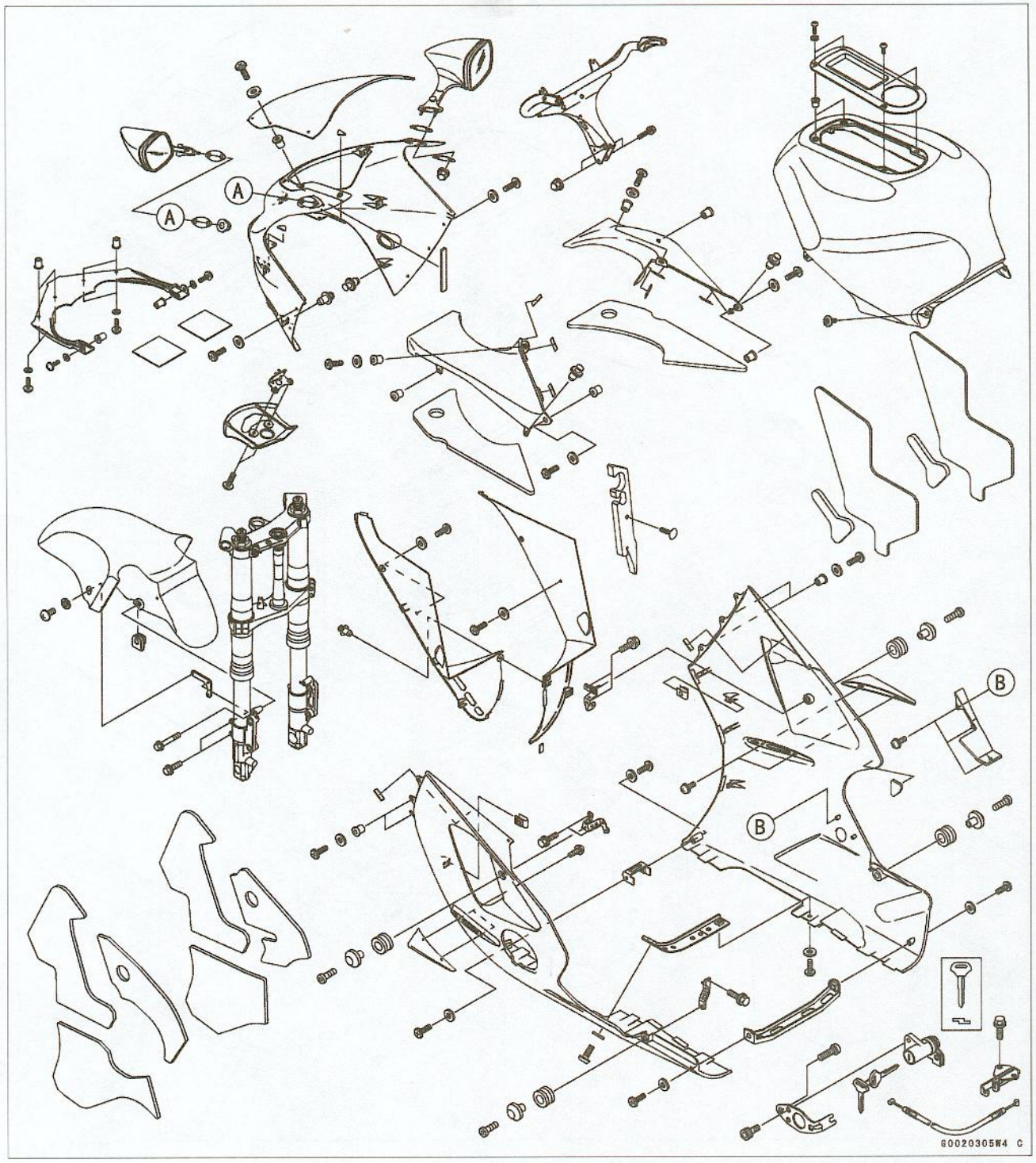
Exploded View



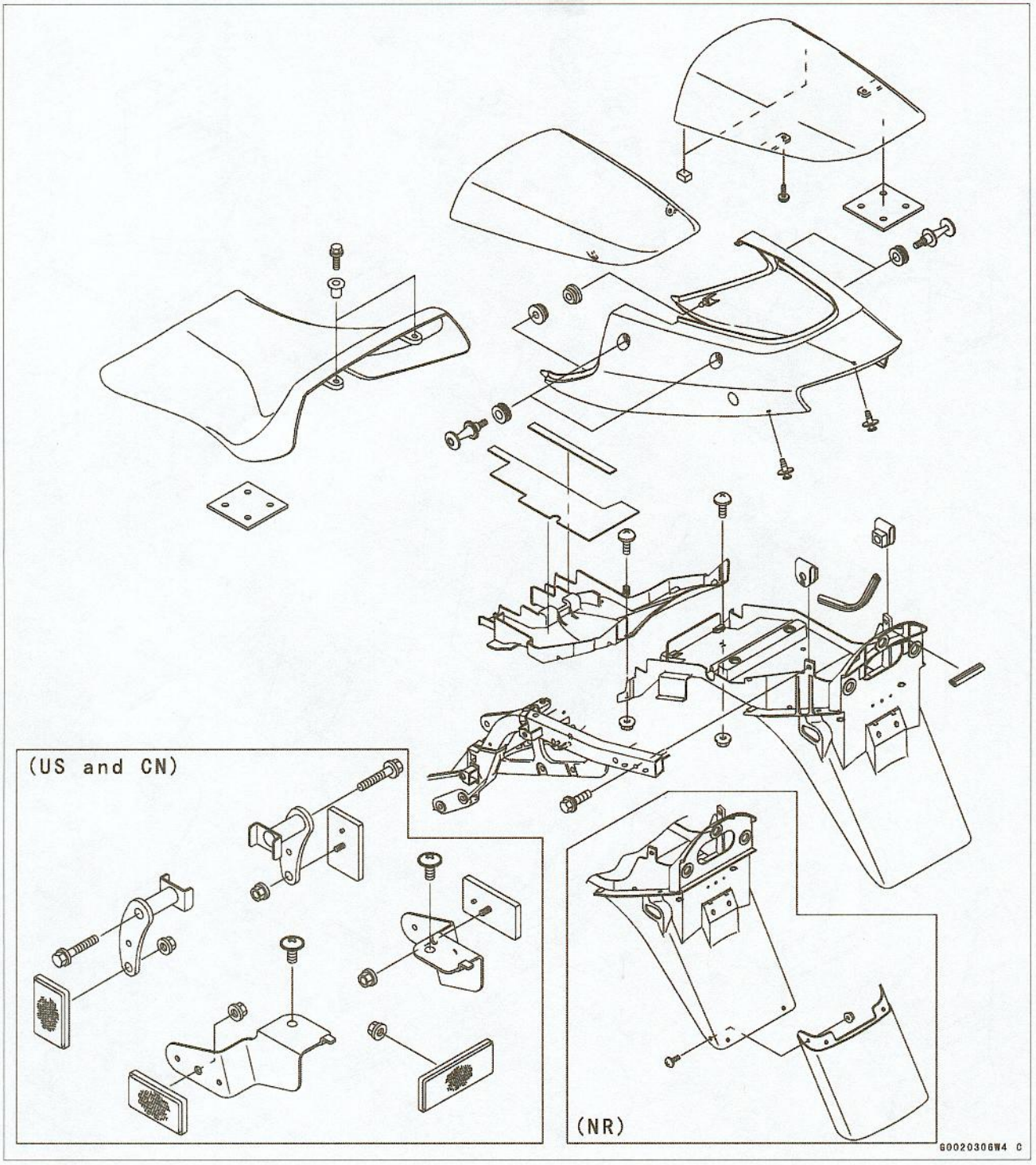
G: Apply grease.

T1: 25 N·m (2.5 kg·m, 18 ft·lb)
T2: 34 N·m (3.5 kg·m, 25 ft·lb)
T3: 49 N·m (5.0 kg·m, 36 ft·lb)
T4: 8.8 N·m (0.9 kg·m, 77 in·lb)
T5: 44 N·m (4.5 kg·m, 33 ft·lb)

Exploded View



Exploded View

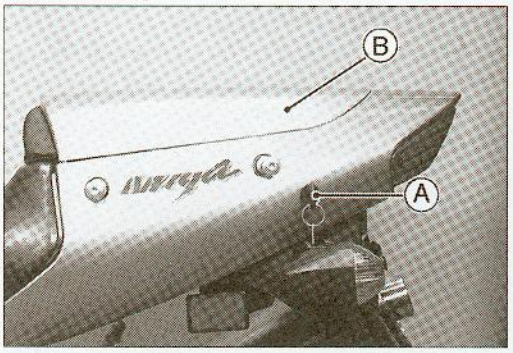


US: U.S.A
CN: Canada
NR: Norway

Seats

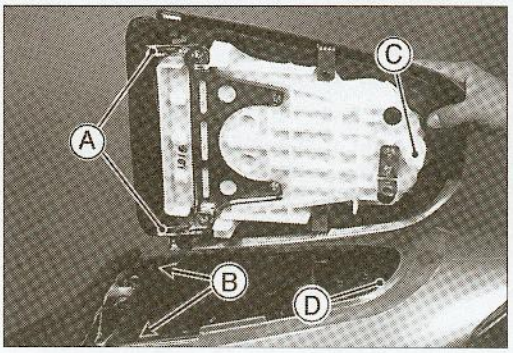
Rear Seat Removal

- Insert the ignition switch key into the seat lock [A], turning the key clockwise, pulling up on the rear of the seat with seat cover [B], and pulling the seat backward.



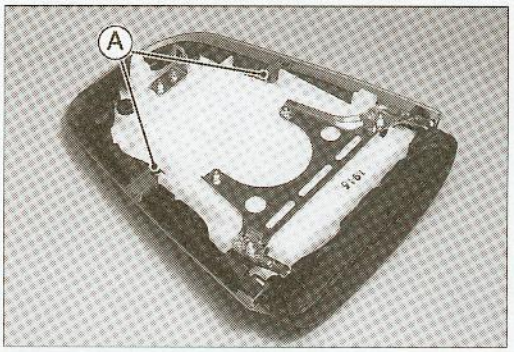
Rear Seat Installation

- Slip the rear seat hooks [A] into the hollow-cubic brackets [B] on the frame.
- Insert the seat pin [C] into the latch hole [D].
- Push down the rear part of the seat until the lock clicks.

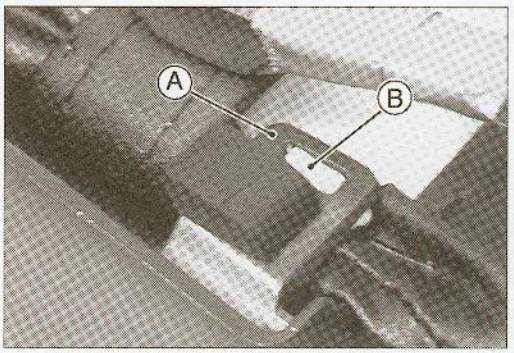


Rear Seat Cover Removal

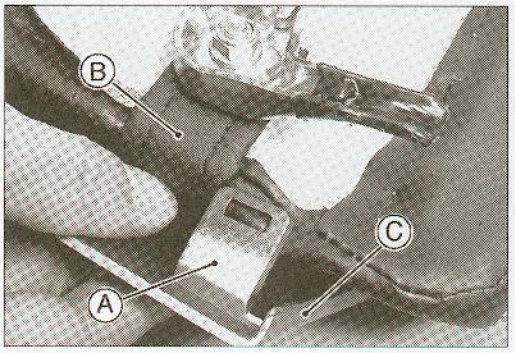
- Remove:
  Rear Seat
  Screws [A]



- Remove the front bracket portions [A] from the projection [B] of the seat.



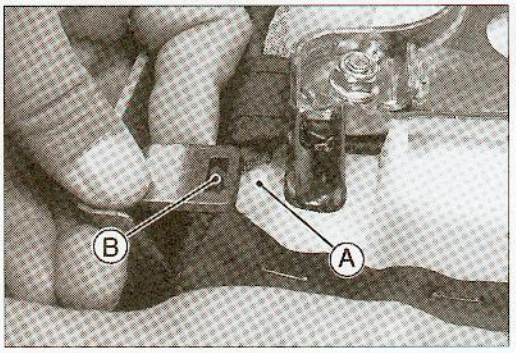
- Clear the bracket portions [A] from the seat band [B].
- Pull the seat cover [C] out.



Seats

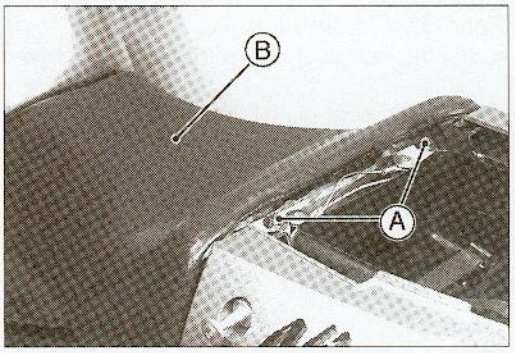
Rear Seat Cover Installation

- Fit the two projections [A] of the rear seat front portion into the slots [B] in the front bracket of the seat cover.
- Tighten the two screws.



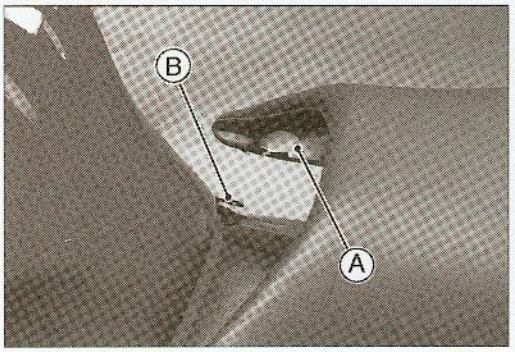
Front Seat Removal

- Remove:
  Rear Seat (see Rear Seat Removal)
  Mounting Bolts [A]
- Remove the front seat [B] by pulling it up on the rear and to the rear.



Front Seat Installation

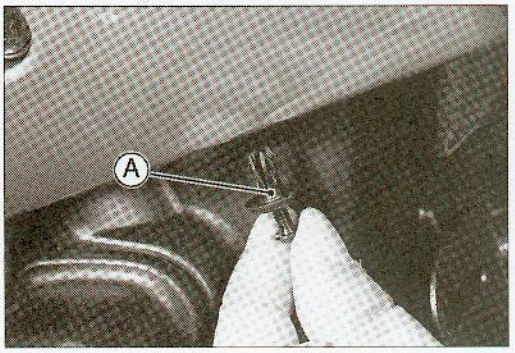
- Slip in the front seat holes [A] to the projections [B] on the fuel tank.
- Tighten the bolts with coller.

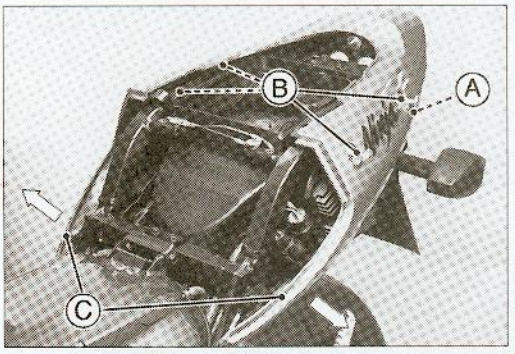


Seat Cover

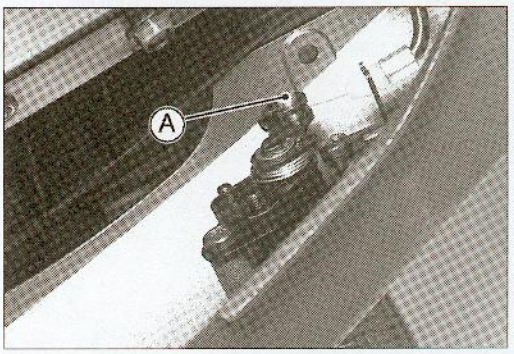
Seat Cover Removal

- Remove:
  Seats
  Rivet Screws [A] (Left and Right)
  Fook Bolts [B]
- Pull the front portions [C] of the seat cover outside, and then remove the seat cover backward.

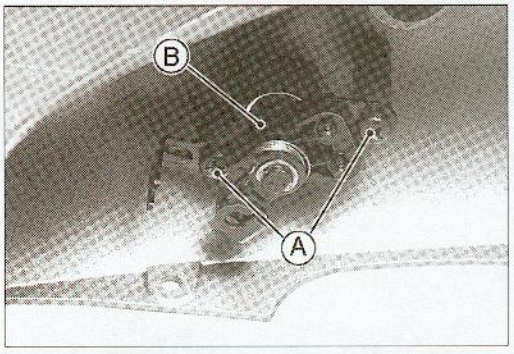




- Remove the seat lock wire end [A].

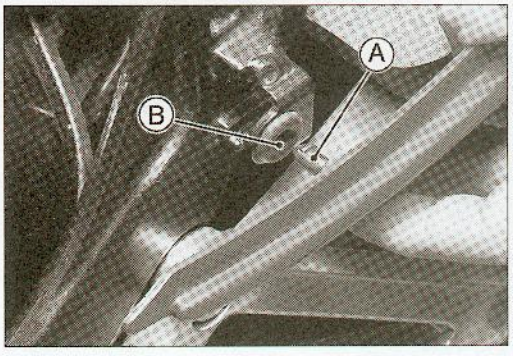


- Remove:
  Screws [A]
  Seat Lock [B]



Seat Cover Installation

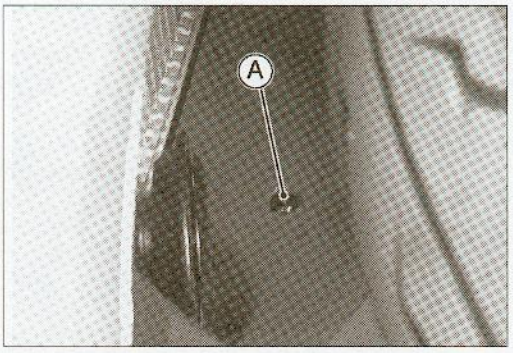
- Installation is reverse of removal.
- Put the projection [A] into the hole [B] on the frame.



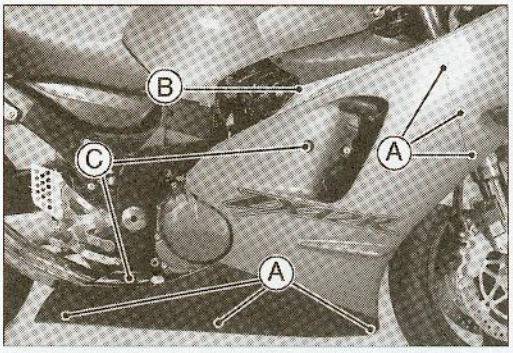
Fairings

Lower Fairing Removal

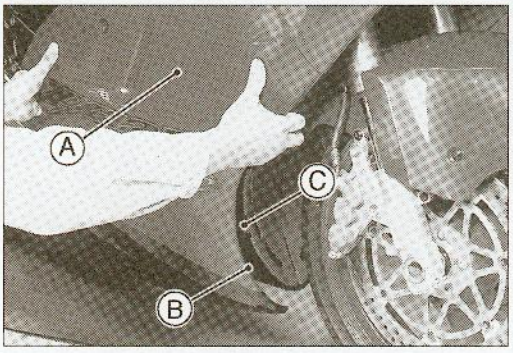
- Remove:
  Inner Fairing Screw [A]



- Remove:
  Screws [A]
  Rivet Screw [B]
  Allen Bolts [C]

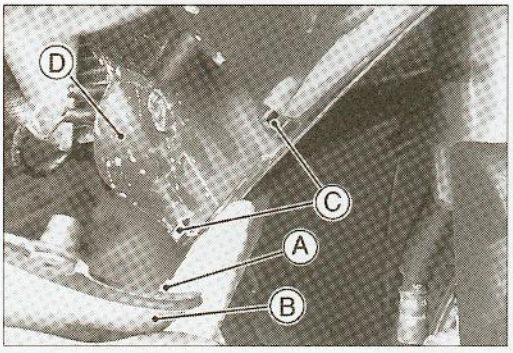


- Pull out the lower fairing [A] from the inner fairing.
- ○ Pushing the hook part [B] backward, and then clear the stopper [C] following the sequence.
  1. Lower Portion
  2. Middle Portion
  3. Upper Portion

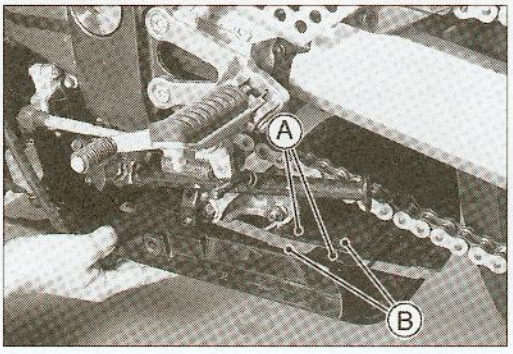


Lower Fairing Installation

- Be sure to in please the hot wind cover.
- Insert the upper portion of the lower firing into the upper firing.
- Fit the hooks [A] on the lower fairing [B] into the stoppers [C] on the inner fairing [D].



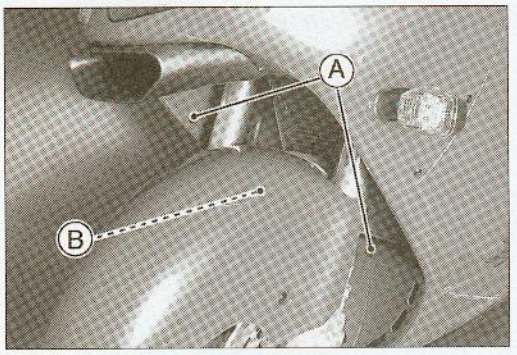
- Engage the engaging parts [A] of the fiaring lower portion and its counters [B].
- First tighten the Allen bolts temporarily, and tighten all screws lightly.
- Tighten the Allen bolts and screws.



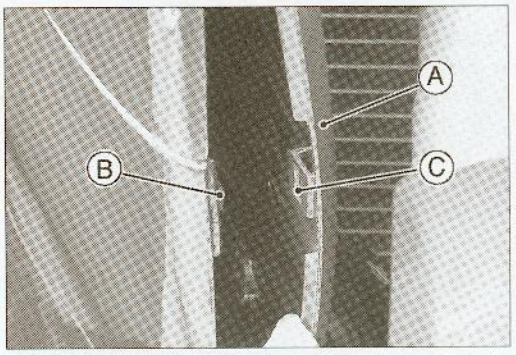
Fairings

Inner Fairinig Removal

- Remove:
  Rivet Screws [A]
  Screw [B]

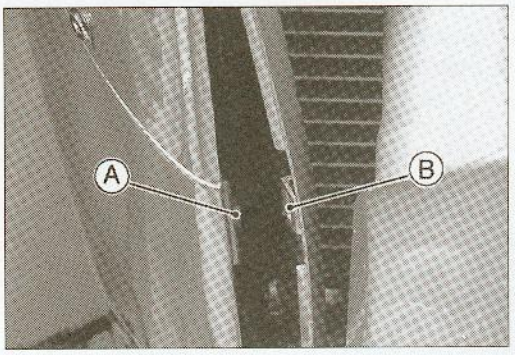


- Pull out the inner fairing [A] to the lower fairing.
- ○ Clear the stoppers [B] to the hooks [C] following the sequence.
  1. Lower Portion
  2. Middle Portion
  3. Upper Portion



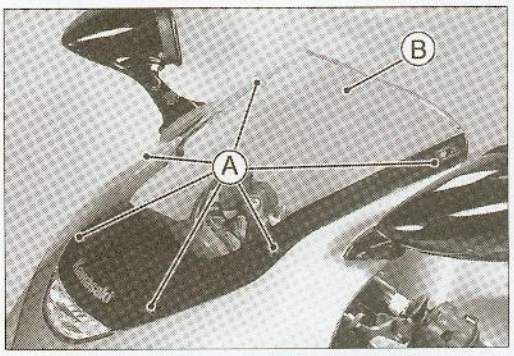
Inner Fairing Installation

- Fit the stoppers [A] onto the hooks [B].



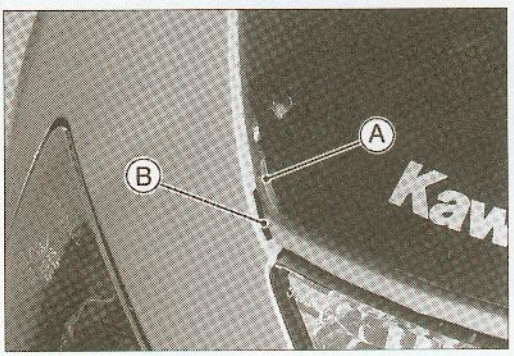
Wind Shield Removal

- Remove:
  Screws [A]
  Window Shield [B]



Wind Shield Installation

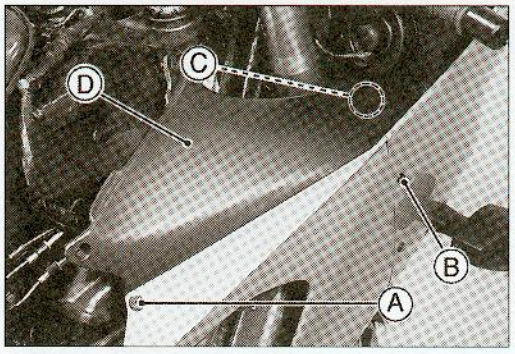
- Insert the tabus [A] of the shield in to the holes [B] of the upper fairing.



Fairings

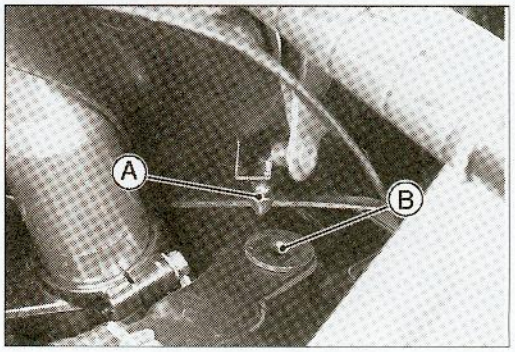
Inner Cover Removal

- Remove:
  Fuel Tank Cover (see Digital Fuel Injection System chapter)
  Rivet Screw [A]
  Screw [B]
- Pull out the projection [C] of the inner cover [D] inward from each hole of the air intake duct.



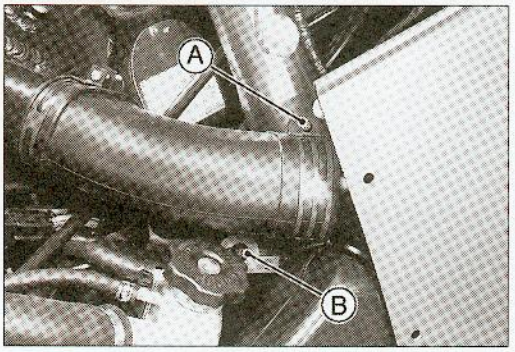
Inner Cover Installation

- Inner cover installation is the reverse of removal.
- Insert the projection [A] of the inner cover into the hole [B] of the air intake duct.

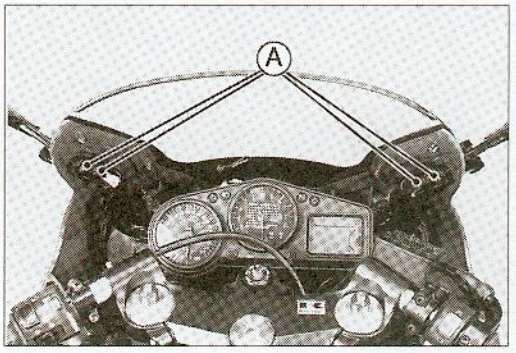


Upper Fairing Removal

- Remove:
  Inner Covers (see Inner Cover Removal)
  Lower Fairings (see Lower Fairing Removal)
  Inner Fairings
- Loosen the front air intake rubber duct clamp screws [A] and remove the upper fairing mounting screws [B].

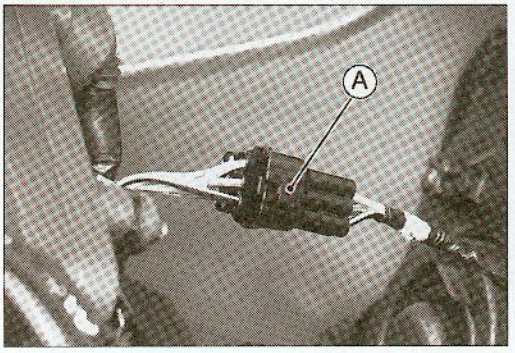


- Remove the nuts [A] and take off the left and right rear view mirrors.



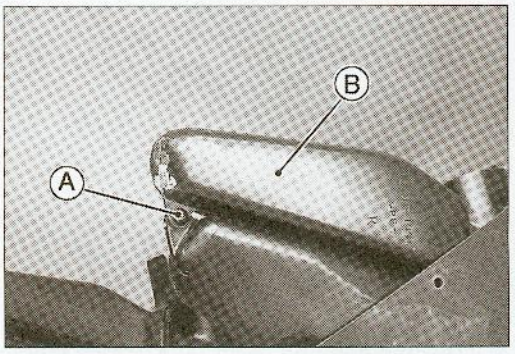
Fairings

- Pull the upper fairing assembly forward and disconnect the sub harness connector [A].

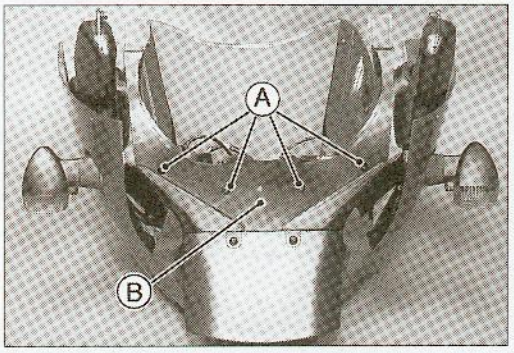


Air Intake Duct Removal

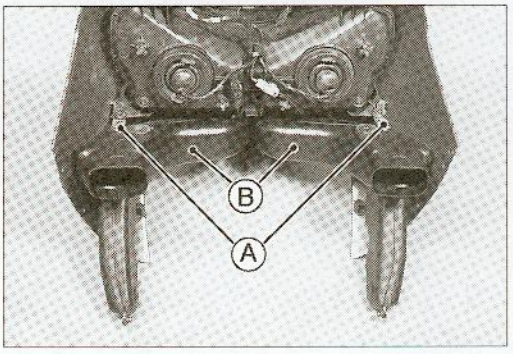
- Remove the upper fairing.
- Remove the screws [A] and pull out the resonators [B].



- Remove:
  Screws [A]
  Plate [B]

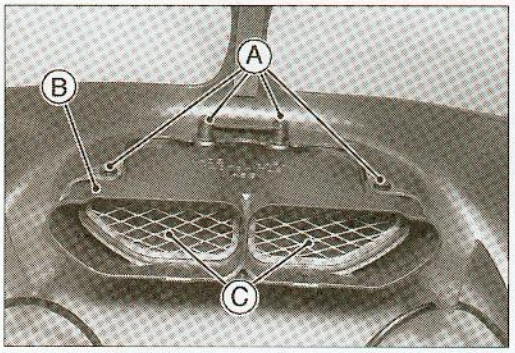


- Unscrew the screws [A].
- Remove the middle air intake ducts [B].



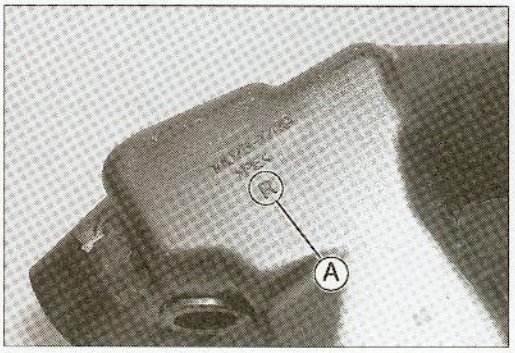
Fairings

- Remove the headlight assy (see Electrical System chapter).
- Remove:
  Screws [A]
  Front Duct [B]
  Screens [C]



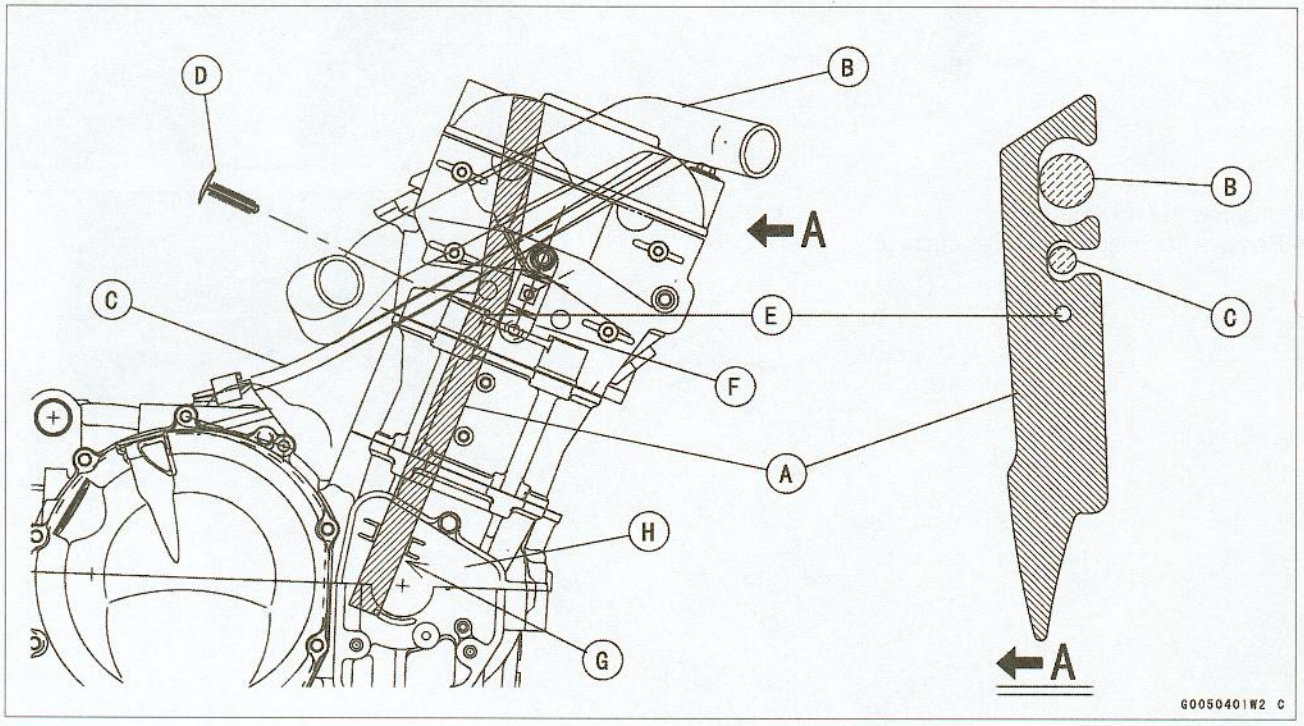
Air Intake Duct Installation

- The left duct has a L mark and right duct has a R mark [A].



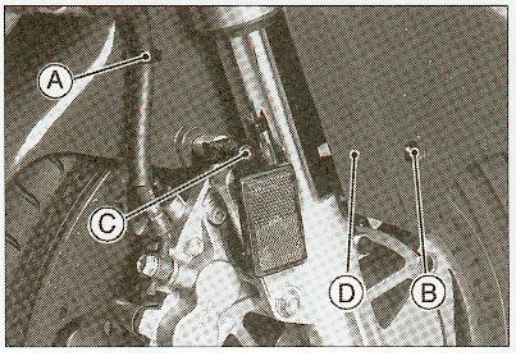
Hot Wind Cover Installation

- Install the hot wind cover [A] following the below.
  Coolant Hose [B]
  Clutch Cable [C]
- ○ Put in the lower part of the cover between the ribs [G] on the crankshaft sensor cover [H].
- ○ Insert the pin [D] through the cover hole [E] to the bracket [F].



Fenders

Front Fender Removal



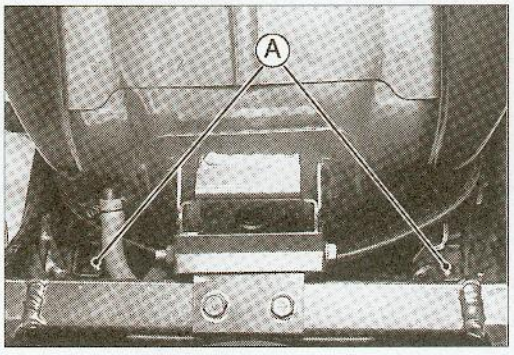
- Remove:
  Brake Hose Clamps [A] (Left and Right)
  Screws [B] (Front Part Screws with Washer)
  Bolts [C]
- Remove the front fender [D].

Front Fender Installation

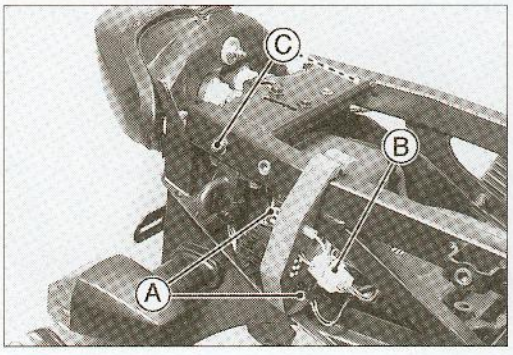
- Install the front fender to the front fork.
- Tighten the screws.
- Install the brake hose clamps to the front fender holes.

Rear Fender Rear Removal

- Remove:
  Rear Seat with cover (see Rear Seat Removal)
  Front Seat (see Front Seat Removal)
  Seat Cover (see Seat Cover Removal)
  Storage Box (see Storage Box Removal)
- Set up the fuel tank (see Digital Fuel Injection System chapter).



- Remove:
  Nuts and Screws [A]



- Disconnect:
  Turn Signal Connectors [A] (Left and Right)
  Tale/Brake Light Connector [B]
- Hang:
  Canister (California Model Only)
  E.C.U. (see Digital Fuel Injection System chapter)
- Remove:
  Bolts [C]
- Pull out the rear fender rear backward.

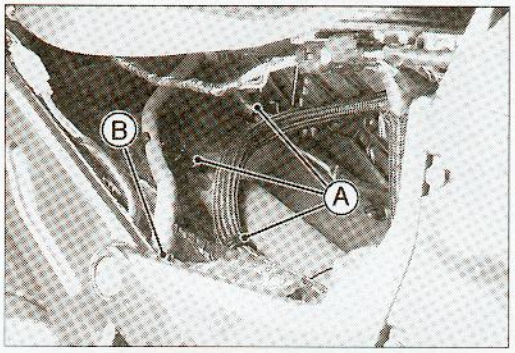
Rear Fender Rear Installation

- Install the front part of the rear fender rear under the rear fender front.

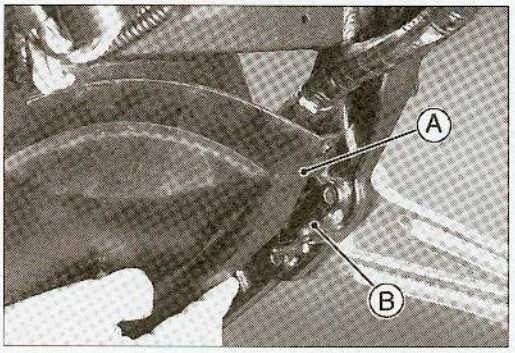
Fenders

Rear Fender Front Removal

- Remove:
  Rear Fender Rear (see Rear Fender Rear Removal)
  Hose and Harness Clamps [A]
  Fuel Drain Tank [B]
- Remove the rear fender front.

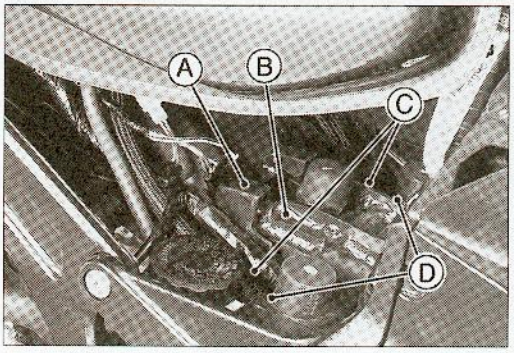


○ Move the rear fender front backward until it stops, and then pull the right side of the rear fender front [A] to clear the brackets [B].



Rear Fender Front Installation

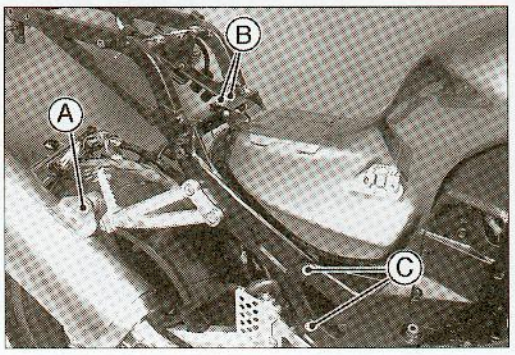
- Install the hose and harness clamps in accordance with Hose, Harness Routing section in General Information chapter.
- Fit on the middle part [A] of the rear fender front onto the bracket [B] and insert both side [C] of the rear fender front into the frame [D].



Rear Frame

Rear Frame Removal

- Remove:
  Seats (see this chapter)
  Rear Fender front (see Rear Fender Front Removal)
  E.C.U. (Not Disconnect, see Digital Fuel Injection System chapter)
- Disconnect:
  Atmospheric Pressure Sensor Connector
  Regulator/Rectifier Connectors
  Muffler Mounting Bolt [A]
  Fuel Tank Mount Bracket Bolts [B]
  Frame Bolts and Nuts [C]



Rear Frame Installation

- Tighten the frame bolts and nuts,

Torque - Rear Frame Bolts and Nuts: 44 N·m (4.5 kg·m, 33 ft·lb)

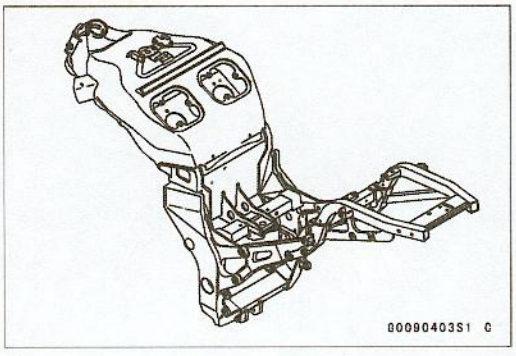
Frame Inspection

- Visually inspect the frame for cracks, dents, bending, or warp.

★If there is any damage to the frame, replace it.

⚠WARNING

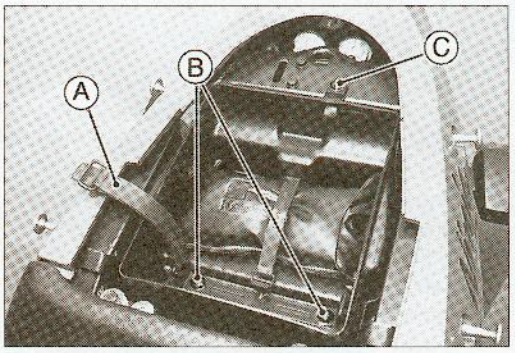
A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.



Storage Box

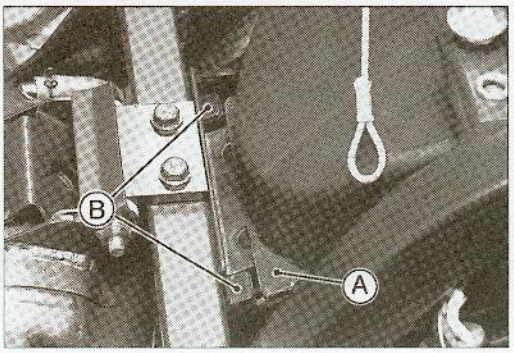
Storage Box Removal

- Remove:
  Seats (see this chapter)
  Band [A]
  Bolts [B]
  Screw [C]
- Pulling up the rear part of the box backward.



Storage Box Installation

- Insert the front part [A] of the box into the hook [B] of the Rear fender rear.



Electrical System

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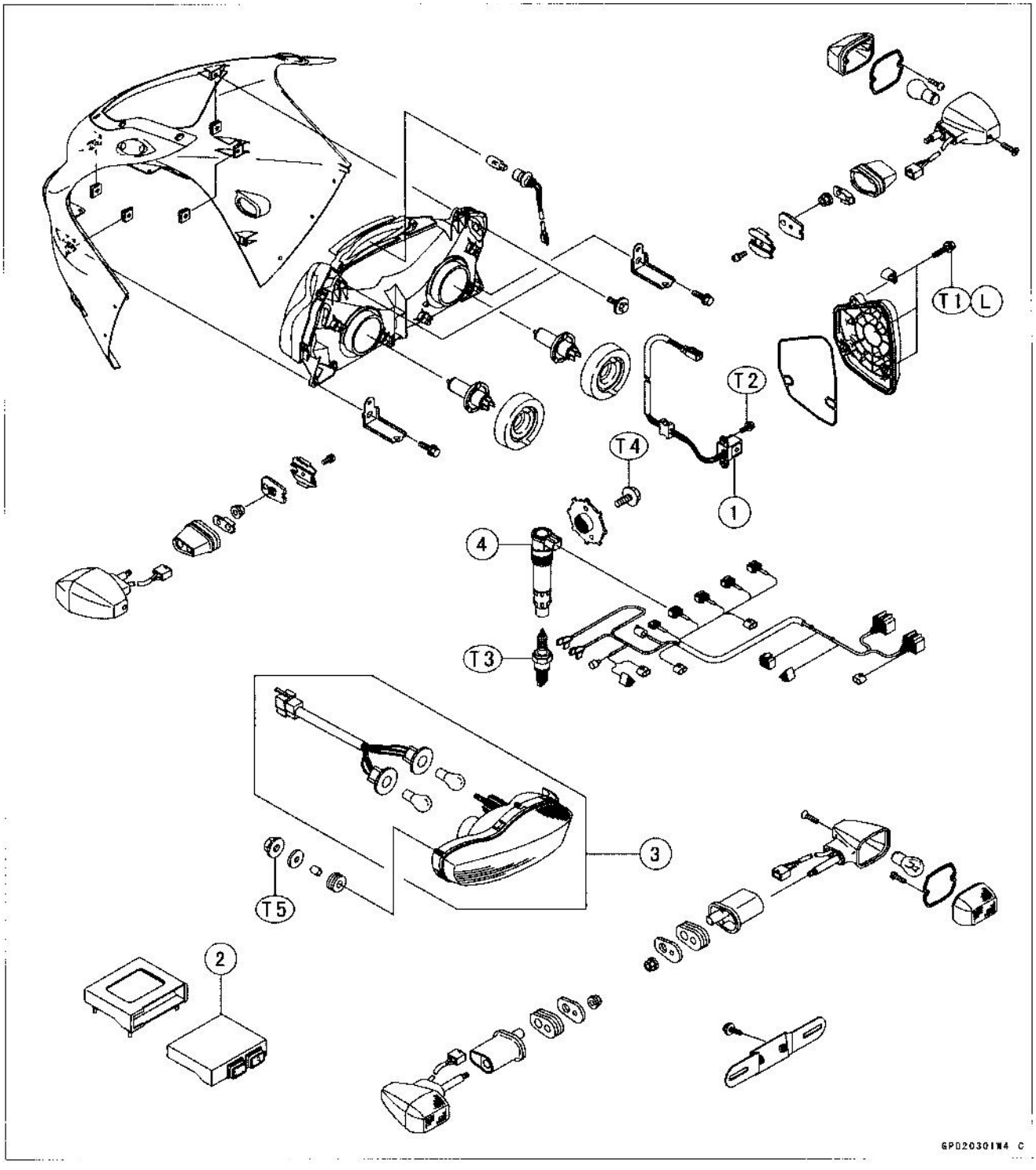
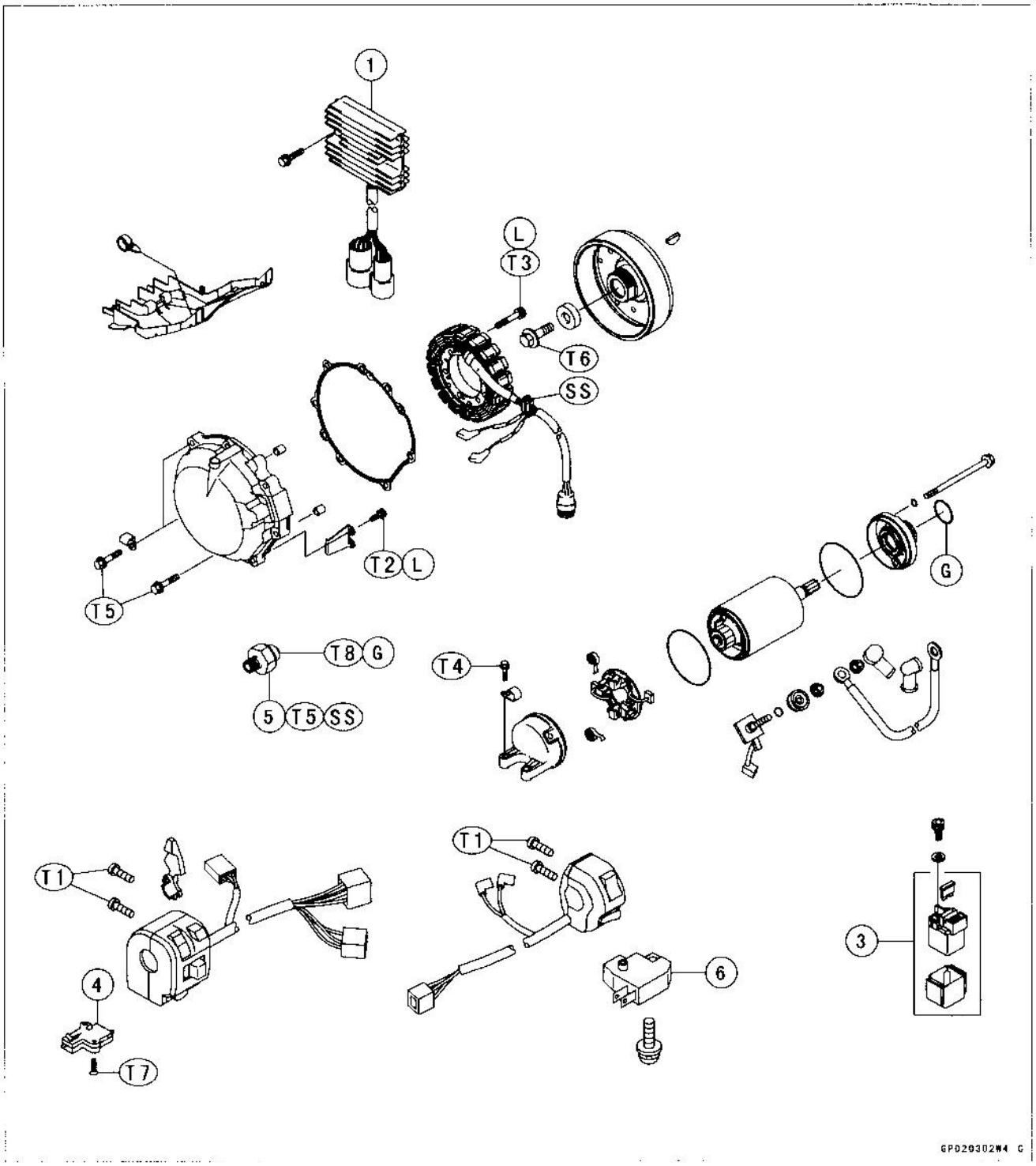
Exploded View



1. Crankshaft Sensor
2. ECU
3. Tail/Brake Lights
4. Stick Coils

L: Apply a non-permanent locking agent.
T1: 15 N·m (1.5 kg·m, 11 ft·lb)
T2: 6 N·m (0.6 kg·m, 53 in·lb)
T3: 13 N·m (1.3 kg·m, 115 in·lb)
T4: 39 N·m (4.0 kg·m, 29 ft·lb)
T5: 5.9 N·m (0.6 kg·m, 52 in·lb)

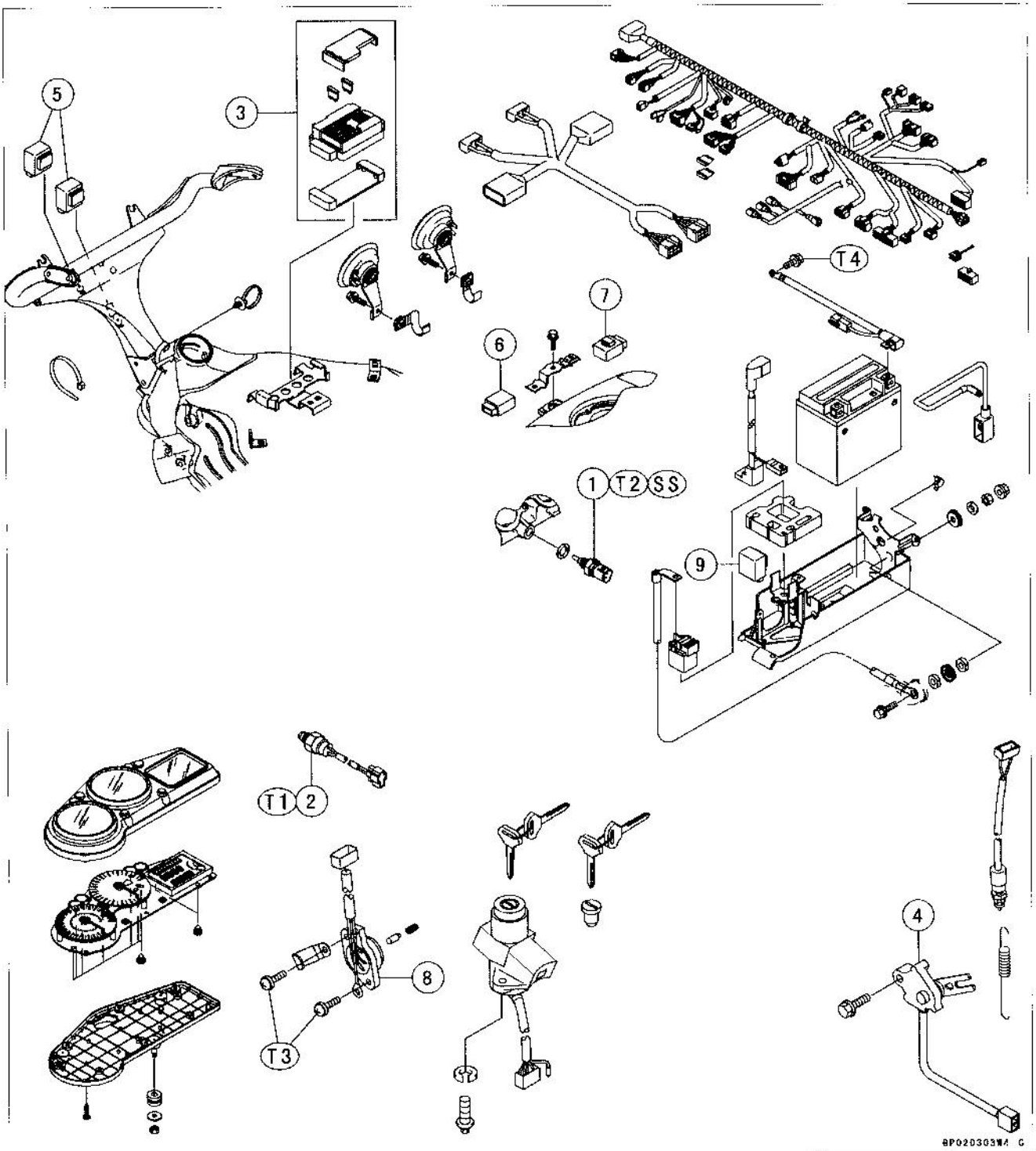
Exploded View



1. Regulator/Rectifier
2. Front Brake Light Switch
3. Starter Relay/Main Fuse
4. Starter Lockout Switch
5. Oil Pressure Switch

SS: Apply silicone sealant.
L: Apply a non-permanent locking agent.
G: Apply grease or engine oil.
T1: 3.4 N·m (0.35 kg·m, 30 in·lb)
T2: 8.6 N·m (0.88 kg·m, 76 in·lb)
T3: 22 N·m (2.2 kg·m, 16 ft·lb)
T4: 12 N·m (1.2 kg·m, 106 in·lb)
T5: 15 N·m (1.5 kg·m, 11 ft·lb)
T6: 110 N·m (11 kg·m, 80 ft·lb)
T7: 1.0 N·m (0.1 kg·m, 9 in·lb)
T8: 1.5 N·m (0.15 kg·m, 13 in·lb)

Exploded View



1. Water Temperature Sensor
2. Fan Switch
3. Junction Box
4. Side Stand Switch
5. Headlight Relays
6. Fuel Pump Relay
7. ECU Relay
8. Gear Position Switch
9. Turn Signal Relay

T1: 18 N·m (1.8 kg·m, 13 ft·lb)
T2: 25 N·m (2.5 kg·m, 18 ft·lb)
T3: 4 N·m (0.4 kg·m, 35 in·lb)
T4: 10 N·m (1.0 kg·m, 87 in·lb)
SS: Apply silicone sealant.

Specifications

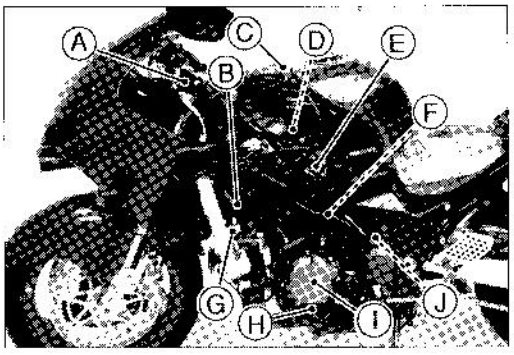
Item	Standard
Battery:	
Type	MF (Maintenance Free) Battery
Capacity	12 V 12 Ah
Voltage	12.6 V or more
Charging System:	
Type	Three-phase AC
Alternator output voltage	85 ~ 120 V @4 000 r/min (rpm)
Stator coil resistance	0.3 ~ 0.5 Ω @20°C (68°F)
Charging voltage (regulator/rectifier output valtage)	14.2 ~ 15.2 V
Ignition System:	
Crankshaft sensor resistance	375 ~ 565 Ω
Crankshaft sensor peak voltage	3.6 V or more
Cam Sensor Resistance	400 ~ 460 Ω
Cam Sensor Peak Voltage	0.2 V or more
Stick coil:	
Primary winding resistance	0.85 ~ 1.15 Ω
Secondary winding resistance	9.2 ~ 13.8 kΩ
Primary peak voltage	80 V or more
Spark plug:	
Spark plug gap	0.7 ~ 0.9 mm (0.028 ~ 0.035 in.)
Electric Starter System:	
Starter motor:	
Brush length	12 mm (0.47 in.), Service Limit 8.5 mm (0.33 in.)
Commutator diameter	28 mm (1.10 in.), Service Limit 27 mm (1.06 in.)
Switch and Sensor:	
Rear brake light switch timing	ON after about 10 mm (0.39 in.) pedal travel
Engine oil pressure switch connections	When engine is stopped: ON When engine is running: OFF
Fan switch resistance:	
Rising temperature	From OFF to ON @ 93 ~ 103°C (199 ~ 217°F)
Falling temperature	From ON to OFF @ above 91°C (196°F)
	ON: Less than 0.5 Ω
	OFF: More than 1 MΩ
Water temperature sensor resistance	in the text
Fuel level sensor resistance:	
Full position	8 ~ 10 Ω
Empty position	122 ~ 126 Ω

Special Tools - Hand Tester: 57001-1394
Flywheel Puller Assembly: 57001-1405
Flywheel Holder: 57001-1313
Lead Wire – Voltage Regulator Adapter: 57001-1448
Lead Wire – Peak Voltage Adapter: 57001-1449

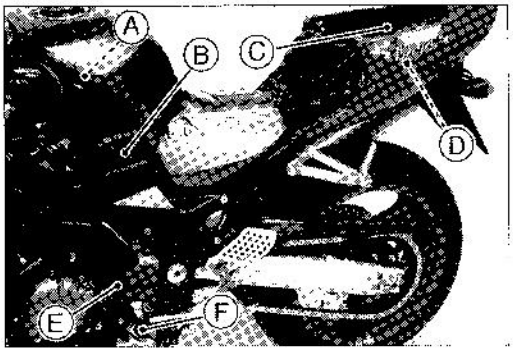
Sealant - Kawasaki Bond (Silicone Sealant): 56019-120

Parts Location

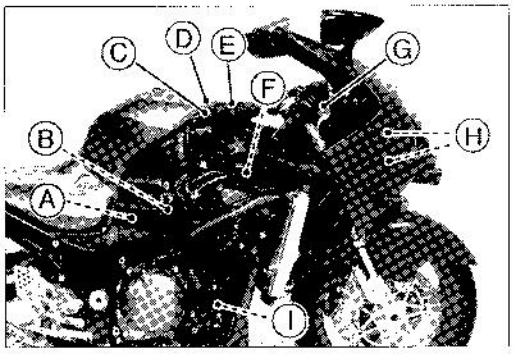
Starter Lockout Switch [A]
Cam Sensor [B]
Fuel Pump Relay [C]
Inlet Air Pressure Sensor [D]
Throttle Sensor [E]
Starter Motor [F]
Radiator Fan Switch [G]
Oil Pressure Switch [H]
Alternator [I]
Speed Sensor [J]



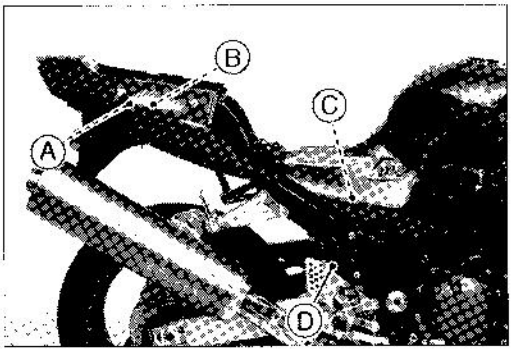
Inlet Air Temperature Sensor [A]
Battery [B]
ECU (Electronic Control Unit) [C]
Regulator/Rectifier [D]
Gear Position Switch [E]
Side Stand Switch [F]



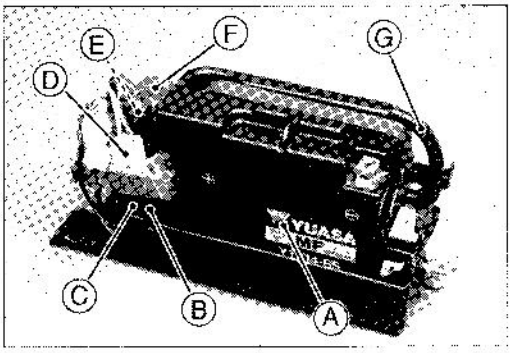
Battery [A]
Water Temperature Sensor [B]
ECU Main Relay [C]
15 A ECU Fuse [D]
Junction Box [E]
Stick Coils (Ignition Coils) [F]
Front Brake Light Switch [G]
Headlight Relays (High and Low Beam) [H]
Crankshaft Sensor [I]



Atmospheric Pressure Sensor [A]
Self-diagnosis Indicator Terminal [B]
Fuel Pump [C]
Rear Brake Light Switch [D]



Battery [A]
Turn Signal Relay [B]
Vehicle-down Sensor [C]
20 A Headlight Fuse [D]
30 A Main Fuse [E]
Starter Relay [F]
Jump Starting Cable [G]



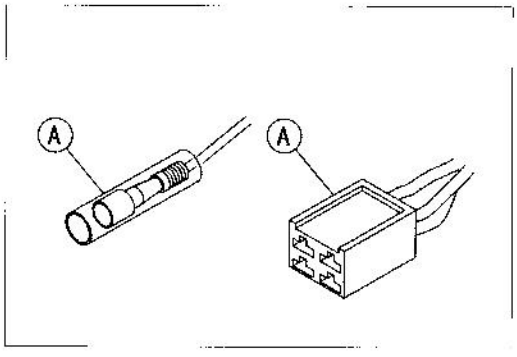
Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

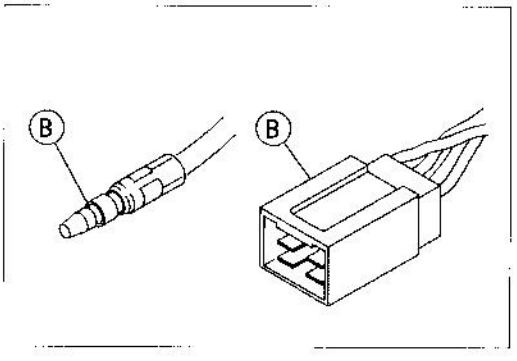
- Do not reverse the battery lead connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Do not use a meter illumination bulb rated for other than voltage or wattage specified in the wiring diagram, as the meter or gauge panel could be warped by excessive heat radiated from the bulb.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items.
  Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they 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]



Male Connectors [B]



Electrical Wiring

Wiring Inspection

- Visually inspect the wiring for signs of burning, fraying, etc.

★ If any wiring is poor, replace the damaged wiring.

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

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

- Check the wiring for continuity.

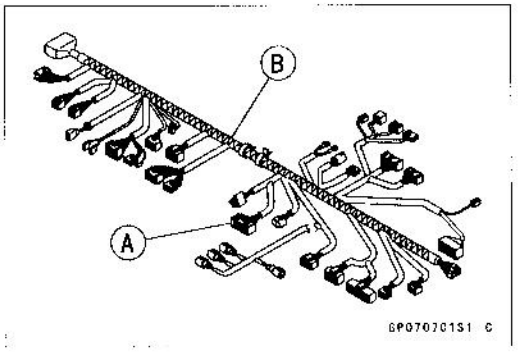
○ Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

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

Special Tool - Hand Tester: 57001–1394

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

★ If the tester does not read 0 Ω, the lead is defective. Replace the lead or the wiring harness [B] if necessary.

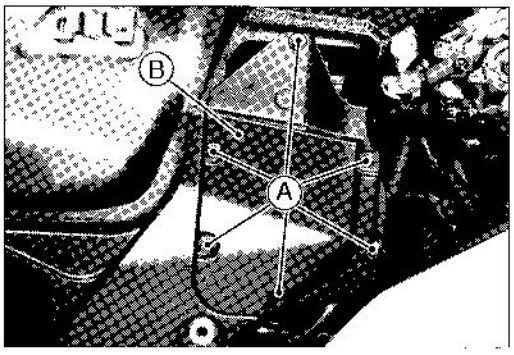


Battery

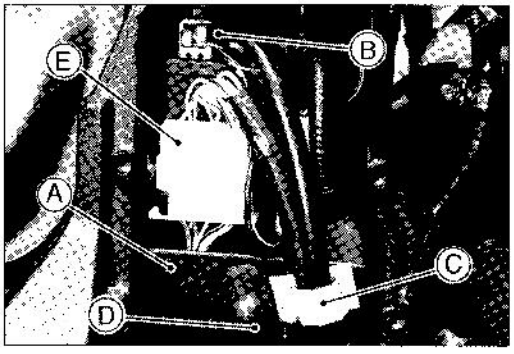
Battery Removal

CAUTION

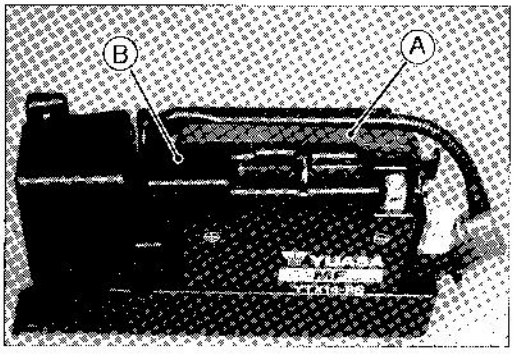
Do not disconnect the battery wires or any other electrical connections when the ignition switch is ON, as this could damage the ECU (Electronic Control Unit).
Never reverse the connections of the battery, this could damage the ECU.



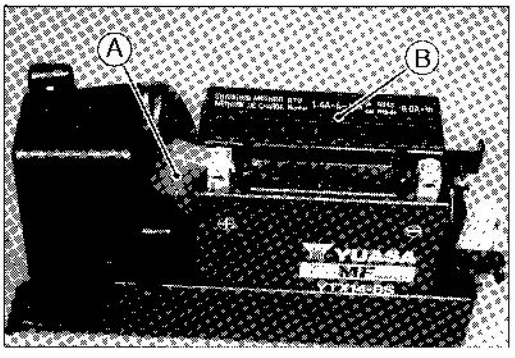
- Turn off the ignition switch.
- Remove:
  Fuel Tank Cover (see Fuel System chapter)
  Seats (see Frame chapter)
  Battery Compartment Cover Bolts [A]
  Battery Compartment Cover [B]



- Slightly pull out the battery tray [A].
- Disconnect the negative (–) terminal wire [B] and release the wires from the clamp [C] on the battery tray.
- Disconnect:
  Starter Motor Wire [D]
  Connector [E]



- Remove the battery tray along with the battery from the battery compartment.
- Unhook the rubber band [A] and remove the battery cover [B].



- Remove:
  Positive (+) Terminal Wire [A]
  Battery [B]

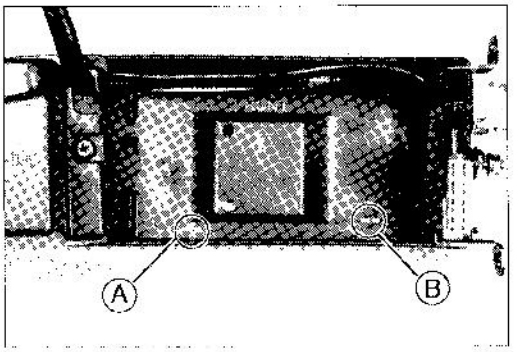
Battery

Battery Installation

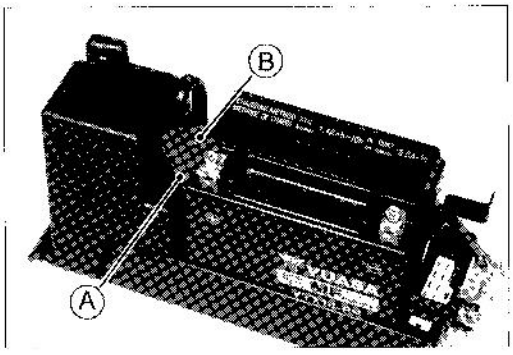
- Place the battery in the tray.

NOTE

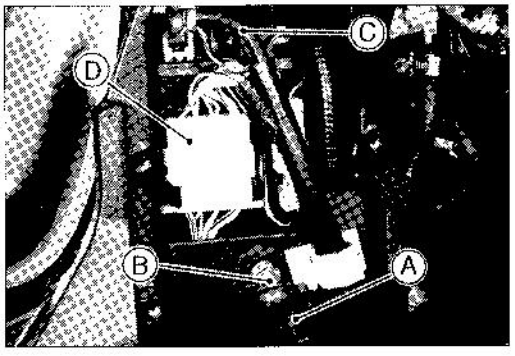
○ *Put the (+) terminal side of the battery on the (+) symbol [A] and the (–) terminal side on the (–) symbol [B].*



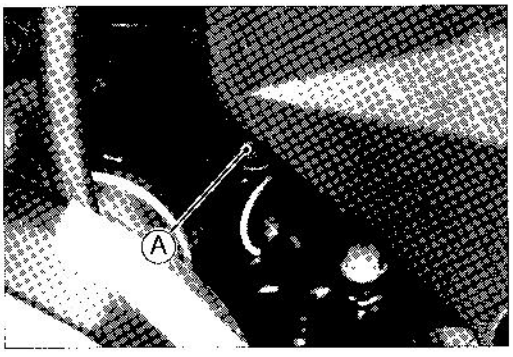
- Connect the capped wire [A] to the (+) terminal.
- Put a light coat of grease on the (+) terminal to prevent corrosion.
- Cover the (+) terminal with its protective cap [B].
- Install:
  Battery Cover
  Rubber Band



- Insert the battery tray along with the battery into the battery compartment.
- Connect the starter motor wire [A] to the terminal [B] and tighten the nut.
○ Cross the starter motor wire over the main harness.
- Connect the black wire [C] to the (–) terminal.
- Put a light coat of grease on the (–) terminal to prevent corrosion.
- Connect the connector [D].



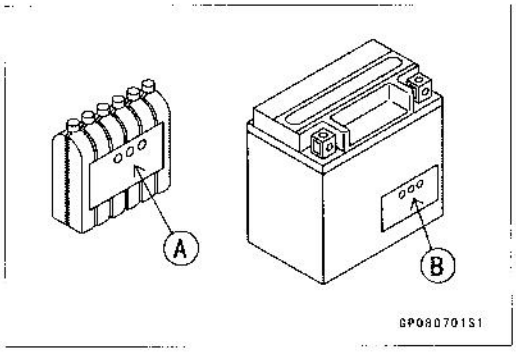
- Confirm that the projection [A] of the battery tray fits into the hole in the left side of the frame.
- Install:
  Removed Parts



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.

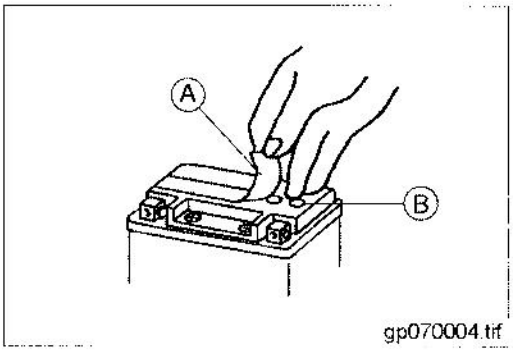
Battery Model Name for ZX1200-A1: YTX14-BS



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.

- Check to see that there is no peeling, tears or holes in the seal sheet on the top of the battery.
- Place the battery on a level surface.
- Remove the seal sheet [A].



gp070004.tif

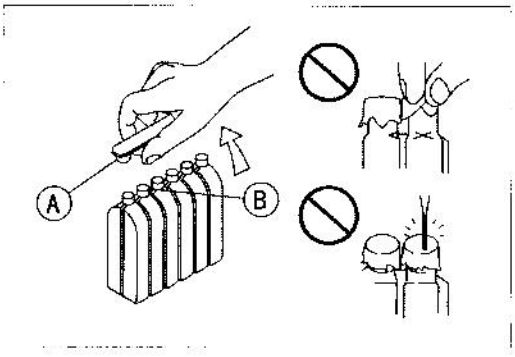
CAUTION

Do not remove the seal sheet sealing the filler ports [B] until just before use.

NOTE

A battery whose seal sheet has any peeling, tears, or holes, requires a refreshing charge (initial charge).

- Take the electrolyte container out of the plastic bag.
- Detach the seal cap [A] from the container.

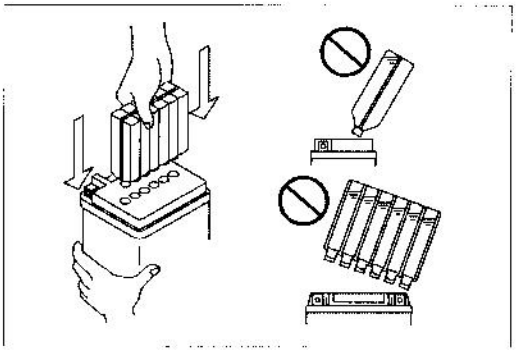


NOTE

Do not discard the seal cap because it is used as the battery plugs later.

Do not peel back or pierce the seals [B] on the container.

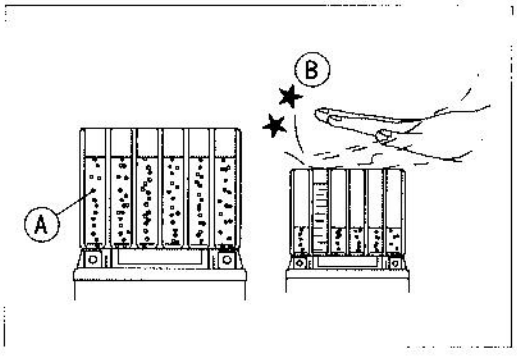
- Place the electrolyte container upside down aligning the six seals with the six battery filler ports.
- Push the container down strongly enough to break the seals. Now the electrolyte should start to flow into the battery.



NOTE

Do not tilt the container as the electrolyte flow may be interrupted.

- Make sure air bubbles [A] are coming up from all six filler ports.
- Leave the container this way for 5 minutes or longer.



NOTE

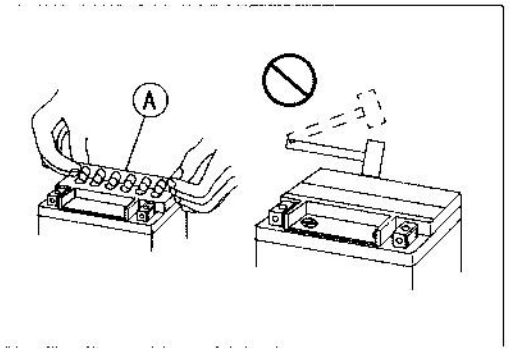
If no air bubbles are coming up from a filler port, tap [B] the bottom of the container two or three times. Never remove the container from the battery.

CAUTION

Fill the electrolyte into the battery until the container is completely emptied.

Battery

- Be certain that all the electrolyte has flowed out.
- Tap the bottom the same way as above if there is any electrolyte left in the container.
- Now pull the container gently out of the battery.
- Let the battery sit for **20** minutes. During this time, the electrolyte permeates the special separators and the gas generated by chemical reaction is released.
- Fit the seal cap [A] tightly into the filler ports until the seal cap is at the same level as the top of the battery.



NOTE

○ *Do not hammer. Press down evenly with both hands.*

⚠ WARNING

Once you installed the seal cap after filling the battery, never remove it, nor add any water or electrolyte.

Initial Charge

While a maintenance free battery can be used after only filling with electrolyte, a battery may not be able to sufficiently move a starter motor to start an engine in the cases shown in the table below, where an initial charge is required before use. However, if a battery shows a terminal voltage of 12.5 V or more, using a digital volt meter, after 10 minutes of filling, no initial charge is necessary.

NOTE

○ *To measure battery terminal voltage, use a digital voltmeter which can be read one decimal place voltage.*

Condition requiring initial charge	Charging method
At low temperature (lower than 0°C)	1.4 A × 2 ~ 3 hours
Battery has been stored under high temperature and humidity.	1.4 A × 15 ~ 20 hours
Seal sheet has been removed, or broken – peeling, tear or hole.	
Battery two or more years old from date of manufacture. Battery manufacturing date is printed on battery top. Example) 12 (Day) 10 (Month) 98 (Year) T1 (Mfg. location)	

Battery

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 lead removed. Give a refresh charge **once a month** during storage.
4) Battery life:
   If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

⚠WARNING

Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.
This procedure prevents sparks at the battery terminals which could ignite any battery gases.
No fire should be drawn near the battery, or no terminals should have the tightening loosened.
The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medial attention if severe.

Interchange

A maintenance free battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a maintenance free battery only on a motorcycle which was originally equipped with a maintenance free battery.

Be careful, if a maintenance free battery is installed on a motorcycle which had an ordinary battery as original equipment, the maintenance free battery's life will be shortened.

Charging Condition Inspection

Battery charging condition can be checked by measuring battery terminal voltage.

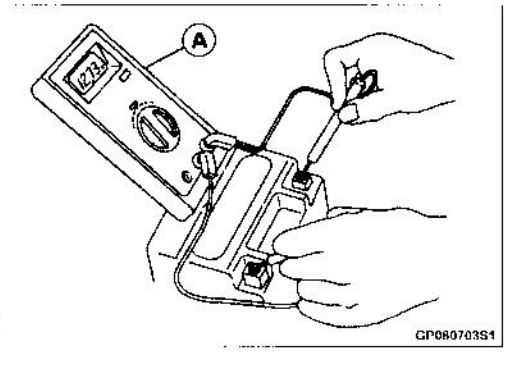
- Remove the battery (see Battery Removal).
- Measure the battery terminal voltage.

NOTE

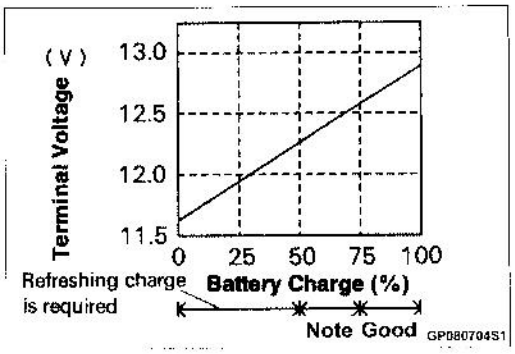
○ *Measure with a digital voltmeter [A] which can be read one decimal place voltage.*

★ If the reading is below the specified, refreshing charge is required.

Battery Terminal Voltage
Standard: **12.6 V or more**



Battery

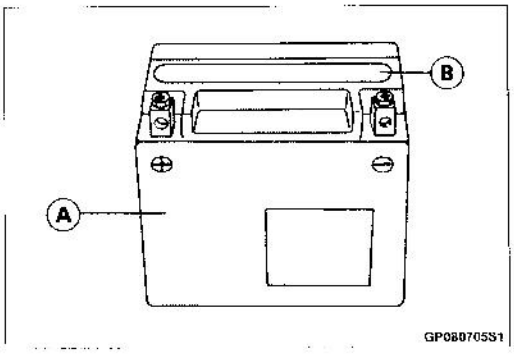


Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Refresh–charge by following method according to the battery terminal voltage.

⚠ WARNING

This battery is sealed type. Never remove seal cap [B] even at charging. Never add water. Charge with current and time as stated below.



Terminal Voltage: 11.5 ~ less than 12.6 V

Standard Charge

1.4 A × 5 ~ 10 h (see following chart)

Quick Charge

6.0 A × 1 h

CAUTION

If possible, do not quick charge. If the quick charge is done due to unavoidable circumstances, do standard charge later on.

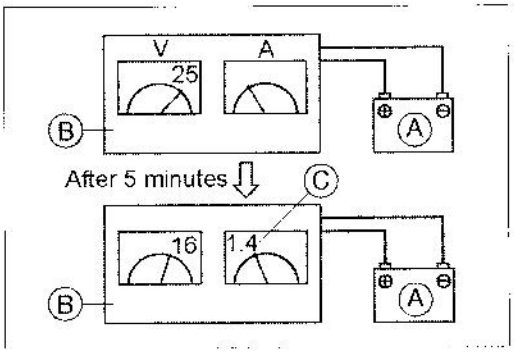
Terminal Voltage : less than 11.5 V

Charging Method: **1.4 A × 20 h**

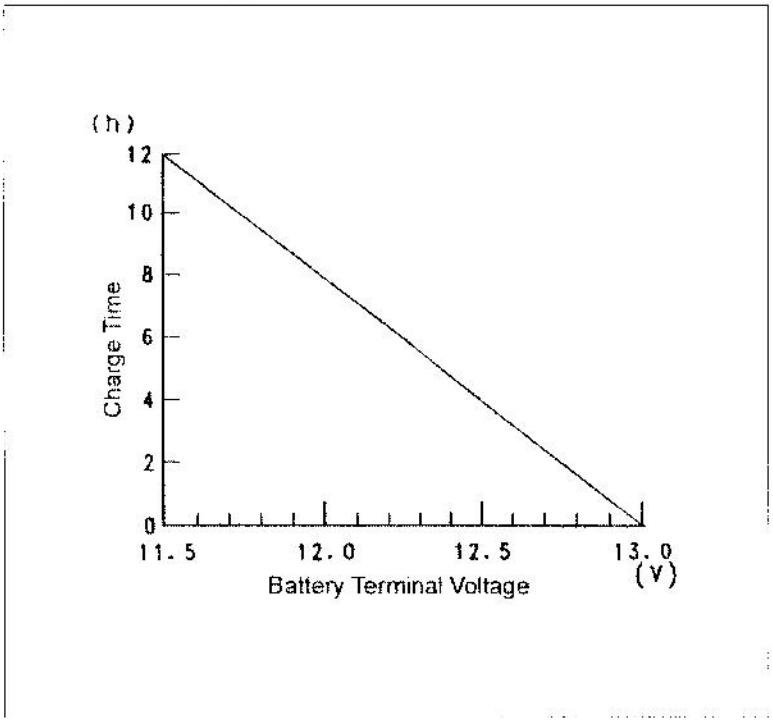
NOTE

Raise the voltage initially (25 V as maximum), and charge for about 5 minutes as a yardstick. If ammeter shows no change in current after 5 minutes, you need a new battery. The current, if it can flow into the battery, tends to become excessive. Adjust the voltage as often as possible to keep the current at standard value (1.4 A).

Battery [A]
Battery Charger [B]
Standard Value [C]



Battery Standard Charge Time Chart



- Determine battery condition after refreshing charge.
- Determine the condition of the battery 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

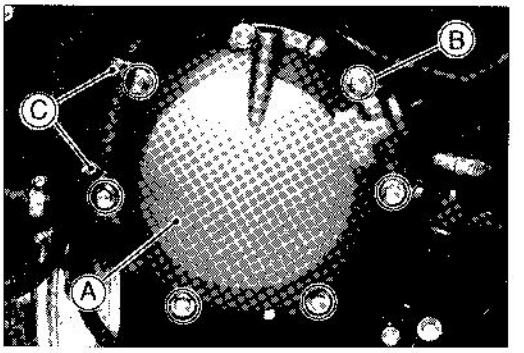
Criteria	Judgement
12.6 V or more	Good
12.0 ~ less than 12.6 V	Charge insufficient → Recharge
less than 12.0 V	Unserviceable → Replace

Charging System

Alternator Cover Removal

- Remove:
  Left Lower Fairing (see Frame chapter)
- Place a suitable container under the alternator cover [A].
- Remove:
  Alternator Cover Bolts [B]
  Clamps [C]
  Alternator Cover

★ If necessary, remove the stator coil from the alternator cover (see Stater Coil Removal).



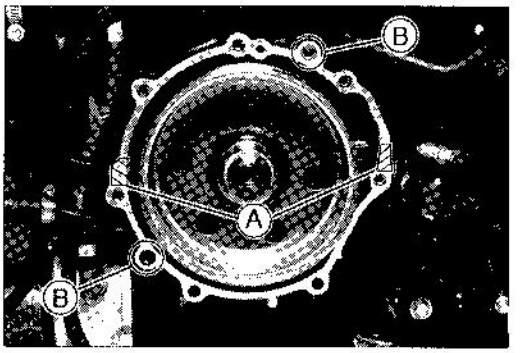
Alternator Cover Installation

- Apply silicone sealant to the alternator wire grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

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

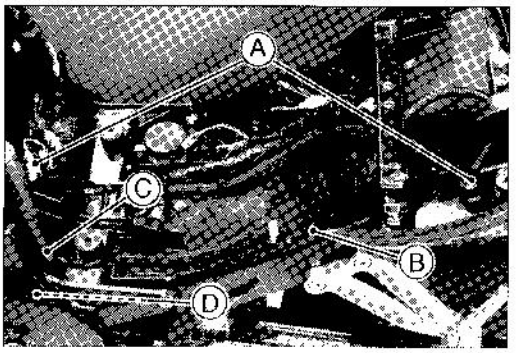
- Check that knock pins [B] are in place on the crankcase.
- Install a new gasket, the alternator cover and clamps.
- Tighten the cover bolts.

Torque - Alternator Cover Bolts: 15 N·m (1.5 kg·m, 11 ft·lb)

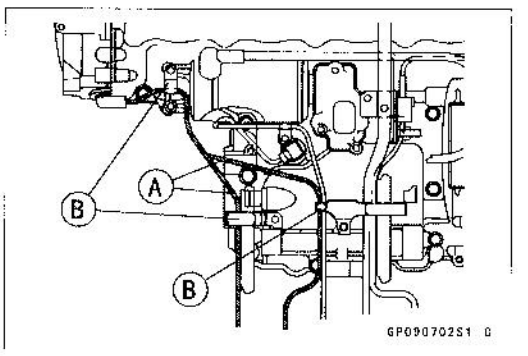


Stator Coil Removal

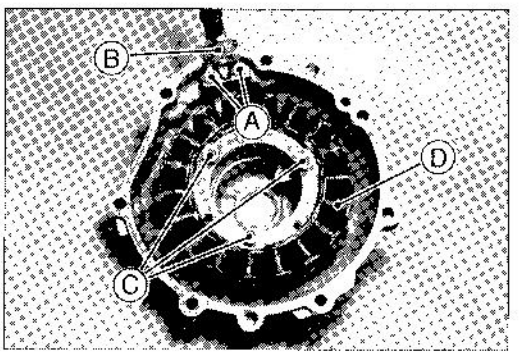
- Remove:
  Lower Fairing (see Frame chapter)
  Fuel Tank (see Digital Fuel Injection System chapter)
  Sprocket Cover
  Alternator Wire Connectors [A]
  Clamp [B]
  Breather Hose Lower End [C]
  Collar [D] on Rear Upper Engine Mounting Bolt



- Remove the alternator wires [A] from the clamps [B].



- Remove:
  Alternator Cover (see Alternator Cover Removal)
  Holding Plate Bolts [A] and Plate
  Alternator Wire Grommet [B]
  Stator Coil Bolts [C]
  Stator Coil [D]



Stator Coil Installation

- Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.

Torque - Stator Coil Bolts: 22 N·m (2.2 kg·m, 16 ft·lb)

- Apply silicone sealant to the circumference of the alternator wire grommet, and fit the grommet into the notch of the cover securely.

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

- Secure the alternator wire with a holding plate, and apply a non-permanent locking agent to the threads of the plate bolts and tighten them.

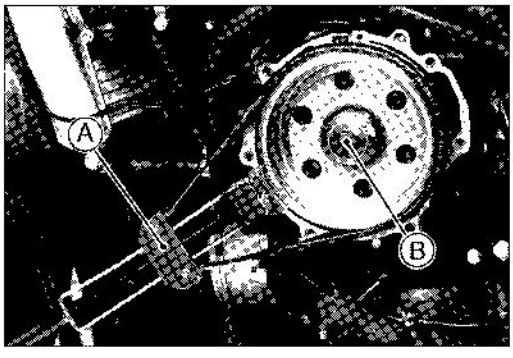
Torque - Alternator Wire Holding Plate Bolts: 8.6 N·m (0.88 kg·m, 76 in·lb)

- Install:
  Alternator Cover (see Alternator Cover Installation)
  Removed Parts

Alternator Rotor Removal

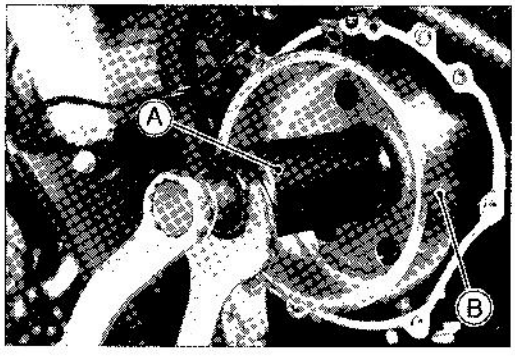
- Remove:
  Alternator Cover (see Alternator Cover Removal)
- Wipe oil off the outer circumference of the rotor.
- Hold the alternator rotor steady with the flywheel holder [A], and remove the rotor bolt [B].

Special Tool - Flywheel Holder: 57001–1313



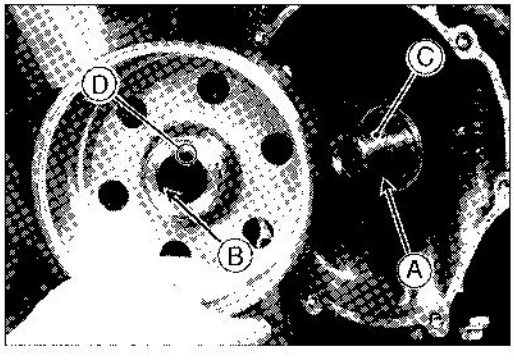
- Using the flywheel puller [A], remove the alternator rotor [B] from the crankshaft.

Special Tool - Flywheel Puller Assembly: 57001–1405



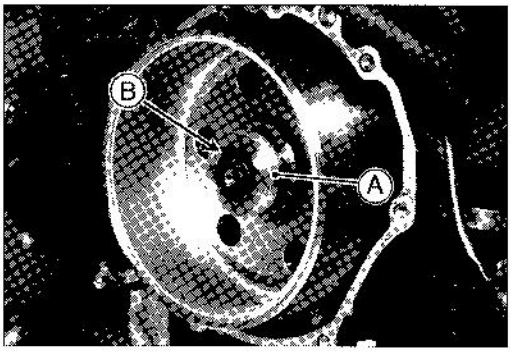
Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  [A] Crankshaft Tapered Portion
  [B] Alternator Rotor Tapered Portion
- Fit the woodruff key [C] securely in the slot in the crankshaft before installing the alternator rotor.
- Align the groove [D] of the rotor with the woodruff key.



Charging System

- Install the washer [A] so that the chamfer side [B] faces outward.



NOTE

○ *Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.*

○ Install the rotor and tighten it with 70 N·m (7.0 kg·m, 52 ft·lb) of torque.
○ Remove the washer and rotor bolt.
○ Check the drawing torque with flywheel puller.

Special Tool - Flywheel Puller Assembly: 57001-1405

★ If the rotor is not pulled out with 20 N·m (2.0 kg·m, 15 ft·lb) of drawing torque, it is installed correctly.
★ If the rotor is pulled out with under 20 N·m (2.0 kg·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 while holding the alternator rotor steady with the flywheel holder.

Special Tool - Flywheel Holder: 57001–1313

Torque - Alternator Rotor Bolt: 110 N·m (11 kg·m, 80 ft·lb)

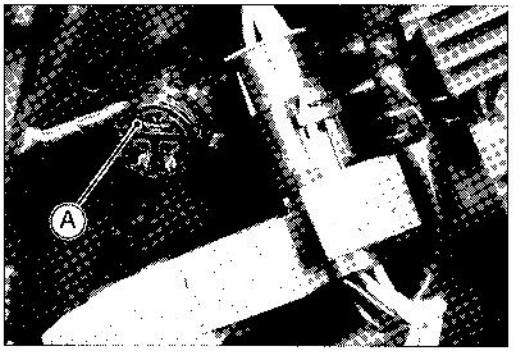
- Install the alternator cover (see Alternator Cover Installation).

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 stator 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 seat cover (see Frame chapter).



○ Disconnect the alternator wire connector [A].
○ Connect the hand tester as shown in the table 1.
○ Start the engine.
○ Run it at the rpm given in the table 1.
○ Note the voltage readings (total 3 measurements).

Table 1 Alternator Output Voltage

Tester Range	Connections		Reading @ 4,000 rpm
	Tester (+) to	Tester (–) to	
250 V AC	One White Wire	Another White Wire	85 ~ 120 V

★If the output voltage shows the value in the table, the alternator operates properly and the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.

- 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	
× 1 Ω	One White Wire	Another White Wire	0.3 ~ 0.5 Ω @20°C (68°F)

★If there is more resistance than shown in the table, or no hand tester reading (infinity) for any two wires, the stator has an open wire and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.

- Using the highest resistance range of the hand tester, measure the resistance between each of the white wires and chassis ground.

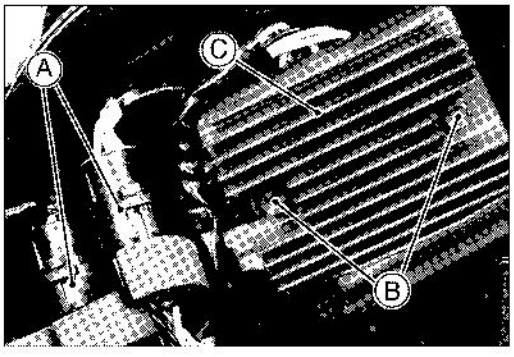
★Any hand tester reading less than infinity (∞) indicates a short, necessitating stator replacement.

★If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Special Tool - Hand Tester: 57001-1394

Regulator/Rectifier Inspection

- Remove:
  Seat Cover (see Frame chapter)
  Connectors [A] (disconnect)
  Bolts [B]
  Regulator/Rectifier [C]

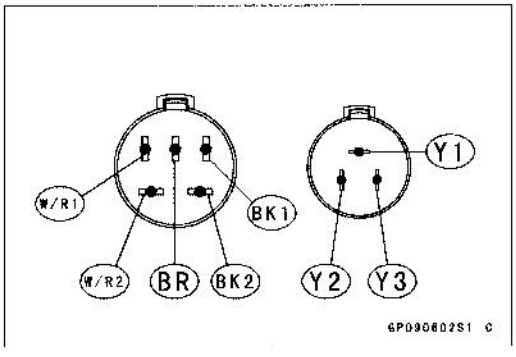


Rectifier Circuit Check:

- Check conductivity of the following pair of terminals.

Rectifier Circuit Inspection

Tester connection	W/R1-Y1,	W/R1-Y2,	W/R1-Y3
	W/R2-Y1,	W/R2-Y2,	W/R2-Y3
	BK1-Y1,	BK1-Y2,	BK1-Y3
	BK2-Y1,	BK2-Y2,	BK2-Y3



★The resistance should be low in one direction and more than ten times as much in the other direction. If any two wires are low or high in both directions, the rectifier is defective and 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

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 wires).

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.

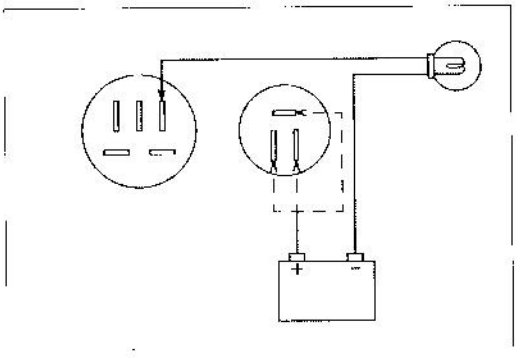
- Check to be sure the rectifier circuit is normal before continuing.

Regulator Circuit Test–1st Step:

- 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.

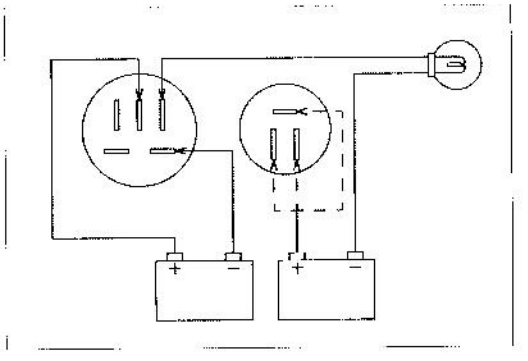


Regulator Circuit Test–2nd Step:

- Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test–1st Step".
- Apply 12 V to the BR (voltage monitoring) 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.



Regulator Circuit Test–3rd Step:

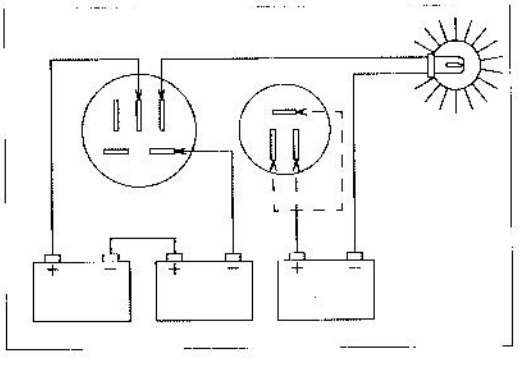
- Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test -1st Step".
- Momentarily apply 24 V to the BR terminal by adding a 12 V battery.
- Check Y1, Y2, and Y3 terminals respectively.

CAUTION

Do not apply more than 24 V to the regulator/rectifier and do not leave the 24 V applied for more than a few seconds, or the unit will be damaged.

★ If the test light did not light when the 24 V was applied momentarily to the BR terminal, the regulator/rectifier is defective. Replace it.

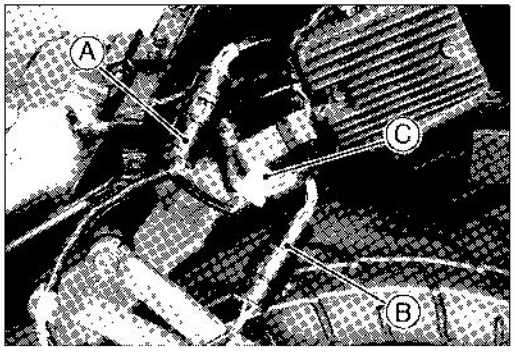
★ If the regulator/rectifier passes all of the tests described, it may still be defective. If the charging system still does not work properly after checking all of the components and the battery, test the regulator/rectifier by replacing it with a known good unit.



Charging System

Regulator/Rectifier Output Voltage Inspection

- Check the battery condition (see Battery section).
- Remove the seat cover (see Frame chapter).
- Warm up the engine to obtain actual alternator operating conditions.
- Turn off the ignition switch, and connect the lead wire-voltage regulator adapter [A] to the regulator/rectifier wire 5 pins connector [B] as shown in the figure.
- Connect the hand tester to the connector [C] of the adapter as shown in the table.
- 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 of US, Canada, Australia and Malaysia models, 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.



Regulator/Rectifier Output Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester ( ) to	
25 V DC	White/Red	Black	14.2 ~ 15.2 V

Special Tools - Hand Tester: 57001–1394
Lead Wire - Voltage Regulator Adapter: 57001–1448

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.

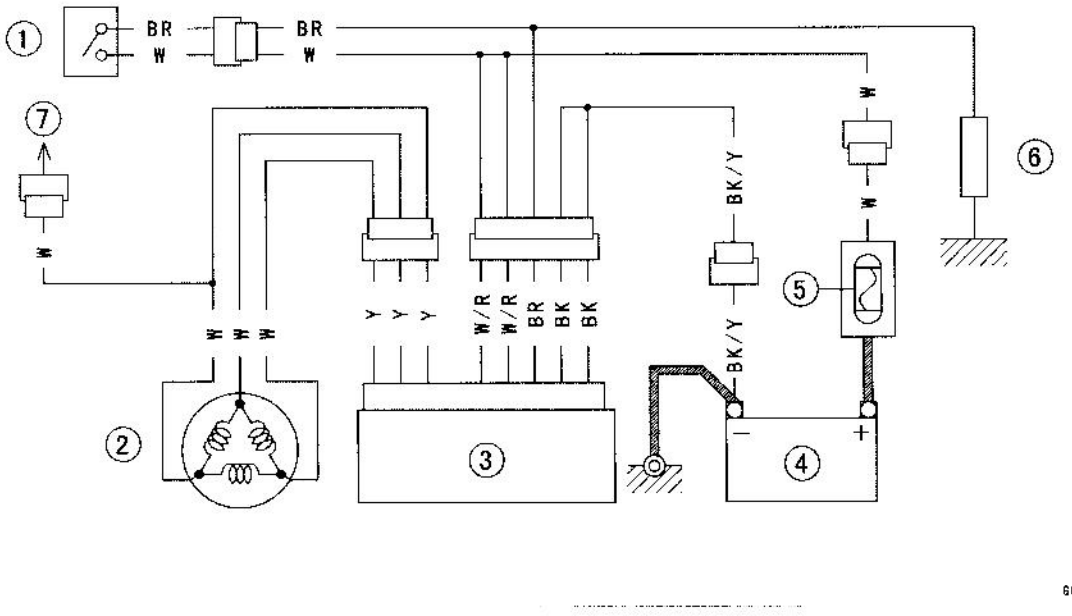
★ If the regulator/rectifier output voltage is kept between the values given in the table, the charging system is considered to be working normally.

★ If the output voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier wires are loose or open.

★ If the battery voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

Charging System

Charging System Circuit



1. Ignition Switch
2. Alternator
3. Regulator/Rectifier
4. Battery
5. Main Fuse 30 A
6. Load
7. Headlight Relay in Junction Box (US, CN, AS, and ML models)

⚠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.

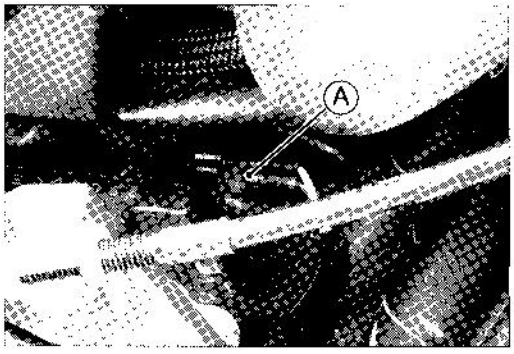
CAUTION

Do not disconnect the battery wires or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent ECU (Electronic Control Unit) damage.
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and ECU.

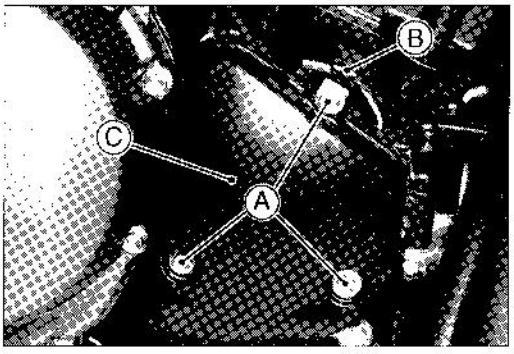
Crankshaft Sensor Removal

- Remove:
  Lower Fairing (see Frame chapter)
  Crankshaft Sensor Wire Connector [A]

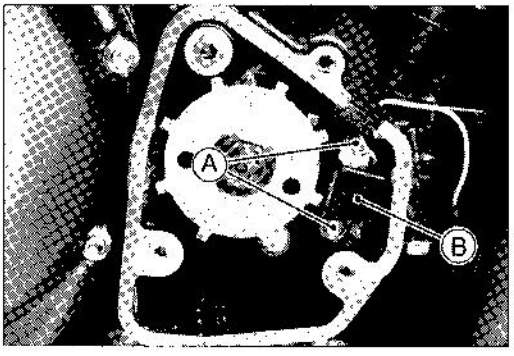
○ Pull the connector forward.



- Remove:
  Crankshaft Sensor Cover Bolts [A] with Clamp [B]
  Crankshaft Sensor Cover [C]



- Remove:
  Crankshaft Sensor Bolts [A]
  Crankshaft Sensor [B]



Ignition System

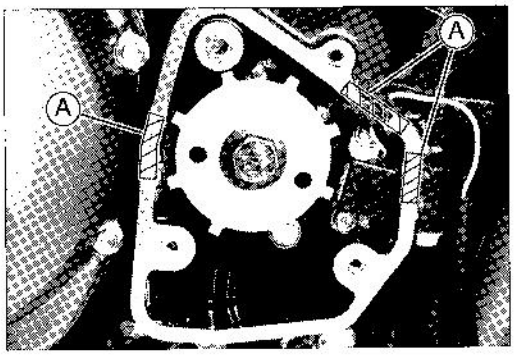
Crankshaft Sensor Installation

- Route the crankshaft sensor wire correctly (see Cable, Wire, and Hose Routing in General Information chapter).
- Install the crankshaft sensor and tighten the crankshaft sensor bolts.

Torque - Crankshaft Sensor Bolts: 6 N·m (0.6 kg·m, 53 in·lb)

- Apply silicone sealant [A] to the crankshaft sensor wire grommet and crankcase halves mating surface on the front and rear sides of the crankshaft sensor cover mount.

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



- Apply a non-permanent locking agent to the threads of the crankshaft sensor cover bolts and tighten them.

Torque - Crankshaft Sensor Cover Bolts: 15 N·m (1.5 kg·m, 11 ft·lb)

- Install the other removed parts.

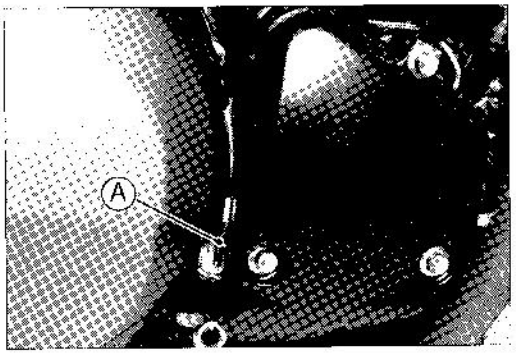
Crankshaft Sensor Inspection

- Remove:
  Lower Fairing (see Frame chapter)
  Crankshaft Sensor Wire Connector [A]
- Set the hand tester to the × 10 Ω range and connect it to the yellow and black wires in the connector.

Special Tool - Hand Tester: 57001–1394

★ If there is more resistance than the specified value, the sensor coil has an open wire and must be replaced. Much less than this resistance means the sensor coil is shorted, and must be replaced.

Crankshaft Sensor Resistance: 375 ~ 565 Ω



- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor wires and chassis ground.

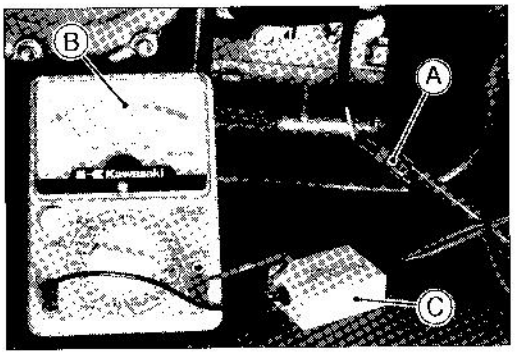
★ Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the crankshaft sensor assembly.

Crankshaft Sensor Peak Voltage Inspection

- Remove:
  Lower Fairing (see Frame chapter)
  Crankshaft Sensor Wire Connector [A]
- Set the hand tester [B] to the 10 V DC range.
- Connect the peak voltage adapter [C] to the hand tester and crankshaft sensor wires in the connector.

Special Tool - Hand Tester: 57001–1394

Recommended Tool- Peak Voltage Adapter
Type: KEK-54-9-B
Brand: KOWA SEIKI



Connections:

Crankshaft Sensor Wire		Adapter		Hand Tester
Yellow	←	Red	→	(+)
Black	←	Black	→	(–)

- Turn the ignition switch and engine stop switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

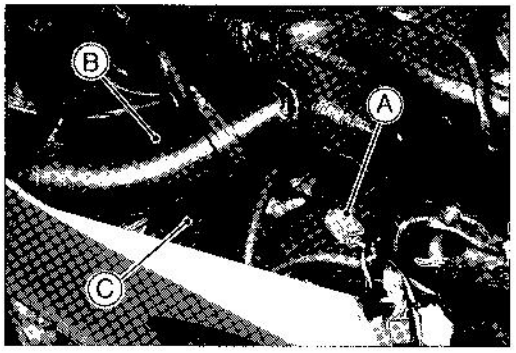
Crankshaft Sensor Peak Voltage
Standard: 3.6 V or more

★ If the peak voltage is lower than the standard, inspect the crankshaft sensor.

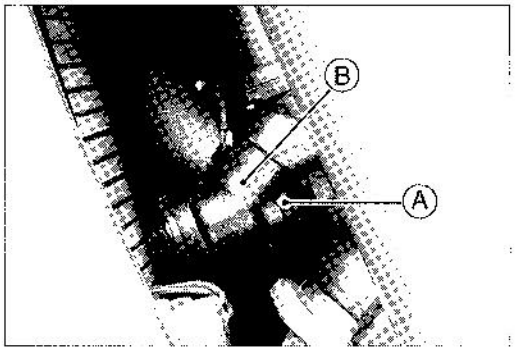
Ignition System

Cam Sensor Removal

- Remove:
  Left Inner Cover (see Frame chapter)
  Cam Sensor Wire Connector [A] (disconnect)
  Air Intake Duct [B]
  Left Side Bolt of Buffle Plate [C]
- Lift the left side of the buffle plate and take out the cam sensor wire connector.



- Remove:
  Cam Sensor Bolt [A]
  Cam Sensor [B]



Cam Sensor Installation

- Apply grease to the O-ring on the cam sensor.
- Tighten:

Torque - Cam Sensor Bolt: 12 N·m (1.2 kg·m, 106 in·lb)

Cam Sensor Inspection

- Remove:
  Left Inner Cover (see Frame chapter)
  Cam Sensor Wire Connector [A] (disconnect)
- Set the hand tester to the × 10 Ω range and connect it to the yellow and black wires in the connector.

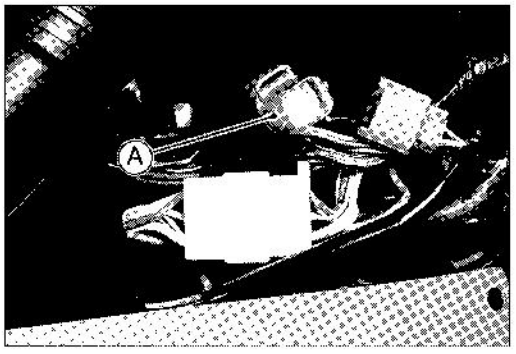
Special Tool - Hand Tester: 57001-1394

★ If there is more resistance than the specified value, the sensor coil has an open wire and must be replaced. Much less than this resistance means the sensor coil is shorted, and must be replaced.

Cam Sensor Resistance: 400 ~ 460 Ω

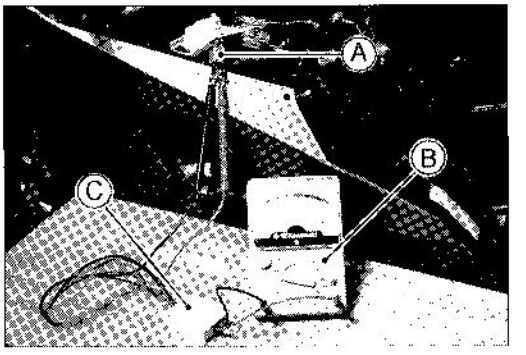
- Using the highest resistance range of the tester, measure the resistance between the cam sensor wires and chassis ground.

★ Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the cam sensor.



Ignition System

Cam Sensor Peak Voltage Inspection



- Remove:
  Left Inner Cover (see Frame chapter)
  Cam Sensor Wire Connector [A]
- Set the hand tester [B] to the 10 V DC range.
- Connect the peak voltage adapter [C] to the hand tester and cam sensor wires in the connector.

Special Tool - Kawasaki Hand Tester: 57001-1394

Recommended Tool- Peak Voltage Adapter
Type: KEK-54-9-B
Brand: KOWA SEIKI

Connections:

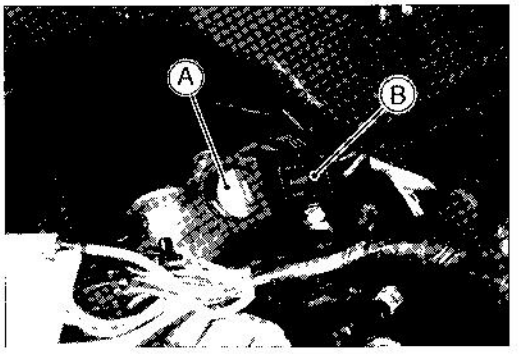
Cam Sensor Wire		Adapter		Hand Tester
Black	←	Red	→	(+)
Yellow	←	Black	→	(−)

- Turn the ignition switch and engine stop switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the cam sensor peak voltage.
- Repeat the measurement 5 or more times.

Cam Sensor Peak Voltage
Standard: 0.2 V or more

★ If the peak voltage is lower than the standard, inspect the cam sensor.

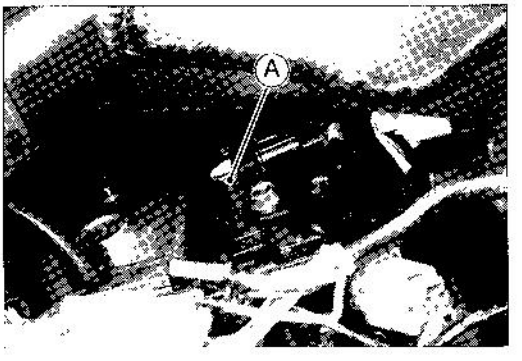
Stick Coil (Ignition Coil together with Spark Plug Cap) Removal



- Remove:
  Inner Covers (see Frame chapter)
  Rubber Plate
- Pull the stick coils [A] off the spark plugs.
- Disconnect the stick coil connectors [B].

CAUTION
Do not pry the connector part of the coil while removing the coil.

Stick Coil (Ignition Coil together with Spark Plug Cap) Installation



- Install the coil using the following steps.
  ○ Connect the connector.
  ○ Insert the coil as shown being careful of the coil head [A] direction.

CAUTION
Do not tap the coil head while installing the coil.

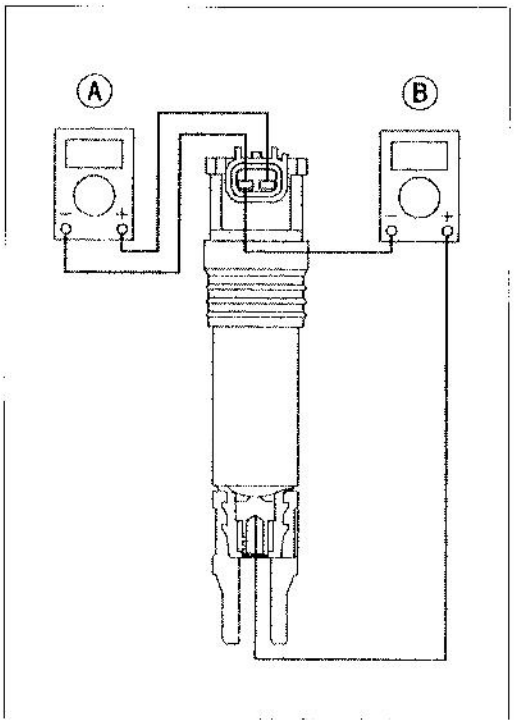
Stick Coil (Ignition Coil together with Spark Plug Cap) Inspection

- Remove the stick coils (see Stick Coil Removal).
- Measure the primary winding resistance [A] as follows.
- Connect the hand tester between the coil terminals.
- Set the tester to the × 1 Ω range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
- Connect the tester between the plug terminal and (–) coil terminal.
- Set the tester to the × 1 kΩ range and read the tester.

Stick Coil Winding Resistance

Primary Windings:	**0.85 ~ 1.15 Ω**
Secondary Windings:	**9.2 ~ 13.8 kΩ**

★ If the tester does not read as specified, replace the coil.



Stick Coil Primary Peak Voltage Inspection

NOTE

Be sure the battery is fully charged.

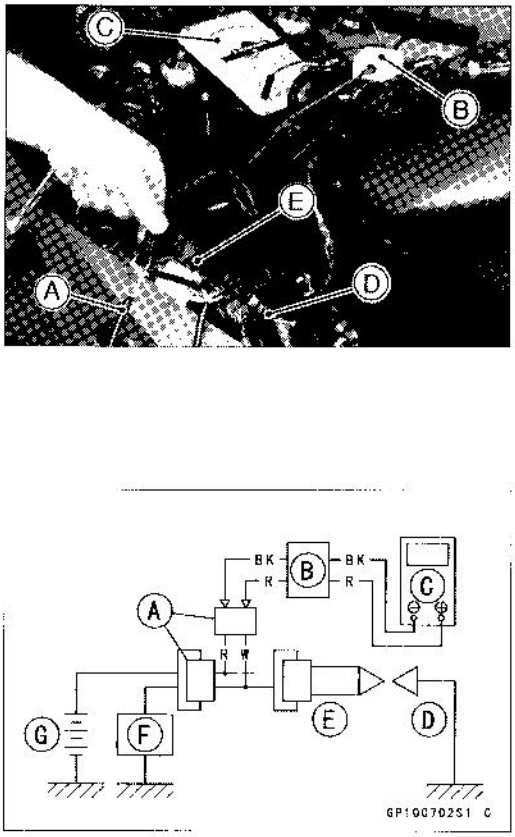
- Remove the stick coils (see Stick Coil Removal), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.
- Disconnect the stick coil connector, and connect the lead wire-peak voltage adapter [A] between the stick coil connector and stick coil.
- Connect a commercially peak voltage adapter [B] between the lead wire-peak voltage adapter and the hand tester [C] which is set to the 250 V DC range.
- Install the new spark plug [D] into each stick coil [E], and ground them onto the engine.

[F] ECU
[G] Battery

Recommended Tool- Peak Voltage Adapter
Type: KEK-54-9-B
Brand: KOWA SEIKI

Special Tools - Hand Tester: 57001–1394
Lead Wire-Peak Voltage Adapter: 57001–1449

Primary Lead Connection
Adapter (R, +) to lead wire-peak voltage adapter (W)
Adapter (BK, -) to lead wire-peak voltage adapter (R)



Ignition System

⚠ WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the ignition switch and the engine stop switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one stick coil.

Stick Coil Primary Peak Voltage
Standard: 80 V or more

- Repeat the test for the other stick coil.

★ If the reading is less than the specified value, check the following.
Stick Coils (see Stick Coil Inspection)
Crankshaft Sensor (see Crankshaft Sensor Inspection)

★ If the stick coils and crankshaft sensor are normal, check the ECU (see Digital Fuel Injection System chapter).

Spark Plug Removal

- Remove:
Stick Coils (see Stick Coil Removal)
- Remove the spark plugs using the 16 mm plug wrench.

Owner's Tool - Spark Plug Wrench, 16 mm: 92110–1132

Spark Plug Installation

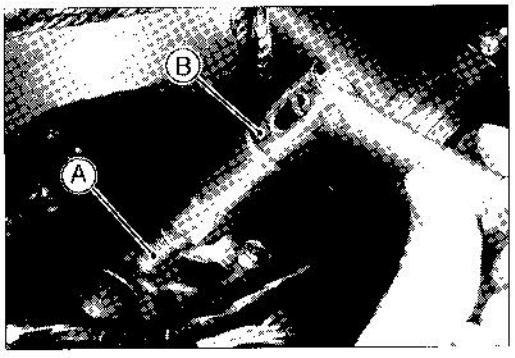
- Insert the spark plug vertically into the plug hole with the plug [A] installed in the plug wrench [B].

Owner's Tool - Spark Plug Wrench, 16mm: 92110–1132

- Tighten the plugs.

Torque - Spark Plugs: 13 N·m (1.3 kg·m, 115 in·lb)

- Fit the stick coils securely.



Spark Plug Cleaning and Inspection

- Remove the spark plug (see Spark Plug Removal).
- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a brush or other suitable tool.

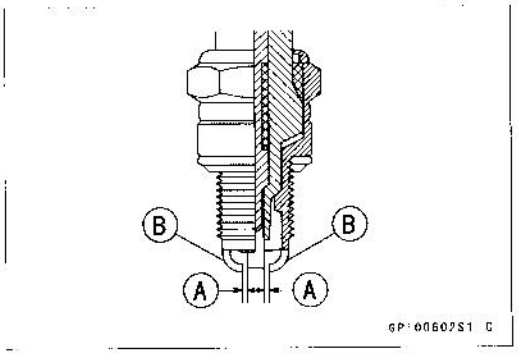
★ If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug or optional spark plug.

Spark Plug Gap Inspection

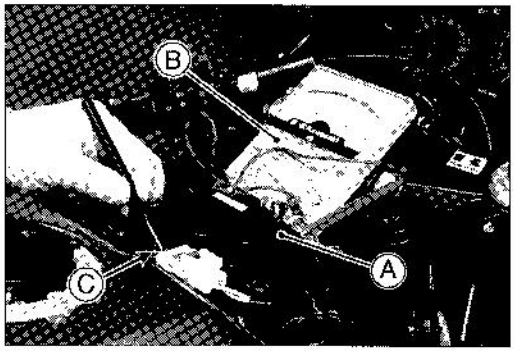
- Measure the gap [A] with a wire-type thickness gauge.

★ If the gaps are incorrect, carefully bend the side electrode [B] with a suitable tool to obtain the correct gaps.

Spark Plug Gap : 0.7 ~ 0.9 mm (0.028 ~ 0.035 in.)



Interlock Operation Inspection



- Remove:
  Fuel Tank Cover (see Digital Fuel Injection System chapter)

○ Do not disconnect the connectors.

1st Check

- Measure the terminal voltage of the G/BK wire in the junction box connector [A] in accordance with the following procedure.

○ Set the tester [B] to the 10 V DC range, connect it to the G/BK wire and frame ground [C].

Connection:
Tester (+) Terminal → G/BK Wire Terminal
Tester (–) Terminal → Frame Ground

Condition:
Transmission Gear → 1st Position
Clutch Lever → Release
Side Stand → Down

○ Turn the ignition switch on.
○ Read the voltage.

Interlock Operation Voltage
Standard: 4 V or more

★ If the voltage is lower than the standard, inspect the side stand switch, starter lockout switch, gear position switch and junction box.
★ If their parts are normality, replace the ECU.
★ If the voltage is standard, push the starter button.
○ Then the starter motor shoud not turn when the starter system circuit is normality.
★ If the starter motor turned, ECU is defective. Replace the ECU.

2nd Check

Using a stand, raise the rear wheel off the ground.

- Inspect the engine for its secure stop after the following operations are completed.
- Run the engine to the following conditions.

Condition:
Transmission Gear → 1st Position
Clutch Lever → Pull in
Side Stand → Up or Down

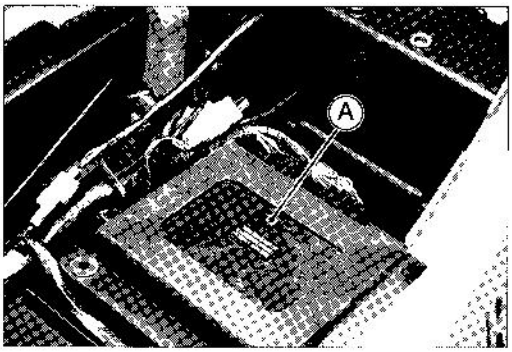
- Gradually release the clutch lever, then the engine will stop.
- Run the engine to the following conditions.

Condition:
Transmission Gear → 1st Position
Clutch Lever → Release
Side Stand → Up

- Set the side stand on the ground, then the engine will stop.

★ If whichever may not be stopped, inspect the gear position switch, starter lockout switch, side stand switch and junction box.
★ If their parts are normality, replace the ECU.

IC Igniter Inspection



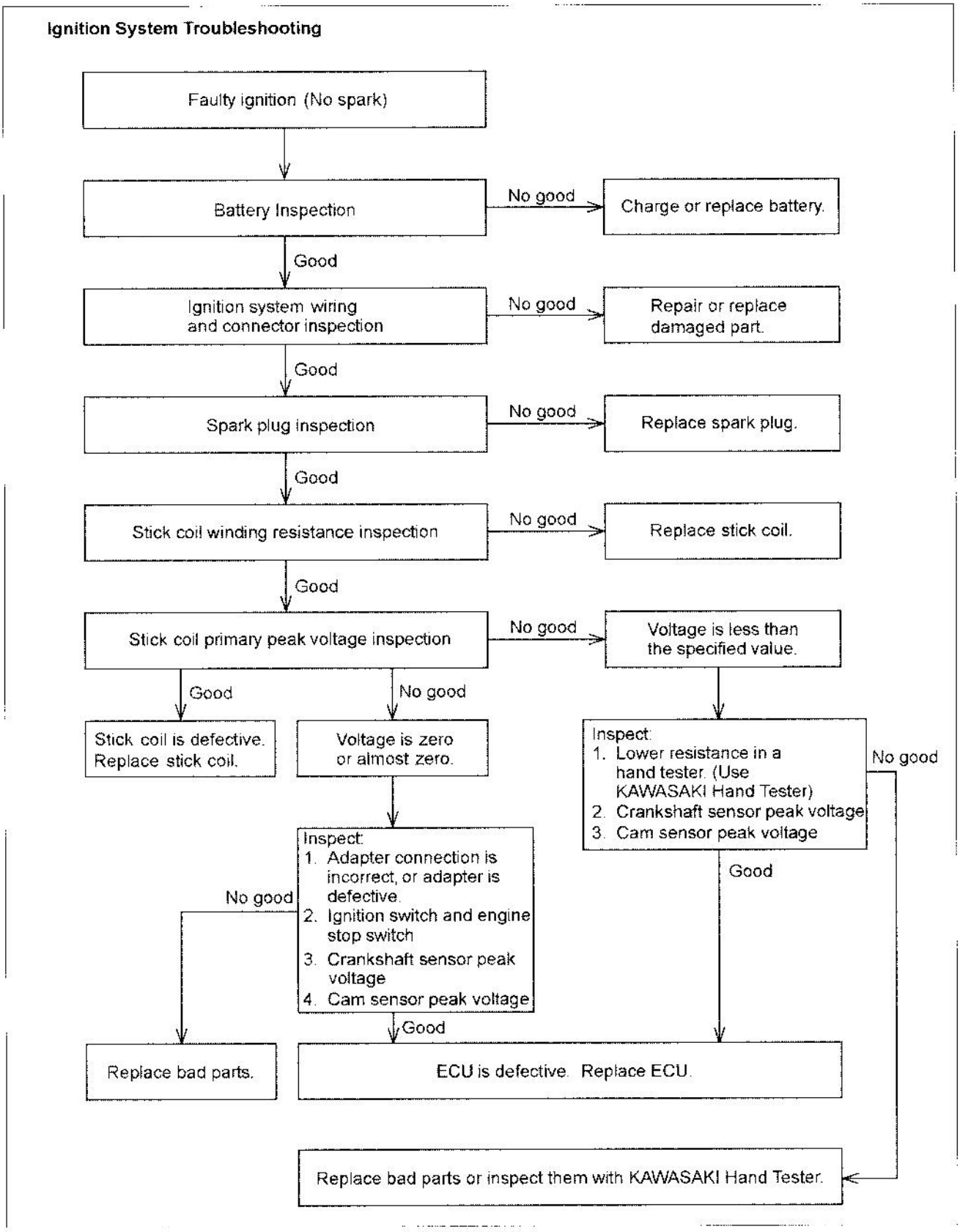
○ The IC igniter is built in the ECU [A].

- Refer to Interlock Operation Inspection, Ignition System Troubleshooting chart and Didital Fuel Injection (DFI) System chapter for ECU Inspection.

Ignition System

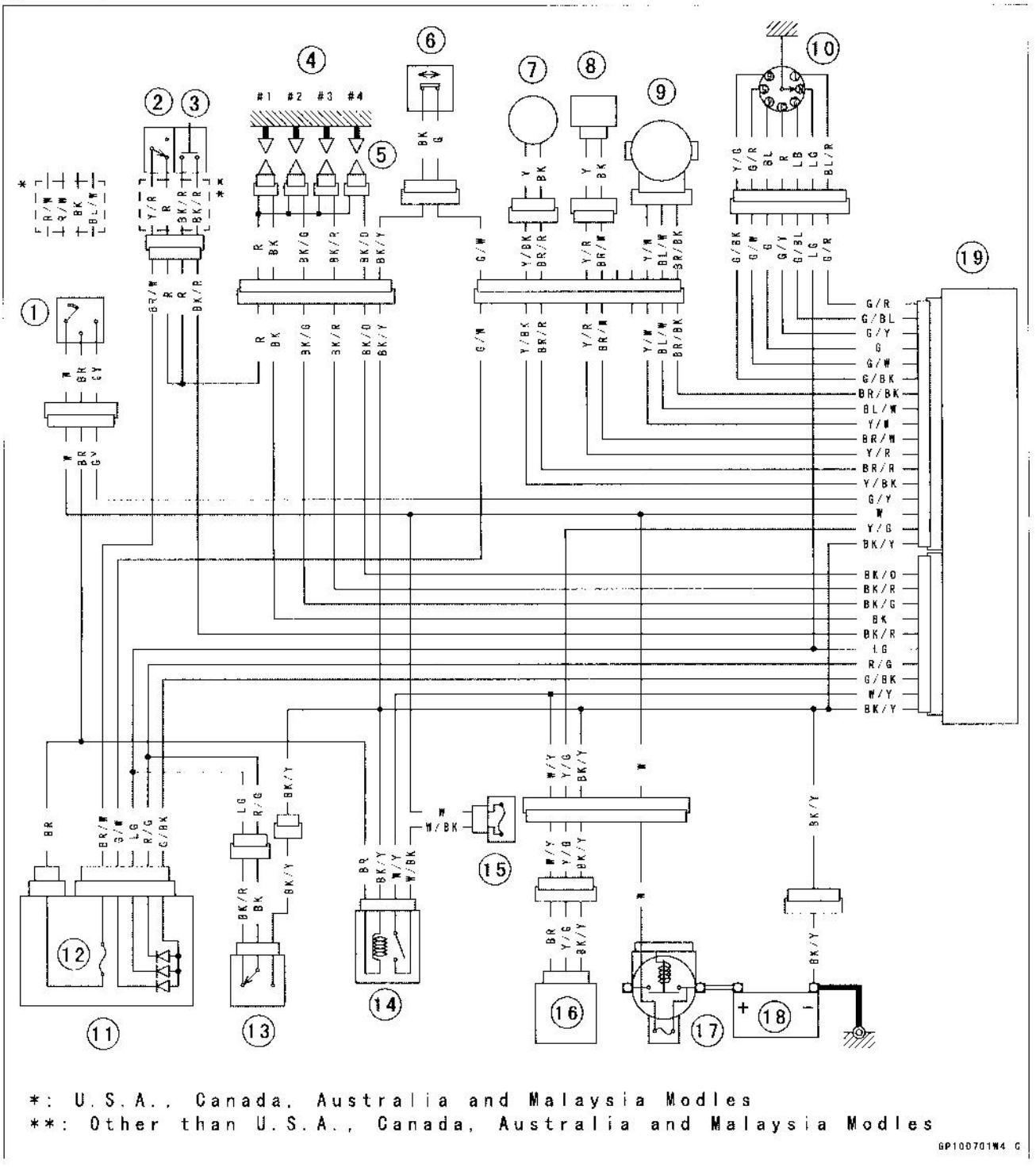
Ignition System Inspection

Ignition System Troubleshooting



Ignition System

Ignition System Circuit

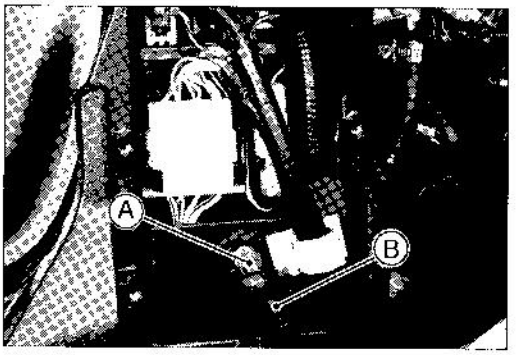


1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Spark Plugs
5. Stick Coils
6. Side Stand Switch
7. Crankshaft Sensor
8. Cam Sensor
9. Throttle Sensor
10. Gear Postion Switch
11. Junction Box
12. Ignition Fuse 10 A
13. Starter Lockout Switch
14. ECU Main Relay
15. ECU Fuse 15 A
16. Vehicle-down Sensor
17. Main Fuse 30 A
18. Battery
19. ECU (Electronic Control Unit)

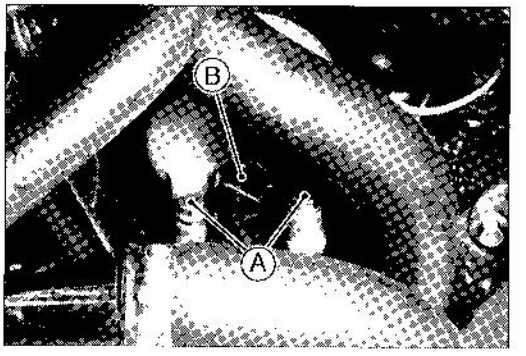
Electric Starter System

Starter Motor Removal

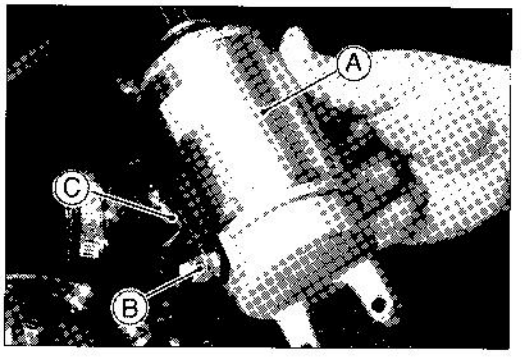
- Remove:
  Battery Compartment Cover (see Battery Removal)
  Terminal Nut [A]
  Starter Motor Wire [B]



- Remove:
  Lower Fairing (see Frame chapter)
  Coolant Reserve Tank
  Starter Motor Mounting Bolts [A]
  Clamp [B] (with Front Side Bolt)



- Pull out the starter motor [A].
- Remove:
  Terminal Nut [B]
  Starter Motor Wire [C]

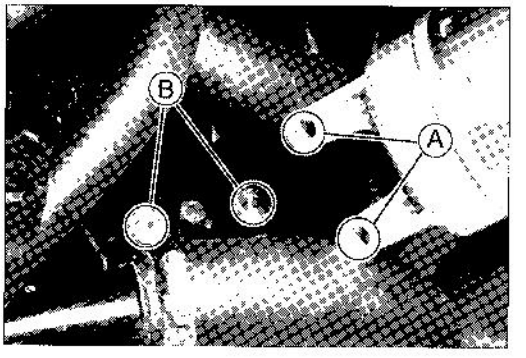


Starter Motor Installation

CAUTION

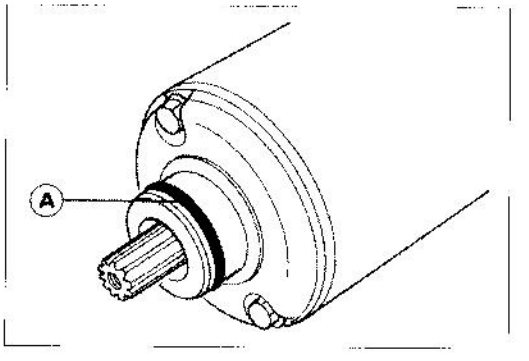
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.



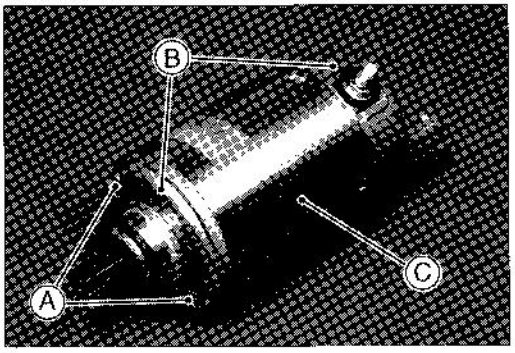
- Apply a small amount of engine oil to the O-ring [A].
- Install the starter motor and tighten the mounting bolts.

Torque - Starter Motor Mounting Bolts: 12 N·m (1.2 kg·m, 106 in·lb)

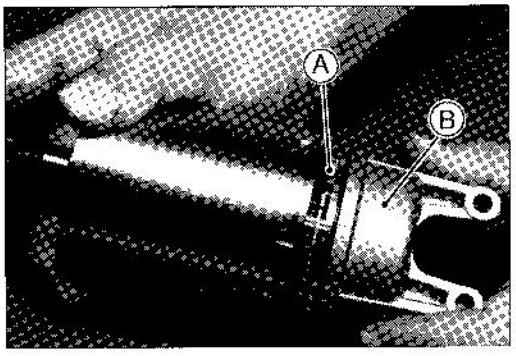


Starter Motor Disassembly

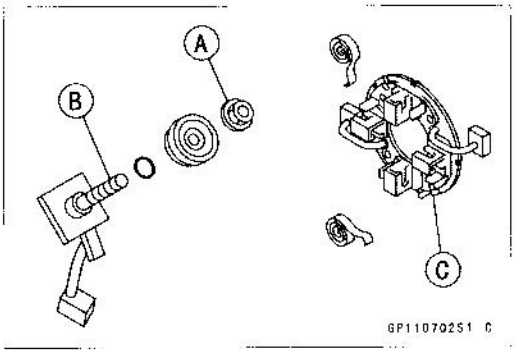
- Take off the starter motor through bolts [A] and remove both end covers [B] and pull the armature out of the yoke [C].



○ The brush plate [A] and brushes come off with the left-hand end cover [B].

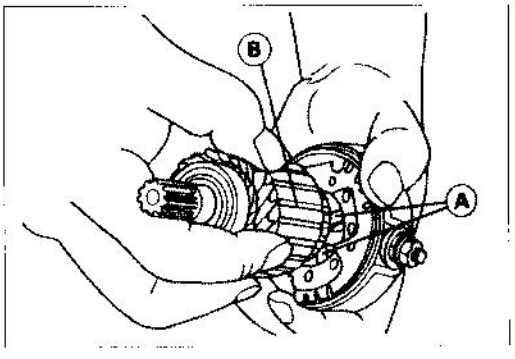


- Remove the terminal locknut [A] and terminal bolt [B], and then remove the brush with the brush plate [C] from the left–hand end cover.

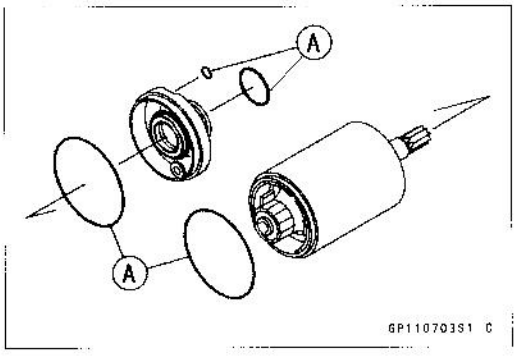


Starter Motor Assembly

- Install the brush plate and brushes [A], and then put the armature [B] among the brushes.

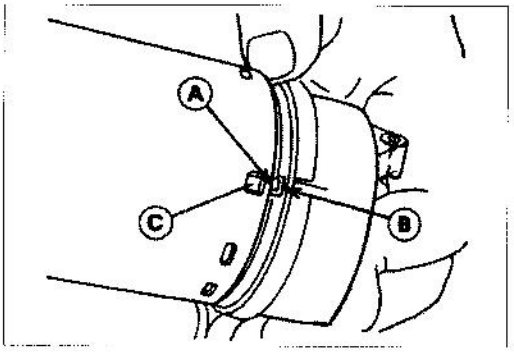


- Install the O–rings [A] as shown.

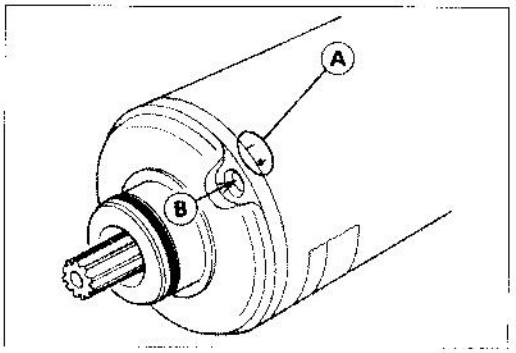


Electric Starter System

- Align the notch [A] in the brush plate with the end cover notch [B] and the mark [C] on the yoke.



- Align the line [A] marked on the yoke with the through bolt hole [B].



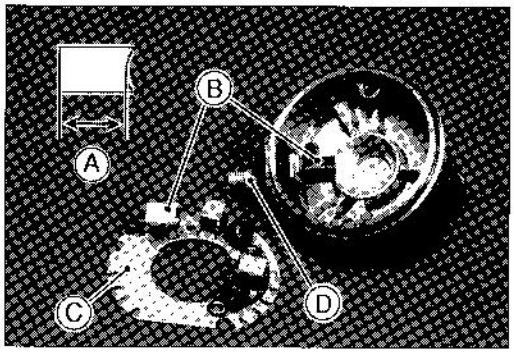
Brush Inspection

- Measure the length [A] of each brush [B].

★ If any is worn down to the service limit, replace the carbon brush holder assembly [C] and the terminal bolt assembly [D].

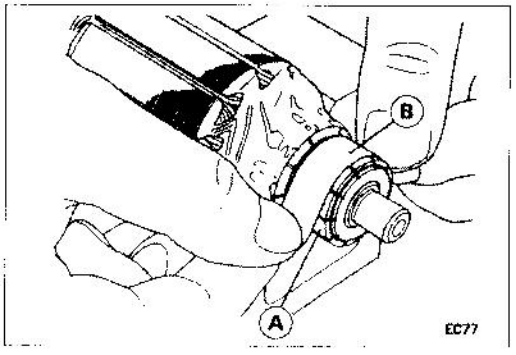
Starter Motor Brush Length

Standard:	**12 mm (0.47 in.)**
Service Limit:	**8.5 mm (0.33 in.)**



Commutator Cleaning and Inspection

- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.

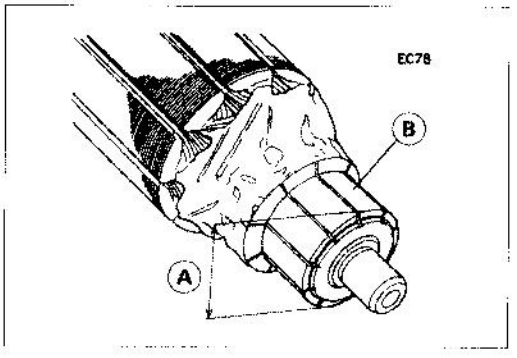


- Measure the diameter [A] of the commutator [B].

★ If the commutator diameter is less than the service limit, replace the starter motor with a new one .

Commutator Diameter

Standard:	**28 mm (1.10 in.)**
Service Limit:	**27 mm (1.06 in.)**



Electric Starter System

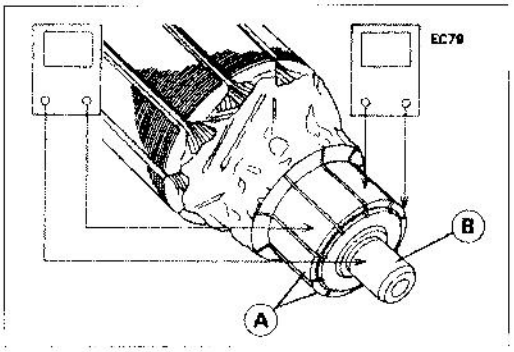
Armature Inspection

- Using the × 1 Ω hand tester range, measure the resistance between any two commutator segments [A].

★If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.

- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].

★If there is any reading at all, the armature has a short and the starter motor must be replaced.



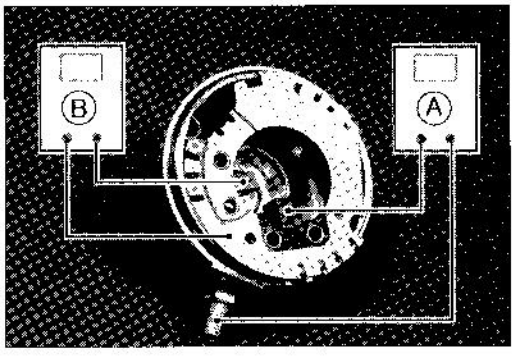
NOTE

○ *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 × 1 Ω hand tester range, measure the resistance as shown.
  [A] Terminal Bolt and Positive Brush
  [B] Brush Plate and Negative Brush

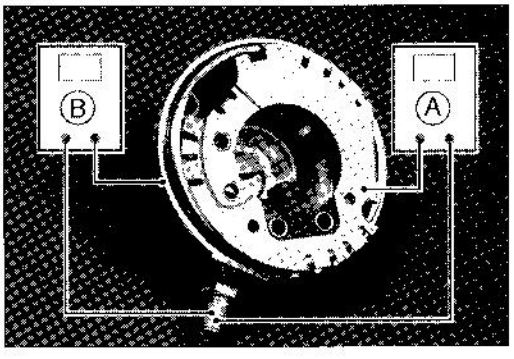
★If there is not close to zero ohms, the brush lead has an open. Replace the terminal bolt assembly and/or the brush holder assembly.



Brush Plate and Terminal Bolt Inspection

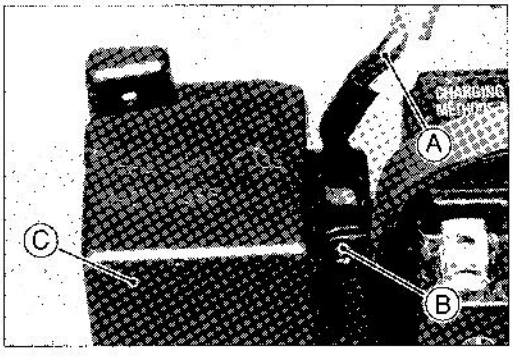
- Using the highest hand tester range, measure the resistance as shown.
  [A] Terminal Bolt and Brush Plate
  [B] Terminal Bolt and Left-hand End Cover

★If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.



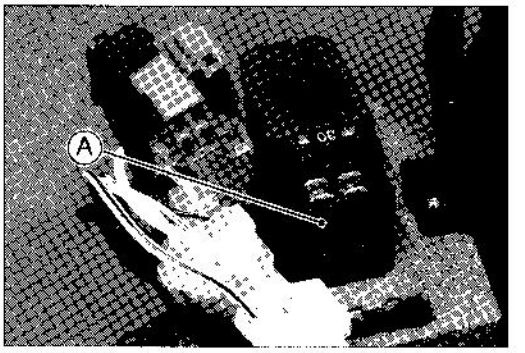
Starter Relay Inspection

- Remove:
  Battery Tray (see Battery Removal)
  Battery Positive (+) Wire [A]
  Screw [B]
  Cover [C]



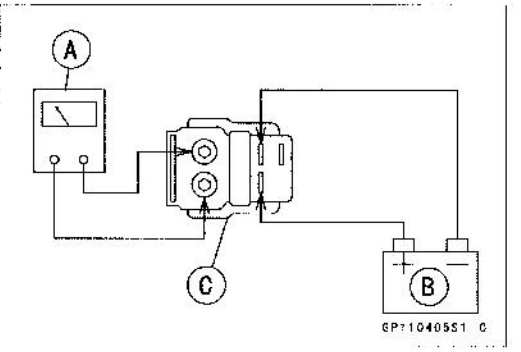
Electric Starter System

- Remove:
  Starter Relay [A]



- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown.

★ If the relay does not work as specified, the relay is defective. Replace the relay.



Testing Relay

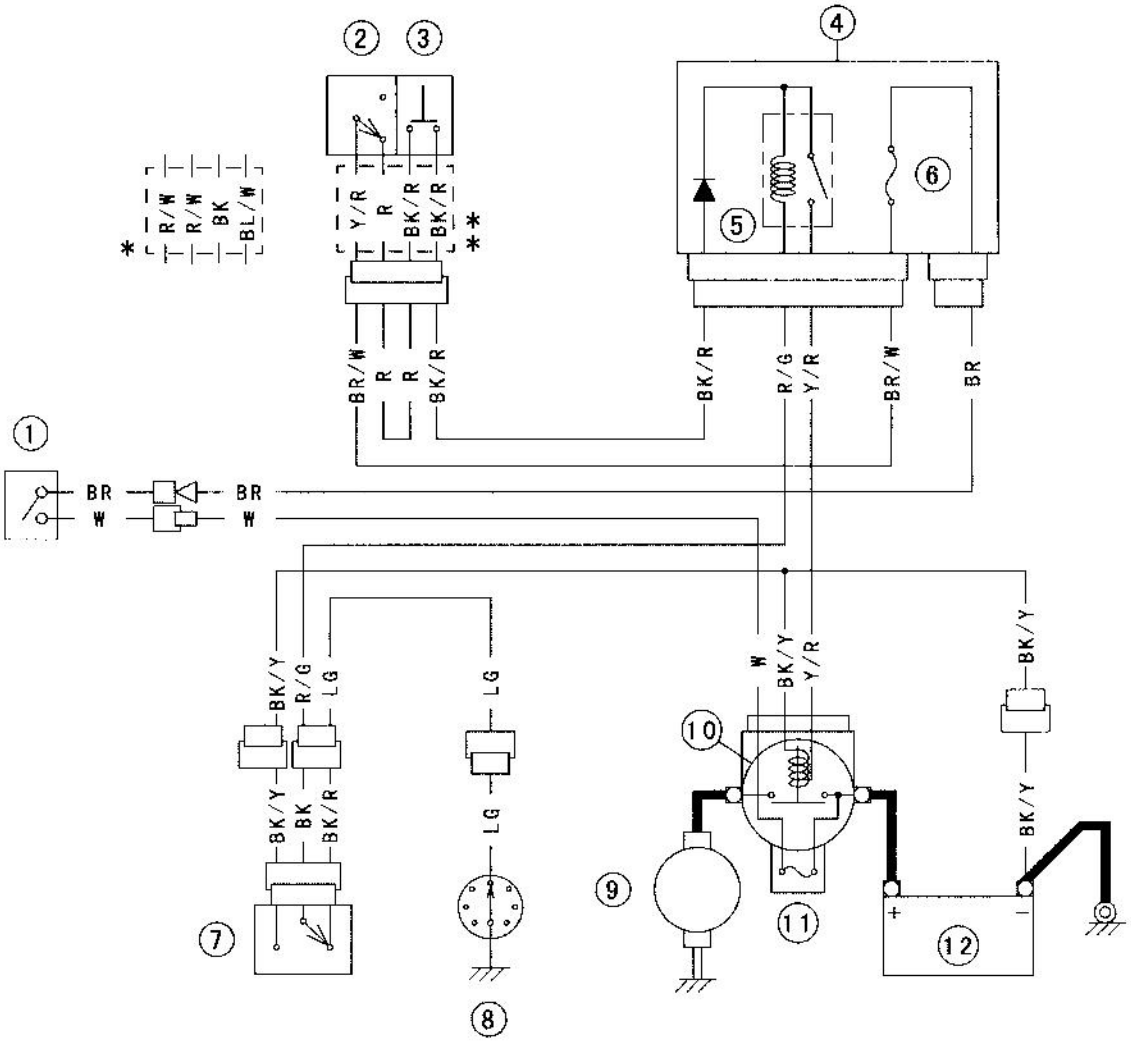
Tester Range: × 1 Ω range

Criteria: **When battery is connected → 0 Ω**

When battery is disconnected → ∞ Ω

Electric Starter System

Electric Starter Circuit



*: U.S.A., Canada, Australia and Malaysia Models
**: Other than U.S.A., Canada, Australia and Malaysia Models

BP110701W4 C

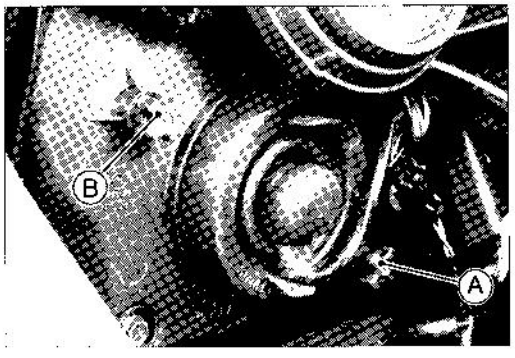
1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Junction Box
5. Starter Circuit Relay
6. Ignition Fuse 10 A
7. Starter Lockout Switch
8. Neutral Switch (in Gear Position Switch)
9. Starter Motor
10. Starter Relay
11. Main Fuse 30 A
12. Battery

Lighting System

The US, Canada, Australia, and Malaysia models adopt the daylight system and have a headlight relay in the junction box. In these models, the headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

Headlight Beam Horizontal/Vertical Adjustment

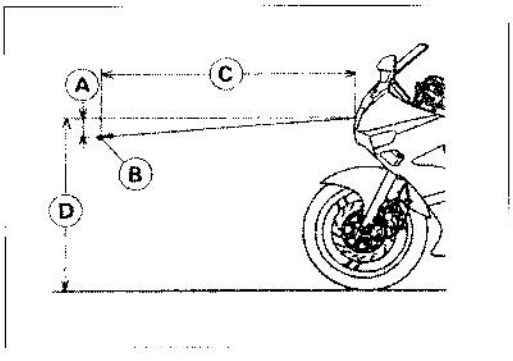
- Turn the horizontal adjusters [A] on the headlight in or out until the beam points straight ahead.
- Turn the vertical adjusters [B] on the headlight in or out to adjust the headlight vertically.



NOTE

On high beam, the brightest points should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight(s) to the proper angle according to local regulations.

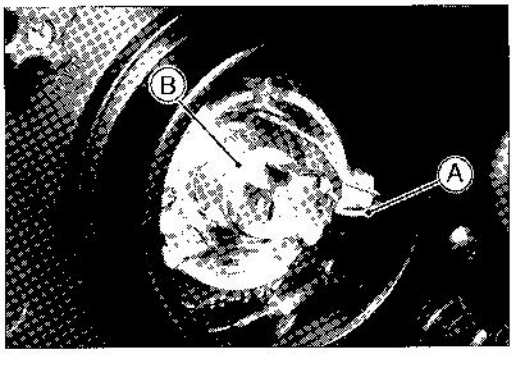
For US model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2 in) drop at 7.6 m (25 ft) measured from the center of the headlights with the motorcycle on its wheels and the rider seated.



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

Headlight Bulb Replacement

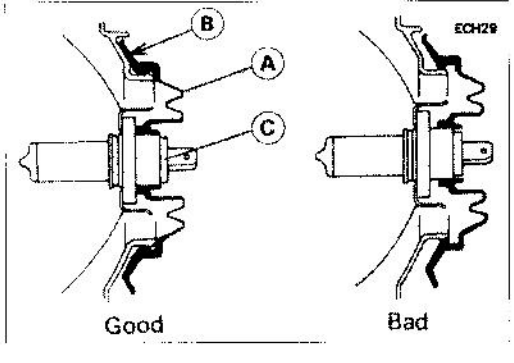
- Remove:
  Headlight Connector
  Headlight Bulb Dust Cover
  Hook [A]
  Headlight Bulb [B]



CAUTION

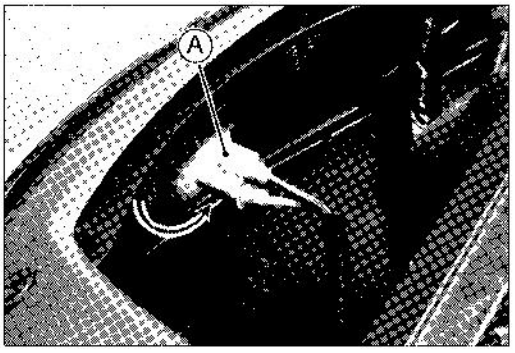
When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.

- Replace the headlight bulb.
- Fit the dust cover [A] with the Top mark [B] upward onto the bulb [C] firmly as shown.
- After installation, adjust the headlight aim (see Headlight Beam Adjustment).

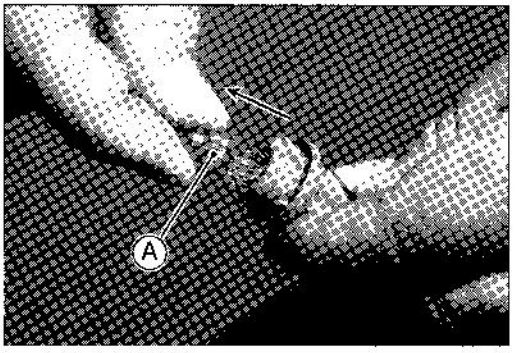


City Light Bulb Replacement

- Remove:
  Wind Shield (see Frame chapter)
- Turn the socket [A] counterclockwise, and remove the socket and bulb.



- Pull the bulb [A] out of the socket.

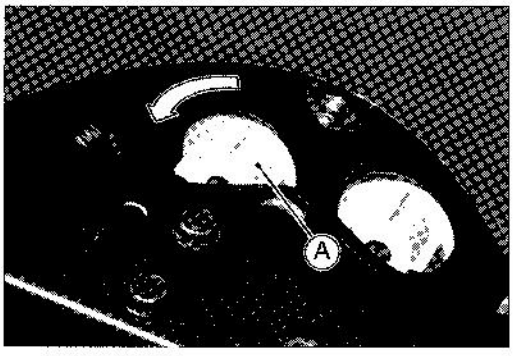


CAUTION

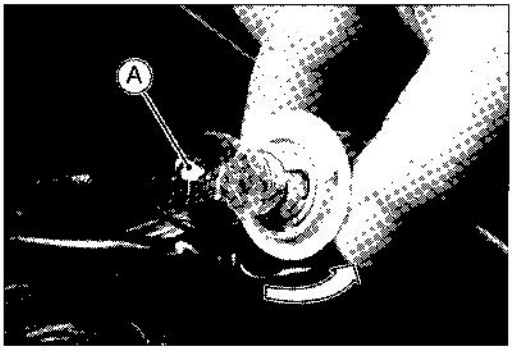
Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.

Tail/Brake Light Bulb Replacement

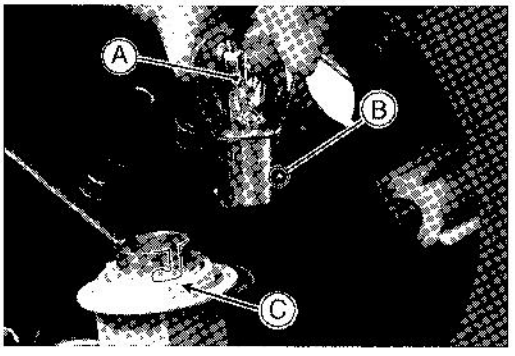
- Remove:
  Rear Seat (see Frame chapter)
  Strage Box (see Frame chapter)
- Turn the socket [A] counterclockwise, and remove the socket and bulb.



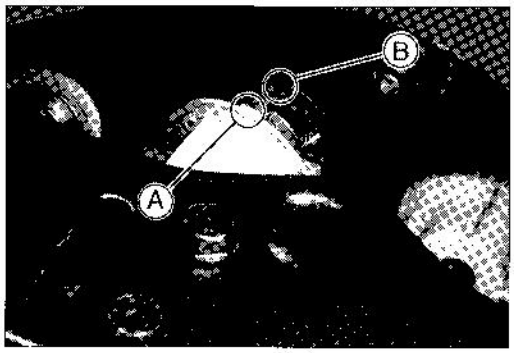
- Push and turn the bulb [A] counterclockwise and remove it.



- Insert a new bulb [A] by aligning its upper pin [B] with the upper groove [C] in the socket, and turn the bulb clockwise.

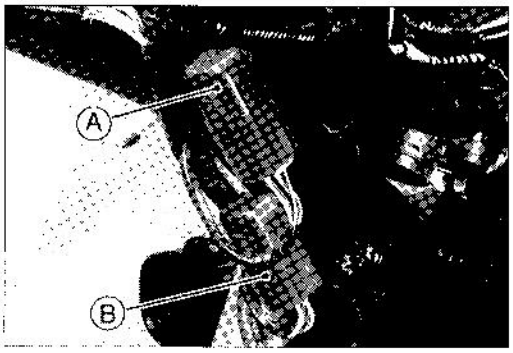


- Insert the socket by aligning its projection [A] with the upper notch [B], and turn it clockwise.



Headlight Relay (High/Low) Inspection

- Remove:
  Upper Fairing (see Frame chapter)
  Headlight Relay (High Beam) [A]
  Headlight Relay (Low Beam) [B]



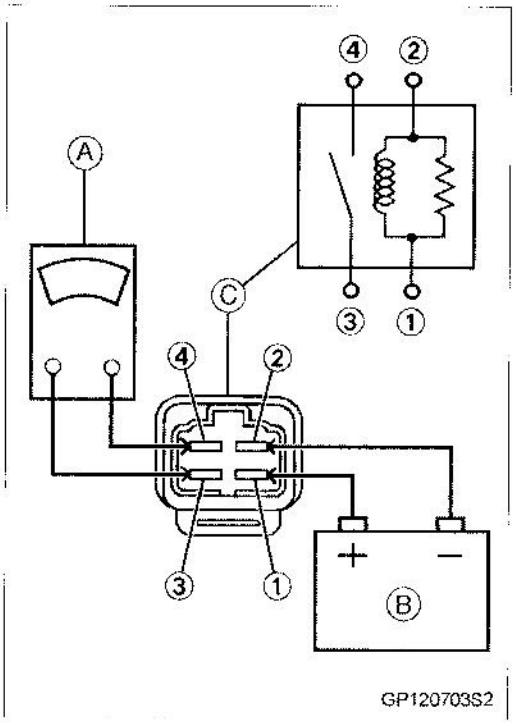
- Connect the hand tester [A] and 12 V battery [B] to the headlight relay [C] as shown.

★ If the relay does not work as specified, the relay is defective. Replace the relay.

Testing Relay

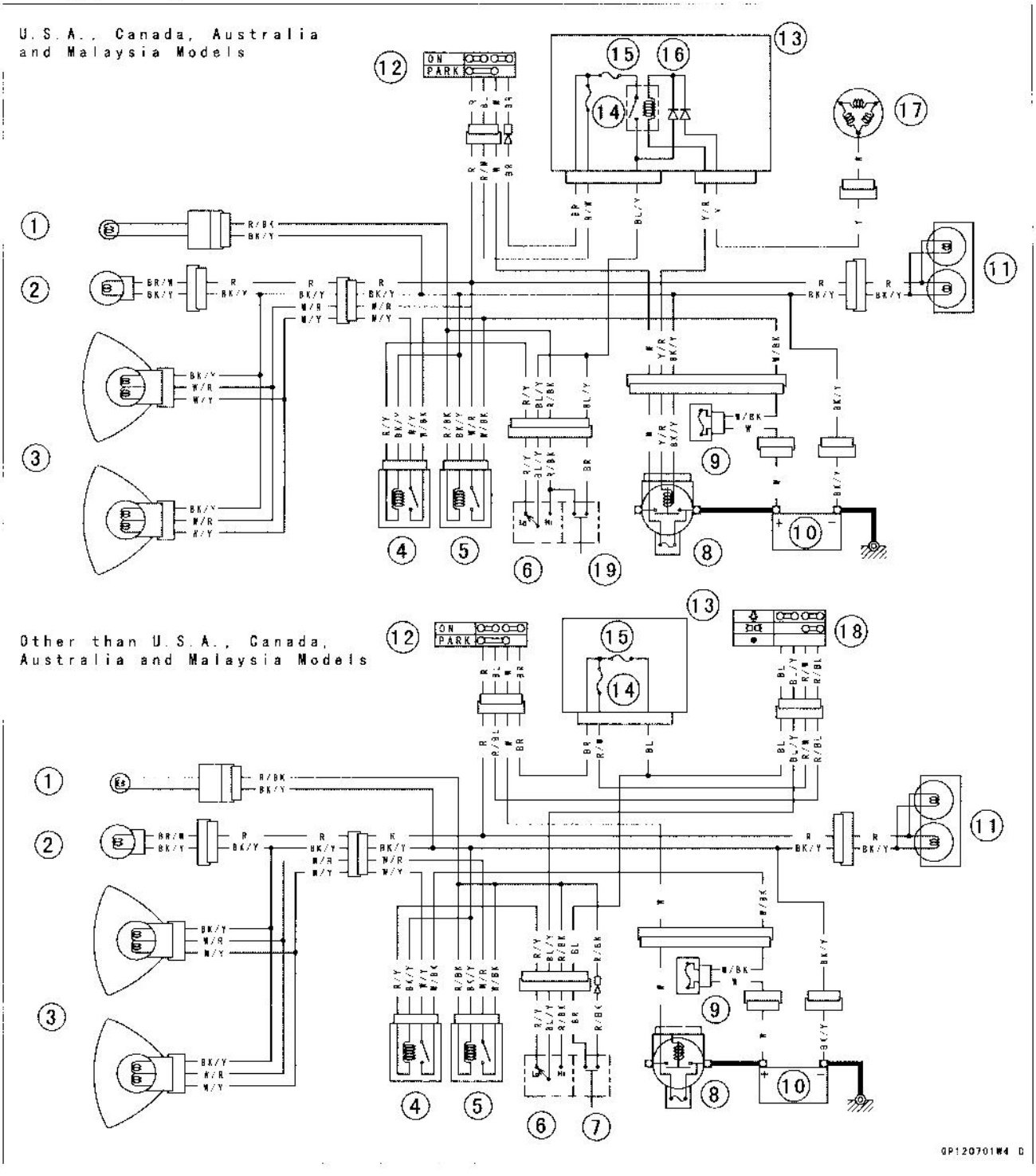
Tester Range: × 1 Ω range

Criteria: **When battery is connected → 0 Ω**
When battery is disconnected → ∝ Ω



Lighting System

Headlight/Tail Light Circuit

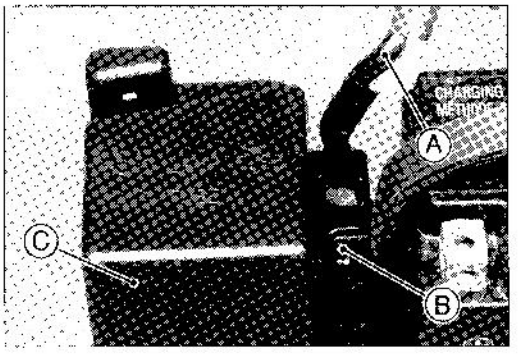


1. High Beam Indicator Light
2. City Light
3. Headlights
4. Headlight Relay (Low Beam)
5. Headlight Relay (High Beam)
6. Dimmer Switch
7. Passing Button
8. Main Fuse 30 A
9. Headlight Fuse 20 A
10. Battery
11. Tail Lights
12. Ignition Switch
13. Junction Box
14. Tail Light Fuse 10 A
15. Headlight Fuse 10 A
16. Headlight Circuit Relay
17. Alternator
18. Headlight Switch
19. Passing Button (Australia and Malaysia Models)

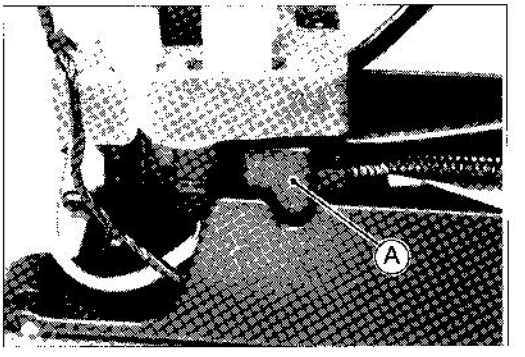
Lighting System

Turn Signal Relay Inspection

- Remove:
  Battery Tray (see Battery Removal)
  Battery Positive (+) Wire [A]
  Screw [B]
  Cover [C]

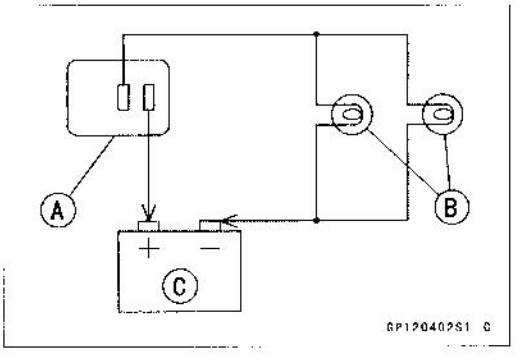


- Remove:
  Turn Signal Relay [A]



- 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.

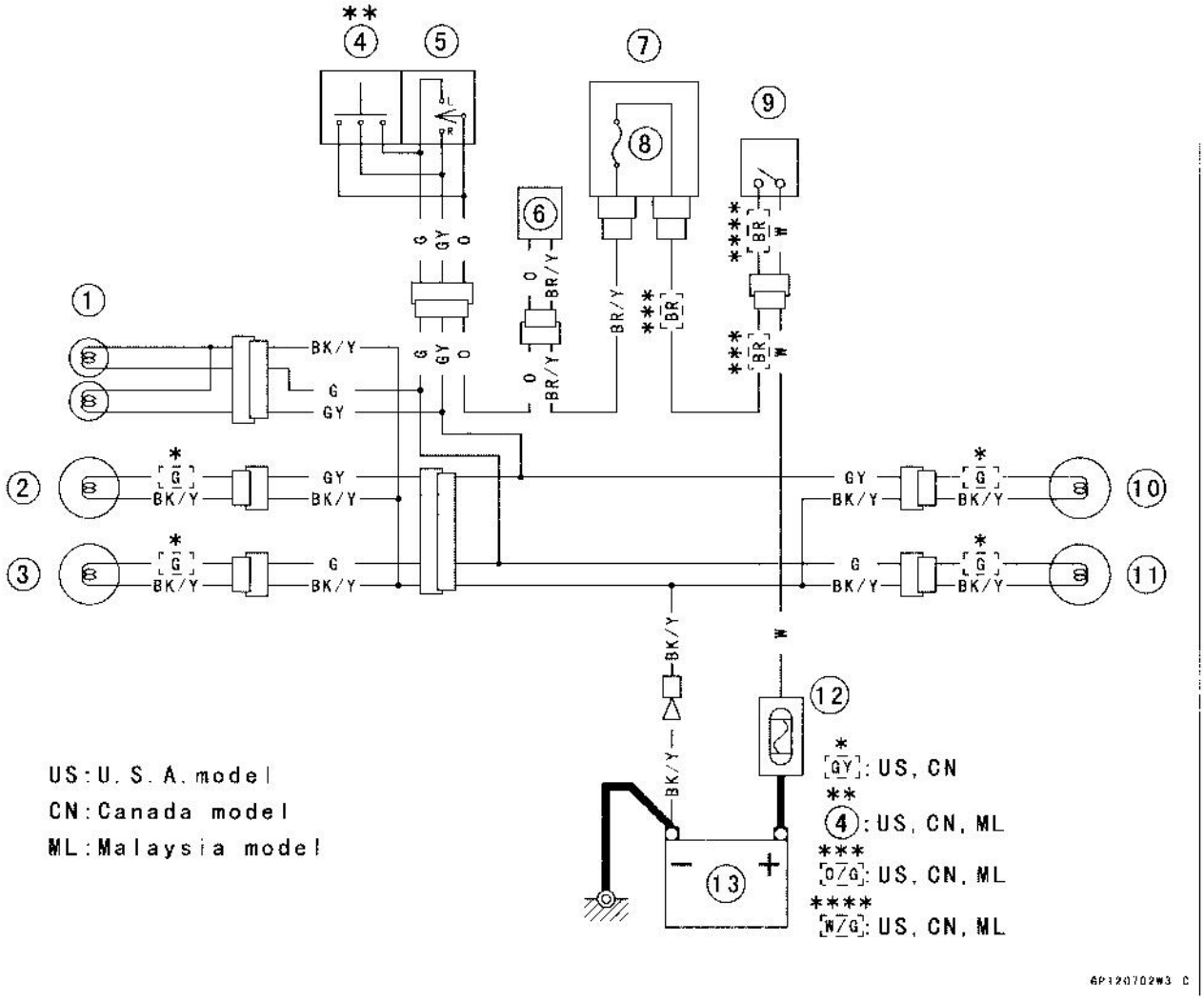


Testing Turn Signal Relay

Load		
The Number of Turn Signal Lights	Wattage(W)	Flashing times (c/m*)
1	21 or 23	140 - 250
2	42 or 46	75 - 95

(*): Cycle(s) per minute

Turn Signal Light Circuit



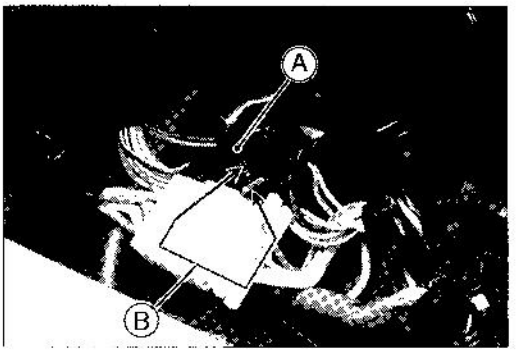
1. Turn Signal Indicator Lights (Right and Left)
2. Front Right Turn Signal Light
3. Front Left Turn Signal Light
4. Hazard Button
5. Turn Signal Switch
6. Turn Signal Relay
7. Junction Box
8. Turn Signal Relay Fuse 10 A
9. Ignition Switch
10. Rear Right Turn Signal Light
11. Rear Left Turn Signal Light
12. Main Fuse 30 A
13. Battery

Radiator Fan System

Fan System Circuit Inspection

- Remove the left inner cover (see Frame chapter).
- Disconnect the 2-pin connector [A] from the radiator fan switch wire connector.
- Using an auxiliary wire [B], connect the terminals in the connector.

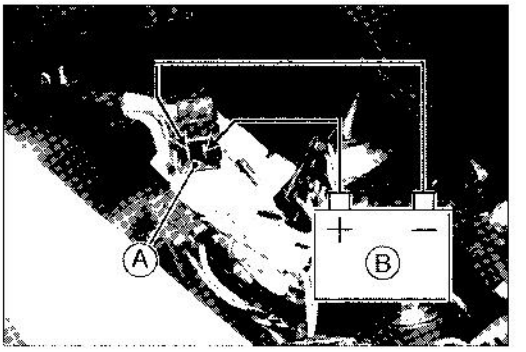
★ If the fan rotates, inspect the fan switch.
★ If the fan does not rotate, inspect the following.
Wires and Connectors
Main Fuse and Fan Fuse
Fan Motor



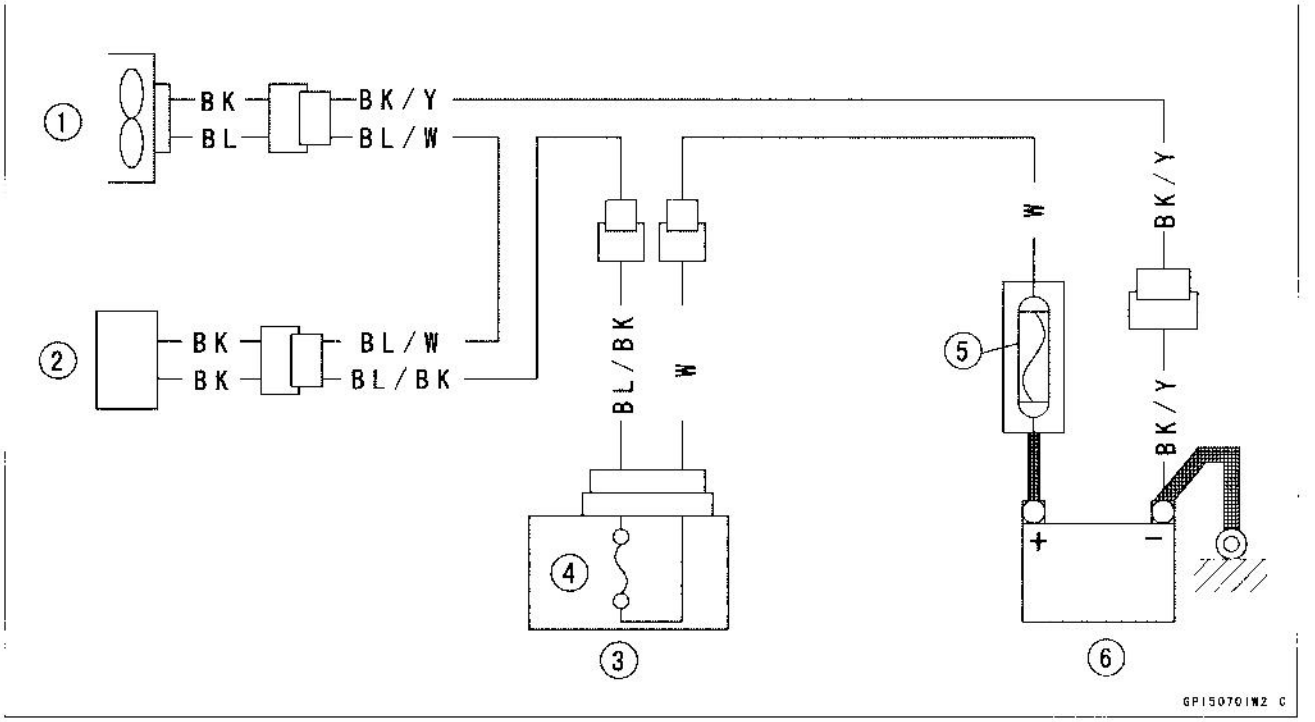
Fan Motor Inspection

- Remove the left inner cover (see Frame chapter).
- Disconnect the 2–pin connector [A] in the fan motor wires.
- 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.



Radiator Fan Circuit

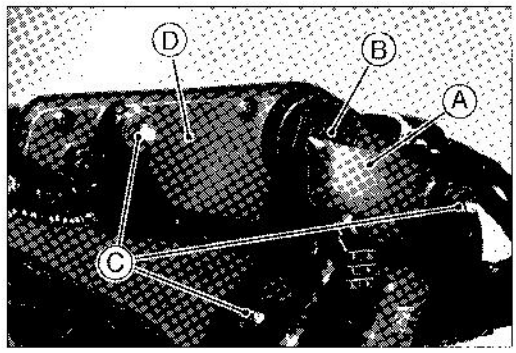


1. Radiator Fan
2. Radiator Fan Switch
3. Junction Box
4. Fan Fuse 10 A
5. Main Fuse 30 A
6. Battery

Meter

Meter Unit Removal

- Remove:
  Upper Fairing (see Frame chapter)
- Slide the dust cover [A] and remove the wiring connector [B].
- Remove:
  Mounting Nuts [C]
  Meter Unit [D]

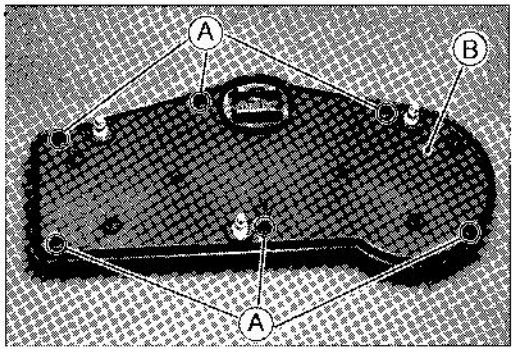


CAUTION

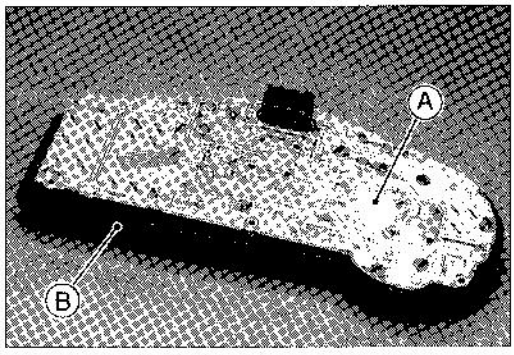
Do not drop the meter unit.

Meter Unit Disassembly

- Remove:
  Meter Unit (see Meters Unit Removal)
  Screws [A]
  Lower Meter Cover [B]

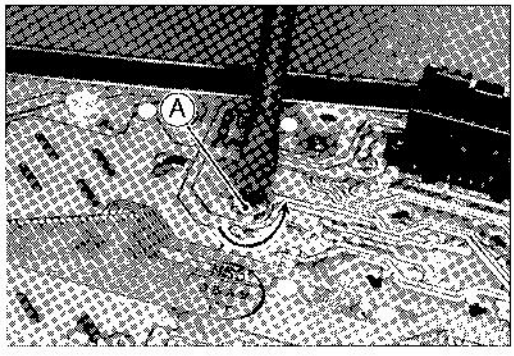


- Separate the meter assembly [A] and upper meter cover [B].

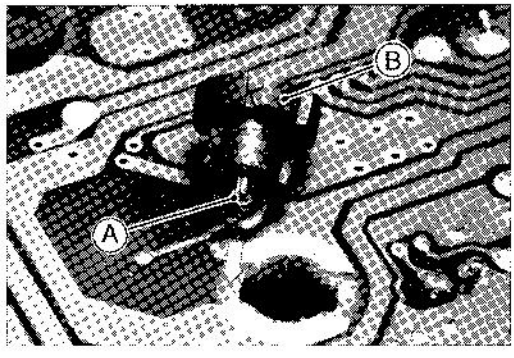


Bulb Replacement

- Remove:
  Lower Meter Cover (see Meter Unit Disassembly)
- Turn out the socket [A] counterclockwise.



- Pull the bulb [A] out off the socket [B].



CAUTION

Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.

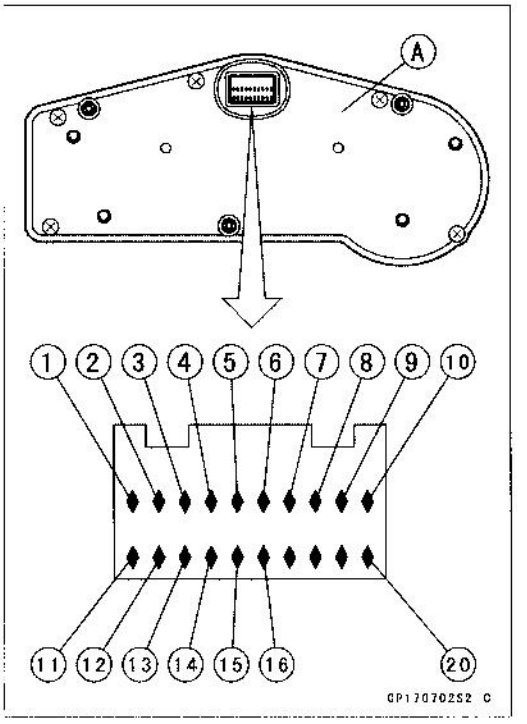
Meter

Meter Unit Inspection

- Remove:
  Meter Unit [A] (see Meter Unit Removal)

CAUTION

Do not drop the meter unit.



[1] Tachometer Pulse
[2] Fuel Level Sensor
[3] Oil Pressure Warning Indicator Light (LED) Ground
[4] Left Turn Signal Indicator Light (+)
[5] Right Turn Signal Indicator Light (–)
[6] High Beam Indicator Light (+)
[7] Neutral Indicator Light (–)
[8] Turn Signal, High Beam Indicator and Meter Lights (–)
[9] Speed Sensor Puls
[10] Water Temperature Sensor
[11] Fuel Reserve Switch
[12] Battery (–)
[13] Speed Sensor Supply Voltage
[14] Ignition
[15] Battery (+)
[16] Meter Lights (+)
[20] FI Indicator Light (LED) Ground

CAUTION

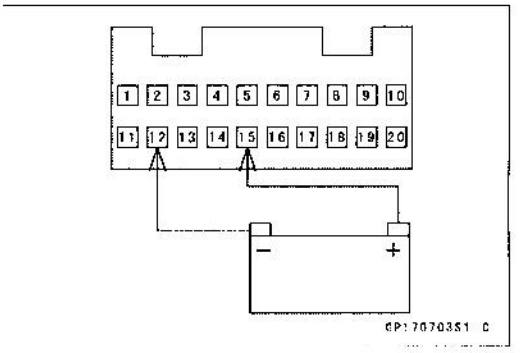
Do not short terminals [12] to [13] and [13] to [9].

Check 1: Liquid Crystal Display (LCD) Segments Check / Speedometer and Tachometer Primary Operation Check

- Using the auxiliary wires, connect a 12 V battery to the meter unit connector as follows.
- Connect the battery positive terminal to terminal [15].
- Connect the battery negative terminal to terminal [12].

○ The speedometer and tachometer needles momentarily point to their last readings.

★ If the meters do not work, replace the meter assembly.



- Connect terminal [15] to terminal [14].

○ The speedometer and tachometer needles momentarily point to their last readings.

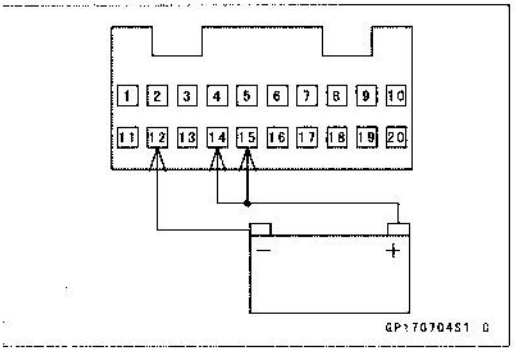
○ All the LCD segments appear for three seconds.

★ If the meters and/or segments do not work, replace the meter assembly.

- Disconnect the terminal [14].

○ All the LCD segments disappear.

★ If the segments do not disappear, replace the meter assembly.

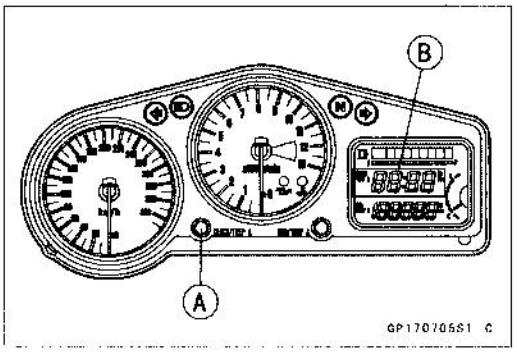


Check 2: CLOCK/TRIP A and ODO/TRIP B Button Operation Check

- Connect the wires in the same circuit as for the Check 1.
- Check that when the CLOCK/TRIP A button [A] is pushed within two seconds, the display [B] cycles through the two modes.

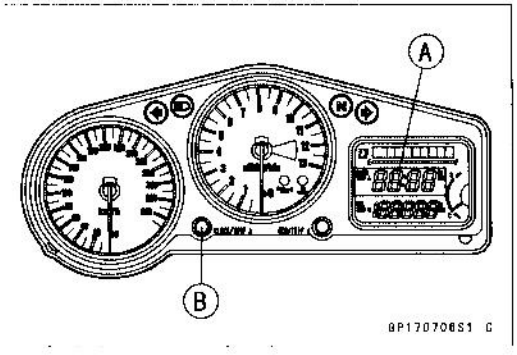
CLOCK → TRIP A → CLOCK

★ If this display function does not work, replace the meter assembly.



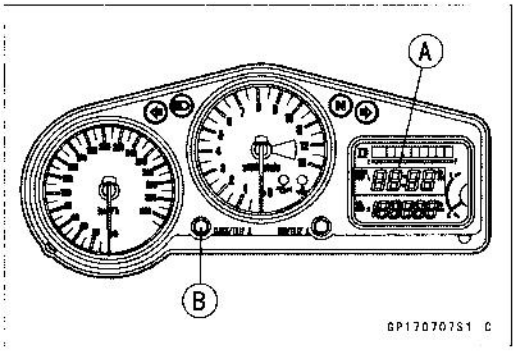
- Cycle the display to the CLOCK mode [A].
- Check that when the CLOCK/TRIP A button [B] is pushed for more than two seconds, the display changes to the clock set mode.
- Check that when the clock set mode, it is possible to adjust the hours and minutes.

★ If this display function does not work and adjust, replace the meter assembly.



- Cycle the display to the TRIP A mode [A].
- Check that when the CLOCK/TRIP A button [B] is pushed for more than two seconds, the display turns to 0.0.

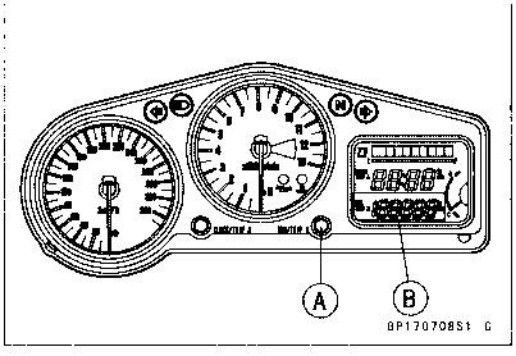
★ If this display function does not indicate 0.0, replace the meter assembly.



- Check that when the ODO/TRIP B button [A] is pushed within two seconds, the display [B] cycles through the two modes.

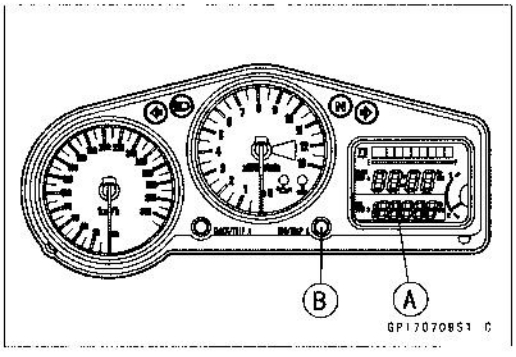
ODO → TRIP B → ODO

★ If this display function does not work, replace the meter assembly.



- Cycle the display to the TRIP B mode [A].
- Check that when the ODO/TRIP B button [B] is pushed for more than two seconds, the display turns to 0.

★ If this display function does not indicate 0, replace the meter assembly.

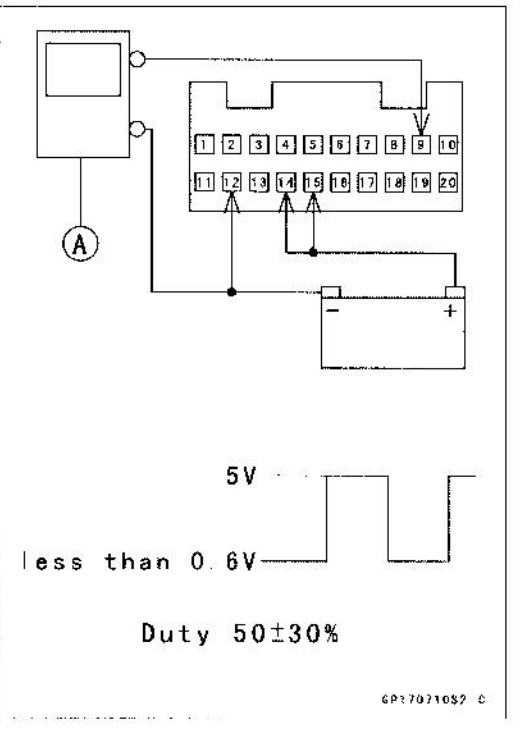


Meter

Check 3: Speedometer Check
- Connect the wires in the same circuit as for the Check 1.
- The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [9].

○ Indicates approximately 60 mph if the input frequency is approximately 1083 Hz.
○ Indicates approximately 60 km/h if the input frequency is approximately 677 Hz.

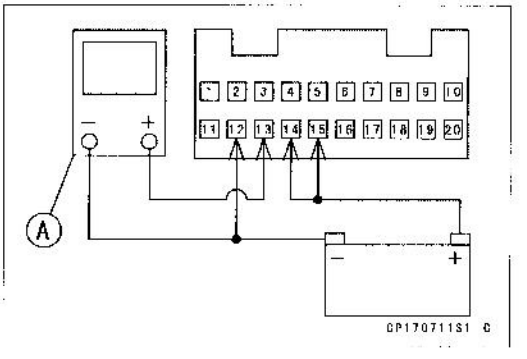
★ If this meter function does not work, replace the meter assembly.



Check 4: Speed Sensor Supply Voltage Check
- Connect the wires in the same circuit as for the Check 1.
- Set the hand tester [A] to the DC 25 V range and connect it to terminals [13] and [12].
  Hand Tester (+) to Terminal 13
  Hand Tester (–) to Terminal 12

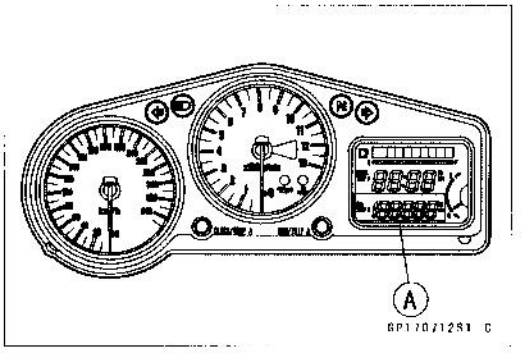
CAUTION
Do not short terminals 13 to 12.

★ If the voltage is not more than 7 V, replace the meter assembly.



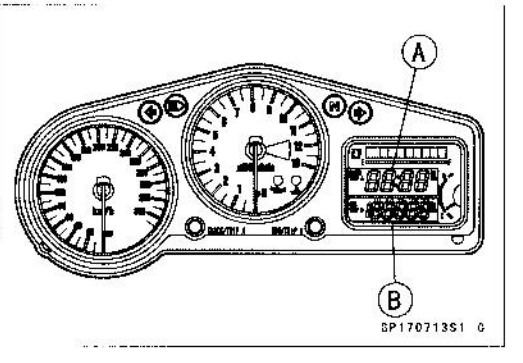
Check 5: ODO Meter Check
- Connect the wires in the same circuit as for the Check 3.
- Cycle the display to the ODO mode [A].
- Raise the input frequency of the oscillator to quickly see the result of this inspection.

★ If the value indicated by the odometer does not increase, replace the meter assembly.



Check 6: TRIP A/ TRIP B Meter Check
- Connect the wires in the same circuit as for the Check 3.
- Cycle the display to the TRIP A [A] or TRIP B [B] mode.
- Raise the input frequency of the oscillator to quickly see the result of this inspection.

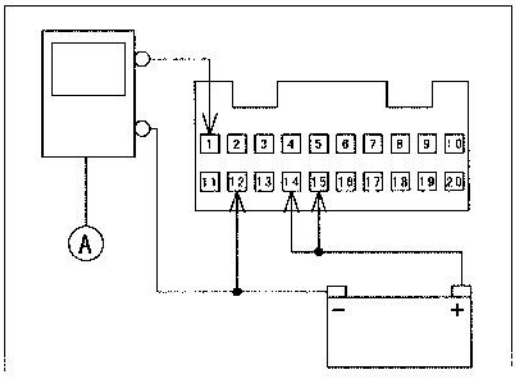
★ If the value indicated by the trip meter A or B does not increase, replace the meter assembly.

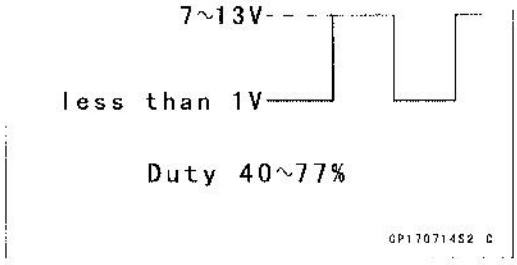


Check 7: Tachometer Check
- Connect the wires in the same circuit as for the Check 1.
- The engine speed (rpm) equivalent to the input frequency is indicated in the oscillator [A], if the square wave is input into terminal [1].

○ Indicates approximately 3,000 rpm if the input frequency is approximately 100 Hz.

★ If this meter function does not work, replace the meter assembly.



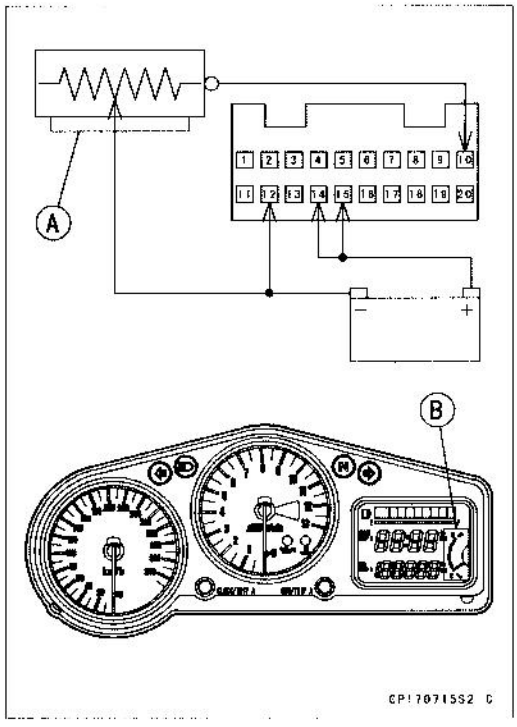


Check 8: Coolant Temperature Gauge Inspection
- Connect the wires in the same circuit as for the Check 1.
- Connect a variable rheostat [A] to terminal [10] and [12] as shown.
- Check that the position of segment [B] matches the resistance value of the variable rheostat.

Resistance (Ω)	Position of Segment	Coolant Temperature (Reference)
16500	1st	less than 30°C (86°F)
11000	2nd	30°C (86°F) ~ 50°C (122°F)
6200	3rd	50°C (122°F) ~ 60°C (140°F)
3800	4th	60°C (140°F) ~ 80°C (176°F)
1800	5th	80°C (176°F) ~ 100°C (212°F)
1100	6th	100°C (212°F) ~ 110°C (230°F)
850	7th	110°C (230°F) ~ 115°C (239°F)
740	8th	115°C (239°F) ~ 120°C (248°F)
660	9 (All, Flash)	120°C (248°F) or more

Resistance values are standard and they have tolerance.

★ If this display function does not work, replace the meter assembly.



Meter

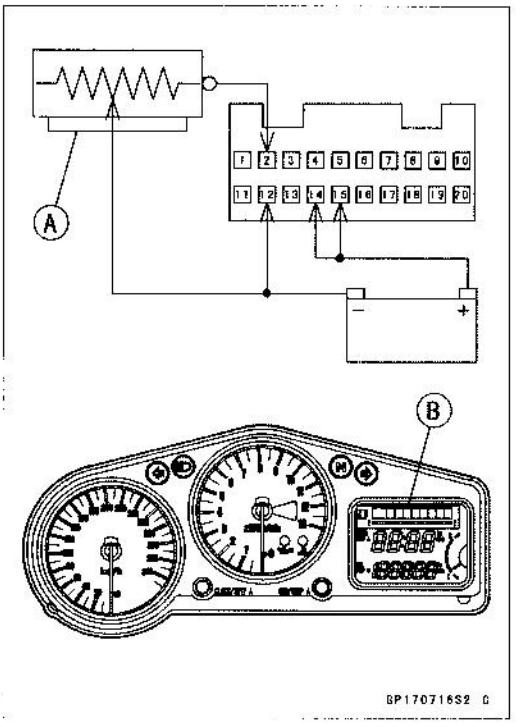
Check 9: Fuel Gauge Inspection

- Connect the wires in the same circuit as for the Check 1.
- Connect a variable rheostat [A] to terminal [2] and [12] as shown.
- Check that the number of segment [B] matches the resistance value of the variable rheostat.

Resistance (Ω)	Number of Segments	Fuel Amount (Reference) (L)
10	8	20
30	7	18
40	6	16
65	5	13
75	4	11
90	3	9
100	2	7
120	1	5

Resistance values are standard and they have tolerance.

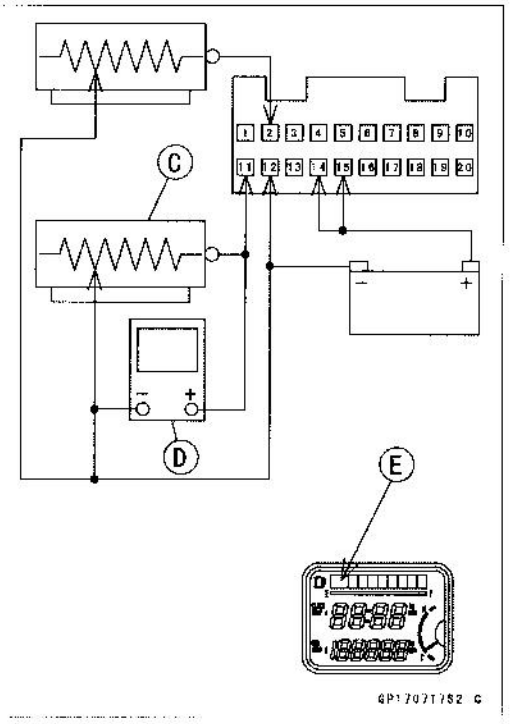
★ If this display function does not work, replace the meter assembly.



- Connect an other variable rheostat [C] to terminal [11] and [12].
- Set the hand tester [D] to the DC 10 V range and connect it to terminals of the variable rheostat as shown.
- When the 1 segment [E] appears, adjust the variable rheostat [C] so that the terminal voltage is less than 5.7 V.

○ Then the segment should flush.

★ If this display function does not flush, replace the meter assembly.



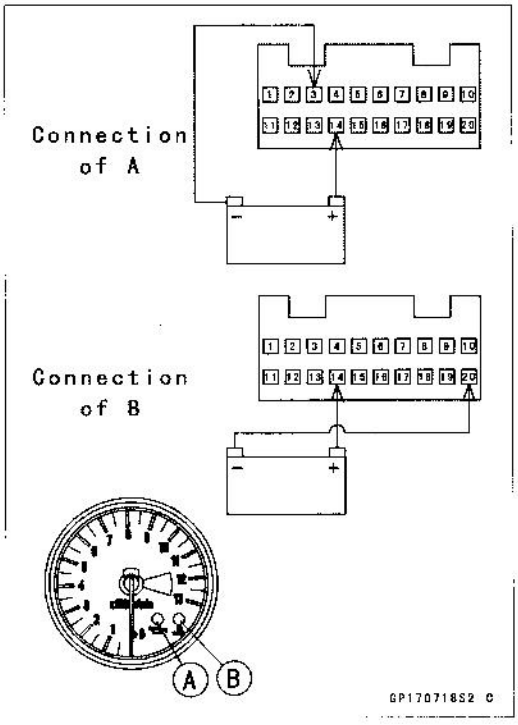
Check 10: LED Light Inspection

- Using the auxiliary wires, connect a 12 V battery to the meter unit connector as follows.

Oil Pressure Warning Indicator Light (LED) [A]:
Battery Positive (+) Terminal to Terminal [14]
Battery Negative ( ) Terminal to Terminal [3]

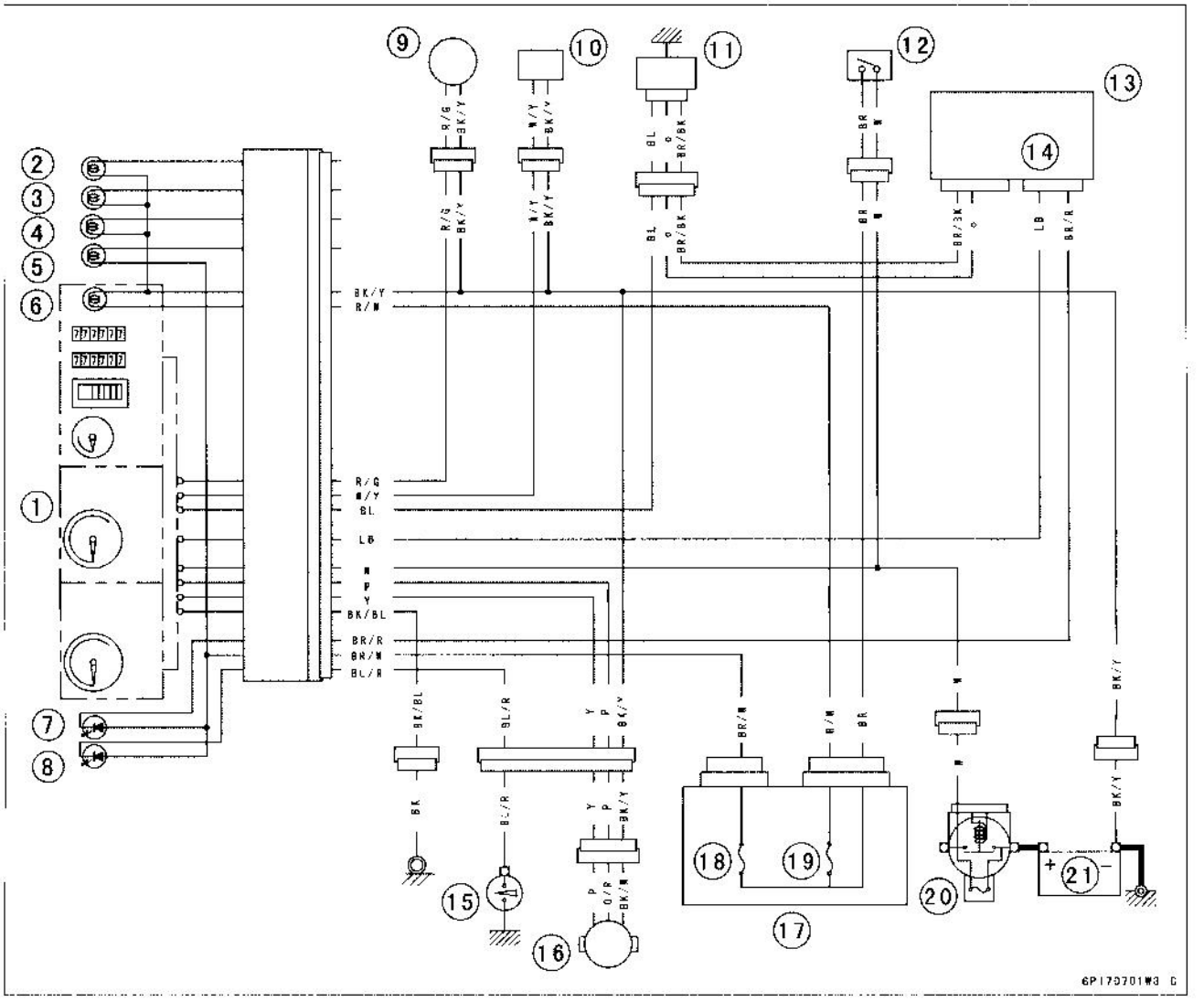
FI Indicator Light (LED) [B]:
Battery Positive (+) Terminal to Terminal [14]
Battery Negative (–) Terminal to Terminal [20]

★ If each LED light does not go on, replace the meter assembly.



Meter

Meter Circuit



1. Meter Unit
2. High Beam Indicator Light 12 V 1.1 W
3. Left Turn Signal Indicator Light 12 V 1.1 W
4. Right Turn Signal Indicator Light 12 V 1.1 W
5. Nutral Indicator Light 12 V 1.1 W
6. Meter Lights 12 V 1.1 W × 3, 12 V 0.7 W × 2
7. FI Indicator Light (LED)
8. Oil Pressure Warning Indicator Light (LED)
9. Fuel Reserve Switch
10. Fuel Level Sensor
11. Water Temperature Sensor
12. Ignition Switch
13. ECU
14. Tachometer Signal
15. Oil Pressure Switch
16. Speed Sensor
17. Junction Box
18. Ignition Fuse 10 A
19. Taillight Fuse 10 A
20. Main Fuse 30 A
21. Battery

Switches and Sensors

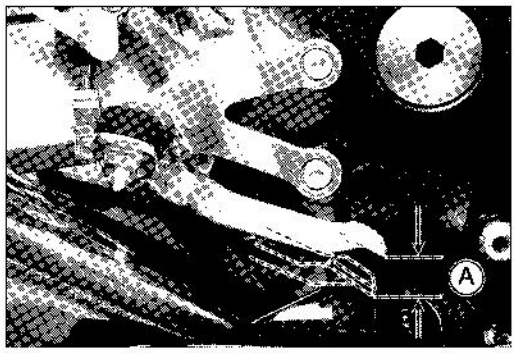
Brake Light Timing Inspection

- 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 (0.39 in.) of pedal travel [A]**



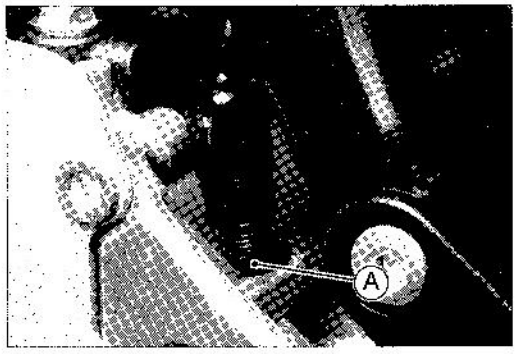
Brake Light Timing Adjustment

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

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

CAUTION

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



Switches and Sensors

Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).

C: For the handlebar switches and the ignition switch, refer to the tables in the Wiring Diagram.

★ If the switch has an open or short, repair it or replace it with a new one.

Special Tool - Hand Tester: 57001–1394

Rear Brake Light Switch Connections

	BR	BL
When brake pedal is pushed down	○—○	
When brake pedal is released		

Side Stand Switch Connections

	G	BK
When side stand is up	○—○	
When side stand is down		

Gear Position Switch Connections

	Color	⏚
When transmission is in 1st	BL/R	○—○
When transmission is in neutral	LG	○—○
When transmission is in 2nd	LB	○—○
When transmission is in 3rd	R	○—○
When transmission is in 4th	BL	○—○
When transmission is in 5th	G/R	○—○
When transmission is in 6th	Y/G	○—○

Engine Oil Pressure Switch Connections*

	SW. Terminal	⏚
When engine is stopped	○—○	
When engine is running		

*: Engine lubrication system is in good condition

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.

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.

★ If the hand tester does not show the specified values, replace the switch.

Fan Switch Resistance

○Rising temperature:

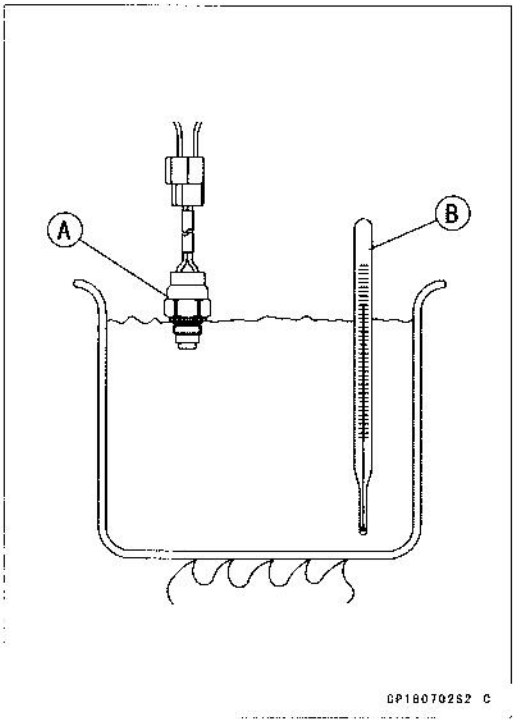
From OFF to ON at 93 ~ 103°C (199 ~ 217°F)

○Falling temperature:

From ON to OFF at above 91°C (196°F)

ON: Less than 0.5 Ω

OFF: More than 1 MΩ



Water Temperature Sensor Inspection

- Remove the water temperature sensor (see Digital Fuel Injection 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.

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.

○ The sensor sends electric signals to the ECU (Electronic Control Unit) and coolant temperature gauge in the meter unit.

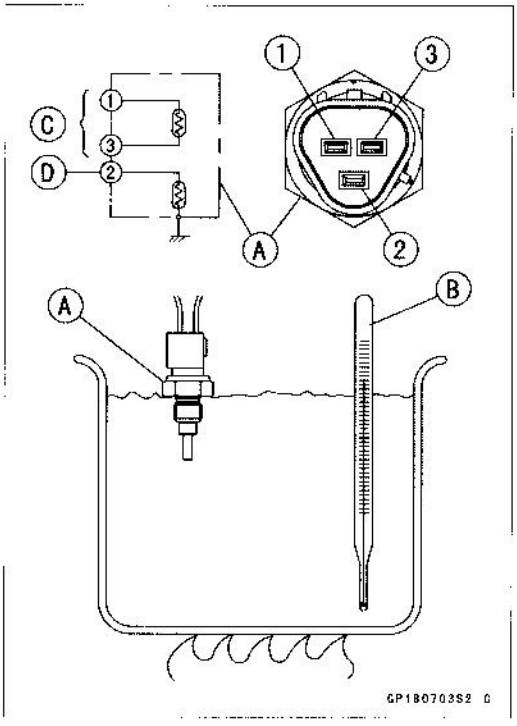
○ Measure the resistance across the terminals and the body (for the gauge) at the temperatures shown in the table.

★ If the hand tester does not show the specified values, replace the sensor.

Water Temperature Sensor

Resistance for ECU [C]	
Temperature	Resistance (kΩ) (Terminal [1] - [3])
20°C (68°F)	$2.45\ ^{+0.14}_{-0.13}$
80°C (176°F)	0.318 ± 0.008
110°C (230°F)	0.1417 ± 0.0018

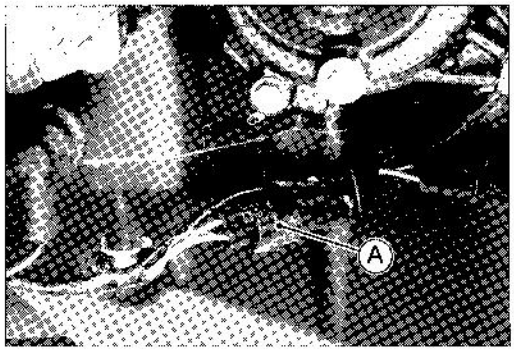
Resistance for Water Temperature Gauge [D]	
Temperature	Resistance (kΩ) (Terminal [2] - Body)
50°C (122°F)	7.115 ± 0.285
80°C (176°F)	2.37 ± 0.237
120°C (248°F)	0.69 ± 0.41



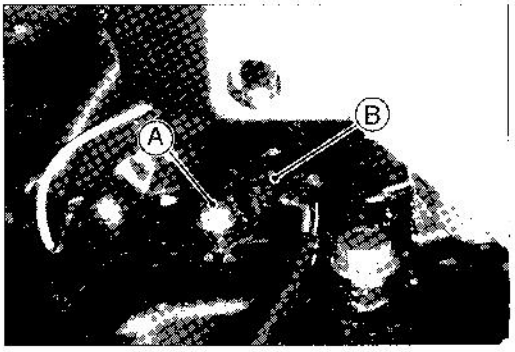
Switches and Sensors

Speed Sensor Removal

- Remove:
  Lower Fairing (see Frame chapter)
  Speed Sensor Wire Connector [A]
  Starter Motor (see Starter Motor Removal)



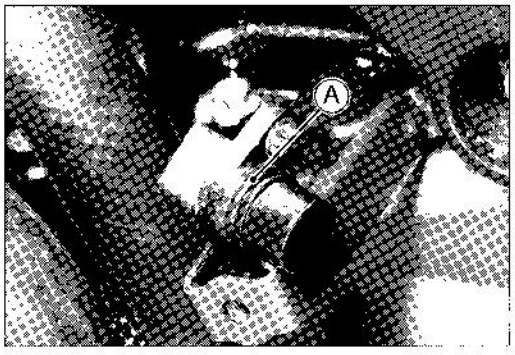
- Remove:
  Speed Sensor Mounting Bolt [A]
  Speed Sensor [B]



Speed Sensor Installation

- Apply grease to the O-ring [A] on the speed sensor.
- Tighten:

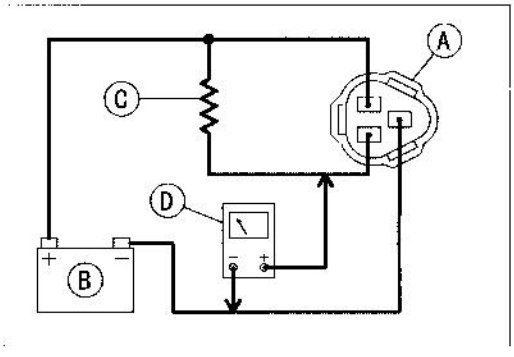
Torque - Speed Sensor Mounting Bolt: 12 N·m (1.2 kg·m, 106 in·lb)



Speed Sensor Inspection

- Remove:
  Speed Sensor (see Speed Sensor Removal)
- Connect the speed sensor connector [A] with a battery [B], 10 kΩ resistor [C] and hand tester [D] as shown.
- Set the tester to the DC 25 V range.

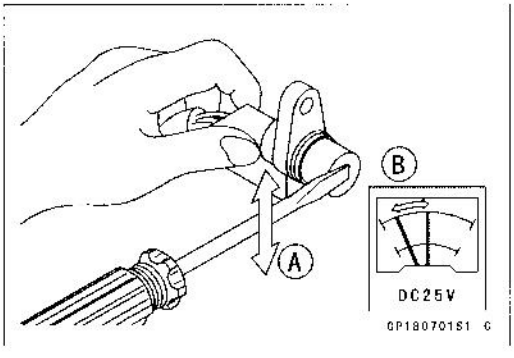
Special Tool - Hand Tester: 57001-1394



- Trace [A] the speed sensor surface with the screw driver.

○ Then the tester indicator should flick [B].

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

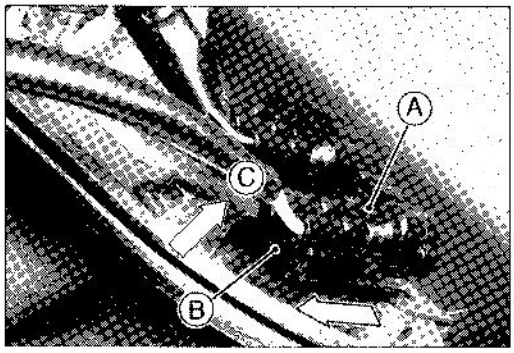


Switches and Sensors

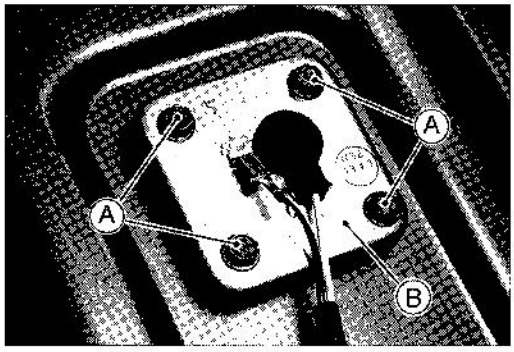
Fuel Level Sensor Inspection

- Remove:
  Fuel Tank (see Fuel System chapter)
  Fuel Level Sensor Wire Connector [A]

○ Push the stopper [B] upward [C] and pull out the connector.



- Remove:
  Bolts [A]
  Fuel Level Sensor [B]



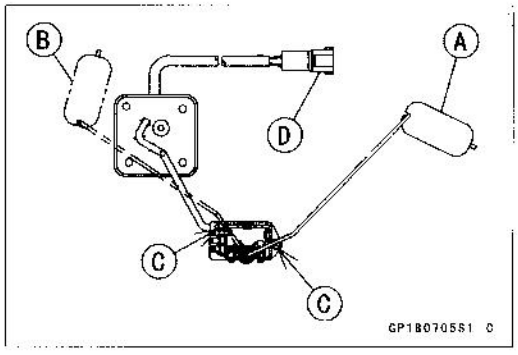
- Check that the float moves up and down smoothly without binding. It should go down under its own weight.

★ If the float does not move smoothly, replace the sensor.
  Float in Full Position [A]
  Float in Empty Position [B]
  Float Arm Stoppers [C]

- Using the hand tester, measure the resistance across the terminals in the fuel level sensor wire connector [D].

Special Tool - Hand Tester: 57001-1394

★ If the tester readings are not as specified, or do not change smoothly according as the float moves up and down, replace the sensor.



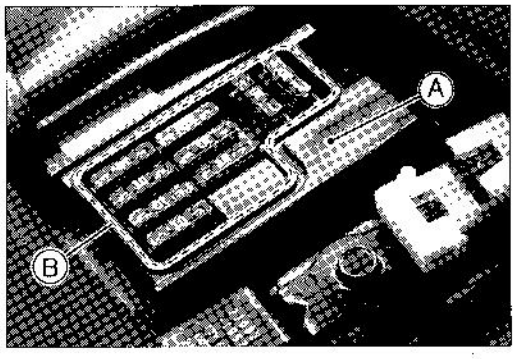
Fuel Level Sensor Resistance
Standard: Full position: 8 ~ 10 Ω
Empty position: 122 ~ 126 Ω

- Tighten:

Torque - Fuel Level Sensor Bolts: 6.9 N·m (0.7 kg·m, 61 in·lb)

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:
  Fuel Tank Cover Plate (see Digital Fuel Injection System chapter)
  Rubber Cover
  Connectors
  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.

Fuse Circuit Inspection

Tester Connection	Tester Reading (Ω)
1 - 1A	0
1 - 2	0
3A - 4	0
6 - 5	0
6 - 10	0
6 - 7	0
6 - 17	0

Tester Connection	Tester Reading (Ω)
1A - 8	∞
2 - 8	∞
3A - 8	∞
6 - 2	∞
6 - 3A	∞
17 - 3A	∞

Starter Circuit/Headlight Relay Inspection

- Remove the junction box.
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the junction box as shown.

★ If the tester does not read as specified, replace the junction box.

Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading (Ω)
Headlight Relay	*7 - 8	∞
	*7 - 13	∞
	(+) ( ) *13 - 9	Not ∞ **

	Tester Connection	Tester Reading (Ω)
Starter Circuit Relay	9 - 11	∞
	12 - 13	∞
	(+) (–) 13 - 11	∞
	(+) (–) 12 - 11	Not ∞ **

(*): U.S.A, Canada, Australia, and Malaysia Models only
(**): The actual reading varies with the hand tester used.
(+): Apply tester positive wire.
(–): Apply tester negative wire.

Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (–)	Tester Connection	Tester Reading (Ω)
Headlight Relay	*9 – 13	*7 – 8	0
Starter Circuit Relay	11 – 12	(+) (–) 13 – 11	Not ∞ **

(*): U.S.A., Canada, Australia, and Malaysia Models only
(**): The actual reading varies with the hand tester used.
(+): Apply tester positive wire.
(–): Apply tester negative wire.

Diode Circuit Inspection

- 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

*: U.S.A., Canada, Australia, and Malaysia Models only

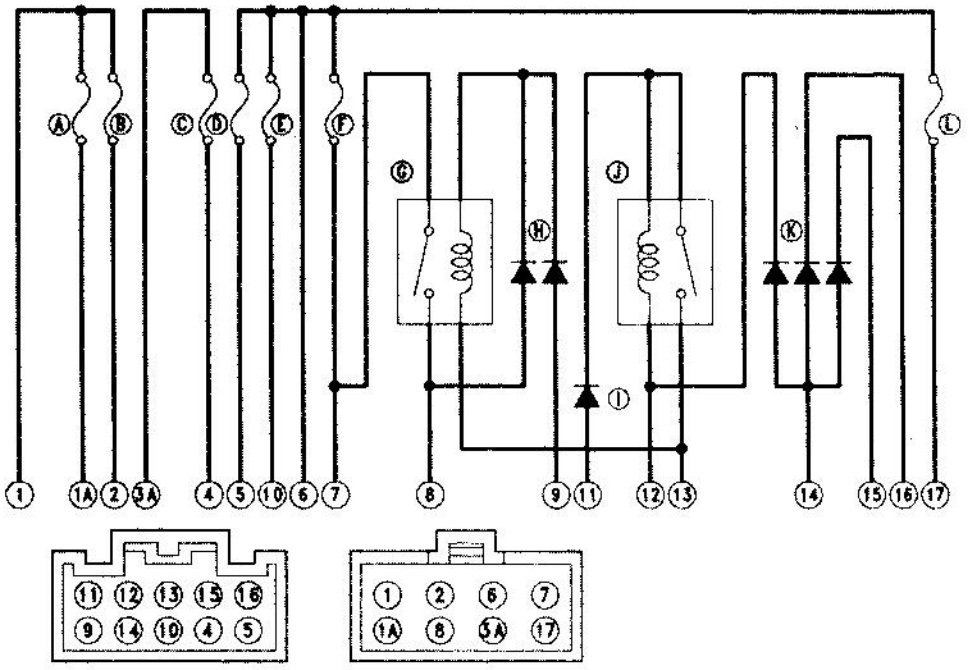
★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the junction box must be replaced.

NOTE

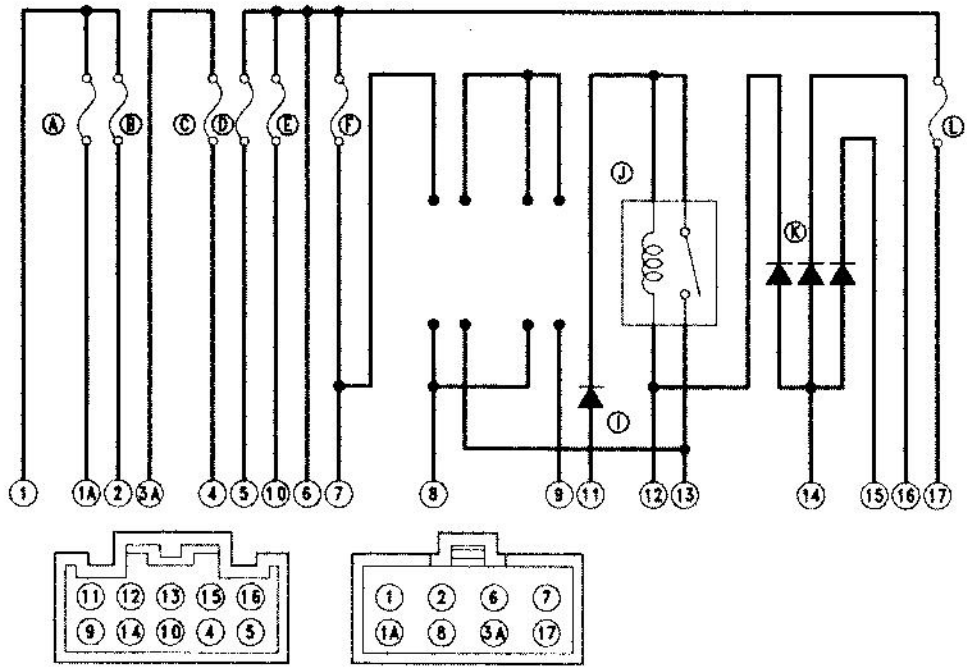
○ *The actual meter reading varies with the meter used and the individual diodes, but, generally speaking, the lower reading should be from zero to one half the scale.*

Junction Box

Junction Box Internal Circuit (U.S.A, Canada, Australia, and Malaysia)



Junction Box Internal Circuit (Other than U.S.A., Canada, Australia, and Malaysia)

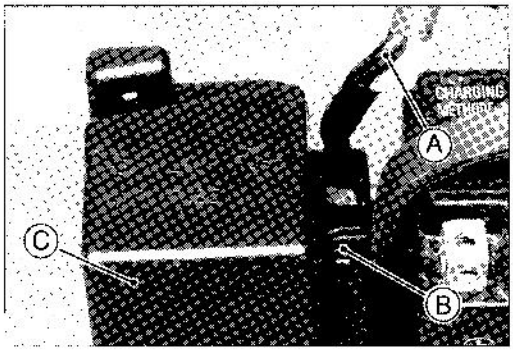


A. Accessory Fuse 10 A
B. Fan Fuse 10 A
C. Turn Signal Relay Fuse 10 A
D. Horn Fuse 10 A
E. Ignition Fuse 10 A
F. Headlight Fuse 10 A
G. Headlight Relay
H. Headlight Diodes
I. Starter Diode
J. Starter Circuit Relay
K. Interlock Diodes
L. Taillight Fuse 10 A

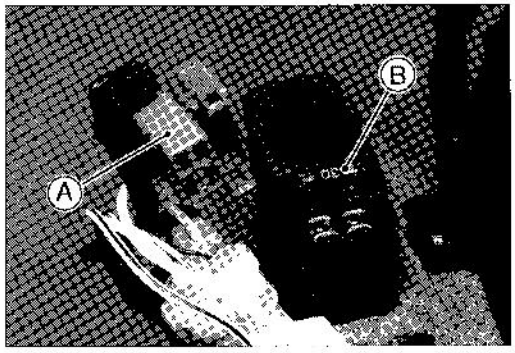
Fuse

30 A Main Fuse Removal

- Remove:
  Battery Tray (see Battery Removal)
  Battery Positive (+) Wire [A]
  Screw [B]
  Cover [C]

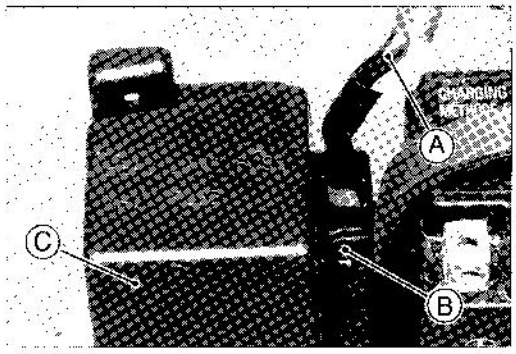


- Disconnect the Connector [A].
- Pull out the 30 A main fuse [B] from the starter relay with a needle nose pliers.

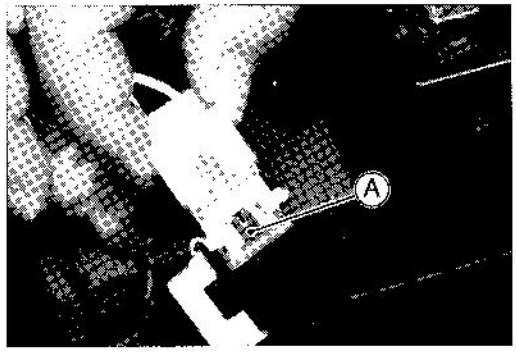


20 A Headlight Fuse Removal

- Remove:
  Battery Tray (see Battery Removal)
  Battery Positive (+) Wire [A]
  Screw [B]
  Cover [C]

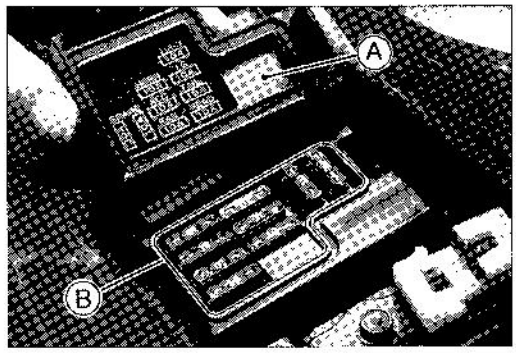


- Remove:
  20 A Headlight Fuse [A]



Junction Box Fuse Removal

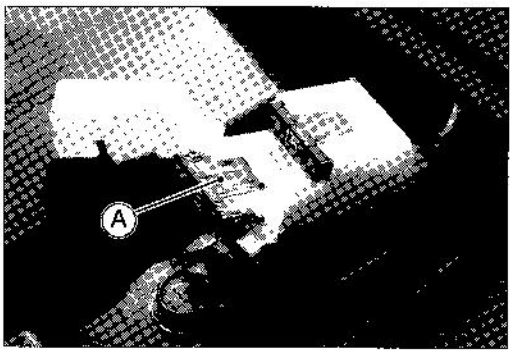
- Remove:
  Fuel Tank Cover Plate (see Digital Fuel Injection System chapter)
  Rubber Cover
- Unlock the hook to lift up the lid [A].
- Pull the fuses [B] straight out of the junction box with a needle nose pliers.



Fuse

15 A ECU Fuse Removal

- Remove:
  Fuel Tank Cover Plate (see Digital Fuel Injection System chapter)
  15 A ECU Fuse [A]



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.

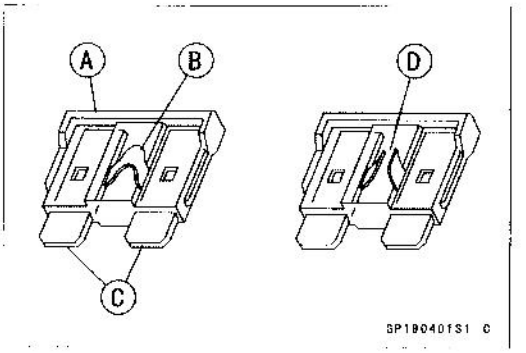
- Install the junction box fuses on the original position as specified on the lid.

Fuse Inspection

- Remove the fuse.
- Inspect the fuse element.

★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

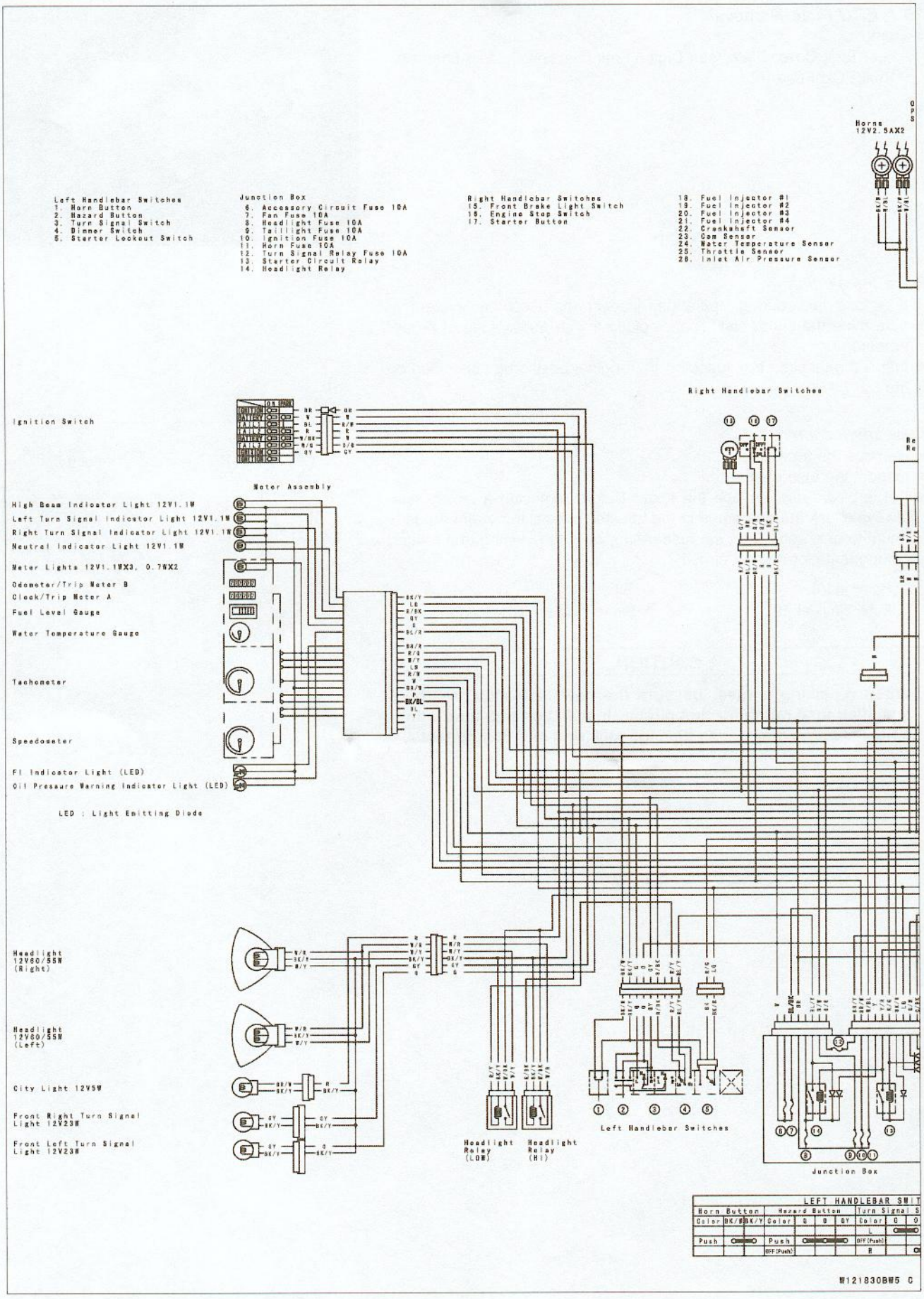
Housing [A]
Fuse Element [B]
Terminals [C]
Blown Element [D]



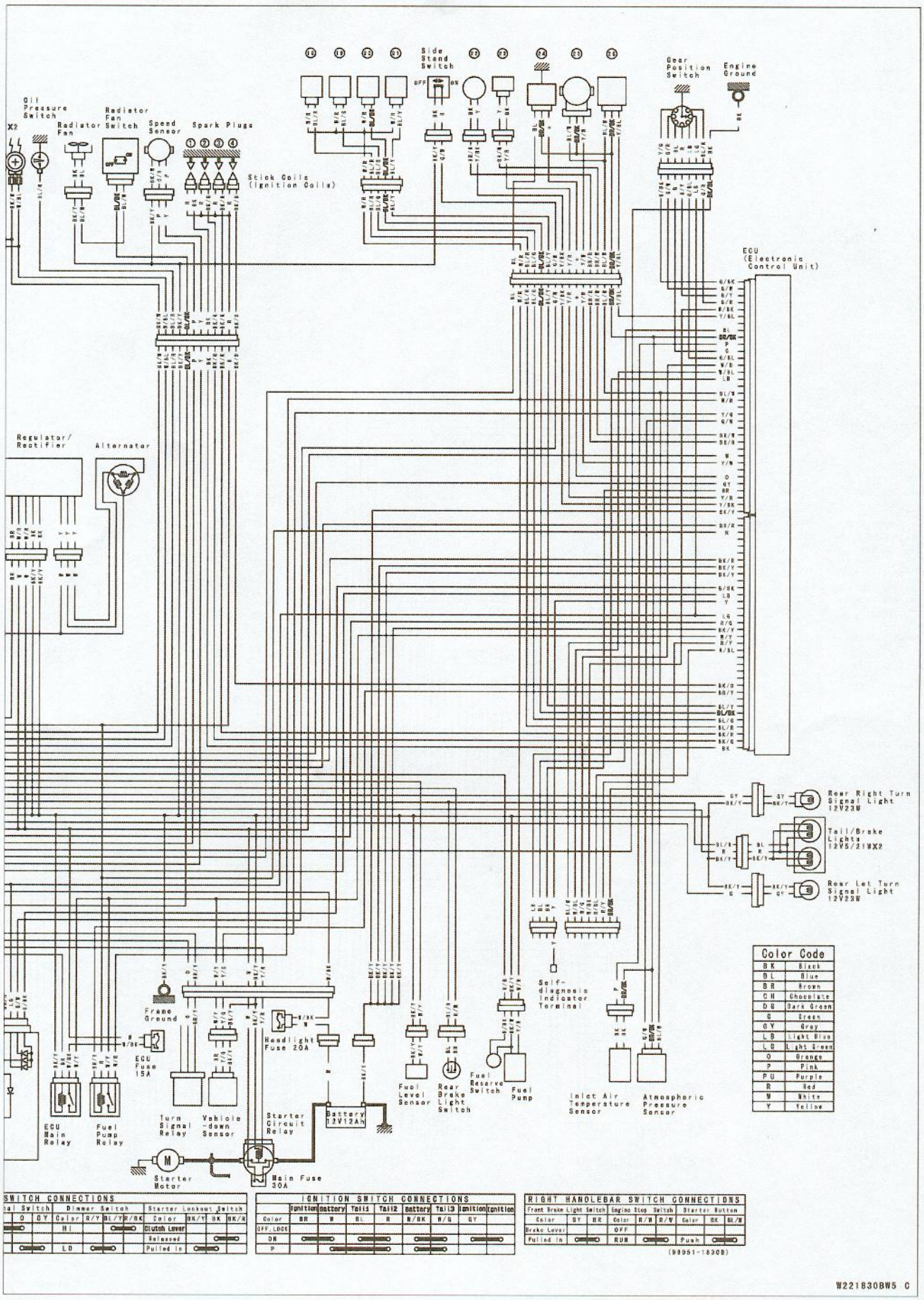
CAUTION

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.

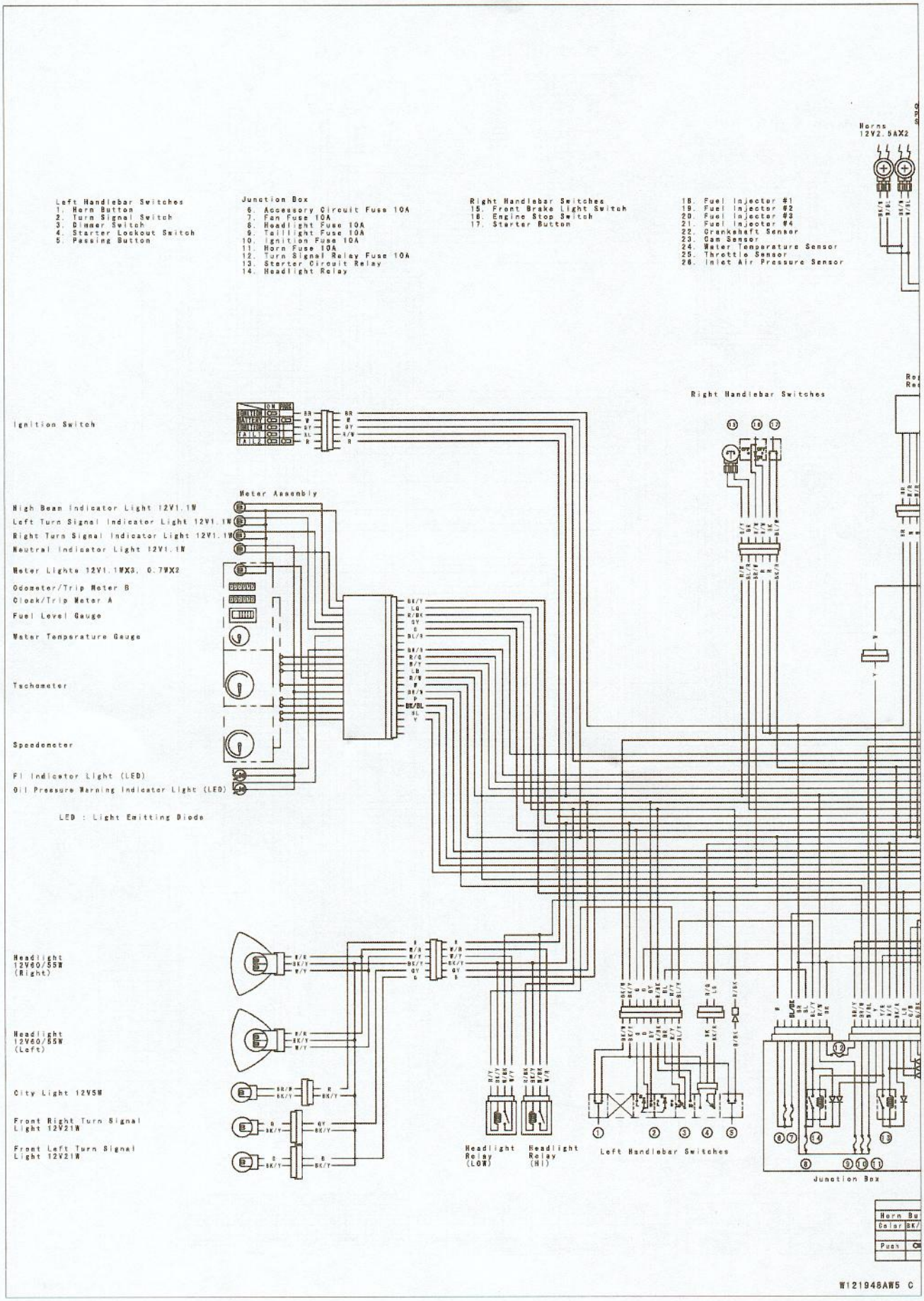
Wiring Diagram (U.S.A. and Canada)



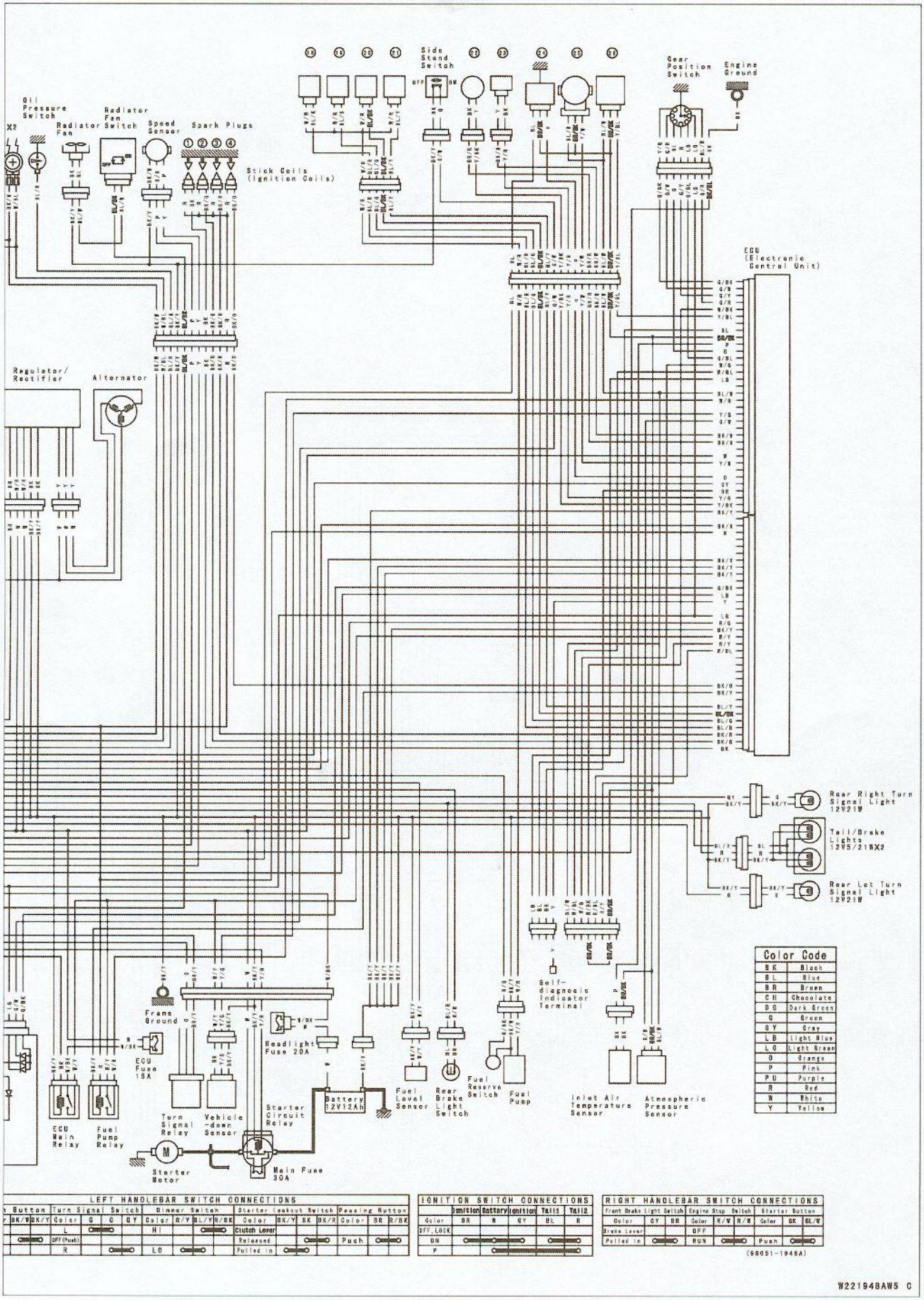
Wiring Diagram (U.S.A. and Canada)



Wiring Diagram (Australia)



Wiring Diagram (Australia)



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

LEFT HANDLEBAR SWITCH CONNECTIONS

Button		Turn Signal Switch			Dimmer Switch				Starter Lockout Switch			Passing Button		
	BK/W	BK/Y	Color	G	C	GY	Color	R/Y	BL/Y	R/BK	Color	BK/Y	BK	BK/R	Color	BR	R/BK
			L				HI				Clutch Lever						
			OFF (Push)								Released				Push		
			R				LO				Pulled in						

IGNITION SWITCH CONNECTIONS

	Ignition	Battery	Ignition	Tail1	Tail2
Color	BR	W	GY	BL	R
OFF, LOCK					
ON					
P					

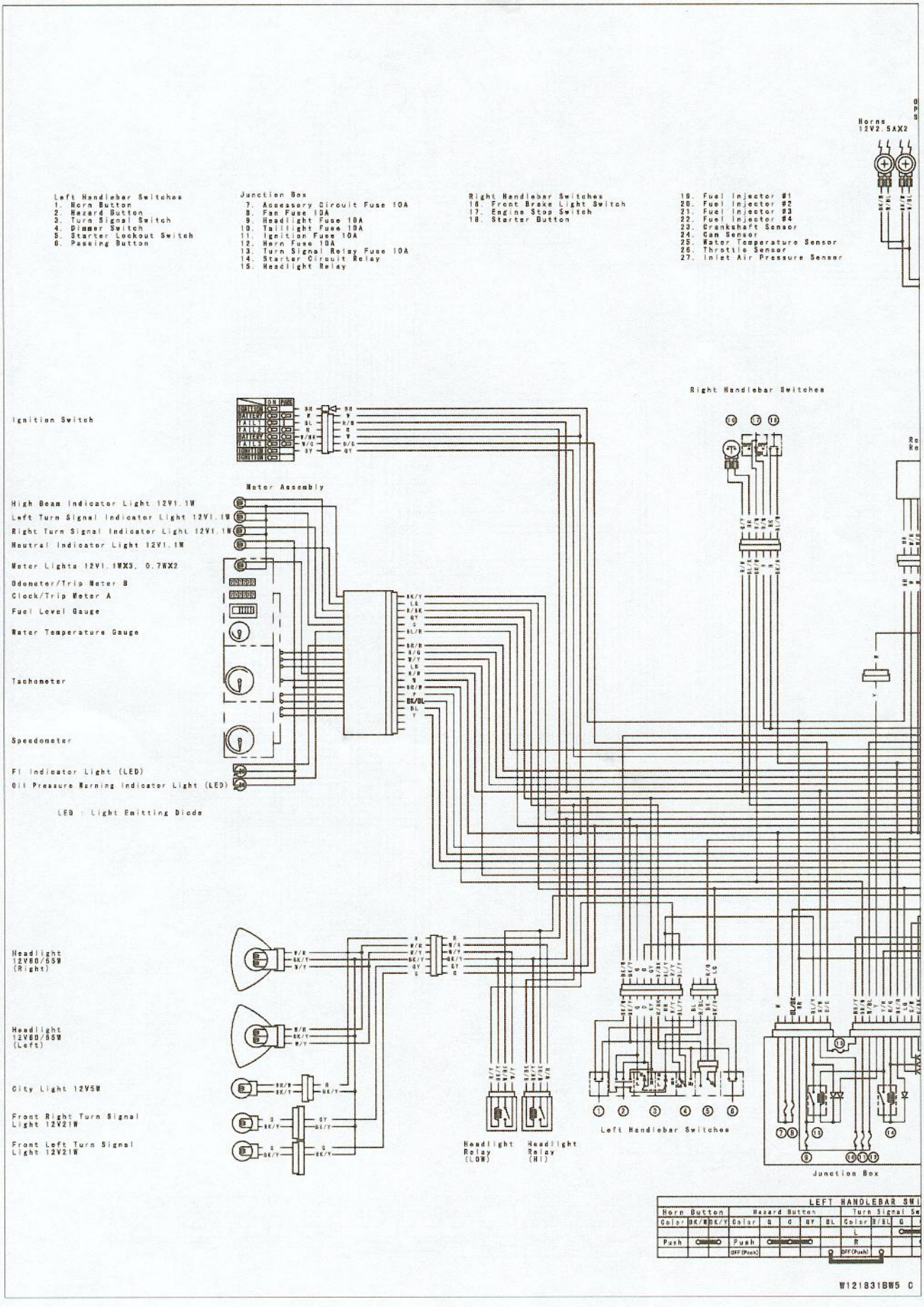
RIGHT HANDLEBAR SWITCH CONNECTIONS

Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	GY	BR	Color	R/W	R/R	Color	BK	BL/W
Brake Lever			OFF					
Pulled in			RUN			Push		

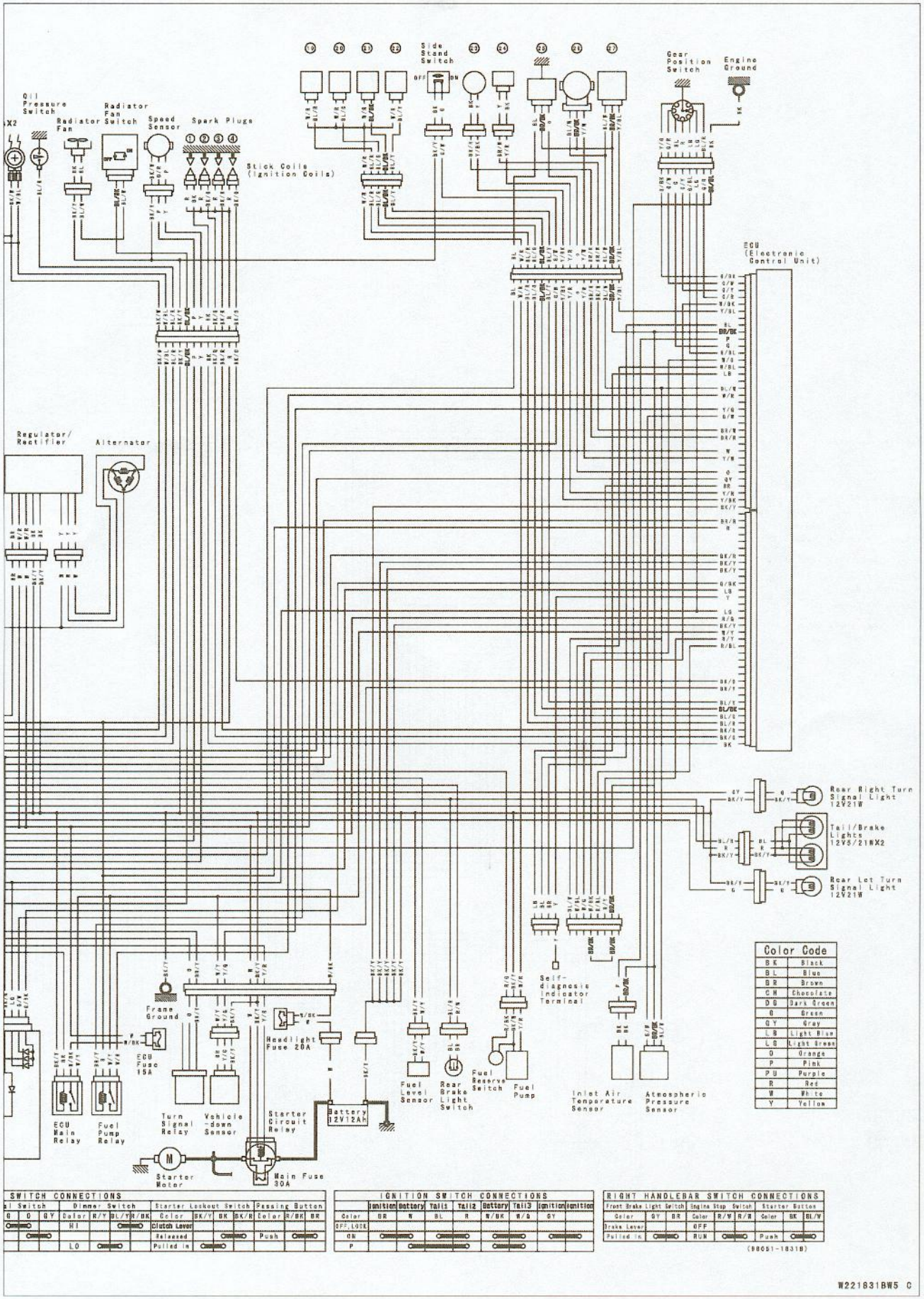
(99051-1948A)

W221948AW5 C

Wiring Diagram (Malaysia)



Wiring Diagram (Malaysia)



Color Code	
BK	Black
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O	Orange
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PU	Purple
R	Red
W	White
Y	Yellow

SWITCH CONNECTIONS																
al Switch			Dimmer Switch				Starter Lockout Switch				Passing Button					
G	O	GY	Color	R/Y	BL/Y	R/BK	Color	BK/Y	BK	BK/R	Color	R/BK	BR			
			HI				Clutch Lever									
							Released				Push					
			LO				Pulled In									

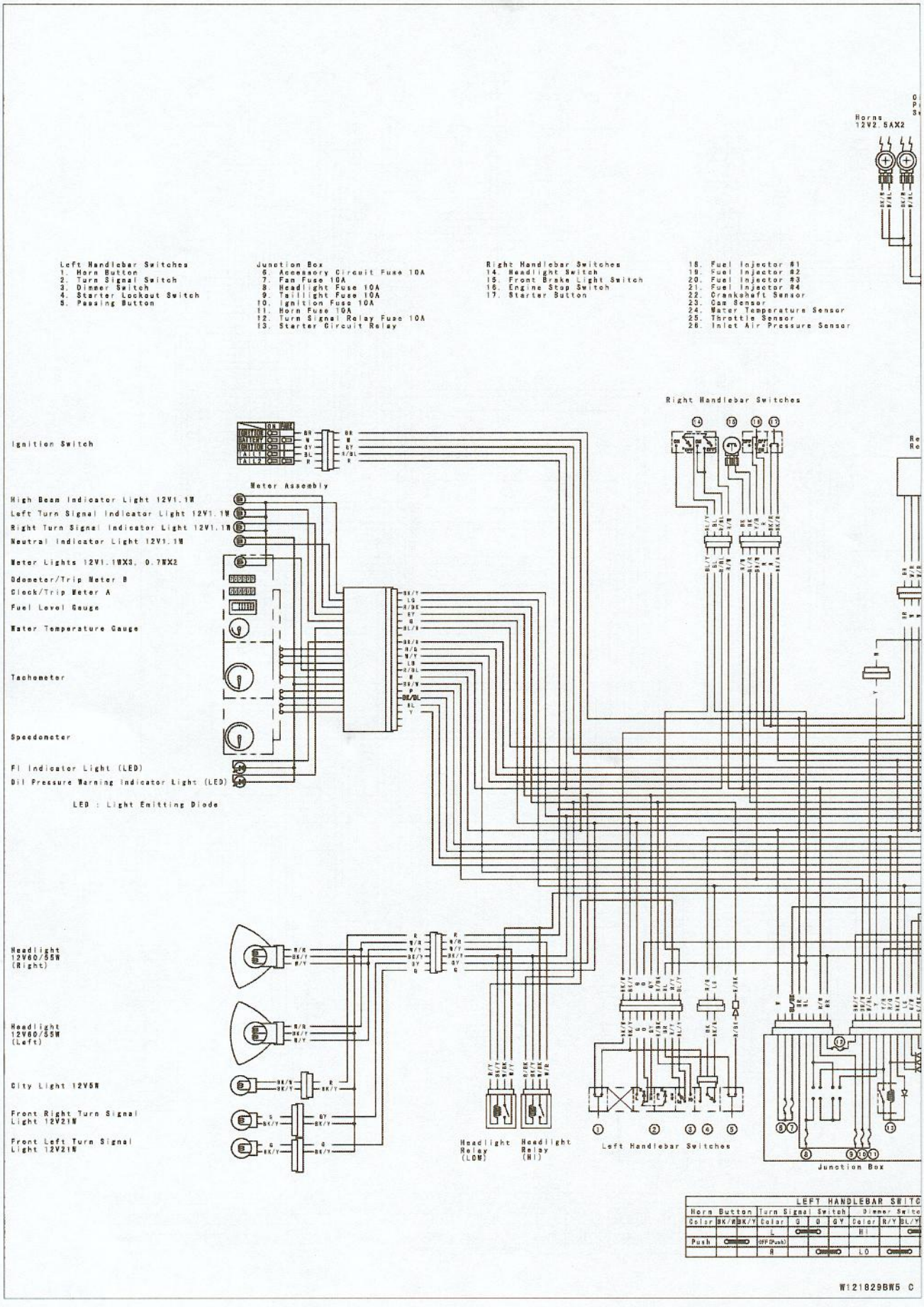
IGNITION SWITCH CONNECTIONS									
	Ignition	Battery	Tail1	Tail2	Battery	Tail3	Ignition	Ignition	
Color	BR	W	BL	R	W/BK	W/G	GY		
OFF, LOCK									
ON									
P									

RIGHT HANDLEBAR SWITCH CONNECTIONS								
Front Brake Light Switch			Engine Stop Switch			Starter Button		
Color	GY	BR	Color	R/W	R/B	Color	BK	BL/W
Brake Lever			OFF					
Pulled In			RUN			Push		

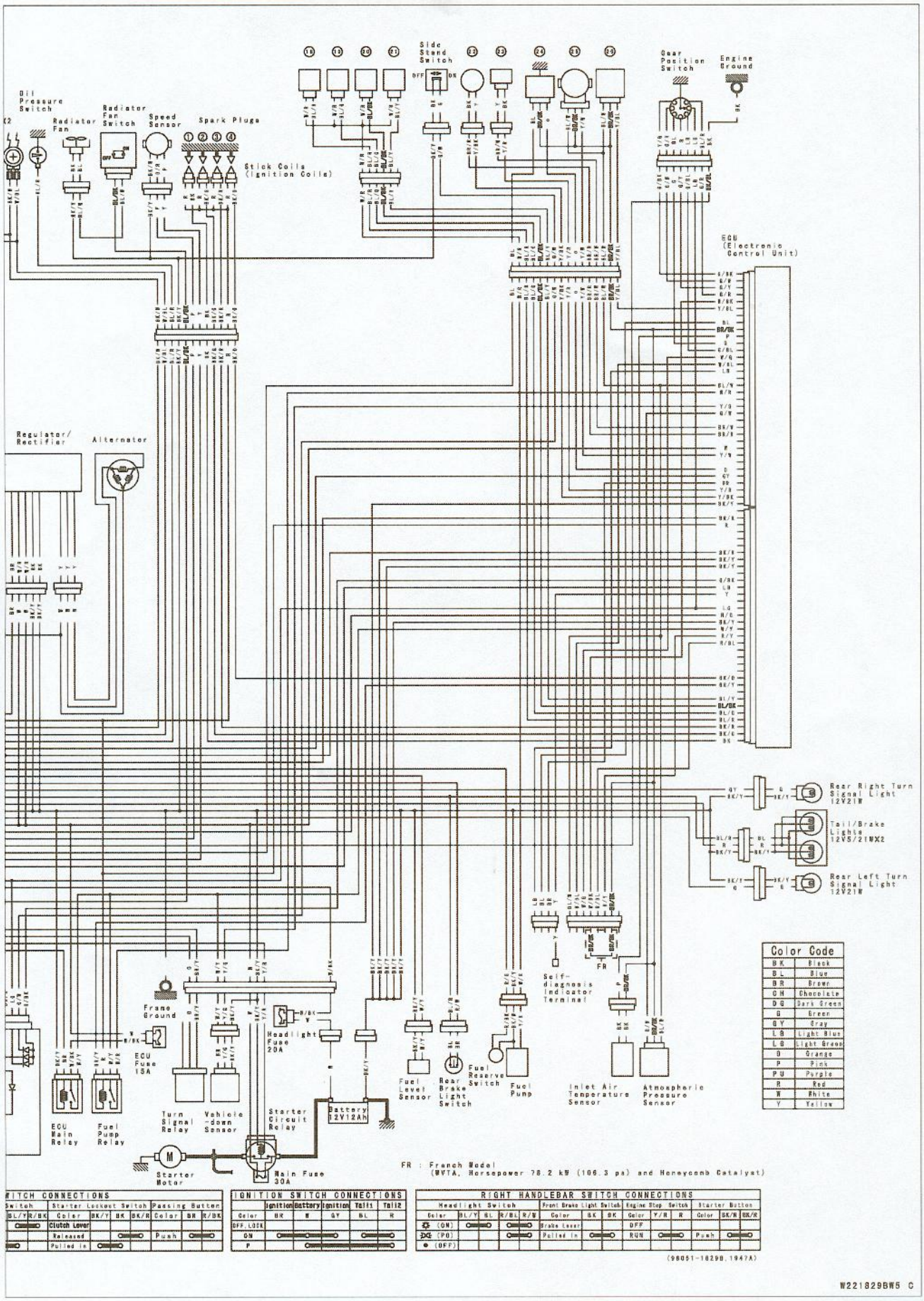
(88CB1-1831B)

W221831BW5 C

Wiring Diagram (Other than U.S.A., Canada, Australia, and Malaysia)



Wiring Diagram (Other than U.S.A., Canada, Australia, and Malaysia)



Appendix

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Additional Considerations for Racing

This motorcycle has been manufactured for use in a reasonable and prudent manner and as a vehicle only. However, some may wish to subject this motorcycle to abnormal operation, such as would be experienced under racing conditions. KAWASAKI STRONGLY RECOMMENDS THAT ALL RIDERS RIDE SAFELY AND OBEY ALL LAWS AND REGULATIONS CONCERNING THEIR MOTORCYCLE AND ITS OPERATION.

Racing should be done under supervised conditions, and recognized sanctioning bodies should be contacted for further details. For those who desire to participate in competitive racing or related use, the following technical information may prove useful. However, please note the following important notes.

- You are entirely responsible for the use of your motorcycle under abnormal conditions such as racing, and Kawasaki shall not be liable for any damages which might arise from such use.
- Kawasaki's Limited Motorcycle Warranty and Limited Emission Control Systems Warranty specifically exclude motorcycles which are used in competition or related uses. Please read the warranty carefully.
- Motorcycle racing is a very sophisticated sport, subject to many variables. The following information is theoretical only, and Kawasaki shall not be liable for any damages which might arise from alterations utilizing this information.
- When the motorcycle is operated on public roads, it **must** be in its original state in order to ensure safety and compliance with applicable regulations.

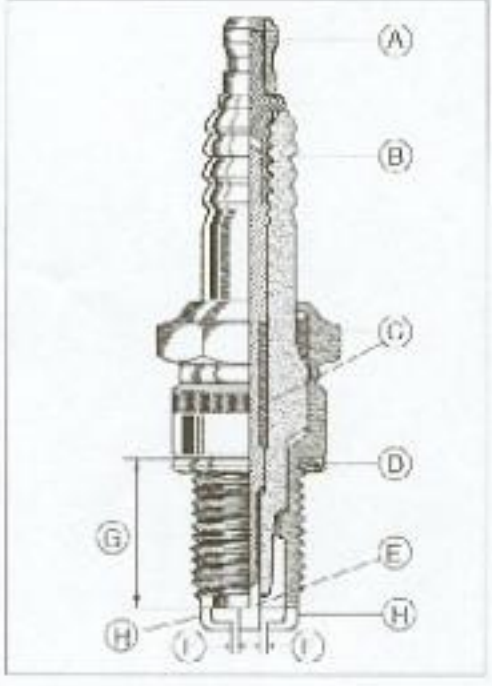
Spark Plug:

The spark plug ignites the fuel and air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plug must be used, and the spark plug must be kept clean and the gap adjusted.

Tests have shown the plug listed in the "General Information" chapter to be the best plug for general use.

Since spark plug requirements change with the ignition and with riding conditions, whether or not a spark plug of the correct heat range is used should be determined by removing and inspecting the plug.

Terminal [A]
Insulator [B]
Cement [C]
Gasket [D]
Center Electrode [E]
Gap [F]
Reach [G]
Side Electrodes [H]



Additional Considerations for Racing

When a plug of the correct heat range is being used, the electrodes will stay hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and the plug itself. This temperature is about 400 - 800°C (750 - 1450°F) and can be judged by noting the condition and color of the ceramic insulator around the center electrode. If the ceramic is clean and of a light brown color, the plug is operating at the right temperature.

A spark plug for higher operating temperatures is used for racing. Such a plug is designed for better cooling efficiency so that it will not overheat and thus is often called a "colder" plug. If a spark plug with too high a heat range is used - that is, a "cold" plug that cools itself too well - the plug will stay too cool to burn off the carbon, and the carbon will collect on the electrodes and the ceramic insulator.

The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause preignition and knocking, which may eventually burn a hole in the top of the piston.

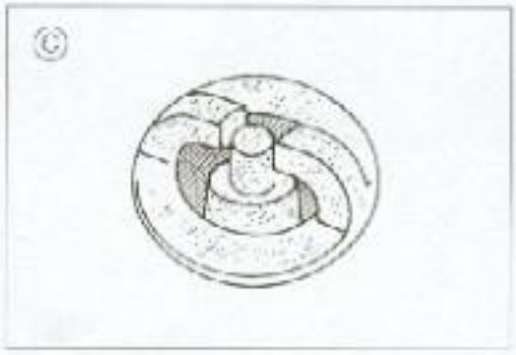
Additional Considerations for Racing

Spark Plug Inspection

- Remove the spark plug and inspect the ceramic insulator.

★Whether or not the right temperature plug is being used can be ascertained by noting the condition of the ceramic insulator around the electrodes. A light brown color indicates the correct plug is being used. If the ceramic is black, it indicates that the plug is firing at too low a temperature, so the next hotter type should be used instead. If the ceramic is white, the plug is operating at too high a temperature and it should be replaced with the next colder type.

Carbon Fouling [A]
Oil Fouling [B]
Normal Operation [C]
Overheating [D]



CAUTION

If the spark plug is replaced with a type other than the standard plug, make certain the replacement plug has the same thread pitch and reach (length of threaded portion) and the same insulator type (regular type or projected type) and the same side electrode type as the standard plug.

If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.

If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.

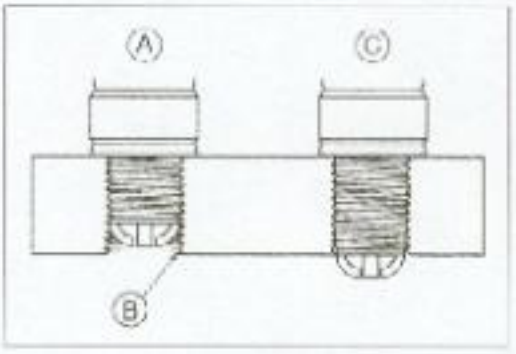
Standard Spark Plug Threads

Diameter:	10 mm (0.39 in.)
Pitch:	1.0 mm (0.039 in.)
Reach:	19 mm (0.75 in.)

NOTE

○ *The heat range of the spark plug functions like a thermostat for the engine. Using the wrong type of spark plug can make the engine run too hot (resulting in engine damage) or too cold (with poor performance, misfiring, and stalling).*

Too short [A]
Carbon builds up here [B]
Correct reach [C]



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
- Fuse blown

Starter motor rotating but engine doesn't turn over:
- Starter clutch trouble

Engine won't turn over:
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure

No fuel flow:
- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

Engine flooded:
- Starting technique faulty

(When flooded, do not crank the engine with the throttle fully opened. This promotes engine flood because more fuel is supplied automatically by DFI.)

No spark; spark weak:
- Vehicle-down sensor (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned OFF
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Stick Coil shorted or not in good contact
- Spark plug incorrect
- IC igniter in ECU trouble
- Cam sensor trouble
- Neutral, starter lockout, or sidestand switch trouble
- Crankshaft sensor trouble
- Stick coil trouble
- Ignition switch or engine stop switch shorted
- Wiring shorted or open
- Fuse blown

Fuel/air mixture incorrect:
- Bypass screw and/or idle adjusting screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing

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)

Poor Running at Low Speed:

Spark weak:
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Stick coil wiring trouble
- Stick coil not in good contact
- Spark plug incorrect
- IC igniter in ECU trouble
- Cam sensor trouble
- Crankshaft sensor trouble
- Stick coil trouble

Fuel/air mixture incorrect:
- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel pump trouble
- Throttle body assy holder loose
- Air cleaner duct loose

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head 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 in ECU trouble
- Throttle body assy not synchronizing
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging
- Air suction valve trouble
- Vacuum switch valve trouble

Poor Running or No Power at High Speed:

Firing incorrect:
- Spark plug dirty, broken, or maladjusted
- Stick coil wiring trouble
- Stick coil not in good contact
- Spark plug incorrect
- Cam sensor trouble
- IC igniter in ECU trouble
- Pickup coil trouble
- Stick coil trouble

Fuel/air mixture incorrect:
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner duct loose
- Air cleaner O-ring damaged
- Water or foreign matter in fuel
- Throttle body assy holder loose
- Fuel to injector insufficient
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking:
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- IC igniter in ECU trouble
- Cam sensor trouble
- Crankshaft sensor trouble

Miscellaneous:
- Throttle valve won't fully open
- Brake dragging
- Clutch slipping
- Overheating
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Air suction valve trouble
- Vacuum switch valve trouble
- Catalytic converters melt down due to muffler over heating (KLEEN)

Overheating:

Firing incorrect:
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- IC igniter in ECU trouble

Muffler overheating:
- For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)
- For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)
- For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil
- For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)
- IC igniter in ECU trouble

Fuel/air mixture incorrect:
- Main jet clogged or wrong size
- Fuel level in carburetor float bowl too low
- Throttle body assy holder loose
- Air cleaner duct loose
- Air cleaner poorly sealed, or missing
- Air cleaner clogged

Compression high:
- Carbon built up in combustion chamber

Engine load faulty:
- Clutch slipping
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging

Lubrication inadequate:
- Engine oil level too low
- Engine oil poor quality or incorrect

Gauge incorrect:
- Water temperature gauge broken
- Water temperature sensor broken

Coolant incorrect:
- Coolant level too low
- Coolant deteriorated
- Wrong coolant mixed ratio

Cooling system component incorrect:
- Radiator fin damaged
- Radiator clogged
- Thermostat trouble
- Radiator cap trouble
- Radiator fan switch trouble
- Fan motor broken
- Fan blade damaged
- Water pump not turning
- Water pump impeller damaged

Over Cooling:

Gauge incorrect:
- Water temperature gauge broken
- Water temperature sensor broken

Cooling system component incorrect:
- Radiator fan switch trouble
- Thermostat trouble

Troubleshooting Guide

Clutch Operation Faulty:

Clutch slipping:
- Friction plate worn or warped
- Steel plate worn or warped
- Clutch spring broken or weak
- Clutch hub or housing unevenly worn
- No clutch lever play
- Clutch inner cable trouble
- Clutch release mechanism trouble

Clutch not disengaging properly:
- Clutch plate warped or too rough
- Clutch spring compression uneven
- Engine oil deteriorated
- Engine oil viscosity too high
- Engine oil level too high
- Clutch housing frozen on drive shaft
- Clutch hub nut loose
- Clutch hub spline damaged
- Clutch friction plate installed wrong
- Clutch lever play excessive
- Clutch release mechanism trouble

Gear Shifting Faulty:

Doesn't go into gear; shift pedal doesn't return:
- Clutch not disengaging
- Shift fork bent or seized
- Gear stuck on the shaft
- Gear positioning lever binding
- Shift return spring weak or broken
- Shift return spring pin loose
- Shift mechanism arm spring broken
- Shift mechanism arm broken
- Shift pawl broken

Jumps out of gear:
- Shift fork ear worn, bent
- Gear groove worn
- Gear dogs and/or dog holes worn
- Shift drum groove worn
- Gear positioning lever spring weak or broken
- Shift fork guide pin worn
- Drive shaft, output shaft, and/or gear splines worn

Overshifts:
- Gear positioning lever spring weak or broken
- Shift mechanism arm spring broken

Abnormal Engine Noise:

Knocking:
- IC igniter in ECU trouble
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- Overheating

Piston slap:
- Cylinder/piston clearance excessive
- Cylinder, piston worn
- Connecting rod bent
- Piston pin, piston pin hole worn

Valve noise:
- Valve clearance incorrect
- Valve spring broken or weak
- Camshaft bearing worn
- Valve lifter worn

Other noise:
- Connecting rod small end clearance excessive
- Connecting rod big end clearance excessive
- Piston ring worn, broken, or stuck
- Piston seizure, damage
- Cylinder head gasket leaking
- Exhaust pipe leaking at cylinder head connection
- Crankshaft runout excessive
- Engine mounts loose
- Crankshaft bearing worn
- Primary gear worn or chipped
- Camshaft chain tensioner trouble
- Camshaft chain, sprocket, guide worn
- Air suction valve damaged
- Vacuum switch valve damaged
- Alternator rotor loose
- Catalytic converters melt down due to muffler overheating (KLEEN)
- Balancer gear worn or chipped
- Balancer shaft position maladjusted
- Balancer bearing worn
- Balancer shaft coupling rubber damper damaged

Abnormal Drive Train Noise:

Clutch noise:
- Clutch damper weak or damaged
- 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
- 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

Exhaust Smokes Excessively:

White smoke:
- Piston oil ring worn
- Cylinder worn
- Valve oil seal damaged
- Valve guide worn
- Engine oil level too high

Black smoke:
- Air cleaner clogged

Brown smoke:
- Air cleaner duct loose
- Air cleaner 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

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)
- Tire air pressure too low
- Front fork oil insufficient and/or leaking
- Front fork oil viscosity too low
- Rear shock adjustment too soft
- Front fork, rear shock absorber spring weak
- Rear shock absorber oil leaking

Brake Doesn't Hold:

- Air in the brake line
- Pad or disc worn
- Brake fluid leakage
- Disc warped
- Contaminated pad
- Brake fluid deteriorated
- Primary or secondary cup damaged in master cylinder
- Master cylinder scratched inside

Battery Trouble:

Battery discharged:
- Battery faulty (too low terminal voltage)
- Battery leads making poor contact
- Load excessive (e.g., bulb of excessive wattage)
- Ignition switch trouble
- Alternator trouble
- Wiring faulty
- Regulator/rectifier trouble

Battery overcharged:
- Regulator/rectifier trouble
- Battery faulty

General Lubrication

Lubrication (Periodic Maintenance)

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

NOTE

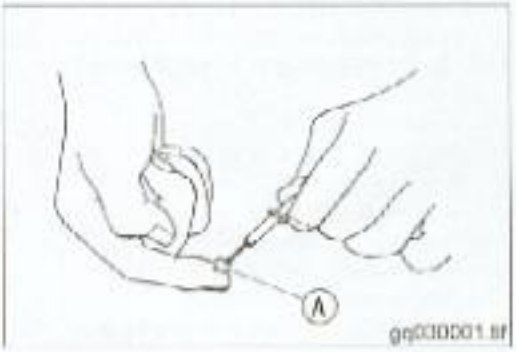
○ *Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

Pivots: Lubricate with Motor Oil.

Rear Brake Rod Joint

Points: Lubricate with Grease.

Clutch Inner Cable Upper and Lower Ends [A]
Throttle Inner Cable Upper and Lower Ends
Fast Idle Inner Cable Upper and Lower end
Clutch Lever Pivot (Apply silicone grease)
Brake Lever Pivot (Apply silicone grease)
Brake Pedal Pivot
Side Stand
Tie-Rod Pivot
Rocker Arm Pivot

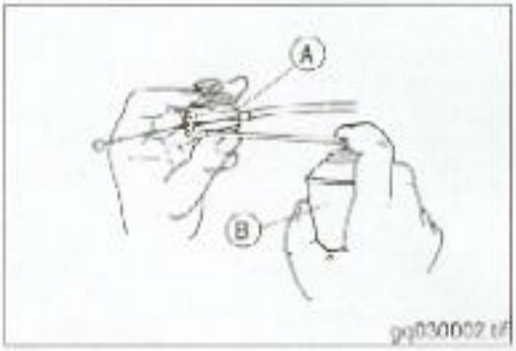


Cables: Lubricate with Cable Lubricant.

Fast Idle Cable
Throttle Cables
Clutch Cable

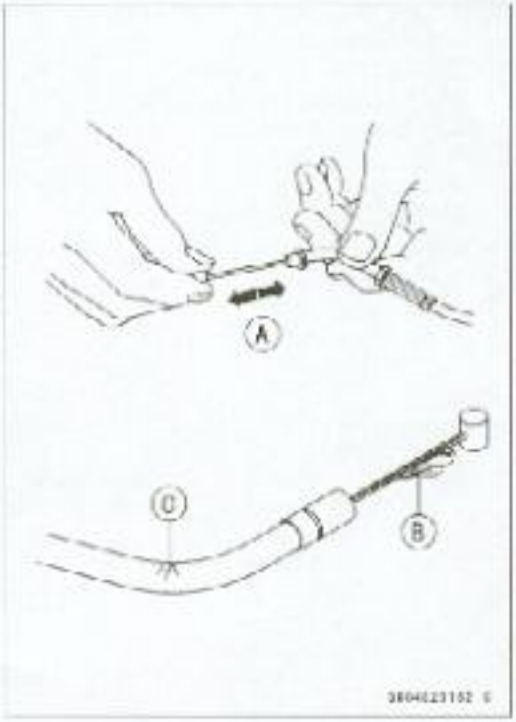
- Lubricate the cables by scoping the oil between the cable and housing.

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



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

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



Nut, Bolt, and Fastener Tightness

Tightness Inspection

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

NOTE

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

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

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

Nut, Bolt and Fastener to be checked

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

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

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

Steering:
- Stem Head Nut
- Handlebar Mounting Bolts

Engine:
- Engine Mounting Bolts and Nuts
- Muffler Mounting Bolts
- Exhaust Pipe Holder Nuts
- Muffler Connecting Clamp Bolt
- Clutch Lever Pivot Nut

Others:
- Sidestand Bolt
- Footpeg Mounting Bolts
- Footpeg Bracket Mounting Bolts

Unit Conversion Table

Prefixes for Units:

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

Units of Mass:

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume:

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

Units of Force:

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

Units of Length:

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

Units of Torque:

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

Units of Pressure:

kPa	×	0.01020	=	kg/cm^2
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cm Hg
kg/cm^2	×	98.07	=	kPa
kg/cm^2	×	14.22	=	psi
cm Hg	×	1.333	=	kPa

Units of Speed:

km/h	×	0.6214	=	mph

Units of Power:

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

Units of Temperature:

$$\frac{9(°C + 40)}{5} - 40 = °F \qquad \frac{5(°F + 40)}{9} - 40 = °C$$