Kawasaki

Voyager XII

Motorcycle Service Manual

Quick Reference Guide

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

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

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Motorcycle
Service Manual

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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) Celsius
DC	direct current
F	farad(s)
°F	degree(s) Fahrenheit
ft	foot, feet
g	gram(s)
h	hour(s)
L	liter(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

EMISSION CONTROL INFORMATION

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

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

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

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

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

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

(Continued on next page)

NOTE

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

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

TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

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

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

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

Foreword

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

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

For the duration of 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 Motorcycle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki motorcycles are introduced by the Special Tool Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

How to Use this Manual

In preparing this manual, we divided the product into its major systems. These systems became the manual's chapters. All information for a particular system from adjustment through disassembly and inspection is located in a single chapter.

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

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

If you want spark plug information, for example, go to the Periodic Maintenance Chart first. The chart tells you how frequently to clean and gap the plug. Next, use the Quick Reference Guide to locate the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Spark Plug section.

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

WARNING

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

CAUTION

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

This manual contains 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.

1

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 detailed account has limitations, a certain amount of basic knowledge is also required for successful work.

Especially note the following:

(1) Dirt

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

(2) Battery 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 plastic faced mallet. Use an impact driver for screws (particularly for the removal of screws held by a locking agent) in order to avoid damaging the screw heads.

(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, Non-permanent Locking Agent

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

(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.

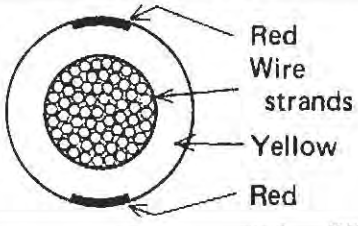
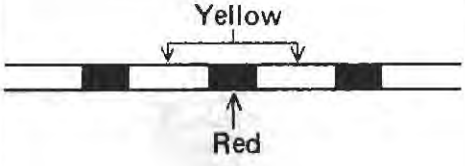
(15) Lubrication

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

Wire (cross-section)	Name of Wire Color	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 of service data in this text have following meanings:

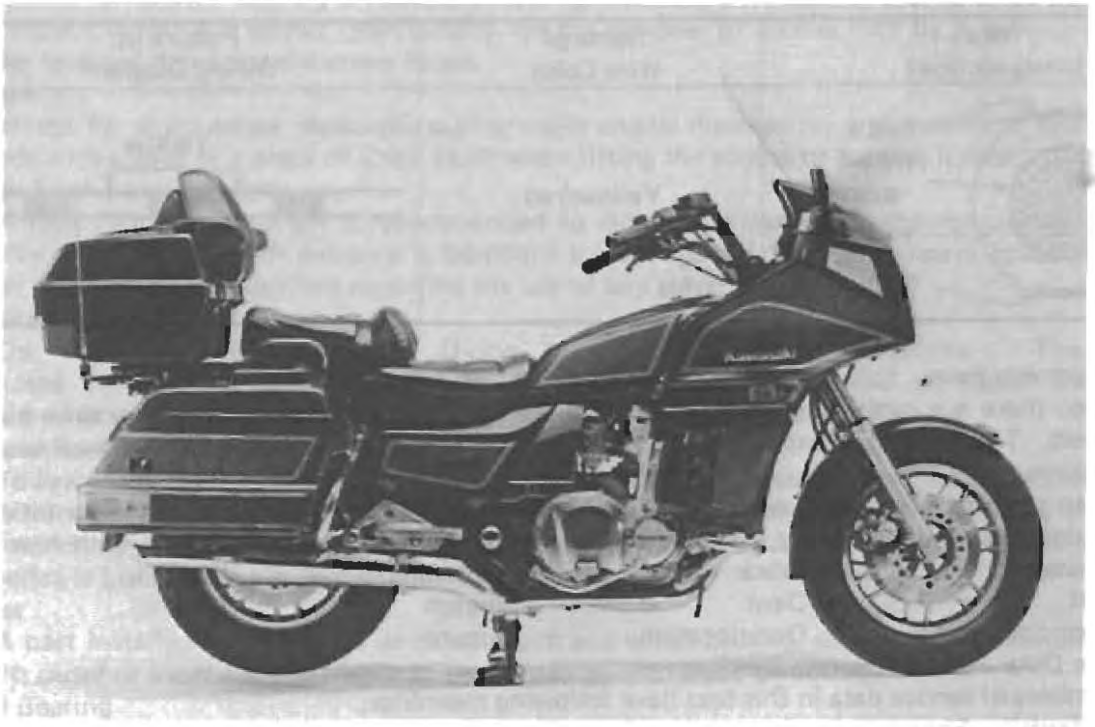
"Standards": Show dimensions or performances which brand-new parts or systems have.

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

Model Identification

ZG1200-A1 Left Side View:

ZG1200-A1 Right Side View:



General Specifications

Cal : California Model

Items			ZG1200-A1
Dimensions:			
Overall length			2,815mm
Overall width			965 mm
Overall height			1,485 mm
Wheelbase			1,620 mm
Road clearance			140 mm
Seat height			755 mm
Dry weight			317 kg (Cal) 317.5 kg
Curb weight:	Front		155 kg
	Rear		191.5 kg (Cal) 192 kg
Fuel tank capacity			23.2 L
Performance:			
Braking distance			12.5 m from 50 km/h
Minimum turning radius			2.9 m
Engine:			
Type			4-stroke, DOHC, 4-cylinder
Cooling system			Liquid-cooled
Bore and stroke			78.0 x 62.6 mm
Displacement			1,196 mL
Compression ratio			10.0
Carburetion system			Carburetors, Keihin CVK30 x 4
Starting system			Electric starter
Ignition system			Battery and coil (transistorized)
Timing advance			Electronically advanced
Ignition timing			10° BTDC @800 r/min (rpm)
Spark plug			NGK DPR8EA-9 or ND X24EPR-U9
Cylinder numbering method			Left to right, 1-2-3-4
Firing order			1-2-4-3
Valve timing:			
Inlet		Open	20° BTDC
		Close	48° ABDC
		Duration	248°
Exhaust		Open	54° BBDC
		Close	14° ATDC
		Duration	248°
Lubrication system			Forced lubrication (wet sump)
Engine oil:			
Grade			SE or SF class
Viscosity			SAE10W40, 10W50, 20W40, or 20W50
Capacity			4.0 L
Drive Train:			
Primary reduction system:			
Type			Gear
Reduction ratio			1.706 (99/58)
Clutch type			Wet multi disc

Items	ZG1200-A1
Transmission:	
Type	5-speed, constant mesh, return shift
Gear ratios: 1st	2.733 (41/15)
2nd	1.800 (36/20)
3rd	1.333 (32/24)
4th	1.035 (29/28)
5th	0.838 (26/31)
Final drive system:	
Type	Shaft
Reduction ratio	2.424 (15/22 x 32/9)
Overall drive ratio	3.470 @Top gear
Final gear case oil:	
Type	API GL-5 Hypoid gear oil SAE 80
Capacity	210 mL
Frame:	
Type	Tubular, double cradle
Caster (rake angle)	30°
Trail	121 mm
Front tire:	
Type	Tubeless
Size	130/90-16 67 H
Rear tire:	
Type	Tubeless
Size	150/90-15 74 H
Front suspension:	
Type	Telescopic fork (pneumatic)
Wheel travel	140 mm
Rear suspension:	
Type	Swing arm
Wheel travel	100 mm
Brake type:	
Front	Dual disc
Rear	Single disc
Electrical Equipment:	
Battery	12 V 20 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 60/55 W (quartz-halogen)
Tail/brake light	12 V 8/27 W x 4
Alternator:	
Type	Three-phase AC
Rated output	35 A @7,500 r/min (rpm), 13.5 V
Voltage regulator:	
Type	Short-circuit

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

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	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
Spark plug -- clean			•	•	•	•	•	•	15-20
Spark plug -- check*			•	•	•	•	•	•	15-20
Air suction valve -- check (US)*			•	•	•	•	•	•	4-7
Air cleaner element -- clean		•		•		•		•	2-15
Throttle grip play -- check*		•		•		•		•	2-6
Idle speed -- check*		•	•	•	•	•	•	•	2-8
Engine vacuum synchronization -- check*		•	•	•	•	•	•	•	2-9
Fuel system -- check*				•		•		•	2-10
Cylinder head bolt tightness -- check*		•		•		•		•	— — —
Evaporative emission control system --check (Cal)*		•	•	•	•	•	•	•	2-20
Engine oil -- change	year	•		•		•		•	6-5
Oil filter -- replace		•		•		•		•	6-5
Radiator hoses, connections -- check*	year	•		•		•		•	3-12
Coolant -- change	2 years							•	3-4
Final gear case oil level -- check*				•		•		•	10-5
Final gear case oil -- change		•						•	10-5
Propeller shaft joint -- lubricate				•				•	10-9
Fuel hose -- replace	4 years								— — —
Clutch fluid level -- check*	month	•	•	•	•	•	•	•	5-5
Clutch fluid -- change	2 years					•			5-5
Clutch fluid hose and pipe -- replace	4 years								— — —
Clutch master cylinder cup and dust seal -- replace	2 years								5-7
Clutch slave cylinder piston seal -- replace	2 years								5-8
Brake lining or pad wear -- check*			•	•	•	•	•	•	11-13
Brake fluid level -- check*	month	•	•	•	•	•	•	•	11-5
Brake fluid -- change	2 years					•			11-6
Brake hose -- replace	4 years								11-14
Brake master cylinder cup and dust seal -- replace	2 years								11-8
Caliper piston seal and dust seal -- replace	2 years								11-11
Brake light switch -- check*		•	•	•	•	•	•	•	15-39
Steering -- check*		•	•	•	•	•	•	•	13-4
Steering stem bearing -- lubricate	2 years					•			13-8
Front fork oil -- change								•	12-5
Tire wear -- check*			•	•	•	•	•	•	9-10
Swing arm pivot -- lubricate				•				•	12-13
General lubrication -- perform			•	•	•	•	•	•	16-8
Nut, bolt, and fastener tightness -- check*		•		•		•		•	16-8

† : 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

Torque and Locking Agent

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

Letters used in the "Remarks" column mean:

L : Apply a non-permanent locking agent to the threads.
LG : Apply liquid gasket to the threads.
M : Apply a molybdenum disulfide lubricant (grease or oil) to the threads and seated surface, or washer.
S : Tighten the fasteners following the specified sequence.
SS : Apply silicone sealant to the threads.
St : Stake the fasteners to prevent loosening.

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Cooling System:				
Radiator Fan Switch	7.8	0.80	69 in-lb	
Water Temperature Sensor	15	1.5	11.0	SS
Engine Top End:				
Cylinder Head Cover Bolts	9.8	1.0	87 in-lb	
Camshaft Cap Bolts	12	1.2	104 in-lb	
Oil Filter Retainers	—	—	—	St
Cylinder Head Bolts: 11 mm (New)	51	5.2	38	M, S
11 mm	48	4.9	35	M, S
8 mm	25	2.5	18.0	
Oil Pipe Banjo Bolts (8 mm)	25	2.5	18.0	
Camshaft Sprocket Bolts	15	1.5	11.0	L
Chain Guide (Rear) Bolt	—	—	—	L
Chain Tensioner Bolts	9.8	1.0	87 in-lb	
Clutch:				
Clutch Lever Pivot Nut	5.9	0.60	52 in-lb	
Master Cylinder Clamp Bolts	11	1.1	95 in-lb	
Clutch Hose Banjo Bolts	25	2.5	18.0	
Clutch Hose Connecting Nut	18	1.8	13.0	
Clutch Slave Cylinder Bolts	—	—	—	L
Bleed Valve	7.8	0.80	69 in-lb	
Clutch Cover Damper Bolts	9.8	1.0	87 in-lb	L
Clutch Hub Nut	130	13.5	98	
Clutch Spring Bolts	11	1.1	95 in-lb	
Engine Lubrication System:				
Crankcase (Lower) Oil Passage Plug	18	1.8	13.0	
Crankcase (Lower) Cap	18	1.8	13.0	
Oil Pump Gear Holder Screws	—	—	—	L
Oil Pump Mounting Bolts	12	1.2	104 in-lb	L
Oil Pump Bracket Bolts	12	1.2	104 in-lb	
Oil Pressure Relief Valve	15	1.5	11.0	L
Oil Pressure Switch	15	1.5	11.0	SS
Engine Drain Plugs	29	3.0	22	
Oil Filter Mounting Bolt	20	2.0	14.5	
Oil Pipe Banjo Bolts (12 mm)	25	2.5	18.0	
Oil Pan Bolts	—	—	—	L (2)

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Engine Removal/Installation:				
Engine Mounting Bolts	34	3.5	25	
Engine Mounting Bracket Bolts	25	2.6	19.0	
Right Down Tube Mounting Bolts	57	5.8	42	
Crankshaft/Transmission:				
Crankcase Bolts: 10 mm (New)	49	5.0	36	S
10 mm	39	4.0	29	S
8 mm (New)	29	3.0	22	
8 mm	27	2.8	20	
6 mm	12	1.2	104 in-lb	
Oil Pipe Banjo Bolts: 8 mm	12	1.2	104 in-lb	
6 mm	7.8	1.0	87 in-lb	
Alternator Shaft Chain Guide Mounting Bolts	—	—	—	L
External Shift Mechanism Return Spring Pin	—	—	—	L
Connecting Rod Big End Cap Nuts	28	2.9	21	M
Crankshaft Flywheel Bolt	145	15.0	110	
Ignition Timing Rotor Bolt	25	2.5	18.0	
Alternator Shaft Coupling Bolt	25	2.5	18.0	
Starter Clutch Holder Bolts	12	1.2	104 in-lb	L
Alternator Shaft Bearing Holder Bolts	—	—	—	L
Idle Gear Shaft Holder Bolt	—	—	—	L
Balancer Shaft Guide Pin Plate Bolt	—	—	—	L
Shift Drum Pin Plate Bolt	9.8	1.0	87 in-lb	L
Shift Drum Bearing Holder Bolts	—	—	—	L
Wheels/Tires:				
Front Axle Nut	88	9.0	65	
Rear Axle Nut	110	11.0	80	
Air Valve Nuts	1.5	0.15	13 in-lb	
Air Valve Locknuts	5.9	0.60	52 in-lb	
Final Drive:				
Front Gear Case Bolts	12	1.2	104 in-lb	L(1)
Damper Cam Nut	225	23	165	M
Drive Gear Nut Cap Bolts	12	1.2	104 in-lb	L
Drive Gear Nut	265	27	195	St
Neutral and Overdrive Switch	9.8	1.0	87 in-lb	L
Switch Collar	4.9	0.50	43 in-lb	SS
Oil Pipe Banjo Bolts (8 mm)	12	1.2	104 in-lb	
Oil Pipe Clamp Bolts	—	—	—	L
Driven Gear Assembly Mounting Bolts	12	1.2	104 in-lb	
Driven Gear Bolt	120	12.0	87	St
Final Gear Case Mounting Nuts	29	3.0	22	
Pinion Nut	120	12.0	87	St
Final Gear Case Cover Bolts	24	2.4	17.5	L

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Final Gear Case Studs	—	—	—	L
(For reference)				
Pinion Bearing Retainer	540	55	400	
Retainer Stop Screw	16	1.6	11.5	
Brakes:				
Brake Lever Pivot Nut	5.9	0.60	52 in-lb	
Front Master Cylinder Clamp Bolts	11	1.1	95 in-lb	
Brake Hose Banjo Bolts	25	2.5	18.0	
Caliper Mounting Bolts	32	3.3	24	
Bleed Valves	7.8	0.80	69 in-lb	
Disc Mounting Bolts	23	2.3	16.5	
Rear Master Cylinder Mounting Bolts	23	2.3	16.5	
Rear Caliper Holder Bolt	98	10.0	72	
Suspension:				
Front Fork Clamp Bolts	20	2.0	14.5	
Front Axle Clamp Nut	14	1.4	10.0	
Front Fork Drain Screws	—	—	—	L
Front Fork Bottom Allen Bolts	20	2.0	14.5	L
Swing Arm Pivot Shaft Retainer Bolts	11	1.1	95 in-lb	
Swing Arm Pivot Shaft Adjuster	18	1.8	13.0	
Adjuster Locknut	53	5.4	39	
Rear Shock Absorber Mounting				
Bolt and Nuts	30	3.1	22	
Rear Shock Absorber Air Hose Fittings	12	1.2	104 in-lb	
Steering:				
Handlebar Clamp Bolts	27	2.8	20	
Handle Grip Bar Mounting Allen Bolts	44	4.5	33	
Weight Mounting Screws	—	—	—	L
Steering Stem Nut	42	4.3	31	
Steering Stem Locknut	11	1.1	95 in-lb	
Frame:				
Trunk Guide Mounting Screws	—	—	—	L
Right Down Tube Mounting Bolts	57	5.8	42	
Rear Frame Mounting Bolts	57	5.8	42	
Electrical System:				
Alternator Mounting Bolts	—	—	—	L
Alternator Coupling Bolt	9.8	1.0	87 in-lb	
Starter Relay Terminal Nuts	4.9	0.50	43 in-lb	
Spark Plugs	14	1.4	10.0	
Ignition Timing Rotor Bolt	25	2.5	18.0	

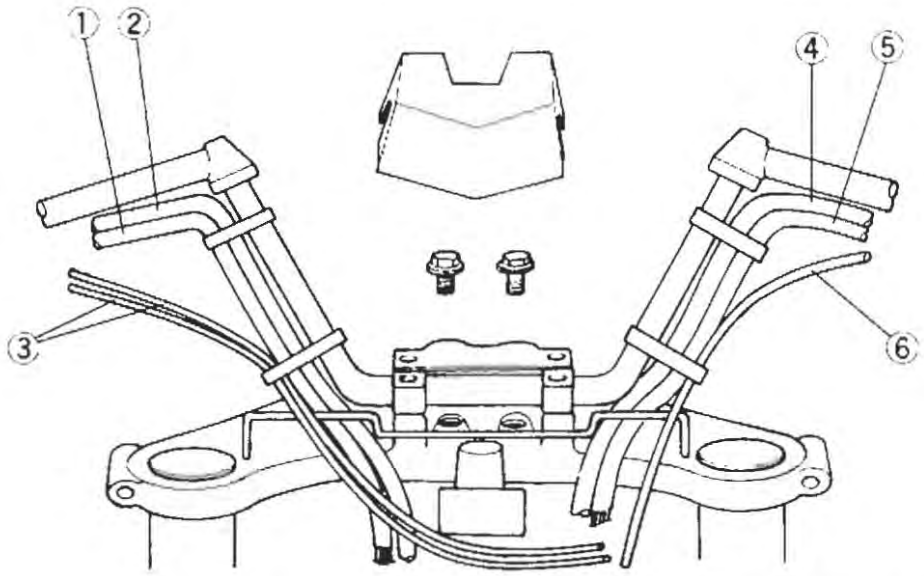
The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

General Fasteners:

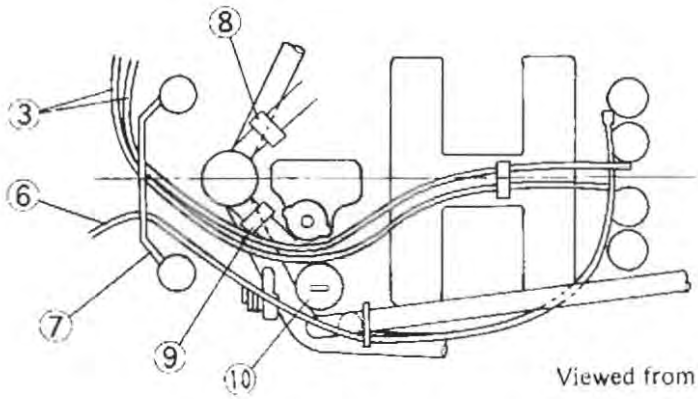
Threads dia. (mm)	Torque		
	N-m	kg-m	ft-lb
5	3.4 – 4.9	0.35 – 0.50	30 – 43 in-lb
6	5.9 – 7.8	0.60 – 0.80	52 – 69 in-lb
8	14 – 19	1.4 – 1.9	10.0 – 13.5
10	25 – 34	2.6 – 3.5	19.0 – 25
12	44 – 61	4.5 – 6.2	33 – 45
14	73 – 98	7.4 – 10.0	54 – 72
16	115 – 155	11.5 – 16.0	83 – 115
18	165 – 225	17.0 – 23	125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

Cable, Wire, and Hose Routing

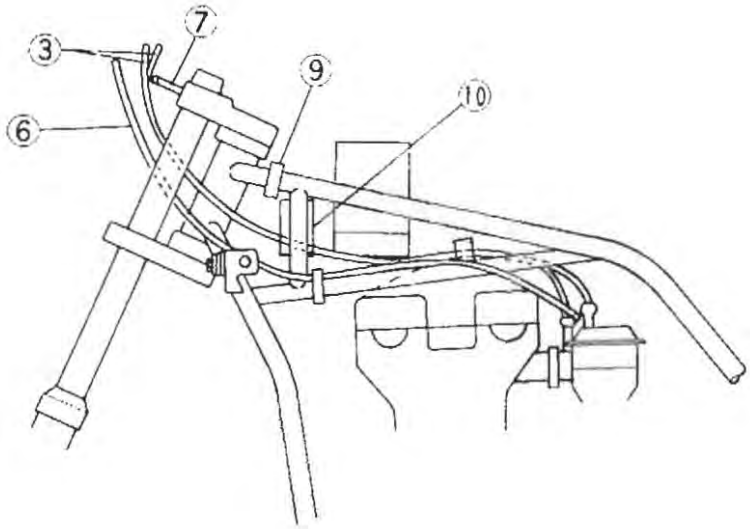
Control Cables



Viewed from Front

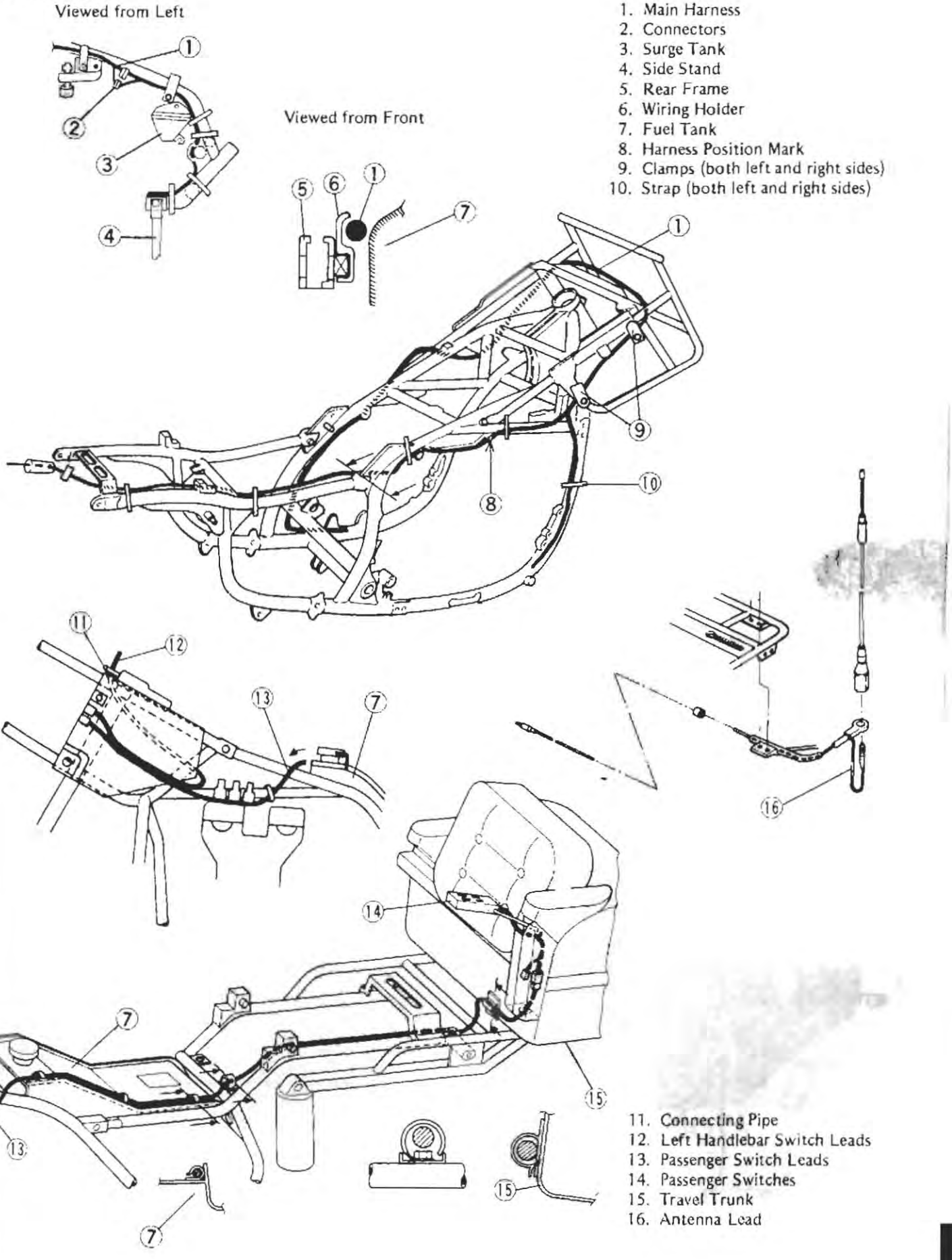


Viewed from Top

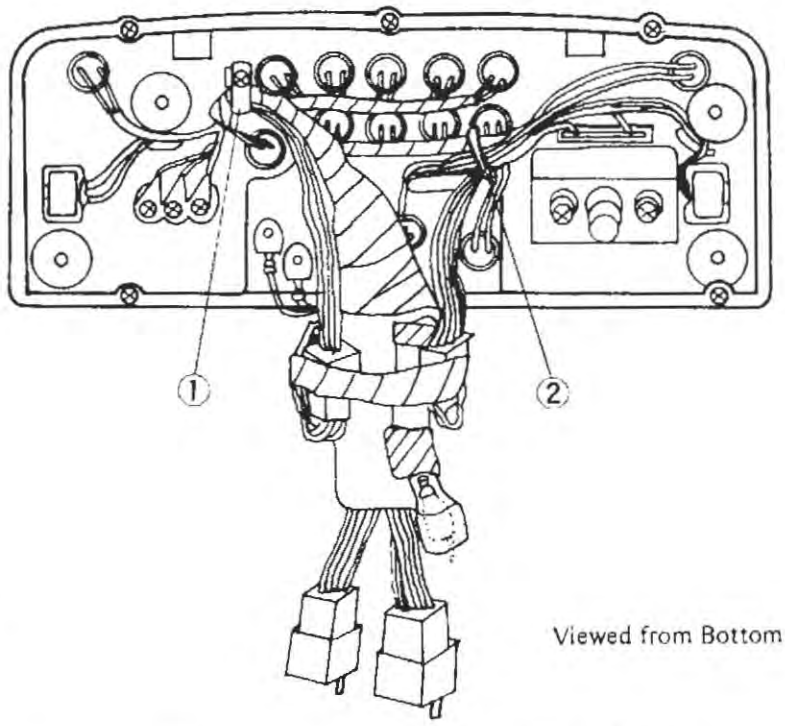


1. Right Handlebar Switch Leads
2. Front Brake Hose
3. Throttle Cables
4. Clutch Fluid Hose
5. Left Handlebar Switch Leads
6. Choke Cable
7. Connecting Pipe
8. Strap (holding front fork air hose and right handlebar switch leads)
9. Strap (holding fuse case leads and left handlebar switch leads)
10. Ignition Coil (#1 & 4)

Electrical Wires

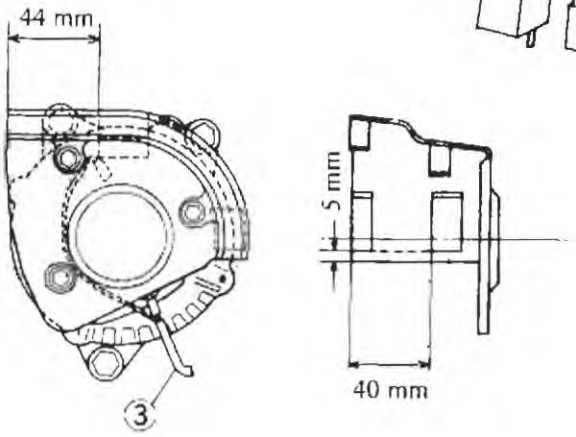


Electrical Wires (Meter Assembly)

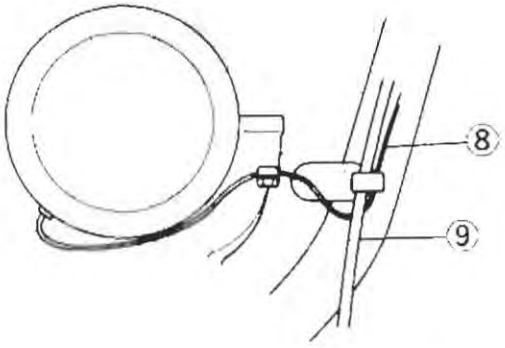


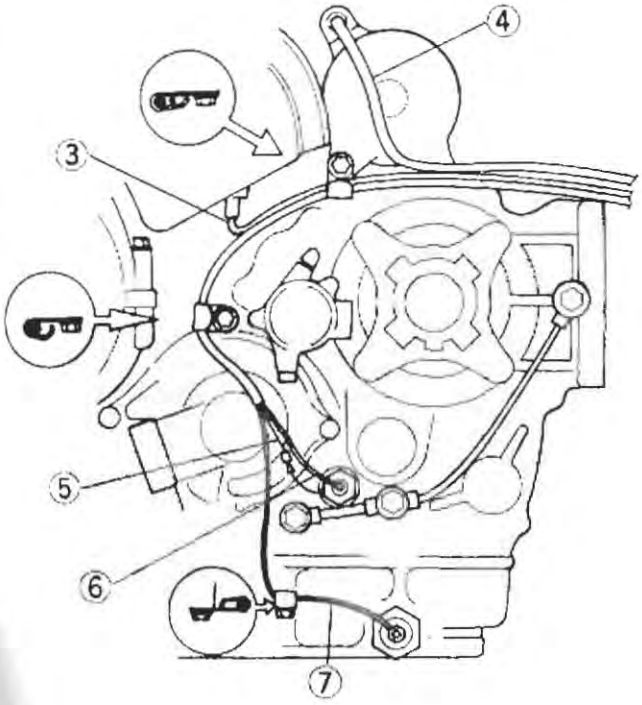
Viewed from Bottom

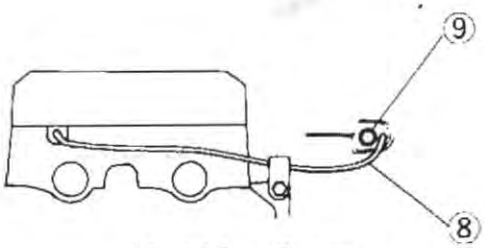
(Engine Left Side)



(Engine Right Side)



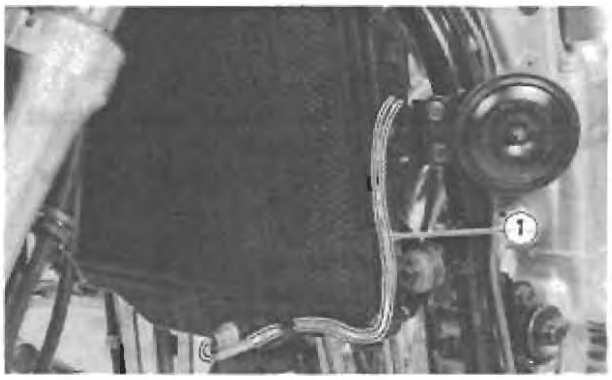


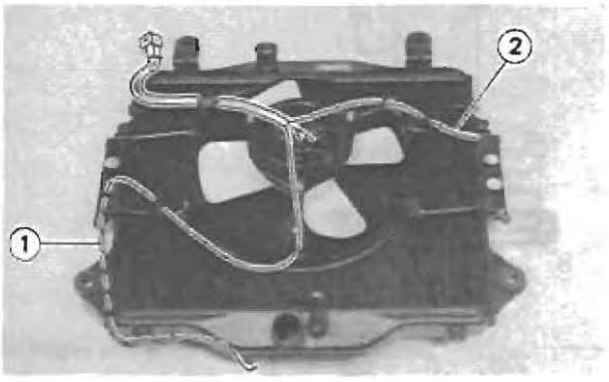


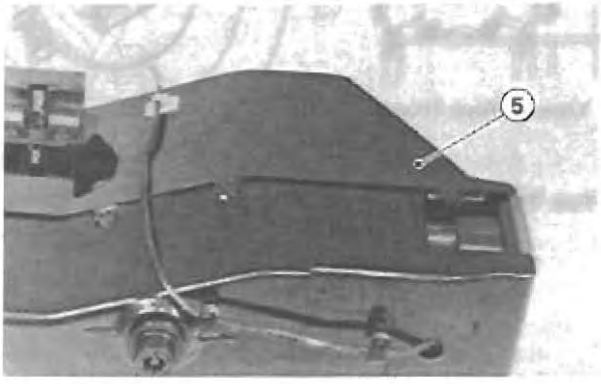
Viewed from Bottom

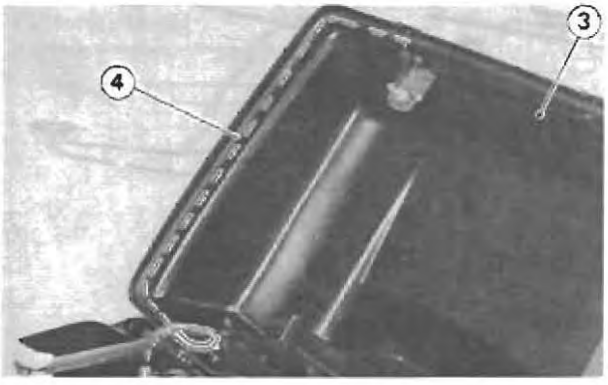
1. Clamp
2. Strap
3. Alternator Leads
4. Starter Motor Lead
5. Overdrive Switch Lead
6. Neutral Switch Lead
7. Oil Pressure Switch Lead
8. Pickup Coil Leads
9. Battery Vent Hose

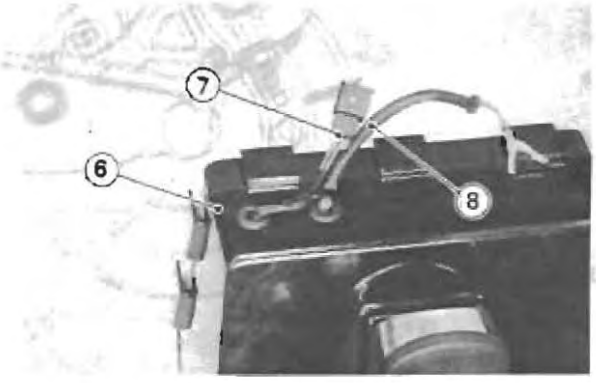
Electrical Wires

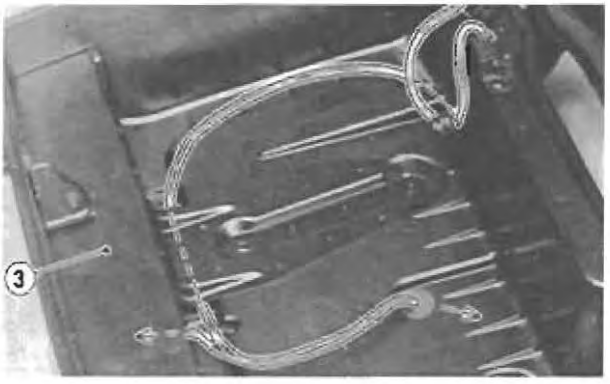


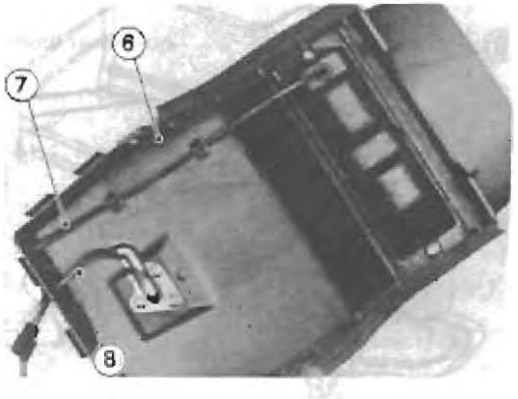






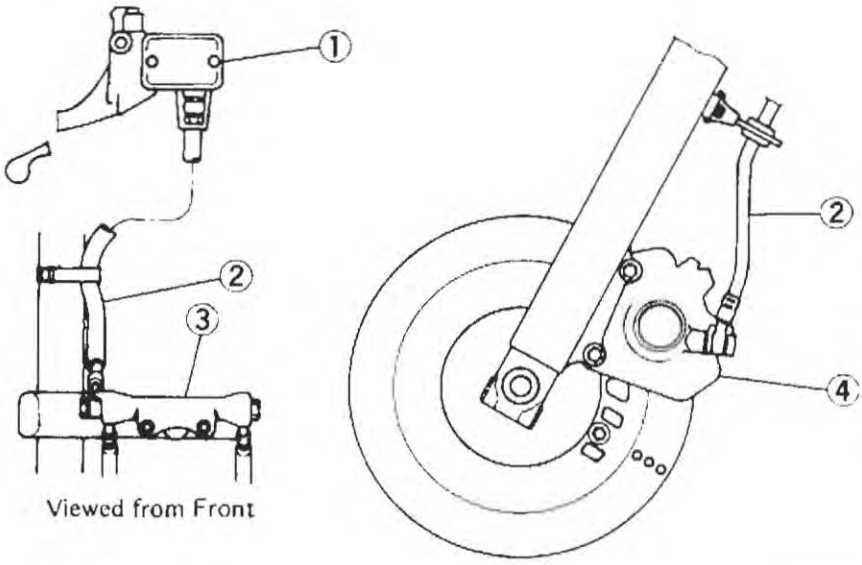






1. Radiator Fan Switch Lead
2. Ground Lead
3. Travel Trunk
4. Trunk Room Light Leads
5. Saddlebag
6. Rear Fender Rear
7. Tail/Brake Light Leads
8. License Light Leads

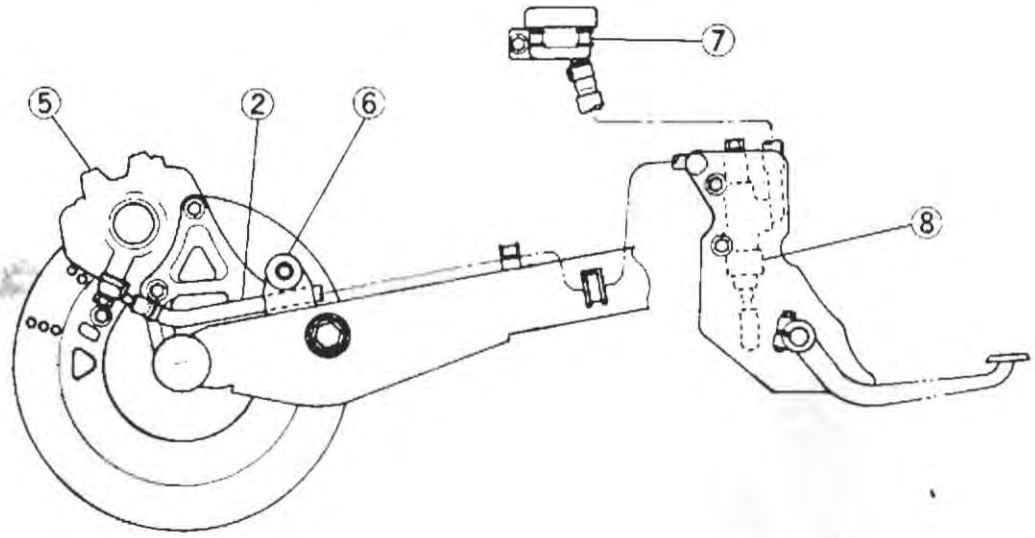
Front Brake Hoses



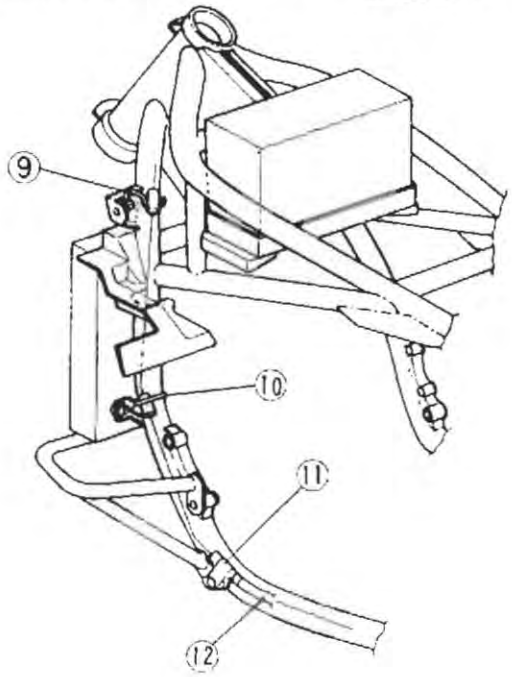
Viewed from Front

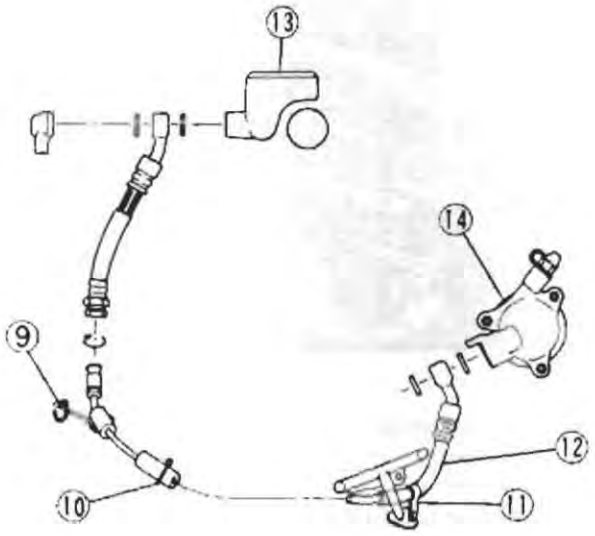
1. Front Brake Master Cylinder
2. Brake Hose
3. 2-way Joint
4. Front Caliper
5. Rear Caliper
6. Rear Shock Absorber Mount
7. Reservoir
8. Rear Brake Master Cylinder
9. Clamp
10. Strap
11. Clamp
12. Clutch Fluid Hose
13. Clutch Master Cylinder
14. Clutch Slave Cylinder

Rear Brake Hoses

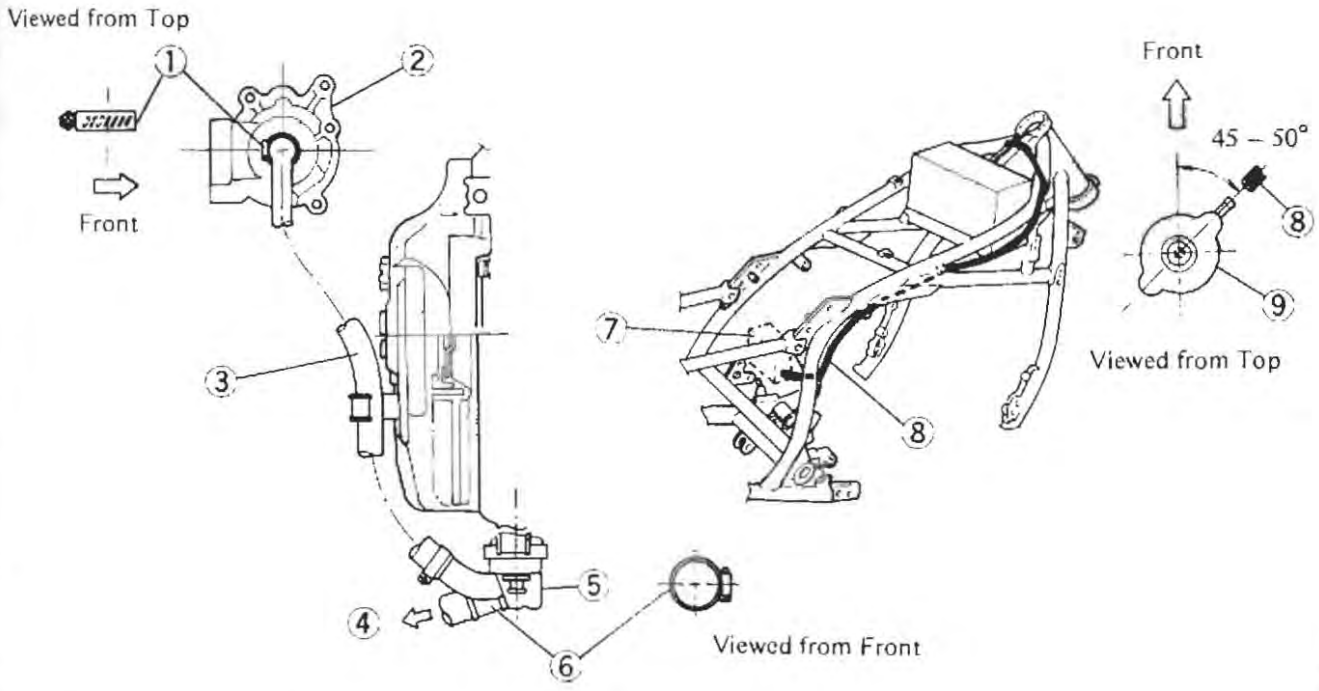


Clutch Fluid Hoses

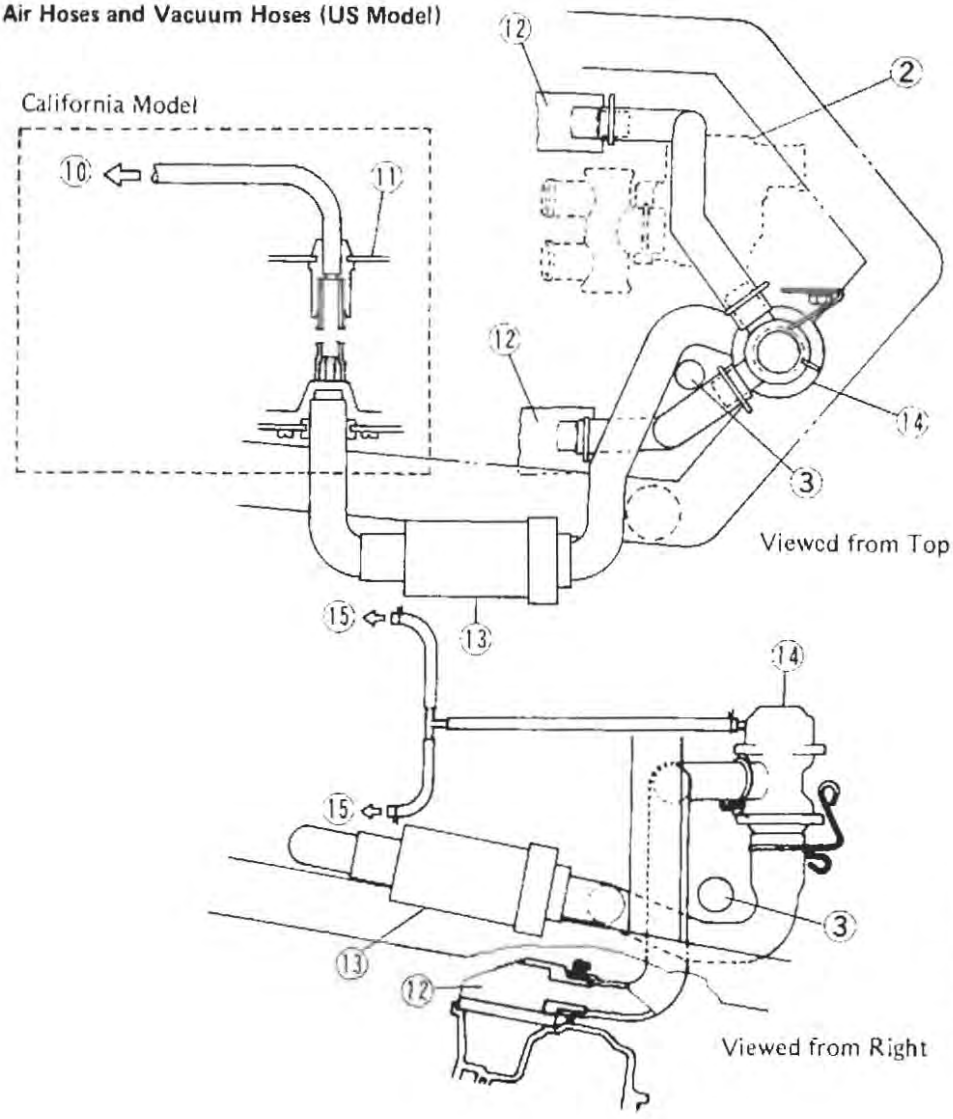




Radiator Hoses

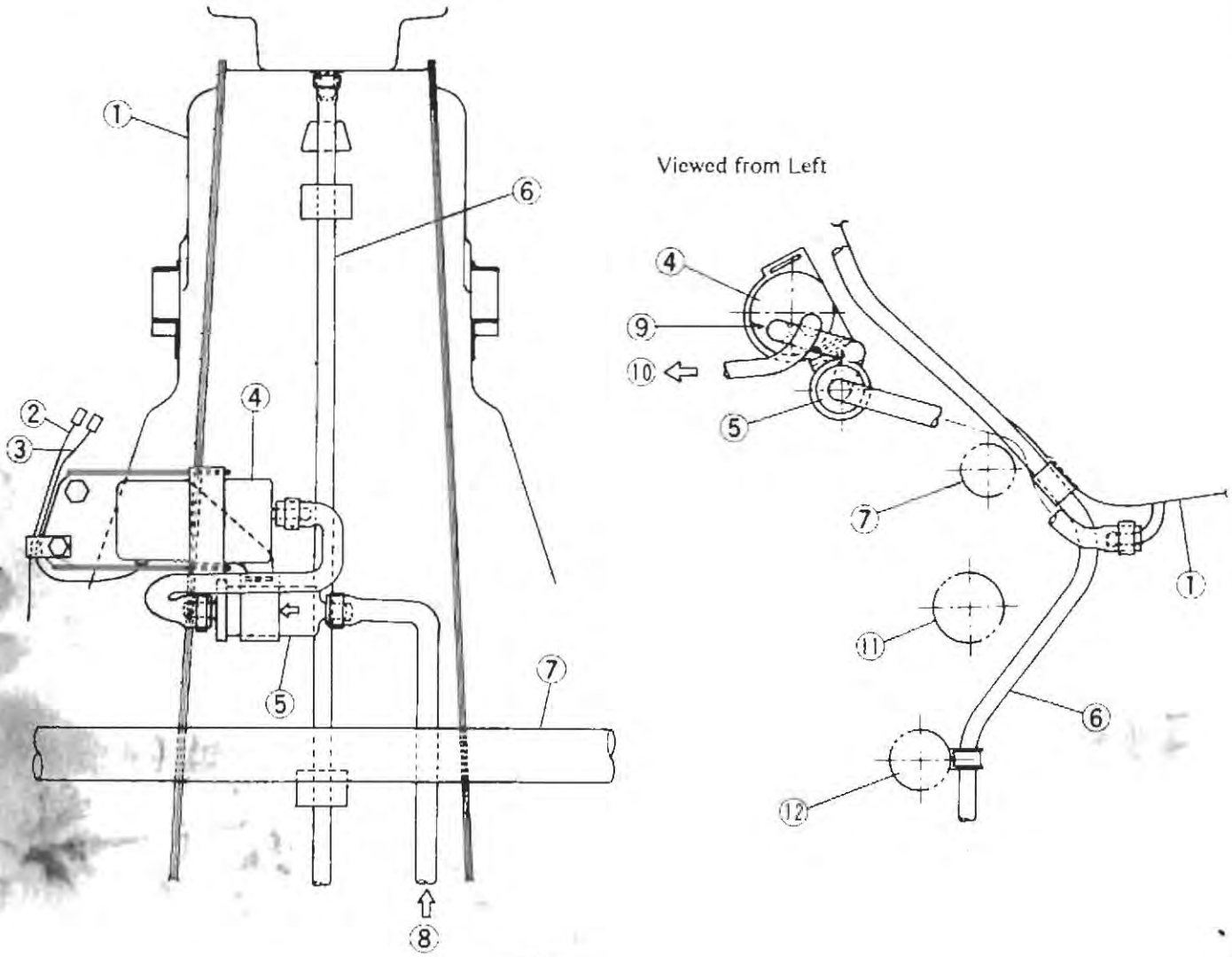


Air Hoses and Vacuum Hoses (US Model)

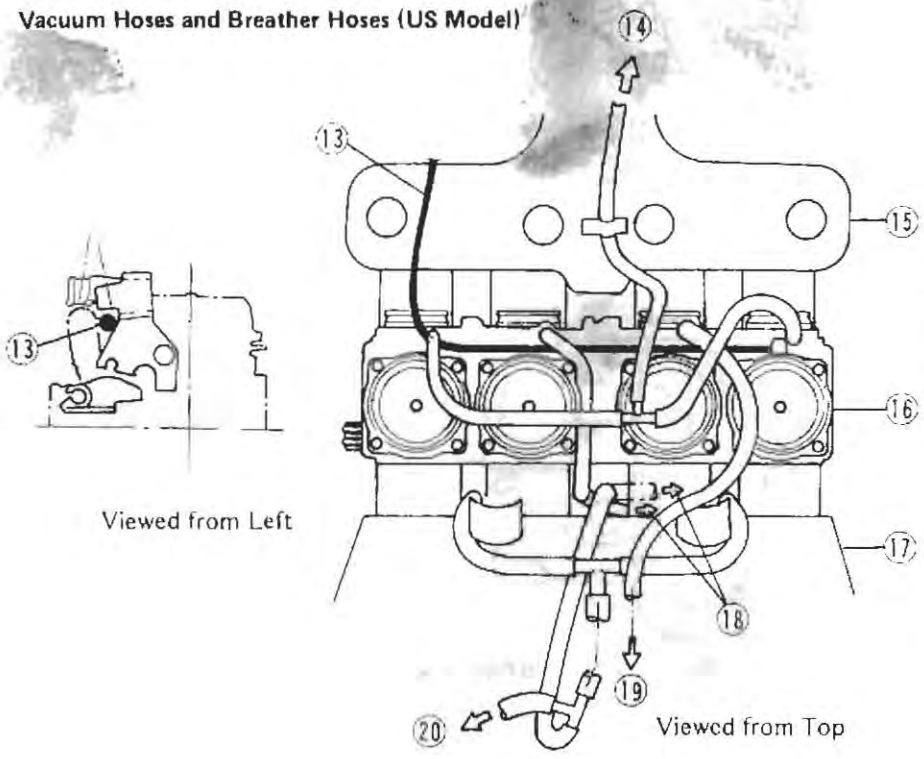


1. Clamp
2. Thermostat Housing
3. Bypass Hose
4. To water pump
5. Radiator
6. Clamp
7. Reservoir Tank
8. Reservoir Tank Hose
9. Radiator Cap
10. To canister
11. Air Cleaner Housing
12. Air Suction Valve Cover
13. Silencer
14. Vacuum Switch Valve
15. To carburetors

Fuel Hoses



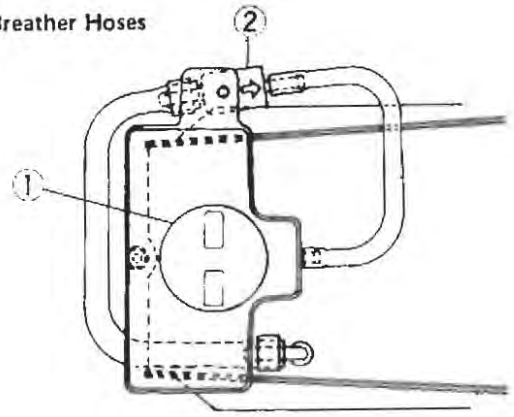
Vacuum Hoses and Breather Hoses (US Model)



1. Fuel Tank
2. Rear Brake Light Switch Leads
3. Fuel Pump Leads
4. Fuel Pump
5. Fuel Filter
6. Drain Hose
7. Frame Tube
8. From Fuel Tank
9. Inlet Fitting
10. To carburetors
11. Swing Arm
12. Frame Tube
13. Choke Cable
14. To Vacuum Switch Valve
15. Cylinder Head Cover
16. Carburetors
17. Surge Tank
*18. To Vacuum Valve
*19. To Liquid/Vapor Separator
*20. To Canister

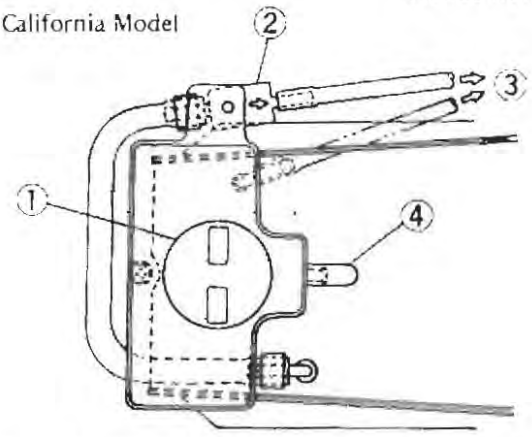
*California Model

Breather Hoses

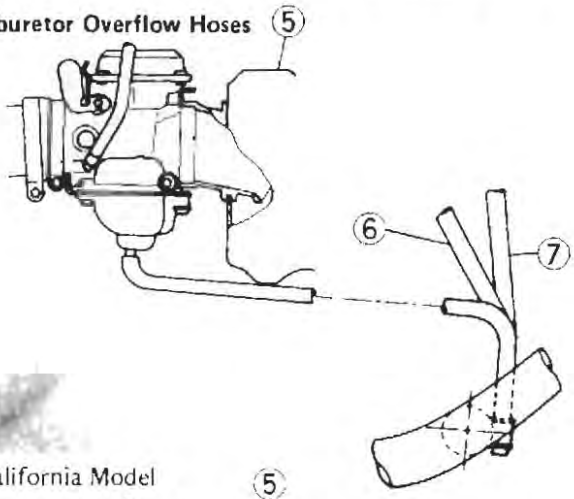


Viewed from Top

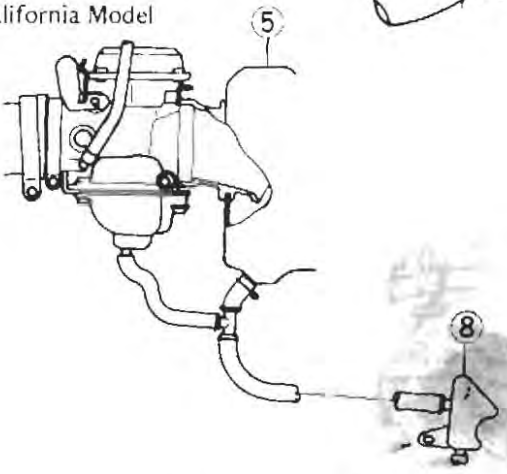
California Model

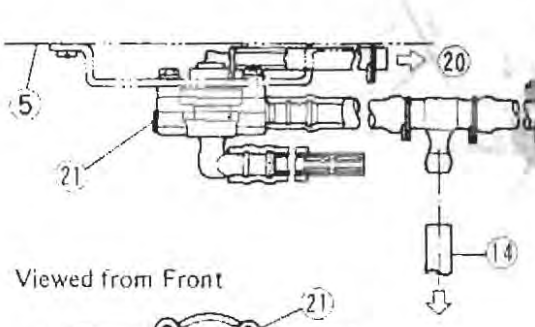


Carburetor Overflow Hoses

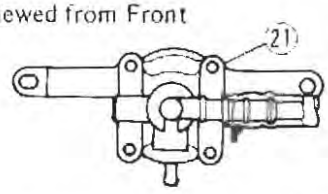


California Model

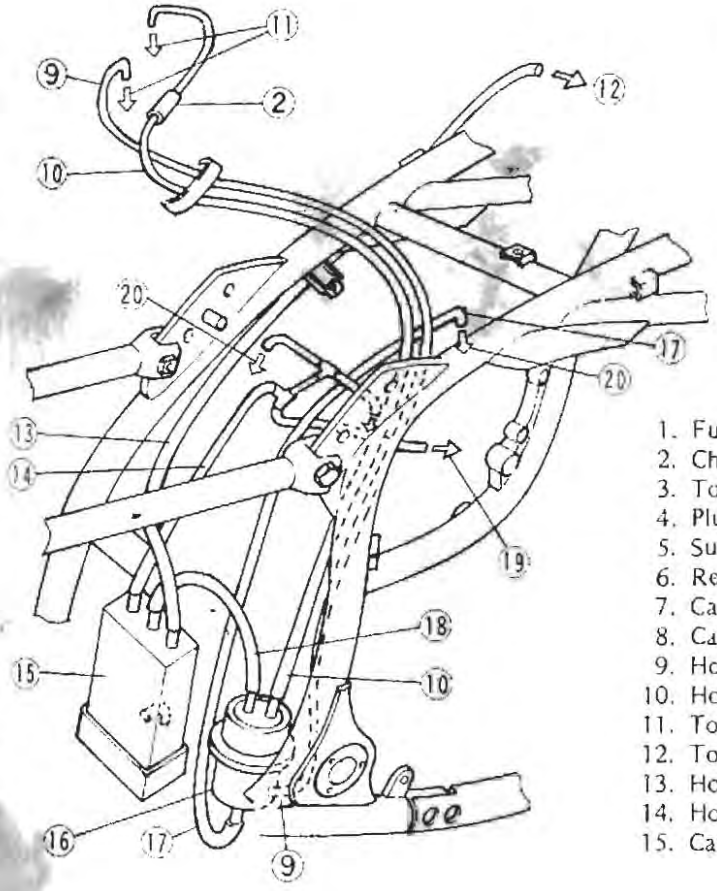




Viewed from Front

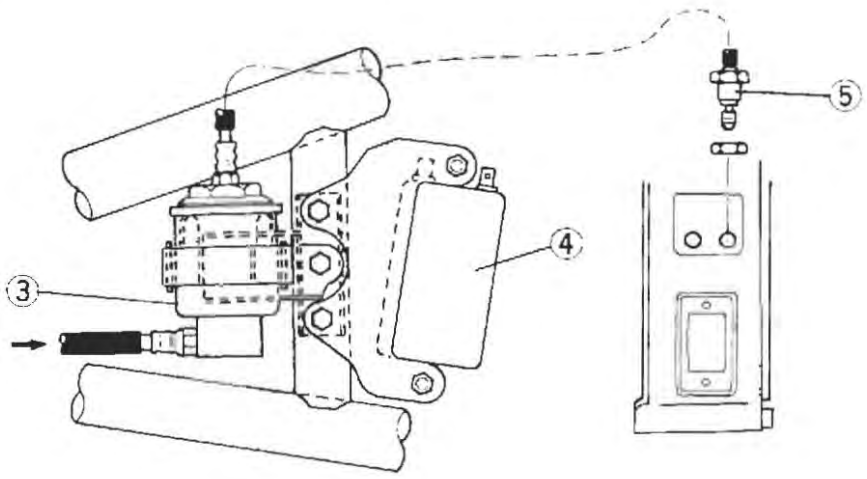


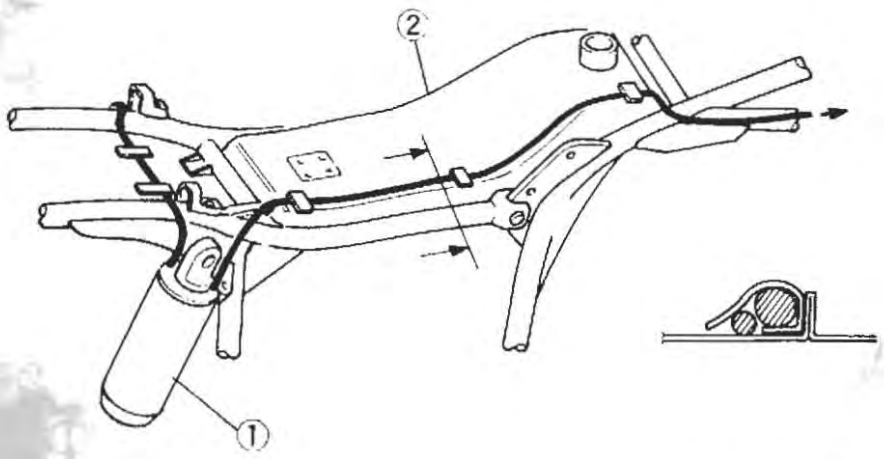
Vacuum Hoses and Breather Hoses (California Model)



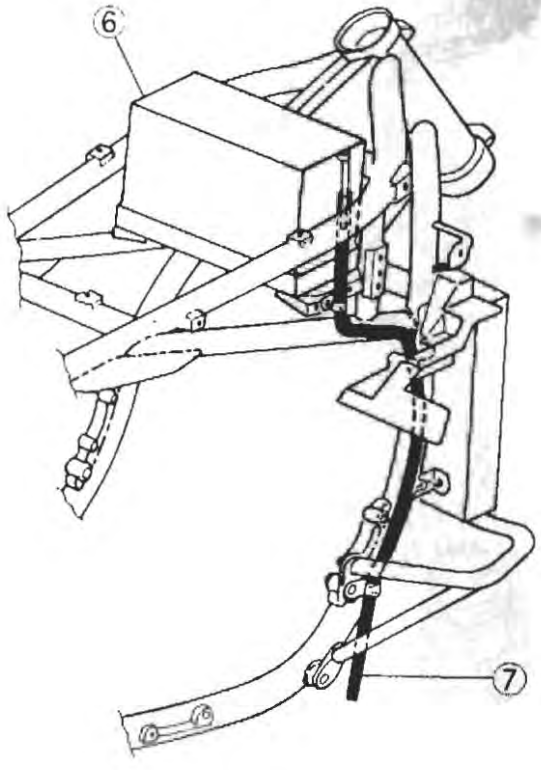
1. Fuel Tank Cap
2. Check Valve
3. To Liquid/Vapor Separator
4. Plug
5. Surge Tank
6. Reservoir Tank Overflow Hose
7. Catch Tank Drain Hose
8. Catch Tank
9. Hose (Red)
10. Hose (Blue, Long)
11. To Fuel Tank
12. To Air Cleaner
13. Hose (Green)
14. Hose (Yellow)
15. Canister
16. Liquid/Vapor Separator
17. Hose (White)
18. Hose (Blue, Short)
19. To Vacuum Valve
20. To Carburetors
21. Vacuum Valve

Rear Shock Absorber Air Hoses





Battery Vent Hose



1. Rear Shock Absorber
2. Fuel Tank
3. Oil Separator
4. Ignition Coil (#2 & 3)
5. Air Valve
6. Battery
7. Battery Vent Hose

Fuel System

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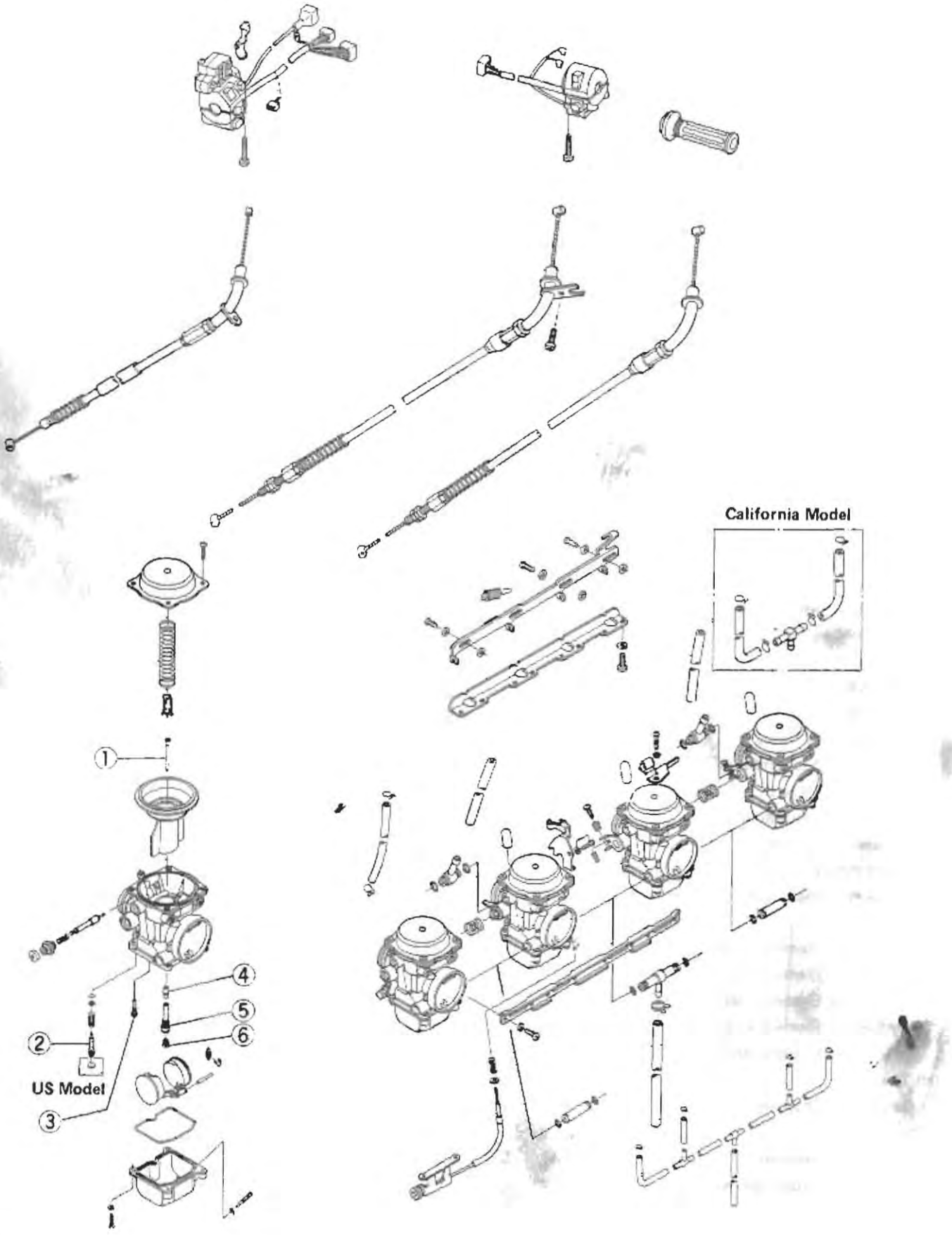
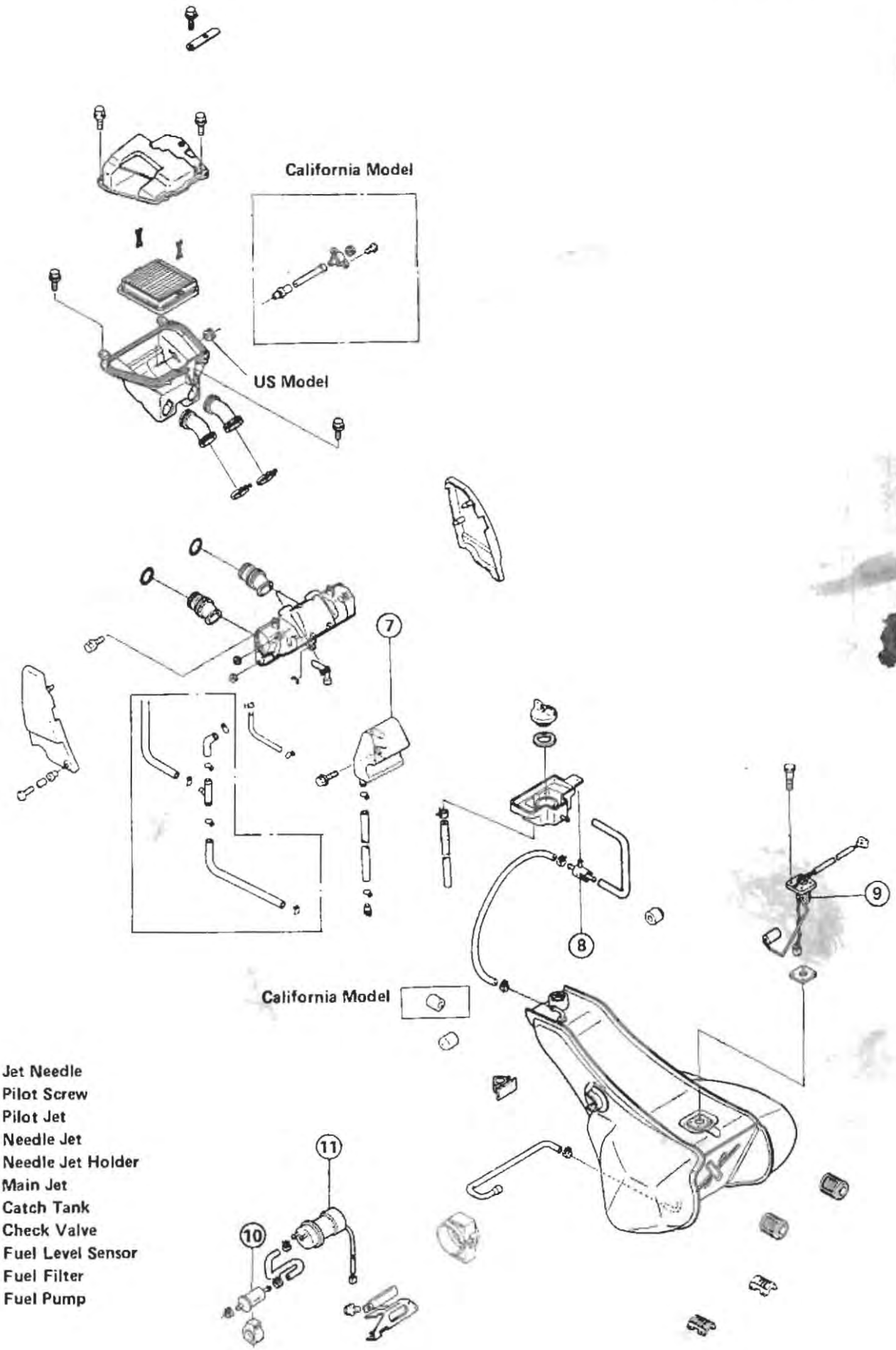
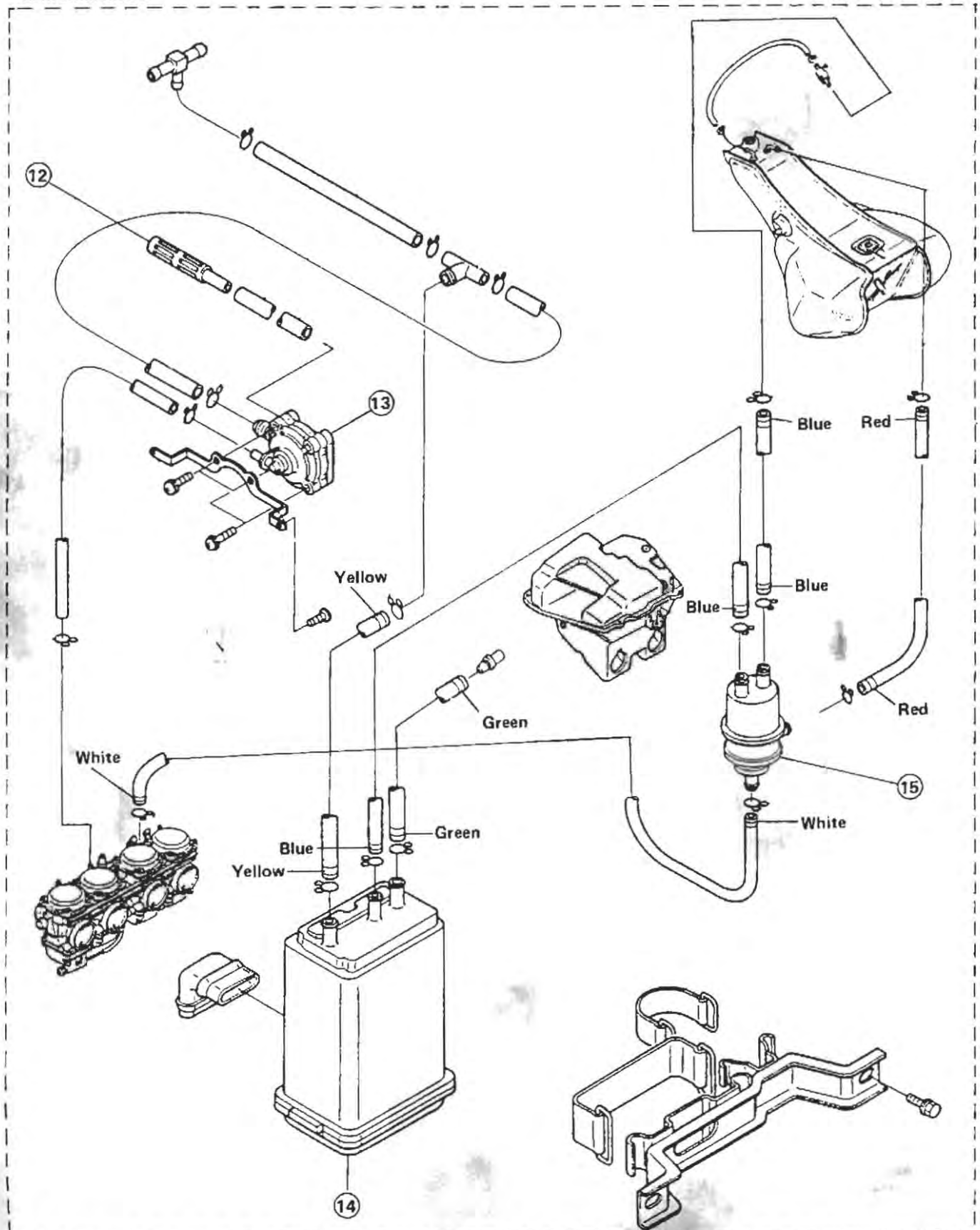
Exploded View





1. Jet Needle
2. Pilot Screw
3. Pilot Jet
4. Needle Jet
5. Needle Jet Holder
6. Main Jet
7. Catch Tank
8. Check Valve
9. Fuel Level Sensor
10. Fuel Filter
11. Fuel Pump

California Model



12. Filter
13. Vacuum Valve
14. Canister
15. Liquid/Vapor Separator

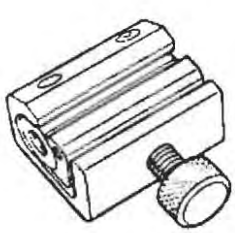
Specifications

Item		Standard
High Altitude Performance Adjustment (US model only):		
Carburetor Adjustment:	Main Jet	105
	Pilot Jet	35
Throttle Grip:		
Throttle Grip Free Play		2 – 3 mm
Choke Cable:		
Choke Cable Free Play		2 – 3 mm
Carburetors:		
Idle Speed		800 ±50 r/min (rpm)
Synchronization Vacuum		Less than 2.7 kPa (2 cmHg)
Standard Specifications:	Make/Type	Keihin/CVK30
	Main Jet	108
	Main Air Jet	100
	Needle Jet	6
	Jet Needle	N36G, California : N36H
	Pilot Jet	38
	Pilot Air Jet	150
	Pilot Screw	2 turns out, US : ——
	Starter Jet	48
	Service Fuel Level	–0.5 ±1 mm
	Float Height	17.0 mm

Special Tools

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

Pressure Cable Luber: K56019-021



Fuel Level Gauge: 57001-1017

Vacuum Gauge: 57001-1198

NOTE

○*The vacuum gauge & tachometer (P/N 57001-1291) can be used instead of the vacuum gauge (P/N 57001-1198).*

High Altitude Performance Adjustment (US Model)

To improve the Emission Control Performance of vehicles operated above **4,000 feet (1,219 meters)**, Kawasaki recommends the following Environmental protection Agency (EPA) approved modification.

NOTE

○*When properly performed, these specified adjustments are not considered to be emission control system "tampering" and vehicle performance is generally unchanged as a result.*

High Altitude Carburetor Adjustments

•High altitude carburetor adjustments require replacement of certain carburetor jets.

High Altitude Carburetor Specifications

Main Jet: 105
Pilot Jet: 35

•After high altitude carburetor adjustments are performed, provide the customer with the Vehicle Emission Control Information Update Label and label installation instructions (P/N 99969-0614).
•Advise the customer that by law, the Vehicle Emission Control Information Update Label must be affixed to any vehicle modified with the high altitude carburetor adjustments.

NOTE

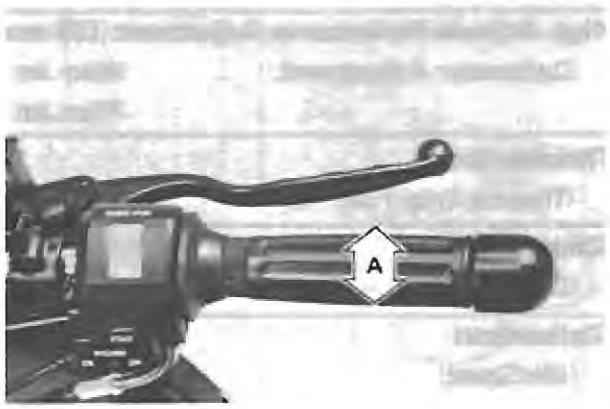
○*If a vehicle with the high altitude adjustments is used below 4,000 feet (1,219 meters), the update label must be removed and the original carburetor parts must be reinstalled.*

Throttle Grip and Cables

Throttle Grip Play Inspection

•Check throttle grip free play by lightly turning the throttle grip back and forth.
★If free play is not correct, adjust the throttle cables.

Throttle Grip Free Play
2 – 3 mm



A. Throttle Grip Free Play

•With the throttle grip closed, check that the decelerator inner cable is tight by touching it at the lower end with a thin-bladed screwdriver.

A. Decelerator Cable

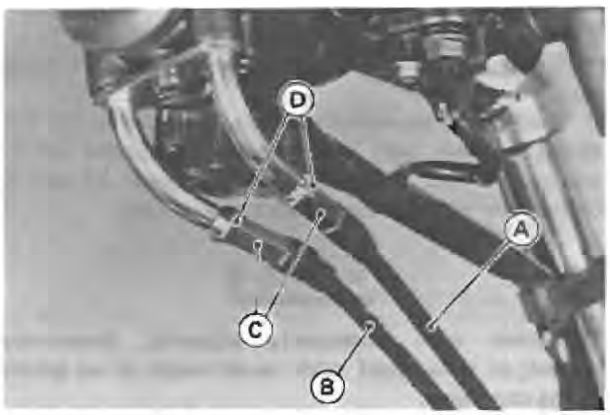
★If the throttle grip free play is incorrect or the decelerator inner cable is loose with the throttle closed, adjust the throttle cables.
★If the free play is correct, make the following test:
•Start the engine.
•Turn the handlebar from side to side while idling the engine.
★If idle speed varies, the throttle cables may be poorly routed or they 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 locknuts and screw both throttle cable adjusters in fully at the upper end of the throttle cables so as to give the throttle grip plenty of play.
- With the throttle grip completely closed, turn out the decelerator cable adjuster until the inner cable just becomes tight. Tighten the locknut.
- Turn the accelerator cable adjuster until the correct throttle grip free play is obtained. Tighten the locknut.



A. Accelerator Cable
B. Decelerator Cable
C. Adjusters
D. Locknuts

NOTE

○*If the throttle cables can not be adjusted by using the cable adjusters at the upper end of the throttle cables, use the cable adjusters at the lower ends of the throttle cables. Do not forget to securely tighten the locknuts after adjustment.*

- Start the engine.
- Turn the handlebar from side to side while idling the engine.
- ★If idle speed varies, the throttle cables may be poorly routed or they 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.**

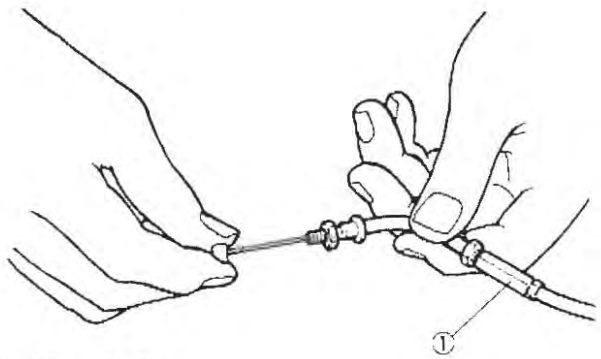
Throttle Cable Lubrication

Whenever the throttle cables are removed and in accordance with the Periodic Maintenance Chart, lubricate the throttle cables (see Appendix chapter).

Throttle Cable Inspection

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

Throttle Cable Inspection



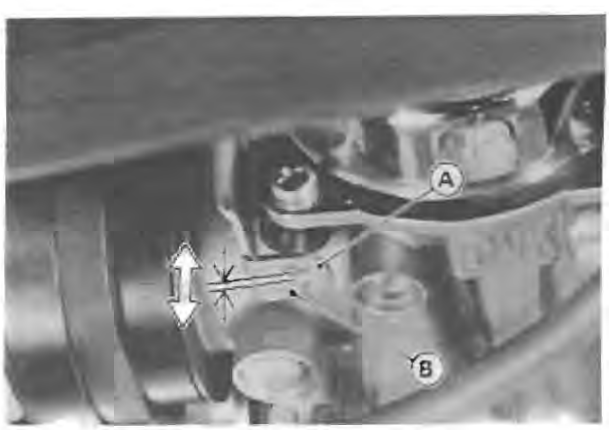
1. Throttle Cable

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

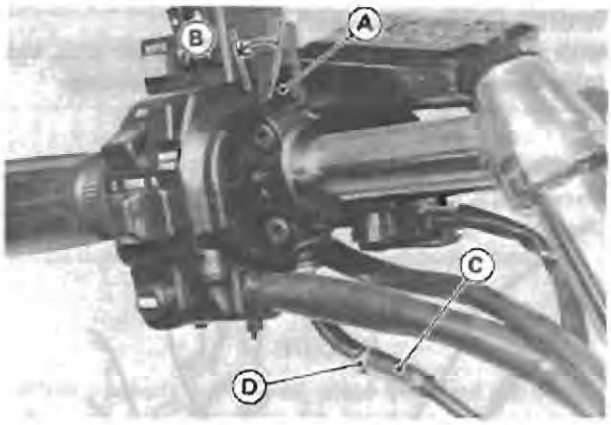
Choke Cable

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 follows:
- Determine the amount of choke cable play at the choke lever. Pull the choke lever until the starter plunger lever at the carburetor contacts with the starter plunger; the amount of choke lever travel is the amount of choke cable play.



A. Starter Plunger Lever
B. Starter Plunger



A. Choke Lever
B. Free Play
C. Adjuster
D. Locknut

★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 adjuster of the choke cable, and turn the adjuster until the cable has the proper amount of play.
- Tighten the locknut after adjustment.

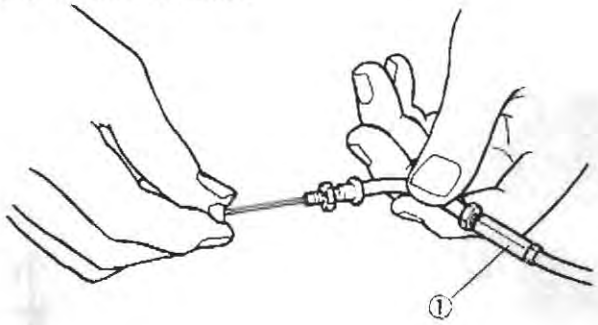
Choke Cable Lubrication

Whenever the choke cable is removed, and in accordance with the Periodic Maintenance Chart, lubricate the choke cable (see Appendix chapter).

Choke Cable Inspection

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

Choke Cable Inspection



1. Choke Cable

★If cable movement is not free after lubricating, if the cable is frayed, or if the housing is kinked, replace 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 cables may be improperly adjusted or incorrectly routed, or they 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

800 ±50 r/min (rpm)

Idle Speed Adjustment

- Turn the idle adjusting screw until idle speed is correct.

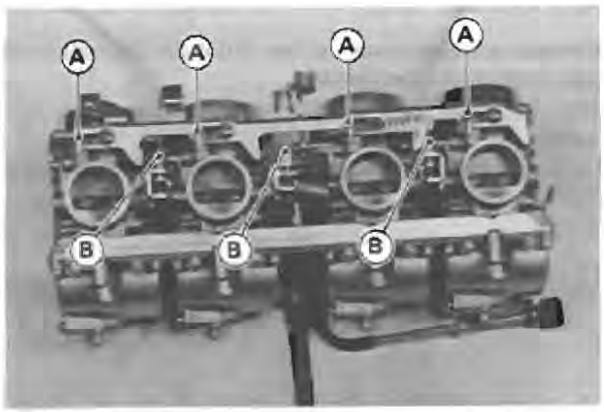
A. Idle Adjusting Screw

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

Carburetor Synchronization Inspection

•Warm up the engine.
•Check idle speed and adjust if necessary.
•Remove the air cleaner housing.
•Attach the vacuum gauge set (special tool: P/N 57001-1198) to the vacuum hose fittings on the carburetors.

(Viewed from front)



A. Vacuum Hose Fitting B. Adjusting Screw

•Install the air cleaner housing. Be sure to install the air cleaner element.
•Start the engine and let it idle to measure the engine intake vacuum.
★If the intake vacuum difference between any two cylinders exceeds the limit, synchronize the carburetors.

Carburetor Synchronization Vacuum

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

•Remove the vacuum gauge set, and install the removed parts.

Carburetor Synchronization

•Turn the adjusting screws to synchronize the carburetors.

NOTE

○*First synchronize the left two and then the right two cylinders by means of the adjusting screw between No. 1 and No. 2 cylinders, and between 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

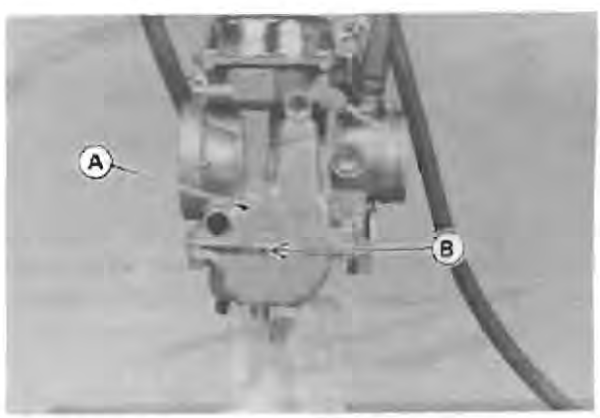
○**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

•Remove the carburetors, and hold them in upright on a stand.
•Connect a fuel tank to the carburetors with a suitable hose.
•Prepare a fuel hose (6 mm in diameter and about 300 mm long).
•Connect the fuel level gauge (special tool) to the carburetor float bowl with the fuel 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.
•Hold the fuel tank 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 again, the fuel level measure shows somewhat higher than the actual fuel level. If the gauge is lowered too far, dump the fuel out of it into 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.
•Remove the fuel level gauge.
•Inspect the fuel level in the other carburetors in the same manner.
★If any fuel level is incorrect, adjust it.



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

Fuel level

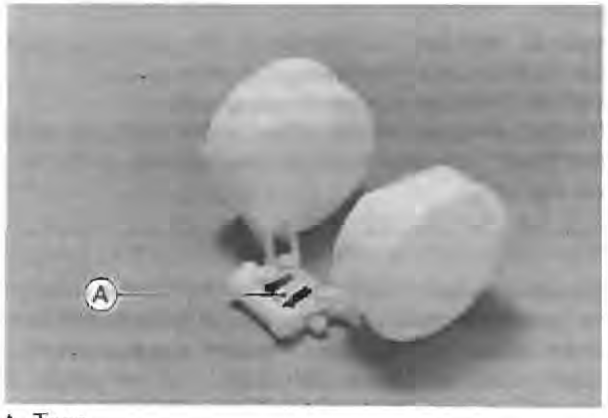
0.5 ±1 mm above the bottom edge of carburetor body

Fuel Level Adjustment

- Read the WARNING in the Fuel Level Inspection.
- Drain the fuel out of 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

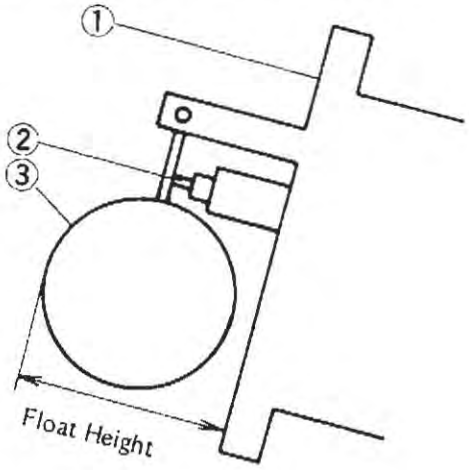


A. Tang

- 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



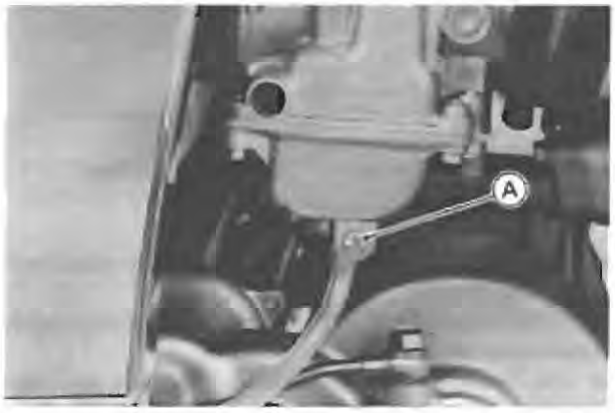
1. Float Bowl Mating Surface
2. Float Valve Needle Rod (contacted but unloaded)
3. Float

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 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.

★If any water or dirt appeared during the above inspection, clean the fuel system (see Carburetor Cleaning and Fuel Tank 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.

- To remove the carburetors, remove the air cleaner housing.
- After removing the carburetors, stuff pieces of lint-free, clean cloth into the carburetor holders and the intake ducts to keep 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.

•Install the carburetor holder clamps so that the screws are positioned downward to prevent them from contacting anything.
•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
Carburetor Synchronization
Throttle Cables
Choke Cable

Carburetor Disassembly/Assembly Notes

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

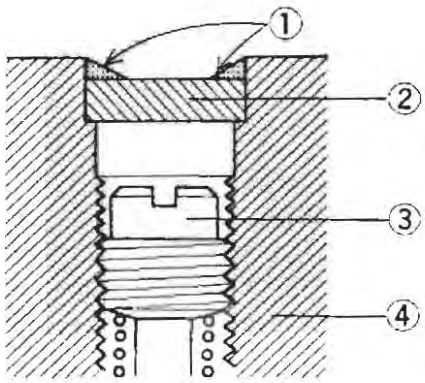
○During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.

•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

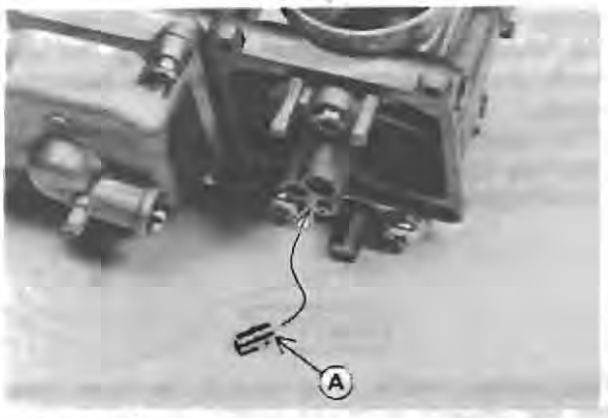
○Do not apply too much bonding agent to the plug or the pilot screw itself may be fixed.

Plug Installation (US model only)



1. Apply 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.



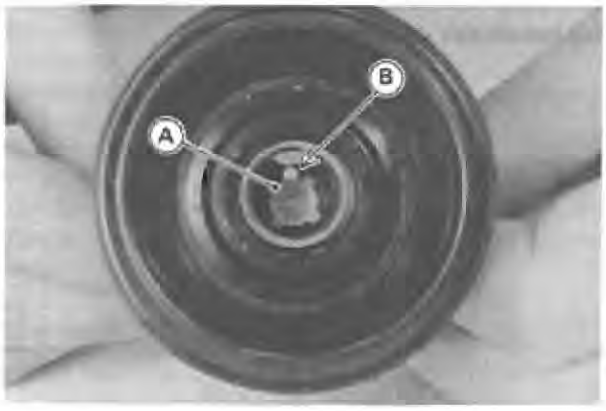
A. Small End

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

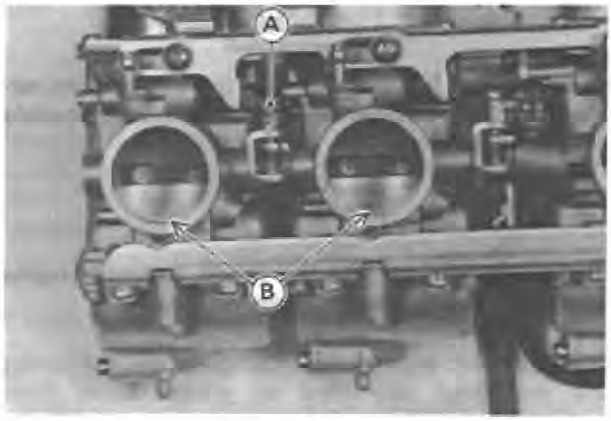
CAUTION

○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



A. Balance Adjusting Screw
B. Clearance

NOTE

○*First synchronize the left two and then the right two carburetors by means of the adjusting screw between No. 1 and No. 2 carburetors, and between No. 3 and No. 4 carburetors.*
○*The synchronize the left two carburetors and the right two carburetors using the center adjusting screw.*

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.
☆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.**

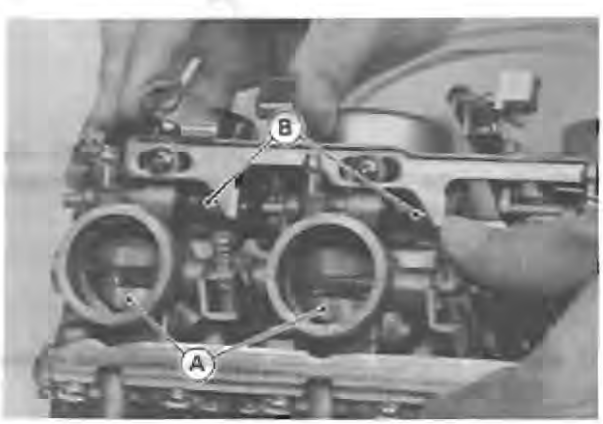
•Disassemble the carburetors.
•Immerse all the metal parts in a carburetor cleaning solution.
•Rinse the parts in water.
•When the parts are clean, dry them with compressed air.
•Blow through the air and fuel passages with compressed air.
•Assemble the carburetors.

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.

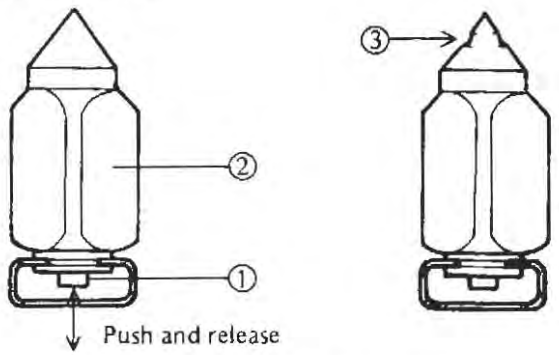
•Remove the carburetors.
•Before disassembling the carburetors, check the fuel level.
★If the fuel level is incorrect, inspect the rest of the carburetor before correcting it.
•Move the choke shaft left and release it to check that the starter plungers move smoothly and return by spring tension.
★If the starter plungers do not work properly, replace the carburetors.
•Turn the throttle cable pulley to check that the throttle valves move smoothly and return by spring tension.
★If the throttle valves do not move smoothly, replace the carburetors.



A. Throttle Valves B. Starter Plungers

•Disassemble the carburetors.
•Clean the carburetors.
•Check that the O-rings on the carburetors 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.

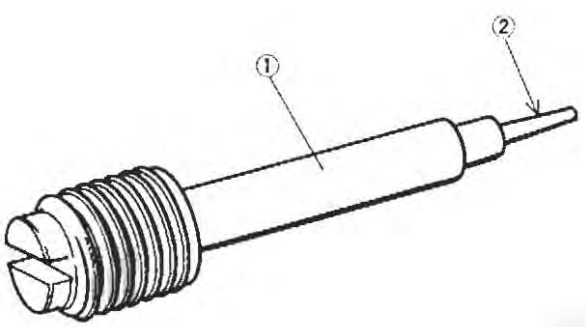
Float Valve Wear



1. Rod
2. Valve Needle
3. Valve Needle Wear

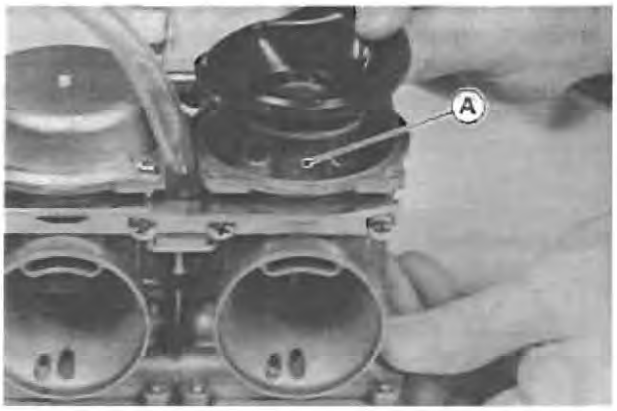
★If the plastic tip is damaged, replace the needle.
•Push in the rod in the other end of the float valve needle and then replace it.
★If it does not spring out, replace the needle.
•Check the tapered portion of the pilot screw for wear or damage.

Pilot Screw

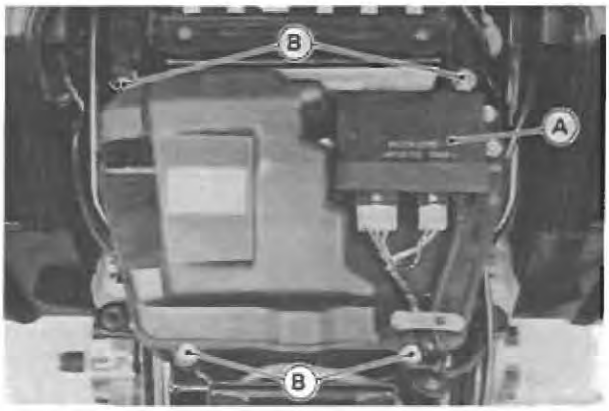


1. Pilot Screw 2. Tapered Portion

★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 the carburetor.



A. Vacuum Piston

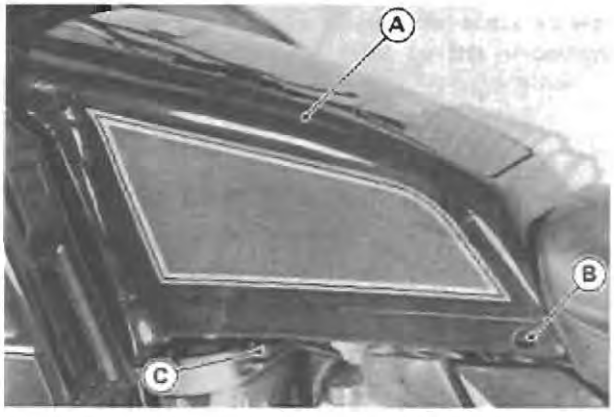


A. IC Igniter B. Housing Bolts

Air Cleaner

Air Cleaner Element Removal

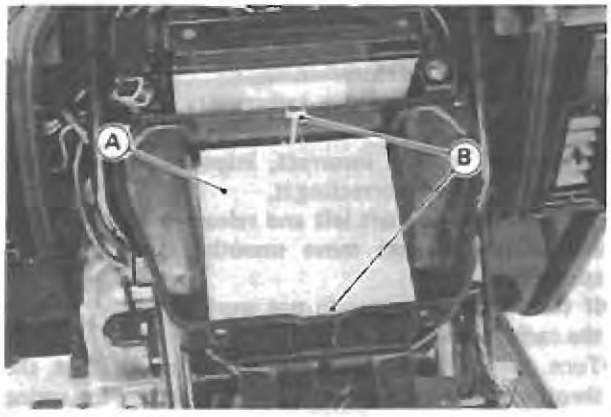
●Remove the dummy tank cover.



A. Dummy Tank Cover C. Retaining Knob
B. Screw

●Open the air cleaner housing upper half by taking out the housing bolts. It is not required to remove the IC igniter.

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



A. Element B. Holders

●Stuff pieces of lint-free, clean cloth into the air intake ducts to keep dirt out of engine.

WARNING

○**If dirt of 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 Notes

●Meet the element sponge gasket with the body opening in the air cleaner housing lower half.

A. Sponge Gasket

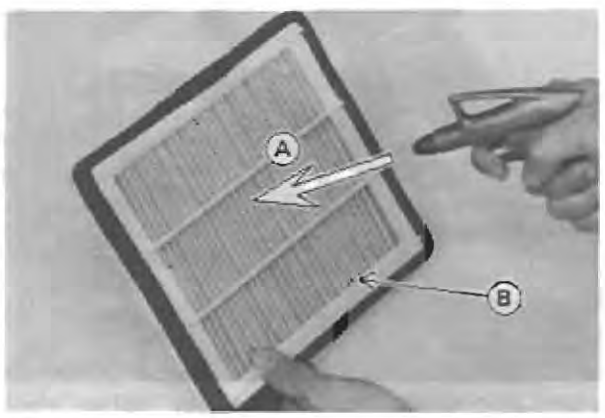
●Be sure to install the element holders in their place.

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.
●Dry the element by directing a stream of compressed air from the clean side to the dirty side.

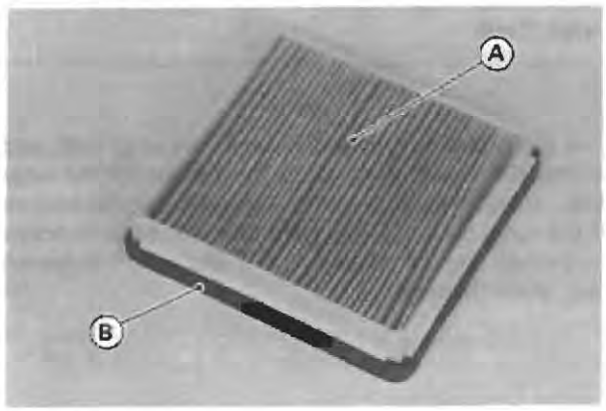


A. Compressed Air
B. Clean Side (Sponge Gasket Side)

●Inspect the element before installing it.

Air Cleaner Element Inspection

●Visually check the element for tears or breaks. Check the sponge gasket also, and the plastic frame.

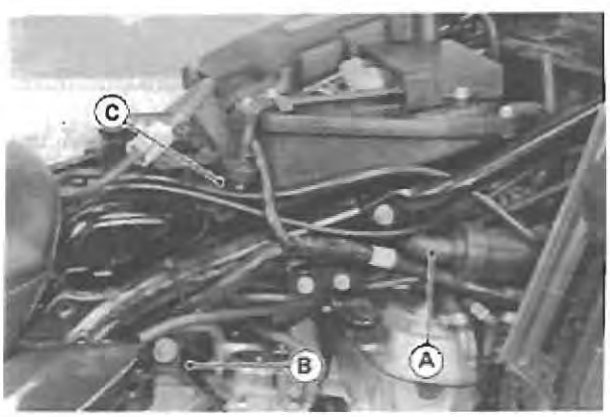


A. Element B. Gasket

★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.

Air Cleaner Housing Removal

●Remove the following.
Dummy Tank Cover
Battery and Tray
IC Igniter
●Pull the air hose connecting the housing to the silencer off the housing.



A. Air Hose C. Housing Mounting Bolt
B. Air Intake Duct Clamps

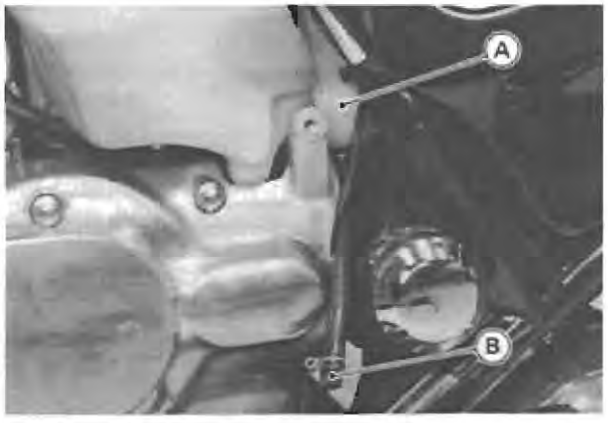
●Loosen the air intake duct clamp screws.
●Remove the remaining housing mounting bolt.
●Pull the air cleaner housing upward and take it off the surge tank.

Catch Tank

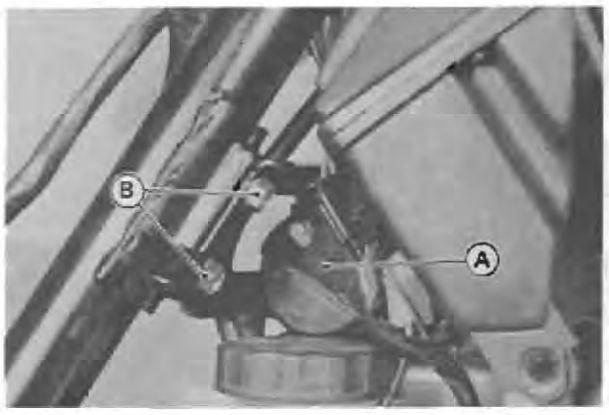
A catch tank is provided beneath the surge tank, and catches the water or oil from the bottom of the surge tank. Usually water or oil do not collect at the bottom of the surge tank. In the event that rain water is drawn in through the air cleaner, or if engine oil is blown back, drain the tank.

Catch Tank Draining

- Visually check the catch tank if the water or oil accumulates in the tank.
- If any water or oil accumulates in the tank, drain it by taking off the drain plug at the lower end of the drain hose.
- Be sure to install the plug firmly, or the air is drawn in through it.



A. Catch Tank B. Drain Plug



A. Fuel Pump B. Pump Bracket Mounting Bolts

- Take out the bolts and remove the fuel pump with its bracket.
- Disconnect the pump lead connector.
- Pull the fuel hoses off the fuel pump. Be prepared for fuel spillage.

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.

A. Fuel Pump B. Fuel Filter

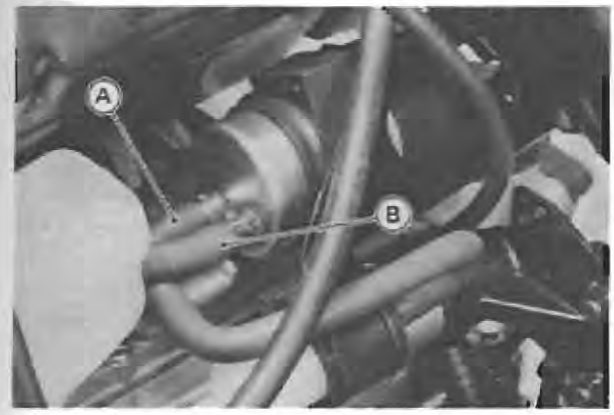
Fuel Pump

Fuel Pump Removal

- Remove the fuel tank for extra clearance.

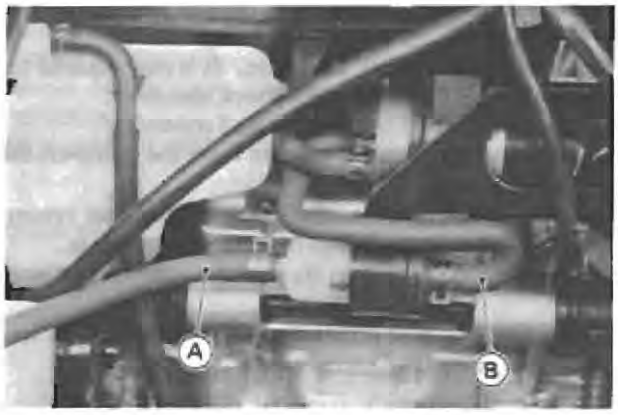
Fuel Pump Installation Notes

- Connect the fuel hose from the filter to the fitting marked INLET, and the hose to the carburetors to the another fitting.



A. Fuel Hose from Filter
B. Fuel Hose to Carburetors

•Be sure to route the hoses so they will not be kinked or stretched.



A. Fuel Hose from Tank B. Fuel Hose to Pump

•Be sure to route the hoses so they will not be kinked or stretched.

Fuel Filter Inspection

•Visually inspect the fuel filter.
★If the filter is clear with no signs of dirt or other contamination, it is OK and need not be replaced.
★If the filter is dark or looks dirty, replace it. Also, check the rest of the fuel system for contamination.

Fuel Filter

Fuel Filter Removal

•Remove the fuel tank for extra clearance.
•Pull the filter off the hose. Be prepared for fuel spillage.

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.**

Fuel Filter Installation Notes

•Install the fuel filter so that the arrow on it shows the fuel flow from the fuel tank to the fuel pump.

Fuel Tank and Fuel Level Sensor

Fuel Tank Removal

WARNING

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

CAUTION

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

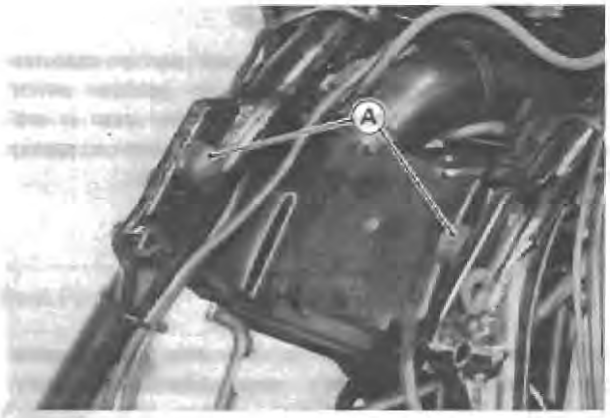
- Before removing the fuel tank, remove the fuel in the tank as possible using a suitable pump.
- Remove the rear shock absorbers. It is not required to remove the air hoses from the shock absorbers.
- Disconnect the fuel level sensor lead connector.
- Free the overflow hose lower end from the clamp on the frame lower pipe.
  - For California vehicles, the breather and fuel return hoses must be disconnected from the tank fittings.
- Holding the fuel tank on its position, remove the rear frame.
- Clamp the fuel hose connecting the fuel tank with the filter shut using the locking pliers.

A. Clamp this hose.

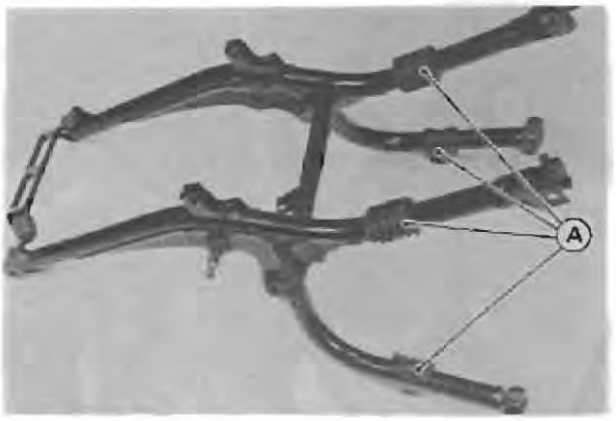
- Pull the fuel hose off the filter. Be prepared for fuel spillage.
- Tilt the tank out the rear of the frame.
- Drain the fuel tank.
  - Arrange a suitable container under the fuel tank.
  - Remove the locking pliers from the fuel hose to flow the remaining fuel in the tank.

Fuel Tank Installation Notes

- Be sure to install the rubber dampers in place.



A. Dampers



A. Dampers

- If the check valve at the breather hose was removed, install it so that the arrow on it shows the fuel vapor flow from the tank to the tank filler tray or canister.

A. Check Valve

- Be sure to route the hoses so they will not be kinked or stretched.

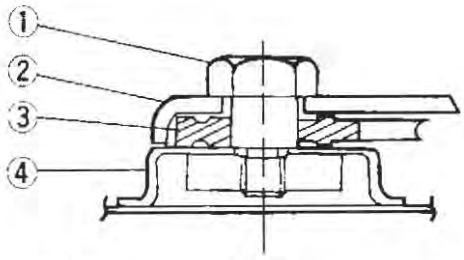
Fuel Level Sensor Removal/Installation Notes

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.**

- Before removing the fuel level sensor, check the fuel level in the fuel tank is low enough to remove the sensor. The fuel level should be below the opening for the sensor mounting.
- Be sure to install the gasket in its place.

Fuel Level Sensor Gasket



1. Stepped Bolt
2. Sensor Bracket
3. Gasket
4. Fuel Tank Bracket

Fuel Tank Cleaning

- Remove the fuel tank and drain it.
- Remove the fuel level sensor.
- Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.

WARNING

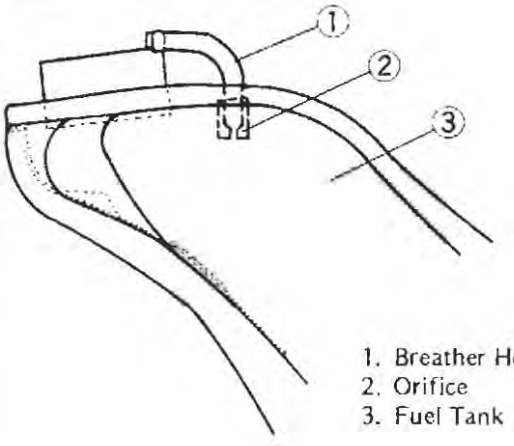
Clean the tank in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents to clean the tank.

- Pour the solvent out of the tank.
- Dry the tank with compressed air.
- Install the fuel level sensor.
- Install the fuel tank.

Fuel Tank Inspection

- Visually inspect the gaskets on the sensor and cap for any damage.
- ★Replace the gaskets if they are damaged.
- Check to see if the orifice at the bottom of the breather hose fitting is not clogged.
- ★If it is clogged, blow through the fitting to free the orifice from clogging.

Breather Hose Fitting Orifice

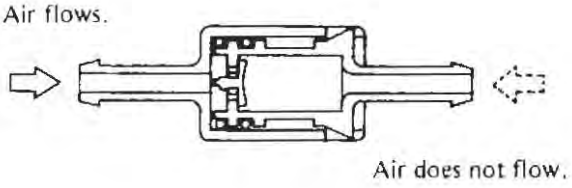


1. Breather Hose Fitting
2. Orifice
3. Fuel Tank

Check Valve Inspection

- Inspect the check valve by blowing air into each hose fitting of the valve. Air flows in the direction of the arrow on the valve, and does not flow in the reverse direction.
- ★If it does not, replace the check valve.

Check Valve



CAUTION

Do not use compressed air during the valve check, or the check valve may be damaged.

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

•To prevent the gasoline from flowing into the canister or from flowing 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 kinked.

Hose Inspection

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

Separator Inspection

•Visually inspect the separator for cracks and other damage.
★If the separator has any cracks or is badly damaged, replace it with a new one.

Separator Operation Test

WARNING

○**Gasoline is extremely flammable and can be explosive under certain conditions. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks.**

•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 hose 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

•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.*

Vacuum Valve Inspection

•Check the vacuum valve by blowing air into the hose fitting of the valve.
○When applying vacuum (2 cmHg) to the vacuum sensing fitting, the valve is opened and air flows from the filter fitting to the carburetor float chamber fitting, and vice versa.
○When stopping to apply vacuum, the valve is closed and air does not flow.
★If the vacuum valve does not operate as described, replace the valve.

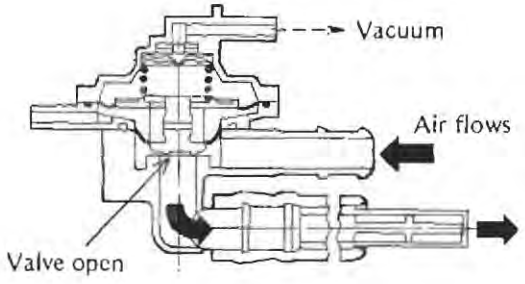
CAUTION

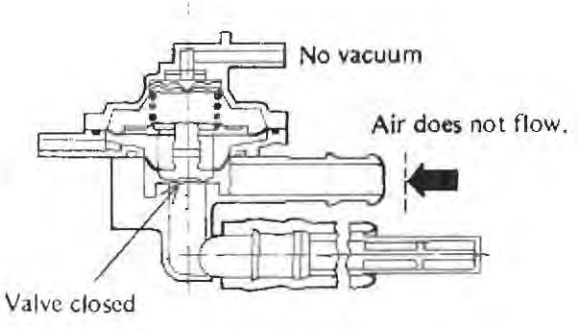
○**Do not use compressed air during the valve check, or the vacuum valve may be damaged.**

NOTE

○*The vacuum valve is opened to apply atmospheric pressure to the carburetor float chambers when the engine is running, and closed to store the vapors from the float chambers in the canister when the engine is stopped.*

Vacuum Valve Operation





Cooling System

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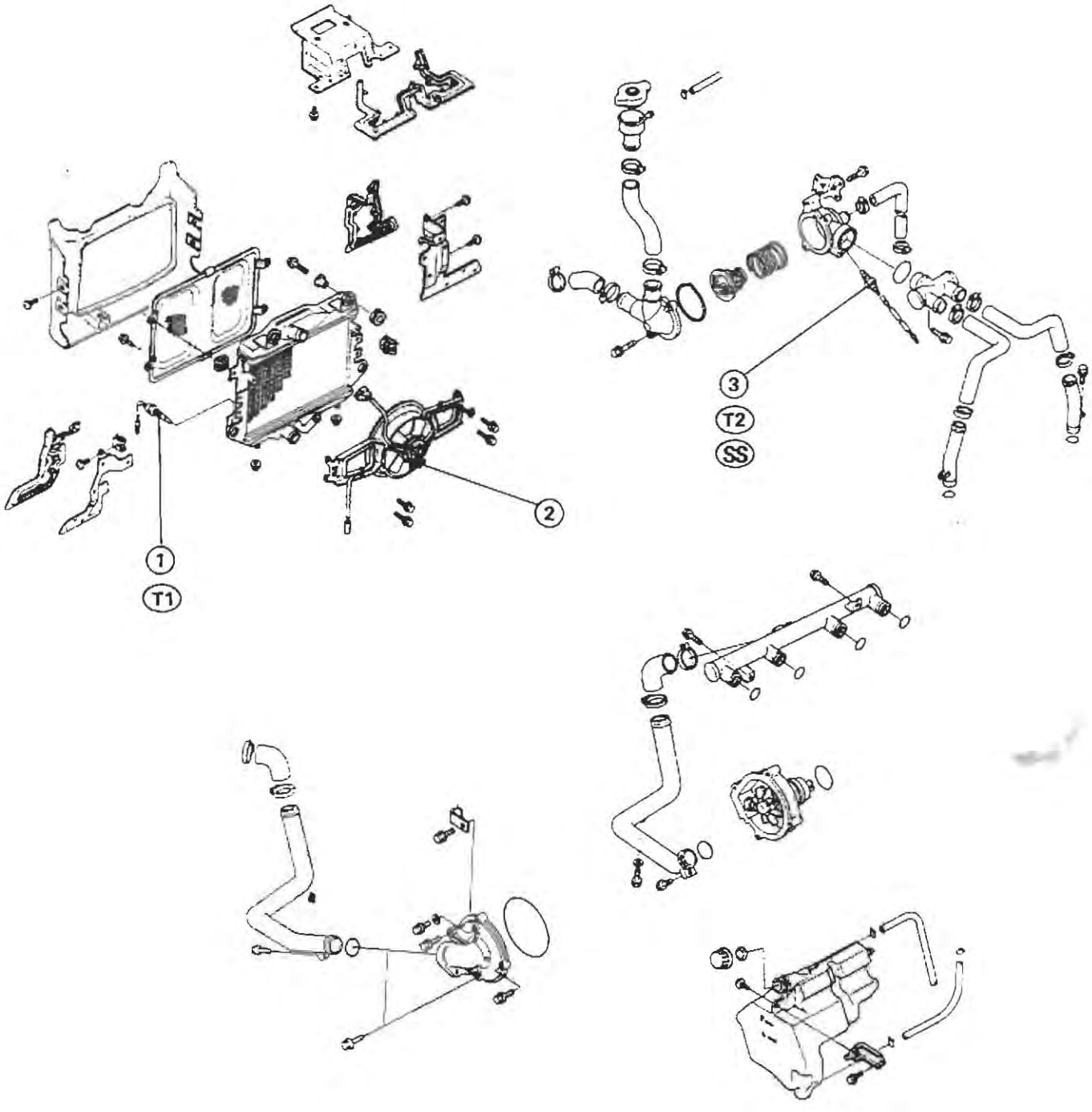
Exploded View



1. Radiator Fan Switch
2. Radiator Fan
3. Water Temperature Sensor

SS : Silicone Sealant

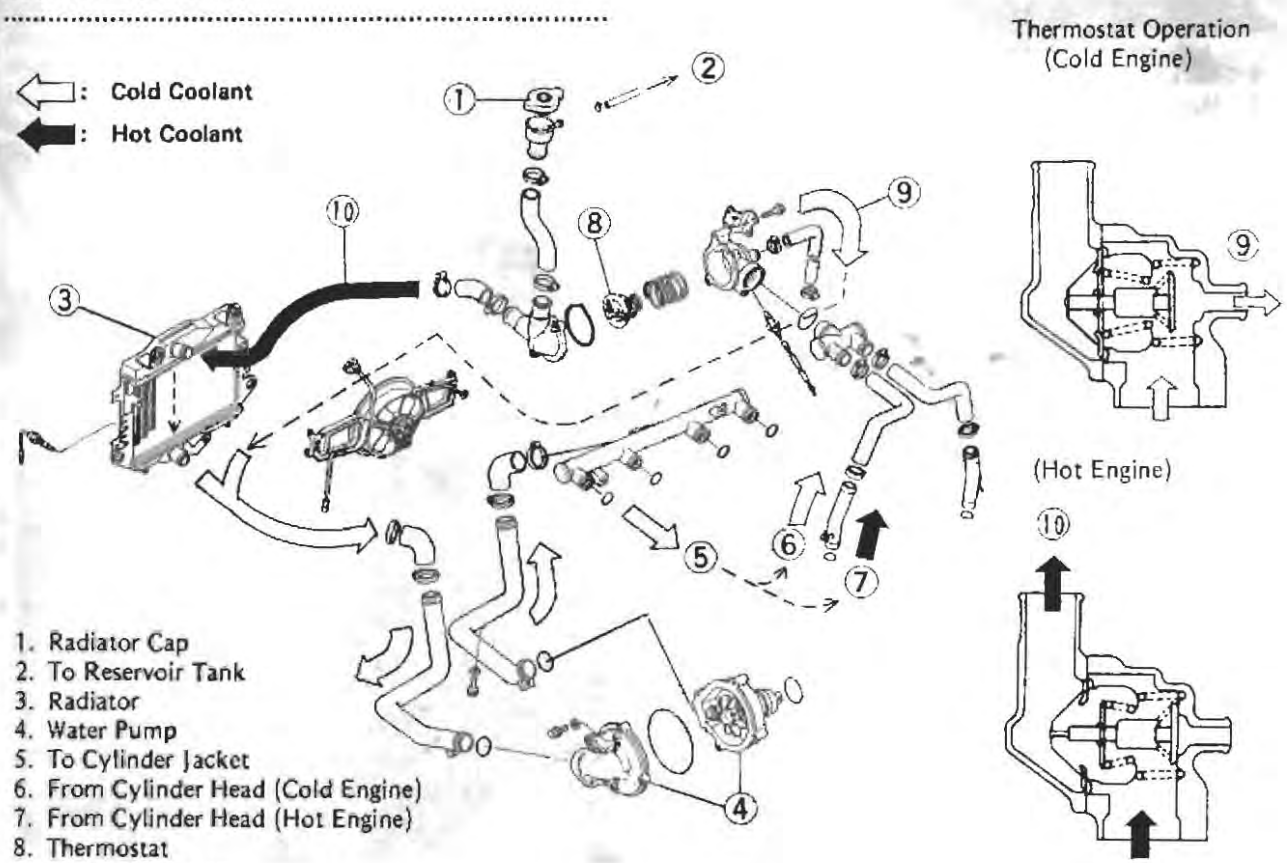
T1 : 7.8 N·m (0.80 kg-m, 69 in-lb)

T2 : 15 N·m (1.5 kg-m, 11.0 ft-lb)

Specifications

Item		Standard
Coolant:		
Type (recommended)		Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Mixed Ratio (Provided coolant when shipping)		Soft water 57%, coolant 43%
Freezing Point (Provided coolant when shipping)		– 30°C (– 22°F)
Total Amount		3.8 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	More than 8 mm @95°C (203°F)

Coolant Flow Chart



Coolant

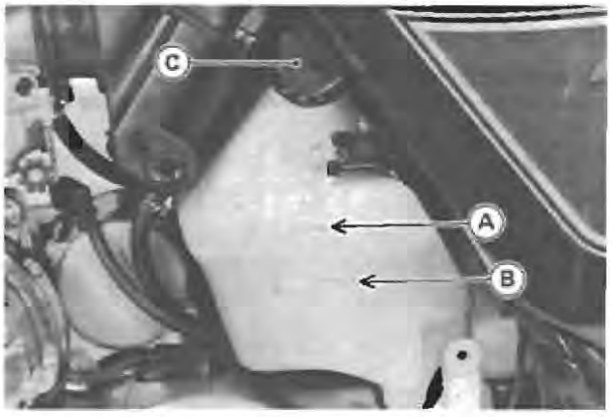
Coolant Level Inspection

- Set the motorcycle up on its center stand.
- Remove the reservoir tank cover.
- Check the coolant level in the reservoir tank. The coolant level should be between the "F" and the "L" marks.

NOTE

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

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



A. "F" Mark
B. "L" Mark
C. Tank Cap

★If the coolant level is low, add coolant through the filler opening to the "F" 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.**

Coolant Inspection

- 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 by removing the radiator cap, the air must be bleed from the cooling system.*

Coolant Change

CAUTION

○**Use coolant containing corrosion inhibitors made specifically for aluminum engines and radiators in accordance with the instructions of the manufactures.**

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.**

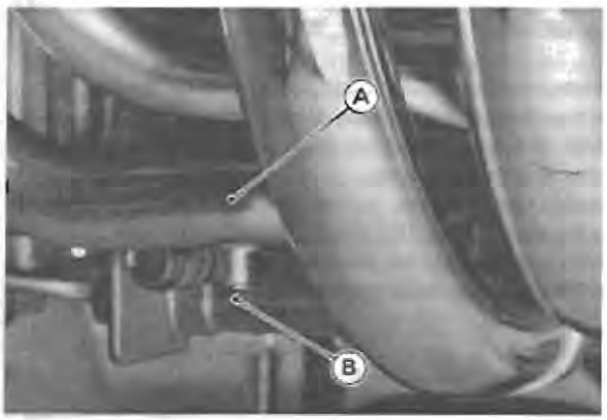
○**Coolant on tires will make them slippery and can cause an accident and injury. Immediately wipe up or wash away any coolant that spills on the frame, engine, or other painted parts.**

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

- Set the motorcycle up on its center stand.
- Remove the dummy tank cover.
- 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.

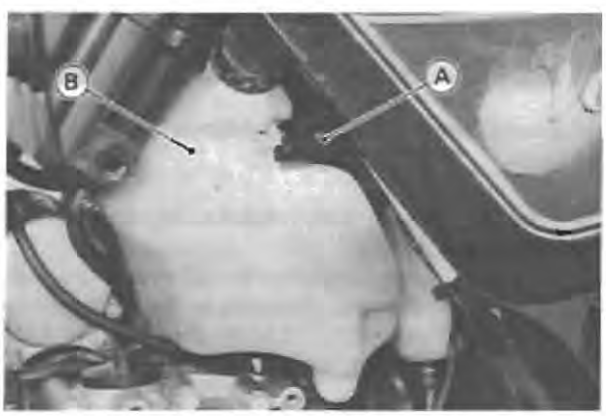
A. Radiator Cap

- Place a container under the drain plug at the bottom of the coolant pipe.
- Drain the coolant from the radiator and engine by removing the drain plug.



A. Coolant Pipe B. Drain Plug

- Remove the reservoir tank cover.
- Unscrew the bolt and remove the reservoir tank with hoses attached.
- Unscrew the cap and pour the coolant into a container.



A. Bolt B. Reservoir Tank

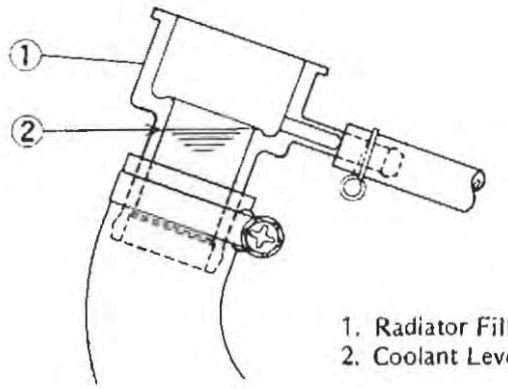
- Inspect the coolant deterioration.
- Install the drain plug. Always replace the gasket with new one, if it is damaged.
- Fill the radiator up to the top of the filler neck with coolant.

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.*

Radiator Filler Neck



1. Radiator Filler Neck
2. Coolant Level

- Fill the reservoir tank up to the "F" mark with coolant, and install the cap.
- Bleed the air from the system.

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

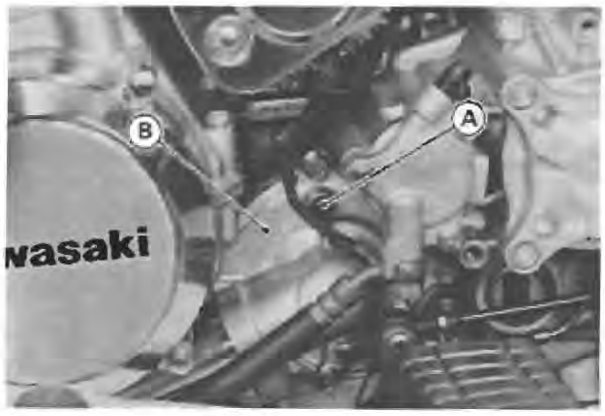
○*Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.*

Original Coolant

Type	:	**Permanent type antifreeze for aluminum engine and radiator**
Color	:	**green**
Mixed Ratio	:	**soft water 57%, coolant 43%**
Freezing Point	:	**−30°C (−22°F)**
Total Amount	:	**3.8 L (up to "F" mark)**

Cooling System Air Bleeding

- Loosen the air bleeder bolt on the top of the water pump cover, and the coolant begins to flow out the air bleeder bolt hole (that is, when all the remaining air has been forced out).



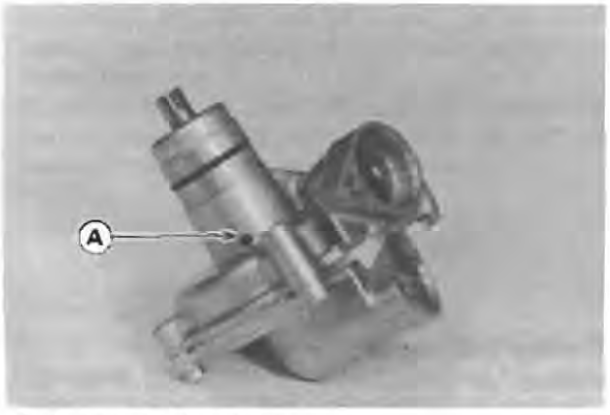
A. Air Bleeder Bolt B. Water Pump Cover

- Tighten the air bleeder bolt.
- Fill the radiator up to the radiator filler neck with coolant.
- Check the cooling system for leaks.
- Install the radiator cap turning it clockwise about ¼ turn.
- 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 "F" mark through the reservoir tank opening.

Mechanical Seal Inspection (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.



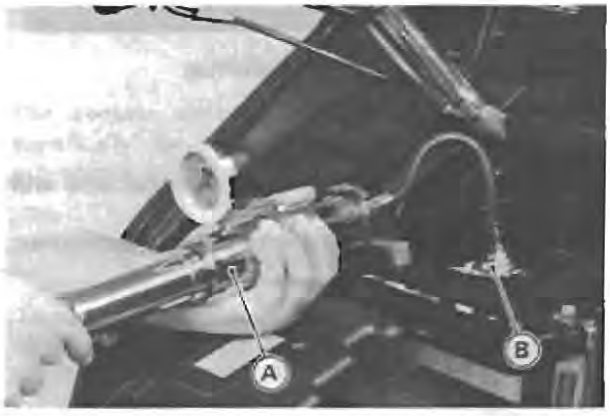
A. Drainage Outlet Passage
at the bottom of the pump body

Cooling System Pressure Test

CAUTION

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

Cooling System Flushing

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

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

CAUTION

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

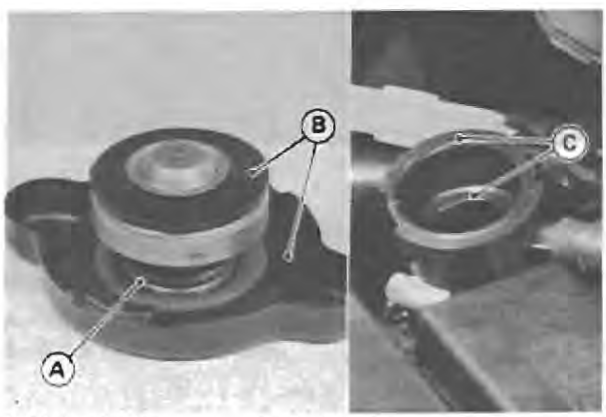
- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant,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

Radiator Cap

Radiator Cap Inspection

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

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



A. Valve Spring
B. Seals
C. Sealing Seats

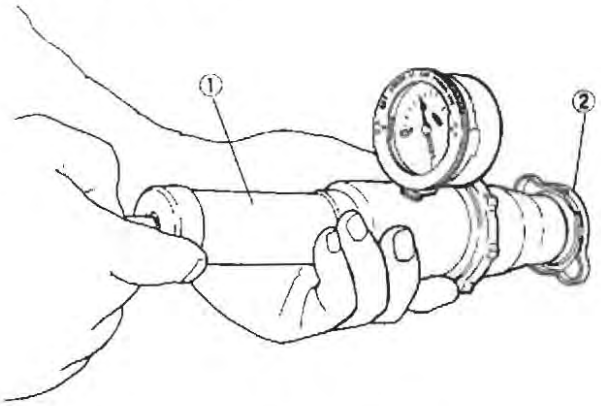
- Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.
- Install the cap on a cooling system pressure tester.
- Watching the pressure gauge, pump the pressure tester to build up the pressure. The cap must retain the pressure at least 6 seconds. Also the cap must open at the specified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

Radiator Cap Relief Pressure

73.5 – 103 kPa
(0.75 – 1.05 kg/cm², 11 – 15 psi)

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

Radiator Cap Test



1. Pressure Tester
2. Radiator Cap

Radiator, Fan, and Fan Switch

Radiator Removal Notes

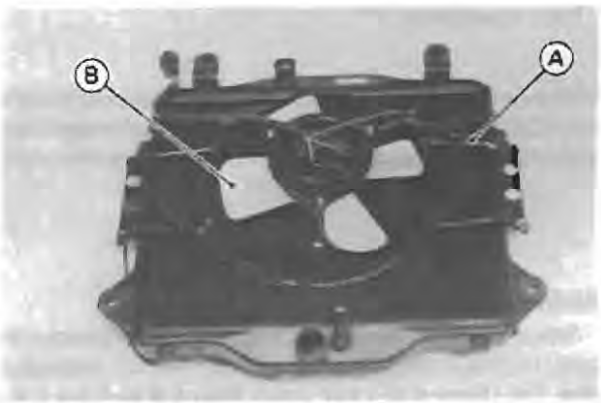
WARNING

○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.

- Wait until the coolant cools down, and then drain the coolant (see Coolant Change).
- Do not touch the radiator core directly, or the radiator fins are deformed.

Radiator Installation Notes

- If the radiator fan was removed, install it onto the radiator. Be sure to ground the lead by tightening it with the fan mounting bolt.



A. Ground Lead
B. Radiator Fan

•If the radiator fan switch was removed, tighten it to the specified torque (see Exploded View). Be sure to install the O-ring onto the switch.

A. Radiator Fan Switch

•Fill the cooling system with the coolant and bleed the air from the system.

Radiator Inspection

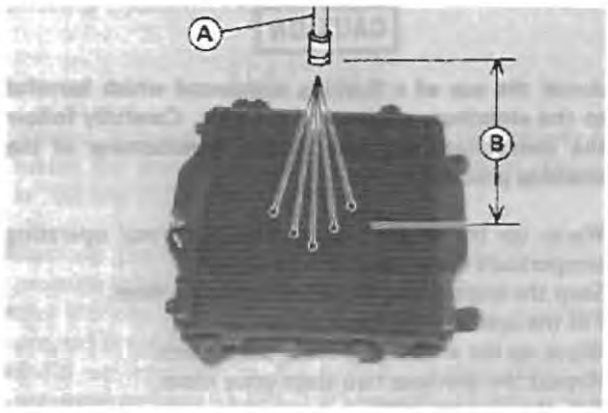
•Check the radiator core.
★If there are obstructions to air flow, remove them.
★If the corrugated fins are deformed, carefully straighten them with the blade of a thin screw driver.

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.

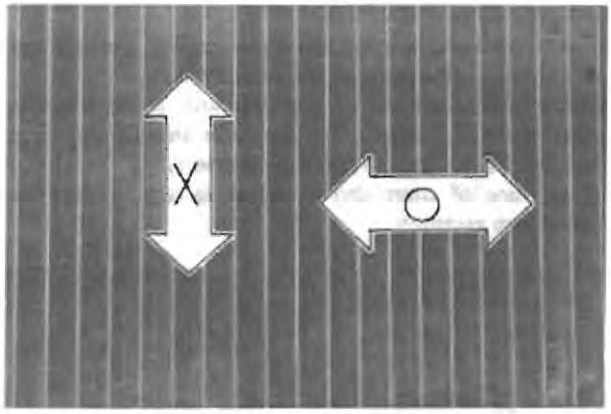
Radiator Cleaning

When cleaning the radiator with a steam cleaner, be careful of the following to prevents radiator damage.
•Keep the steam gun away more than **0.5 m** from the radiator core.



A. Steam Gun B. More than 0.5 m

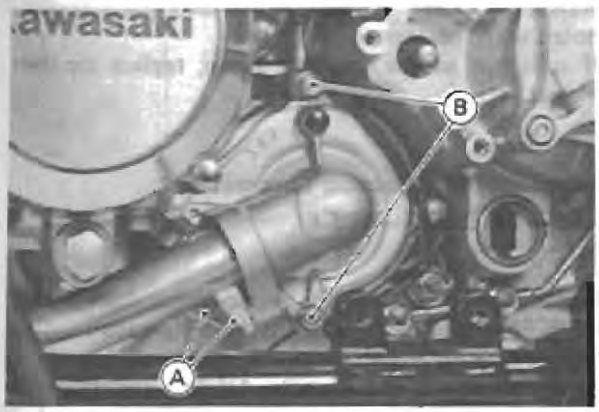
•Run the gun horizontally following the core fin direction holding it perpendicular to the core surface.



Water Pump

Water Pump Removal

•Wait until the coolant cools down, and then drain the coolant (see Coolant Change).
•Remove the following.
Shift Pedal Linkage
Front Gear Case Cover
Clutch Slave Cylinder
Radiator
Mufflers and Exhaust Pipes
•Remove the water pipe holding bolts and pull the pipes off the pump.

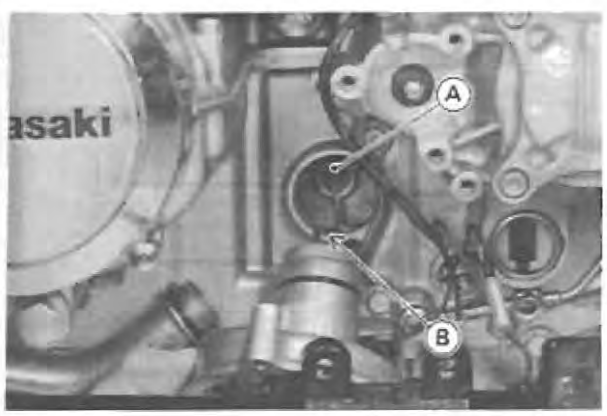


A. Pipe Holding Bolts B. Pump Mounting Bolts

•Pull the pump out of the crankcase.

Water Pump Installation Notes

•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 Projection
B. Water Pump Shaft Slot

•Be sure to install the O-ring on each water pipe fitting.

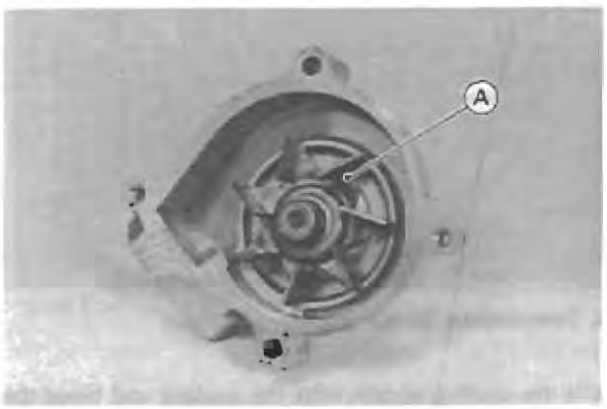
A. O-ring

•Fill the cooling system with the coolant and bleed the air from the system.

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

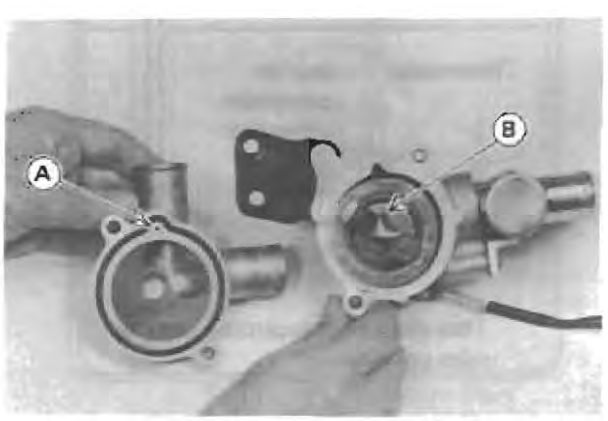
Thermostat and Temperature Sensor

Thermostat Removal Note

•Wait until the coolant cools down, and then drain the coolant (see Coolant Change).

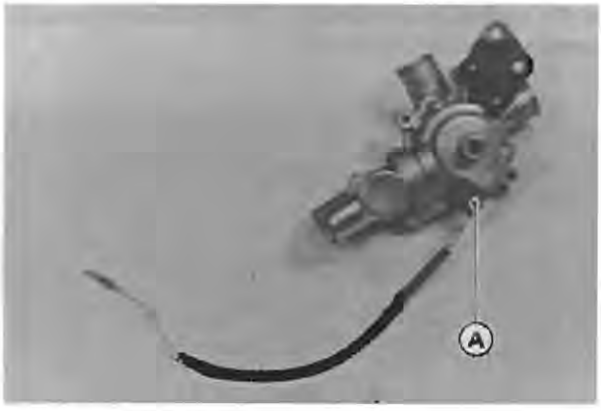
Thermostat Installation Notes

•Blow the air bleeder hole in the thermostat housing with compressed air.



A. Air Bleeder Hole B. Air Bleeder Valve

•Install the thermostat in its housing so that the air bleeder valve is on top.
•If the coolant temperature sensor was removed, apply a silicone sealant to the threads, and tighten it to the specified torque (see Exploded View).



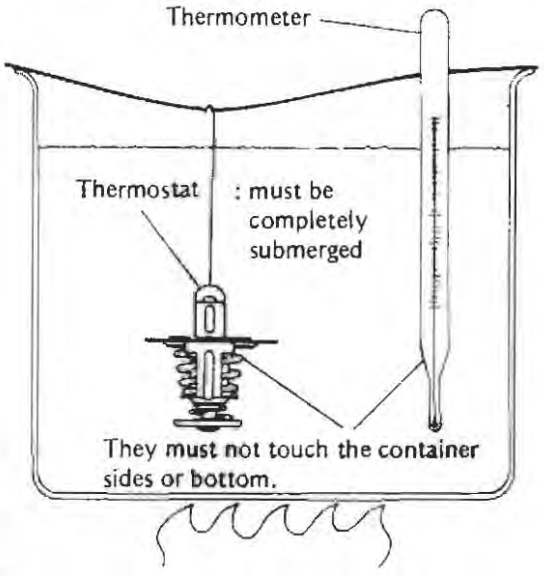
A. Temperature Sensor

•Fill the cooling system with the coolant and bleed the air from the system.

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



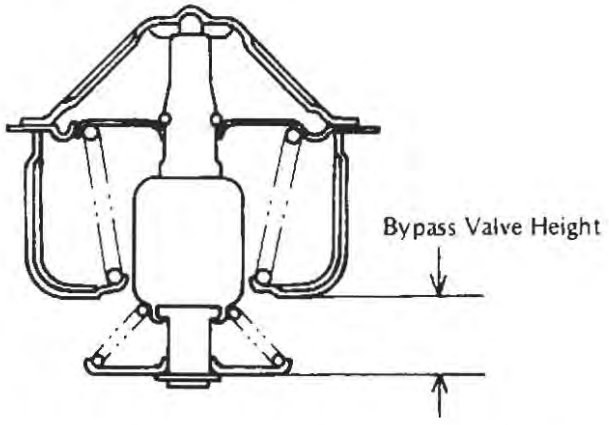
•Watch the valve. As soon as the valve starts to open, note the temperature.
★If it is out of the specified range, replace the thermostat.

Thermostat Valve Opening Temperature

80 – 84°C (176 – 183°F)

•Continue heating until the water temperature is 95°C (203°F), and hold the water at the temperature for five minutes.
•Then measure the bypass valve height. The difference between the two bypass valve heights, measured at room temperature and at 95°C (203°F), is the full valve lift.
★If it is less than the standard range, replace the thermostat.

Valve Lift Measurement



*The bypass valve height difference is the valve lift.

Thermostat Valve Full Opening Lift

More than 8 mm @95°C (203°F)

Hoses and Pipes

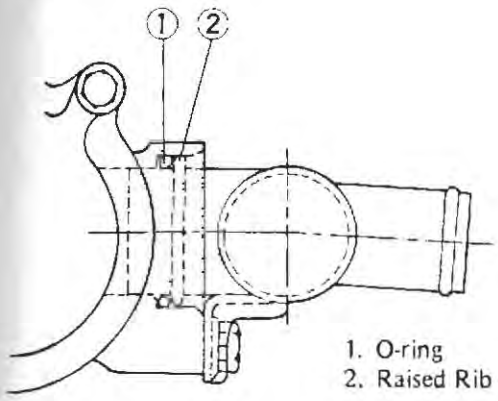
Hose and Pipe Removal Note

•Wait until the coolant cools down, and then drain the coolant (see Coolant Change).

Hose and Pipe Installation Notes

•Be sure to install the O-ring on each pipe fitting which is mounted onto the cylinder, cylinder head, thermostat housing, or water pump.

O-ring on Pipe Fitting



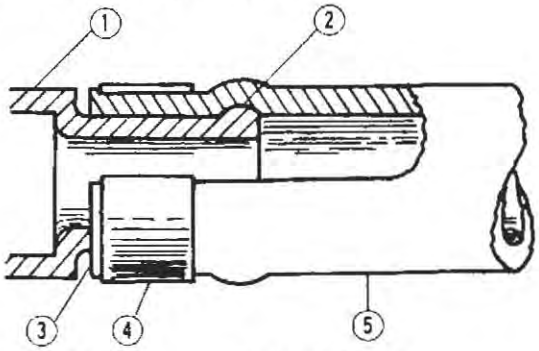
1. O-ring
2. Raised Rib on Pipe

•Install the hoses and pipes being careful to follow bending direction or installation marks. Avoid sharp bending, kinking, flattening, or twisting.

•Install the clamps as near as possible to the hose end to clear the raised rib on the fitting. This will prevent the hoses from working loose.

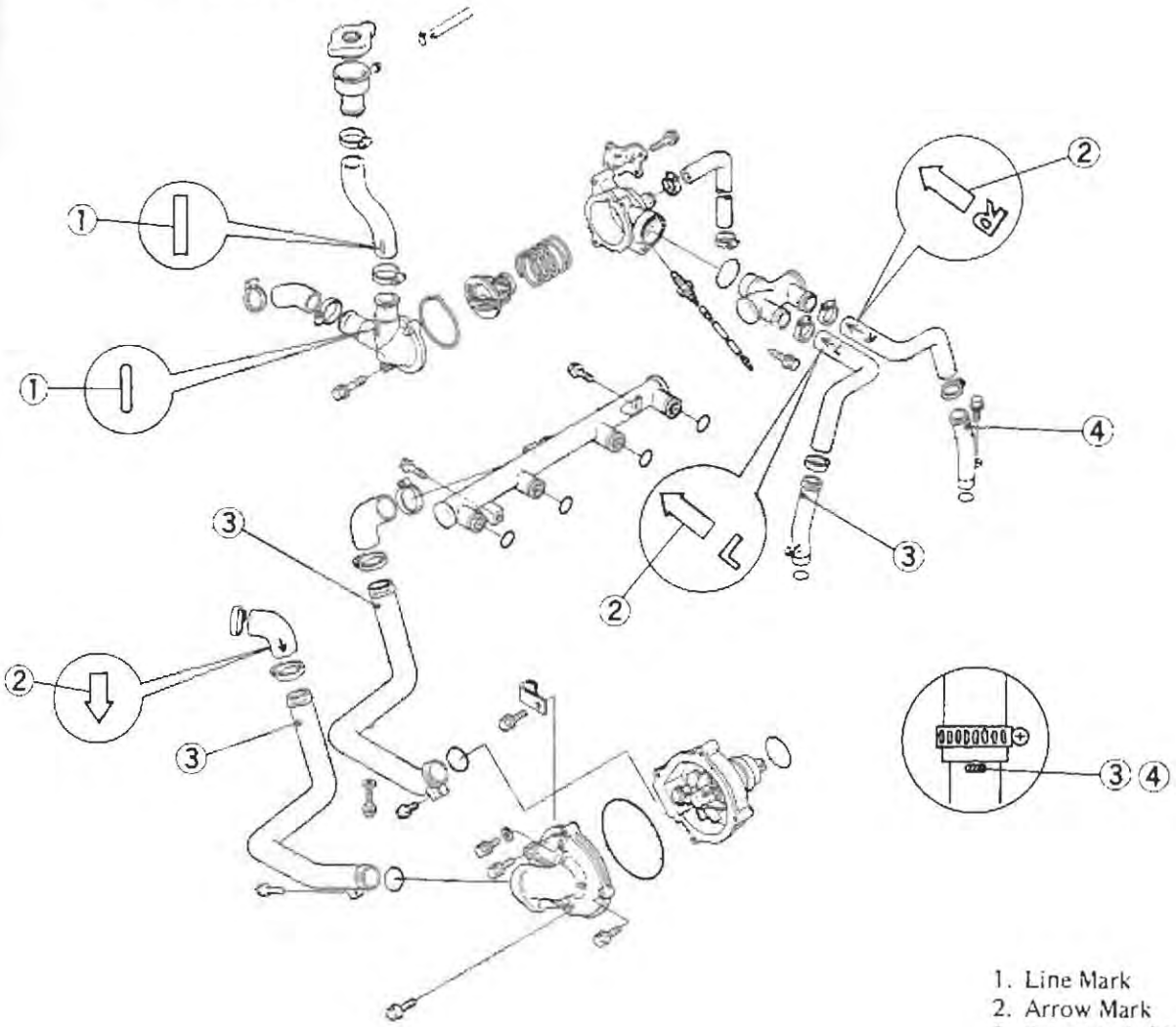
○The clamp screws should be positioned correctly to prevent the clamps from contacting anything.

Hose and Clamp Installation



1. Fitting
2. Raised Rib
3. Hose End
4. Hose Clamp
5. Hose

Installation Marks on Hoses and Pipes



1. Line Mark
2. Arrow Mark
3. Paint Mark (White)
4. Paint Mark (Yellow)

- Fill the cooling system with the coolant and bleed the air from the system.

Hose Inspection

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

Engine Top End

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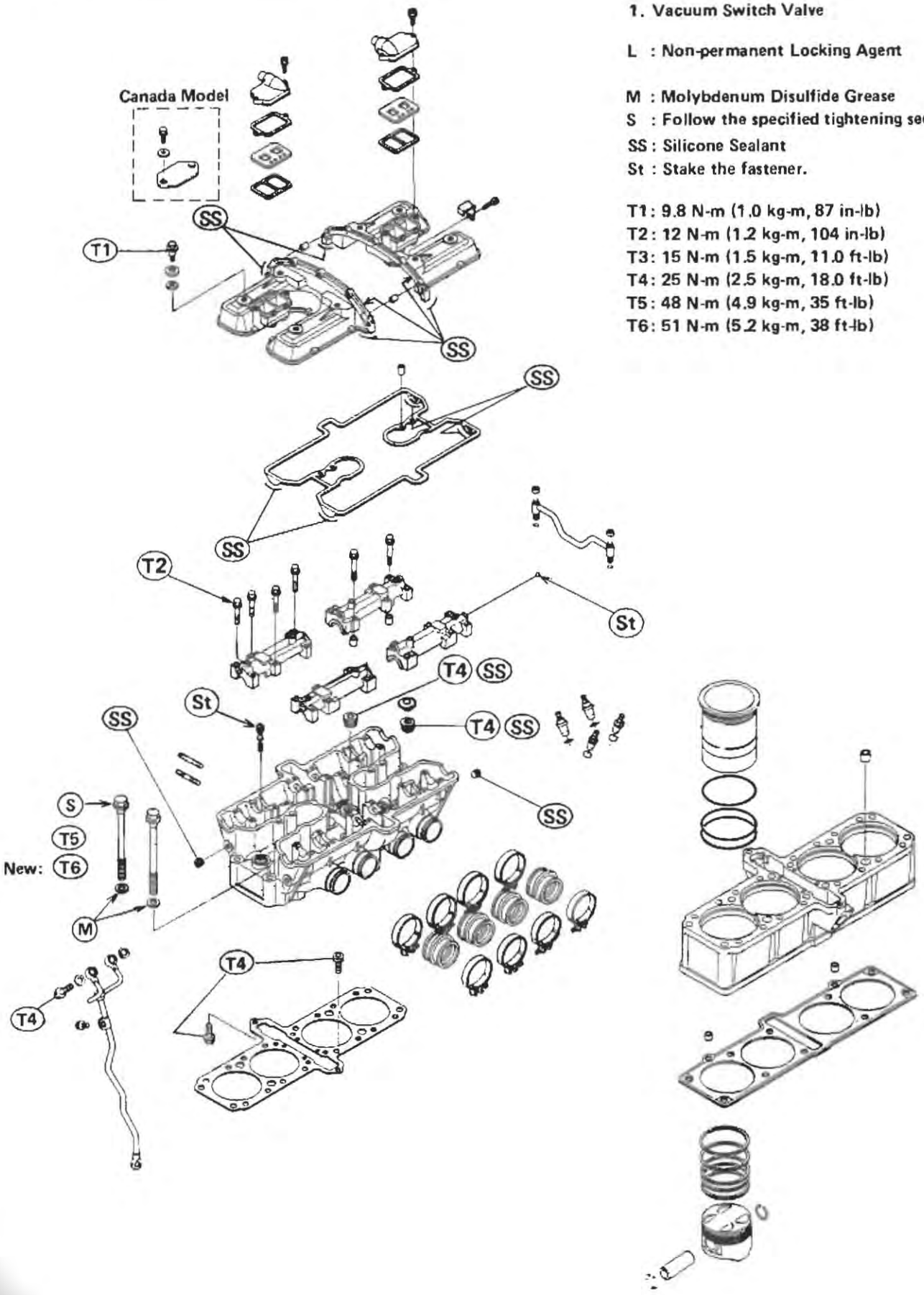
Exploded View

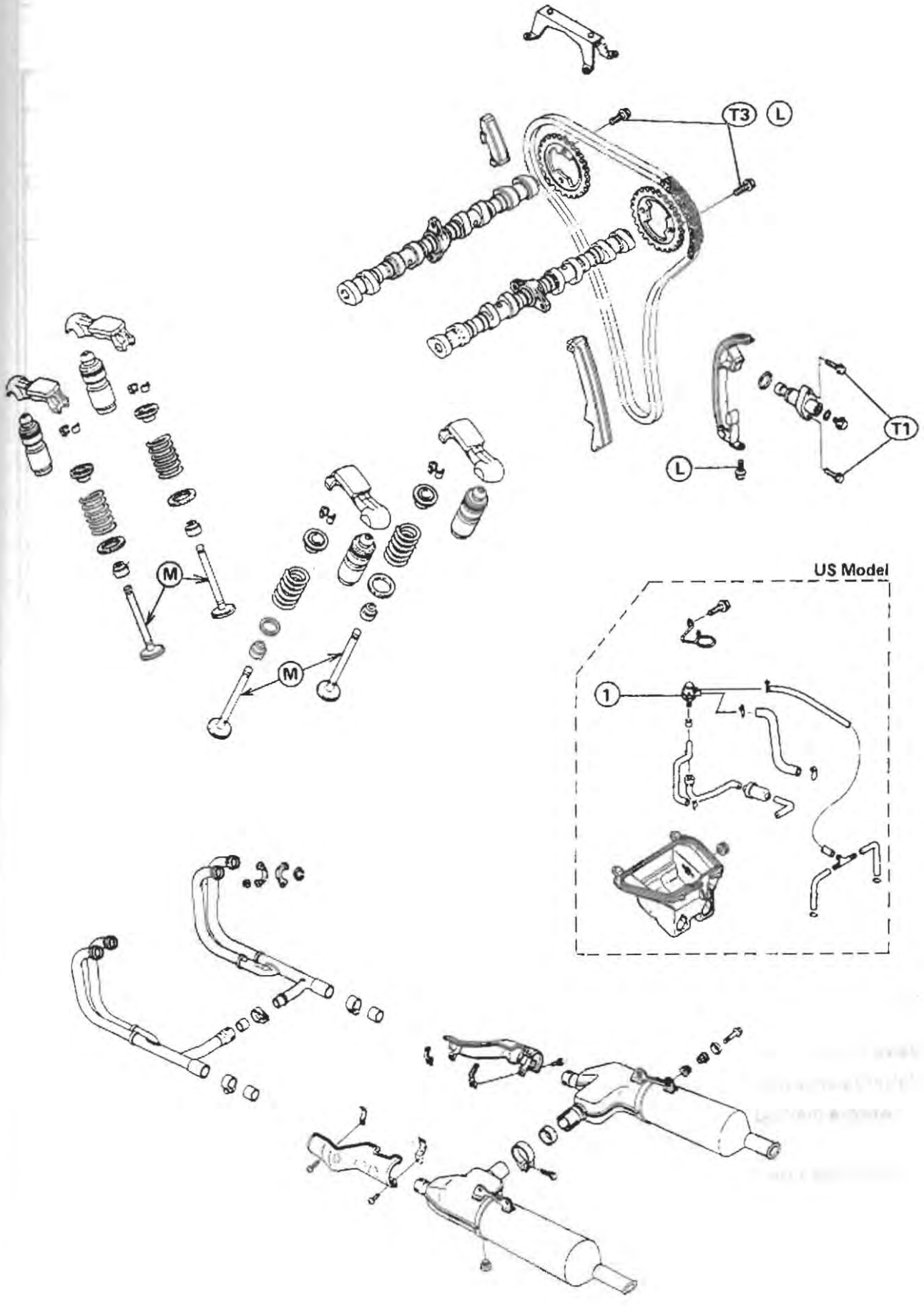


1. Vacuum Switch Valve

L : Non-permanent Locking Agent

M : Molybdenum Disulfide Grease
S : Follow the specified tightening sequence.
SS : Silicone Sealant
St : Stake the fastener.

T1 : 9.8 N-m (1.0 kg-m, 87 in-lb)
T2 : 12 N-m (1.2 kg-m, 104 in-lb)
T3 : 15 N-m (1.5 kg-m, 11.0 ft-lb)
T4 : 25 N-m (2.5 kg-m, 18.0 ft-lb)
T5 : 48 N-m (4.9 kg-m, 35 ft-lb)
T6 : 51 N-m (5.2 kg-m, 38 ft-lb)


T3
L
T1
L
M
M
US Model
1

Specifications

Item	Standard	Service Limit
Clean Air System (US model only):		
Vacuum Switch Valves Switch Pressure:		
Open → Close	57 – 65 kPa (430 – 490 mmHg)	– – –
Camshafts:		
Cam Height	37.021 – 37.163 mm	36.92 mm
Camshaft Runout	0.03 mm TIR	0.1 mm TIR
Camshaft Bearing Oil Clearance:		
Journal A	0.030 – 0.072 mm	0.16 mm
Journal B	0.070 – 0.112 mm	0.20 mm
Camshaft Journal Diameter:		
Journal A	24.949 – 24.970 mm	24.92 mm
Journal B	24.909 – 24.930 mm	24.88 mm
Camshaft Bearing Inside Diameter	25.000 – 25.021 mm	25.08 mm
Camshaft Chain:		
Camshaft Chain 20-link Length	158.8 – 159.0 mm	161.2 mm
Hydraulic Lash Adjuster (HLA):		
Hydraulic Lash Adjuster Leak Down Distance	0 – 0.2 mm	0.2 mm
Cylinder Head:		
Cylinder Compression	(usable range) 960 kPa – 1,470 kPa (9.8 – 15.0 kg/cm², 139 – 213 psi)	– – –
Cylinder Head Warp	– – –	0.05 mm
Valves:		
Valve Head Thickness: Inlet	0.8 mm	0.4 mm
Exhaust	1.0 mm	0.5 mm
Valve Stem Bend	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	5.500 – 5.512 mm	5.58 mm
Valve/Valve Guide Clearance (wobble method): Inlet	0.02 – 0.09 mm	0.29 mm
Exhaust	0.07 – 0.14 mm	0.34 mm
Valve Spring Free Length	41.3 mm	39.5 mm

Item		Standard	Service Limit
Valve Seating Surface:			
Width		0.5 – 1.0 mm	– – –
Outside Diameter:	Inlet	28.9 – 29.1 mm	– – –
	Exhaust	24.9 – 25.1 mm	– – –
Valve Seat Cutting Angle		32°, 45°, 60°	– – –
Cylinders and Pistons:			
Cylinder Inside Diameter		77.994 – 78.006 mm	78.10 mm
Piston Diameter		77.935 – 77.950 mm	77.80 mm
Piston/Cylinder Clearance		0.044 – 0.071 mm	– – –
Oversize Piston and Rings		+ 0.50 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 Thickness:	Top & Second	0.97 – 0.99 mm	0.90 mm
Piston Ring Groove Width:	Top	1.02 – 1.04 mm	1.12 mm
	Second	1.01 – 1.03 mm	1.11 mm
	Oil	2.01 – 2.03 mm	2.11 mm
Piston Ring End Gap:	Top	0.20 – 0.35 mm	0.7 mm
	Second	0.20 – 0.40 mm	0.7 mm

Special Tools

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

Piston Base: 57001-149

Compression Gauge: 57001-221

Adapter: 57001-1183

Valve Spring Compressor Assembly: 57001-241

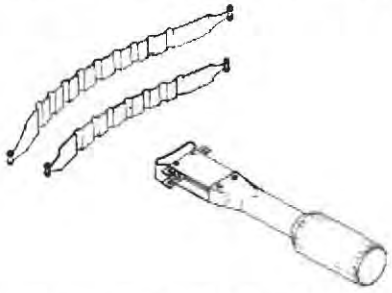
Adapter: 57001-1019

Piston Pin Puller Assembly: 57001-910

Valve Guide Arbor: 57001-1021

Valve Guide Reamer: 57001-1079

Piston Ring Compressor Assembly (4): 57001-1094



Valve Seat Cutter 45° – ϕ27.5 : 57001-1114
Valve Seat Cutter 32° – ϕ28.0 : 57001-1119
Valve Seat Cutter 32° – ϕ30.0 : 57001-1120
Valve Seat Cutter 60° – ϕ30.0 : 57001-1123
Valve Seat Cutter 45° – ϕ30.0 : 57001-1187

Cutter Holder ϕ5.5 : 57001-1125

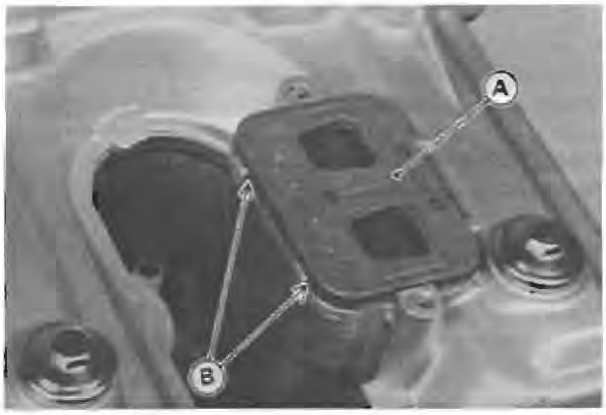
Bar: 57001-1128

Tappet Bleeder: 57001-1200

Clean Air System (US model)

Air Suction Valve Installation Note

•Install the air suction valve assembly into its housing so that the rear edge of it contacts with the rear projection on the housing.

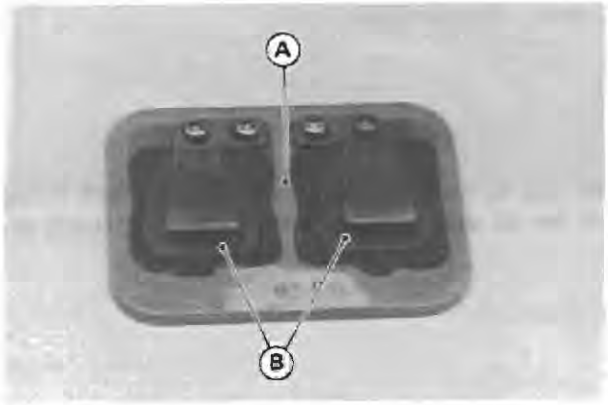


A. Air Suction Valve Assembly B. No gap.

Air Suction Valve Inspection

•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.**

Vacuum Switch Valve Test

•Check the vacuum switch valve by blowing air into the air hose fitting.

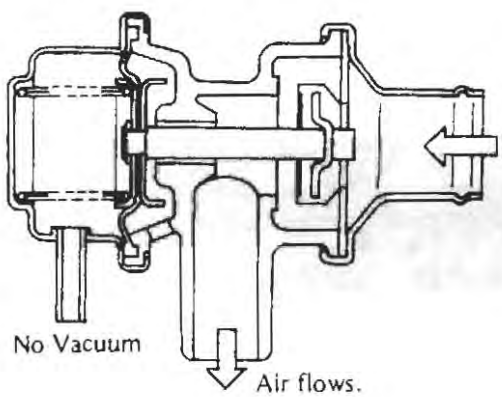
○When the vacuum applied to the vacuum hose fitting of the valve is low, the vacuum switch valve is opened and air flows through the air hose fittings.

○When the vacuum rises gradually and reach a certain level, the valve is closed and air does not flow.

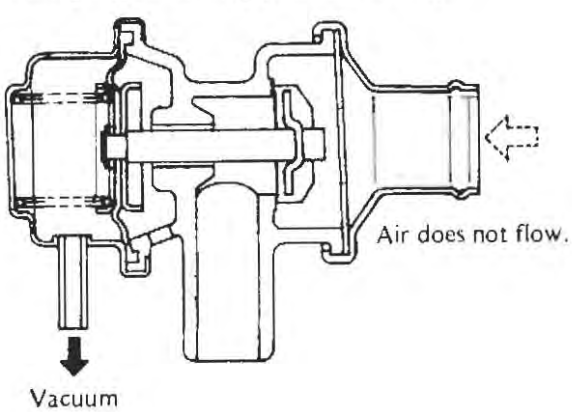
★If the vacuum switch valve does not operate as described, replace the valve.

Vacuum Switch Valve Operation

During Cruising (Open Throttle)



During Engine Braking (Closed Throttle)



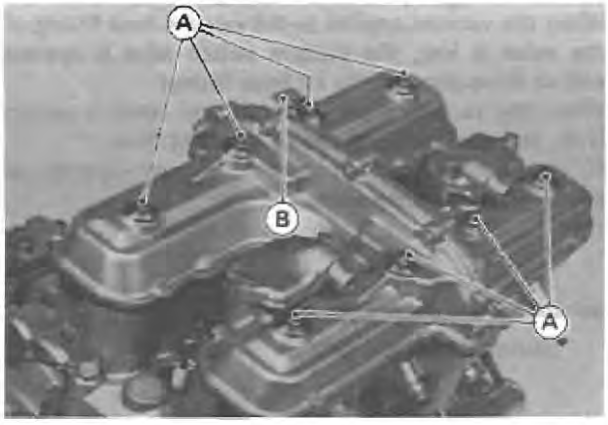
Vacuum Switch Valve Closing Pressure

Open → Close: 57 – 65 kPa (430 – 490 mmHg)

Cylinder Head Covers

Cylinder Head Cover Removal Notes

- Remove the cylinder head covers by taking out the cover mounting bolts.
- Remove the air suction valves and head cover assembly Allen bolts and separate the left and right covers if the engine is on the frame.



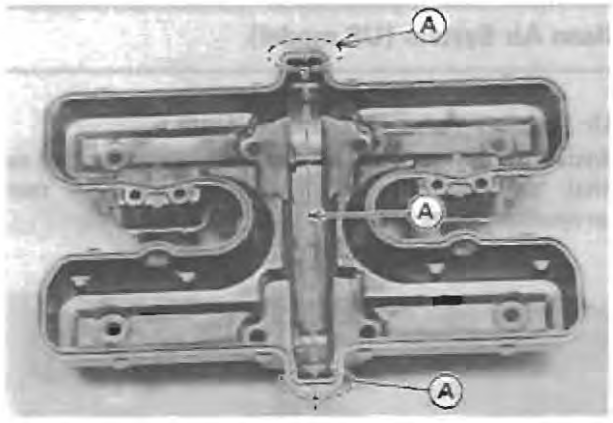
A. Cylinder Head Cover Mounting Bolts
B. Clamp

- Be careful not to fall the rubber dampers on each fitting of the oil pipe into the chain tunnel.

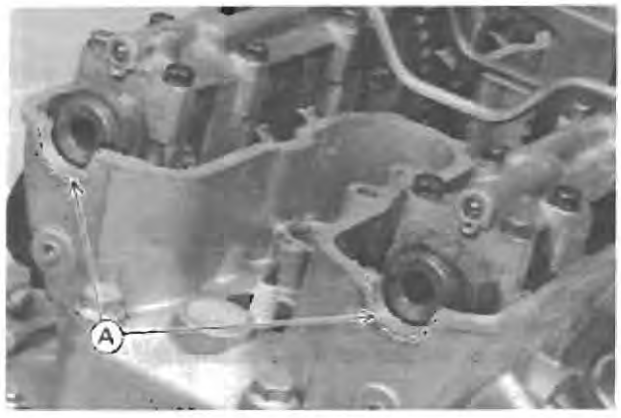
A. Rubber Dampers

Cylinder Head Cover Installation Notes

- If the left and right covers were separated, assemble them with bolts and knock pins. One of the bolt should be tightened with the cable clamp.
- Apply a silicone sealant to the mating surfaces of the cylinder head and covers as shown.



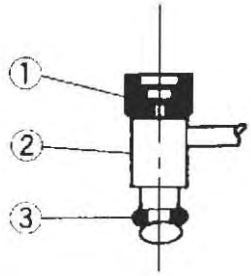
A. Apply silicone sealant.



A. Apply silicone sealant.

- Be sure to install the rubber damper onto each fitting of the oil pipe with the correct side of it facing up.

Oil Pipe Damper Installation



1. Rubber Damper
2. Oil Pipe Fitting
3. O-ring

Camshaft Chain Tensioner

Camshaft Chain Tensioner Removal Notes

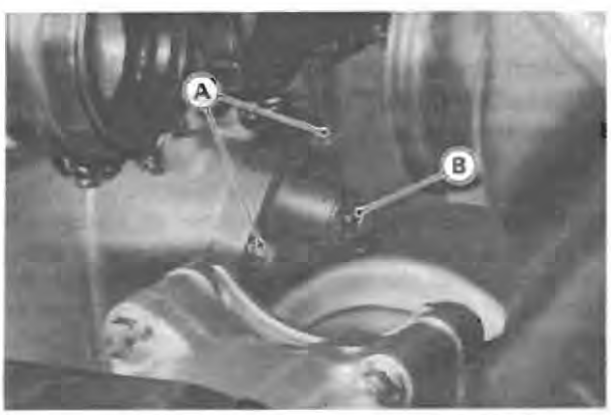
CAUTION

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.



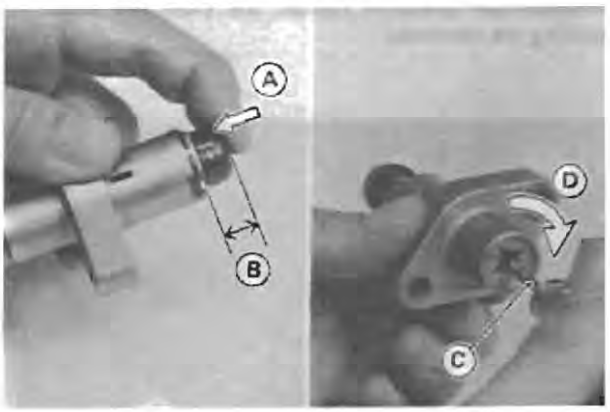
A. Mounting Bolts B. Cap Bolt

Camshaft Chain Tensioner Installation Notes

- 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.

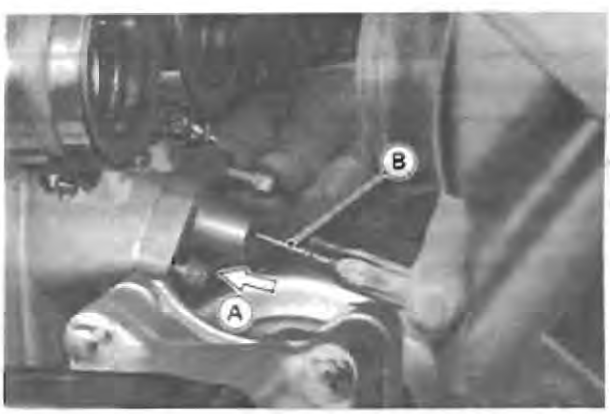
CAUTION

○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 with the screwdriver install the tensioner on the cylinder block.
- While pushing the tensioner against the cylinder block as shown, remove the screwdriver.



A. Push the tensioner. B. Screwdriver

- Holding the tensioner, tighten the mounting bolts to the specified torque (see Exploded View).
- Install the O-ring and tighten the cap bolt.

Replacement Chain Tensioner Installation Notes

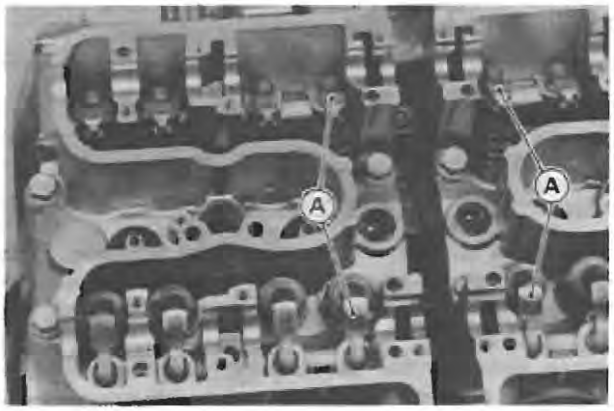
- A replacement chain tensioner (spare parts) has a push rod holder plate.

CAUTION

○Do not pull the rod holder plate while the tensioner is removed. This could detach the rod and the tensioner cannot be installed easily.

•Remove the plate to release the push rod after installing the tensioner.

A. Rod Holder Plate



A. Rocker Arms

CAUTION

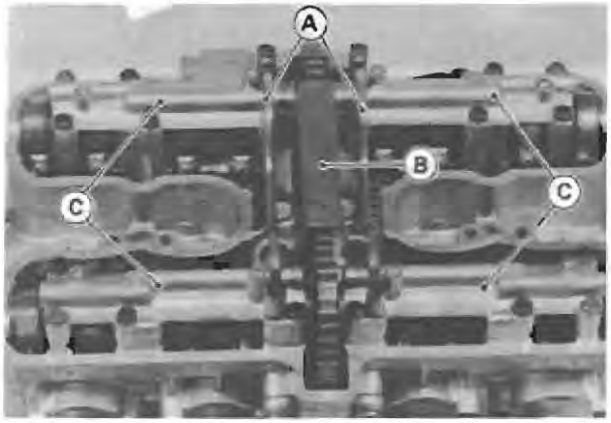
○**The crankshaft may be turned, while the camshafts are removed, but always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.**

Camshafts and Sprockets

Camshaft Removal Notes

•Remove the camshaft chain tensioner before removing the camshaft caps.

•Pull the oil pipes with the rubber dampers and O-rings.



A. Oil Pipes
B. Chain Guide
C. Camshaft Caps

•Remove the camshaft cap bolts and take off the camshaft caps.

•Remove the camshafts. At this time, the rocker arms can be removed easily. Be careful not to fall them into the chain tunnel.

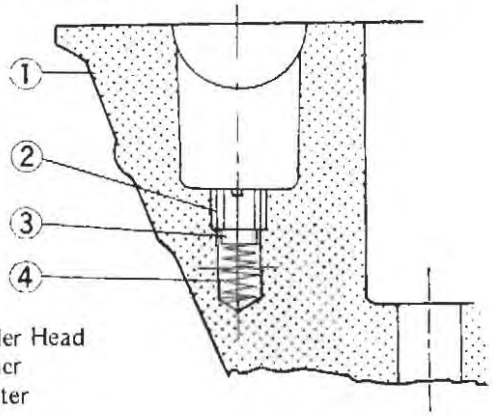
Camshaft Installation Notes (Including Chain Timing Procedure)

•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.

•If the oil filter(s) for the lash adjuster oil passage will be replaced, install the spring, new filter, and retainer.

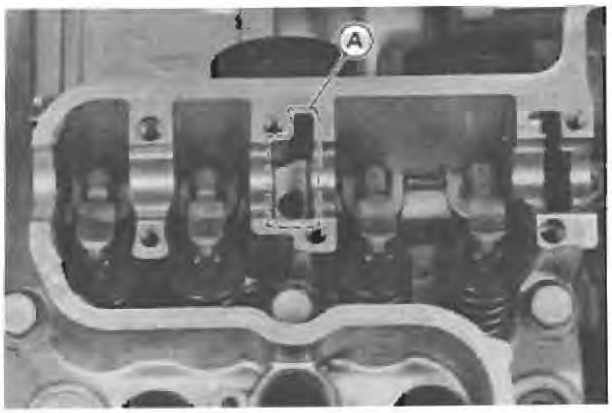
○The top end of the retainer should be level with the bottom of the oil reservoir. Stake the retainer to secure it in place.

Lash Adjuster Oil Filter



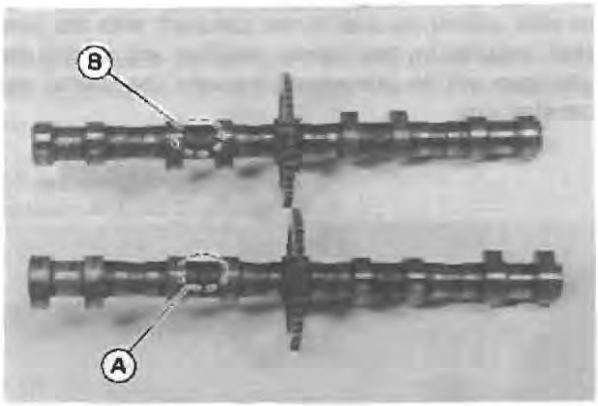
1. Cylinder Head
2. Retainer
3. Oil Filter
4. Spring

•Fill the oil reservoirs on the cylinder head with engine oil before installing the camshafts.



A. Oil Reservoir

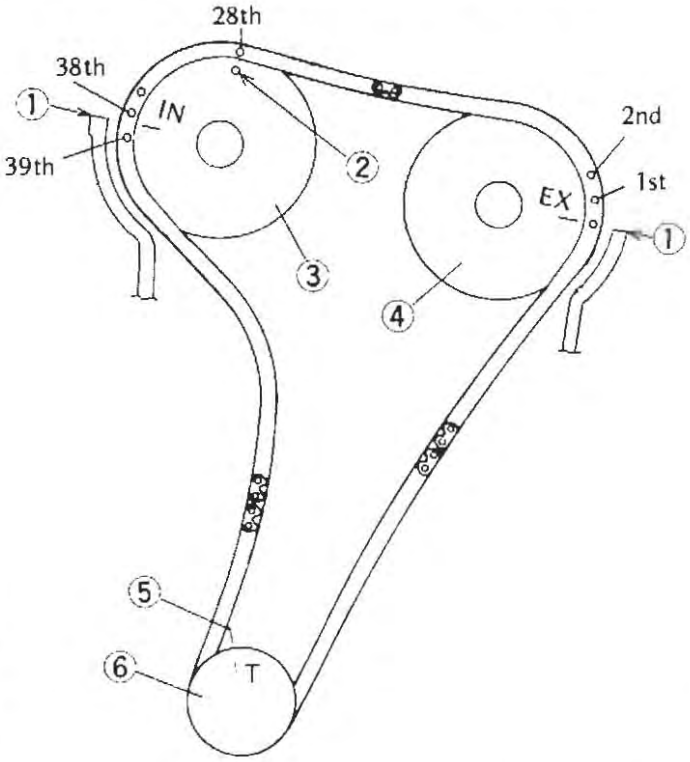
- If the camshaft(s) and/or cylinder head are replaced with new ones, apply a thin coat of a molybdenum disulfide grease on the new cam part surfaces.
- The exhaust camshaft has an EX mark and the inlet camshaft has an IN mark. Be careful not to mix up these shafts.



A. EX Mark B. IN Mark

- Engage the camshaft chain with the camshaft sprockets so that the chain timing is correct.
  - Position the crankshaft at 1, 4 piston TDC.
  - Pull the tension side (exhaust side) of the chain taut to install the chain on the exhaust camshaft sprocket.
  - Engage the chain and sprockets. The timing marks must be positioned as shown, after the camshaft chain slack is taken up by the tensioner.

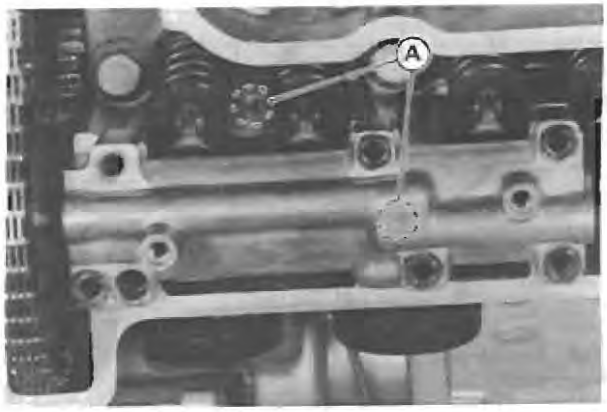
Camshaft Chain Timing (Chain Tensioner Installed)



Viewed from Right

1. Cylinder Head Upper Edge
2. Punch Mark
3. Inlet Camshaft Sprocket
4. Exhaust Camshaft Sprocket
5. Timing Mark
6. Timing Rotor

- In according to the camshaft cap location numbers, install the caps in the correct position.



A. Camshaft Cap Location Numbers

CAUTION

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

○First tighten down all camshaft cap bolts evenly to seat the camshafts in place, then torque all bolts to the specified torque (see Exploded View), from the chain tunnel side to the outside.

○Be sure to install the top chain guide with the camshaft cap bolts.

●After installing the camshaft caps, install the chain tensioner and then check the camshaft chain timing again.

●Fill the oil passage in each camshaft cap with engine oil before installing the oil pipes.

Camshaft Sprocket Installation Notes

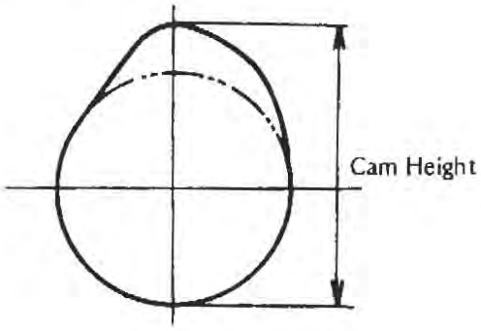
●The inlet and exhaust sprockets are identical.

●Both sprockets should be installed with the marked side of the sprocket facing the opposite side of the sprocket mount.

●Apply a non-permanent locking agent to the camshaft sprocket bolts and tighten them to the specified torque (see Exploded View).

Cam Height Measurement

Cam Height Measurement

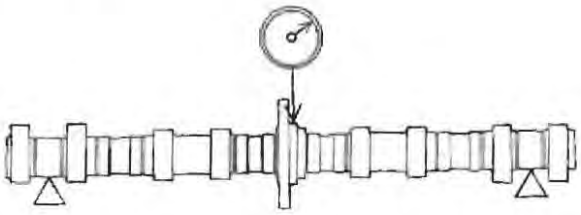


Cam Height

Standard :	**37.021 – 37.163 mm**
Service Limit:	**36.92 mm**

Camshaft Runout

Camshaft Runout Measurement



Camshaft Runout

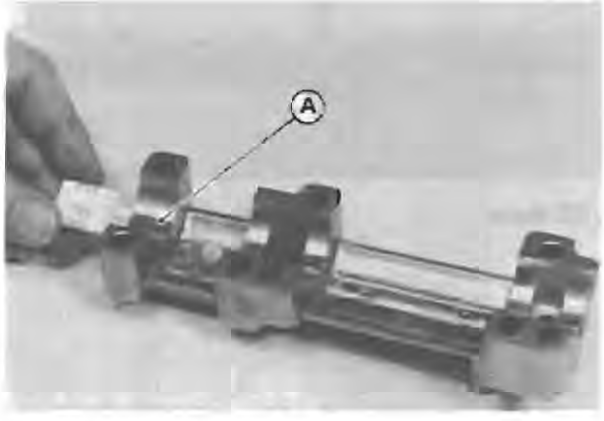
Standard:	**0.03 mm TIR**
Service Limit:	**0.1 mm TIR**

Camshaft Bearing 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.

●Wipe each journal surface on the crankshafts and caps clean of oil.

●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 (see Exploded View).

NOTE

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

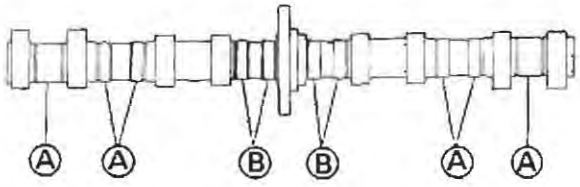
•Remove the camshaft caps again, and measure the plastigage width to determine the clearance between each journal and the camshaft cap. Measure the widest portion of the plastigage.

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

Camshaft Bearing Oil Clearance

	Standard	Service Limit
Journal A	0.030 – 0.072 mm	0.16 mm
Journal B	0.070 – 0.112 mm	0.20 mm

Camshaft Journal Identification



A. Journal A
B. Journal B

★If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.

Camshaft Journal Diameter

	Standard	Service Limit
Journal A	24.949 – 24.970 mm	24.92 mm
Journal B	24.909 – 24.930 mm	24.88 mm

★If the clearance still remains out of the limit, replace the cylinder head unit.

Camshaft Chain and Guides

Camshaft Chain Removal Note

•Camshaft chain removal requires the crankcase splitting and crankshaft removal.

Camshaft Chain Guide Removal Notes

•The top chain guide is removed during camshaft removal.

•The front chain guides (upper and lower) can be removed after removing the cylinder head.

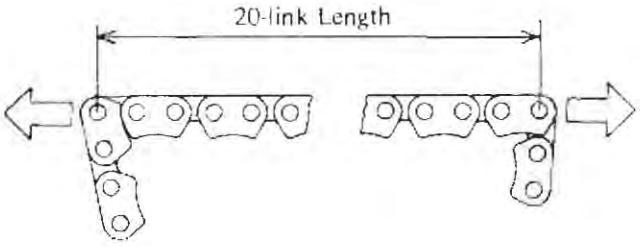
•The rear chain guide can be removed after splitting the crankcase.

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.

Chain Length Measurement



Camshaft Chain 20-link Length

Standard: 158.8 – 159.0 mm
Service Limit: 161.2 mm

Camshaft Chain Guide Wear

•Visually inspect the rubber on the guides.

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

Hydraulic Lash Adjuster (HLA)

HLA Removal Notes

•Take off the rocker arms.

•Pull out the hydraulic lash adjuster.

CAUTION

○Be careful not to damage or deform a lash adjuster by tapping it during removal or installation.

○Do not drop the lash adjuster or hit it sharply. If it is deformed, the plunger will not operate smoothly.

A. Rocker Arms B. Hydraulic Lash Adjuster

HLA Installation Notes

CAUTION

○**Prior to installation, measure the lash adjuster leak-down. If it is greater than specified, replace the adjuster. Also, be sure to air-bleed it.**

○**To clean the adjuster, rinse it in clean kerosene and then blow it dry with compressed air. Do not dry it with a cloth to prevent dust or lint contamination. Be careful not to get any adhesives or liquid gasket on the adjuster during servicing.**

- Before installing the adjusters in the cylinder head, fill the holes for adjuster with clean engine oil.
- Put the adjusters in their holes, being careful not to get any air or dust in the holes and not to allow the kerosene to leak out of the adjusters.
- Install the rocker arms.

HLA Air Bleeding

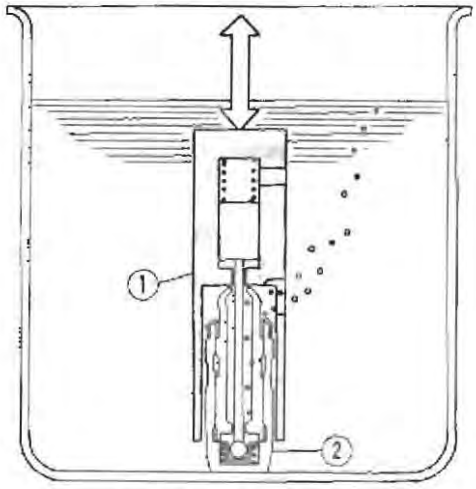
- Provide a container filled with kerosene.
- Insert the lash adjuster into the tappet bleeder (special tool) and move it up and down in the kerosene.
- Check that the lash adjuster plunger moves up and down smoothly.

★If the plunger does not move smoothly, replace the lash adjuster.

NOTE

○*Keep the lash adjuster always upright and immersed in kerosene for easy air bleeding.*

Lash Adjuster Air Bleeding



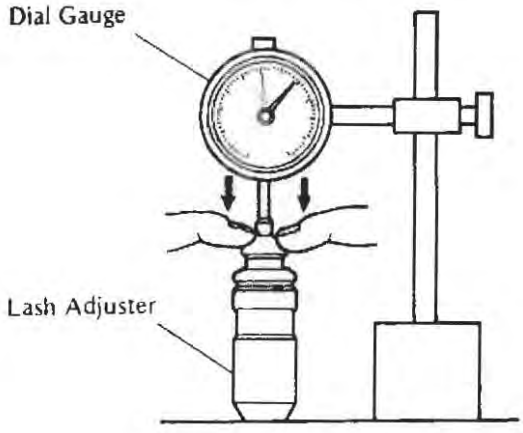
1. Tappet Bleeder: 57001-1200
2. Hydraulic Lash Adjuster

- When air bubbles stop coming out of the adjuster, lift the bleeder off the adjuster and take the adjuster out of the container with the adjuster kept upright.

HLA Leak-down Measurement

- Put the lash adjuster vertically on a measuring stand and set the dial gauge on the adjuster.
- Push down the head of the adjuster quickly with your fingers and measure the distance it sinks.

Measuring Leak-down Distance of the Lash Adjuster



Leak-down Distance

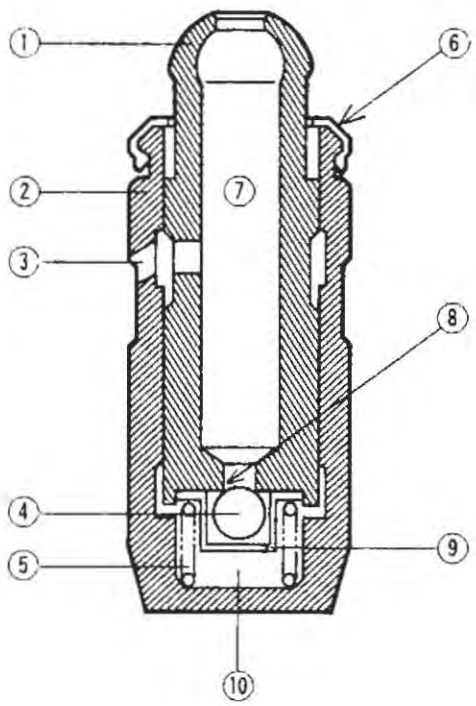
Standard:	**0 – 0.2 mm**
Service Limit:	**0.2 mm**

*If the leak-down distance exceeds the service limit, repeat the air bleeding operation and then measure the leak-down again. If leak-down is still out of the service limit, replace the adjuster.

NOTE

Be careful not to tip the lash adjuster and not to allow the kerosene to leak out of the adjuster.

Hydraulic Lash Adjuster
(Free Ball Type)



1. Pivot Plunger
2. Body
3. Oil Feed Passage
4. Ball-check Valve
5. Plunger Spring
6. Retainer Cap
7. Reservoir
8. Ball Seat
9. Ball Cage
10. High Pressure Chamber

HLA Troubleshooting Guide

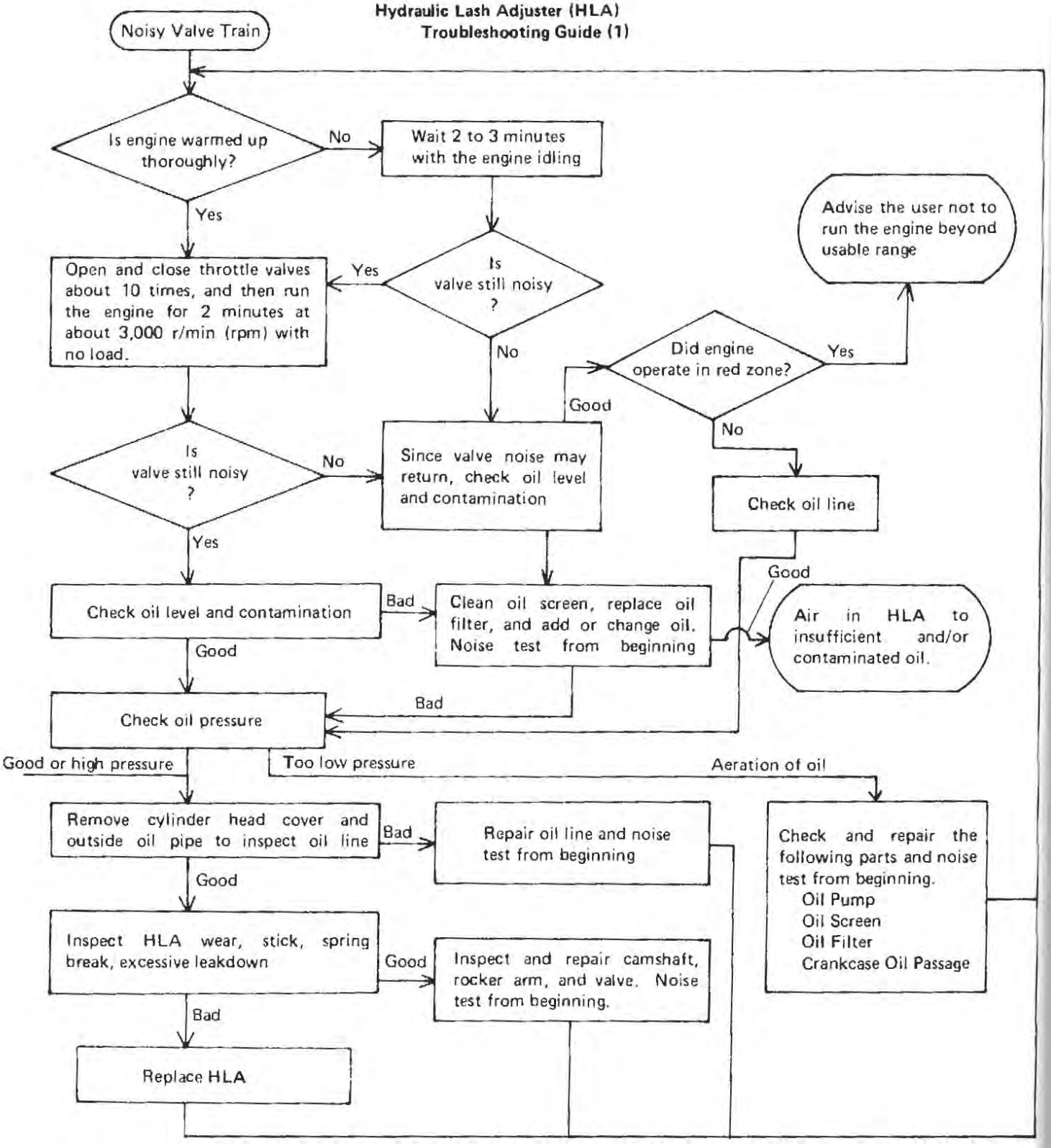
Aeration of Oil

Insufficient engine oil will cause air to enter the lash adjuster resulting in tappet noise or poor engine running at both low and high speeds.

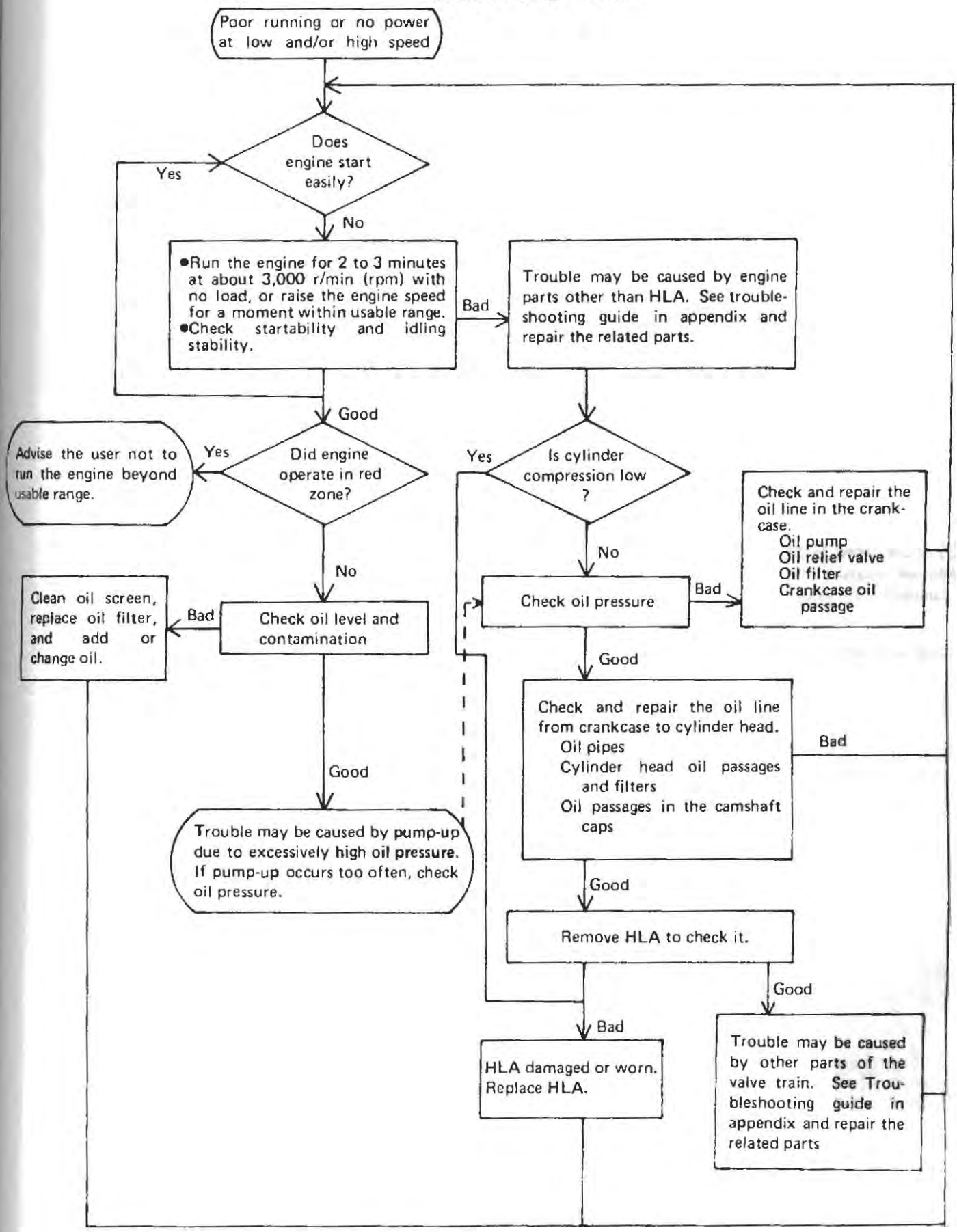
Pump-Up

Excessive oil pressure will cause the lash adjuster to hold the valve open. Also, operation in red zone can cause valve float. This allows the rockers to momentarily lift off the end of the HLA, which then draws in oil to move the plunger up, preventing the valve from seating completely.

Hydraulic Lash Adjuster (HLA) Troubleshooting Guide (1)



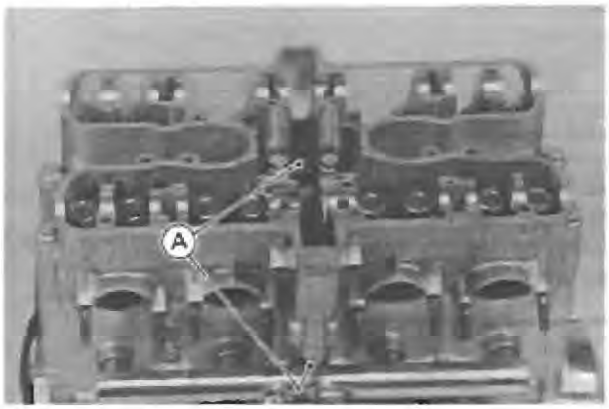
Hydraulic Lash Adjuster (HLA)
Trouble Shooting Guide (2)



Cylinder Head

Cylinder Head Removal Note

●Be sure to remove the bolts at the front and rear of the cylinder head chain tunnel.

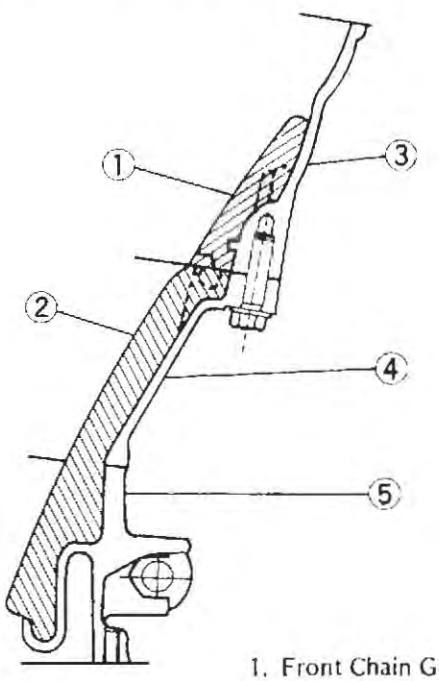


A. Cylinder Head Bolts

Cylinder Head Installation Notes

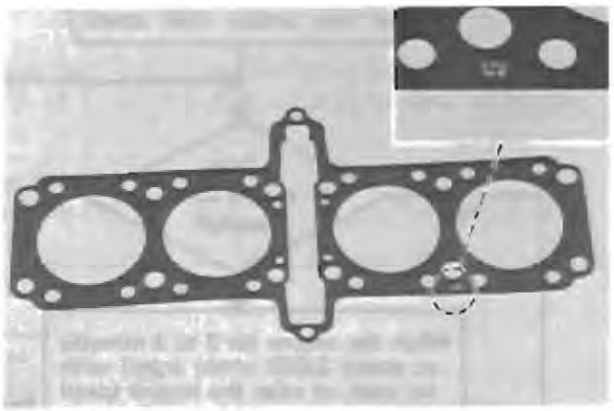
●Before installing the cylinder head, be sure the front camshaft chain guides are in place.

Front Camshaft Chain Guides



1. Front Chain Guide (Upper)
2. Front Chain Guide (Lower)
3. Cylinder Head
4. Cylinder
5. Crankcase

●Install the new cylinder head gasket with the side marked UP facing up.

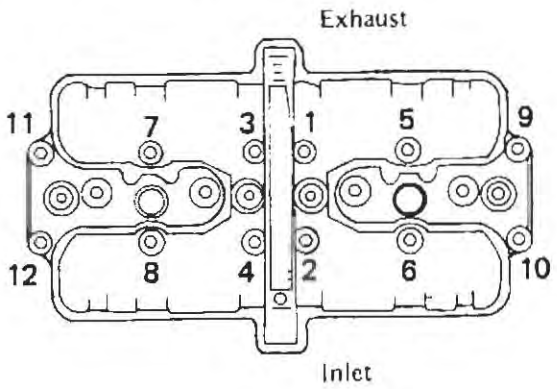


●Tighten the cylinder head bolts.

○Apply a molybdenum disulfide lubricant (grease or oil type, either will do) to both upper and lower sides of the 11 mm cylinder head bolt washers.

○Torque the 11 mm cylinder head bolts following the tightening sequence. Torque them first to about one half of the specified torque and then torque them to the specified torque (see Exploded View).

Cylinder Head Bolt Tightening Sequence



○Torque the 8 mm cylinder head bolts to the specified torque (see Exploded View).

●Install new washers on each side of the oil pipe fittings, and tighten the banjo bolts to the specified torque (see Exploded View).

Cylinder Compression Measurement

●Before measuring compression, do the following:

○Be sure the battery is fully charged.

○Warm up the engine (if the engine will run).

○During warm-up, check for leaks around the cylinder head gasket.
●Stop the engine, remove the spark plugs, and attach compression gauge and adapter (special tools) firmly into the spark plug hole.

A. Compression Gauge: 57001-221
B. Adapter: 57001-1183

●Using the jumper cables, connect the removed battery to the disconnected battery cables.
○Connect the jumper cable from the positive (+) terminal of the battery to the positive (+) battery cable.
○Connect another jumper cable from the negative (−) terminal of the battery to the negative (−) battery cable.

WARNING

○**Take care that you do not touch the positive and negative cables together, and do not touch the cables to the frame.**
○**Do not reverse polarity by connecting positive (+) to negative (−) or a serious damage to the electrical system may occur.**

●Hold the throttle wide open and crank the engine with the starter.
●When the gauge stops rising, stop cranking and read the gauge.
●Repeat the measurement for the other cylinder.

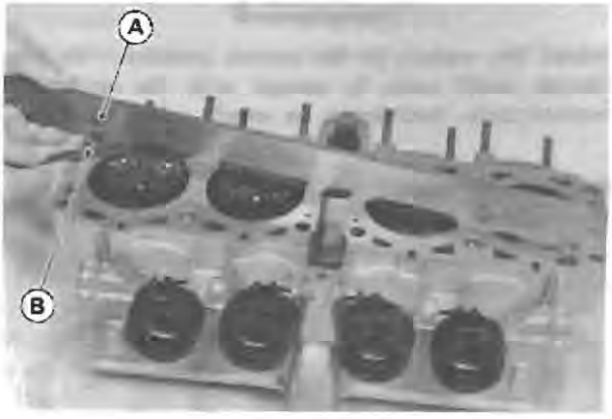
Cylinder Compression

Usable Range: 960 – 1,470 kPa
(9.8 – 15.0 kg/cm², 139 – 213 psi)

★If the compression is within the specified range, the piston rings, cylinder and valves are probably in good condition.
★If cylinder compression is higher than the specified range, check the following:
○Carbon build-up on the piston head and cylinder head. – clean off any carbon on the piston head and cylinder head.
○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.
○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 the compression is below the specified range, squirt a little oil into the spark plug hole and repeat the compression measurement.
☆If the compression does not change very much, the piston rings are probably OK, check the following:
○Gas leakage around the cylinder head – replace the damaged gasket and check the cylinder head for warp.
○Condition of the valve seating.
○Hydraulic lash adjuster (operation, seizure, spring breakage) – replace the damaged lash adjuster.
○Oil pressure – if the pressure is high, check the oil line for clogs.
☆If the compression increases, the piston rings are not sealing properly, check the following:
○Piston/cylinder clearance, piston seizure.
○Piston ring, piston ring groove.

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

- Remove the cylinder head.
- Remove the valves.
- Wash the head with a high flash-point solvent.
- Scrape the carbon out of the combustion chamber and exhaust port with a suitable tool.

Carburetor Holders

Carburetor Holder Installation Notes

- Install the carburetor holders so that the projections of them face upwards and align with the cylinder head ribs.

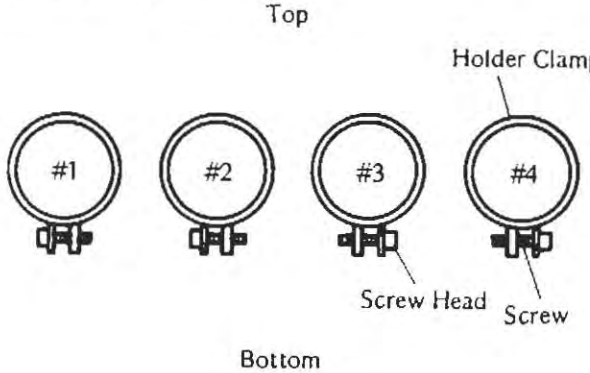
A. Holder Projection B. Rib

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

WARNING

○Install the clamps in the correct position. Or, the clamps could come in contact with the carburetor control parts, resulting in an unsafe riding condition.

Holder Clamp Installation



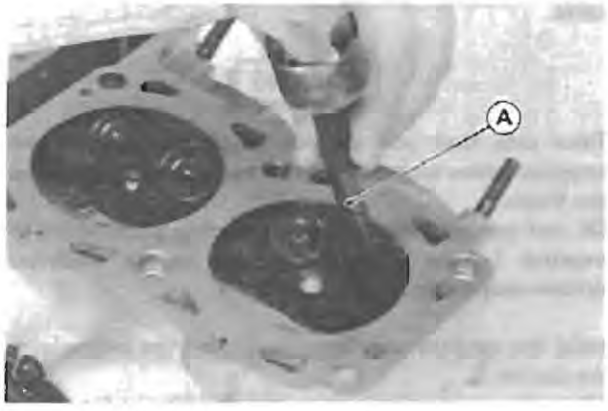
Valves

Valve Mechanism Removal Notes

- Use the valve spring compressor assembly and adapter (special tools) 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 the valve guide arbor (special tool) to remove the guide from the top of the head.



A. Valve Guide Arbor: 57001-1021

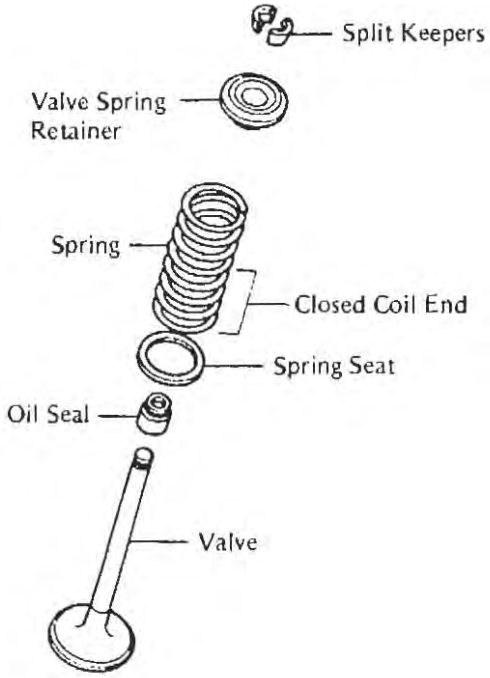
Valve Mechanism Installation Notes

- Install the valve guide.
  - ○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. Be sure to install the O-ring under the valve guide flange.
  - ○Ream the valve guide with the valve guide reamer (special tool) even if the old guide is re-used.

A. Valve Guide Reamer: 57001-1079

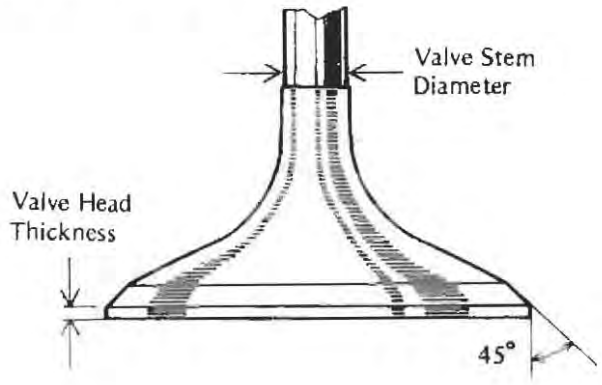
•Install the valve.
○Check to see that the valve moves smoothly up and down in the guide.
○Check to see that the valve seats properly in the valve seat. If it does not, repair the valve seat.
○Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation..
○Be sure to install the spring seat under the spring.
○Install the spring so that the closed coil end is facing toward the valve seat (downwards).

Valve and Spring



Valve Head Thickness

Valve Head Shape

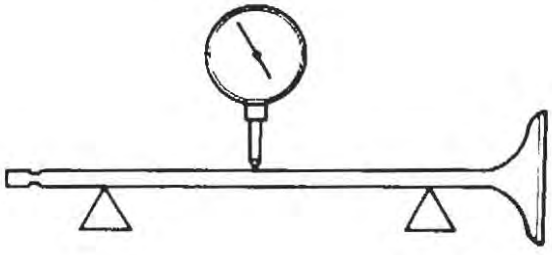


Valve Head Thickness

	Standard	Service Limit
Inlet	**0.8 mm**	**0.4 mm**
Exhaust	**1.0 mm**	**0.5 mm**

Valve Stem Bend

Valve Stem Bend Measurement



Valve Stem Bend

Standard:	**0.02 mm TIR**
Service Limit:	**0.05 mm TIR**

Valve/Valve Guide Clearance Measurement (Wobble Method)

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

•Insert a new valve into the guide and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
•Move the stem back and forth 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.

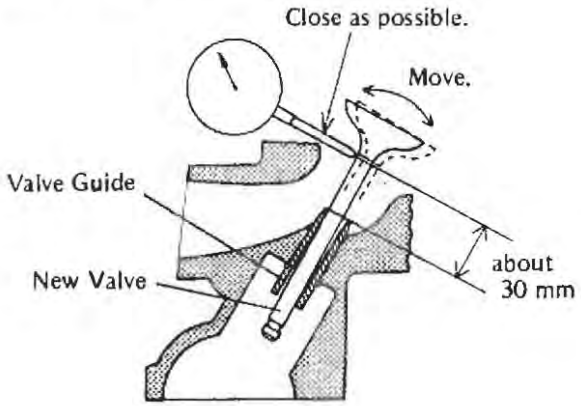
NOTE

○*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 – 0.09 mm	0.29 mm
Exhaust	0.07 – 0.14 mm	0.34 mm

Wobble Method



Valve Seat Inspection

- 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

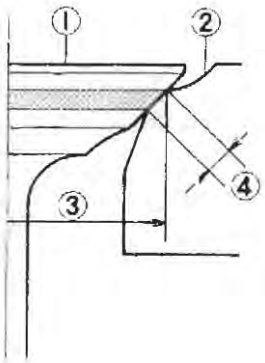
Inlet	:	0.5 – 1.0 mm
Exhaust	:	0.5 – 1.0 mm

NOTE

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

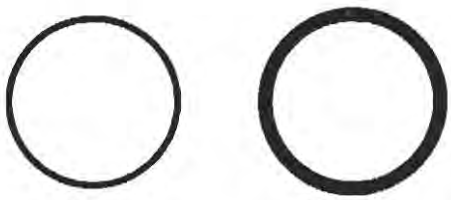
★If the valve seating pattern is not correct, repair the seat (see Valve Seat Repair).

Valve Seating Area Dimensions

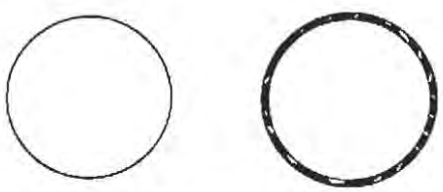


1. Valve
2. Valve Seat
3. Seating Area Outside Diameter
4. Seating Area Width

Valve Seating Pattern



Good Too Wide



Too Narrow Uneven

- 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	:	28.9 – 29.1 mm
Exhaust	:	24.9 – 25.1 mm

Valve Seat Repair

- Use the following procedures and tools to repair the valve seat.

Valve Seat Cutters

Inlet Valves

45° – φ30.0	57001-1187
32° – φ30.0	57001-1120
60° – φ30.0	57001-1123

Exhaust Valves

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

Holder and Bar

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

Seat Cutter Operating Care:

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

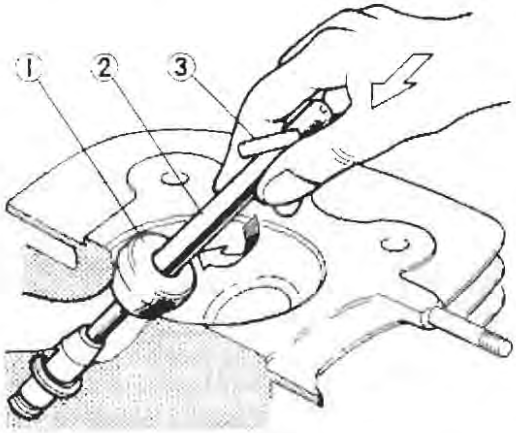
○*Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

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

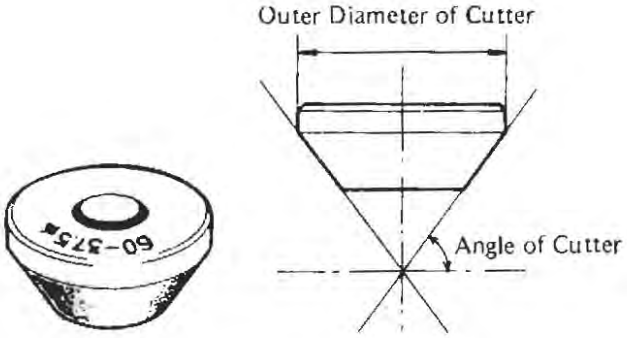
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter:

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

60° . . . . . Cutter angle
37.5φ . . . . . Outer diameter of cutter

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.

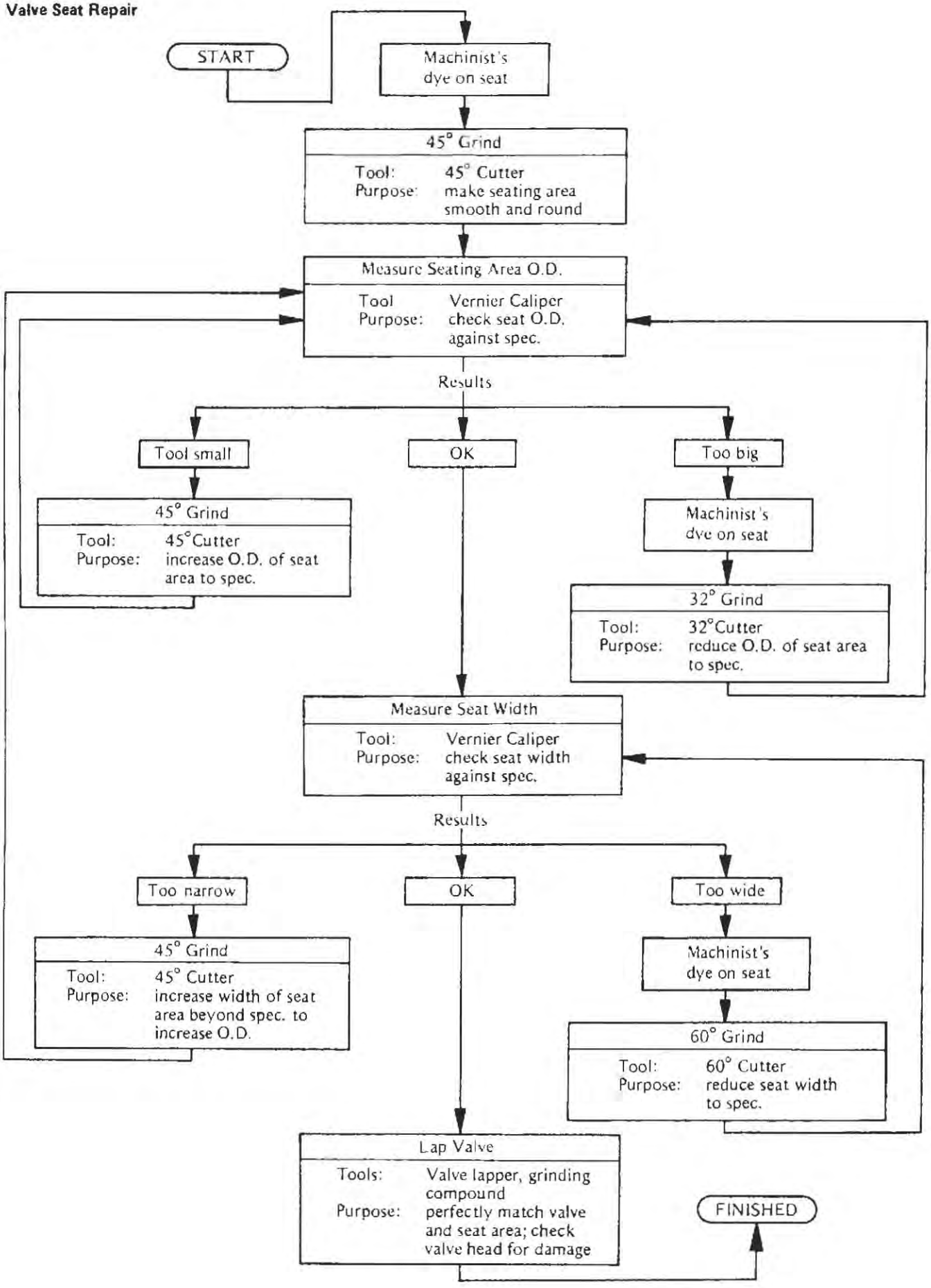
★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.

- 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.

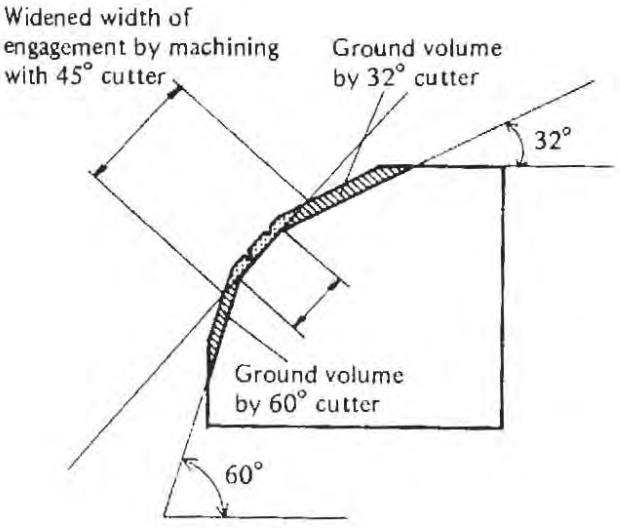
Valve Seat Repair



CAUTION

○**The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent over-grinding.**

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.

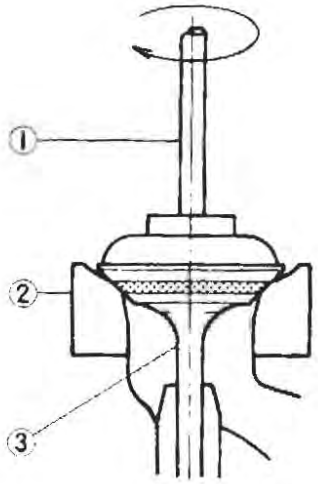
○Repeat the process with a fine grinding compound.

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

★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.

Valve Lapping



1. Lapper
2. Valve Seat
3. Valve

Cylinders and Pistons

Piston Removal Notes

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

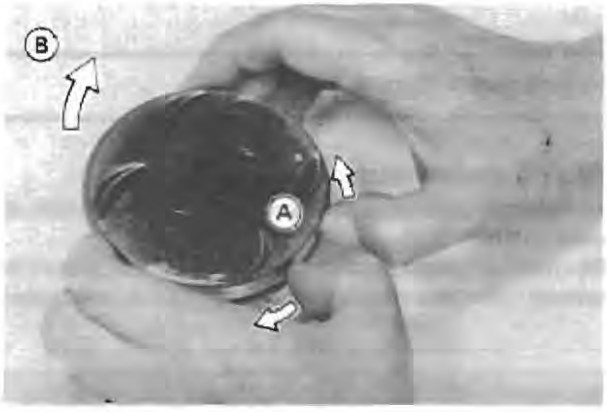
○Be sure to place a clean cloth under the piston to prevent the snap ring from falling into the crankcase.

A. Snap Ring

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

A. Piston Pin Puller Assembly: 57001-910

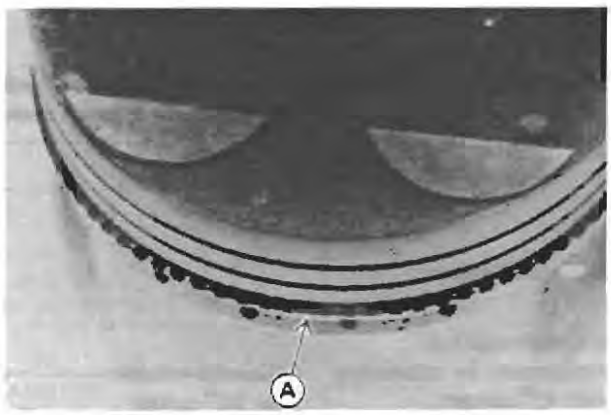
•Remove the top and second piston rings.
○Spread the ring opening with your thumbs and then push up on the opposite side of the ring to remove it.
•Remove the 3-piece oil ring with your thumbs in the same manner.



A. Spread. B. Push up.

Piston Installation Notes

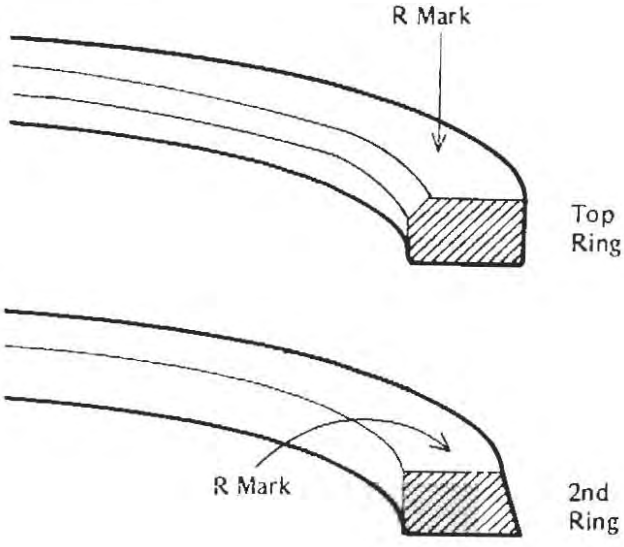
•If a new piston is installed, be sure to check piston/cylinder clearance before starting (see Piston/Cylinder Clearance).
•Install the 3-piece oil ring.
○First install the expander in the bottom ring groove so that the expander ends butt together, never overlap.



A. Expander ends butt together.

○Install the upper and lower steel rails. There is no UP or DOWN to the rails. They can be installed either way.
•Install the top and second rings in that order.
○Do not mix up the top and second rings. The top and second rings are not symmetrical and must be installed with the correct side facing up.

Piston Rings



•The arrow on the top of the piston must point toward the front of the engine.
•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.**

Cylinder Installation Notes

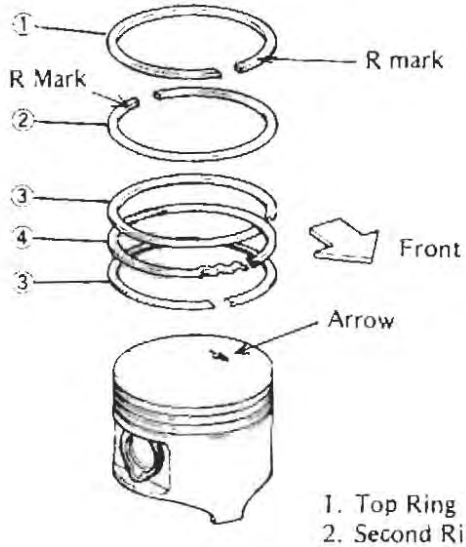
•If a new cylinder is installed, be sure to check piston/cylinder clearance before starting (see Piston/Cylinder Clearance).

•Turn the piston rings so that the openings are in the specified positions.

Piston Ring Opening Positions

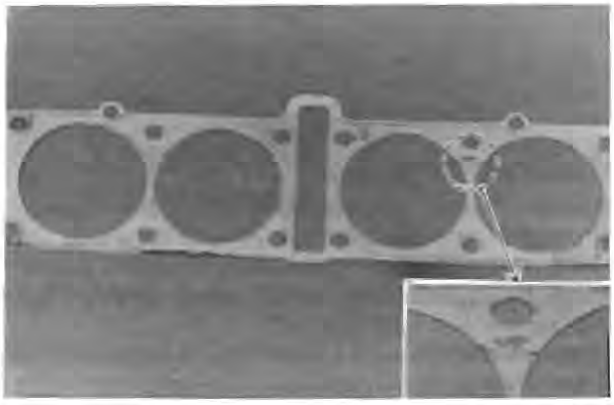
Top Ring:	**Forward**
Second Ring:	**Rear**
Oil Expander:	**Forward**
Top Oil Rail:	**30° Left of Forward**
Bottom Oil Rail:	**30 ° Right of Forward**

Piston Ring Openings: Viewed from Front



1. Top Ring
2. Second Ring
3. Steel Rail, Oil Ring
4. Expander, Oil Ring

•Install a new cylinder base gasket with the side marked UP facing up.



•Install the cylinder block on the pistons.

○Slip the piston bases (special tools) under the base gasket and pistons to hold them level.

○Compress the piston rings using the piston ring compressor assemblies (special tools).

A. Piston Ring Compressor Assembly: 57001-1094
B. Piston Base: 57001-149

Cylinder Inside Diameter

•Measure the cylinder inside diameter.

○Use a dial bore gauge to measure front-to-back and side-to-side at the points shown below.

Cylinder Inside Diameter

Standard:	**77.994 – 78.006 mm, and less than 0.01 mm difference between any two measurements**
Service Limit:	**78.10 mm, or more than 0.05 mm difference between any two measurements**

★If any of the cylinder inside diameter measurements is greater than the service limit, the cylinder must be bored oversize and then honed (see Cylinder Boring and Honing). However, if the amount of boring necessary would make the cylinder inside diameter greater than the bore limit, the cylinder must be replaced.

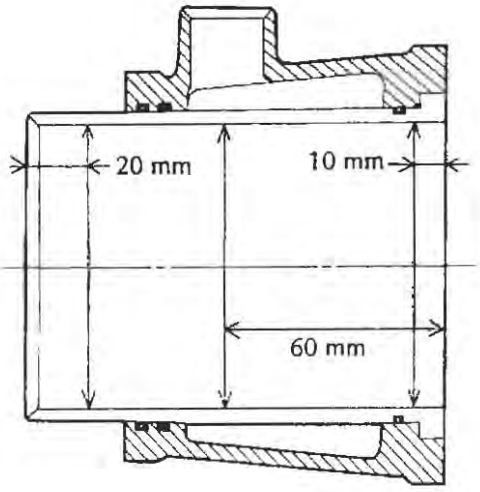
NOTE

○*If the cylinder has been bored oversize, see the Oversize Cylinder Inside Diameter table.*

Oversize Cylinder Inside Diameter

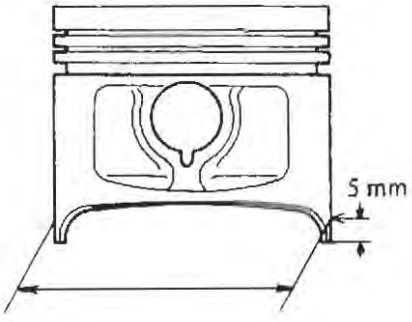
Standard: Measure at bottom of cylinder for baseline standard diameter
Service Limit: Standard plus 0.1 mm, or more than 0.05 mm difference between any two measurements
Bore Limit: 78.50 mm

Cylinder Inside Diameter Measurement



Piston Diameter

Piston Diameter Measurement



Piston Diameter

Standard: 77.935 – 77.950 mm
Service Limit 77.80 mm

NOTE

©If the oversize piston has been used, see Oversize Piston Diameter table.

Oversize Piston Diameter

Standard: 77.935 – 77.950 mm plus 0.50 mm as stamped in piston head.
Service Limit: Standard size minus 0.15 mm

Piston/Cylinder Clearance

- Measure the piston diameter.
- Measure the cylinder inside diameter with a dial bore gauge at the bottom of the cylinder.
- Subtract the piston diameter from the cylinder inside diameter to get the piston/cylinder clearance.
- ★If the piston/cylinder clearance is less than the specified range, use a small piston or increase the cylinder inside diameter by honing (see Cylinder Boring and Honing).
- ★If the piston/cylinder clearance is greater than the specified range, use a large piston or bore to the next larger oversize (see Cylinder Boring and Honing).

Piston/Cylinder Clearance

Standard: 0.044 – 0.071 mm

Cylinder Boring and Honing

- When boring and honing a cylinder, follow the boring and honing tool manufacturer's instructions. Note the following:
- Before boring a cylinder, measure the diameter of the piston to be used. Bore and hone the cylinder to obtain the standard piston/cylinder clearance specified.
- Cylinder inside diameter must not vary by more than 0.01 mm at any point.
- Do not measure the cylinder inside diameter immediately after boring or honing, because the boring and honing operations heat the cylinder. Heat affects cylinder size.

Piston/Cylinder Seizure

- Visually inspect the cylinder and piston damage.
- ★If there is only light damage, smooth the piston with #400 emery cloth. Remove small aluminum deposits from the cylinder with #400 emery cloth or light honing.
- ★If the damage is severe, the cylinder must be bored oversize and an oversized piston installed.

Piston Cleaning

●Remove the piston and piston rings.

CAUTION

○**Never clean the piston head with the engine assembled. Carbon particles will fall between the piston and cylinder, and damage the crankshaft bearings.**

●Scrape the carbon off the piston head.
○Use the scraping tool carefully. Do not gouge the piston head.
●Clean the piston ring groove with a broken piston ring or other suitable tool.

CAUTION

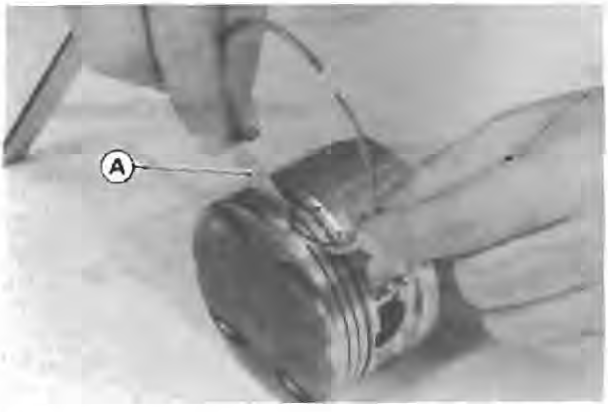
○**Be careful not to widen the ring grooves or the piston must be replaced.**

Piston Ring and Ring Groove Wear

●Visually inspect the piston rings and ring grooves.
★If the piston rings are worn unevenly or damaged, replace them.
★If the ring grooves are worn unevenly or damaged, replace both the piston and piston rings.
●Measure the clearance between the top and second rings and their grooves.

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

★If the piston ring groove clearance is greater than the service limit, measure the ring thickness and groove width as follows to decide whether to replace the rings, the piston or both.

Piston Ring Thickness (Top & Second)

Standard:	0.97 – 0.99 mm
Service Limit:	0.90 mm

Piston Ring Groove Width

	Standard	Service Limit
Top	1.02 – 1.04 mm	1.12 mm
Second	1.01 – 1.03 mm	1.11 mm
Oil	2.01 – 2.03 mm	2.11 mm

NOTE

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

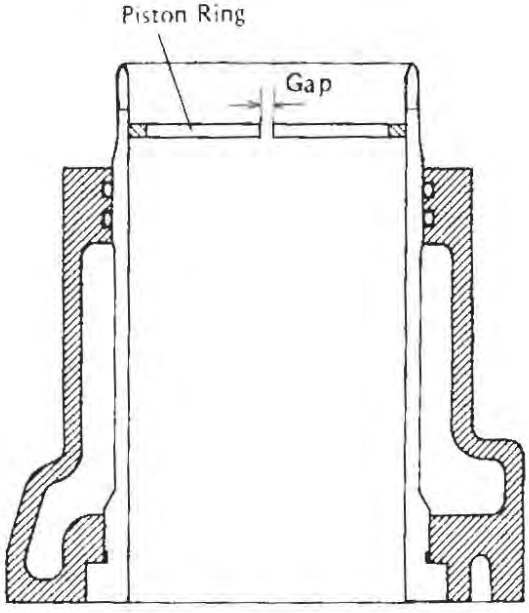
Piston Ring End Gap (top and second only)

●Push each ring (one at a time) into the bottom end of the cylinder.
○Use the piston to push it in to be sure it is square.
●Measure the gap between the end of the ring with a thickness gauge.

Piston Ring End Gap

	Standard	Service Limit
Top	0.20 – 0.35 mm	0.7 mm
Second	0.20 – 0.40 mm	0.7 mm

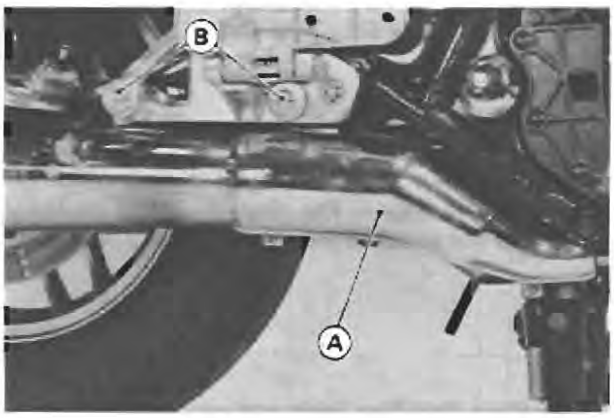
Piston Ring End Gap Measurement



Exhaust Pipes and Mufflers

Muffler Removal Notes

●Remove the mufflers as following.
○Remove the left and right muffler covers.



A. Muffler Cover B. Muffler Mounting Bolt

○Loosen the clamps connecting the left and right mufflers and exhaust pipes.
○Remove the left and right muffler mounting bolts.
○Pull the mufflers out rear ends of the exhaust pipes.

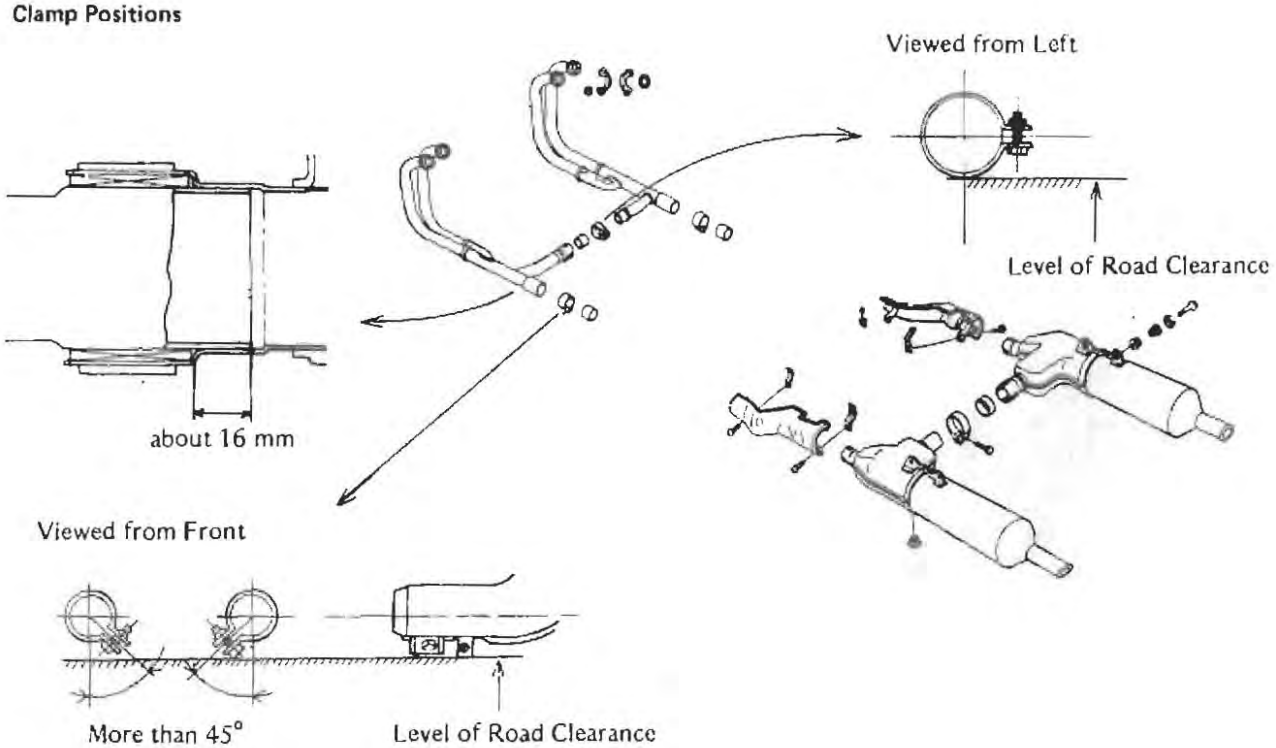
Exhaust Pipe and Muffler Installation Notes

●Install the clamps so that the openings are in the specified positions to obtain the specified road clearance of the vehicle.
●Tighten the exhaust pipe and 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.
○Secondly, tighten the exhaust pipe holder nuts evenly to avoid exhaust leaks.

A. Exhaust Pipe Holder Nuts

○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.

Clamp Positions



Clutch

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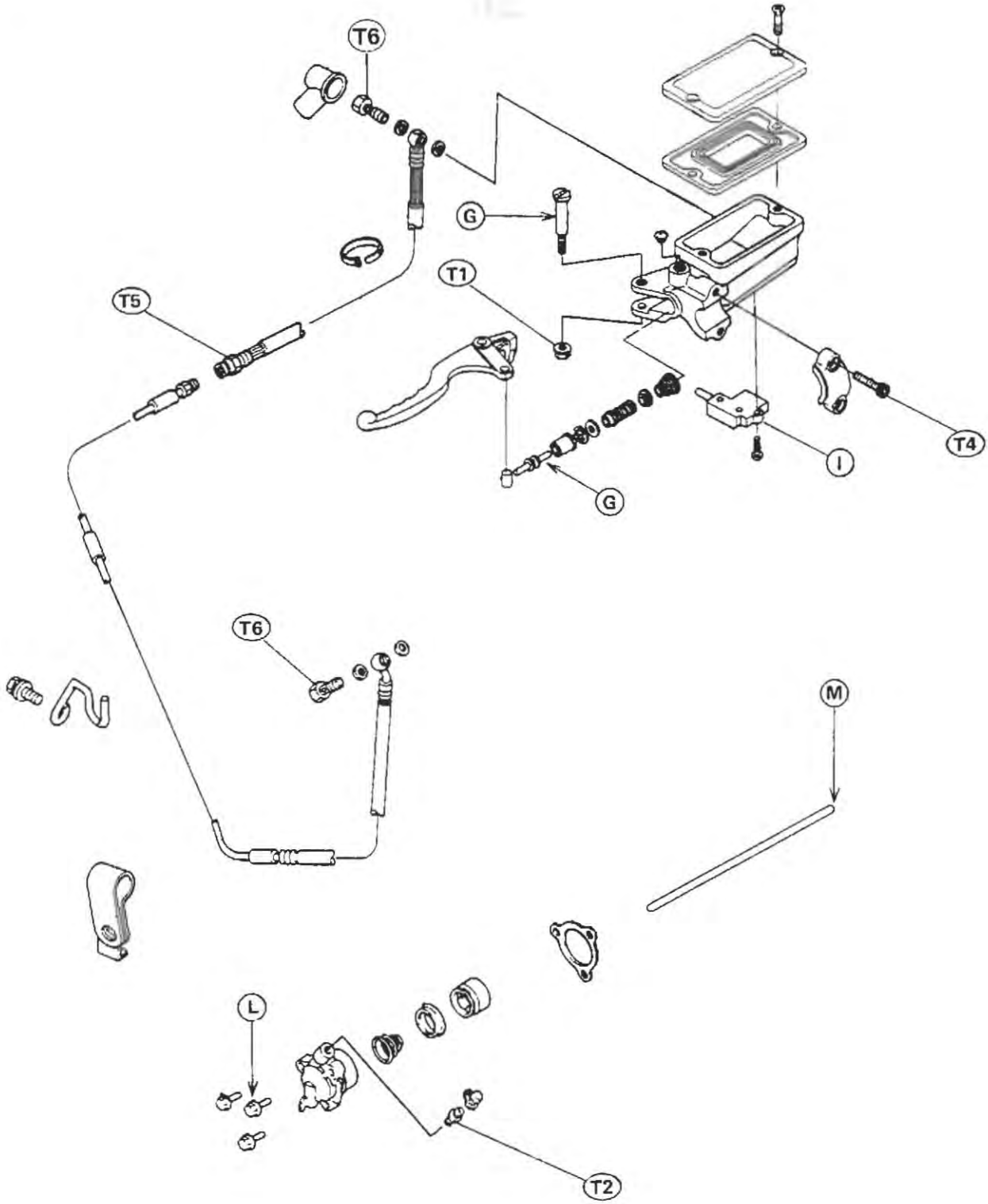
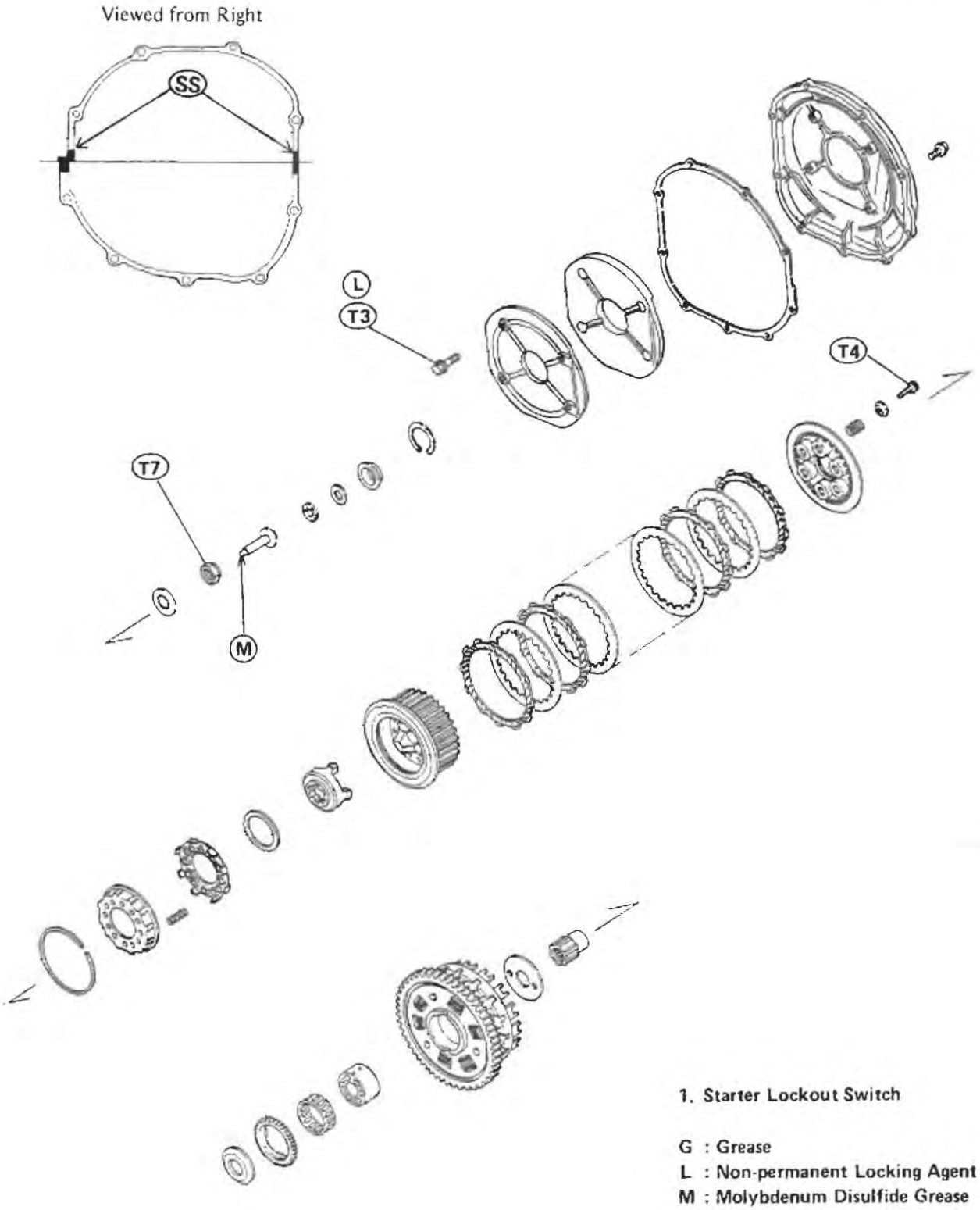
Exploded View





1. Starter Lockout Switch

G : Grease
L : Non-permanent Locking Agent
M : Molybdenum Disulfide Grease
SS : Silicone Sealant

T1 : 5.9 N-m (0.60 kg-m, 52 in-lb)
T2 : 7.8 N-m (0.80 kg-m, 69 in-lb)
T3 : 9.8 N-m (1.0 kg-m, 87 in-lb)
T4 : 11 N-m (1.1 kg-m, 95 in-lb)
T5 : 18 N-m (1.8 kg-m, 13.0 ft-lb)
T6 : 25 N-m (2.5 kg-m, 18.0 ft-lb)
T7 : 130 N-m (13.5 kg-m, 98 ft-lb)

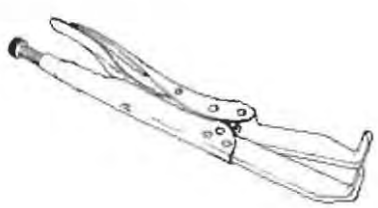
Specifications

Item		Standard	Service Limit
Clutch Fluid:	Grade	D.O.T.4 Heavy Duty Brake Fluid	
	Brand (recommended)	Castrol Girling-Universal Castrol GT (LMA) Castrol Disc Brake Fluid Check Shock Premium Heavy Duty	
Clutch:	Friction Plate Thickness	2.9 – 3.1 mm	2.8 mm
	Friction and Steel Plate Warp	Less than 0.2 mm	0.3 mm
	Clutch Spring Free Length	33.2 mm	32.1 mm

Special Tool

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

Clutch Holder: 57001-305



NOTE

○*The clutch holder (P/N 57001-1243) can be used instead of the clutch holder (P/N 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

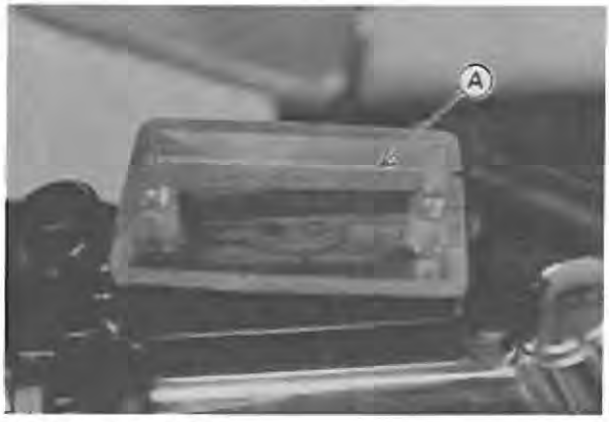
★If the fluid level is lower than the lower level, check for the fluid leakage of the clutch line, and add the fluid as follows.

○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.

●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.

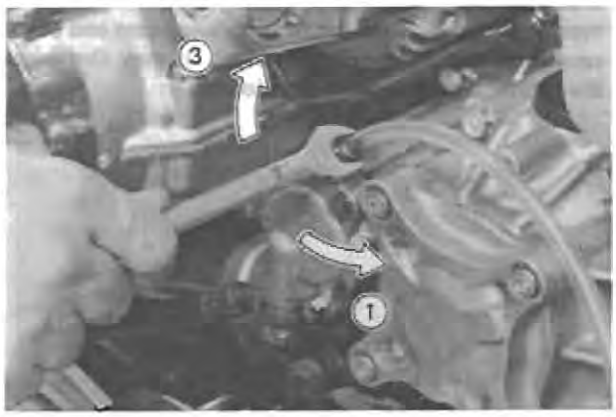
●Open the bleed valve, squeeze the clutch lever, close the valve with the clutch held applied, and then quickly release the lever. Repeat this operation until the clutch line is filled and fluid starts coming out into the plastic hose.

NOTE

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

●Tighten the bleed valve to the specified torque Exploded View).

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

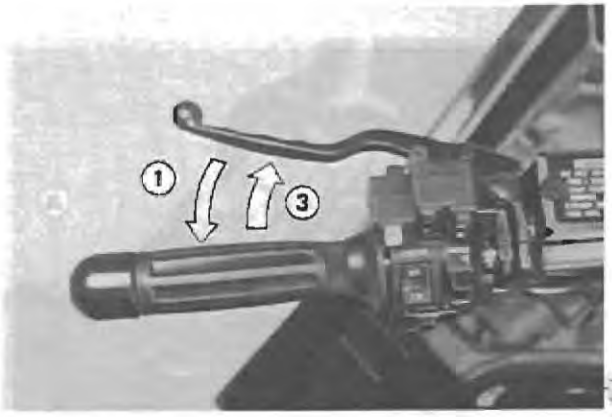
○*The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

- 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 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.
- 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 specified torque (see Exploded View).
- 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.

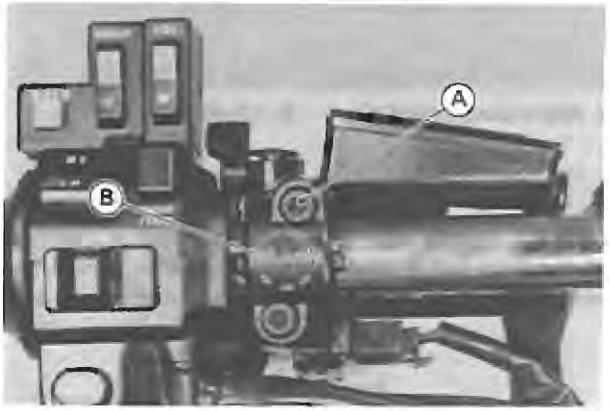
Clutch Master Cylinder

Clutch Master Cylinder Removal

- Disconnect the starter lockout switch wires.
- Remove the clamp bolts and clamp, and take the clutch master cylinder off the handlebar.

Clutch Master Cylinder Installation Notes

- The master cylinder clamp must be installed with the UP mark faced upwards.
- Tighten the upper clamp bolt first, and then the lower clamp bolt to the specified torque (see Exploded View). There will be a gap at the lower part of the clamp after tightening.

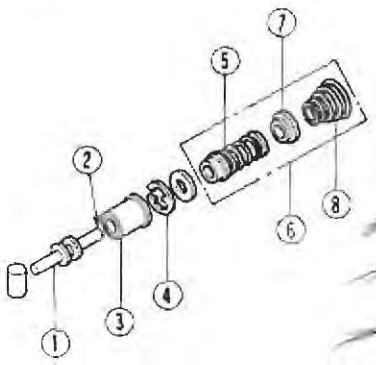


A. Tighten upper clamp bolt first.
B. UP Mark

Clutch Master Cylinder Disassembly

- Drian the clutch fluid.
- Pull back the dust cover, and remove the banjo bolt to disconnect the clutch hose from the master cylinder. There is a flat washer on each side of the hose fitting.
- 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 secondary cup from the piston since removal will damage it.

Clutch Master Cylinder Assembly Notes

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

CAUTION

○Use only disc brake fluid, isopropyl alcohol, or ethyl alcohol, for cleaning 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 cylinder.

- 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.

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

Clutch Master Cylinder Inspection (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 them.

- Inspect the primary cup and secondary cup.

★If a cup is worn, damaged, softened (rotted), or swollen, replace it.

★If fluid leakage is noted at the clutch lever, the piston assembly should be replaced to renew the cup.

- Check the dust cover for damage.

★If it is damaged, replace it.

- Check that the relief and supply ports are not plugged.

★If the small relief port becomes plugged, the clutch will slip. Blow the ports clean with compressed air.

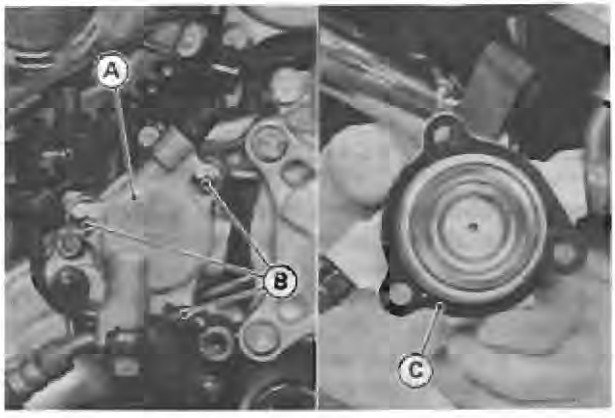
- Check the piston return spring for any damage.

★If the spring is damaged, replace it.

Clutch Slave Cylinder

Clutch Slave Cylinder Removal Notes

- Remove the mounting bolts.
- Remove the slave cylinder unit and spacer.



A. Slave Cylinder Unit C. Spacer
B. Mounting Bolts

CAUTION

○Do not spill clutch fluid onto any painted surface.
○Do not squeeze the clutch lever during the slave cylinder removal, or the slave cylinder will be moved out of their proper position.

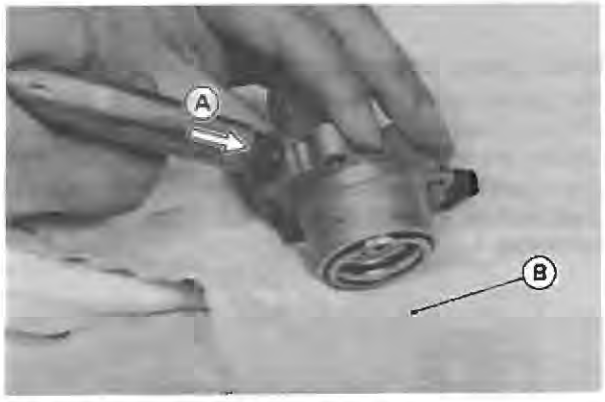
Clutch Slave Cylinder Installation Notes

- Replace the spacer with new one.
- If the clutch push rod was pulled out, apply a molybdenum disulfide grease to the flat end of the rod, and insert it with the round end of it facing outward (towards the engine left side).

A. Round End

Clutch Slave Cylinder Disassembly

- Reomove the banjo bolt and pour the fluid into a container.
- 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 Notes

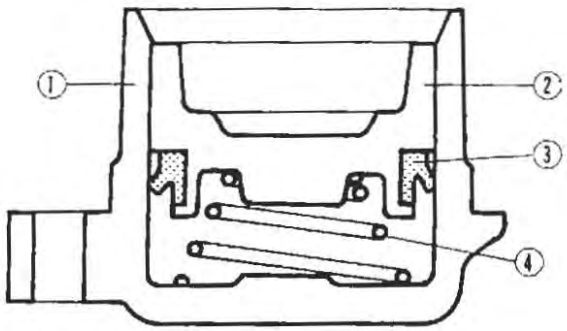
- Before assmebly, clean all parts including the cylinder with brake fluid or alcohol.

CAUTION

○Use only disc brake fluid, isopropyl alcohol, or ethyl alcohol, for cleaning 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 cylinder.

- 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.

Clutch Slave Cylinder

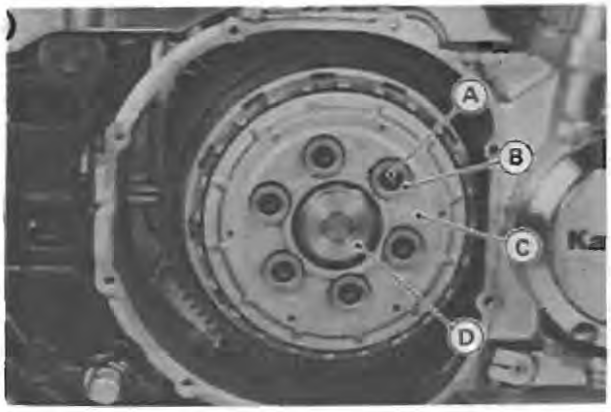


1. Cylinder
2. Piston
3. Fluid Seal
4. Spring

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

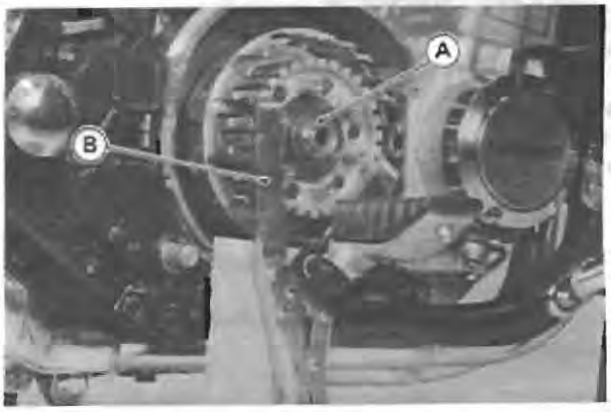
Clutch Slave Cylinder Inspection (Visually Inspection)

●Visually inspect the piston and cylinder surfaces.
★Replace the cylinder and piston if they are badly scored or rusty.
★Replace the fluid seal under any of the following conditions: fluid leakage around the piston or the seal is stuck to the cylinder.
●Check the piston spring for any damage.
★If the spring is damaged, replace it.



A. Clutch Spring Bolt
B. Washer
C. Spring Plate
D. Spring Plate Pusher

●Remove the friction plates and steel plates.
●When loosening the clutch hub self-locking nut, use the holder (special tool) to keep the clutch hub from turning as shown in the figure below.
○Reinstall the right footpeg to set the holder.
○Insert a thick cloth or a board between the holder and the frame tube to avoid damaging the painted surface of the tube.



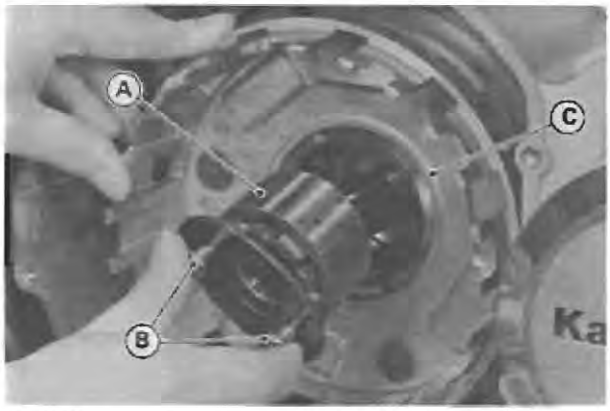
A. Hub Nut
B. Holder: 57001-305

Clutch

Clutch Removal

●Remove the clutch cover.
○Remove the brake pedal and right footpeg.
●Remove the clutch spring Allen bolts, washers, and springs.
●Remove the spring plate with the spring plate pusher and circlip.

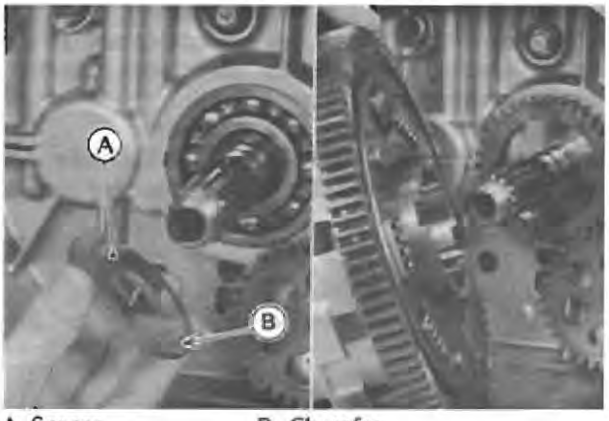
●Pull out the clutch hub, splined collar, thrust washer, clutch housing bearing collar, needle bearing, clutch housing, oil pump drive gear, and spacer.
○The clutch housing bearing collar can easily be removed by installing clutch cover bolts into the collar tapping holes and pulling them.
○The clutch housing can be removed after removing the bearing collar.



A. Collar C. Clutch Housing
B. Clutch Cover Bolts

Clutch Installation Notes

•Install the spacer with the chamfer side facing in.



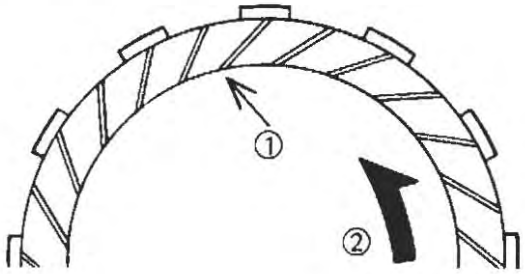
A. Spacer B. Chamfer

•Install the clutch housing bearing collar with tapping hole side facing out.
•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 specified torque (see Exploded View).
○Put a wooden bar behind the cylinder block to set the holder.

A. Holder: 57001-305

•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).

Friction Plate Installation



1. Oil Groove 2. Direction of Rotation

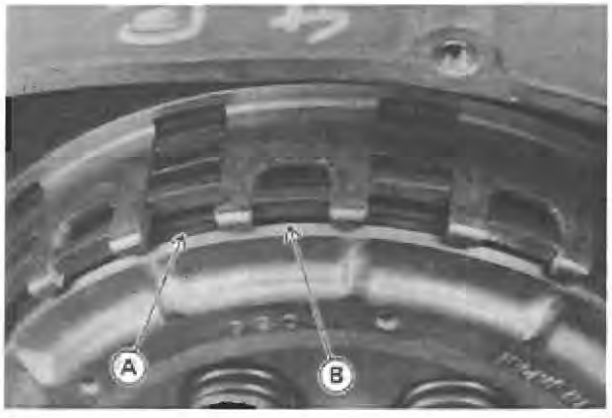
○The first steel plate and the last steel plate must be a thinner one (2.6 mm thick). The other plates from the second to the seventh must be a thicker one (2.9 mm thick).

CAUTION

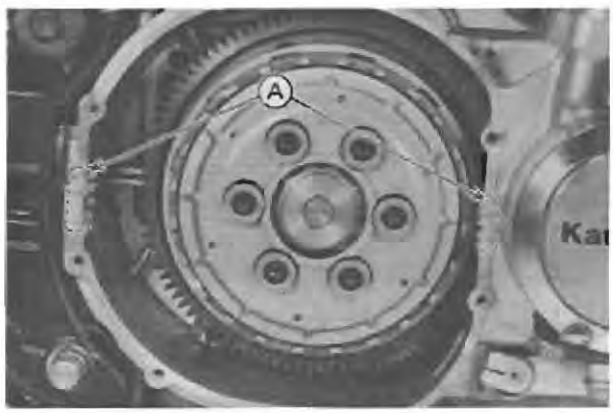
○**If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

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.*



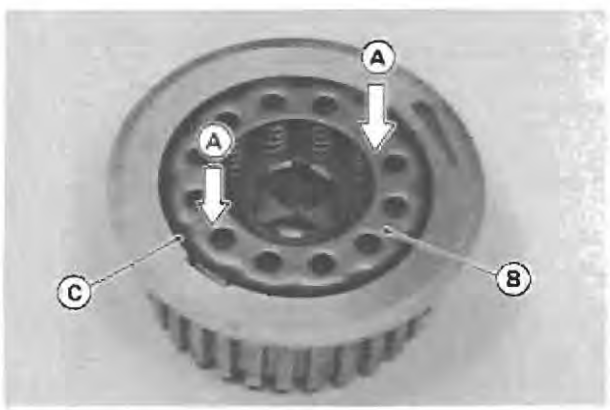
•Apply a silicone sealant to the crankcase halves mating surface on the front and rear sides of the cover mount.



A. Apply silicone sealant.

Clutch Hub Disassembly

•Push in the damper spring plate, and remove the circlip.



A. Press
B. Damper Spring Plate
C. Retainer

•Take the damper spring plate, damper springs, damper spring seat, seat stop, and damper cam follower out of the clutch hub.

Friction Plate Wear, Damage Inspection

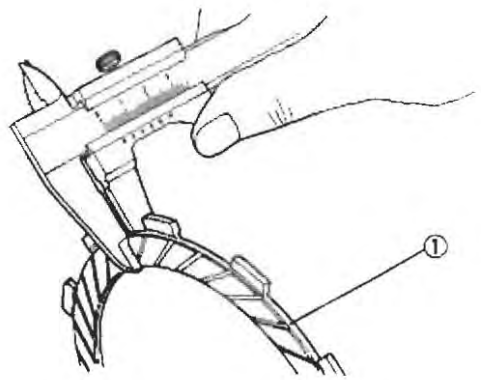
•Visually inspect the friction plates to see if they show any signs of seizure, overheating, or uneven wear.

★If any plates show signs of damage, replace the friction plates and steel plates as a set.

Friction Plate Thickness

Standard:	**2.9 – 3.1 mm**
Service Limit:	**2.8 mm**

Friction Plate Thickness Measurement



A. Friction Plate

Friction or Steel Plate Warp Inspection

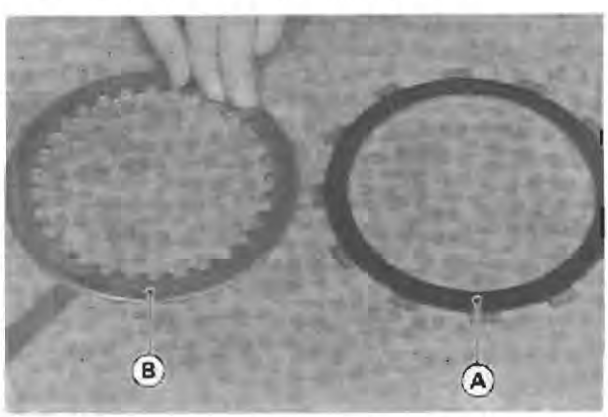
•Place each friction plate or steel plate on a surface plate, and measure the gap between the surface plate and each friction plate or steel plate. The gap is the amount of or steel plate warp.

★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

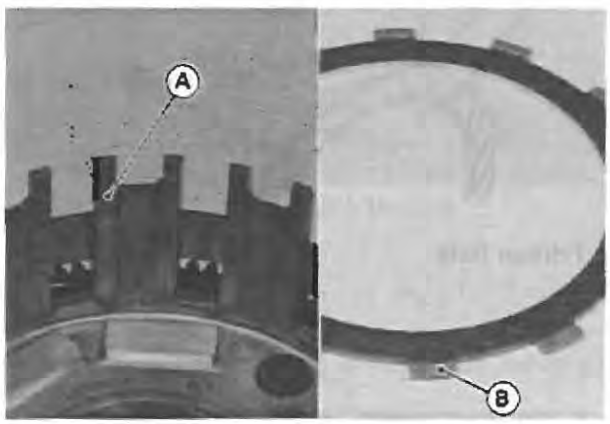
Clutch Spring Free Length

Standard:	**33.2 mm**
Service Limit:	**32.1 mm**

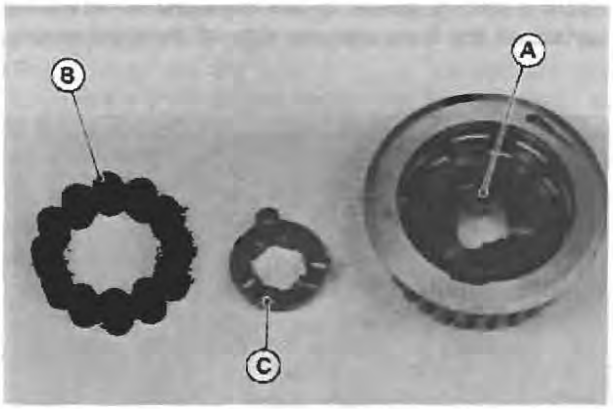
Clutch Housing Finger Inspection

•Visually inspect the fingers of the clutch housing where the tangs 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 tangs are damaged.



A. Clutch Housing Finger B. Friction Plate Tang



A. Damper Cam C. Cam Follower
B. Damper Spring

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

Cam Damper Inspection

•Visually inspect the damper cam, damper spring, and cam follower.

★Replace any part that appears damaged.

Engine Lubrication System

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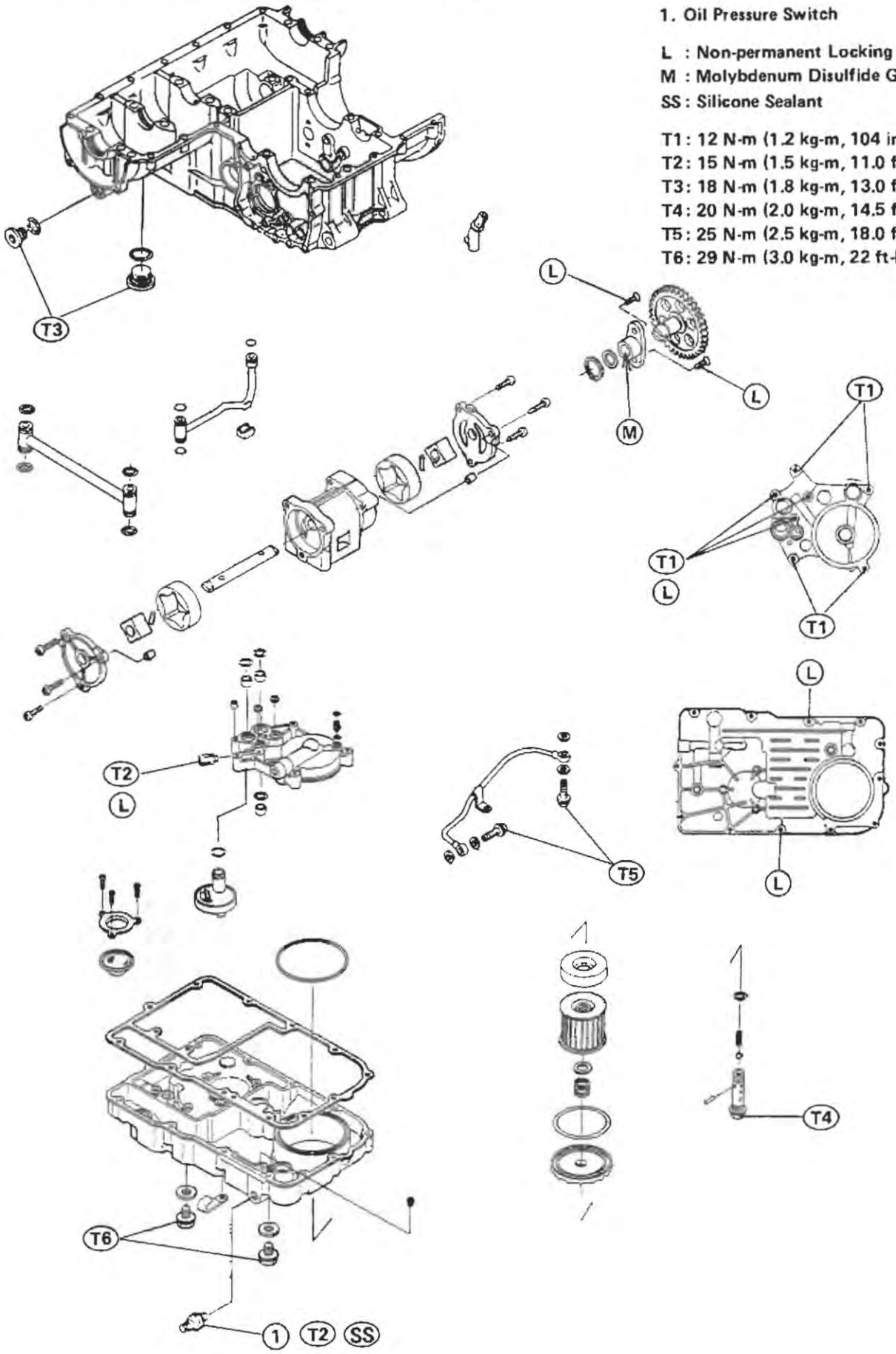
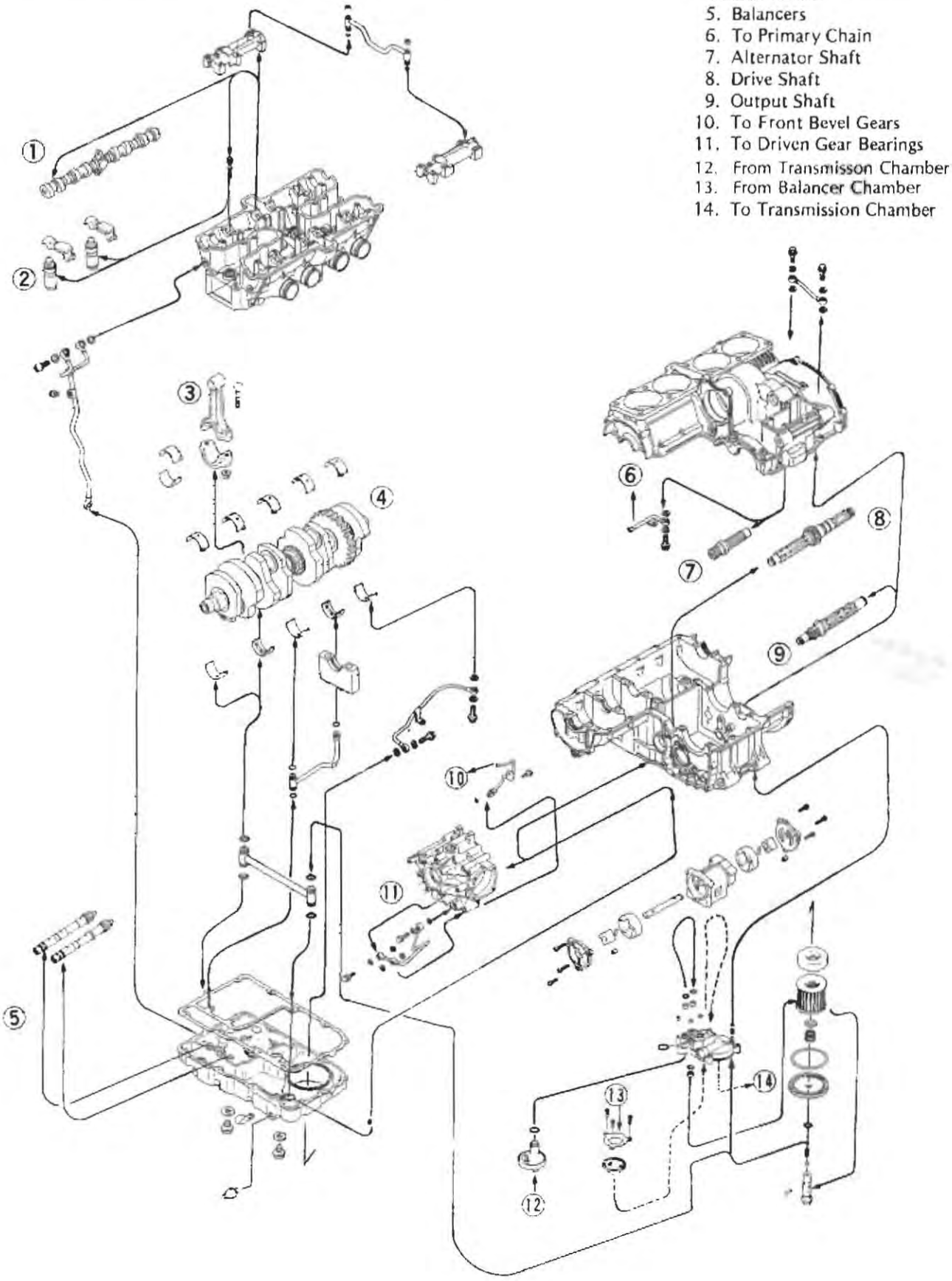
Exploded View



Engine Oil Flow Chart



1. Camshaft
2. Hydraulic Lash Adjuster
3. Connecting Rod
4. Crankshaft
5. Balancers
6. To Primary Chain
7. Alternator Shaft
8. Drive Shaft
9. Output Shaft
10. To Front Bevel Gears
11. To Driven Gear Bearings
12. From Transmisson Chamber
13. From Balancer Chamber
14. To Transmission Chamber

Specifications

Item		Standard
Engine Oil:	Grade	SE or SF class
	Viscosity	SAE 10W40, 10W50, 20W40, or 20W50
	Capacity	3.2 L (when filter is not removed) 3.5 L (when filter is removed) 4.0 L (when engine is completely dry)
	Oil level	Between upper and lower levels
Oil Pump and Relief Valve: Oil Pressure @4,000 r/min (rpm), Oil Temp. 80°C (176°F)		About 370 kPa (3.8 kg/cm², 54 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

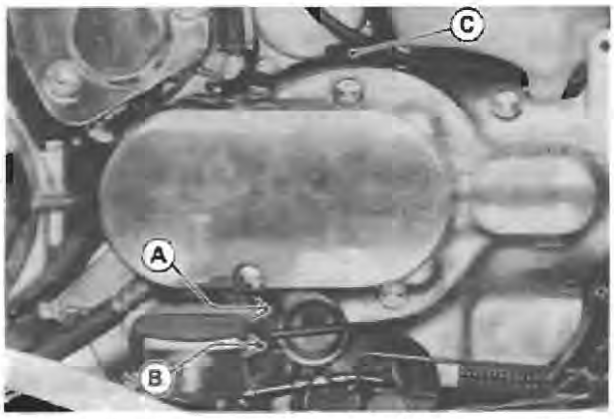
Engine Oil and Filter

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.

CAUTION

○Insufficient, deteriorated, or contaminated engine oil will cause the hydraulic lash adjusters to malfunction, and develop tappet noise or poor engine running.



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

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

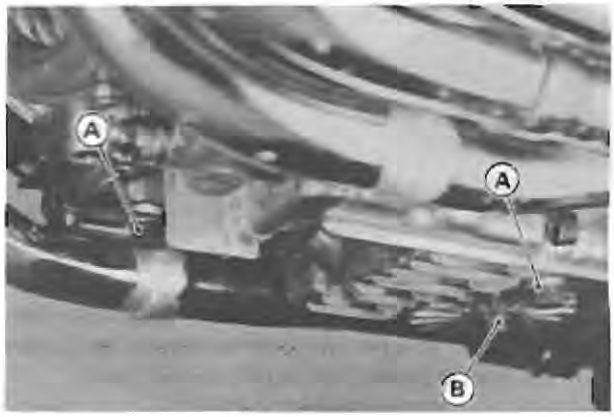
○If the engine oil type and make are unknown, use any brand of the specified oil to top up the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

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

●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 or SF class**
Viscosity: **SAE 10W40, 10W50, 20W40, or 20W50**

Required Amount
When filter is not removed: 3.2 L
When filter is removed: 3.5 L

Oil Filter and Bypass Valve Removal

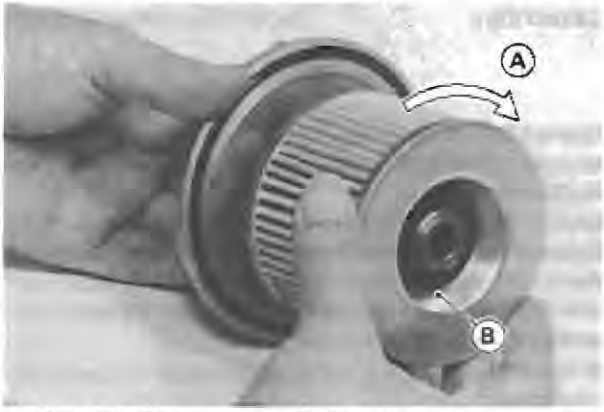
- With the motorcycle up on its center stand, place an oil pan beneath the engine.
- Unscrew the oil filter mounting bolt and drop out the filter.
- Remove the oil fence.
- Holding the filter steady, turn the mounting bolt to work the filter free.
- Remove the flat washer and spring, and pull the filter 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 B. Bypass Valve

- 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 and Oil Pressure Switch

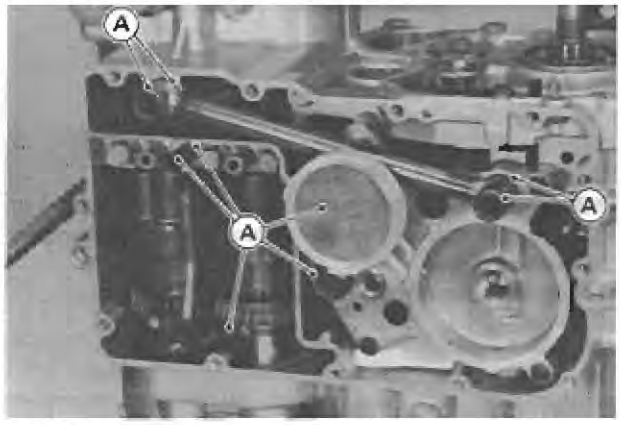
Oil Pan Removal

- Drain the engine oil (see Engine Oil and/or Filter Change).
- 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.

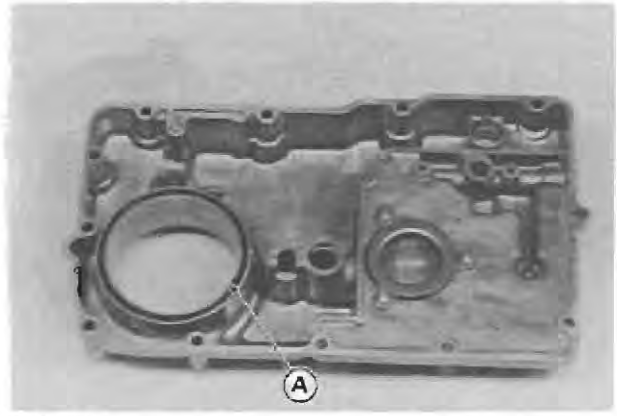
Oil Pan Installation Notes

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

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



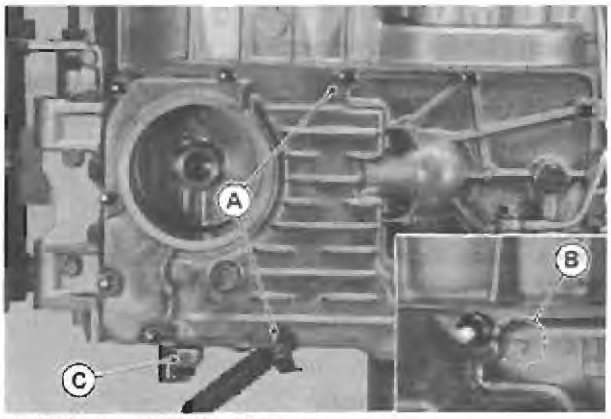
A. O-rings



A. O-ring

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

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



A. Bolts requiring locking agent.
B. Triangular Mark
C. Oil Pressure Switch

•If the oil pressure switch was removed, apply a silicone sealant to the threads and tighten it to the specified torque (see Exploded View).

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

•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.

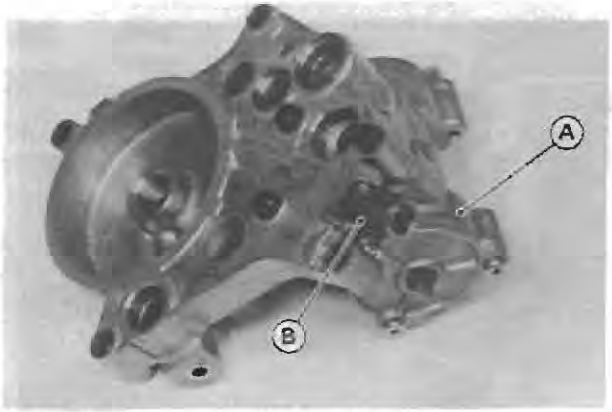
•Pull out the oil screen, oil pipe, collar, and O-rings.

•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.

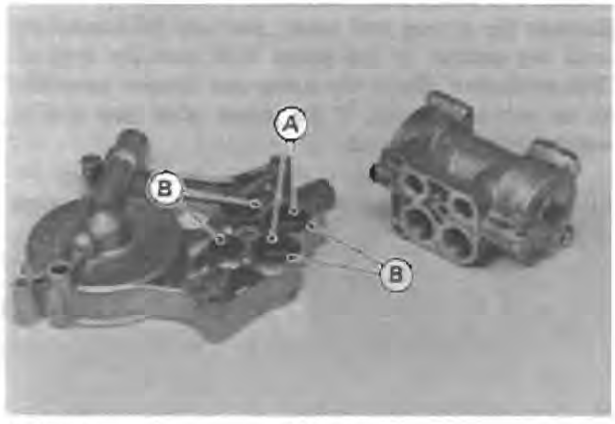
Oil Pump and Relief Valve Installation Notes

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

CAUTION

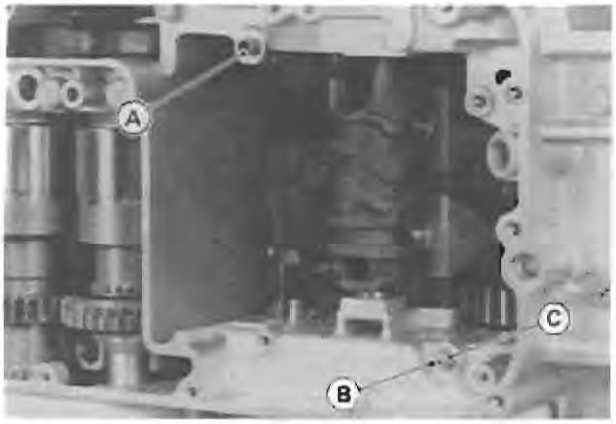
Do not over-apply a non-permanent locking agent to the threads. This may block the oil passage.

- 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

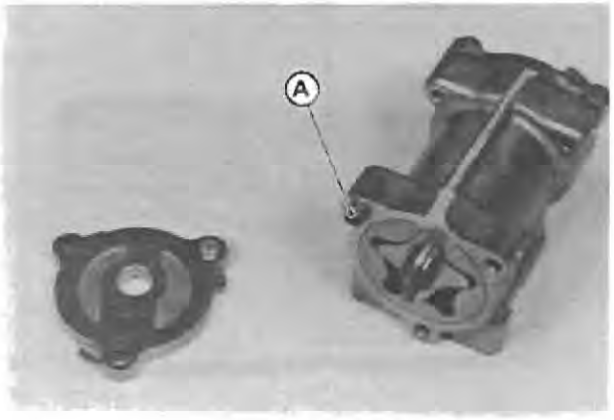
- If the oil pump drive gear and/or water pump are installed, check that the oil pump shaft catches of both components are vertical.
- Tighten the oil pump bracket bolts to the specified torque (see Exploded View).

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

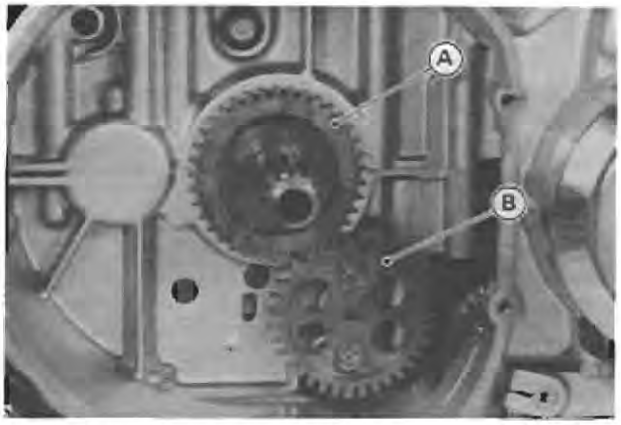
- The oil pump drive gear is removed during clutch assembly removal (see Clutch chapter).

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.

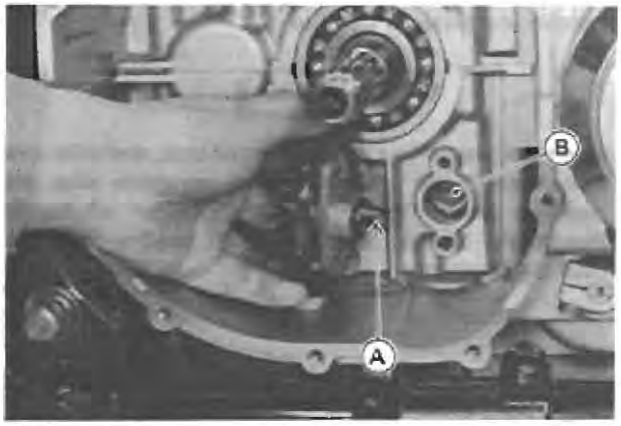


A. Oil Pump Drive Gear B. Oil Pump Gear

•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.

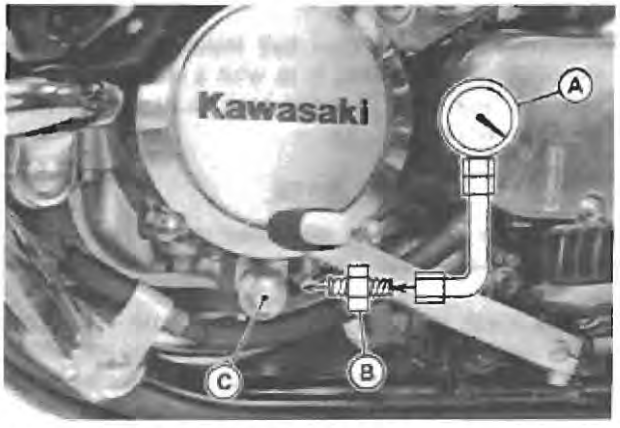


A. Slot B. Projection

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

Oil Pressure Measurement

•Measure the oil pressure at normal operating temperature.
○Warm up the engine, and then stop the engine.
○Remove the oil passage plug.
○Install the oil pressure gauge and adapter (special tools).



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

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.
○Stop the engine.
○Remove the oil pressure gauge and adapter.
○Install the oil passage plug.
★If the oil pressure is significantly below the specification, inspect the oil pump and relief valve.

Oil Pressure

About 370 kPa (3.8 kg/cm², 54 psi)
@4,000 r/min (rpm), 80°C (176°F)

☆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 with a high flash-point solvent and blow out any foreign particles that may be in the valve with compressed air.

WARNING

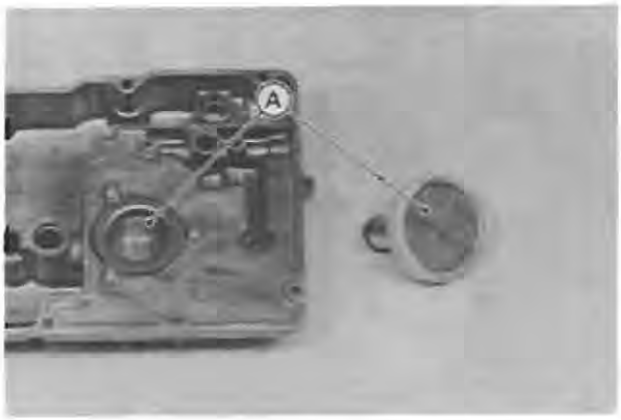
○**Clean the parts in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents.**

★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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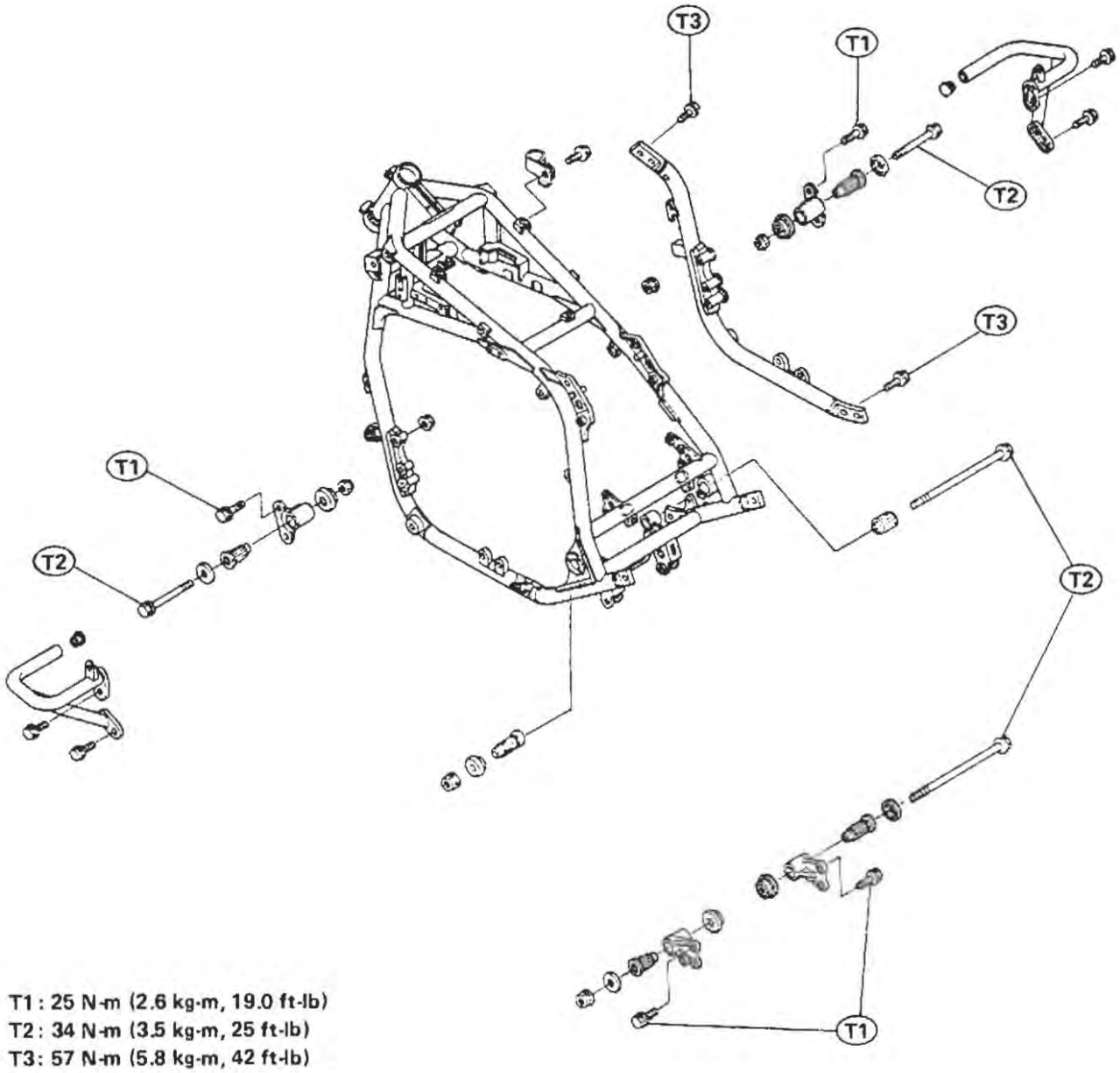
Exploded View



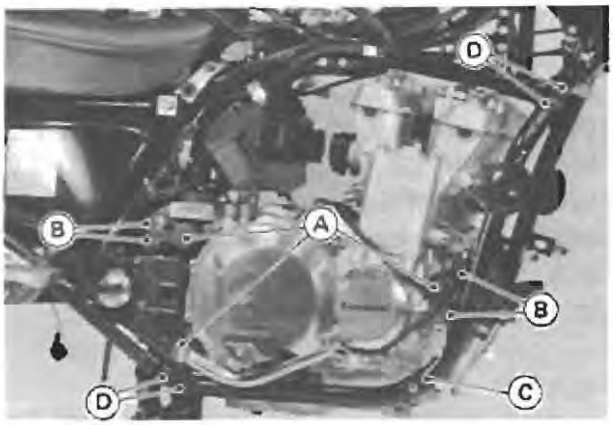
T1 : 25 N-m (2.6 kg-m, 19.0 ft-lb)
T2 : 34 N-m (3.5 kg-m, 25 ft-lb)
T3 : 57 N-m (5.8 kg-m, 42 ft-lb)

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).
- For later installation convenience, note and record how and where cables, wirings, and hoses are routed. They should not be bent sharply, kinked, or twisted.
- Remove the following:
  - Battery
  - Air Cleaner Housing
  - Carburetors
  - Fairing
  - Radiator
  - Thermostat Housing
  - Ignition Coils
  - Mufflers and Exhaust Pipes
  - Rear Wheel
  - Final Gear Case
- Disconnect wirings from the engine components, and free them from the clamps if there are.
  - Starter Motor Lead
  - Alternator Leads
  - Neutral Switch Wire
  - Overdrive Switch Wire
  - Oil Pressure Switch Wire
  - Pickup Coil Leads
  - Battery Ground Lead
- Remove the engine mounting bolts. Support the engine before sliding out the engine mounting bolts.
- Remove the engine mounting bracket bolts and take off the brackets.
- Remove the right down tube and the rear brake pedal.
- Remove the engine.

A. Mounting Bolts B. Bracket Bolts



A. Mounting Bolts
B. Bracket Bolts
C. Right Down Tube
D. Tube Mounting Bolts

Engine Installation Notes

- Be sure to install the rubber dampers on the engine mounting brackets.
- Tighten the engine mounting bolts and bracket bolts to the specified torque (see Exploded View).
- Remove the swing arm to engage the propeller shaft with the front driven gear joint, if necessary.
- 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 Cables
  - Choke Cable

Crankshaft/Transmission

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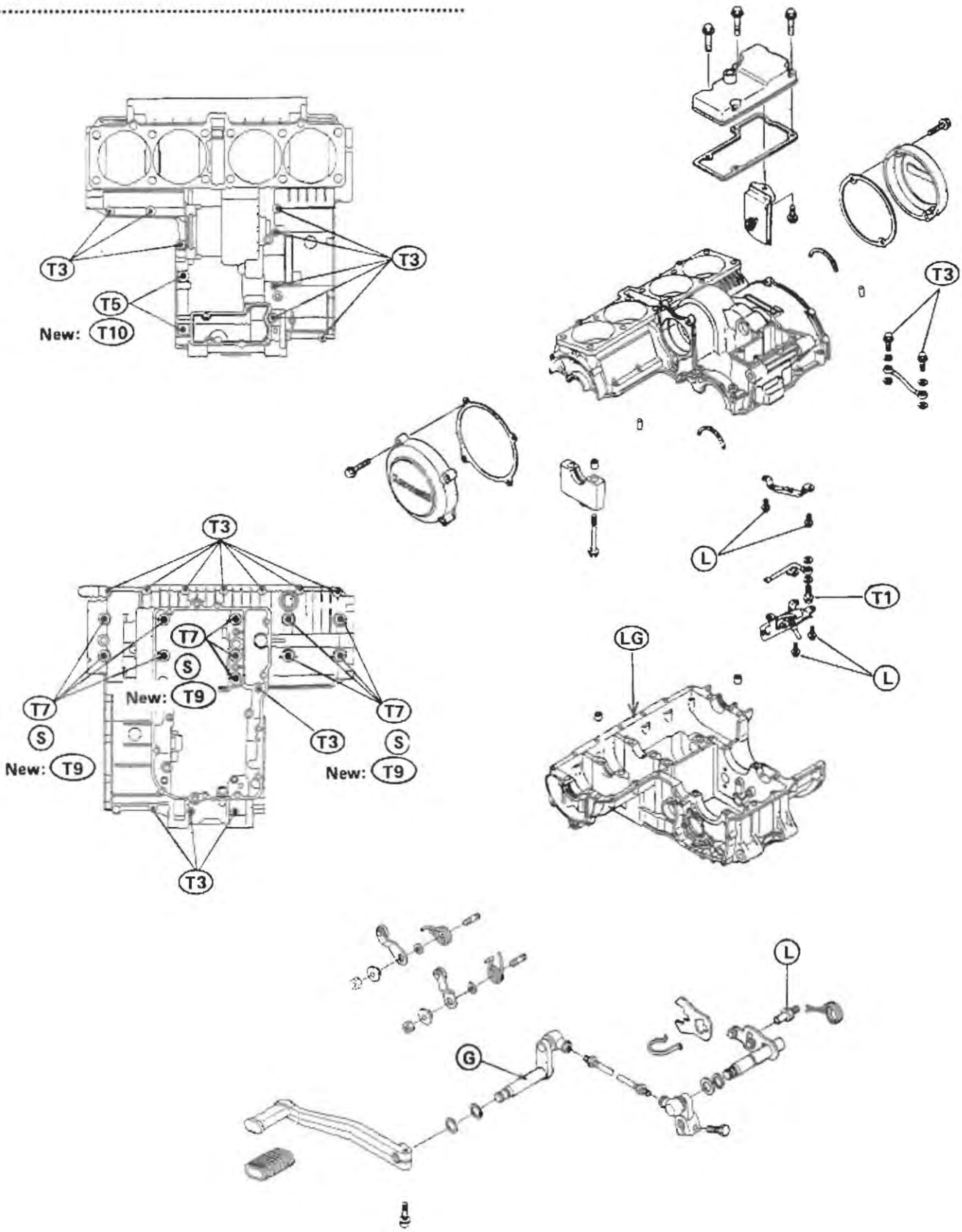
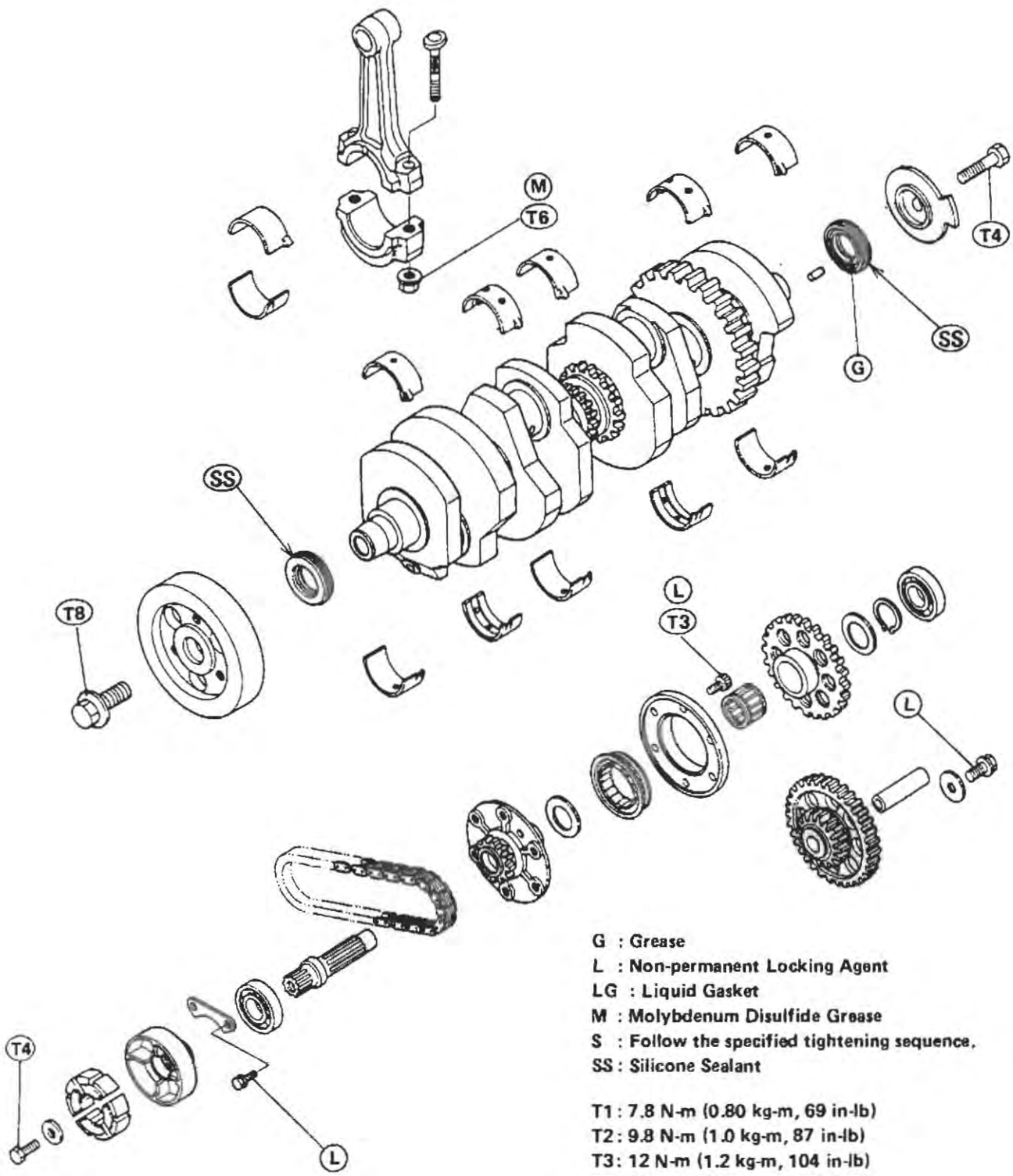
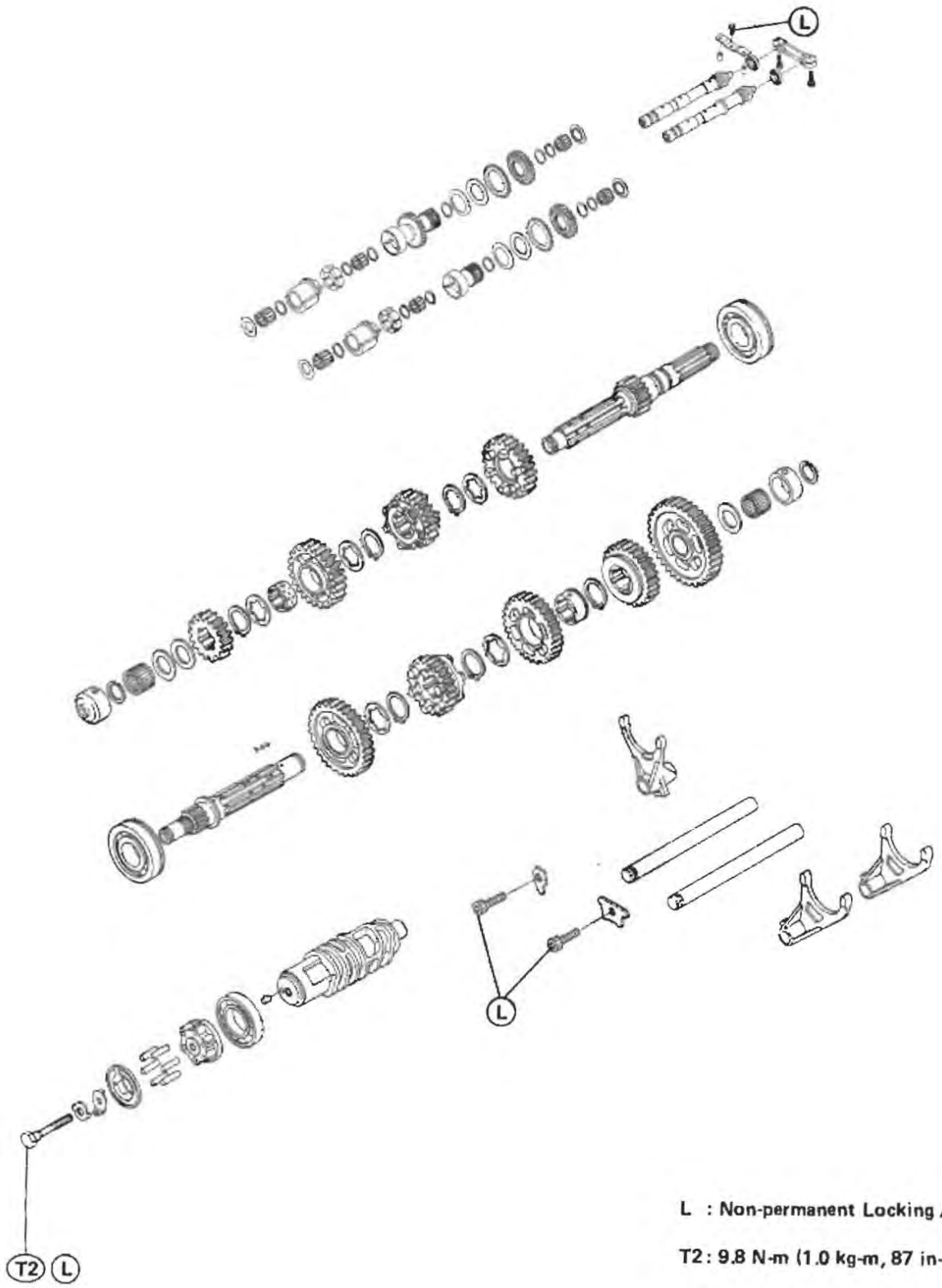
Exploded View





G : Grease
L : Non-permanent Locking Agent
LG : Liquid Gasket
M : Molybdenum Disulfide Grease
S : Follow the specified tightening sequence.
SS : Silicone Sealant

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 : 25 N-m (2.5 kg-m, 18.0 ft-lb)
T5 : 27 N-m (2.8 kg-m, 20 ft-lb)
T6 : 28 N-m (2.9 kg-m, 21 ft-lb)
T7 : 39 N-m (4.0 kg-m, 29 ft-lb)
T8 : 145 N-m (15.0 kg-m, 110 ft-lb)
T9 : 49 N-m (5.0 kg-m, 36 ft-lb)
T10 : 29 N-m (3.0 kg-m, 22 ft-lb)



L : Non-permanent Locking Agent

T2 : 9.8 N·m (1.0 kg-m, 87 in-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 Clearance		0.13 – 0.38 mm	0.50 mm
Connecting Rod Big End Bearing Insert/Crankpin Clearance		0.040 – 0.064 mm	0.10 mm
Crankpin Diameter:		37.984 – 38.000 mm	37.97 mm
Marking	None	37.984 – 37.992 mm	
	○	37.993 – 38.000 mm	
Connecting Rod Big End Bore Diameter:		41.000 – 41.016 mm	– – –
Marking	None	41.000 – 41.008 mm	
	○	41.009 – 41.016 mm	
Connecting Rod Big End Bearing Insert Thickness:	Brown	1.476 – 1.480 mm	– – –
	Black	1.480 – 1.484 mm	– – –
	Blue	1.484 – 1.488 mm	– – –

Connecting Rod Big End Bearing Insert Selection:

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
○	○	Black	92028-1395
None	None		
○	None	Blue	92028-1394
None	○	Brown	92028-1396

Crankshaft Runout		– – –	0.05 mm TIR
Crankshaft Main Bearing Insert/Journal Clearance		0.022 – 0.046 mm	0.08 mm
Crankshaft Main Journal Diameter:		37.984 – 38.000 mm	37.96 mm
Marking	None	37.984 – 37.992 mm	
	1	37.993 – 38.000 mm	
Crankcase Main Bearing Bore Diameter:		41.000 – 41.016 mm	– – –
Marking	○	41.000 – 41.008 mm	
	None	41.009 – 41.016 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	92028-1460	2, 4
			92028-1457	1, 3, 5
None	None	Blue	92028-1458	2, 4
			92028-1455	1, 3, 5
○	None	Black	92028-1459	2, 4
None	1		92028-1456	1, 3, 5

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

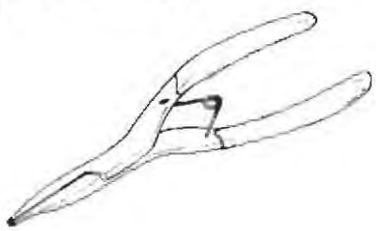
Crankshaft Side Clearance	0.05 – 0.20 mm	0.40 mm
Alternator Shaft:		
Alternator Shaft Chain 20-link Length	158.8 – 159.0 mm	161.2 mm
Transmission:		
Gear Backlash	0.02 – 0.19 mm	0.25 mm
Shift Fork Ear Thickness	5.9 – 6.0 mm	5.8 mm
Gear Shift Fork Groove Width	6.05 – 6.15 mm	6.3 mm
Shift Fork Guide Pin Diameter	7.9 – 8.0 mm	7.8 mm
Shift Drum Groove Width	8.05 – 8.20 mm	8.3 mm
Primary Reduction:		
Primary Gear/Clutch Housing Gear Backlash	0.03 – 0.11 mm	0.15 mm

Special Tools

Along with common hand tools, the following more specialized tools are required for complete crankshaft/transmission servicing.

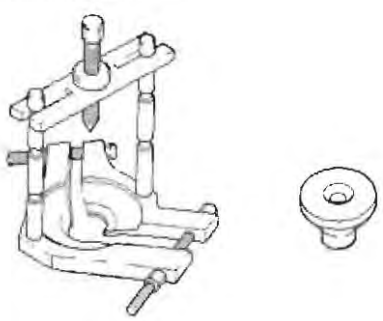
Driver: 57001-137

Circlip Pliers: 57001-144



Bearing Puller: 57001-158

Adapter: 57001-317

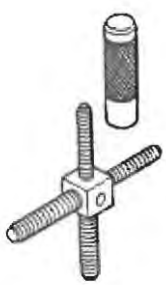


Magneto Puller: 57001-259

Bearing Driver Set: 57001-1129

Clutch Holder: 57001-1156

Rotor Puller: 57001-1216

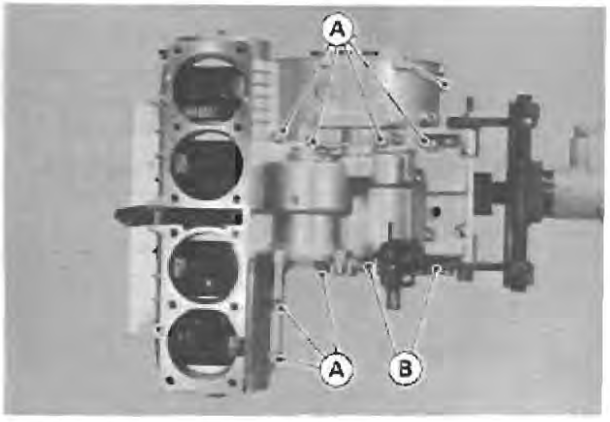


Crankcase Splitting

Crankcase Splitting

- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove the following parts from the engine.
  - External Shift Mechanism
  - Starter Motor
  - Alternator
  - Pickup Coils
  - Clutch Cover
  - Left Engine Cover
- Remove the following parts only if the crankshaft is to be removed.
  - Pistons
  - Flywheel
- Remove the following part only if the transmission drive shaft assembly is to be disassembled.
  - Clutch
- Remove the following part only if the transmission output shaft assembly is to be disassembled.
  - Damper Cam
- Remove the 6 mm upper crankcase-half bolts first, and then the 8 mm bolts.

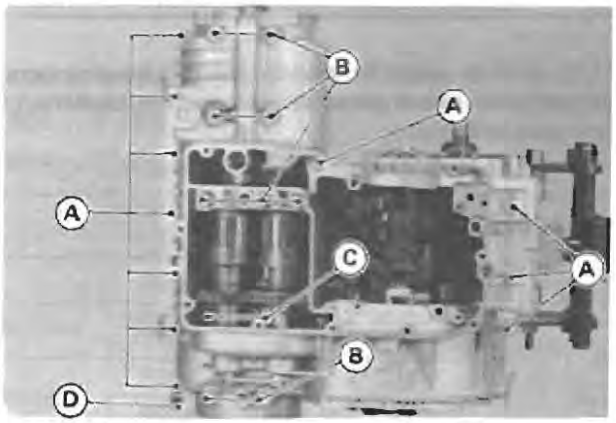
Crankcase Bolts



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 10 mm bolts. Be careful not to take out the crankshaft main bearing cap bolts.
- The clamp is installed with one of the 6 mm bolts.

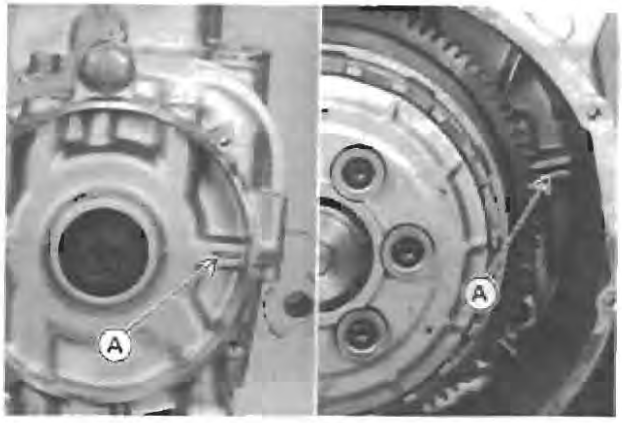
Crankcase Bolts



A. 6 mm Bolts
B. 10 mm Bolts
C. Removal is not necessary for crankcase split.
D. Clamp

- 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.

Crankcase Pry Points



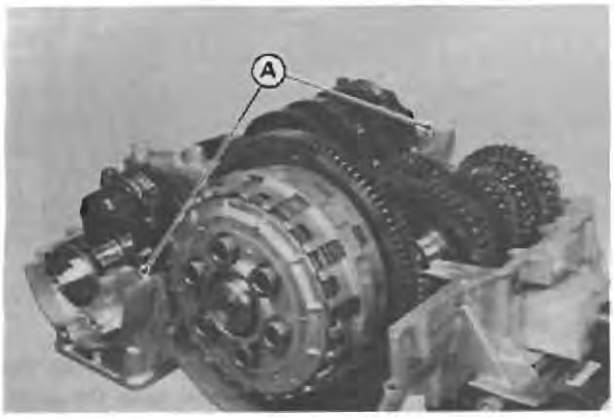
A. Pry Point

Crankcase Assembly Notes

NOTE

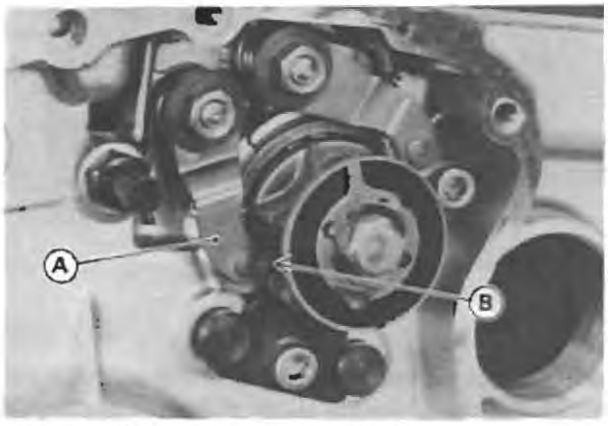
- *The upper crankcase half, the lower crankcase half, and the crankshaft main bearing cap are machined at the factory in the assembled state, so the crankcase halves and the main bearing cap must be replaced together as a set.*

•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.
○Check that the oil seals are in both ends of the crankshaft if the crankshaft have been removed. Be careful not to mix up the seals (see Crankshaft Installation).
•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 and the circumference of each seal.

CAUTION

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

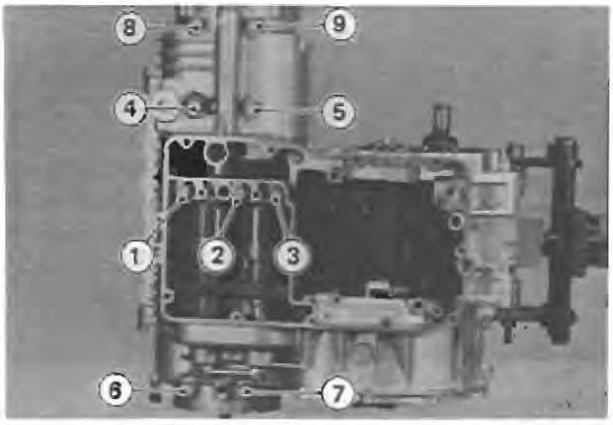
A. Do not apply a liquid gasket here.

•Apply a silicone sealant to the circumference of the oil seals at both ends of the crankshaft.
•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 balancers so that the mark on the rear balancer weight aligns with the center of the oil passage hole. At this time, the mark on the front balancer weight is a little closer to the rear side.

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 10 mm bolts (sequence numbered 1 through 3) have a flat washer.
○Following the sequence numbers on the lower crankcase half, torque the 10 mm bolts first to about one half of the specification (see Exploded View), and finally to the specification in the same sequence.

10 mm Bolt Tightening Sequence



Torque Value for 10 mm Bolts

First: 20 N-m (2.0 kg-m, 14.5 ft-lb)
Final: 39 N-m (4.0 kg-m, 29 ft-lb)
(when using new bolts)
First: 25 N-m (2.5 kg-m, 18.0 ft-lb)
Final: 49 N-m (5.0 kg-m, 36 ft-lb)

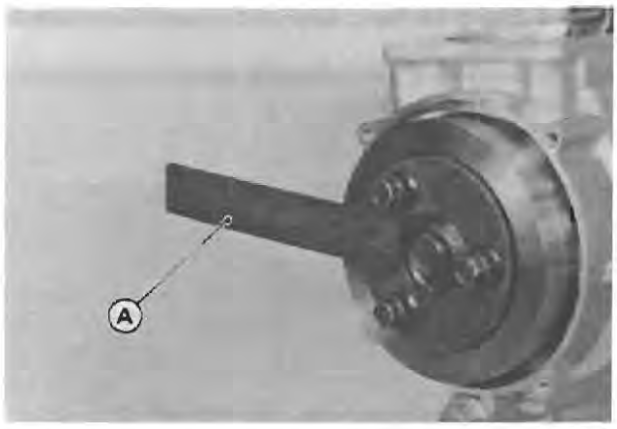
○Torque the 6 mm bolts to the specification (see Exploded View).
●After tightening all crankcase bolts, check the following items:
○Drive shaft and output shaft turn freely.
○While spinning the output shaft, gears shift smoothly from the 1st to 5th gear, and 5th to 1st.
○When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.

Crankshaft/Connecting Rods

Crankshaft, Connecting Rod Removal/Installation:

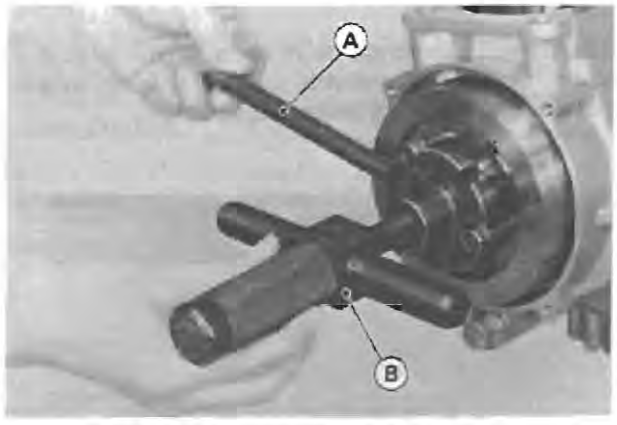
Flywheel Removal/Installation Notes

●Use the clutch holder (special tool) to loosen and tighten the crankshaft flywheel bolt.
○Prepare three 8 mm bolts (20 mm or more length, 1.25 mm pitch) and three or six 10 mm nuts (8 mm or more hight).
○Install the clutch holder using the 8 mm bolts. The 10 mm nuts are set to the both sides or inside of the holder as a collar.
●Tighten the 8 mm bolts securely.



A. Clutch Holder: 57001-1156

●Using the magneto puller (special tool) to hold the flywheel steady, remove the flywheel with the rotor puller (special tool).



A. Magneto Puller: 57001-259
B. Rotor Puller: 57001-1216

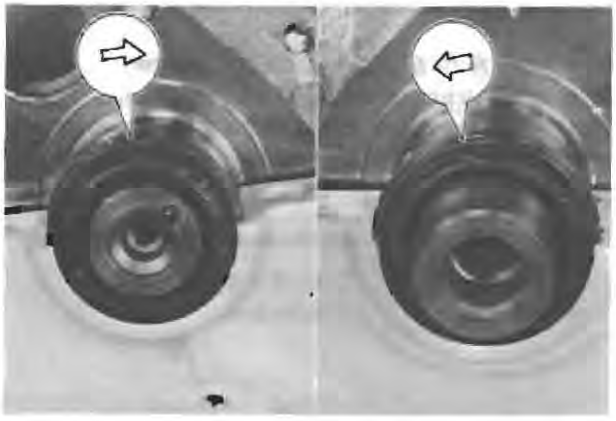
●When installing the flywheel, clean the inside of the flywheel hub and the end of the crankshaft thoroughly or the taper will not fit snugly.
●Tighten the flywheel bolt to the specified torque (see Exploded View).
○Replace the flywheel bolt with new one. This bolt is a special finishing bolt.

Crankshaft Removal

●Remove the engine.
●Remove the pistons.
●Split the crankcase.
●Remove the alternator shaft and starter clutch.
●Remove the main bearing cap bolts with flat washers, and take off the cap.
●Lift up the crankshaft with the camshaft chain and alternator shaft chain. There is the oil seal on both ends of the crankshaft.

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.
- Apply a high temperature grease to the lips of the right side oil seal (timing rotor side), and fit the oil seals onto both ends of the crankshaft with the arrow mark on the seal facing out. The arrow mark should show the same direction of the crankshaft rotation (clockwise, watching from the ignition timing rotor side).



- Apply a silicone sealant to the circumference of the oil seals.
- 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.

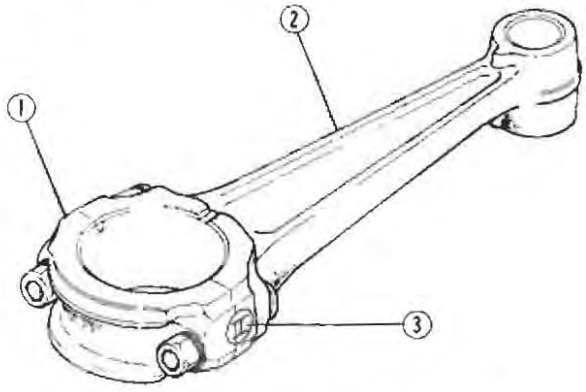
CAUTION

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

- Before installing the connecting rods, blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.
- 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.
- Tighten the cap nuts to the specified torque (see Exploded View).

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.

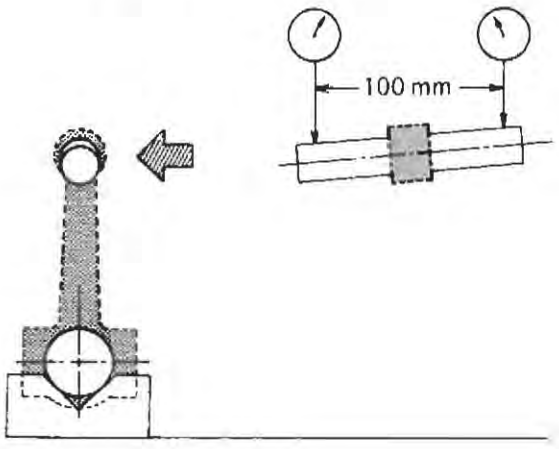
Connecting Rod Bend/Twist

•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

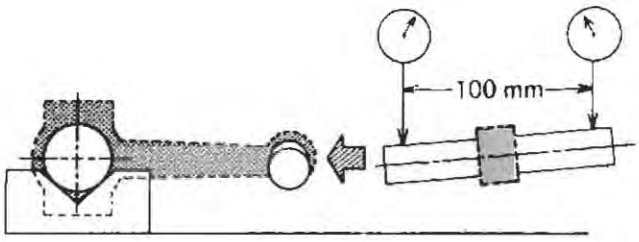


•Measure connecting rod twist.
○With the big-end arbor still on V block, hold the connecting rod horizontally and measure the amount that the arbor varies form being parallel with the surface plate over a 100 mm length of the arbor to determine the amount of connecting rod twist.
★If connecting rod twist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

Connecting Rod Twist

Service Limit:	**0.2/100 mm**

Connecting Rod Twist Measurement

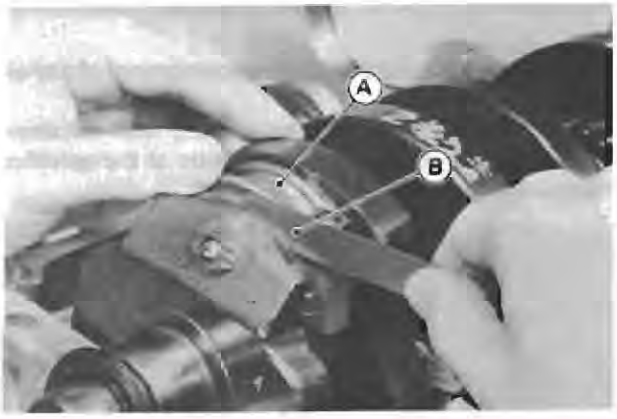


Connecting Rod Big End Side Clearance

•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 – 0.38 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:	**0.040 – 0.064 mm**
Service Limit:	**0.10 mm**

★If clearance is within the standard, no bearing replacement is required.
★If clearance is between 0.064 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:	**37.984 – 38.000 mm**
Service Limit:	**37.97 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:	**37.984 – 37.992 mm**
○ :	**37.993 – 38.000 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.

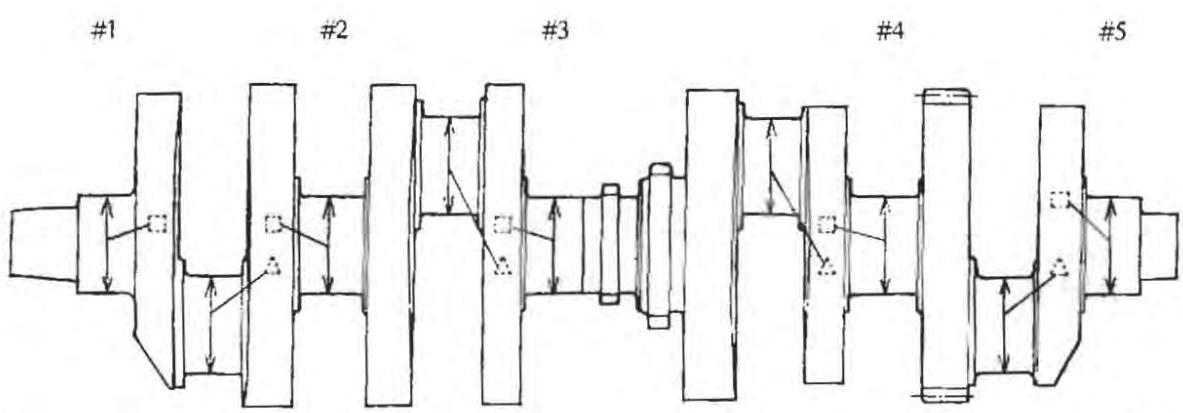
NOTE

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

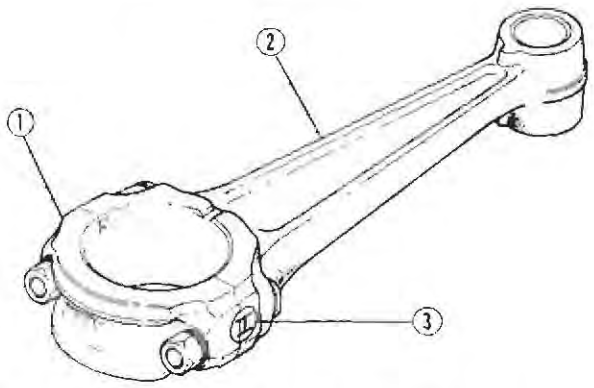
Connecting Rod Big End Inside Diameter Marks

None:	**41.000 – 41.008 mm**
○ :	**41.009 – 41.016 mm**

Crankshaft Mark Location



Connecting Rod Mark Location



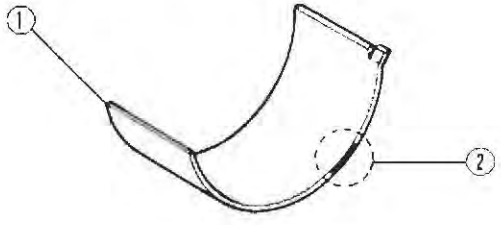
1. Big End Cap
2. Connecting Rod
3. Diameter Mark
   ○mark or no mark, around weight mark alphabet

●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/crankpin clearance with plastigage.

Bearing Insert Selection

Con-rod Big End Bore Diameter Mark	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
○	○	Black	92028-1395
None	None		
○	None	Blue	92028-1394
None	○	Brown	92028-1396

Bearing Insert Size Mark Location



1. Bearing Insert
2. Color Size Mark

Crankshaft Runout

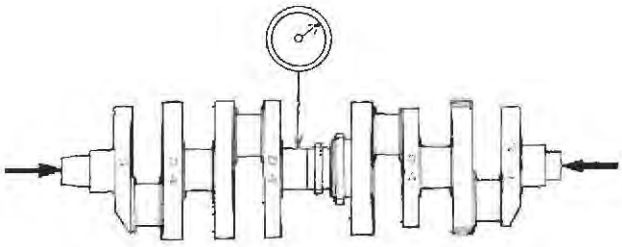
●Measure the crankshaft runout.
○Set the crankshaft in a flywheel alignment jig or on V blocks.
○Set a dial gauge against the center journal.
○Turn the crankshaft slowly to measure the runout. The difference between the highest and lowest dial gauge readings (TIR) is the amount of runout.

★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:	**0.022 – 0.046 mm**
Service Limit:	**0.08 mm**

*If clearance is within the standard, no bearing replacement is required.
*If clearance is between 0.046 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:	**37.984 – 38.000 mm**
Service Limit:	**37.96 mm**

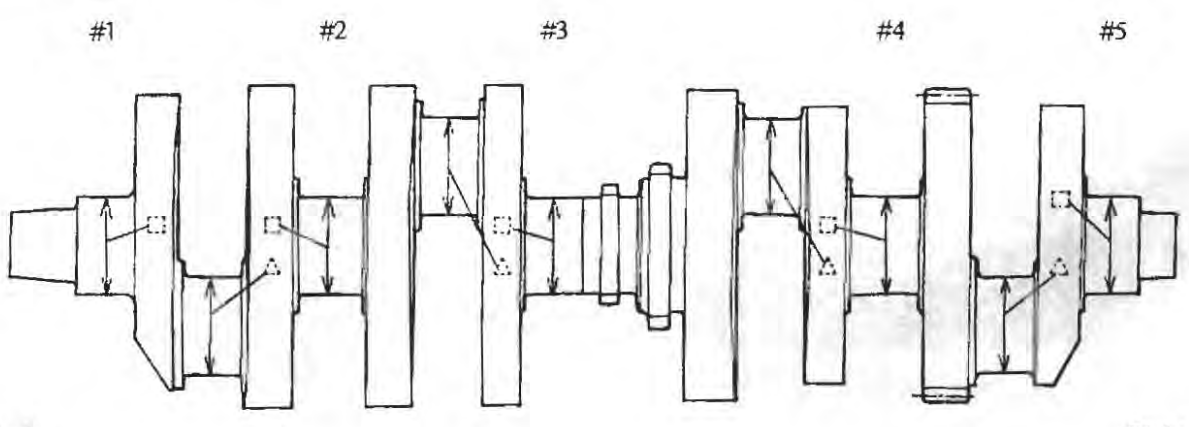
*If any journal has worn past the service limit, replace the crankshaft with a new one.
*If the measured journal diameter are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, write new marks on it.

Crankshaft Main Journal Diameter Marks

None:	**37.984 – 37.992 mm**
1 :	**37.993 – 38.000 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.

Crankshaft Mark Location



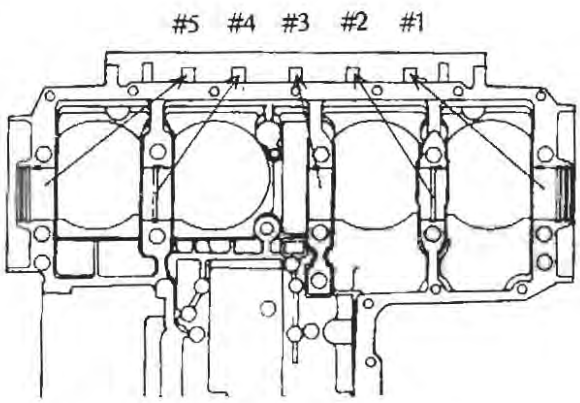
NOTE

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

Crankcase Main Bearing Bore Diameter Marks

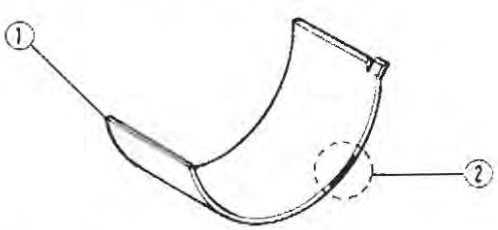
○ :	**41.000 – 41.008 mm**
None:	**41.009 – 41.016 mm**

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

Bearing Insert Selection

Crankcase Main Bearing Bore Diameter Mark	Crankshaft Main Journal Diameter Mark	Bearing Insert*		
		Size Color	Part Number	Journal Nos.
○	1	Brown	92028-1460	2, 4
			92028-1457	1,3,5
None	None	Blue	92028-1458	2,4
			92028-1455	1,3,5
○	None	Black	92028-1459	2,4
None	1		92028-1456	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 and the crank web at the No.2 journal to determine clearance.

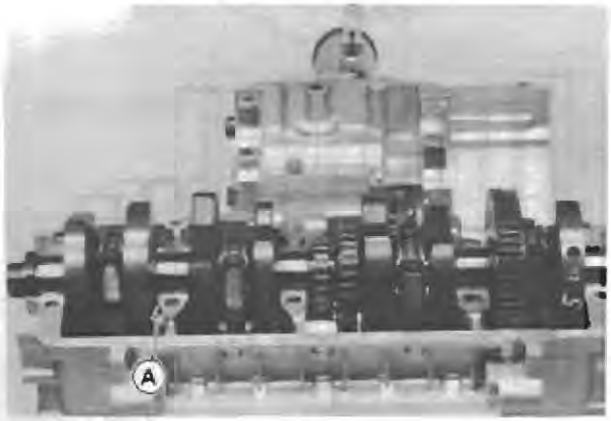
*If the clearance exceeds the service limit, replace the crankcase halves and main bearing cap as a set.

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. Measure here.

Balancers

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 pins.

•Pull the balancer shafts with the oil seals toward the right out of the crankcase. At the same time, the balancer weight and gear assemblies come off.

Balancer Installation Notes

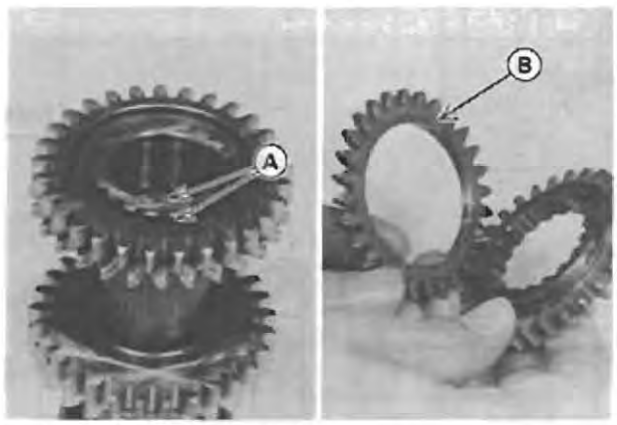
•When coupling the balancer weight and the damper housing, observe the following.

○Check that the damper rubbers are in place.

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

A. Weight Center B. Mark

•If the balancer gears were removed, install the balancer gears onto the damper housing with the punch mark on the main gear aligning with the mark on the end of the damper housing. The oil grooved side of the sub gear must be faced to the main gear.



A. Align marks. B. Oil Groove

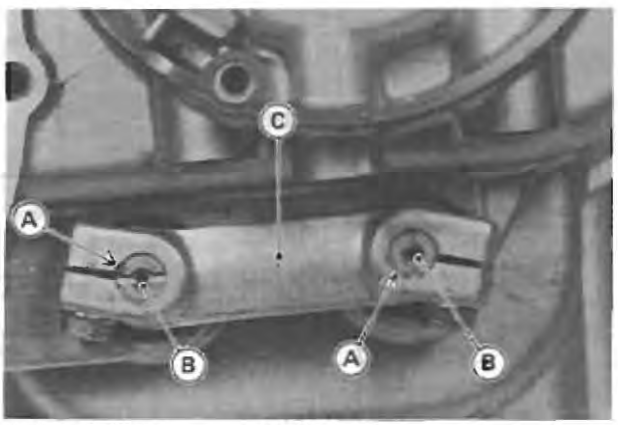
•Fit the copper washers on both sides of the weight and gear assembly. The projected side faces toward the assembly.

A. Projected Side

•Mesh the front and rear balancer gears aligning the punch marks on the gears.

A. Align marks.

•Turn the balancer shafts until the punch mark on the end of each shaft points to the correct side. The mark on the front shaft points to the rear. And then, install the clamp lever on the shafts and tighten the clamp bolts temporarily.



A. Punch Mark C. Clamp Lever
B. Balancer Shaft

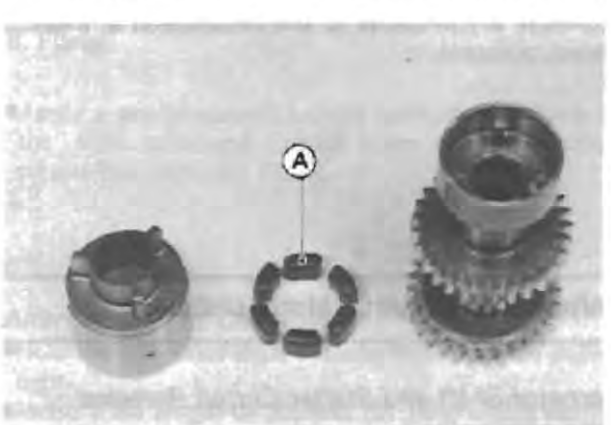
•Adjust the balancer gear backlash during the preparation of the motorcycle. The amount of backlash can be changed by turning the balancer shafts.
○Start the engine and let it at idle.
○Loosen the balancer shaft clamp bolts.
○Turn the front balancer shaft clockwise until the balancer gear makes a noise.
○Turn back the shaft counterclockwise until just the gear spots making a noise.
○Adjust the rear balancer shaft in the same manner.
○Tighten the balancer shaft clamp bolts securely.

Balancer Gear Inspection

•Visually inspect the balancer gears for chipping, abrasion, color change, or other damage.
★If they appear damaged or deteriorated, replace them.

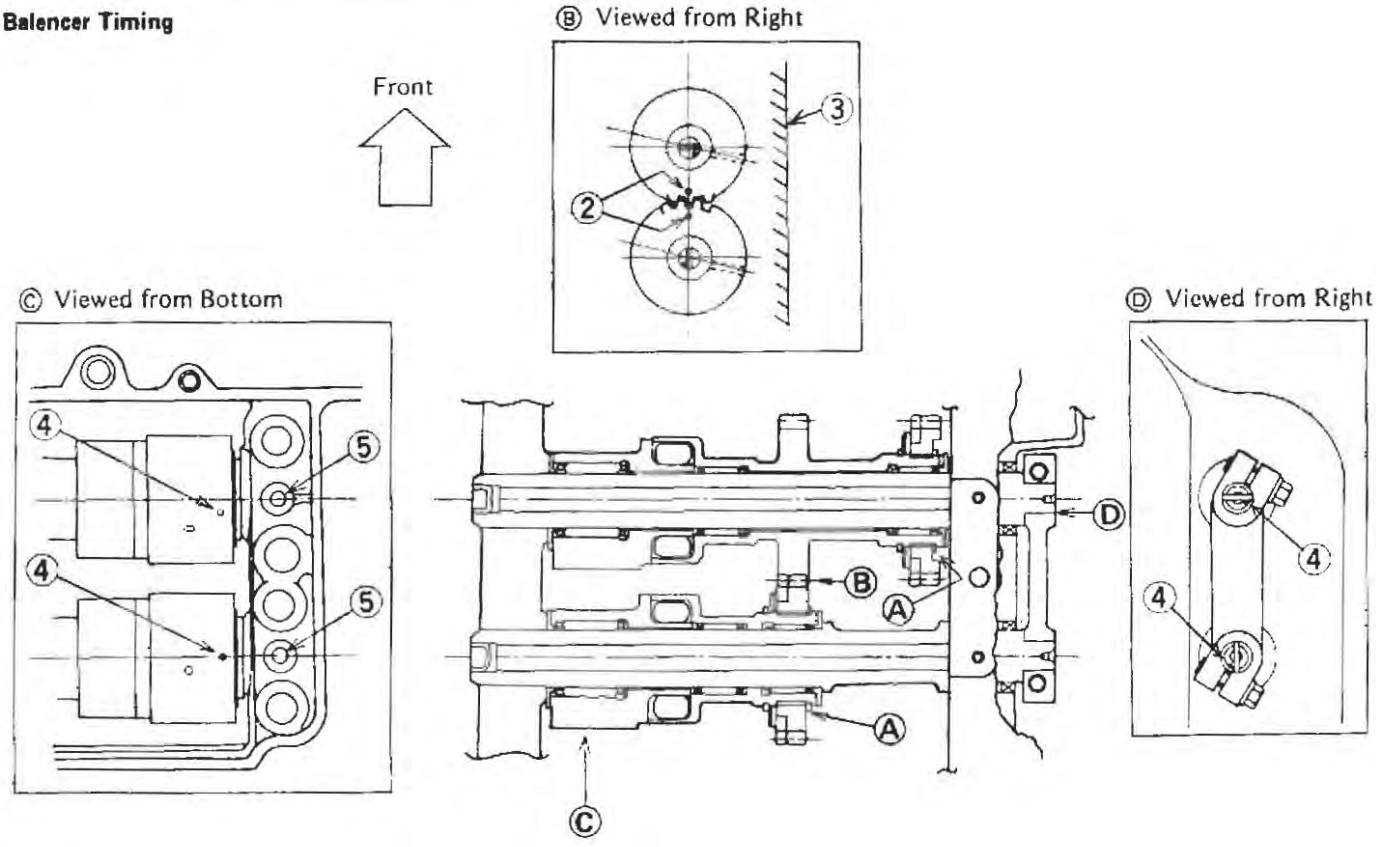
Damper Inspection

•Visually inspect the rubber dampers.
★If they appear damaged or deteriorated, replace them.



A. Rubber Dampers

Balancer Timing



1. Balancer Gear
2. Align the punch marks.
3. Lower Crankcase Bottom Edge
4. Punch Mark
5. Oil Passage Hole

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

Alternator Shaft and Starter Clutch Removal

●Remove the engine.

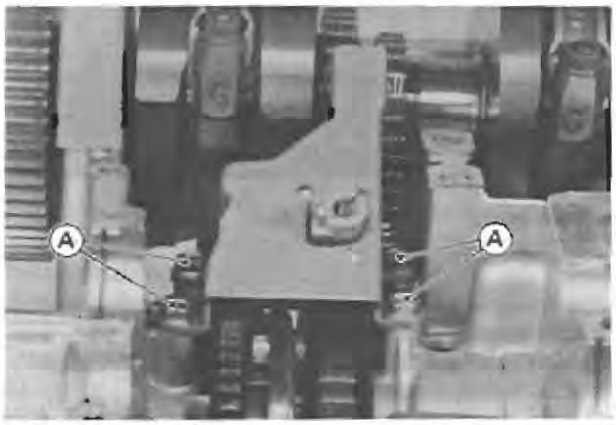
●Split the crankcase.

●Remove the transmission output and drive shaft assemblies.

●Keeping the crankshaft from turning, remove the coupling bolt at the alternator shaft left end.

A. Coupling Bolt

- Pull the coupling from the shaft with the damper rubbers and flat washer.
- Remove the bearing holder bolts and take off the holder.
- Holding the chain tensioner bracket, remove the tensioner bracket bolts and take off the tensioner assembly.



A. Tensioner Bracket Bolts

- Remove the oil pipe by taking out the banjo bolt.

A. Oil Pipe

- Holding the starter motor clutch, pull the alternator shaft with the ball bearing. And then, free the starter motor clutch from the chain.

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. Apply a non-permanent locking agent to the threads of the idle gear shaft holder bolt.
- If the alternator shaft right end ball bearing was removed, install it so that the shield side of it faces in and press it until it stops by the bearing driver set (special tool: P/N 57001-1129).
- Apply a non-permanent locking agent to the threads of the alternator shaft bearing holder bolts.
- Lock the chain tensioner inserting a thin wire into the hole on the tensioner push rod, and install the tensioner assembly.

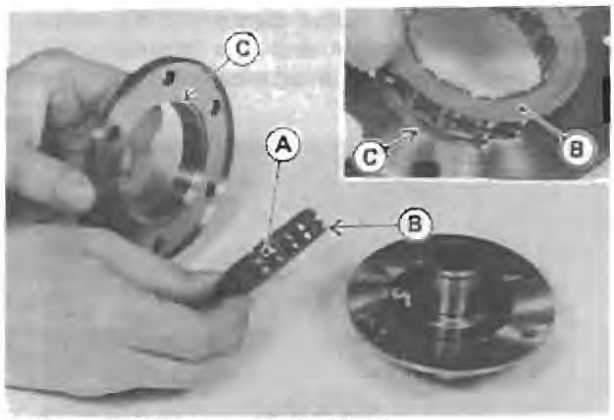
A. Insert a wire into the hole.

Starter Clutch Disassembly

- Remove the circlip and flat washer.
- Pull the starter clutch gear and take off the needle bearing and flat washer.
- Holding the starter clutch assembly with a vise, remove the Allen bolts and take off the one-way clutch.

Starter Clutch Assembly Notes

- Be sure to install the one-way clutch so that the flange of it fits on the holder dent.



A. One-way Clutch
B. Flange
C. Holder Dent

- Apply a non-permanent locking agent to the threads of the Allen bolts and tighten them to the specified torque (see Exploded View).

Alternator Shaft Chain Wear

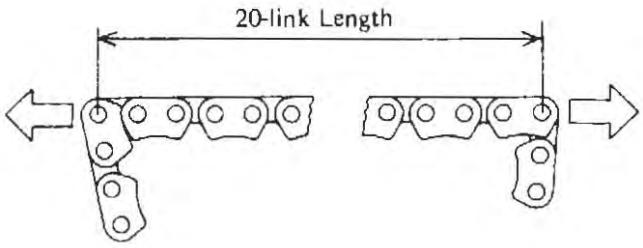
- Hold the alternator shaft chain so that it may be pulled tight.
- Measure the length of 20 links (21 pins) with a vernier caliper.

★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:	**161.2 mm**

Chain 20-Links Length Measurement

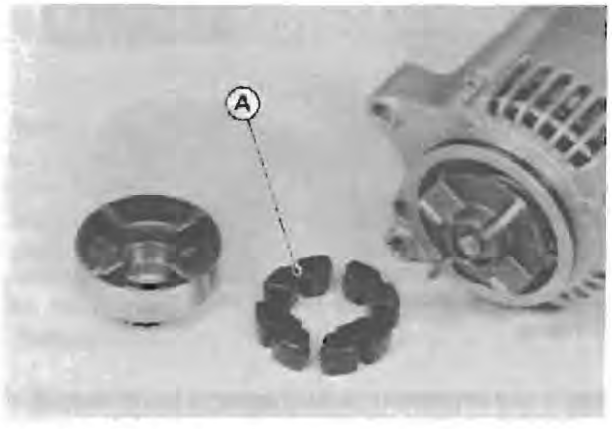


Chain Guide Wear

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

Damper Inspection

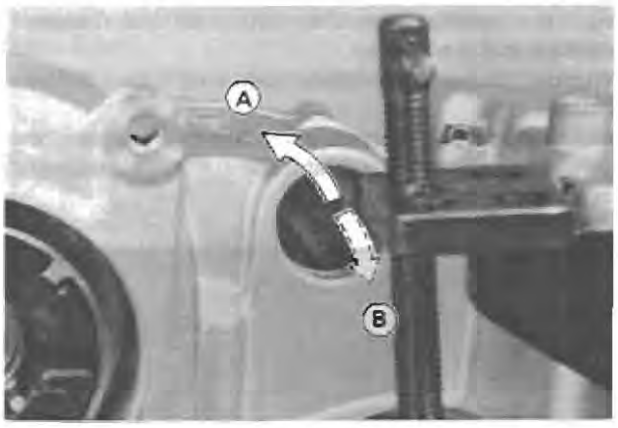
●Visually inspect the rubber dampers of the coupling between the alternator and the alternator shaft.
★If they appear damaged or deteriorated, replace them.



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.

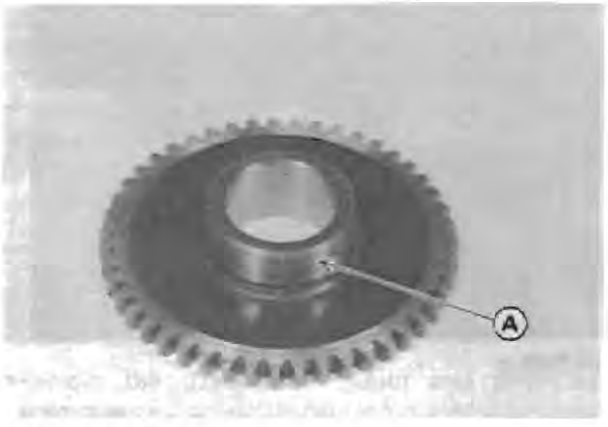


A. Turn freely. B. Locked.

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

NOTE

○*Examine the starter clutch gear as well. Replace it if it is worn or damaged.*



A. Inspect surface.

Ball and Needle Bearing Wear

●Check the ball bearings: alternator shaft LH and RH.
○Since the ball bearing is made 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 bearing: 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.

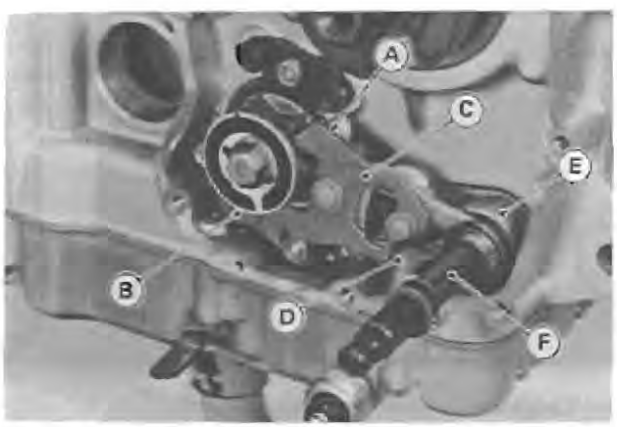
A. Neutral Positioning Lever
B. Gear Positioning Lever

Transmission

Transmission External Shift Mechanism:

External Shift Mechanism Removal

●Remove the front bevel gear case.
●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

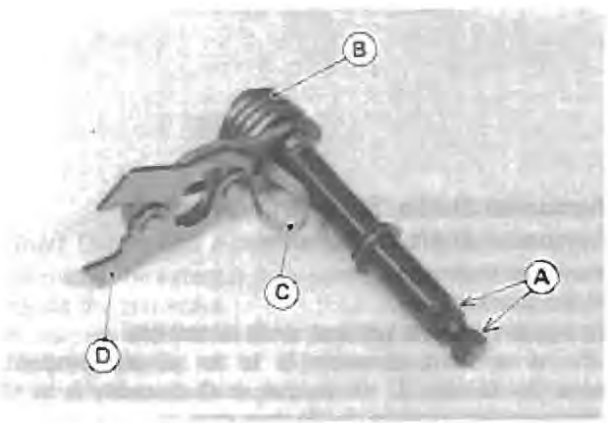
●Remove the nuts and take off the neutral positioning lever and gear positioning lever. Each lever has the collar, spring, and washer.

External Shift Mechanism Installation Notes

●The neutral positioning lever spring is painted red.
●The projected side of the collar must face toward the lever.

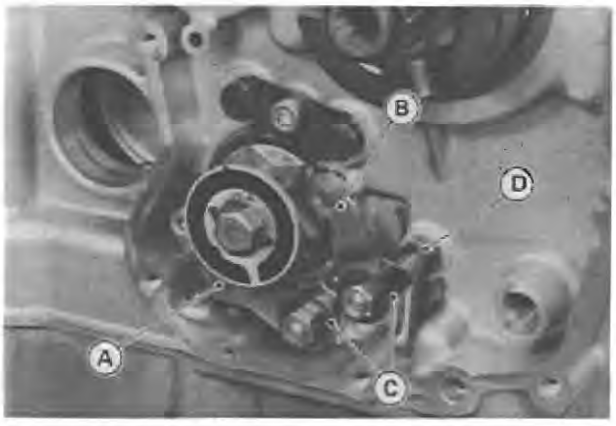
External Shift Mechanism Inspection

●Examine the shift shaft for any damage.

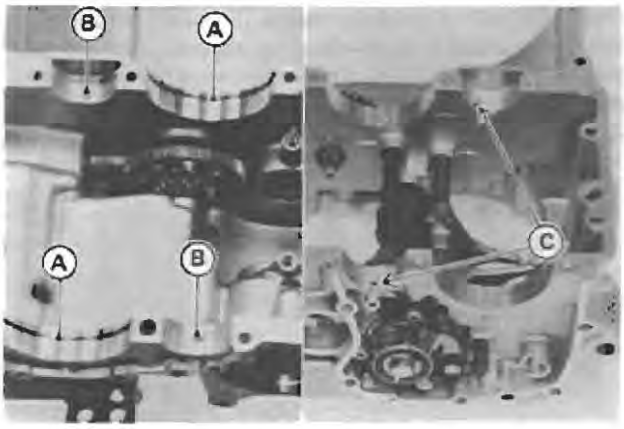


A. Splines
B. Return Spring
C. Arm Spring
D. Arm

○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.
●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



A. Set Ring C. Oil Passage Holes
B. Set 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.

- 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 and right sides)

Transmission Shafts, Shift Drum, Forks:

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. If the output shaft assembly is to be disassembled, remove the damper cam.

Transmission Shaft Installation Notes

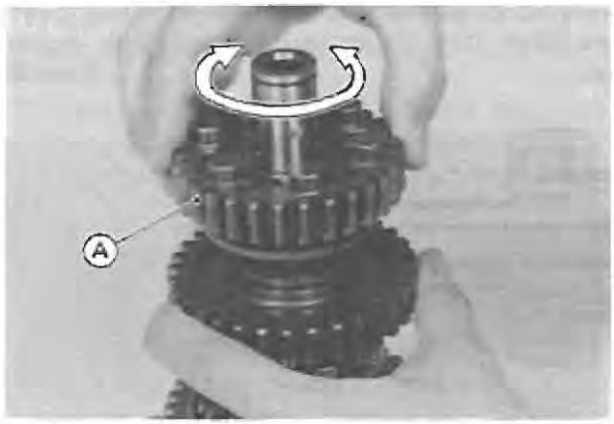
- With a high flash-point solvent, clean off the outer circumferences of the transmission ball bearings and needle bearings, and their bearing housings, and wipe dry.
- Check to see that the set rings and set pins are in place in the transmission bearing housings, and blow the oil passages in the bearing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

NOTE

○*If the standard set rings (P/N: 14013-1054) cannot be put into the crankcase and ball bearing grooves, use the thin set rings (P/N: 14013-1055) instead of the standard set rings.*

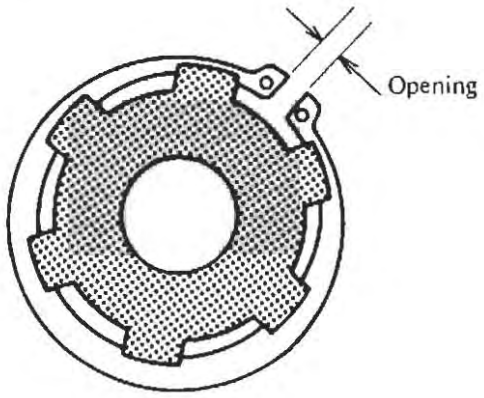
Transmission Shaft Disassembly

- Remove the transmission shafts.
- Using the circlip pliers (special tool: P/N 57001-144) to remove the circlips, disassemble the transmission shafts.
- The 4th 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 this gear in a vertical position while holding the 3rd gear, and pull off the gear upwards.
- The ball bearings are press-fit on the transmission shafts. To remove the bearings, use the bearing puller and adapter (special tools: 57001-158 and 57001-317).



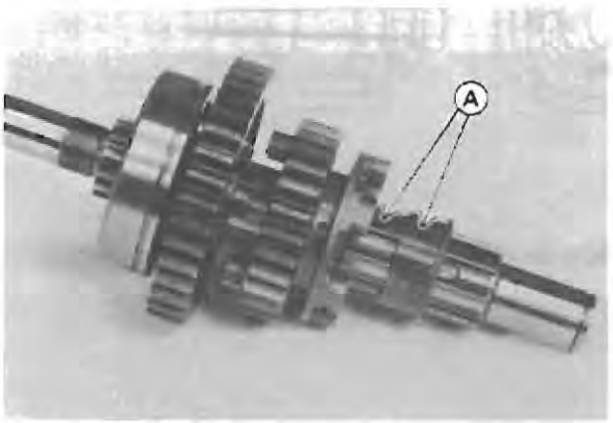
A. 4th Gear

Circlip Installation



Transmission Shaft Assembly Notes

- When installing the 4th 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 5th gear bushing and output shaft 3rd gear bushing to the shaft, align their oil holes with the holes in the shaft.



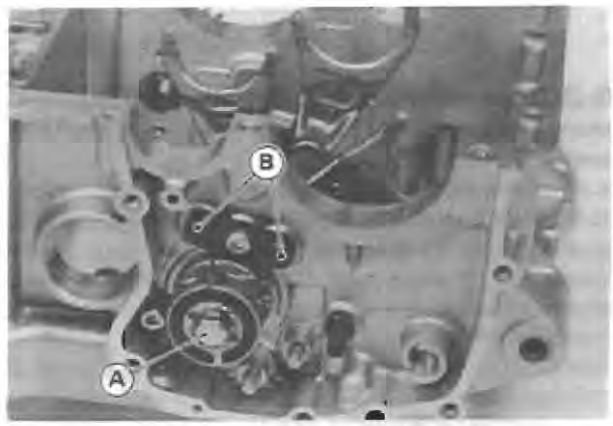
A. Align oil holes.

- Replace any circlip that were removed with new ones.
- Always install circlips so that the opening is aligned with a spline groove.
- The transmission gears can be identified by size;
  Drive shaft gears – the smallest diameter gear is 1st gear, and the largest is 5th.
  Output shaft gears – the largest diameter gear is 1st gear, and the smallest is 5th.

- Using the driver (special tool: 57001-137), install the ball bearings. 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 damper cam.

Shift Drum and Fork Removal

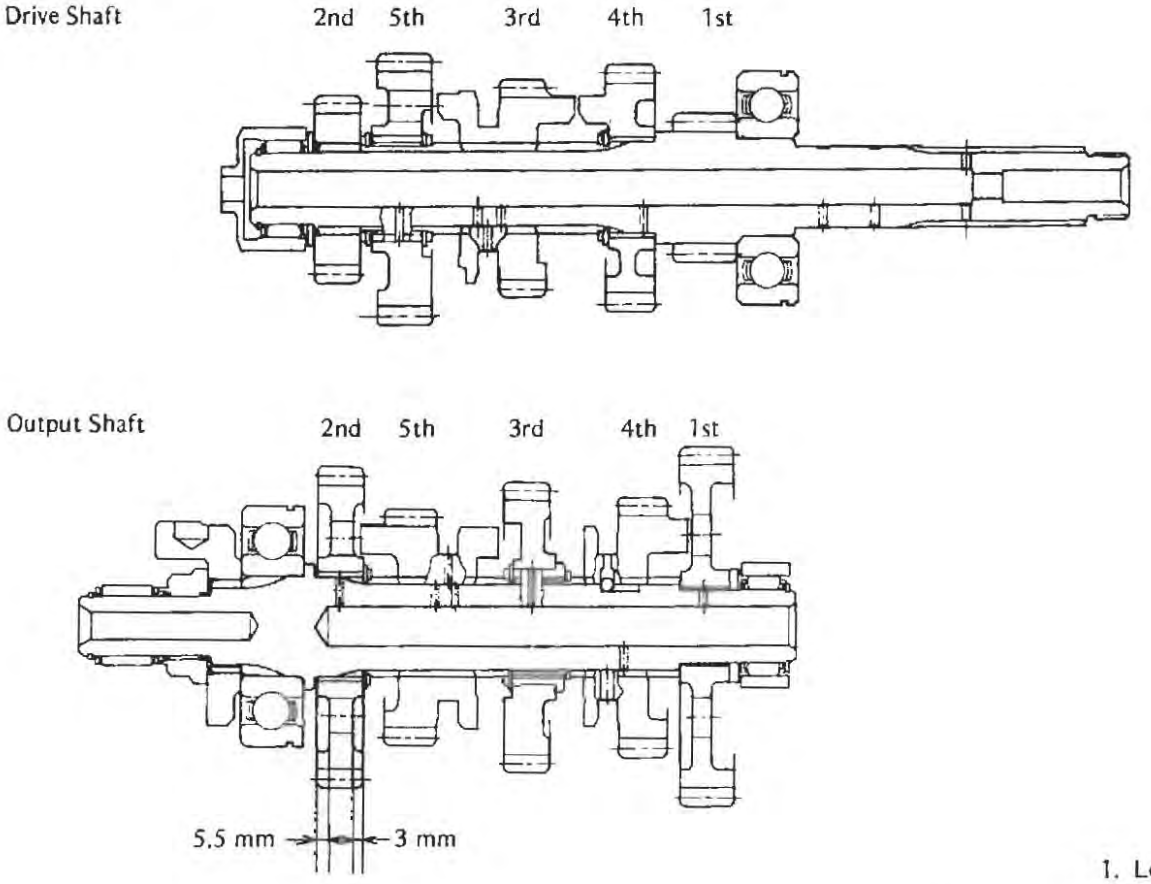
- Remove the external shift mechanism.
- Split the crankcase.
- Unscrew the Allen bolts holding the shift drum ball bearing holders.

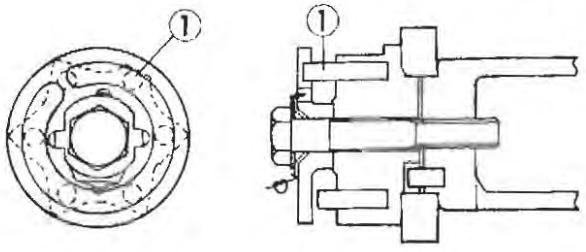


A. Shift Drum B. Shift Rods

- Pull out the shift rods, and take off the shift forks.
- Pull out the shift drum.

Transmission Gears



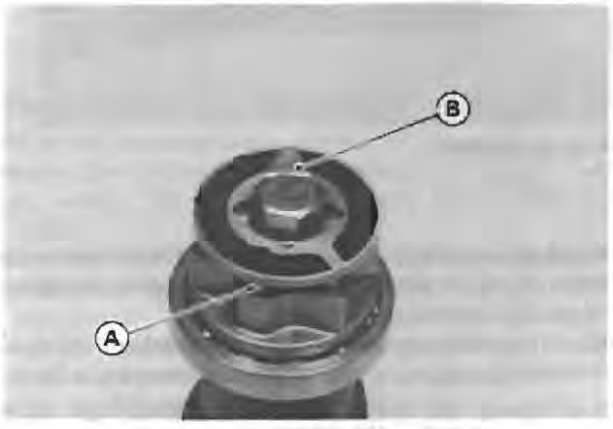


1. Long Pin

Shift Drum and Fork Installation Notes

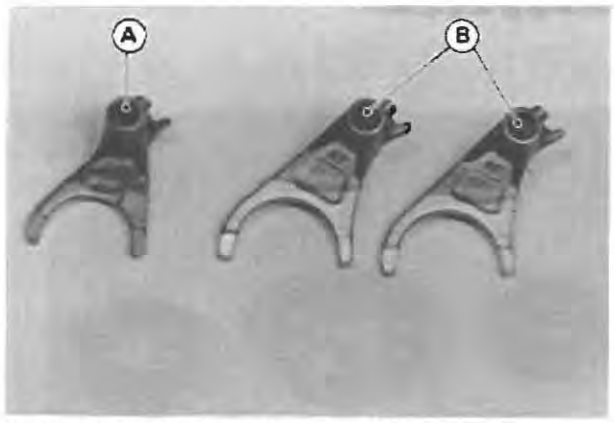
- If the shift drum pin plate was removed, install it as following.
- One of the six pins is longer than the others. The long shift drum pin must be installed in the correct position, and must be fit into the recess in the back of the pin plate. If these parts are assembled in the wrong position, the neutral indicator light will not light when the gears are in neutral.
- Install the overdrive switch contact with the tooth of the contact fitting into the hole of the shift drum pin plate. Be careful not to bend the contact. If the contact is installed in the wrong position or is bent, the overdrive indicator light will not light when the gears are in overdrive.
- Apply a non-permanent locking agent to the threads of the pin plate bolt and tighten it to the specified torque (see Exploded View).

Shift Drum Pin Plate and Overdrive Contact



A. Long Pin B. Overdrive Switch Contact

•The fingers of the drive shaft shift fork are shorter than output shaft fork's. The output shaft forks are identical.



A. Drive Shaft Fork B. Output Shaft Forks

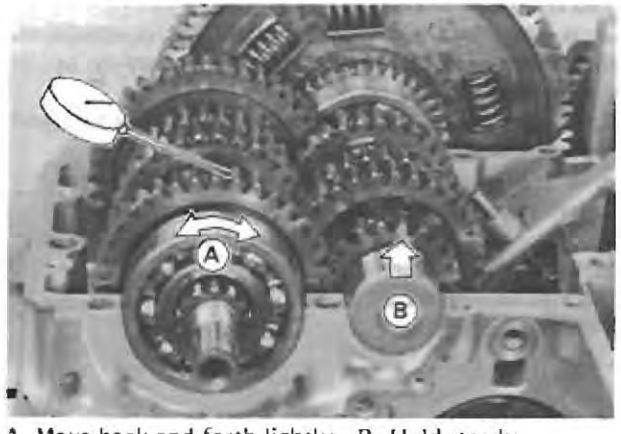
•Apply a non-permanent locking agent to the threads of the shift drum bearing holder Allen bolts.

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

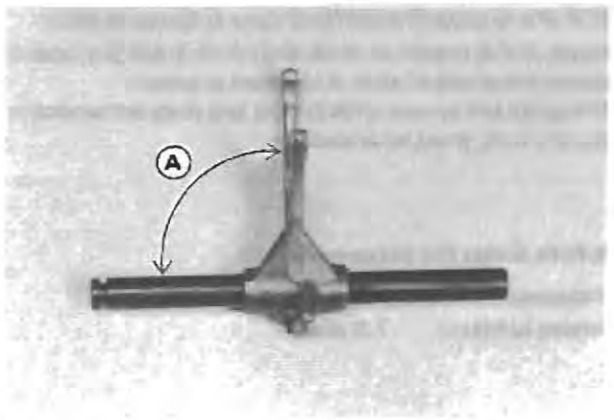
Standard:	**0.02 – 0.19 mm**
Service Limit:	**0.25 mm**



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.

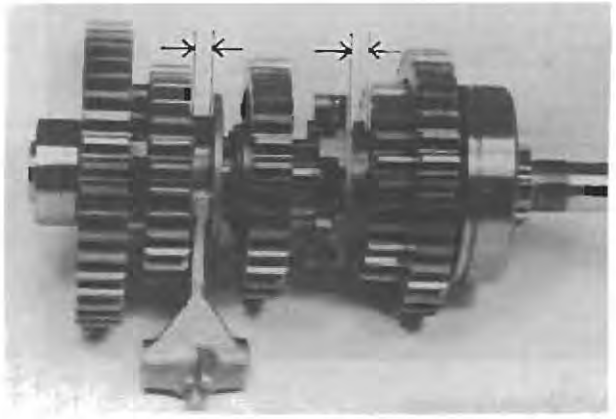
Shift Fork Ear Thickness

Standard:	**5.9 – 6.0 mm**
Service Limit:	**5.8 mm**

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

Gear Shift Fork Groove Width

Standard:	**6.05 – 6.15 mm**
Service Limit:	**6.3 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.

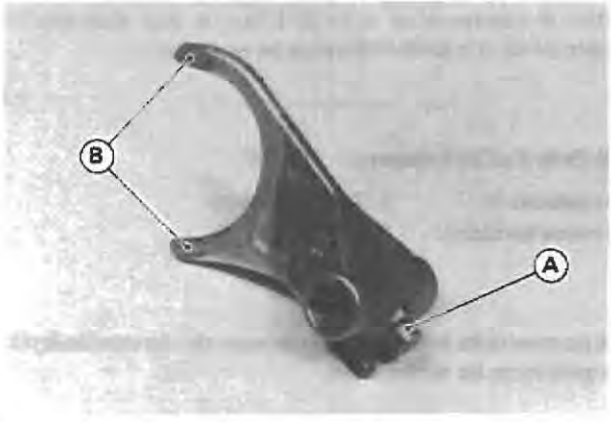
Shift Fork Guide Pin Diameter

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

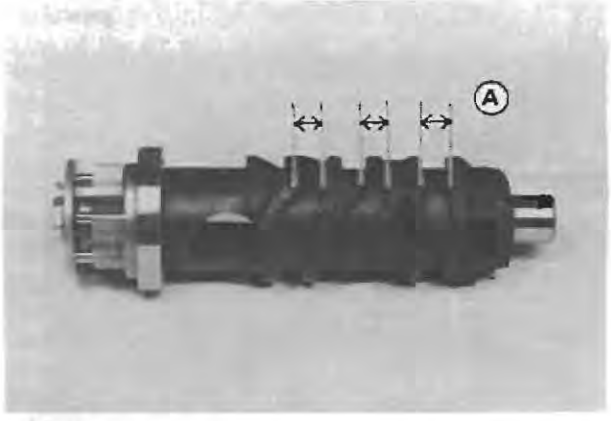
★If any shift drum groove is worn over the service limit, the drum must be replaced.

Shift Drum Groove Width

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



A. Shift Fork Guide Pin B. Shift Fork Ears

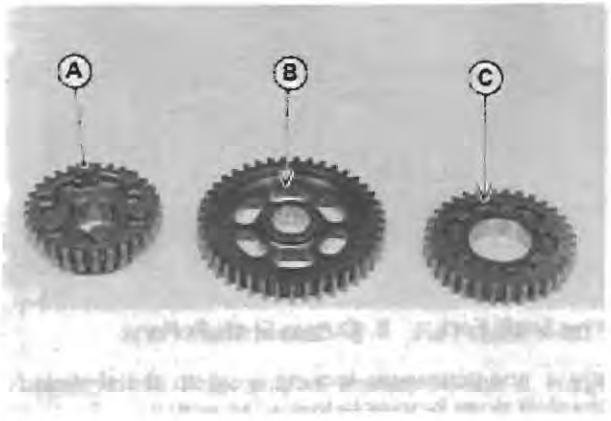


A. Shift Drum Grooves

Gear Dog, Dog Hole, and Recess Damage

•Visually inspect the gear dogs, and gear dog holes, and recesses.

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



A. Dog C. Recess
B. Dog Hole

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, and LH.

○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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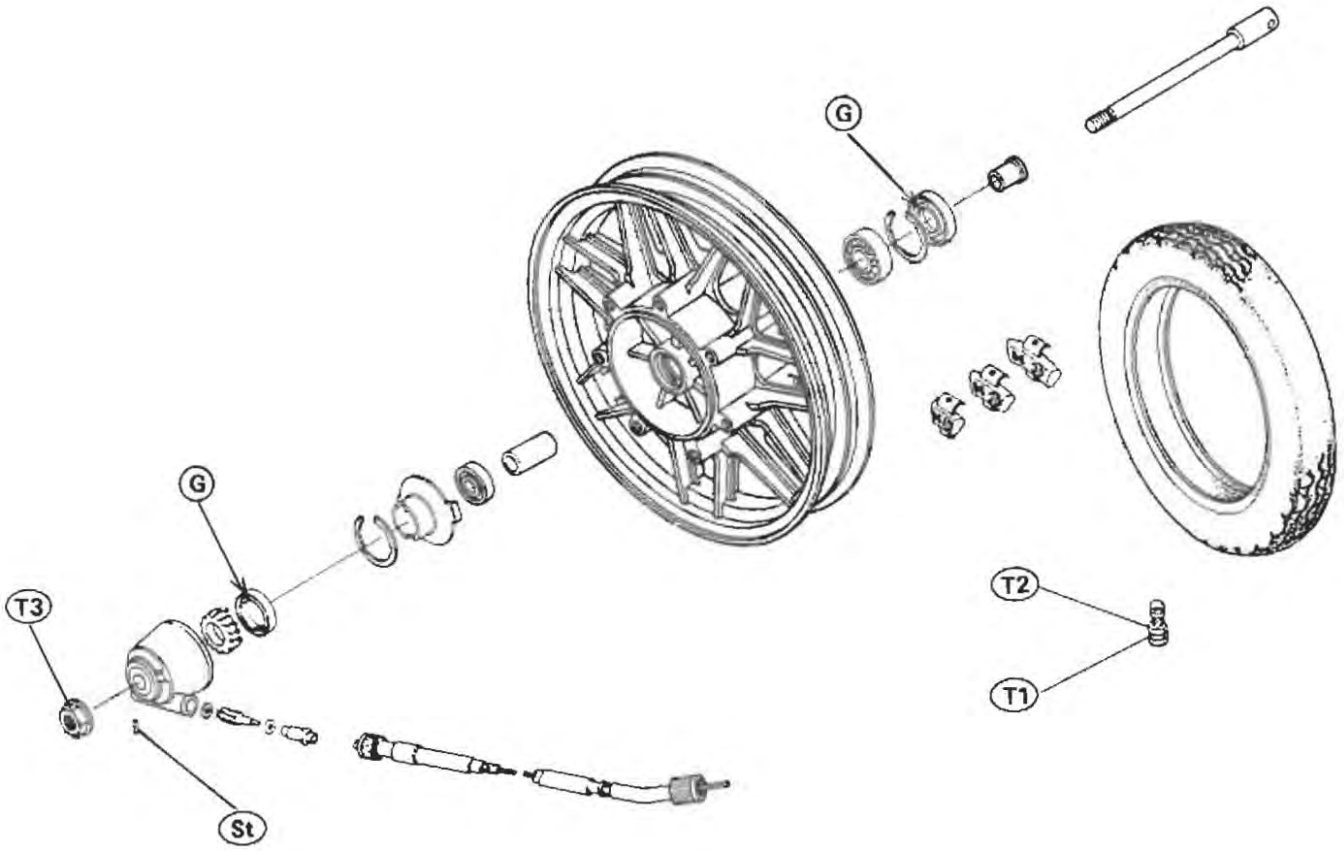
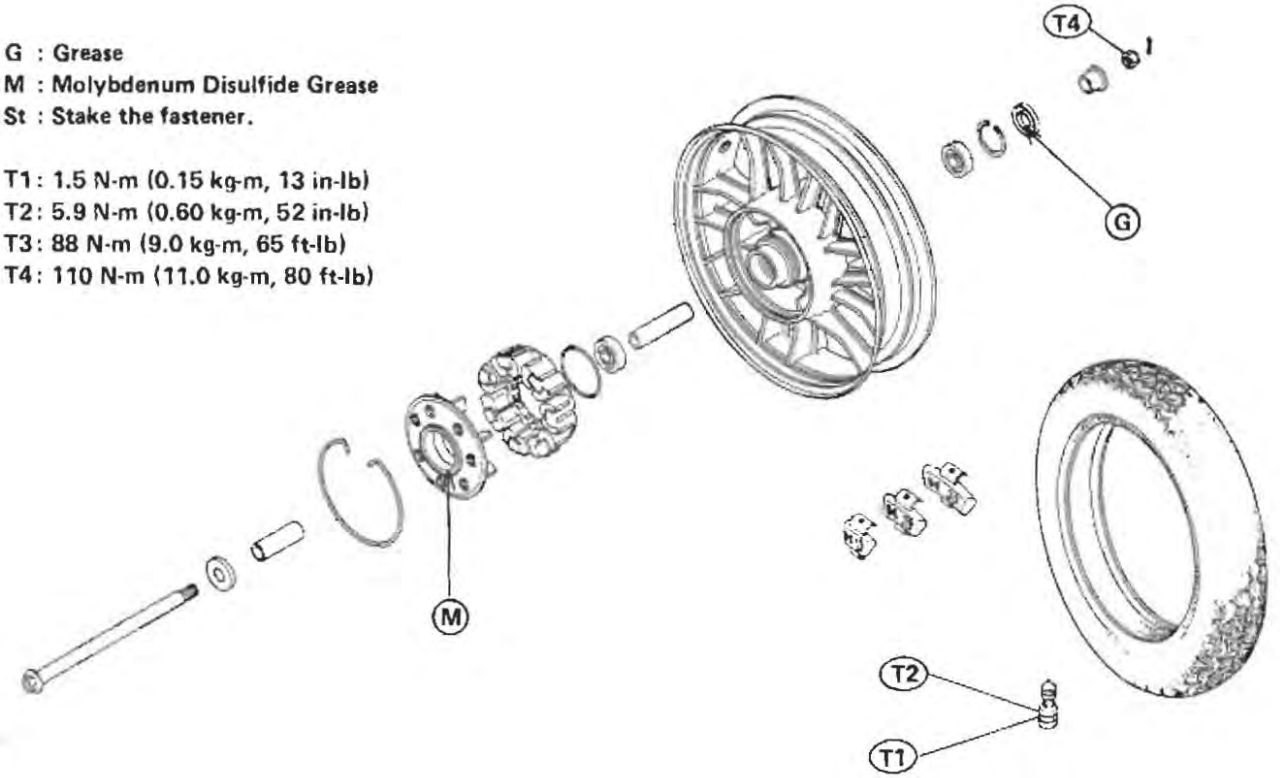
Exploded View



G : Grease
M : Molybdenum Disulfide Grease
St : Stake the fastener.

T1: 1.5 N-m (0.15 kg-m, 13 in-lb)
T2: 5.9 N-m (0.60 kg-m, 52 in-lb)
T3: 88 N-m (9.0 kg-m, 65 ft-lb)
T4: 110 N-m (11.0 kg-m, 80 ft-lb)



Specifications

Item		Standard	Service Limit
Wheels:			
Rim Runout:	Axial	– – –	0.5 mm
	Radial	– – –	0.8 mm
Axle Runout/100 mm		– – –	0.2 mm 0.7 mm : Repair Limit
Wheel Balance		Less than 10 g	– – –
Balance Weights		10 g, 20 g, 30 g	– – –
Tires:			
Tire Tread Depth:	Front	4.5 mm	1 mm
	Rear	7.3 mm	2 mm : Under 130 km/h 3 mm : Over 130 km/h
Standard Tire:	Front	130/90-16 67H DUNLOP F21 Tubeless	– – –
	Rear	150/90-15 74H DUNLOP K425A Tubeless	– – –

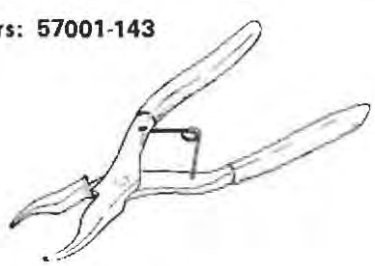
Tire Air Pressure:

Front	225 kPa (2.25 kg/cm^2, 32 psi)	
Rear	Up to 120 kg (265 lb) Load	225 kPa (2.25 kg/cm^2, 32 psi)
	120 – 203 kg (265 – 448 lb) Load	280 kPa (2.8 kg/cm^2, 40 psi)

Special Tools

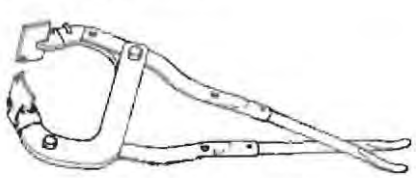
Along with common hand tools, the following more specialized tools are required for complete wheels/tires servicing.

Circlip Pliers: 57001-143



Rim Protector: 57001-1063

Bead Breaker: 57001-1072

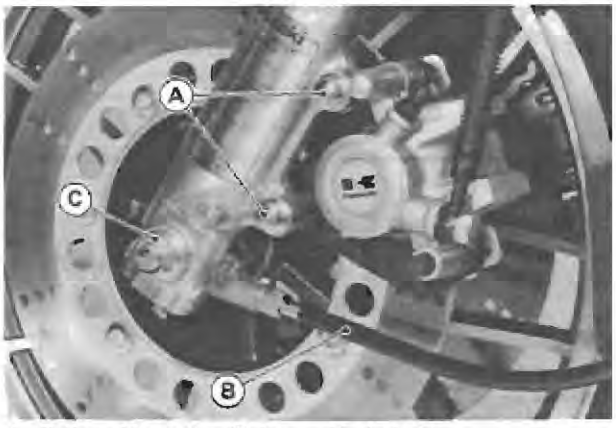


Bearing Driver Set: 57001-1129

Wheels

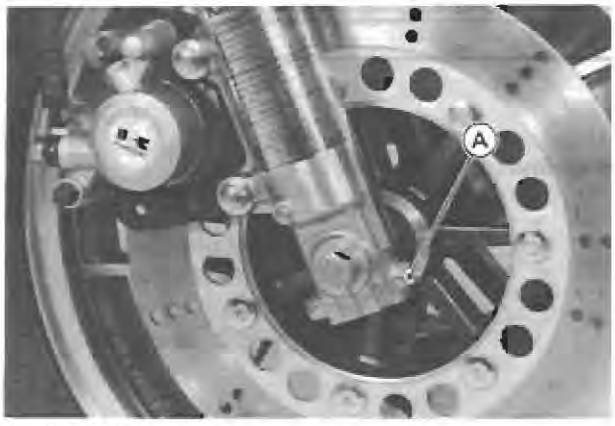
Front Wheel Removal

- Disconnect the speedometer cable lower end.
- Remove the both mounting bolts for one of the brake calipers. Support the caliper so that it does not hang by its brake hose.



A. Caliper Mounting Bolts C. Axle Nut
B. Speedometer Cable

- Remove the axle nut.
- Loosen the axle clamp bolt.



A. Axle Clamp Bolt

- Use a jack under the engine or other suitable means to lift the front of the motorcycle.
- Pull out the axle and drop the front wheel out of the forks.

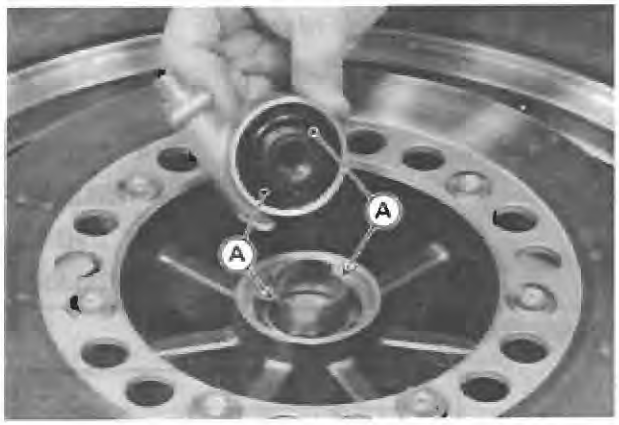
CAUTION

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

- Insert a wood wedge (4 – 5 mm thick) between the disc brake pads. This prevents the pads from being moved out of their proper position, should the brake lever be squeezed accidentally.

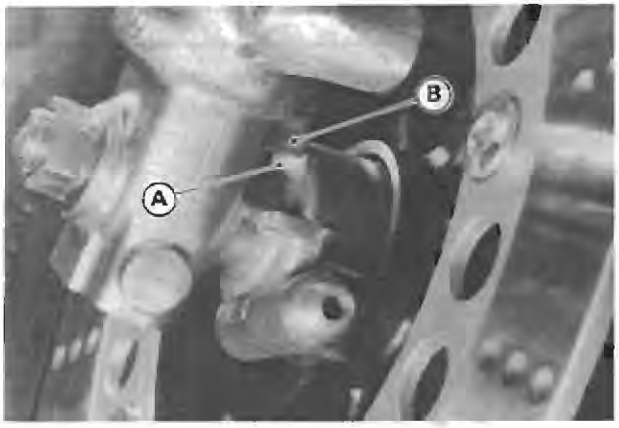
Front Wheel Installation Notes

- Apply grease to the seal lips for the grease seals on the speedometer gear housing and the right end of the wheel hub.
- Install the speedometer gear housing so that it fits in the speedometer gear drive notches.



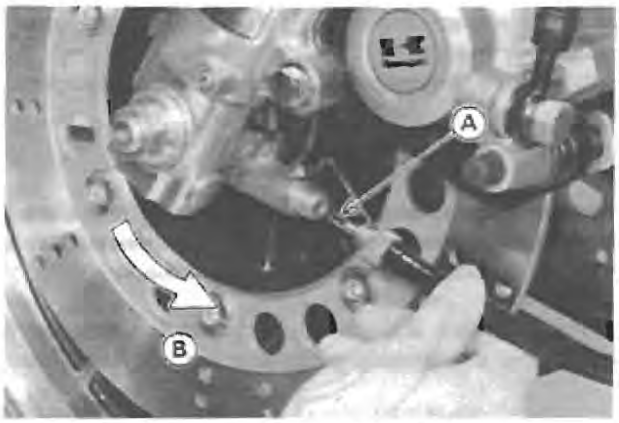
A. Fit in the gear drive notches.

- Fit the speedometer gear housing tongue between the stops on the left fork leg.



A. Tongue B. Stops

- Insert the speedometer inner cable into the speedometer gear housing while turning the wheel so that the slot in the end of the cable will seat on the tongue of the cable will seat on the tongue of the speedometer pinion. Tighten the cable nut with pliers.



A. Slot B. Turn the wheel.

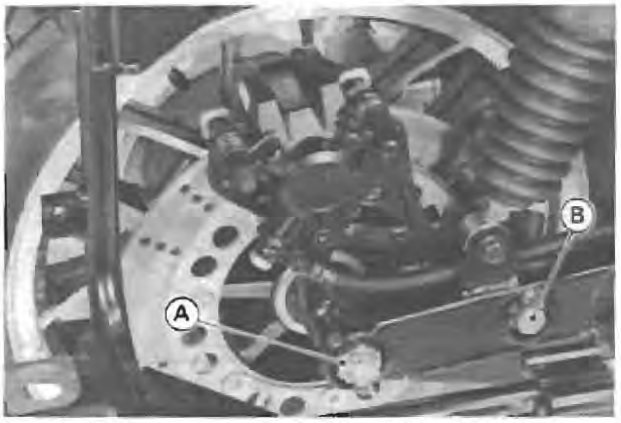
- Tighten the following fasteners to the specified torque (see Exploded View).
  - Axle Nut
  - Axle Clamp Bolt (see Suspension chapter)
  - Brake Caliper Mounting Bolts (see Brakes chapter)
- Completely clean off any grease that has gotten on either side of the brake discs with a high flash point solvent. Do not use one which will leave an oily residue.
- Pump the brake lever several times until a full, firm lever "feel" is obtained.

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 the following parts.
  - Saddlebags
  - Rear Fender Rear and Bracket
  - Mufflers
- Remove the cotter pin and axle nut.

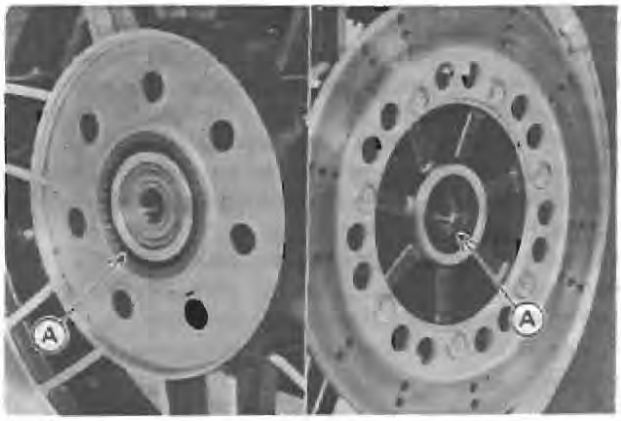


A. Axle Nut B. Caliper Holder Bolt

- Remove the brake caliper holder bolt.
- Pull out the axle and slide the caliper off the disc. Support the caliper so that it does not hang by its brake hose.
- Slide the rear wheel toward the right to disengage the wheel from the final gear case.
- Insert a wood wedge (4 – 5 mm thick) between the disc brake pads. This prevents the pads from being moved out of their proper position, should the brake pedal be squeezed accidentally.

Rear Wheel Installation Notes

- Apply grease to the splines on the rear wheel coupling and the seal lips of the grease seal on the right end of the wheel hub.



A. Grease.

- Be sure insert the distance collar between the final gear case and the left end of the hub.

A. Distance Collar

- Tighten the following fasteners to the specified torque (see Exploded View).
  - Axle Nut
  - Caliper Holder Bolt (see Brakes chapter)
- Completely clean off any gease that has gotten on either side of the brake disc with a high flash point solvent. Do not use one which will leave an oily residue.

•Pump the brake pedal several times until a full, firm pedal "feel" is obtained.

WARNING

○**Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**

Wheel (Rim) Inspection

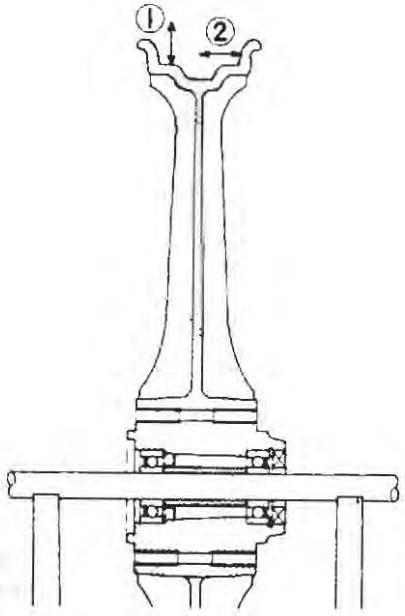
If there is any doubt as to the condition of the wheel or if the wheel has received a heavy impact check the rim runout as follows:

•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.

Rim Runout

	Service Limit
Axial	0.5 mm
Radial	0.8 mm

Rim Runout



•Carefully inspect the wheel for small cracks, dents, bending, or warping.
★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.

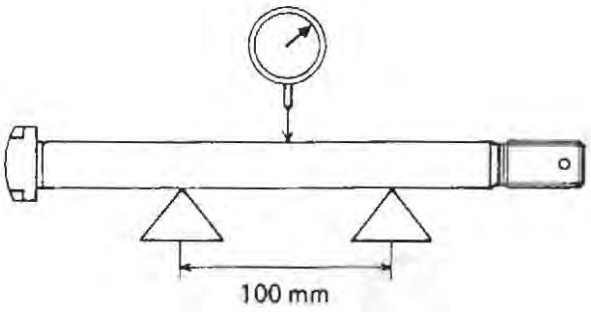
Axle Inspection

•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 blocks. 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

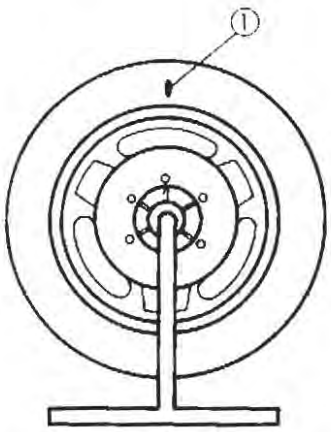


Wheel Balance

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



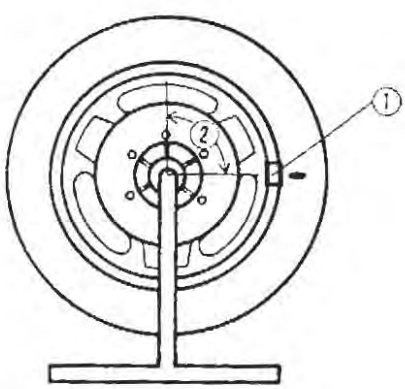
1. Mark

●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 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.
●Permanently install the balance weight.

Wheel Balance Adjust



1. Balance Weight
2. ¼ Turn

To install the 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 soap and water solution or rubber lubricant. This helps the balance weight slip onto the rim flange.

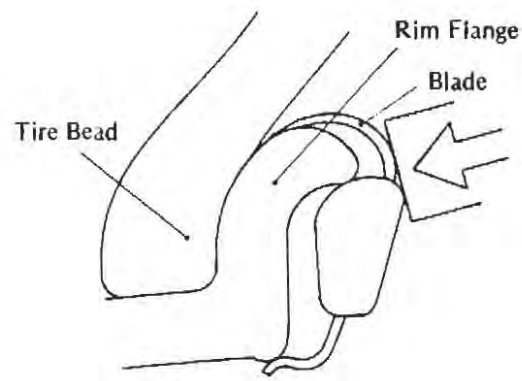
CAUTION

○**Do not lubricate the tire bead with engine oil or gasoline because they will deteriorate the tire.**

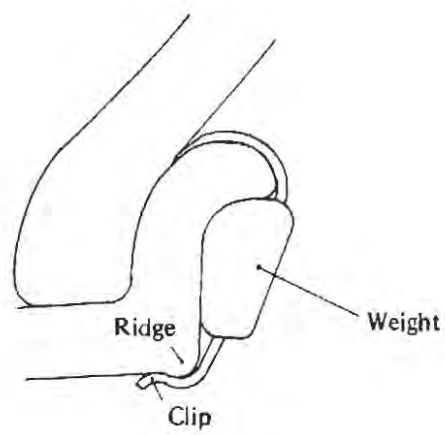
●Install the balance weight on the rim.
○Slip the weight onto the rim flange by pushing or lightly hammering the weight in the direction shown in the figure.
○Check that the blade and weight seat fully on the rim flange, and that the clip is hooked over the rim ridge and reaches the flat portion of the rim.

Balance Weight Installation

(a) Press or lightly hammer the weight in.



(b) Installation completed.



WARNING

○If the balance weight has any play on the rim flange, the blade and/or the clip have been stretched. Replace the loose balance weight.
○Do not reuse balance weights.

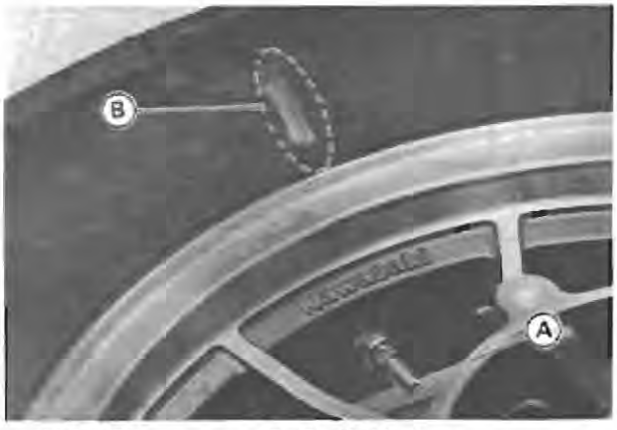
Balance Weight

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

Tires

Tire Removal

- Remove the wheel from the motorcycle, 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 can be reinstalled in the same position.
- Take out the valve core to let out the air.



A. Valve Core B. Chalk Mark

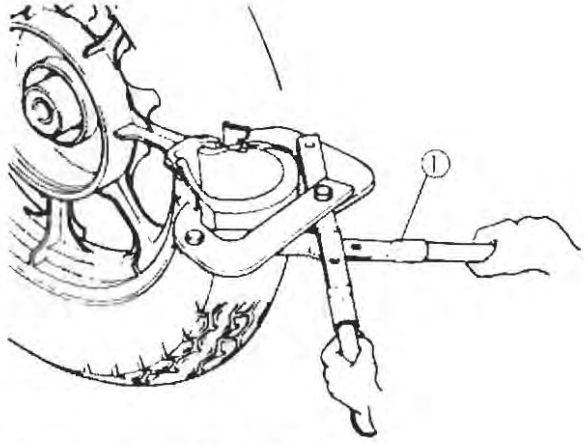
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

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).

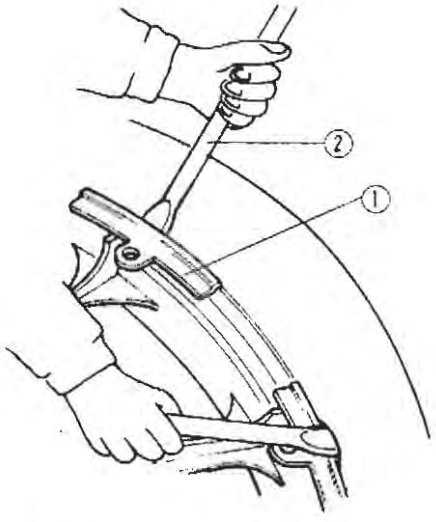
Tire Bead Breaker



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

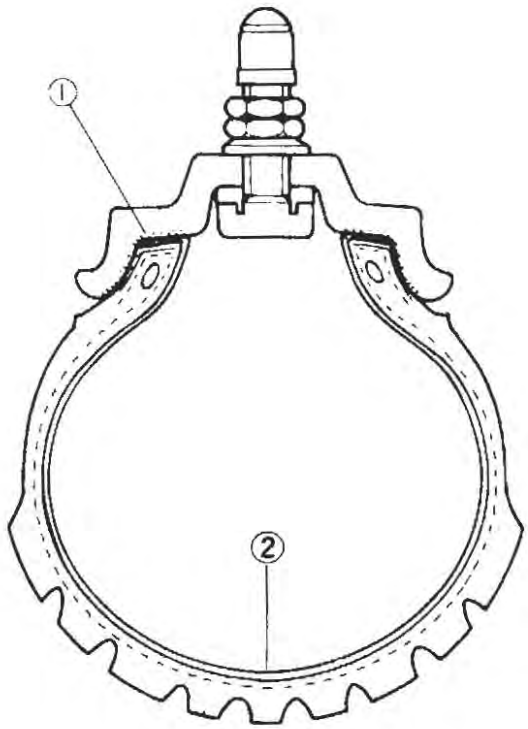
NOTE

○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.

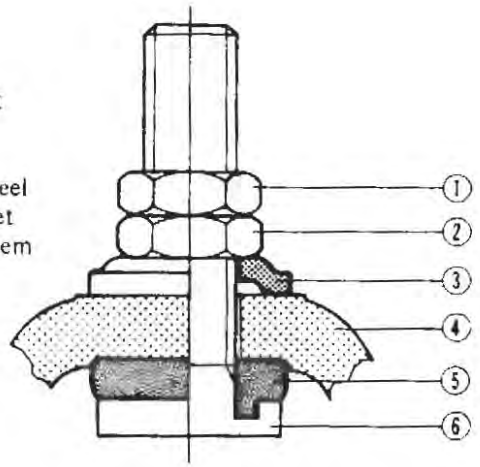
Air Sealing Surfaces



1. Air Sealing Surfaces
2. Inner Liner

- After removing the bead on one side, remove the other bead from the same side.
- Remove the rim from the tire.
- Remove the rim protectors from the rim.

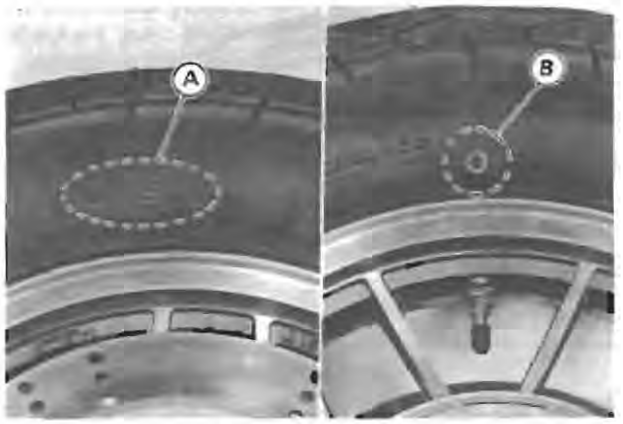
Air Valve



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

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)

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. (see Exploded View).
- 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.
- 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 and 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.
- 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.

NOTE

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

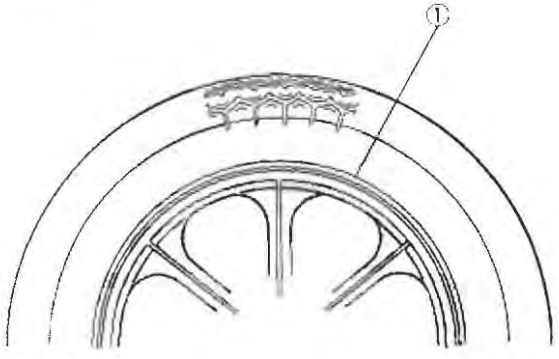
- Install the other side of the tire bead onto the rim in the same manner.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate 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/cm², 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

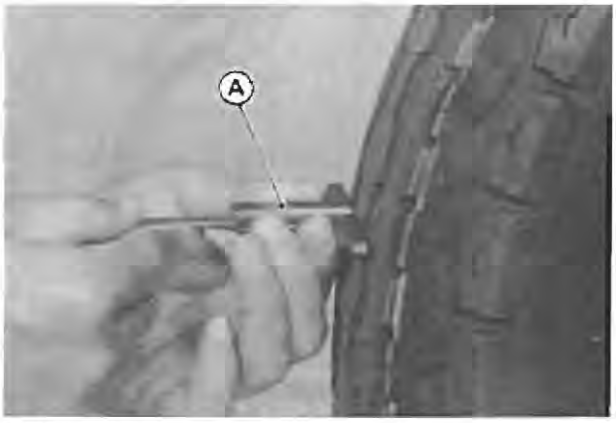
- If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core. Lubricate the rim flanges and tire beads. Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leaks. Inflate the tire slightly above standard inflation. 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).
- Install the brake disc(s).
- Balance the wheel.

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	**4.5 mm**
Service Limit	**1 mm**
Rear	
Standard	**7.3 mm**
Service Limit	**2 mm (Under 130 km/h)**
	3 mm (Over 130 km/h)

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	**130/90-16 67 H**
Make, Type	**DUNLOP F21 Tubeless**
Rear	
Size	**150/90-15 74 H**
Make, Type	**DUNLOP K425A Tubeless**

Tire Air Pressure (when cold)

Front	225 kPa (2.25 kg/cm², 32 psi)	
Rear	Up to 120 kg (265 lb) Load	225 kPa (2.25 kg, 32 psi)
	120 – 203 kg (265 – 448 lb) Load	280 kPa (2.8 kg/cm², 40 psi)

Tire Repair Recommendation

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs 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.

Wheel Bearings and Grease Seals

Wheel Bearing Removal Notes

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

Wheel Bearing Installation Notes

●Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
●Pack the front bearings (single face shield type) with a good quality bearing grease before installation.
●Install the wheel bearings using the bearing driver set (special tool: P/N 57001-1129) so that the marked sides face out. The front bearings (single face shield type) should be installed with the shielded sides facing out.

Wheel Bearing Inspection

●Turn the bearing back and forth while checking for roughness of binding.
★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.

Grease Seal Inspection

●Visually inspect the grease seal.
★Replace any if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged.

Speedometer Gear Housing

Speedometer Gear Housing Disassembly Notes

●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

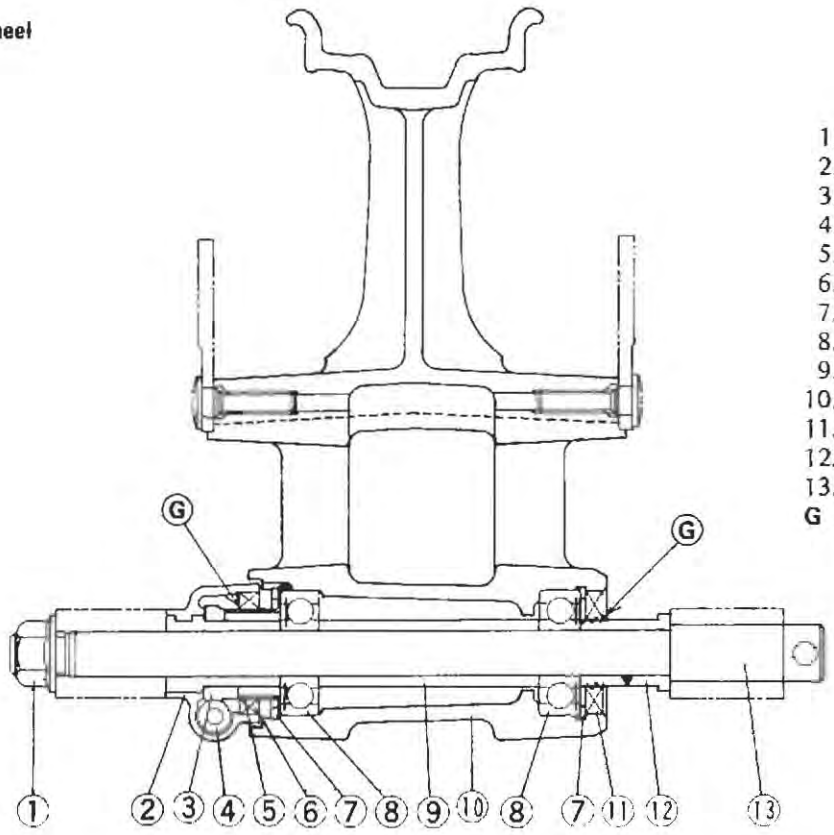
○*It is recommended that the assembly be replaced rather than attempting to repair the components.*

Speedometer Gear Housing Assembly Notes

●After inserting a new pin, stake the housing hole to secure the pin in place.
●Pack the gear housing with a high temperature grease.

Wheel Bearings

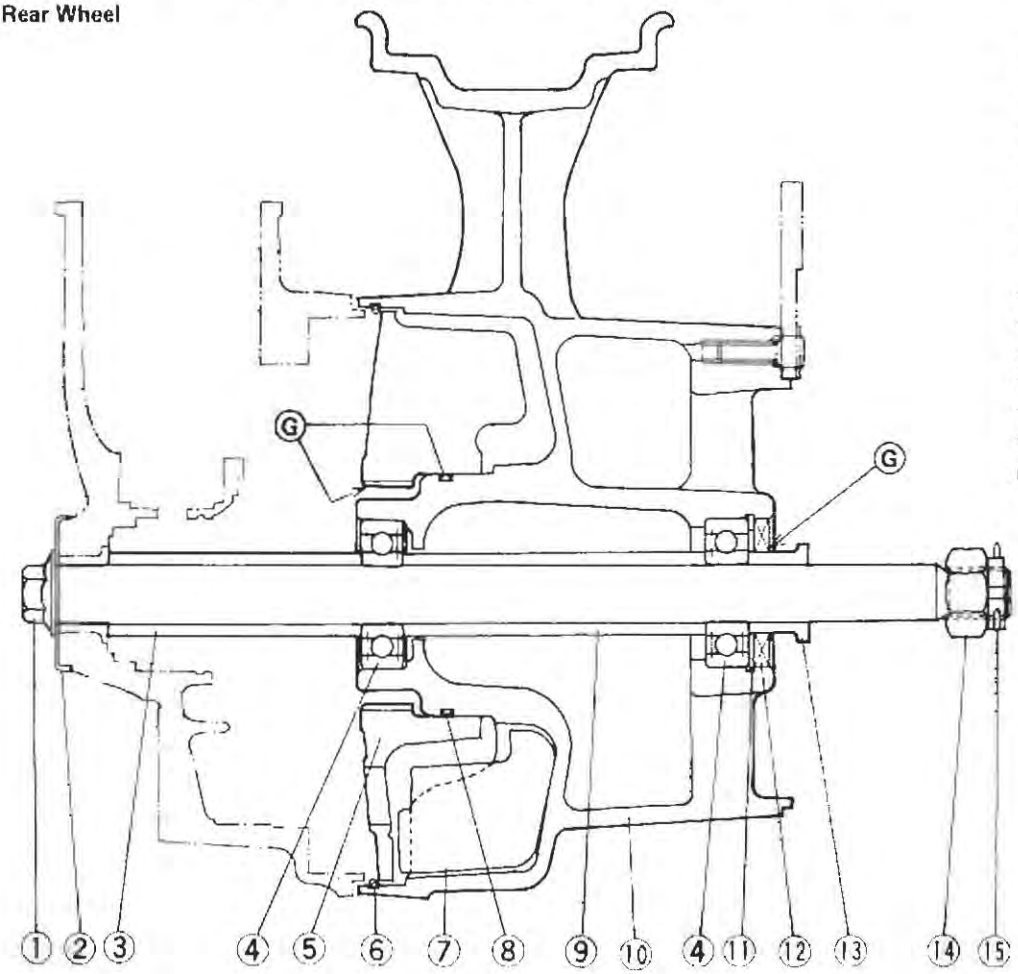
Front Wheel



1. Axle Nut
2. Speedometer Gear Housing
3. Speedometer Gear
4. Pinion
5. Speedometer Gear Drive
6. Grease Seal
7. Circlip
8. Bearing
9. Distance Collar
10. Rim
11. Grease Seal
12. Collar
13. Axle

G : Grease.

Rear Wheel



1. Axle
2. Cover
3. Distance Collar
4. Bearing
5. Rear Wheel Coupling
6. Circlip
7. Rubber Damper
8. O-ring
9. Distance Collar
10. Rim
11. Circlip
12. Grease Seal
13. Collar
14. Axle Nut
15. Cotton Pin

G : Grease.

Final Drive
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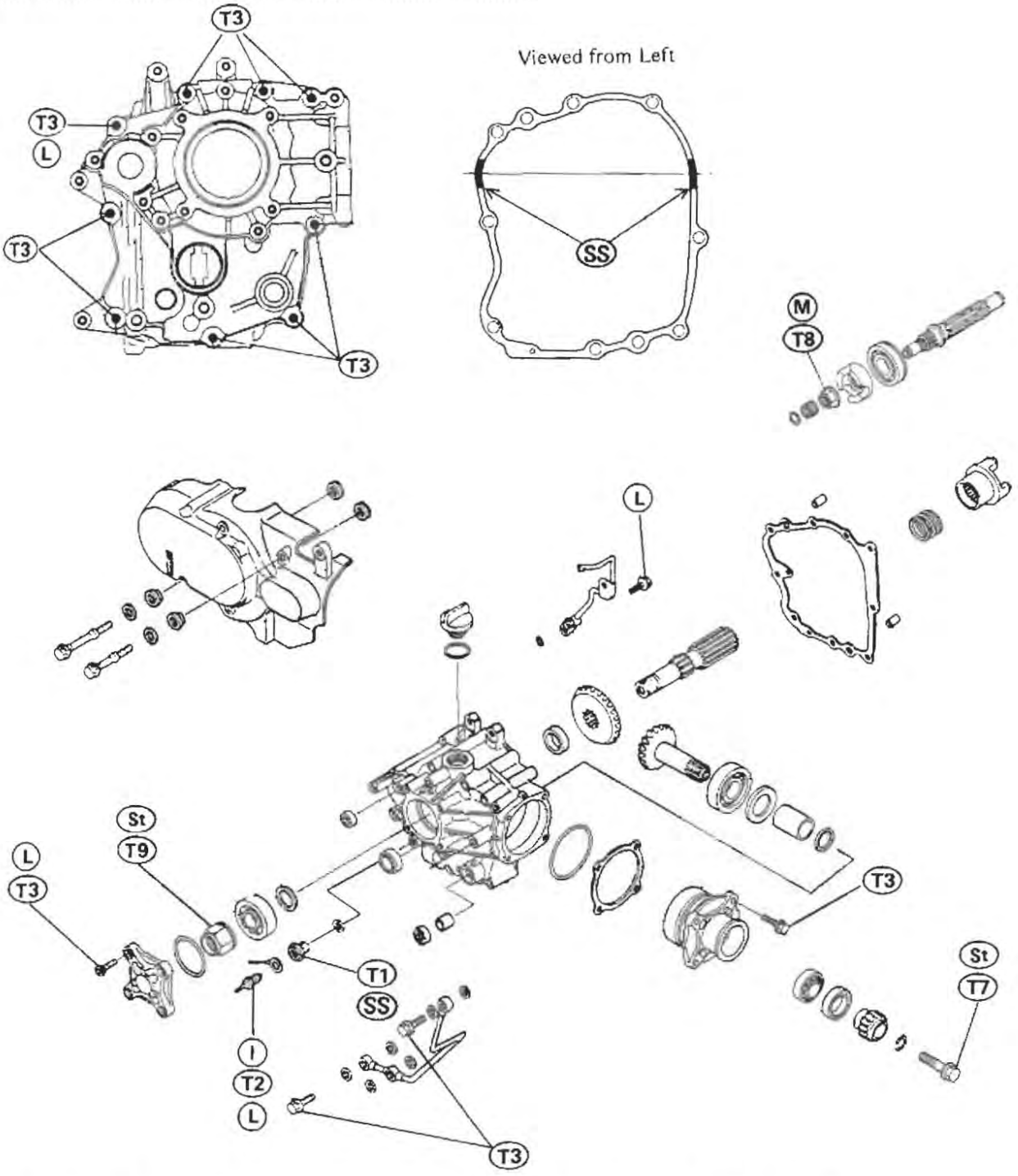
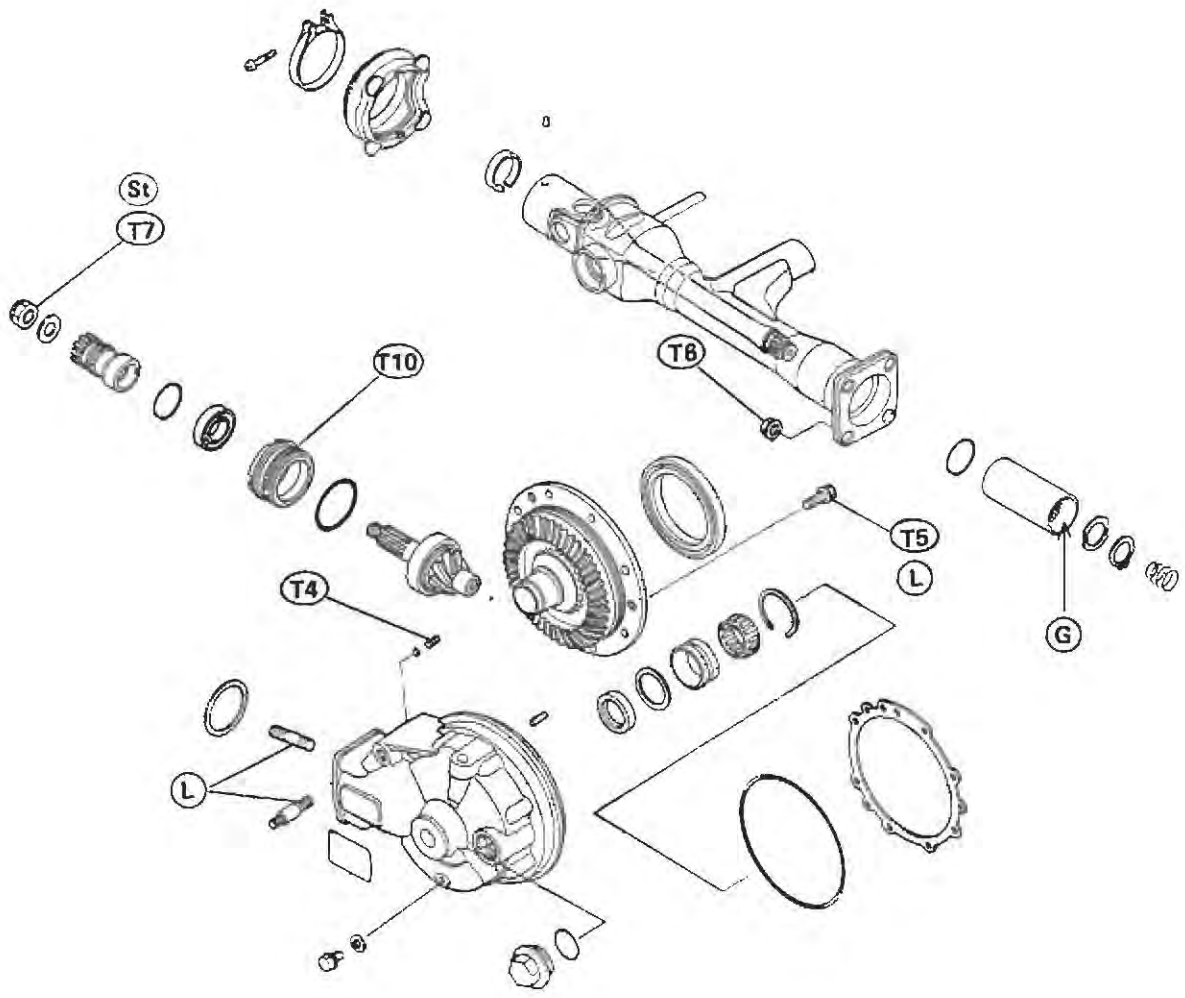
Exploded View



1. Neutral and Overdrive Switch

G : Grease
L : Non-permanent Locking Agent
SS : Silicone Sealant
M : Molybdenum Disulfide Grease
St : Stake the fastener.

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 : 12 N-m (1.2 kg-m, 104 in-lb)
T4 : 16 N-m (1.6 kg-m, 11.5 ft-lb)
T5 : 24 N-m (2.4 kg-m, 17.5 ft-lb)
T6 : 29 N-m (3.0 kg-m, 22 ft-lb)
T7 : 120 N-m (12.0 kg-m, 87 ft-lb)
T8 : 225 N-m (23 kg-m, 165 ft-lb)
T9 : 265 N-m (27 kg-m, 195 ft-lb)
T10 : 540 N-m (55 kg-m, 400 ft-lb)



Specifications

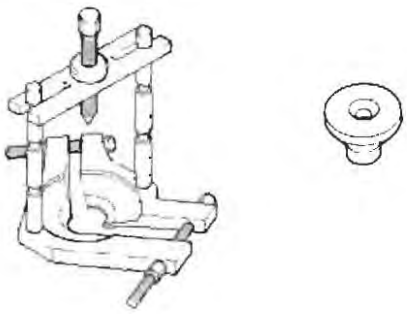
Item	Standard
Final Gear Case Oil:	
Grade	API GL-5 Hypoid Gear Oil
Viscosity	SAE80
Amount	210 mL
Oil Level	Bottom of filler opening
Final Gear Case:	
Final Bevel Gear Backlash	0.06 – 0.10 mm (at gear shaft spline)
	0.10 – 0.15 mm (at gear tooth)
Front Bevel Gears:	
Preload for Driven Gear Bearings	0.6 – 1.0 N·m (0.06 – 0.10 kg-m, 5 – 9 in-lb)
Front Bevel Gear Backlash	0.13 – 0.18 mm (at gear tooth)

Special Tools

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

Bearing Puller: 57001-158

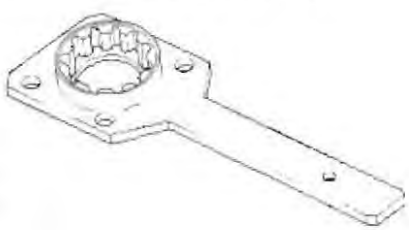
Adapter: 57001-317



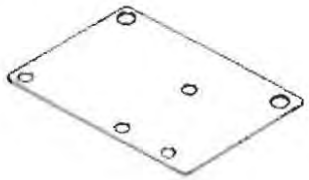
Driver: 57001-382

Damper Cam Holder: 57001-1025

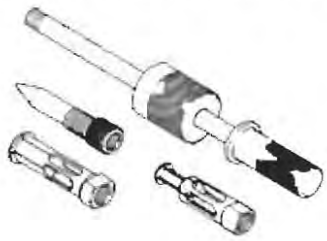
Driven Gear Holder: 57001-1027



Dial Gauge Holder: 57001-1049

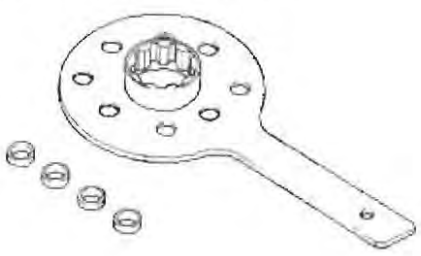


Oil Seal and Bearing Remover: 57001-1058

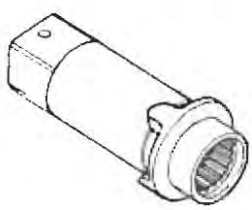


Bearing Driver Set: 57001-1129

Pinion Gear Holder: 57001-1165



Drive Gear Holder: 57001-1226



Final Gear Case Oil

Final Gear Case Oil Level Inspection

- Support the motorcycle on its center stand.
- Remove the left saddlebag.
- Unscrew the filler plug. The oil level should come to the bottom of the filler opening.

A. Filler Opening B. Drain Plug

★If it is low, first check the final gear case for oil leakage, remedy it if necessary, and add oil through the filler opening. Use the same type and brand of oil that is already in the final gear case.

- Install the filler plug.

Final Gear Case Oil Change

- Warm up the oil by running the motorcycle so that the oil will pick up any sediment and drain easily. Then stop it.
- Support the motorcycle on its center stand.
- Place an oil pan beneath the final gear case, and remove the drain plug.

WARNING

○**When draining or filling the final gear case, be careful that no oil gets on the tire or rim. Clean off any oil that inadvertently gets on them with a high flash-point solvent.**

- After the oil has completely drained out, install the drain plug with a new gasket.
- Fill the final gear case with the specified oil and quantity.

Final Gear Case Oil

Amount	**210 mL**
Grade	**API GL-5 hypoid gear oil**
Viscosity:	**SAE 80**

NOTE

○*The term "GL-5" indicates a quality and additive rating. A "GL-6" rated hypoid gear oil can also be used.*

- Be sure the O-ring is in place, and Install the filler plug.

Final Gear Case

NOTE

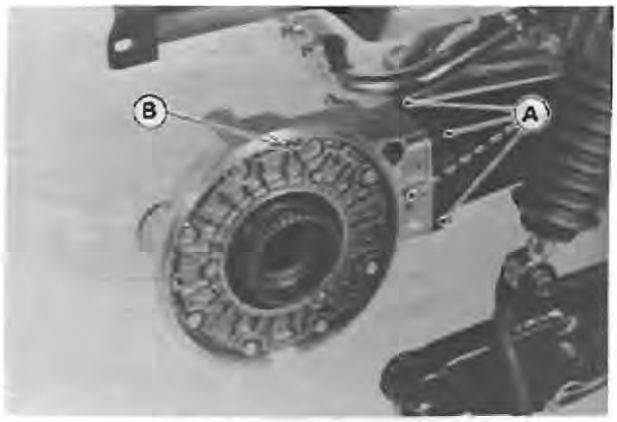
○*This manual does not cover the pinion gear removal because of the highly specialized equipment that is required. If the pinion gear removal is necessary, it should be done by a properly equipped shop.*

Final Gear Case Removal

- If the final gear case is to be disassembled, drain the final gear case oil.
- Remove the following.
  - Travel Trunk and Bracket
  - Rear Seat
  - Saddlebags and Brackets
  - Rear Wheel
- Remove the left shock absorber from its studs by taking off the mounting nuts.
- Remove the final gear case by taking off the mounting nuts. The spring comes off with the case.

NOTE

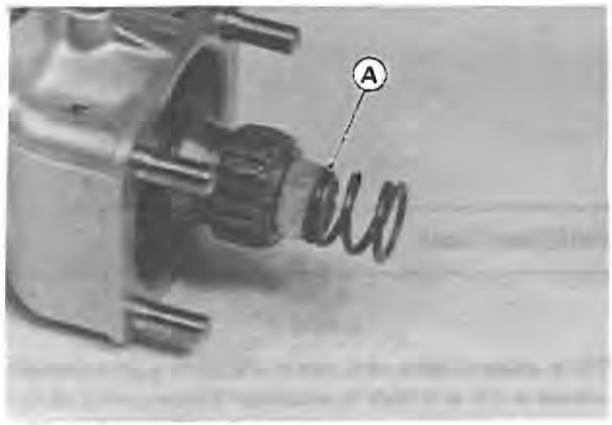
○*If the final gear case is full of oil, place the case so that the breather hole is on top.*



A. Final Gear Case Mounting Nuts
B. Breather Hole

Final Gear Case Installation Notes

- Lubricate the propeller shaft joint (see Propeller Shaft Joint Lubrication).
- Install the spring so that small diameter end faces toward to final gear case.



A. Small Diameter End

- Fit the pinion gear splines into the propeller shaft joint while turning the ring gear hub.
- Tighten the final gear case mounting nuts to the specified torque (see Exploded View).
- If the final gear case oil was drained, fill the case with oil.

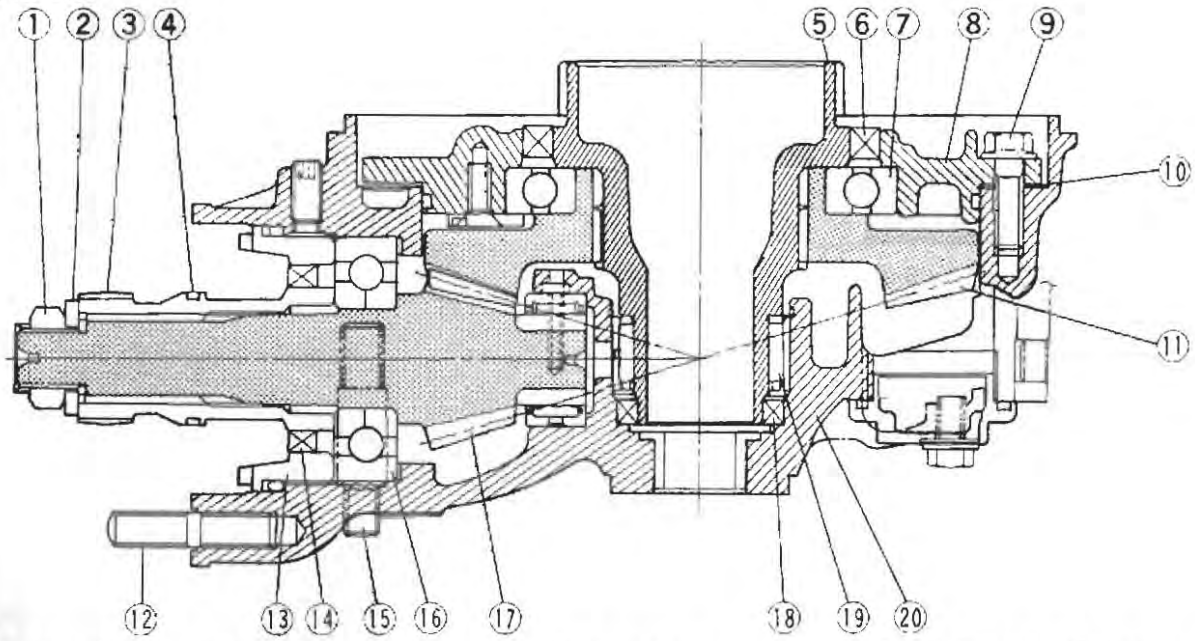
Final Gear Case Disassembly (to replace the oil seals)

- Remove the final gear case cover mounting bolts.
- Use the cover bolts to remove the ring gear assembly from the gear case. The shim(s) comes off with the assembly.

A. Jack the cover up with bolts.

- To remove the ring gear oil seal, soak the ring gear assembly in oil and heat the oil to **120 ~ 150°C (248 ~ 302°F)**, and then pry out the seal. Be careful not to scratch the sealing surface on the ring gear hub.

Final Gear Case

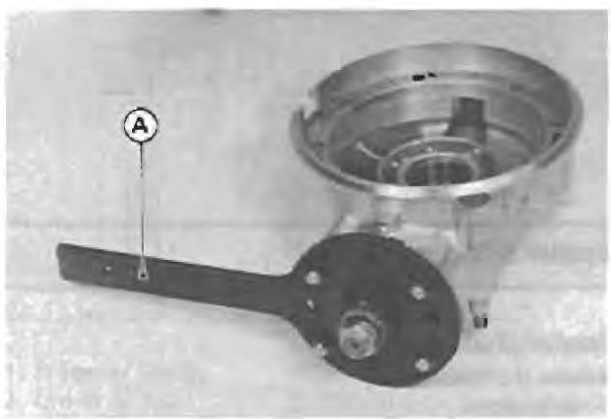


1. Pinion Gear Nut
2. Washer
3. Pinion Gear Joint
4. O-ring
5. Ring Gear Hub
6. Oil Seal
7. Ball Bearing
8. Final Gear Case Cover
9. Cover Mounting Bolts
10. Ring Gear Shim(s)
11. Ring Gear
12. Studs
13. Pinion Bearing Retainer
14. Oil Seal
15. Stud
16. Ball Bearing (Four-point Contact)
17. Pinion Gear
18. Oil Seal
19. Needle Bearing
20. Final Gear Case

CAUTION

○**Do not heat the case with a torch. This will warp the case.**

●Remove the snap ring and pull out the needle bearing outer race and oil seal together using the oil seal and bearing remover (special tool: P/N 57001-1058).
●Remove the oil seal on the pinion bearing retainer without the pinion removal.
○Unscrew the pinion nut using the pinion gear holder (special tool).

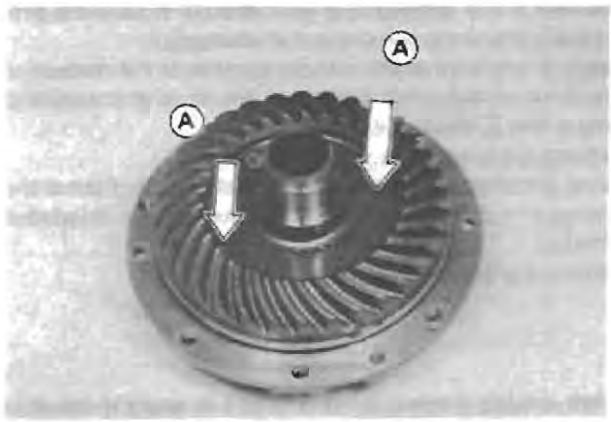


A. Pinion Gear Holder: 57001-1165

○Remove the washer and pinion joint with the O-ring.
○Pull out the oil seal on the pinion bearing retainer using a suitable puller.

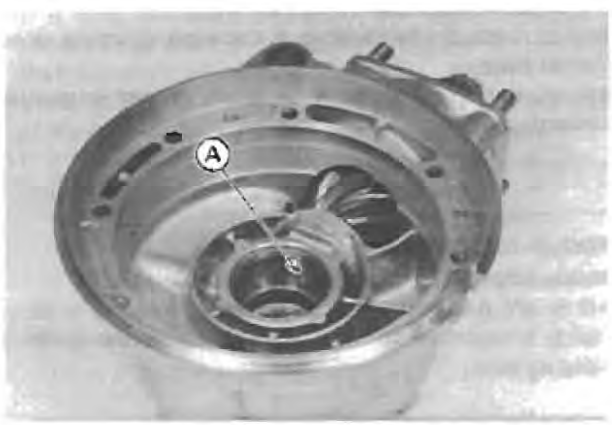
Final Gear Case Assembly Notes
(to replace the oil seals)

●The ring gear and pinion are lapped as a set in the factory to get the best tooth contact. They must be installed as a pair, never replace one without the other.
●Use a suitable driver to drive in the oil seals being careful of installation direction and depth.
●Press the ring gear assembly slowly with a suitable driver to firmly seat the ball bearing if it may slide out a little by removal.



A. Press here.

●Align the oil hole in the needle bearing outer race with the hole on the bearing housing (pinion gear side).



A. Oil Hole

●Blow the breather hole in the final gear case cover clean with compressed air.

A. Breather Hole

•Reinstall the original ring gear shim(s) to keep the gear backlash and the tooth contact unchanged.
•Apply a non-permanent locking agent to the threads of the cover bolts, and tighten them to the specified torque (see Exploded View).
•Replace the pinion nut with new one.
•Using the pinion gear holder (special tool), tighten the pinion nut to the specified torque (see Exploded View).
•Stake the pinion nut with a punch.

CAUTION

○**When staking the nut, be careful not to apply shock to the pinion and its bearing. Such a shock could damage the pinion and/or bearing.**

•Apply a non-permanent locking agent to the threads of each stud and install them to the case if they were removed.

Bevel Gear Inspection

•Visually check the bevel gears for scoring, chipping, or other damage.
★Replace the bevel gears as a set if either gear is damaged.

Pinion Joint Inspection

•Visually inspect the splines of the pinion joint.
★If they are badly worn or chipped, replace the joint with a new one. Also, inspect the propeller shaft sliding joint.

A. Check splined portion.

Ball Bearing Inspection

Since the ball bearing is made to extremely close tolerances, the wear must be judged by feel rather than measurement.
•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 (as a gear set).

Needle Bearing Inspection

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

Oil Seal Inspection

•Inspect the oil seal.
★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged.

Propeller Shaft

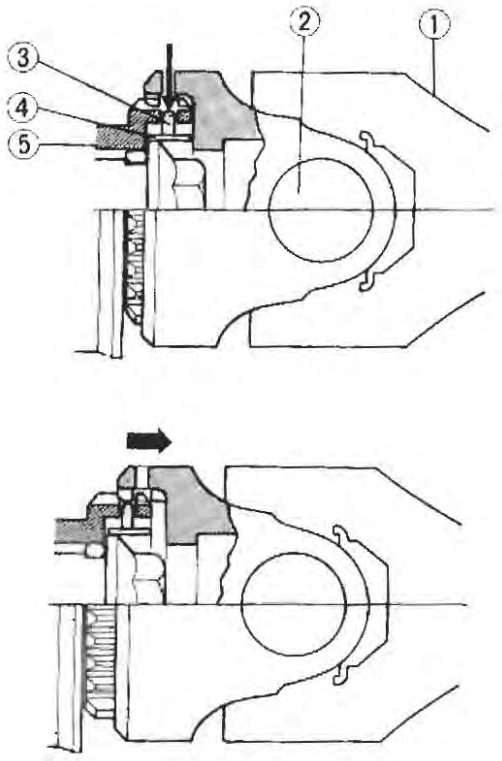
Propeller Shaft Removal

•Remove the following.
Rear Wheel
Final Gear Case
Swing Arm
•Remove the propeller shaft from the front driven gear joint.
○Turn the propeller shaft so that the locking pin access hole on the propeller shaft comes outside.

A. Locking Pin Access Hole

○Pushing on the locking pin a little into the propeller shaft, slip the propeller shaft off the driven gear joint.

Disengagement of Propeller Shaft from Driven Gear Joint



1. Propeller Shaft
2. Universal Joint
3. Locking Pin
4. Spring
5. Driven Gear Joint

- Remove the circlip and washer from the rear end of the propeller shaft.
- Pull out the propeller shaft sliding joint off the propeller shaft.

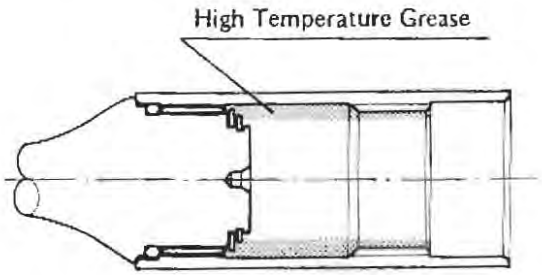
Propeller Shaft Installation Notes

- Check the O-ring on the rear end of the propeller shaft for any kind of damage, and replace it if necessary.
- Lubricate the propeller shaft joint (see Propeller Shaft Joint Lubrication).
- After connecting the propeller shaft to the driven gear joint, pull the propeller shaft rearward to check that the shaft is secured in place by the locking pin.

Propeller Shaft Joint Lubrication

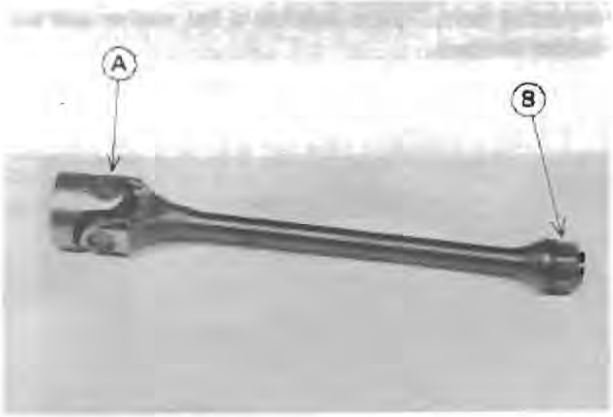
- Wipe off the old grease from the propeller shaft sliding joint and pinion joint.
- Pack the propeller shaft sliding joint with 20 mL (16 grams) of high temperature grease.

Propeller Shaft Sliding Joint Lubrication



Propeller Shaft Inspection

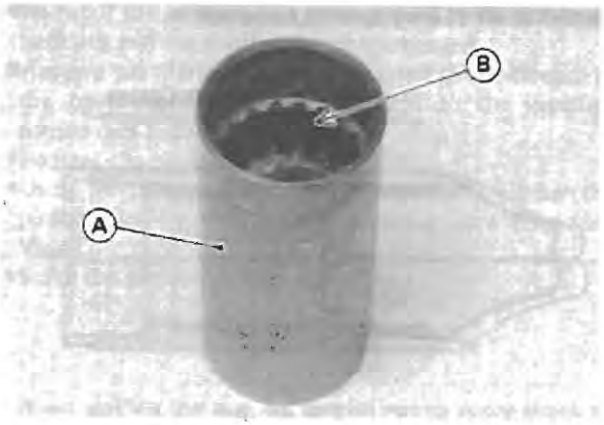
- Check that the universal joint works smoothly without rattling or sticking.
- ★If it does not work smoothly, the needle bearings of the universal joint are damaged. Replace the propeller shaft assembly with a new one.
- Visually inspect the bearing of the shaft and the wear of the splined section at the rear end of the shaft.
- ★If it is bent at all, replace the propeller shaft assembly. Do not attempt to straighten a bent shaft.



A. Check universal joint.
B. Inspect shaft and splined portion.

Propeller Shaft Sliding Joint Inspection

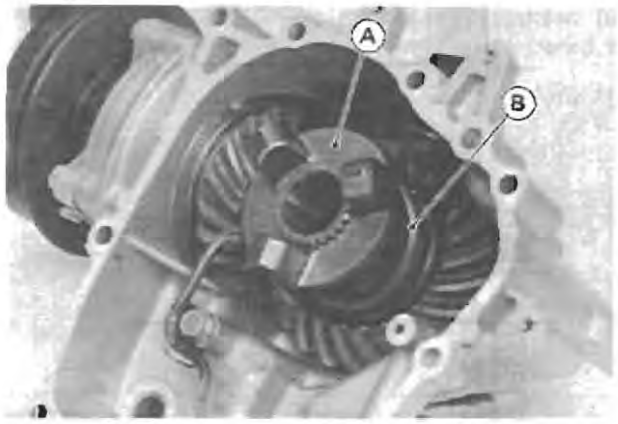
- Visually inspect the internal splines of the propeller shaft sliding joint.
- ★If they are badly worn or chipped, replace the joint with a new one.



A. Propeller Shaft Joint
B. Check the splined portion.

Water Pump
Rear Wheel
Final Gear Case

- Disengage the front end of the propeller shaft from the driven gear joint and slide back the propeller shaft (see Propeller Shaft Removal).
- Place an oil pan beneath the front gear case.
- Unscrew the front gear case mounting bolts and remove the front gear case. The cam follower and the damper spring come off with the gear case.

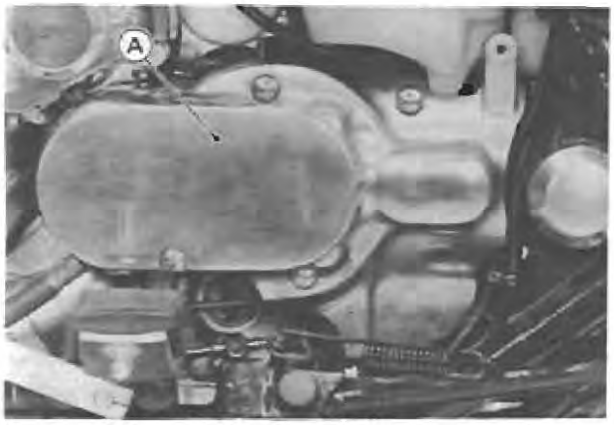


A. Cam Follower B. Damper Spring

Front Bevel Gears

Front Gear Case Removal

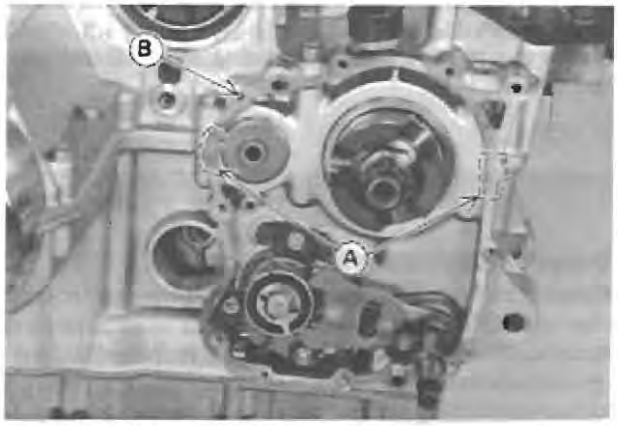
- Remove the front gear case cover by taking out the mounting bolts. Each bolt has a flat washer and two rubber dampers.



A. Front Gear Case Cover

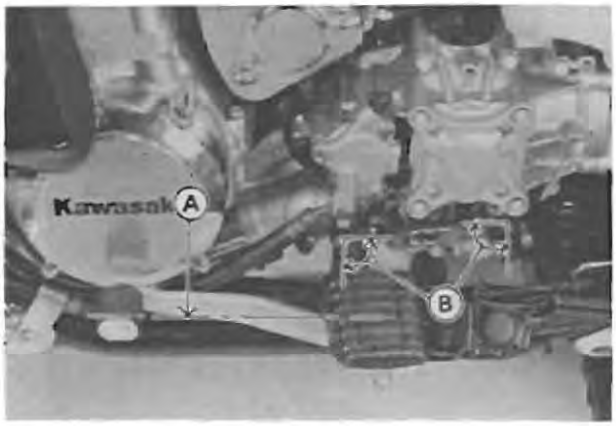
- Remove the following.
  Clutch Slave Cylinder
  Clutch Push Rod
  Radiator
  Mufflers and Exhaust Pipes

- Apply a silicone sealant to the crankcase halves mating surface on the front and rear sides of the case mount.



A. Apply silicone sealant.
B. Bolt requiring locking agent.

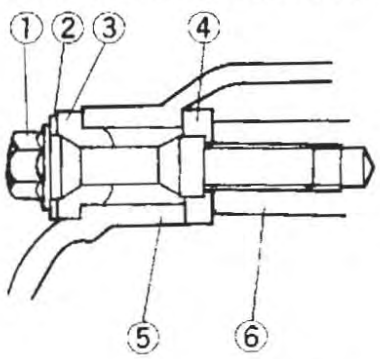
- Tighten the front gear case mounting bolts to the specified torque (see Exploded View).
- Apply a non-permanent locking agent to the threads of the case bolt at the location shown.
- Install the shift pedal linkage and the left footpeg so that the top end of the shift pedal levels with the top of the footpeg.



A. Level B. 90°

○If the shift pedal linkage was removal from the footpeg bracket, apply a grease to the pivot shaft before installing it to the bracket.
●Check the engine oil level and add oil if necessary.
●Fit the rubber dampers and bolts onto the front gear case, and then the screw in the bolts to mount the cover.

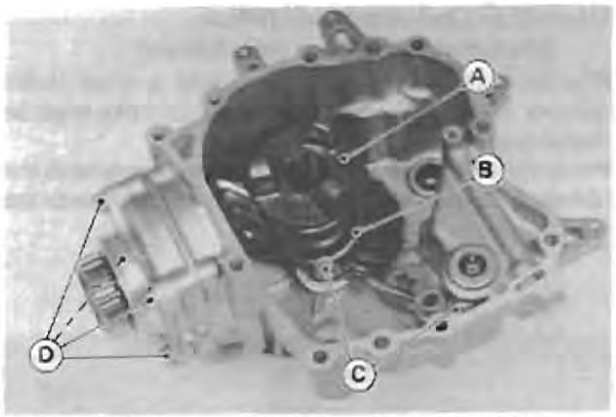
Front Gear Case Cover Bolt and Rubber Dampers



1. Bolt
2. Washer
3. Rubber Damper
4. Rubber Damper
5. Front Gear Case Cover
6. Front Gear Case

Front Gear Case Disassembly
(including drive gear removal)

●Remove the cam follower and the damper spring.
●Remove the driven gear assembly mounting bolts and pull the assembly off the case.
●Unscrew the oil pipe clamp bolts from inside the case and remove the oil pipe with the O-ring.

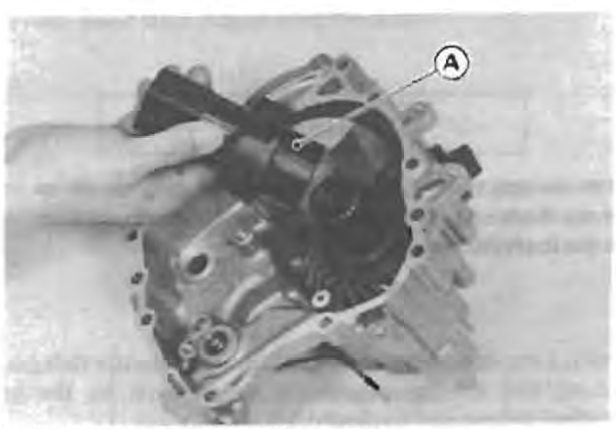


A. Cam Follower
B. Damper Spring
C. Oil Pipe Clamp Bolts
D. Driven Gear Assembly Mounting Bolts

●Remove the drive gear.
○Unscrew the drive gear nut cap mounting bolts, and remove the cap with the O-ring.

A. Drive Gear Nut Cap

○Pry open the drive gear nut with a small chisel.
○Unscrew the drive gear nut holding the drive gear shaft with the holder (special tool).

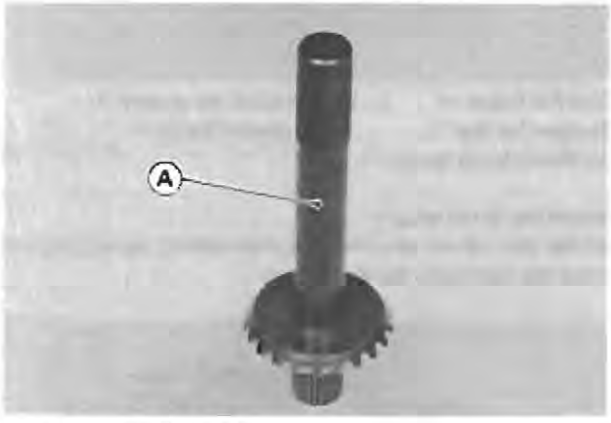


A. Drive Gear Holder: 57001-1226

○Pull off the drive gear shaft with the drive gear, collar, and shim(s).
●Remove the drive gear shaft ball bearing using the bearing driver set (special tool: P/N 57001-1129).

Front Gear Case Assembly Notes (including drive gear Installation)

- The drive and driven gears are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Press the drive gear and shaft assembly slowly with the driver (special tool) to firmly seat the gear onto the shaft.



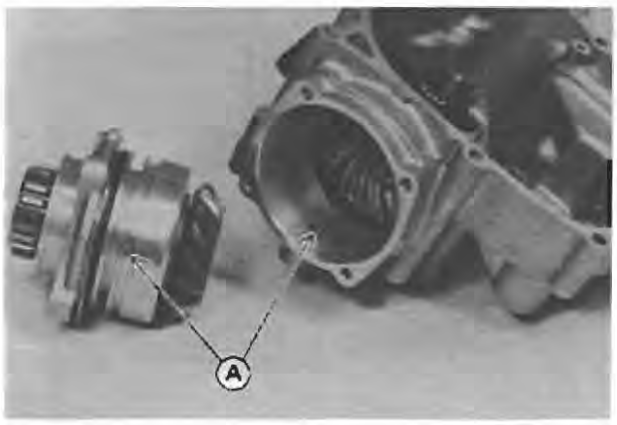
A. Driver: 57001-382

- Be sure to check and adjust the bearing preload and the bevel gear backlash and tooth contact, when any of the backlash-related parts are replaced (see Front Bevel Gear Adjustment).
- After completing all adjustment, re-assemble the front gear case.
  - Replace the drive gear nut with a new one.
  - Apply oil to the threads and seating surface of the nut, and tighten it to the specified torque (see Exploded View).
  - Loosen the nut completely and retighten it to the specified torque.
  - Stake the nut to secure it in place.

CAUTION

When staking the nut, be careful not to apply shock to the shaft and its bearing. Such a shock could damage the shaft and/or bearing.

  - Apply a non-permanent locking agent to the threads, and tighten the cap mounting Allen bolts to the specified torque (see Exploded View).
  - Install the driven gear assembly so that the oil hole on the housing aligns with the oil hole in the case.
  - Tighten the driven gear assembly mounting bolts to the specified torque (see Exploded View).
  - Apply a non-permanent locking agent to the threads, and tighten the case inside oil pipe clamp bolts.



A. Oil Holes

- If the neutral and overdrive switch and collar were removed, install them as following.
  - Apply a silicone sealant to the threads of the collar and tighten it to the specified torque (see Exploded View).
  - Apply a non-permanent locking agent to the threads, and install the neutral and overdrive switch so that the terminal lead runs toward the front of the case.
    Tighten the switch to the specified torque (see Exploded View).
- If the case outside oil pipe was removed, use a new flat washer on each side of the fittings, and tighten the banjo bolts to the specified torque (see Exploded View).

Driven Gear Disassembly

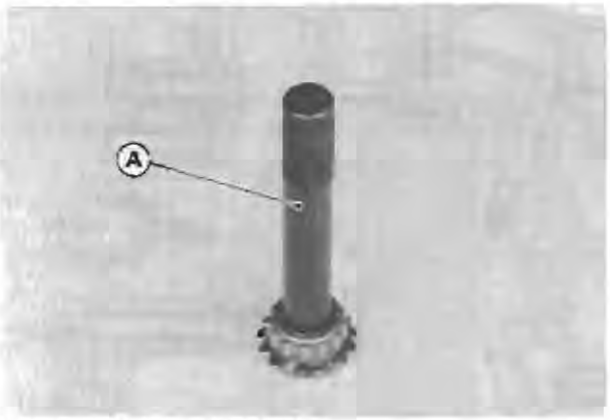
- Holding the driven gear joint with the driven gear holder (special tool), unscrew the driven gear bolt.

A. Driven Gear Bolt
B. Driven Gear Holder: 57001-1027

- Remove the driven gear joint with the O-ring.
- Remove the driven gear from the bearing housing.
- Remove the collar and the spacer from the driven gear.
- Press the tapered roller bearing and oil seal out of the housing using the bearing driver set (special tool: 57001-1129).
- Remove the tapered roller bearing which is pressed onto the driven gear shaft with the bearing puller and adapter (special tools: 57001-158 and 57001-317).

Driven Gear Assembly Notes

- The drive and driven gears are lapped as a set at the factory to get the best tooth contact. They must be replaced as a set.
- Be sure to check and adjust the bearing preload and the bevel gear backlash and tooth contact (see Front Bevel Gear Adjustment).
- Drive the tapered roller bearing inner race onto the driven gear shaft using the bearing driver (special tool).



A. Bearing Driver: 57001-382

- After completely the bearing preload adjustment, re-assemble the driven gear assembly.
  - Using the bearing driver set (special tool: 57001-1129), press the oil seal in until the face of the seal is level with the end of the bearing housing hole.
  - Tighten the driven gear bolt to the specified torque (see Exploded View).
  - Stake the driven gear bolt to prevent it from loosening.

CAUTION

When staking the nut, be careful not to apply shock to the driven gear and their bearings. Such a shock could damage the driven gear and/or bearings.

Damper Cam Removal

- Remove the retainer and needle bearing.
- Holding the damper cam with the damper cam holder (special tool), unscrew the damper cam nut.

A. Damper Cam B. Holder: 57001-1025

Damper Cam Installation Notes

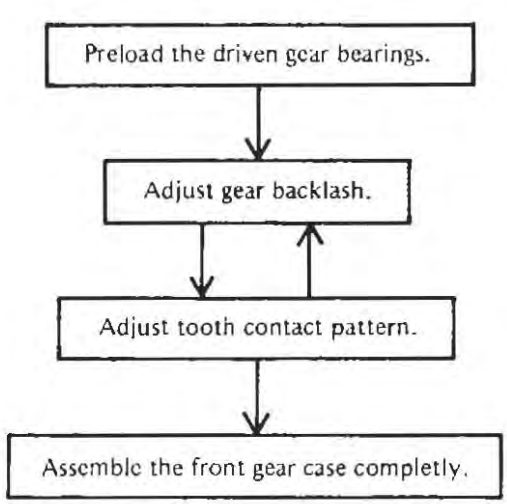
- Replace the damper cam nut with a new one.
- Tighten the damper cam nut to the specified torque (see Exploded View).
  - Apply a small amount of oil to the threads and the seating surface of the nut.

Front Bevel Gear Adjustment

In order to prevent one gear from moving away from the other gear under load, the tapered roller bearings must be properly **preloaded**. Also the **backlash** (distance one gear will move back and forth without moving the other gear) and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

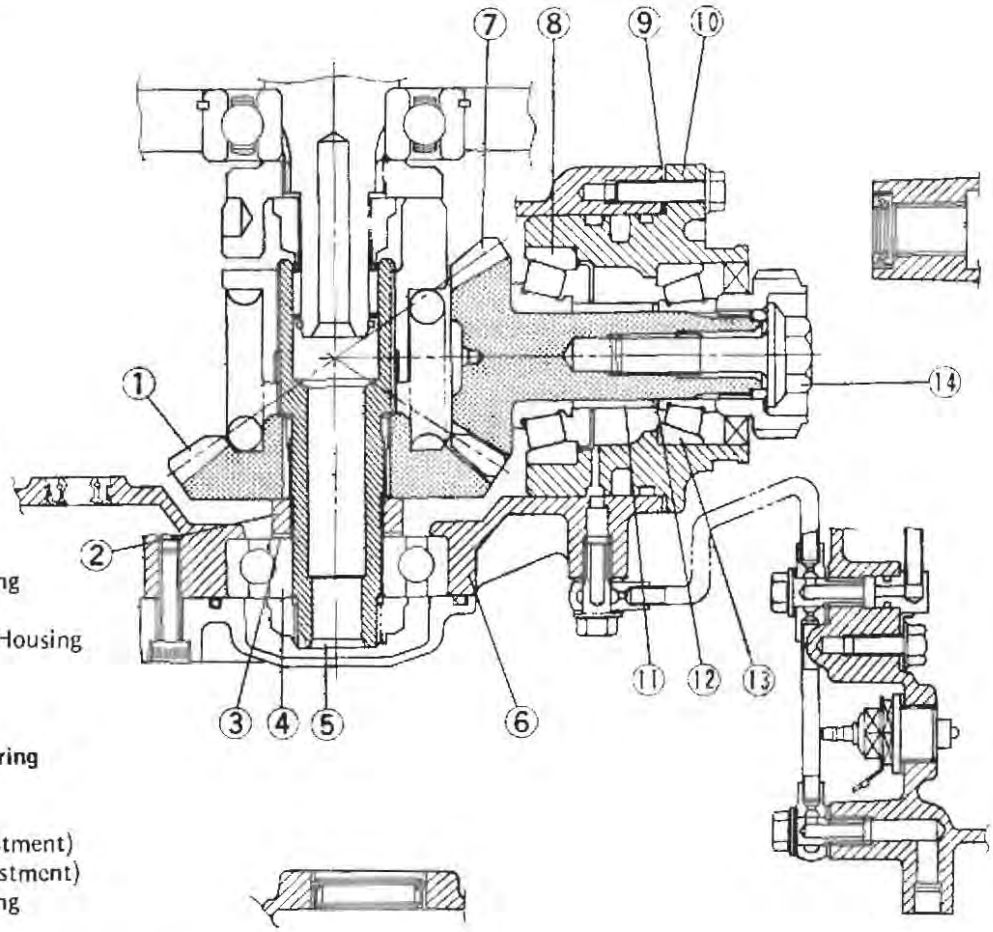
Above three adjustments are of critical importance and must be carried out in the correct sequence and method.

Front Bevel Gear Adjustment Procedure



When the any of the backlash-related parts are replaced, or the driven gear bolt is loosened; even if the purpose is not to replace the parts, be sure to check and adjust the bearing preload and the bevel gear backlash and tooth contact by replacing shims.

Backlash-Related Parts



1. Drive Gear
2. Collar
3. Drive Gear Shim(s)
4. Ball Bearing
5. Drive Gear Shaft
6. Front Gear Case
7. Driven Gear
8. Tapered Roller Bearing
9. Driven Gear Shim(s)
10. Driven Gear Bearing Housing

Parts which influence bearing preload only

11. Collar (Preload Adjustment)
12. Spacer (Preload Adjustment)
13. Tapered Roller Bearing
*14. Driven Gear Bolt

*Preload adjustment is necessary whenever the bolt is loosened, even if the purpose is not to replace the parts.

Preload adjustment

•Assemble the driven gear assembly, and tighten the driven gear nut to the specified torque (see Exploded View). Do not install the oil seal and do not stake the bolt until the correct bearing preload is obtained.

CAUTION

○**To start with, choose a shim or collar so that the bearings are just SNUG with NO play but also with NO preload.**

○**Any over-preload on the bearings could damage the bearings.**

•Apply a little engine oil to the bearings, and turn the gear shaft more than 5 turns to allow the bearings to seat.

•Measure the bearing preload. Bearing preload is defined as the force or torque which is needed to start the gear shaft turning.

Preload for Driven Gear Bearing

Using Spring Scale:

3 – 5 N (0.30 – 0.50 kg, 0.7 – 1.1 lb)

Using Torque Wrench:

0.6 – 1.0 N-m (0.06 – 0.10 kg-m, 5 – 9 in-lb)

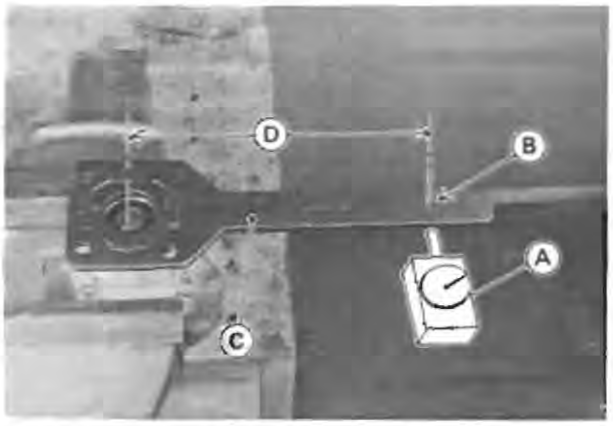
NOTE

○*Preload can be measured either with a spring scale or a beam-type torque wrench. When measured with a spring scale, the preload is designated by force (N, kg, lb), and when measured with a torque wrench, it is designated by torque (N-m, kg-m, in-lb).*

○*Using Spring Scale:*

Hook the spring scale on the handle at a point 200 mm apart from the center of the gear shaft.

Hold the bearing housing in a vise so that the gear shaft axis is vertical. Apply force to the handle horizontally and at a right angle to it.



A. Spring Scale
B. Hole
C. Driven Gear Holder: 57001-1027
D. 200 mm

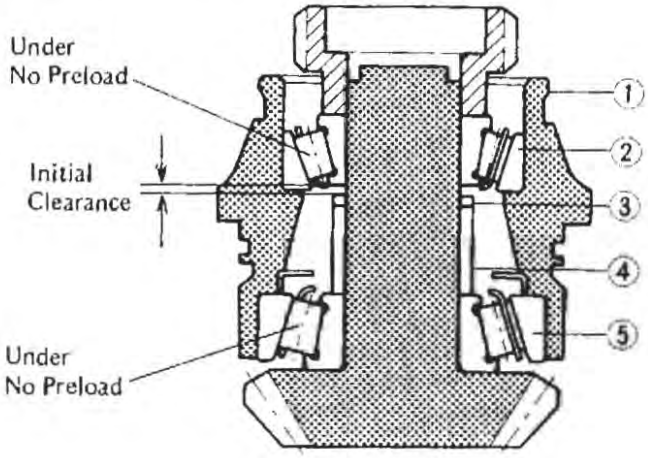
*If the preload is out of the specified range, replace the bearing collar and/or spacer. To increase preload, decrease the stack length of the collar and spacer. To decrease preload increase the stack length of the collar and spacer.

☆Change the stack length a little at a time.

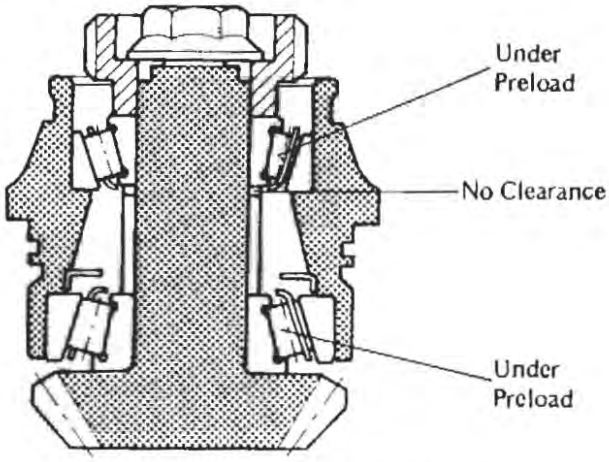
●Re-check the bearing preload, and re-adjust as necessary.

Bearing Preloading Mechanism

(A) Before Tightening



(B) After Tightening



1. Bearing Housing
2. Tapered Roller Bearing
3. Spacer
4. Collar
5. Tapered Roller Bearing

Collars for Preload Adjustment

Length (mm)	Part Number
22.8	92027-1152
22.9	92027-1153
23.0	92027-1154
23.1	92027-1155
23.2	92027-1156
23.3	92027-1157
23.4	92027-1158
23.5	92027-1159
23.6	92027-1160
23.7	92027-1161
23.8	92027-1162
23.9	92027-1163
24.0	92027-1164
24.1	92027-1165

Spacers for Preload Adjustment

Thickness (mm)	Part Number
1.70	92025-1072
1.72	92025-1073
1.74	92025-1074
1.76	92025-1075
1.78	92025-1076
1.80	92025-1077

Backlash adjustment

- Clean any dirt and oil off bevel gear teeth.
- Install the drive gear with the primary shim (1.0 mm thickness), and tighten the nut to the specified torque (see Exploded View).

NOTE

○*Do not stake the head of the nut until both backlash and tooth contact adjustments are finished.*

- Install the driven gear assembly to the front gear case with the primary shim (1.0 mm thickness), and tighten the mounting bolts to the specified torque (see Exploded View).

○Check the backlash during the tightening of the mounting bolts, and stop tightening them immediately if the backlash disappears. Then, change the shim to a thicker one.

- Install the dial gauge holder (special tool) with 6 mm bolts and nuts on the front gear case to mount a dial gauge.
- Set up a dial gauge against a drive gear tooth to check gear backlash. The gauge stem must be in line with the direction of tooth travel.
- To measure the backlash, move the drive gear back and forth while holding the driven gear steady with a suitable tool. The difference between the highest and lowest gauge readings is the amount of backlash.

★If the backlash is not within the limit, replace the gear shim(s) at the drive and/or driven gear. To increase backlash, increase the thickness of the shim(s). To decrease backlash, decrease the thickness of the shim(s).

☆Change the thickness a little at a time.

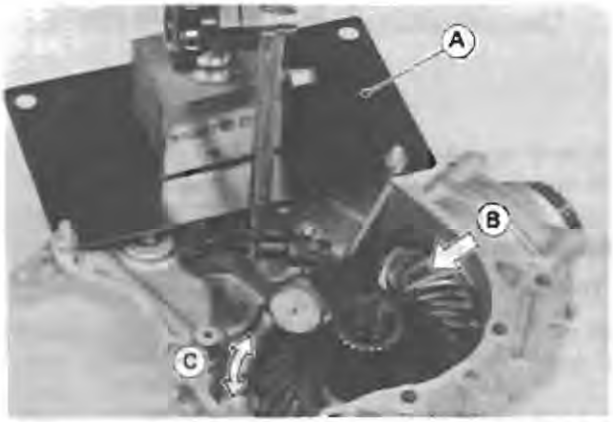
- Re-check the backlash, and re-adjust as necessary.

NOTE

○*It is OK to use the pack of two shims. Do not use the pack of three or more shims.*

Front Bevel Gear Backlash (at the gear tooth)

0.13 – 0.18 mm



A. Holder: 57001-1049
B. Hold the driven gear.
C. Move the drive gear.

Shims for Drive Gear

Thickness (mm)	Part Number
0.15	92025-1688
0.5	92025-1689
0.6	92025-1690
0.7	92025-1691
0.8	92025-1692
0.9	92025-1693
1.0	92025-1694
1.1	92025-1695
1.2	92025-1696

Shims for Driven Gear

Thickness (mm)	Part Number
0.1	92025-1724
0.15	92025-1725
0.5	92025-1726
0.6	92025-1727
0.7	92025-1728
0.8	92025-1729
0.9	92025-1730
1.0	92025-1731
1.2	92025-1732

Tooth contact adjustment

- Clean any dirt and oil off the bevel gear teeth.
- Apply checking compound to 4 or 5 teeth on the driven gear.

NOTE

○*Apply checking compound to the teeth in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.*

○*The checking compound must be smooth and firm, with the consistency of tooth paste.*

○*Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use this for checking the bevel gears.*

- Turn the driven gear for 3 or 4 revolutions in the drive and reverse (coast) directions, while creating a drag on the drive gear.
- Check the drive pattern and coast pattern of the bevel gear teeth. The tooth contact patterns of both drive and coast sides should be centrally located between the top and bottom of the tooth, and little closer to the toe of the tooth.

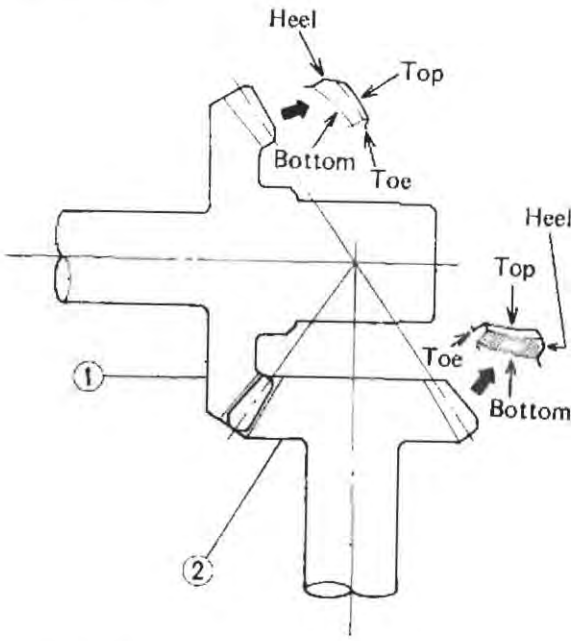
★If the tooth contact pattern is incorrect, replace the shim(s) at the drive gear and shim(s) at the driven gear, following the examples shown. Then erase the tooth contact patterns, and check them again. Also check the backlash every time the shims are replaced. Repeat the shim change procedure as necessary.

NOTE

○*If the backlash goes out of standard range after changing shims, correct the backlash before checking the tooth contact pattern.*

○*It is OK to use the pack of two shims. Do not use the pack of three or more shims.*

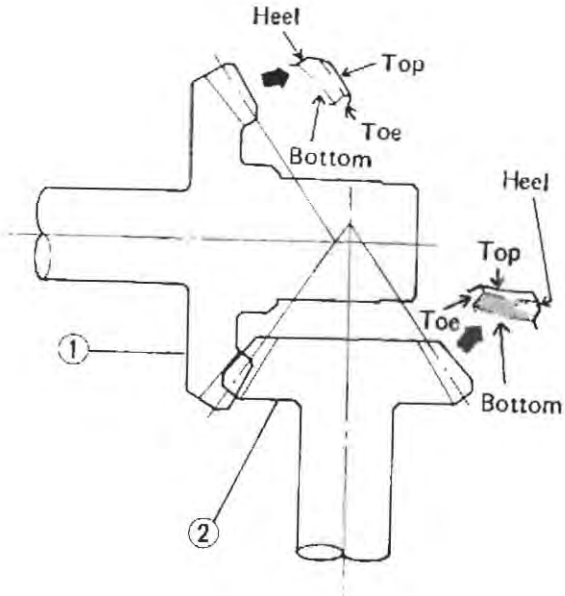
Correct Tooth Contact Pattern



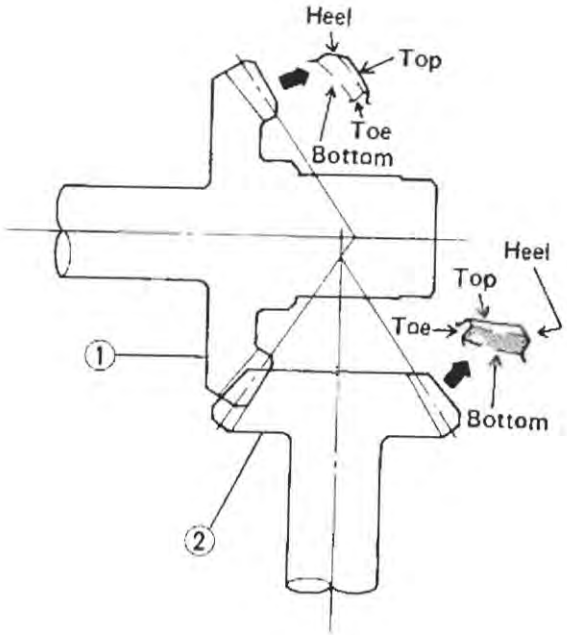
1. Drive Gear
2. Driven Gear

Incorrect Tooth Contact Patterns

Example 1: Increase the thickness of the drive gear shim(s) by 0.05 mm, and/or increase the thickness of the driven gear shim(s) by 0.05 mm to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.



Example 2: Decrease the thickness of the drive gear shim(s) by 0.05 mm, and/or decrease the thickness of the driven gear shim(s) by 0.05 mm to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.



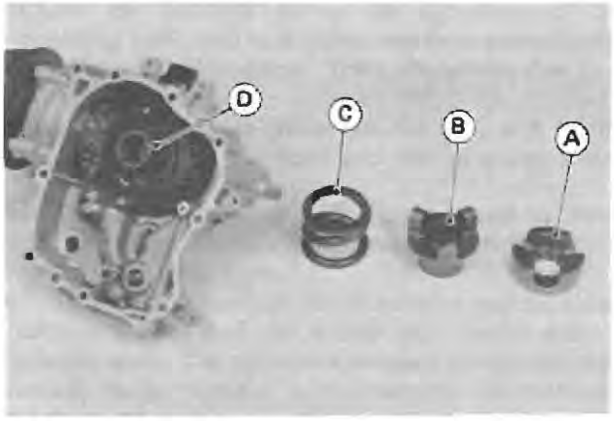
1. Drive Gear
2. Driven Gear

Bevel Gear Inspection

- Visually check the bevel gears for scoring, chipping, or other damage.
- ★Replace the bevel gears as a set if either gear is damaged.

Cam Damper Inspection

- Visually inspect the damper cam, cam follower, spring, and shaft.
- ★Replace the part if it appears damaged.



A. Cam
B. Cam Follower
C. Spring
D. Shaft

Ball Bearing Inspection

- Since the ball bearing is made 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.

Tapered Roller Bearing Inspection

- Visually inspect the bearing for abrasion, color change, or other damage.
- ★If there is any doubt as to the condition of a bearing, replace it.

Needle Bearing Inspection

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

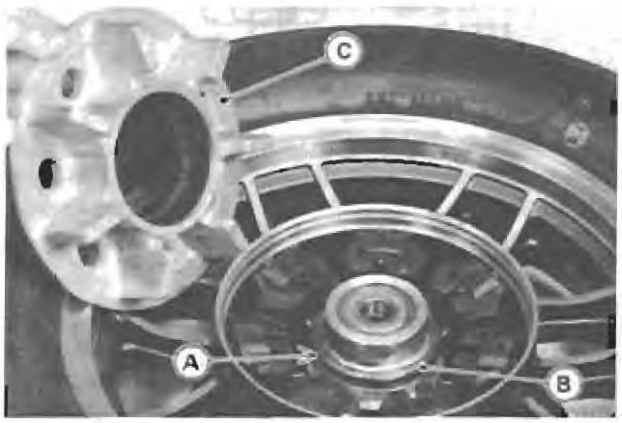
Oil Seal Inspection

- Inspect the oil seals.
- ★Replace it if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or been otherwise damaged.

Rear Wheel Coupling

Rear Wheel Coupling Installation Note

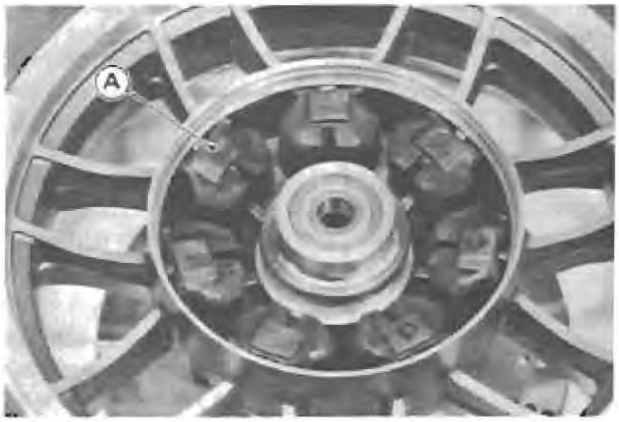
- Apply grease to the O-ring on the rear hub and install the rear wheel coupling.



A. Grease.
B. O-ring
C. Rear Wheel Coupling

Damper Inspection

- Visually inspect the rubber damper of the rear wheel coupling.
- ★If it appears damaged or deteriorated, replace it.



A. Rubber Damper

Brakes

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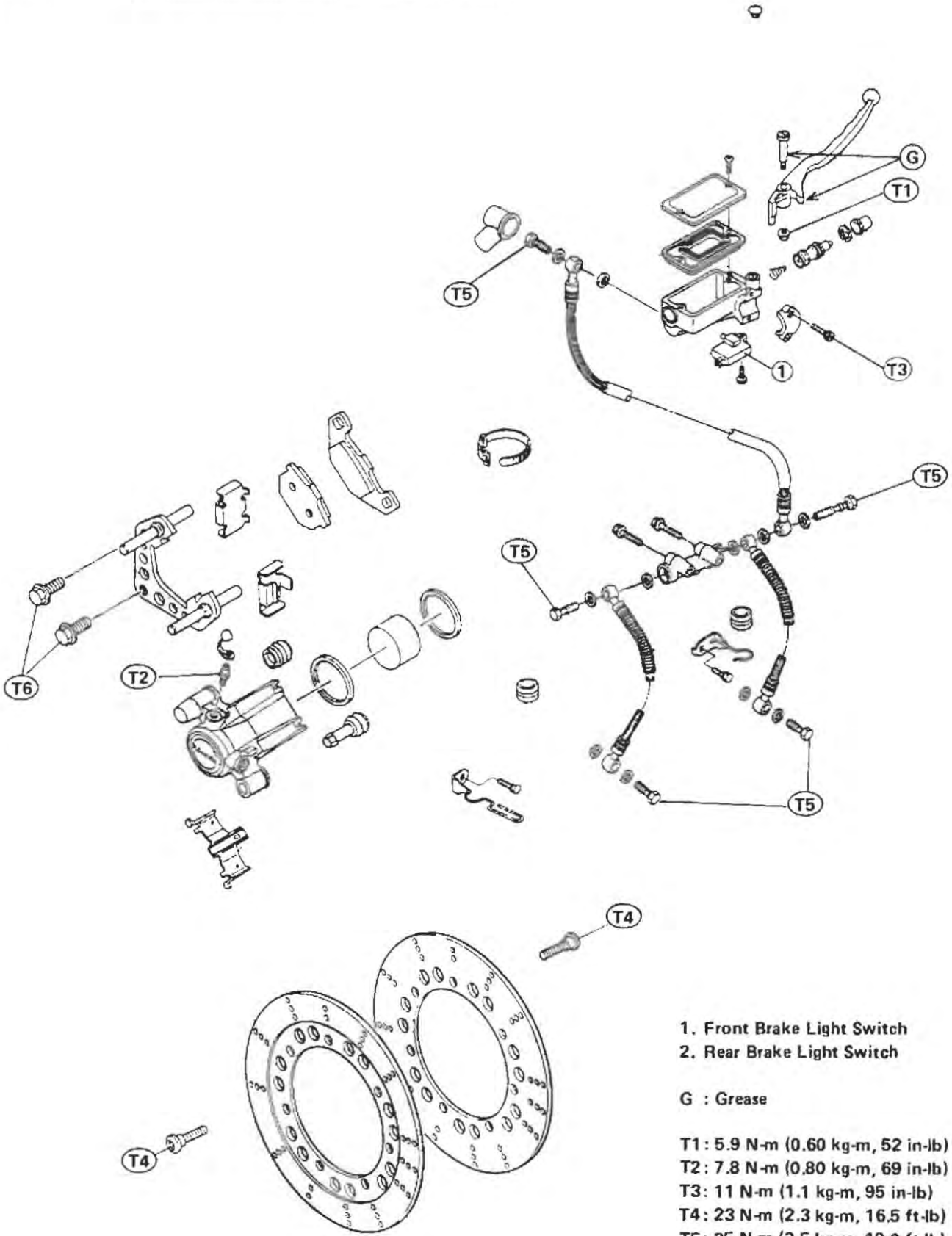
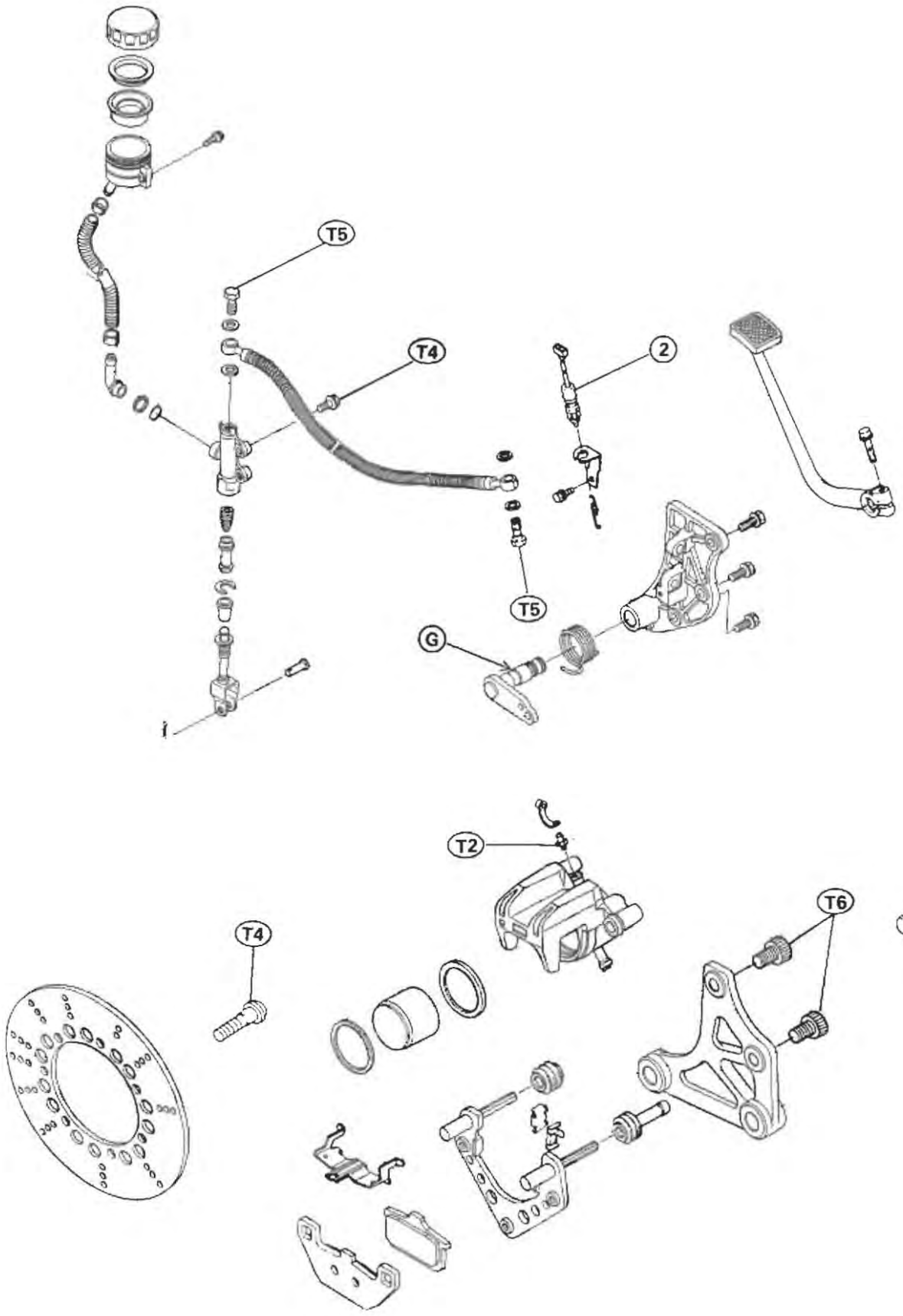
Exploded View



1. Front Brake Light Switch
2. Rear Brake Light Switch

G : Grease

T1 : 5.9 N-m (0.60 kg-m, 52 in-lb)
T2 : 7.8 N-m (0.80 kg-m, 69 in-lb)
T3 : 11 N-m (1.1 kg-m, 95 in-lb)
T4 : 23 N-m (2.3 kg-m, 16.5 ft-lb)
T5 : 25 N-m (2.5 kg-m, 18.0 ft-lb)
T6 : 32 N-m (3.3 kg-m, 24 ft-lb)
T7 : 98 N-m (10.0 kg-m, 72 ft-lb)


T5
T4
2
T5
G
T2
T4
T6
T7

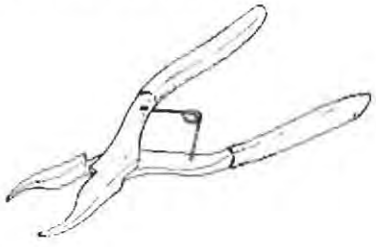
Specifications

Item			Standard	Service Limit
Brake Fluid:	Grade		D.O.T.4	
	Brand (recommended)		Castrol Girling-Universal Castrol GT (LMA) Castrol Disc Brake Fluid Check Shock Premium Heavy Duty	
Pads:	Pad Lining Thickness:		5 mm	1 mm
Discs:	Disc Thickness:	Front	4.8 – 5.1 mm	4.5 mm
		Rear	6.8 – 7.1 mm	6.0 mm
	Disc Runout		Under 0.15 mm	0.3 mm

Special Tool

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

Circlip Pliers: 57001-143



Brake Fluid

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 Disc Brake Fluid

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

WARNING

○Never reuse old brake fluid.
○Do not use fluid from a container that has been left unsealed or that has been open for a long time.
○Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
○Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
○Don't add or change the fluid in the rain or when a strong wind is blowing.
○If any of the brake line fittings or the bleed valve is opened at any time, the AIR MUST BE BLED FROM THE BRAKE.

CAUTION

○Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.

Brake Fluid Level Inspection

•Position the reservoir horizontal, and check that the fluid level in the reservoir is higher than the lower level.
*If the fluid level is lower than the lower level, check for the fluid leakage of the brake 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.

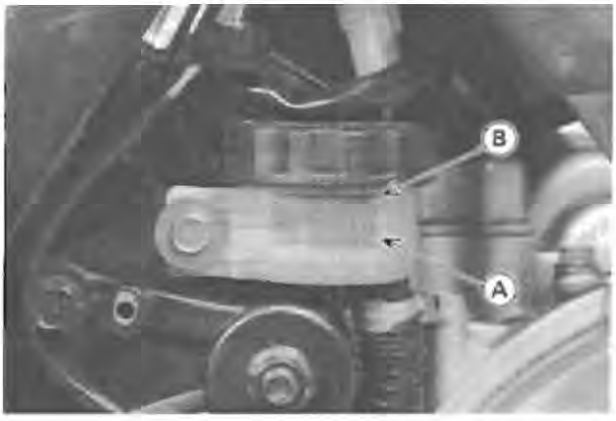
WARNING

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

Front Brake Fluid Reservoir

A. Lower Level Line B. Upper Level Line

Rear Brake Fluid Reservoir



A. Lower Level Line B. Upper Level Line

•Apply a brake forcefully for a few seconds, and check for fluid leakage around the fittings.

WARNING

○If the brake lever or pedal has a soft or "sponge feeling" when it is applied, there might be air in the brake line or the brake may be defective. Since it is dangerous to operate the vehicle under such conditions, bleed the air from the brake line immediately.

Brake Fluid Changing

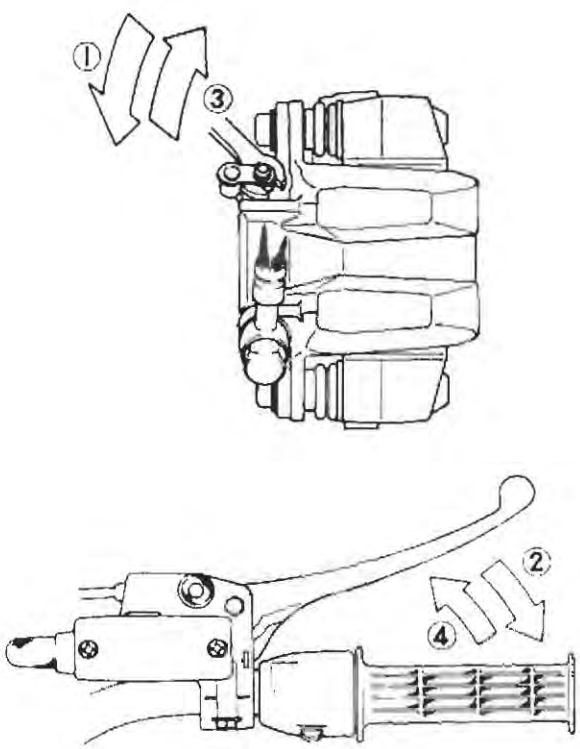
- Remove the reservoir cap, and remove the rubber cap on the bleed valve.
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Open the bleed valve (counterclockwise to open), and pump the brake lever or pedal until all the fluid is drained 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.

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.

Brake Line Air Bleeding

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

NOTE

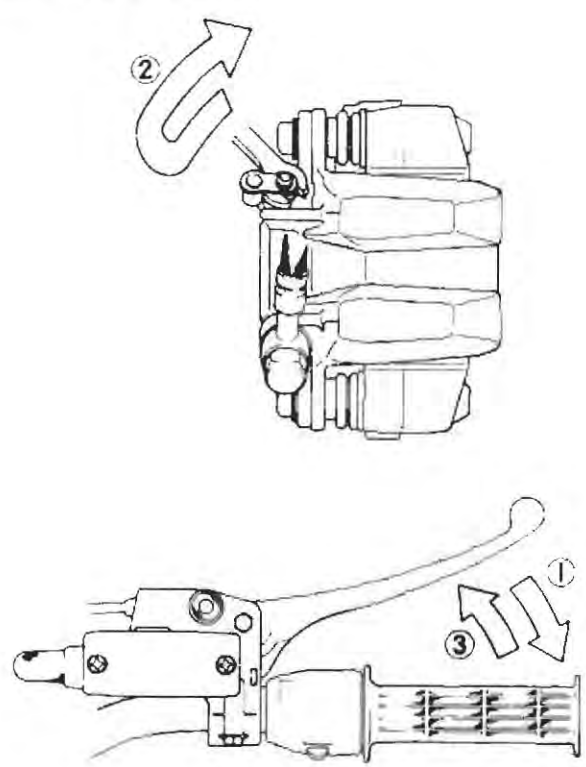
○*The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

- Connect a clear plastic hose to the bleed valve(s) at the caliper(s), running the other end of the hose into a container.
- 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.
- Front brake line:

○Pump the brake 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.

○Repeat the previous step one more time for the other side.

Bleeding the Brake Line



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

- Rear brake line:
  - 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.
- When air bleeding is finished, check that the fluid is filled to the upper level line marked in the reservoir (see Brake Fluid Level Inspection).
- Install the reservoir cap.
- Tighten the bleed valve(s) to the specified torque (see Exploded View).
- Apply the brake forcefully for a few seconds, and check for fluid leakage around the fittings.

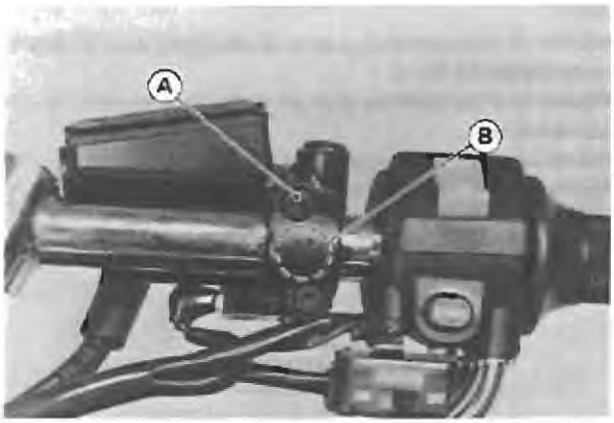
Master Cylinders

Front Master Cylinder Removal

- Disconnect the front brake light switch wires from the switch.
- Remove the front master cylinder clamp bolts and clamp, and take the master cylinder off the handlebar.

Front Master Cylinder Installation Notes

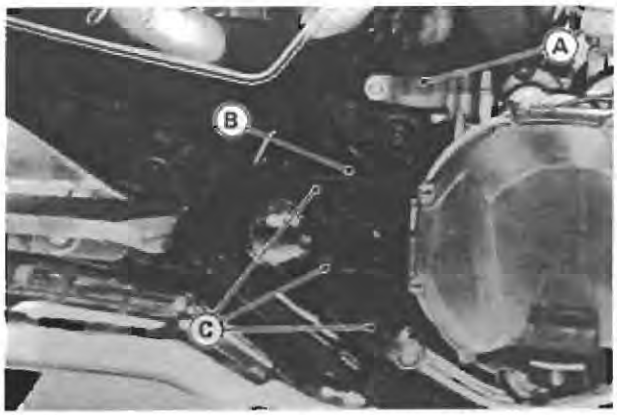
- The master cylinder clamp must be installed with the arrow mark upward.
- Tighten the upper clamp bolt first and then the lower clamp bolt to the specified torque (see Exploded View). There will be a gap at the lower part of the clamp after tightening.



A. Tighten upper clamp bolts first. B. Arrow Mark

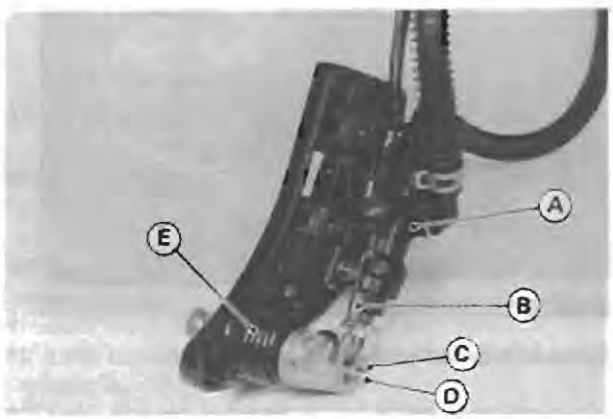
Rear Master Cylinder Removal

- Remove the reservoir mounting bolt.
- 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. Immediately wipe up any brake fluid that spills.



A. Reservoir
B. Banjo Bolt
C. Master Cylinder Bracket Bolts

- Remove the brake pedal bolt and take off the brake pedal.
- Remove the rear master cylinder bracket mounting bolts.
- Free the brake light switch spring and brake pedal shaft lever return spring.



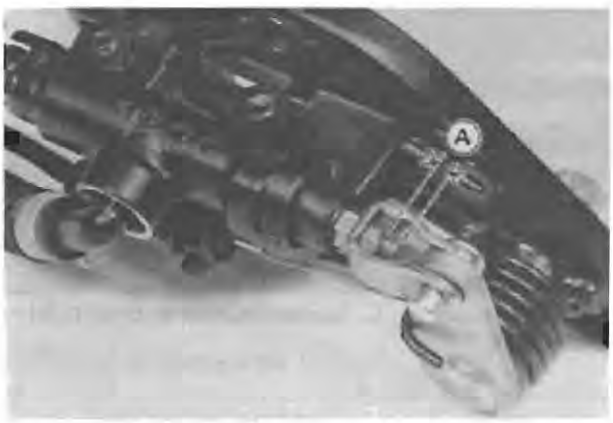
A. Master Cylinder
B. Brake Light Switch Spring
C. Cotter Pin
D. Clevis Pin
E. Lever Return Spring

- Remove the cotter pin from the clevis pin and pull out the clevis pin.
- Remove the master cylinder mounting bolts and take off the cylinder.

Rear Master Cylinder Installation Notes

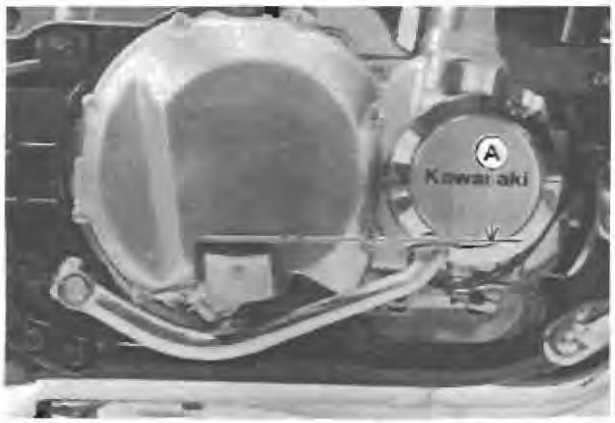
- If the brake pedal shaft is removed from the bracket, wipe the old grease off the shaft and apply a grease to the shaft.
- If the push rod clevis nut or locknut was loosened, adjust the clevis position to obtain the correct pedal position.
- To adjust the clevis position so that the push rod protrusion is 4 – 5 mm below the clevis nut, the pedal position will be the correctly.

Push Rod Protrusion



A. 4 – 5 mm

Pedal Position



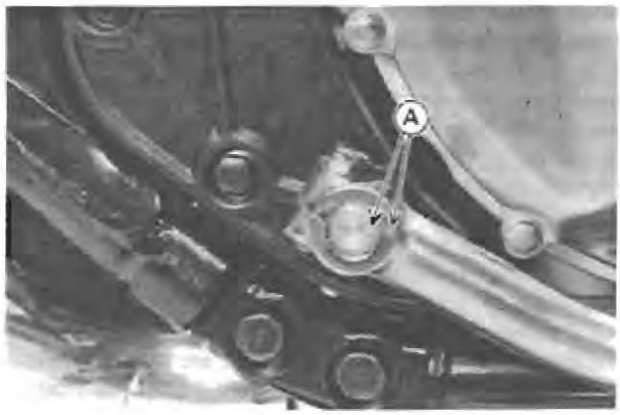
A. Level with top of footpeg.

NOTE

If the correct pedal position cannot be obtained by adjusting the push rod clevis, the pedal may be deformed or incorrectly installed.

After adjusting the clevis, tighten the locknut to the specified torque (see Exploded View).

- Tighten the rear master cylinder mounting bolts to the specified torque (see Exploded View).
- Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolts to he specified torque (see Exploded View). Be sure that the metal pipe is properly fitted into the U-shaped notch in the master cylinder.
- Install the brake pedal to the pedal shaft aligning the marks on the pedal and shaft.



A. Align marks.

- Check and adjust the rear brake light switch (see Electrical System chapter).
- Bleed the brake line after master cylinder installation.
- Check the brake for weak braking power, brake drag, and fluid leakage.

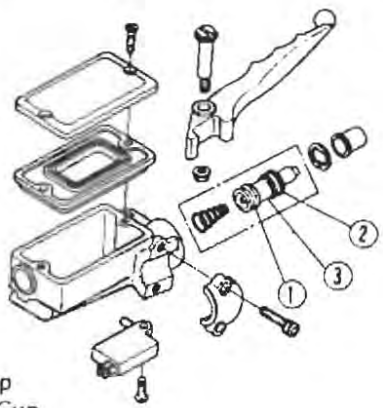
Front Master Cylinder Disassembly

- 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. Immediately wipe up any brake fluid that spills.
- Remove the reservoir 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 place.
- Remove the retainer with circlip pliers and pull out the piston with the secondary cup, and take off the primary cup and spring.

CAUTION

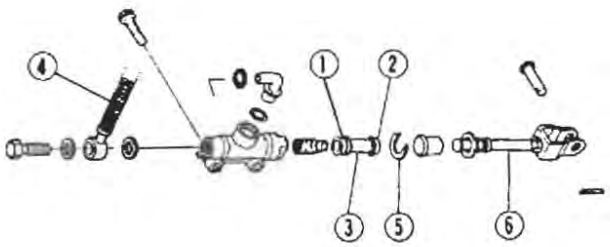
Do not remove the secondary cup from the piston since removal will damage it.

Front Master Cylinder



1. Primary Cup
2. Secondary Cup
3. Piston

Rear Master Cylinder



1. Primary Cup
2. Secondary Cup
3. Piston
4. Brake Hose
5. Retainer
6. Push Rod

●Remove the retainer with 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, and apply brake fluid to the parts removed and to the inner wall of the cylinder.

CAUTION

○**Use only 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.**

●Tighten the brake lever pivot bolt and tighten the locknut to the specified torque (see Exploded View).
●Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolt to the specified torque (see Exploded View).
●Bleed the brake line after master cylinder installation.
●Check the brake for weak braking power, brake drag, and fluid leakage.

Rear Master Cylinder Disassembly

●Remove the retainer with circlip pliers, and pull out the piston stop and push rod, as a set. Then remove the piston and secondary cup, and the spring and primary cup.

CAUTION

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

Rear Master Cylinder Assembly Notes

●Before assembly, clean all parts including the master cylinder with brake fluid or alcohol, and to apply brake fluid to the parts removed and to the inner wall of the cylinder.

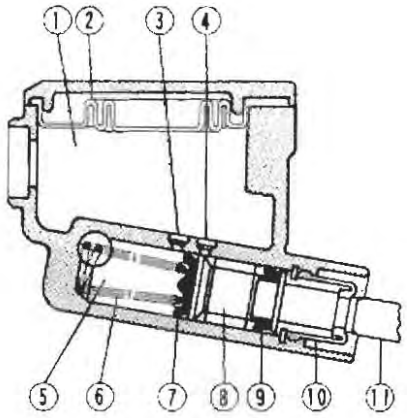
CAUTION

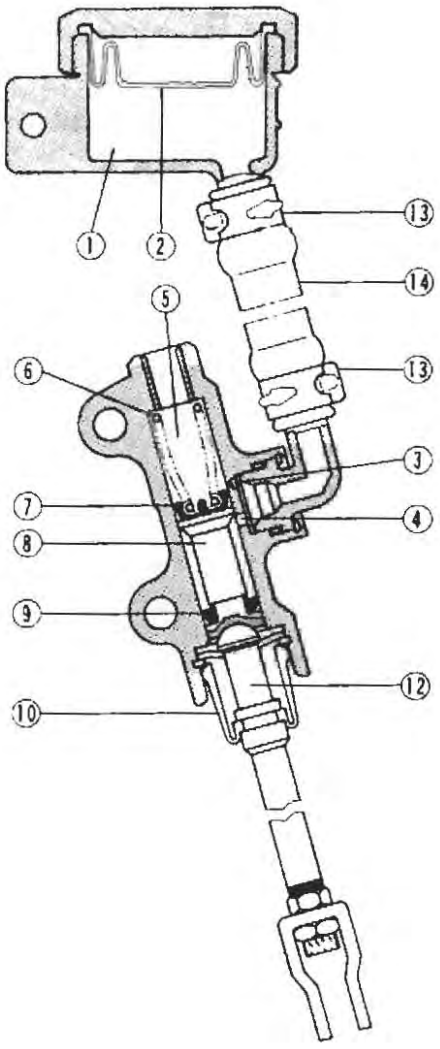
○**Use only brake fluid, isopropyl alcohol, or ethyl alcohol, for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely,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

Master Cylinder Inspection (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 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 damage.
★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 Cap
8. Piston
9. Secondary Cup
10. Dust Cover
11. Brake lever
12. Push Rod
13. Clamp
14. Hose

Calipers

Caliper Removal

●Remove the caliper mounting bolts and take the caliper off the disc.

A. Caliper Mounting Bolts

A. Caliper Mounting Bolts

Caliper Installation Notes

- Tighten the caliper mounting bolts to the specified torque (see Exploded View).
- Check the brake for weak braking power, brake drag, and fluid leakage.

WARNING

○**Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brake will not function on the first application of the lever or pedal if this is not done.**

Caliper Disassembly Notes

- 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.

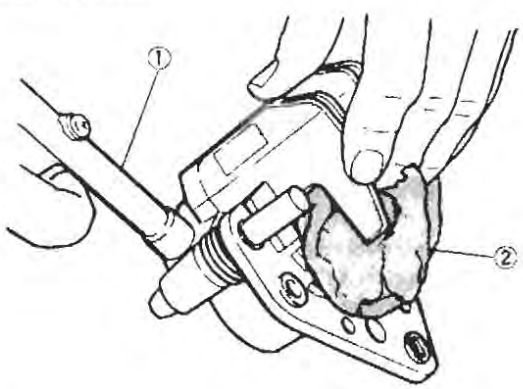
- Remove the brake hose banjo bolt and disconnect the hose from the caliper. There is a flat washer on each side of the hose fitting. Immediately wipe up any brake fluid that spills.
- Using compressed air, remove the piston.

○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.**

Piston Removal



1. Apply compressed air. 2. Cloth

Caliper Assembly Notes

- Before assembly, clean all parts including the caliper with brake fluid or alcohol, and apply brake fluid to the parts removed and to the inner wall of the caliper 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.**

- 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

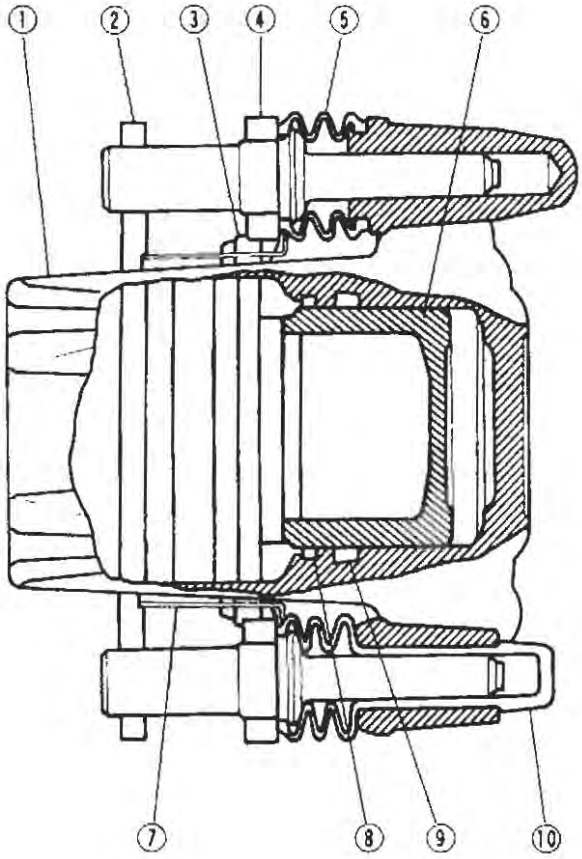
- Connect the brake hose to the caliper putting a new flat washer on each side of the brake hose fitting. Tighten the brake hose banjo bolt to the specified torque (see Exploded View).
- Bleed the brake line after caliper installation.

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.

- 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.

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

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 and 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 that the caliper holder shafts are not badly worn or stepped, or the rubber friction boots are not damaged.

★If the rubber friction boots are damaged, replace the rubber friction boots, and the caliper holder.

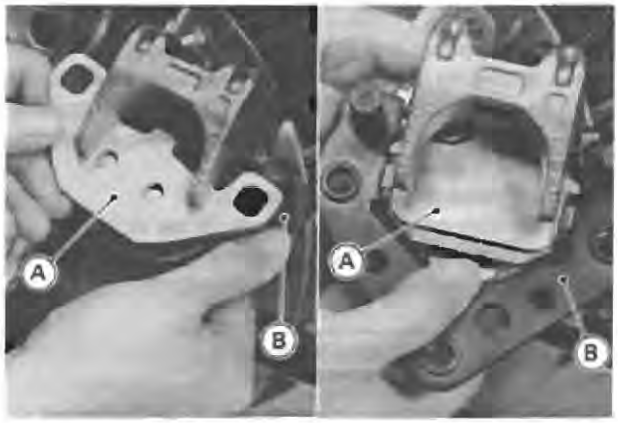
Pads

Pad Removal

•Remove the caliper. The brake hose disconnection is not required.

•Take the piston-side pad out of the caliper holder.

•Push the caliper holder forward the piston, and then remove the pad from the caliper holder shafts.



A. Pad B. Caliper Holder

Pad Installation Notes

•Before installation, clean the pads with a high flash point solvent.

WARNING

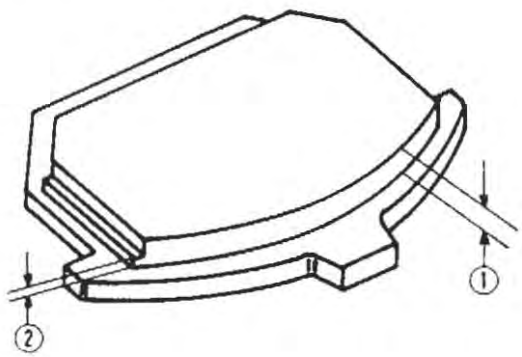
○**When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.**

•Push the caliper piston in by hand as far as it will go, and then install the pads.

Lining 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	**5 mm**
Service Limit	**1 mm**

Discs

Disc Removal

•Remove the front or rear wheel.
•Remove the disc mounting Allen bolts and take off the disc.

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.

Disc Installation Notes

•The minimum thickness of the disc is marked on the disc. Install the disc with the marked side facing out.

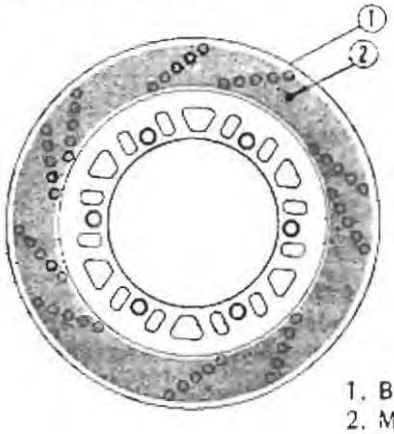
A. Minimum Thickness Marking

•Tighten the disc mounting Allen bolts to the specified torque (see Exploded View).

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.

Disc Wear Measurement



1. Brake Disc
2. Measuring Area

Front Disc Thickness

Standard	**4.8 – 5.1 mm**
Service Limit	**4.5 mm**

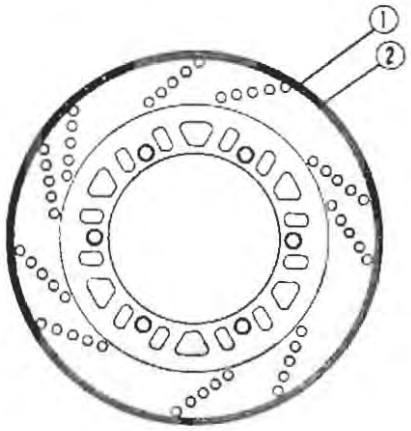
Rear Disc Thickness

Standard	**6.8 – 7.1 mm**
Service Limit	**6.0 mm**

Disc Warp

•Set up a dial gauge against the disc at the point as shown in the figure, and measure disc runout.
★If runout exceeds the service limit, replace the disc.

Disc Warp Measurement



1. Brake Disc
2. Measuring Area

Disc Runout

Standard	**Under 0.15 mm**
Service Limit	**0.3 mm**

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.

Brake Hose Replacement

•Pump the brake fluid out of the line as explained in the Brake Fluid Changing.
•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 master 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 putting a new flat washer on each side of the brake hose fitting.
•Tighten the brake hose banjo bolts to the specified torque (see Exploded View).

Suspension

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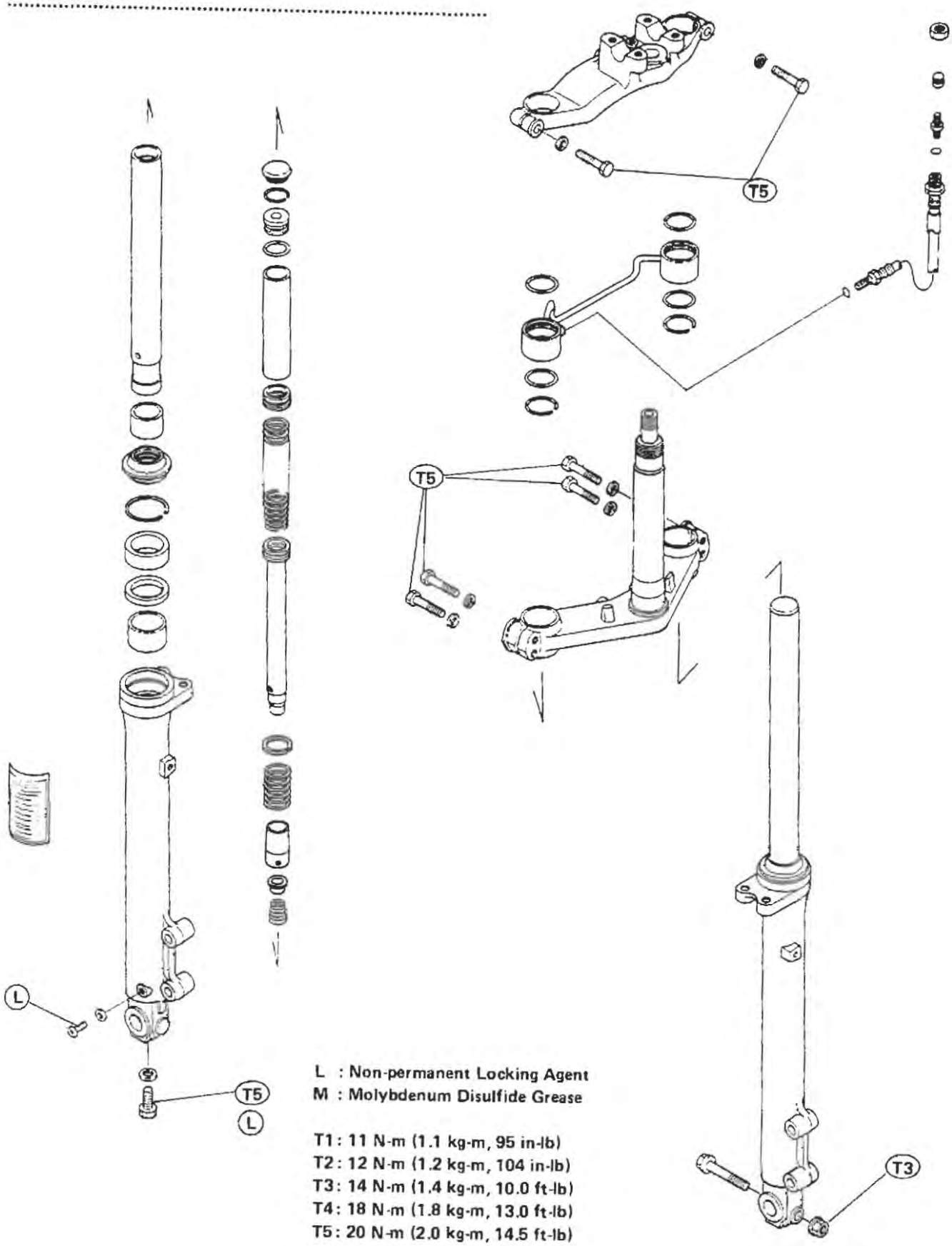
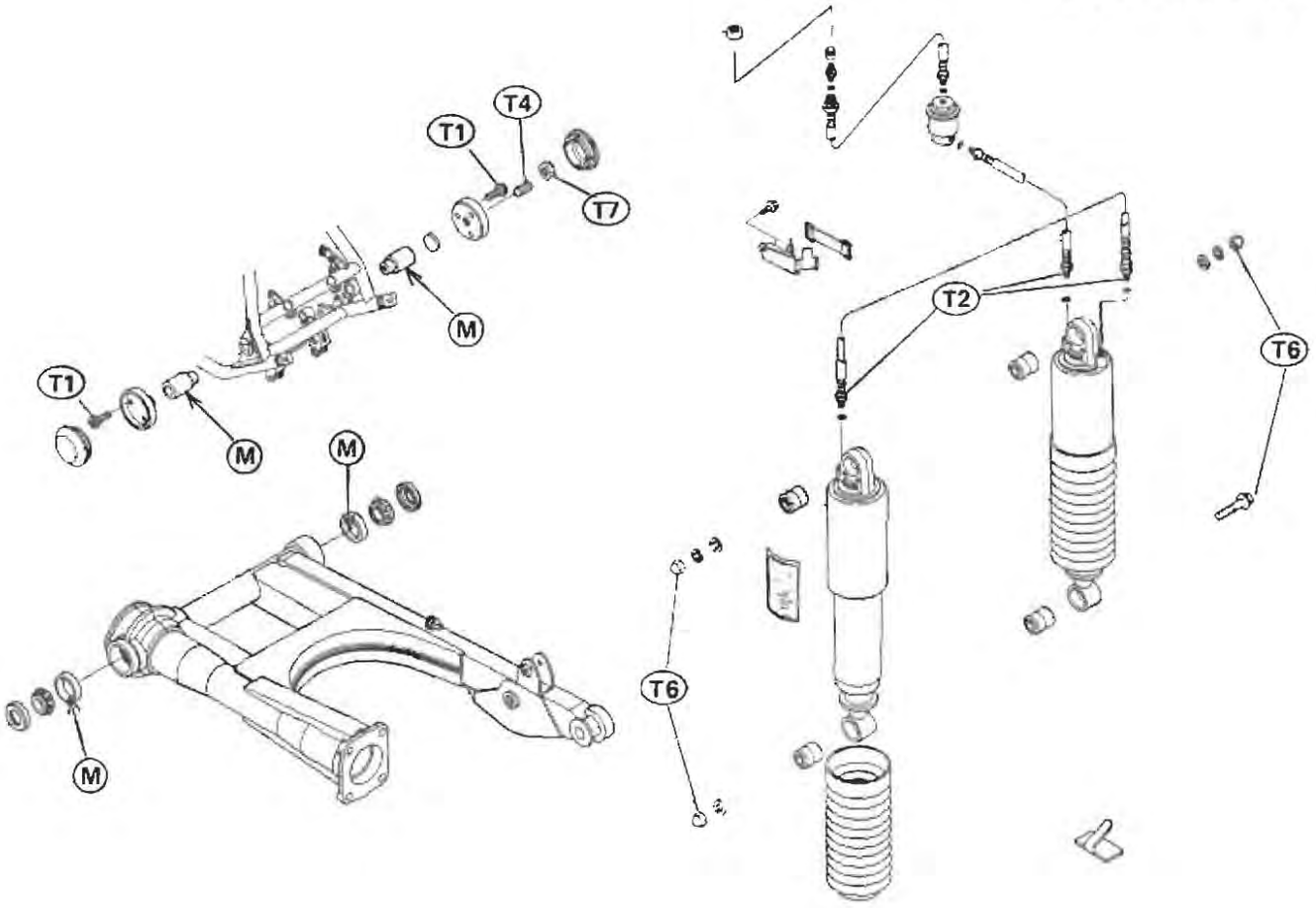
Exploded View



L : Non-permanent Locking Agent
M : Molybdenum Disulfide Grease

T1: 11 N-m (1.1 kg-m, 95 in-lb)
T2: 12 N-m (1.2 kg-m, 104 in-lb)
T3: 14 N-m (1.4 kg-m, 10.0 ft-lb)
T4: 18 N-m (1.8 kg-m, 13.0 ft-lb)
T5: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T6: 30 N-m (3.1 kg-m, 22 ft-lb)
T7: 53 N-m (5.4 kg-m, 39 ft-lb)



Specifications

Item	Standard
Front Fork:	
Air Pressure	50 kPa (0.5 kg/cm², 7.1 psi)
	Usable Range: 40 – 60 kPa (0.4 – 0.6 kg/cm², 5.7 – 8.5 psi)
Fork Oil: Viscosity	SAE10W20
Amount/Side	391 ±2.5 mL
Oil Level	160 ±2 mm (Fully compressed)
Rear Shock Absorbers:	
Air pressure	150 kPa (1.5 kg/cm², 21 psi)
	Usable Range: 150 – 250 kPa (1.5 – 2.5 kg/cm², 21 – 36 psi)
Damping Force	No. 2 of 4 positions
Shock Absorber Oil:	
Viscosity	SAE5W
Oil Capacity/Side	230 mL
Air Chamber Capacity/Side	160 mL

Special Tools

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

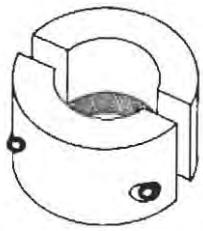
Front Fork Cylinder Holder Handle: 57001-183

Adapter: 57001-1057

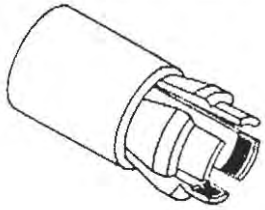
Oil Seal and Bearing Remover: 57001-1058

Bearing Driver Set: 57001-1129

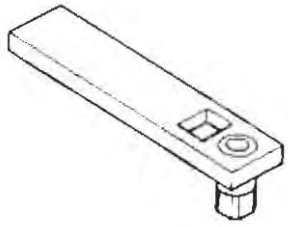
Fork Outer Tube Weight: 57001-1218



Fork Oil Seal Driver: 57001-1219



Socket Wrench Holder: 57001-1225



Front Fork

Air Pressure Adjustment

- Put the motorcycle on its center stand, and raise the front wheel off the ground using a jack or other suitable stand under the engine.
- Check and adjust the air pressure when the front fork is cold (room temperature).

NOTE

- *Do not use tire gauges for checking the air suspension's air pressure. They may 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 250 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 or 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.**

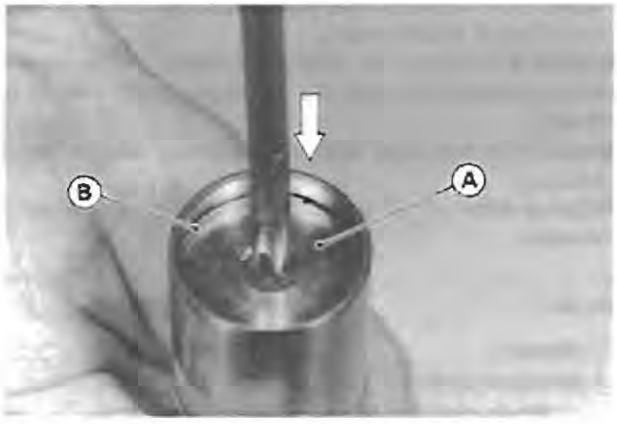
A. Air Valve

Front Fork Air Pressure

Standard:	50 kPa (0.5 kg/cm², 7.1 psi)
Usable Range:	40 – 60 kPa (0.4 – 0.6 kg/cm², 5.7 – 8.5 psi)

Fork Oil Change

- Remove the front fork legs.
- Remove the cap, retaining ring, and top plug from the fork leg.
- Pushing the top plug down, remove the retaining ring.

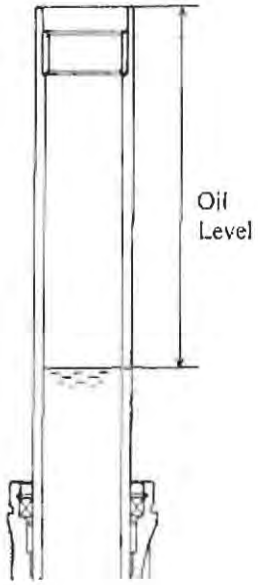


A. Top Plug B. Retaining Ring

- Pull out the collar, oil filter, and spring.
- Pour out the fork oil into a suitable container, pumping as necessary to empty out all the oil.
- 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 compressed and held upright, 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.**

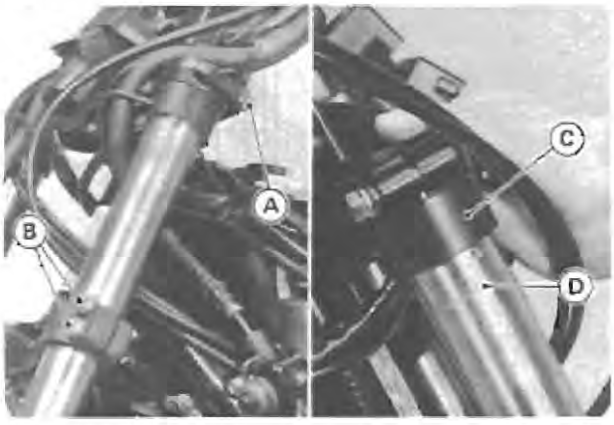
- Inspect the O-ring on the top plug, and replace it with a new one if it is damaged.
- Install the spring, oil filter, and collar. The spring must be installed with the small diameter end of it down.
- Install the top plug with the retaining ring. Install the cap.
- Change the oil of the other fork leg in the same manner.

Fork Oil

Viscosity	**SAE10W20**
Amount per side	
When changing oil:	**330 mL**
After disassembly and completely dry:	**391 ±2.5 mL**
Level	**160 ±2 mm (fully compressed)**

Front Fork Removal (each fork leg)

- Release the air pressure from the fork.
- Remove the following.
  - Front Wheel
  - Front Fender
  - Fairing
- Remove the caliper from the fork leg to be removed, and rest the caliper on some kind of stand so that it doesn't dangle.
- Loosen the upper and lower fork clamp bolts.
- Holding the connecting pipe, work the fork leg down and out of the stem head and connecting pipe with a twisting motion.

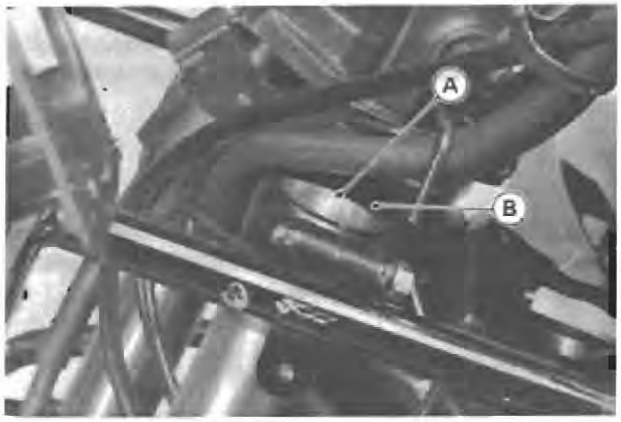


A. Upper Clamp Bolt
B. Lower Clamp Bolts
C. Connecting Pipe
D. Retaining Ring

- Remove the connecting pipe retaining ring toward the fork leg top, and slide the fork leg off the stem base.
- Stick a piece of tape over the air hole to keep the oil from running out of the fork.

Front Fork Installation Notes (each fork leg)

- Route the control cables, clutch and brake hoses, and electrical wirings correctly.
- The connecting pipe is between the stem head and the retaining ring on the fork leg.
- Install the fork leg so that the top of the inner tube is aligned with the upper surface of the stem head.

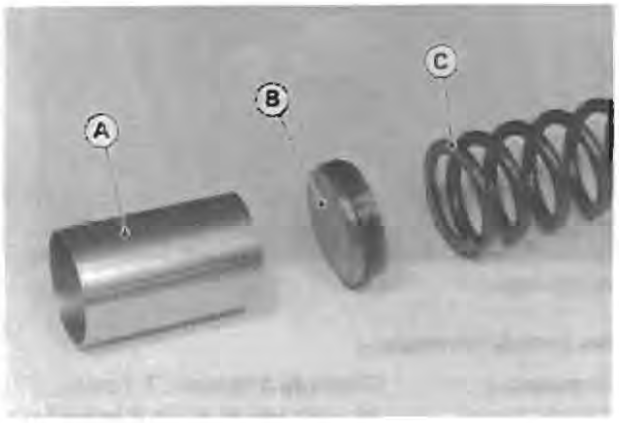


A. Inner Tube Top
B. Upper Surface of Stem Head

- Tighten the upper and lower clamp bolts to the specified torque (see Exploded View).
- Adjust the front fork air pressure.

Fork Leg Disassembly

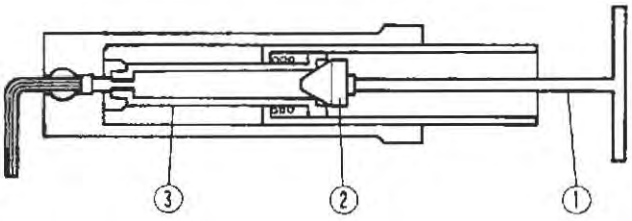
- Remove the cap, retaining ring, and top plug.
- ○Pushing the top plug down, remove the retaining ring.
- Pull out the collar, oil filter, and spring.



A. Collar
B. Oil Filter
C. Spring

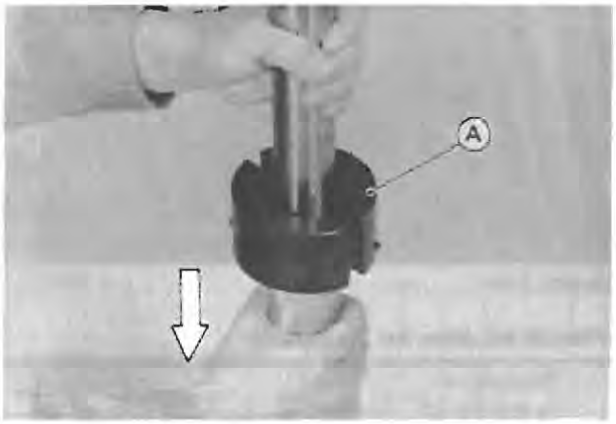
•Pour out the fork oil into a suitable container.
•Remove the axle clamp bolt and nut if it is the right fork leg.
•Stop the cylinder from turning by using the front fork cylinder holder handle and adapter (special tools). Unscrew the Allen bolt and take the bolt and gasket out of the bottom of the outer tube.

Front Fork Cylinder Removal



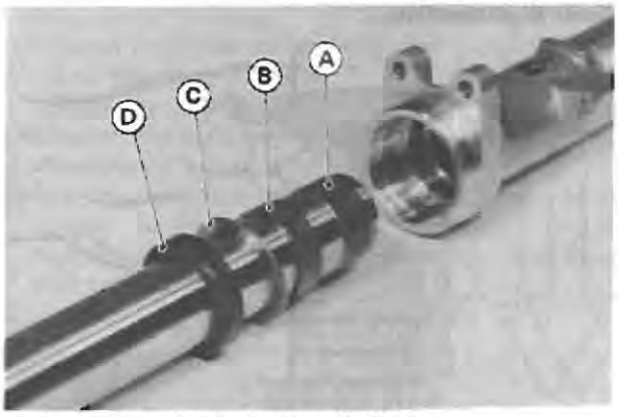
1. Front Fork Cylinder Holder Handle: 57001-183
2. Adapter: 57001-1057
3. Front Fork Cylinder

•Remove the cylinder unit and the short spring from the top of the front fork tube.
•Separate the inner tube from the outer tube.
○Remove the dust seal and retainer from the outer tube top.
○Mount the weight (special tool) on the top of the outer tube, by fitting the step of the weight to the top corner of the outer tube.
○Holding the inner tube by hand in a vertical position, stroke the outer tube several times and pull it down.



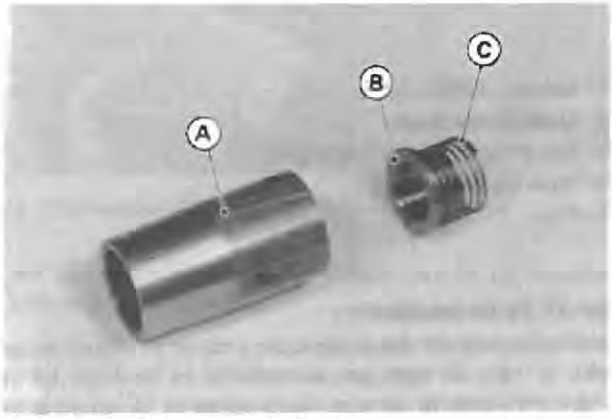
A. Fork Outer Tube Weight: 57001-1218

○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

•There is the cylinder base, valve, and spring at the outer tube bottom.

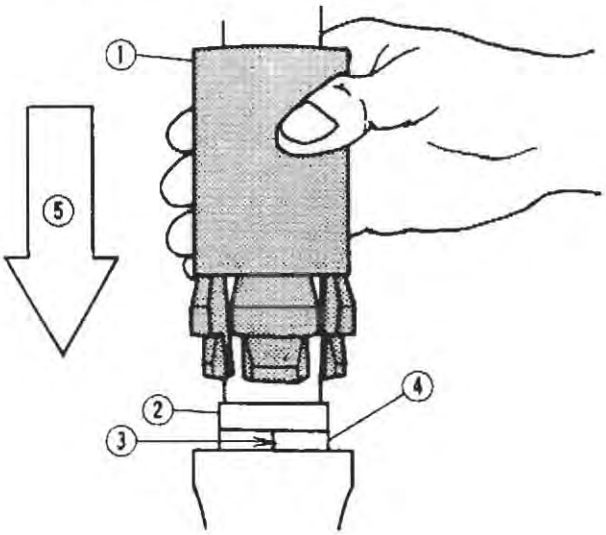


A. Cylinder Base
B. Valve
C. Spring

Fork Leg Assembly Notes

•Inspect the guide bushes (see Guide Bush Inspection), and replace them with new ones if necessary.
•Check the top plug O-ring for damage. Replace it with new one if damaged.
•Apply a non-permanent locking agent to the threads of the Allen bolt. Tighten the Allen bolt to the specified torque (see Exploded View), using the front fork cylinder holder handle and adapter (special tools) to stop the cylinder from turning.
•Use the fork oil seal driver (special tool) to install the guide bush and the oil seal in the front fork.
○Install the guide bush (with a used guide bush or washer on it) by tapping the used guide bush or washer with the driver until it stops. The slit of the bush must be faced toward the left or right.
•If the drain screw was removed, check the gasket for damage. Replace the damaged gasket with a new one. Before installing the drain screw, apply a non-permanent locking agent to the threads of the screw, and tighten the screw securely.
•Pour in the type and amount of fork oil specified and adjust the oil level.
•Install the long spring with the small diameter end of it down.

Guide Bush Installation



1. Driver: 57001-1219
2. Used Guide Bush
3. Slit (toward the left or right)
4. New Guide Bush
5. 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 damage.

★If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

CAUTION

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

Guide Bush Inspection

- Visually inspect the guide bushes.

★Replace them if necessary.

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.

Rear Shock Absorbers

Air Pressure Adjustment

- Put the motorcycle up on its center stand to raise the rear wheel off the ground.
- Check and adjust the air pressure when the rear shock absorbers are cold (room temperature).

NOTE

○Do not use tire gauges 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 500 kPa (5.0 kg/cm², 71 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 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

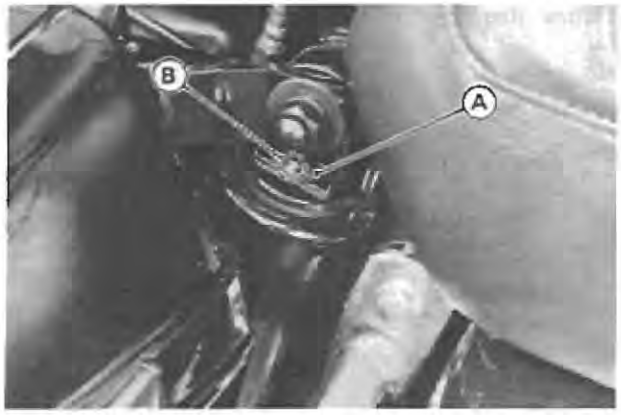
Air Pressure Usable Range kPa (kg/cm², psi)	Setting	Load	Road
150 (1.5, 21) ↑↓ 250 (2.5, 36)	Soft ↑↓ Hard	Light ↑↓ Heavy	Good ↑↓ Bad

NOTE

○*The recommended air pressure is 150 kPa (1.5 kg/cm², 21 psi) for average rider with no accessories.*

Damping Force Adjustment

- Turn the adjusters to the desired number until you feel a click. The numbers on the adjuster show the setting position of the damper.
- Be sure to turn both adjusters to the same setting position.



A. Damper Adjuster B. Position Number

WARNING

○**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**

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:*

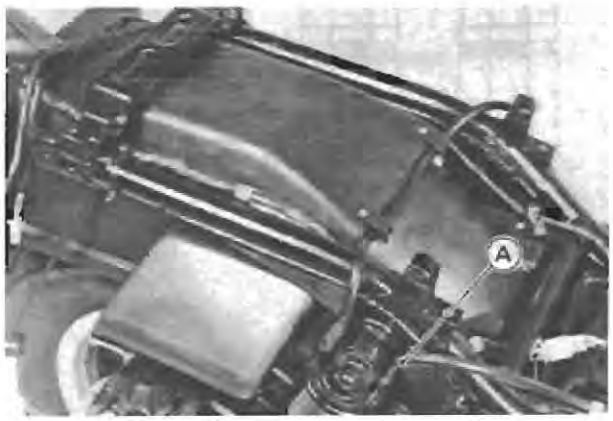
○*The recommended setting position is the No. 2 position for one rider with no accessories.*

Damper Force

Setting Position	Damping Force	Setting	Load	Road	Speed
1	↓	Soft	Light	Good	Low
2		↕	↕	↕	↕
3		↕	↕	↕	↕
4	Stronger	Hard	Heavy	Bad	High

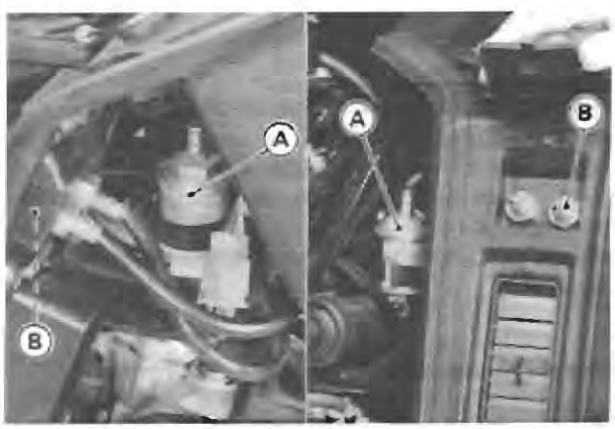
Rear Shock Absorber Removal

- Support the motorcycle on its center stand.
- Release the air pressure from the rear shock absorbers.
- Remove the following.
  Travel Trunk and Bracket
  Rear Seat
  Saddlebags and Brackets
- Remove the nuts and bolt holding the rear shock absorbers.
- Pull the shock units off their mounting studs and disconnect the air hose from the oil separator. Plug the hose fitting hole on the right shock unit to keep the oil from running out of the unit.



A. Disconnect this hose.

- If the oil separator and air valve are to be removed, remove the following.
  Fairing
  Dummy Tank Cover
  Front Seat



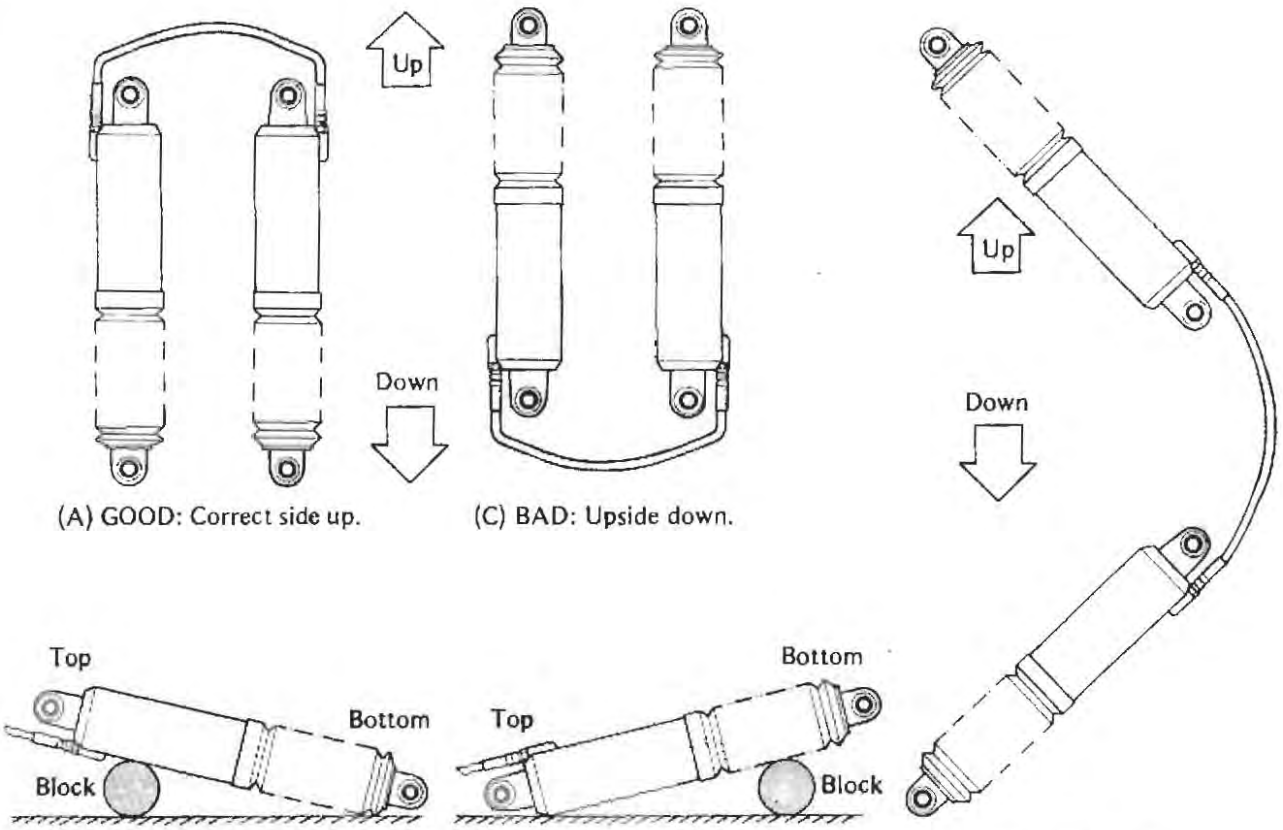
A. Oil Separator B. Air Valve

NOTE

○*Do not compress only one of the shock units. If this is done, the damper oil may flow out through the connecting hose to the other shock unit, and the oil levels will change.*

○*After removal, place the shock units so that the correct side is up. If they are left upside down or in other incorrect conditions, the oil in the shock unit may flow through the connecting hose and the oil level may change.*

Placing Methods of Rear Shock Absorbers



(A) GOOD: Correct side up.
(C) BAD: Upside down.
(B) GOOD: Top is higher.
(D) BAD: Top is lower.
(E) BAD: Oil flows.

Rear Shock Absorber Installation Notes

- Before installing the rear shock absorbers, connect the air hose from the oil separator if it was disconnected. Tighten the hose fitting to the specified torque (see Exploded View).
- Install each shock unit with the damper adjuster faced out.
- Install the shock absorber mounting nuts and bolt. Each nut has a large flat washer, and each upper nut has lockwasher additionally.
- Tighten the mounting nuts and bolt to the specified torque (see Exploded View).
- Adjust the air pressure and damping force.

Rear Shock Absorber Installation

A. Front

Rear Shock Absorber Oil Filling

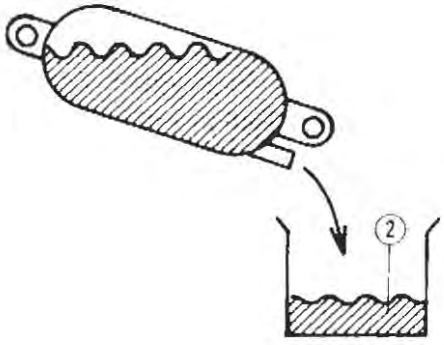
- Disconnect the air hose from the shock unit.
- Fill the shock unit with the specified oil from the hose fitting hole.

Shock Absorber Oil (per one unit)

Oil Viscosity:	**SAE5W**
Oil Capacity:	**230 mL**
Air Chamber Capacity:	**160 mL**

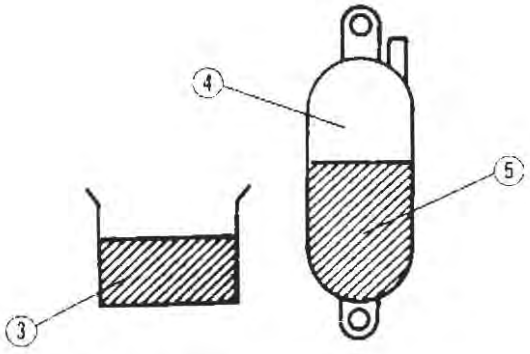
1. Hose Fitting Hole: Fill the shock unit with the specified oil.

•Drain the oil until the removed oil volume comes to the specified air chamber capacity.



2. Removed Oil

•Stop to remove the oil when the removed oil volume becomes equal to the specified air chamber volume.
○The shock unit should have a specified amount of oil.

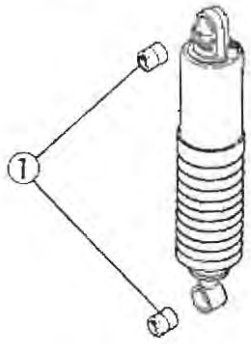


3. Removed Oil (equal to air chamber volume)
4. Specified Air Chamber Capacity
5. Specified Oil Capacity

Rear Shock Absorber Inspection

•Since the rear shock absorbers are sealed units which cannot be disassembled, only external checks are necessary.
★If one unit is damaged, replace both shock absorbers as a set. If only one unit is replaced and the two are not balanced, motorcycle instability at high speeds may result.
•Check the rubber bushings.
★Replace any that are worn, cracked, hardened, or otherwise damaged.

Rear Shock Absorber Rubber Bushings



1. Rubber Bushings

Rear Shock Absorber Scrapping

•Before a rear shock absorber is scrapped, release any air pressure and oil completely by removing the air hoses.

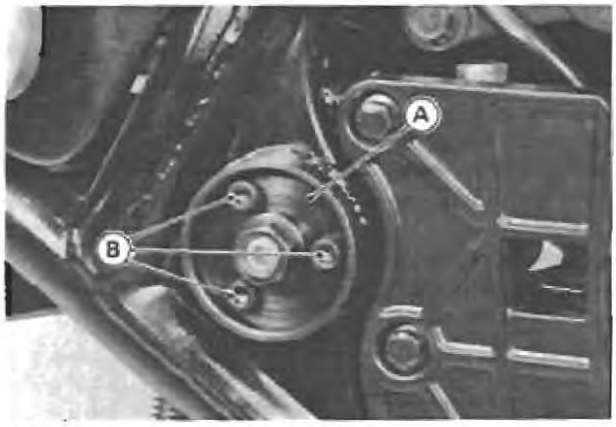
WARNING

○**Do not incinerate a shock absorber without first removing the air hose or it may explode.**

Swing Arm

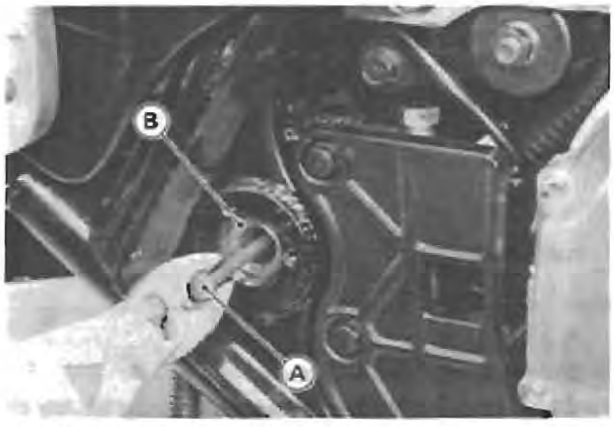
Swing Arm Removal

•Remove the following.
Travel Trunk and Bracket
Saddlebags and Brackets
Rear Wheel
Final Gear Case
•Remove the mounting bolt from the lower end of the right shock absorber.
•Free the brake hose from the clamps on the swing arm.
•Pry off the swing arm pivot caps.
•Unscrew the Allen bolts to remove the shaft retainers on both sides.



A. Retainer B. Bolts

•While holding the swing arm, pull out the swing arm shafts using a suitable bolt or screw.

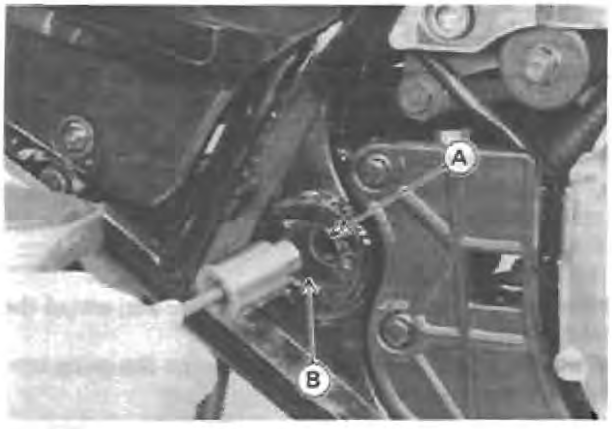


A. A Suitable Bolt or Screw
B. Swing Arm Shaft

•Pull back the swing arm and take it off.

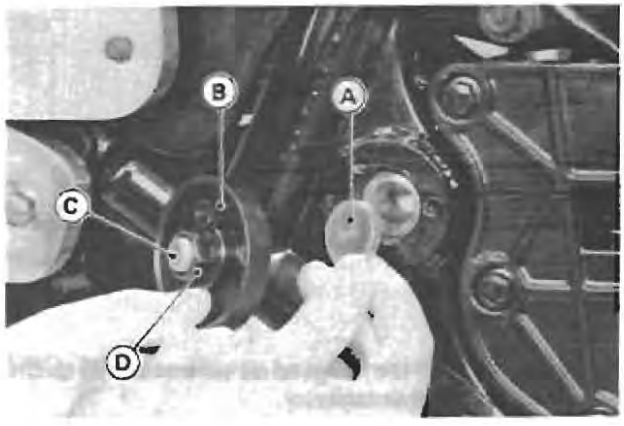
Swing Arm Installation Notes
(including Swing Arm Alignment)

•Grease the swing arm shaft holes with a molybdenum disulfide grease and install the swing arm shafts.



A. Swing Arm Shaft Hole B. Grease.

•Align the swing arm as the following sequence.
○Install the left shaft retainer and tighten the Allen bolts to the specified torque (see Exploded View).
○Install the spacer and right shaft retainer. Temporarily tighten the retainer mounting Allen bolts.



A. Spacer C. Adjuster
B. Retainer D. Locknut

○Screw in the adjuster until it stops and tighten it to the specified torque (see Exploded View).
○Using the socket wrench holder (special tool), tighten the adjuster locknut to the specified torque (see Exploded View) while keeping the adjuster from turning.

A. Socket Wrench Holder: 57001-1225

○Tighten the right shaft retainer mounting Allen bolts to the specified torque (see Exploded View).
•Move the swing arm up and down to check for abnormal friction, and push and pull it from side to side to check for bearing play (see Swing Arm Bearing Inspection).

Swing Arm Bearing Removal

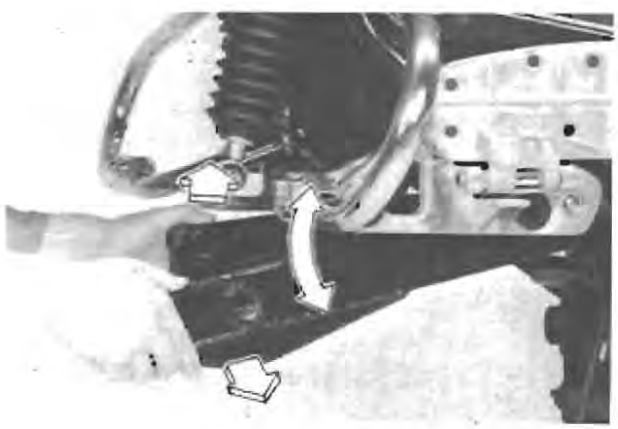
- Pull out the grease seals and tapered roller bearing inner races.
- Pull out the outer races of the tapered roller bearings using the oil seal and bearing remover (special tool: P/N 57001-1058).

Swing Arm Bearing Installation

- Lubricate the swing arm bearings before installation (see Swing Arm Bearing Lubrication).
- Use the bearing driver set (special tool: P/N 57001-1129) to press in the tapered roller bearing outer races and grease seals.

Swing Arm Bearing Inspection

- Remove the rear wheel, both rear shock absorbers, and final gear case.
- Move the swing arm up and down to check for abnormal friction, and push and pull it from side to side to check for bearing play.



★If abnormal friction is felt, the bearings are damaged. Replace both left and right bearings and grease seals.

★The play developed during use may indicate bearing damage. In this case, remove the swing arm and inspect the bearings. Replace both left and right bearings if one of the bearings is damaged.

Swing Arm Bearing Lubrication

- Remove the swing arm, and remove the grease seals from both sides of the swing arm.
- Clean out the old grease from the bearings, and apply a molybdenum disulfide grease to them.

A. Grease.

- Install the new grease seals, smearing them with a thin coat of molybdenum disulfide grease.
- Install the swing arm.

Steering

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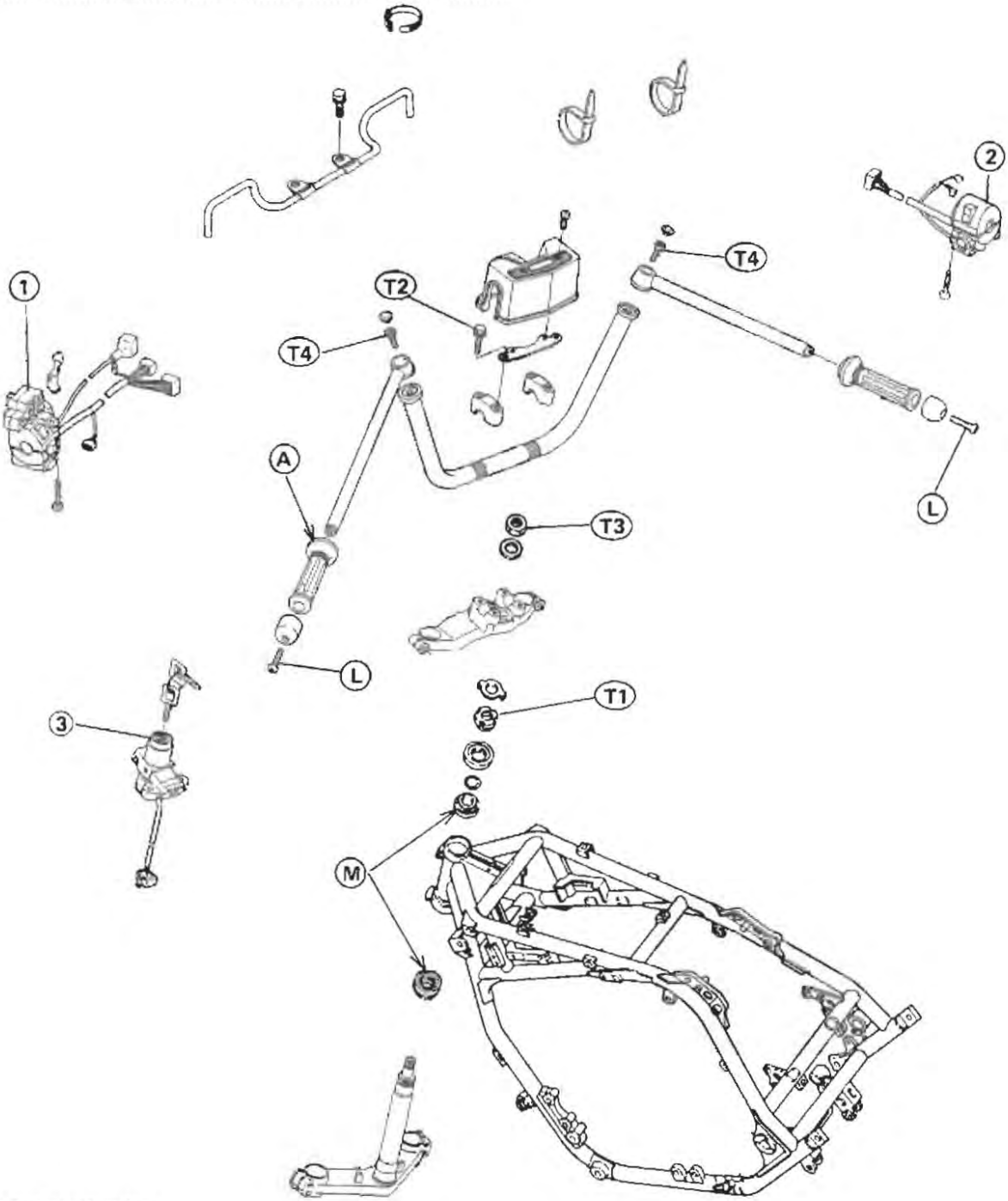
Exploded View



1. LH Switch Housing
2. RH Switch Housing
3. Ignition Switch

A : Adhesive Agent
L : Non-permanent Locking Agent
M : Molybdenum Disulfide Grease

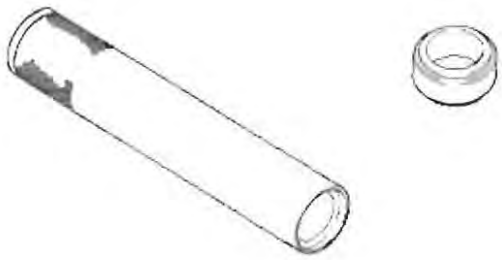
T1: 11 N-m (1.1 kg-m, 95 in-lb)
T2: 27 N-m (2.8 kg-m, 20 ft-lb)
T3: 42 N-m (4.3 kg-m, 31 ft-lb)
T4: 44 N-m (4.5 kg-m, 33 ft-lb)

Special Tools

Along with common head tools, the following more specialized tools are required for complete steering servicing.

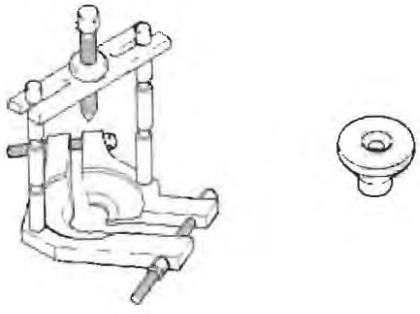
Stem Bearing Driver: 57001-137

Adapter: 57001-1074



Bearing Puller: 57001-158

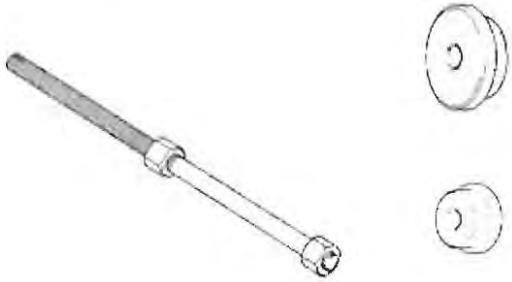
Adapter: 57001-317



Driver Press Shaft: 57001-1075

Driver: 57001-1077

Driver: 57001-1106



Stem Nut Wrench: 57001-1100

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.
- Use a jack under the engine to lift the front wheel off the ground.

Checking for steering too tight:

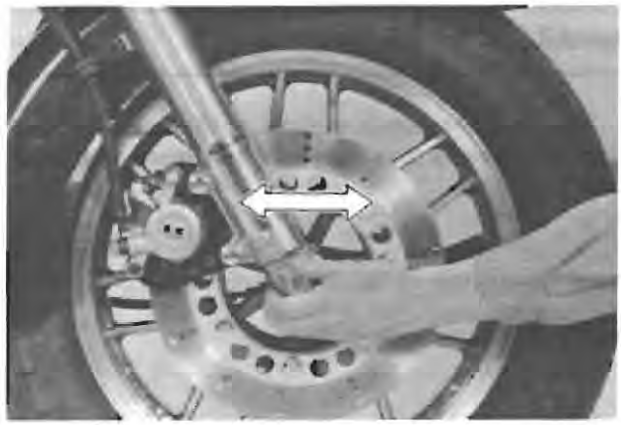
- With the front wheel pointing straight ahead, alternately nudge each end of the handlebar. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.
- ★If the wheel binds or catches before the stop, the steering is too tight.

NOTE

○*The wires and cables 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.*

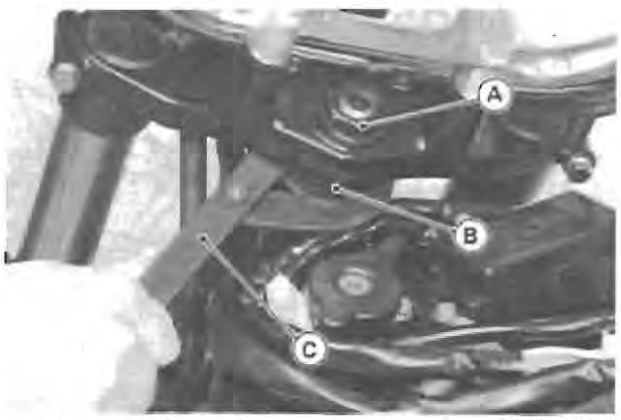
Checking for steering too loose:

- Stand in front of the motorcycle and grasp the lower ends of the 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

- Set the motorcycle up on its center stand.
- Remove the following parts.
  Dummy Tank Cover
  Battery
  Stem Head Cover
  Fairing
- 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).



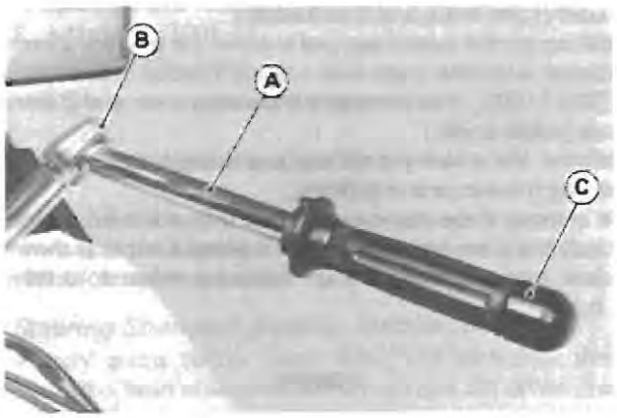
A. Stem Head Nut C. Stem Nut Wrench: 57001-1100
B. Stem Locknut

- If the steering is too tight, loosen the stem locknut a fraction of a turn; if the steering is too loose, tighten the locknut a fraction of a turn. Turn the locknut 1/8 turn at a time maximum.
- Tighten the steering stem head nut to the specified torque (see Exploded View).
- Tighten the front fork lower clamp bolts to the specified torque (see Exploded View in Suspension chapter).
- Check the steering again.
- ★If the steering is still too tight or too loose, repeat the adjustment.
- Install the removed parts.

Handlebar

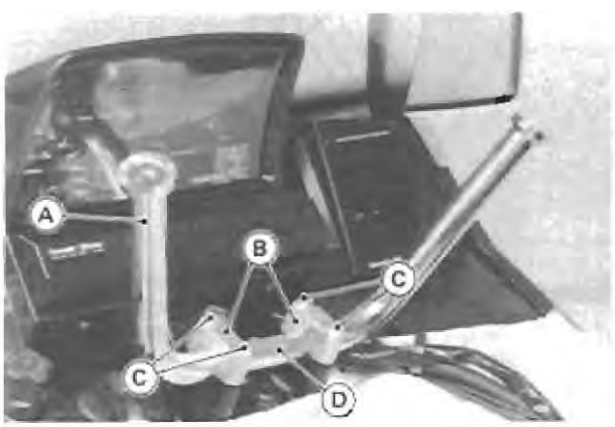
Handlebar Removal

•Remove the handle grip bars.
○Remove the clutch and front brake master cylinders with their hoses connected by taking out the clamp bolts, and let them hang free.
○Open the handlebar switch housings by taking out their screws, and let them hang free.
○Remove the grip bars by taking out the caps and Allen bolts.



A. Handle Grip Bar
B. Cap
C. Weight

•Remove the handlebar.
○Remove the straps to free the cables and wires from the handlebar.
○Remove the stem head cover by taking out the screws.
○Remove the handlebar by taking out the clamp bolts, stem head cover bracket, and clamps.



A. Handlebar
B. Clamps
C. Clamp Bolts
D. Stem Head Cover Bracket

Handlebar Installation Notes (including Handlebar Position Adjustment)

•Handlebar position can be adjusted to change height, to be inclined the handlebar forwards and backwards, and to be bent the grip bars inwards and outwards.

WARNING

○**When adjusting handlebar position out of the standard, always check that the handlebar does not contact the fairing or windshield, by turning the handlebar to either side. If the handlebar contacts anything, the handlebar position must be adjusted again.**

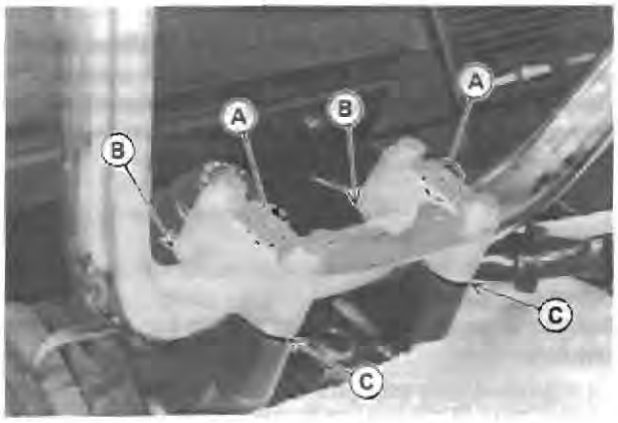
•To set the handlebar into the standard position, observe the following.
○Align the angle of the handlebar with the angle of the front fork.

A. Parallel

○Align the marks on the handlebar and the handle grip bars.

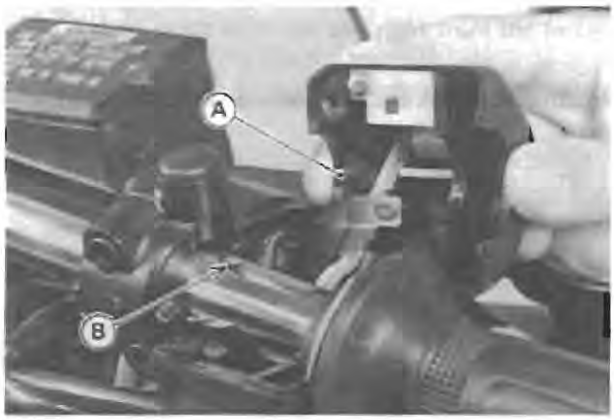
A. Marks

- Install the handlebar clamps with the arrow marks on them pointing forward.
- Tighten the front clamp bolts first, and then the rear clamp bolts to the specified torque (see Exploded View). There will be a gap at the rear part of the clamp after tightening.



A. Arrow
B. No Gap
C. Even Gap

- Tighten the handle grip bar Allen bolts to the specified torque (see Exploded View).
- Apply a non-permanent locking agent to the threads of the screws, and install the weights with them.
- Route the cables and wires correctly. The cables and wires must not hinder handlebar movement.
- The upper or lower half of the switch housings has a small projection. Fit the projection into the small hole in each handle grip bar.



A. Projection
B. Hole

- Check and adjust the following.
  - Throttle Grip
  - Choke Cable
  - Front Brake
  - Clutch

Steering Stem and Bearings

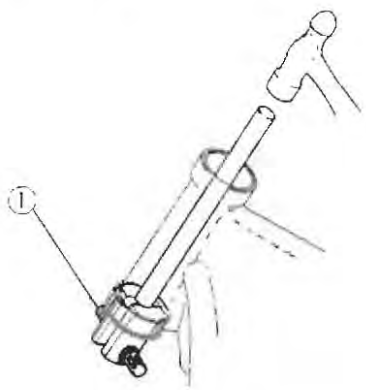
Steering Stem and Bearing Removal

- Remove the following parts.
  - Handlebar
  - Fairing
  - Dummy Tank Cover
  - Battery
  - Front Wheel
  - Front Fork Legs
- Remove the mounting bolts, free the brake hose joint from the stem base, and remove the front brake assembly as a set.
- Remove the stem head nut, and take off the flat washer, stem head, and lockwasher.
- Push up on the stem base, and remove the steering stem locknut with the stem nut wrench (special tool: P/N 57001-1100), then remove the steering stem and stem base (single unit).
- Remove the steering stem cap and upper tapered roller bearing inner race and O-ring.
- 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

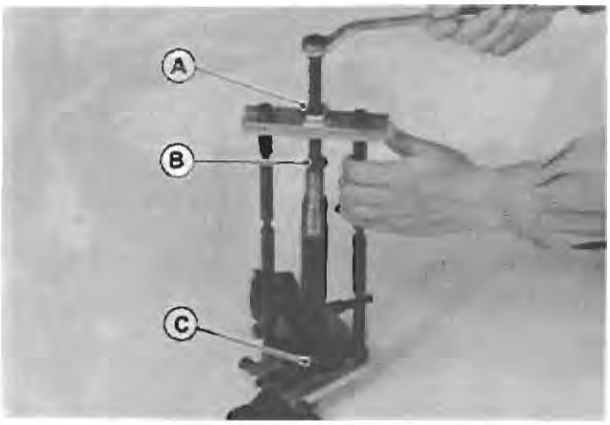
○*If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.*

Outer Race Removal

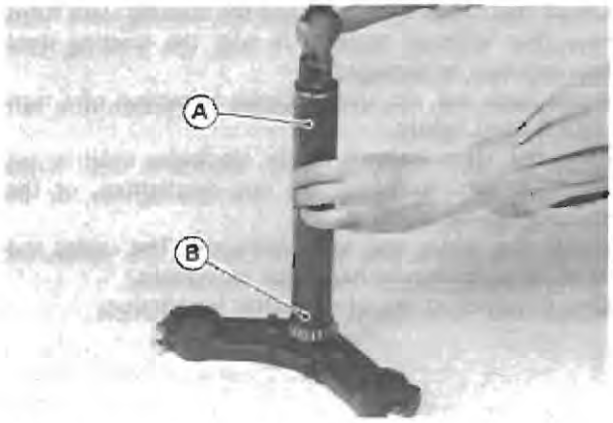


1. Stem Bearing Remover: 57001-1107

- Remove the lower inner race (with its grease seal) which is pressed onto the steering stem, with the bearing puller and adapter (special tools).

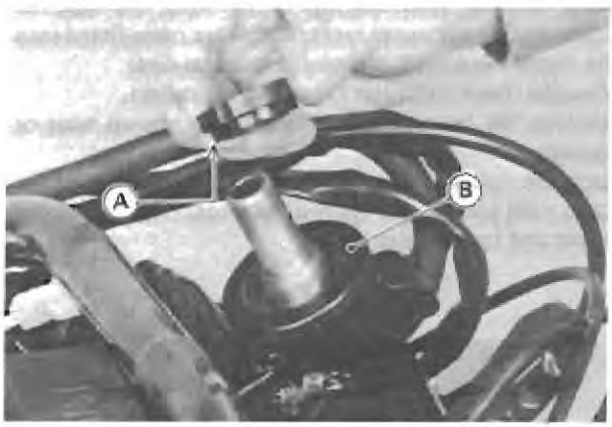


A. Bearing Puller: 57001-158
B. Adapter: 57001-317
C. Bearing Inner Race



A. Stem Bearing Driver: 57001-137
B. Adapter: 57001-1074

•Lubricate the steering stem bearings with grease.
•Install the stem locknut so that the stepped side faces down.

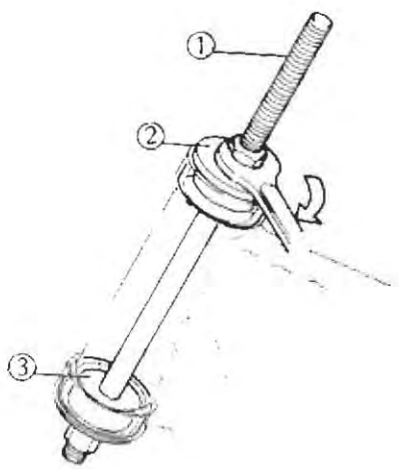


A. Stepped Side B. Cap

Steering Stem and Bearing Installation Notes

•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

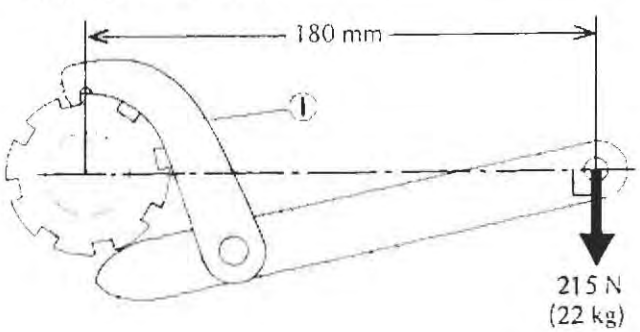


1. Driver Press Shaft: 57001-1075
2. Driver: 57001-1106
3. Driver: 57001-1077

•Apply grease to the tapered roller bearing, and drive it onto the steering stem using the stem bearing driver and adapter (special tools).

•If the stem bearing outer races was reinstalled, perform the following four steps to 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 215 N (22 kg) force in the direction shown.)

Torquing Stem Locknut



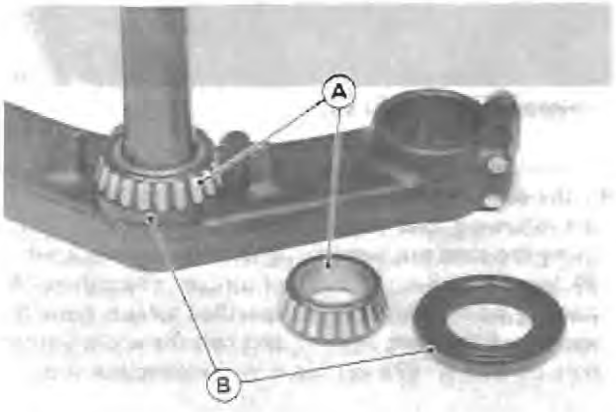
1. Stem Nut Wrench: 57001-1100

○Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings 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.
●Route the cables and wires correctly. The cables and wires must not hinder handlebar movement.
●Check and adjust the steering after installation.

A. O-ring

Steering Stem Bearing Inspection and Lubrication

●Using a high flash-point solvent, wash the upper and lower tapered roller bearings 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 shown wear or damage.
●Pack the upper and lower tapered roller bearings in the cages with grease, and apply a light coat of grease to the upper and lower outer races.



A. Taper Roller Bearings B. Grease Seals

Steering Stem Warp

●Whenever the steering 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.

Grease Seal and O-ring Inspection

●Visually inspect the grease seal and O-ring for any signs of deterioration or damage.
★Replace the grease seal, O-ring, or bearing (assembled with grease seal) if it shows any signs of damage.

Frame

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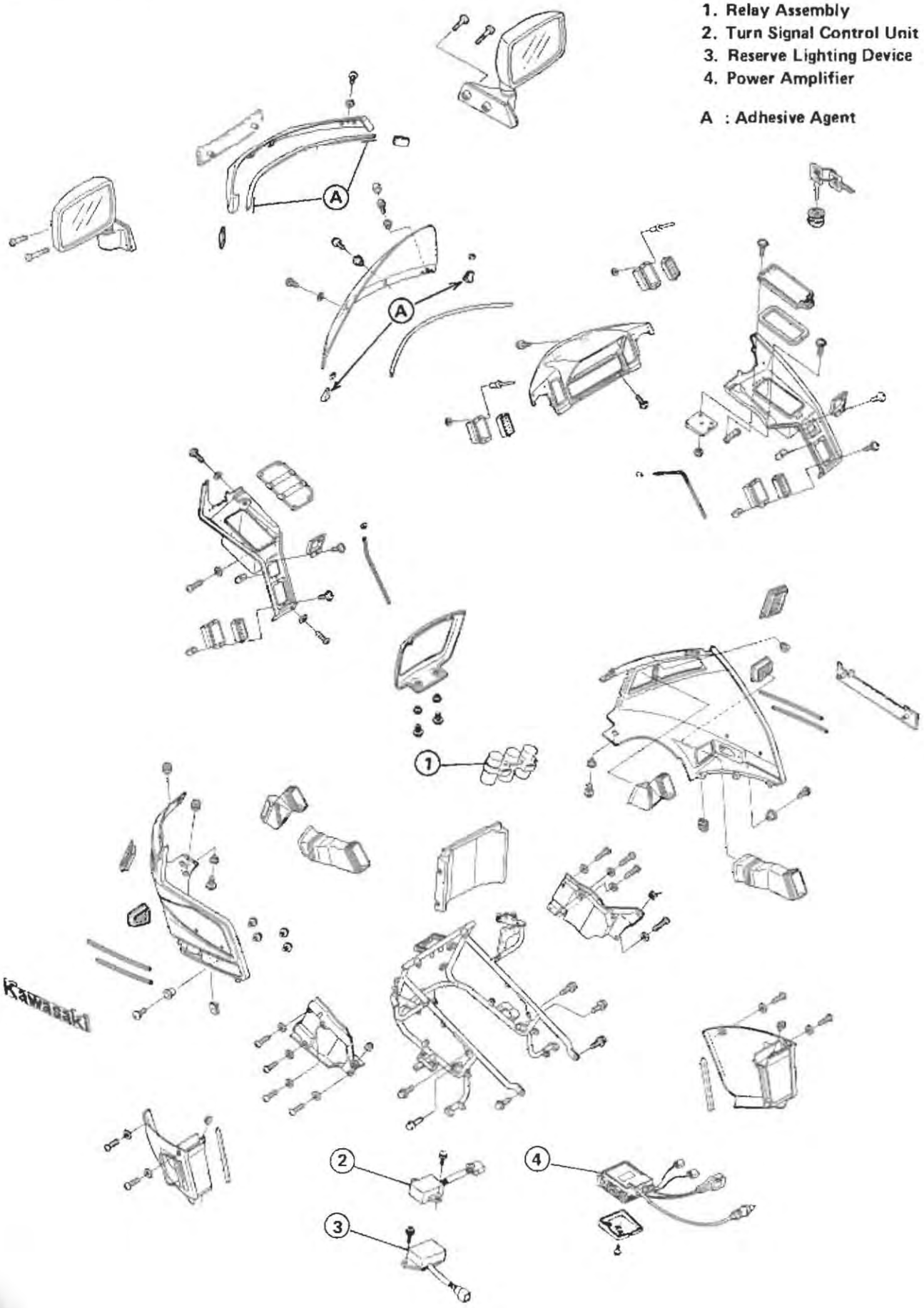
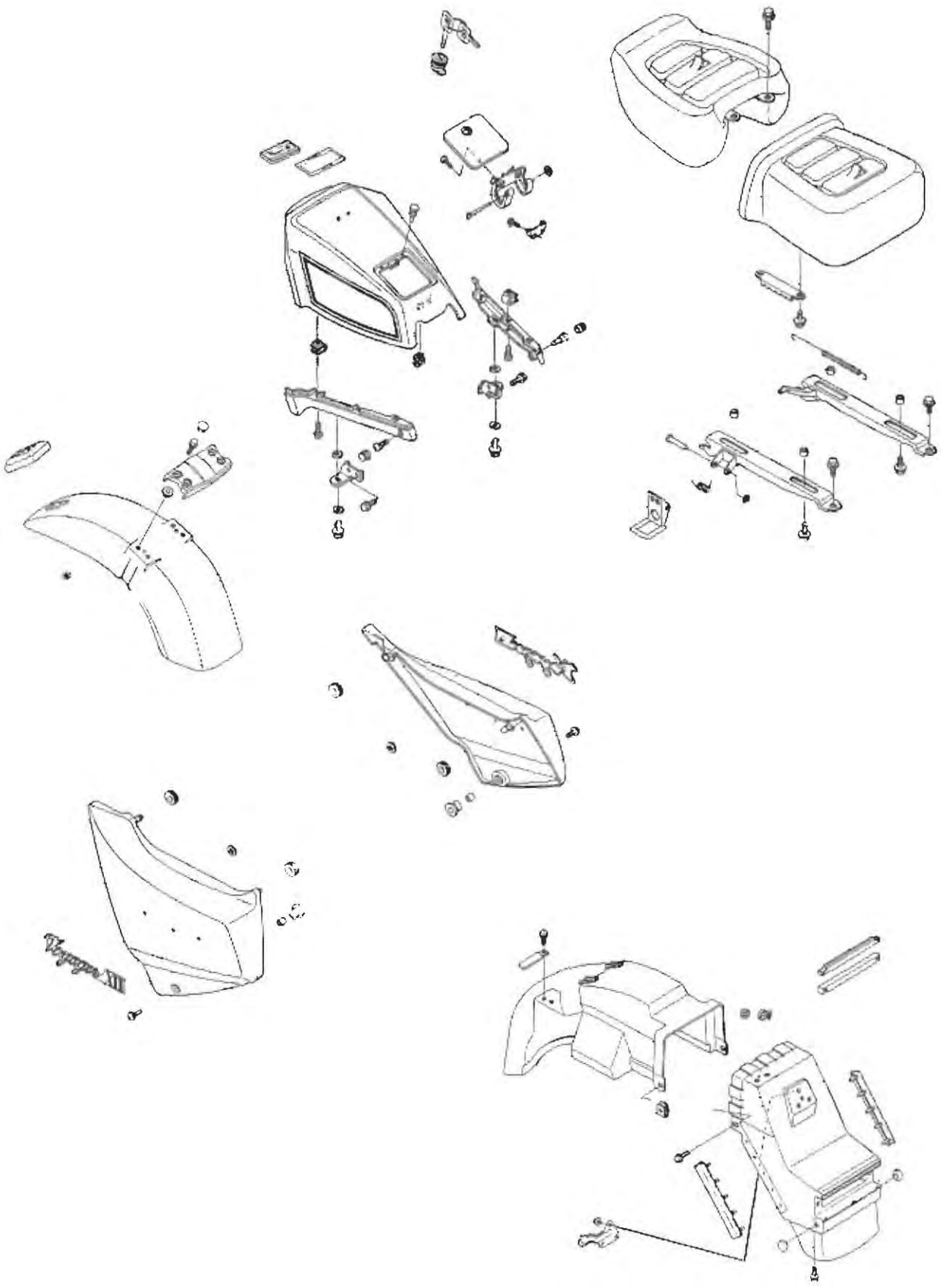
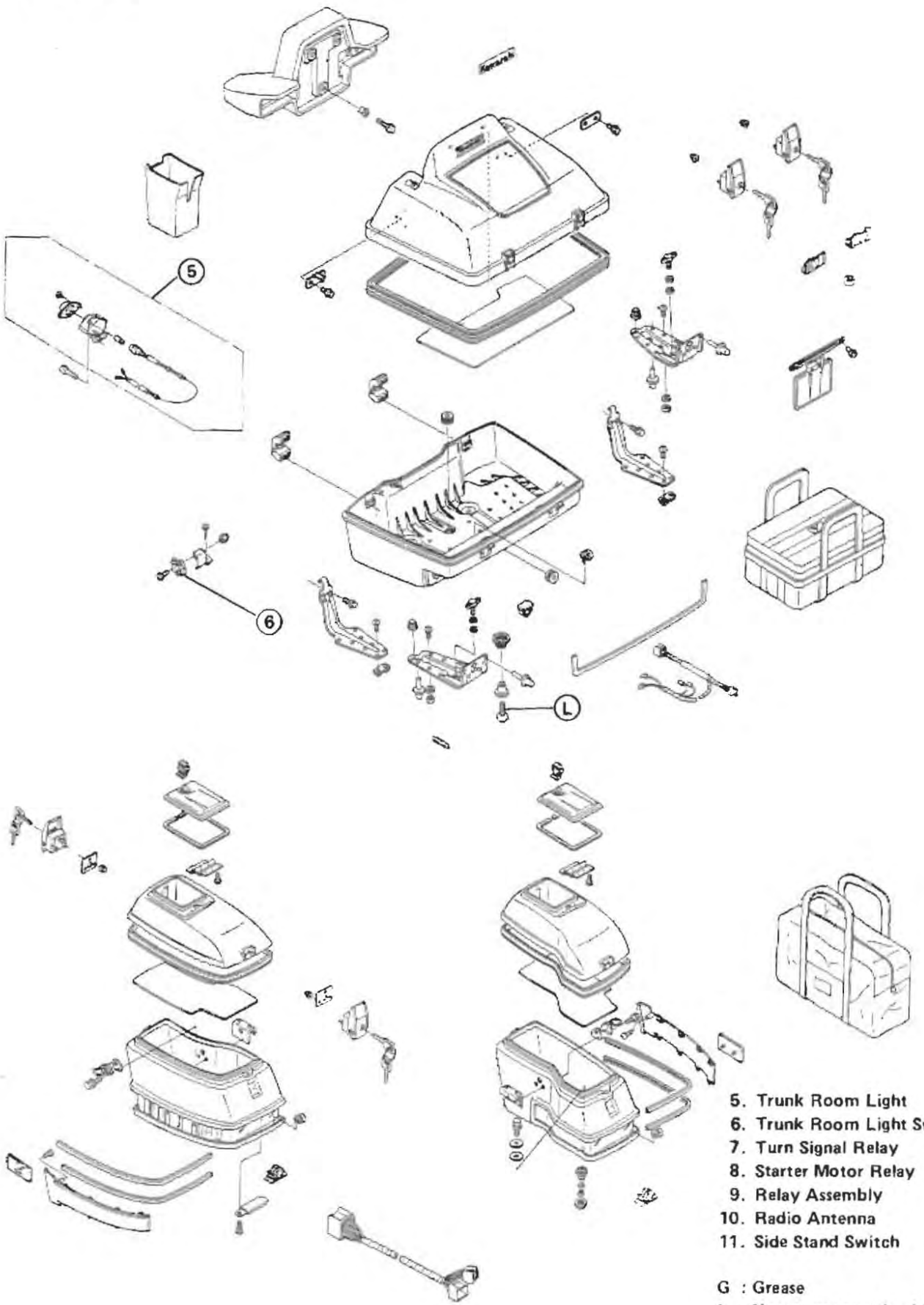
Exploded View



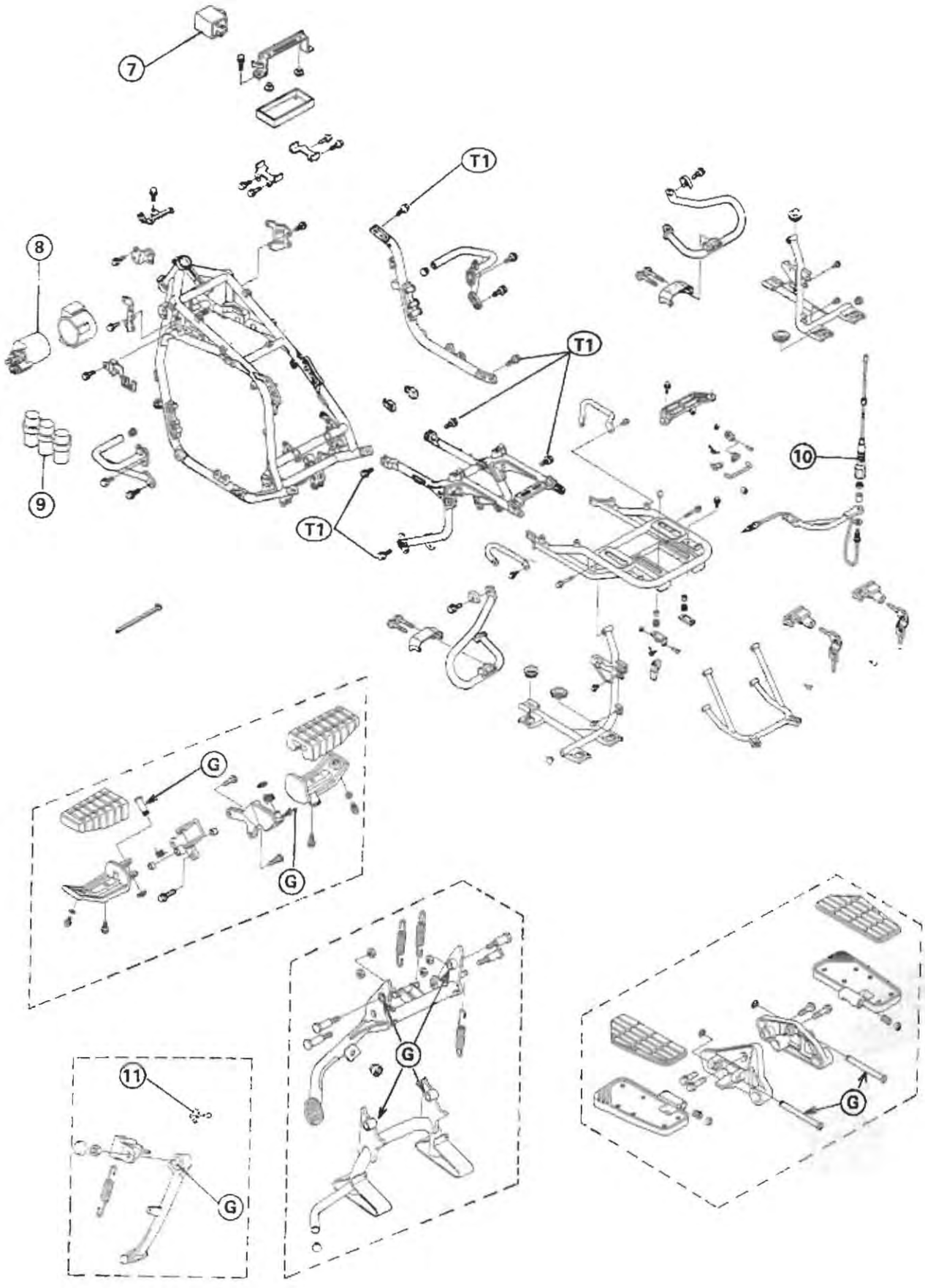

Voyager XII



5. Trunk Room Light
6. Trunk Room Light Switch
7. Turn Signal Relay
8. Starter Motor Relay
9. Relay Assembly
10. Radio Antenna
11. Side Stand Switch

G : Grease
L : Non-permanent Locking Agent

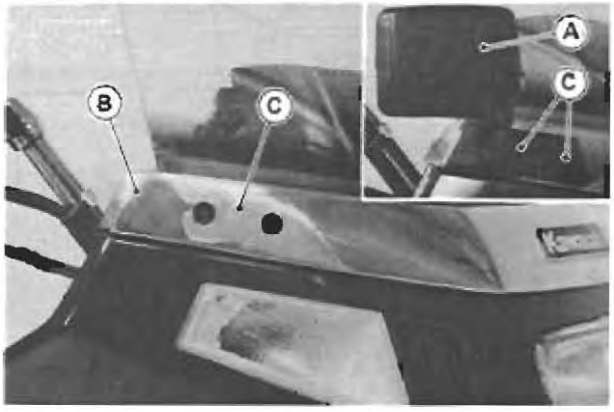
T1 : 57 N-m (5.8 kg-m, 42 ft-lb)


7
T1
8
T1
T1
10
9
G
G
G
11
G
G

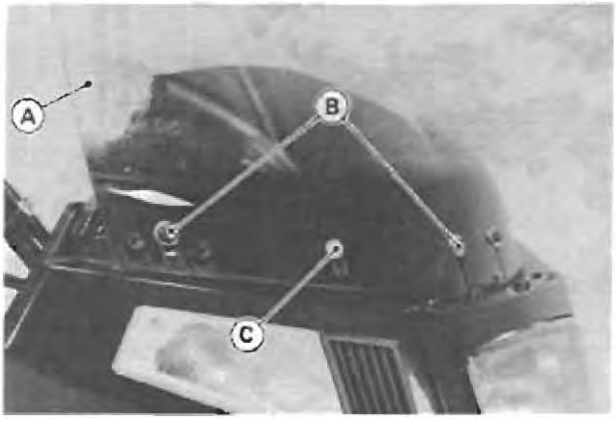
Fairing

Fairing Removal

●Remove the windshield as the following sequence.

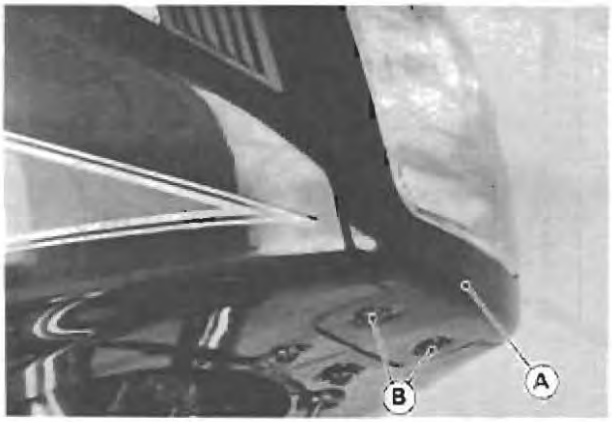


A. Rear View Mirrors
B. Windshield Cover
C. Screws

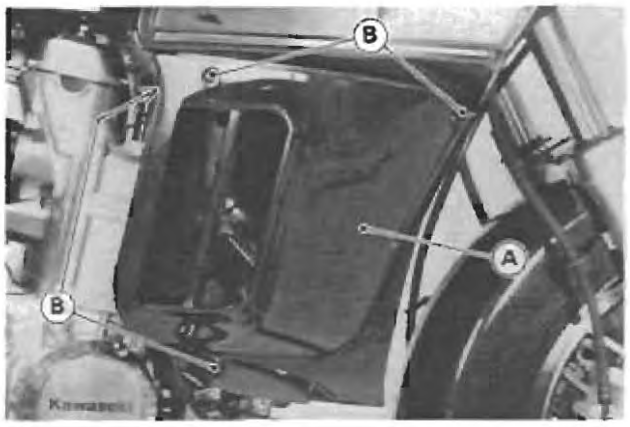


A. Windshield
B. Loosen these screws.
C. Remove this screw.

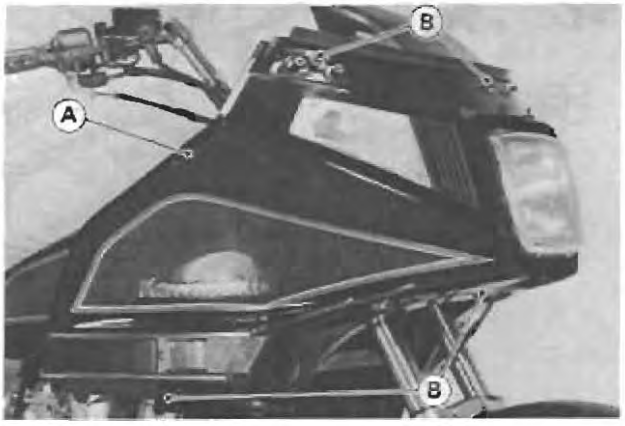
●Remove the fairing outer covers.



A. Headlight Cover
B. Screws



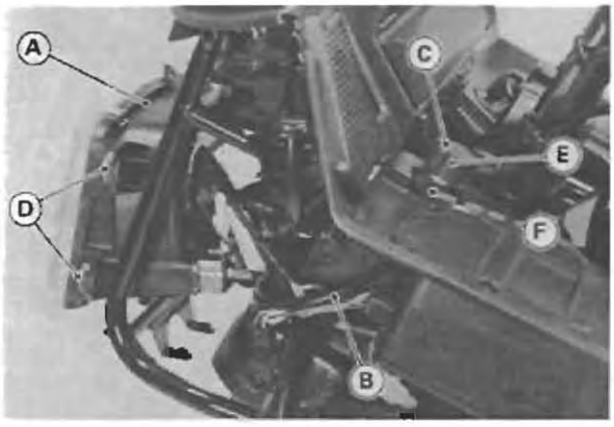
A. Lower Cover
B. Screws



A. Upper Cover
B. Screws

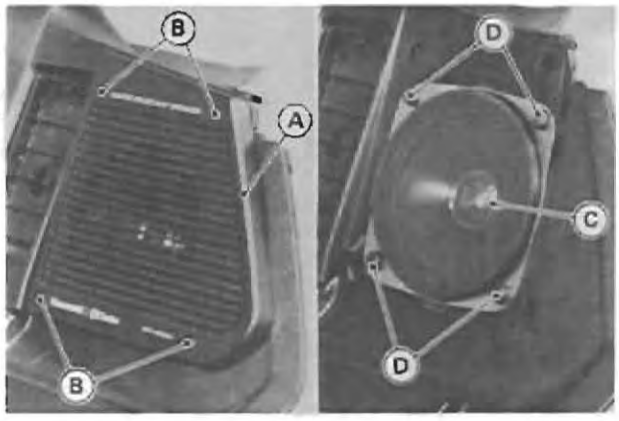
A. Air Ducts

●Remove the headlight unit with the remote cable.
○To free the remote cable from the fairing inner cover, remove the headlight beam adjuster and cable mounting nut.

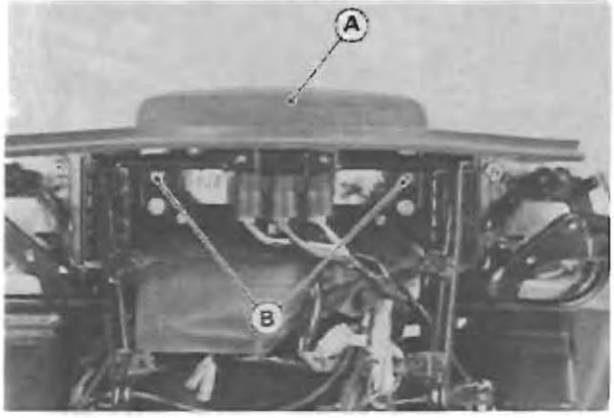


A. Headlight Unit
B. Remote Cable
C. Adjuster
D. Mounting Bolts
E. Screw
F. Cable Mounting Nut

●Remove the speakers and meter assembly.



A. Speaker Cover
B. Allen Bolts
C. Speaker
D. Screws



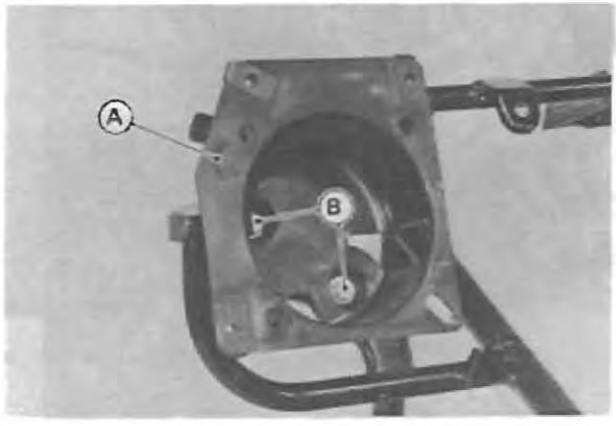
A. Meter Assembly
B. Mounting Nuts

●Remove the fairing inner covers.
○To remove the right inner cover, free the suspension air hoses from the cover.

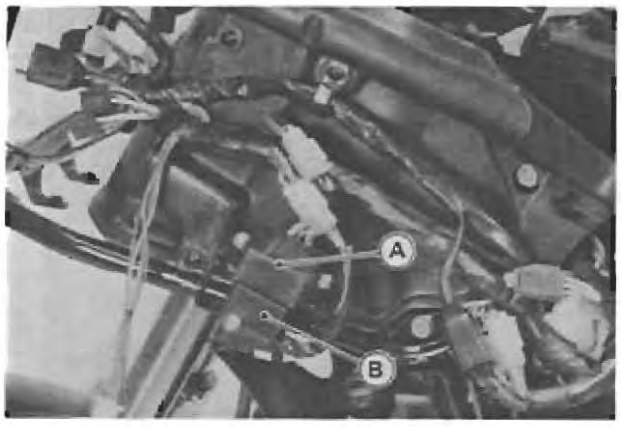
A. Air Hoses

A. Inner Cover
B. Screws

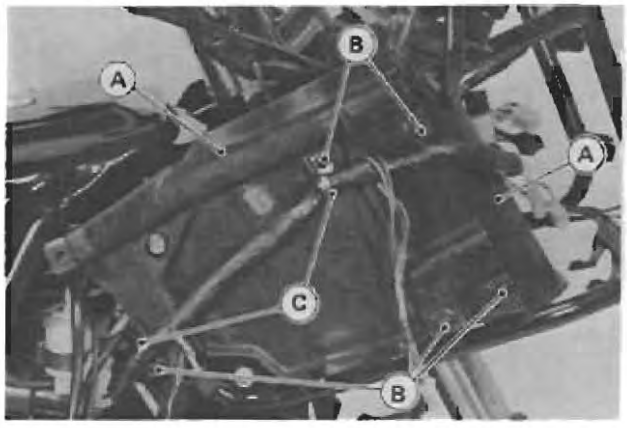
●Remove the electrical components from the fairing bracket.



A. Speaker Housing
B. Bolts

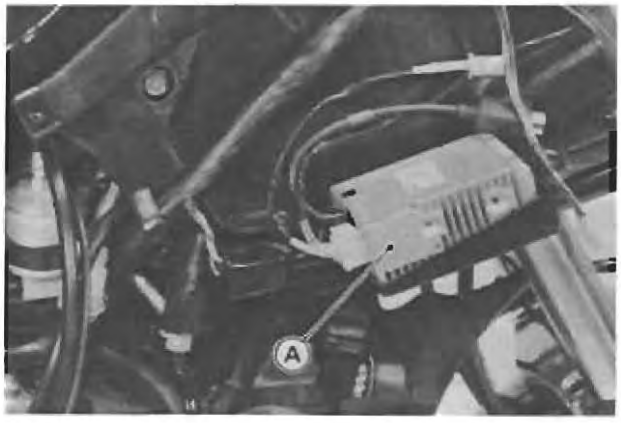


A. Turn Signal Control Unit
B. Reserve Lighting Device



A. Inside Cover B. Screws C. Clamps

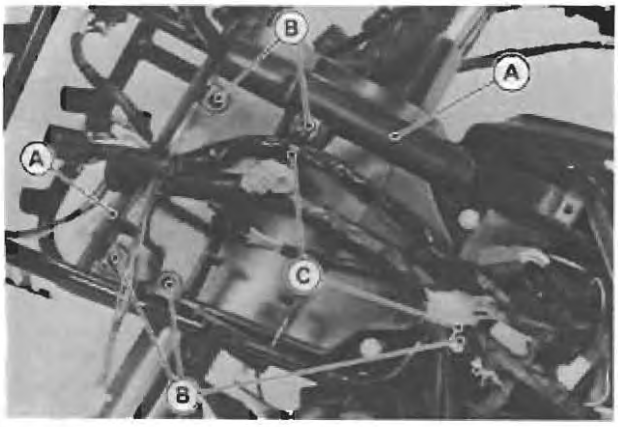
●Remove the radiator shoulder covers.



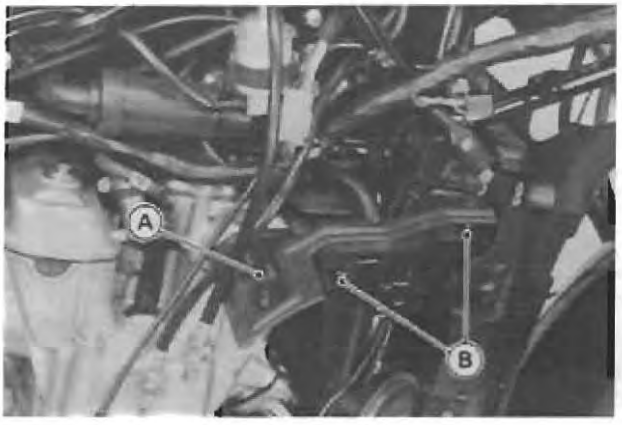
A. Power Amplifier

A. Radiator Shoulder Cover B. Screws

●Remove the fairing inside covers.

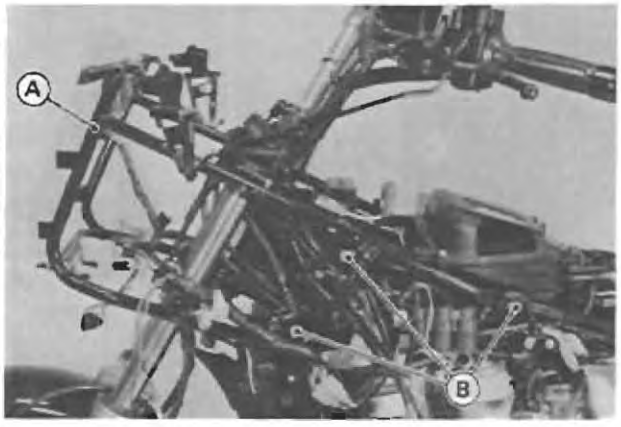


A. Inside Cover B. Screws C Clamps



A. Radiator Shoulder Cover B. Screws

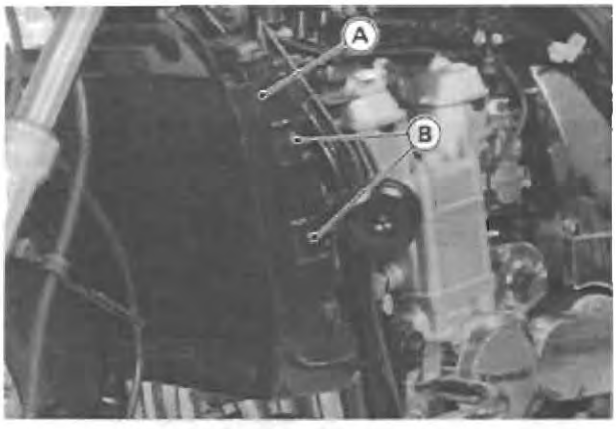
●Remove the fairing bracket.



A. Fairing Bracket B. Bolts

A. Fairing Bracket B. Bolts

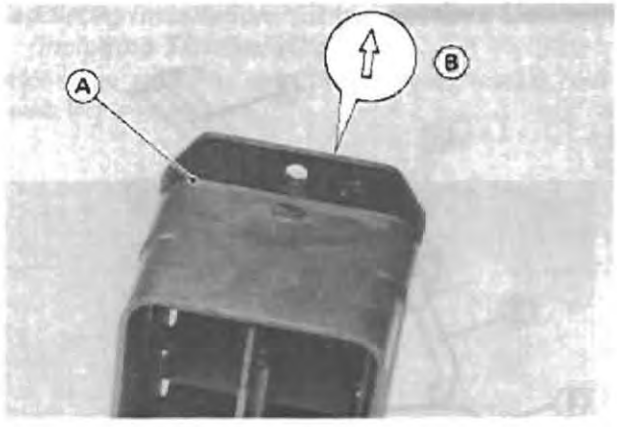
●Remove the radiator front cover.



A. Radiator Front Cover B. Screws

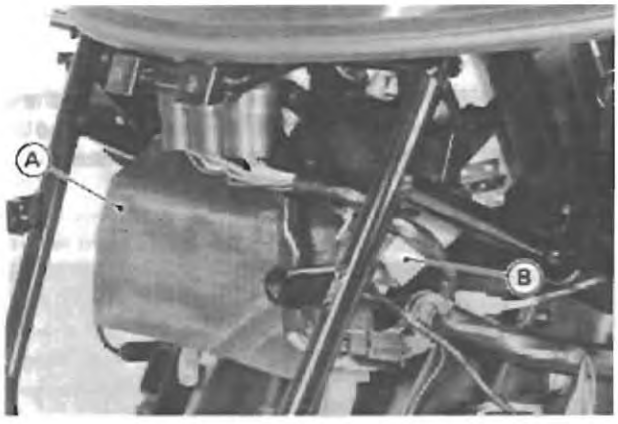
Fairing Installation Notes

●Route the cables, wirings, and hoses correctly.
●If the ventilation louvers were removed, install them with the arrow pointing up.



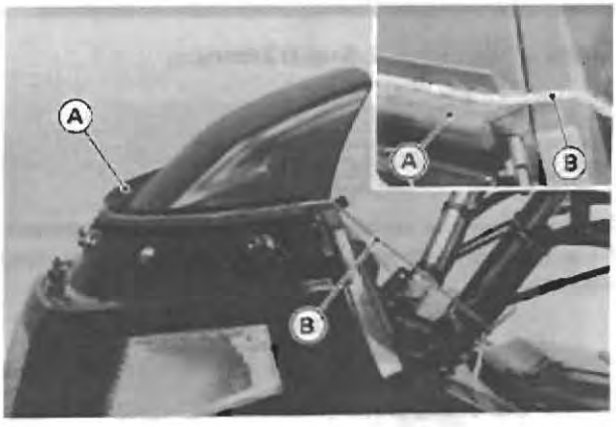
A. Louver B. Arrow

●Be sure to cover the radio and cassette player with the watertight seat.



A. Watertight Seat B. Radio and Cassette Player

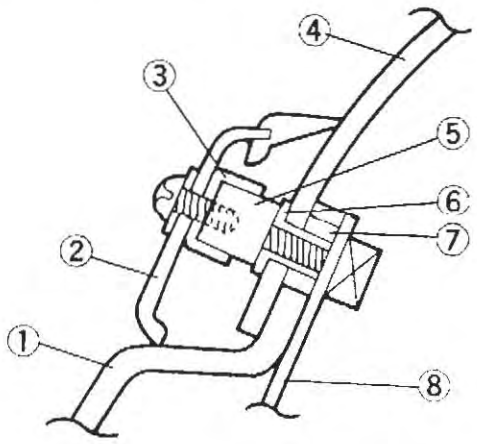
●Install the windshield as the following.
○Before installing the windshield on the fairing, route a string around the groove of the seal trimming.



A. Seal Trimming B. String

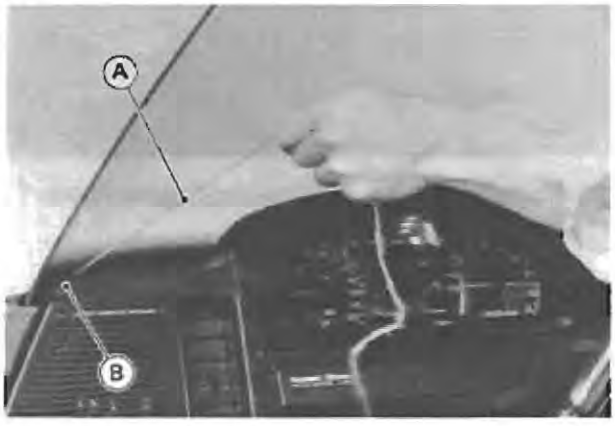
○Place the windshield onto the fairing so that its dented portions fit between the collars and the fairing.

Windshield Installation



1. Fairing
2. Windshield Cover
3. Rubber Damper
4. Windshield
5. Mounting Bolts
6. Flanged Collar
7. Collar
8. Bracket

○Pull up the string which has been routed around the groove of the seal trimming so that the upper end of the trimming properly fits to the inside of the windshield.

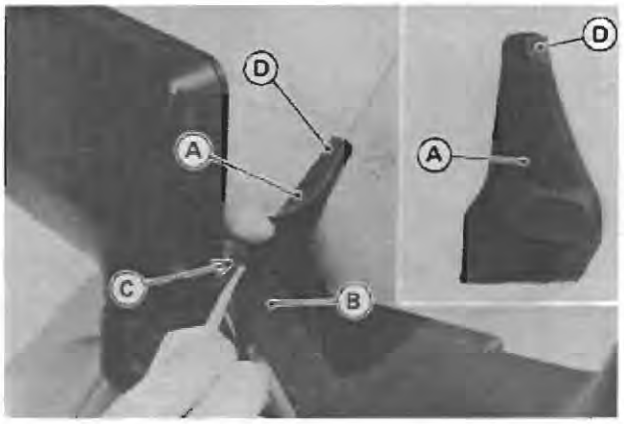


A. String B. Seal Trimming

CAUTION

○**Do not use any tools such as a screwdriver to prevent the black-printed area of the windshield from being damaged.**

○Press the seal trimming against the windhsield with your fingers to make watertight contacts at them.
●Fit the end trimmings onto the left and right ends of the windshield lower portion.
○Apply an adhesive agent to the area shown to fix the end trimming onto the windshield cover trimming.



A. End Trimming C. Adhesive Agent
B. Windshield Cover Trimming D. Clamp

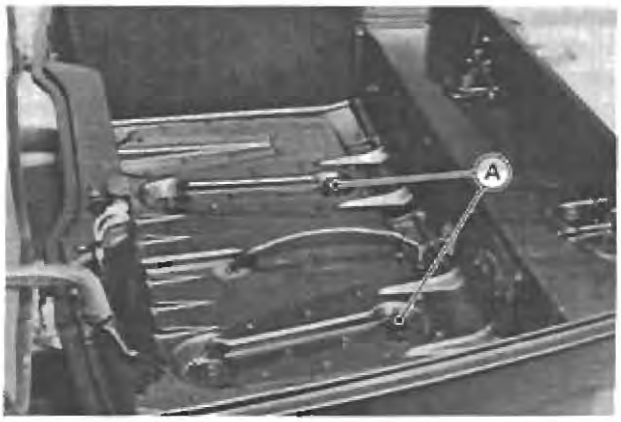
Travel Trunk and Saddlebags

Travel Trunk Removal Notes

●Move the travel trunk rearward as far as it will go, and disconnect the wiring connectors from the trunk and passenger switches.

A. Connectors B. Passenger Switches

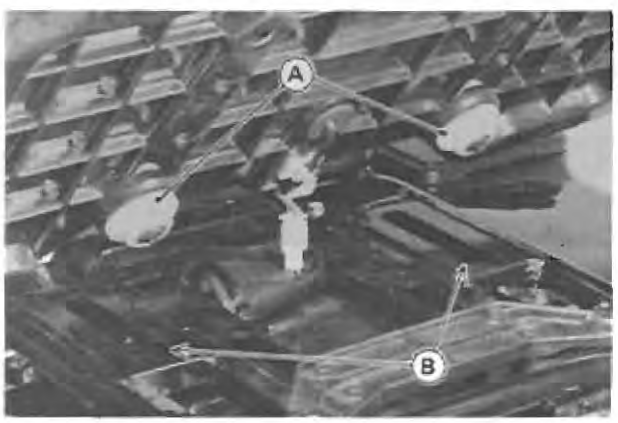
●Remove the wing screws at the bottom of the travel trunk.



A. Wing Screws

Travel Trunk Installation Note

- Place the travel trunk on the bracket so that the holders on its bottom fit into the bracket holes.



A. Holders B. Holes

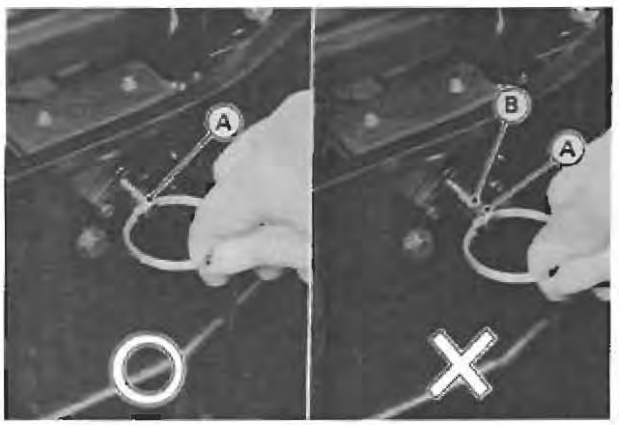
Saddlebag Removal Note

- Remove the lid from the saddlebag, pull the knob and unhook the saddlebag from the bracket.

A. Knob

Saddlebag Installation Notes (including Tail End Alignment)

- Hook the saddlebag onto the saddlebag bracket, and push in the locking pin.



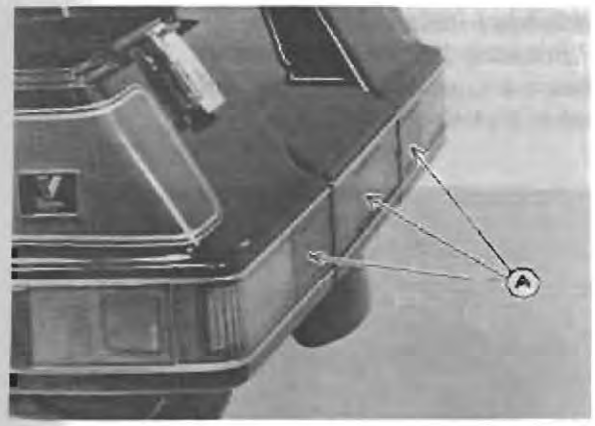
A. Locking Pin B. Red Line

WARNING

When installing the saddlebags, be sure the locking pin is all the way in. If you can see the red line on the locking pin, it is not securely latched. Be sure the red line is out of sight. If the saddlebag is not secure, it could fall off while you are riding the motorcycle possibly causing a crash.

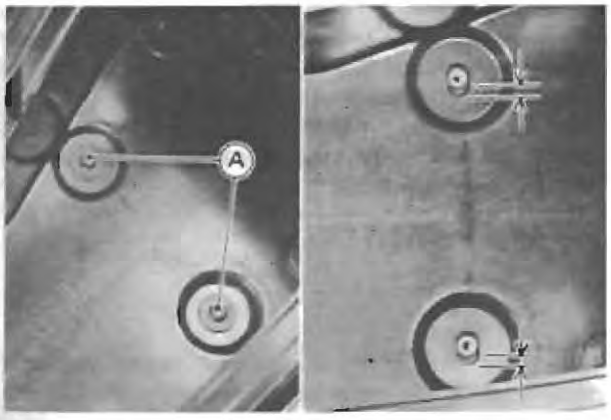
- Align the tail ends of the rear fender rear and saddlebags if the parts which relate to the tail end alignment were handled.

A. Level B. Even Clearance

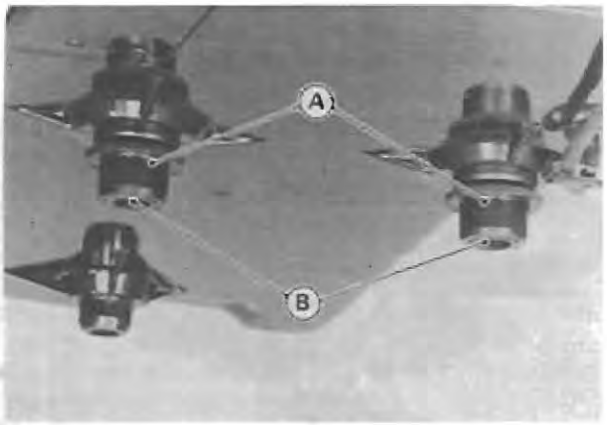


A. No Step

○Loosen the saddlebag leg mounting bolts and nuts, turn the adjusters to raise or lower them, and align the saddlebag tail end with the fender tail end.
○Slide the saddlebag and equalize the left and right saddlebag side clearances.

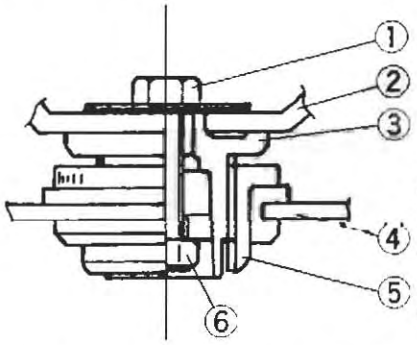


A. Saddlebag Leg Mounting Bolts



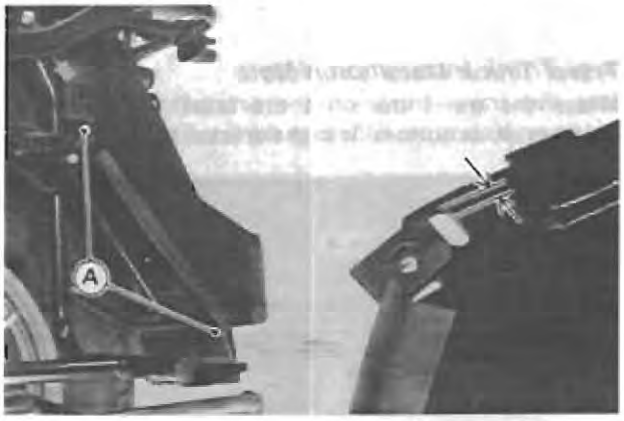
A. Adjusters B. Nuts

Saddlebag Leg



1. Mounting Bolt
2. Saddlebag
3. Leg
4. Bracket
5. Adjuster
6. Nut

○Loosen the rear fender rear mounting bolts and slide it back and forth to align the fender tail end with the saddlebag end.



A. Rear Fender Rear Mounting Bolts

○Tighten the bolts and nuts after adjustment.

Bracket Removal Notes

●Remove the travel trank bracket together with the saddlebag brackets.
○Before removing the travel trank bracket, free the antenna bracket from the trank bracket.

A. Travel Trank Bracket C. Antenna Bracket
B. Saddlebag Bracket

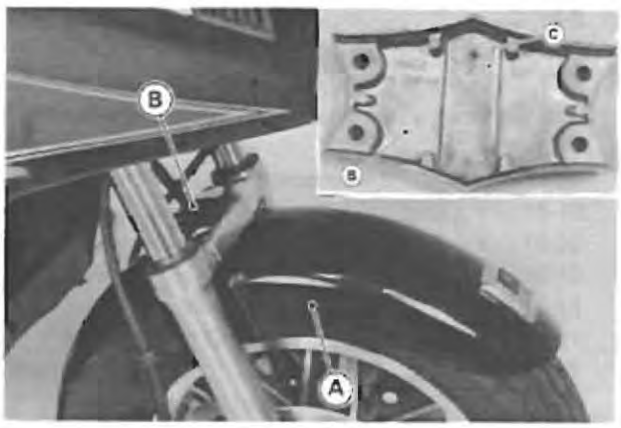
Bracket Installation Note

•Tighten the rear shock absorber upper mounting nuts to the specified torque (see Exploded View in the Suspension chapter).

Front Fender

Front Fender Installation Note

•Install the front fender brace with the arrow pointing forward.

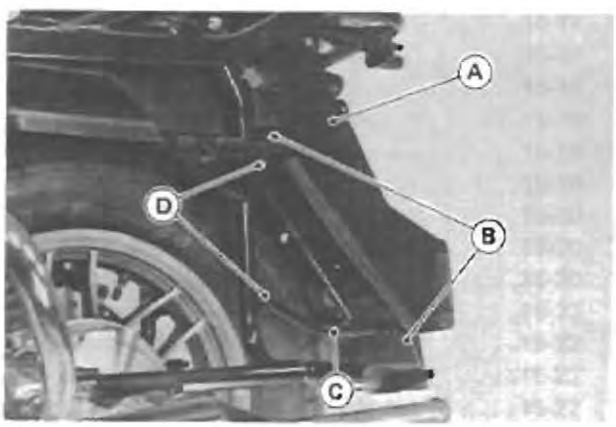


A. Front Fender B. Brace C. Arrow

Rear Fender

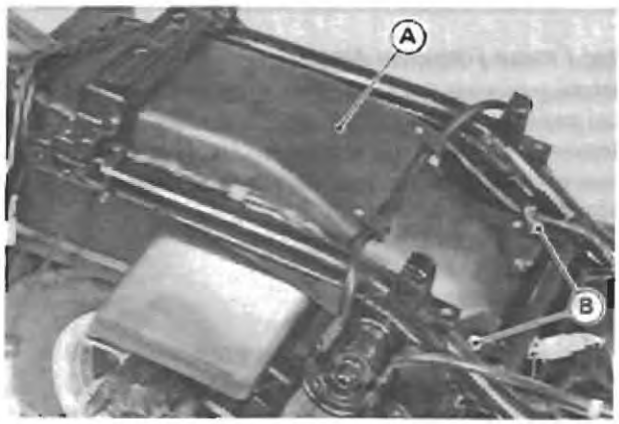
Rear Fender Removal Notes

•Remove the rear fender rear and its bracket.



A. Rear Fender Rear C. Bracket
B. Fender Mounting Bolts D. Bracket Mounting Bolts

•Remove the rear fender front.

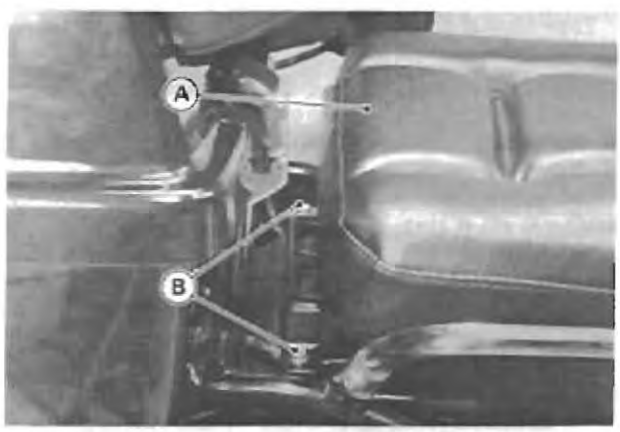


A. Rear Fender Front B. Mounting Bolts

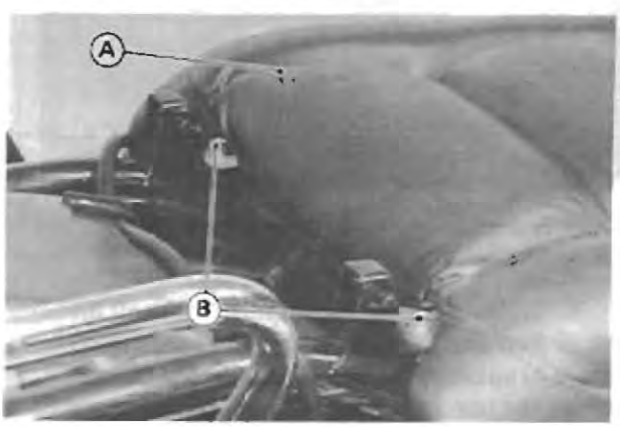
Seats

Seat Removal Note

•Move the rear seat forward as far as it will go.



A. Rear Seat B. Mounting Bolts



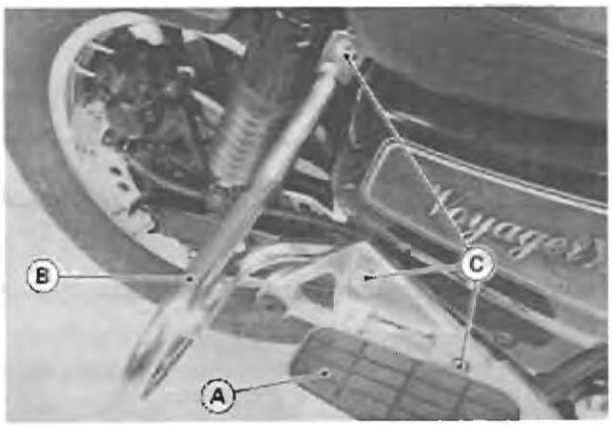
A. Front Seat B. Mounting Bolts

Rear Frame

Rear Frame Removal Notes

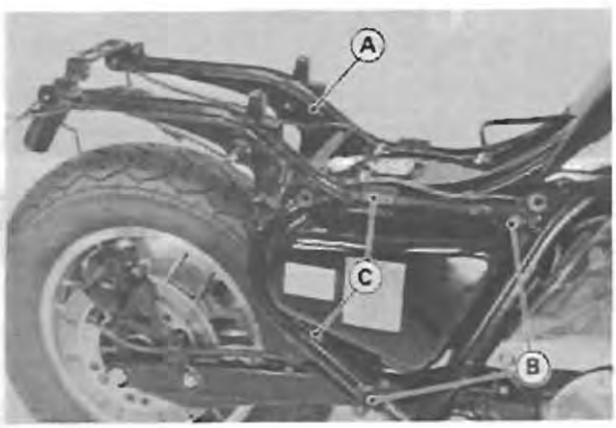
- Before removing the rear frame, remove the fuel in the fuel tank as possible using a suitable pump.
- Remove the rear shock absorbers. It is not required to remove the air hoses from the shock absorbers.
- Remove the following.

Travel Trank and Bracket
Saddlebags and Brackets
Rear Fender and Bracket
Mufflers
Seats
Rear Shock Absorbers
Side Covers
Footboards and Bumpers



A. Footboard
B. Bumper
C. Mounting Bolts

- Holding the fuel tank, remove the rear frame.



A. Rear Frame
B. Mounting Bolts
C. Damper Rubbers

Rear Frame Installation Notes

- Be sure to install the damper rubbers in place.
- Tighten the rear frame mounting bolts to the specified torque (see Exploded View).
- Route the wirings and hoses correctly.

Electrical System

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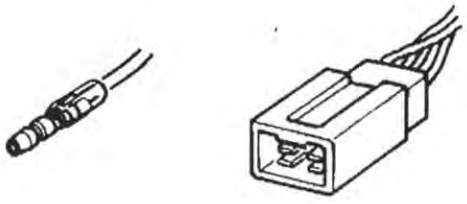
Precautions

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 the audio system, do not connect or disconnect the battery leads without removing the 3A audio fuse in the fuse case.
- 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

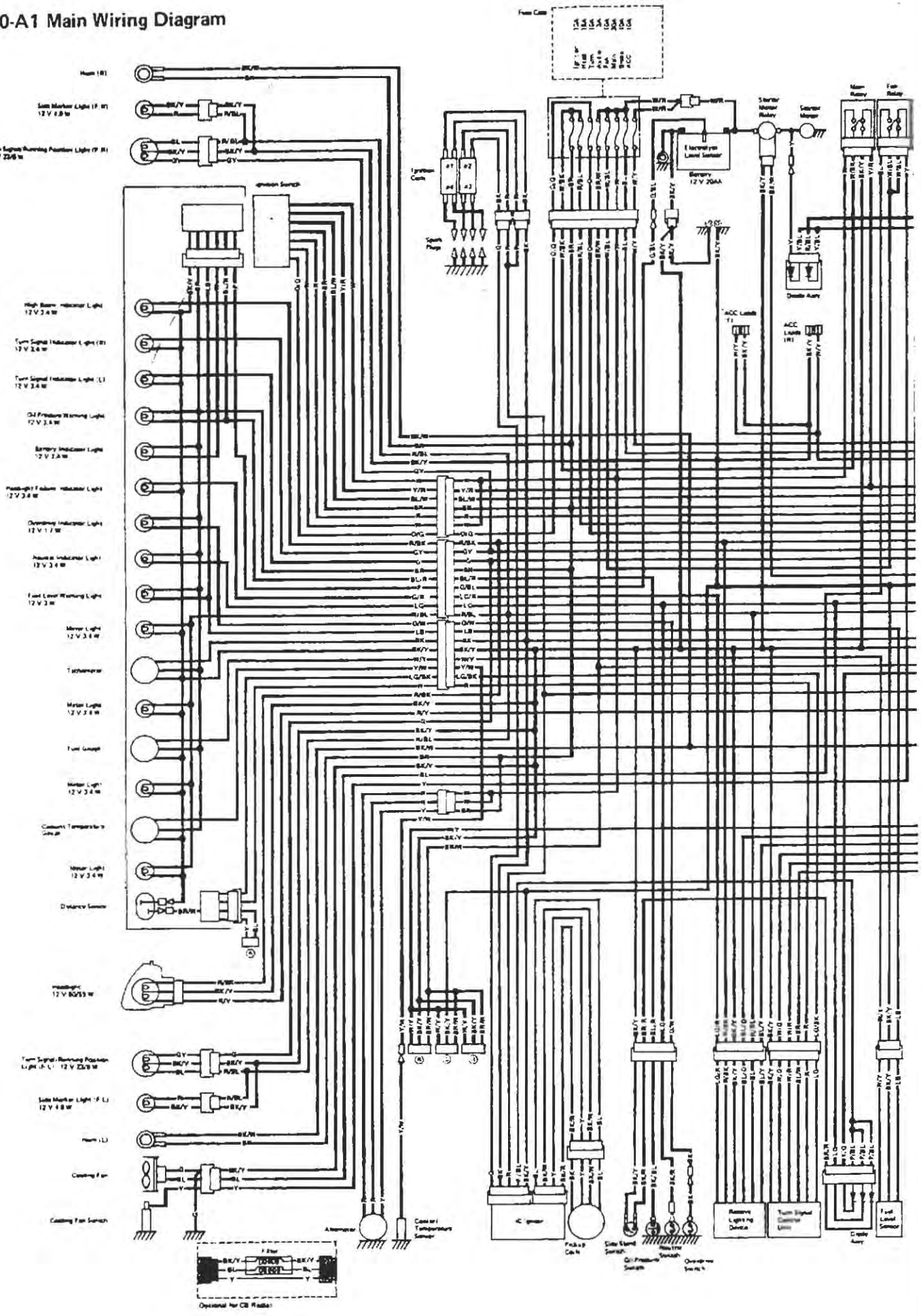


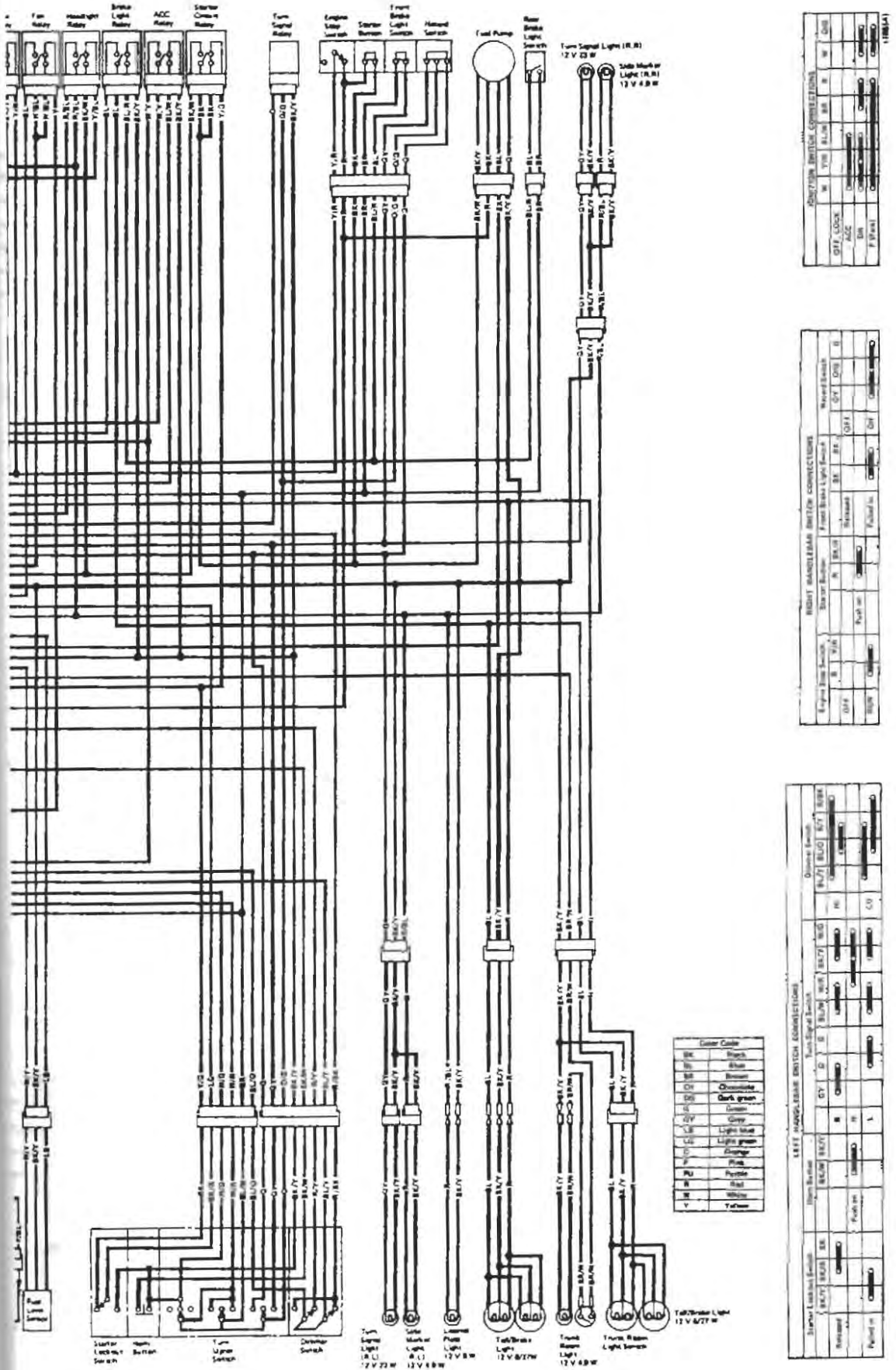
- Color Codes:

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

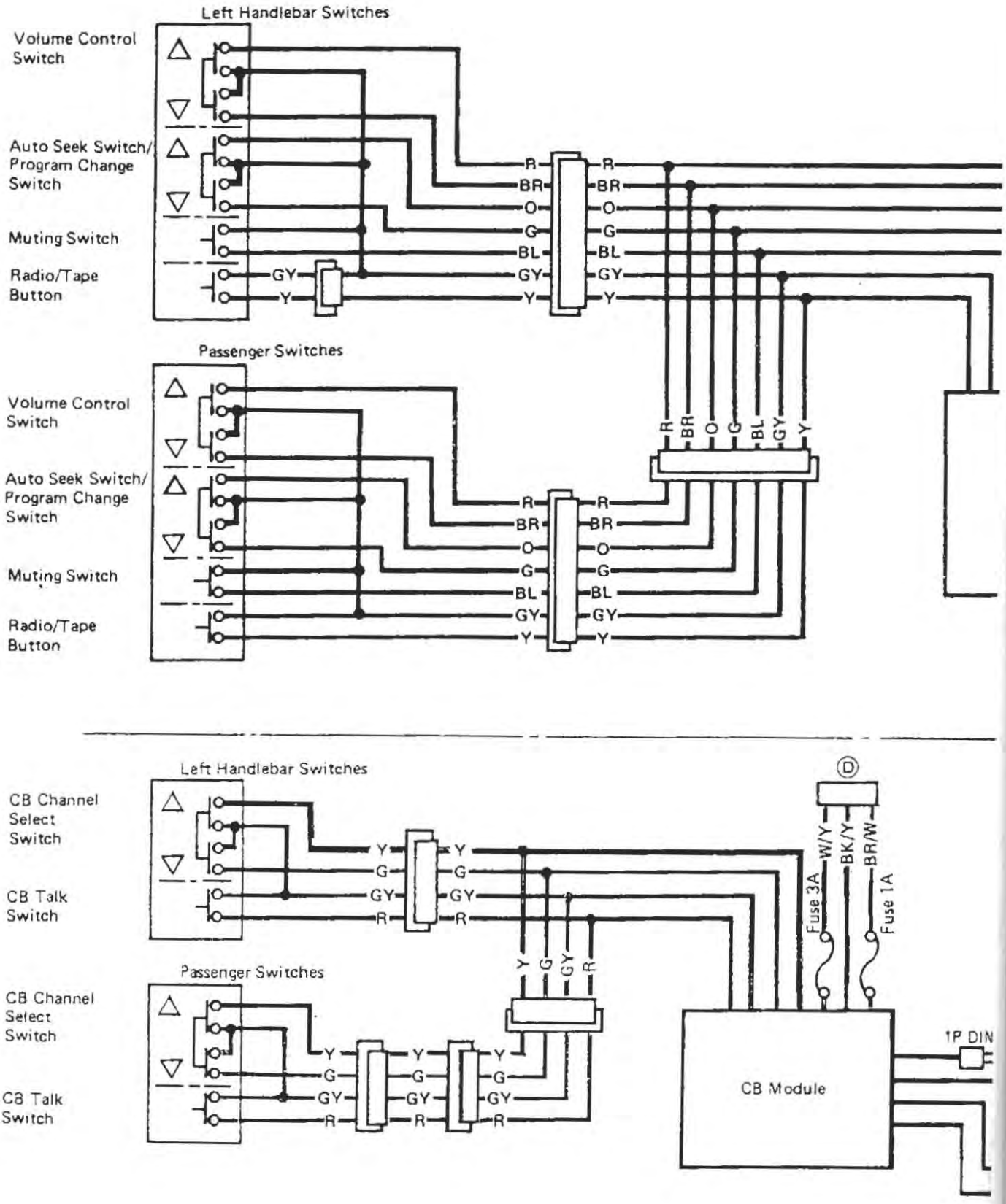
- Measure coil and winding resistance when the part is cold (at room temperature).

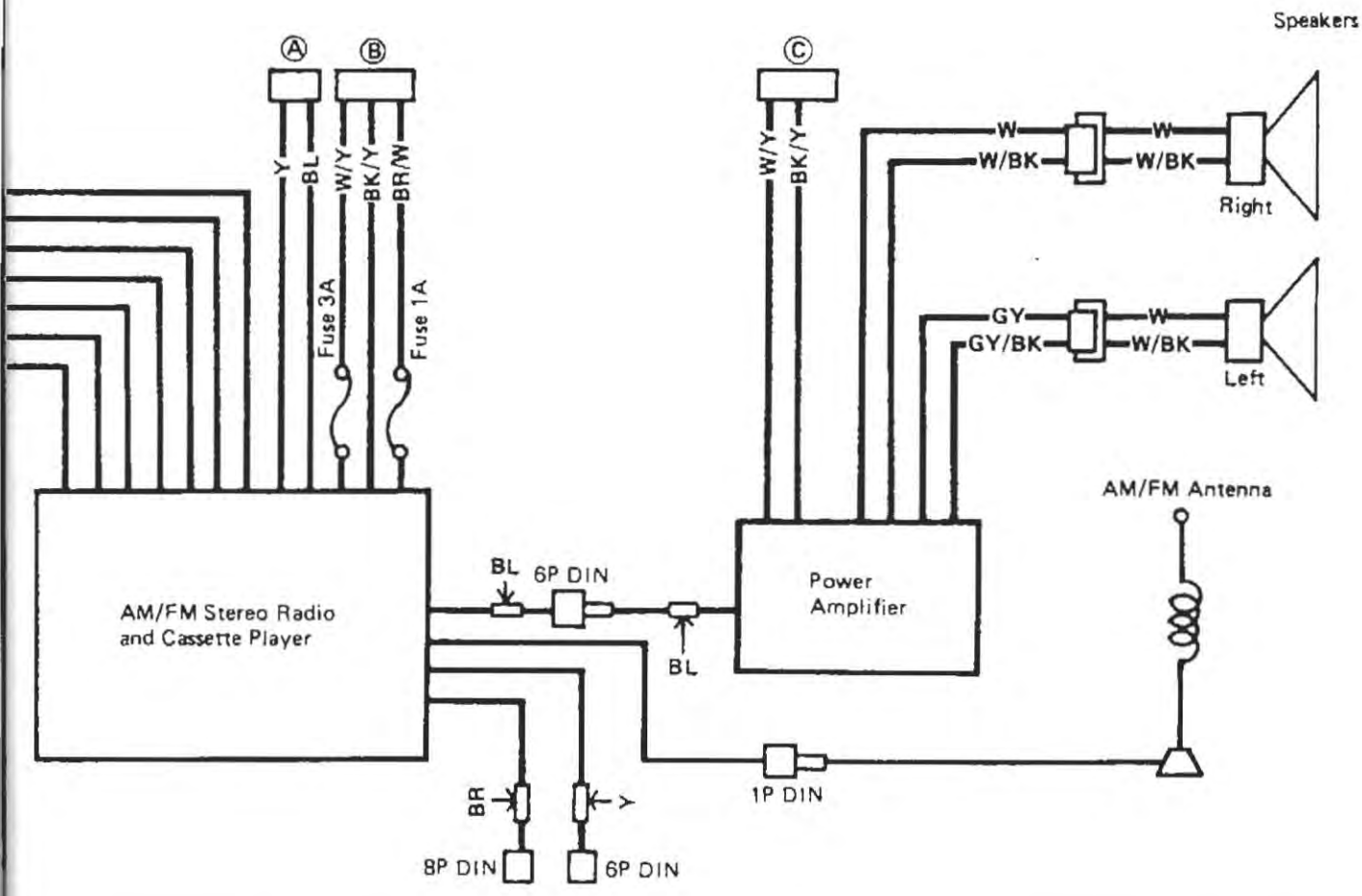
ZG1200-A1 Main Wiring Diagram

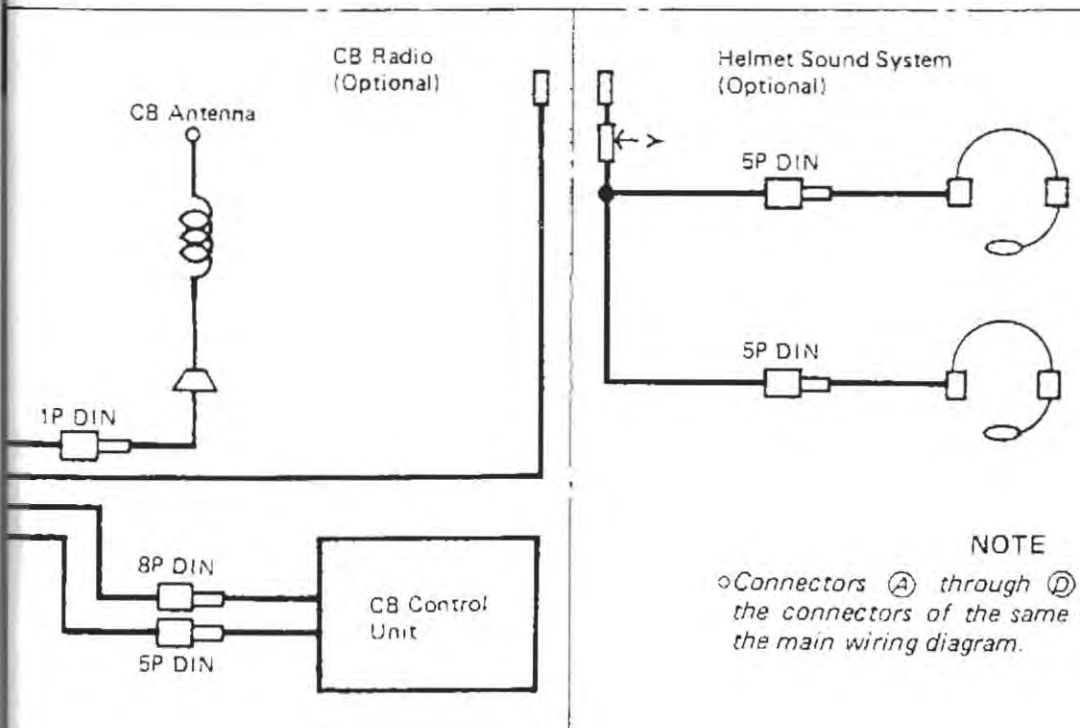




ZG1200-A1 Audio System Wiring Diagram



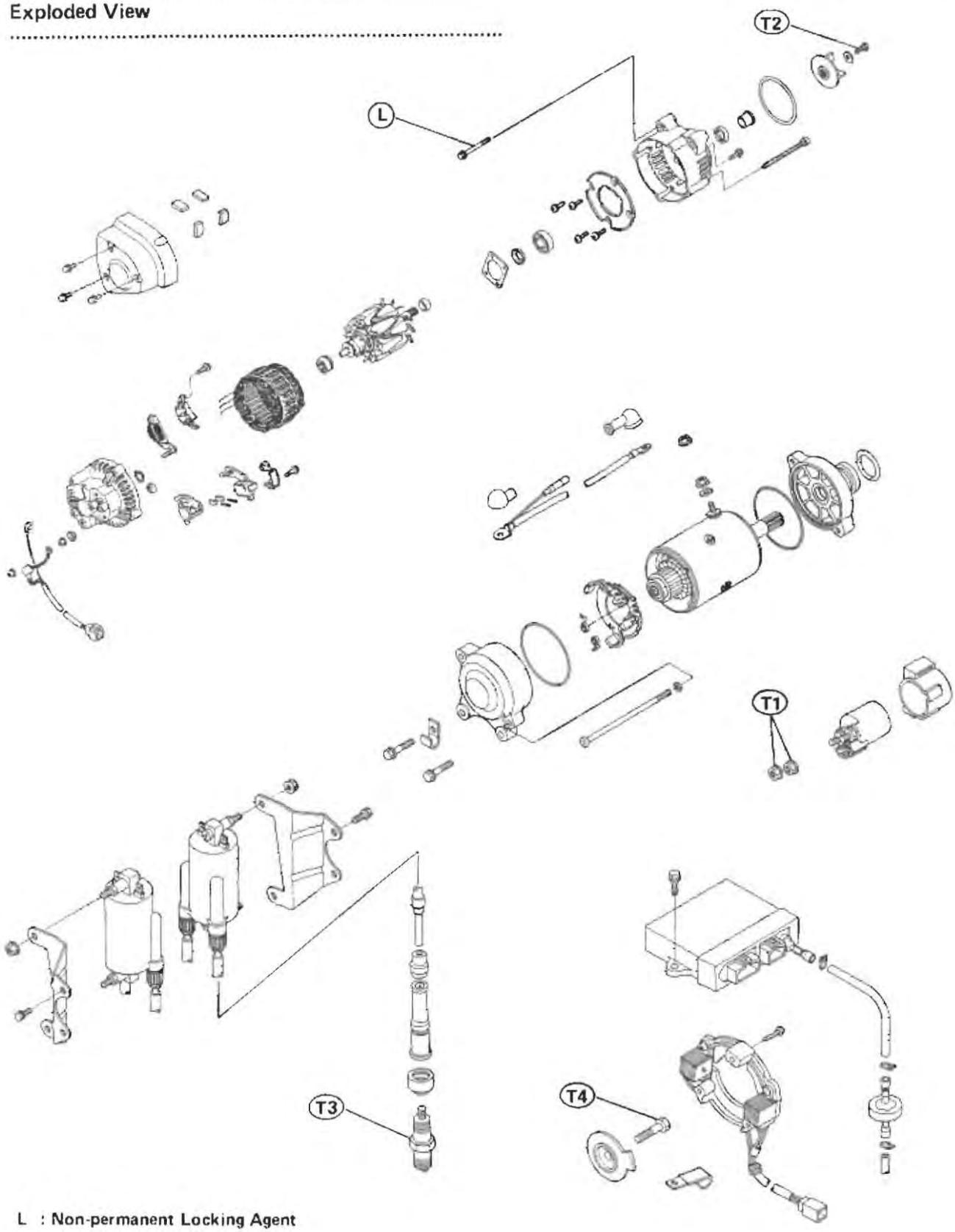




NOTE

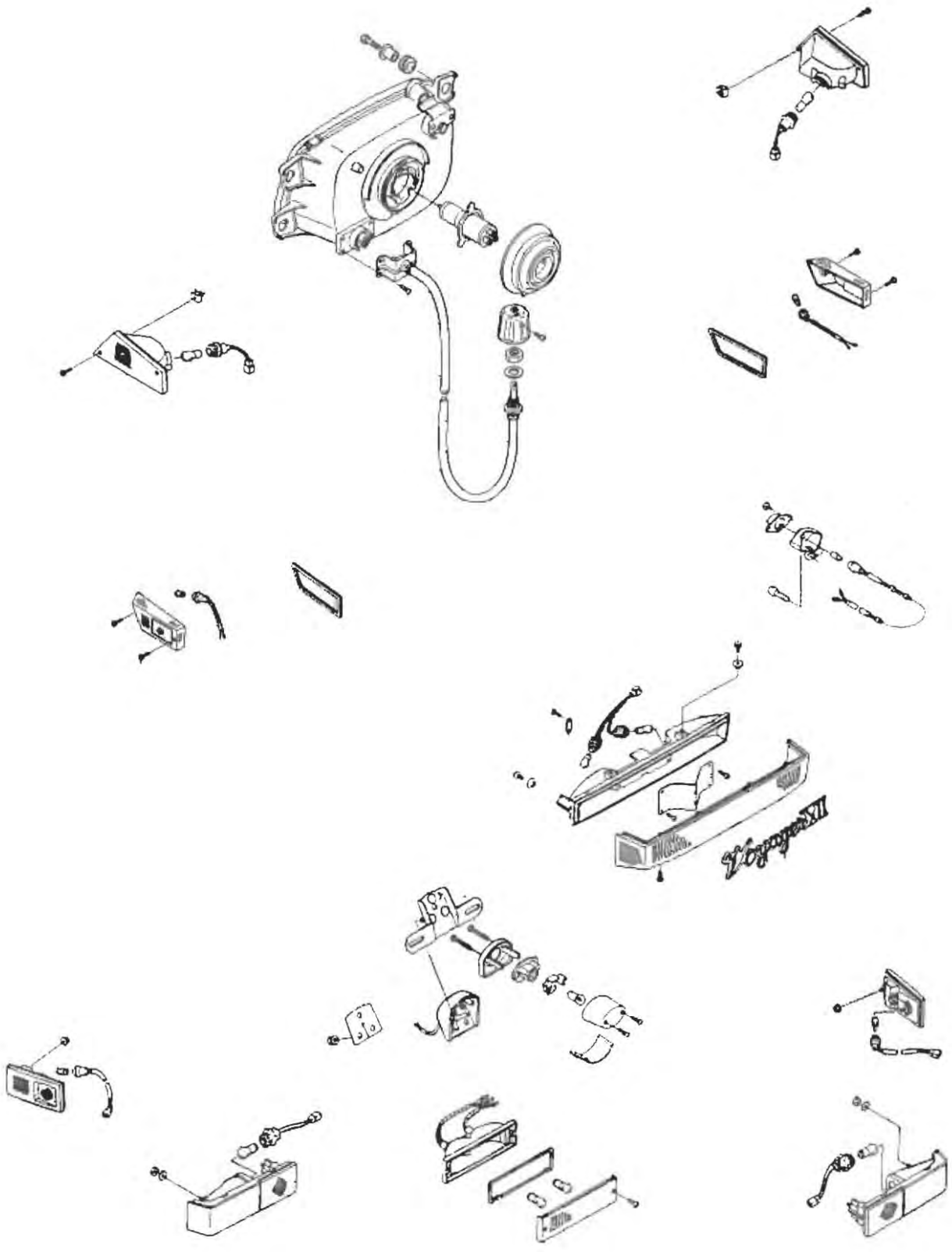
○*Connectors Ⓐ through Ⓓ are connected to the connectors of the same reference letter in the main wiring diagram.*

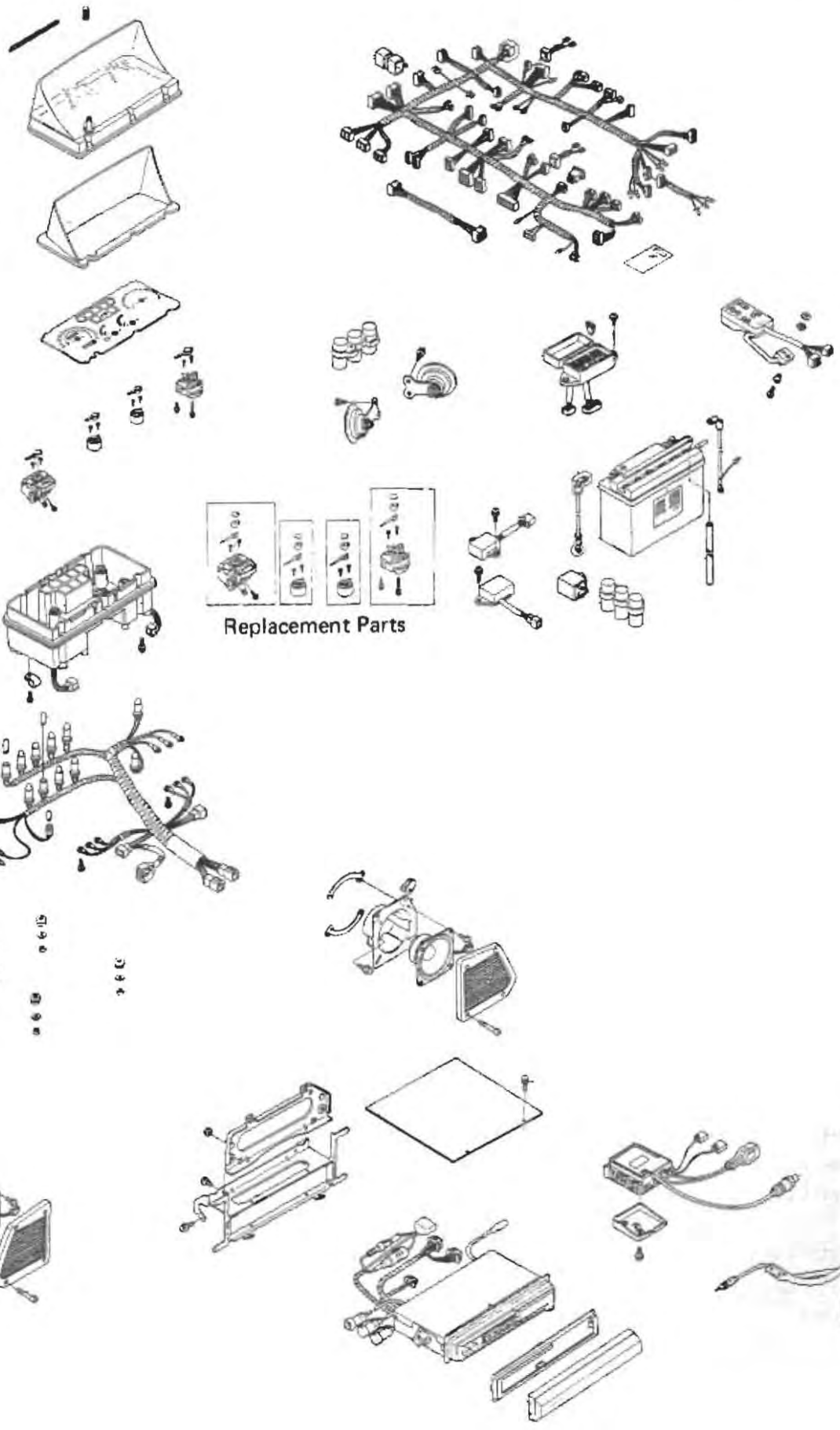
Exploded View



L : Non-permanent Locking Agent

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)




Replacement Parts

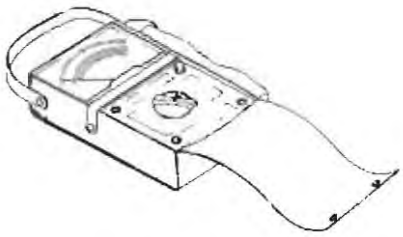
Specifications

Item	Standard	Service Limit
Battery:		
Type	12 V 20 Ah	
Specific Gravity	1.280 @20°C (68°F)	
Alternator:		
Type	Three-phase AC, regulator and rectifier contained in the unit	
Rated Output	35 A @7500 r/min (rpm), 13.5 V	
Charging Voltage	13.5 V Night @4000 r/min (rpm)	
Charging Amperage	19 A Night @4000 r/min (rpm)	
Regulated Voltage	14.7 ±0.5 V	
Carbon Brush Length	16.5 mm	8 mm
Brush Spring Tension	310 – 430 g (with new brush)	210 g
Rotor Coil Resistance	3.5 – 5.0 Ω	—
Slip Ring Diameter	23 mm	22.2 mm
Ignition System:		
Ignition Timing	10° BTDC @800 r/min (rpm)	
Pickup Coil Resistance	360 – 440 Ω	
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:		
Standard	NGK DPR8EA-9 or ND X24EPR-U9	
Option: Low Speed, Cold	NGK DPR7EA-9 or ND X22EPR-U9	
High Speed	NGK DPR9EA-9 or ND X27EPR-U9	
Plug Gap	0.8 – 0.9 mm	
Electric Starter System:		
Starter Motor:		
Carbon Brush Length	12.0 – 13.0 mm	6 mm
Commutator Groove Depth	0.5 – 0.8 mm	0.2 mm
Cooling Fan Circuit:		
Fan Switch	ON: above 94 – 100°C (201 – 212°F) OFF: below 91°C (196°F)	
Meters and Gauges:		
Electrolyte Level Sensor Resistance	about 680 Ω	
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	
Switches:		
Rear Brake Light Switch	ON after about 15 mm pedal travel	

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.

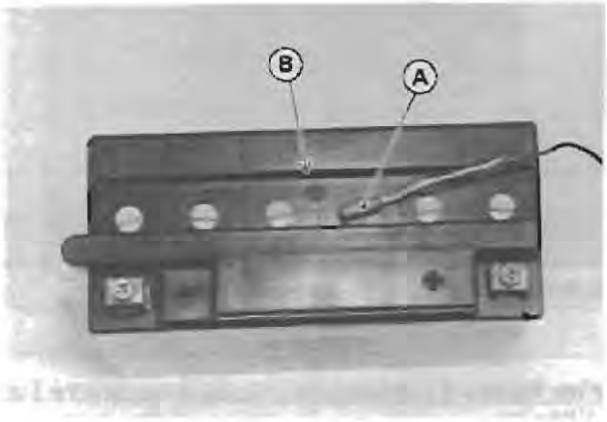
- ○When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.
- ○Never add sulphuric 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.
- ★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.

A. Level Lines



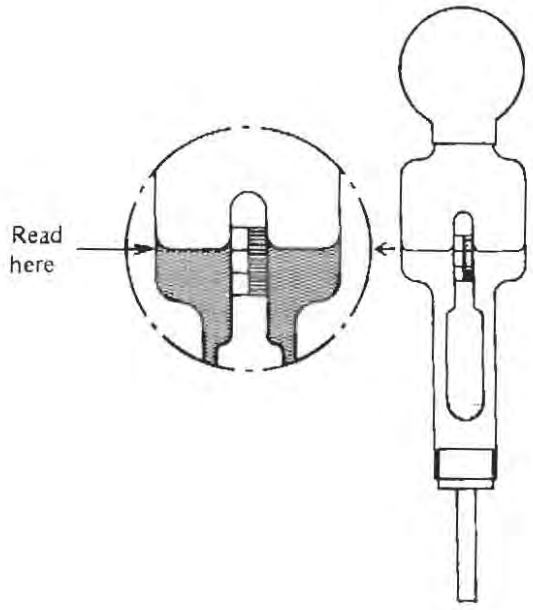
A. Electrolyte Level Sensor
B. Arrow shows sensor position.

Battery Charging:

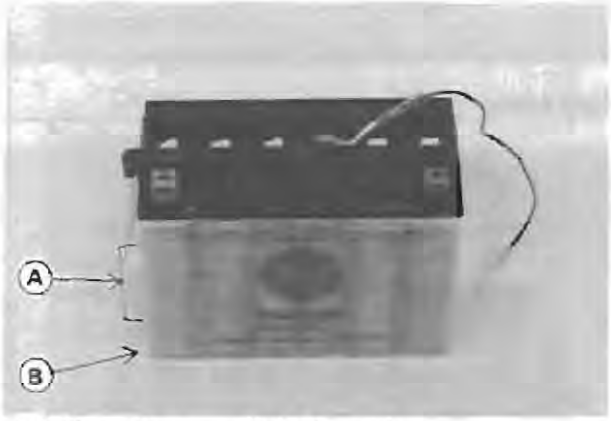
Battery Condition

•Before charging, check battery condition by testing the specific gravity of the electrolyte in each cell with a hydrometer.

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 1.200 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 and electrolyte level sensor.

•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.

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. 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.**

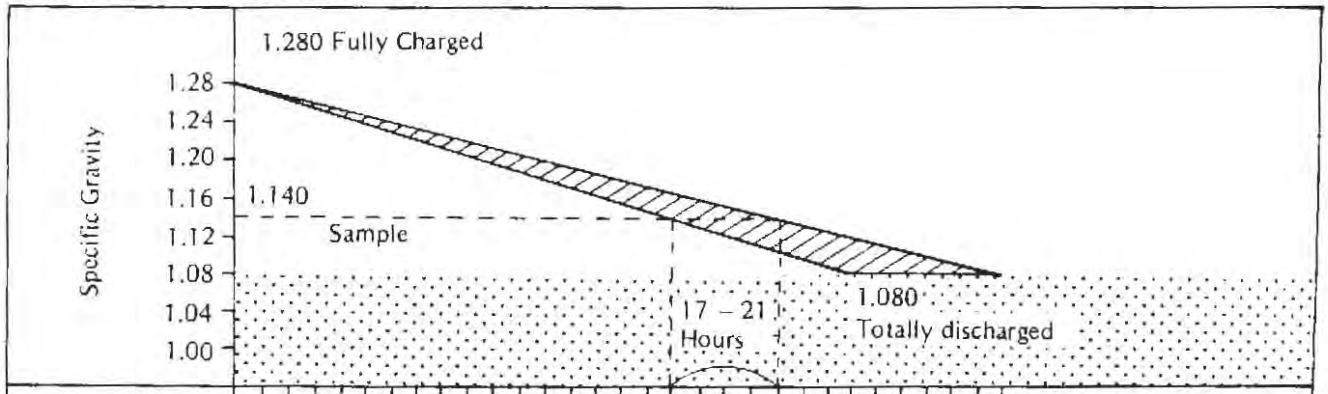
•Set the charge rate and time according to the battery condition previously determined (see Battery Condition), using the table.

CAUTION

○**Do not use a high rate battary 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 Charging Rate/Time Table (12V 20Ah)



at 1A charge rate	1 5 10 15 20 25 30
at 2A charge rate	1 5 10 15
at 3A charge rate	1 2 3 4 5 6 7 8 9 10
at 4A charge rate	1 2 3 4 5 6 7 7.5
at 5A charge rate	1 2 3 4 5 6
at 6A charge rate	1 2 3 4 5
	Hours of Charging Time at Rates Shown

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

Battery Test Charging

- If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the table.
- 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 an 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.

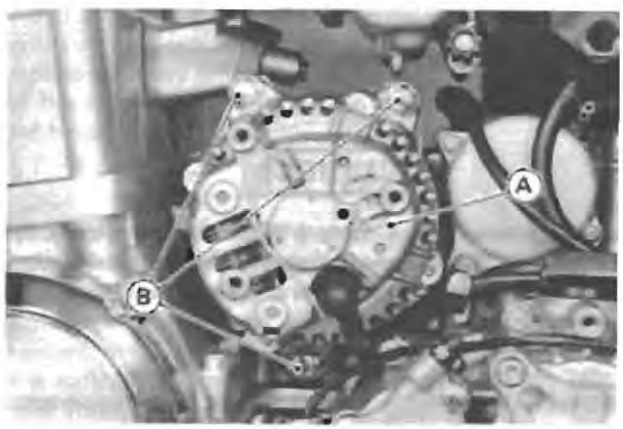
Alternator

The alternator contains the following electrical components in its compact housing:

Alternator Stator and Rotor
Rectifier
Regulator

Alternator Removal Note

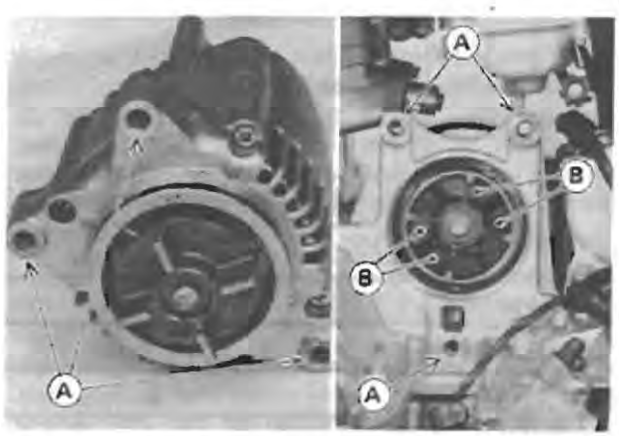
- Remove the alternator.



A. Alternator B. Mounting Bolts

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.

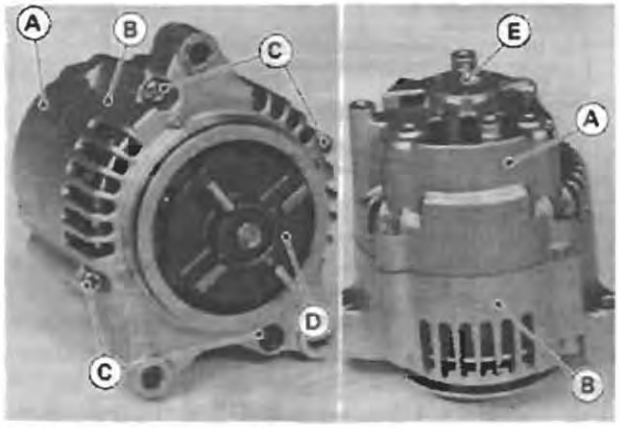


A. Clean here. B. Rubber Dampers

- Apply a non-permanent locking agent to the threads of the alternator mounting bolts.

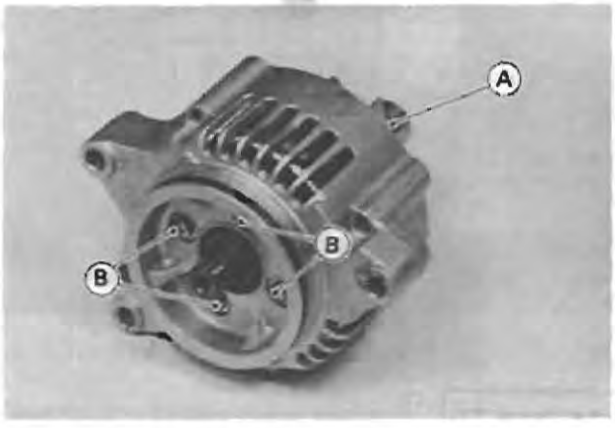
Alternator Disassembly Notes

- Separate the alternator LH and RH housings.
  - Mark the housings before separation so that the housings can be assembled in the same position.
  - If necessary, heat the left end of the LH housing to about 50 – 60°C (120 – 140°F).



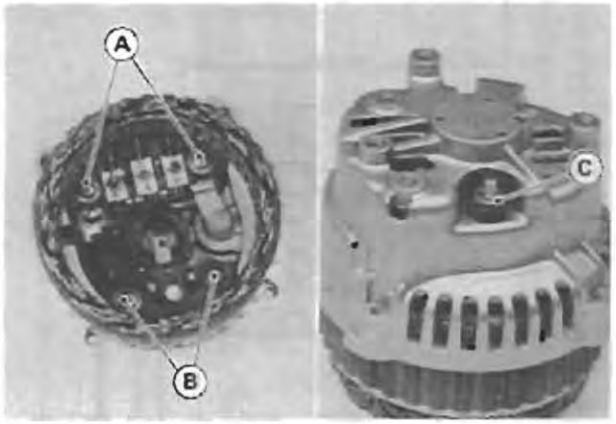
A. LH Housing
B. RH Housing
C. Housing Screws
D. Coupling
E. Heat here.

- Remove the rotor from the RH housing.



A. Rotor
B. Bearing Holder Screws

- Remove the stator, rectifier, regulator, and carbon brush assembly together from the LH housing.



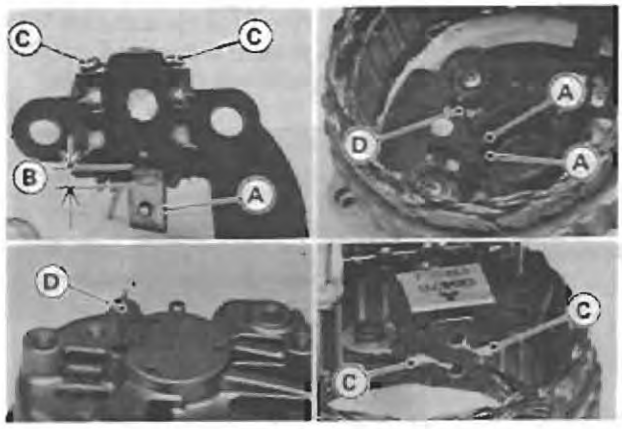
A. Rectifier Mounting Screws
B. Regulator Mounting Screws
C. Terminal Nut

- Unsolder the stator coil leads from the rectifier terminals.

Alternator Assembly Notes

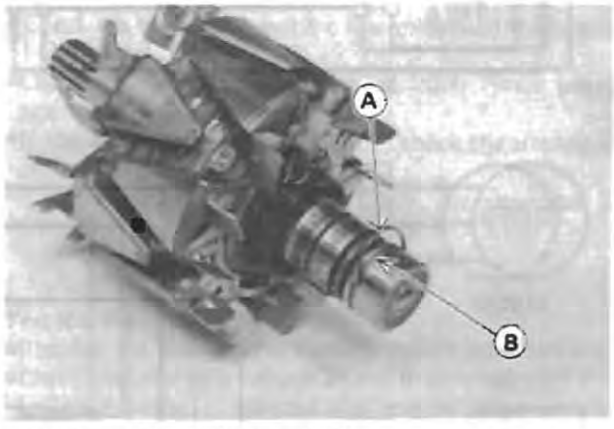
- Press the LH bearing onto the rotor shaft with the bearing long end from the ring groove facing out.
- Solder the carbon brush lead end with the brush holder so that the brush projects as shown.

Carbon Brush Installation



A. Carbon Brush
B. 3 – 4 mm
C. Solder.
D. Thin Wire

- Push the brushes into the holder, and hold them in their positions with a thin wire running through the holes on the LH housing, brush holder, and brushes.
- Position the retainer on the LH bearing groove so that the protruding portion of the retainer comes to the deeper side of the groove.



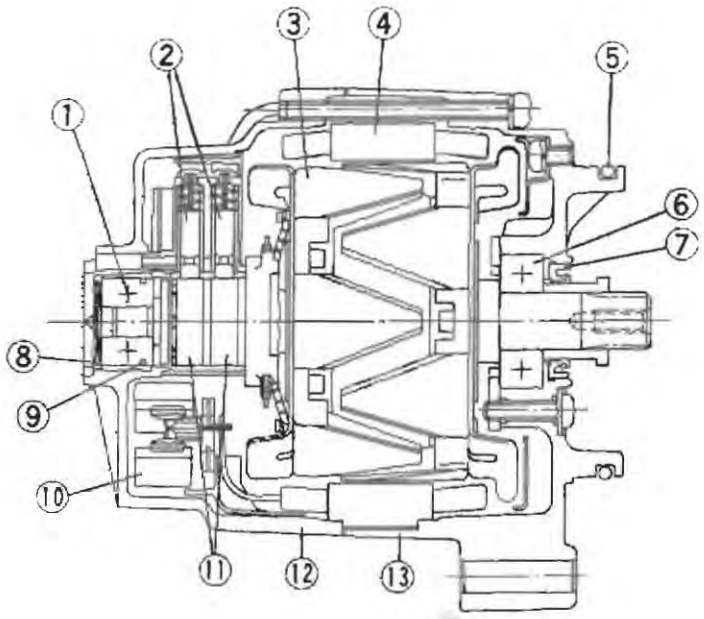
A. Retainer (Protruding Portion)
B. Groove (Deeper Side)

- After assembling the alternator, be sure the rotor turns freely.

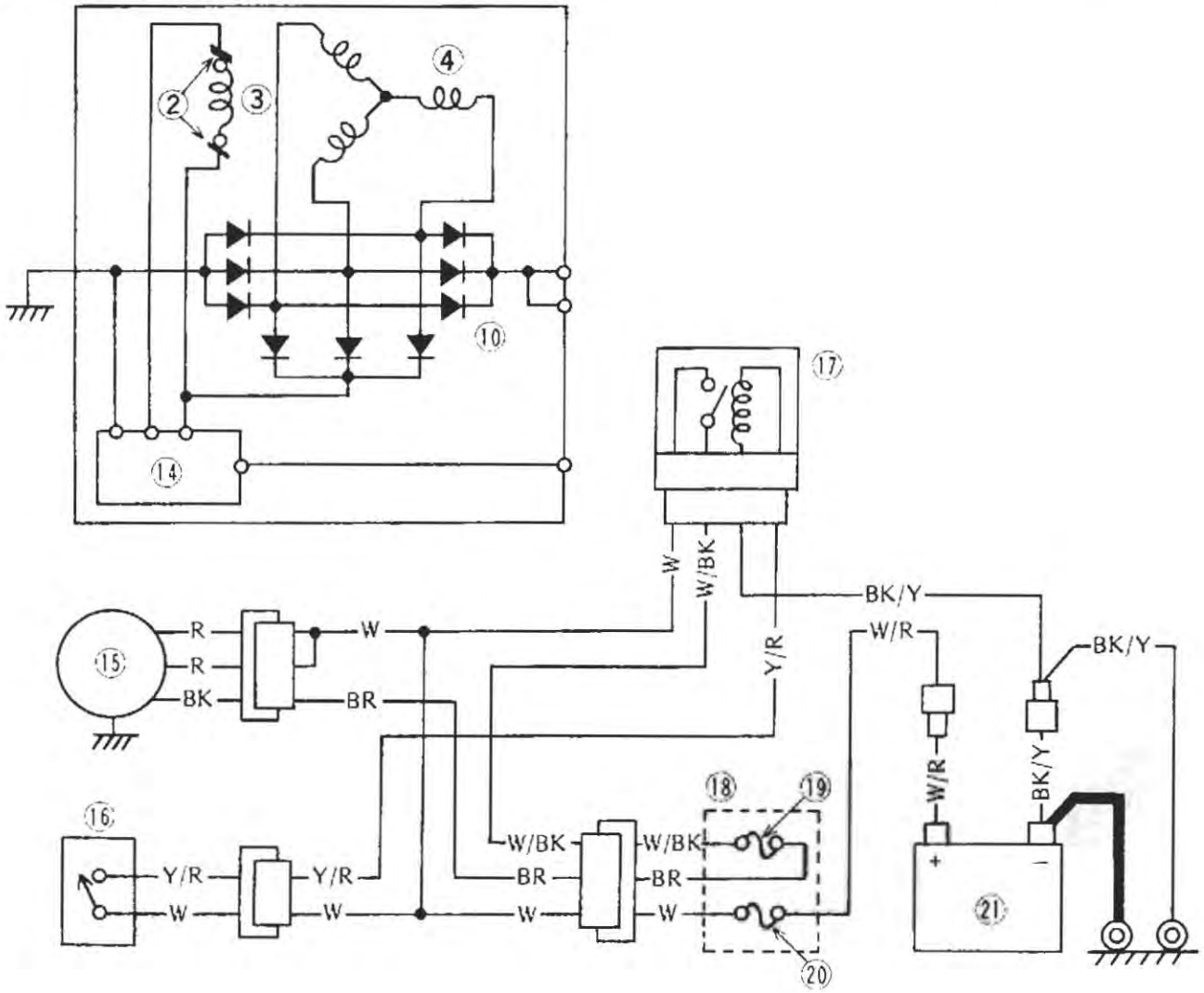
Charging System Circuit

1. LH Bearing
2. Carbon Brushes
3. Rotor
4. Stator
5. O-ring
6. RH Bearing
7. Oil Seal
8. Spring Washer
9. Retainer
10. Rectifier
11. Slip Ring
12. LH Housing
13. RH Housing
14. Regulator
15. Alternator
16. Ignition Switch
17. Main Relay
18. Fuse Case
19. 10 A Fuse
20. 30 A Fuse
21. Battery

Alternator



Alternator Internal Circuit



Alternator Operational Inspection

For any charging system problems, always check the charging system wiring first, and then check the system with the following tests shown in the test guide.

Test Guide

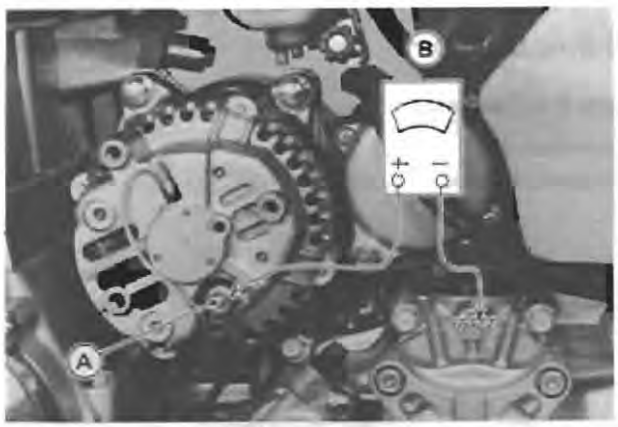
Trouble	Beginning Test No.
Battery discharged	Test No. 1
Battery overcharged	Test No. 6

Test No. 1 – Charging Voltage

- Replace the discharged battery with a good battery.
- Check the charging voltage at the alternator B terminal with the engine idling and running at 2000 r/min (rpm).

★If the voltage at 2000 r/min (rpm) is higher than the voltage at idle speed, go to Test No. 3.

★If the voltage at 2000 r/min (rpm) is the same as the voltage at idle speed (voltage does not change), go to Test No. 2.



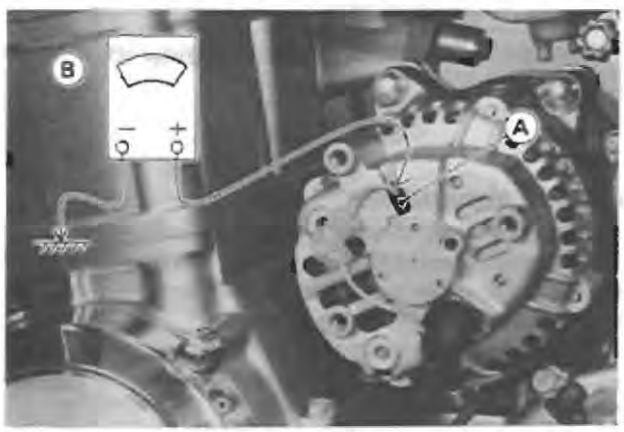
A. B Terminal B. Voltmeter

Test No. 2 – Battery Power Supply

- Check the voltage at the F terminal with the ignition switch turned on but engine stopped.

★If the battery voltage appears at the F terminal, go to Test No. 3.

★If the voltage is 0V, check the main harness side.



A. F Terminal B. Voltmeter

Test No. 3 – Regulated Voltage

- Remove the 10A fuse for the headlight in the fuse case.
- Check the charging voltage at the B terminal with the engine running at 4000 – 5000 r/min (rpm).

★If the voltage is within 14.2 – 15.2 V, the regulator is OK. Go to Test No. 4.

★If the voltage is less than 14.0 or more than 15.5 V, the alternator is defective. Check the alternator unit.

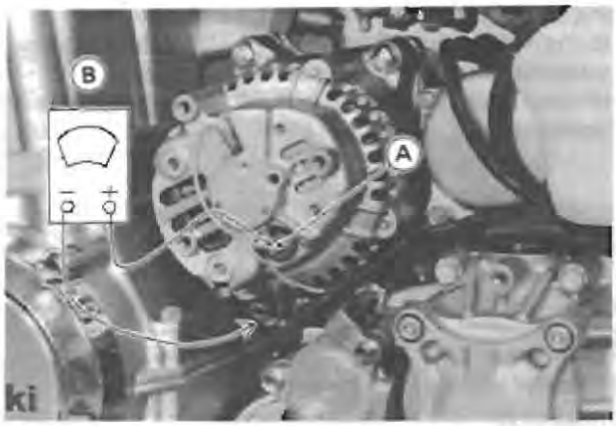
Test No. 4 – Charging Amperage

- Disconnect the lead from the B terminal.
- Check the charging amperage between the B terminal and the lead with the enigne running at 2000 r/min (rpm). Turn on the headlight, tail/brake lights, turn signal tights, etc. during the test.

★If the amperage is less than 15 A, the alternator is defective.

★If the amperage is 15 – 20 A, go to Test No. 5.

★If the amperage is more than 20 A, the alternator is OK. The trouble is in the other parts.



A. B Terminal B. Ammeter

Test No. 5 – Charging Amperage (Review)

- Discharge the battery a little or reinstall the discharged battery.
- Check the wiring between the B terminal and the battery (+) terminal.
- Check the charging amperage at 2000 r/min (rpm) again.

★If the amperage is less than 20 A, check the alternator unit.

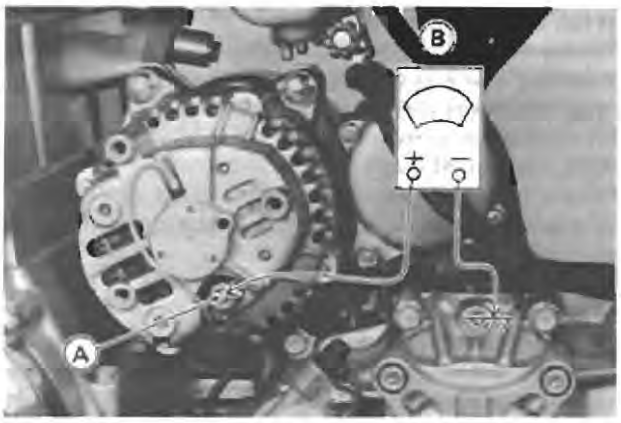
★If the amperage is more than 20 A, the alternator is OK. The trouble is in the other parts.

Test No. 6 – Charging Voltage

- Replace the overcharged battery with a good battery.
- Check the charging voltage at the B terminal with the engine running. Increase the engine speed slowly during the test.

★If the voltage does not rise more than 15.5 V, go to Test No. 7.

★If the voltage rises more than 15.5 V, the alternator (regulator) is defective.



A. B Terminal B. Voltmeter

Test No. 7 – Regulated Voltage

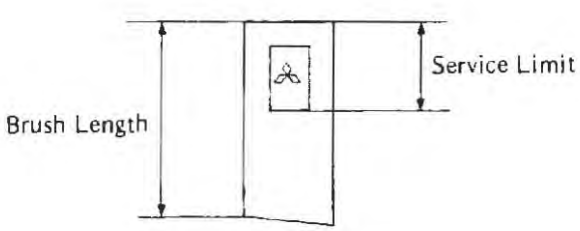
- Remove the 10 A fuse for the headlight in the fuse case.
- Check the charging voltage at the B terminal with the engine running at 4000 – 5000 r/min (rpm).
- ★If the voltage is within 14.2 – 15.2 V, the alternator (regulator) is OK. The trouble is in other parts.
- ★If the voltage is more than 15.5 V, the alternator is defective.

Carbon Brush Length

Carbon Brush Length

Standard:	**16.5 mm**
Service Limit:	**8 mm**

Carbon Brush Length



Brush Spring Tension

- Push the carbon brush into the holder until the protrusion of it comes to 2 mm from the holder, and then measure the spring tension at this instart.
- ★If the tension is less than the service limit, replace the spring.

Brush Spring Tension

Standard:	**310 – 430 g (with new brush)**
Service Limit:	**210 g**

Rotor Coil Inspection

- Measure the rotor coil resistance between the slip rings.
- ★If the resistance is not as specified, replace the rotor.

Rotor Coil Resistance

3.5 – 5.0 Ω

- Using the highest ohmmeter range, measure the resistance between he 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.

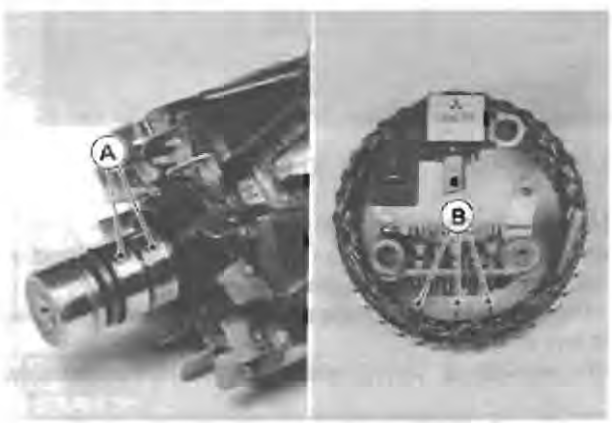
Slip Ring Cleaning

- Visually inspect the slip ring for dirt or pitting.
- ★If necessary, smooth the slip ring with lathe or fine emery cloth.

Slip Ring Diameter

Slip Ring Diameter

Standard:	**23 mm**
Service Limit:	**22.2 mm**



A. Slip Rings B. Stator Coil Windings

Stator Coil Inspection

- Using an ohmmeter, check the stator coil windings for continuity (close to 0 Ω).
- ★If the meter shows no continuity, the stator coil winding has an open lead and must be replaced.
- 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.

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.

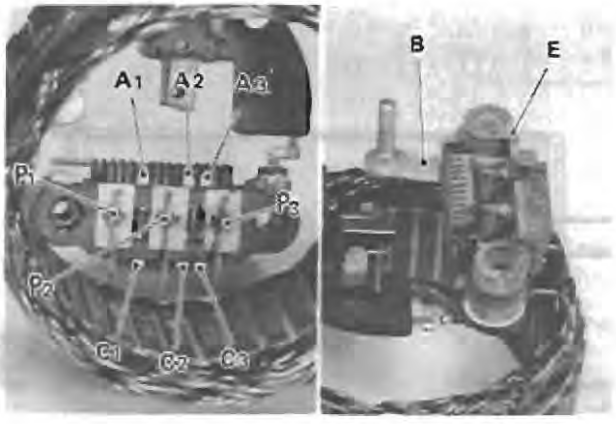
NOTE

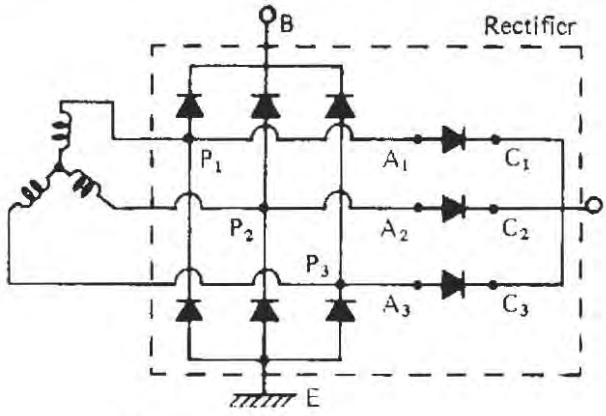
○*The actual meter reading varies with the meter used and the individual diode, but, generally speaking, the lower reading should be from zero to the first 1/2 of the scale.*

CAUTION

○**If a megger or a meter with a large-capacity battery is used, the rectifier will be damaged.**

Rectifier Inspection





Ball Bearing Inspection

- Turn each bearing back and forth while checking for roughness or binding.
- ★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.

Ignition System

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.**

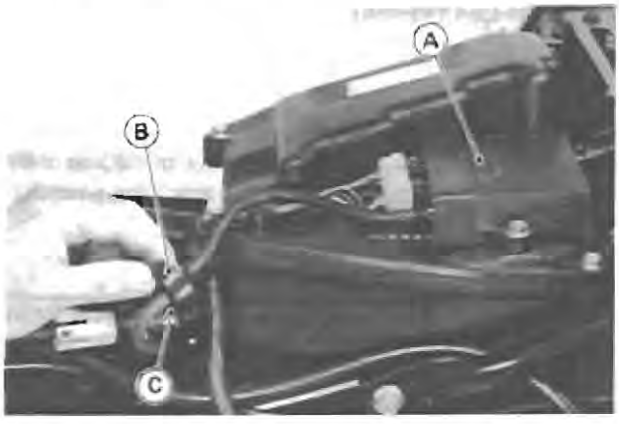
CAUTION

○**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.**

IC Igniter Installation Note

- Connect the filter to the vacuum hoses so that the marked side of the filter faces to the opposite side of the IC igniter.



A. IC Igniter
B. Filter
C. Marked Side

Ignition Coil Installation Notes

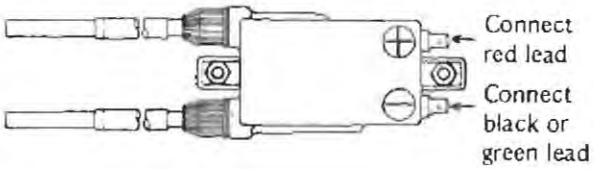
- Connect the primary wires to the primary coil terminals as follows:

○Black and red wires → #1 & 4 ignition coil (Left)
○Green and red wires → #2 & 3 ignition coil (Right)

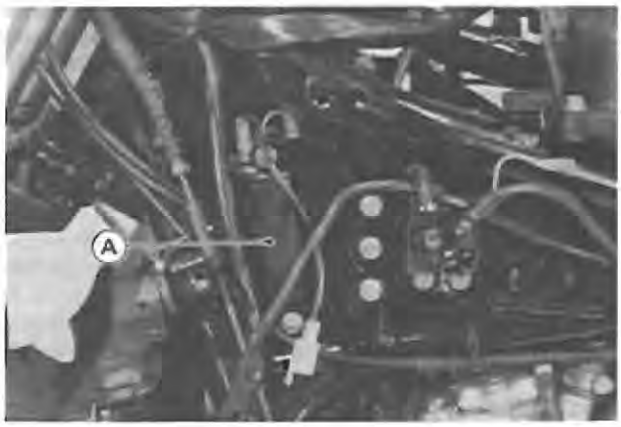
- The + and – markings next to the primary coil terminals on the ignition coil body indicate the polarity of the terminals. The polarity of the two spark plug leads are as shown when the primary leads are connected as indicated in the figure. But both the primary wires (positive red, and negative black 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



A. Ignition Coil (#1 & 4)

Spark Plug Removal Note

- Remove the battery before removing the #2 and #4 spark plugs. If necessary, use the spark plug wrench (special tool: P/N 57001-1024).

Spark Plug Installation Note

- Tighten the spark plug to the specified torque (see Exploded View).

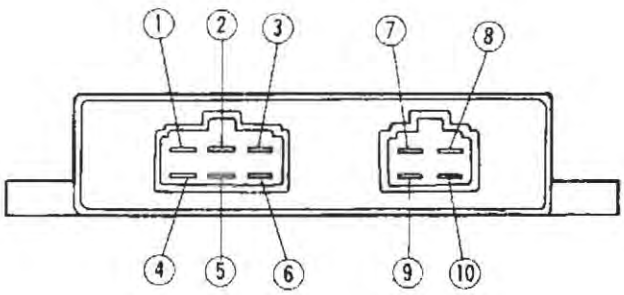
IC Igniter Inspection

- Check the IC igniter in according to the IC Igniter Troubleshooting chart.
- To inspect the IC igniter internal resistance, perform the following.
- 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



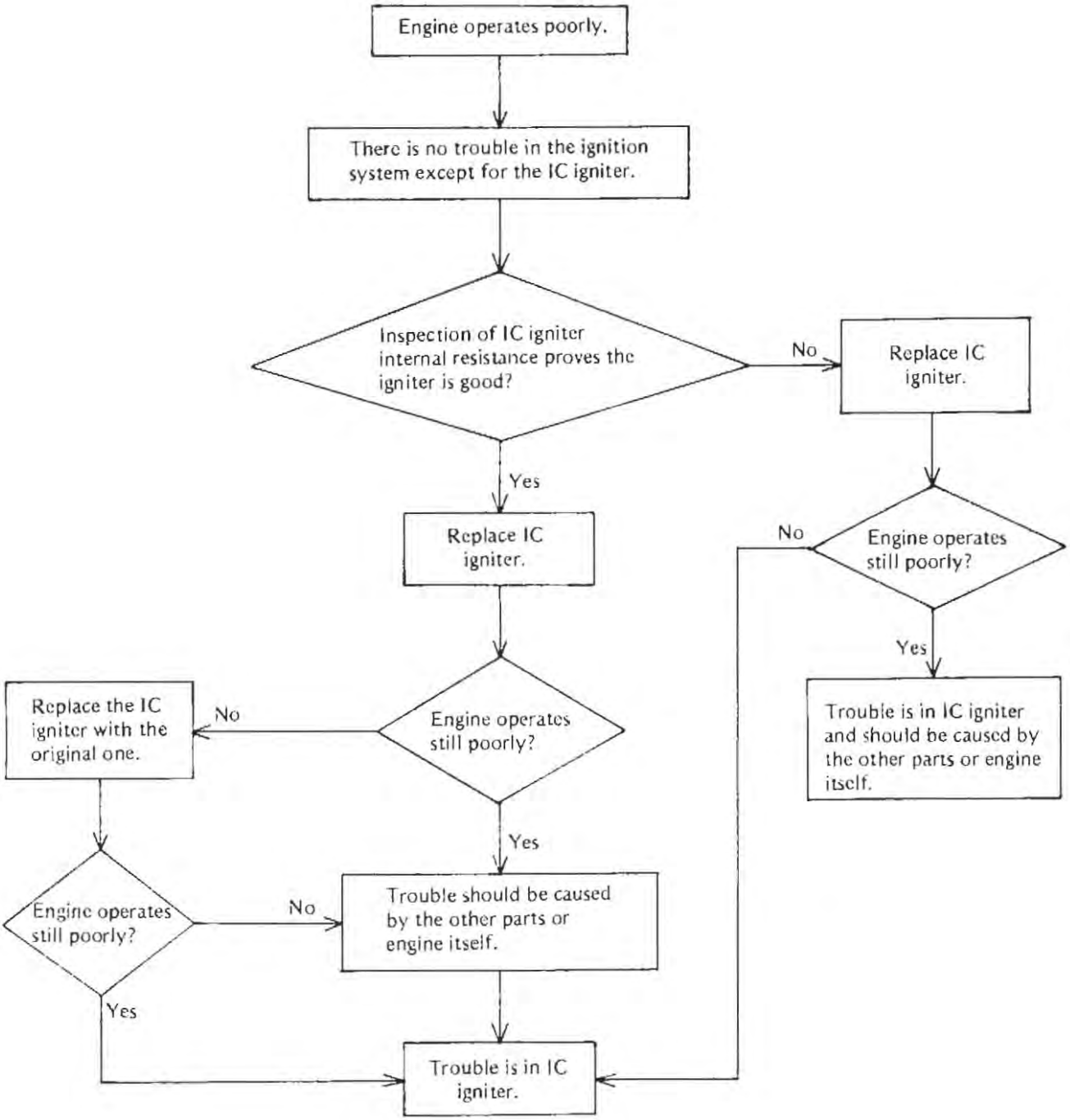
IC Igniter Internal Resistance*

Tester (–) Lead Connection \ Tester (+) Lead Connection	1	2	3	4	5	6	7	8	9	10
1		∞	∞	∞	∞	∞	–	–	–	–
2	∞		∞	∞	∞	∞	–	–	–	–
3	C	∞		C	D	A	–	–	–	–
4	∞	∞	∞		∞	∞	–	–	–	–
5	F	∞	D	F		E	–	–	–	–
6	B	∞	A	B	E		–	–	–	–
7	–	–	–	–	–	–		C	C	C
8	–	–	–	–	–	–	C		C	C
9	–	–	–	–	–	–	C	C		C
10	–	–	–	–	–	–	C	C	C	

Value (kΩ)	
∞	Infinity
A	0.9 – 1.5
B	2 – 3.8
C	3.6 – 5.5
D	8 – 12
E	9 – 13
F	13 – 24

*Measured with hand tester 57001-983. A tester other than the Kawasaki Hand Tester may show different readings.

IC Igniter Troubleshooting



Pickup Coil Inspection

●Measure the pickup coil winding resistance.

★If the resistance is not as specified, replace the pickup coil assembly.

Pickup Coil Resistance

360 – 440 Ω

●Measure the resistance between the pickup coil leads and the coil mounting plate.

★If the resistance is less than infinity, replace the pickup coil assembly.

A. Pickup Coils

Ignition Coil Inspection

•Check the spark plug leads for visible damage.

★If any spark plug lead is damaged, replace the coil.

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.

•Connect the ignition coil (with the spark plug cap left installed at each of the spark plug leads) to the tester, and measure the arcing distance.

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:

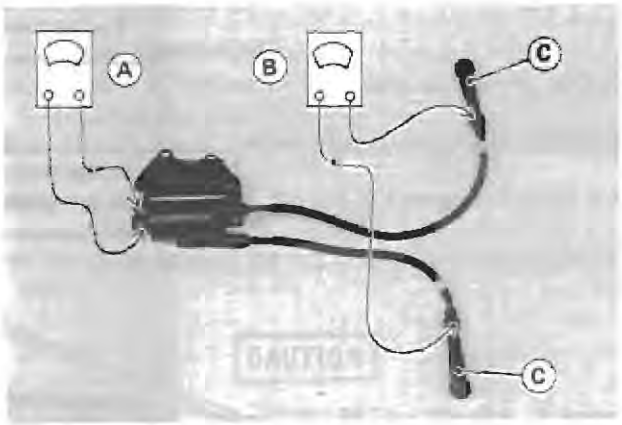
If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

•Measure the primary winding resistance and the secondary winding resistance.

★If the resistance is not as specified, replace the ignition 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.
C. Spark Plug Cap (removed)

Spark Plug Cleaning and Inspection

•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

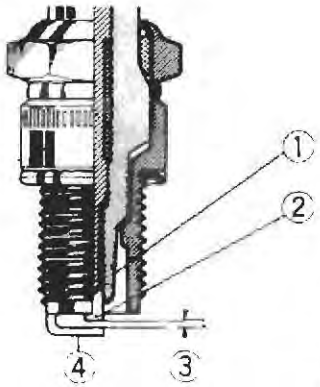
•Measure the gap with a wire-type thickness gauge.

★If the gap is incorrect, carefully bend the side electrode with a suitable tool to obtain the correct gap.

Spark Plug Gap

0.8 – 0.9 mm

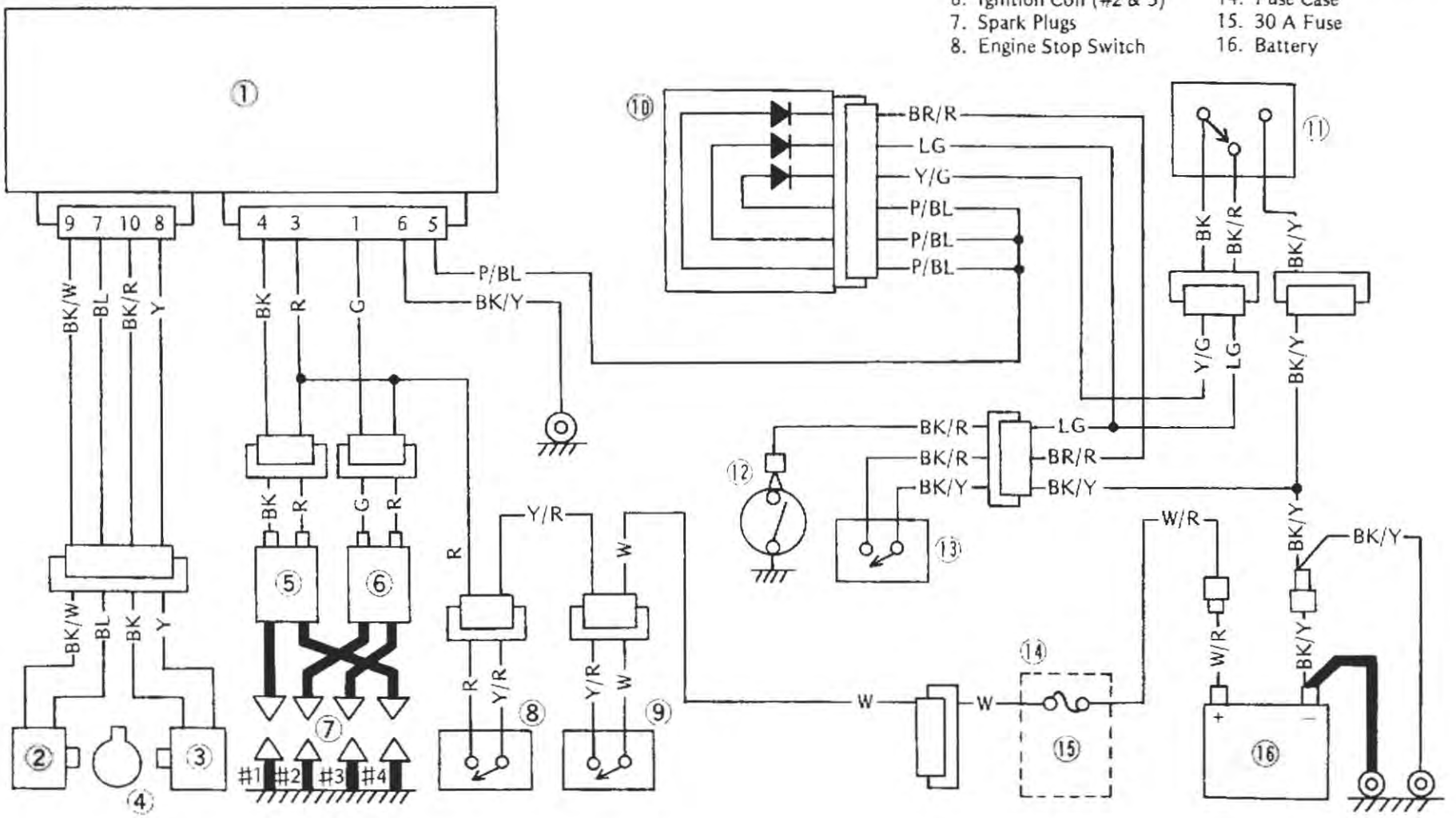
Spark Plug Gap



1. Insulator
2. Center Electrode
3. Plug Gap
4. Side Electrode

Ignition Circuit

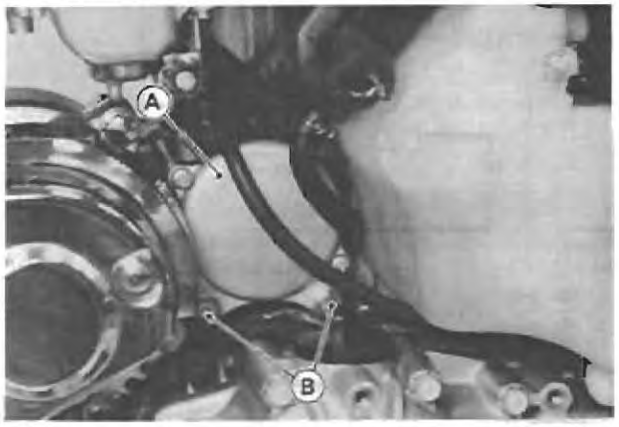
1. IC Igniter
2. Pickup Coil (#2 & 3)
3. Pickup Coil (#1 & 4)
4. Timing Rotor
5. Ignition Coil (#1 & 4)
6. Ignition Coil (#2 & 3)
7. Spark Plugs
8. Engine Stop Switch
9. Ignition Switch
10. Diode Assembly
11. Starter Lockout Switch
12. Neutral Switch
13. Side Stand Switch
14. Fuse Case
15. 30 A Fuse
16. Battery



Electric Starter System

Starter Motor Removal Note

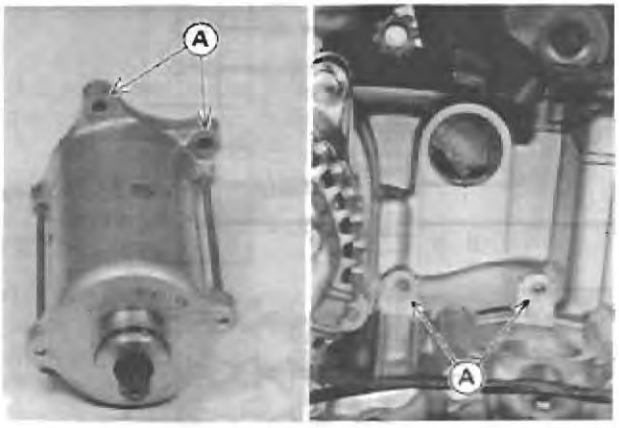
●Remove the starter motor.



A. Starter Motor B. Mounting Bolts

Starter Motor Installation Note

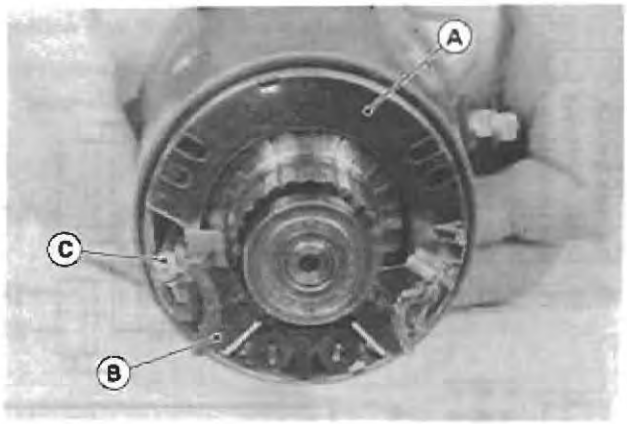
●Clean the starter motor legs and crankcase where the starter motor is grounded.



A. Clean here.

Starter Motor Disassembly Note

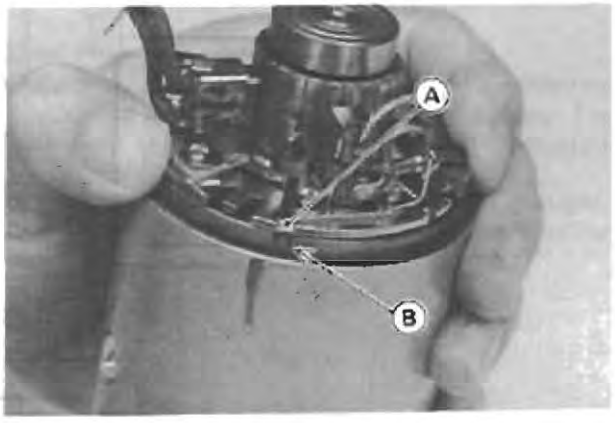
●Remove the (+) side carbon brush lead screw, and take off the brush plate.



A. Brush Plate C. Screw
B. (+) Side Carbon Brush

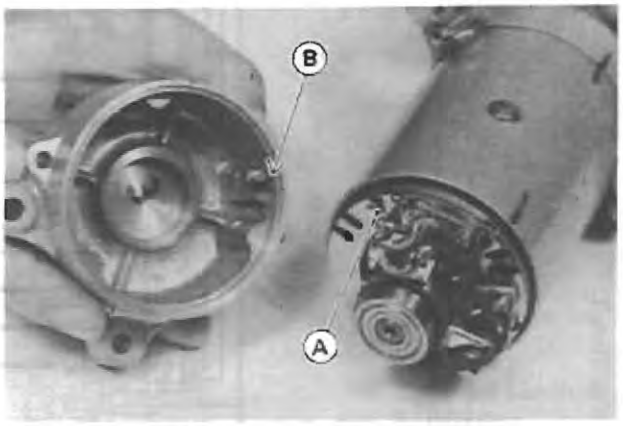
Starter Motor Assembly Notes

●Push the brush plate into place with the tab in the notch.



A. Tab B. Notch

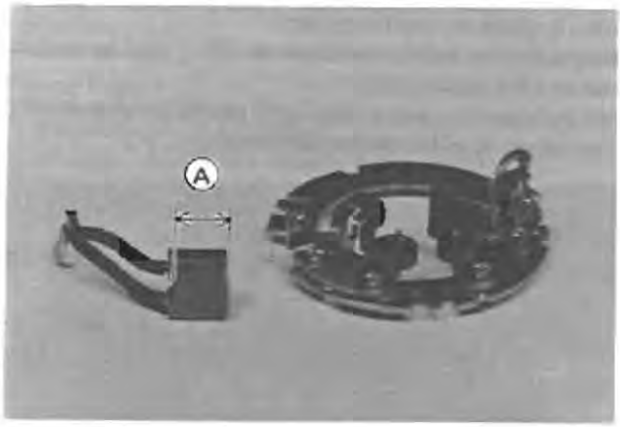
●Install the brush end cover so that the long vertical tab on the brush plate aligns with the key slot in the cover.



A. Tab B. Key Slot

Carbon Brush Length

Carbon Brush Length



Carbon Brush Length

Standard: 12.0 – 13.0 mm
Service Limit: 6 mm

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

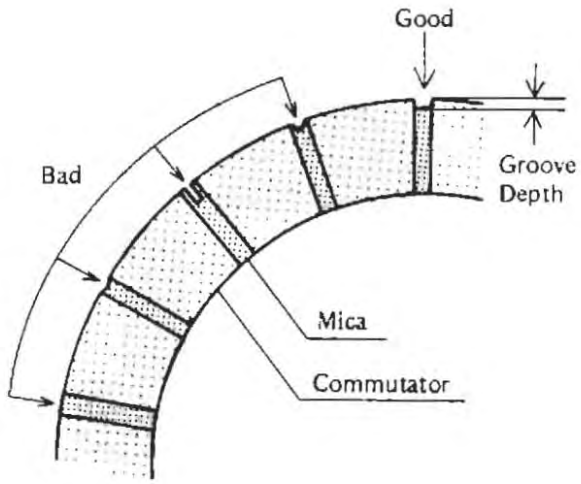
- Determine as accurately as possible the depth of the grooves between commutator segments.

★Replace the starter motor with a new one if the groove depth is less than the service limit.

Commutator Groove Depth

Standard: 0.5 – 0.8 mm
Service Limit: 0.2 mm

Commutator



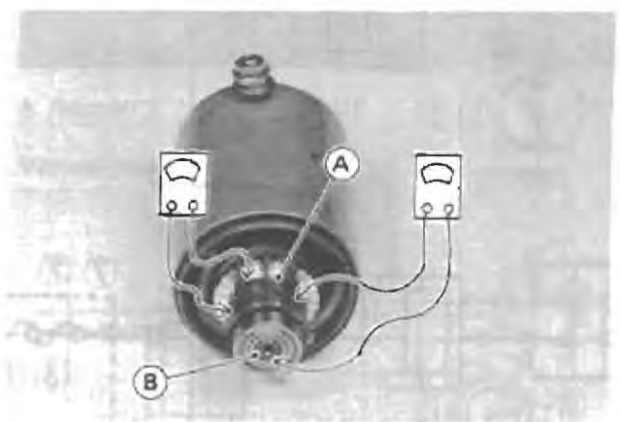
Armature Inspection

- Measure the resistance between each segment and all the others.

★If the resistance is too high or even infinite, the armature winding has an open circuit. Replace the starter motor.

- Measure the resistance between the commutator and the armature shaft.

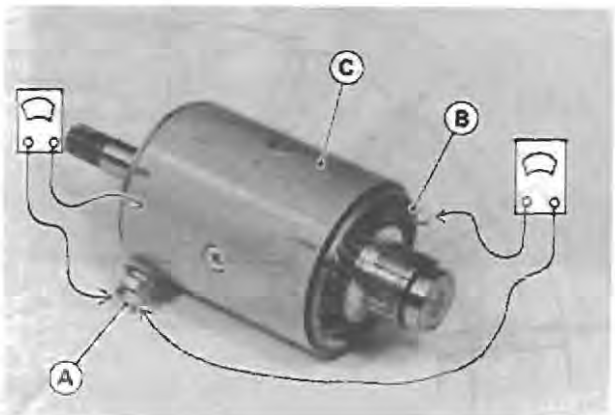
★If the resistance is less than infinite, the armature is shorted. Replace the starter motor.



A. Segments B. Shaft

Field Coil Inspection

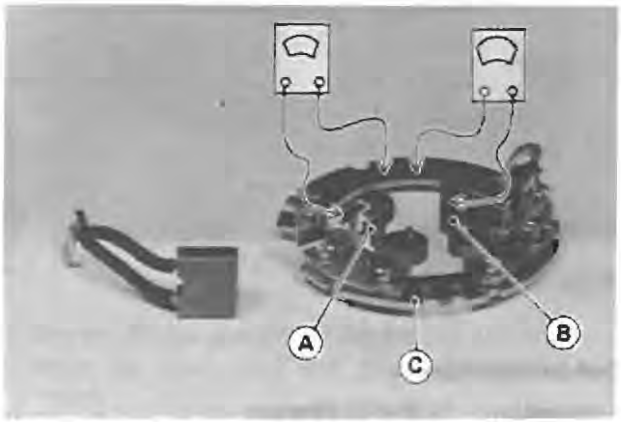
- Measure the resistance between the starter motor terminal and the (+) side carbon brush terminal lead.
- ★If the resistance is greater than 0 Ω, the field coils have an open. Replace the starter motor.
- Measure the resistance between the yoke and the starter motor terminal or (+) side carbon brush terminal lead.
- ★If the resistance is less than infinite, the field coils are shorted to ground. Replace the starter motor.



A. Starter Motor Terminal
B. (+) Side Carbon Brush Terminal Lead
C. Yoke

Brush Plate Inspection

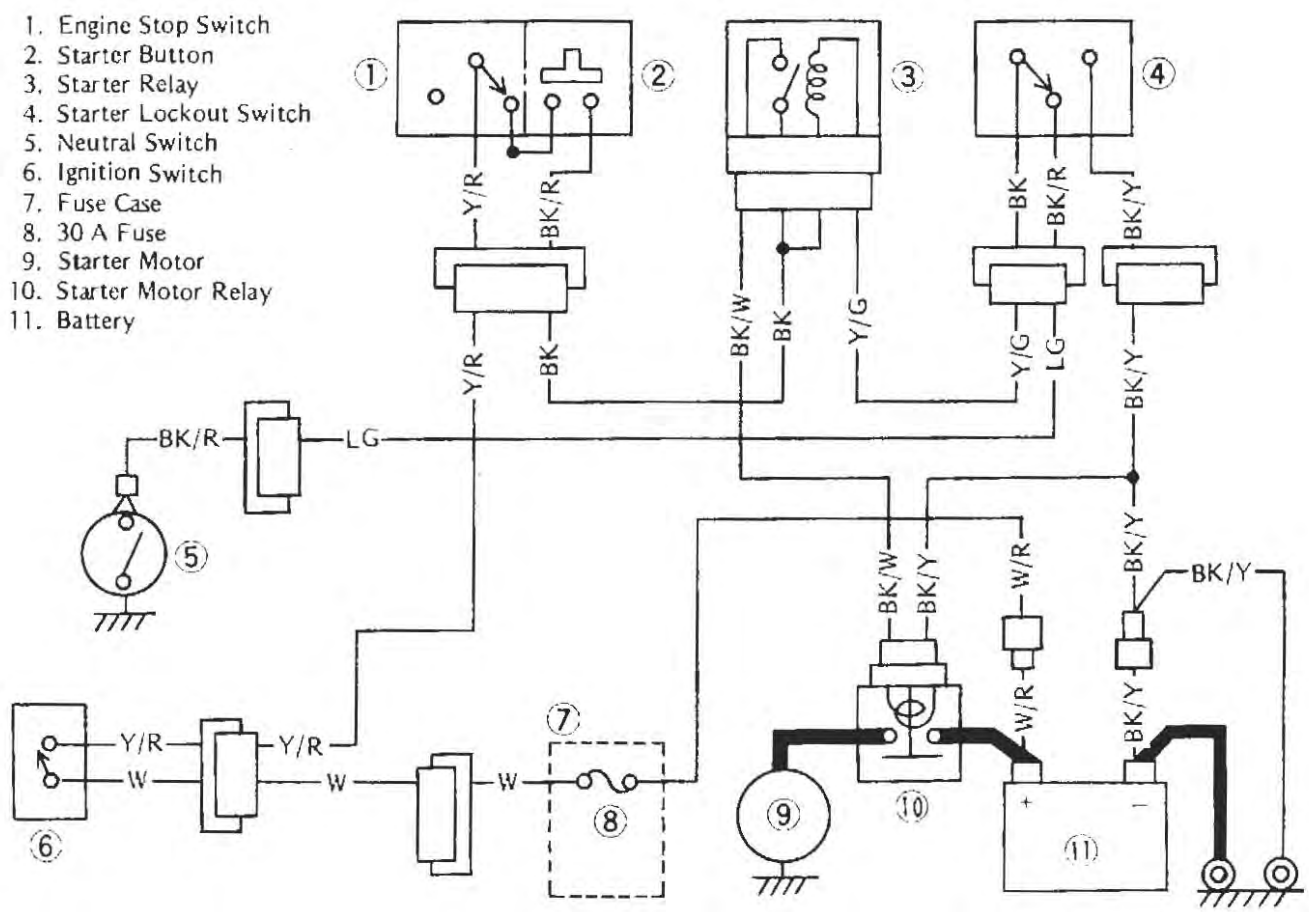
- Measure the resistance between the (+) side carbon brush holder and the metal plate.
- ★If the resistance is less than infinite, the holder has a short. Replace the starter motor.
- Measure the resistance between the (–) side carbon brush and the metal plate.
- ★If the resistance is greater than 0 Ω, the brush assembly has an open. Replace the starter motor.



A. (+)Side Carbon Brush Holder
B. (–) Side Carbon Brush
C. Metal Plate

Electric Starter Circuit

1. Engine Stop Switch
2. Starter Button
3. Starter Relay
4. Starter Lockout Switch
5. Neutral Switch
6. Ignition Switch
7. Fuse Case
8. 30 A Fuse
9. Starter Motor
10. Starter Motor Relay
11. Battery



Starter Motor Relay Inspection

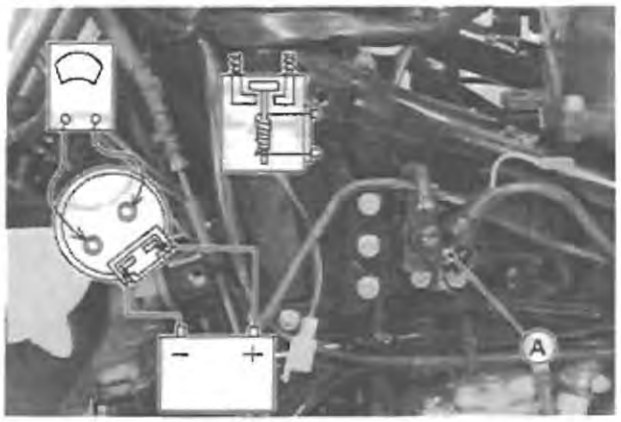
●Connect an ohmmeter and 12 V battery to the starter motor relay as shown.

★If the relay does not work as specified, the relay is defective.

Testing Relay

Meter Range: x 1 Ω range
Criteria: When battery is connected → 0 Ω
When battery is disconnected → ∞ Ω

Testing Relay



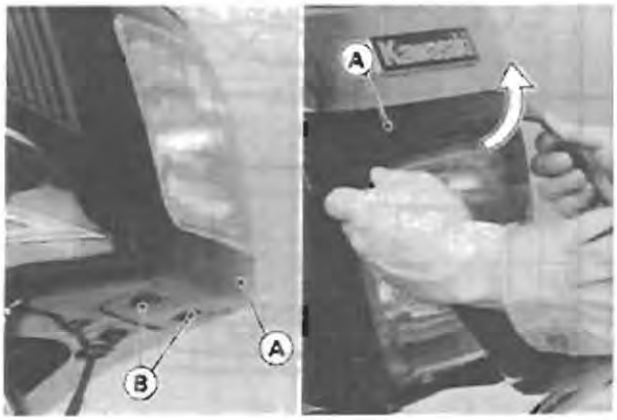
A. Starter Motor Relay

Lighting System

Headlight Circuit:

Headlight Beam Horizontal Adjustment

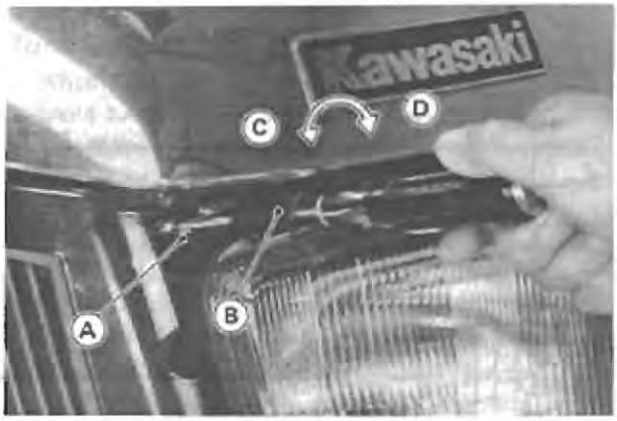
●Remove the headlight cover.



A. Headlight Cover B. Mounting Screws

●Put a Phillips screwdriver into the adjuster guide.

●Turn the adjuster in or out until the beam points straight ahead.



A. Adjuster C. Left
B. Adjuster Guide D. Right

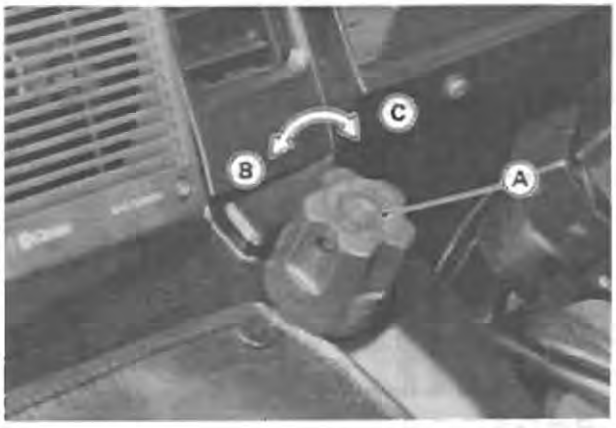
●Install the headlight cover.

Headlight Beam Vertical Adjustment

NOTE

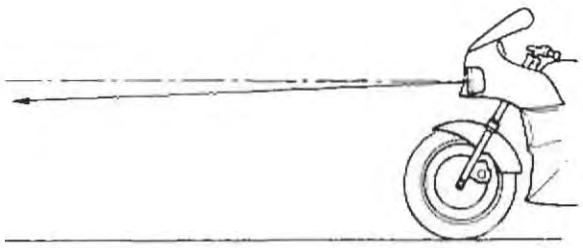
○*On high beam, the brightest point should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight to the proper angle according to local regulations.*

●Turn the adjuster to the direction "UP" or "DOWN", to adjust the headlight vertically.



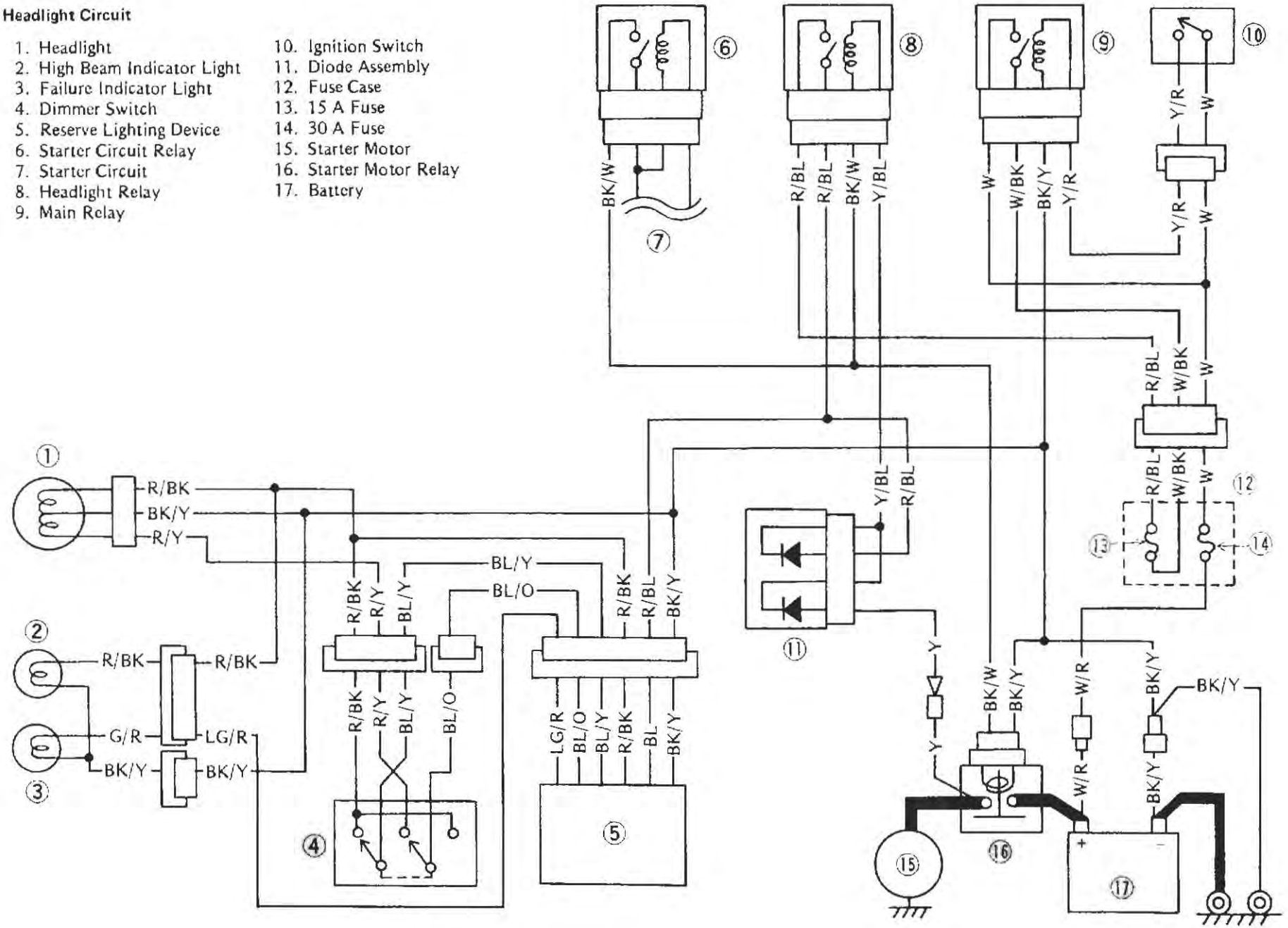
A. Adjuster B. UP C. DOWN

Vertical Adjustment



Headlight Circuit

1. Headlight
2. High Beam Indicator Light
3. Failure Indicator Light
4. Dimmer Switch
5. Reserve Lighting Device
6. Starter Circuit Relay
7. Starter Circuit
8. Headlight Relay
9. Main Relay
10. Ignition Switch
11. Diode Assembly
12. Fuse Case
13. 15 A Fuse
14. 30 A Fuse
15. Starter Motor
16. Starter Motor Relay
17. Battery



Headlight Reserve Lighting System Inspection

If either high or low beam burns out, the reserve lighting system switches over to the remaining filament automatically, and lights the white headlight failure indicator light to show that the headlight bulb must be replaced. If the high beam filament burns out, the low beam is automatically turned on; if low beam burns out, the high beam is turned on but more dimly than normal.

The US and Canadian models contain a relay in 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 reverse lighting device check out good, the device is defective.

A. Reserve Lighting Device
B. Turn Signal Control Unit

Turn Signal Circuit:

Turn Signal Control Unit Inspection

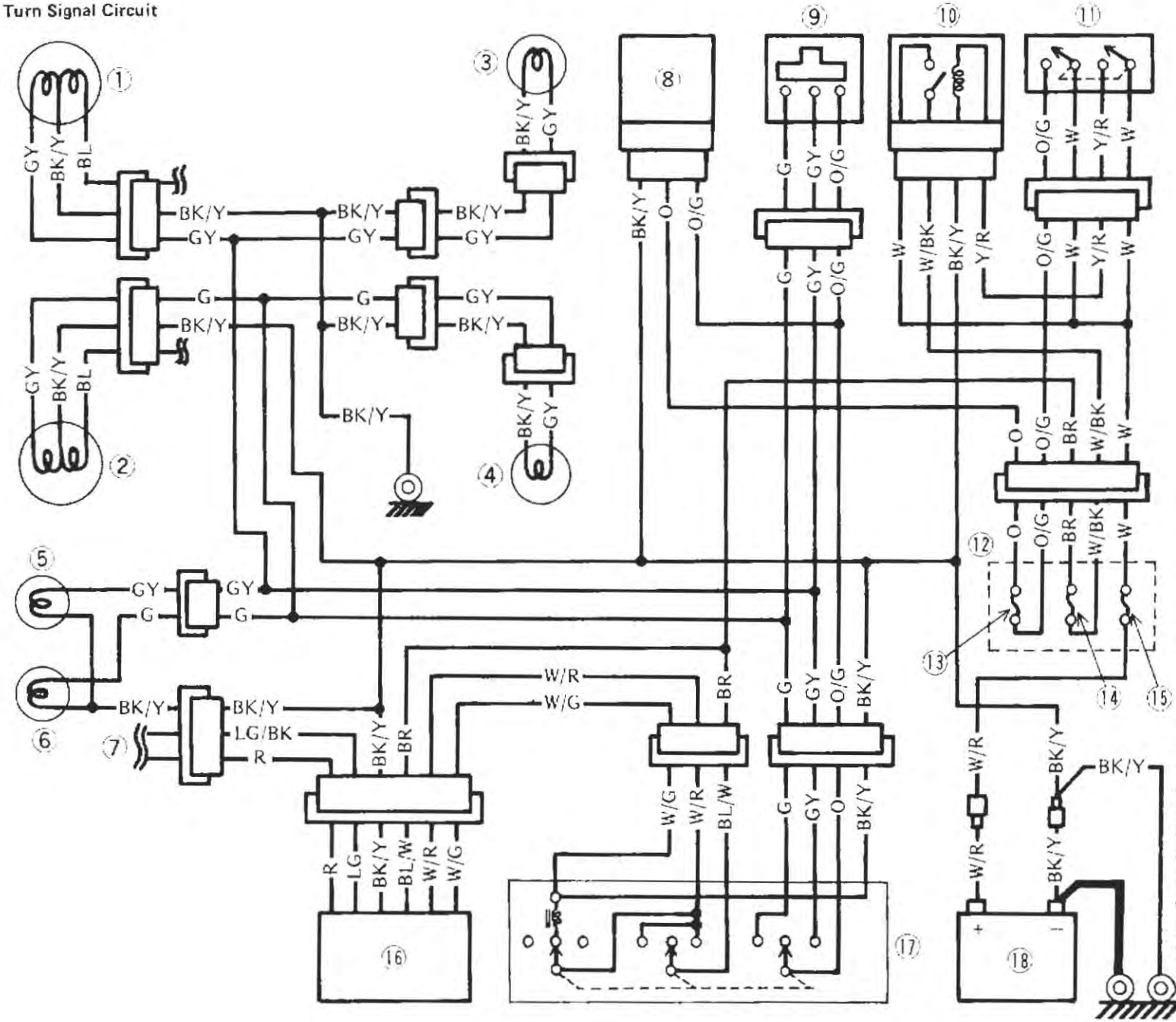
When the turn signal switch is in ON position, a solenoid turns off the turn signal after it has been on for 4 seconds, plus the time that the motorcycle has traveled an additional 50 meters. The cancelling system consists of the battery (power source), turn signal control unit, distance sensor, solenoid, and turn signal switch. When the turn signal switch is pushed to the left or right, the turn signals start flashing and the control unit starts counting off 4 seconds. At the end of this time, the control unit starts calculating distance traveled using pulses from the distance sensor at the rear of the speedometer. When the motorcycle has traveled 50 meters, the control unit operates the solenoid, which returns the turn signal switch to the OFF position.

★If all wirings and components other than the turn signal control unit check out good, the unit is defective.

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.

Turn Signal Circuit



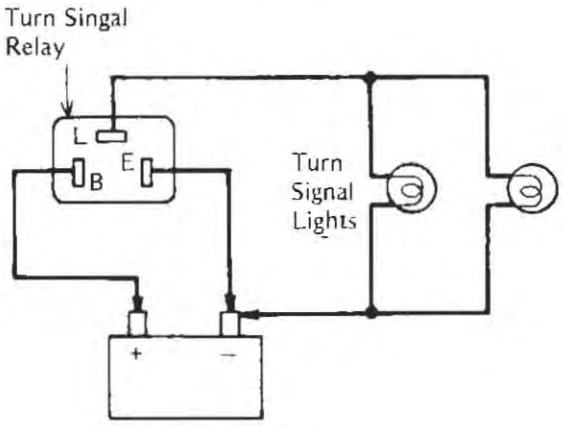
1. Front Right Turn Signal/Running Position Light
2. Front Left Turn Signal/Running Position Light
3. Rear Right Turn Signal Light
4. Rear Left Turn Signal Light
5. Right Turn Signal Indicator Light
6. Left Turn Signal Indicator Light
7. Meter and Gauge Circuit
8. Turn Signal Relay
9. Hazard Switch
10. Main Relay
11. Ignition Switch
12. Fuse Case
13. 10 A Fuse
14. 10 A Fuse
15. 30 A Fuse
16. Turn Signal Control Unit
17. Turn Signal Switch
18. Battery

Turn Signal Relay Inspection

- Remove the turn signal relay.
- 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

A. Turn Signal Relay

Bulb Replacement:

Bulb Replacement Notes

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.

- Remove and install the headlight bulb.

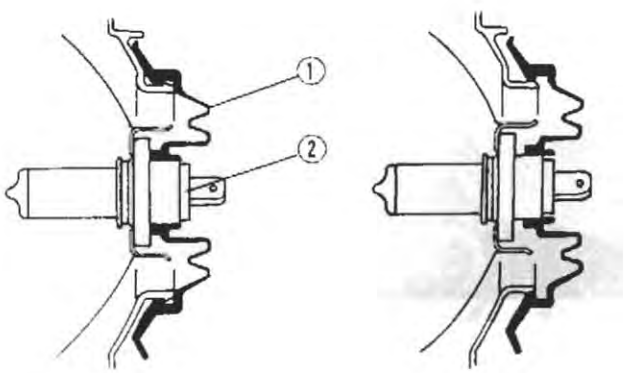
CAUTION

○When handling quartz-halogen bulbs, never touch the glass 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 headlight bulb firmly as shown.

A. Top Mark B. Dust Cover

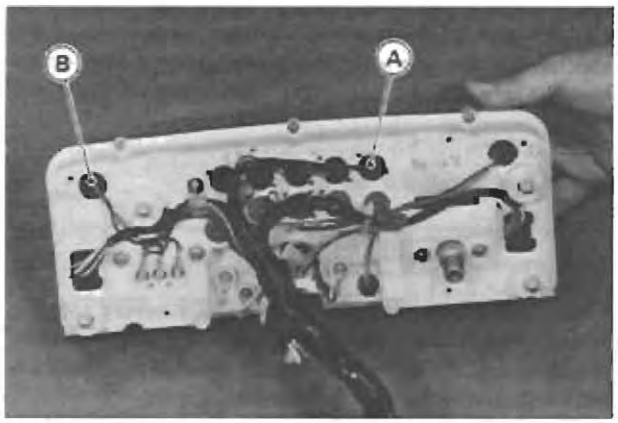
Dust Cover Installation



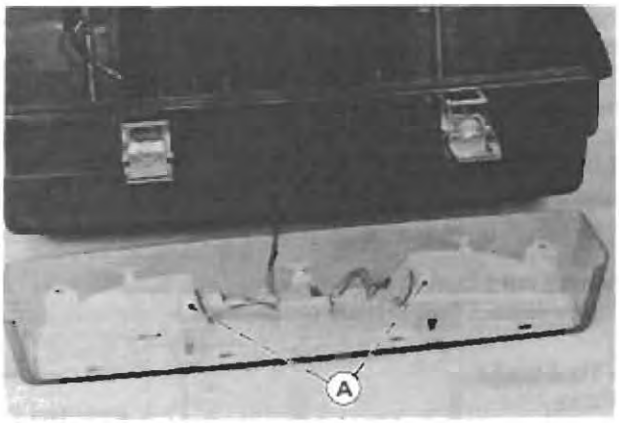
Good Bad

1. Dust Cover 2. Headlight Bulb

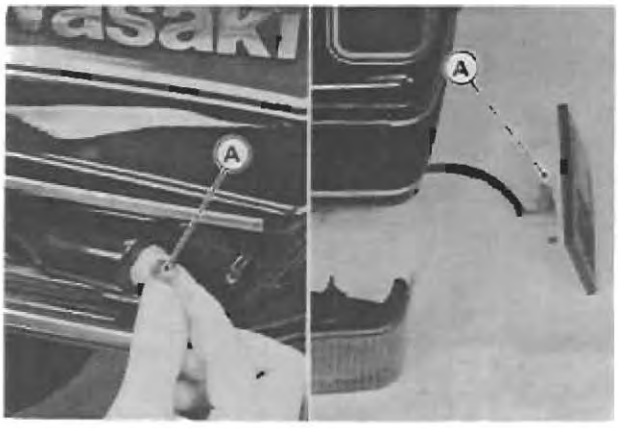
●Remove the wedge-base type bulbs.
○Pull out the bulbs and sockets, and/or pull the bulbs off the sockets.



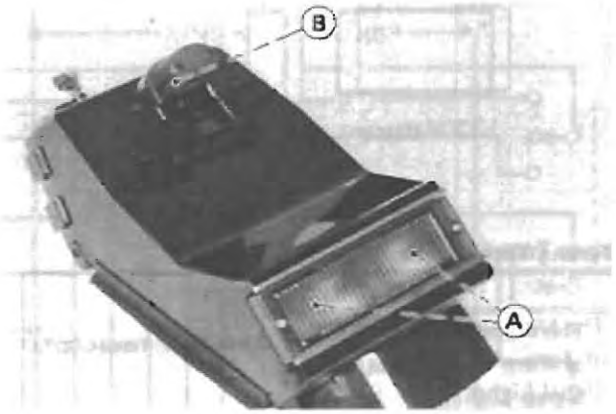
A. Indicator Bulbs B. Illumination Bulbs



A. Tail/Brake Light Bulbs



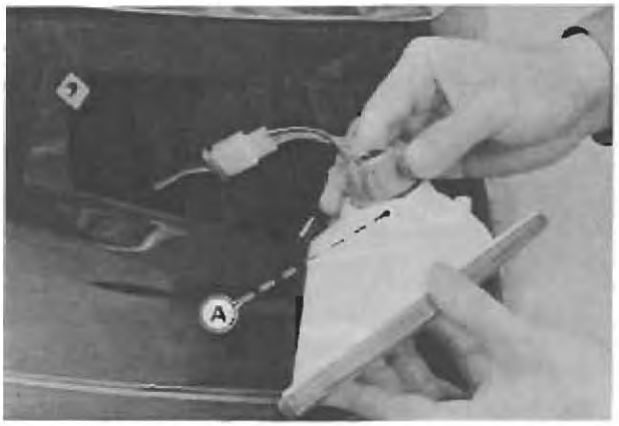
A. Side Marker Light Bulb



A. Tail/Brake Light Bulbs
B. License Plate Light Bulb

A. Trunk Room Light Bulb

●Remove the lock pin type bulbs.
○Pull out the bulbs and sockets.
○Push the bulb in, turn it counterclockwise, and pull it out of the socket.



A. Turn Signal/Running Position Light Bulb

A. Turn Signal Light Bulb

Fuel Pump

The fuel pump does not operate when the ignition switch is turned on only. The pump operates when the starter button is pushed on or the engine is running.

Fuel Pump Internal Resistance

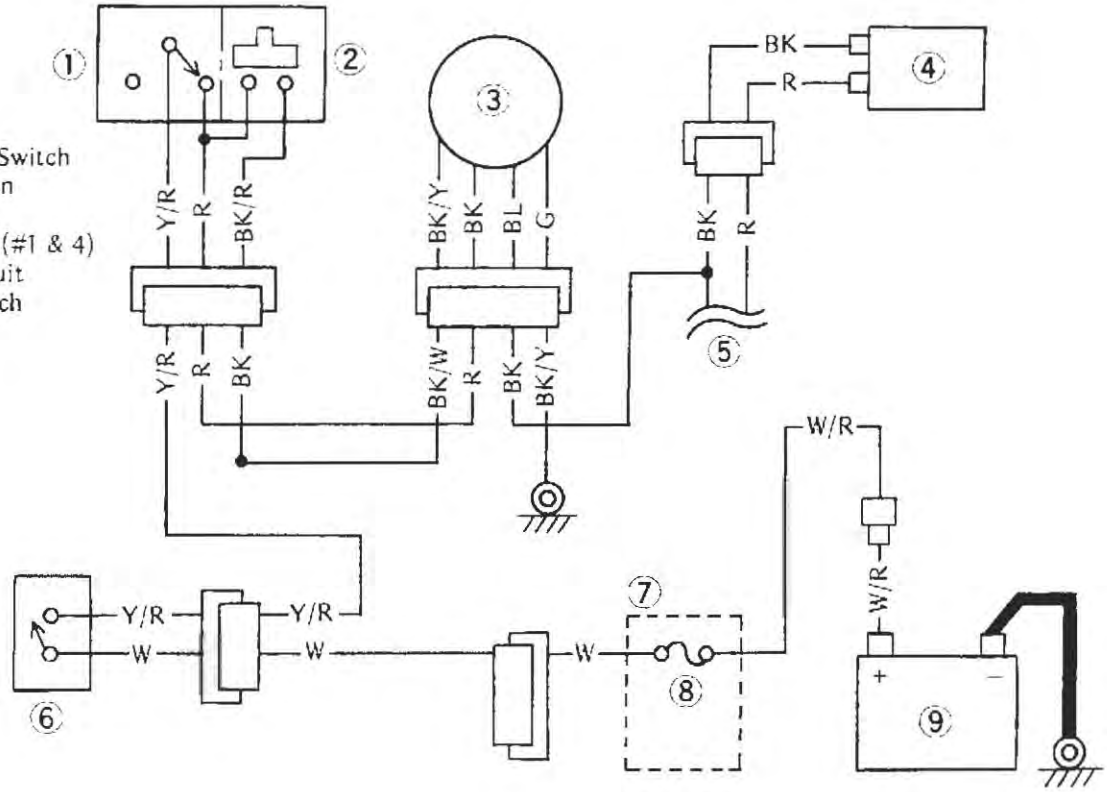
- Set the ohmmeter to the x 1 kΩ range and make the measurements shown in the table.
- ★If the meter readings are not as specified, replace the fuel pump.

Fuel Pump Internal Resistance

		Tester (+) Lead Connection		
	Lead	BK	BL	BK/Y
Tester (−) Lead Connection	BK		∞	∞
	BL	∞		∞
	BK/Y	∞	More than 20 kΩ	

Fuel Pump Circuit

1. Engine Stop Switch
2. Starter Button
3. Fuel Pump
4. Ignition Coil (#1 & 4)
5. Ignition Circuit
6. Ignition Switch
7. Fuse Case
8. 30 A Fuse
9. Battery



Cooling Fan Circuit

Cooling Fan Circuit Inspection

If the fan does not run while the water temperature gauge hand is in the hot range, check the water temperature gauge, or the cooling fan circuit.

- Visually inspect the radiator fan.
- ★If the fan blades or shroud are damaged, replace the fan assembly.
- Pull off the fan switch lead, and ground it with a suitable lead.
- ★If the fan turns, inspect the fan switch.
- ★If the fan does not turn, check the fan, fan relay or wiring as follows.

WARNING

○**Be careful not to touch the fan blades to avoid injury.**

Fan Motor Inspection

- Pull out the fan connector and connect it to 12 V battery as follows.

Fan connector (male)

G	→	**Battery (–)**
BL	→	**Battery (+)**

★If the fan does not turn, replace the fan assembly.

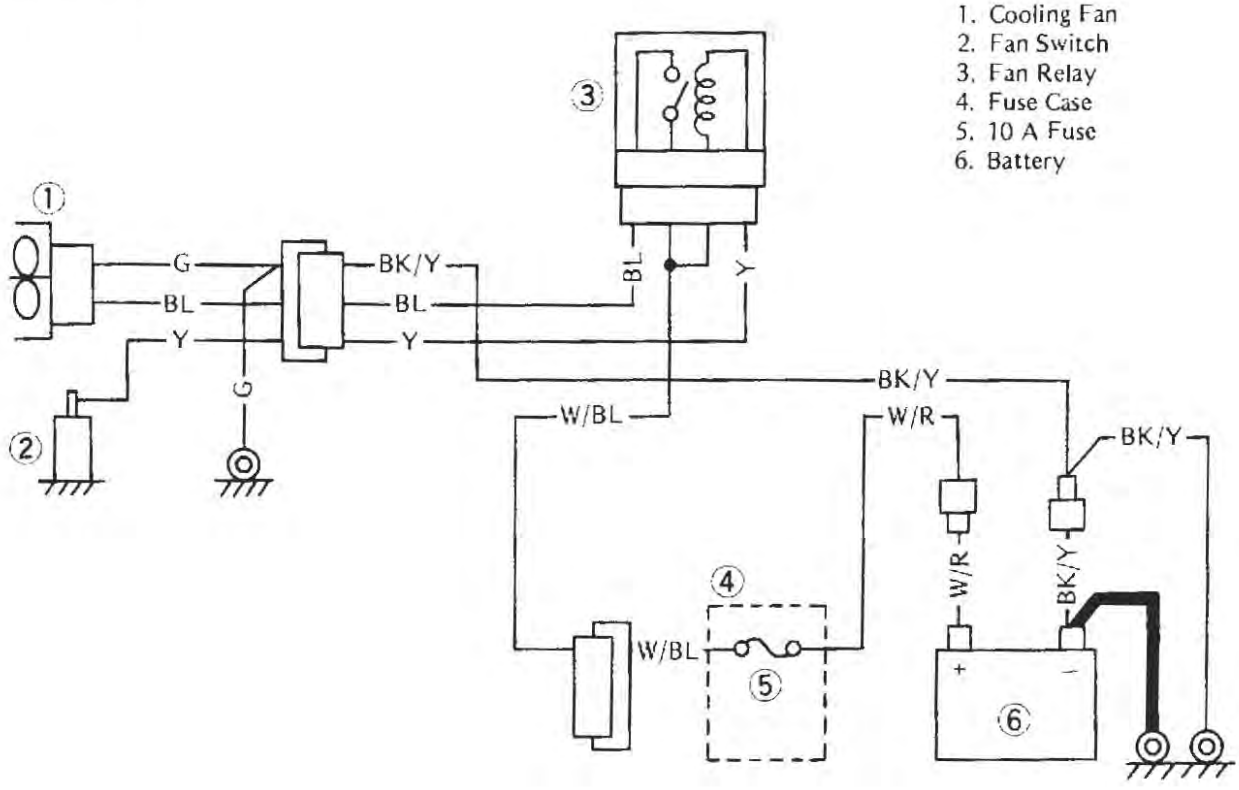
Fan Switch Inspection

- Remove the fan switch, and check the internal resistance of the fan switch across the switch terminal and the body.
- Suspend the switch in a container of water so that the temperature-sensing projection and threaded portion are submerged.
- ★The fan switch resistance should change as shown in the table. If it does not, replace the switch.

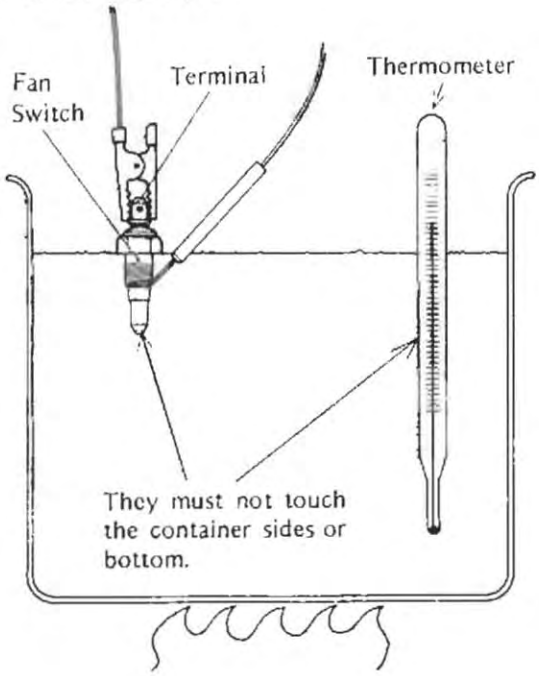
Fan Switch Resistance

Temperature	Resistance Change
Atmospheric temperature	∞ Ω
Raise 94 – 100°C → (201 – 212°F)	∞ → 0.5 Ω
91°C (196°F) Lower ←	∞ ← 0.5 Ω

Cooling Fan Circuit



Fan Switch Inspection



Meters and Gauges

Meter Assembly Removal/Installation Notes

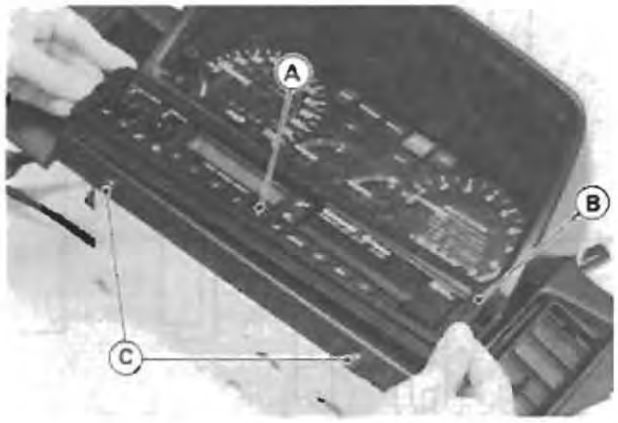
●The meter assembly is removed and installed during the fairing removal and installation.

CAUTION

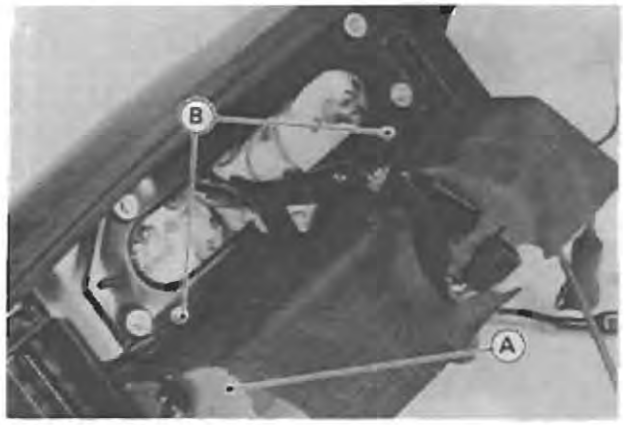
○Place the meter or gauge so that the face is up. If a meter or gauge is left upside down or sideways for any length of time it will malfunction.

Meter Assembly Separation/Assembly Notes

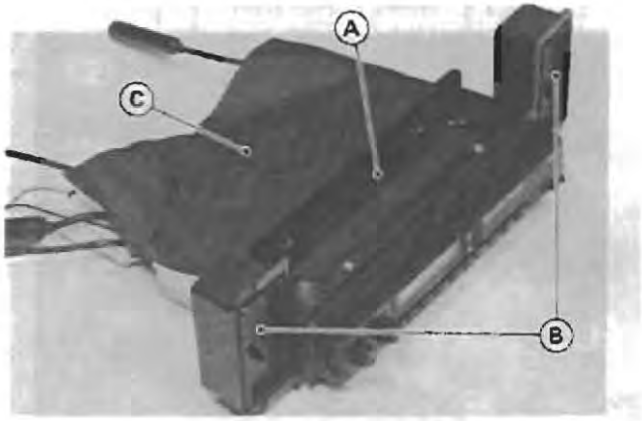
●Remove the radio and cassette player.



A. Radio and Cassette Player
B. Player Front Panel
C. Mounting Screws

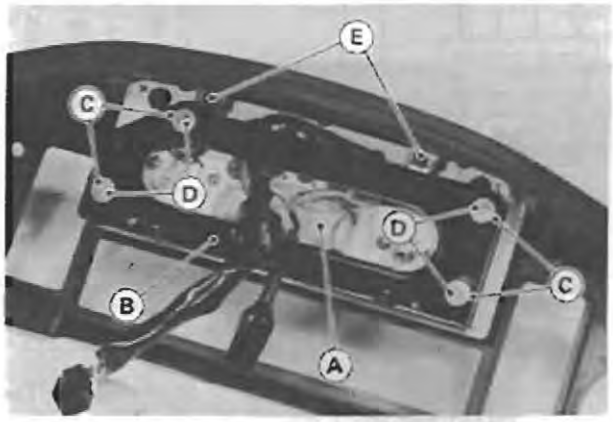


A. Radio and Cassette Player
B. Mounting Bolts



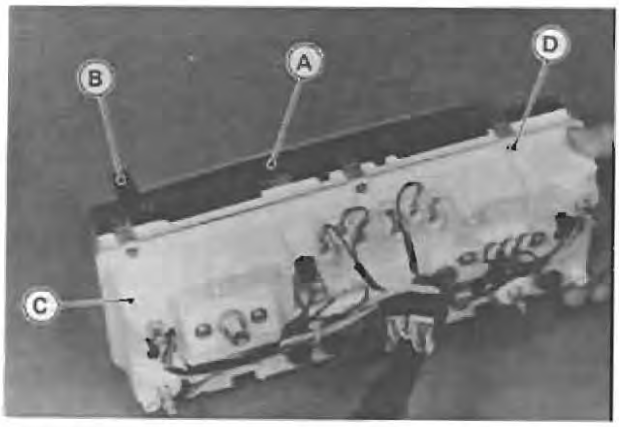
A. Mounting Bracket
B. Louvers
C. Watertight Seat

●Remove the meter and gauge assembly.



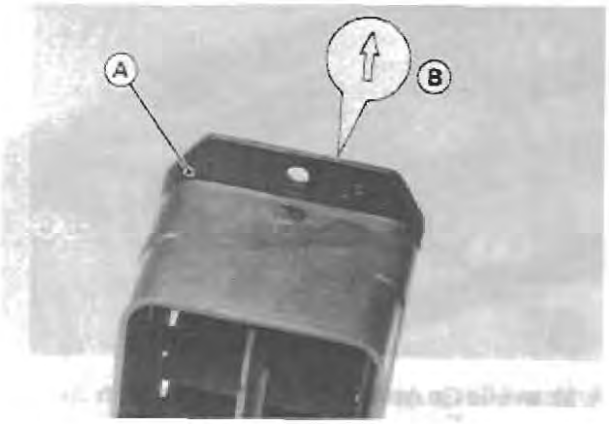
A. Meter and Gauge Assembly
B. Mounting Bracket
C. Rubber Dampers
D. Mounting Nuts
E. Mounting Screws

A. Meter and Gauge Assembly
B. Meter Assembly Cover
C. Seal Trimming



A. Panel Cover
B. Trip Reset Knob
C. Lower Case
D. Screws

●If the ventilation louvers were removed, install them with the arrow pointing up.



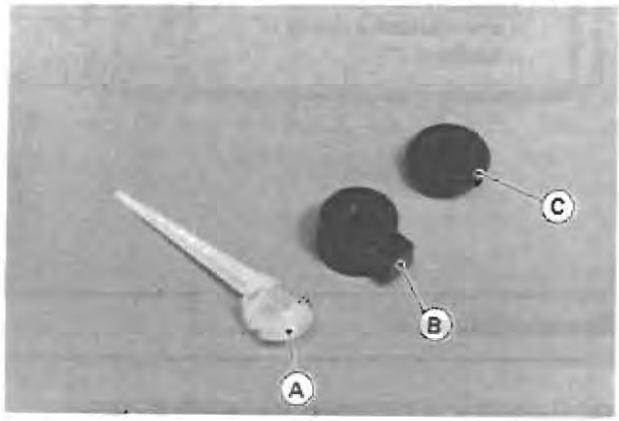
A. Louver
B. Arrow

Meter and Gauge Replacement Notes

CAUTION

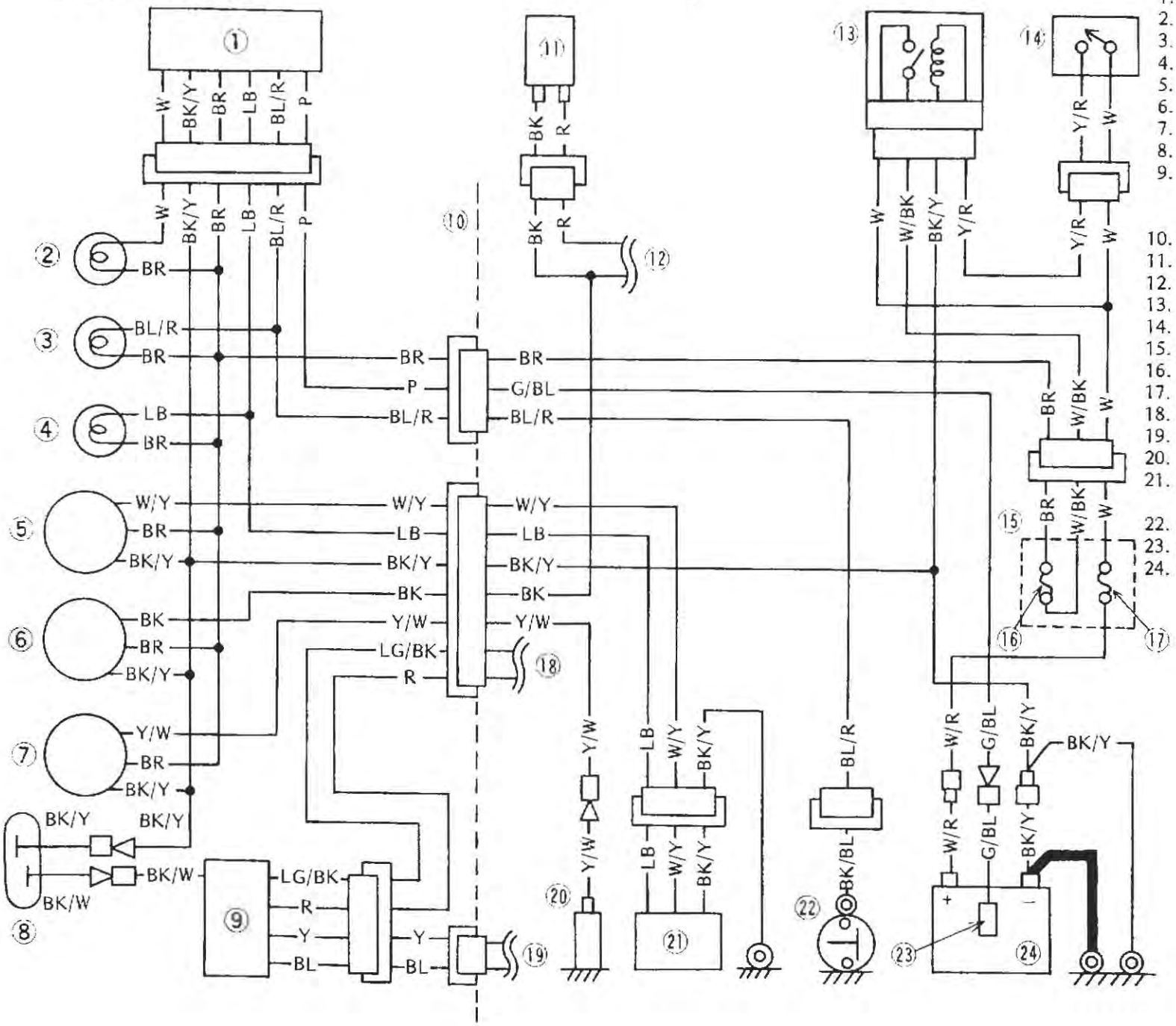
Do not remove a meter pointer unless the meter is to be replaced. The pointers cannot be reinstalled. The pointer mounting is different from replacement meters.

●To disassemble the meter case, remove all the screws and wiring from the back side of the case.
●Pull the pointer off the meter shaft of the bad meter only, and remove the meter unit from the dial face.
●After mounting the meter unit on the dial face, put on the pointer so that it fits on the meter shaft notch.
●Install the retainer, and tighten the cap while holding the pointer.



A. Pointer
B. Cap
C. Retainer

Meter and Gauge Circuit



1. Indicator Light Self-check Unit
2. Battery Indicator Light
3. Oil Pressure Warning Light
4. Fuel Level Warning Light
5. Fuel Gauge
6. Tachometer
7. Water Temperature Gauge
8. Distance Sensor
9. AV/AC Signal Unit
   AV: Auto Volume (Audio)
   AC: Auto Cancel (Signal)
10. Meter Assembly Side
11. Ignition Coil (#1 & 4)
12. Ignition Circuit
13. Main Relay
14. Ignition Switch
15. Fuse Case
16. 10 A Fuse
17. 30 A Fuse
18. Turn Signal Circuit
19. Audio Circuit
20. Water Temperature Sensor
21. Fuel Level Sensor
    (Low Fuel Level Sensor)
22. Oil Pressure Switch
23. Electrolyte Level Sensor
24. Battery

Tachometer Inspection

NOTE

○*The tachometer inspection is explained on the assumption that the ignition system operates normally.*

- 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.
- Check the tachometer circuit wiring.
- ★If all wiring and components other than the tachometer unit check out good, the unit is suspect. Check the unit as shown.
- Turn the ignition switch ON.
- With the BK/Y and the BR lead connected, open or connect the BK lead to the BR lead repeatedly. Then, the meter hand should flick.
- ★If the hand does not flick, replace the tachometer unit.

Fuel Gauge Opeartion Inspection

- Prepare an auxiliary wire, and check the operation of the gauge.

Fuel Gauge Operation Check

Ignition Switch Position:	**ON**
Wire Location:	**Female 3-pin sensor connector (disconnected)**
Results:	**Gauge should read E when W/Y and BK/Y wires are opened. Gauge should read F when W/Y and BK/Y wires are shorted.**

CAUTION

○**Do not short-circuit the leads longer than necessary. When the hand swings to the "F" position, stop short-circuiting. Otherwise a good meter could be damaged.**

- ★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.
- ★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.

Water Temperature Gauge Operation Check

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.
- ★If all wiring and components other than the water temperature gauge unit check out good, the unit is defective.

Indicator Light Self-check Unit Inspection

- Prepare four auxiliary wires and 12 V battery.
- Disconnect the 9-pin connectors from the meter assembly.
- Connect the battery (+) terminal to the BR meter lead, and the battery (–) terminal to the BK/Y meter lead. The battery indicator light should turn on at this time.
- ★If the indicator light does not turn on, check the wiring and bulb. If they are OK, the self-check unit is defective. Replace the meter assembly.
- Connect the battery (+) terminal to the P meter lead. The battery indicator light should turn off at this time.
- ★If the indicator light does not turn off, the self-check unit is defective. Replace the meter assembly.
- Connect the battery (–) terminal to the BL/R meter lead. The battery, oil, and fuel indicator lights should turn on at this time.
- ★If any light does not turn on, check the wiring and bulb. If they are OK, the self-check unit is defective. Replace the meter assembly.
- ★If the above tests prove that the left-check unit is good, check the main wiring harness side.

Indicator Light Self-check Operation

Switch and Sensor	Ignition	OFF, ON
	Battery (Electrolyte Level)*	OFF, ON, ON
	Fuel Level (Low Fuel)**	OFF, ON, ON
	Oil Pressure***	OFF, ON
Indicator Light	Battery	ON, ON
	Fuel Level	ON, ON
	Oil Pressure	ON

*Electrolyte Level Sensor: OFF → Less than 2 V
ON → More than 4 V

**Low Fuel Level Sensor: OFF → Fuel level is above the sensor.
ON → Fuel level is below the sensor.

***Oil Pressure Switch: OFF → Engine is running.
ON → Engine is stopped.

AV/AC Signal Unit Inspection

- Prepare an auxiliary wire.
- Disconnect the AV/AC signal unit BK/W lead from the distance sensor.
- Turn on the ignition switch and audio power switch.
- Measure the voltage between the Y lead (+) and the BL lead (–). The voltage should be 8 V.

★If the voltage is not as specified, check the AV control circuit. If the AV control circuit is good, the signal unit is defective. Replace the meter assembly.

- Ground the signal unit BK/W lead with an auxiliary wire and measure the voltage again. The voltage should be 2 V.

★If the voltage is not as specified, the signal unit is defective. Replace the meter assembly.

- Turn on (L or R) the turn signal switch.
- Measure the voltage between the LG/BK lead (+) and the BK/Y lead (–). The voltage should be 6 V when the signal unit BK/W lead is grounded, and 0 V when the BK/W lead is opened.

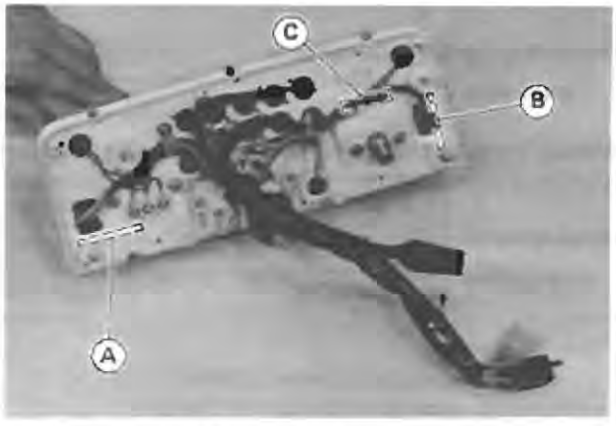
★If it does not as specified, check the AC control circuit. If the AC control circuit is good, the signal unit is defective. Replace the meter assembly.

★If the above tests prove that the AV/AC signal unit is good, check the distance sensor, audio system, and/or turn signal circuit.

Distance Sensor Inspection

- Disconnect the distance sensor leads.
- Measure the resistance between the sensor leads while turning the front wheel slowly. The meter should show continuity and then open periodically as the wheel revolutions.

★If it does not, replace the distance sensor.



A. Indicator Light Self-check Unit
B. AV/AC Signal Unit
C. Distance Sensor

AV Control Circuit Inspection

- Disconnect the 2-pin connector from the meter assembly.
- Turn on the ignition switch and audio power switch.
- Measure the voltage between the Y lead (+) and the BL lead (–) in the female 2-pin connector. The voltage should be 8 V.

★If the voltage is not as specified, the trouble is in the audio system.

AC Control Circuit Inspection

- Disconnect the 9-pin white connector from the meter assembly.
- Turn on the ignition switch and turn signal switch.
- Measure the voltage between the R lead (+) and the BK/Y lead (–) in the female 9-pin connector. The voltage should be 6 V.

★If the voltage is not as specified, the trouble is in the turn signal circuit.

Electrolyte Level Sensor Inspection

- Disconnect the electrolyte level sensor lead.
- Measure the voltage between the sensor lead (+) and the battery (–) terminal.

★If the voltage is lower than the specified value, first check the electrolyte level in the cell where the sensor is installed. If the level is lower than the lower level line, add distilled water. If the level is high enough, remove the sensor from the battery to check for an open lead and to check the sensor lead stick for corrosion or other damage. If any trouble is found in the lead or stick, repair or replace it.

Electrolyte Level Sensor Voltage

More than 6 V

- Measure the resistance of the electrolyte level sensor.

★If the resistance is not as specified, replace the sensor.

Electrolyte Level Sensor Resistance

about 680 Ω

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.

- Inspect the leads and 3-pin connector.

★If they show any signs of damage, replace the sensor.

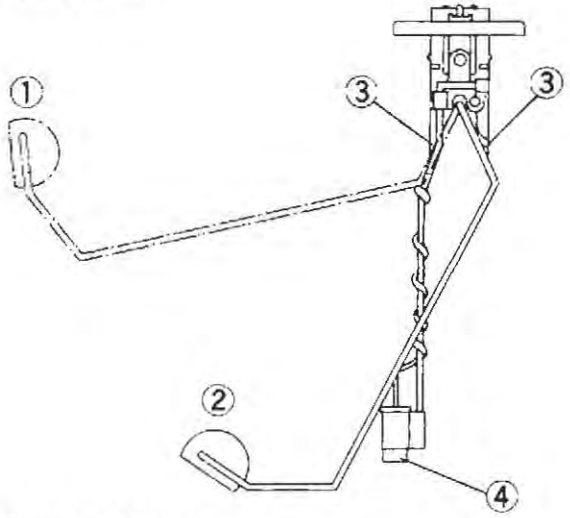
- Measure the resistance between the W/Y and BK/Y sensor leads.

★If the resistance is not as specified, or the resistance values 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**

Fuel Level Sensor



1. Float in Full Position
2. Float in Empty Position
3. Float Arm Stop
4. Low Fuel Level Sensor

Water Temperature Sensor Inspection

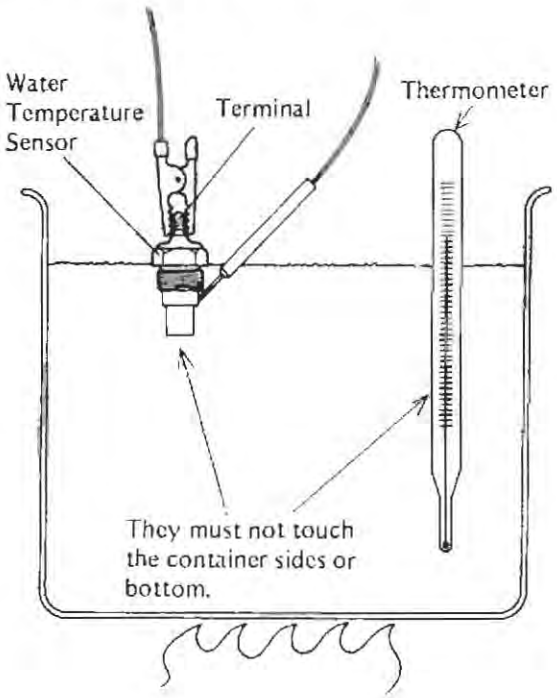
- Remove the water temperature sensor, and check the internal resistance of the sensor across the sensor terminal and the body.
- Suspend the sensor in a container of water so that the temperature sensing projection and threaded portion are submerged.

★If the resistance is not as specified, replace the sensor.

Water Temperature Sensor Resistance

80°C (176°F):	**About 52 Ω**
100°C (212°F):	**About 27 Ω**

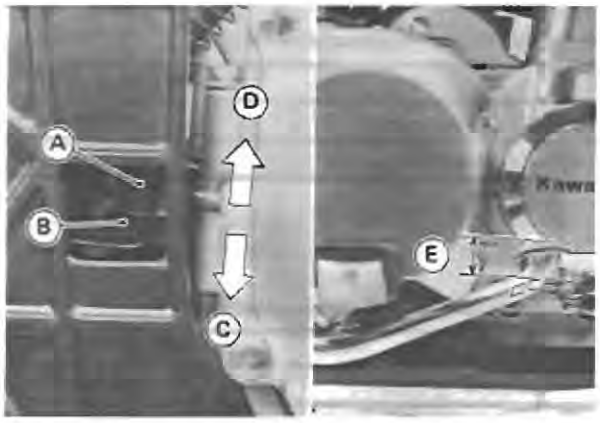
Water Temperature Sensor Inspection



Switches

Rear Brake Light Switch Adjustment

•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 Light Switch
B. Adjusting Nut
C. Lights sooner.
D. Lights later.
E. 15 mm

★If it does not, adjust the rear brake light switch up or down. To change the switch position, turn the adjusting nut.

CAUTION

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

Switch Inspection

•Using an ohmmeter, check to see that only the connections shown in the table have continuity (about zero ohms).

★If the switch has an open or short, repair it or replace it with new one.

Ignition Switch Connections

	W	Y/R	BL/W	BR	R	W	O/G
OFF, LOCK							
ACC	○		○				
ON	○	○	○	○	○	○	○
P(Park)	○				○	○	○

Starter Lockout Switch Connections

	BK/Y	BK/R	BK
When clutch lever is pulled in	○	○	
When clutch lever is released		○	○

Dimmer Switch Connections

	BL/Y	BL/O	R/Y	R/BK
HI	○		○	○
		○		
LO	○		○	
		○		○

Horn Button Connections

	BK/W	BK/Y
Push on	○	○

Volume Control Switch Connections

	R	GY	BR
▲ UP	○	○	
▼ DOWN		○	○

Turn Signal Switch Connections

	GY	O	G	BL/W	W/R	BK/Y	W/G
R	○	○		○	○	○	○
N					○	○	○
L		○	○	○	○	○	○

Auto Seek Switch/Program Change Switch Connections

	O	GY	G
▲ UP	○——	——○	
▼ DOWN		○——	——○

Muting Switch Connections

	BL	GY
OFF		
ON	○——	——○

Radio/Tape Button Connections

	Y	GY
Push on	○——	——○

Engine Stop Switch Connectons

	R	Y/R
OFF		
RUN	○——	——○

Starter Button Connections

	R	BK/R
Push on	○——	——○

Hazard Switch Connections

	GY	O/G	G
OFF			
ON	○——	——○ ○——	——○

Front Brake Light Switch Connections

	BK	BK
When brake lever is pulled in	○——	——○

Rear Brake Light Switch Connections

	BR	BL
When brake pedal is pushed down	○——	——○

Side Stand Switch Connections

	BK/R	BK/Y
When side stand is up	○——	——○
When side stand is down		

Trunk Room Light Switch Connections

	BR/W	BR/W
When trunk is opened	○——	——○
When trunk is closed		

Oil Pressure Switch Connections*

	SW. Terminal	Ground
When engine is stopped	○——	——○
When engine is running		

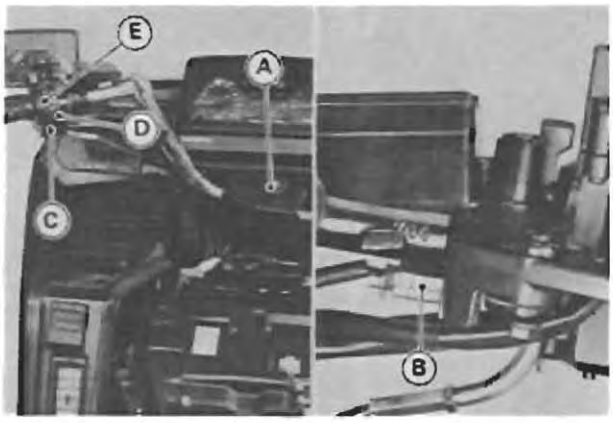
* : Engine lubrication system is in good condition.

Neutral Switch Connections

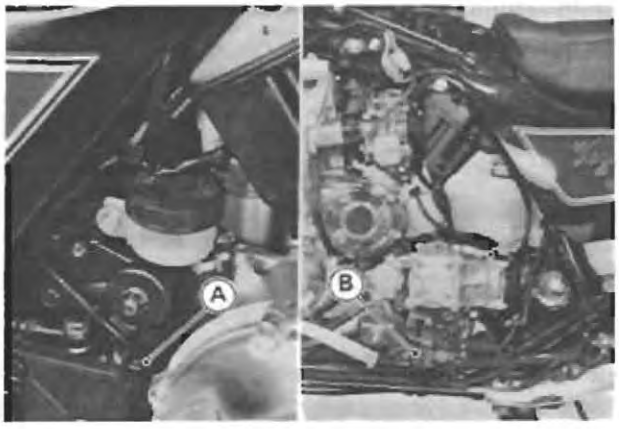
Gear Position	SW. Terminal	Ground
Neutral	○——	——○
Others		

Overdrive Switch Connections

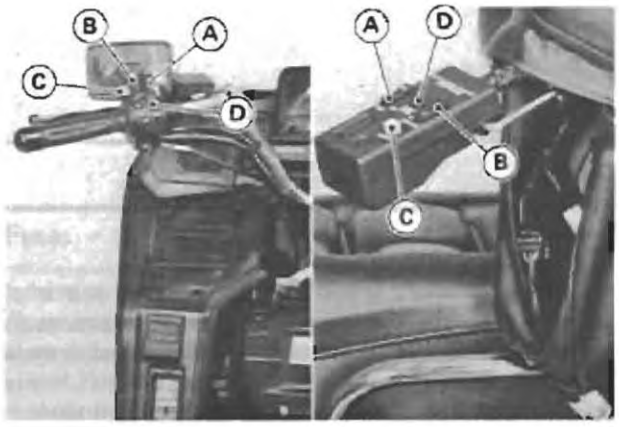
Gear Position	BK	Ground
Overdrive (5th gear)	○——	——○
Others		



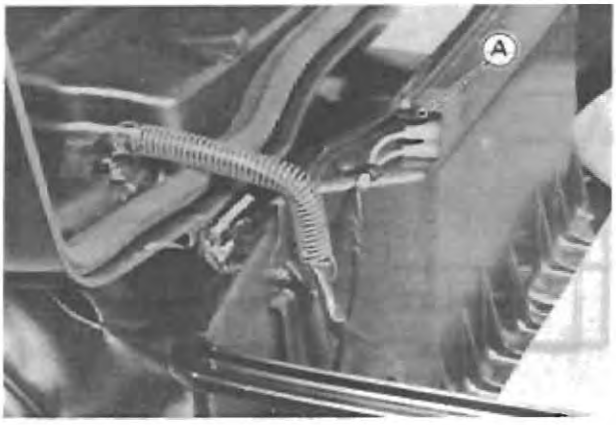
A. Ignition Switch
B. Starter Lockout Switch
C. Horn Button
D. Turn Signal Switch
E. Dimmer Switch



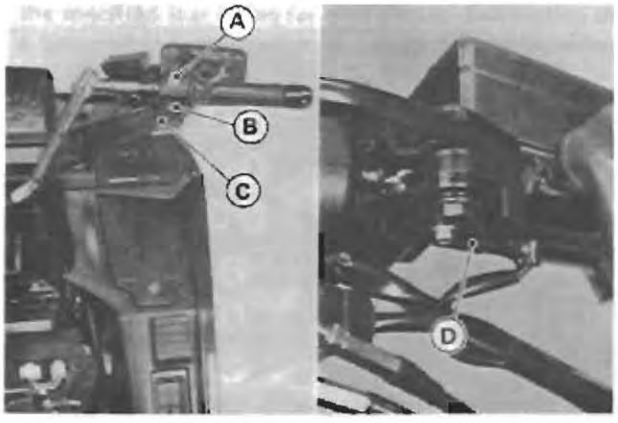
A. Rear Brake Light Switch B. Side Stand Switch



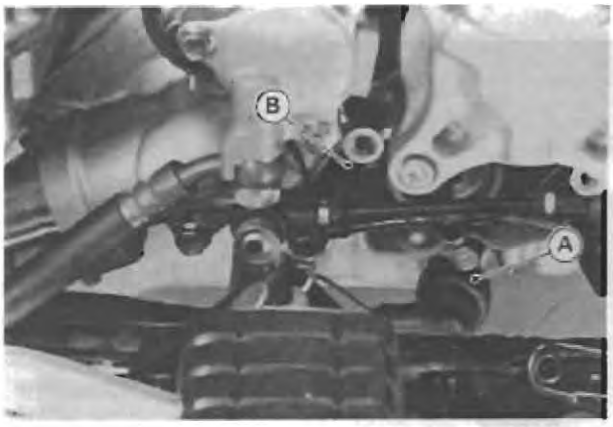
A. Volume Control Switch
B. Auto Seek Switch/Program Change Switch
C. Muting Switch
D. Radio/Tape Button



A. Trunk Room Light Switch



A. Engine Stop Switch
B. Starter Button
C. Hazard Switch
D. Front Brake Light Switch



A. Oil Pressure Switch
B. Neutral and Overdrive Switch

Relays

Relay Inspection

NOTE

○*For inspections of the starter motor relay and turn signal relay, refer to the appropriate sections for them.*

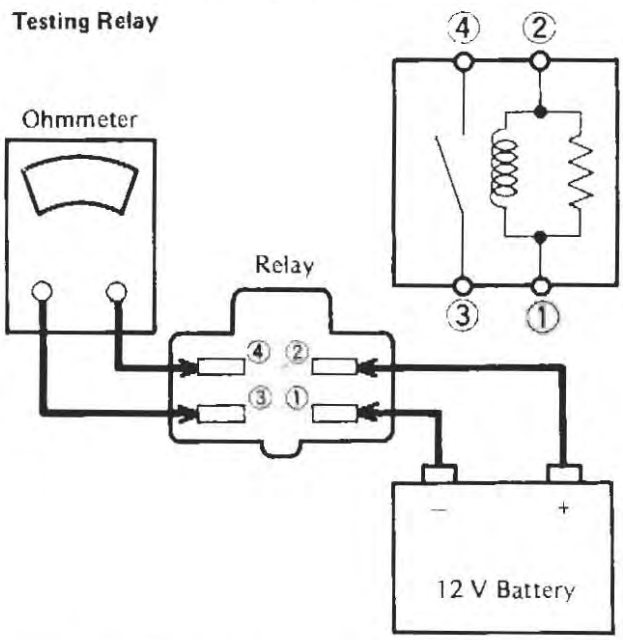
●Connect an ohmmeter and 12 V battery to the relay as shown.

★If the relay does not work as specified, the relay is defective.

Testing Relay

Meter Range: **x 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

A. Relays (Fan, Brake Light, ACC)

A. Relays (Main, Starter Circuit, Headlight)

Diodes

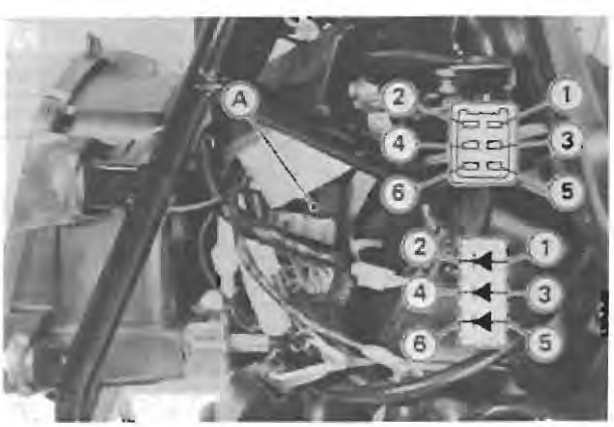
Diode Inspection

●Zero the ohmmeter, and connect it to each pair of terminals to check the resistance in both directions.

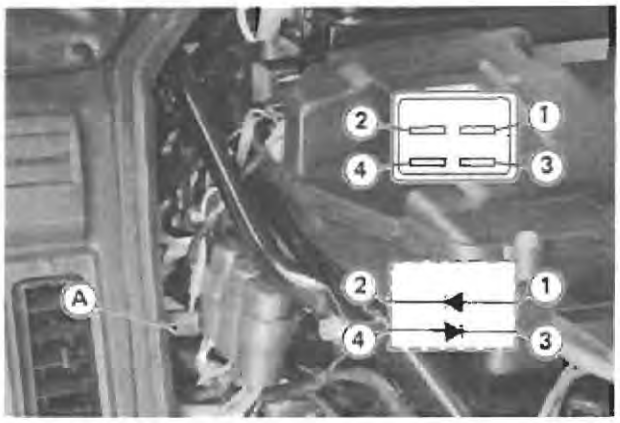
★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the diode assembly must be replaced.

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.*



A. Diode Assembly (Ignition)



A. Diode Assembly (Headlight)

A. Fuse Case

A. Fuse Cases for Audio System

Fuses

Fuse Inspection

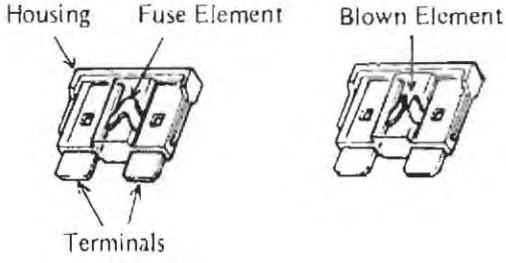
●Inspect the fuse element.

★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 (Wedge Type)



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.

○Measure the resistance between the ends of the leads.

★If the resistance is not 0 Ω, the lead is defective. Replace the lead or the wiring loom if necessary.

Appendix

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Nut, Bolt, and Fastener Tightness 16-8
Tightness Inspection 16-8
Unit Conversion Table 16-10

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.

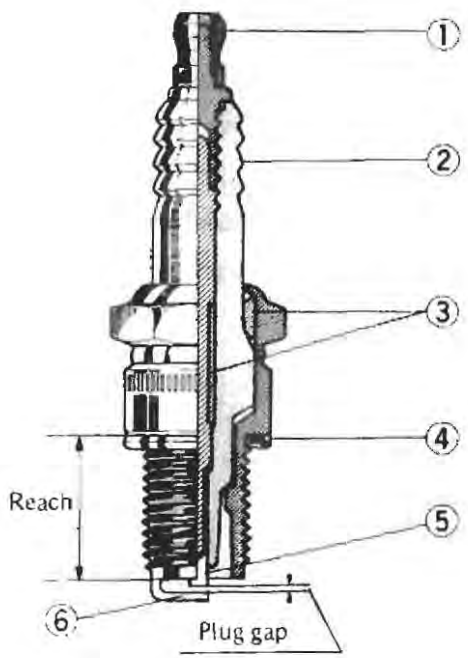
Since spark plug requirements change with the ignition and carburetion adjustments and with riding conditions, whether or not a spark plug of a correct heat range is used should be determined by removing and inspecting the plug.

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 collect on the electrodes and the ceramic insulator.

The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause preignition and knocking, which may eventually burn a hole in the top of the piston.

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.**

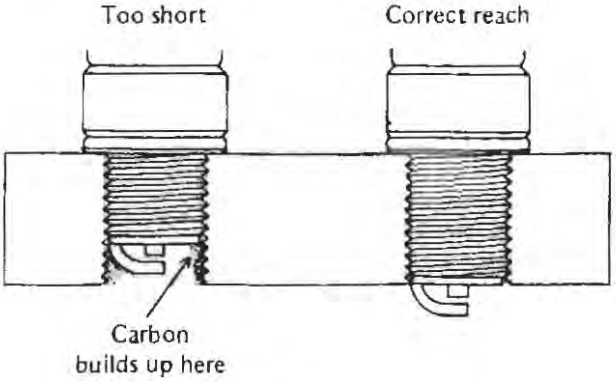
○**If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.**

○**If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preigniton, and possibly burning 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
- 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 tank air vent obstructed
- Fuel pump trouble
- 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
- 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)
- Hydraulic lash adjuster damaged (worn, seizure, or spring broken)
- Hydraulic lash adjuster oil passage clogged

Poor Running at Low Speed:

Spark weak:
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter trouble
- 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 or surge tank duct loose
- Fuel pump trouble

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head warped
- Cylinder head gasket damaged
- Engine not sufficiently warmed up after lash adjuster installation
- Hydraulic lash adjuster damaged (worn, seizure, or spring broken)
- Hydraulic lash adjuster oil passage clogged
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Backfiring when deceleration:
- Vacuum switch valve broken
- Air suction valve trouble

Other:
- IC igniter trouble
- Carburetors not synchronizing
- Carburetor vacuum piston doesn't slide smoothly
- Engine oil viscosity too high
- Drive train trouble
- Final gear case oil viscosity too high
- 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 or surge tank duct poorly sealed
- Water of foreign matter in fuel
- Carburetor holder loose
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Hydraulic lash adjuster damaged (worn, seizure, or spring broken)
- Hydraulic lash adjuster oil passage clogged
- 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

Backfiring when deceleration:
- Vacuum switch valve broken
- Air suction valve trouble

Miscellaneous:
- Throttle valve won't fully open
- Vacuum piston don't slide smoothly
- Brake dragging
- Clutch slipping
- Overheating
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Final gear case oil viscosity too high
- Air suction valve trouble
- Vacuum switch valve trouble
- Balancer mechanism malfunctioning

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 or surge tank 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
- Final gear case oil viscosity too high
- 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 position 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:
Engine not sufficiently warmed up after lash adjuster installation
Hydraulic lash adjuster damaged (worn, seizure, or spring broken)
Air in hydraulic lash adjuster
Metal chips or dust jammed in hydraulic lash adjuster
Engine operated in red zone
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 line noise:
Bevel gear bearings worn
Bevel gears worn or chipped
Bevel gears maladjusted
Rear wheel coupling damaged
Insufficient lubricant

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 filter 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
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 or surge tank 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)

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 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

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

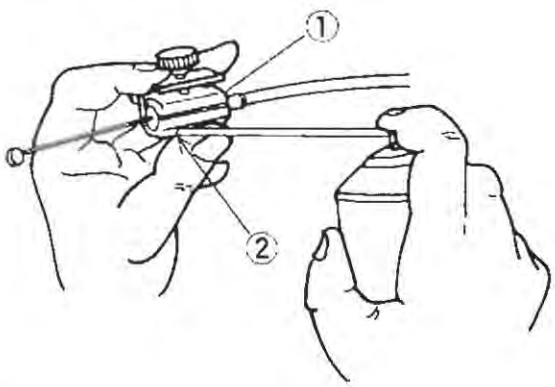
○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure spray water, perform the general lubrication.*

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 Upper Ends
Speedometer Inner Cable*
*Grease the lower part of the inner cable sparingly.

Cables: Lubricate with Rust Inhibitor.
Choke Cable
Throttle Cables

Cable Lubrication



1. Pressure Cable Luber: K56019-021
2. Lubricate cables with a penetrating rust inhibitor.

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 basic torque table (see Torque and Locking Agent in the General Information chapter).
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
- Rear Axle Nut Cotter Pin

Brakes:
- Front Master Cylinder Clamp Bolts
- Front Caliper Mounting Bolts
- Rear Master Cylinder Mounting Bolts
- Rear Caliper Holder Mounting Bolt
- Rear Caliper Mounting Bolts
- 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 Bolt and Nuts
- Swing Arm Pivot Shaft Nuts

Steering:
- Stem Head Nut
- Handlebar Clamp Bolts
- Handle Grip Bar Bolts

Engine:
- Engine Mounting Bolts
- Cylinder Head Bolts
- Exhaust Pipe Mounting Nuts
- Muffler Mounting Bolts
- Exhaust Pipe and Muffler Connecting Clamp Bolts
- Clutch Master Cylinder Clamp Bolts
- Clutch Lever Pivot Nut
- Radiator Mounting Bolts
- Shift Pedal Bolt

Others:
- Center Stand Bolts
- Side Stand Nut
- Rear Frame Mounting Bolts

Right Down Tube Mounting Bolts
Footpeg Bracket Mounting Bolts
Footboard Bracket Mounting Bolts
Final Gear Case Mounting Nuts
Engine Guard Mounting Bolts
Bumper Mounting Bolts
Grab Bar Mounting Bolts
Travel Trunk Mounting Bolts
Dummy Tank Cover Mounting Screws

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
milli	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:

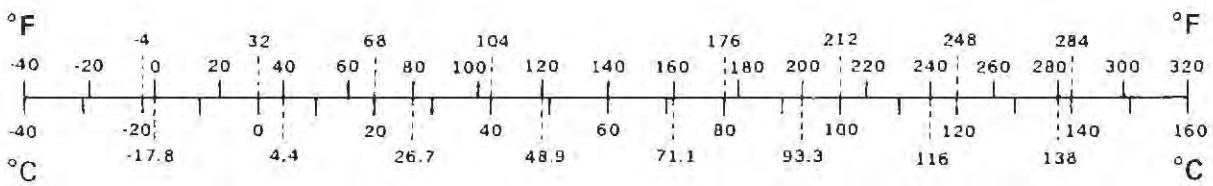
km/h	x	0.6214	=	mph

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.
1986	ZG1200-A1	JKAZG9A1□GA000001, or JKAZG9A1□GB500001

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

Kawasaki
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