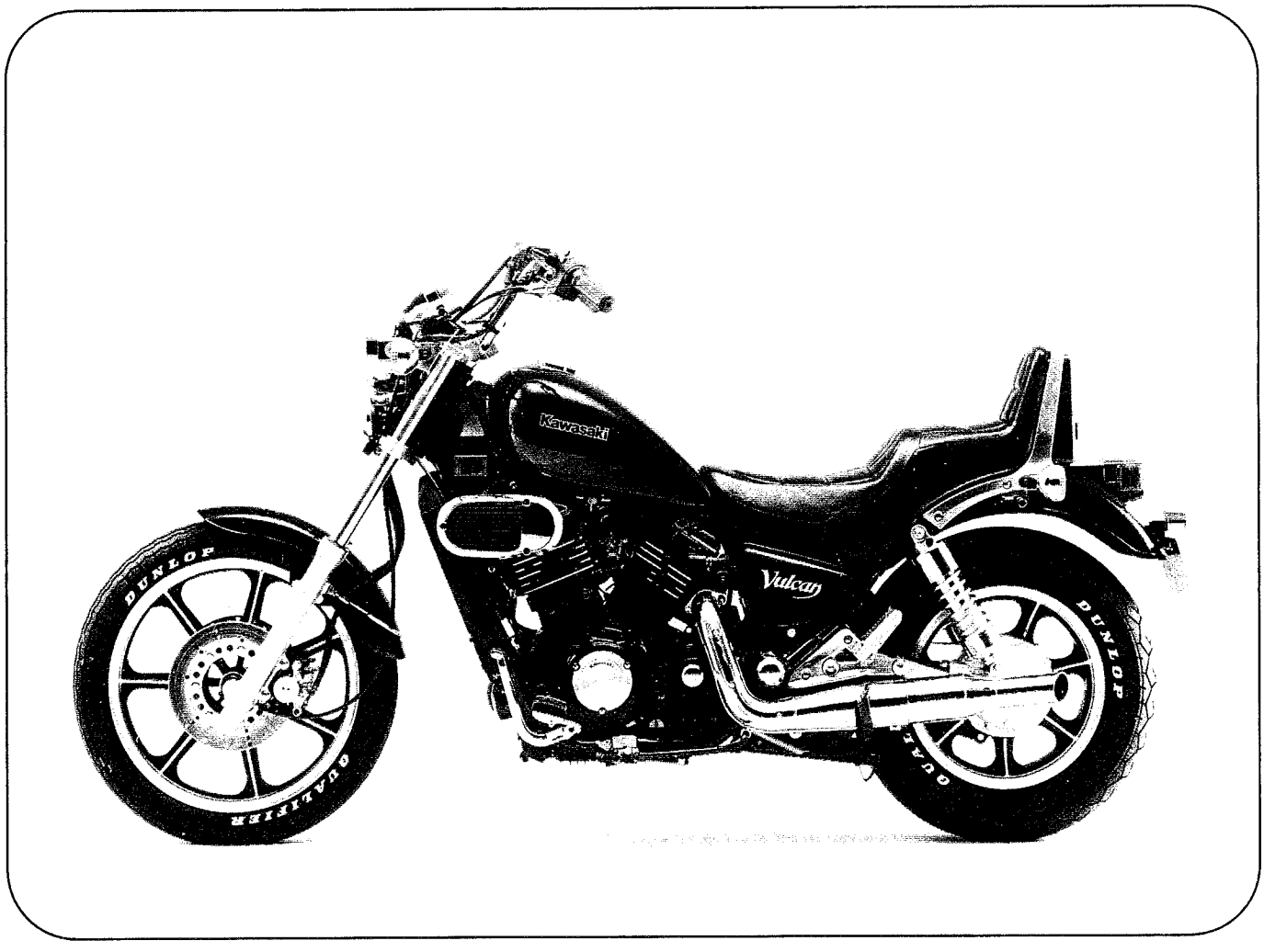
Kawasaki

Vulcan VN750 TWIN




# Motorcycle Service Manual

# Quick Reference Guide



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

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

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# Motorcycle Service Manual

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

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

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

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This warning may apply to any of the following components or any assembly containing one or more of these components:—

Brake Shoes or Pads
Clutch Friction Material
Gaskets
Insulators

SAFETY INSTRUCTIONS

- Operate if possible out of doors or in a well ventilated place.
- Preferably use hand tools or low speed tools equipped, if necessary, with an appropriate dust extraction facility. If high speed tools are used, they should always be so equipped.
- If possible, dampen before cutting or drilling.
- Dampen dust and place it in properly closed receptacle and dispose of it safely.

## LIST OF ABBREVIATIONS

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

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

## EMISSION CONTROL INFORMATION

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

1. Crankcase Emission Control System

   This system eliminates the release of crankcase vapors into the atmosphere. Instead, the vapors are routed through an oil separator to the intake side of the engine. While the engine is operating, the vapors are drawn into combustion chamber, where they are burned along with the fuel and air supplied by the carburetion system.

2. Exhaust Emission Control System

   This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel 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 system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

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

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

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

**WARNING**

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

**CAUTION**

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

This manual contains 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

## Table of Contents

## Before Servicing

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

**Especially note the following:**

(1) Dirt

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

(2) Battery Ground

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

(3) Installation, Assembly

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

(4) Tightening Sequence

When installing bolts, nuts, or screws for which a tightening sequence is given in this Service Manual, make sure to follow the sequence. When installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit, thus ensuring that the part has been installed in its proper location. Then, tighten them to the specified torque in the tightening sequence and method indicated. If tightening sequence instructions are not given, tighten them evenly in a cross pattern. Conversely, to remove a part, first loosen all the bolts, nuts, or screws that are retaining the part a 1/4–turn before removing them.

(5) Torque

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

(6) Force

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

(7) Edges

Watch for sharp edges, as they could cause injury through careless handling, especially during major engine disassembly and assembly. Use a clean piece of thick cloth when lifting the engine or turning it over.

(8) High-Flash Point Solvent

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

(9) Gasket, O-Ring

Replace a gasket or an O-ring with a new part when disassembling. Remove any foreign matter from the mating surface of the gasket or O-ring to ensure a perfectly smooth surface to prevent oil or compression leaks.

(10) Liquid Gasket, Locking Agent

Clean and prepare surfaces where liquid gasket or non-permanent locking agent will be used. Apply them sparingly. Excessive amount may block engine oil passages and cause serious damage.

(11) Press

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

(12) Ball Bearing and Needle Bearing

Do not remove a ball bearing or a needle bearing unless it is absolutely necessary. Replace any ball or needle bearings that were removed with new ones. Install bearings with the manufacturer and size marks facing out, applying pressure evenly with a suitable driver. Apply force only to the end of the race that contacts the press fit portion, and press it evenly over the base component.

(13) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals. Oil or grease seals should be pressed into place using a suitable driver, applying a force uniformly to the end of seal until the face of the seal is even with the end of the hole, unless instructed otherwise. When pressing in an oil or grease seal which has manufacturer's marks, press it in with the marks facing out.

(14) Circlip, Retaining Ring, and Cotter Pin

When installing circlips and retaining rings, take care to compress or expand them only enough to install them and no more. Install the circlip with its chamfered side facing load side as well.

Replace any circlips, retaining rings, and cotter pins that were removed with new ones, as removal weakens and deforms them. If old ones are reused, they could become detached while the motorcycle is driven, leading to a major problem.

(15) Lubrication

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

(16) Direction of Engine Rotation

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

(17) Replacement Parts

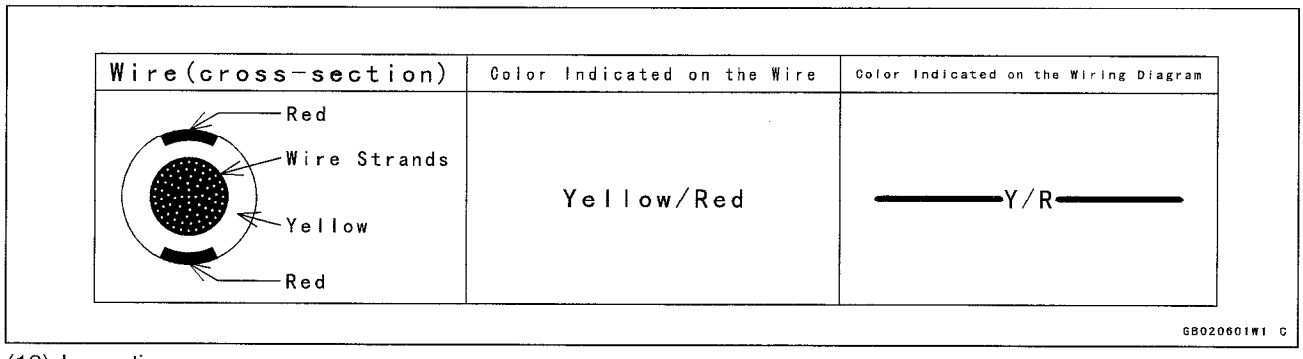
When there is a replacement instruction, replace these parts with new ones every time they are removed.

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

(18) Electrical Wires

All the electrical wires are either one-color or two-color. A two-color wire is identified first by the primary color and then the stripe 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. Unless instructed otherwise, electrical wires must be connected to wires of the same color.

**Two-Color Electrical**




(19) Inspection

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

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

(20) Specifications

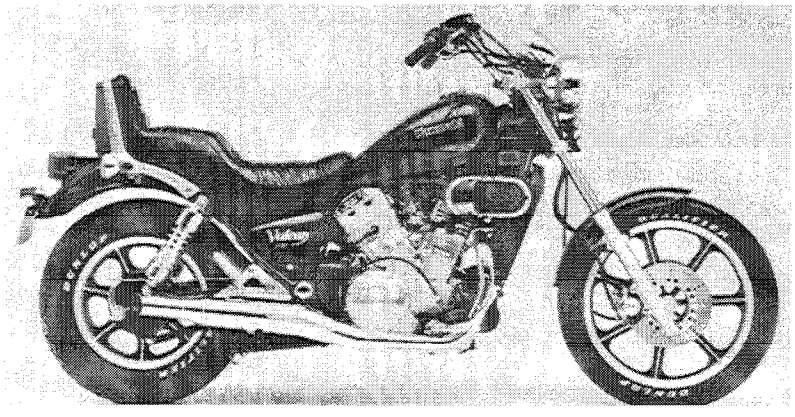
Specification terms are defined as follows:

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

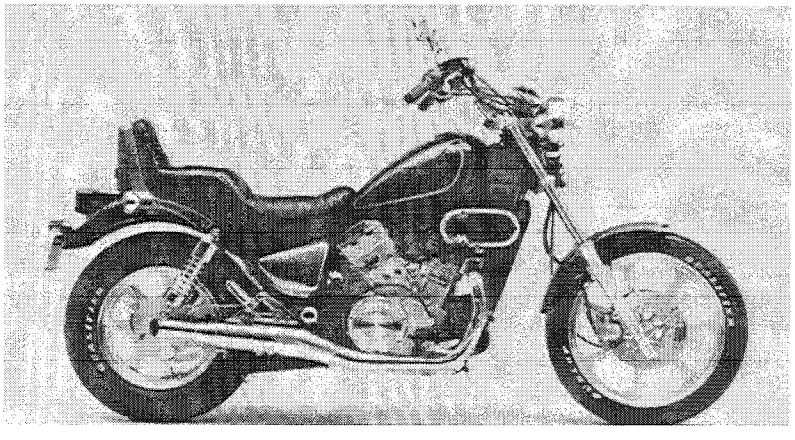
"Service Limits" indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.

## Model Identification

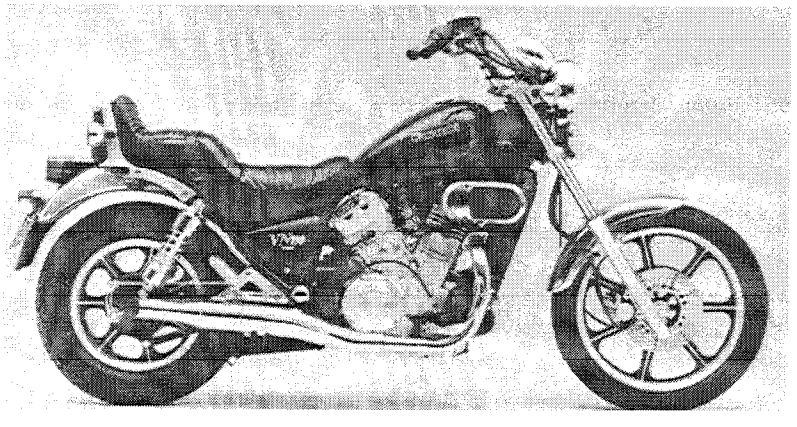
VN700-A1 (US Model)
or VN750-A1 (Canada Model)



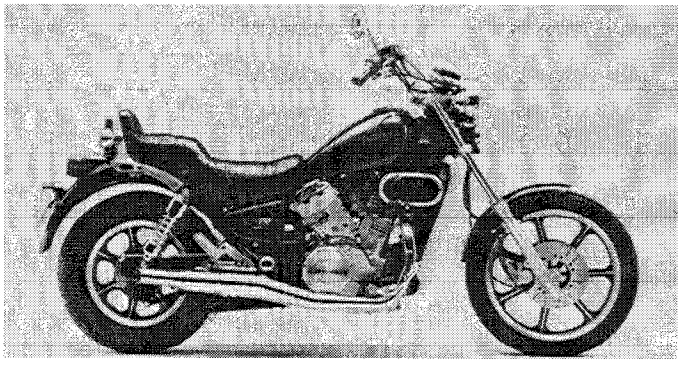
VN750-A2
(US, Canada Model)



VN750-A3 (US, Canada Model)

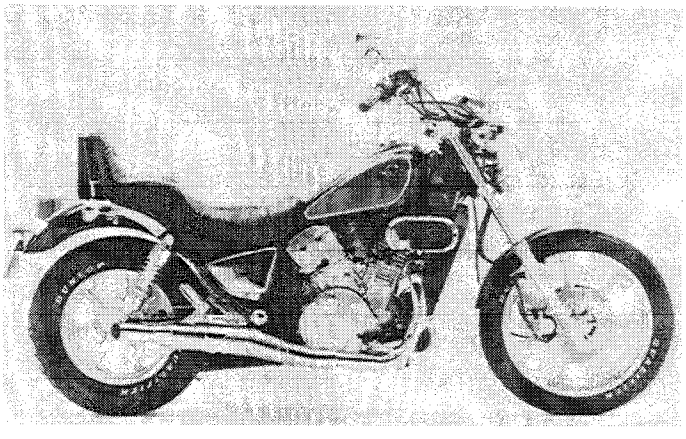


VN750-A2, A3
(European or General Model)



VN750-A4, A5
(European Model)

VN750-A6, A7
(US, Canada Model)



VN750-A8 ~ A12
(US, Canada Model)

VN750-A13
(US Model)

## General Specifications

| Items | | | VN700-A1, VN750-A1 ~ |
|---|---|---|---|
| **Dimensions:** | | | |
| Overall length | | | 2,310 mm, Ⓐ Ⓒ Ⓢ Ⓤ 2,295 mm, ** Ⓔ 2,300 mm, ** Ⓖ 2,310 mm |
| Overall width | | | 860 mm, Ⓒ Ⓤ 850 mm |
| Overall height | | | 1,235 mm, Ⓒ Ⓤ 1,225 mm |
| Wheelbase | | | 1,585 mm, Ⓒ Ⓤ 1,580 mm |
| Road clearance | | | 135 mm, Ⓒ Ⓤ 150 mm |
| Seat height | | | 750 mm, Ⓒ Ⓤ 735 mm |
| Dry weight | | | 223 kg, Ⓒa 219.5 kg, Ⓒ Ⓤ 219 kg |
| Curb weight | Front | | 110 kg, Ⓒa 108.5 kg, Ⓒ Ⓤ 108 kg |
| | Rear | | 131 kg, Ⓒ Ⓒa Ⓤ 128 kg |
| Fuel tank capacity | | | 13.5 L |
| **Performance:** | | | |
| Climbing ability | | | 20° |
| Braking distance | | | 12.5 m from 50 km/h |
| Minimum turning radius | | | 2.9 m |
| **Engine:** | | | |
| Type | | | 4-stroke, DOHC, V 2-cylinder |
| Cooling system | | | Liquid-cooled |
| Bore and stroke | | | *82.0 x 66.2 mm, 84.9 x 66.2 mm |
| Displacement | | | *699 mL, 749 mL |
| Compression ratio | | | 10.3 |
| Maximum horsepower | | | 48.5 kW (66 PS), Ⓒ Ⓢ 50.0 kW (68 PS), Ⓖ 36.8 kW (50 PS), Ⓕ 45.9 kW (62.4 PS), @7,500 r/min (rpm), Ⓤ —, Ⓦ 27.2 kW (37 PS) @5,200 r/min (rpm) ** Ⓔ 44.0kW (60PS), Ⓕ 43.0kW (58.5PS) @7,500r/min (rpm) |
| Maximum torque | | | 64.7 N-m (6.6 kg-m, 47.7 ft-lb) @6,000 r/min (rpm), Ⓒ Ⓢ 64.7 N-m (6.6 kg-m, 47.7 ft-lb) @6,500 r/min (rpm), Ⓕ —, Ⓖ 55.9 N-m (5.7 kg-m, 41.2 ft-lb) @3,000 r/min (rpm), Ⓤ —, Ⓦ 53.9 N-m (5.5 kg-m, 39.8 ft-lb) @3,000 r/min (rpm) ** Ⓔ 61.0 N-m (6.2 kg-m, 44.8ft-lb) @5,500r/min (rpm), Ⓕ — |
| Carburetion system | | | Carburetors, keihin CVK34 x 2 |
| Starting System | | | Electric starter |
| Ignition system | | | Battery and coil (transistorized) |
| Timing advance | | | Electronically advanced |
| Ignition timing | | | From 5° BTDC @1,100 r/min (rpm) to 25° BTDC @3,500 r/min (rpm) ***From 5° BTDC @1,300 r/min (rpm) to 25° BTDC @3,500 r/min (rpm) |
| Spark plug | Standard | | NGK DPR7EA-9 or ND X22EPR-U9, Ⓐ Ⓒa Ⓘ Ⓢ Ⓤ NGK DP7EA-9 or ND X22EP-U9 |
| | Option | | NGK DPR8EA-9 or ND X24EPR-U9, Ⓐ Ⓒa Ⓘ Ⓢ Ⓤ NGK DP8EA-9 or ND X24EP-U9 |
| Cylinder numbering method | | | Front to rear, 1-2 |
| Firing order | | | 1-2 |
| Valve timing: | Inlet | Open | 30° BTDC |
| | | Close | 74° ABDC |
| | | Duration | 284° |
| | Exhaust | Open | 66° BBDC |
| | | Close | 40° ATDC |
| | | Duration | 286° |
| Lubrication system | | | Forced lubrication (wet sump) |
| Engine oil: | Grade | | SE, SF, or SG class |
| | Viscosity | | SAE10W-40, 10W-50, 20W-40, or 20W-50 |
| | Capacity | | 4.0 L |

| Items | | | VN700-A1, VN750-A1 ~ |
|---|---|---|---|
| **Drive Train:** | | | |
| Primary reduction system: | | | |
| Type | | | Gear |
| Reduction ratio | | | 2.428 (85/35) |
| Clutch type | | | Wet multi disc |
| Transmission: | Type | | 5-speed, constant mesh, return shift |
| | Gear ratios: | 1st | 2.250 (36/16) |
| | | 2nd | 1.600 (32/20) |
| | | 3rd | 1.230 (32/26) |
| | | 4th | 1.000 (26/26) |
| | | 5th | 0.857 (24/28) |
| Final drive system: | | | Shaft drive |
| Reduction ratio | | | 2.454 (15/22 x 36/10), Ⓤ Ⓒ 2.522 (15/22 x 37/10) |
| Overall drive ratio | | | 5.109, Ⓤ Ⓒ 5.251 @Top gear |
| Final gear case oil: | | Type | API GL-5 Hypoid gear oil<br>SAE90 (above 5°C)<br>SAE80 (below 5°C) |
| | | Capacity | 150 mL |
| **Frame:** | | | |
| Type | | | Tubular, double cradle |
| Caster (rake angle) | | | 32° |
| Trail | | | 127 mm |
| Front Tire: | Type | | Tubeless |
| | Size | | 100/90-19 57H |
| Rear Tire: | Type | | Tubeless |
| | Size | | 150/90-15 74H, 150/90 B15 M/C 74H, 150/90-15 M/C 74H |
| Front suspension: | Type | | Telescopic fork (VN700-A1 and VN750-A1 ~ A4 : pneumatic) |
| | Wheel travel | | 150 mm |
| Rear suspension: | Type | | Swing arm |
| | Wheel travel | | 90 mm |
| Brake type: | Front | | Dual disc |
| | Rear | | Drum |
| **Electrical Equipment:** | | | |
| Battery | | | 12 V 14 Ah |
| Headlight: | Type | | Semi-sealed beam |
| | Bulb | | 12 V 60/55 W (quartz-halogen) |
| Tail/brake light | | | 12 V 5/21 W x 2, ⒸⓊⓈ 8/27 W x 2 |
| Alternator: | Type | | Three-phase AC |
| | Rated output | | 24 A @8,000 r/min (rpm), 14 V |
| Voltage regulator: | Type | | Short-circuit |

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

* : VN700
Ⓐ : Australia Model Ⓔ : Europe Model
Ⓒ : Canada Model
Ⓒa : California Model
Ⓕ : France Model
*** : VN750-A4, A5 Switzerland Model
** : VN750-A9~
Ⓖ : West Germany Model
Ⓘ : Italy Model
Ⓢ : South Africa Model
Ⓤ : US Model
Ⓦ : Switzerland Model

## Periodic Maintenance Chart

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

| FREQUENCY | Whichever comes first → ↓ | 1 000 km (600 mile) | 6 000 km (4 000 mile) | 12 000 km ( 7 500 mile) | 18 000 km (12 000 mile) | 24 000 km (15 000 mile) | 30 000 km (20 000 mile) | 36 000 km (24 000 mile) | * ODOMETER READING |
|---|---|---|---|---|---|---|---|---|---|
| OPERATION | Every | | | | | | | | See Page |
| Spark plug-clean | | | ● | ● | ● | ● | ● | ● | 15-21 |
| Spark plug-check † | | | ● | ● | ● | ● | ● | ● | 15-21 |
| Air suction valve (U)(W)-check † | | | ● | ● | ● | ● | ● | ● | 4-10 |
| Air cleaner element-clean | | ● | | ● | | ● | | ● | 2-23 |
| Air cleaner element-replace | 5 cleanings | | | | | ● | | | 2-23 |
| Throttle grip play-check † | | ● | | ● | | ● | | ● | 2-5 |
| Idle speed-check † | | ● | ● | ● | ● | ● | ● | ● | 2-9 |
| Engine vacuum synchronization-check † | | ● | ● | ● | ● | ● | ● | ● | 2-10 |
| Fuel system-check† | | | | ● | | ● | | ● | 2-13 |
| Fuel hoses, connections-check† | | | ● | ● | ● | ● | ● | ● | |
| Coolant-change | 2 years | | | | | | | ● | 3-4 |
| Evaporative emission control system (CA)- check † | | ● | ● | ● | ● | ● | ● | ● | 2-27 |
| Engine oil-change | year | ● | | ● | | ● | | ● | 6-5 |
| Oil filter-replace | | ● | | ● | | ● | | ● | 6-6 |
| Oil screen-clean | | ● | | ● | | ● | | ● | 6-5 |
| Radiator hoses, connections-check† | year | ● | | ● | | ● | | ● | 3-9 |
| Final gear case oil level-check† | | | | ● | | ● | | ● | 10-6 |
| Final gear case oil-change | | ● | | | | | | ● | 10-6 |
| Propeller shaft joint-lubricate | | | ● | | | | | ● | 10-6 |
| Fuel hose-replace | 4 years | | | | | | | | – |
| Clutch-adjust | | ● | ● | ● | ● | ● | ● | ● | 5-4 |
| Brake hoses, connections-check† | | | ● | ● | ● | ● | ● | ● | |
| Brake lining or pad wear-check † | | | ● | ● | ● | ● | ● | ● | 11-4,7 |
| Brake fluid level-check† | month | ● | ● | ● | ● | ● | ● | ● | 11-10 |
| Brake fluid-change | 2 years | | | | | ● | | | 11-11 |
| Brake hose-replace | 4 years | | | | | | | | 11-13 |
| Brake master cylinder cup and dust seal-replace | 2 years | | | | | | | | 11-9 |
| Caliper piston seal and dust seal-replace | 2 years | | | | | | | | 11-6 |
| Brake play-check † | | ● | ● | ● | ● | ● | ● | ● | 11-4 |
| Brake light switch-check † | | ● | ● | ● | ● | ● | ● | ● | 15-46 |
| Brake camshaft-lubricate | 2 years | | | | | ● | | | 11-15 |
| Brake cable-replace | 2 years | | | | | | | | 11-13 |
| Steering-check † | | ● | ● | ● | ● | ● | ● | ● | 13-4 |
| Steering stem bearing-lubricate | 2 years | | | | | ● | | | 13-8 |
| Front fork oil-change | | | | | | | | ● | 12-5 |
| Tire wear-check † | | | ● | ● | ● | ● | ● | ● | 9-10 |
| Swingarm pivot-lubricate | | | | ● | | | | ● | 12-15 |
| Battery electrolyte level-check† | month | ● | ● | ● | ● | ● | ● | ● | 15-10 |
| General lubrication-perform | | | ● | ● | ● | ● | ● | ● | 2-8,16-8 |
| Nut, bolt, and fastener ightness-check † | | ● | | ● | | ● | | ● | 16-8 |

* : For higher odometer readings, repeat at the frequency interval established here.
† : Replace, add, adjust, clean, or torque if necessary.

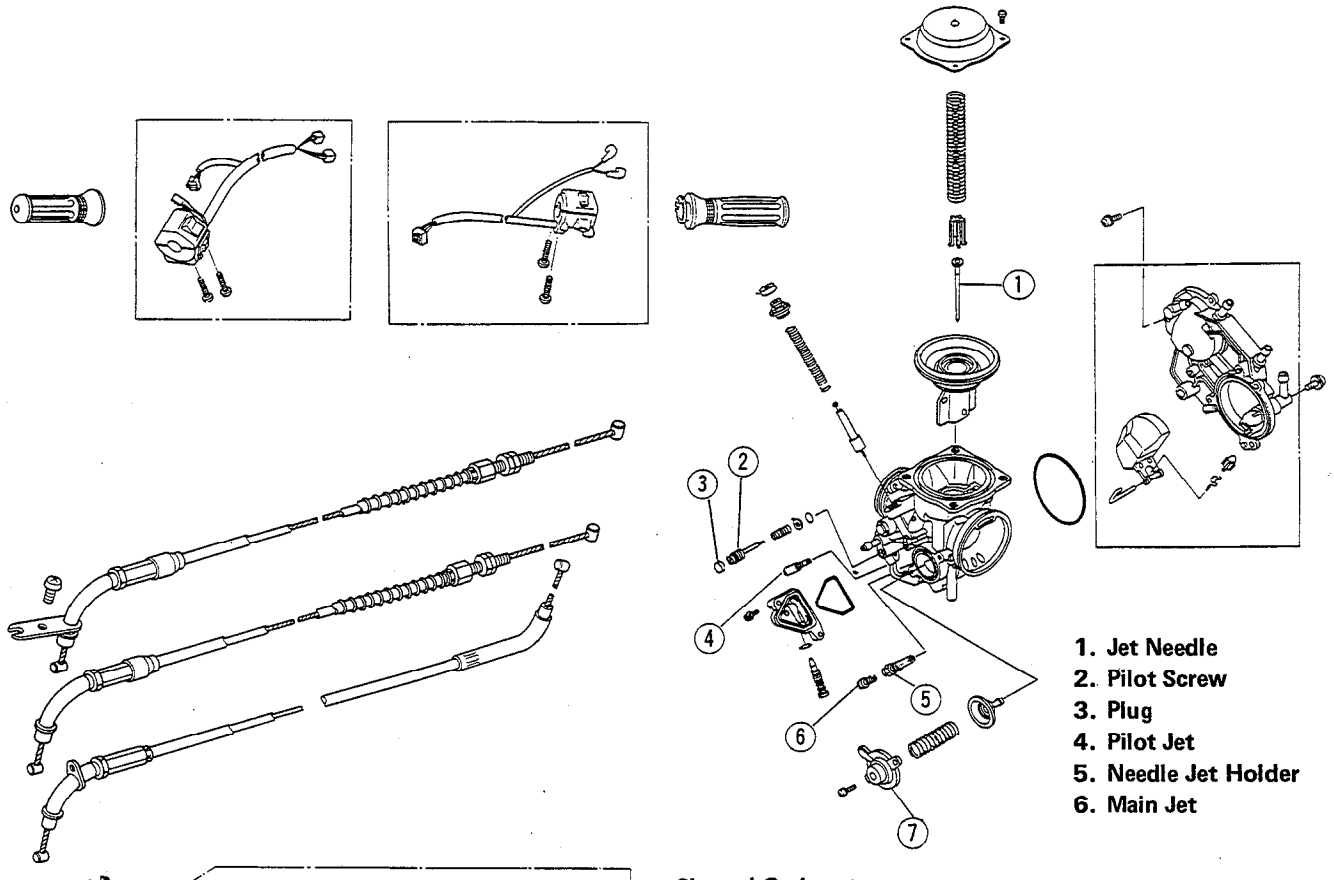
(Ca): California vehicle only (U): US vehicle only (W): Switzerland Model

# Fuel System

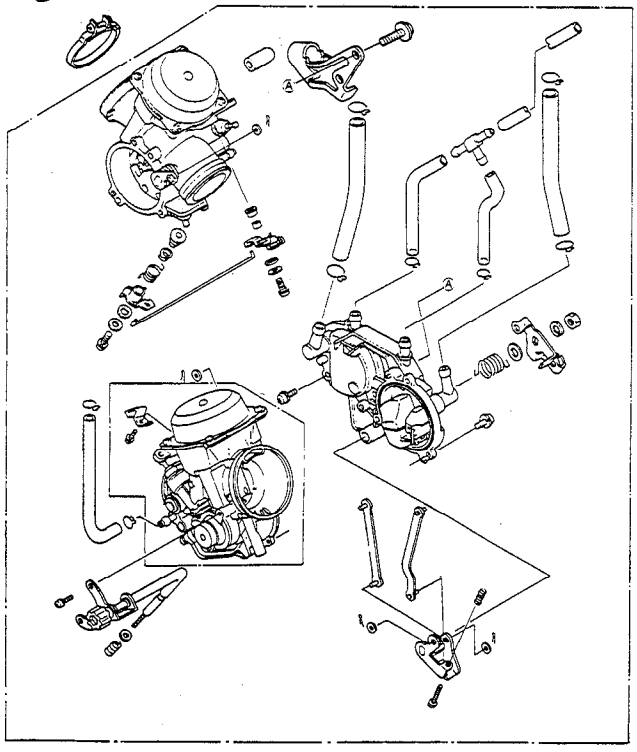
2

## Table of Contents

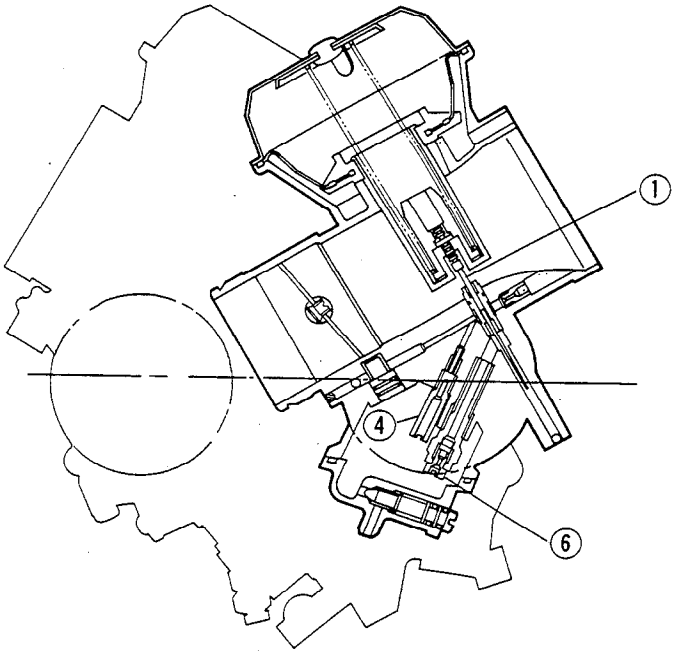
## Exploded View




1. Jet Needle
2. Pilot Screw
3. Plug
4. Pilot Jet
5. Needle Jet Holder
6. Main Jet

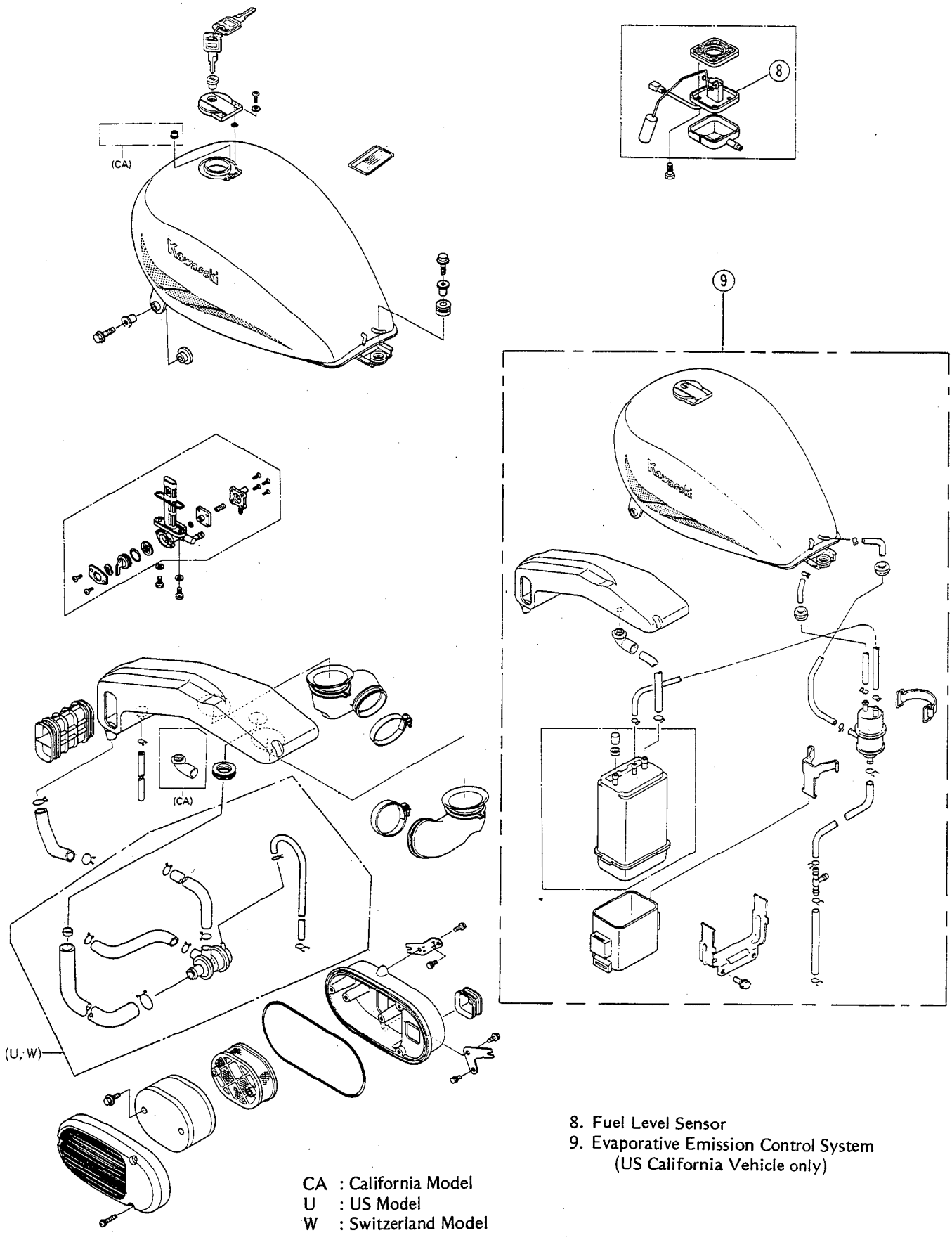


**Slanted Carburetor**




**7. Coasting Enricher**

The system prevents back firing during engine braking by supplying a rich fuel mixture to the engine.




CA : California Model
U : US Model
W : Switzerland Model

8. Fuel Level Sensor
9. Evaporative Emission Control System
(US California Vehicle only)

## Specifications

**Throttle Grip Play**

**Standard:** 2 – 3 mm

**Choke Cable Free Play**

**Standard:** 2 – 3 mm

**Carburetor Specifications for VN700A**

| | |
|---|---|
| Make/Type | Keihin CVK34 |
| Main Jet | 135 |
| Main Air Jet | (100) |
| Jet Needle | Front: N27H, Rear: N27M |
| Pilot Jet | 38 |
| Pilot Air Jet | (95) |
| Pilot Screw (turns out) | – |
| Starter Jet | (52) |
| Service Fuel Level | see P. 2-12 |
| Float Height | see P. 2-12 |
| Optional Main Jet | 125, 128, 130, 132, 138, 140 |

**Carburetor Specifications for VN750A**

| Models | A1 | A2 | A3 | A4 | A5 ~ A8 | A9 ~ |
|---|---|---|---|---|---|---|
| Make/Type | Keihin CVK34 | | | | | |
| Main Jet | Ⓒ 132 | 110<br>Ⓒ Ⓤ ←<br>Ⓖ 108<br>Ⓦ 108 | ←<br>←<br>←<br>Ⓦ 105 | ←<br>←<br>←<br>← | ←<br>←<br>←<br>← | 110<br>Ⓒ Ⓤ 132<br>←<br>＊Ⓦ 108 |
| Main Air Jet | (100) | ← | ← | ← | ← | ← |
| Jet Needle Front | Ⓒ N27J | ←<br>N31F<br>Ⓤ N27U | ←<br>Ⓒ Ⓤ N53A | ←<br>←<br>Ⓦ N60D | ←<br>←<br>← | N31F<br>Ⓒ Ⓤ N53A<br>＊Ⓦ N96E |
| Rear | Ⓒ N27K | ←<br>N31F<br>Ⓤ N27V | ←<br>Ⓒ Ⓤ N53B | ←<br>←<br>Ⓦ N60D | ←<br>←<br>← | N31F<br>Ⓒ Ⓤ N53B<br>＊Ⓦ N96E |
| Pilot Jet | 38 | ← | ← | ← | ← | ← |
| Pilot Air Jet | (95) | ← | ← | ← | ← | ← |
| Pilot Screw (turns out) | 1 5/8 | ← | ←<br>Ⓒ 2 | ←<br>←<br>Ⓦ — | ←<br>←<br>← | 1 1/2<br>Ⓒ 2<br>← |
| Starter Jet | (52) | | | | | |
| Fuel Level (for reference) | 1.5 mm above float chamber | | | | | |
| Service Fuel Level | see P. 2-12 | | | | | |
| Float Height | see P. 2-12 | | | | | |

Ⓒ : Canada Model Ⓤ : US Model
Ⓖ : West Germany Model Ⓦ : Switzerland Model
＊Ⓦ : VN750-A10~ Austria and Switzerland Models

**Idle Speed**

**Standard:** 1,100 ±50 r/min (rpm)
***1,300 ±50 r/min (rpm)

**Air Cleaner Element Oil**

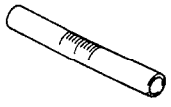
**Grade:** SE class
**Viscosity:** SAE 30

*** : VN750-A4, A5 Switzerland Model

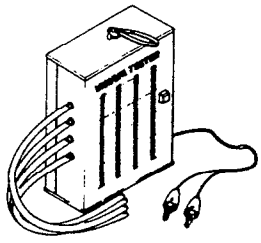
## Special Tools

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

**Fuel Level Gauge: 57001-1017**



**Vacuum Gauge Set: 57001-1198**



## Throttle Grip and Cables

If the throttle grip has excessive free play due to cable stretch or misadjustment, there will be a delay in throttle response. Also, the throttle valves may not open fully at full throttle.

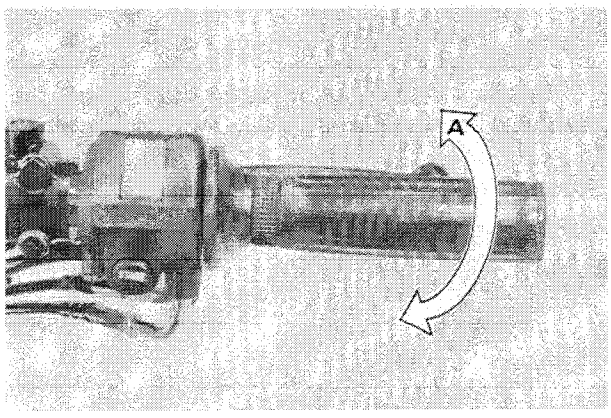
On the other hand, if the throttle grip has no play, the throttle will be hard to control, and the idle speed will be erratic. Check the throttle grip play periodically in accordance with the Periodic Maintenance Chart, and adjust the play if necessary.

### *Throttle Grip Play Inspection*

●Check that there is **2 – 3 mm** throttle grip free play by lightly turning the throttle grip back and forth.

**Throttle Grip Free Play**

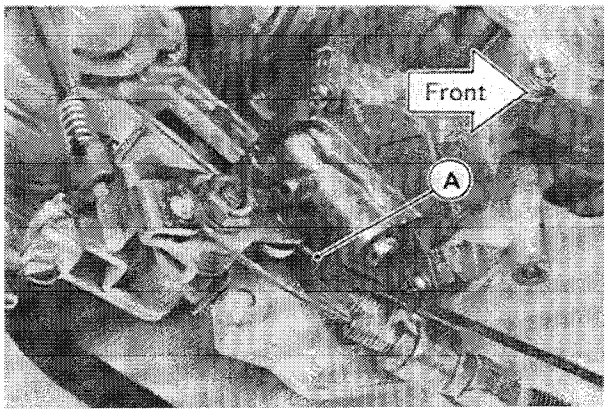
**2 – 3 mm**




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.

(In the photo, the carburetors have been removed for clarity)




A. Decelerator Inner Cable

★If the throttle grip free play is not correct 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 one may be damaged.

●Correct any problem before operating the motorcycle.

**WARNING**

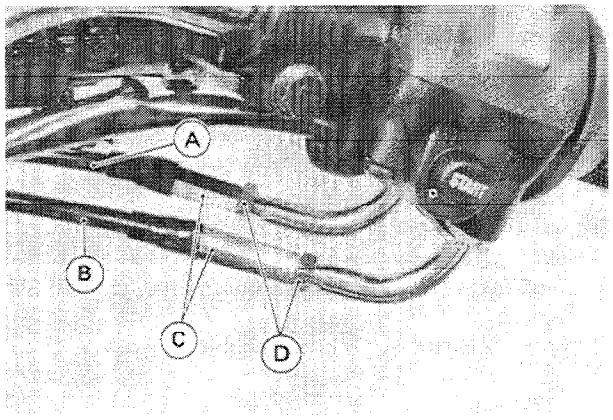
○**Operation with an improperly adjusted, incorrectly routed, or damaged cable could result in an unsafe riding condition.**

### *Throttle Cable Play Adjustment*

●Loosen the locknuts, and screw both throttle cable adjuster nuts in fully at the upper end of the throttle cables to give the throttle grip plenty of play.

●With the throttle grip completely closed, turn out the deceleration cable adjuster nut until the inner cable just becomes tight.

●Tighten the locknut.

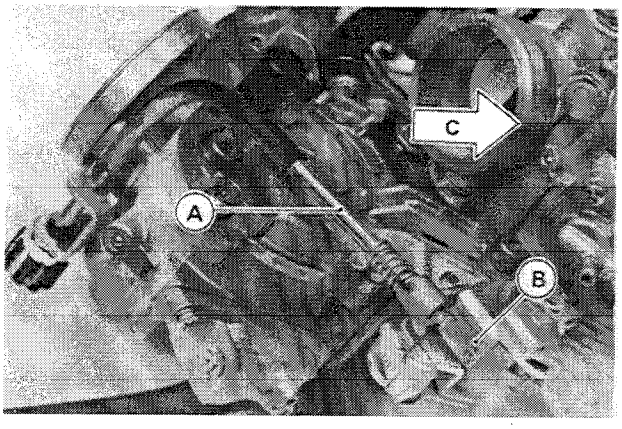



A. Accelerator Cable
B. Decelerator Cable
C. Adjusters
D. Locknuts

●Turn the accelerator cable adjuster nut until the correct throttle grip free play is obtained.

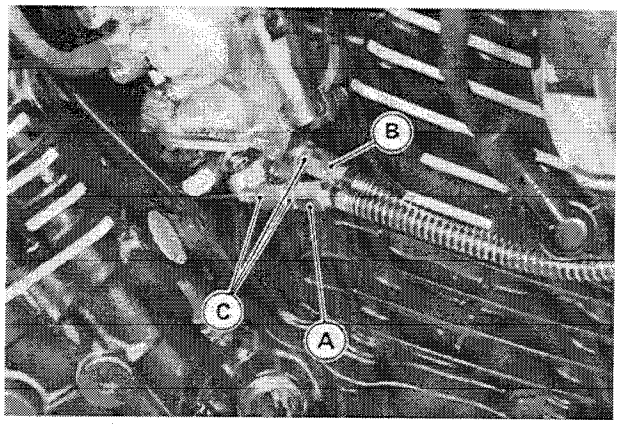
●Tighten the locknut.

●Check that the throttle linkage lever stops against the idle adjusting screw with the throttle grip closed.




A. Idle Adjusting Screw C. Front
B. Lever

★If the throttle cables cannot be adjusted by using the cable adjuster nuts at the upper ends of the throttle cables, use the cable adjusters at the lower ends of the throttle cables as follows.




A. Accelerator Cable Adjuster
B. Decelerator Cable Adjuster
C. Locknuts

○Remove the accelerator cable adjuster and locknut.
○Adjust the decelerator cable.
○Reinstall the accelerator cable adjuster, and then adjust it.
○Be sure to tighten the adjuster locknuts.

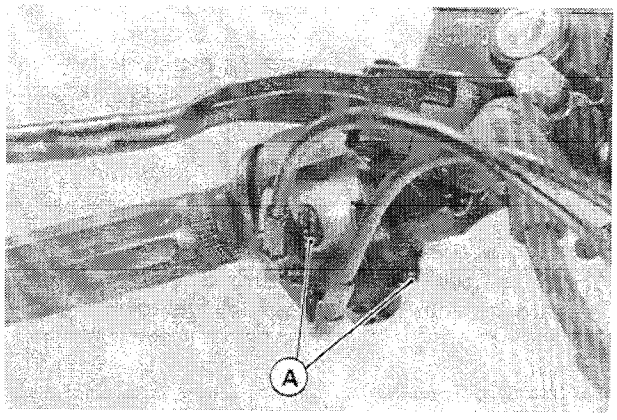
●Start the engine.
●Turn the handlebar from side to side while idling the engine.
★If idle speed varies, the throttle cable may be poorly routed or it may be damaged.
●Correct any problem before operating the motorcycle.

**WARNING**

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

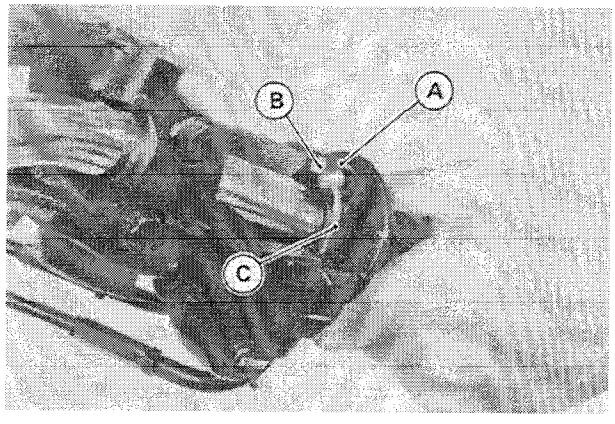
### *Throttle Cable Removal*

●Loosen the locknuts at the throttle grip and turn in the adjusters fully to give the cables plenty of play.
●Take out the two screws holding the right switch case halves together.




A. Remove the screws.

●Slip the inner cable tips from the catches on the throttle pulley, and free the cables from the handlebar.

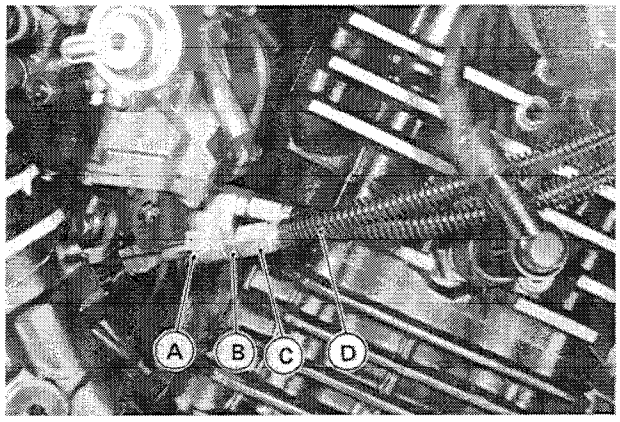



A. Pulley C. Decelerator Cable
B. Accelerator Cable

**NOTE**

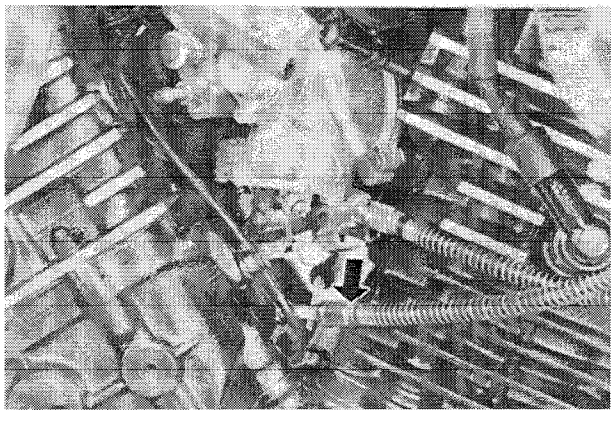
○*If the carburetors are to be removed, separate the throttle cable lower ends after removing the carburetors.*

★If the throttle cables are to be removed with the carburetors installed, work as follows.
●Loosen the locknuts at the lower end of the accelerator cable.
●Remove one of the locknuts and then the adjuster from the bracket.

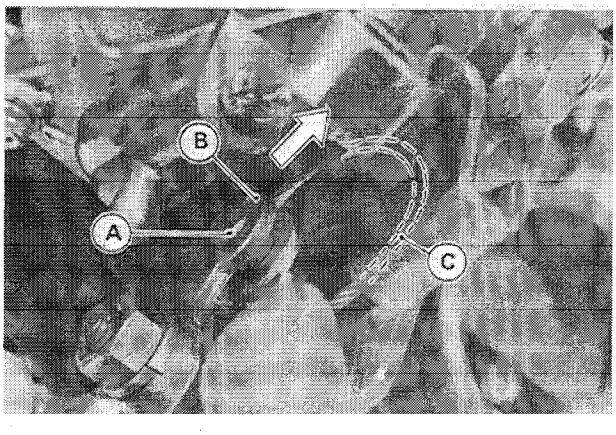



A. Remove the Locknut
B. Locknut
C. Adjuster
D. Accelerator Cable

•Slip the tip of the inner cable out of the lever.



•Remove the inner cable tip of the decelerator cable in the same manner, noting the slit position.

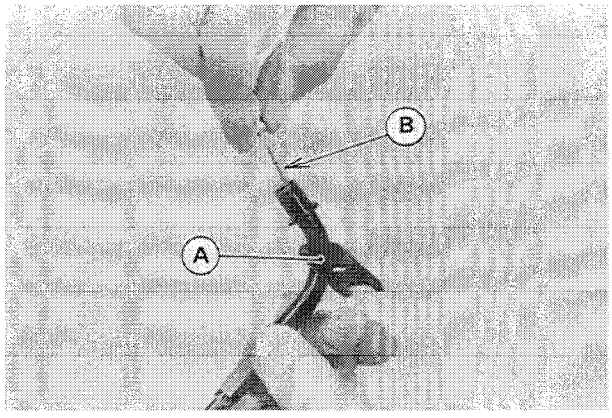



A. Cable Tip
B. Slit of the Lever
C. Decelerator Cable

•Free the right fuel tank cover by removing the mounting screws.
•Pull out the throttle cables.

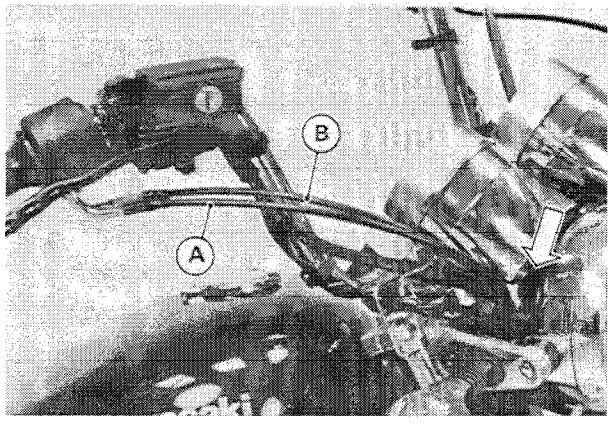
### *Throttle Cable Installation Notes*

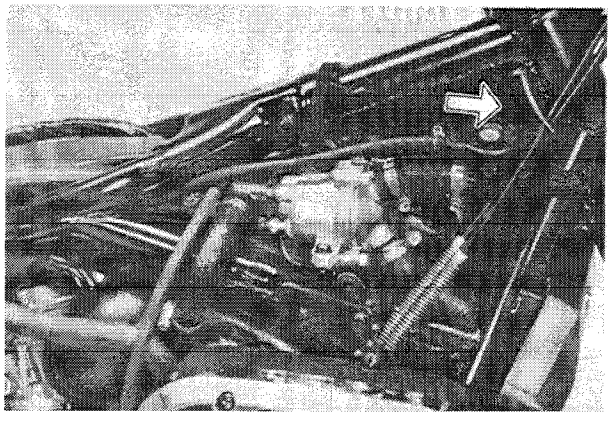
•Before installing the throttle cables, lubricate them (see Throttle Cable Lubrication).
○The accelerator inner cable is shorter than the decelerator inner cable. Besides, the accelerator cable has a cable guide. Be careful not to confuse them when installing.




A. Cable Guide
B. Accelerator Cable

•Route the throttle cables as shown.
•Adjust the cables.



A. Accelerator Cable
B. Decelerator Cable

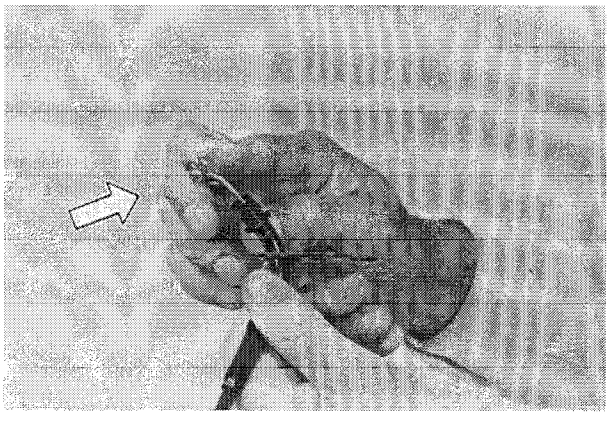
**WARNING**

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

### *Throttle Cable Lubrication*

Whenever the throttle cable is removed, and in accordance with the Periodic Maintenance Chart (see General Information chapter), perform the following.

●Apply a thin coating of grease to the throttle cable lower end.

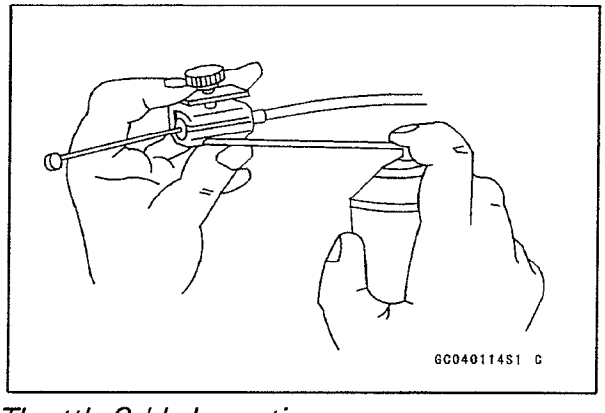


A. Apply grease.

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

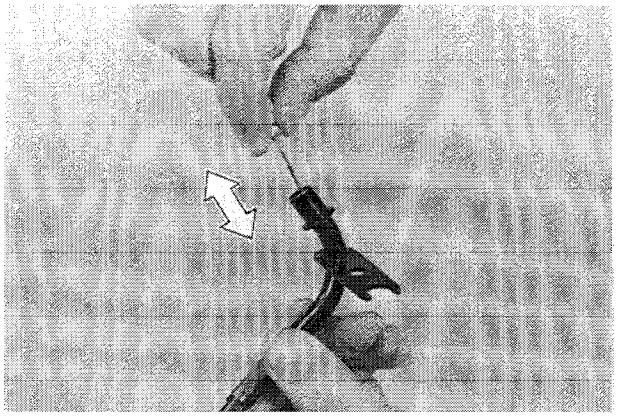
○ The cable may be lubricated by using a pressure cable luber with an aerosol cable lubricant.

**Cable Lubrication**




### *Throttle Cable Inspection*

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



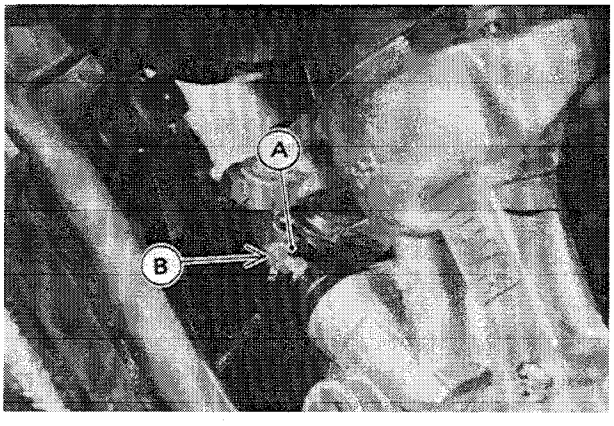
## Choke Cable

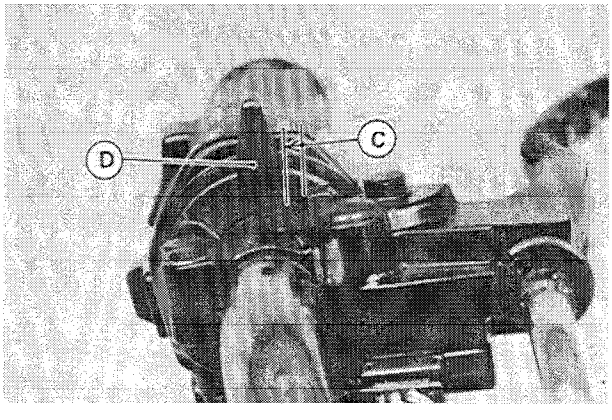
### *Choke Cable Free Play Inspection*

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

★If there is any irregularity, check the choke cable as follows.

●Check to see that the plunger lever fork makes contact with the plunger top when the choke lever travel is **2 – 3 mm** from the rest position.



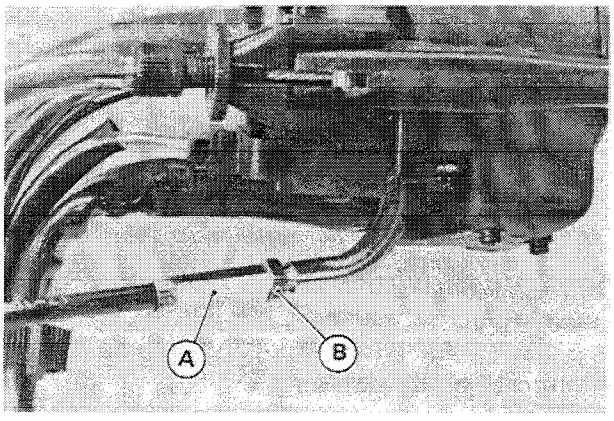

A. Lever Fork
B. Plunger Top
C. Travel
D. Choke Lever

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

**Choke Cable Free Play**
**2 – 3 mm**

### *Choke Cable Adjustment*

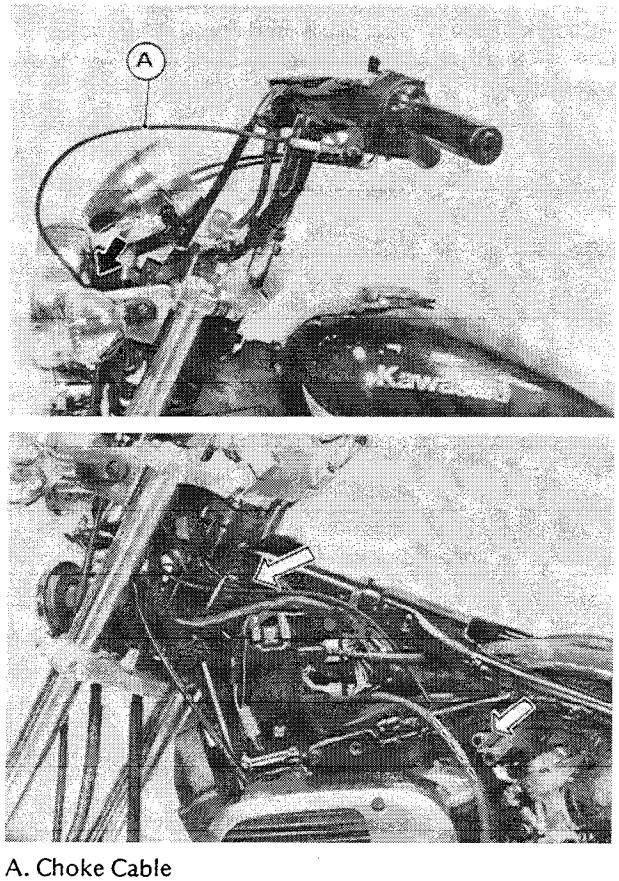
- Loosen the locknut at the adjuster nut of the choke cable, and turn the adjuster nut until the cable has the proper amount of play.
- Tighten the locknut after adjustment.




A. Adjuster Nut B. Locknut

### *Choke Cable Installation*

- Run the choke cable as shown.




A. Choke Cable

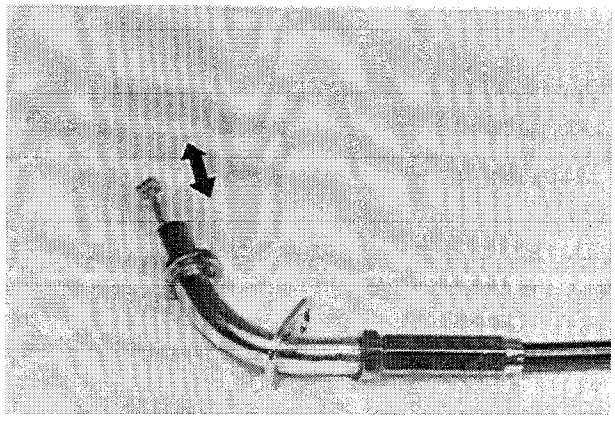
### *Choke Cable Lubrication*

Whenever the choke cable is removed, lubricate the choke cable as follows.

- Lubricate the choke cable by seeping oil between the cable and cable housing in the same manner as the throttle cable.

### *Choke Cable Inspection*

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



★If cable movement is not free after lubricating (see Choke Cable Lubrication), if the cable is frayed, or if the housing is kinked, 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 cable may be improperly adjusted or incorrectly routed, or it may be damaged. Be sure to correct any of these conditions before riding.

**WARNING**

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

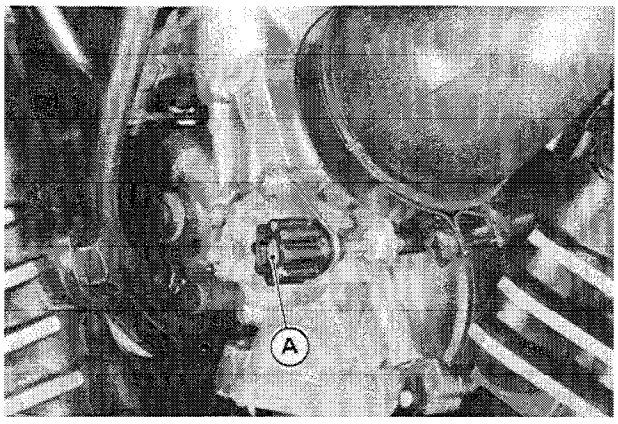
- Check idle speed.

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

**Idle Speed**
**1,100 ±50 r/min (rpm)**

### *Idle Speed Adjustment*

•Turn the adjusting screw until idle speed is correct.
○The throttle linkage lever must stop against the idle adjusting screw with the throttle grip closed.




A. Adjusting Screw

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

### *High Altitude Performance Adjustment (U.S. model)*

**For '85 model**

○High altitude adjustment is not necessary since this vehicle meets emission requirements at high altitudes.

**NOTE**

○*For those instances when the standard main jet (No. 135) does not produce satisfactory high altitude performance, Kawasaki provides additional alternate main jets for high altitude adjustment.*

**Alternate High Altitude Main Jets**

**No. 132, No. 130, No. 128, No. 125**

**For '86 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. High altitude adjustment requires installation of the following carburetor components:

**High Altitude Carburetor Specifications**

| | |
|---|---|
| **Main Jet** | **No. 130** |
| **Pilot Jet** | **No. 35** |

○When properly performed, these specified adjustments are not considered to be emission control system "tampering."
•After high altitude carburetor adjustments are performed, provide the customer with the Vehicle Emission Control Information Update Label and label installation instructions (KMC part number 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.
★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.

**NOTE**

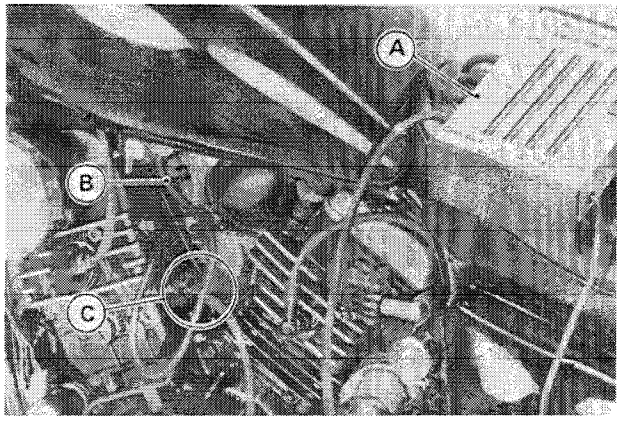
○*For those instances when the recommended high altitude main jet (No. 130) does not produce satisfactory high altitude performance, Kawasaki provides additional alternate main jets for high altitude adjustment.*

**Alternate High Altitude Main Jets**

**No. 128, No. 125, No. 122**

### *Carburetor Synchronization Inspection*

•Warm up the engine.
•Check idle speed and adjust if necessary.
•Attach a vacuum gauge set (special tool) to the vacuum hose fittings on the carburetors, using suitable three-way fittings.




A. Vacuum Gauge: 57001-1198
B. Vacuum Hose
C. Three-Way Fitting (e.g. 92005-1017)

•Start the engine and let it idle to measure the engine intake vacuum.
★If the intake vacuum difference between two cylinders exceeds the limit, synchronize the carburetor butterfly valves.

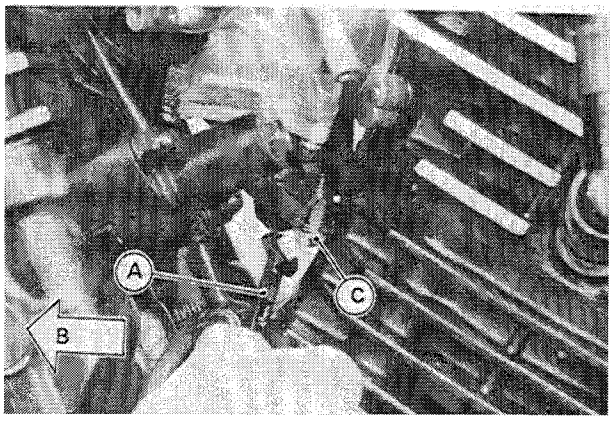
**Carburetor Synchronization Vacuum**

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

### *Carburetor Synchronization*

•With the engine idling, turn the adjuster bolt with a 7 mm wrench to synchronize the butterfly valves.

○When the adjuster bolt is **turned in,** the vacuum increases on rear cylinder. When the bolt is **backed out,** the vacuum decreases on rear cylinder.

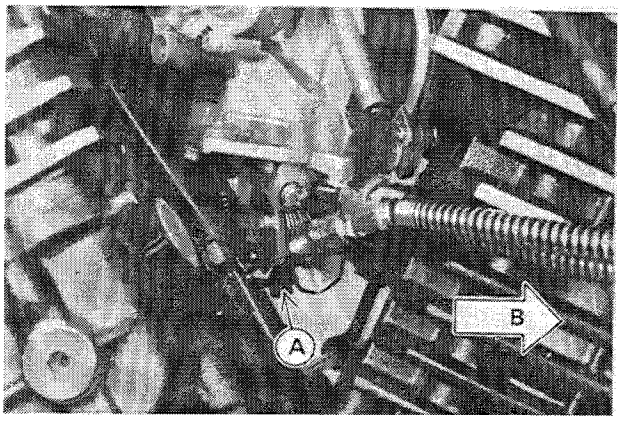



A. 7 mm Wrench
B. Front
C. Adjuster Bolt

★When the adjuster bolt head is out of position to insert a wrench or a screwdriver, work as follows.

○Stop the engine.

○Turn the throttle lever a little to adjust the bolt adequately with a wrench or a screwdriver.




A. Adjuster Bolt
B. Front

○Check idle speed and synchronization, and adjust them if necessary.

### *Fuel Level Inspection*

**NOTE**

○*Carburetor fuel level cannot be checked with the carburetors removed. If there is any doubt, check the fuel level before removing the carburetors.*

**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.**

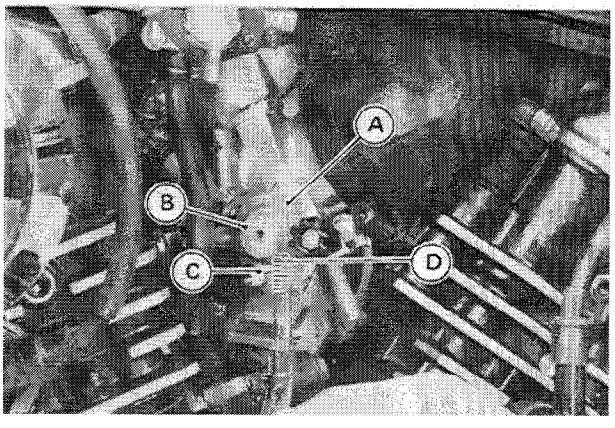
•Secure the motorcycle in a true vertical position.

○When the engine has been removed, set it on a flat surface with the carburetors installed. Put the fuel tank on a bench, and connect the fuel tap to the carburetors using a suitable hose.

•Prepare a rubber or plastic hose.

•Connect fuel level gauge 57001-1017 to the carburetor bottom cover with the hose.

•Hold the gauge vertically against the side of the carburetor body so that the "zero" line is several millimeters higher than the upper edge of the coasting enricher mounting screw.




A. Fuel Level Gauge: 57001-1017
B. Coasting Enricher
C. Upper Edge of the Screw
D. "Zero" Line

•Turn the fuel tap to the PRI position to feed fuel to the carburetor, then turn out the carburetor drain plug a few turns.

•Wait until the fuel level in the gauge settles.

•Keeping the gauge vertical, slowly lower the gauge until the "zero" line is even with the upper edge of the coasting enricher mounting screw.

**NOTE**

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

•Read the fuel level in the gauge and compare it to the specification. Screw in the carburetor drain plug.

**Fuel Level**

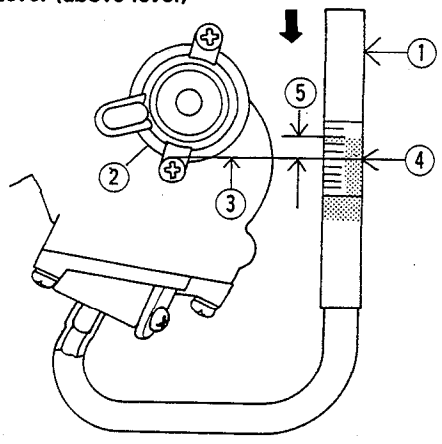
**Front Carburetor:**

**0.8 mm below to 1.2 mm above the upper edge of the coasting enricher mounting screw.**

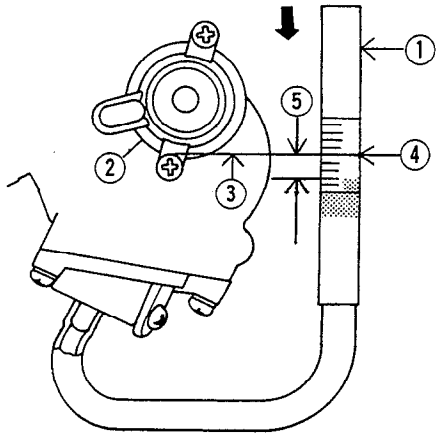
**Rear Carburetor:**

**1.2 mm below to 0.8 mm above the upper edge of the coasting enricher mounting screw.**

**Fuel Level (above level)**




**Fuel Level (below level)**




1. Fuel Level Gauge: 57001-1017
2. Coasting Enricher
3. Upper Edge of the Screw
4. "Zero" Line
5. Fuel Level

**NOTE**

○*Repeat the measurement until the fuel level reaches the constant value.*

•Turn the fuel tap to the ON position and remove the fuel level gauge.

•Inspect the fuel level in the other carburetor in the same manner.

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

*Fuel Level Adjustment*

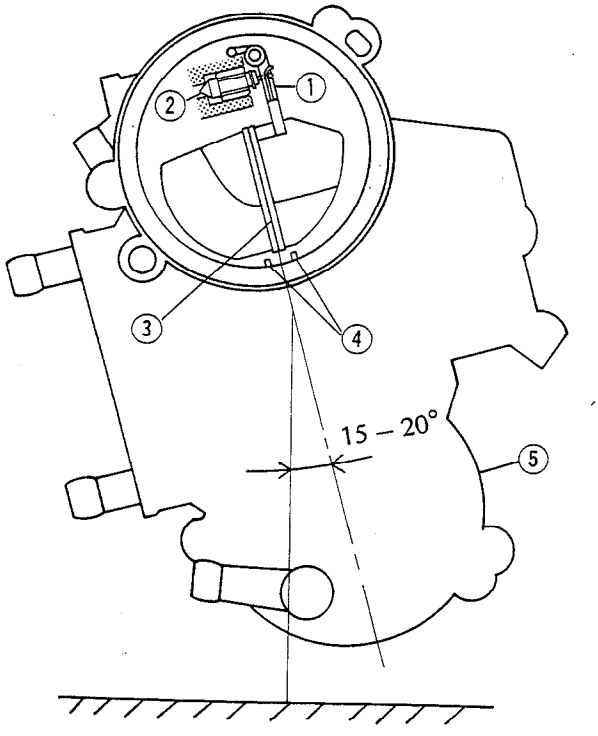
○Read the WARNING in the Fuel Level Inspection.

•Remove the float chamber by taking out the screws (see Carburetor Separation).

•Hold the float chamber body almost vertical so that the spring loaded rod in the float valve needle makes contact with the tang on the float but is not pushed down.

•Check that the float mating edge is between the chamber ribs as shown.

**Fuel Level Adjustment**




1. Float Tang
2. Float Valve
3. Float Mating Edge
4. Chamber Ribs
5. Float Chamber Body

★If the float height is maladjusted, bend the tang on the float a very slight amount so that the float edge is between the chamber ribs.

•Repeat the adjustment for the other float as necessary.

•Assemble the carburetors, and recheck the fuel level respectively.

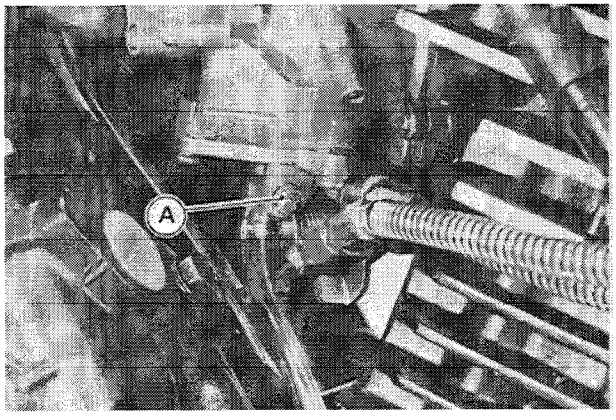
★If the fuel level cannot be adjusted by this method, the float or the float valve is damaged.

*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 each carburetor bottom cover.
●Run the lower ends of the hoses into a suitable container.
●Turn the fuel tap to the PRI position to drain the fuel.
●Turn out each drain plug a few turns and drain the float chambers.




A. Drain Plug

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

*Carburetor Removal*

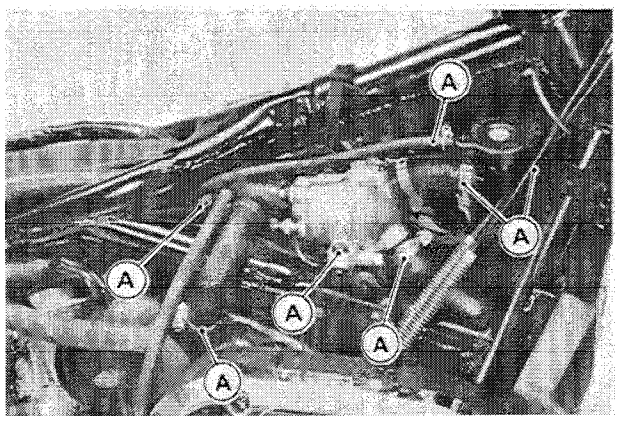
**NOTE**

○*Carburetor fuel level cannot be checked with the carburetors removed. If there is any doubt, check the fuel level before removing the carburetors.*

**WARNING**

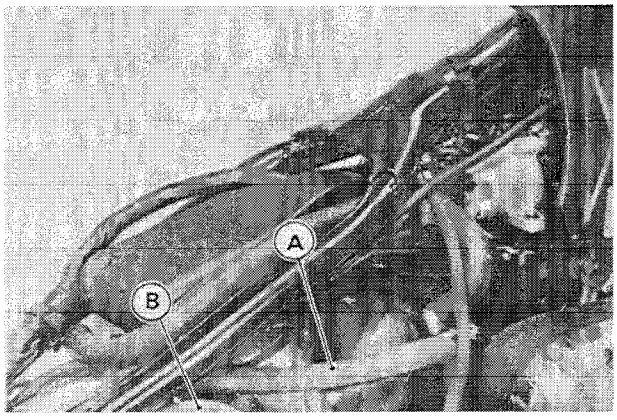
○**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

●Remove the following parts to allow raising the rear of the surge tank. This makes surge tank duct removal and installation much easier.
○On California models, remove the charcoal canister purge hose from the surge tank and pull it out of the way.
Seat
Fuel Tank and Fuel Tank Covers
Air Cleaner Housings
Throttle Cable Upper Ends
Thermostat Housing and Radiator Cap Assemblies
Mian Wire Harness Sheath



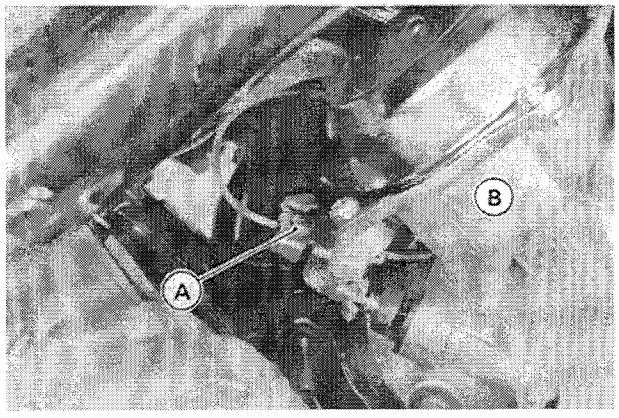

A. Remove here and take out the assemblies.

Clean Air System Hoses



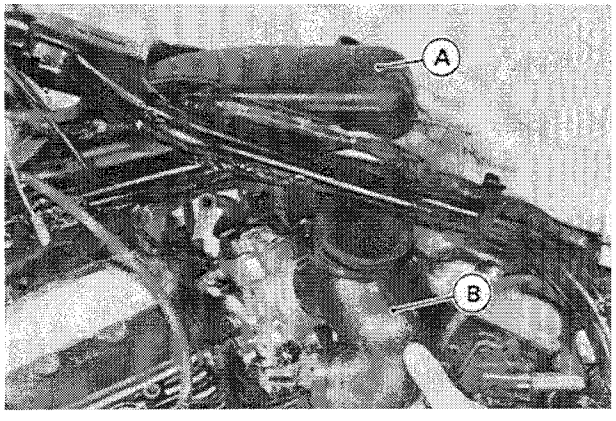

A. Right Hand Air Hose B. Vacuum Hose

●Remove the choke cable lower end as follows.
○Loosen the locknut at the cable upper end and turn in the adjuster nut fully to give the cable plenty of play.
○Slip the outer cable out of the cable bracket at the front carburetor.
○Slip the inner cable tip from the plunger lever at the rear carburetor, and pull off the cable.



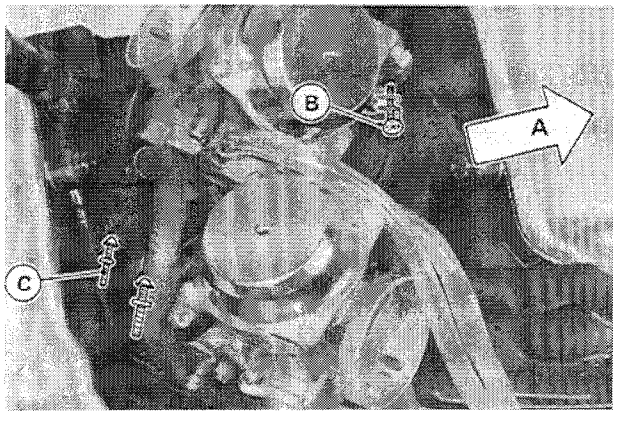

A. Choke Cable Tip B. Rear Carburetor

•Unscrew the clamp screws of the surge tank ducts.
•While tilting up the surge tank as far as it will go, pull the ducts out of the tank and the carburetors.



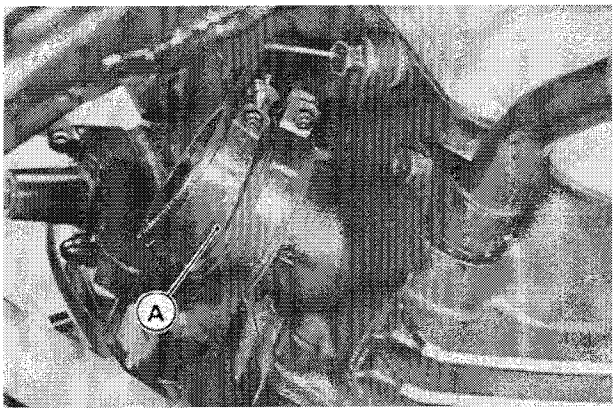

A. Surge Tank B. Surge Tank Ducts

•Loosen the carburetor holder clamp screws shown.




A. Front
B. Loosen this clamp screw only.
C. Loosen this clamp screw only.

•While pulling the carburetor assembly up, remove it from the motorcycle right side.
○The front carburetor holder may be left on the cylinder.




A. Front Carburetor Holder

•Remove the throttle cable lower ends.
•After removing the carburetors, stuff pieces of lint-free, clean cloths into the carburetor and the engine inlets to keep the dirt out of the engine and carburetors.

**WARNING**

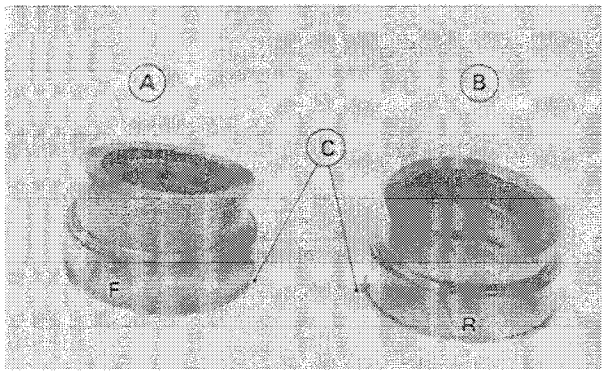
○**If dirt or dust is allowed to pass through into the carburetors, the throttle may become stuck, possibly causing an accident.**

**CAUTION**

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

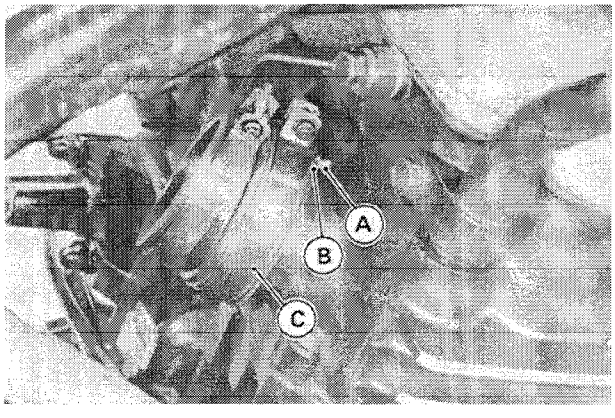
*Carburetor Installation Notes*

○Carburetor installation is the reverse of removal. Note the following.
○The front carburetor holder has an **F** mark and the rear carburetor holder has a **R** mark. Be careful not to mix up these holders.



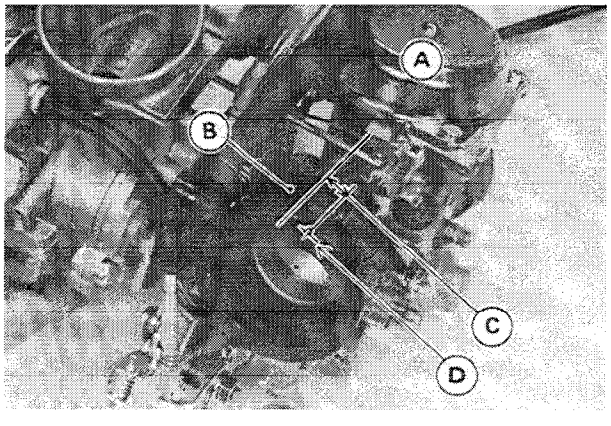

A. Front Holder
B. Rear Holder
C. Projections

●Install the front carburetor holder on the cylinder head aligning the projections.




A. Front Cylinder Projection
B. Holder Projection
C. Secure this clamp only.

●Install the rear carburetor holder on the rear carburetor as shown.

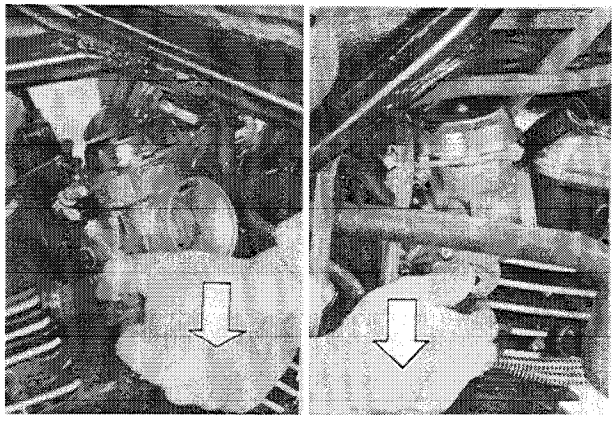



A. Rear Carburetor
B. Secure this clamp only
C. About 15 mm
D. Protrusion

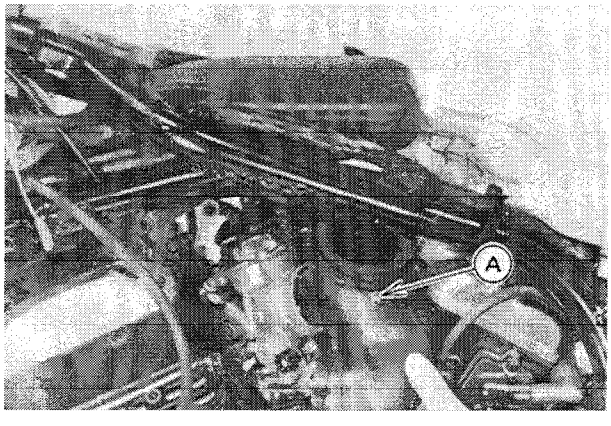
**CAUTION**

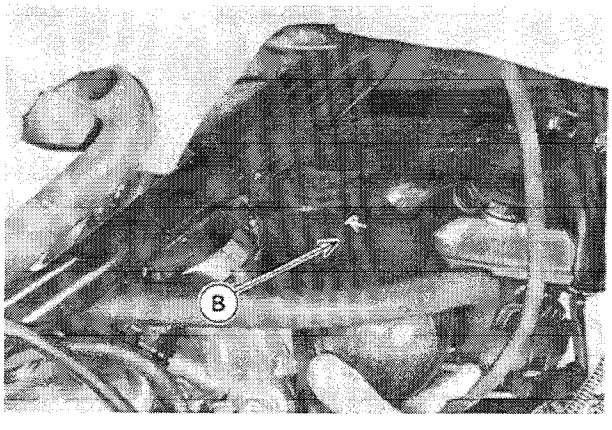
○**Be sure to install the holder clamp screws in the direction shown, with the screw head inside. Or, the screws could come in contact with the throttle linkage resulting in an unsafe riding condition.**

●While pushing down the carburetor assembly, install it on each cylinder. The rear carburetor holder projection should align with the cylinder head projection.



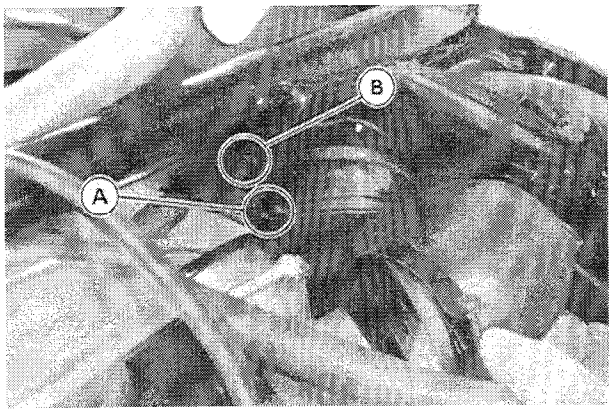
●Tighten the holder clamp screws securely.
○The front duct has **F** mark and the rear duct has **R** mark as shown.




A. F mark
B. R mark

●While aligning the duct notch onto the surge tank projection, fit each duct into the surge tank as shown.

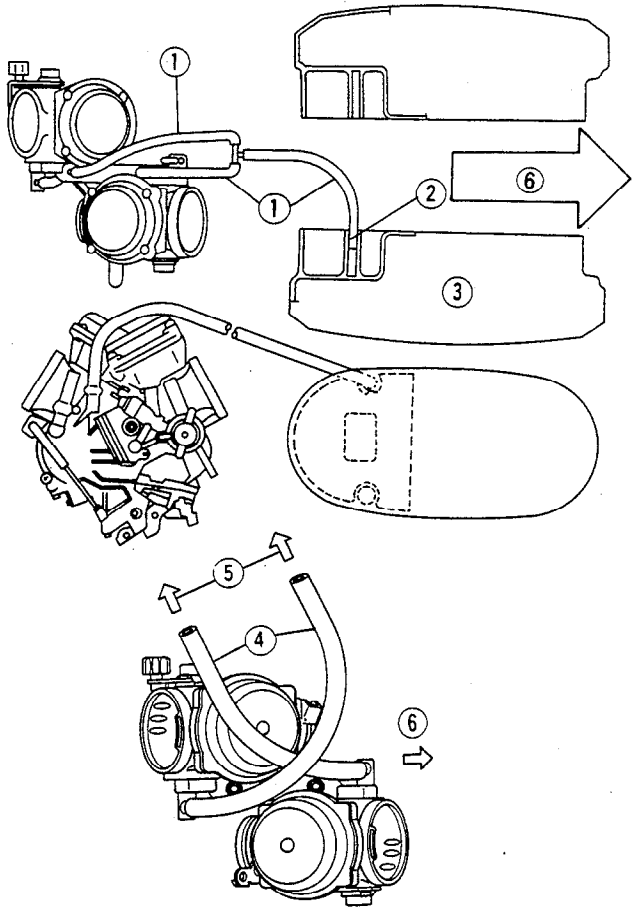



A. Notch B. Tank Projection

●Insert the vent hose into the right air cleaner housing as shown.

●Install the two fuel hoses crossing each other as shown to prevent its obstruction.

**Vent Hose and Fuel Hose Installation**




1. Vent Hoses
2. Do not insert the hose too deep.
3. Right-Hand Air Cleaner Housing
4. Fuel Hoses
5. To Fuel Tap
6. Front

**CAUTION**

○**Keep the hoses free of obstruction.**

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

**WARNING**

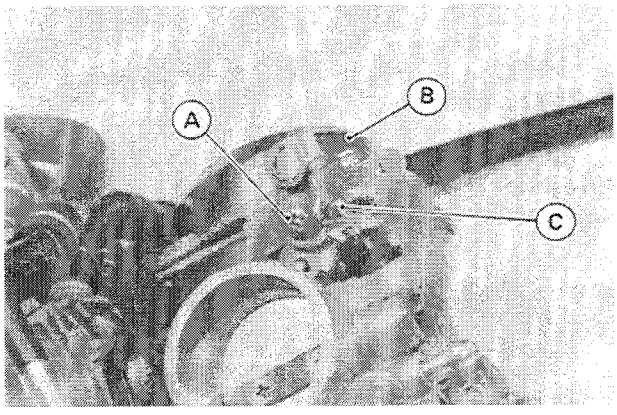
○**Fuel spilled from the carburetors is hazardous.**

○Adjust the following items if necessary.
Idle Speed
Carburetor Synchronization
Throttle Cables
Choke Cable

*Carburetor Separation*

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

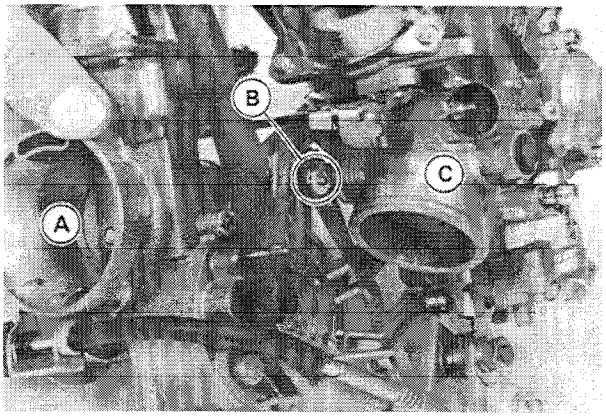
●Remove the choke link collar by taking out the mounting screw on the rear carburetor.
●Separate the linkage from the starter plunger.




A. Screw and Collar C. Starter Plunger
B. Rear Carburetor

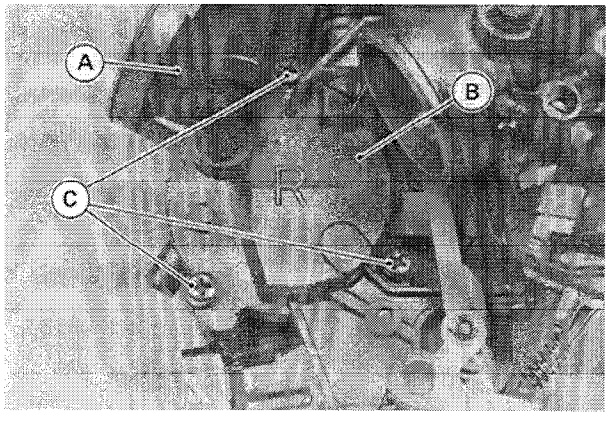
**Rear Carburetor Separation**

●If the rear carburetor is to be separated, remove the following parts.
○Remove the throttle link pin and plastic washer by pulling out the cotter pin.




A. Front Carburetor
B. Throttle Link Pin
C. Rear Carburetor

○Separate the float chamber body from the carburetor body by taking out the mounting screws.

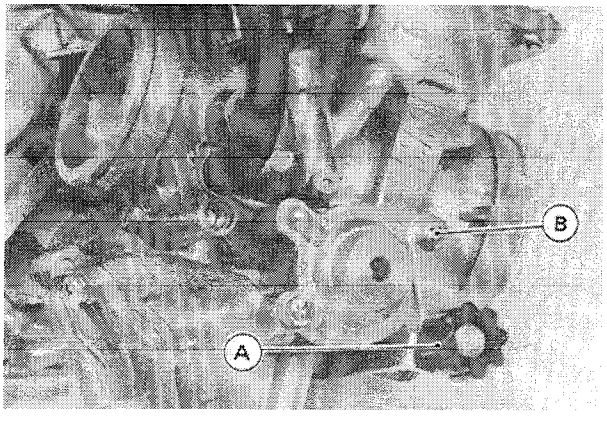



A. Rear Carburetor
B. Float Chamber Body
C. Mounting Screws (3)

**Front Carburetor Separation**

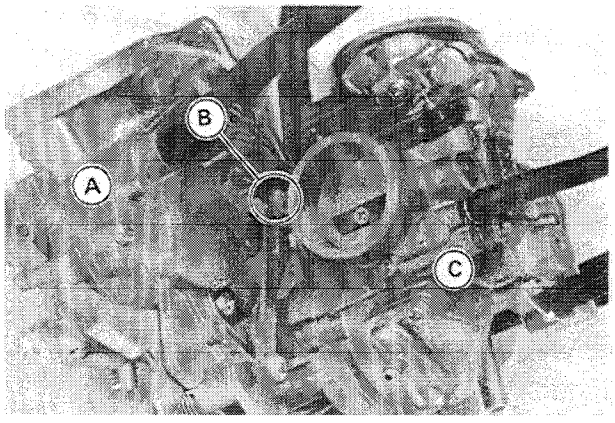
●If the front carburetor is to be separated, remove the following parts.

○Remove the idle adjuster bracket by taking off the screw.



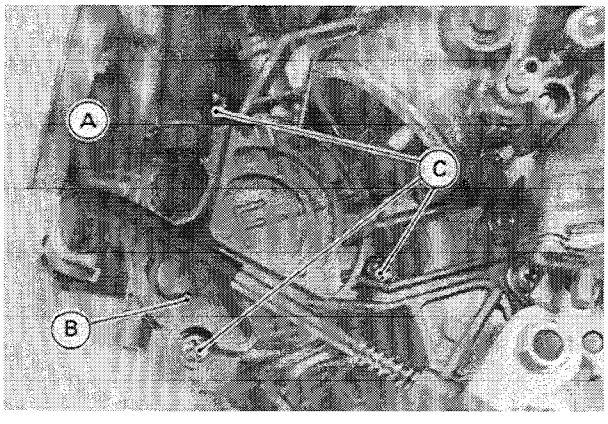

A. Idle Adjuster
B. Bracket Screw

○Remove the throttle link pin and plastic washer by pulling out the cotter pin.




A. Rear Carburetor
B. Throttle Link Pin
C. Front Carburetor

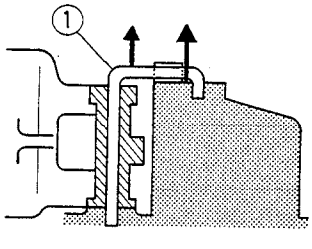
○Separate the float chamber body from the carburetor body by taking out the mounting screws.

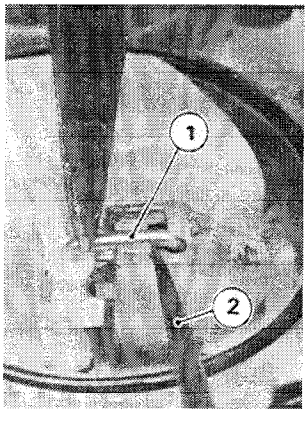



A. Front Carburetor
B. Float Chamber Body
C. Mounting Screws

*Carburetor Disassembly Notes*

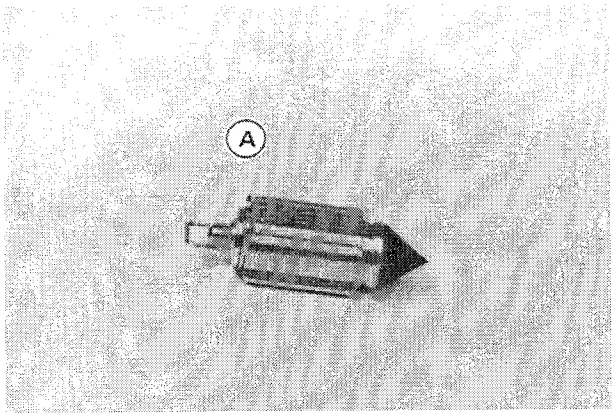
●While prying out the float pivot pin with an awl or other suitable tool, pull it out with needle nose pliers.



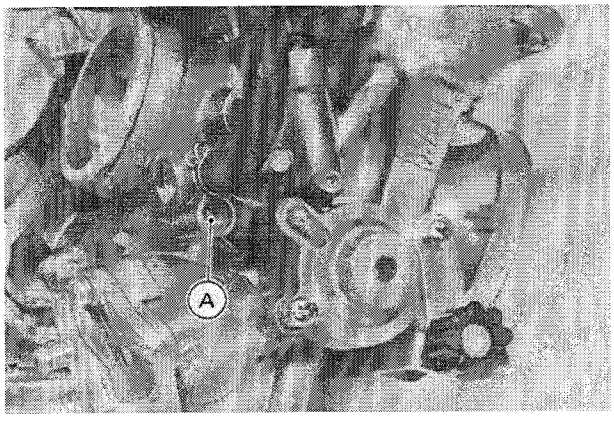

1. Float Pivot Pin
2. Awl

●Remove the float valve needle from the float.




A. Float Valve Needle

●For the US model, remove the pilot screw plug as follows:
○Punch a hole in the plug and pry it out 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.




A. Pilot Screw Plug Hole

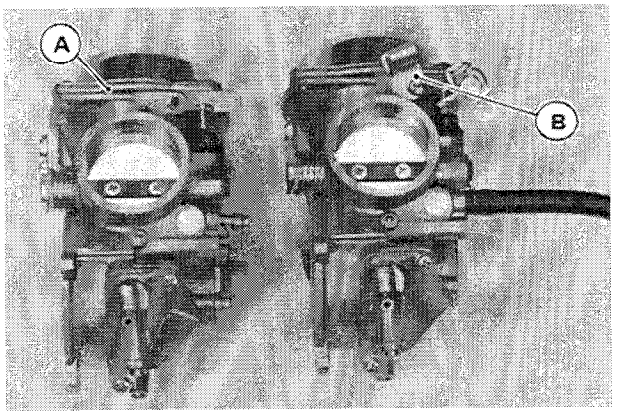
**CAUTION**

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

*Carburetor Assembly Notes*

**CAUTION**

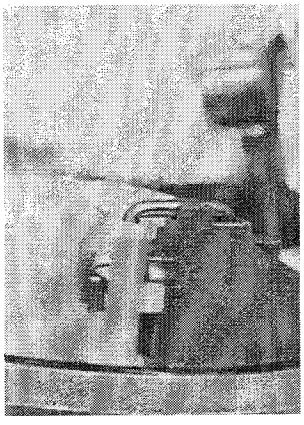
○**The front carburetor has a choke stay shown. Do not confuse the front and the rear carburetors during installation.**

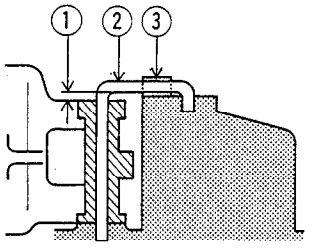



A. Rear Carburetor
B. Choke Stay on the Front Carburetor

○Do not interchange the jet needles between the front and the rear carburetors.

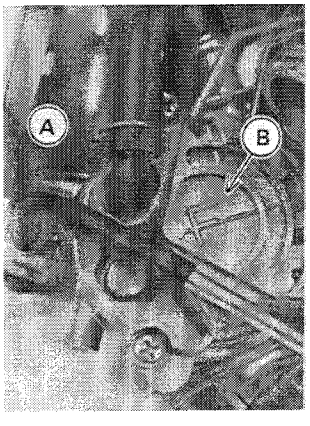
●Insert the float on the float pivot pin.
●While tapping the float pivot pin lightly, press the pivot evenly into the float chamber body as shown.
○Do not tap the portion shown.

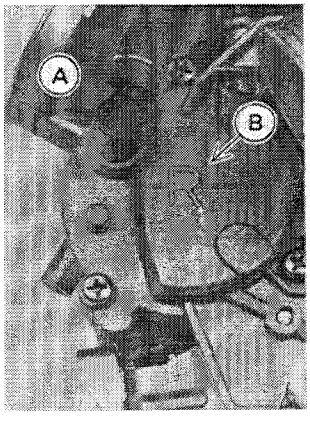





1. Clearance: 0.2 to 0.4 mm
2. Do not tap here.
3. Tap the pin as far as it will go.

○Replace the float chamber and bottom cover O-ring with new ones when installing.
●Install the front carburetor onto the **F** marked chamber and the rear carburetor onto the **R** marked chamber respectively.



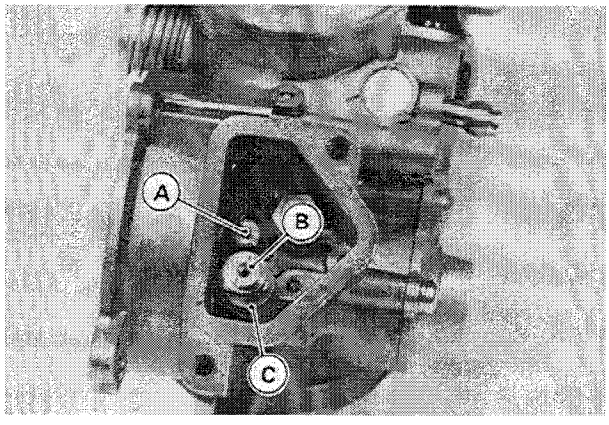

A. Front Carburetor
B. F Mark
C. Rear Carburetor
D. R Mark

○Keep dirt or other foreign material from entering into the float chamber.

**CAUTION**

**○If dirt gets into the float chamber, the float valve may become stuck open, causing carburetor overflow and requiring carburetor cleaning.**

●Carefully screw in the needle jet holder, main jet, and the slow jet.

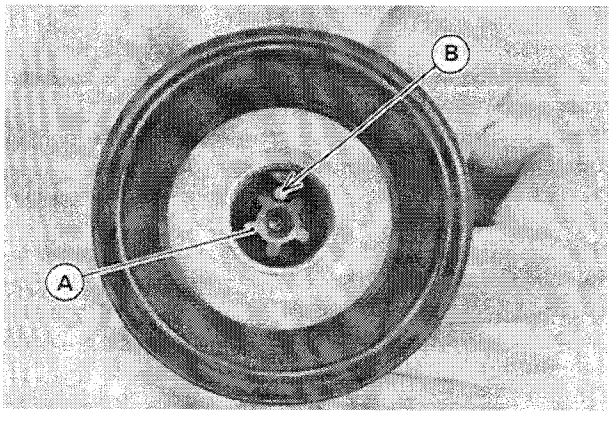



A. Slow Jet
B. Main Jet
C. Needle Jet Holder

**CAUTION**

**○Do not overtighten the needle jet holder, main jet, and the slow jet. These parts 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

●After installing the upper chamber cover, check that the vacuum piston slides up and down smoothly without binding in the carburetor bore.

●Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly.

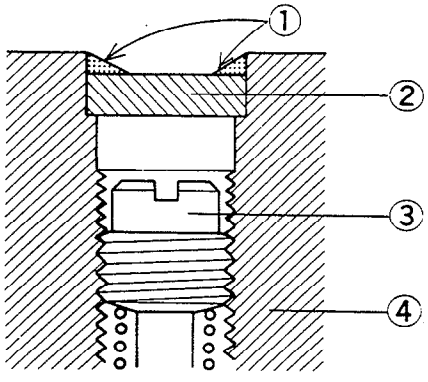
●For the US model, install the pilot screw plug as follows:

○Install a new plug in the pilot screw hole, and apply a small amount of a bonding agent to the circumference of the plug to fix the plug.

**CAUTION**

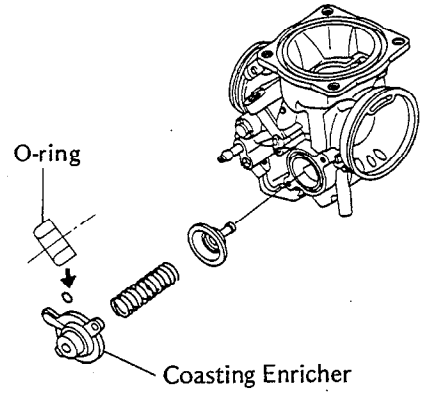
**○Do not apply too much bond on the plug to keep the pilot screw itself from being fixed.**

**Plug Installation (US model only)**




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

●Install the O-ring in the coasting enricher system so that the flat end faces in.



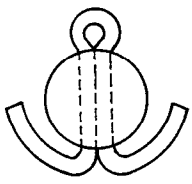
•While fitting the throttle link pin into the other throttle link, install the float chamber body.
•After installing the plastic washer, insert a new cotter pin and spread its end.

**WARNING**

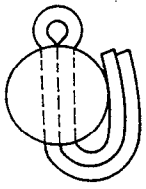
○**Be sure to replace the cotter pin with a new one and spread its end as shown. Or, the pin could come in contact with the carburetor holder or holder clamp resulting in an unsafe riding condition.**

**Cotter Pin Installation**

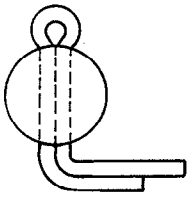
Good



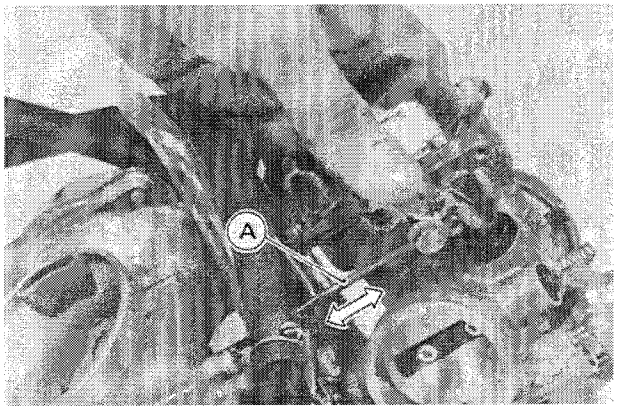
or



Bad



•Insert the choke rod into the choke lever from outside to inside respectively.
•After assembling the choke mechanism, check to see that the choke rod slides right to left smoothly without abnormal friction.

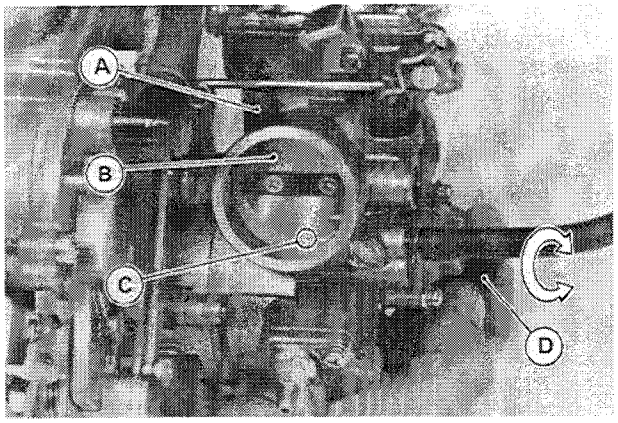



A. Choke Rod

**CAUTION**

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

•Turn the idle adjuster screw to align the front butterfly valve with the edge of the by-pass hole.




A. Front Carburetor
B. Butterfly Valve
C. By-Pass Hole
D. Idle Adjuster Screw

•Align each butterfly valve with the by-pass hole edge by turning the synchronization adjuster bolt.
○Check to see that all throttle valves open and close smoothly without binding when turning the throttle lever.

*Carburetor Cleaning*

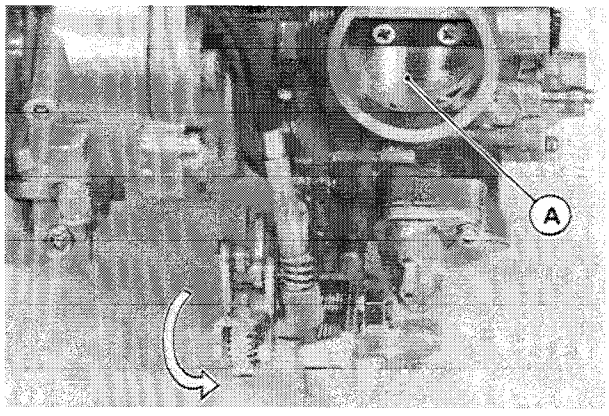
**WARNING**

○**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, or 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 rubber or plastic 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.




A. Throttle Valves

*Carburetor Inspection*

**WARNING**

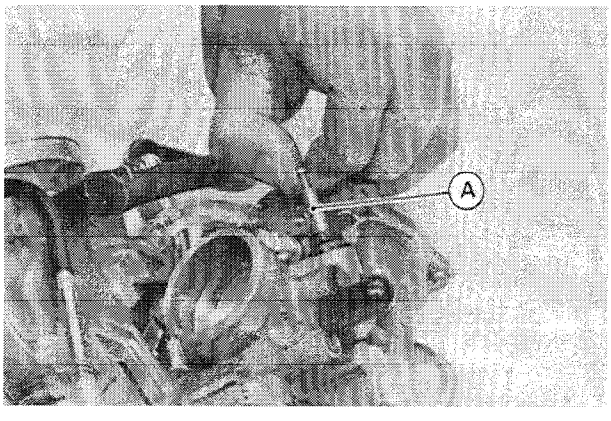
○**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

- Before disassembling the carburetors, check the fuel level (see Fuel Level Inspection).

★If the fuel level is incorrect, inspect the rest of the carburetor before correcting it.

- Remove the carburetors.
- Move the choke lever 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.




A. Starter Plunger

- Turn the throttle lever to check that the throttle butterfly valves move smoothly and return back by the spring tension.

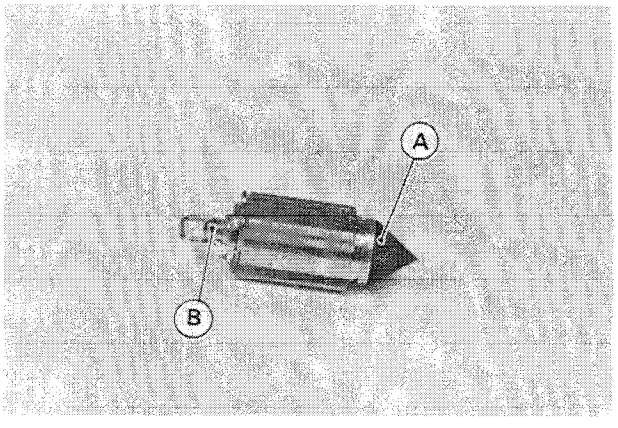
★If the throttle valves do not move smoothly, replace the carburetors.

- Disassemble the carburetors.
- Clean the carburetors.
- Check that the O-rings and diaphragms are in good condition.

  O-rings for Drain Plug and Coasting Enricher
  Diaphragms for Vacuum Piston and Coasting Enricher

★If any of the O-rings or diaphragms are not in good condition, replace them.

- Check the plastic tip of the float valve needle. It should be smooth, without any grooves, scratches, or tears.



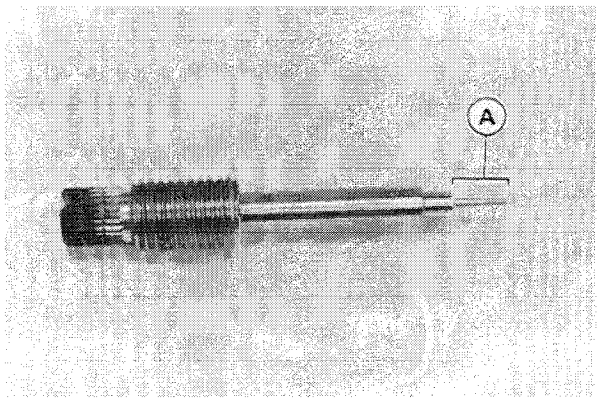

A. Tip B. Rod

★If the plastic tip is damaged, replace the needle.

- Push the rod in the other end of the float valve needle and then release it.

★If it does not spring out, replace the needle.

- Check the tapered portion of the pilot screw for wear or damage.



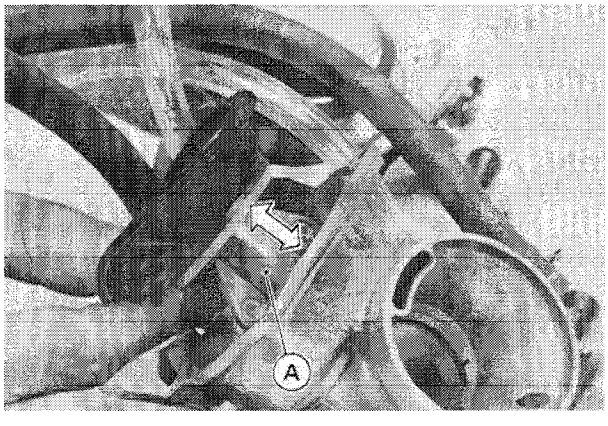

A. Tapered Portion

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

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

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

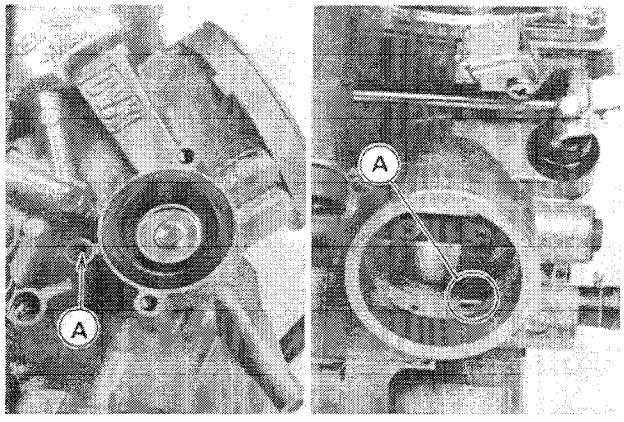
●If the piston sliding surface of the carburetor body is badly scratched or worn, replace the carburetor body.




A. Vacuum Piston

●Check the inlet vacuum passage for the coasting enricher system, if backfiring occurs too often.

★If the passage is clogged, blow it through with compressed air.

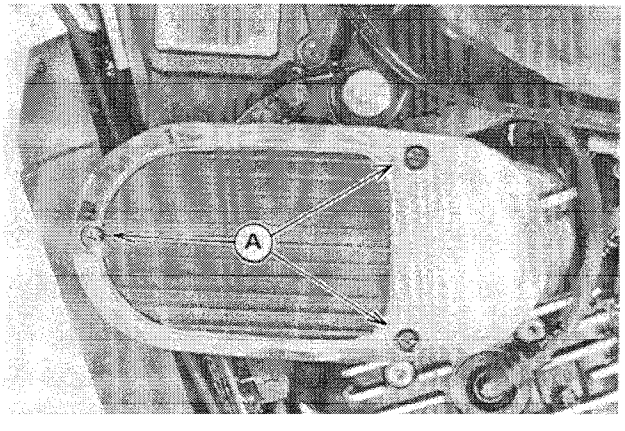



A. Inlet Vacuum Passage

## Air Cleaner

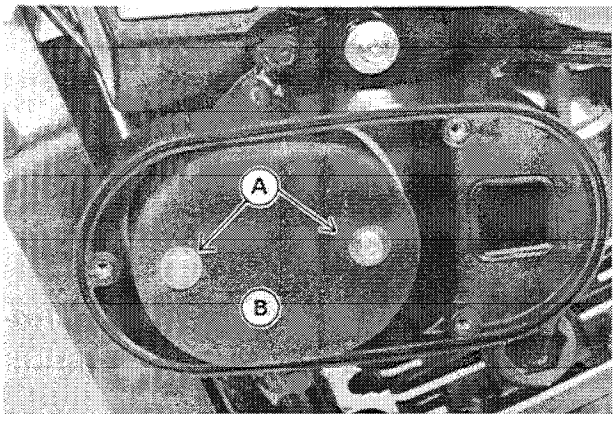
### *Air Cleaner Element Removal*

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




A. Screws

●Unscrew the two bolts and washers to remove the element.




A. Bolts and Washers B. Element

- Remove the other side element in the same manner.
- Push a clean, lint-free towel into the air cleaner housing to keep dirt or other foreign material from entering.

**WARNING**

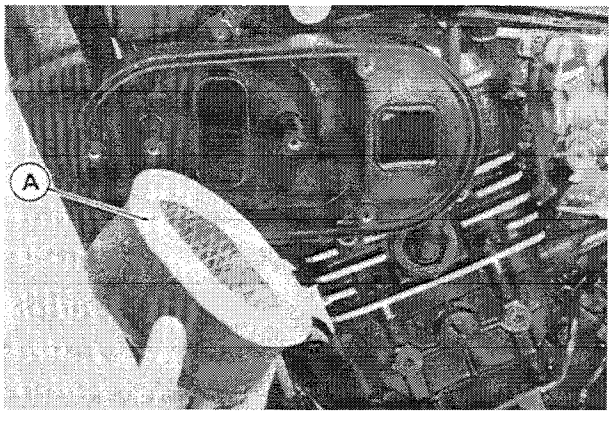
**○If dirt or dust is allowed to pass through into the carburetors, the butterfly valves may become stuck, possibly causing an accident.**

**CAUTION**

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

### *Air Cleaner Element Installation*

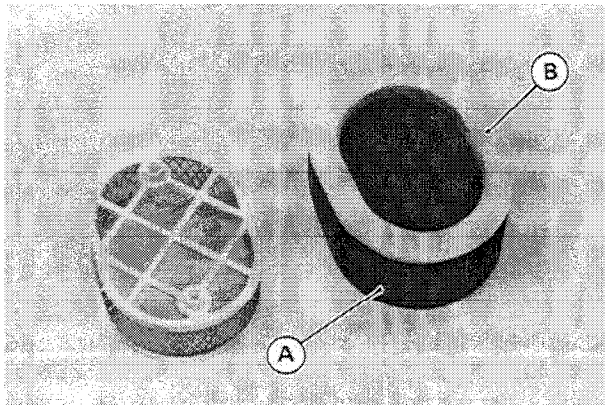
- Element installation is the reverse of removal. Note the following.
- Install the white sponge felt of the element facing in.




A. White Side of the Element

### *Air Cleaner Element Inspection and Replacement*

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




A. Element B. Gasket

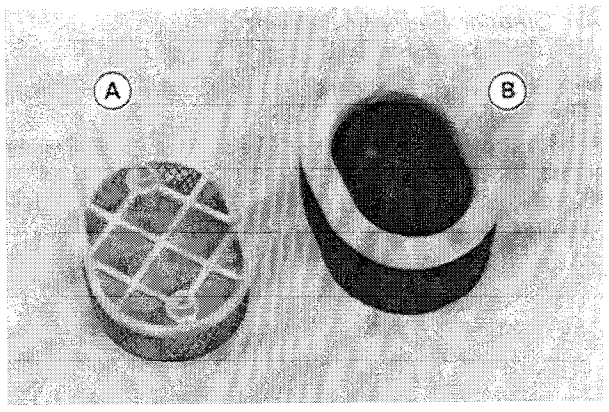
★If the element or gasket have any tears or breaks, replace the element.
★If the element frame is damaged or distorted, replace the element.
★If the sponge gasket comes loose, stick it back on with an adhesive sealant.
- Repeated cleaning opens the pores of the foam in the element. Replace the element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

### *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.*
*○Replace the element after cleaning it 5 times or if it is damaged.*

- Remove the air cleaner element.
- Disassemble the element and inspect the element parts for damage. The damaged part must be replaced or it will allow dirt into the carburetors.

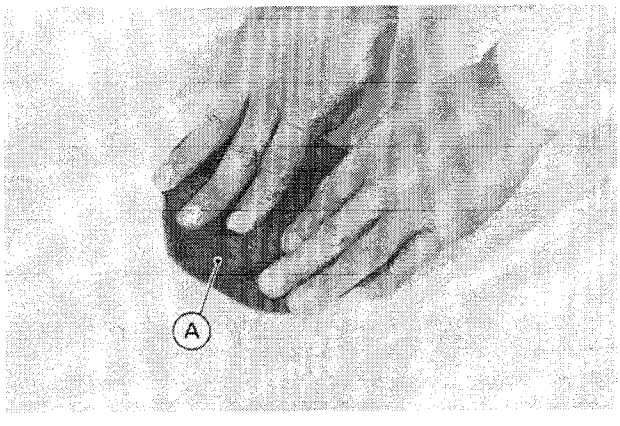



A. Frame B. Element

**WARNING**

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

●Clean the element in a bath of a high flash-point solvent, and then dry it with compressed air or by shaking it.
●After cleaning, saturate the sponge filter with SE class SAE 30 oil, squeeze out the excess, then wrap it in a clean rag and squeeze it dry as possible. Be careful not to tear the sponge filter.

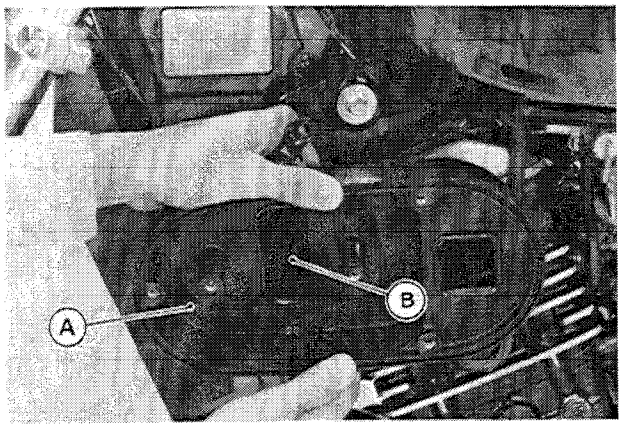



A. Element

●Assemble the element.
●Install the element.

*Air Cleaner Housing Removal*

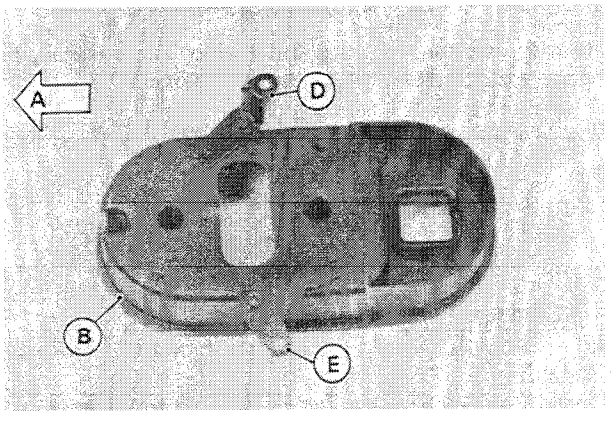
●After removing the air cleaner element, take out the mounting bolts and pull the housing out of the air cleaner duct.

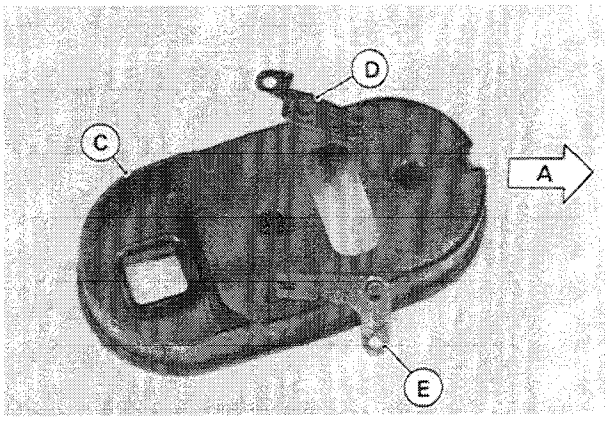



A. Air Cleaner Housing B. Duct

*Air Cleaner Assembly*

○The right and left air cleaner parts are identical, however, housing stay installation is different.
●Install the housing stays as shown.



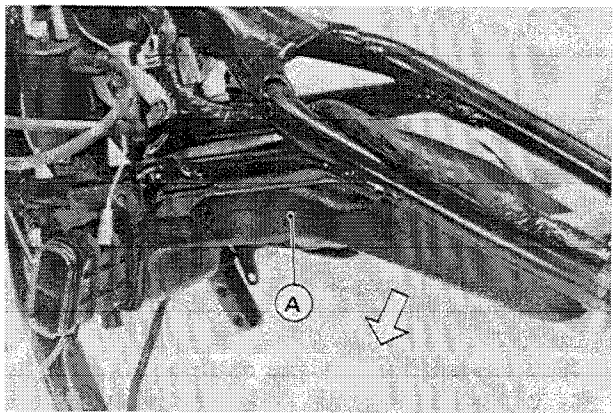




A. Front D. Upper stays
B. Right Air Cleaning Housing E. Lower stays
C. Left Air Cleaner Housing

## Surge Tank

### *Surge Tank Removal*

- Remove the engine (see Engine Removal in Engine Removal/Installation chapter).
- Remove the surge tank from the frame.




A. Surge Tank

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

**WARNING**

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

**CAUTION**

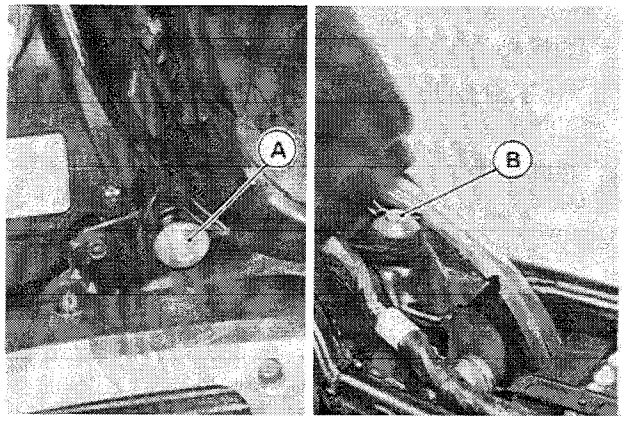
**If gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

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

## Fuel Tank

### *Fuel Tank Removal*

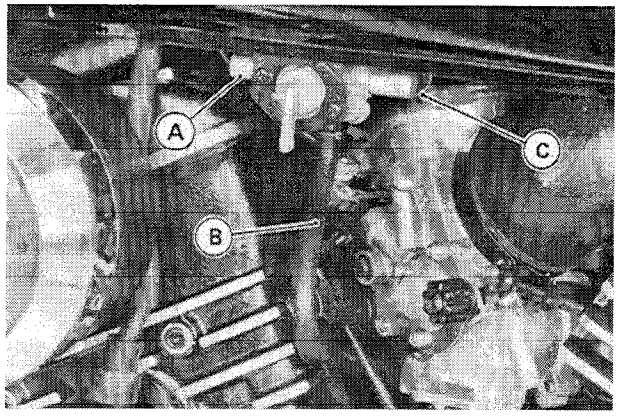
- Remove the seat (see Seat Removal in Frame chapter).
- Remove the bolts from the rear end and the front part of the tank.




A. Bolts B. Bolt

### *Fuel Tap Installation*

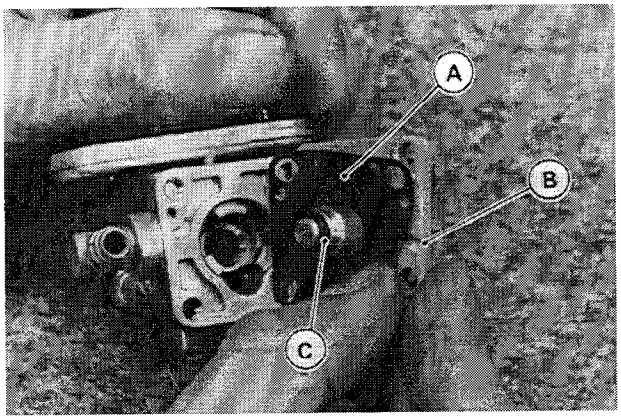
- Be sure the O-ring is in good condition to prevent leaks.
- Be sure the nylon washers are in good condition to prevent leaks.
- Do not use steel washers in place of the nylon washers, because they will not seal the bolts properly and fuel will leak (see Fuel Tank and Tap Cleaning).
- Be sure to clamp the fuel hoses to the tap to prevent leaks.
- Install each hose to the fuel tap as shown.




A. Fuel Hose for Rear Carburetor
B. Vacuum Hose
C. Fuel Hose for Front Carburetor

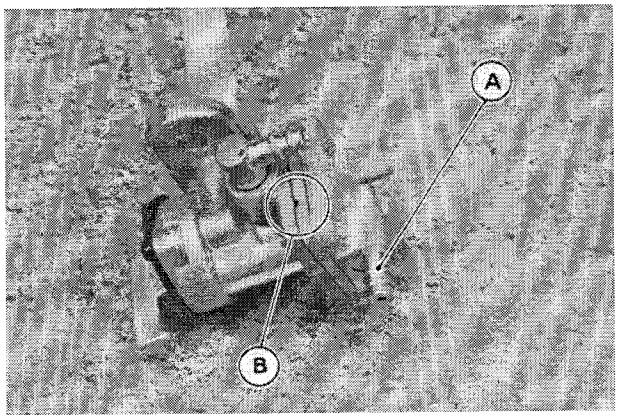
*Fuel Tap Assembly Note*

●Install the diaphragm plate so that the groove in the plate faces toward the O-ring side.




A. Diaphragm Plate B. Groove C.O-ring

●Orient the diaphragm plate and cover so that the groove and vacuum hose fitting align.




A. Vacuum Hose Fitting B. Groove

*Fuel Tank and Tap Cleaning*

●Remove the fuel tank and drain it (see Fuel Tank Removal).

●Pour some high flash-point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.

**WARNING**

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

●Pour the solvent out of the tank.

●Remove the fuel tap from the tank by taking out the bolts with nylon washers.

●Clean the fuel tap filter screens in a high flash-point solvent.

●Pour high flash-point solvent through the tap in all lever positions.

●Dry the tank and tap with compressed air.

●Install the tap on the tank.

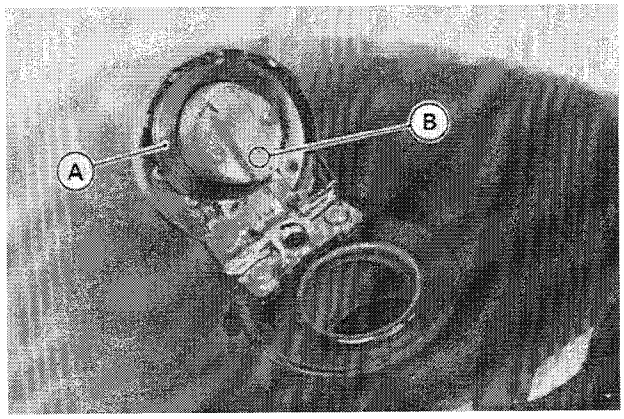
●Install the fuel tank.

*Fuel Tank and Cap Inspection*

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

★Replace the gaskets if they are damaged.

●Check to see if the tank cap breathers (also the fuel return pipe for the US california vehicle) are not clogged.




A. Gasket B. Breather

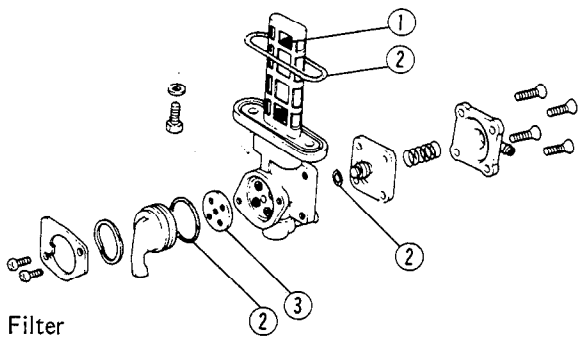
★If they are clogged, replace the tank cap.

*Fuel Tap Inspection*

●Remove the fuel tap.

●Check the fuel tap filter screens for any breaks or deterioration.

**Fuel Tap**



1. Filter
2. O-ring
3. Gasket

★If the fuel tap screens have any breaks or are deteriorated, it may allow dirt to reach the carburetor, causing poor running. Replace the fuel tap.
★If the fuel tap leaks, or allows fuel to flow when it is ON or RES without engine running, replace the damaged gasket or O-ring.

## 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 (Periodic Inspection)*

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

### *Separator Inspection*

•Disconnect the hoses from the liquid/vapor separator, and remove the separator from the motorcycle.
•Visually inspect the separator for cracks and other damage.
★If the separator has any 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. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

•Connect the hoses to the separator, and install the separator on the motorcycle.
•Disconnect the breather hose from the separator, and inject about **20 mL** of gasoline into the separator through the hose fitting.
•Disconnect the fuel return from the fuel tank.
•Run the open end of the return hose into the container level with the tank top.
•Start the engine, and let it idle.
★If the gasoline in the separator comes out of the hose, the separator works well. If it does not, replace the separator with a new one.

### *Canister Inspection*

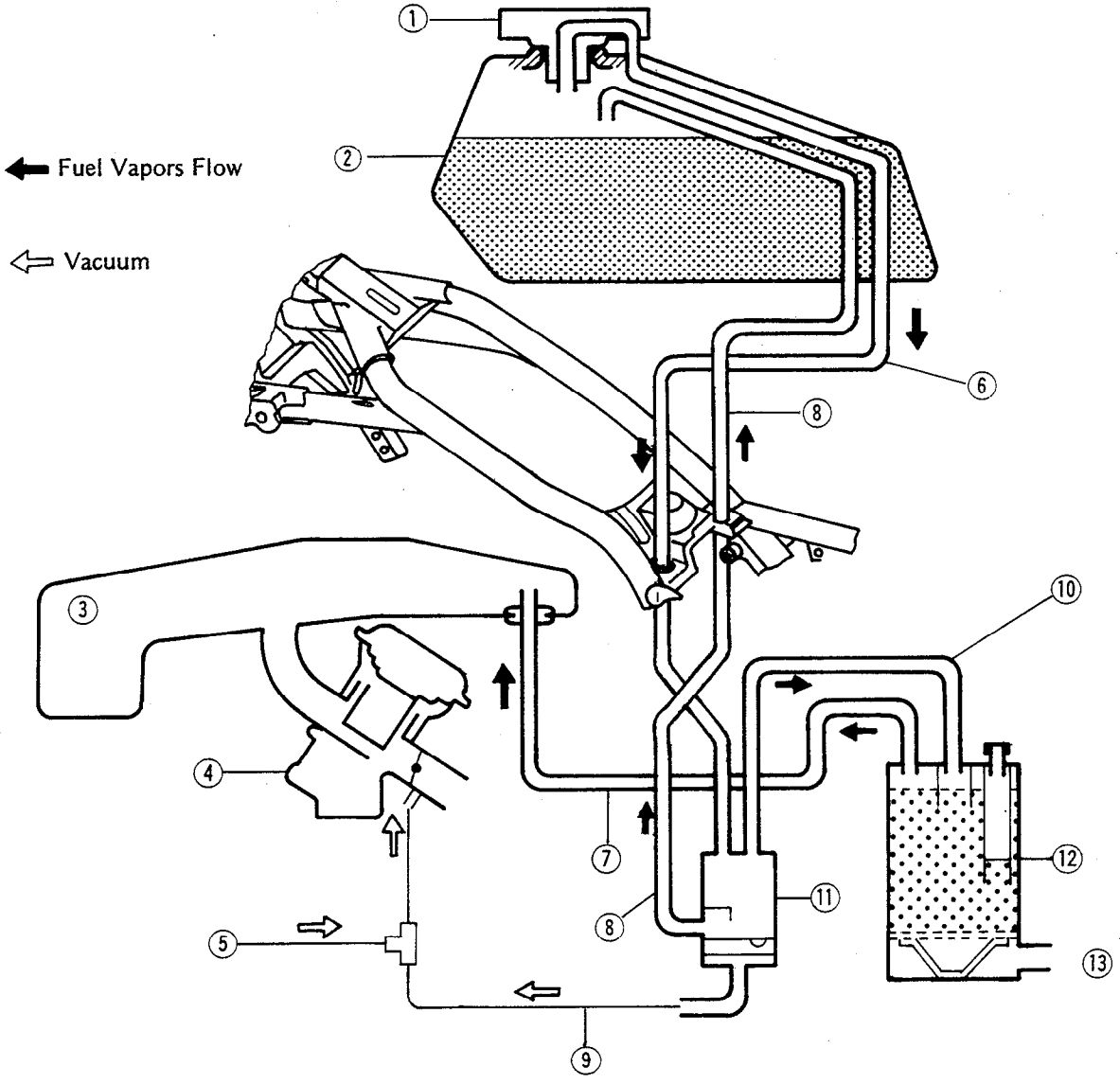
- Remove the canister, and disconnect the hoses from the canister.
- Visually inspect the canister for cracks and other damage.

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

**NOTE**

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

**Evaporative Emission Control System**



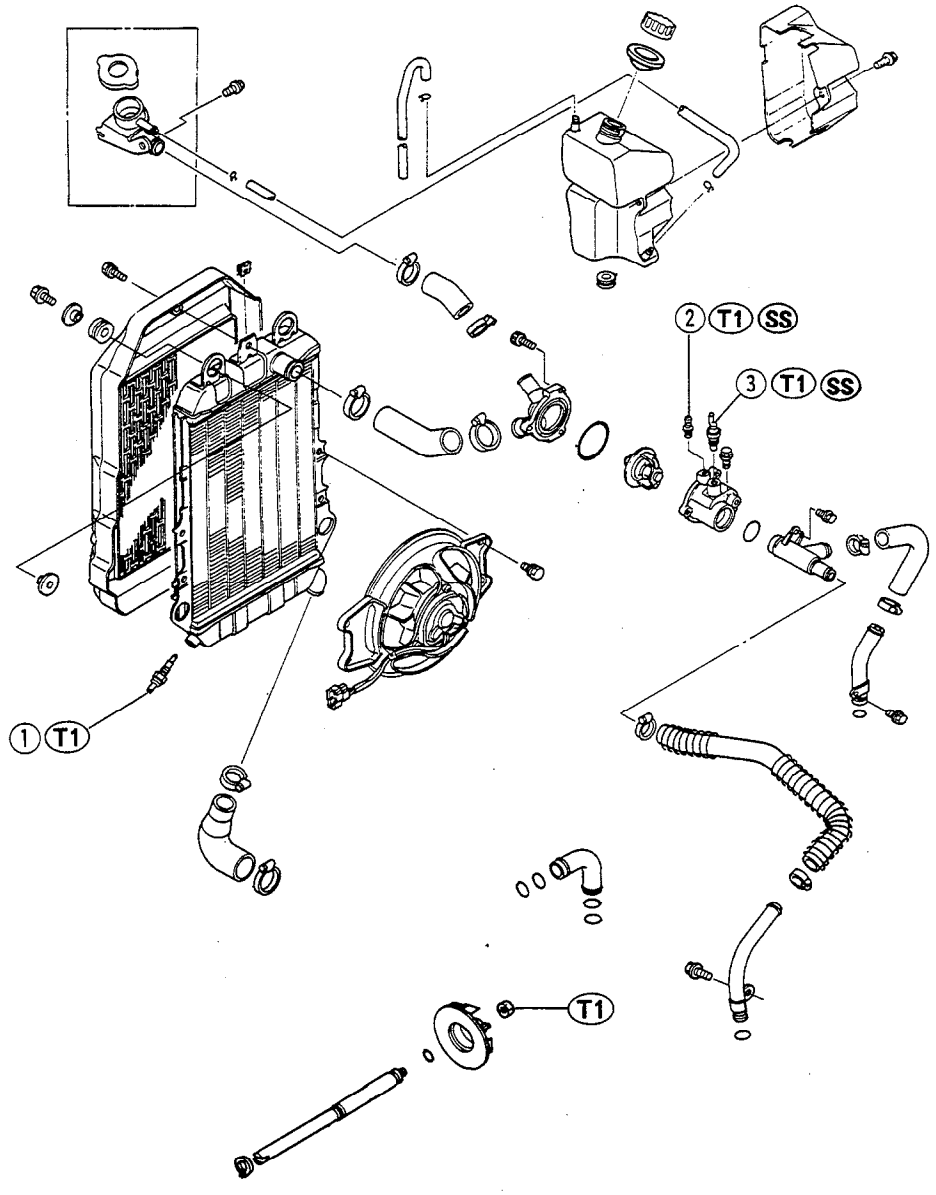

1. Tank Cap
2. Fuel Tank
3. Surge Tank
4. Rear Carburetor
5. Vacuum Switch Valve
6. Breather Hose (blue)
7. Purge Hose (green)
8. Return Hose (red)
9. Vacuum Pulse Hose (white)
10. Breather Hose (blue)
11. Separator : return pump
12. Canister
13. Rear

3

# Cooling System

## Table of Contents

## Exploded View



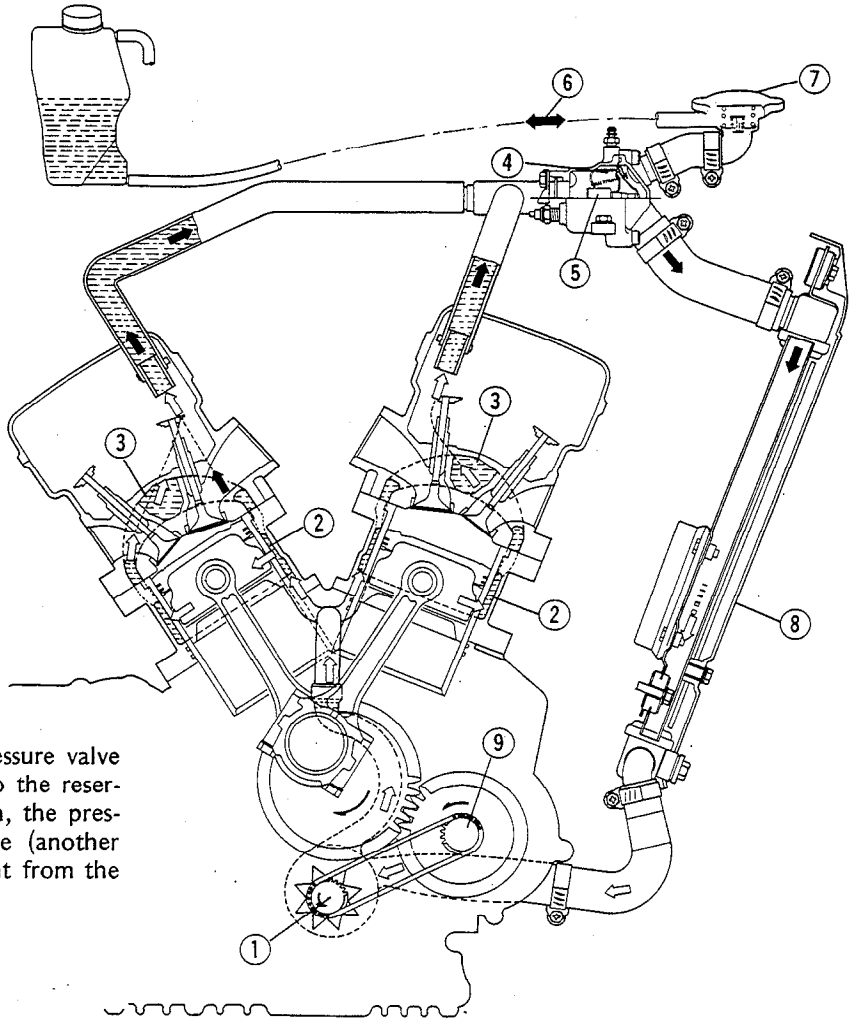

1. Fan Switch
2. Bleeder Bolt
3. Water Temperature Sensor

SS: Apply silicone sealant.
T1: 7.8 N-m (0.8 kg-m, 69 in-lb)

## Specifications

| Item | Standard |
|---|---|
| **Original Coolant:** | |
| Type | Permanent type of antifreeze for aluminum engine and radiator |
| Color | Green |
| Mixed ratio | Soft water 50%, coolant 50% |
| Freezing point | –35°C (–31°F) |
| Total amount | 1.5 L |
| **Radiator Cap:** | |
| Relief pressure | 93 – 123 kPa (0.95 – 1.25 kg/cm², 14 – 18 psi) |
| **Thermostat:** | |
| Valve opening temperature | 80 – 84°C (176 – 183°F) |
| Valve full open lift | not less than 8 mm @95°C (203°F) |

## Cooling System




: **Hot Coolant**

: **Cold Coolant**

1. **Water Pump coupled with oil pump**
2. **Cylinder Jacket**
3. **Cylinder Head Jacket**
4. **Bypass Hole (Air bleeder hole)**
   When the engine is cold, the thermostat is closed so that the coolant flow is restricted through the bypass hole, causing the engine to warm up more quickly.
5. **Thermostat**
6. **To reservoir tank**
   When the engine is hot, the pressure valve allows air and vapor to escape into the reservoir. When the engine cools down, the pressure drop draws the vacuum valve (another small valve) open, admitting coolant from the reservoir into the radiator.
7. **Radiator Cap**
8. **Radiator**
9. **Balancer Shaft**

## Coolant

### Coolant Level Inspection

•Situate the motorcycle so that it is perpendicular to the ground (on its center stand).

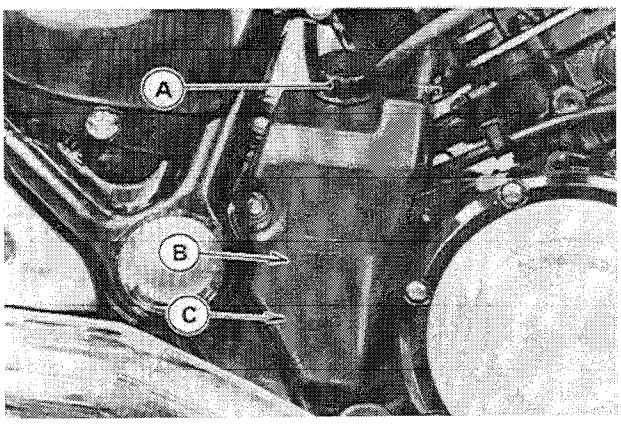
•Check the level through the coolant level gauge on the reservoir tank cover. The coolant level should be between the FULL and the LOW marks.

**NOTE**

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

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

★If the coolant level is low, remove the reservoir tank cap and add coolant through the filler opening to the FULL mark.




A. Tank Cap
B. Full Mark
C. Low Mark

**CAUTION**

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

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

### Coolant 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 charging, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.

### Coolant Draining

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

**CAUTION**

○**Use coolant containing corrosion inhibitors made specifically for aluminum engines and radiators in accordance with the instructions of the manufacturers (see Coolant Filling section).**

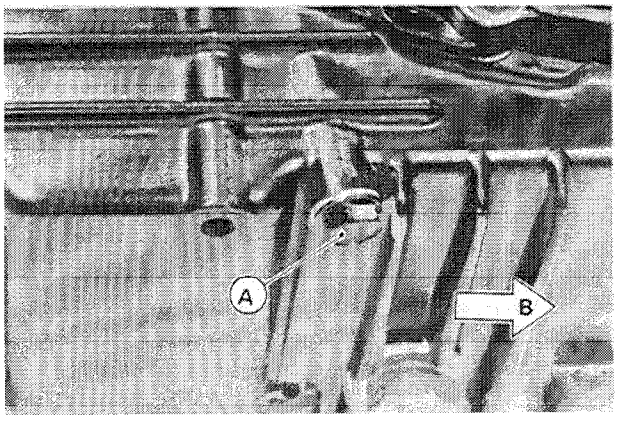
**WARNING**

○**To avoid burns, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down.**

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

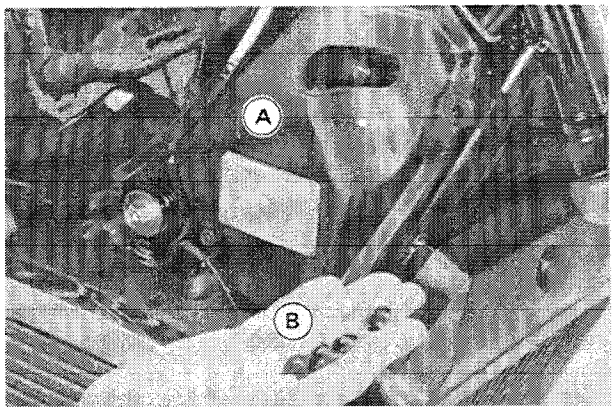
○**Since coolant is harmful to the human body, do not use for drinking.**

•While relieving possible cooling system pressure, drain the coolant from the engine by removing the drain plug at the bottom of the right crankcase.



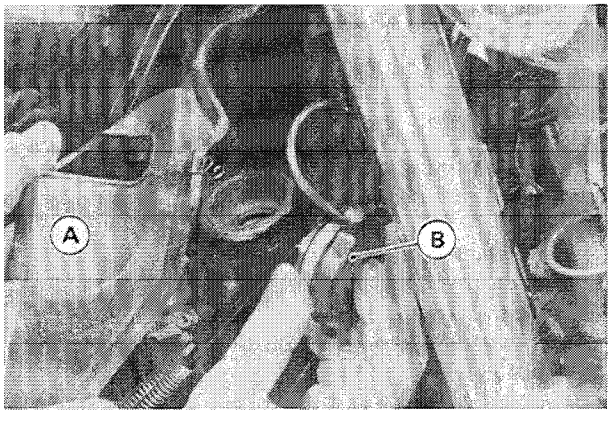

A. Drain Plug
B. Front

•To open the radiator cap first free the fuel tank covers from the frame by removing the screws on both sides.




A. Fuel Tank Covers B. Screws

●Move back the covers to allow access from the vehicle right side.
○It is not necessary to separate the right and left covers for radiator cap removal.
●Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.

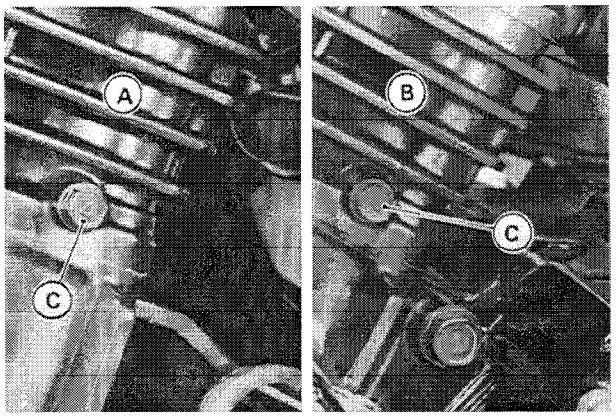



A. Fuel Tank Cover B. Radiator Cap

**CAUTION**

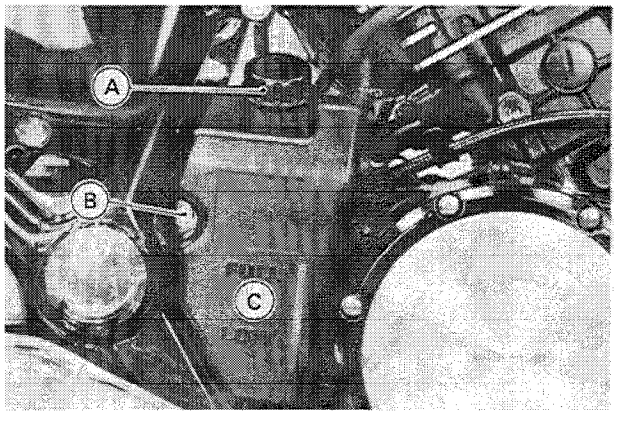
○**Be careful not to damage the throttle cables during radiator cap removal.**

●Remove the drain plugs at the bottom of the front cylinder (right side of motorcycle) and rear cylinder (left side of motorcycle).



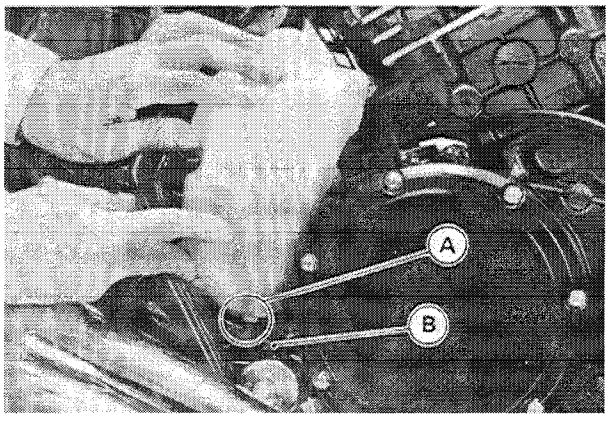

A. Front Cylinder C. Drain Plugs
B. Rear Cylinder

●Remove the right side cover.
●Unscrew the reservoir tank cap and tank mounting bolt to remove the tank cover.




A. Tank Cap C. Tank Cover
B. Bolt

●Raise up the reservoir tank to remove it from the stay with the hoses attached.




A. Stopper B. Stay

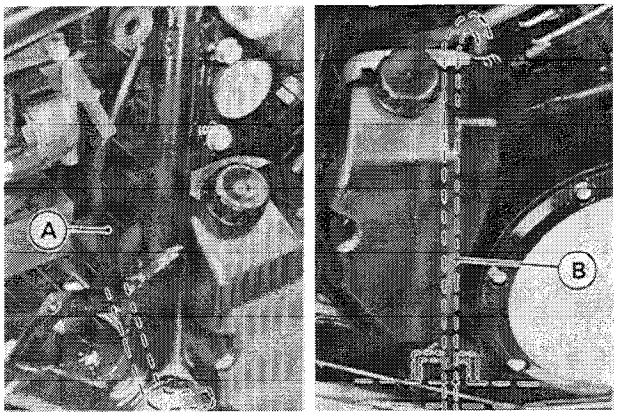
•Turn over the tank and pour the coolant into a suitable container.
•Inspect the old coolant for color and smell (see Coolant Inspection).

### *Coolant Filling*

•Install the drain plugs. Always replace the gaskets with new ones, if they are damaged.
•Tighten the drain plugs to the specification.

**Tightening Torque**
**Water pump drain plug:**
**8.8 N-m (0.9 kg-m, 78 in-lb)**
**Cylinder drain plugs:**
**8.8 N-m (0.9 kg-m, 78 in-lb)**

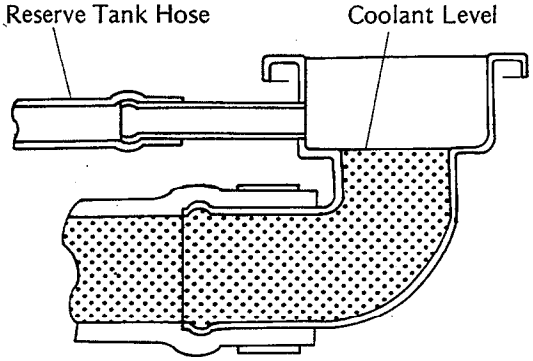
•Install the reservoir tank. Run the tank hoses as shown.




A. Upper Hose B. Lower Hose (breather hose)

•Install the right side cover.
•Insert a flexible spont funnel in the radiator filler under the fuel tank cover.
•Fill the radiator up to the bottom of the radiator filler neck with coolant, and install the cap by turning it clockwise about ¼ turn while pushing it down.

**Radiator Filler Neck**




**NOTE**

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

•Fill the reservoir tank up to the FULL mark with coolant, install the cap, and then bleed 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 scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system.**

**NOTE**

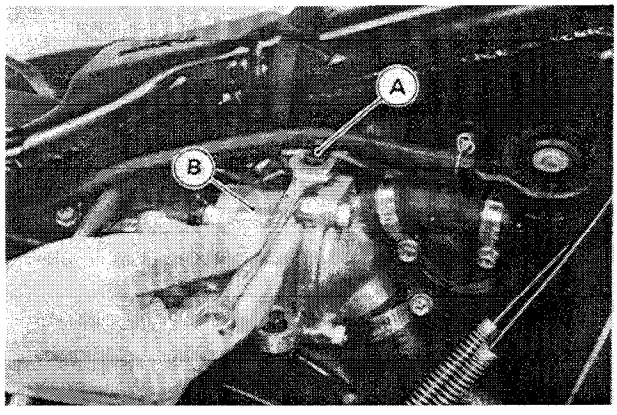
○*Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.*

**Original Coolant**

| | | |
|---|---|---|
| **Type** | : | **Permanent type antifreeze for aluminum engine and radiator** |
| **Color** | : | **green** |
| **Mixed ratio** | : | **soft water 50%, coolant 50%** |
| **Freezing point** | : | **–35°C (–31°F)** |
| **Total amount** | : | **1.8 L (up to "Full" mark)** |

### *Air Bleeding*

Before putting the motorcycle into operation, any air trapped in the cooling system must be removed as follows.
•Remove the fuel tank (see Fuel Tank Removal in Fuel System chapter).
•Remove the radiator cap (see Coolant Draining).
•Loosen the air bleeder bolt on the top of the thermostat housing.



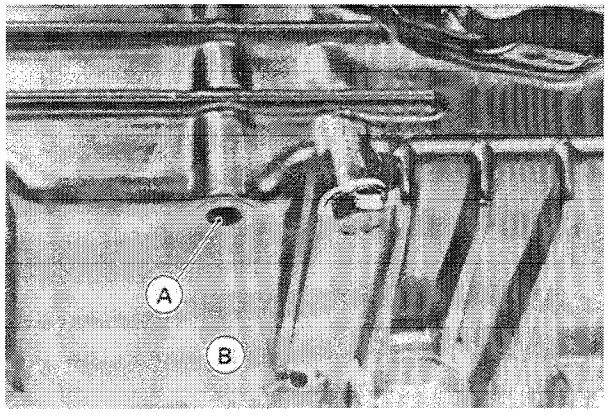

A. Air Bleeder Bolt B. Thermostat Housing

- Pour the coolant into the radiator until the coolant begins to flow out the air bleeder bolt hole (that is, until all the remaining air is forced out).
- Tighten the air bleeder bolt to the specified torque (see Exploded View).
- Fill the radiator up to the radiator filler neck with coolant and install the cap.
- Check the cooling system for leaks.
- Start the engine, warm it up thoroughly, and then stop it.
- Check the coolant level in the reservoir tank after the engine cools down.
- ★If the coolant level is low, add coolant up to the Full mark through the reservoir tank opening.

### *Visual Leak Inspection*

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

- Check the right crankcase drainage outlet passage for coolant leaks.
- ★If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Remove the right engine cover and check the mechanical seal (see Mechanical Seal Inspection).
- ★If there are no apparent leaks, pressure test the system.



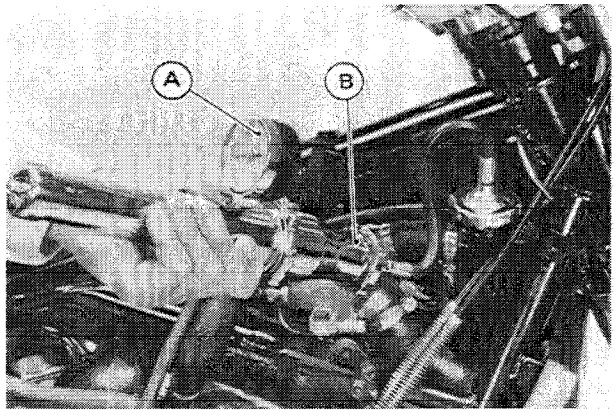

A. Drainage Outlet Passage B. Right Crankcase

### *Cooling System Pressure Testing*

**CAUTION**

○**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure: 123 kPa (1.25 kg/cm², 18 psi).**

- Remove the fuel tank.
- Remove the radiator cap, and install a cooling system pressure tester on the 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 123 kPa (1.25 kg/cm², 18 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 for cylinder head gasket, cylinder gasket and cylinder liner O-ring leaks.

### *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**

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

## Disassembly and Assembly Precautions

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

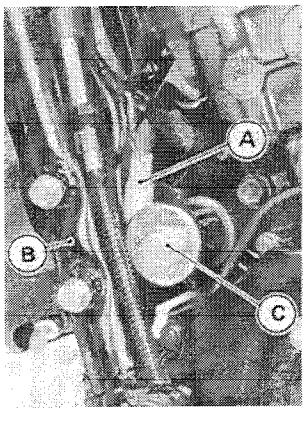
## Radiator

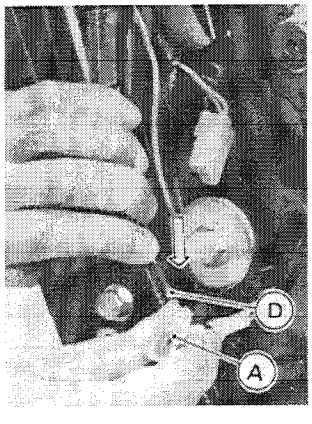
### *Radiator Removal*

**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.**

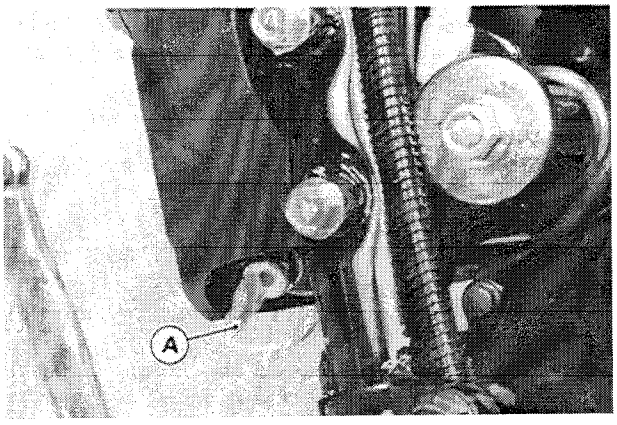
- Disconnect the fan motor connector.
- Route the leads between the frame and the engine mounting bolt to pull out the connector.



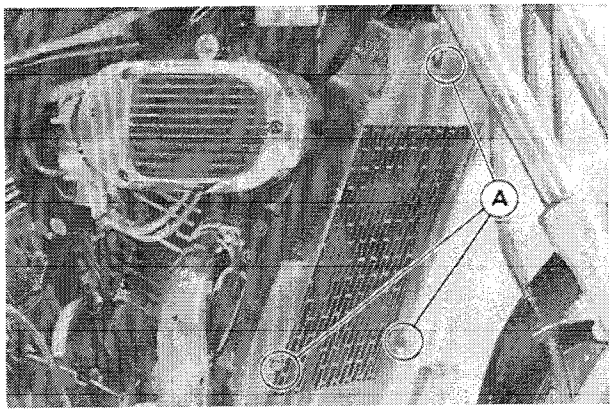

A. Connector
B. Frame
C. Mounting Bolt
D. Leads

- Pull off the fan switch terminal lead.



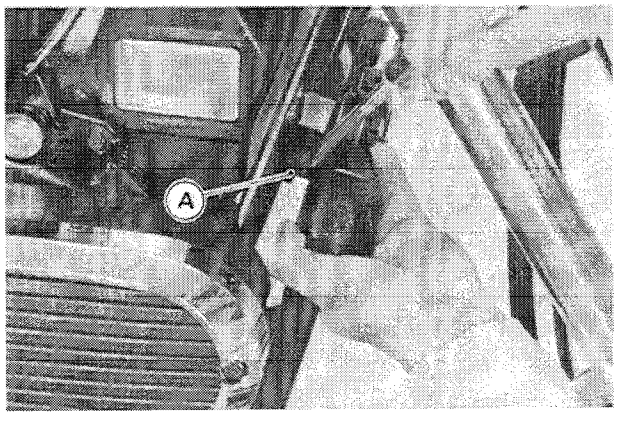

A. Fan Switch Terminal

- Unscrew the mounting bolts to remove the radiator cover.



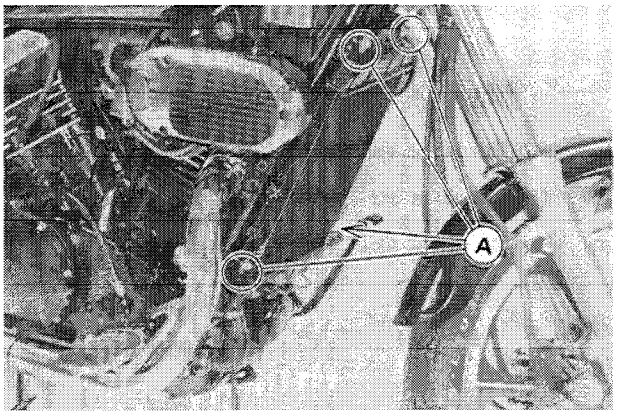

A. Radiator Cover Mounting Bolts

- After removing the hose clamp, pull the radiator hose off the radiator cap assembly fitting.




A. Fitting

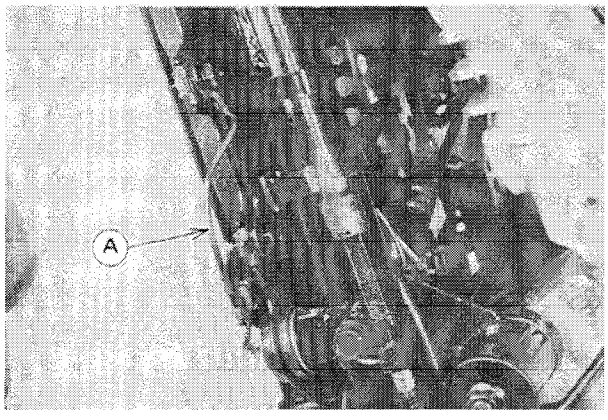
- Remove the reservoir tank hose end at the radiator.
- Remove the radiator mounting bolts (4).
- Remove the radiator with the radiator fan installed taking care not to damage the radiator core and the radiator fan.




A. Radiator Mounting Bolts

### *Radiator Installation Note*

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

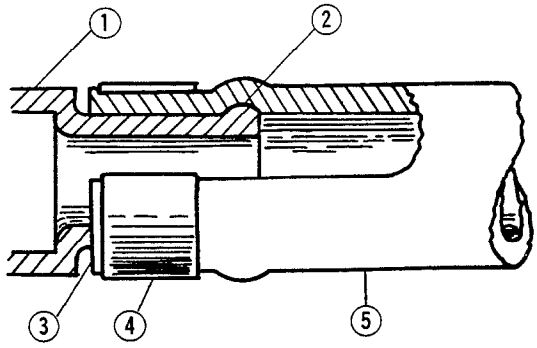



A. Fan Ground Lead

### *Radiator Hose, Reservoir Tank Hose Installation Notes*

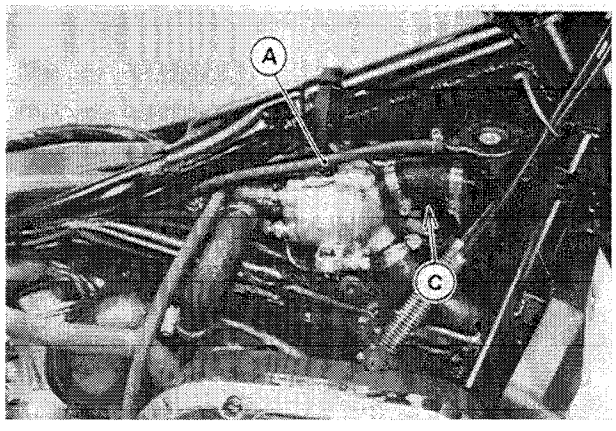
- Install the radiator hoses being careful to follow bending direction. Avoid sharp bending, kinking, flattening, or twisting.
- Push the hoses completely onto their fittings.
- Install the clamps as near as possible to the hose end to clear the raised rib on the fitting. This will prevent the hoses from working loose.

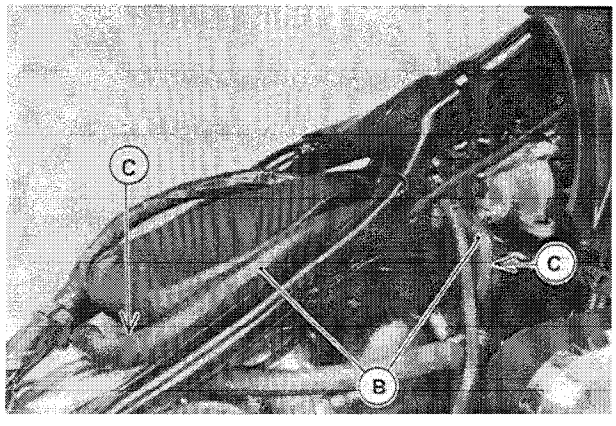
**Hose and Clamp Installation**




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

- Tighten the hose clamps securely.
- Run the reservoir tank hoses as shown.




A. Upper Reservoir Tank Hose
B. Hoses
C. Hose Bend

### *Radiator Hose, Reservoir Tank Hose Inspection*

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

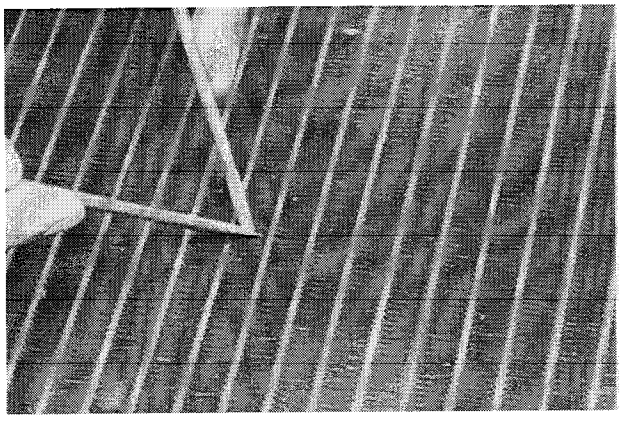
*Radiator Inspection*

•Check the radiator core.

★If there are obstructions to air flow, remove them.

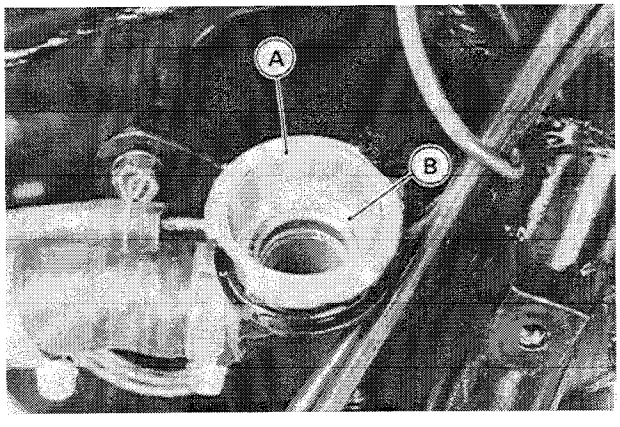
★If the corrugated fins are deformed, carefully straighten them with the blade of thin screwdriver.

★If the air passages of the radiator core are blocked more than **20%** by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.



•Check the radiator filler neck for signs of damage.

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

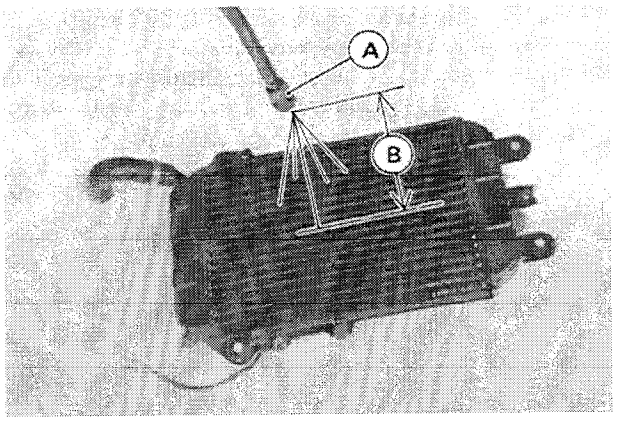



A. Top Sealing Seat B. Bottom Sealing Seat

*Radiator Cleaning Notes*

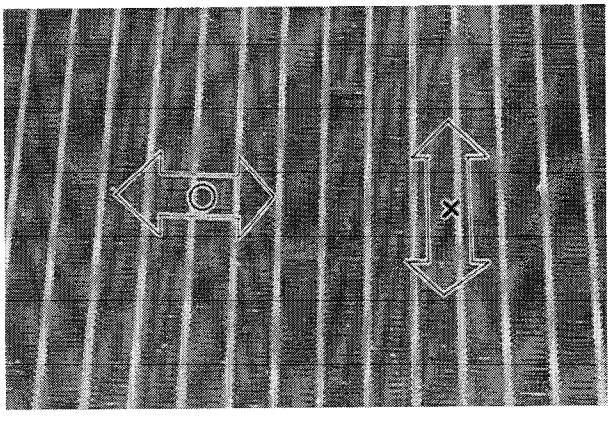
When cleaning the radiator with a steam cleaner, be careful of the following to prevents radiator damage.

•Keep the steam gun away more than **50 cm** from the radiator core.




A. Steam Gun B. More than 50 cm

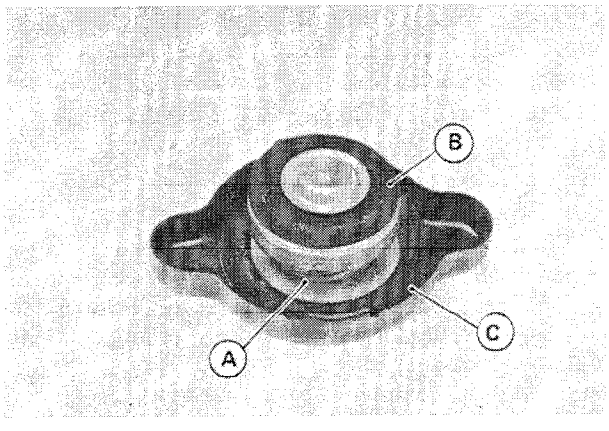
•Run the gun horizontally following the core fin direction holding it perpendicular to the core surface.



*Radiator Cap Inspection*

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

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

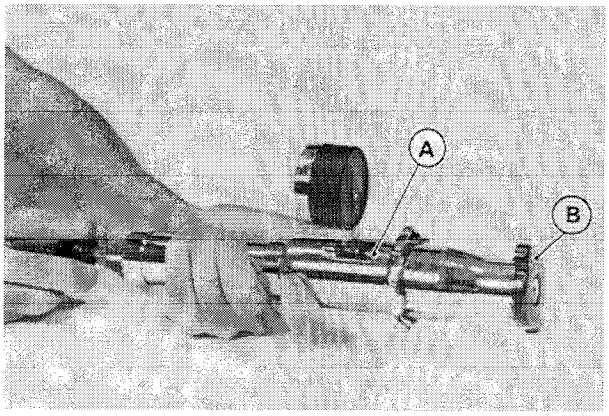



A. Valve Spring C. Top Seal
B. Bottom Seal

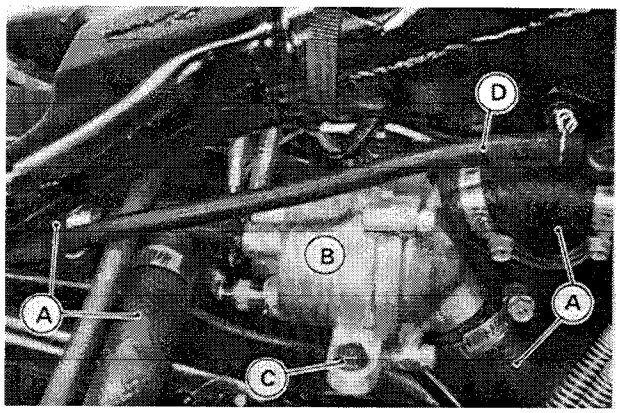
•Wet the cap sealing surfaces with water or coolant to prevent pressure leaks. Install the cap on a cooling pressure tester.
•Watching the gauge, pump the tester to build up the pressure.
○The cap must open at the relief pressure (the gauge hand flicks down). Also, the cap must hold any pressure less than the relief pressure for at least 6 seconds.

**Radiator Cap Relief Pressure**
**73.5 to 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.




A. Pressure Tester B. Radiator Cap




A. Radiator Hoses
B. Thermostat Housing
C. Bolts
D. Reservoir Tank Hose

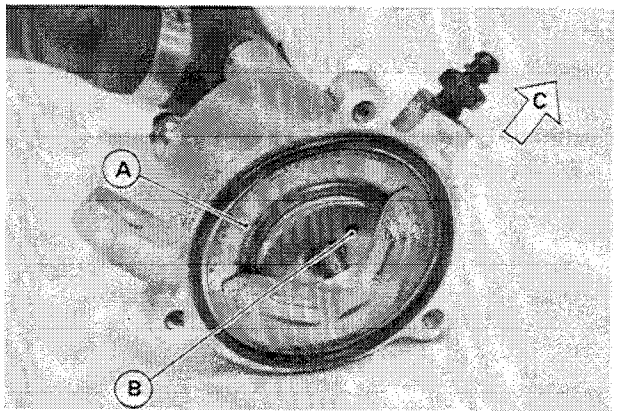
## Thermostat

### *Thermostat Cover Removal*

•Drain the coolant from the radiator by removing the radiator drain plug and the radiator cap.
•Remove the fuel tank cover and the fuel tank (see Fuel Tank Removal in Fuel System chapter).
•Remove the radiator hoses and the reservoir tank hose.
•Pull off the water temperature sensor lead.
•Unscrew the mounting bolts to remove the thermostat housing.

### *Thermostat Installation Note*

•Install the thermostat in the thermostat housing so that the air bleeder hole is on top as shown.

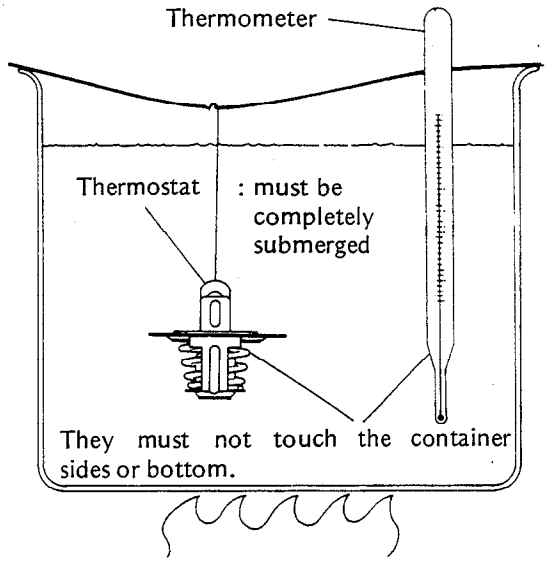



A. Thermostat
B. Air Bleeder Hole
C. Top

### *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**



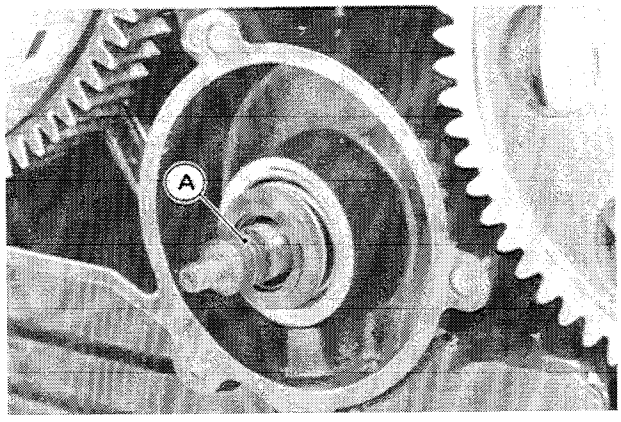

•Watch the valve. As soon as the valve starts to open, note the temperature.
★If it is out of the specified range, replace the thermostat.

**Thermostat Valve Opening Temperature Range**
**80 – 84°C (176 – 183°F)**

## Water Pump, Mechanical Seal

*Pump Impeller Removal*
•Remove the right engine cover (see Right Engine Cover Removal in Clutch chapter).
•Unscrew the nut to remove the impeller.

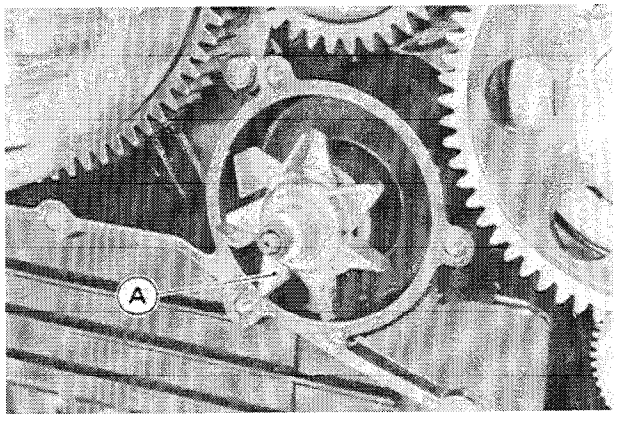
*Pump Impeller Installation Notes*
•Be sure to install a new O-ring on the shaft.




A. O-ring

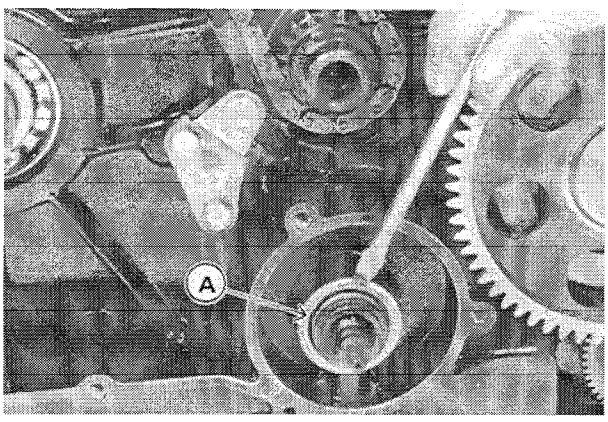
•Tighten the impeller nut to the specified torque (see Exploded View).

*Pump Impeller Inspection*
•Visually check the impeller.
★If the surface is corroded, or if the blades are damaged, replace the water pump impeller and O-ring.



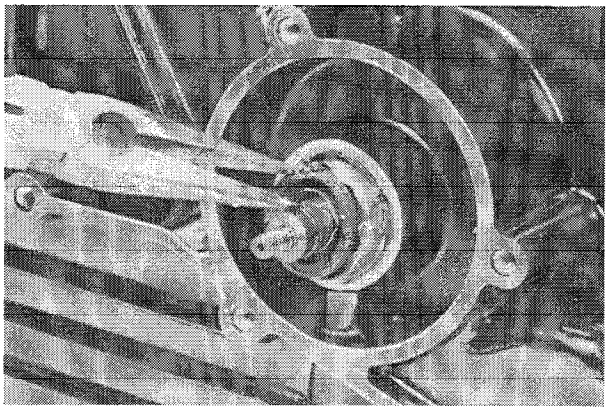

A. Impeller

*Mechanical Seal Removal*
•Remove the right engine cover (see Right Engine Cover Removal in Clutch chapter).
•Pry the mechanical seal flange off with a small chisel.




A. Flange

•Pull the mechanical seal out of the right crankcase with needle nose pliers. Discard the mechanical seal.



CAUTION

○**Be careful not to damage the water pump shaft and O-ring, and the inner sealing surface of the case.**

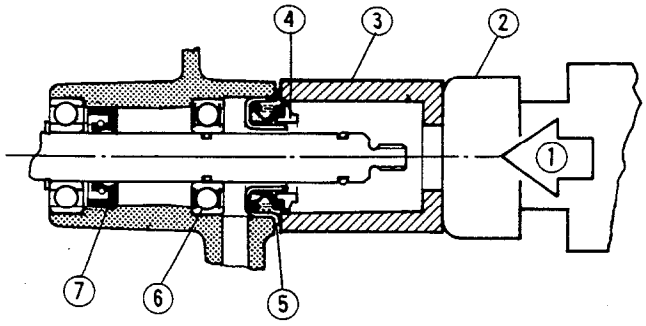
*Mechanical Seal Installation Notes*

**NOTE**

○*Since the replacement mechanical seal has a adhesive coated body, do not apply a liquid gasket to the exterior surface of the body.*

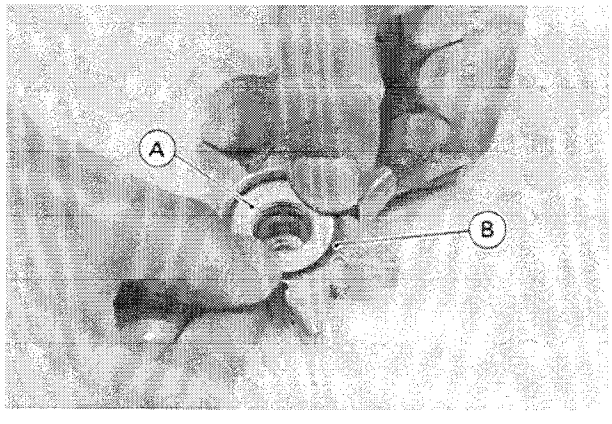
•Press the seat into the hole by using a bearing driver (special tool) until it bottoms out.

**Mechanical Seal Assembly**




1. Press here
2. Bearing Driver: 57001-1129
3. 28 mm Socket
4. Seat
5. Stop here
6. Double Sealed Ball Bearing
7. Oil Seal

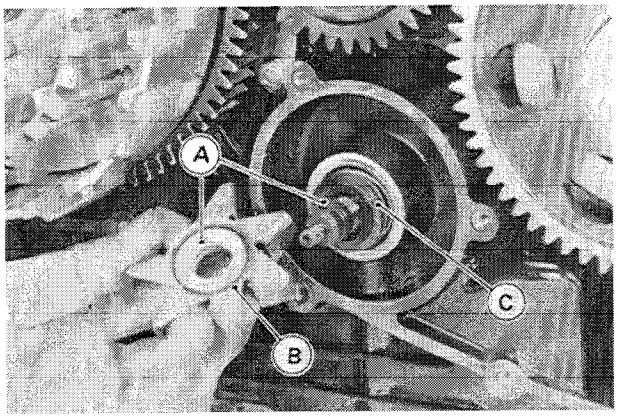
•Clean the sliding surface of the mechanical seal with a high flash-point solvent, and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.
•Apply coolant to the surfaces of the rubber seal and sealing seat, and press the rubber seal and sealing seat into the impeller by hand until the seat bottoms out.




A. Sealing Seat B. Rubber Seal

*Mechanical Seal Inspection*

•Visually inspect the mechanical seal.
•If any one of the parts is damaged, replace the mechanical seal as a unit (both seals in the impeller and in the crankcase).
○The sealing seat and rubber seal may be removed easily by hand.

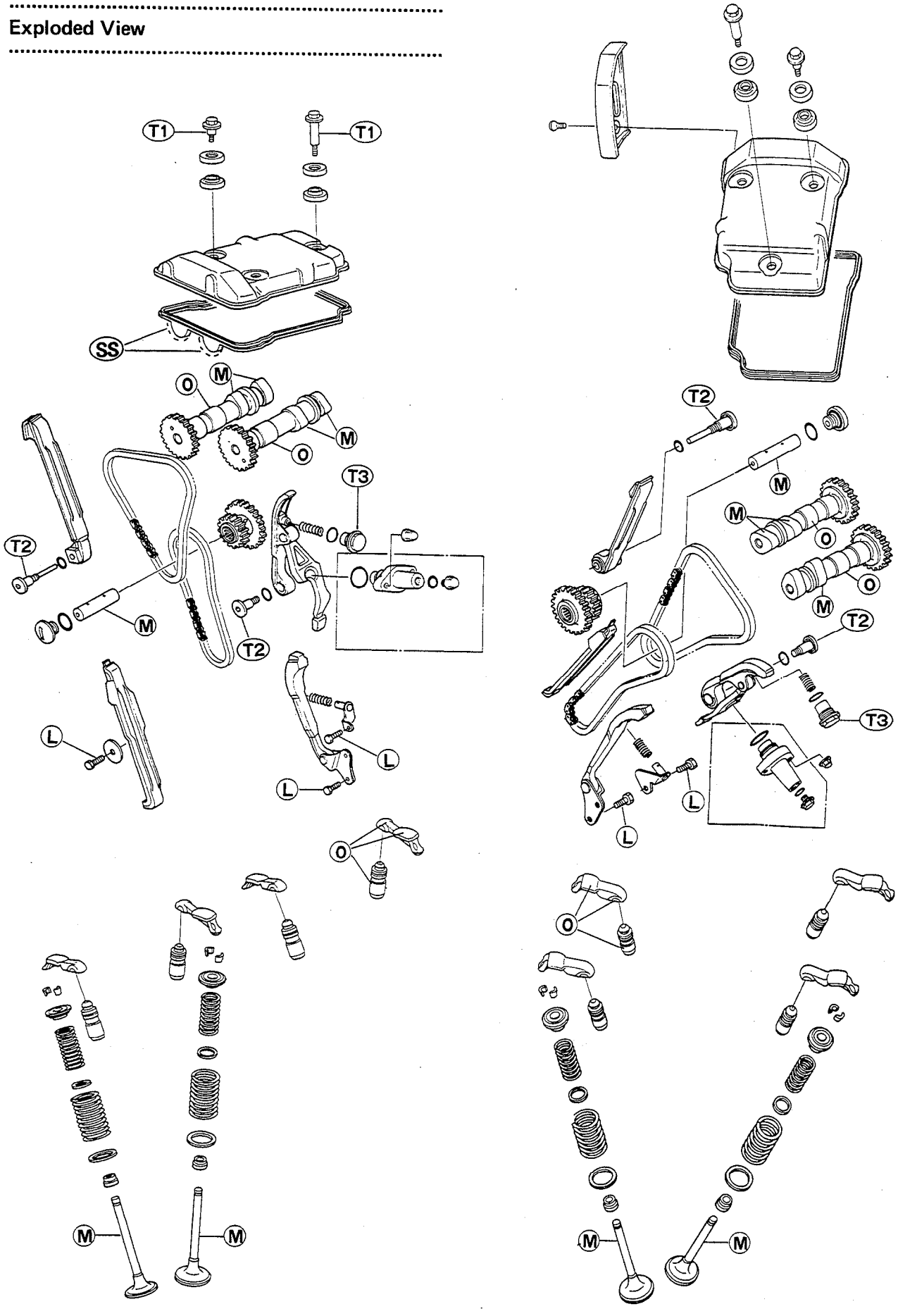


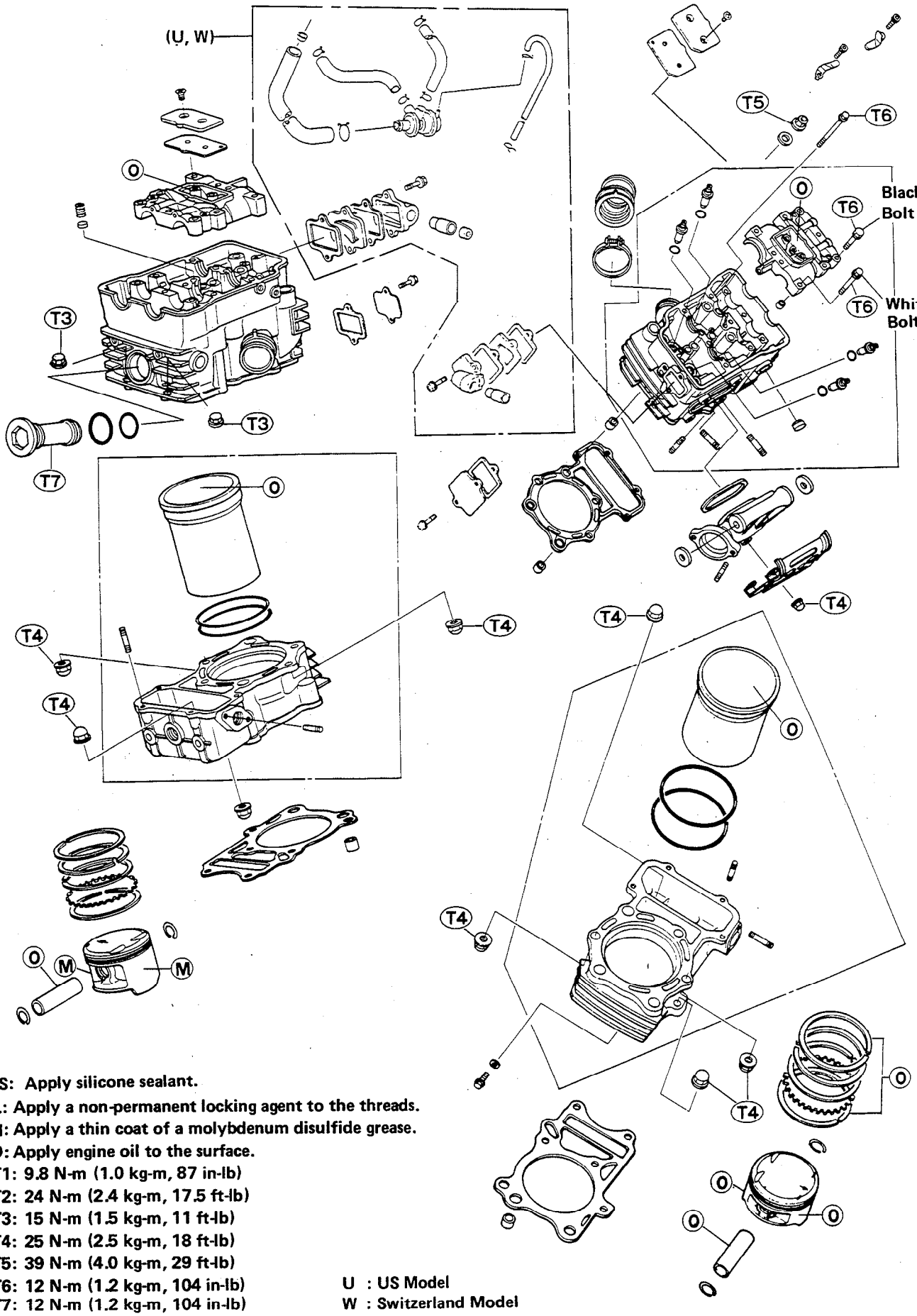

A. Impeller Sealing Seat Surface
B. Rubber Seal
C. Mechanical Seal Diaphragm

# Engine Top End

## Table of Contents

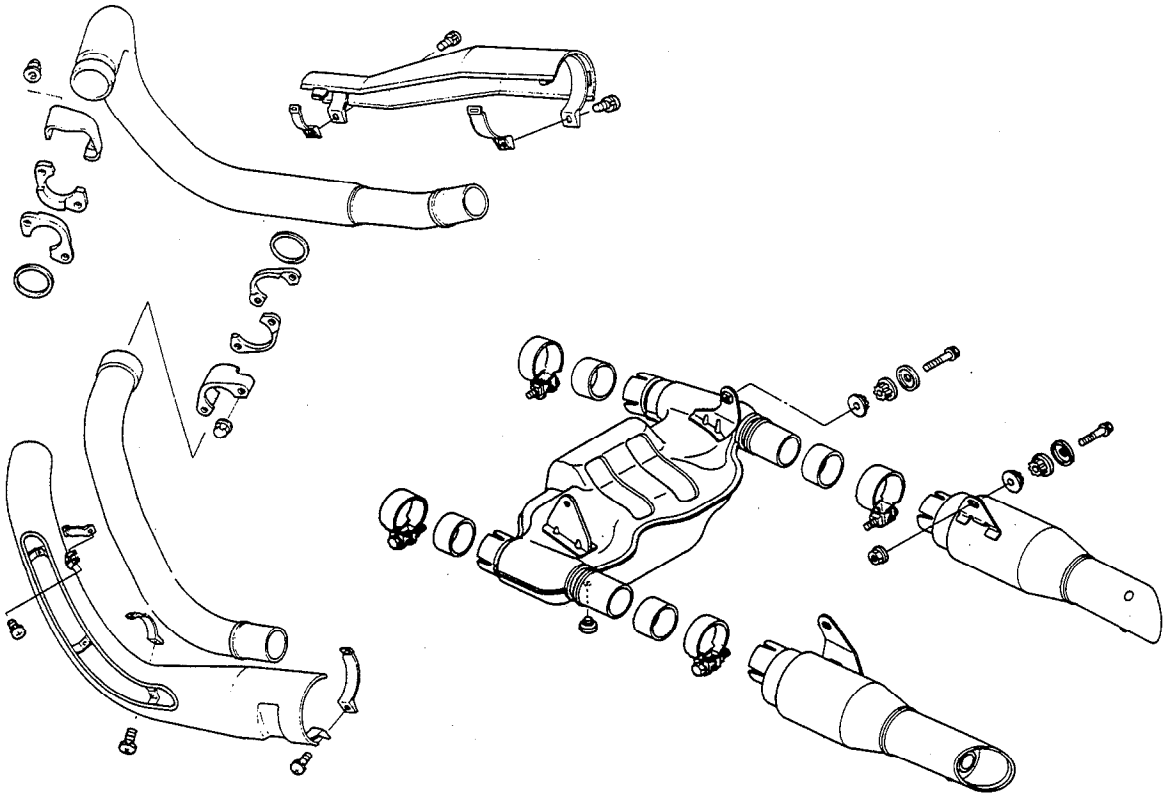
## Exploded View






SS: Apply silicone sealant.
L: Apply a non-permanent locking agent to the threads.
M: Apply a thin coat of a molybdenum disulfide grease.
O: Apply engine oil to the surface.
T1: 9.8 N-m (1.0 kg-m, 87 in-lb)
T2: 24 N-m (2.4 kg-m, 17.5 ft-lb)
T3: 15 N-m (1.5 kg-m, 11 ft-lb)
T4: 25 N-m (2.5 kg-m, 18 ft-lb)
T5: 39 N-m (4.0 kg-m, 29 ft-lb)
T6: 12 N-m (1.2 kg-m, 104 in-lb)
T7: 12 N-m (1.2 kg-m, 104 in-lb)

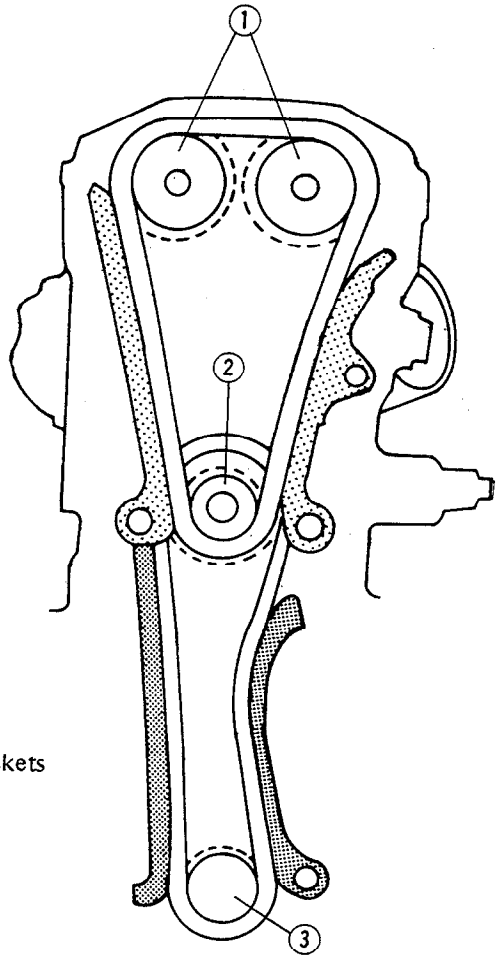
U : US Model
W : Switzerland Model



**Two-stage Cam Drive System**

By using a two-stage camshaft chain drive on this double overhead-cam engine, the space between the cylinders can be narrowed for a better looking design.

Accordingly, the camshaft sprockets can be made smaller, allowing the VN to have such a compact engine that does not seem to have double overhead cams.



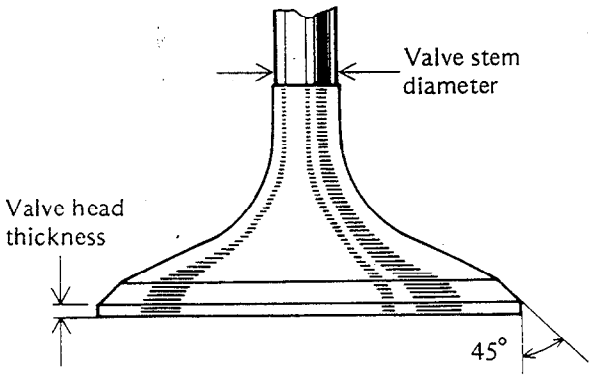

1. Cam Sprockets
2. Intermediate Sprockets
3. Crank Sprocket

## Specifications

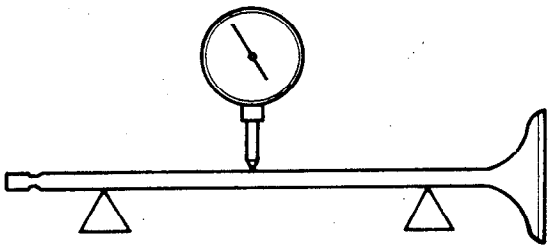
| Item | | Standard | Service Limit |
|---|---|---|---|
| **Clean Air System:** | | | |
| Vacuum switch valves closing pressure | | 39 – 47 kPa (290 – 350 mmHg) | – – – |
| **Camshaft:** | | | |
| Cam height | Inlet (front, rear) | 33.450 – 33.558 mm | 33.350 mm |
| | Exhaust (front, rear) | 33.139 – 33.247 mm | 33.039 mm |
| Camshaft bearing clearance | | 0.020 – 0.062 mm | 0.15 mm |
| Camshaft journal diameter | | 26.959 – 26.980 mm | 26.93 mm |
| Camshaft bearing inside diameter | | 27.000 – 27.021 mm | 27.08 mm |
| Camshaft chain 20-link length | | | |
| | upper chain | 127.0 – 127.4 mm | 128.9 mm |
| | lower chain | 127.0 – 127.4 mm | 128.9 mm |
| **Cylinder Compression:** | | | |
| (Usable range) | | 890 – 1,370 kPa @300 r/min (rpm) (9.1 – 14 kg/cm²) (129 – 199 psi) | – – – |
| **Cylinder Head, Valves:** | | | |
| Valve clearance | | unadjustable (Auto adjuster) | |
| Hydraulic lash adjuster leak down distance | | 0 – 0.2 mm | 0.2 mm |
| Cylinder head warp | | – – – | 0.05 mm |
| Valve head thickness: | Inlet | 0.8 mm | 0.4 mm |
| | Exhaust | 1.0 mm | 0.5 mm |
| Valve stem bend | | not more than 0.02 mm TIR | 0.05 mm TIR |
| Valve stem diameter: | Inlet | 5.475 – 5.490 mm | 5.46 mm |
| | Exhaust | 5.455 – 5.470 mm | 5.44 mm |
| Valve guide inside diameter: | | | |
| | Inlet | 5.500 – 5.512 mm | 5.58 mm |
| | Exhaust | 5.500 – 5.512 mm | 5.58 mm |
| Valve/valve guide clearance | | | |
| (wobble method): | Inlet | 0.02 – 0.08 mm | 0.22 mm |
| | Exhaust | 0.07 – 0.13 mm | 0.27 mm |
| Valve seating surface: | | | |
| Outside diameter | Inlet | 30.9 – 31.1 mm | – – – |
| | Exhaust | 26.9 – 27.1 mm | – – – |
| Width | Inlet | 0.5 – 1.0 mm | – – – |
| | Exhaust | 0.5 – 1.0 mm | – – – |

| Item | | Standard | Service Limit |
|---|---|---|---|
| Valve spring free length: Inner | | 35.9 mm | 33.8 mm |
| Outer | | 41.5 mm | 39.4 mm |
| Valve seat cutting angle | | 32°, 45°, 60° | – – – |
| **Cylinder Block, Piston:** | | | |
| Cylinder inside diameter | VN700: | 82.000 – 82.012 mm | 82.1 mm |
| | VN750: | 84.900 – 84.912 mm | 85.0 mm |
| Piston diameter | VN700: | 81.942 – 81.957 mm | 81.8 mm |
| | VN750: | 84.842 – 84.857 mm | 84.7 mm |
| Piston/cylinder clearance | | 0.043 – 0.070 mm | – – – |
| Oversize piston and rings | | +0.5 and +1.0 mm | – – – |
| Piston ring/groove clearance | Top | 0.03 – 0.07 mm | 0.17 mm |
| | Second | 0.02 – 0.06 mm | 0.16 mm |
| Piston ring groove width | Top | 1.02 – 1.04 mm | 1.12 mm |
| | Second | 1.01 – 1.03 mm | 1.11 mm |
| Piston ring thickness | Top | 0.97 – 0.99 mm | 1.08 mm |
| | Second | 0.97 – 0.99 mm | 1.08 mm |
| Piston ring end gap | Top | 0.25 – 0.45 mm | 0.75 mm |
| | Second | 0.25 – 0.45 mm | 0.75 mm |

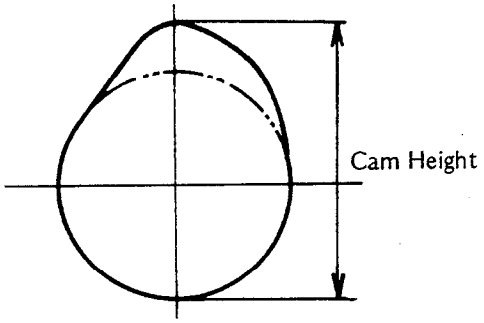
**Valve Head**




**Valve Stem Bend**



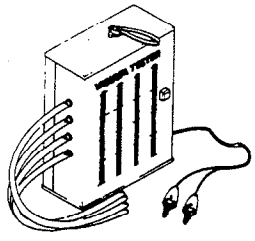
**Cam Height Measurement**



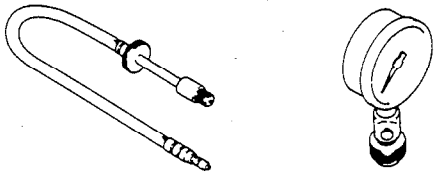
## Special Tools

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

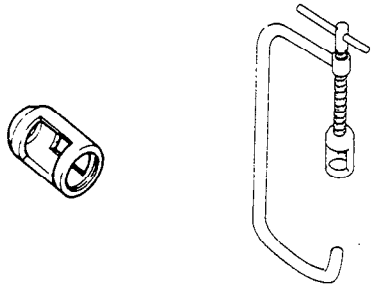
**Vacuum Gauge: 57001-1198**



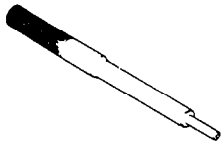
**Compression Gauge: 57001-221**
**Adapter: 57001-1018**



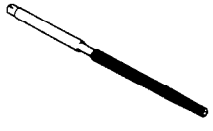
**Valve Spring Compressor Assembly: 57001-241**
**Adapter: 57001-1019**



**Valve Guide Arbor: 57001-1021**

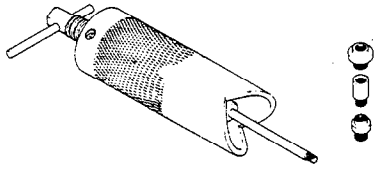


**Valve Guide Reamer: 57001-1079**

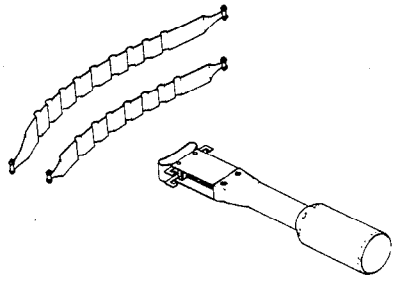


**Use the following seat cutters.**
**(Cutter Holder $\phi$5.5 mm: 57001-1125)**
**(Bar: 57001-1128)**
**(Seat Cutter: 57001-1114)**
**(Seat Cutter: 57001-1187)**
**(Outside Cutter: 57001-1119)**
**(Outside Cutter: 57001-1199)**
**(Inside Cutter: 57001-1123)**

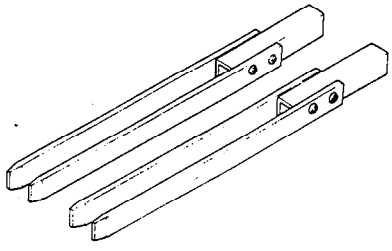
**Piston Pin Puller Assembly: 57001-910**



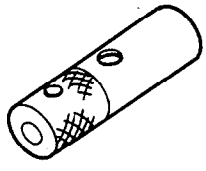
**Piston Ring Compressor Assembly: 57001-1094**



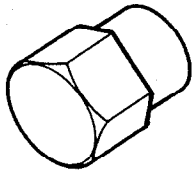
**Piston Base: 57001-341**



**Tappet Bleeder: 57001-1200**



**Hexagonal Wrench: 57001-1210**



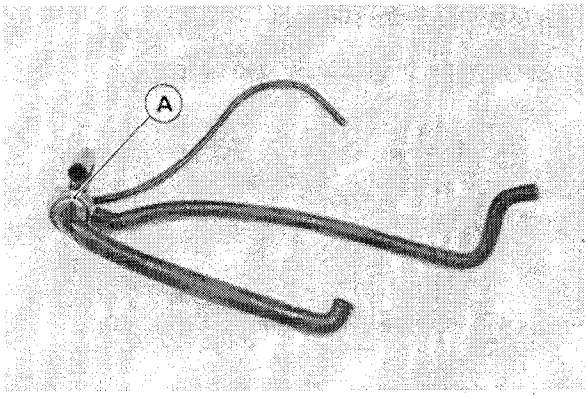
**NOTE**

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

## Clean Air System (US and Switzerland models)

### *Vacuum Switch Valve Removal*

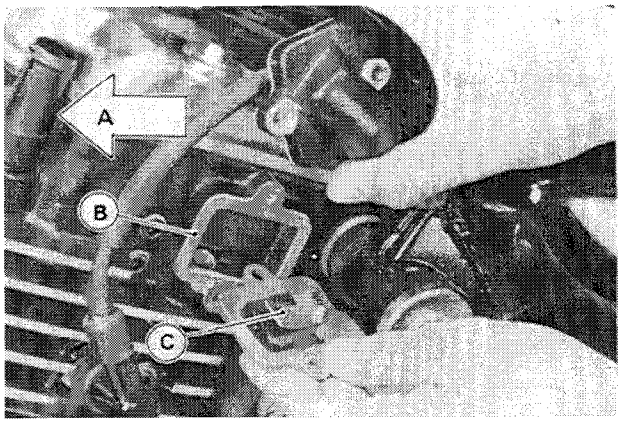
- Remove the seat (see Frame chapter).
- Pull off the air hoses and vacuum hose to remove the vacuum switch valve.




A. Vacuum Switch Valve

### *Air Suction Valve Installation Note*

- Replace the gasket with a new one, and install the air suction valve so that the valve stop points toward the front.

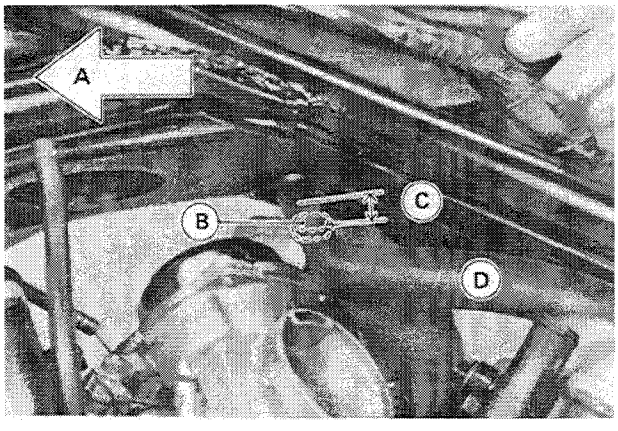


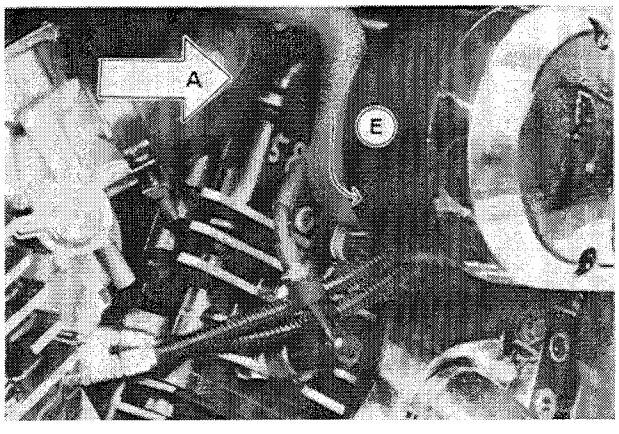

A. Front
B. Gasket
C. Stop

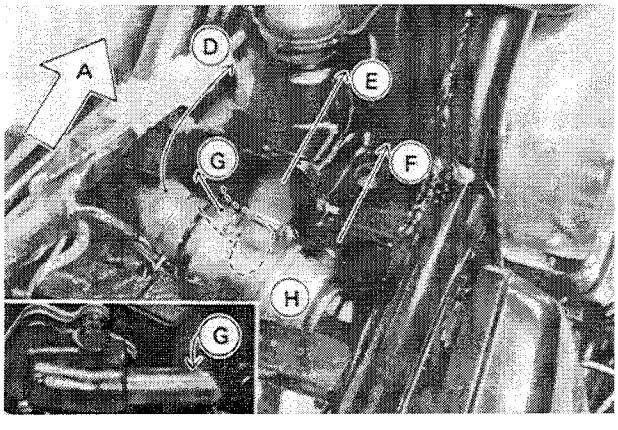
### *Clean Air System Hose Installation*

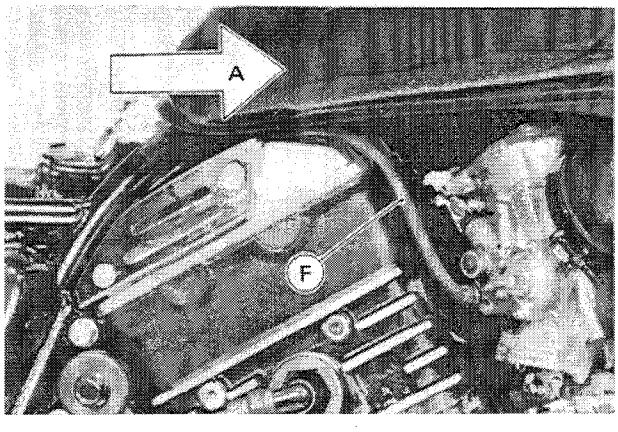
- Route the air hoses and vacuum hose as shown.
- Check that the nozzle is in the air hose. If the nozzle is loose, apply an adhesive to it and reinstall it as shown.
- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the surge tank, vacuum switch valve, rear carburetor and air suction valves.

★If they are damaged, replace them.



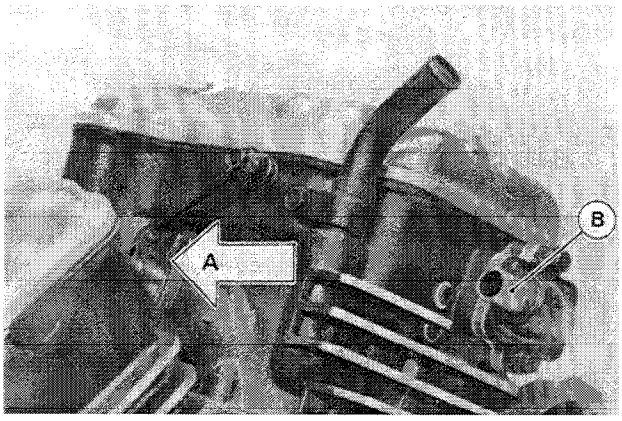




A. Front
B. Nozzle
C. 10 mm
D. Air Hose for Surge Tank
E. Air Hose for Right-Hand Air Suction Valve
F. Vacuum Hose
G. Air Hose for Left-Hand Air Suction Valve
H. Vacuum Switch Valve

●Install each suction valve cover so that the pipe faces the rear.




A. Rear B. Pipe

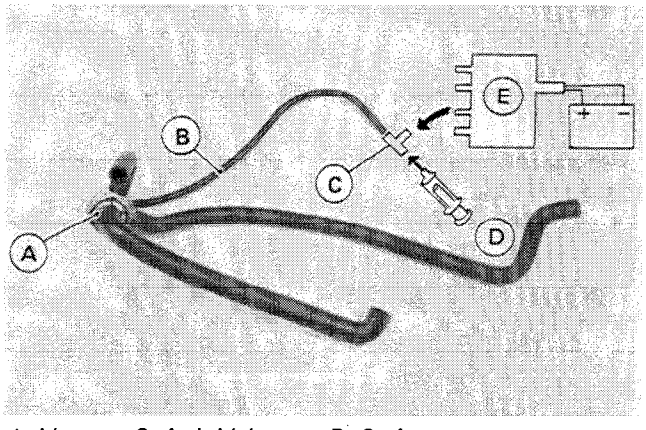
### *Vacuum Switch Valve Test*

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

●Remove the vacuum switch valve.

●Connect the vacuum gauge and syringe to the vacuum hose as shown.

●Gradually raise the vacuum (lower the pressure) applied to the vacuum switch valve, and check the valve operation. When the vacuum is low, the vacuum switch valve should permit air to flow. When the vacuum rises to a certain level **39 – 47 kPa (290 – 350 mmHg)**, it should stop air flow.




A. Vacuum Switch Valve
B. Vacuum Hose
C. Three Way Joint: e.g. 92005-1017
D. Syringe
E. Vacuum Gauge: 57001-1198

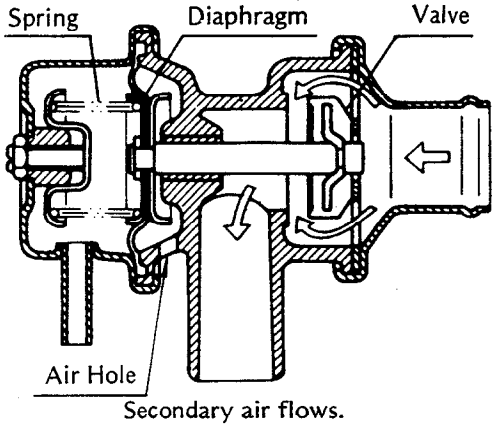
★If the vacuum switch valve does not operate as described, replace it with a new one.

**NOTE**

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

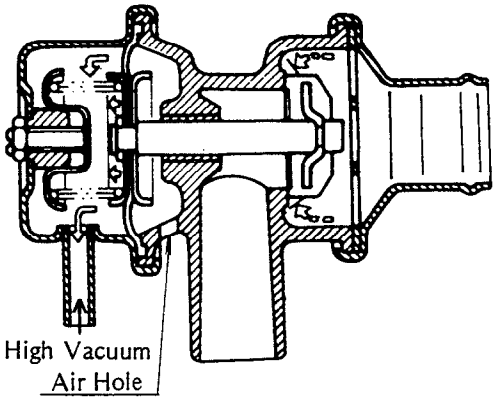
**Vacuum Switch Valve Operation**

1. During Cruising (open throttle)




Secondary air flows.

2. During Engine Braking (closed throttle)




Secondary air cannot flow.

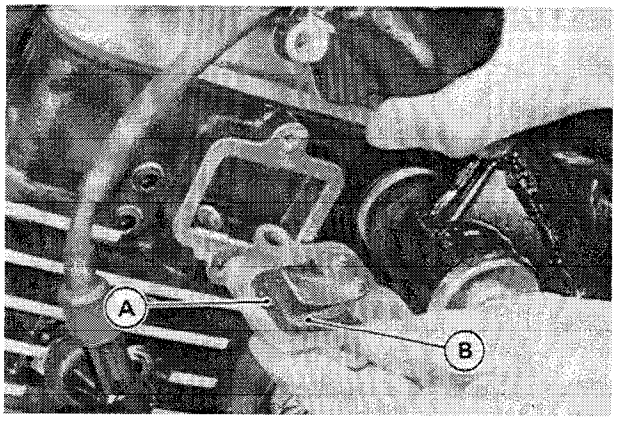
### *Air Suction Valve Inspection*

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

●Remove the air suction valves.

●Visually inspect the reeds for cracks, folds, warps, heat damage, or other damage.

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




A. Reed Contact Area B. Reed

- Check the reed contact area 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 area, 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.**

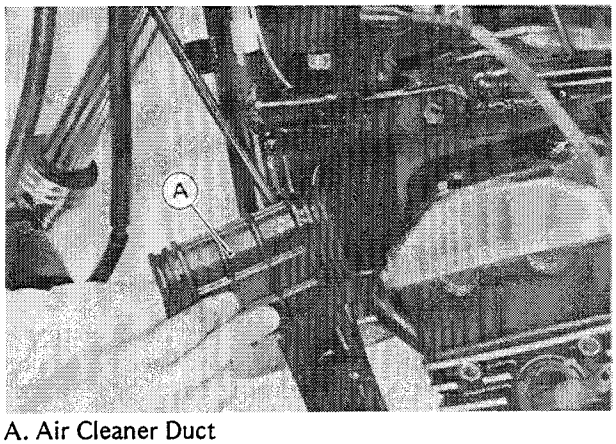
## Cylinder Head Cover

### *Front Cylinder Head Cover Removal*

**NOTE**

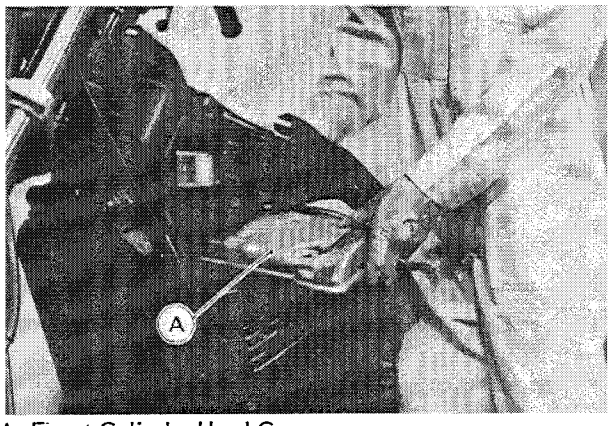
○*Front cylinder head cover can be removed with the engine installed.*

- Remove the air cleaners and air cleaner ducts to allow raising the front of the surge tank.




A. Air Cleaner Duct

- Remove the coolant hose and strip back the main wiring harness sheath to allow raising the rear of the surge tank.




A. Front Cylinder Head Cover

- Remove the surge tank ducts.
- Remove the cover mounting bolts.
- Lift the cylinder head cover up against the surge tank.
- While lifting firmly against the surge tank, slide the cover out the left-hand side.

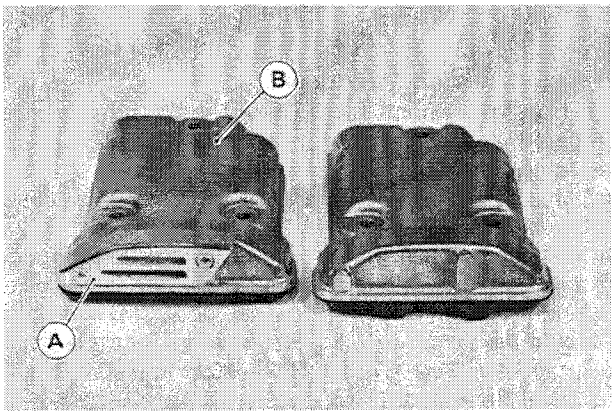
### *Rear Cylinder Head Cover Removal Notes*

**NOTE**

○*Remove the engine before cylinder head cover removal (see Engine Removal/Installation chapter).*

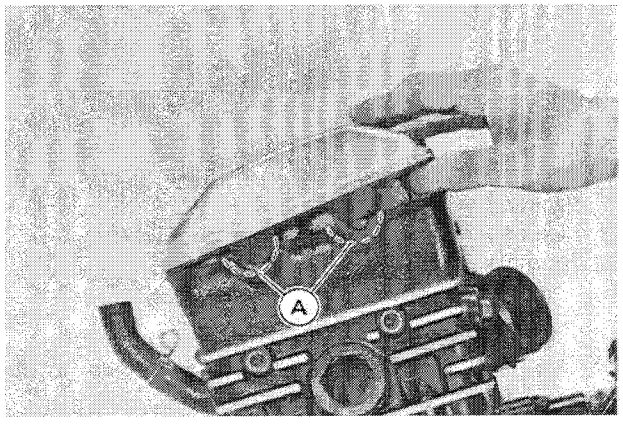
### *Cylinder Head Cover Installation Notes*

○The rear cylinder head cover has a heat shield, while the front cover does not.




A. Heat Shield B. Rear Cylinder Head Cover

- Replace the headcover gasket with a new one, if it is damaged.
- Apply silicone sealant to the plug as shown in the figure below.




A. Apply silicone sealant here.

- Tighten the cover bolts to the specified torque (see Exploded View).

## Cam Chain Tensioner and Cam Chain Tension Spring

### *Front Cam Chain Tensioner Removal*

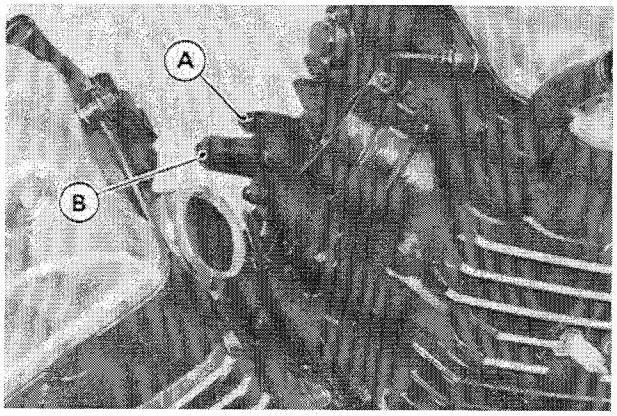
**CAUTION**

**This is a non-return type cam chain tensioner. The push rod does not return to its original position once it moves out to take up cam chain slack. Observe all the rules listed below:**

**○When removing the tensioner, do not take out the mounting nuts only halfway. Retightening the mounting nuts from this position could damage the tensioner and the camshaft chain. Once the nuts 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.**

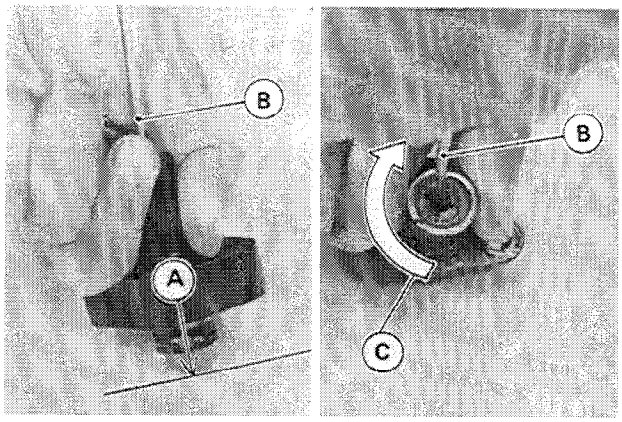
- Remove the outside oil pipe (see Engine Lubrication System).
- Loosen the cap bolt before tensioner removal for later disassembly convenience.
- Unscrew the mounting nuts and remove the camshaft chain tensioner.




A. Mounting Nuts B. Cap Bolt

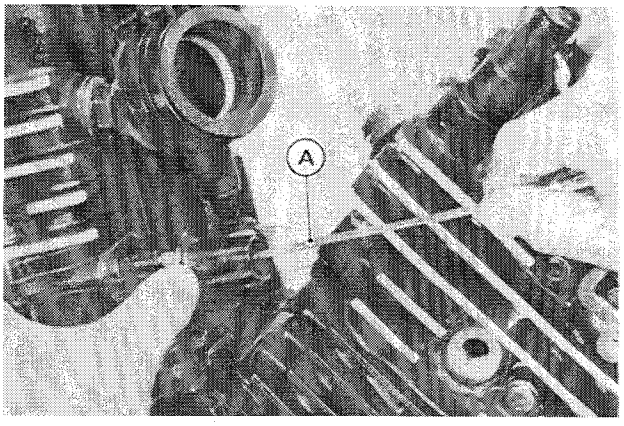
### *Cam Chain Tensioner Installation*

- Remove the cap bolt and O-ring.
- Replace the O-ring with a new one, if it is damaged.
- While compressing the push rod, turn it **clockwise** with a suitable screwdriver until the rod stops.



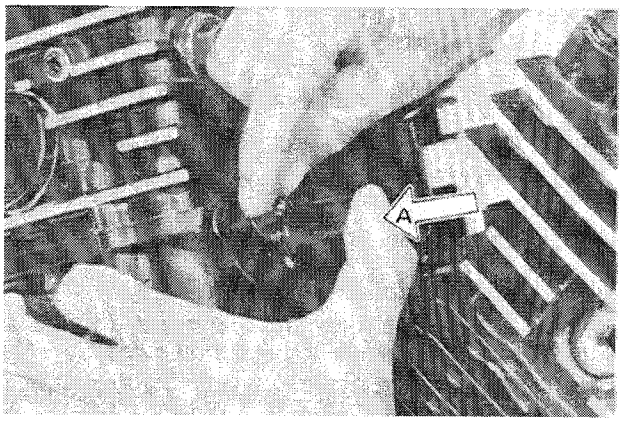

A. Compress the rod C. Clockwise
B. Screwdriver

- 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.



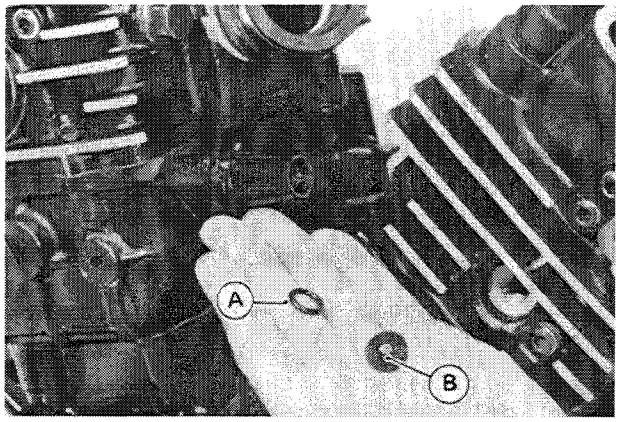

A. Screwdriver

- Tighten the mounting nuts finger tight to hold the tensioner.
- Install the outside oil pipe (see Engine Lubrication System).




A. Push the tensioner.

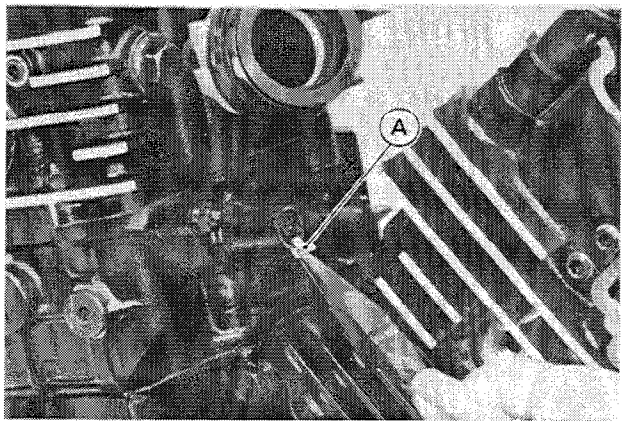
●Then, tighten the nuts.
●Install the O-ring and tighten the cap bolt.




A. O-ring B. Cap Bolt

### *Replacement Chain Tensioner Installation*

○A replacement chain tensioner from stock has a rod holder plate.
●Install the tensioner on the cylinder block, and tighten the mounting nuts.
●Remove the plate to release the push rod.




A. Rod Holder Plate

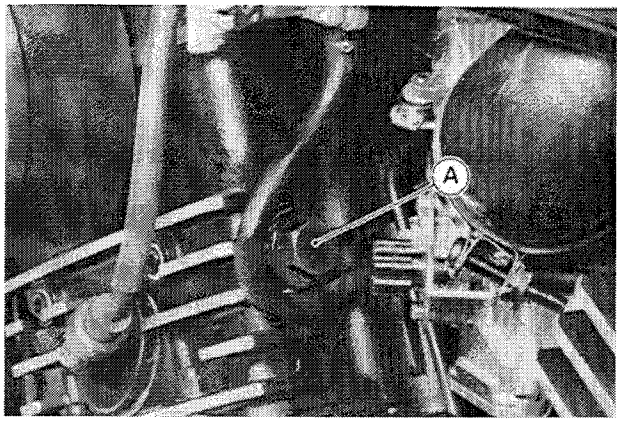
●Install the O-ring and tighten the cap bolt.

### *Rear Chain Tensioner Removal Notes*

●Remove the rear chain tensioner in the same manner as the front chain tensioner noting the following.
○Remove the coolant reservoir tank before rear tensioner removal.
○It is not necessary to remove the outside oil pipe.

### *Upper Chain Tension Spring Removal*

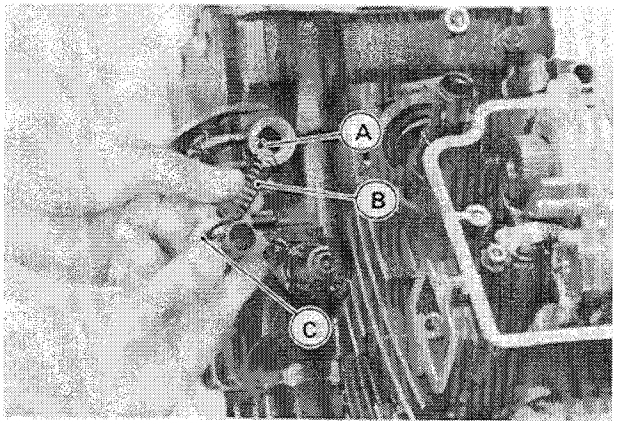
●Unscrew the mounting bolt to take out the upper chain tension spring.




A. Mounting Bolt

### *Upper Chain Tension Spring Installation*

●Replace the O-ring with a new one, if it is damaged.
●Insert the tension spring on the chain guide protrusion, and install the mounting bolt.
●Tighten the mounting bolt to the specified torque (see Exploded View).




A. Chain Guide Protrusion C. O-ring
B. Spring

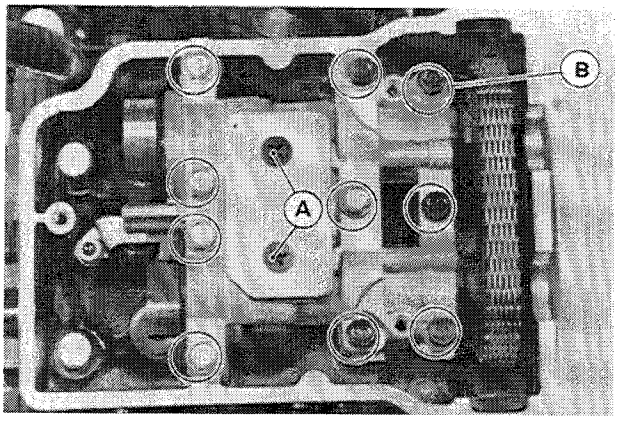
## Camshaft, Camshaft Chain

### *Camshafts Removal*

**NOTE**

○*Remove the cam chain tensioner and upper tension spring before removing the camshaft cap.*

●Unscrew the mounting screws to remove the reservoir cover.
●Remove the camshaft cap by taking out the mounting bolts.




A. Screws B. Bolts

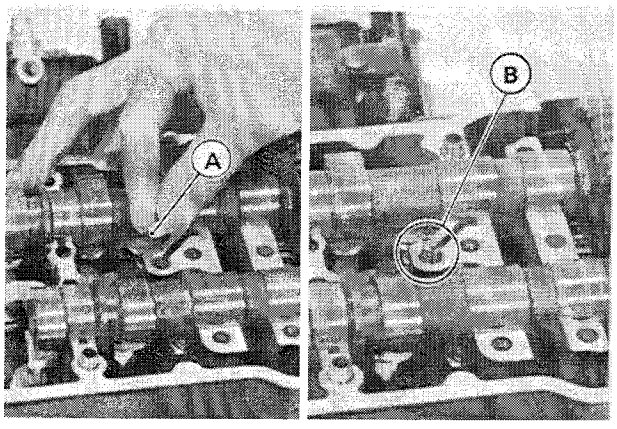
●Remove the camshafts.

**CAUTION**

○**If the camshafts are removed, always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the idler sprocket. A kinked chain could damage both the chain and the sprocket.**

### *Camshafts Installation Notes*

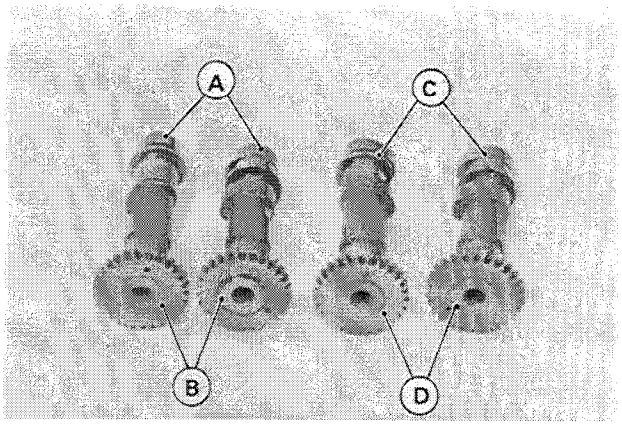
○The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.
●Replace the oil filter for the lash adjuster oil passage with a new one whenever the cylinder head is removed.
●Be sure to install the retainer spring on the oil filter.




A. Oil Filter B. Spring

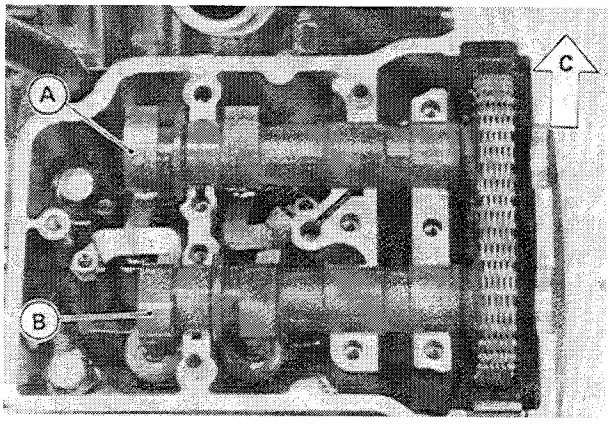
**NOTE**

○*Each rear camshaft has a groove on the sprocket end for identification. Be careful not to mix it up with the front camshaft.*



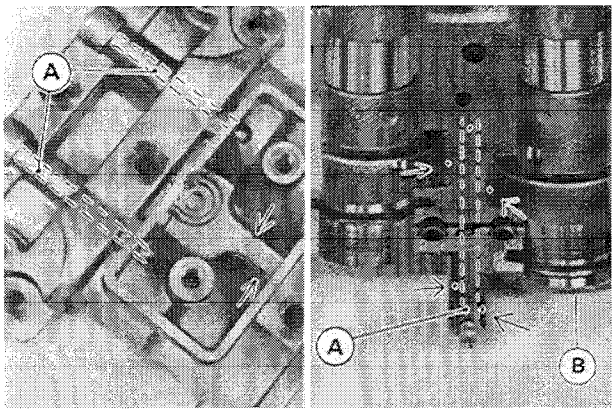

A. Rear Camshafts C. Front Camshafts
B. Grooves D. No Groove

●Apply engine oil to all cam parts. If the camshaft(s) and/or cylinder head are replaced with new ones, apply a thin coat of a molybdenum disulfide engine assembly grease on the new cam part surfaces.
●Apply engine oil to the camshaft bearing in the cylinder head.
●Engage the camshaft sprockets with the cam chain (see Chain Timing Procedure), and put the exhaust and inlet camshafts in place.
○The exhaust camshaft is shorter than the inlet camshaft.



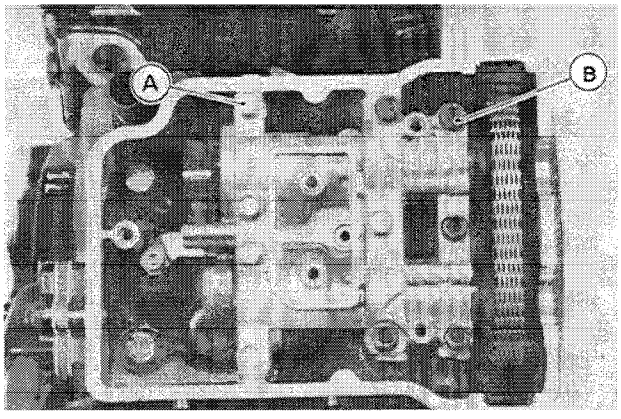

A. Inlet Camshaft C. Inlet Side
B. Exhaust Camshaft

●Check that the knock pins (2) are in place.
●Blow the oil passage clean with compressed air.



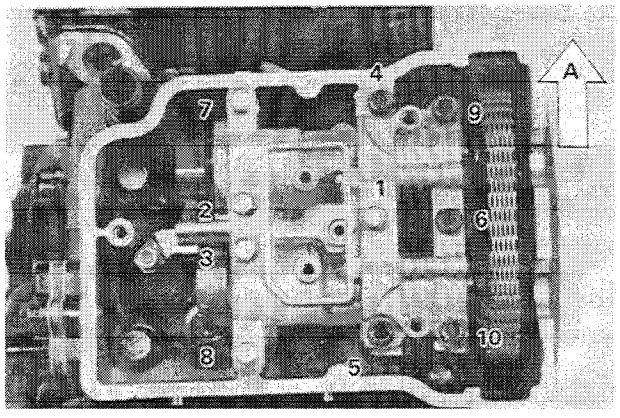

A. Oil Passage B. Camshaft Cap

●Install the camshaft cap bolts as shown.



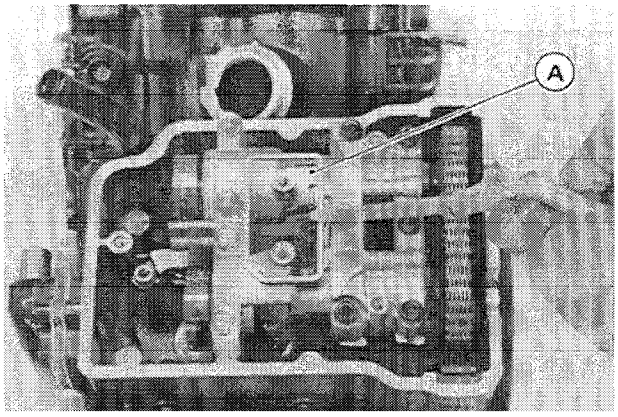

A. White Bolts: 45 ℓ B. Black Bolts: 38 ℓ

●Tighten the mounting bolts to the specified torque (see Exploded View) in the order shown.
○The sequence numbers are marked on the cap.
●After tightening all the bolts, retighten the bolt marked 1 to the specified torque.



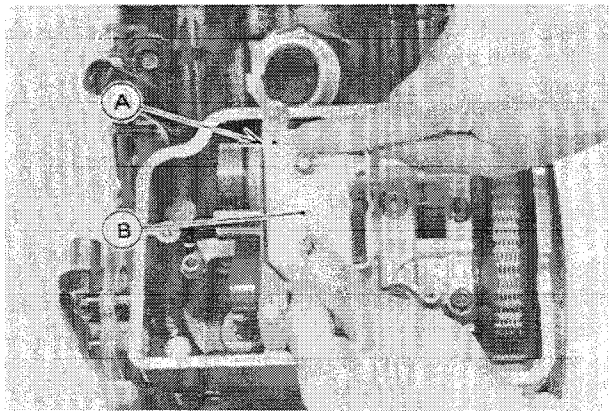

A. Inlet Side

●Fill the reservoir with engine oil after bearing cap installation.




A. Reservoir

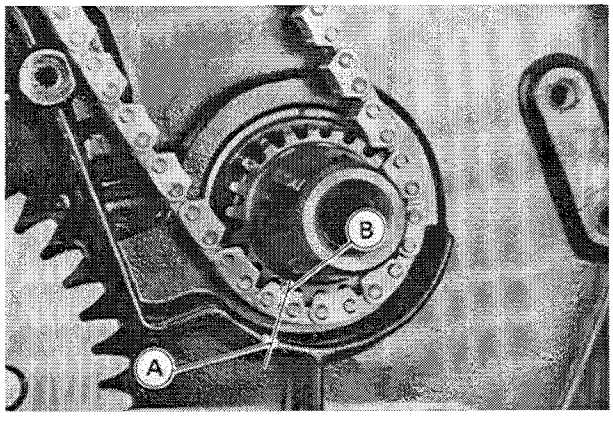
●Check that the bleeder hole is not clogged, and install the reservoir cap.




A. Bleeder Hole B. Reservoir Cap

*Front Camshaft Chain Timing Procedure*

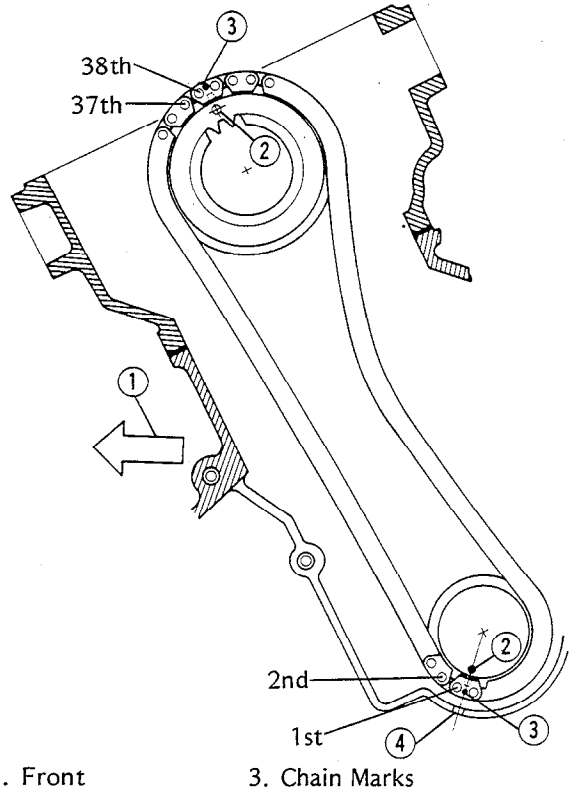
●Remove the alternator.
●Set the front piston at **TDC.**
○The crankshaft sprocket mark should be aligned with the crankcase mark at TDC.




A. Crankcase Mark B. Sprocket Mark

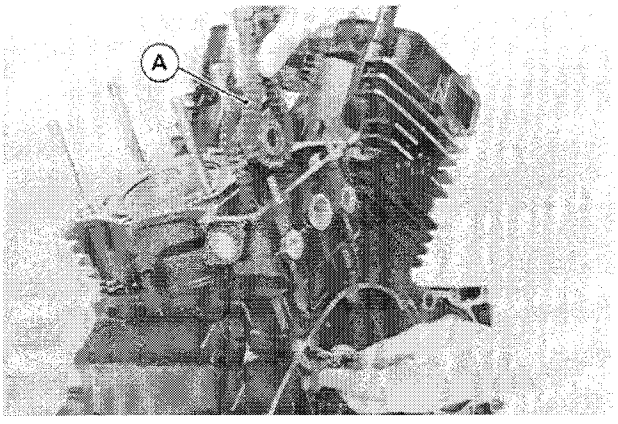
●Locate the two marked side plates on the lower camshaft chain as follows.
○Early model chains are not marked. If no marks can be found, mark the side plate of any link in the lower camshaft chain, and from here count **38 pins.** Mark the side plate with the 38th pin.
○Position the lower camshaft chain so that the **38 pins** between the marked side plates are toward the front of the motorcycle.

**Front Lower Camshaft Chain Timing**
**(Left side view, front piston at TDC)**



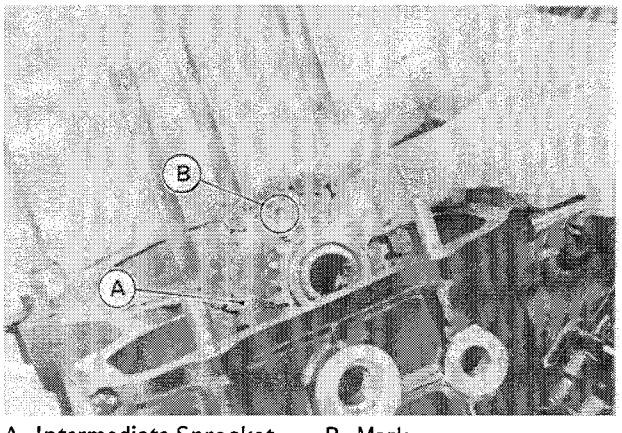

1. Front
2. Sprocket Marks
3. Chain Marks
4. Crankcase Mark

○Apply a thin coat of a molybdenum disulfide grease to the intermediate sprocket shaft.
○Slip the upper camshaft chain (wider one) over the intermediate sprocket.



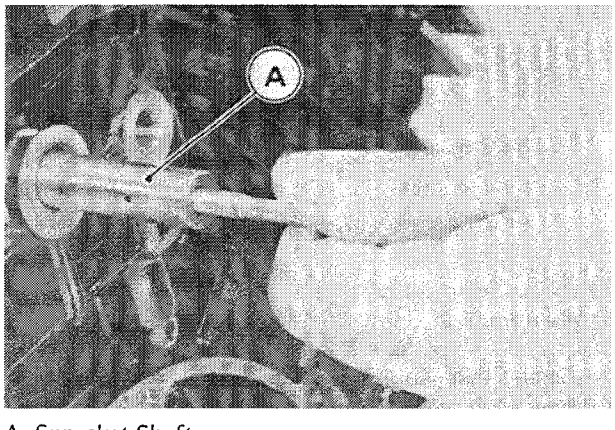

A. Upper Chain

○Align one marked plate with the punch mark on the larger intermediate sprocket and align the other marked plate with the punch mark on the crankshaft sprocket (In the photograph, the upper camshaft chain has been removed for clarity).




A. Intermediate Sprocket B. Mark

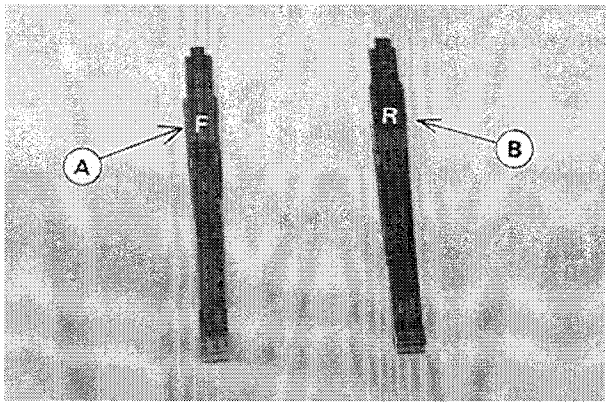
○While lifting up the intermediate sprocket, install the intermediate sprocket shaft and retaining bolt.




A. Sprocket Shaft

●Install the lower chain guides and then the upper chain guides for the front cylinder.

○The lower chain guide (front) for the front cylinder has an **F** mark and the guide for the rear cylinder has a **R** mark as shown. The **F** marked chain guide is shorter than the **R** marked chain guide.

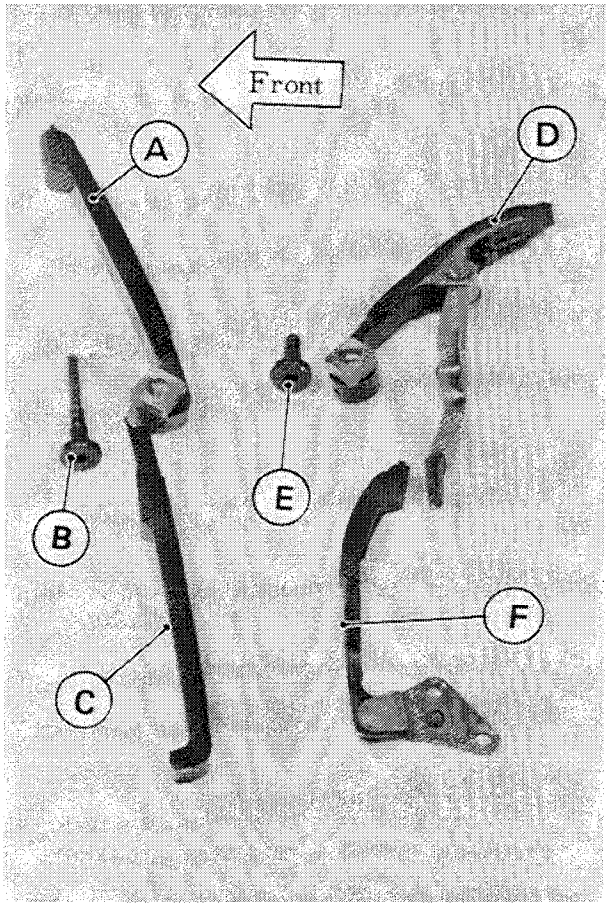



A. F Mark B. R Mark

**CAUTION**

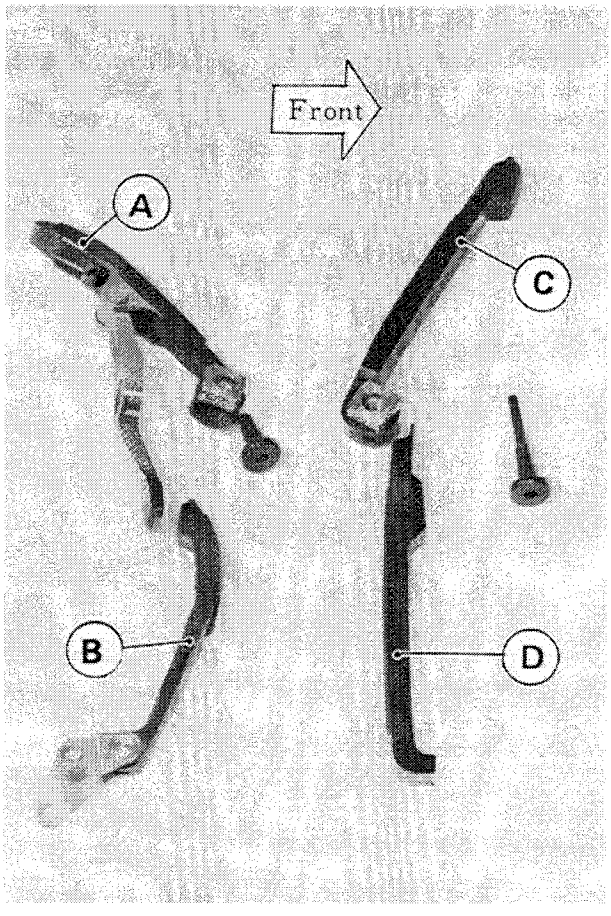
○*Be careful not to confuse the camshaft chain guides during installation, since these parts are not interchangeable.*

**Front Cylinder Chain Guides**



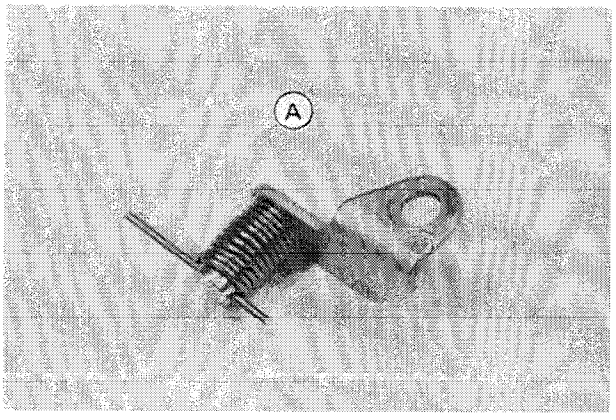

A. Upper Chain Guide (front)
B. Mounting Bolt (long)
C. Lower Chain Guide (front)
D. Upper Chain Guide (rear)
E. Mounting Bolt (short)
F. Lower Chain Guide (rear)

**Rear Cylinder Chain Guides**




A. Upper Chain Guide (rear)
B. Lower Chain Guide (rear)
C. Upper Chain Guide (front)
D. Lower Chain Guide (front)

○Only the rear lower chain guide is inserted from the crankcase.
●Tighten the chain guide mounting bolts. If the bolt is re-used, apply a non-permanent locking agent to the threads.
●Compressing the tension spring against the holder, insert a short piece of wire (φ1.5 — 1.9 mm) through the hole in the holder.

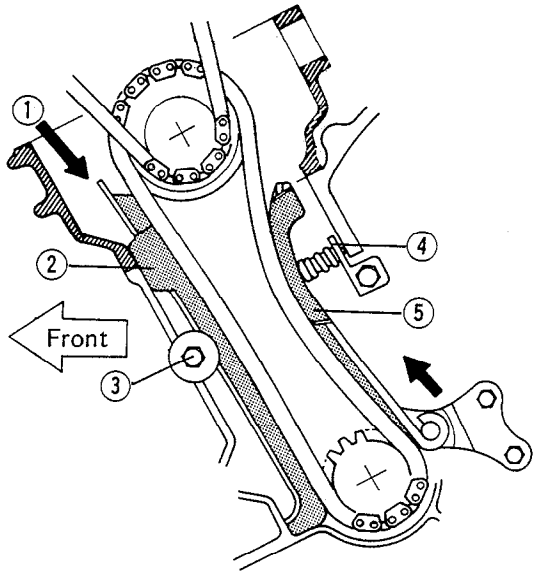



A. Lower Tension Spring Assembly for Front Cylinder

●After installing the lower tension spring assembly as shown, pull out the wire to release the spring.

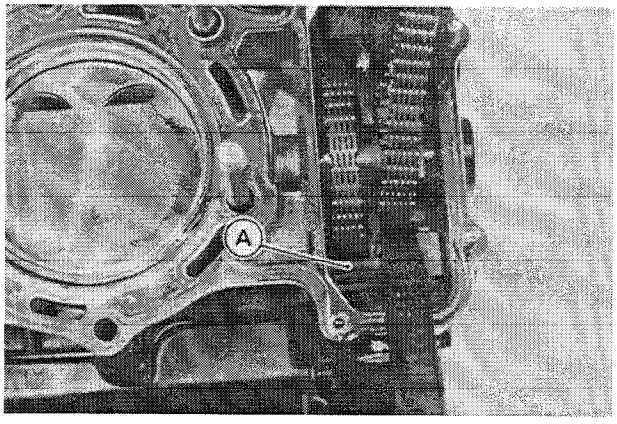
●Be sure to install the front chain guide mounting bolt after applying a non-permanent locking agent to the threads.

**Camshaft Chain Guide Installation (Front Cylinder)**



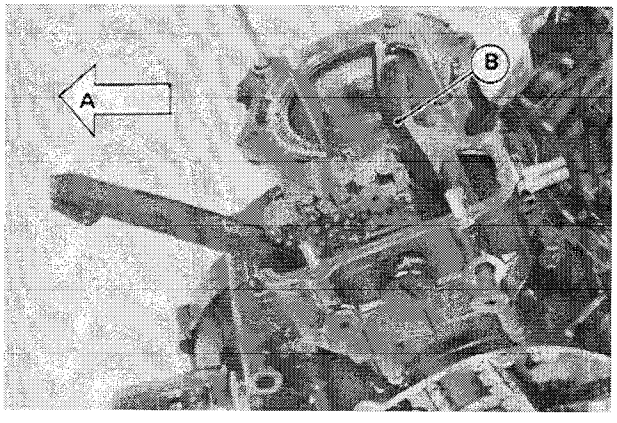

1. Installation Directions
2. Front Chain Guide **(F Mark)**
3. Front Chain Guide Retaining Bolt
4. Tension Spring Assembly
5. Rear Chain Guide

●After inserting the upper guides as shown, tighten the mounting bolts (with O-ring) to the specified torque (see Exploded View).
○Insert the long mounting bolt into the top of the lower guide .



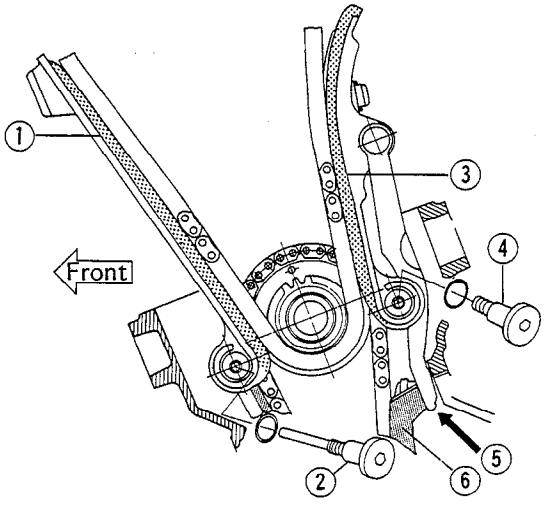

A. Long Mounting Bolt

○Insert the rear guide behind the top of the lower guide.



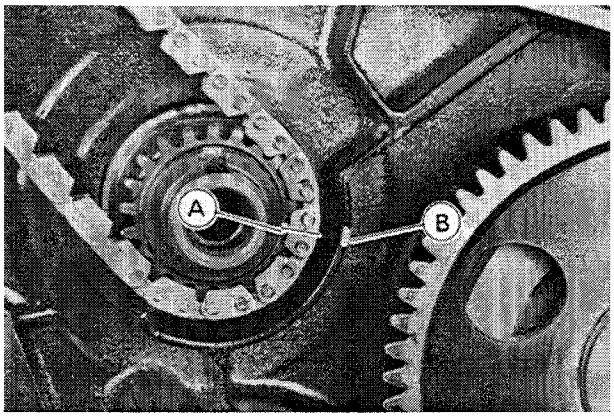

A. Front B. Rear Guide

**Upper Chain Guide Installation (Left Side View)**



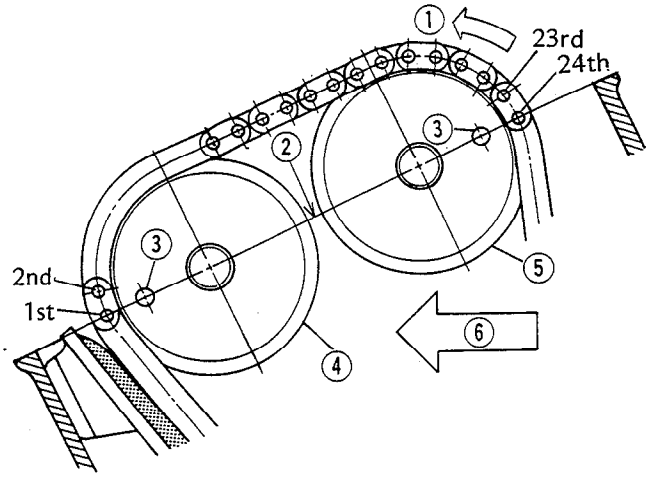

1. Upper Chain Guide
2. Mounting Bolt (long)
3. Upper Chain Guide
4. Mounting Bolt (short)
5. Insert the upper guide here.
6. Lower Chain Guide

- Install the front cylinder head (see Cylinder Head Installation).
- Position the front piston at **TDC** by turning the primary gear nut on the right side.
  - The crankshaft sprocket mark should be aligned with the crankcase mark at **TDC** (left side view, see above).
- While pulling the upper cam chain, install the front camshafts so that the punch marks on the shaft sprockets are aligned with the upper surface of the cylinder head and positioned respectively as shown.
  - ★If the camshafts cannot be positioned so that the punch marks are aligned with the cylinder head surface, re-check the lower cam chain timing.
- After tightening the camshaft cap bolts to the specified torque, install the camshaft tensioner and upper tension spring.
- Check the timing again.




A. Sprocket Mark B. Crankcase Mark

**Front Camshaft Chain Timing**
**(left side view, front piston at TDC)**

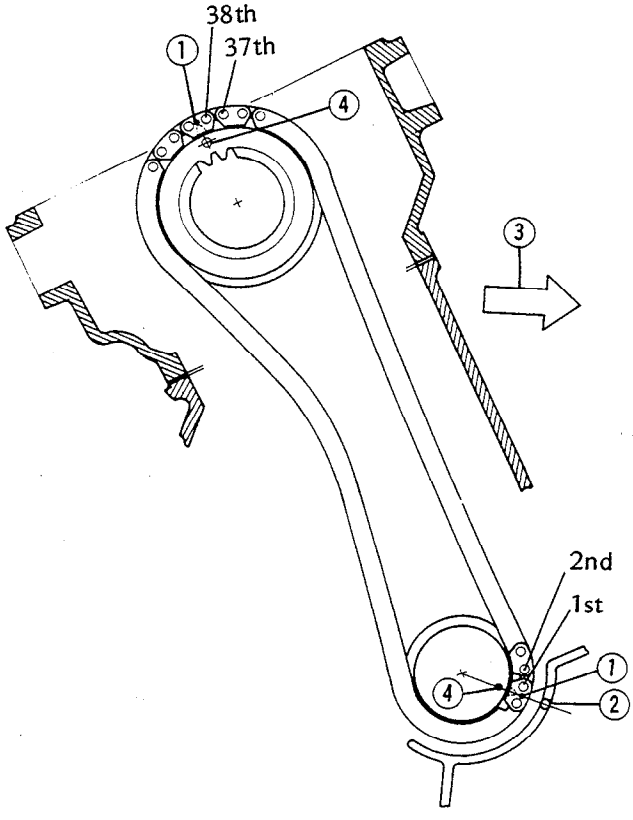



1. Turning Direction
2. Cylidner Head Upper Surface
3. Marks
4. Exhaust Camshaft
5. Inlet Camshaft
6. Front

*Rear Camshaft Timing Procedure*

- Adjust the rear camshaft chain timing in the same manner as the front cylinder noting the following.
  - Position the rear piston at **TDC** by turning the crankshaft clockwise (right side view).
  - The crankshaft sprocket mark should be aligned with the crankcase mark at TDC (right side view).
  - Engage the lower camshaft chain as shown.

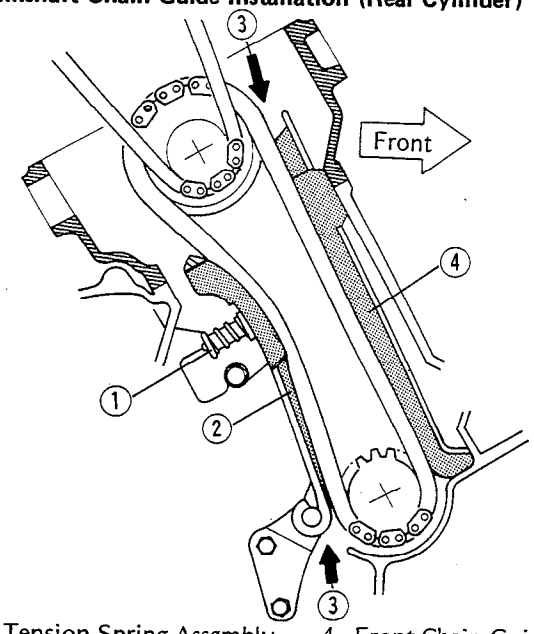
**Rear Lower Camshaft Chain Timing**
**(Right side view, rear piston at TDC)**




1. Chain Marks
2. Crankcase Mark
3. Front
4. Sprocket Marks

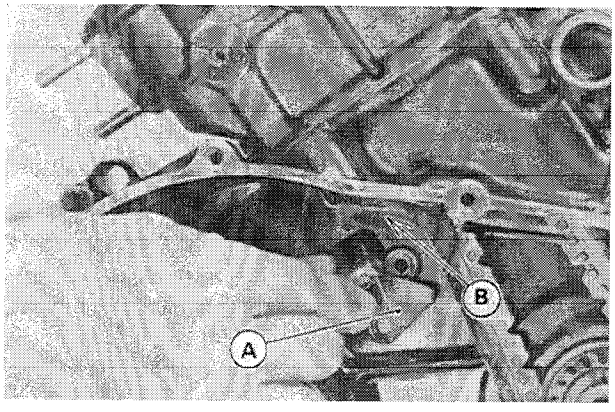
- Install the lower chain guides as shown. The chain guide has a **R** mark on it.

**Camshaft Chain Guide Installation (Rear Cylinder)**

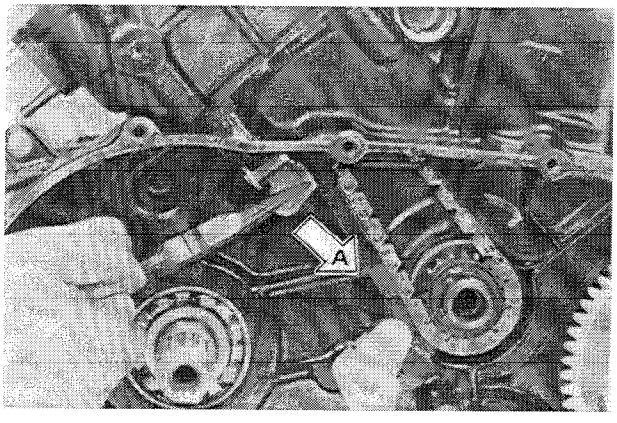



1. Tension Spring Assembly
2. Rear Chain Guides
3. Installation Directions
4. Front Chain Guide (R Mark)

oInstall the lower tension spring assembly so that its edge fits against the "step" in the case.




A. Lower Tension Spring Assembly for Rear Cylinder
B. Step




A. Pull out the wire.

oInstall the upper chain guides as shown.

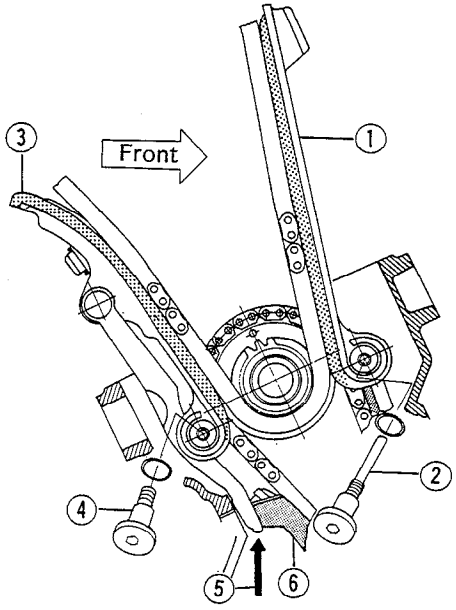
●After inserting the upper guides as shown, tighten the mounting bolts (with O-ring) to the specified torque (see Exploded View).

oInsert the long mounting bolt into the top of the lower guide .

oInsert the rear guide behind the top of the lower guide.

oInstall the rear cylinder head (see Cylinder Head Installation).

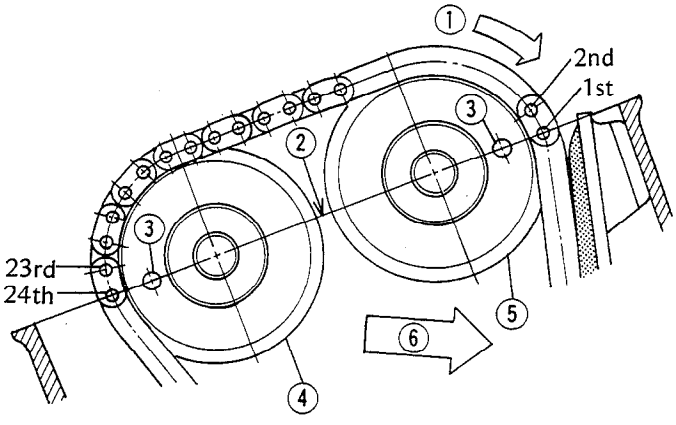
**Upper Chain Guide Installation (right side view)**




1. Upper Chain Guide
2. Mounting Bolt (long)
3. Upper Chain Guide
4. Mounting Bolt (short)
5. Insert the upper guide here.
6. Lower Chain Guide

oEngage the upper camshaft chain with the camshaft sprockets as shown.

**Rear Camshaft Chain Timing**
**(right side view, rear piston at TDC)**




1. Turning Direction
2. Cylinder Head Upper Surface
3. Marks
4. Exhaust Camshaft
5. Inlet Camshaft
6. Front

●Install the alternator rotor and inside alternator cover (see Electrical System chapter).

### *Camshaft Chain Timing Inspection*

If the camshaft chain timing is suspect, check it as follows.

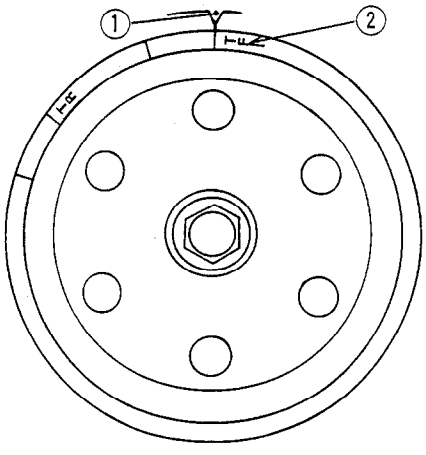
**NOTE**

○*Camshaft chain timing for front cylinder can be checked with the engine installed in the frame.*

**For Front Cylinder**

●Remove the following parts.
Front Cylinder Head Cover (see Front Cylinder Head Cover Removal).
Outside Alternator Cover (see Outside Alternator Cover Removal)

●Align the front cylinder top dead center mark **TF** with the mark on the inside alternator cover by turning the crankshaft **counterclockwise (left side view).**




1. Timing Mark on Inside Alternator Cover
2. TDC Mark for Front Piston

**CAUTION**

○**If the crankshaft is rotated clockwise (left side view) with the alternator installed, the starter clutch will engage, turning the starter motor. Increased effort will be required, and starter drive components may be damaged.**

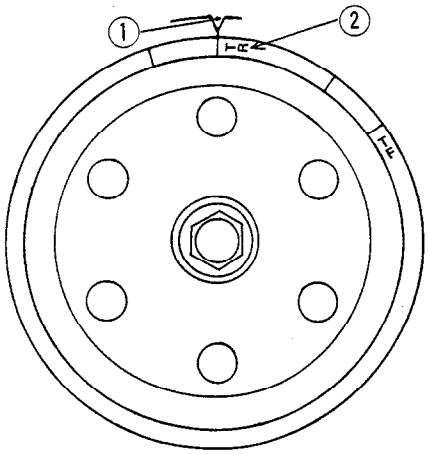
○The timing marks should be aligned with the front cylinder head upper surface and positioned respectively as shown (see Front Camshaft Chain Timing Procedure).

**For Rear Cylinder**

●Remove the engine.

●Remove the rear cylinder head cover and the outside alternator cover.

●Turn the crankshaft **counterclockwise 305°** (left side view) to align the rear cylinder top dead center mark **TR** with the mark on the inside alternator cover.




1. Timing Mark on Inside Alternator Cover
2. TDC Mark for Rear Piston

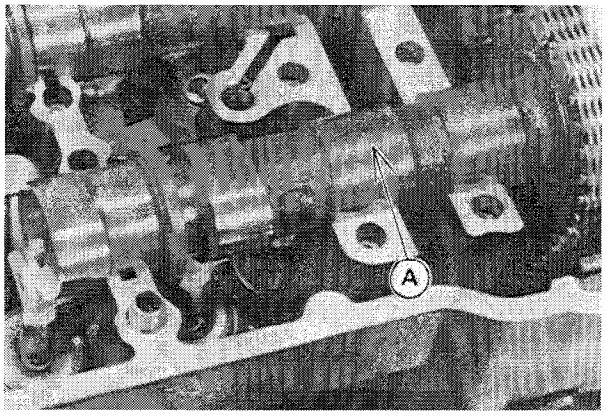
○The timing marks should be aligned with the rear cylinder head upper surface and positioned respectively (see Rear Camshaft Chain Timing Procedure).

### *Camshaft Bearing 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.

○Journal clearance **less than 0.025 mm** can not be measured by plastigauge, however, using genuine parts maintains the minimum standard clearance.

●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.



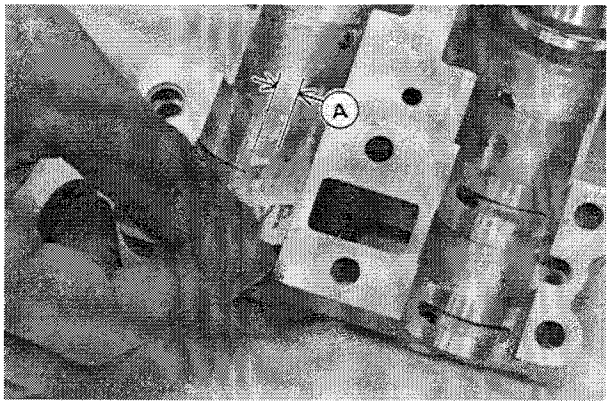

A. Plastigage Strip

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

**NOTE**

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

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




A. Plastigage

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

**Camshaft Bearing Clearance**

| | |
|---|---|
| **Standard:** | **0.020 – 0.062 mm** |
| **Service Limit:** | **0.15 mm** |

★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:** | **26.959 – 26.980 mm** |
| **Service Limit:** | **26.93 mm** |

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

### *Upper/Lower Camshaft Chain Wear*

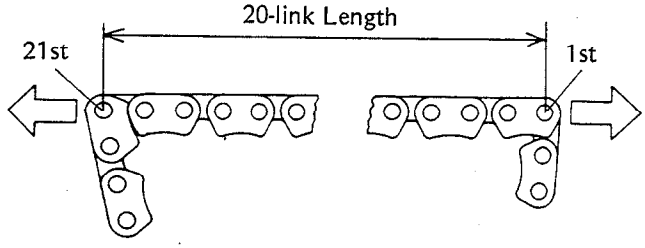
●Hold the chain taut with a force of about 5 kg in some manner, and measure a 20-link length. Since the chain may wear unevenly, take measurements at several places.

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

**Camshaft Chain 20-link Length (upper and lower)**

| | |
|---|---|
| **Standard:** | **127.0 – 127.4 mm** |
| **Service limit:** | **128.9 mm** |

**Chain Length Measurement**

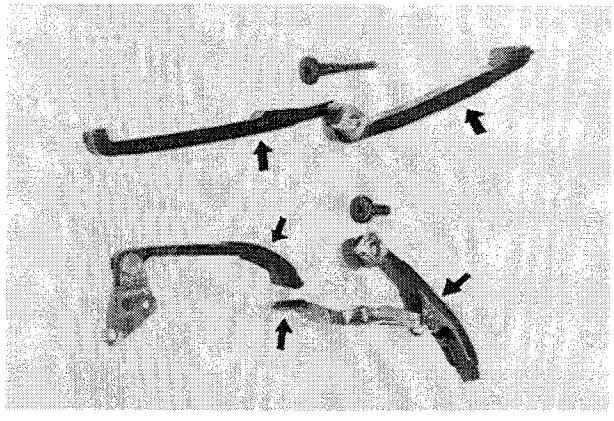



### *Camshaft Chain Guide Wear*

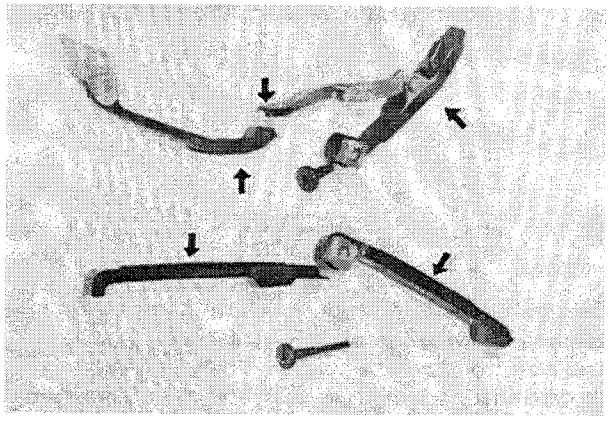
●Visually inspect the rubber on the guides.

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

**Guides for Front Cylinder**



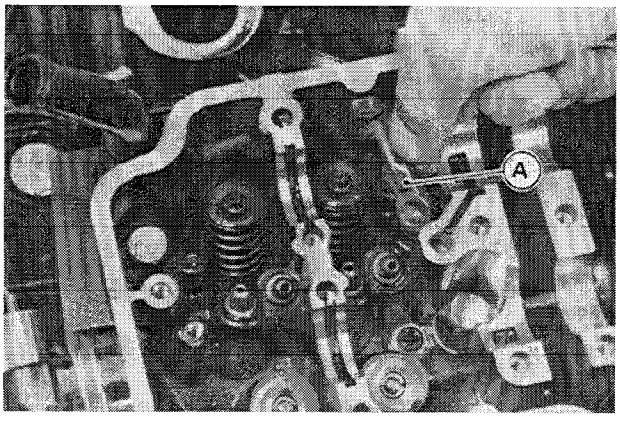
**Guides for Rear Cylinder**



## Hydraulic Lash Adjuster (HLA)

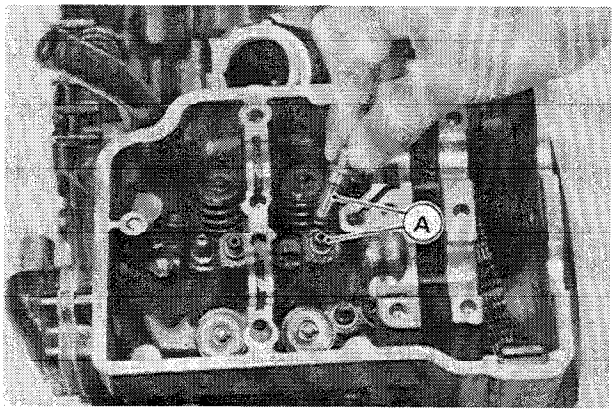
### *HLA Removal*

- Unscrew the mounting bolts to remove the plate springs.
- Take off the rocker arms.




A. Rocker Arms

- Pull out the hydraulic lash adjuster.




A. Lash Adjusters

**CAUTION**

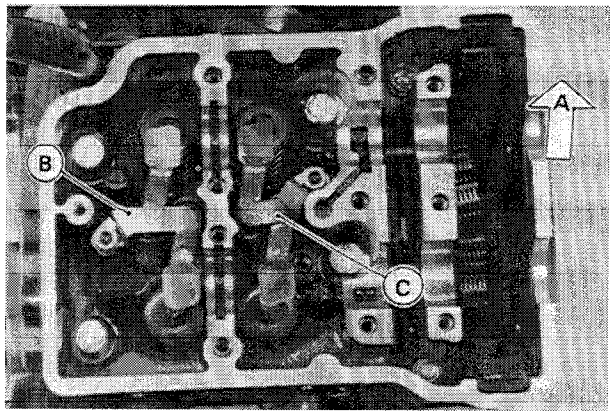
**○Be careful not to damage or deform a lash adjuster by tapping it during removal or installation.**
**○Do not drop the lash adjuster or hit it sharply. If it is deformed, the plunger will not operate smoothly.**

### *HLA Installation*

**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 and the plate springs as shown.




A. Inlet Side
B. Plate Spring (long)
C. Plate Spring (short)

### *HLA Air Bleeding*

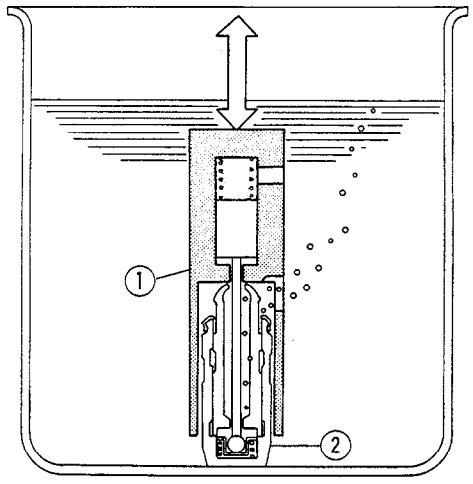
- Provide a container filled with kerosene.
- Insert the lash adjuster into the tappet bleeder (Special Tool) and move it up and down in the kerosene.
- Check that the lash adjuster plunger moves up and down smoothly.

★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**



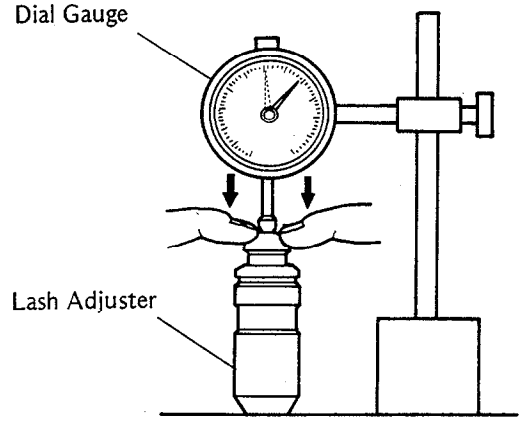

1. Tappet Bleeder: 57001-1200
2. Hydraulic Lash Adjuster

●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**

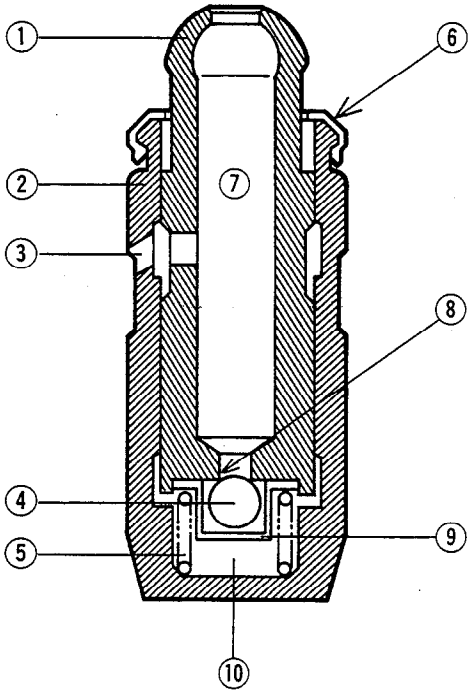
| | |
|---|---|
| **Standard:** | **0 to 0.2 mm** |
| **Service Limit:** | **0.2 mm** |

★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*

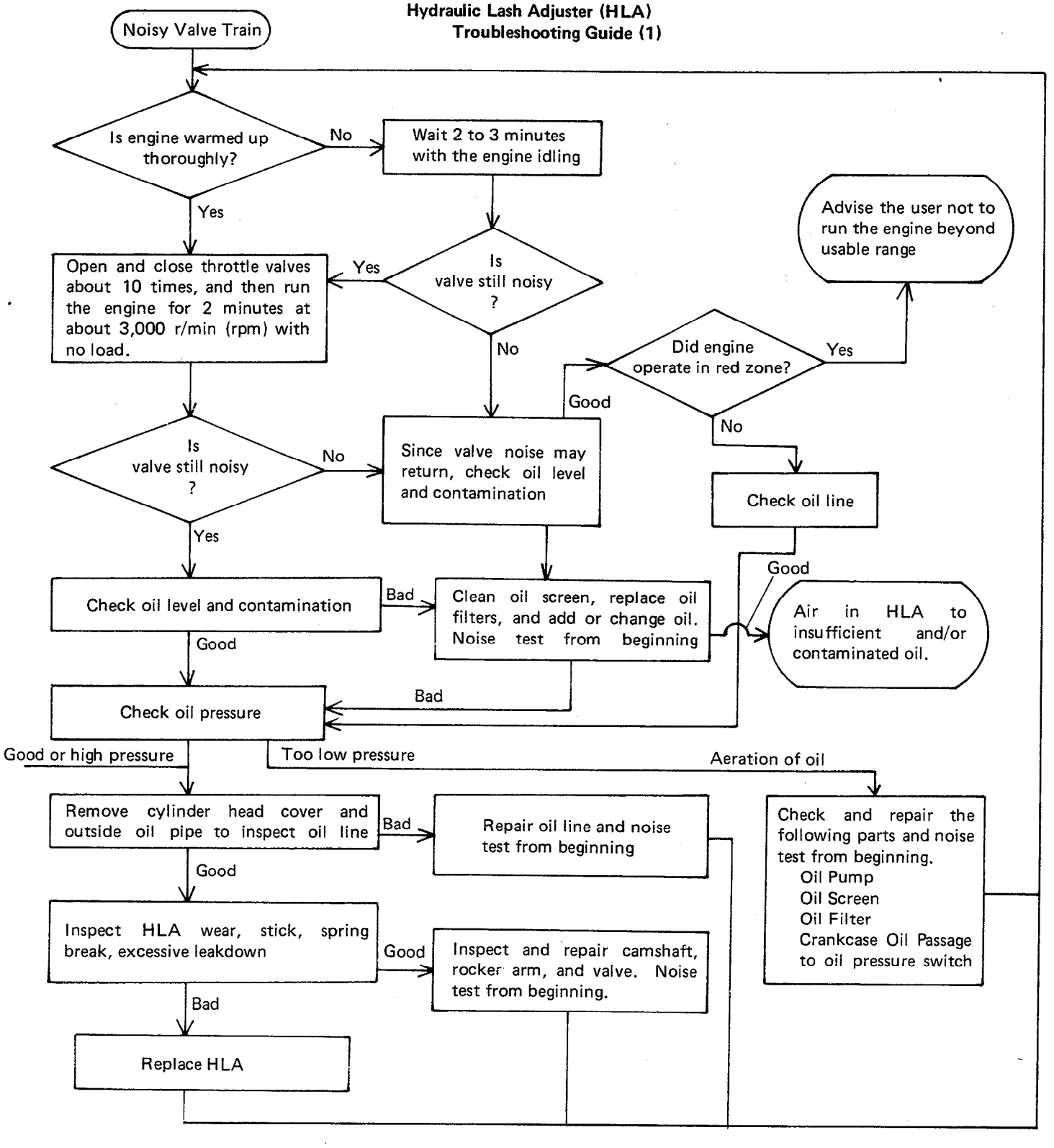
**Aeration of Oil**

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.

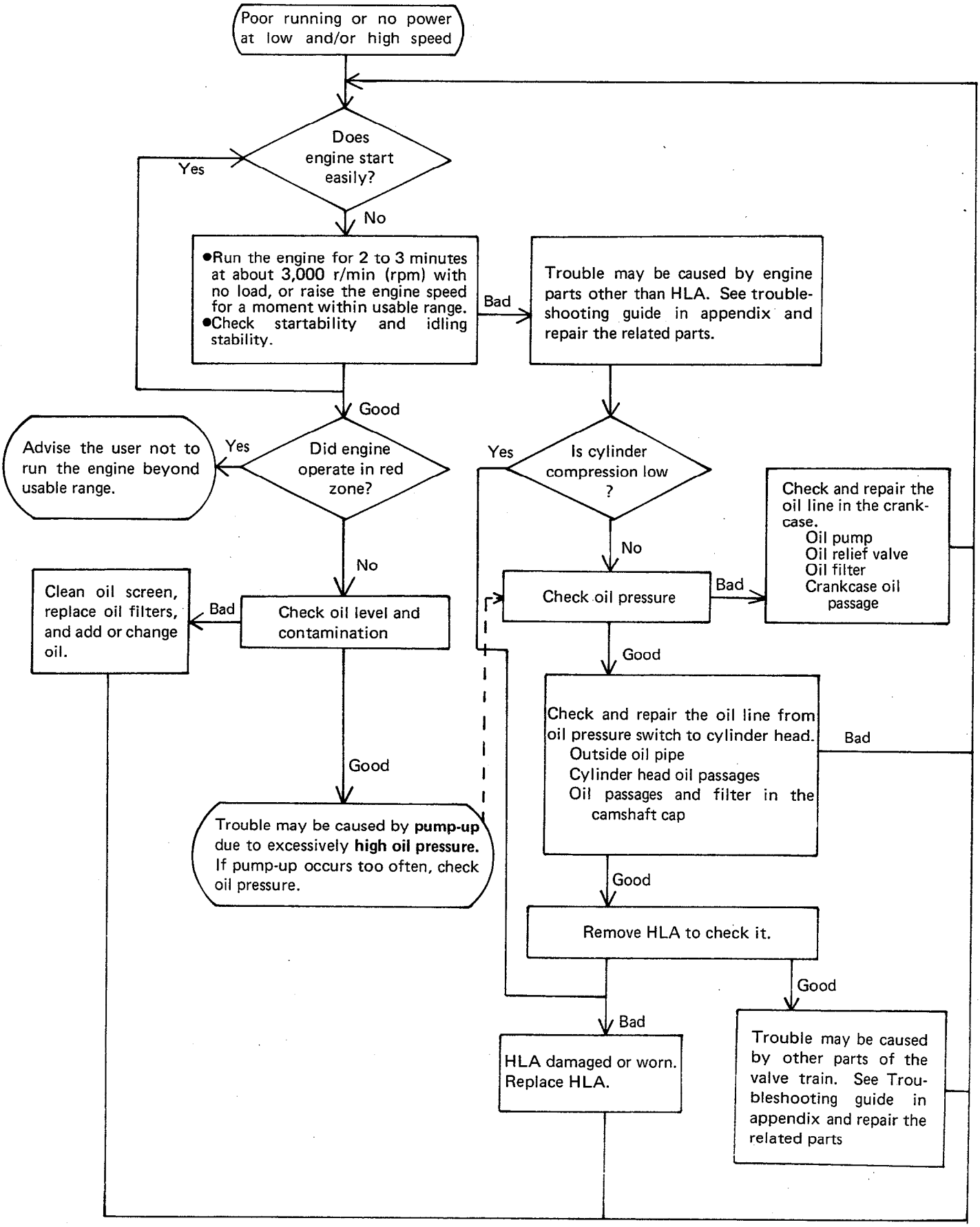
**Pump-Up**

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)**



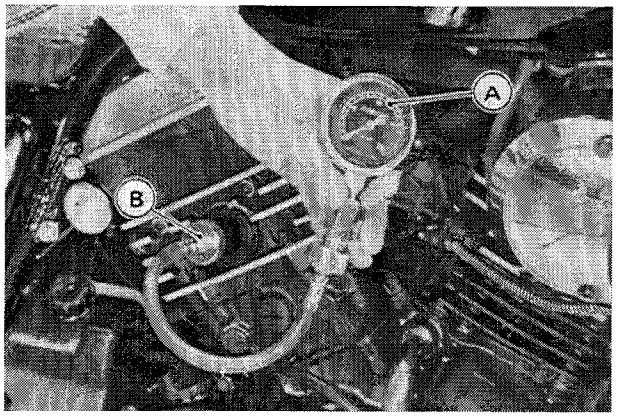
**Hydraulic Lash Adjuster (HLA)**
**Trouble Shooting Guide (2)**



## Cylinder Head

### *Compression Measurement*

- Check that the battery is fully charged.
- Thoroughly warm up the engine so that engine oil between the piston and cylinder wall will help seal compression as it does during normal running.
- Stop the engine.
- Remove one spark plug and attach the compression gauge (special tool) firmly into the spark plug hole. Do not remove the other spark plug, only the plug lead.
- For the other cylinder, remove both spark plugs.




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

- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.
- Repeat the measurement for the other cylinder.

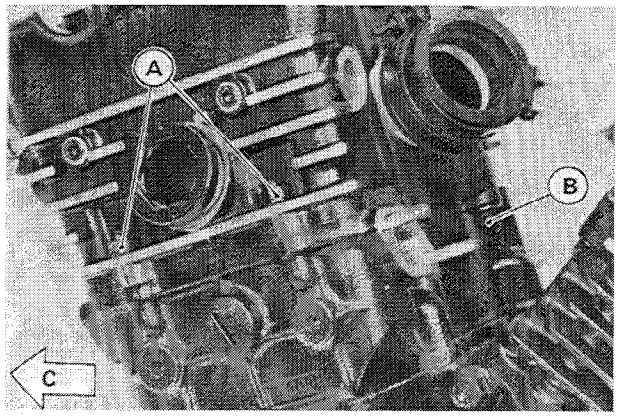
**Cylinder Compression (Usable Range)**
**890 – 1,370 kPa @300 r/min (rpm)**
**(9.1 – 14 kg/cm$^2$, 129 – 199 psi)**

★If cylinder compression is higher than the standard value, 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.

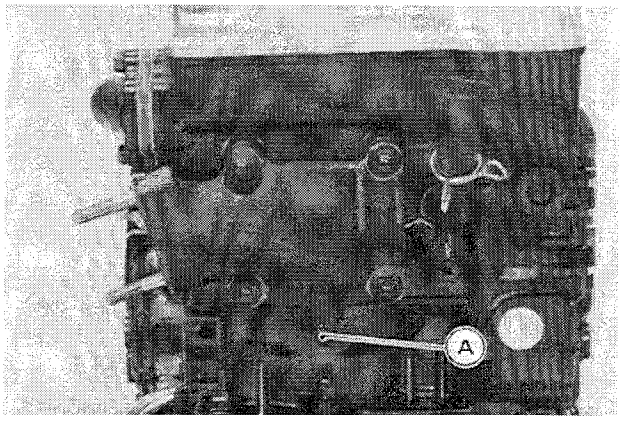
★If cylinder compression is lower than the service limit, check the following:
○Gas leakage around the cylinder head – replace the damaged gasket and check the cylinder head for warp.
○Condition of the valve seating.
○Piston/cylinder clearance, piston seizure.
○Piston ring, piston ring groove.
○Hydraulic lash adjuster (operation, seizure, spring breakage) – replace the damaged lash adjuster.
○Oil pressure – if the pressure is high, check the oil line for clogs.

### *Cylinder Head Removal*

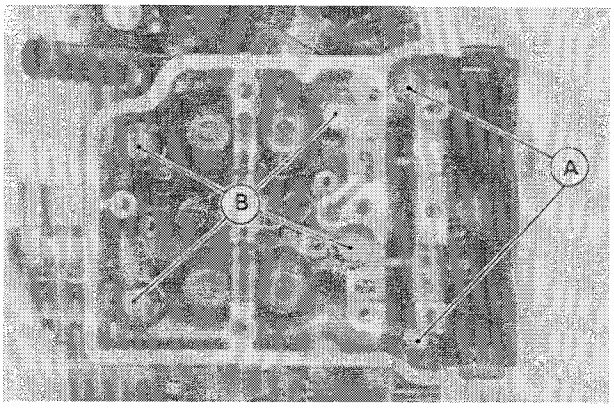
- Remove the following parts.
  Carburetors (see Fuel System chapter)
  Outside Oil Pipe (see Engine Lubrication System chapter)
  Cylinder Head Covers
- Remove the camshafts (see Camshaft Removal).
- Remove the 6 mm bolts, the 8 mm nuts and the 10 mm nuts in that order. This prevents excessive stress on the smaller bolts and studs.




A. 6 mm Nuts (2)
B. 8 mm Nut
C. Front

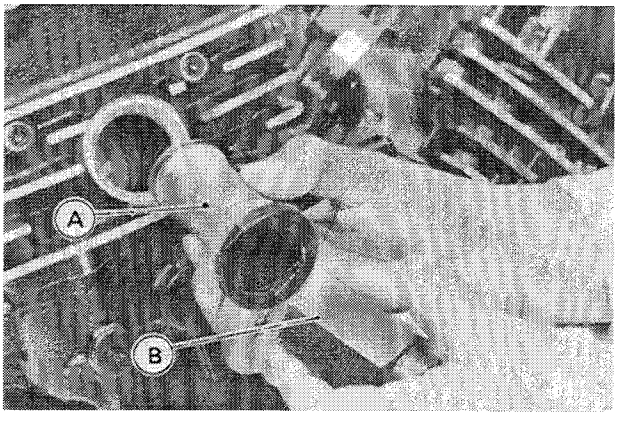



A. 8 mm Nut




A. 6 mm Nuts (2) B. 10 mm Nuts (4)

•Remove the spark plug retainer with a hexagonal wrench (special tool).




A. Spark Plug Retainer
B. Hexagonal Wrench: 57001-1210

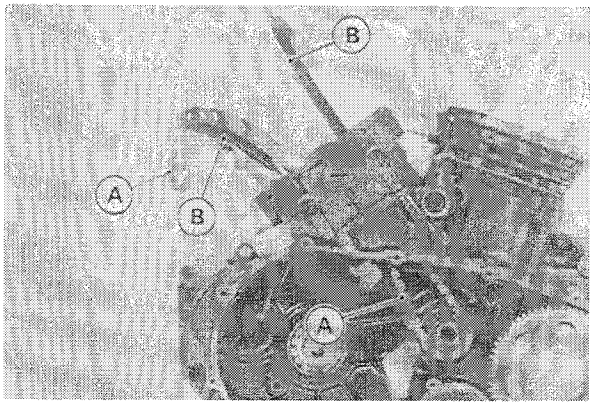
•Tap the cylinder head with a plastic mallet to remove it.

CAUTION

○**When the cylinder head is put upside down or sideways, remove the hydraulic lash adjusters and bleed air in the adjusters.**

*Cylinder Head Installation Notes*

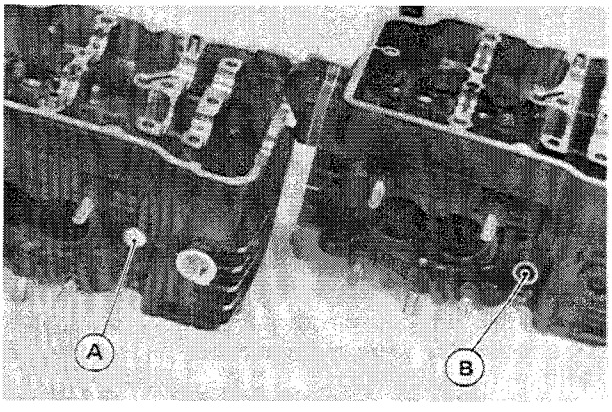
•Before cylinder head installation, install the chain and the chain guides (see Front Cylinder Block Installation Notes).




A. Chains B. Chain Guides

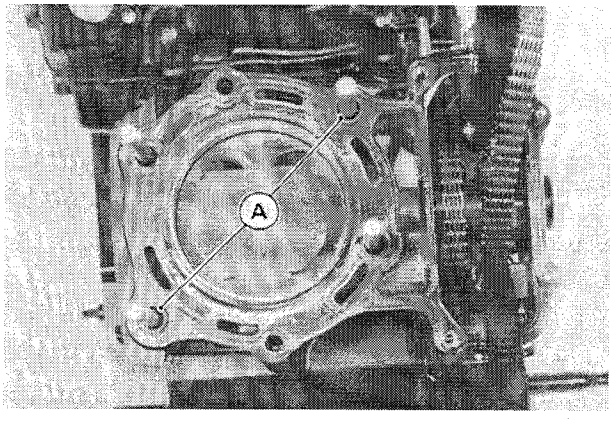
**NOTE**

○*The front cylinder head has a breather pipe, and the rear cylinder head has a plugged hole. Be careful not to mix up these heads.*




A. Plug in Rear Cylinder Head
B. Breather Pipe in Front Cylinder Head

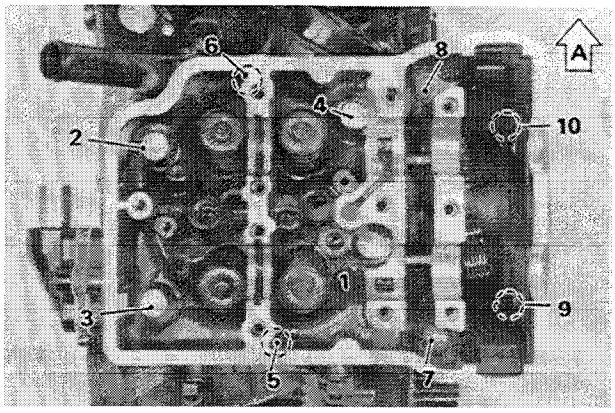
•See that the knock pins(2) are in place on the cylinder and install the new cylinder head gasket.




A. Knock Pins

●Tighten the cylinder head bolts and nuts following the tightening sequence. Tighten them to the first torque and then tighten them to the final torque as shown.

**Cylinder Head Bolt, Nut Tightening Sequence and Torque**

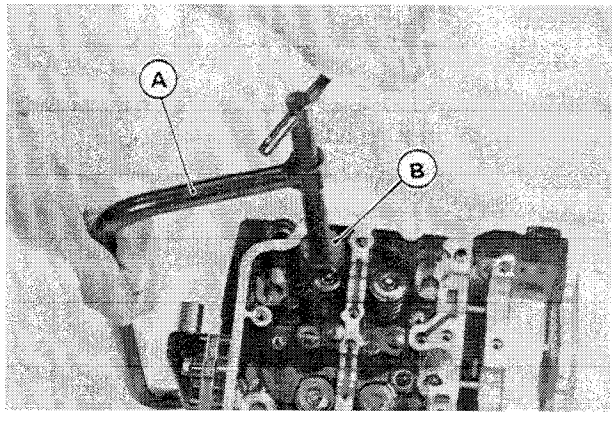



A. Inlet Side

| | First N-m (kg-m, ft-lb) | | Final N-m (kg-m, ft-lb) |
|---|---|---|---|
| 1 – 4 : M10 – | 25 (2.5, 18.0) | → | 39 (4.0, 29) |
| 5 – 6 : M8 – | 18 (1.8, 13.0) | → | 25 (2.5, 18.0) |
| 7 – 8 : M6 – | 6.9 (0.7, 61 in-lb) | → | 12 (1.2, 8.5) |
| 9 – 10 : M6 – | 8.8 (0.9, 78 in-lb) | → | 15 (1.5, 11.0) |

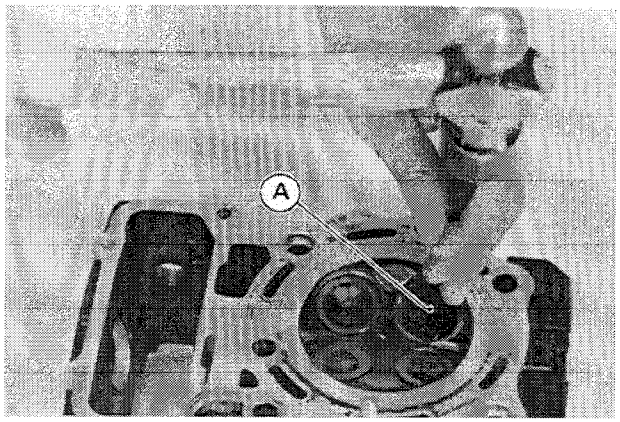
### *Cylinder Head Disassembly*

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




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

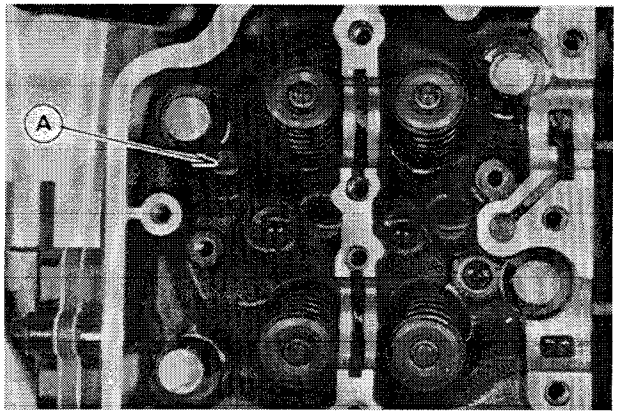
●Heat the area around the valve guide to about 120 – 150°C (248 – 302°F), and hammer lightly on valve guide arbor (special tool) to remove the guide from the top of the head.




A. Valve Guide Arbor: 57001-1021

### *Cylinder Head Cleaning*

●Remove the oil filter for lash adjuster.
●Blow the oil passages clean with compressed air.

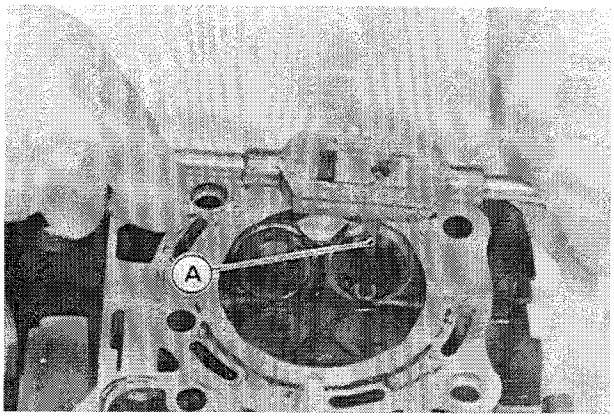



A. Blow oil passages.

●Install the new oil filter.

### *Cylinder Head Assembly*

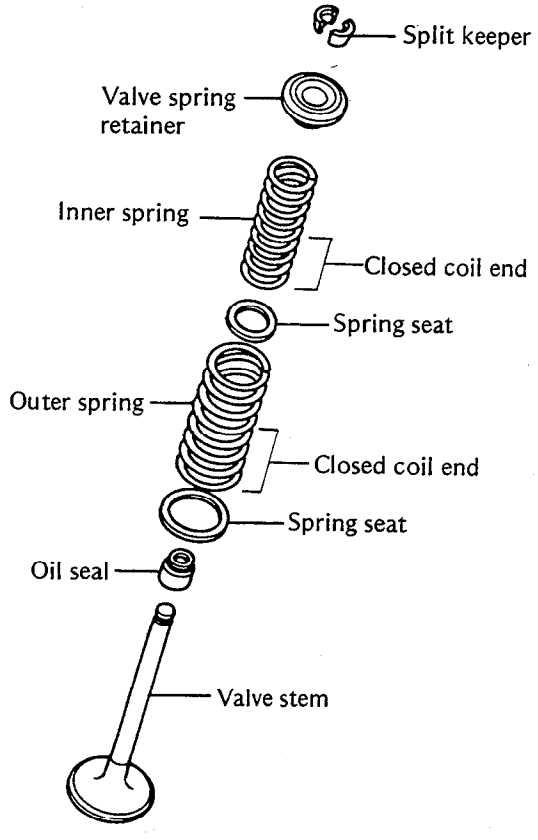
●Apply oil to the valve guide outer surface before installation.
●Heat the area around the valve guide hole to about 120 – 150°C (248 – 302°F).
●Drive the valve guide in from the top of the head using the valve guide arbor. The flange stops the guide from going in too far.
●Ream the valve guide with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



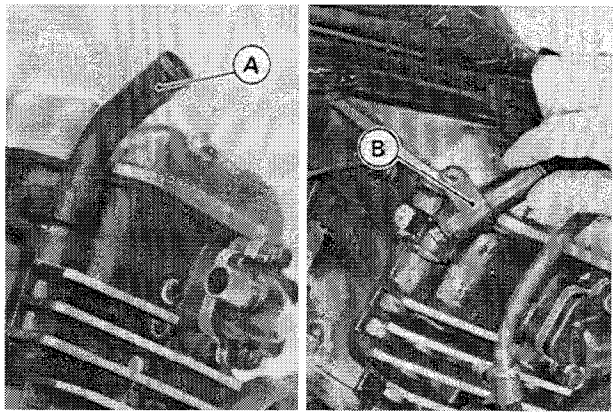

A. Valve Guide Reamer: 57001-1079

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

**Valve and Springs**



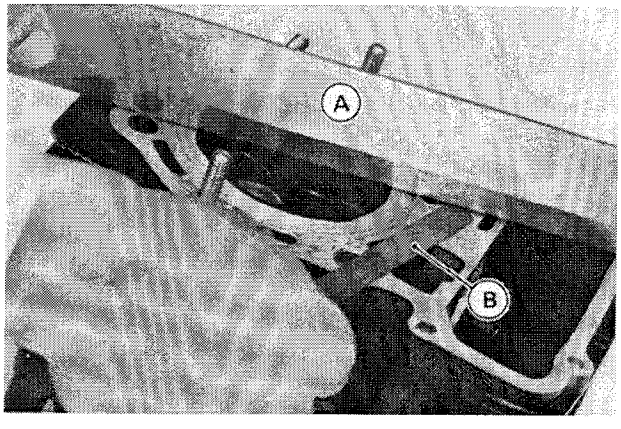

•Apply a thin coat of molybdenum disulfide engine assembly grease to the valve stem before valve installation.
•Be sure to install the inner and outer spring seats under the inner and outer springs.
•Install the springs so that the narrow-pitch end is facing toward the valve seat (downwards).
•Install the water pipe and O-ring on each cylinder as shown.




A. Front Water Pipe B. Rear Water Pipe

*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**

## Valves

### *Valve Clearance Inspection*

**NOTE**

○*Since the hydraulic lash adjusters constantly maintain zero clearance, it is not necessary to inspect or adjust the valve clearances.*

### *Valve Seat Inspection*

- Remove the valve (see Cylinder Head Disassembly and Assembly).
- Coat the 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**

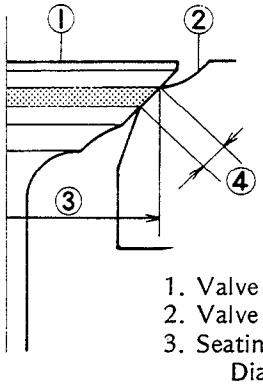
| | |
|---|---|
| **Inlet:** | **0.5 – 1.0 mm** |
| **Exhaust:** | **0.5 – 1.0 mm** |

**NOTE**

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

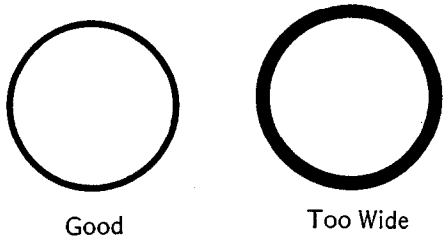
★If the valve seating pattern is not correct, repair the seat (see Valve Seat Repair).

**Valve Seating Area Dimensions**



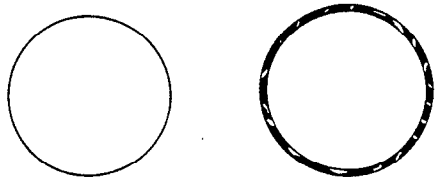

1. Valve
2. Valve Seat
3. Seating Area Outside Diameter
4. Seating Area Width

**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:** | **30.9 – 31.1 mm** |
| **Exhaust:** | **26.9 – 27.1 mm** |

### *Valve Seat Repair*

- Follow the manufacturer's instructions for use of valve seat cutters.

**Use These Cutters**

| | |
|---|---|
| **Intake Valve** | |
| **45° – φ27.5** | **57001-1187** |
| **32° – φ33.0** | **57001-1199** |
| **60° – φ30.0** | **57001-1123** |
| **Exhaust Valve** | |
| **45° – φ27.5** | **57001-1114** |
| **32° – φ28.0** | **57001-1119** |
| **60° – φ30.0** | **57001-1123** |

**Use This Holder and Bar**

| | |
|---|---|
| **Holder — $\phi$5.5** | **57001-1125** |
| **Bar** | **57001-1128** |

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

**Seat Cutter Operating Cares:**

1. This valve seat cutter is developed to grind the valve seat for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or strike the valve seat cutter, or the diamond particles may fall off.
3. Always 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**

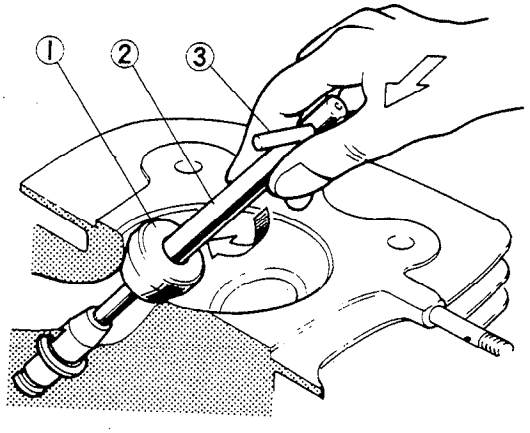
○*Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

4. Setting the valve seat cutter holder carefully in position, operate the cutter with 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

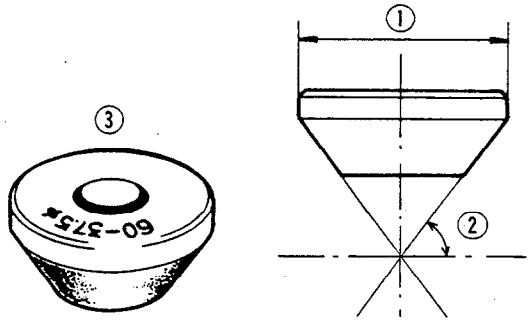
5. After use, clean the cutter with washing oil and apply a thin layer of engine oil before storing.

**Marks Stamped on the Cutter:**

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

| | |
|---|---|
| 60° . . . . . | Cutter angle |
| 37.5 $\phi$ . . . . . | Outer diameter of cutter |

**Cutter**




1. Outer Diameter of Cutter
2. Cutter Angle
3. 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 sink the valve too far into the head which will completely compress the HLA, holding the valve open. The cylinder head must be replaced.**

- Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.

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

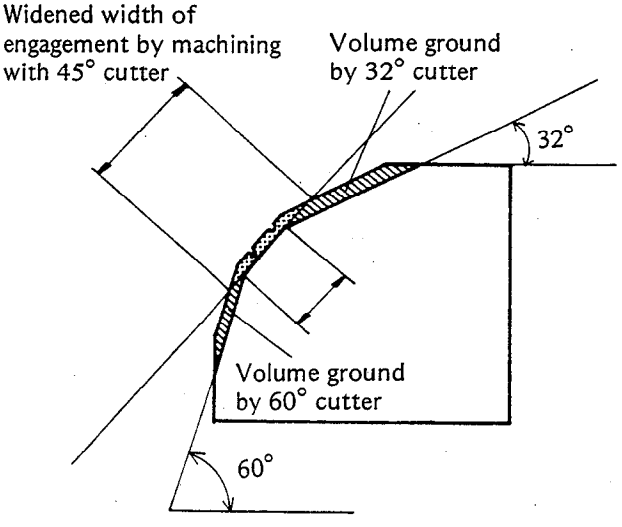
★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.

●Grind the seat at a 32° angle until the seat O.D. is within the specified range.
○To make the 32° grind, fit a 32° cutter to the holder, and slide it into the valve guide.
○Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

CAUTION

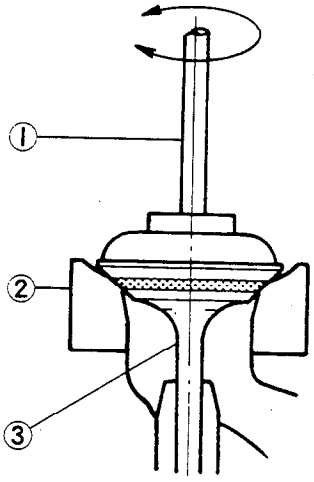
**○The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent over-grinding.**

**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.
○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

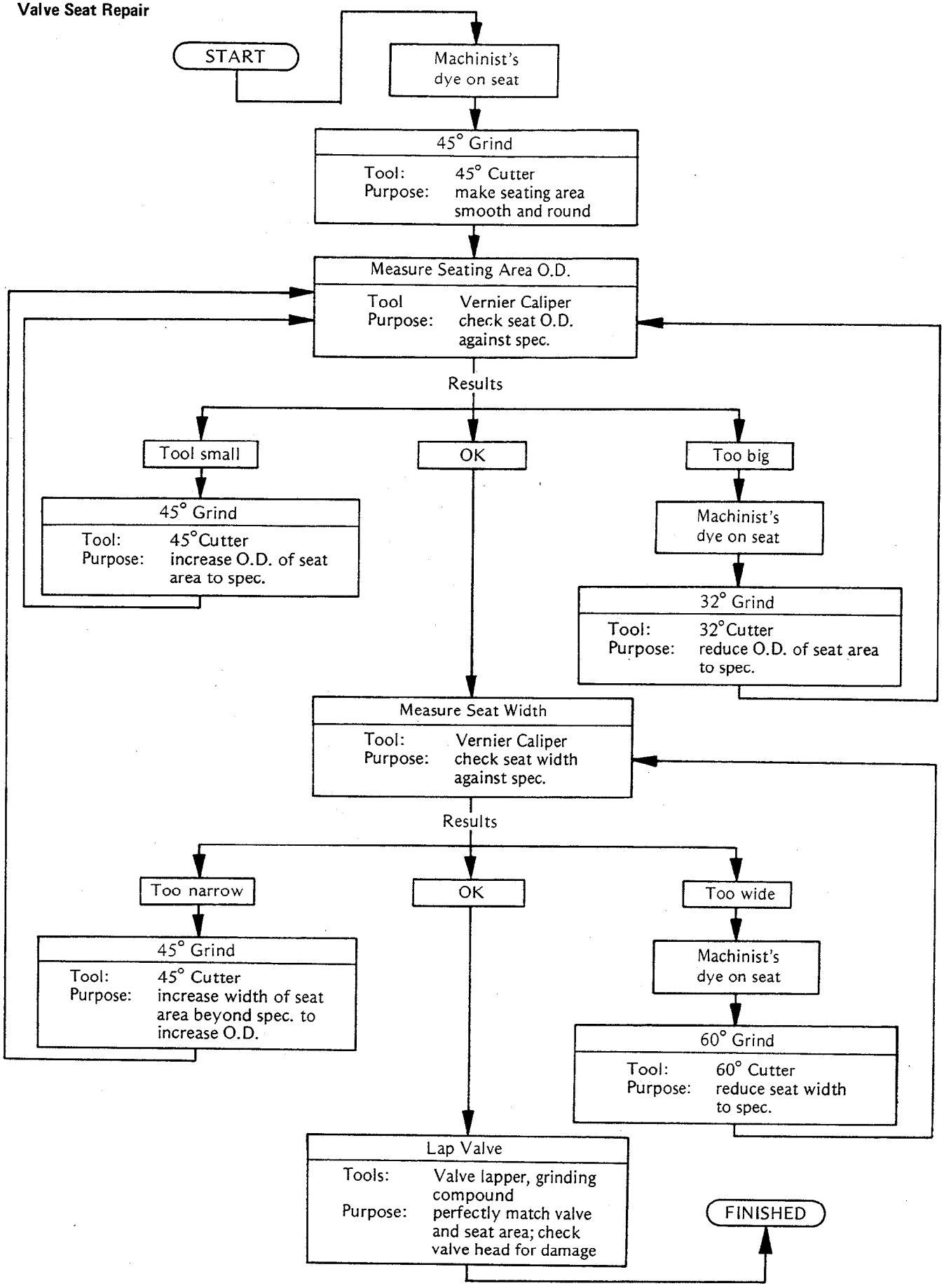
### *Measuring Valve-to-Guide Clearance (Wobble Method)*

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

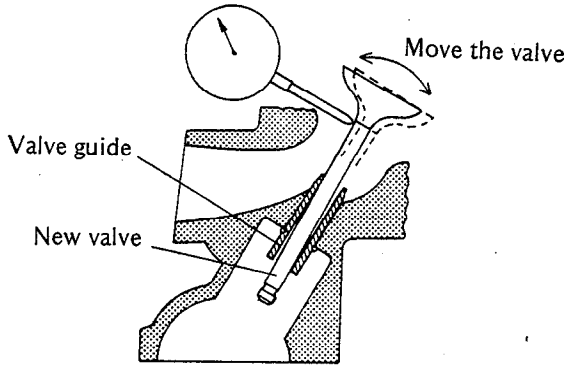
**Valve Seat Repair**



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

| | Standard | Service Limit |
|---|---|---|
| Inlet | 0.02 – 0.08 mm | 0.22 mm |
| Exhaust | 0.07 – 0.13 mm | 0.27 mm |

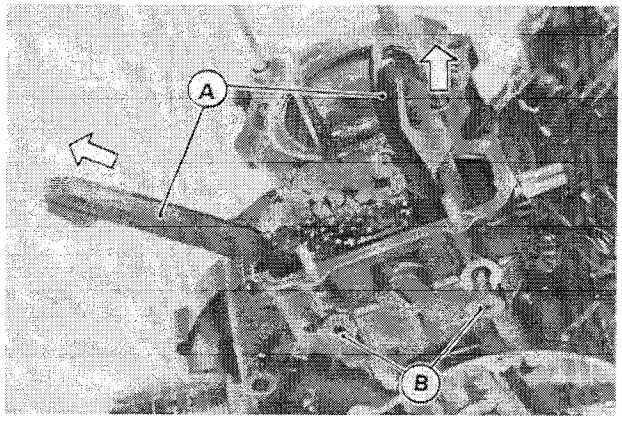
**Wobble Method**




## Cylinder, Piston

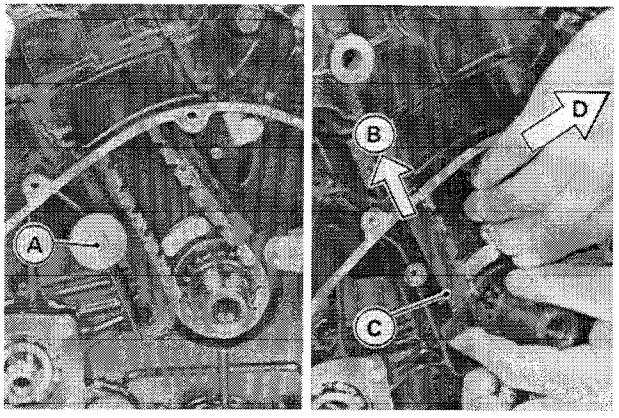
*Front Cylinder Block Removal*

- Remove the cylinder head.
- Remove the alternator.
- Unscrew the mounting bolts to remove the upper chain guides.



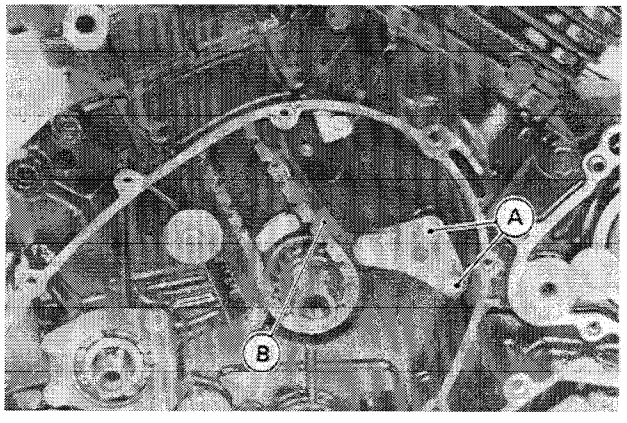

A. Upper Chain Guides B. Bolts

- Unscrew the retainer bolt on the front lower chain guide.
- While pulling the chain to give a play, push up and remove the front lower chain guide.



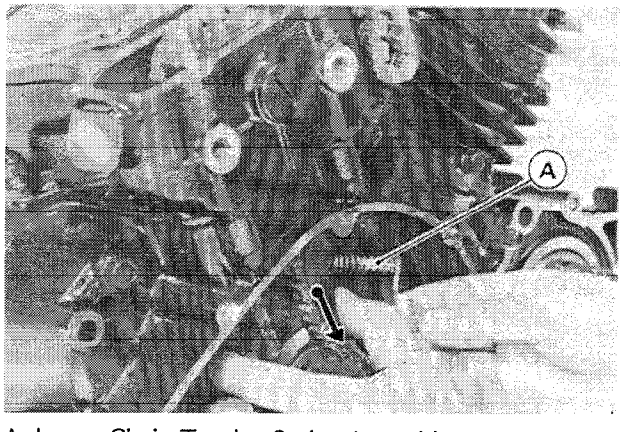

A. Guide Retainer Bolt C. Lower Chain Guide (front)
B. Push up the guide. D. Pull the chain.

- Unscrew the following bolts in order to remove the rear lower chain guide.



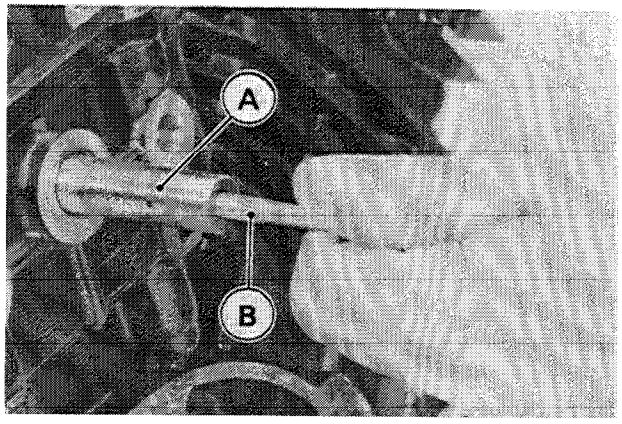

A. Bolts B. Lower Chain Guide (rear)

- Unscrew the mounting bolt to remove the lower chain tension spring assembly.



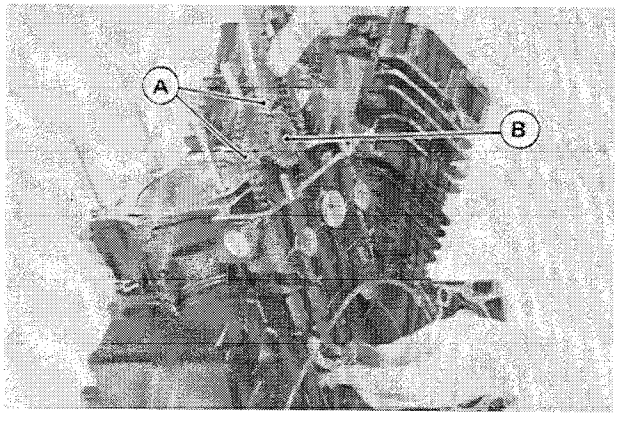

A. Lower Chain Tension Spring Assembly

•Unscrew the mounting bolts and pull down the rear lower chain guide to remove it.
•Pull the idler shaft out using a suitable bolt (φ6 mm x p1.0 mm).



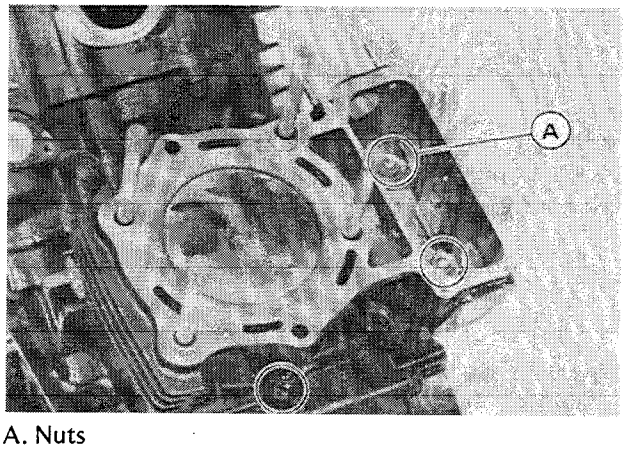

A. Idler Shaft B. Bolt

•After removing the lower camshaft chain from the crankshaft, pull out the upper and lower camshaft chains, and the idler sprocket.




A. Camshaft Chains B. Idler Sprocket

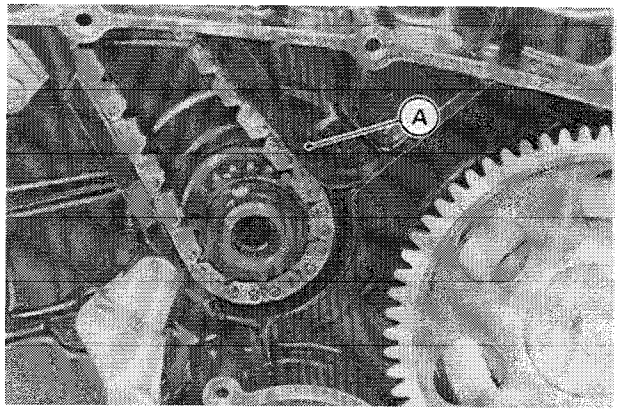
•Unscrew the following nuts to remove the cylinder.




A. Nuts

*Rear Cylinder Block Removal Notes*

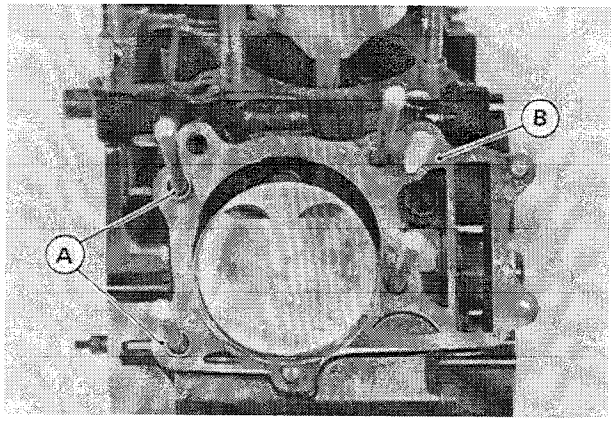
•Remove the rear cylinder block in the same manner as front cylinder block removal, noting the following.
○Remove the clutch gear (see Clutch chapter).
○Remove the primary gear (see Crankshaft Removal in Crankshaft/Transmission chapter).
○The front lower chain guide in the rear cylinder does not have a retainer bolt (as compared with the same part in the front cylinder).




A. Lower Chain Guide (front)

*Cylinder Block Installation Notes*

•Install a new cylinder base gasket. Check that the knock pins (2) are in place.



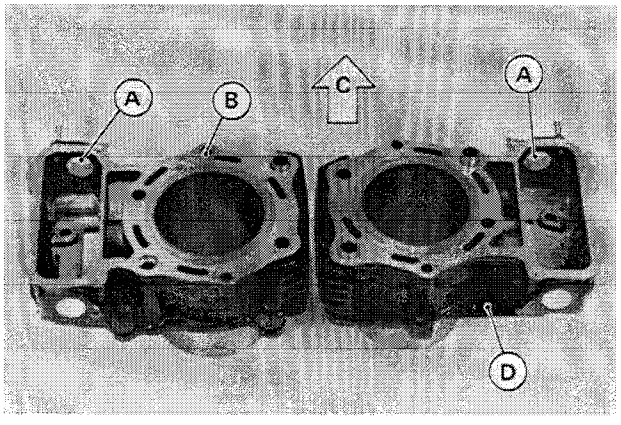

A. Knock Pins B. Gasket

•Apply an engine oil to the cylinder bores and piston skirts.

**NOTE**

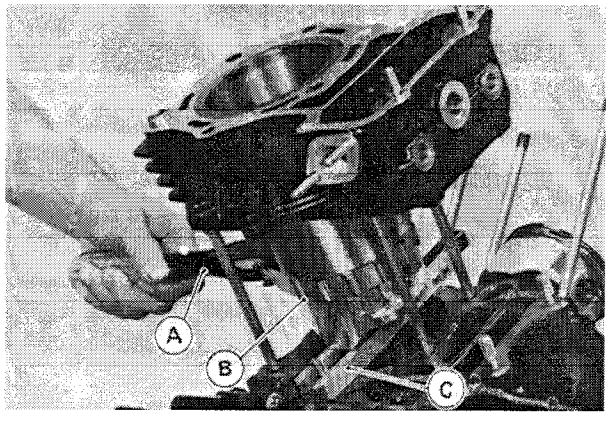
○*The front and rear cylinders have different chain tensioner positions. Be careful not to confuse the cylinders when installing.*

●Install the cylinder with the chain tensioner hole facing toward the rear of the engine.



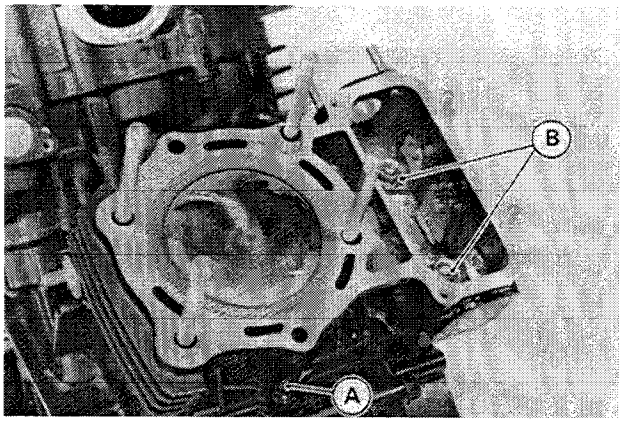

A. Chain Tensioner Holes
B. Rear Cylinder
C. Rear
D. Front Cylinder

●Start with the rear cylinder.
●Slip a piston base (special tool) under the piston to hold it level.
●Compress the piston rings using piston ring compressor assemblies (special tool). This makes installation easier.




A. Piston Ring Compressor Assembly: 57001-1094
B. Use belt ($\phi$67 – 79 mm)
with cut-away side facing up.
C. Piston Base: 57001-341

●Tighten the nuts and cap nut to the specified torque (see Exploded View).

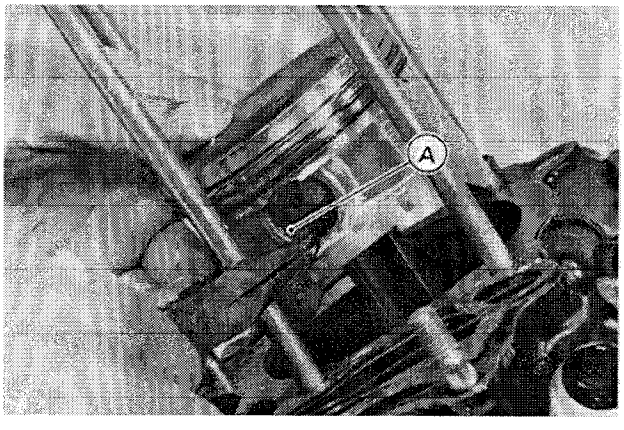



A. Cap Nut
B. Nuts

●While setting the camshaft chain timing, install the camshaft chains and chain guides (see Camshaft Chain Timing).

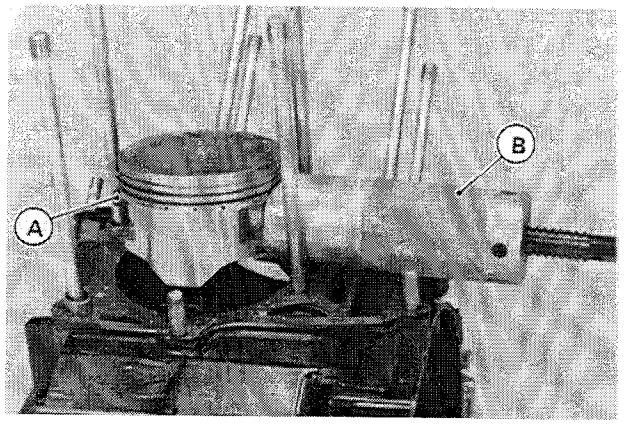
*Piston Removal Notes*

●Remove one piston pin snap ring from each piston.



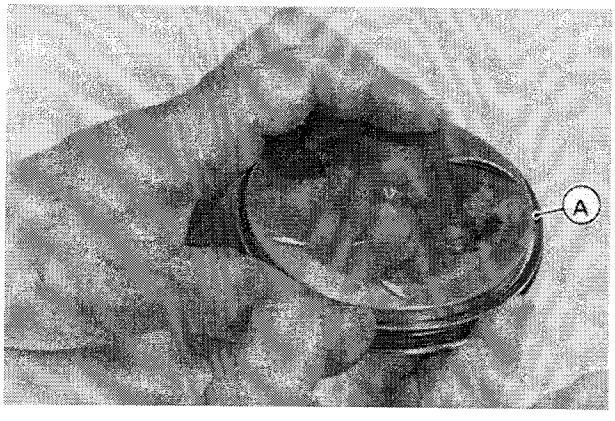

A. Snap Ring

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




A. Piston Pin Puller Adapter
B. Piston Pin Puller Assembly: 57001-910

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

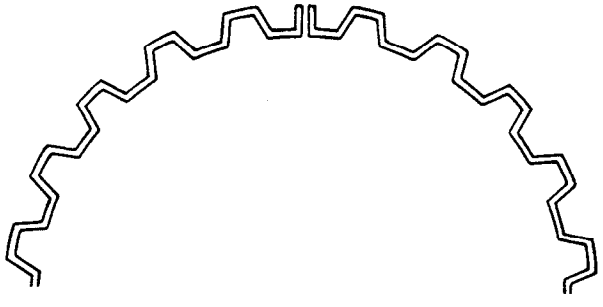



A. Piston Ring

### *Piston Installation Notes*

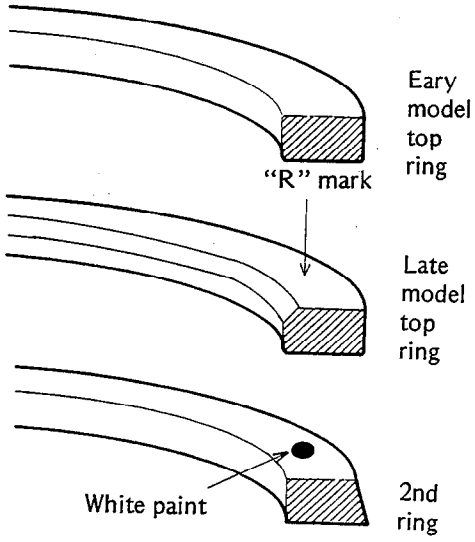
- Oil Ring Installation:
  - First install the expander in the piston oil ring groove so that the expander ends butt together, never overlap.
  - Install the upper and lower steel rails. There is no UP or DOWN to the rails. They can be installed either way.

**Oil Ring Expander Installation**



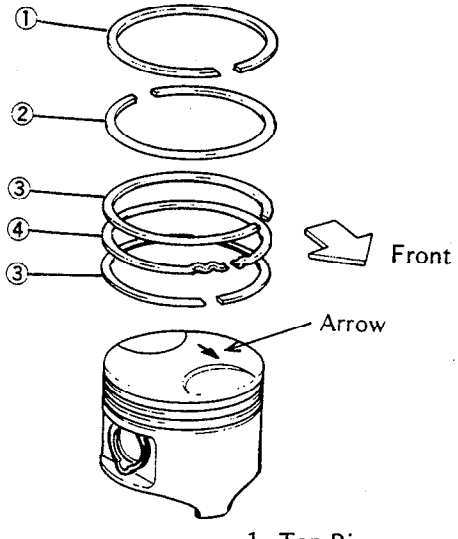
- Do not mix up the second and top rings.
- Early model top ring is rectangular and symmetrical with respect to the horizontal axis: it can be installed either way.
  But late model top ring is not symmetrical.
- Install the late model top ring so that the chamfered side or the marked side faces up.
- The second ring is not symmetrical. Install it so that the marked side faces up.

**Cross Section of Piston Rings**



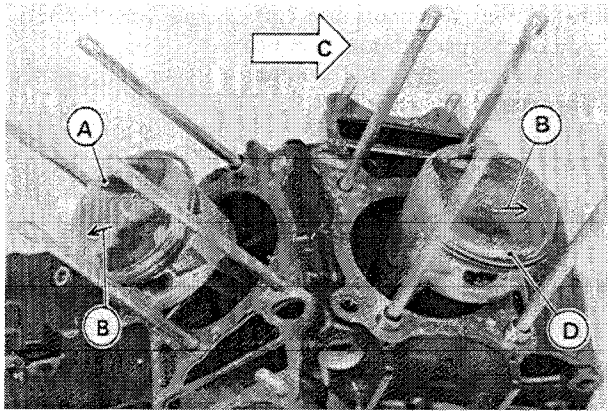

- Position each piston ring so that the opening in the top ring and the oil ring expander openings are facing toward the exhaust side, and the second ring opening faces toward the inlet side.
- The openings of the oil ring steel rails must be about 30 – 45° to either side of the top ring opening.

**Piston Ring Openings**
**:Viewed from Exhaust side**




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

•The arrow on the top of the front piston must point toward front and the arrow on the rear piston must point toward rear.




A. Rear Piston
B. Arrows
C. Front
D. Front Piston

**CAUTION**

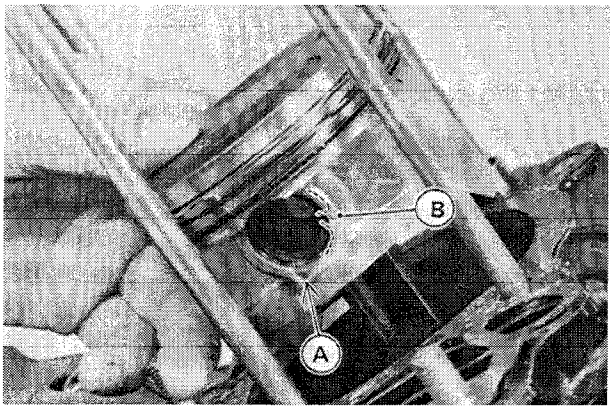
○**Incorrect installation of the pistons could cause piston breakage and result in severe engine damage.**

•When installing a piston pin snap ring, compress it only enough to install it and no more.

**CAUTION**

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

•Fit a new piston pin snap ring into the side of the piston so that the ring opening does not coincide with the notches in the piston pin hole.



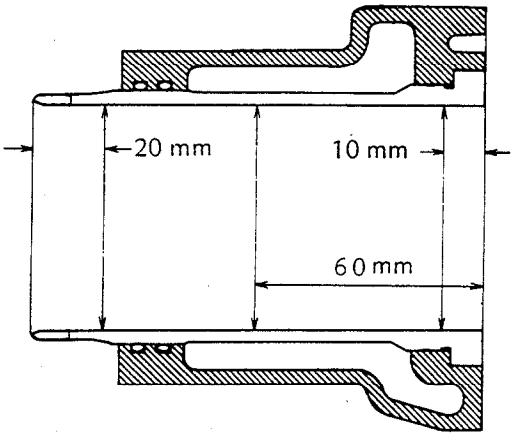

A. Notch
B. Ring Opening

### *Cylinder Inside Diameter*

•Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the 3 locations (total of 6 measurements) shown in the figure.

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

**Cylinder Inside Diameter Measurement**




**Cylinder Inside Diameter**

**Standard:** **82.000 – 82.012 mm (VN700) or 84.900 – 84.912 mm (VN750) and less than 0.01 mm difference between any two measurement**

**Service Limit:** **82.1 mm (VN700), 85.0 mm (VN750) or more then 0.05 mm difference between any two measurements**

### *Cylinder Boring, Honing*

When boring and honing a cylinder, note the following:

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

**Oversize Pistons and Rings**

| | |
|---|---|
| **0.5 mm** | **First Oversize** |
| **1.0 mm** | **Second Oversize** |

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

○Cylinder inside diameter must not vary more than **0.01 mm** at any point.
○Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.
○In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus **0.1 mm** and the service limit for the piston is the oversize piston original diameter minus **0.15 mm**. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

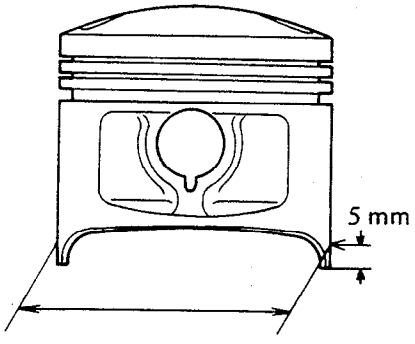
### *Piston Diameter Measurement*

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

**Piston Diameter**

**Standard: 81.942 – 81.957 mm (VN700), 84.842 – 84.857 mm (VN750)**
**Service Limit: 81.8 mm (VN700), 84.7 mm (VN750)**

**Piston Diameter Measurement**

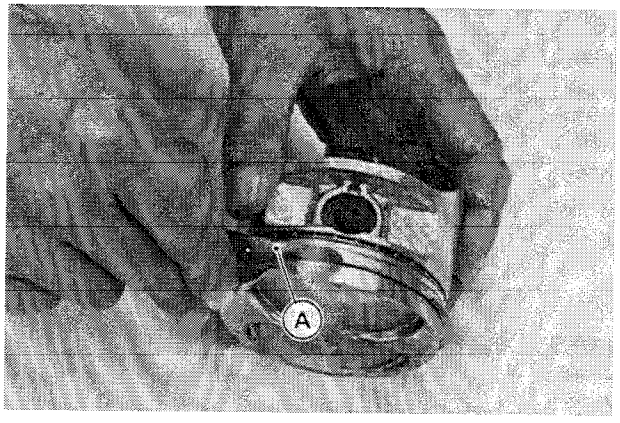



### *Piston Ring, Piston Ring Groove Wear*

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

**Piston Ring Groove Clearance**

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




A. Thickness Gauge

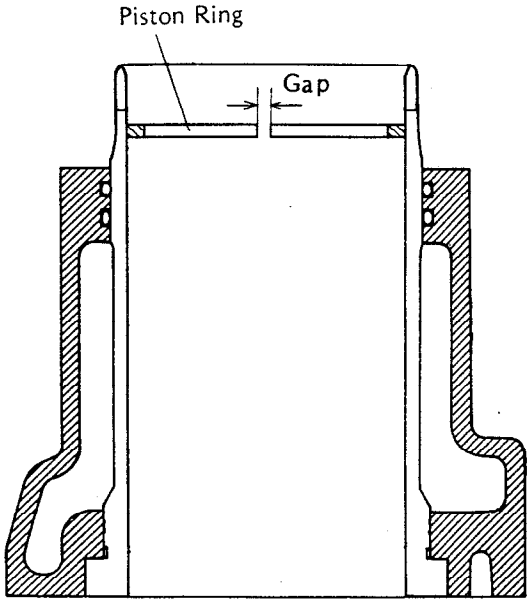
### *Piston Ring End Gap*

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

**Piston Ring End Gap**

| | Standard | Service Limit |
|---|---|---|
| **Top** | **0.25 – 0.45 mm** | **0.75 mm** |
| **Second** | **0.25 – 0.45 mm** | **0.75 mm** |

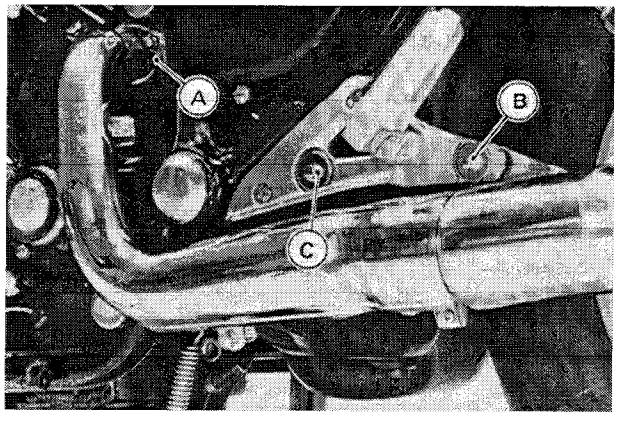
**End Gap Measurement**




## Exhaust System

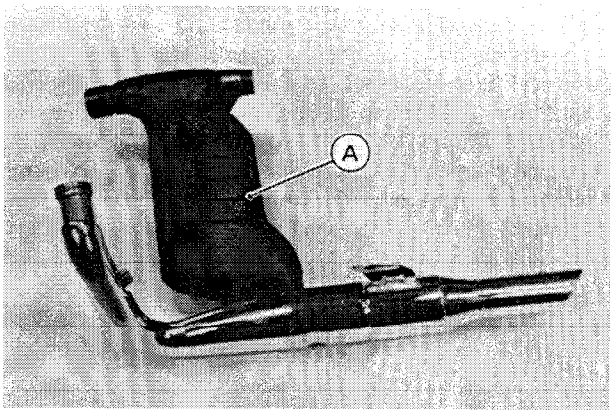
### *Muffler Assembly Removal*

- Remove the right exhaust pipe.
- Remove the right muffler from the power chamber.
- Remove the left exhaust pipe holders. Do not remove the muffler cover.
- Unscrew the left muffler mounting bolt, nut and power chamber mounting bolt.




A. Exhaust Pipe Holders
B. Muffler Mounting Bolt and Nut
C. Power Chamber Mounting Bolt

- Drop off the muffler assembly.



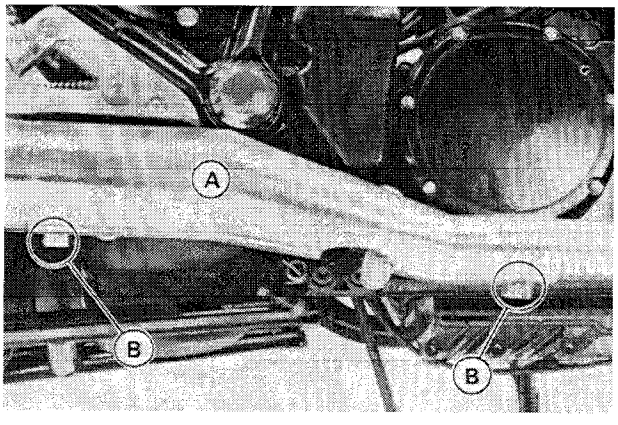

A. Muffler Assembly

### *Muffler Assembly Installation Notes*

- Tighten the muffler mounting bolts, nuts, and clamp bolts in the order and method indicated below.
  - First, tighten all the bolts and nuts to a snug fit.
  - Next, tighten the exhaust pipe holder nuts evenly to avoid exhaust leaks.
  - Finally, 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.

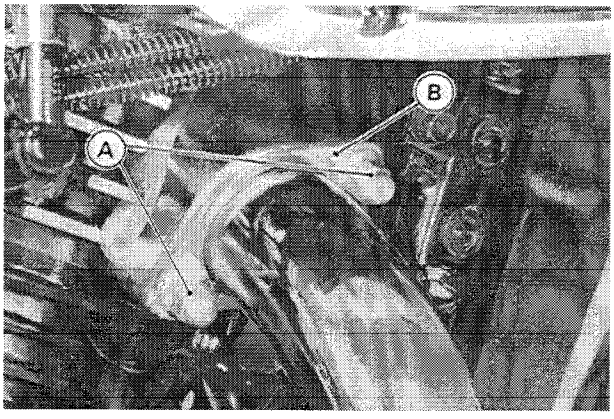
### *Right Exhaust Pipe Removal*

- Remove the muffler cover and clamps by taking out the screws.



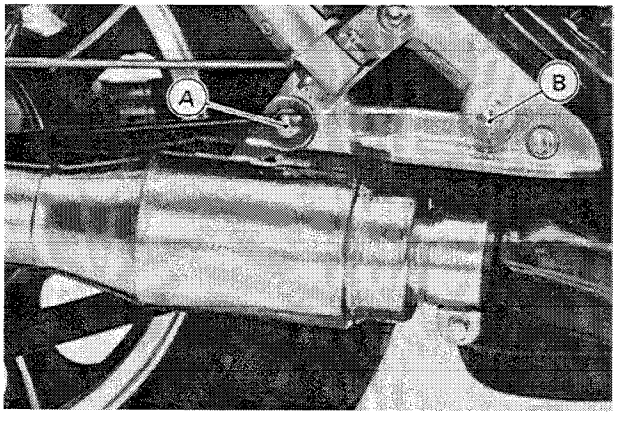

A. Muffler Cover B. Screws

●Unscrew the exhaust pipe holder nuts to remove the holder cover.



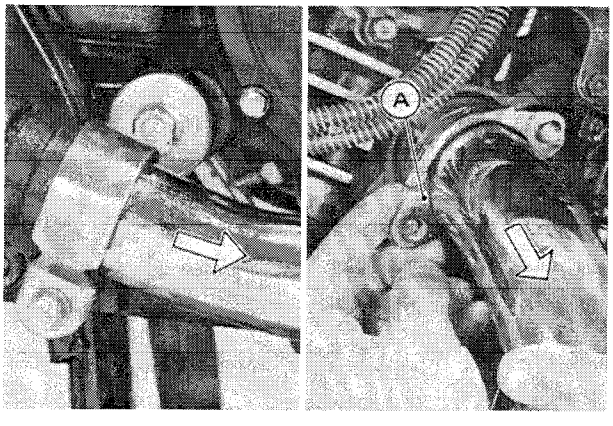

A. Nuts B. Cover

●Remove the muffler mounting bolt, nut and chamber mounting bolt for easy removal of the exhaust pipe.




A. Muffler Mounting Bolt and Nut
B. Chamber Mounting Bolt

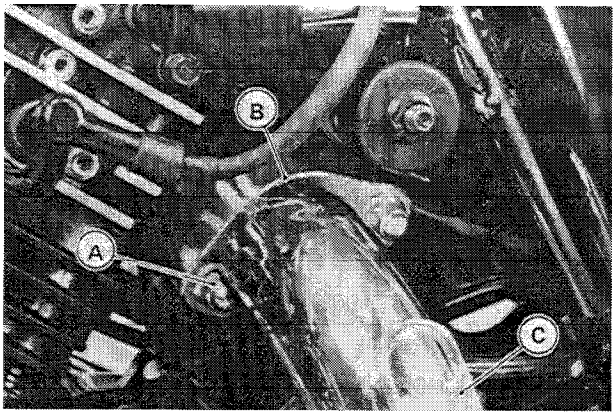
●Loosen the clamp bolt and pull the lower end of the exhaust pipe out of the muffler. Simultaneously, remove the exhaust pipe holders while pulling the exhaust pipe outward.



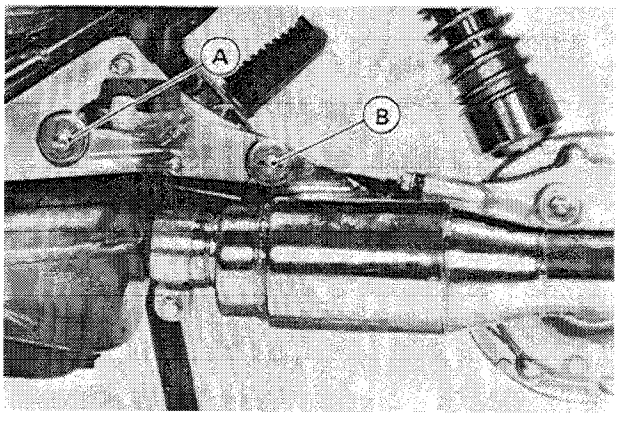

A. Holders

### *Left Exhaust Pipe Removal*

●Remove the left exhaust pipe in the same manner as the right exhaust pipe.



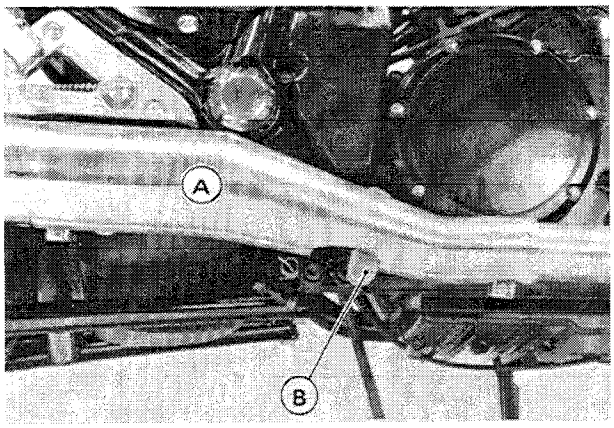

A. Exhaust Pipe Mounting Nuts
B. Cover
C. Muffler Cover




A. Chamber Mounting Bolt
B. Muffler Mounting Bolt and Nut

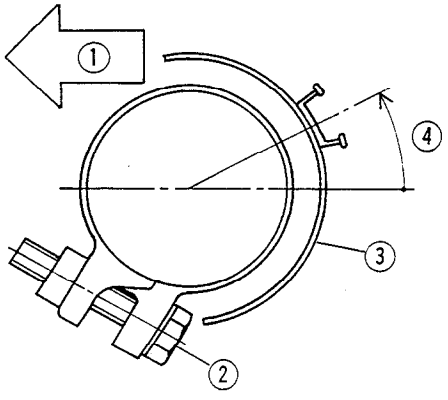
### *Exhaust Pipe Installation Notes*

●Check the gasket at the power chamber connection. If a gasket is damaged, replace it.
●Install the power chamber clamp bolts as shown so that they do not touch the muffler cover.



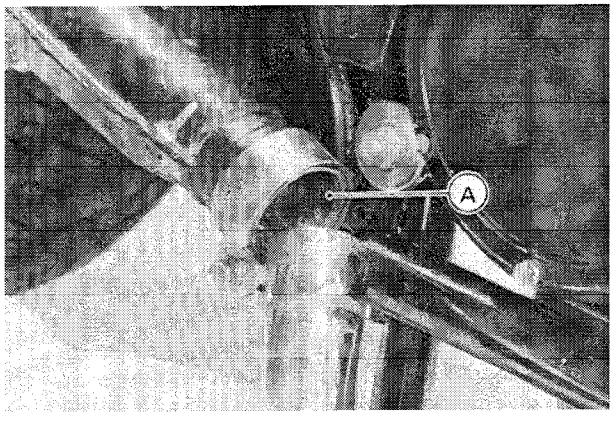

A. Muffler Cover B. Clamp Bolt

**Muffler Cover Installation**



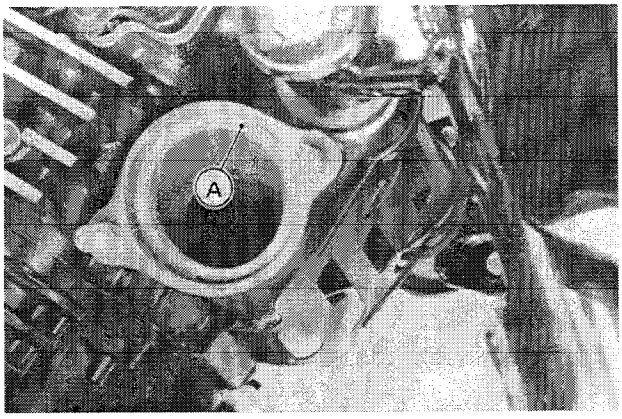

1. Inside
2. Clamp Bolt
3. Muffler Cover
4. 15°

•After inserting the gasket into the muffler, tighten the clamp bolt lightly and push the end of the exhaust pipe into the gasket.



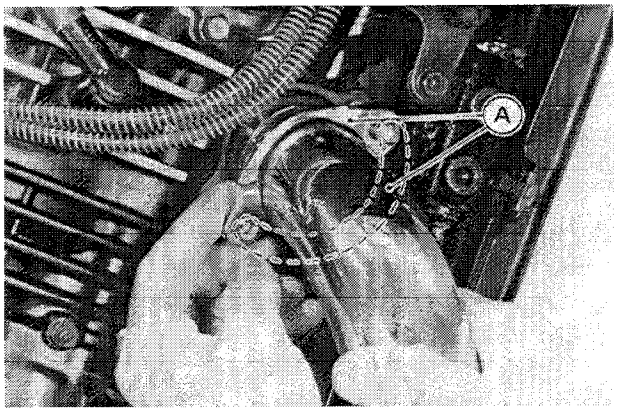

A. Gasket

•Check the gasket at the exhaust holder and replace it if damaged.




A. Gasket

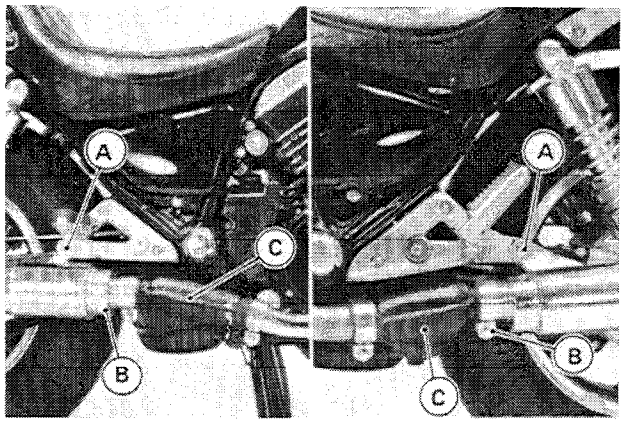
•Install the lower holder first, and then the upper holder with the round edge facing out.




A. Holders

*Muffler Removal Notes*

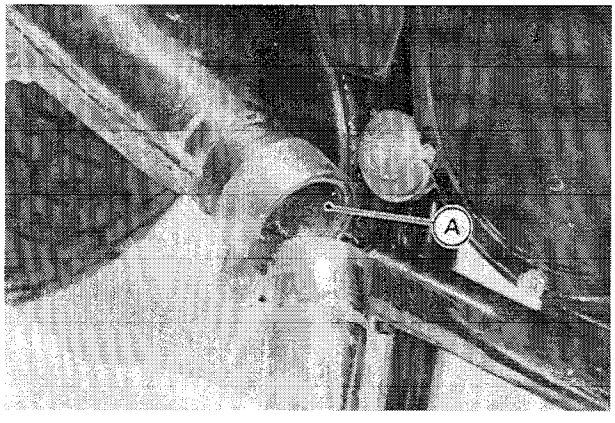
•Remove the muffler cover and clamps by taking out the screws.
•Unscrew the mounting bolt and nut from the foot peg bracket.
•Loosen the clamp bolt and pull the muffler out of the power chamber.




A. Mounting Bolt and Nut
B. Clamp Bolt
C. Power Chamber

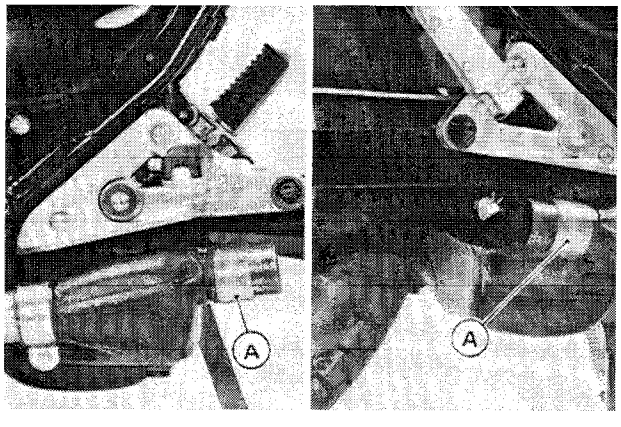
### *Muffler Installation Notes*

- Check the gasket at the chamber connection and replace it if damaged.




A. Gasket

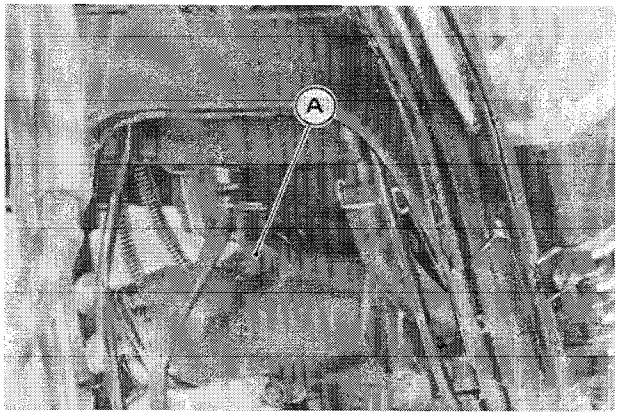
- After inserting the gasket into the power chamber, push in the muffler and secure the clamp.




A. Gaskets

### *Front Exhaust Manifold Removal*

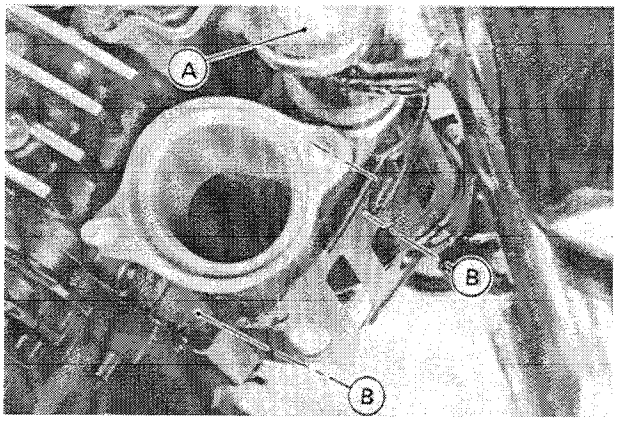
- Remove the radiator (see Radiator Removal in Cooling System chapter).
- Remove the right exhaust pipe (see Right Exhaust Pipe Removal).
- Unscrew the mounting nuts to remove the front exhaust manifold.




A. Cap Nuts (4)

### *Rear Exhaust Manifold Removal*

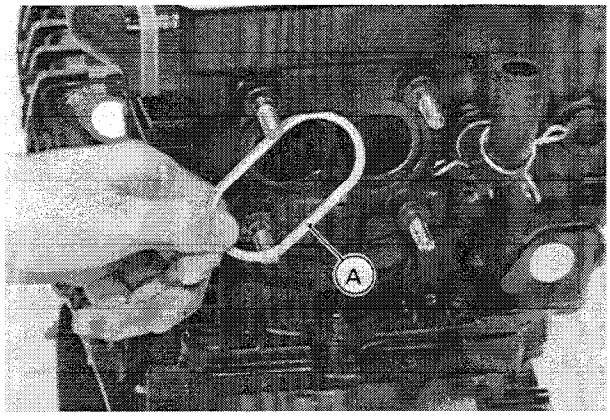
- Remove the left exhaust pipe.
- Remove the rear engine mounting bolt and nut.
- Unscrew the mounting nuts to remove the rear exhaust manifold along with the heat guard.




A. Engine Mounting Bolt and Nut
B. Cap Nuts

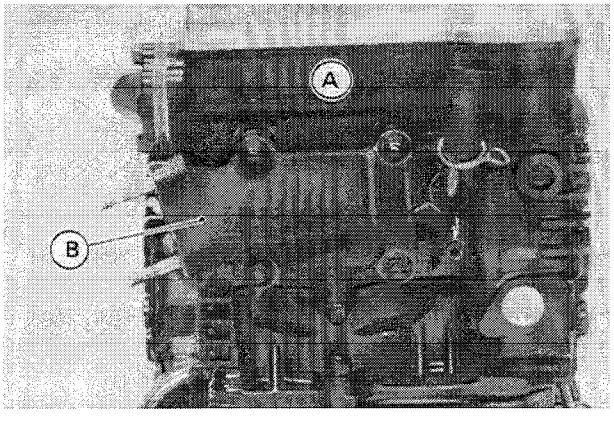
### *Exhaust Manifold Installation*

- Check the gasket at each exhaust manifold, and replace it if damaged.



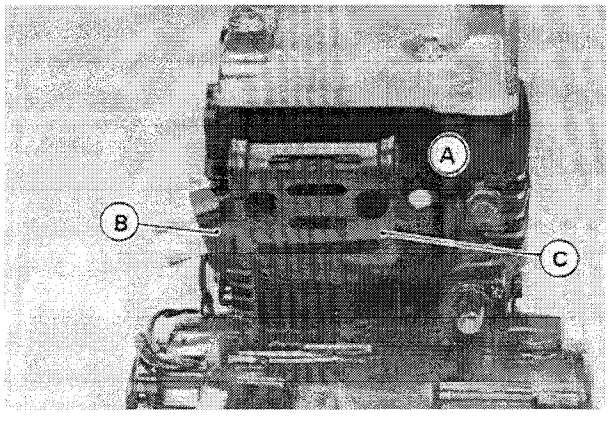

A. Exhaust Manifold Gasket

●Install each exhaust manifold as shown.




A. Front Cylinder Head B. Front Manifold

○The rear manifold has a heat guard plate.




A. Rear Cylinder Head
B. Rear Manifold
C. Heat Guard Plate

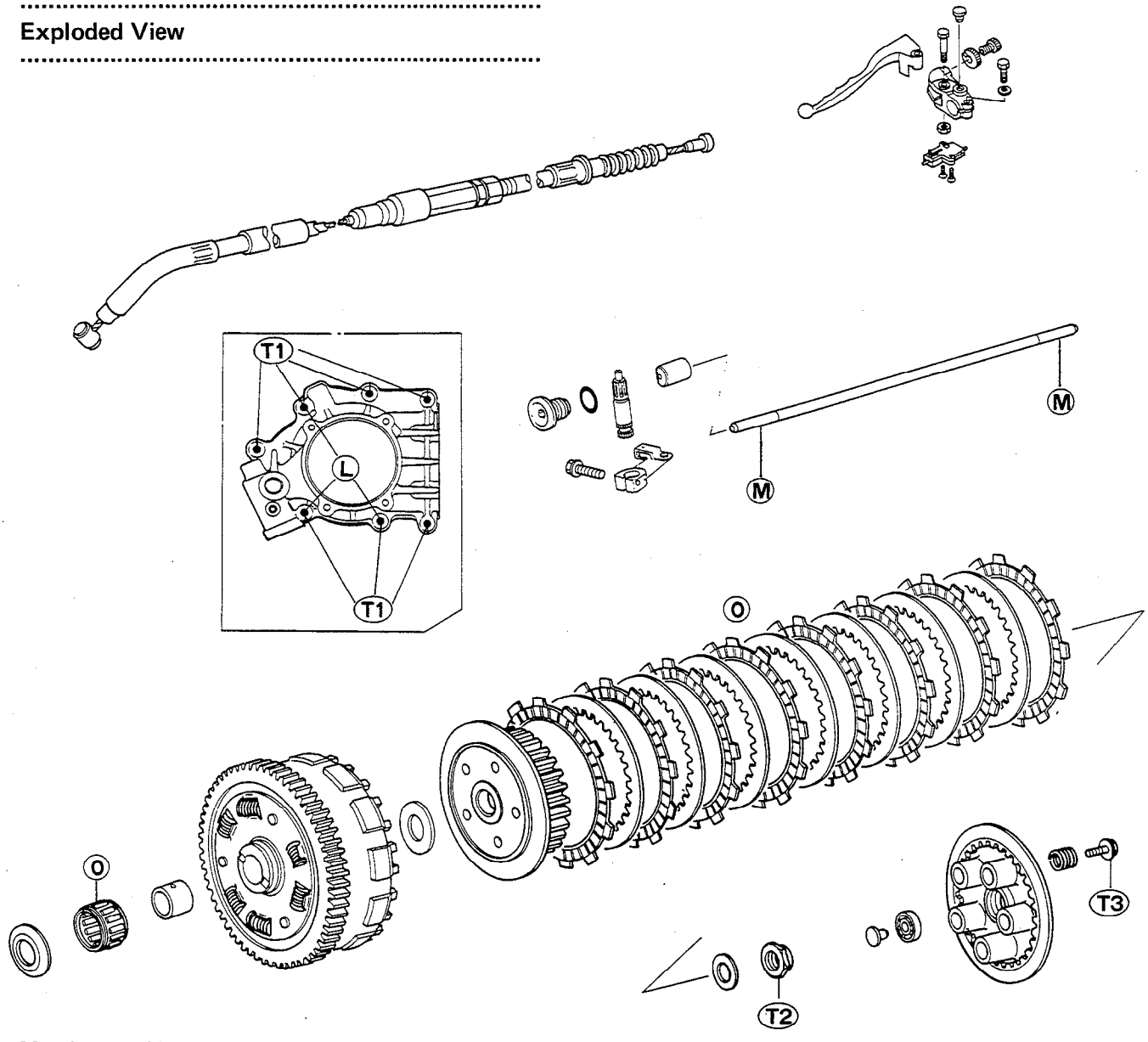
●Tighten the mounting nuts evenly to the specified torque (see Exploded View).
●Tighten the rear engine mounting nut to the specified torque (see Exploded View in Engine Removal/Installation chapter).

# Clutch

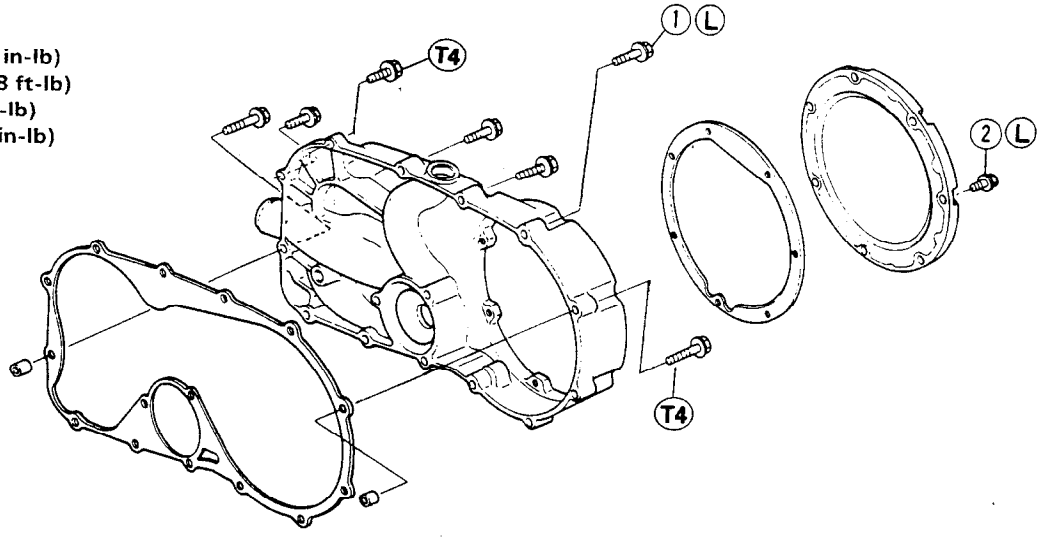


## Table of Contents

## Exploded View




M: Apply a thin coat of molybdenum disulfide grease.
L: Apply a non-permanent locking agent to the threads.
1: Bolt, 6 × 30
2: Bolt, 6 × 16
T1: 12 N-m (1.2 kg-m, 104 in-lb)
T2: 130 N-m (13.5 kg-m, 98 ft-lb)
T3: 9 N-m (0.9 kg-m, 78 in-lb)
T4: 9.8 N-m (1.0 kg-m, 87 in-lb)



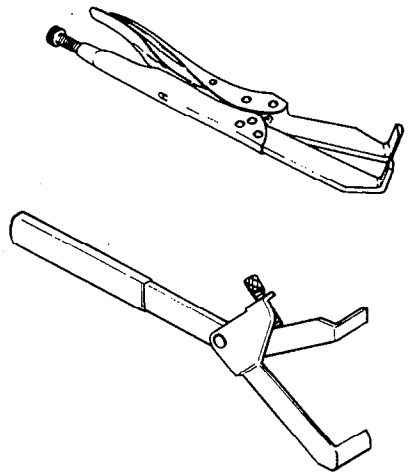
## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| **Clutch:** | | |
| Clutch lever play | 2 – 3 mm | – – – |
| Clutch spring free length | 33 – 34.2 mm | 32.6 mm |
| Friction plate thickness | 2.9 – 3.1 mm | 2.8 mm |
| Friction and steel plate warp | not more than 0.2 mm | 0.3 mm |

## Special Tools

**Oil Seal Guide: 57001-261**

**Clutch Holder: 57001-305, or 57001-1243**



## Clutch

### *Clutch Lever Play Adjustment*

Clutch cable stretch causes the clutch lever to develop excessive play. Too much play will prevent complete disengagement and may result in shifting difficulty and possible clutch and transmission damage. Most of the play must be adjusted out, but small amount must remain so that the clutch release lever will function properly.

Clutch plate wear also causes the clutch to go out of adjustment. This wear causes the play between the push rod and the rack to gradually diminish until the push rod touches the rack. When this play is lost, the clutch will not engage fully, causing the clutch to slip.

**NOTE**

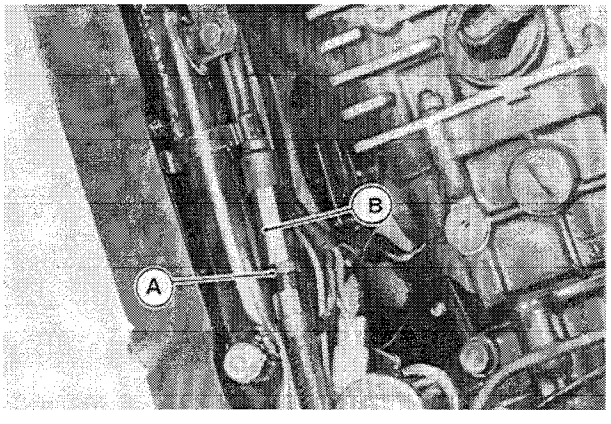
○*Even though the proper amount of play exists at the clutch lever, clutch lever play alone cannot be used to determine whether or not the clutch requires adjustment.*

The following adjustment procedure compensates for both cable stretch and plate wear.

**WARNING**

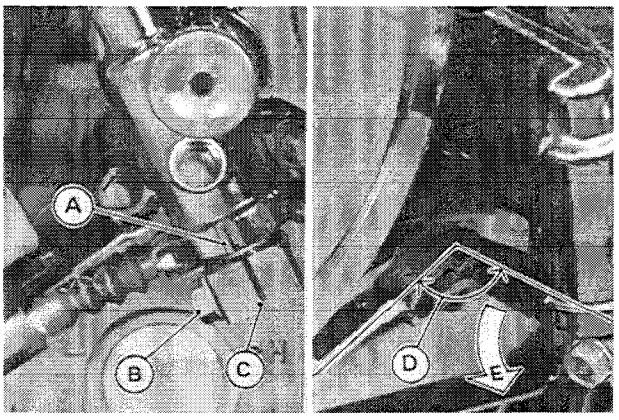
○**To avoid a serious burn, never touch a hot engine or exhaust pipe during clutch adjustment.**

●Turn in fully the locknut and adjusting nut at the center of the clutch cable to give the cable plenty of play.




A. Locknut B. Adjuster

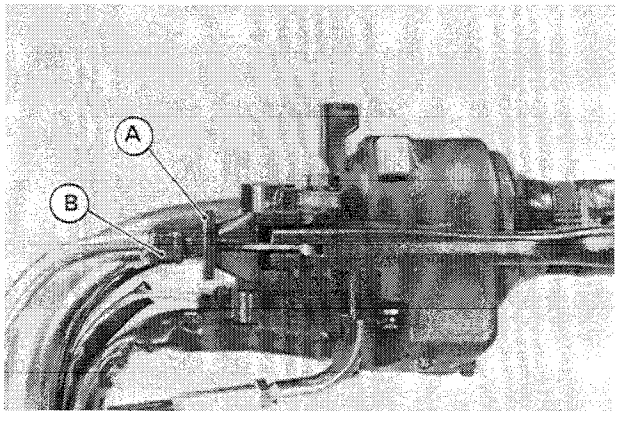
●Turn the clutch release lever until it becomes hard to turn. This is the point where the clutch is just starting to release. Check that the gap in the clutch release lever is directly below the rib on the front bevel gear case boss.




A. Rib
B. Bolt
C. Gap
D. 70 – 80°
E. Turn the clutch lever.

●Otherwise, remove the clutch release lever bolt, and remount the clutch release lever at a new position on the shaft to obtain the proper alignment. In this position the angle between the cable and the lever should be 70 to 80°.

●Loosen the knurled locknut at the clutch lever just enough so that the adjuster will turn freely, and then turn the adjuster to make a 5 – 6 mm gap between the adjuster and locknut.



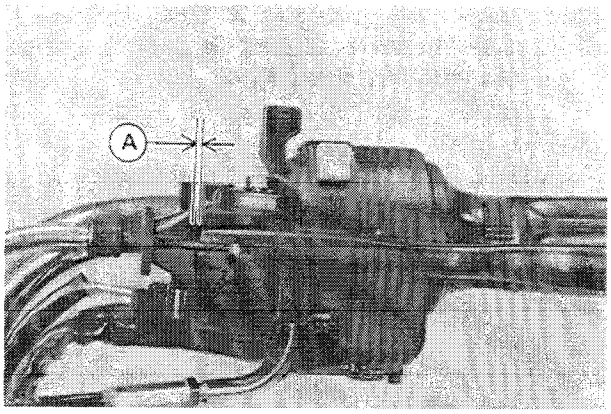

A. Locknut B. Adjuster

●Take up all the cable play with the adjusting nut at the center of the cable, and then tighten the locknut.

**WARNING**

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

●Turn the adjuster at the clutch lever so that the clutch lever will have **2 – 3 mm** of play, and tighten the knurled locknut.

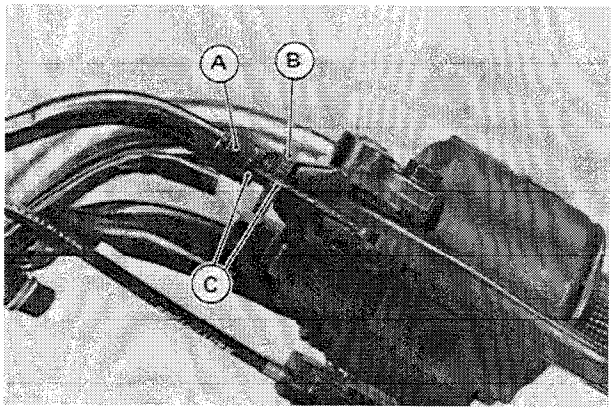



A. Free Play

**Clutch Lever Free Play**
**2 to 3 mm**

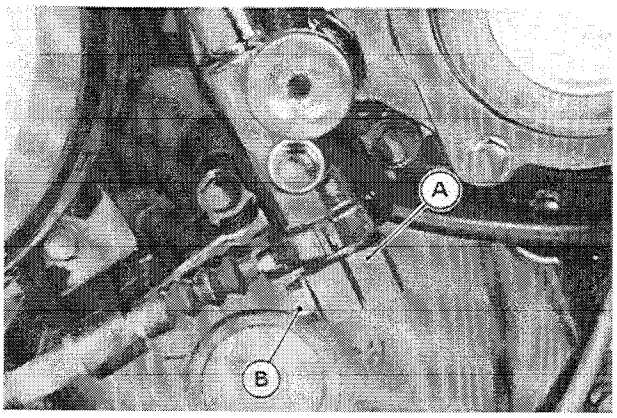
### *Clutch Cable Removal*

- At the middle of the clutch cable, loosen the locknut and screw in the adjuster to give the cable plenty of play.
- Loosen the knurled locknut at the clutch lever, and screw in the adjuster.
- Line up the slots in the clutch lever, knurled locknut, and adjuster, and then free the cable from the lever.



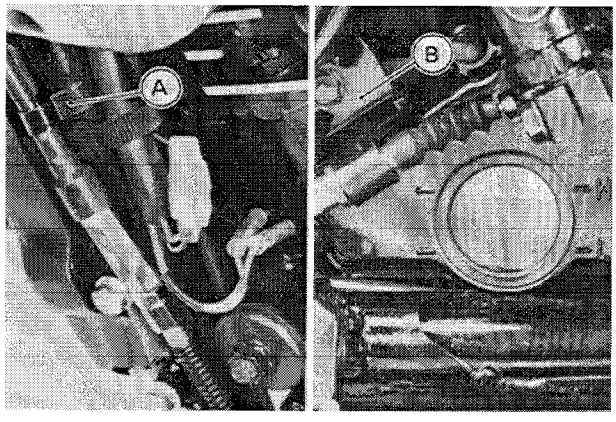

A. Adjuster
B. Knurled Locknut
C. Slot

- Unscrew the lever bolt to remove the clutch release lever.




A. Clutch Release Lever B. Lever Bolt

- Free the clutch inner cable tip from the clutch release lever.
- Remove the clutch cable bracket.
- Pry off the clutch cable clamp to pull out the cable.



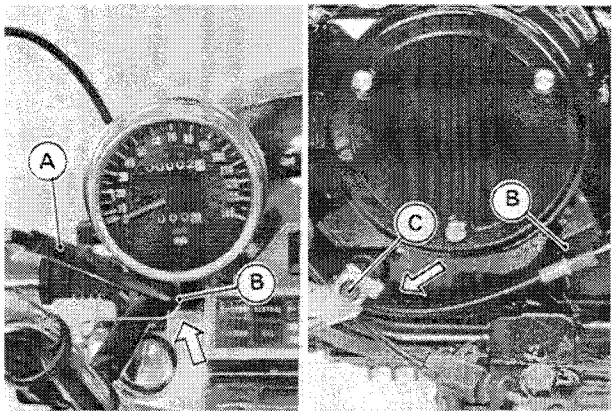

A. Clutch Cable Clamp B. Clutch Cable Bracket

### *Clutch Cable Installation*

- Run the clutch cable as shown.
  - Route the cable under the shift shaft.
  - Secure the cable with the clamps.

**WARNING**

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

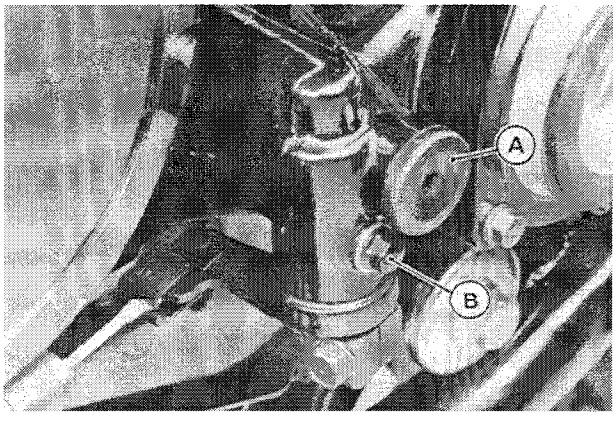



A. Clutch Cable
B. Clamps
C. Shift Shaft

### *Clutch Release Removal*

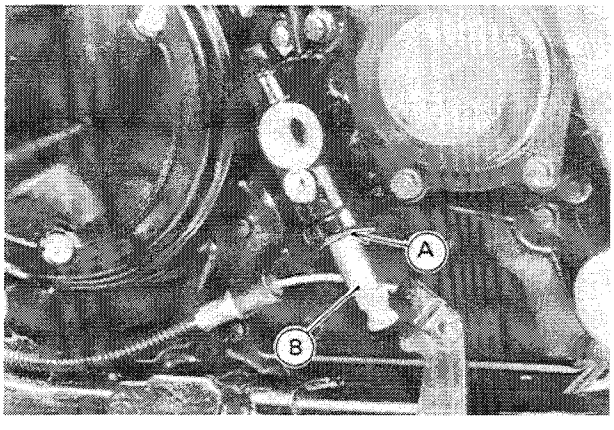
If necessary, remove the clutch release as follows.

- Situate the motorcycle on its center stand to keep engine oil loss to a minimum. Place an oil pan beneath the front bevel gear case.
- Free the clutch inner cable tip from the clutch release lever (see Clutch Removal).
- Unscrew the plastic plug and the guide bolt.



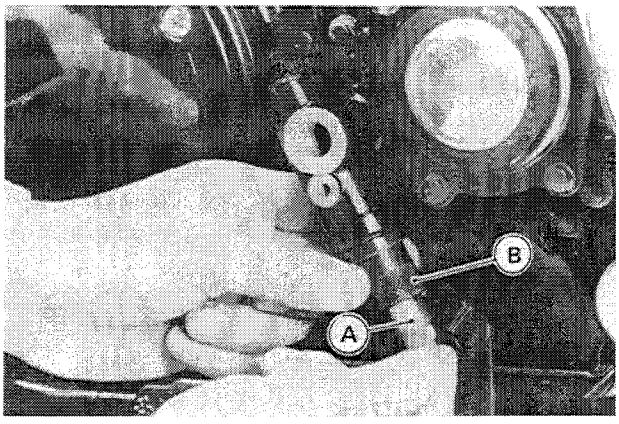

A. Plug
B. Guide Bolt

- Pull the release shaft lightly until it stops at the oil seal lip.




A. Oil Seal
B. Release Shaft

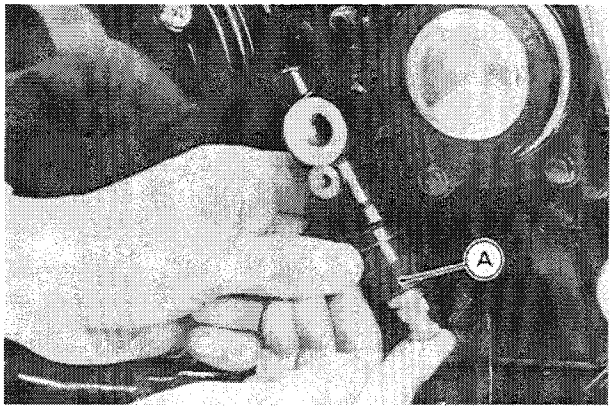
- Insert the oil seal guide (special tool) in the release shaft oil seal to protect the seal lip, and then pull out the shaft along with the seal guide.




A. Release Shaft
B. Oil Seal Guide: 57001-261

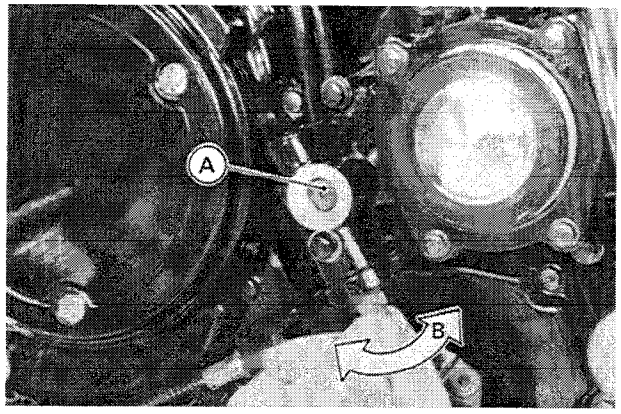
### *Clutch Release Installation Notes*

- Install the clutch release shaft using the oil seal guide (special tool).
- Install the guide bolt. Replace the aluminum gasket with a new one, if it is damaged.



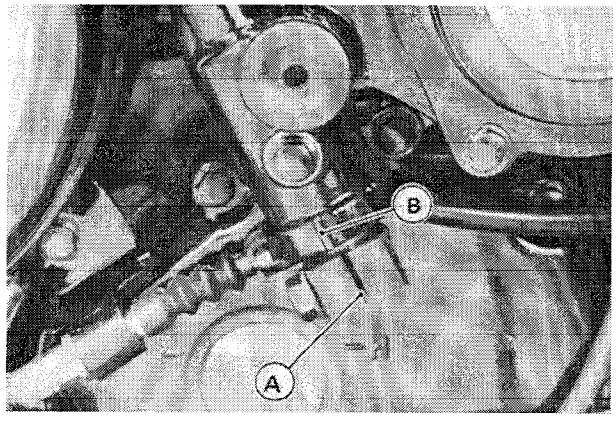

A. Oil Seal Guide: 57001-261

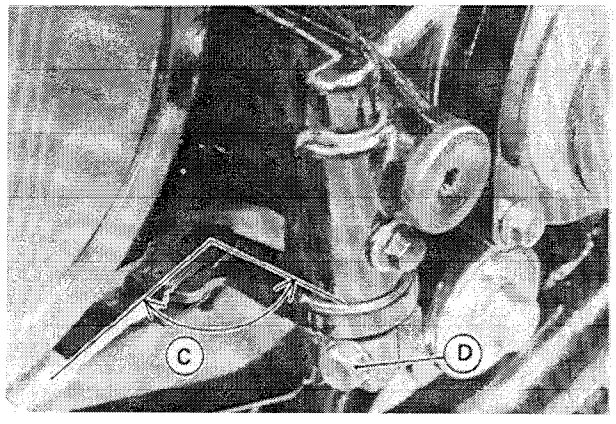
- Insert the release rack and check that the rack engages with the release shaft by hand turning the shaft.




A. Release Rack B. Turn the shaft

•With the inner cable tip inserted on the lever and with the lever shaft turned fully clockwise, install the lever on the shaft so that the gap in the lever is aligned with the rib on the case.
○In this position, the lever makes a 70 – 80° angle with the clutch cable.
•Tighten the lever mounting bolt.




A. Release Lever Gap C. 70 – 80°
B. Rib D. Bolt

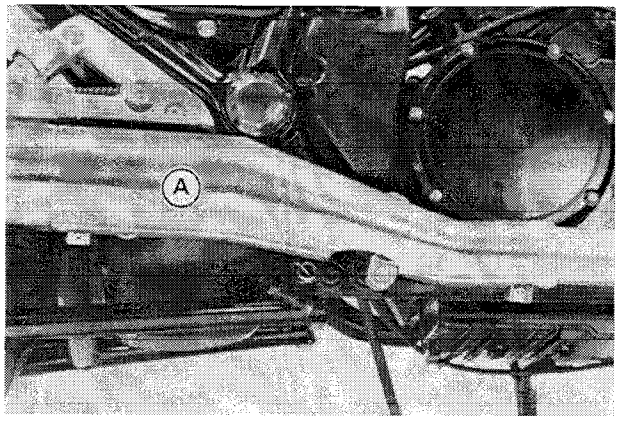
•Adjust the clutch lever play (see Clutch Lever Play Adjustment).
•Check the engine oil level and add oil if necessary (see Oil Level Inspection in Engine Lubrication System).

### *Clutch Plates/Clutch Hub Removal*

**NOTE**

○*Remove only the clutch cover for the clutch plate and clutch hub removal.*

•Support the motorcycle on its side stand to keep engine oil loss to a minimum. Place an oil pan beneath the clutch cover.
•Remove the muffler cover by taking off the mounting screws.

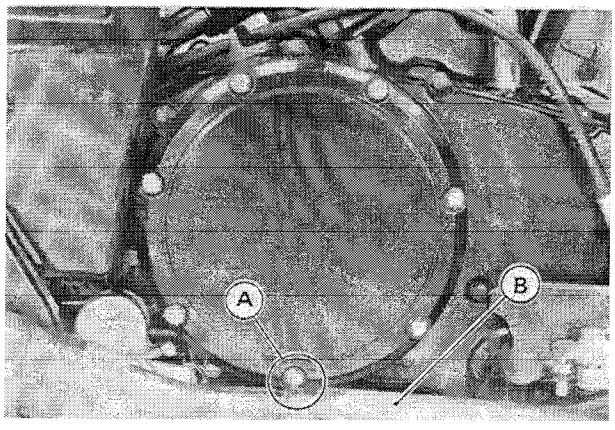



A. Muffler Cover

•Remove the clutch cover bolts.

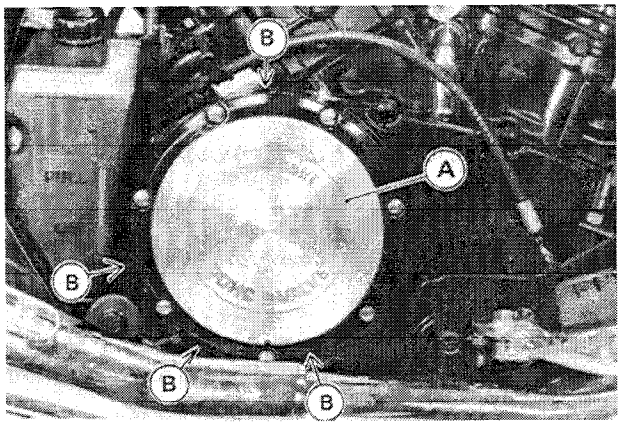
**NOTE**

○*To remove the bottom cover bolt do not use a socket wrench, only a wrench to prevent bolt damage.*



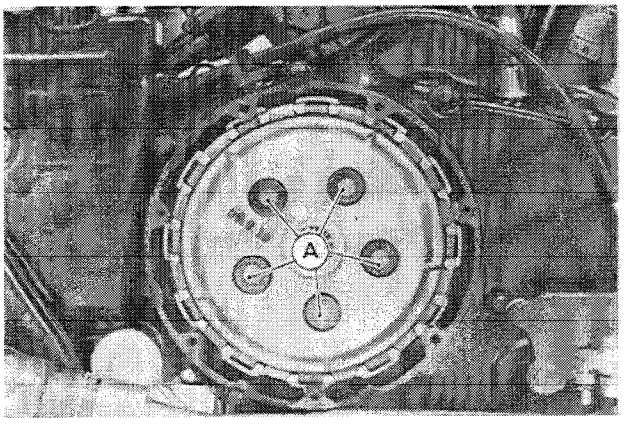

A. Cover Bolt at the bottom B. Exhaust Pipe

•Pry off the clutch cover with a thick-bladed screwdriver.



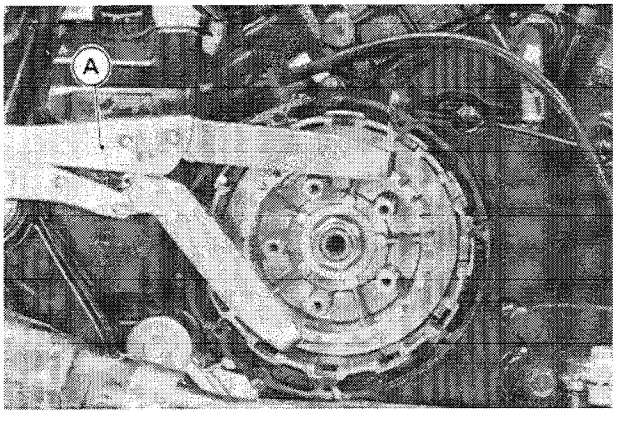

A. Clutch Cover B. Pry Points (4)

•Remove the clutch spring bolts, washers and springs.
•Remove the friction plates and steel plates.




A. Clutch Spring Bolts

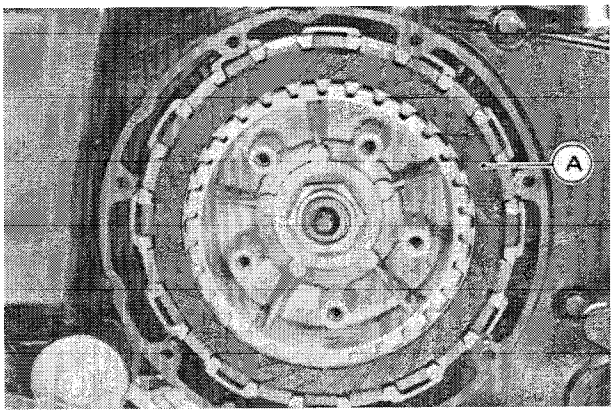
•Pull out the clutch push rod.
•When loosening the clutch hub self-locking nut, use the holder (special tool) to keep the clutch hub from turning as shown.
○Turn the wrench counterclockwise slowly.




A. Clutch Holder: 57001-305 or 57001-1243

**Early Model**

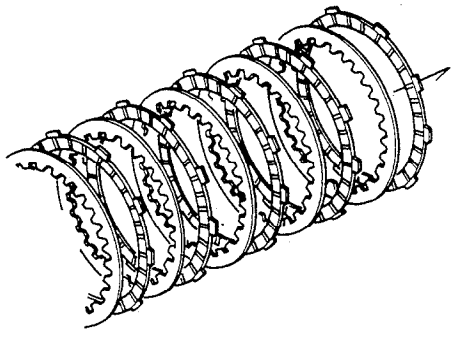
○The grooves on the friction plate surfaces are cut tangentially and radially. Install the friction plates so that the grooves run toward the center in the direction of the clutch housing rotation (counterclockwise viewed from the engine right side).




A. Grooves

**Late Model**

○The grooves on the friction plate surfaces are cut just radially. Plate installation is free of its rotation direction.

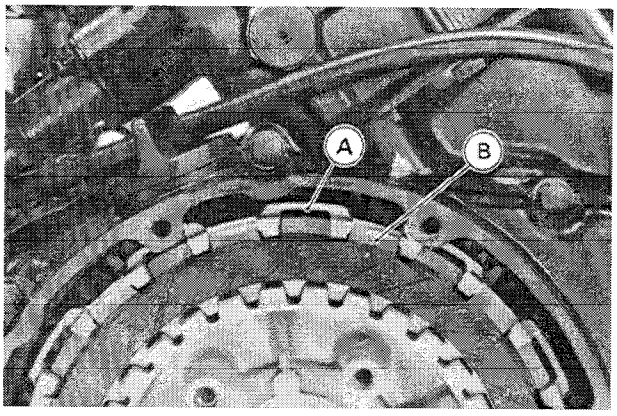


CAUTION

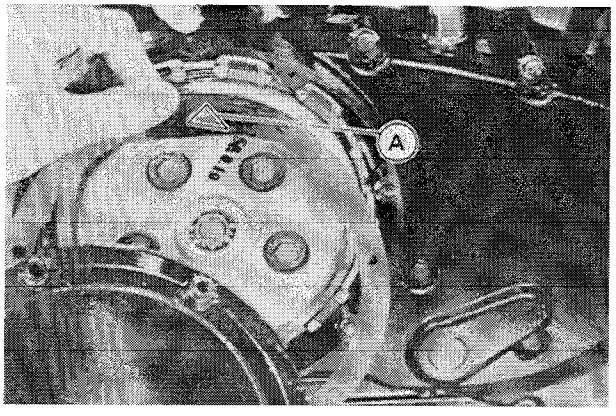
○**If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

**NOTE**

○*Install the first seven friction plates fitting their tangs of plates in the main grooves* A *in the clutch housing. Then, install the last one fitting its tangs in the secondary grooves* B

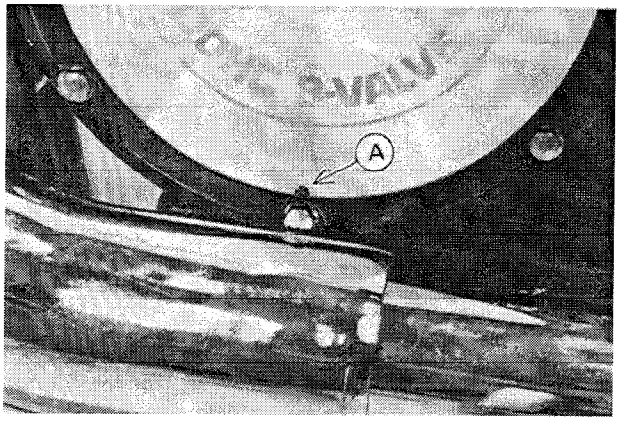



- Tighten the clutch spring bolts to the specified torque (see Exploded View).
- Install the clutch push rod, smearing it with a thin coat of a molybdenum disulfide grease.
- Install the clutch cover gasket with the triangular mark on top.




A. Triangular Mark

- Install the clutch cover so that the indicator is at the bottom.

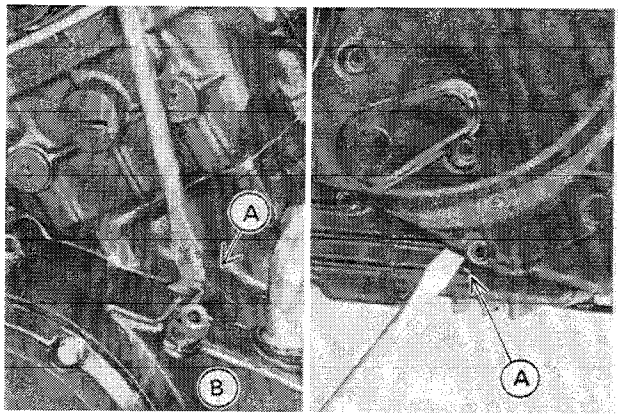



A. Indicator

- If the clutch cover bolts are used ones, apply a non-permanent locking agent to the threads. Or, replace them with new ones.
- Check the engine oil level and add oil if necessary (see Oil Level Inspection in Engine Lubrication System).

### *Right Engine Cover Removal*

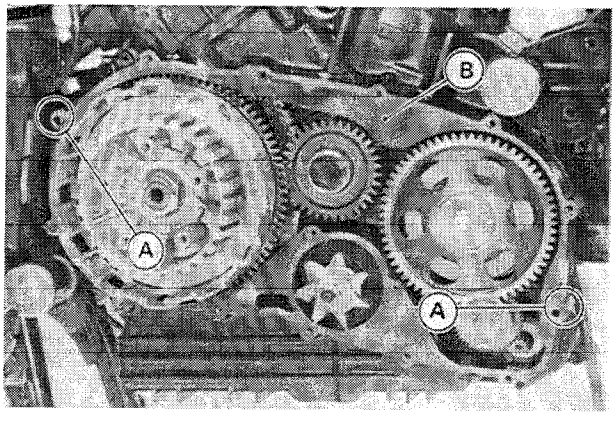
- Support the motorcycle on its center stand.
- Drain the engine oil (see Engine Oil Change in Engine Lubrication System).
- Drain the coolant (see Coolant Draining in Cooling System). To avoid burns, wait until the coolant cools down.
- Remove the right exhaust pipe (see Right Exhaust Pipe Removal in Engine Top End).
- Remove the subframe assembly (see Subframe Assembly Removal in Frame chapter) and let it hang free.
- Unscrew the bolts to remove the right engine cover. The cover has two pry points shown.




A. Pry here. B. Right Engine Cover

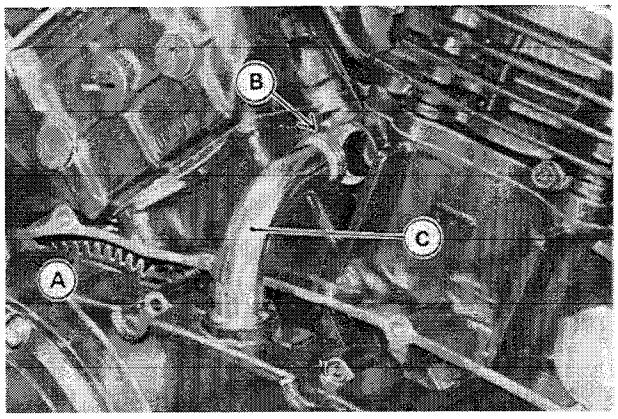
### *Right Engine Cover Installation Notes*

- Check to see that the knock pins and the new gasket are in place on the cover.

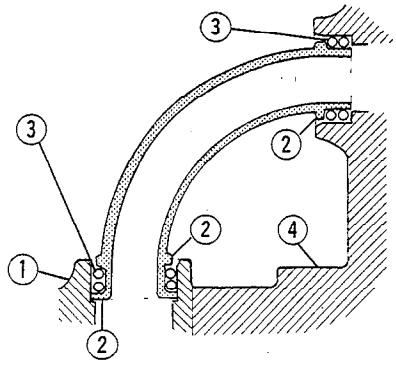



A. Knock Pins B. New Gasket

•Insert the double-bead end of the water pipe in the right engine cover.
○The water pipe has two O-rings on each end. Both O-rings should be all the way into the hole at each end of the pipe. Do not apply a grease to them.
•Install the right engine cover while inserting the single-bead end of the pipe into the right crankcase.

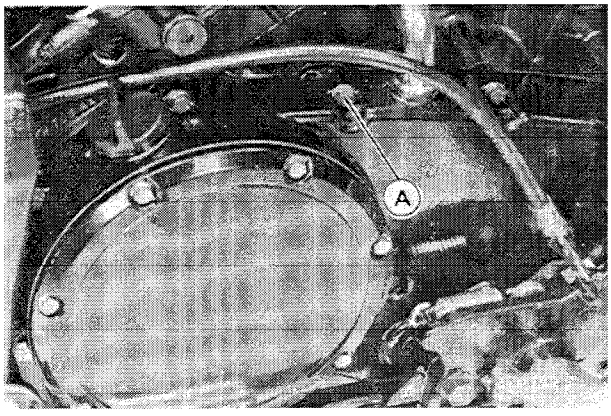



A. Right Engine Cover
B. O-rings
C. Water Pipe




1. Right Engine Cover
2. Beads
3. O-rings
4. Right Crankcase

•Install the cover bolts.
○If the bolt shown is reused, apply a non-permanent locking agent to the threads.




A. Sealant Coated Bolt (φ6 x L30 mm)

•Fill the engine with engine oil (see Engine Oil Change in Engine Lubrication System chapter).

### *Clutch Disassembly*

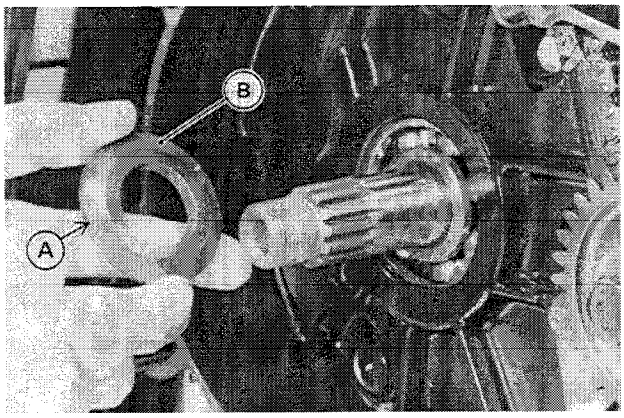
**NOTE**

○*It is not necessary to remove the clutch cover for removal of clutch unit including the clutch housing/gear.*

•Remove the right engine cover (see Right Engine Cover Removal).
•Remove the clutch plates and the clutch hub (see Clutch Plates/Clutch Hub Removal).
•Remove the clutch housing/gear.

### *Clutch Assembly*

•Install the spacer with the chamfered side facing inward.



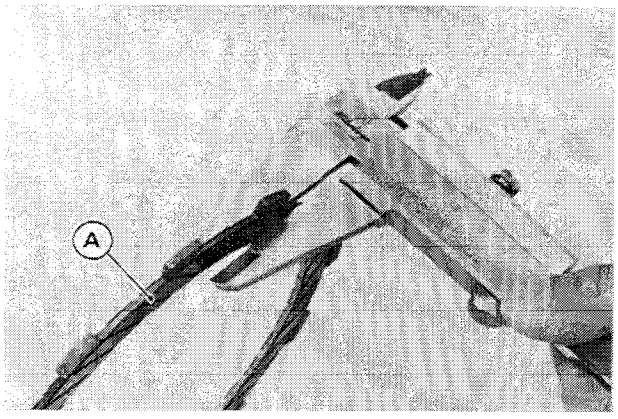

A. Spacer
B. Chamfer

•Install the clutch housing gear.
•Install the clutch hub and the clutch plates (see Clutch Plates/Clutch Hub Installation).
•Install the clutch push rod, smearing it with a thin coat of molybdenum disulfide grease.
•Install the right engine cover (see Right Engine Cover Installation).

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

**Friction Plate Thickness Measurement**




A. Friction Plate

**Friction Plate Thickness**

| | |
|---|---|
| **Standard:** | **2.9 to 3.1 mm** |
| **Service Limit:** | **2.8 mm** |

### *Friction or Steel Plate Warp Inspection*

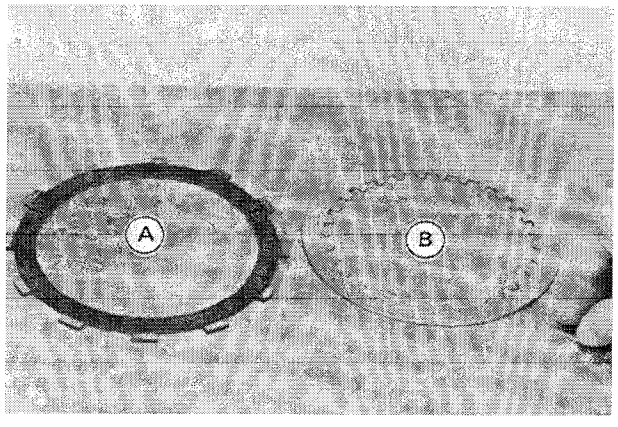
- Place each friction plate or steel plate on a surface plate, and measure the gap between the surface plate and each friction plate or steel plate. The gap is the amount of warp.

★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**

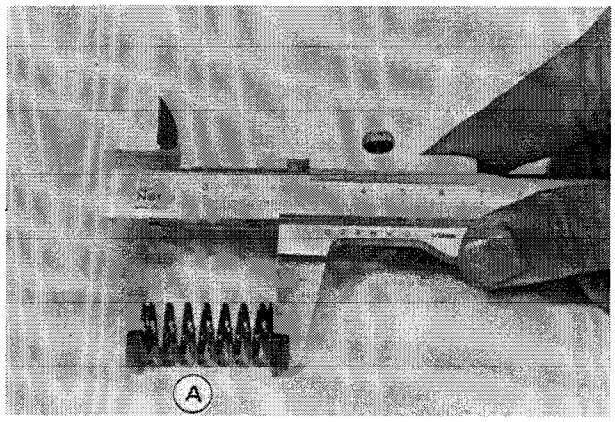



A. Friction Plate B. Steel Plate

### *Clutch Spring Free Length Measurement*

**Clutch Spring Free Length**

| | |
|---|---|
| **Standard:** | **33 to 34.2 mm** |
| **Service Limit:** | **32.6 mm** |

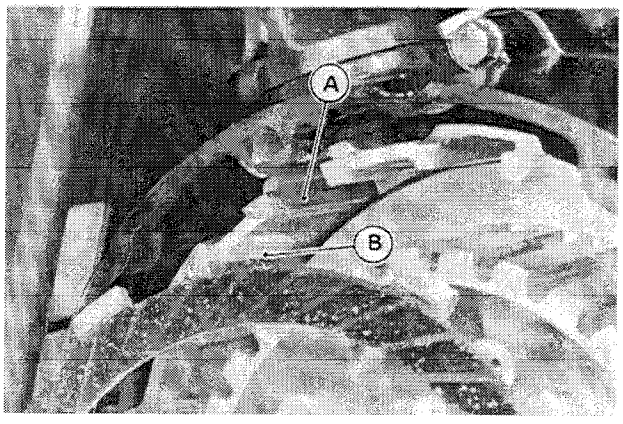



A. Clutch Spring

### *Clutch Housing Finger Inspection*

- Visually inspect the fingers of the clutch housing where the friction plate tangs hit them.

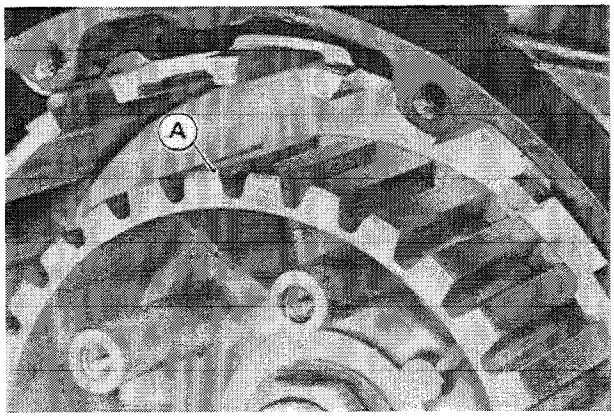
★If they are badly worn or if there are grooves cut where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.




A. Clutch Housing Finger B. Friction Plate Tang

### *Clutch Hub Spline Inspection*

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

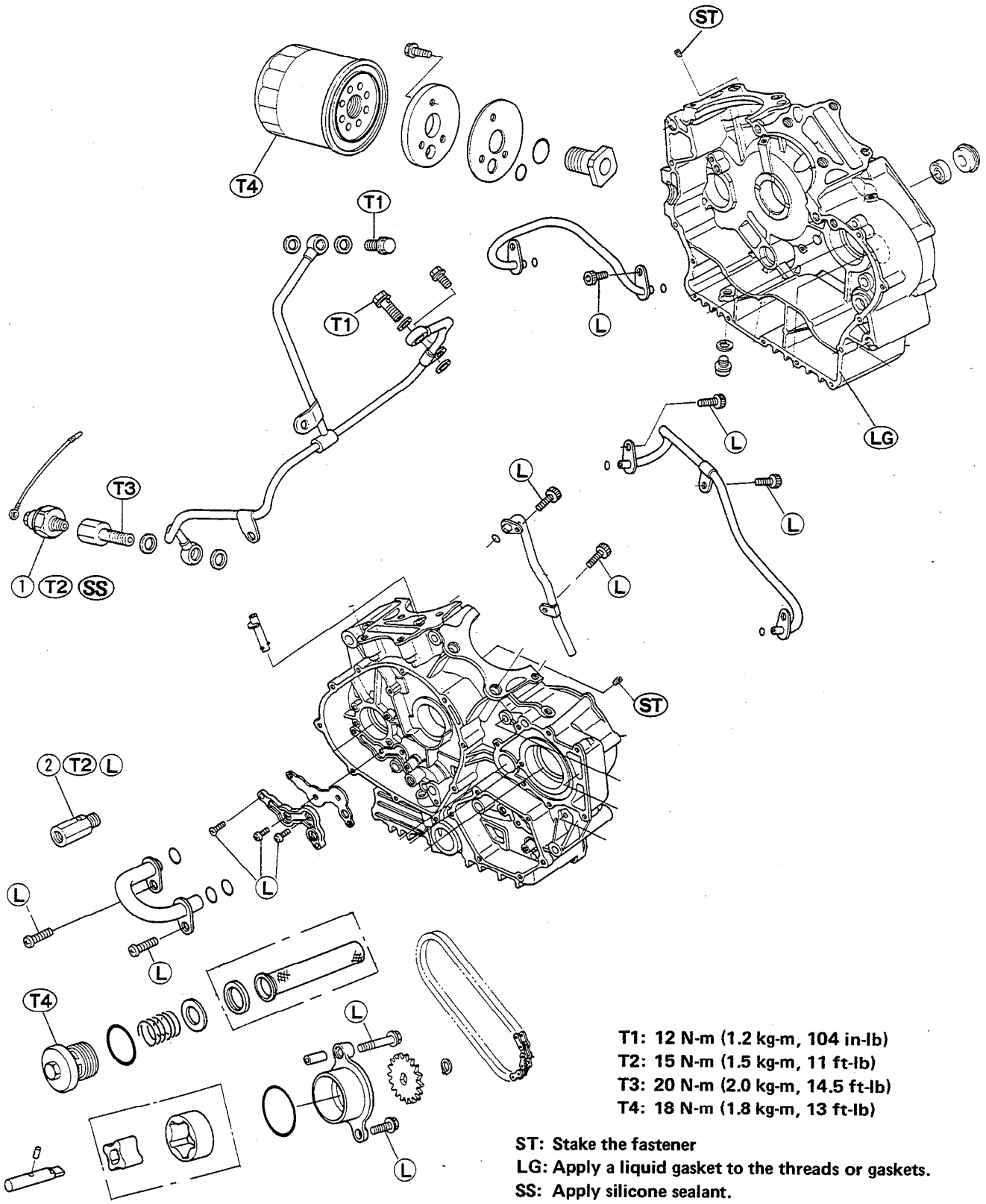



A. Clutch Hub Spline

# Engine Lubrication System

## Table of Contents

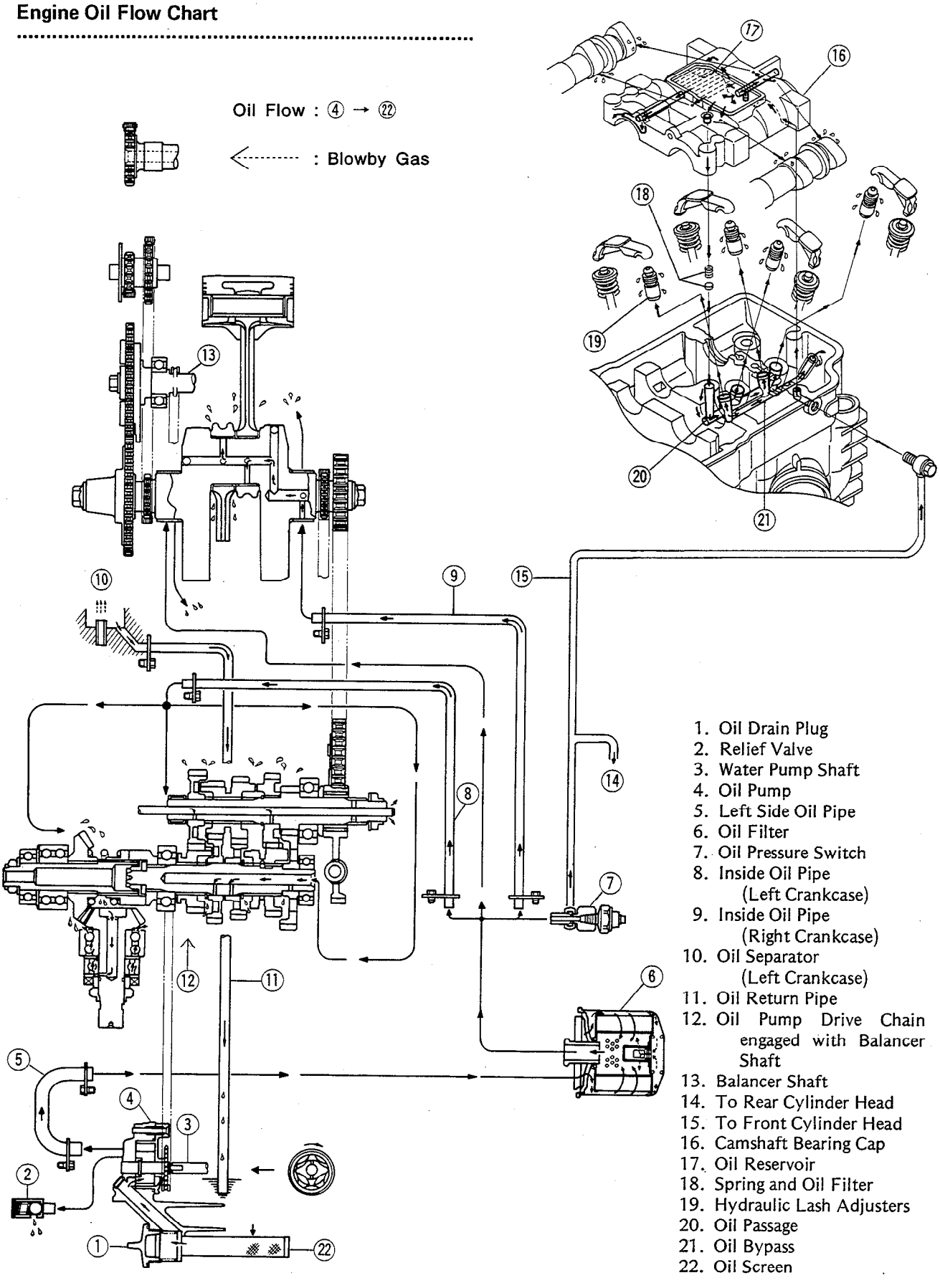
## Exploded View




T1: 12 N-m (1.2 kg-m, 104 in-lb)
T2: 15 N-m (1.5 kg-m, 11 ft-lb)
T3: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T4: 18 N-m (1.8 kg-m, 13 ft-lb)

ST: Stake the fastener
LG: Apply a liquid gasket to the threads or gaskets.
SS: Apply silicone sealant.
L: Apply a non-permanent locking agent to the threads.
1. Oil Pressure Switch
2. Relief Valve

## Engine Oil Flow Chart



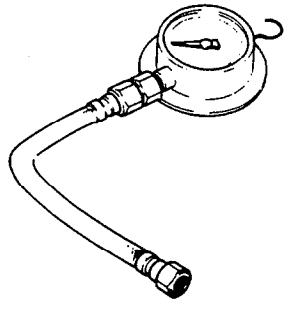

1. Oil Drain Plug
2. Relief Valve
3. Water Pump Shaft
4. Oil Pump
5. Left Side Oil Pipe
6. Oil Filter
7. Oil Pressure Switch
8. Inside Oil Pipe (Left Crankcase)
9. Inside Oil Pipe (Right Crankcase)
10. Oil Separator (Left Crankcase)
11. Oil Return Pipe
12. Oil Pump Drive Chain engaged with Balancer Shaft
13. Balancer Shaft
14. To Rear Cylinder Head
15. To Front Cylinder Head
16. Camshaft Bearing Cap
17. Oil Reservoir
18. Spring and Oil Filter
19. Hydraulic Lash Adjusters
20. Oil Passage
21. Oil Bypass
22. Oil Screen

## Specifications

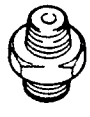
| Item | | Standard | Service Limit |
|---|---|---|---|
| Oil pressure @4,000 rpm (r/min), oil temp. 90°C (194°F) | | 294 – 355 kPa (3.0 – 3.6 kg/cm², 43 – 51 psi) | |
| Engine oil: | Grade | SE, SF, or SG class | |
| | Viscosity | SAE 10W-40, 10W-50, 20W-40, or 20W-50 | |
| | Amount | 3.6 L (when filter is not removed)<br>4.0 L (when filter is removed) | |
| Oil pump: | | | |
| Outer rotor/inner rotor clearance | | under 0.12 mm | 0.20 mm |
| Outer rotor/pump body clearance | | 0.15 – 0.21 mm | 0.30 mm |
| Outer rotor diameter | | 40.53 – 40.56 mm | 40.45 mm |
| Pump body diameter | | 40.71 – 40.74 mm | 40.80 mm |
| Rotor side clearance | | 0.02 – 0.07 mm | 0.12 mm |
| Pump drive chain slack | | 8 – 10 mm | 13 mm |

## Special Tools

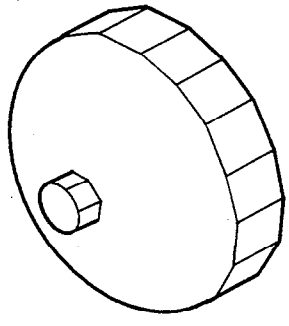
**Pressure Gauge: 57001-164**



**Oil Pressure Gauge Adapter: 57001-1033**



**Oil Filter Wrench: 57001-1212**



On and after VN750-A10:

NOTE

○ *Use the oil filter wrench (57001-1249) instead of the wrench (57001-1212).*

## Engine Oil, Oil Filter and Oil Pump Screen

**WARNING**

**○In order for the engine, transmission, and clutch to function properly; maintain the engine oil at the proper level, change the oil and filter, and inspect the oil screen accordance with the Periodic Maintenance Chart. Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure.**

**CAUTION**

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

### *Engine Oil Level Inspection*

●If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.

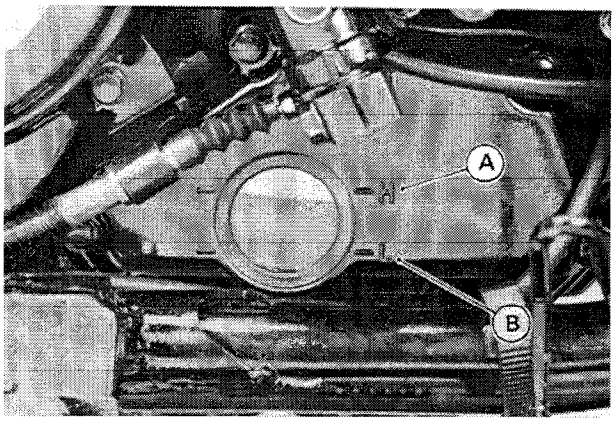
**CAUTION**

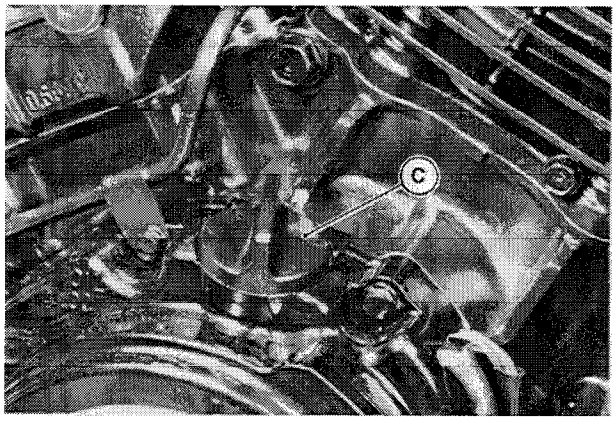
**○Racing the engine before the oil reaches every part can cause engine seizure.**

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

**NOTE**

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



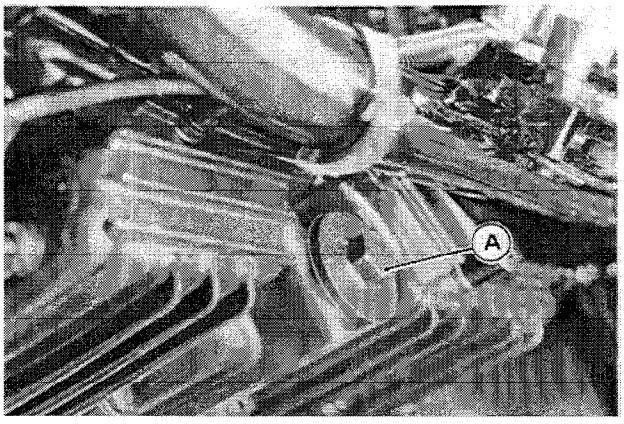

A. Upper Level
B. Lower Level
C. Oil Filler Opening Cap

**CAUTION**

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

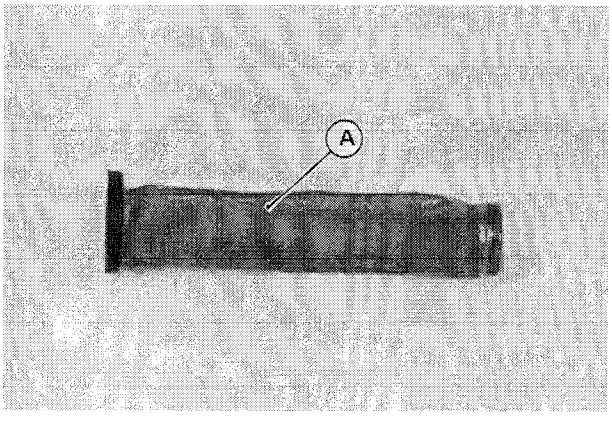
### *Engine Oil Change and Oil Pump Screen Cleaning*

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




A. Drain Plug

○The retainer spring comes off with the drain plug.
●Pull out the washer and oil screen.




A. Oil Screen

●Clean the oil pump screen thoroughly whenever the engine oil is changed.
●Clean the oil pump screen with high flash-point solvent and remove any particles stuck to it.

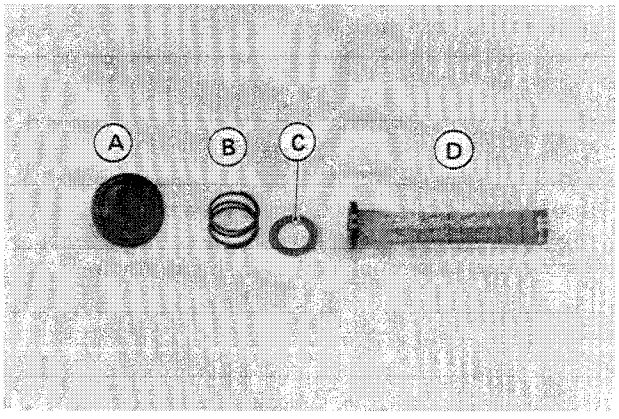
**WARNING**

○**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.
●Check the O-ring on the drain plug for damage.
★Replace the O-ring with a new one if it is damaged.
●After the oil has completely drained out, insert the screen, washer, spring and drain plug with the O-ring in that order.




A. Drain Plug and O-ring
B. Spring
C. Washer
D. Screen

●Tighten the plug to the specified torque (see Exploded View).
●Fill the engine with a good quality motor oil specified in the table.
●Check the oil level.

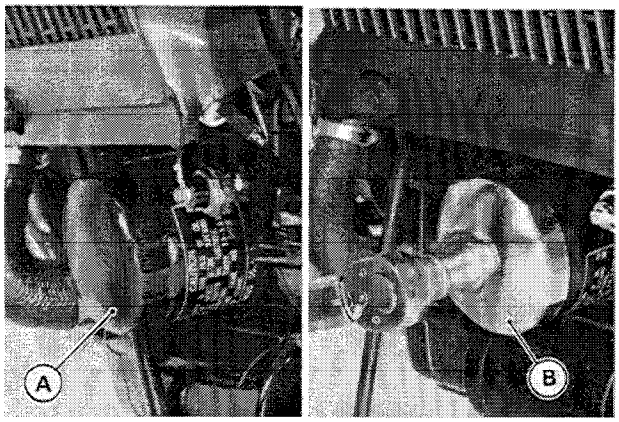
**Engine Oil**

| | |
|---|---|
| **Grade:** | **SE, SF, or SG class** |
| **Viscosity:** | **SAE 10W40, 10W50, 20W40, or 20W50** |

**Required Amount**
**When filter is not removed: 3.6 L**
**When filter is removed: 4.0 L**

*Oil Filter Removal*

●Place an oil pan beneath the oil filter.
●Remove the oil filter with an oil filter wrench (special tool).




A. Oil Filter B. Oil Filter Wrench: 57001-1212

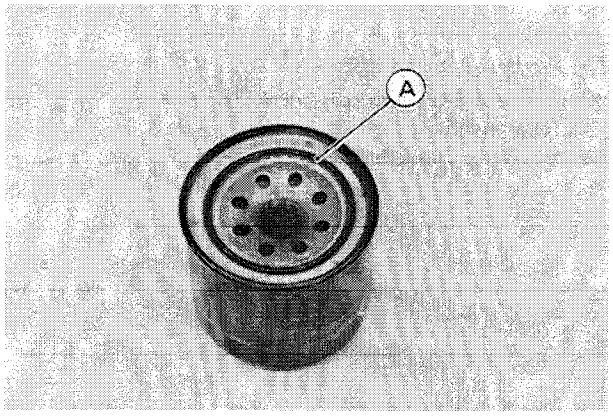
**On and after VN750-A10:**

**NOTE**

○*Use the oil filter wrench (57001-1249) instead of the wrench (57001-1212).*

### *Oil Filter Installation Notes*

- Replace the oil filter with a new one in accordance with the Periodic Maintenance Chart.
- Check that the oil filter O-ring is in good condition, and apply a thin film of oil to the O-ring before installation.



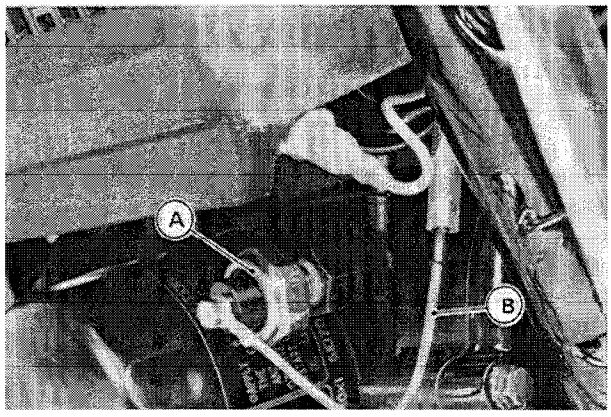

A. O-ring

- Tighten the oil filter with the oil filter wrench to the specified torque (see Exploded View).
- Add engine oil (see Oil Level Inspection).
- Thoroughly warm up the engine and check for oil leakage.

## Oil Pump

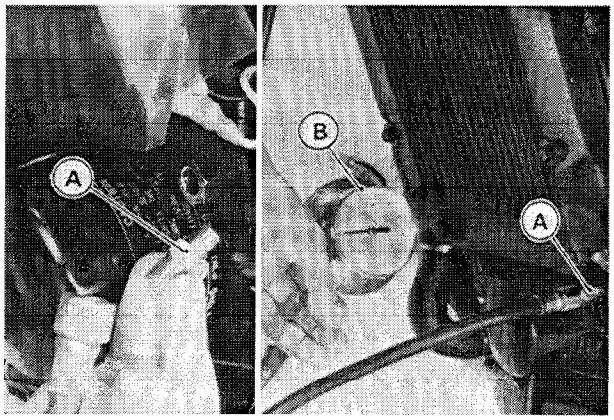
### *Oil Pressure Measurement*

- Measure the oil pressure at normal operating temperature.
  - ○Warm up the engine, and then stop it.
  - ○Pull off the oil pressure switch lead.
  - ○Remove the oil pressure switch.




A. Oil Pressure Switch B. Lead

○Install the oil pressure gauge and adapter (special tools).




A. Adapter: 57001-1033
B. Pressure Gauge: 57001-164

**WARNING**

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

○Start the engine again.
○Run the engine at the specified speed, and read the oil pressure gauge.
★If the oil pressure is significantly below the specification, inspect the oil pump (see below) and relief valve (see Relief Valve Inspection).

**Oil Pressure**
**294 – 355 kPa (3.0 – 3.6 kg/cm², 43 – 51 psi)**
**@4,000 r/min (rpm), 90°C (194°F) of oil temp.**

☆If the oil pump and relief valve are not at fault, inspect the rest of the lubrication system.
○Stop the engine.
○Remove the oil pressure gauge and adapter.
○After applying a liquid gasket to the threads of the oil pressure switch, reinstall the switch and lead.

*Oil Pump Chain Slack Inspection*

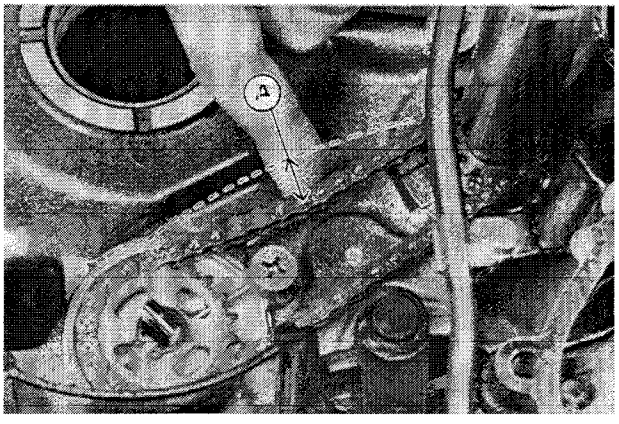
**CAUTION**

**○If the chain becomes badly worn, the chain could make contact with crankcase.**

●Measure the vertical movement midway between the sprockets.
★If the chain slack exceeds the service limit, replace the chain.

**Oil Pump Chain Slack**

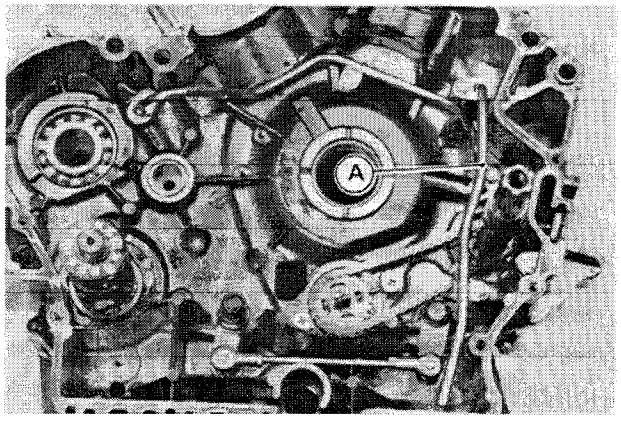
| | |
|---|---|
| **Standard:** | **8 to 10 mm** |
| **Service Limit:** | **13 mm** |




A. Chain Slack

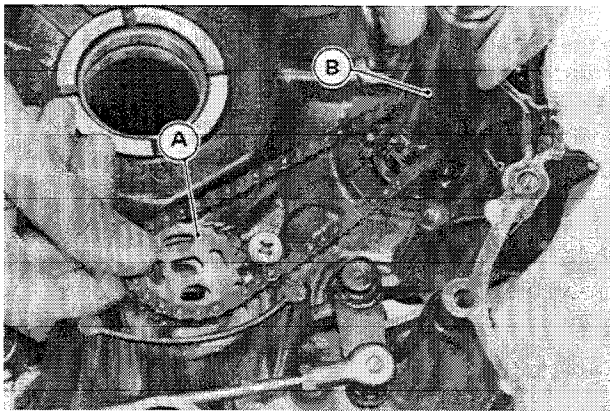
*Oil Pump Disassembly*

●Split the crankcase (see Crankcase Splitting in Crankshaft/Transmission chapter).
●Remove the crankshaft.
●Remove the oil return pipe.



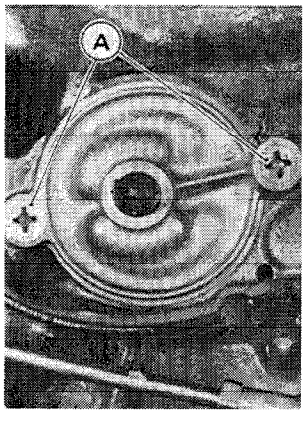

A. Oil Return Pipe

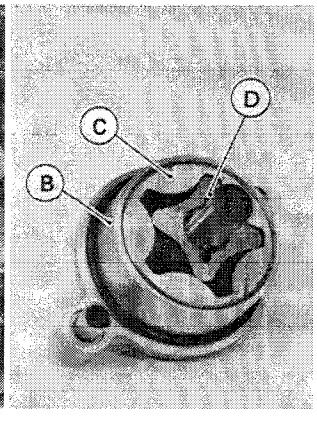
•After removing the circlip on the pump shaft, remove the sprocket and the balancer shaft along with the pump chain.




A. Sprocket B. Balancer Shaft

•Remove the mounting screws to take out the pump body with the shaft and rotors.



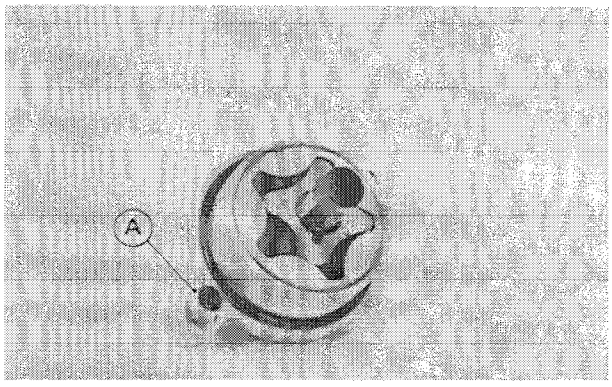




A. Screws C. Outer Rotor
B. Pump Body D. Inner Rotor

•Drop the rotors out of the oil pump body.

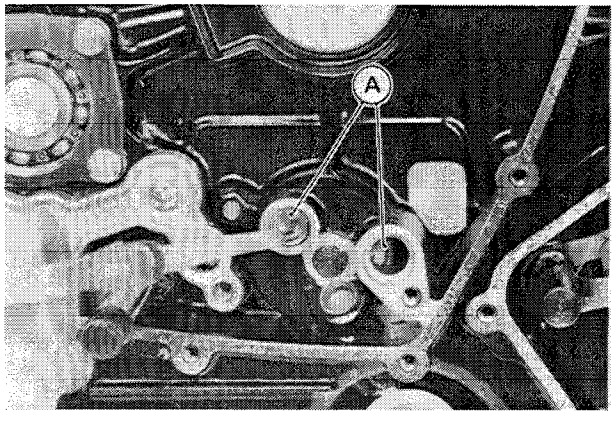
*Oil Pump Assembly Notes*

•Check that the dowel pin is in place in the pump body.



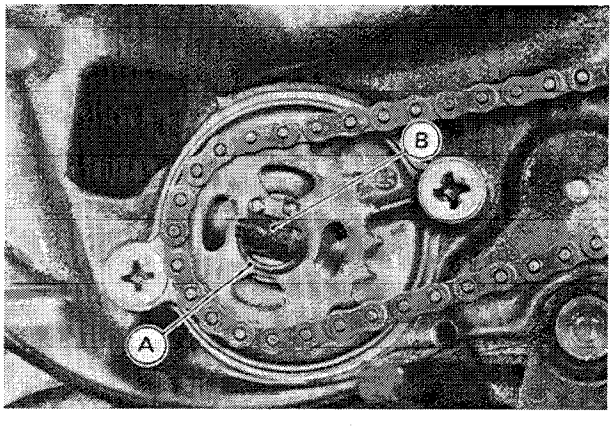

A. Dowel Pin

•Apply a non-permanent locking agent to the threads of the pump mounting screws.
•Fill the pump with engine oil from the crankcase left side while turning the shaft.




A. Holes

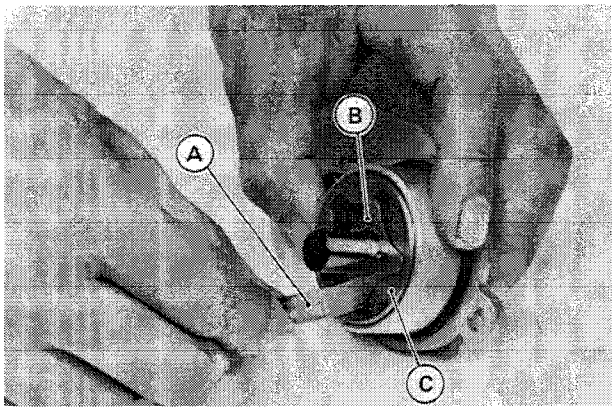
•Install a new circlip on the shaft so that the sharp edge faces away from the sprocket and the opening is on the shaft flat surface.




A. Circlip B. Flat Surface

### *Oil Pump Outer Rotor/Inner Rotor Clearance*

●Remove the oil pump body (see Oil Pump Disassembly).
●Measure the clearance between the rotors with a thickness gauge as shown.




A. Thickness Gauge
B. Inner Rotor
C. Outer Rotor

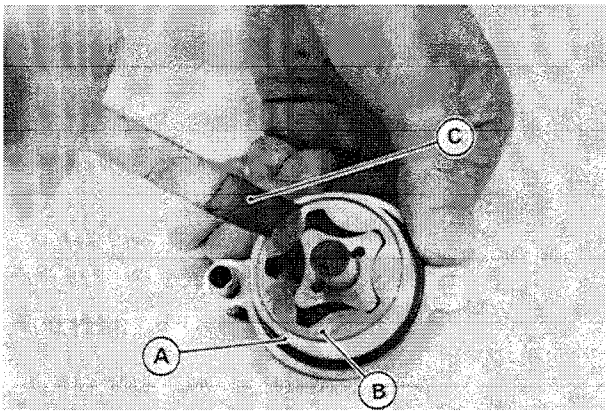
**Oil Pump Outer Rotor/Inner Rotor Clearance**

| | |
|---|---|
| **Standard:** | **Under 0.12 mm** |
| **Service Limit:** | **0.20 mm** |

★If the clearance is greater than the service limit, replace the rotors as a set.

### *Oil Pump Outer Rotor/Pump Body Clearance*

●Remove the oil pump body (see Oil Pump Disassembly).
●Measure the clearance between the outer rotor and the pump body with a thickness gauge, as shown.

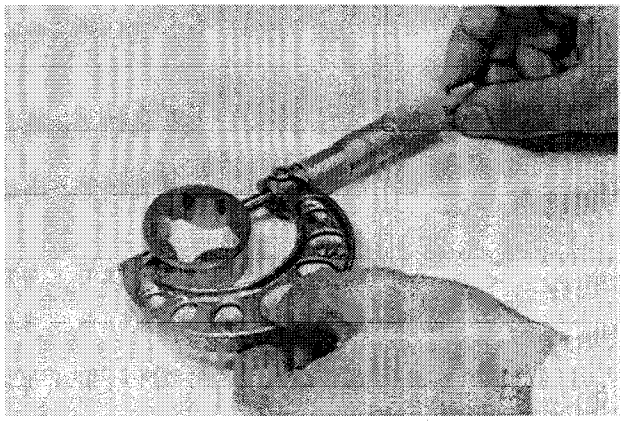



A. Pump Body
B. Outer Rotor
C. Thickness Gauge

**Oil Pump Outer Rotor/Pump Body Clearance**

| | |
|---|---|
| **Standard:** | **0.15 – 0.21 mm** |
| **Service Limit:** | **0.30 mm** |

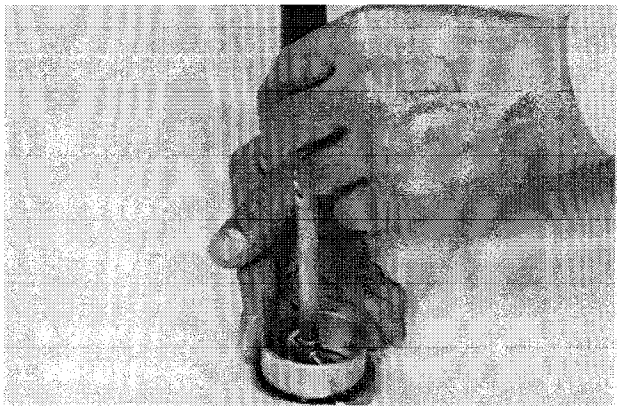
★If the clearance is greater than the service limit, measure the outer rotor diameter and the pump body inside diameter to see which is faulty.
●Measure the rotor diameter with a micrometer.



**Oil Pump Outer Rotor Diameter**

| | |
|---|---|
| **Standard:** | **40.53 – 40.56 mm** |
| **Service Limit:** | **40.45 mm** |

★If the outer rotor diameter is less than the service limit, replace the rotors as a set.
●Measure the pump body inside diameter with a bore gauge.



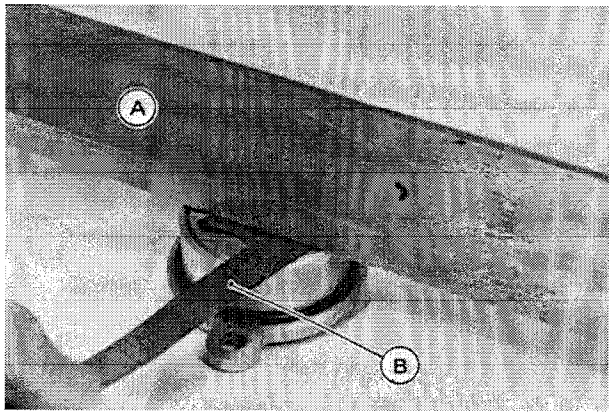
**Oil Pump Body Inside Diameter**

| | |
|---|---|
| **Standard:** | **40.71 – 40.74 mm** |
| **Service Limit:** | **40.80 mm** |

★If the pump body inside diameter is greater than the service limit, replace it.

### *Oil Pump Rotor Side Clearance*

- Remove the oil pump body (see Oil Pump Disassembly).
- Lay a straightedge across the pump body and measure the clearance between the body and rotors with a thickness gauge.




A. Straightedge B. Thickness Gauge

**Oil Pump Rotor Side Clearance**

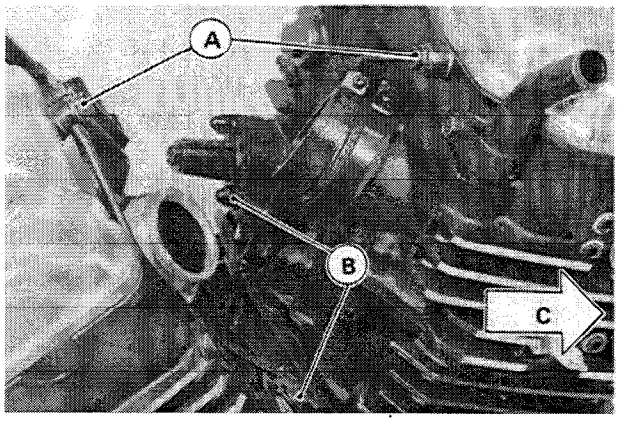
| | |
|---|---|
| **Standard:** | **0.02 – 0.07 mm** |
| **Service Limit:** | **0.12 mm** |

★If the rotor side clearance is greater than the service limit, replace the oil pump assembly.

## Oil Pipe and Relief Valve

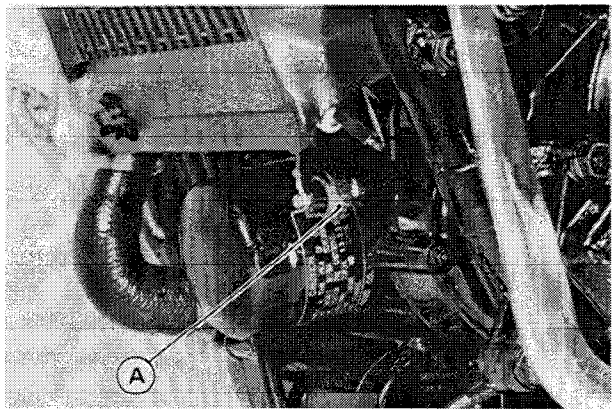
### *Outside Oil Pipe Removal*

- Remove the engine (see Engine Removal/Installation chapter).
- Remove the carburetors (see Carburetor Removal).
- Remove the banjo bolts on the front and rear cylinder heads.
- Unscrew the mounting bolt and nut on the front and rear cylinders.



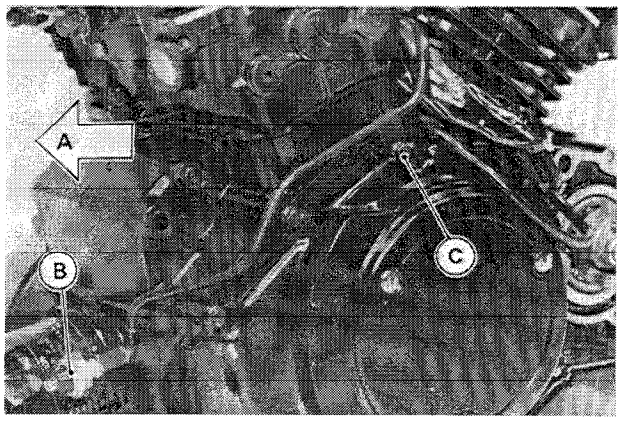

A. Banjo Bolts C. Front
B. Mounting Bolt and Nut

- After removing the oil pressure switch lead, remove the banjo bolt with the oil pressure switch installed.




A. Oil Pressure Switch

- Remove the alternator cover mounting bolt; sealant coated bolt.




A. Front C. Sealant Coated Bolt
B. Oil Pressure Switch

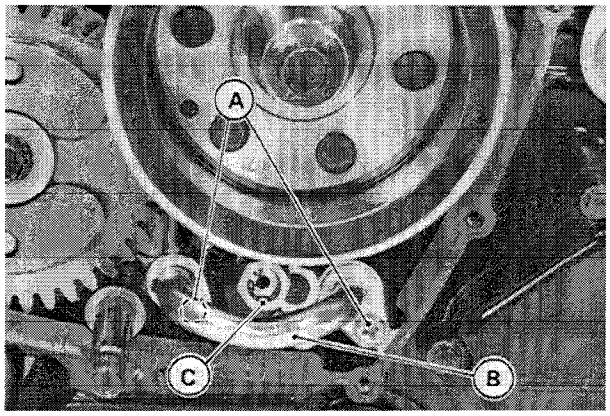
•Remove the outside oil pipe.

### *Outside Oil Pipe Installation Notes*

•Discard the used flat washers and install the new washer on each side of the pipe fittings.
•Tighten the banjo bolts and mounting bolts to a snug fit, and tighten them to the specification (see Exploded View).
★If the alternator cover mounting bolt (sealant coated bolt) is re-used, apply a non-permanent locking agent to the threads.

### *Relief Valve and Left Side Oil Pipe Removal*

•Remove the engine (see Engine Removal/Installation chapter).
•Remove the inside alternator cover (see Electrical System chapter).
•Remove the relief valve.
•Unscrew the mounting screws to remove the left side oil pipe.




A. Mounting Screws.
B. Oil Pipe
C. Relief Valve

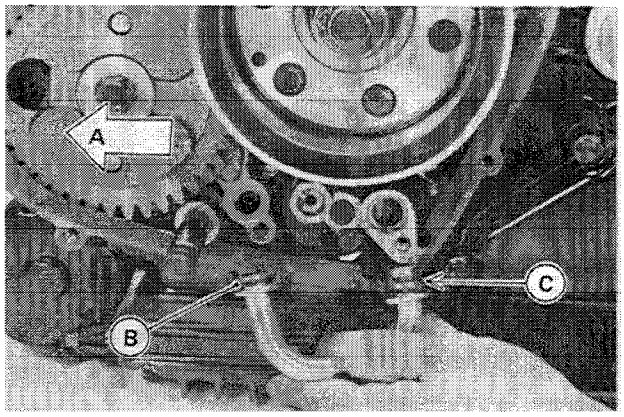
### *Relief Valve and Left Side Oil Pipe Installation Notes*

•Install the alternator rotor (see Electrical System chapter).
•Apply a non-permanent locking agent to the threads of the relief valve, and tighten it to the specified torque (see Exploded View).

**CAUTION**

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

○The front end of the oil pipe has one O-ring and the other end has two O-rings.

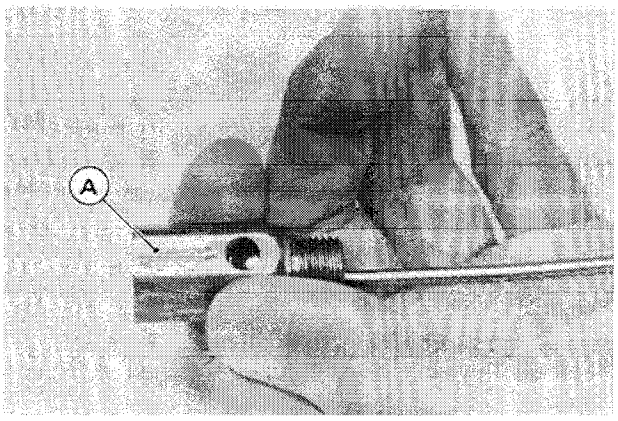



A. Front
B. O-ring
C. O-rings (2)

★If they are damaged, replace them with new ones.
•Be sure to install them in place, smearing them with a small amount of oil.
•Fill the pipe with engine oil.
•Apply a non-permanent locking agent to the mounting screw threads.

### *Relief Valve Inspection*

•Remove the relief valve (see Relief Valve Removal).
•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.




A. Relief Valve

**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, clean the valve 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.

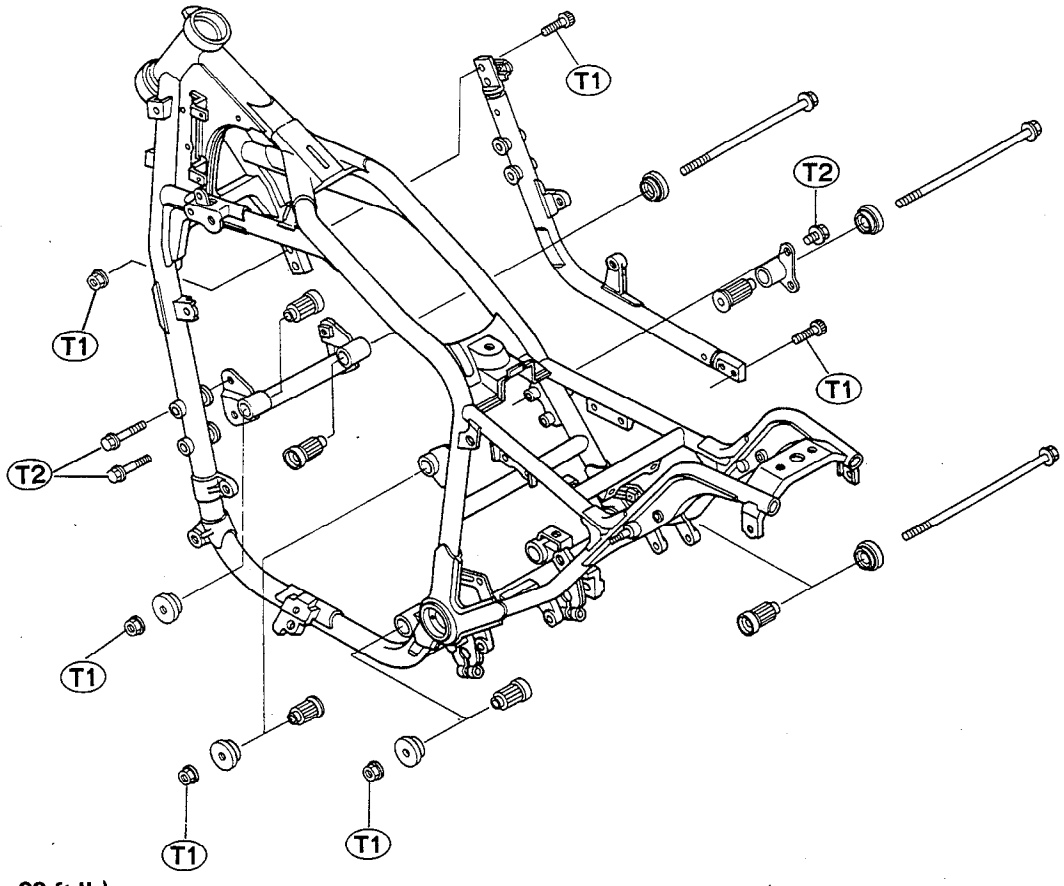
### *Oil Passage Cover and Inside Oil Pipe Removal/Installation*

○See Crankcase Disassembly and Assembly in Crankshaft/Transmission chapter.

# Engine Removal/Installation

## Table of Contents

## Exploded View

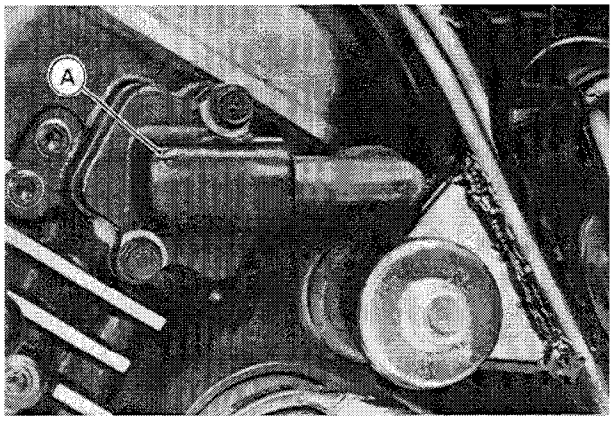



**T1: 44 N-m (4.5 kg-m, 33 ft-lb)**
**T2: 24 N-m (2.4 kg-m, 17.5 ft-lb)**

## Engine Removal/Installation

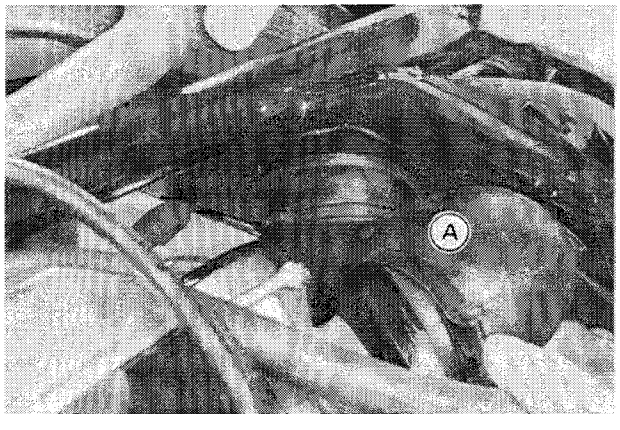
### *Engine Removal*

- Support the motorcycle on its center stand so that it is stable during removal and installation.
- For later installation convenience, note and record how and where cables, wiring, and hoses are routed. They should not be bent sharply, kinked, or twisted.
- Drain the engine oil (see Engine Oil Change in Engine Lubrication System).
- Drain the coolant (see Coolant Draining in Cooling System). To avoid burns, wait until the coolant cools down.
- Remove the following parts.
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Air Cleaner Housing (see Fuel System chapter)
  - Radiator, Reservoir Tank and Water Hoses (see Cooling System chapter)
  - Left Hand Air Suction Valve, Vacuum Switch Valve and Hoses (US model)
  - Exhaust Pipe and Muffler Assembly (see Engine Top End chapter)
  - Subframe along with Foot Peg and Brake Pedal (see Frame chapter)
  - Front Bevel Gear Case (see Final Drive chapter)
- Pull off the following cables.
  - Throttle Cable Upper Ends (see Fuel System chapter)
  - Choke Cable Lower End (see Fuel System chapter)
  - Clutch Cable Lower End (see Clutch chapter)
- Disconnect the wiring from the engine components, and free them from the clamps.
  - Rear Brake Switch Lead
  - Starter Motor Lead
  - Neutral Switch Wire
  - Oil Pressure Switch Wire
  - Engine Ground Lead
  - Ignition Coil Lead
  - Alternator Leads
  - Pickup Coil Leads
- While supporting the engine on blocks, remove the mounting bracket bolts and engine mounting bolts starting with top to bottom.

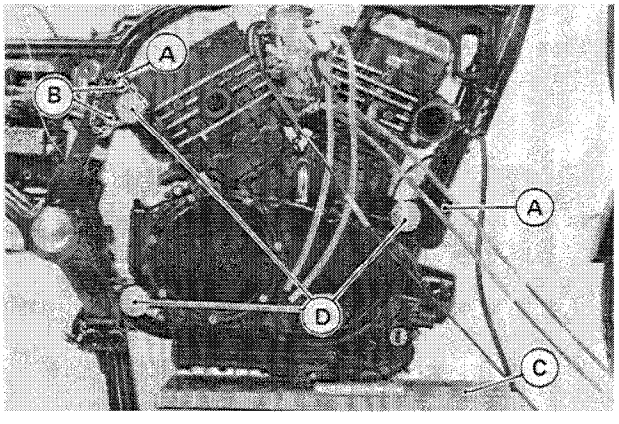


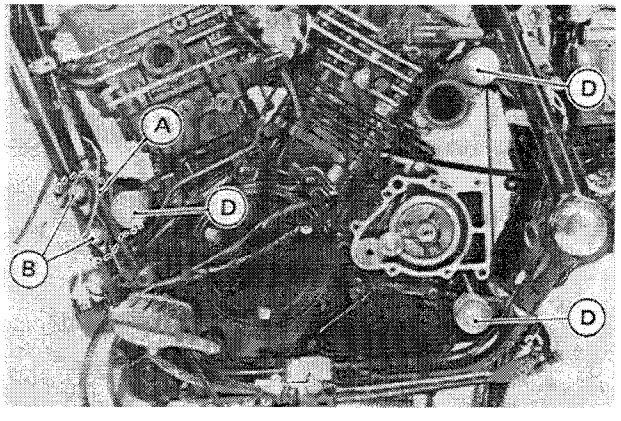

A. Left Hand Air Suction Valve

Shift Pedal
Surge Tank Ducts



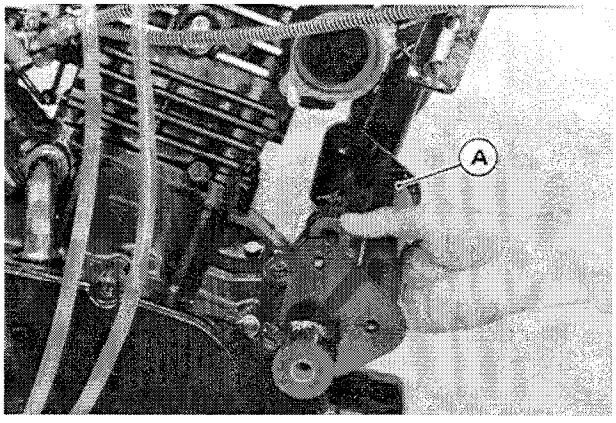

A. Duct




A. Brackets
B. Bracket Bolts
C. Blocks
D. Engine Mounting Bolts

●Remove the brackets.

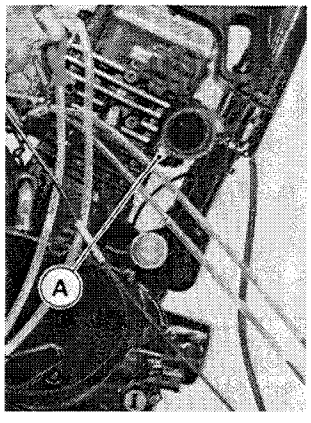


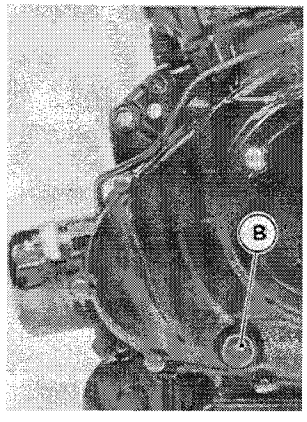

A. Bracket

●Remove the engine unit from the vehicle's right side.

**CAUTION**

○**When removing the engine unit, be careful not to damage the exhaust flange studs and the shift shaft.**




A. Exhaust Flange Studs B. Shift Shaft

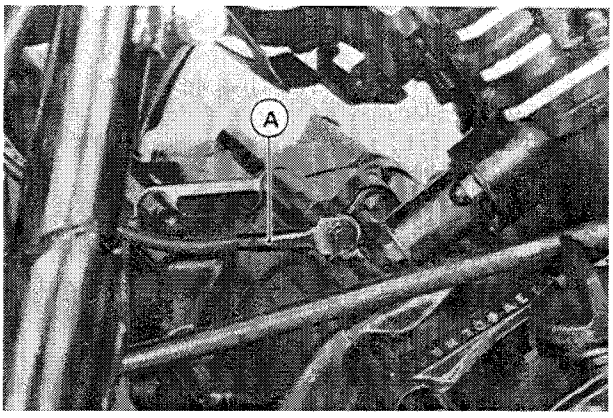
### *Engine Installation Notes*

○Engine installation is the reverse of removal. Note the following.

●Be sure to install the rubber dampers on the engine mounting brackets.

●Tighten the engine mounting nuts and bracket bolts to the specified torque (see Exploded View).

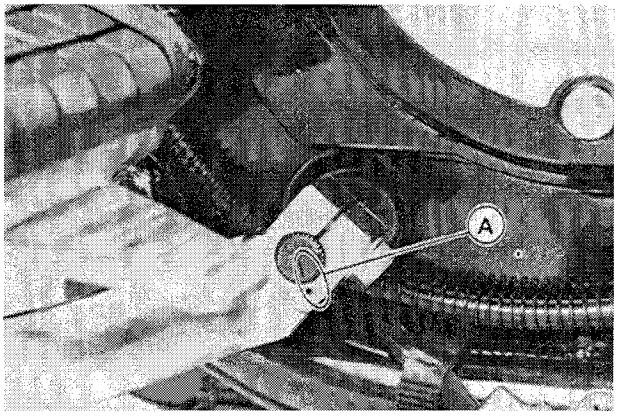
●Be sure to install the engine ground lead.




A. Engine Ground Lead

●Install the front bevel gear case (see Front Bevel Gear Case in Final Drive).

●Install the shift pedal on the shaft so that the mark on the pedal is aligned with the mark on the shaft.




A. Marks

●Run the following cables and wires correctly (see each appropriate chapter).
Clutch Cable
Choke Cable
Throttle Cables
Brake Cable
Starter Motor Lead

●Adjust the following parts (see each appropriate chapter).
Clutch Cable
Choke Cable
Throttle Cables
Brake Pedal Play

●Fill the engine with engine oil (see Engine Lubrication System chapter).

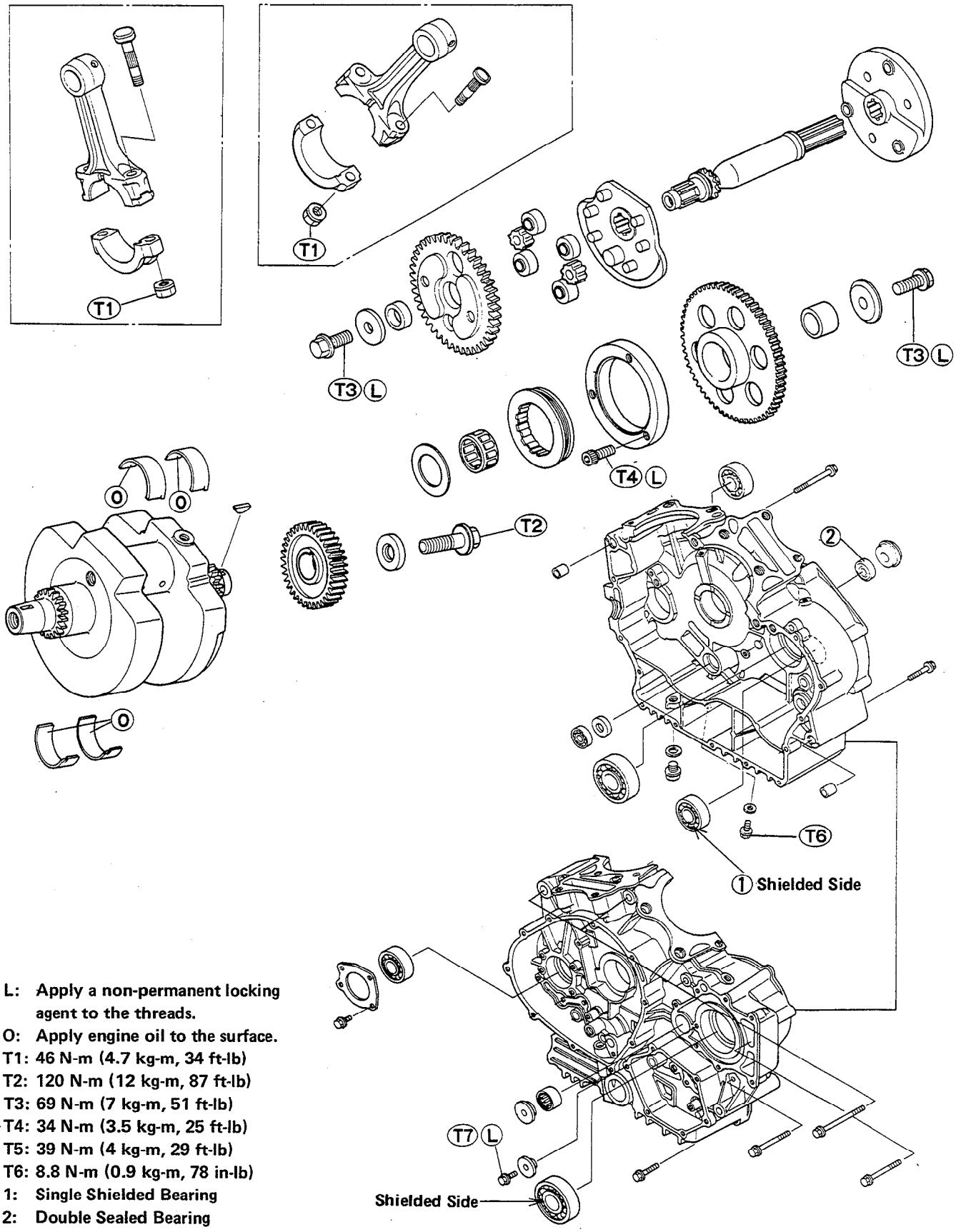
●Fill the engine with coolant and bleed air in the cooling system (see Cooling System chapter).

●Adjust the carburetor synchronization and idling.

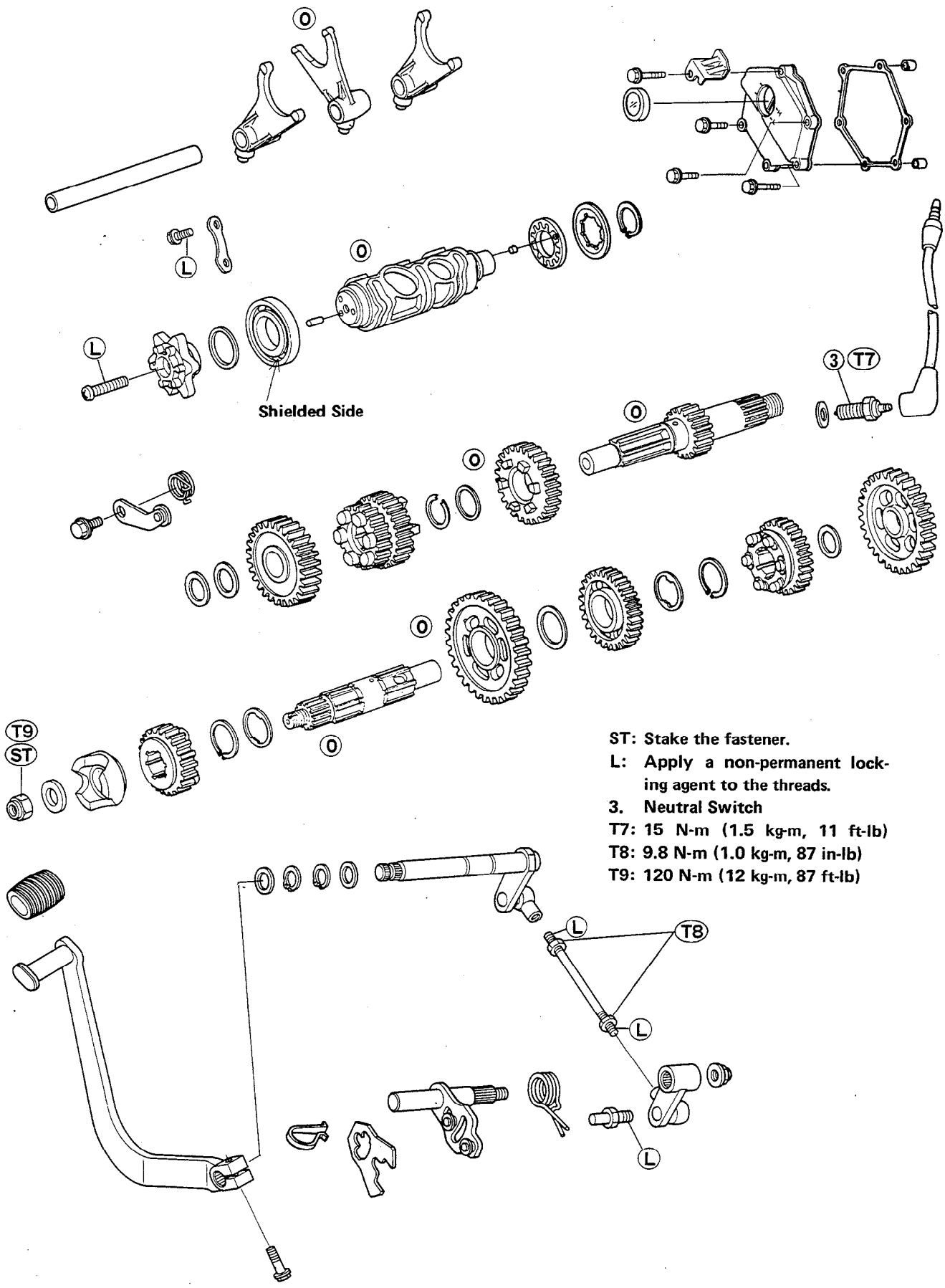
# Crankshaft/Transmission

## Table of Contents

## Exploded View




L: Apply a non-permanent locking agent to the threads.
O: Apply engine oil to the surface.
T1: 46 N-m (4.7 kg-m, 34 ft-lb)
T2: 120 N-m (12 kg-m, 87 ft-lb)
T3: 69 N-m (7 kg-m, 51 ft-lb)
T4: 34 N-m (3.5 kg-m, 25 ft-lb)
T5: 39 N-m (4 kg-m, 29 ft-lb)
T6: 8.8 N-m (0.9 kg-m, 78 in-lb)
1: Single Shielded Bearing
2: Double Sealed Bearing


O
L
O
L
Shielded Side
3
T7
O
O
O
T9
ST
O
ST: Stake the fastener.
L: Apply a non-permanent locking agent to the threads.
3. Neutral Switch
T7: 15 N-m (1.5 kg-m, 11 ft-lb)
T8: 9.8 N-m (1.0 kg-m, 87 in-lb)
T9: 120 N-m (12 kg-m, 87 ft-lb)
L
T8
L
L

## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| Crankshaft, Connecting Rods: | | |
| Connecting rod bend | — — — | 0.2/100 mm |
| Connecting rod twist | — — — | 0.4/100 mm |
| Connecting rod big end side clearance | 0.16 – 0.46 mm | 0.7 mm |
| Connecting rod big end bearing insert/crankpin clearance | 0.026 – 0.054 mm | 0.09 mm |
| Crankpin diameter: | 42.984 – 43.000 mm | 42.97 mm |
| Marking: None | 42.984 – 42.992 mm | |
| Marking: 1 | 42.993 – 43.000 mm | |
| Connecting rod big end bore diameter: | 46.000 – 46.020 mm | — — — |
| Marking: None | 46.000 – 46.010 mm | |
| Marking: ○ | 46.011 – 46.020 mm | |
| Connecting rod big end bearing insert thickness: | | |
| Brown | 1.483 – 1.487 mm | — — — |
| Black | 1.487 – 1.491 mm | — — — |
| Blue | 1.491 – 1.495 mm | — — — |

Connecting rod big end bearing insert selection:

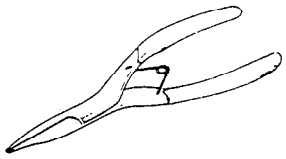
| Con-rod Big End Bore Diameter Marking | Crankpin Diameter Marking | Bearing Insert | |
|---|---|---|---|
| | | Size Color | Part Number |
| ○ | 1 | Black | 13034-1058 |
| None | None | | |
| ○ | None | Blue | 13034-1057 |
| None | 1 | Brown | 13034-1059 |

| | | |
|---|---|---|
| Crankshaft runout | 0.02 mm | 0.05 mm TIR |
| Crankshaft main journal diameter: | 42.984 – 43.000 mm | 42.96 mm |
| Crankcase main bearing bore diameter: | 43.025 – 43.041 mm | 43.09 mm |
| Crankshaft side clearance | 0.05 – 0.55 mm | 0.75 mm |
| Crankshaft web length | 96.85 – 96.95 mm | 96.6 mm |
| Transmission: | | |
| Shift fork ear thickness | 4.9 – 5.0 mm | 4.8 mm |
| Gear shift fork groove width | 5.05 – 5.15 mm | 5.3 mm |
| Shift fork guide pin diameter | 5.9 – 6.0 mm | 5.8 mm |
| Shift drum groove width | 6.05 – 6.20 mm | 6.3 mm |

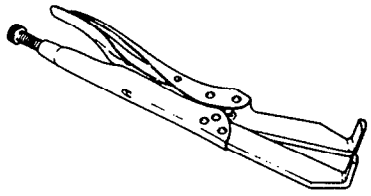
## Special Tools

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

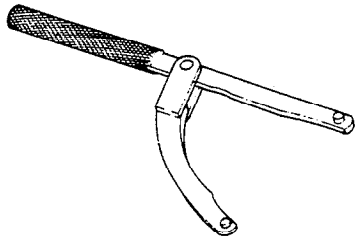
**Circlip Pliers: 57001-144**



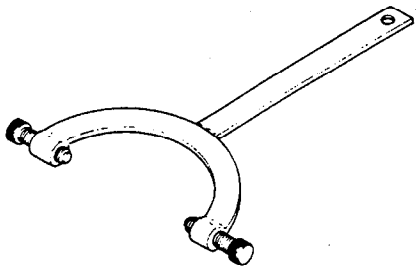
**Clutch Holder: 57001-305**



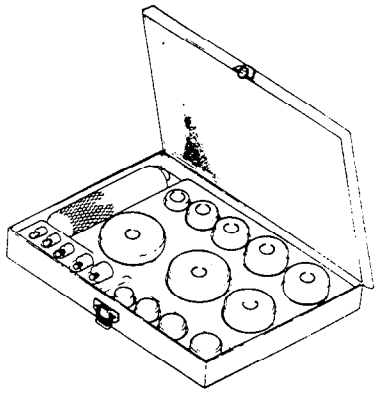
**Flywheel Holder: 57001-306**



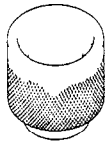
**Flywheel Holder: 57001-308**



**Bearing Driver Set: 57001-1129**



**Oil Seal Driver: 57001-1091**



**NOTE**

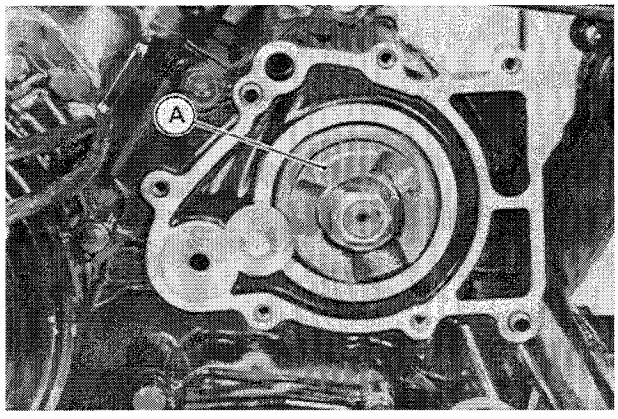
- *The clutch holder (P/N 57001-1243) can be used instead of the clutch holder (P/N 57001-305).*
- *The flywheel holder (P/N 57001-1313) can be used instead of the flywheel holder (P/N 57001-308).*

## Crankcase Splitting

*Crankcase Splitting*

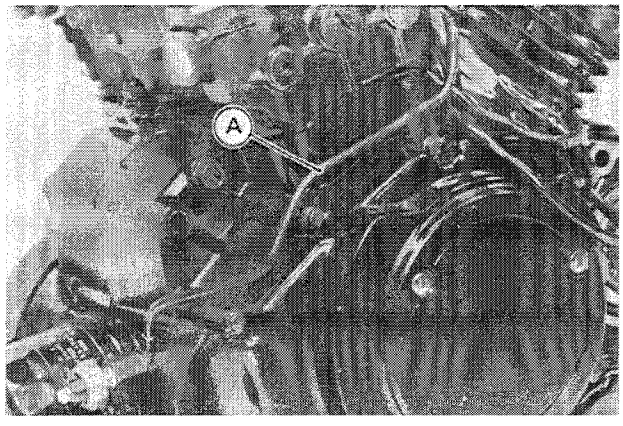
- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface or, preferably, in a suitable block to hold the engine steady while parts are being removed.
- Remove the following parts from the engine..

Damper cam on the output shaft left side (see Final Drive chapter)




A. Damper Cam

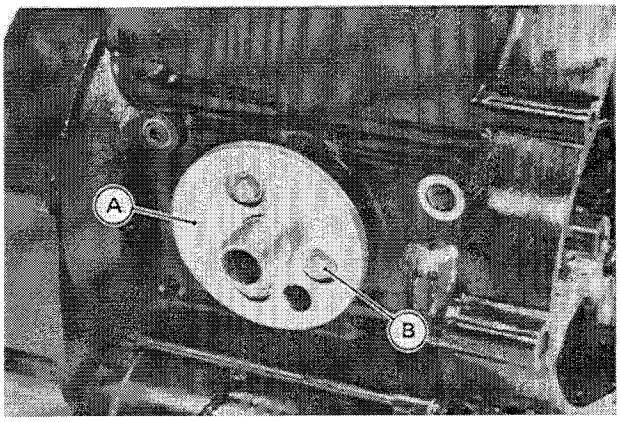
Carburetors (see Fuel System chapter)
Outside Oil Pipe (see Engine Lubrication System)




A. Oil Pipe

Cylinder Head Covers
Cylinder Heads and Camshaft Chains
Cylinders, Pistons and Cylinder Base Gaskets
Clutch Gear
Primary Gear
Alternator
Right and Left Balancers
Alternator Covers and Electric Starter
Oil Filter (see Engine Lubrication System chapter)

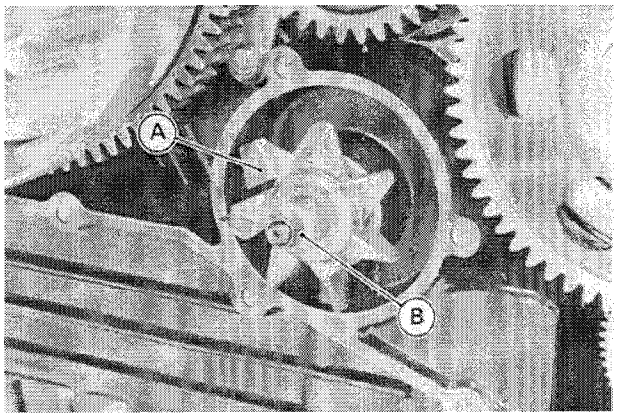
- Unscrew the mounting bolts to remove the oil filter plate and gasket.




A. Plate B. Bolts

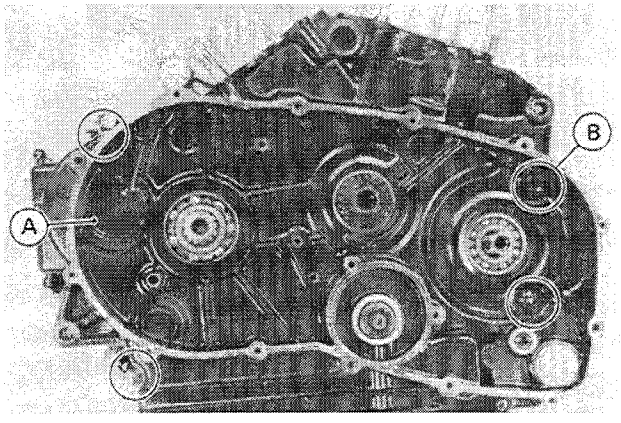
**NOTE**

○*It is not necessary to remove the water pump impeller and nut for crankcase splitting.*



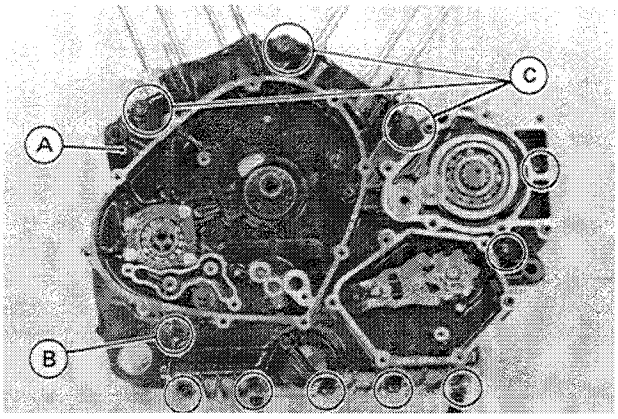

A. Impeller B. Nut

- Unscrew the 6 mm right crankcase bolts (4).



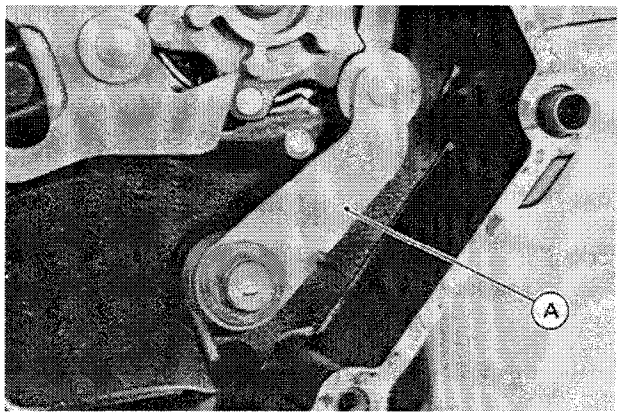

A. Right Crankcase B. 6 mm Bolts

●Unscrew the 6 mm left crankcase bolts (8) first, and then the 10 mm bolts (3).



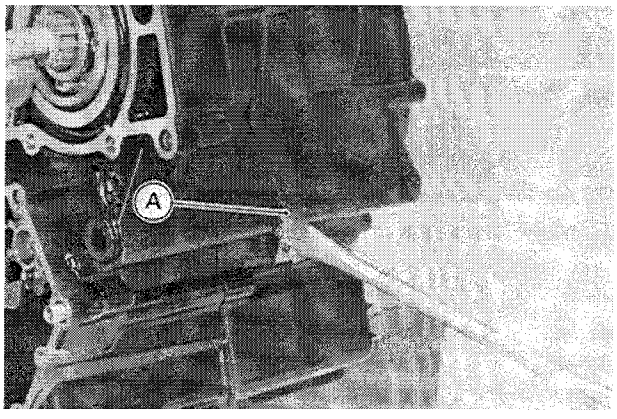

A. Left Crankcase C. 10 mm Bolts
B. 6 mm Bolts (8)

●Remove the gear positioning lever.

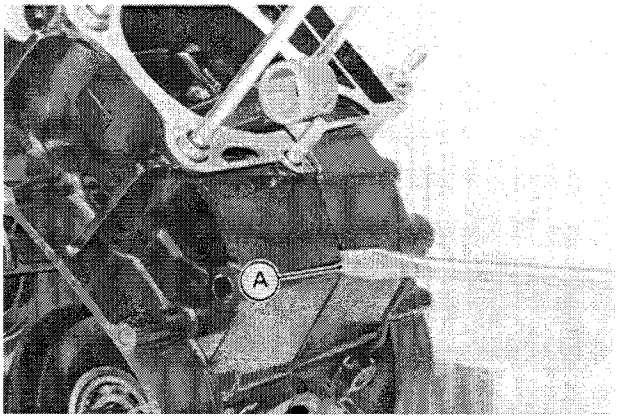



A. Gear Positioning Lever

●Pry at the points shown to split the crankcase halves apart, and remove the right crankcase half. There are two knock pins on the right and left mating surfaces.

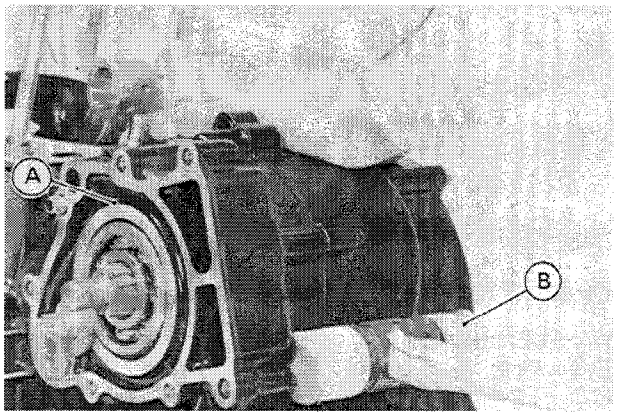



A. Pry Point (Rear)




A. Pry Point (Front)

●Tap the left crankcase portions with a plastic mallet to split the crankcase evenly as shown.

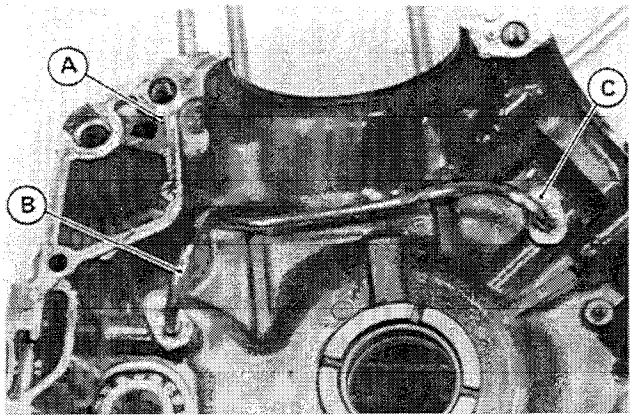



A. Left Crankcase B. Tap here

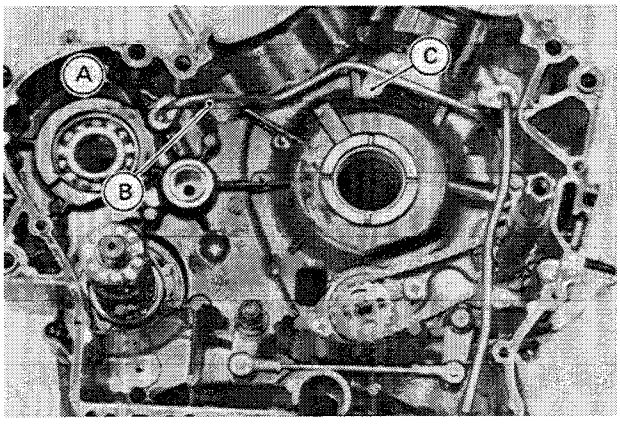
●Turn the engine so that the left crankcase is down.
●Lift off the right crankcase half.

*Crankcase Disassembly*

●Remove the following parts.
Crankshaft
Transmission Shaft Assemblies
Oil Pump
●Unscrew the mounting bolts to remove the oil pipes on the right and left crankcase.

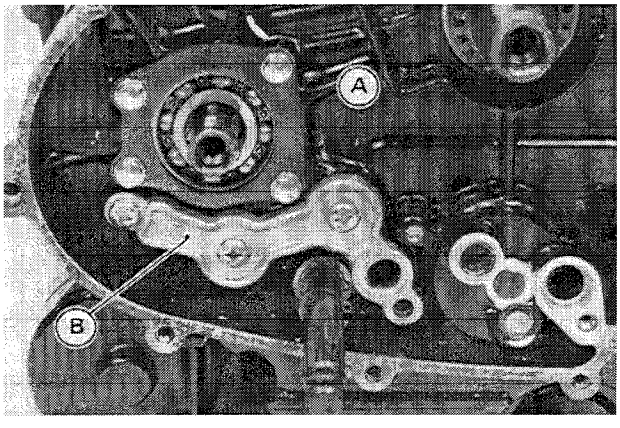



A. Right Crankcase
B. Oil Pipe
C. Mounting Bolts



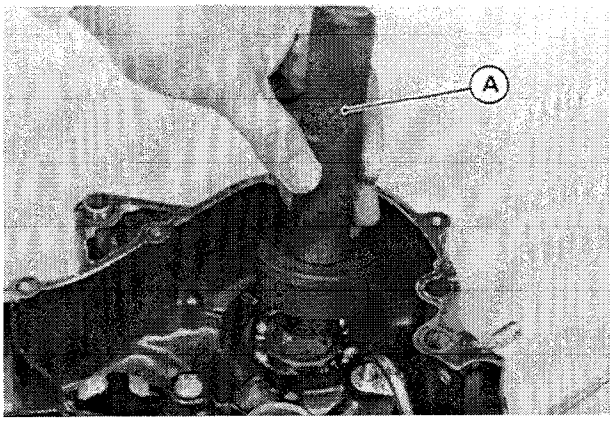

A. Left Crankcase
B. Oil Pipes
C. Mounting Bolts

•Unscrew the mounting screws to remove the oil passage cover and gasket on the left crankcase.




A. Left Side of the Left Crankcase
B. Oil Passage Cover

•After removing the bearing retainers, push out the bearings using a bearing driver set (special tool) and a press.



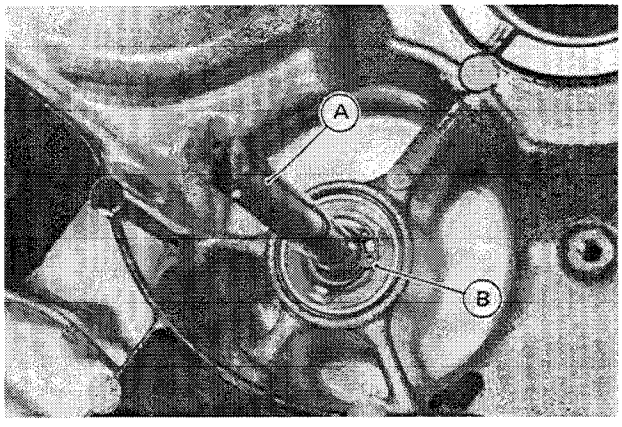

A. Bearing Driver Set: 57001-1129

○In the absence of the above mentioned tools, satisfactory results may be obtained by quickly heating the case (in the area immediately surrounding the bearing) to approximately 93°C (200°F) max., and tapping the bearing in or out.

**CAUTION**

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

•Remove the circlip from the water pump shaft.

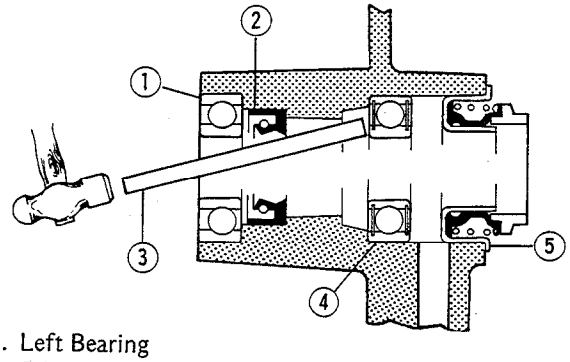



A. Water Pump Shaft
B. Circlip

•Remove the water pump shaft from the right crankcase.
•Insert a metal rod into the case, and remove the right bearing along with the mechanical seal by lightly tapping around the inner race.

●Remove the left bearing and oil seal in the same manner.
★If the mechanical seal is damaged by removing, replace it with a new one.

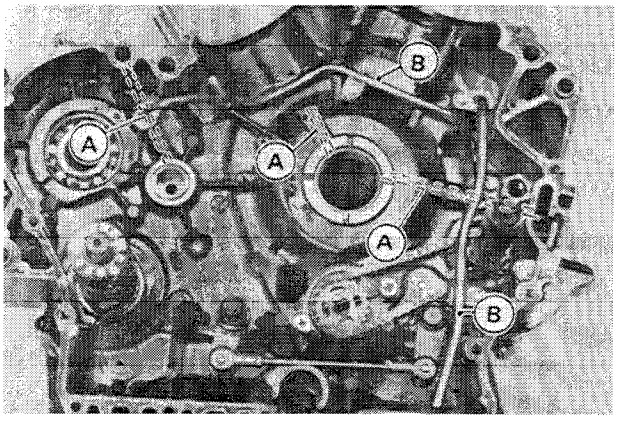
**Ball Bearing and Oil Seal Removal**

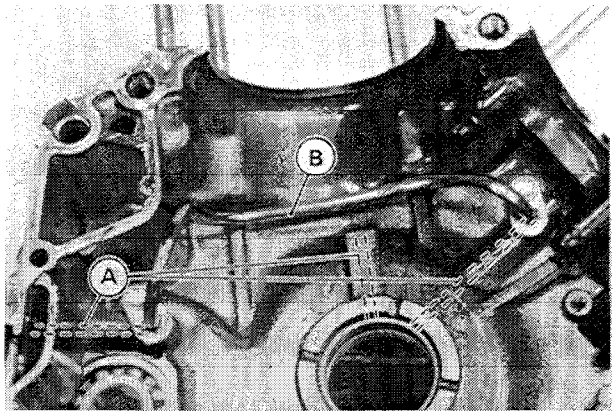



1. Left Bearing
2. Oil Seal
3. Metal Rod
4. Right Bearing (sealed bearing)
5. Mechanical Seal

*Crankcase Assembly*

○Remove the oil pipes, and blow the crankcase passages and oil pipes clean with compressed air.



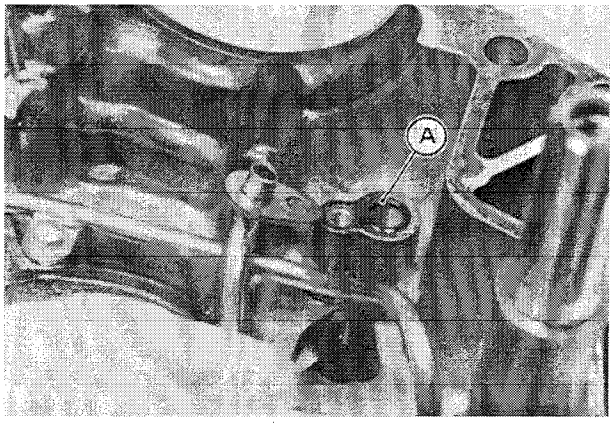

A. Oil Passage B. Oil Pipes

●Apply a non-permanent locking agent to the threads of the oil line plugs.
●Tighten the oil line plugs and nozzles to the specified torque.

| | |
|---|---|
| **Oil line plug:** | **9.8 N-m (1.0 kg-m, 87 in-lb)** |
| **Nozzle:** | **2.9 N-m (0.3 kg-m, 26 in-lb)** |

●Press each crankcase bearing in until it bottoms out using a bearing driver (special tools: 57001-1129) which does not contact the bearing inner race.

●Replace the oil pipe O-ring with a new one if it is damaged
●Be sure to install it as shown, smearing a thin coat of oil on it.

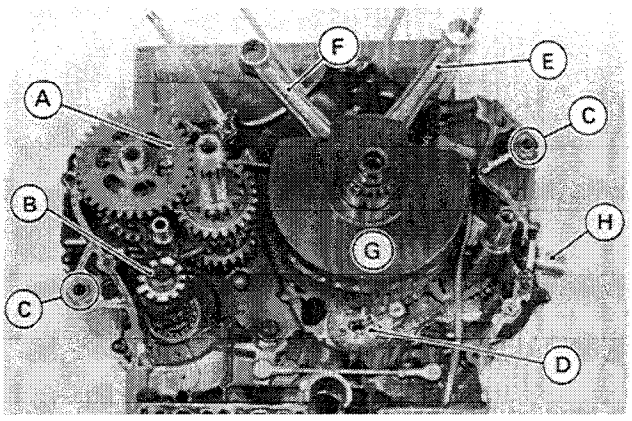



A. O-Ring

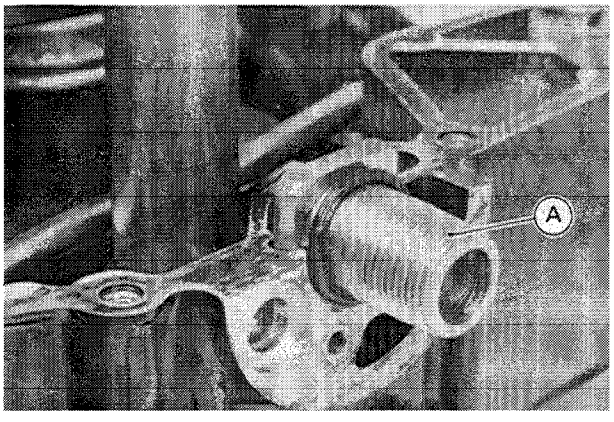
●If the oil pipe mounting bolt is re-used, apply a non-permanent locking agent to the threads.

●Replace the oil passage cover gasket with a new one.
●Apply a non-permanent locking agent to the threads of the mounting screws for the oil pipe and oil passage cover.

●Check to see that the following parts are in place or in the left crankcase half.

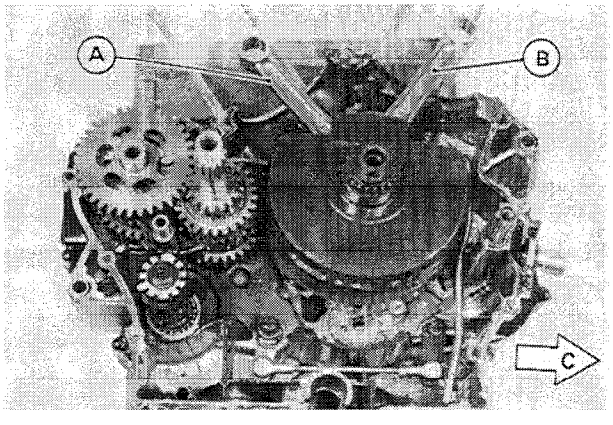



A. Transmission Gears
B. Shift Drum
C. Knock Pins
D. Oil Pump
E. Right Connecting Rod
F. Left Connecting Rod
G. Crankshaft
H. Oil Filter Adapter Bolt



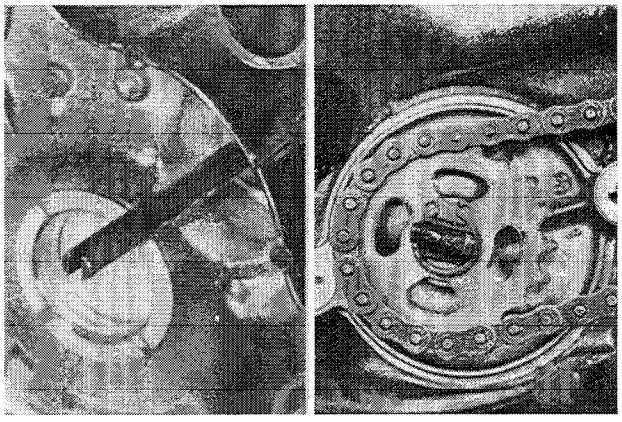

A. Oil Filter Adapter Bolt

●Insert the right connecting rod into the front cylinder opening and the left connecting rod into the rear cylinder opening

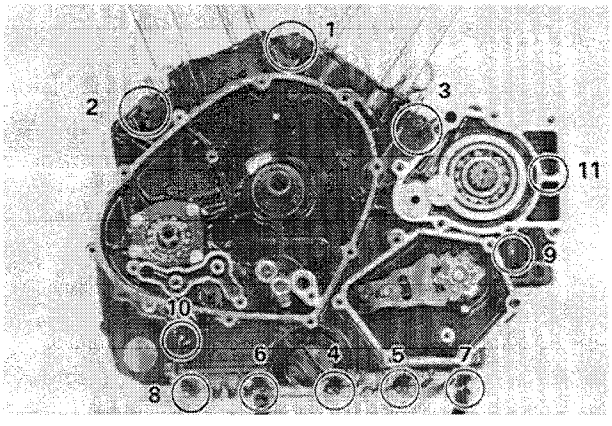



A. Left Connecting Rod
B. Right Connecting Rod
C. Front

●With a high flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
●Apply a liquid gasket to the mating surface of the left crankcase half.
●Install the right crankcase, fitting the oil pump shaft projection into the water pump shaft slot.

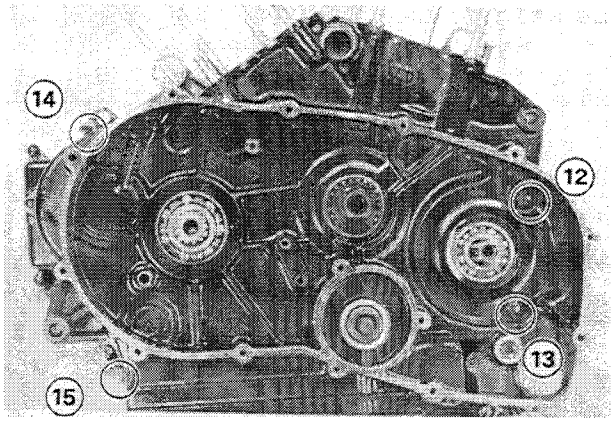


○Tap the case lightly and evenly with a plastic mallet.
●Tighten the left crankcase half bolts as follows.
○Lightly tighten all the left crankcase half bolts to a snug fit.
○Tighten the **10 mm** bolts first in the order shown to the specified torque (see Exploded View).
○Next, tighten the **6 mm** bolts evenly.



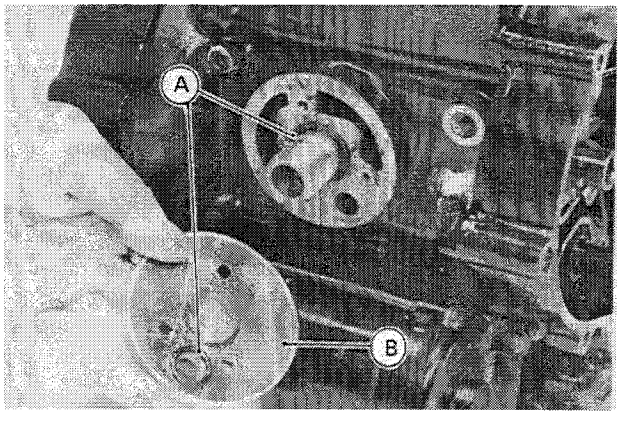

1, 2, 3.: 10 mm Bolts
4 – 11: 6 mm Bolts

●Finally tighten the right crankcase bolts (4) evenly.




12 – 15: 6 mm Bolts

●Install the oil filter plate and new gasket.
○Be sure to install the O-rings.




A. O-Rings B. Gasket

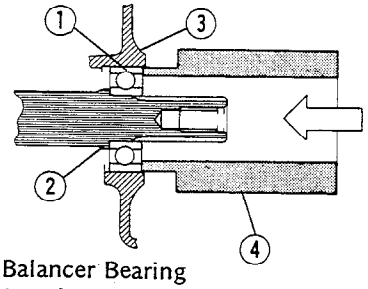
●After tightening all crankcase bolts, check the following items:
○Drive shaft and output shaft turn freely.
○While spinning the output shaft, gears shift smoothly from 1st to 5th gear, and 5th to 1st.
○When the output shaft stays still, the transmission can not be shifted to 2nd gear or other higher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

### *Right Balancer Bearing Installation*

If the right balancer bearing is removed, install it as follows.

●Temporarily press the right balancer bearing into the right crankcase until it is leveled with the outboard end of the bearing housing, using the oil seal driver (special tool).
●Temporarily install the left balancer and balancer shaft in the left crankcase.
●Tighten all the crankcase bolts.
●Finally press the right balancer bearing into the right crankcase until it stops at the shoulder of the balancer shaft.

**Right Balancer Bearing Installation**

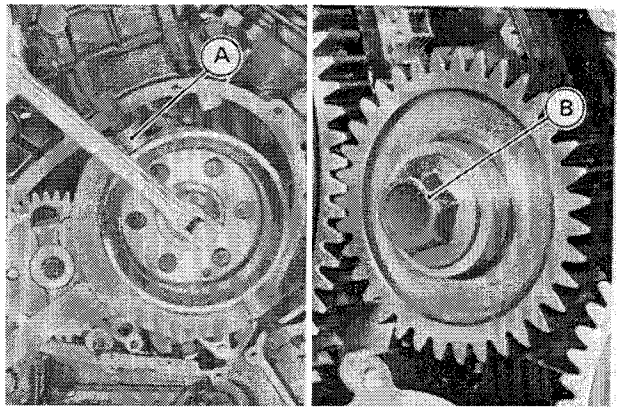



1. Right Balancer Bearing
2. Shoulder of Balancer Shaft
3. Bearing Housing of Right Crankcase
4. Oil Seal Driver: 57001-1091

## Crankshaft/Connecting Rods

### *Crankshaft Removal*

●Remove the inside alternator cover (see Electrical System chapter).
●Remove the right engine cover (see Clutch chapter).
●While holding the alternator rotor with the flywheel holder (special tool), loosen the primary gear bolt.

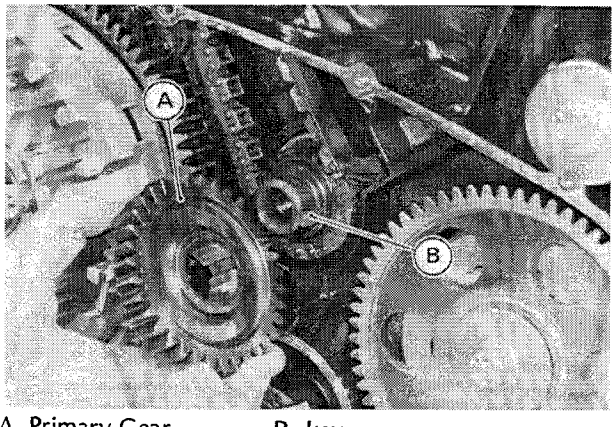



A. Flywheel Holder: 57001-308
B. Primary Gear Bolt

●Split the crankcase.
●Remove the crankshaft.

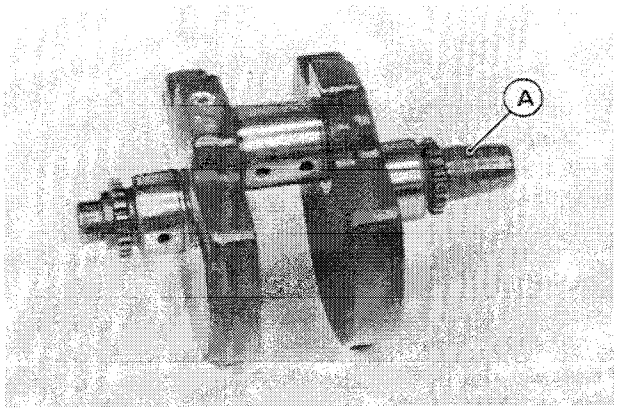
### *Crankshaft Installation Notes*

●Install the primary gear and key.



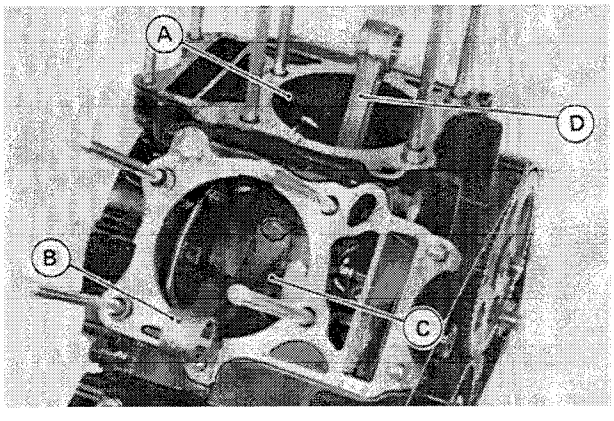

A. Primary Gear B. key

- While holding the alternator rotor with the flywheel holder (57001-308), tighten the pinion gear nut to the specified torque (see Exploded View).
- Install the crankshaft tapered end into the left crankcase.




A. Tapered End

- Install the right connecting rod into the rear cylinder opening and the left connecting rod into the front cylinder opening as shown.




A. Front Cylinder Opening
B. Left Connecting Rod
C. Rear Cylinder Opening
D. Right Connecting Rod

### *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.

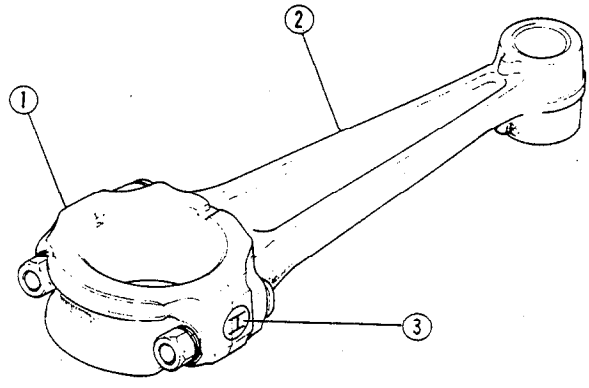
**CAUTION**

**○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, the right and left connecting rods should have the same weight mark. The weight mark is indicated by a capital letter, and is stamped on the connecting rod big end.

**Weight Mark Location**

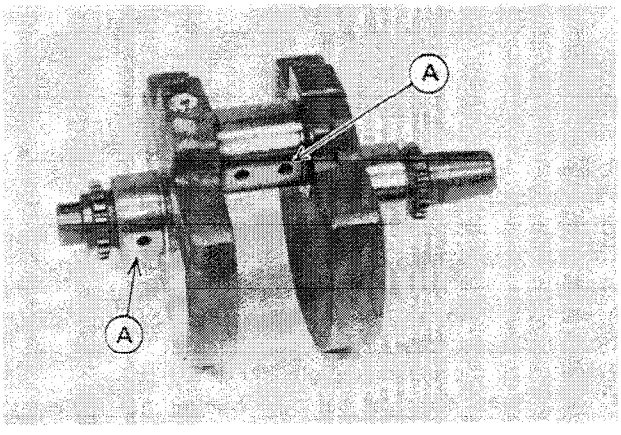



1. Big end cap
2. Connecting rod
3. Weight mark, alphabet

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

### *Crankshaft/Connecting Rod Cleaning*

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



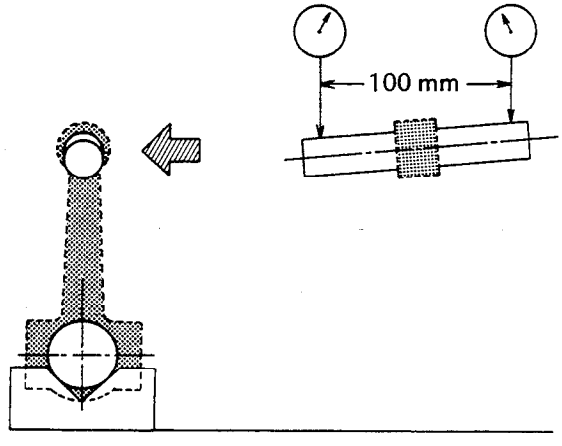

A. Oil Passages

### *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 the V blocks.
○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**

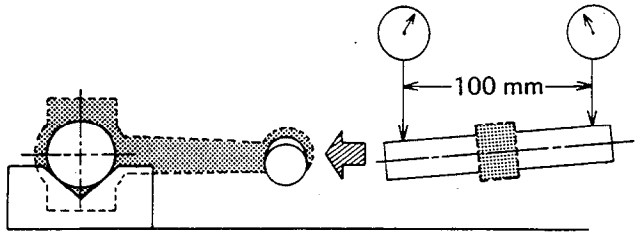
**Connecting Rod Bend Measurement**




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

**Connecting Rod Twist**
**Service Limit: 0.4/100 mm**

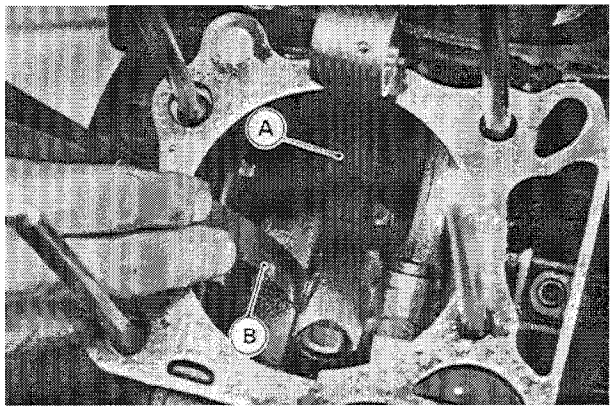
**Connecting Rod Twist Measurement**




### *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: 0.16 – 0.46 mm**
**Service Limit: 0.70 mm**




A. Connecting Rod B. Thickness Gauge

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

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

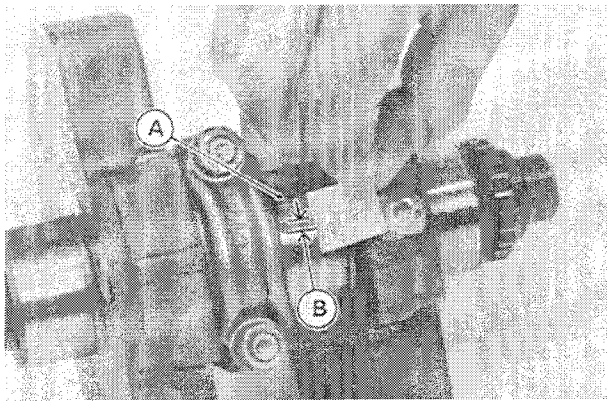
Bearing insert/crankpin wear is measured using a plastigage (press gauge), which is inserted into the clearance to be measured. The plastigage indicates the clearance by the amount it is compressed and widened when the parts are assembled.

- ●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:** | **0.026 – 0.054 mm** |
| **Service Limit:** | **0.09 mm** |

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

★If clearance is between **0.054 mm** and the service limit **(0.09 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 crankpin.

**Crankpin Diameter**

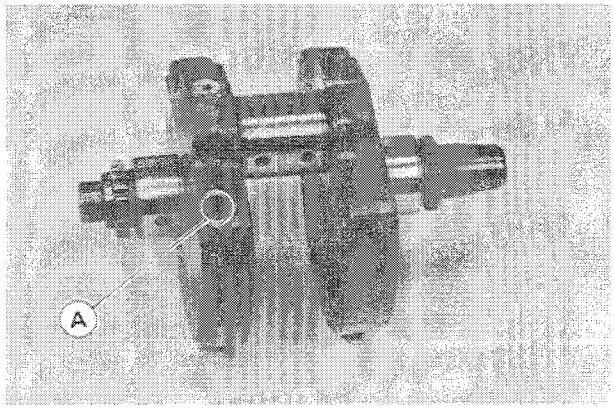
| | |
|---|---|
| **Standard:** | **42.984 – 43.000 mm** |
| **Service Limit:** | **42.97 mm** |

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

★If the measured crankpin diameter is not less than the service limit, but, does not coincide with the original diameter marking on the crankshaft, write a new mark on it.

**Crankpin Diameter Marks**

| Crankpin Diameter Measurement | | Crankshaft Mark |
|---|---|---|
| **42.984 – 42.992 mm** | : | **None** |
| **42.993 – 43.000 mm** | : | **1** |




A. Crankshaft Mark

- ●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.

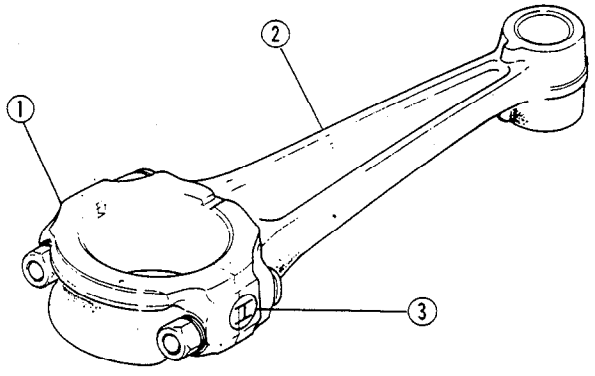
**NOTE**

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

**Connecting Rod Big End Inside Diameter Marks**

| Diameter Measurement | | Mark |
|---|---|---|
| 46.000 – 46.010 mm | : | None |
| 46.011 – 46.020 mm | : | ○ |

**Connecting Rod Mark Location**



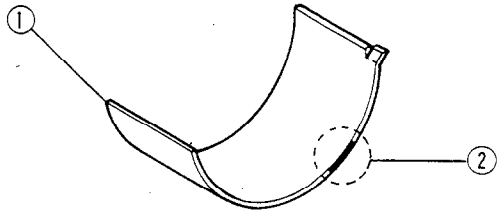

1. Big End Cap
2. Connecting Rod
3. Diameter Mark
   Circle around weight mark letter

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

**Bearing Insert Selection**

| Con-rod Big End Bore Diameter Mark | Crankpin Diameter Mark | Bearing Insert | |
|---|---|---|---|
| | | Size Color | Part Number |
| ○ | 1 | Black | 13034-1058 |
| None | None | | |
| ○ | None | Blue | 13034-1057 |
| None | 1 | Brown | 13034-1059 |

**Bearing Insert Size Mark Location**




1. Bearing Insert
2. Color Size Mark

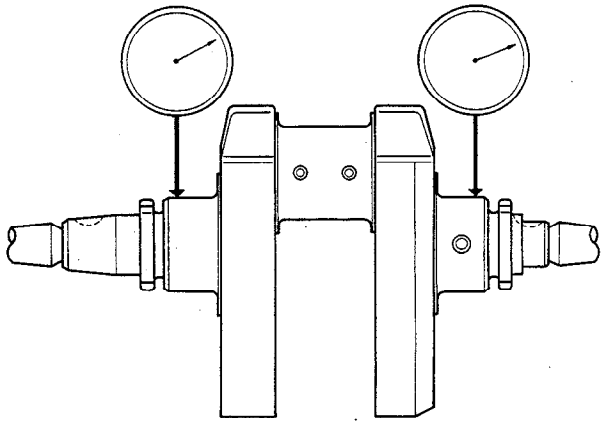
*Crankshaft Runout*

•Measure the crankshaft runout.
○Set the crankshaft in a flywheel alignment jig or on V blocks.
○Set a dial gauge against the journal shown.
○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**

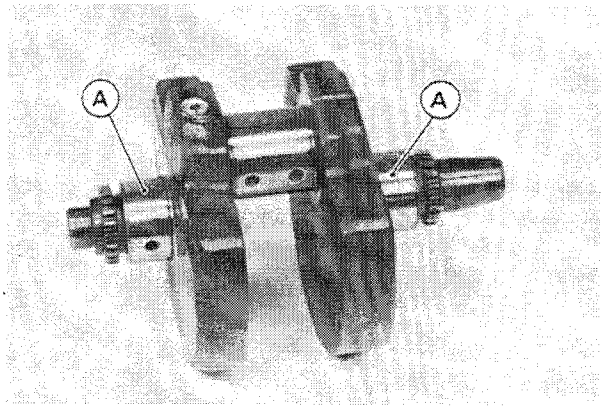
| | |
|---|---|
| **Standard:** | **0.02 mm** |
| **Service Limit:** | **0.05 mm TIR** |

**Crankshaft Runout**



*Crankshaft Main Bearing /Main Journal Wear*

•Measure the diameter of each crankshaft main journal with a micrometer.
★If the diameter of any journal is less than the service limit, replace the crankshaft.

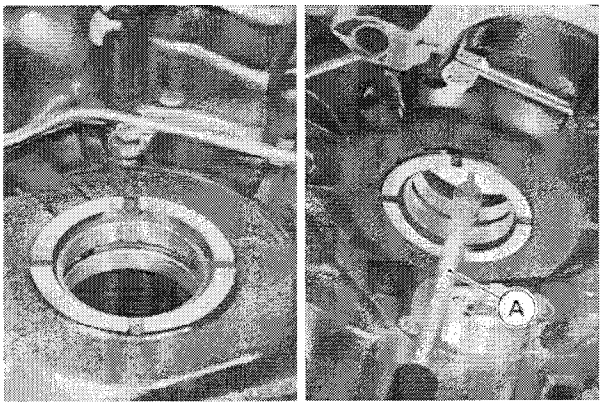



A. Crankshaft Main Journals

**Crankshaft Main Journal Diameter**

| | |
|---|---|
| **Standard:** | **42.984 – 43.000 mm** |
| **Service Limit:** | **42.96 mm** |

•Visually inspect the internal surface of each main bearing in the crankcase halves.
★If they are any signs of seizure, damage, or excessive wear, replace the crankcase halves as a set.
•Measure the diameter of each crankcase main bearing in the crankcase halves with a cylinder gauge.
★If it exceeds the service limit, replace the crankcase halves as a set.




A. Cylinder Gauge

**Crankcase Main Bearing Bore Diameter**

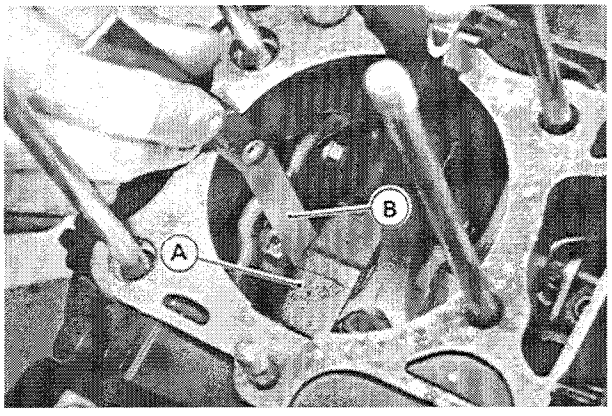
| | |
|---|---|
| **Standard:** | **43.025 – 43.041 mm** |
| **Service Limit:** | **43.09 mm** |

*Crankshaft Side Clearance*

•Measure crankshaft side clearance.
○Insert a thickness gauge between the crankcase main bearing housing and the crank web.

**Crankshaft Side Clearance**

| | |
|---|---|
| **Standard:** | **0.05 – 0.55 mm** |
| **Service Limit:** | **0.75 mm** |

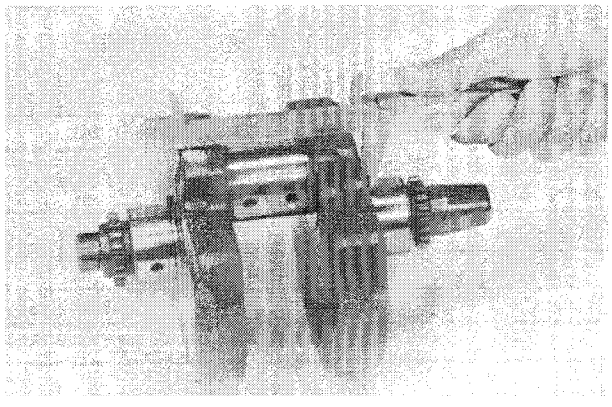



A. Crankshaft B. Thickness Gauge

★If the clearance is greater than the service limit, measure the crankshaft web length to see whether the crankshaft or the crankcase is faulty.

**Crankshaft Web Length**

| | |
|---|---|
| **Standard:** | **96.85 – 96.95 mm** |
| **Service Limit:** | **96.6 mm** |



★If the length measurement is smaller than the service limit, replace the crankshaft. Otherwise, replace the crankcase halves as a set.

**NOTE**

○*The right and left crankcase halves are machined at the factory in the assembled state, so they must be replaced as a set.*

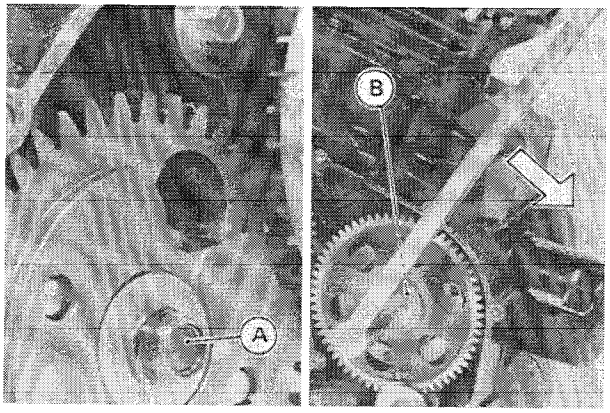
## Balancer

### *Left Balancer Removal*

- Remove the alternator (see Alternator Removal in Electrical System chapter).
- Remove the right engine cover (see Clutch chapter).
- While holding the right balancer shaft bolt with a wrench, loosen the left balancer shaft bolt.

**NOTE**

○*The left balancer shaft bolt has left-hand threads. Turn the wrench clockwise for removal.*

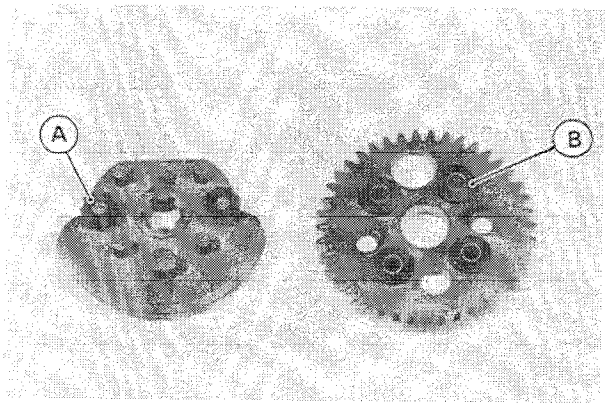



A. Left Balancer Bolt B. Right Balancer

- Remove the bolt, washer, collar, balancer gear, and left balancer.

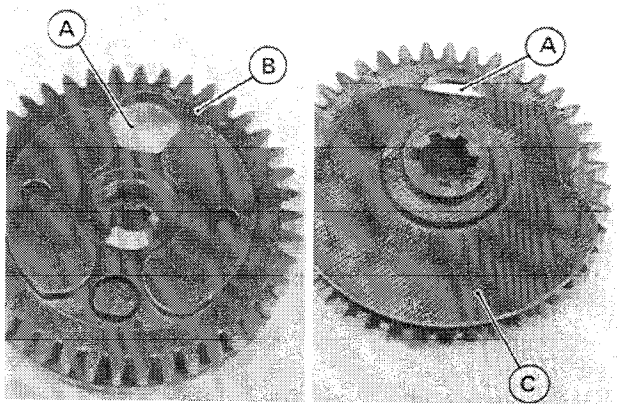
### *Left Balancer Installation*

- Install the right balancer and starter gear (see Right Balancer Installation).
- Install the balancer dampers on the balancer gear and balancer as shown.



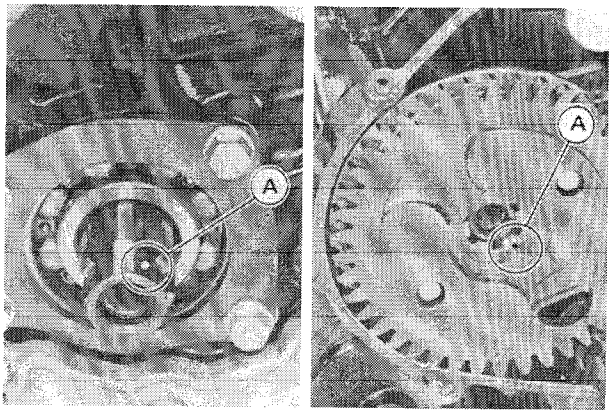

A. Dampers B. Dampers

- Assemble the gear and balancer being careful of the position.



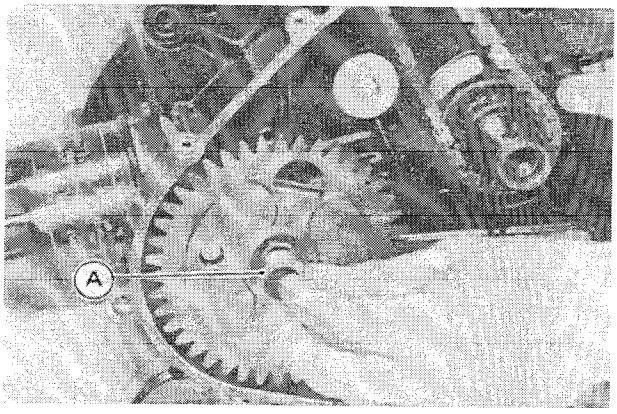

A. Balancer Hole
B. Balancer Gear
C. Left Balancer

- Install the balancer assembly on the shaft, aligning the weight punch mark with the shaft punch mark.



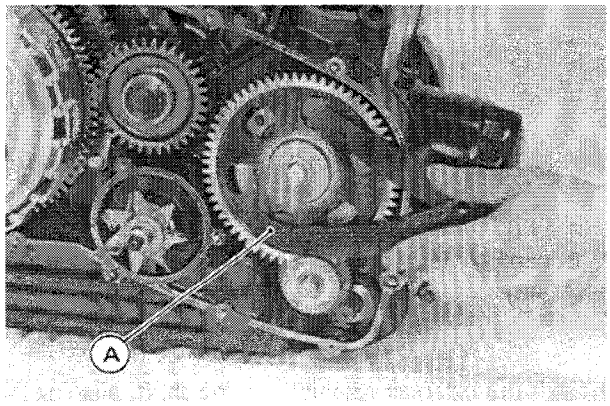

A. Punch Marks

- Install the collar.




A. Collar

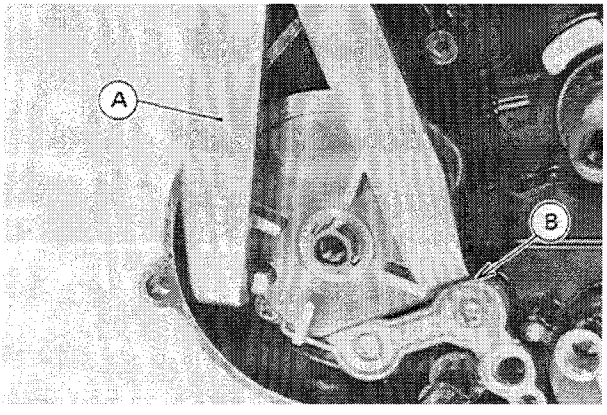
- Apply a non-permanent locking agent to the threads of the balancer shaft bolt.
- Tighten the balancer shaft bolt (left-hand thread) by turning it couterclockwise to the specified torque (see Exploded View). Use a flywheel holder (special tool) to keep the starter gear from turning as shown.




A. Flywheel Holder: 57001-306

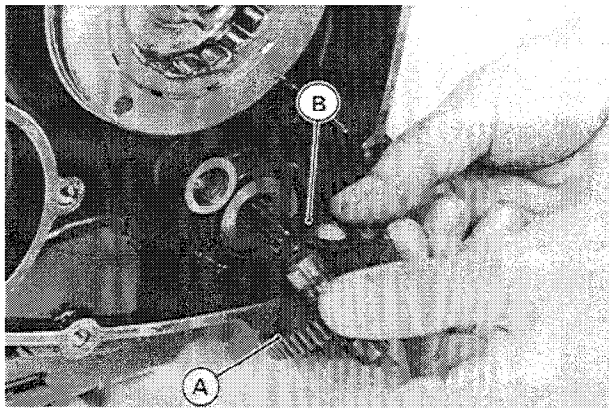
### *Right Balancer Removal*

- Remove the left balancer gear (see Left Balancer Removal).
- Temporarily install the left balancer.
- Loosen the right balancer shaft bolt (right-hand thread) by turning it counterclockwise. Use the clutch holder (special tool) to keep the left balancer from turning.



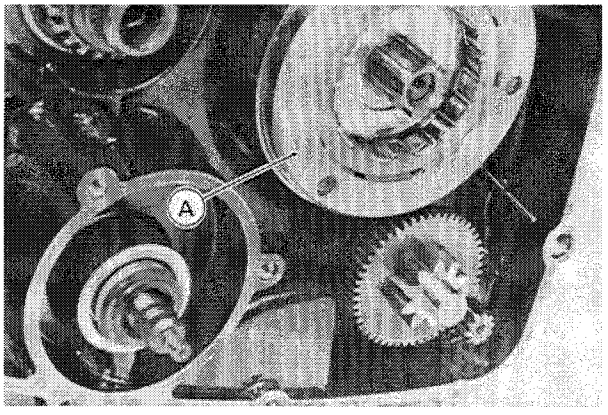

A. Clutch Holder: 57001-305
B. Brace the tool on the oil passage cover

- Remove the shaft bolt, washer, and starter gear.
- Pull out the starter idle gear and thrust washer.




A. Idle Gear B. Washer

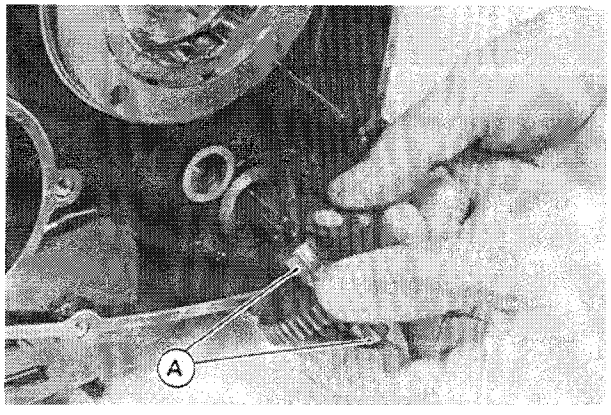
- Remove the right balancer and starter clutch.




A. Right Balancer and Starter Clutch

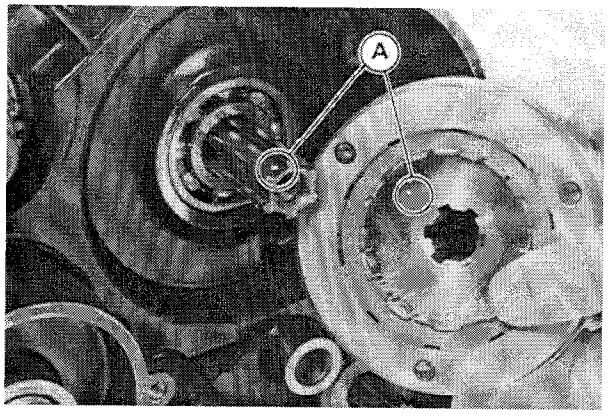
### *Right Balancer Installation Notes*

- The installation is the reverse of removal. Note the following.
- Apply a molybdenum disulfide grease to the idler shaft.



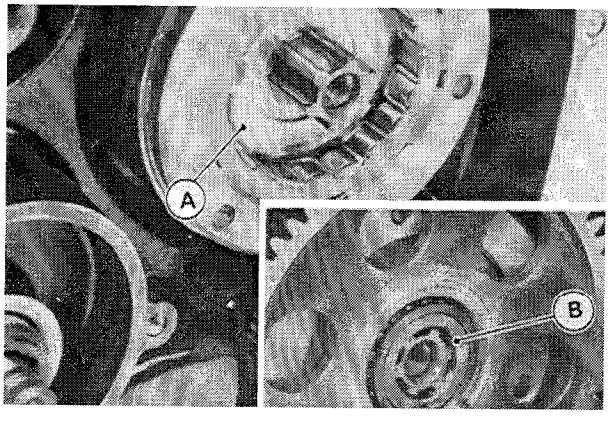

A. Grease here

●Install the balancer and starter clutch, aligning the weight punch mark with the shaft punch mark.



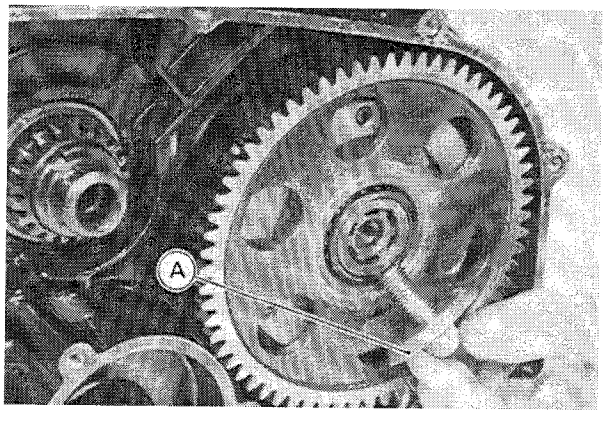

A. Punch Mark

●Be sure the collar fits into the copper washer.



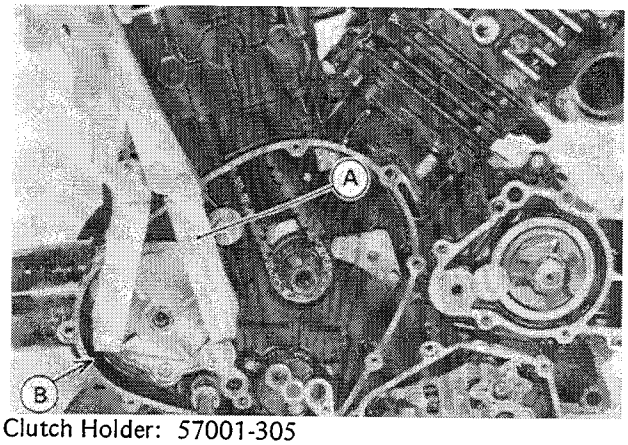

A. Washer B. Collar

○Install the washer with the chamfered side facing inboard.




A. Washer

●Apply a non-permanent locking agent to the threads of the balancer shaft bolt.
●Temporarily install the left balancer.
●Tighten the balancer shaft bolt to the specified torque, using the clutch holder (special tool).



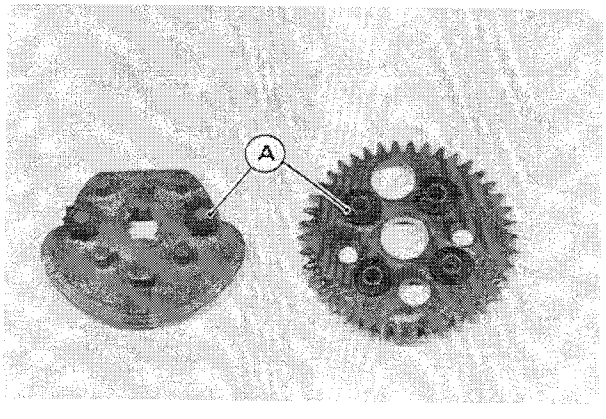

A. Clutch Holder: 57001-305
B. Brace the tool on the cover

### *Right Balancer Disassembly/Assembly*

○See Starter Clutch Disassembly and Starter Clutch Assembly Notes in Electrical System chapter.

### *Balancer Damper Inspection*

●Remove the left balancer and take out the balancer dampers.
●Visually inspect the rubber dampers.
★If they appear damaged or deteriorated, replace them.




A. Rubber Dampers

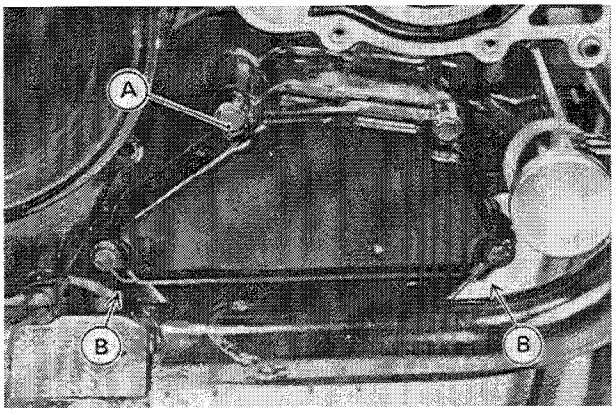
## Transmission

### *External Shift Mechanism Removal*

**NOTE**

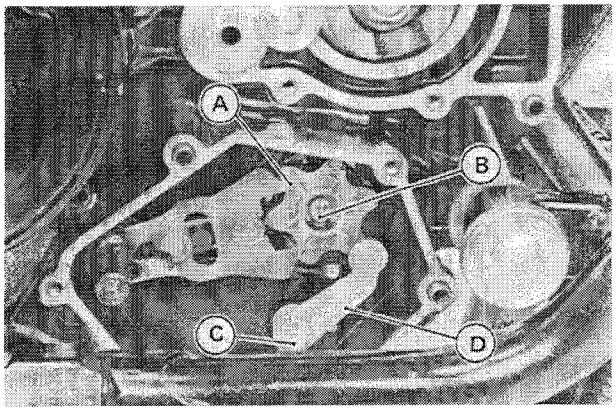
○*The shift cover can be removed with the engine mounted in the frame.*

●Drain the engine oil.
●Remove the front bevel gear case (see Front Bevel Gear Case Removal in Final Drive chapter).
●Unscrew the cover mounting bolts and pry at the two points shown to remove the cover.




A. Mounting Bolts B. Pry Points

●Unscrew the shift drum screw to remove the shift drum cam, if necessary.
●Remove the gear positioning lever by taking out the bolt.

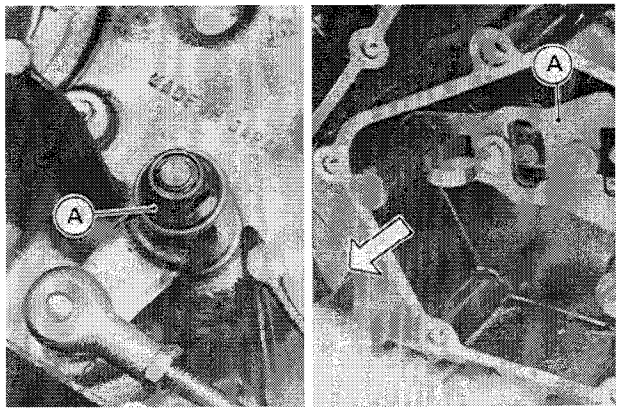



A. Shift Drum Cam C. Bolt
B. Screw D. Gear Positioning Lever

**NOTE**

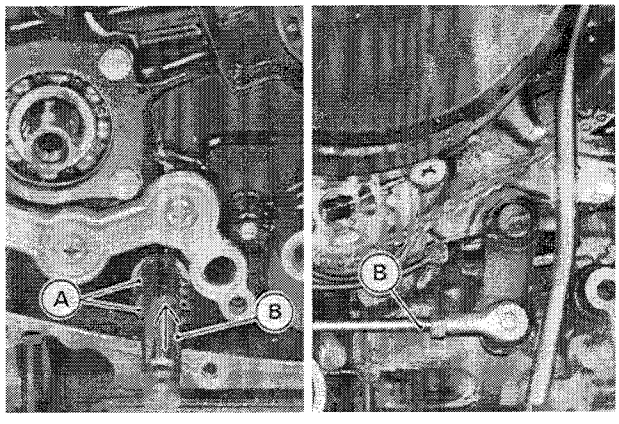
○*It is not necessary to remove the shift drum for crankcase splitting.*

●Split the crankcase (see Crankcase Splitting).
●Remove the nut to pull out the shift mechanism arm.




A. Nut B. Shift Mechanism Arm

●Remove the circlips and washers to push in the shift shaft and shift linkage.

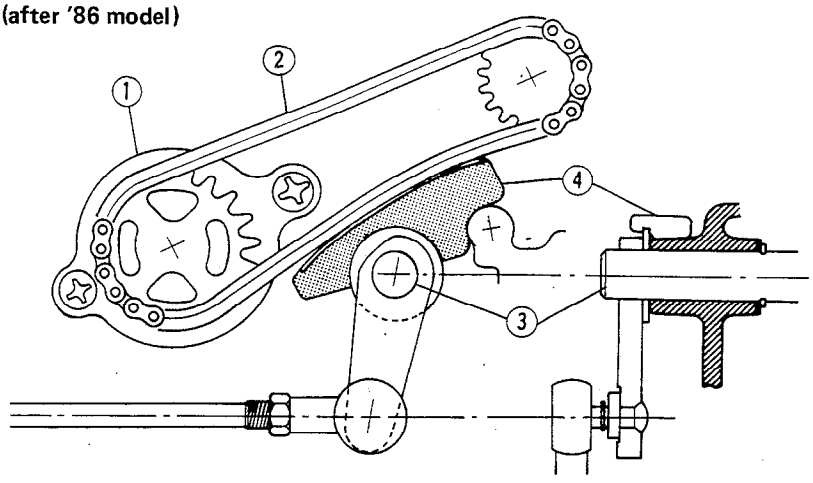



A. Circlips and Washer
B. Shift Shaft and Shift Linkage

### *External Shift Mechanism Installation*

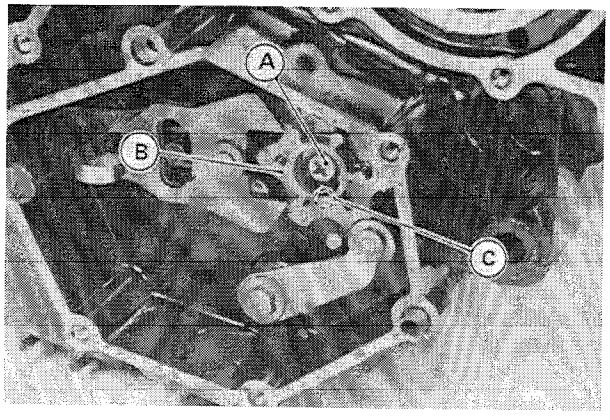
○Installation is the reverse of removal. Note the following.
●The late model has an oil pump chain guide. Before installing the shift shaft and shift linkage, be sure to insert the chain guide on the shift shaft as shown.

**Oil Pump Chain Guide Installation (after '86 model)**



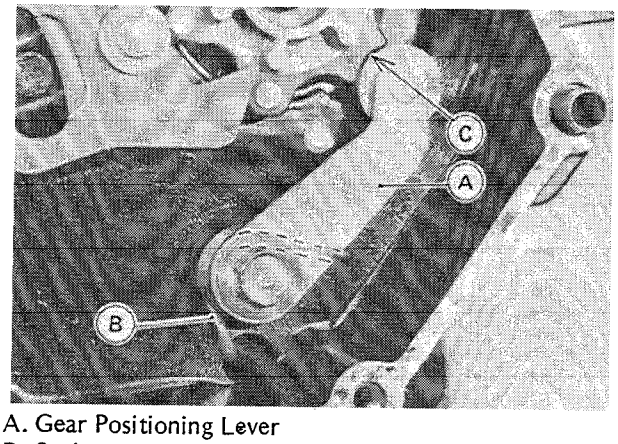

1. Oil Pump
2. Oil Pump Chain
3. Shift Shaft
4. Oil Pump Chain Guide

- Fit the knock pin into the cam hole to install the cam.
- Apply a non-permanent locking agent to the threads of the cam mounting bolt (shift drum) and tighten it.



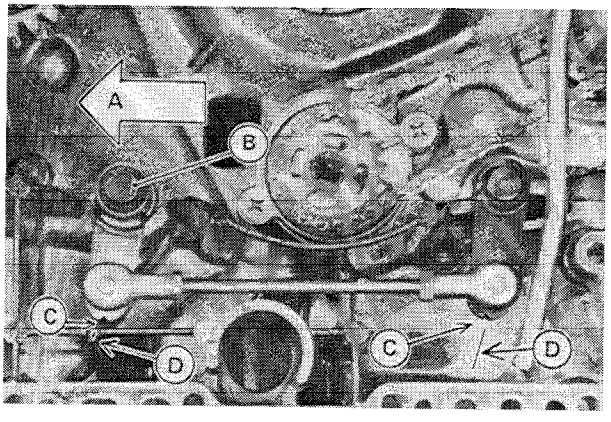

A. Cam Mounting Screw
B. Cam
C. Knock Pin

- After installing the gear positioning lever and spring, tighten the mounting bolt. Check that the lever turns freely.
- Check to see that the shift drum is in the neutral position shown.



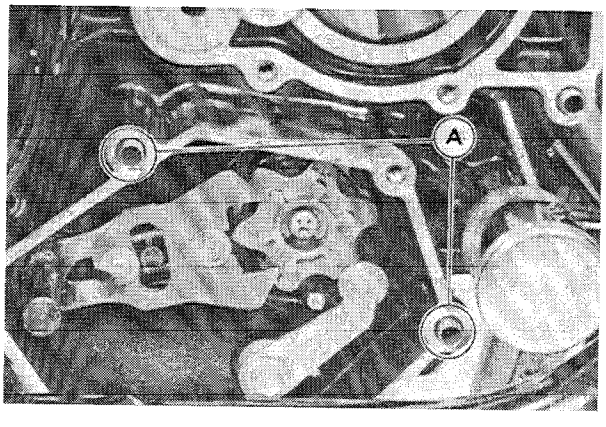

A. Gear Positioning Lever
B. Spring
C. Neutral Dent (shallower dent)

- Tilt the shift linkage rearward until the shift lever notches align with the crankcase marks.
- While holding the linkage in position, insert the shift mechanism arm with the return spring installed, and tighten the nut.




A. Rear
B. Nut
C. Shift Lever Notches
D. Crankcase Marks

- Install the shift cover as follows.
  - Check that the knock pins (2) are in place.
  - Install the new gasket.



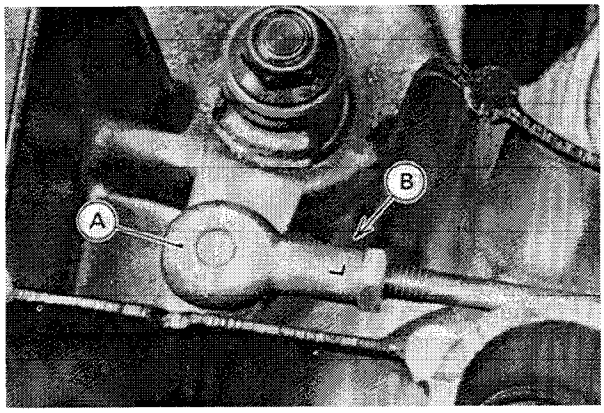

A. Knock Pins

- Tighten the cover mounting bolts.

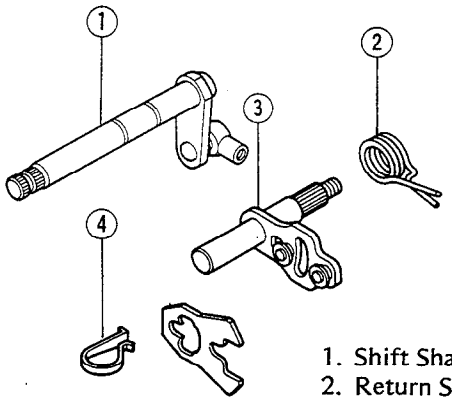
*External Shift Mechanism Disassembly Note*

**NOTE**

○*The rear rod end has left-hand threads. Turn the nut clockwise for removal. The front rod end has right-hand threads.*




A. Rear End B. L Mark: Left Hand Thread

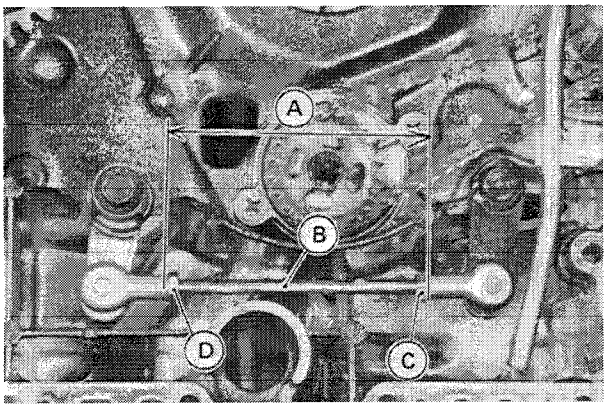



1. Shift Shaft
2. Return Spring
3. Shift Mechanism Arm
4. Arm Spring

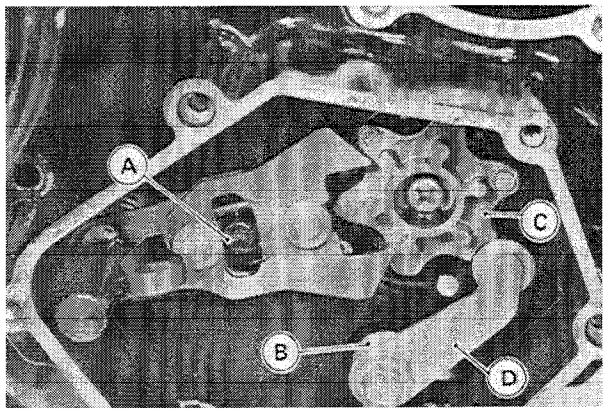
○Check the shift shaft for bending or damage to the splines.
☆If the shaft is bent, straighten or replace it. If the splines are damaged, replace the shaft.
○Check the return spring and arm spring for breaks or distortion.
☆If the springs are damaged in any way, replace them.
○Check the shift mechanism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

*External Shift Mechanism Assembly Notes*

●After applying a non-permanent locking agent to the threads of the rods, screw the rod into each rod end.
●Turn the rod to make a **88 to 92 mm length** including the locknuts as shown.
●Tighten the locknuts to the specified torque (see Exploded Views).




A. 88 to 92 mm
B. Rod
C. Locknut (right-hand threads)
D. Locknut (left-hand threads)




A. Return Spring Pin
B. Spring
C. Shift Drum Cam
D. Gear Positioning Lever

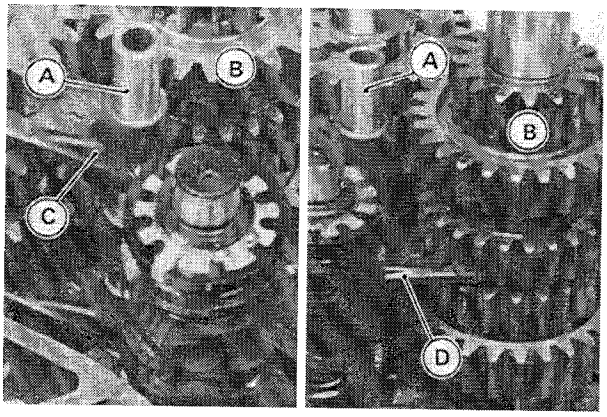
*External Shift Mechanism Inspection*

●Examine the shift shaft for any damage.

●Visually inspect the shift drum cam.
★If it is badly worn or if it shows any damage, replace it.

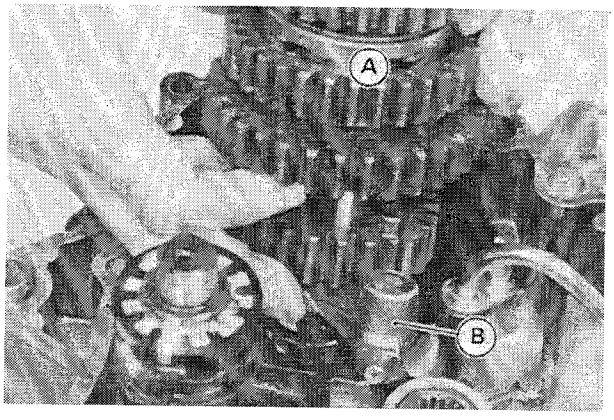
### *Transmission Shaft Removal*

- Take out the crankshaft.
- Pull out the shift rod.
- Remove the drive shaft assembly with the right and middle shift forks in place.




A. Shift Rod
B. Drive Shaft Assembly
C. Right Shift Fork
D. Middle Shift Fork

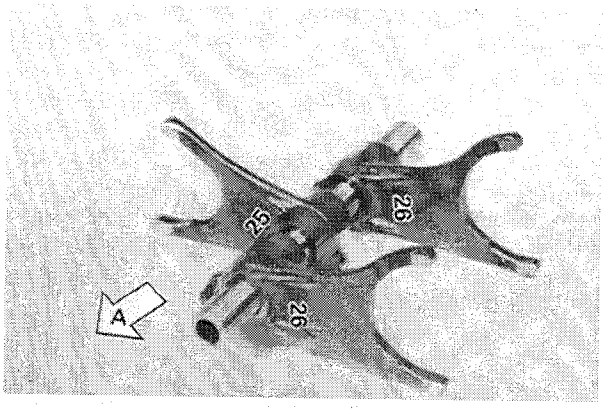
- Remove the output shaft assembly with the left shift fork in place.



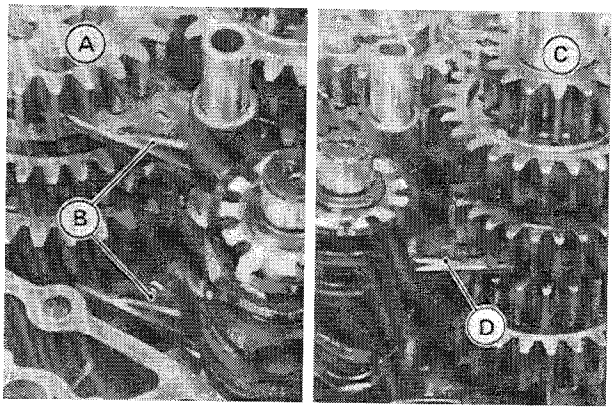

A. Output Shaft Assembly
B. Left Shift Fork

### *Transmission Shaft Installation Notes*

- The shift forks can be identified by the numbers **25** and **26**.
- Install the shift forks with the identification numbers facing the left crankcase half in the positions shown.



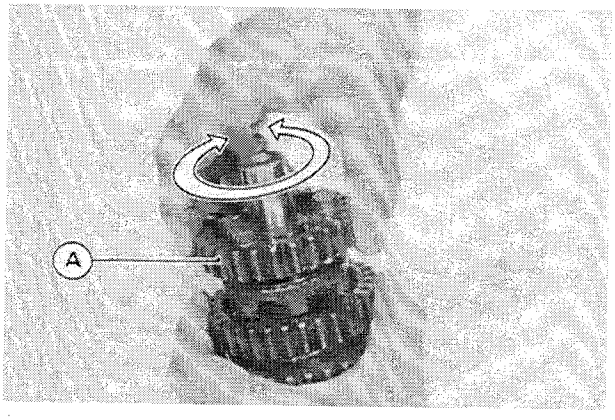

A. Bottom (toward left crankcase half)




A. Output Shaft
B. Shift Forks Marked **26**
C. Drive Shaft
D. Shift Fork Marked **25**

### *Transmission Shaft Disassembly*

- Remove the transmission shafts.
- Using circlip pliers (57001-144), remove the circlips and 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 the shaft in a vertical position while holding the 3rd gear, and pull off the 4th gear upwards.

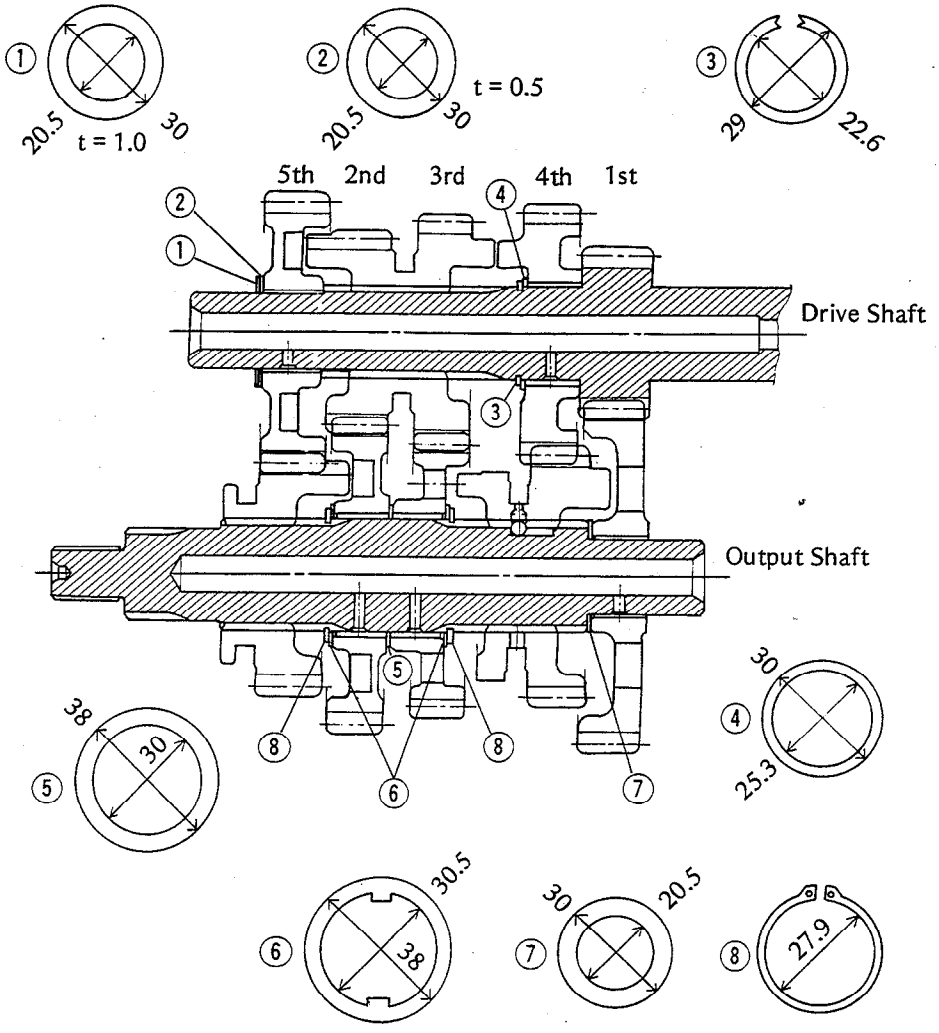



A. 4th Gear

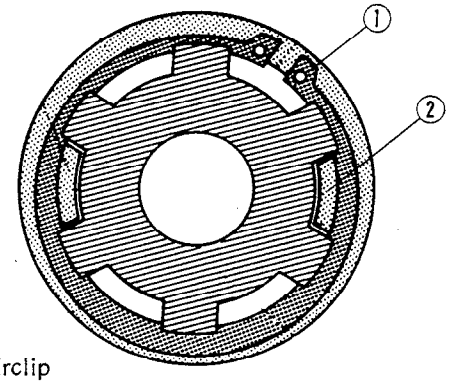
### *Transmission Shaft Assembly Notes*

- Assembly is the reverse of disassembly. Note the following.
- 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.
- Use a high flash-point solvent to clean the crankcase and all the transmission, shift drum, and crankshaft part.
- Apply engine oil to the transmission gears and shift drum where they turn in the crankcase and on the drive and output shafts.
- Replace any circlips that were removed with new ones.
- Always install circlips so that the opening is aligned with a spline groove.

**Transmission Assembly**



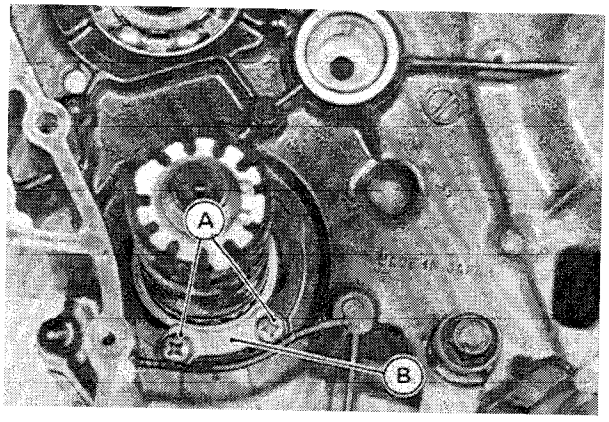

**Circlip and Toothed Washer Installation**



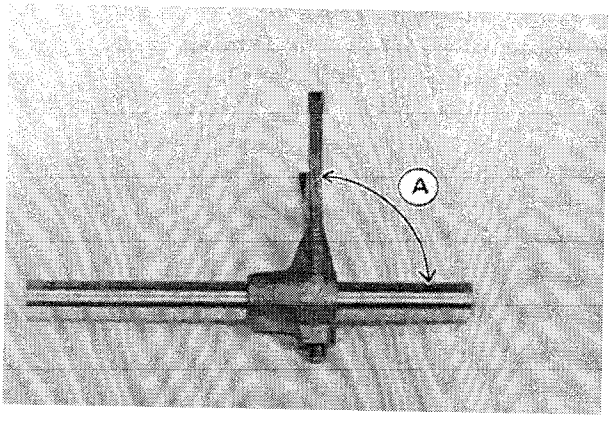
1. Circlip
2. Toothed Washer

### *Shift Drum Removal*

- Remove the gear positioning lever in the shift cover.
- Remove the drive and output shaft assemblies (see Transmission Disassembly).
- Unscrew the mounting screws to remove the drum retainer.

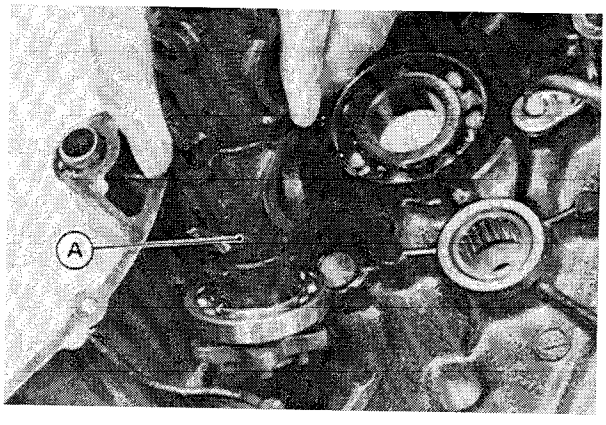



A. Screws B. Retainer




A. 90°

○While aligning the shift drum cam with the left crankcase hole, pull out the shift drum.




A. Shift Drum

### *Shift Drum Installation Note*

●If the retainer bolts are re-used, apply a non-permanent locking agent to the threads.

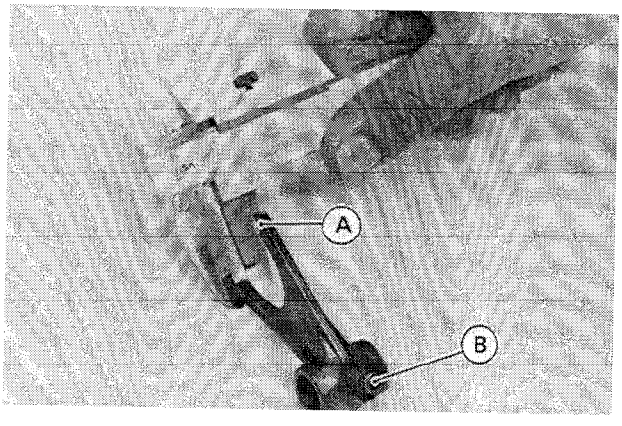
### *Shift Fork Bending*

●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.

### *Shift Fork/Gear Groove Wear*

●Measure the thickness of the shift fork ears.

★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.




A. Shift Fork Ear B. Guide Pin

**Shift Fork Ear Thickness**

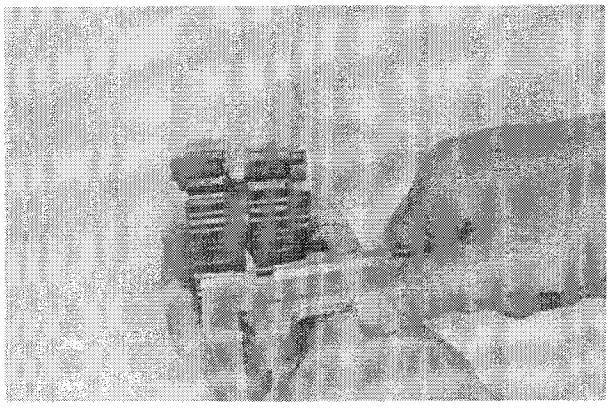
| | |
|---|---|
| **Standard :** | **4.9 – 5.0 mm** |
| **Service Limit:** | **4.8 mm** |

●Measure the width of the shift fork grooves in the transmission gears.

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

**Gear Shift Fork Groove Width**

| | |
|---|---|
| **Standard:** | **5.05 — 5.15 mm** |
| **Service Limit:** | **5.3 mm** |



### *Shift Fork Guide Pin Wear*

●Measure the diameter of each shift fork guide pin.

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

**Shift Fork Guide Pin Diameter**

| | |
|---|---|
| **Standard:** | **5.9 — 6.0 mm** |
| **Service Limit:** | **5.8 mm** |

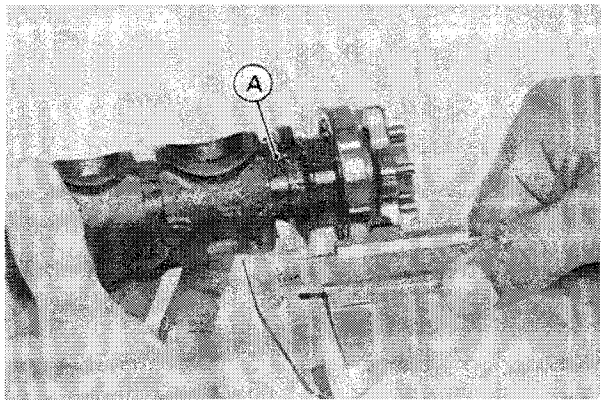
### *Shift Drum Groove Wear*

●Measure the width of each shift drum groove.

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

**Shift Drum Groove Width**

| | |
|---|---|
| **Standard:** | **6.05 — 6.20 mm** |
| **Service Limit:** | **6.3 mm** |

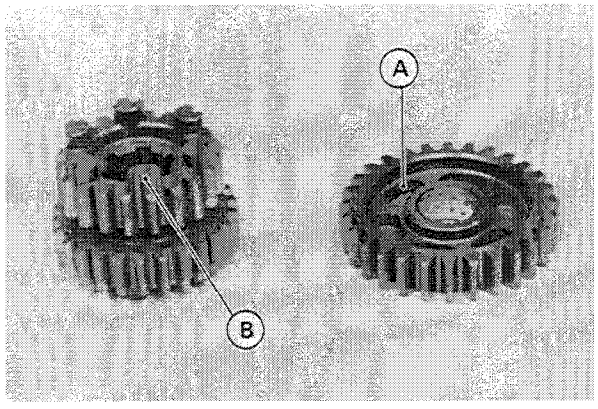



A. Shift Drum Grooves

### *Gear Dog/Gear Dog Hole Damage*

●Visually inspect the gear dogs and gear dog holes.

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




A. Dog Hole B. Dog

### *Ball and Needle Bearing Wear*

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

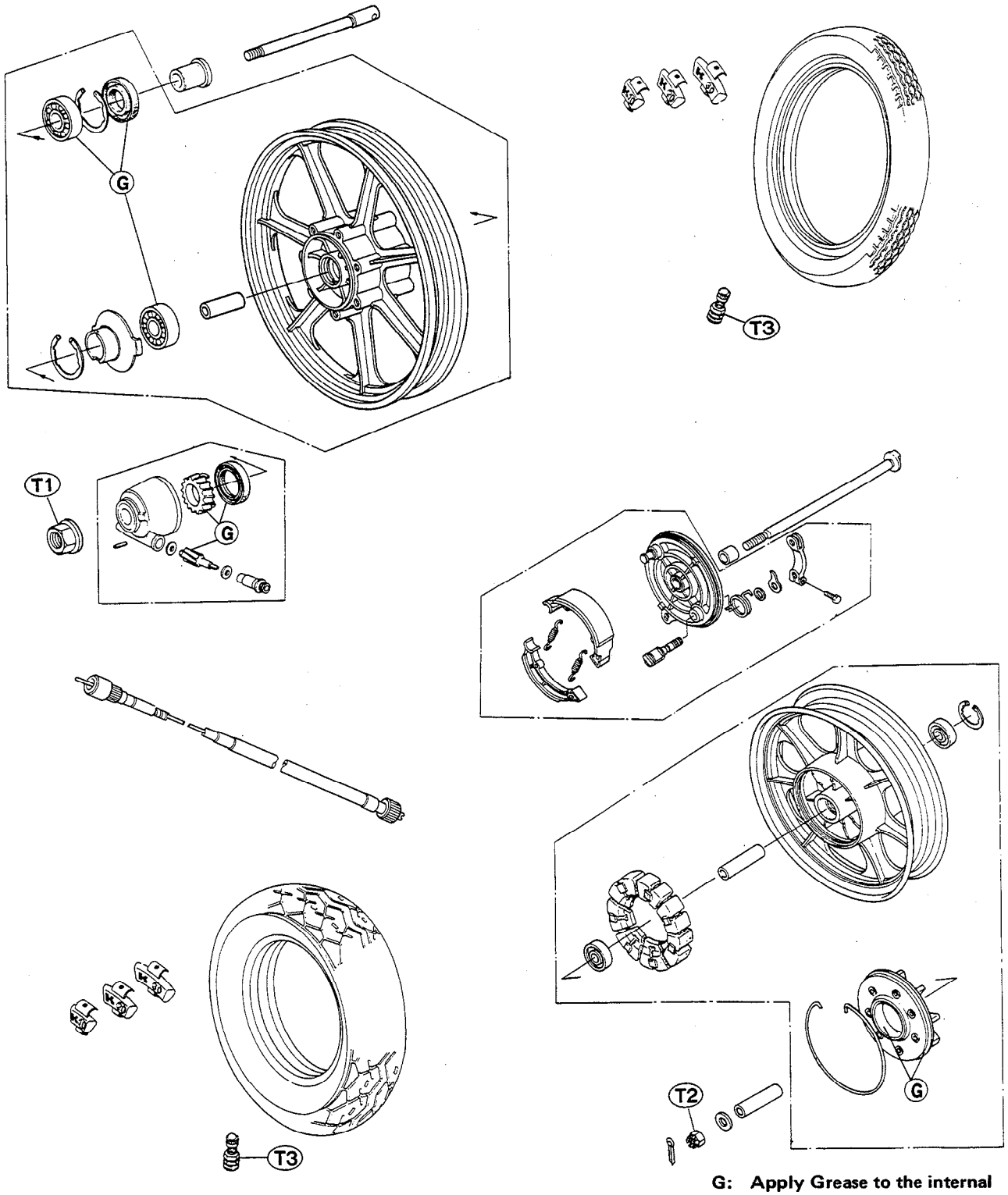
○The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

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

# Wheels/Tires

## Table of Contents

## Exploded View




**G: Apply Grease to the internal surface**
**T1: 59 N-m (6 kg-m, 43 ft-lb)**
**T2: 110 N-m (11 kg-m, 80 ft-lb)**
**T3: 1.5 N-m (0.15 kg-m, 13 in-lb)**
**T4: 19 N-m (1.9 kg-m, 13.5 ft-lb)**

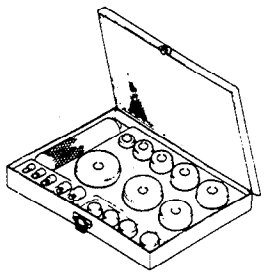
## Specifications

| Item | | Standard |
|---|---|---|
| **Wheels:** | | |
| Wheel balance | | Imbalance of less than 10 g |
| Front tire | Make & type | DUNLOP F11G ( ⓒⓤ F11A) Tubeless or METZELER MARATHON FRONT |
| | Tire size | 100/90-19 57H |
| | Air pressure | 200 kPa (2.0 kg/cm², 28 psi) |
| | Tread depth | 4.4 mm (Service limit : 1 mm) |
| Rear tire | Make & type | DUNLOP K425G ( ⓒⓤ K425) Tubeless or METZELER ME88 MARATHON EURO |
| | Tire size | 150/90-15 74H, 150/90 B15 M/C 74H, or 150/90-15 M/C 74H |
| | Air pressure | over — up to<br>— — — — 97.5 kg (215 lb) 200 kPa (2.0 kg/cm², 28 psi)<br>97.5 kg (215 lb) — 184 kg, *180 kg (406 lb, *397 lb) 225 kPa (2.25 kg/cm², 32 psi) |
| | Tread depth | 7.3 mm (service limit: 2 mm) |
| Rim runout | Radial | — — — (service limit: 0.8 mm) |
| | Axial | — — — (service limit: 0.5 mm) |
| Axle runout | | under 0.05 mm<br>(Service limit 0.2 mm) |

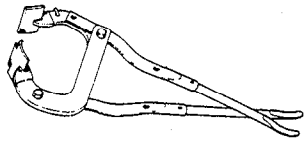
* : ⒶⒸⓈⓤ Models  Ⓐ : Australia Model  Ⓒ : Canada Model  Ⓢ : South Africa Model  Ⓤ : US Model

## Special Tools

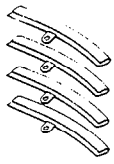
**Bearing Driver Set: 57001-1129**



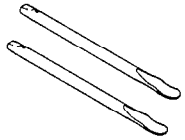
**Beed Breaker Assembly: 57001-1072**



**Rim Protector: 57001-1063**



**Tire Irons: 57001-1073**



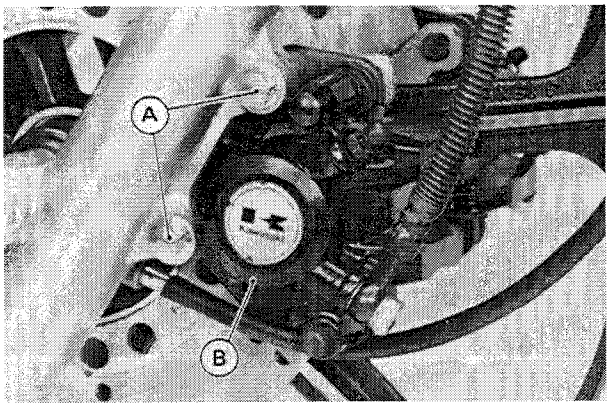
**NOTE**

○*The tire irons (P/N 57001-1073) are included in the beed breaker assembly (P/N 57001-1072).*

## Wheels (Rims)

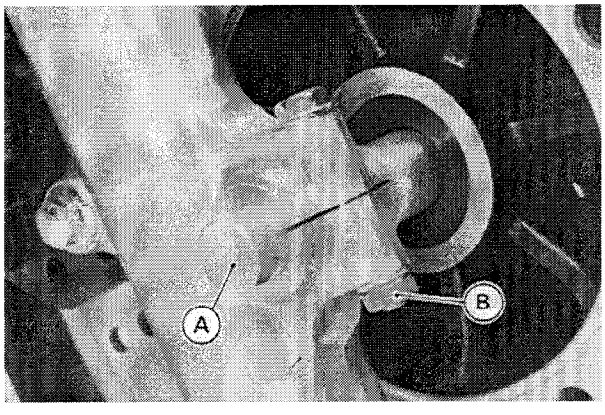
### *Front Wheel Removal*

- Remove the following parts before front wheel removal.
  - Speedometer cable lower end
  - Either brake caliper




A. Caliper Mounting Bolts B. Caliper

  - Axle nut
  - Right side axle clamp bolt and nut




A. Axle B. Axle Clamp Bolt and Nut

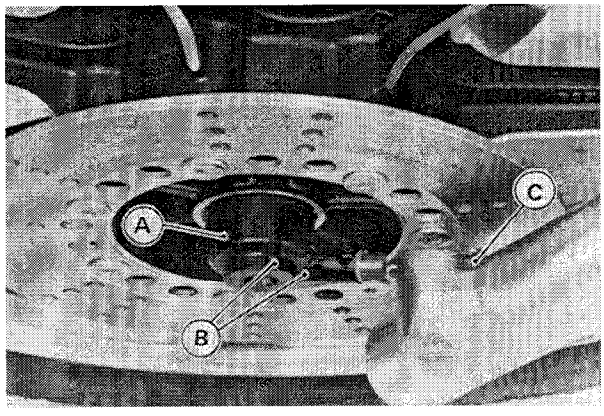
- Lift the front wheel off the ground (see Front Fork Air Pressure Adjustment in Suspension chapter).
- Pull out the axle to the right and drop the front wheel out of the fork.
- Remove the front wheel.

**CAUTION**

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

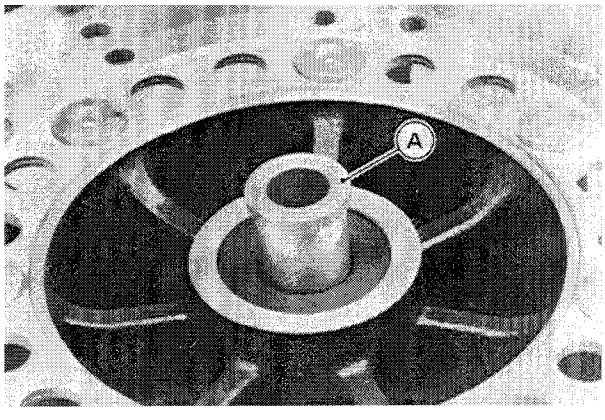
### *Front Wheel Installation Notes*

- Install the speedometer gear housing so that it fits in the speedometer gear drive notches (see Speedometer Gear Housing Assembly).
- Align the speedometer gear housing so that the stop on the fork leg will fit between the stops on the gear housing.




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

- Be sure to insert the collar on the right side of the hub.




A. Collar

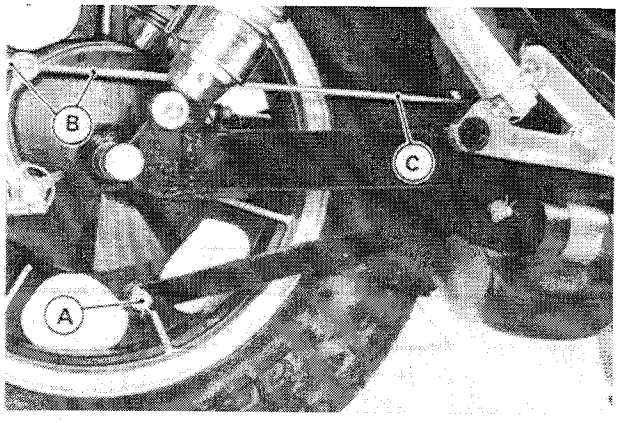
- Install the axle shaft from the right side of the hub.
- Position the speedometer gear housing so that the speedometer cable is naturally routed (see Speedometer Gear Housing Installation).
- Tighten the axle nut to the specified torque (see Exploded View for all torque values).
- Tighten the axle clamp nut to **20 N-m (2.0 kg-m, 14.5 ft-lb)** of torque.
- Tighten the caliper mounting bolts to **32 N-m (3.3 kg-m, 24 ft-lb)** of torque.
- Check the front brake operation.

**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.**

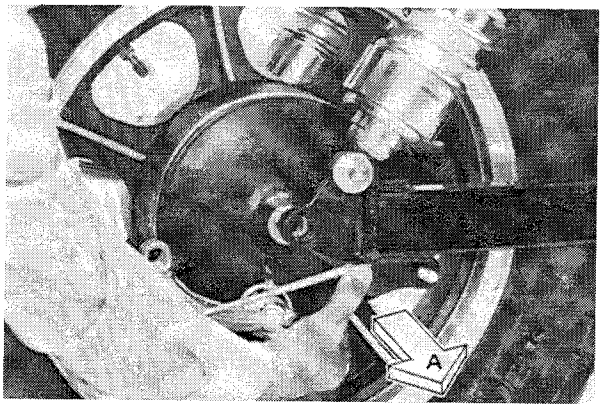
### *Rear Wheel Removal*

●Remove the following parts.
  ○Right muffler (see Engine Top End chapter)
  ○Cotter pin and axle nut (loosened)
  ○Safety clip and torque link nut
  ○Brake adjusting nut, joint and spring
●Separate the brake rod from the wheel.




A. Safety Clip and Torque Link Nut
B. Adjusting Nut and Spring
C. Brake Rod

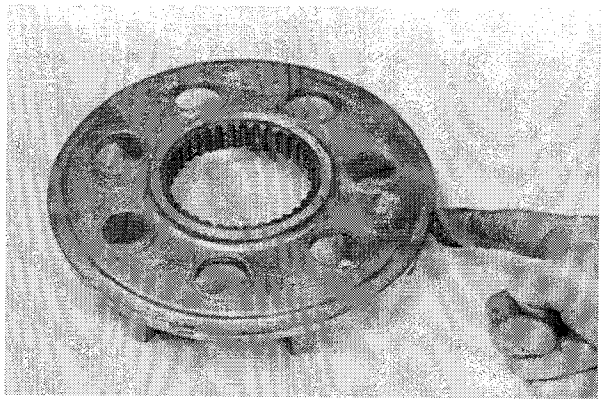
●Set the motorcycle on its center stand.
●Remove the axle nut.
●Pull out the axle and collar.
●Slide the rear wheel toward the right to disengage the wheel from the final gear case.




A. Slide the wheel toward the right

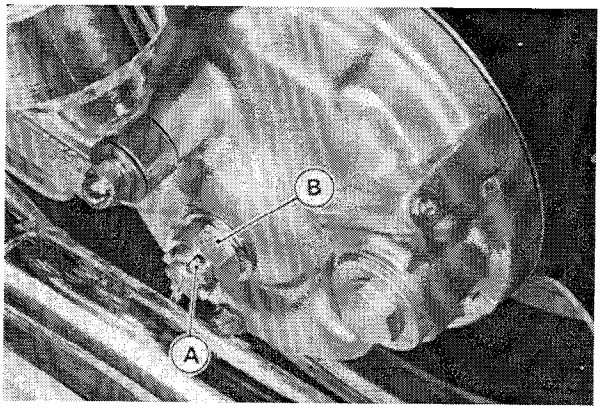
### *Rear Wheel Installation*

●Apply grease to the splined portion and the circumference of the rear wheel coupling.



A. Grease.

●Be sure to insert the collar on the right side of the hub.
●To prevent a soft, or "spongy feeling" brake, center the brake panel assembly in the brake drum as follows.
  ○Tighten the axle nut to a snug fit.
  ○Spin the wheel, and apply the rear brake, and then tighten the rear axle nut to the specified torque.
●Check the rear brake for weak braking power and brake drag.
●Replace the axle nut cotter pin with a new one.




A. Cotter Pin  B. Axle Nut

### *Wheel Inspection*

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

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

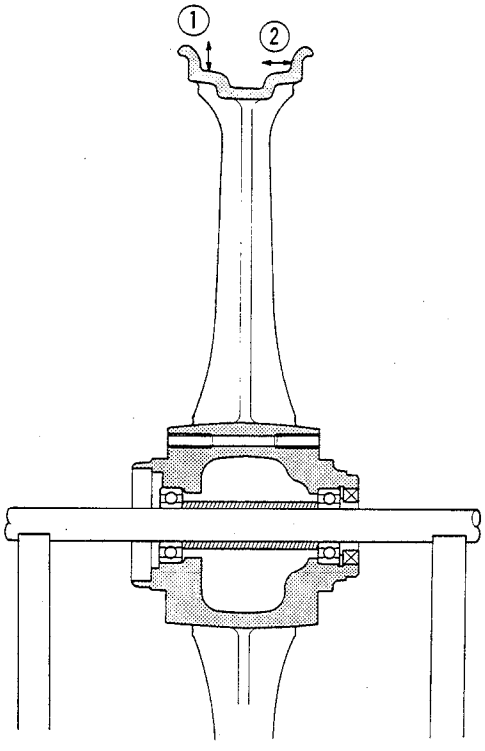
Set the dial gauge against the outer circumference of the rim, and rotate the wheel to measure radial runout. The difference between the highest and lowest dial readings is the amount of runout.

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

**Radial Runout**
**Service Limit:** **0.8 mm**

**Axial Runout**
**Service Limit:** **0.5 mm**

**Rim Runout**




1. Radial Runout
2. Axial 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.

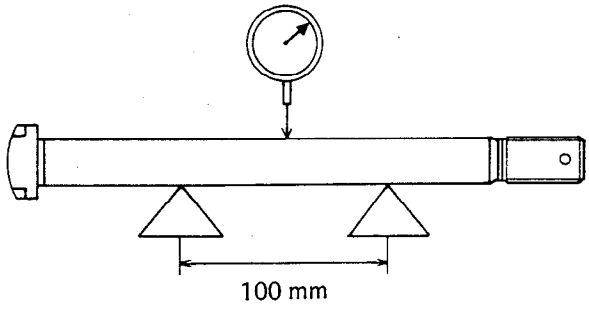
*Axle Inspection*

●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 the runout exceeds the service limit, replace the axle.

**Axle Runout/100 mm**
**Service Limit:** **0.2 mm**

**Axle Runout**

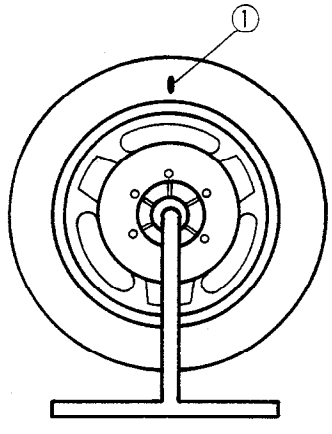



*Wheel Balance Check*

●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**



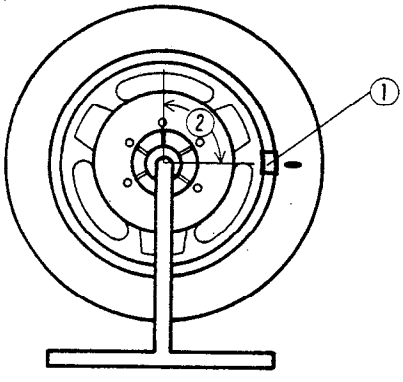

1. Mark

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

### *Wheel Balance Adjustment*

•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

### *Balancer Weight Installation:*

○It is not necessary to reduce the tire pressure for balancer weight installation.
•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 on the rim flange by pushing or lightly hammering the weight in the direction shown in the figure.
○Check that the blade and weight seat fully on the rim flange, and that the clip is hooked over the rim ridge and reaches the flat portion of the rim.

**WARNING**

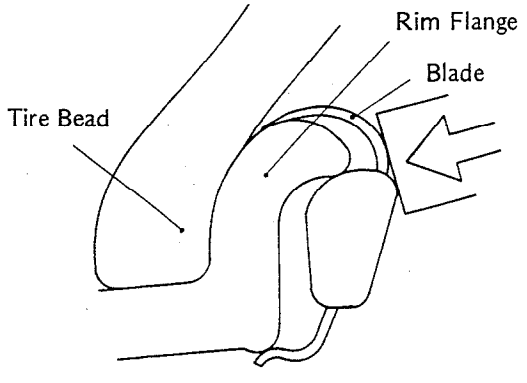
**○If the balance weight has any play on the rim flange, the weight blade and/or clip have been stretched. Replace the loose balance weight.**
**○Do not reuse the balance weights.**
**○Unbalanced wheels can create an unsafe riding condition.**

**Balance Weights**

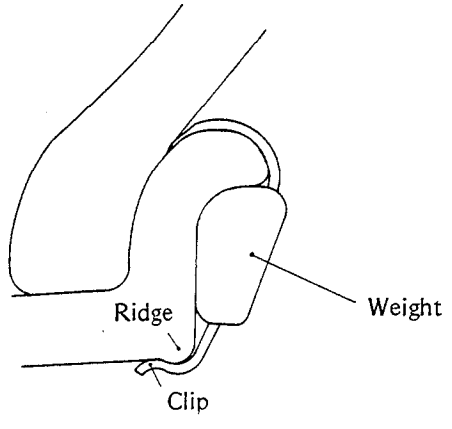
| Part Number | Weight (grams) |
|---|---|
| 41075-1014 | 10 |
| 41075-1015 | 20 |
| 41075-1016 | 30 |

**Installing Balance Weight**

(a) Press or lightly hammer the weight in.




(b) Installation completed.

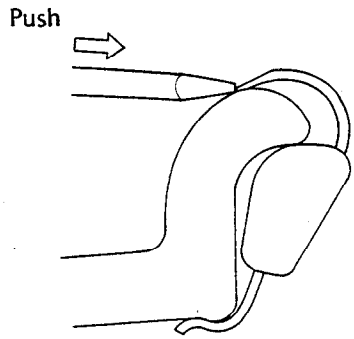


*Balancer Weight Removal*

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

- Push the blade portion toward the outside with a regular tip screwdriver, and slip the weight off the rim flange.
- Discard the used balance weight.

**Removing Balance Weight (without tire on rim)**




(b)When the tire is on the rim.

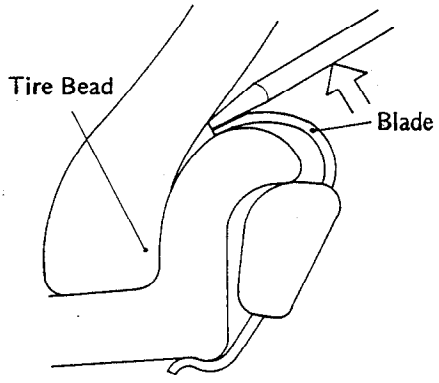
- Pry the balance weight off the rim flange using a regular tip screwdriver as shown in the figure.

○Insert the tip of the screwdriver between the tire bead and the weight blade until the end of the tip reaches the end of the weight blade.

○Push the screwdriver grip toward the tire so that the balance weight slips off the rim flange.

- Discard the used balance weight.

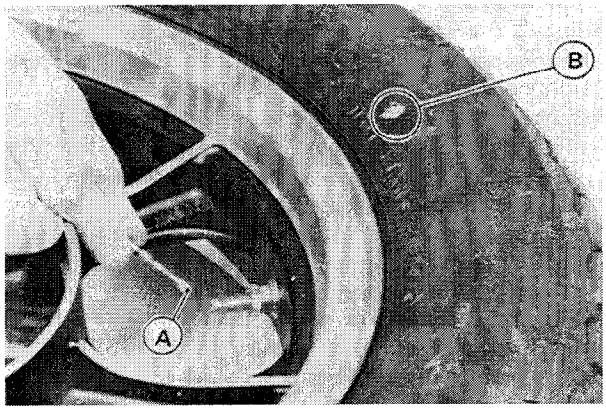
**Removing Balance Weight (with tire on rim)**




## Tires

*Tire Removal*

- Remove the wheel from the motorcycle, 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

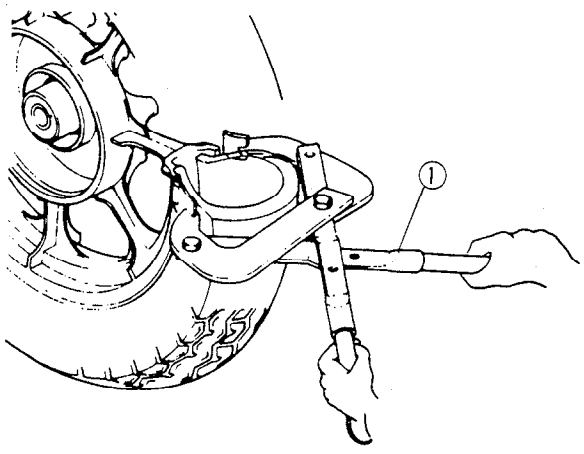
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

**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).

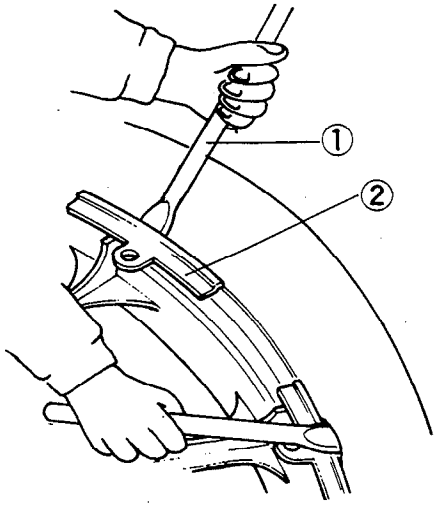
**Tire Beads Breaking**




A. 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 and pry the tire off the rim with tire irons (special tools)

**Tire Removal**



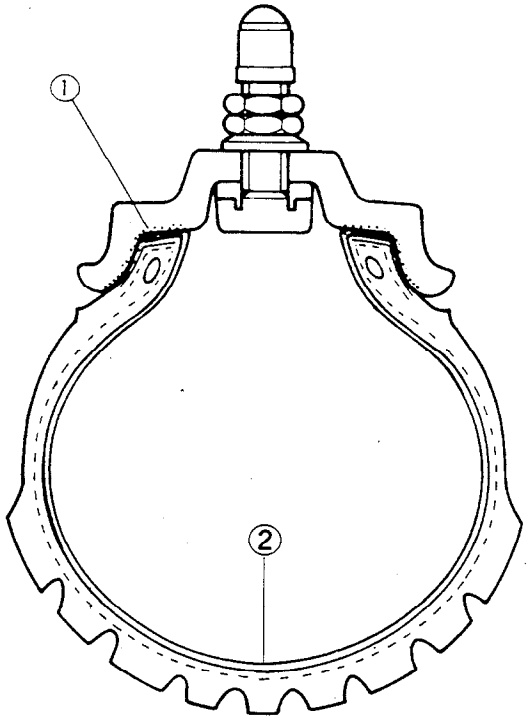

1. Tire Irons: 57001-1073
2. Rim Protectors: 57001-1063

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

**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**



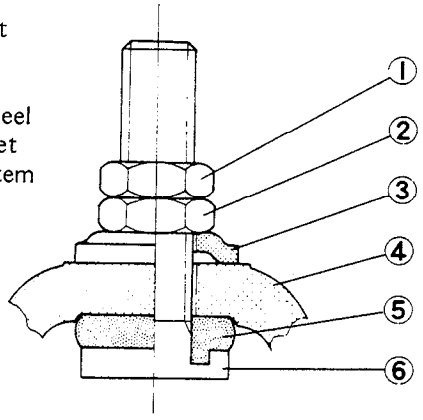

1. Air Sealing Surfaces
2. Inner Liner

*Tire Installation*

- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Replace the valve with a new one. Tighten the mounting nut and locknut to the specified torque.

**Air Valve**

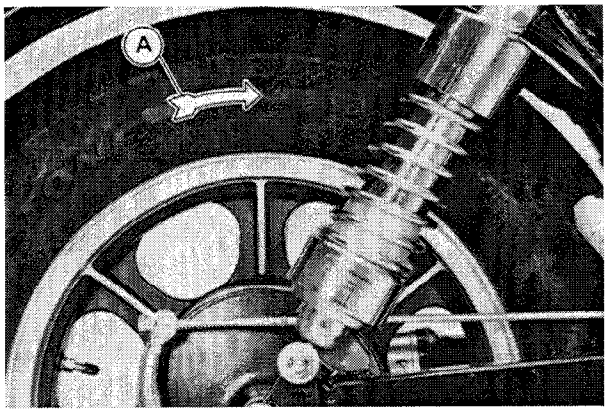
1. Locknut
2. Nut
3. Washer
4. Cast Wheel
5. Grommet
6. Valve Stem



•Apply a soap and water solution, or rubber lubricant to the rim flanges, rim protectors, tire beads, and tire irons.

**NOTE**

○*The direction of rear tire rotation is shown by an arrow on the tire side-wall. Be sure to install it on the rim accordingly.*




A. Rotation Mark (Arrow)

•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).
•By hand, slide as much as possible of the lower side of the tire bead over the rim flange, starting at the side opposite the valve.
•Fit the rim protectors and tire irons to install the remaining part of the tire bead which cannot be installed by hand. For easy tire installation, position the part of the bead which is already over the rim flange in the rim well.

**NOTE**

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

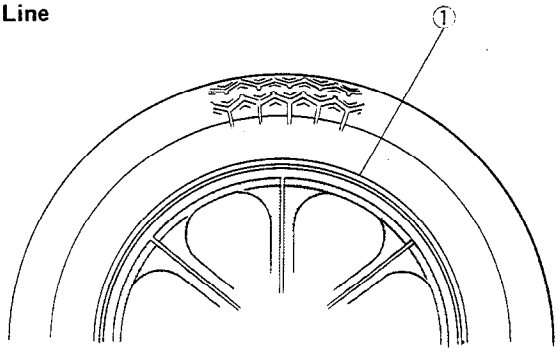
•Install the other side of the tire bead onto the rim in the same manner.
•Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
•Center the rim in the tire beads, and inflate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

**WARNING**

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

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

**Rim Line**




1. Rim line

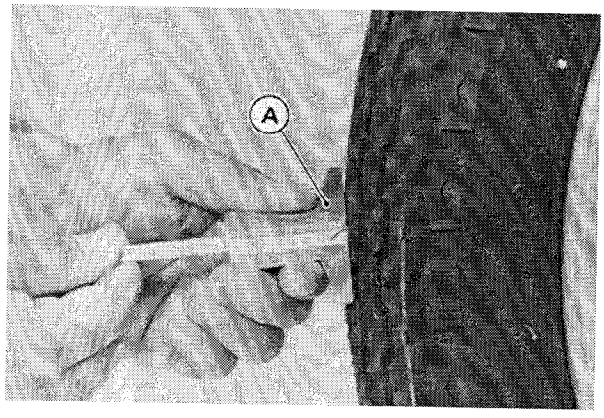
•If the rim flanges and tire side-wall rim lines are not parallel, remove the valve core. Lubricate the rim flanges and tire beads. Install the valve core and inflate the tire again.
•After the tire beads seat in the rim flanges, check for air leaks. Inflate the tire slightly above standard inflation. 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).
•Adjust the wheel balance (see Wheel Balance).

## *Tire Inspection*

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

•Remove any imbedded stones or other foreign particles from the tread.

•Visually inspect the tire for cracks and cuts, replacing the tire in case of bad damage. Swelling or high spots indicate internal damage, requiring tire replacement.
•Measure the tread depth at the center of the tread with a depth gauge. Since the tire may wear unevenly, take measurements at several places.
★If any measurement is less than the service limit, replace the tire.




A. Depth Gauge

**Tire Tread Depth**

| | |
|---|---|
| **Front** | |
| **Standard** | **4.4 mm** |
| **Service Limit** | **1 mm** |
| **Rear** | |
| **Standard** | **7.3 mm** |
| **Service Limit** | **2 mm** |

**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** | **100/90-19 57H** |
| **Mark, Type** | **TUBELESS DUNLOP F11G ( ©Ⓤ F11A) or METZELER MARATHON FRONT** |
| **Rear** | |
| **Size** | **150/90-15 74H, 150/90 B15 M/C 74H, or 150/90-15 M/C 74H** |
| **Make, Type** | **TUBELESS DUNLOP K425G ( ©Ⓤ K425) or METZELER ME88 MARATHON EURO** |

Ⓤ : U.S. Model
© : Canadian Model

*Tire Repair*

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the another type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repair than by temporary (external) one. Permanent (internal) repair also has 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) repair is recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

## Hub Bearings

*Front Hub Bearing Removal*

**CAUTION**

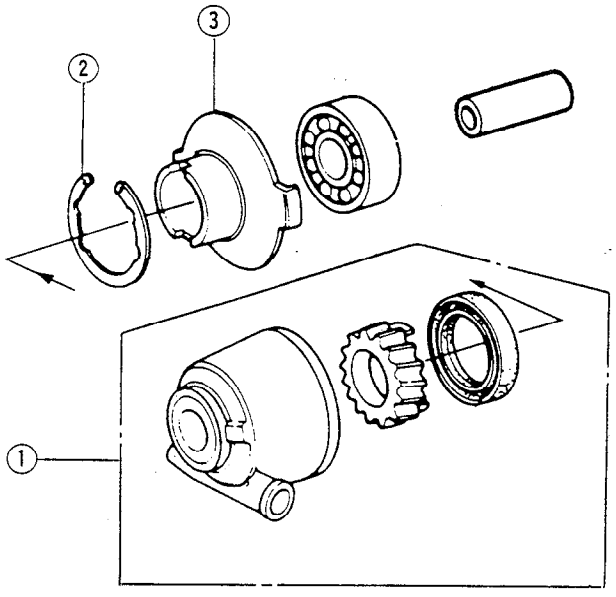
**○Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

Tire Air Pressure (when cold)

| | Load | Air Pressure |
|---|---|---|
| Front | — | 200 kPa (2.0 kg/cm², 28 psi) |
| Rear | Up to 97.5 kg (215 lb) | 200 kPa (2.0 kg/cm², 28 psi) |
| | Over 97.5 – up to 184 kg (215 – 406 lb) | 225 kPa (2.25 kg/cm², 32 psi) |
| | Ⓐ ©Ⓢ Ⓤ Over 97.5 – 180 kg (215 – 397 lb) | |

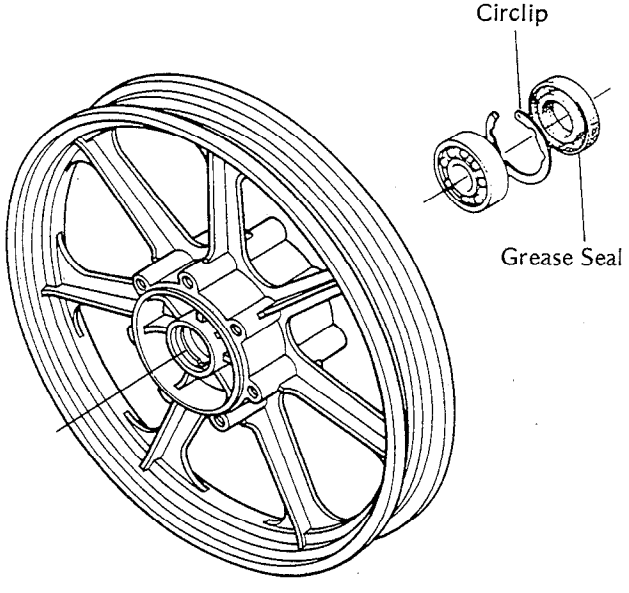
Ⓐ : Australia Model Ⓢ : South Africa Model
© : Canada Model Ⓤ : US Model

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



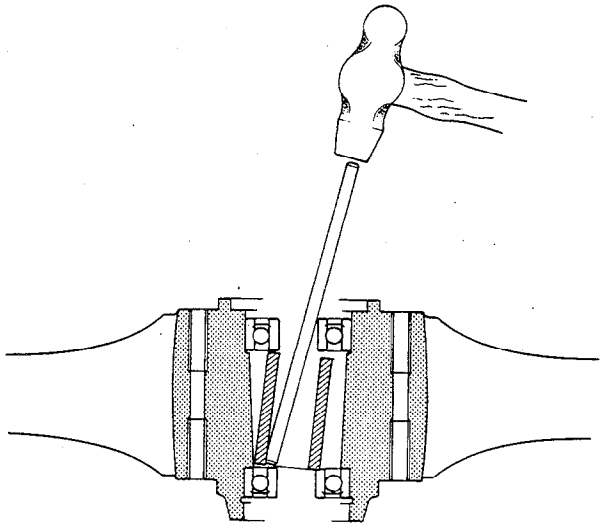

1. Speedometer
2. Circlip
3. Speedometer Receiver

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



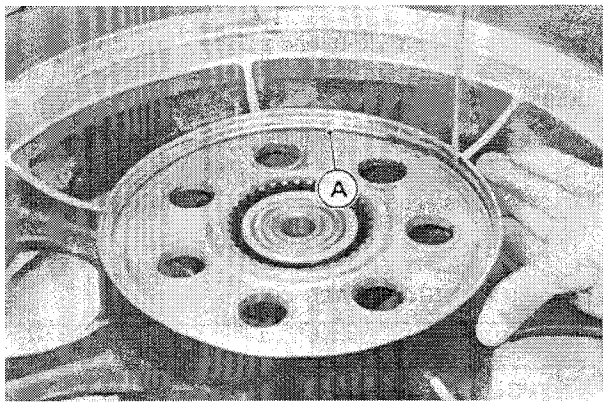

- Insert a metal rod into the hub from the left side, and remove the right side bearing by tapping evenly around the bearing inner race.
- Remove the remaining bearing by tapping evenly around the bearing inner race. The distance collar comes out with the bearing.

**Bearing Removal**



### *Rear Hub Bearing Removal*

- Remove the rear wheel.
- Remove the brake panel.
- Remove the rear wheel coupling after prying off the snap ring.

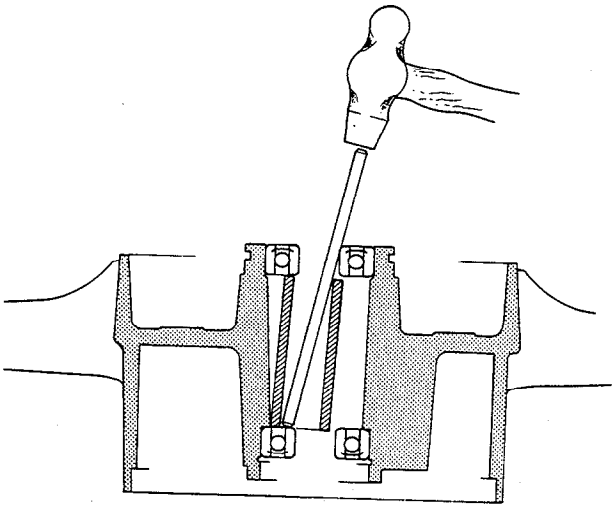



A. Snap Ring

- Remove the circlip from the brake side.
- Insert a metal rod into the hub from the left side, and remove the right side bearing by tapping evenly around the bearing inner race.

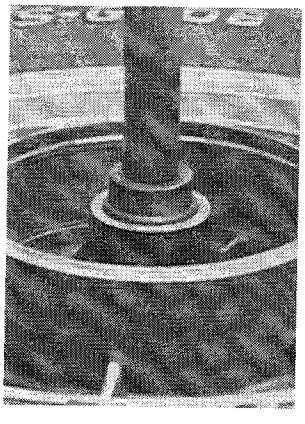
●Remove the remaining bearing by tapping evenly around the bearing inner race. The distance collar comes out with the bearing.

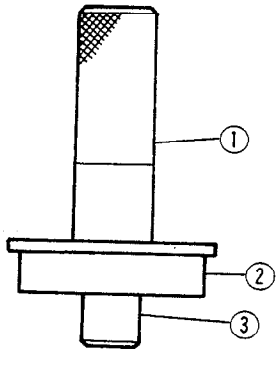
**Bearing Removal**



### *Front or Rear Hub Bearing Installation*

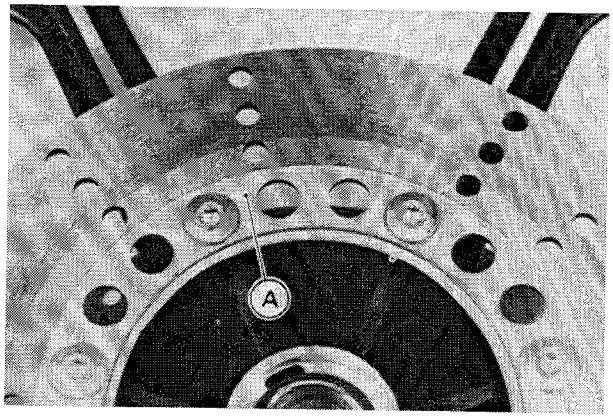
●Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air.
●Pack each front bearing with wheel bearing grease.
●Press either front bearing into the hub so that the sealed sides face outwards. Press either rear hub bearing into the hub so that the marked sides face outwards.
●Use a bearing driver (special tool) which does not contact the bearing inner race.
●Press the wheel bearing (right side) into the hub until it stops at the bottom of the hole.






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

○Tighten the front disc mounting Allen bolts to the specified torque. The disc must be installed with the chamfered hole side facing toward the wheel and the marked side facing outwards.

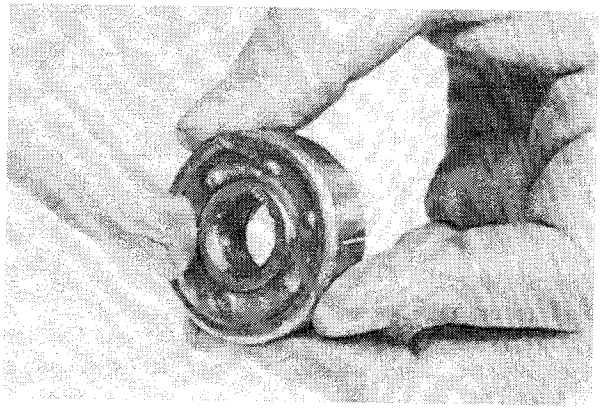



A. Marked Side

○After installing the discs, check the disc runout. Completely clean off any grease that has gotten on either side of the disc with a high flash-point solvent. Do not use one which will leave an oily residue.

### *Front Hub Bearing Lubrication, Inspection*

●Remove the wheel bearings on the front wheel hub.
●Wipe the old grease out of the hub before bearing installation.
●Wash the bearings with a high flash-point solvent, and dry them (do not spin them while they are dry).
●Inspect the bearings for damage. Replace any damaged bearing.
●Pack the bearings with good quality bearing grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.



●Examine the bearing seal for tears or leakage.
★If the seal is torn or is leaking, replace the bearing.

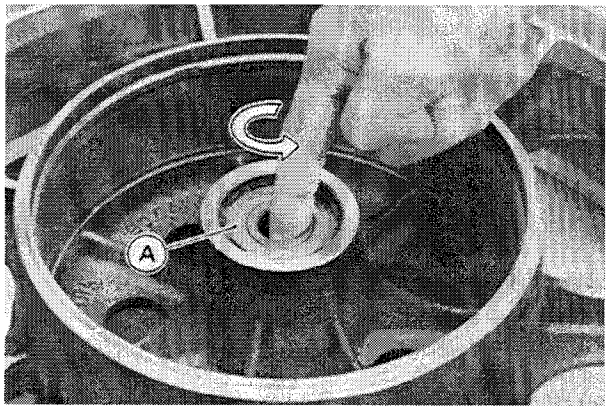
*Rear Hub Bearing Inspection*

**NOTE**

○*Since the bearings on the rear wheel hub are packed with grease and shielded, they cannot be lubricated.*

●Turn each bearing back and forth while checking for roughness or binding. If roughness or binding is found, replace the bearing.

●Examine the bearing shield for damage or leakage.
★If the shield is damaged or is leaking, replace the bearing.

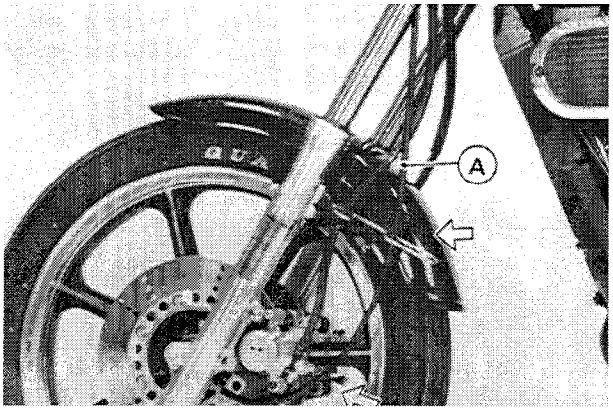



A. Bearing Shield B. Turn Inner Race

## Speedometer Gear Housing

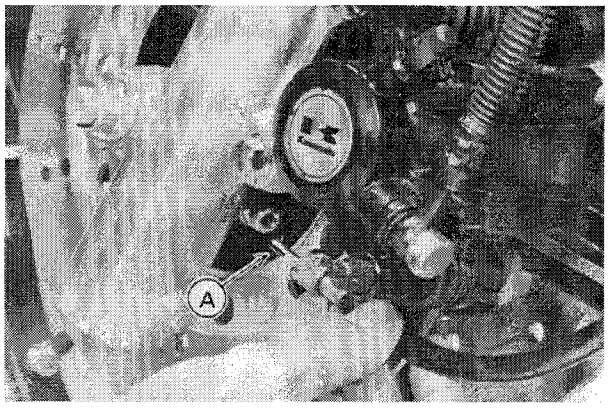
*Speedometer Gear Housing Installation*

●Tighten the axle nut and clamp bolt to a snug fit.
●Position the speedometer gear housing so that the speedometer cable is naturally routed. Avoid sharp bends.




A. Speedometer Cable

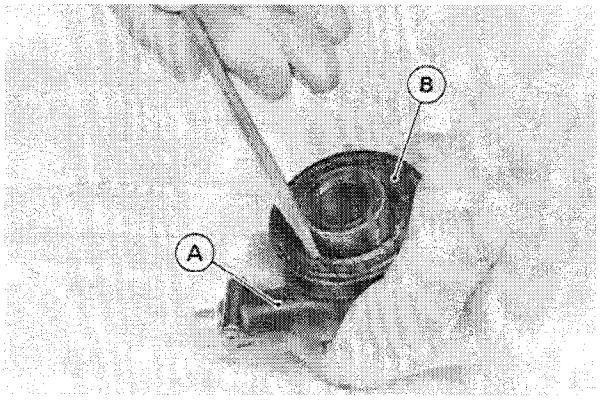
●Insert the speedometer inner cable into the housing while turning the wheel so that the slot in the end of the cable seat on the tongue of the speedometer pinion.




A. Slot

*Speedometer Gear Housing Disassembly*

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



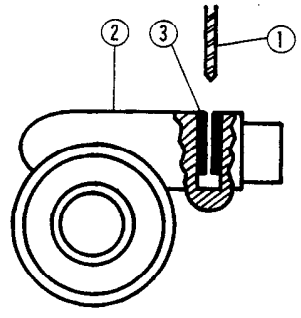

A. Speedometer Gear Housing B. Grease Seal

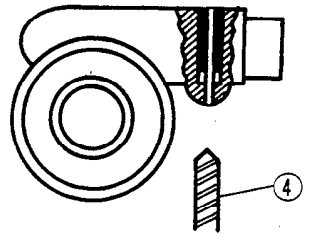
●Pull out the speedometer gear.
●If the speedometer cable bushing or speedometer pinion needs to be removed, first drill the housing through the pin using a 1.0 to 1.5 mm drill bit. Drill the housing from the under side using a 3.0 to 3.5 mm drill bit. Using a suitable 3 mm rod, tap out the pin, and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

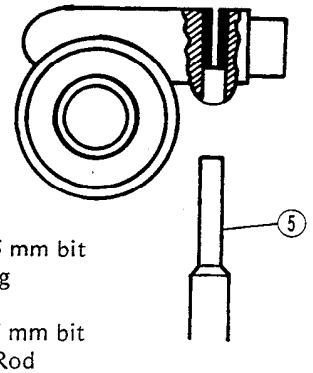
**NOTE**

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

**Speedometer Gear Housing Pin Removal**



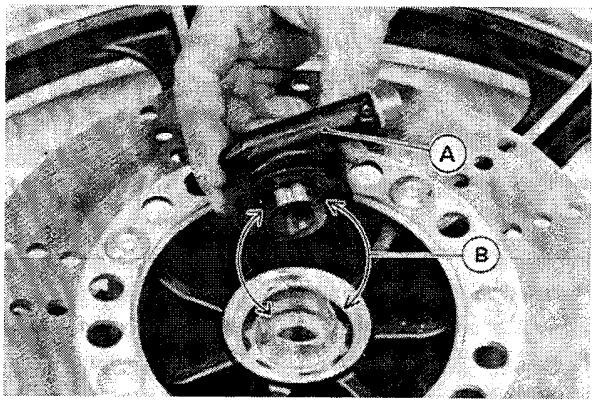




1. 1 – 1.5 mm bit
2. Housing
3. Pin
4. 3 – 3.5 mm bit
5. 3 mm Rod

*Speedometer Gear Housing Assembly*

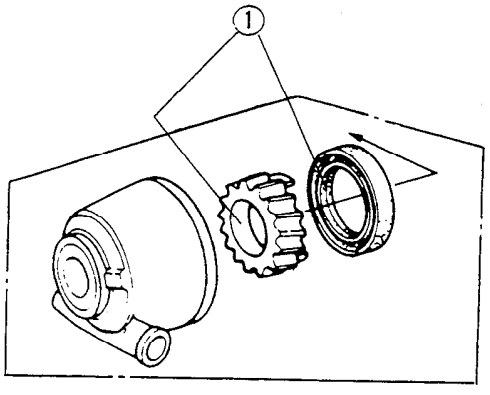
●When assembling the speedometer gear housing, be careful of the following items.
○After inserting a new pin, stake the housing hole to secure the pin in place.
○Replace the grease seal with a new one. Apply a little grease to the seal. Install it using a press or a suitable driver so that the face of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




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

*Speedometer Gear Assembly Lubrication*

●Remove the speedometer gear housing and disassemble the speedometer gear.
●Clean the gear and exposed portion of the pinion with a high flash-point solvent, dry them, and apply grease to the gear teeth and inside of the gear



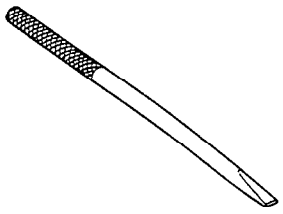

1. Grease

●Assemble the speedometer gear and install the speedometer gear housing.

## Special Tools (Addition)

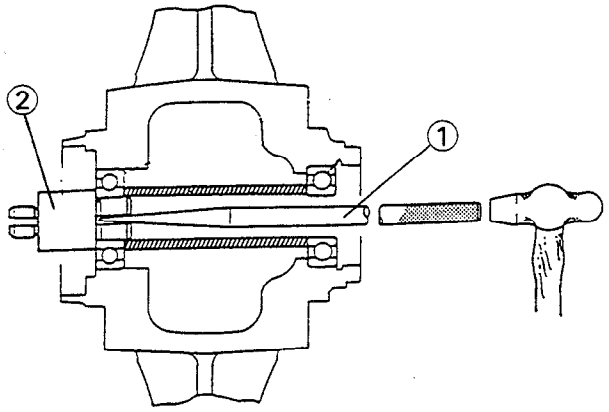
The following special tools are newly available.

**Bearing Remover Shaft: 57001-1265**



**Bearing Remover Head: 57001-1267**

- The bearing remover shaft and head (special tools) can be used to remove the hub bearings.

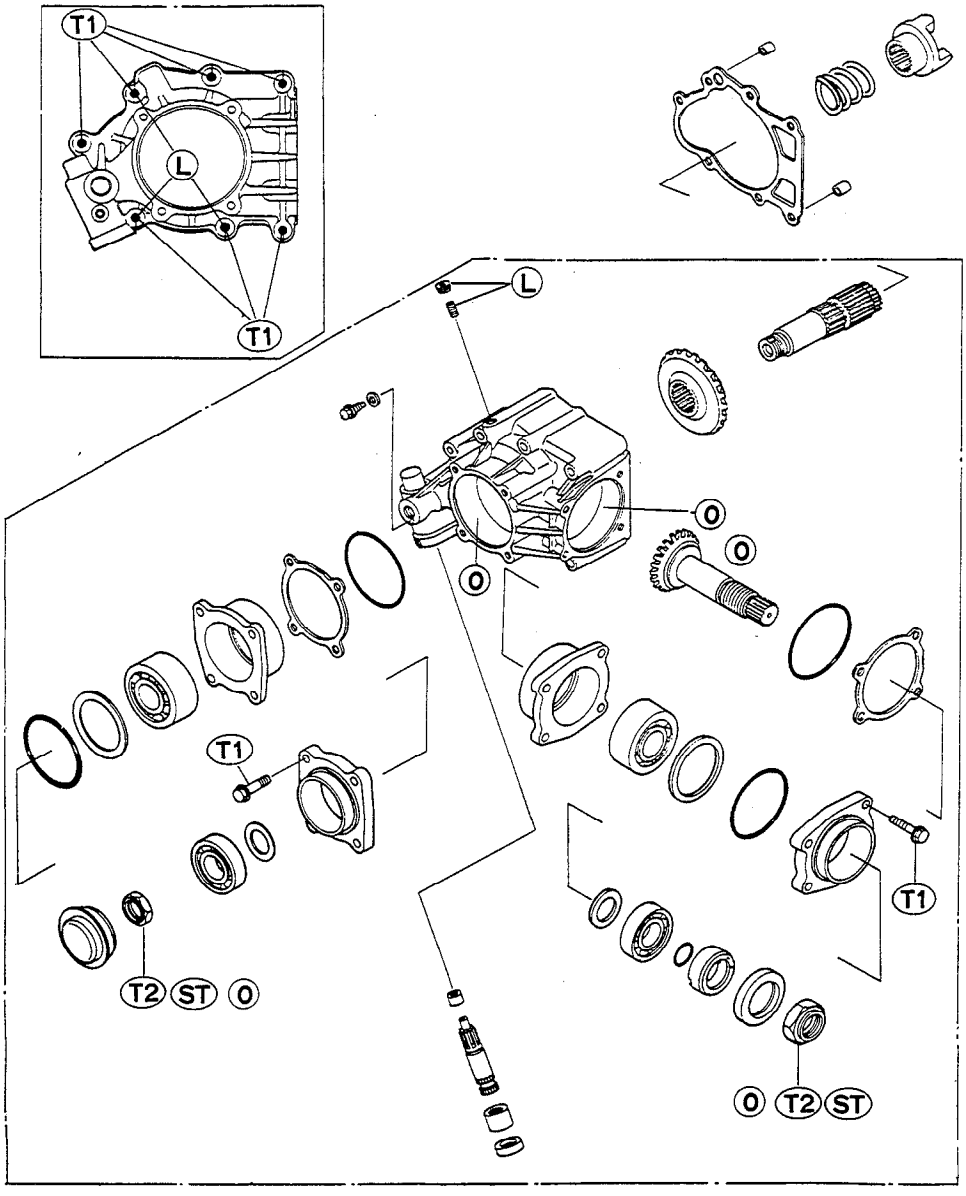



1. Bearing Remover Shaft: 57001-1265
2. Bearing Remover Head: 57001-1267

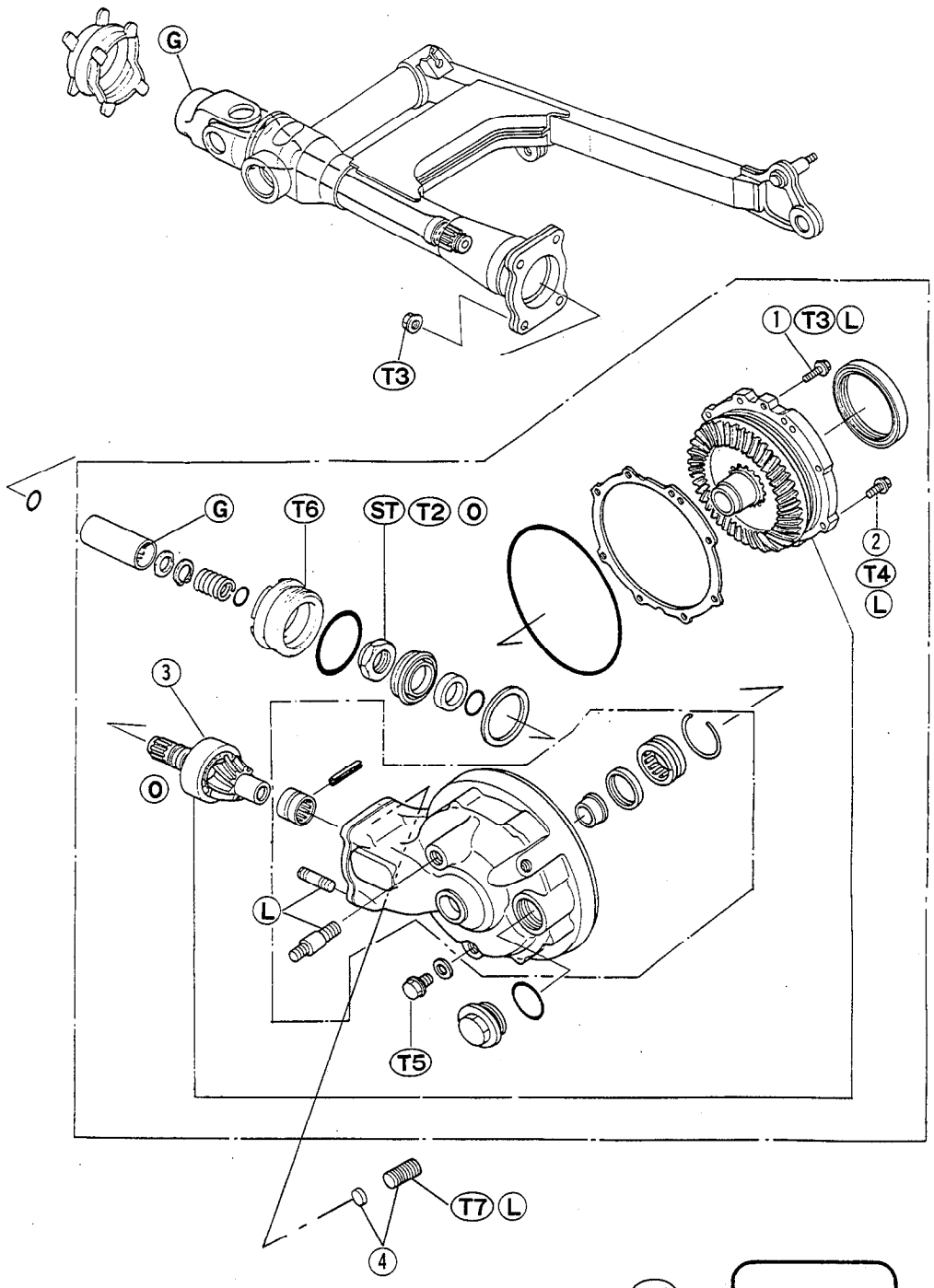
# Final Drive

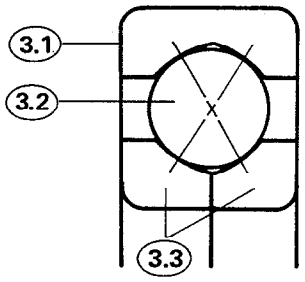
## Table of Contents

## Exploded View




O: Apply engine oil to the internal surface before installation.
LG: Apply a liquid gasket.
L: Apply a non-permanent locking agent to the threads.
G: Apply a high temperature grease.
ST: Stake the fastener
1: Bolt, 8 x 28
2: Bolt, 10 x 24
T1: 12 N-m (1.2 kg-m, 104 in-lb)
T2: 135 N-m (14 kg-m, 100 ft-lb)
T3: 24 N-m (2.4 kg-m, 17.5 ft-lb)
T4: 34 N-m (3.5 kg-m, 25 ft-lb)
T5: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T6: 245 N-m (25 kg-m, 181 ft-lb)
T7: 16 N-m (1.6 kg-m, 11.5 ft-lb)




**3. Four-Point Contact Ball Bearing**

The bearing, a single-row and angular-contact type, has split inner races to obtain arched grooves on the inner and outer races. Since the arched grooves provides 4-point contact for the balls under load, the bearing can support two-directional thrust combined with a radial load.

**4. Copper Plug and Lockbolt**

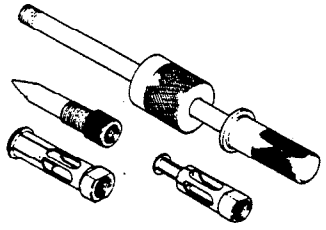
3.1. Outer Race
3.2. Balls
3.3. Inner Races

## Specifications

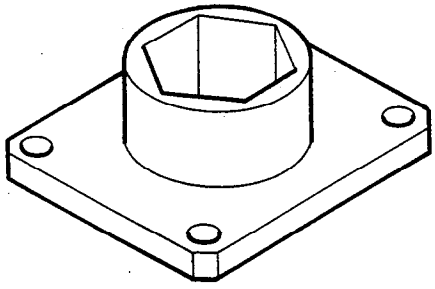
| Item | | Standard |
|---|---|---|
| Final Gear Case Oil: | Grade | API GL-5 hypoid gear oil |
| | Amount | 150 mL |
| | Viscosity | When above 5°C (41°F) SAE 90<br>When below 5°C (41°F) SAE 80 |
| Final Bevel Gear Backlash: | | 0.07 – 0.10 mm |
| Front Bevel Gear Backlash: | | 0.10 – 0.15 mm |
| Bearing Housing Gap: (front bevel gear) | Standard | not more than 0.03 mm |
| | Usable range | not more than 0.05 mm |

## Special Tools

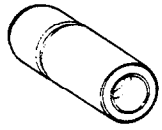
**Oil Seal & Bearing Remover: 57001-1058**



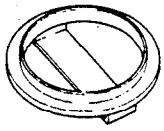
**Socket Wrench (36 mm): 57001-1213**



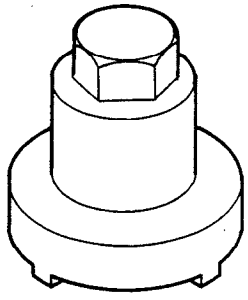
**Pinion Gear Holder: 57001-1186**



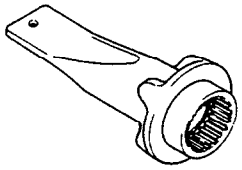
**Oil Seal Guide: 57001-1163**



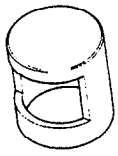
**Socket Wrench: 57001-1201**



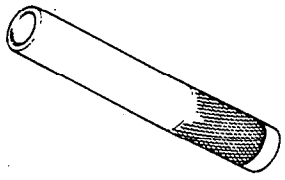
Drive Gear Holder: 57001-1026



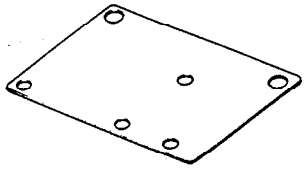
Cam Damper Compressor "A": 57001-1041



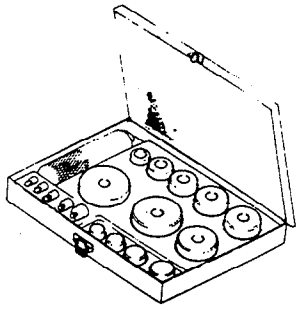
Bearing Driver: 57001-382



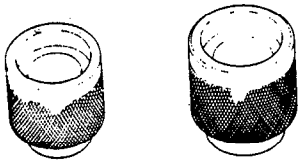
Dial Gauge Holder: 57001-1049



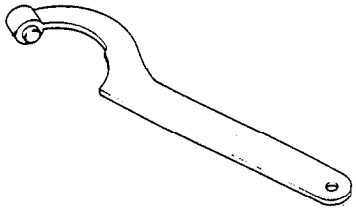
Bearing Driver Set: 57001-1129



Oil Seal Driver: 57001-1091, 1104



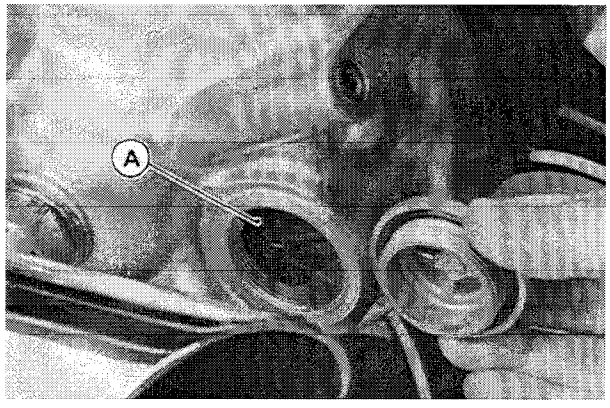
Damper Cam Holder: 57001-1025



## Final Gear Case Oil

### *Final Gear Case Oil Level Inspection*

- According to the Periodic Maintenance Chart, or if the lubricant level is suspected of being low, check the final gear case oil level.
- Support the motorcycle on its center stand.
- Unscrew the filler plug. The oil level is correct if a small amount of oil comes out of the opening.



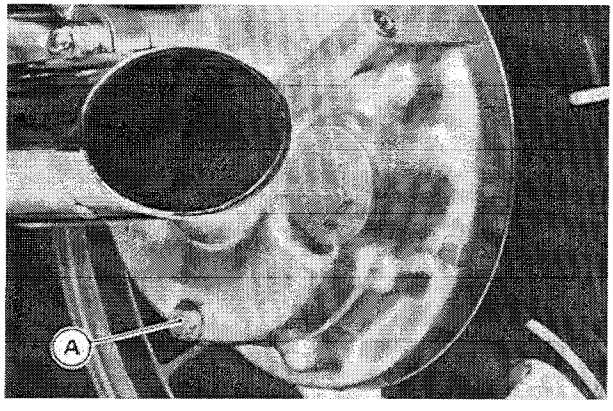

A. Filler Opening

★If no oil comes out, first check the final gear case for oil leakage, remedy it if necessary, and add oil through the filler hole. 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.




A. 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 aluminum gasket, and tighten it to the specified torque (see Exploded View).
- Fill the final gear case with the specified oil and quantity.

**Final Gear Case Oil:**

| | |
|---|---|
| **Amount** | **150 mL** |
| **Grade** | **API GL-5 hypoid gear oil** |
| **Viscosity:** | |
| **When above 5°C (41°F)** | **SAE 90** |
| **When below 5°C (41°F)** | **SAE 80** |

**NOTE**

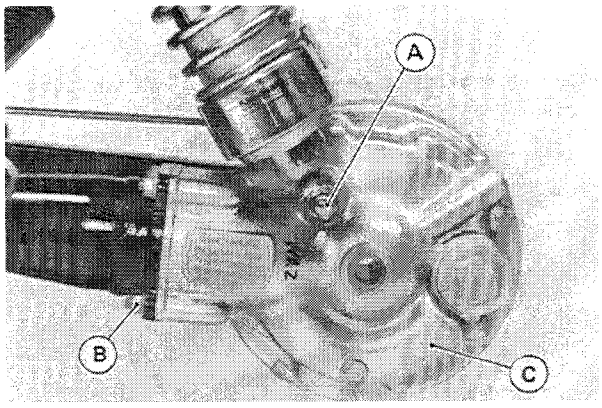
○*The term "GL-5" indicates a quality and additive rating. A "GL-6" rated hypoid gear oil can also be used.*

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

## Final Bevel Gears

### *Final Gear Case Removal*

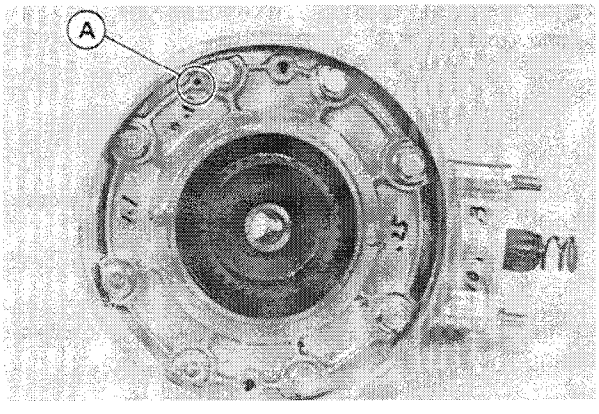
- If the final gear case is to be disassembled, drain the final gear case oil (see Final Gear Case Oil Change).
- Remove the rear wheel (see Wheel/Tires chapter).
- Remove the left rear muffler (see Rear Muffler Removal in Engine Top End chapter).
- Unscrew the mounting nuts to remove the left shock absorber.
- Remove the final gear case by taking off the mounting nuts. The spring comes off with the case.




A. Mounting Nuts (upper and lower) for Shock Absorber
B. Gear Case Mounting Nuts (4)
C. Final Gear Case

**NOTE**

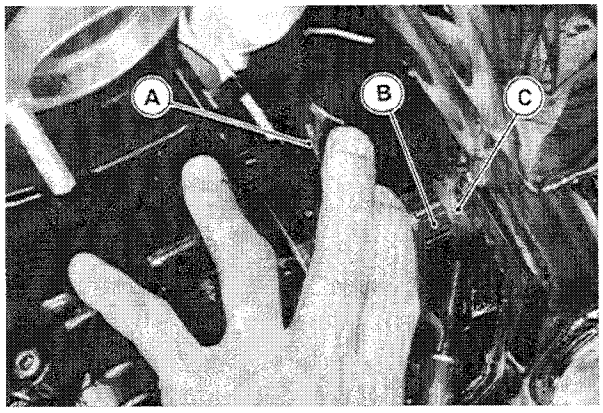
○*If the final gear case is full of oil, place the case so that the breather hole is on top.*




A. Breather Hole

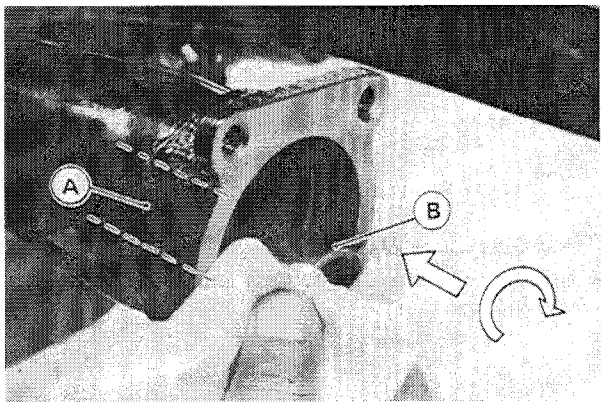
### *Final Gear Case Installation Notes*

★If the propeller shaft slides out of the front driven gear, re-install it as follows.
○Push back the boots to visually align the driven gear splines and the propeller shaft splines.



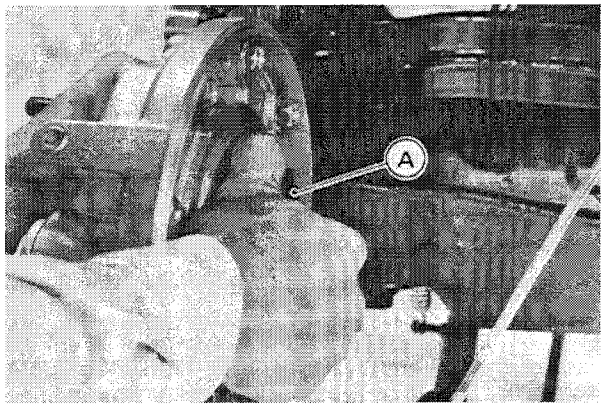

A. Boot
B. Driven Gear Splines
C. Propeller Shaft Splines

●Insert the propeller shaft into the gear splines while pushing the propeller shaft forward and turning it by hand.



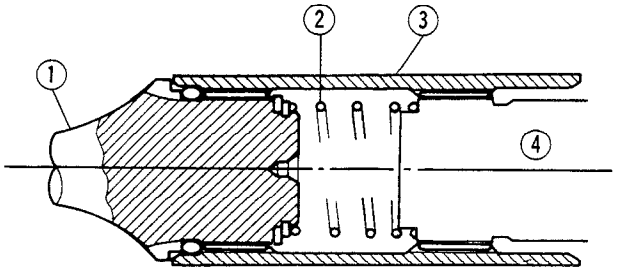

A. Propeller Shaft B. Push it forward and turn it.

●Lubricate the propeller shaft joint (see Propeller Shaft Lubrication).
●Fit the pinion gear splines into the propeller shaft joint while turning the ring gear hub.




A. Ring Gear Hub

**Propeller Shaft Joint Installation**

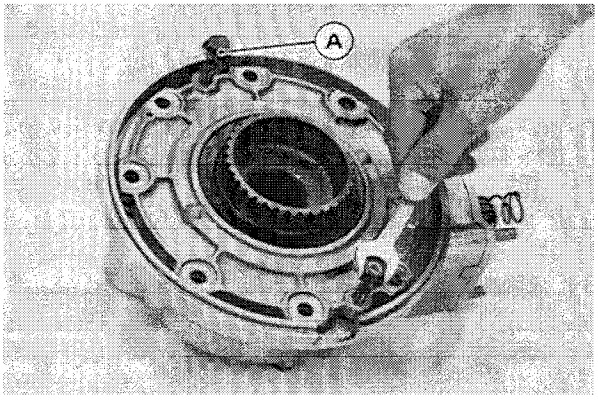



1. Propeller Shaft
2. Coil Spring
3. Joint
4. Pinion Gear

•Tighten the final gear case mounting nuts to the specified torque (see Exploded View).
•Install the rear wheel.
•Adjust the rear brake pedal free play (see Rear Brake Pedal Adjustment in Brakes chapter).
•If the final gear case oil was drained, fill the case with oil (see Final Gear Case Oil Change).

*Final Gear Case Disassembly*

•Use two cover bolts to remove the ring gear assembly from the gear case.

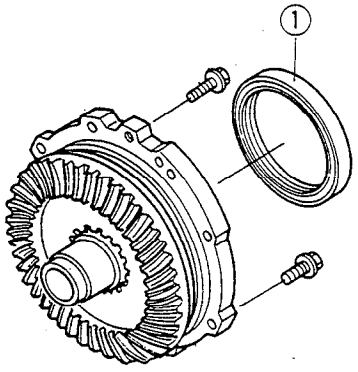



A. Cover Bolts (ϕ8 x P1.25 mm)

•Remove the pinion gear assembly (see Pinion Gear Disassembly).
•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.

**CAUTION**

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



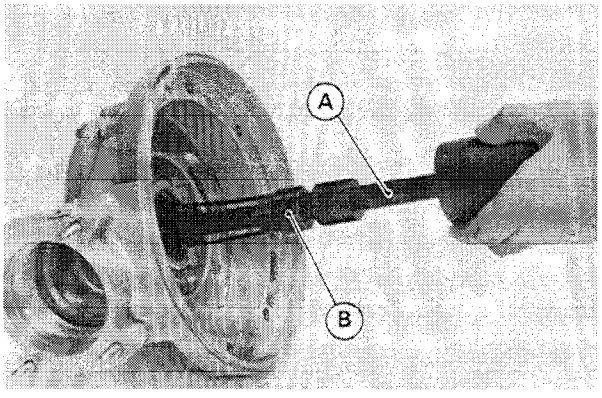

1. Ring Gear Oil Seal

•Remove the needle bearing outer race and oil seal in the final gear case as follows.
○Remove the snap ring.
○Soak the final gear case in oil and heat the oil to approximately **100°C (212°F)**.

**CAUTION**

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

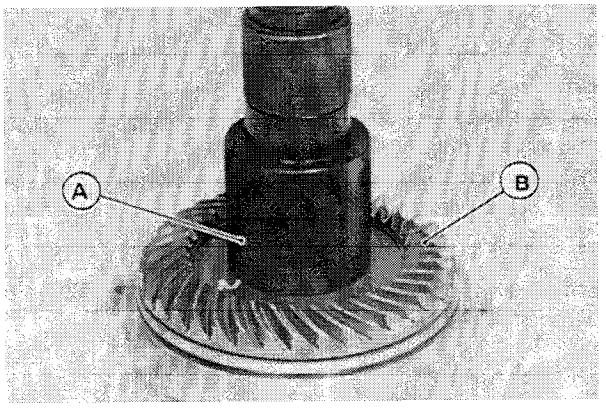
•Pull out the oil seal and bearing outer race together using the oil seal & bearing remover (special tool).




A. Oil Seal & Bearing Remover: 57001-1058
B. Adapter

*Final Gear Case Assembly Notes*

- 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.
- When final gear case parts are replaced, the final bevel gears must be adjusted (see Final Bevel Gear Adjustment).
- If no parts of the final bevel gear case are replaced, install the shims in the original positions to keep the gear backlash and the tooth contact unchanged.
- Blow the breather hole clean with compressed air.
- Press the ring gear assembly slowly with a oil seal driver (special tool) to firmly seat the ball bearing.



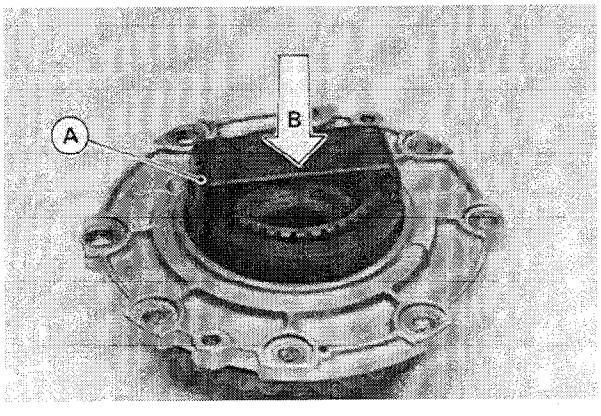

A. Oil Seal Driver: 57001-1104
B. Ring Gear Assembly

**CAUTION**

- **Since the ring gear may slide out a little by removal, be sure to press the ring gear assembly in the housing before installation. The operation prevents gear maladjustment.**

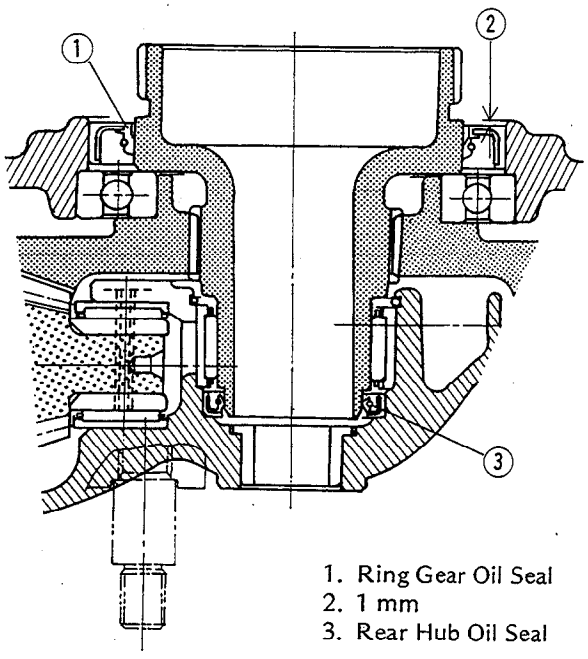
- Use the oil seal guide (special tool) to drive in the oil seals being careful of installation direction and depth, as shown.

**Ring Gear Oil Seal Installation**



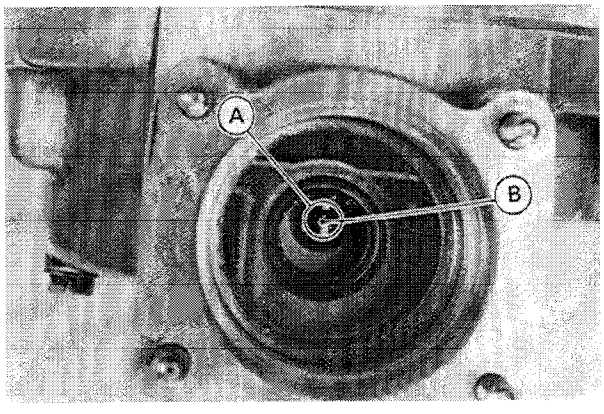

A. Oil Seal Guide: 57001-1163 B. Press here

**Rear Hub Oil Seal Installation**



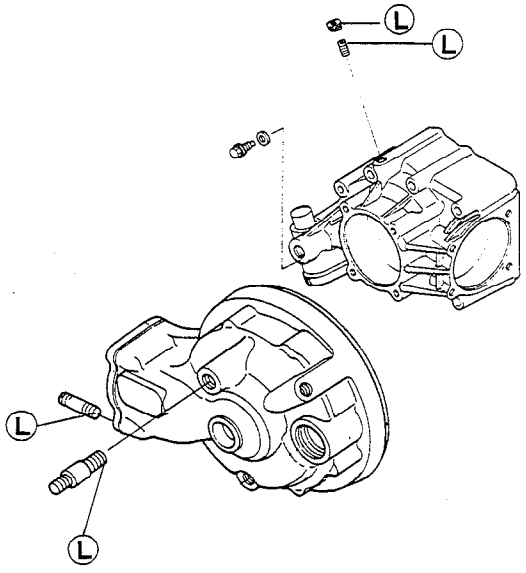

1. Ring Gear Oil Seal
2. 1 mm
3. Rear Hub Oil Seal

- Align the oil hole in the needle bearing outer race with the oil hole in the final gear case.




A. Outer Race Oil Hole B. Gear Case Oil Hole

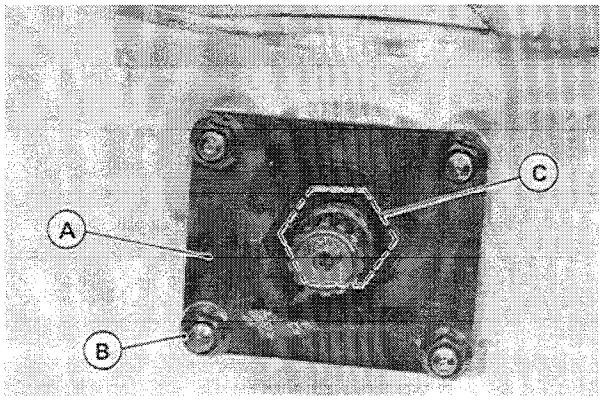
- Apply a non-permanent locking agent to the inner end of each stud and to the oil line plug to prevent oil leakage.




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

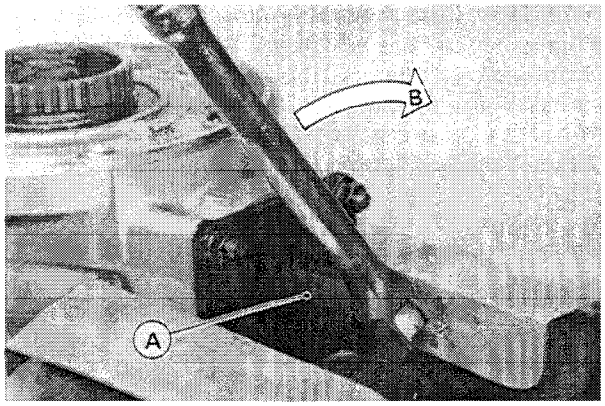
### *Pinion Gear Disassembly*

- Remove the ring gear assembly.
- Remove the O-ring on the pinion gear shaft.
- Pry open the staking on the pinion gear nut with a small chisel.
- Install the socket wrench (special tool) on the final gear case to hold the pinion gear nut.
- Tighten the case mounting nuts to the specified torque (see Exploded View).




A. Socket Wrench (36 mm): 57001-1213
B. Mounting Nuts
C. Pinion Gear Nut (right hand threads)

- Unscrew the nut by turning the pinion gear **clockwise** with the pinion gear holder (special tool).

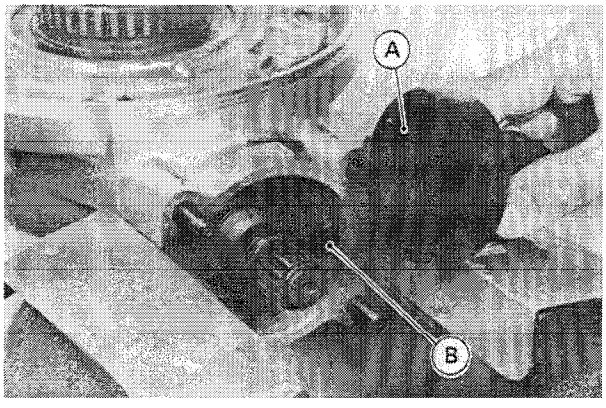


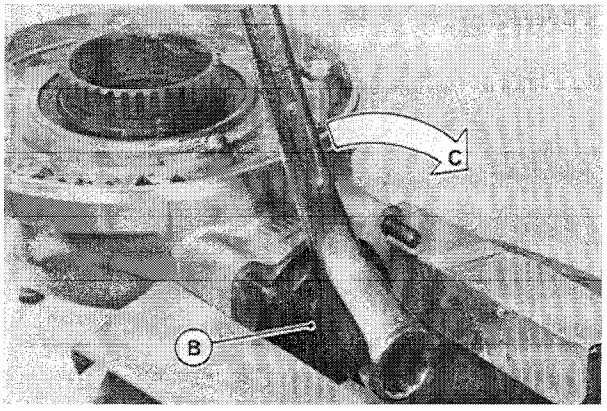

A. Pinion Gear Holder: 57001-1186
B. Turning Direction for Nut Removal

- Late model has a lockbolt holding the pinion gear bearing retainer. Unscrew the Allen bolt and remove the copper plug.
- ○Remove the pinion gear bearing retainer using the socket wrench (special tool).

**NOTE**

○*The bearing retainer has left-hand threads. Turn the wrench as shown for removal.*



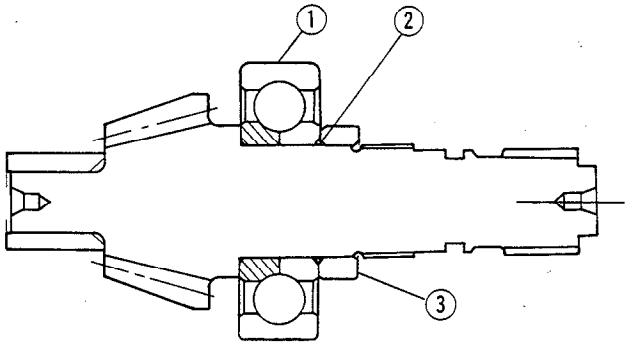

A. Socket Wrench: 57001-1201
B. Bearing Retainer
C. Turning Direction for Removal

○Push the pinion gear assembly out of the final gear case. The shim(s) comes off with the assembly.
●Remove the pinion gear collar and O-ring. The O-ring is between the collar and the ball bearing.
●The ball bearing has split inner races.

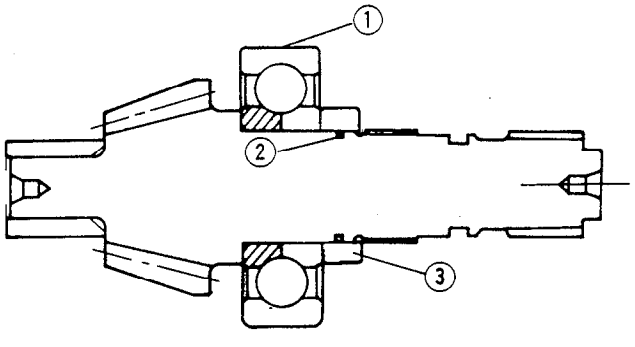
### *Pinion Gear Assembly*

●Pinion gear assembly is the reverse of disassembly. Note the following.
●The pinion gear and ring gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
●The four point contact ball bearing has split inner races. Be sure to install it without any gap between the inner races.
●Be sure to check and adjust the bevel gear backlash and tooth contact, when any of the backlash-related parts are replaced (see Final Bevel Gear Adjustment).
○After completing all adjustment, re-assemble the final gear case.
●Be sure to install the O-ring for the pinion gear collar.

**Pinion Gear Assembly (early model)**



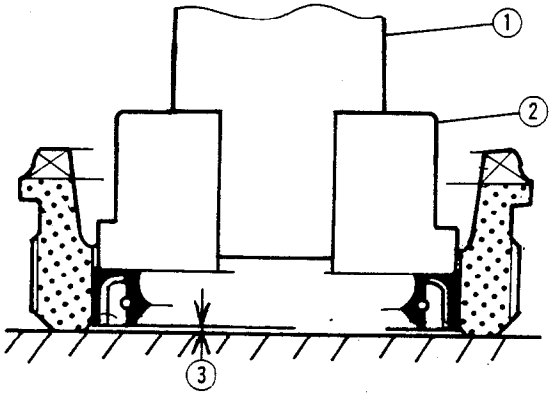

**Pinion Gear Assembly (later model)**




1. Ball Bearing
2. O-Ring
3. Collar

●Use the bearing driver (special tool) to insert the oil seal evenly in the bearing retainer as shown. Be careful of the installation direction and position.

**Bearing Retainer Oil Seal Installation**




1. Holder: 57001-1132
2. Driver: 57001-1145
3. 0.5 mm

●Tighten the bearing retainer to the specified torque (see Exploded View).
●Late model has a lockbolt holding the pinion gear bearing retainer. Be sure to install the copper plug and apply non-permanent locking agent to the threads of the lockbolt, then tighten the bolt to the specified torque (see Exploded View).
○Use a new pinion gear nut.
●Tighten the pinion gear nut to the specified torque (see Exploded View).
●Stake the head of the nut with a punch to secure the nut in place.

**CAUTION**

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

### *Ring Gear Assembly*

●The ring gear assembly and pinion gear are lapped together at the factory to get the best tooth contact. They must be replaced as a set.
●Be sure to check and adjust the bevel gear backlash and tooth contact, when any of the backlash-related parts are replaced (see Final Bevel Gear Adjustment).
●After completing all adjustment, re-assemble the final gear case.
○Tighten the case mounting bolts and nuts to the specified torque (see Exploded View).
○Fill the final gear case with the specified amount of oil.

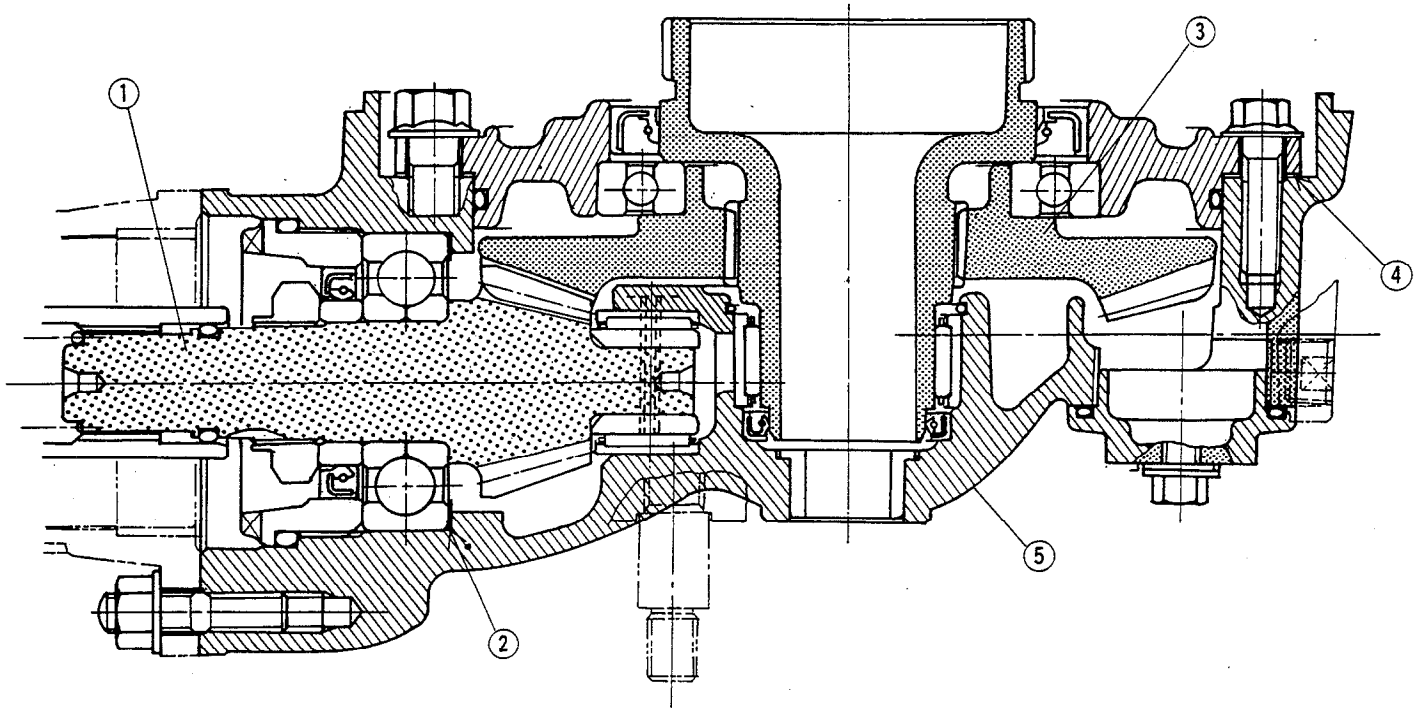
## *Final Bevel Gear Adjustment*

The **backlash** and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

After replacing any of the backlash-related parts, be sure to check and adjust the backlash and tooth contact of the bevel gears. First, adjust backlash, and then tooth contact by replacing shims.

**Backlash-Related Parts**

1. Pinion Gear
2. Pinion Gear Shim(s)
3. Ring Gear Assembly
4. Ring Gear Shim(s)
5. Final Gear Case




**Pinion Gear Shims**

| Thickness (mm) | Part Number |
|---|---|
| 0.10 | 92025-1519 |
| 0.15 | 92025-1520 |
| 0.20 | 92025-1521 |
| 0.30 | 92025-1522 |
| 0.40 | 92025-1523 |
| 0.50 (primary) | 92025-1524 |

**Ring Gear Shims**

| Thickness (mm) | Part Number |
|---|---|
| 0.15 | 92025-1525 |
| 0.5 | 92025-1526 |
| 0.6 | 92025-1527 |
| 0.7 | 92025-1528 |
| 0.8 | 92025-1529 |
| 0.9 | 92025-1530 |
| 1.0 (primary) | 92025-1531 |
| 1.2 | 92025-1532 |

NOTE

○*Use these shims for gear backlash and tooth contact adjustment.*

**Backlash Adjustment**

- Clean any dirt and oil off the bevel gear teeth.
- Press the ring gear assembly slowly with an oil seal driver (57001-1104) to firmly seat the ball bearing.

CAUTION

○**Do not install the pinion gear nut, collar and O-rings during adjustment.**

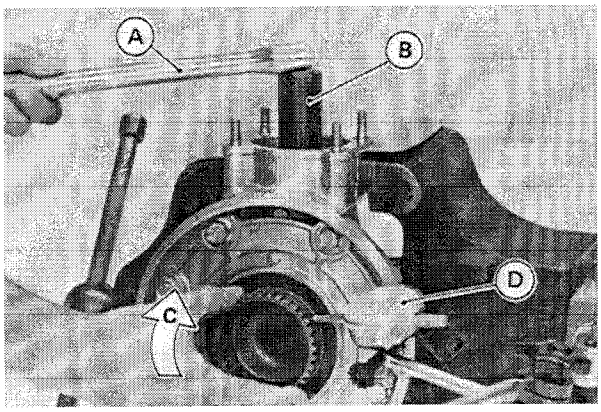
- Install the pinion gear assembly with the primary (**0.5 mm thickness**) shim, and tighten the bearing retainer to the specified torque (see Exploded View).
- Install the ring gear assembly with the primary (**1.0 mm thickness**) shim, and tighten the cover mounting bolts to the specified torque (see Exploded View).

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

- Mount a dial gauge on a vise so that the tip of the gauge is against the splined portion of the ring gear shaft.
- To measure the backlash, move the ring gear back and forth while holding the pinion gear steady. The difference between the highest and the lowest gauge reading is the amount of backlash.

○Measure backlash at three locations equally spaced on the splines.

**Final Bevel Gear Backlash: 0.07 – 0.10 mm**




A. Hold here.
B. Pinion Gear Holder: 57001-1186
C. Move the ring gear.
D. Dial Gauge

★If the backlash is not within the limit, replace the ring gear shims. 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

**Tooth contact adjustment**

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

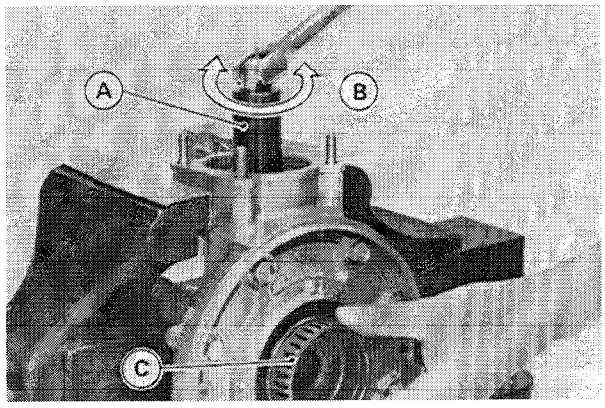
NOTE

○*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 at automotive supply stores for the purpose of checking differential gear tooth patterns and contact.*

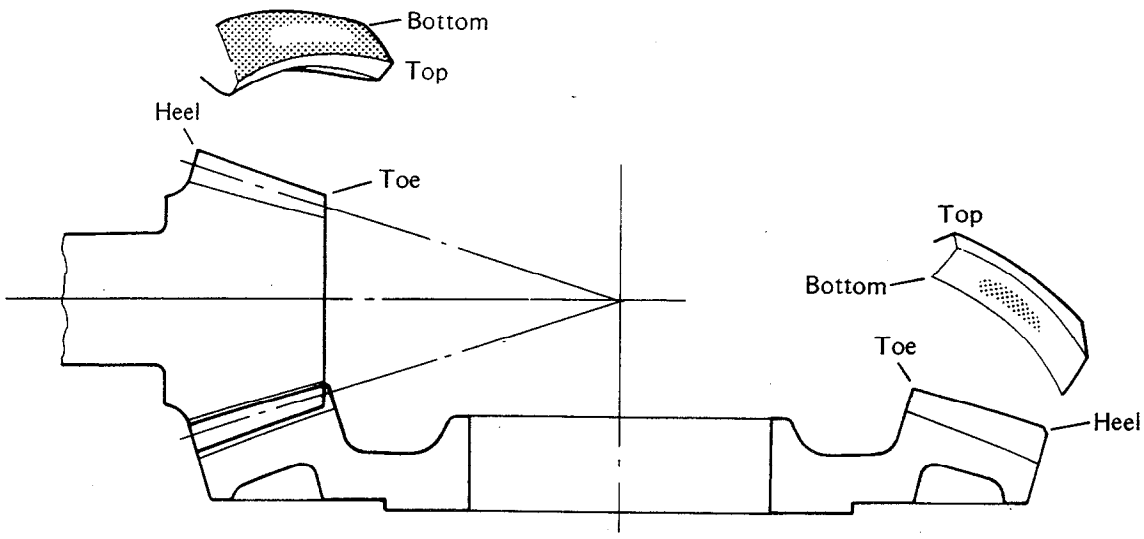
- Install the shim(s) and pinion gear assembly, and tighten the bearing retainer to the specified torque (see Exploded View).
- Install the shim(s) and ring gear assembly, and tighten the cover bolts to the specified torque (see Exploded View).
- Turn the pinion gear for one revolution back and forth, while creating a drag on the ring gear.




A. Pinion Gear Holder: 57001-1186
B. Turn the Pinion Gear
C. Drag

- Remove the ring and pinion gear assemblies to 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. The drive pattern can be a little closer to the toe and the coast pattern can be a somewhat longer and closer to the toe.

**Correct Tooth Contact Pattern**



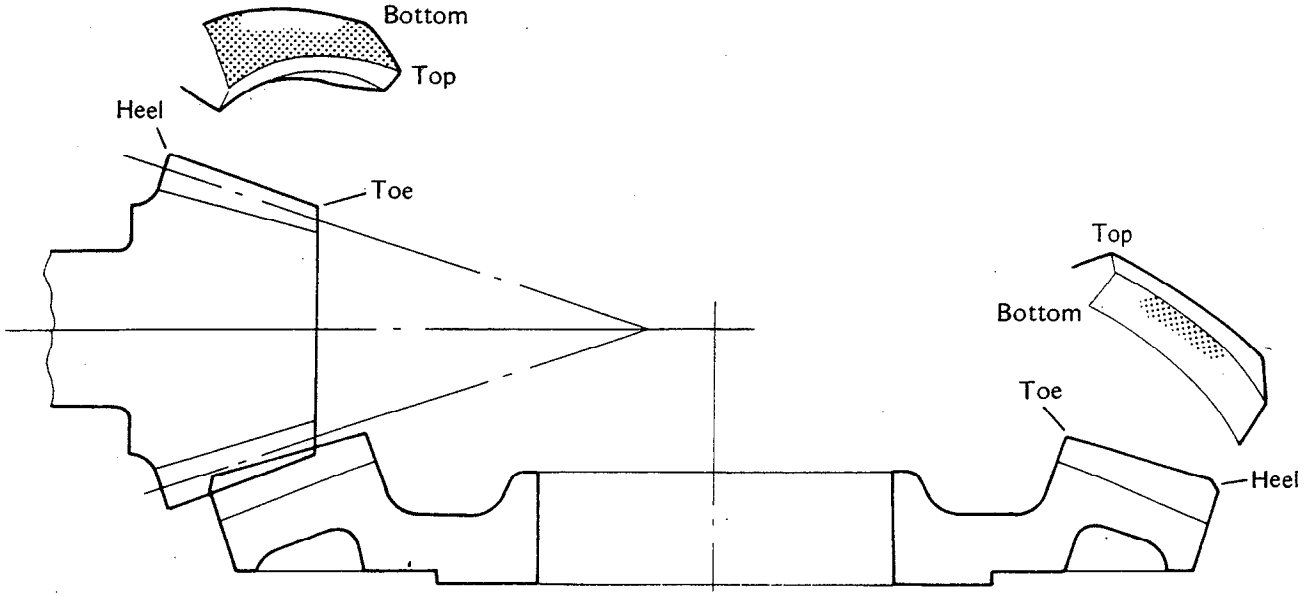

★If the tooth contact pattern is incorrect, replace the pinion gear shim(s), following the examples shown. Then erase the tooth contact patterns, and check them again. Also check the backlash every time the shim(s) are replaced. Repeat the shim change procedure as necessary.

**NOTE**

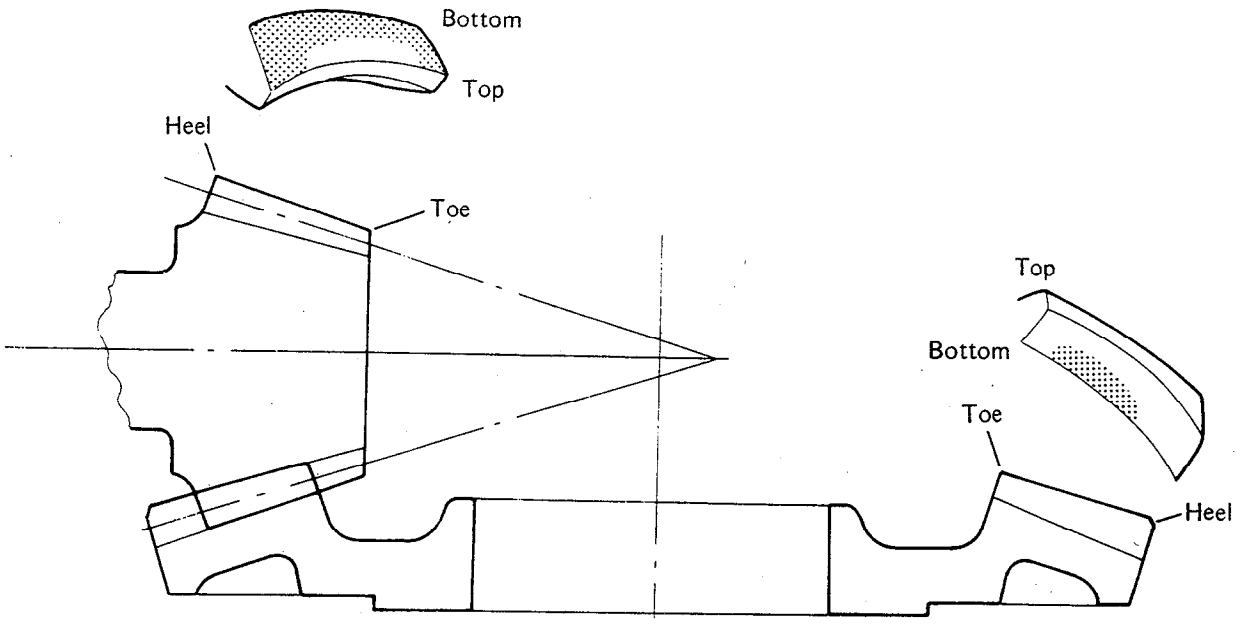
○*If the backlash is out of the standard range after changing the pinion gear shim(s), replace the ring gear shim(s) to correct the backlash before checking the tooth contact pattern.*

**Incorrect Tooth Contact Patterns**

Example 1: Decrease the thickness of the pinion gear shim(s) by **0.05 mm** to correct the pattern shown below.



Example 2: Increase the thickness of the pinion gear shim(s) by **0.05 mm** to correct the pattern shown below.




*Bevel Gear Inspection*

- Remove the ring gear assembly and pinion gear from the final gear case (see Ring Gear Disassembly and Pinion Gear Disassembly).
- Visually check the bevel gears for scoring, chipping, or other damage.

★Replace the bevel gears as a set if either gear is damaged.

*Pinion Gear Bearing Inspection*

- Disassemble the pinion gear (see Pinion Gear Disassembly).
- Visually inspect the bearings for abrasion, color change, or other damage.

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

*Oil Seal Inspection*

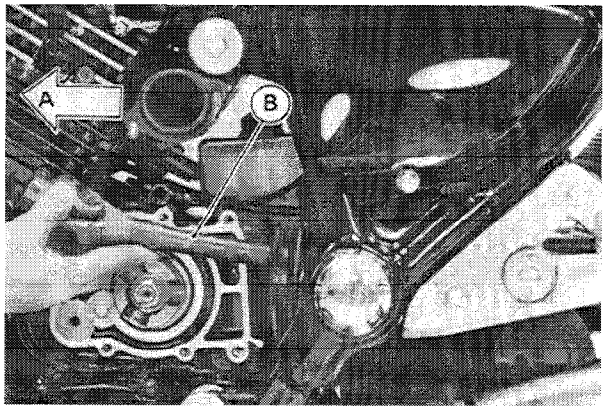
- Inspect the oil seals.

★Replace any if the lips are misshapen, discolored (indicating that the rubber has deteriorated), hardened, or otherwise damaged.

## Propeller Shaft

*Propeller Shaft Removal*

- Remove the front bevel gear case (see Front Bevel Gear Case Removal).
- Pull out the propeller shaft forward.



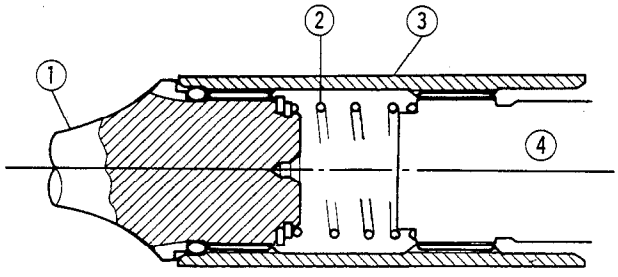

A. Front B. Propeller Shaft

○If the coil spring in the propeller shaft joint slides out and remains in the swing arm, retrieve the spring with a magnet.

### *Propeller Shaft Installation*

- Lubricate the propeller shaft before installation (see Propeller Shaft Lubrication).
- Install the propeller shaft being careful of installation direction.
- Fit the coil spring in place as shown.
- Insert the propeller shaft into the swing arm while turning the shaft in order to fit the joint splines onto the pinion gear splines.

**Propeller Shaft Joint Installation**

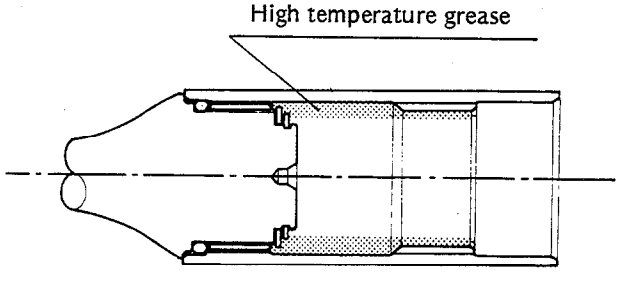



1. Propeller Shaft
2. Coil Spring
3. Joint
4. Pinion Gear

### *Propeller Shaft Joint Lubrication*

- Remove the final gear case and propeller shaft.
- Wipe off the old grease from the propeller shaft sliding joint and pinion gear joint.
- Pack the propeller shaft sliding joint with specified amount of a high temperature grease.

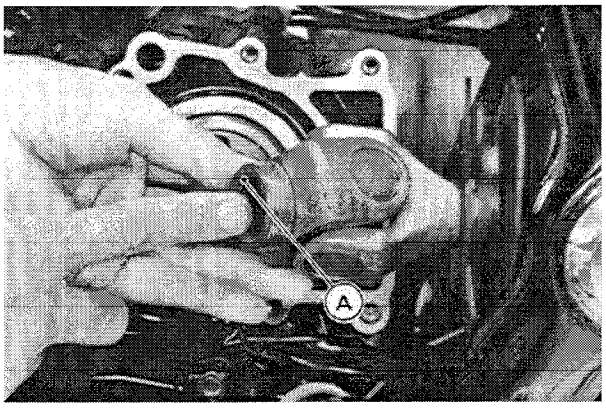
**Propeller Shaft Sliding Joint Lubrication**




**Grease for Sliding Joint Lubrication:**

| | |
|---|---|
| **Type** | **High temperature grease** |
| **Amount** | **17 mL** |

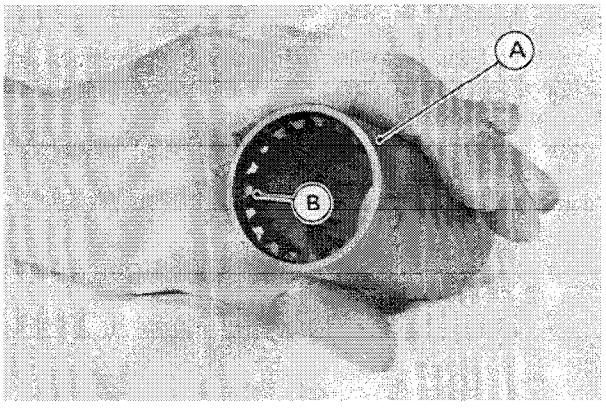
- Wipe the old grease off the front end of the propeller shaft and from the driven shaft.
- Apply a thin coat of a high temperature grease to the splines.




A. Splines.

### *Propeller Shaft Joint Inspection*

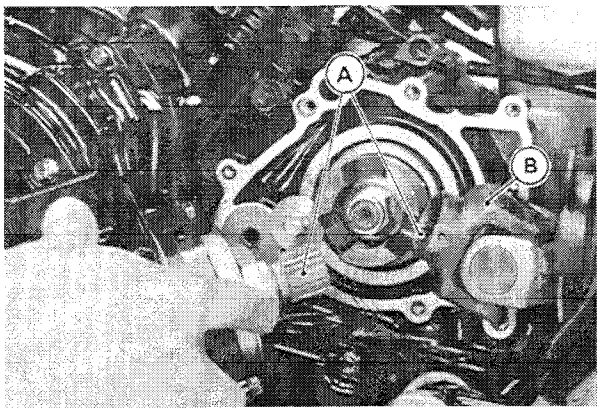
- Remove the propeller shaft (see Propeller Shaft Removal).
- Visually inspect the internal splines of the propeller shaft sliding joint.
- ★If they are badly worn or chipped, replace the joint with a new one.



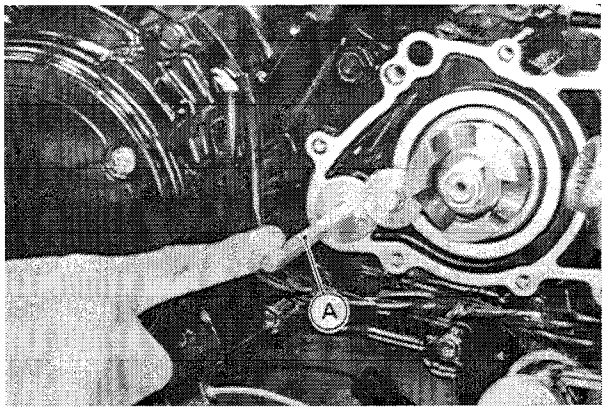

A. Propeller Shaft Joint B. Splined Portion

### *Propeller Shaft Inspection*

- Remove the propeller shaft (see Propeller Shaft Removal).
- Check that the universal joint works smoothly without rattling or sticking.
- ★If it does not work smoothly, the needle bearing in the universal joint are damaged. Replace the propeller shaft with a new one.
- Visually inspect the splines on the propeller shaft.
- ★If they are badly worn or chipped, replace the propeller shaft. Also, inspect the splines on the front driven bevel gear.




A. Splines B. Universal Joint




A. Clutch Push Rod

## Front Bevel Gear Removal/Assembly

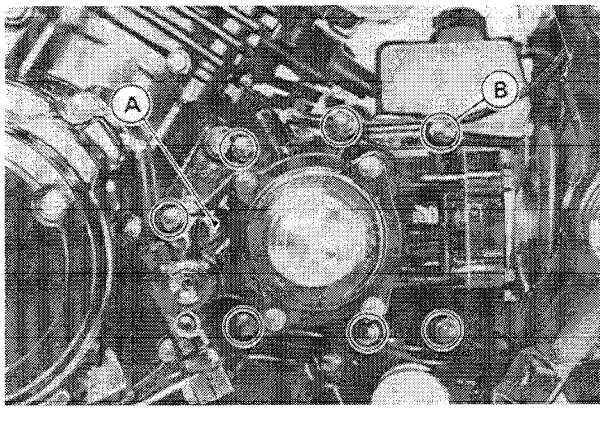
### *Front Bevel Gear Case Removal*

- Support the motorcycle on its center stand to keep engine oil loss to a minimum. Place an oil pan beneath the front bevel gear case.
- Remove the clutch cable lower end (see Clutch Cable Removal in Clutch chapter).

**NOTE**

*It is not necessary to remove the clutch release for front gear case removal.*

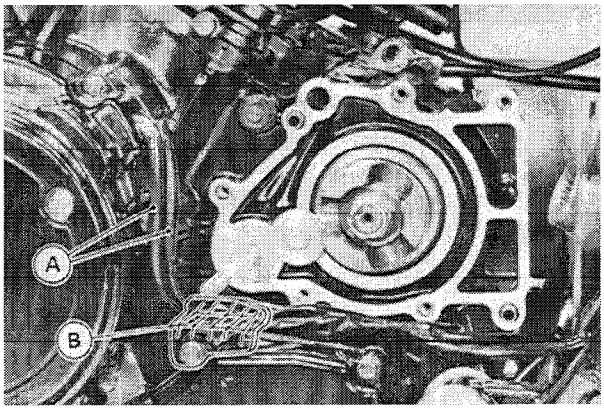
- Unscrew the gear case bolts to remove the front bevel gear case.




A. Front Bevel Gear Case B. Bolts

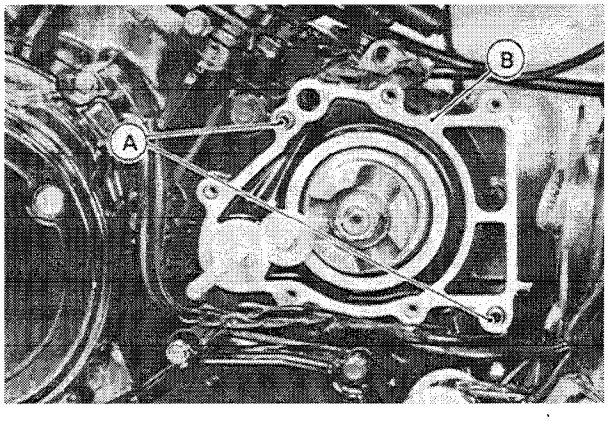
### *Front Bevel Gear Case Installation Notes*

- Install the clutch push rod, smearing a thin coat of molybdenum disulfide grease on both ends. The rod can be installed in either direction.
- Install the propeller shaft (see Propeller Shaft Installation).
- Run the alternator leads and pickup coil leads as shown. Make sure they do not get pinched by the gear case.



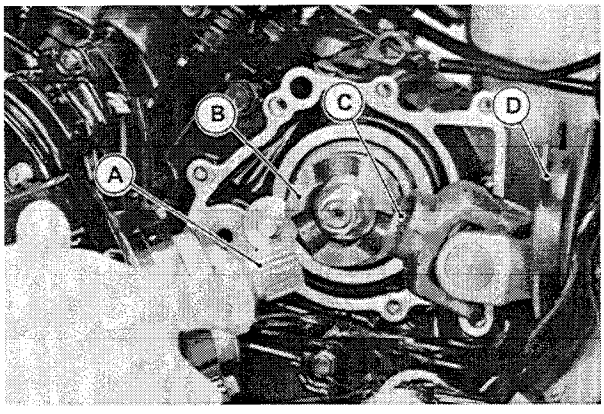

A. Leads B. Clamp

- Check to see that the knock pins and the new gasket are in place on the case.



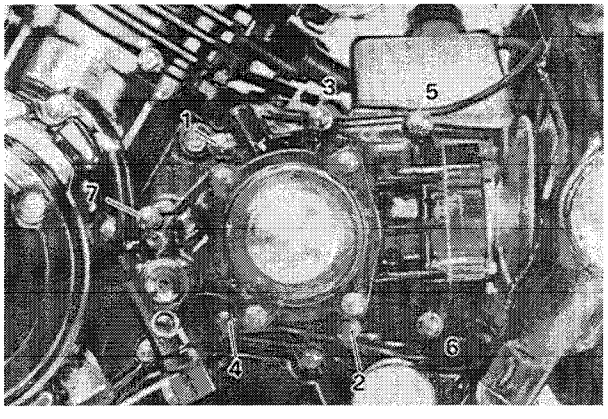

A. Knock Pins B. Install the new gasket here.

- Install the front bevel gear case, while meshing the damper cams and aligning the driven gear splines with the propeller shaft splines.
- Fit the boots in place.




A. Driven Gear Splines
B. Damper Cams
C. Propeller Shaft Splines
D. Boots

- When re-using the 95 mm long case mounting bolts, apply a non-permanent locking agent to the threads.
- The damper cam spring suspends the case, so tighten the gear case mounting bolts gradually and evenly in the order shown.



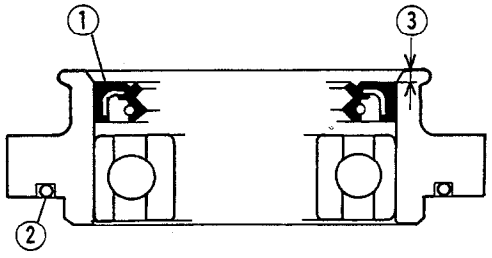

1, 2, 4: Sealant Coated Bolts, 95 mm long

- Install the clutch release (see Clutch Release Installation in Clutch chapter).
- Check the engine oil level and add oil if necessary (see Oil Level Inspection in Engine Lubrication System).

### *Front Bevel Gear Case Assembly Notes*

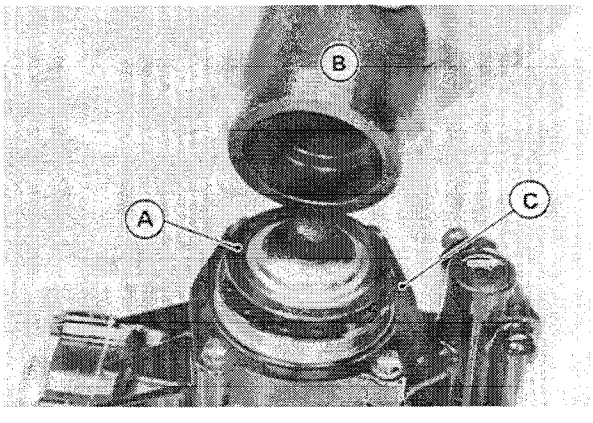
- After completing the bearing housing adjustment (see Bearing Installation Adjustment), install the oil seal in both outer bearing housings as shown.

**Outer Bearing Housing Assembly**




1. Oil Seal
2. O-Ring
3. (2 mm)

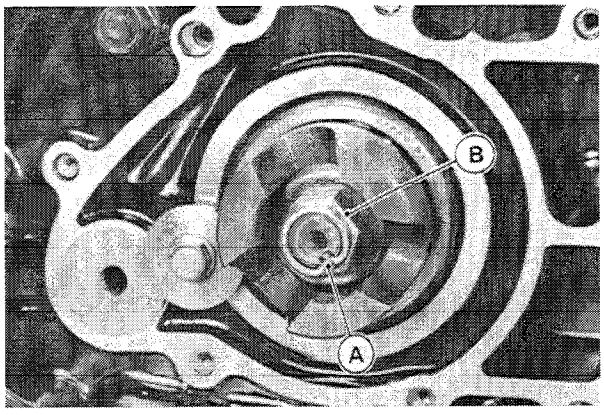
- When re-using the oil nozzle, apply a non-permanent locking agent to the threads (see Exploded View).
- If the oil line plug is a used one, apply a non-permanent locking agent to the threads.
- Press the cap into the case using the oil seal driver (special tool) which does not contact the metal part of the cap.



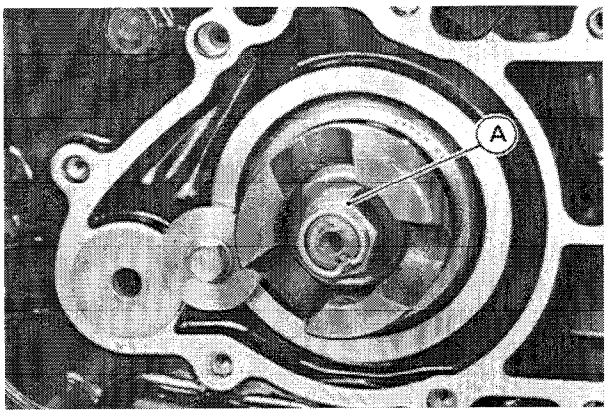

A. Cap
B. Oil Seal Driver: 57001-1091
C. Front Bevel Gear Case

### *Damper Cam Removal*

- Pry open the staking on the damper cam nut with a small chisel.

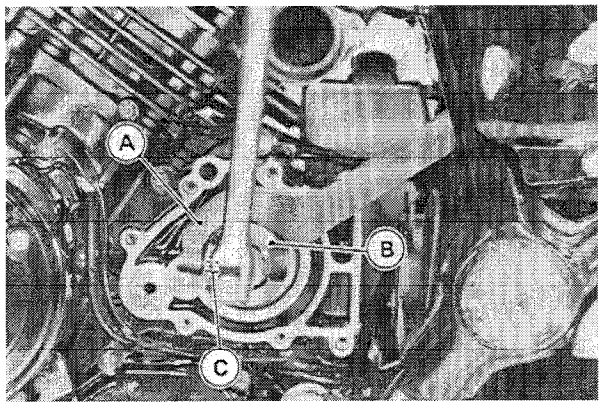



A. Staking B. Damper Cam Nut




A. Damper Cam Nut

- Use the damper cam holder (special tool) to hold the damper cam stationary, and remove the damper cam nut.




A. Holder: 57001-1025
B. Damper Cam
C. Insert the holder pin in the hole.

### *Damper Cam Installation Notes*

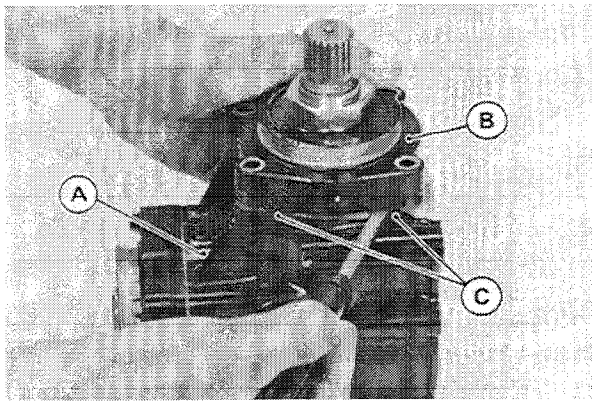
- Replace the damper cam nut with a new one whenever it is loosened.
- Tighten the damper cam nut to the specified torque.
- Stake the nut to the notch on the shaft to prevent loosening.

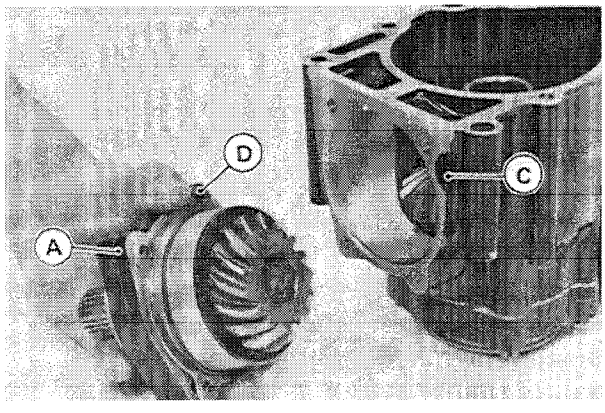
**CAUTION**

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

### *Front Driven Gear Removal*

- Remove the front bevel gear case (see Front Bevel Gear Case Removal).
- Remove the bearing retainer bolts and pry at the four points shown to remove the front driven gear assembly. The shim(s) comes off with the assembly.



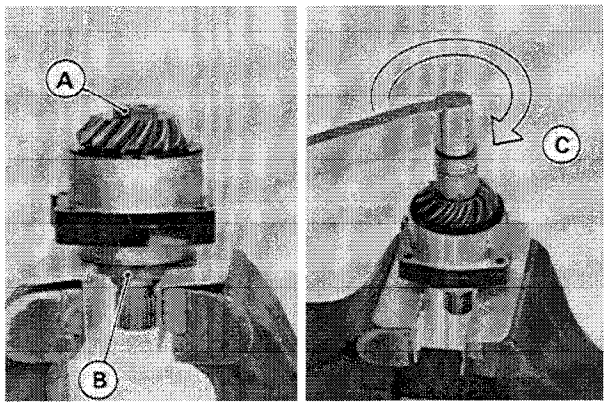




A. Front Driven Gear Assembly C. Pry Points
B. Bearing Retainers D. Shims

- Pry open the staking on the front driven gear nut with a small chisel.
- Clamp the driven gear nut in a vise and unscrew the nut by turning the driven gear using a suitable nut as a tool.

**NOTE**

○*Since the driven gear nut has left-hand threads, turn the gear as shown.*



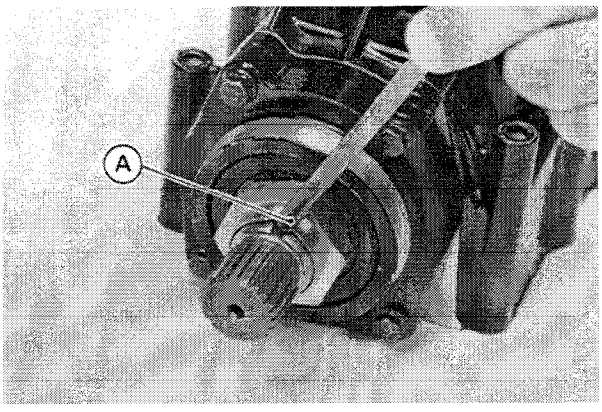

A. Suitable Nut (width across flats: 22 mm)
B. Driven Gear Nut
C. Turn it clockwise for removal.

### *Front Driven Gear Installation Notes*

- The front drive gear and driven gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Be sure to check and adjust the bevel gear backlash and tooth contact, when any of the backlash-related parts are replaced (see Front Bevel Gear Adjustment).
- Tighten the front driven gear nut to the specified torque (see Exploded View).
- Apply a high temperature grease to the oil seal lip.
- Stake the head of the nut with a punch to secure the nut in place.

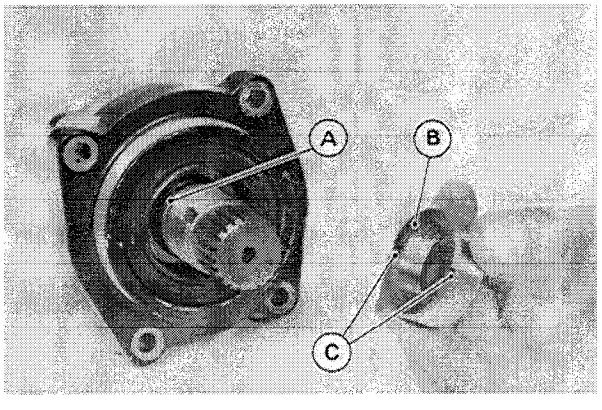
**CAUTION**

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




A. Stake here

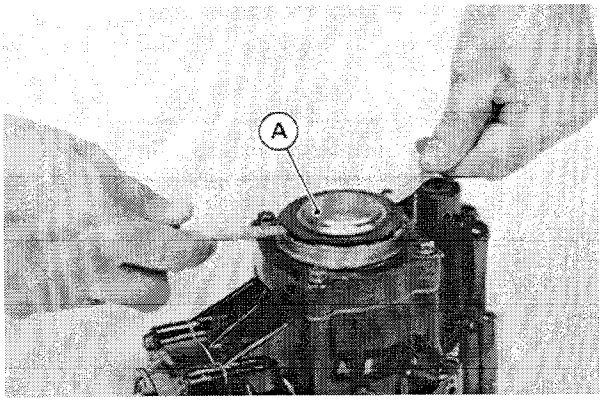
- Be sure to install the O-ring on the driven shaft, smearing a thin coat of grease on it.
- Install the driven gear collar so that the oil groove goes first and the collar does not pinch the O-ring.




A. O-Ring
B. Output Shaft Collar
C. Oil Grooves

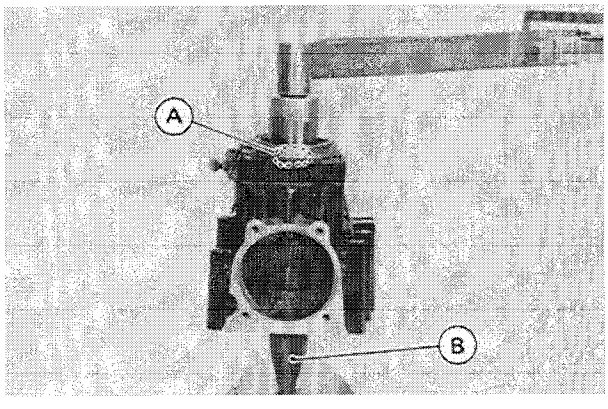
### *Front Drive Gear Removal*

- Remove the front driven gear assembly (see Front Driven Gear Removal).
- Remove the damper cam and spring.
- Pry off the gear case cap.



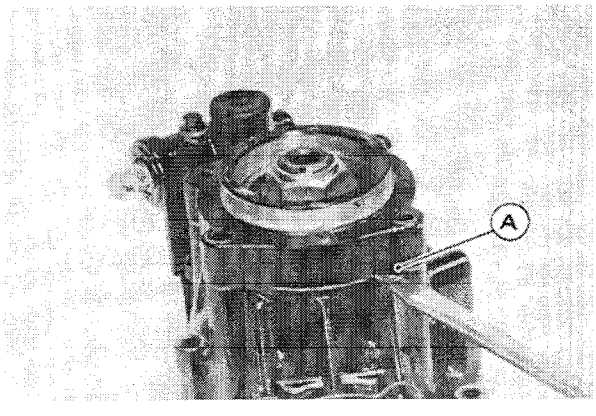

A. Cap

- Pry open the staking on the front drive gear nut with a small chisel.
- Loosen the drive gear nut while holding the drive gear shaft with the holder (special tool).




A. Drive Gear Nut B. Holder: 57001-1026

- Pull the front drive gear assembly out of the bearing housing.
- Pry at the two points shown to remove the bearing housing. The shim(s) comes off with the housing.



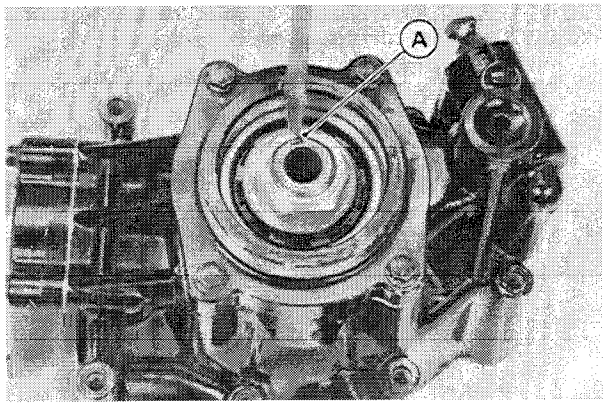

A. Pry here

### *Front Drive Gear Installation*

- Front drive gear installation is the reverse of removal. Note the following.
- The front drive gear and driven gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Be sure to check and adjust the bevel gear backlash and tooth contact, when any of the backlash-related parts are replaced (see Front Bevel Gear Adjustment).
- Replace the front drive gear nut with a new one.
- Tighten the front drive gear nut to the specified torque (see Exploded View).
- Stake the front drive gear nut to secure in place.

**CAUTION**

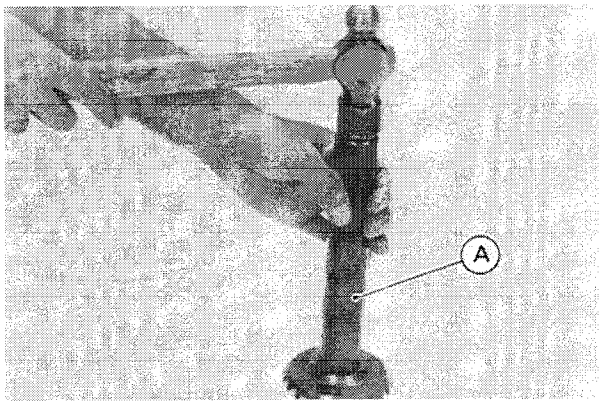
**When staking the nut, be careful not to apply shock to the shaft and bearings. Such a shock could damage the shaft and/or bearings.**




A. Stake here

### *Front Drive Gear Assembly Note*

- Install the bevel gear on the drive shaft with a driver (special tool) until the gear is firmly seated against the cam damper splines.




A. Bearing Driver: 57001-382

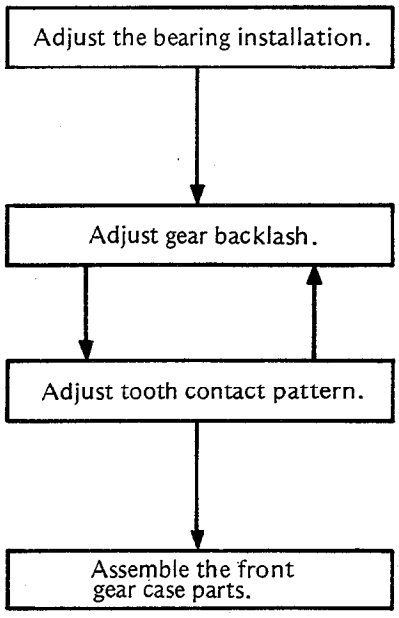
## Front Bevel Gear Adjustment

In order to prevent one gear from moving away from the other gear under load, the front gear ball bearings must be just snug **with no end play**. Also the **backlash** and **tooth contact pattern** of the bevel gears must be correct to prevent the gears from making noise and being damaged.

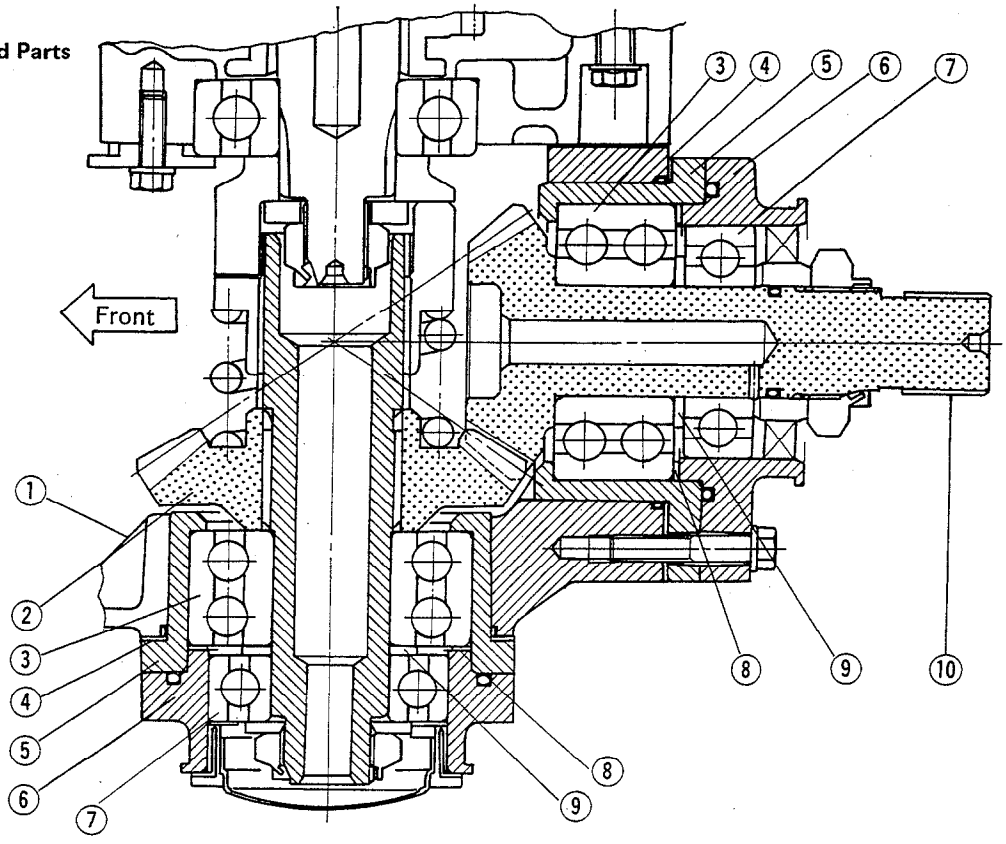
When replacing any one of the backlash-related parts, be sure to check and adjust the backlash and tooth contact. First adjust the backlash, and then tooth contact by replacing shims.

These three adjustments are of critical importance and must be carried out in the correct sequence, using the procedures shown.

**Front Bevel Gear Adjustment Procedure**




**Backlash-Related Parts**




1. Front Bevel Gear Case
2. Drive Bevel Gear
3. Double Row Bearings
4. Gear Shims
5. Inner Bearing Housings
6. Outer Bearing Housings
7. Single Row Bearings
8. Bearing Shims
9. Washers
10. Driven Bevel Gear

**Bearing Shims**

| Thickness (mm) | Part Number |
|---|---|
| 0.12 | 92025-1571 |
| 0.15 | 92025-1511 |
| 0.18 | 92025-1572 |
| 0.8 | 92025-1512 |
| 0.9 | 92025-1513 |
| 1.0 | 92025-1514 |
| 1.1 | 92025-1515 |
| 1.2 | 92025-1516 |
| 1.3 | 92025-1517 |
| 1.4 (primary) | 92025-1518 |

**Gear Shims**

| Thickness (mm) | Part Number |
|---|---|
| 0.10 | 92025-1258 |
| 0.15 | 92025-1259 |
| 0.20 | 92025-1260 |
| 0.30 | 92025-1261 |
| 0.60 | 92025-1262 |
| 0.90 | 92025-1263 |
| 1.20 (primary) | 92025-1264 |

**NOTE**

○*Use the bearing shims for bearing installation, and the gear shims for gear backlash and tooth contact adjustments.*

○*The bearing shims and the gear shims are interchangeable between drive and driven gear assemblies.*

## *Bearing Installation Adjustment*

**NOTE**

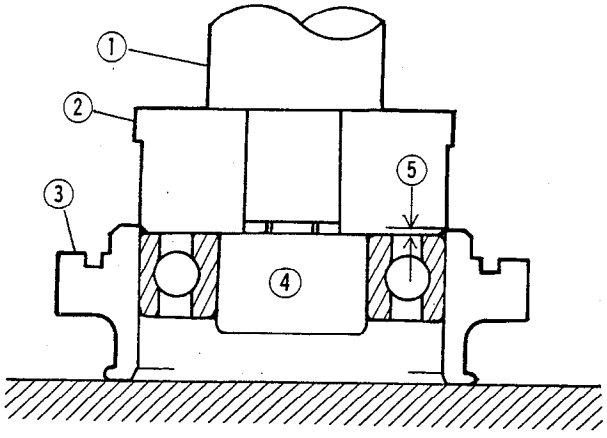
○*Do not install the O-rings and the oil seal until bearing installation is adjusted.*

○*The housings are interchangeable between drive and driven gear assemblies.*

○*When replacing any one of the following parts, check and adjust the bearing installation.*
*Outside Bearing Housings*
*Inside Bearing Housings*
*Double Row Bearings*
*Single Row Bearings*

- Press each bearing into place using the bearing driver (57001-1129) because it does not contact the bearing inner race.
- Temporarily press the single row bearing into the outside bearing housing as shown.

**Single Row Bearing Installation**



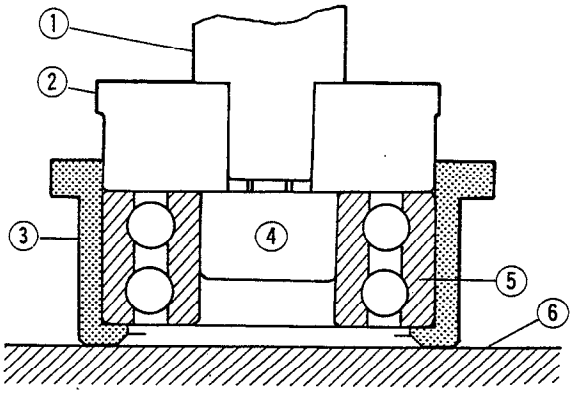

1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1147
3. Outside Bearing Housing
4. Bearing Driver: 57001-1139
5. 1.5 – 2.0 mm

- Press the double row bearing into the inside bearing housing until the bearing bottoms out.

**CAUTION**

○**When installing the double row bearing into the housing, hold the bottom on a flat surface to prevent housing damage.**

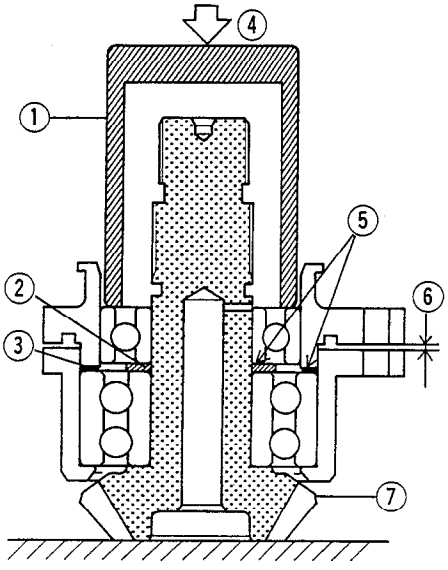
**Double Row Bearing Installation**




1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1148
3. Inside Bearing Housing
4. Bearing Driver: 57001-1139
5. Double Row Bearing
6. Flat Surface

•Install the thickest shim (t1.4 mm) between the double row bearing and the outside bearing housing, and the washer (smaller diameter) between the bearings.
•While pushing the outside bearing housing lightly against the shim with the compressor (special tool), measure the gap **C** as shown.
○Take a measurement at each of the clearance hole positions (Total of four measurements).

**Bearing Housing Gap Inspection**




1. Compressor "A" 57001-1041
2. Washer: 92022-1663
3. Shim
4. Press here
5. Without Any Gap
6. Housing Gap C
7. Driven (or Drive) Gear

★If the average of the four measurements **C** is out of the usable range, re-adjust the gap by changing the shim.

**Bearing Housing Gap C**
**Standard : not more than 0.03 mm**
**Usable Range : not more than 0.05 mm**

★If any of the measurement **C** is zero, remove the outside bearing housing to check that the shim and the washer make good contact with the single row bearing and the outside bearing housing.
○This can be checked by applying checking compound to the shim and the washer.

**NOTE**

○*Apply checking compound to the shim and washer in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact pattern may not appear.*
○*Checking compounds are available at automotive supply stores.*

★If there is no contact pattern, re-adjust the bearing housing using a thinner shim.

**CAUTION**

○**If the shim and the washer are installed loosely, it could cause gear noise and gear damage.**

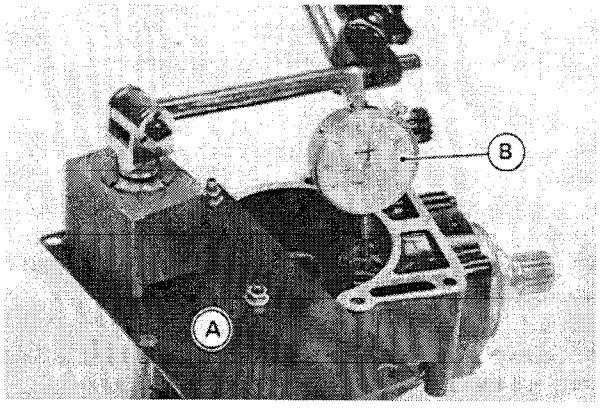
*Backlash Adjustment*

•Clean any dirt and oil off bevel gear teeth.
•Install the drive and driven gear assembly with the primary (**1.2** mm thickness) gear shim(s).
•Tighten the front bearing housing mounting bolts to the specified torque (see Exploded Views).

**NOTE**

○*Do not stake the head of the nut until both backlash and tooth contact adjustments are finished.*
○*Check the backlash during the tightening of the bolts, and stop tightening them immediately if the backlash disappears. Then, change the shim to a thicker one.*

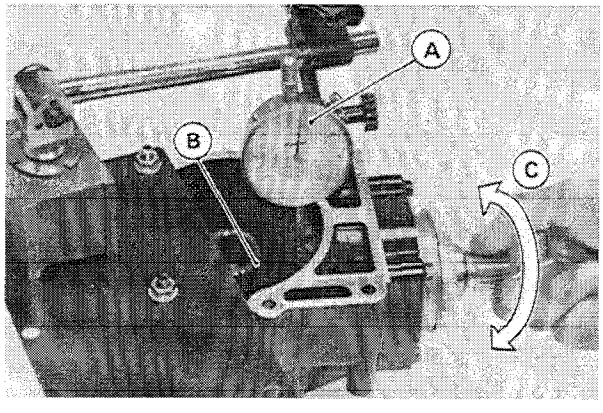
•Install the dial gauge holder (special tool) with 6 mm bolts and nuts on the front gear case to mount a dial gauge.
•Set up a dial gauge against a driven gear tooth to check gear backlash. The gauge stem must be in line with the direction of tooth travel.




A. Holder: 57001-1049 B. Dial Gauge

•To measure the backlash, move the driven gear back and forth while holding the drive 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.

**Front Bevel Gear Backlash: 0.10 — 0.15 mm**




A. Dial Gauge
B. Hold the drive gear.
C. Move the driven gear.

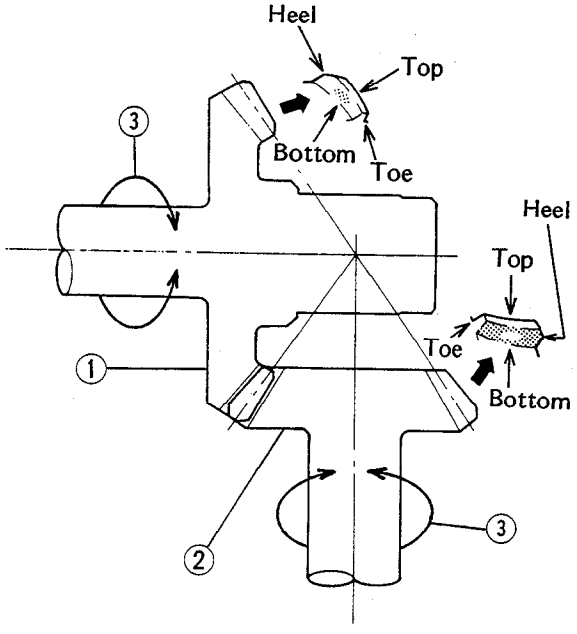
*Tooth Contact Adjustment*

•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 and 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 at automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use one of these for checking the bevel gears.*

**Correct Tooth Contact Pattern**




1. Drive Shaft Bevel Gear
2. Driven Shaft Bevel Gear
3. Turn the Gears

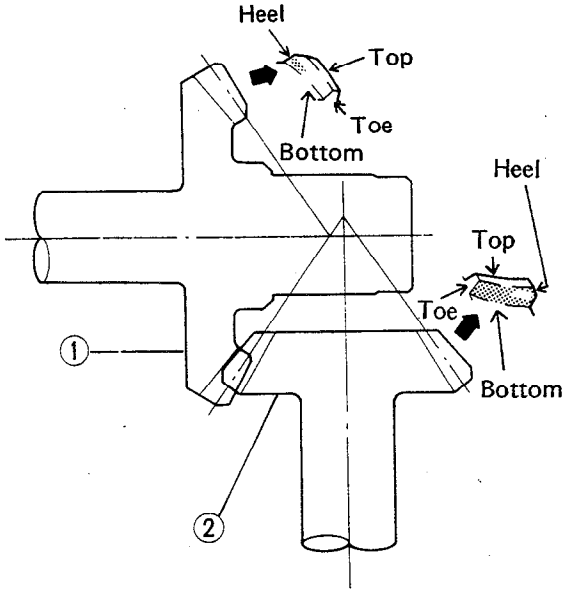
•Turn the driven gear for 3 or 4 revolutions back and forth, while creating a drag on the drive gear.
•Check the drive pattern and coast pattern of the bevel gear teeth. The tooth contact patterns of both drive and coast sides should be centrally located between the top and bottom of the tooth, and little closer to the toe of the tooth.
★If the tooth contact pattern is incorrect, replace the gear shim(s) at the drive gear and the gear 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.*

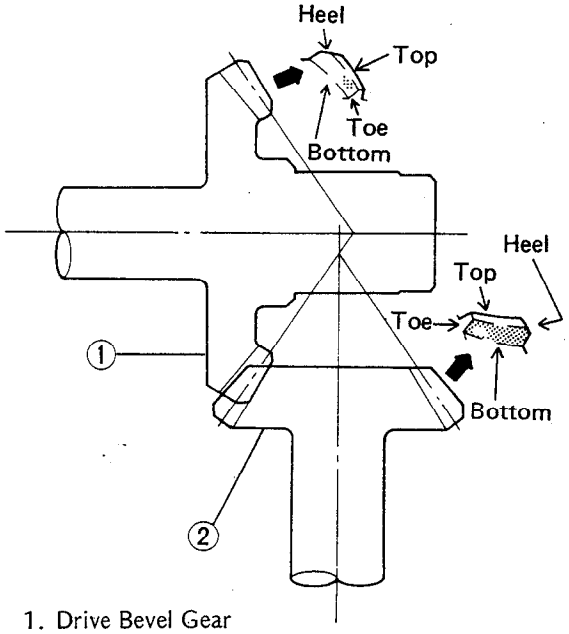
**Incorrect Tooth Contact Patterns**

Example 1: Decrease the thickness of the shim pack at the drive gear housing by **0.05 mm**, and increase the thickness of the shim pack at the driven gear housing by **0.1 mm** to correct the pattern.




1. Drive Bevel Gear
2. Driven Bevel Gear

Example 2: Increase the thickness of the shim pack at the drive gear housing by **0.05 mm**, and decrease the thickness of the shim pack at the driven gear housing by **0.1 mm** to correct the pattern.

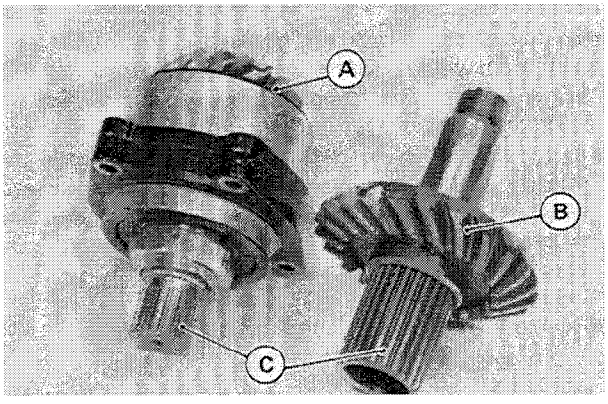



1. Drive Bevel Gear
2. Drive Bevel Gear

## Front Bevel Gears Inspection

### *Bevel Gear Inspection*

- Remove the front drive and driven gears (see Front Drive and Driven Gear Removal).
- Visually check the bevel gears for scoring, chipping, or other damage.
- ★Replace the bevel gears as a set if either gear is damaged.
- Visually inspect the gear splines.
- ★If either gear has badly worn or damaged splines, replace the bevel gears as a set.




A. Driven Gear
B. Drive Gear
C. Splines

### *Bevel Gear Bearing Inspection*

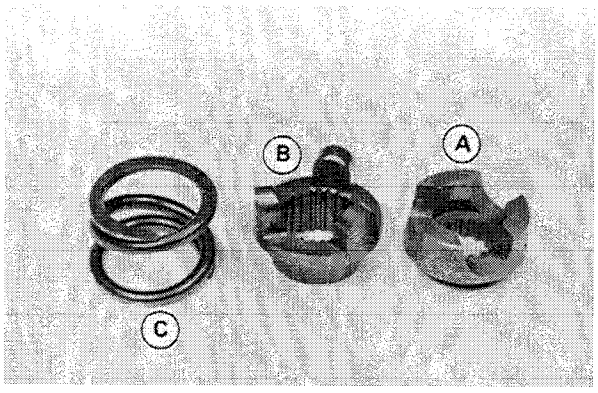
- Visually inspect the bearings for abrasion, color change, or other damage.
- ★If there is any doubt as to the condition of a bearing, replace it.

### *Oil Seal Inspection*

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

*Cam Damper Inspection*

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



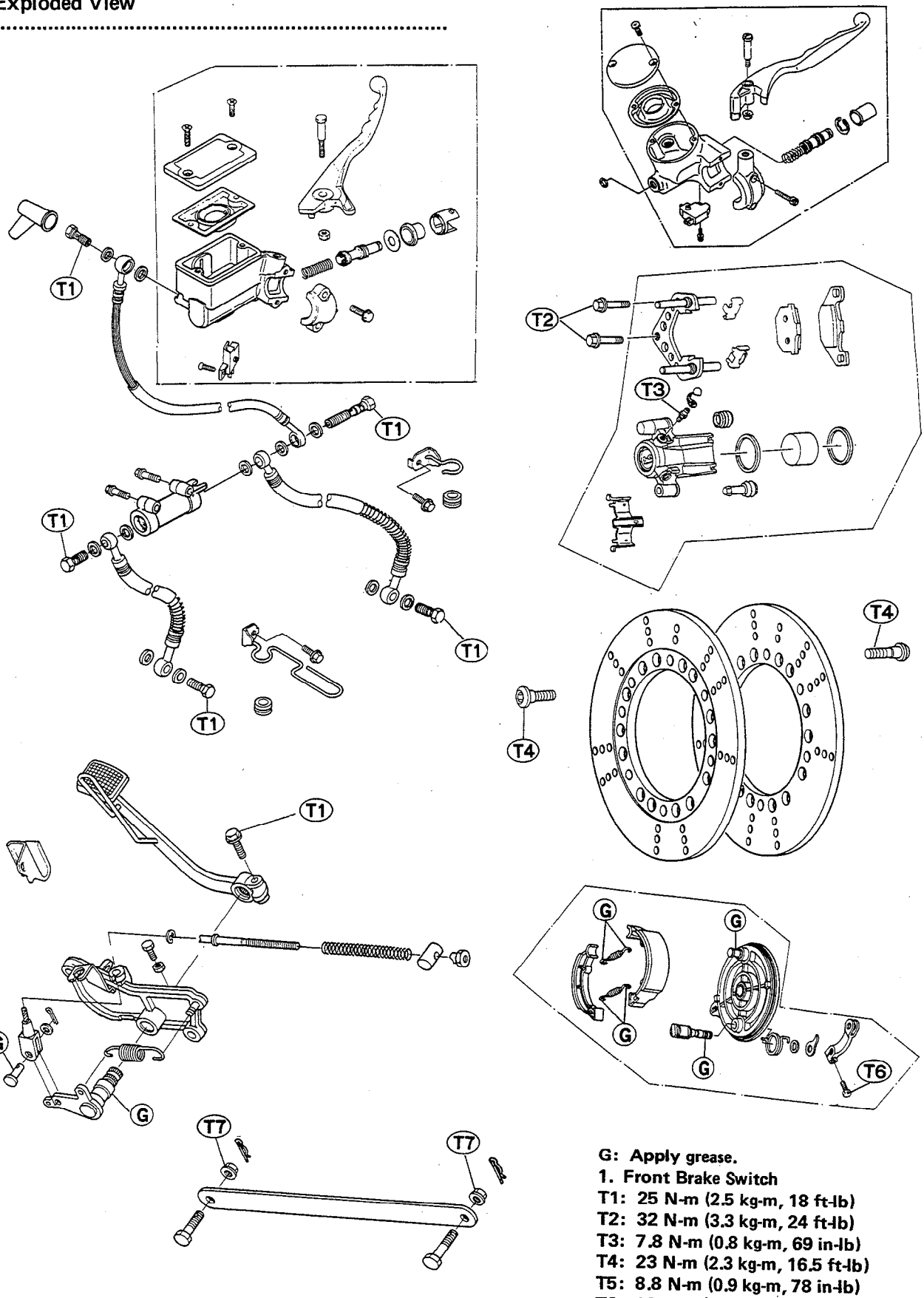

A. Cam
B. Cam Follower
C. Spring

# Brakes

## Table of Contents

## Exploded View

VN750-A7 ~



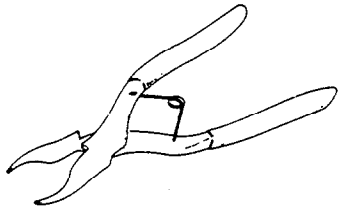

G: Apply grease.
1. Front Brake Switch
T1: 25 N-m (2.5 kg-m, 18 ft-lb)
T2: 32 N-m (3.3 kg-m, 24 ft-lb)
T3: 7.8 N-m (0.8 kg-m, 69 in-lb)
T4: 23 N-m (2.3 kg-m, 16.5 ft-lb)
T5: 8.8 N-m (0.9 kg-m, 78 in-lb)
T6: 19 N-m (1.9 kg-m, 13.5 ft-lb)
T7: 29 N-m (3.0 kg-m, 22 ft-lb)

## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| **Brakes:** | | |
| Brake fluid grade | D.O.T.4 | |
| Brake lever | Non-adjustable | |
| Brake pedal position | above 55 - 65 mm | |
| Brake pedal play | 20 - 30 mm | |
| Front disc brake | | |
| Pad lining thickness | 4.85 mm | 1 mm |
| Disc thickness | 4.8 - 5.1 mm | 4.5 mm |
| Disc runout | under 0.2 mm | 0.3 mm |
| Rear drum brake | | |
| Cam lever angle | 80 - 90° | |
| Drum inside diameter | 180.00 - 180.16 mm | 180.75 mm |

## Special Tool

**Circlip Pliers: 57001-143**



## Brake Adjustment

### *Front Brake Adjustment*

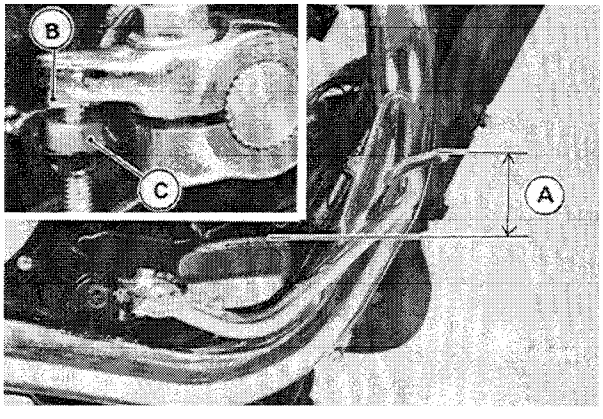
Disc and disc pad wears are automatically compensated for and has no effect on brake lever action. So there are no parts that require adjustment on the front brake. However if the brake lever has a soft, or "spongy feeling", check the brake fluid level in the master cylinder and bleed the air from the brake line (see Bleeding the Brake Line).

**NOTE**

○*Check the brake fluid level in accordance with the Periodic Maintenance Chart.*

### *Rear Brake Pedal Position Adjustment*

●Check the position of the brake pedal, relative to the top of the footpeg.




A. Brake Pedal Position
B. Adjuster Bolt
C. Locknut

**Brake Pedal Position**

**Above top of foot peg: 55 to 65 mm**

●Loosen the locknut and turn the adjuster bolt until the brake pedal is correctly positioned.
●Tighten the locknut securely.

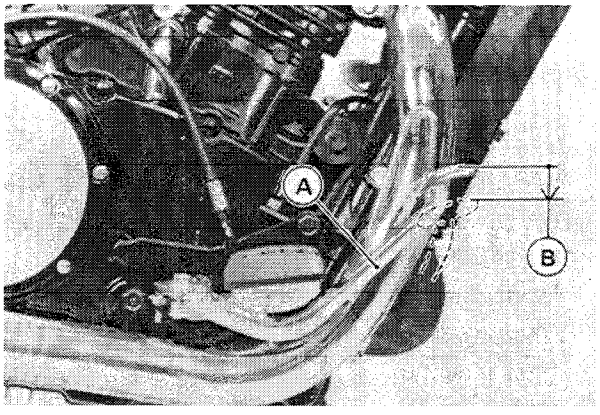
●After adjusting brake pedal position, check rear brake light switch (see Electrical System chapter) and brake pedal free play, and adjust them if necessary.

**NOTE**

○*If the pedal position cannot be adjusted by turning the adjuster bolt, the brake pedal may be deformed or incorrectly installed.*

### *Rear Brake Pedal Free Play Adjustment*

●Depress the rear brake pedal lightly by hand. This is the free play.

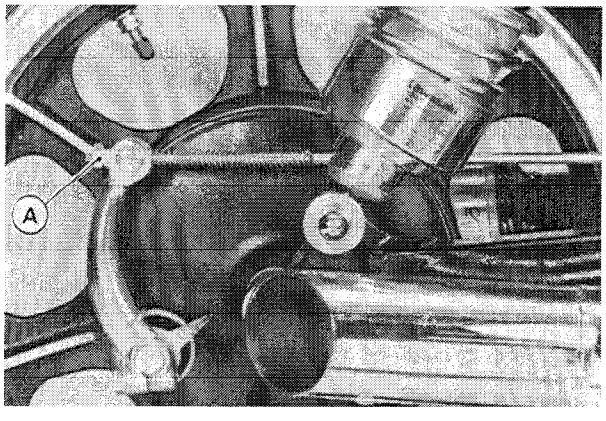



A. Rear Brake Pedal
B. Play

**Brake Pedal Play**

**Standard: 20 to 30 mm**

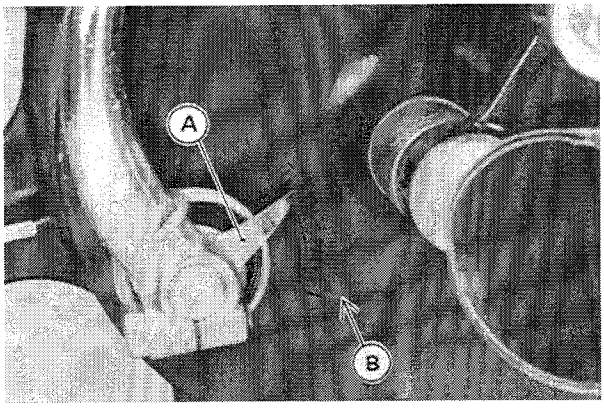
★If the rear brake pedal free play is incorrect, adjust it.
●Turn the adjusting nut at the brake panel.




A. Adjusting Nut

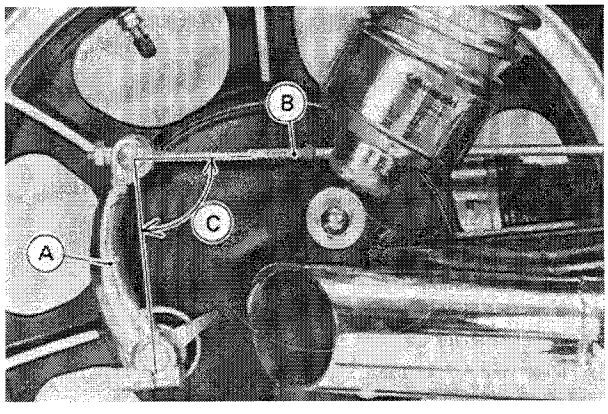
### *Rear Brake Lining Wear Inspection*

●Check that the brake lining wear indicator points within the USABLE RANGE when the rear brake is fully applied.
★If does not, the brake shoes must be immediately replaced and the other brake parts examined.




A. Wear Indicator B. Usable Range

•Check that the rear brake cam lever comes to an **80° – 90°** angle with the rear brake rod when the rear brake is fully applied.
★If it does not, adjust the rear brake cam lever angle.




A. Cam Lever C. 80 – 90°
B. Brake Rod

**Cam Lever Angle**
**Standard: 80° – 90°**

**WARNING**

○**Since a cam lever angle greater than 90° reduces braking effectiveness, cam lever angle adjustment should not be neglected.**

*Rear Brake Cam Lever Angle Adjustment*

•Remove the bolt and nut, and take off the cam lever.
•Mount the cam lever at a new position so that the cam lever comes to an **80° – 90°** angle with the rear brake rod when the brake is fully applied.
•Adjust the brake play.

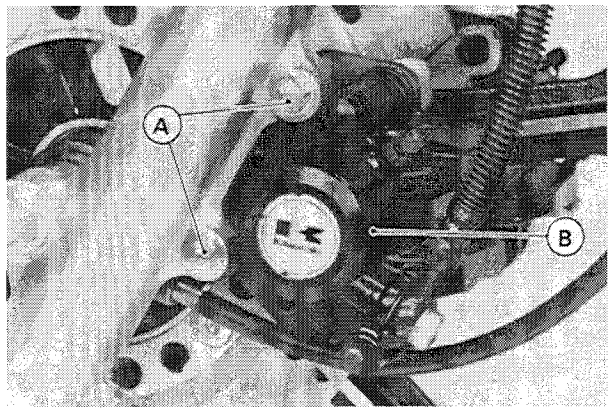
**WARNING**

○**A change in cam lever angle is caused by wear of internal brake parts. Whenever the cam lever angel is adjusted, also check for drag and proper operation, taking particular note of the brake lining wear indicator position.**
○**In case of doubt as to braking effectiveness, disassemble and inspect all internal brake parts. Worn parts could cause the brake to lock or fail.**

## Calipers

*Front Caliper Removal*

•Separate the brake hose from the caliper by taking off the banjo bolt.
•Remove the caliper mounting bolts, and take off the calipers.




A. Mounting Bolts B. Caliper

•If the caliper is to be disassembled after removal and if compressed air is not available, remove the piston using the following procedure.
○Remove the pads.
○Temporarily reconnect the brake hose to the caliper. The banjo bolt need not be torqued.
○Pump the brake lever to remove the caliper piston.
○Immediately wipe up any brake fluid that spills.
○Disconnect the brake hose from the caliper.

### *Caliper Installation Notes*

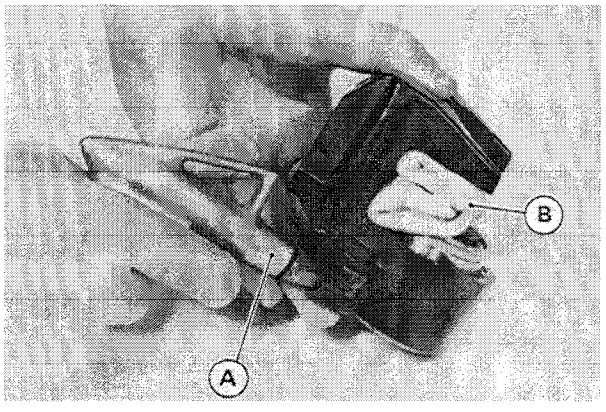
- Connect the brake hose to the caliper putting a new flat washer on each side of the brake hose fitting.
- Check the fluid level in the master cylinder, and bleed the brake line (see Bleeding the Brake Line).
- Check the brake for weak braking power, brake drag, and fluid leakage.

### *Caliper Disassembly Notes*

- Using compressed air, remove the piston.
  - Cover the caliper opening with a clean, heavy cloth.
  - Remove the piston by lightly applying compressed air to where the brake line fits into the caliper.

**WARNING**

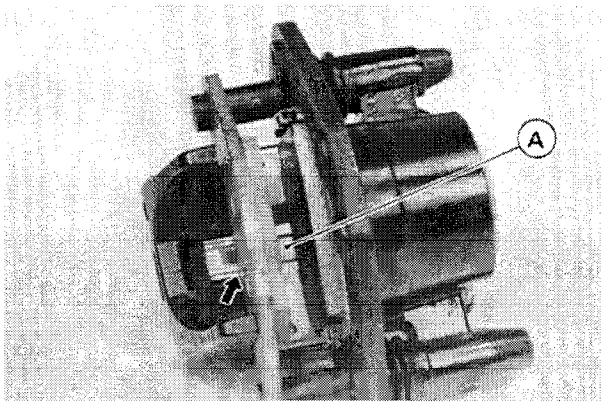
- **To avoid serious injury, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**




A. Apply compressed air. B. Cloth

### *Caliper Assembly Notes*

- Apply brake fluid to the outside of the piston and the fluid seal, and push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston skirt get scratched.
- Apply a thin coat of silicone grease to the caliper holder shafts and holder holes. (silicone grease is a special high temperature, water-resistant grease).
- Install the anti-rattle spring in the calipers as shown.




A. Anti-rattle spring

### *Fluid Seal Damage:*

The fluid seal around the piston maintains the proper pad/disc clearance. If this seal is not satisfactory, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

Replace the fluid seals under any of the following conditions: (a) fluid leakage around the pad; (b) brakes overheat; (c) there is a large difference in left and right pad wear; (d) the seal is stuck to the piston. If the fluid seal is replaced, replace the dust seal as well. Also, replace all seals every other time the pads are changed.

### *Dust Seal and Cover Damage*

- Check that the dust seals and covers are not cracked, worn, swollen, or otherwise damaged.
- ★If they show any damage, replace them.

### *Piston and Cylinder Damage*

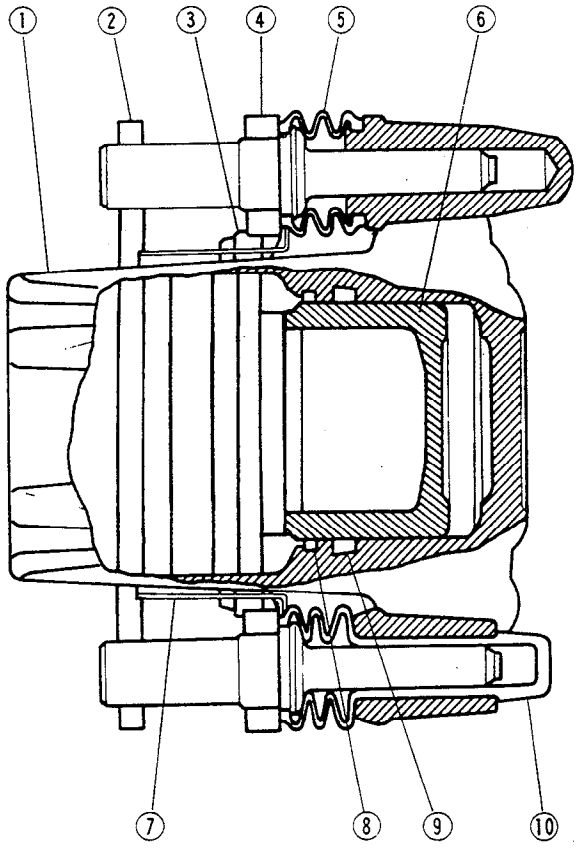
- Visually inspect the piston and cylinder surfaces.
- ★Replace the caliper if the cylinder and piston are badly scored or rusty.

### *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, and that the rubber friction boots are not damaged.
- ★If the rubber friction boots on the shafts are damaged, replace the rubber friction boots, and the caliper holder.

**Caliper**

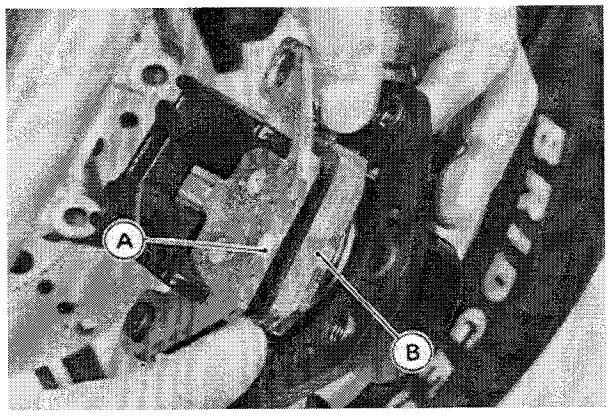



1. Caliper
2. Brake Pad
3. Brake Pad
4. Caliper Holder
5. Dust Cover
6. Piston
7. Anti-Rattle Spring
8. Dust Seal
9. Fluid Seal
10. Friction Boot

## Brake Pads

### *Pad Removal*

- Lift off the caliper by taking off the mounting bolts.
- Push the caliper holder toward the piston side, and then remove the pads.




A. Pad B. Pad

### *Pad Installation Notes*

- Push the caliper piston in by hand as far as it will go to allow clearance for the pads.

**WARNING**

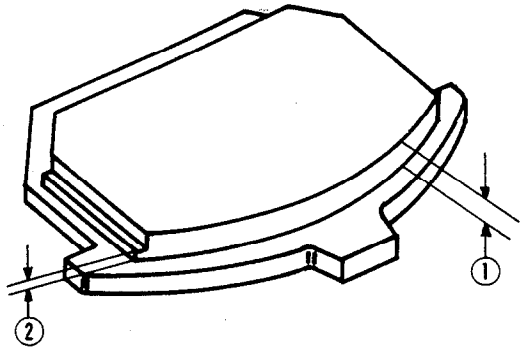
- **Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

### *Lining Wear*

In accordance with the Periodic Maintenance Chart, inspect the front brake for wear.

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

**Brake Pad**




1. Lining Thickness 2. Service Limit

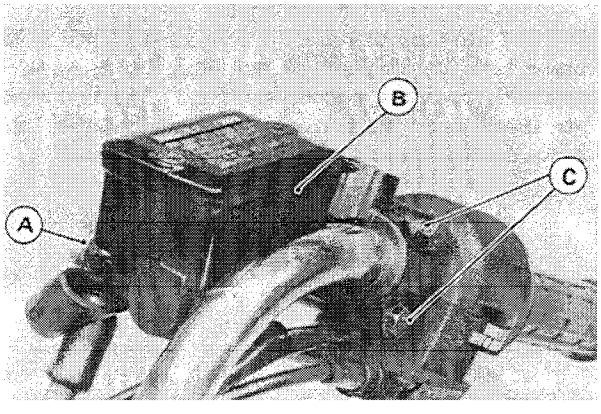
**Pad Lining Thickness**

| | |
|---|---|
| **Standard** | **4.85 mm (front)** |
| **Service Limit** | **1 mm** |

## Master Cylinder

### *Front Master Cylinder Removal*

•Pull back the dust cover, and remove the banjo bolt to disconnect the upper brake hose from the master cylinder. There is a flat washer on each side of the hose fitting.

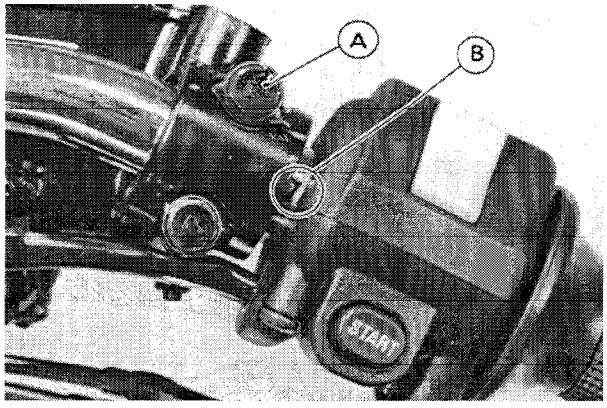



A. Banjo Bolt
B. Master Cylinder
C. Clamp Bolts

•Remove the clamp bolts and take off the master cylinder. Immediately wipe up any brake fluid that spills.

### *Front Master Cylinder Installation Notes*

•The master cylinder clamp must be installed with the small projection towards the throttle grip.
•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. Projection

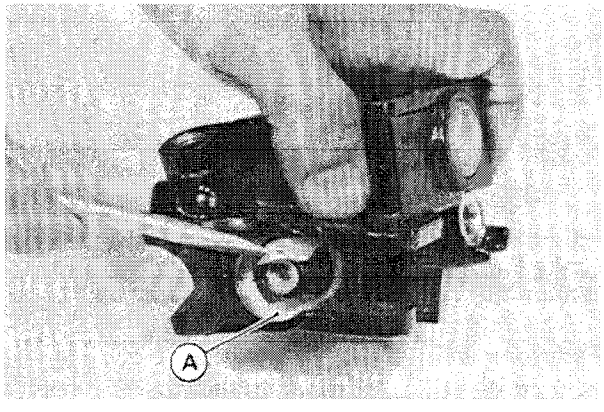
•Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolt to the specified torque (see Exploded View).

### *Inspection and Adjustment After Installation*

•Bleed the brake line after master cylinder installation.
•Check the brake for weak braking power, brake drag, and fluid leakage.

### *Front Master Cylinder Disassembly Notes*

•Remove the front master cylinder from the handlebar.
•Remove the master cylinder cap and diaphragm, and empty out the brake fluid.
•Remove the locknut and pivot bolt, and remove the brake lever.
•Using a thin-bladed screwdriver or some other suitable tool, press in the liner tabs which catch in the holes in the master cylinder, and then remove the liner.



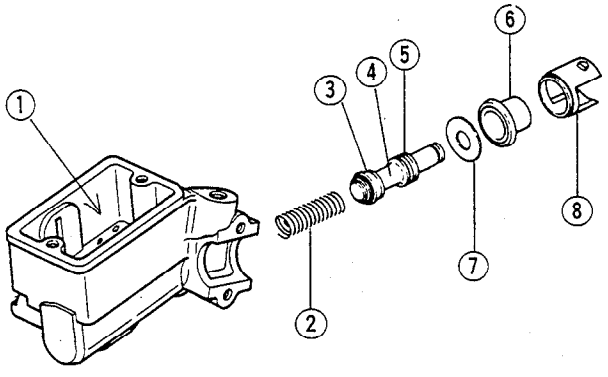

A. Liner

•Slide the dust cover out of place.
•Remove the stopper with circlip pliers.
•Remove the piston with the secondary cup, primary cup and spring.

**NOTE**

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

**Front Master Cylinder**




1. Cylinder Body
2. Spring
3. Primary Cup
4. Piston
5. Secondary Cup
6. Dust Cover
7. Stopper
8. Liner

*Front Master Cylinder Assembly Notes*

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

**CAUTION**

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

•Apply brake fluid to the parts removed and to the inner wall of the cylinder.
○Take care not to scratch the piston or the inner wall of the cylinder.
○Tighten the brake lever pivot bolt and locknut.

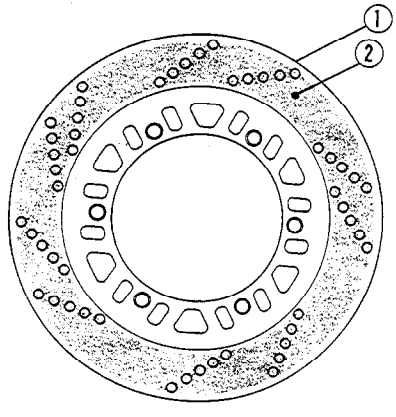
*Master Cylinder Inspection (Visual Inspection)*

•Disassemble the front master cylinder.
•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 and/or piston show any damage, replace them.
•Inspect the primary and secondary cups.
★If a cup is worn, damaged, softened (rotted), or swollen, replace the piston assembly.
★If fluid leakage is noted, 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 the piston assembly.

## Disc

*Disc Wear*

•Measure the thickness of each disc at the point where it has worn the most.
★Replace the disc if it has worn past the service limit.




1. Brake Disc
2. Measuring Area

**Front Disc Thickness**

| | |
|---|---|
| **Standard** | **4.8 to 5.1 mm** |
| **Service Limit** | **4.5 mm** |

### *Disc Cleaning*

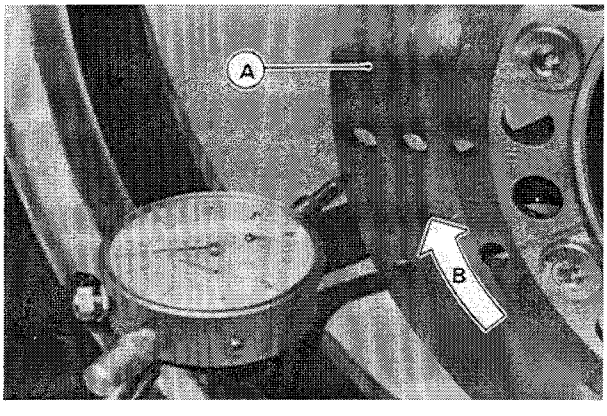
Poor braking can be caused by oil on a disc. Oil on a disc must be cleaned off with an oilless cleaning fluid such as trichloroethylene or acetone.

**WARNING**

○**These cleaning fluids are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacturer's warnings.**

### *Disc Warp*

- Jack up the motorcycle so that the front wheel is off the ground (see Front Fork Air Pressure Adjustment in Suspension chapter).
- Turn the handlebar fully to one side.
- Set up a dial gauge against the front disc as shown, and measure disc runout.
- If runout exceeds the service limit, replace the disc.




A. Brake Disc B. Turn the disc by hand

**Disc Runout**

| | |
|---|---|
| **Standard** | **Under 0.2 mm** |
| **Service Limit** | **0.3 mm** |

## Brake Fluid

### *Fluid Level Inspection*

In accordance with the Periodic Maintenance Chart, inspect the brake fluid level in the front brake fluid reservoir.

- Check the brake fluid level in the reservoir.

**NOTE**

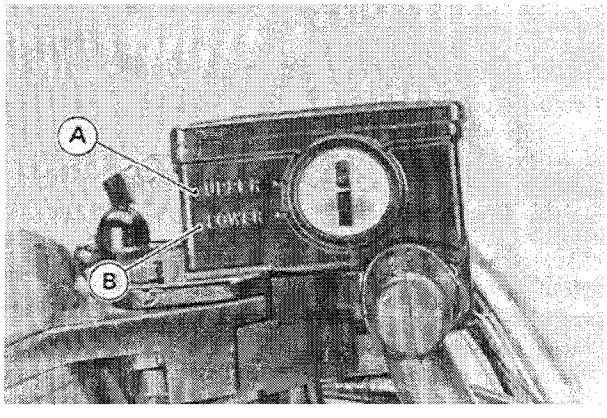
○*Hold the reservoir horizontal when checking brake fluid level (handlebar turned so that the reservoir is level).*

★The fluid level should be between the upper and lower level lines. If the fluid level is lower than the lower level line, fill the reservoir to the upper level line with the same type and brand of fluid that already is in the reservoir.

**WARNING**

○**Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that already is in the reservoir are unidentified. After changing the fluid, use only the same type and brand of fluid thereafter. Mixing different types and brands of brake fluid lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.**

**Front Brake Fluid Reservoir**




A. Upper Level Line B. Lower Level Line

### *Brake Fluid Recommendation*

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.

### *Brake Fluid Change*

In accordance with the Periodic Maintenance Chart, change the brake fluid. The brake fluid should also be changed if it becomes contaminated with dirt or water.

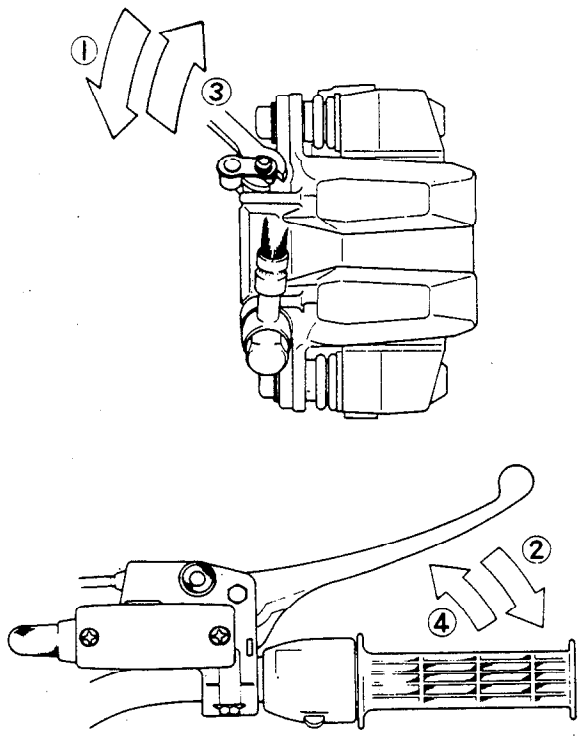
- Remove the reservoir cap, and remove the rubber cap on the bleed valve on the caliper.
- Attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Open the bleed valve (counterclockwise to open), and pump the brake lever until all the fluid is drained from the line.
- Close the bleed valve.
- 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, close the valve with the brake held applied, and then quickly release the lever. 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.*

- Repeat the above 2 steps one more time for the other side.
- Bleed the air from the lines (continue with Bleeding the Brake).

**Filling up the Brake Line**




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

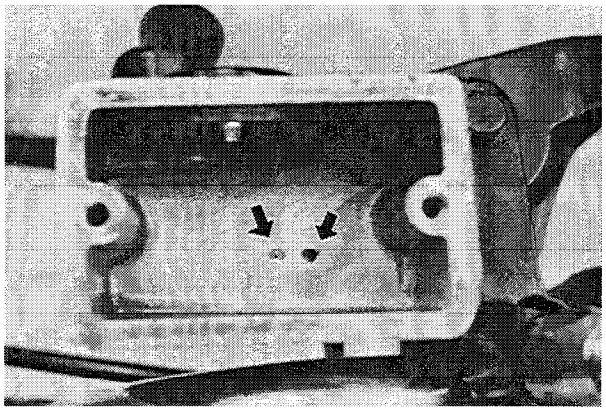
### *Bleeding the Brake Line*

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

Bleed the air from the brake whenever brake lever action feels soft or spongy, after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.

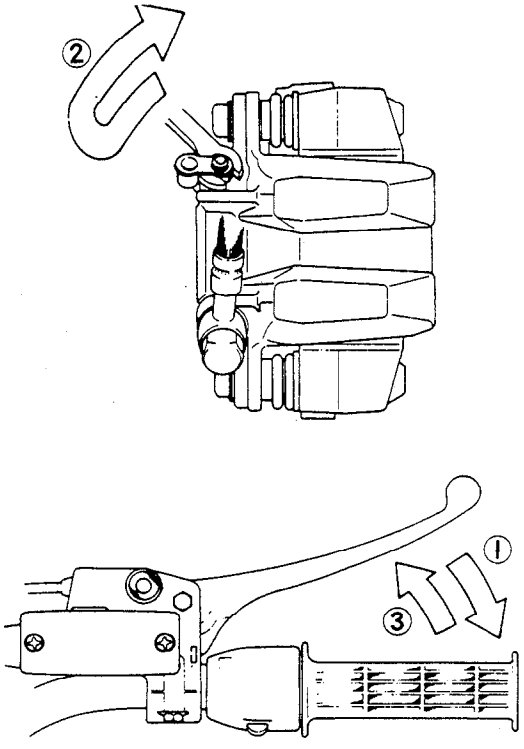
- Remove the reservoir cap, and check that there is plenty of fluid in the reservoir. The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.

•With the reservoir cap off, slowly pump the brake lever 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.

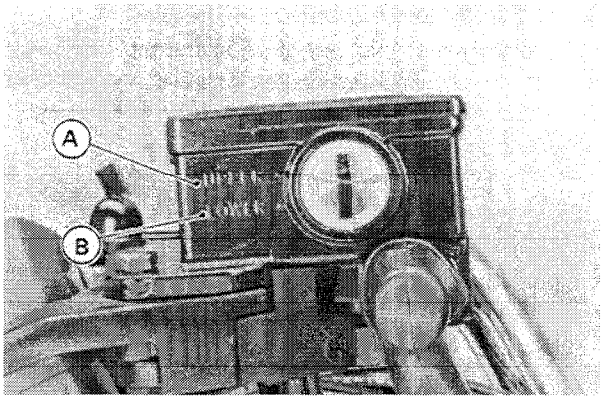


•Bleed the air from the front brake line, using the bleed valves on the brake calipers.
•Repeat the previous step one more time for the other side.
•When air bleeding is finished, install the rubber cap(s) on the bleed valve, and check that the brake fluid is between the upper and lower level lines (handlebar turned so that the reservoir is level).

**Bleeding the Brake Line**




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




A. Upper Level Line B. Lower Level Line

**WARNING**

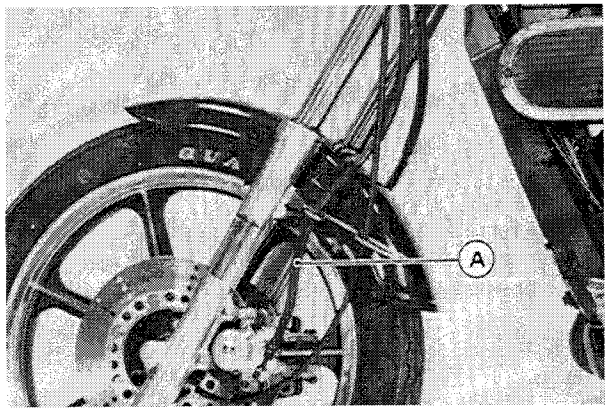
○**When working with the disc brake, observe the precautions listed below.**

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

## 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.




A. Brake Hose

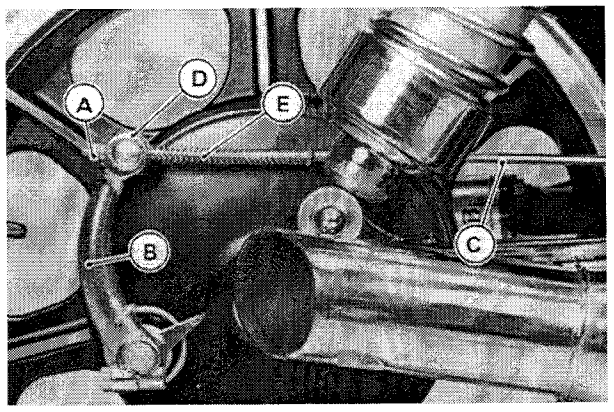
### *Brake Hose Replacement*

●Pump the brake fluid out of the line as explained in the Brake Fluid Change in Brake Fluid Section.
●Remove the banjo bolts at both ends of the brake hose, and pull the hose off the motorcycle.
●Install the new brake hose in its place, and tighten the banjo bolts to the specified torque, noting the following:
○Use a new flat washer for each side of the fittings.
○See Exploded View for torque specifications.

## Rear Brake Cable

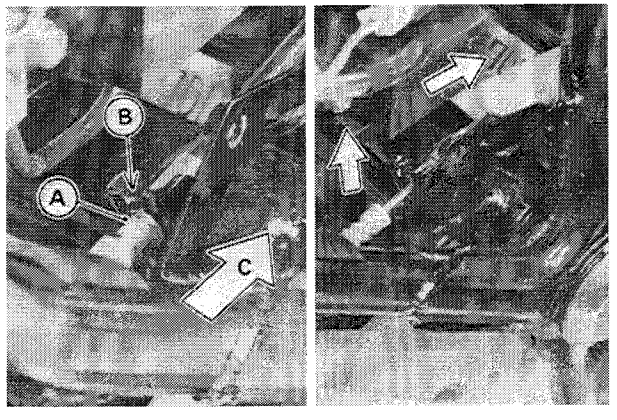
### *Rear Brake Cable Removal*

●Remove the brake cable adjuster nut at the rear wheel.
●Pull the rod end out of the cam lever on the brake panel. Do not lose the joint and spring.




A. Adjust Nut
B. Cam Lever
C. Brake Rod
D. Joint
E. Spring

●Remove the right side cover.
●Pry off the circlip at the middle of the brake cable.
●Slide the cable dust cover out of place, and pull the brake outer cable forward to slip the inner cable out of the slot in the stay.

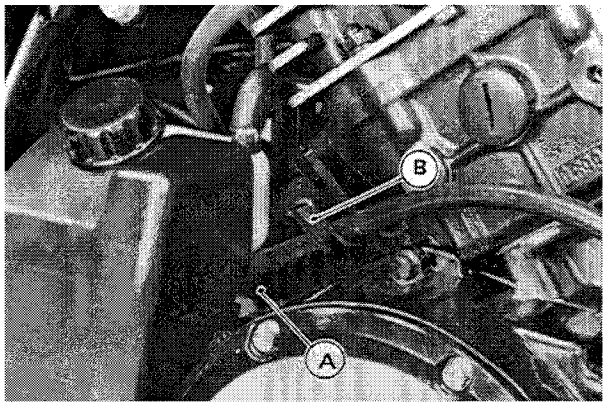



A. Circlip
B. Slot
C. Front

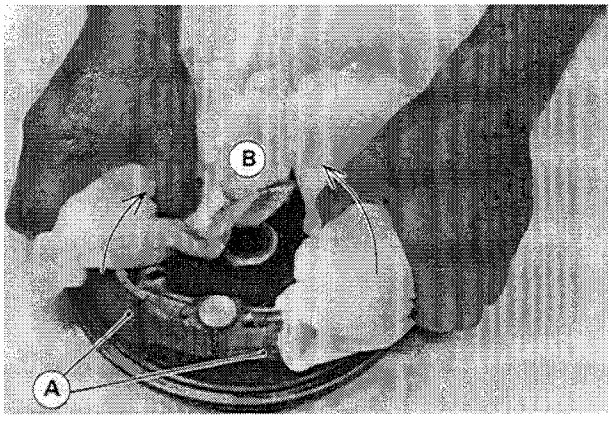
●Separate the brake cable from the brake shaft (see Brake Pedal/Shaft Removal).

### *Rear Brake Cable Installation Notes*

●Before installing the brake cable, lubricate it.
●Run the brake cable through the clamp and the reservoir tank dent.




A. Reservoir Tank Dent B. Clamp




A. Brake Shoes B. Lift

•After installing the brake cable, adjust the rear brake (see Rear Brake Position Adjustment and Rear Brake Pedal Free Play Adjustment).

•Before removing the brake cam lever, mark the position of the cam lever so that it can be installed later in the same position.

## Brake Panel

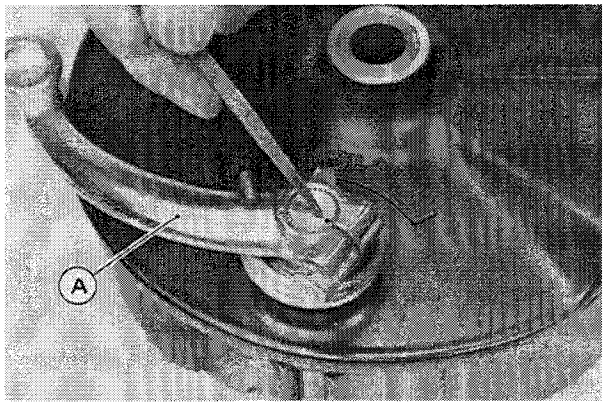
### *Brake Panel Disassembly*

•Remove the rear wheel (see Rear Wheel Removal in Wheels/Tires chapter).
•Pull the panel assembly out of the wheel.

**WARNING**

**Brake linings contain asbestos fiber. Inhalation of asbestos may cause serious scarring of the lungs and may promote other internal injury and illness, including cancer. Observe the following precautions when handling brake linings.**
**○Never blow brake lining dust with compressed air.**
**○If any components are to be cleaned, wash with detergent, then immediately discard the cleaning solution and wash you hands.**
**○Do not grind any brake lining material unless a ventilation hood is available and properly used.**

•Using a clean cloth around the linings to prevent grease or oil from getting on them, remove the brake shoes by pulling up on the center of the linings.



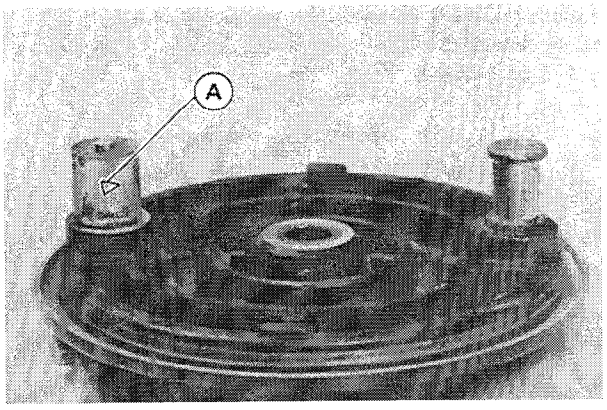

A. Brake Cam Lever

### *Brake Panel Assembly Notes*

•Clean the old grease from the camshaft and regrease it. Apply grease to the center of shaft and very lightly on the cam surfaces. Do not overgrease.
•Push the camshaft into the panel so that the triangular mark on the cam surface points toward the center of the panel.

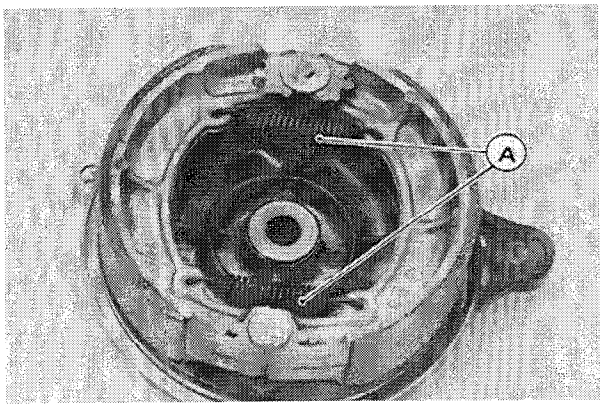
**WARNING**

**○Improper installation will cause ineffective braking.**



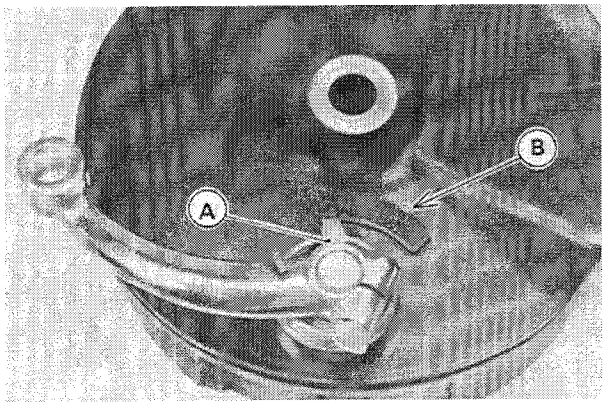

A. Triangular Mark

○The brake shoe springs are identical.




A. Brake Shoe Springs

●Fit the springs onto the brake shoes. Wrap a clean cloth around the linings to prevent grease or oil from getting on them, and install the shoes on the brake panel.
●Install the O-ring and fit the indicator on the serration so that it points to the extreme left of the USABLE RANGE.

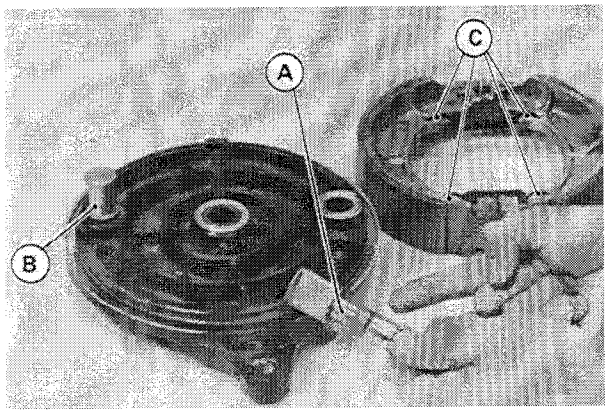



A. Indicator B. USABLE RANGE

●Install the cam lever in its original position on the camshaft, and tighten its bolt.

### *Rear Brake Camshaft Lubrication*

●Disassemble the rear drum brake.
●Using a high flash-point solvent, clean the old grease off the brake camshaft, camshaft hole, and other pivot points.
★Replace the drum brake parts if they show wear or damage.
●Apply grease to the brake pivot points (brake shoe anchor pin, spring ends, and cam surface of the camshaft) and fill the camshaft groove with grease. Do not get any grease on the brake shoe linings, and wipe off any excess grease so that it does not get on the linings or drum after brake assembly.



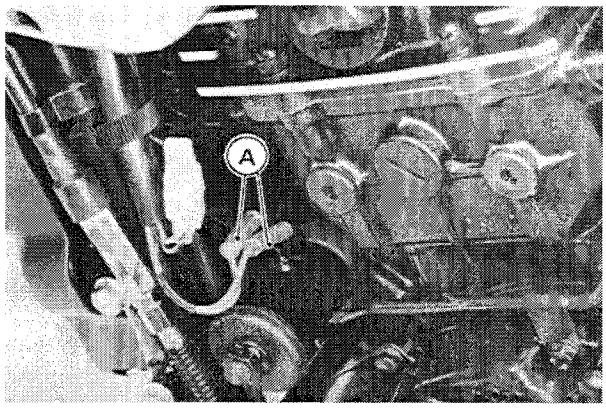

A. Brake Camshaft
B. Anchor Pin
C. Spring Ends
} Apply grease

●Assemble the rear drum brake.
●Adjust the brake play.

## Brake Pedal

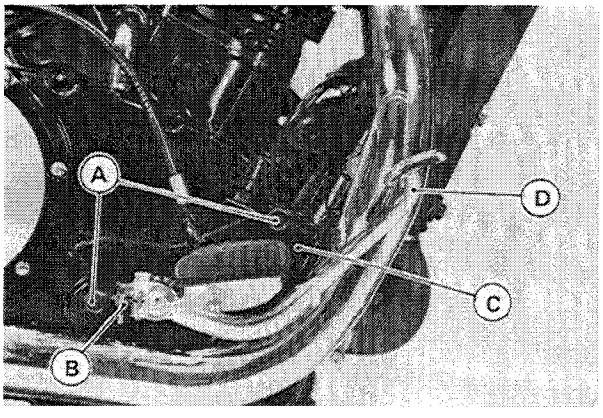
### *Brake Pedal/Shaft Removal*

●Screw in the brake pedal adjusting bolt in order to free the brake pedal.
●Unscrew the mounting bolt to remove the brake pedal.
●Pull off the brake switch connector.



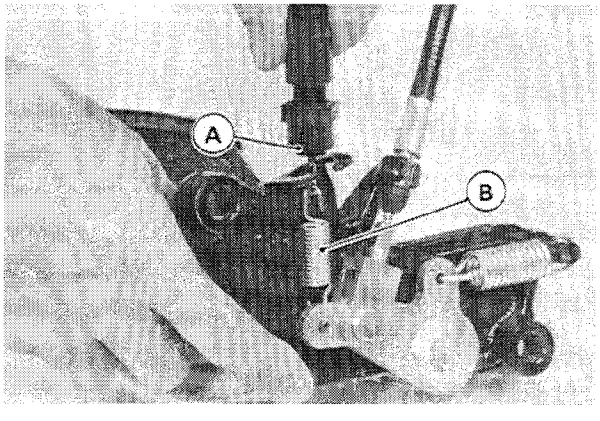

A. Brake Switch Connector

•Take out the footpeg bracket mounting bolts to remove the bracket with the brake shaft, brake cable and brake switch.



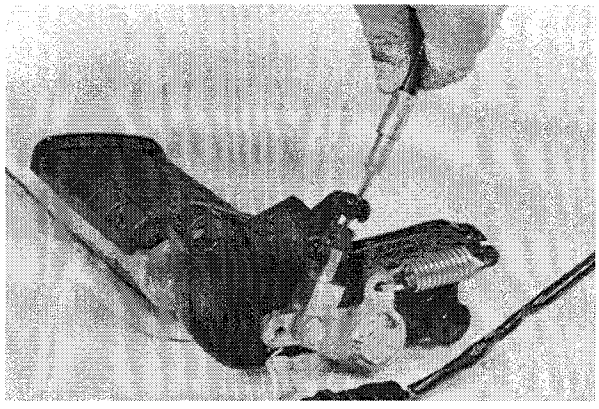

A. Mounting Bolts
B. Adjusting Bolt
C. Footpeg Bracket
D. Brake Pedal

•Press in the rear brake light switch tabs and then pull the switch with the spring installed up and out of the stay.
•Remove the switch spring to separate the switch from the footpeg bracket.

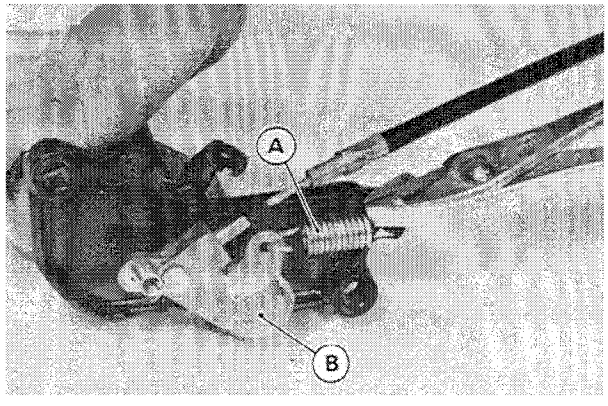



A. Tabs
B. Spring

•Slide the brake cable dust cover out of place.
•Pull the brake cable up and out of the lug on the footpeg bracket.

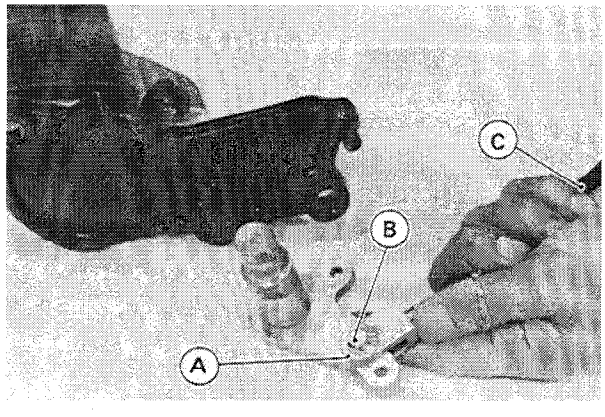


•Remove the pedal shaft after unhooking the return spring.




A. Return Spring
B. Brake Shaft

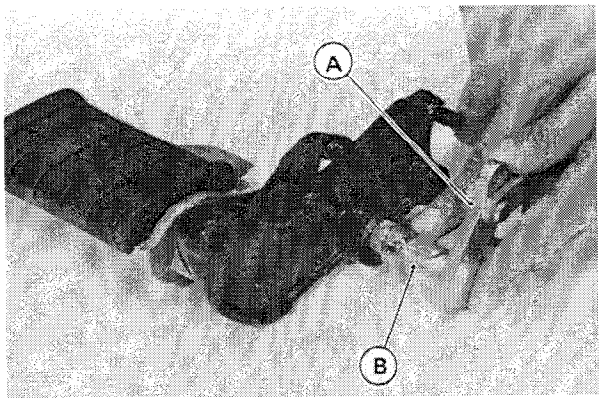
•Take out the cotter pin and the clevis pin to separate the shaft from the brake cable.




A. Cotter Pin
B. Clevis Pin
C. Brake Cable

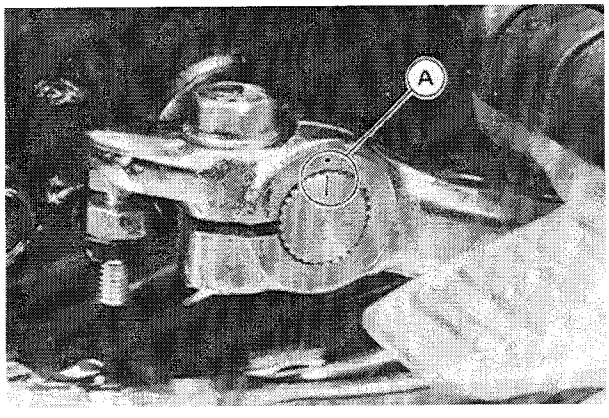
*Brake Pedal/Shaft Installation Notes*

●Grease the brake shaft and the clevis pin before installation.




A. Clevis Pin B. Brake Shaft

●Insert a new cotter pin, and bend the end.
●Install the footpeg bracket and tighten the mounting bolts.
●Install the brake pedal on the shaft so that the mark on the pedal is aligned with the mark on the shaft.



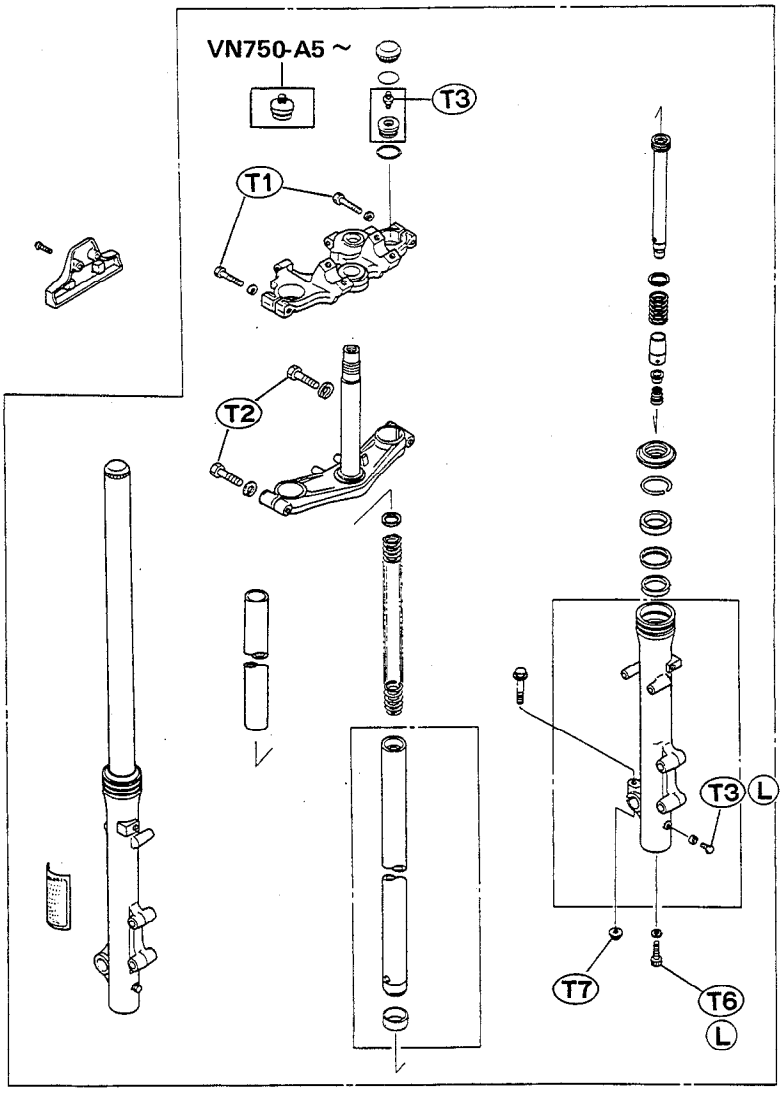

A. Marks

●Check the brake pedal position, and readjust it if necessary.

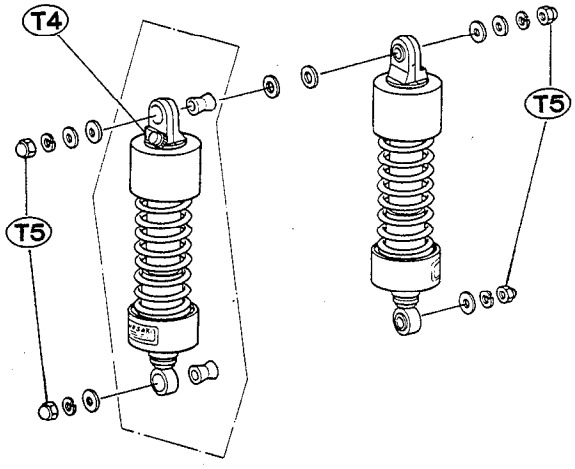
# Suspension

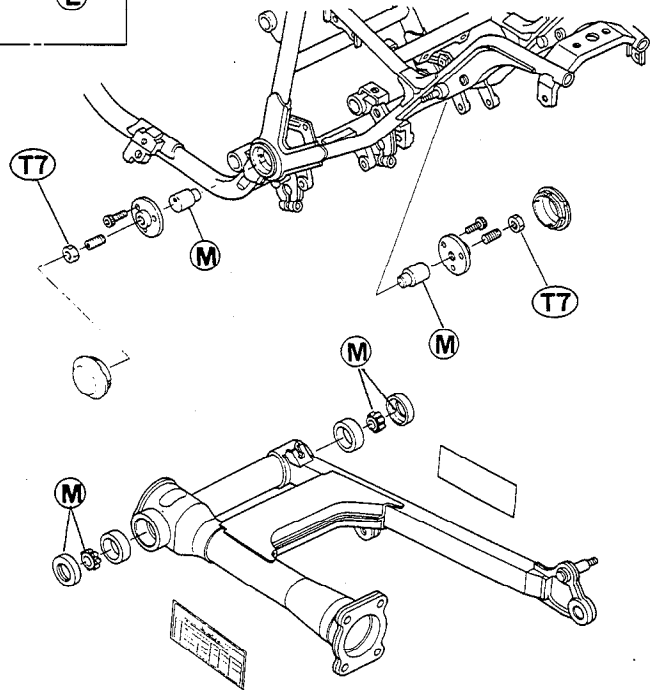
## Table of Contents

## Exploded View




L: Apply a non-permanent locking agent.
M: Apply a molybdenum disulfide grease.
T1: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T2: 25 N-m (2.5 kg-m, 18 ft-lb)
T3: 7.8 N-m (0.8 kg-m, 69 in-lb)
T4: 6.9 N-m (0.7 kg-m, 61 in-lb)
T5: 30 N-m (3.1 kg-m, 22 ft-lb)
T6: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T7: 13 N-m (1.3 kg-m, 113 in-lb)



## Specifications

### Rear Shock Absorber

| | |
|---|---|
| Air pressure: | |
| (Standard) | Atmospheric pressure |
| (Usable range) | 0 – 294 kPa (0 – 3.0 kg/cm², 0 – 43 psi) |
| Oil viscosity: | SAE 5W |
| Oil capacity (per one unit): | 142 ±2.5 mL, Ⓒ Ⓤ 139 ±2.5 mL |
| Air chamber capacity (per one unit): | 88 mL , Ⓒ Ⓤ 91 mL |
| Damper setting: | No. 3, Ⓒ Ⓤ No.2 |

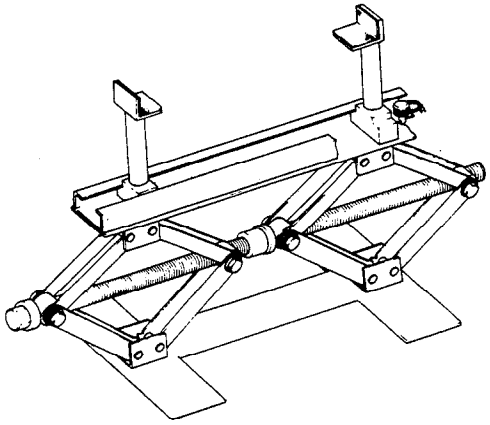
Ⓒ : Canadian Model
Ⓤ : US Model

### Front Fork

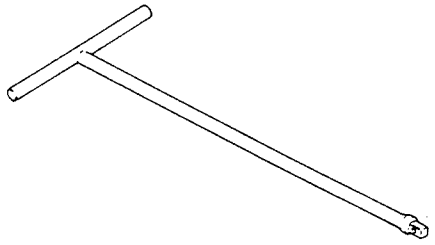
| | |
|---|---|
| Oil viscosity: | SAE10W – 20 |
| Oil capacity (completely dry): | 373 ±2.5 mL, Ⓒ Ⓤ 362 ±2.5 mL |
| (when changing oil): | approx. 320 mL, Ⓒ Ⓤ 310 mL |
| Oil level (compressed without main spring): | 215 ±10 mm, Ⓒ Ⓤ 230 ±10 mm |
| Air pressure: | VN700-A1 and VN750-A1 ~ A4 |
| (Standard) | Atmospheric pressure |
| (Usable range) | 0 – 49 kPa (0 – 0.5 kg/cm², 0 – 7.1 psi) |

## Special Tools

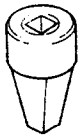
**Jack: 57001-1238**



**Front Fork Cylinder Holder Handle: 57001-183**

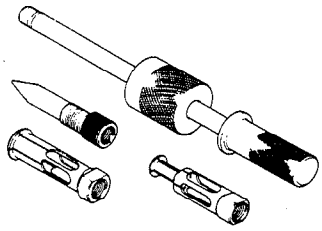


**Front Fork Cylinder Holder Adapter: 57001-1057**

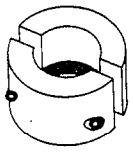


**Oil Seal Driver: 57001-1104**

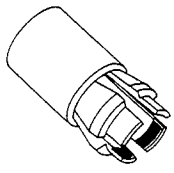
**Oil Seal & Bearing Remover: 57001-1058**



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



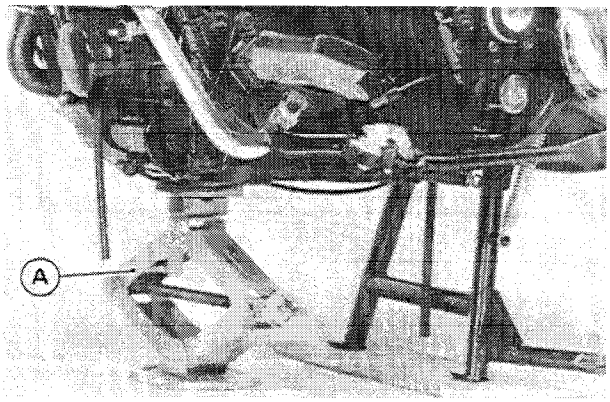
**Driver: 57001-1219**



## Front Fork

*Air Pressure Adjustment*
*(VN700-A1 and VN750-A1 ~ A4)*

- Support the motorcycle on its center stand.
- Use a jack (common tool or special tool) under the engine or other suitable means to lift the front wheel off the ground.



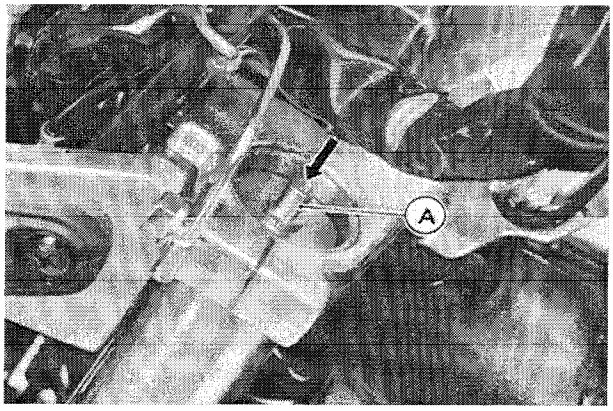

A. Jack (common tool or special tool: 57001-1238)

- Check and adjust the air pressure when the front fork is cold (room temperature).

**Front Fork Air Pressure**

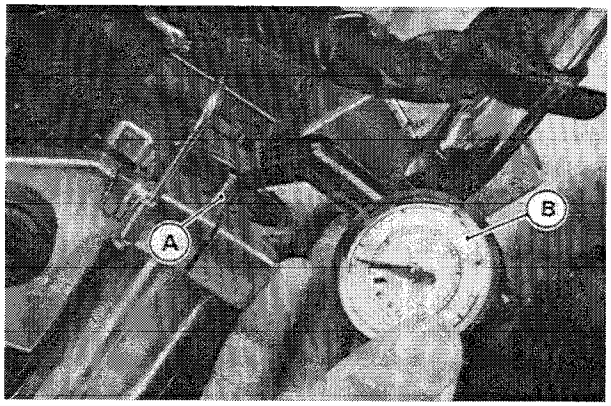
| | |
|---|---|
| **Standard:** | **Atmospheric pressure (for one average-built rider with no accessories)** |
| **Usable range:** | **0 – 49 kPa (0 – 0.5 kg/cm², 0 – 7.1 psi)** |

- Adjust the air pressure to **atmospheric pressure** as follows.
  - Remove the air valve cap and push in the valve core.
  - Reinstall the air valve cap.




A. Air Valve

- Under special conditions, however, adjust the shock absorption to suit your preference within the usable range as follows.
- Inject air through the valve with a hand pump to raise and adjust the pressure.
- Check the air pressure with a pressure gauge.




A. Air Valve B. Pressure Gauge

**NOTE**

- *Do not use a tire gauge for checking air suspension's air pressure. It 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**

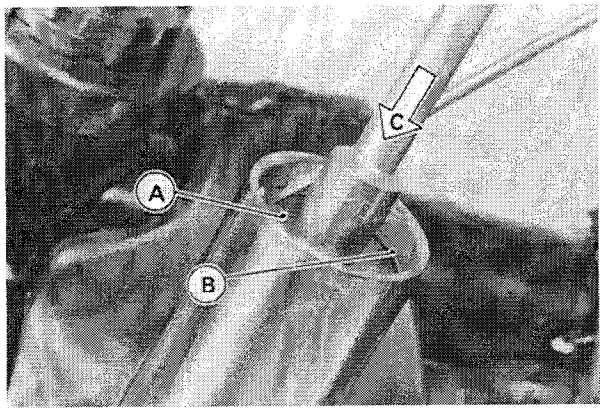
- **Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 245 kPa (2.50 kg/cm², 36 psi) may damage the oil seal.**
- **Try to set the air pressure of the right and left fork legs as equally as possible.**

**WARNING**

- **Be sure to adjust the air pressure within the usable range. Pressure too high 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 without first removing the air valve or it may explode.**
- **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.**

*Fork Oil Changing*

- Support the motorcycle on its center stand.
- Release the air in the fork leg through the air valve at the top of the fork leg.
- Push the top plug down to remove the plug retaining ring, and then remove the plug.
- Pull out the collar, fork spring seat and fork spring.

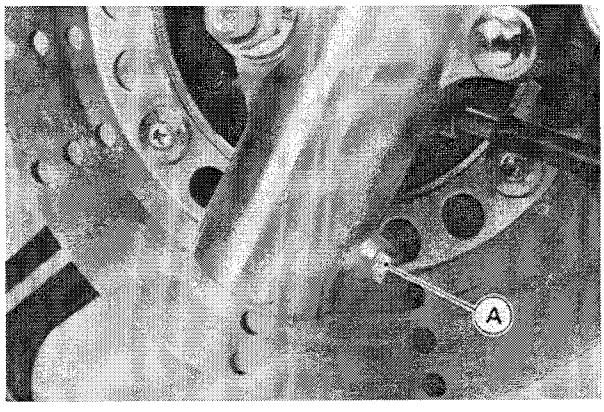



A. Top Plug
B. Ring
C. Press here

**WARNING**

○**Be sure to release any air pressure and remove the plug slowly, or the plug may cause injury by shooting out of the fork tube.**

- Remove the drain bolt.




A. Drain Bolt

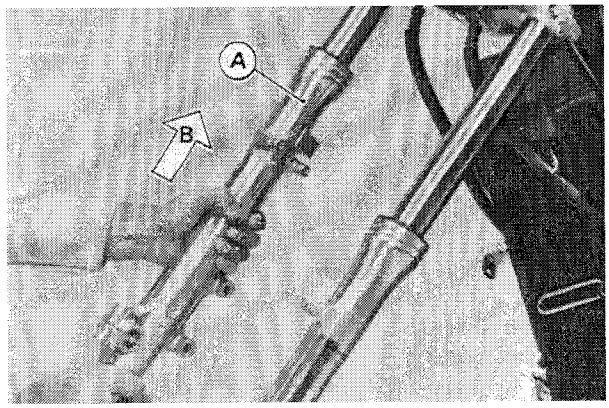
- Allow the oil to drain into a suitable container. If you pump the fork leg to force out the oil, be sure to catch the oil in a container as it squirts out.
- Wash the drain bolt threads clean of oil, and blow them dry.
- Apply a non-permanent locking agent to the threads of the drain bolt, and install the bolt and gasket.
- Pour in the type and amount of oil and adjust the oil level.

**Front Fork Oil**

| | |
|---|---|
| **Viscosity:** | **SAE10W–20** |
| **When changing oil:** | **approx. 320 mL,** Ⓒ Ⓤ **310 mL** |
| **After disassembly and completely dry:** | **373 ±2.5 mL,** Ⓒ Ⓤ **362 ±2.5 mL** |
| **Oil level:** | **215 ±10 mm,** Ⓒ Ⓤ **230 ±10 mm** |

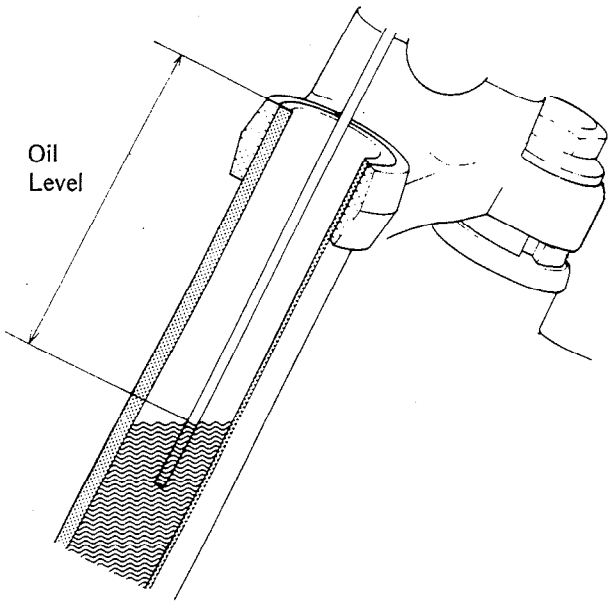
Ⓒ : Canadian Model, Ⓤ : US Model

- Using a jack under the engine, remove the front wheel (see Front Wheel Removal in Wheels/Tires chapter).
- With the fork leg bottom held, push up the fork leg a few times to expel the air in the fork oil.
- With the fork **fully pushed up**, insert a tape measure or rod in the inner tube, and measure the distance from the top of the inner tube to the oil.




A. Fork Leg
B. Push up the leg

**Fork Oil Level Measurement**



★If the oil is above or below the specified level, remove or add oil and recheck the oil level.

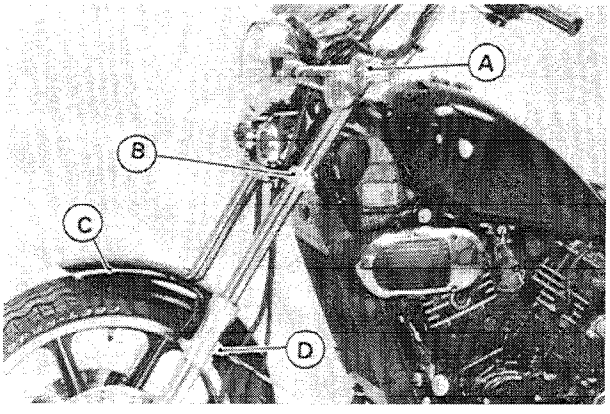
**CAUTION**

○**The operation of air front fork 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, spring seat and collar.
- Replace the plug retaining rings with new ones.
- Install the top plug by pushing down the plug and insert the plug retaining ring.
- Change the oil of the other fork leg in the same manner.
- Adjust the air pressure.

### *Front Fork Removal (each fork leg)*

- Release air pressure from the fork leg.
- Remove the following parts.
  - Caliper (see Brakes chapter)
  - Front Wheel (see Wheels/Tires chapter)
  - Front Fender (see Frame chapter)
  - Upper Clamp Bolt (loosen)
  - Lower Clamp Bolt (loosen)
  - Brake Hose Clamp

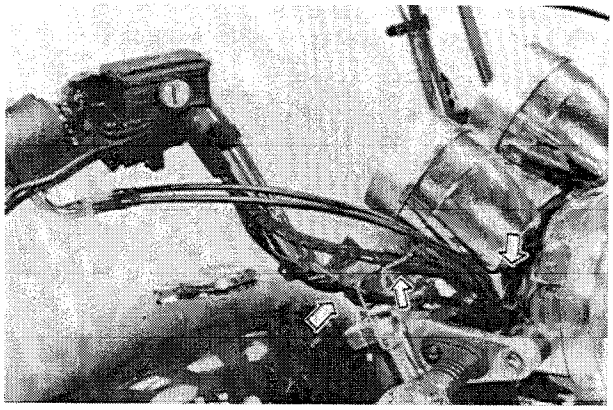


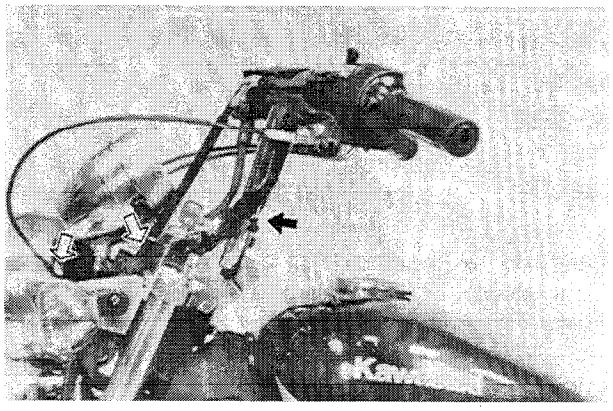

A. Upper Clamp Bolt
B. Lower Clamp Bolt
C. Fender
D. Brake Hose Clamp

- With a twisting motion, work the fork leg down and out.

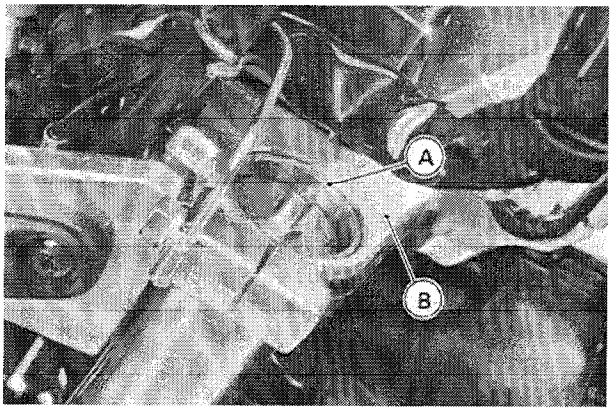
### *Front Fork Installation Notes*

- Route the cables, the wiring looms and the brake hose correctly. They must not hinder handlebar movement.





- Install the fork tube so that the top of the fork inner tube is aligned with the upper surface of the upper bracket.
- Tighten the clamp bolts to the specified torque (see Exploded View).




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

### *Front Fork Disassembly*

- Release air pressure from the fork leg.
- Remove the front fork leg (see Front Fork Removal).
- Remove the top plug, collar, spring seat, and spring (see Fork Oil Change).

**NOTE**

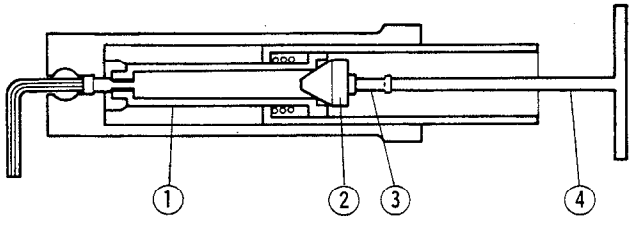
○*The top plug should be removed before the fork is separated.*

- Pour out the fork oil, and take out the main spring.
- Stop the front fork cylinder from turning by using the front fork cylinder holder, adapter (special tools), and a suitable extension bar. Unscrew the Allen bolt, and take off the bolt and gasket from the bottom of the outer tube.

**NOTE**

○*Use a suitable extension bar more than 70 mm long.*

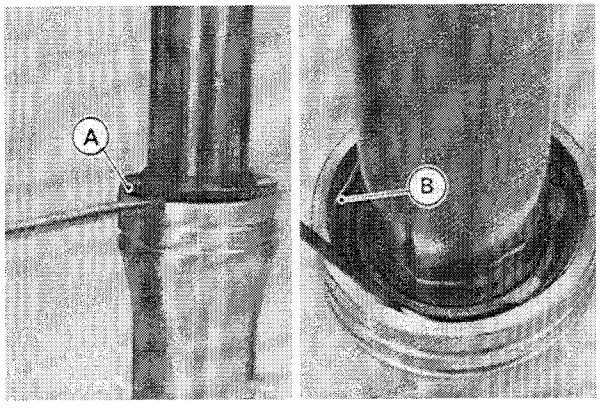
**Front Fork Cylinder Removal**




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

- Remove the piston, cylinder unit and short spring by turning the front fork upside down.
- Separate the inner tube from the outer tube as follows.

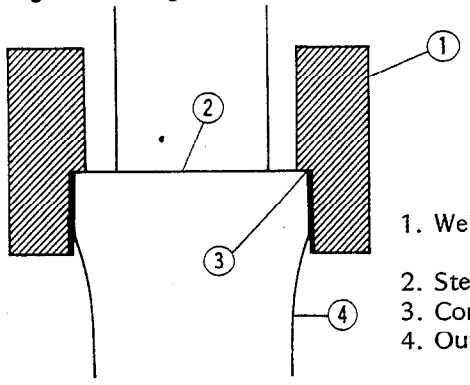
○Remove the dust seal from the outer tube.
○Remove the snap ring from the outer tube.




A. Dust Seal B. Snap Ring

- Use the fork outer tube weight (special tool) to separate the inner tube from the outer tube.
- Mount the weight (special tool) on the top of the outer tube by fitting the step of the weight (special tool) to the top corner of the outer tube.

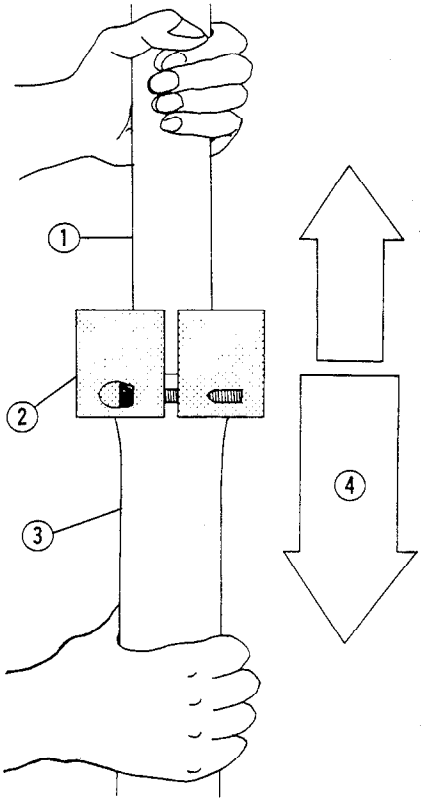
**Weight Mounting**




1. Weight: 57001-1218
2. Step
3. Corner
4. Outer Tube

- Holding the inner tube by hand in a vertical position, pull down the outer tube several times to pull out the inner tube.

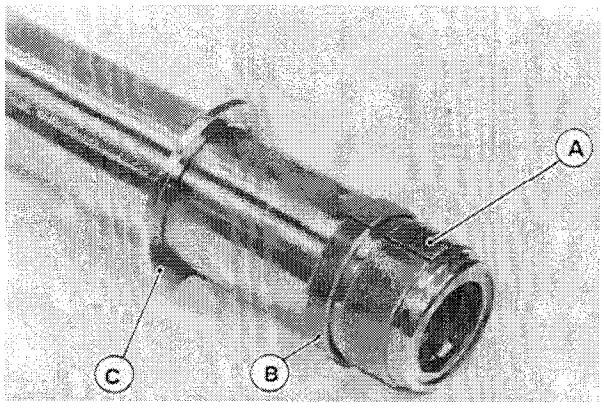
**Front Fork Separation**




1. Inner Tube
2. Weight: 57001-1218
3. Outer Tube
4. Pull down

○The driver (special tool: 57001-1104) may also be used for outer tube separation. Face the big end of the driver downward.

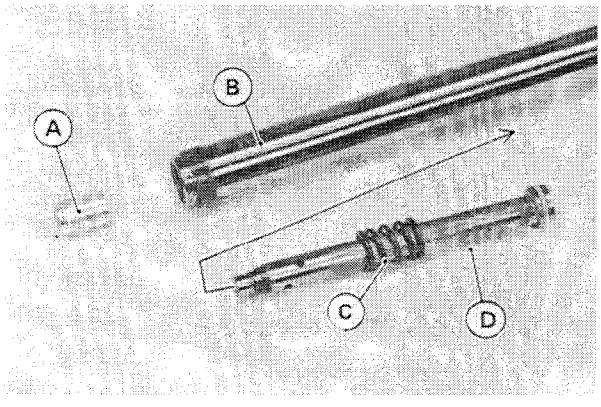
- Remove the oil seal, washer and outer tube guide bush, from the inner tube after removing the outer tube from the inner tube.
- Pull the cylinder base, valve, and spring at the outer tube bottom.
- Discard the used inner and outer tube guide bushes.




A. Inner Tube Guide Bush
B. Outer Tube Guide Bush
C. Washer

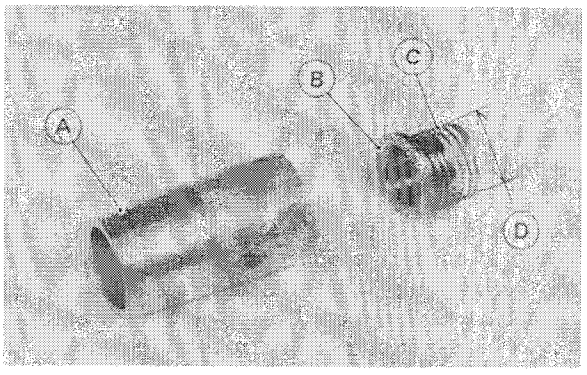
*Front Fork Assembly*

- Fork assembly is the reverse of disassembly. Pay attention to the following item.
- Check the top plug O-ring. Replace them with new ones if damaged.
- Replace the removed oil seal with a new one.
- Replace the removed guide bushes with new ones.
- Insert the cylinder unit with the short spring installed into the inner tube.
- Insert the inner tube and cylinder as a set into the outer tube.




A. Cylinder Base
B. Inner Tube
C. Short Spring
D. Cylinder Unit

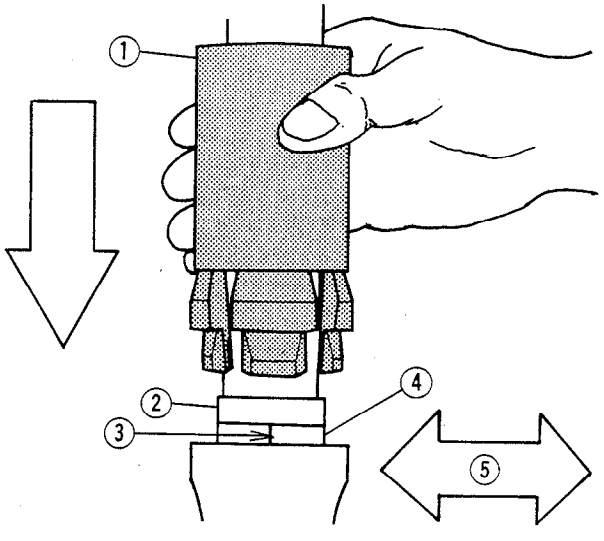
- Be sure to install the cylinder base, valve, and spring in the bottom of the outer tube.




A. Cylinder Base
B. Valve
C. Spring
D. Larger Diameter

- Apply non-permanent locking agent to the Allen bolt.
- Tighten the Allen bolt to the specified torque, using the front fork cylinder holder handle, an extension bar, and holder adapter (special tools) to stop the cylinder from turning.
- Install the outer tube guide bush with a used guide bush as a tool by tapping the used guide bush with the driver (special tool) until it stops. The split of the bush must be faced toward the left or right.

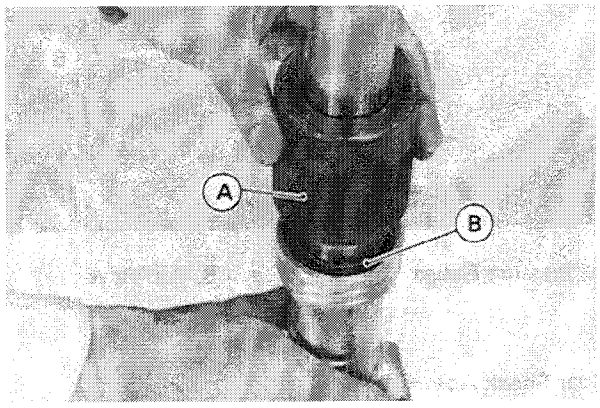
**Guide Bush Installation**




1. Driver: 57001-1219
2. Used Guide Bush
3. Split
4. New Guide Bush
5. Front and Rear

○The driver (57001-1104) may also be used for guide bush installation.

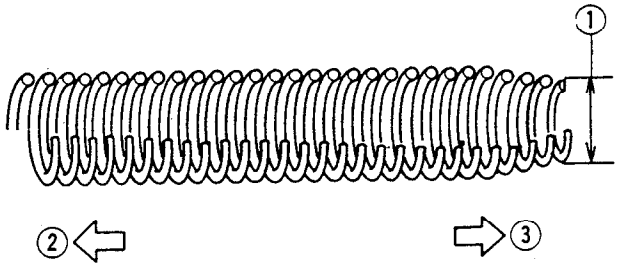
•Install the washer.
•Replace the oil seal with a new one.
•Apply oil to the outside of the inner tube, and install the oil seal with the oil seal driver (special tools) so that the marked side faces out.




A. Oil Seal Driver: 57001-1104
B. Oil Seal

•Install the fork main spring with the smaller diameter end facing down.

**Installing Fork Spring**




1. Smaller Diameter
2. Top
3. Bottom

○Insert the spring seat and the collar.
•Tighten the valve to the specified torque (see Exploded Views) with the valve held with a vise.
•After installing the fork tube, install the top plug (see Fork Oil Change).

*Inner Tube Inspection*

•Visually inspect the inner tube, and repair any damage.
•Nicks or rust damage can sometimes be repaired by using a wet-stone to remove the sharp edges or raised areas which cause seal damaged.
★If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.
•Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.

**CAUTION**

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

*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 Absorber

The rear shock absorbers can be adjusted by changing the air pressure and damping force to suit various riding and loading conditions.

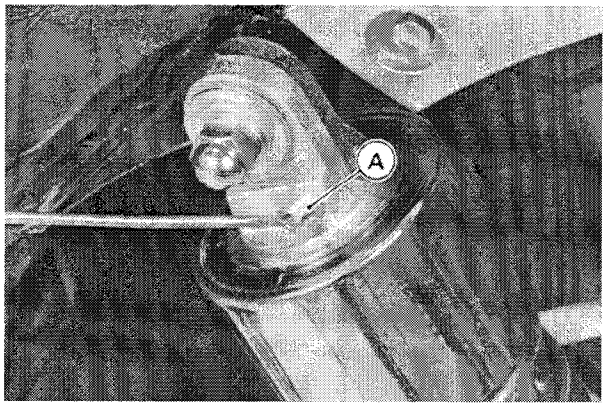
*Air Pressure Adjustment*

•Support the motorcycle on its center stand to raise the rear wheel off the ground.
•Check and adjust the air pressure when the rear shock absorber is cold (room temperature).

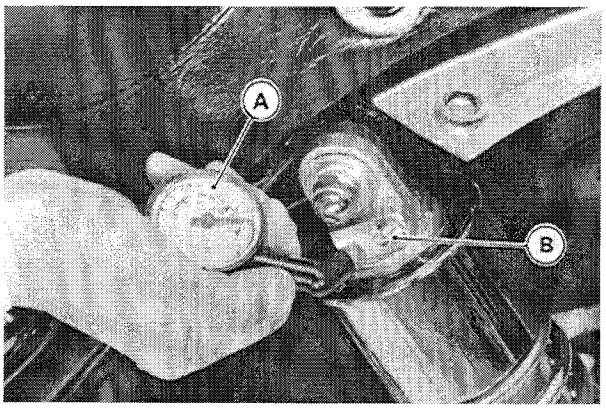
**Rear Shock Absorber Air Pressure**

**Standard: Atmospheric pressure**
**(for one average-built rider with no accessories)**
**Usable Range: 0 – 294 kPa**
**(0 – 3.0 kg/cm$^2$, 0 – 43 psi)**

•Adjust the air pressure to **atmospheric pressure** as follows.
○Remove the air valve cap and push in the valve core.
○Reinstall the air valve cap.




A. Valve




A. Pressure Gauge B. Air Valve

**Rear Shock Absorber Air Pressure**

| Air Pressure kPa (kg/cm², psi) | Setting | Load | Road |
|---|---|---|---|
| 0 (0.0, 0) | Soft | Light | Good |
| ↑↓ | ↑↓ | ↑↓ | ↑↓ |
| 294 (3.0, 43) | Hard | Heavy | Bad |

- Under special conditions, however, adjust the shock absorption to suit your preference within the usable range as follows.
- To raise the pressure, inject air through the valve with a tire pump.
- Check the air pressure with a pressure gauge.

**NOTE**

- *Do not use a tire gauge for checking air pressure. It 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 of 667 N (69 kg, 150 lb) with no accessories. Ordinarily, the heavier the total load becomes, the higher the air pressure should be set.*

**CAUTION**

- **Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 490 kPa (5.0 kg/cm², 71 psi) may damage the oil seal.**
- **Try to set the air pressure of the right and left fork legs as equally as possible.**

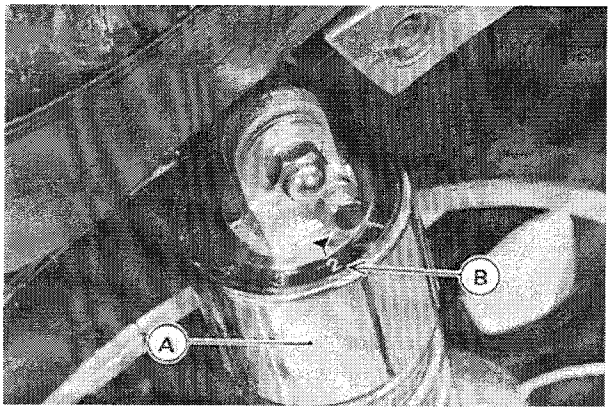
**WARNING**

- **Be sure to adjust the air pressure within the usable range. Pressure too high can produce a hazardous riding condition.**
- **Only air or nitrogen gas can be used. Never inject oxygen or any kind of explosive gas.**

- After adjusting the pressure, install the air valve cap.

### *Damping Force Adjustment*

- Turn the adjuster 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 as follows for one average-built rider with no accessories.***

***No. 2:*** Ⓒ Ⓤ

***No. 3:*** ***other than*** Ⓒ Ⓤ

Ⓒ : *Canadian Model* Ⓤ : *US Model*

**Damper Force**

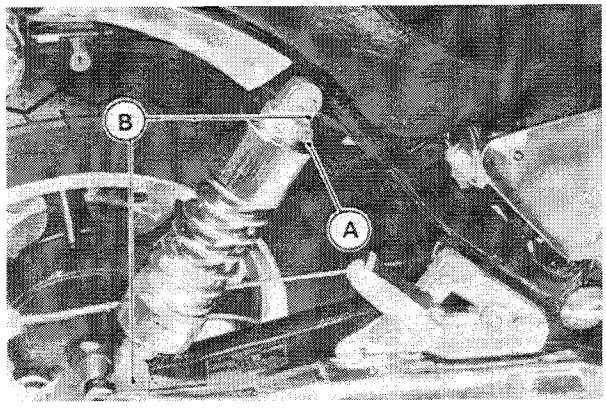
| Setting Position | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 1 | ↓ | Soft | Light | Good | Low |
| 2 | | ↑ | ↑ | ↑ | ↑ |
| 3 | | ↓ | ↓ | ↓ | ↓ |
| 4 | Stronger | Hard | Heavy | Bad | High |

### *Rear Shock Absorber Removal*

- Support the motorcycle on its center stand.
- Remove the nuts, lockwashers, and flat washers from both ends of the shock absorber.
- Pull off the rear shock absorber.

### *Rear Shock Absorber Installation Note*

- Install the shock absorber with the air valve cap faced outboard.




A. Air Valve Cap B. Mounting Nuts

- Tighten the upper and lower mounting nuts to the specified torque (see Exploded View).

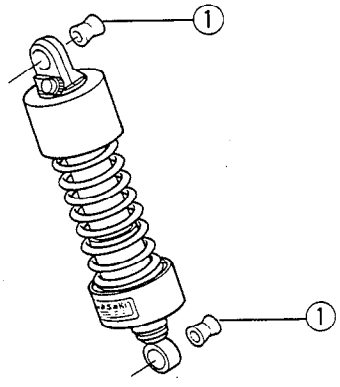
### *Rear Shock Absorber Inspection*

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.




1. Rubber Bushings

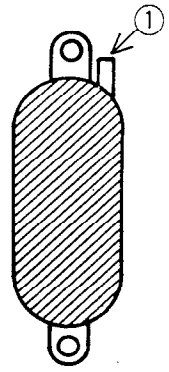
### *Rear Shock Absorber Oil Filling*

- Unscrew the air valve.
- Remove the shock absorber.
- Fill the shock unit with the specified oil from the air valve opening.

**Shock Absorber Oil (per one unit)**

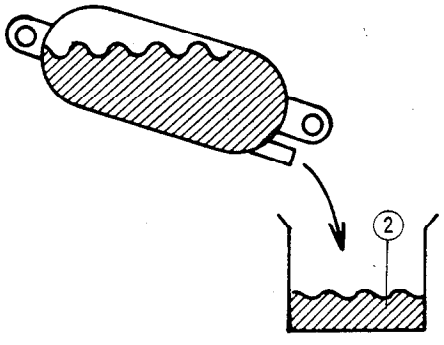
| | |
|---|---|
| **Oil viscosity:** | **SAE5W** |
| **Oil capacity:** | **142 ±2.5 mL,** |
| | **Ⓒ Ⓤ 139 ±2.5 mL** |
| **Air chamber capacity:** | **88 mL,** |
| | **Ⓒ Ⓤ 91 mL** |

**Ⓒ : Canadian Model Ⓤ : US Model**



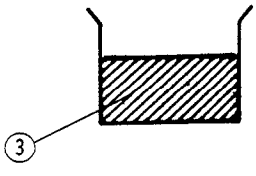

1. Air Valve Opening: Fill the shock unit with the specified oil.

●Drain the oil until the removed oil volume comes to the specified air chamber capacity.



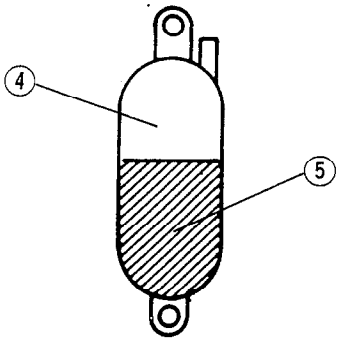

2. Removed Oil

●Stop to remove the oil when the removed oil volume becomes equal to the specified air chamber volume.




3. Removed Oil (equal to air chamber volume)

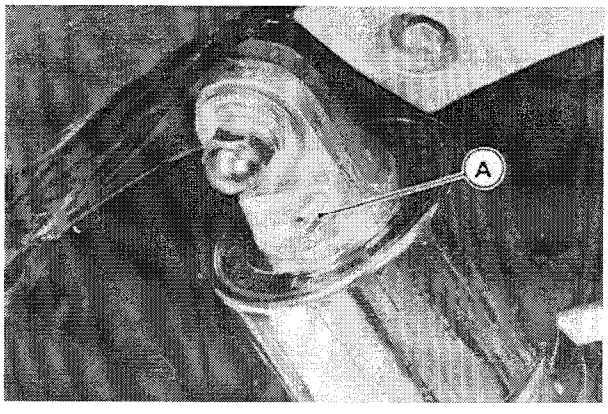
○The shock unit should have a specified amount of oil.




4. Specified air chamber capacity
5. Specified oil capacity

### *Rear Shock Scrapping*

●Before a rear shock absorber is scrapped, release any air pressure and oil completely by removing the air valve.




A. Air Valve

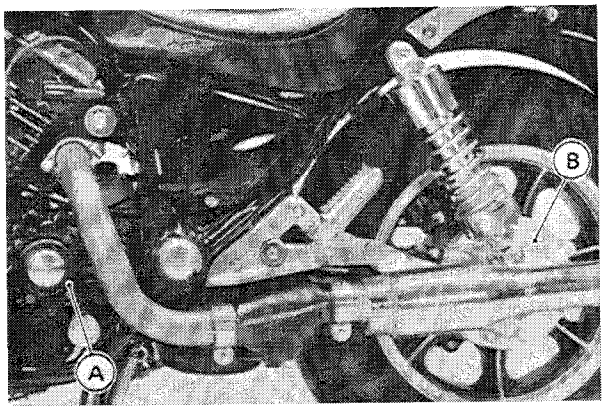
**WARNING**

○**Do not incinerate a shock absorber without first removing the air valve or it may explode.**

## Swing Arm

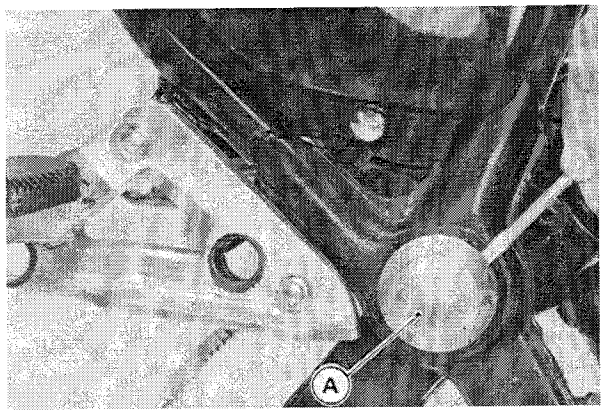
### *Swing Arm Removal*

●Remove the muffler assembly (see Engine Top End chapter).
●Remove the right shock absorber.
●Remove the final gear case (see Final Gear Case Removal in Final Drive chapter).
●Remove the front bevel gear case (see Front Bevel Gear Case Removal).



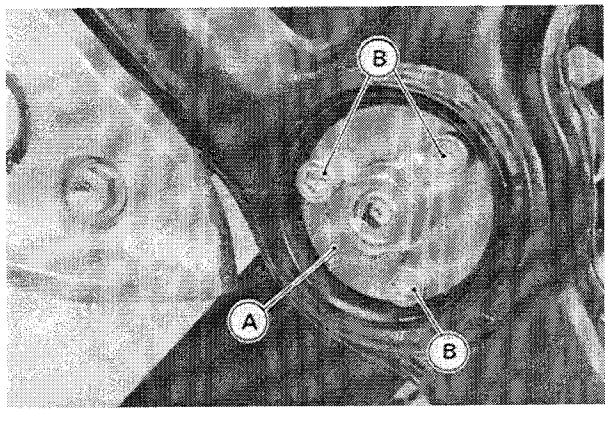

A. Front Bevel Gear Case B. Final Gear Case

•Pull out the propeller shaft.
•Pry off the right and left swing arm caps.



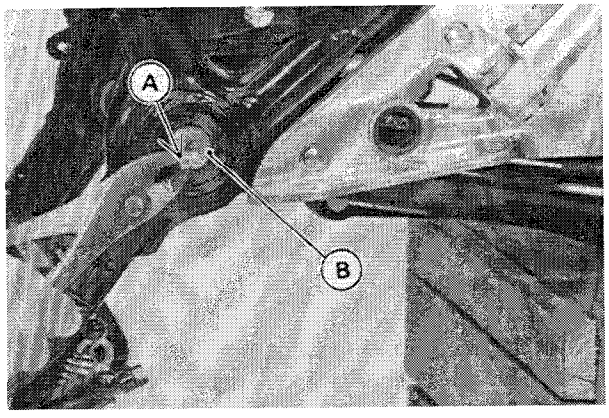

A. Caps

•Unscrew the mounting bolts to remove the shaft retainers on both sides.



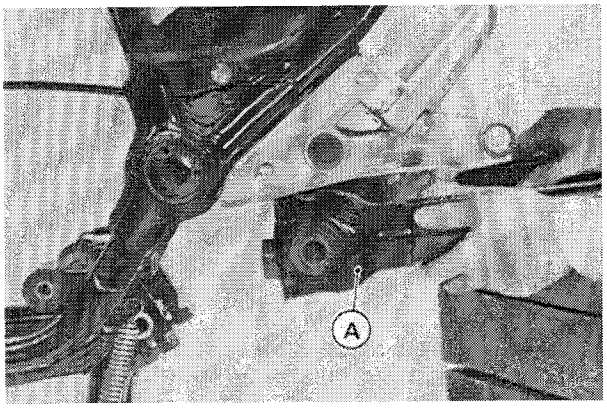

A. Retainer B. Bolts

•While holding the swing arm, pull out the swing arm shafts using a suitable bolt or screw (φ5 x P0.8).




A. A Suitable Bolt or Screw
B. Swing Arm Shaft

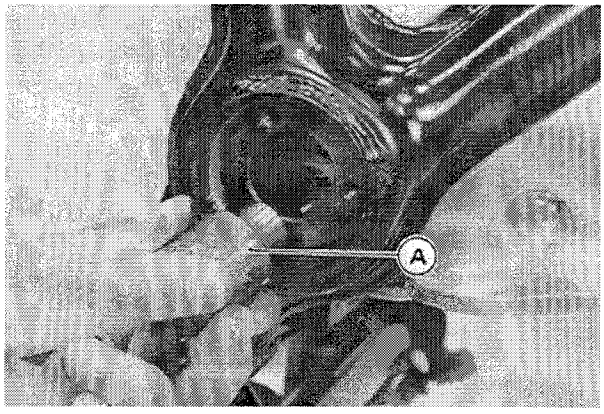
•Pull back the swing arm and drop it off.




A. Swing Arm

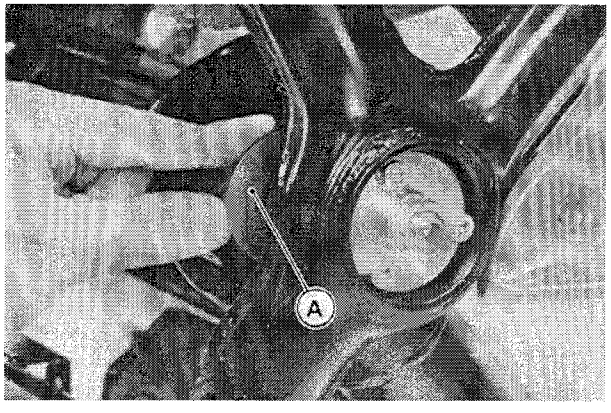
*Swing Arm Installation and Alignment*

•Lubricate the swing arm shaft bearings before swing arm installation (see Swing Arm Lubrication).
•Grease the swing arm shaft with a molybdenum disulfide grease.



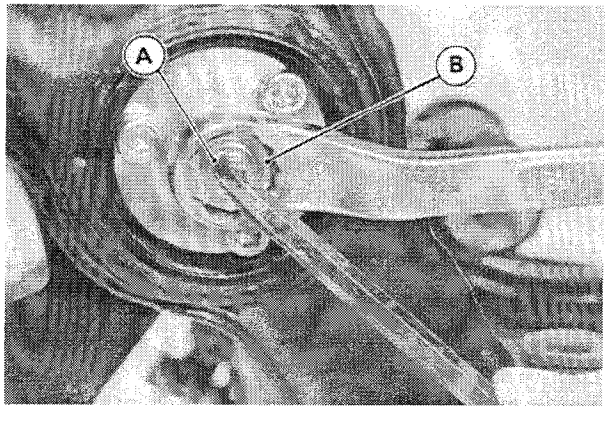

A. Swing Arm Shaft

●Install the swing arm and swing arm shafts.
●Install the shaft retainers and tighten the mounting bolts.
●Temporarily install the adjuster bolts and locknuts.
●Adjust the swing arm left side clearance as follows.
○Insert a suitable shim, 2.5 mm thick, between the frame gasset and the swing arm left side.




A. Shim

○Screw in the right adjuster bolt to push in the right swing arm shaft until the swing arm stops against the shim.
○Tighten the locknut to the specified torque (see Exploded View).

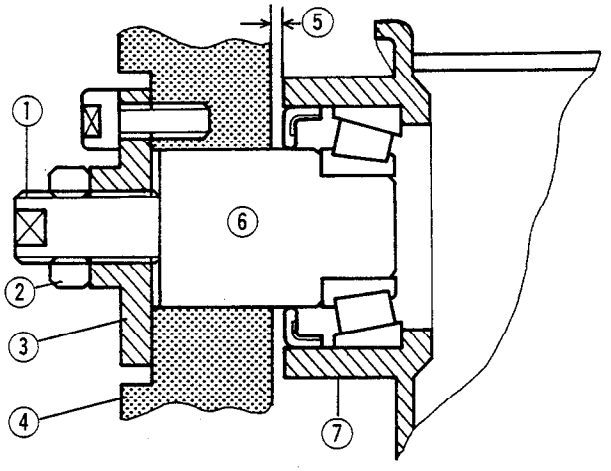



A. Right Adjuster Bolt B. Locknut

○Take out the suitable shim from the swing arm left side.
○Screw in the left adjuster bolt until it stops, and then tighten the locknut to the specified torque (see Exploded View).

**Swing Arm Left Side Clearance: 2.4 – 2.6 mm**

**Swing Arm Pivot**

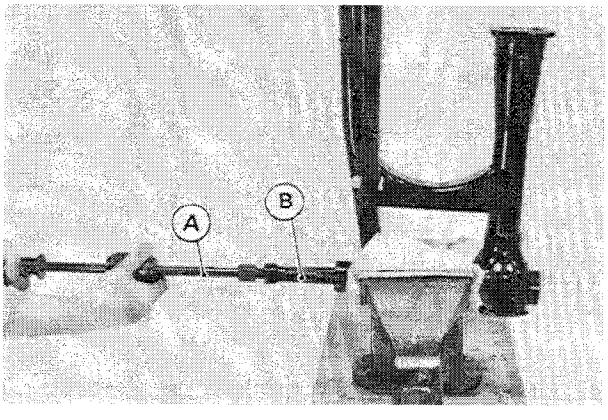



1. Adjuster Bolt
2. Locknut
3. Shaft Retainer
4. Frame Gusset
5. Left Side Clearance
6. Swing Arm Shaft
7. Swing Arm

●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.

## *Swing Arm Disassembly Notes*

●Pull out the outer races of the tapered roller bearings using the bearing and oil seal remover and adapter (special tools).

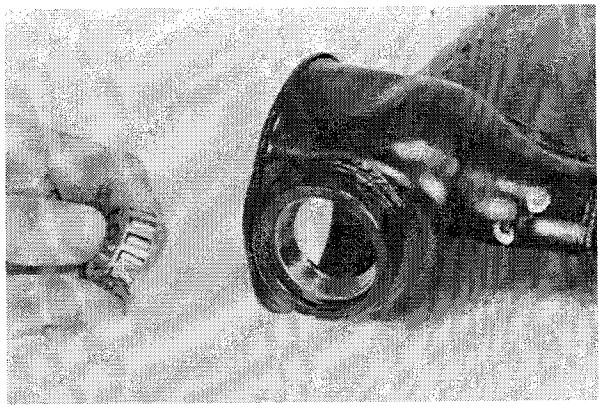



A. Remover: 57001-1058 B. Adapter: 57001-1061

### *Swing Arm Assembly Note*

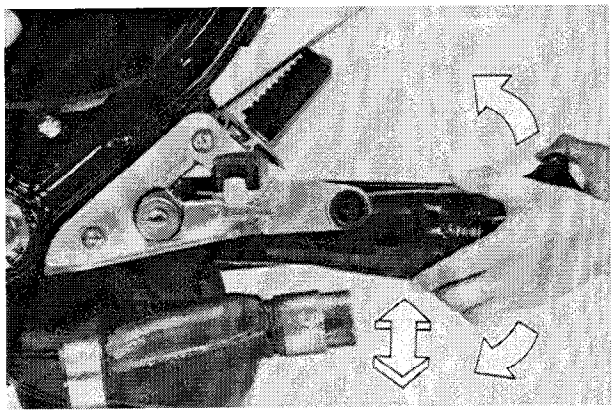
- Use a suitable bearing driver in the bearing driver set (57001-1129) to press in the tapered roller bearing outer races and grease seals.

- Apply grease liberally to the races, and pack the cone bearings with grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.



### *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.

- Install the new grease seals, smearing them with a thin coat of molybdenum disulfide grease.
- Install the swing arm (see Swing Arm Installation).

### *Swing Arm Lubrication*

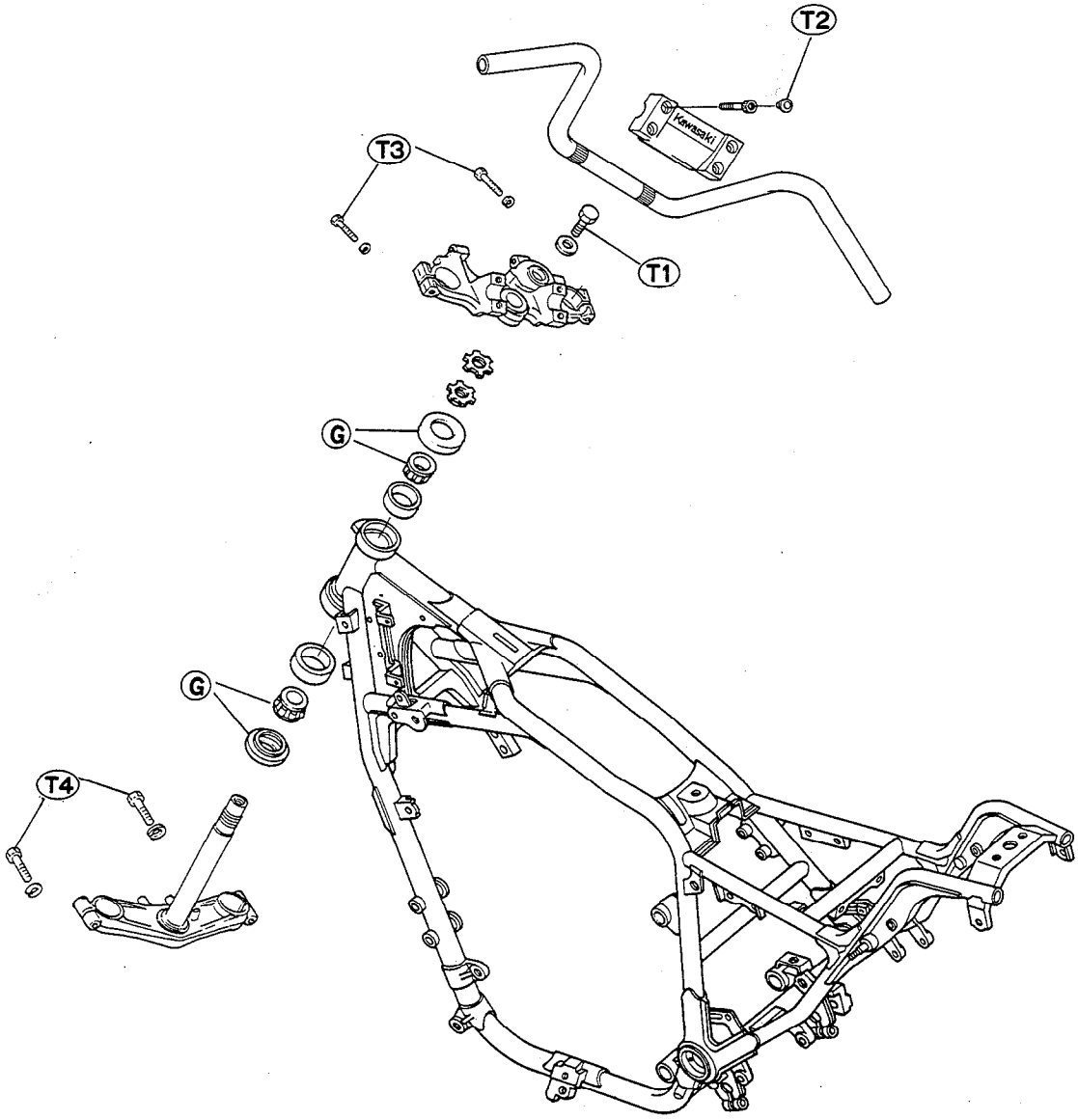
Grease the swing arm shaft bearings with a molybdenum disulfide chassis assembly grease in accordance with the Periodic Maintenance Chart.

- Remove the swing arm, and remove the grease seals from both sides of the swing arm (see Swing Arm Disassembly Notes).
- Clean out the old grease from the bearings.

# Steering

## Table of Contents

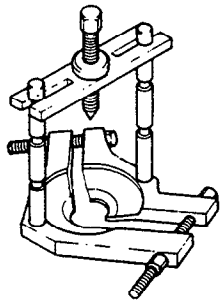
## Exploded View




G: Apply grease.
T1: 39 N-m (4.0 kg-m, 29 ft-lb)
T2: 24 N-m (2.4 kg-m, 17.5 ft-lb)
T3: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T4: 25 N-m (2.5 kg-m, 18 ft-lb)

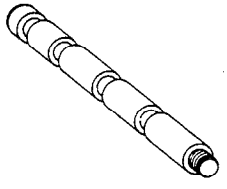
## Special Tools

**Bearing Puller: 57001-158**

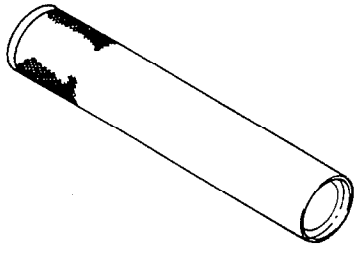


**Adapter: 57001-317**

**Pole: 57001-1190**

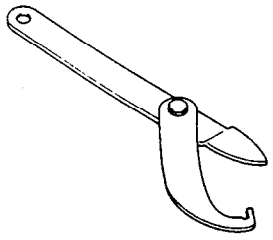


**Stem Bearing Driver: 57001-137**

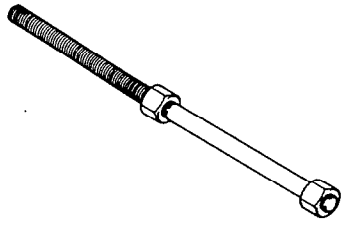


**Adapter: 57001-1074**

**Stem Nut Wrench: 57001-1100 (2 sets)**



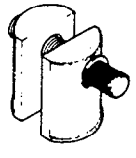
**Driver Press Shaft: 57001-1075**



**Driver: 57001-1106**

**Driver: 57001-1076**

**Stem Bearing Remover: 57001-1107**



**NOTE**

○*The poles (P/N 57001-1190) are included in the bearing puller (P/N 57001-158).*

## 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 fork "clunk" or "click"when the brake is applied or when the motorcycle is ridden over a pothole.
2. The handlebars seem to vibrate more than normal.

### *Steering Inspection*

- Set the motorcycle on its center stand or other suitable stand.
- Use a jack under the engine to lift the front wheel off the ground (see Suspension chapter).

**Checking for Steering Too Tight:**

- With the front wheel pointing straight ahead, lightly push one end of the handlebar. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.

★If the wheel binds or catches before the stop, the steering is too tight.

**NOTE**

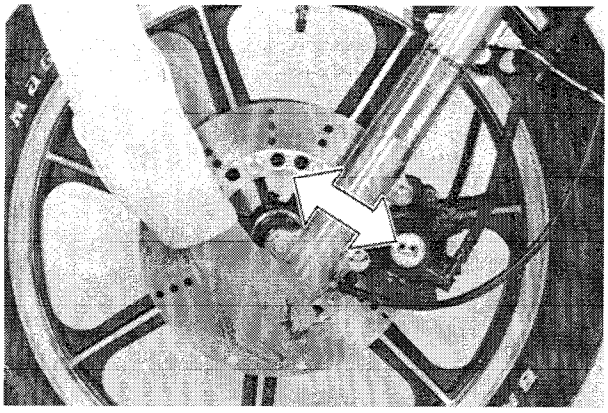
○*The cables and wiring will have some effect on the motion of the fork which must be taken into account. Be sure the wires and cables are properly routed.*

○*The bearings must be in good condition and properly lubricated in order for any test to be valid.*

**Checking for Steering Too Loose:**

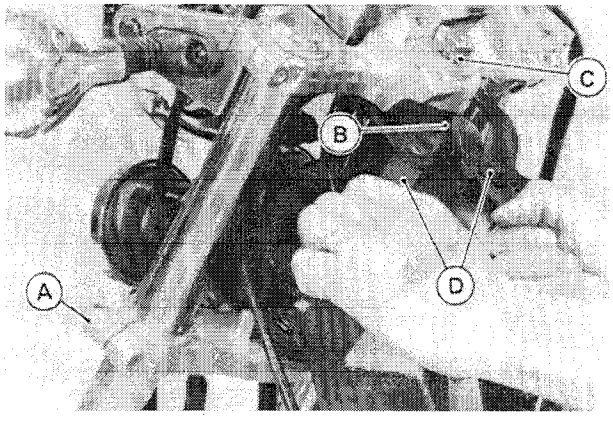
- Stand in front of the motorcycle and grasp the lower ends of the fork near the axle.
- Feel for steering looseness by pushing and pulling the fork.

★If you feel looseness, the steering is too loose.



### *Steering Adjustment*

- Set the motorcycle up on its center stand.
- Remove the fuel tank to avoid damaging the painted surface.
- Remove the handlebar (see Handlebar Removal in this chapter).
- Loosen the left and right front fork lower clamp bolts. This allows the fork inner tubes to slide in the steering stem base.
- Loosen the steering stem head bolt and upper steering stem locknut. Use stem nut wrenches (special tools) to turn the steering stem locknuts.




A. Fork Lower Clamp Bolts
B. Upper Stem Locknut
C. Stem Head Bolt
D. Stem Nut Wrenches: 57001-1100

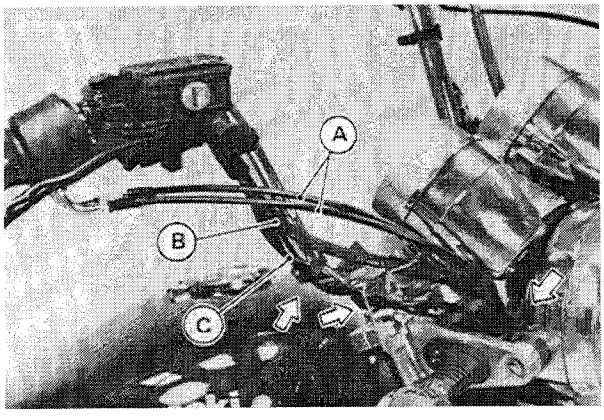
- Using a jack under the engine, lift the front wheel off the ground.
- If the steering is too tight, loosen the lower stem locknut a fraction of a turn; if the steering is too loose, tighten the locknut a fraction of a turn. Turn the locknut 1/8 turn (maximum) at a time.
- While holding the lower stem locknut with the other wrench (special tool), lightly tighten the upper locknut.
- Tighten the steering stem head bolt to the specified torque.

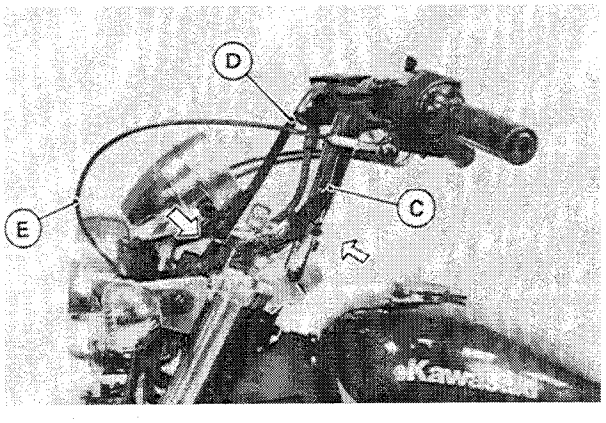
●Tighten the front fork lower clamp bolts to the specified torque.
●Check the steering again.
★If the steering is still too tight or too loose, repeat the adjustment.
●Install the removed parts. Check that cables and wires are routed properly.

**NOTE**

○*Do not confuse the adjustment procedure with the new bearing installation procedure. Installation of new tapered roller bearings requires that you torque the lower stem locknut to seat the races, then loosen the locknut and proceed with the adjustment procedure.*

●Route the cables, the brake hoses and the wire looms as shown. They must not hinder handlebar movement.



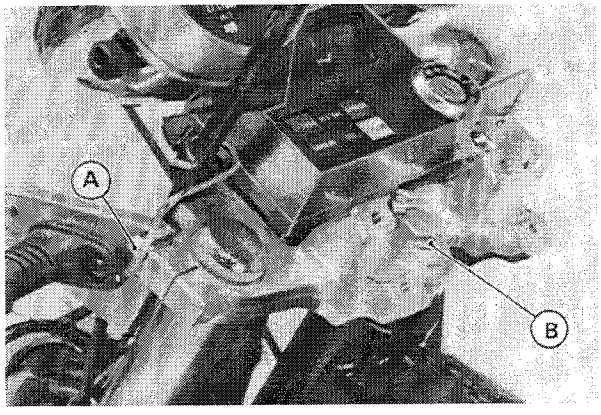

A. Throttle Cables
B. Brake Hoses
C. Wire Looms
D. Clutch Cable
E. Choke Cable

●Check and adjust the following items.
Front Brake
Clutch
Throttle Cables
Headlight Aim

## Steering Removal/Installation

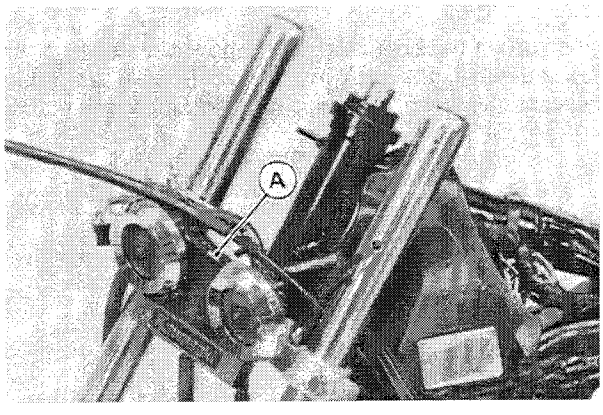
### *Steering Stem Removal*

●Remove the following parts.
Fuel tank (see Fuel System chapter)
Front wheel (see Wheels/Tires chapter)
Meter Cable
Handlebar (see Handlebar Removal in this chapter)
●Remove the stem head bolt and flat washer.
●Loosen the fork upper clamp bolts and remove the steering stem head.



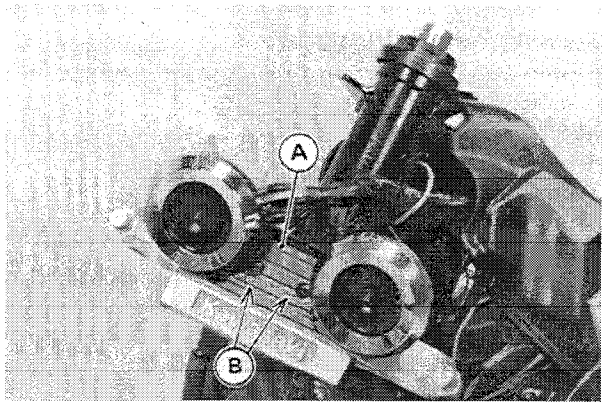

A. Upper Clamp Bolt
B. Stem Head Bolt

●Pull off the horn leads.



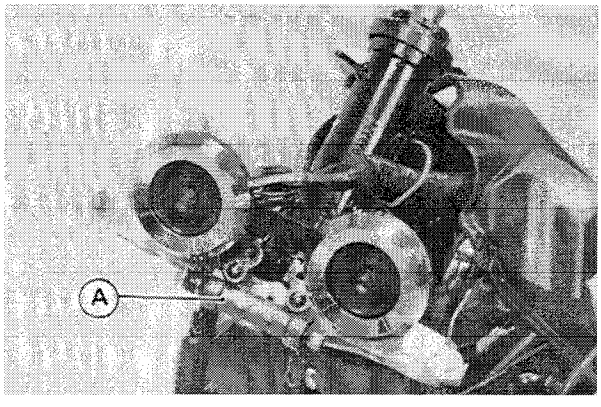

A. Horn Leads

●Remove the front fork legs (see Suspension chapter).
●Remove the front fork cover by taking out the mounting screws.



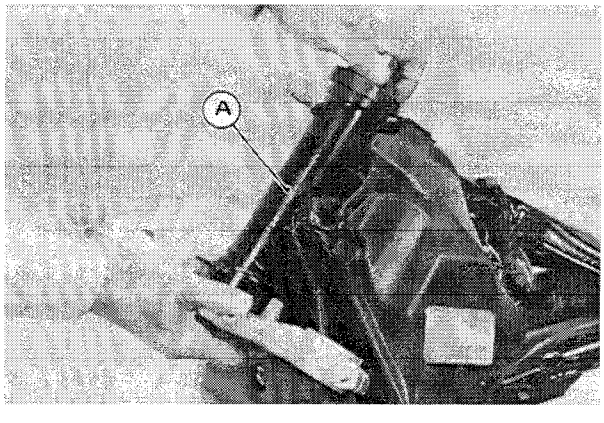

A. Front Fork Cover B. Screws

- Remove the mounting bolts and horn assembly to free the brake hose joint from the stem base.
- Remove the front brake assembly as a set.




A. Brake Hose Joint

- Push up on the stem base, and remove the steering stem locknuts with the stem nut wrench (special tool), then remove the steering stem and stem base (single unit).



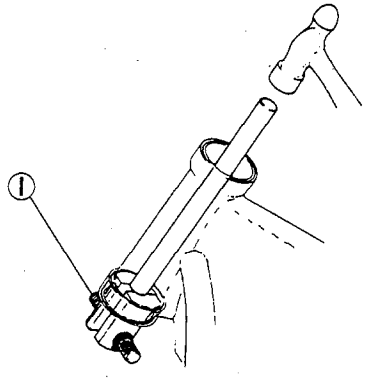

A. Steering Stem and Stem Base

- Remove the steering stem cap, grease seal, and upper tapered roller bearing inner race.
- To remove the outer races pressed into the head pipe, install the stem bearing remover (special tool) as shown below, and hammer the stem bearing remover to drive out the race.

**NOTE**

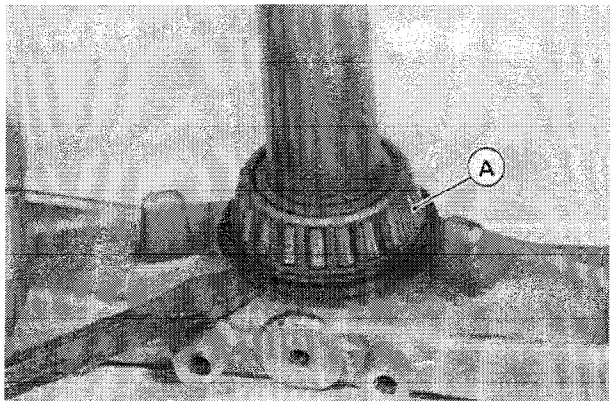
○*If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) shoud be replaced with new ones.*

**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 a chisel.

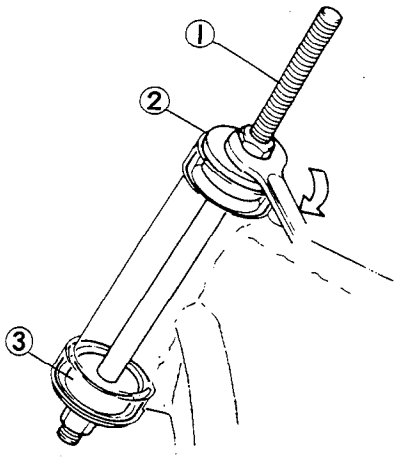



A. Lower Inner Race and Grease Seal

*Steering Stem 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**

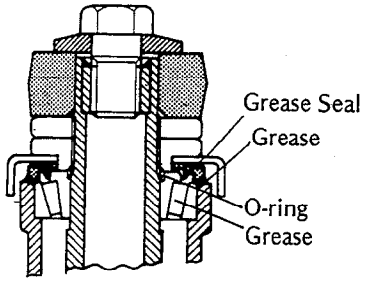


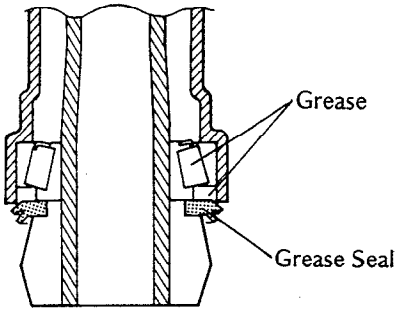

1. Driver Press Shaft: 57001-1075
2. Driver: 57001-1106
3. Driver: 57001-1076

●Install the grease seals as shown, applying grease to the lips and inserting the lip of the lower seal into the head pipe.

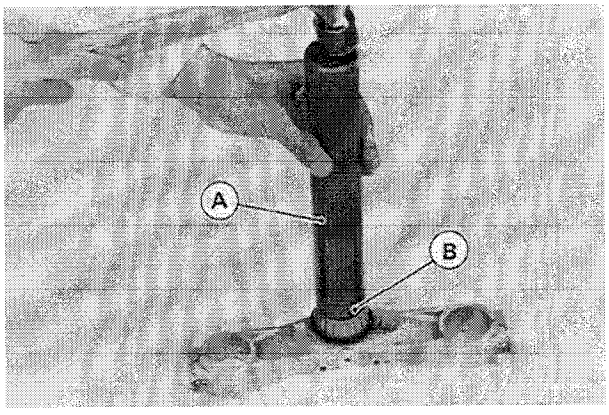
○The late model has an O-ring inside the upper bearing inner race.

**Grease Seal Installation**




●Apply grease to the tapered roller bearing, and drive it onto the steering stem using the stem bearing driver (special tool) with the adapter smaller side facing down.



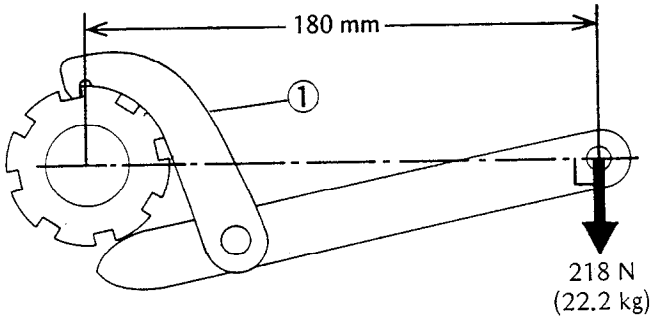

A. Stem Bearing Driver: 57001-137
B. Adapter: 57001-1074

●Lubricate the steering stem bearings with grease.
●Install the lower stem locknut so that the smaller diameter faces down.

The following four steps should be performed after steering bearing installation. This procedure settles the bearings in place.

○Using the stem nut wrench, tighten the lower stem locknut to **39 N-m (4.0 kg-m, 29 ft-lb)** of torque. To tighten the locknut to the specified torque, hook the wrench on the stem locknut, and pull the wrench at the hole with 22.2 kg of force in the direction shown.

**Torquing Stem Locknut to Seat Bearings**



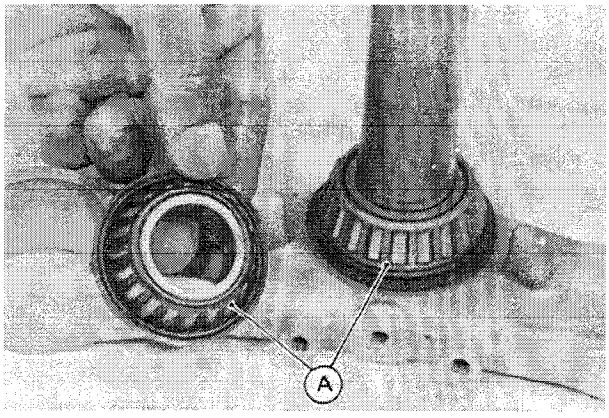

1. Stem Nut Wrench: 57001-1100

○Check that there is no play and that the steering stem turns smoothly without looseness. Otherwise, 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.
●Adjust the steering (see Steering Adjustment).
●Install the parts removed. Check that all cables and wires are routed properly.

## Steering Maintenance

### *Steering Stem Bearing Lubrication*

In accordance with the Periodic Maintenance Chart, or whenever the steering stem is disassembled, the steering stem bearings should be relubricated.
●Remove the steering stem.
●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 off grease and dirt.
●Visually check the outer races and the rollers.
★Replace the bearing assemblies if they show wear or damage.
●Apply grease liberally to the upper and lower races, and pack the cone bearings with grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.
●Install the steering stem, and adjust the steering.




A. Steering Stem Bearings

### *Bearing Wear, Damage*

●Using a high flash-point solvent, wash the upper and lower tapered rollers in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean off grease and dirt.
●Visually check the outer races and the rollers.
★Replace the bearing assemblies if they show any signs of damage.

### *Grease Seal Deterioration, Damage*

●Inspect the grease seal on the upper tapered roller bearing for any signs of deterioration or damage.
★Replace the grease seal if necessary.

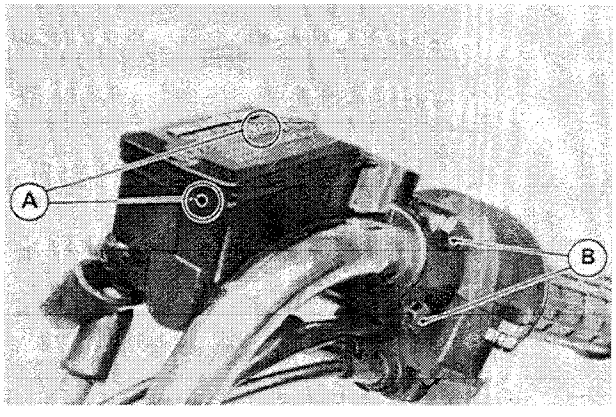
### *Steering Stem Warp*

●Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.
★If the steering stem shaft is bent, replace the steering stem.

## Handlebar

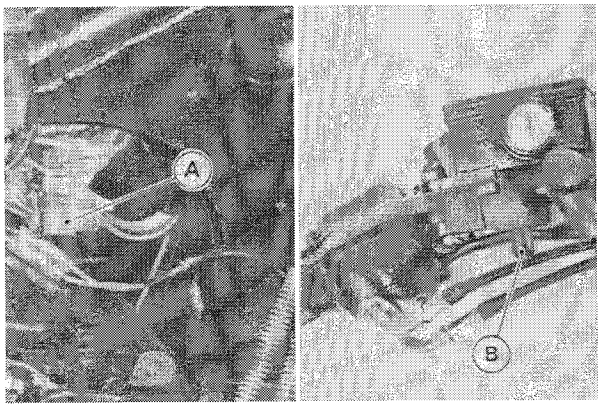
### *Handlebar Removal*

●Remove the throttle cable upper ends (see Fuel System).
●Remove the choke cable lower end (see Carburetor Removal in Fuel System chapter).
●Remove the brake master cylinder with the hose installed by taking out the clamp bolts (2), and let it hang free.
○Stick a piece of tape over the breather holes (2) to keep the fluid from spilling out of the brake reservoir.



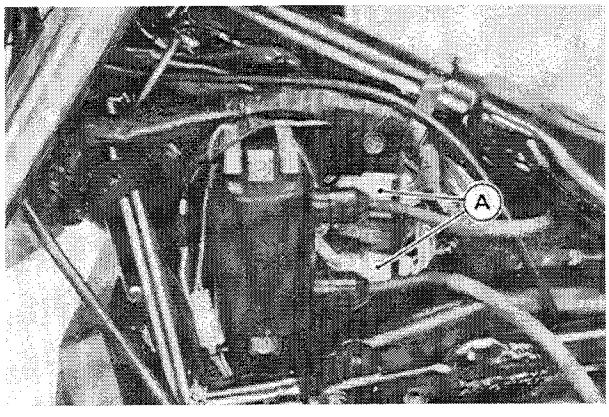

A. Bleeder Holes B. Mounting Bolts

●Free the fuel tank covers by taking out the mounting screws.
●Pull out the front brake switch connector, and the red connector behind the right hand fuel tank cover.



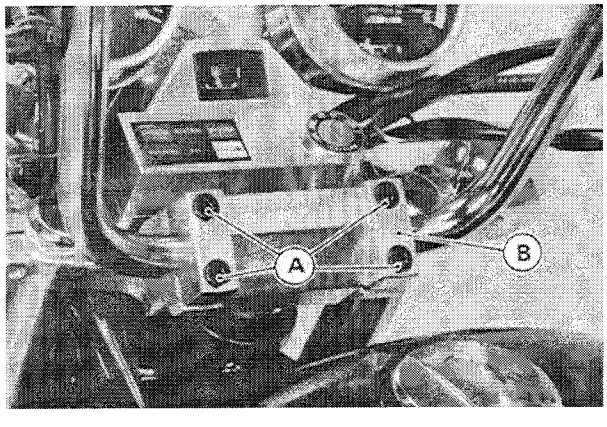

A. Red Connector B. Brake Switch Connector

•Remove the following parts from the motorcycle left side.
Clutch Cable (see Clutch chapter)
Starter Lockout Switch Connector
Ignition Coil and then White Connectors (2) (behind the left hand fuel tank cover)




A. Connectors

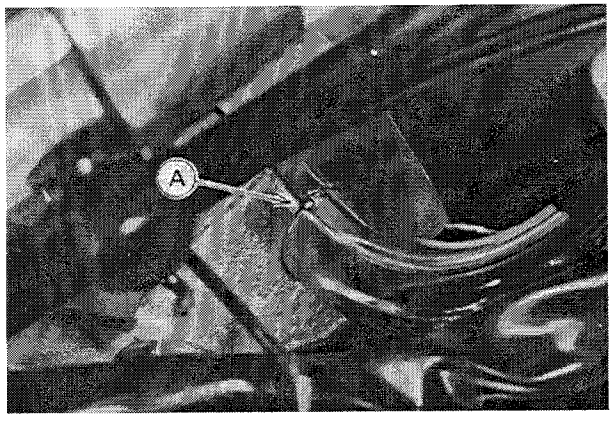
•Remove the handlebar by taking out the plugs, the clamp bolts and clamp.




A. Clamp Bolts B. Clamp

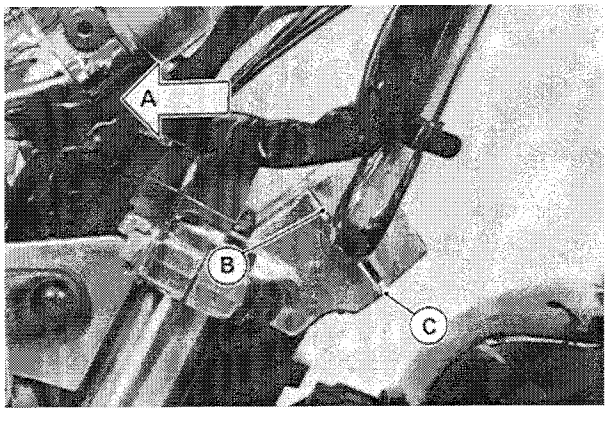
*Handlebar Installation Notes*

•Set the handlebar to match its punched mark to the front mating face of the handlebar clamp.



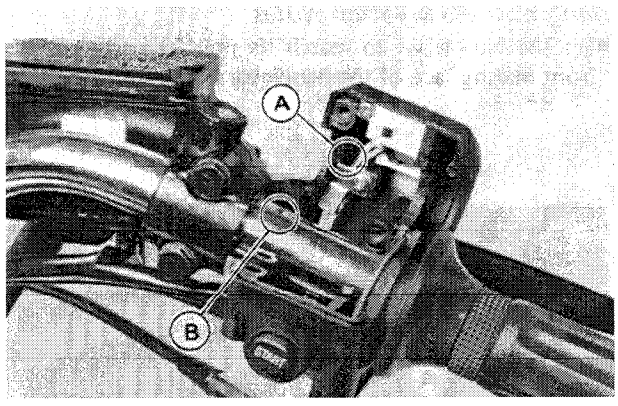

A. Punched Mark

•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.



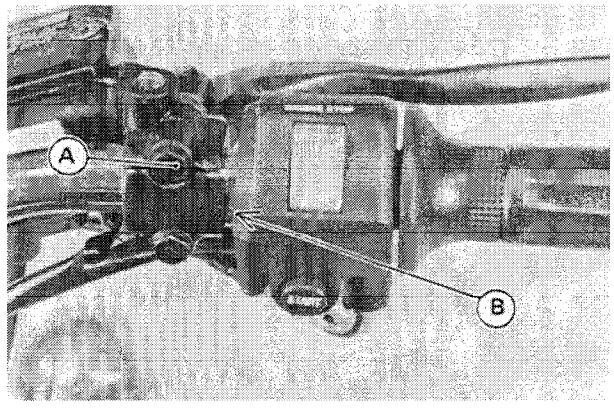

A. Front C. Even Gap
B. No Gap

•The front half of both the left and right switch housings has a small projection. Fit the projection into the small hole in the handlebar.




A. Projection B. Hole

- The master cylinder clamp must be installed with the small projection towards the throttle grip.
- Tighten the upper clamp bolt first, and then the lower clamp bolt to the specified torque. There will be a gap at the lower part of the clamp after tightening.



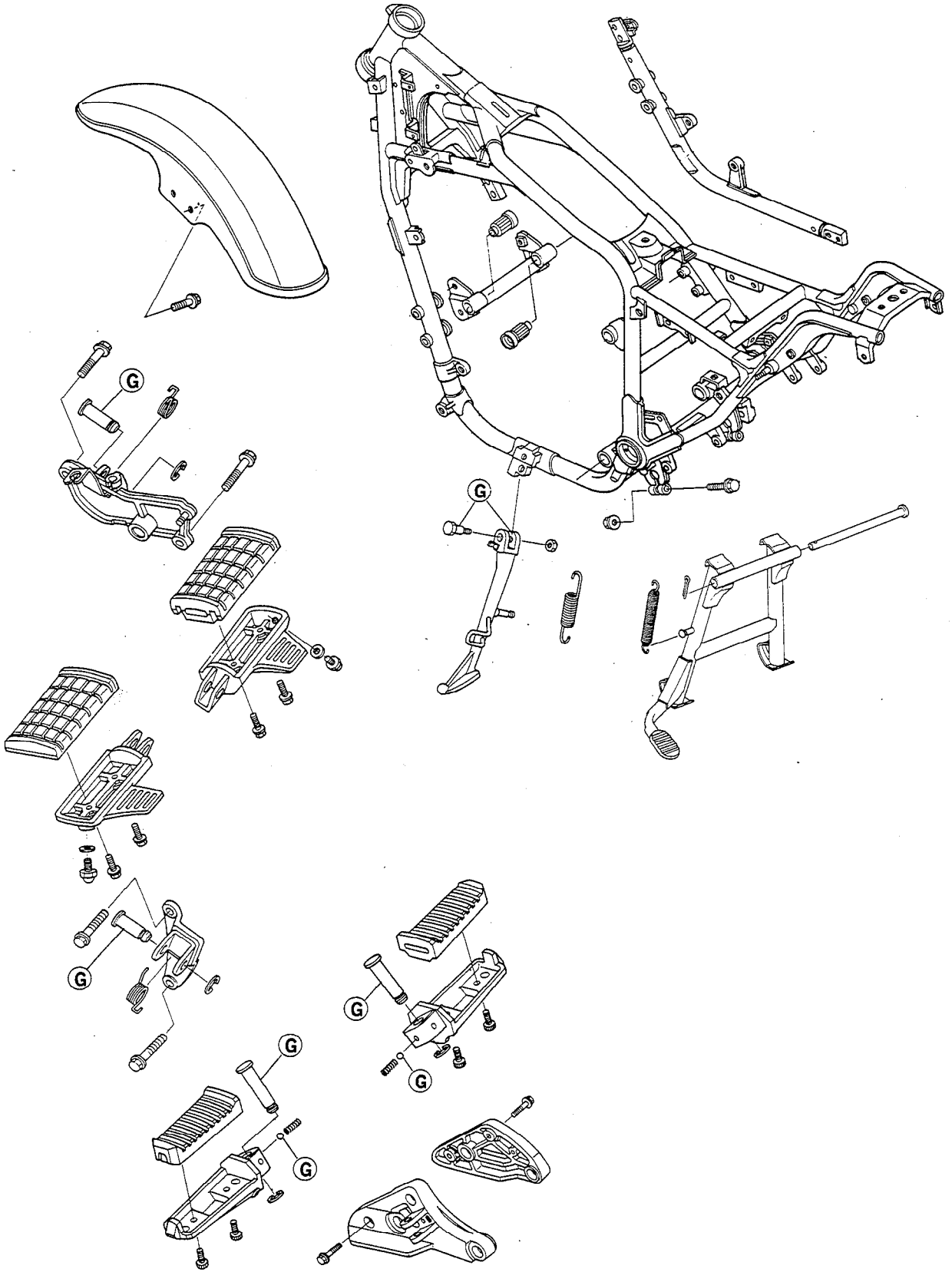

A. Tighten upper clamp bolt first. B. Projection

- Check and adjust the following items:
  - Throttle grip
  - Clutch
  - Front brake
  - Choke Cable

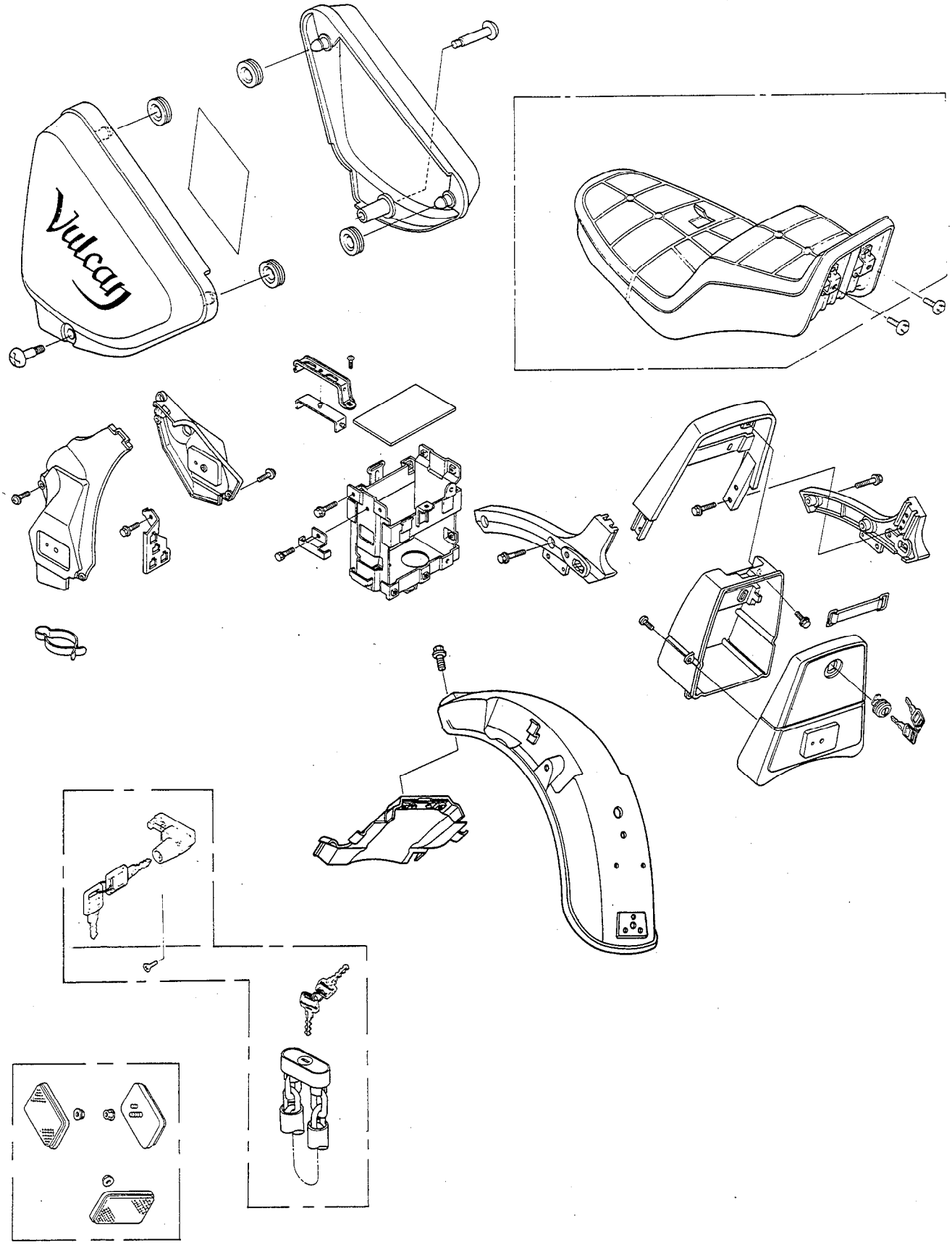
# Frame

## Table of Contents

## Exploded View



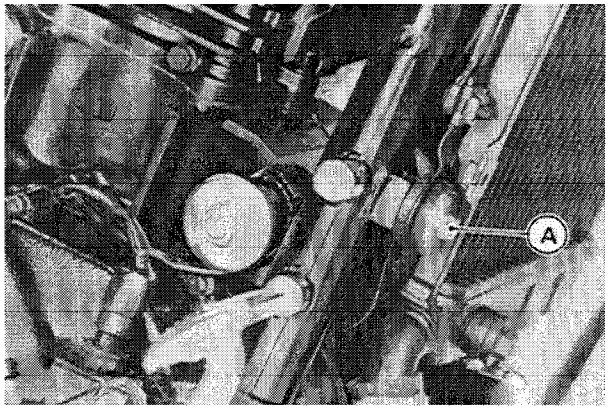

G: Apply grease.


Vulcan

## Subframe

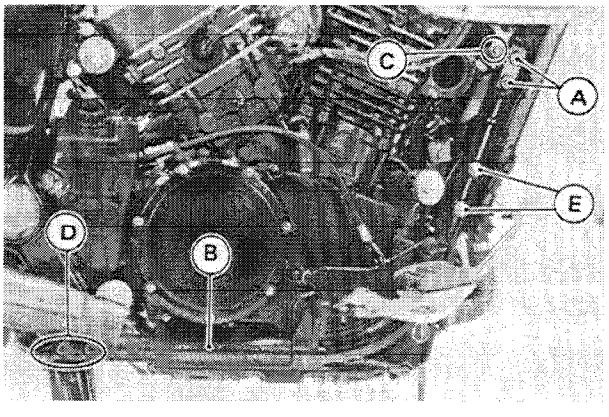
### *Subframe Removal*

- Remove the right exhaust pipe (see Right Exhaust Pipe Removal in Engine Top End).
- Remove the radiator cover (see Radiator Removal in Cooling System).
- Remove the radiator mounting bolt shown.




A. Radiator Mounting Bolt

- Unscrew the following bolts and nuts to remove the subframe. The frame may be removed with the foot peg, the brake pedal and brake cable installed.

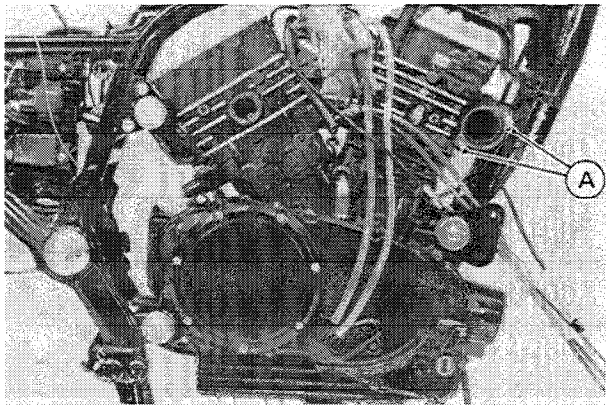



A. Bolts
B. Subframe
C. Air Cleaner Mounting Bolt
D. Bolts and Nuts
E. Engine Mounting Bolts

- To separate the subframe from the mainframe, free the brake switch, and the brake cable from the rear end and the middle stay of the brake cable (see Brake Cable Removal in Brakes).

**CAUTION**

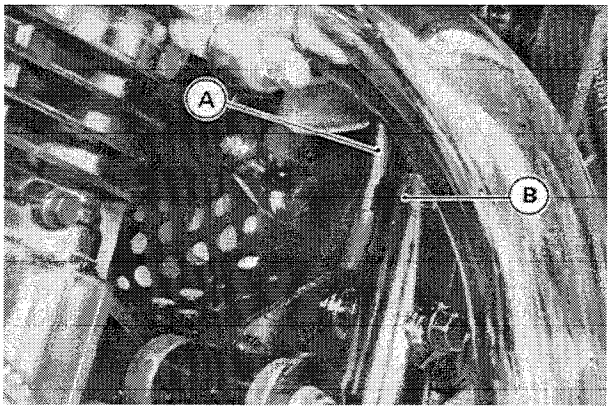
**○Be careful not to damage the exhaust pipe mounting studs with wrenches during subframe removal.**




A. Studs

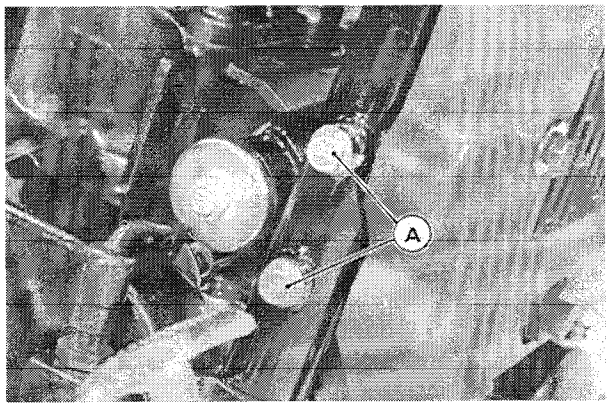
### *Subframe Installation Notes*

- Route the air cleaner drain tube behind the subframe mounting nuts and secure with a wiring strap to prevent interference with the exhaust pipe.

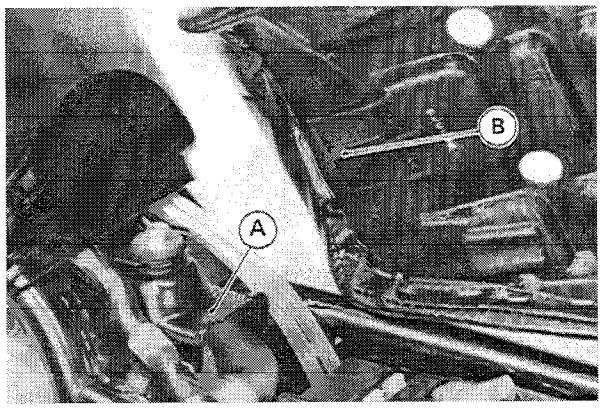



A. Air Cleaner Drain Tube  B. Wiring Strap

- Install the engine mounting bolts and tighten them to the specified torque before right exhaust pipe installation (see Exploded View in Engine Removal/Installation chapter).




A. Engine Mounting Bolts

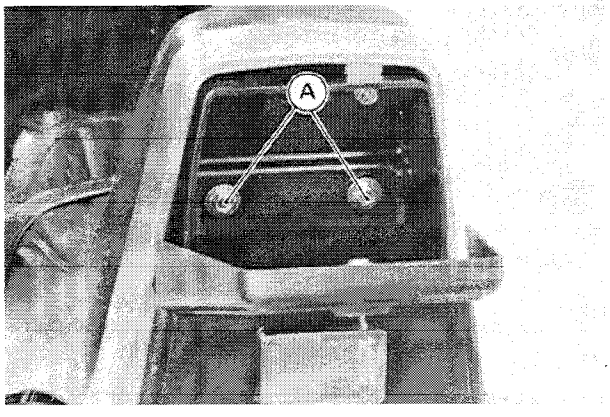



A. Brace B. Hook

## Seat

*Seat Removal*

- Open the document/tool kit container.
- Remove the seat mounting bolts.
- Lift the seat up and to the rear.




A. Bolts

*Seat Installation Note*

- Slip the hook on the bottom of the front end of the seat under the brace on the frame.

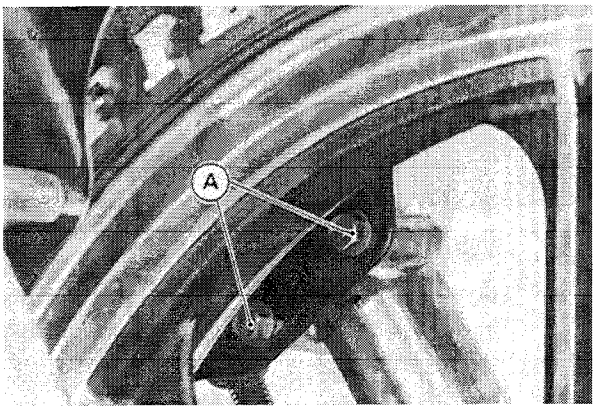
## Fender

*Front Fender Removal*

**CAUTION**

- **Be careful not to scratch the painted surface during removal or installation.**

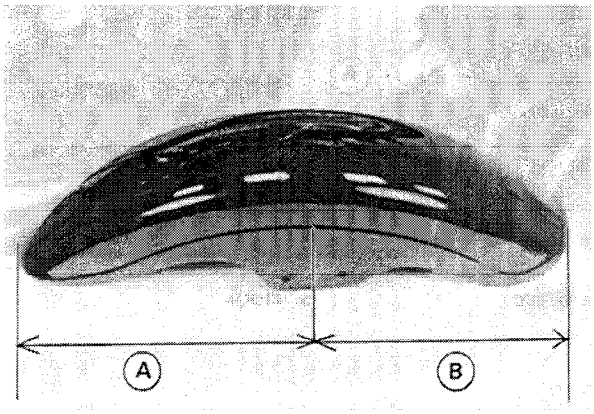
- Remove the mounting bolts on both sides to separate the fender from the front fork. The fender may be removed with the wheel installed.



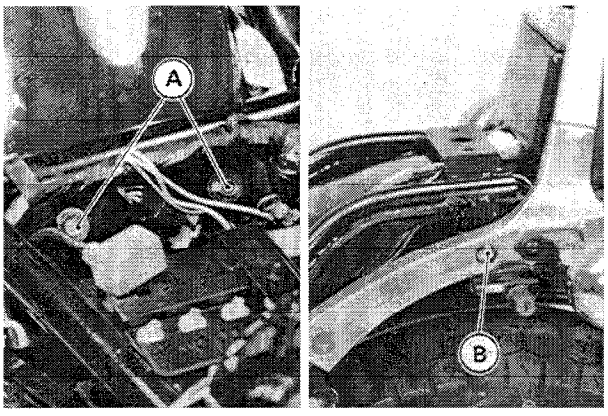

A. Bolts

*Front Fender Installation Note*

●Install the front fender so that the longer side faces to the front.




A. Longer Side B. Shorter Side



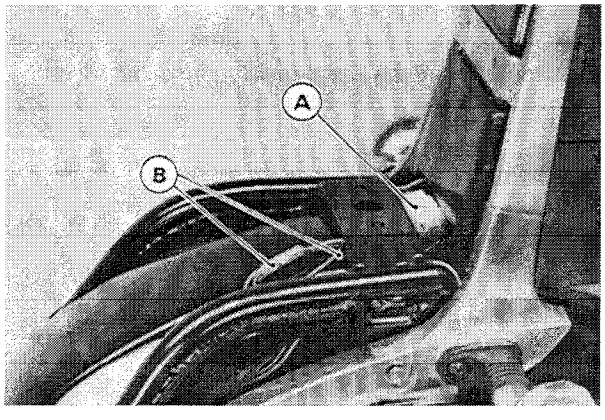

A. Front Bolts B. Rear Bolts

*Rear Fender Removal*

**CAUTION**

○**Be careful not to scratch the painted surface during removal or installation.**

●Remove the seat (see Seat Removal).
●Pull off the connector and two leads.



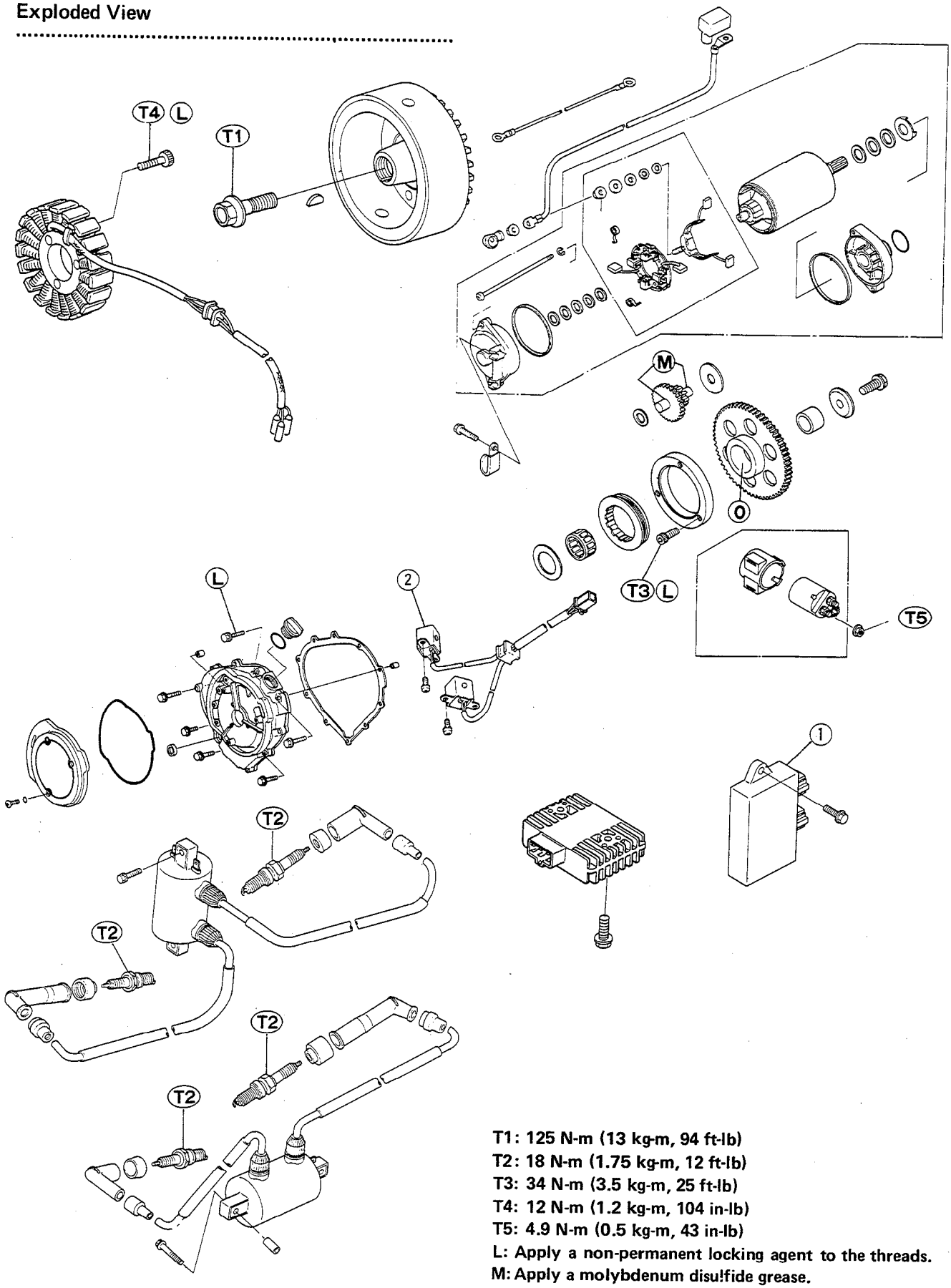

A. Connector B. R Lead and BK/Y Leads

●Remove the mounting bolts from the front part of the rear fender.
●Unscrew the mounting bolts (2) on both sides to remove the rear fender.

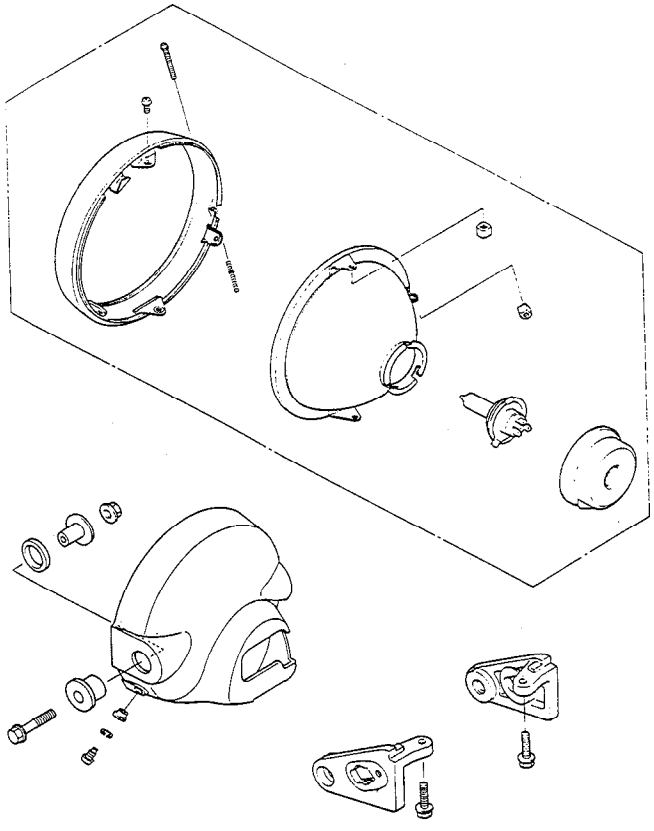
# Electrical System

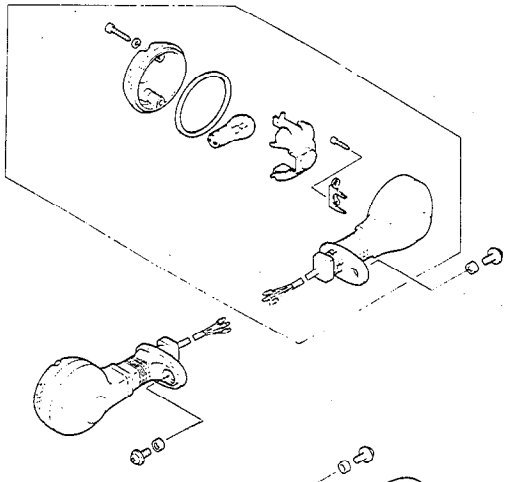
## Table of Contents

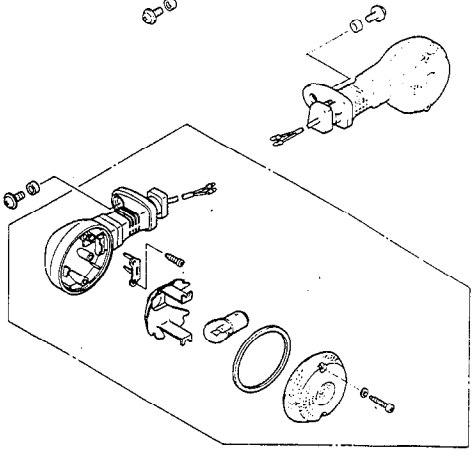
## Exploded View

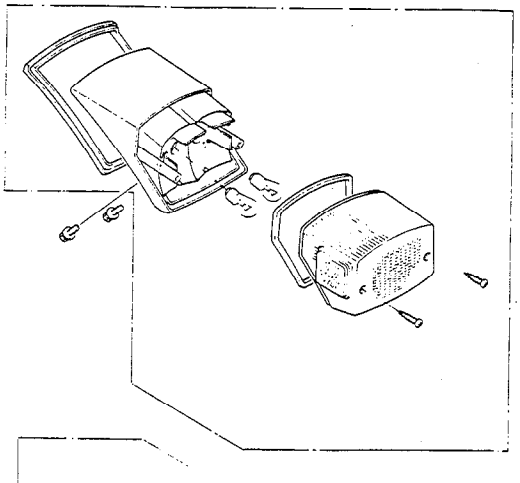


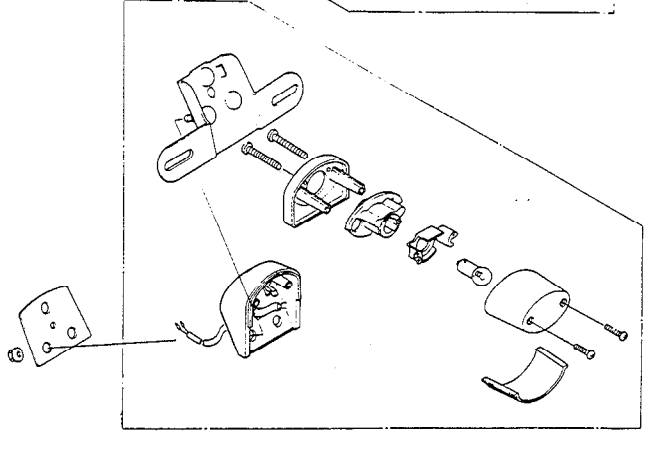

T1: 125 N-m (13 kg-m, 94 ft-lb)
T2: 18 N-m (1.75 kg-m, 12 ft-lb)
T3: 34 N-m (3.5 kg-m, 25 ft-lb)
T4: 12 N-m (1.2 kg-m, 104 in-lb)
T5: 4.9 N-m (0.5 kg-m, 43 in-lb)
L: Apply a non-permanent locking agent to the threads.
M: Apply a molybdenum disulfide grease.
O: Apply engine oil.











**1. IC Ignitor:**

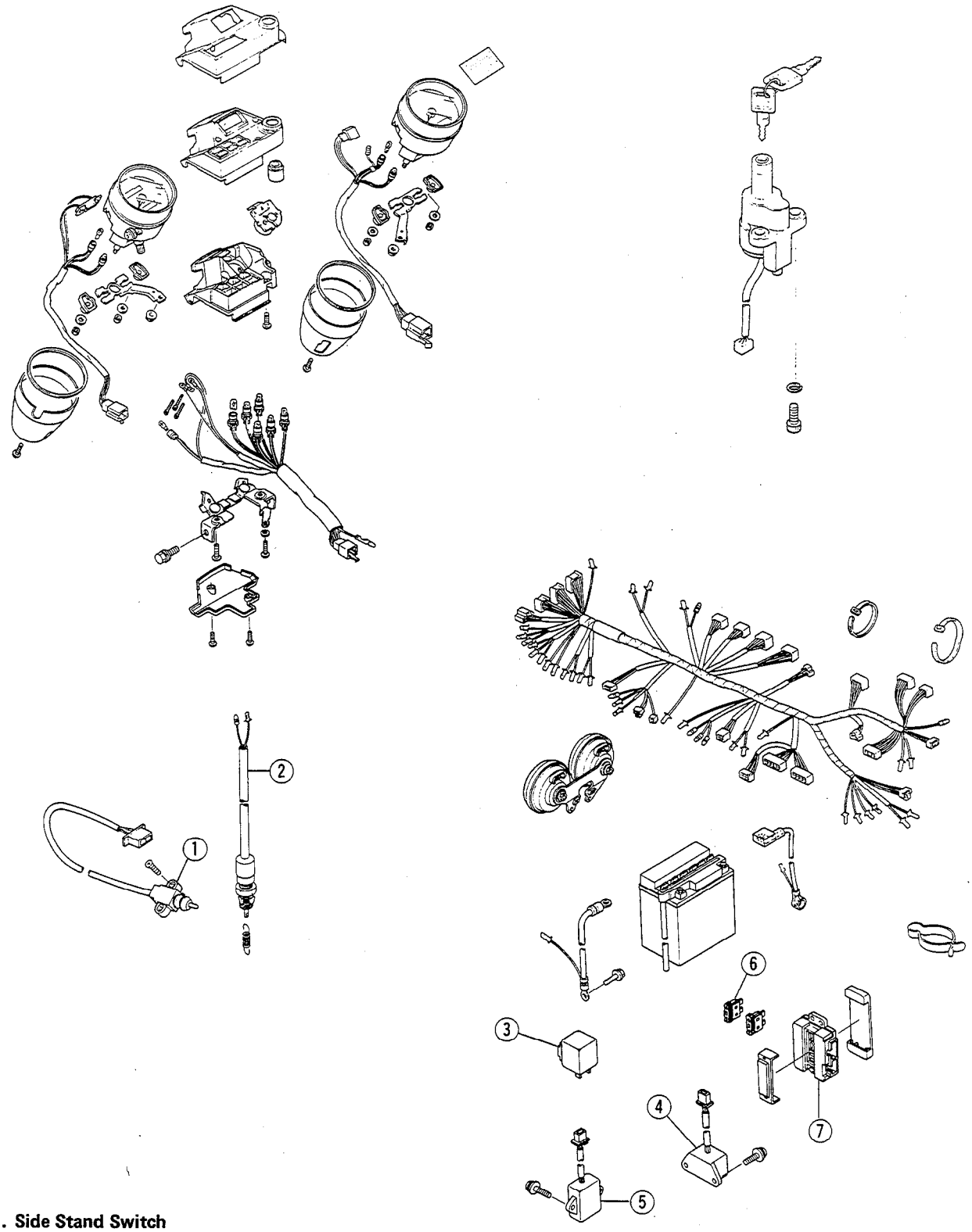
The IC ignitor has mainly two functions. The first function is to supply current to the primary winding of the ignition coil. The second function is to determine the ignition timing with the power transistor in the ignitor.

**2. Pickup Coil:**

Every time either end of the timing plate on the alternator rotor passes under the pickup coil, a pulse is generated and sent to the IC ignitor.

**Interlock Circuit:**

If the side stand is down, the clutch engaged, and the transmission in gear, the ignition system will not work. If any of these conditions is not met, the ignition system works and the engine can be started and run. The motorcycle cannot be ridden with the side stand down.




1. Side Stand Switch
2. Rear Brake Light Switch
3. Turn Signal Relay
4. Reserve Lighting Unit
5. Turn Signal Control Unit
6. Fuse
7. Junction Box

## Specifications

### Battery

| | |
|---|---|
| Type: | 12 V 14 Ah |
| Specific gravity: | 1.28 @20°C (68°F) |

### Charging System

Regulator/rectifier output voltage:
Battery voltage to 14 – 15 V Night, @4,000 r/min (rpm)
Stator coil resistance: 0.34 – 0.52 Ω

### Ignition System

| | |
|---|---|
| Spark plug gap: | 0.8 – 0.9 mm |
| Plug cap resistance: | 3.75 – 6.25 kΩ |
| Ignition coil resistance | |
| Primary winding: | 1.8 – 2.2 Ω |
| Secondary winding: | 19 – 29 kΩ |
| Ignition timing: | 5° BTDC @1,100 r/min (rpm) – 25° BTDC 3,500 r/min (rpm) |
| Pickup coil resistance: | 355 – 535 Ω |

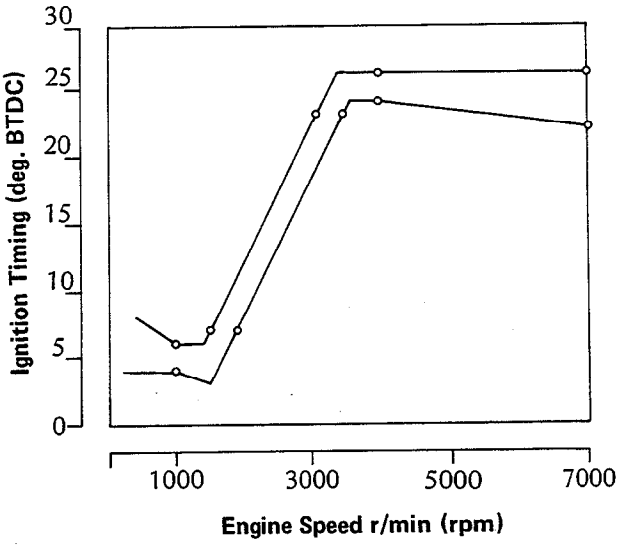
### Starter System

| | |
|---|---|
| Starter motor: | |
| Carbon brush length: | |
| Standard: | 12.0 – 12.5 mm |
| Service limit: | 8.5 mm |
| Commutator diameter: | |
| Standard: | 27.9 – 28.3 mm |
| Service limit: | 27.0 mm |

### Switches and Sensors

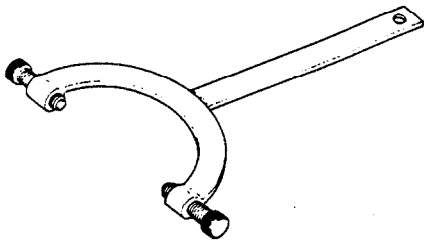
| | | |
|---|---|---|
| Front brake light switch: | Non adjustable | |
| Rear brake light switch: | On after about 15 mm pedal travel | |
| Fuel level sensor resistance: | | |
| | Full position 3 – 12 Ω | |
| | Empty position 70 – 120 Ω | |
| Water temperature sensor resistance: | | |
| | 80°C (176°F) 42 – 62 Ω | |
| | 100°C (212°F) 22 – 33 Ω | |
| Fan Switch resistance: | | |
| above | 94 – 100°C (201 – 212°F) | ON |
| less than | 91°C (196°F) | OFF |

### Ignition Timing/Engine Speed Relationship

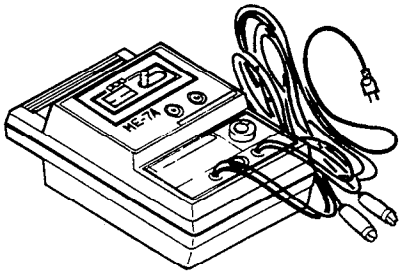


## Special Tools

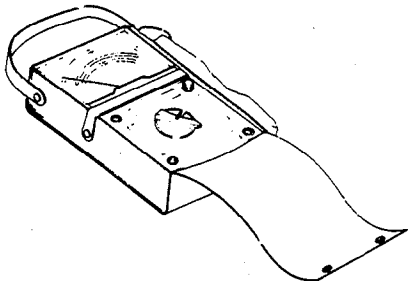
**Flywheel Holder: 57001-308**



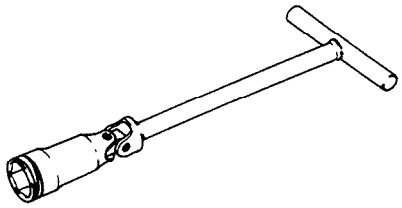
**Ignition Coil Tester: 57001-1242**



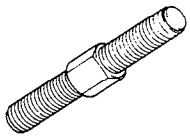
Hand Tester: 57001-1394

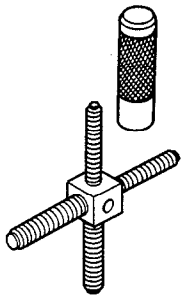


**Spark Plug Wrench: 57001-1024**

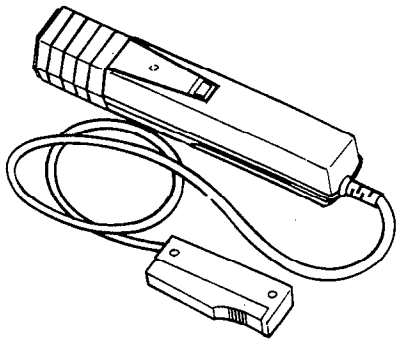


**Rotor Puller: 57001-1099, or 57001-1216**





**Timing Tester: 57001-1241**



**NOTE**

○*The flywheel holder (P/N 57001-1313) can be used instead of the flywheel holder (P/N 57001-308).*

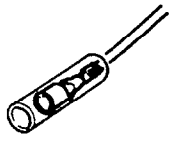
## Precautions

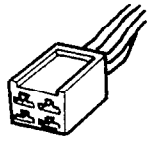
There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter 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 caused by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

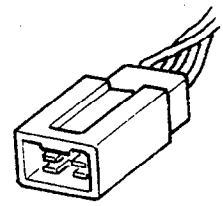
- Electrical Connectors

**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 |

## Battery

### *Precautions*

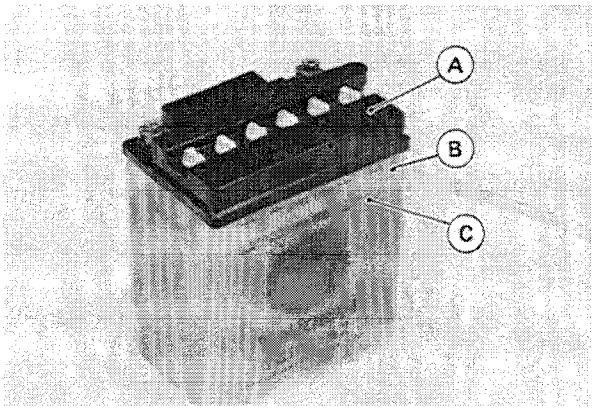
Following a few simple rules will greatly extend the life of the battery.

- 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.
○DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.

### *Electrolyte Level Inspection*

●Remove the battery.
●Visually check the electrolyte level in the battery.



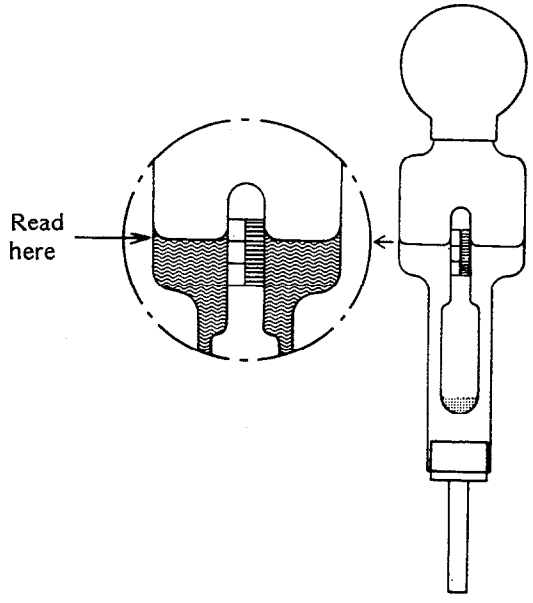

A. Battery
B. Upper Level
C. Lower Level

★If the level line of electrolyte in any cell is below the lower level line on the battery case, add distilled water only to that cell.
●Install the battery.

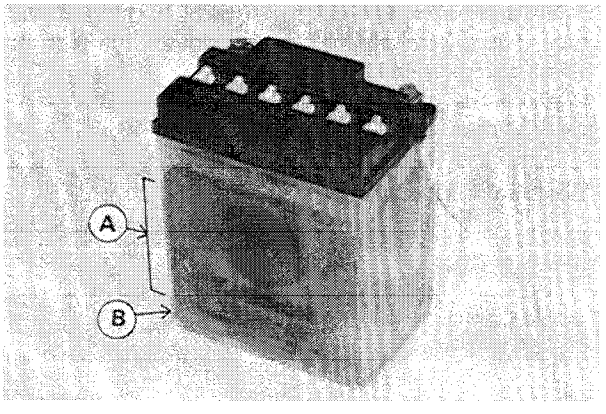
### *Battery Condition*

●Before charging, check battery condition by testing the specific gravity of the electrolyte in each cell.
○Draw a little fluid from the cell with a hydrometer.
○Read the level of the electrolyte on the floating scale. This is the specific gravity of the electrolyte.

**Hydrometer**




●Look for sediment and white sulfation inside the cells on the bottom of the plates.




A. Sulfation here
B. Sediment here

●See the Battery Troubleshooting Guide in Battery Test Charging.
★If the specific gravity is below 1.200, 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. It is generally best to replace a battery in this condition.

★If the specific gravity of all the cells is 1.280 or more, the battery is fully charged.

### *Battery Initial Charging*

Before being placed in service, a new battery should be given an initial charging.

- Cut off the sealed end of the battery vent hose and remove the filler caps.
- Fill each cell to the upper level line on the battery case with fresh electrolyte at a temperature of 30°C (86°F) or less. Let the battery stand for about 30 minutes before charging.

**NOTE**

○*If the electrolyte level drops, add electrolyte to the upper level line before charging.*

- Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and charge it for 10 hours. For example, if the battery is rated at 18 Ah, the charging rate would be 1.8 A.

**WARNING**

○**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

**CAUTION**

○**Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charging rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than-normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

○**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

- Turn the charger off, then disconnect it from the battery.
- Check battery voltage. Battery voltage should be 12 – 13 V.
- Check the specific gravity of each cell with a hydrometer (see Battery Condition).

★If the voltmeter or hydrometer readings are below those specified, additional charging is necessary before the battery can be installed.

### *Battery Ordinary Charging*

- Remove the battery from the motorcycle.

**CAUTION**

○**Always remove the battery from the motorcycle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the motorcycle.**

- Clean off the battery using a baking soda-and-water solution.

○Mix one heaping tablespoon of baking soda in one cup of water.

○Be careful not to get any of the cleaning solution in the battery.

○The terminals must be especially clean.

- If any of the cells are low, fill them to the LOWER level line with distilled water only. The electrolyte will expand during charging, and the level will rise.
- Connect a charger to the battery BEFORE plugging it in or turning it on.

**WARNING**

**○Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

**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.**

•Set the charging rate and time according to the battery condition previously determined (see Battery Condition), using the Battery Charging Rate/Time Table.

•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.

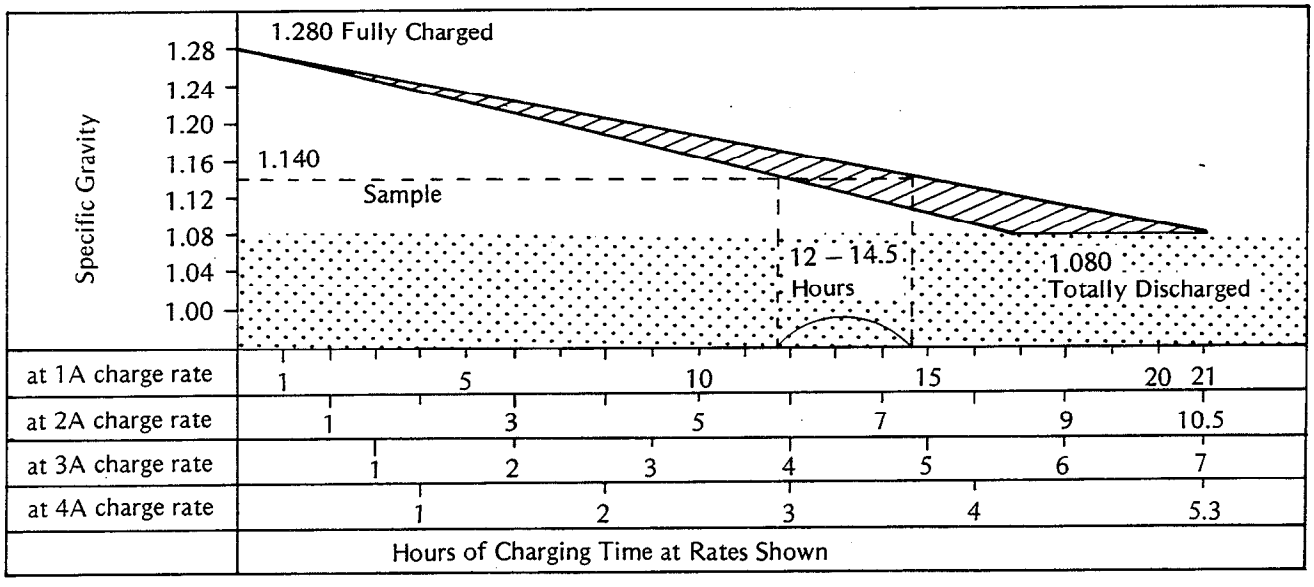
**CAUTION**

**○Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charging rate can be reduced to the level required.**

*Battery Test Charging*

•If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the Battery Troubleshooting Guide table.

**Battery Charging Rate/Time Table (12V 14Ah)**



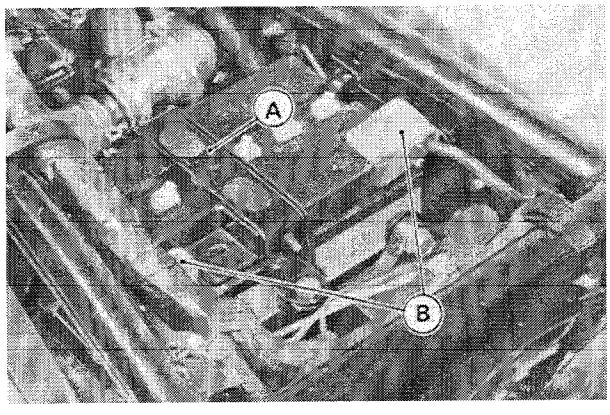

**Battery Troubleshooting Guide**

| | Good Battery | Suspect Battery | Action |
|---|---|---|---|
| Plates | (+) chocolate color<br>(−) gray | white (sulphated); + plates broken or corroded | Replace |
| Sediment | none, or small amount | sediment up to plates, causing short | Replace |
| Voltage | above 12 V | below 12 V | Test charge |
| Electrolyte Level | above plates | below top of plates | Fill and test charge |
| Specific Gravity | above 1.200 in all cells; no two cells more than 0.020 different | below 1.100, or difference of more than 0.020 between two cells | Test charge |

●To test charge a battery, perform the ordinary charging procedure and monitor the battery voltage and other signs as mentioned below.
★If the battery voltage suddenly jumps to over 13 V just after the start of charging, the plates are probably sulfated. A good battery will rise to 12 V immediately 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, sulphuric 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.

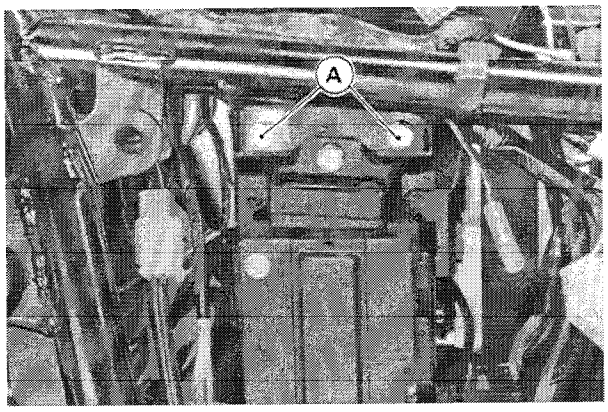
### *Battery Case Removal*

●Remove the following parts.
Seat (see Seat Removal in Frame chapter).
Right and Left Covers
Battery Terminals
Battery Retainer
Battery



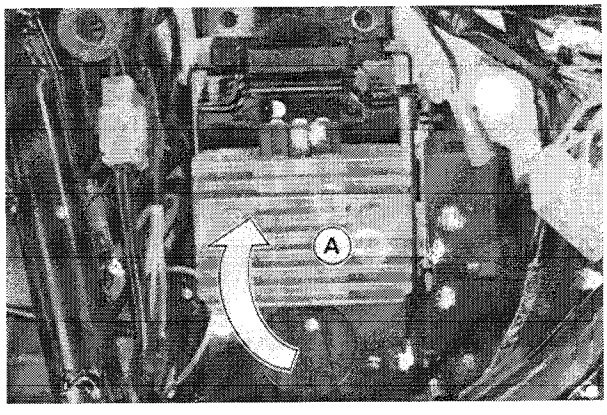

A. Retainer B. Terminals

Ignition Coil
Turn Signal Relay
Engine Ground Terminal
●Pull off the following part's connectors and terminals.
Battery
Ignitor
Junction Box
Turn Signal Control Unit
Reserve Lighting Switch
Starter Relay
●Remove the case mounting bolts on both sides.



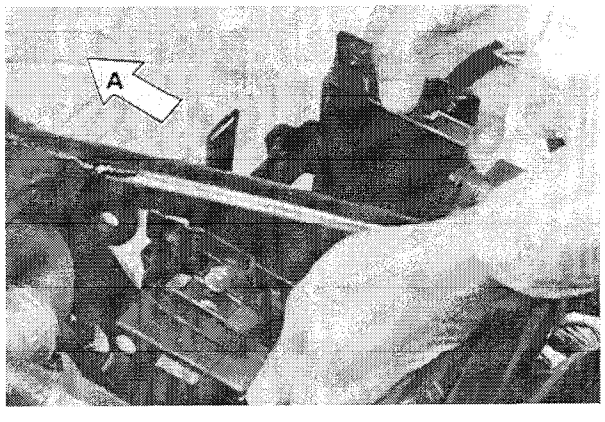

A. Case Mounting Bolts

●Lay the battery case on its side to remove the regulator/rectifier from the case bottom.




A. Regulator/Rectifier

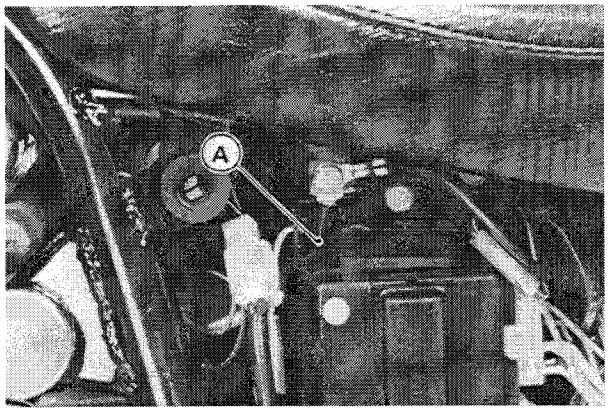
●Remove the starter relay with the starter motor lead installed.
●Take out the battery case from the right side.




A. Front

*Battery Case Installation*

●Be sure to install the engine ground lead.

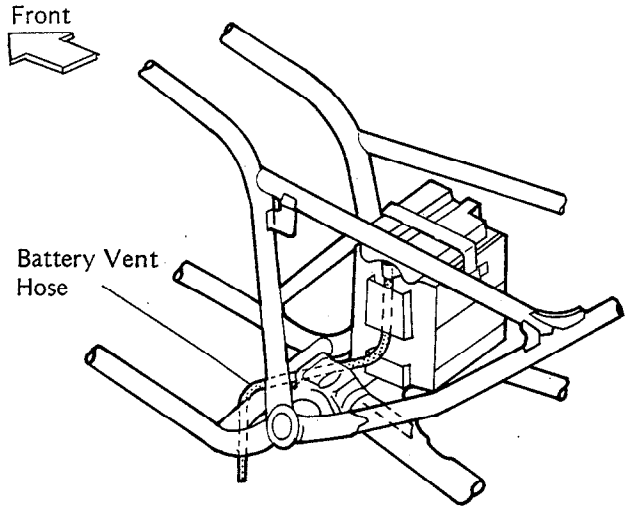



A. Engine Ground Lead

*Battery Vent Hose Routing*

●Route the battery vent hose as shown.

**Battery Vent Hose Routing**

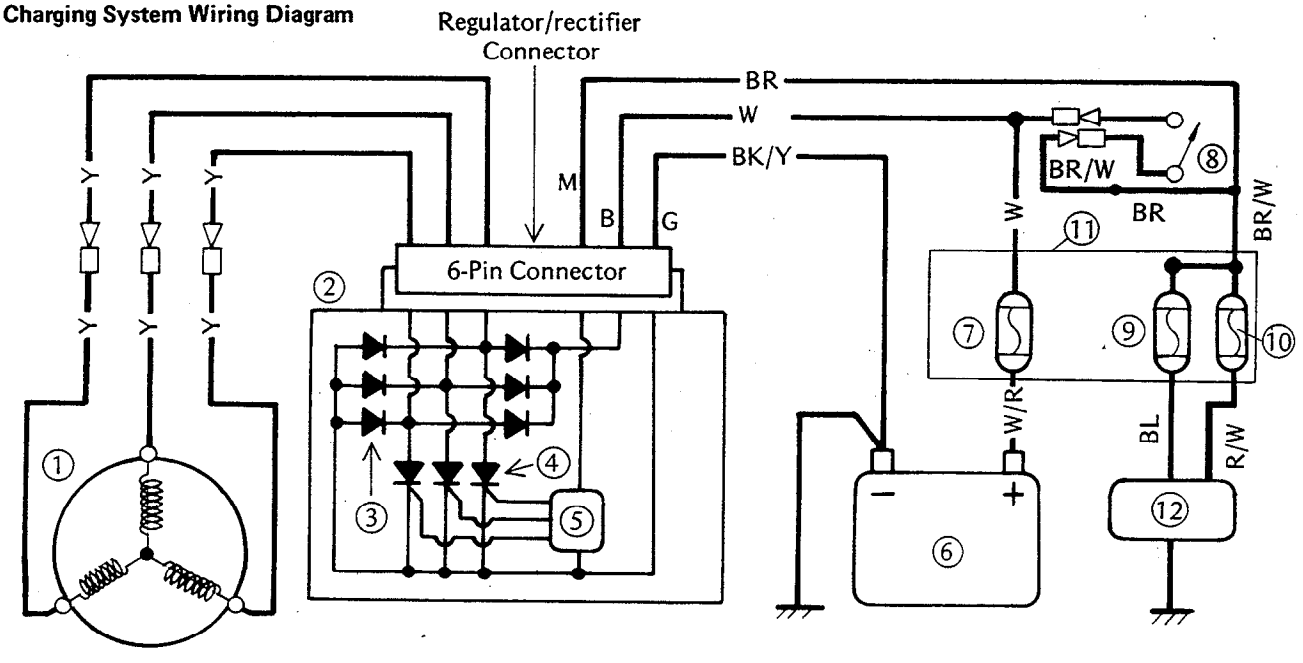



**WARNING**

**○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 can explode the battery.**

## Charging System

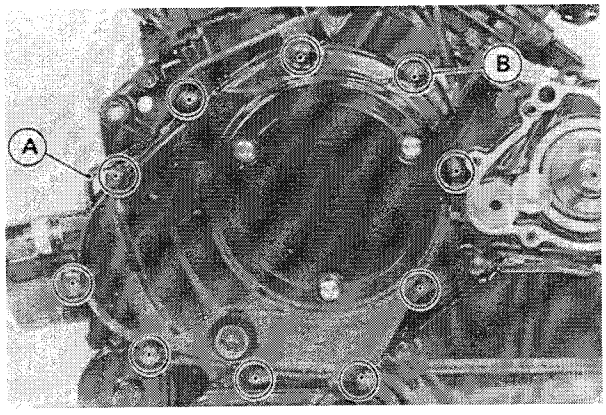
**Charging System Wiring Diagram**




1. Alternator
2. Regulator/rectifier
3. Diodes
4. Thyristors
5. Control Circuit
6. 12 V Battery
7. Main 30 A Fuse
8. Ignition Switch
9. 10A Fuse for Headlight
10. 10A Fuse for Taillight
11. Junction Box
12. Loads: Headlight, Meter Unit, Ignition System, Turn Signal Lights, Brake Lights, Cooling Fan, Horn

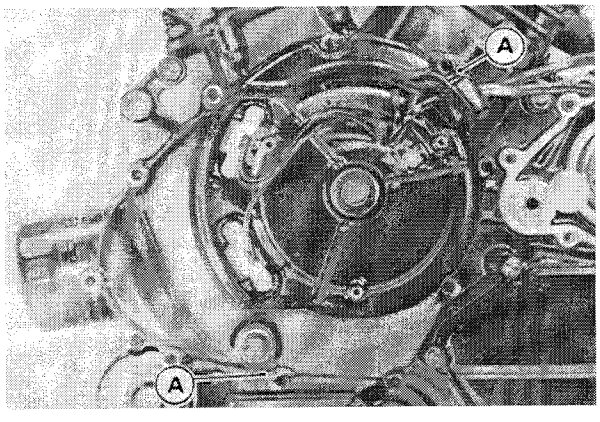
### *Inside Alternator Cover Removal*

- Remove the engine from the frame (see Engine Removal/Installation chapter).
- Remove the outside oil pipe (see Outside Oil Pipe Removal in Engine Lubrication System).
- Remove the inside alternator cover mounting bolts.




A. Outside Oil Pipe B. Bolts

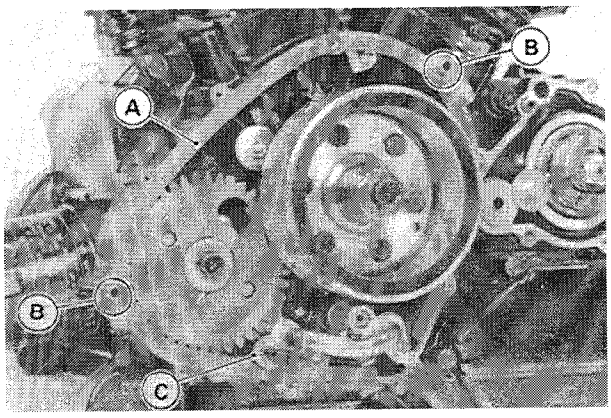
- Pry off the cover with a thick blade screwdriver.




A. Pry Points (2)

### *Inside Alternator Cover Installation Notes*

- Check to see that the gasket, the shift shaft washer and the knock pins are in place.



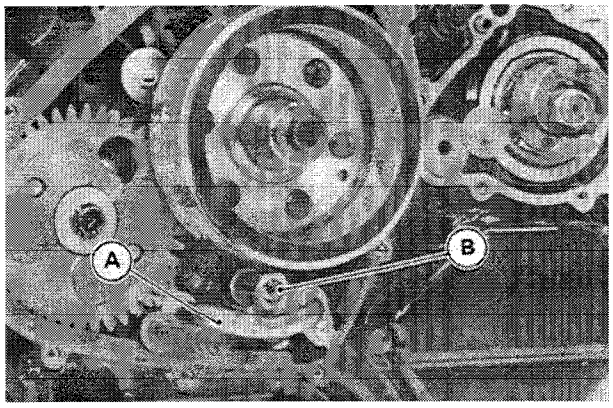

A. Gasket
B. Knock Pins
C. Shift Shaft Washer

- When installing the cover and oil pipe mounting bolt shown, apply a non-permanent locking agent to the threads.


A. Sealant Coated Bolt, 30 mm long

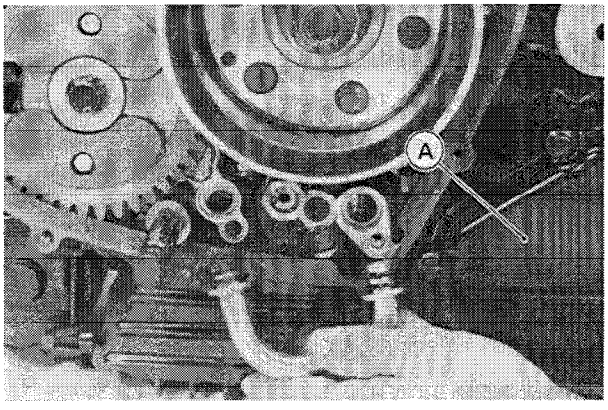
### *Alternator Rotor Removal*

- Remove the inside alternator cover (see Inside Alternator Cover Removal).
- Remove the left side oil pipe and the oil relief valve for alternator rotor removal convenience.



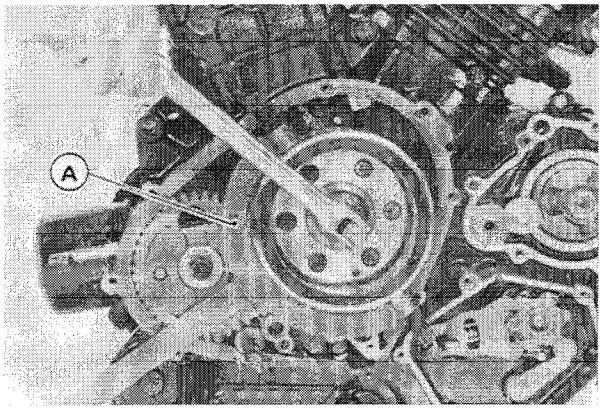

A. Oil Pipe B. Oil Relief Valve

•Also, remove the shift cover (see Shift Cover Removal in Crankshaft/ Transmission chapter).



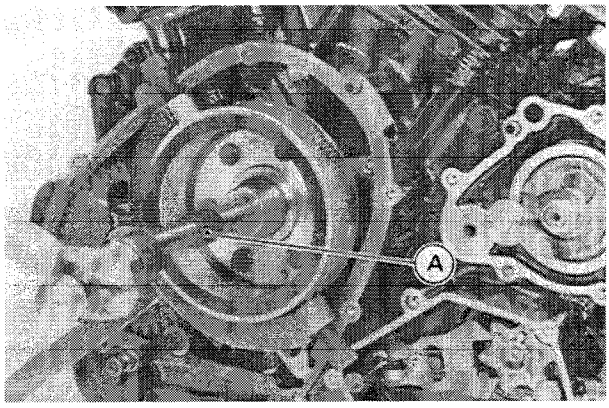

A. Shift Cover

•Remove the rotor bolt while holding the alternator rotor steady with the flywheel holder (special tool).




A. Flywheel Holder: 57001-308

•Use the rotor puller (special tool) to remove the alternator rotor.




A. Rotor Puller: 57001-1099 or 1216

**NOTE**

○*If the rotor is difficult to remove, turn the puller shaft with the wrench on it while tapping the head of the shaft with a hammer.*

**CAUTION**

○**Be careful not to strike the rotor itself. Striking the rotor can cause the magnets to lose their magnetism.**

### *Alternator Rotor Installation Notes*

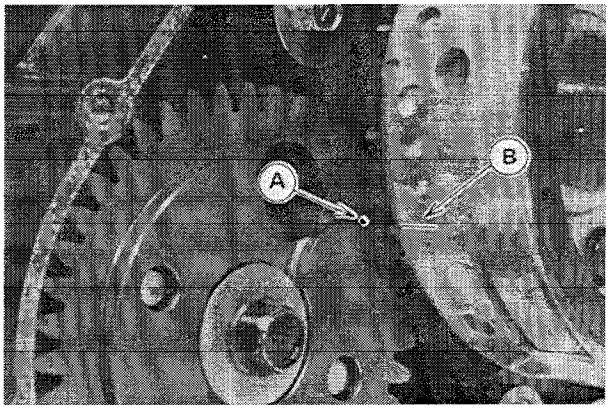
•Clean off any oil or dirt that may be on the crankshaft taper.

**CAUTION**

○**Oil, dirt, or incorrect tightening may cause rotor loosening and serious damage.**

•See that the key is fitted in place on the crankshaft properly, and then fit the rotor in place.

•When installing the alternator, align the alternator gear mark with the balancer punch mark.



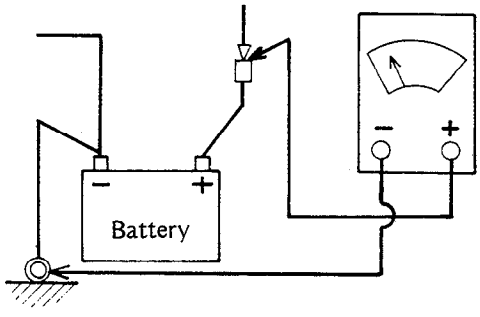

A. Punched Mark or Line Mark B. Line Mark

•Tighten the rotor bolt specified torque using the same holder (special tool) as used during removal.

*Regulator/Rectifier Output Voltage Measurement*

•Warm up the engine to obtain actual alternator operating conditions.
•Stop the engine and connect a voltmeter to the battery leads as shown.

**Regulator/Rectifier Output Voltage**




•Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight of US and Canadian models, disconnect the headlight connector).
★The readings should show nearly battery voltage when the engine speed is low, and as the engine speed rises, the readings should also rise. But they must stay within the specified range.
★If the output voltage is much higher than the specification, the regulator/rectifier is defective.
★If the output voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads.

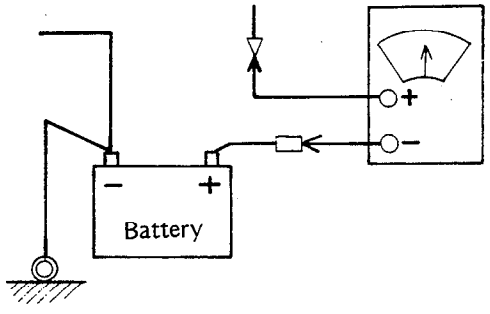
**Regulator/Rectifier Output Voltage**

| | | |
|---|---|---|
| **Meter range:** | | **25 V DC** |
| **Connection:** | | **Battery lead (connected)** |
| **Meter (+)** | — | **W/R lead** |
| **Meter (—)** | — | **BK/Y lead** |
| **Reading:** | | **Battery voltage to 14 — 15 V** |

*Regulator/Rectifier Output Current Measurement*

•Set the ammeter to the 20 A DC range.
•Disconnect the battery + lead.
•Connect the — meter lead to the battery + lead, and connect the + meter lead to the W/R lead. This puts the meter in series with the regulator/rectifier and battery so that the battery charging amperage can be measured.

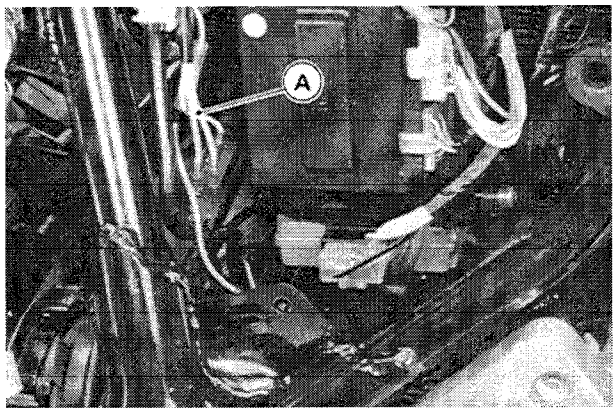
**Measuring Regulator/Rectifier Output Current**




•Remove the fuses for the headlight and taillight so there will be no load other than ignition on the system.
•Start the engine and run it at **4,000 rpm.**
•After the engine is run for a while, the amperage should drop as the battery returns to full charge.
★If the amperage does not drop, check the battery and charge it if it is not fully charged. Repeat this test. If the amperage still does not drop, check the regulator/rectifier.

*Stator Coil Resistance Measurement*

•Disconnect the alternator leads.




A. Alternator Leads

- Zero the ohmmeter and connect it to the alternator leads.
- ★If the measurement is higher than the specification, the stator has an open lead. Replace the stator.
- ★If the measurement is lower than the specification, the stator is shorted and must be replaced.

**Stator Coil Resistance**

| | |
|---|---|
| **Meter range:** | **x 1 Ω** |
| **Connection:** | **Alternator leads** |
| **One meter lead —** | **One yellow lead** |
| **Other meter lead —** | **Another yellow lead** |
| **Reading:** | **0.34 to 0.52 Ω** |

### *Stator Coil Installation Test*

- Disconnect the alternator leads.
- Using the highest resistance range of the tester, measure the resistance between each yellow lead and chassis ground.
- ★Any meter reading less than infinity (∞) indicates a short, necessitating stator replacement.

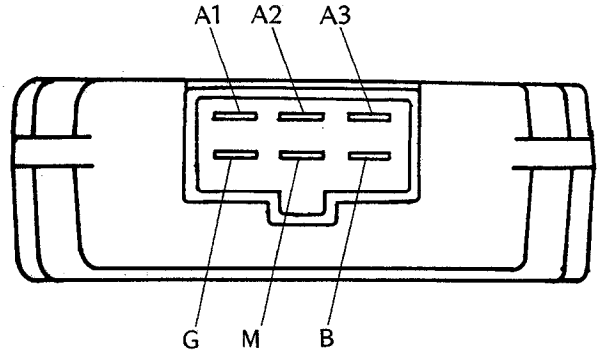
**Stator Coil Insulation Test**

| | |
|---|---|
| **Meter range:** | **x 1 kΩ** |
| **Connection:** | **Alternator leads (disconnected)** |
| **One meter lead —** | **One yellow alternator lead** |
| **Other meter lead —** | **Chassis ground** |
| **Reading:** | **No reading (∞ Ω)** |

### *Regulator/Rectifier Inspection*

- Remove the left side cover.
- Pull out the connector.
- Be sure to set the hand tester to the **100 Ω range** and zero the tester.
- Check the resistance between the regulator/rectifier terminals following the table.
- ★If there is more resistance than the specified value, the unit has an open lead and must be replaced. Much less than this resistance means the unit is shorted, and must be replaced.

**Regulator/Rectifier Terminal**




| | |
|---|---|
| **B** (Battery) Terminal | **A1** (Alternator) Terminal |
| **M** (Monitor) Terminal | **A2** (Alternator) Terminal |
| **G** (Ground) Terminal | **A3** (Alternator) Terminal |

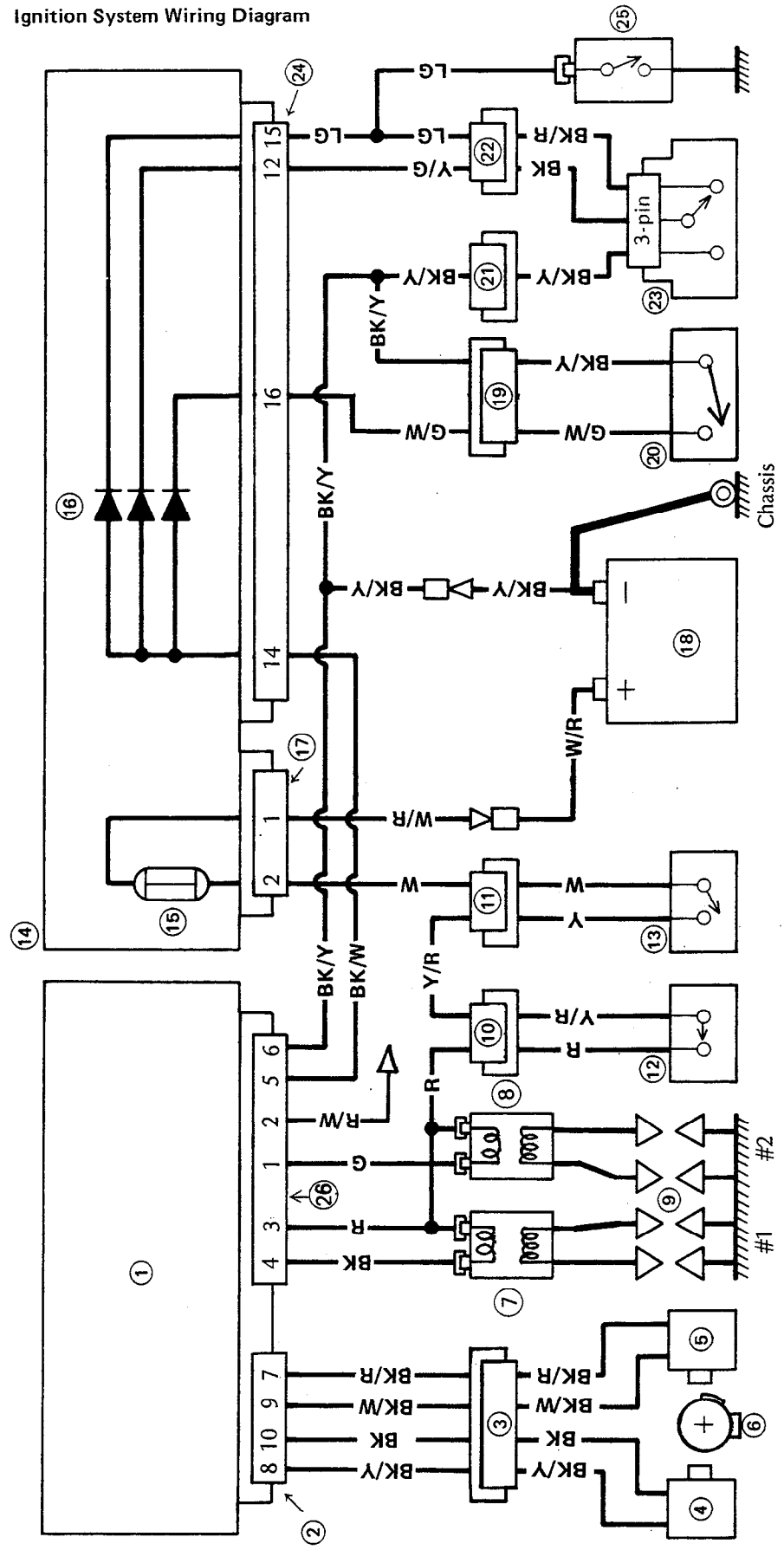
**Regulator/Rectifier Resistance**

| Range x 100 Ω | | Meter (+) Lead Connection | | | |
|---|---|---|---|---|---|
| | Terminal | **B** | **M** | **G** | **A1, 2, 3** |
| Meter (−) Lead Connection | **B** | | ∞ | ∞ | ∞ |
| | **M** | 10 kΩ ~∞ | | 10 kΩ ~∞ | 10 kΩ ~∞ |
| | **G** | 0.4 ~ 2 kΩ | 1 ~ 5 kΩ | | 0.2 ~ 0.6 kΩ |
| | **A1, 2, 3** | 0.2 ~ 0.6 kΩ | ∞ | ∞ | * |

*Any meter reading among A1, A2 and A3 should indicate infinity.

## Ignition System

### Ignition System Wiring Diagram

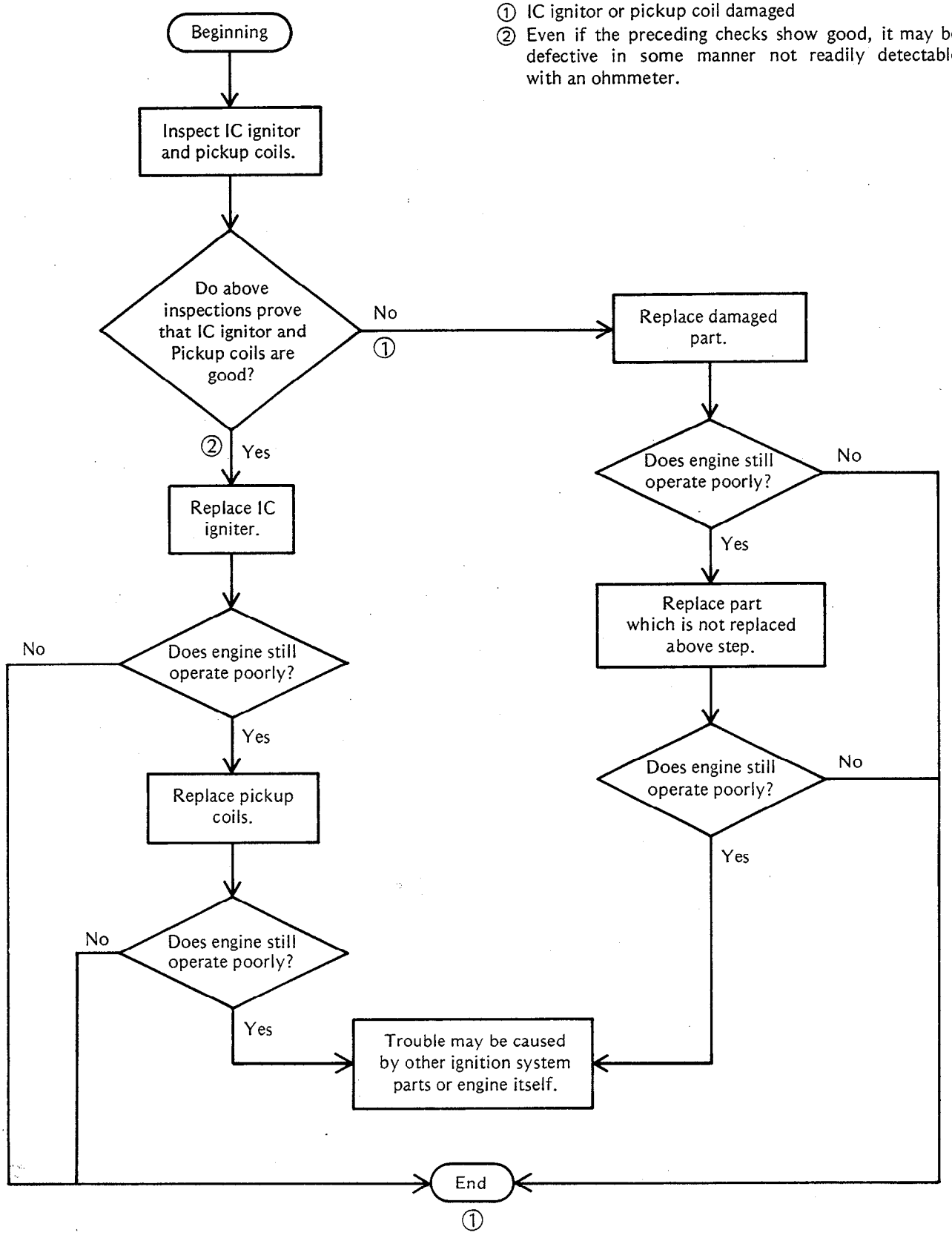


*Ignition System Troubleshooting*

○For any ignition system problems, always check the ignition system wiring first (see Wiring Inspection).

**Ignition System Troubleshooting:**

① IC ignitor or pickup coil damaged
② Even if the preceding checks show good, it may be defective in some manner not readily detectable with an ohmmeter.



### *Safety Instructions*

**WARNING**

**○The ignition system produces extremely high voltage. Do not touch the spark plugs, high tension coils, or spark plug leads while the engine is running, or you could receive a severe electrical shock.**

**CAUTION**

**○Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC ignitor damage.**

**○Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and IC ignitor.**

### *Spark Plug Removal/Installation Note*

●Carefully pull the spark plug cap from the spark plug and unscrew the spark plug.

○If necessary, use spark plug wrench 57001-1024.

●Tighten the spark plug to the specified torque (see Exploded View).

### *Spark Plug Cleaning and Inspection*

●Remove the spark plug

●Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool.

★If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug or its equivalent.

### *Spark Plug Gap*

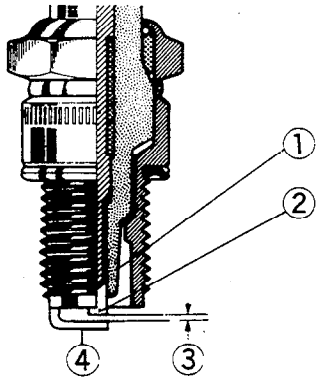
●Measure the gap with a wire-type thickness gauge.

★If the gap is incorrect, carefully bend the side electrode with a suitable tool to obtain the correct gap.

**Spark Plug Gap**

**0.8 – 0.9 mm**

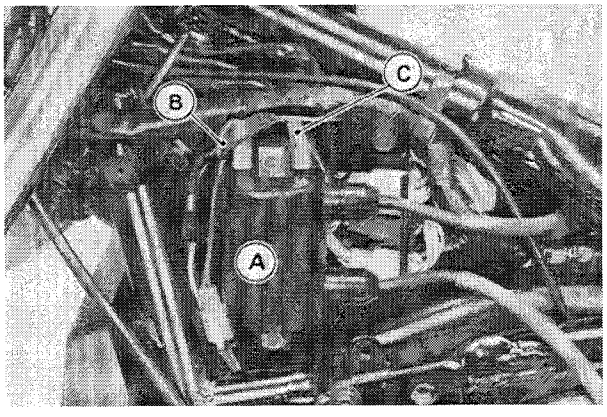
**Spark Plug Gap**



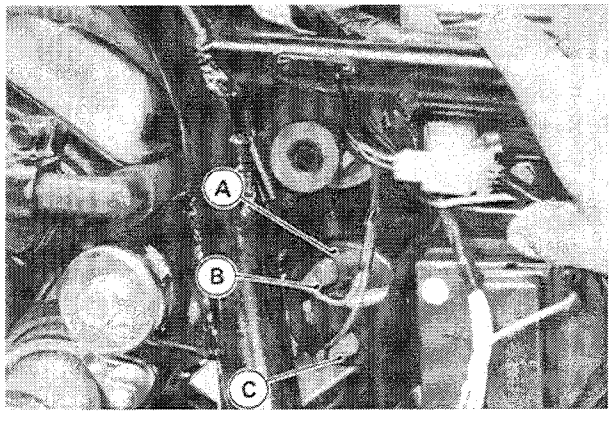

1. Insulator
2. Center Electrode
3. Plug Gap
4. Side Electrode

### *Ignition Coil Installation Notes*

●Connect the primary wires to the primary coil terminals as shown.

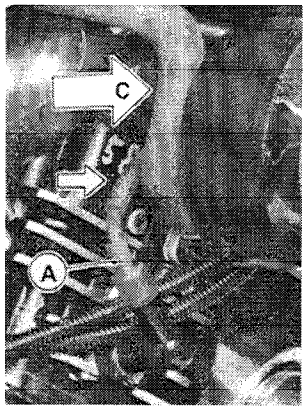


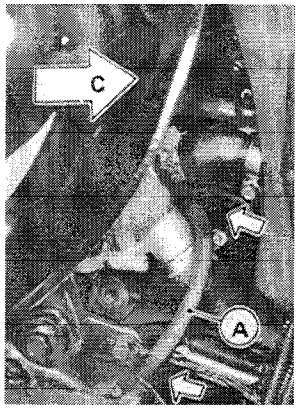

A. Front Ignition Coil
B. R Primary Wire
C. BK Primary Wire

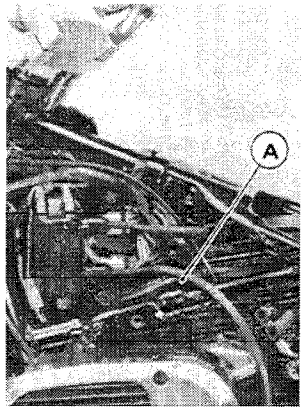


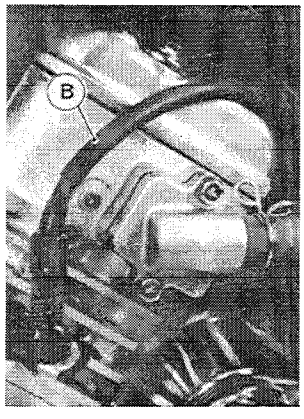

A. Rear Ignition Coil
B. R Primary Wire
C. G Primary Wire

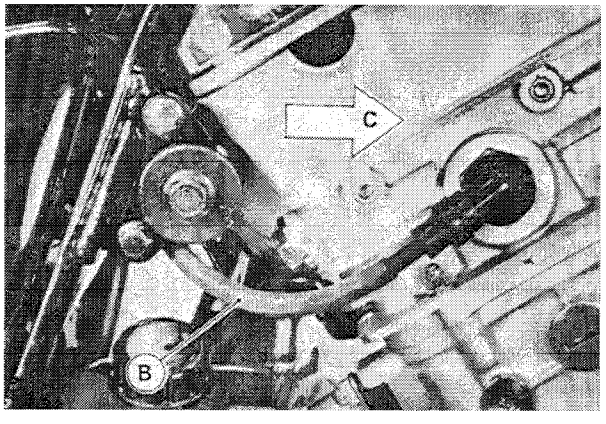
•Install the ignition coils on the original position.
○The front ignition coil has the longest spark plug lead.
•Route each spark plug lead as shown.




A. Front Spark Plug Leads
B. Rear Spark Plug Leads
C. Front

### *Ignition Coil Arcing Distance Measurement*

•Measure the arcing distance with the Kawasaki coil tester (special tool: PN 57001-1242) to check the condition of the ignition coil.

**NOTE**

○*Since a tester other than the Kawasaki coil tester may produce a different arcing distance, the Kawasaki coil tester is recommended for reliable results.*

•Remove the ignition coil.

•Connect the ignition coil (with the spark plug cap left installed at the end of the spark plug lead) to the tester in the manner prescribed by the manufacturer and measure the arcing distance.

**Ignition Coil Arcing Distance**

**7 mm or more**

**WARNING**

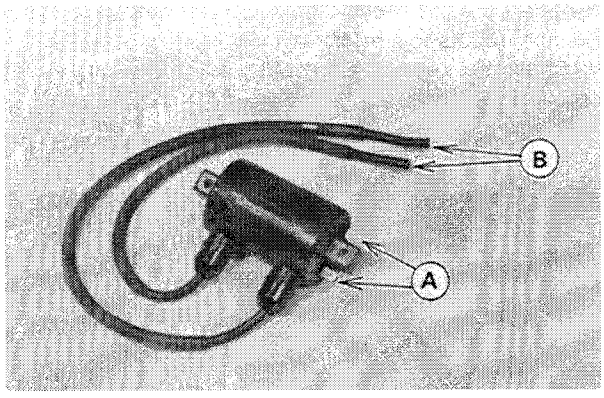
○**To avoid extremely high voltage shocks, do not touch the ignition coil body or leads.**

★If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.
•To determine which part is defective, measure the arcing distance again with the spark plug cap 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 cap.

### *Ignition Coil Resistance Measurement*

If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.
•Disconnect the primary leads from the coil terminals.
•Measure the primary winding resistance.
○Connect an ohmmeter between the coil terminals.
○Set the tester to the x 1 Ω range, and read the meter.
•Measure the secondary winding resistance.
○Pull the spark plug cap off each lead.
○Connect the hand tester between the spark plug leads.
○Set the meter to the x 1 kΩ range, and read the meter.
★If the meter does not read as specified, replace the coil.

**Ignition Coil Winding Resistance**
**Primary windings: 1.8 – 2.2 Ω**
**Secondary windings: 19 – 29 kΩ**



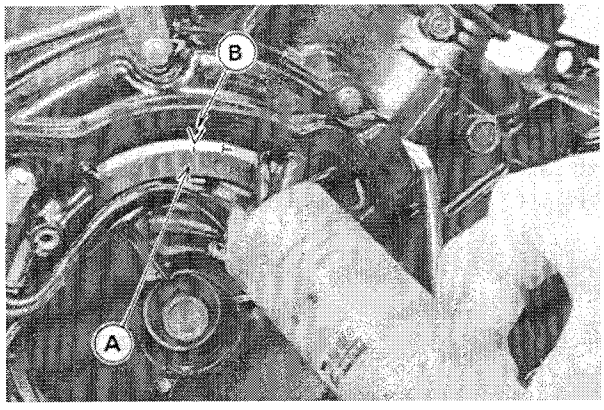

A. Measure primary winding resistance.
B. Measure secondary winding resistance.

★If the meter reads as specified, the ignition coil windings are probably good. However, if the ignition system still does not perform as it should after all other components have been checked, test replace the coil with one known to be good.
●Check the spark plug leads for visible damage.
★If any spark plug lead is damaged, replace the coil.

## *Ignition Timing Inspection (Dynamic)*

This model has a transistorized ignition system. Since the system has no mechanical parts such as a cam or contact breakers, **no periodic maintenance is required.**
●Remove the outside alternator cover (see Pickup Coil Removal).
●Connect the timing light (special tool: 57001-1241) in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
○Use the front spark plug lead for the front cylinder timing inspection and the rear spark plug lead for the rear cylinder.
●Start the engine, run the engine at **1,100 rpm**, and direct the light at the timing marks on the alternator rotor and inside alternator cover. The marks should align at **1,100 rpm.**

**Ignition Timing**
**5° BTDC @1,100 r/min (rpm)**

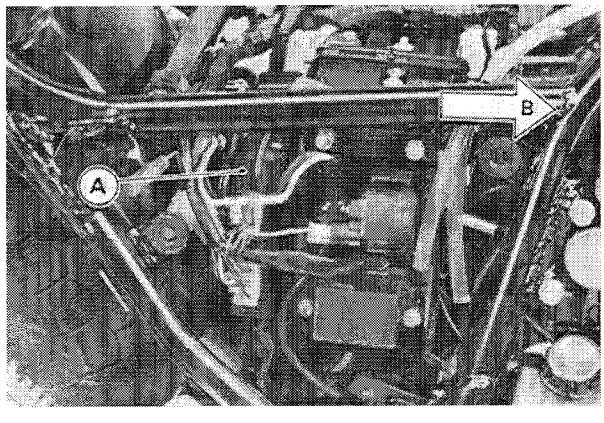



A. Timing Mark B. Timing Mark on the Cover

★If the ignition timing is suspect, check the IC ignitor and the pickup coils (see IC Ignitor Inspection, Pickup Coil Inspection).
●Check the engine oil level and add if necessary (see Oil Level Inspection in Engine Lubrication System).

## *IC Ignitor Inspection*

●Remove the battery case (see Battery Case Removal).
●Remove the IC ignitor.




A. IC Ignitor B. Front

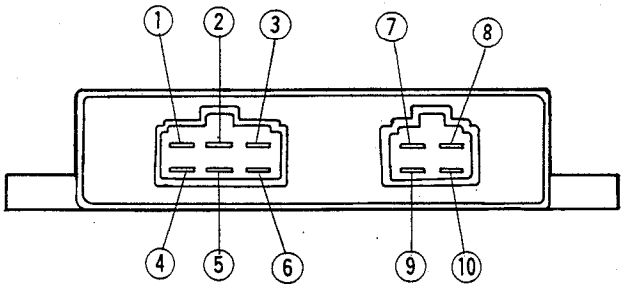
●Set the ohmmeter to the **x 1 kΩ range** and make the measurements shown in the table.
★If the meter readings are not as specified, replace the IC ignitor.

**CAUTION**

○**Use only Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.**

○**If a megger or a meter with a large-capacity battery is used, the IC ignitor will be damaged.**

**Terminal No. of IC Ignitor**



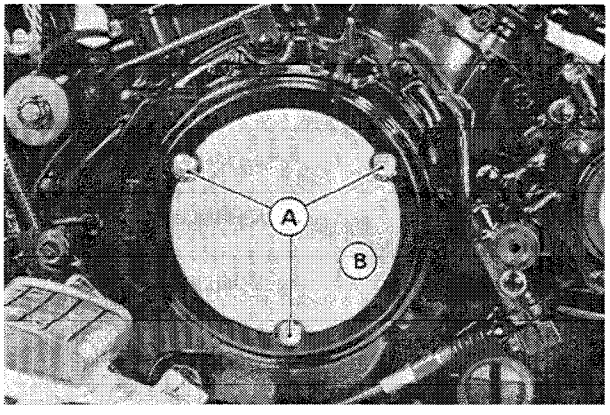

*Outside Alternator Cover Removal*

**NOTE**

○*Outside alternator cover may be removed with the engine installed in the frame.*

●Support the motorcycle on its center stand to keep engine oil loss to a minimum.

●Remove the outside alternator cover by taking out the mounting screws.




A. Screws B. Outside Alternator Cover

**IC Ignitor Internal Resistance**

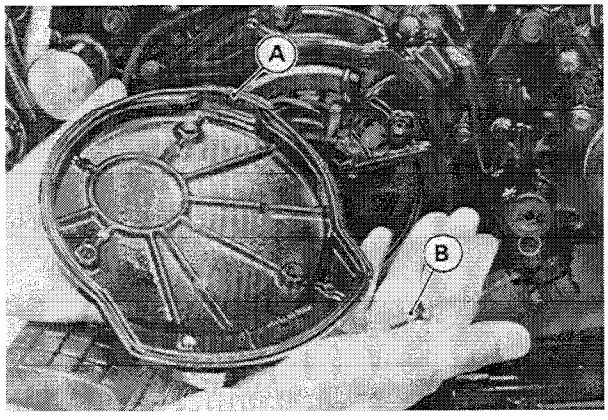
| Tester (−) Lead Connection \ Tester (+) Lead Connection | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | ∞ | ∞ | ∞ | ∞ | ∞ | — | — | — | — |
| 2 | G | | F | G | G | F | — | — | — | — |
| 3 | C | F | | C | E | A | — | — | — | — |
| 4 | ∞ | ∞ | ∞ | | ∞ | ∞ | — | — | — | — |
| 5 | F | G | E | F | | E | — | — | — | — |
| 6 | B | F | A | B | E | | — | — | — | — |
| 7 | — | — | — | — | — | — | | D | D | D |
| 8 | — | — | — | — | — | — | D | | D | D |
| 9 | — | — | — | — | — | — | D | D | | D |
| 10 | — | — | — | — | — | — | D | D | D | |

| Value (kΩ) | |
|---|---|
| ∞ | Infinity |
| A | 0.9 – 1.7 |
| B | 2 – 4 |
| C | 3.6 – 6 |
| D | 4 – 6 |
| E | 8.5 – 15 |
| F | 14 – 26 |
| G | 24 – 50 |

*Measured with hand tester 57001-1394. A tester other than the Kawasaki Hand Tester may show different readings.

### *Outside Alternator Cover Installation Note*

- Fit the gasket into the groove on the outside alternator cover, after applying a small amount of liquid gasket to it.
- Before installing the screws, place each O-ring just under the screw head and apply a thin coat of oil to it in order to prevent its damage.




A. Gasket B. O-Rings

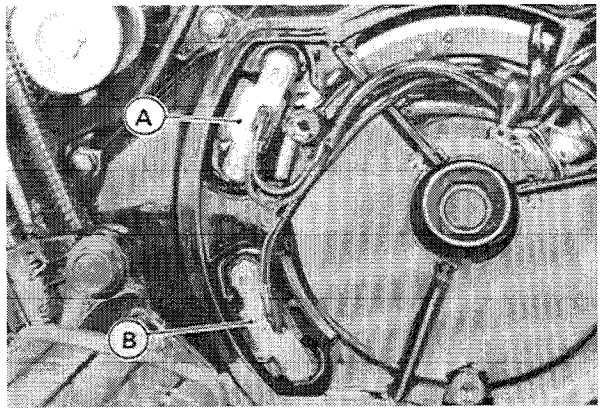
### *Pickup Coil Removal*

- Remove the engine (see Engine Removal/Installation chapter).
- Remove the outside alternator cover (see Outside Alternator Cover Removal).
- Remove the inside alternator cover (see Inside Alternator Cover Removal).
- Cut the wiring straps and pull out the pickup coil connector.
- Remove the pickup coils by removing the mounting screws.

### *Pickup Coil Installation Notes*

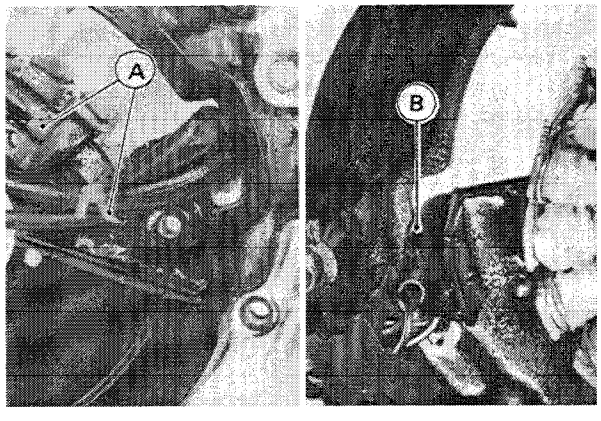
Pickup coil installation is reverse of removal. Note the following.

- Install the pickup coil on the original position shown.



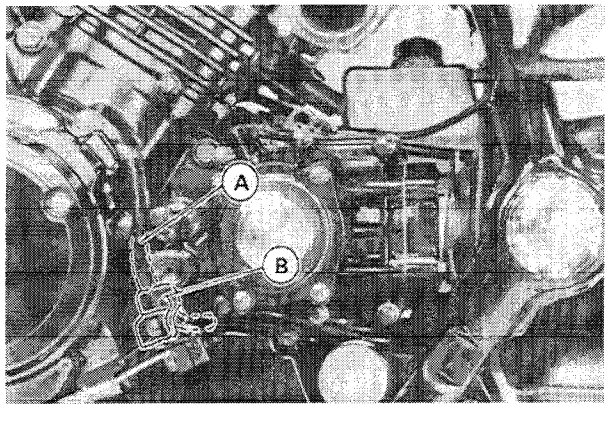

A. Pickup Coil for the Rear Cylinder
:BK/W and BK/R Leads
B. Pickup Coil for the Front Cylinder
:BK/Y and BK leads

- Be sure to route the pickup coil leads onto the inside alternator cover rib and secure them with the new wiring straps as shown to prevent interference with the rotor.




A. Wiring Straps B. Leads

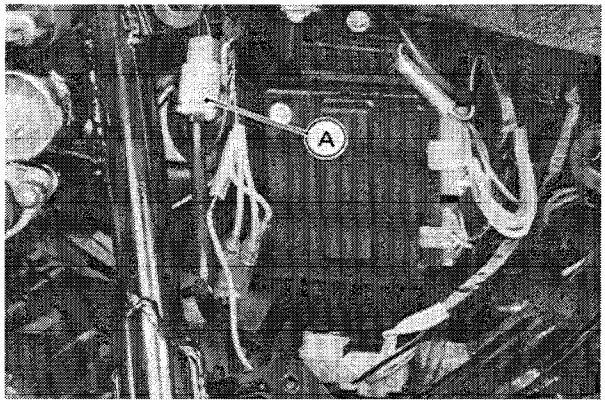
- Install the inside cover and the outside cover.
- Run the pickup coil and the alternator leads as shown.




A. Leads B. Clamp

*Pickup Coil Inspection*

●Pull out the pickup coil connector.




A. Pickup Coil Connector

●Zero the ohmmeter, and connect it to pickup coil leads.

★If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

**Pickup Coil Resistance**
**355 – 535 Ω**

●Using the highest resistance range of the ohmmeter, measure the resistance between the pickup coil leads and chassis ground.

★Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pickup coil assembly.

## Electric Starter System

*Starter Motor Removal*

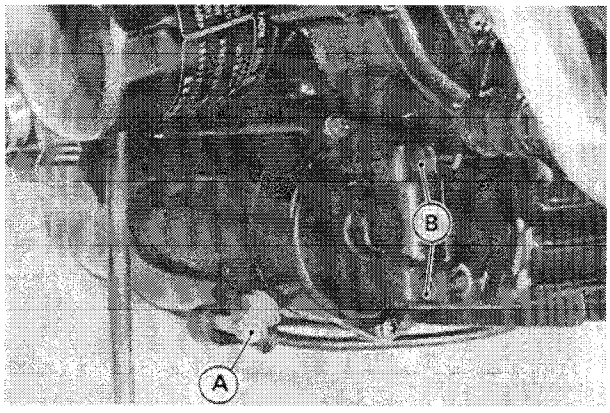
**CAUTION**

○**Do not tap the starter motor shaft. Tapping on the shaft could damage the motor.**

●Drain the engine oil (see Engine Oil Change in Engine Lubrication System).

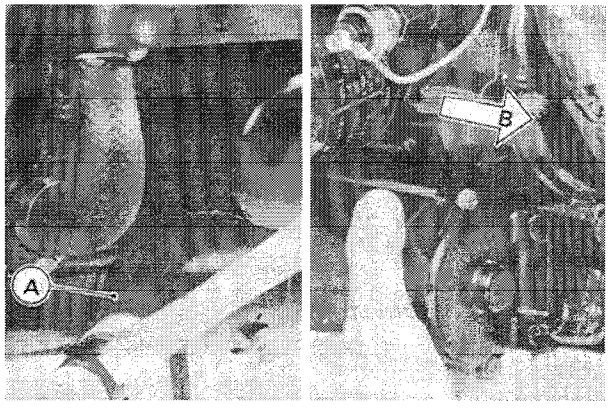
●Unscrew the starter motor terminal nut and remove the starter lead.

●Remove the mounting bolts.



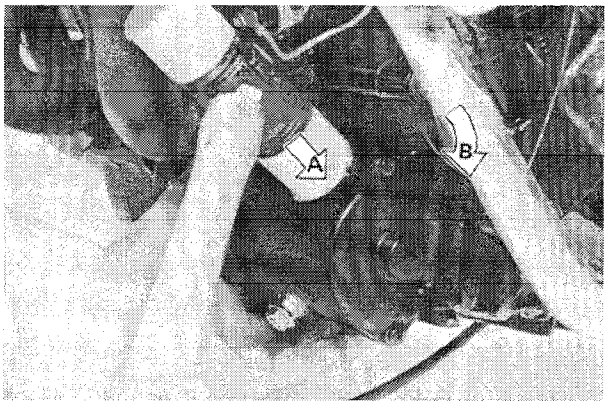

A. Terminal Nut B. Mounting Bolts

●While tapping lightly on the motor front cover, move the motor toward the left until the fitting surface slides out.




A. Tap here B. Move the motor fully.

●Tilt the motor and tap the motor end cover lightly to take it out.



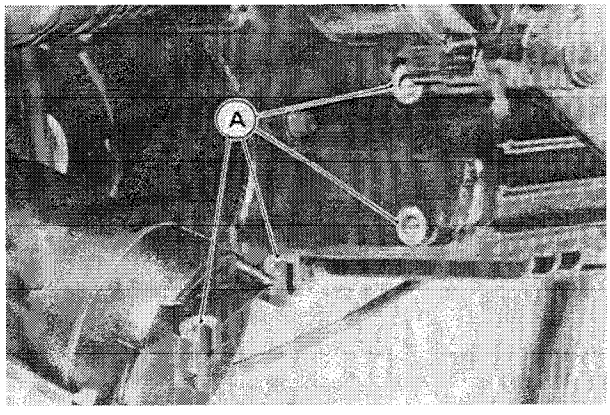

A. Tap here lightly B. Tilt the motor

*Starter Motor Installation Notes*

CAUTION

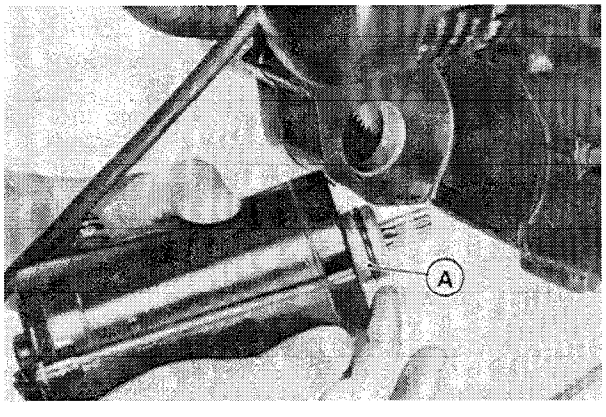
○**Do not tap the starter motor shaft. Tapping on the shaft could damage the motor.**

•When installing the starter motor, clean the starter motor legs and crankcase where the starter motor is grounded.



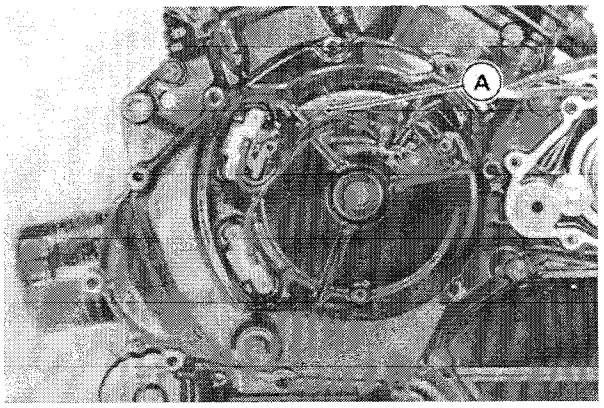

A. Clean here.

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



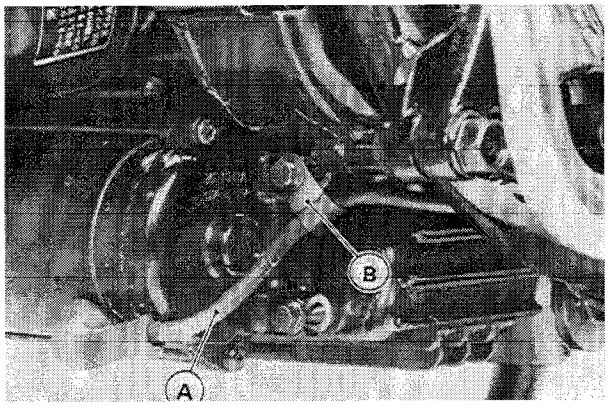

A. O-ring

•Insert the starter motor into the crankcase. If the starter is difficult to insert, turn the alternator by hand so that the motor pinion will mesh with the idle gear.




A. Alternator

•Run the starter motor lead and secure it with a clamp.



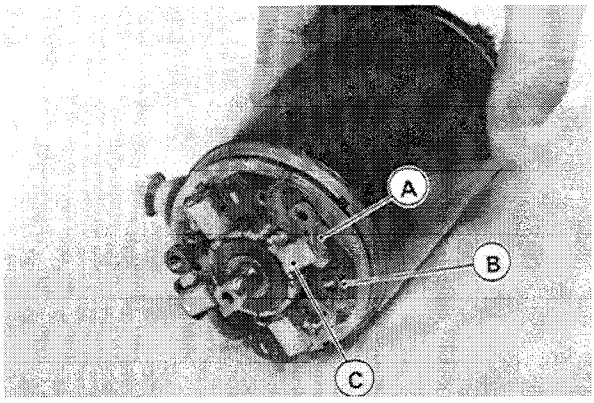

A. Starter Motor Lead B. Clamp

•Check the engine oil level and add oil.

*Starter Motor Disassembly*

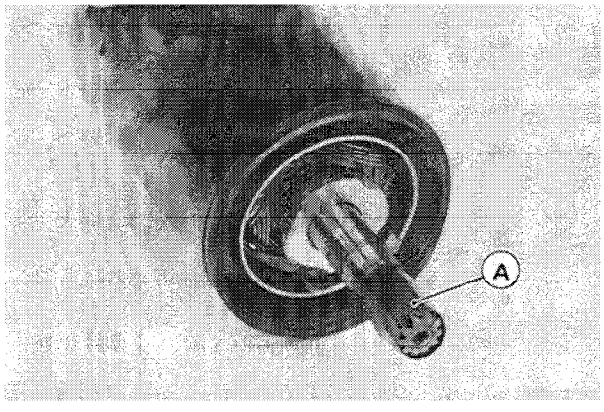
•Insert a suitable washer between each brush holder and spring in order to hold the springs.

○This enables easy armature removal (or installation).




A. Suitable Washer
B. Spring
C. Brush Holder

•Before removing (or installing) the end cover on the pinion side, tape the pinion to prevent oil seal damage.

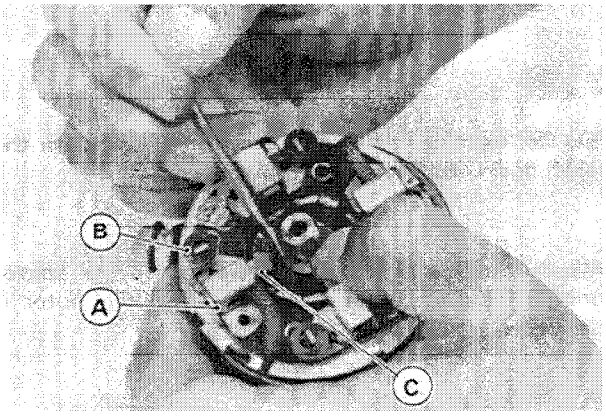



A. Tape the pinion

•Pull out the armature.

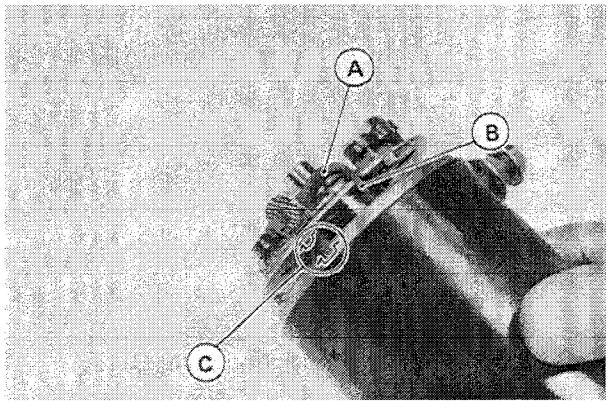
*Starter Motor Assembly*

•After holding the spring with suitable washers, insert the brushes as shown.
•Fit the brush leads into the Ω-shaped notches.



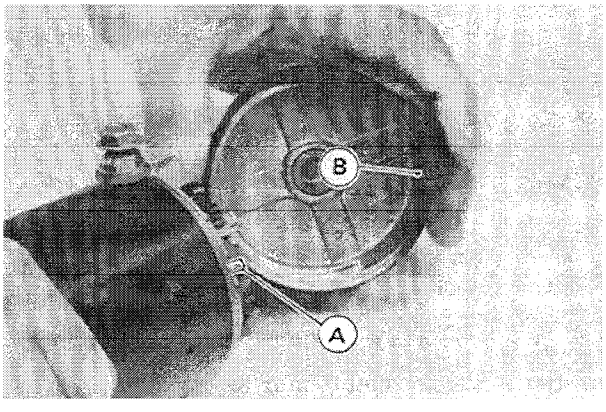

A. Washers
B. Springs
C. Brushes

•Fit the projection of the brush plate into the yoke notch.



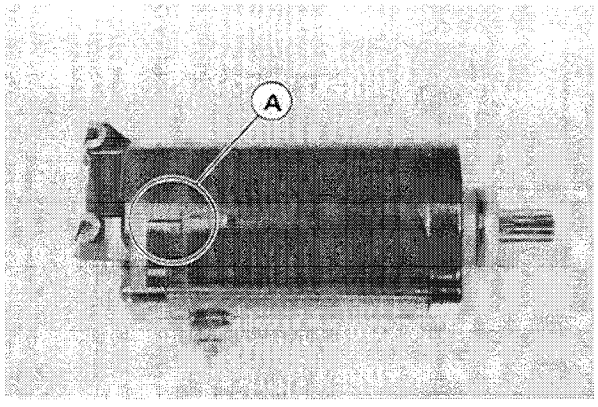

A. Leads
B. Ω-shaped Notches
C. Projection and Notch

•After inserting the armature, pull out the washers to release the springs.
•Fit the long tongue of the brush plate into the end plate groove.




A. Tongue
B. Groove

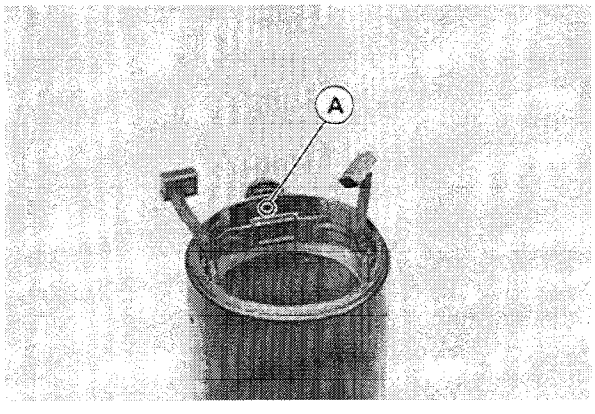
○Tape the pinion to prevent oil seal damage.
○When the yoke, brush plate, and covers are properly assembled, the lines on the yoke and cover should be aligned.




A. Lines

### *Yoke Assembly Note*

●The projection on the insulator comes to the outside.




A. Projection

### *Electrical Starter System Inspection Caution*

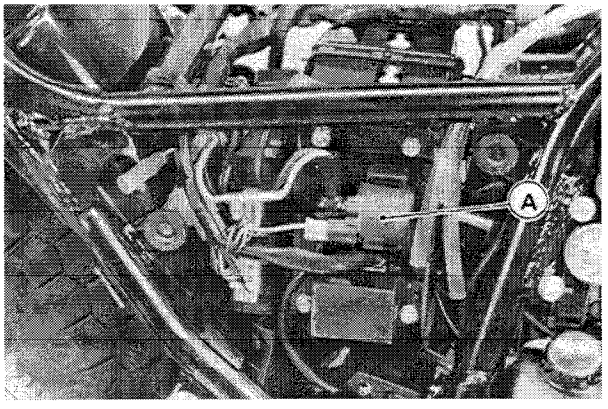
For any electrical starter system problems, always check the electrical starter system wiring first (see Wiring Inspection).

**CAUTION**

**○Because of the large amount of current, never keep the starter switch pushed any time that the starter motor will not turn over, or the current may burn out the starter motor windings.**

### *Starter Relay Inspection*

●Disconnect the starter motor lead and battery positive (+) lead from the starter relay.




A. Starter Relay

**CAUTION**

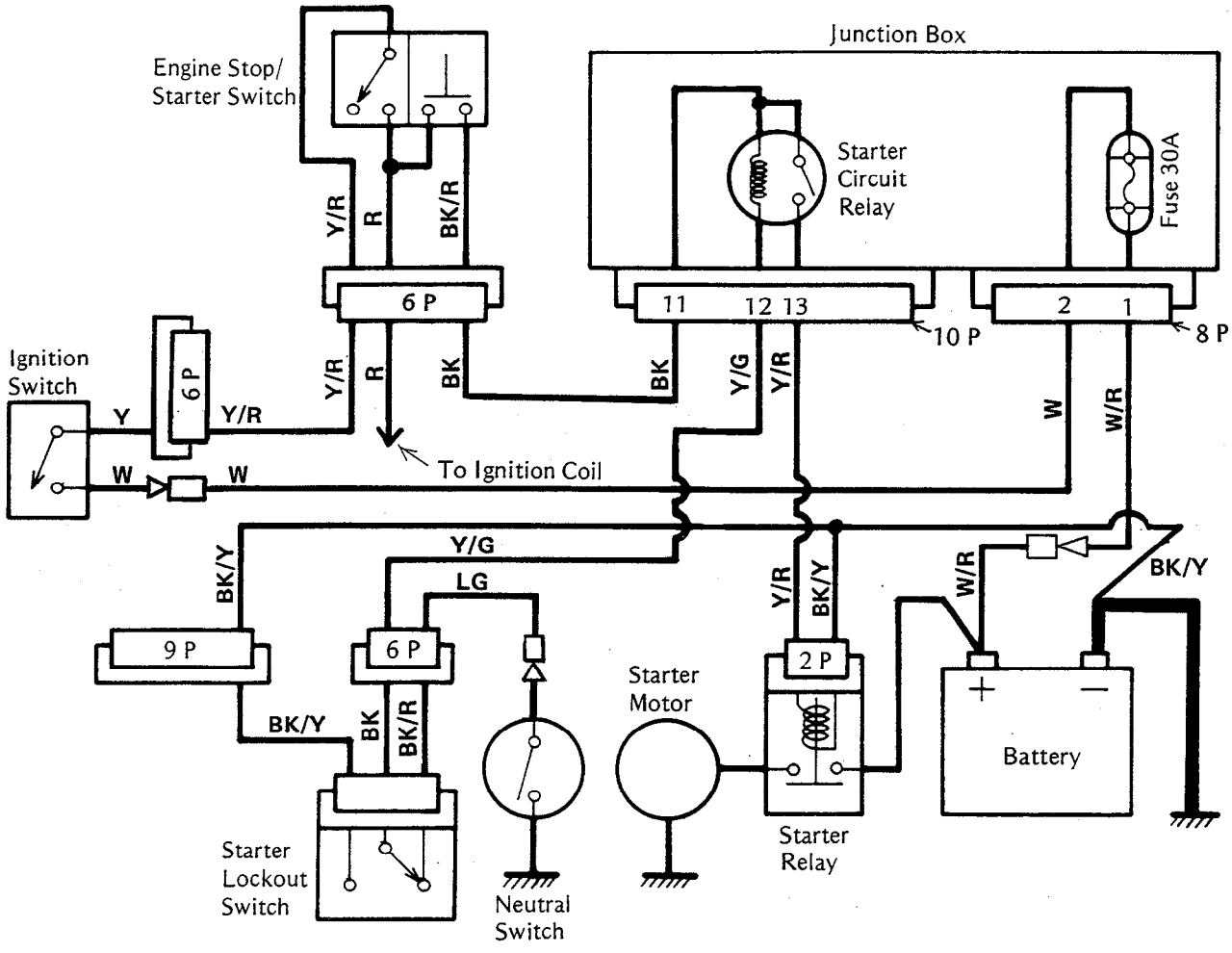
**○The battery positive (+) lead with the rubber cap is connected directly to the battery positive (+) terminal even when the ignition switch is off, so take care not to short the removed lead to chassis ground.**

●Using the x 1 Ω ohmmeter range, measure the resistance across the relay terminals.
★If the relay clicks but the meter does not read zero, the relay is defective and must be replaced. If the relay does not click at all, the relay is defective and must be replaced.
★If the relay makes a single clicking sound and the meter reads zero, the relay is good. The trouble is in the starter motor or the motor power supply wires.

**Switch Position:**
**Ignition switch ON**
**Engine stop switch RUN**
**Starter button ON**
**Neutral switch ON (Transmission is in Neutral)**

| | |
|---|---|
| **Meter Connection:** | |
| **Location** | **Starter relay terminals (Leads disconnected)** |
| **Meter Range** | **x 1 Ω** |
| **Meter Reading:** | **0 Ω and relay clicks when starter switch is pushed.** |

**Electric Starter Circuit**

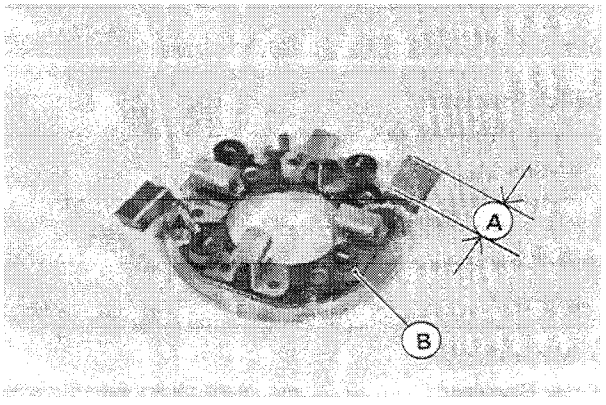



### *Brush Inspection*

- Measure the length of each brush.
- ★If any is worn down to the service limit, replace all brushes.

**Starter Motor Brush Length**

| | |
|---|---|
| **Standard:** | **12.0 – 12.5 mm** |
| **Service Limit:** | **8.5 mm** |



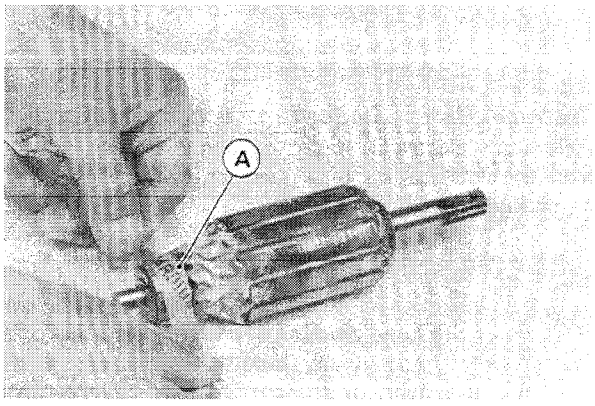

A. Measure brush length. B. Brush Spring

### *Brush Spring Inspection*

- Check that the brush springs are in place and snap the brushes firmly into place.
- ★If not, reinstall or replace the spring.

### *Commutator Cleaning and Inspection*

- Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves.




A. Commutator

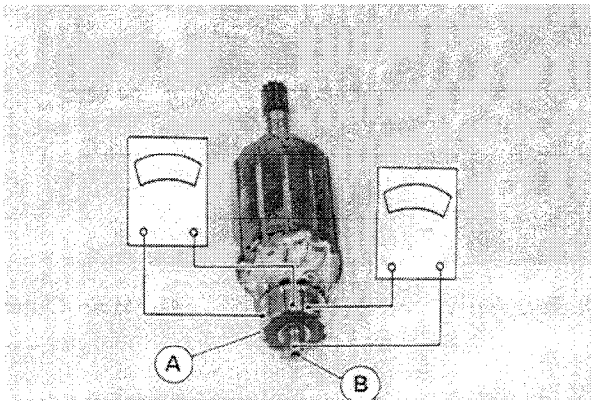
●Inspect the commutator surfaces for discoloration.
★If they are discolored or burned, replace the starter motor.
●Measure the diameter of the commutator.
★Replace the starter motor with a new one if the commutator diameter is less than the service limit.

**Commutator Diameter**

| | |
|---|---|
| **Standard:** | **27.9 – 28.3 mm** |
| **Service Limit:** | **27 mm** |

### *Armature Inspection*

●Using the x 1 Ω ohmmeter range, measure the resistance between any two commutator segments.
★If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.



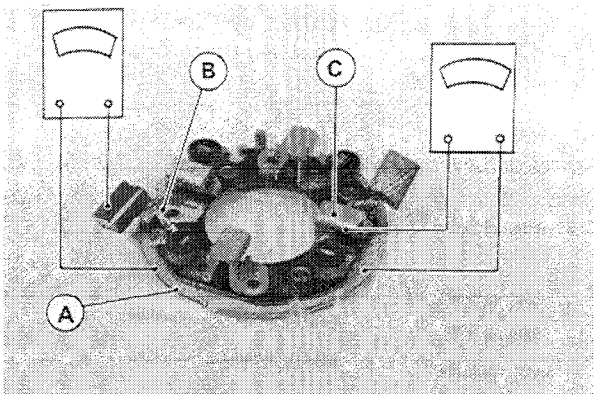

A. Segment B. Shaft

●Using the highest ohmmeter range, measure the resistance between the commutator and the shaft.
★If there is any reading at all, the armature has a short and the starter motor must be replaced.

Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.

### *Brush Plate Inspection*

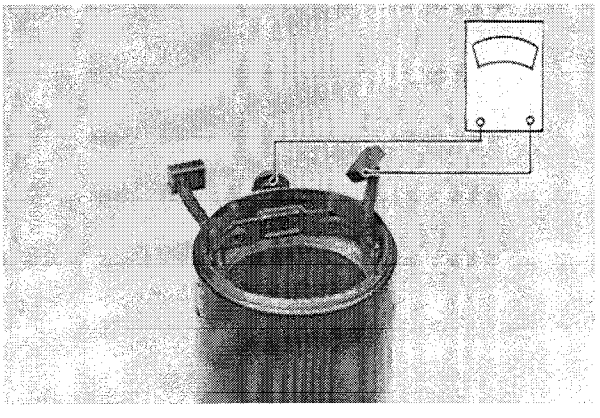
●Using the x 1 Ω ohmmeter range, measure the resistance between the carbon brush and the plate.
★If there is not close to zero ohms, the brush plate has an open and it must be replaced.
●Using the highest ohmmeter range, measure the resistance between the metal plate and the brush holders.
★If there is any reading at all, the brush holder has a short and the brush plate must be replaced.




A. Metal Plate C. Brush Holders
B. Brush Leads

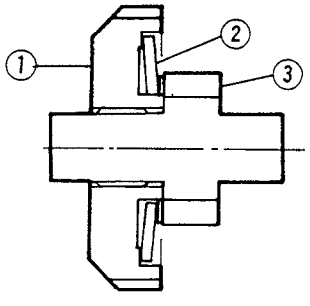
### *Brush and Lead Assembly Inspection*

●Using the x 1 Ω ohmmeter range, measure the resistance between the brush and the terminal bolt.
★If there is a high resistance or no reading (∞), a lead is open and the brush and lead assembly must be replaced.



### *Torque Limiter Installation Note*

For later VN700, 750 model, a torque limiter is newly equipped in place of the starter idle gear.
●Apply a molybdenum disulfide grease to the shaft of the torque limiter.




1. Gear 2. Spring 3. Pinion

### *Torque Limiter Inspection*

●Remove the torque limiter and visually inspect it.
★If the limiter has wear, discoloration, or other damage, replace it as a set.

### *Starter Clutch Removal*

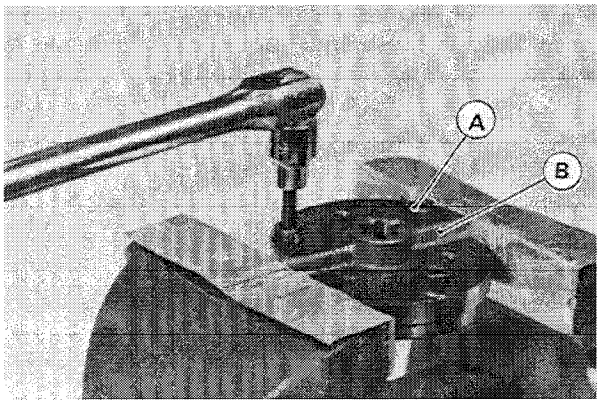
○See Right Balancer Removal in Crankshaft/Transmission chapter.

### *Starter Clutch Installation*

○See Right Balancer Installation in Crankshaft/Transmission chapter.

### *Starter Clutch Disassembly*

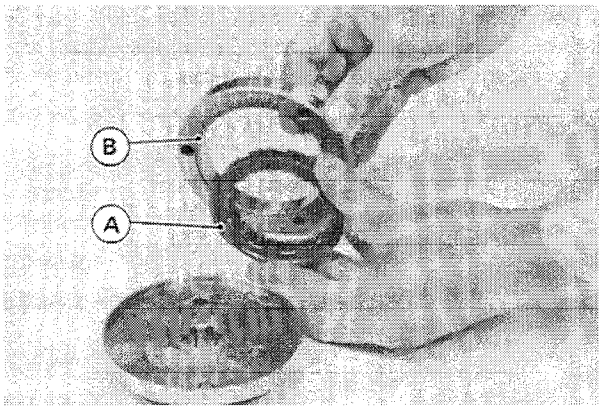
●Remove the right balancer.
●Remove the starter coupling bolts with the balancer held with a vise as shown.
●Pull the coupling out of the balancer.
●Push out the one-way clutch from the coupling.




A. Bolts B. Balancer and Coupling

### *Starter Clutch Assembly Notes*

●Be sure to install the one-way clutch so that the flange fits on the coupling recess

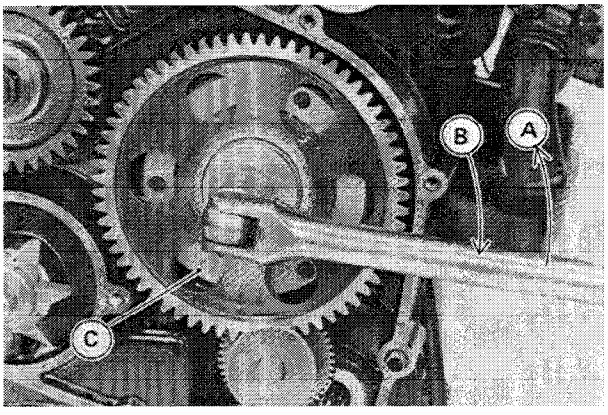



A. Flange B. Coupling Recess

●Insert the right balancer on the coupling.
●Tighten the mounting bolts to the specified torque, after applying a non-permanent locking agent to the threads (see Exploded View).

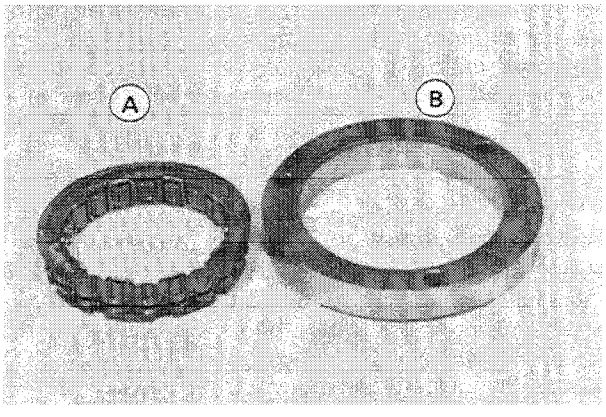
### *Starter Clutch Inspection*

●Turn the starter clutch by holding the balancer shaft bolt with a wrench.
○When viewed from the right side of the engine, the clutch should turn counterclockwise freely, but should not turn clockwise.

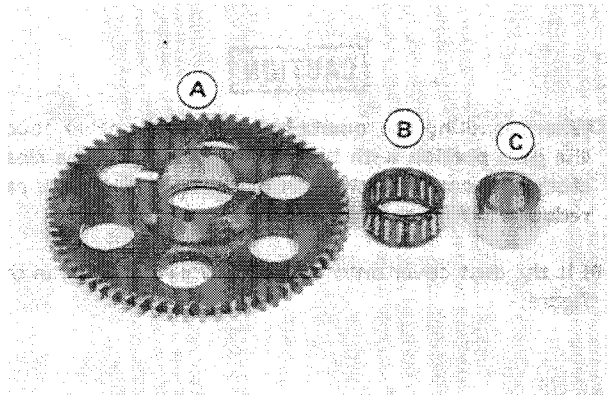



A. Turn freely B. Locked C. Starter Clutch

★If the starter clutch does not operate as it should or if it makes noise, go to the next step.
●Disassemble the starter clutch.
★If the one-way clutch installation is incorrect, reinstall it.
★Visually inspect the clutch parts for damage: one-way clutch, starter coupling and starter gear.
★If there is any worn or damaged part, replace it.




A. One-way Clutch B. Inner Race (Starter Coupling)



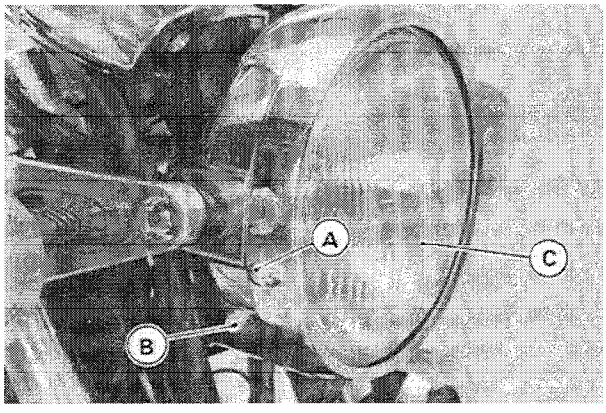

A. Starter Gear
B. Needle Bearing
C. Collar

## Lighting System

The headlight beam is adjustable both horizontally and vertically. Headlight aiming must be correctly adjusted for your safe riding as well as oncoming drivers. In most areas it is illegal to ride with improperly adjusted headlights.

### *Headlight Beam Horizontal Adjustment*

●Turn the adjusting screw on the headlight rim in or out until the beam points straight ahead. Turning the adjusting screw clockwise makes the headlight beam point to the left.

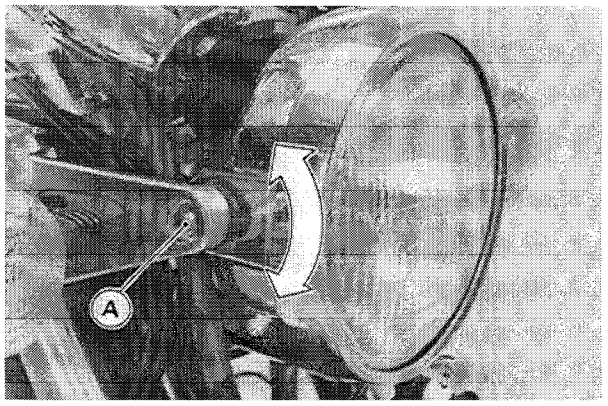



A. Adjusting Screw
B. Mounting Screws
C. Headlight Unit

### *Headlight Beam Vertical Adjustment*

●Just tilt the headlight unit by hand for vertical adjustment.

○It is not necessary to loosen the headlight housing mounting bolts.



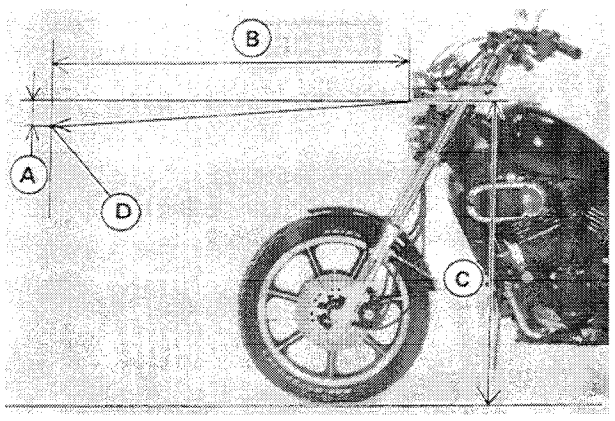

A. Mounting Bolts

**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.*

○*For US model, the proper angle is 0.4 degrees below horizontal. This is a 50 mm (2 in) drop at 7.6 m (25 ft) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.*

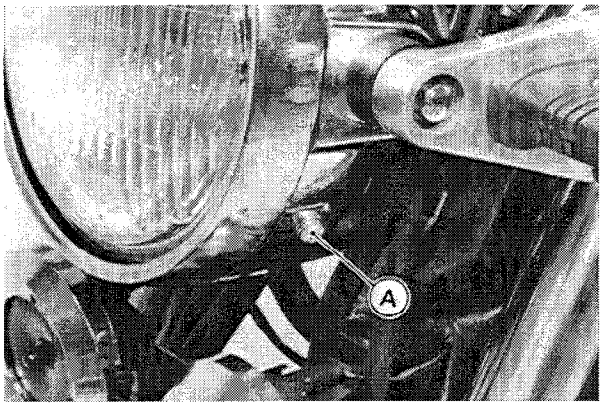
**Vertical Adjustment**




A. 50 mm (2 in)
B. 7.6 m (25 ft)
C. Height of Headlight Center
D. Center of Brightest Spot

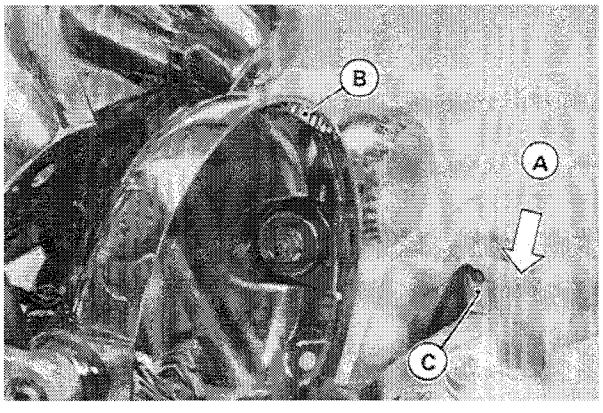
### *Headlight Removal*

●Remove the mounting screws.




A. Mounting Screws

●Tap the headlight unit top lightly to unhook the tab from the stop and drop out the unit.

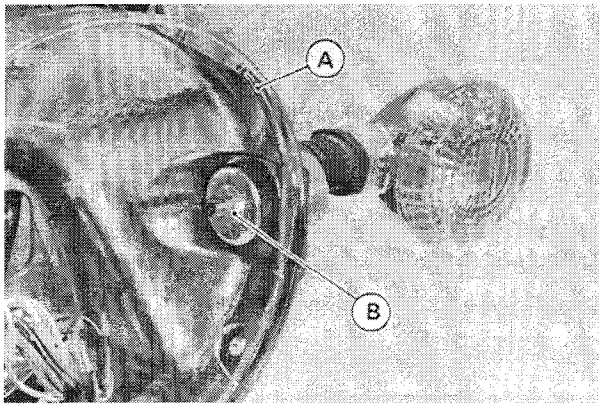



A. Tap here
B. Stop
C. Tab

**CAUTION**

○**Do not force forward the headlight body, which is made of plastic.**

●Pull off all the connectors and leads.
●Remove the headlight housing mounting nuts and bolts on both sides to take off the housing.




A. Headlight Housing
B. Mounting Nuts and Bolts

*Headlight Bulb Replacement Notes*

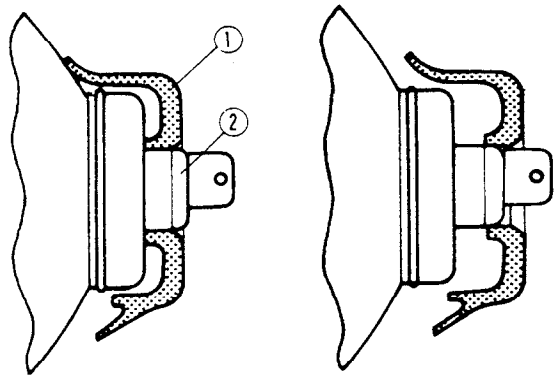
**CAUTION**

○**When handling the quartz-halogen bulbs, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.**

●Fit the dust cover onto the bulb firmly as shown in the figure.

**Dust Cover Installation**

782109

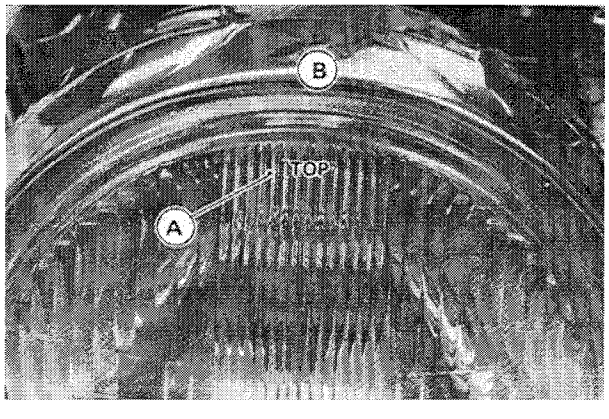



Good Bad

1. Dust Cover
2. Headlight Bulb

*Headlight Unit Installation Notes*

●Install the headlight unit so that the "TOP" mark on the lens points up.

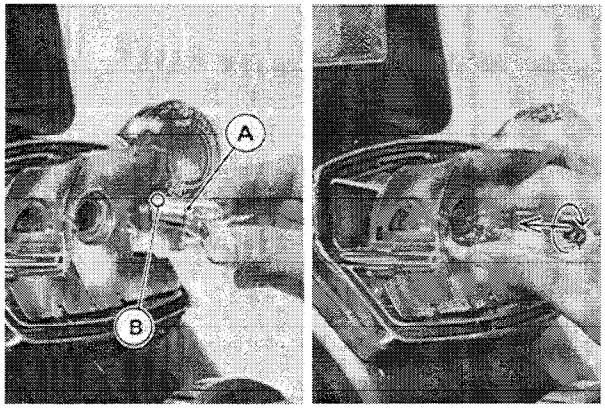



A. Top Mark
B. Up

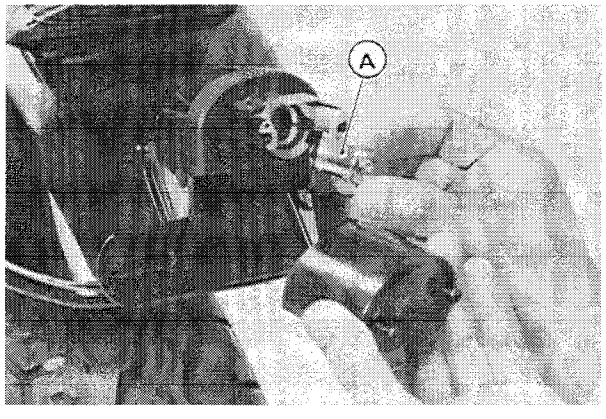
●Check the headlight aiming after installation.

### *Tail/Brake Light and License Plate Light Bulb Replacement Notes*

●Insert the new bulb by aligning the pins with the grooves in the socket.
●Push the bulb in, turn it clockwise, and release it. It should lock in position.
●Be careful not to overtighten the lens mounting screws.




A. Tail Brake Light B. Pin

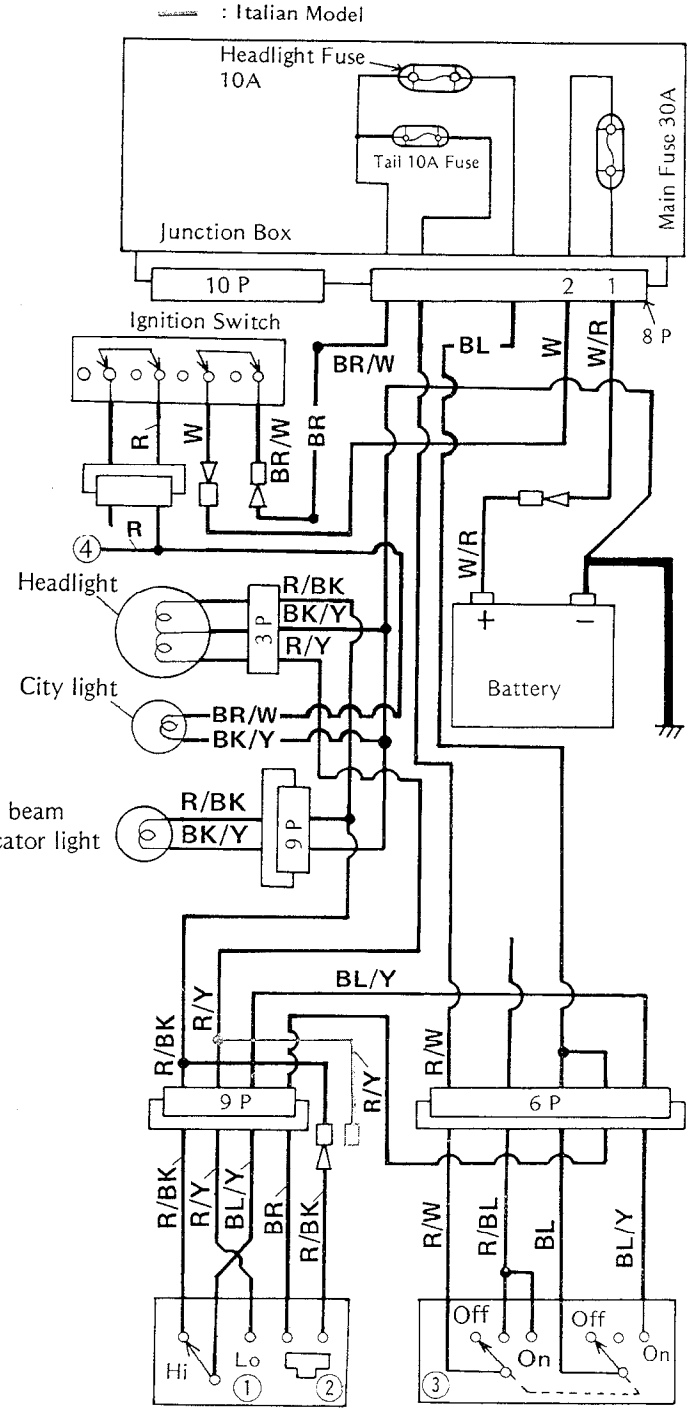



A. License Plate Light

### *Lighting System Inspection Note*

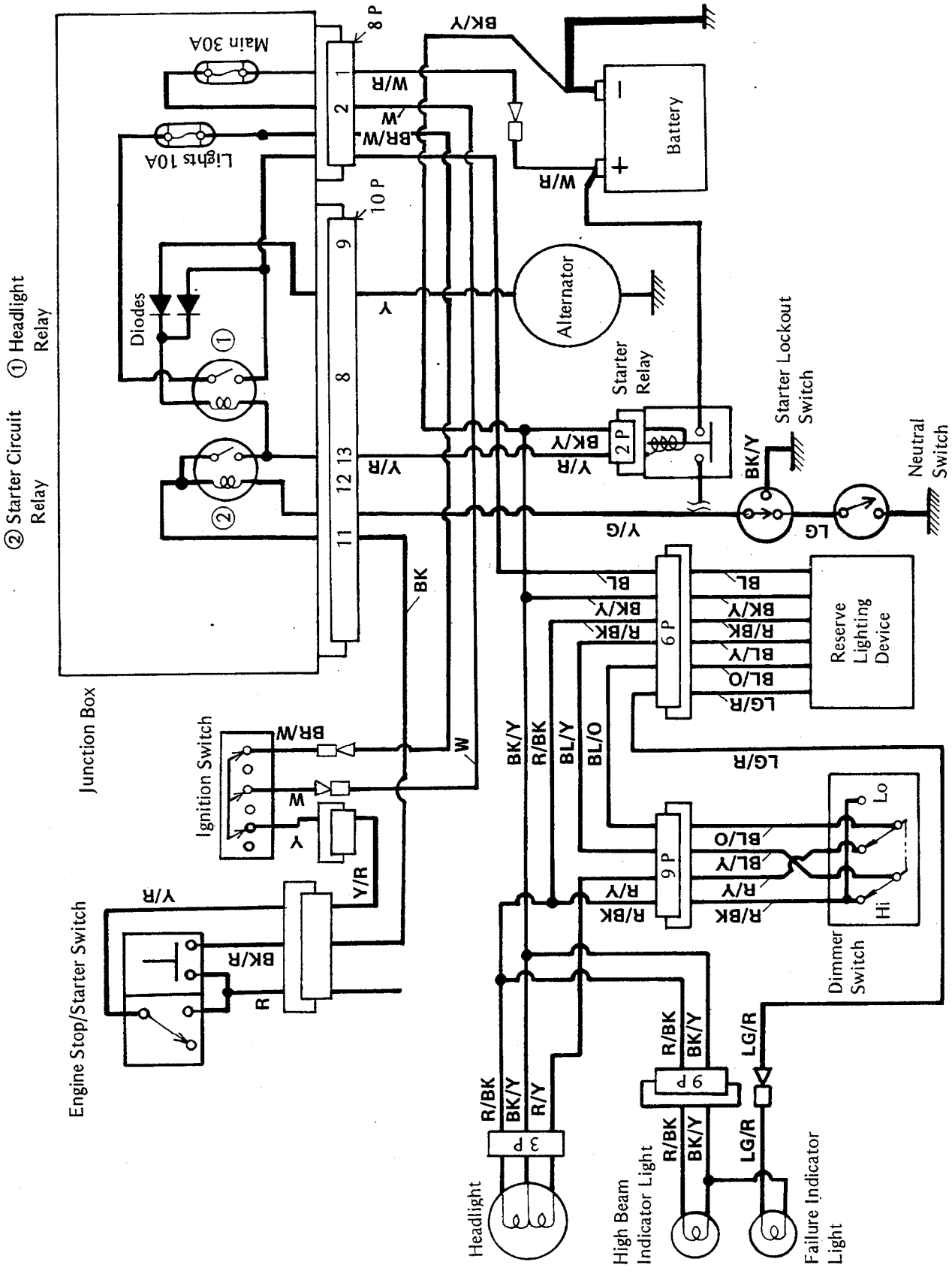
○For any lighting system problems, always check the lighting system wiring and the bulbs first (see Wiring Inspection).

**Headlight Circuit (other than US and Canadian Models)**




1. Dimmer Switch
2. Passing Button
3. Headlight Switch
4. To Tail Light

**Headlight Circuit**
**(US and Canada Models shown)**



### *Headlight Reserve Lighting System Inspection (US and Canadian Models)*

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 circuit. In these models, the headlight does not go on when the ignition switch is first turned on, but the headlight goes on once the starter button is pushed to start the engine, and stays on until the ignition switch is turned off. But the headlight goes out whenever the starter button is pushed to restart the engine after engine stalling.

★If all wirings and components other than the reserve lighting device check out good, the device is defective.

**Reserve Lighting System Operation**

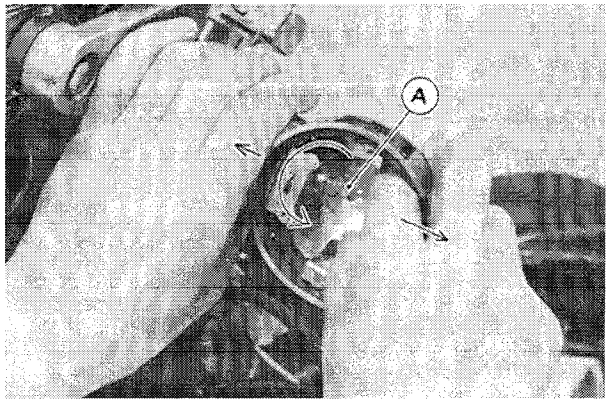
| Headlight | Dimmer Switch Position | Headlight Failure Indicator Light | Reserve Lighting |
|---|---|---|---|
| Both high and low beam filaments are normal | HI | Goes on (hardly visible) | ——— |
| | LO | Goes on (hardly visible) | ——— |
| High beam filament burned out | HI | Goes on | Low beam comes 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

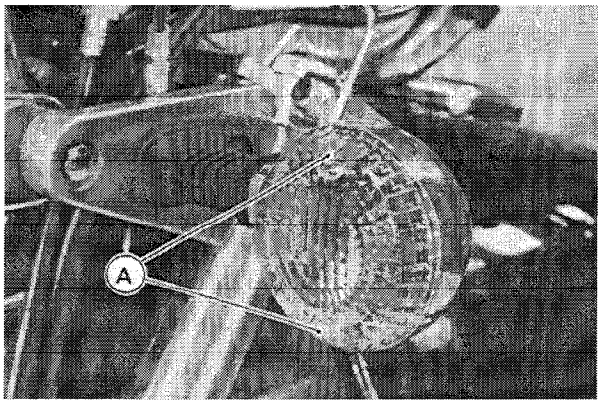
### *Turn Signal Light Bulb Replacement*

- Unscrew the mounting screws to remove the lens.
- Push the bulb in, turn it counterclockwise, and pull it out.
- Be sure the socket is clean.
- Insert the new bulb by aligning the pins with the grooves in the socket.
- Push the bulb in, turn it clockwise, and release it. It should lock in position.

○Be careful not to overtighten the lens mounting screws.




A. Bulb



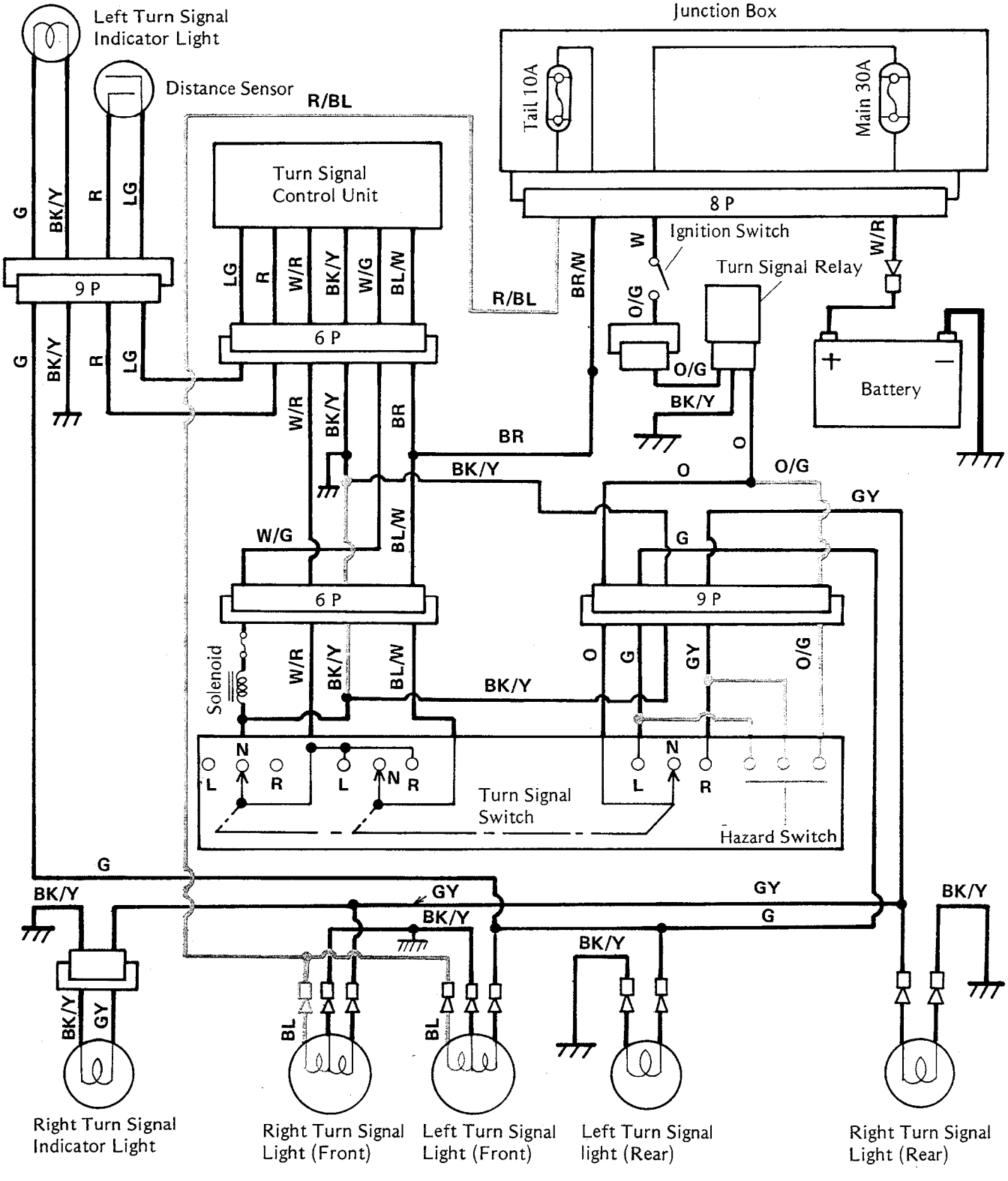

A. Mounting Screws

## Turn Signal Circuit and Automatic Cancelling System (VN700A and VN750-A1, A2, A3, A4, Models)

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.

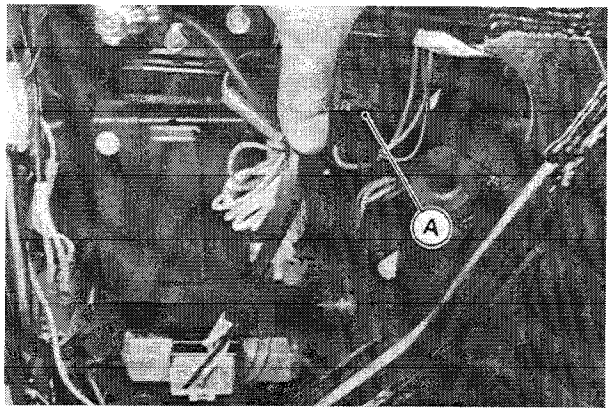
The cancelling system consists of the battery (power source), turn signal control unit, distance sensor, solenoid, and turn signal switch. When the turn signal switch is pushed to the left or right, the turn signals start flashing and the control unit starts counting off 4 seconds. At the end of this 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.

: US and Canada Model



### *Turn Signal Relay Inspection*

- Remove the seat and the left side cover.
- Remove the turn signal relay from the battery case.

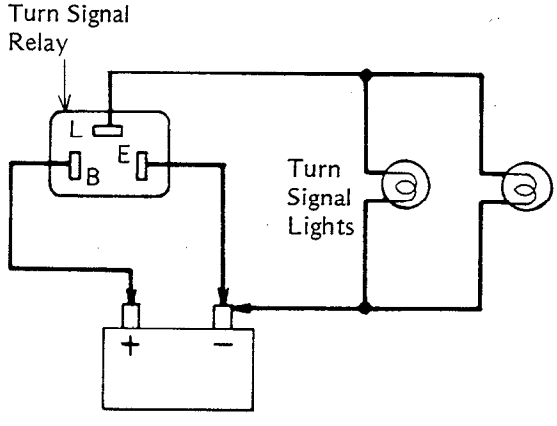



A. Turn Signal Relay

- 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.)**




12 V Battery

**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 | |

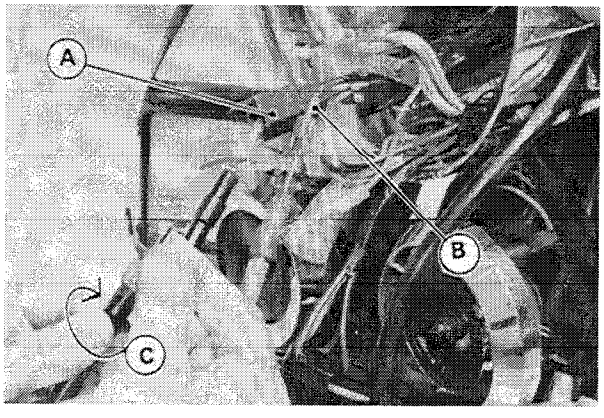
* : Cycle(s) per minute

### *Automatic Cancelling Distance Sensor Inspection (VN700A and VN750-A1, A2, A3, A4 Models)*

If the turn signal cancelling system does not function properly, first check all the wiring connections carefully, and then inspect the distance sensor and turn signal switch/solenoid assembly. If all these are good, replace the turn signal control unit.

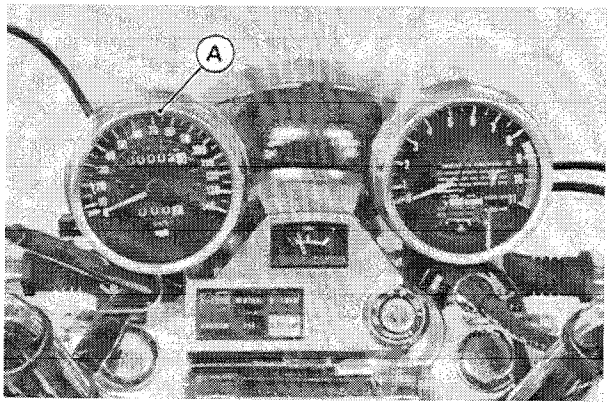
- Remove the speedometer cable lower end from the speedometer gear housing on the front axle.
- Open the headlight housing.
- Pull off the brown connector and the red lead to connect an ohmmeter across to the light green lead in the brown connector and the red lead.
- Turning the speedometer inner cable slowly, count how many times the sensor shows continuity.

○The ohmmeter should show continuity and then open **4 times per turn.**




A. Light Green Lead in the Brown Connector
B. Red Lead
C. Turn the speedometer inner cable.

★If it does not, replace the speedometer unit.

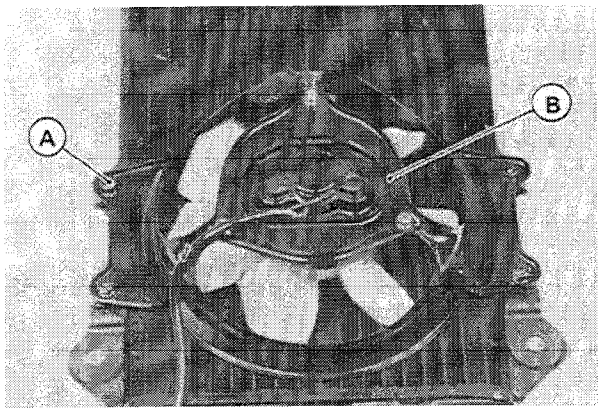



A. Speedometer Unit with a built-in Distance Sensor

## Cooling Fan System

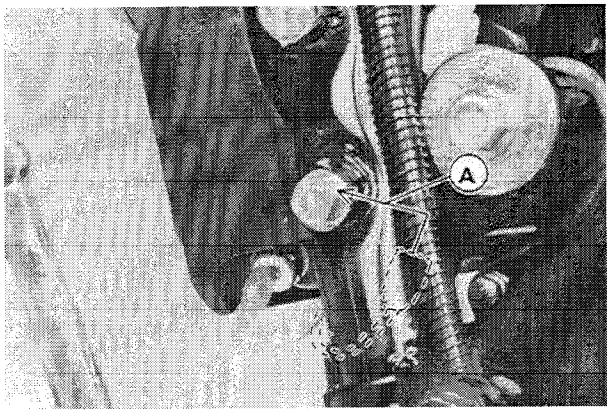
### *Radiator Fan Removal*

- Remove the radiator with the radiator fan installed (see Radiator Removal in Cooling System).
- Unscrew the mounting bolts (4) to separate the fan assembly from the radiator.




A. Bolts (4) B. Fan Assembly

- 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 (see Fan Switch Inspection) or the radiator ground lead.
- ★If the fan does not turn, check the fan motor, fan relay in the junction box or wiring as follows.




A. Fan Switch Lead: ground it.

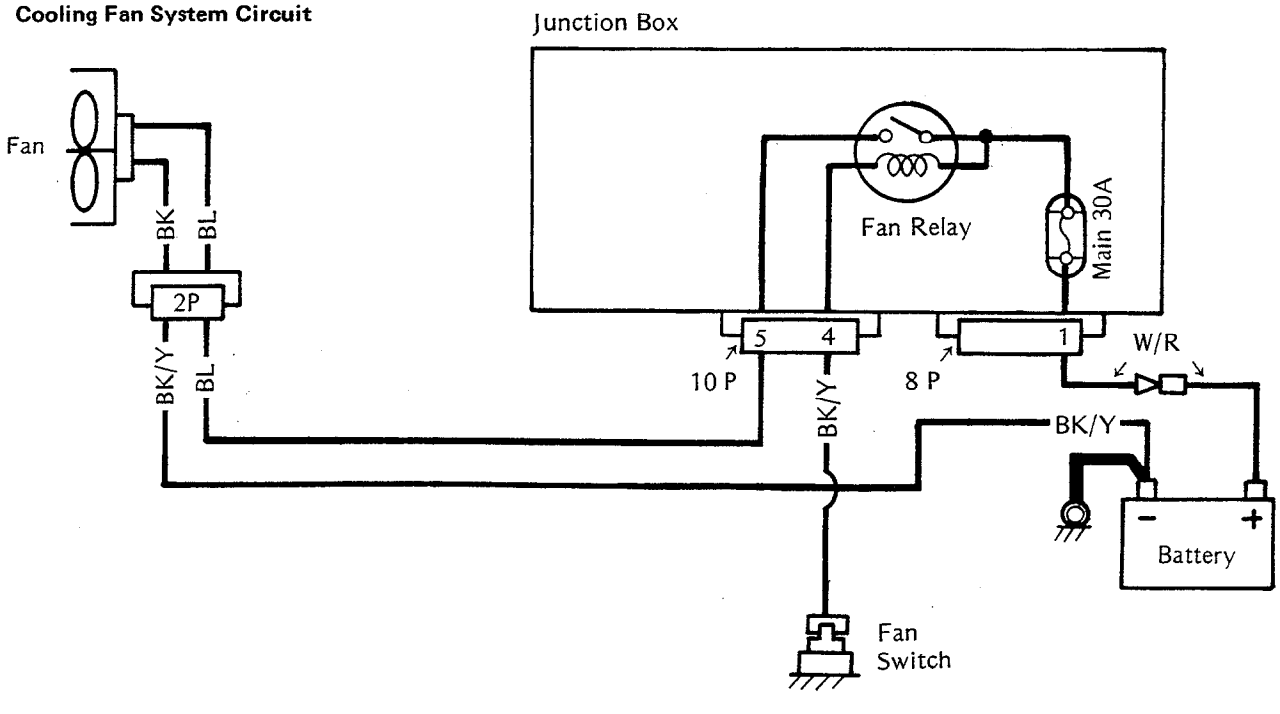
### *Fan System Circuit Inspection*

If the fan does not run while the water temperature gauge hand is in the hot range, check the water temperature gauge (mentioned above), or the cooling fan system (given below).

**WARNING**

**○Be careful not to touch the fan blades to avoid injury.**

**Cooling Fan System Circuit**



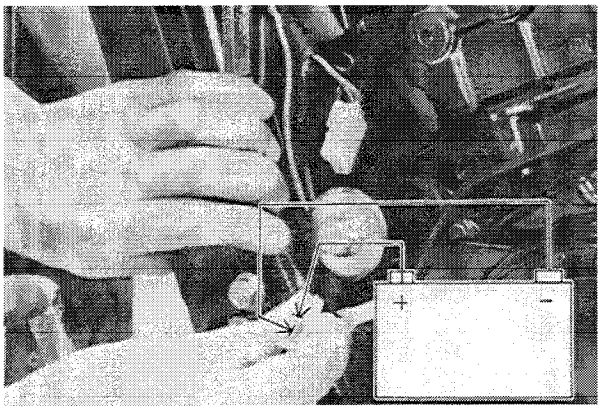
### *Fan Motor Inspection*

●Pull out the fan connector and connect it to 12 V battery as follows.

**Fan connector (male)**

| | | |
|---|---|---|
| **BK** | → | **Battery (–)** |
| **BL** | → | **Battery (+)** |

★If the fan does not turn, replace the fan assembly.



A. Fan Connector

### *Fan Relay Inspection*

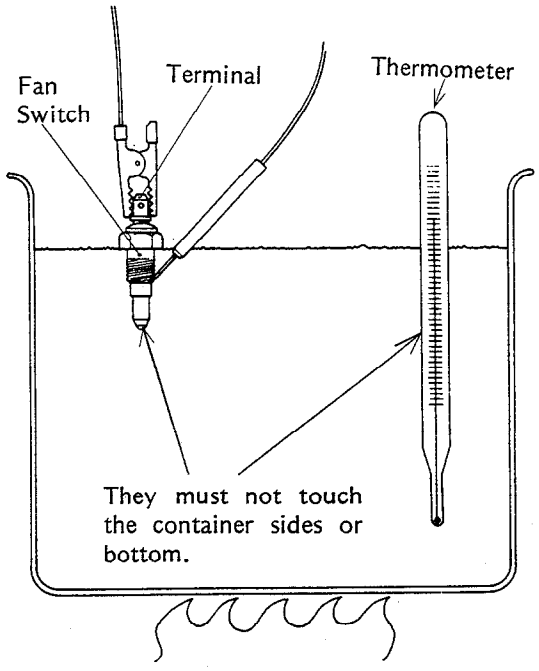
Refer to the Fan, Starter Circuit, and Headlight Relay Inspection in the Junction Box section.

### *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.

**Fan Switch Inspection**



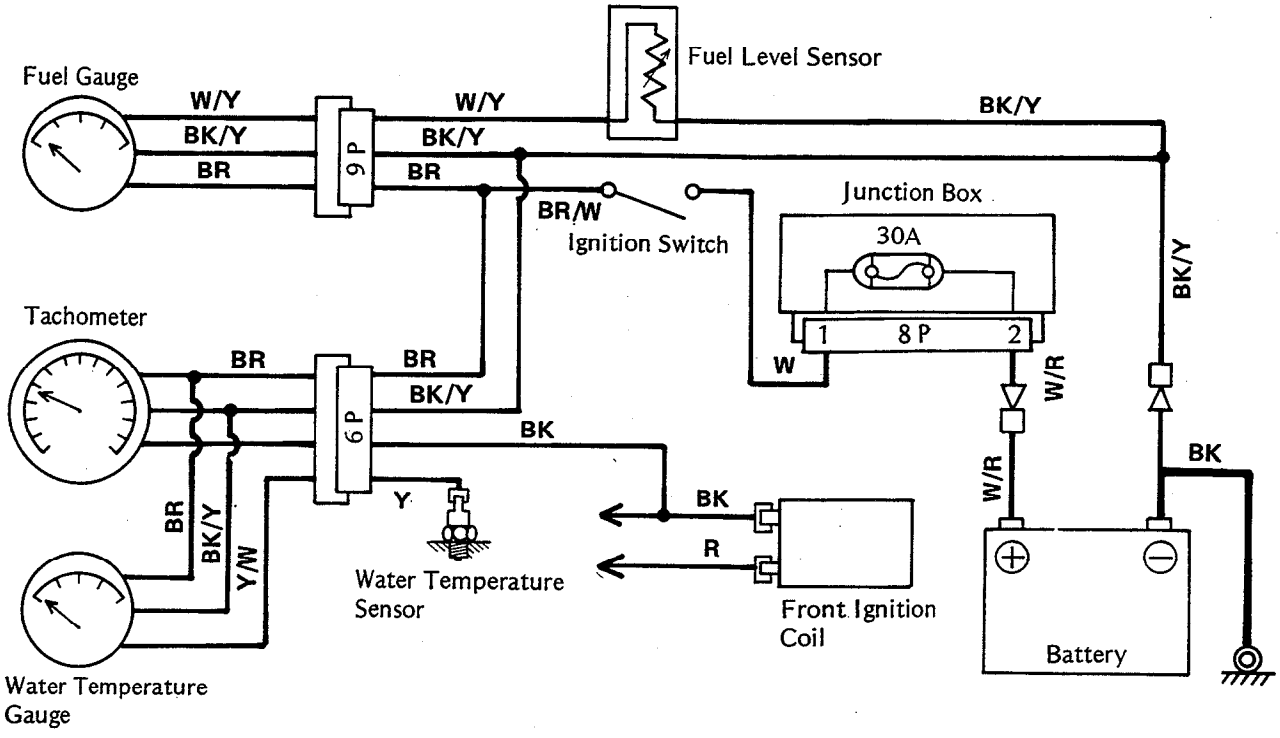

★The fan switch resistance should change as shown in the table. If it does not, replace the switch.

**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 |

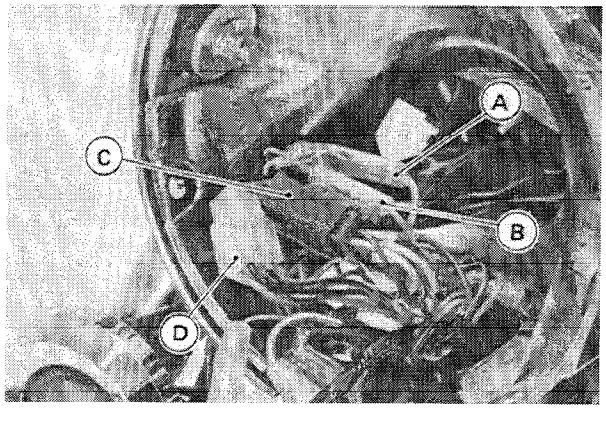
## Meter and Gauges

**Tachometer, Water Temperature Gauge and Fuel Gauge Circuit Diagram**



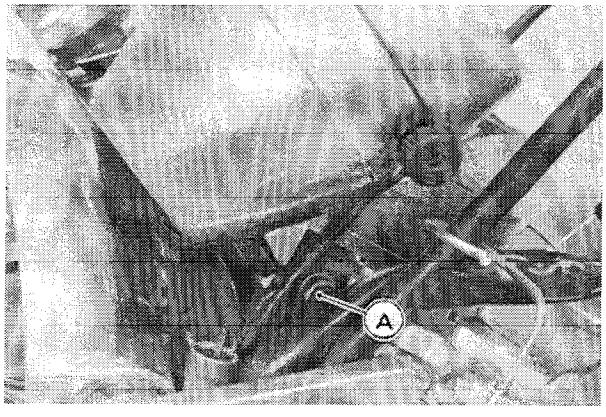

### *Meter Panel Removal*

- Remove the speedometer cable from the meter unit.
- Remove the mounting screws to drop out the headlight unit (see Headlight Unit Removal).
- Pull out the meter connectors in the headlight unit.




A. LG/R Lead
B. R Lead
C. Brown Connector
D. White Connector

- Remove the meter unit by taking off the mounting bolts on both sides.



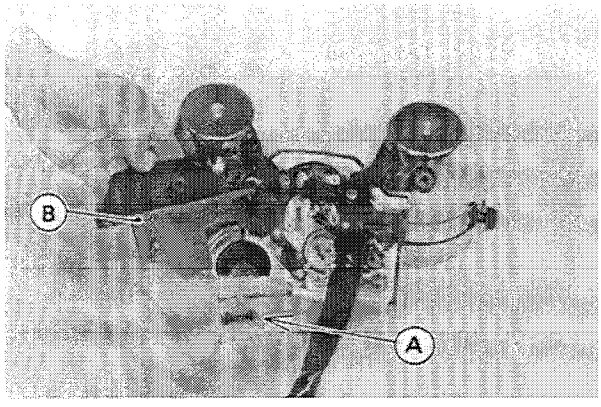

A. Mounting Bolts

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.**

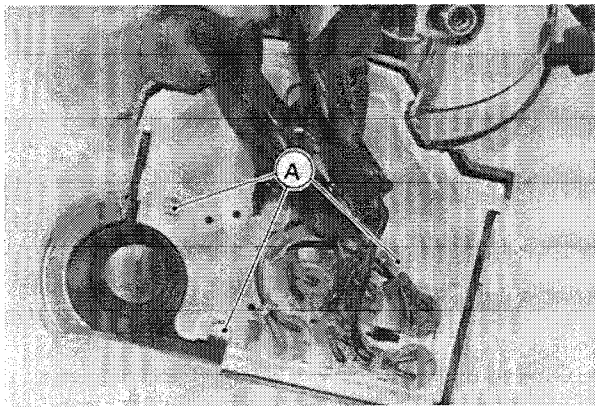
*Meter Panel Disassembly*

- Remove the meter units.
- Remove the screws (2) to take out the panel.

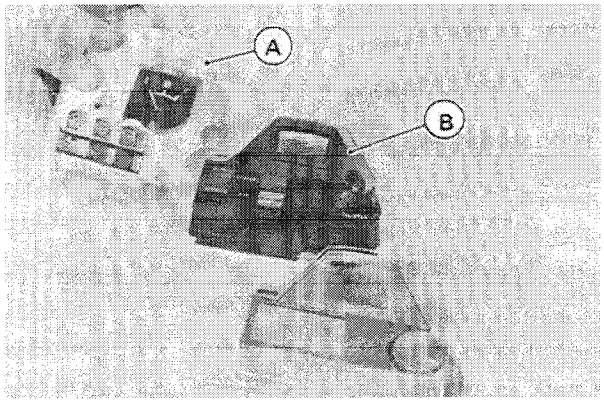



A. Screws B. Panel

- Remove the other mounting screws (3) to separate the white and the black panel covers.



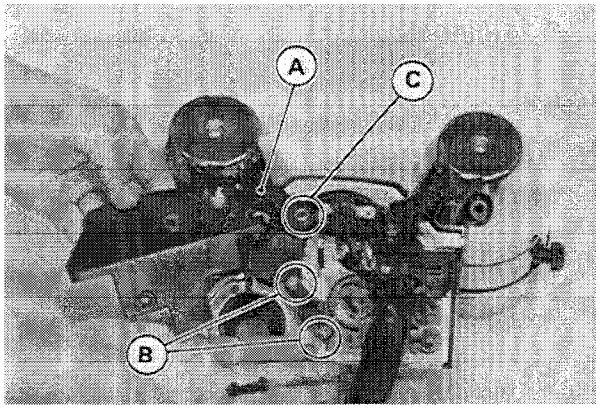

A. Screws




A. White Panel Cover B. Black Panel Cover

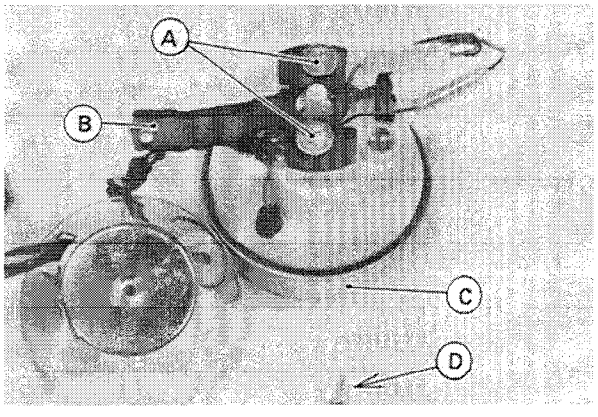
*Tachometer Unit Disassembly*

- Remove the screws (2) to take off the bracket.
- Remove the bracket nut and screws (3) to take off the meter units.




A. Bracket C. Nut
B. Screws

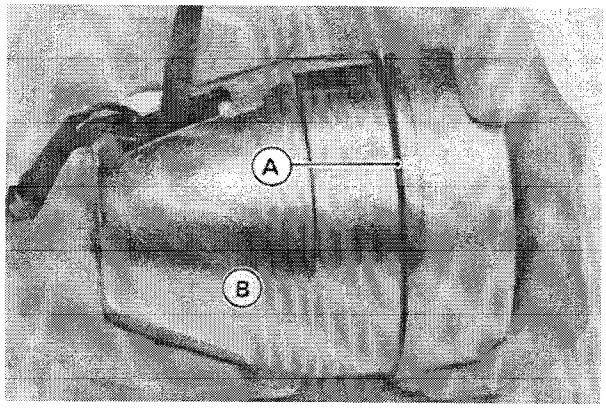
- Do not disassemble the speedometer unit.
- Pull the tachometer unit cover off the unit after removing the screw at the bottom of the unit.
- Unscrew the mounting nuts to remove the mounting bracket.




A. Mounting Nuts C. Unit Cover
B. Mounting Bracket D. Screw

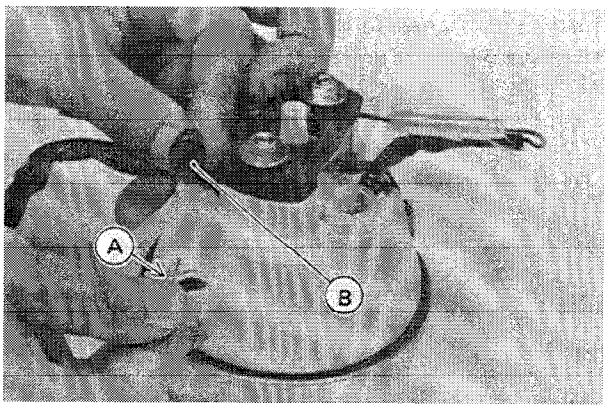
*Tachometer Unit Assembly*

- Insert the unit cover fully to secure the rubber gasket around the cover.
- Tighten the mounting screw. Do not overtighten it.



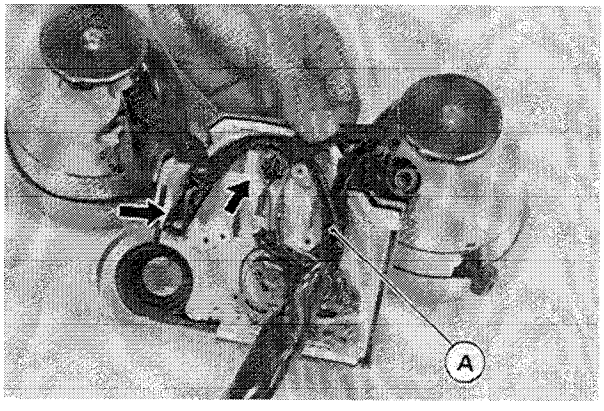

A. Gasket B. Cover

•Route the harnesses as shown being careful that they do not get pinched by bracket or cover.

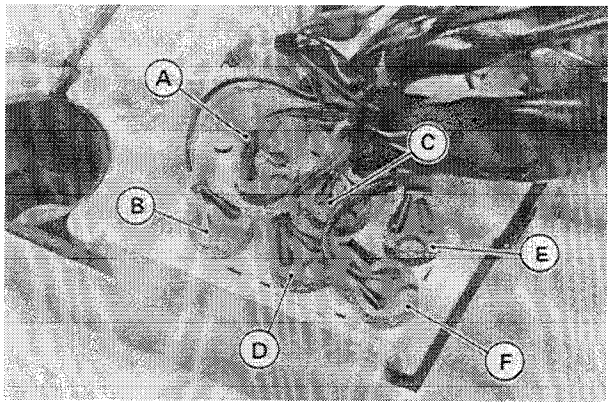



A. Bulb B. Socket

•Install each socket and new bulb on the original positions shown.




A. Harness




A. GR and BK/Y Lead
B. LG/R and BK/Y Lead
C. BR and LG Lead
D. BL/R and BR Lead
E. G and BK/Y Lead
F. R/BK and BK/Y Lead

### *Bulb Replacement Notes*

•To remove the wedge-base type bulbs (indicator and illumination), pull out the bulbs and sockets, and pull the bulbs off the sockets.

**CAUTION**

○**Do not use bulbs rated for greater wattage than the specified value, as the meter or gauge panel could become warped by excessive heat radiated from the bulbs.**

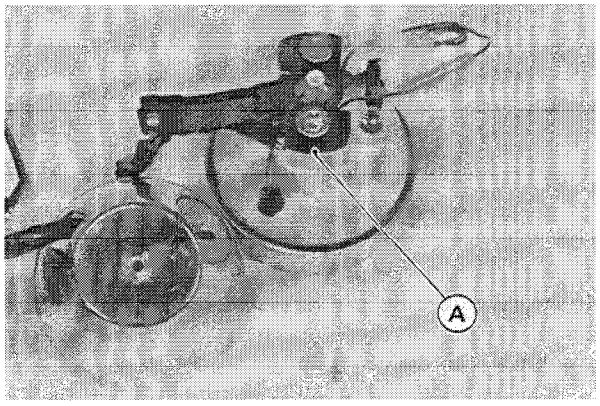
### *Tachometer Inspection*

**NOTE**

○*The tachometer inspection is explained on the assumption that the ignition system operates normally.*

•Check to see that the rubber dampers are installed at the meter mounting bracket.
★Install a new damper where it is absent.

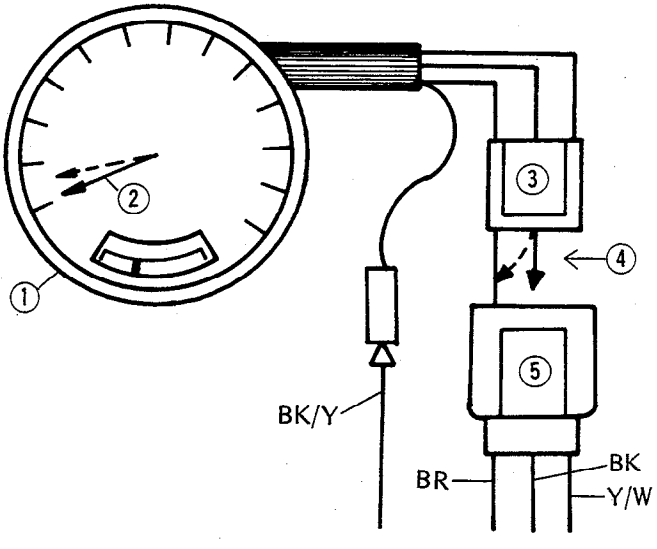
•Check to see that the rubber dampers at the meter mounting bracket are in good condition. They should not be hard or cracked.
★Replace any damaged rubber dampers with new ones.
•Check to see that all meter mounting bolts and nuts are tightened securely.
★Tighten the loose fasteners.




A. Rubber Dampers

•Check the tachometer circuit wiring (see Wiring Inspection).
★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.

**Tachometer Insepction**




1. Tachometer Unit
2. Hand
3. Tachometer Female Connector
4. Auxiliary Leads
5. Tachometer Male Connector

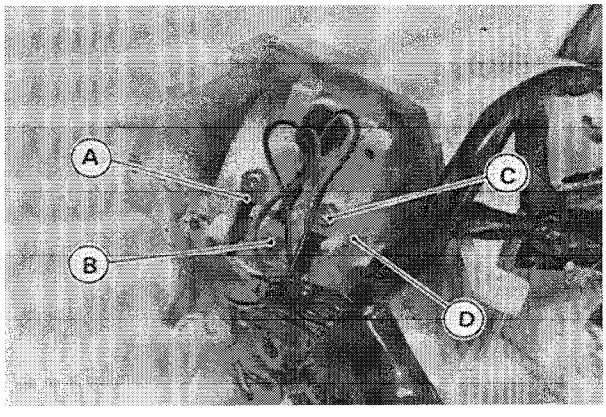
★If the hand does not flick, replace the tachometer unit.

*Fuel Gauge Unit Removal Note*

•After removing the meter panel covers, remove the leads (see below) and take out the fuel gauge unit.

*Fuel Gauge Unit Installation Note*

•Install each lead of the fuel gauge unit on the original positions as shown.




A. W/Y Lead
B. BK/Y Lead
C. BR Lead
D. Fuel Gauge Unit

*Fuel Gauge Operation Inspection*

•Prepare an auxiliary wire, and check the operation of the gauge.

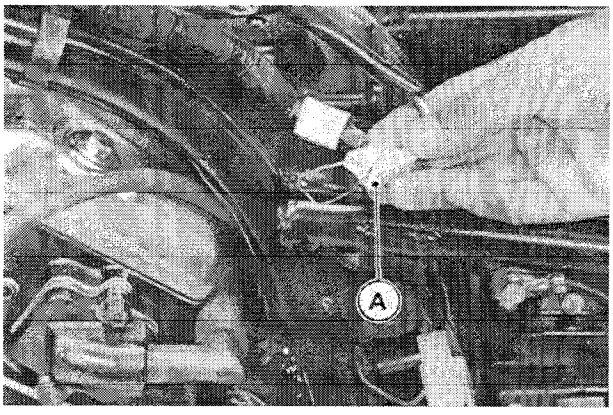
**Fuel Gauge Operation Check**

**Ignition Switch Position: ON**

**Wire Location: Female 2-pin sensor connector (disconnected)**

**Results: Gauge should read E when connector wires are opened.**

**Gauge should read F when connector wires are shorted.**




A. 2-Pin Connector open or short-circuit the leads.

**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 the these readings are not obtained, the trouble is with the gauge and/or wiring.
●Check the fuel gauge circuit wiring (see Wiring Inspection).
★If all wiring and components other than the fuel gauge unit check out good, the unit is defective.

*Water Temperature Gauge Operation Inspection*

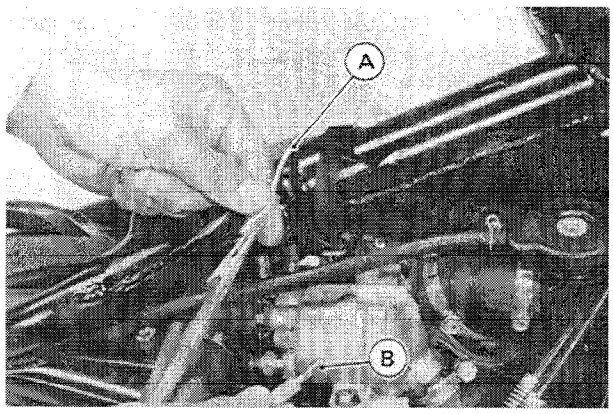
●Prepare an auxiliary wire, and check the operation of the gauge.

**Gauge Operation Test**

**Ignition Switch Position: ON**
**Wire Location: Female, Sensor Connector (disconnected)**
**Results: Gauge should read C when sensor wire is opened.**
**Gauge should read H when sensor wire is grounded to engine.**

**CAUTION**

○**Do not ground the wiring longer than necessary. After the hand swings to the H position, stop the test. Otherwise the gauge could be damaged.**



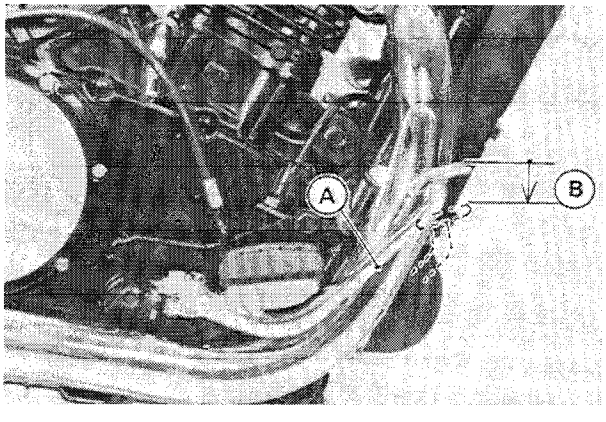

A. Sensor Connector
B. Open or ground the lead to check circuit.

★If the gauge readings are correct, the water temperature sensor is bad. If these readings are not obtained, the trouble is with the gauge and/or wiring.
●Check the water temperature gauge circuit wiring (see Wiring Inspection).
★If all wiring and components other than the water temperature gauge unit check out good, the unit is defective.

## Switches and Sensors

*Rear Brake Light Switch Inspection*

●Turn on the ignition switch.
●Check the operation of the rear brake light switch by depressing the brake pedal. The brake light should go on after about **15 mm** of pedal travel.
★If it does not, adjust the brake light switch.



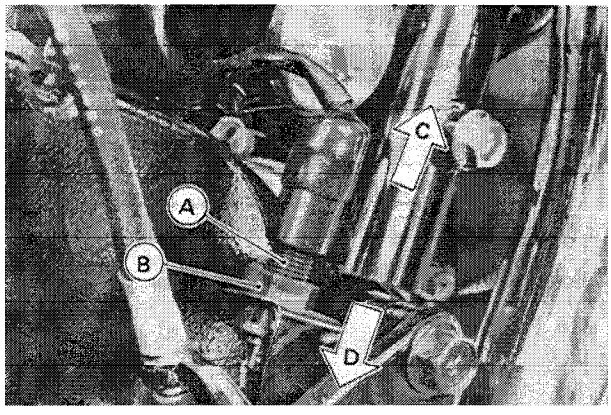

A. Rear Brake Pedal B. 15 mm

**Brake Light Switch**
**ON after about 15 mm travel**

*Rear Brake Light Switch Adjustment*
●Turn the adjusting nut to adjust the switch.

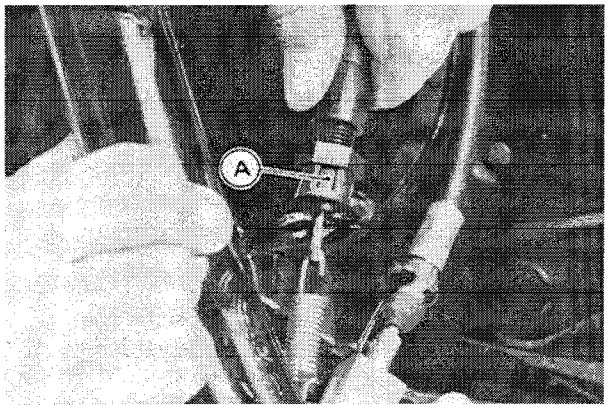
**WARNING**

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




A. Switch Body
B. Adjusting Nut
C. Lights sooner.
D. Lights later.

*Rear Brake Light Switch Removal*
●Remove the rear brake light switch connector.
●Press in the rear brake light switch tabs which catch in the bracket hole, and remove the rear brake light switch.




A. Tabs

*Switch Inspection*
●Using a hand tester (special tool), check to see that only the connectings 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.

**Abbreviation**

Ⓤ : US  Ⓒ : Canada

**Ignition Switch Connections**

| | BR/W | W | Y | BL | R | W/BK | O/G |
|---|---|---|---|---|---|---|---|
| OFF, LOCK | | | | | | | |
| ON | ● | ● | ● | ● | ● | ● | ● |
| P(Park) | | ● | | | ● | ● | ● |

**Turn Signal Switch Connections**

| | W/G | BK/Y | W/R | BL/W | G | O | GY |
|---|---|---|---|---|---|---|---|
| L | | | ● | ● | ● | ● | |
| N | ● | ● | ● | | | | |
| R | | | ● | ● | | ● | ● |

**Starter Lockout Switch Connections**

| | BK/Y | Y/G | LG |
|---|---|---|---|
| When clutch lever is pulled in | ● | ● | |
| When clutch lever is released | | ● | ● |

**Starter Button Connections**

| | BK/R | BK/R, or *R |
|---|---|---|
| Free | | |
| Push on | ● | ● |

* : ⓊⒸ

**Horn Button Connections**

| | BK/W | BK/Y |
|---|---|---|
| Free | | |
| Push on | ● | ● |

**Engine Stop Switch Connections**

| | R | Y/R |
|---|---|---|
| OFF | | |
| RUN | ○—— | ——○ |

**Dimmer Switch Connections ( Ⓤ Ⓒ )**

| | BL/Y | BL/O | R/Y | R/BK |
|---|---|---|---|---|
| HI | ○—— | ——○ | ○—— | ——○ |
| LO | ○—— | | ——○ | |

**Dimmer Switch Connections (Other than Ⓤ Ⓒ )**

| | R/BK | BL/Y | R/Y |
|---|---|---|---|
| HI | ○—— | ——○ | |
| LO | | ○—— | ——○ |

**Hazard Switch Connections ( Ⓤ Ⓒ )**

| | GY | O/G | G |
|---|---|---|---|
| Off ■ | | | |
| On ▬ | ○—— | ——○ | ○—— |

**Passing Button Connections (Other than Ⓤ Ⓒ )**

| | | BL | R/BK |
|---|---|---|---|
| Free | | | |
| Push on | | ○—— | ——○ |

**Headlight Switch Connections (Other than US, Canada)**

| | R/W | R/BL | BL | BL/Y |
|---|---|---|---|---|
| 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**

| | BR | G/W |
|---|---|---|
| When side stand is up | ○—— | ——○ |
| When side stand is down | | |

**Neutral Switch Connections**

| | LG | ⏚ |
|---|---|---|
| When transmission is in neutral | ○—— | ——○ |
| When transmission is not in neutral | | |

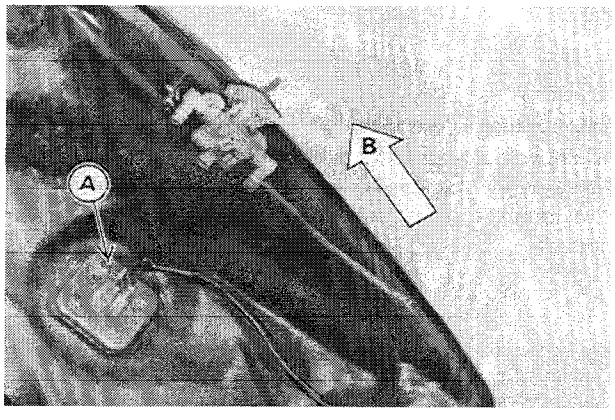
**Oil Pressure Switch Connections***

| | SW. Terminal | ⏚ |
|---|---|---|
| When engine is stopped | ○—— | ——○ |
| When engine is running | | |

*Engine lubrication System is in good condition.

### *Fuel Level Sensor Installation*

- Install the sensor being careful of the installation position of the sensor lead terminal.



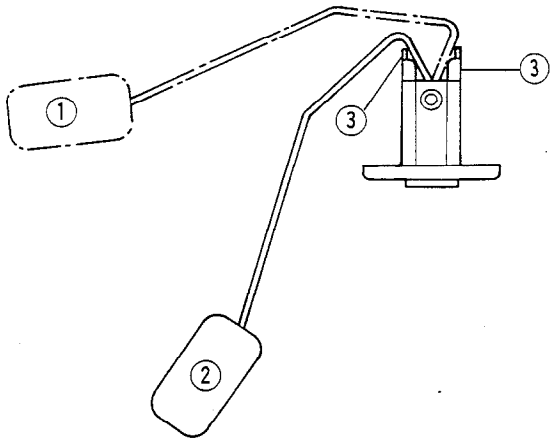

A. Terminal B. Front

### *Fuel Level Sensor Inspection*

- Remove the fuel level sensor.
- Check that the float moves up and down smoothly without binding. It should go down under its own weight.

★If the float does not move smoothly, replace the sensor.

**Fuel Level Sensor**




1. Float in full position
2. Float in empty position
3. Float arm stop

•Measure the resistance of the fuel level sensor with an ohmmeter.
★If the ohmmeter does not show the specified values, or the readings do not change smoothly as the float moves up and down, replace the sensor.

**Fuel Level Sensor Resistance**

**Full Position: 3 – 12 Ω**
**Empty Position: 70 – 120 Ω**

•Inspect the leads and 2-pin connector.
★If they show any signs of damage, replace the sensor.

### *Water Temperature Sensor Removal Note*

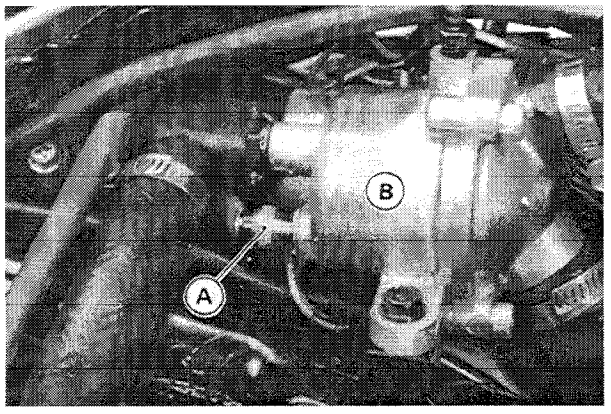
•Drain the coolant before removing the sensor.

**CAUTION**

○**The water temperature sensor should never be allowed to fall on a hard surface. Such a shock to the part can damage it.**

### *Water Temperature Sensor Installation Note*

•Apply silicone sealant to the threads before mounting the sensor.
•Tighten the sensor to the specified torque (see Exploded Views in Cooling System).




A. Water Temperature Sensor
B. Thermostat Housing

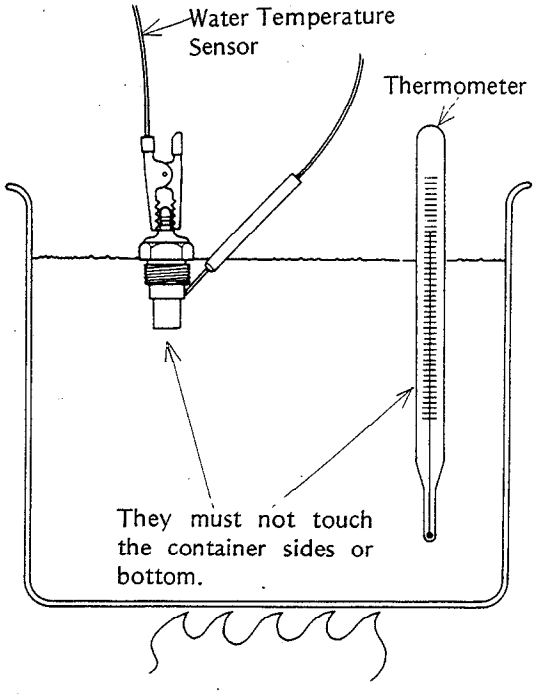
### *Water Temperature Sensor Inspection*

•Remove the water temperature sensor.
•Suspend the sensor in a container of water so that the temperature sensing projection and threaded portion are submerged. The sensor must not touch the container sides or bottom.
•Suspend an accurate thermometer in the water. It must not touch the container, either.
•Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.
•Using an ohmmeter, measure the internal resistance of the sensor across the terminal and the body at the temperatures shown in the table.
★If the ohmmeter does not show the specified values, replace the sensor.

**Internal Resistance of Water Temperature Sensor**

**80°C (176°F): 42 – 62 Ω**
**100°C (212°F): 22 – 33 Ω**

**Water Temperature Sensor Inspection**

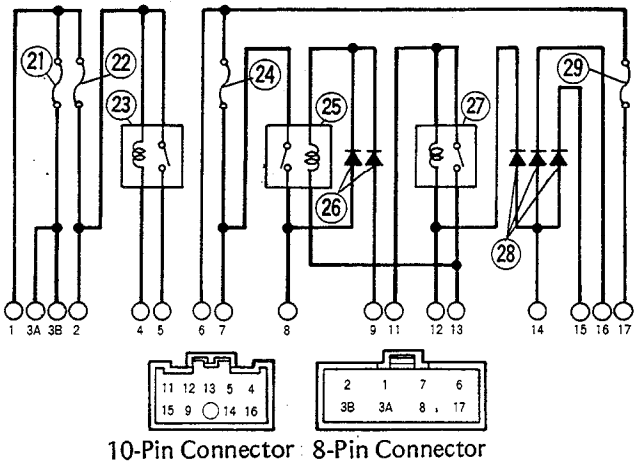


## Junction Box

The junction box has fuses, relays and diodes. The relays and diodes can not be removed. For other than US and Canadian Models, it has not a headlight relay.

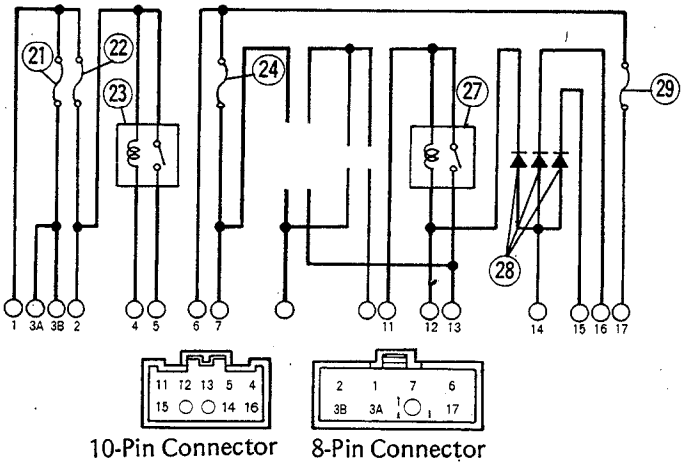
**Junction Box Internal Circuit**

(US and Canadian Model)




10-Pin Connector 8-Pin Connector

(Other than US and Canadian Model)

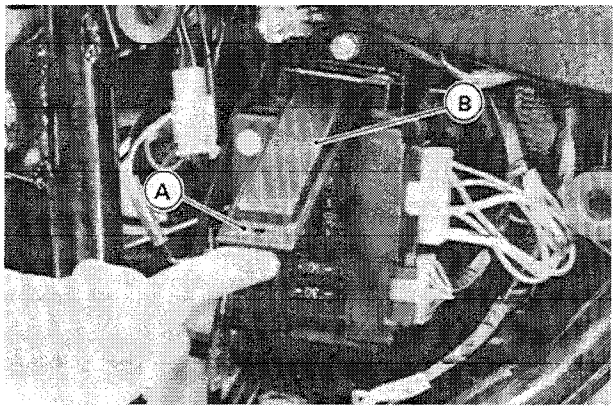


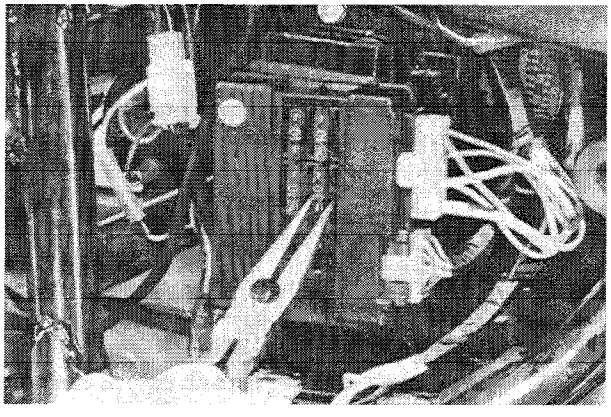

10-Pin Connector 8-Pin Connector

21. Accessory 10A Fuse
22. Main 30A Fuse
23. Fan Relay
24. Headlight 10A Fuse
25. Headlight Relay
26. Diodes
27. Starter Circuit Relay
28. Diodes for Safety Device
29. Tail Light 10A Fuse

*Fuse Removal*

- Remove the left side cover.
- Unlock the hook to lift up the fuse cover.
- Pull the fuses straight off the junction box with needle nose pliers.

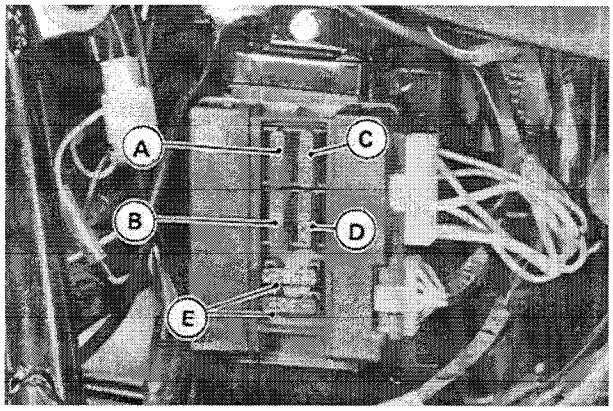


A. Hook B. Fuse Cover

*Fuse Installation Note*

○Install the fuses on the original positions shown.




A. 10A for Tail Light
B. 10A for Accessory
C. 10A for Headlight Relay
D. 30A for Main Relay
E. Spare Fuses

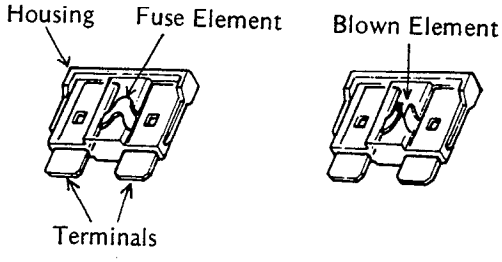
*Fuse Inspection*

●Remove the fuse from the junction box.
●Inspect the fuse element.
★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

**CAUTION**

○**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**

**Fuse**




*Junction Box Fuse Circuit Inspection*

●Remove the junction box from the motorcycle.
●Pull off the connectors from the junction box.
●Make sure all connector terminals are clean and tight, and none of them have been bent.
★Clean the dirty terminals and, straighten slightly-bent terminals.
●Check conductivity of the numbered terminals.
★If the meter does not read as specified, replace the junction box.

**Fuse Circuit Inspection**

| Meter Connection | | | Meter Reading (Ω) |
|---|---|---|---|
| 1 | — | 2 | 0 |
| 1 | — | 3A | 0 |
| 6 | — | 7 | 0 |
| 6 | — | 17 | 0 |
| 1 | — | 7 | ∞ |
| *3A | — | 8 | *∞ |
| *8 | — | 17 | *∞ |

*** : US and Canadian Models only**

*Fan, Starter Relay and Headlight Relay Inspection*

●Remove the junction box from the motorcycle.
●Check conductivity of the following numbered terminals by connecting an ohmmeter and one 12 V battery to the junction box as shown.
★If the meter does not read as specified, replace the junction box.

**Relay Circuit Inspection (with the battery disconnected)**

| Meter Connection | Meter Reading (Ω) |
|---|---|
| 2-5 | ∞ |
| 4-5 | ∞ |
| *7-8 | *∞ |
| 7-13 | ∞ |
| 11-13 | ∞ |
| 12-13 | ∞ |

* : US and Canadian Models only

**Relay Circuit Inspection (with the battery connected)**

| Meter Connection | Battery Connection + | — | Meter Reading (Ω) |
|---|---|---|---|
| 2-5 | 2 | 4 | 0 |
| *7-8 | *9 | 13 | *0 |
| 11-13 | 11 | 12 | 0 |

* : US and Canadian Models only

### *Diode Circuit Inspection*

- Remove the junction box from the motorcycle.
- Pull off the connectors from the junction box.
- Check conductivity of the following pair of terminals.

**Terminal for Diode Circuit Inspection**

***13-8, *13-9, 12-14, 15-14, 16-14**

*** : US and Canadian Models only**

★The resistance should be zero in one direction and infinite in the other direction. If any diode shows zero or infinite in both directions, the diode is defective and the junction box must be replaced.

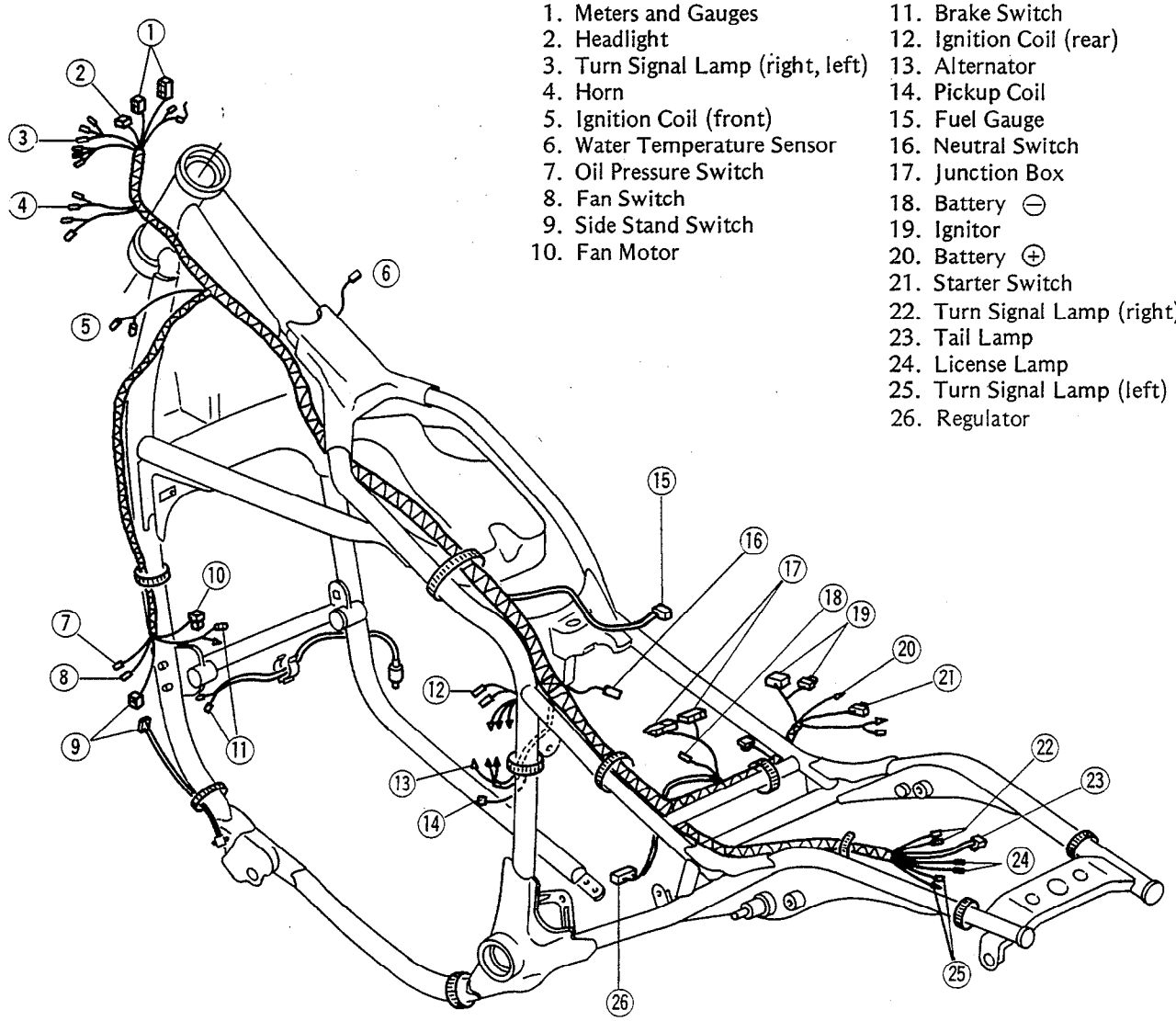
## Electrical Wiring

### *Wiring Inspection*

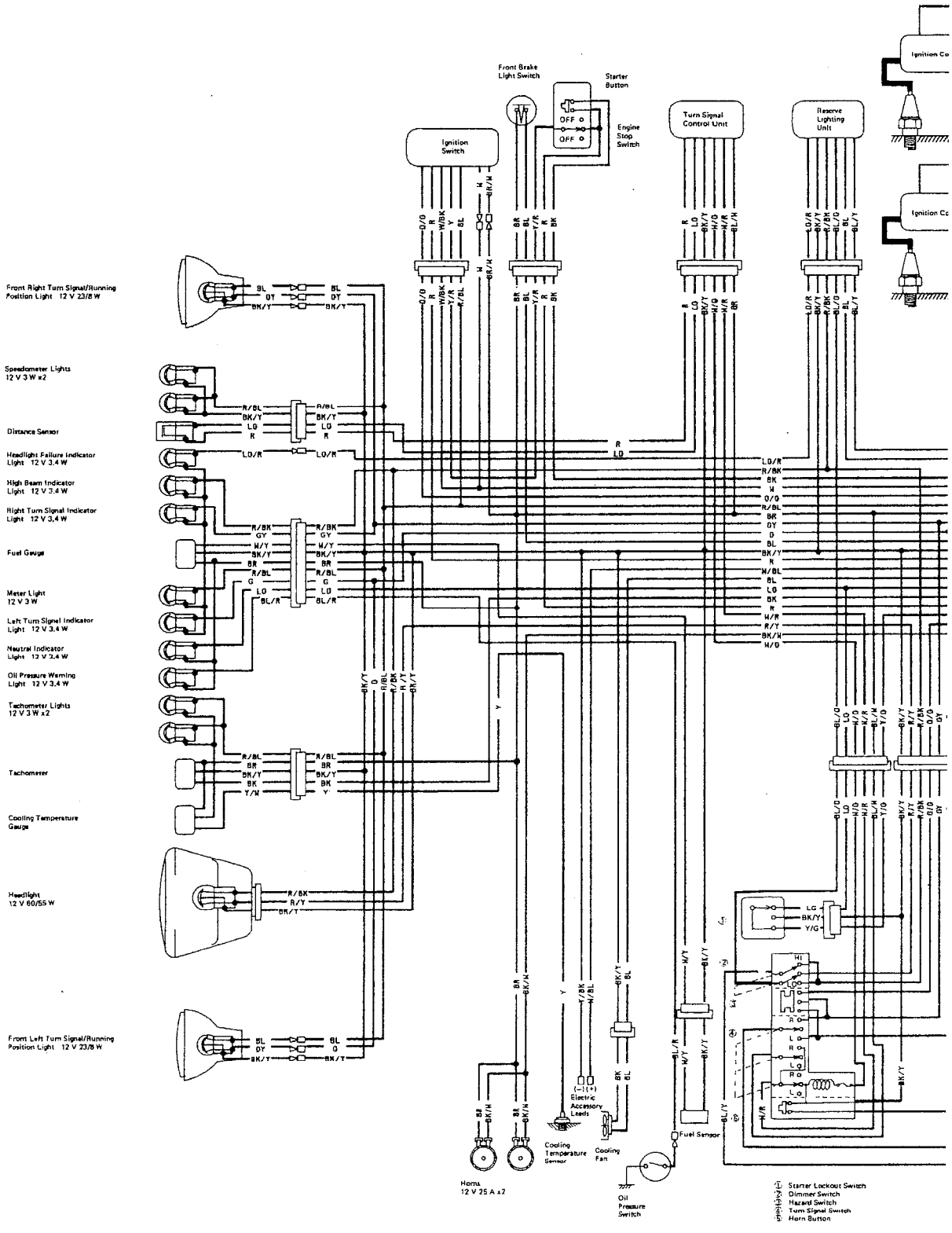
- Visually inspect the wiring for signs of burning, fraying, etc.
- ★If any wiring is poor, replace the damaged wiring.
- Pull each connector apart and inspect it for corrosion, dirt, and damage.
- ★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
- Check the wiring for continuity.
- ○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
- ○Connect an ohmmeter between the ends of the leads.
- ○Set the meter to the x 1 Ω range, and read the meter.
- ★If the meter does not read 0 Ω, the lead is defective. Replace the lead or the wiring loom if necessary.

**Wire Routing**

1. Meters and Gauges
2. Headlight
3. Turn Signal Lamp (right, left)
4. Horn
5. Ignition Coil (front)
6. Water Temperature Sensor
7. Oil Pressure Switch
8. Fan Switch
9. Side Stand Switch
10. Fan Motor
11. Brake Switch
12. Ignition Coil (rear)
13. Alternator
14. Pickup Coil
15. Fuel Gauge
16. Neutral Switch
17. Junction Box
18. Battery ⊖
19. Ignitor
20. Battery ⊕
21. Starter Switch
22. Turn Signal Lamp (right)
23. Tail Lamp
24. License Lamp
25. Turn Signal Lamp (left)
26. Regulator



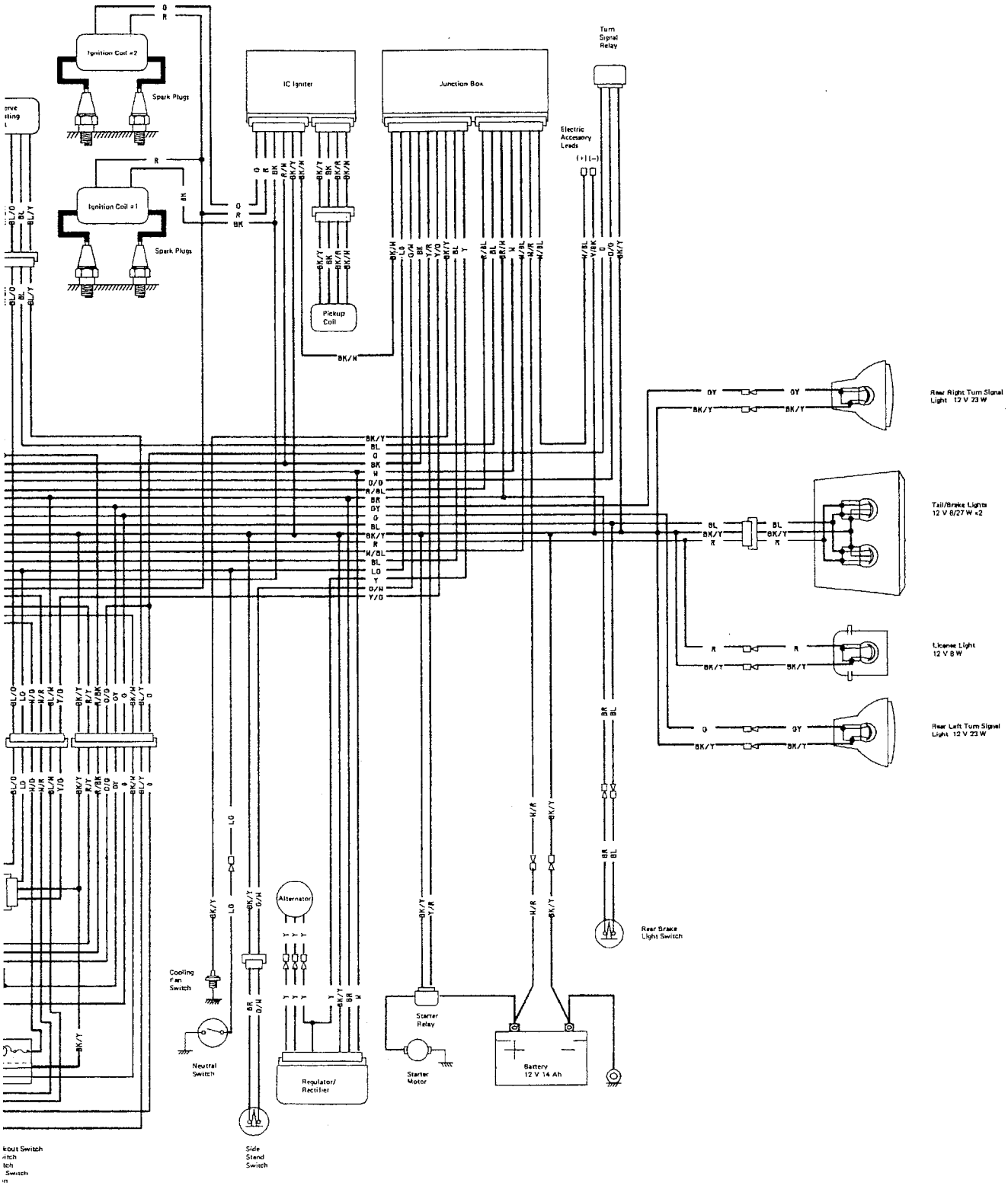
# VN700-A1, VN750-A1, A2, A3, A4 Wiring Diagram (US and Canada)




LEFT HANDLEBAR SWITCH CONNECTIONS

| Horn Button | | | Turn Signal Switch | | | | | | | Hazard Switch | | | | Dimmer Switch | | | | | Starter Lockout Switch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | W/G | BK/Y | W/R | BL/W | G | O | GY | Color | G | O/G | GY | Color | R/Y | BL/O | BL/Y | R/BK | Color | BK/Y | Y/G | LG |
| | | | L | | | | | | | | | | | | HI | | | | | Released | | | |
| Push | | | | | | | | | | | ON | | | | | | | | | | | | |
| | | | R | | | | | | | | | | | | LO | | | | | Pulled in | | | |

| | Horn | Batt |
|---|---|---|
| Color | BR/W | |
| OFF, LOCK | | |
| ON | | |
| P (Park) | | |



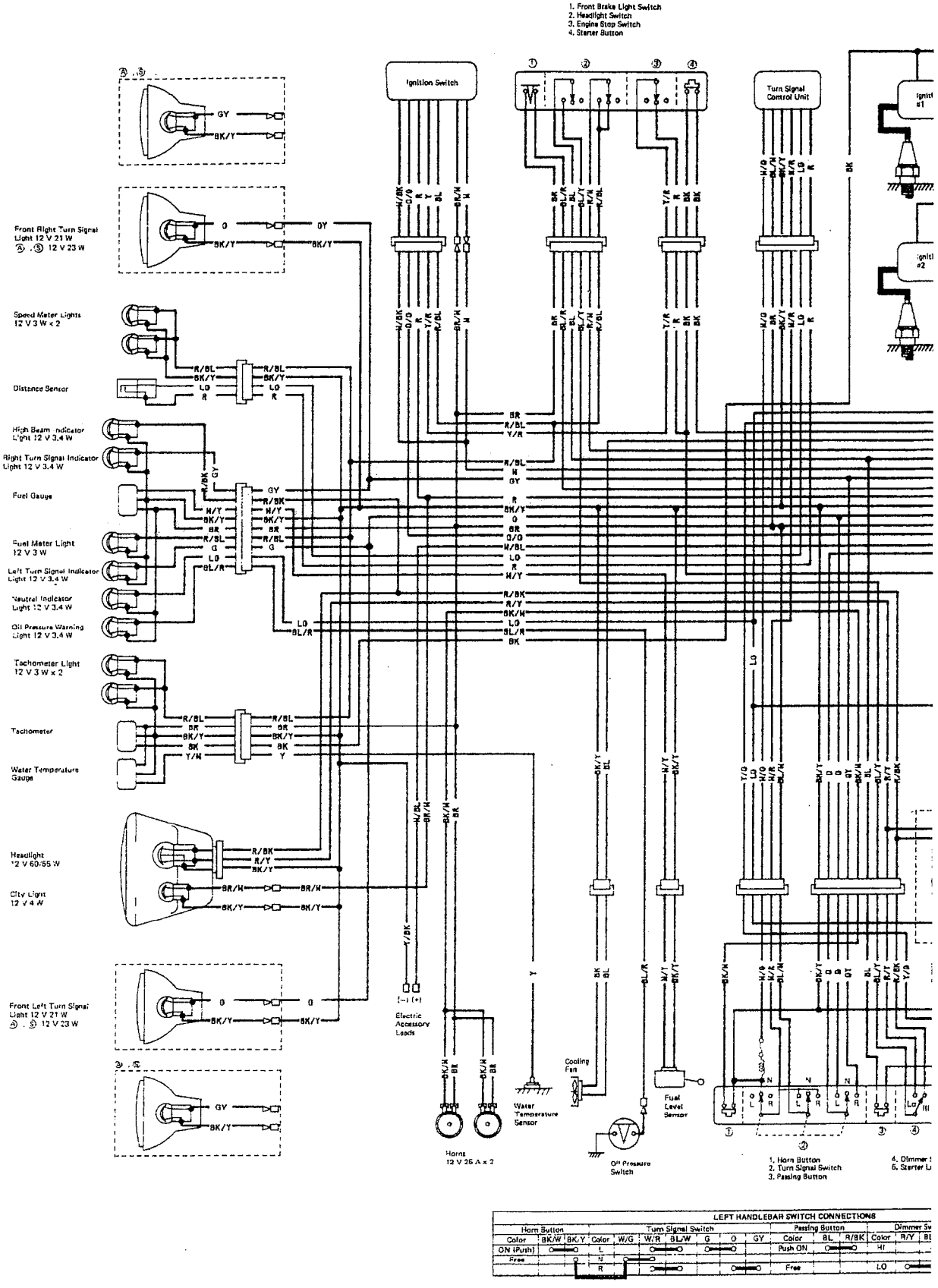

| IGNITION SWITCH CONNECTIONS | | | | | | |
|---|---|---|---|---|---|---|
| | Horn | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail 3 |
| Color | BR/W | W | Y | B | R | W/BK | O/G |
| OFF, LOCK | | | | | | | |
| ON | | | | | | | |
| P (Park) | | | | | | | |

[18035]

| RIGHT HANDLEBAR SWITCH CONNECTIONS | | | |
|---|---|---|---|
| | Engine Stop/Starter Switch | | |
| Color | Y/R | R | BK |
| OFF | | | |
| RUN | | | |
| Push with RUN | | | |

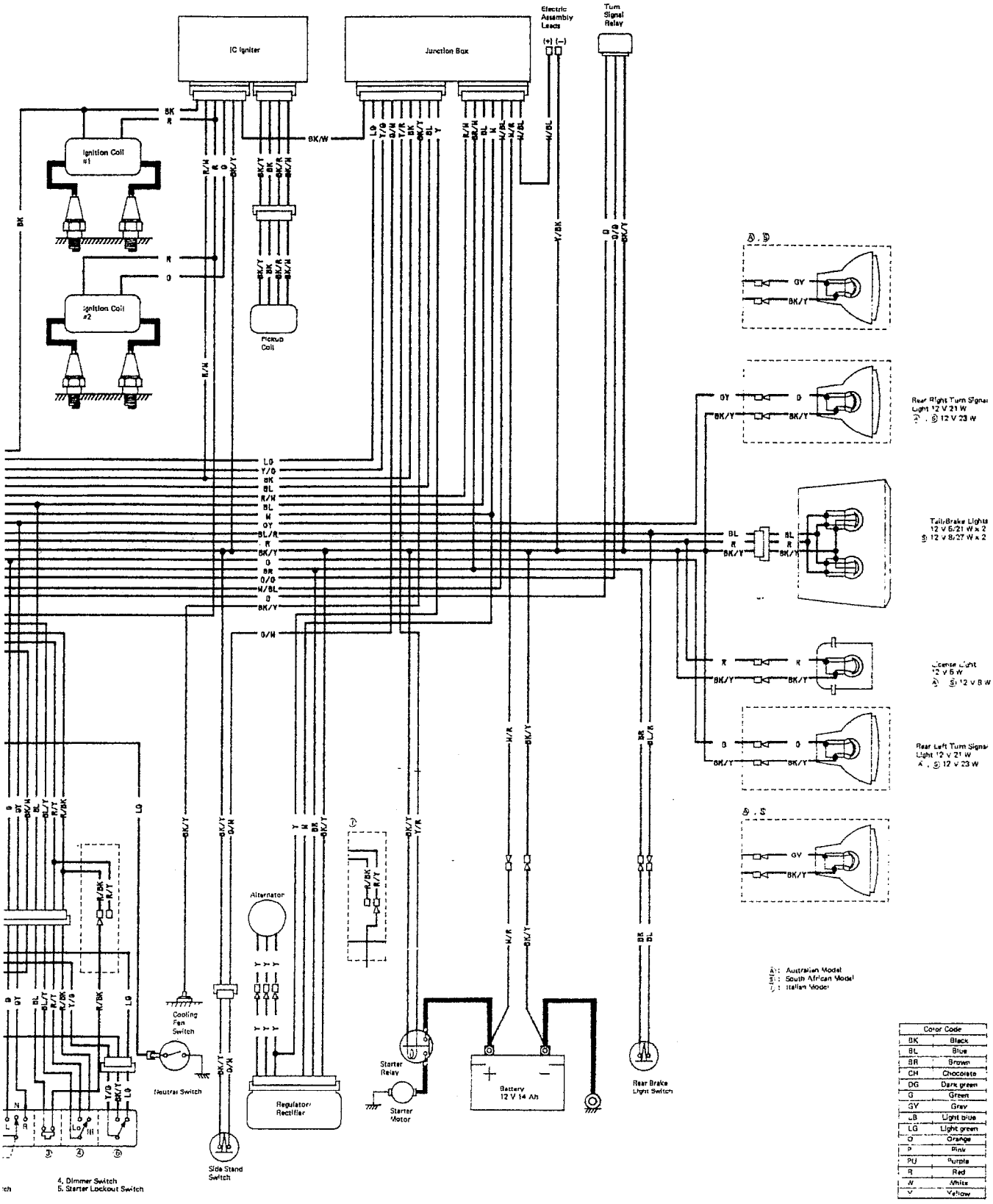
| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| LB | Light Blue |
| LG | Light Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

## VN750-A2, A3, A4 Wiring Diagram (other than US and Canada)




LEFT HANDLEBAR SWITCH CONNECTIONS

| | Horn Button | | Turn Signal Switch | | | | | | Passing Button | | | Dimmer Sw | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | W/G | W/R | BL/W | G | O | GY | Color | BL | R/BK | Color | R/Y | Bl |
| ON (Push) | ○—○ | | L | | ○—○ | | ○—○ | | | Push ON | ○—○ | | HI | | |
| Free | | ○ | N | | | | | | | | | | | | |
| | | | R | | ○—○ | | | ○—○ | | Free | | | LO | ○—○ | |




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

4. Dimmer Switch
5. Starter Lockout Switch

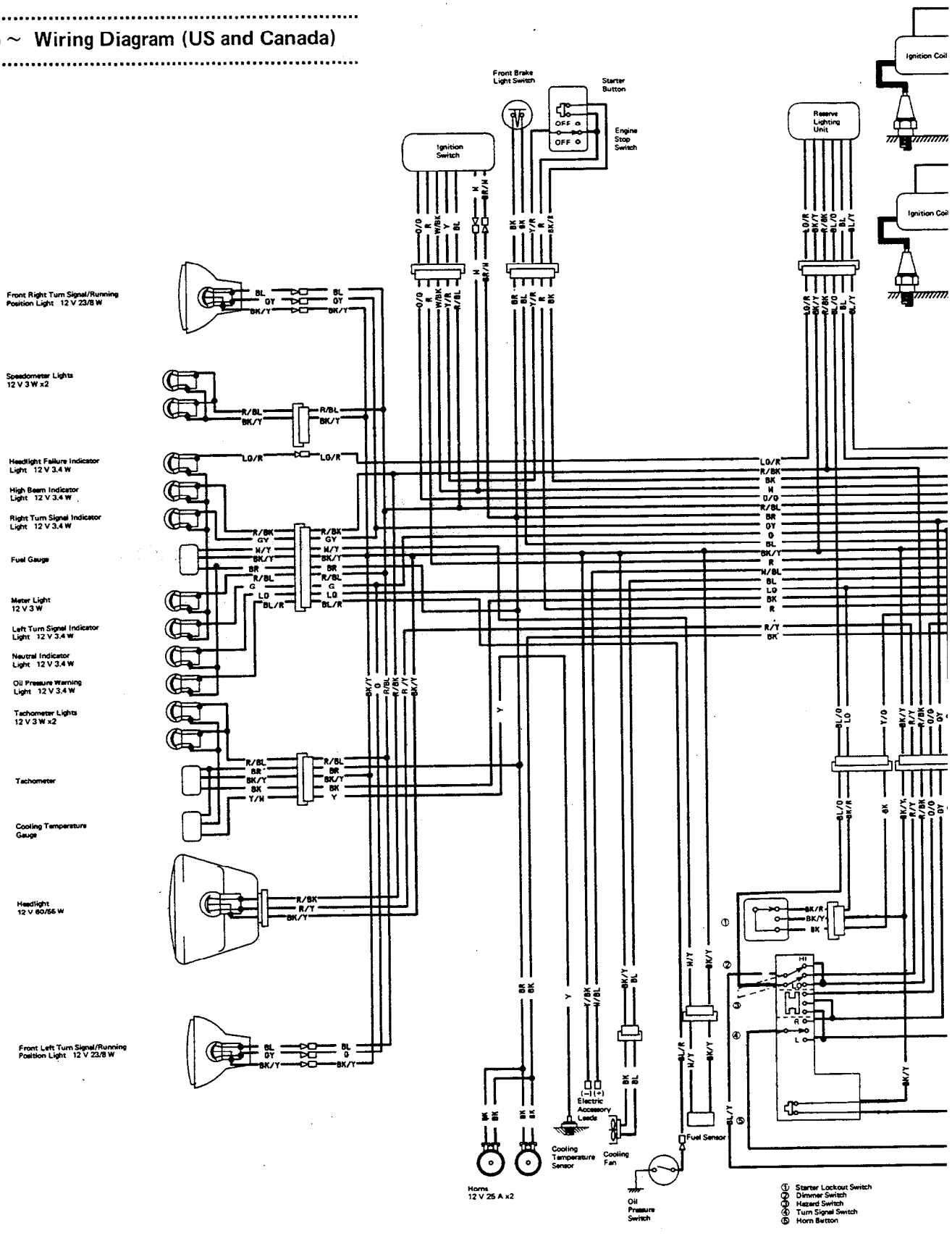
| INJECTIONS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ton | Dimmer Switch | | | | | Starter Lockout Switch | | | |
| | R/BK | Color | R/Y | BL/Y | R/BK | Color | BK/Y | Y/G | LG |
| | | HI | | | | Pulled In | | | |
| | | LO | | | | Released | | | |

| IGNITION SWITCH | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Horn | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail 3 |
| Color | BR/W | W | Y | BL | R | W/BK | O/G |
| OFF, LOCK | | | | | | | |
| ON | | | | | | | |
| P (Park) | | | | | | | |

| RIGHT HANDLEBAR SWITCH | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Starter Switch | | Engine Stop Switch | | | Headlight Switch | | | | | Front Brake Light Switch | | |
| Color | BK | BK | Color | Y/R | R | Color | R/W | R/BL | BL | BL/Y | Color | BR | BL/R |
| Free | | | OFF | | | OFF | | | | | Free | | |
| PUSH | | | RUN | | | ⇔ | | | | | | | |
| | | | OFF | | | ON | | | | | Pulled In | | |

(18659)

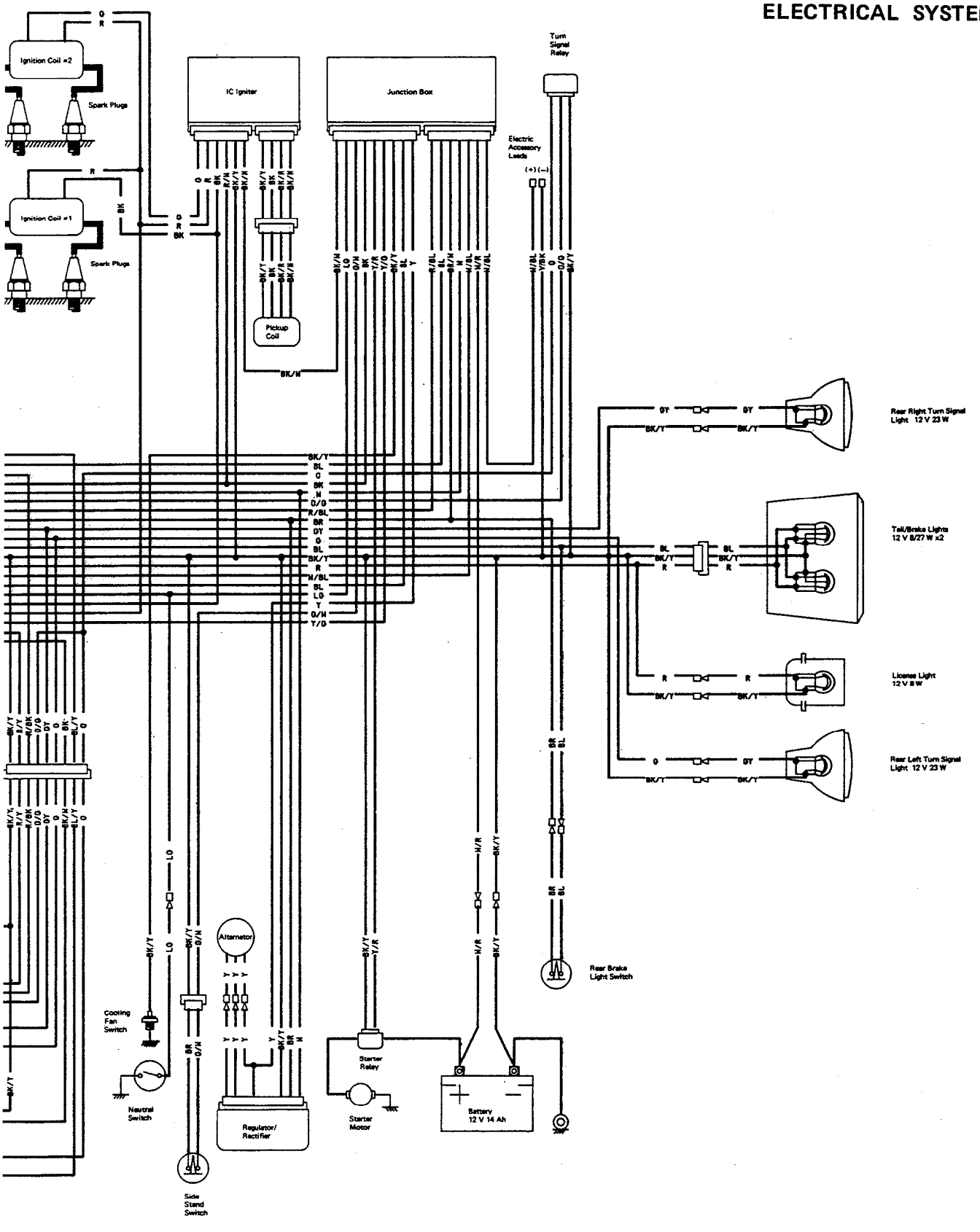
# VN750-A5 ~ Wiring Diagram (US and Canada)




LEFT HANDLEBAR SWITCH CONNECTIONS

| Horn Button | | | Turn Signal Switch | | | | Hazard Switch | | | | Dimmer Switch | | | | | Starter Lockout Switch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | G | O | GY | Color | G | O/G | GY | Color | R/Y | BL/O | BL/Y | R/BK | Color | BK/Y | BK | BK/R |
| | | | L | | | | | | | | HI | | | | | Released | | | |
| Push | | | | | | | ON | | | | | | | | | | | | |
| | | | R | | | | | | | | LO | | | | | Pulled in | | | |

| | Horn | Ba |
|---|---|---|
| Color | BR/W | |
| OFF, LOCK | | |
| ON | | |
| P (Park) | | |



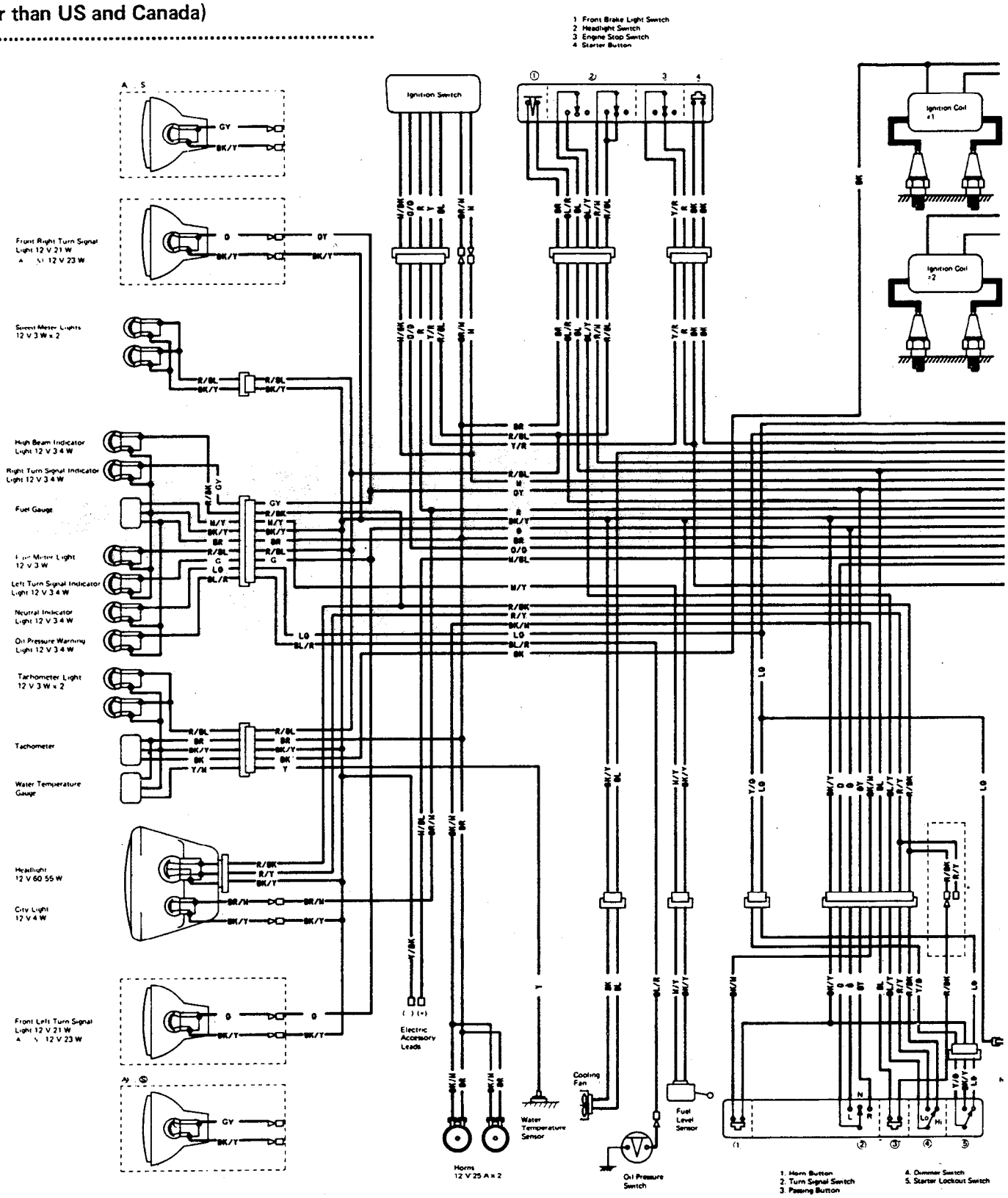

| IGNITION SWITCH CONNECTIONS | | | | | | |
|---|---|---|---|---|---|---|
| Horn | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail 3 |
| BR/W | W | Y | B | R | W/BK | O/G |
| | | | | | | |
| | | | | | | |

(1131A)

| RIGHT HANDLEBAR SWITCH CONNECTIONS | | | |
|---|---|---|---|
| Engine Stop/Starter Switch | | | |
| Color | Y/R | R | BK/R |
| OFF | | | |
| RUN | | | |
| Push with RUN | | | |

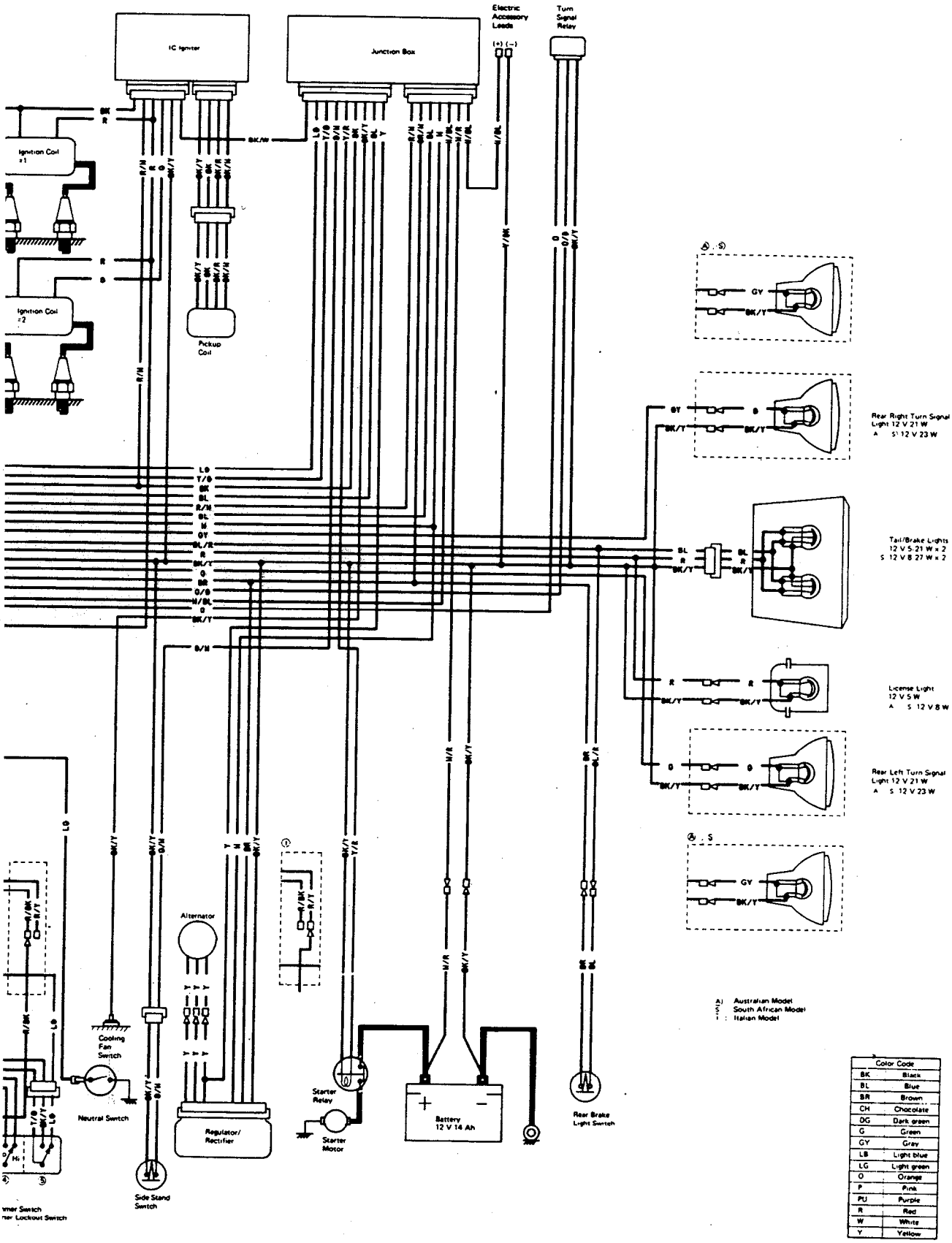
| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Grey |
| LB | Light Blue |
| LG | Light Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

## VN750-A5 ~ Wiring Diagram (other than US and Canada)




**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Horn Button | | | Turn Signal Switch | | | | Passing Button | | | Dimmer Switch | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | G | O | GY | Color | BL | R/BK | Color | R/Y | BL/Y | R/BK | C |
| ON (Push) | ○ | ○ | L | ○ | | ○ | Push ON | ○ | ○ | HI | | ○ | | Pus |
| Free | | | N | | | | | | | | | | | |
| | | | R | | ○ | ○ | Free | | | LO | ○ | ○ | | Rel |




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

| Starter Switch | | | Starter Lockout Switch | | |
|---|---|---|---|---|---|
| | BL/Y | R/BK | Color | BK/Y | Y/G | LG |
| | | | Pulled in | | | |
| | | | Released | | | |

| IGNITION SWITCH | | | | | | | |
|---|---|---|---|---|---|---|---|
| Color | Horn | Battery 1 | Ignition | Tail ¼ | Tail 2 | Battery 2 | Tail 3 |
| | BR/W | W | Y | BL | R | W/BK | O/G |
| OFF, LOCK | | | | | | | |
| ON | | | | | | | |
| P (Park) | | | | | | | |

| RIGHT HANDLEBAR SWITCH | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Starter Switch | | | Engine Stop Switch | | | Headlight Switch | | | | | Front Brake Light Switch | |
| Color | BK | BK | Color | Y/R | R | Color | R/W | R/BL | BL | BL/Y | Color | BR | BL/R |
| Free | | | OFF | | | OFF | | | | | Free | | |
| PUSH | | | RUN | | | ● | | | | | | | |
| | | | OFF | | | ON | | | | | Pulled in | | |

(98051-1132A)

# Appendix

## Table of Contents

## 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 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
- Balancer bearing seizure

**No fuel flow:**
- Fuel tap vacuum hose clogged
- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

**Engine flooded:**
- Fuel level in carburetor float bowl too high
- Float valve worn or stuck open
- Starting technique faulty
- (When flooded, crank the engine with the throttle fully open to allow more air to reach the engine.)

**No spark; spark weak:**
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- IC ignitor 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 ignitor 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 chamber too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Surge tank duct loose

**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
- Coasting enricher trouble

**Other:**
- IC ignitor 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 ignitor 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 chamber too high or too low
- Bleed holes of air bleed pipe or needle jet clogged
- Air cleaner clogged, poorly sealed, or missing
- Surge tank duct poorly sealed
- Water or foreign matter in fuel
- Carburetor holder loose
- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged

**Compression low:**
- Spark plug loose
- Cylinder head not sufficiently tightened down
- 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 ignitor trouble

**Backfiring when deceleration:**
- Vacuum switch valve broken
- Air suction valve trouble
- Coasting enricher trouble

**Miscellaneous:**
- Throttle valve won't fully open
- Carburetor vacuum piston doesn'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 ignitor trouble

**Fuel/air mixture incorrect:**
- Main jet clogged or wrong size
- Fuel level in carburetor float chamber too low
- Carburetor holder loose
- Air cleaner poorly sealed, or missing
- Air cleaner duct poorly sealed
- Air cleaner clogged
- Surge tank duct poorly sealed

**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 in junction box 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:**
No clutch lever play
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 inner cable catching

**Clutch not disengaging properly:**
Clutch lever play excessive
Clutch plate warped or too rough
Clutch spring compression uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch release mechanism trouble
Clutch hub locknut loose

## Gear Shifting Faulty:

**Doesn't go into gear; shift pedal doesn't return:**
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft
Gear position 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 ignitor 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
Upper or lower tension spring trouble
Camshaft chain, sprocket, guide worn
Air suction valve damaged
Balancer gear worn or chipped
Balancer shaft position maladjusted
Balancer bearing worn
Balancer coupling rubber damper damaged
Oil pump chain, sprocket 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
**Drum brake noise:**
Brake linings overworn or worn unevenly
Drum worn unevenly or scored
Brake springs weak or broken
Foreign matter in hub
Brake not properly adjusted
**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 chamber too high
**Brown smoke:**
Main jet too small
Fuel level in carburetor float chamber too low
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 bolt loose
**Handlebar pulls to one side:**
Frame bent
Wheel misalignment
Swing arm bent or twisted
Steering maladjusted
Front fork bent
Right/left fork oil level uneven
Right/left rear shock absorbers unbalanced
**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, rear shock absorber spring weak
Rear shock absorber oil leaking

## Brake Doesn't Hold:

**Disc brake:**
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
**Drum brake:**
Brake maladjusted
Brake linings or drum worn
Overheated
Water in brake drum
Brake cam, camshaft worn
Oil on brake linings

## 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
Regulator/Rectifier trouble
Stator coil open or short
Wiring faulty

## Battery Overcharged:

Alternator trouble
Regulator/Rectifier trouble
Battery trouble
Wiring faulty

## 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
- Clutch Lever
- Front Brake Lever
- Rear Brake Cable Clevis Pin
- Rear Brake Pedal
- Rear Brake Rod Joint
- Side Stand

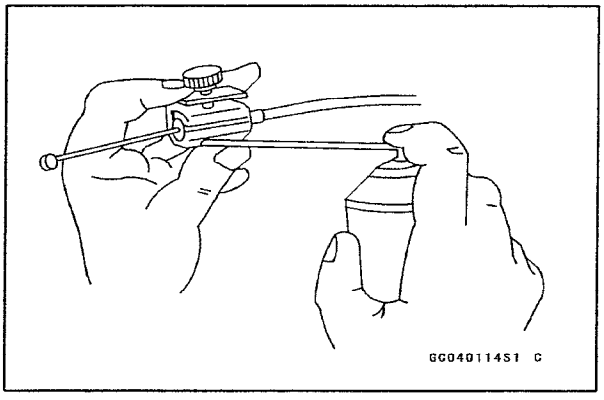
**Points: Lubricate with Grease.**
- Throttle Inner Cable Lower Ends
- Throttle Inner Cable Upper Ends
- Speedometer Inner Cable*
- Choke Inner Cable Upper End
- Choke Inner Cable Lower End
- Clutch Inner Cable Upper End
- Clutch Inner Cable Lower End
- Handlebar Throttle Grip Portion
- Rear Brake Inner Cable Front End
- Rear Brake Inner Cable Rear End

*Grease the lower part of the inner cable sparingly.

**Cables: Lubricate with Motor Oil.**
- Choke Cable
- Clutch Cable
- Rear Brake Cable
- Throttle Cables

- Lubricate the cable by seeping the oil between the cable and cable housing.
- The cable may be lubricated by using a pressure cable luber with an aerosol cable lubricant.

**Cable Lubrication**




## Nut, Bolt, and Fastener Tightness

### *Tightness Inspection*

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

**NOTE**

○*Check engine fastener tightness when the engine is cold (at room temperature).*

○If there are loose fasteners, retighten them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not in the appropriate chapter, see the Standard Torque Table. First loosen each fastener 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 Nut
  - Rear Axle Nut
  - Rear Axle Nut Cotter Pin
- Brakes:
  - Front Master Cylinder Clamp Bolts
  - Front Caliper Mounting Bolts
  - Brake Cam Lever Bolt
  - Torque Link Nuts
  - Torque Link Nut Safety Clips
  - Brake Lever Pivot Nut
  - Brake Pedal Bolt
  - Brake Cable Clevis Pin Cotter Pin
  - Brake Cable Circlip
- Suspension:
  - Front Fork Clamp Bolts
  - Front Fender Mounting Bolts
  - Rear Shock Absorber Nuts
  - Swing Arm Pivot Shaft Locknuts
- Steering:
  - Stem Head Bolt
  - Handlebar Clamp Bolts
- Engine:
  - Engine Mounting Nuts
  - Engine Mounting Bracket Nuts
  - Muffler Connecting Pipe Clamp Bolts
  - Muffler Mounting Nuts
  - Muffler Mounting Bolts
  - Exhaust Pipe Holder Nuts
  - Shift Pedal Bolt
  - Clutch Lever Pivot Nut
- Others:
  - Side Stand Pivot Bolt and Nut
  - Clutch Lever Holder Bolt and Nut
  - Center Stand Cotter Pin
  - Front Footpeg Circlips

Rear Footpeg Circlips
Right Switch Housing Screws
Front Footpeg Bracket Bolts
Rear Footpeg Bracket Bolts
Subframe Mounting Bolts

## Standard Torque Table

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

**General Fasteners**

| Threads dia. (mm) | Torque | | |
|---|---|---|---|
| | N-m | kg-m | ft-lb |
| 5 | 3.4 – 4.9 | 0.35 – 0.50 | 30 – 43 in-lb |
| 6 | 5.9 – 7.8 | 0.60 – 0.80 | 52 – 69 in-lb |
| 8 | 14 – 19 | 1.4 – 1.9 | 10.0 – 13.5 |
| 10 | 25 – 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 |

## 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 | $\mu$ | 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:

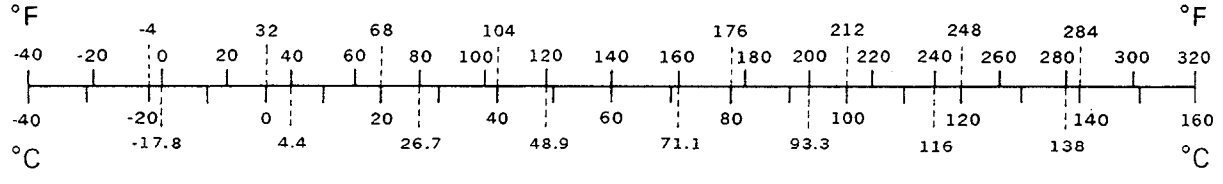
| | | | | |
|---|---|---|---|---|
| km/h | x | 0.6214 | = | mph |

### 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:

$$\frac{9\,(°C + 40)}{5} - 40 = °F \qquad \frac{5\,(°F + 40)}{9} - 40 = °C$$



# Supplement-2000 Model

## Table of Contents

# 17-2 SUPPLEMENT-2000 MODEL

## Foreword

**How to Use this Manual**

This "Supplement-2000 Model" designed to be used in conjunction with the front part of this manual (up to 16-8). The specifications and maintenance procedures described in this chapter are only those that are unique to the VN750-A16 model.

Complete and proper servicing of the VN750-A16 model therefore requires mechanics to read both this chapter and the front of this manual.

## General Information

### General Specifications

| Items | | VN750-A16 |
|---|---|---|
| **Dimensions:** | | |
| Overall length | | 2,295 mm |
| Overall width | | 850 mm |
| Overall height | | 1,225 mm |
| Wheelbase | | 1,580 mm |
| Road clearance | | 150 mm |
| Seat height | | 735 mm |
| Dry weight | | 219 kg, (CA) 219.5 kg |
| Curb weight | Front | 108 kg, (CA) 108.5 kg |
| | Rear | 128 kg |
| Fuel tank capacity | | 13.5 L |
| **Performance:** | | |
| Minimum turning radius | | 2.9 m |
| **Engine:** | | |
| Type | | 4-stroke, DOHC, V2-cylinder |
| Cooling system | | Liquid-cooled |
| Bore and stroke | | 84.9 × 66.2 mm |
| Displacement | | 749 mL |
| Compression ratio | | 10.3 |
| Maximum horsepower | | (US) –, |
| Maximum torque | | (US) –, |
| Carburetion system | | Carburetors, Keihin CVK34 × 2 |
| Starting system | | Electric starter |
| Ignition system | | Battery and coil (transistorized) |
| Timing advance | | Electronically advanced |
| Ignition timing | | From 5.0° BTDC @1,100 r/min (rpm) to 25° BTDC @3,500 r/min (rpm) |
| Spark plugs | Standard | NGK DP7EA-9 or ND X22EP-U9 |
| | Option | NGK DP8EA-9 or ND X24EP-U9 |
| Cylinder numbering method | | Front to rear, 1-2 |
| Firing order | | 1-2 |
| Valve timing: | | |
| Inlet | Open | 30° BTDC |
| | Close | 74° ABDC |
| | Duration | 284° |
| Exhaust | Open | 66° BBDC |
| | Close | 40° ATDC |
| | Duration | 286° |
| Lubrication system | | Forced lubrication (wet sump) |
| Engine oil: | Grade | SE, SF or SG class |
| | Viscosity | SAE10W-40, 10W-50, 20W-40, or 20W-50 |
| | Capacity | 4.0 L |

## General Information

| Items | | VN750-A16 |
|---|---|---|
| **Drive Train:** | | |
| Primary reduction system: | | |
| Type | | Gear |
| Reduction ratio | | 2.428 (85/35) |
| Clutch type | | Wet multi disc |
| Transmission: | | |
| Type | | 5-speed, constant mesh, return shift |
| Gear ratios: | 1st | 2.250 (36/16) |
| | 2nd | 1.600 (32/20) |
| | 3rd | 1.230 (32/26) |
| | 4th | 1.000 (26/26) |
| | 5th | 0.857 (24/28) |
| Final drive system: | | Shaft drive |
| Reduction ratio | | 2.522 (15/22 × 37/10) |
| Overall drive ratio | | 5.251 @Top gear |
| Final gear case oil: | Type | API GL-5 Hypoid gear oil |
| | | SAE90 (above 5°C) |
| | | SAE80 (above 5°C) |
| | Capacity | 150 mL |
| **Frame:** | | |
| Type | | Tubular, double cradle |
| Caster (rake angle) | | 32° |
| Trail | | 127 mm |
| Front tire: | Type | Tubeless |
| | Size | 100/90-19 57H |
| Rear tire: | Type | Tubeless |
| | Size | 150/90-15 M/C 74H |
| Front suspension: | Type | Telescopic fork |
| | Wheel travel | 150 mm |
| Rear suspension: | Type | Swingarm |
| | Wheel travel | 90 mm |
| Brake Type: | Front | Dual disc |
| | Rear | Drum |
| **Electrical Equipment:** | | |
| Battery | | 12 V 14 Ah |
| Headlight: | Type | Semi-sealed beam |
| | Bulb | 12 V 60/55 W (quartz-halogen) |
| Tail/brake light | | 12 V 8/27 WXZ |
| Alternator: | Type | Three-phase AC |
| | Rated output | 24 A @8,000 r/min (rpm), 14 V |
| Voltage regulator: | Type | Short-circuit |

Specifications are subject to change without notice, and may not apply to every country.
(CA) : California Model
(US) : U.S.A. Model

## Wheels/Tires

### Specifications

| Item | | Standard | | Service limit |
|---|---|---|---|---|
| **Wheels (Rims):** | | | | |
| Rim runout: | Axial | – – – | | 0.5 mm |
| | Radial | – – – | | 0.8 mm |
| Axle runout/100 mm | | 0.05 mm or less | | 0.2 mm |
| Wheel balance | | 10 g or less | | – – – |
| Balance weights | | 10 g, 20 g, 30 g | | – – – |
| **Tires:** | | | | |
| Air pressure: (when cold) | | | | |
| | Front | 200 kPa (2.0 kg/cm$^2$, 28 psi) | | – – – |
| | Rear | up to 97.5 kg (215 lb) | 200 kPa (2.0 kb/cm$^2$, 28 psi) | – – – |
| | | 97.5 kg ~ 180 kg (215 lb ~ 397 lb) | 225 kPa (2.25 kg/cm$^2$, 32 psi) | – – – |
| Tread depth: | | | | |
| | Front | DUNLOP | 4.4 mm | 1 mm |
| | | BRIDGESTONE | 4.3 mm | |
| | Rear | DUNLOP | 7.3 mm | 2 mm |
| | | BRIDGESTONE | 6.2 mm | |
| Standard tires: | | Make, Type | | Size |
| | Front | Tubeless: DUNLOP F11A | | 100/90-19 57H |
| | | BRIDGESTONE EXEDRA L309 | | |
| | Rear | Tubeless: DUNLOP K425 | | 150/90-15 M/C 74H |
| | | BRIDGESTONE EXEDRA G526 | | |

**⚠ WARNING**

**Use the same manufacture's tires on both front and rear wheels.**

## Wheels/Tires

### Tire

*Tire Inspection*

**Tread Depth**

**Front:**

| | |
|---|---|
| **Standard:** | **4.4 mm (DUNLOP)** |
| | **4.3 mm (BRIDGESTONE)** |
| **Service Limit:** | **1 mm** |

**Rear:**

| | |
|---|---|
| **Standard:** | **7.3 mm (DUNLOP)** |
| | **6.2 mm (BRIDGESTONE)** |
| **Service Limit:** | **2 mm** |

**⚠ WARNING**

**To ensure safe handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure. Use the same manufacturer's tires on both front and rear wheels.**

# Supplement-2001 Model

## Table of Contents

## Foreword

**How to Use this Manual**

This "Supplement-2001 Model" designed to be used in conjunction with the front part of this manual (up to 17-6). The specifications and maintenance procedures described in this chapter are only those that are unique to the VN750-A17 model.

Complete and proper servicing of the VN750-A17 model therefore requires mechanics to read both this chapter and the front of this manual.

## General Information

### General Specifications

| Items | | VN750-A17 |
|---|---|---|
| **Dimensions:** | | |
| Overall length | | 2,295 mm |
| Overall width | | 850 mm |
| Overall height | | 1,225 mm |
| Wheelbase | | 1,580 mm |
| Road clearance | | 150 mm |
| Seat height | | 735 mm |
| Dry weight | | 219 kg, (CA) 219.5 kg |
| Curb weight | Front | 108 kg, (CA) 108.5 kg |
| | Rear | 128 kg |
| Fuel tank capacity | | 13.5 L |
| **Performance:** | | |
| Minimum turning radius | | 2.9 m |
| **Engine:** | | |
| Type | | 4-stroke, DOHC, V2-cylinder |
| Cooling system | | Liquid-cooled |
| Bore and stroke | | 84.9 × 66.2 mm |
| Displacement | | 749 mL |
| Compression ratio | | 10.3 |
| Maximum horsepower | | (US) – |
| Maximum torque | | (US) – |
| Carburetion system | | Carburetors, Keihin CVK34 × 2 |
| Starting system | | Electric starter |
| Ignition system | | Battery and coil (transistorized) |
| Timing advance | | Electronically advanced |
| Ignition timing | | From 5.0° BTDC @1,100 r/min (rpm) to 25° BTDC @3,500 r/min (rpm) |
| Spark plugs | Standard | NGK DP7EA-9 or ND X22EP-U9 |
| | Option | NGK DP8EA-9 or ND X24EP-U9 |
| Cylinder numbering method | | Front to rear, 1-2 |
| Firing order | | 1-2 |
| Valve timing: | | |
| Inlet | Open | 30° BTDC |
| | Close | 74° ABDC |
| | Duration | 284° |
| Exhaust | Open | 66° BBDC |
| | Close | 40° ATDC |
| | Duration | 286° |
| Lubrication system | | Forced lubrication (wet sump) |
| Engine oil: | Grade | API SE, SF or SG class, or API SH or SJ with JASO MA |
| | Viscosity | SAE10W-40, 10W-50, 20W-40, or 20W-50 |
| | Capacity | 4.0 L |

| Items | | VN750-A17 |
|---|---|---|
| **Drive Train:** | | |
| Primary reduction system: | | |
| Type | | Gear |
| Reduction ratio | | 2.428 (85/35) |
| Clutch type | | Wet multi disc |
| Transmission: | | |
| Type | | 5-speed, constant mesh, return shift |
| Gear ratios: | 1st | 2.250 (36/16) |
| | 2nd | 1.600 (32/20) |
| | 3rd | 1.230 (32/26) |
| | 4th | 1.000 (26/26) |
| | 5th | 0.857 (24/28) |
| Final drive system: | | Shaft drive |
| Reduction ratio | | 2.522 (15/22 × 37/10) |
| Overall drive ratio | | 5.251 @Top gear |
| Final gear case oil: | Type | API GL-5 Hypoid gear oil<br>SAE90 (above 5°C)<br>SAE80 (above 5°C) |
| | Capacity | 150 mL |
| **Frame:** | | |
| Type | | Tubular, double cradle |
| Caster (rake angle) | | 32° |
| Trail | | 127 mm |
| Front tire: | Type | Tubeless |
| | Size | 100/90-19 57H |
| Rear tire: | Type | Tubeless |
| | Size | 150/90-15 M/C 74H |
| Front suspension: | Type | Telescopic fork |
| | Wheel travel | 150 mm |
| Rear suspension: | Type | Swingarm |
| | Wheel travel | 90 mm |
| Brake Type: | Front | Dual disc |
| | Rear | Drum |
| **Electrical Equipment:** | | |
| Battery | | 12 V 14 Ah |
| Headlight: | Type | Semi-sealed beam |
| | Bulb | 12 V 60/55 W (quartz-halogen) |
| Tail/brake light | | 12 V 5/21 W x 2 |
| Alternator: | Type | Three-phase AC |
| | Rated output | 24 A @8,000 r/min (rpm), 14 V |
| Voltage regulator: | Type | Short-circuit |

Specifications are subject to change without notice, and may not apply to every country.
(CA) : California Model
(US) : U.S.A. Model

## Periodic Maintenance Chart

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

| FREQUENCY / OPERATION | Whichever comes first → ↓ / Every | 800 km (500 mile) | 5 000 km (3 000 mile) | 10 000 km (6 000 mile) | 15 000 km (9 000 mile) | 20 000 km (12 000 mile) | 25 000 km (15 000 mile) | 30 000 km (18 000 mile) | * ODOMETER READING See Page |
|---|---|---|---|---|---|---|---|---|---|
| Spark plug-clean | | | ● | ● | ● | ● | ● | ● | 15-21 |
| Spark plug-check † | | | ● | ● | ● | ● | ● | ● | 15-21 |
| Air suction valve (U)(W)-check † | | | ● | ● | ● | ● | ● | ● | 4-10 |
| Air cleaner element-clean | | ● | | ● | | ● | | ● | 2-23 |
| Air cleaner element-replace | 5 cleanings | | | | | ● | | | 2-23 |
| Throttle grip play-check † | | ● | | ● | | ● | | ● | 2-5 |
| Idle speed-check † | | ● | ● | ● | ● | ● | ● | ● | 2-9 |
| Engine vacuum synchronization-check † | | ● | ● | ● | ● | ● | ● | ● | 2-10 |
| Fuel system-check† | | | | ● | | ● | | ● | 2-13 |
| Fuel hoses, connections-check† | | | ● | ● | ● | ● | ● | ● | |
| Coolant-change | 2 years | | | | | | | ● | 3-4 |
| Evaporative emission control system (CA)- check † | | ● | ● | ● | ● | ● | ● | ● | 2-27 |
| Engine oil-change | year | ● | | ● | | ● | | ● | 6-5 |
| Oil filter-replace | | ● | | ● | | ● | | ● | 6-6 |
| Oil screen-clean | | ● | | ● | | ● | | ● | 6-5 |
| Radiator hoses, connections-check† | year | ● | | ● | | ● | | ● | 3-9 |
| Final gear case oil level-check† | | | | ● | | ● | | ● | 10-6 |
| Final gear case oil-change | | ● | | | | | | ● | 10-6 |
| Propeller shaft joint-lubricate | | | | ● | | | | ● | 10-6 |
| Fuel hose-replace | 4 years | | | | | | | | – |
| Clutch-adjust | | ● | ● | ● | ● | ● | ● | ● | 5-4 |
| Brake hoses, connections-check† | | | ● | ● | ● | ● | ● | ● | |
| Brake lining or pad wear-check † | | | ● | ● | ● | ● | ● | ● | 11-4,7 |
| Brake fluid level-check† | month | ● | ● | ● | ● | ● | ● | ● | 11-10 |
| Brake fluid-change | 2 years | | | | | ● | | | 11-11 |
| Brake hose-replace | 4 years | | | | | | | | 11-13 |
| Brake master cylinder cup and dust seal-replace | 2 years | | | | | | | | 11-9 |
| Caliper piston seal and dust seal-replace | 2 years | | | | | | | | 11-6 |
| Brake play-check † | | ● | ● | ● | ● | ● | ● | ● | 11-4 |
| Brake light switch-check † | | ● | ● | ● | ● | ● | ● | ● | 15-46 |
| Brake camshaft-lubricate | 2 years | | | | | ● | | | 11-15 |
| Brake cable-replace | 2 years | | | | | | | | 11-13 |
| Steering-check † | | ● | ● | ● | ● | ● | ● | ● | 13-4 |
| Steering stem bearing-lubricate | 2 years | | | | | ● | | | 13-8 |
| Front fork oil-change | | | | | | | | ● | 12-5 |
| Tire wear-check † | | | ● | ● | ● | ● | ● | ● | 9-10 |
| Swingarm pivot-lubricate | | | | ● | | | | ● | 12-15 |
| Battery electrolyte level-check† | month | ● | ● | ● | ● | ● | ● | ● | 15-10 |
| General lubrication-perform | | | ● | ● | ● | ● | ● | ● | 2-8,16-8 |
| Nut, bolt, and fastener ightness-check † | | ● | | ● | | ● | | ● | 16-8 |

* : For higher odometer readings, repeat at the frequency interval established here.
† : Replace, add, adjust, clean, or torque if necessary.

(Ca): California vehicle only (U): U.S.A. vehicle only (W): Switzerland Model

## Periodic Maintenance Chart

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

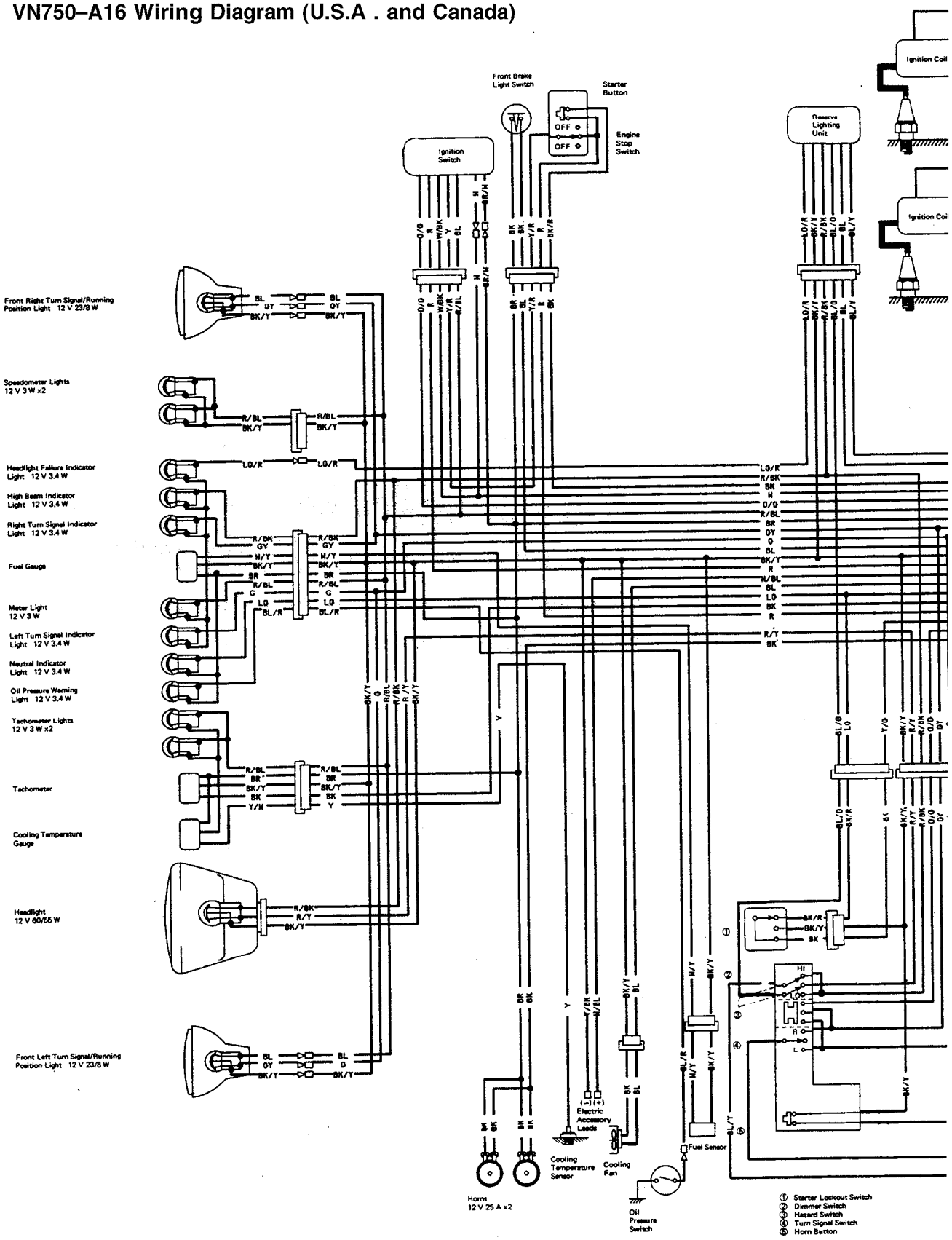
| FREQUENCY | Whichever comes first → ↓ | * ODOMETER READING | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1000 km (600 mile) | 6 000 km (4 000 mile) | 12 000 km ( 7 500 mile) | 18 000 km (12 000 mile) | 24 000 km (15 000 mile) | 30 000 km (20 000 mile) | 36 000 km (24 000 mile) | |
| OPERATION | Every | | | | | | | | See Page |
| Spark plug-clean | | | ● | ● | ● | ● | ● | ● | 15-21 |
| Spark plug-check † | | | ● | ● | ● | ● | ● | ● | 15-21 |
| Air suction valve (U)(W)-check † | | | ● | ● | ● | ● | ● | ● | 4-10 |
| Air cleaner element-clean | | ● | | ● | | ● | | ● | 2-23 |
| Air cleaner element-replace | 5 cleanings | | | | | ● | | | 2-23 |
| Throttle grip play-check † | | ● | | ● | | ● | | ● | 2-5 |
| Idle speed-check † | | ● | ● | ● | ● | ● | ● | ● | 2-9 |
| Engine vacuum synchronization-check † | | ● | ● | ● | ● | ● | ● | ● | 2-10 |
| Fuel system-check† | | | | ● | | ● | | ● | 2-13 |
| Fuel hoses, connections-check† | | | ● | ● | ● | ● | ● | ● | |
| Coolant-change | 2 years | | | | | | | ● | 3-4 |
| Evaporative emission control system (CA)- check † | | ● | ● | ● | ● | ● | ● | ● | 2-27 |
| Engine oil-change | year | ● | | ● | | ● | | ● | 6-5 |
| Oil filter-replace | | ● | | ● | | ● | | ● | 6-6 |
| Oil screen-clean | | ● | | ● | | ● | | ● | 6-5 |
| Radiator hoses, connections-check† | year | ● | | ● | | ● | | ● | 3-9 |
| Final gear case oil level-check† | | | | ● | | ● | | ● | 10-6 |
| Final gear case oil-change | | ● | | | | | | ● | 10-6 |
| Propeller shaft joint-lubricate | | | | ● | | | | ● | 10-6 |
| Fuel hose-replace | 4 years | | | | | | | | – |
| Clutch-adjust | | ● | ● | ● | ● | ● | ● | ● | 5-4 |
| Brake hoses, connections-check† | | | ● | ● | ● | ● | ● | ● | |
| Brake lining or pad wear-check † | | | ● | ● | ● | ● | ● | ● | 11-4,7 |
| Brake fluid level-check† | month | ● | ● | ● | ● | ● | ● | ● | 11-10 |
| Brake fluid-change | 2 years | | | | | ● | | | 11-11 |
| Brake hose-replace | 4 years | | | | | | | | 11-13 |
| Brake master cylinder cup and dust seal-replace | 2 years | | | | | | | | 11-9 |
| Caliper piston seal and dust seal-replace | 2 years | | | | | | | | 11-6 |
| Brake play-check † | | ● | ● | ● | ● | ● | ● | ● | 11-4 |
| Brake light switch-check † | | ● | ● | ● | ● | ● | ● | ● | 15-46 |
| Brake camshaft-lubricate | 2 years | | | | | ● | | | 11-15 |
| Brake cable-replace | 2 years | | | | | | | | 11-13 |
| Steering-check † | | ● | ● | ● | ● | ● | ● | ● | 13-4 |
| Steering stem bearing-lubricate | 2 years | | | | | ● | | | 13-8 |
| Front fork oil-change | | | | | | | | ● | 12-5 |
| Tire wear-check † | | | ● | ● | ● | ● | ● | ● | 9-10 |
| Swingarm pivot-lubricate | | | | ● | | | | ● | 12-15 |
| Battery electrolyte level-check† | month | ● | ● | ● | ● | ● | ● | ● | 15-10 |
| General lubrication-perform | | | ● | ● | ● | ● | ● | ● | 2-8,16-8 |
| Nut, bolt, and fastener ightness-check † | | ● | | ● | | ● | | ● | 16-8 |

* : For higher odometer readings, repeat at the frequency interval established here.
† : Replace, add, adjust, clean, or torque if necessary.

(Ca): California vehicle only (U): U.S.A. vehicle only (W): Switzerland Model

## Electrical System

### VN750–A16 Wiring Diagram (U.S.A . and Canada)

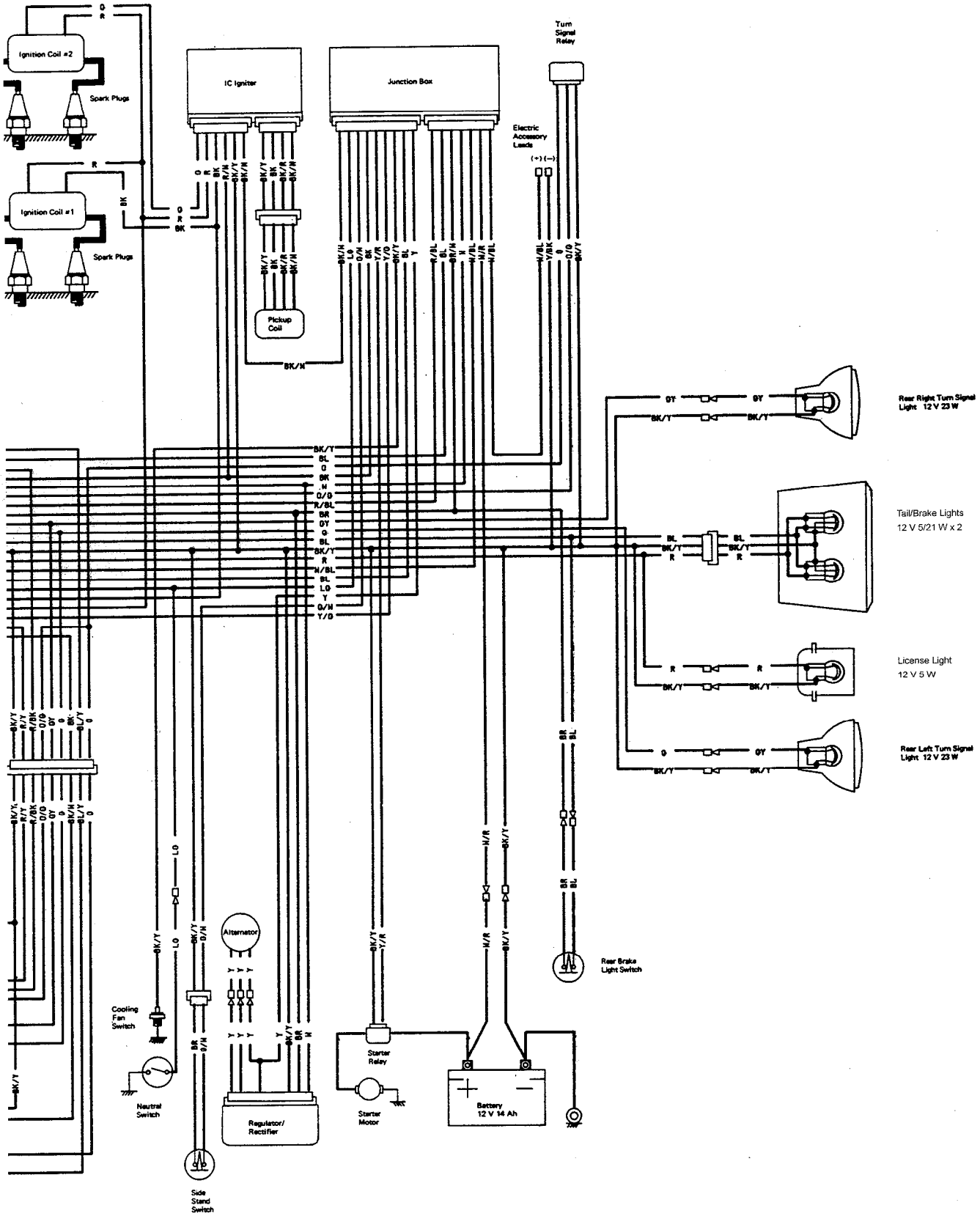



**LEFT HANDLEBAR SWITCH CONNECTIONS**

| Horn Button | | | Turn Signal Switch | | | | Hazard Switch | | | | Dimmer Switch | | | | | Starter Lockout Switch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | G | O | GY | Color | G | O/G | GY | Color | R/Y | BL/O | BL/Y | R/BK | Color | BK/Y | BK | BK/R |
| | | | L | | | | | | | | HI | | | | | Released | | | |
| Push | | | | | | | ON | | | | | | | | | | | | |
| | | | R | | | | | | | | LO | | | | | Pulled in | | | |

| | Horn | Ba |
|---|---|---|
| Color | BR/W | |
| OFF, LOCK | | |
| ON | | |
| P (Park) | | |

## Electrical System




| IGNITION SWITCH CONNECTIONS | | | | | | |
|---|---|---|---|---|---|---|
| Horn | Battery 1 | Ignition | Tail 1 | Tail 2 | Battery 2 | Tail 3 |
| BR/W | W | Y | B | R | W/BK | O/G |
| | | | | | | |
| | | | | | | |

(98051-1131B)

| RIGHT HANDLEBAR SWITCH CONNECTIONS | | | |
|---|---|---|---|
| Engine Stop/Starter Switch | | | |
| Color | Y/R | R | BK/R |
| OFF | | | |
| RUN | | | |
| Push with RUN | | | |

| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| LB | Light Blue |
| LG | Light Green |
| O | Orange |
| P | Pink |
| R | Red |
| W | White |
| Y | Yellow |

## MODEL APPLICATION

| Year | Model | Beginning Frame No. |
|---|---|---|
| 1985 | VN700-A1 (US) | JKAVN6A1□FA000001 |
| | VN750-A1(Canada) | JKAVNDA1□FA000001 |
| 1986 | VN750-A2 (US, Canada) | JKAVNDA1□GA002501 |
| | VN750-A2 (US, Lincoln) | JKAVNDA1□GB500001 |
| | VN750-A2 (Europe, General) | VN750A-002501 |
| 1987 | VN750-A3 (US, Canada) | JKAVNDA1□HA005501 |
| | VN750-A3 (US-Lincoln) | JKAVNDA1□HB508301 |
| | VN750-A3 (Europe, General) | VN750A-005501 |
| 1988 | VN750-A4 (US, Canada) | JKAVNDA1□JA006701 |
| | VN750-A4 (US-Lincoln) | JKAVNDA1□JB509501 |
| | VN750-A4 (Europe, General) | VN750A-006701 |
| 1989 | VN750-A5 (US, Canada) | JKAVNDA1□KA007901 |
| | VN750-A5 (US-Lincoln) | JKAVNDA1□KB510701 |
| | VN750-A5 (Europe, General) | VN750A-007901 |
| 1990 | VN750-A6 (US, Canada) | JKAVNDA1□LA009001 |
| | VN750-A6 (US-Lincoln) | JKAVNDA1□LB512901 |
| 1991 | VN750-A7 (US, Canada) | JKAVNDA1□MB515101 |
| 1992 | VN750-A8 (US, Canada) | JKAVNDA1□NB517301 |
| 1993 | VN750-A9 (US, Canada) | JKAVNDA1□PB520601 |
| | VN750-A9 (Europe, General) | VN750A-600001 |
| 1994 | VN750-A10 (US, Canada) | JKAVNDA1□RB524801 |
| | VN750-A10 (Europe, General) | VN750A-602001 |
| 1995 | VN750-A11 (US-Lincoln) | JKAVNDA1□SB529701 |
| 1996 | VN750-A12 (US-Lincoln) | JKAVNDA1□TB534900 |
| 1997 | VN750-A13 (US- Lincoln) | JKAVNDA1□VB536701 |
| 1998 | VN750-A14 | JKAVNDA1□WB538501 |
| 1999 | VN750-A15 | JKAVNDA1□XB539401 |
| 2000 | VN750-A16 | JKAVNDA1□YB541601 |
| 2001 | VN750-A17 | JKAVNDA1□IB543401 |

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

Kawasaki
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