Kawasaki GPz900R

Motorcycle Service Manual

Quick Reference Guide

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

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

Kawasaki

GPz900R

Motorcycle Service Manual

First Edition ① : Feb. 10, 1984 ①

LIST OF ABBREVIATIONS

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

Read OWNER'S MANUAL before operating.

Foreword

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

In order to perform the work efficiently and to avoid costly mistakes, read the text, throughly 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 your warranty period, especially, 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 Motorcycle:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki motorcycles are introduced by the Special Tool Catalog. 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 become 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 served, could result in damage to or destruction of equipment.**

This manual contains five 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 WARNING, CAUTION, or 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.
- ☆ Indicates a conditional sub-step or what action to take based upon the results of the conditional step it follows.

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

General Information

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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 detail 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 Ground

Remove the ground (–) lead from the battery before performing any disassembly operations on the motorcycle. 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) Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, they should all be started in their holes and tightened 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 of 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.

(4) Torque

The torque values given in this Service Manual should always be adhered to. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

(5) 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 plasticfaced 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.

(6) 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.

(7) High Flash-point Solvent

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

(8) Gasket, O-ring

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

(9) Liquid Gasket, Nonpermanent 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 nonpermanent locking agent commonly available in North America is Loctite Lock'n Seal (Blue).

(10) 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.

(11) Ball Bearing

When installing a ball bearing, the bearing race which is affected by friction should be pushed by a suitable driver. This prevents severe stress on the balls and races, and prevents races and balls from being dented. Press a ball bearing until it stops at the stop in the hole or on the shaft.

(12) 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.

(13) Seal Guide

A seal guide is required for certain oil or grease seals during installation to avoid damage to the seal lips. Before a shaft passes through a seal, apply a little oil, preferably high temperature grease on the lips to reduce rubber to metal friction.

(14) Circlip, Retaining Ring

Replace any circlips and retaining rings 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.

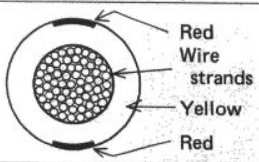
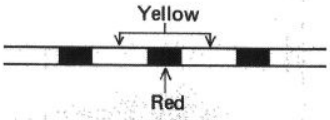
(15) Lubrication

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 singlecolor or twocolor and, with only a few exceptions, must be connected to wires of the same color. On any of the twocolor wires there is a greater amount of one color and a lesser amount of a second color, so a twocolor 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	Picture in Wiring Diagram
	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) Service Data

Numbers pf service data in this text have following meanings:

"Standards": Show dimensions or performances which brand-new parts or systems have.

"Service limits": Indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.

Model Identification

ZL900-A1 Left Side View:

ZL900-A1 Right Side View:

General Specifications

Items	ZX900-A1
Dimensions:	
Overall length	2,200 mm, Ⓒ ⓢⓐ Ⓤ 2,150 mm
Overall width	750 mm
Overall height	1,215 mm
Wheelbase	1,495 mm
Road clearance	140 mm
Seat height	780 mm
Dry weight	2,240 N (228 kg), Ⓒⓐⓛ 2,240 N (228.5 kg)
Curb weight: Front	1,210 N (123 kg), Ⓒⓐⓛ 1,210 N (123.5 kg)
Rear	1,240 N (126 kg)
Fuel tank capacity	22.0 L
Performance:	
Climbing ability	30°
Braking distance	12.5 m from 50 km/h
Minimum turning radius	2.7 m
Engine:	
Type	4-stroke, DOHC, 4-cylinder
Cooling system	Liquid-cooled
Bore and stroke	72.5 x 55.0 mm
Displacement	908 mL
Compression ratio	11.0
Maximum horsepower	Max. 84.6 kW (115 PS) @9,500 r/min (rpm), Ⓒ Ⓤ 80.9 kW (110 PS) @9,500 r/min (rpm), Ⓢ 50.7 kW (69 PS) @6,000 r/min (rpm)
Maximum torque	85.3 N-m (8.7 kg-m, 62.9 ft-lb) @8,500 r/min (rpm) Ⓢ 85.3 N-m (8.7 kg-m, 62.9 ft-lb) @5,000 r/min (rpm)
Carburetion system	Carburetors, Keihin CVK34 x 4
Starting system	Electric starter
Ignition system	Battery and coil (transistorized)
Timing advance	Electronically advanced
Ignition timing	From 10° BTDC @1,000 r/min (rpm) to 35° BTDC @3,500 r/min (rpm)
Spark plug	NGK DR8ES or ND X27ESR-U Ⓒ NGK DR8ES-L or ND X24ESR-U Ⓞ Ⓘ NGK D9EA or ND X27ES-U Ⓤ NGK D8EA or ND X24ES-U

(Continued on next page.)

Items		ZX900-A1
Cylinder numbering method		Left to right, 1-2-3-4
Firing order		1-2-4-3
Valve timing:		
Inlet	Open	45° BTDC
	Close	65° ABDC
	Duration	290°
Exhaust	Open	65° BBDC
	Close	45° ATDC
	Duration	290°
Lubrication system		Forced lubrication (wet sump with cooler)
Engine oil:		
Grade		SE class
Viscosity		SAE10W40, 10W50, 20W40, or 20W50
Capacity		4.0 L
Drive Train:		
Primary reduction system:		
Type		Gear
Reduction ratio		1.732 (97/56)
Clutch type		Wet multi disc
Transmission:		
Type		6-speed, constant mesh, return shift
Gear ratios:	1st	2.800 (42/15)
	2nd	2.000 (38/19)
	3rd	1.590 (35/22)
	4th	1.333 (32/24)
	5th	1.153 (30/26)
	6th	1.035 (29/28)
Final drive system:		
Type		Chain drive
Reduction ratio		2.882 (49/17), Ⓒ Ⓤ 2.941 (50/17)
Overall drive ratio		5.170, Ⓒ Ⓤ 5.276 @Top gear
Frame:		
Type		Tubular, diamond
Caster (rake angle)		29°
Trail		114 mm
Front tire:		
Type		Tubeless
Size		120/80V16-V250
Rear tire:		
Type		Tubeless
Size		130/80V18-V250

Items	ZX900-A1
Front suspension:	
Type	Telescopic fork (pneumatic)
Wheel travel	140 mm
Rear suspension:	
Type	Swing arm (unitrak)
Wheel travel	115 mm
Brake type:	
Front	Dual disc
Rear	Single disc
Electrical Equipment:	
Battery	12 V 14 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 60/55 W (quartz-halogen)
Tail/brake light	12 V 5/21 W x 2 , Ⓒ ⓈⒶ Ⓤ 12 V 8/27 W x 2
Alternator:	
Type	Three-phase AC
Rated output	25 A @6,000 r/min (rpm), 14 V
Voltage regulator:	
Type	Short-circuit

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

Ⓒ : Canadian Model
Ⓒal : Californian Model
Ⓘ : Italian Model
Ⓞ : Other than Europe Model
Ⓢ : Swiss Model
ⓈⒶ : South Aflican Model
Ⓤ : US Model

Periodic Maintenance Chart

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

OPERATION \ FREQUENCY	Every (Whichever comes first)	*ODOMETER READING 800 km	5,000 km	10,000 km	15,000 km	20,000 km	25,000 km	30,000 km	See Page
Spark plug — clean		•	•	•	•	•	•	•	16-23
Spark plug — check †		•	•	•	•	•	•	•	16-23
Valve clearance — check †		•	•	•	•	•	•	•	4-18
Air suction valve (US) — check †			•	•	•	•	•	•	4-7
Air cleaner element — clean			•		•		•		2-13
Air cleaner element — replace	5 cleanings			•		•		•	2-13
Throttle grip play — check †		•	•	•	•	•	•	•	2-5
Idle speed — check †		•	•	•	•	•	•	•	2-7
Engine vacuum synchronization — check †		•	•	•	•	•	•	•	2-7
Fuel system cleanliness — check †				•		•		•	2-9
Cylinder head bolt tightness — check †		•		•		•		•	4-3
Coolant — change	2 years							•	3-4
Evaporative emission control system (Cal) — check †		•	•	•	•	•	•	•	2-15
Engine oil — change	year	•	•	•	•	•	•	•	6-6
Oil filter — replace		•		•		•		•	6-6
Radiator hoses, connections — check †	year	•		•		•		•	3-10
Fuel hose — replace	4 years								
Clutch fluid level — check †	month	•	•	•	•	•	•	•	5-5
Clutch fluid — change	year			•		•		•	5-5
Clutch fluid hose and pipe — replace	4 years								5-7
Clutch master cylinder cup and dust seal — replace	2 years								5-7
Clutch slave cylinder piston seal — replace	2 years								5-8
Drive chain wear — check †			•	•	•	•	•	•	10-5
Drive chain — lubricate	300 km								10-5
Drive chain slack — check †	800 km								10-4
Brake lining wear — check †			•	•	•	•	•	•	11-8
Brake fluid level — check †	month	•	•	•	•	•	•	•	11-12
Brake fluid — change	year			•		•		•	11-13
Brake hose and pipe — replace	4 years								11-15
Anti-dive brake plunger assembly — replace	2 years								12-10

OPERATION \ FREQUENCY	Whichever comes first ➡ ⬇ Every	*ODOMETER READING 800 km	5,000 km	10,000 km	15,000 km	20,000 km	25,000 km	30,000 km	See Page
Brake master cylinder cup and dust seal — replace	2 years								11-9
Caliper piston seal and dust seal — replace	2 years								11-6
Brake light switch — check †		•	•	•	•	•	•	•	16-34
Steering — check †		•	•	•	•	•	•	•	13-4
Steering stem bearing — lubricate	2 years					•			13-6
Front fork oil — change				•		•		•	12-5
Tire wear — check †			•	•	•	•	•	•	9-9
Wheel bearing — lubricate	2 years					•			9-12
Speedometer gear — lubricate	2 years					•			9-13
Swing arm pivot, uni-trak linkage — lubricate				•		•		•	12-14
Battery electrolyte level — check †	month	•	•	•	•	•	•	•	16-9
General lubrication — perform			•	•	•	•	•	•	17-8
Nut, bolt, and fastener tightness — check †		•		•		•		•	17-8

* : For higher odometer readings, repeat at the frequency interval established here.
† : Replace, add, adjust, clean, or torque if necessary.
(Cal) : California vehicle only
(US) : US only

Fuel System

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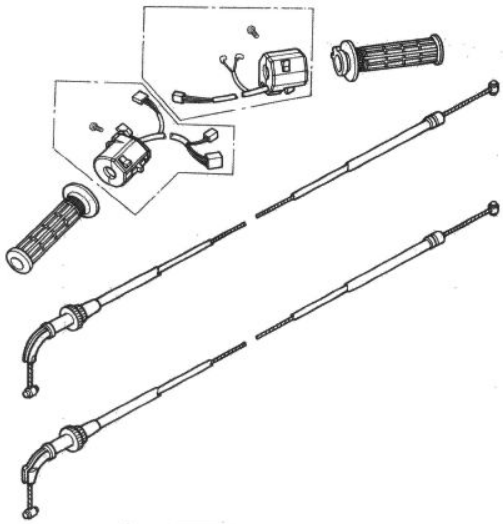
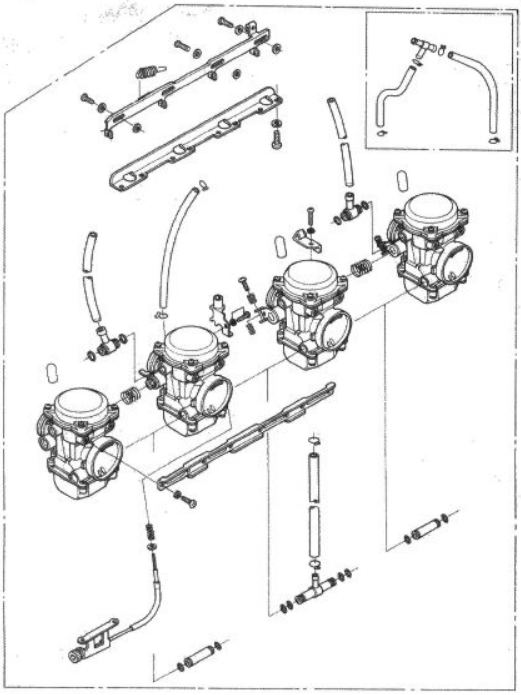
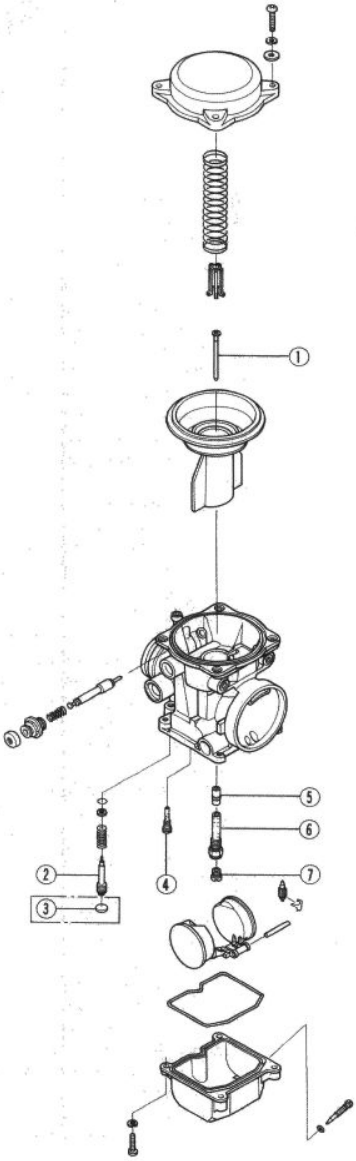
Fuel Gauge and Level Sensor
(see Electrical System chapter)

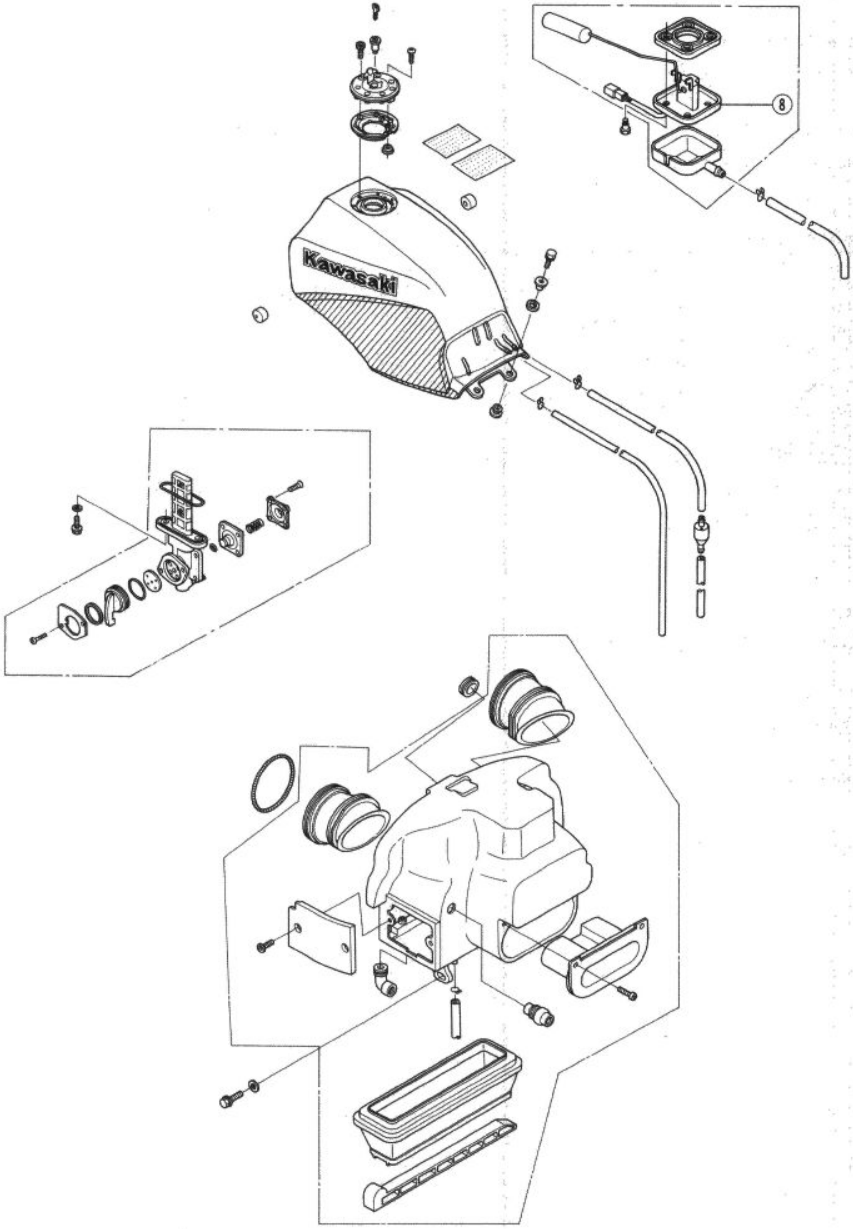
Exploded View







1. Jet Needle
2. Pilot Screw
3. Plug (US model only)
4. Pilot Jet
5. Needle Jet
6. Needle Jet Holder
7. Main Jet
8. Fuel Level Sensor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Kawasaki

Specifications

Throttle Grip Free Play

Standard: 2 – 3 mm

Choke Cable Free Play

Standard: 2 – 3 mm

Carburetor Specifications

Make/Type	Keihin/CVK34
MainJet	132, Ⓢ Ⓤ 135, (Cal) 138
Main Air Jet	100
Jet Needle	N27B, Ⓤ N27A
Pilot Jet	35
Pilot Air Jet	160
Pilot Screw	2½ turns out, Ⓤ —
Starter Jet	42, (Cal) 38
Fuel Level	–0.5 mm
Float Helight	17 mm

(Cal) : Californian model
Ⓢ : Swiss model
Ⓤ : US model

Idle Speed

Standard: 1,000 ±50 r/min (rpm)

Air Cleaner Element Oil

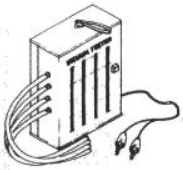
Grade: SE class
Viscosity: SAE 30

Special Tools

Along with common hand tools, the following more specialized tools are required for complete fuel system servicing.

Fuel Level Gauge: 57001-1017

Vacuum Gauge: 57001-1152

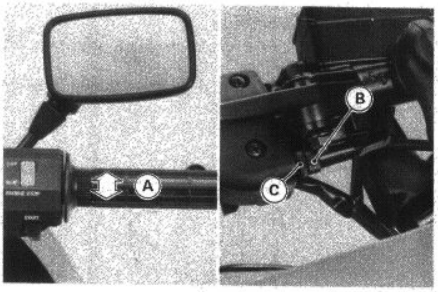


Throttle Grip and Cable

Throttle Grip Play Inspection

●Check throttle grip free play.
★If free play is not correct, adjust the throttle cable.

Throttle Grip Free Play
2 – 3 mm



A. Throttle Grip Free Play
B. Adjuster
C. Locknut

★If the free play is correct make the following test:
●Start the engine.
●Turn the handlebar from side to side while idling the engine.
★If idle speed varies, the throttle cable may be poorly routed or it may be damaged.
●Correct any problem before operating the motorcycle.

WARNING

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

Throttle Cable Adjustment

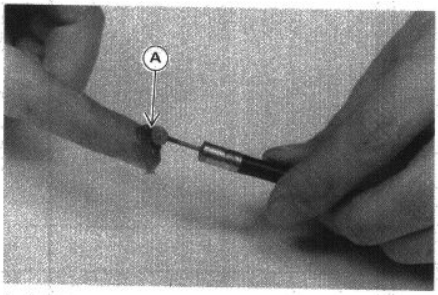
●Loosen the locknut at the upper end of the throttle cable.
●Turn the adjuster until throttle grip free play is correct. Turning the adjusting nut OUT (lengthening the adjusting nut) will reduce play.
●Tighten the locknut.
●Start the engine.
●Turn the handlebar from side to side while idling the engine.
★If idle speed varies, the throttle cable may be poorly routed or it may be damaged.
●Correct any problem before operating the motorcycle.

WARNING

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

Throttle Cable Lubrication

Whenever the throttle cable is removed, and in accordance with the Periodic Maintenance Chart (see General Information chapter), perform the following.
●Apply a thin coating of grease to the throttle cable lower end.



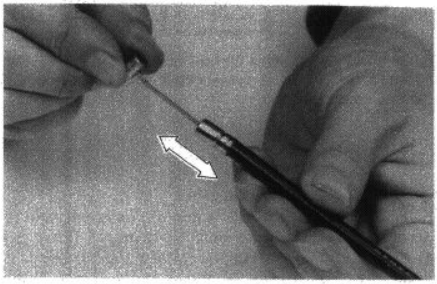
A. Apply grease.

●Lubricate the throttle cable by seeping the oil between the cable and cable housing.

Cable Lubrication

Throttle Cable Inspection

●With the throttle cable disconnected at both ends, the cable should move freely within the cable housing.



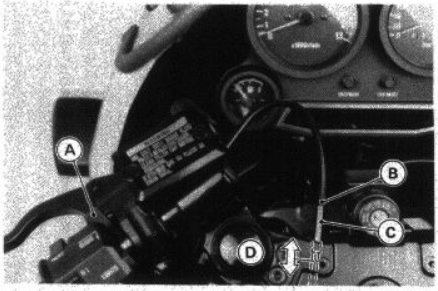
Choke Cable

Choke Cable Free Play Inspection

- Check that the choke lever returns properly and that the inner cable slides smoothly.

★If there is any irregularity, check the choke cable as following:

- Push the choke lever back all the way to its released position.
- Determine the amount of choke cable play at the adjusting nut of the choke cable. Pull out and push in the cable housing; the amount of cable travel is the amount of cable free play.



A. Choke Lever
B. Locknut
C. Adjusting Nut
D. Play

★If free play is not correct, adjust the choke cable.

Choke Cable Free Play

2 – 3 mm

Choke Cable Adjustment

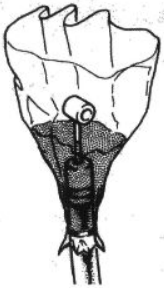
- Loosen the locknut at the adjusting nut of the choke cable, and turn the adjusting nut until the cable has the proper amount of play.
- Tighten the locknut after adjustment.

Choke Cable Lubrication

Whenever the choke cable removed, lubricate the choke cable as following.

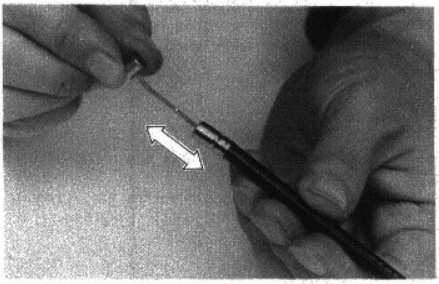
- Lubricate the choke cable by seeping the oil between the cable and cable housing.

Cable Lubrication



Choke Cable Inspection

- With the choke cable disconnected at the both ends, the cable should move freely within the cable housing.



★If cable movement is not free after lubricating (see Choke Cable Lubrication), if the cable is frayed, or if the housing is kinked, replaced the cable.

Carburetors

Idle Speed Inspection

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

★If handlebar movement changes the idle speed; the throttle cable may be improperly adjusted or incorrectly routed, or it may be damaged. Be sure to correct any of these conditions before riding.

WARNING

○**Operation with improperly adjusted incorrectly routed, or a damaged cable could result in an unsafe riding condition.**

- Check idle speed.

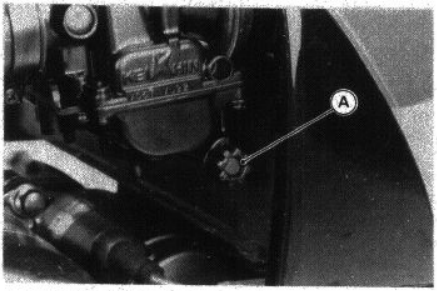
★If the idle speed is out of the specified range, adjust it.

Idle Speed

1,000 ±50 r/min (rpm)

Idle Speed Adjustment

- Turn the adjusting screw until idle speed is correct.



A. Adjusting Screw

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

Vacuum Synchronization Inspection

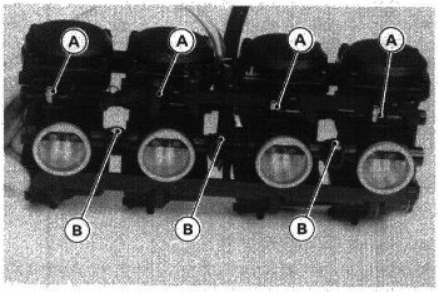
- Warm up the engine.
- Check idle speed and adjust if necessary.
- Remove the fuel tank.
- Supply fuel to the carburetors with an auxiliary fuel tank.

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 spark; this includes any appliance with a pilot light.**

- Attach vacuum gauge 57001-1152 to the vacuum hose fittings on the carburetors.

(Viewed from front)



A. Vacuum Hose Fitting B. Adjusting Screw

- Start the engine and idle to measure the engine intake vacuum.

★If the intake vacuum difference between any two cylinders exceeds the limit synchronize the carburetor butterfly valves.

Engine Vacuum Synchronization

Less than 2.7 kPa (2 cmHg) difference between any two cylinders

- Remove the vacuum gauge, connect vacuum hose(s), vacuum hose fitting(s), and/or put cap(s) back on fitting(s).
- Install the fuel tank.

Butterfly Valve Synchronization

- Turn the adjusting screws to synchronize the butterfly valves.

NOTE

○*With the engine idling, first synchronize the left two or right two cylinders by means of the adjusting screw between No. 1 and No. 2 cylinders, or No. 3 and No. 4 cylinders. Then synchronize the left two cylinders and the right two cylinders using the center adjusting screw.*

- Check idle speed and adjust if necessary.

Fuel Level Inspection

WARNING

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

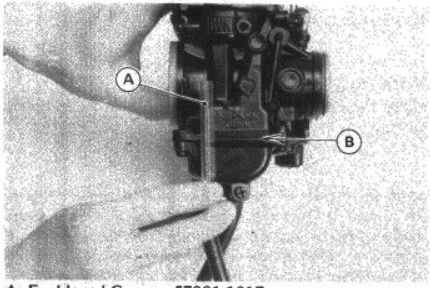
- Remove the carburetors, and hold them in true vertical position on a stand.
- Put the fuel tank on a bench, and connect the fuel tap to the carburetors using a suitable hose.
- Prepare a rubber hose (6 mm in diameter and about 300 mm long).
- Connect fuel level gauge 57001-1017 to the carburetor float bowl with the rubber hose.
- Hold the gauge vertically against the side of the carburetor body so that the "zero" line is several millimeters higher than the bottom edge of the carburetor body.
- Turn the fuel tap to the PRI position to feed fuel to the carburetor, then turn out the carburetor drain plug a few turns.
- Wait until the fuel level in the gauge settles.
- Keeping the gauge vertical, slowly lower the gauge until the "zero" line is even with the bottom edge of the carburetor body.

NOTE

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

- Read the fuel level in the gauge and compare it to the specification. Screw in the carburetor drain plug.
- Turn the fuel tap to the ON position and remove the fuel level gauge.
- Inspect the fuel level in the other carburetors in the same manner.

★If the fuel level is incorrect, adjust it (see Fuel Level Adjustment).



A. Fuel Level Gauge: 57001-1017
B. Carburetor Body Bottom Edge

Fuel Level

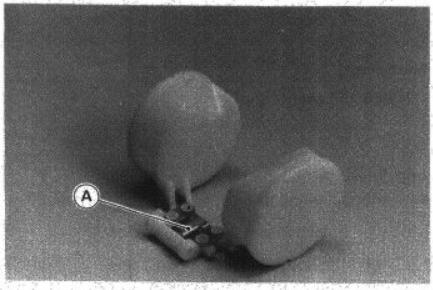
0.5 ±1 mm above the bottom edge of carburetor body

Fuel Level Adjustment

- Read the WARNING in the Fuel Level Inspection.
- Drain fuel from the carburetors into a suitable container.
- Remove the float bowl by taking out the screws with lockwashers.
- Slide out the pivot pin and remove the float.
- Bend the tang on the float arm very slightly to change the float height. Increasing the float height lowers the fuel level and decreasing the float height raises the fuel level.

Float Height

17.0 mm

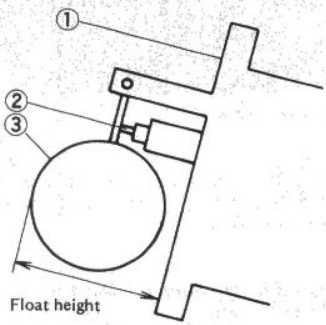


A. Tang

- Assemble the carburetor, and recheck the fuel level.

★If the fuel level cannot be adjusted by this method, the float or the float valve is damaged.

Float Height Measurement-Keihin Carburetor



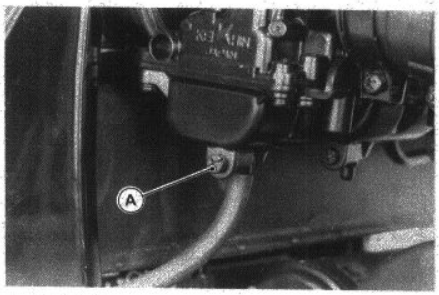
1. Float bowl mating surface
2. Float valve needle rod (contacted but unloaded)
3. Float

Fuel System Cleanliness Inspection

WARNING

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

●Connect a suitable hose to the fitting at the bottom of each carburetor float bowl.
●Run the lower ends of the hoses into a suitable container.
●Turn the fuel tap to the PRI position.
●**Turn out** each drain plug a few turns and drain the **float bowls.**



A. Drain Plug

●Check to see if water or dirt comes out.
●Tighten the drain plugs and turn the fuel tap to ON position.
★If any water or dirt appeared during the above inspection, clean the fuel system (see Carburetor Cleaning and Fuel Tank and Tap Cleaning).

Carburetor Removal/Installation Notes

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.**

●After removing the carburetors, stuff pieces of lint-free, clean cloths into the carburetor holders and the intake ducts to keep the dirt out of the engine and air cleaner.

WARNING

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

CAUTION

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

●After installing the carburetors, perform the following.
○Check fuel leakage from the carburetors.

WARNING

○**Fuel spilled from the carburetors is hazardous.**

○Adjust the following items if necessary.
Idle speed
Vacuum Synchronization
Throttle cable
Choke cable

Carburetor Disassembly/Assembly Notes

●Read the WARNINGS in the Carburetor Removal/Installation Points.
●For the US model, remove the pilot screw plug as follows:
○Punch a hole in the plug and pry it at with an awl or other suitable tool.
●Turn in the pilot screw and count the number of turns until it seats fully but not tightly, and then remove the screw. This is to set the screw to its original position when assembling.
●After installing the upper chamber cover, check that the vacuum piston slides up and down smoothly without binding in the carburetor bore.

CAUTION

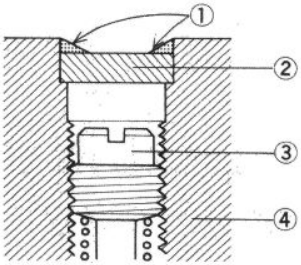
○**During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.**

●Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly.
●For the US model, install the pilot screw plug as follow:
○Install a new plug in the pilot screw hole, and apply a small amount of a bonding agent to the circumference of the plug to fix the plug.

CAUTION

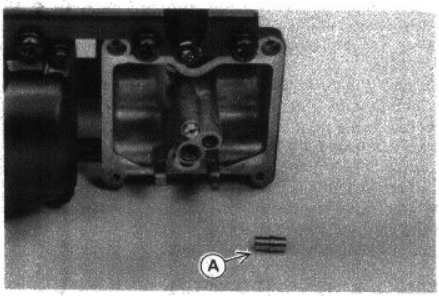
○**Do not apply too much bond on the plug to keep the pilot screw itself from being fixed.**

Plug Installation (US model only)



1. Apply a bonding agent.
2. Plug
3. Pilot screw
4. Carburetor body

•Turn the carburetor body upside-down, and drop the needle jet into place so that the smaller diameter end of the jet goes in first.



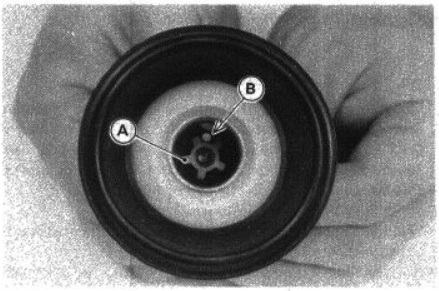
A. Small End

•Carefully screw in the air bleed pipe. It will seat against the needle jet, pushing the end of the jet into the carburetor bore.

CAUTION

○**Do not force the air bleed pipe or overtighten it. The needle jet or the carburetor body could be damaged requiring replacement.**

•Slip the needle through the hole in the center of the vacuum piston, and put the spring seat on the top of the needle. Turn the seat so that it does not block the hole at the bottom of the vacuum piston.



A. Spring Seat B. Hole

Carburetor Separation/Assembly Notes

•Read the WARNINGS in the Carburetor Removal/Installation Notes.

•The center lines of the carburetor bores must be parallel both horizontally and vertically. If they are not, loosen the mounting screws and align the carburetors on a flat surface. Retighten the mounting screws.

•After assembling the choke mechanism, check to see that the choke shaft slides right to left smoothly without abnormal friction.

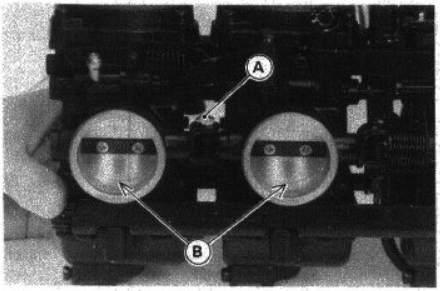
CAUTION

○**Fuel mixture trouble could result if the starter does not seat properly in its rest position after the choke knob it returned.**

•Visually synchronize the throttle (butterfly) valves.

○Check to see that all throttle valves open and close smoothly without binding when turning the pulley.

○Visually check the clearance between the throttle valve and the carburetor bore in each carburetor.



A. Balance Adjusting Screw
B. Clearance

☆If there is a difference between any two carburetors, turn the balance adjusting screw(s) to obtain the same clearance.

Carburetor Cleaning

WARNING

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

CAUTION

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

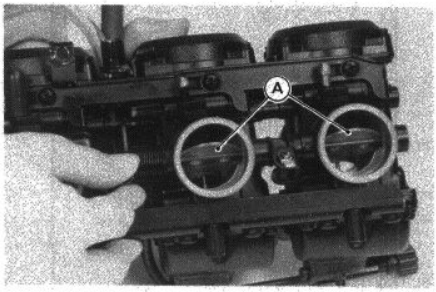
●Disassemble the carburetors.
●Immerse all the metal parts in a carburetor cleaning solution.
●Rinse the parts in water.
●When the parts are clean, dry them with compressed air.
●Blow through the air and fuel passages with compressed air.
●Assemble the carburetors.

Carburetor Inspection

WARNING

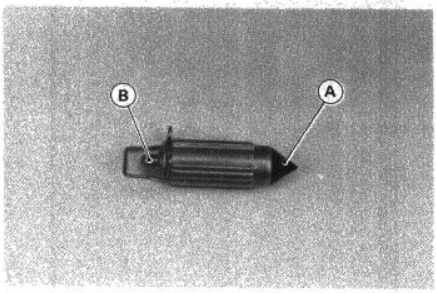
○Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

●Remove the carburetors.
●Before disassembling the carburetors, check the fuel level (see Fuel Level Inspection).
★If the fuel level is incorrect, inspect the rest of the carburetor before correcting it.
●Move the choke shaft left and release it to check that the starter plungers move smoothly and return with spring tension.
★If the starter plungers do not work properly, replace the carburetors.
●Turn the throttle cable pulley to check that the throttle butterfly valves move smoothly and return back with the spring tension.
★If the throttle valves do not more smoothly, replace the carburetors.



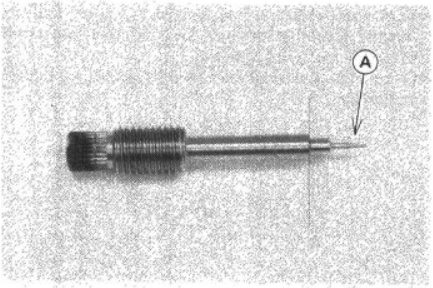
A. Throttle Valves

●Disassemble the carburetors.
●Clean the carburetors.
●Check that the O-rings on the float bowl and drain plug and the diaphragm on the vacuum piston are in good condition.
★If any of the O-rings or diaphragms are not in good condition, replace them.
●Check the plastic tip of the float valve needle. It should be smooth, without any grooves, scratches, or tears.



A. Tip B. Rod

★If the plastic tip is damaged, replace the needle.
●Push in the rod in the other end of the float valve needle and then replace it.
★If it does not spring out, replace the needle.
●Check the tapered portion of the pilot screw for wear or damage.

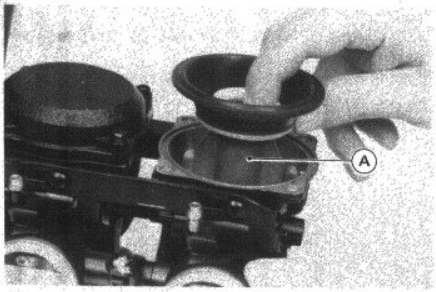


A. Tapered Portion

★If the pilot screw is worn or damaged on the tapered portion, it will prevent the engine from idling smoothly. Replace it.

●Check that the vacuum piston moves smoothly in the carburetor body. The surface of the piston must not be excessively worn.

★If the vacuum piston does not move smoothly, or if it is very loose in carburetor body, replace both the body and the vacuum piston.



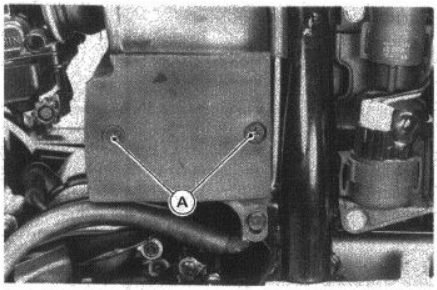
A. Vacuum Piston

Air Cleaner

Air Cleaner Element Removal

●Remove the left side cover.

●Remove the air cleaner cover by taking out the screws.



A. Screws

●Pull out the air cleaner element holder, and take off the element.

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

WARNING

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

CAUTION

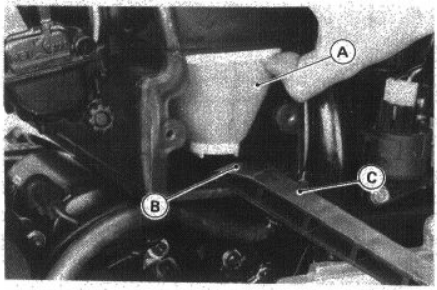
○**If dirt gets through into the engine, excessive engine wear and possibly engine damage will occur.**

Air Cleaner Element Installation

●Element installation is the reverse of removal. Note the following.

●Meet the element sponge with the body opening.

●While pushing the element, against the opening, insert the element holder with the chamfer facing upwards. The element holder should be easily installed.



A. Element
B. Chamfer
C. Holder

Air Cleaner Element Cleaning

NOTE

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

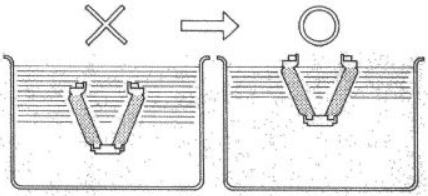
●Remove the air cleaner element (see Air Cleaner Element Removal).

WARNING

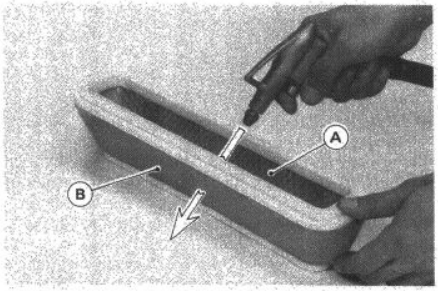
○**Clean the element in a well-ventilated area, and take care that there is no spark or flame near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents to clean the element.**

●Clean the element in a bath of a high flash-point solvent, and then dry it with compressed air or by shaking it.
○When rinsing the element in solvent, do not mix the element inside bath and the element outside bath to prevent the contamination of the inside element.

Element Rinse

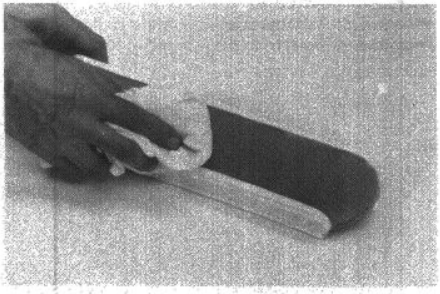


○Dry the element by directing a stream of compressed air from the inside to the outside (from the clean side to the dirty side).



A. Inside B. Outside

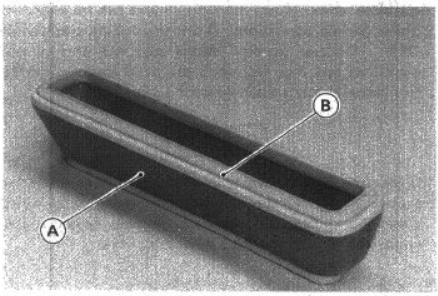
●After cleaning, saturate a clean, lint-free towel with SE class SAE 30 oil and apply the oil to the element by tapping the element outside with the towel.



●Inspect the element before installing it (see Air Cleaner Element Inspection and Replacement and Air Cleaner Element Installation).

Air Cleaner Element Inspection and Replacement

●Remove the air cleaner element (see Air Cleaner Element Removal).
●Clean the air cleaner element (see Air Cleaner Element Cleaning).
●Visually check the element for tears or breaks. Check the sponge gasket also, and the plastic frame.



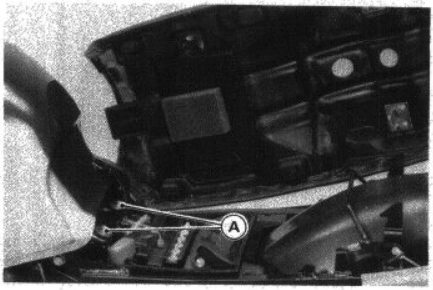
A. Element B. Gasket

★If the element or gasket have any tears or breaks, replace the element.
★If the element frame is damaged or distorted, replace the element.
★If the sponge gasket comes loose, stick it back on with an adhesive sealant.
●Repeated cleaning opens the pores of the foam in the element. Replace the element according to the Periodic Maintenance Chart (see General Information chapter).

Fuel Tank

Fuel Tank Removal

- Remove the seat and both side covers.
- Remove the bolts from the rear end of the tank.



A. Bolts

- Turn the fuel tap on the ON position.
- Pull the hoses off the tank and tap.
- ○For California vehicles, the breather and fuel return hoses must be disconnected from the tank fittings before tank removal. Plug the fuel return fitting. This prevents gasoline from flowing into the canister.

WARNING

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

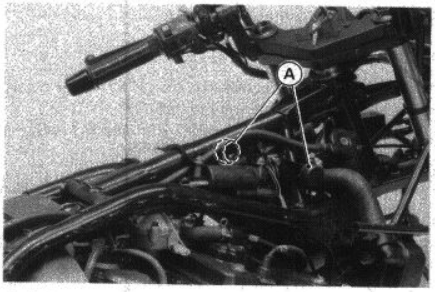
CAUTION

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

- Tilt the tank out the rear of the frame.
- Disconnect the fuel level sensor leads.
- Drain the fuel tank.
- ○Arrange a suitable container under the fuel tank.
- ○Turn the fuel tap PRI to drain the fuel into the container.

Fuel Tank Installation

- Fuel Tank installation is the reverse of removal. Note the following.
- Read the WARNING the Fuel Tank Removal section.
- Check the rubber dampers on the frame top-tube.



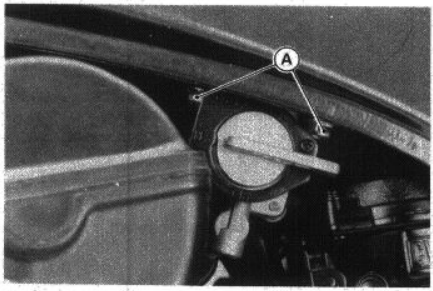
A. Dampers

★If the dampers are damaged or deteriorated, replace them.

- Be sure the hoses are clamped to the fuel tap and fuel tank to prevent leaks.

Fuel Tap Removal

- Remove the fuel tank and drain it (see Fuel Tank Removal).
- Remove the bolts with nylon flat washers and take out the fuel tap.



A. Bolts

Fuel Tap Installation

- Fuel tap installation is the reverse of removal. Note the following.
- Be sure the O-ring is in good condition to prevent leaks.
- Be sure to clamp the fuel hose to the tap to prevent leaks.
- Be sure the nylon washers are in good condition to prevent leaks.
- ○Do not use steel washers in place of the nylon washers, because they will not seal the bolts properly and fuel will leak.

Fuel Tank and Tap Cleaning

- Remove the fuel tank and drain it (see Fuel Tank Removal).
- Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.

WARNING

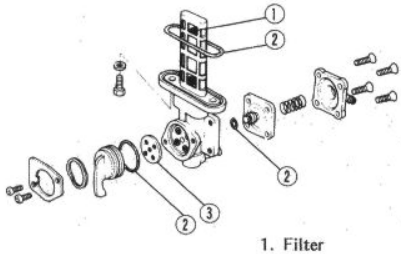
○**Clean the tank in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents to clean the tank.**

- Pour the solvent out of the tank.
- Remove the fuel tap from the tank by taking out the bolts with nylon washers.
- Clean the fuel tap filter screens in a high flash-point solvent.
- Pour high flash-point solvent through the tap in all lever positions.
- Dry the tank and tap with compressed air.
- Install the tap in the tank (see Fuel Tap Installation).
- Install the fuel tank (see Fuel Tank Installation).

Fuel Tap Inspection

- Remove the fuel tap (see Fuel Tap Removal).
- Check the fuel tap filter screens for any breaks or deterioration.

Fuel Tap



1. Filter
2. O-ring
3. Gasket

★If the fuel tap screens have any breaks or are deteriorated, it may allow dirt to reach the carburetor, causing poor running. Replace the fuel tap.

★If the fuel tap leaks, or allows fuel to flow when it is ON or RES without engine running, replace the damaged gasket or O-ring.

Fuel Tank and Cap Inspection

- Visually inspect the gaskets on the tank and cap for any damage.

★Replace the gaskets if they are damaged.

- Remove the hose(s) from the fuel tank, and open the tank cap.
- Check to see if the breather and water drain pipes (also the fuel return pipe for the US California vehicle) in the tank do not cloged up. Check the tank cap breather too.

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

Evaporative Emission Control System (US California Vehicle 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 inspection must be made at the intervals specified by the Periodic Maintenance Chart.

Parts Removal/Installation Notes

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 greately reduced. If the canister does become contaminated replace it with a new one.**

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

Hose Inspection

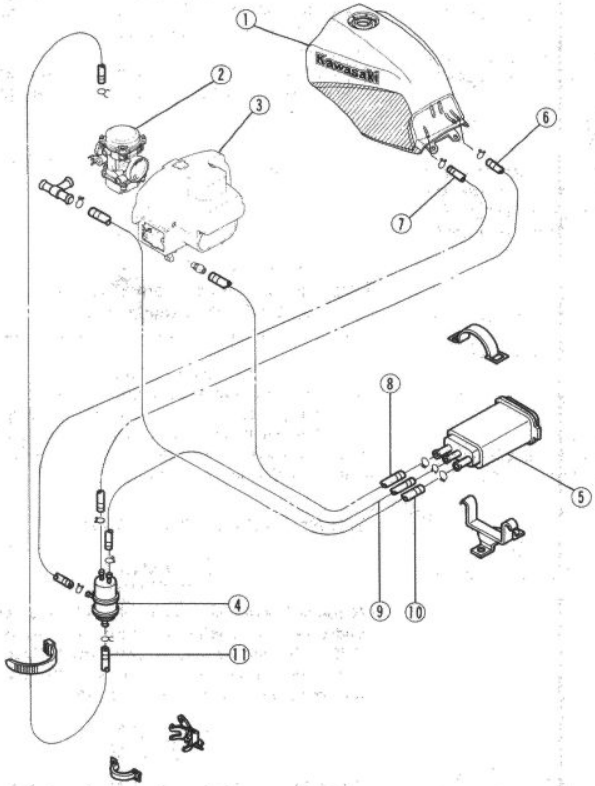
- Check that the hoses are securely connected.
- Replace any kinked, deteriorated or damaged hoses.

Separator Inspection

- Disconnect the hoses from the liquid/vapor separator, and remove the separator from the motorcycle.
- Visually inspect the separator for cracks and other damage.

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

Evaporative Emission Control System



1. Fuel Tank
2. Carburetor
3. Air Cleaner Housing
4. Liquid/Vapor Separator
5. Canister
6. Breather Hose (Blue)
7. Fuel Return Hose (Red)
8. Purge Hose (Green)
9. Breather Hose (Blue)
10. Breather Hose (Yellow)
11. Vacuum Hose (White)

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 into the separator through the hose fitting.
- Disconnect the fuel return from the fuel tank.
- Run the open end of the return hose into the container level with the tank top.
- 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

- Remove the canister, and disconnect the hoses from the canister.
- Visually inspect the canister for cracks and other damage.

★If the canister has any crack 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

3

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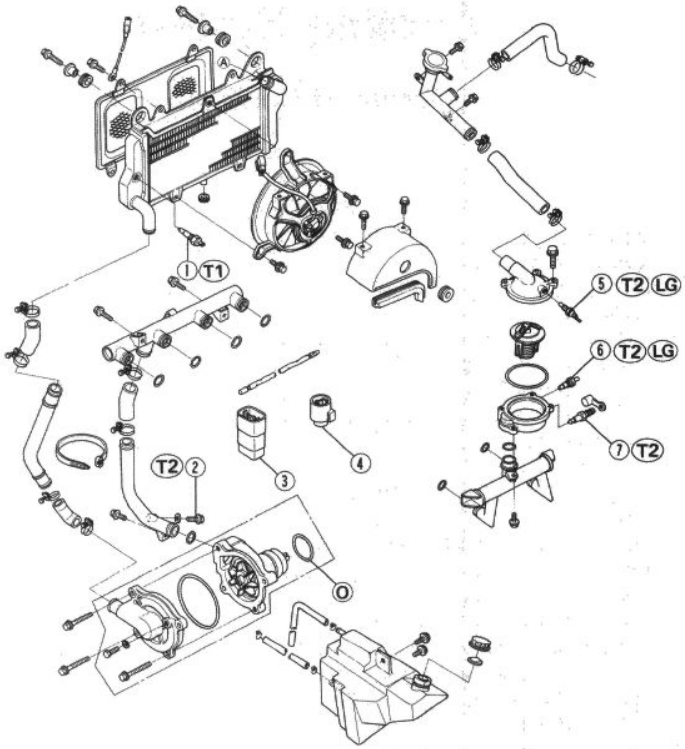
Exploded Views



1. Fan Switch (97°C)
2. Drain Plug
3. Fan Switch Relay
4. Fan Relay
5. Water Temperature Sensor
6. Fan Switch (110°)
7. Bleeder Bolt

LG : Apply liquid gasket to the threads.
O : Apply oil at installation.
T1: 7.4 N-m (0.75 kg-m, 65 in-lb)
T2: 7.8 N-m (0.80 kg-m, 69 in-lb)

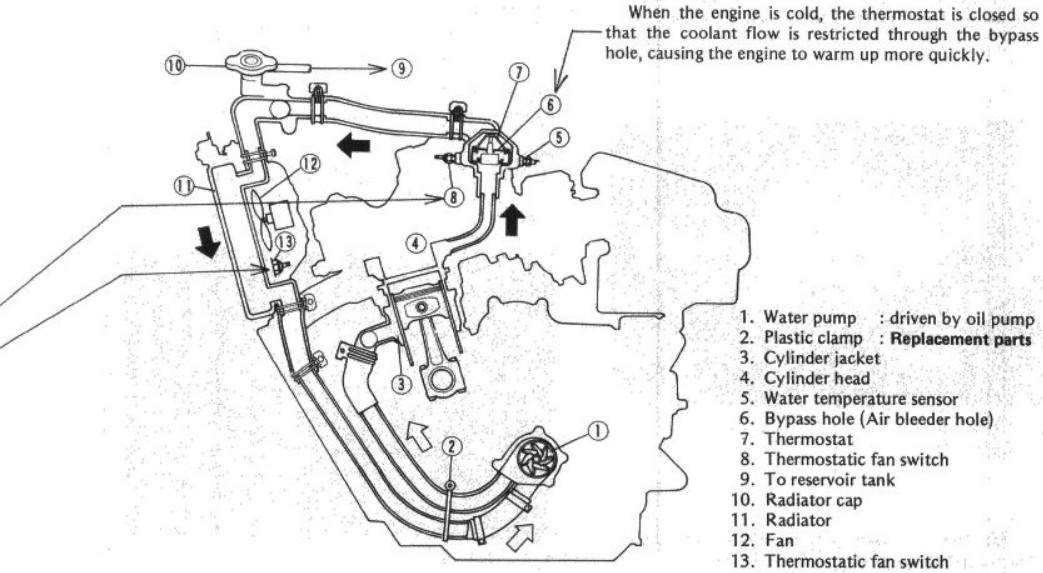
If the liquid or engine oil temperature goes up beyond the predetermined level, either thermostatic fan switch conducts to operate the fan relay. The fan relay closes its contacts, completes the fan motor circuit, and the cooling fan turns to speed up the cooling action of the radiator. When the liquid or oil cools down; the fan switches cut the relay current, and the fan stops. This electric cooling fan system saves engine power, and reduces the battery load.

Specifications

Item		Standard
Cooling Provided when Shipping		
	Type	Permanent type of antifreeze for aluminum engine and radiator
	Color	Green
	Mixed ratio	Soft water 57%, coolant 43%
	Freezing point	– 30°C (– 22°F)
	Total amount	2.9 L
Radiator Cap:	Relief pressure	73.5 – 103 kPa (0.75 – 1.05 kg/cm², 11 – 15 psi)
Thermostat:		
Valve opening temperature		80 – 84°C (176 – 183°F)
Valve full opening lift		not less than 8 mm @ 95°C (203°F)

Cooling System

The water cooling system is a pressurized forced circulation type. When the engine load varies, this system controls the engine temperature within narrow limits where the engine operates most efficiently. In this way the engine performs stably in various riding conditions, and possesses high durability.



Coolant

Coolant Deterioration

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

NOTE

○Be sure to inspect the coolant at the reservoir tank. If the coolant is checked at the radiator by removing the radiator cap, the air must be bled from the cooling system.

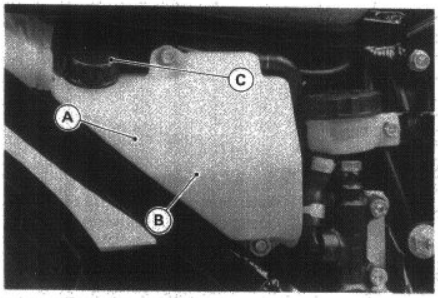
Coolant Level Inspection

- Situate the motorcycle so that it is perpendicular to the ground (on its center stand).
- Check the level through the coolant level gauge on the reservoir tank. The coolant level should be between the FULL and the LOW marks.

NOTE

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

○Do not check the level through the coolant filler of radiator by removing the cap. If the cap is removed, the air may get into the coolant, and lower the cooling efficiency.



A. "FULL" Mark
B. "LOW" Mark
C. Tank Cap

★If the amount of coolant is insufficient, add coolant through the filler opening to the FULL mark.

CAUTION

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

○If coolant must be added often, or the reservoir tank has run completely dry; there is probably leakage in the cooling system. Check the system for leaks (See Visual Leak Inspection, and Pressure Testing).

Coolant Draining

The coolant should be changed periodically to ensure long engine life.

CAUTION

○Use coolant containing corrosion inhibitors made specifically for aluminum engines and radiators in accordance with the instructions of the manufactures (See Coolant Filling Section).

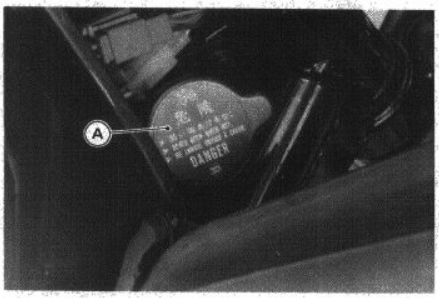
WARNING

○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.

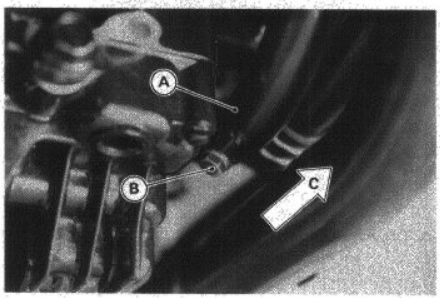
○Since coolant is harmful to the human body, do not use for drinking.

- Remove the fairing.
- Remove the fuel tank mounting bolts and move the tank backwards.
- Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop and wait there for a few seconds. Then push down and remove the cap.



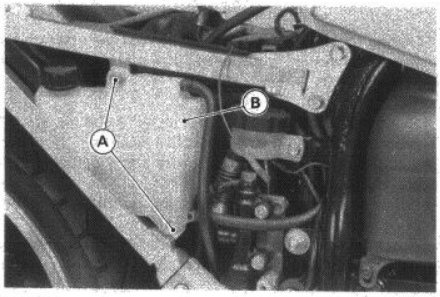
A. Radiator Cap

•Drain the coolant from the radiator and engine by removing the drain plug at the bottom of the radiator pipe.



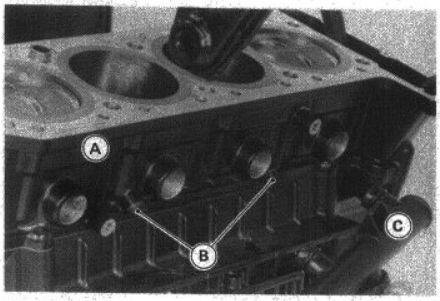
A. Radiator Pipe
B. Drain Plug
C. Front

•Remove the right side cover.
•Unscrew the bolts and remove the reservoir tank with hoses attached.
•Unscrew the cap and pour the coolant into a container.



A. Bolt
B. Reservoir Tank

•Remove the drain plugs (2) at the bottom of the cylinder after removal of the exhaust pipes and the front water pipe.



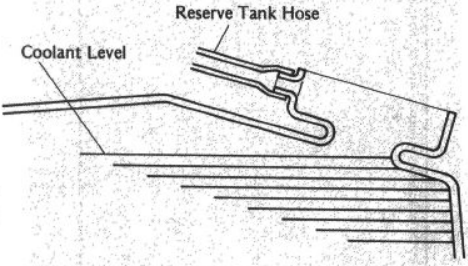
A. Cylinder
B. Drain Plug
C. Front Water Pipe

•Inspect the old coolant for color, smell (mentioned above).

Coolant Filling

•Install the drain plugs. Always replace the gaskets with new ones, if they are damaged.
•Tighten the drain plugs to the specification (see Exploded Views).
•Fill the radiator up to the bottom of the radiator filler neck with coolant, and install the cap turning it clockwise about ¼ turn.

Radiator Filler Neck



NOTE

○*Pour in the coolant slowly so that it can expel the air from the engine and radiator.*
○*The radiator cap must be installed in two steps. First turn the cap clockwise to the first stop. Then push down on it and the rest of the way.*

•Fill the reservoir tank up to the FULL mark 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.**

NOTE

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

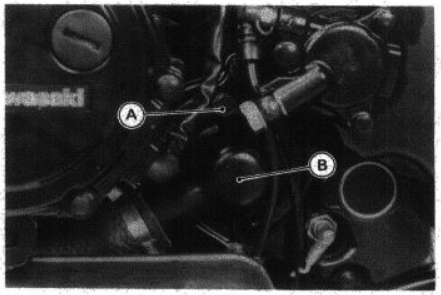
The coolant provided when shipping

Type	:	Permanent type antifreeze for aluminum engine and radiator
Color	:	green
Mixed ratio	:	soft water 57%, coolant 43%
Freezing point	:	−30° (−22°F)
Total amount	:	2.9 L (up to "Full"mark)

Air Bleeding

Before putting the motorcycle into operation, any air trapped in the cooling system must be removed as follows.

- Remove the radiator cap.
- Loosen the air bleeder bolt on the top of the water pump cover.



A. Air Bleeder Bolt B. Water Pump Cover

- Pour the coolant into the radiator until the coolant begins to flow out the air bleeder bolt hole (that is, all the remaining air forced out).
- Tighten the air bleeder bolt.
- Fill the radiator up to the radiator filler neck with coolant.
- Check the cooling system for leaks.
- Start the engine, warm it up thoroughly, and then stop it.
- Check the coolant level in the reservoir tank after the engine cools down.

★If the coolant level is low, add coolant up to the Full mark through the reservoir tank opening.

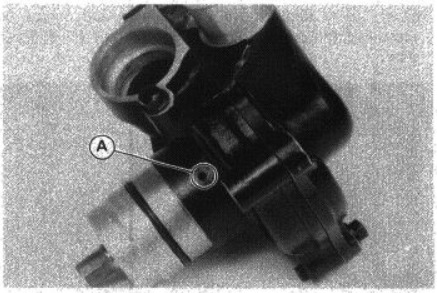
Visual Leak Inspection

Any time the system slowly loses water, inspect for leaks.

- Check the water pump body drainage outlet passage for coolant leaks.

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

★If there are no apparent leaks, pressure test the system.



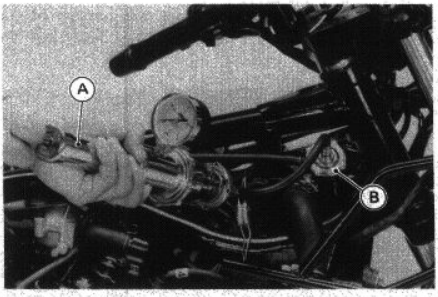
A. Drainage Outlet Passage
: at the bottom of the pump body

Cooling System Pressure Testing

CAUTION

○**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure: 103 kPa (1.05 kg/cm², 15 psi).**

- Remove the radiator cap, and install a cooling system pressure tester on the radiator filler neck.
- Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.
- Build up pressure in the system carefully until the pressure reaches 103 kPa (1.05 kg/cm², 15 psi).
- Watch the gauge for at least 6 seconds. If the pressure holds steady, the system is all right.



A. Pressure Tester B. Adapter

- Remove the pressure tester, replenish the coolant, and install the radiator cap.

★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 cylinder liner O-ring leak.

Flushing

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

- Drain the cooling system.
- Fill the cooling system with fresh water mixed with a flushing compound.

CAUTION

Avoid the use of a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning produce.

- 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.

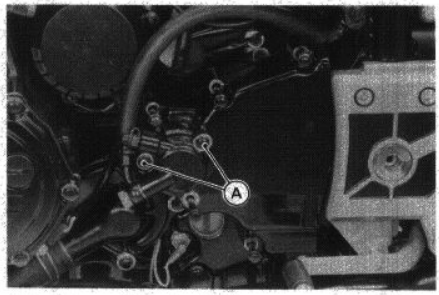
Disassembly and Assembly Precautions

- Prior to disassembly of cooling system parts (radiator, pump, sensors, etc), wait until coolant cools down and drain coolant.
- After assembling and filling the system with coolant, bleed air from the system.

Water Pump

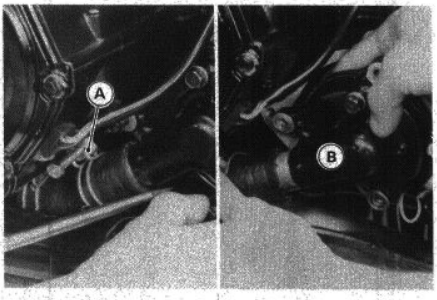
Pump Cover Removal

- Remove the engine sprocket cover with the clutch slave cylinder installed. The two cover bolts removal is not needed.
- Remove the clutch push rod to prevent its damage.



A. Bolt removal is not needed

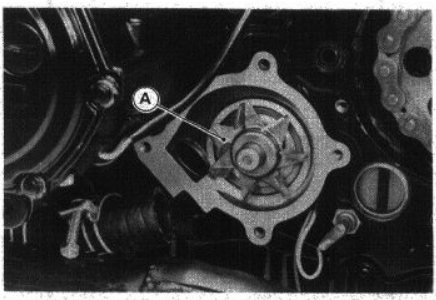
- Loosen the clamp and remove the water pump cover.



A. Clamp B. Water Pump Cover

Pump Impeller Inspection

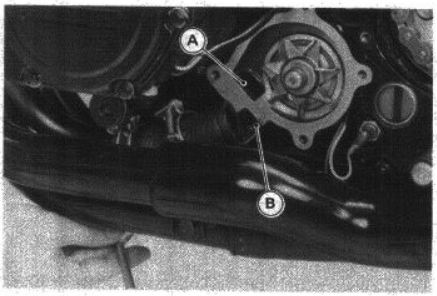
- Visually check the impeller.
- ★If the surface is corroded, or if the blades are damaged, replace the water pump unit.



A. Impeller

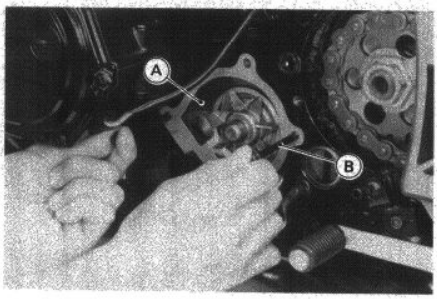
Water Pump Removal

- Drain the engine oil (see Engine Oil and/or Filter Change in the Engine Lubrication System Chapter).
- Remove the water pipe mounting bolt and pull the pipe out of the pump case.



A. Water Pipe B. Bolt

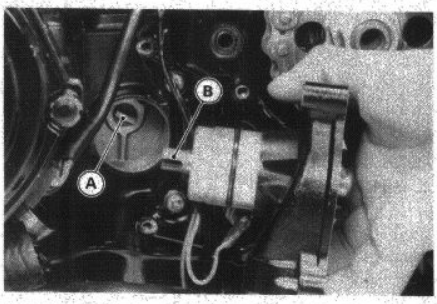
●Pull the pump unit out of the left crankcase.
○The pump unit may be removed by installing the sprocket cover bolts and pulling them.



A. Pump Unit B. Bolt

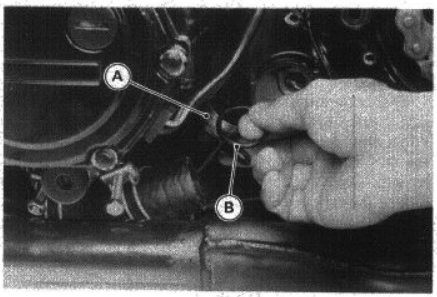
Water Pump Installation Note

●When installing the water pump, note the position of the oil pump shaft projection and turn the water pump shaft so that the projection fits into the slot.



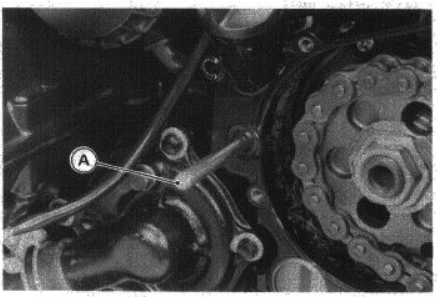
A. Oil Pump Shaft B. Water Pump Shaft

●Be sure to install the water pipe O-ring.



A. Water Pipe B. O-ring

●Install the clutch push rod so that the round end faces outwards.

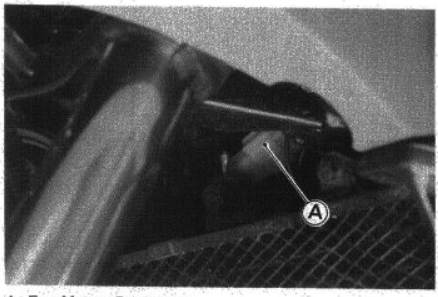


A. Push Rod Round End

Radiator, Radiator Fan

Removal Note

●Disconnect the fan motor connector before removal of the radiator or radiator fan.

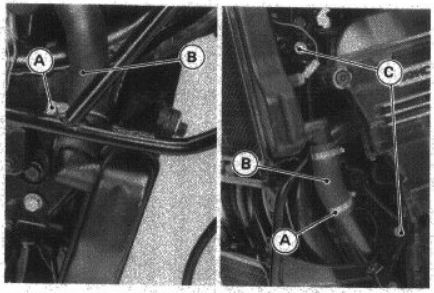


A. Fan Motor Connector

WARNING

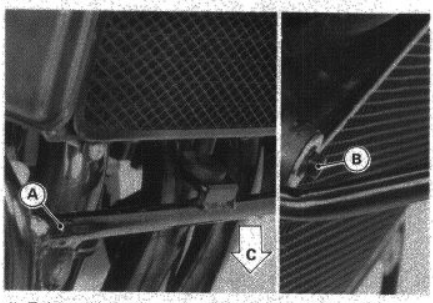
○The radiator fan and fan switch are connected directly to the battery. The radiator fan may start even if the ignition switch is off. NEVER TOUCH THE RADIATOR FAN UNTIL THE ENGINE COMPLETELY COOLS OFF. TOUCHING THE FAN BEFORE THE ENGINE COOLS COULD CAUSE INJURY FROM THE FAN BLADES.

- Loosen the hose clamps and pull out the radiator hoses on both sides.
- Remove the mounting bolts (2) from the fairing bracket.



A. Clamp
B. Radiator Hose
C. Fairing Bracket Mounting Bolt

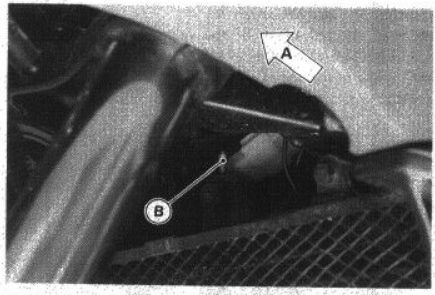
- Remove the radiator mounting bolts (2).
- Push the fairing bracket down and remove the radiator taking care not to damage the radiator core and the fan.



A. Fairing Bracket
B. Radiator Mounting Bolt
C. Removal Direction

Radiator Installation Note

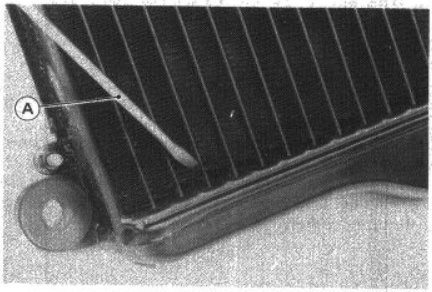
- Be sure to install the fan switch ground lead on the chassis.



A. Front
B. Fan Switch Ground Lead

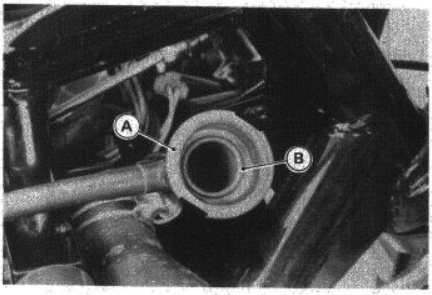
Radiator Inspection

- Check the radiator core.
- ★If there are obstructions to air flow, remove them.
- ★If the corrugated fins are deformed, carefully straighten them with the blade of a thin screw driver.



A. Thin Screwdriver

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

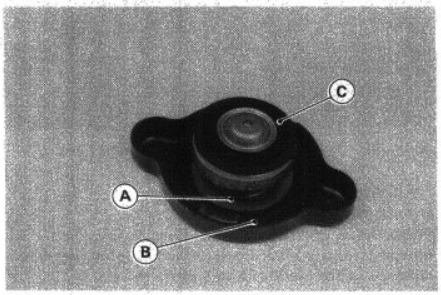


A. Top Sealing Seat
B. Bottom Sealing Seat

Radiator Cap Inspection

- Check the condition of the valve spring, and the top and bottom valve seals of the radiator cap.

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

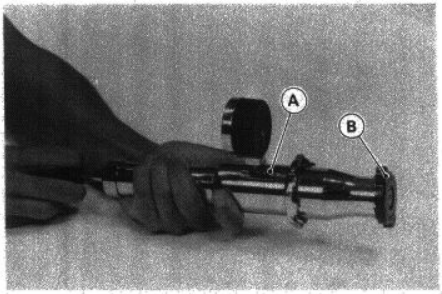


A. Valve Spring
B. Top Seal
C. Bottom Seal

- Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.
- Install the cap on a cooling system pressure tester.
- Watching the pressure gauge, pump the pressure tester to build up the pressure. The cap must retain the pressure at least 6 seconds. Also the cap must open at the pressure shown in the table.

Radiator Cap Relief Pressure
73.5 – 103 kPa
(0.75 – 1.05 kg/cm^2, 11 – 15 psi)

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



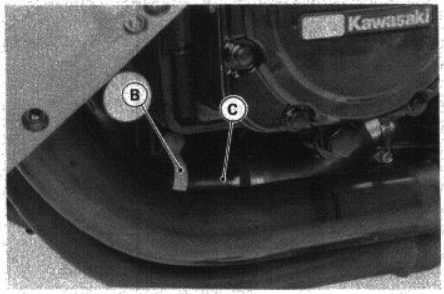
A. Pressure Tester
B. Radiator Cap

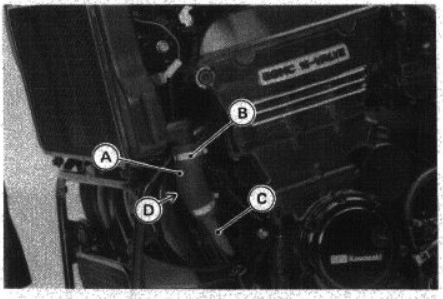
Radiator Hose, Reservoir Tank Hose Inspection

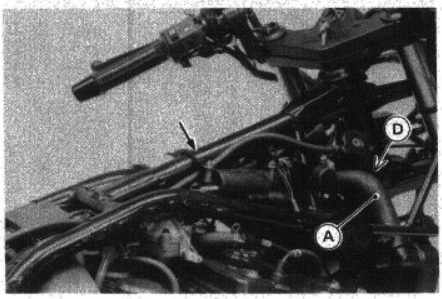
- In accordance with the Periodic Maintenance Chart, visually inspect the hoses for signs of deterioration. Squeeze the hose. A hose should not be hard and brittle, nor should it be soft or swollen.
- Replace any damaged hose.

Radiator Hose, Pipe, Reservoir Tank Hose Installation Note

- Install the radiator hoses or pipes being careful to follow bending direction.(See Exploded Views). Avoid sharp bending, kinking, flattening, or twisting.
- Tighten the hose clamps securely.
- Bind water pipes with a plastic clamp and make sure they do not touch the exhaust pipe.

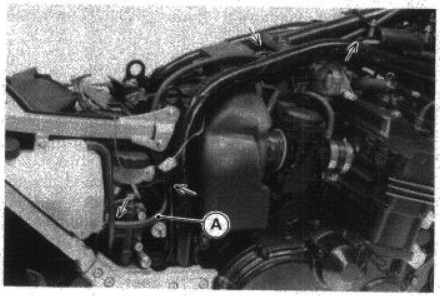






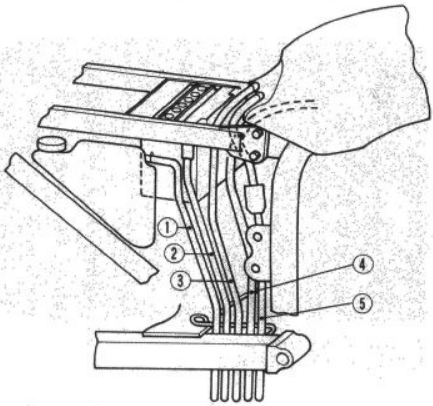
A. Radiator Hose
B. Clamp
C. Pipe
D. Bend

●Route the reservoir tank hoses as shown.



A. Reservoir Tank Hose

Reservoir Tank Hose Installation

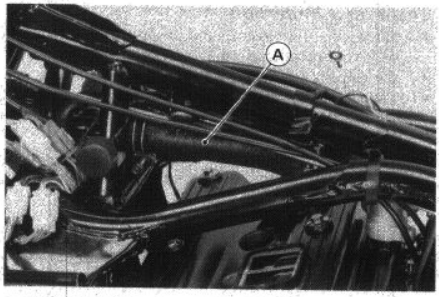


1. Reservoir Tank Hose
2. Battery Vent Hose
3. Overflow Hose (Fuel tank)
4. Overflow Hose (Fuel gauge)
5. Air Vent Hose (Fuel tank)

Thermostat

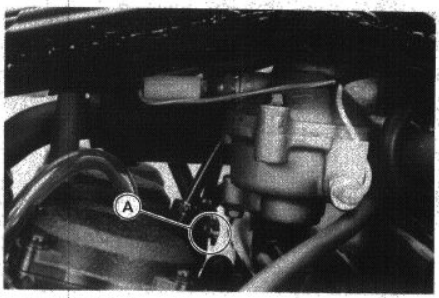
Thermostat Removal

●Remove the following parts.
○Fairings
○Fuel tank
○Ignition coils
○Air suction valves and hoses (US model)
●Remove the radiator hose.

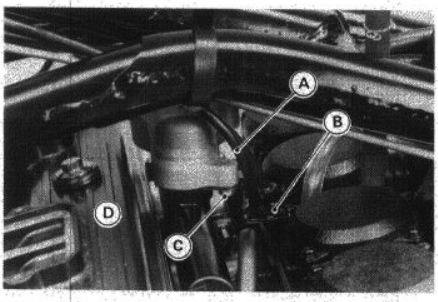


A. Radiator Hose

●Loosen the locknut at the choke cable adjusting nut.
●Remove the choke cable lower end, clamp screw, and thermostat mounting bolt.
●Remove the thermostat housing with the head cover.



A. Choke Cable Lower End

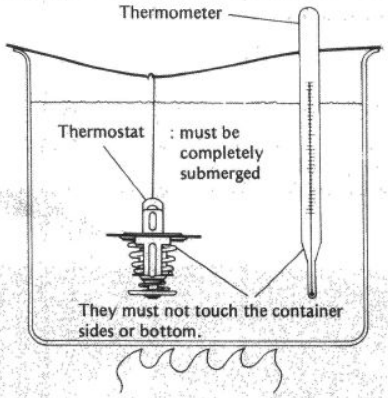


A. Choke Cable
B. Clamp Screw
C. Mounting Bolt
D. Head Cover

Thermostat Inspection

- Remove the thermostat, and inspect the thermostat valve at room temperature.
- ★If the valve is open, replace the valve with a new one.
- To check valve opening temperature, suspend the thermostat and an accurate thermometer in a container of water.
- Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.

Valve Opening Temperature Measurement



- Watch the valve. As soon as the valve starts to open, note the temperature.
- ★If it is out of the service limit range, replace the thermostat.

Thermostat Valve Opening Temperature

80 – 84°C (176 – 183°F)

Thermostatic Fan Switches
Water Temperature Sensor

Removal Caution

CAUTION

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

Water Temperature Sensor Removal

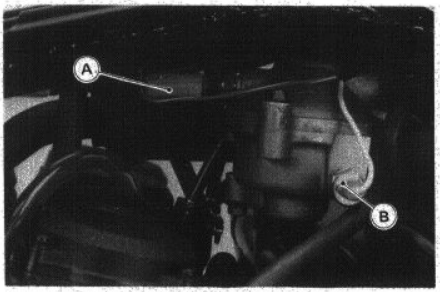
- Drain the coolant (See Coolant Draining).
- Remove the sensor connector.
- Remove the thermostat housing (See Thermostat Removal).
- Remove the sensor.

Installation Note

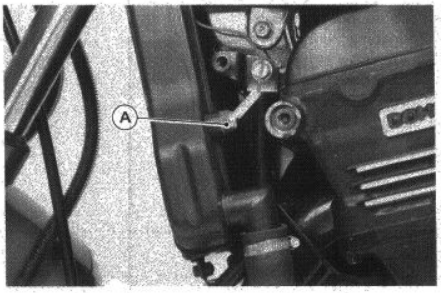
- Apply a liquid gasket compound to the threads before mouting the sensor and the switch.
- ○Do not apply a liquid gasket compound to the thermostatic fan switch on the radiator.
- Tighten the water temperature sensor and the fan switch to the specification (See Exploded Views).

Inspection

Refer to the Electrical System chapter.



A. Water Temperature Sensor
B. Thermostatic Fan Switch



A. Thermostatic Fan Switch on the radiator

Engine Top End

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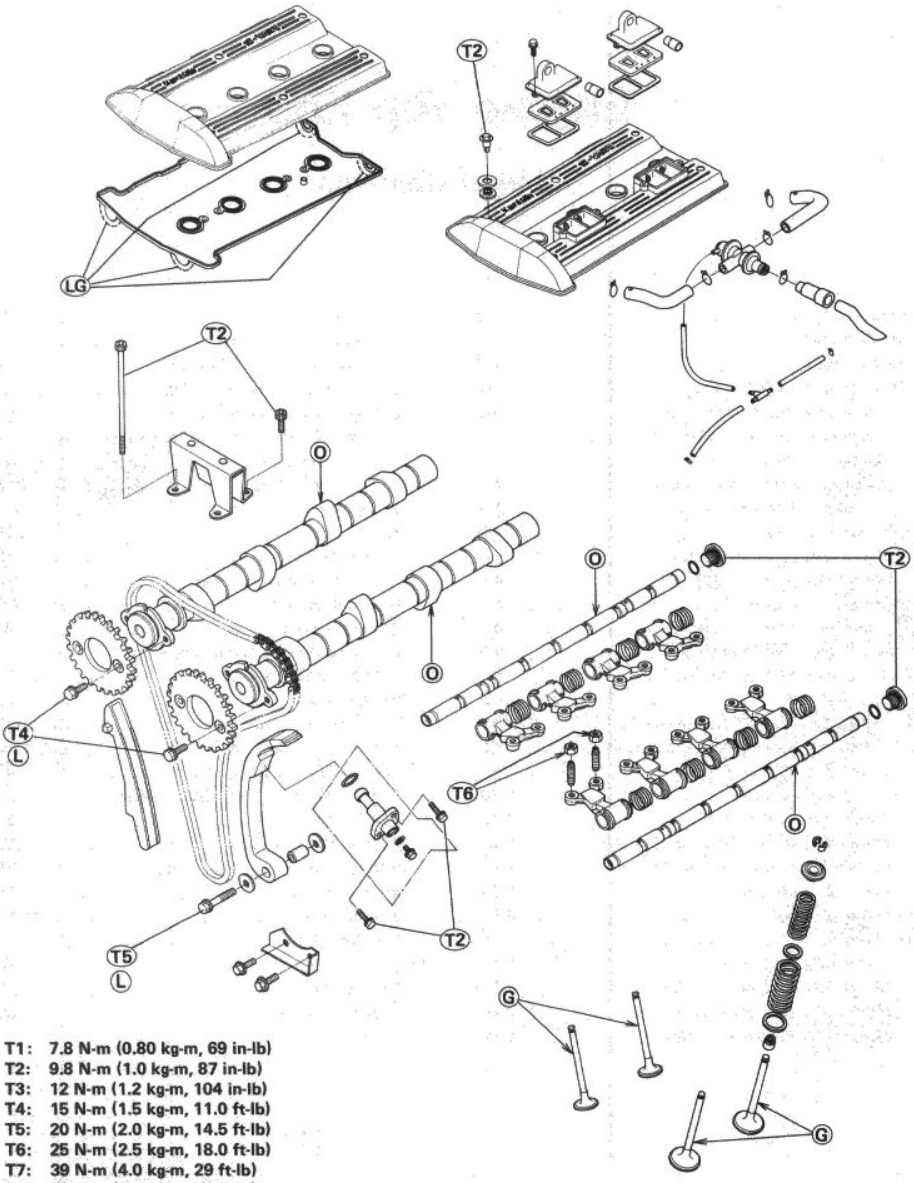
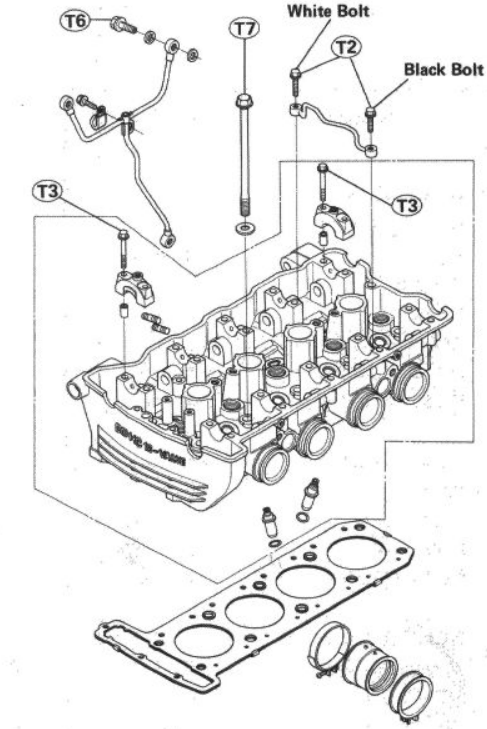
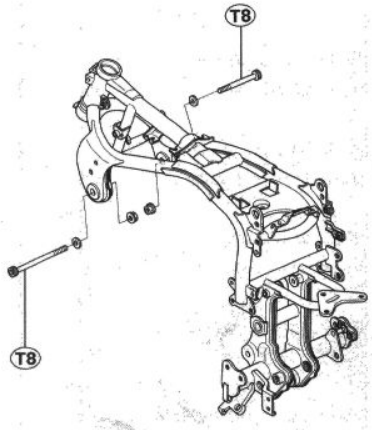
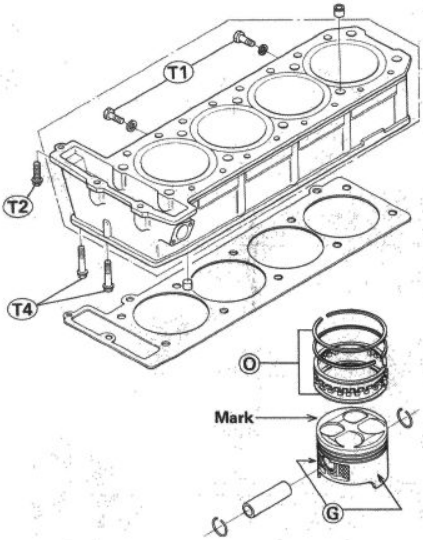
Exploded Views

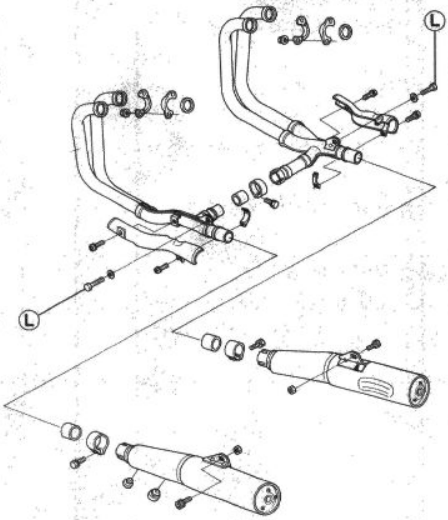


T1: 7.8 N-m (0.80 kg-m, 69 in-lb)
T2: 9.8 N-m (1.0 kg-m, 87 in-lb)
T3: 12 N-m (1.2 kg-m, 104 in-lb)
T4: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T5: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T6: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T7: 39 N-m (4.0 kg-m, 29 ft-lb)
T8: 59 N-m (6.0 kg-m, 43 ft-lb)







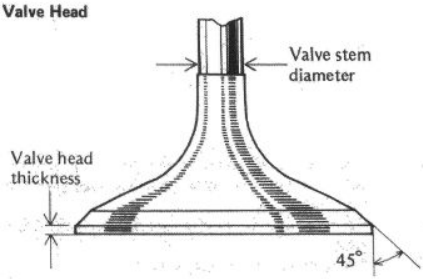


LG : Apply a liquid gasket to the threads or gaskets.
L : Apply a non-permanent locking agent to the threads.
G : Apply a thin coat of a molybdenum disulfide grease.
O : Apply engine oil to the surface.

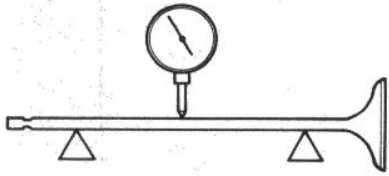
Specifications

Item		Standard	Service Limit
Cylinder Head, Valves:			
Valve clearance:	Inlet	0.13 – 0.18 mm	– – –
	Exhaust	0.18 – 0.23 mm	– – –
Cylinder head warp		– – –	0.05 mm
Valve head thickness:	Inlet	0.5 mm	0.25 mm
	Exhaust	1 mm	0.7 mm
Valve stem bend		Less than 0.02 mm TIR	0.05 mm TIR
Valve stem diameter:	Inlet	5.475 – 5.490 mm	5.46 mm
	Exhaust	5.455 – 5.470 mm	5.44 mm
Valve guide inside diameter:			
	Inlet	5.500 – 5.512 mm	5.58 mm
	Exhaust	5.500 – 5.512 mm	5.58 mm
Valve/valve guide clearance (wobble method):	Inlet	0.02 – 0.08 mm	0.22 mm
	Exhaust	0.07 – 0.14 mm	0.27 mm
Valve seating surface:			
Outside diameter	Inlet	28.3 – 28.5 mm	– – –
	Exhaust	24.0 – 24.2 mm	– – –
Width	Inlet	0.5 – 1.0 mm	– – –
	Exhaust	0.5 – 1.0 mm	– – –
Valve spring free length:	Inner	36.3 mm	35 mm
	Outer	40.4 mm	39 mm
Valve seat cutting angle:			
Inlet, Exhaust		32°, 45°, 60°	– – –
Clean Air System:			
Vacuum Switch Valve Closing Pressure: Open → Close		54 – 68 kPa (410 – 510 mmHg)	– – –

Valve Head

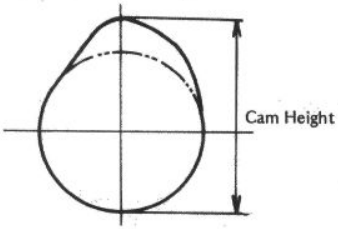


Valve Stem Bend

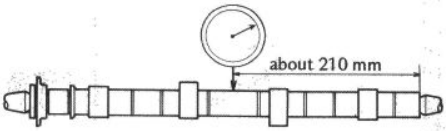


Item		Standard	Service Limit
Camshaft:			
Cam height	Inlet	35.824 – 35.940 mm	35.71 mm
	Exhaust	35.824 – 35.940 mm	35.71 mm
Camshaft bearing oil clearance		0.078 – 0.121 mm	0.21 mm
Camshaft journal diameter		24.900 – 24.922 mm	24.87 mm
Camshaft bearing inside diameter		25.000 – 25.021 mm	25.08 mm
Camshaft runout		not more than 0.02 mm TIR	0.1 mm TIR
Camshaft chain 20-link length		158.8 – 159.2 mm	161.5 mm
Rocker arm inside diameter		12.500 – 12.518 mm	12.55 mm
Rocker shaft diameter		12.466 – 12.484 mm	12.44 mm
Cylinder Compression:		(usable range) 920 kPa – 1,420 kPa @ 450 r/min (rpm) (9.4 – 14.5 kg/cm² 134 – 206 psi)	
Cylinder Block, Piston:			
Cylinder inside diameter		72.494 – 72.506 mm	72.6 mm
Piston diameter		72.435 – 72.450 mm	72.3 mm
Piston/cylinder clearance		0.044 – 0.071 mm	– – –
Oversize piston and rings		+ 0.5 mm and +1.0 mm	– – –
Piston ring/groove clearance			
	Top	0.03 – 0.07 mm	0.17 mm
	Second	0.02 – 0.06 mm	0.16 mm
Piston ring groove width	Top	1.02 – 1.04 mm	1.12 mm
	Second	1.01 – 1.03 mm	1.12 mm
	Oil	2.51 – 2.53 mm	2.6 mm
Piston ring thickness	Top	0.97 – 0.99 mm	0.9 mm
	Second	0.97 – 0.99 mm	0.9 mm
Piston ring end gap	Top	0.2 – 0.35 mm	0.7 mm
	Second	0.2 – 0.35 mm	0.7 mm
	Oil	0.2 – 0.7 mm	1.0 mm

Cam Height Measurement



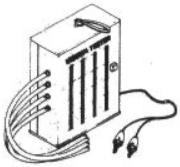
Camshaft Runout



Special Tools

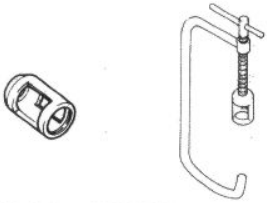
Along with common hand tools, the following more specialized tools are required for complete engine top end servicing.

Vacuum Gauge: 57001-1152



Compression Gauge: 57001-221
Adapter: 57001-1018

Valve Spring Compressor Assembly: 57001-241
Adapter: 57001-1019



Valve Guide Arbor: 57001-1021

Valve Guide Reamer: 57001-1079

Valve Seat Cutter Set: 57001-1110

Use the following tools in the set.

(Cutter Holder ϕ5.5 mm: 57001-1125)

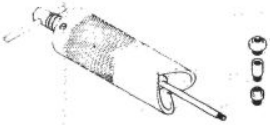
(Bar: 57001-1128)

(#2 Seat Cutter: 57001-1114)
(#2 Seat Cutter: 57001-1187)

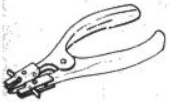
(#7 Outside Cutter: 57001-1119)
(#8 Outside Cutter: 57001-1120)

(#11 Inside Cutter: 57001-1123)

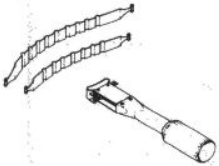
Piston Pin Pulller Assembly: 57001-910



Piston Ring Pliers: 57001-115



Piston Ring Compressor Assembly: 57001-1094

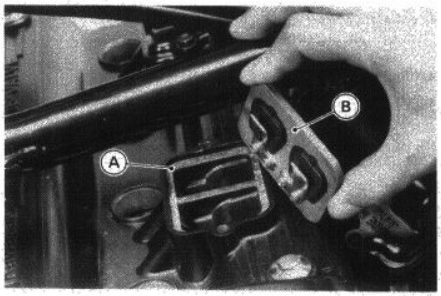


Piston Base: 57001-149

Clean Air System (US model)

Air Suction Valve Installation

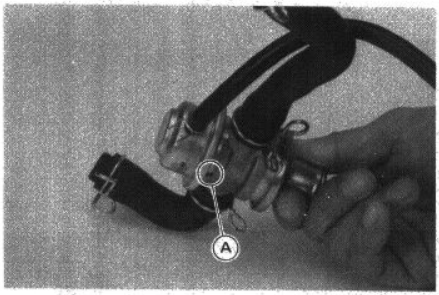
●Replace the gasket with a new one, and install it between the cylinder head cover and the valve assembly.



A. Gasket B. Valve Assembly

Vacuum Switch Valve Installation

●Install the switch valve so that the air hole faces downwards.



A. Air Hole

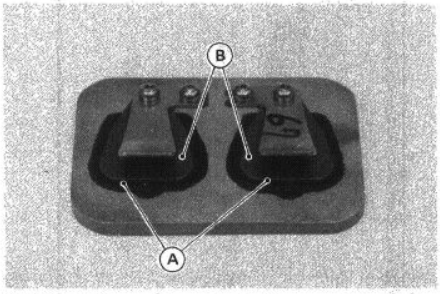
Air Suction Valve Inspection

The air suction valve is essentially a check valve which allows fresh air to flow from the air cleaner into the exhaust port. Any air that has passed the air suction valve is prevented form returning to the air cleaner.

●Remove the air suction valves.

●Visually inspect the reeds 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.



A. Valve Holder B. Reeds

●Check the reed contact areas of the valve holder for grooves, scratches, any signs of separation from the holder, or heat damage.

★If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.

●If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high flash-point solvent.

CAUTION

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

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, silencer, vacuum switch valve, #1 and #4 carburetors, and air suction valve covers.

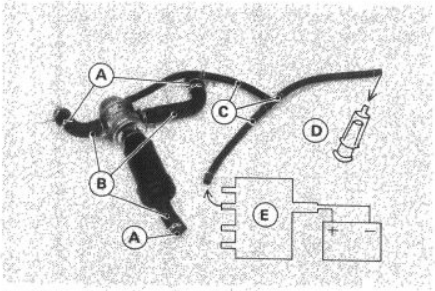
★If they are not, correct them. Replace them if they are damaged.

Vacuum Switch Valve Test

Using the vacuum gauge (special tool) and a syringe, inspect the vacuum switch operation as follows:

●Remove the vacuum switch valve.

●Connect the vacuum gauge and syringe to the vacuum hoses as follows.

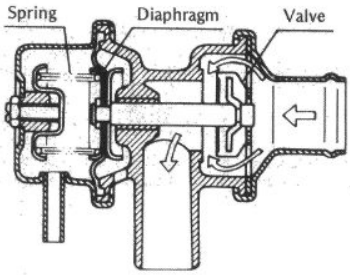


A. Plug
B. Air Hose
C. Vacuum Hose
D. Syringe
E. Vacuum Gauge: 57001-1152

●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 rises a certain level 54 – 68 kPa (410 – 510 mmHg), it should stop air flow. When the vacuum is high enough, the air cannot also flow through the valve.

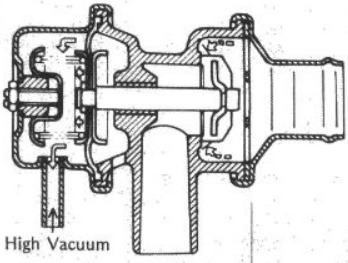
Vacuum Switch Valve Operation

1. During Cruising (open throttle)



Secondary air flows.

2. During Engine Braking (Closed throttle)



Secondary air cannot flow.

★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.*

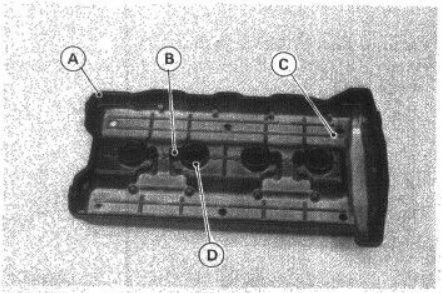
Cylinder Head Cover

Cylinder Head Cover Removal

●Remove the following parts before the removal.
- ○Fairings
- ○Fuel tank (See Fuel Tank Removal in Fuel System)
- ○Ignition coils
- ○Air suction valves and hoses (US model).

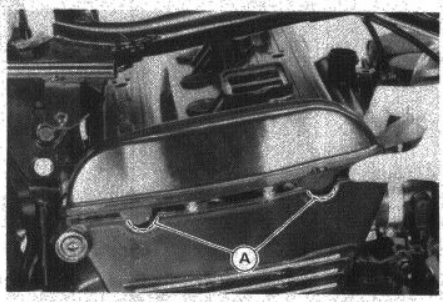
Installation Note

●Replace the headcover gasket or gasket with new one, if it is damaged.
●Stick the gaskets partially to the cover with a liquid gasket for installation convenience.
●Be sure to install the knock pins.



A. Headcover Gasket
B. Knock Pin
C. Head Cover
D. Gasket

●Apply a liquid gasket as shown in the figure below.



A. Liquid Gasket Applied Areas

•Tighten the cover bolts to the specification (See Exploded Views).

Cam Chain Tensioner

Chain Tensioner Removal

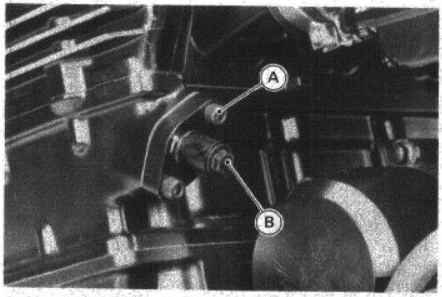
CAUTION

This is a non-return type cam chain tensioner. The push rod does not return to its original position once it moves out to take up cam 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 "Chain Tensioner Installation".

○Do not turn over the crankshaft while the tensioner is removed. This could upset the cam chain timing, and damage the valves.

•Loosen the cap bolt before tensioner removal for later disassembly convenience.
•Unscrew the mounting bolts and remove the camshaft chain tensioner.



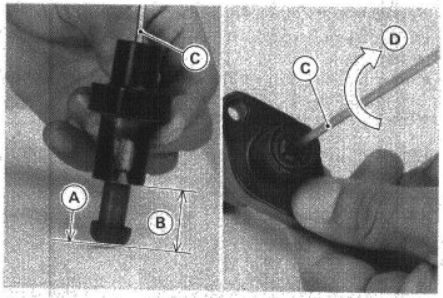
A. Mounting Bolt B. Cap Bolt

Chain Tensioner Installation

•Remove the cap bolt and O-ring.
•While compressing the push rod, turn it **clockwise** with a suitable screwdriver to put it into until the rod protrusion comes to about **10 mm** from the tensioner body as shown.

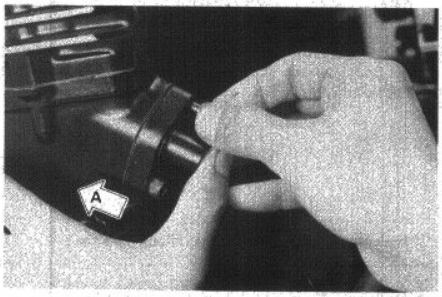
CAUTION

○Do not turn the rod counterclockwise at installation. This could detach the rod and the tensioner cannot be reinstalled.



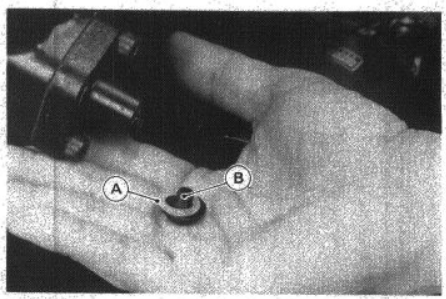
A. Compress the rod C. Screwdriver
B. About 10 mm D. Clockwise

•While holding the rod in position, install the tensioner on the cylinder block.
•While pushing the tensioner against the cylinder block as shown, remove the screwdriver.
•Tighten the mounting bolts finger tight to hold the tensioner.



A. Push the tensioner.

•Tighten the mounting bolts to the specification.
•Install the O-ring and tighten the cap bolt.



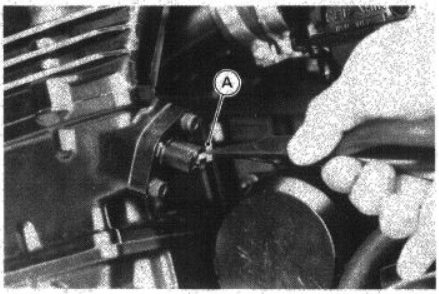
A. O-ring B. Cap Bolt

Replacement Chain Tensioner Installation

○A replacement chain tensioner from stock has a rod holder plate.

●Install the tensioner on the cylinder block, and tighten the mounting bolts to the specification.

●Remove the plate to release the push rod.



A. Rod Holder Plate

●Install the O-ring and tighten the cap bolt.

CAUTION

○Do not pull the rod while the tensioner is removed. This could detach the rod and the tensioner cannot be reinstalled.

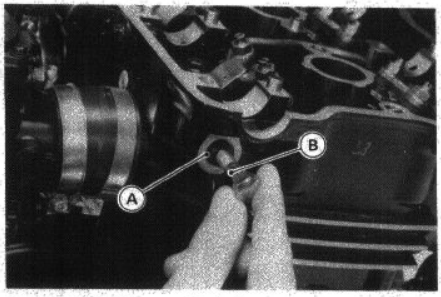
Camshaft, Camshaft Chain, Rocker Shaft

Camshafts, Rocker Shafts Removal Note

●Remove the cam chain tensioner assembly before removing the camshafts.

●Remove the rocker shaft (small).

●Using the suitable bolt (8 P 1.25 x more than 18 mm long), pull the rocker shaft (long) out.



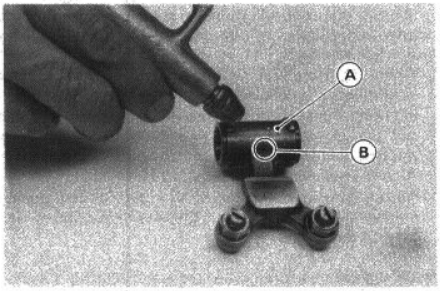
A. Rocker Shaft B. Bolt

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.

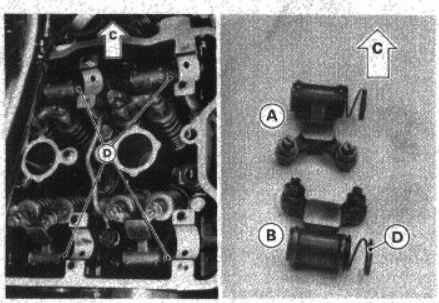
Camshafts, Rocker Shafts Installation Notes

●Blow the rocker arm oil passage clean with compressed air and apply oil to the internal surface before installation.



A. Rocker Arm B. Oil Passage

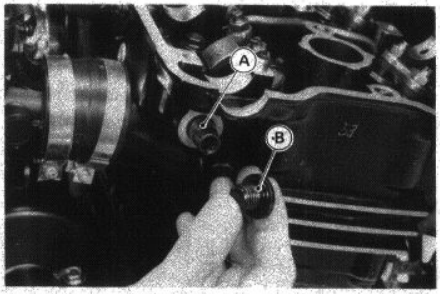
●Install the retainer spring on each rocker arm so that the spring is placed on the rocker arm right side at the installation.



A. Exhaust Side C. Front
B. Inlet Side D. Retainer Spring

●Apply engine oil to the rocker shaft, insert the shaft running it through the cylinder head, the rocker arms and springs.

●Tighten the rocker shaft (small) to the specification (See Exploded Views).

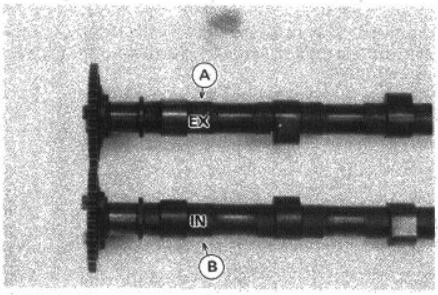


A. Rocker shaft (long) B. Rocker shaft (small)

- Tighten the head bolts to the specification, following the specified tightening sequence (See Cylinder Head Installation Note).
- Install the head oil pipes (See Head Oil Pipe Installation).
- Apply engine oil to all cam parts. If the camshaft(s) and/or cylinder head are replaced with new ones, apply a thin coat of a molybdenum disulfide engine assembly grease on the new cam part surfaces.

NOTE

○*The exhaust camshaft has an EX mark and the inlet camshaft has an IN mark. Be careful not to mix up these shafts.*



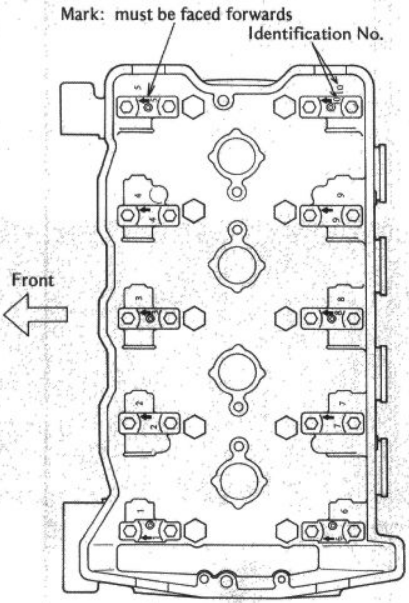
A. EX mark B. IN mark

- Apply engine oil to the camshaft bearing portion.
- Install the camshaft caps in the correct locations as shown in the figure below. Location numbers are marked on the cylinder head and each caps.

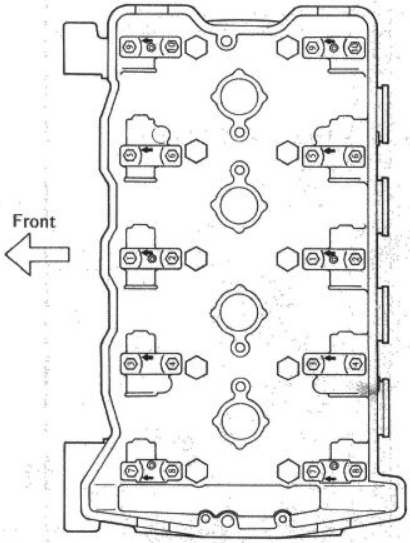
CAUTION

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

Camshaft Cap Installation



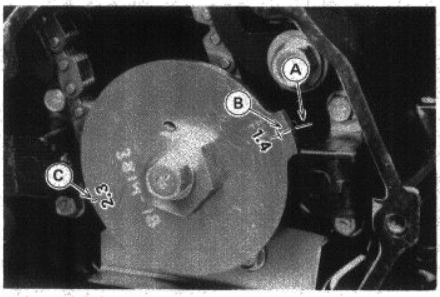
Camshaft Cap Bolt Tightening Sequence



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

Chain Timing Procedure

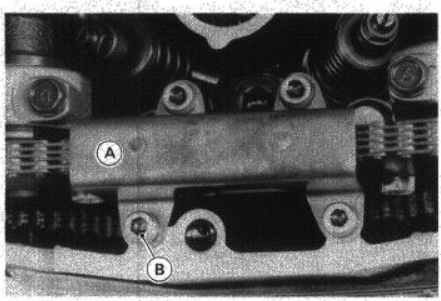
- Position the crankshaft at TDC for the #1 and #4 pistons, engage the cam chain with the camshaft sprockets as shown.



A. Timing Mark
B. TDC mark for #1 and #4 pistons
C. TDC mark for #2 and #3 pistons

- Pull the tension side (exhaust side) of the chain taut to install the chain.
  - ○The timing marks must be aligned with the cylinder head upper surface and positioned respectively as shown, after the camshaft chain slack is taken up by the tensioner.

- Install the top chain guide and tighten the mounting bolts to the specification (See Exploded Views).



A. Top Chain Guide B. Mounting Bolt

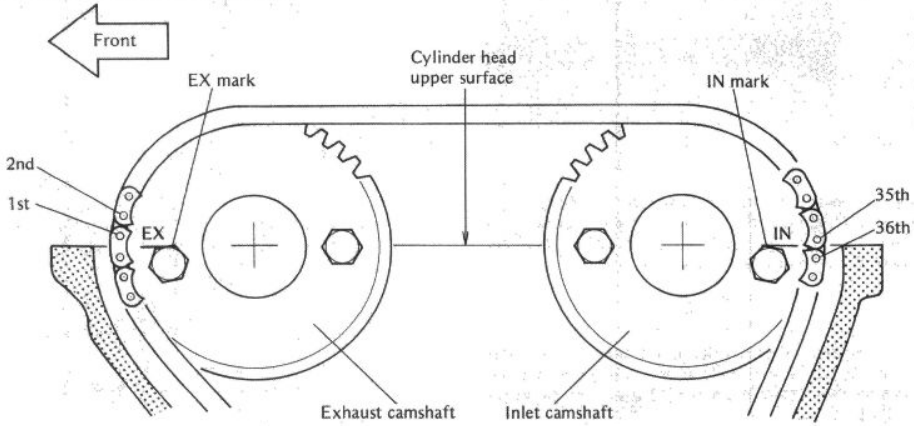
Camshaft and Sprocket Assembly Notes

- ○The inlet and exhaust sprockets are identical.
- Install the sprockets so that the marked side faces outwards.
- Apply a locking agent to the camshaft sprocket bolts and tighten them to the specification (See Exploded Views).
- If a new camshaft is to be used, apply a thin coat of a molybdenum disulfide grease to the cam surfaces.

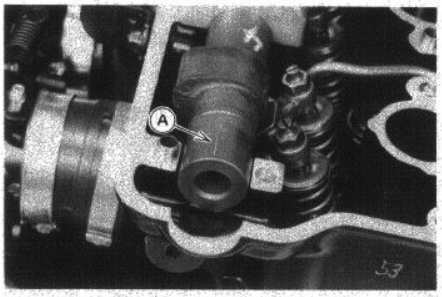
Camshaft Oil Clearance Inspection

The journal wear is measured using plastigage (press gauge), which is inserted into the clearance to be measured. The plastigage indicates the clearance by the amount it is compressed and widened when the parts are assembled.

Camshaft Chain Timing (left side view)



●Cut strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft with the camshaft installed in the correct position and so that the plastigage will be compressed between the journal and camshaft cap.



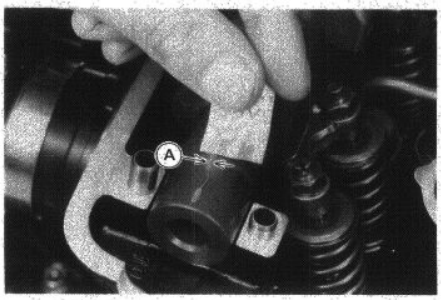
A. Plastigage Strip

●Install the camshaft caps, tightening the bolts in the correct sequence to the specified torque.

NOTE

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

●Remove the camshaft caps again, and measure the plastigage width to determine the clearance between each journal and the camshft cap. Measure the widest portion of the plastigage.



A. Plastigage Width

★If any clearance exceeds 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 Bearing Oil Clearance

Standard	:	**0.078 – 0.121 mm**
Service limit	:	**0.21 mm**

Camshaft Chain Wear

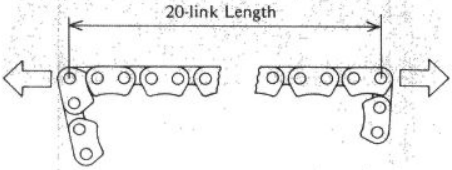
●Hold the chain taut with a force of about 5 kg in some manner, and measure a 20-link length. Since the chain may wear unevenly, take measurements at several places.

★If any measurement exceeds the service limit, replace the chain.

Camshaft Chain 20-link Length

Standard	:	**158.8 – 159.2 mm**
Service limit	:	**161.5 mm**

Chain Length Measurement

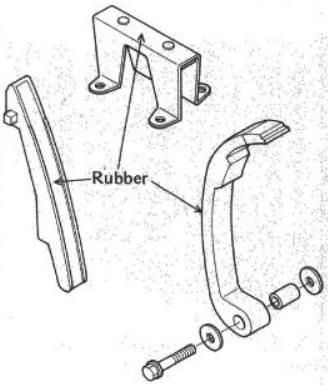


Camshaft Chain Guide Wear

●Visually inspect the rubber on the guides.

★If the rubber is damaged, cut, or is missing pieces, replace the guides.

Camshaft Chain Guides



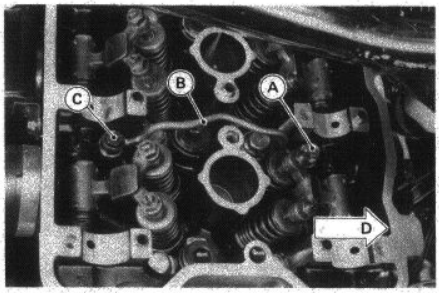
Oil Pipe

Oil Pipe Installation Note

- Before installation, flush out the oil pipes with a high flash-point solvent.

Head Oil Pipe Installation Note

- Install the white bolts on the exhaust side and the black bolts on the inlet side.
- Tighten the oil bolts to the specification (See Exploded Views).



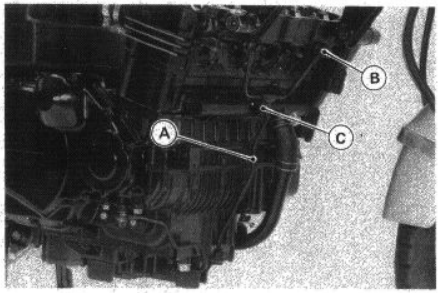
A. White Bolt
B. Head Oil Pipe
C. Black Bolt
D. Exhaust Side

Main Oil Pipe Removal Note

- Remove the radiator (See Radiator Removal in Cooling System) before removal of the main oil pipes.

Main Oil Pipe Installation Note

- Discard the used flat washers and install new washers on each side of the pipe fittings.
- Tighten the banjo bolts and mounting bolts to a snug fit, and tighten them to the specification (See Exploded Views).

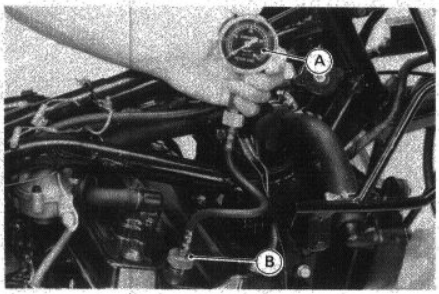


A. Main Oil Pipe
B. Banjo Bolt
C. Mounting Bolt

Cylinder Head

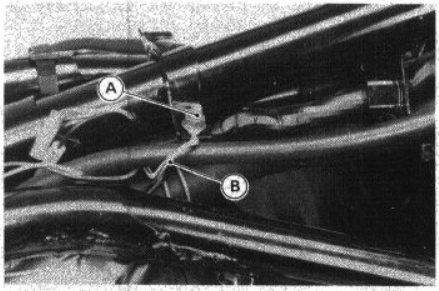
Compression Measurement

- Thoroughly warm up the engine so that engine oil between the piston and cylinder wall will help seal compression as it does during normal running.
- Stop the engine, remove the spark plugs and ignition coils, and attach compression gauge (special tool) firmly into the spark plug hole.



A. Compression Gauge: 57001-221
B. Adapter: 57001-1018

- Install the main harness ground lead using a suitable bolt.



A. Suitable Bolt and Nut
B. Main Harness Ground Lead

- 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.
- Repeat the measurement for the other cylinder.

Cylinder Compression (Usable Range)

920 – 1,420 kPa @450 r/min (rpm)
(9.4 – 14.5 kg/cm^2, 134 – 206 psi)

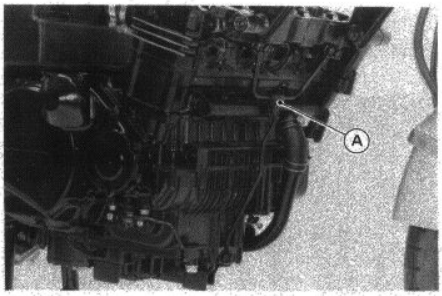
★If cylinder compression is higher than the standard value, check the following:
1. Carbon build-up on the piston on the piston head and cylinder head.
   – clean off any carbon on the piston head and cylinder head.
2. Cylinder head gasket, cylinder base gasket – use only the proper gaskets for the cylinder head and base. The use of gaskets of the incorrect thickness will change the compression.
3. Valve stem oil seals and piston rings – rapid carbon accumulation in the combustion chambers may be caused by damaged valve stem oil seals and/or damaged piston oil rings. This may be indicated by white exhaust smoke.

★If cylinder compression is lower than the service limit, check the following:
1. Gas leakage around the cylinder head – replace the damaged gasket and check the cylinder head for warp.
2. Condition of the valve seating.
3. Valve clearance – if a valve requires an unusually adjustment to obtain proper clearance, the valve may be bend, and not seating completely.
4. Piston/cylinder clearance, piston seizure.
5. Piston ring, piston ring groove.

Cylinder Head Removal Notes

●Remove the following parts.
- ○Cylinder head cover (See Cylinder Head Cover Removal).
- ○Cam chain tensioner (See Chain Tensioner Removal).
- ○Camshaft

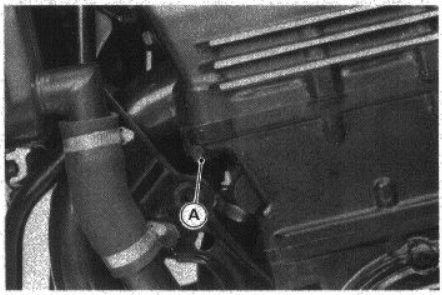
●Remove the main oil pipe.



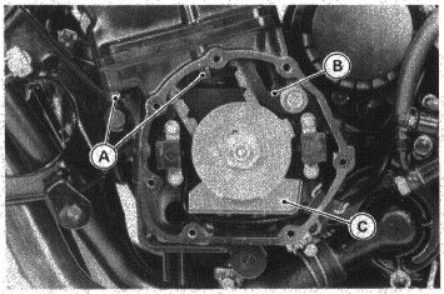
A. Main Oil Pipe

●Remove the plate.

●Remove the cylinder head bolt and the cylinder bolts (6 mm) first, then remove the cylinder head bolts (10 mm). This prevents excessive stress on the small bolts.

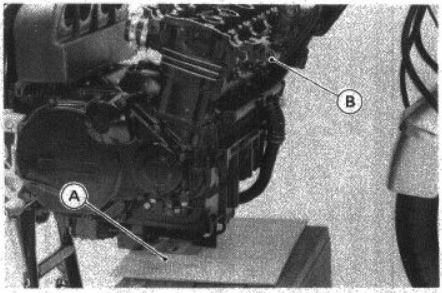


A. Cylinder Head Bolt (6 mm)



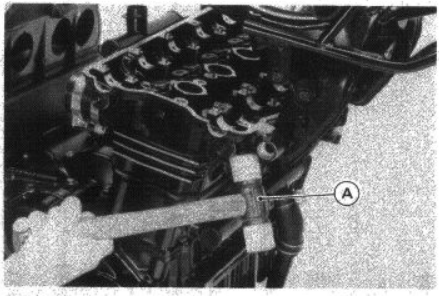
A. Cylinder Bolt (6 mm) C. Plate
B. Chain Guide (Mounting Bolt and Collar)

●At removal of the cylinder head mounting bolts, use a jack or stand so that the engine unit is stable during removal and installation operation.



A. Stand
B. Cylinder Head Mounting Bolt

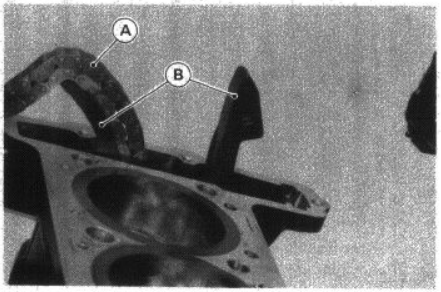
- Tap the portions as shown with a mallet to remove the cylinder head.



A. Mallet

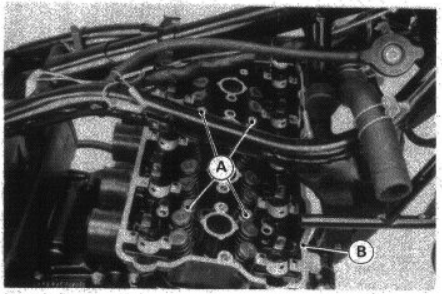
Cylinder Head Installation Notes

- Before cylinder head installation, install the chain and the chain guides.



A. Chain B. Chain Guide

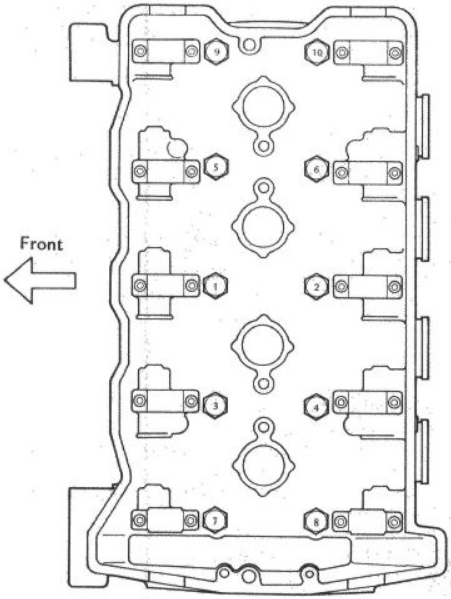
- Insert the following bolts (4) into the cylinder head prior to the head installation.



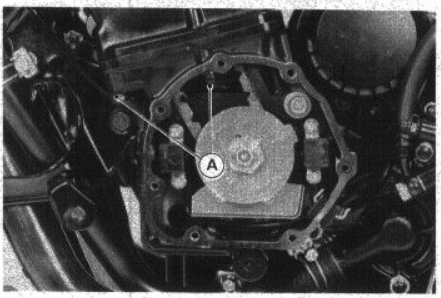
A. Bolt B. Cylinder Head

- The camshaft caps are machined with the cylinder head so if a new cylinder head is installed, use the caps that are supplied with the new head.
- Torque the cylinder head bolts following the tightening sequence. Torque them first to about one half of the specification and then torque them to the specification as shown.

Cylinder Head Bolt Tightening Sequence



- Tighten the cylinder bolts to the specification.

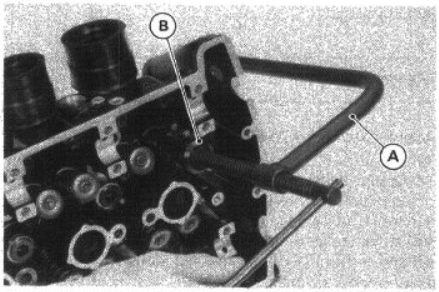


A. Cylinder Bolt

- Install the head oil pipes (See Head Oil Pipe Installation).
- Install the cam shafts and camshaft caps (See Camshaft Installation Note).
- Tighten the cylinder head mounting bolts to the specification (See Exploded Views).

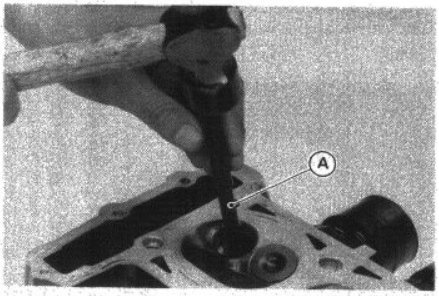
Cylinder Head Disassembly and Assembly (Valve Mechanism Removal and Installation)

- Use valve spring compressor assembly (special tool) to press down the valve spring retainer, and remove the split keepers.



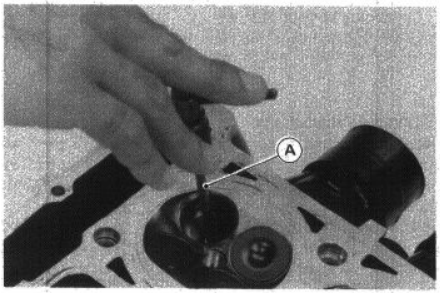
A. Valve Spring Compressor Assembly: 57001-241
B. Adapter: 57001-1019

- Heat the area around the valve guide to about 120 – 150°C (248 – 302°F), and hammer lightly on valve guide arbor (special tool) to remove the guide from the top of the head.



A. Valve Guide Arbor: 57001-1021

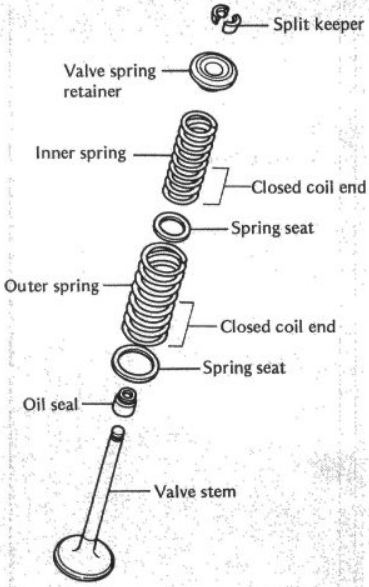
- Valve Guide Installation:
  - ○Apply oil to the valve guide outer surface before installation.
  - ○Heat the area around the valve guide hole to about 120 – 150°C (248 – 302°F).
  - ○Drive the valve guide in from the top of the head using the valve guide arbor. The circlip stops the guide from going in too far.
  - ○Ream the valve guide with a valve guide reamer (special tool) even if the old guide is re-used.



A. Valve Guide Reamer: 57001-1079

- Valve Installation.
  - ○Check to see that the valve moves smoothly up and down in the guide.
  - ○Check to see that the valve seats properly in the valve seat. If it does not, repair the valve seat.

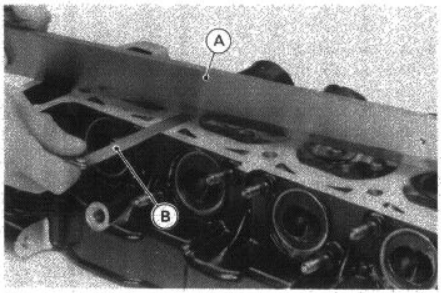
Valve and Springs



○Apply a thin coat of molybdenum disulfide engine assembly grease to the valve stem before valve installation.
○Be sure to install the inner and outer spring seats under the inner and outer springs.
○Install the springs so that the narrow-pitch end is facing toward the valve seat (downwards).

Cylinder Head Warp

●Lay a straightedge across the lower surface of the head at several different points, and measure warp by inserting a thickness gauge between the straightedge and the head.
★If warp exceeds the service limit, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.



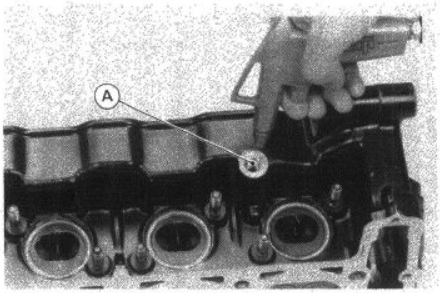
A. Straightedge B. Thickness Gauge

Cylinder Head Warp

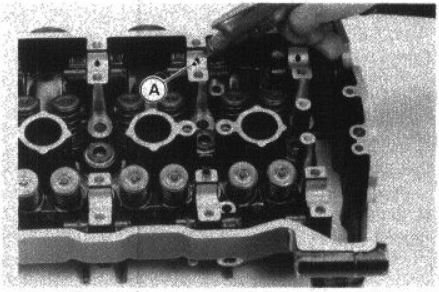
Service Limit: 0.05 mm

Cylinder Head Cleaning

●Before installation, blow the oil passages clean with compressed air.



A. Oil Passage

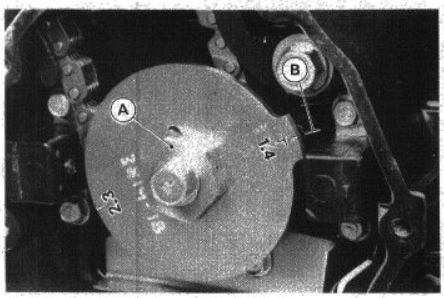


A. Oil Passage

Valves

Valve Clearance Inspection

●If the engine is hot, wait until the engine cools. Valve clearance must be checked when the engine is cold (room temperature).
●Remove the fuel tank (See Fuel Tank Removal).
●Remove the ignition coils.
●Remove the air suction valve and air hoses (US model).
●Remove the cylinder head cover.
○Situate the motorcycle on its center stand to make engine oil loss to a minimum.
●Place an oil pan beneath the pickup coil cover and remove the cover.
●Check the valve clearance when the pistons are at TDC, according to the table below.
○The pistons are numbered beginning with the engine left side.
●Using a wrench on the crankshaft rotation nut, turn the crankshaft counterclockwise until a TDC mark on the rotor is aligned with the timing mark on the crankcase.



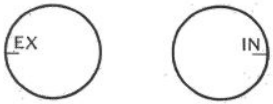
A. Rotation Nut B. TDC Mark

○Measure the valve clearance of the valves of which cam lobe is pointing away from the rocker arm.
●Each piston has two inlet and two exhaust valves. Measure this two inlet or exhaust valves at the same crankshaft position.

Valve Clearance Measuring Position

#4 Piston TDC at End of Compression Stroke →
Inlet valve clearance of #2 and #4 pistons, and
Exhaust valve clearance of #3 and #4 pistons

Camshaft Sprocket Position

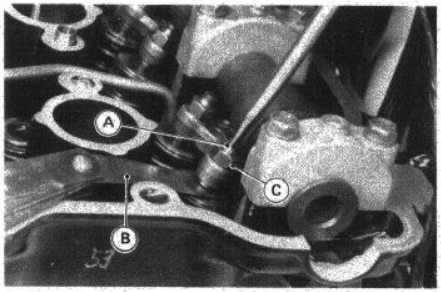


#1 Piston TDC at End of Compression Stroke →
Inlet valve clearance of #1 and #3 pistons, and
Exhaust valve clearance of #1 and #2 pistons

NOTE

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

●Measure the clearance of each valve by inserting a thickness gauge between the adjusting screw and the valve stem.



A. Adjusting Screw
B. Thickness Gauge
C. Locknut

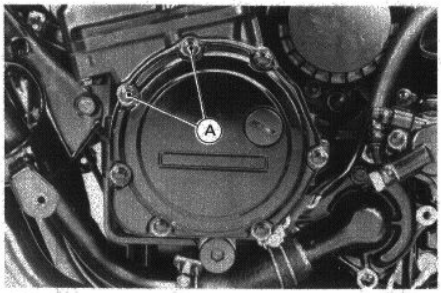
Valve Clearance (when cold)

Inlet	:	**0.13 – 0.18 mm**
Exhaust	:	**0.18 – 0.23 mm**

Valve Clearance Adjustment

★If the valve clearance is incorrect, loosen the locknut and turn the adjusting screw until the correct clearance is obtained.
●Tighten the locknut.
●Install the pickup coil cover and new gasket.

○Apply a non-permanent locking agent to the following bolts(2) at installation.



A. Bolt

○Check the engine oil level and add if necessary (See Oil Level Inspection in Engine Lubrication System).

Valve Seat Inspection

●Remove the valve (see Cylinder Head Disassembly and Assembly).
●Coat valve seat with machinist's dye.
●Push the valve into the guide.
●Rotate the valve against the seat with a lapping tool.
●Pull the valve out, and check the seating pattern on the valve head. It must be the correct width and even all the way around.

Valve Seating Surface Width

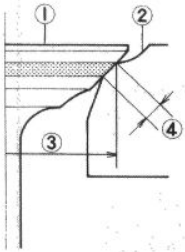
Inlet	:	**0.5 – 1.0 mm**
Exhaust	:	**0.5 – 1.0 mm**

NOTE

○*The valve stem and guide must be in good condition or this check will not be valid.*

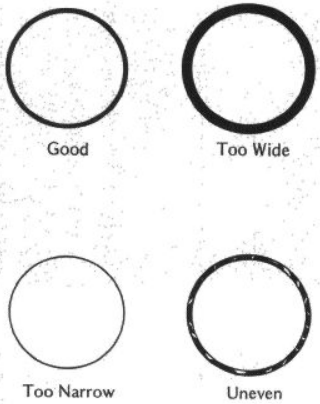
★If the valve seating pattern is not correct, repair the seat (see Valve Seat Repair).

Valve Seating Area Dimensions



1. Valve
2. Valve Seat
3. Seating Area Outside diameter
4. Seating Area Width

Valve Seating Pattern



●Measure the outside diameter of the seating pattern on the valve seat.

★If the outside diameter of the valve seating pattern is too large or too small, repair the seat (see Valve Seat Repair).

Valve Seating Surface Outside Diameter

Inlet :	**28.3 – 28.5 mm**
Exhaust :	**24.0 – 24.2 mm**

Valve Seat Repair

●Follow the manufacturer's instructions for use of valve seat cutter set.

Valve Seat Cutter Set

Part Number : 57001-1110

Used Cutters in Set

Intake Valve

②	45° – φ27.5	57001-1187
⑧	32° – φ30.0	57001-1120
⑪	60° – φ30.0	57001-1123

Exhaust Valve

②	45° – φ27.5	57001-1114
⑦	32° – φ28.0	57001-1119
⑪	60° – φ30.0	57001-1123

Used Holder and Bar in Set

Holder – φ5.5	**57001-1125**
Bar	**57001-1128**

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

Seat Cutter Operating Cares:

1. This valve seat cutter is developed to grind the valve seat for repair. Therefore the cutter must not be used for other purposes than seat repair.
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

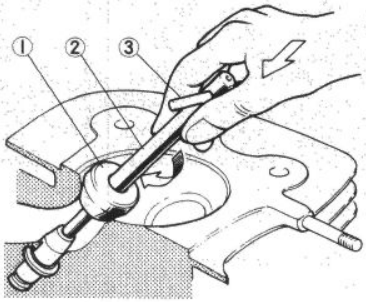
○*Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

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.*

Valve Seat Cutter



1. Cutter
2. Cutter Holder
3. Bar

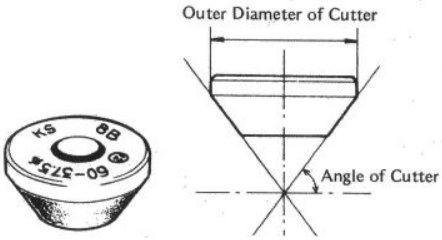
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter:

The marks stamped on the back of the cutter represent the following.

①	Cutter number, selected from ① to ⑫
45°	Cutter angle
24.5φ	Outer diameter of cutter
KS00	Manufactured lot number

Cutter



Operating Procedures:

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter to 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.**

- 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.

★If the outside diameter of the seating surface is too large, make the 32° grind described below.

★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.

- Grind the seat at a 32° angle until the seat O.D. is within the specified range.

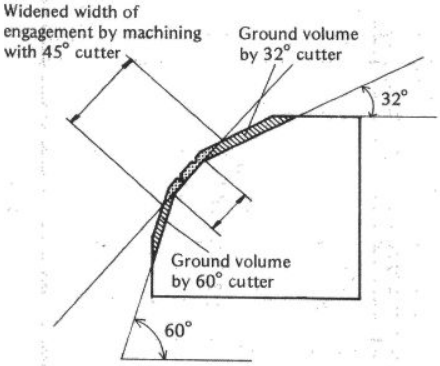
○To make the 32° grind, fit a 32° cutter to the holder, and slide it into the valve guide.

○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.**

Valve Seat Repair



○After making the 32° grind, return to the seat O.D. measurement step above.

- To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.

★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.

★If the seat width is too wide, make the 60° grind described below.

★If the seat width is within the specified range, lap the valve to the seat as described below.

- Grind the seat at a 60° angle until the seat width is within the specified range.

○To make the 60° grind, fit a 60° cutter to the holder, and slide it into the valve guide.

○Turn the holder, while pressing down lightly.

○After making the 60° grind, return to the seat width measurement step above.

- Lap the valve to the seat, once the seat width and O.D. are within the ranges specified above.

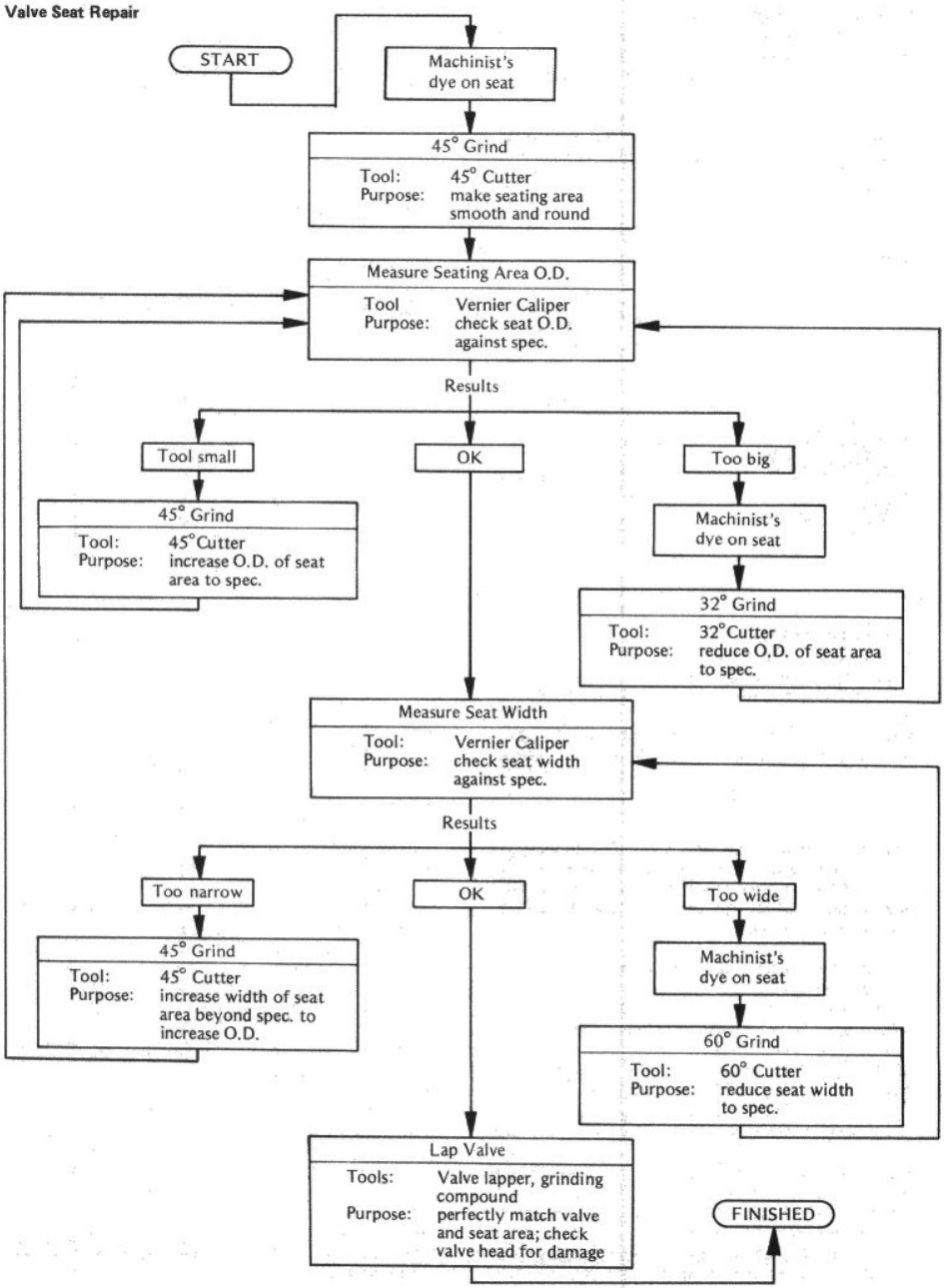
○Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.

○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.

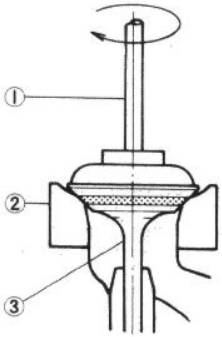
- The seating area should be marked about in the middle of the valve face.

Valve Seat Repair



★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 clearances (see Valve Clearance Adjustment).

Valve Lapping



1. Lapper
2. Valve Seat
3. Valve

Measuring Valve-to-Guide Clearance (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 into the guide against the stem perpendicular to it as close as possible to the cylinder head mating surface.
●Move the stem back and forth to measure valve/valve guide clearance.
●Repeat the measurement in a direction at a right angle to the first.
★If the reading exceeds the service limit, replace the guide.

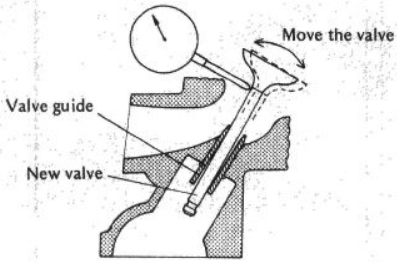
NOTE

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

Valve/Valve Guide Clearance (Wobble Method)

	Standard	Service Limit
Inlet	**0.02 – 0.08 mm**	**0.22 mm**
Exhaust	**0.07 – 0.14 mm**	**0.27 mm**

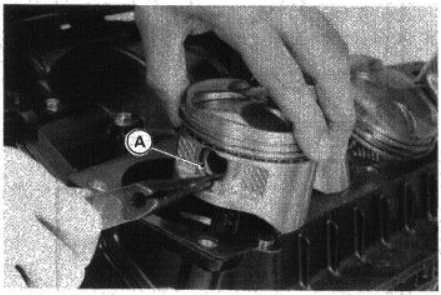
Wobble Method



Cylinder, Piston

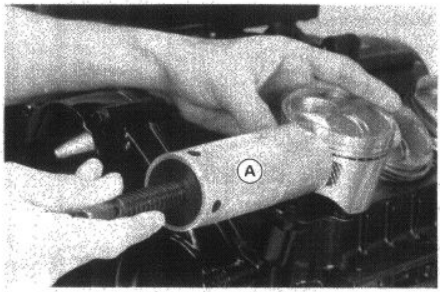
Piston Removal Notes

●Remove the piston pin snap rings from the outside of each piston.



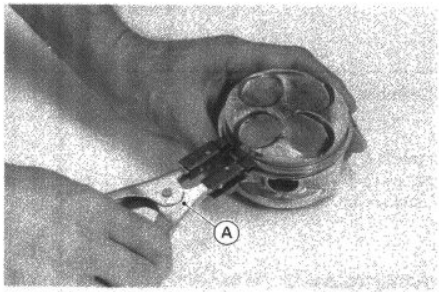
A. Snap Ring

●Remove the piston by pushing its piston pin out the side that the snap ring was removed. Use piston pin puller assembly (special tool), if the pin is tight.



A. Piston Pin Puller Assembly: 57001-910

- Remove the top and second rings with the piston ring pliers (special tool). If the special tool is not available, carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



A. Piston Ring Pliers: 57001-115

Piston Installation Note

- The arrow on the Top of the piston must point toward front.
- When installing a 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.**

- Oil Ring Installation:

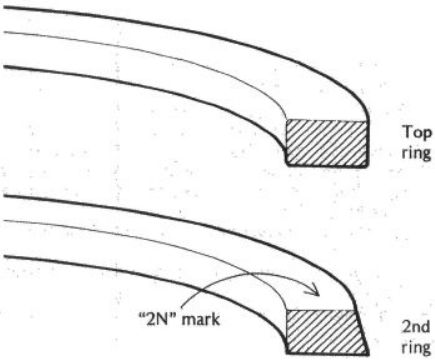
○First install the expander in the piston oil ring groove so that expander ends butt together, never overlap.

○Install the upper and lower steel rails. There is no UP or DOWN to the rails. They can be installed either way.

Oil Ring Expander Installation

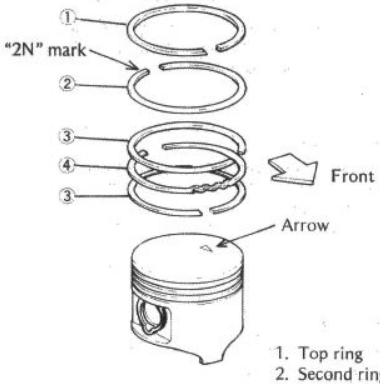
- Do not mix up the second and top ring. The top ring is rectangular and symetrical with respect to the horizontal axis; it can be installed either way.
- The second ring is not symetrical and must be installed as shown.

Cross Section of Piston Rings



- Position each piston ring so that the opening in the top ring and oil ring steel rails are facing forwards, and the second ring and oil ring expander openings face the rear. The openings of the oil ring steel rails must be about 30 – 40° of angle from the opening of the top ring.

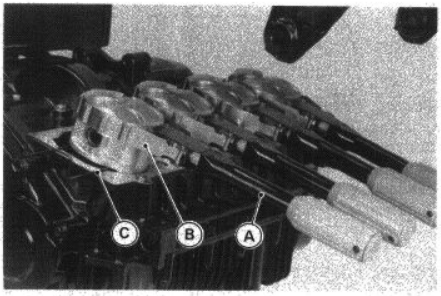
Piston Ring Openings
: Viewed from Front



1. Top ring
2. Second ring
3. Steel rail, oil ring
4. Expander, oil ring

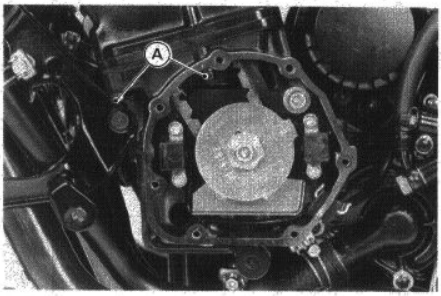
Cylinder Block Installation Notes

- If new pistons and/or new cylinder block are installed, apply a thin coat of a molybdenum disulfide engine assembly grease to the new pistons and cylinder bores.
- Slip piston bases (special tool) under the pistons to hold them level.
- Compress the piston rings using piston ring compressor assemblies (special tool).



A. Piston Ring Compressor Assembly: 57001-1094
B. Use belt ($\phi 50 - \phi 67$).
C. Piston base: 57001-149

- Torque the cylinder bolt after the cylinder head bolts tightening.



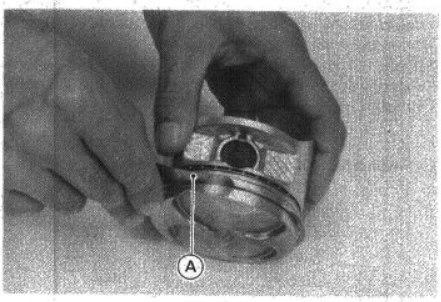
A. Cylinder Bolt

Piston Ring, Piston Ring Groove Wear

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

Piston Ring Groove Clearance

	Standard	Service Limit
Top	0.03 – 0.07 mm	0.17 mm
Second	0.02 – 0.06 mm	0.16 mm



A. Thickness Gauge:

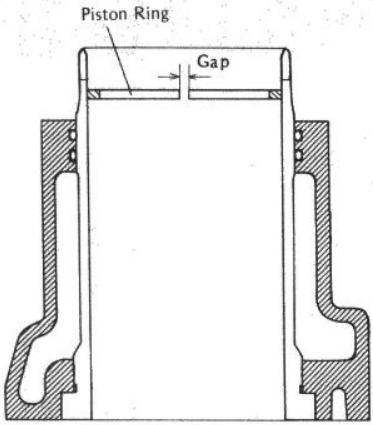
Piston Ring End Gap

- Place the piston ring 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.

Piston Ring End Gap

	Standard	Service Limit
Top	0.2 – 0.35 mm	0.7 mm
Second	0.2 – 0.35 mm	0.7 mm
Oil	0.2 – 0.7 mm	1.0 mm

End Gap Measurement

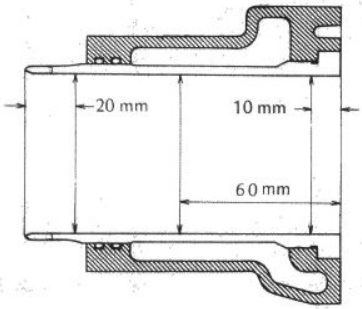


Cylinder Inside Diameter

●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 3 locations (total of 6 measurements) shown in the figure.

★If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder will have to be bored to oversize and then honed.

Cylinder Inside Diameter Measurement



Cylinder Inside Diameter

Standard: **72.494 – 72.506 mm and less than 0.01 mm difference between any two measurements**

Service Limit: **72.6 mm, or more than 0.05 mm difference between any two measurements**

Piston Diameter

●Measure the outside diameter of each piston 5 mm up from the bottom of the piston at a right angle to the direction of the piston pin.

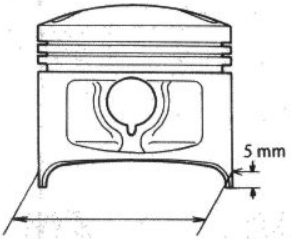
★If the measurement is under the service limit, replace the piston.

Piston Diameter

Standard: **72.435 – 72.450 mm**

Service Limit: **72.3 mm**

Piston Diameter Measurement



Boring, Honing

when boring and honing a cylinder, note the following:

○There are two sizes of oversize pistons available. Oversize pistons require oversize rings.

Oversize Pistons and Rings

0.5 mm	Oversize
1.0 mm	Oversize

○Before boring a cylinder, first measure the exact diameter of the oversize piston, and then, according to the standard clearance in the Service Data Section, determine the rebore diameter. However, if the amount of boring necessary would make the inside diameter greater than **1.0 mm** oversize, the cylinder block must be replaced.

○Cylinder inside diameter must not vary more than **0.01 mm** at any point.

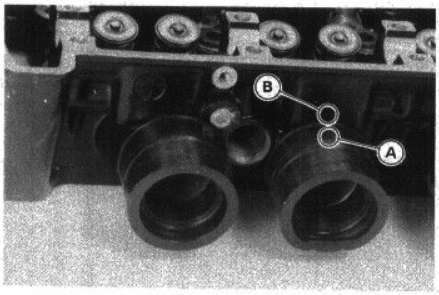
○Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

○In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus **0.1 mm** and the service limit for the piston is the oversize piston original diameter minus **0.15 mm**. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.
○Never separate the liner from the cylinder, because the top surface of cylinder and liner is machined at the factory as an assembly.

Carburetor Holder

Carburetor Holder Installation

●Install the carburetor holders so that the projections are aligned with the cylinder head marks. Then the projection faces upwards.



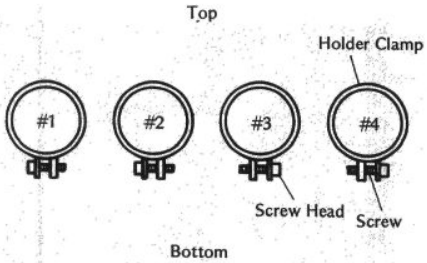
A. Holder Projection B. Mark

●Install the holder clamps as shown being careful of the screw position and the screw head direction.

WARNING

○Install the clamp screws horizontal. Or, the screws could come in contact with the vacuum adjusting screws, resulting in an unsafe riding condition.

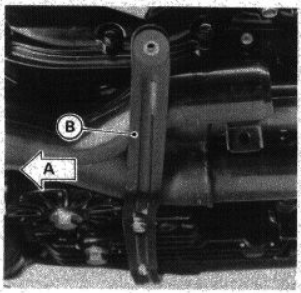
Holder Clamp Installation



Muffler

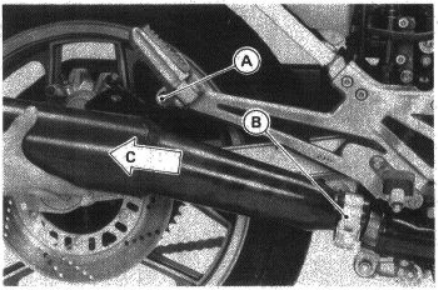
Removal Notes

●Removal the radiator (See Radiator Removal in Cooling System Chapter).
●Remove the bracket from the engine bottom.



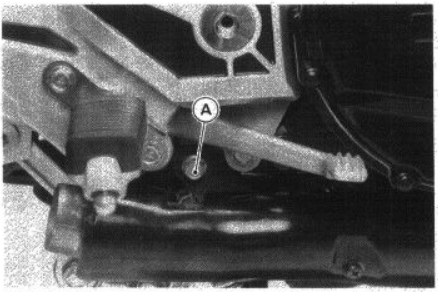
A. Front B. Bracket

- Remove the mounting bolts on both sides.
- Loosen the clamps and pull the mufflers out of the exhaust pipes.



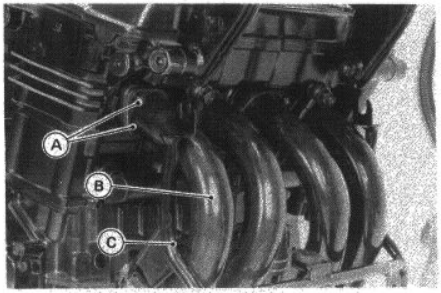
A. Mounting Bolt
B. Clamp
C. Pull out

- Remove the exhaust pipe mounting bolts on both sides.



A. Exhaust Pipe Mounting Bolts

- Remove the horns.
- Remove the exhaust pipe holders and nuts.
- Remove the exhaust pipes with the fairing bracket.



A. Exhaust Pipe Holder and Nut
B. Exhaust Pipe
C. Fairing Bracket

Installation Notes

- Tighten the muffler mounting bolts, nuts, and clamp bolts in the order and method indicated below.
  - First, tighten all the bolts and nuts to a snug fit.
  - Apply a non permanent locking agent to the exhaust pipe mounting bolts threads.
  - Secondly, tighten the exhaust pipe holder nuts evenly to avoid exhaust leaks.
  - Lastly, tighten the rest of the mounting bolts and clamp bolts securely.
- Thoroughly warm up the engine, wait until the engine cools down, and retighten all the clamp bolts.

Clutch

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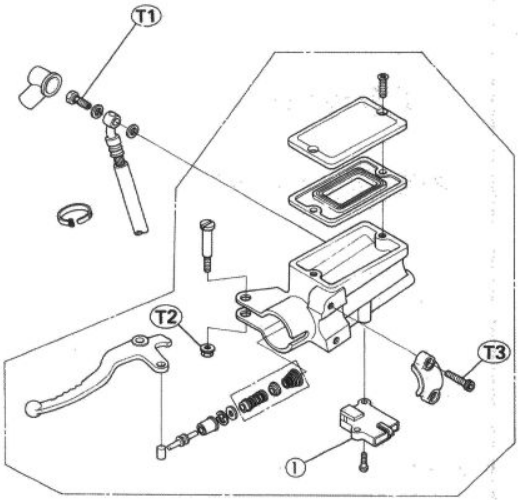
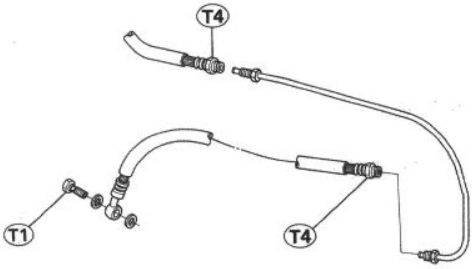
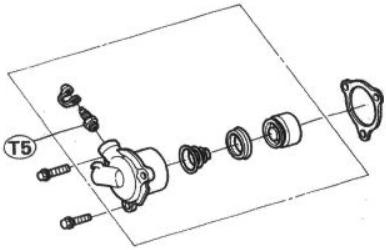
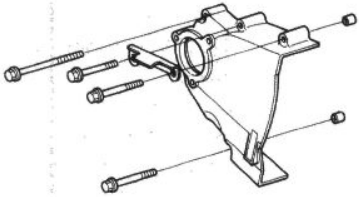
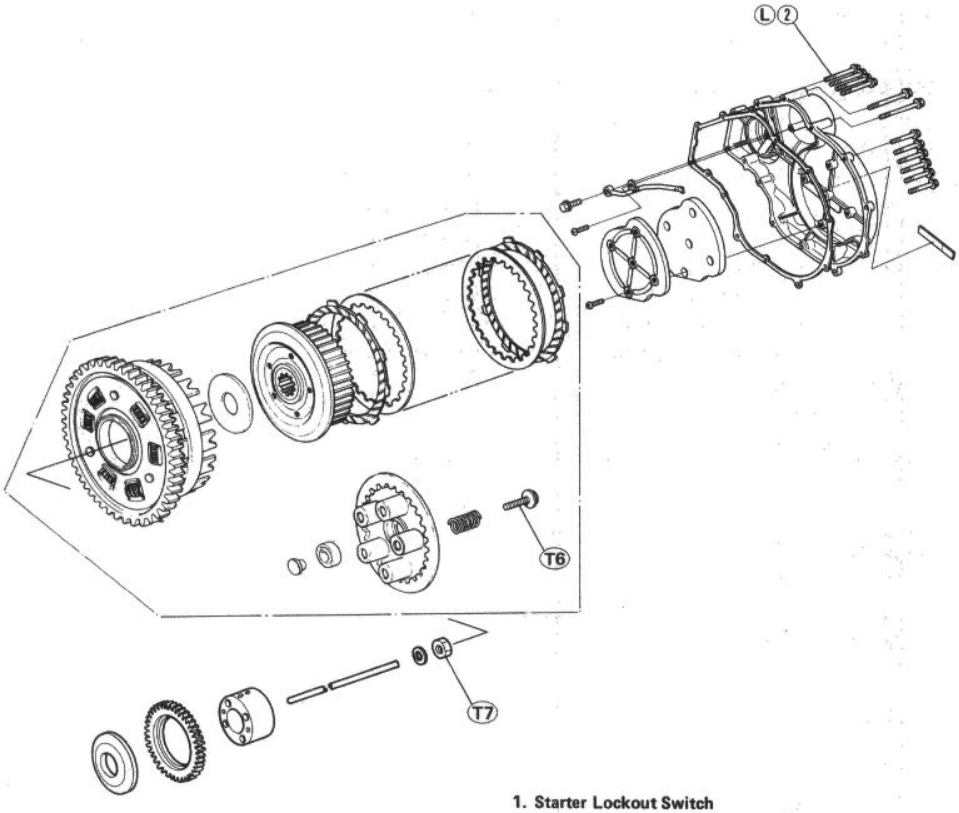










1. Starter Lockout Switch
2. Cover Bolts: Four of them require a non-permanent locking agent (see Right Cover Installation Note).

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

T1: 29 N-m (3.0 kg-m, 22 ft-lb)
T2: 5.9 N-m (0.60 kg-m, 52 in-lb)
T3: 11 N-m (1.1 kg-m, 95 in-lb)
T4: 18 N-m (1.8 kg-m, 13.0 ft-lb)
T5: 7.8 N-m (0.80 kg-m, 69 in-lb)
T6: 9.8 N-m (1.0 kg-m, 87 in-lb)
T7: 130 N-m (13.5 kg-m, 98 ft-lb)

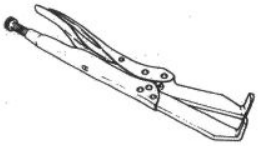
Specifications

Item		Standard	Service Limit
Recomended Clutch Fluid:	Grade	D.O.T.4	
	Brand	Castrol Girling–Universal Castrol GT (LMA) Castrol Disc Brake Fluid Check Shock Premium Heavy Duty	
Clutch:	Clutch lever play	Non-adjustable	– – –
	Clutch spring free length	33 – 34.2 mm	32.6 mm
	Friction plate thickness	2.9 – 3.1 mm	2.75 mm
	Friction and steel plate warp	Less than 0.2 mm	0.3 mm
Primary Reduction:			
	Primary gear/clutch housing gear backlush	0.03 mm – 0.10 mm	0.14 mm

Special Tool

Along with common hand tools, the following more specialized tool is required for complete clutch servicing.

Holder: 57001-305



Clutch Fluid

Clutch Fluid Recommendation

Recommended fluids are given in the table below. If none of the recommended fluids are available, use extra heavy-duty brake fluid only from a container marked D.O.T.4.

Recommended Clutch Fluid

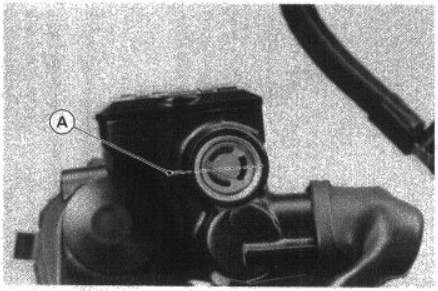
Grade:	**D.O.T.4 Heavy Duty Brake Fluid**
Brand:	**Castrol Girling – Universal**
	Castrol GT (LMA)
	Castrol Disc Brake Fluid
	Check Shock Premium Heavy Duty

NOTE

○*Since the clutch fluid is the same as the brake fluid, refer to Brake Fluid Section in Brakes for further details.*

Clutch Fluid Level Inspection

●Position the reservoir horizontal, and check that the fluid level in the reservoir is higher than the lower level.



A. Lower Level Line

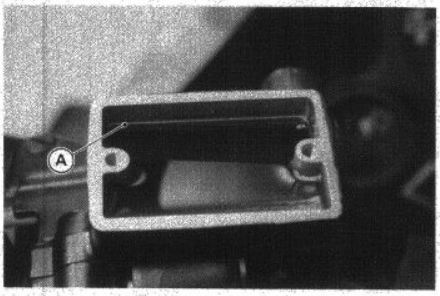
★If the fluid level is lower than the lower level, check for the fluid leakage of the clutch line, and add the fluid as follows.

○Remove the reservoir cap, and fill the reservoir to the upper level line in the reservoir with the same type and brand of the fluid that already is in the reservoir. And then install the reservoir cap.

WARNING

○**Change the fluid in the clutch line completely if the fluid must be refilled but the type and brand of the fluid that already is in the reservoir are unidentified.**

○**After changing the fluid, use only the same type and brand of fluid thereafter. Mixing different types and brands of fluid lowers the fluid boiling point and could cause the clutch to be ineffective. It may also cause the rubber clutch parts to deteriorate.**



A. Upper Level Line

●Operate the clutch, and check for fluid leakage around the fittings.

WARNING

○**If the clutch lever has a soft or "spongy feeling" when it is applied, there might be air in the clutch lines or the clutch may be defective. Since it is dangerous to operate the motorcycle under such conditions, bleed the air from the clutch line immediately.**

Clutch Fluid changing

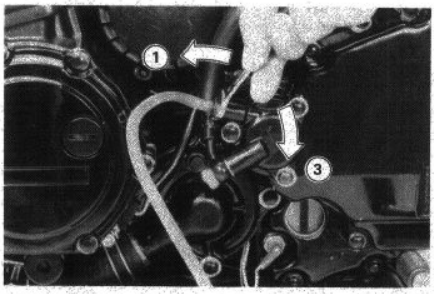
●Remove the reservoir cap.
●Remove the rubber cap on the bleed valve.
●Attach a clear plastic hose to the bleed valve on the clutch slave cylinder, and run the other end of the hose into a container.
●Open the bleed valve (counterclockwise to open), and pump the clutch lever until all the fluid is drained from the line.
●Close the bleed valve.
●Remove the diaphragm.
●Fill the reservoir with fresh fluid.
●Open the bleed valve,squeeze the clutch lever, close the valve with the clutch held applied, and then quickly release the lever. Repeat this operation until the clutch line is filled and fluid starts coming out into the plastic hose.

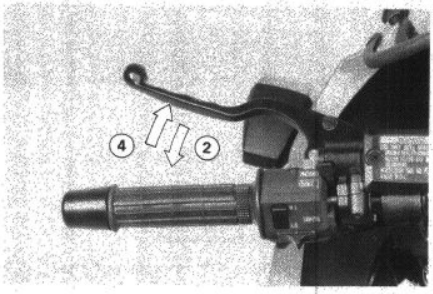
NOTE

○*Replenish the fluid in the reservoir as often as necessary to keep it from running completely out.*

●Tighten the bleed valve to the specification (See Exploded Views).

Filling up Clutch Line





1. Open the bleed valve.
2. Apply the clutch lever and hold it.
3. Close the bleed valve.
4. Then release the clutch lever suddenly.

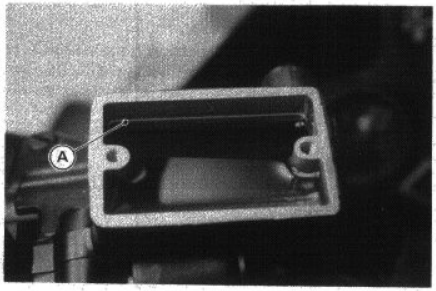
Clutch Line Air Bleeding

- Remove the reservoir cap, and check that there is plenty of fluid in the reservoir.

NOTE

○*The fluid level must be checked several times during the bleeding operation and replenished 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.*

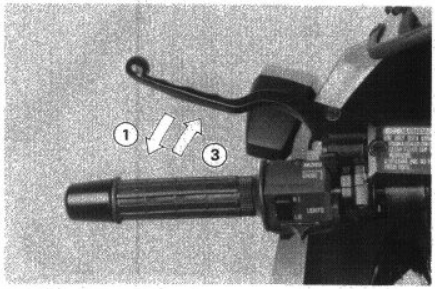
- Connect a clear plastic hose to the bleed valve at the clutch slave cylinder, running the other end of the hose into a container.
- With the reservoir cap off, slowly pump the clutch lever several times until no air bubbles can be see rising up through the fluid from the holes at the bottom of the reservoir. This bleeds the air from the master cylinder end of the line.
- Pump the clutch lever a few times until it becomes hard and then, holding the lever squeezed, quickly open (turn counterclockwise) and close the bleed valve. Then release the lever. Repeat this operation until no more air can be seen coming out into the plastic hose.
- When air bleeding is finished, check that the fluid is filled to the upper level line marked in the reservoir.

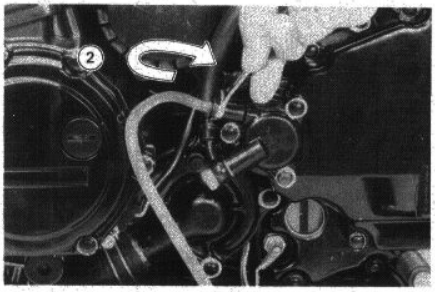


A. Upper Level Line

- Install the reservoir cap.
- Tighten the bleed valve to the specification.
- Apply the clutch lever forcefully for a few seconds, and check for fluid leakage around the fittings.

Bleeding Clutch Line





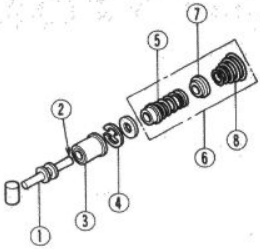
1. Hold the clutch lever applied.
2. Quickly open and close the valve.
3. Release the clutch lever.

Clutch Master Cylinder

Master Cylinder Disassembly

- Drain the clutch fluid.
- Remove the clutch lever and the master cylinder.
- Remove the push rod, the dust seal and the circlip.

Master Cylinder Inside Parts



1. Push rod
2. Rod round end
3. Dust seal
4. Circlip
5. Primary cup
6. Piston assembly
7. Secondary cup
8. Spring

CAUTION

○**Do not remove the primary cup and secondary cup from the piston or the cylinder since removal will damage them.**

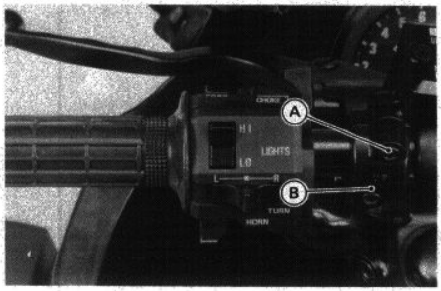
Master Cylinder Assembly Note

- Apply brake fluid to the parts removed and to the inner wall of the cylinder. Take care not to scratch the piston or the inner wall of cylinder.
- Check to see that the piston return spring pushes back the piston to its rest position when the spring is compressed.
- Install the push rod with the dust seal fitted into the groove.

○The push rod round end must be faced inwards.

Master Cylinder Installation

- The master cylinder clamp must be installed with the UP mark faced upwards.
- Torque the upper clamp bolt first, and then the lower clamp bolt to the specification. There will be a gap at the lower part of the clamp after tightening.



A. Tighten upper clamp bolt first
B. Up mark

Inspection and Adjustment after Installation

- Bleed the clutch line after master cylinder installation (see Clutch Line Air Bleeding).
- Check that the clutch line has proper fluid pressure and no fluid leakage.

Visual Inspection

- Check that there are no scratches, rust or pitting on the inside of the master cylinder and on the outside of the piston.
- ★If the master cylinder or piston shows any damage, replace the master cylinder and piston.
- Inspect the primary cup.
- ★If a cup is worn, damaged, softened (rotted), or swollen, replace the piston assembly.
- ★If fluid leakage is noted at the clutch lever, the piston assembly should be replaced to renew the cups.

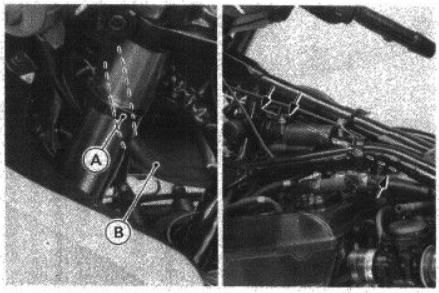
NOTE

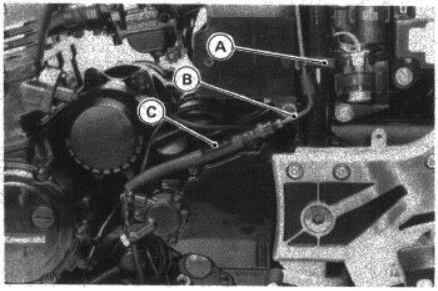
○*The cups and spring are part of the piston assembly. Replace the piston assembly if any one of the cups or the spring requires replacement.*

Clutch Pipe

Installation Note

- Route and clamp the clutch pipe as shown.
- Tighten the banjo bolts and the pipe joint to the specification (see Exploded Views).





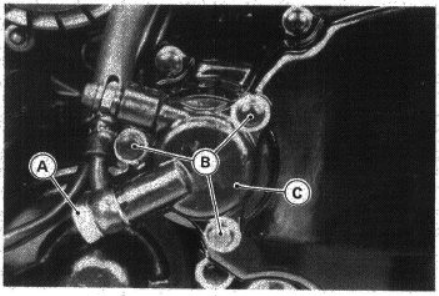
A. Band
B. Clutch Pipe
C. Clamp

Clutch Slave Cylinder

Since the hydraulic clutch compensate automatically friction plate wear and has no clutch cable, no periodic adjustment is needed.

Clutch Slave Cylinder Removal

- Remove the banjo bolt.
- Remove the mounting bolts.
- Remove the slave cylinder unit.



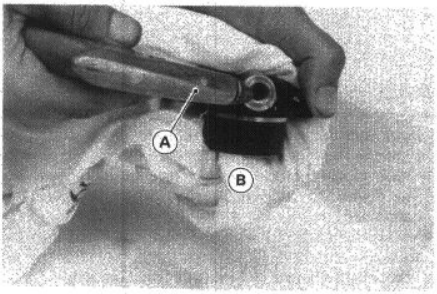
A. Banjo Bolt
B. Mounting Bolt
C. Slave Cylinder Unit

CAUTION

○Do not spill clutch fluid onto any painted surface.

Clutch Slave Cylinder Disassembly

- Remove the banjo bolt.
- Using compressed air, remove the piston.
  - ○Cover the cylinder opening with a clean, heavy cloth.
  - ○Face the opening downwards.
  - ○Remove the piston by lightly applying compressed air to where the clutch line fits into the slave cylinder.



A. Apply compressed air.
B. Cloth

CAUTION

○If the fluid seal is removed from the piston, replace the seal with a new one. Removal would damage the seal.

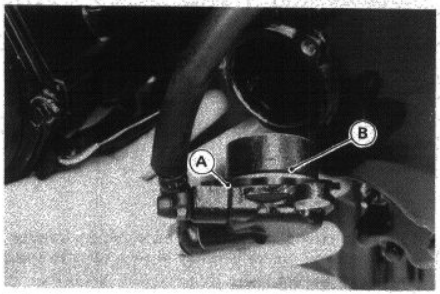
WARNING

○**To avoid serious injury, never place your fingers or palm in front of the cylinder opening. If you apply high compressed air to the cylinder, the piston may injure your hand or fingers.**

Clutch Slave Cylinder Assembly

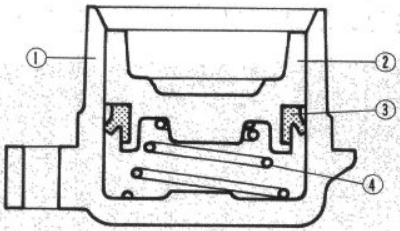
- Install the fluid seal being careful of the installation direction.
- Check that the fluid seal is properly fitted into the piston groove.
- Apply clutch fluid to the outside of the piston and the fluid seal, and push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston get scratched.
- Install the insulator and the slave cylinder assembly.

○Push the piston in by hand as far as it will go at installation.



A. Insulator B. Slave Cylinder Assembly

Clutch Slave Cylinder



1. Cylinder
2. Piston
3. Fluid Seal
4. Spring

- Use a new flat washer on each side of the hose fitting.
- Tighten the banjo bolt to the specification (see Exploded Views).
- Fill the clutch fluid into the clutch line and bleed the clutch line. (See Clutch Fluid Changing and Clutch Line Air Bleeding).

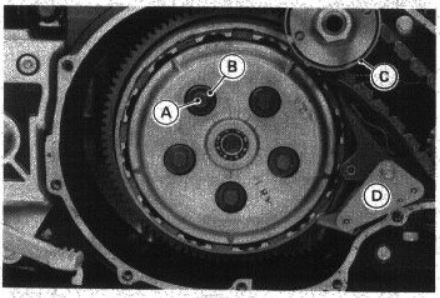
Clutch

Clutch Removal

NOTE

○*It is not necessary to remove the alternator sprocket and the chain tensioner for clutch removal.*

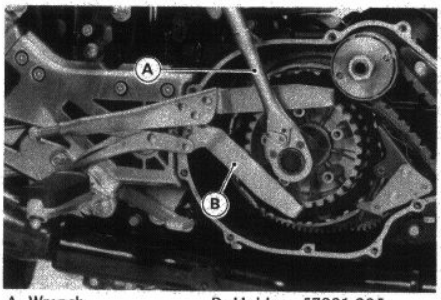
- Remove the right engine cover.
- Remove the clutch spring bolts, washers and springs.
- Remove the friction plates and steel plates.



A. Clutch Spring Bolt
B. Washer
C. Alternator Sprocket
D. Chain Tensioner

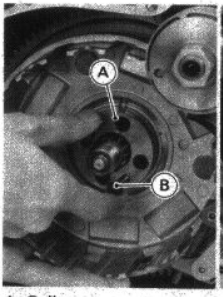
- When loosening the clutch hub selflocking nut, use the holder (special tool) to the keep the clutch hub from turning as shown in the figure below.

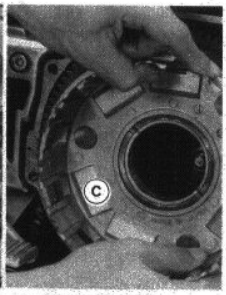
○Turn the wrench counterclockwise slowly.



A. Wrench B. Holder: 57001-305

- Pull out the clutch hub, thrust washer, clutch housing bearing collar, clutch housing, another thrust washer, and washer.
- ○The clutch housing bearing collar can easily be removed by installing right engine cover bolts into the collar holes and pulling them.
- ○The clutch housing can be removed after removing the bearing collar.

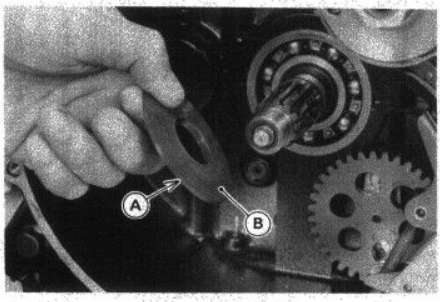




A. Collar
B. Right Engine Cover Bolt
C. Clutch Housing

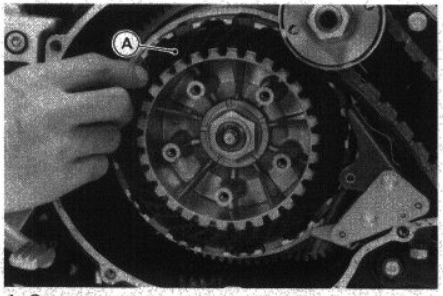
Clutch Installation

- Install the spacer with the chamfer side facing inwards.



A. Spacer B. Chamfer

- Discard the used clutch hub self-locking nut, and install a new nut.
- Install the clutch holder to keep the clutch hub from turning and tighten the clutch hub nut to the specification (See Exploded Views).
- Install the friction plates and steel plates, starting with a friction plate and alternating them.
- ○The grooves on the friction plate surfaces are cut tangentially and radially, install the friction plates so that the grooves run toward the center in the direction of the clutch housing rotation (counterclockwise viewed from the engine right side).



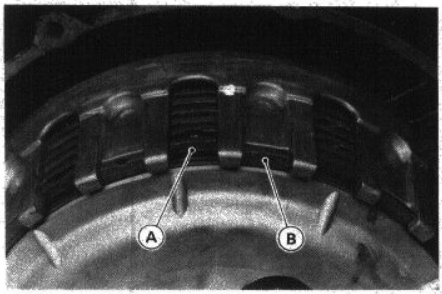
A. Grooves

CAUTION

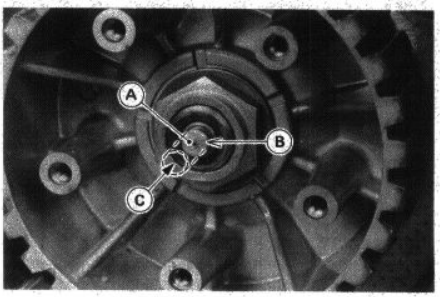
- ○**If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

NOTE

- ○***First, Install the seven friction plates fitting the tangs of plates in the grooves Ⓐ in the clutch housing. And then, install the last one fitting the tangs in the grooves Ⓑ in the housing.***



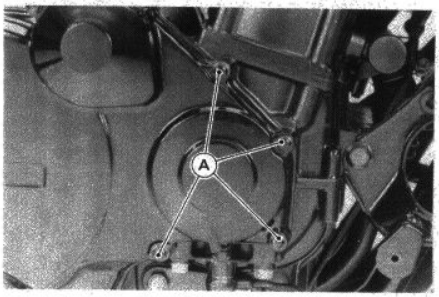
- Install the clutch push rod so that the flat end faces outward (towards the engine right side).
- Check that the clutch push rod is in the retracted position.
  - If not, push the rod into the shaft by hand prior to the engine right cover installation.



A. Flat End of the Push Rod
B. Retracted Position
C. Push the Rod

Right Cover Installation Note

- Apply a non-permanent locking agent to the following bolts.



A. Bolt

Right Cover Cleaning

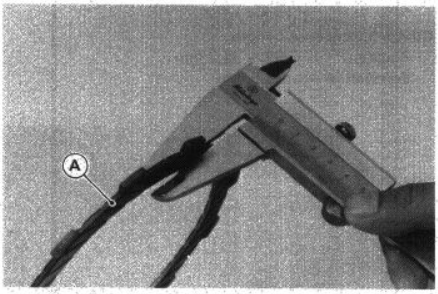
- Remove the banjo bolt and blow out any particles which may obstruct the oil pipe.

A. Oil Pipe

Friction Plate Wear, Damage Inspection

- Visually inspect the friction plates to see if they show any signs of seizure, overheating, or uneven wear.
- ★If any plates show signs of damage, replace the friction plates and steel plates as a set.

Friction Plate Thickness Measurement



A. Friction Plate

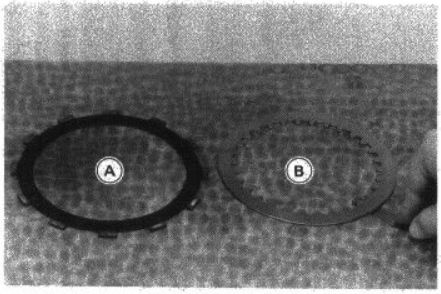
Friction Plate Thickness
Standard: 2.9 – 3.1 mm
Service Limit: 2.75 mm

Friction or Steel Plate Warp Inspection

- Place each friction plate or steel plate on a surface plate, and measure the gap between the surface plate and each friction plate or steel plate. 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: **less than 0.2 mm**
Service Limit: **0.3 mm**

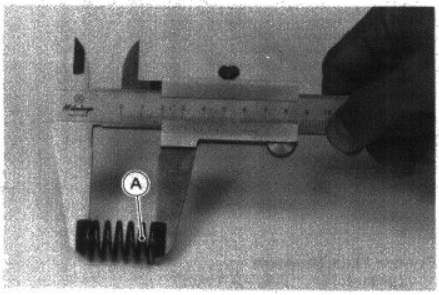
Friction and Steel Plate Warp Measurement



A. Friction Plate B. Steel Plate

Clutch Spring Free Length Measurement

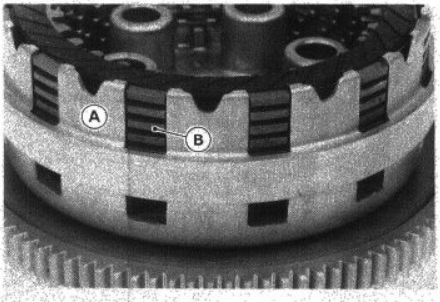
Clutch Spring Free Length
Standard: **33 – 34.2 mm**
Service Limit: **32.6 mm**



A. Clutch Spring

Clutch Housing Finger Inspection

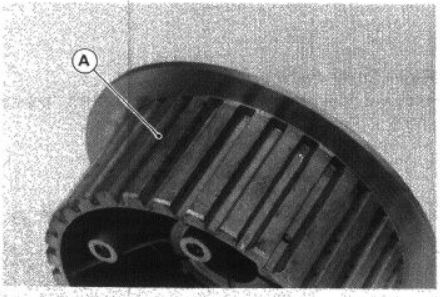
- Visually inspect the fingers of the clutch housing where the housing of the friction plates hit them.
- ★If they are badly worn or if there are grooves cut where the tangs hit, replace the housing. Also, replace the friction plates if their tanks are damaged.



A. Clutch Housing Finger B. Friction Plate Tang

Clutch Hub Spline Inspection

- Visually inspect where the teeth on the steel plates wear against the splines of the clutch hub.
- ★If there are notches worn into the splines, replace the clutch hub. Also, replace the steel plates if their teeth are damaged.



A. Clutch Hub Spline

Engine Lubrication System

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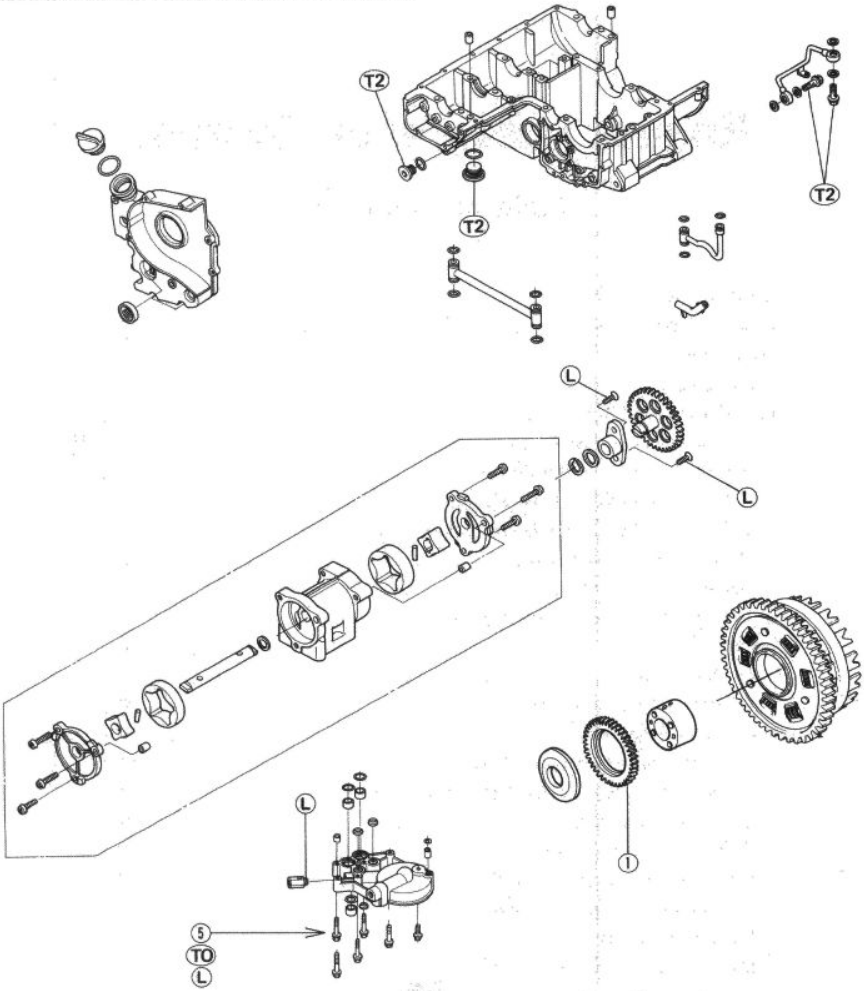
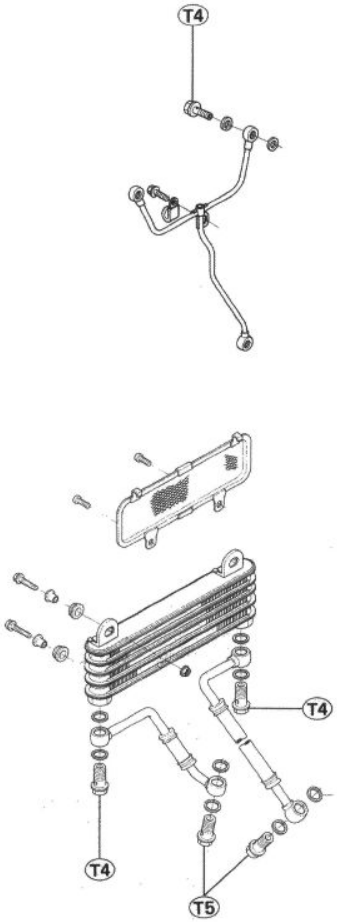
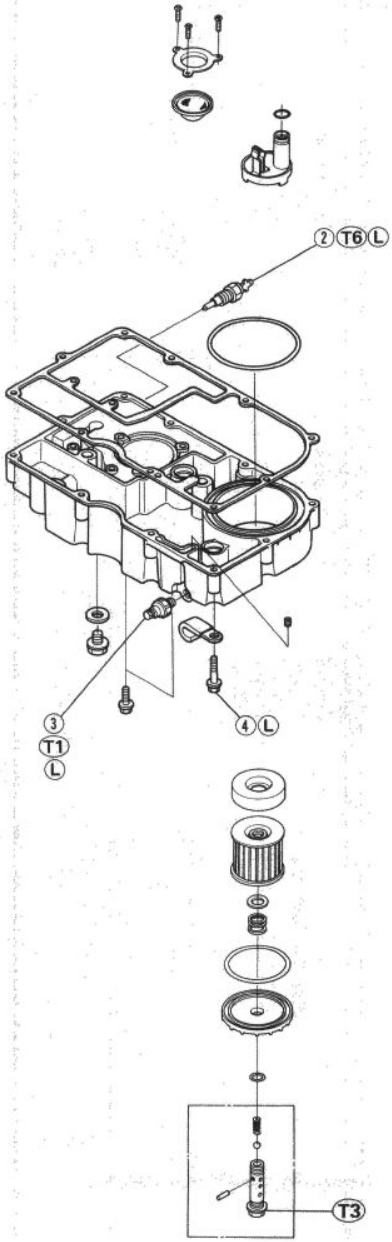
Oil Pressure Switch (see Electrical system Chapter)

6-2 ENGINE LUBRICATION SYSTEM

Exploded View





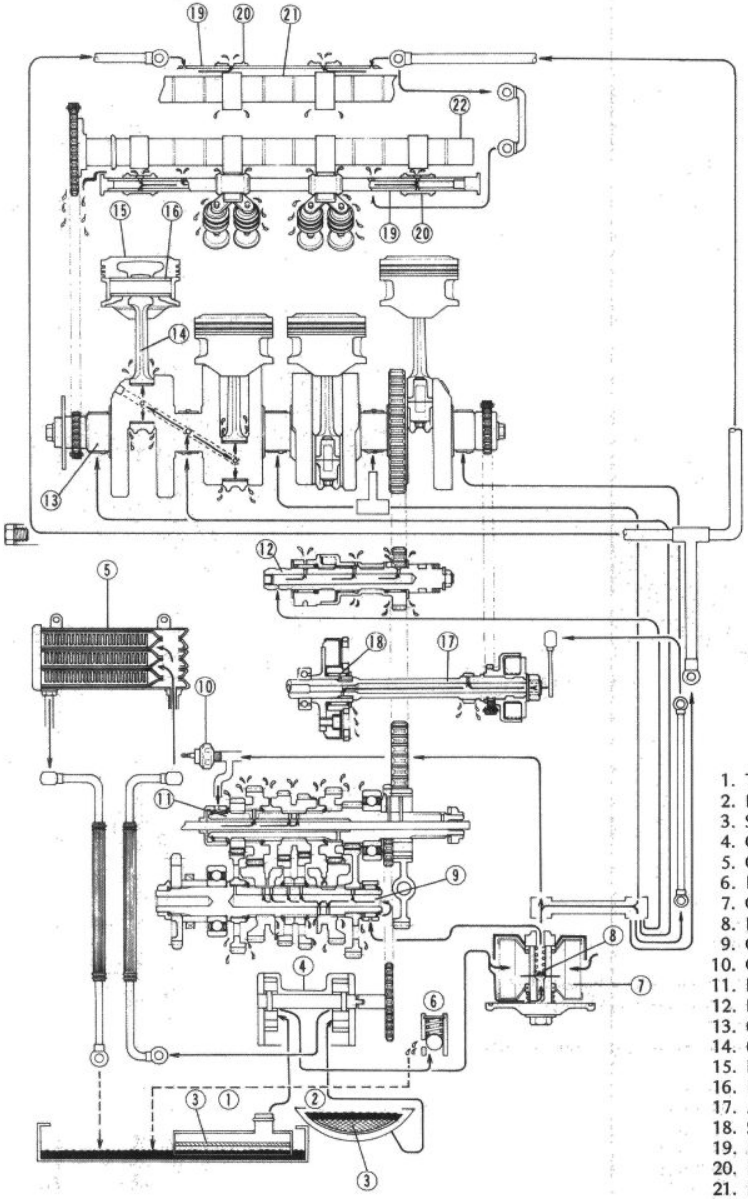


1. Oil Pump Driven Gear
2. Oil Temperature Switch
3. Oil Pressure Switch
4. Oil Pan Bolts: Three of them require locking agent (see Oil Pan Installation Notes)
5. Oil Pump Mounting Bolts

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

TO: 9.8 N-m (1.0 kg-m, 87 in-lb)
T1: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T2: 18 N-m (1.8 kg-m, 13.0 ft-lb)
T3: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T4: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T5: 34 N-m (3.5 kg-m, 25 ft-lb)
T6: 7.8 N-m (0.80 kg-m, 69 in-lb)

Engine Oil Flow Chart



1. Transmission Chamber
2. Balancer Chamber
3. Screen
4. Oil Pump
5. Oil Cooler
6. Relief Valve
7. Oil Filter
8. Bypass Valve
9. Output Shaft
10. Oil Pressure Switch
11. Drive Shaft
12. Balancer
13. Crankshaft
14. Connecting Rod
15. Piston
16. Piston Pin
17. Alternator Shaft
18. Starter Clutch
19. Rocker Shaft
20. Rocker Arm
21. Exhaust Camshaft
22. Inlet Camshaft

Specifications

Item		Standard
Engine oil:	Grade	SE class
	Viscosity	SAE 10W40, 10W50, 20W40, or 20W50
	Amount	4.0 L
	Level	Between upper and lower levels
Relief valve opening pressure		420 – 590 kPa (4.4 – 6.0 kg/cm², 63 – 85 psi)
Oil pressure @4,000 r/min (rpm), oil temp. 90°C (194°F)		265 – 325 kPa (2.7 – 3.3 kg/cm², 38 – 47 psi)

Special Tools

Along with common hand tools, the following more specialized tools are required for complete engine lubrication system servicing.

Oil Pressure Gauge: 57001-164

Oil Pressure Gauge Adapter: 57001-1188

Engine Oil and 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.

Engine Oil Level Inspection

●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.

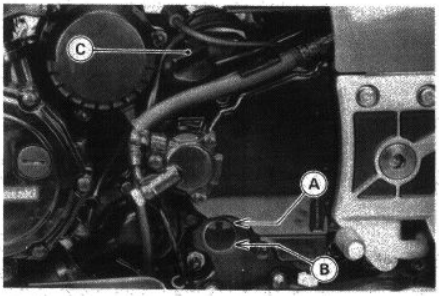
CAUTION

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

●If the motorcycle has just been used, wait several minutes for all the oil to drain down.
●Situate the motorcycle so that it is perpendicular to the ground, and check the engine oil level through the oil level gauge.
★The oil level should come up between the upper and lower level lines.
★If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
★If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.

NOTE

○If the engine oil type and make are unknown, use any brand of the specified oil to top up the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.



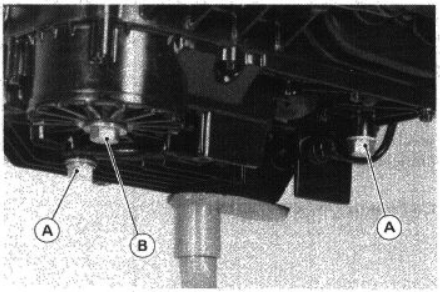
A. Upper Level
B. Lower Level
C. Oil Filler Opening Cap

CAUTION

○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 and/or Filter Change

●Remove the under cowling.
●Warm up the engine so that the oil will pick up any sediment and drain easily. Then stop the engine.
●With the motorcycle up on its center stand, place an oil pan beneath the engine.
●Remove two engine drain plugs, and let the oil drain completely.



A. Drain Plug
B. Oil Filter Mounting Bolt

●If the oil filter is to be changed, replace it with a new one (see Oil Filter and Bypass Valve Removal and Installation Notes).
●Check the gaskets at the drain plugs for damage.
★Replace the gaskets with new ones if they are damaged.
●After the oil has completely drained out, install the drain plugs with the gaskets, and tighten them to the specified torque (see Exploded View).
●Fill the engine with a good quality motor oil specified in the table.
●Check the oil level.

Engine Oil

Grade:	**SE class**
Viscosity:	**SAE 10W40, 10W50, 20W40, or 20W50**

Required Amount
When filter is not removed: 3.5 L
When filter is removed: 4.0 L

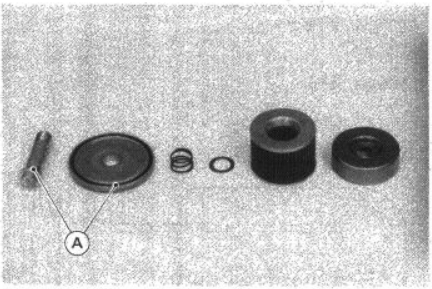
Oil Filter and Bypass Valve Removal

- Remove the under cowling.
- With the motorcycle up on its center stand, place an oil pan beneath the engine.
- Unscrew the oil filter mounting bolt and drop out the filter.
- Remove the oil fence.
- Holding the filter steady, turn the mounting bolt to work the filter free.
- Remove the flat washer and spring, and pull the filter cover off the bolt.
- The oil filter bypass valve is assembled in the mounting bolt.

Oil Filter and Bypass Valve Installation Notes

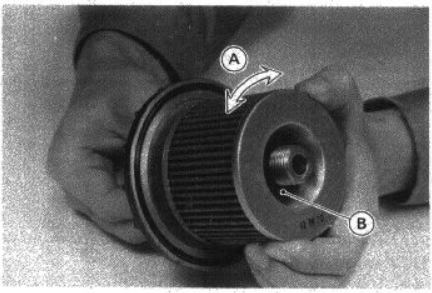
- Check that the O-rings are in good condition.

★If they are damaged, replace them with new ones.



A. O-rings

- Apply oil to the mounting bolt, turn the filter or the mounting bolt to work the filter into place. Be careful that the filter grommets do not slip out of place.



A. Turn the filter. B. Grommet

- Install the oil filter and tighten the mounting bolt to the specified torque (see Exploded View).
- Add engine oil. (see Oil Level Inspection).

Bypass Valve Disassembly

- Remove the oil filter. Oil draining is not necessary.
- Drive the retaining pin out of the filter mounting bolt.
- Drop out the spring and the bypass valve steel ball.

Bypass Valve Assembly

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

Bypass Valve Cleaning and Inspection

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

WARNING

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

- Visually inspect the bypass valve parts.

★If there is any damaged part, replace it.

Oil Pan

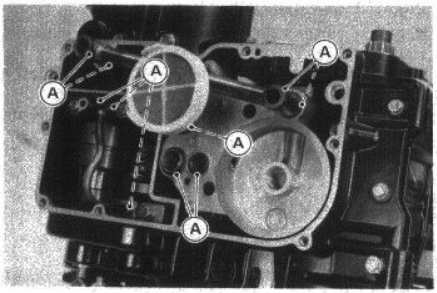
Oil Pan Removal

- Drain the engine oil (see Engine Oil and/or Filter Change).
- Remove the banjo bolts at the ends of both oil cooler hoses.
- Remove the mufflers and exhaust pipes.
- Remove the oil filter. (see Oil Filter and Bypass Valve Removal and Installation Notes).
- Remove the banjo bolts at both ends of the oil pipe connecting the oil pan and the crankcase lower half.
- Remove the banjo bolt at the lower end of the oil pipe connecting the oil pan and the cylinder head.
- Remove the oil pan bolts, and oil pipe and pull the oil pan off the crankcase.
- The oil pipes in the crankcase and one of the oil screens come off with the oil pan.

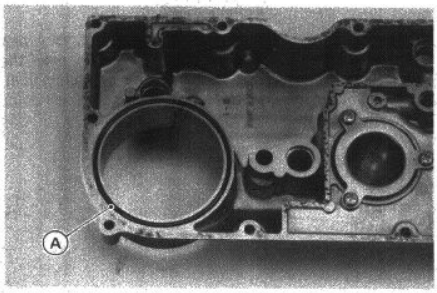
Oil Pan Installation Notes

•Check that the O-rings are in good condition.

○The outlet side O-ring between the oil pan and the oil pump bracket must be installed so that flat side faces the bracket.



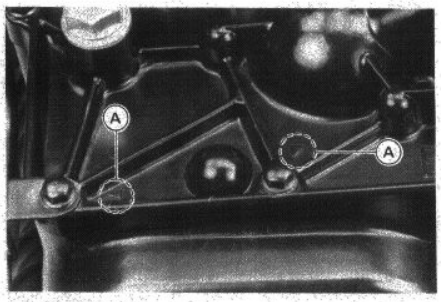
A. O-rings



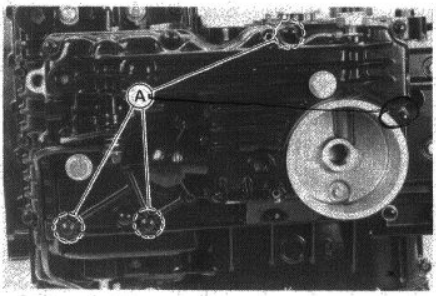
A. O-ring

•Apply a small amount of oil to the O-rings.

•Apply a non-permanent locking agent to the threads of the ~~three~~ FOUR oil pan bolts which are indicated by the triangular marks.



A. Triangular Mark

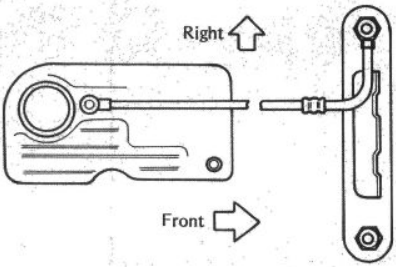


A. Bolts requiring locking agent.

•Tighten the oil pipe and hose banjo bolts to the specified torque (see Exploded View).

○The oil cooler intake hose (right side) must be installed correctly as shown.

Oil Cooler Hose



•Install the oil filter and fill the engine with the specified oil. (see Engine Oil and/or Filter Change).

Oil Pump and Relief Valve

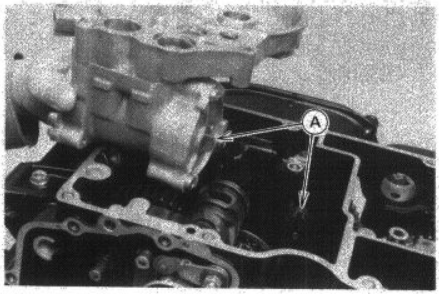
Oil Pump and Relief Valve Removal

•Remove the oil pan.

•Pull out the oil screen, oil pipe, collar, and O-rings.

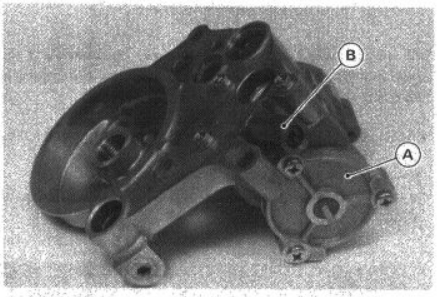
•Unscrew the oil pump bracket bolts, and pull out the bracket and pump as an assembly.

○Remove the pickup coil cover, and turn the crankshaft until the catches of the pump shaft ends are vertical. This procedure allows the pump and bracket assembly to be removed easily, if the pump drive gear and/or water pump are installed.



A. Catches

●Remove the oil pump mounting bolts, and separate the pump from the bracket.



A. Oil Pump B. Relief Valve

●Unscrew the relief valve.

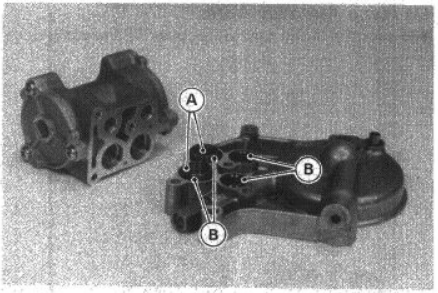
Oil Pump and Relief Valve Installation Notes

●Apply a non-permanent locking agent to the threads of the relief valve, and torque it to the specified (see Exploded View).

CAUTION

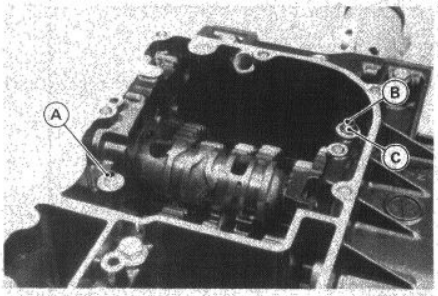
○**Do not over-apply a non-permanent locking agent to the threads. This may block the oil passage.**

●Fill the pump with engine oil before installation.
●Check that the collars and O-rings are between the oil pump and the bracket. The outlet side O-rings must be installed so that the flat side faces the bracket.



A. Collars B. O-rings

●Apply a non-permanent locking agent to the threads of the oil pump mounting bolts.
●Tighten the oil pump mounting bolts to the specified torque (see Exploded View).
●Check that the knock pin, nozzle, and O-ring are between the crankcase lower half and the oil pump bracket. The small hole of the nozzle must face the bracket.



A. Knock Pin C. O-ring
B. Nozzle

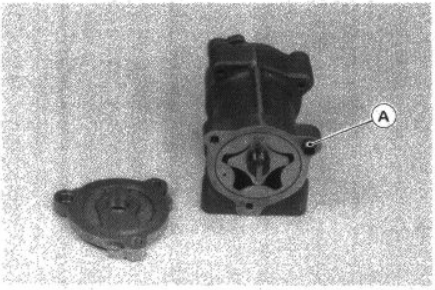
●If the oil pump drive gear and/or water pump are installed, check that the oil pump shaft catches of both components are vertical.
●Install the pickup coil cover if it was removed (see Pickup Coil Removal/Installation Notes).

Oil Pump Disassembly

●Remove the oil pump.
●Take out the oil pump cover screws.
●Take out the oil pump cover.
●Drop the rotors out of the oil pump body.
●Pull the pin out of the pump shaft.
●Remove the rotors from the other side of the pump in the same manner.
●Pull the oil pump shaft out of the body.

Oil Pump Assembly Notes

•Be sure the dowel pins are in place in the pump body.



A. Dowel Pin

•Before installing the oil pump, be sure the shaft and rotors turn freely.

Oil Pump Drive Gear Removal

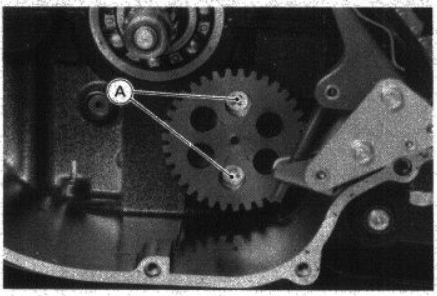
•The oil pump drive gear is removed during clutch assembly removal (see Clutch chapter).

Oil Pump Drive Gear Installation

•The oil pump drive gear is installed during clutch assembly installation (see Clutch chapter).

Oil Pump Gear Removal

•Remove the clutch assembly (see Clutch chapter).
•Turn the oil pump gear until the gear holder screws are visible through the holes in the oil pump gear.

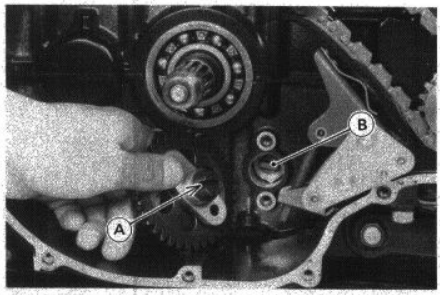


A. Screws

•Take out the screws and remove the oil pump gear with the holder.
•Remove the circlip and separate the gear from the holder.

Oil Pump Gear Installation Notes

•When installing the oil pump gear, note the position of the oil pump shaft projection and turn the gear so that the projection fits into the slot of the shaft.



A. Slot B. Projection

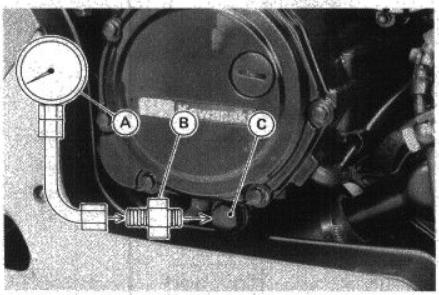
•Apply a non-permanent locking agent to the threads of the holder screws.

Oil Pressure Measurement

NOTE

○*If relief valve opening pressure measurement is necessary, measure the oil pressure before the engine is warmed up.*

•Measure the relief valve opening pressure when the engine is cold.
○Remove the oil passage plug.
○Install oil pressure gauge 57001-164 and adapter 57001-1188.



A. Oil Pressure Gauge: 57001-164
B. Adapter: 57001-1188
C. Plug

○Start the engine, and read the oil pressure gauge while running the engine at various speeds. A normal relief valve keeps the maximum oil pressure between the specified values.

Relief Valve Opening Pressure

430 – 590 kPa
(4.4 – 6.0 kg/cm^2, 63 – 85 psi)

○Stop the engine.
○Remove the oil pressure gauge and adapter.
○Install the oil passage plug.
★If the reading exceeds the standard by very much, the relief valve is stuck at its closed position.
★If the reading is much lower than the standard, the relief valve may be stuck open, or there may be other damage in the lubrication system. Stop the engine immediately and find the cause.
●Measure the oil pressure at normal operating temperature.
○Warm up the engine, and then stop the engine.
○Install the oil pressure gauge and adapter as shown above.

WARNING

○If the oil passage plug is removed while the engine is warm, hot engine oil will drain through the oil passage; take care against burns.

○Start the engine again.
○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.

Oil Pressure

265 – 325 kPa (2.7 – 3.3 kg/cm^2, 38 – 47 psi)
@4,000 r/min (rpm), 90°C (194°F) of oil temp.

☆If the oil pump and relief valve are not at fault, inspect the rest of the lubrication system.

Oil Pump Inspection

●Disassemble the oil pump.
●Visually inspect the oil pump body, outer and inner rotors, and covers.
★If there is any damage or uneven wear, replace the rotors or the oil pump assembly.

Relief Valve Inspection

●Remove the relief valve.
●Check to see if the steel ball inside the valve slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by valve spring pressure.

NOTE

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

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

WARNING

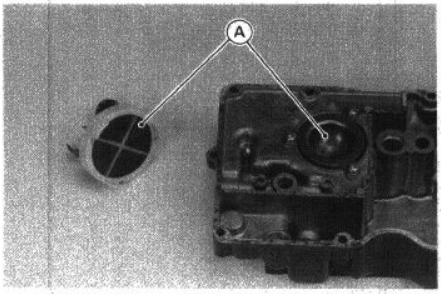
○Clean the parts in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents.

★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 Screens

Oil Screen Removal

●Remove the oil pan.
●Pull the oil screen which is located on the oil pump bracket, and take it off the bracket.



A. Oil Screens

●Unscrew the screws and take off the oil screen which is located on the oil pan.

Oil Screen Installation Note

●Clean the oil screens thoroughly whenever they are removed for any reason.

Oil Screen Cleaning and Inspection

●Clean the oil screen with high flash-point solvent and remove any particles stuck to it.

WARNING

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

NOTE

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

●Check the screen carefully for any damage: holes and broken wires.

★If the screen is damaged, replace it.

Engine Removal/Installation

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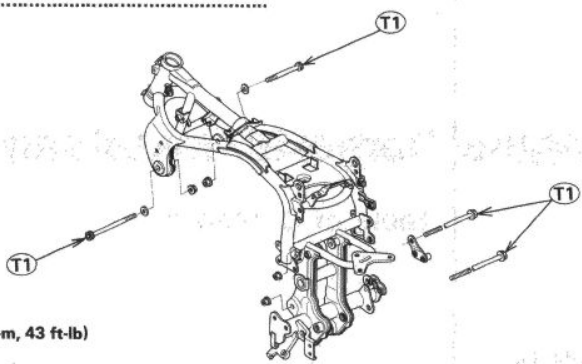
Exploded View



T1: 59 N-m (6.0 kg-m, 43 ft-lb)

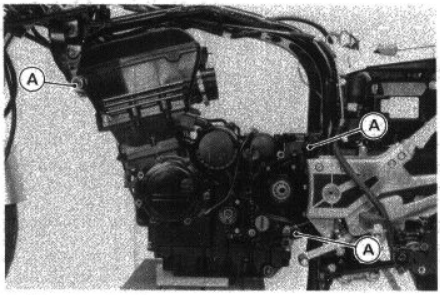
Engine Removal/Installation

Engine Removal

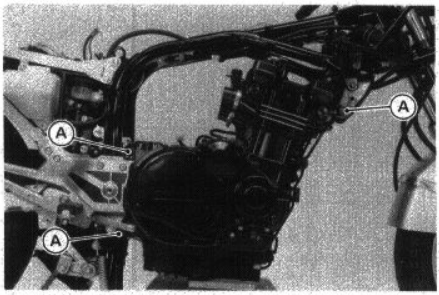
- Drain the engine oil (see Engine Oil Change in the Engine Lubrication System chapter).
- Drain the coolant (see Coolant Change in the Cooling System chapter).
- Remove the following:
  - ○Seat
  - ○Fuel Tank
  - ○Fairing and Under Cowling
  - ○Radiator and Oil Cooler
  - ○Engine Sprocket
  - ○Water Pump and Hoses
  - ○Mufflers and Exhaust Pipes (with Horns and Bracket)
  - ○Ignition Coils
  - ○Vacuum Switch Valve (US model) and Hoses
  - ○Carburetors
  - ○Air Cleaner Housing
- Disconnect wirings from the engine components, and free them from the clamps if there are.
  - ○Starter Motor Lead
  - ○Neutral Switch Wire
  - ○Oil Pressure Switch Wire
  - ○Oil Temperature Switch Wire
  - ○Battery Ground Lead
- Remove the engine mounting bolts. Support the engine before sliding out the engine mounting bolts.

Engine Installation

- Engine installation is the reverse of removal. Note the following.
- Tighten the engine mounting bolts to the specified torque (see Exploded View).
- Fill the engine with engine oil (see Engine Oil Change in the Engine Lubrication System chapter).
- Fill the engine with coolant (see Coolant Change in the Cooling System chapter).
- Adjust the following.
  - ○Throttle Cable
  - ○Choke Cable
  - ○Drive Chain



A. Mounting Bolts



A. Mounting Bolts

Crankshaft/Transmission

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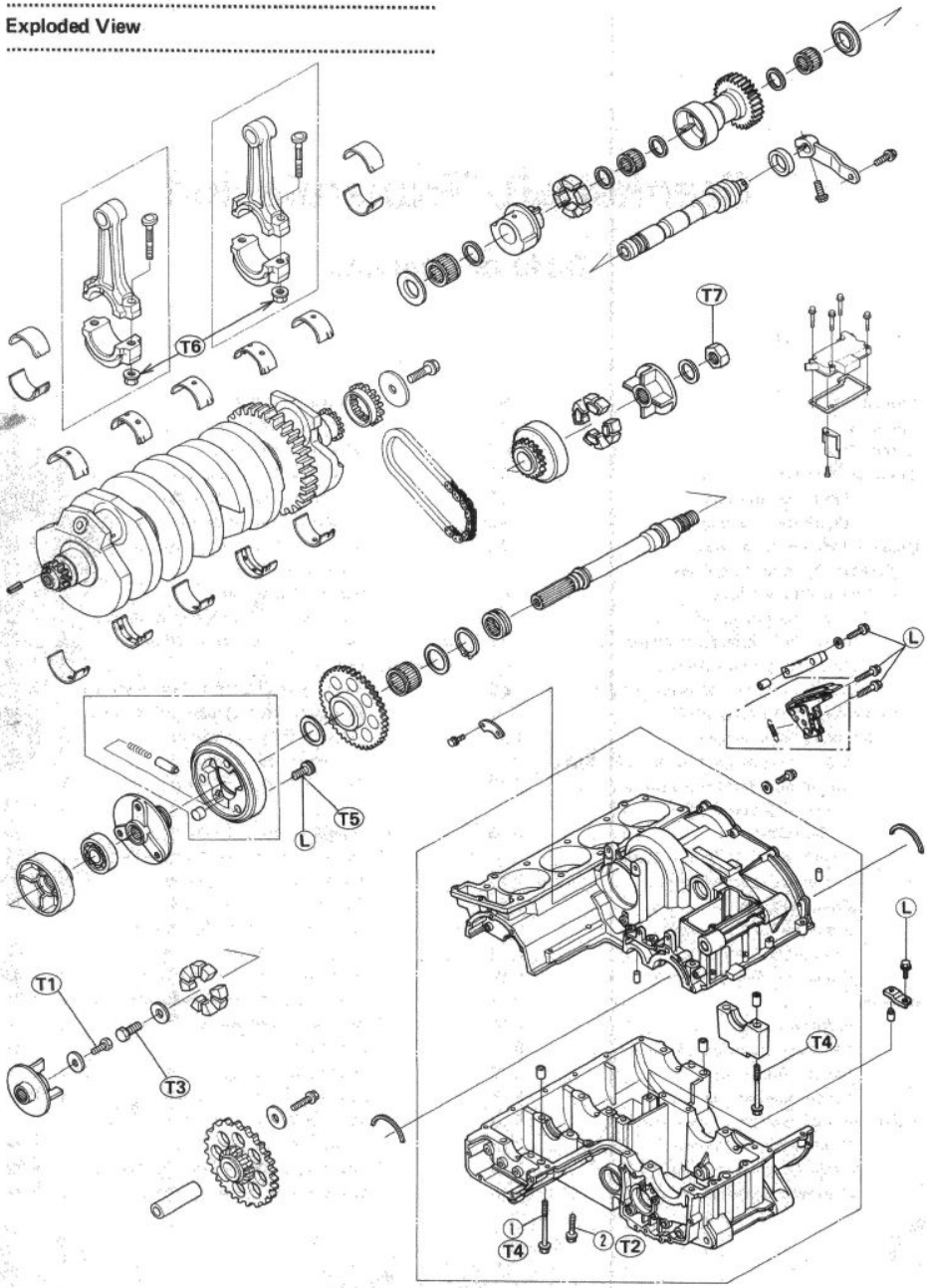
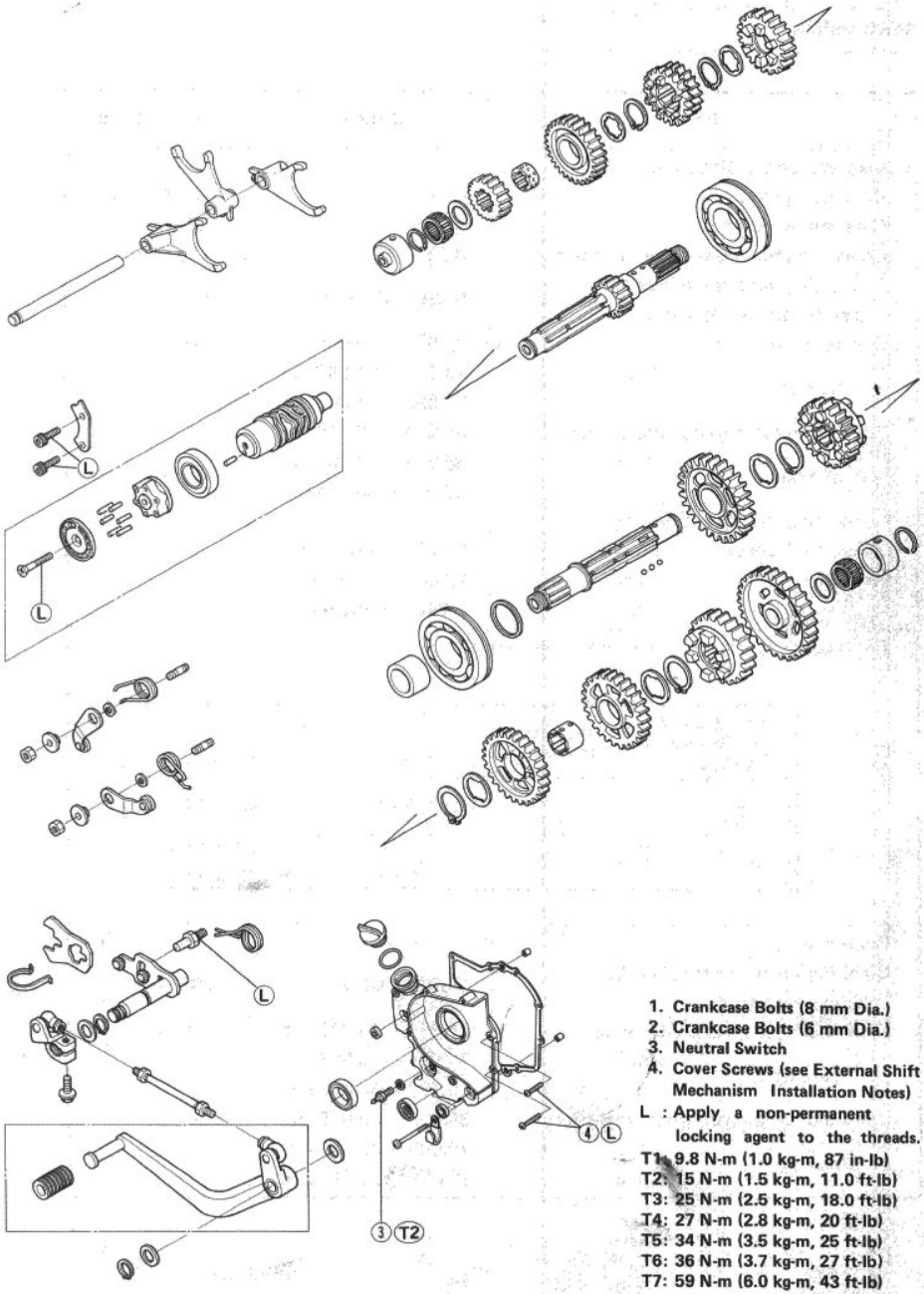
Exploded View





1. Crankcase Bolts (8 mm Dia.)
2. Crankcase Bolts (6 mm Dia.)
3. Neutral Switch
4. Cover Screws (see External Shift Mechanism Installation Notes)

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

T1: 9.8 N-m (1.0 kg-m, 87 in-lb)
T2: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T3: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T4: 27 N-m (2.8 kg-m, 20 ft-lb)
T5: 34 N-m (3.5 kg-m, 25 ft-lb)
T6: 36 N-m (3.7 kg-m, 27 ft-lb)
T7: 59 N-m (6.0 kg-m, 43 ft-lb)

Specifications

Item		Standard	Service Limit
Crankshaft, Connecting Rods:			
Connecting rod bend		– – –	0.2/100 mm
Connecting rod twist		– – –	0.2/100 mm
Connecting rod big end side clearnace		0.13 – 0.33 mm	0.50 mm
Connecting rod big end bearing insert/crankpin clearance		0.036 – 0.066 mm	0.10 mm
Crankpin diameter:		34.984 – 35.000 mm	34.97 mm
Marking	None	34.984 – 34.992 mm	
	○	34.993 – 35.000 mm	
Connecting rod big end bore diameter:		38.000 – 38.016 mm	– – –
Marking	None	38.000 – 38.008 mm	
	○	38.009 – 38.016 mm	
Connecting rod big end bearing insert thickness:	Brown	1.475 – 1.480 mm	– – –
	Black	1.480 – 1.485 mm	– – –
	Blue	1.485 – 1.490 mm	– – –

Connecting rod big end bearng insert selection:

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
○	○	Black	92028-1322
None	None		
○	None	Blue	92028-1321
None	○	Brown	92028-1323

Crankshaft runout		– – –	0.05 mm TIR
Crankshaft main bearing insert/journal clearance		0.020 – 0.044 mm	0.08 mm
Crankshaft main journal diameter:		35.984 – 36.000 mm	35.96 mm
Marking	None	35.984 – 35.992 mm	
	1	35.993 – 36.000 mm	
Crankcase main bearing bore diameter:		39.000 – 39.016 mm	– – –
Marking	○	39.000 – 39.008 mm	
	None	39.009 – 39.016 mm	

Item	Standard	Service Limit
Crankshaft main bearing insert thickness:		
Brown	1.490 – 1.494 mm	– – –
Black	1.494 – 1.498 mm	– – –
Blue	1.498 – 1.502 mm	– – –

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	92028-1102	2, 4
			92028-1274	1, 3, 5
None	None	Blue	92028-1100	2, 4
			92028-1272	1, 3, 5
○	None	Black	92028-1101	2, 4
None	1		92028-1273	1, 3, 5

*The bearing inserts for Nos. 2 and 4 journals have oil grooves.

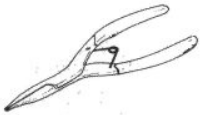
Crankshaft side clearance	0.05 – 0.20 mm	0.40 mm
Alternator shaft chain 20-link length	158.8 – 159.2 mm	161.5 mm
Transmission:		
Gear backlash	0.06 – 0.23 mm	0.3 mm
Gear shift fork groove width	5.05 – 5.15 mm	5.3 mm
Shift fork ear thickness	4.9 – 5.0 mm	4.8 mm
Shift fork guide pin diameter	7.9 – 8.0 mm	7.8 mm
Shift drum groove width	8.05 – 8.20 mm	8.3 mm

Special Tools

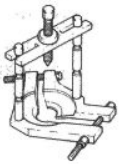
Along with common hand tools and precision instrument specialized tools are required for complete crankshaft/transmission servicing.

Driver: 57001-137

Circlip Pliers: 57001-144



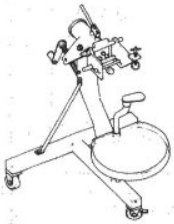
Bearing Puller: 57001-158



Oil Seal Guide: 57001-264

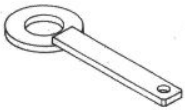
Bearing Puller Adapter: 57001-317

Engine Stand: 57001-900



Bearing Driver Set: 57001-1129

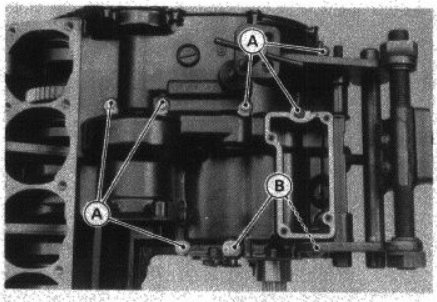
Coupling Holder: 57001-1189



Crankcase Splitting

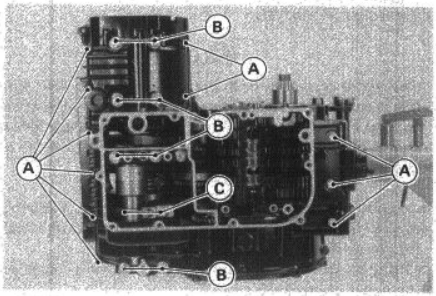
Crankcase Splitting

- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface or, preferably, into engine stand 57001-900 to hold the engine steady while parts are being removed.
- Remove the following parts from the engine.
  - External Shift Mechanism Cover
  - Starter Motor
  - Alternator
  - Pickup Coils
  - Right Engine Cover
  - Alternator Shaft Chain Tensioner
- Remove the following parts only if the crankshaft is to be removed.
  - Pistons
  - Alternator Shaft Chain and Sprockets
- Remove the following part only if the transmission drive shaft assembly is to be disassembled.
  - Clutch
- Remove the 6 mm upper crankcase-half bolts first, and then the 8 mm bolts.



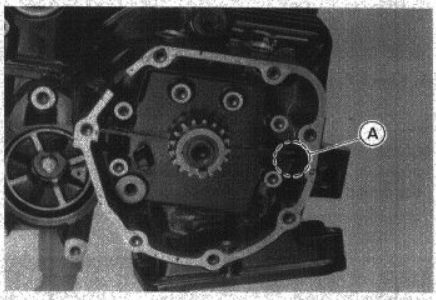
A. 6 mm Bolts B. 8 mm Bolts

- Turn the engine upside down and remove the following parts.
  - Oil pump and Bracket
- Remove the 6 mm lower crankcase-half bolts first, and then the 8 mm bolts. Be careful not to take out the crankshaft main bearing cap bolts.

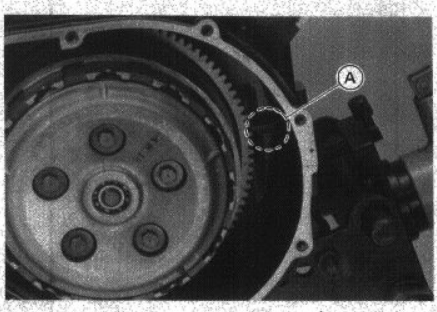


A. 6 mm Bolts
B. 8 mm Bolts
C. Remove is not necessary for crankcase split.

- Pry the points indicated in the figure to split the crankcase halves apart, and remove the lower crankcase half. There are two knock pins on the left and right of the mating surface.



A. Pry Point



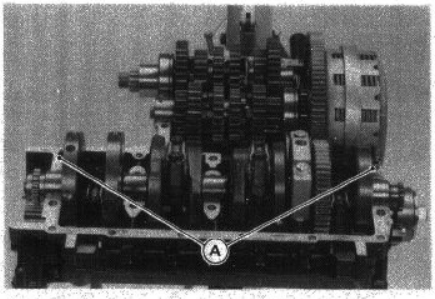
A. Pry Point

Crankcase Assembly

NOTE

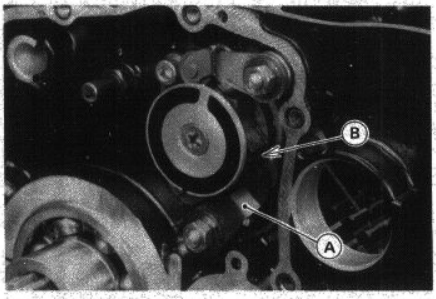
○*The upper crankcase half, the lower crankcase half, and the crankshaft main bearing cap are machined at the factory in the assembled state, so the crankcase halves and the main bearing cap must be replaced together as a set.*

●Assembly is the reverse of splitting. Note the following.
●Before fitting the lower case on the upper case, check the following.
○Check to see that the following parts are in place on the upper crankcase half.



A. Knock Pins

○Check to see that the shift drum is in the neutral position, that is, the neutral positioning lever fits into the detent on the shift drum bearing holder.



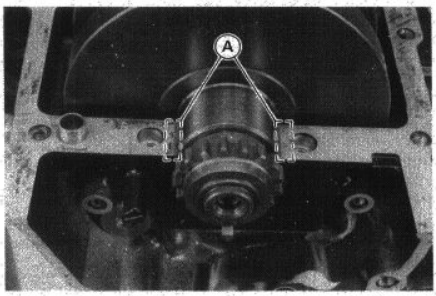
A. Neutral Positioning Lever B. Neutral Detent

○Check that the crankshaft is positioned so the #1 and 4 pistons are at TDC.
●With a high flash-point solvent, clean off the mating surfaces of the crankcases halves and wipe dry.

●Apply a liquid gasket to the mating surface of the lower crankcase half.

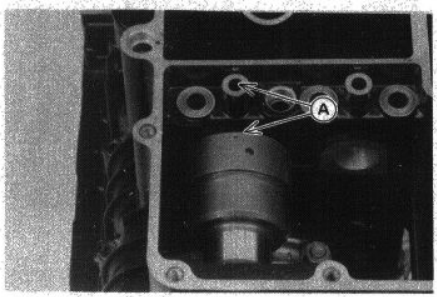
CAUTION

○**Do not apply a liquid gasket around the crankshaft main bearing inserts.**



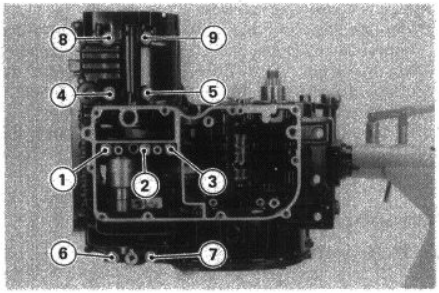
A. Do not apply a liquid gasket here.

●Fit the lower crankcase half on the upper crankcase half observing the following.
○Set the shift forks so that the fingers of each fork fit into the grooves of the gears.
○Hold the balancer so that the mark on the balancer weight aligns with the center of the oil passage hole.



A. Align mark with hole center.

●Tighten the lower crankcase half bolts using the following 3 steps:
○Lightly tighten all lower crankcase half bolts to a snug fit. The three 8 mm bolts (sequence numbered 1 through 3) have a flat washer.
○Following the sequence numbers on the lower crankcase half, torque the 8 mm bolts first to about one half of the specification (see Exploded View), and finally to the specification in the same sequence.



Torque Value for 8 mm Bolts

First:	**14 N-m (1.4 kg-m, 10.0 ft-lb)**
Final:	**27 N-m (2.8 kg-m, 20 ft-lb)**

○Torque the 6 mm bolts to the specification (see Exploded View).
●After tightening all crankcase bolts, check the following items:
○Drive shaft and output 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 be shift to 2nd gear or other higher gear positions.

Crankshaft/Connecting Rods

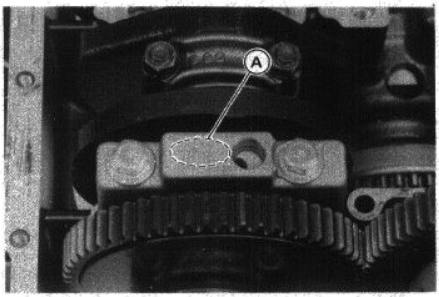
Crankshaft, Connecting Rod Removal/Installation:

Crankshaft Removal

●Remove the engine.
●Remove the pistons.
●Split the crankcase.
●Remove the main bearing cap bolts with flat washers, and take off the cap.

Crankshaft Installation Notes

●If the crankshaft or bearing inserts are replaced with new ones, check clearance with plastigage before assembling engine to be sure the correct bearing inserts are installed.
●Install the crankshaft main bearing cap with the arrow on it pointing forward. Tighten bolts to the specified torque (see Exploded View).



A. Arrow point forward.

Connecting Rod Removal

●Remove the crankshaft.
●Mark and record locations of the connecting rods and their big end caps so that they can be re-assembled in their original positions.
●Remove the connecting rod big end cap nuts, and take off the rod and cap with the bearing inserts.

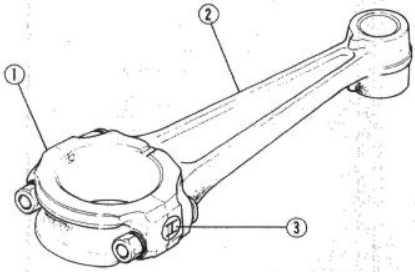
CAUTION

○To prevent damage to the crankpin surfaces, do not allow the big end cap bolts to bump against them.

Connecting Rod Installation Notes

●To minimize vibration, a pair of connecting rod (left two rods or right two) should have the same weight mark. The left two rods are a pair and the right two rods are a pair. The weight mark is indicated by a capital letter, and is stamped on the connecting rod big end.

Weight Mark Location



1. Big end cap
2. Connecting rod
3. Weight mark, alphabet

- If the connecting rods or bearing inserts are replaced with new ones check clearance with plastigage before assembling engine to be sure the correct bearing inserts are installed.

Crankshaft, Connecting Rod Inspection/Maintenance:

Crankshaft/Connecting Rod Cleaning

- After removing the connecting rods from the crankshaft 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.

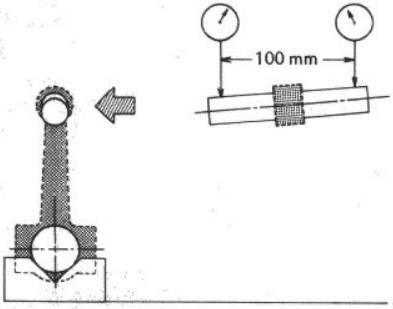
Connecting Rod Bend/Twist

- Measure connecting rod bend.
  - ○Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
  - ○Select an arbor of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
  - ○Select an arbor of the same diameter as the piston pin and at least 100 mm long, and insert the arbor through the connecting rod small end.
  - ○On a surface plate, set the big-end arbor on V block.
  - ○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**

Connecting Rod Bend Measurement

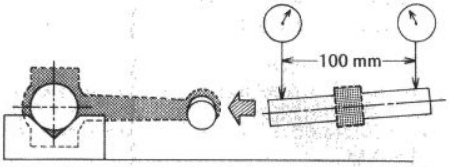


- Measure connecting rod twist.
  - ○With the big-end arbor still on V block, hold the connecting rod horizontally and measure the amount that the arbor varies form being parallel with the surface plate over a 100 mm length of the arbor to determine the amount of connecting rod twist.
  - ★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist

Service Limit:	**0.2/100 mm**

Connecting Rod Twist Measurement

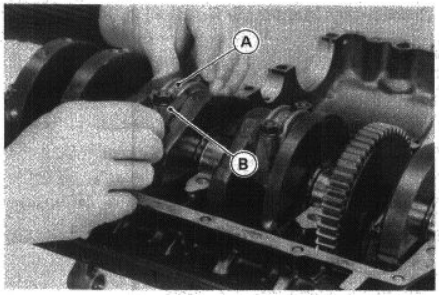


Connecting Rod Big End Side Clearance

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

Connecting Rod Big End Side Clearance

Standard:	**0.13 – 0.33 mm**
Service Limit:	**0.50 mm**



A. Connecting Rod B. Thickness Gauge

★If 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, also the crankshaft must be replaced.

Connecting Rod Big End Bearing Insert/Crankpin Wear

Bearing insert/crankpin wear is measured using a plastigage (press gauge), which is inserted into the clearance to be measured. The plastigage indicates the clearance by the amount it is compressed and widened when the parts are assembled.

●Measure the bearing insert/crankpin clearance.

○Remove the connecting rod big end caps and wipe each bearing insert and crankpin surface clean of oil.

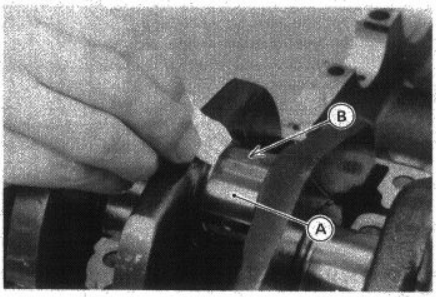
○Cut strips of plastigage to bearing insert width, and place a strip on the crankpin for each connecting rod parallel to the crankshaft so that the plastigage will be compressed between the crankpin and the bearing insert.

○Install the connecting rod big end caps and tighten the big end cap nuts to the specified torque (see Exploded View).

NOTE

○*Do not turn the crankshaft during clearance measurement.*

○Remove the connecting rod big end caps, and measure the plastigage width to determine the bearing insert/crankpin clearance.



A. Crankpin B. Plastigage

Connecting Rod Big End Bearing Insert/Crankpin Clearance

Standard:	**0.036 – 0.066 mm**
Service Limit:	**0.10 mm**

★If clearance is within the standard, no bearing replacement is required.

★If clearance is between 0.066 mm and the service limit (0.10 mm), replace the bearing inserts with inserts painted blue. Check insert/crankpin clearance with plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★If clearance exceeds the service limit, measure the diameter of the crankpins.

Crankpin Diameter

Standard:	**34.984 – 35.000 mm**
Service Limit:	**34.97 mm**

★If any crankpin has worn past the service limit, replace the crankshaft with a new one.

★If the measured crankpin diameter are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, write new marks on it.

Crankpin Diameter Marks

None:	**34.984 – 34.992 mm**
○ :	**34.993 – 35.000 mm**

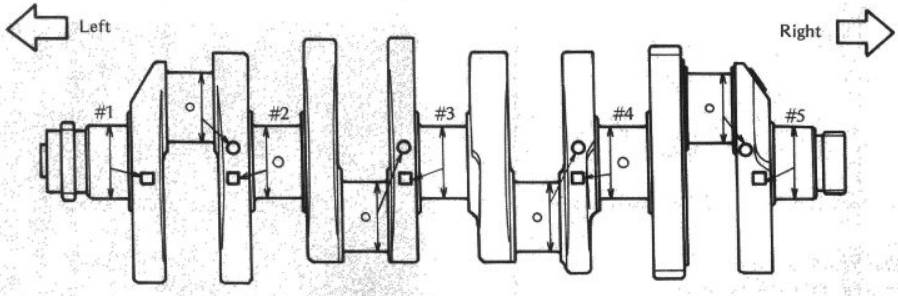
●Put the connecting rod big end caps on the rods and tighten the nuts to the specified torque (see Exploded View).

●Measure the inside diameter, and mark each connecting rod big end in accordance with the inside diameter.

NOTE

○*The mark already on the big end should almost coincide with the measurement.*

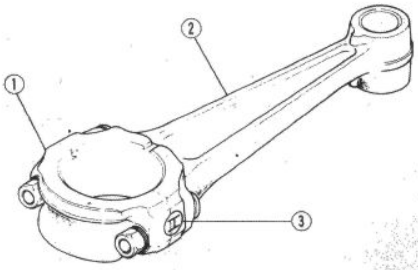
Crankshaft Mark Location



Connecting Rod Big End Inside Diameter Marks

None:	38.000 – 38.008 mm
○ :	38.009 – 38.016 mm

Connecting Rod Mark Location



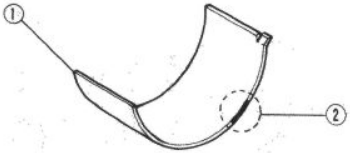
1. Big end cap
2. Connecting rod
3. Diameter mark
   ○mark or no mark, around weight mark alphabet

●Select the proper bearing insert in accordance with the combination of the connecting rod and crankshaft coding.
●Install the new insert in the connecting rod and check insert/journal clearance with plastigage.

Bearing Insert Selection

Con-rod Big End Bore Diameter Mark	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
○	○	Black	92028-1322
None	None		
○	None	Blue	92028-1321
None	○	Brown	92028-1323

Bearing Insert Size Mark Location



1. Bearing insert
2. Color size mark

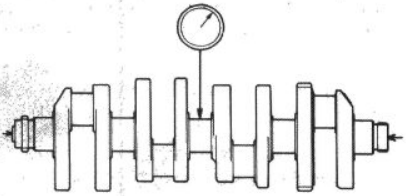
Crankshaft Runout

●Measure the crankshaft runout.
○Set the crankshaft in a flywheel alignment jig or on V blocks.
○Set a dial gauge against the center journal.
○Turn the crankshaft slowly to measure the runout. The difference between the highest and lowest dial gauge readings (TIR) is the amount of runout.
★If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

Service Limit: 0.05 mm TIR

Crankshaft Runout



Crankshaft Main Bearing Insert/Journal Wear

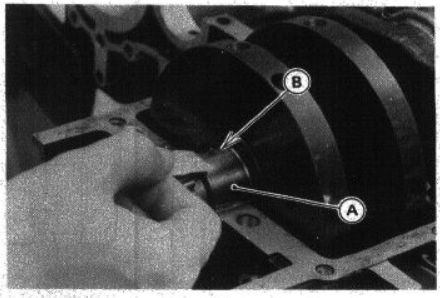
Bearing insert/journal wear is measured using a plastigage (press gauge), which is inserted into the clearance to be measured. The plastigage indicates the clearance by the amount it is compressed and widened when the parts are assembled.

●Measure the bearing insert/journal clearance.
○Split the crankcase and wipe each bearing insert and journal surface clean of oil.
○Cut strips of plastigage to bearing insert width, and place a strip on each journal parallel to the crankshaft so that the plastigage will be compressed between the journal and the bearing insert.
○Install the lower crankcase half, and tighten the case bolts to the specified torque (see Exploded View).

NOTE

○*Do not turn the crankshaft during clearance measurement.*

○Remove the lower crankcase half and measure the plastigage width to determine the bearing insert/journal clearance.



A. Journal B. Plastigage

Crankshaft Main Bearing Insert/Journal Clearance

Standard:	**0.020 – 0.044 mm**
Service Limit:	**0.08 mm**

★If clearance is within the standard, no bearing replacement is required.
★If clearance is between 0.044 mm and the service limit (0.08 mm), replace the bearing inserts with inserts painted blue. Check insert/journal clearance with plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
★If clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

Crankshaft Main Journal Diameter

Standard:	**35.984 – 36.000 mm**
Service Limit:	**35.96 mm**

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

Crankshaft Main Journal Diameter Marks

None:	**35.984 – 35.992 mm**
1 :	**35.993 – 36.000 mm**

●Put the lower crankcase half and bearing cap on the upper crankcase half without bearing inserts, and tighten the case and cap bolts to the specified torque and sequence (see Crankcase Assembly).
●Measure the main bearing bore diameter, and mark the upper crankcase half in accordance with the bore diameter.

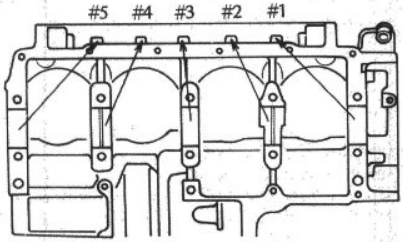
NOTE

○*The mark already on the upper crankcase half should almost coincide with the measurement.*

Crankcase Main Bearing Bore Diameter Marks

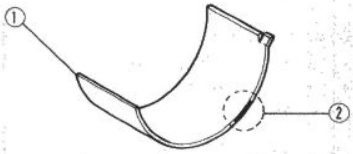
○ :	**39.000 – 39.008 mm**
None:	**39.009 –39.016 mm**

Crankcase Mark Location



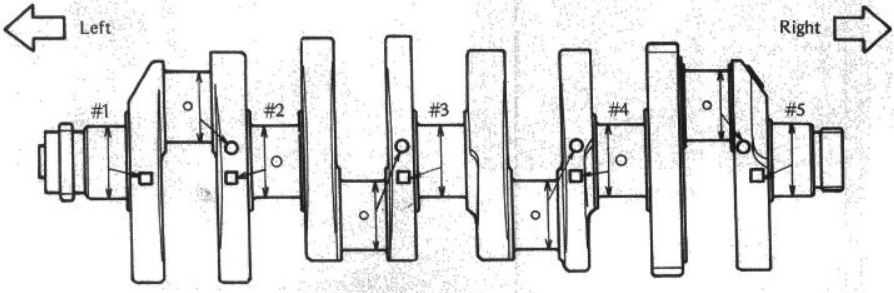
●Select the proper bearing insert in accordance with the combination of the crankcase and crankshaft coding.
●Install the new insert in the crankcase and cap and check insert/journal clearance with plastigage.

Bearing Insert Size Mark Location



1. Bearing insert 2. Color size mark

Crankshaft Mark Location



Bearing Insert Selection

Crankcase Main Bearing Bore Diameter Mark	Crankshaft Main Journal Diameter Mark	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92028-1102	2, 4
			92028-1274	1, 3, 5
None	None	Blue	92028-1100	2,4
			92028-1272	1, 3, 5
○	None	Black	92028-1101	2, 4
None	1		92028-1273	1, 3, 5

*The bearing inserts for Nos. 2 and 4 journals have oil groove.

Crankshaft Side Clearance

●Measure crankshaft side clearance.

○Insert a thickness gauge between the crankcase main bearing cap and the crank web at the No.2 journal to determine clearance.

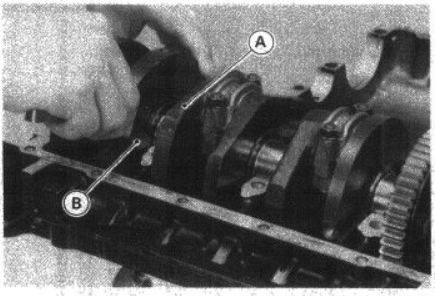
★If the clearance exceeds the service limit, replace the crankcase halves and main bearing cap as a set.

NOTE

○*The upper crankcase half, lower crankcase half, and main bearing cap are machined at the factory in the assembled state, so they must be replaced as a set.*

Crankshaft Side Clearance

Standard: **0.05 – 0.20 mm**
Service Limit: **0.40 mm**



A. Crankshaft B. Thickness Gauge

Balancer

Balancer Removal

●Split the crankcase.

●Unscrew the balancer shaft clamp bolts, and pull off the clamp lever.

●Unscrew the bolt holding the balancer shaft guide pin plate, and take off the plate and guide pin.

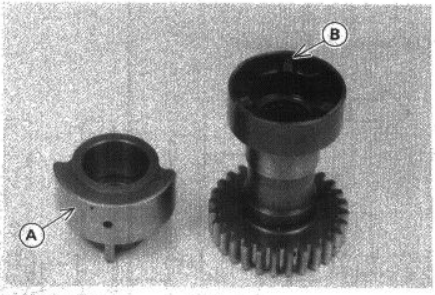
●Pull the balancer shaft with the oil seal toward the right out of the crankcase. At the same time, the balancer weight and gear assembly comes off.

Balancer Installation Notes

●When coupling the balancer weight and the gear, observe the following.

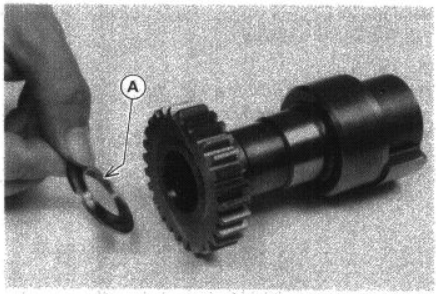
○Check that the damper rubbers are in place.

○Fit the balancer weight into the gear so that the weight is opposite the mark on the gear.

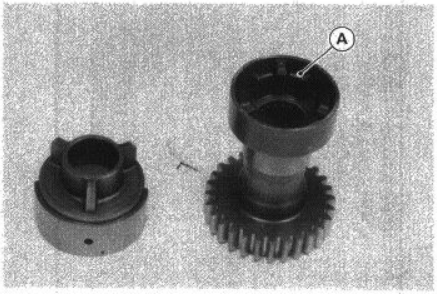


A. Weight Portion B. Mark

●Fit the copper washers on both sides of the weight and gear assembly. The projected side faces toward the assembly.



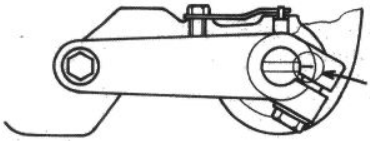
A. Projected Side



A. Rubber Dampers

●Turn the balancer shaft until the line mark on the end of the shaft points to the front. And then, install the clamp lever. Tighten the bolt at the rear of the lever first then tighten the clamp bolt at the front of the lever temporarily.

Balancer Shaft Installation



●Adjust the balancer shaft position during the preparation of the motorcycle.
○Start the engine and let it at idle.
○Loosen the clamp bolt and turn the balancer shaft counterclockwise until the balancer gear makes a noise.
○Turn the shaft clockwise until the balancer gear stops to make a noise, and tighten the clamp bolt securely.

Damper Inspection

●Remove the balancer and disassemble the weight and gear assembly.
●Visually inspect the rubber dampers.
★If they appear damaged or deteriorated, replace them.

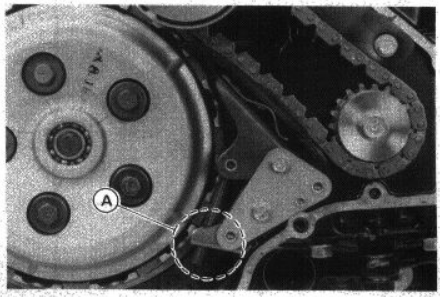
Needle Bearing Wear

●Visually check the needle bearings.
○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
★If there is any doubt as to the condition of a needle bearing, replace it.

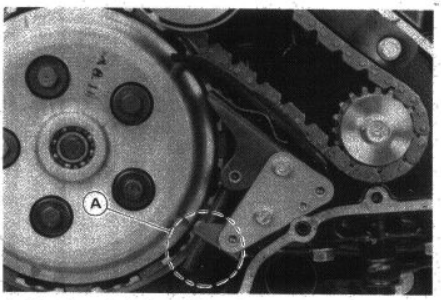
Alternator Shaft/Starter Motor Clutch

Chain Tensioner Removal

●Remove the right engine cover.
●Lock the alternator shaft chain tensioner.
○Push the tensioner guide and the rod stop lever so that the stop lever keeps the rod from returning.
●Remove the tensioner mounting bolts and take off the tensioner assembly.



A. Tensioner in free positioned



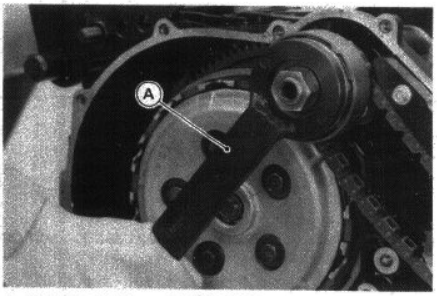
A. Tensioner in lock positioned

Chain Tensioner Installation Note

- Lock the chain tensioner and install it with the mounting bolts. The tensioner should be freed from the locked position after installing it.

Chain and Sprocket Removal

- Remove the right engine cover.
- Remove the chain tensioner.
- Using coupling holder 57001-1189, to keep the alternator shaft from turning, remove the alternator shaft right end nut and crankshaft right end bolt.
- If necessary, remove the coupling bolt at the alternator shaft left end at this time.



A. Coupling Holder: 57001-1189

- Pull the chain and the sprockets as a set.

Chain and Sprocket Installation Note

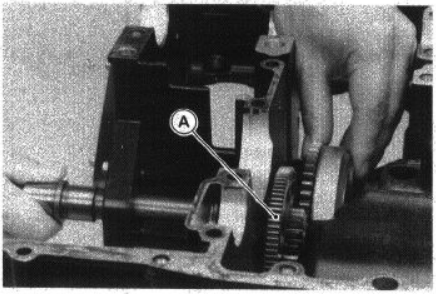
- Tighten the alternator shaft right end nut, crankshaft right end bolt, and alternator left end bolt to the specified torque. (see Exploded View)

Alternator Shaft and Starter Clutch Removal

- Remove the engine.
- Split the crankcase.
- Remove the alternator shaft chain and sprockets.
- Remove the coupling with the rubber dampers at the left end of the shaft.
- Holding the starter motor clutch, pull the alternator shaft off the crankcase.

Alternator Shaft and Starter Clutch Installation Notes

- If the starter motor idle gear is removed, install it so that the small diameter gear side faces to the starter motor side.



A. Idle Gear

- If the alternator shaft ball bearing and/or needle bearing is removed, install it so that the marked side of it faces out and press it until it stops by bearing driver set 57001-1129.

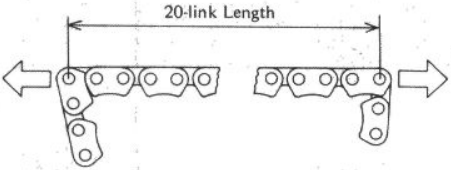
Alternator Shaft Chain Wear

- Hold the alternator shaft chain so that it may be pulled tight.
- Measure the length of 20 links (21 pins) with a vernier caliper.
- ★If the 20 link length of the alternator shaft chain is greater than the service limit, replace it.

Alternator Shaft Chain 20-link Length

Standard:	**158.8 – 159.2 mm**
Service Limit:	**161.5 mm**

Chain 20-Links Length Measurement



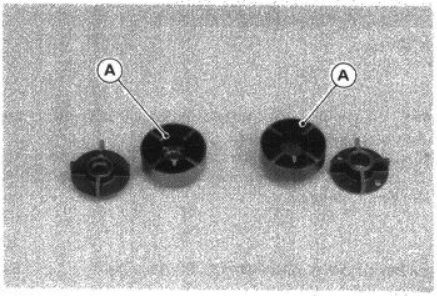
Chain Guide Wear

- Visually inspect the rubber on the guides.
- If the rubber is cut or damaged in any way, replace the guide.

Damper Inspection

- Visually inspect the rubber dampers at both end couplings of the alternator shaft.

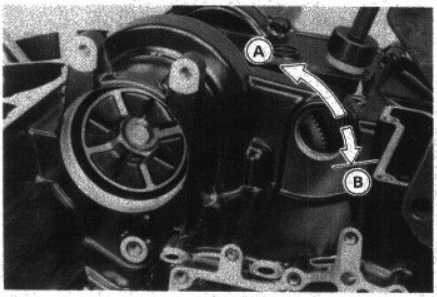
★If they appear damaged or deteriorated, replace them.



A. Rubber Dampers

Starter Motor Clutch Inspection

- Remove the starter motor.
- Turn the starter motor idle gear by hand. When viewed from the left side of the engine, the idle gear should turn counterclockwise freely, but should not turn clockwise.



A. Turn freely. B. Locked

★If the starter clutch does not operate as it should or if it makes noise, go to the next step.

- Disassemble the starter motor clutch, and visually inspect the clutch parts: springs, spring caps, rollers, and gear.

★If there is any worn or damaged part, replace it.

Ball and Needle Bearing Wear

- Check the ball bearing: alternator shaft LH.

○Since the ball bearing is make to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean the bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

○Spin the bearing by hand to check its condition.

★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.

- Check the following needle bearings: alternator shaft RH and starter motor clutch.

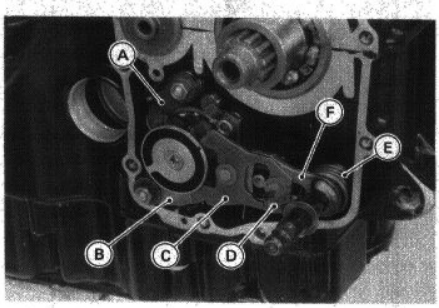
○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If there is any doubt as to the condition of a needle bearing, replace it.

Transmission

Transmission External Shift Mechanism:
External Shift Mechanism Removal

- Remove the engine sprocket.
- Drain the coolant (see Coolant Change in the Cooling System Chapter).
- Remove the water pump.
- Place an oil pan beneath the external shift mechanism cover.
- Pull out the clutch push rod.
- Remove the external shift mechanism cover screws and bolts. Pull off the external shift mechanism cover and gasket. There are two knock pins in the cover mating surface.
- Move the shift mechanism arm out of its position on the end of the shift drum, and pull out the shift shaft with the arm, spring, and shaft return spring.

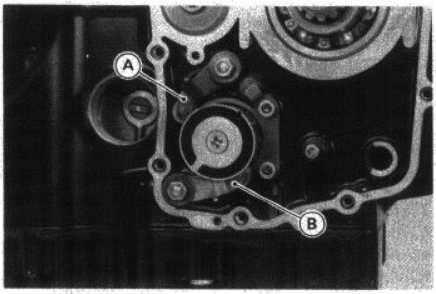


A. Neutral Positioning Lever
B. Gear Positioning Lever
C. Shift Mechanism Arm
D. Arm Spring
E. Return Spring
F. Shift Shaft

•Remove the nuts and take off the neutral positioning lever and gear positioning lever. Each lever has the collor, spring, and washer.

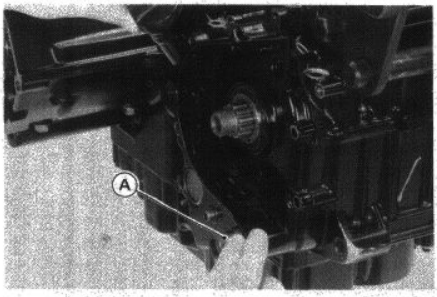
External Shift Mechanism Installation Notes

•The neutral positioning lever and the gear positioning lever are identical. The spring painted blue is for the neutral positioning lever.
•The projected side of the collar must face toward the lever.



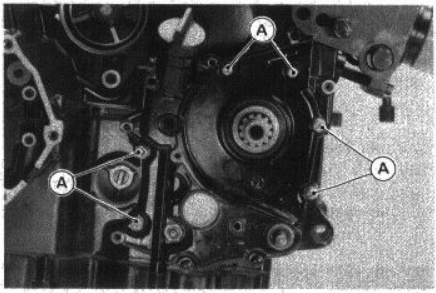
A. Neutral Positioning Lever
B. Gear Positioning Lever

•Apply a high temperature grease to the seal lips.
•Use oil seal guide 57001-264 to protect the seal during shift mechanism cover installation.



A. Oil Seal Guide: 57001-264

•Apply a non-permanent locking agent to the threads of the cover screws.

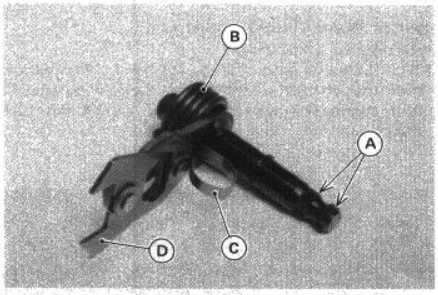


A. Screws

•Fill the engine with coolant (see Coolant Change in the Cooling System Chapter).
•Check the engine oil level, and add oil if necessary (see Engine Oil Level Inspection in the Engine Lubrication System Chapter).

External Shift Mechanism Inspection

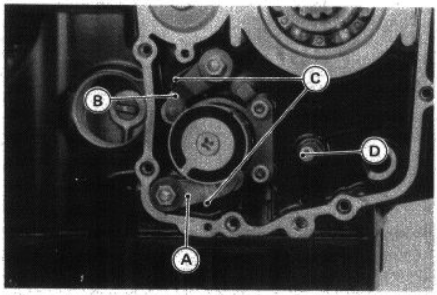
•Examine the shift shaft for any damage.



A. Splines
B. Return Spring
C. Arm Spring
D. Arm

○Check the shift shaft for bending or damage to the splines.
☆If the shaft is bent, straighten or replace it. If the splines are damaged, replace the shaft.
○Check the return spring and arm spring for breaks or distortion.
☆If the springs are damaged in any way, replace them.
○Check the shift mechanism arm for distortion.
☆If the shift mechanism arm is damaged in any way, replace the arm.
•Check the return spring pin is not loose.
★If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it to the specified torque (see Exploded View).

●Check the gear positioning lever, neutral positioning lever, and their springs for breaks or distortion.
★If the levers or springs are damaged in any way, replace them.



A. Gear Positioning Lever C. Springs
B. Neutral Positioning Lever D. Return Spring Pin

●Visually inspect the shift drum pins, pin holder, and pin plate.
★If they are badly worn or if they show any damage, replace them.

Transmission Shafts, Shift Dram, Forks:

Transmission Removal/Disassembly:

Transmission Shaft Removal

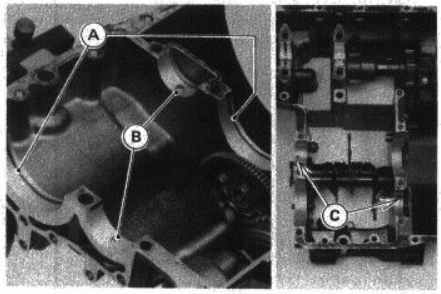
●Remove the engine.
●Split the crankcase.
●Take out the drive and output shaft assemblies.
●If the drive shaft assembly is to be disassembled, remove the clutch.

Transmission Shaft Installation

●Install the clutch if it has been removed.
●With a high flash-point solvent, clean off the outer circumferances of the transmission ball bearings and needle bearings, and their bearing housings, and wipe dry.
●Check to see that the set rings and set pins are in place in the transmission bearing housings, and blow the oil passages in the bearing housings clean with compressed air.

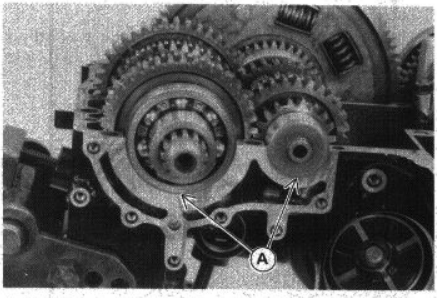
NOTE

○*If the standard set rings (P/N: 14013-1005) cannot be put into the crankcase and ball bearing grooves, use the thin set rings (P/N: 14013-1006) instead of the standard set rings.*



A. Set Rings C. Oil Passage Holes
B. Set Pins

●Install the drive and output shaft assemblies in the upper crankcase half.
○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.

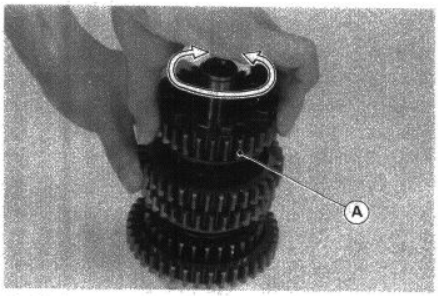


A. No Clearance (both left ad right sides)

●Assemble the crankcase.
●Install the engine.

Transmission Shaft Disassembly

●Remove the transmission shafts.
●Using circlip pliers 57001-144 to remove the circlips, disassemble the transmission shafts.
●The 5th gear on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. To remove this gear from the shaft, quickly spin the shaft in a vertical position while holding the 3rd gear, and pull off the 5th gear upwards.

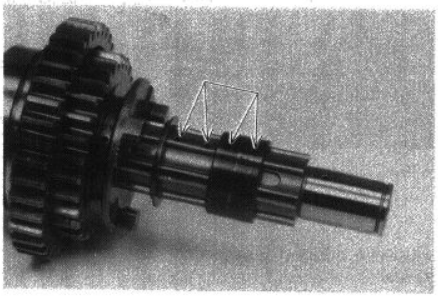


A. 5th Gear

- The ball bearings are press-fit on the transmission shafts. To remove the bearings, use bearing puller 57001-158 and adapter 57001-317.

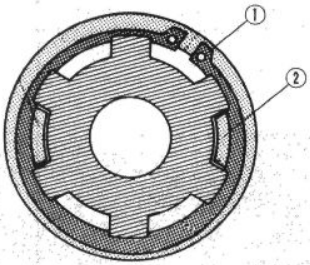
Transmission Shaft Assembly

- Assembly is the reverse of disassembly. Note the following.
- When installing the 5th gear and steel balls on the output shaft, do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.
- When assembling the drive shaft 6th gear bushing and output shaft 3rd/4th gear bushing to the shaft, align their oil holes with the holes in the shaft.



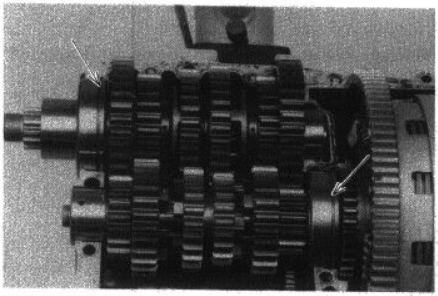
- Replace any circlip that were removed with new ones.
- Always install circlips so that the opening is aligned with a spline groove, and install toothed washers so that the teeth are not aligned with the circlip opening.
- The transmission gears can be identified by size;
  Drive shaft gears – the smallest diameter gear is 1st gear, and the largest is 6th.
  Output shaft gears – the largest diameter gear is 1st gear, and the smallest in 6th.

Circlip and Toothed Washer Installation



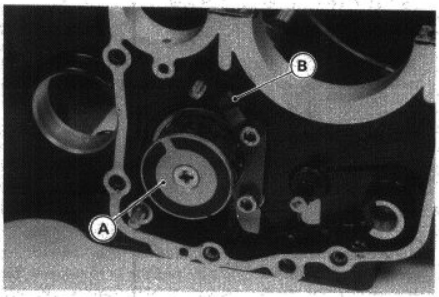
1. Circlip
2. Toothed Washer

- Using driver 57001-137, install the ball bearings and collar. The ball bearing for the drive shaft must be pressed on with the set ring groove toward the clutch side. The bearing for the output shaft must be pressed on with the set ring groove toward the opposite side of the engine sprocket.



Shift Drum and Fork Removal

- Remove the external shift mechanism.
- Remove the oil pump and bracket.
- Unscrew the Allen bolts holding the shift drum ball bearing holder.



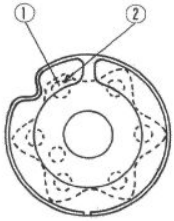
A. Shift Drum B. Shift Rod

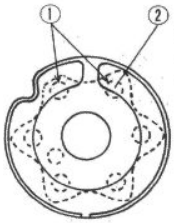
•Pull out the shift rod, and take off the shift forks.
•Pull out the shift drum.

Shift Drum and Fork Installation

•Installation is the reverse of removal. Note the following.
•If the shift drum pin plate was removed, install it as following.
○One of the six pins is longer than the others. The long shift drum pin must be installed in the correct position, and must be fit into the correct hole in the back of the pin plate. If these parts are assembled in the wrong position, the neutral indicator light will not light when the gears are in neutral.

Shift Drum Pin Plate

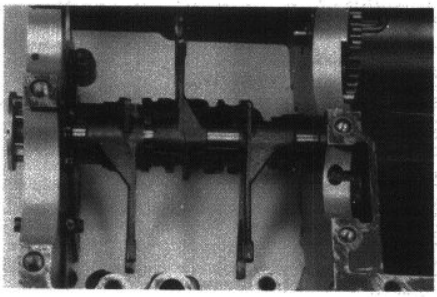




1. Long Pin
2. Recess in Pin Plate

If the pin plate has two recesses, the long pin should be instelled as shown above.

○Apply a non-permanent locking agent to the pin plate screw.
•The shift forks can be identified by their shape. Install them as following.



Transmission Maintenance:

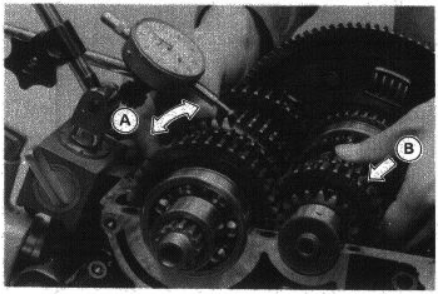
Gear Backlash

•Split the crankcase leaving the transmission in place.
•Set a dial gauge against the teeth on one gear, and move the gear back and forth while holding the other gear steady. The difference between the highest and the lowest gauge readings is the amount of backlash.

★Replace both gears if the amount of backlash exceeds the service limit.

Gear Backlash

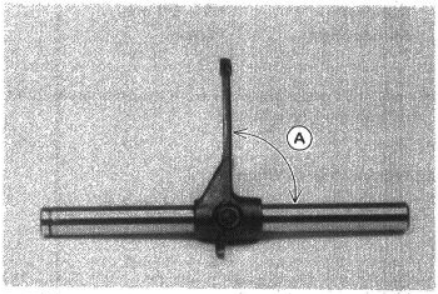
Standard:	**0.06 – 0.23 mm**
Service Limit:	**0.3 mm**



A. Move back and forth lightly. B. Hold steady.

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.



A. 90°

Shift Fork/Gear Groove Wear

•Measure the thickness of the ears shift fork, and measure the width of the shift fork grooves on transmission gears.
★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

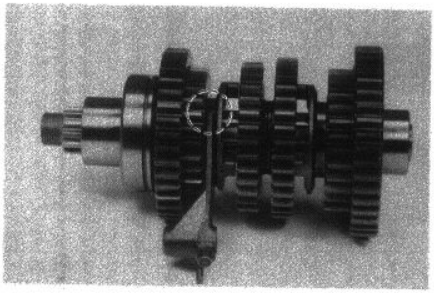
Shift Fork Ear Thickness

Standard:	**4.9 – 5.0 mm**
Service Limit:	**4.8 mm**

★If a gear shift fork groove is worn over the service limit, the gear must be replaced.

Gear Shift Fork Groove Width

Standard:	**5.05 – 5.15 mm**
Service Limit:	**5.3 mm**



Shift Fork Guide Pin/Shift Drum Groove Wear

●Measure the diameter of each shift fork guide pin, and measure the width of each shift drum groove.

★If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

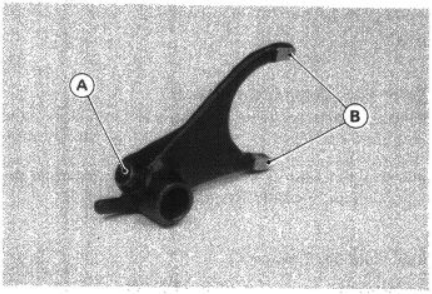
Shift Fork Guide Pin Diameter

Standard:	**7.9 – 8.0 mm**
Service Limit:	**7.8 mm**

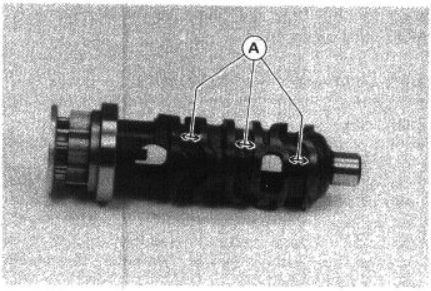
★If any shift drum groove is worn over the service limit, the drum must be replaced.

Shift Drum Groove Width

Standard:	**8.05 – 8.20 mm**
Service Limit:	**8.3 mm**



A. Shift Fork Guide Pin B. Shift Fork Ears

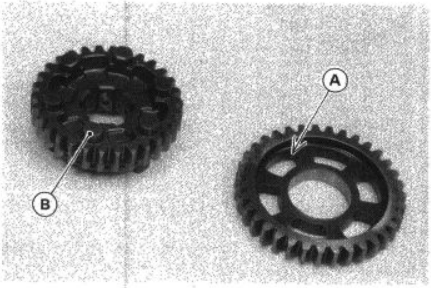


A. Shift Drum Grooves

Gear Dog/Gear Dog Hole Damage

●Visually inspect the gear dogs and gear dog holes.

★Replace any gears that have damaged or excessively worn dogs or dog holes.



A. Dog Hole B. Dog

Ball and Needle Bearing Wear

●Check the following ball bearings: shift drum LH, drive shaft RH, and output shaft LH.

○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.

○Spin the bearing by hand to check its condition.

★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.

●Check the following needle bearing: drive shaft LH and output shaft RH.

○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If there is any doubt as to the condition of a needle bearing, replace it.

Wheels/Tires

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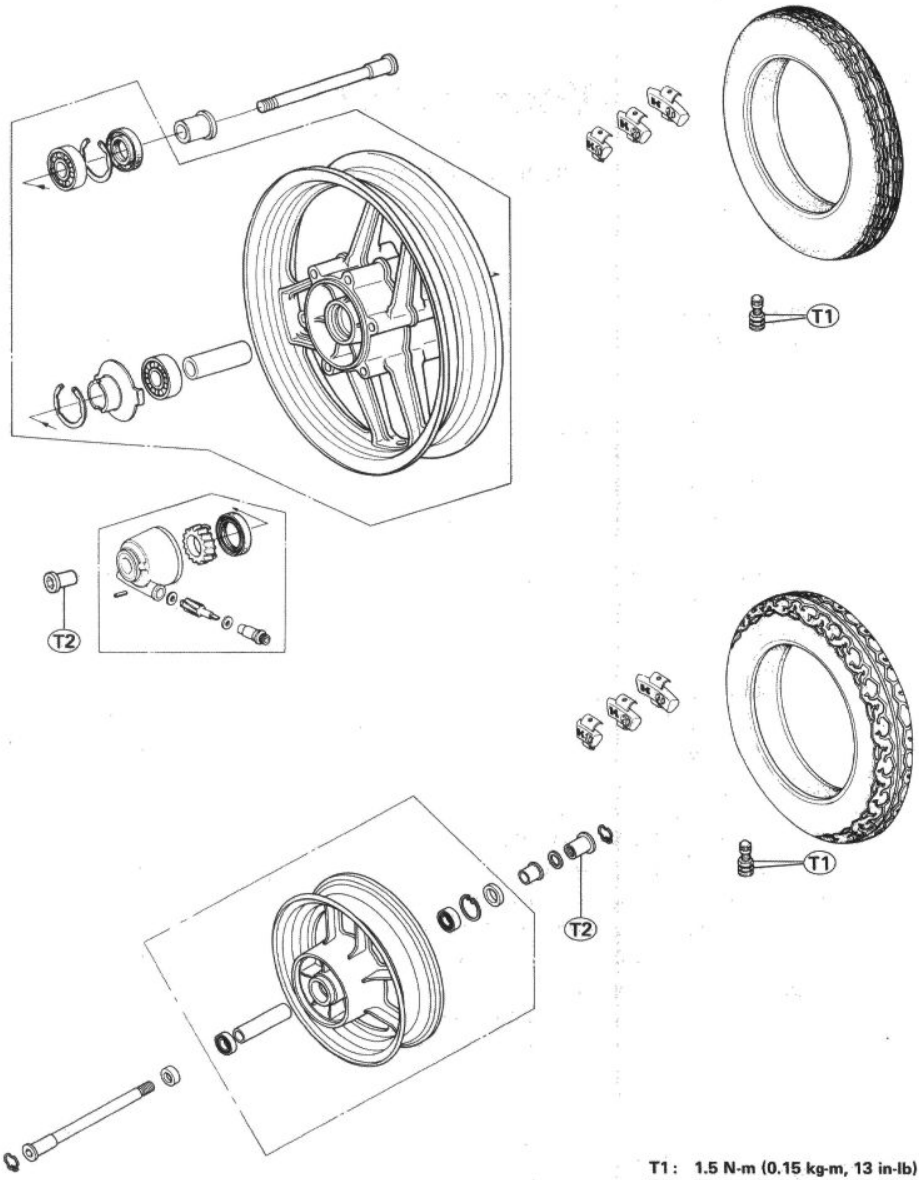
Exploded View



T1: 1.5 N-m (0.15 kg-m, 13 in-lb)
T2: 88 N-m (9.0 kg-m, 65 ft-lb)

Specifications

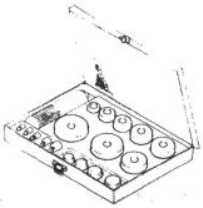
Item		Standard	Service Limit
Wheels:			
Tire tread depth:	Front	4.4 mm	1 mm
	Rear	7.0 mm	2 mm (Under 130 kph) 3 mm (Over 130 kph)
Standard tire:	Front	120/80 V 16-V250 TUBELESS DUNLOP F-17	– – – – – –
	Rear	130/80 V 18-V250 TUBELESS DUNLOP K727	– – – – – –

			Load	Air Pressure (when cold)	
				Under 210 kph (Under 130 mph)	Over 210 kph (Over 130 mph)
Tire air Pressure	US and Canadian Model	Front	Up to 956 N (97.5 kg, 215 lb)	221 kPa (2.25 kg/cm², 32 psi)	
			956 – 1,770 N (97.5 – 180 kg, 215 – 397 lb)	245 kPa (2.50 kg/cm², 36 psi)	
		Rear	Up to 1,770 N (180 kg, 397 lb)	245 kPa (2.50 kg/cm², 36 psi)	
	Other than US and Canadian Model	Front	Up to 956 N (97.5 kg, 215 lb)	221 kPa (2.25 kg/cm², 32 psi)	245 kPa (2.5 kg/cm², 36 psi)
			956 – 1,775 N (97.5 – 181 kg, 215 – 397 lb)	245 kPa (2.5 kg/cm², 36 psi)	
		Rear	Up to 1,775 N (181 kg, 399 lb)	245 kPa (2.5 kg/cm², 36 psi)	284 kPa (2.9 kg/cm², 41 psi)

Rim runout:	Axial	– – –	0.5 mm
	Radial	– – –	0.8 mm
Axle runout/100 mm:		Under 0.05 mm	0.2 mm (0.7 mm : RL)

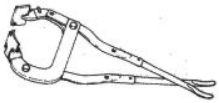
Special Tools

Bearing Driver Set: 57001-1129
Use the following tools in the set.
Bearing Driver Holder: 57001-1132
Bearing Driver Holder: 57001-1135
Bearing Driver Holder: 57001-1136
Bearing Driver Holder: 57001-1145
Bearing Driver Holder: 57001-1146

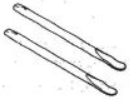


Rim Protector: 57001-1063

Bead Breaker Ass'y: 57001-1072



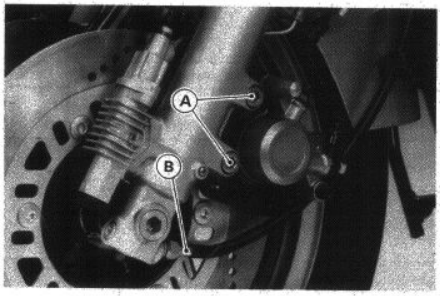
Tire Lever: 57001-1073



Wheels (Rims)

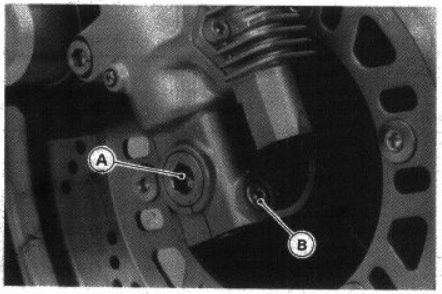
Front Wheel Removal

●Remove the following parts before front wheel removal.
○Speedometer cable lower end
○One of the brake caliper mounting bolts



A. Caliper Mounting Bolts B. Speedometer Cable

○Right side axle clamp bolts loosened



A. Axle B. Axle Clamp Bolt

○Axle loosend
●Use a jack under the engine or other suitable means to lift the front of the motorcycle. Pull out the axle to the right and drop the front wheel out of the forks.
●Remove the caliper (one of the calipers).
●Remove the front wheel.

CAUTION

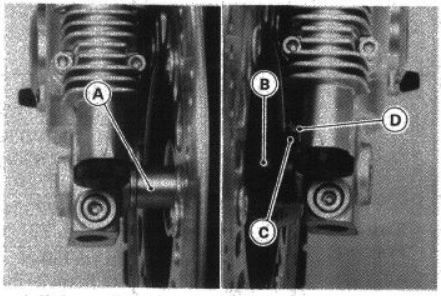
○Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the discs do not touch the ground.

Front Wheel Installation

●When installing the front wheel, be careful of the following items.
○Installation is the reverse of removal.

NOTE

○Install the speedometer gear housing so that it fits in the speedometer gear drive notches.
○Fit the speedometer gear housing stop to the fork leg stop, and check that the collar is on the right side of the hub.



A. Collar
B. Speedometer Gear Housing
C. Housing Stop
D. Fork Leg Stop

○Tighten the axle nut to the specified torque.
○Tighten the axle clamp bolts to the specified torque.
○Tighten the caliper mounting bolts to the specified torque.
○Check the front brake.

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 brakes will not function on the first application of the lever if this is not done.

Rear Wheel Removal

●Remove or loosen the following parts before rear wheel removal.
○Axle clamp bolts (loosen)
○Caliper fixing bolt and collar fixing bolt (loosen)
○Drive chain (fully loosen)
○Axle nut and axle (remove)
○Caliper (remove)
●Pull the drive chain toward the left, and remove the rear wheel.

CAUTION

○**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

Rear Wheel Installation

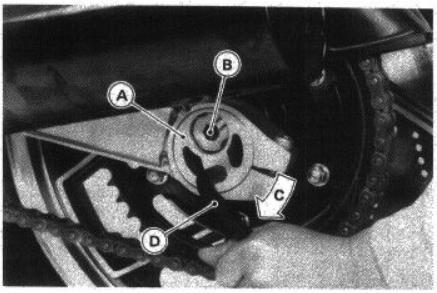
●When installating the rear wheel, be careful of the following items.

○Installation is the reverse of removal.

○Adjust the drive chain after installation (see Drive Chain Adjustment in Final Drive chapter).

NOTE

○***When adjusting the drive chain, turn the chain adjuster against the wheel rotation.***



A. Chain Adjuster
B. Axle Nut
C. Rotation
D. Allen Wrench

○Tighten the axle nut and axle clamp bolts to specified torque.

Wheel Inspection

If there is any doubt as to the condition of the wheel, or if the wheel has received a heavy impact, check the rim runout as follows:

Remove the tire and support the wheel by the axle. Set a dial gauge against the side of the rim, and rotate the wheel to measure the axial runout. The difference between the highest and lowest dial readings is the amount of runout.

Set the dial gauge against the outer circumference of the rim, and rotate the wheel to measure radial runout. The difference between the highest and lowest dial readings is the amount of runout.

If rim runout exceeds the service limit, check the wheel bearings first. Replace them if they are damaged. If the problem is not due to the bearings, the wheel must be replaced. Do not attempt to repair a damaged wheel.

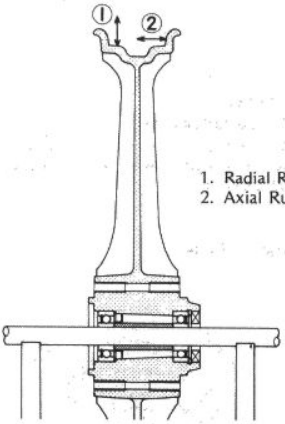
Axial Runout

Service Limit:	**0.5 mm**

Radial Runout

Service Limit:	**0.8 mm**

Rim Runout



1. Radial Runout
2. Axial Runout

Carefully inspect the wheel for small cracks, dents, bending, or warp. If there is any damage to the wheel, it must be replaced.

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.**

If the rim has a scratch deeper than 0.5 mm and/or across the rim sealing surface, replace the wheel.

Axle Inspection

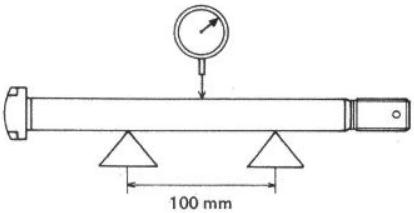
To measure axle runout, remove the axle, place it in V blocks that are 100 mm apart, and set a dial gauge on the axle at a point halfway between the block. Turn the axle to measure the runout. The amount of runout is the amount of dial variation.

If runout exceeds the service limit, straighten the axle or replace it. If the axle cannot be straightened to within service limit, or if runout exceeds the repair limit, replace the axle.

Axle Runout/100 mm

Service Limit:	**0.2 mm**
Repair Limit:	**0.7 mm**

Axle Runout

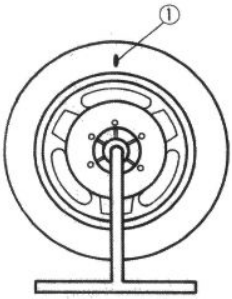


Wheel Balance

To check the wheel balance:

- Support the wheel so that it can be spun freely
- Spin the wheel lightly, and mark the wheel at the top when the wheel stops.

Wheel Balance Check



1. Mark

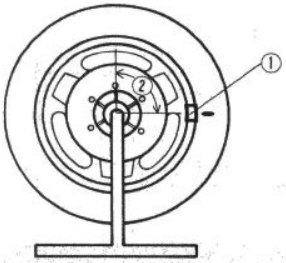
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.

To balance the wheel:

- If the wheel always stops in one position, provisionally attach a balance weight on the rim at the marking using an adhesive tape.
- Rotate the wheel ¼ turn, 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 ¼ turn.
- Rotate the wheel another ¼ turn and then another ¼ turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.

- To install the balance weights on the rim, first reduce the tire pressure, pry the tire bead from the rim, and then insert the blade part of the balance weight between the rim and the tire bead until the stepped portion of the weight is hooked over the edge of the rim.

Wheel Balance Adjust



1. Balance Weight
2. ¼ Turn

Installation of Balance Weight:

- Check if the weight portion has any play on the blade-and-clip plate.
- ★If it does, discard it.
- Lubricate the balance weight blade, tire bead, and rim flange with a slap and water solution or rubber lubricant. This helps the balance weight slip on the rim flange.

CAUTION

- ○**Do not lubricate the tire bead with engine oil or gasoline 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.

WARNING

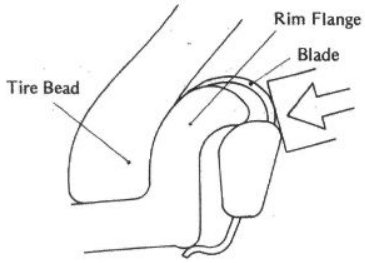
- ○**If the balance weight has any play on the rim flange, the blade and/ or clip of weight are widened. Replace the loose balance weight.**
- ○**Do not reuse used balance weights.**

Balance Weight

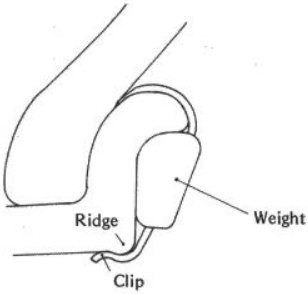
Part Number	Weight (grams)
41075-1014	10
41075-1015	20
41075-1016	30

Installing Balance Weight

(a) Press or lightly hammer the weight in.



(b) Installation completed.

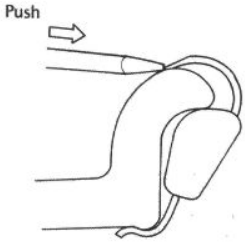


Removal of Balance Weight:

(a)When the tire is not on the rim.

- Push 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.

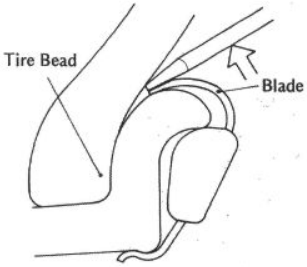
Removing Balance Weight (without tire on rim)



(b)When the tire is on the rim.

- Pry 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 and weight blade 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.

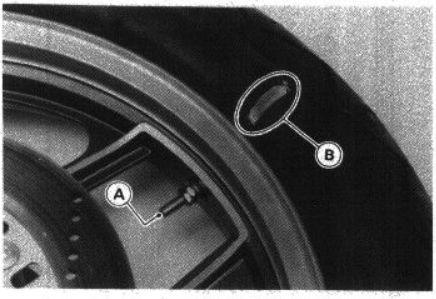
Removing Balance Weight (with tire on rim)



Tires

Tire Removal

- Remove the wheel from the motorcycle (see Wheel Removal), and remove the disc(s) from the hub.
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire will be reinstalled in the same position.
- Take out the valve core to let out the air.



A. Valve Core B. Chalk Mark

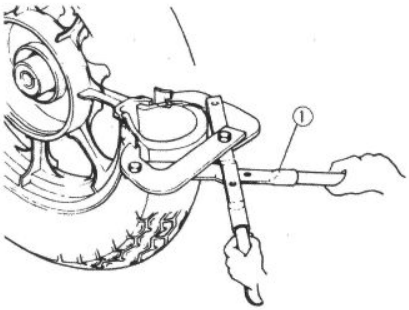
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

CAUTION

○**Never lubricate with mineral oil (engine oil) or gasoline because they will cause deterioration of the tire.**

- Break the beads away from both sides of the rim with the bead breaker (special tool).

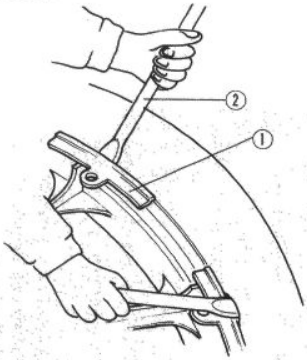
Tire Beads Brake



1. Bead Breaker: 57001-1072

- Install the rim protectors (special tools) around the valve stem. Lubricate the tire irons and rim protectors with a soap and water solution, or rubber lubricant.
- Step on the side of the tire opposite the valve stem, and start prying the tire off the rim near the valve stem with tire irons (special tools).

Tire Removal



1. Rim Protectors: 57001-1063
2. Tire Irons: 57001-1073

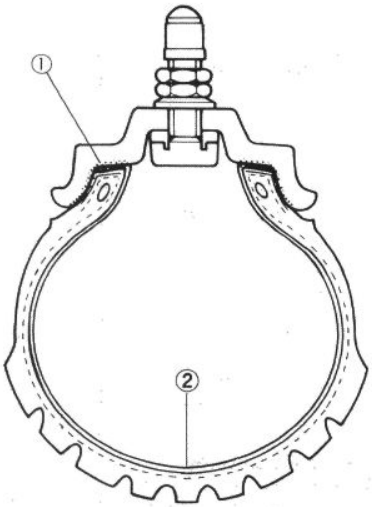
NOTE

○*For easier removal, always position the tire bead opposite the valve stem in the rim well, and pry the tire bead a little at a time.*

CAUTION

○**Be careful not to scratch the inner liner and air sealing surfaces of the rim and tire with the tire irons. A scratched inner liner or sealing surface may allow air to leak.**

Air Sealing Surfaces



1. Air Sealing Surfaces
2. Inner Liner

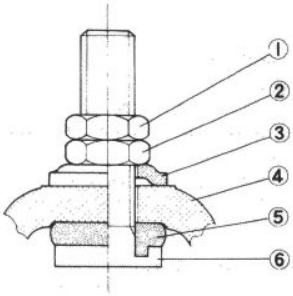
- After removing the bead on one side, turn the wheel over and remove the other side.
- Remove the rim from the tire.
- Remove the rim protectors from the rim.

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.
- Replace the valve with a new one. Tighten the mounting nut and locknut to the specified torque.

Air Valve

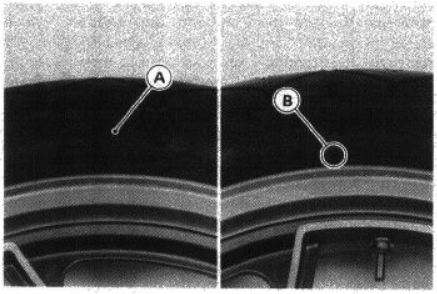
1. Locknut
2. Nut
3. Washer
4. Cast Wheel
5. Grommet
6. Valve Stem



- Apply a soap and water solution, or rubber lubricant to the rim flanges, rim protectors, tire beads, and tire irons.
- Check the tire rotation mark on the rear tire and install it on the rim accordingly.

NOTE

○*The direction of the tire rotation is shown by an arrow on the tire sidewall.*



A. Rotation Mark (Arrow)
B. Balance Mark (Yellow Paint)

- Position the tire on the rim so that the valve is at the tire balance mark (the chalk mark made during removal, or the yellow paint mark on a new tire).
- Fit the rim protectors on the rim flange near the valve stem.
- By hand, slide as much as possible of the lower side of the tire bead over the rim flange, starting at the side opposite the valve.
- Use tire irons to install the remaining part of the tire bead which cannot be installed by hand. For easy tire installation, position the part of the bead which is already over the rim flange in the rim well.

NOTE

○*To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.*

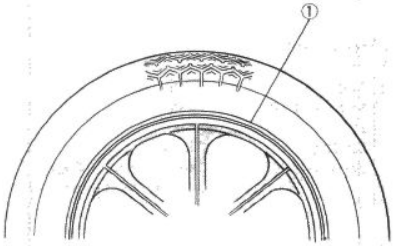
- Install the other side of the tire bead onto the rim in the same manner.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.

WARNING

○**Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 390 kPa (4.0 kg/cm^2, 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.**

- Check to see that the rim lines on both sides of the tire sidewalls are parallel with the rim flanges.

Rim Line



1. Rim line

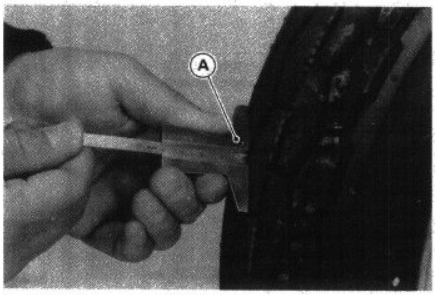
- If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core. Lubricate the rim flanges and tire beads. Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leaks. Inflate the tire slightly above standard inflation. Use a soap and water solution or submerge it, and check for bubbles that would indicate leakage.
- Adjust the air pressure to the specified pressure (see Tire Inspection).
- Adjust the wheel balance (see Wheel Balance).

Tire Inspection

As the tire tread wears down, the tire becomes more susceptible the 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 bad damage. Swelling or high spots indicate internal damage, requiring tire replacement.
- Measure the tread depth at the center of the tread with a depth gauge. Since the tire may wear unevenly, take measurements at several places.

★If any measurement is less than the service limit, replace the tire.



A. Depth Gauge

Tire Tread Depth

Front	
Standard	**4.4 mm**
Service Limit	**1 mm**
Rear	
Standard	**7.0 mm**
Service Limit	**2 mm (Up to 130 kph)** **3 mm (Over 130 kph)**

WARNING

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

NOTE

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

Standard Tire

Front	
Size	**120/80 V 16**
Make, Type	**TUBELESS DUNLOP F17**
Rear	
Size	**130/80 V 18**
Make, Type	**TUBELESS DUNLOP K727**

Tire Air Pressure (when cold)
(US and Canadian Model)

Front	Up to 956 N (97.5 kg, 215 lb)	221 kPa (2.25 kg/cm², 32 psi)
	956 – 1,770 N (97.5 – 180 kg, 215 – 397 lb)	245 kPa (2.50 kg/cm², 36 psi)
Rear	Up to 1,770 N (180 kg, 397 lb)	245 kPa (2.50 kg/cm², 36 psi)

Tire repair

Currently two types of repair for tubeless tires have come into wide use. One type is called temporary (external) repairs which can be carried out without removing the tire from the rim, and another type is called permanent (internal) repairs which require 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 also 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.

Tire Air Pressure (when cold)
(Other than US and Canadian Model)

	Load	Air Pressure (when cold)	
		Under 210 km/h (130 mph)	Over 210 km/h (130 mph)
Front	Up to 956 N (97.5 kg, 215 lb)	221 kPa (2.25 kg/cm², 32 psi)	245 kPa (2.5 kg/cm², 36 psi)
	956 – 1,775 N (97.5 – 181 kg, 215 – 397 lb)	245 kPa (2.5 kg/cm², 36 psi)	
Rear	Up to 1,775 N (181 kg, 399 lb)	245 kPa (2.5 kg/cm², 36 psi)	284 kPa (2.90 kg/cm², 41 psi)

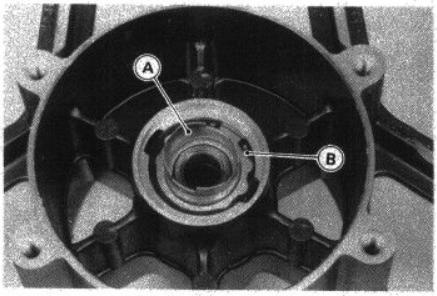
Hub Bearings

Front Hub Bearing Removal

CAUTION

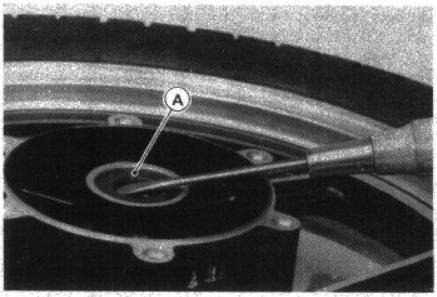
○**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

- Remove the front wheel.
- Remove the speedometer gear housing, and collar(s) from the wheel.
- Remove the disc mounting Allen bolts and take off the discs.
- Remove the circlip and speedometer gear drive.



A. Speedometer Gear Drive B. Circlip

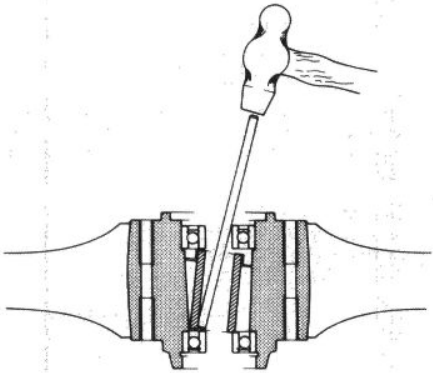
- Remove the grease seal using a hook, and remove the circlip.



A. Grease Seal

- Insert a metal rod into the hub from the left side, and remove the right side bearing by tapping evenly around the bearing inner race.
- Remove the remaining bearing by tapping evenly around the bearing inner race. The distance collar comes out with the bearing.

Bearing Removal

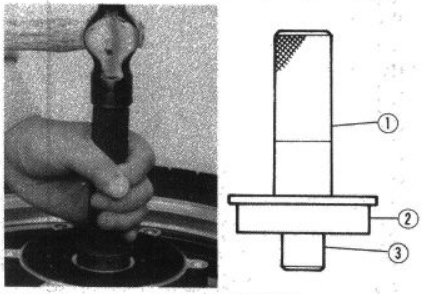


Front Hub Bearing Installation

- When install the front hub, be careful of the following items.

○Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.

○Inspect the bearings and replace them if necessary. Lubricate them and install them using the bearing driver and the bearing driver holder (special tools) so that the marked sides or shield sides face out.



1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1145
3. Bearing Driver: 57001-1135

○Inspect the grease seal and replace if necessary. Press it in until it stops at the circlip in the hole using the same special tools used for bearing installation.

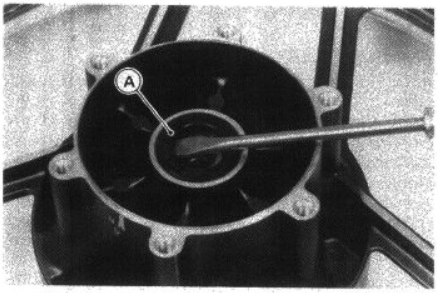
○Tighten the disc mounting Allen bolts to the specified torque. The disc must be installed with the chamfered hole side facing toward the wheel. After installing the disc check the disc runout. Completely clean off any grease that has gotton on either side of the disc with a high flash-point solvent. Do not use one which will leave an oily residue.

Rear Hub Bearing Removal

CAUTION

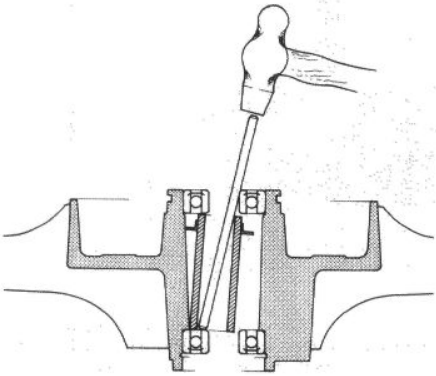
○**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

- Remove the rear wheel.
- Remove the coupling sleeve, rear wheel coupling, and coupling collar from the wheel.
- Remove the disc mounting Allen bolts and take off the disc.
- Remove the grease seal using a hook, and remove the circlip.



A. Grease Seal

Bearing Removal



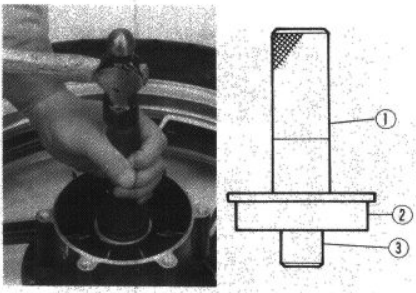
- Insert a metal rod into the hub from the left side, and remove the right side bearing by tapping evenly around the bearing inner race.
- Remove the remaining bearing by tapping evenly around the bearing inner race. The distance collar comes out with the bearing.

Rear Hub Bearing Installation

- When installating the rear hub, be careful of the following items.

○Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.

○Inspect the bearings and replace them if necessary (see Hub Bearing inspection). Lubricate them and install them using the bearing driver and the bearing driver holder (special tools) so that the marked sides or shield sides face out.

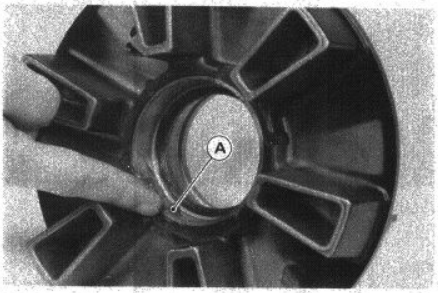


1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1146
3. Bearing Driver: 57001-1136

○Inspect the grease seal and replace if necessary (see Grease Seal inspection). Press it in until it stops at the circlip in the hole using the same special tools used for bearing installation.

○Inspect the bush on the rear hub replace it with a new one if it has deteriorated, and apply a little grease to the bush.

○Apply a little grease to the inside of the rear coupling.

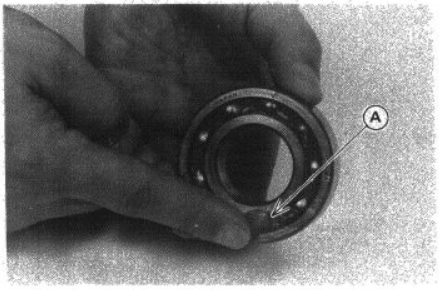


A. Grease.

○Tighten the disc mounting Allen bolts to the specified torque. The disc must be installed with the chamfered hole side facing toward the wheel. After installing the disc, check the disc runout (see Disc Wear in Brake chapter).
○Completely clean off any grease that has gotton on either side of the disc with a high flash-point solvent. Do not use one which will leave an oily residue.

Hub Bearing Inspection and Lubrication

Since the wheel bearings are made to extremely close tolerances, the clearance cannot normally be measured. Wash the bearing with a high flashpoint 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. For front hub bearing, if the bearing is to be used again, rewash it with a high flashpoint solvent, dry it, and pack it with good quality bearing grease before installation. Turn the bearing by hand a few times to make sure the grease is distributed uniformly inside the bearing, and wipe the old grease out of the hub before bearing installation. Clean and grease the wheel bearings in accordance with the Periodic Maintenance Chart.



A. Grease.

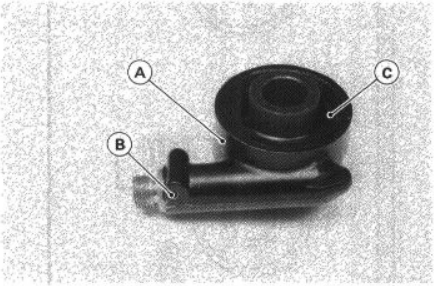
Grease Seal Inspection and Lubrication

If the grease seals are examined without removing the seals themselves, lock for discoloration (indicating the rubber has deteriorated), hardening, damage to the internal ribbing, or other damage. If the seal or internal ribbing has hardened, the clearance between the seal and the axle sleeve will not be taken up, which will allow dirt and moisture to enter and reach the bearing. If in doubt as to its condition and whenever the seal is removed for greasing the bearing, the seal should be replaced. The seal are generally damaged upon removal.

Speedometer Gear Housing

Speedometer Gear Housing Disassembly

●Pull the speedometer gear housing and collar off the front wheel.
●Pull out the grease seal using a hook.



A. Speedometer Gear Housing C. Grease Seal
B. Pin

●Pull out the speedometer gear.
●If the speedometer cable bushing or speedometer pinion needs to be removed, first drill the housing through the pin using a 1.0 to 1.5 mm drill bit. Drill the housing from the under side using a 3.0 to 3.5 mm drill bit. Using a suitable 3 mm rod, tap out the pin, and then pull out the speedometer cable bushing, pinion, and washers.

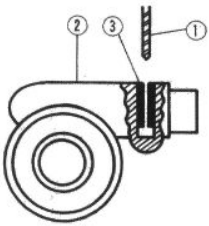
NOTE

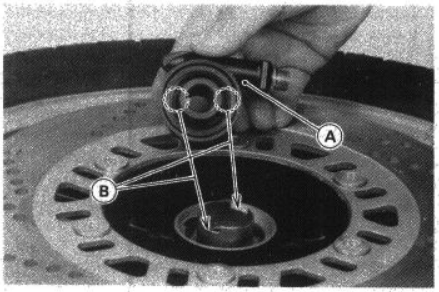
○*It is recommended that the assembly be replaced rather than attempting to repair the components.*

Speedometer Gear Housing Assembly

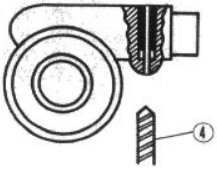
●When assembling the speedometer gear housing, be careful of the following items.
○After inserting a new pin, stake the housing hole to secure the pin in place.
○Replace the grease seal with a new one. Apply a little grease to the seal. Install it using a press or a suitable driver so that the face of the seal is level with the surface of the housing.
○Regrease the speedometer gear.
○Install the speedometer gear housing so that it fits in the speedometer gear drive notches.

Speedometer Gear Housing Pin Removal



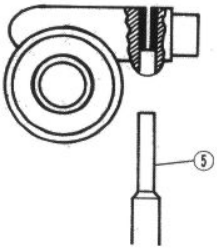


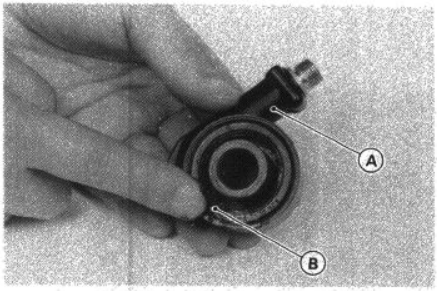
A. Speedometer Gear Housing
B. Fit in the gear drive notches.



Speedometer Gear Housing Lubrication

Clean and grease the speedometer gear housing in accordance with the Periodic Maintenance Chart.





A. Speedometer Gear Housing
B. Grease.

1. 1 ~ 1.5 mm bit
2. Housing
3. Pin
4. 3 ~ 3.5 mm bit
5. 3 mm Rod

Final Drive

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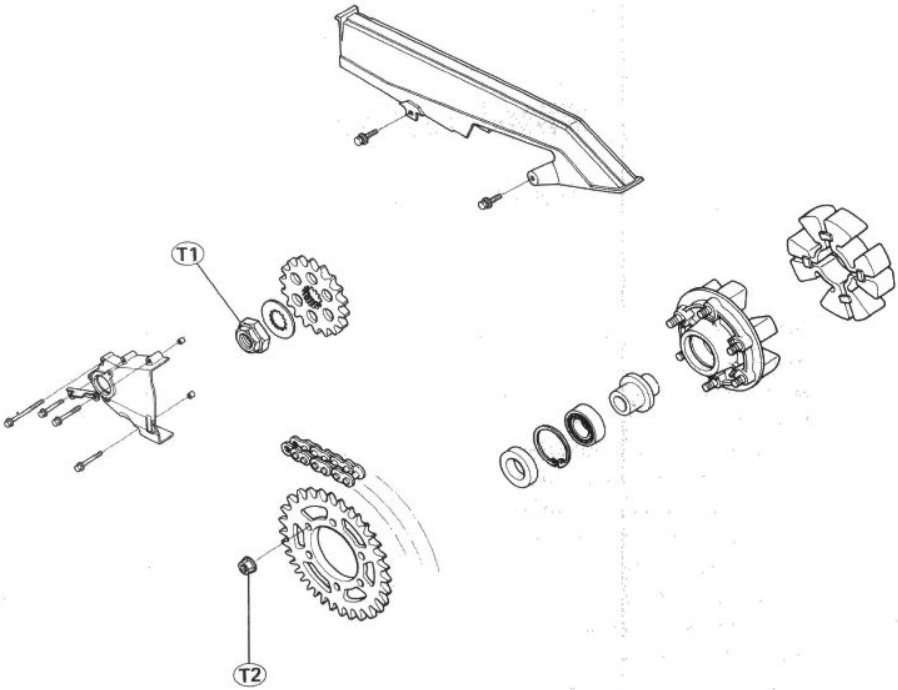
Damper Inspection 10-10

Exploded View



T1: 98 N-m (10.0 kg-m, 72 ft-lb)
T2: 39 N-m (4.0 kg-m, 29 ft-lb)

Specifications

Item	Standard	Service Limit
Drive Chain:		
Make and type	Enuma Endless	– – –
	EK530 KVDO 114 Link	– – –
Chain slack	35 – 40 mm	Less than 35 mm, or more 45 mm
20-Link length	317.5 – 318.4 mm	323 mm
Sprockets:		
Engine sprocket diameter	75.67 – 75.87 mm/17T	75.0 mm
Rear Sprocket diameter	237.54 – 238.04 mm/49T	237.2 mm
	242.72 – 243.22 mm/50T	242.4 mm
Rear sprocket warp	Under 0.4 mm	0.5 mm

Special Tools

Bearing Driver Set: 57001-1129

Use following tools in the set.

Bearing Driver Holder: 57001-1140
Bearing Driver: 57001-1146
Bearing Driver: 57001-1148

Drive Chain

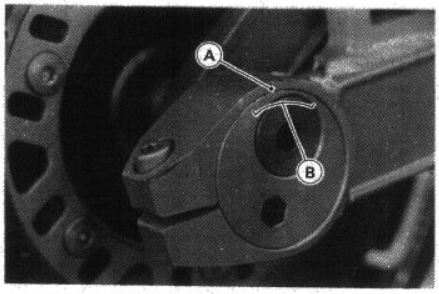
The drive chain must be checked, adjusted, and lubricated in accordance with the Periodic Maintenance Chart for safety and to prevent excessive wear. If the chain becomes badly worn or maladjusted – either too loose or too tight – the chain could jump off the sprocket or break.

WARNING

○**A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control.**

Drive Chain Slack Inspection

- Set the motorcycle up on its center stand.
- Check to see if wheel alignment is properly adjusted. The left and right notches on the swing arm should point to the same marks or positions on the left and right chain adjusters. If they do not, adjust wheel alignment as described in the later paragraph–Wheel Alignment Adjustment.



A. Swing Arm Notch B. Marks

NOTE

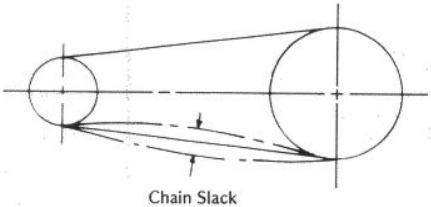
○*Wheel alignment can also be checked using the straight-edge or string method.*

WARNING

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

- Route the rear wheel to find the position where the chain is tightest, and measure the vertical movement midway between the sprockets.
- If the drive chain is too tight or too loose adjust it so that the chain slack will be within the standard value.

Chain Slack Inspection



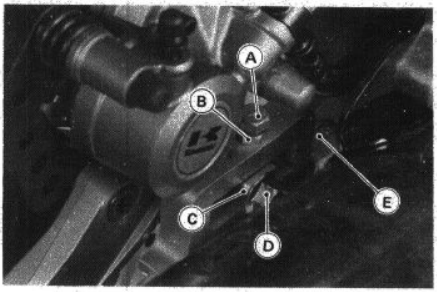
Chain Slack

Drive Chain Slack

Standard:	**35 – 40 mm**
Tool Tight:	**Less than 35 mm**
Tool Loose:	**More than 45 mm**

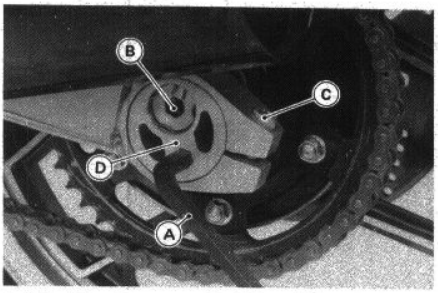
Drive Chain Slack Adjustment

- Loosen the locknut and collar fixing bolt.
- Loosen the caliper fixing bolt.



A. Collar Fixing Bolt
B. Locknut
C. Collar
D. Caliper Fixing Bolt
E. Swing Arm

- Loosen the left and right chain adjuster clamp bolts.
- Insert on Allen wrench into the rear axle and turn the chain adjusters forward or rearward until the drive chain has the correct amount of chain slack.



A. Allen Wrench
B. Rear Axle
C. Adjuster Clamp Bolt
D. Chain Adjuster

•Tighten the chain adjuster clamp bolts to the specified torque.

WARNING

○**If the clamp bolts are not securely tightened, an unsafe riding condition may result.**

•Rotate the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
•Tighten the caliper fixing bolt, collar fixing bolts and locknut securely.

NOTE

○*After chain adjustment check that the collar is under the collar fixing bolt. If it is not, move the fixing bolt to another hole in the swing arm.*

•Check the rear brake effectiveness.

Wheel Alignment Adjustment

•Remove the left or right retaining ring.
•Loosen the axle nut.
•Loosen the collar and caliper fixing bolts.
•Loosen the left or right chain adjuster clamp bolt, and turn the chain adjuster so that the left and right notches on the swing arm point to the same marks or positions on the left and right adjusters.
•Inspect the chain slack.
•Tighten the collar and caliper fixing bolts.
•Tighten the clamp bolts and axle nut to the specified torque.
•Insert the retaining ring to secure the axle shaft.

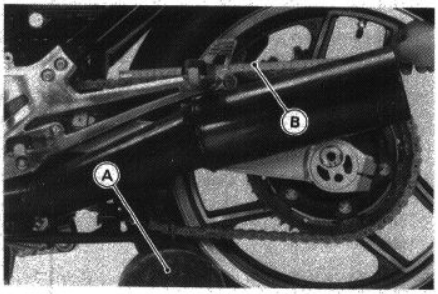
WARNING

○**If the axle nut and clamp bolts are not securely tightened and the retaining ring is not installed, an unsafe riding condition may result.**

Drive Chain Wear Inspection

•Rotate the rear wheel to inspect the drive chain for damaged rollers, and loose pins and links.
•Also inspect the sprockets for unevenly or excessively worn teeth, and damaged teeth.
★If there is any irregularity, replace the drive chain and both sprockets.

•Stretch the chain taut hanging a 98 N (10 kg, 20 lb) weight on the chain.
•Measure the length of 20 links on the straight part of the chain from pin center of the 1st pin to pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.



A. Weight B. Measure

Drive Chain 20-Link Length

Standard:	**317.5 – 318.4 mm**
Service Limit:	**323 mm**

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

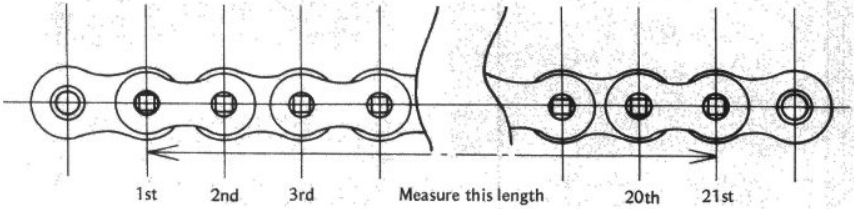
WARNING

○**For safety, use only the standard chain. It is an endless type and should not be cut for installation.**

Drive Chain Lubrication

The chain should be lubricated with a lubricant which will both prevent the exterior from rusting and also absorb shock and reduce friction in the interior of the chain. An effective, good quality lubricant specially formulated for chains is best for regular chain lubrication.

Chain Length



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

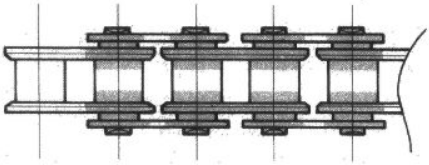
- If the chain appears especially dirty, it should be cleaned before lubrication.

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-rings.**
- **Immediately blow the chain dry with compressed air after cleaning.**
- **Complete cleaning and drying the chain within 10 minutes.**

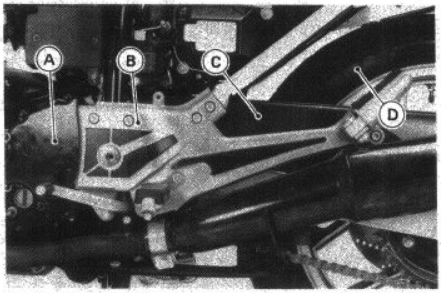
- Apply oil to the sides of the rollers so that oil will penetrate to the rollers and bushings. Apply the oil to the O-rings so that the O-rings will be coated with oil.
- Wipe off any excess oil.

Drive Chain



Drive Chain Removal

- Remove the left footpeg bracket (see Footpeg Bracket Removal in Frame chapter).



A. Engine Sprocket Cover
B. Left Footpeg Bracket
C. Chain Cover
D. Rear Wheel

- Remove the chain cover.
- Remove the rear wheel (see Rear Wheel Removal in Wheels and Tires chapter).
- Remove the engine sprocket (see Engine Sprocket Removal).
- Remove the drive chain toward the left side.

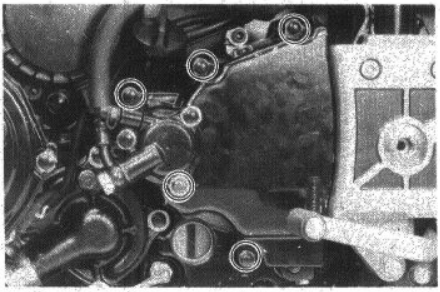
Drive Chain Installation

- When installing the drive chain, be careful of the following items.
  - Installation is the reverse of removal.
  - Adjust the drive chain after installation.
  - Tighten the pivot shaft nut to the specified torque.
  - Tighten the axle clamp bolts to the specified torque.

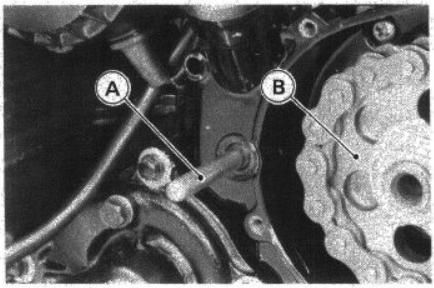
Sprocket, Coupling

Engine Sprocket Removal

- Remove the engine sprocket cover.

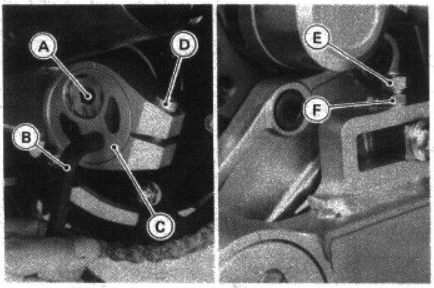


- It is not needed to remove the clutch slave cylinder and two bolts for the cover removal.
- Take the clutch push rod out of the drive shaft so that the push rod does not get damaged during engine sprocket removal.



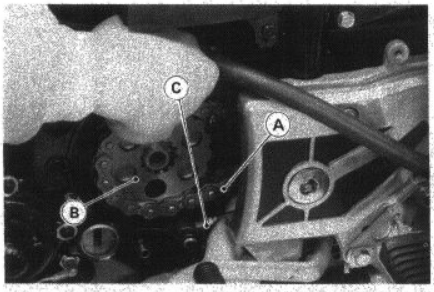
A. Push Rod B. Sprocket

- Loosen the engine sprocket nut while applying the rear brake.
- Loosen the locknut and caliper fixing bolt.
- Loosen the left and right chain adjuster clamp bolts.
- Turn the chain adjusters so that the chain is loose.



A. Rear Axle
B. Hexagon Wrench
C. Chain Adjuster
D. Adjuster Clamp Bolt
E. Caliper Fixing Bolt
F. Locknut

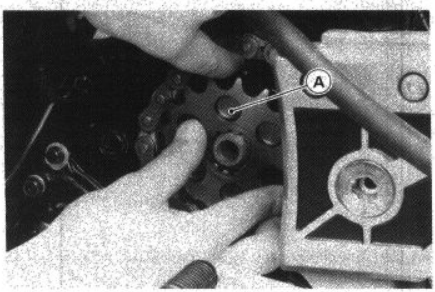
- Remove the drive chain from the rear sprocket with the rear wheel installed.
- Remove the washer and pull the engine sprocket off the output shaft with the drive chain. When this time, push up the chain to clear the shift pedal linkage.



A. Drive Chain
B. Engine Sprocket
C. Shift Pedal Linkage

Engine Sprocket Installation

- Engage the sprocket with the drive chain so the recess faces outwards.
- Install the sprocket onto the output shaft.



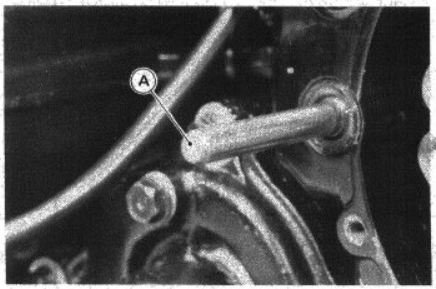
A. Recess Face

○ Discard the used lockwasher and install a new one, and finger tighten the sprocket nut.

- Install the drive chain on the rear sprocket. Temporarily, adjust the chain to remove all slack.
- Tighten the sprocket nut to the specification, while applying the rear brake.
- Bend the lockwasher to hold the nut with pliers.

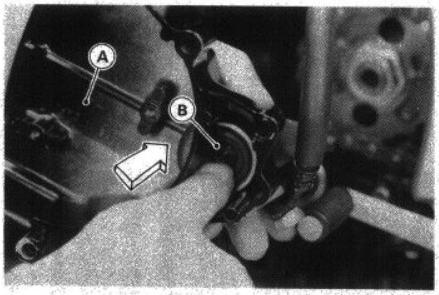
○ Do not use a screwdriver, chisel or any other tool having a sharp edge.

- Install the clutch push rod so that the round end faces outwards.



A. Push Rod Round End

- Push the slave cylinder piston in by hand as far as it will go and install the engine sprocket cover.



A. Engine Sprocket Cover B. Push the piston in.

•Adjust the chain slack (see Chain Slack Adjustment in Final Drive chapter).

Rear Sprocket, Coupling Removal

•Remove the rear wheel (see rear wheel removal in Wheels/Tires chapter).

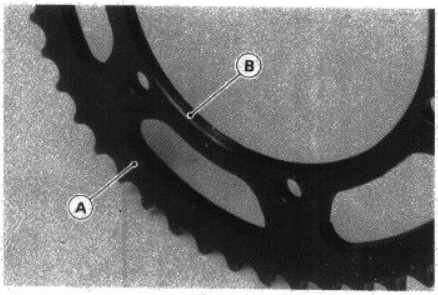
CAUTION

○**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 the disc does not touch the ground.**

•Remove the coupling from the wheel.
•Pull out the coupling collar from the left, and the coupling sleeve from the right.
•Install the rubber damper and wheel coupling temporarily on the rear hub to aid in rear sprocket removal.
•Remove the rear sprocket nuts (6) to separate the rear sprocket from the wheel coupling.
•Remove the coupling from the rear wheel.

Rear Sprocket, Coupling Installation

•When installating the rear sprocket and coupling be careful of the following items.
○Installation is the reverse of removal.
○Replace the grease seal with a new one using the suitable driver. Press the seal in until the face of the seal is level with the end of the grease seal hole. Apply a little grease to the grease seal lip.
○Install the rear sprocket with the chamfered side facing to toward the hub. Tighten the sprocket nuts to the specified torque.

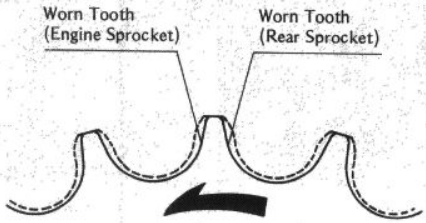


A. Rear Sprocket B. Chamfered Side

Sprocket Wear

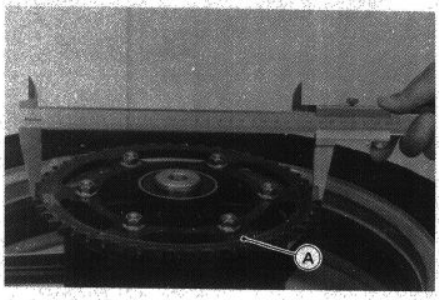
Visually inspect the sprocket teeth. If they are worn as illustrated, replace the sprocket.

Sprocket Teeth



Direction of rotation

Measure the diameter of the sprocket at the base of the teeth. If the sprocket is worn down to less than the service limit, replace the sprocket.



A. Rear Sprocket

Sprocket Diameter

Engine Sprocket

Standard	75.67 – 75.87 mm
Service Limit	75.0 mm

Rear Sprocket

49T	Standard	237.54 -- 238.04 mm
	Service Limit	237.2 mm
50T	Standard	242.72 – 243.22 mm
	Service Limit	242.4 mm

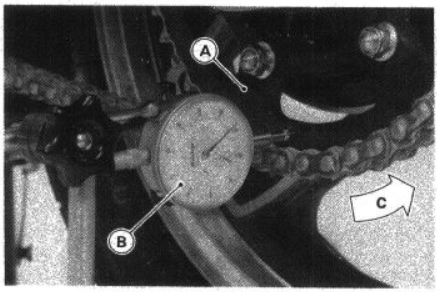
NOTE

○*If a sprocket requires replacement, the chain is provably worn also. Upon replacing a sprocket, inspect the chain.*

Sprocket Warp

Elevate the rear wheel so that it will turn freely, and set a dial gauge against the rear sprocket near the teeth as shown. Rotate the rear wheel. 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.



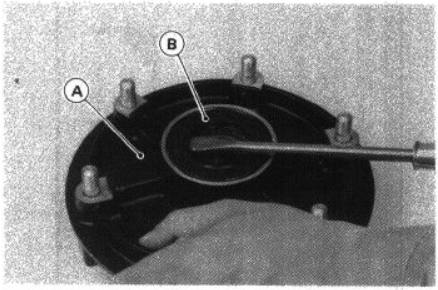
A. Rear Sprocket B. Dial Gauge C. Turn.

Rear Sprocket Warp

Standard	Under 0.4 mm
Service Limit	0.5 mm

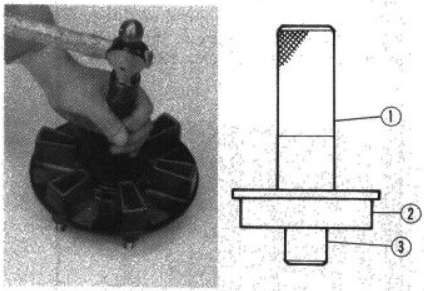
Coupling Bearing Removal

●Using a hook, pull out the grease seal and remove the circlip.



A. Wheel Coupling B. Grease Seal

●Using the bearing driver and driver holder (special tools) or some other suitable tool, remove the bearing by tapping form the wheel side.



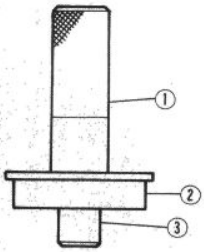
1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1146
3. Bearing Driver: 57001-1140

Coupling Bearing Installation

●When installating the coupling bearing be careful of the following items.

○Installation is the reverse of removal.

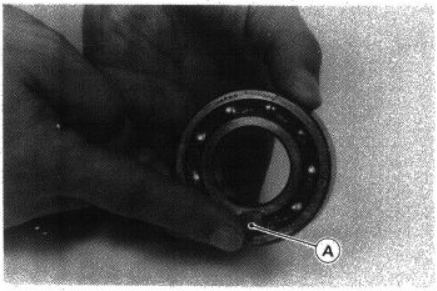
○Inspect the bearing, and replace if necessary (see Coupling Bearing Inspection). Lubricate it, and then install it using the wheel bearing driver and the bearing driver holder (special tools).



1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1148
3. Bearing Driver: 57001-1140

Coupling Bearing Inspection and Lubrication

Since the coupling bearings are made to extremely close tolerances, the clearance cannot normally be measured. Wash the bearing with a high flash-point solvent, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition. If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced. If the same bearing is to be used again, re-wash it with a high flash-point solvent, dry it, and pack it with good quality bearing grease before installation. Turn the bearing by hand a few times to make sure the grease is distributed uniformly inside the bearing, and wipe the old grease the wheel bearings in accordance with the Periodic Maintenance Chart.



A. Grease.

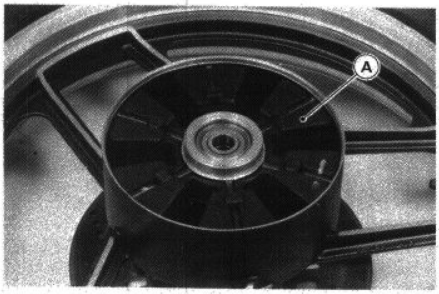
Grease Seal Inspection and Lubrication

If the grease seals are examined without removing the seals themselves, look for discoloration (indicating the rubber has deteriorated), hardening, damage to the internal ribbing, or other damage. If the seal or internal ribbing has hardened, the clearance between the seal and the axle sleeve will not be taken up, which will allow dirt and moisture to enter and reach the bearing. If in doubt as to its condition and whenever the seal is removed for greasing the bearing, the seal should be replaced. The seals are generally damaged upon removal.

Damper Inspection

Remove the rear wheel coupling, and inspect the rubber damper.

Replace the damper if it appears damaged or deteriorated.



A. Rubber Damper

Brakes

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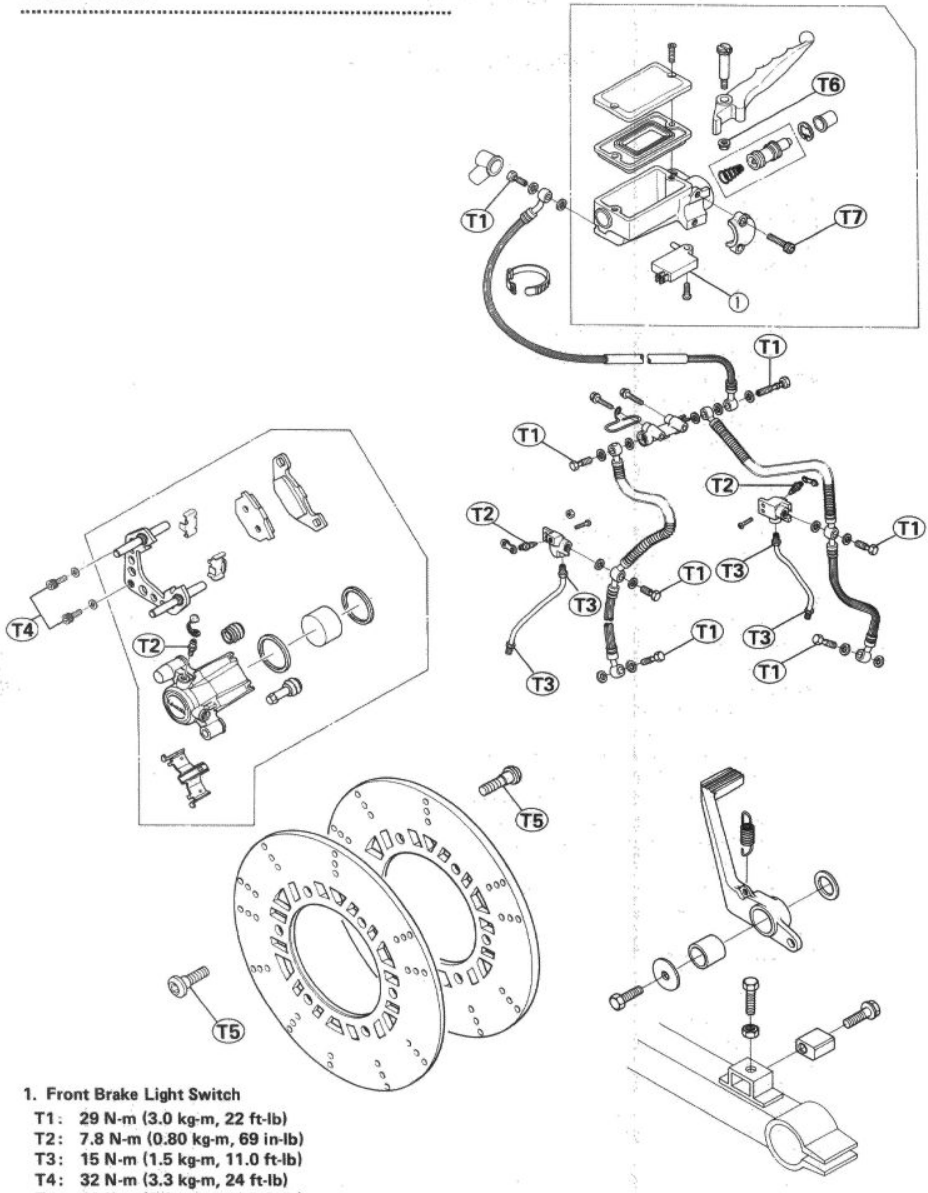
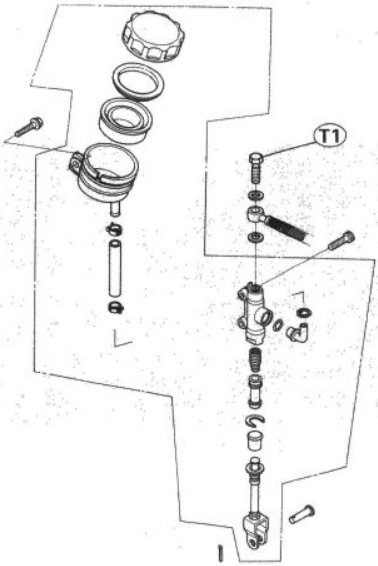
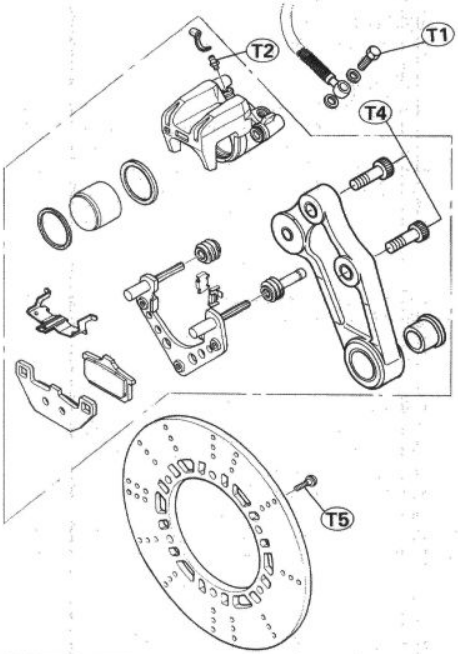
Exploded View



1. Front Brake Light Switch

T1: 29 N-m (3.0 kg-m, 22 ft-lb)
T2: 7.8 N-m (0.80 kg-m, 69 in-lb)
T3: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T4: 32 N-m (3.3 kg-m, 24 ft-lb)
T5: 23 N-m (2.3 kg-m, 16.5 ft-lb)
T6: 5.9 N-m (0.60 kg-m, 52 in-lb)
T7: 11 N-m (1.1 kg-m, 95 in-lb)





Specifications

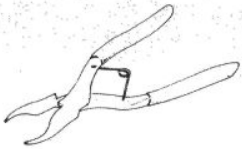
Item		Standard	Service Limit
Brakes:			
Pad lining thickness:	Front and Rear	4.85 mm	1 mm
Brake fluid grade		D.O.T.4	– – –
Brake pedal position		29 – 39 mm	– – –
Disc runout:	Front	Under 0.15 mm	0.3 mm
	Rear	Under 0.15 mm	0.3 mm
Disc thickness:	Front	4.8 – 5.1 mm	4.5 mm
	Rear	6.8 – 7.1 mm	6.0 mm

Recommended Brake Fluid

Castrol Girling-Universal
Castrol GT
Castrol Disc Brake Fluid
Check Shock Premium Heavy Duty

Special Tool

Circlip Pliers: 57001-143



Brake Adjustment

Front Brake:

Disc and disc pad wear is automatically compensated for and has no effect on brake lever action. So there are no parts that require adjustment on the front brake. However if the brake lever has a soft, or "spongy feeling", check the brake fluid level in the master cylinder and bleed the air from the brake line (see Bleeding the Brake).

NOTE

○*Check the brake fluid level in accordance with the Periodic Maintenance Chart.*

Rear Brake:

Disc and disc pad wear is automatically compensated for and has no effect on brake pedal action. However, the brake pedal position may occasionally require adjustment due to wear of the pedal pivot, or in case of disassembly. If the brake pedal has a soft, or "spongy feeling", check the brake fluid level in the reservoir and bleed the air from the brake line (see Bleeding the Brake).

NOTE

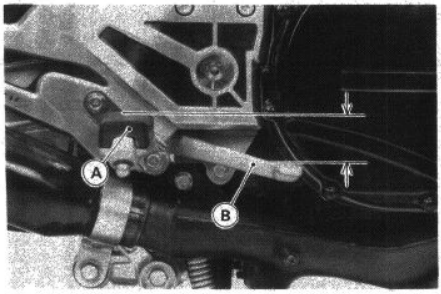
○*Check the brake fluid level in accordance with the Periodic Maintenance Chart.*

Brake Pedal Position Inspection

●When the brake pedal is in its position, it should be at the correct position.

Pedal Position

Pedal Position 29 – 39 mm below top of footpeg



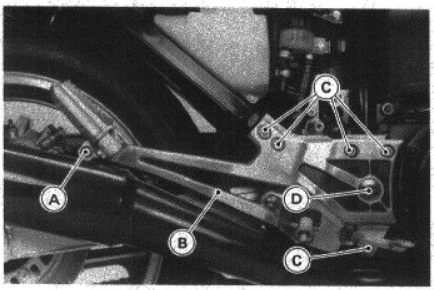
A. Footpeg B. Brake Pedal

●If it is not, adjust the brake pedal position as follows.

Brake Pedal Position Adjustment

●Remove the rear brake fluid reservoir mounting bolt.

●Remove the footpeg bracket bolts and nut (as shown), and remove the footpeg bracket with rear master cylinder.

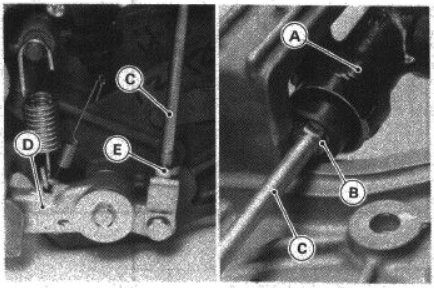


A. Muffler Mounting Bolt
B. Footpeg Bracket
C. Mounting Bolts
D. Pivot Nut

CAUTION

○**Take care not to damage the brake hose. Damage the brake line greatly reduces the brake line strength and brake fluid leakage, resulting in the loss of brake control.**

●Loosen the locknut, and turn in or turn out the adjusting nut to adjust the brake pedal position.



A. Master Cylinder
B. Adjusting Nut
C. Push Rod
D. Brake Pedal
E. Locknut

NOTE

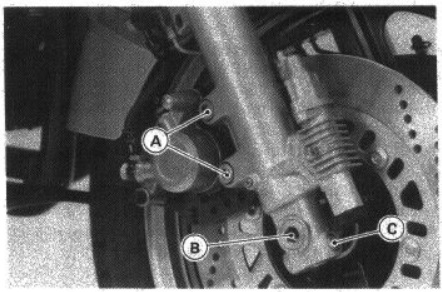
○*If the pedal position cannot be adjusted by turning the push rod, the brake pedal may be deformed or incorrectly installed.*

●Reinstall the footpeg bracket, and check the brake pedal position.

Calipers

Front Caliper Removal

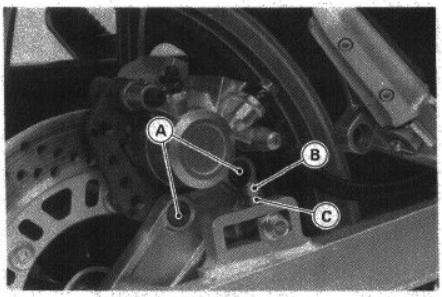
- Remove the following parts before front caliper removal.
- Put the motorcycle on center stand, remove lower fairing and support motorcycle with a jack under the engine or other suitable means.
  - ○Loosen the caliper mounting bolts
  - ○Loosen the right side axle clamp bolt
  - ○Remove the axle and drop the front wheel.
- Push the front wheel toward the rear, then remove the caliper with caliper holder from the front fork.
- Remove the brake hose from the caliper.



A. Caliper Mounting Bolts C. Axle Clamp Bolt
B. Axle

Rear Caliper Removal

- Remove the right side muffler.
- Remove the caliper mounting bolts, and take off the caliper body with caliper holder. Loosen the locknut and remove the collar fixing bolt if necessary.



A. Mounting Bolts C. Locknut
B. Collar Fixing Bolt

- Remove the brake hose from the caliper.
- If the caliper is to be disassembled after removal and if compressed air is not available, remove the piston using the following two steps before disconnecting the brake hose from the caliper.
  - ○Remove the pads.
  - ○Pump the brake lever or pedal to remove the caliper piston.
  - ○Immediately wipe up any brake fluid that spills.

Caliper Installation Notes

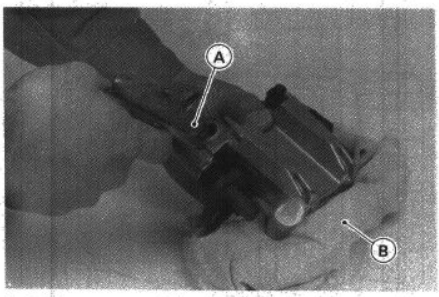
- Connect the brake hose to the caliper putting a new flat washer on each side of the brake hose fitting.
- Check the fluid level in the master cylinder, and bleed the brake line (see Bleeding the Brake).
- Check the brake for weak braking power, brake drag, and fluid leakage.

Caliper Disassembly Notes

- Using compressed air, remove the piston.
  - ○Cover the caliper opening with a clean, heavy cloth.
  - ○Remove the piston by lightly applying compressed air to where the brake line fits into the caliper.

WARNING

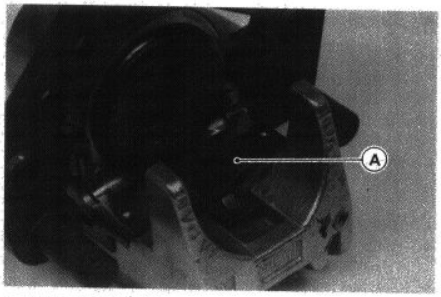
○To avoid serious injury, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the piston may crush your hand or fingers.



A. Apply compressed air. B. Cloth

Caliper Assembly Notes

- Apply brake fluid to the outside of the piston and the fluid seal, and push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston skirt get scratched.
- Install the dust seal around the piston. Check that the dust seal is properly fitted into the grooves in the piston and caliper.
- Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts and holder holes. (PBC is a special high temperature, water-resistant grease).
- Install the anti-rattle spring in the calipers as shown.

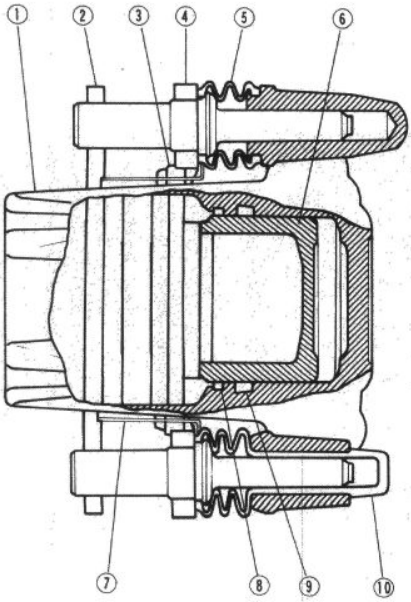


A. Anti-rattle Spring

Fluid Seal Damage

The fluid seal around the piston maintains the proper pad/disc clearance. If this seal is not satisfactory, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

Caliper



1. Caliper
2. Brake Pad
3. Brake Pad
4. Caliper Holder
5. Dust Cover
6. Piston
7. Anti-Rattle Spring
8. Dust Seal
9. Fluid Seal
10. Friction Boot

Replace the fluid seals under any of the following conditions: (a) fluid leakage around the pad; (b) brakes overheat; (c) there is a large difference in left and right pad wear; (d) the seal is stuck to the piston. If the fluid seal is replaced, replace the dust seal as well. Also, replace all seals every other time the pads are changed.

Dust Seal and Cover Damage

- ●Check that the dust seals and covers are not cracked, worn, swollen, or otherwise damaged.
- ★If they show any damage, replace them.

Piston Cylinder Damage

- ●Visually inspect the piston and cylinder surfaces.
- ★Replace the cylinder and piston if they are badly scored or rusty.

Caliper Holder Shaft Wear

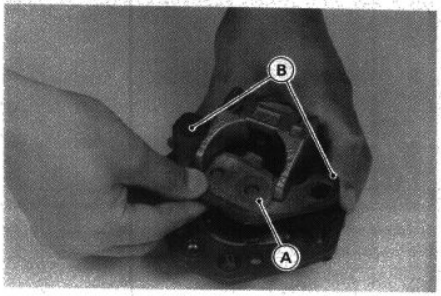
The caliper body must slide smoothly on the caliper holder shafts. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

- ●Check to see if the caliper holder shafts are not badly worn or stepped, or rubber friction boot are not damaged.
- ★If the shafts rubber friction boot are damaged, re place the rubber friction boot, and the caliper holder.

Brake Pads

Pad Removal

- ●Remove the caliper with caliper holder.
- ●Take off the piston side pad form the caliper holder.
- ●Push the caliper holder to the piston side, and then remove the pad from the caliper holder shaft.



A. Pad B. Caliper Holder

Pad Installation Notes

●Push the caliper piston in by hand as far as it will go.

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 brake will not function on the first application of the lever or pedal if this is not done.

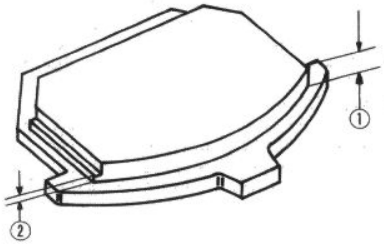
Lining Wear

In accordance with the Periodic Maintenance Chart, inspect the front and rear brakes for wear.

●Check the lining thickness of the pads in each caliper.

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

Brake Pad



1. Lining Thickness 2. Service Limit

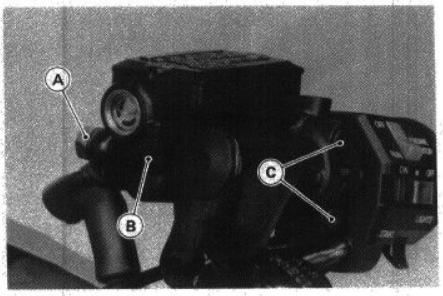
Pad Lining Thickness

Standard	**4.85 mm**
Service Limit	**1 mm**

Master Cylinders

Front Master Cylinder Removal

●Pull back the dust cover, and remove the banjo bolt to disconnect the upper brake hose from the master cylinder. There is a flat washer on each side of the hose fitting.



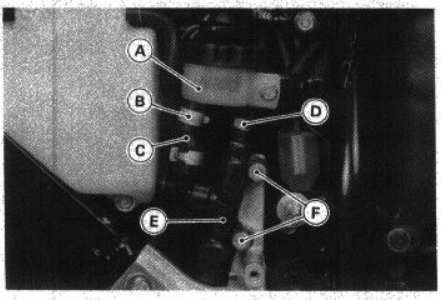
A. Banjo Bolt
B. Master Cylinder
C. Clamp Bolts

●Remove the clamp bolts and take off the master cylinder. Immediately wipe up any brake fluid that spills.

Rear Master Cylinder Removal

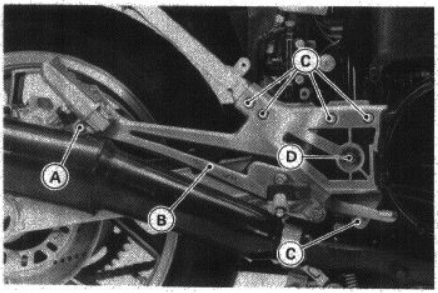
●Remove the reservoir mounting bolt and slide the clamp out of its place. Disconnect the brake hose from the reservoir. Immediately wipe up any brake fluid that spills.

●Remove the banjo bolt to disconnect the brake hose from the master cylinder, and temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum. There is a flat washer on each side of the hose fitting.

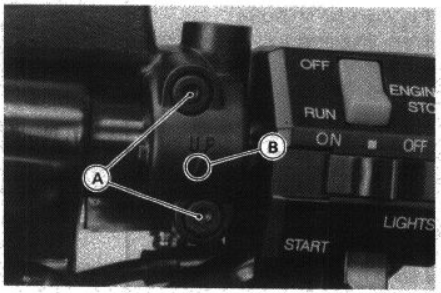


A. Reservoir
B. Hose Clamp
C. Brake Hose
D. Banjo Bolt
E. Master Cylinder
F. Mounting Bolts

●Remove the footpeg bracket bolts and nut (as shown), and remove the footpeg bracket with rear master cylinder.

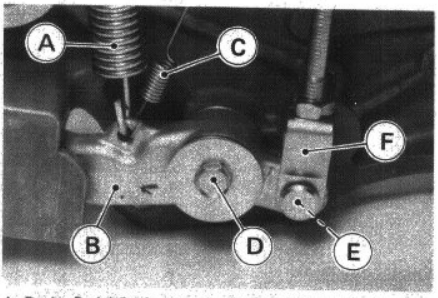


A. Muffler Mounting Bolt
B. Footpeg Bracket
C. Mounting Bolt
D. Pivot Nut



A. Tighten upper clamp bolts first.
B. Arrow Mark

- Remove the master cylinder with the brake pedal. When the master cylinder is removed, the brake pedal spring, brake light switch spring, brake pedal mounting bolt, washer and master cylinder mounting bolts should be removed from the footpeg bracket.
- Remove the cotter pin from the bracket and remove the pedal.



A. Brake Pedal Spring
B. Brake Pedal
C. Light Switch Spring
D. Pedal Mounting Bolt
E. Cotter Pin
F. Bracket

Front Master Cylinder Installation Notes

- Master Cylinder Clamp Installation:
  - ○The master cylinder clamp must be installed with the arrow mark upward.
  - ○Torque the upper clamp bolt first, and then the lower clamp bolt to the specification. There will be a gap at the lower part of the clamp after tightening.
- Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolts to the specified torque.

Rear Master Cylinder Installation Notes

- Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolts to the specified torque. Be sure that the metal pipe is properly fitted into the U-shaped notch in the master cylinder.
- Tighten the rear master cylinder mounting bolts (2) securely after installing the footpeg bracket.
- Check and adjust the following items.
  - ○Adjust the brake pedal position after installation (see Rear Brake Pedal Position Inspection).
  - ○Rear brake light switch (see Rear Brake Light Switch Adjustment in Switchs and Sensors chapter).

Inspection and Adjustment After Installation

- Bleed the brake line after master cylinder installation.
- Check the brake for weak breaking power, brake drag, and fluid leakage.

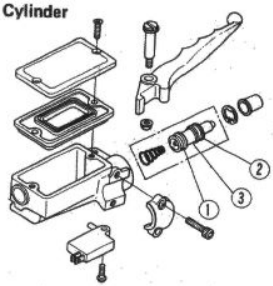
Front Master Cylinder Disassembly Notes

- Remove the front master cylinder from the handlebar.
- Remove the master cylinder cap and diaphragm, and empty out the brake fluid.
- Remove the locknut and pivot bolt, and remove the brake lever.
- Slide the dust cover out of its place.
- Remove the retainer with a circlip priers and pull the piston with secondary cup, and take off the primary cup and spring.

NOTE

○*Do not remove the secondary cup from the piston since removal will damage them.*

Front Master Cylinder



1. Primary Cup
2. Secondary Cup
3. Piston

Rear Master Cylinder Disassembly Notes

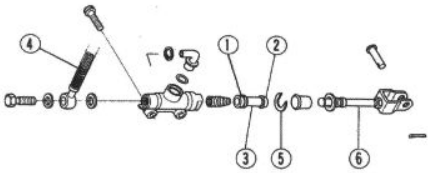
●Remove the rear master cylinder from the right footpeg bracket.

●Remove the retainer with a circlip priers, and pull out the piston stop, push rod, as a set. Then remove the piston and secondary cup, spring and primary cup.

NOTE

○*Do not remove the secondary cup from the piston since removal will damage them.*

Rear Master Cylinder



1. Primary Cup
2. Secondary Cup
3. Piston
4. Brake Hose
5. Retainer
6. Push Rod

●Remove the retainer with a circlip pliers and pull out the brake hose connector and O-ring from the master cylinder.

Front Master Cylinder Assembly Notes

●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, motor 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.

○Tighten the brake lever pivot bolt and tighten the locknut to the specified torque.

Rear Master Cylinder Assembly Notes

●Before assembly, clean all parts including the master cylinder with brake fluid or alcohol, and apply brake fluid to the removed parts and the inner wall of the cylinder.

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, motor 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.**

●Take care not to scratch the piston or the inner wall of the cylinder.

●When assembling the rear master cylinder parts, they must be assembled correctly.

Master Cylinder Inspection (Visual Inspection)

●Disassemble the front and rear master cylinders.

●Check that there are no scratches, rust or pitting on the inside of the master cylinder and on the outside of the piston.

★If the master cylinder or piston shows any damage, replace them.

●Inspect the primary cups and secondary cups.

★If a cup is worn, damaged, softened (rotted), or swollen, replace it.

★If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cup.

●Check the dust covers for damaged.

★If they are damaged, replace them.

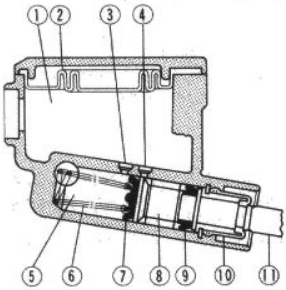
●Check that the relief and supply ports are not plugged.

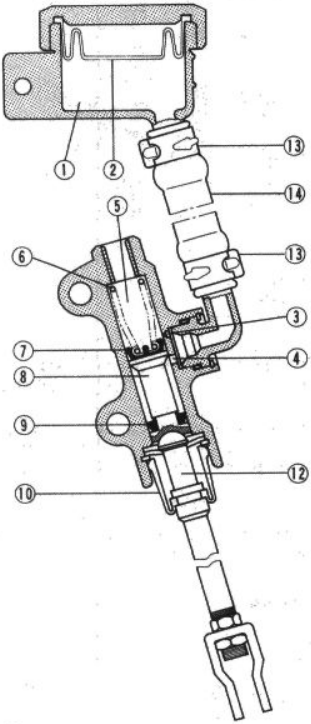
★If the small relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

●Check the piston return springs for any damage.

★If the spring is damaged, replace it.

Front and Rear Master Cylinders

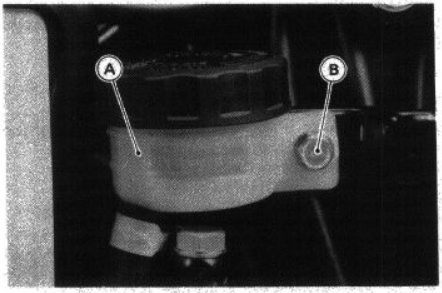




1. Reservoir
2. Diaphragm
3. Relief Port
4. Supply Port
5. Cylinder
6. Return Spring
7. Primary Cup
8. Piston
9. Secondary Cup
10. Dust Cover
11. Brake Lever
12. Push Rod
13. Clamp
14. Hose

Reservoir Disassembly Notes

- Remove the rear brake reservoir mounting bolt, and take the reservoir off the frame.



A. Reservoir B. Mounting Bolt

- Take off the reservoir cap and diaphragm, and empty the brake fluid into a suitable container.
- Slide the hose clamps, and pull the brake hose off the reservoir. Immediately wipe up any brake fluid that spills.

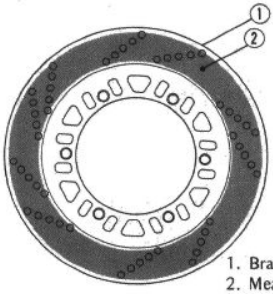
Reservoir Assembly Notes

- Install the clamps for the brake hose ends.
- Fill the reservoir with fresh brake fluid, and bleed the brake line (see Bleeding the Brake).

Discs

Disc wear

Measure the thickness of each disc at the point where it has worn the most. Replace the disc if it has worn past the service limit.



1. Brake Disc
2. Measuring Points

Front Disc Thickness	
Standard	**4.8 – 5.1 mm**
Service Limit	**4.5 mm**
Rear Disc Thickness	
Standard	**6.8 – 7.1 mm**
Service Limit	**6.0 mm**

Disc Cleaning

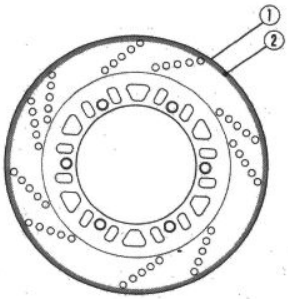
Poor braking can be caused by oil on the disc. Oil on the disc must be cleaned off with an oil-less cleaning fluid such as trichloroethylene or acetone.

WARNING

○**These cleaning fluid are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacuturers warnings.**

Disc Warp

Jack up the motorcycle so that the front wheel is off the ground, and turn the handlebar fully to one side. Set up a dial gauge against the front disc as illustrated, and measure disc runout. Remove the jack, set the motorcycle up on its center stand, and then measure the rear disc runout. If runout exceeds the service limit, replace the disc.



1. Brake Disc
2. Measuring Points

Disc Runout	
Standard	**Under 0.1 mm**
Service Limit	**0.3 mm**

Brake Fluid

Fluid Level Inspection

In accordance with the Periodic Maintenance Chart, inspect the brake fluid level in the front and rear brake fluid reservoirs.

●Check the brake fluid level in the reservoir.

NOTE

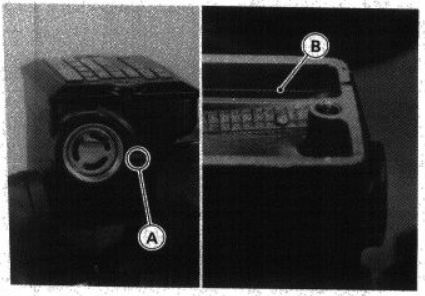
○***Hold the reservoir horizontal when checking brake fluid level.***

★The fluid level must be kept above the lower level lines. If the fluid level is lower than the lower level line, fill the reservoir to the upper level line of the reservoir.

WARNING

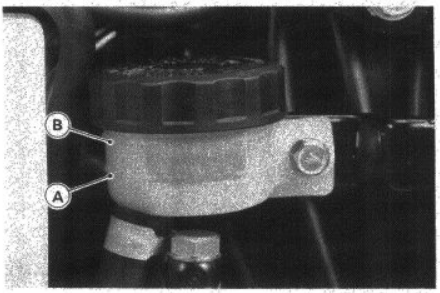
○**Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that already is in the reservoir are unidentified. After changing the fluid, use only the same type and brand of fluid thereafter. Mixing different types and brands of brake fluid lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.**

Front Brake Fluid Reservoir



A. Lower Level Line B. Upper Level Line

Rear Brake Fluid Reservoir



A. Lower Level Line B. Upper Level Line

Brake Fluid Change

In accordance with the Periodic Maintenance Chart, change the brake fluid. The brake fluid should also be changed if it becomes contaminated with dirt or water.

Brake Fluid Requirement:

Recommended fluids are given in the table below. If none of the recommended brake fluids are available, use extra heavy-duty brake fluid only from a container marked D.O.T.4.

Recommended Brake Fluid

Type	**D.O.T.4**
Brand	**Check Shock Premium Heavy Duty**
	Castrol Girling-Universal
	Castrol GT (LMA)
	Castrol Disc Brake Fluid

Changing Brake Fluid:

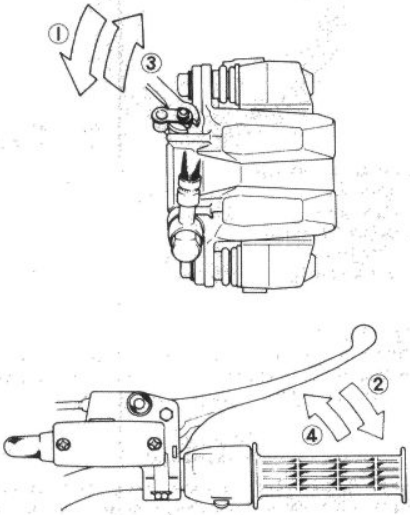
- Remove the reservoir cap, and remove the rubber cap on the bleed valve.
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Open the bleed valve (counterclockwise to open), and pump the brake lever or pedal until all the fluid is drained from the line.
- Close the bleed valve.
- Front brake: Since a dual disc brake is used, repeat the above 4 steps one more time for the other side.
- Fill the reservoir with fresh brake fluid.
- Open the bleed valve, apply the brake by the brake lever or pedal, close the valve with the brake held applied, and then quickly release the lever or pedal. Repeat this operation until the brake line is filled and fluid starts coming out of the plastic hose.

NOTE

○Replenish the fluid in the reservoir as often as necessary to keep it from running completely out.

- Front brake: Repeat the above 2 steps one more time for the other side.
- Bleed the air from the lines (continue with Bleeding the Brake).

Filling up the Brake Line



1. Open the bleed valve.
2. Apply the brake and hold it.
3. Close the bleed valve.
4. Then quickly release the brake.

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.

Bleed the air from the brake 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.

- Remove the reservoir cap, and check that there is plenty of fluid in the reservoir. The fluid level must be checked several times during the bleeding operation and replenished 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.

- With the reservoir cap off, slowly pump the brake lever or pedal several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. This bleeds the air from the master cylinder end of the line.

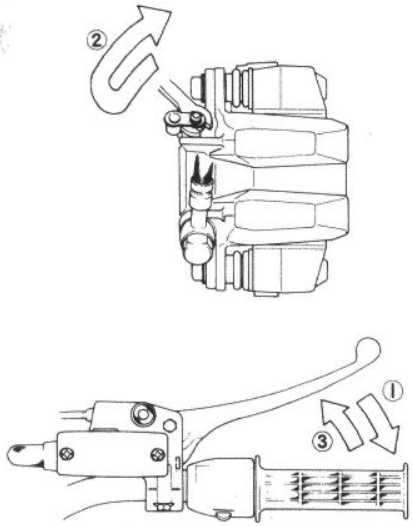
Bleeding the rear brake line:

- Install the reservoir cap, and connect a clear plastic hose to the bleed valve at the caliper, running the other end of the hose into a container. Pump the brake pedal a few times until it becomes hard and then, holding the pedal pushed down, quickly open (turn counterclockwise) and close the bleed valve. Then release the pedal. Repeat this operation until no more air can be seen coming out into the plastic hose. Check the fluid level in the reservoir every so often, replenishing it as necessary.

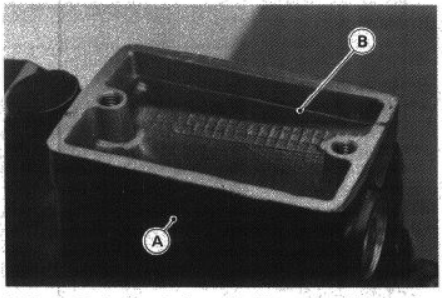
Bleeding the front brake line:

- Bleed the air from the front brake line, first using the bleed valves on the brake calipers and the anti-dive units, and then using the bleed valves on the junction blocks.
- Repeat the previous step one more time for the other side.
- When air bleeding is finished, install the rubber cap(s) on the bleed valve, and check that the brake fluid is filled to the upper level line marked in the reservoir (handlebar turned so that the reservoir is level).

Bleeding the Brake Line



1. Hold the brake applied.
2. Quickly open and close the valve.
3. Release the brake.



A. Front Brake Reservoir B. Upper Level Line

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 discs, 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, motor 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 reach and break down the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE.**

Brake Hoses

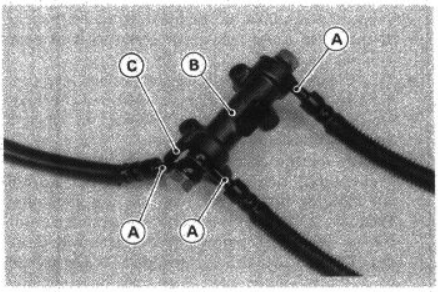
Brake Hose Inspection

- The high pressure inside the brake line can cause fluid to leak 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 or bulges are noticed.
- The metal pipes which feed the brake fluid to the anti-dive units are made of plated steel, and will rust if the plating is damaged. Replace the pipe if it is rusted, cracked (especially check the fittings), or if the plating is badly scratched.

Brake Hose Replacement

- Pump the brake fluid out of the line as explained in the Brake Fluid Change in Brake Fluid Section.
- Remove the banjo bolts at both ends of the brake hose, and pull the hose off the motorcycle. Especially, for the brake hose between the rear muster cylinder and the reservoir, loosen the clamps at both ends of the hose, and take off the hose.
- Install the new brake hose in its place, and tighten the banjo bolts to the specified torque, noting the following.

○Use a new flat washer for each side of the fittings.



A. Metal Pipe
B. Joint
C. Notch

Suspension

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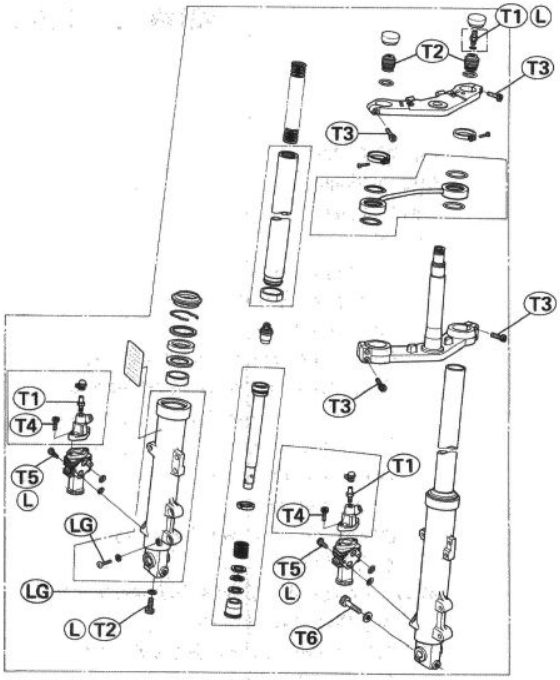
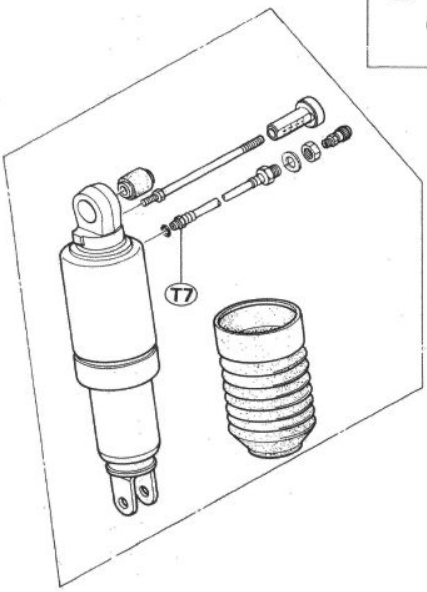
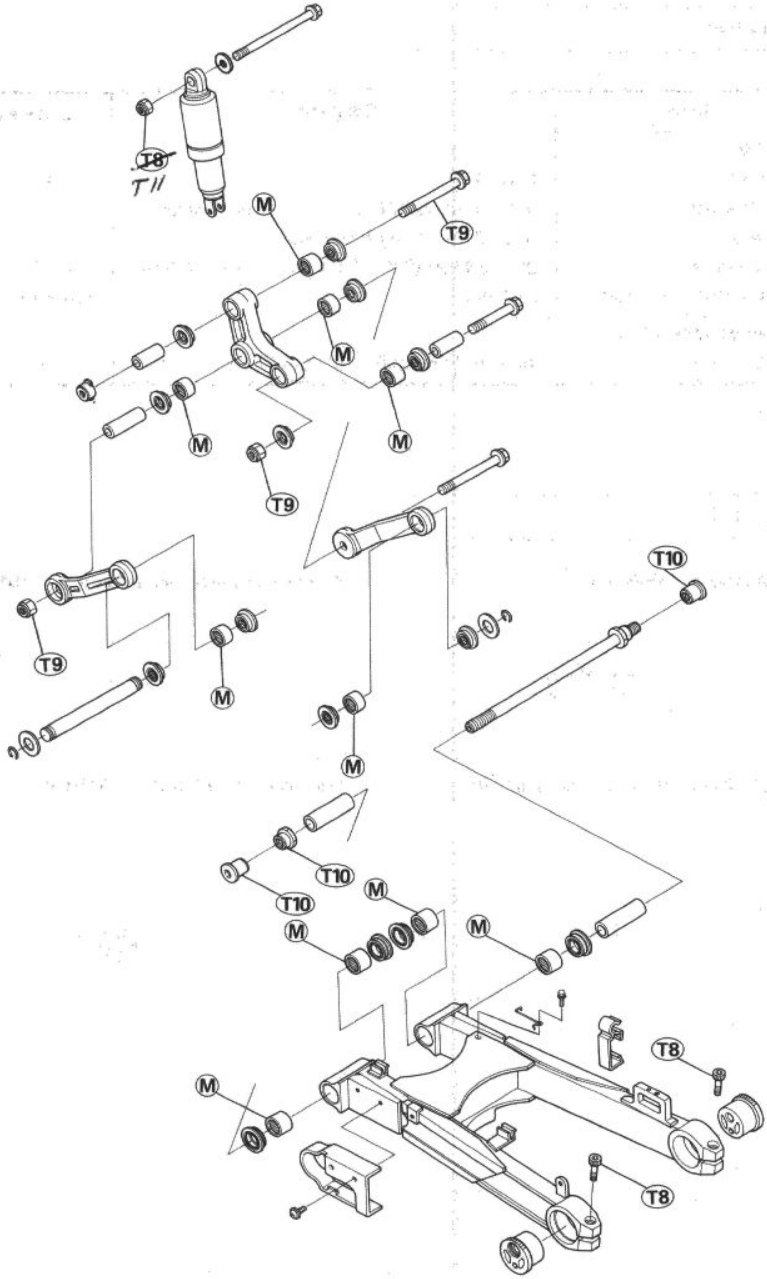
Exploded View





L : Apply a non-permanent locking agent to the threads.
LG : Apply liquid gasket.
M : Apply molybdenum disulfide grease.

T1 : 7.8 N-m (0.80 kg-m, 69 in-lb)
T2 : 23 N-m (2.3 kg-m, 16.5 ft-lb)
T3 : 21 N-m (2.1 kg-m, 15.0 ft-lb)
T4 : 4.4 N-m (0.45 kg-m, 39 in-lb)
T5 : 6.9 N-m (0.70 kg-m, 69 in-lb)
T6 : 20 N-m (2.0 kg-m, 14.5 ft-lb)
T7 : 12 N-m (1.2 kg-m, 104 in-lb)
T8 : 39 N-m (4.0 kg-m, 29 ft-lb)
T9 : 59 N-m (6.0 kg-m, 43 ft-lb)
T10 : 88 N-m (9.0 kg-m, 65 ft-lb)
T11 : 24 N-m (2.4 kg-m, 17.5 ft-lb)

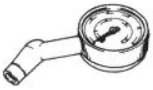

T8
T11
M
T9
M
M
M
T9
T9
M
T10
M
T10
T10
M
M
M
T8
M
T8

Specifications

Item	Standard	Service Limit
Front Fork:		
Oil type	SAE 10W	– – –
Oil capacity	298 ±4 mL (approx. 255 mL at oil change)	– – –
Oil level	362 ±2 mL (Fully Extended)	– – –
Air pressure	39 – 59 kPa (0.4 – 0.6 kg/cm², 5.7 – 8.5 psi)	– – –
Fork spring free length	512 mm	502 mm
Rear Shock Absorbers:		
Air pressure	49 – 147 kPa (0.5 – 1.5 kg/cm², 7.1 – 21 psi)	– – –

Special Tools

Air Pressure Gauge: 52005-1003



Front Fork Cylinder Holder Adapter: 57001-1057

Front Fork Cylinder Holder Handle: 57001-183

Front Fork Oil Seal Driver: 57001-1104

Front Fork

Air Pressure Adjustment

- Put the motorcycle on its center stand, and raise the front wheel off the ground using a jack under the engine or other suitable means.
- Use the air pressure gauge (special tool: P/N 52005-1003) specially made for air suspensions.
- Check and adjust the air pressure when the front fork is cold (room temperature).

NOTE

○*Do not use a tire gauge for checking air suspension's air pressure. They do not indicate the correct pressure because of air leaks that occur when the gauge is applied to the valve.*

○*Lower air pressure is for comfortable riding, but it should be increased for high speed riding, or riding on bad roads.*

CAUTION

○**Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 245 kPa (2.50 kg/cm², 36 psi) may damage the oil seal.**

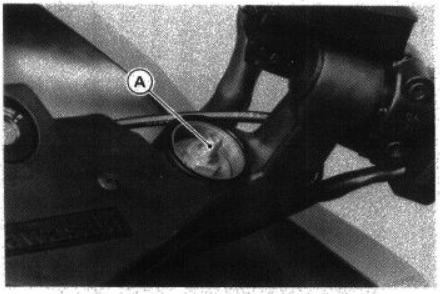
WARNING

○**Be sure to adjust the air pressure within the usable range. Pressure too high or too low can produce a hazardous riding condition.**

○**Only air on nitrogen gas can be used. Never inject oxygen or any kind of explosive gas.**

○**Do not incinerate the front fork.**

○**Do not remove the springs and rely on compressed air only. Correct springs must be used in this suspension system. Use without springs can lead to a condition causing accident and injury.**



A. Air Valve

Front Fork Air Pressure

Standard	**49 kPa (0.5 kg/cm², 7.1 psi)**
Usable range:	**39 – 59 kPa (0.4 – 0.6 kg/cm², 5.7 – 8.5 psi)**

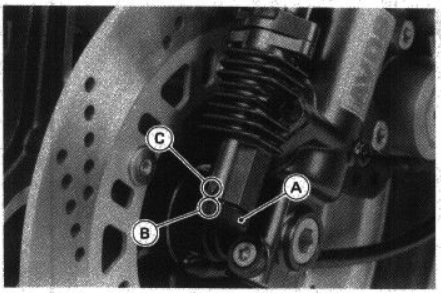
Anti-Dive Adjustment

The anti-dive adjuster on each front fork leg has 3 positions so that the anti-dive system can be adjusted for different road and loading conditions. The numbers on the adjuster show the setting position of the anti-dive system.

- Turn the anti-dive adjuster until you feel a click so that the desired position number aligns with the triangular mark.
- Check to see that both adjusters are turned to the same relative position.

WARNING

○**If both anti-dive adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**



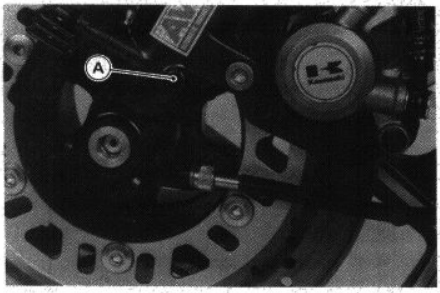
A. Anti-Dive Adjuster C. Triangular Mark
B. Position Number

Anti-Dive Adjustment

Position 1	**Weak**
Position 2	**Moderate**
Position 3	**Strong**

Fork Oil Change

- Release the air in both fork legs through the air valve at the top of the fork leg.
- Unscrew the drain screw and top plug from one fork leg, and pull out the fork spring and spring seat.

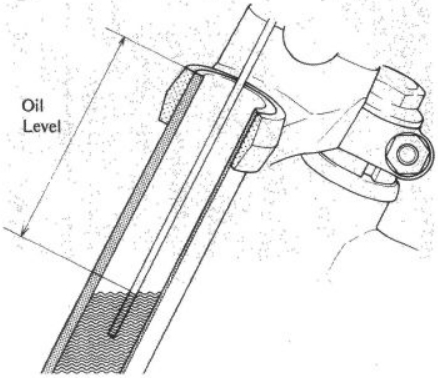


A. Drain Screw

- Allow the oil to drain into a suitable container. If you pump the fork legs to force out the oil, be sure to catch to oil in a container as it squirts out.
- Wash the drain screw threads clean of oil, and blow them dry.
- Apply a liquid gasket to the threads of the drain screw, and install the screw and gasket.
- **Pour in the specified type and amount of oil.**
- Pump the fork enough times to expel the air from the upper and lower chambers.
- With the fork fully extended insert a tape measure or rod in the inner tube, and measure the distance from the top of the inner tube to the oil.

★If the oil is above or below the specified level, remove or add oil and recheck the oil level.

Fork Oil Level Measurement



CAUTION

○**The operation of air front forks is especially dependent upon correct oil level. Higher level than specified may cause oil leakage and seal breakage. So be sure to maintain the specified level.**

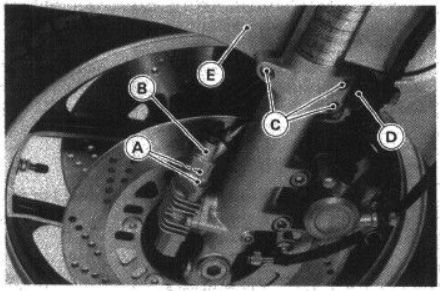
- Inspect the O-ring on the top plug, and replace it with a new one if it is damaged.
- Install the spring and spring seat.
- Tighten the top plug.
- Change the oil of the other fork leg in the same manner.
- Adjust the air pressure.

Front Fork Oil

Viscosity	**SAE10W**
Amount per side	
When changing oil:	**255 mL**
After disassembly and completely dry:	**298 ±4 mL**
Level	**362 ±2 mm**

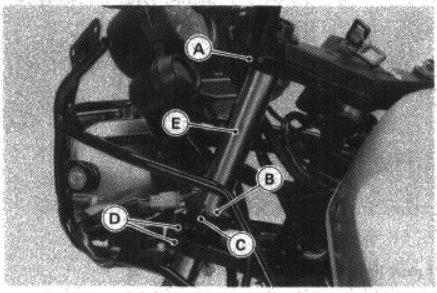
Front Fork Removal (each fork leg)

- Remove the fork leg from the motorcycle as follows.
- Release air pressure from the forks.
- Remove the fairing assembly (see Fairing Removal in Frame chapter).
- **Remove the stem head cover and handlebar mounting bolts, and take off the handlebar from the stem head.**
- Remove the front wheel (see Front Wheel Removal in Wheels and Tires chapter).
- **Remove the caliper from the fork leg to be removed, and rest the caliper on some kind of stand so that it dosen't dangle.**
- Remove the front fender (see Front Fender Removal in Wheel and Tires chapter).



A. Blake Plunger Allen Bolts
B. Blake Plunger
C. Fender Mounting Bolt
D. Junction Block
E. Front Fender

- Remove the Allen bolts, and remove the brake plunger.
- Remove the junction block mounting screw and take it off.
- Loosen the upper and lower fork clamp bolts, and connecting pipe clamp screw.
- With a twisting motion, work the fork leg down and out.



A. Upper Clamp Bolt
B. Clamp
C. Connecting Pipe
D. Lower Clamp Bolt
E. Fork Leg

•Stick a tape on the air hole to keep the oil from flowing out of the fork.

Front Fork Installation (each fork leg)

•When installing the fork leg, be careful of the following items.
○If the fork leg was disassembled, check the fork oil level. Then inject air through the air valve after installation.
○Brake assembly (Install the brake joint to the stem base).
○Route the brake and clutch hoses correctly.
○Connecting pipe and clamps between the stem base and stem head.
○Handlebar mounting bolt tightening.
○Tighten the lower and upper clamp bolts to specified torque.
○Set the connecting pipe on the steering stem.
○Clamp screws tightening.
○Tighten the handlebar mounting bolts to the specified torque.
○Tighten the caliper mounting bolts to the specified torque.
○Check the front brake after installation.

Front Fork Disassembly

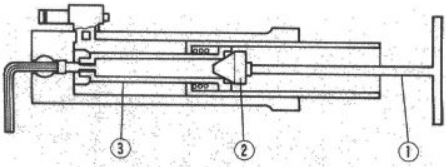
•Remove the front fork leg.
•Remove the top plug, O-ring, and spring.

NOTE

○*The top plug should be loosened before the fork is removed.*

•Pour out the fork oil, and take off the TCV (Travel Control Valve).
•Stop the cylinder from turning by using the front fork cylinder holder handle and adapter (special tools). Unscrew the Allen bolt and take off the bolt, and gasket from the bottom of the outer tube.

Fornt Fork Cylinder Removal



1. Front Fork Cylinder Holder Handle: 57001-183
2. Adapter: 57001-1057
3. Front Fork Cylinder

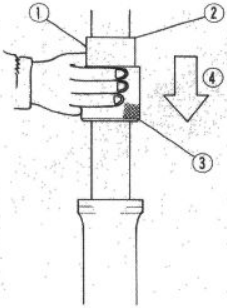
•Remove the piston and cylinder unit and short spring up side down of the front fork.

•Separate the inner tube from the outer tube as follows.
○Remove the dust seal from the outer tube.
○Remove the retainer and washer from the outer tube.
○Holding the inner tube by hand and keeping the fork leg in a vertical position, tap the outer tube on the upper end with the driver (special tool) until the outer tube falls off the inner tube. Face the big end of the driver downward.

CAUTION

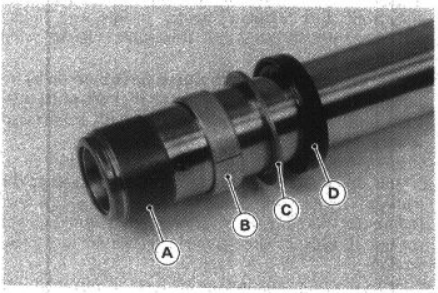
○**To avoid damaging the inner tube guide bush to not tap the outer tube when the fork leg is put horizontally on a work bench.**

Front Frok Outer Tube Removal



1. Driver: 57001-1104
2. Small End
3. Big End
4. Tap

○Remove the oil seal, washer and outer tube guide bush, from the inner tube.



A. Inner Tube Guide Bush
B. Outer Tube Guide Bush
C. Washer
D. Oil Seal

●Remove the cylinder base out of the bottom of the outer tube.

Front Fork Assembly

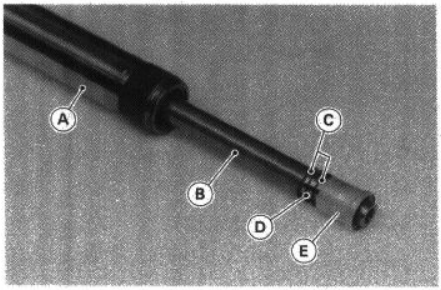
●Fork assembly is the reverse of disassembly. Pay attension to the following items.

○Check the O-rings for damage to the top plug. Replace them with new ones if damaged.

○Replace the removed oil seal with a new one.

○Inspect the guide bushes (see Guide Bush Inspection), and repalce them with new ones if necessary.

○Insert the cylinder unit to the inner tube, and put on the washers and stop.



A. Inner Tube
B. Cylinder
C. Spring Washer
D. Washer
E. Stop

○Insert the inner tube and cylinder as a set to the outer tube.

○Apply liquid gasket to both sides of the gasket, apply a non-permanent locking agent to the Allen bolt. Tighten the Allen bolt to the specified torque, using the front fork cylinder holder handle and holder adapter (special tools) to stop the cylinder from turning.

○Install the guide bush (with a used guide bush on it) by tapping the (used guide bush with the) driver (special tool) until it stops. The slit of the bush must faced toward the left or right.

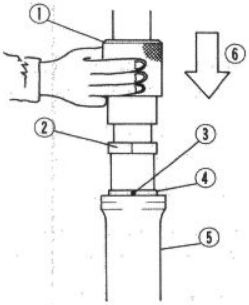
○Install the oil seal with the driver (special tool).

○If the drain screw is removed, check the gasket for damage. Replace the damaged gasket with a new one. Before installing the drain screw, apply a liquid gasket to the threads of the screw, and tighten the screw securely.

○Pour in the type and amount of fork oil specified (see Specifications), and adjust the oil level.

○Tighten the top plug to the specified torque after fork installation.

Guide Bush Installation



1. Driver: 57001-1104
2. Used Guide Bush
3. Slit
4. New Guide Bush
5. Outer Tube
6. Tap

Inner Tube Inspection

●Visually inspect the inner tube, and repair any damage.

●Nicks or rust damage can sometimes be repaired by using a wetstone to remove sharp edges or raised areas which cause seal damaged.

★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.

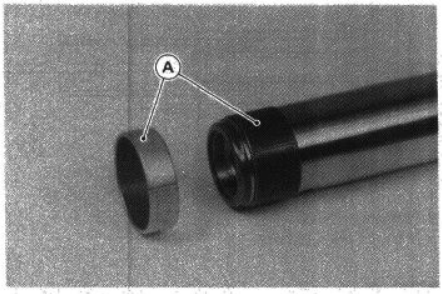
●Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.

CAUTION

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

Guide Bush Inspection

●Visually inspect the guide bushes, and replace them if necessary.

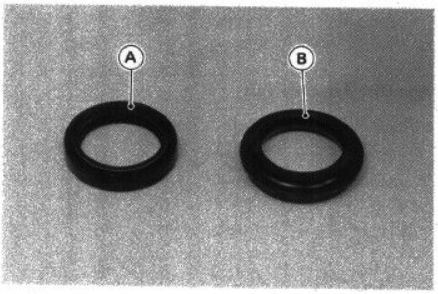


A. Guide Bushes

Oil Seal and Dust Seal Inspection

- Inspect the oil seal and dust seal for any signs of deterioration or damage.

★Replace them if necessary. Replace the oil seal with a new one whenever it has been removed.



A. Oil Seal B. Dust Seal

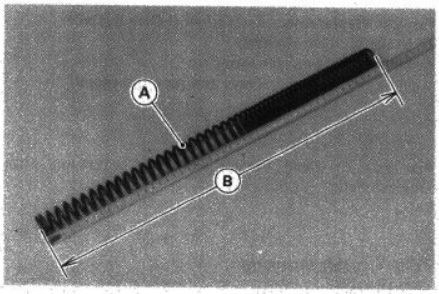
Spring Tension

- Since the spring becomes shorter as it weakens, check its free length 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.

Frok Spring Free Length

Standard:	**512 mm**
Service Limit:	**502 mm**



A. Fork Spring B. Free Length

AVDS (Automatic Variable Damping System)

Anti-Dive Valve Removal

- Remove the bolts and separate the brake plunger from the anti-dive valve.
- Unscrew the brake pipe nipple and remove the metal pipe and brake plunger.
- Remove the mounting bolts, and take off the anti dive valve from the outer tube.

NOTE

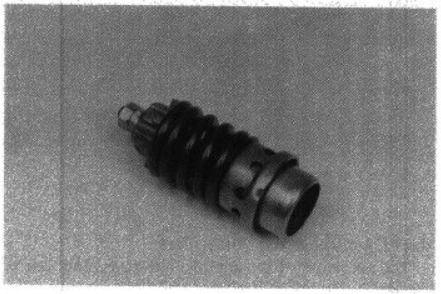
○*Do not disassemble the anti-dive valve and brake plunger assemblies for repair or replacement of internal parts. Always replace them as assemblies.*

TCV (Travel Control Valve) Removal

- Remove the front fork leg.
- Remove the top plug, O-ring, Spring, and pour the fork oil, and take off the TCV up side down of the fork.

NOTE

○*Do not disassemble the TCV assembly for repair or replacement of parts. Always replace them as assemblies.*



Anti-Dive Valve Installation

- Reinstall the anti-dive valve and brake plunger assembly, and metal pipe.

NOTE

○*Bleed the anti-dive and brake line after anti-dive valve installation.*

TCV Installation Notes

- Install the TCV with the nut side end top.
- Installation is the reverse of removal.

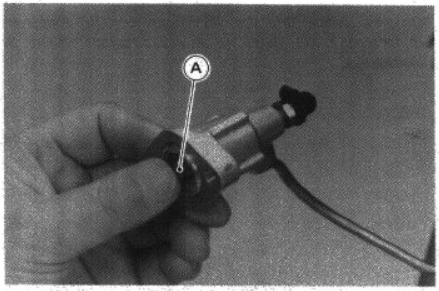
Brake Fluid and Fork Oil Leak Inspection

- Visually inspect the anti-dive unit for brake fluid and fork oil leakage.
- ★If the brake fluid leaks, replace the brake plunger assembly.
- ★If the fork oil leaks, replace the O-rings or anti-dive valve assembly.

Brake Plunger Assembly Test

The brake plunger assembly can be tested by separating it from the anti-dive valve assembly with the brake line connected to the brake plunger assembly.

- Separate the plunger assembly from the anti-dive valve assembly.
- Unbolt the brake line junction from the fork leg to prevent the metal pipe from being deformed.
- Check to see if the plunger in the brake plunger assembly comes out by a 2 mm when the front brake is lightly applied, and check to see if the plunger goes in smoothly when it is pushed in with your finger.
- ★If the plunger does not move lightly or is stuck in the body, replace the brake plunger assembly.



A. Brake Plunger

Anti-Dive Valve Assembly Test

The operation of the anti-dive valve assembly can be checked by removing the front fork leg from the motorcycle.

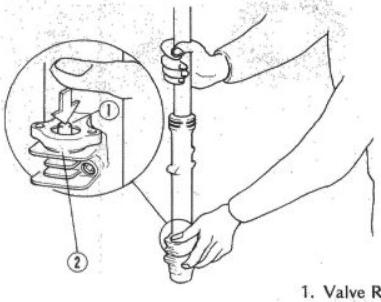
- Separate the brake plunger assembly from the anti-dive valve assembly with the brake line connected.
- Unscrew the top plug, and take the fork spring out of the fork tube.
- Remove the front wheel, disc brake caliper, front fender and brake line junction from the fork leg.
- Remove the front fork leg with its anti-dive valve assembly installed and tape the equalizing hole in the fork inner tube to prevent the fork oil from flowing out during anti-dive valve assembly test.
- With the fork leg held upright, compress the fork leg, and see that the compression stroke is light and smooth when the valve rod is not pushed in and that there is notable damping when the valve rod is pushed in with your finger.

NOTE

○*The extension stroke should be smooth with notable damping regardless of valve rod positions.*

- ★If the fork leg has heavy compression stroke when the valve rod is left released, or if it has light compression stroke when the rod is pushed in; the anti-dive valve assembly does not operate properly necessitating replacement of the anti-dive assembly.

Anti-Dive Assembly Test



1. Valve Rod
2. Valve Assy

Metal Pipe Damage

- The metal pipes which feed the brake fluid to the anti-dive units are made of plated steel, and will rust if the plating is damaged. Replace the pipe if it is rusted, cracked (especially check the fitting), or if the plating is badly scratched.

Anti-Dive System Part Replacement

In accordance with the Periodic Maintenance Chart, replace the following anti-dive system parts.

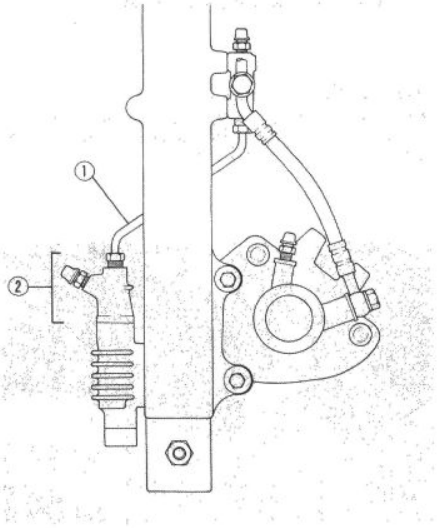
Periodic Replacement Parts of Anti-Dive System
Brake plunger assembly
Metal pipe (between anti-dive unit and junction block)

- Be sure to bleed the air from the brake line after replacement.

TCV Troubleshooting

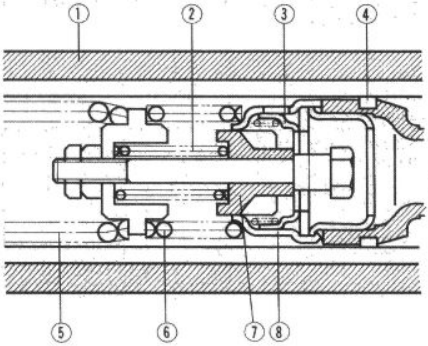
If the damping force is not working, inspect the TCV according to the troubleshooting guide.

Periodic Replacement Parts of Anti-Dive System



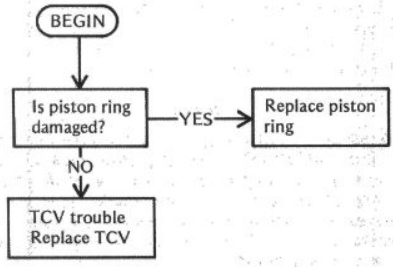
1. Metal Pipe
2. Brake Plunger Assembly

TCV

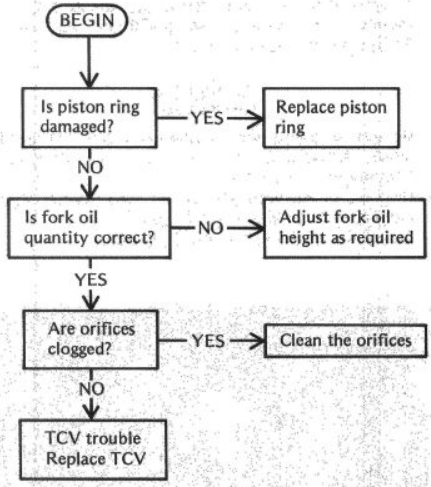


1. Inner Tube
2. Spring (Check Valve)
3. Valve
4. Piston Ring
5. Fork Spring
6. Spring (TCV)
7. Spool
8. Valve Case

Damping force is not working at compression stroke



Damping force is not working on extension stroke



Rear Shock Absorber

Rear Shock Absorber Adjustment

The rear shock absorbers can be adjusted by changing the air pressure and damping force to suit various riding and loading conditions.

Air Pressure Inspection

- Put the motorcycle up on its center stand to raise the rear wheel off the ground.
- Use air pressure gauge 52005-1003 specially made for air suspensions.
- Check and adjust the air pressure when the rear shock absorber is cold (room temperature).

NOTE

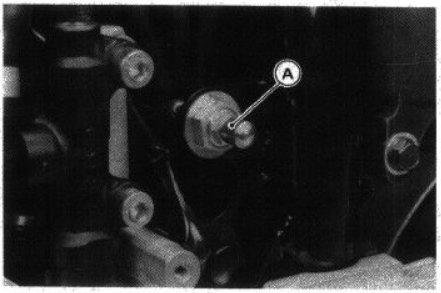
○*Do not use a tire gauge for checking air pressure. They may not indicate the correct air pressure because of air leaks that occur when the gauge is applied to the valve.*
○*Lower air pressure is for comfortable riding for an average-built rider with no accessories. Ordinarily, the heavier the total load becomes, the higher the air pressure should be set.*

CAUTION

○**Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 490 kPa (5.0 kg/cm², 71 psi) may damage the oil seal.**

WARNING

○**Be sure to adjust the air pressure within the unable range. Pressure too high or too low can produce a hazardous riding condition.**
○**Only air or nitrogen gas can be used. Never inject oxygen or any kind of explosive gas.**
○**Do not incinerate the rear shock absorber.**



A. Air Valve

Rear Shock Absorber Air Pressure

Air Pressure Usable Range kPa (kg/cm², psi)	Setting	Load	Road
49 (0.5, 7.9)	Soft	Light	Good
↑	↑	↑	↑
↓	↓	↓	↓
147 (1.5, 21)	Hard	Heavy	Bad

NOTE

○*The recommended air pressure is 78 kPa (0.8 kg/cm², 11 psi) for one rider with no accessories.*

Damping Force Adjustment

- Push and pull the adjusting stick to the desired number until you feel a click. The numbers on the adjusting stick show the setting position.

A. Adjusting Stick

NOTE

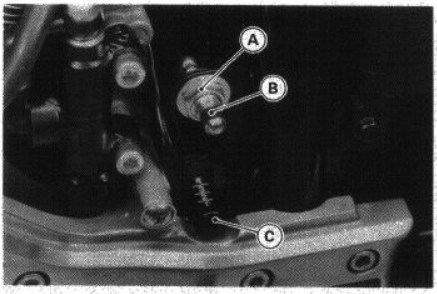
○*The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding, or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table:*

Damper Adjuster

Adjuster Position	Damping Force	Setting	Load	Road	Speed
1	Stronger	Soft	Light	Good	Low
2	↓	↑	↑	↑	↑
3		↓	↓	↓	↓
4		Hard	Heavy	Bad	High

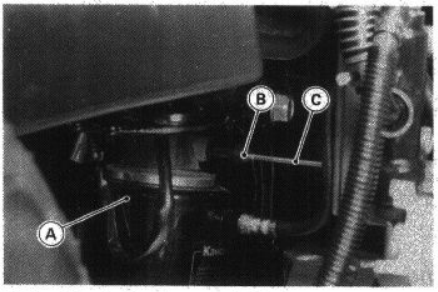
Rear Shock Absorber Removal

- Remove the following parts before rear shock absorber removal.
○Side covers
○Coolant reserve tank
- Remove the air valve mounting nut and free the air hose.



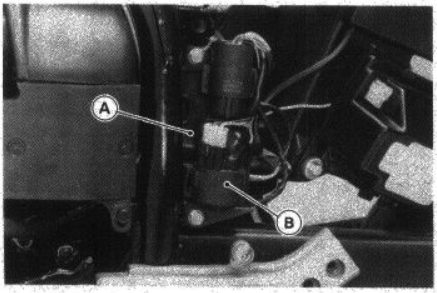
A. Mounting Nut
B. Air Valve
C. Damper Adjusting Stick

●Loosen the locknut and unscrew the damper adjusting stick and take it with the rod.



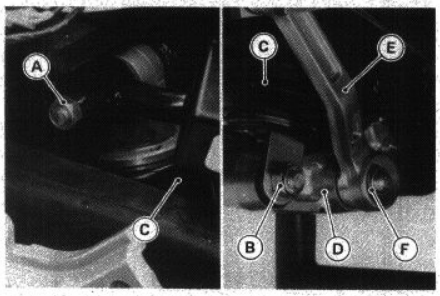
A. Rear Shock Absorber
B. Locknut
C. Rod

●Remove the relay bracket mounting bolts and free the bracket.



A. Relay Bracket
B. Starter Relay

●Loosen the upper shock absorber nut. Do not remove it yet.
●Remove the lower shock absorber bolt, and tie rod lower bolt.



A. Upper Shock Absorber Nut
B. Lower Shock Absorber Nut
C. Shock Absorber
D. Uni-trak Rocker Arm
E. Uni-trak Tie Rod
F. Tie Rod Bolt

●Remove the upper shock absorber nut and bolt, then take off the rear shock absorber unit toward the ground.

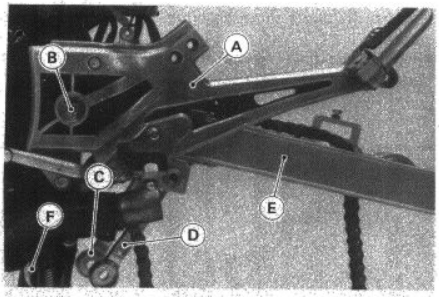
Rear Shock Absorber Installation

●When installing the rear shock absorber, be careful of the following items.
○Installation is the reverse of removal.
○Tighten the upper and lower shock absorber nuts to the specified torque.

Swing Arm, Uni-trak

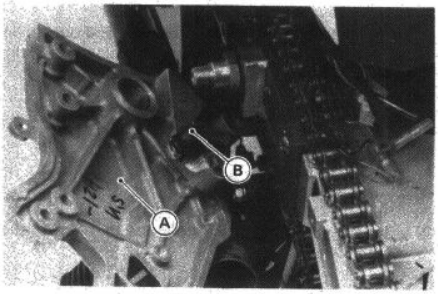
Swing Arm, Uni-trak Removal

●Remove the following parts before swing arm removal.
○Seat
○Side Covers
○Mufflers
○Rear Wheel
○Rear Shock Absorber
●Remove the swing arm pivot nuts.
●Remove the right side footpeg bracket bolts and rear brake reservoir mounting bolt, then take off the bracket with rear master cylinder and rear caliper.



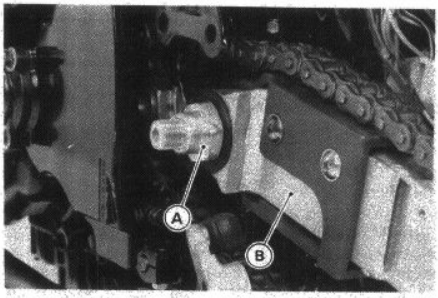
A. Footpeg Bracket
B. Pivot Nut
C. Tie-rod
D. Tie-rod
E. Swing Arm
F. Rocker Arm

●Remove the circlip and washer, then separate the left footpeg bracket and shift pedal.



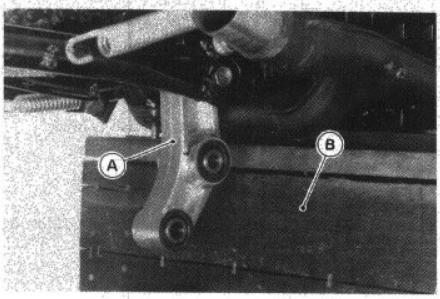
A. Footpeg Bracket B. Shift Pedal

●Remove the pivot nut and pull the pivot shaft toward the right.



A. Pivot Nut B. Swing Arm

●Remove the swing arm with tie-rod, and then separate them.
●Put a suitable box under the engine.
●Retract the center stand, and pull out the bolt and remove the rocker arm from the bottom end of the main frame.

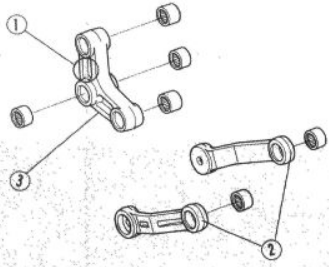


A. Rocker Arm B. Box

Swing Arm, Uni-trak Installation

●When installing the swing arm or uni-trak, be careful of the following items.
○Installation is the reverse of removal.
○Apply Molybdenum Disulfide Grease to the inside of the needle bearings as shown.

Uni-trak Needle Bearing



1. Arrow Mark
2. Tie-rod
3. Rocker Arm

○Install the rocker arm so that the arrow mark on the rocker arm points to the front.

Steering

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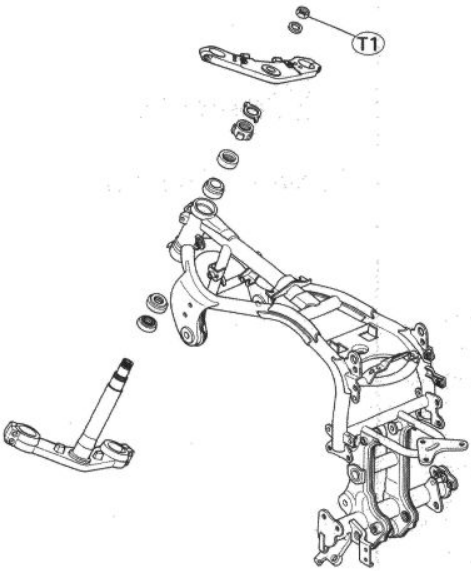
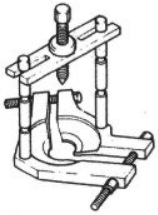
Exploded View



T1 : 39 N-m (4.0 kg-m, 29 ft-lb)

Special Tools

Bearing Puller: 57001-158



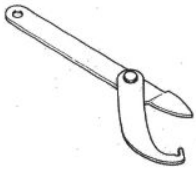
Adapter: 57001-317

Pole: 57001-1190

Stem Bearing Driver: 57001-137

Adapter: 57001-1074

Stem Nut Wrench: 57001-1100



Driver Press Shaft: 57001-1075

Driver: 57001-1106

Driver: 57001-1076

Stem Bearing Remover: 57001-1107

Steering Adjustment

When the steering bearings are properly adjusted, the handlebar will turn freely from side to side with no looseness of the steering stem within the frame. In other words, the bearings will have little or no free play and absolutely no preload. Inspect the steering according to the Periodic Maintenance Chart or if the following symptoms are noticed.

Symptoms:

Tight

1. The motorcycle wanders while being ridden.
2. The steering feels tight.
3. The bearing races becomes notched.

Loose

1. The forks "clunk" or "click" when the brake is applied or when the motorcycle is ridden over a pothole.
2. The handlebars seem to vibrate more than normal.

Steering Inspection

- Set the motorcycle on its center stand or other suitable stand.
- Remove the lower fairing. Use a jack under the engine to lift the front wheel off the ground.

Checking for Steering Too Tight:

- 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.

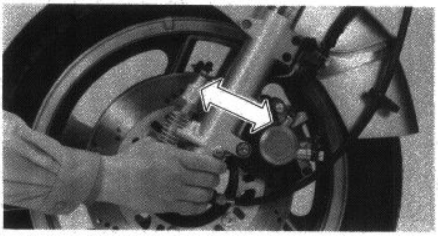
NOTE

○*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.*

Checking for Steering Too Loose:

- Stand in front of the motorcycle and grasp the lower ends of fork near the axle.
- Feel for steering looseness by pushing and pulling the forks.

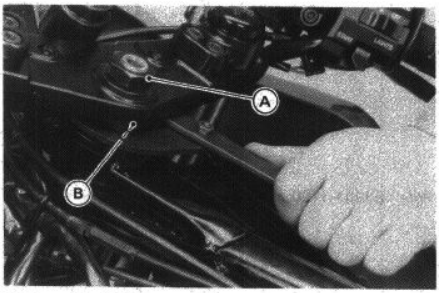
★If you feel looseness, the steering is too loose.



Steering Adjustment

Proper steering adjustment is completed by finding out the correct position of the lower stem locknut and by tightening the stem head bolt to the specified torque.

- Set the motorcycle up on its center stand.
- Remove the fairing.
- Remove the fuel tank to avoid damaging the painted surface.
- Remove the screws, and take off the stem head cover.
- Loosen the front fork lower clamp bolts and stem head nut.
- Using a jack under the engine, lift the front wheel off the ground.
- Loosen the stem locknut all the way with the stem nut wrench (special tool).



A. Stem Head Nut B. Stem Locknut

- If the steering is too tight, loosen the stem locknut a fraction of turn; if the steering is too loose, tighten the locknut a fraction of turn. Turn the locknut a 1/8 turn at maximum at a time.
- Tighten the steering stem head nut to the specified torque.
- Tighten the front fork lower clamp bolts to the specified torque.
- Check the steering again.

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

- Install the removed parts.

Steering Removal/Installation

Steering Stem Removal

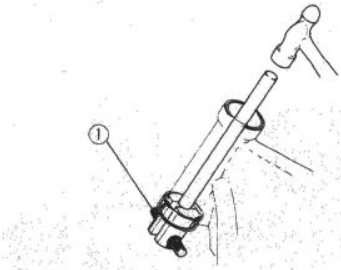
- Remove the following parts.
  - ○Fuel tank
  - ○Front wheel
  - ○Fairing, failing stay
  - ○Handlebars
  - ○Front fork legs
- Remove the mounting bolts (2), free the brake hose joint from the stem base, and remove the front brake assembly as a set.

- Remove the stem head nut and flat washer.
- Remove the steering stem head.
- Take off the lockwasher.
- Push up on the stem base, and remove the steering stem locknut with the stem nut wrench (special tool), then remove the steering stem and stem base (single unit).
- Remove the steering stem cap and upper tapered roller bearing inner race.
- To remove the outer races pressed into the head pipe, install the stem bearing remover (special tool) as shown below, and hammer the stem bearing remover to drive it out.

NOTE

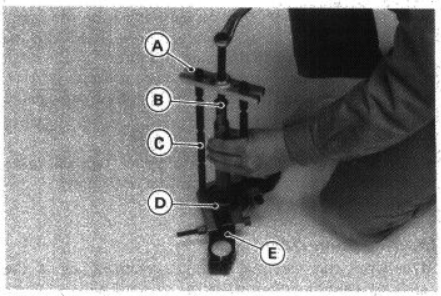
○*If any steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.*

Outer Race Removal



1. Stem Bearing Remover: 57001-1107

- Remove the lower inner race with grease seal which is pressed onto the steering stem, with the steering stem bearing puller and adapters (special tools).

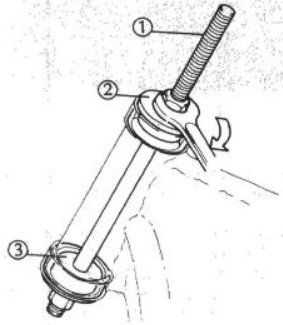


A. Bearing Puller (57001-158)
B. Adapter (57001-317)
C. Pole (57001-1190)
D. Bearing Inner Race
E. Stem Base

Steering Stem Installation

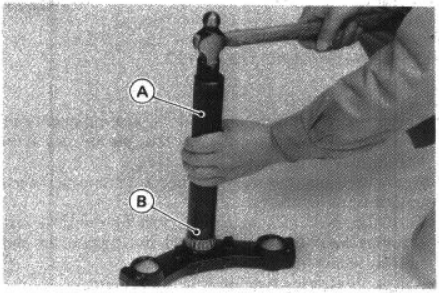
- Apply grease to the outer races, and then drive them into the head pipe using the drivers and the driver press shaft (special tools).

Outer Race Installation



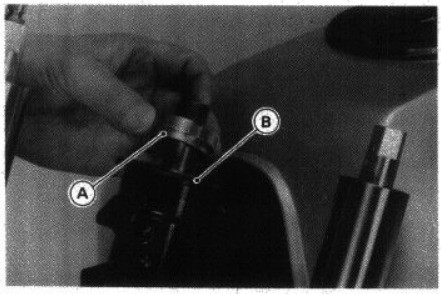
1. Driver Press Shaft: 57001-1075
2. Driver: 57001-1106
3. Driver: 57001-1076

- Apply grease to the tapered roller bearing, and drive it onto the steering stem using the stem bearing driver and adapter (special tools).



A. Stem Bearing Driver: 57001-137
B. Adapter: 57001-1074

- Lubricate the steering stem bearings with grease.
- Install the stem locknut so that the notched side faces down.
- Install the lockwasher, steering stem head, washer, and nut. Loosely install the nut at this time.

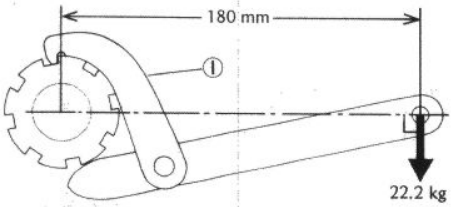


A. Notch Side B. Cap

The following four steps should be performed after steering bearing installation. This procedure settle the bearings in place.

○Using the stem nut wrench, tighten the stem locknut to 39 N-m (4.0 kg-m, 29 ft-lb) of torque. To tighten the steering stem locknut to the specified torque, hook the wrench on the stem locknut, and pull the wrench at the hole by 22.2 kg force in the direction shown.

Torquing Stem Locknut



1. Stem Nut Wrench: 57001-1100

○Check that there is no play and the steering stem turns smoothly without the rattle. If not, the steering stem bearing may be damaged.

○Again back out the stem locknut a fraction of a 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.

●Adjust the steering (see Steering Adjustment).

●Reinstall the following parts.

○Front fork legs
○Handlebars
○Fairing stay, fairing
○Front wheel
○Fuel tank

●Route the cables and harnesses correctly. The cables and wiring harnesses must not hinder handlebar movement.

●Check and adjust the following items.

○Front brake
○Clutch
○Throttle cable
○Rear view mirrors
○Headlight aim

Steering Maintenance

Steering Stem Bearing Lubrication

In accordance with the Periodic Maintenance Chart, the steering stem bearings should be relubricated.

●Remove the steering stem.

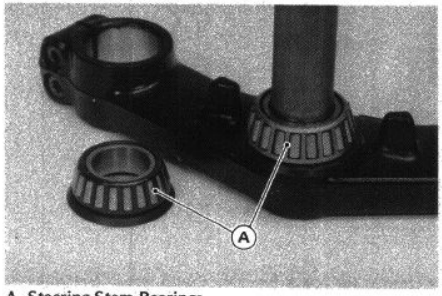
●Using a high flash-point solvent, wash the upper and lower taperd roller bearings in the cages, and wipe the upper and lower outer races, whcih are press-fitted into the frame head pipe, clean of grease and dirt.

●Visually check the outer races and the rollers.

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

●Pack the upper and lower tapered roller bearings in the cages with grease, and apply light coat of grease to the upper and lower outer races.

●Install the steering stem, and adjust the steering.



A. Steering Stem Bearings

Bearing Wear, Damage

●Using a high flash-point solvent, wash the upper and lower tapered rollers in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean of grease and dirt.

●Visually check the outer races and the rollers.

★Replace the bearing assemblies if they show damage.

Grease Seal Deterioration, Damage

●Inspect the grease seal on the upper tapered roller bearing for any signs of deterioration or damage.

★Replace the grease seal if necessary.

Steering Stem Warp

●Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.

★If the steering stem shaft is bent, replace the steering stem.

Controls

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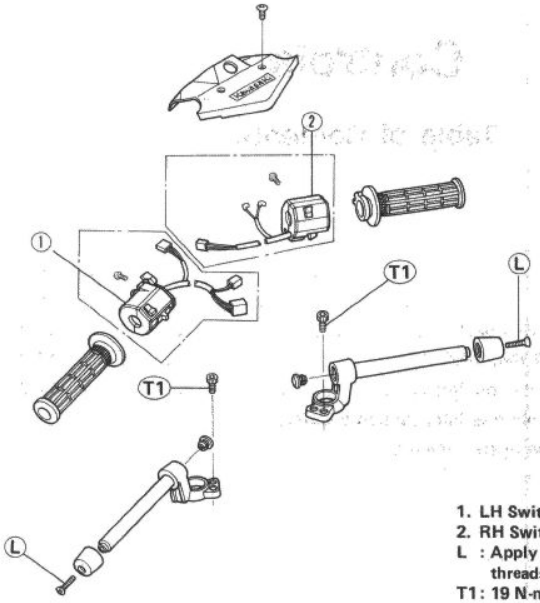
Exploded View



1. LH Switch Housing
2. RH Switch Housing

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

T1: 19 N-m (1.9 kg-m, 13.5 ft-lb)

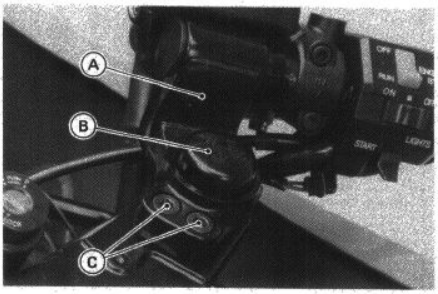
Handlebars

Left Handlebar Removal

- Remove the stem head cover.
- Remove the clutch master cylinder.
- Remove the screws, and open the left switch housing.
- Remove the handlebar mounting bolts and take off the handlebar.

Right Handlebar Removal

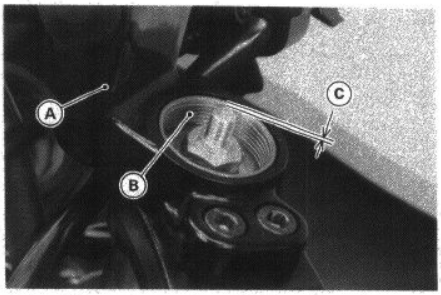
- Remove the front master cylinder.
- Remove the screws, open the right switch housing, and take off the throttle grip.
- Remove the handlebar mounting bolts and take off the handlebar.



A. Handlebar
B. Cap
C. Mounting Bolts

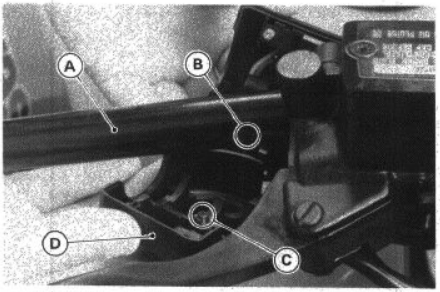
Handlebars Installation Notes

- Position the handlebar on the stem head, and tighten the mounting bolts to the specified torque.
  - The handlebar must fit squarely on the fork inner tube top without any clearance.



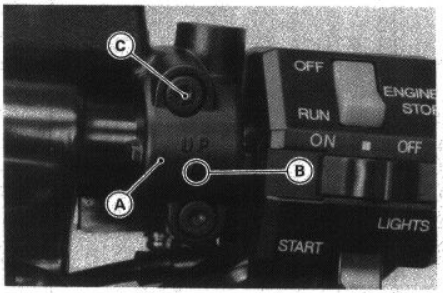
A. Handlebar
B. Fork Inner Tube
C. Clearance

- The front half of both the left and right switch housings has a small projection. Fit the projection into a small hole in the handlebar.



A. Handlebar
B. Small Hole
C. Projection
D. Front Half of Switch Housing

- The front brake and clutch master cylinder clamp must installed with the arrow mark upward. Tighten the upper clamp bolt first, and then the lower clamp bolt both to the specified torque. There will be a gap at the lower part of the clamp after tightening.



A. Clamp
B. Arrow Mark
C. Tighten upper clamp bolt first

- Check and adjust the following items:
  - Throttle grip
  - Clutch
  - Front brake

Frame

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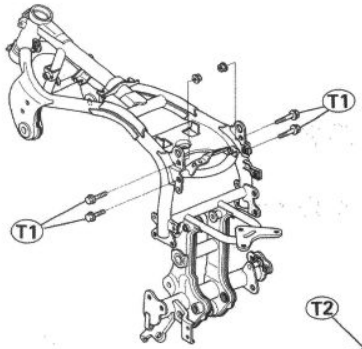
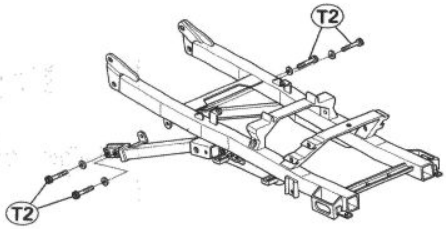
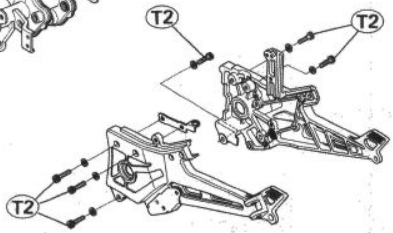
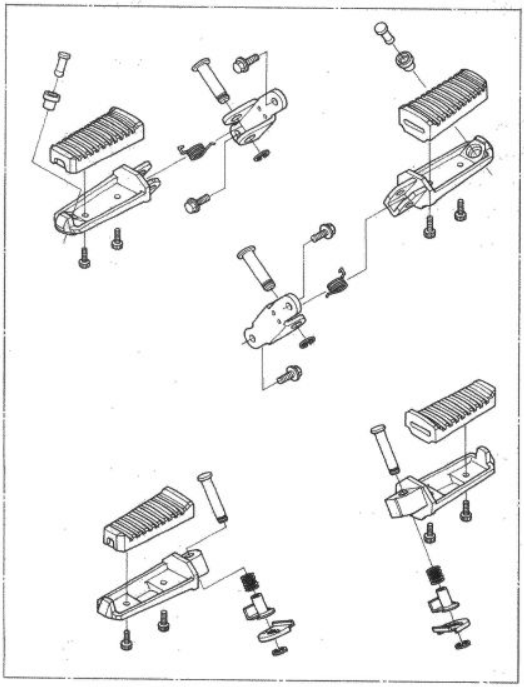
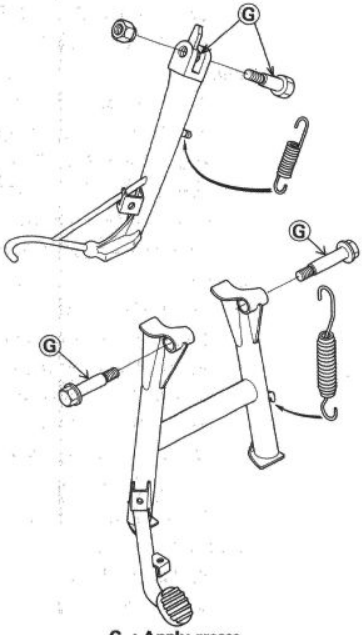
Exploded View





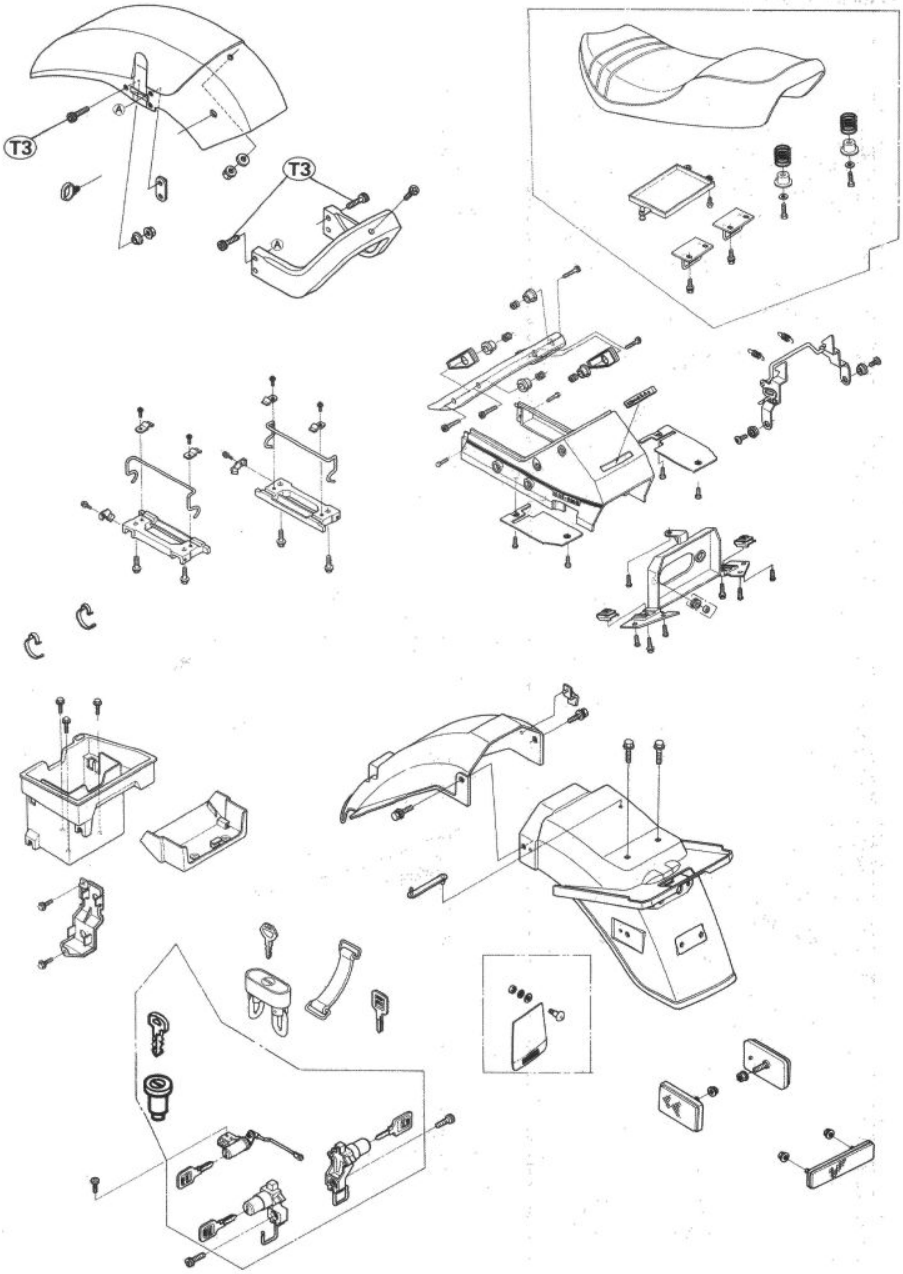




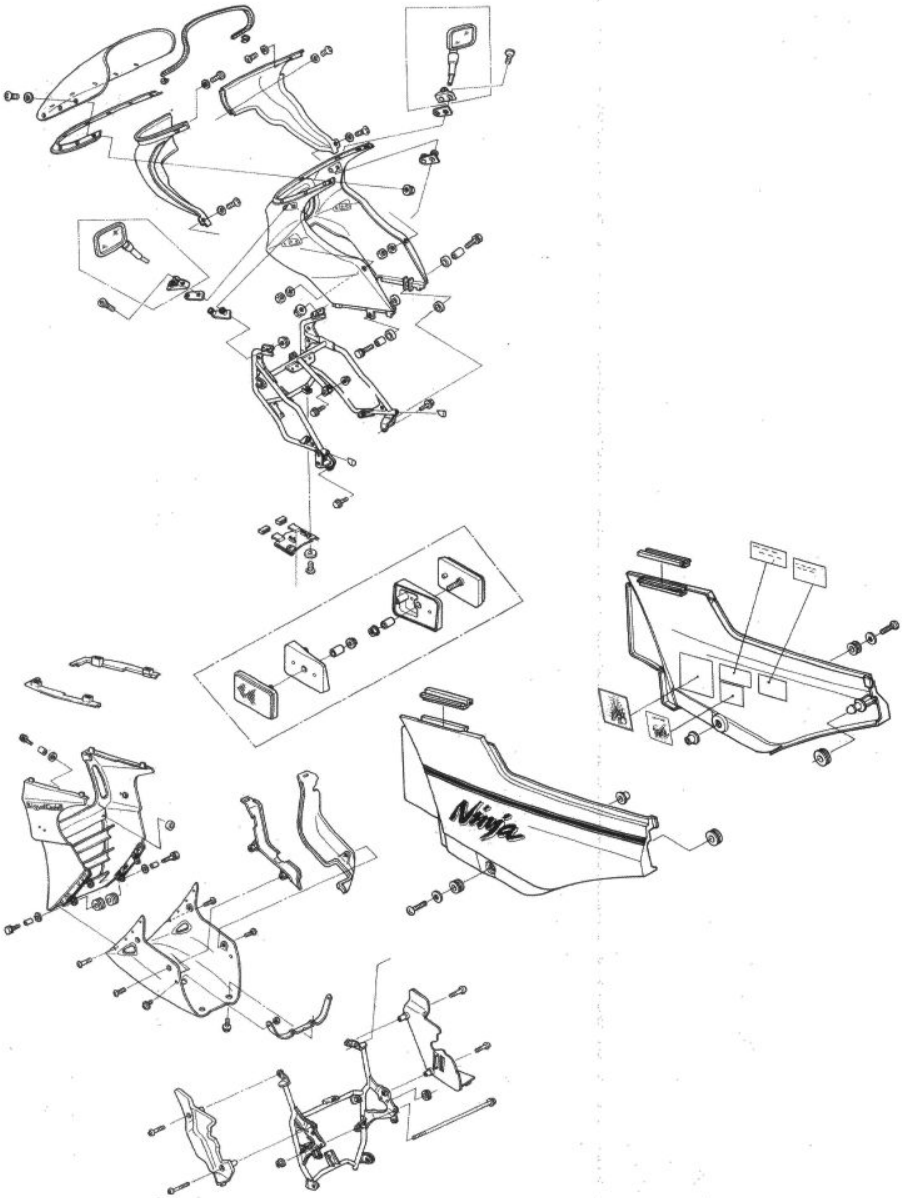


G : Apply grease.

T1 : 19 N-m (1.9 kg-m, 14.0 ft-lb)
T2 : 27 N-m (2.8 kg-m, 20 ft-lb)
T3 : 8.8 N-m (0.90 kg-m, 78 in-lb)


T3
T3
A
A

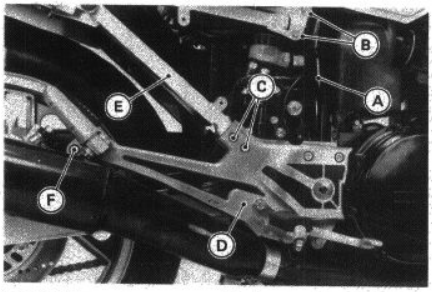
Exploded View (Cont.):



Rear Frame

Rear Frame Removal

●Remove the following parts before rear frame removal.
○Seat
○Fuel tank
○Side cover
○Coolant reserve tank
○Battery
○Junction box and its wirings, connectors.
○Starter relay terminals
●Disconnect the brake, tail, and licence light connectors.
●Remove the battery case mounting bolts and take the wiring harness from the rear side of the battery case.
●Loosen the rear frame upper bolts and remove the rear frame lower bolts.
●Remove the upper bolts and tilt the rear frame toward the rear.



A. Main Frame
B. Rear Frame Upper Bolts
C. Rear Frame Lower Bolts
D. Footpeg Bracket
E. Rear Frame
F. Muffler Mounting Bolt

●Remove the grab rail and seat cover from the rear frame.

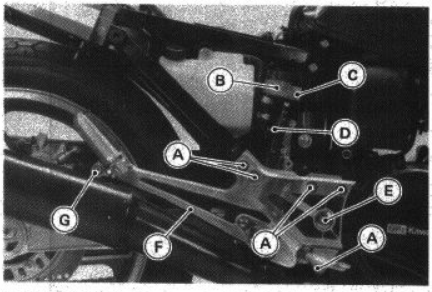
Rear Frame Installation

●Rear frame installation is the reverse of removal.

Footpeg Brackets

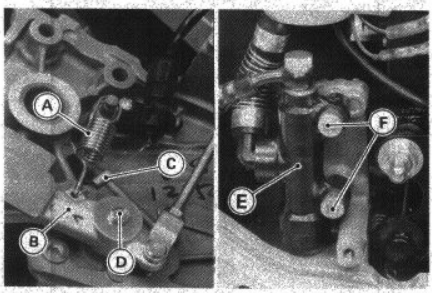
Right Footpeg Bracket Removal

●Remove the right side cover.
●Disconnect the rear brake light switch leads.
●Remove the rear brake fluid reservoir mounting bolt.
●Remove the swing arm pivot nut.
●Remove the footpeg bracket bolts and washers, then take off the bracket with rear master cylinder.



A. Bracket Bolt
B. Rear Brake Fluid Reservoir
C. Mounting Bolt
D. Rear Master Cylinder
E. Swing Arm Pivot Nut
F. Bracket Bolt
G. Footpeg Bracket
H. MufflerMounting Bolt

●Remove the brake pedal spring and rear brake light switch spring from the footpeg bracket.
●Remove the rear master cylinder mounting bolts and brake pedal pivot bolt and then take off the rear master cylinder and brake pedal as a set.

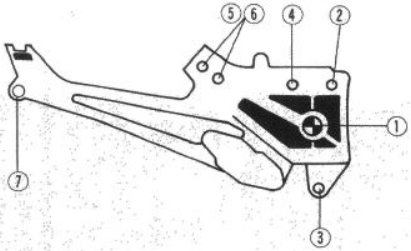


A. Brake Pedal Spring
B. Brake Pedal
C. Brake Light Spring
D. Brake Pedal Pivot Bolt
E. Rear Master Cylinder
F. Mounting Bolts

Right Footpeg Bracket Installation Note

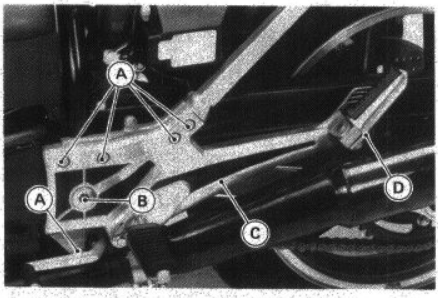
○Loosely tighten the swing arm pivot nut first, to seat the footpeg bracket. Loosely tighten all the bolts, and then tighten the specified torque following the tightening sequence as shown.

Right Footpeg Mounting



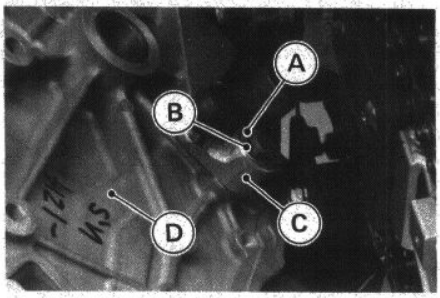
Left Footpeg Bracket Removal

- Remove the left side cover.
- Remove the swing arm pivot nut.
- Remove the footpeg bracket mounting bolts and washers, and take off the bracket with shift pedal.



A. Mounting Bolt
B. Pivot Nut
C. Mounting Bolt
D. Footpeg Bracket
E. Muffler Mounting Bolt

- Remove the shift pedal pivot circlip and washer, and take the shift pedal from the bracket.

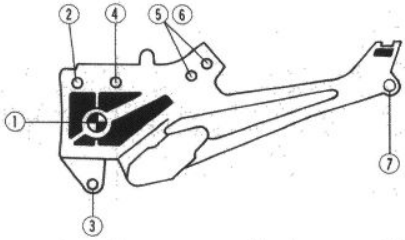


A. Washer
B. Circlip
C. Shift Pedal
D. Footpeg Bracket

Left Footpeg Bracket Installation Note

○Loosely tighten the swing arm pivot nut first, to seat the footpeg bracket. Loosely tighten all the bolts, and then tighten them to the specified torque following the tightening sequence as shown.

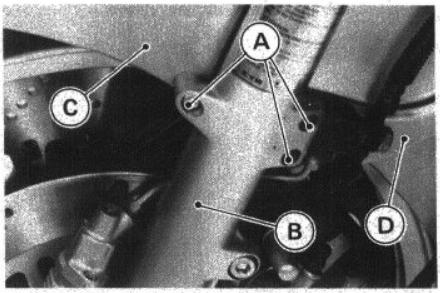
Left Footpeg Mounting



Fenders

Front Fender Removal

- Remove the speedometer cable lower end.
- Remove the front fender mounting bolts (left and right) and take off the brace inside the fender.
- Remove the fender with brace and then separate them.



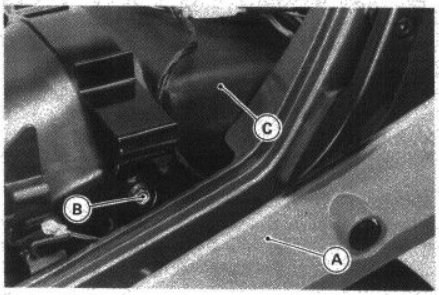
A. Fender Mounting Bolts
B. Fork
C. Front Fender
D. Brace

Front Fender Installation Note

- Front fender installation is the reverse of removal.

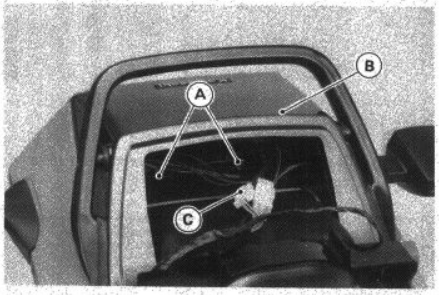
Rear Fender Rear Section Removal

- Remove the seat.
- Remove the mounting bolts from the front of the rear fender rear section.



A. Seat Cover
B. Mounting Bolts
C. Rear Fender Rear Section

- Disconnect the license light connector.
- Remove the mounting bolts from the rear of the rear fender rear section.

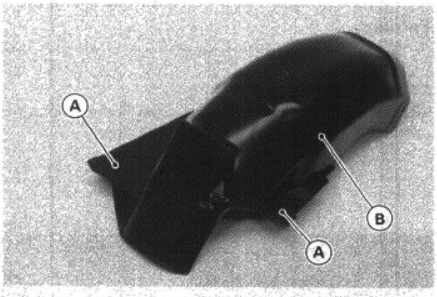


A. Mounting Bolts
B. Seat Cover
C. License Light Connector

- Take off the rear fender rear section toward the rear.

Rear Fender Front Section Removal

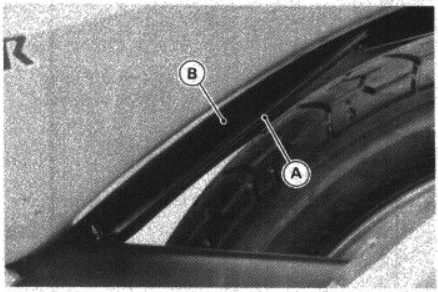
- Remove the rear fender rear section.
- Push the left and right flaps inside, and free the rear fender front section from the slit in the frame.



A. Flaps
B. Rear Fender Front Section

Rear Fender Front Section Installation Note

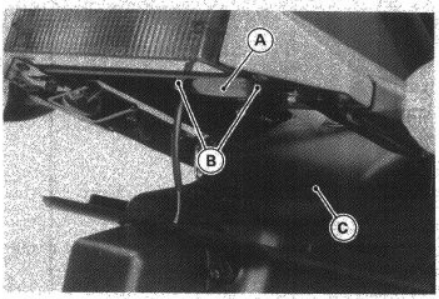
- When installing the rear fender front section, fit the flaps into the slot in the rear frame.



A. Slot
B. Rear Frame

Rear Fender Rear Section Installation Note

- When installing the rear fender rear section, fit the rear fender cover into the seat cover, and attach the rear fender rear section to the bottom of the fender cover.

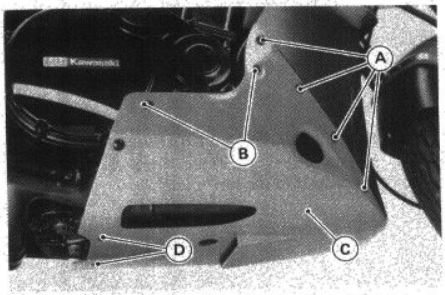


A. Rear Fender Cover
B. Mounting Bolts
C. Rear Fender Rear Section

Fairings

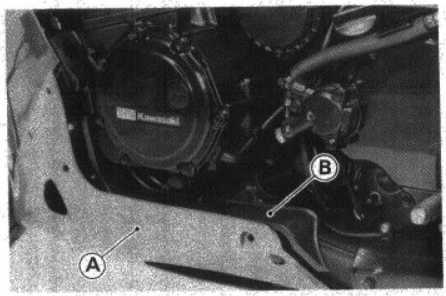
Lower Fairing Removal

- Remove the mounting screws, cover mounting screws and bolts (bottom) from the lower fairing.



A. Mounting Screws
B. Cover Mounting Screws
C. Lower Fairing
D. Mounting Bolts

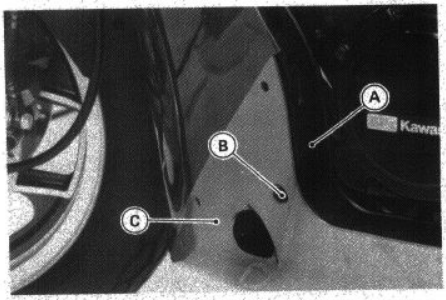
- Take off the lower fairing, and lower fairing cover.



A. Lower Fairing
B. Lower Fairing Cover

Lower Fairing Installation

- Attach the lower fairing to the bottom of the engine, and loosely tighten the bottom mounting bolt.
- Fit the left and right lower fairing covers to the inside of the lower fairing, and loosely tighten the cover mounting screws.

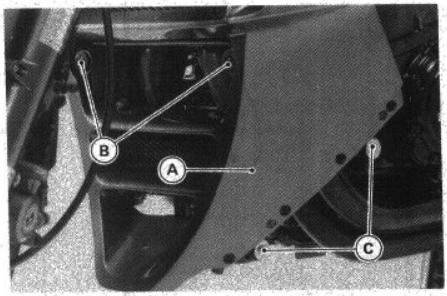


A. Lower Fairing Cover
B. Mounting Screw
C. Lower Fairing

- Loosely tighten the mounting screws.
- Tighten all the bolts and screws sequrely.

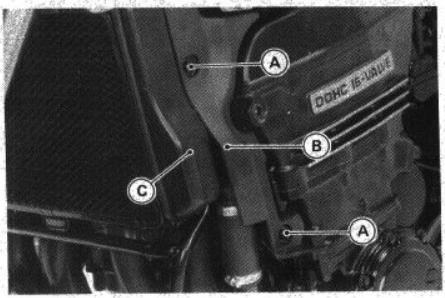
Middle Fairing Removal

- Remove the lower fairing.
- Remove the middle fairing mounting bolts (front and side), and take off the middle fairing.



A. Middle Fairing
B. Mounting Bolts
C. Mounting Bolts

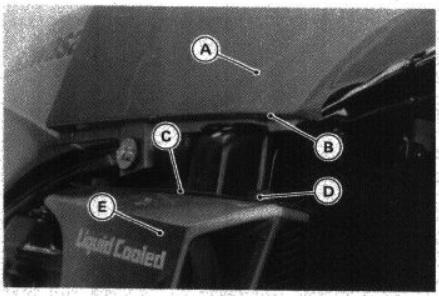
- Remove the middle fairing cover screws, and take off the left and right covers.



A. Cover Screws
B. Middle Fairing Cover
C. Radiator

Middle Fairing Installation

- Install the left and right middle fairing cover.
- Attach the damper rubber to the top of the middle fairing. Then fit the tang into the hole in the upper fairing.

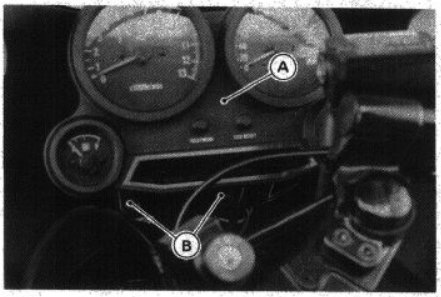


A. Upper Fairing
B. Hole
C. Damper Rubber
D. Tang
E. Middle Fairing

- Install the middle fairing, and tighten the mounting bolts.
- Install the lower fairing.

Upper Fairing Removal

- Remove the lower fairing.
- Remove the middle fairing.
- Remove the speedometer cable lower end.
- Remove the ignition switch cover screws and take off the cover.
- Remove the meter mounting bolts, and pull the meter assembly to the rear.



A. Meter Assembly
B. Meter Mounting Bolts

- Rest the meter assembly on the fuel tank.

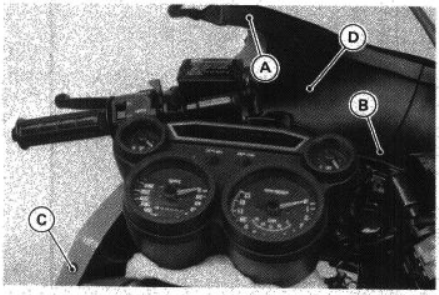
NOTE

○*Cover the fuel tank with a thick cloth to avoid damaging the painted surface.*

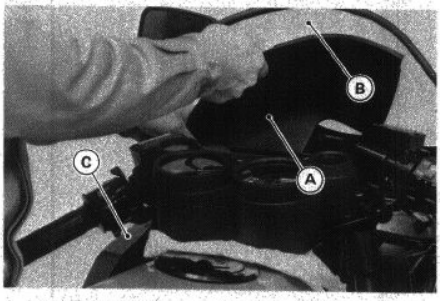
CAUTION

○**Place the meters so that they are upright. If a meter is left upside down or sideways for any length of time it will malfunction.**

- Remove the inner fairing mounting screws, and remove the inner fairing.



A. Screws (Left and Right)
B. Screw (Center)
C. Screws (Left and Right)
D. Upper Fairing

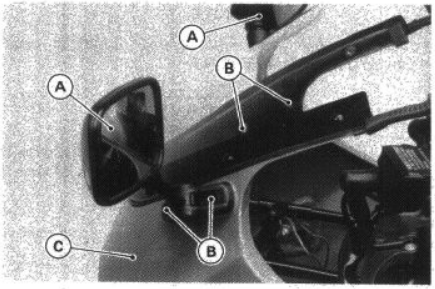


A. Inner Fairing half
B. Windshield
C. Upper Fairing

NOTE

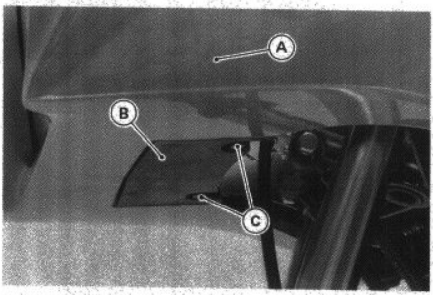
○*When removing the inner fairing half, be careful not to damage the inside surface of the windshield.*

- Remove the rear view mirror mounting screws, and take off the mirrors, and rubber dampers.

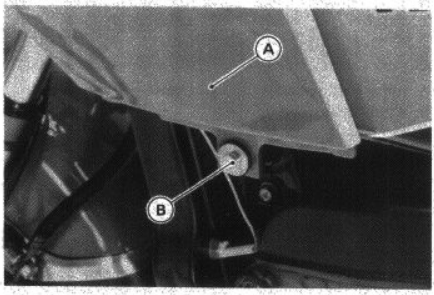


A. Rear View Mirrors
B. Mounting Screws
C. Upper Fairing

●Disconnect the front turn signal light lead connectors.
●Remove the headlight cover bolts, and take off the cover. Remove the upper fairing mounting bolts, and remove the upper fairing toward the front, clearing the fairing stays.



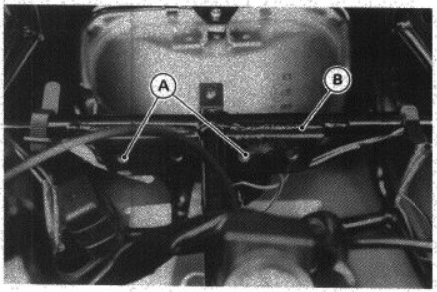
A. Upper Fairing
B. Headlight Cover
C. Cover Bolts



A. Upper Fairing
B. Mounting Bolts

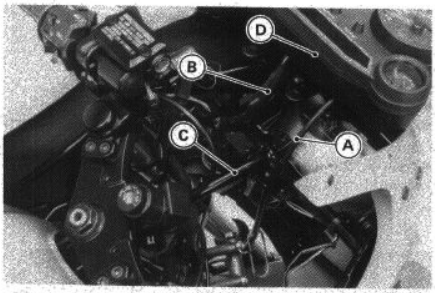
Upper Fairing Installation

●Upper fairing installation is the reverse of removal. Pay attention to the following items.
○When installing the meter assembly, use the the thread holes as shown.



A. Use Thread Holes
B. Fairing Stay

○Route the speedometer cable and meter wiring as shown in the figure.

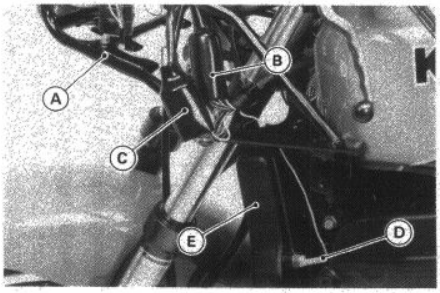


A. Speedometer Cable
B. Meter Wiring
C. Fairing Stay
D. Meter Assembly

○Do not forget to install the speedometer cable lower end to the speedometer gear housing.

Fairing Stay Removal

●Remove the lower fairing.
●Remove the middle fairing.
●Remove the upper fairing.
●Disconnect the wiring harness connectors or wiring lead of the radiator.

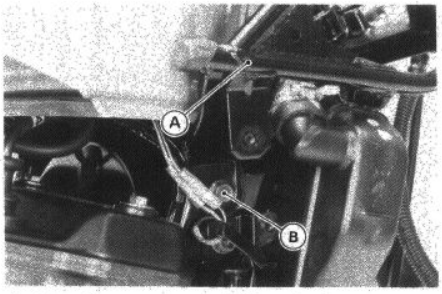


A. Fairing Stay
B. Wiring Connector
C. Wiring Connector
D. Wiring Lead
E. Radiator

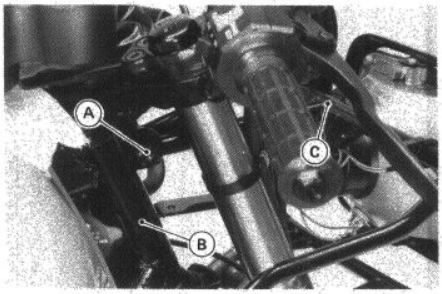
●Remove the fairing stay mounting bolts and nut. Remove the fairing stay toward the front.

NOTE

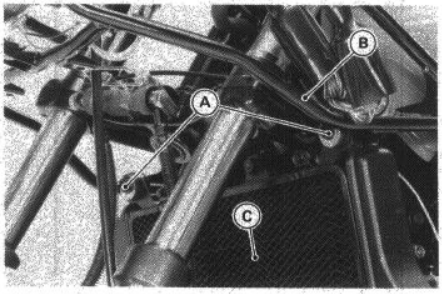
○*If the fuel tank interferes with the fairing stay, remove the fuel tank first.*



A. Fairing Stay
B. Mounting Bolt



A. Mounting Nut
B. Stem Head Pipe
C. Fairing Stay



A. Mounting Bolt
B. Fairing Stay
C. Radiator

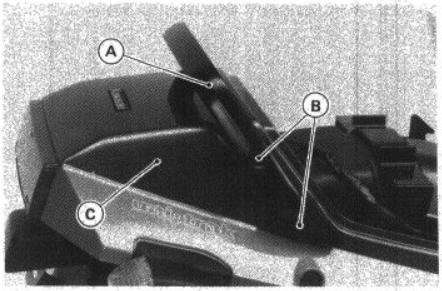
Fairing Stay Installation Notes

●When installing the fairing stay, be careful not to damage the radiator and radiator hose.

Seat Cover

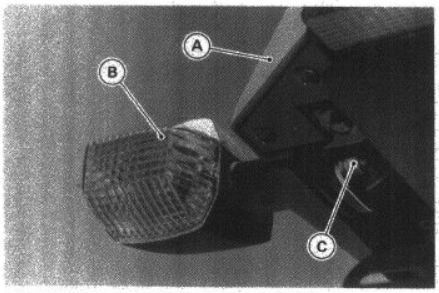
Seat Cover Removal

●Remove the seat.
●Remove both side covers.
●Disconnect the tail light wiring connector.
●Remove the grab rail mounting bolts and take off the grab rail.



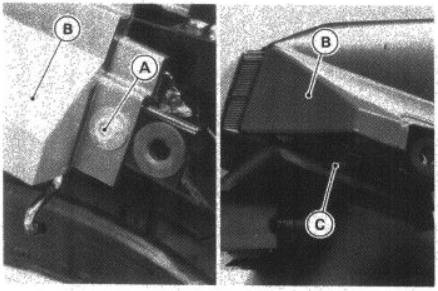
A. Grab Rail
B. Mounting Bolts
C. Seat Cover

●Remove the left and right rear turn signal mounting bolts and let them hang free.



A. Seat Cover
B. Rear Turn Signal
C. Mounting Bolt

●Remove the seat cover bolts and take off the seat cover.



A. Seat Cover Bolt
B. Seat Cover
C. Seat Cover Bolt

Seat Cover Installation

●Seat cover installation is the reverse of removal.

Electrical System

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Precautions

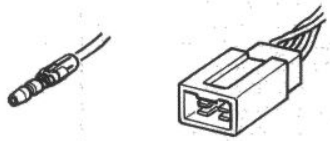
There are numbers of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter switch 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 brough on by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.

- Electrical Connectors

Female Connectors

Male Connectors

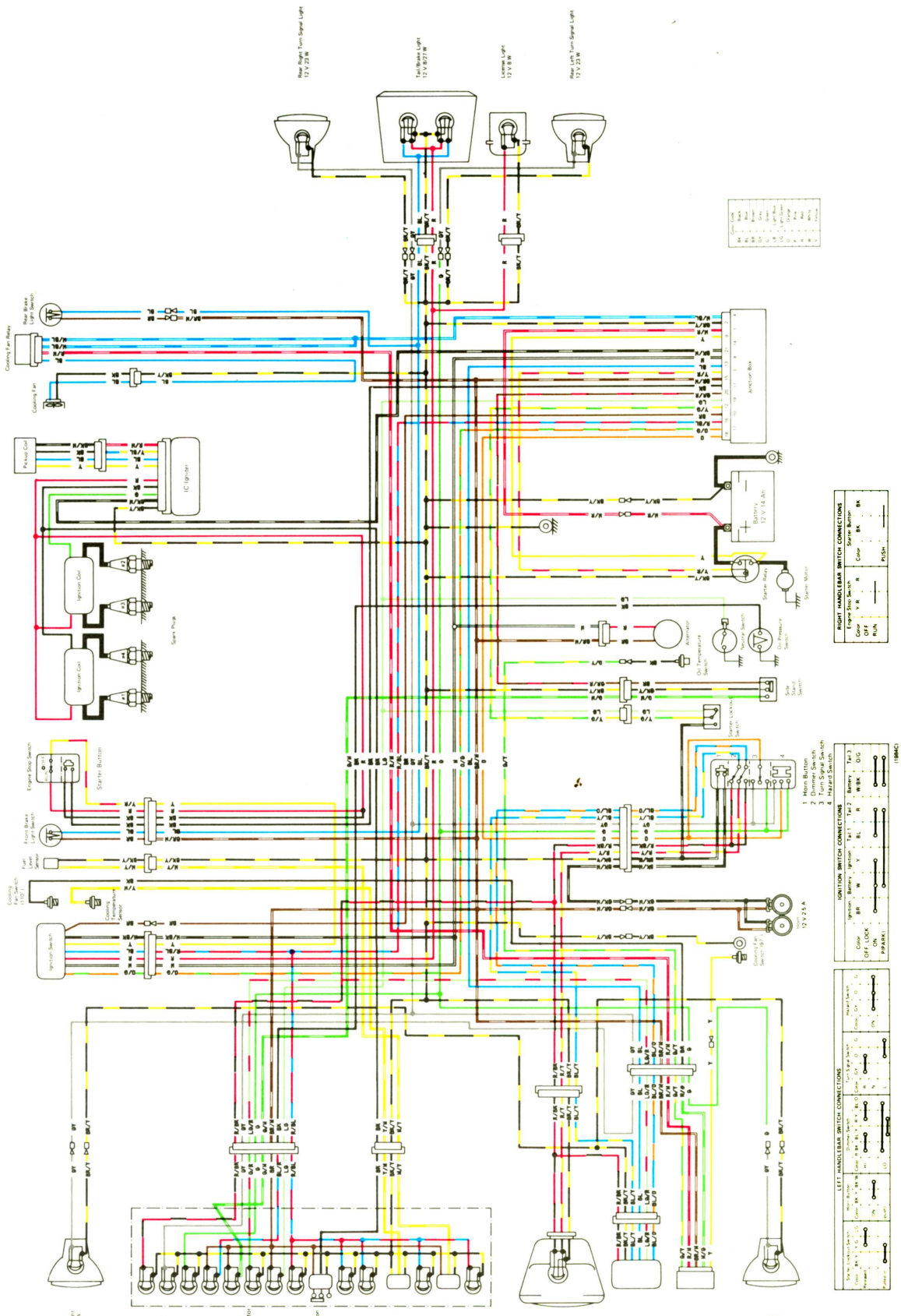


- Color Codes:

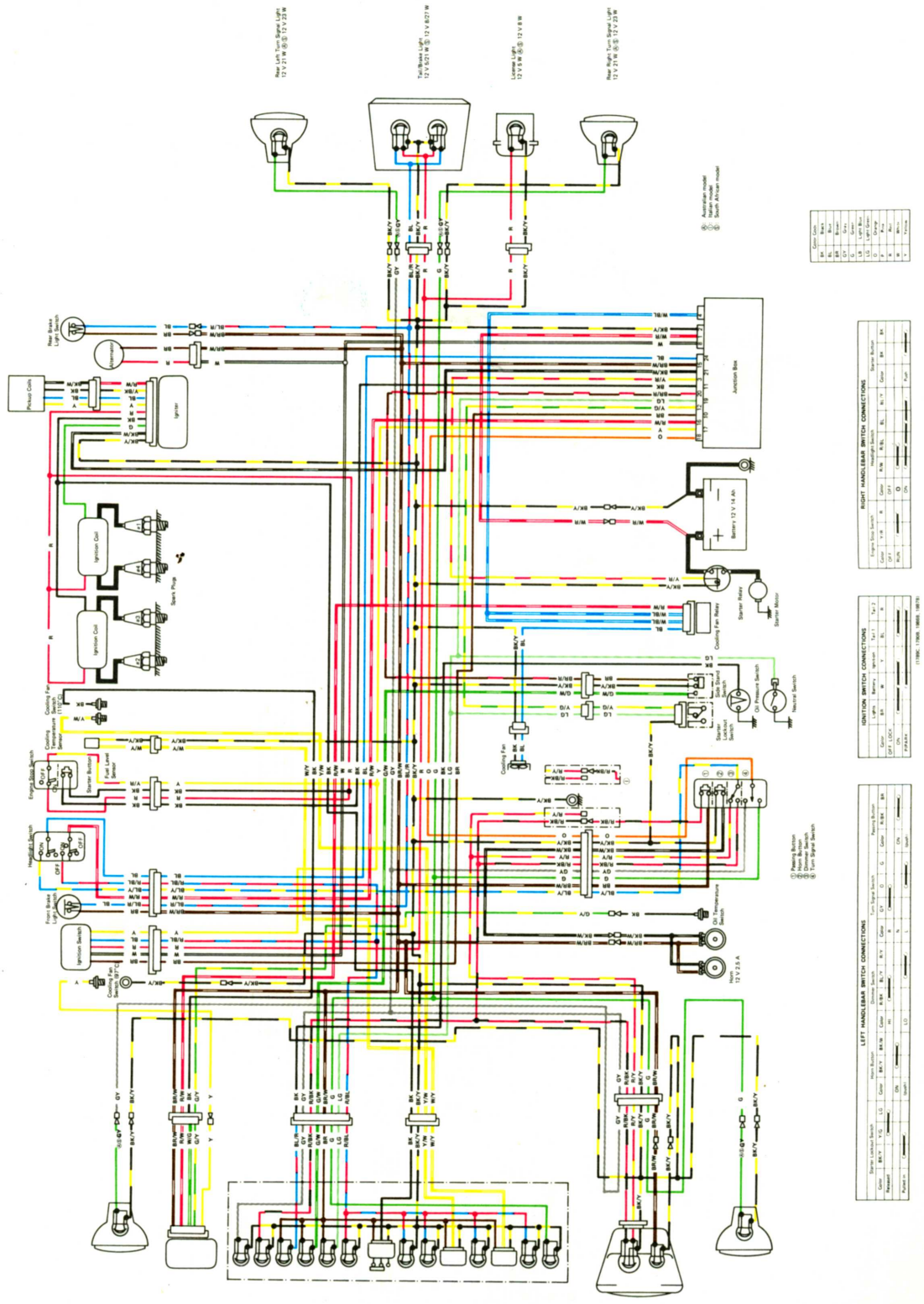
BK	Black
BL	Blue
BR	Brown
CH	Chocolate
DG	Dark green
G	Green
GY	Gray
LB	Light blue
LG	Light green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

- Measure coil and winding resistance when the part is cold (at room temperature).

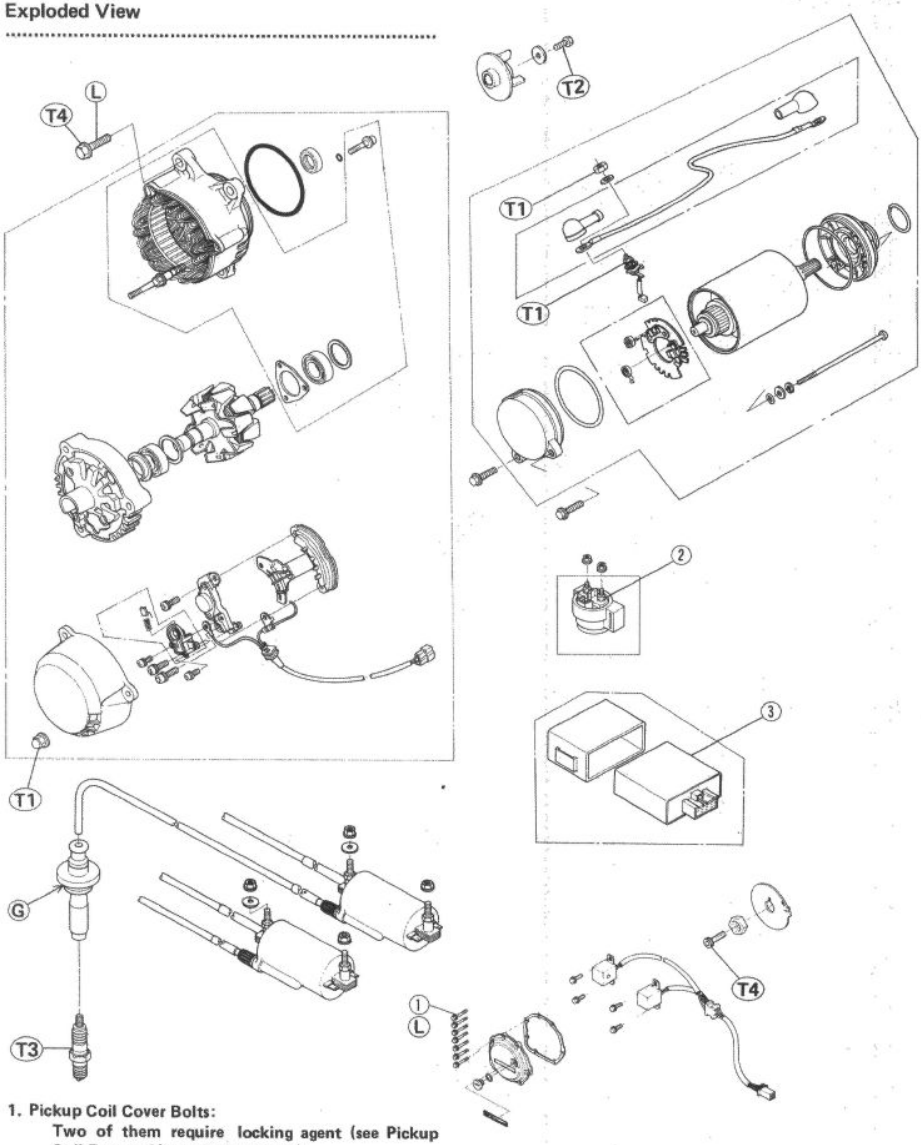
ZX900-A1 Wiring Diagram (US and Canada)



ZX900-A1 Wiring Diagram (Other than US and Canada)



Exploded View

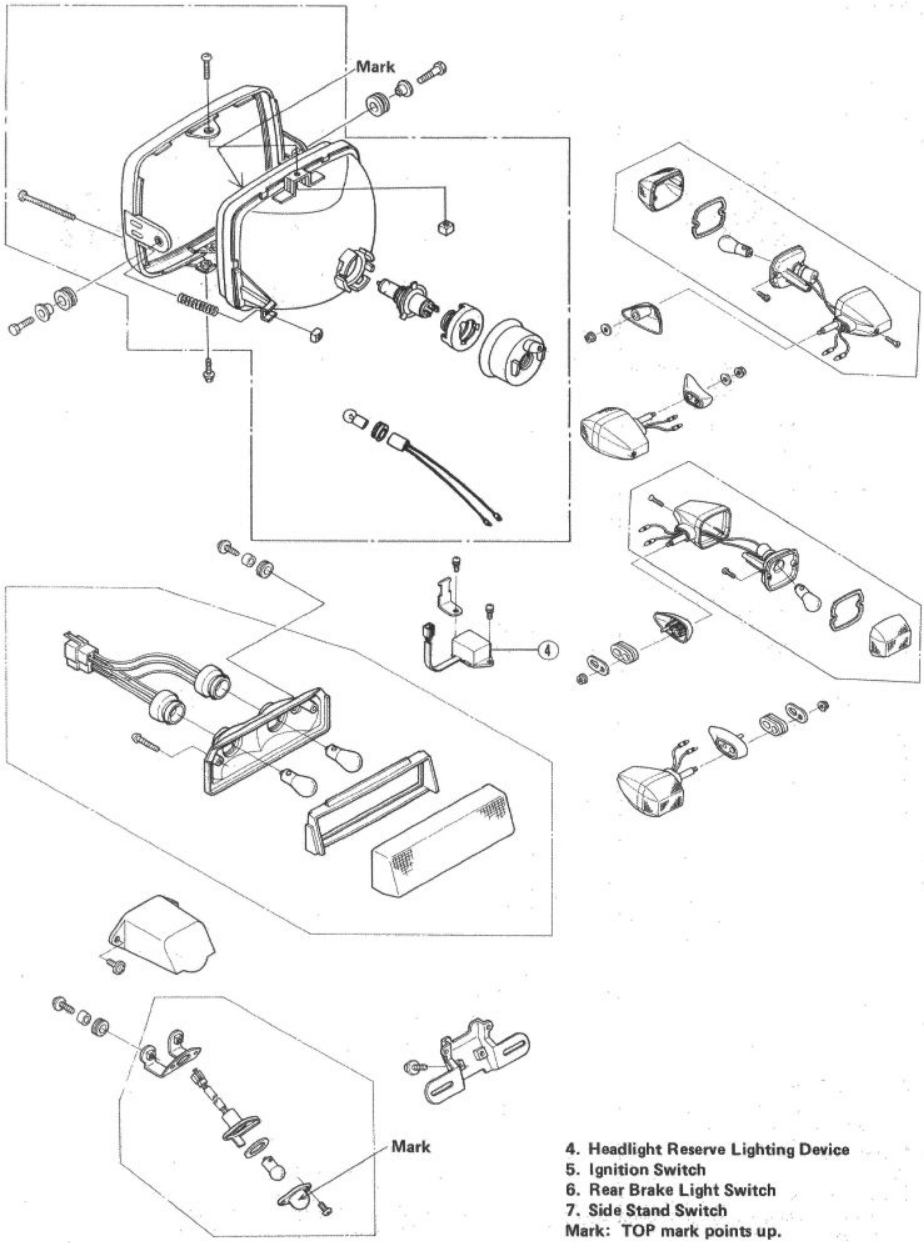


1. Pickup Coil Cover Bolts:
   Two of them require locking agent (see Pickup Coil Removal/Installation Notes)
2. Starter Relay
3. IC Igniter

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

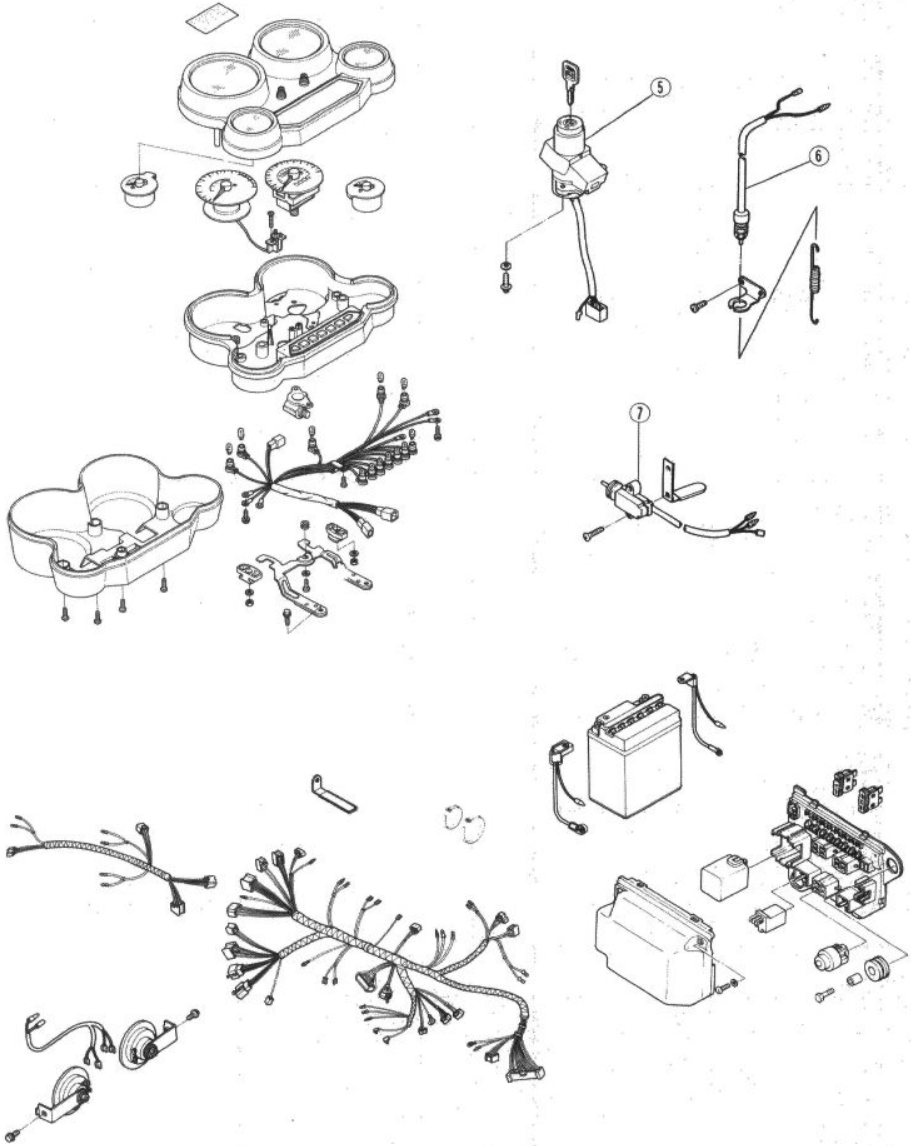
T1: 4.9 N-m (0.50 kg-m, 43 in-lb)
T2: 9.8 N-m (1.0 kg-m, 87 in-lb)
T3: 14 N-m (1.4 kg-m, 10.0 ft-lb)
T4: 25 N-m (2.5 kg-m, 18.0 ft-lb)

Exploded View (Cont.):



4. Headlight Reserve Lighting Device
5. Ignition Switch
6. Rear Brake Light Switch
7. Side Stand Switch

Mark: TOP mark points up.


5
6
7

Specifications

Battery

Type:	12 V 14 Ah
Specific gravity:	1.280 @20°C (68°F)

Alternator

Type:	Three-phase AC, regulator and rectifier contained in one housing
Rated output:	25 A @6,000 r/min (rpm), 14 V
Charging voltage:	13.5 V @4,000 r/min (rpm) (with Headlight Switch ON if applicable)
Stator coil resistance:	Less than 1.0 Ω
Rotor coil resistance:	About 4 Ω
Slip ring diameter:	Standard: 14.4 mm Service Limit: 14.0 mm
Carbon brush length:	Standard: 10.5 mm Service Limit: 4.5 mm

Ignition System

Ignition timing:	10° BTDC @1,000 r/min (rpm) – 35° BTDC @3,500 r/min (rpm)
Pickup coil resistance:	390 – 590 Ω
Pickup coil air gap:	0.5 – 0.9 mm
Ignition coil:	
3 needle arcing distance:	7 mm or more
Primary winding resistance:	1.8 – 2.8 Ω
Secondary winding resistance:	10 – 16 kΩ
Spark plug gap:	0.6 – 0.7 mm

Starter System

Starter motor:	
Carbon brush length:	Standard: 12 mm Service limit: 8.5 mm
Commutator groove Depth:	Standard: 0.45 – 0.75 mm Service Limit: 0.2 mm
Commutator diameter:	Standard: 28 mm Service Limit: 27 mm

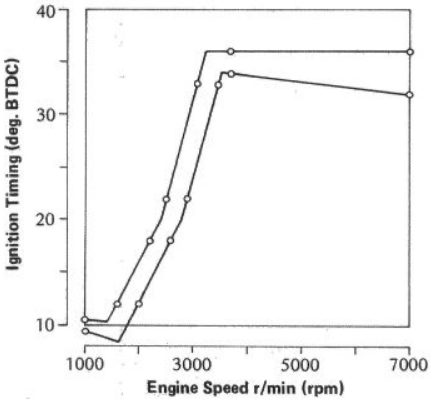
Spark Plug

	Standard	Low Speed Riding	High Speed Riding
US	NGK D8EA or ND X24ES-U	NGK D7EA or ND X22 ES-U	NGK D9EA or ND X27ES-U
Canada	NGK DR8ES-L or ND X24ESR-U	NGK DR7ES or ND X22ESR-U	NGK DR8ES or ND X27ESR-U
Europe except below	NGK DR8ES or ND X27ESR-U	Same as standard	Same as standard
Italy and Other than above	NGK D9EA or ND X27ES-U	Same as standard	Same as standard

Switches and Sensors

Rear brake light switch:	On after about 15 mm pedal travel	
Fan switch (97°C):	Off → On	94 – 100°C (201 – 212°F)
	On → Off	above 90°C (194°F)
Fan switch (110°C):	Off → On	107 – 113°C (225 – 235°F)
	On → Off	above 104°C (219°F)
Oil temperature switch (120°C):		
	On → Off	117 – 123°C (243 – 253°F)
	Off → On	above 113°C (235°F)
Fuel level sensor resistance:		
	Full position	3 – 12 Ω
	Empty position	70 – 120 Ω
Water temperature sensor resistance:		
	80°C (176°F)	about 52 Ω
	100°C (212°F)	about 27 Ω

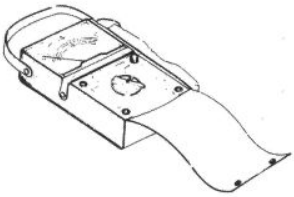
Ignition Timing/Engine Speed Relationship



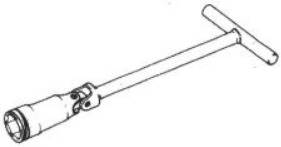
Special Tools

Along with common hand tools, the following more specialized tools are required for complete electrical system servicing.

Hand Tester: 57001-983



Spark Plug Wrench: 57001-1024



Bearing Driver Set: 57001-1129

Battery

Precautions:

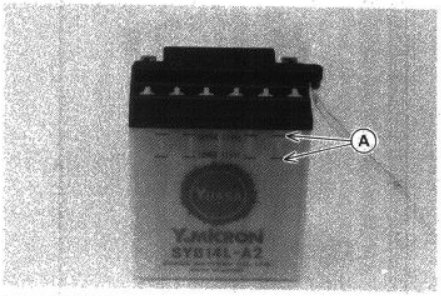
Following a few simple rules will greatly extend the life of the battery.

- ○When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.
- ○Never add sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.
- ○Avoid quick-charging the battery. A quick-charge will damage the battery plates.
- ○Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulphate (turn white), and the battery will no longer take a charge.
- ○Keep the battery well-charged during cold weather so that the electrolyte does not freeze and crack open the battery. The more discharged the battery becomes, the more easily it freezes.
- ○Always keep the battery vent hose free of obstruction, and make sure it does not get pinched, crimped, or melted shut by contact with the hot muffler. If battery gases cannot escape through this hose, they will explode the battery.
- ○DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.

Electrolyte:

Electrolyte Level Inspection

- ●Remove the battery.
- ●Visually check the electrolyte level in the battery.



A. Level Lines

★If the level of electrolyte in any cell is below the lower level line on the battery case, add distilled water only to that cell.

- ●Install the battery.

Battery Charging:

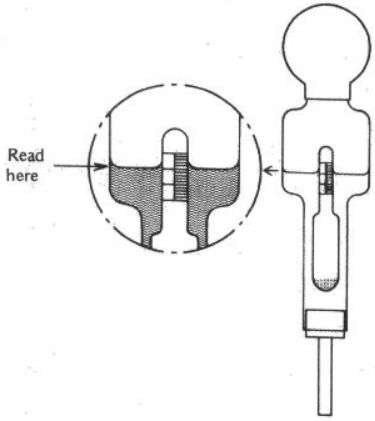
Battery Condition

●Before charging, check battery condition by testing the specific gravity of the electrolyte in each cell.

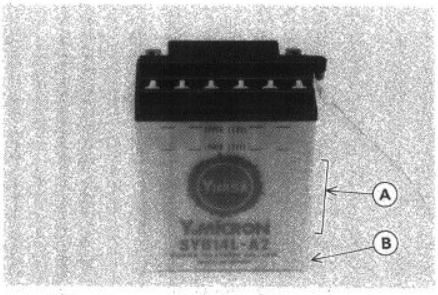
○Draw a little fluid from the cell with a hydrometer.

○Read the level of the electrolyte on the floating scale. This is the specific gravity of the electrolyte.

Hydrometer



●Look for sediment and white sulfation inside the cells on the bottom of the plates.



A. Sulfation here B. Sediment here

●See the Battery Troubleshooting Guide in Battery Test Charging.

★If the specific gravity is below 1.280 the battery needs to be charged.

NOTE

○*The specific gravity of the electrolyte varies with changes in temperature, so the specific gravity reading must be corrected for the temperature of the electrolyte.*

○*Celsius: Add 0.007 points to reading for each 10°C above 20°C or subtract 0.007 points for each 10°C below 20°C.*

○*Fahrenheit: Add 0.004 points to reading for each 10°F above 68°F or subtract 0.004 points for each 10°F below 68°F.*

★If the specific gravity of any of the cells is more than 0.050 away from any other reading, the battery will probably not accept a charge. If it generally best to replace a battery in this condition.

★If the specific gravity of all the cells is 1.280 or more the battery is fully charged.

Battery Initial Charging

Before being placed in service, a new battery should be given an initial charging.

●Cut off the sealed end of the battery vent hose and remove the filler caps.

●Fill each cell to the upper level line on the battery case with fresh electrolyte at a temperature of 30°C (86°F) or less. Let the battery stand for about 30 minutes before charging.

NOTE

○*If the electrolyte level drops, add electrolyte to the upper level line before charging.*

●Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and charge it for 10 hours. For example, if the battery is rated at 18 Ah, the charging rate would be 1.8 A.

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.**

CAUTION

○**Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than -normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

○**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

●Turn the charger off, then disconnect it from the battery.
●Check battery voltage. Battery voltage should be 12 – 13 V.
●Check the specific gravity of each cell with a hydrometer (see Battery Condition).
★If the voltmeter or hydrometer readings are below those specified, additional charging is necessary before the battery can be installed.

Battery Ordinary Charging

●Remove the battery from the motorcycle.

CAUTION

○**Always remove the battery from the motorcycle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the motorcycle.**

●Clean off the battery using a baking soda-and-water solution.
○Mix one heaping tablespoon of baking soda in one cup of water.
○Be careful not to get any of the cleaning solution in the battery.
○The terminals must be especially clean.
●If any of the cells are low, fill them to the LOWER level line with distilled water only. The electrolyte will expand during charging, and the level will rise.
●Connect a charger to the battery BEFORE plugging it in or turning it on.

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.**

●Set the charge rate and time according to the battery condition previously determined (see Battery Condition), using the table.

CAUTION

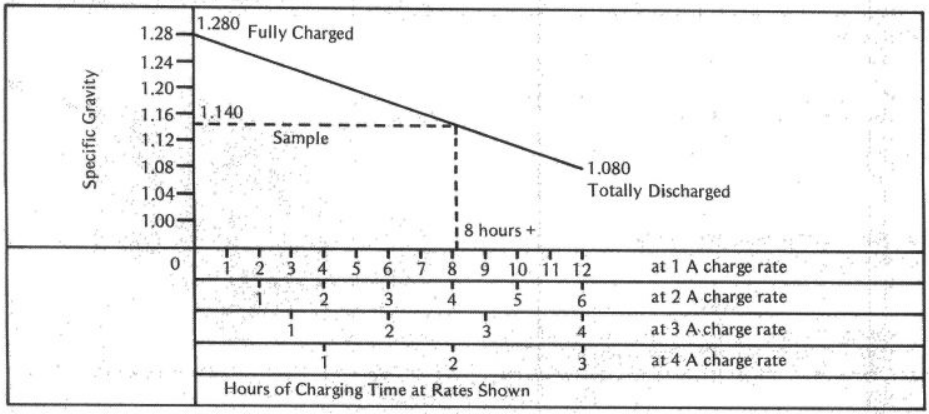
○**Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than -normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**
○**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

●Turn the charger off or unplug it, then disconnect it from the battery.
●Check battery condition (See Battery Condition).
★If the battery condition indicates that it is not fully charged, additional charging time is necessary.

Battery Test Charging

●If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the table.

Battery Charging Rate/Time Table



Battery Troubleshooting Guide

	Good Battery	Suspect Battery	Action
Plates	(+) chocolate color (–) gray	white (sulphated); + plates broken or corroded	Replace
Sediment	none, or small amount	sediment up to plates, causing short	Replace
Voltage	above 12 V	below 12 V	Test charge
Electrolyte Level	above plates	below top of plates	Fill and test charge
Specific Gravity	above 1.200 in all cells; no two cells more than 0.020 different	below 1.100, or difference of more than 0.020 between two cells	Test charge

●To test charge a battery, perform the ordinary charging procedure and monitor the battery voltage and other signs as mentioned below.

★If the battery voltage suddenly jumps to over 13 V just after the start of charging, the plates are probably sulfated. A good battery will rise to 12 V immeditely and then gradually go up to 12.5 or 13 V in about 30 min to and hour after the start of charging.

★If one cell produces no gas bubbles or has a very low specific gravity, it is probably shorted.

★If there does not appear to be enough sediment in a cell to short the plates, but that cell has a very low specific gravity after the battery is fully charged, the trouble may be that there is not enough acid in that one cell. In this case only, sulfuric acid solution may be added to correct the specific gravity.

★If a fully charged battery not in use loses its charge after 2 to 7 days; or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

Alternator

The alternator contains the following electrical components in its compact housing:

○Alternator stator and rotor
○Rectifier
○Regulator

Alternator Removal/Disassembly:

Alternator Removal

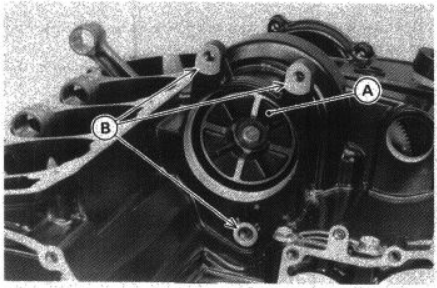
NOTE

○*Alternator removal is not necessary to remove the rectifier, regulator, and carbon brush assembly. They can be removed often removing the alternator end cover.*

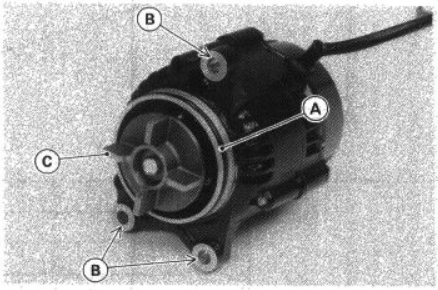
●Disconnect the alternator lead connector.
●Unscrew the alternator mounting bolts and pull the alternator out of the engine. Do not lose the alternator coupling dampers.

Alternator Installation Notes

●Check that the rubber dampers are in place before installing the alternator.
●Clean the alternator legs and crankcase where the alternator is grounded.
●Install the alternator.
○Apply a small amount of engine oil to the rubber dampers and the O-ring.



A. Rubber Damper B. Clean here.



A. O-ring
B. Clean here.
C. Coupling Blades

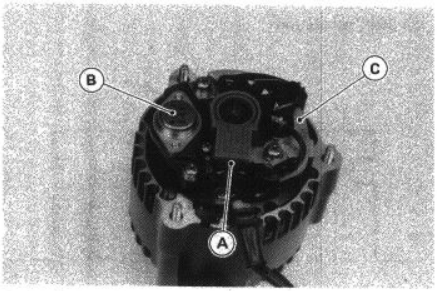
○Align the blades of the alternator coupling with the slots in the rubber dampers, and temporarily install the alternator with the mounting bolts finger tight.
○Apply a non-permanent locking agent to the threads of the alternator mounting bolts.
○Screw in the mounting bolts evenly to engage the couping with the rubber dampers.
○Tighten the bolts to the specified torque (see Exploded View)

CAUTION

○If any resistance is felt when tightening the mounting bolts, stop immediately, and check the alignment of the coupling blades with the slots in the rubber dampers.

Alternator Disassembly

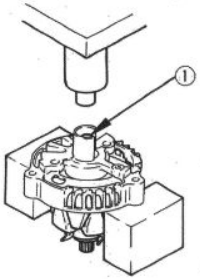
●Remove the cap nuts and take off the end cover. The following parts can be removed.



A. Brush Assembly
B. Regulator
C. Rectifier

○Carbon brush assembly and rubber seal with mounting screws removed.
○Regulator with mounting screws removed.
○Rectifier and cover with stator coil windings unsoldered.
○The alternator lead assembly can be separated from the rectifier by unsoldering the connections.
●Unscrew the bolt holding the alternator coupling, and take off the coupling.
●Cover the splined portion of the rotor shaft with a thin tape to prevent damaging the oil seal lip.
●Unscrew the bearing holder screws, and pull off the RH housing half with the oil seal and stator.
●Press out the rotor shaft from the LH housing half, and remove the rotor with the bearings.

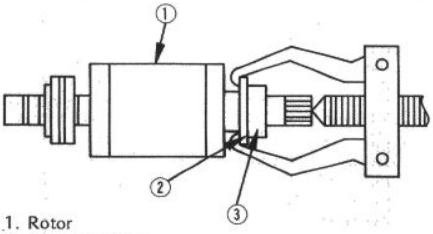
Rotor Removal



1. Rotor Shaft

●To remove the ball bearings, use a suitable puller.
○Pull out the RH ball bearing with the bearing holder.

Bearing Removal

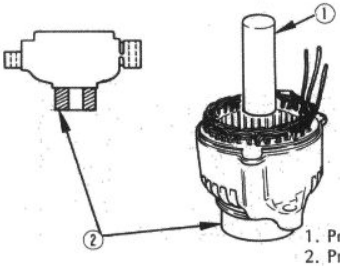


1. Rotor
2. Bearing Holder
3. RH Ball Bearing

Alternator Assembly Notes

●Assembly the parts in the following sequence.
○Position the RH housing half so that the RH bearing housing is seated on a suitable press fixture.

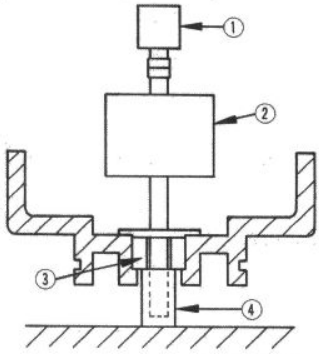
RH Bearing Installation



1. Press
2. Press Fixture

○Press the RH ball bearing into the RH housing half with bearing driver set 57001-1129.
○Install the bearing holder with its mounting screws. If necessary, repair or replace the holder before installation.
○Position the RH ball bearing so that the inner race is seated on a suitable press fixture.

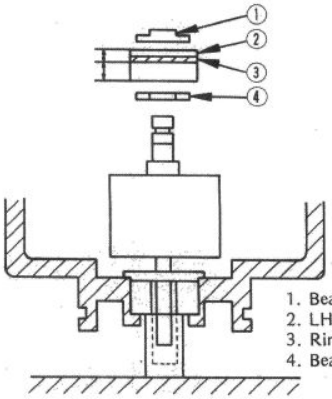
Rotor Installation



1. Press
2. Rotor
3. RH Ball Bearing
4. Press Fixture

○Press the rotor shaft into the RH ball bearing.
○Press the LH ball bearing and bearing covers onto the rotor shaft. The bearing long end from the circlip groove must be faced in.

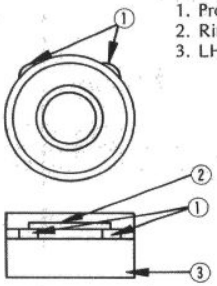
LH Bearing Installation



1. Bearing Cover
2. LH Ball Bearing
3. Ring
4. Bearing Cover

○Position the LH ball bearing ring so that the projections of it are aligned with the ring positioning groove, and install the LH housing half.

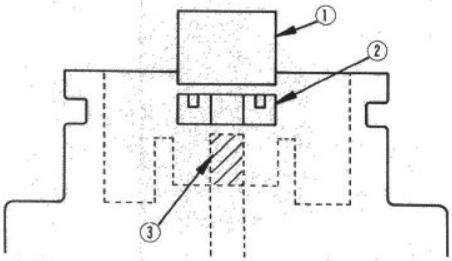
Ball Bearing Ring



1. Projections of Ring
2. Ring Groove
3. LH Ball Bearing

○Install the oil seal to the RH housing half so that the spring band side of it faces out. Before inserting the rotor shaft right end into the oil seal, splined portion of the shaft must be covered with a thin tape to prevent damaging the oil seal lip.

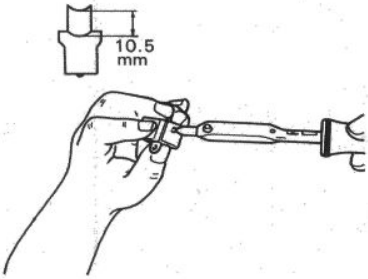
Oil Seal Installation



1. Press 2. Oil Seal 3. Shaft covered with tape

●Solder the carbon brush lead with the brush holder if they were disassembled.

Carbon Brush Installation



- Be careful not to forget to install the rectifier cover and carbon brush rubber seal.
- Tighten the fasteners to the specified torque if required (see Exploded view).

Alternator Troubleshooting:

For any charging system problems, always check the charging system wiring first (see Wiring Inspection), and then check the system with the following tests shown in the troubleshooting guide.

Troubleshooting Guide

Test No.	Trouble	Symptoms
1	Battery discharged	Starter not turning
2	Battery overcharged	Electrolyte level lowering quickly
3	Noise	Alternator noise

Test No. 1-Battery Discharged

- Remove the nuts holding the alternator cover, and take off the cover.
- Check that the alternator leads and connectors are in good condition.

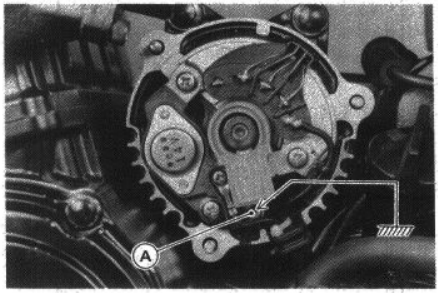
★If not, repair or replace the damaged parts.

- Replace the discharged battery with a good battery.
- Check battery voltage with the engine running.

★If the battery voltage is higher than 13.5 V, the charging system is in good condition.

★If the battery voltage is lower than 13.5 V, check the following.

- Ground the F te minal of the regulator to the chassis with a auxiliary wire.



A. F Terminal

- Start the engine, and check the battery voltage with the engine running.

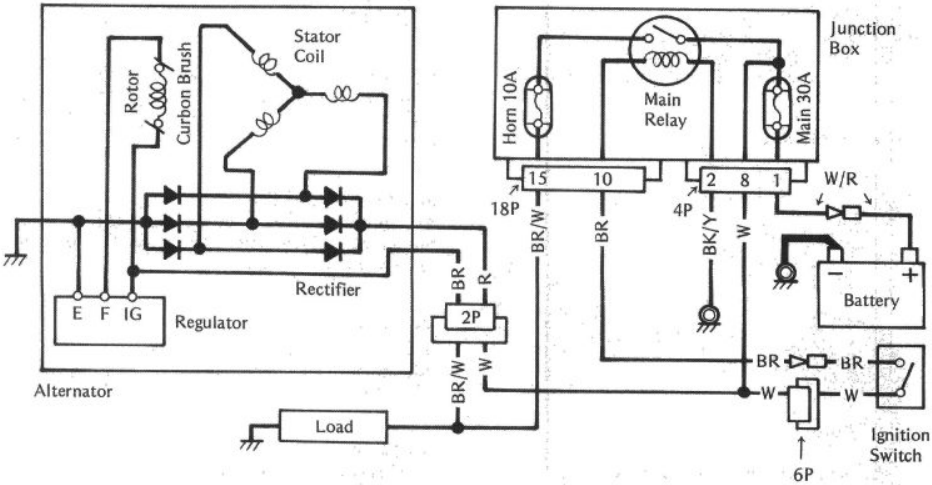
★If the battery voltage is higher than 13.5 V, check the following.

○Regulator

★If the battery voltage is lower than 13.5 V, check the following.

○Carbon brushes, Slip rings
○Rectifier
○Stator coil
○Rotor coil

Charging System Circuit

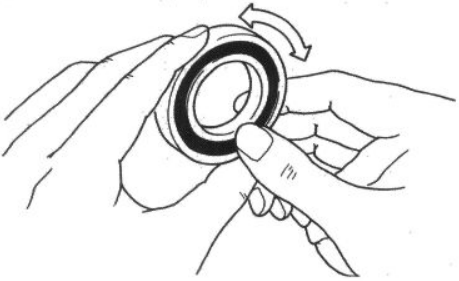


Test No.2-Battery Overcharged
●Check the regulator and/or rotor.
★Repair or replace the damaged parts.

Test No.3-Noise
●Check the ball bearings, stator coil, and/or rectifier if the alternator makes a noise.
★Repair or replace the damaged parts.

Alternator Inspection:
Ball Bearing Inspection
●Turn each bearing back and forth while checking for roughness or binding

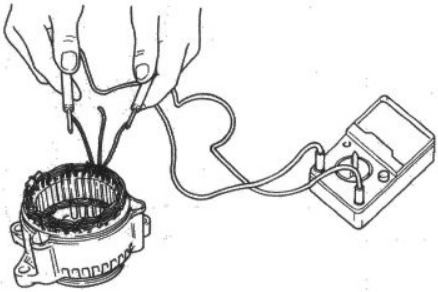
Bearing Inspection



★If roughness or binding is found, replace the bearing.
●Examine the bearing seal for tears or leakage.
★If the seal is torn or is leaking, replace the bearing

Stator Coil Inspection
●Measure the stator coil resistance.
○Connect an ohmmeter between the coil wirings.
○Set the meter to the x 1 Ω range, and read the meter.

Stator Coil Resistance



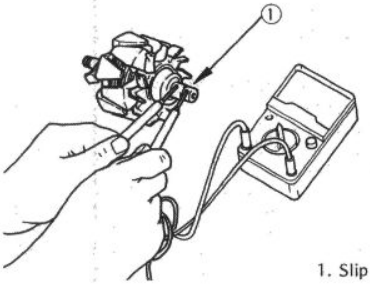
★If the meter does not read as specified, replace the stator coil.

Stator Coil Resistance
Less than 1.0 Ω

●Using the highest ohmmeter range, measure the resistance between the stator coil core and each of the coil windings.
★If there is any reading at all, the stator coil winding has a short and must be replaced.

Rotor Coil Inspection
●Measure the rotor coil resistance.
○Connect an ohmmeter between the slip rings.
○Set the meter to the x 1 Ω range, and read the meter.

Rotor Coil Resistance



1. Slip Ring

★If the meter does not read as specified, replace the rotor.

Rotor Coil Resistance
About 4 Ω

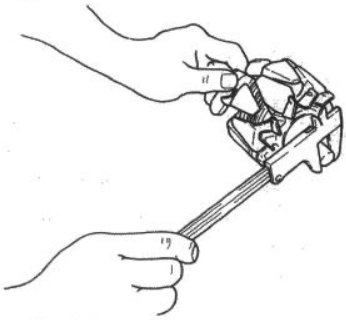
●Using the highest ohmmeter range, measure the resistance between the rotor shaft and each of the slip rings.
★If there is any reading at all, the rotor coil has a short and must be replaced.

Slip Ring Cleaning
●Visually inspect the slip ring for dirt or pitting.
★If necessary, smooth the slip ring with No. 300 – No. 500 emery cloth.

Slip Ring Diameter
●Measure the diameter of the slip ring.
★If the measurement is less than the service limit, replace the rotor.

Slip Ring Diameter
Standard: 14.4 mm
Service Limit: 14.0 mm

Slip Ring Diameter

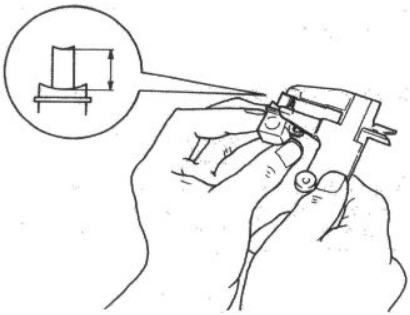


Carbon Brush Length

- Measure the length of both carbon brushes that stick out of the housing.

★If either one is worn down to less than the service limit, replace it.

Carbon Brush Length Measurement



Carbon Brush Length (projected portion)
Standard: 10.5 mm
Service Limit: 4.5 mm

Rectifier Inspection

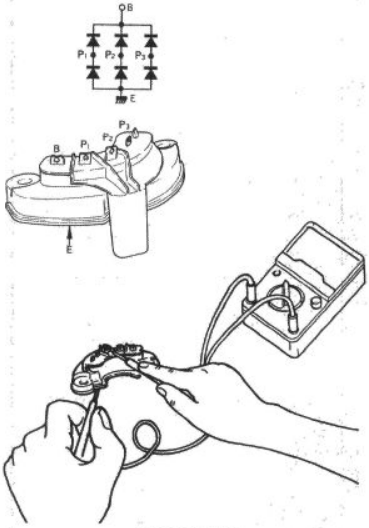
- Set an ohmmeter to the x 1 kΩ range.
- Connect the ohmmeter to the ends of each diode, and check the resistance in both direction. The resistance should be low in one direction and more than ten times as much in the other direction.

★If any diode shows low or high in both directions, the diode is defective and the rectifier must be replaced.

NOTE

○*The actual meter reading varies with the meter used and the individual diode, but, generally speaking, the lower reading should be from zero to the first 1/2 of the scale.*

Rectifier Inspection



CAUTION

○**If a megger or a meter with a large-capacity battery is used, the rectifier will be damaged.**

Regulator Inspection

- Prepare testing tools.

Test light:	Bulb rated 12 V 3.4 W
Batteries:	Two 12 V batteries
Test wires:	Three auxiliary wires

CAUTION

○**The test light works as an indicator and also a current limiter to protect the regulator from excessive current. Do not use an ammeter instead of a test light.**

- Connect the test light and the 12 V battery to the regulator as shown. The test light should go on at this time.

CAUTION

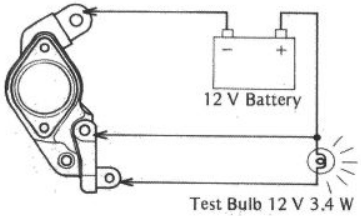
○**Do not contact the regulator metal case with the wires from the battery (+) or (–) terminal during the test.**

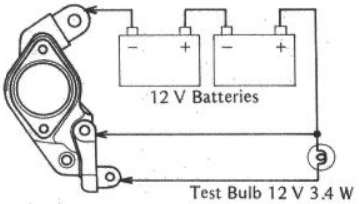
★If the test light does not go on, the regulator is damaged and must be replaced.

- Connect the test light and two 12 V batteries to the regulator as shown. The test light should not go on at this time.

★If the test light goes on, the regulator is damaged and must be replaced.

Regulator Inspection





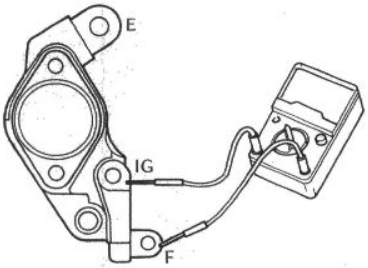
●Check the resistance in both directions between the terminals of the regulator with an ohmmeter as shown.

Regulator Internal Resistance

Meter Range	Connections		Reading
	Meter (+) to	Meter (–) to	
x 100 Ω	F	E	170 Ω
x 1 kΩ	E	F	4 kΩ
x 100 Ω	IG	E	800 Ω
x 1 kΩ	E	IG	2 kΩ
x 1 kΩ	F	IG	2 kΩ
x 100 Ω	IG	F	150 Ω

★Meter readings should be nearly values shown in the table. If the resistance is infinity (no reading) or 0 Ω, the regulator is damaged and must be replaced.

Regulator Inspection



Ignition System

Safety Instructions:

WARNING

○**The ignition system produces extremely high voltage. Do not touch the spark plugs, high tension coils, or spark plug leads while the engine is running, or you could receive a severe electrical shock.**

CAUTION

○**Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC igniter damage.**

○**Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and IC igniter.**

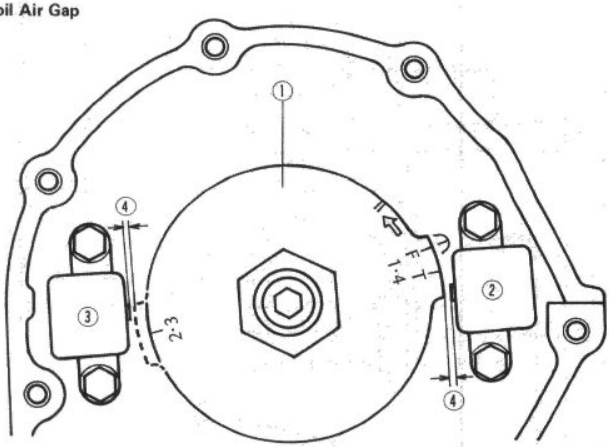
Parts Removal:

Pickup Coil Removal/Installation Notes

●Install the pickup coils so that the air gaps (clearance between the timing rotor projection and the pickup coil core) of both pickup coils are equal.

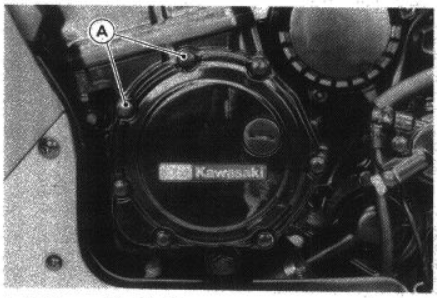
Pickup Coil Air Gap
0.5 – 0.9 mm

Pickup Coil Air Gap



1. Timing Rotor
2. #1 & 4 Pickup Coil
3. #2 & 3 Pickup Coil
4. Air Gap

●Apply a non-permanent locking agent to the threads of two bolts holding the pickup coil cover.



A. Bolts requiring locking agent

Ignition Coil Removal/Installation Notes

●Connect the primary wires to the primary coil terminals as follows:

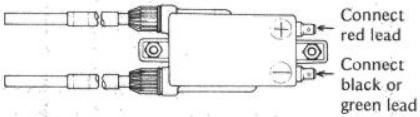
○Black and red wires → No. 1 & 4 ignition coil

○Green and red wires → No. 2 & 3 ignition coil

●The + and – markings next to the primary coil terminals on the ignition coil body indicate the polarity of the terminals. The polarity of the two spark plug leads are as shown when the primary leads are connected as indicated in the figure. But both the primary wires (positive red, and negative black and green) can be connected with either terminal on the ignition coil without changing the engine performance.

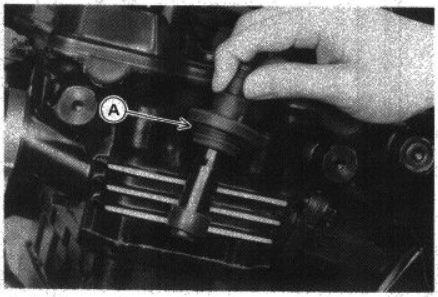
Polarity of Ignition Coil

(–) #1 or #2 spark plug lead



(+) #4 or #3 spark plug lead

●Apply grease to the neck under the flange of the spark plug cap, and put it on the spark plug.



A. Apply grease.

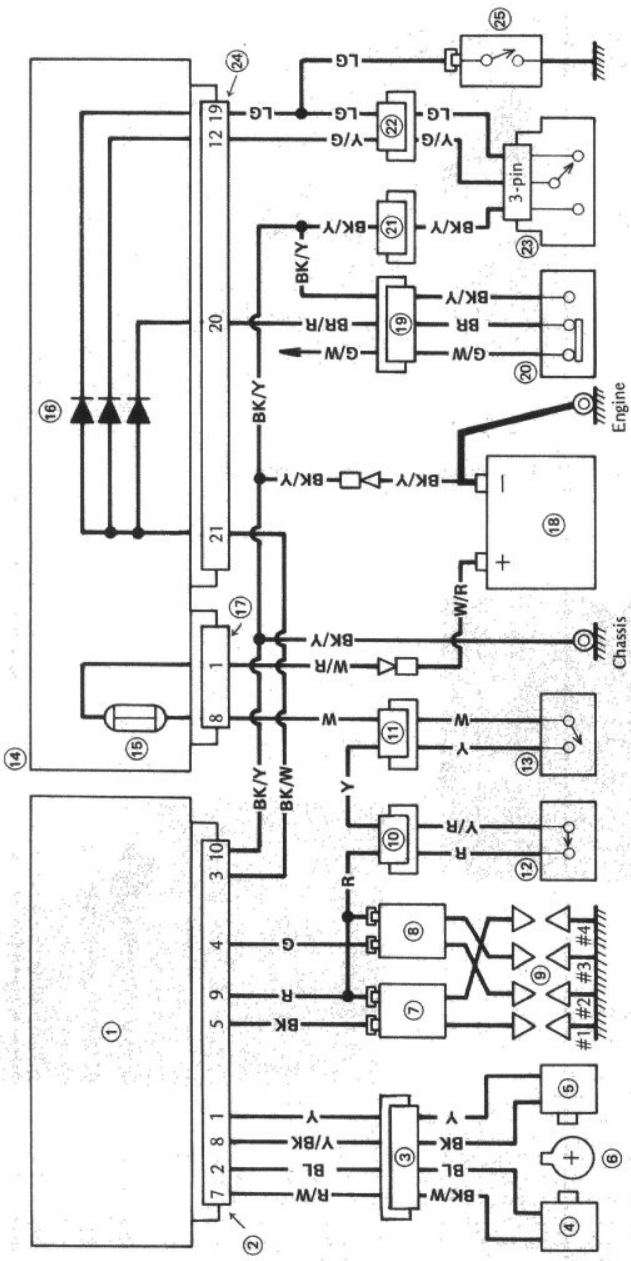
Spark Plug Removal/Installation Note

●Carefully pull the spark plug cap from the spark plug and the unscrew the spark plug.

○If necessary, use spark plug wrench 57001-1024.

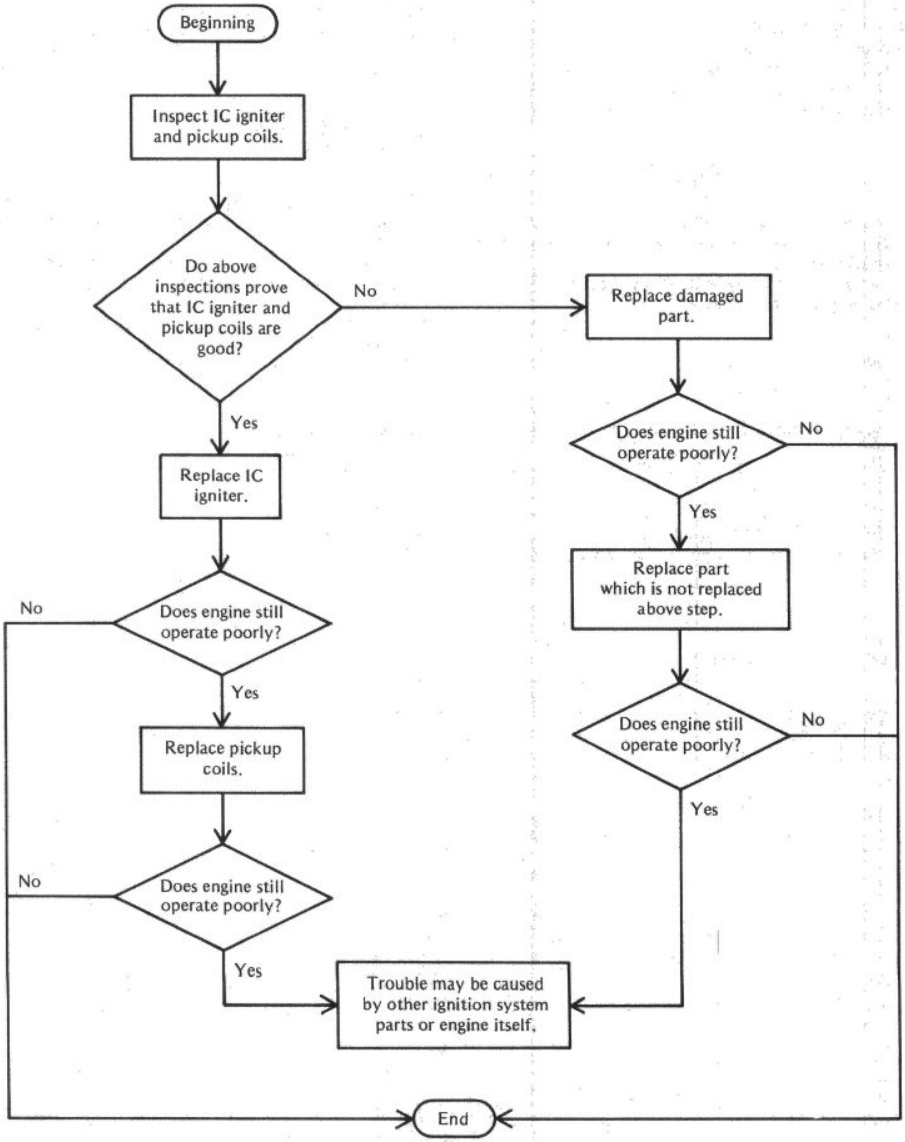
●Tighten the spark plug to the specified torque (see Exploded View).

Ignition System Wiring Diagram



1. IC igniter
2. IC igniter 10-pin connector
3. Pickup coil 4-pin connector
4. Pickup coil for #2 and #3 cylinder
5. Pickup coil for #1 and #4 cylinder
6. Timing rotor
7. Ignition coil for #1 and #4 cylinders
8. Ignition coil for #2 and #3 cylinders
9. Spark Plugs
10. Engine stop switch 4-pin connector (US model: 6-pin connector)
11. Ignition switch 6-pin connector
12. Engine stop switch
13. Ignition switch
14. Junction box
15. 30A fuse
16. Diodes
17. Junction box 4-pin connector
18. Battery
19. Side stand switch 3-pin connector
20. Side stand switch
21. LH switch 9-pin connector
22. Starter lockout switch 2-pin connector
23. Starter lockout switch
24. Junction box 18-pin connector
25. Neutral switch

Ignition System Troubleshooting:



Ignition System Inspection:

For any ignition system problems, always check the ignition system wiring first (see Wiring Inspection).

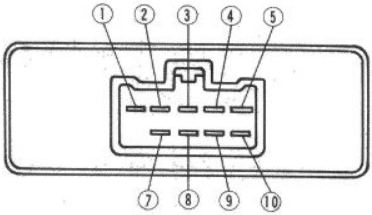
IC Igniter Inspection

- Remove the IC igniter.
- Set the ohmmeter to the x 1 kΩ range and make the measurements shown in the table.
- ★If the meter readings are not as specified, replace the IC igniter.

CAUTION

- ○**Use only Hand Tester 57001-983 for this test. A tester other than the Kawasaki Hand Tester may show different readings.**
- ○**If a megger or a meter with a large-capacity battery is used, the IC igniter will be damaged.**

Terminal No. of IC Igniter



IC Igniter Intenal Resistance*

Tester (−) Lead Connection \ Tester (+) Lead Connection	1	2	3	4	5	7	8	9	10
1		A	D	B	B	A	A	B	A
2	A		D	B	B	A	A	B	A
3	D	D		E	E	D	D	B	D
4	∞	∞	∞		∞	∞	∞	∞	∞
5	∞	∞	∞	∞		∞	∞	∞	∞
7	A	A	D	B	B		A	B	A
8	A	A	D	B	B	A		B	A
9	B	B	B	C	C	B	B		A
10	A	A	C	A	A	A	A	A	

Value (kΩ)	
∞	Infinity
A	2 – 6
B	5 – 11
C	9 – 20
D	15 – 28
E	25 – 55

*Measured with hand tester 57001-983. A tester other than the Kawasaki Hand Tester may show different readings.

Pickup Coil Inspection

- Disconnect the pickup coil connector.
- Zero the ohmmeter, and connect it to pickup coil leads.
- ★If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

Pickup Coil Resistance
390 – 590 Ω

- Using the highest resistance range of the ohmmeter, measure the resistance between the pickup coil leads and chassis ground.
- ★Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pickup coil assembly.
- Check the pickup coil air gaps (clearance between the timing rotor projection and the pickup coil core).
- ★If both air gaps are not equal, reposition the pickup coils.

Pickup Coil Air Gap
0.5 – 0.9 mm

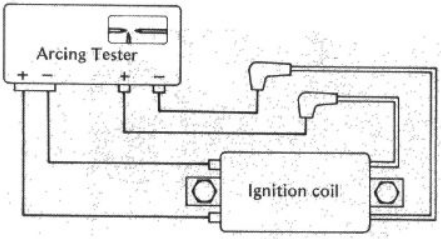
Ignition Coil Inspection

Measuring arcing distance:

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance with a suitable tester for the 3-needle method.

●Remove the ignition coil.
●Connect the ignition coil (with the spark plug cap left installed at each of the spark plug lead) to the tester, and measure the arcing distance.

Ignition Coil Test



WARNING

○**To avoid extremely high voltage shocks, do not touch the coil or leads.**

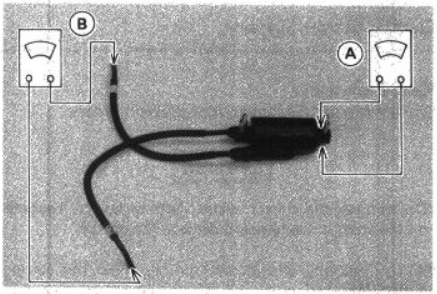
★If the distance reading is less than the specified value, the ignition coil or spark plug caps are defective.

Ignition Coil Arcing Distance
7 mm or more

●To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil.
★If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug caps.

Measuring coil resistance:
If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.
●Disconnect the primary leads from the coil terminals.
●Measure the primary winding resistance.
○Connect an ohmmeter between the coil terminals.
○Set the meter to the x 1 Ω range, and read the meter.
●Measure the secondary winding resistance.
○Pull the spark plug cap off each lead.
○Connect an ohmmeter between the spark plug leads.
○Set the meter to the x 1 kΩ range, and read the meter.
★If the meter does not read as specified, replace the coil.

Ignition Coil Winding Resistance
Primary windings: 1.8 – 2.8 Ω
Secondary windings: 10 – 16 kΩ



A. Measure primary winding resistance.
B. Measure secondary winding resistance.

★If the meter reads as specified, the ignition coil windings are probably good. However, if the ignition system still does not perform as it should after all other components have been checked, test replace the coil with one known to be good.
●Check the spark plug leads for visible damage.
★If any spark plug lead is damaged, replace the coil.

Spark Plug Cleaning and Inspection

●Remove the spark plug.
●Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool.
★If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug or its equivalent.

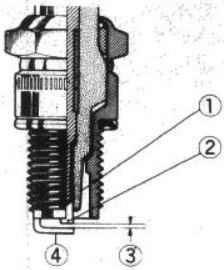
Spark Plug Gap

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

Spark Plug Gap

0.6 – 0.7 mm

Spark Plug Gap



1. Insulator
2. Center Electrode
3. Plug Gap
4. Side Electrode

Electric Starter System

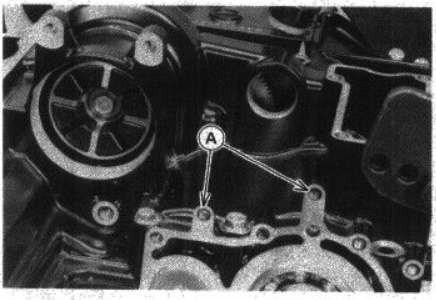
Parts Removal:

Starter Motor Removal/Installation Notes

CAUTION

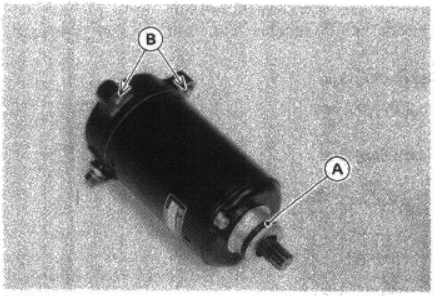
○**Do not tap the starter motor shaft or body. Tapping on the shaft or body could damage the motor.**

●When installing the starter motor, clean the starter motor legs and crankcase where the starter motor is grounded.



A. Clean here.

●Apply a small amount of engine oil to the O-ring.



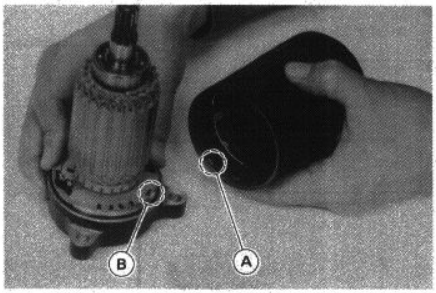
A. O-ring B. Clean here.

●Check and adjust the following items.
Engine Oil
Drive Chain Slack

Starter Motor Disassembly/Assembly Notes

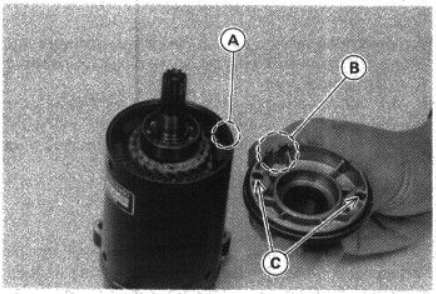
●Before removing or installing the RH end cover, cover the teeth of pinion with a thin tape to prevent the damaging the oil seal.

●Fit the alignment projection of the yoke into the notches of the brush plate and the LH end cover.



A. Projection B. Notches

●Fit one of the projections on the yoke into the groove of the RH end cover, and at the same time align the holes for the end cover screws.



A. Projection
B. Groove
C. End Cover Screw Holes

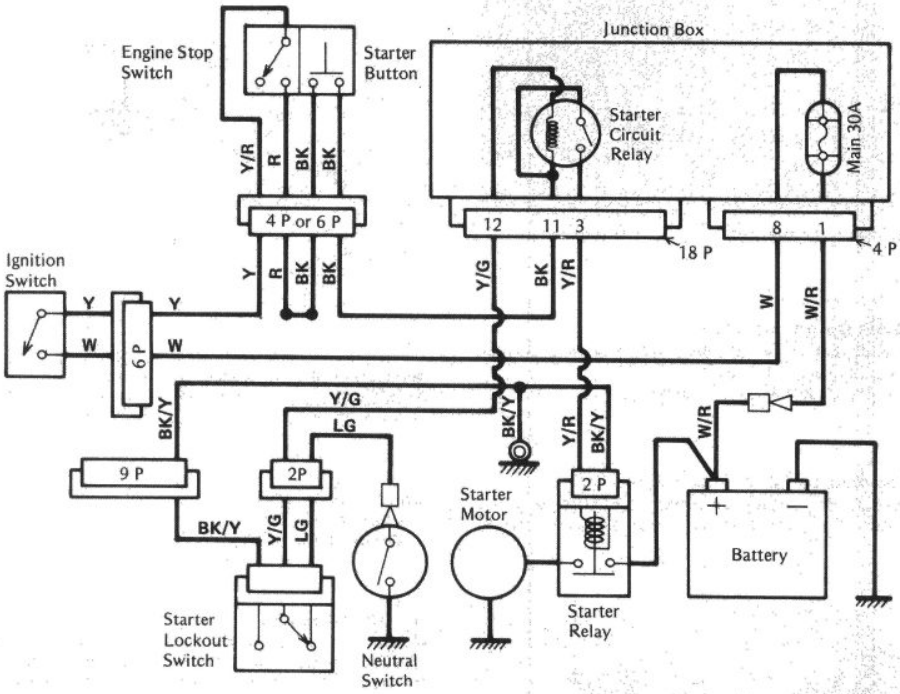
Inspection:

For any electrical starter system problems, always check the electrical starter system wiring first (see Wiring Inspection).

CAUTION

○**Because of the large amount of current, never keep the starter switch pushed any time that the starter motor will not turn over, or the current may burn out the starter motor windings.**

Electric Starter Circuit



Starter Relay Inspection

●Disconnect the starter motor lead and battery positive (+) lead from the starter relay.

CAUTION

○**The battery positive (+) lead with the rubber cap is connected directly to the battery positive (+) terminal even when the ignition switch is off, so take care not to short the removed lead to chassis ground.**

●Using the x 1 Ω ohmmeter range, measure the resistance across the relay terminals.

★If the relay clicks but the meter does not read zero, the relay is defective and must be replaced. If the relay does not click at all, the relay is defective and must be replaced.

★If the relay makes a single clicking sound and the meter reads zero the relay is good. The trouble is in the starter motor or the motor power supply wires.

Switch Position:
Ignition switch ON
Engine stop switch RUN
Starter button ON
Neutral switch ON (Transmission is in Neutral)

Meter Connection:

Location	**Starter relay terminals (Leads disconnected)**
Meter Range	**x 1 Ω**
Meter Reading:	**0 Ω and relay clicks when starter button is pushed.**

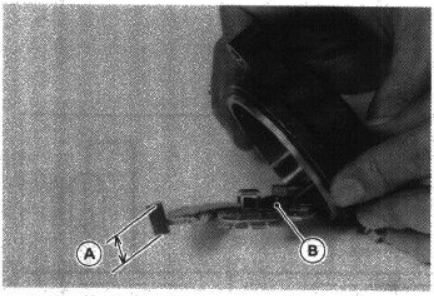
Brush Inspection

●Measure the length of each brush.

★If any is worn down to the service limit, replace all brushes.

Starter Motor Brush Length

Standard:	**12 mm**
Service Limit:	**8.5 mm**



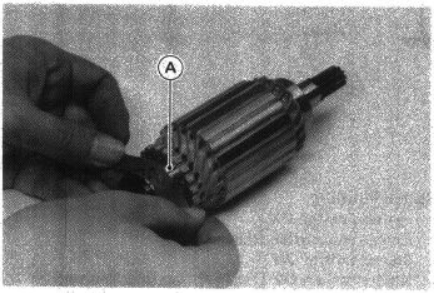
A. Measure brush length. B. Brush Spring

Brush Spring Inspection

- Check that the brush springs are in place and snap the brushes firmly into place.
- ★If not, reinstall or replace the spring.

Commutator Cleaning and Inspection

- Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated.



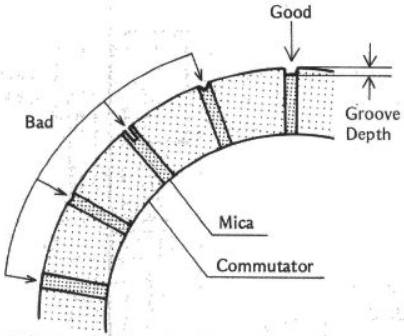
A. Commutator

- Determine as accurately as possible the depth of the grooves between commutator segments.
- ★Replace the starter motor with a new one if the groove depth is less than the service limit.

Commutator Groove Depth

Standard:	**0.45 – 0.75 mm**
Service Limit:	**0.2 mm**

Commutator



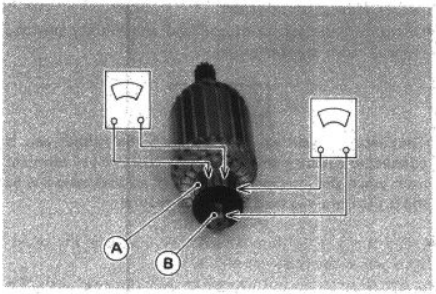
- Measure the diameter of the commutator.
- ★Replace the starter motor with a new one if the commutator diameter is less than the service limit.

Commutator Diameter

Standard:	**28 mm**
Service Limit:	**27 mm**

Armature Inspection

- Using the x 1 Ω ohmmeter range, measure the resistance between any two commutator segments.
- ★If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.



A. Segment B. Shaft

- Using the highest ohmmeter range, measure the resistance between the commutator and the shaft.

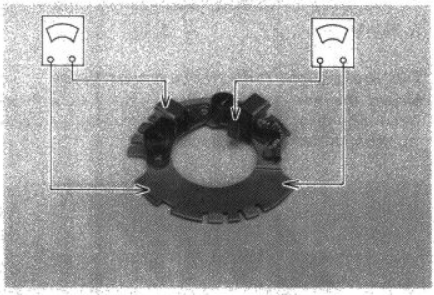
★If there is any reading at all, the armature has a short and the starter motor must be replaced.

Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. 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 Plate Inspection

●Using the x 1 Ω ohmmeter range, measure the resistance between the brush and the plate.

★If there is not close to zero ohms, the brush plate has an open and it must be replaced.



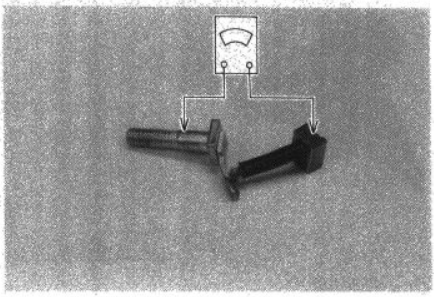
●Using the highest ohmmeter range, measure the resistance between the metal plate and the brush holders.

★If there is any reading at all, the brush holder has a short and the brush plate must be replaced.

Brush and Lead Assembly Inspection

●Using the x 1 Ω ohmmeter range, measure the resistance between the brush and the terminal bolt.

★If there is a high resistance or no reading (∞), a lead is open and the brush and lead assembly must be replaced.

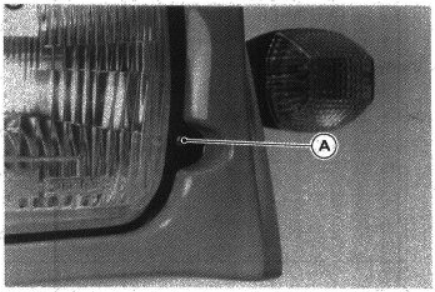


Lighting System

Adjustment:

The headlight beam is adjustable both horizontally and vertically. Headlight aiming must be correctly adjusted for your safe riding as well as oncoming drivers. In most areas it is illegal to ride with improperly adjusted headlights.

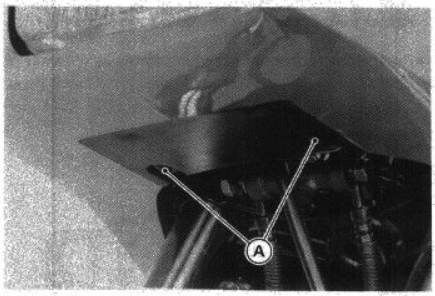
Headlight Beam Horizontal Adjustment



A. Adjusting screw for horizontal adjustment

Headlight Beam Vertical Adjustment

●Remove the bolts holding the cover under the headlight.

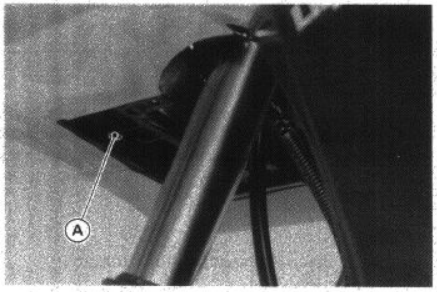


A. Cover Bolts

●Loosen the lower headlight bolt, and adjust the headlight vertically.

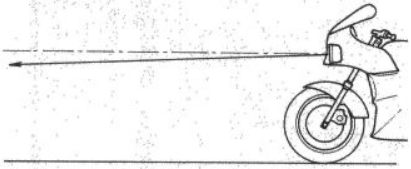
NOTE

○*On high beam, the brightest point should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight to the proper angle according to local regulations.*



A. Lower Headlight Bolt

Vertical Adjustment



Parts Removal:

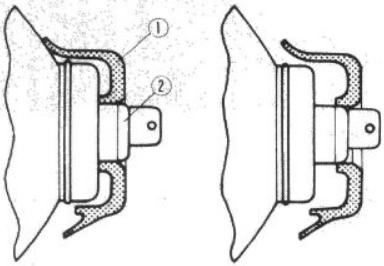
Headlight Bulb Replacement Notes

CAUTION

○**When handling the quartz-halogen bulbs, 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.**

●Fit the dust cover onto the bulb firmly as shown in the figure.

Dust Cover Installation

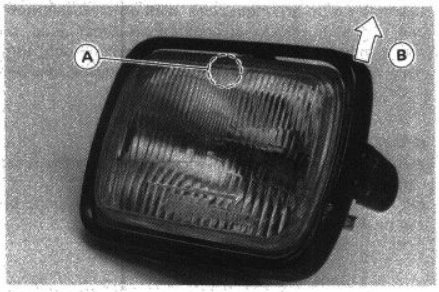


Good Bad

1. Dust Cover
2. Headlight Bulb

Headlight Unit Removal/Installation Note

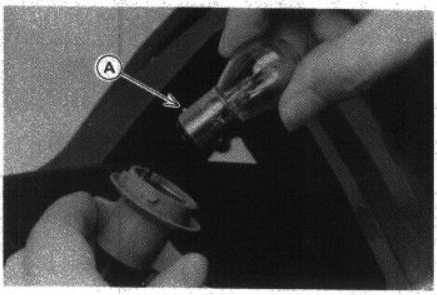
●Install the headlight unit so that the "TOP" mark on the lens points up.



A. Top Mark B. Up

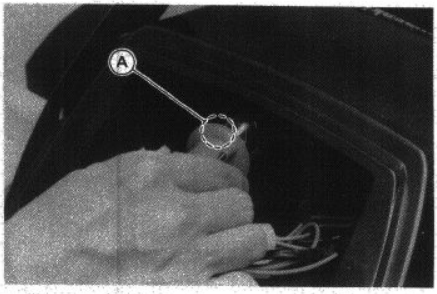
Tail/Brake Light Bulb Replacement Notes

●Insert the new bulb by aligning the pins with the grooves in the walls of the socket so that the pin closest to the bulb base is to the upper right.

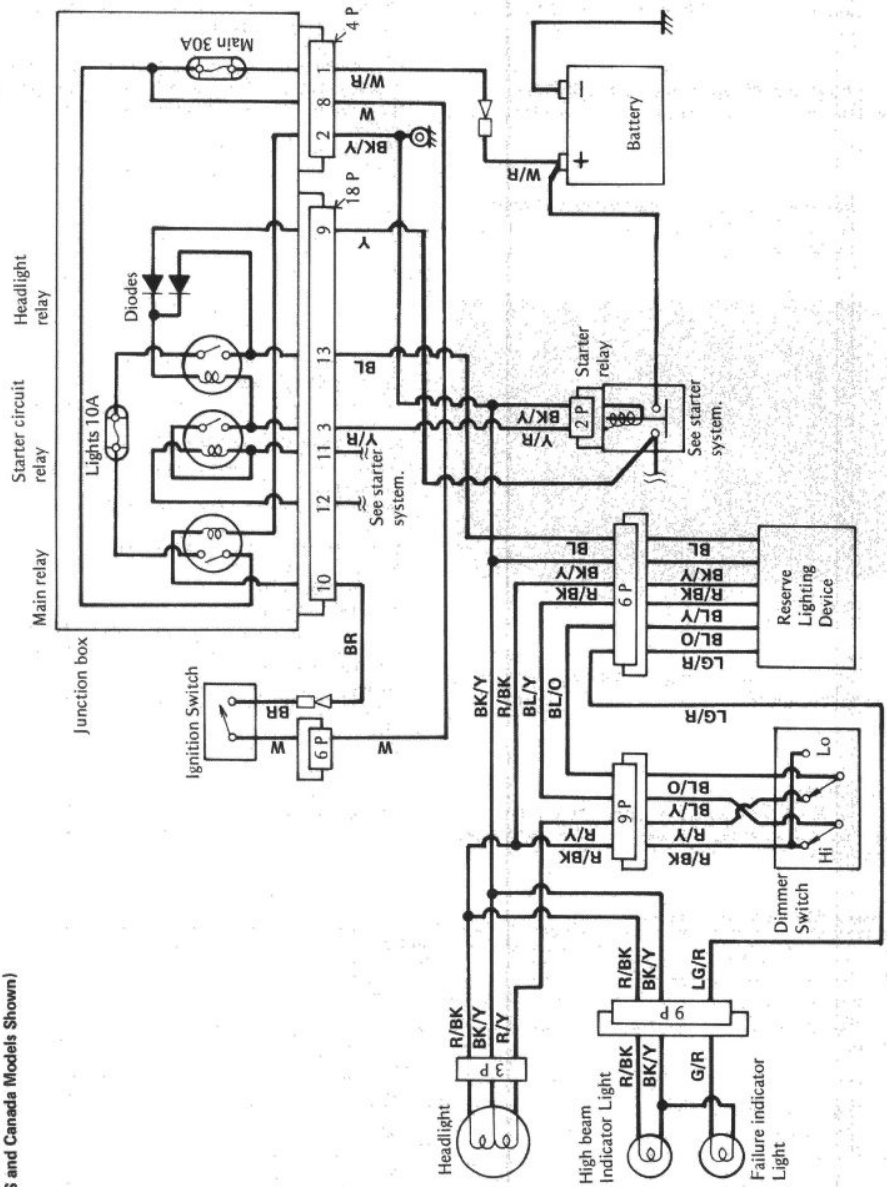


A. Pin Closest to Base.

●Insert the socket by aligning the tangs with the catches in the housing so that the triangular mark points up, and turn it clockwise.



A. Triangular Mark



Headlight Circuit (US and Canada Models Shown)

Tail/Brake Light Lens Removal/Installation Note

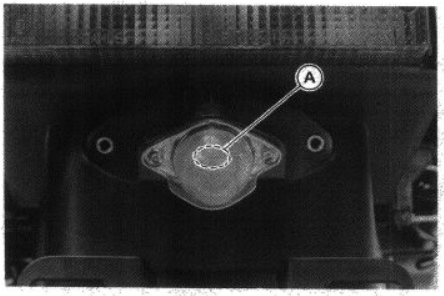
●Be careful not to overtighten the lens mounting screws.

Turn Signal Light Bulb Replacement Note

●Be careful not to overtighten the lens mounting screws.

License Plate Light Bulb Replacement Notes

●Install the bulb socket and lens so that the "TOP" mark on the lens points up.



A. "TOP" Mark

●Be careful not to overtighten the lens and socket mounting screws.

Inspection:

For any lighting system problems, always check the lighting system wiring and the bulbs first (see Wiring Inspection).

Headlight Reserve Lighting System Inspection

The US and Canadian models contain a relay in the headlight circuit. In these models, the headlight does not go on when the ignition switch is first turned on, but the headlight goes on once the starter button is pushed to start the engine, and stays on until the ignition switch is turned off. But the headlight goes out whenever the starter button is pushed to restart the engine after engine stalling.

★If all wirings and components other than the reserve lighting device check out good, the device is defective.

Cooling Fan System

Fan System Circuit Inspection

●Disconnect the female 6-pin connector from the fan switch relay.

●Ground the red/white wire to the engine with a suitable wire.

★If the fan turns, inspect the following.

○Wires and Connectors

○Junction Box Parts

○Fan Switch Relay

○Switches (Fan Switches and Oil Temperature Switch)

★If the fan does not turns, inspect the following.

○Wires and Connectors

○Junction Box Parts

○Fan Relay

○Fan

Fan Inspection

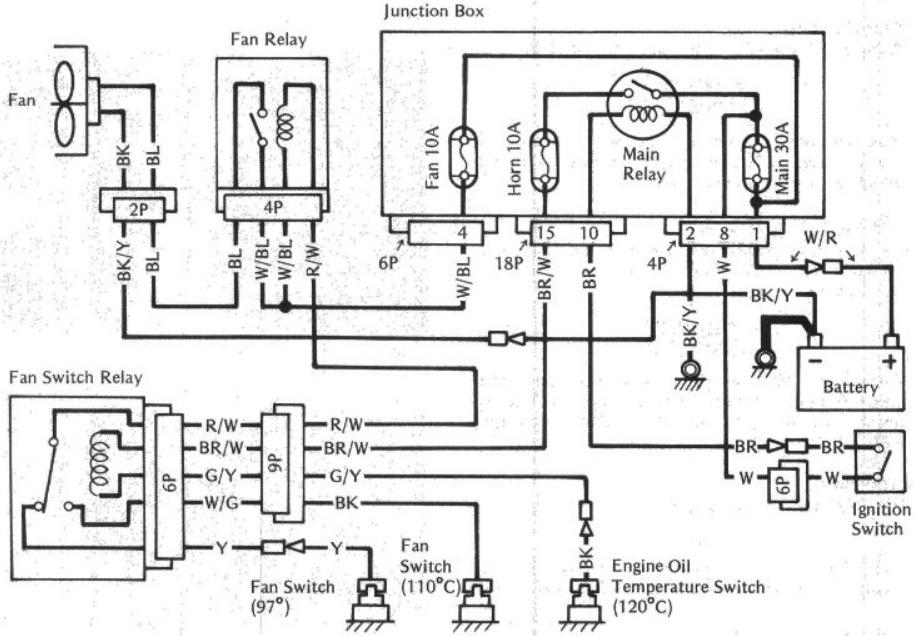
●Disconnect the 2-pin connector of the fan leads.

●Using two auxiliary wires, supply battery power to the fan.

Reserve Lighting System Operation

Headlight	Dimmer Switch Position	Headlight Failure Indicator Light	Reserve Lighting
Both high and low beam filaments are normal	HI	Goes on (hardly visible)	————
	LO	Goes on (hardly visible)	————
High beam filament burned out	HI	Goes on	Low beam comes on.
	LO	Goes on (hardly visible)	————
Low beam filament burned out	HI	Goes on (hardly visible)	————
	LO	Goes on	High beam comes on dimly.

Cooling Fan Circuit



Wire Connections

Blue Lead ⟷ Battery (+)
Black/Yellow Lead ⟷ Battery (–)

★If the fan does not turn at this time, the fan is defective and must be replaced.

Fan Relay Inspection

Refer to the Main, Starter Circuit, and Headlight Relay Inspection in the Junction Box section.

Fan Switch Relay Inspection

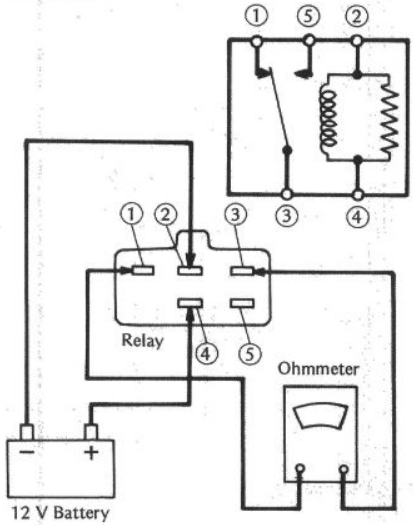
- Remove the relay from the motorcycle.
- Connect an ohmmeter and one 12 V battery to the relay as shown.

★If the relay does not work as specified, the relay is defective.

Testing Relay

	①	③	⑤
	Y	R/W	W/G
When battery is connected		○—○	
When battery is disconnected	○—○		

Testing Relay



Meters and Gauges

Parts Removal:

Meter and Gauge Removal/Installation Note

CAUTION

○**Place the meter or gauge so that the face is up. If a meter or gauge is left upside down or sideways for any length of time it will malfunction.**

Bulb Replacement Notes

●To remove the wedge-base type bulbs (indicator and illumination), pull out the bulb sockets and pull the bulbs off the sockets.

CAUTION

○**Do not use bulbs rated for greater wattage than the specified value, as the meter or gauge panel could become warped by excessive heat radiated from the bulbs.**

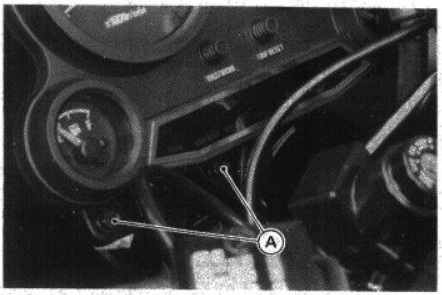
Inspection:

Tach/Voltmeter Inspection

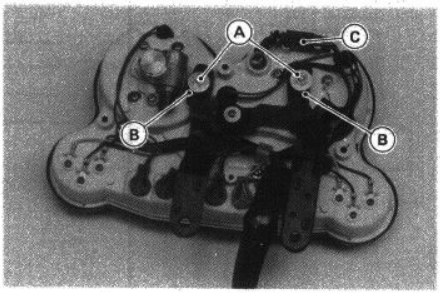
NOTE

○*The Tach/Voltmeter inspection is explained on the assumption that the ignition system operates normally.*

●Check to see that the rubber dampers are installed at the meter mounting bracket.
★Install a new damper where it is absent.
●Check to see that the rubber dampers at the meter mounting bracket are in good condition they should not be hard or cracked.
★Replace any damaged rubber dampers with new ones.
●Check to see that all meter mounting bolts and nuts are tightened securely.
★Tighten the loose fasteners.

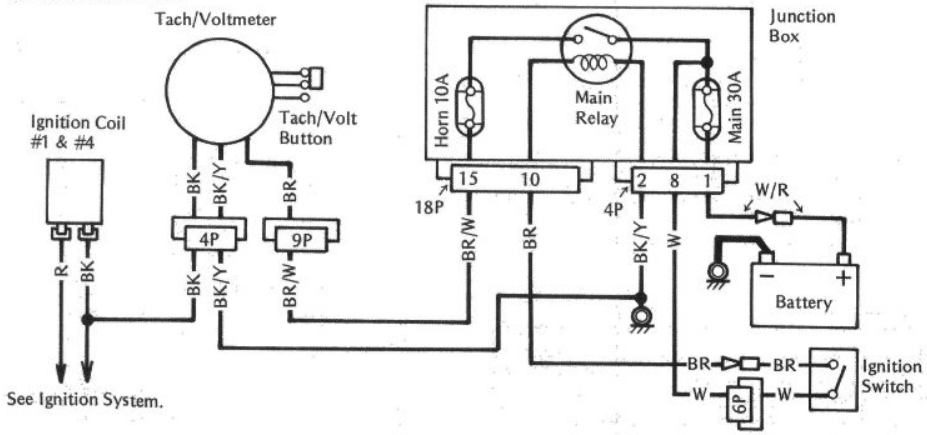


A. Meter Mounting Bolts



A. Meter Mounting Nuts
B. Rubber Damper
C. Tach/Voltmeter 3pin Connector

Tach/Voltmeter Circuit



•Check the tach/voltmeter circuit wiring (see Wiring Inspection).
★If all wiring and components other than the tach/voltmeter unit check out good, the unit is defective.

Fuel Gauge Operation Inspection

•Prepare an auxiliary wire, and check the operation of the gauge.

Fuel Gauge Operation Check

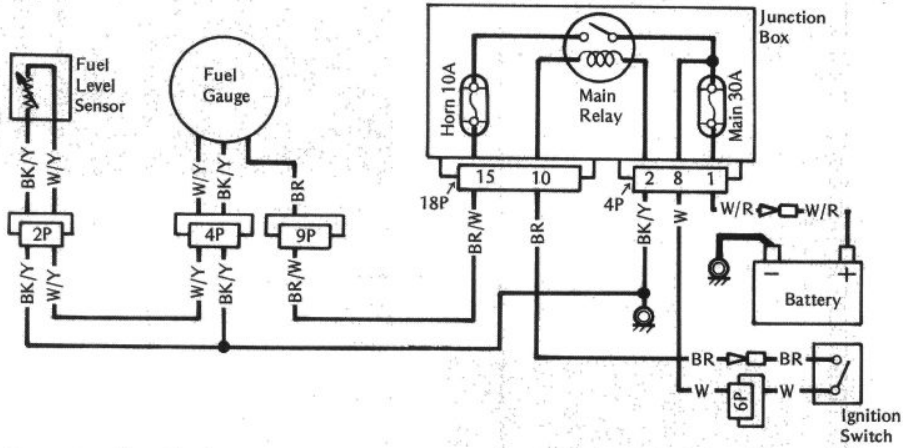
Ignition Switch Position: ON
Wire Location: Female 2-pin sensor connector (disconnected)
Results: Gauge should read E when connector wires are opened.
Gauge should read F when connector wires are shorted.

★If the gauge readings are correct, the fuel level sensor is bad. If these readings are not obtained, the trouble is with the gauge and/or wiring.
•Check the fuel gauge circuit wiring (see Wiring Inspection).
★If all wiring and components other than the fuel gauge unit check out good, the unit is defective.

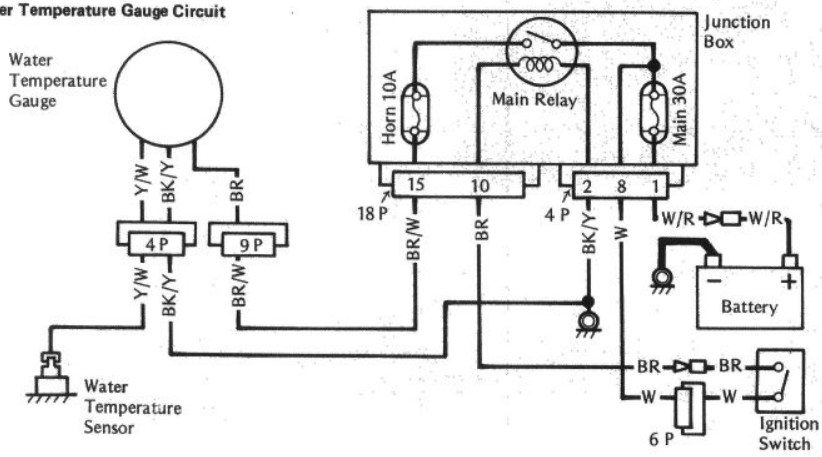
Water Temperature Gauge Operation Inspection

•Prepare an auxiliary wire, and check the operation of the gauge.

Fuel Gauge Circuit



Water Temperature Gauge Circuit



Gauge Operation Test

Ignition Switch Position: ON

Wire Location: Female, Sensor Connector (disconnected)

Results: Gauge should read C when connector wire is opened.
Gauge should read H when connector wire is grounded to engine.

CAUTION

○Do not ground the wiring longer than necessary. After the needle swings to the H position, stop the test. Otherwise the gauge could be damaged.

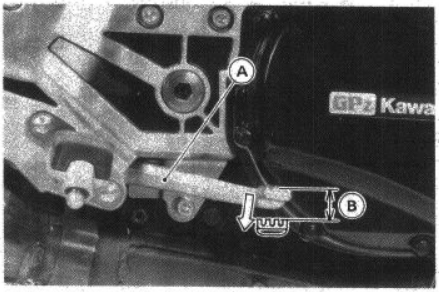
★If the gauge readings are correct, the water temperature sensor is bad. If these readings are not obtained, the trouble is with the gauge and/or wiring.
●Check the water temperature gauge circuit wiring (see Wiring Inspection).
★If all wiring and components other than the water temperature gauge unit check out good, the unit is defective.

Switches and Sensors

Adjustment:

Rear Brake Light Switch Inspection

●Turn on the ignition switch.
●Check the operation of the rear brake light switch by depressing the brake pedal. The brake light should go on after about 15 mm of pedal travel.



A. Rear Brake Pedal B. 15 mm

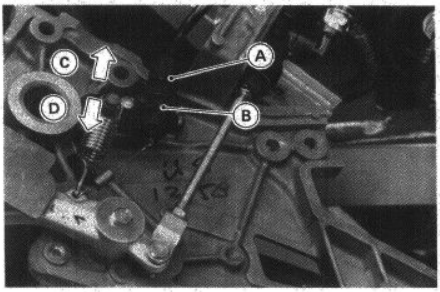
★If it does not, adjust the brake light switch.

Rear Brake Light Switch Adjustment

●Remove the RH footpeg bracket from the frame (see Footpeg Bracket Removal in the Frame chapter).
●Turn the adjusting nut to adjust the switch.

CAUTION

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



A. Rear Brake Light Switch
B. Adjusting Nut
C. Lights sooner.
D. Lights later.

Parts Removal:

Removal Note

●Refer to the appropriate chapters for the switches and sensors.

Inspection:

Switch Inspection

●Using an ohmmeter, check to see that only the connections shown in the table have continuity (about zoro ohms).
★If the switch has an open or short, repair it or replace it with new one.

Starter Lockout Switch Connections

	BK/Y	Y/G	LG
When clutch lever is pulled in	○——	——○	
When clutch lever is released		○——	——○

Ignition Switch Connections

	BR	W	Y	BL	R	W/BK	O/G
OFF, LOCK							
ON	○——	——○	——○	○——	——○	○——	——○
P(Park)		○——	———	———	——○	○——	——○
						US, Canada	

Dimmer Switch Connections (US, Canada)

	BL/Y	BL/O	R/Y	R/BK
HI	○	○	○	○
LO	○	○	○	○

Dimmer Switch Connections (Other than US, Canada)

	R/BK	BL/Y	R/Y
HI	○	○	
LO		○	○

Turn Signal Switch Connections

	GY	O	G
R	○	○	
N			
L		○	○

Hazard Switch Connections

	GY	O	G
Off ■			
On ▬	○	○	○

Passing Button Connections

	BR	R/BK
Free		
Push on	○	○

Horn Button Connections

	BK/W	BK/Y
Free		
Push on	○	○

Engine Stop Switch Connections

	R	Y/R
OFF		
RUN	○	○

Starter Button Connections

	BK	BK
Free		
Push on	○	○

Headlight Switch Connections

	R/W	R/BL	BL	BL/Y
OFF				
■	○	○		
ON	○	○	○	○

Front Brake Light Switch Connections

	BR	BL
When brake lever is pulled in	○	○

Rear Brake Light Switch Connections

	BR	BL
When brake pedal is pushed down	○	○

Side Stand Switch Connections

	BR	BK/Y	G/W
When side stand is up	○	○	
When side stand is down		○	○

Neutral Switch Connections

	LG	⏚
When transmission is in neutral	○	○
When transmission is not in neutral		

Oil Pressure Switch Connections*

	SW. Terminal	⏚
When engine is stopped	○	○
When engine is running		

* : Engine lubrication system is in good condition.

Engine Oil Temperature Switch Connections

○**Rising temperature: From ON to OFF at 117 – 123°C (243 – 253°F)**

○**Falling temperature: From OFF to ON above 113°C ~~(253°F)~~** 235

~~**OFF:**~~ ON **Less than 0.5 Ω**

~~**ON:**~~ OFF **More than 1 MΩ**

Fan Switch (97°C) Connections

○**Rising temperature: From OFF to ON at 94 – 100°C (201 – 212°F)**

○**Falling temperature: From ON to OFF above 90°C (194°F)**

~~**OFF:**~~ **Less than 0.5 Ω** ON

~~**ON:**~~ **More than 1 MΩ** OFF

Fan Switch (110°C) Connections

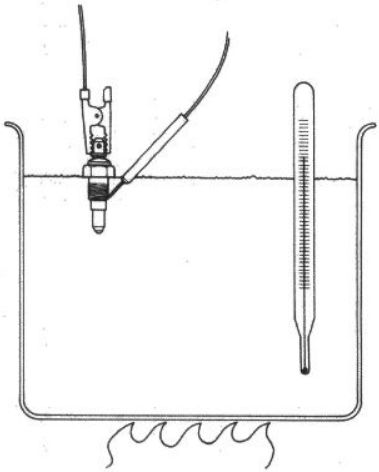
○**Rising temperature: From OFF to ON at 107 – 113°C (225 – 235°F)**

○**Falling temperature: From ON to OFF above 104°C (219°F)**

~~OFF~~: Less than 0.5 Ω ON

~~ON~~: More than 1 MΩ OFF

Oil Temperature and Fan Switch Inspection



●Suspend the switch in a container of water so that the temperature-sensing projection and threaded portion are submerged.

NOTE

○*Use oil for the oil temperature switch, and coolant for the 110°C Fan Switch.*

●Suspend an accurate thermometer in the water.

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 water while stirring the water gently.

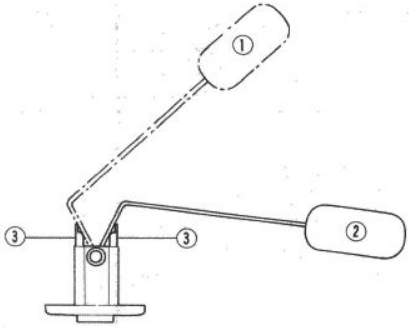
Fuel Level Sensor Inspection

●Remove the fuel level sensor.

●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.

Fuel Level Sensor



1. Float in full position
2. Float in empty position
3. Float arm stop

●Measure the resistance of the fuel level sensor with an ohmmeter.

★If the ohmmeter does not show the specified values, or the readings do not change smoothly as the float moves up and down, replace the sensor.

Fuel Level Sensor Resistance

Full Position: 3 – 12 Ω

Empty Position: 70 – 120 Ω

●Inspect the leads and 2-pin connector.

★If they show any signs of damage, replace the sensor.

Water Temperature Sensor Inspection

●Remove the water temperature sensor.

●Suspend the sensor in a container of water so that the temperature sensing projection and threaded portion are submerged. The sensor must not touch the container sides or bottom.

●Suspend an accurate thermometer in the water. It must not touch the container, either.

●Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.

●Using an ohmmeter, measure the internal resistance of the sensor across the terminal and the body at the temperatures shown in the table.

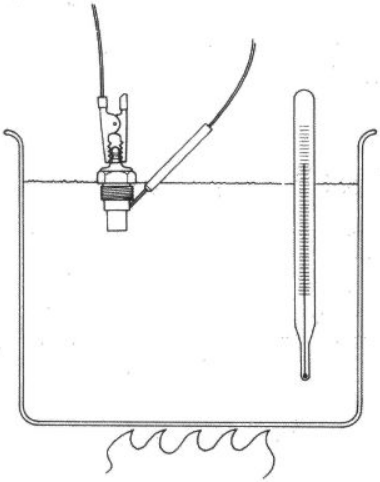
★If the ohmmeter does not show the specified values, replace the sensor.

Internal Resistance of Water Temperature Sensor

80°C (176°F): About 52 Ω

100°C (212°F): About 27 Ω

Water Temperature Sensor Inspection



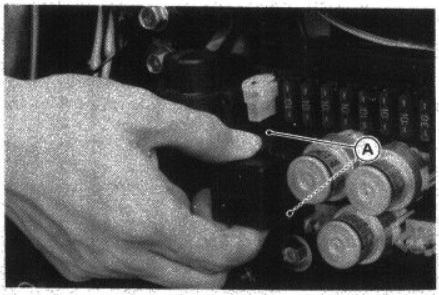
Junction Box

The junction box contains the following electrical components:
○Fuses
○Relays
○Diodes
○ACC 2-Pin Connector

Parts Removal:

Junction Box Parts Removal Note

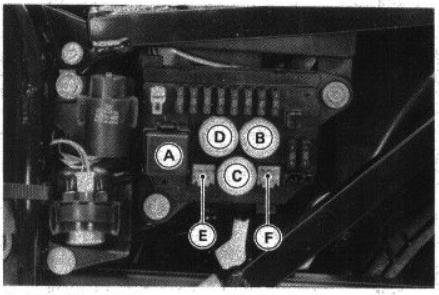
●Unlock the locking arm(s), and pull the relays and connectors straight off the junction box.



A. Unlock the locking arm(s)

Junction Box Parts Installation Notes

●Orient the relays and connectors correctly.
●Push the relays and connectors all the way in place until you feel a click.



A. Turn Signal Relay
B. Main Relay
C. Starter Circuit Relay
D. Headlight Relay
E. Diode Assembly for Headlight Relay
F. Diode Assembly for Starter Circuit Relay

Inspection:

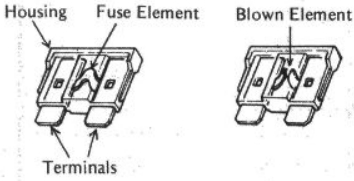
Fuse Inspection

●Remove the fuse from the junction box.
●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.

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.**

Fuse



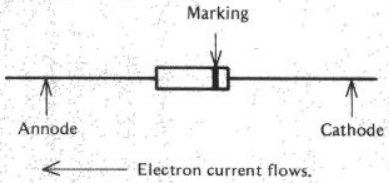
Diode Inspection

●Disconnect the diode assembly from the junction box.
●Zero the ohmmeter, and connect it to each diode lead to check the resistance in both directions.
★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 diode assembly must be replaced.

NOTE

○*The actual meter reading varies with the meter used and the individual diode, but, generally speaking, the lower reading should be from zero to the first ½ of the scale.*

Polarity of Diode

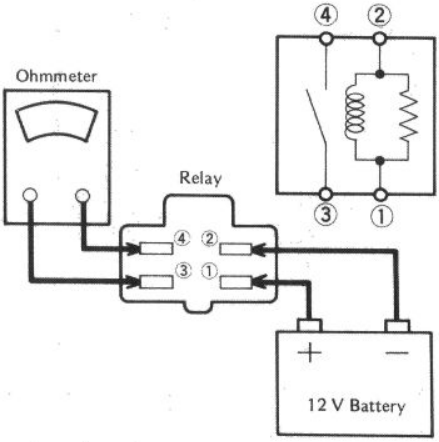


Main, Starter Circuit, and Headlight Relay Inspection

- Remove the relay from the junction box.
- Connect an ohmmeter and one 12 V battery to the relay as shown.
- ★If the relay does not work as specified, the relay is defective.

Testing Relay
Meter range: 1 Ω range
Criteria:
When battery is connected → 0 Ω
When battery is disconnected → ∞ Ω

Testing Relay

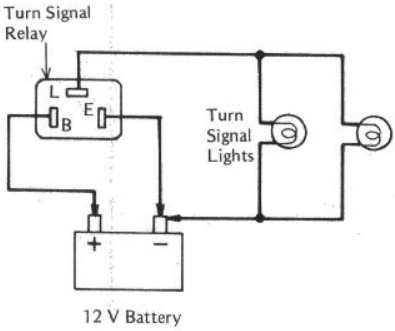


① and ② : Relay Coil Terminals
③ and ④ : Relay Switch Terminals

Turn Signal Relay Inspection

- Remove the turn signal relay from the junction box.
- 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.
- ★If the lights do not flash as specified, replace the turn signal relay.

Testing Turn Signal Relay
(Example: Two lights are connected.)



Testing Turn Signal

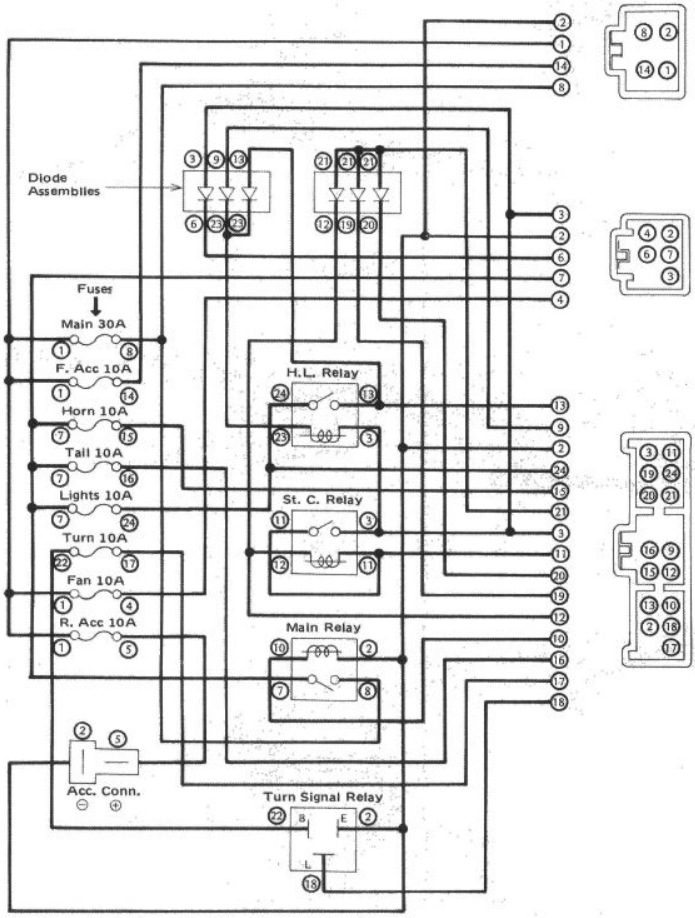
Load		Flashing Times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1	21 – 23	More than 150
2	42 – 46	75 – 95
3	63 – 69	
4	84 – 92	

* : Cycle(s) per minute

Junction Box Internal Circuit Inspection

- Remove the junction box from the motorcycle.
- Disconnect all the fuses, relays, diode assemblies, and connectors from the junction box.
- Make sure all connector terminals are clean and tight, and none of them have been bent.
- ★Clean the dirty terminals, and straighten slightly-bent terminals.
- Check conductivity of the internal circuit. Both terminals of the same number should conduct, and the differently numbered terminals should not conduct.
- ★If there are any open or short circuits, replace the junction box.

Junction Box Internal Circuit

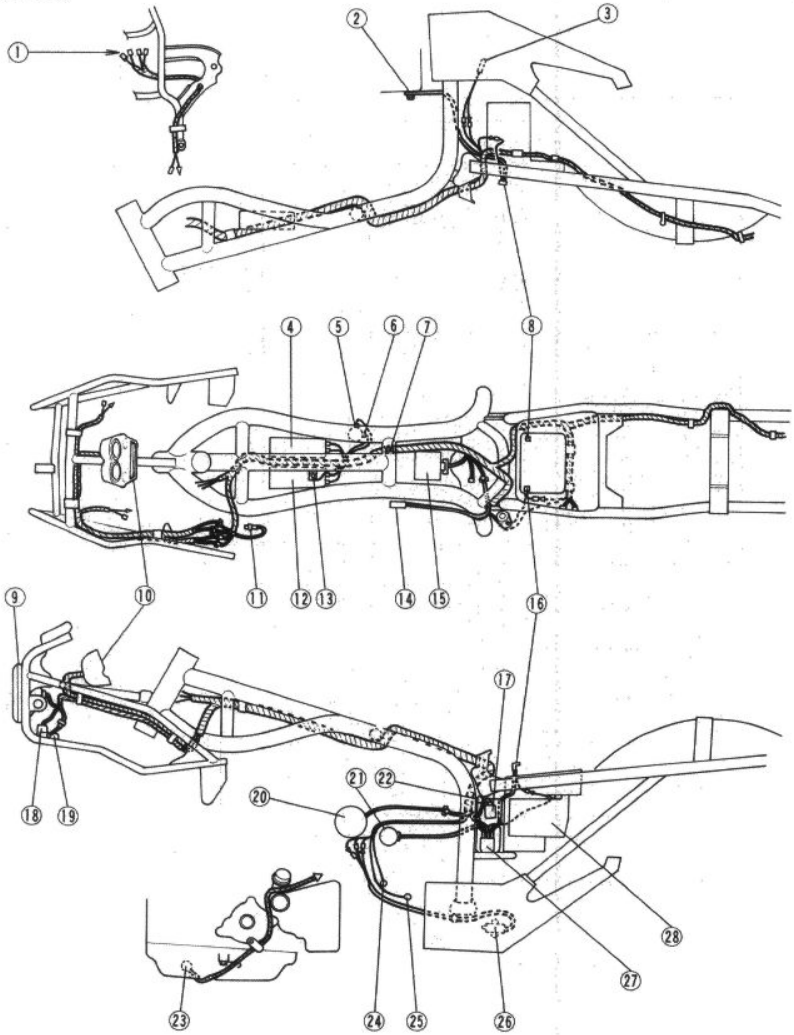


Electrical Wiring

Wiring Inspection

- ●Visually inspect the wiring for signs of burning, fraying, etc.
- ★If any wiring is poor, replace the damaged wiring.
- ●Pull each connector 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 an ohmmeter between the ends of the leads.
- ○Set the meter to the x 1 Ω range, and read the meter.
- ★If the meter does not read 0 Ω, the lead is defective. Replace the lead or the wiring loom if necessary.

Wiring Routing



1. Horns
2. Ground (Battery –)
3. Rear Brake Light Switch
4. Ignition Coil (#2 & 3)
5. Fan Switch (110°C)
6. Water Temperature Sensor
7. Position Mark (White Tape)
8. Battery ⊖
9. Headlight
10. Meters and Gauges Assembly
11. Fan Switch (97°C)
12. Ignition Coil (#1 & 4)
13. Ground (Main Harness)
14. Pickup Coils
15. IC Igniter
16. Battery ⊕
17. Fan Relay
18. Fan Switch Relay
19. Reserve Lighting Device
20. Alternator
21. Starter Motor
22. Ground (Main Harness)
23. Oil Temperature Switch
24. Neutral Switch
25. Oil Pressure Switch
26. Side Stand Switch
27. Starter Relay
28. Junction Box

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 points.

- 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 competitive 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.

Carburetor:

Sometimes an alteration may be desirable for improved performance under special conditions when proper mixture is not obtained after the carburetor has been properly adjusted, and all parts cleaned and found to be functioning properly.

If the engine still exhibits symptoms of overly lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a smaller or larger one. A smaller numbered jet gives a leaner mixture and a larger numbered jet a richer mixture.

Spark Plug:

The spark plug ignites the fuel/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 adjusted.

Test have shown the plug listed in the "Electrical System" chapter to be the best plug for general use.

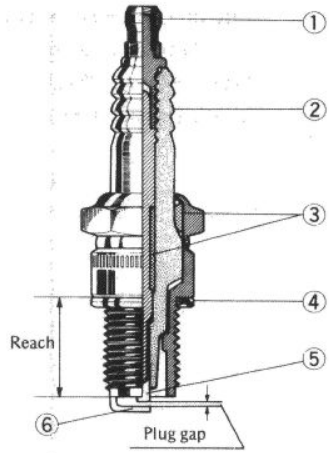
Since spark plug requirements change with the ignition and carburetion adjustments and with riding conditions, whether or not a spark plug of a correct heat range is used should be determined by removing and inspecting the plug.

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 – 1,450°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 iteself too well – the plug will stay too cool to burn off the carbon, and the carbon will correct 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 buildup on the plug can also cause other troubles. It can heat up redhot and cause preignition and knocking, which may eventually burn a hole in the top of the piston.

Spark Plug

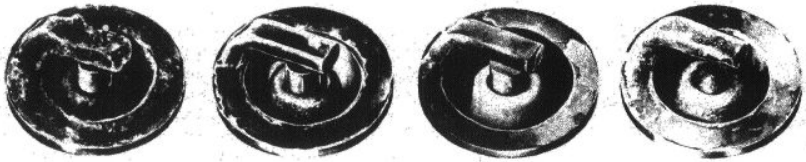


1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center electrode
6. Side electrode

Spark Plug Inspection

- Remove the spark plug and inspect the ceramic insulator.

Spark Plug Condition



Carbon fouling | Oil fouling | Normal operation | Overheating

★Whether or not the right temperature plug is being used can be ascertained by noting the condition of the ceramic insulator around the electrode. A light brown color indicates the correct plug is being used. If the ceramic is white, the plug is operating at too high a temperature and it should be replaced with the next colder type.

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) as the standard plug.

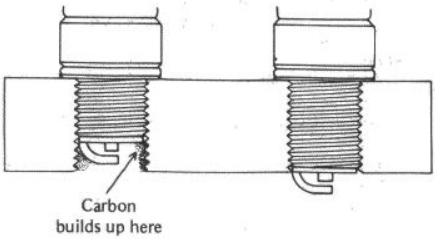
○If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.

○If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly buring a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.

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).

Plug Reach



Standard Spark Plug Threads

Diameter:	**12 mm**
Pitch:	**1.25 mm**
Reach:	**19.0 mm**

Troubleshooting Guide

NOTE

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

Engine Doesn't Start, Starting Difficulty:

Starter motor not rotating:
- Starter lockout or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- 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 motor clutch trouble

Engine won't turn over:
- Valve seizure
- Rocker arm seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Alternator shaft bearing seizure
- Balancer bearing seizure

No fuel flow:
- Fuel tap vacuum hose clogged
- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

Engine flooded:
- Fuel level in carburetor float bowl too high
- Float valve worn or stuck open
- Starting technique faulty
- (When flooded, crank the engine with the throttle fully open to allow more air to reach the engine.)

No spark; spark weak:
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- IC igniter trouble
- Neutral, starter lockout, or side stand switch trouble
- Pickup coil trouble
- Ignition coil trouble
- Ignition or engine stop switch shorted
- Wiring shorted or open
- Fuse blown

Compression Low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land 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
- Spark plug cap or high tension wiring trouble
- Spark Plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter trouble
- Pickup coil trouble
- Ignition coil trouble

Fuel/air mixture incorrect:
- Pilot screw maladjusted
- Pilot jet, or air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Starter plunger stuck open
- Fuel level in carburetor float bowl too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Air cleaner duct loose

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head warped
- Cylinder head gasket damaged
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Other:
- IC igniter trouble
- Carburetors not synchronizing
- Vacuum piston doesn't slide smoothly
- 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
- Spark plug cap shorted or not in good contact

Spark plug incorrect
IC igniter trouble
Pickup coil trouble
Ignition coil trouble

Fuel/air mixture incorrect:
Starter plunger stuck open
Main jet clogged or wrong size
Jet needle or needle jet worn
Air jet clogged
Fuel level in carburetor float bowl too high or too low
Bleed holes of air bleed pipe or needle jet clogged
Air cleaner clogged, poorly sealed, or missing
Air cleaner duct poorly sealed
Water of foreign matter in fuel
Carburetor holder loose
Fuel tank air vent obstructed
Fuel tap clogged
Fuel line clogged

Compression low:
Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/land clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking:
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
IC igniter trouble

Miscellaneous:
Throttle valve won't fully open
Vaccum piston doesn't slide smoothly
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

Overheating:

Firing incorrect:
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
IC igniter trouble

Fuel/air mixture incorrect:
Main jet clogged or wrong size
Fuel level in carburetor float bowl too low
Carburetor holder loose
Air cleaner poorly sealed, or missing
Air cleaner duct poorly sealed
Air cleaner clogged

Compression high:
Carbon built up in combustion chamber

Engine load faulty:
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Brake dragging

Lubrication inadequate:
Engine oil level too low
Engine oil poor quality or incorrect

Gauge incorrect:
Water temperature gauge broken
Water temperature sensor broken

Coolant incorrect:
Coolant level too low
Coolant deteriorated

Cooling system component incorrect:
Radiator clogged
Thermostat trouble
Radiator cap trouble
Thermostatic fan switch trouble
Fan relay 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:
Thermostatic fan switch trouble
Thermostat trouble

Clutch Operation Faulty:

Clutch slipping:
Friction plate worn or warped
Steel plate worn or warped
Clutch spring broken or weak
Clutch release mechanism trouble
Clutch hub or housing unevenly worn

Clutch not disengaging properly:
Clutch plate warped or too rough
Clutch spring tension uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch release mechanism trouble
Clutch hub locknut loose
Air in the clutch fluid line
Clutch fluid leak
Clutch fluid deteriorated
Primary or secondary cup damaged
Master cylinder scratched inside

Gear Shifting Faulty:

Doesn't go into gear; shift pedal does't return:
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft

Gear positioning lever binding
Neutral 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 worn
Gear groove worn
Gear dogs and/or dog holes worn
Shift drum groove worn
Gear positioning lever spring weak or broken
Shift fork 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 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 holes worn

Valve noise:
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn

Other noise:
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring worn, broken or stuck
Piston seizure, damage
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
Balancer gear worn or chipped
Balancer shaft position maladjusted
Balancer bearing worn
Balancer or alternator shaft coupling rubber damper damaged
Alternator shaft chain tensioner trouble
Alternator shaft chain, sprocket, guide worn

Abnormal Drive Train Noise:

Clutch noise:
Weak or damaged rubber damper
Clutch housing/friction plate clearance excessive
Clutch housing gear worn

Transmission noise:
Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

Drive chain noise:
Drive chain adjusted improperly
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 bearings worn
Crankshaft bearings worn
Oil pressure switch damaged
Wiring damaged
Relief valve stuck open
O-ring at the oil pipe in the crankcase damaged

Exhaust Smokes Excessively:

White smoke:
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Cylinder head gasket damaged
Engine oil level too high

Black smoke:
Air cleaner clogged
Main jet too large or fallen off
Starter plunger stuck open
Fuel level in carburetor float bowl too high

Brown smoke:
Main jet too small
Fuel level in carburetor float bowl too low
Air cleaner duct loose
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory:

Handlebar hard to turn:

Steering stem locknut too tight
Bearing damaged
Steering bearing lubrication inadequate
Steering stem bent
Tire air pressure too low

Handlebar shakes or excessively vibrates:

Tire worn
Swing arm pivot bearing worn
Rim warped, or not balanced
Wheel bearing worn
Handlebar clamp loose
Steering stem head nut loose

Handlebar pulls to one side:

Frame bent
Wheel misalignment
Swing arm bent or twisted
Steering maladjusted
Front fork bent
Right/left fork legs unbalanced (oil level, air pressure, anti-dive setting)

Shock absorption unsatisfactory:

(Too hard)
Front fork oil excessive
Front fork oil viscosity too high
Front fork air pressure too high
Rear shock absorber air pressure too high
Tire air pressure too high
Front fork anti-dive mechanism trouble
Front fork bent
(Too soft)
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Front fork air pressure too low
Rear shock absorber air pressure too low
Front fork, rear shock absorber spring weak
Rear shock absorber oil leaking
Front fork anti-dive mechanism trouble

Brake Doesn't Hold:

Air in the brake line
Pad or disc worn
Brake fluid leak
Disc warped
Contaminated pad
Brake fluid deteriorated
Primary or secondary cup damaged
Master cylinder scratched inside

Battery Discharged:

Battery faulty (e.g., plates sulphated, shorted through sedimentation, electrolyte level too low)
Batterly leads making poor contact
Load excessive (e.g., bulb of excessive wattage)
Ignition switch trouble
Alternator trouble
Wiring faulty

Battery Overcharged:

Alternator trouble

General Lubrication

Lubrication

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

NOTE

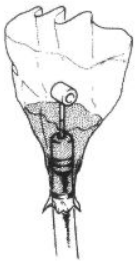
○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure spray water, perform the general lubrication.*

Pivots: Lubricate with Motor Oil.
Center Stand
Side Stand
Clutch Lever
Brake Lever
Brake Pedal
Rear Brake Rod Joint

Points: Lubricate with Grease.
Throttle Inner Cable Lower End
Speedometer Inner Cable*
*Grease the lower part of the inner cable sparingly.

Cables: Lubricate with Motor Oil.
Choke Cable
Throttle Cable

Cable Lubrication



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, retorque 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 ½ turn, then tighten it.
★If cotter pins are damaged, replace them with new ones.

Nut, Bolt, and Fastener to be checked
Wheels:
- Front Axle Nut
- Front Axle Clamp Bolts
- Rear Axle Nut
- Chain Adjuster Clamp Bolts

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

Suspension:
- Front Fork Clamp Bolts
- Front Fender Mounting Bolts
- Rear Shock Absorber Mounting Bolts
- Swing Arm Pivot Shaft Nuts
- Uni-trak Link Nuts

Steering:
- Stem Head Nut
- Handlebar Mounting Bolts

Engine:
- Engine Mounting Bolts
- Cylinder Head Bolts
- Muffler Mounting Nuts
- Muffler Mounting Bolts
- Muffler Connecting Clamp Bolts
- Clutch Master Cylinder Clamp Bolts
- Clutch Lever Pivot Nut

Others:
- Center Stand Bolts
- Side Stand Bolt
- Front Footpeg Mounting Bolts
- Rear Frame Mounting Bolts
- Footpeg Bracket Mounting Bolts

Standard Torque Table

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

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 – 39	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	125 – 165
20	225 – 325	23 – 33	165 – 240

Unit Conversion Table

Prefixes for Units:

Prefix	Symbol	Power
mega	M	x 1,000,000
kilo	k	x 1,000
centi	c	x 0.01
mili	m	x 0.001
micro	μ	x 0.000001

Units of Mass:

kg	x	2.205	=	lb
g	x	0.03527	=	oz

Units of Volume:

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

Units of Force:

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

Units of Length:

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

Units of Torque:

N-m	x	0.1020	=	kg-m
N-m	x	0.7376	=	ft-lb
N-m	x	8.851	=	in-lb
kg-m	x	9.807	=	N-m
kg-m	x	7.233	=	ft-lb
kg-m	x	86.80	=	in-lb

Units of Pressure:

kPa	x	0.01020	=	kg/cm^2
kPa	x	0.1450	=	psi
kPa	x	0.7501	=	cm Hg
kg/cm^2	x	98.07	=	kPa
kg/cm^2	x	14.22	=	psi
cm Hg	x	1.333	=	kPa

Units of Speed:

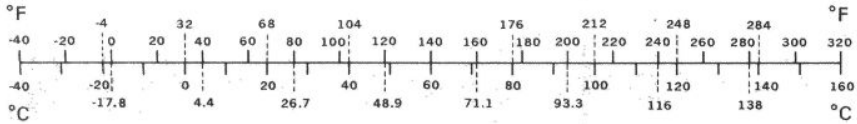
km/h	x	0.6214	=	mph

Units of Power:

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

Units of Temperature:

$$\frac{9\,(°C + 40)}{5} - 40 = °F \qquad \frac{5\,(°F + 40)}{9} - 40 = °C$$



MODEL APPLICATION

Year	Model	Beginning Frame No.
1984	ZX900-A1	JKAZX2A1□EA000001, or JKAZX2A1□EB500001, or ZX900A-000001
1985	ZX900-A2	JKAZX2A1□FA015001, or JKAZX2A1□FB505301, or ZX900A-015001

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

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