Kawasaki KLF300



All Terrain Vehicle Service Manual

Quick Reference Guide

General Information	1
Fuel System	2
Engine Top End	3
Engine Left Side	4
Engine Right Side	5
Engine Removal/Installation	6
Engine Bottom End/Transmission	7
Wheels/Tires	8
Final Drive	9
Brakes	10
Suspension	11
Steering	12
Frame	13
Electrical System	14
Appendix	15

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 or procedure required.

Kawasaki

KLF300

All Terrain Vehicle
Service Manual

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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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First Edition ① : Feb. 25, 1985 Ⓜ

PLEASE DO NOT TAMPER WITH NOISE CONTROL SYSTEM

To minimize the noise emissions from this product, Kawasaki has equipped it with effective intake and exhaust silencing systems. They are designed to give optimum performance while maintaining a low noise level. Please do not remove these systems, or alter them in any way which results in an increase in noise level.

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) Celcius	r	revolution
DC	direct current	rpm	revolution(s) per minute
F	farad(s)	TDC	top dead center
°F	degree(s) Fahrenheit	TIR	total indicator reading
ft	foot, feet	V	volt(s)
g	gram(s)	W	watt(s)
h	hour(s)	Ω	ohm(s)
L	liter(s)		

Read OWNER'S MANUAL before operating.

Foreword

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

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

For the duration of 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 vehicle:

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

How to Use this Manual

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

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

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

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

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

WARNING

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

CAUTION

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

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

NOTE

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

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

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

1

General Information

Table of Contents

Before Servicing 1-2
Model Identification 1-4
General Specifications 1-5
Periodic Maintenance Chart 1-7
Torque and Locking Agent 1-8

1-2 GENERAL INFORMATION

Before Servicing

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

Especially note the following:

(1) Dirt

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

(2) Battery Ground

Remove the ground (–) lead from the battery before performing any disassembly operations on the motorcycle. This prevents:

(a) the possibility of accidentally turning the engine over while partially disassembled.

(b) sparks at electrical connections which will occur when they are disconnected.

(c) damage to electrical parts.

(3) Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, they should all be started in their holes and tightened to a snug fit. Then tighten them evenly in a cross pattern. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter of turn and then remove them.

Where there is a tightening sequence indication in this Service Manual, the bolts, nuts, or screws must be tightened in the order and method indicated.

(4) Torque

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

(5) Force

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

(6) Edges

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

(7) High Flash-point Solvent

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

(8) Gasket, O-ring

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

(9) Liquid Gasket, Non-permanent Locking Agent

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

(10) Press

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

(11) Ball Bearing

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

(12) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals.

When pressing in a seal which has manufacturer's marks, press it in with the marks facing out. Seals should be pressed into place using a suitable driver, which contacts evenly with the side of seal, until the face of the seal is even with the end of the hole.

(13) Seal Guide

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

(14) Circlip, Retaining Ring

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

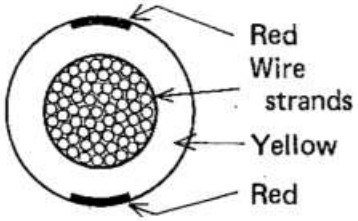
(15) Lubrication

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

Don't use just any oil or grease. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended. This manual makes reference to molybdenum disulfide grease (MoS_2) in the assembly of certain engine and chassis parts. Always check manufacturer recommendations before using such special lubricants.

(16) Electrical Wires

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

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

(17) Replacement Parts

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

(18) Inspection

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

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

(19) Service Data

Numbers of service data in this text have following meanings:

"Standards": Show dimensions or performances which brand-new parts or systems have.
"Service limits": Indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.

Model Identification

KLF300-A1 Left Side View:



KLF300-A1 Right Side View:



General Specifications

Items			KLF300-A1
Dimensions:			
Overall length			1,850 mm
Overall width			1,100 mm
Overall height			1,045 mm
Wheelbase			1,200 mm
Road clearance			195 mm
Seat height			750 mm
Dry weight			2,220 N (226 kg), 2,190 N (223 kg) (US, CAN)
Curb weight:	Front		1,070 N (109.5 kg), 1,060 N (108.5 kg) (US, CAN)
	Rear		1,240 N (126.5 kg), 1,220 N (124.5 kg) (US, CAN)
Fuel tank capacity			8.2 L
Performance:			
Minimum turning radius			3.0 m (Locked axle mode) 2.6 m (Differential mode)
Engine:			
Type			4-stroke, SOHC, 1-cylinder
Cooling system			Air cooled
Bore and stroke			76.0 x 64.0 mm
Displacement			290 mL
Compression ratio			8.6
Maximum horsepower			15.4 kW (21 PS) @7,000 r/min (rpm)
Maximum torque			22.6 N-m (2.3 kg-m, 16.6 ft-lb) @6,000 r/min (rpm)
Carburetion system			Carburetor, Keihin CVK32
Starting system			Electric starter
Ignition system			Battery and coil (Transistorized)
Timing advance			Electronically advanced
Ignition timing			From 10° BTDC @1,300 r/min (rpm) to 40° BTDC @4,000 r/min (rpm)
Spark plug			NGK B8ES NGK BR8ES (CAN, UK)
Valve timing:	Inlet	Open	27° BTDC
		Close	65° ABDC
		Duration	272°
	Exhaust	Open	62° BBDC
		Close	30° ATDC
		Duration	272°
Lubrication system			Forced lubrication (wet sump)
Engine oil:	Grade		SE or SF class
	Viscosity		SAE10W40, 10W50, 20W40, or 20W50
	Capacity		1.7 L

(Continued on next page.)

Items			KLF300-A1
Drive Train:			
Primary reduction system:		Type	Gear
		Reduction ratio	2.888 (78/27)
Clutch type			Wet multi disc and centrifugal
Transmission:	Type		5-speed plus reverse, constant mesh, return shift
	Gear ratios:	1st	3.090 (34/11)
		2nd	1.928 (27/14)
		3rd	1.368 (26/19)
		4th	1.000 (23/23)
		5th	0.769 (20/26)
		Reverse	3.072 (26/11 x 26/20)
Final drive system:	Type		Shaft
	Reduction ratio		4.886 (20/16 x 43/11)
Overall drive ratio			10.858 @Top gear
Final gear case oil:	Type		API GL-5 Hypoid gear oil SAE 90 (above 5°C, 41°F) or SAE 80 (below 5°C, 41°F)
	Capacity		0.3 L
Frame:			
Type			Double tubular
Caster (rake angle)			4°
Camber			0.8° @1G
Trail			17 mm
Tread			830 mm
Front tire:	Type		Tubeless
	Size		22 x 9.00-10
Rear tire:	Type		Tubeless
	Size		24 x 11.00-10
Suspension:	Front	Type	Double wishbone-link
		Wheel travel	115 mm
	Rear	Type	Torque tube-link
		Wheel travel	120 mm
Brake type:	Front		Drum (Hydraulic)
	Rear		Drum (Mechanical)
Electrical Equipment:			
Battery			12 V 19 Ah
Headlight:	Type		Semi-sealed beam
	Bulb		12 V 60 W
Taillight			12 V 8 W
Alternator:	Type		Three-phase AC
	Rated output		23.5 A @9,000 r/min (rpm), 14 V
Voltage regulator:	Type		Short-circuit

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

Periodic Maintenance Chart

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

• = Clean, adjust, lubricate, tighten, or replace parts as necessary.	First Service	Regular Service			
	After 10 hrs. of use	Every 10 days of use	Every 30 days of use	Every 90 days of use	Every year of use
Chassis:					
Brake adjustment – check*	•	•			
Brake wear – check*	•	•			
Brake fluid level – check			•		
Brake fluid – change					•
Master cylinder cup and dust seal – replace					2 years
Wheel cylinder piston seal and dust seal – replace					2 years
Brake hose – replace					2 years
Cable adjustment*	•	•			
Steering play – check	•			•	
Final gear case oil – change*	•				•
General lubrication*			•		
Bolts and nuts – tighten	•	•			
Battery – check	•		•		
Engine:					
Clutch adjustment*	•	•			
Valve clearance – check*	•			•	
Fuel system cleanliness – check*	•			•	
Air cleaner – service*	•	•			
Engine oil – change*	•			•	
Oil filter – change*	•			•	
Spark plug – clean and gap	•			•	
Spark arrester – clean					•

*Service more frequently when operated in mud, dust, or other harsh riding conditions.

Torque and Locking Agent

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

Letters used in the "Remarks" column mean:
L : Apply a non-permanent locking agent to the threads.
O : Apply an oil to the threads and seated surface.
S : Tighten the fasteners following the specified sequence.
St : Stake the fasteners to prevent loosening.

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Engine Top End:				
Cylinder Head Bolts: 6 mm	12	1.2	104 in-lb	S
8 mm	29	3.0	22	S
Cylinder Bolt	12	1.2	104 in-lb	
Valve Clearance Adjusting Screw Locknuts	12	1.2	104 in-lb	
Camshaft Sprocket Bolt	41	4.2	30	
Camshaft Chain Guide Pivot Bolt	9.8	1.0	87 in-lb	
Engine Left Side:				
Starter Clutch Allen Bolts	49	5.0	36	L
Engine Right Side:				
Oil Drain Plug	29	3.0	22	
Primary Clutch Hub Nut	83	8.5	61	O
Secondary Clutch Hub Nut	78	8.0	58	O
Secondary Clutch Spring Bolts	12	1.2	104 in-lb	
Engine Removal/Installation:				
Engine Mounting Bolts: 8 mm	25	2.5	18.0	
10 mm	34	3.5	25	
Engine Mounting Bracket Bolts	25	2.5	18.0	
Engine Bottom End/Transmission:				
Oil Pipe Banjo Bolts	20	2.0	14.5	
Shift Drum Stopper Bolt	12	1.2	104 in-lb	
Shift Drum Pin Plate Bolt	12	1.2	104 in-lb	
Shift Shaft Return Spring Pin	17	1.7	12.0	L
Clutch Release Cam Pin	17	1.7	12.0	L
Balancer Gear Nut	83	8.5	61	O
Balancer Drive Gear and Oil Pump Drive Gear Nut	78	8.0	58	O
Wheels/Tires:				
Wheel Nuts	34	3.5	25	
Front Hub Nuts	34	3.5	25	

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Final Drive:				
Front Gear Case Bolts (8 mm)	25	2.5	18.0	
Output Shaft LH Bearing Housing Bolts	12	1.2	104 in-lb	
LH Bearing Holder	98	10.0	72	St
Drive Gear Nut	88	9.0	65	O
Driven Gear Nut	78	8.0	58	O
Driven Gear Shaft Oil Seal Housing Nuts	25	2.5	18.0	
Front Gear Case Plug (Odometer Gear Holder: Option)	20	2.0	14.5	
Propeller Shaft Housing Nuts	25	2.5	18.0	
Axle Shaft Pipe Bolts	20	2.0	14.5	
Pinion Gear Nut	78	8.0	58	O, St
Ring Gear and Differential Gear Housing Bolts	29	3.0	22	L
Final Gear Case Cover Bolts	25	2.5	18.0	
Final Gear Case Filler Cap	29	3.0	22	
Final Gear Case Drain Plug	20	2.0	14.5	
Differential Shift Fork Holder Screws	6.9	0.70	61 in-lb	
Brakes:				
Master Cylinder Clamp Bolts	11	1.1	95 in-lb	S
Brake Lever Pivot Nut	5.9	0.60	52 in-lb	
Wheel Cylinder Bolts	7.8	0.80	69 in-lb	
Shoe Adjuster Bolts	7.8	0.80	69 in-lb	
Brake Panel Mounting Bolts:				
Front	20	2.0	14.5	
Rear	29	3.0	22	
Rear Axle Nuts	145	15.0	110	
Brake Hose Banjo Bolts	29	3.0	22	
Brake Pipe Nipple	20	2.0	14.5	
Brake Pedal Nut	29	3.0	22	
Suspension:				
Shock Absorber Mounting Bolts	34	3.5	25	
Suspension Arm Pivot Bolts: 10 mm	34	3.5	25	
12 mm	88	9.0	65	
Steering:				
Handlebar Holder Bolts	20	2.0	14.5	S
Stem Clamp Allen Bolts	20	2.0	14.5	
Stem Bottom End Nut	29	3.0	22	
Stem Bearing Housing Bolts	20	2.0	14.5	
Tie-rod End Nuts	41	4.2	30	
Tie-rod Adjusting Sleeve Locknuts	29	3.0	22	
Knuckle Arm Pivot Nuts	41	4.2	30	
Electrical System:				
Alternator Rotor Bolt	59	6.0	43	
Spark Plug	27	2.8	20	
Neutral and Reverse Indicator Switch Mounting Screws	—	—	—	L

1-10 GENERAL INFORMATION

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

General Fasteners:

Threads dia. (mm)	Torque		
	N-m	kg-m	ft-lb
5	3.4 – 4.9	0.35 – 0.50	30 – 43 in-lb
6	5.9 – 7.8	0.60 – 0.80	52 – 69 in-lb
8	14 – 19	1.4 – 1.9	10.0 – 13.5
10	25 – 39	2.6 – 3.5	19.0 – 25
12	44 – 61	4.5 – 6.2	33 – 45
14	73 – 98	7.4 – 10.0	54 – 72
16	115 – 155	11.5 – 16.0	83 – 115
18	165 – 225	17.0 – 23	125 – 165
20	225 – 325	23 – 33	165 – 240

Fuel System

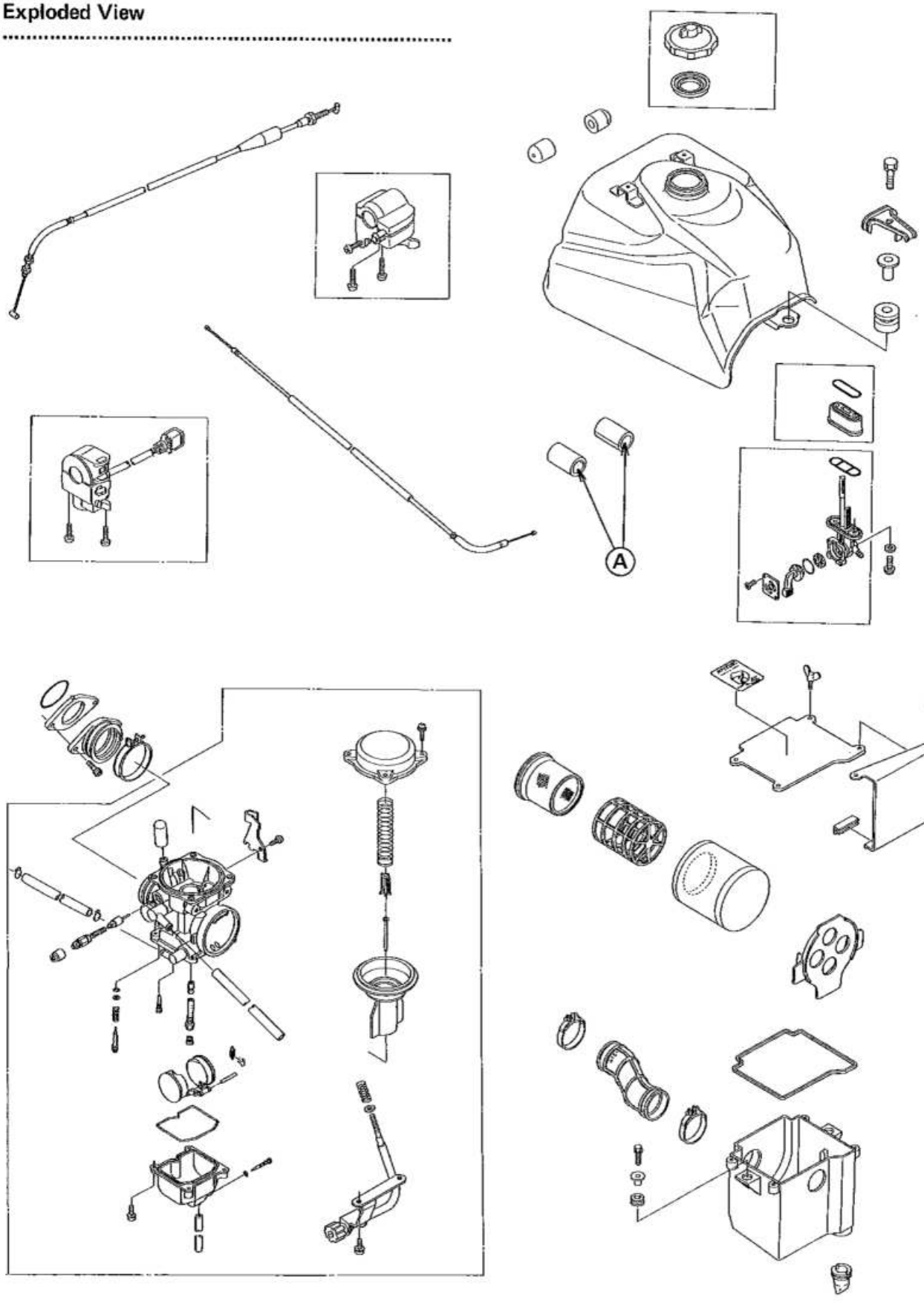
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Table of Contents

Exploded View 2-2
Specifications 2-3
Special Tool 2-3
Throttle Case and Cable 2-4
Throttle Lever Free Play Inspection 2-4
Throttle Cable Adjustment 2-4
Throttle Case Removal/Disassembly 2-4
Throttle Case Assembly/Installation 2-4
Throttle Cable Removal 2-5
Throttle Cable Installation 2-5
Throttle Case and Cable Lubrication 2-5
Throttle Case Inspection 2-6
Throttle Cable Inspection 2-6
Choke Lever and Cable 2-6
Choke Lever and Cable Removal 2-6
Choke Lever and Cable Installation 2-7
Choke Lever and Cable Lurbication 2-7
Choke Cable Inspection 2-8
Carburetor 2-8
Carburetor Pilot Screw Adjustment 2-8
Idle Speed Adjustment 2-9
Fuel Level Inspection 2-9
Fuel Level Adjustment 2-9
Fuel System Cleanliness Inspection 2-10
Carburetor Removal 2-10
Carburetor Installation 2-10
Carburetor Disassembly 2-10
Carburetor Assembly 2-11
Carburetor Cleaning 2-12
Carburetor Inspection 2-12
Air Cleaner 2-13
Air Cleaner Element Removal 2-13
Air Cleaner Element Installation 2-14
Air Cleaner Removal 2-14
Air Cleaner Installation 2-14
Air Cleaner Element Cleaning 2-14
Air Cleaner Element Inspection and Replacement 2-15
Fuel Tank 2-15
Fuel Tank Removal 2-15
Fuel Tank Installation 2-15
Fuel Tap Removal 2-16
Fuel Tank Inspection 2-16
Fuel Tank and Tap Cleaning 2-16
Fuel Tap Inspection 2-16

2-2 FUEL SYSTEM

Exploded View



A : Apply adhesive.

Specifications

Item	Standard
Throttle Lever Free Play	2 – 3 mm
Carburetor: Make/Type	Keihin/CVK32
Main Jet	#130
Main Air Jet	#100
Jet Needle	N27Q
Needle Jet	#6
Pilot Jet	#38
Pilot Air Jet	#140
Pilot Screw	$2^{1}/_{8}$ turns out
Starter Jet	#52
Service Fuel Level	–0.5 mm
Float Height	17.0 mm
Air Cleaner Element Oil:	
Grade	SE class
Viscosity	SAE30

Special Tool

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

Fuel Level Gauge: 57001-1017



Throttle Case and Cable

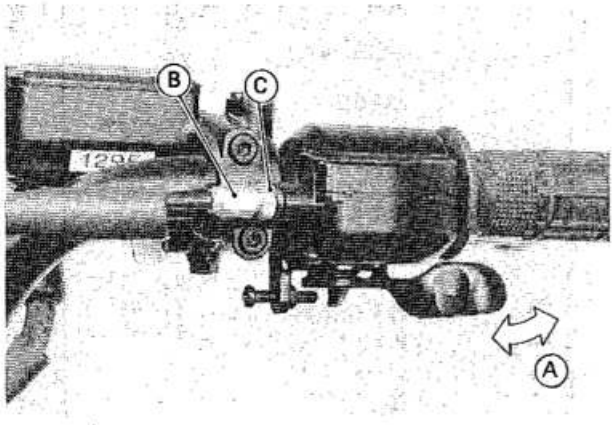
Throttle Lever Free Play Inspection

●Check throttle lever free play.

★If free play is not within specifications, adjust the throttle cable (see Throttle Cable Adjustment).

Throttle Lever Free Play

Standard: **2 – 3 mm**



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

Throttle Cable Adjustment

●Slide the cable adjuster dust cover out of place.

●Turn the adjuster until throttle lever free play is correct. Turning the adjuster "out" (lengthening the adjuster) will reduce free play.

●Slide back the dust cover.

NOTE

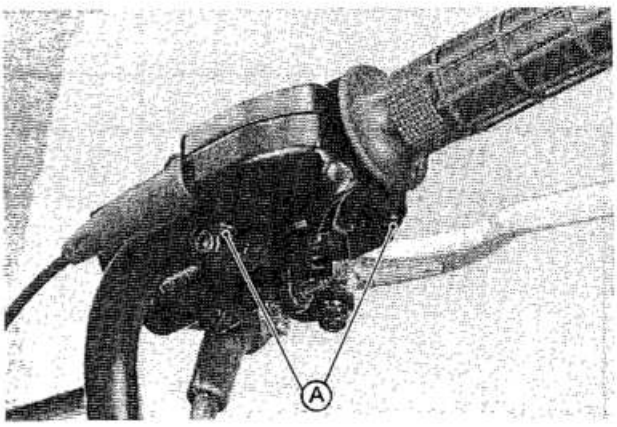
○*If the throttle cable cannot be adjusted by using the adjuster at the throttle case, use the adjuster at the carburetor. Do not forget to securely tighten the adjuster mounting nuts.*

Throttle Case Removal/Disassembly

●Remove the throttle case.

○Remove the throttle case screws and pull the case open.

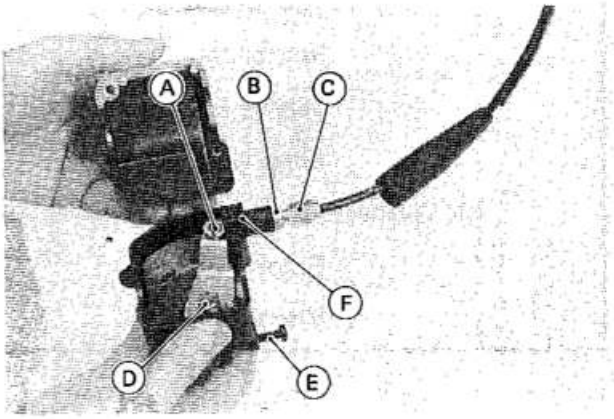
○Slide the cable adjuster dust cover out of place, and take off the grommet.



A. Throttle Case Screws

○Pull the cable tip from the throttle lever catch.

○Loosen the locknut and unscrew the adjuster.



A. Cable Tip
B. Locknut
C. Adjuster
D. Throttle Lever Bolt
E. Limiter Screw
F. Grommet

●Disassemble the throttle case.

○Remove the throttle lever bolt, lockwasher, and flat washer, and lift the throttle lever and return spring from the case. The control lever pivot bushing comes off with the lever.

○Loosen the locknut and unscrew the throttle limiter screw.

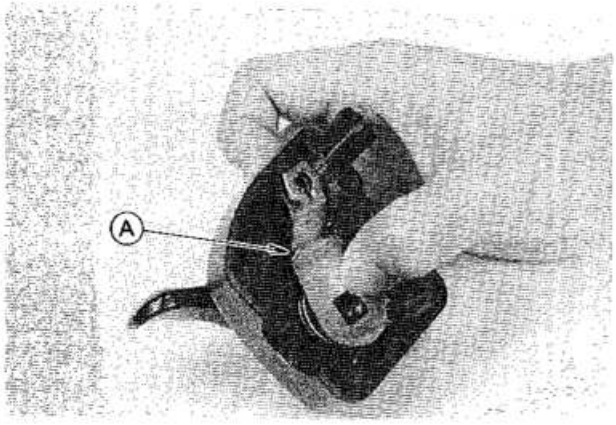
○Pull the throttle control lever out of the case.

Throttle Case Assembly/Installation

●Throttle case assembly/installation is the reverse of removal/disassembly. Note the following.

●Lubricate the throttle case and cable before assembly/installation (see Throttle Case and Cable Lubrication).

●Be certain that the return spring is correctly installed on the throttle lever.



A. Return Spring Hook

- Tighten the throttle lever bolt to the specified torque (see Exploded View).
- Swing the throttle control lever so that the carburetor throttle valve is fully open. Turn the throttle limiter screw until it is speced about 1 mm away from the throttle lever stop.

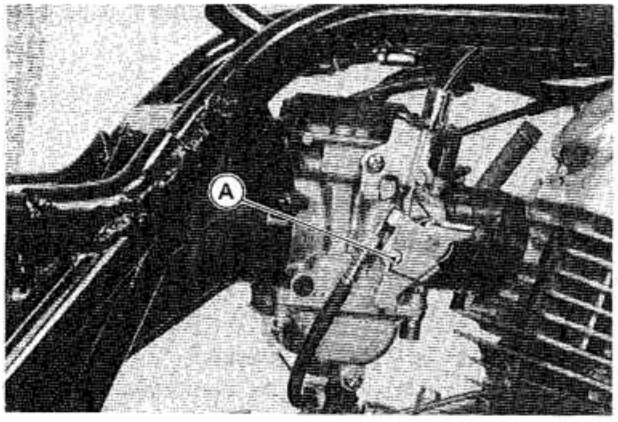
WARNING

○Operation with an improperly assembled throttle case could result in an unsafe riding condition.

- Adjust the throttle cable (see Throttle Cable Adjustment).

Throttle Cable Removal

- Remove the front fender (see Front Fender Removal in the Frame chapter).
- Remove and disassemble the throttle case to free the upper end of the cable from the case (see Throttle Case Removal/Disassembly).
- Slip the cable lower end out of the pulley.

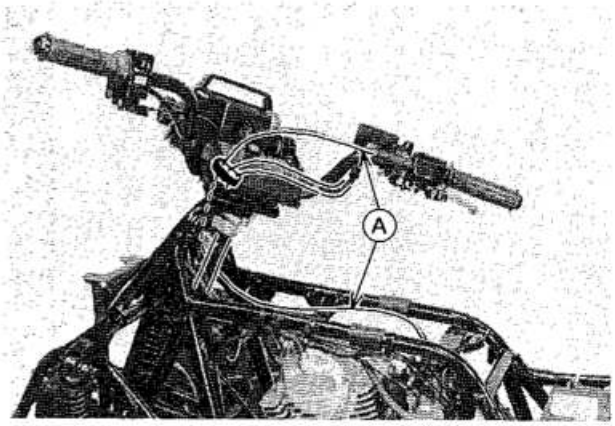


A. Cable End

- Loosen the mounting nuts at the cable lower end adjuster and free the cable from the bracket.
- Note cable routing for proper installation, and pull the cable from the vehicle.

Throttle Cable Installation

- Throttle cable installation is the reverse of removal. Note the following.
- Lubricate the throttle cable before installation (see Throttle Case and Cable Lubrication).
- Route the cable as shown.



A. Throttle Cable

WARNING

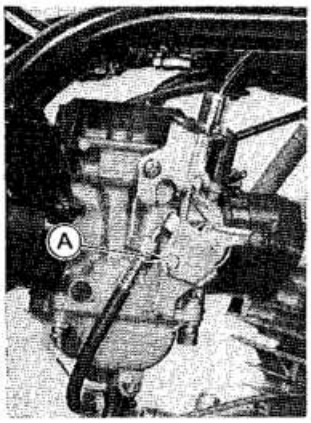
○Operation with an improperly adjusted, incorrectly routed, or damaged cable could result in an unsafe riding condition.

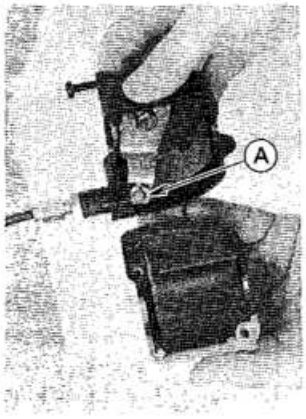
- Adjust the throttle cable (see Throttle Cable Adjustment).

Throttle Case and Cable Lubrication

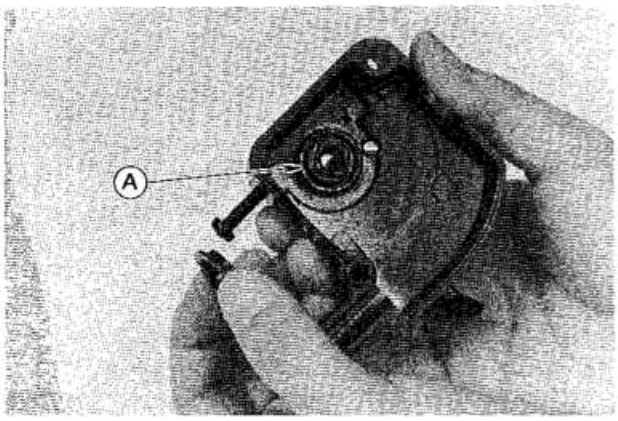
Whenever the throttle case disassembled, and in accordance with the Periodic Maintenance Chart, perform the following.

- Apply a thin coating of multi-purpose grease to the throttle control lever pivot area and the throttle cable ends.





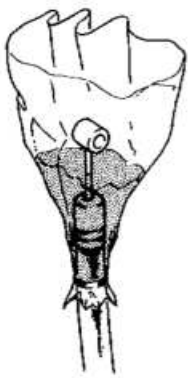
A. Apply grease.



A. Apply grease.

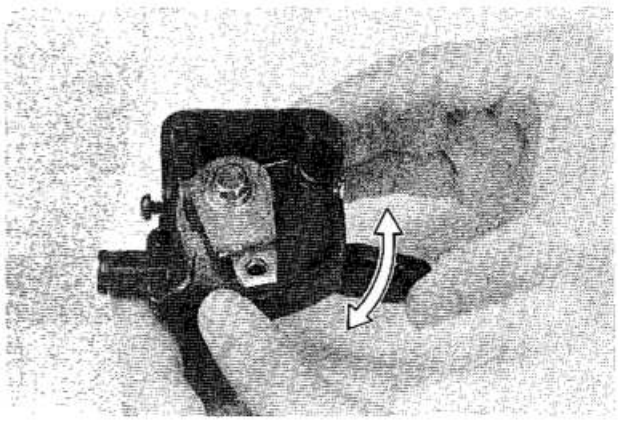
•Lubricate the throttle cable by seeping the oil between the cable and cable housing.

Cable Lubrication



Throttle Case Inspection

•With the throttle cable disconnected from the throttle lever, the lever should move freely and return smoothly by spring.

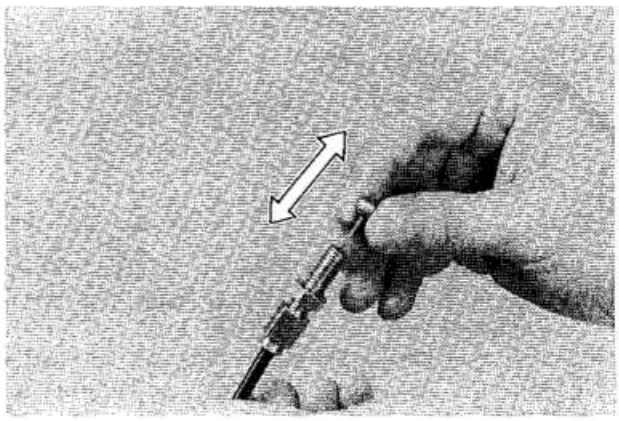


★If the lever bends, disassemble the throttle case, and clean and lubricate the throttle case (see Throttle Case and Cable Lubrication).

•Examine the lever and case for cracks. Replace the case assembly if it is cracked.

Throttle Cable Inspection

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



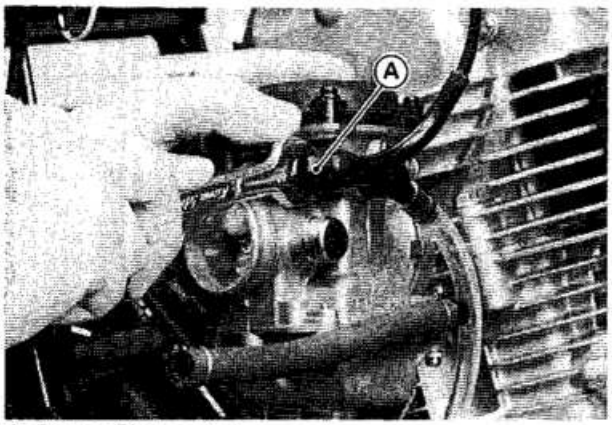
★If cable movement is not free after lubrication (see Throttle Case and Cable Lubrication), if the cable is frayed, or if the cable housing is kinked, replace the cable.

Choke Lever and Cable

Choke Lever and Cable Removal

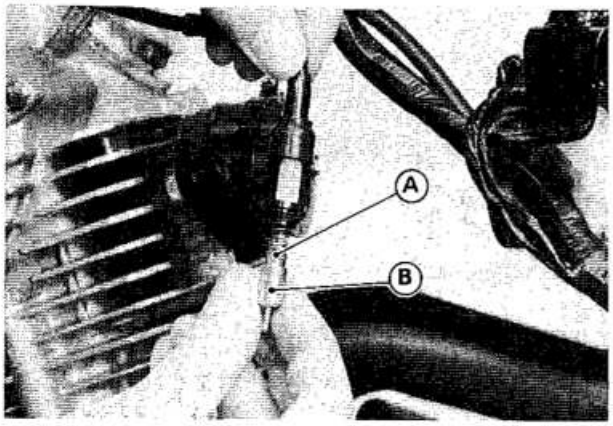
•Remove the carburetor (see Carburetor Removal).

•Unscrew the starter plunger cap and pull out the starter plunger.



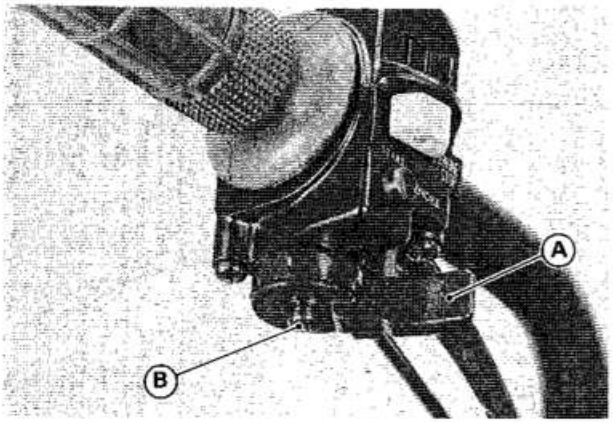
A. Starter Plunger Cap

•Hold the starter plunger spring compressed, and free the choke cable lower end from the plunger.



A. Cable End B. Starter Plunger

•Unscrew the choke lever mounting screw and take off the lockwasher and flat washer.

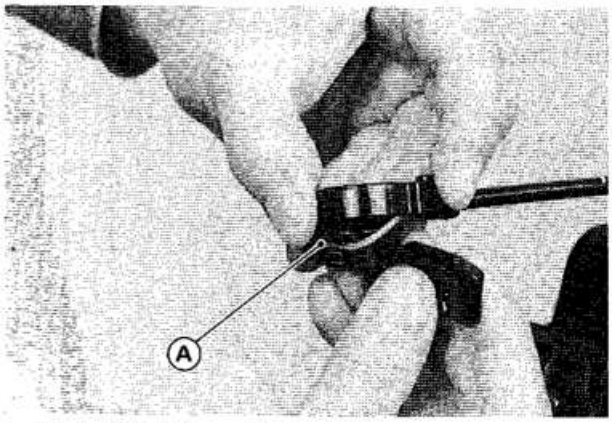


A. Choke Lever B. Lever Mounting Screw

•Pull the choke lever off the housing, and free the choke cable upper end from the lever. There is the wave washer between the lever and the housing.
•Note the choke cable routing for proper installation, and pull the cable from the vehicle.

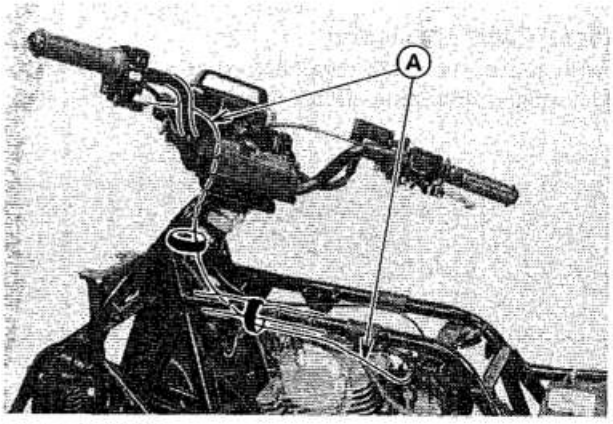
Choke Lever and Cable Installation

•Choke cable installation is the reverse of removal. Note the following.
•Lubricate the choke lever and cable before installation (see Choke Lever and Cable Lubrication).
•Fit the choke cable upper end to the catch on the choke lever as shown.



A. Choke Cable Upper End

•Route the choke cable as shown.

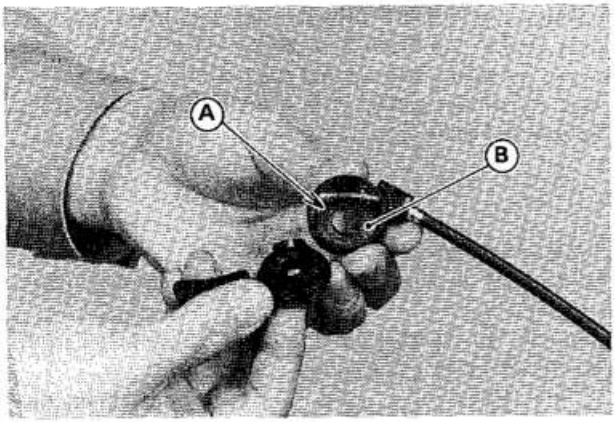


A. Choke Cable

Choke Lever and Cable Lubrication

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

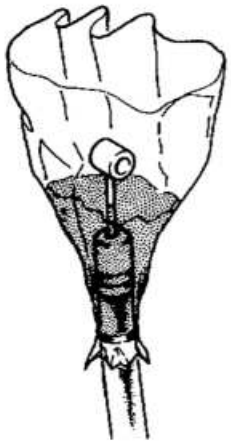
•Apply a thin coating of multi-purpose grease to the wave washer between the lever and the housing.



A. Apply grease. B. Wave Washer

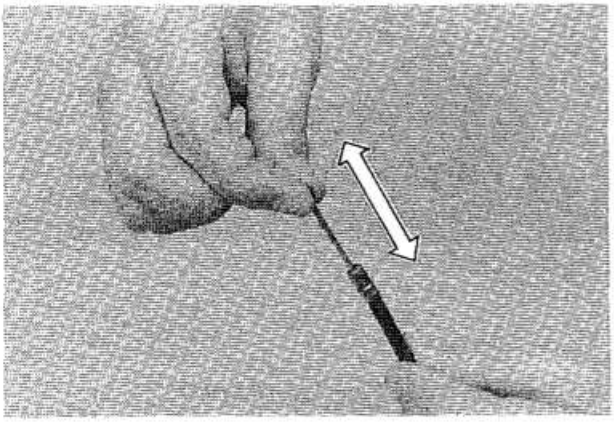
•Lubricate the choke cable by seeping the oil between the cable and cable housing.

Cable Lubrication



Choke Cable Inspection

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



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

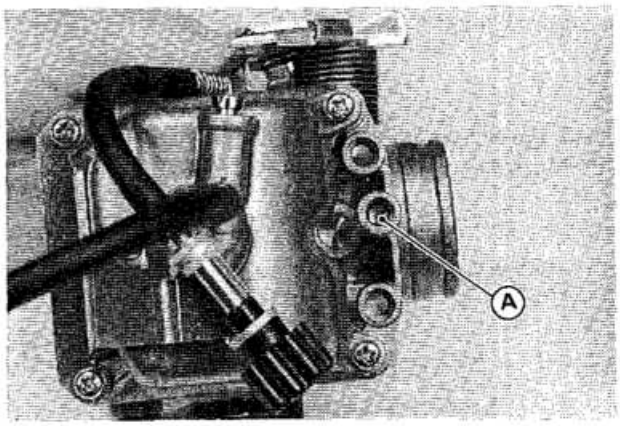
Carburetor

Carburetor Pilot Screw Adjustment

•Remove the carburetor (see Carburetor Removal).
•Turn the carburetor pilot screw all the way in until it seats lightly.

CAUTION

○**Do not overtighten the pilot screw or the carburetor body will be damaged and require replacement.**



A. Pilot Screw

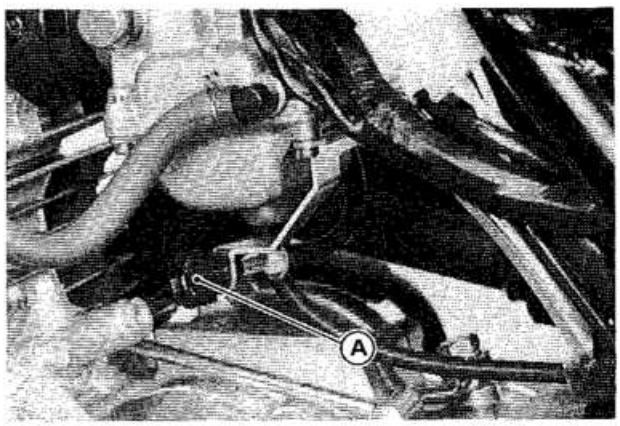
•Back the pilot screw out the specified number of turns.

Carburetor Pilot Screw Setting

Standard: **$2^{1}/_{8}$ turns out**

Idle Speed Adjustment

•Adjust the pilot screw if necessary (see Carburetor Pilot Screw Adjustment).
•Start the engine and warm it up thoroughly.
•Turn the idle adjusting screw to obtain the slowest smooth idle speed.



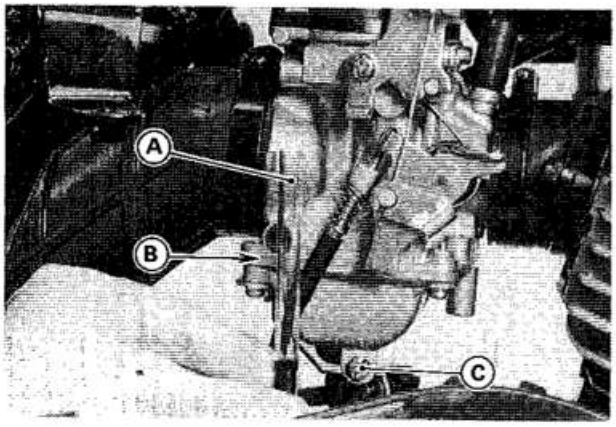
A. Idle Adjusting Screw

Fuel Level Inspection

WARNING

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

•Park the vehicle on a level surface.
•Connect the fuel level gauge (special tool) to the open end of the carburetor overflow tube.



A. Fuel Level Gauge: 57001-1017
B. Carburetor body bottom edge
C. Drain Plug

•Hold the gauge vertically against the side of the carburetor body so that the "zero" line is several millimeters higher than the bottom edge of the carburetor body.
•Turn the fuel tap to the ON position to feed fuel to the carburetor and gauge, then turn out the carburetor drain plug a few turns.
•Wait until the fuel level in the gauge settle.
•Keeping the gauge vertical, slowly lower the gauge until the "zero" line is even with the bottom edge of the carburetor body.

NOTE

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

•Read the fuel level in the gauge and compare it to the specification.
•Tighten the drain plug and remove the fuel level gauge.
★If the fuel level is incorrect, adjust it (see Fuel Level Adjustment).

Fuel Level

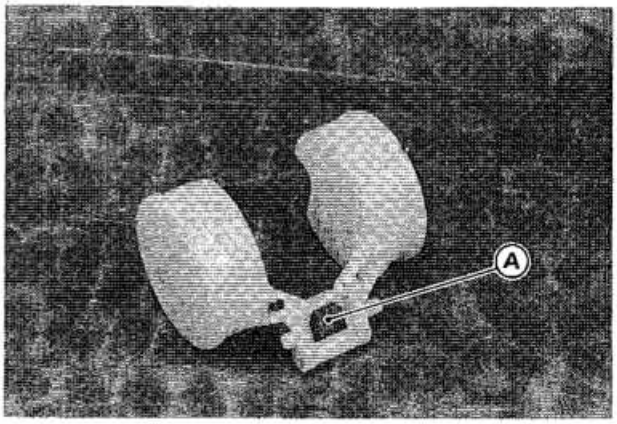
0.5 ±1 mm above the bottom edge of the carburetor body

Fuel Level Adjustment

•Remove the carburetor (see Carburetor Removal).
•Drain the carburetor into a suitable container.
•Remove the float bowl by taking out the screws with lockwashers.
•Slide out the pivot pin and remove the float.
•Bend the tang on the float arm very slighty to change the float height. Increasing the float height lowers the fuel level and decreasing the float height raises the fuel level.

Float Height

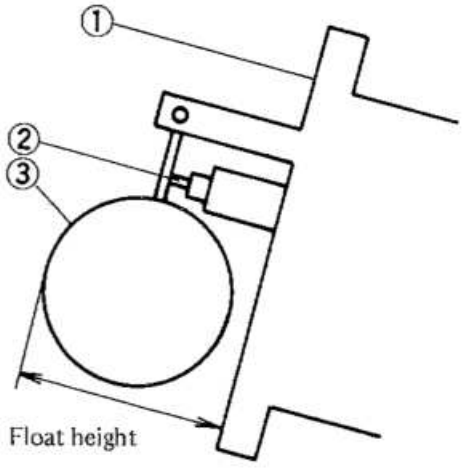
Standard: **17.0 mm**



A. Tang

•Assemble the carburetor, install it on the vehicle, and recheck the fuel level.
★If the fuel level cannot be adjusted by this method, the float or the float valve is damaged.

Float Height Measurement-Keihin Carburetor



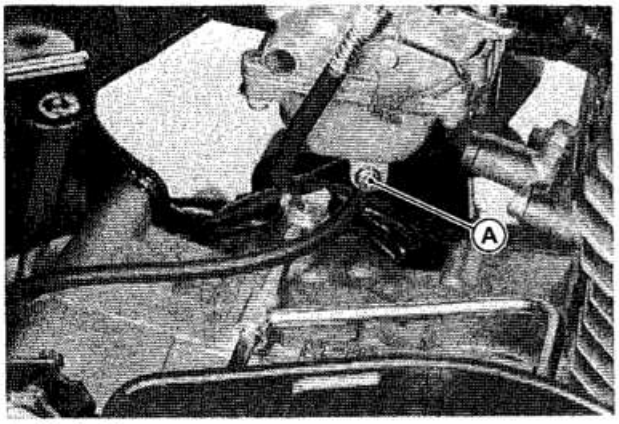
1. Float bowl mating surface
2. Float valve needle rod (contacted but unloaded)
3. Float

Fuel System Cleanliness Inspection

WARNING

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

- Run the lower end of the carburetor overflow tube to a suitable container.
- Turn out the carburetor drain plug a few turns and drain the fuel system.



A. Drain Plug

- Check to see if water or dirt comes out.
- Tighten the drain plug.

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

Carburetor Removal

- Remove the fuel tank (see Fuel Tank Removal).

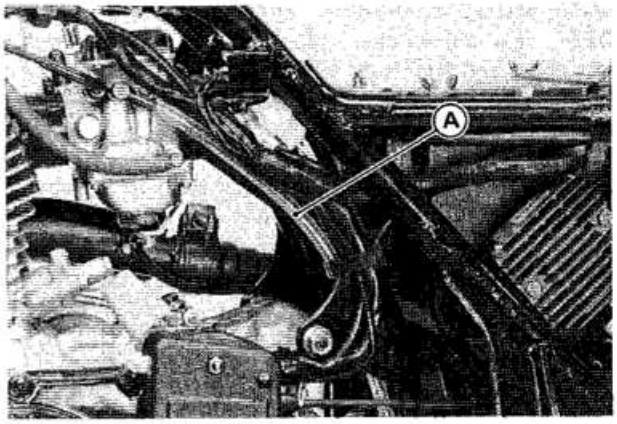
WARNING

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

- Slip the throttle cable lower end out of the carburetor pulley (see Throttle Cable Removal).
- Loosen the clamps on the carburetor holder and the air cleaner duct.
- Pull the air cleaner duct off the mouth of the carburetor.
- Pull the carburetor out the carburetor holder.
- Unscrew the starter plunger cap and free the lower end of the carburetor choke cable from the carburetor (see Choke Cable Removal).

Carburetor Installation

- Carburetor Installation is the reverse of removal. Note the following.
- Route the carburetor vent hose as shown.



A. Carburetor Vent Hose

- Check fuel leakage from the carburetor.

WARNING

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

- Adjust the pilot screw (see Carburetor Pilot Screw Adjustment).
- If the carburetor has been disassembled, or if there is some other reason that the fuel level may be incorrect, inspect the fuel level (see Carburetor Fuel Level Inspection).
- Adjust the idle speed (see Idle Speed Adjustment).
- Adjust the throttle cable (see Throttle Cable Adjustment).

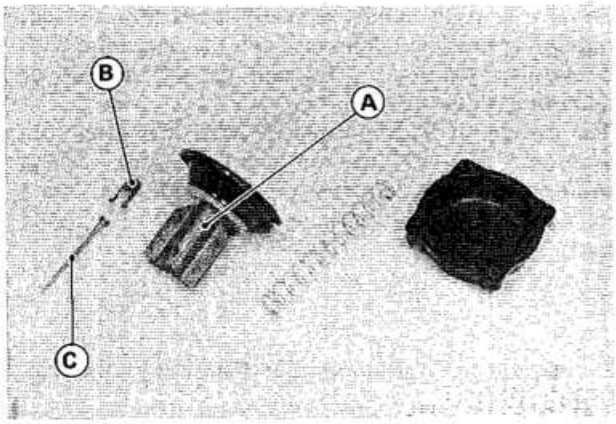
Carburetor Disassembly

- Remove the carburetor (see Carburetor Removal).
- Remove the carburetor top end as follows.
- Remove the upper chamber cover screws and take off the cover and spring.
- Pull out the vacuum piston with the diaphragm.

CAUTION

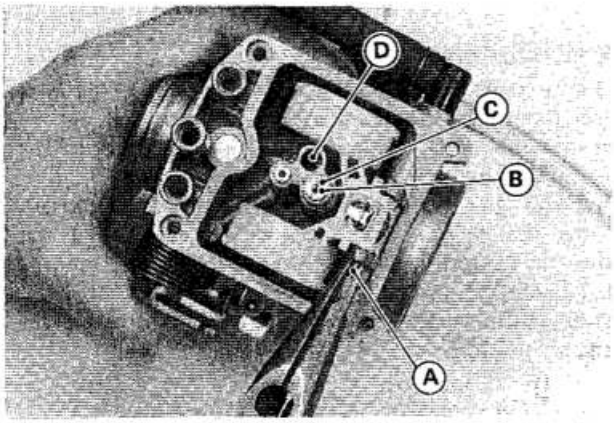
○**During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove diaphragm.**

- Slide the jet needle out of the vacuum piston from the bottom. It will come out with a spring seat.



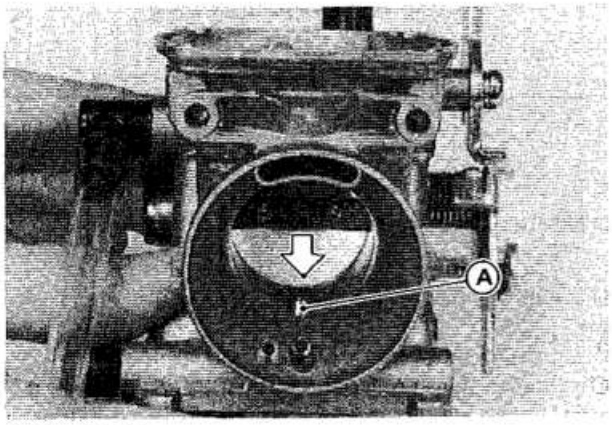
A. Vacuum Piston
B. Spring Seat
C. Jet Needle

•Remove the carburetor bottom end as follows.
•Unscrew the pilot screw and remove it with its spring, washer, and O-ring.
•Remove the float bowl screws and take off the float bowl and O-ring.
•Slide out the float pivot pin, remove the float, and drop out the float needle valve with its hanger.



A. Float Pivot Pin
B. Main Jet
C. Air Bleed Pipe
D. Pilot Jet

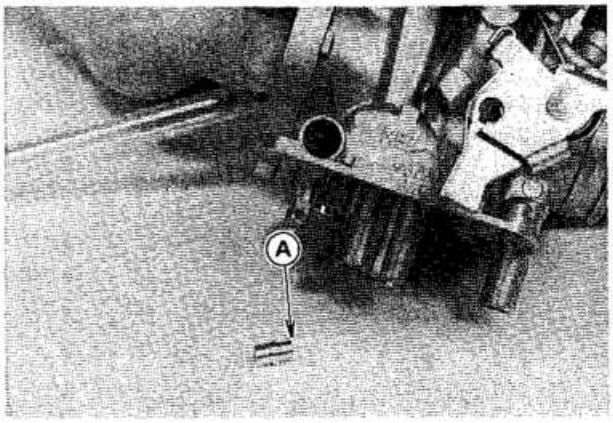
•Unscrew the main jet, pilot jet, and air bleed pipe.
•Push the needle jet out from the inside of the carburetor with your finger.



A. Needle Jet

Carburetor Assembly

•Carburetor assembly is the reverse of disassembly. Note the following.
•Turn the carburetor body upside-down, and drop the needle jet into place. The smaller diameter end of the jet goes in first.



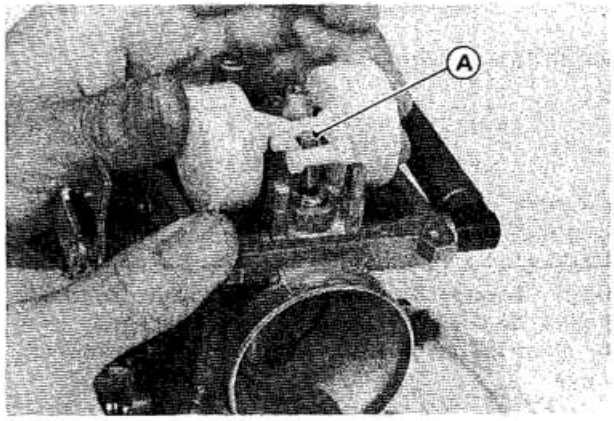
A. Small End

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

CAUTION

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

•Drop the float valve needle into the valve seat and hold the float in place with the tab hooked into the needle hanger.



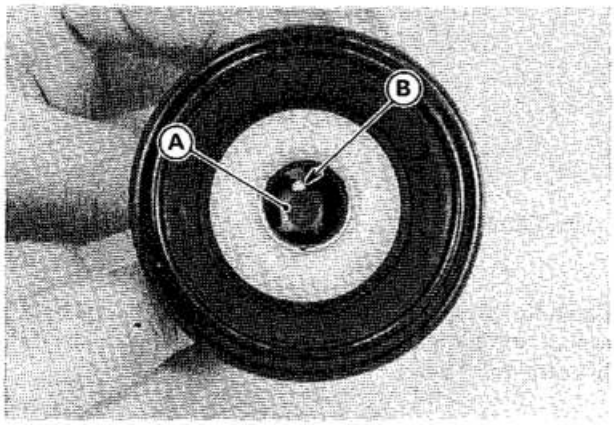
A. Needle Hanger

•Slip the float pivot pin through the pivot posts and the float. The float stop tab must be on the correct side as shown.

WARNING

○If the float is improperly installed, the specified fuel level cannot be maintained. Fuel spilled from the carburetor is hazardous.

- Set the float height as specified (see Fuel Level Adjustment).
- 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.

Carburetor Cleaning

WARNING

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

CAUTION

○Do not use compressed air on an assembled carburetor, the floats may be crushed by the pressure, and the vacuum piston diaphragms may be damaged.

○Remove as many rubber or plastic parts from the carburetor as possible before cleaning the carburetor with a cleaning solution. This will prevent damage or deterioration of the parts.

○The carburetor body has plastic parts that cannot be removed. DO NOT use a strong carburetor cleaning solution which could attack these parts; instead, use a mild high flash-point cleaning solution safe for plastic parts.

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

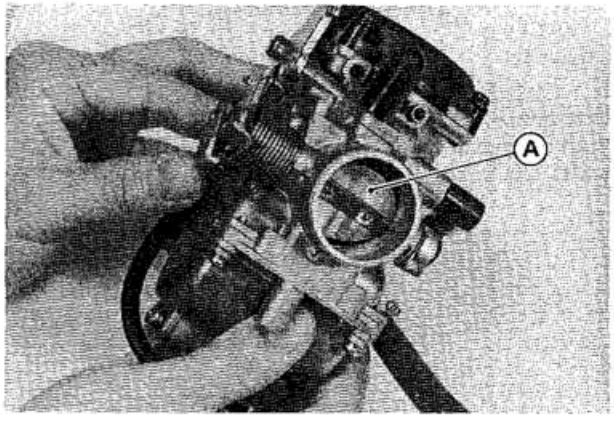
Carburetor Inspection

- Before removing the carburetor, check the fuel level (see Fuel Level Inspection).

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

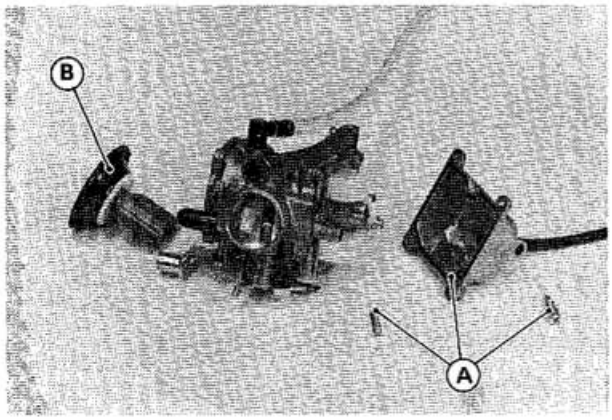
- Remove the carburetor (see Carburetor Removal).
- Turn the throttle cable pulley to check that the throttle butterfly valve moves smoothly and returns back with the spring tension.

★If the throttle valve does not move smoothly, replace the carburetor.

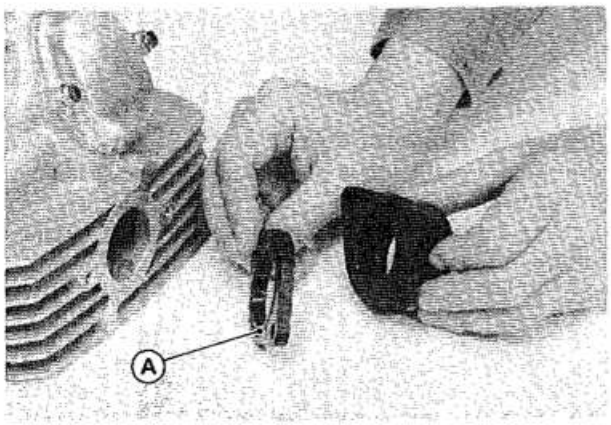


A. Throttle Butterfly Valve

- Disassemble the carburetor (see Carburetor Disassembly).
- Clean the carburetor (see Carburetor Cleaning).
- Check that the O-rings on the float bowl, drain plug, pilot screw, and carburetor holder, and the diaphragm on the vacuum piston.



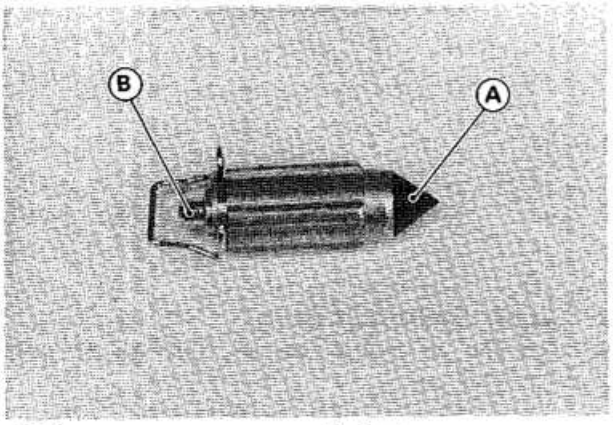
A. O-rings B. Diaphragm



A. O-ring

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

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



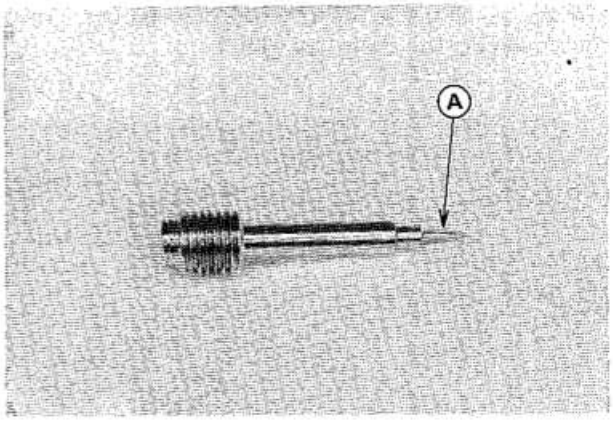
A. Tip B. Rod

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

●Push in the rod in the other end of the float valve needle and then 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.

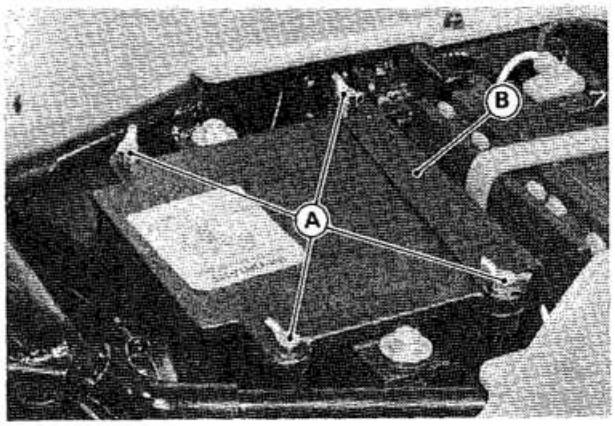
★If the vacuum piston does not move smoothly, or if it is very loose in the carburetor body, replace both the body and the vacuum piston.

Air Cleaner

Air Cleaner Element Removal

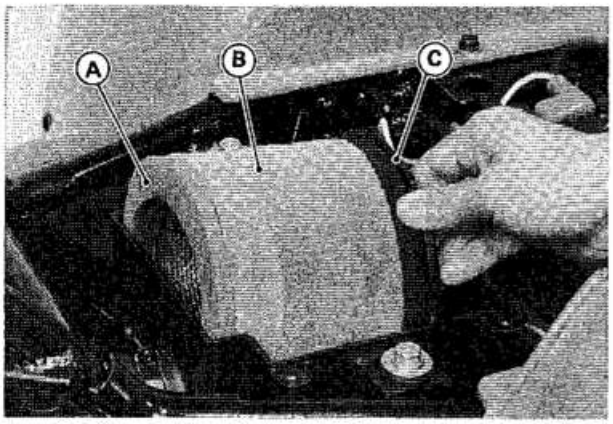
●Remove the seat (see Seat Removal in the Frame chapter).

●Remove the air cleaner cover by taking out the screws and then lifting the cover. The baffle plate comes out with the cover.



A. Screws B. Baffle Plate

•Lift the air cleaner element straight up and out. The element holder will come free with it.

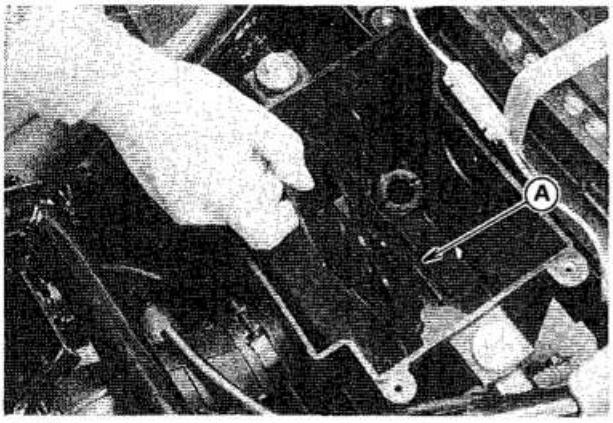


A. Gasket B. Element C. Holder

Air Cleaner Element Installation

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

•Set the element holder in place, as shown, with its lower edge in the slot in the bottom of the air cleaner.



A. Slot

•Smear a little grease on the foam gasket.

•Slide the air cleaner element into place with the foam gasket toward the engine.

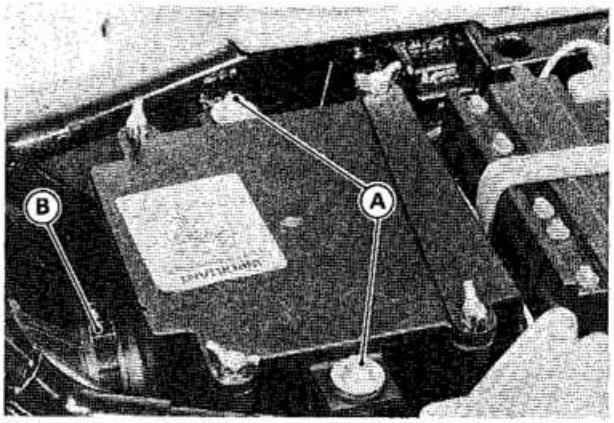
Air Cleaner Removal

•Remove the seat (see Seat Removal in the Frame chapter).

•Take out the bolts holding the air cleaner to the frame.

•Loosen the clamp on the duct to the air cleaner mouth.

•Pull the air cleaner out of the frame.

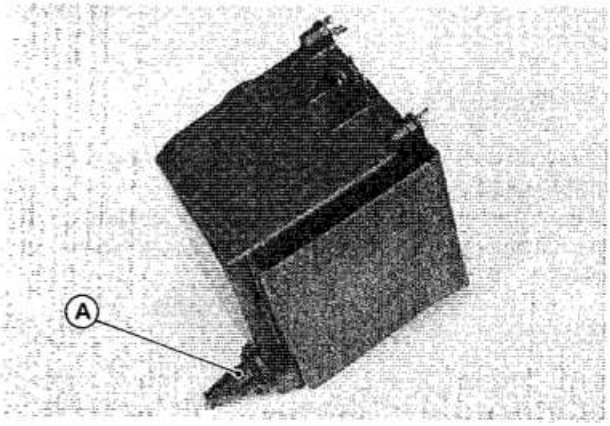


A. Bolts B. Clamp

Air Cleaner Installation

•Air cleaner installation is the reverse of removal. Note the following.

•If the drain was removed, twist it into place on the bottom of the air cleaner.



A. Drain

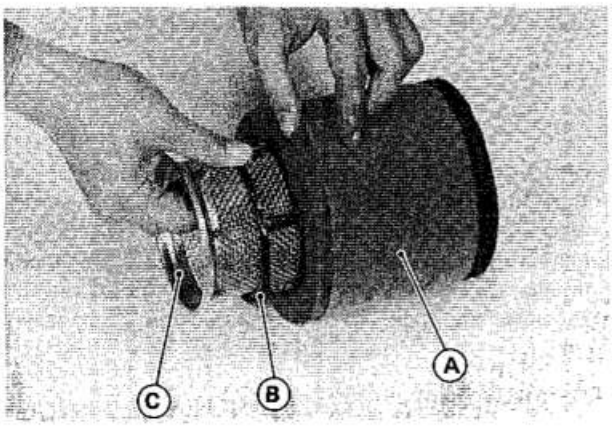
Air Cleaner Element Cleaning

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

WARNING

○Clean the element in a well-ventilated area, and take care that there is no spark or flame 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 element. A fire or explosion could result.

•Peel the air cleaner element off the plastic frame inside it.



A. Element B. Frame C. Screen

•Wash the element in a bath of high flash-point solvent and then squeeze it dry.

CAUTION

○Do not wring or twist the element as it may tear.

•Saturate the element with SAE30 motor oil, or a commercially available air cleaner oil, and squeeze out the excess.
•Wrap the element in a clean, dry cloth and squeeze it as dry as possible.
•Pull the element back over the plastic frame.
•Inspect the element before installing it (see Air Cleaner Element Inspection and Replacement and Air Cleaner Element Installation).

Air Cleaner Element Inspection and Replacement

•Remove the air cleaner element (see Air Cleaner Element Removal).
•Clean the air cleaner element (see Air Cleaner Element Cleaning).
•Visually check the element for tears or breaks in the foam. Check the foam gasket also, and the plastic frame and screen.
★If the element or gasket have any tears or breaks, replace the element.
★If the plastic frame and/or screen are damaged or distorted, replace the damaged one.
•Repeated cleaning opens the pores of the foam in the element. Replace the element according to the Periodic Maintenance Chart (see General Information chapter).

Fuel Tank

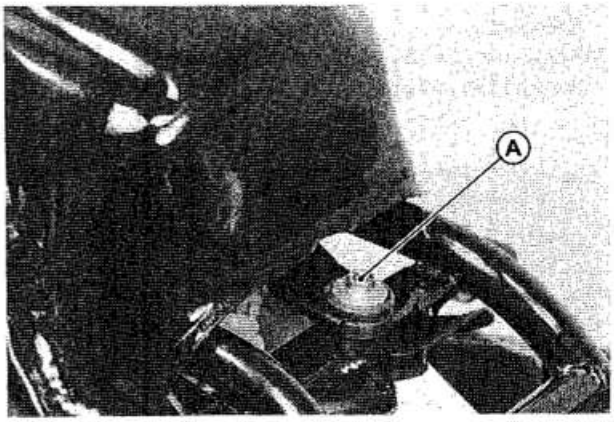
Fuel Tank Removal

•Remove the front fender (see Front Frender Removal in the Frame chapter).
•Turn the fuel tap to the OFF position.
•Pull the fuel hose off the tap.

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 bolt with lockwasher and flat washer from the rear end of the tank.

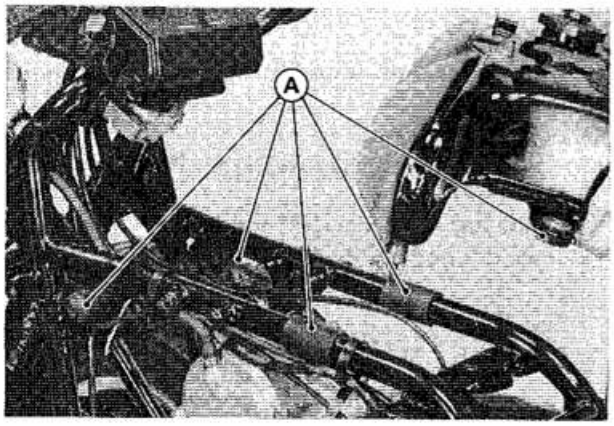


A. Bolt

•Tilt the tank out the rear of the frame.
•Drain the fuel tank.
○Arrange a suitable container under the fuel tank.
○Turn the fuel tap to the RES position to drain the fuel into the container.

Fuel Tank Installation

•Fuel tank installation is the reverse of removal. Note the following.
•Read the WARNING in the Fuel Tank Removal section.
•Check the rubber dmapers on the frame top-tubes and on the rear end of the fuel tank.

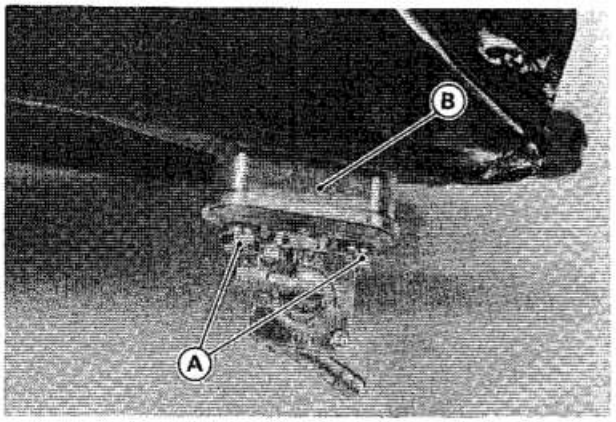


A. Dampers

★If the dampers are damaged or deteriorated, replace them.
•Be sure the fuel hose is clamped to the fuel tap to prevent leaks.

Fuel Tap Removal

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



A. Bolts B. Spacer

Fuel Tap Installation

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

Fuel Tank and Tap Cleaning

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

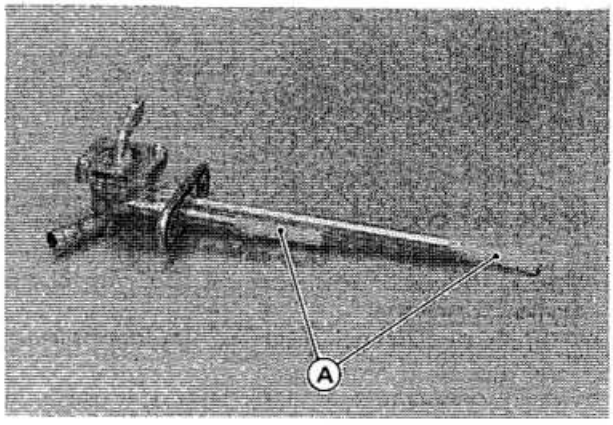
WARNING

○Clean the tank in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area; 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 tank. A fire or explosion could result.

•Pour the solvent out 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 both ON and RES positions.
•Dry the tank and tap with compressed air.
•Install the tap in the tank (see Fuel Tap Installation).
•Install the fuel tank (see Fuel Tank Installation).

Fuel Tap Inspection

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



A. Screens

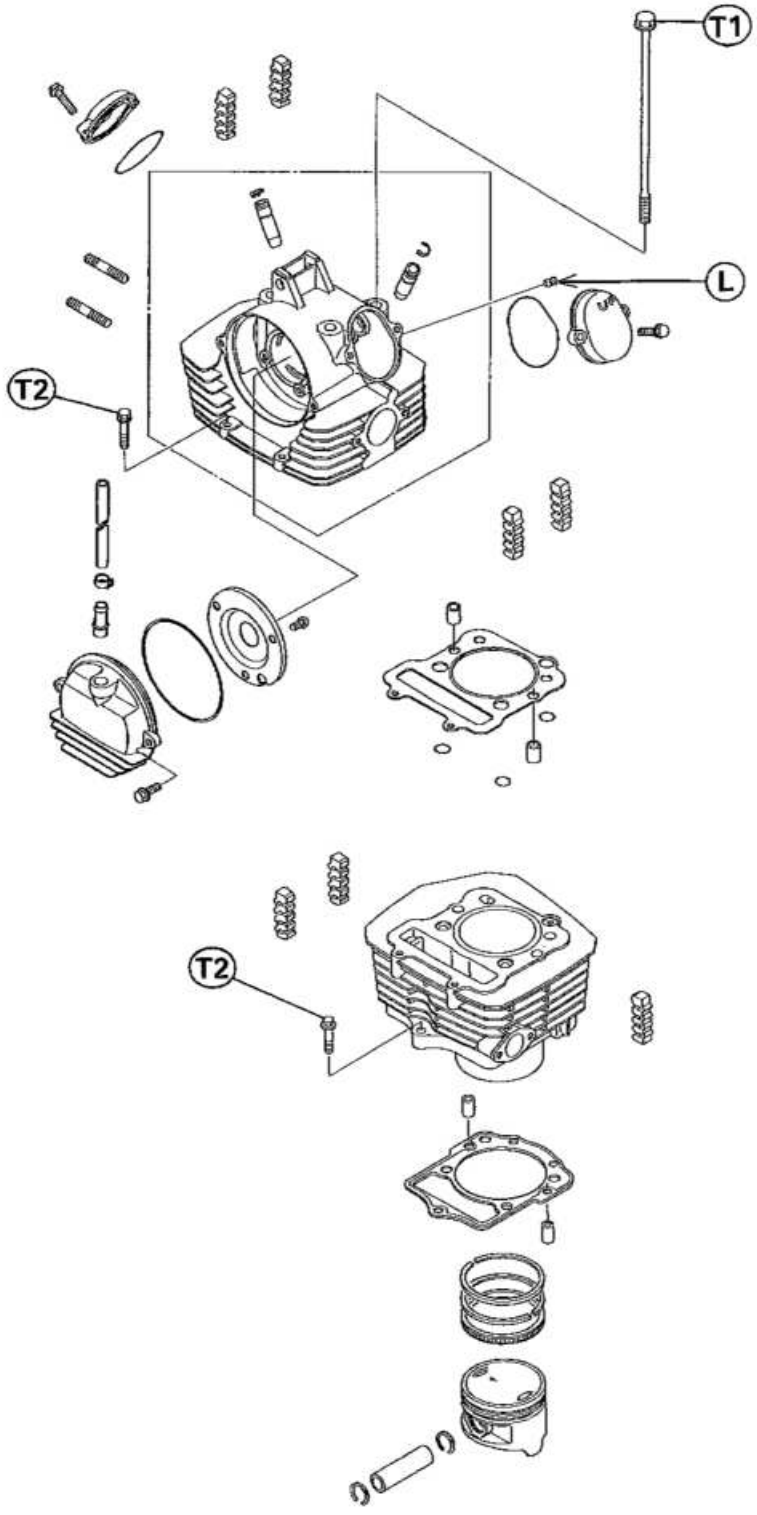
★If the fuel tap screens have any breaks or are deteriorated, it may allow dirt to reach the carburetor, causing poor running. Replace the fuel tap.
★If the fuel tap leaks, or allows fuel to flow when it is OFF, replace the damaged gasket or O-rings.

Engine Top End

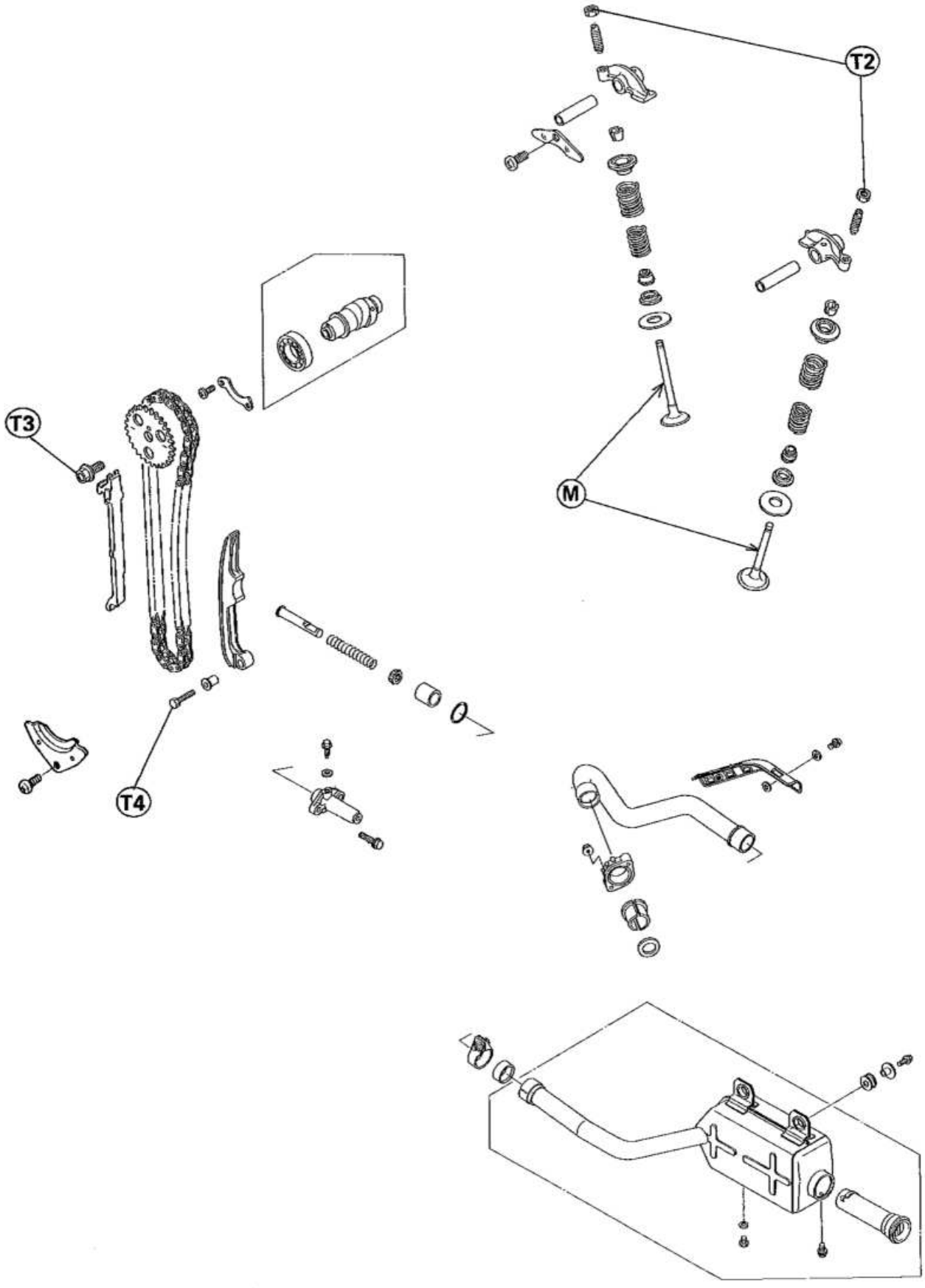
Table of Contents

Exploded View 3-2
Specifications 3-4
Special Tools 3-6
Cylinder Head 3-7
  Cylinder Head Removal 3-7
  Cylinder Head Installation 3-7
  Cylinder Head Cleaning 3-8
  Cylinder Head Warp 3-8
Valves, Guides, Seats, Springs, Oil Seals 3-8
  Valves 3-8
    Valve Clearance Check 3-8
    Valve Clearance Adjustment 3-9
    Valve Removal 3-9
    Valve Installation 3-10
    Valve Visual Inspection 3-10
    Valve Head Thickness 3-11
    Valve Stem Bend 3-11
    Valve Stem Diameter 3-11
    Valve Stem Grinding 3-11
  Valve Guides 3-11
    Valve Guide Inside Diameter 3-11
    Valve Guide Removal 3-11
    Valve Guide Installation 3-12
  Valve Seats 3-12
    Valve Seat Inspection 3-12
    Valve Seat Repair 3-13
  Valve Springs 3-16
    Valve Spring Removal/Installation 3-16
    Valve Spring Free Length 3-16
  Valve Stem Oil Seals 3-16
    Valve Stem Oil Seal Removal 3-16
    Valve Stem Oil Seal Installation 3-16
Camshaft Sprocket 3-16
  Camshaft Sprocket Removal 3-16
  Camshaft Sprocket Installation 3-17
Camshaft, Rocker Arms and Shafts 3-17
  Rocker Arms and Shafts 3-17
    Rocker Arm and Shaft Removal 3-17
    Rocker Arm and Shaft Installation 3-18
    Rocker Arm Inspection 3-18
    Rocker Shaft Diameter 3-18
  Camshaft 3-19
    Camshaft Removal 3-19
    Camshaft Installation 3-19
    Cam Wear Inspection 3-19
    Camshaft Bearing Inspection 3-19
Camshaft Chain, Guides and Tensioner 3-20
  Camshaft Chain 3-20
    Camshaft Chain Removal 3-20
    Camshaft Chain Installation 3-20
    Camshaft Chain Wear 3-20
  Camshaft Chain Guides 3-20
    Camshaft Chain Guide Removal 3-20
    Camshaft Chain Guide Installation 3-20
    Camshaft Chain Guide Wear 3-21
  Camshaft Chain Tensioner 3-21
    Camshaft Chain Tensioner Removal 3-21
    Camshaft Chain Tensioner Installation . . . 3-21
    Camshaft Chain Tensioner Disassembly . . 3-22
    Camshaft Chain Tensioner Assembly 3-22
    Camshaft Chain Tensioner Wear 3-22
Cylinder, Piston and Rings 3-22
  Cylinder Removal/Installation 3-22
    Cylinder Removal 3-22
    Cylinder Installation 3-22
  Piston and Ring Removal/Installation 3-23
    Piston and Ring Removal 3-23
    Piston and Ring Installation 3-24
  Cylinder, Piston and Ring Maintenance 3-25
    Compression Measurement 3-25
    Cylinder/Piston Wear 3-26
    Piston/Cylinder Clearance 3-27
    Cylinder Boring and Honing 3-27
    Piston/Cylinder Seizure 3-28
    Piston Cleaning 3-28
    Piston Ring and Ring Groove Wear 3-28
    Piston Ring End Gap 3-28
Exhaust System 3-29
  Spark Arrester 3-29
    Spark Arrester Cleaning 3-29
  Exhaust Pipe and Muffler 3-29
    Exhaust Pipe and Muffler Removal 3-29
    Exhaust Pipe and Muffler Installation . . . 3-30
    Exhaust System Inspection 3-30

Exploded View



L : Apply a non-permanent locking agent.
M : Apply a molybdenum disulfide grease.
T1 : 29 N-m (3.0 kg-m, 22 ft-lb)
T2 : 12 N-m (1.2 kg-m, 104 in-lb)
T3 : 41 N-m (4.2 kg-m, 30 ft-lb)
T4 : 9.8 N-m (1.0 kg-m, 87 in-lb)


T2
T3
M
T4

Specifications

Cylinder Head:

Item	Standard	Service Limit
Cylinder Head Warp	———	0.05 mm

Valve, Guides, Seats, Springs, Oil Seals:

Item		Standard	Service Limit
Valve Clearance:	IN.	0.10 – 0.15 mm	——
	EX.	0.15 – 0.20 mm	——
Valve Seating Surface Angle		45°	——
Valve Head Thickness:	IN.	0.80 – 1.20 mm	0.5 mm
	EX.	0.80 – 1.20 mm	0.7 mm
Valve Stem Bend		0.02 mm TIR	0.05 mm TIR
Valve Stem Diameter:	IN.	6.965 – 6.980 mm	6.95 mm
	EX.	6.950 – 6.970 mm	6.94 mm
Valve Guide Inside Diameter		7.000 – 7.015 mm	7.08 mm
Valve Seating Width		0.5 – 1.0 mm	——
Valve Seating Surface Diameter:			
	IN.	35.7 – 36.3 mm	——
	EX.	29.7 – 30.3 mm	——
Valve Spring Free Length:	Inner	32.4 mm	31.1 mm
	Outer	37.3 mm	35.8 mm

Camshaft, Rocker Arms and Shafts:

Item	Standard	Service Limit
Rocker Arm Inside Diameter	13.000 – 13.018 mm	13.05 mm
Rocker Shaft Diameter	12.976 – 12.994 mm	12.95 mm
Cam Height	40.876 – 40.984 mm	40.78 mm

Camshaft Chain, Guides and Tensioner:

Item		Standard	Service Limit
Camshaft Chain Length/20-link		160.00 – 160.56 mm	162.4 mm
Camshaft Chain Guide Groove			
Depth:	Front	No groove	2.0 mm
	Rear	No groove	1.5 mm

Cylinder, Piston, Rings:

Item	Standard	Service Limit
Cylinder Compression	795 – 1,240 kPa (8.1 – 12.6 kg/cm², 115 – 179 psi)	—
Cylinder Inside Diameter	76.000 – 76.012 mm, and less than 0.01 mm difference between any two measurements	76.10 mm, or more than 0.05 mm difference between any two measurements
Piston Diameter	75.950 – 75.965 mm	75.81 mm
Piston/Cylinder Clearance	0.035 – 0.062 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	1.22 – 1.24 mm	1.32 mm
Second	1.21 – 1.23 mm	1.31 mm
Oil	2.51 – 2.53 mm	2.61 mm
Piston Ring Thickness:		
Top & Second	1.170 – 1.190 mm	1.10 mm
Piston Ring End Gap:		
Top & Second	0.20 – 0.35 mm	0.7 mm

Special Tools

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

Valve Guide Reamer: 57001-162



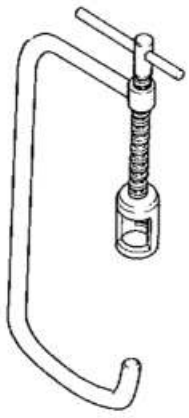
Valve Guide Arbor: 57001-163



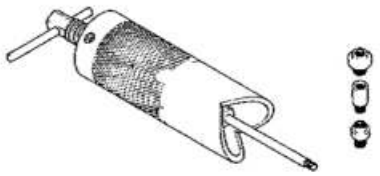
Compression Gauge: 57001-221
with Adapter Hose: 57001-1159



Valve Spring Compressor Assy: 57001-241



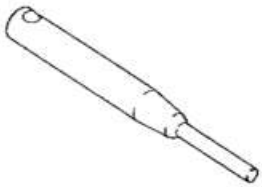
Piston Pin Puller Assy: 57001-910
(use Adapter "C": 57001-914)



#4 Seat Cutter: 57001-1116
#5 Seat Cutter: 57001-1117
#9 Outside Cutter: 57001-1121
#10 Outside Cutter: 57001-1122
#12 Inside Cutter: 57001-1124



Cutter Holder: 57001-1126



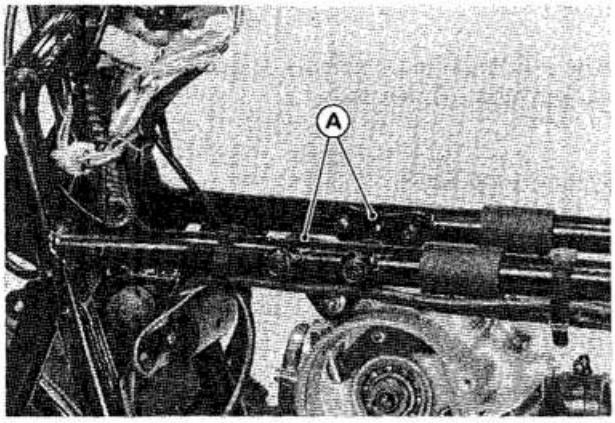
Bar: 57001-1128



Cylinder Head

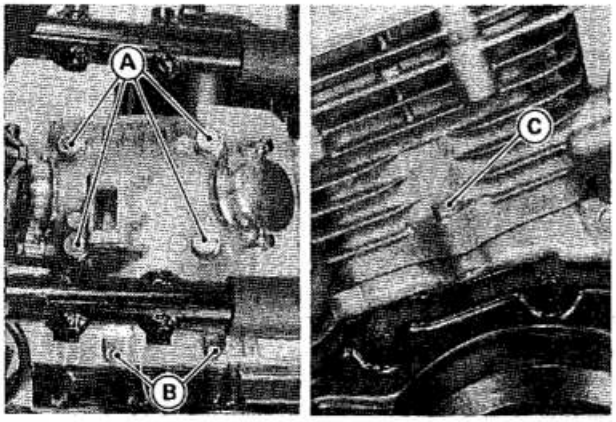
Cylinder Head Removal

- Remove the following parts.
  - Fuel Tank
  - Carburetor
  - Exhaust Pipe and Muffler
  - Crankshaft Sprocket
- Pull the spark plug cap off the spark plug.
- Remove the cylinder head bracket bolts and nuts, and take off the brackets.



A. Cylinder Head Brackets

- Remove the cylinder base bolt.
- Loosen the cylinder head bolts completely and remove all the bolts.



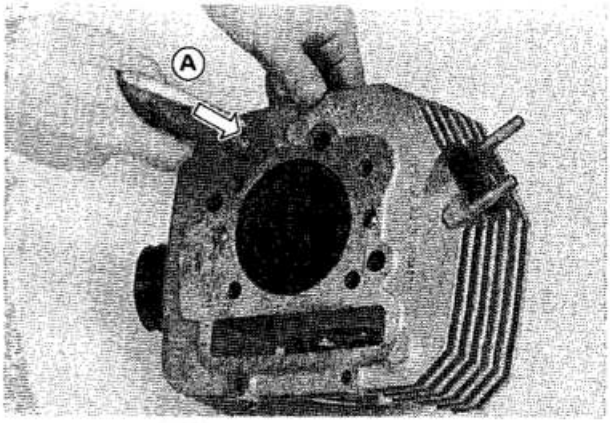
A. 8 mm Cylinder Head Bolts
B. 6 mm Cylinder Head Bolts
C. Cylinder Base Bolt

- Remove the cylinder head.

○Lift the head clear of the dowel pins in the cylinder.
○Slide the head out of the frame.

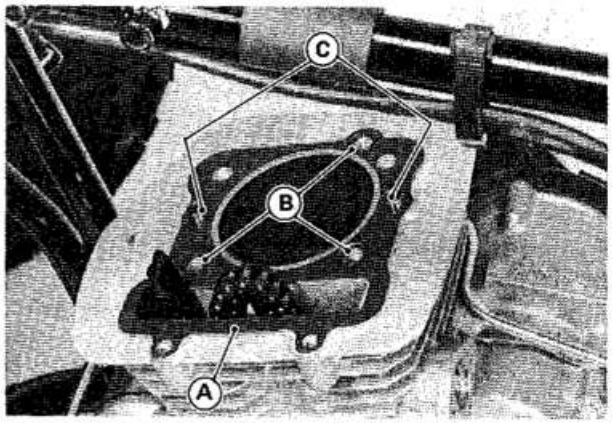
Cylinder Head Installation

- Blow out the oil passage with compressed air.



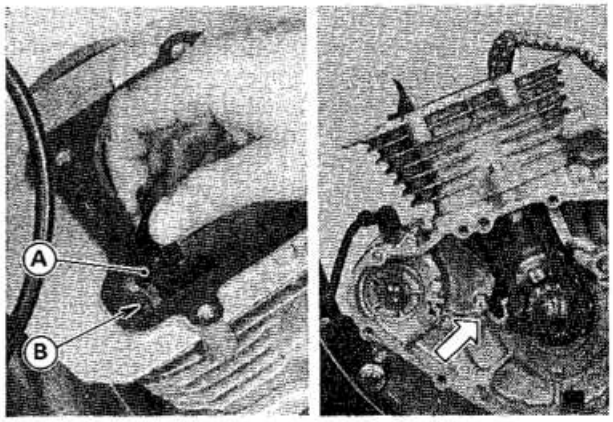
A. Compressed Air

- Install a new cylinder head gasket.



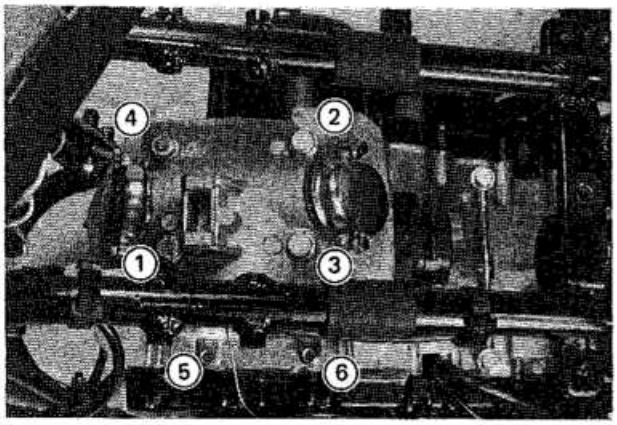
A. Cylinder Head Gasket
B. O-rings
C. Dowel Pins

- Be sure the dowel pins and O-rings are in place.
- Slip the cylinder head into position. Be sure the hook of the front camshaft chain guide hangs on the cylinder catch, and is between the cylinder and the cylinder head.



A. Chain Guide Hook
B. Catch

•Tighten the cylinder head bolts in a criss-cross pattern as shown, in two steps.



Cylinder Head Bolt Torque

First Torquing	
8 mm Bolt:	15 N-m (1.5 kg-m, 11.0 ft-lb)
6 mm Bolt:	5.9 N-m (0.60 kg-m, 52 in-lb)
Final Torquing	
8 mm Bolt:	29 N-m (3.0 kg-m, 22 ft-lb)
6 mm Bolt:	12 N-m (1.2 kg-m, 104 in-lb)

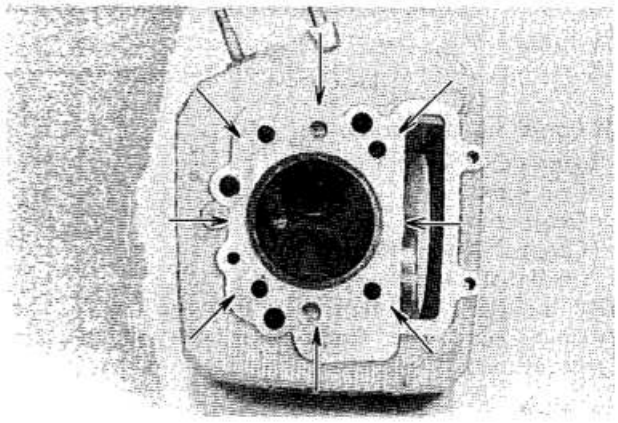
•Tighten the cylinder base bolt to the specified torque (see Exploded View).
•Install the cylinder head brackets, and tighten the bolts to the specified torque (see Exploded View in the Engine Removal/Installation chapter).
•The remainder of Cylinder Head Installation is the reverse of removal.

Cylinder Head Cleaning

•Remove the cylinder head (see Cylinder Head Removal).
•Remove the valves (see Valve Removal).
•Wash the head with a high flash-point solvent.
•Scrape the carbon out of the combustion chamber and exhaust port with a suitable tool.
•Install the valves (see Valve Installation).
•Install the cylinder head (see Cylinder Head Installation).

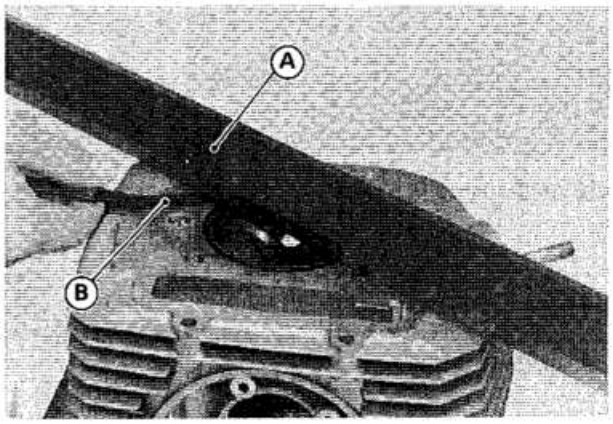
Cylinder Head Warp

•Clean the cylinder head (see Cylinder Head Cleaning).
•Lay a straightedge across the lower surface of the cylinder head at the positions shown.



•Use a thickness gauge to measure the space between the straightedge and the head.

Cylinder Head Warp
Service Limit: 0.05 mm



A. Straightedge B. Thickness Gauge

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

Valves, Guides, Seats, Springs, Oil Seals

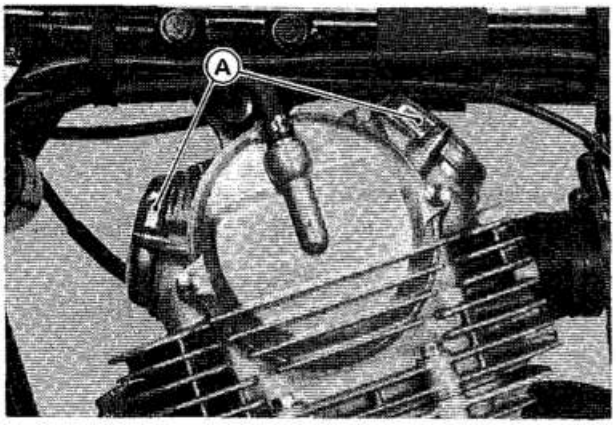
Valves:

Valve Clearance Check

NOTE

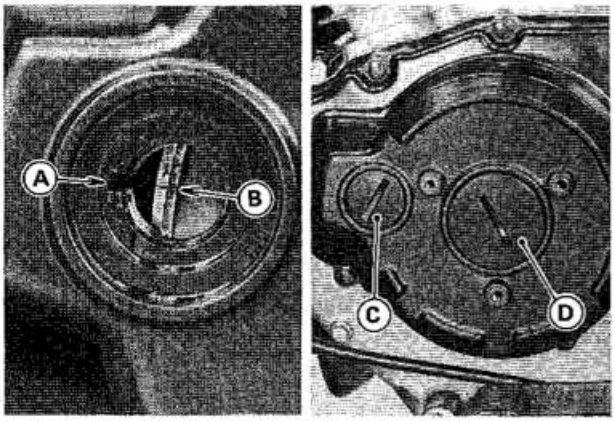
○*Check the valve clearance only when the engine is cold (cool to the touch).*

•Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
•Take out the bolts and remove the valve adjusting caps with O-rings.



A. Valve Adjusing Caps

•Unscrew the left engine cover guard screws, and take off the guard.
•Remove the timing inspection plug and cover center plug.
•Turn the crankshaft counterclockwise with a wrench on the alternator rotor bolt, and watch the intake valve. When the intake valve opens and closes, keep turning the crankshaft counterclockwise until the T mark on the alternator rotor aligns with the slot, as shown.

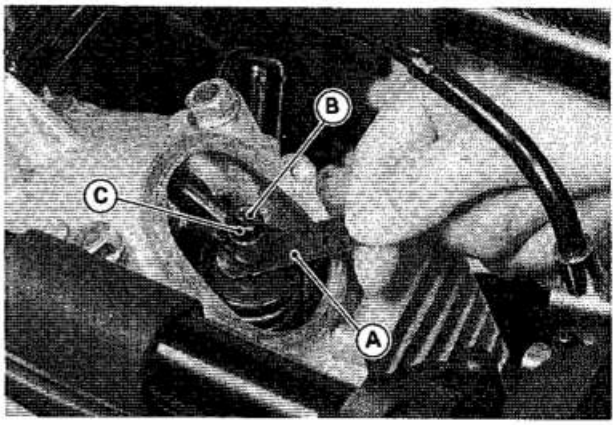


A. Slot
B. T Mark
C. Timing Inspection Plug
D. Cover Center Plug

•Measure the clearance of each valve between the end of the valve stem and the adjusting screw on the rocker arm with a thickness gauge.
★If the valve clearance is not correct, adjust it (see Valve Clearance Adjustment).

Valve Clearance (when cold)

Intake:	**0.10 – 0.15 mm**
Exhaust	**0.15 – 0.20 mm**



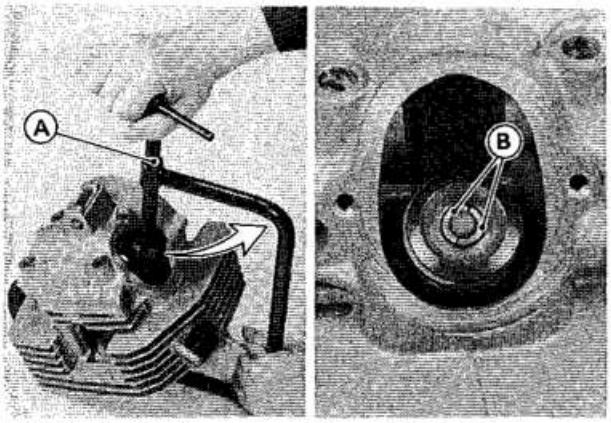
A. Thickness Gauge
B. Adjusting Screw
C. Locknut

Valve Clearance Adjustment

•Check the valve clearance (see Valve Clearance Check).
★If the valve clearance is not correct, continue with the following procedure.
•Loosen the locknut and turn the adjusting screw until the clearance is correct.
★If it is not possible to open the clearance far enough, the valve may have been sunk too far into the head during valve seat repair. It may be possible to grind the end of the stem slightly to gain clearance (see Valve Stem Grinding).
•Hold the adjusting screw from turning and tighten the locknut to the specified torque (see Exploded View).
•Recheck the clearance.
★If the clearance is incorrect, repeat the adjustment procedure.
★If the clearance is correct, perform the adjustment procedure on the other valve.

Valve Removal

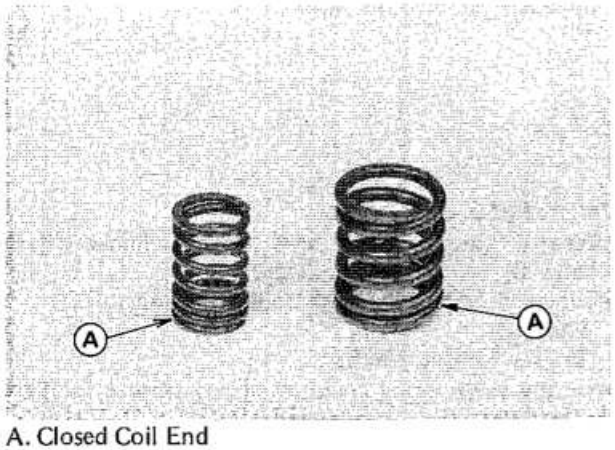
•Remove the cylinder head (see Cylinder Head Removal).
•Remove the following parts from the cylinder head.
Camshaft
Rocker Arm and Shafts
•Use the valve spring compressor assy (special tool) to press down the valve spring retainer.
•Remove the split keepers.
•Loosen the valve spring compressor and take out the following parts:
Valve Spring Retainer
Outer Spring
Inner Spring
•Push out the valve.
•Repeat the procedure for the other valve.



A. Valve Spring Compressor Assy: 57001-241
B. Split Keepers

Valve Installation

- If a new valve is to be used, check the valve-to-guide clearance (see Valve Stem Diameter, Valve Guide Inside Diameter).
- ★If there is too little clearance, ream the valve guide (see Valve Guide Installation).
- ★If there is too much clearance, install a new valve guide (see Valve Guide Removal and Valve Guide Installation).
- Check the valve seating (see Valve Seat Inspection).
- After proper valve seating has been confirmed, replace the valve stem oil seal (see Valve Stem Oil Seal Removal and Valve Stem Oil Seal Installation).
- Smear the valve stem end with a thin coat of molybdenum disulfide engine assembly grease, and push the valve into the guide.
- Put the inner and outer springs in place.
  - Place the springs so that the closed coil end of each spring faces down.

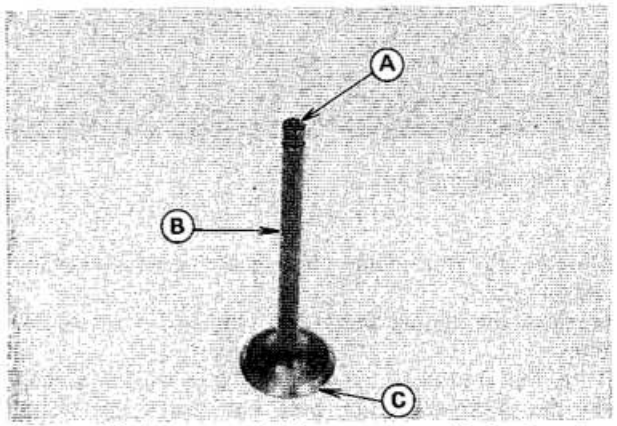


A. Closed Coil End

- Set the spring retainer on the springs.
- Use the valve spring compressor to press down the valve spring retainer.
- Install the split keepers, and slowly remove the spring compressor. Be sure the keepers stay in place, holding the retainer down.
- Repeat the procedure for the other valve.
- Install the removed parts to the cylinder head.
- Install the cylinder head (see Cylinder Head Installation).
- Check and adjust the valve clearance as needed (see Valve Clearance Check and Valve Clearance Adjustment).

Valve Visual Inspection

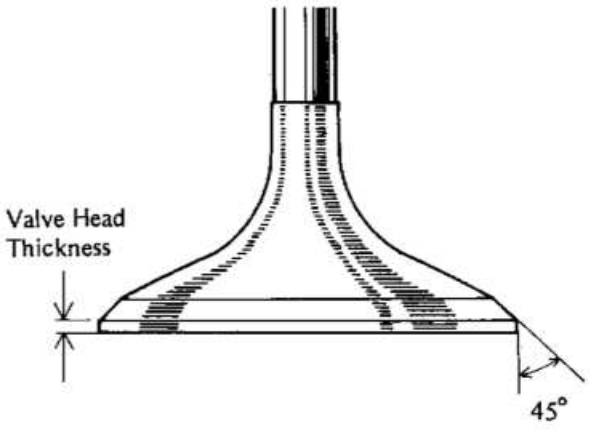
- Inspect the valve head seating area for erosion, nicks, and warpage.



A. Stem End B. Stem C. Seating Area

- ★If the valve head seating area is warped, replace the valve.
- ★If the valve head seating area is eroded or nicked, it may be possible to repair the valve on a valve refacing machine. Follow the refacing machine manufacturer's instructions.
- Inspect the stem for obvious wear, discoloration, and stem end damage.
- ★If the stem is obviously worn or discolored, replace the valve.
- ★If the stem end is damaged, it may be possible to repair it on a valve refacing machine (see Valve Stem Grinding).
- Go on to Valve Head Thickness, Valve Stem Bend, and Valve Stem Diameter.

Valve Head Shape



Valve Head Thickness

•Measure the thickness of the valve head.

★If the valve head thickness is less than the service limit, replace the valve.

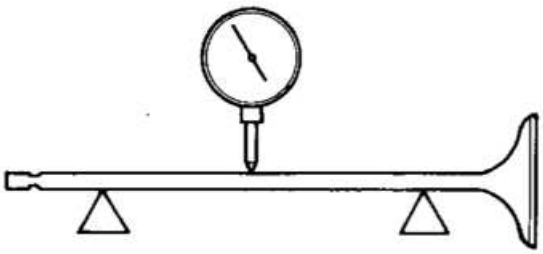
Valve Head Thickness

Intake	**Standard:**	**0.80 – 1.20 mm**
	Service Limit:	**0.5 mm**
Exhaust	**Standard:**	**0.80 – 1.20 mm**
	Service Limit:	**0.7 mm**

Valve Stem Bend

•Support the valve in V blocks at each end of the stem.

Valve Stem Bend



•Position a dial gauge perpendicular to the stem.

•Turn the valve and read the variation on the dial gauge.

★If the stem bend is greater than the service limit, replace the valve.

Valve Stem Bend

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

Valve Stem Diameter

•Measure the diameter of the valve stem in two directions at right angles, at four different positions on the stem.

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

Valve Stem Diameter

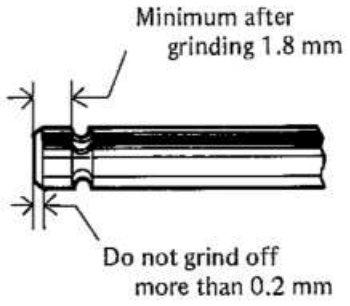
Intake	**Standard:**	**6.965 – 6.980 mm**
	Service Limit:	**6.95 mm**
Exhaust	**Standard:**	**6.950 – 6.970 mm**
	Service Limit:	**6.94 mm**

Valve Stem Grinding

•The end of the valve stem may be ground slightly to remove damage or to gain valve clearance after a valve job.

•Follow the valve refacing machine manufacture's instructions.

Valve Stem Grinding



Valve Guides:

Valve Guide Inside Diameter

•Use a small hole gauge and a micrometer to measure the inside diameter of the valve guide at four places down the length of the guide.

★If any measurement is greater than the service limit, replace the valve guide (see Valve Guide Removal and Valve Guide Installation).

Valve Guide Inside Diameter

Standard:	**7.000 – 7.015 mm**
Service Limit:	**7.08 mm**

Valve Guide Removal

•Remove the cylinder head (see Cylinder Head Removal).

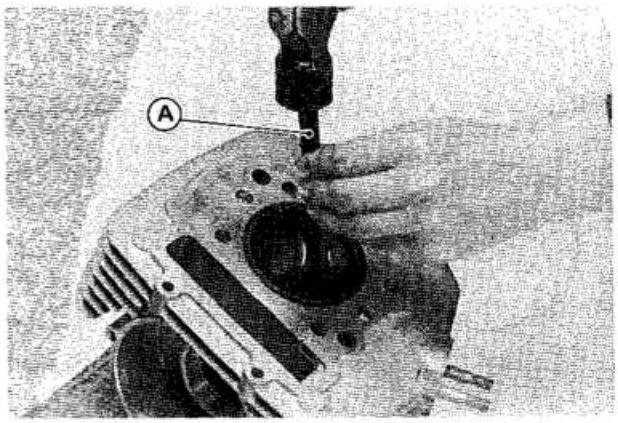
•Remove the valve (see Valve Removal).

•Remove the valve stem oil seal (see Valve Stem Oil Seal Removal).

•Heat the area around the guide to 120° to 150°C (250° to 300°F).

•Fit the valve guide arbor (special tool) into the guide from the combustion chamber side of the head.

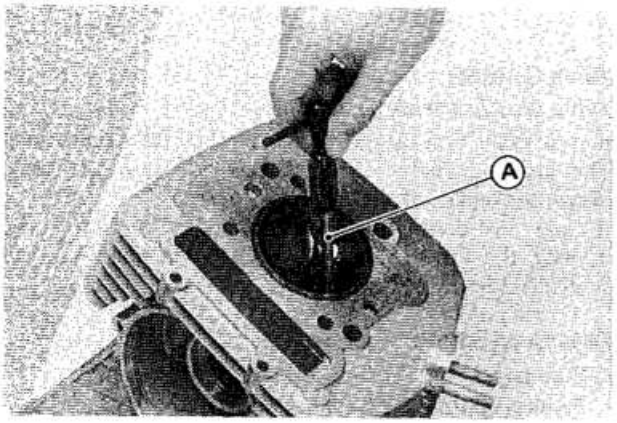
•Drive the guide out of the head by hammering lightly on the arbor.



A. Valve Guide Arbor: 57001-163

Valve Guide Installation

- Clean the valve guide hole in the cylinder head.
- Lightly oil the valve guide.
- Set the circlip onto the valve guide groove.
- Heat the cylinder head around the valve guide hole to 120° to 150°C (250° to 300°F).
- Use the valve guide arbor and a hammer to drive the guide into the head from the outside until the circlip on the guide seats against the head.
- Allow the cylinder head to cool.
- Ream the valve guide with the valve guide reamer (special tool) even if the old guide is reused.



A. Valve Guide Reamer: 57001-162

- Check valve seating (see Valve Seat Inspection).
- Install the valve stem oil seal (see Valve Stem Oil Seal Installation).
- Install the valve (see Valve Installation).
- Install the cylinder head (see Cylinder Head Installation).

Valve Seats:

Valve Seat Inspection

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

Valve Seating Width

Standard: 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).

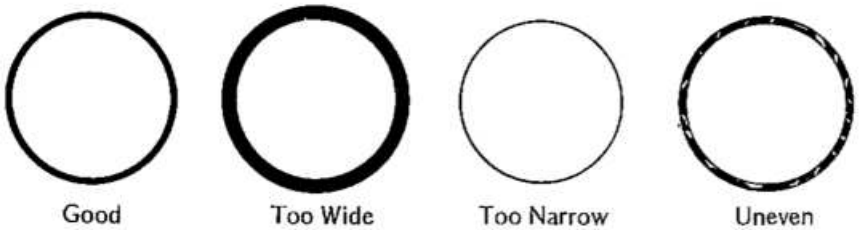
- Measure the outside diameter of the seating pattern on the valve seat.

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

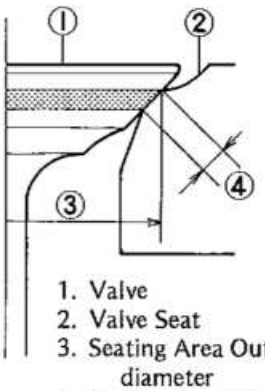
Valve Seating Surface Outside Diameter

Intake:	**35.7 – 36.3 mm**
Exhaust:	**29.7 – 30.3 mm**

Valve Seating Pattern



Good Too Wide Too Narrow Uneven



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

Valve Seat Repair

- Clean the cylinder head thoroughly (see Cylinder Head Cleaning).
- Use the following procedure and tools to repair the valve seat.

Used Valve Seat Cutters

Intake Valve	
⑤ 45° – φ41.5	57001-1117
⑩ 32° – φ38.5	57001-1122
⑫ 60° – φ41.0	57001-1124
Exhaust Valve	
④ 45° – φ35.0	57001-1116
⑨ 32° – φ35.0	57001-1121
⑫ 60° – φ41.0	57001-1124

Used Holder and Bar

Holder – φ7.0	57001-1126
Bar	57001-1128

Seat Cutter Operating Cares:

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

NOTE

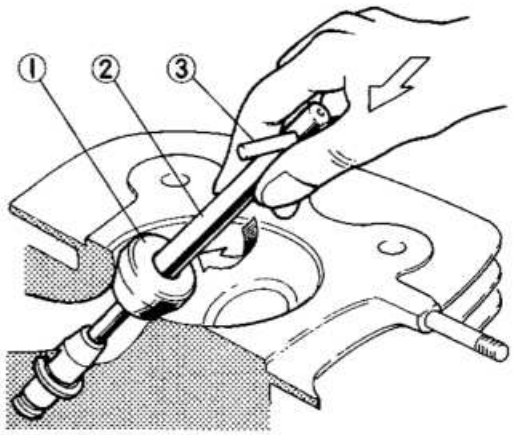
○A wire brush must not be used to remove the ground particles from the cutter. That will cause the diamond particles to fall off.

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

NOTE

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

Valve Seat Cutter



1. Cutter
2. Cutter Holder
3. Bar

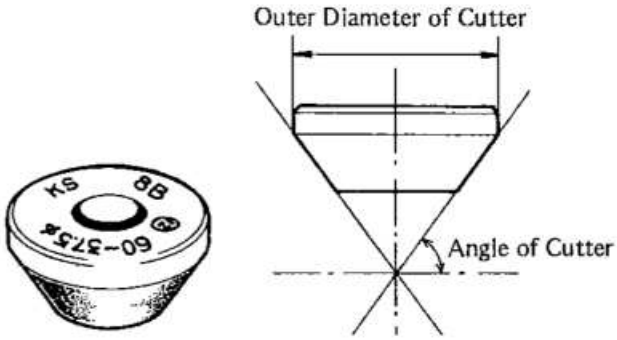
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter:

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

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

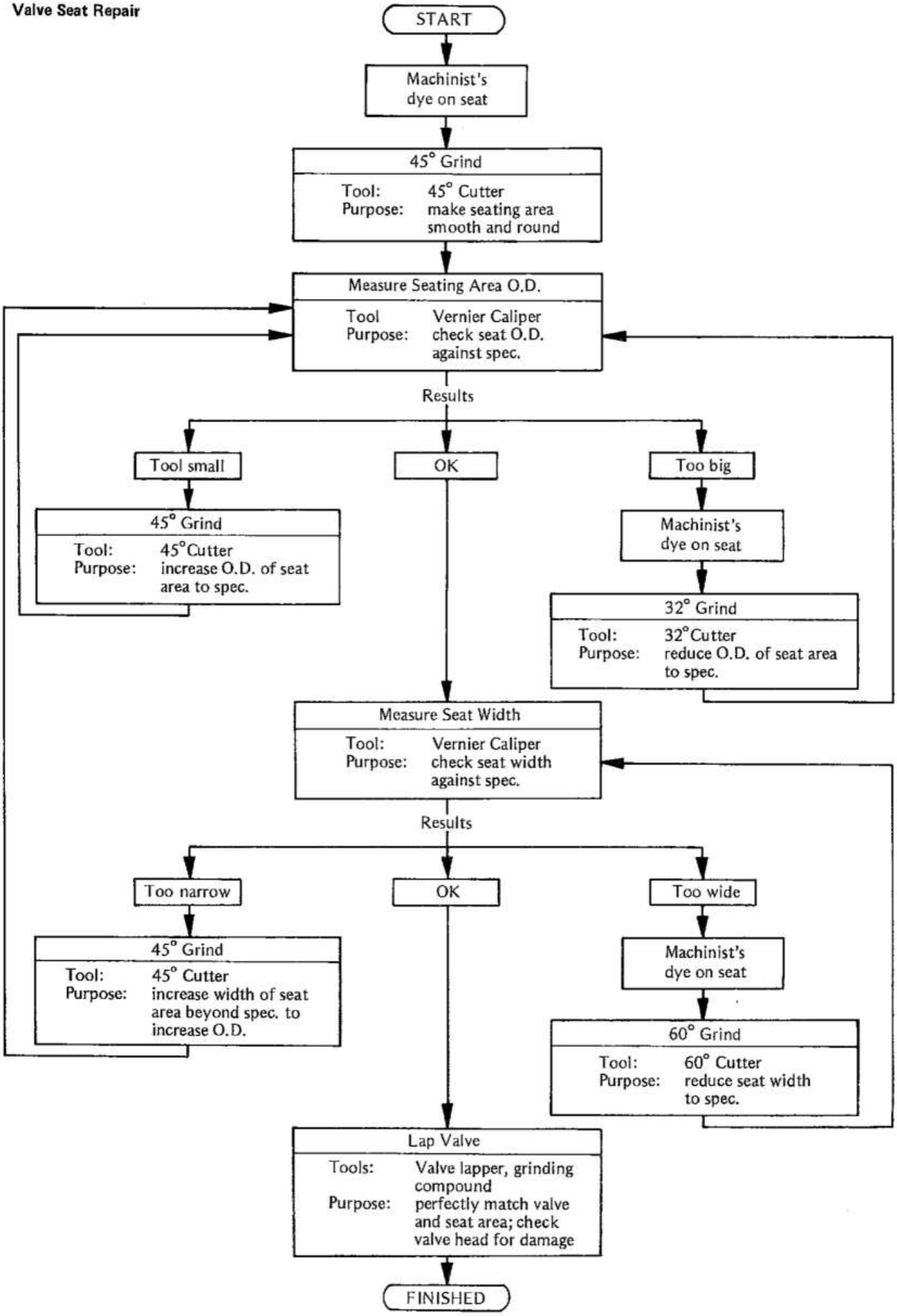
Cutter



Operating Procedures:

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

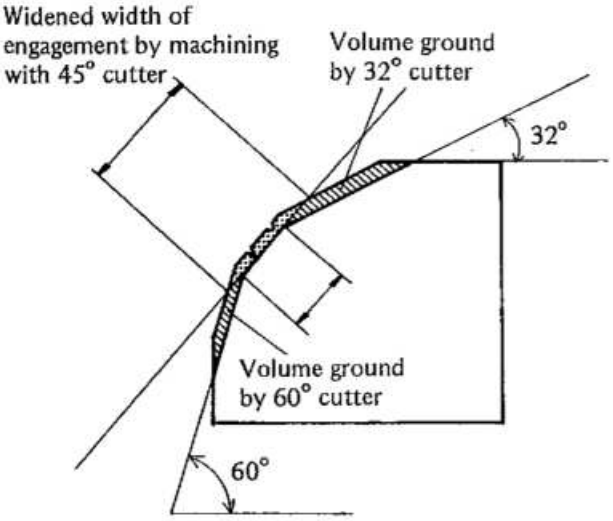
Valve Seat Repair



CAUTION

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

Valve Seat Repair



•Measure the outside diameter of the seating surface with a vernier caliper (see Valve Seat Inspection).
★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.
oTo make the 32° grind, fit a 32° cutter to the holder, and slide it into the valve guide.
oTurn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.

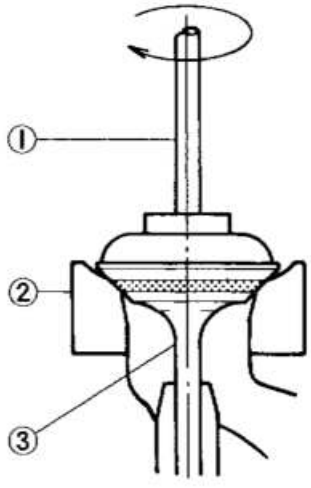
CAUTION

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

oAfter 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 (see Valve Seat Inspection).
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.
★If the seat width is too wide, make the 60° grind described below.
★If the seat width is within the specified range, lap the valve to the seat as described below.
•Grind the seat at a 60° angle until the seat width is within the specified range.
oTo make the 60° grind, fit a 60° cutter to the holder, and slide it into the valve guide.
oTurn the holder, while pressing down lightly.
oAfter 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 specified range.
oPut a little coarse grinding compound on the face of the valve in a number of places around the valve head.
oSpin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
oRepeat the process with a fine grinding compound.

Valve Lapping



1. Lapper
2. Valve Seat
3. Valve

•The seating area should be marked about in the middle of the valve face.
★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
•Be sure to remove all grinding compound before assembly.
•When the engine is assembled, be sure to adjust the valve clearances (see Valve Clearance Adjustment).

Valve Springs:

Valve Spring Removal/Installation

- The valve springs are removed and installed during valve removal and installation (see Valve Removal and Valve Installation).

Valve Spring Free Length

- Measure the valve spring free length with a vernier caliper.

★If the free length is less than the service limit, replace the spring.

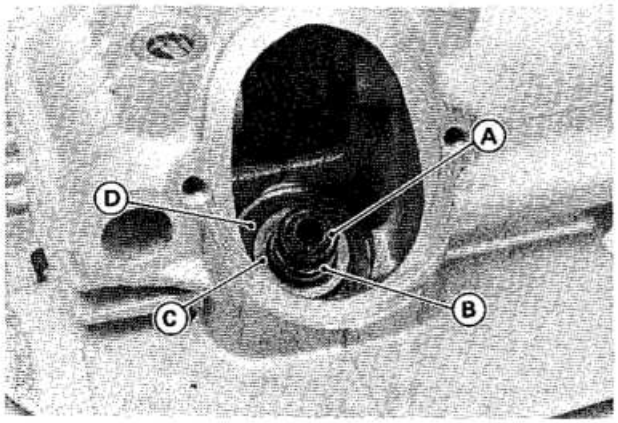
Valve Spring Free Length

Inner	**Standard:**	**32.4 mm**
	Service Limit:	**31.1 mm**
Outer	**Standard:**	**37.3 mm**
	Service Limit:	**35.8 mm**

Valve Stem Oil Seals:

Valve Stem Oil Seal Removal

- Remove the valve (see Valve Removal).
- Remove the seal clip with a small screw driver or other pointed tool.
- Pull the valve stem oil seal off the end of the valve guide. The inner and outer spring seats can be removed from the head.



A. Oil Seal
B. Clip
C. Inner Spring Seat
D. Outer Spring Seat

Valve Stem Oil Seal Installation

NOTE

○*For best results, do not reuse old valve stem oil seals, especially if valves are replaced.*

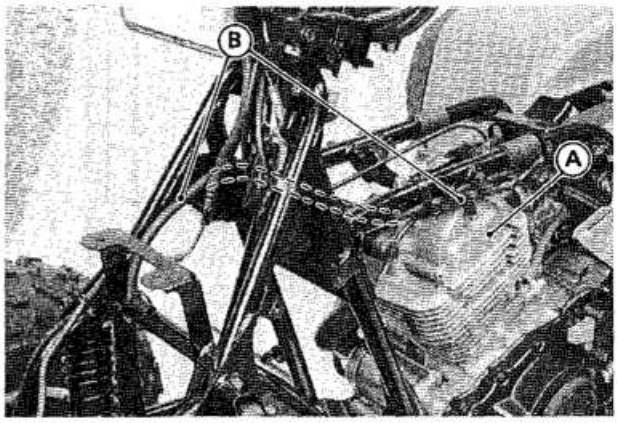
- Be sure the end of the valve guide is clean.
- Be sure the inner and outer spring seats are in place.
- Oil the inside of the seal and slip it over the end of the guide.
- Push the seal clip down over the seal until it seats in the groove in the seal.
- Install the valve (see Valve Installation).

Camshaft Sprocket

Camshaft Sprocket Removal

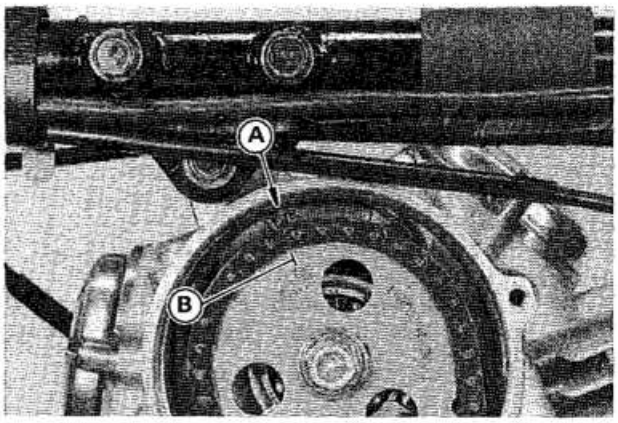
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Unscrew the left engine cover guard screws, and take off the guard.
- Remove the cover center plug.
- Remove the bolts and take off the camshaft cover.

○It may be necessary to pry the cover off with a screwdriver. There are prying gaps under the screw hole bosses.



A. Camshaft Cover
B. Cylinder Head Vent Hose

- Turn the crankshaft with a wrench on the alternator rotor bolt until the "LF300" mark on the camshaft sprocket aligns with the pointer on the cylinder head.

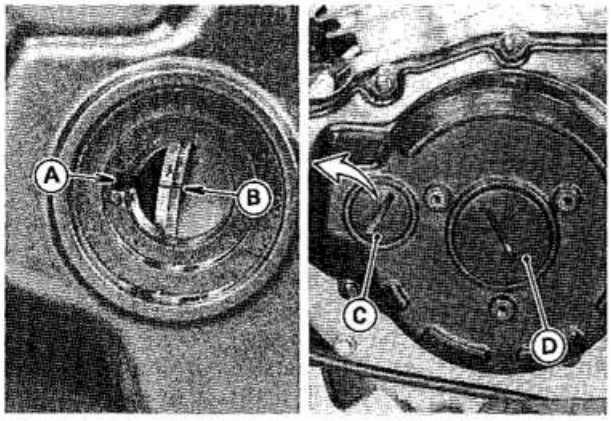


A. Pointer
B. "LF300" Mark

•Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
•Remove the camshaft sprocket bolt.
○Hold the crankshaft from turning with a wrench on the alternator rotor bolt.
•Slide the sprocket off the shoulder on the camshaft and out from under the chain.
•Support the chain on a screwdriver or other tool stuck in the hole in the head.

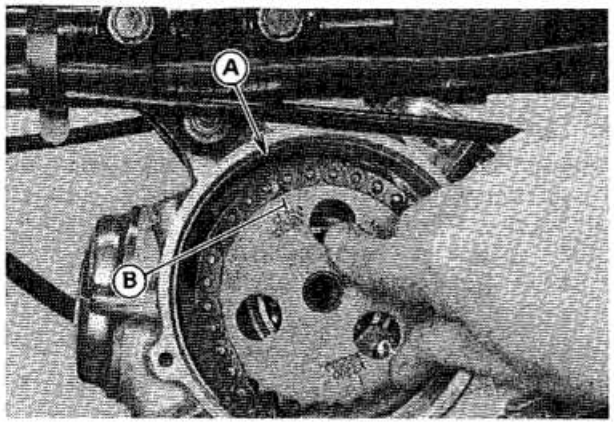
Camshaft Sprocket Installation

•Remove the timing inspection plug, and check to see that the "T" mark on the alternator rotor aligns with the slot.



A. Slot
B. T Mark
C. Timing Inspection Plug
D. Cover Center Plug

★If the "T" mark is not aligned, hold the camchain taut and turn the crankshaft with a wrench on the alternator rotor bolt.
•Fit the sprocket under the chain and slip it over the shoulder on the camshaft so that the "LF300" mark on the sprocket aligns with the pointer on the cylinder head.



A. Pointer
B. "LF300" Mark

•Screw in the bolt and tighten it to the specified torque (see Exploded View), while holding the crankshaft from turning with a wrench on the alternator rotor bolt.
•Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
•Before going any further, check the cam timing.
○Turn the crankshaft counterclockwise with a wrench on the alternator rotor bolt, until the "LF300" mark on the sprocket realings with the pointer on the head.

CAUTION

○**If any resistance is felt when turning the crankshaft, stop immediately, or you may bend the valves.**

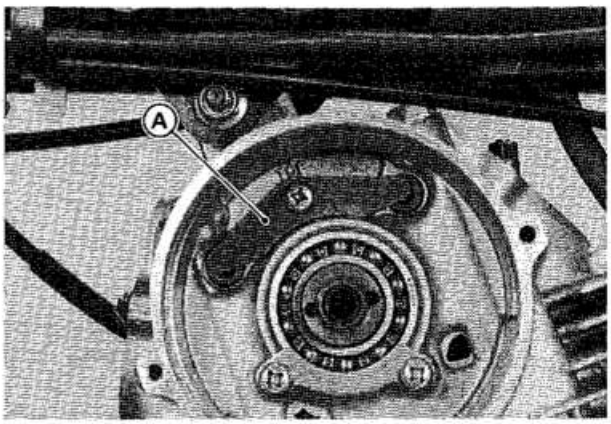
○The "T" mark on the alternator rotor should align with the slot.
★If the camshaft timing is not correct, remove the sprocket from the camshaft, and install it again as detailed above.
•Smear a little engine oil on the camshaft cover O-ring, and push the cover into place.
•Put in the camshaft cover bolts and tighten them securely.
•Install the timing inspection plug, cover center plug, and guard.
•Install the fuel tank (see Fuel Tank Installation in the Fuel System chapter).

Camshaft, Rocker Arms and Shafts

Rocker Arms and Shafts:

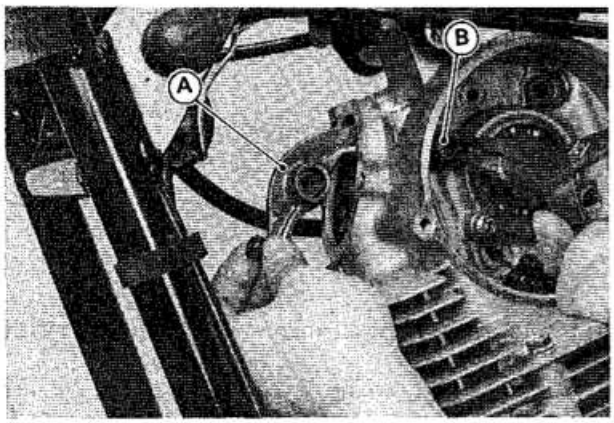
Rocker Arm and Shaft Removal

•Remove the camshaft sprocket (see Camshaft Sprocket Removal).
•Take out the screw and remove the rocker shaft retainer.



A. Rocker Shaft Retainer

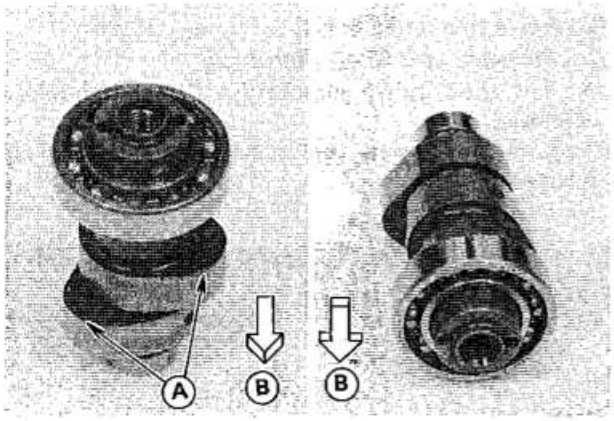
- Take out the bolts and remove the valve adjusting caps.
- Loosen all the cylinder head bolts to free the cylinder head from the tension.
- Pull out the rocker shafts and remove the rocker arms.



A. Rocker Arm B. Shaft

Rocker Arm and Shaft Installation

- Rocker arm and shaft installation is the reverse of removal. Note the following.
- Before installation of the rocker arms and shafts, turn the camshaft so that the cam lobes point to the "down".

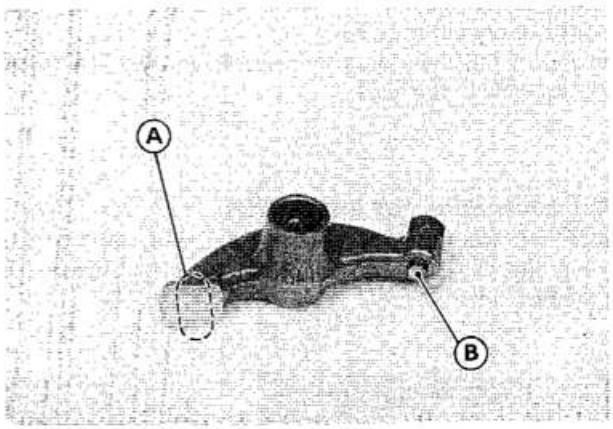


A. Cam Lobes B. Down

- Tighten all the cylinder head bolts as following the specified sequence and torquing (see Cylinder Head Installation).
- After installation, be sure to check and adjust the valve clearance (see Valve Clearance Adjustment).

Rocker Arm Inspection

- Inspect the area on the rocker where the cam rubs.



A. Rocker Wear Area B. Adjusting Screw

★If the rocker arm is scored, discolored or otherwise damaged, replace it. Also inspect the camshaft lobes (see Cam Wear Inspection).

- Inspect the end of the valve clearance adjusting screw where it contacts the valve stem.

★If the end of the adjusting screw is mushroomed or damaged in any way , or if the screw will not turn smoothly, replace it. Also inspect the end of the valve stem (see Valve Visual Inspection).

- Measure the inside diameter of the rocker arm with a dial bore gauge.

★If the rocker arm inside diameter is larger than the service limit, replace it. Also check the rocker shaft diameter (see Rocker Shaft Diameter).

Rocker Arm Inside Diameter

Standard:	**13.000 – 13.018 mm**
Service Limit:	**13.05 mm**

Rocker Shaft Diameter

- Measure the diameter of the rocker shaft where the rocker arm pivots on it with a micrometer.

★If the rocker shaft diameter is smaller than the service limit, replace it. Also check the rocker arm inside diameter (see Rocker Arm Inspection).

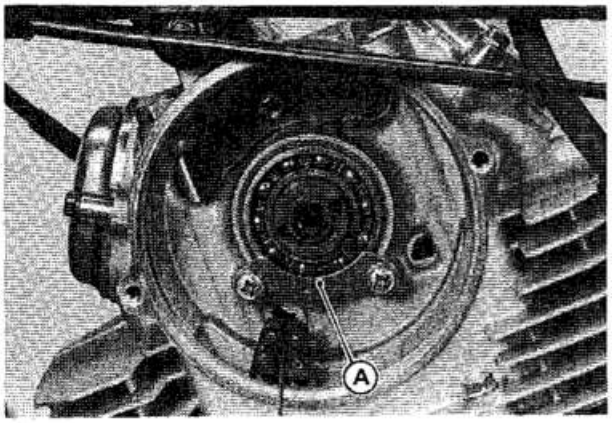
Rocker Shaft Diameter

Standard:	**12.976 – 12.994 mm**
Service Limit:	**12.95 mm**

Camshaft:

Camshaft Removal

- Remove the camshaft sprocket (see Camshaft Sprocket Removal).
- Take out the screws and remove the bearing retainer.



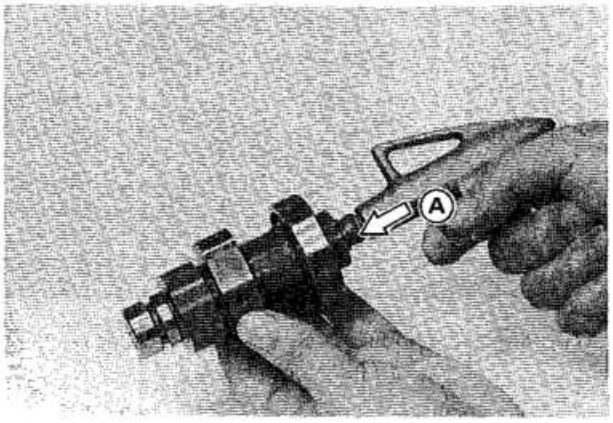
A. Bearing Retainer

- Pull the camshaft straight out of the head.

○Screw the camshaft sprocket bolt into the end of the camshaft and pull it with the camshaft.

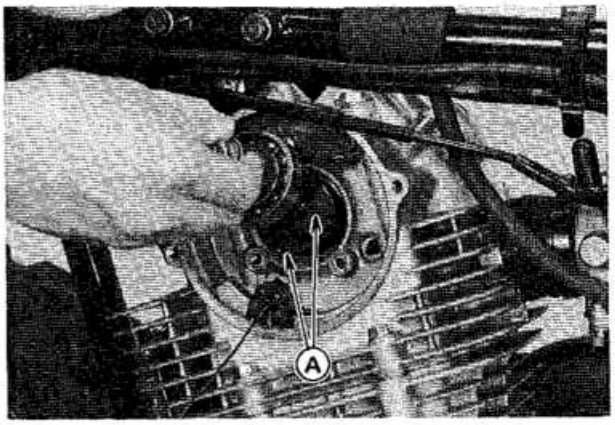
Camshaft Installation

- Camshaft installation is the reverse of removal. Note the following.
- Blow the oil passage with compressed air.



A. Compressed Air

- Carefully push the camshaft into the cylinder head with the cam loves "down".



A. Cam Lobes

Cam Wear Inspection

- Measure the height of each cam lobe with a micrometer.

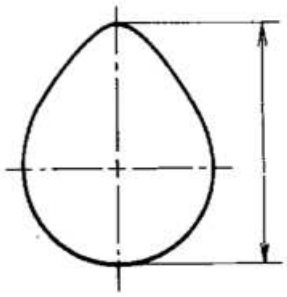
★If the cam height is less than the service limit for either lobe, replace the camshaft.

- Go on to Camshaft Bearing Inspection.

Cam Height

Standard:	**40.876 – 40.984 mm**
Service Limit:	**40.78 mm**

Cam Height



Camshaft Bearing Inspection

- Check the ball bearing which is press-fitted on the camshaft.

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

○Spin the bearing by hand to check its condition.

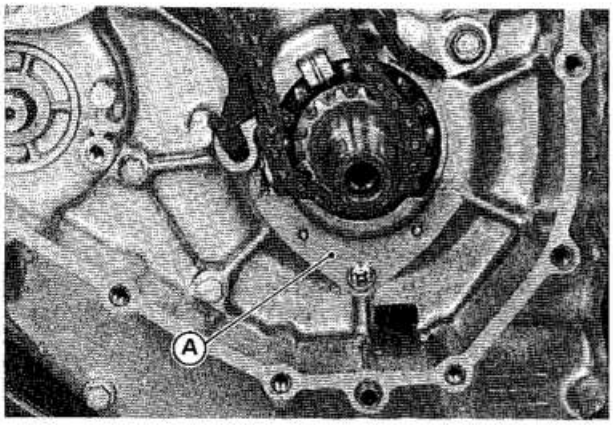
★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.

Camshaft Chain, Guides and Tensioner

Camshaft Chain:

Camshaft Chain Removal

- Remove the camshaft sprocket (see Camshaft Sprocket Removal).
- Remove the starter chain and sprockets (see Starter Chain and Sprocket Removal in the Engine Left Side chapter).
- Take out the screw and remove the camshaft chain guard below the left hand end of the crankshaft.



A. Chain Guard

- Remove the camshaft chain.

Camshaft Chain Installation

- Camshaft chain installation is the reverse of removal. Note the following.

CAUTION

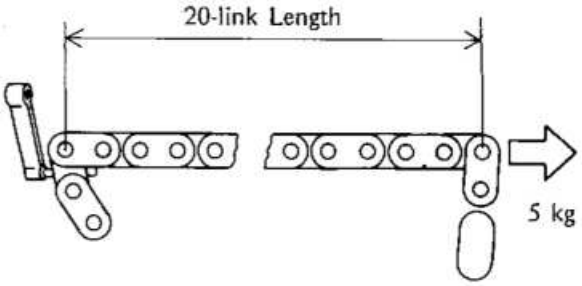
○Always pull the camshaft chain taut while turning the crankshaft when the camshaft chain is loose. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

- Be sure the camshaft chain guard holes fit onto the pins on the crankcase.

Camshaft Chain Wear

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

Camshaft Chain 20-Link Length



★If the 20 link length of the camshaft chain is greater than the service limit, replace it.

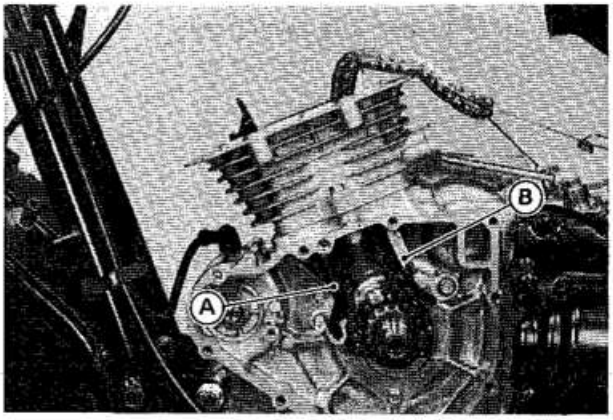
Camshaft Chain 20-Link Length

Standard:	**160.00 – 160.56 mm**
Service Limit:	**162 .4 mm**

Camshaft Chain Guides:

Camshaft Chain Guide Removal

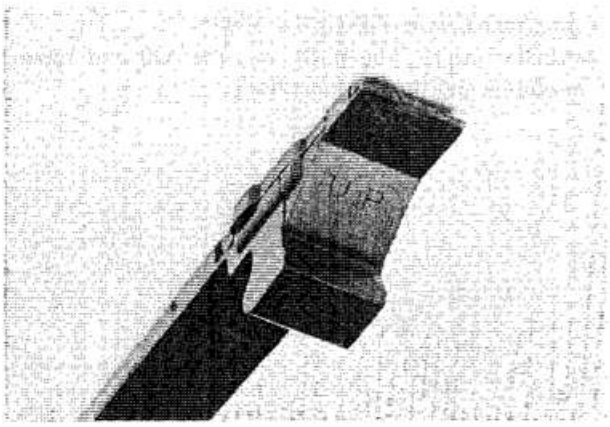
- Remove the cylinder head (see Cylinder Head Removal).
- Remove the starter chain and sprockets (see Starter Chain and Sprocket Removal in the Engine Left Side chapter).
- Pull up the front chain guide.
- Remove the pivot bolt and take off the rear chain guide.



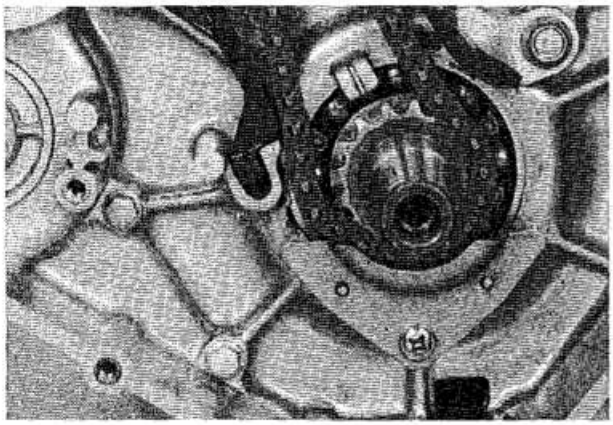
A. Front Chain Guide B. Rear Chain Guide

Camshaft Chain Guide Installation

- Camshaft chain guide installation is the reverse of removal. Note the following.
- The front camshaft chain guide is marked "UP" on the top end.



•The front guide bottom end fits into a notch in the crankcase.



•Tighten the rear guide pivot bolt to the specified torque (see Exploded View).

Camshaft Chain Guide Wear

•Visually inspect the rubber on the guides.

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

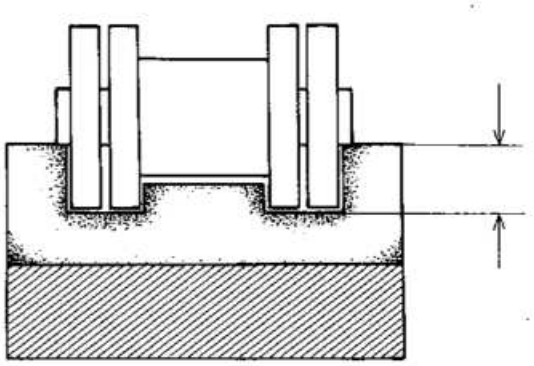
•Measure the depth of the groove in the guides.

★If either camshaft chain guide is worn beyond the service limit, replace it.

Camshaft Chain Guide Groove Depth

Front	**Standard:**	**No groove**
	Service Limit:	**2.0 mm**
Rear	**Standard:**	**No groove**
	Service Limit:	**1.5 mm**

Camshaft Chain Guide Groove Depth



Camshaft Chain Tensioner:

Camshaft Chain Tensioner Removal

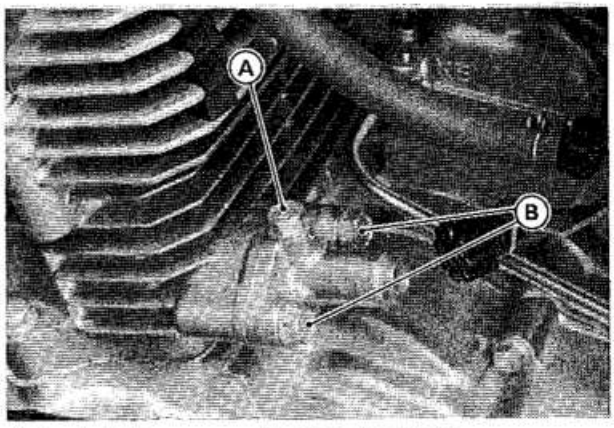
•Remove the lock bolt in the top of the camshaft chain tensioner.

○Screw in a longer bolt (6 mm diameter and 1.0 mm pitch threads) and tighten it securely to hold the tensioner push rod in place.

•Take out the tensioner mounting bolts and remove the camshaft chain tensioner.

CAUTION

○Do not turn the engine while the camshaft chain tensioner is removed. Engine damage could result.



A. Lock Bolt B. Mounting Bolts

Camshaft Chain Tensioner Installation

•Camshaft chain tensioner installation is the reverse of removal. Note the following.

•If the longer bolt locking the push rod in place was removed, the tensioner must be assembled before installation (see Camshaft Chain Tensioner Assembly).

•If new camshaft chain, sprocket, or chain guides were installed, disassemble the tensioner before installation (see Camshaft Chain Tensioner Disassembly).
•Be sure the O-ring is in place in the tensioner body.
•After installation of the reassembled tensioner, loosen the lock bolt and then tighten it. With the bolt loose, the stiff spring inside takes up any slack automatically.

Camshaft Chain Tensioner Disassembly

•Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
•Remove the bolt locking the push rod in place.
•Carefully pull the push rod out of the tensioner body. Do not drop the ball and retainer assembly or the spring.
•Slide the ball and retainer assembly and the spring off the push rod.

Camshaft Chain Tensioner Assembly

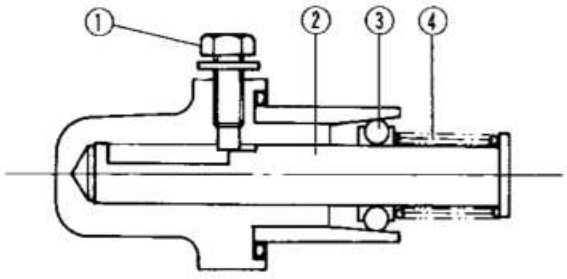
•Slip the spring over the push rod and compress it down past the hole.
•Insert a piece of wire in the hole to hold the spring in place.





•Drop the ball and retainer assembly onto the push rod.
•Push the push rod up into the tensioner body held vertically.
•When the push rod is in as far as it will go, screw in the lock bolt with its washer.
•Pull out the wire, releasing the spring.

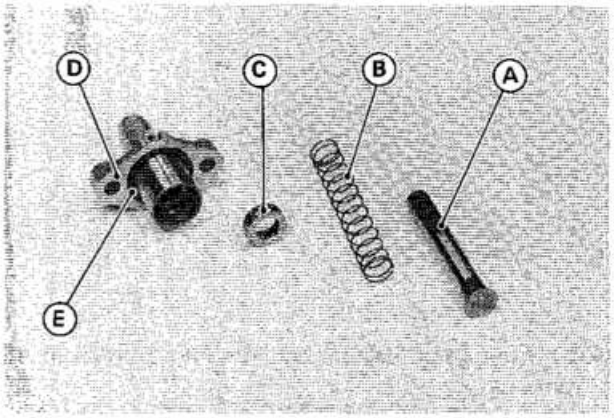
Chain Tensioner



1. Lock Bolt
2. Push Rod
3. Ball
4. Spring

Camshaft Chain Tensioner Wear

•Visually inspect the push rod, the ball and retainer assembly, and the tensioner body.



A. Push Rod
B. Spring
C. Ball and Retainer Assembly
D. Tensioner Body
E. O-ring

•Slide the push rod in and out of the tensioner body without the spring or ball and retainer assembly.
★If the parts show any damage, or if the push rod does not slide smoothly in the tensioner body, replace the camshaft chain tensioner.

Cylinder, Piston and Rings

Cylinder Removal/Installation:

Cylinder Removal

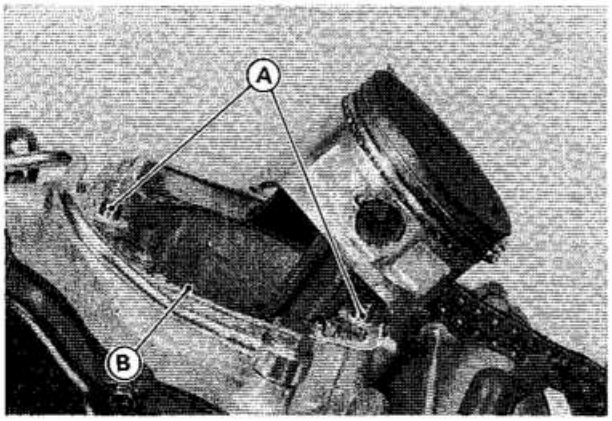
•Remove the cylinder head (see Cylinder Head Removal).
•Remove the cylinder head gasket, O-rings, and dowel pins.
•Pry up the cylinder with a suitable tool to free the cylinder from the crankcase.
•Lift the cylinder off.
•Immediately stuff a clean cloth around the piston to prevent parts or dirt from falling into the crankcase.

Cylinder Installation

NOTE

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

- Blow out the oil passage with compressed air to be sure it is not blocked.
- Clean any remains of the old cylinder base gasket from the bottom of the cylinder and the top of the crankcase.
- Remove the cloth from around the piston.
- Be sure the dowel pins are in place in the crankcase.



A. Dowel Pins B. Cylinder Base Gasket

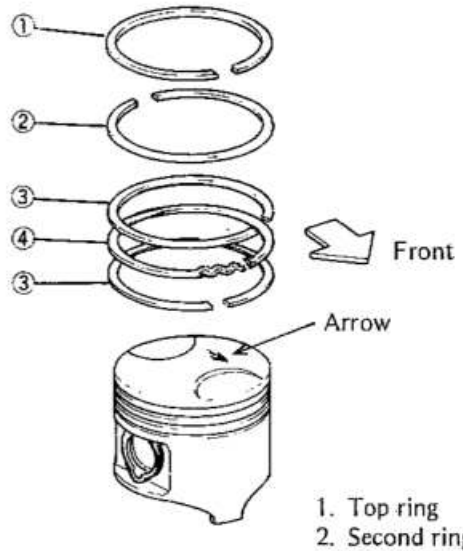
- Install a new cylinder base gasket.
- Turn the crankshaft until the piston is at BDC.
  - Hold the camshaft chain taut.
  - Turn the crankshaft until the piston is all the way down.
- Turn the piston rings so that the gaps are in the specified positions.

Piston Ring Gap Positions

Ring	Gap Position
Top	Forward
Second	Rear
Oil Expander	Forward
Top Oil Rail	30° Left of Forward
Bottom Oil Rail	30° Right of Forward

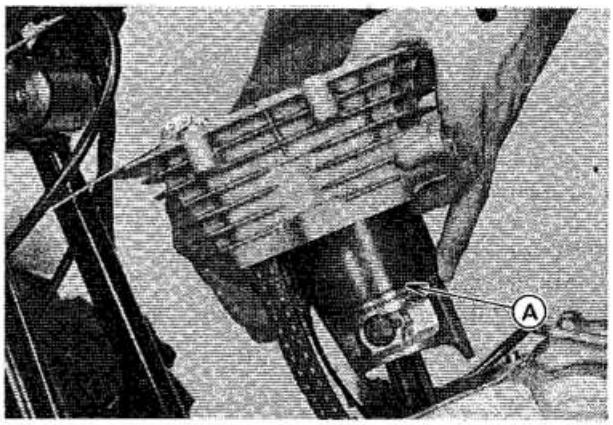
- Oil the piston rings and smear some oil inside the cylinder bore.
- Hold the cylinder in position above the case and push the camshaft chain up through the tunnel.
- The camshaft chain guides also fit inside the tunnel.

Piston Rings



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

- Fit the cylinder down over the piston and rings.
  - Hold the rings into their groove with your fingers so that the cylinder does not catch on them.



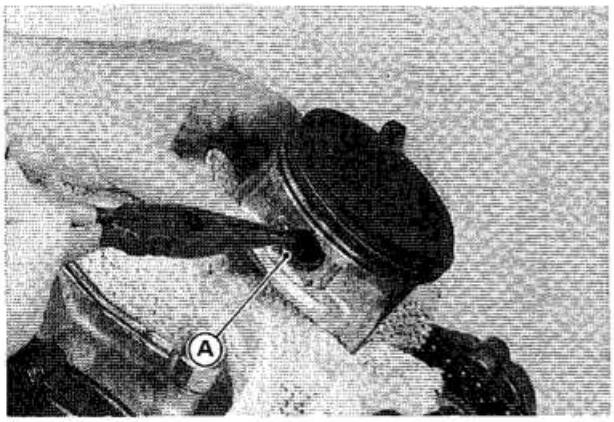
A.Piston Rings

- Push the cylinder down solidly against the crankcase.
- Install the cylinder head (see Cylinder Head Installation).

Piston and Ring Removal/Installation:

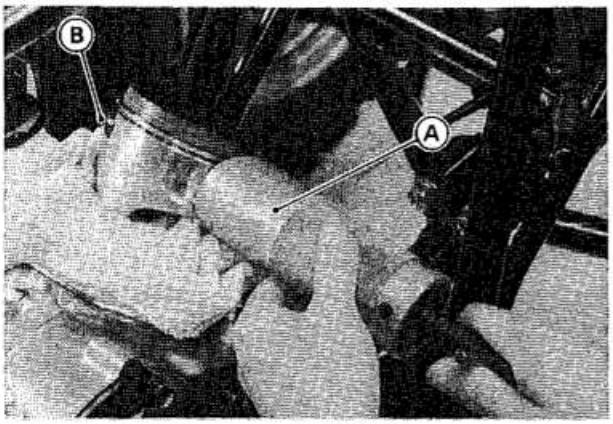
Piston and Ring Removal

- Remove the cylinder (see Cylinder Removal).
- Remove one of the piston pin snap rings.



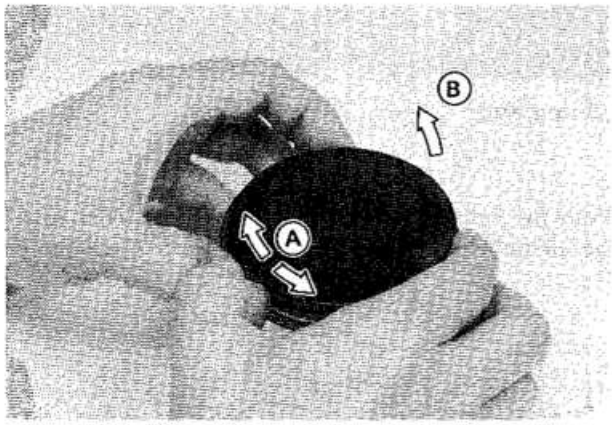
A. Piston Pin Snap Ring

•Push out the piston pin, and remove the piston.
○If necessary, use the piston pin puller assy (special tool).



A. Piston Pin Puller Assy: 57001-910
B. Adapter "C": 57001-914

•Remove the top and second piston rings.
○Spread the ring open with your thumbs.
○Push up on the opposite side with your fingers.



A. Spread. B. Push up.

•Remove the oil ring upper and lower steel rails.
○Spread the rail open with your thumbs.
○Push up on the opposite side with your fingers.
•Remove the oil ring expander.

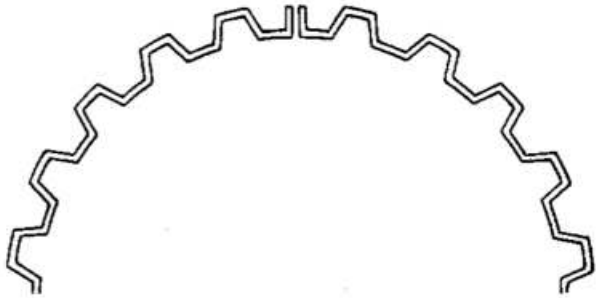
Piston and Ring Installation

NOTE

○*If a new piston is used, check piston to cylinder clearance (see Piston/Cylinder Clearance), and use new piston rings.*

•Install the oil ring expander in the bottom piston ring groove so the ends butt together.

Oil Ring Expander Installation

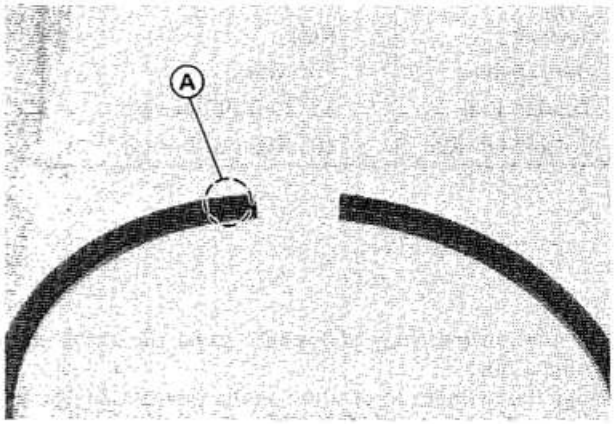


•Install the oil ring steel rails, one above the expander and one below it.
○Spread the rail with your thumbs, but only enough to fit the rail over the piston.
○Release the rail into the bottom piston ring groove.

NOTE

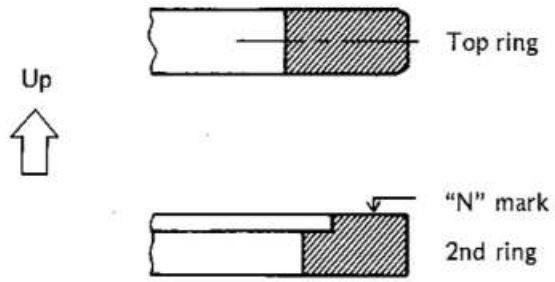
○*The oil ring rails have no "top" or "bottom".*

•Install the second and top rings in that order.
○Install the second ring so that the "N" marked side faces up. The top ring is symmetric with respect to the horizontal axis; it can be installed either way.

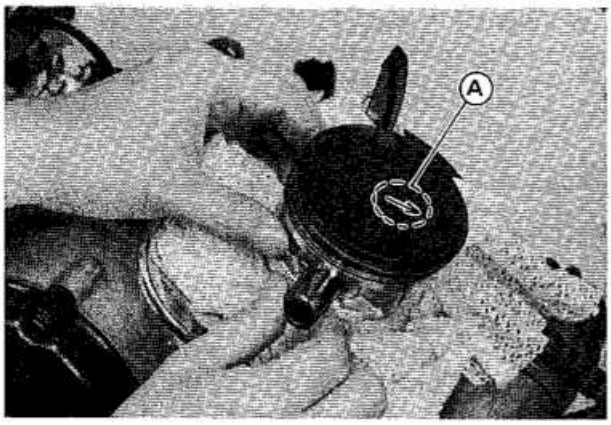


A. "N" Mark

Top and Second Rings



•Install the piston pin.
○Oil the piston pin lightly and slide it through the side of the piston without a snap ring.
○Hold the piston in position over the connecting rod, with the arrow pointing forward, and slide the piston pin the rest of the way through the connecting rod and piston.



A. Arrow pointing forward.

○Install a new piston pin snap ring.

CAUTION

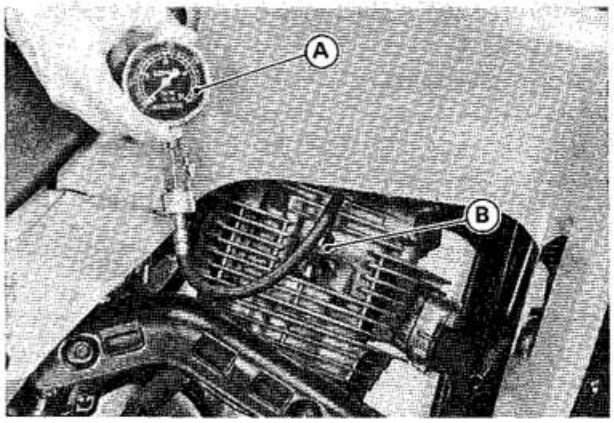
○**Do not reuse the snap ring which was removed. Removal weakens and deforms the snap ring. It could fall out and score the cylinder wall.**

•Install the cylinder (see Cylinder Installation).

Cylinder, Piston and Ring Maintenance:

Compression Measurement

•Before measuring compression, do the following:
○Check cylinder head bolt torque (see Cylinder Head Installation).
○Be sure the battery is fully charged (see Battery Condition in the Electrical System chapter).
○Warm up the engine (if the engine will run).
○During warm-up, check for leaks around the cylinder head gasket.
•Remove the spark plug.
•Set the compression gauge and adapter hose (special tools) into the spark plug hole.
•Hold the throttle wide open and crank the engine with the starter.
•When the gauge stops rising, stop cranking and read the gauge.



A. Compression Gauge: 57001-221
B. Adapter Hose: 57001-1159

Cylinder Compression

Standard: 795 – 1,240 kPa
(8.1 – 12.6 kg/cm², 115 – 179 psi)

★If the compression is within the specified range, the piston rings, cylinder and valves are probably in good condition.
★If the compression is higher than the specified range, see the **Compression Too High** table.
★If the compression is below the specified range, squirt a little oil into the spark plug hole and repeat the compression measurement.
☆If the compression does not change very much, the piston rings are probably OK. See the **Wet Compression - No Change** table.
☆If the compression increases, the piston rings are not sealing properly. See the **Wet Compression - Increase** table.

Compression Too High

Possible Problems	Solutions	References
Carbon build up on piston head and cylinder head	Remove carbon	Piston Cleaning and Cylinder Head Cleaning
	Check possible oil leaks to combustion chamber	Valve Stem Oil Seal Inspection, Valve Stem Diameter, Valve Guide Inside Diameter, and check piston oil ring for visible damage.
Cylinder head or base gasket too thin	Replace gaskets	Cylinder Head Removal, Cylinder Head Installation, Cylinder Removal, and Cylinder Installation

Wet Compression - No Change

Possible Problems	Solutions	References
Improper valve clearance	Check clearance	Valve Clearance Check, and Valve Clearance Adjustment
Worn valve seats	Check seats	Valve Seat Inspection, and Valve Seat Repair
Burned valve	Check valves	Valve Visual Inspection, and Valve Head Thickness
Cylinder head leak	Check head gasket	Cylinder Head Removal, and Cylinder Head Installation
	Check head flatness	Cylinder Head Warp

Wet Compression - Increase

Possible Problems	Solutions	References
Too much piston-to-cylinder clearance	Check clearance	Cylinder/Piston Wear, Piston/Cylinder Clearance, and Cylinder Boring and Honing
Worn piston rings, and ring grooves	Check piston and rings	Piston Ring and Ring Groove Wear, and Piston Ring End Gap (top and second only).

Cylinder/Piston Wear

●Measure the cylinder inside diameter.

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

Cylinder Inside Diameter

Standard: **76.000 – 76.012 mm, and less than 0.01 mm difference between any two measurements**

Service Limit: **76.01 mm, or more than 0.05 mm difference between any two measurements**

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

NOTE

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

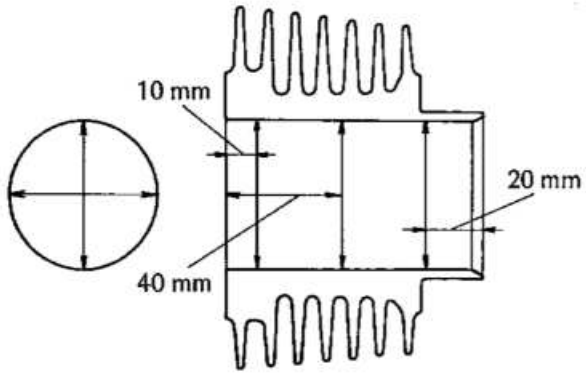
Oversize Cylinder Inside Diameter

Standard	Service Limit	Bore Limit
Measure at bottom of cylinder for baseline standard diameter	Standard plus 0.1 mm, or more than 0.05 mm difference between any two measurements	77.0 mm

Oversize Piston Diameter

Standard	Service Limit
75.950 – 75.965 mm plus 0.5 or 1.0 mm as stamped in piston head	Standard size minus 0.15 mm

Cylinder Diameter Measurement

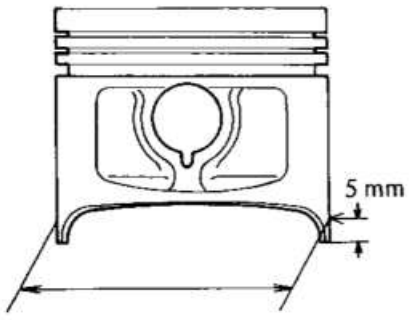


•Measure the piston diameter at the point shown with a micrometer.

Piston Diameter

Standard: **75.950 – 75.965 mm**
Service Limit: **75.81 mm**

Piston Diameter Measurement



★If the piston diameter is less than the service limit, replace it.

NOTE

○*If the cylinder has been bored oversize, use the Oversize Piston Diameter table.*

Piston/Cylinder Clearance

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

Piston/Cylinder Clearance

Standard: **0.035 – 0.062 mm**

Cylinder Boring and Honing

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

Piston/Cylinder Seizure

- In case of seizure, remove the cylinder (see Cylinder Removal).
- Visually inspect the cylinder and piston damage.
- ★If there is only light damage, smooth the piston with #400 emery cloth. Remove small aluminum deposits from the cylinder with #400 emery cloth or light honing.
- ★If the damage is severe, the cylinder must be bored oversize and an oversized piston installed.

Piston Cleaning

- Remove the piston and piston rings (see Piston and Ring Removal).

CAUTION

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

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

CAUTION

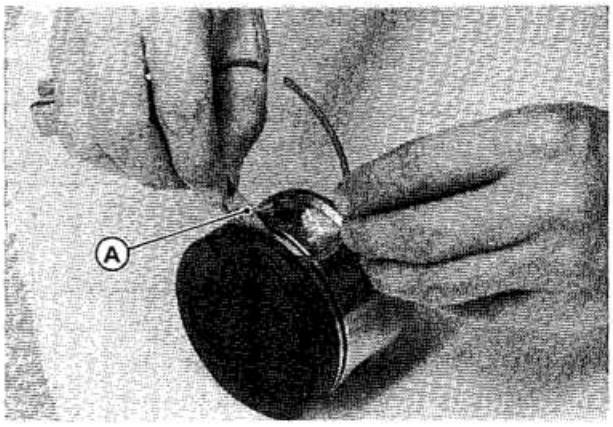
- ○**Be careful not to widen the ring grooves or the piston must be replaced.**

Piston Ring and Ring Groove Wear

- Visually inspect the piston rings and ring grooves.
- ★If the piston rings are worn unevenly or damaged, replace them.
- ★If the ring grooves are worn unevenly or damaged, replace both the piston and piston rings.
- Measure the clearance between the top and second rings and their grooves.
- ○Install the rings in their grooves.
- ○Use a thickness gauge to measure the clearance at several points around the piston.

Piston Ring/Groove Clearance

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



A. Thickness Gauge

- ★If the piston ring groove clearance is greater than the service limit, measure the ring thickness and groove width as follows to decide whether to replace the rings, the piston or both.
- Measure the piston ring groove width.
- ○Use a vernier caliper at several points around the piston.

Piston Ring Groove Width

Top	**Standard:**	**1.22 – 1.24 mm**
	Service Limit:	**1.32 mm**
Second	**Standard:**	**1.21 – 1.23 mm**
	Service Limit:	**1.31 mm**
Oil	**Standard:**	**2.51 – 2.53 mm**
	Service Limit:	**2.61 mm**

- ★If the width of any of the three grooves is wider than the service limit at any point, replace the piston.
- Measure the piston ring thickness.
- ○Use a micrometer to measure at several points around the ring.

Piston Ring Thickness (Top & Second)

Standard:	**1.170 – 1.190 mm**
Service Limit:	**1.10 mm**

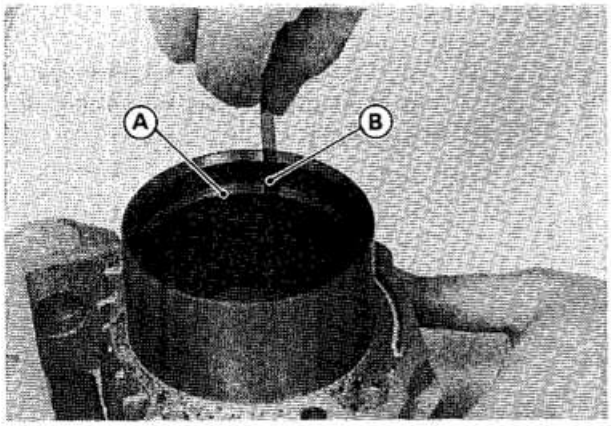
- ★If any of the measurements is less than the service limit on either of the rings, replace the entire set of rings.

NOTE

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

Piston Ring End Gap (top and second only)

- Remove the piston rings (see Piston and Ring Removal).
- Push each ring (one at a time) into the bottom end of the cylinder.
- ○Use the piston to push it in to be sure it is square.
- Measure the gap between the ends of the ring with a thickness gauge.



A. Piston Ring B. Thickenss Gauge

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

Piston Ring End Gap (Top & Second)

Standard:	**0.20 – 0.35 mm**
Service Limit:	**0.7 mm**

Exhaust System

Spark Arrester:

This motorcycle is equipped with a spark arrester approved for off-road use by the U.S. Forest Service. It must be properly maintained to ensure its efficiency.

CAUTION

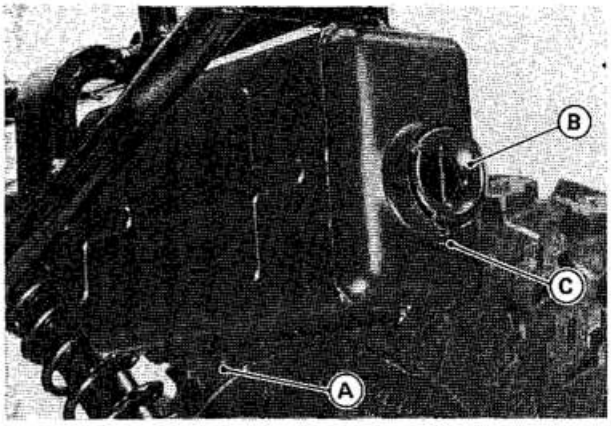
○**The spark arrester must be installed correctly and functioning properly to provide adequate fire protection.**

Spark Arrester Cleaning

WARNING

○**To avoid burns, wear gloves while cleaning the spark arrester. Since the engine must be run during this procedure, the muffler will become hot.**

- Remove the drain plug on the muffler.
- In an open area away from combustible materials, start the engine with the transmission in neutral.
- Raise and lower engine speed while tapping on the muffler with a rubber mallet until carbon particles are purged from the muffler.



A. Drain Plug C. Mounting Bolt
B. Spark Arrester

WARNING

○**Do not run the engine is a closed area. Exhaust gases contain carbon monoxide, a colorless, odorless, poisonous gas. Breathing exhaust gas leads to carbon monoxide poisoning, asphyxiation, and death.**

- Stop the engine.
- Install the drain plug.
- Remove the spark arrester mounting bolt from the muffler.
- Pull the spark arrester out of the muffler.
- Scrape carbon deposits off the spark arrester and slide it back into the muffler.
- Install the mounting bolt and tighten it securely.

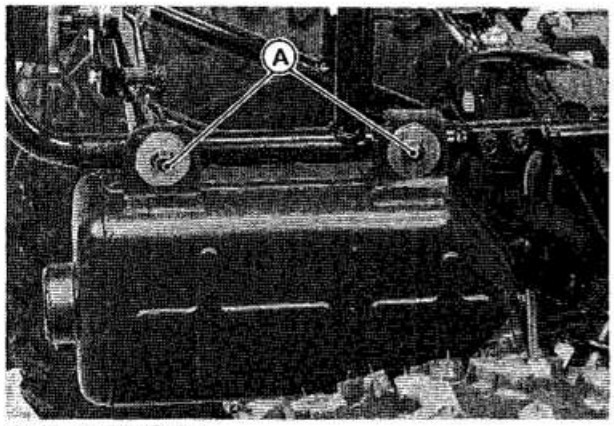
WARNING

○**Never run the engine with the spark arrester removed near combustible materials. Hot carbon particles may start a fire.**

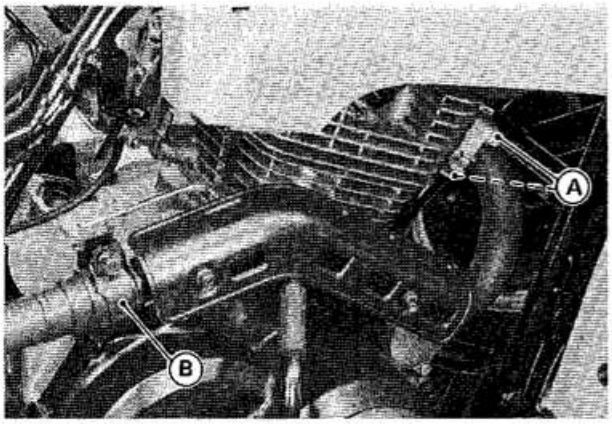
Exhaust Pipe and Muffler:

Exhaust Pipe and Muffler Removal

- Loosen the muffler clamp bolt until the clamp turns freely on the muffler.
- Take out the muffler mounting bolts. Do not lose the collars.
- ○For extra clearance, first remove the rear fender assembly (see Rear Fender Removal in the Frame chapter).
- Remove the muffler from the rear of the frame.
- Take off the exhaust pipe holder nuts at the cylinder head.
- Work the exhaust pipe out of the frame and remove it.
- Remove the exhaust pipe holder and split collar.
- Remove the exhaust pipe gasket from the cylinder head.



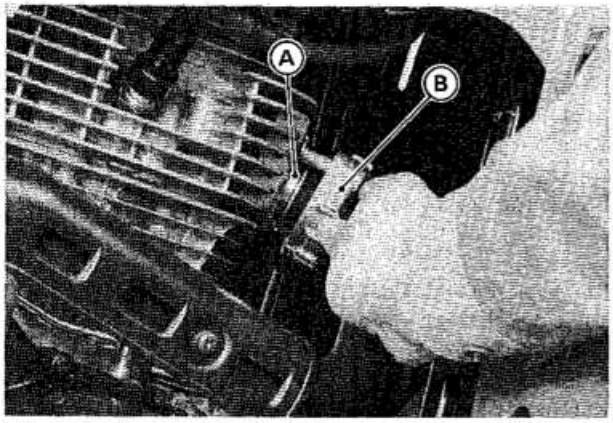
A. Mounting Bolts



A. Holder Nuts B. Clamp

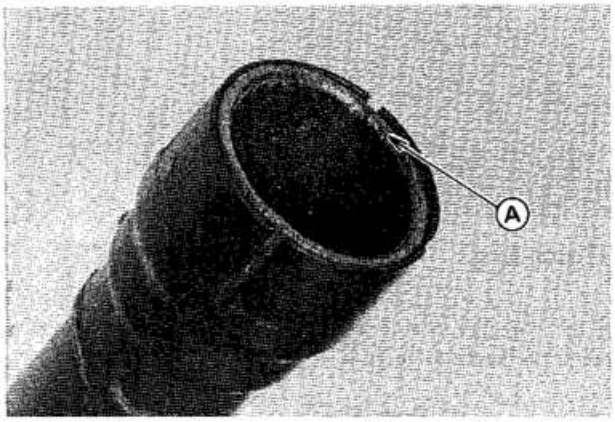
Exhaust Pipe and Muffler Installation

- Smear a little grease on a new exhaust pipe gasket and stick it into the exhaust port in the cylinder head.
- Slip the exhaust pipe holder over the exhaust pipe.
- Attach the exhaust pipe loosely to the cylinder head.
  - Tape the split collar in place as shown.



A. Split Keeper B. Holder

  - Position the exhaust pipe in the exhaust port.
  - Slide the holder into place on the studs.
  - Thread on the nuts, but do not tighten them yet.
- Fit the gasket into the muffler so that the chamfered side of the gasket faces to the front.



A. Chamfer

- Slip the muffler into place from the rear of the frame, so that it fits over the exhaust pipe.
  - Be sure that the collars are in place in the rubber dampers in the muffler.
  - Hold the muffler up and put in the mounting bolts, but do not tighten them yet.
- Tighten the exhaust pipe holder nuts evenly and securely.
- Tighten the muffler mounting bolts securely.
- Tighten the muffler clamp bolt securely.
- If the rear fender was removed, install it (see Rear Fender Installation in the Frame chapter).

Exhaust System Inspection

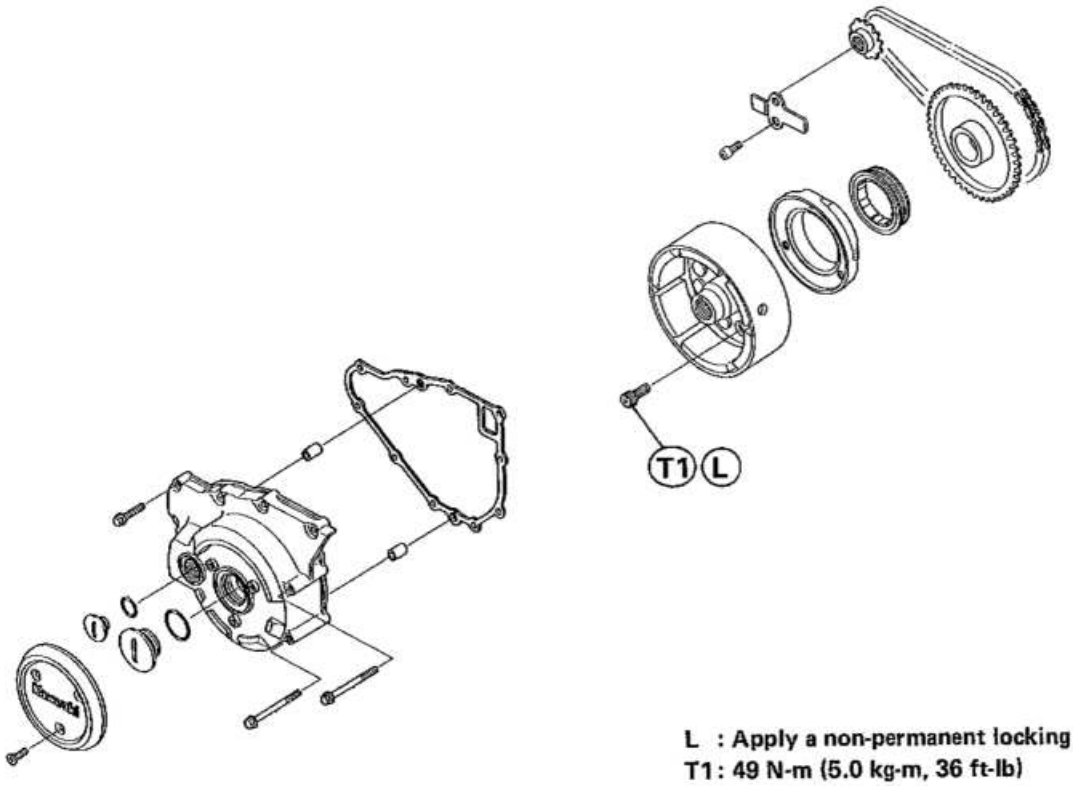
- Before removing the exhaust system, check for signs of leakage at the exhaust pipe gasket in the cylinder head and at the muffler clamp.
  - ★If there are signs of leakage around the exhaust pipe gasket, it should be replaced. If the muffler-to-exhaust pipe joint leaks, tighten the clamp.
- Remove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

Engine Left Side

Table of Contents

Exploded View 4-2
Specifications 4-3
Special Tool 4-3
Left Engine Cover 4-4
    Left Engine Cover Removal 4-4
    Left Engine Cover Installation 4-4
Alternator Rotor and Stator (see Electrical System chapter)
Pickup Coil (see Electrical System chapter)
Starter Clutch 4-4
    Starter Clutch Removal 4-4
    Starter Clutch Installation 4-5
    Starter Clutch Inspection 4-5
Starter Chain and Sprockets 4-5
    Starter Chain and Sprocket Removal 4-5
    Starter Chain and Sprocket Installation 4-5
    Starter Chain Wear 4-6

Exploded View



L : Apply a non-permanent locking agent.
T1 : 49 N-m (5.0 kg-m, 36 ft-lb)

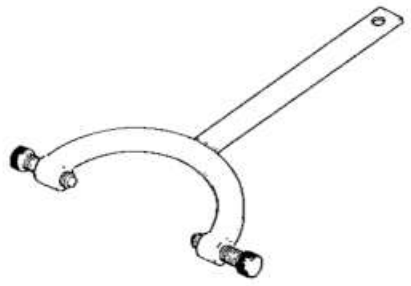
Specifications

Item	Standard	Service Limit
Starter Chain 20-Link Length	155.8 – 156.1 mm	158.0 mm

Special Tool

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

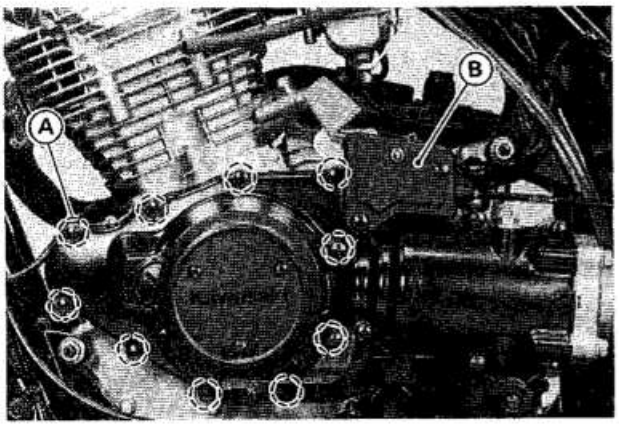
Flywheel Holder: 57001-308



Left Engine Cover

Left Engine Cover Removal

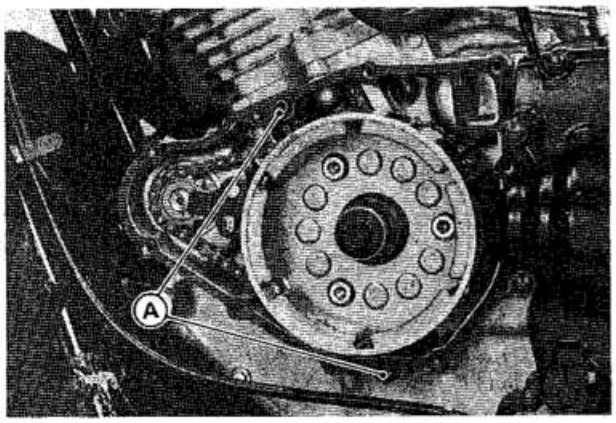
- Place an oil pan beneath the engine left side.
- Disconnect the alternator connector and pickup coil connector.
- Remove the left engine cover.
- ○Remove the differential shift lever case.
- ○Unscrew the cover mounting bolts.



A. Left Engine Cover Mounting Bolts
B. Differential Shift Lever Case

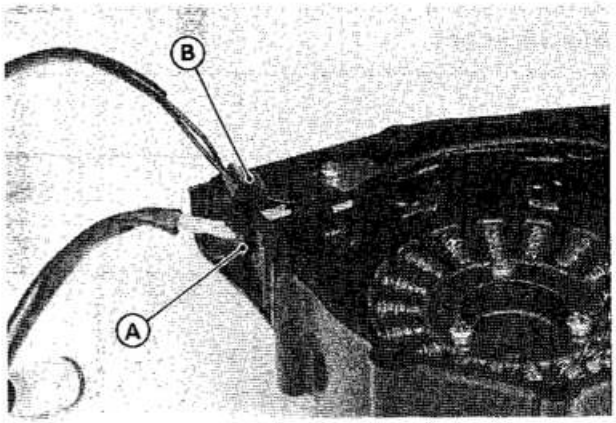
Left Engine Cover Installation

- Left engine cover installation is the reverse of removal. Note the following.
- Be sure all of the old gasket has been removed from the left engine cover and the left hand crankcase sealing surfaces.
- Check the dowel pins are in place, and fit a new gasket on the crankcase.



A. Dowel Pins

- Fit the lead grommets into the notches on the left engine cover.



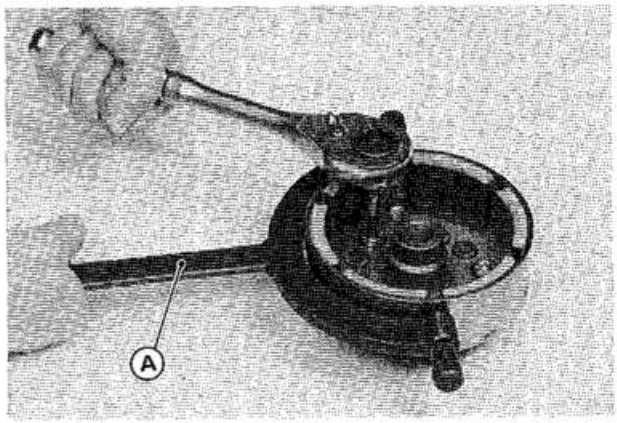
A. Grommet for Alternator Lead
B. Grommet for Pickup Coil Lead

- Tighten the front gear case 8 mm mounting bolt to the specified torque (see Exploded View in the Final Drive chapter).
- Add engine oil (see Engine Oil and Oil Filter Change in the Engine Right Side chapter).

Starter Clutch

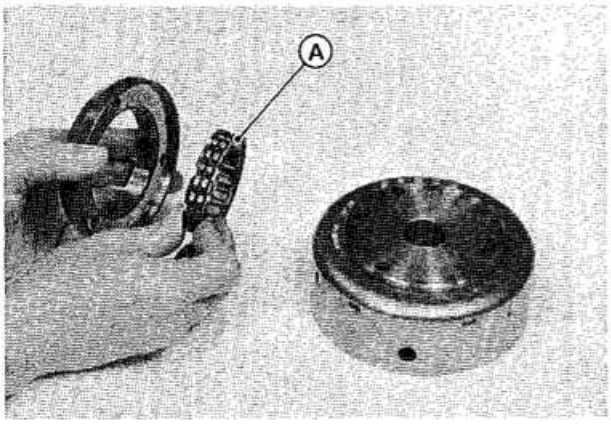
Starter Clutch Removal

- Remove the alternator rotor (see Alternator Rotor Removal in the Electrical System chapter).
- Hold the rotor with the flywheel holder (special tool) and take out the Allen bolts.



A. Flywheel Holder: 57001-308

- Take out the one-way clutch.



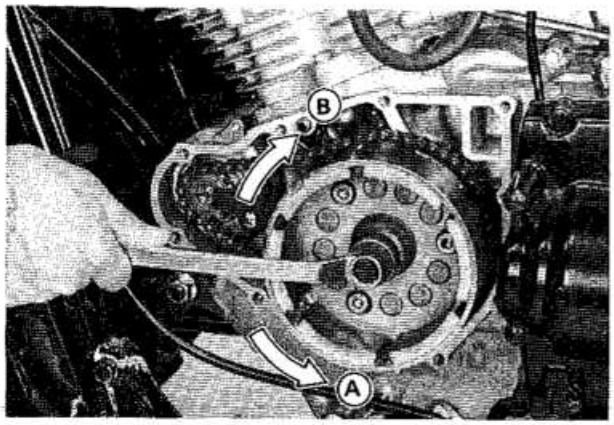
A. One-way Clutch

Starter Clutch Installation

- Starter clutch installation is the reverse of removal. Note the following.
- Apply a non-permanent locking agent to the threads of the Allen bolts which hold the starter clutch to the flywheel.
- Tighten the Allen bolts to the specified torque (see Exploded View).

Starter Clutch Inspection

- Remove the left engine cover (see Left Engine Cover Removal).
- Turn the alternator rotor.



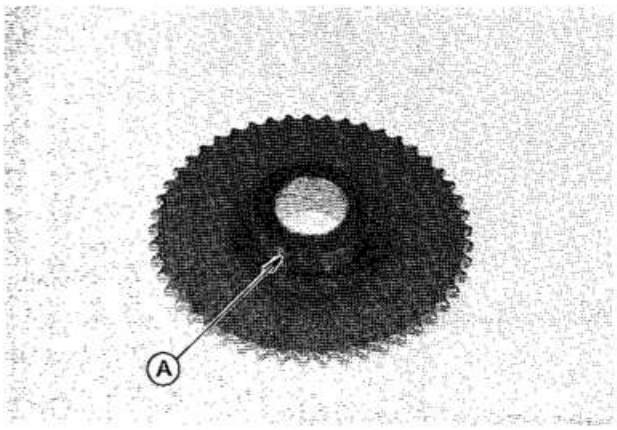
A. Turn freely. B. Turn with starter chain sprocket.

★If the alternator rotor turns counterclockwise freely from the starter chain sprocket, but not clockwise, the clutch is operating as it should.

★If the clutch does not operate as its should, or if it makes noise, disassemble it (see Starter Clutch Removal), examine each part visually, and replace any worn or damaged parts.

NOTE

○*Examine the starter chain sprocket as well. Replace it if it is worn or damaged.*

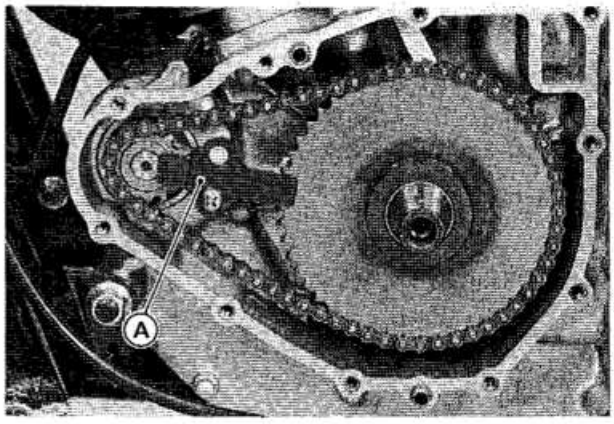


A. Inspect surface.

Starter Chain and Sprockets

Starter Chain and Sprocket Removal

- Remove the alternator rotor (see Alternator Rotor Removal in the Electrical System chapter).
- Take out the screw and remove the sprocket guide.

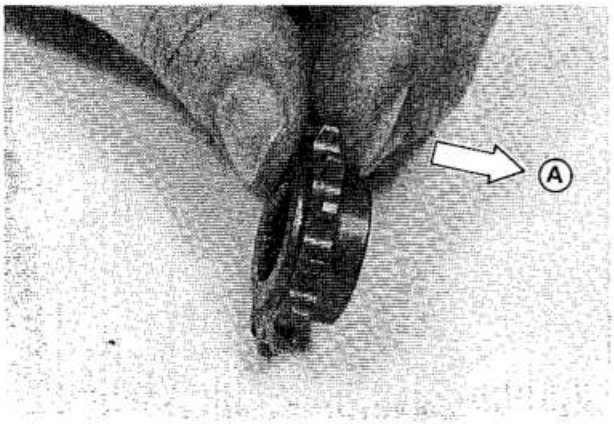


A. Sprocket Guide

- Pull both sprockets off simultaneously with the chain.

Starter Chain and Sprocket Installation

- Starter chain and sprocket installation is the reverse of removal. Note the following.
- The protruding side of the small sprocket must face in.



A. Toward engine.

•The protruding side of the large sprocket must face out.

Starter Chain Wear

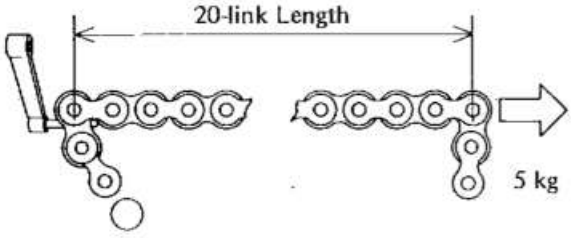
•Hold the starter chain taut with a force of about 5 kg in some manner, and measure a 20-link length. Since the chain may wear unevenly, take measurements at several places.

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

Starter Chain 20-Link Length

Standard:	**155.8 – 156.1 mm**
Service Limit:	**158.0 mm**

Starter Chain Measurement



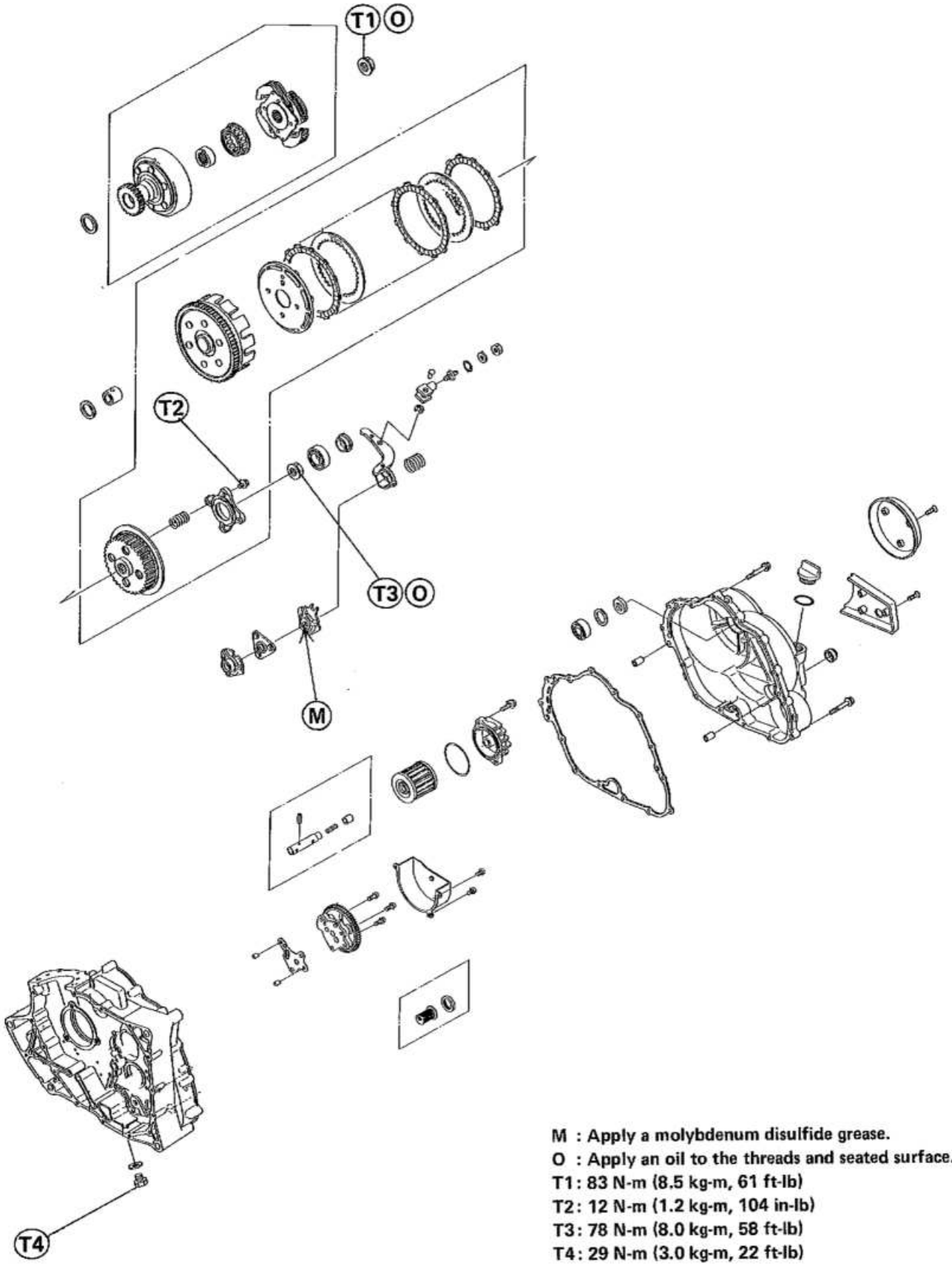
Engine Right Side

Table of Contents

Exploded View 5-2
Specifications 5-3
Special Tools 5-3
Right Engine Cover 5-4
  Right Engine Cover Removal 5-4
  Right Engine Cover Installation 5-4
Clutches 5-4
  Clutch Adjustment 5-4
    Clutch Adjustment 5-4
  Clutch Removal 5-5
    Clutch Removal 5-5
    Clutch Installation 5-6
  Clutch Inspection 5-7
    Primary Clutch Housing Wear 5-7
    Primary Clutch Shoe Lining Wear 5-7
    One-way Clutch Inspection 5-7
    Friction Plate Wear and Damage 5-8
    Friction Plate and Steel Plate Warp 5-8
    Secondary Clutch Housing Finger Damage 5-8
    Secondary Clutch Hub Spline Damage . . 5-8
    Secondary Clutch Spring Wear 5-8
  Clutch Release 5-9
    Clutch Release Removal 5-9
    Clutch Release Installation 5-9
    Clutch Release Wear 5-9
Primary Reduction 5-9
  Primary Gear Removal 5-9
  Primary Gear Installation 5-9
  Secondary Gear Removal 5-9
  Secondary Gear Installation 5-9
  Primary and Secondary Gear Damage . . 5-9
  Gear Backlash 5-10
  Primary Gear/Crankshaft Wear 5-10
  Secondary Gear/Collar Wear 5-10
Lubrication System 5-11
  Engine Oil and Filter 5-11
    Engine Oil Level Inspection 5-11
    Engine Oil and Filter Change 5-11
  Oil Pump 5-12
    Oil Pump Removal 5-12
    Oil Pump Installation 5-12
    Oil Pump Disassembly 5-13
    Oil Pump Assembly 5-13
    Oil Pump Inspection 5-13
  Oil Screen 5-13
    Oil Screen Removal 5-13
    Oil Screen Installation 5-13
    Oil Screen Cleaning and Inspection 5-14
  Oil Filter Bypass Valve 5-14
    Bypass Valve Disassembly 5-14
    Bypass Valve Assembly 5-14
    Bypass Valve Cleaning and Inspection . . 5-14

5-2 ENGINE RIGHT SIDE

Exploded View



M : Apply a molybdenum disulfide grease.
O : Apply an oil to the threads and seated surface.
T1: 83 N-m (8.5 kg-m, 61 ft-lb)
T2: 12 N-m (1.2 kg-m, 104 in-lb)
T3: 78 N-m (8.0 kg-m, 58 ft-lb)
T4: 29 N-m (3.0 kg-m, 22 ft-lb)

Specifications

Clutches:

Item	Standard	Service Limit
Primary Clutch:		
Primary Clutch Housing Inside Diameter	125.0 – 125.2 mm	125.5 mm
Primary Clutch Shoe Groove Depth	1.0 mm	0.5 mm
Secondary Clutch:		
Friction Plate Thickness	2.92 – 3.08 mm	2.8 mm
Friction Plate Warp	Under 0.15 mm	0.3 mm
Steel Plate Warp	Under 0.2 mm	0.3 mm
Clutch Spring Free Length	30.38 mm	28.8 mm

Primary Reduction:

Item	Standard	Service Limit
Gear Backlash	0.02 – 0.11 mm	0.14 mm
Primary Gear Inside Diameter	27.000 – 27.021 mm	27.03 mm
Crankshaft Diameter	26.959 – 26.980 mm	26.94 mm
Secondary Gear Inside Diameter	25.000 – 25.021 mm	25.03 mm
Secondary Gear Collar Diameter	24.970 – 24.985 mm	24.95 mm

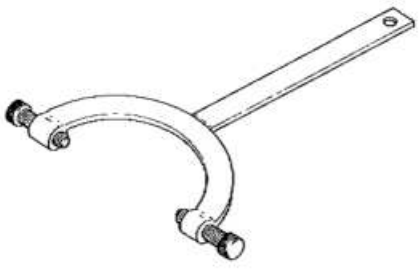
Lubrication System:

Item		Standard	Service Limit
Engine Oil:	Grade	SE or SF class	———
	Viscosity	SAE 10W40, 10W50, 20W40, 20W50	———
	Capacity:	1.7 L	———

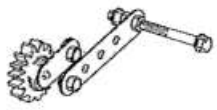
Special Tools

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

Flywheel Holder: 57001-308



Gear Holder: 57001-1015



Right Engine Cover

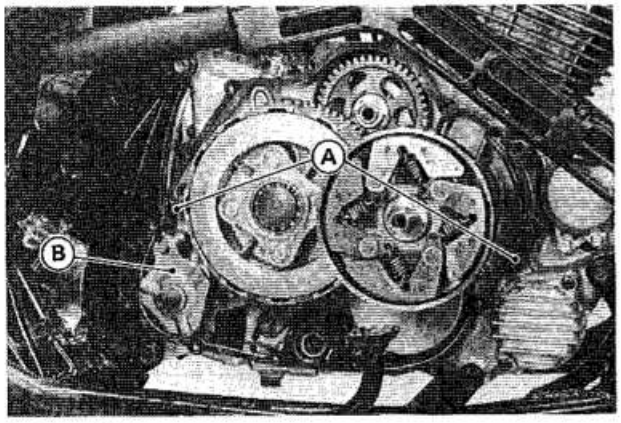
Right Engine Cover Removal

- Drain the engine oil (see Engine Oil and Oil Filter Change).
- Remove the right footpeg.
- Take out the bolts and remove the right engine cover.

○The clutch release assembly comes out with the right engine cover.

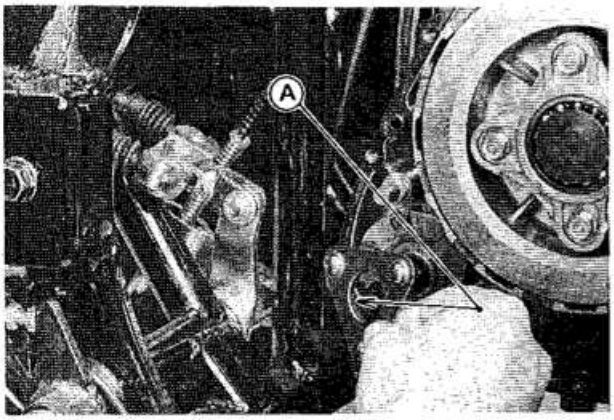
Right Engine Cover Installation

- Be sure all of the old gasket has been removed from the right engine cover and the right hand crankcase sealing surfaces.
- Check that the following items are in place:
  Dowel pins
  Clutch release cams and ball assembly



A. Dowel Pins
B. Clutch Release Cams and Ball Assembly

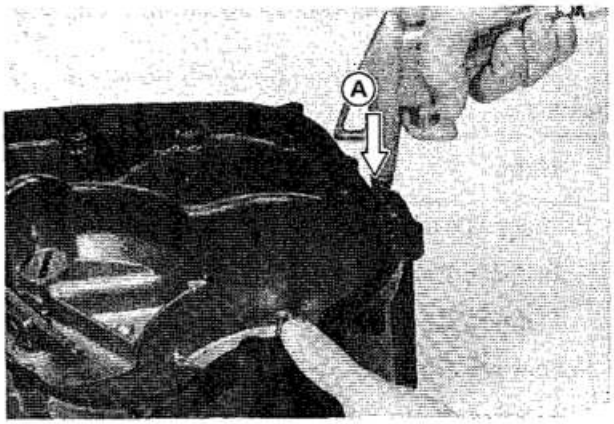
○The projected portion of the ball assembly must be faced in.



A. Projected Portion

○Apply a molybdenum disulfide grease to the pivot of the outer cam.

- Fit a new right engine cover gasket.
- Using compressed air, blow out any particles which may obstruct the oil passage on the right engine cover.



A. Compressed Air

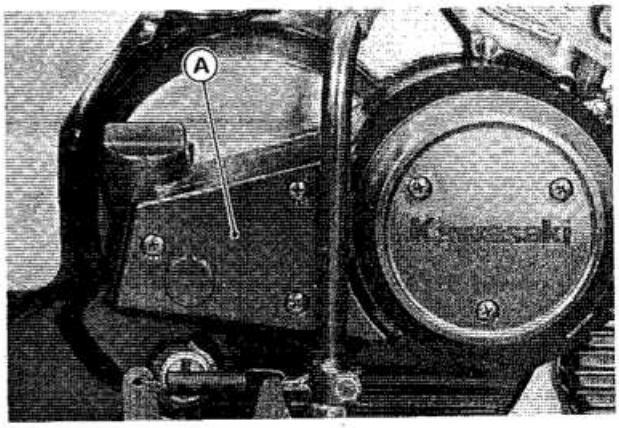
- Install the right engine cover and tighten the screws securely.
- Adjust the clutch (see Clutch Adjustment).
- Install the right footpeg.
- Fill the engine with oil (see Engine Oil and Oil Filter Change).

Clutches

Clutch Adjustment:

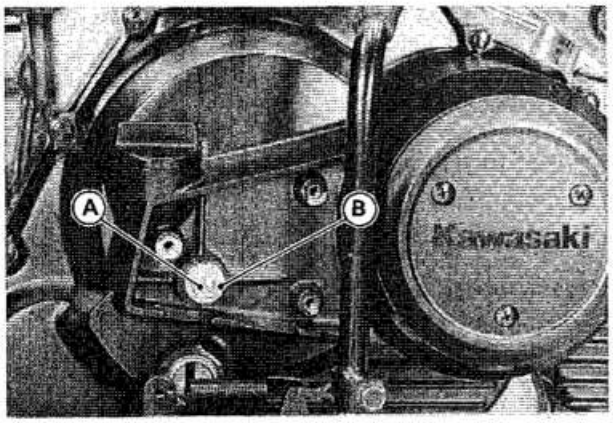
Clutch Adjustment

- Remove the clutch release adjusting screw cover.



A. Clutch Release Adjusting Screw Cover

- Loosen the clutch release adjusting screw locknut.
- Turn the adjusting screw clockwise until it becomes hard to turn.
- Turn the adjusting screw counterclockwise until it becomes hard to turn.
- Tighten the locknut without changing the adjusting screw position.



A. Adjusting Screw B. Locknut

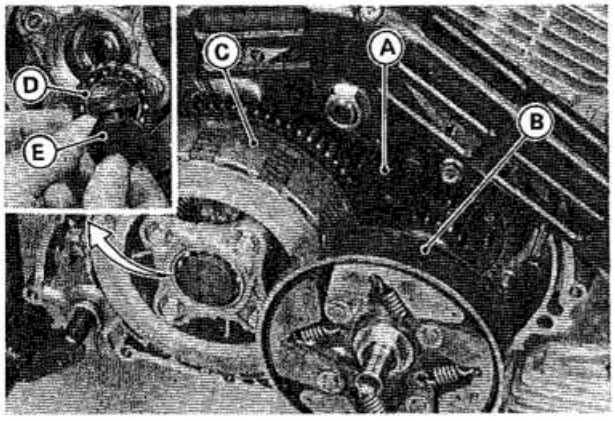
●Install the clutch release adjusting screw cover.

Clutch Removal:

Clutch Removal

●Remove the right engine cover (see Right Engine Cover Removal).

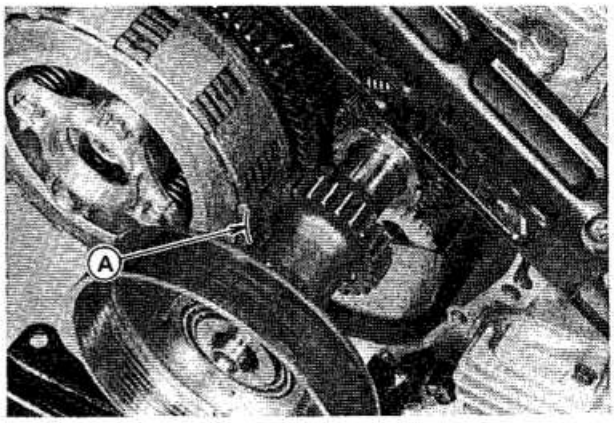
●Using the gear holder (special tool), hold the primary gear and secondary gear to keep them from turning, and remove the primary clutch hub nut.



A. Gear Holder: 57001-1015
B. Primary Clutch
C. Secondary Clutch
D. Ball Bearing
E. Pusher

●If the seconday clutch will be removed, remove the pusher and ball bearing from the secondary clutch spring plate, and loosen the secondary clutch hub nut at this time.

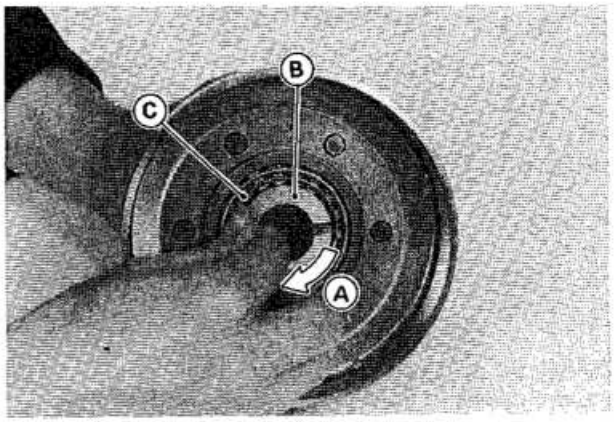
●Turn the secondary clutch until the dent on the secondary clutch housing comes against the primary gear, and pull out the primary clutch housing with the hub.



A. Dent

●Take out the primary clutch hub assembly, inner race, and one-way clutch.

○Inner race can easily be removed by turning clockwise.

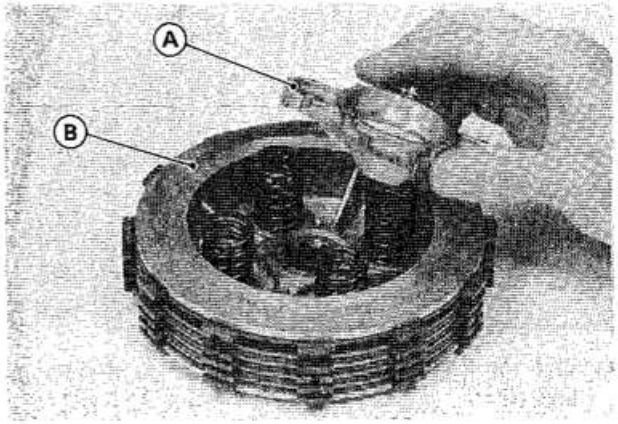


A. Turn clockwise.
B. Inner Race
C. One-way Clutch

●Remove the secondary clutch hub and clutch plate assembly as a set.

●Remove the secondary clutch housing and sleeve. There is the spacer behind the sleeve.

●To remove the secondary clutch plates, unscrew the clutch spring bolts and take off the spring plate and springs.



A. Spring Plate B. Secondary Clutch Hub

Clutch Installation

•Primary and secondary clutch installation is the reverse of removal. Note the following.

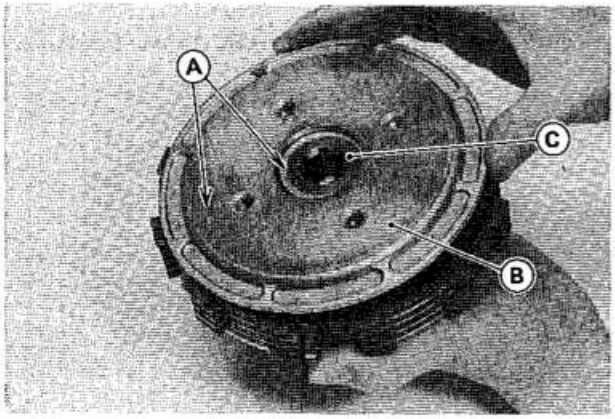
•Assemble the secondary clutch plates.

○Install the friction plates and steel plates to the clutch hub, starting with a friction plate and alternating them.

CAUTION

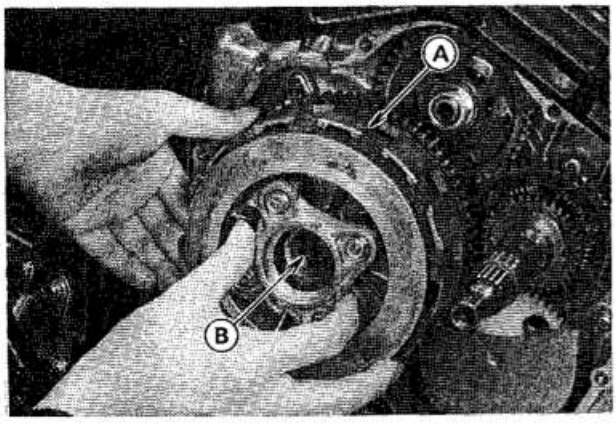
○If new dry steel plates and friction plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.

○Install the clutch wheel so that the mark on the clutch wheel is aligned with the mark on the clutch hub.



A. Align the marks.
B. Clutch Wheel
C. Clutch Hub

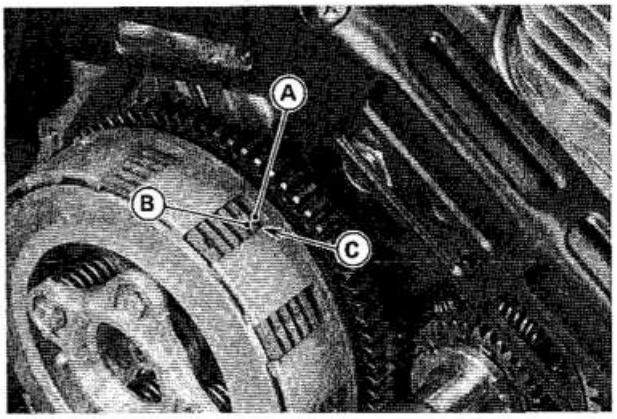
○Install the clutch spring plate with the springs and spring bolts temporarily, and fit the clutch hub and plate assembly into the clutch housing aligning the friction plate tangs with the clutch housing fingers and clutch hub splines with the drive shaft splines.



A. Align the friction plate tangs with the clutch housing fingers.
B. Align the clutch hub splines with the drive shaft splines.

•Cross tighten the secondary clutch spring bolts evenly to the specified torque (see Exploded View).

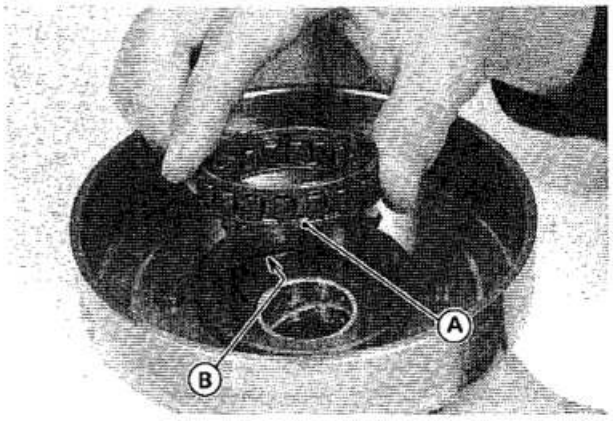
○Be sure that the clutch wheel splines fit onto the clutch hub splines. When the clutch wheel is installed correctly, there is no gap between the clutch wheel and the next friction plate, and clutch plates have no play.



A. Clutch Wheel
B. Friction Plate
C. No gap

•Fit the one-way clutch into the primary clutch housing.

○Fit the projection on the cage into the groove on the housing first, and then install the one-way clutch completely.



A. Projection
B. Groove

•Tighten the primary and secondary clutch hub nuts to the specified torque (see Exploded View).

○Apply a small amount of oil to the threads and the seating surfaces of the primary and secondary clutch hub nuts.

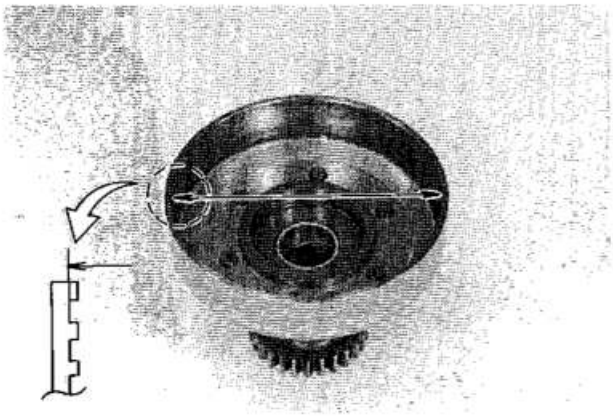
Clutch Inspection:

Primary Clutch Housing Wear

•Measure the inside diameter of the clutch housing where the shoes wear against it.

○Use calipers and measure at several points as shown.

★If any measurement is greater than the service limit, replace the primary clutch housing.



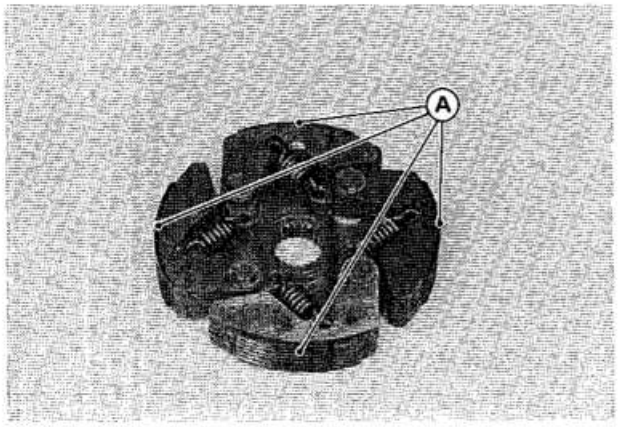
Primary Clutch Housing Inside Diameter

Standard:	**125.0 – 125.2 mm**
Service Limit:	**125.5 mm**

Primary Clutch Shoe Lining Wear

•Visually inspect the primary clutch shoe lining for uneven wear, discoloration, or missing friction material, cracks, or other damage.

★If any of the linings are damaged, replace the shoes as a set.



A. Primary Clutch Shoe Linings

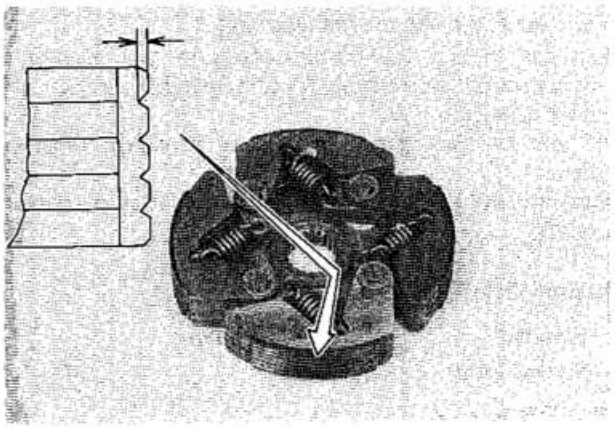
•Measure the shoe groove depth.

○Use a depth gauge, and measure at several points as shown.

★If any measurement is less than the service limit, replace all shoes as a set.

Primary Clutch Shoe Groove Depth

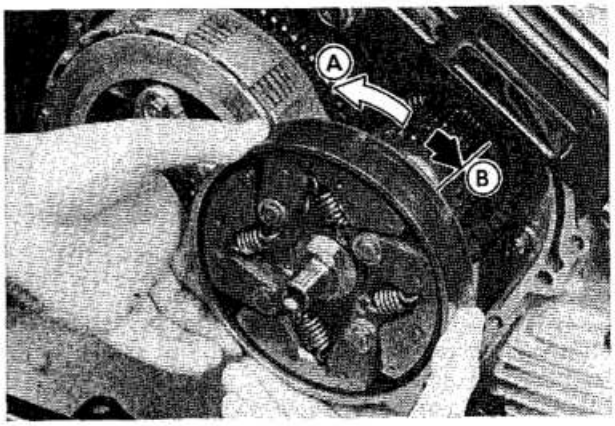
Standard:	**1.0 mm**
Service Limit:	**0.5 mm**



One-way Clutch Inspection

•Remove the right engine cover (see Right Engine Cover Removal).

•Turn the primary clutch housing by hand. When viewed from the right side of the engine, the primary clutch housing should turn counterclockwise freely, but should not turn clockwise.

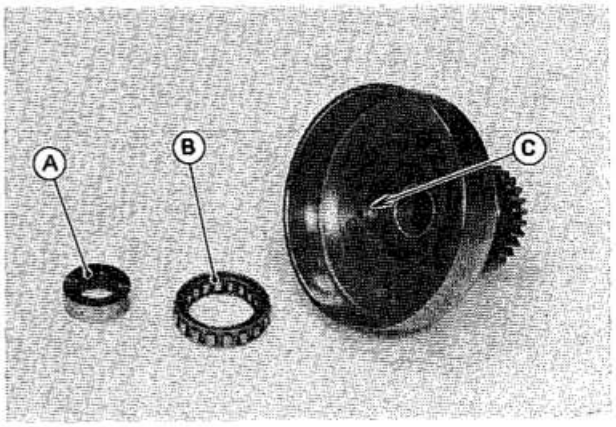


A. Turn freely. B. Locked.

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

•Remove the primary clutch (see Clutch Removal). Visually inspect the clutch parts: one-way clutch, inner race, and outer race at the primary clutch housing.

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



A. Inner Race C. Outer Race
B. One-way Clutch

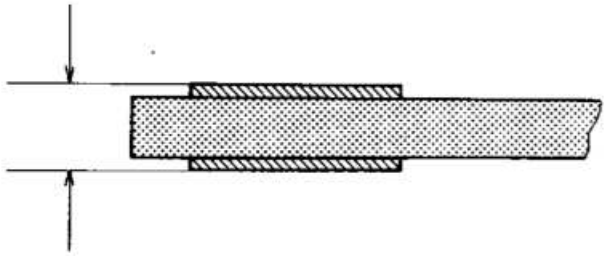
Friction Plate Wear and Damage

- Visually inspect the friction plates for uneven wear, discoloration, or missing friction material, cracks, or other damage.
- ★If any of the friction plates are damaged, replace them.
- Measure the thickness of the friction paltes at several points.

Friction Plate Thickness

Standard:	**2.92 – 3.08 mm**
Service Limit:	**2.8 mm**

Friction Plate Thickness



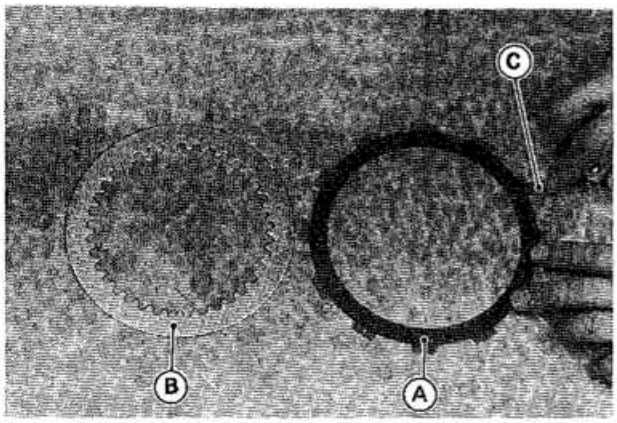
★If any of the measurements is less than the service limit, replace the friction plate.

Friction Plate and Steel Plate Warp

- Lay each plate on a surface plate.
- Hold one side down and use a thickness gauge to measure the gap between the other side of the plate and the surface plate.
- ★If any of the clutch plates is warped beyond the service limit, replace it.

Friction Plate and Steel Plate Warp

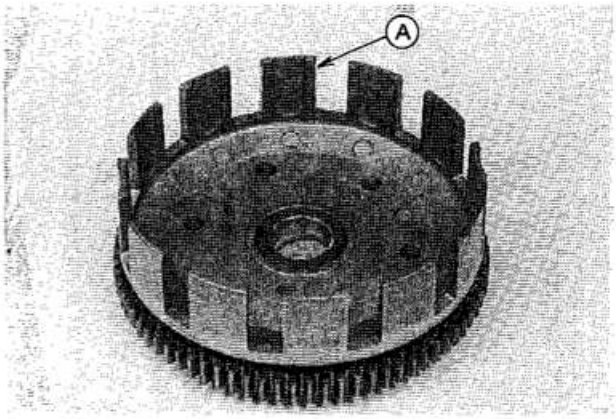
Standard:	**Under 0.15 mm (Friction Plate)**
	Under 0.2 mm (Steel Plate)
Service Limit:	**0.3 mm**



A. Friction Plate
B. Steel Plate
C. Thickness Gauge

Secondary Clutch Housing Finger Damage

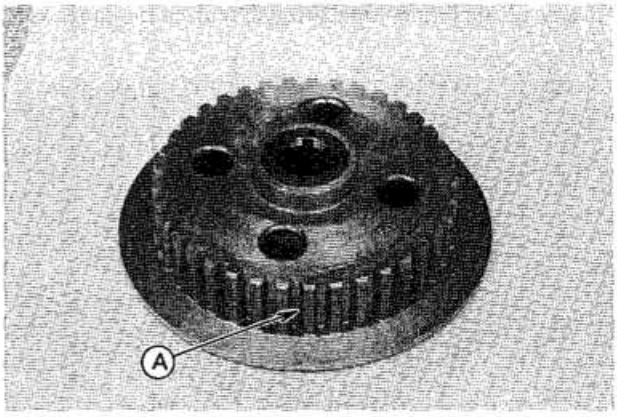
- Visually inspect the fingers of the clutch housing where the housing of the friction plates hit them.
- ★If they are badly worn or if there are grooves cut where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.



A. Clutch Housing Finger

Secondary Clutch Hub Spline Damage

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



A. Clutch Hub Spline

Secondary Clutch Spring Wear

- Measure the spring free length.
- ★If measurement is less than the service limit, replace it.

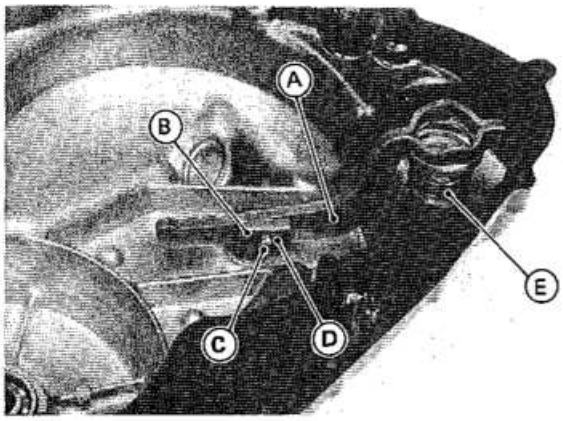
Clutch Spring Free Length

Standard:	**30.38 mm**
Service Limit:	**28.8 mm**

Clutch Release:

Clutch Release Removal

- Remove the right engine cover (see Right Engine Cover Removal).
- Remove the clutch release adjusting screw cover from the outside of the right engine cover.
- Unscrew the locknut and adjusting screw.
- Take off the flat washer and O-ring.
- Pull the clutch release lever and spring out of the right engine cover.
- Remove the E-ring, and pull the clevis pin from the clutch release lever clevis.



A. Clutch Release Lever
B. Clevis
C. Pin
D. E-ring
E. Spring

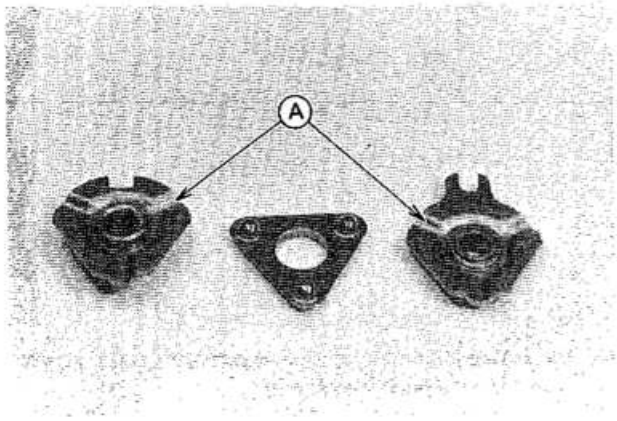
- Pull the release cams and ball assembly from the shift shaft.

Clutch Release Installation

- Clutch release installation is the reverse of removal.

Clutch Release Wear

- Visually inspect the O-ring at the clutch adjusting screw, the cam area, and the ball assembly.



A. Cam Area

★If the O-ring is damage, deteriorated, compressed, or hardened, replace it. If the cam area is damaged, or if the ball assembly is worn visibly, replace the damaged part. Also inspect the clutch release lever spring for damage. Replace it if necessary.

Primary Reduction

Primary Gear Removal

- The primary gear is removed during primary clutch removal (see Clutch Removal).

Primary Gear Installation

- The primary gear is installed during primary clutch installation (see Clutch Installation).

Secondary Gear Removal

- The secondary gear is removed during clutch removal (see Clutch Removal).

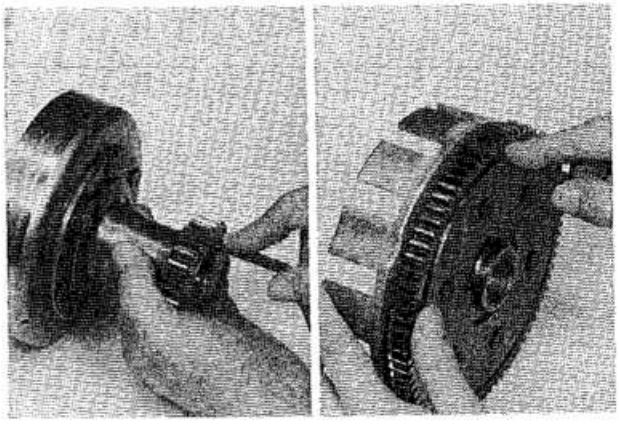
Secondary Gear Installation

- The secondary gear is installed during clutch installation (see Clutch Installation).

Primary and Secondary Gear Damage

- Visually inspect the teeth on the primary and secondary gears.

★If heavy damage is found, replace the damaged gear.
★If light damage is found, repair it with an oil-stone.

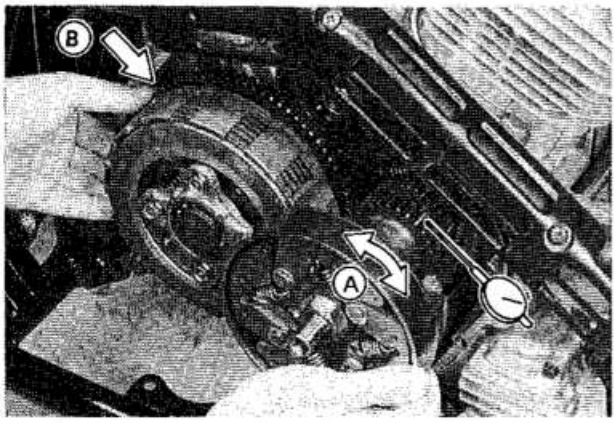


Gear Backlash

•Remove the right engine cover (see Right Engine Cover Removal).
•Set a dial gauge against the teeth on one gear, and move the gear back and forth while holding the other gear steady. The difference between the highest and the lowest gauge readings is the amount of backlash.
★If the amount of backlash exceeds the service limit, replace both gears.

Gear Backlash

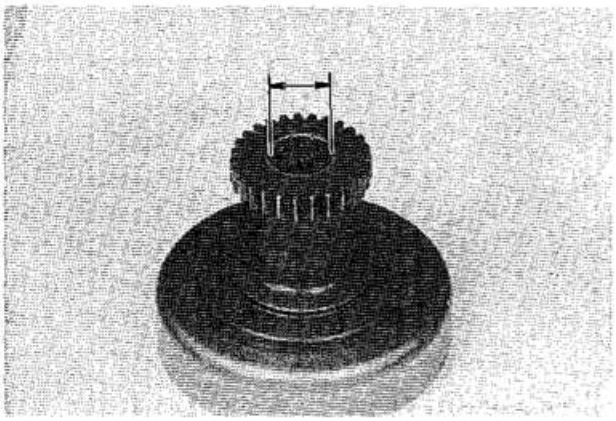
Standard:	**0.02 – 0.11 mm**
Service Limit:	**0.14 mm**

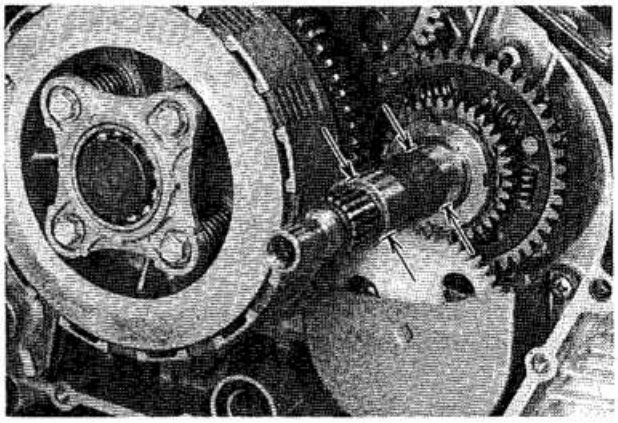


A. Move back and forth lightly. B. Hold steady.

Primary Gear/Crankshaft Wear

•Measure the inside diameter of the primary gear.
•Measure the outside diameter of the crankshaft.





★If the inside diameter of the primary gear is greater than the service limit, replace it.
★If the outside diameter of the crankshaft is less than the service limit, replace it.

Primary Gear Inside Diameter

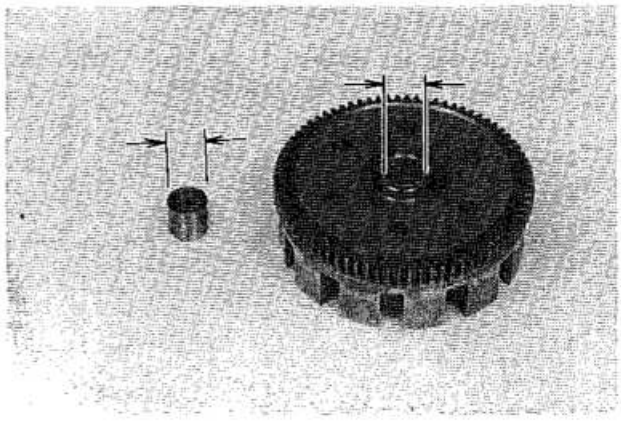
Standard:	**27.000 – 27.021 mm**
Service Limit:	**27.03 mm**

Crankshaft Diameter

Standard:	**26.959 – 26.980 mm**
Service Limit:	**26.94 mm**

Secondary Gear/Collar Wear

•Measure the inside diameter of the secondary gear.
•Measure the outside diameter of the collar mounting on the drive shaft.



★If the inside diameter of the secondary gear is greater than the service limit, replace it.
★If the outside diameter of the collar is less than the service limit, replace it.

Secondary Gear Inside Diameter

Standard:	**25.000 – 25.021 mm**
Service Limit:	**25.03 mm**

Secondary Gear Collar Diameter

Standard:	**24.970 – 24.985 mm**
Service Limit:	**24.95 mm**

Lubrication System

Engine Oil and Filter:

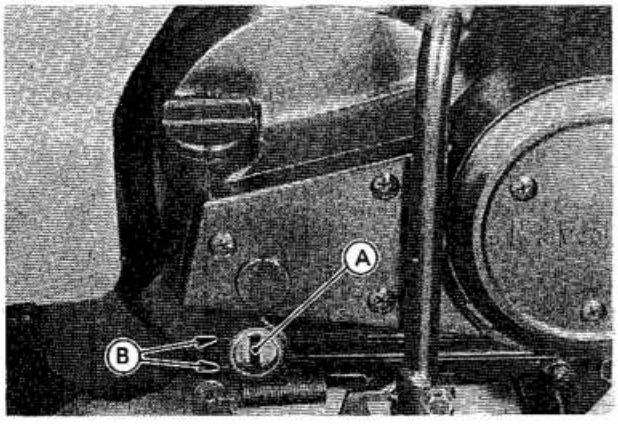
Engine Oil Level Inspection

- Park the vehicle so that it is level, both side-to-side and front-to-rear.
- If the oil has just been changed, start the engine and run it for several minutes to fill the oil filter.

CAUTION

- **Allow the engine to idle for several minutes so that oil may reach all parts of the engine. Racing a "dry" engine may cause severe damage.**

- Stop the engine and wait several minutes for all the oil to drain back to the sump.
- Check the level of the oil in the window gauge in the lower part of the right engine cover.
- The oil level should be between the lines next to the gauge.

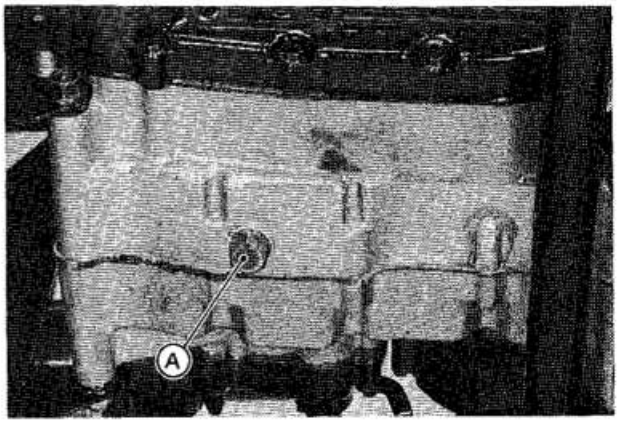


A. Gauge B. Level Lines

- ★If the level is too high, suck the excess oil out the filler hole with a syringe or other suitable device.
- ★If the level is too low, add oil through the filler hole. Use the same type and make of oil that is already in the engine.

Engine Oil and Filter Change

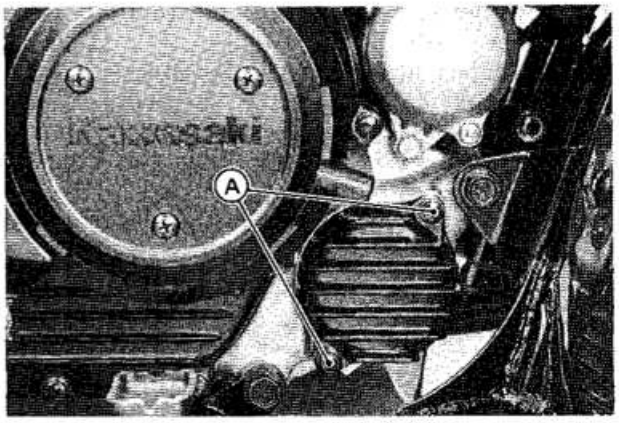
- Warm up the engine, then shut if off.
- Set a pan beneath the engine and remove the oil drain plug.



A. Oil Drain Plug

- Remove the oil filter.

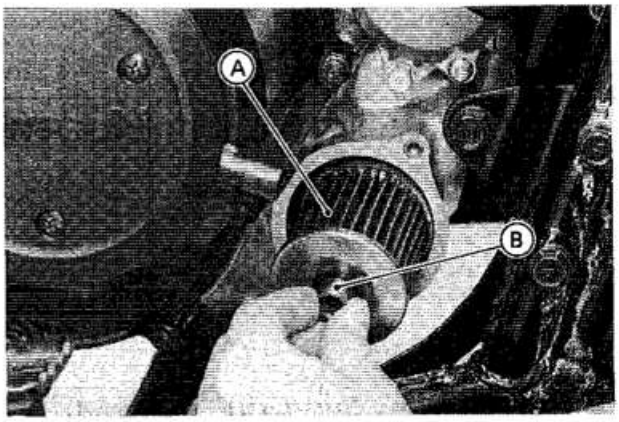
○Take out the oil filter cover bolts.



A. Oil Filter Cover Bolts

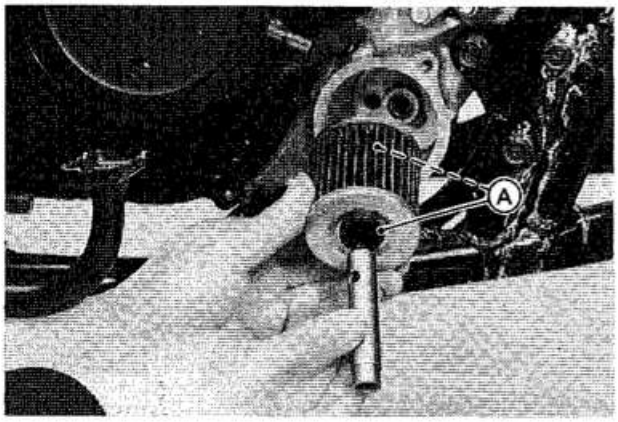
○Remove the oil filter cover.

○Pull out the oil filter; the filter mounting pin will probably come out with it.



A. Oil Filter B. Filter Mounting Pin

oPull the filter off the pin.
•Install the new filter.
oBe sure both filter grommets are in place. Oil them lightly and push the filter onto the pin.



A. Grommets

oPut the filter with pin into the filter cavity. The larger end of the pin goes in first.
oCheck that the filter cover O-ring is in place.
oInstall the oil filter cover and tighten the bolts securely.
•Install the oil drain plug with a new aluminum gasket, and tighten it to the specified torque (see Exploded View).
•Fill the engine with the specified oil and quantity.

Engine Oil

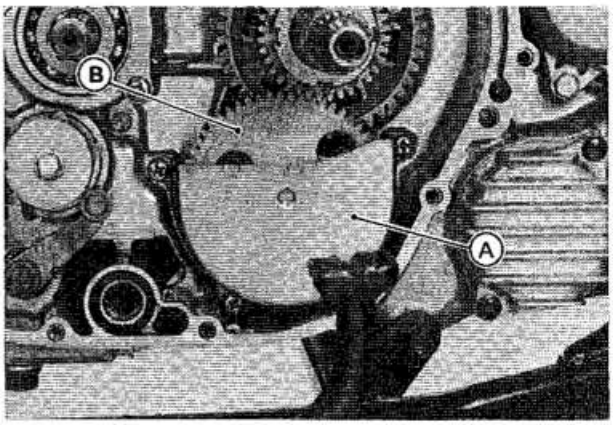
Grade:	**SE or SF class**
Viscosity:	**SAE10W40, 10W50, 20W40, or 20W50**
Capacity:	**1.7 L**

•Be sure the O-ring is in place, and install the filter cap.

Oil Pump:

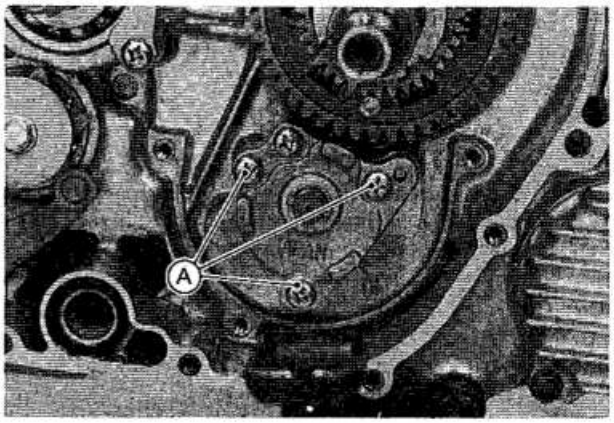
Oil Pump Removal

•Remove the primary clutch (see Clutch Removal).
•Take out the screws and remove the oil pump guard.



A. Oil Pump Guard B. Oil Pump Gear

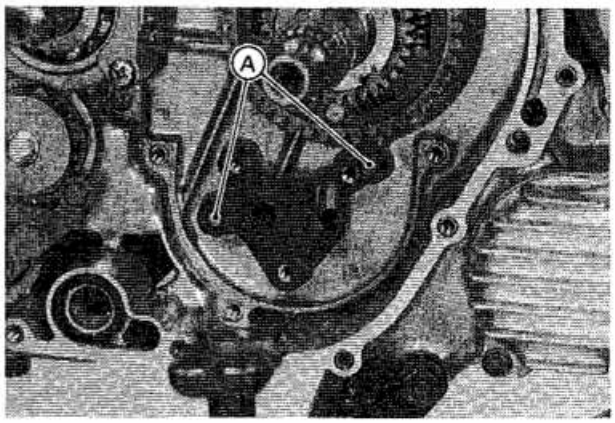
•Pull the oil pump gear from the oil pump.
•Take out the screws and remove the oil pump.



A. Screws B. Arrow

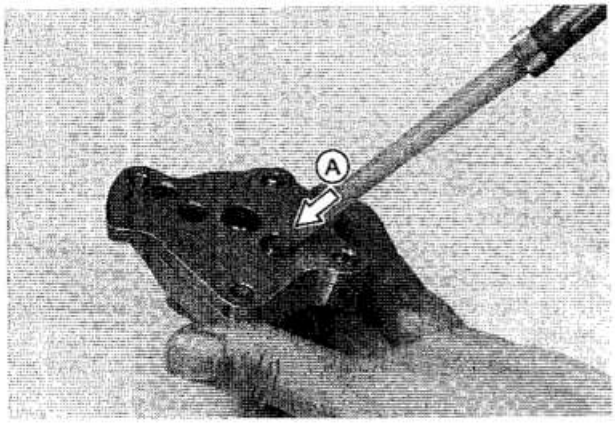
Oil Pump Installation

•Installation is the reverse of removal. Note the following.
•Be sure the dowel pins under the oil pump are in place.



A. Dowel Pins

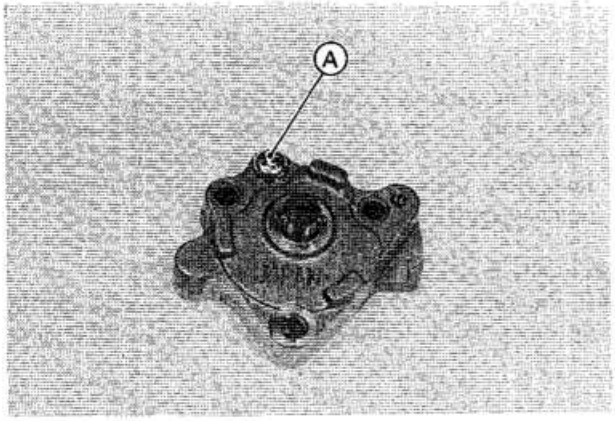
•Fill the pump with engine oil before installation.



A. Oil

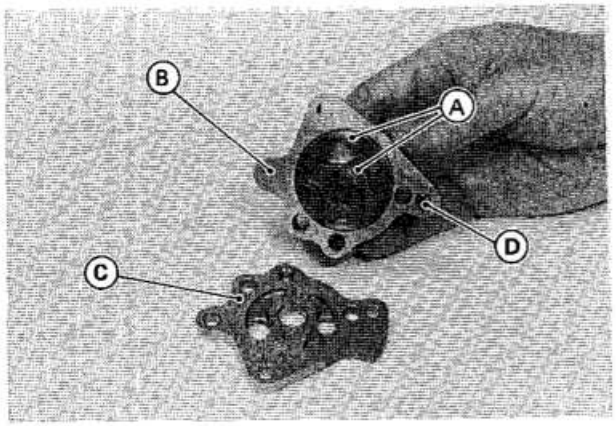
Oil Pump Disassembly

•Remove the oil pump (see Oil Pump Removal).
•Take out the oil pump cover screw.



A. Screw

•Take off the oil pump cover.
•Drop the rotors out of the oil pump body.



A. Rotors
B. Oil Pump Body
C. Oil Pump Cover
D. Dowel Pin

•Pull the pin out of the pump shaft, and pull off the shaft.

Oil Pump Assembly

•Oil pump assembly is the reverse of disassembly. Note the following.
•Be sure the dowel pin is in place in the pump body.
•Before installing the oil pump, be sure the gear and rotors turn freely.

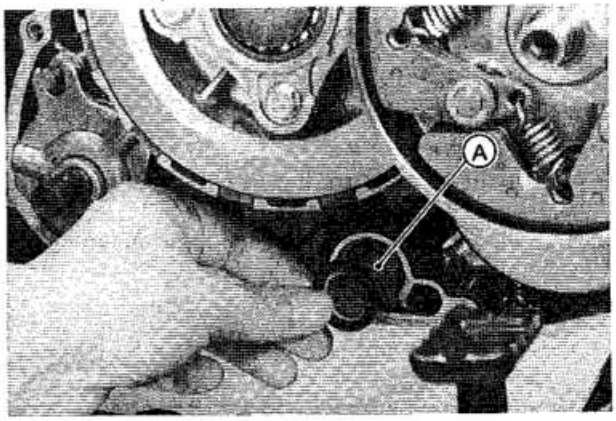
Oil Pump Inspection

•Visually inspect the oil pump body, rotors, and cover.
★If there is any damage or uneven wear, replace the oil pump assembly.

Oil Screen:

Oil Screen Removal

•Remove the right engine cover (see Right Engine Cover Removal).
•Pull the screen out of the crankcase.



A. Oil Screen

Oil Screen Installation

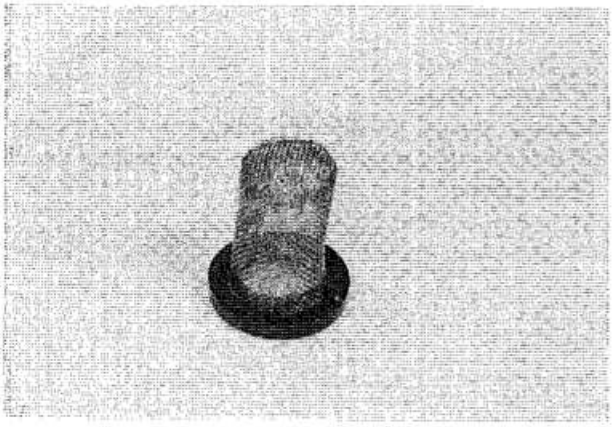
•Oil screen installation is the reverse of removal. Note the following.
•Clean the screen thoroughly whenever it is removed for any reason.

Oil Screen Cleaning and Inspection

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

WARNING

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



NOTE

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

•Check the screen carefully for any damage: holes, broken wires, gasket pulling off.

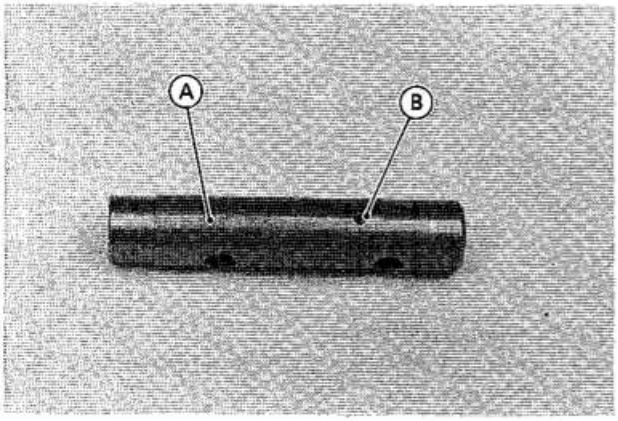
★If the screen is damaged, replace it.

Oil Filter Bypass Valve:

Bypass Valve Removal

•Remove the oil filter (see Engine Oil and Filter Change. Oil draining is not necessary).

•Drive the retaining pin out of the filter mounting pin.



A. Filter Mounting Pin B. Retaining Pin

•Drop out the spring and the bypass valve piston.

Bypass Valve Installation

•Drop the bypass valve piston closed end first into the filter mounting pin.

•Put the spring into the mounting pin and compress it beyond the small hole.

•Drive the retaining pin into the small hole to hold the spring.

•Install the oil filter (see Engine Oil and Filter Change).

Bypass Valve Cleaning and Inspection

•Clean the bypass valve parts in a high flash-point solvent.

WARNING

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

•Visually inspect the bypass valve parts.

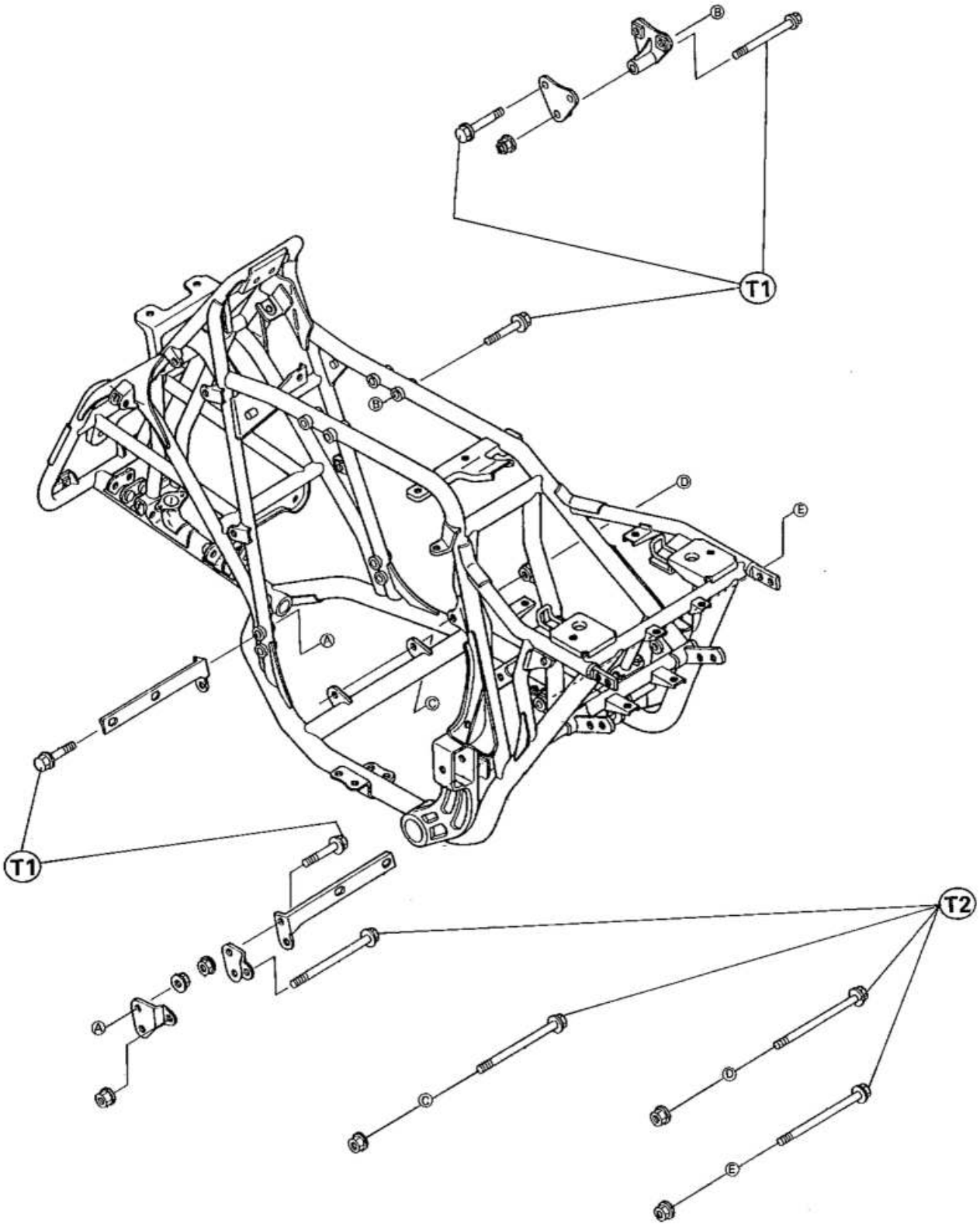
★If the spring is bent or distorted, replace it. If the piston is worn, replace all of the bypass valve parts.

Engine Removal/Installation

Table of Contents

Exploded View 6-2
Engine Removal/Installation 6-3
Engine Removal 6-3
Engine Installation 6-3

Exploded View

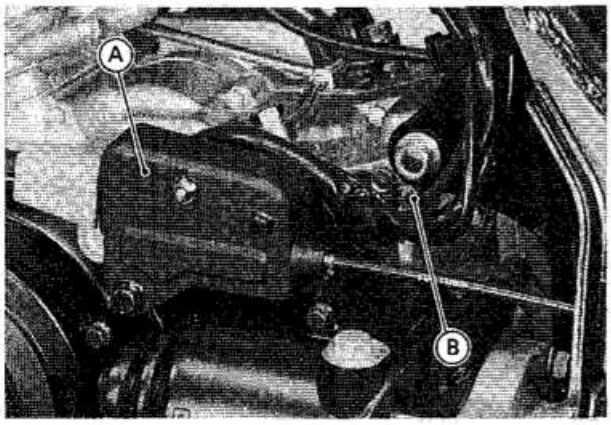


T1 : 25 N-m (2.5 kg-m, 18.0 ft-lb)
T2 : 34 N-m (3.5 kg-m, 25 ft-lb)

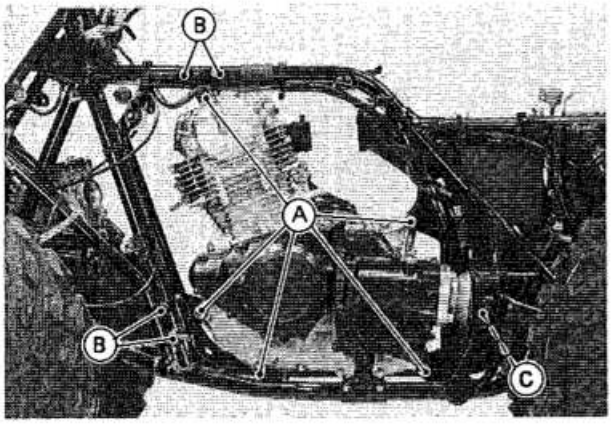
Engine Removal/Installation

Engine Removal

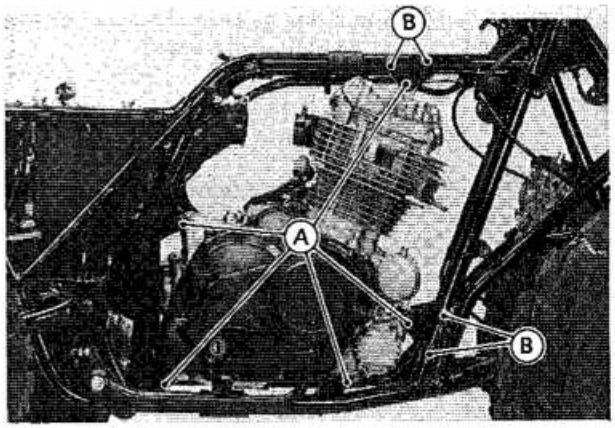
●Drain the engine oil (see Engine Oil and Filter Change in the Engine Right Side chapter).
●Remove the following parts.
Front Fender and Rear Fender
Fuel Tank
Carburetor
Exhaust Pipe and Muffler
Differential Shift Lever Case
Shift Pedal
●Disconnect the following cable and leads from the engine.
Reverse Cable
Starter Motor Lead
Alternator Leads
Pickup Coil Leads
Spark Plug Lead
Battery Ground Lead



A. Differential Shift Lever Case
B. Battery Ground Lead



A. Mounting Bolts C. Dust Cover Clamp
B. Bracket Bolts

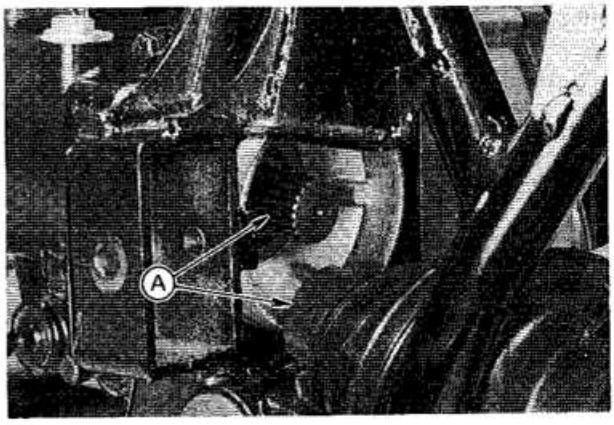


A. Mounting Bolts B. Bracket Bolts

●Free the cylinder head vent hose and carburetor vent hose from the frame.
●Loosen the propeller shaft dust cover front clamp.
●Remove the engine mounting bolts and bracket bolts.
○It may be necessary to support the engine while sliding out the engine mounting bolts.
●Lift the engine up to free the engine from the mounts, pull the engine to the right side of the frame, and free the engine from the propeller shaft.

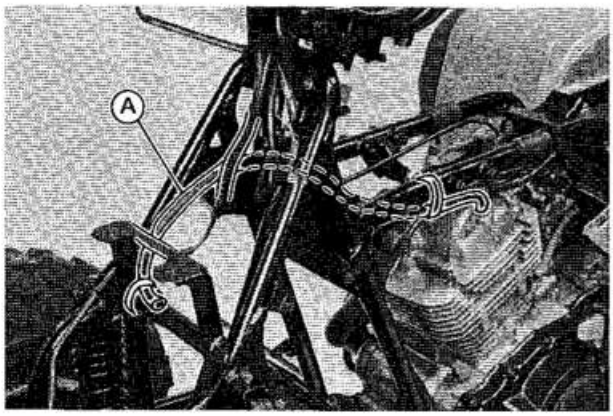
Engine Installation

●Engine installation is the reverse of removal. Note the following.
●Apply grease to the splines at the front end of the propeller shaft and fit the propeller shaft front end to the front driven gear shaft rear end.
○For extra clearance, first slide back the rear axle and propeller shaft (see Front Gear Case Removal in the Final Drive chapter).

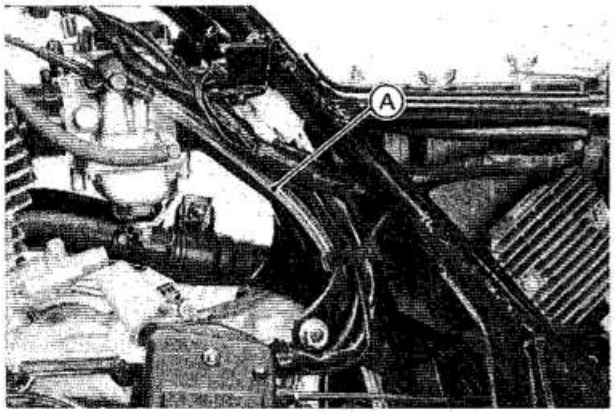


A. Apply grease.

- Tighten the engine mounting bolts and bracket bolts to the specified torque (see Exploded View).
- Route the vent hoses as shown.



A. Cylinder Head Vent Hose



A. Carburetor Vent Hose

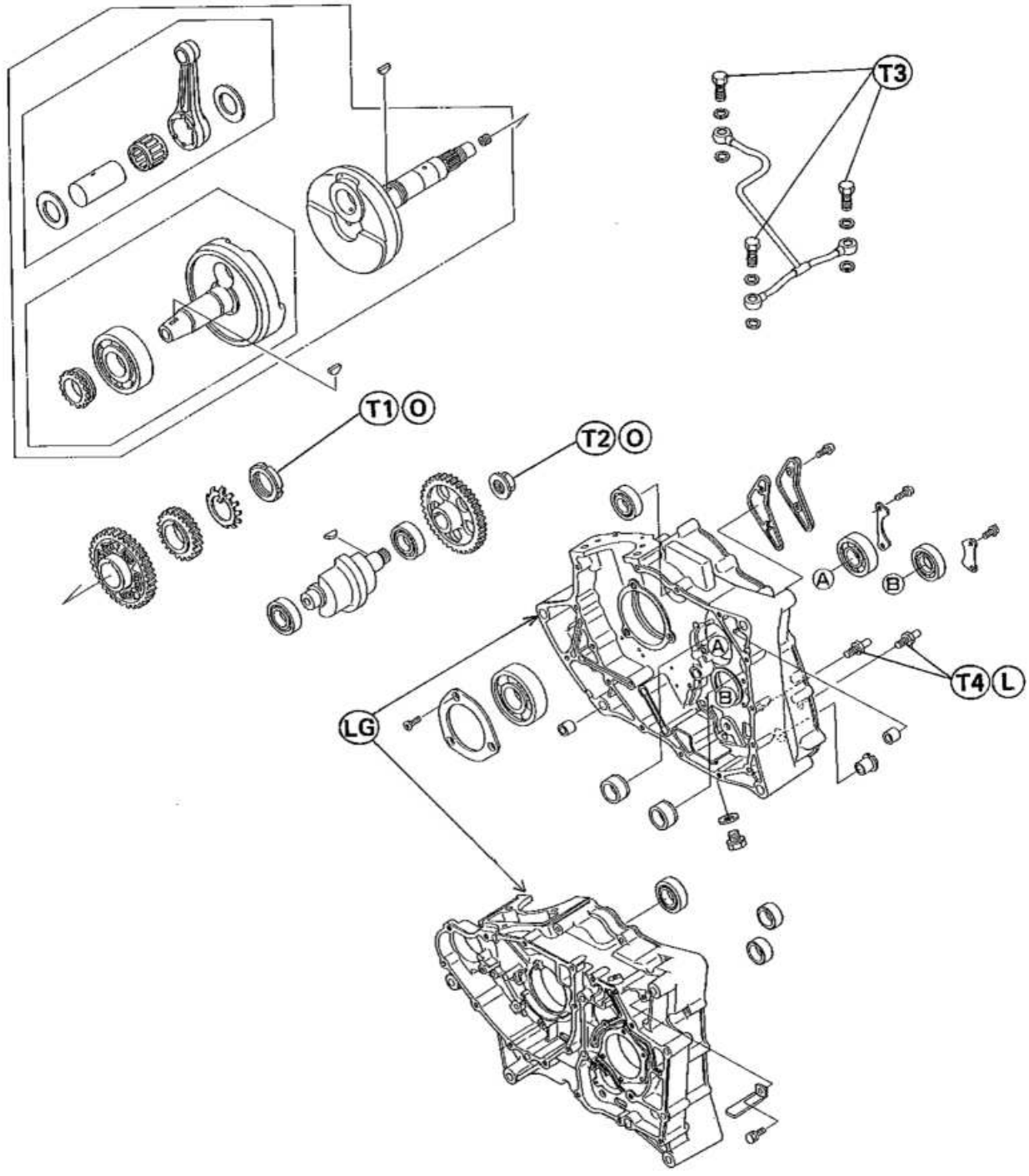
- Fill the engine with engine oil (see Engine Oil and Filter Change in the Engine Right Side chapter).
- Adjust the reverse cable (see Reverse Cable Adjustment in the Engine Bottom End/Transmission chapter).

Engine Bottom End/Transmission

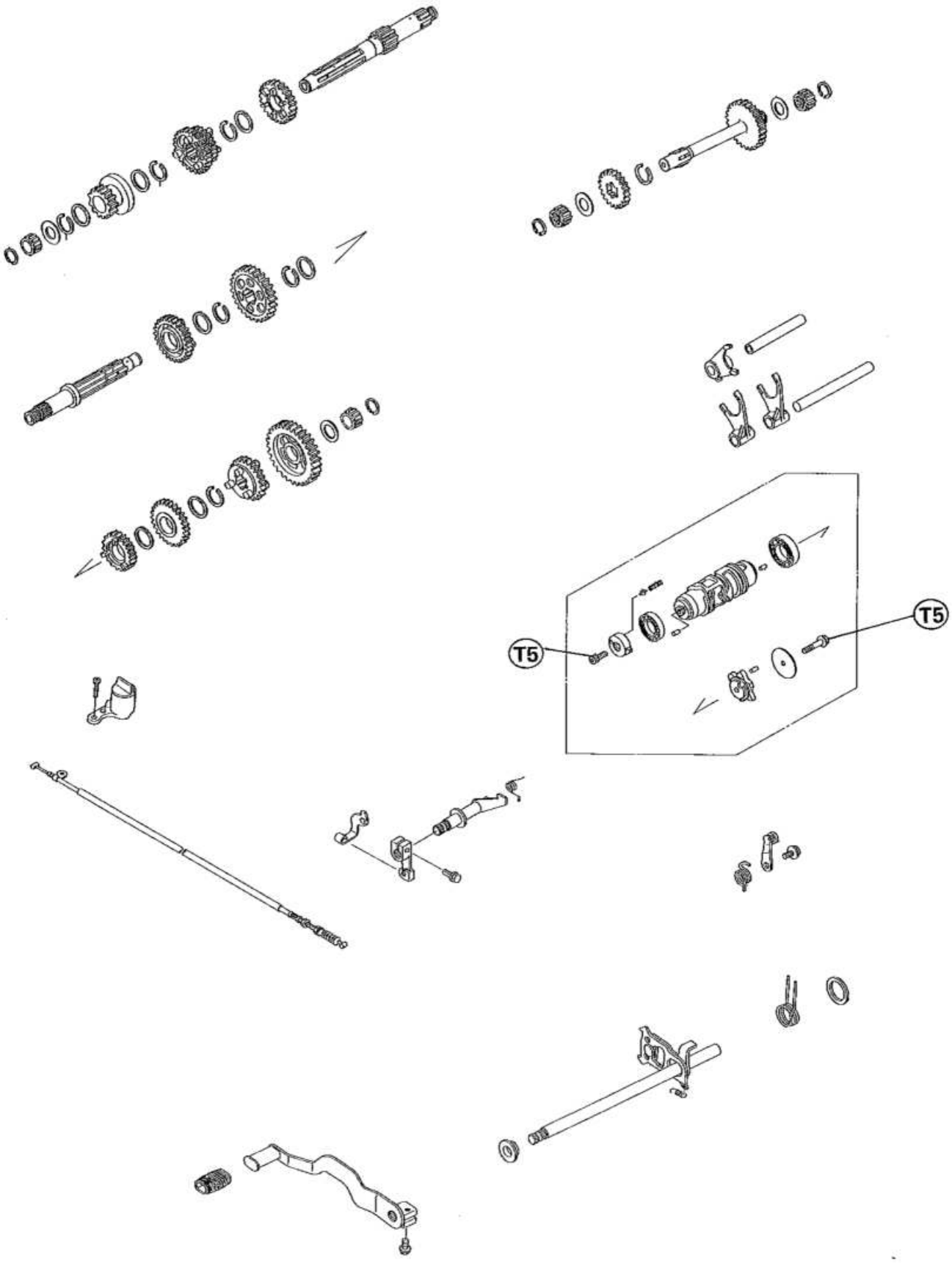
Table of Contents

Exploded View 7-2
Specifications 7-4
Special Tools 7-4
Crankcase Splitting 7-5
  Crankcase Disassembly 7-5
  Crankcase Assembly 7-5
Crankshaft and Connecting Rod 7-6
  Crankshaft Removal 7-6
  Crankshaft Installation 7-6
  Crankshaft Disassembly 7-6
  Crankshaft Assembly 7-6
  Connecting Rod Bend/Twist 7-7
  Connecting Rod Big End Radial Clearance 7-8
  Connecting Rod Big End Side Clearance 7-8
  Crankshaft Alignment 7-8
  Connecting Rod Big End Seizure 7-9
Transmission 7-9
  Transmission External Shift Mechanism . . . 7-9
  External Shift Mechanism Removal 7-9
  External Shift Mechanism Installation 7-10
  External Shift Mechanism Inspection 7-10
  Shift Drum Stop Lever Removal 7-10
  Shift Drum Stop Lever Installation 7-10
  Shift Drum Stop Lever Inspection 7-10
  Reverse Knob and Cable 7-11
  Reverse Knob Free Play Inspection 7-11
  Reverse Cable Adjustment 7-11
  Reverse Knob and Cable Removal 7-11
  Reverse Knob and Cable Installation . . . 7-11
  Reverse Cable Lubrication 7-12
  Reverse Cable Inspection 7-12
Transmission Shafts, Shift Drum, Forks . . . 7-12
  Transmission Removal 7-12
  Transmission Installation 7-12
  Transmission Shaft Disassembly 7-13
  Transmission Shaft Assembly 7-14
  Shift Fork Bending 7-14
  Shift Fork/Gear Groove Wear 7-14
  Shift Fork Guide Pin/Shift Drum Groove Wear 7-14
  Gear Dog/Gear Dog Hole and Recess Damage 7-15
Balancer 7-15
  Balancer Drive Removal 7-15
  Balancer Drive Installation 7-16
  Balancer Removal 7-16
  Balancer Installation 7-16
Ball and Needle Bearings 7-16
  Ball and Needle Bearing Replacement 7-16
  Ball and Needle Bearing Wear 7-16

Exploded View



L : Apply a non-permanent locking agent.
LG: Apply a liquid gasket.
O : Apply an oil to the threads and seated surface.
T1: 78 N-m (8.0 kg-m, 58 ft-lb)
T2: 83 N-m (8.5 kg-m, 61 ft-lb)
T3: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T4: 17 N-m (1.7 kg-m, 12.0 ft-lb)
T5: 12 N-m (1.2 kg-m, 104 in-lb)


T5
T5

Specifications

Crankshaft, Connecting Rod:

Item	Standard	Service Limit
Connecting Rod Bend	Under 0.05/100 mm	0.2/100 mm
Connecting Rod Twist	Under 0.05/100 mm	0.2/100 mm
Connecting Rod Big End Radial Clearance	0.004 – 0.017 mm	0.07 mm
Connecting Rod Big End Side Clearance	0.25 – 0.35 mm	0.6 mm
Crankshaft Runout: Left Half	Under 0.03 mm TIR	0.08 mm TIR
Right Half	Under 0.04 mm TIR	0.10 mm TIR

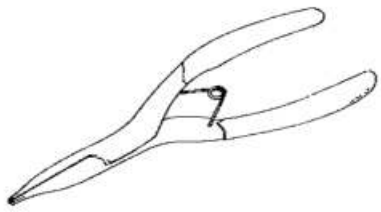
Transmission:

Item	Standard	Service Limit
Shift Fork Ear Thickness	4.4 – 4.5 mm	4.3 mm
Gear Shift Fork Groove Width	4.55 – 4.65 mm	4.8 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

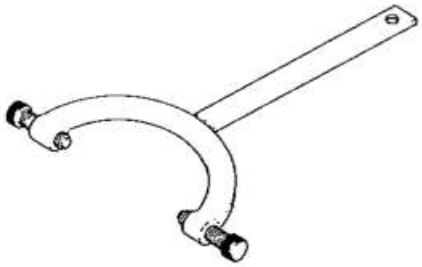
Special Tools

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

Circlip Pliers: 57001-144



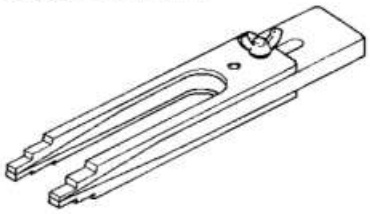
Flywheel Holder: 57001-308



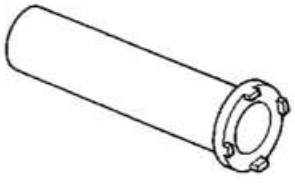
Bearing Driver Set: 57001-1129



Crankshaft Jig: 57001-1174



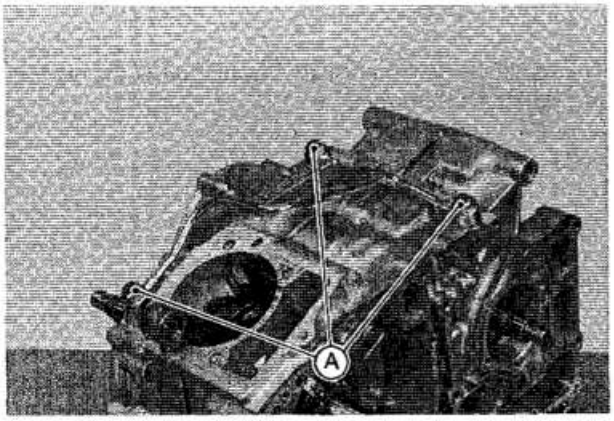
Socket Wrench: 57001-1214



Crankcase Splitting

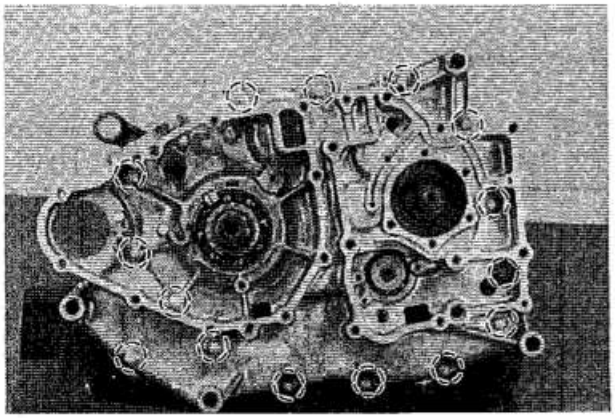
Crankcase Disassembly

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Remove the following parts.
  - Piston
  - Starter Motor
  - Oil Filter
  - Front Bevel Gear Case
  - Front Bevel Drive Gear
  - Output Shaft LH Bearing Housing
  - Shift Drum Stop Lever
  - Neutral and Reverse Switch
  - Clutches
  - Oil Pump
  - External Shift Mechanism
  - Alternator Rotor
  - Camshaft Chain and Guides
- Remove the gaskets and dowel pins on the outside of the crankcase.
- Remove the banjo bolts and take off the oil pipe.

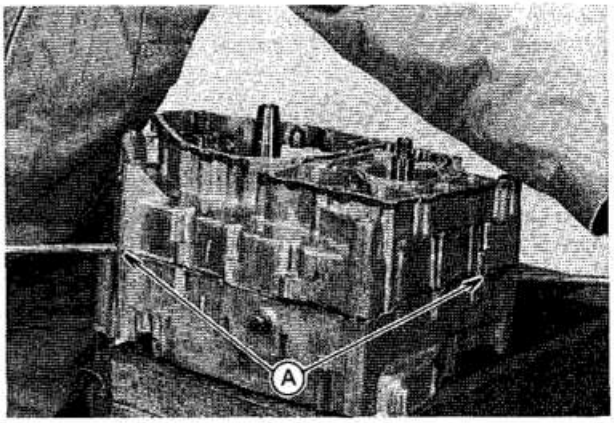


A. Banjo Bolts

- Remove the crankcase screws.



- Separate the crankcase halves.
  - Pry at the gaps at the front and rear of the crankcase to split the case halves apart.



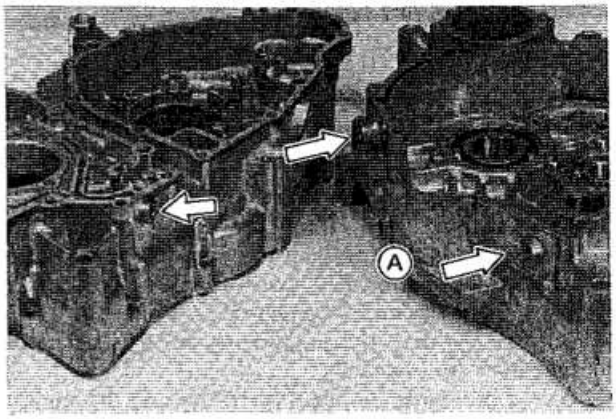
A. Pry at these gaps.

  - Lift off the right crankcase half.

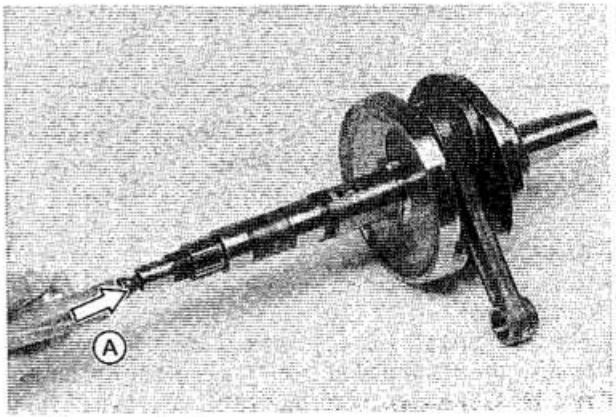
Crankcase Assembly

NOTE

- *Be certain that all parts are cleaned thoroughly before assembly.*
- *Blow through all oil passages with compressed air to clear any blockage.*



A. Compressed Air



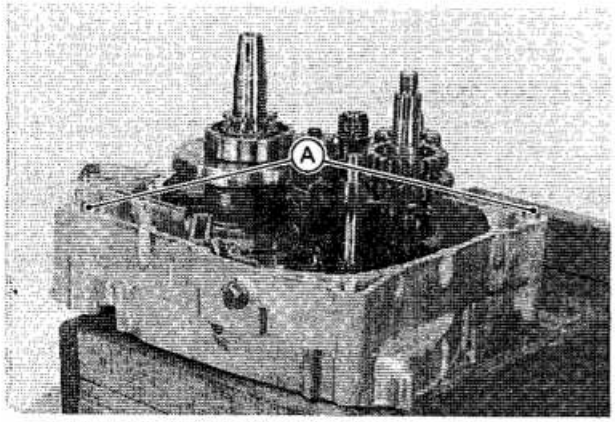
A. Compressed Air

○*Be sure all transmission shafts, shift forks, and the shift drum are in place in the left crankcase half.*

WARNING

○**Clean the engine parts in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean parts. A fire or explosion could result.**

- Apply a small amount of engine oil to the transmission gears, bearings, and shift drum.
- Be sure the mating surfaces of the crankcase halves are clean and dry.
- Be sure the crankcase dowel pins are in position.



A. Dowel Pins

- Apply a liquid gasket to the mating surface of the right crankcase half.
- Fit the left crankcase half on the right crankcase half, and tighten the crankcase screws securely.
- Rotate the shift drum to the neutral position.
- Check to see that the crankshaft, drive shaft, and output shaft all turn freely.

★If any of the shafts do not turn freely, split the crankcase to locate the problem.

- The remainder of Crankcase Assembly is the reverse of disassembly.

Crankshaft and Connecting Rod

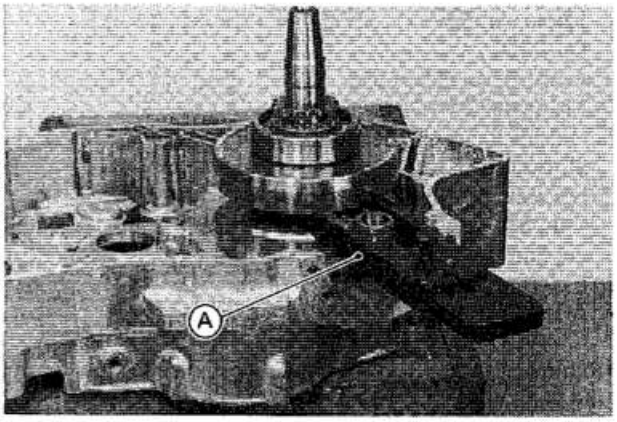
Crankshaft Removal

- Remove the balancer drive gear (see Balancer Drive Removal).
- Split the crankcase (see Crankcase Disassembly).
- Remove the transmission (see Transmission Removal).
- Press the crankshaft from the right crankcase half with a press.

Crankshaft Installation

- Position the right crankcase half so that the RH main bearing housing is seated on a suitable press fixture.
- Press the crankshaft into the RH main bearing.

○Insert the crankshaft jig (special tool) between the crankshaft halves, opposite the crankpin, to prevent crankshaft distortion during installation.



A. Crankshaft Jig: 57001-1174

- The remainder of Crankshaft Installation is the reverse of Crankshaft Removal.

Crankshaft Disassembly

NOTE

○*Since assembly of the crankshaft demands exacting tolerances, the disassembly and reassembly of the crankshaft should only be performed by experienced mechanics with the necessary tools and equipment.*

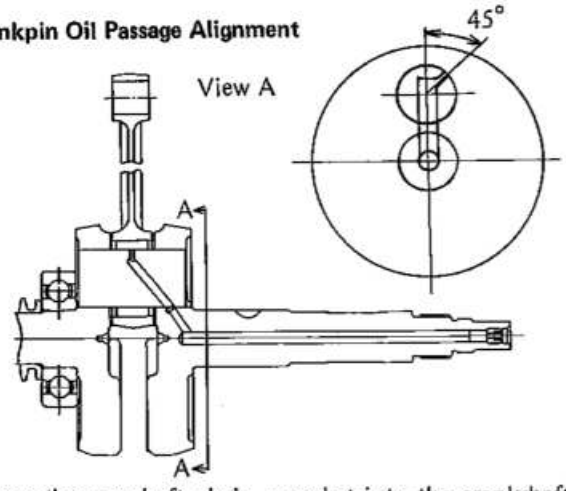
○*The crankshaft left main bearing, chain sprocket, and left crankshaft are available separately as spare part, however, it is recommended that the crankshaft assembly be replaced rather than attempting to replace the components.*

- Press the crankpin out of the crank halves to separate the crank halves, connecting rod, crankpin needle bearing, and crankpin.

Crankshaft Assembly

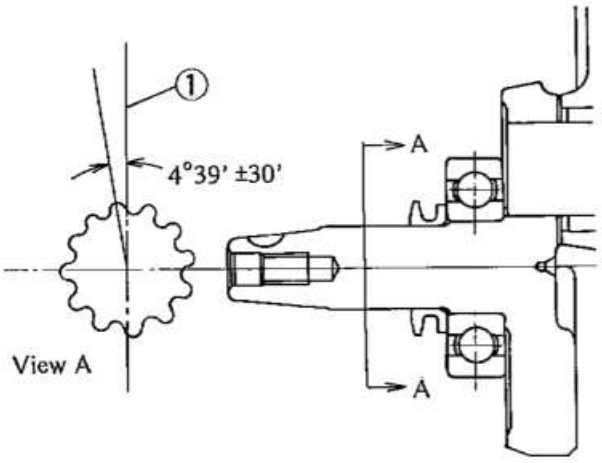
- Check the connecting rod radial clearance within specifications (see Connecting Rod Big End Radial Clearance).
- Press the crank halves onto the crankpin until connecting rod side clearance is within specifications (see Connecting Rod Big End Side Clearance).

Crankpin Oil Passage Alignment



●Press the camshaft chain sprocket into the crankshaft as shown. The chamfered side of it faces to the ball bearing.

Camshaft Chain Sprocket Installation



1. Direction of Crankpin Center

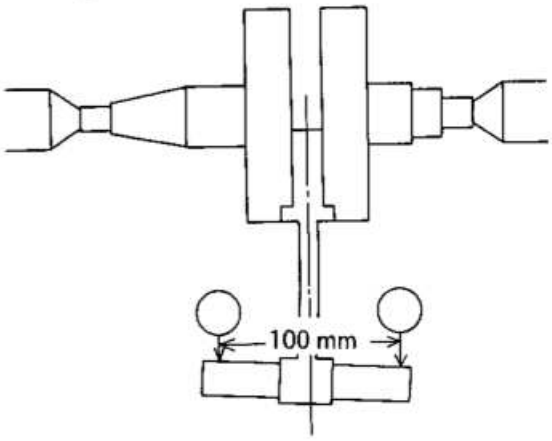
●Adjust crankshaft runout until runout is within specifications (see Crankshaft Runout).

Connecting Rod Bend/Twist

●Measure connecting rod bend.

○Set the crankshaft in an alignment jig or in V blocks on a surface plate.

Connecting Rod Bend



○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.

○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.

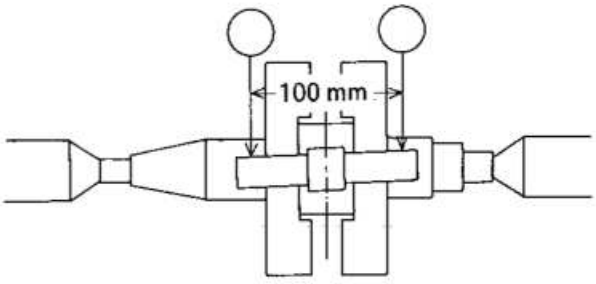
Connecting Rod Bend

Standard:	**Under 0.05/100 mm**
Service Limit:	**0.2/100 mm**

●Measure connecting rod twist.

○With the crankshaft still in the alignment jig, hold the connecting rod horizontally and measure the amount that the arbor varies from being parallel with the crankshaft over a 100 mm length of the arbor to determine the amount of connecting rod twist.

Connecting Rod Twist



★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

Connecting Rod Twist

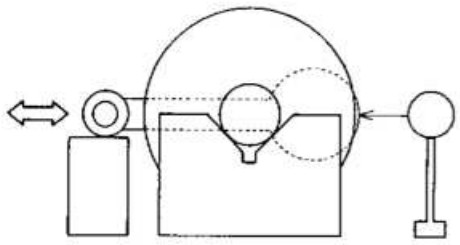
Standard:	**Under 0.05/100 mm**
Service Limit:	**0.2/100 mm**

Connecting Rod Big End Radial Clearance

●Check big end radial clearance.

○Set the crankshaft in an alignment jig or on V blocks, and place a dial gauge aginst the connecting rod big end.

Connecting Rod Big End Radial Clearance



○Push the connecting rod first towards the gauge and then in the opposite direction. The difference between the two gauge readings is the radial clearance.

★If the radial clearance exceeds the service limit, the crankshaft assembly must be replaced or disassembled and the crankpin, needle bearing, and connecting rod big end examined for wear.

Connecting Rod Big End Radial Clearance

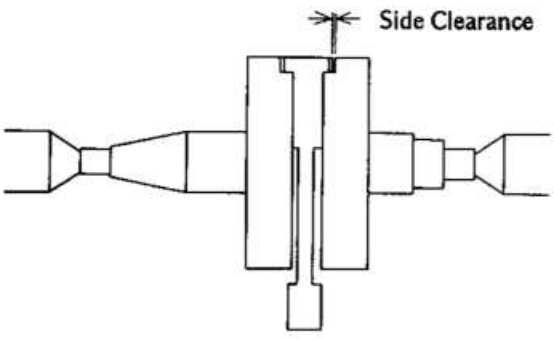
Standard:	**0.004 – 0.017 mm**
Service Limit:	**0.07 mm**

Connecting Rod Big End Side Clearance

●Measure big end side clearance.

○Insert feeler gauges between the big end and either crank half to determine clearance.

Connecting Rod Big End Side Clearance



★If big end side clearance exceeds the service limit, the crankshaft assembly must be replaced or disassembled and the connecting rod and thrust washers measured for wear.

Connecting Rod Big End Side Clearance

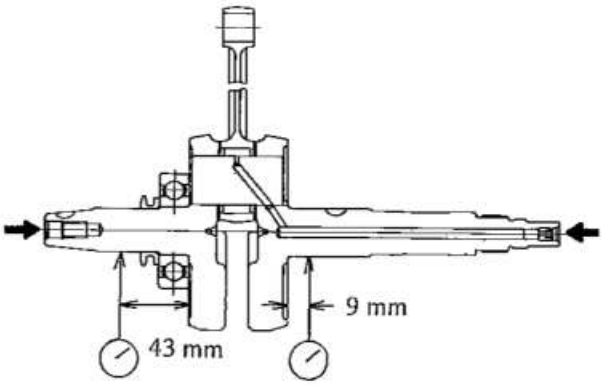
Standard:	**0.25 – 0.35 mm**
Service Limit:	**0.6 mm**

Crankshaft Alignment

●Check crankshaft alignment by measuring runout.

○With the crankshaft in an alignment jig, rotate the crankshaft slowly and measure runout at each of the locations shown.

Crankshaft Runout



★If runout at either location exceeds the service limit, align the crankshaft so that runout is within the service limits.

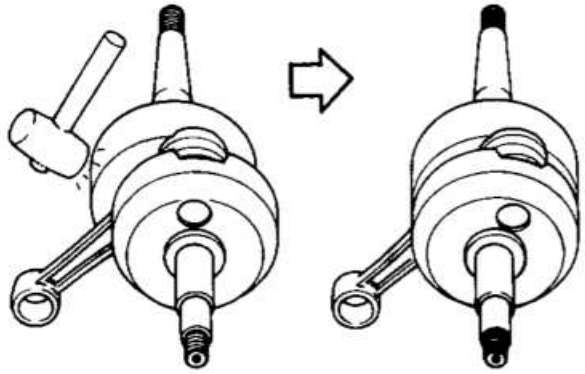
Crankshaft Runout

Left Half	**Stnadard:**	**Under 0.03 mm TIR**
	Service Limit:	**0.08 mm TIR**
Right Half	**Standard:**	**Under 0.04 mm TIR**
	Service Limit:	**0.10 mm TIR**

●Align the crankshaft.

○In the case of horizontal misalignment, strike the projecting crankshaft half with a plastic, soft lead, or brass hammer as shown.

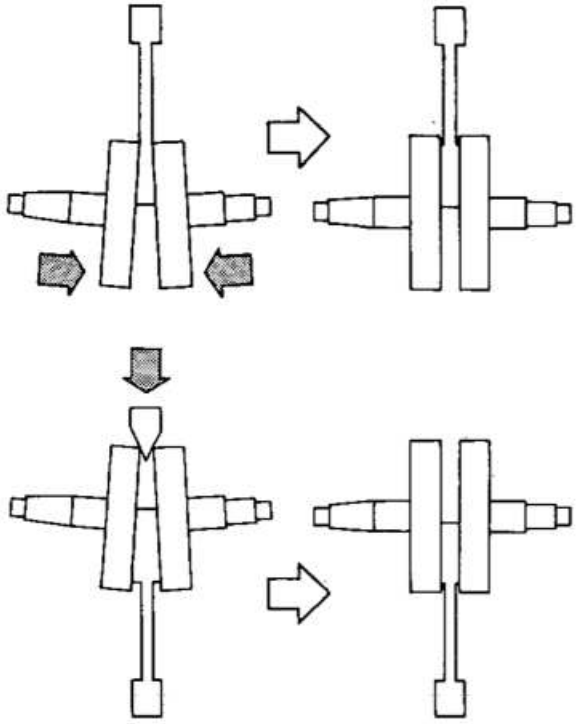
Flywheel Horizontal Misalignment



- Recheck the runout and repeat the process until the runout is within service limits.

○Vertical misalignment is corrected either by driving a wedge in between the crank halves, or by squeezing the crank halves in a vise, depending on the nature of the misalignment.

Flywheel Vertical Misalignment



○In case of both horizontal and vertical misalignment, correct the horizontal misalignment first.

○Recheck big end side clearance after aligning crankshaft (see Connecting Rod Big End Side Clearance).

NOTE

○*If crankshaft alignment cannot be corrected by the above method, replace the crankpin or crank halves as required.*

Connecting Rod Big End Seizure

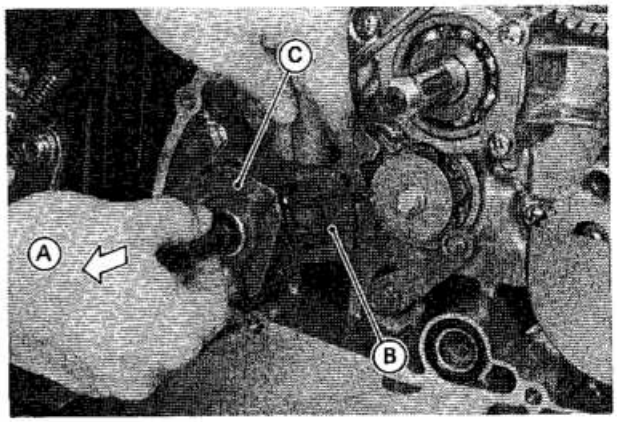
- In case of serious seizure with damage to the crank halves, the crankshaft must be replaced. If the seizure was less severe, disassemble the crankshaft and replace the crankpin, needle bearing, and connecting rod (see Crankshaft Disassembly).

Transmission

Transmission External Shift Mechanism:

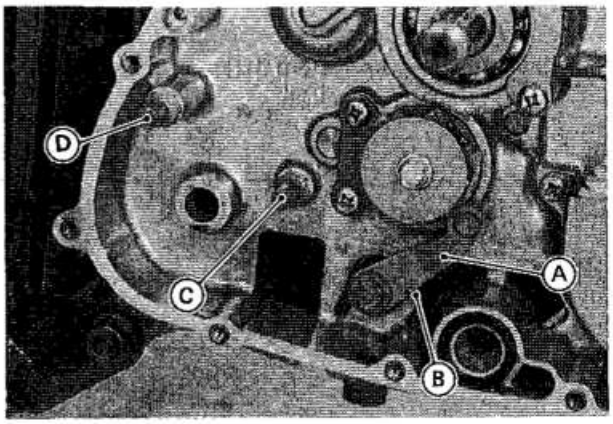
External Shift Mechanism Removal

- Remove the clutches (see Clutch Removal in the Engine Right Side chapter).
- Take off the clutch release cam and ball assembly.
- Remove the bolt and take off the shift pedal.
- Move the shift mechanism arm out of its position on the end of the shift drum, and pull out the shift mechanism shaft.



A. Pull out the mechanism shaft.
B. Return Spring
C. Clutch Release Cam

- Remove the shift drum positioning lever bolt and take off the lever with its spring.



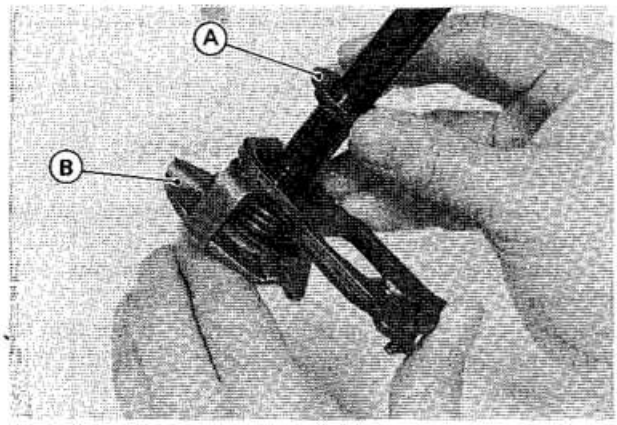
A. Shift Drum Positioning Lever
B. Spring
C. Return Spring Pin
D. Clutch Release Cam Pin

External Shift Mechanism Installation

•External shift mechanism installation is the reverse of removal. Note the following.

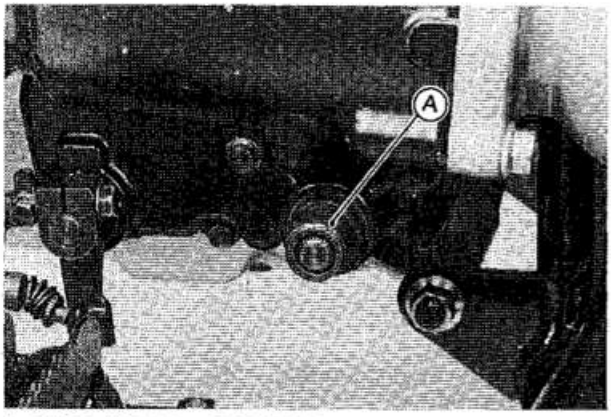
•Check the shift drum positioning lever swings smoothly after tightening the pivot bolt.

•Be sure the shift mechanism arm collar and clutch release cam are in place.



A. Collar B. Clutch Release Cam

•Use the oil seal guide (special tool) to protect the seal during shift mechanism installation.

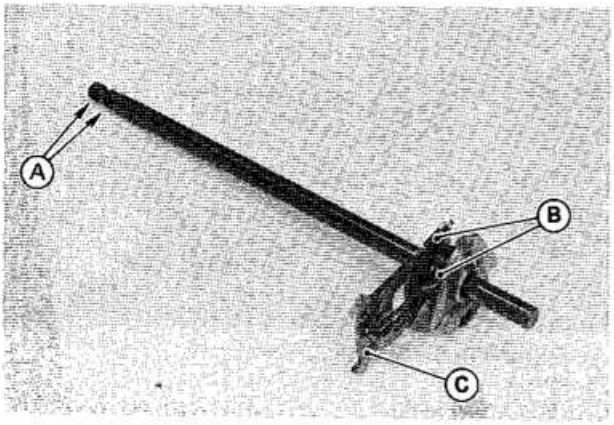


A. Oil Seal Guide: 57001-264

•Position the shift shaft return spring ends on either side of the return spirng pin.

External Shift Mechanism Inspection

•Examine the shift mechanism for any damage.



A. Splines B. Springs C. Lever

○Check the shift shaft for bending or damage to the spline.

☆If the shaft is bent, straighten or replace it. If the spline is damaged, replace the shaft.

○Check the springs 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 lever.

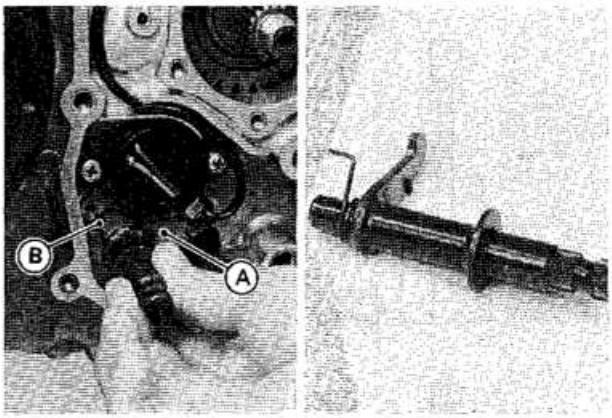
○Check the return spring pin and/or cam pin is not loose.

☆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).

Shift Drum Stop Lever Removal

•Remove the front gear case (see Front Gear Case Removal in the Final Drive chapter).

•Pull the shift drum stop lever off the crankcase with its spring.



A. Shift Drum Stop Lever B. Spring

Shift Drum Stop Lever Installation

•Shift drum stop lever installation is the reverse of removal.

Shift Drum Stop Lever Inspection

•Check the shift drum stop lever for distortion.

★If the shift drum stop lever is damaged in any way, replace the lever.

•Check the spring for break or distortion.

★If the spring is damaged in any way, replace the spring.

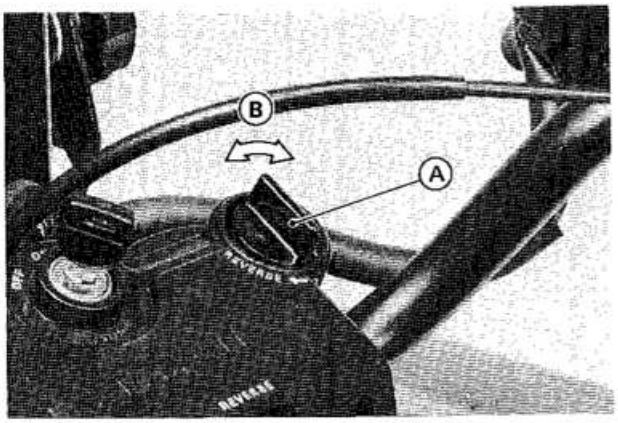
Reverse Knob and Cable:

Reverse Knob Free Play Inspection

- Check the reverse knob free play when the transmission is in neutral.
- If free play is not within specifications, adjust the reverse cable (see Reverse Cable Adjustment).

Reverse Knob Free Play

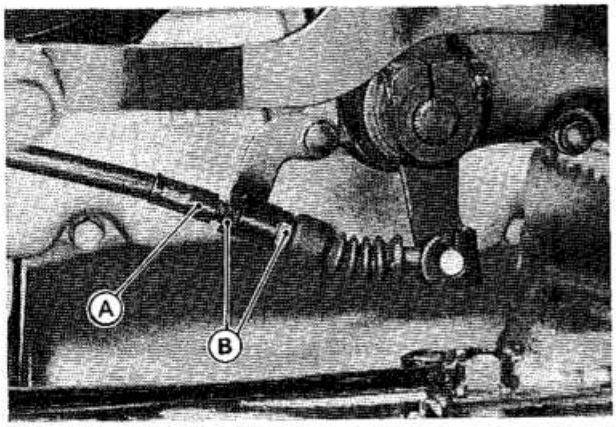
Standard: **2 – 3 mm**



A. Reverse Knob B. Free Play

Reverse Cable Adjustment

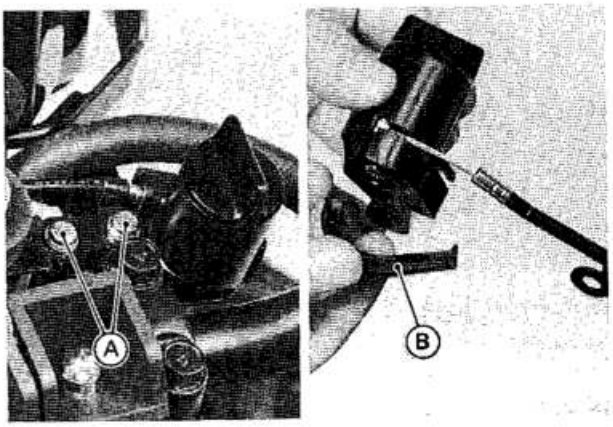
- Loosen the mounting nuts at the adjuster of the reverse cable, and slide the adjuster until the reverse knob has the proper amount of play.
- Tighten the mounting nuts after adjustment.



A. Adjuster B. Mounting Nuts

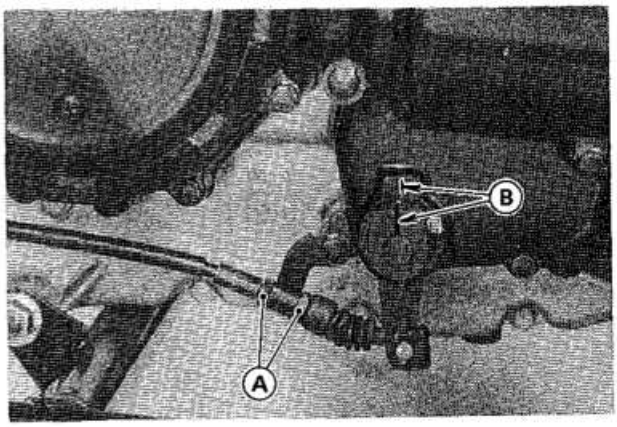
Reverse Knob and Cable Removal

- Remove the screws and take off the reverse knob assembly with the cable.



A. Screws B. Cable Holder

- Pull the cable holder out the assembly, and free the reverse cable upper end from the assembly.
- Loosen the mounting nuts and take off the cable adjuster from its bracket.

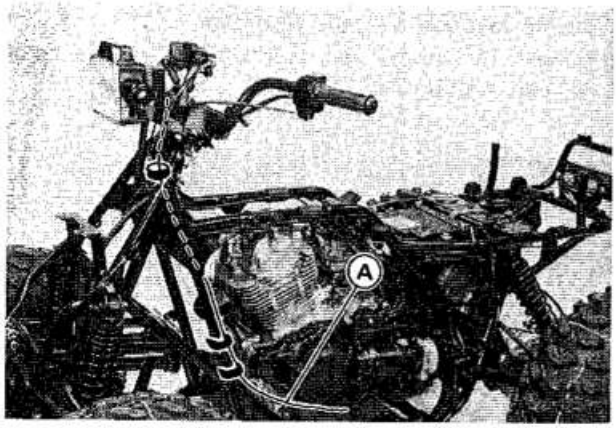


A. Mounting Nuts B. Align mark with slot.

- Free the cable from the vehicle.

Reverse Knob and Cable Installation

- Installation is the reverse of removal. Note the following.
- When the reverse lever was removed, mount the lever on the shift drum stop lever shaft so that the slot of the lever aligns with the mark on the front gear case.
- Route the reverse cable as shown.
- Adjust the reverse cable (see Reverse Cable Adjustment).



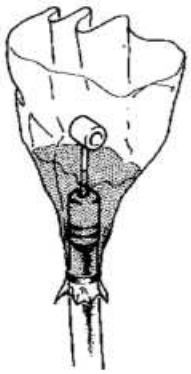
A. Reverse Cable

Reverse Cable Lubrication

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

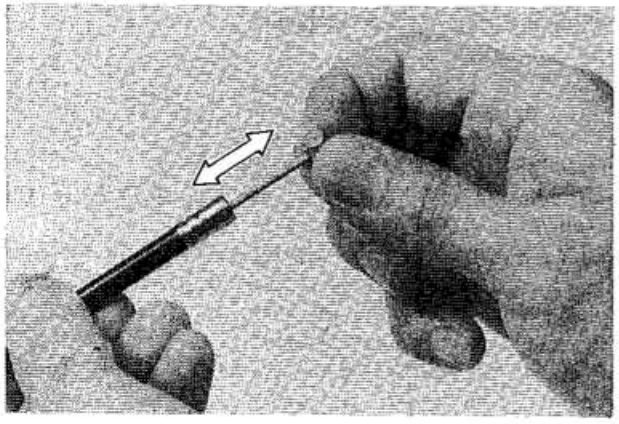
- Lubricate the reverse cable by seeping the oil between the cable and cable housing.
- Apply a small amount of multi-purpose grease to the cable lower end.

Cable Lubrication



Reverse Cable Inspection

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

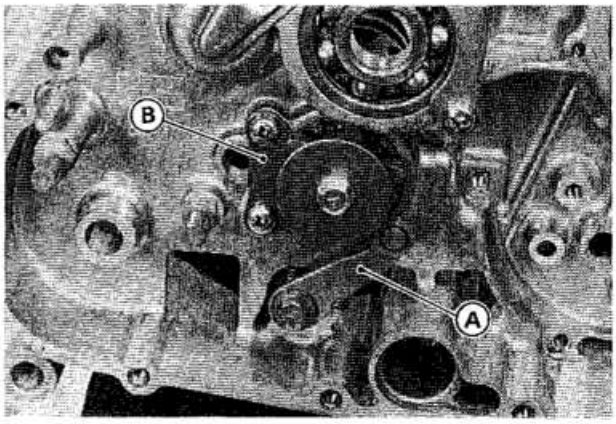


★If cable movement is not free after lubricating (see Reverse Cable Lubrication), if the cable is frayed, or if the housing is kinked, replace the cable.

Transmission Shafts, Shift Drum, Forks:

Transmission Removal

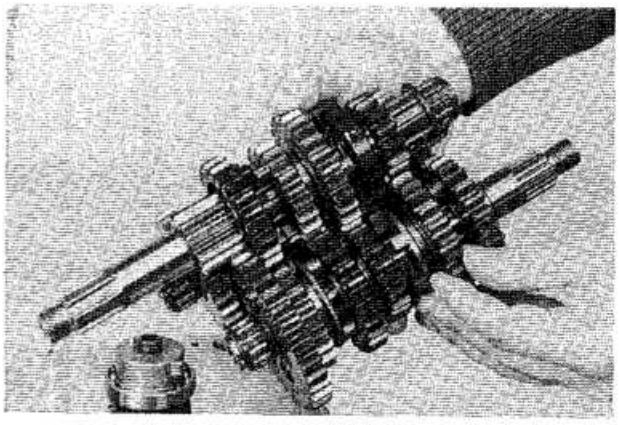
- Split the crankcase (see Crankcase Disassembly).
- Pull out the shift rods and take out the forks.
- Pull out the transmission shafts at the same time.
- To remove the shift drum, remove the shift drum positioning lever and shift drum bearing stopper.



A. Shift Drum Positioning Lever B. Bearing Stopper

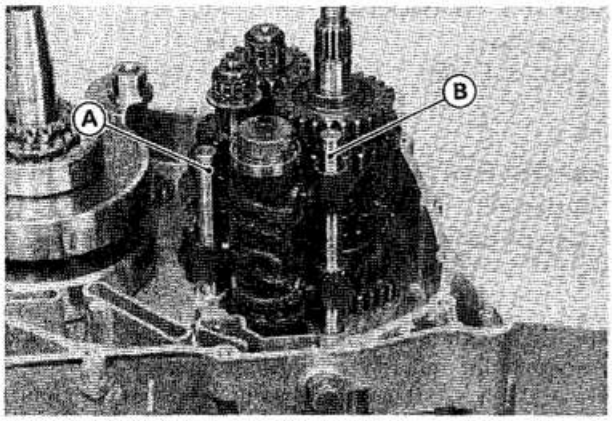
Transmission Installation

- Set the transmission shafts, and fit them into the right crankcase half at the same time.
  - Apply a small amount of engine oil to the transmission gears, bearings, and shaft journals.

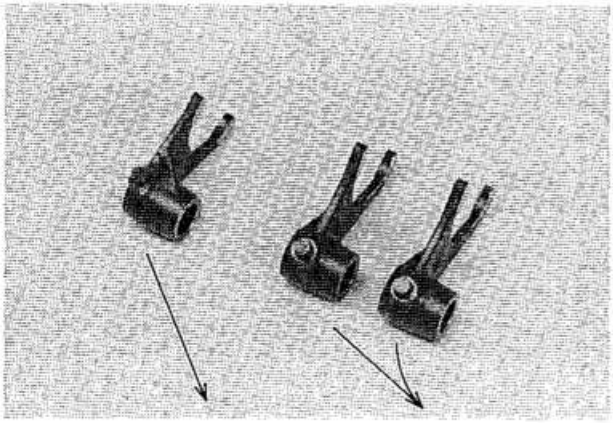


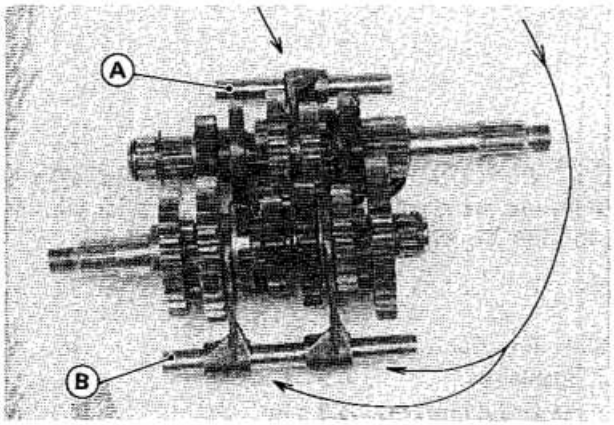
- Fit each shift fork into the groove of the proper gear so that the shift fork guide pin is in the proper groove on the shift drum.
  - Apply a small amount of engine oil to the shift fork fingers.
  - The forks for the output shaft are identical.

●Install the shift rods.
○Apply a small amount of engine oil to the shift rods.
○Insert the shorter shift rod through the drive shaft fork, and the longer rod through the output shaft forks.



A. Short B. Long



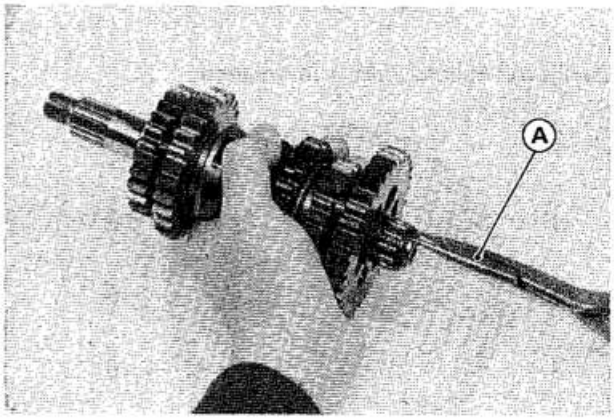


A. Short B. Long

●Assemble the crankcase (see Crankcase Assembly).

Transmission Shaft Disassembly

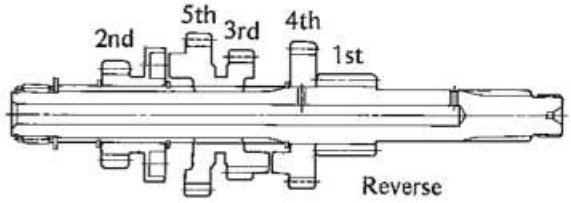
●Remove the transmission shafts (see Transmission Removal).
●Using the circlip pliers (special tool), remove the circlip and disassemble the transmission shafts completely.



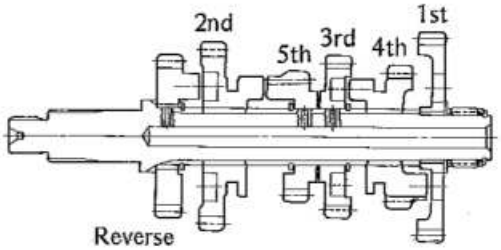
A. Circlip Pliers: 57001-144

Transmission Gears

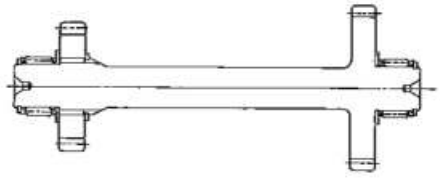
Drive Shaft



Output Shaft



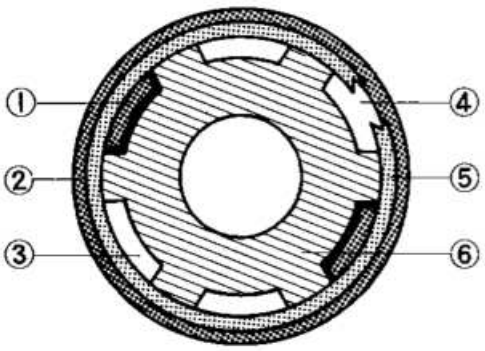
Reverse Shaft



Transmission Shaft Assembly

- Assembly is the reverse of disassembly. Note the following.
- Replace any circlips that were removed with new ones.
- Always install circlips so that the opening is aligned with a spline groove, and install toothed washers so that the teeth are not aligned with the circlip opening.

Circlip and Splined Washer Installation

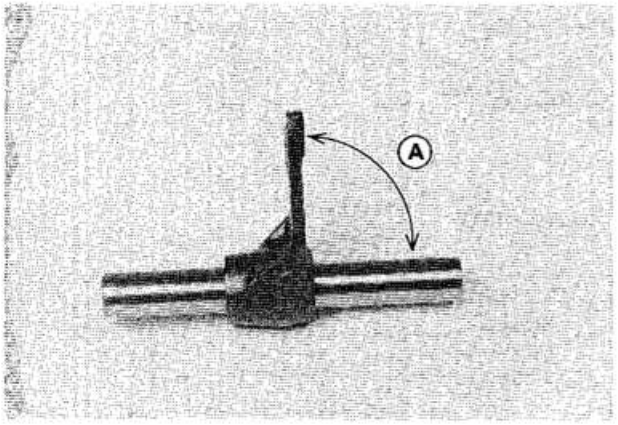


1. Teeth of Splined Washer
2. Splined Washer
3. Groove of Shaft
4. Opening of Circlip
5. Circlip
6. Shaft

- The transmission gears can be identified by size;
  Drive shaft gears — the smallest diameter gear is 1st gear, and the largest is 5th.
  Output shaft gears — the largest diameter gear is 1st gear, and the smallest in 5th.

Shift Fork Bending

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.



A. 90°

Shift Fork/Gear Groove Wear

- Measure the thickness of the ears on each shift fork, and measure the width of the shift fork grooves on transmission gears.

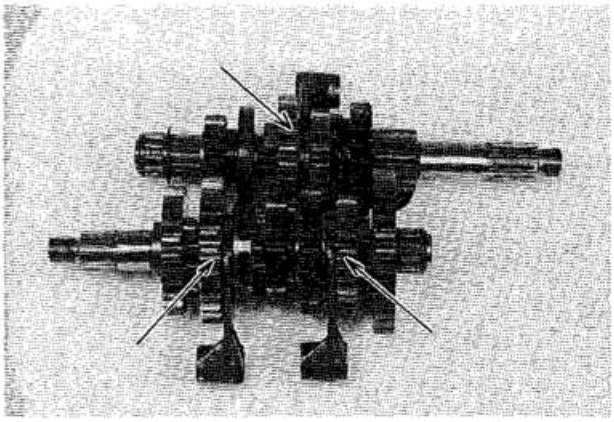
Shift Fork Ear Thickness

Standard:	**4.4 – 4.5 mm**
Service Limit:	**4.3 mm**

Gear Shift Fork Groove Width

Standard:	**4.55 – 4.65 mm**
Service Limit:	**4.8 mm**

★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.
★If a gear shift fork groove is worn over the service limit, the gear must be replaced.



Shift Fork Guide Pin/Shift Drum Groove Wear

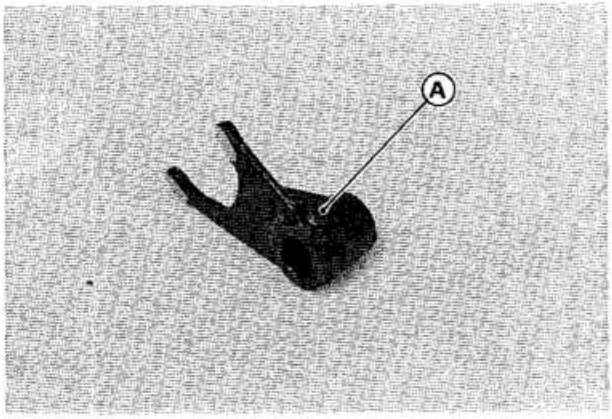
- Measure the diameter of each shift fork guide pin, and measure the width of each shift drum groove.

Shift Fork Guide Pin Diameter

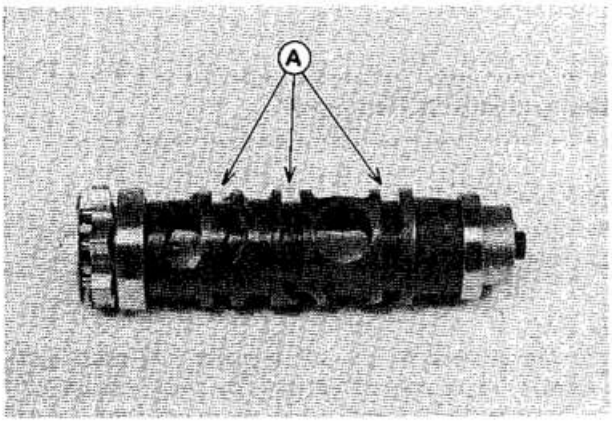
Standard:	**5.9 – 6.0 mm**
Service Limit:	**5.8 mm**

Shift Drum Groove Width

Standard:	**6.05 – 6.20 mm**
Service Limit:	**6.3 mm**



A. Shift Fork Guide Pin

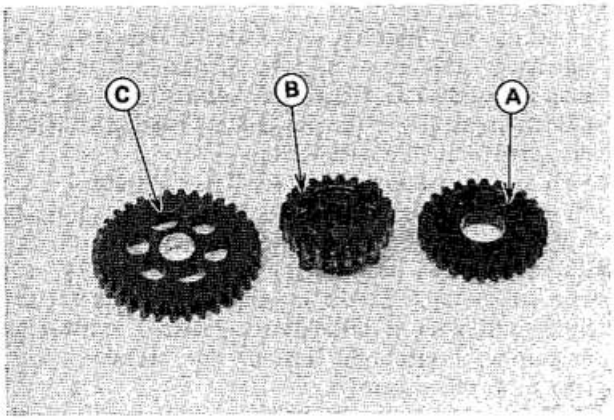


A. Shift Drum Grooves

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

Gear Dog/Gear Dog Hole and Recess Damage

•Visually inspect the gear dogs, gear dog holes and/or recesses. Replace any gears that have damaged or excessively worn dogs, dog holes, or recesses.

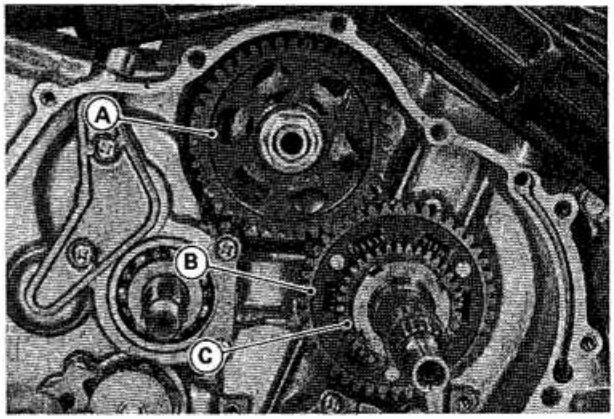


A. Recess B. Dog C. Dog Hole

Balancer

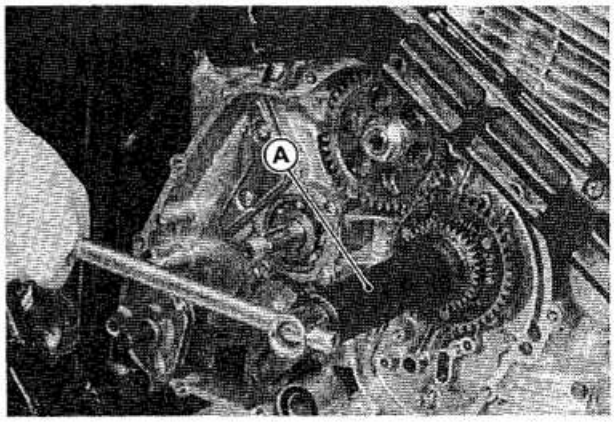
Balancer Drive Removal

•Remove the clutches (see Clutch Removal in the Engine Right Side chapter).
•Remove the left engine cover (see Left Engine Cover Removal in the Engine Left Side chapter).
•Fit the flywheel holder (special tool: P/N 57001-308) to the alternator rotor.
•Remove the balancer gear nut and gear while holding the crankshaft from turning.



A. Balancer Gear C. Oil Pump Drive Gear
B. Balancer Drive Gear

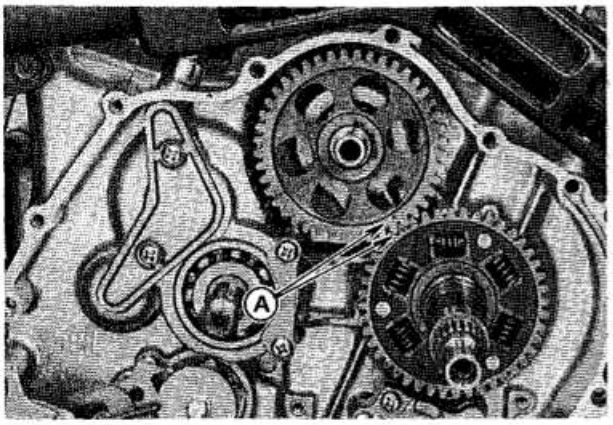
•Flatten the side of the toothed washer where it is bent up against the nut mounting the balancer drive gear and oil pump drive gear.
•Remove the nut with the socket wrench (special tool), and take off the oil pump drive gear and balancer drive gear.



A. Socket Wrench: 57001-1214

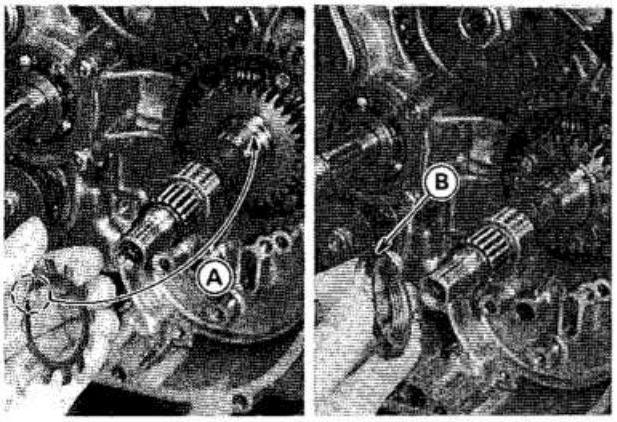
Balancer Drive Installation

- Balancer drive installation is the reverse of removal. Note the following.
- Mesh the balancer gear with the balancer drive gear so that the punch mark on the balancer gear aligns with the punch mark on the drive gear.



A. Align punch marks.

- Position the toothed washer on the crankshaft.
  - Fit the tooth of the washer into the groove of the oil pump drive gear.



A. Fit tooth into groove. B. Chamfer

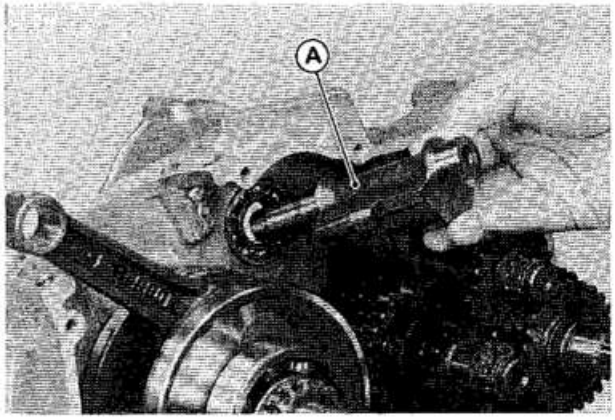
- Apply oil to the gear mounting nuts, and tighten them to the specified torque (see Exploded View).
  - Install the balancer drive and oil pump drive gear mounting nut so that the chamfered side of it faces in.

Balancer Removal

- Rmove the balancer drive gear (see Balancer Drive Removal).
- Split the crankcase (see Crankcase Splitting).
- Lift the balancer out of the right hand crankcase half.

Balancer Installation

- Balancer installation is the reverse of removal.



A. Balancer

Ball and Needle Bearings

Ball and Needle Bearing Replacement

- Using a press or puller, remove the ball bearing and/or needle bearing.

NOTE

  - *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 touch. This will warp the case. Soak the case in oil and heat the oil.**

- Using a press and the bearing driver set (special tool: P/N 57001-1129), install the new bearing until it stops at the bottom of its housing.

Ball and Needle Bearing Wear

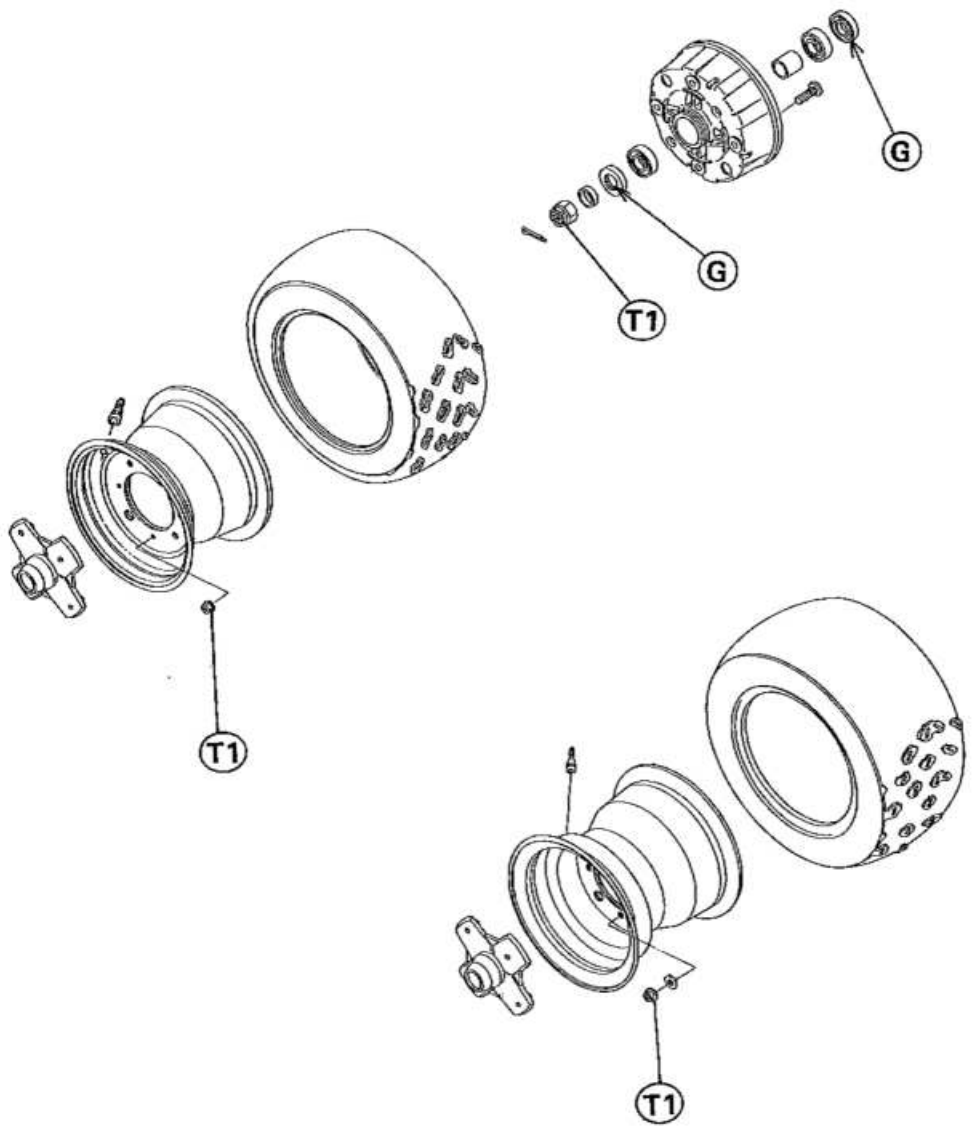
- Check the ball bearings.
  - Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
  - Spin the bearing by hand to check its condition.
    - ★ If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.
- Check the needle bearings.
  - The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
    - ★ If there is any doubt as to the condition of a needle bearing, replace it.

Wheels/Tires

Table of Contents

Exploded View 8-2
Specifications 8-3
Special Tools 8-3
Wheel Alignment 8-4
    Toe-in Inspection 8-4
    Toe-in Adjustment 8-5
Wheels (Rims) 8-5
    Wheel Removal 8-5
    Wheel Installation 8-5
    Wheel Inspection 8-6
    Wheel Replacement 8-6
Tires 8-6
    Tire Removal 8-6
    Tire Installation 8-7
    Tire Inspection 8-8
Front Hub Bearings 8-8
    Front Hub Bearing Removal 8-8
    Front Hub Bearing Installation 8-9
    Front Hub Bearing Inspection 8-9

Exploded View



G : Apply grease.
T1 : 34 N-m (3.5 kg-m, 25 ft-lb)

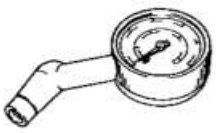
Specifications

Item		Standard
Wheel Alignment:	Caster	5°
	Camber	4°
	Toe-in	27 mm
Tires:	Front	22 x 9.00 – 10 Dunlop, Knobby Tubeless
	Rear	24 x 11.00 – 10 Dunlop, Knobby Tubeless
Tire Inflation Pressure (when cold):	Front & Rear	28 kPa (0.28 kg/cm², 4 psi)

Special Tools

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

Air Pressure Gauge: 52005-1003



Bearing Driver Set: 57001-1129



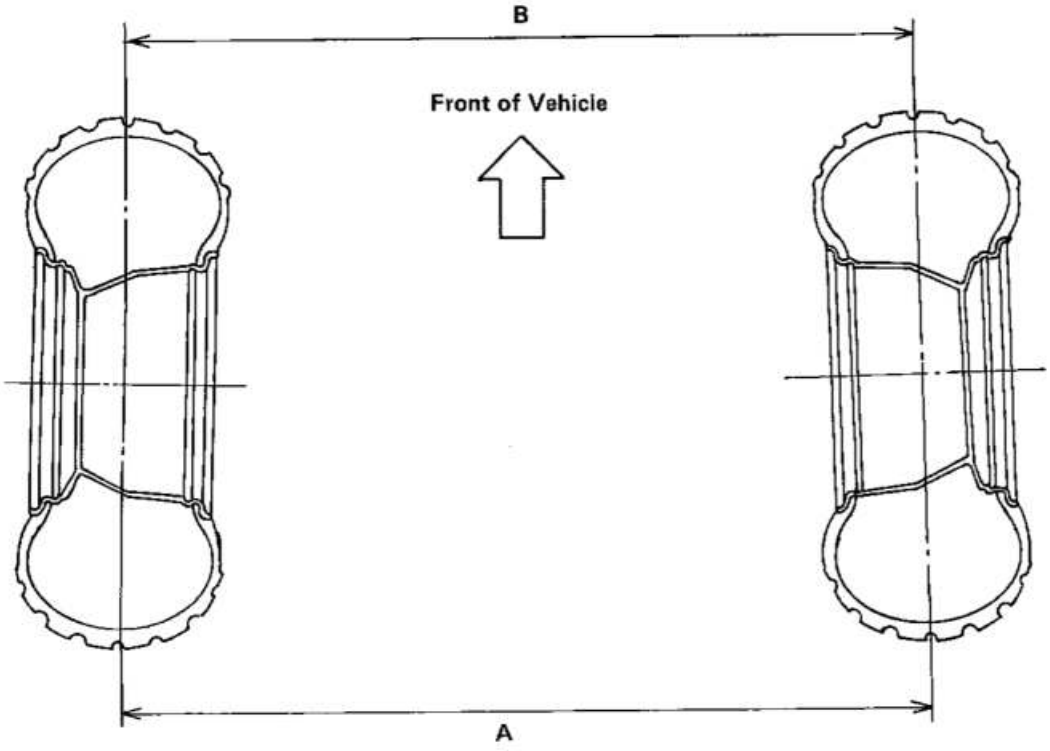
Wheel Alignment

Toe-in is amount front wheels are closer together in front than at rear at the spindle height. When there is toe-in, the distance A is greater than B as shown.

The purpose of toe-in is to avoid the front wheels from getting out of parallel at any time, and to prevent any slipping or scuffing action between the tires and the ground. If toe-in is incorrect, the front wheels will be dragged along the ground, scuffing and wearing the tread knobs.

Caster and camber are built-in and require no adjustment.

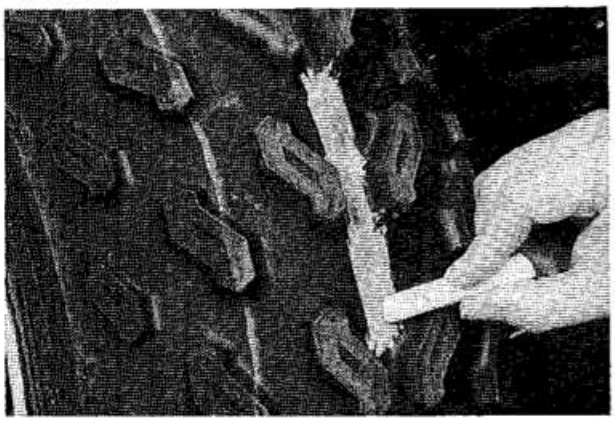
Toe-in of Front Wheels

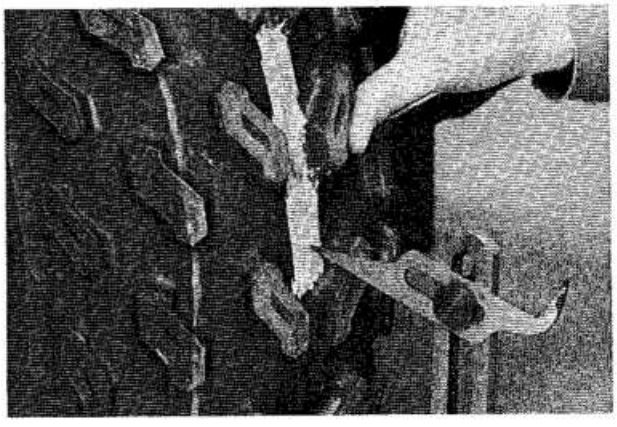


A – B = Amount of Toe-in
(Distance A and B are measured at hub height)

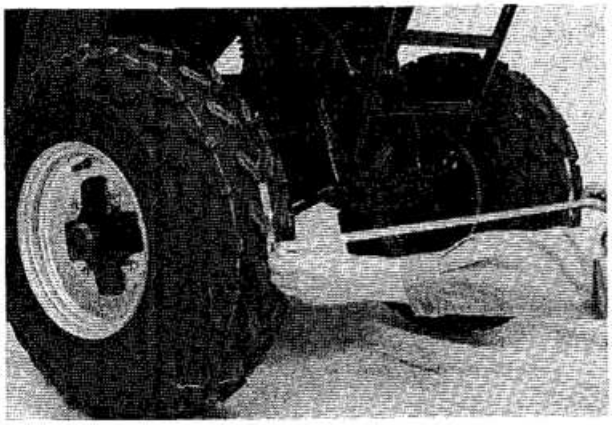
Toe-in Inspection

- Support the vehicle on a stand so that the front wheels are off the ground.
- Apply a heavy coat of the chalk to near the center of the tires.
- Using a needle nose scriber, form a thin line near the center of the chalk coating while turning the wheel.





•Lower the vehicle to the ground, and set the handlebar straight ahead.
•At the level of the hub height, measure the distance between the scribed lines for both front and rear of the tires.



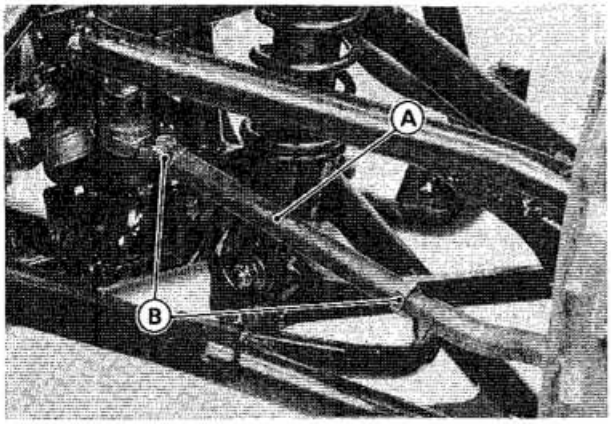
•Subtract the measurement of the front from the measurement of the rear to get the toe-in.
★If the toe-in is without the specified range, adjust it (see Toe-in Adjustment).

Toe-in of Front Wheels

Standard: 27 mm

Toe-in Adjustment

•Loosen the locknuts and turn the tie rod adjusting sleeves to adjust the toe-in.



A. Adjusting Sleeve B. Locknuts

○When the toe-in is adjusted correctly, the handlebar must be positioned straight ahead. If not, turn both tie rod adjusting sleeves in the same direction until the handlebar is set correctly.

NOTE

○The handlebar can be set without changing toe-in by turning both adjusting sleeves the same direction and same number of turns.

•Tighten the locknuts to the specified torque (see Exploded View in the Steering chapter).

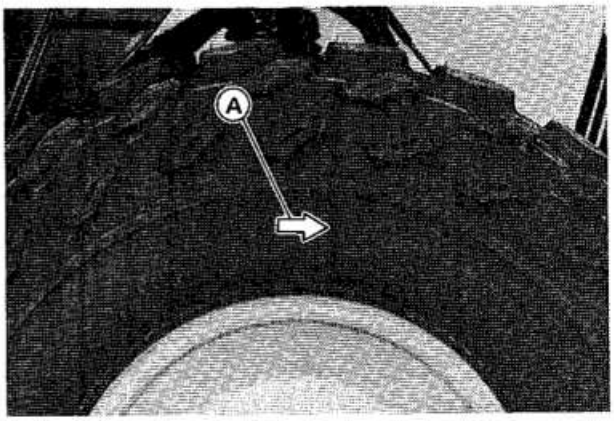
Wheels (Rims)

Wheel Removal

•Support the vehicle on a stand so that the wheel is off the ground.
•Pull off the wheel cap.
•Take off the wheel nuts holding the wheel to the hub.

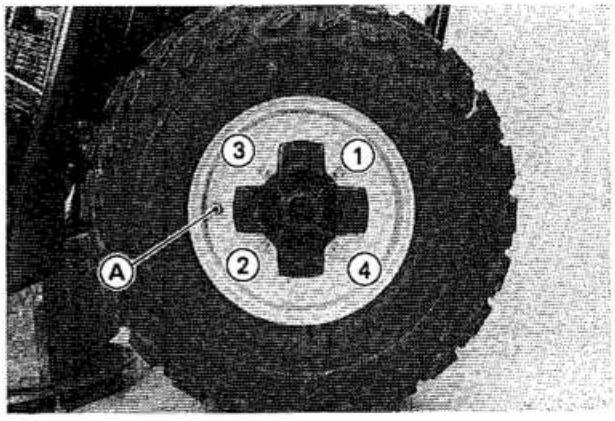
Wheel Installation

•Mount the wheel on the studs.
○Position the wheel so that the valve stem is toward the outside of the vehicle and the tire rotation mark on the tire sidewall shows the direction of the tire rotation correctly.



A. Rotation Mark

○For the front wheels, align the shoe check and adjust holes on the rim with the holes on the drum.
○Tighten the wheel nuts in a criss-cross pattern to the specified torque (see Exploded View).

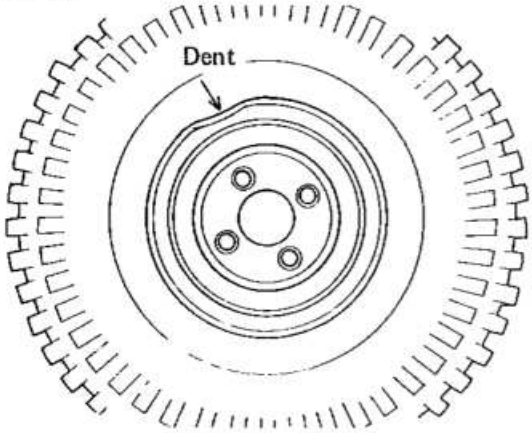


A. Valve Stem

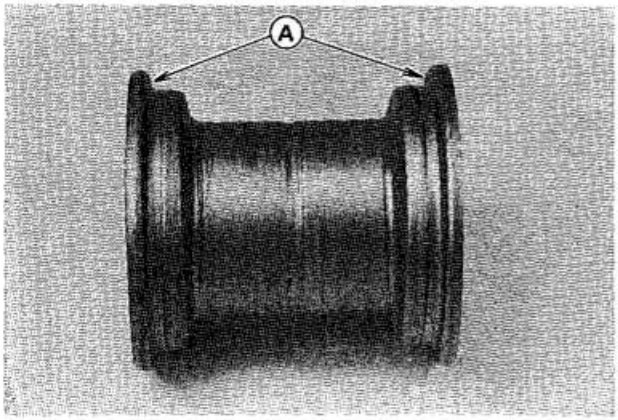
Wheel Inspection

•Examine both sides of the rim for dents. If the rim is dented, replace it.

Rim Dent



•If the tire is removed, inspect the air sealing surfaces of the rim for scratches or nicks. Smooth the sealing surfaces with fine emery cloth if necessary.



A. Sealing Surfaces

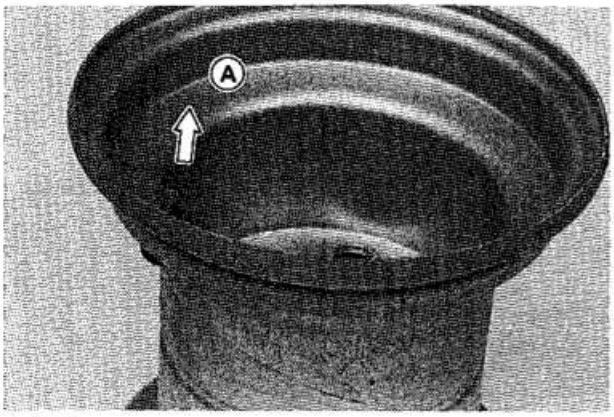
Wheel Replacement

•Remove the wheel (see Wheel Removal).

•Disassemble the tire from the rim (see Tire Removal).

•Install a new valve stem in the new rim.

○**Remove the valve cap, lubricate the stem with a soap** and water solution, and pull the stem through the rim from the inside out until it snaps into place.



A. Pull.

CAUTION

○**Do not use engine oil or gasoline to lubricate the stem because they will deteriorate the rubber.**

•Mount the tire on the new rim (see Tire Installation).

•Install the wheel (see Wheel Installation).

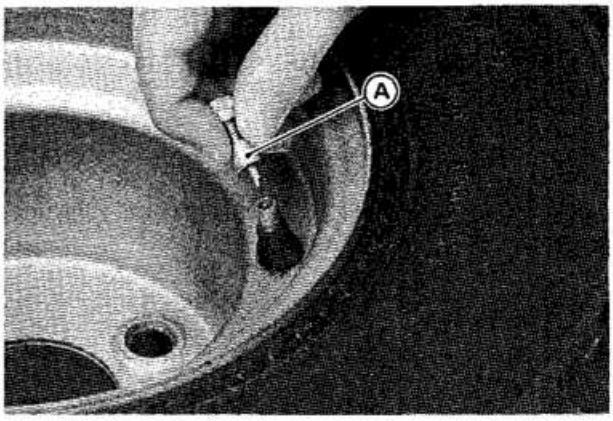
Tires

Tire Removal

•Remove the wheel (see Wheel Removal).

•Unscrew the valve core to deflate the tire.

○Use a proper valve core tool.



A. Valve Core Tool

•Lubricate the tire beads and rim flanges on both sides of the wheel with a soap and water solution. This helps the tire beads slip off the rim flanges.

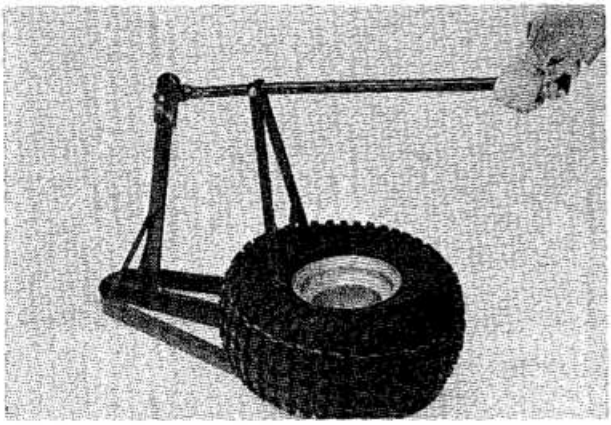


A. Apply lubricant.

CAUTION

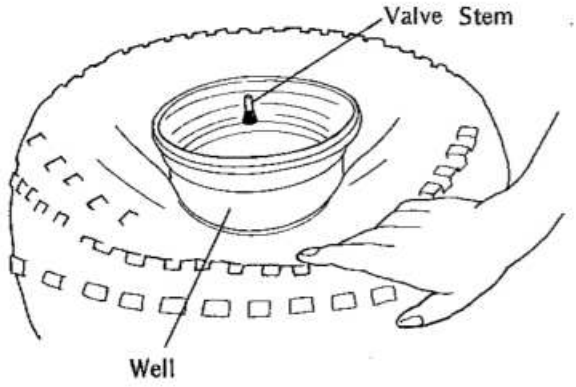
○**Do not lubricate the tire beads and rim flanges with engine oil or gasoline because they will deteriorate the tire.**

●Break the tire beads away from both sides of the rim with a tire tool.



●Kneel on the side of the tire opposite the valve stem, forcing the tire bead into the center well of the rim.

Rim Center Well

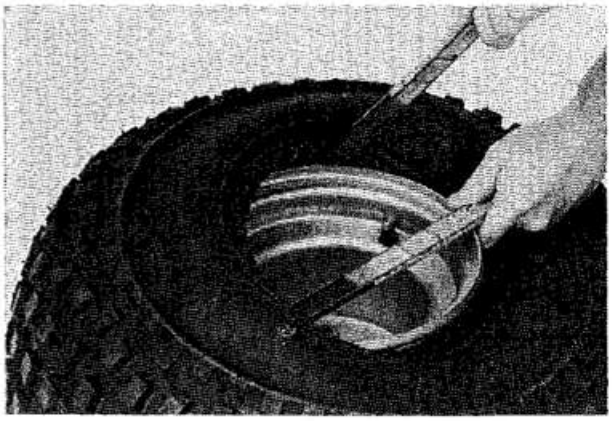


●Lubricate two tire irons with soap and water, and begin prying the first bead off the rim near the valve stem.

CAUTION

○**Do not scratch the air sealing surfaces of the tire or rim. Scratches or nicks on the sealing surfaces will allow the tire to deflate.**

●Work around the rim with the tire irons a little at a time, while continuing to hold the bead opposite the irons in the center well of the rim.



●Lift the second bead up into the center well and use the same procedure as in removing the first bead.

Tire Installation

●Inspect the rim (see Wheel Inspection).
●Check the tire for wear and damage (see Tire Inspection).
●Lubricate the tire beads, rim flanges, and the tire irons with a soap and water solution.

CAUTION

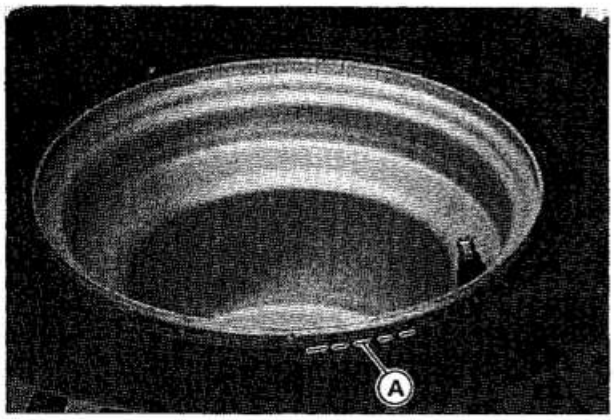
○**Do not use the lubricant to lubricate the tire beads and rim because it may cause the tire separation.**

●By hand, slide as much of the first bead as possible over the rim flange, starting at the side opposite the valve stem.
○As the bead goes onto the rim, force the bead into the center well of the rim to ease installation.
●Use the tire irons to install the rest of the bead.
●Use the same procedure to install the second bead.
●Lubricate the tire beads again, center the tire on the rim, and inflate the tire until the tire beads seat on the rim.

WARNING

○**Do not inflate the tire to more than 137 kPa (1.40 kg/cm^2, 20 psi). Overinflation can cause the tire to explode, causing personal injury.**

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



A. Rim Line

- If the rim lines and the rim flanges are not parallel, deflate the tire, lubricate the sealing surfaces again, and reinflate the tire.
- After the beads are properly seated, check for air leaks.
  - Inflate the tire to 35 kPa (0.35 kg/cm², 5 psi). Apply a soap and water solution around the tire bead and check for bubbles.
- Deflate the tire to specified pressure (see Specifications).
- Install the wheel (see Wheel Installation).
- Wipe off the soap and water solution on the tire, and dry out the tire before operation.

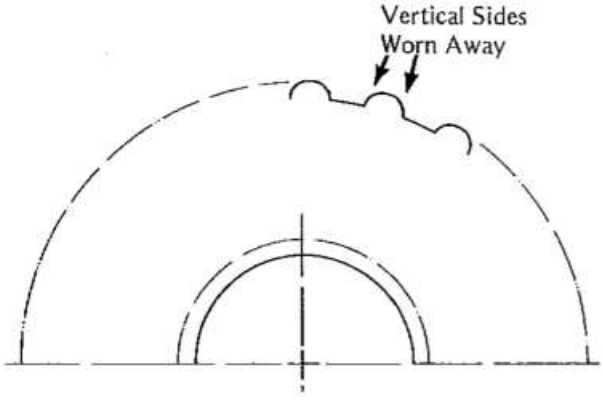
WARNING

Do not operate the vehicle when the water and soap still exist around the tire beads. They will cause the tire separation, and a hazardous condition may result.

Tire Inspection

- Examine the tire for damage and wear.
  - If the tire is cut or cracked, replace it.
  - Lumps or high spots on the tread or sidewalls indicate internal damage requiring tire replacement.
  - Remove any foreign objects from the tread. After removal, check for leaks with a soap and water solution.
  - Check the shape of the tread knobs. If no vertical side is left on the drive side of the knobs, replace the tire.

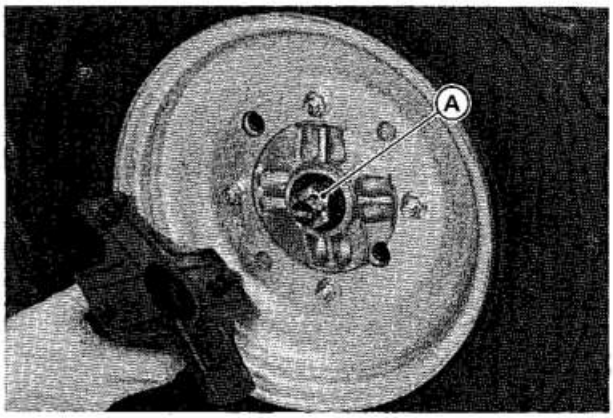
Tire Wear



Front Hub Bearings

Front Hub Bearing Removal

- Pull off the wheel cap.
- Remove the cotter pin and loosen the hub nut.



A. Hub Nut

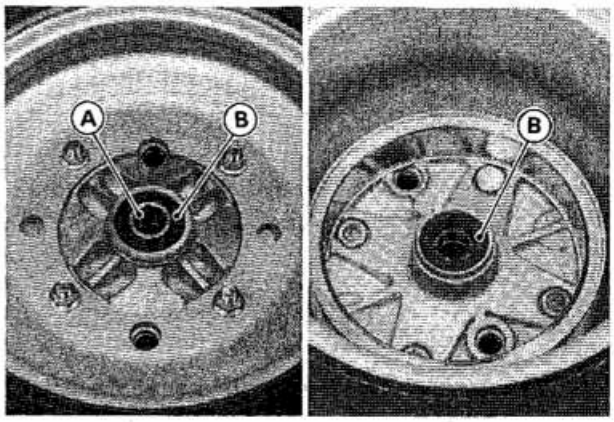
- Pull off the wheel with the hub assembly, and pull out the collar.

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:

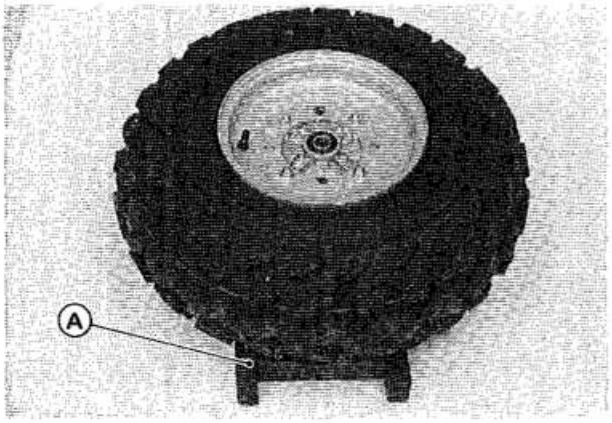
1. **Never blow brake lining dust with compressed air.**
2. **If any components are to be cleaned, wash them with detergent, then immediately discard the cleaning solution and wash your hands.**
3. **Do not grind any brake lining material unless a ventilation hood is available and properly used.**

- Remove the grease seals, bearings and spacer pipe.



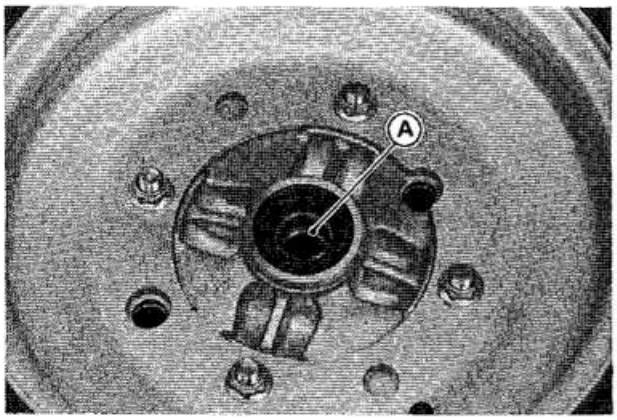
A. Collar B. Grease Seal

oPosition the hub assembly on wooden blocks to allow bearing removal.



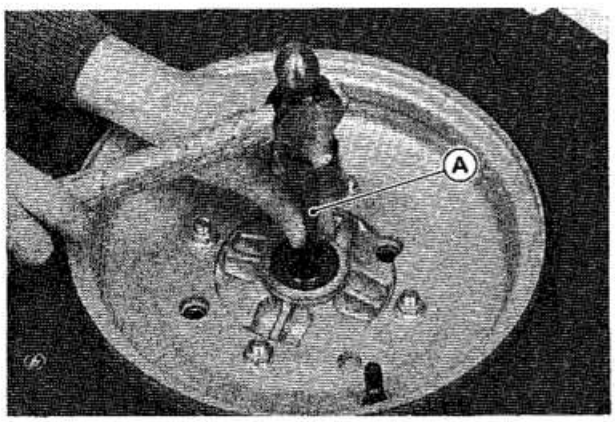
A. Wooden Block

oPry the spacer pipe toward one side.



A. Spacer Pipe

oDrive the bearing out by tapping on the exposed portion of the spacer pipe end with a hammer and metal rod. The grease seal is tapped out with the bearing.

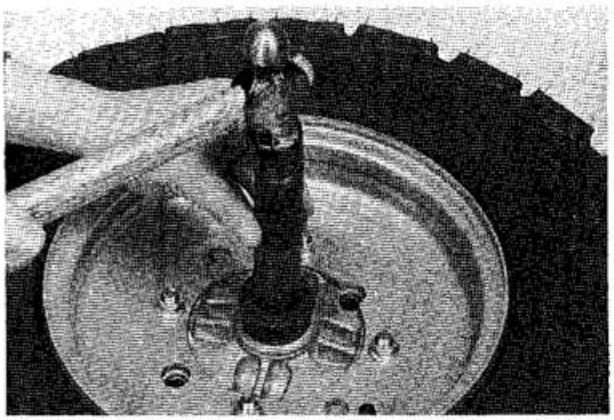


A. Metal Rod

oInsert the spacer pipe into the hub assembly.
oDrive out the remaining bearing and grease seal by tapping on the spacer pipe with a suitable driver.
•Deburr the spacer pipe as needed.

Front Hub Bearing Installation

•Installation is the reverse of removal. Note the following.
•Drive either bearing into the hub assembly with the bearing driver set (special tool: P/N 57001-1129).



•Apply grease to the lips of the grease seals.
•Tighten the hub nut to the specified torque (see Exploded View).

Front Hub Bearing Inspection

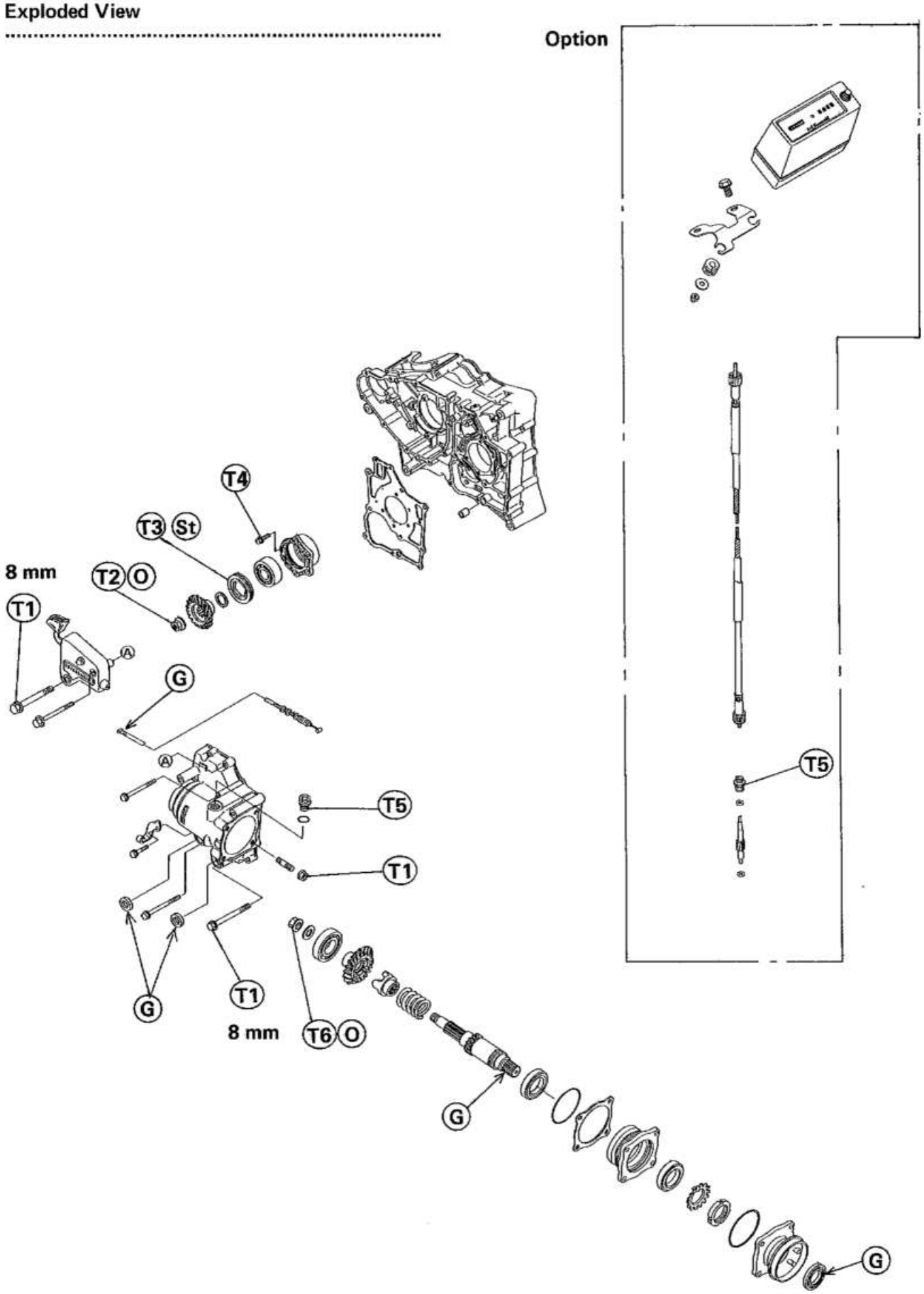
•Remove the hub assembly (see Front Hub Bearing Removal).
•Turn each bearing back and forth while checking for roughness or binding.
★If roughness or binding is found, replace the bearing.
•Examine the bearing seal for tears or leakage.
★If the seal is torn or is leaking, replace the bearing.

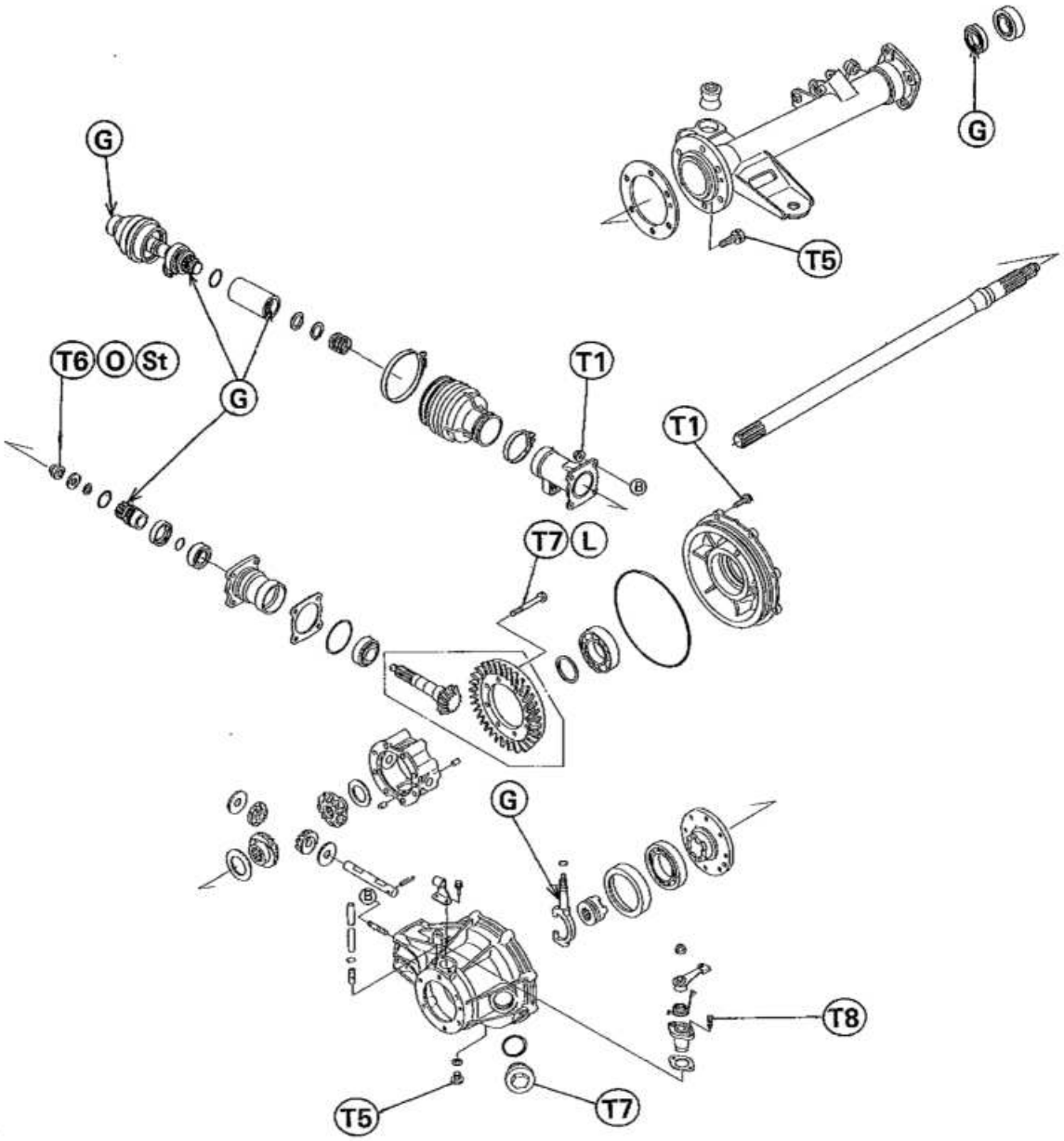
Final Drive

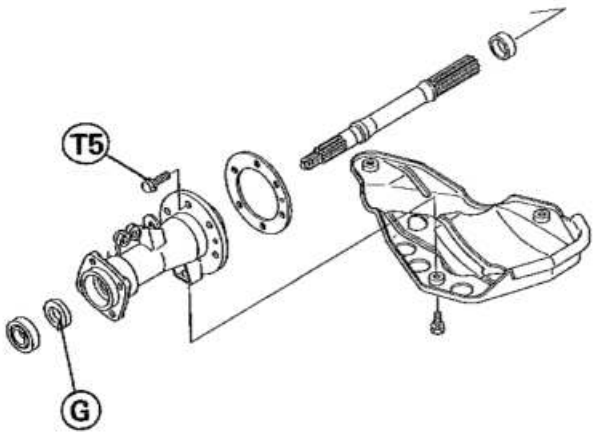
Table of Contents

Exploded View 9-2
Specifications 9-4
Special Tools 9-5
Final Gear Case Oil 9-6
Final Gear Case Oil Level Inspection . . . 9-6
Final Gear Case Oil Change 9-6
Front Bevel Gears and Cam Damper 9-6
Front Gear Case Removal 9-6
Front Gear Case Installation 9-8
Front Drive Gear Removal/ Installation 9-9
Front Driven Gear and Cam Damper Removal 9-9
Front Driven Gear and Cam Damper Installation 9-9
Front Bevel Gear Adjustment 9-10
Bevel Gear Inspection 9-14
Ball Bearing Inspection 9-14
Tapered Roller Bearing Inspection 9-14
Oil Seal Inspection 9-14
Cam Damper Inspection 9-14
Propeller Shaft 9-14
Propeller Shaft Removal 9-14
Propeller Shaft Installation 9-15
Propeller Shaft Lubrication 9-15
Propeller Shaft Joint and Pinion Joint Inspection 9-15
Propeller Shaft Inspection 9-15
Rear Axle Shafts 9-16
Rear Axle and Propeller Shaft Removal 9-16
Rear Axle and Propeller Shaft Installation 9-16
Axle Shaft Removal 9-17
Axle Shaft Installation 9-17
Axle Shaft Inspection 9-18
Ball Bearing Inspection 9-18
Oil Seal Inspection 9-18
Final Bevel Gears and Differential Gears 9-18
Pinion Gear Disassembly 9-18
Pinion Gear Assembly 9-19
Ring Gear and Differential Gear Disassembly 9-19
Ring Gear and Differential Gear Assembly 9-20
Final Bevel Gear Adjustment 9-20
Bevel Gear Inspection 9-25
Differential Gear Inspection 9-25
Tapered Roller Bearing Inspection 9-25
Ball Bearing Inspection 9-25
Oil Seal Inspection 9-25
Differential Shift Mechanism 9-25
Shift Lever Case and Cable Removal 9-25
Shift Lever Case and Cable Installation 9-26
Shifter and Shift Fork Removal 9-26
Shifter and Shift Fork Installation 9-26
Differential Cable Adjustment 9-27
Differential Cable Lubrication 9-28
Differential Cable Inspection 9-28
Shifter and Shift Fork Inspection 9-28

Exploded View







G : Apply grease.
L : Apply a non-permanent locking agent.
O : Apply an oil to the threads and seated surface.
St : Stake the fastener.
T1: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T2: 88 N-m (9.0 kg-m, 65 ft-lb)
T3: 98 N-m (10.0 kg-m, 72 ft-lb)
T4: 12 N-m (1.2 kg-m, 104 in-lb)
T5: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T6: 78 N-m (8.0 kg-m, 58 ft-lb)
T7: 29 N-m (3.0 kg-m, 22 ft-lb)
T8: 6.9 N-m (0.70 kg-m, 61 in-lb)

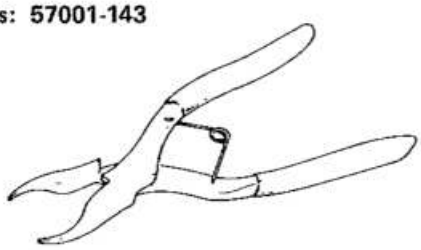
Specifications

Item	Standard
Final Gear Case Oil:	
Type	API GL-5 Hypoid gear oil SAE 90 (above 5°C, 41°F) or SAE80 (below 5°C, 41°F)
Capacity	0.3 L
Bevel Gear Bearing Preload	0.3 – 0.6 N-m
	(0.03 – 0.06 kg-m, 2.6 – 5.2 in-lb)
Bevel Gear Backlash: Front	0.06 – 0.10 mm
	(at bearing preload nut)
Rear	0.08 – 0.25 mm
	(at ring gear tooth)

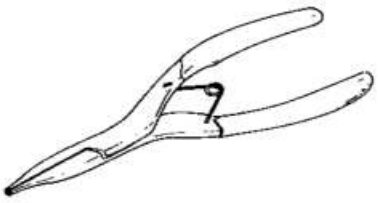
Special Tools

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

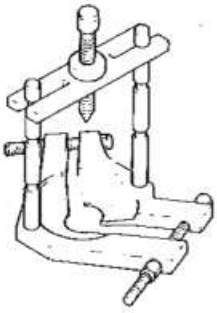
Circlip Pliers: 57001-143



Circlip Pliers: 57001-144



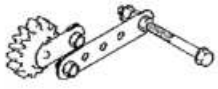
Bearing puller: 57001-158



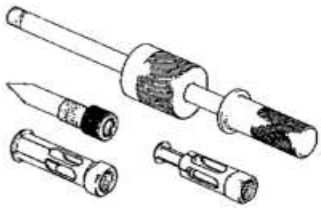
Oil Seal Guide: 57001-264
(Two guides are required)



Gear Holder: 57001-1015



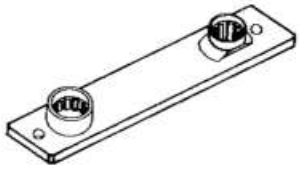
Oil Seal & Bearing Remover: 57001-1058



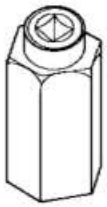
Bearing Driver Set: 57001-1129



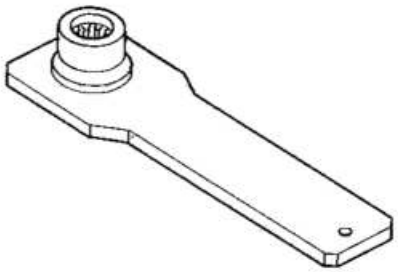
Bevel Gear Holder: 57001-1193



Hexagon Wrench: 57001-1194



Driven Gear Holder: 57001-1215



Final Gear Case Oil

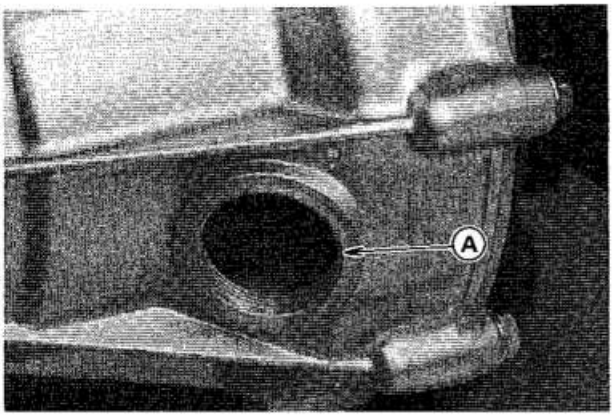
Final Gear Case Oil Level Inspection

- Park the vehicle so that it is level, both side-to-side and front-to rear.
- Remove the filler cap.

CAUTION

○**Be careful not to allow any dirt or foreign materials to enter the gear case.**

- Check the oil level. The oil level should come to the bottom of the filler opening.



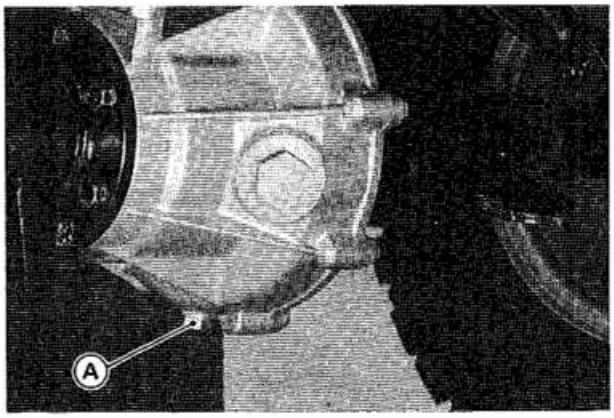
A. Filler Opening

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

- Be sure the O-ring is in place, and tighten the filler cap to the specified torque (see Exploded View).

Final Gear Case Oil Change

- Warm up the oil by running the vehicle so that the oil will pick up any sediment and drain easily. Then stop the vehicle.
- Park the vehicle so that it is level, both side-to-side and front-to-rear.
- 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 up to the bottom of filler opening with the oil specified below.

Final Gear Case Oil

Type:	**API GL-5 Hypoid gear oil** **SAE90 (above 5°C, 41°F)** **SAE80 (below 5°C, 41°F)**
Capacity:	**0.3 L**

NOTE

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

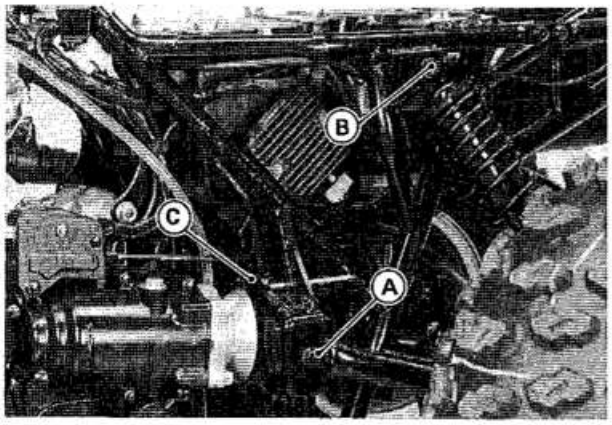
- Be sure the O-ring is in place, and tighten the filler cap to the specified torque (see Exploded View).

Front Bevel Gears and Cam Damper

Front Gear Case Removal

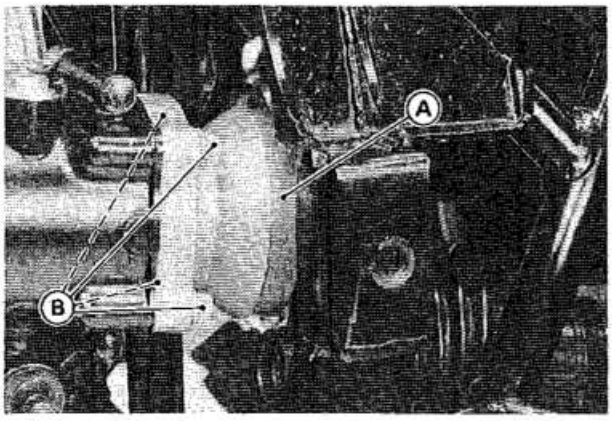
- Loosen the clamp screw at the front of the propeller shaft dust cover.
- Support the rear of the frame so that the rear wheels are off the ground.
- Remove the pivot bolts at the front of the left and right suspension arms.

•Remove the upper mounting bolts and nuts at the left and right rear shock absorbers.
•Pull the rear axle and propeller shaft toward the rear to free the propeller shaft front end from the front drive gear shaft rear end.



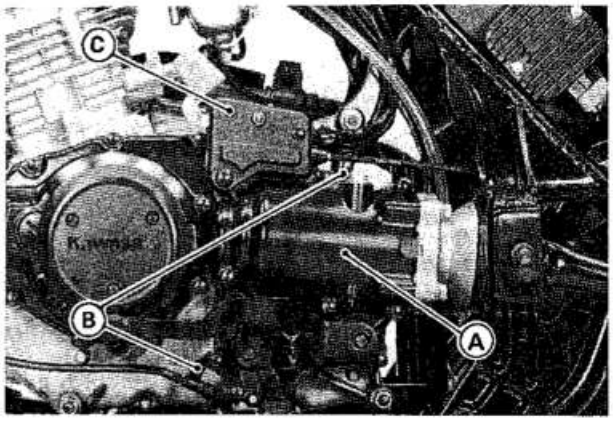
A. Pivot Bolt
B. Upper Mounting Bolt
C. Dust Cover Clamp

•Place an oil pan beneath the engine left side.
•Remove the shift pedal clamp bolt and take off the pedal from the shaft.
•Remove the reverse lever clamp bolt and take off the lever from the shaft.
•Remove the oil seal housing mounting nuts and take off the housing.



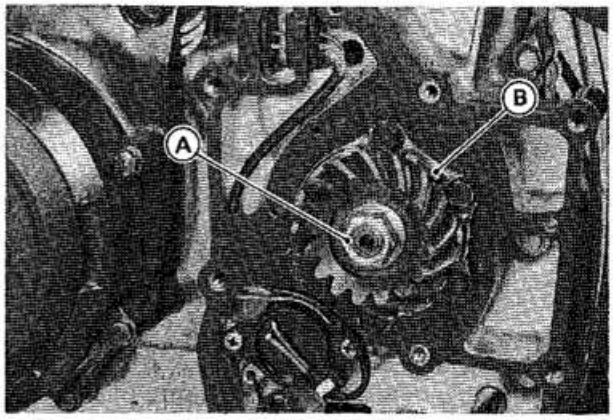
A. Oil Seal Housing
B. Mounting Nuts

•Remove the front gear case mounting bolts and take off the case. The differential shift lever case, differential cable bracket, and reverse cable bracket come off with the mounting bolts.



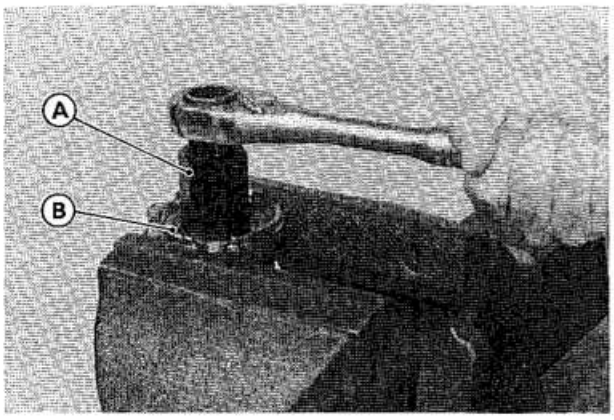
A. Front Gear Case
B. Cable Brackets
C. Differential Shift Lever Case

•Remove the drive gear and output shaft LH bearing housing to complete the removal of the front gear case gasket.
○Shift the transmission gears in any gear position.
○Remove the right engine cover (see Right Engine Cover Removal in the Engine Right Side chapter).
○Using the gear holder (special tool: P/N 57001-1015), hold the primary and secondary gears to keep them from turning (see Clutch Removal in the Engine Right Side chapter).
○Unscrew the drive gear nut and take off the drive gear and shim(s).



A. Drive Gear Nut
B. LH Bearing Housing

○Remove the bolts holding the output shaft LH bearing housing and pull out the bearing housing.
○Remove the gasket and dowel pins from the crankcase.
•To remove the output shaft LH bearing from its housing, remove the bearing holder using the hexagon wrench (special tool) and drive out the bearing with the bearing driver set (special tool: P/N 57001-1129) if necessary.



A. Hexagon Wrench: 57001-1194
B. Bearing Holder

Front Gear Case Installation

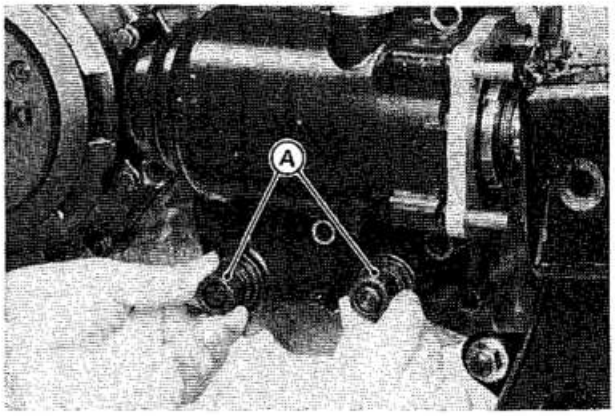
- Front gear case installation is the reverse of removal. Note the following.
- The front drive gear and driven gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
- Be sure to check and adjust the bearing preload and the bevel gear backlash and tooth contact, when any of the parts which influence these items are replaced (see Front Bevel Gear Adjustment).
- Install the LH bearing, bearing housing, and drive gear.
  - If the LH bearing was removed, drive the bearing into the bearing housing.
  - Install the bearing holder so that the flat side of it faces out, and tighten it to the specified torque (see Exploded View).
  - Stake the bearing holder after torquing with a punch.

CAUTION

When staking the holder, be careful not to apply shock to the bearing. Such a shock could damage the bearing.

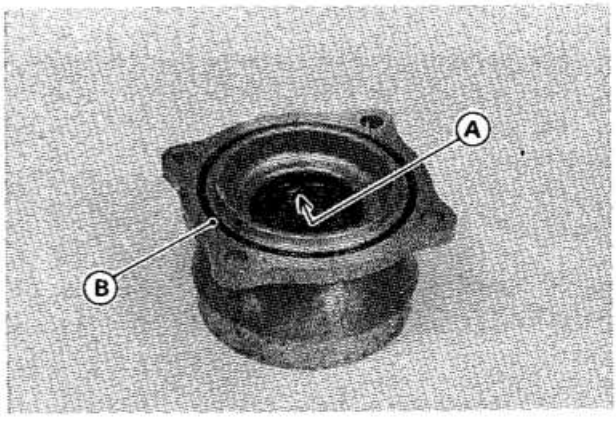
  - Install the LH bearing and housing to the crankcase, and tighten the housing bolts to the specified torque (see Exploded View). The front gear case gasket should be installed after finishing the front bevel gear adjustment.
  - Install the shim(s) and drive gear onto the output shaft.
  - Apply an oil to the threads and seated surface on the drive gear nut, and tighten it to the specified torque (see Exploded View).

- Apply grease to the oil seals on the front gear case, and use the oil seal guides (special tools) to protect the oil seals during case installation.



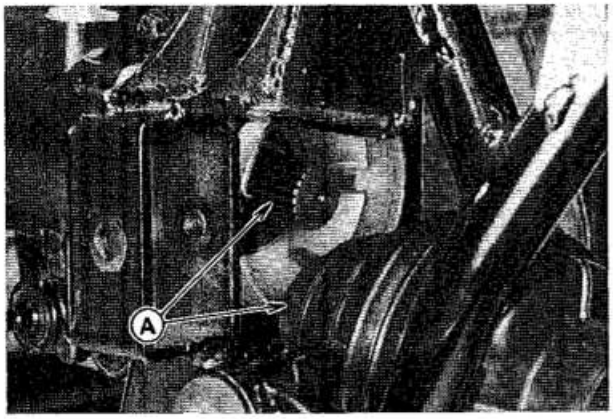
A. Oil Seal Guides: 57001-264

- Tighten the front gear case 8 mm bolts to the specified torque (see Exploded View).
- Apply a high temperature grease to the oil seal and install the oil seal housing to the front gear case. Be sure the O-ring is in place in the groove on the housing.



A. Apply grease. B. O-ring

- Tighten the oil seal housing nuts to the specified torque (see Exploded View).
- Apply grease to the splines at the front end of the propeller shaft and fit the propeller shaft to the drive gear shaft.



A. Apply grease.

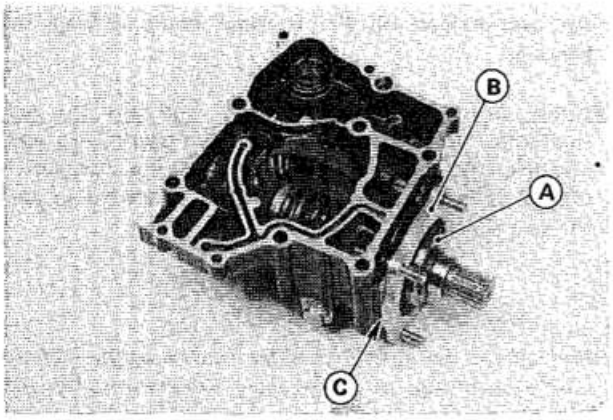
- Tighten the following fastener to the specified torque (see Exploded View in the Suspension chapter).
  Rear Shock Absorber Mounting Bolts and Nuts
  Rear Suspension Arm Pivot Bolts
- Adjust the reverse cable (see Reverse Cable Adjustment in the Engine Bottom/Transmission chapter).
- Add engine oil as if necessary (see Engine Oil Level Inspection in the Engine Right Side chapter).

Front Drive Gear Removal/Installation

- The front drive gear is removed and installed during front gear case removal and installation (see Front Gear Case Removal and Installation).

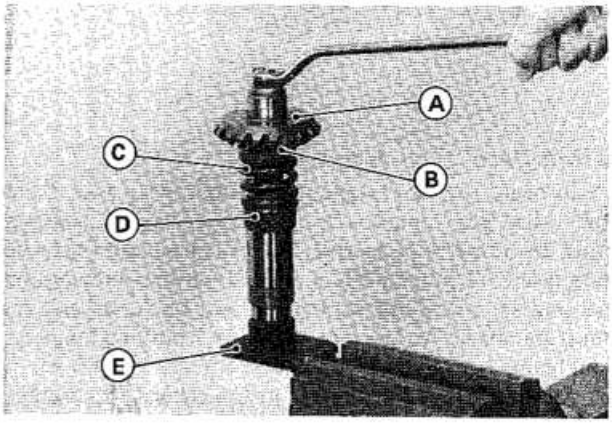
Front Driven Gear and Cam Damper Removal

- Remove the front gear case (see Front Gear Case Removal).
- Pull the driven gear and cam damper assembly out of the front gear case. The shim(s) comes off with the assembly.



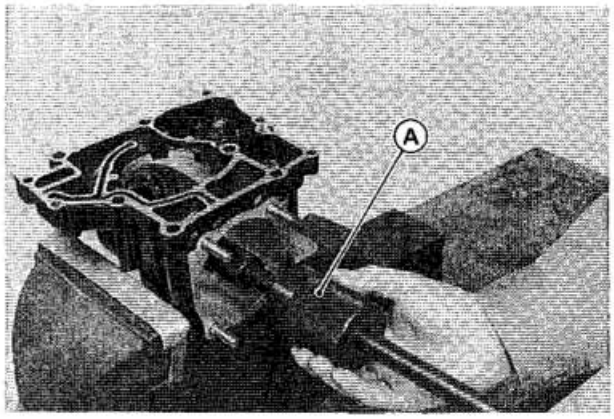
A. Bearing Preload Nut
B. Bearing Housing
C. Shim(s)

- Bend back the toothed washer tabs and remove the bearing preload nut.
- Pull the tapered roller bearings and housing out of the shaft.
- If necessary, use the bearing puller (special tool: P/N 57001-158).
- Using the driven gear holder (special tool), remove the driven gear nut and take off the driven gear, damper cam follower, and spring. The spring seat is press-fitted onto the shaft.



A. Driven Gear
B. Damper Cam Follower
C. Spring
D. Spring Seat
E. Driven Gear Holder: 57001-1215

- To remove the ball bearing press-fitted onto the front gear case, use the oil seal and bearing remover (special tool).



A. Oil Seal and Bearing Remover: 57001-1058

Front Driven Gear and Cam Damper Installation

- Front driven gear and cam damper installation is the reverse or 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 bearing preload and the bevel gear backlash and tooth contact, when any of the parts which influence these items are replaced (see Front Bevel Gear Adjustment).
- Replace the driven gear nut with a new one.
- Apply an oil to the threads and seated surface on the front driven gear nut, and tighten it to the specified torque (see Exploded View).

Drive Gear Shims (* : Standard)

Thickness (mm)	Part Number
0.15	92025-1573
0.20	92025-1574
0.7	92025-1534
0.8	92025-1535
0.9	92025-1536
1.0*	92025-1537
1.1	92025-1575
1.2	92025-1538
1.3	92025-1533

Front Bevel Gear Adjustment

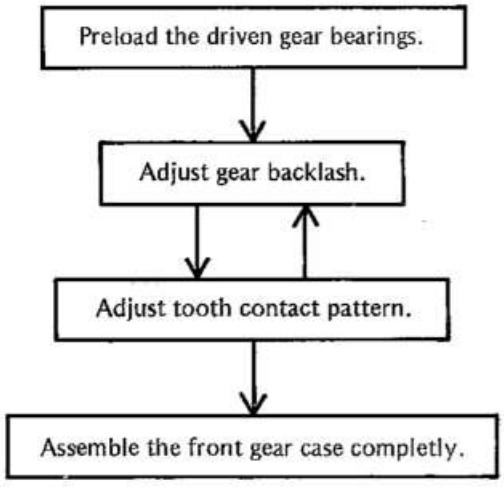
In order to prevent one gear from moving away from the other gear under load, the tapered roller bearings must be properly **preloaded.** Aslo the **backlash** (distance one gear will move back and forth without moving the other gear) and **tooth contact pattern** of the bevel gears must be correct to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

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

Driven Gear Shims (* : Standard)

Thickness (mm)	Part Number
0.1	92025-1697
0.15	92025-1698
0.5	92025-1699
0.8	92025-1700
1.0*	92025-1701
1.2	92025-1702

Front Bevel Gear Adjustment Procedure



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

Preload adjustment

- Assemble the bearing housing, and tighten the bearing preload nut to adjust the bearing preload.

CAUTION

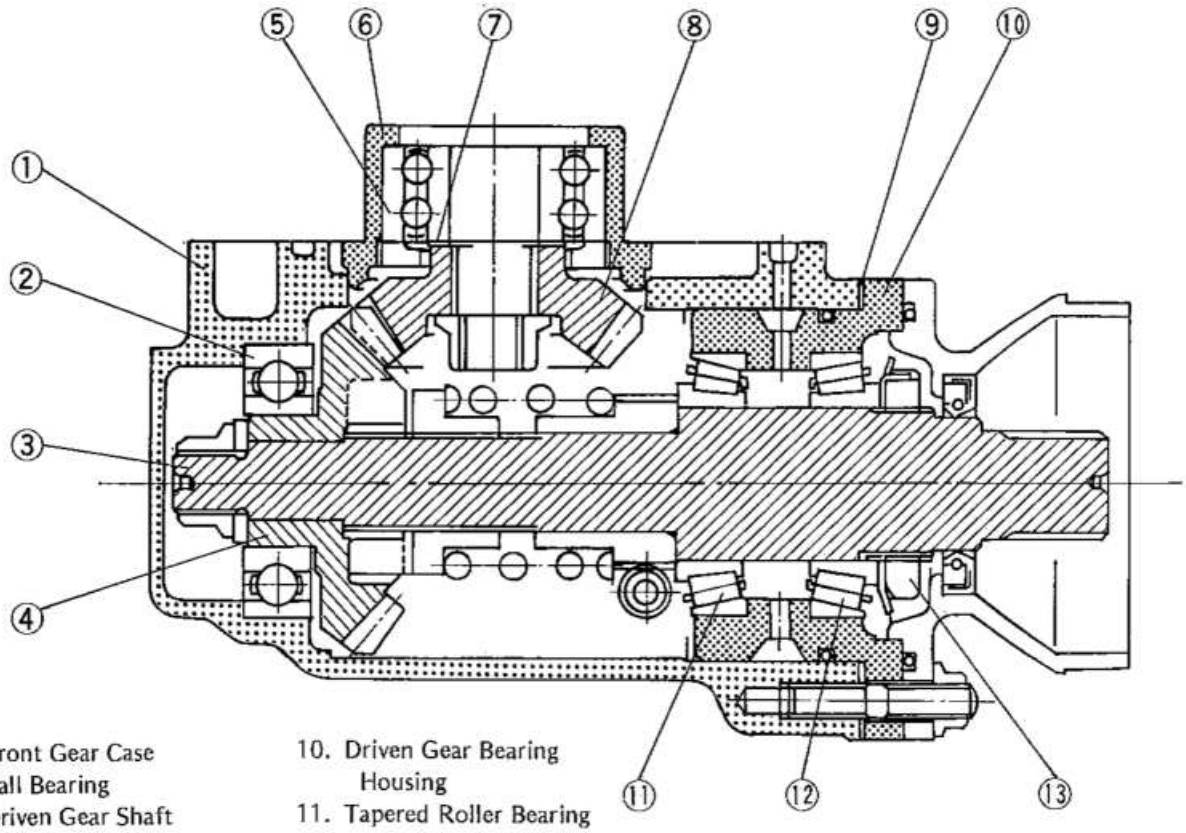
- **To start with, tighten the bearing preload nut so that the bearings are just SNUG with NO play but also with NO preload.**
- **An over-preload on the bearings could damage the bearings.**

- Apply engine oil to the bearings, and turn the gear shaft more than 5 turns to allow the bearings to seat.
- Measure the bearing preload. Bearing preload is difined as the force or torque which is needed to start the gear shaft turning.

NOTE

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

Backlash-Related Parts



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

Parts which influence the bearing preload only

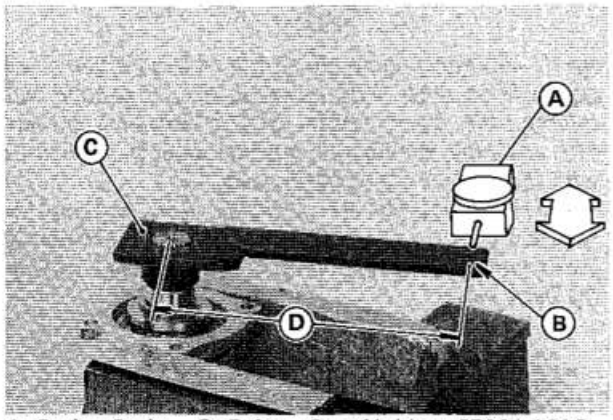
12. Tapered Roller Bearing
*13. Bearing Preload Nut

*Whenever the nut is loosened, even if the purpose is not to replace the parts.

Using Spring Scale:

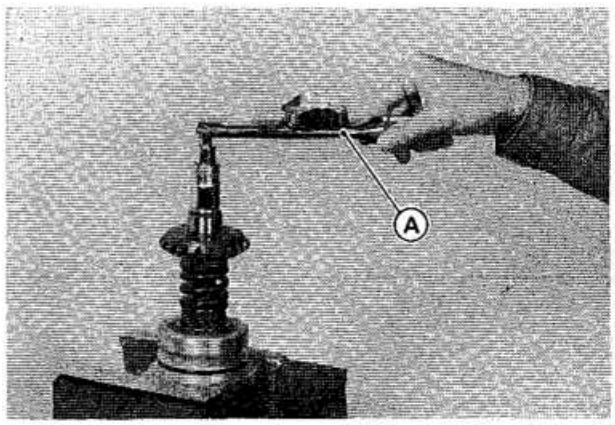
Hook the spring scale on the handle at a point 180 mm apart from the center of the gear shaft.

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



A. Spring Scale
B. Hole
C. Driven Gear Holder: 57001-1215
D. 180 mm

Using Torque Wrench:



A. Torque Wrench

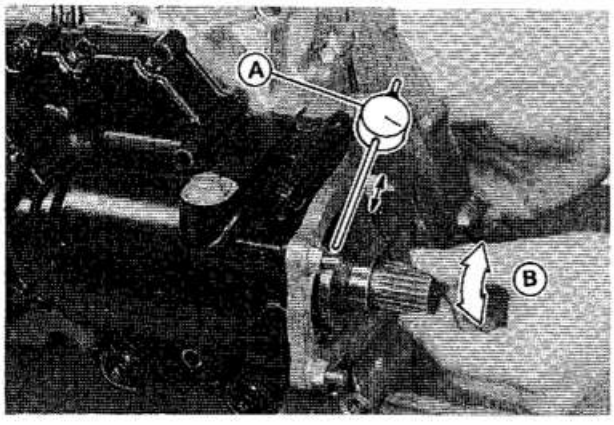
★If the preload is out of the specified range, loosen or tighten the bearing preload nut. To decrease preload, loosen the bearing preload nut. To increase preload, tighten the nut.

☆Change the tightening torque of the nut a little at a time.
●Re-check the bearing preload, and re-adjust as necessary.

Preload for Driven Gear Bearings

Using spring scale:	**1.7 – 3.3 N (0.17 – 0.33 kg)**
Using torque wrench:	**0.3 – 0.6 N·m (0.03 – 0.06 kg-m, 2.6 – 5.2 in-lb)**

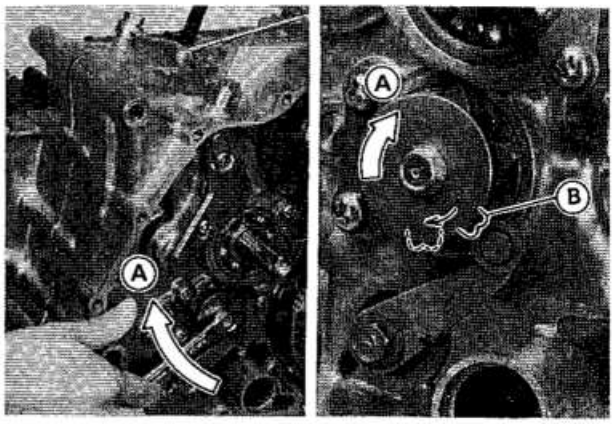
Backlash adjustment
●Clean any dirt and oil off the bevel gear teeth.
●Install the drive gear with the standard shim (see the shim tables), and tighten the nut to the specified torque (see Exploded View).
○Apply an oil to the threads and seated surface on the nut.
●Install the driven gear and cam damper assembly to the front gear case with the standard shim (see the shim tables), and tighten the mounting nuts to the specified torque (see Exploded View) without the oil seal housing.
●Install the front gear case to the crankcase, and tighten the 8 mm case bolts to the specified torque (see Exploded View).
○Check the backlash during the tightening of the case mounting bolts, and stop tightening them immediately if the backlash disappears. Then, change the shim to a thinner one.
●Set up a dial gauge against a bearing preload nut of the driven gear shaft to check gear backlash.



A. Dial Gauge B. Move.

●To measure the backlash, move the driven gear back and forth while holding the drive gear steady. The difference between the highest and lowest gauge readings is the amount of backlash.

○To hold the drive gear steady, hold the shift drum at the full-turned position.



A. Turn B. Neutral Detent

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

Standard:	**0.06 – 0.10 mm (at bearing preload nut)**

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

NOTE

○*Apply checking compound to the teeth in a thin, even coat with a fairly stiff paint brush. If painted too thickly, the exact tooth pattern may not appear.*
○*The checking compound must be smooth and firm, with the consistency of tooth paste.*
○*Special compounds are available from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use this for checking the bevel gears.*

●Turn the driven gear for 3 or 4 revolutions in the drive and reverse (coast) directions, while creating a drag on the drive gear.

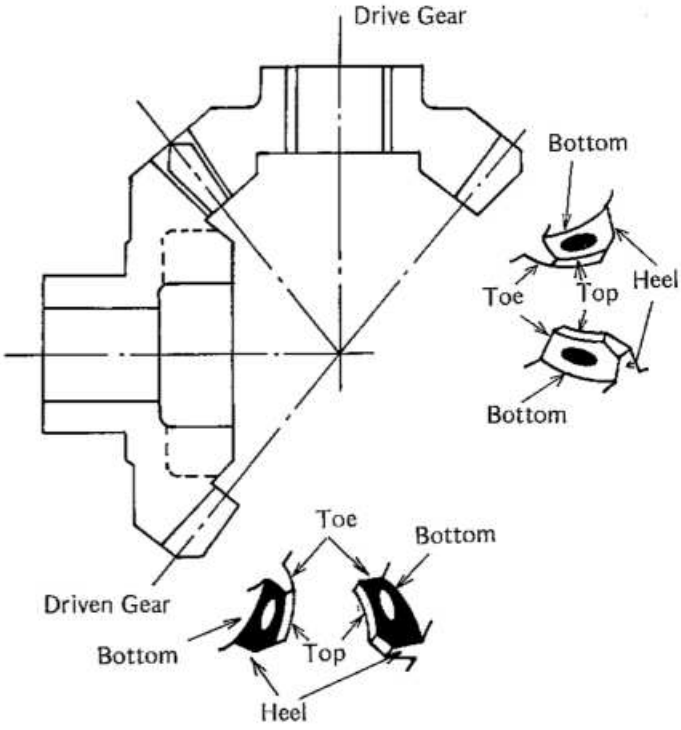
●Check the drive pattern and coast pattern of the bevel gear teeth. The tooth contact patterns of both drive and coast sides should be centrally located between the top and bottom of the tooth, and a little closer to the toe of the tooth.

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

NOTE

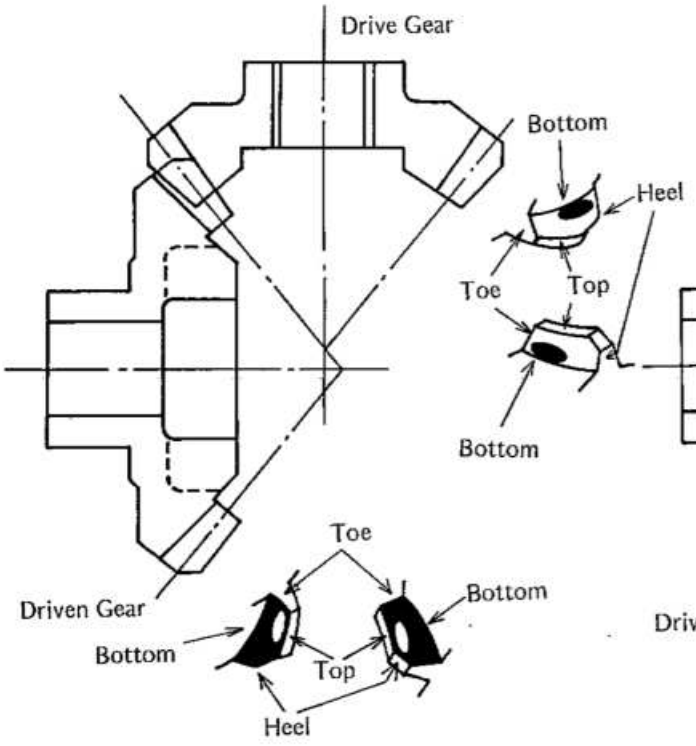
○*If the backlash is out of the standard range after changing shims, correct the backlash before checking the tooth contact pattern.*

Correct Tooth Contact Pattern

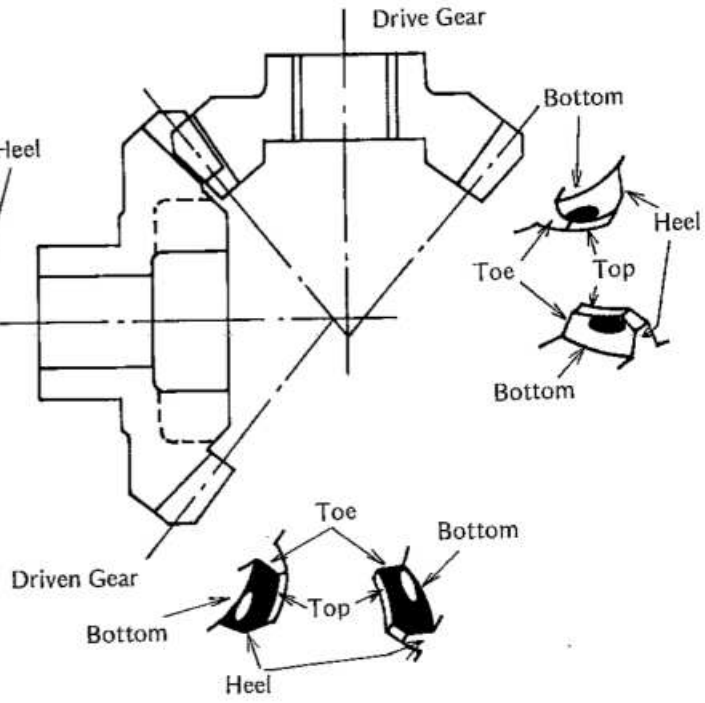


Incorrect Tooth Contact Patterns

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



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



Bevel Gear Inspection

•Visually check the bevel gears for scoring, chipping, or other damage.

★Replace the bevel gears as a set if either gear is damaged.

Ball Bearing Inspection

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

•Spin the bearing by hand to check its condition.

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

Tapered Roller Bearing Inspection

•Visually inspect the bearing for abrasion, color change, or other damage.

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

Oil Seal Inspection

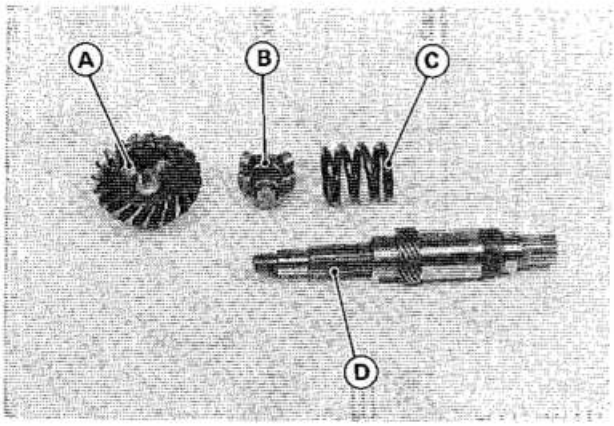
•Inspect the oil seals.

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

Cam Damper Inspection

•Visually inspect the damper cam (driven gear), cam follower, spring, and shaft.

★Replace the part if it appears damaged.



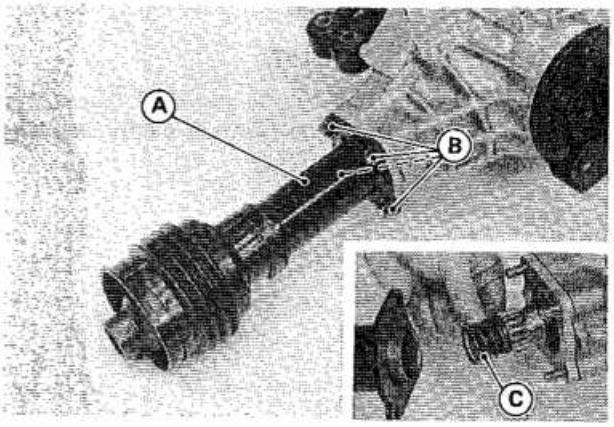
A. Cam (driven gear)
B. Cam Follower
C. Spring
D. Shaft

Propeller Shaft

Propeller Shaft Removal

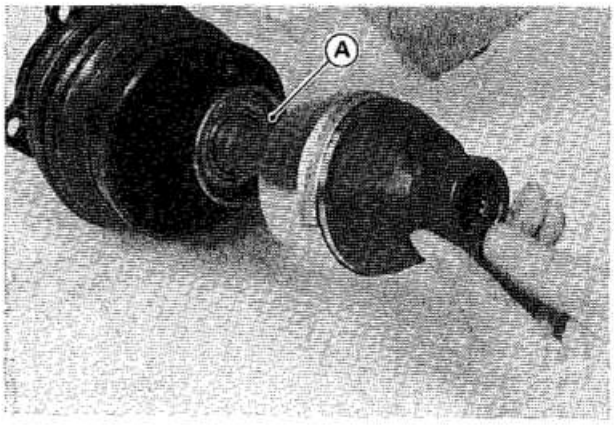
•Remove the rear axle and propeller shaft (see Rear Axle and Propeller Shaft Removal).

•Remove the propeller shaft housing mounting nuts and take off the housing with the propeller shaft. The spring comes off with the propeller shaft.



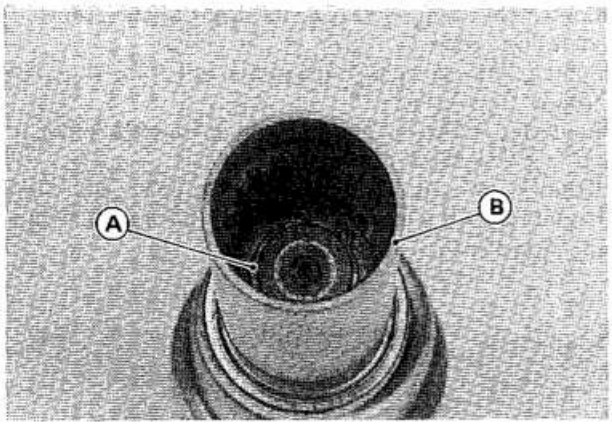
A. Propeller Shaft Housing
B. Mounting Nuts
C. Spring

•Remove the circlip with the circlip pliers (special tool: P/N 57001-143), and pull out the propeller shaft assembly from the housing.

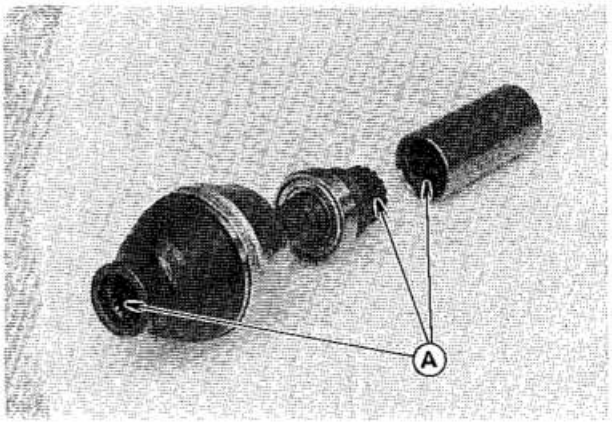


A. Circlip

•Remove the circlip with the circlip pliers (special tool: P/N 57001-144), and pull out the propeller shaft from the propeller shaft joint. The washer comes off with the joint.



A. Circlip B. Propeller Shaft Joint



A. Apply grease.

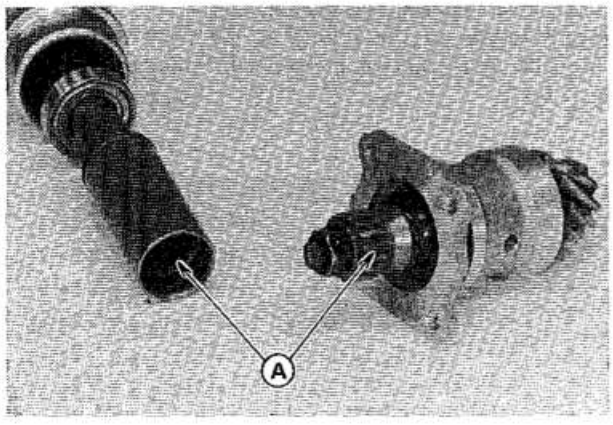
Propeller Shaft Installation

- Propeller shaft installation is the reverse of removal. Note the following.
- Lubricate the propeller shaft before installation (see Propeller Shaft Lubrication).
- Tighten the propeller shaft housing mounting nuts to the specified torque (see Exploded View).

Propeller Shaft Lubrication

- Lubricate the propeller shaft joint.

○ Wipe the old grease off the propeller shaft joint and pinion gear joint, and apply grease to the splines on them.



A. Apply grease.

- Lubricate the propeller shaft.

○ Wipe the old grease off the splines on the propeller shaft, and apply grease to them.

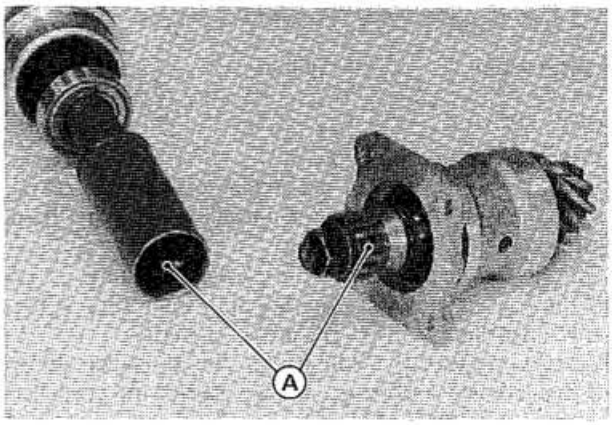
Propeller Shaft Joint and Pinion Gear Joint Inspection

- Visually inspect the internal splines of the propeller shaft sliding joint.

★ If they are badly worn or chipped, replace the joint with a new one.

- Visually inspect the splines of the pinion gear joint.

★ If they are badly worn or chipped, replace the joint with a new one.



A. Splines

Propeller Shaft Inspection

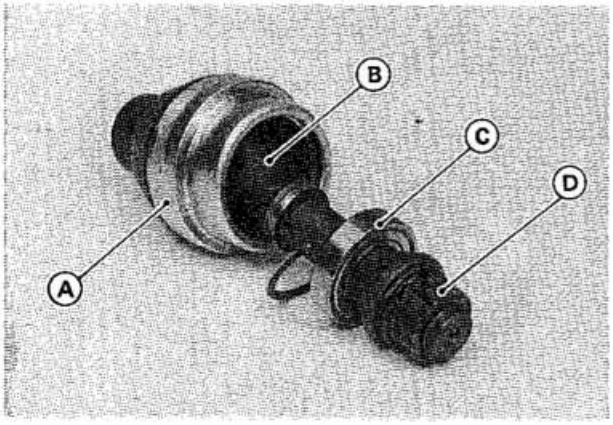
- Check that the universal joint works smoothly without rattling or sticking.

★ If it does not, the bearing of the universal joint is damaged. Replace the propeller shaft with a new one.

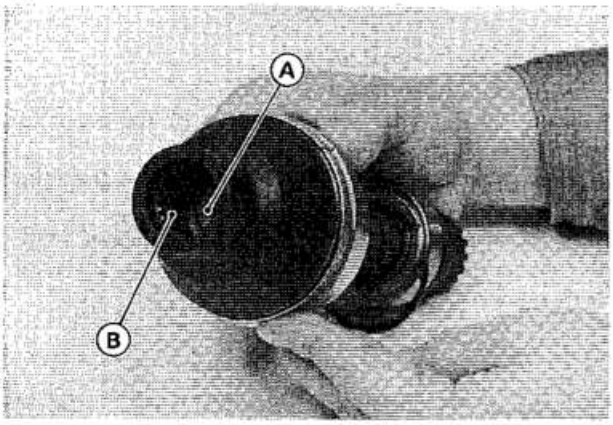
- Visually inspect the grease seal and cap for the universal joint.

★ If there is any signs of deterioration, damage, or loosen, replace the propeller shaft.

★ If the grease leakage is noted, replace the propeller shaft.



A. Universal Joint
B. Grease Seal
C. Center Bearing
D. Splines



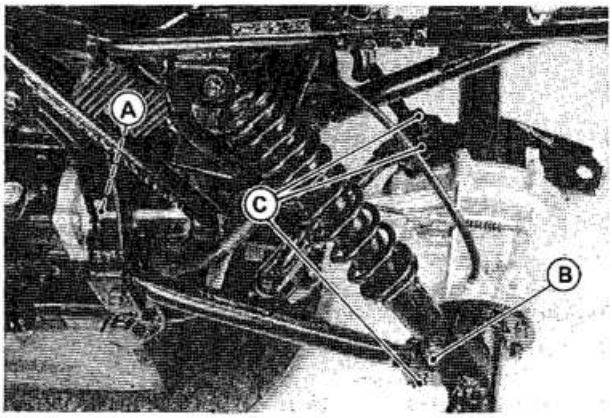
A. Grease Cap
B. Splines

•Inspect the center bearing.
○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement.
○Spin the bearing by hand to check its condition.
★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace the propeller shaft.
•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 gear shaft.

Rear Axle Shafts

Rear Axle and Propeller Shaft Removal

•If the final gear case is to be disassembled, drain the final gear case oil (see Final Gear Case Oil Change).
•Remove the following parts.
Rear Wheels
Rear Drums
Rear Brake Panels
•Loosen the clamp screw at the front of the propeller shaft dust cover.
•Support the vehicle with the frame so that the rear axle are free from loads.
•Remove the lower mounting bolts of the left and right rear shock absorbers.
•Remove the suspension arm pivot bolts and nuts mounting to the rear axle, and free the rear axle with the propeller shaft from the vehicle.



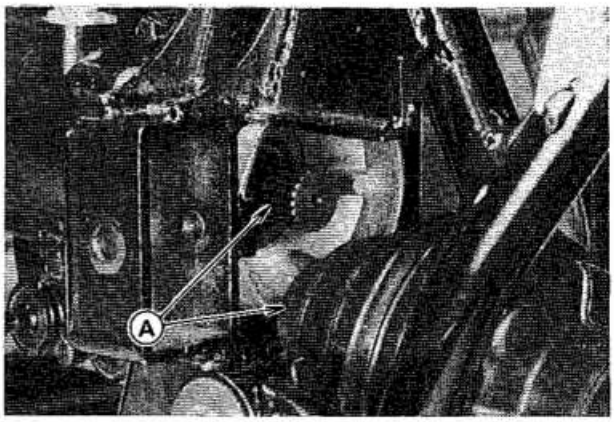
A. Dust Cover Clamp
B. Lower Mounting Bolt
C. Pivot Bolts

NOTE

○*If the final gear case is full of oil, place the rear axle so that the correct side of it is up. If the rear axle is upside down or sideways, the oil will be drained out of the case through the vent hose.*

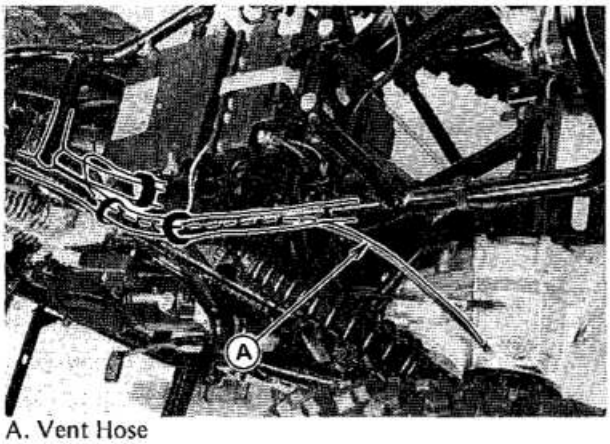
Rear Axle and Propeller Shaft Installation

•Rear axle and propeller shaft installation is the reverse of removal. Note the following.
•Apply grease to the splines at the front end of the propeller shaft and fit the propeller shaft to the drive gear shaft.



A. Apply grease.

•Tighten the following bolts and nuts to the specified torque (see Exploded View in the Suspension chapter).
Shock Absorber Lower Mounting Bolts
Suspension Arm Pivot Bolts and Nuts
•Route the final gear case vent hose as shown.

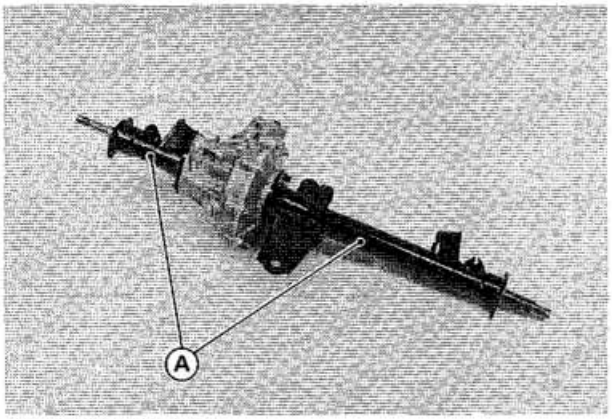


A. Vent Hose

•If the final gear case oil was drained, fill the case with oil (see Final Gear Case Oil Change).

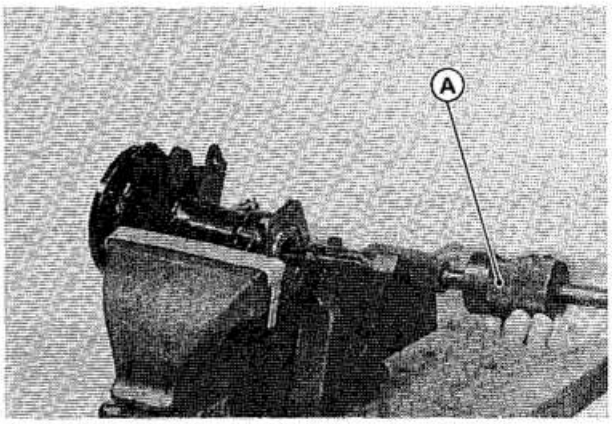
Axle Shaft Removal

•Remove the rear axle and propeller shaft (see Rear Axle and Propeller Shaft Removal).
•Remove the axle shaft pipe mounting bolts, and take off the left and right axle shaft pipes with shafts. The aluminum gasket comes off with each shaft pipe.



A. Axle Shaft Pipes

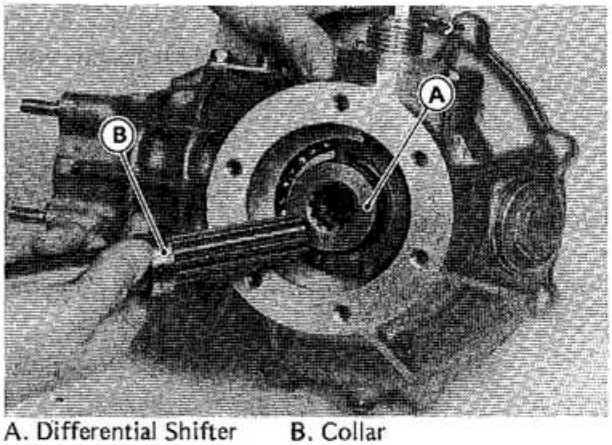
•Pull the collar off the left axle shaft.
•To remove the ball bearings press-fitted onto the axle shaft pipes, use the oil seal and bearing remover (special tool). Also remove the oil seal behind each bearing using the same special tool.



A. Oil Seal and Bearing Remover: 57001-1058

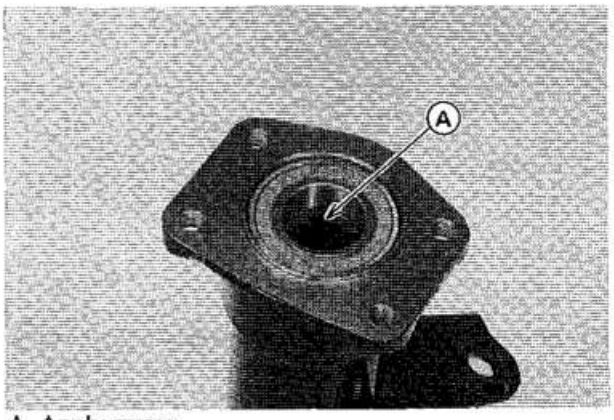
Axle Shaft Installation

•Axle shaft installation is the reverse of removal. Note the following.
•Using a press and the bearing driver set (special tool: P/N 57001-1129), install the oil seals and ball bearings until they stop at the bottoms of their housings.
•Be sure the differential shifter and collar are in place when installing the left axle shaft.



A. Differential Shifter B. Collar

•Apply grease to the oil seals on the axle shaft pipes.

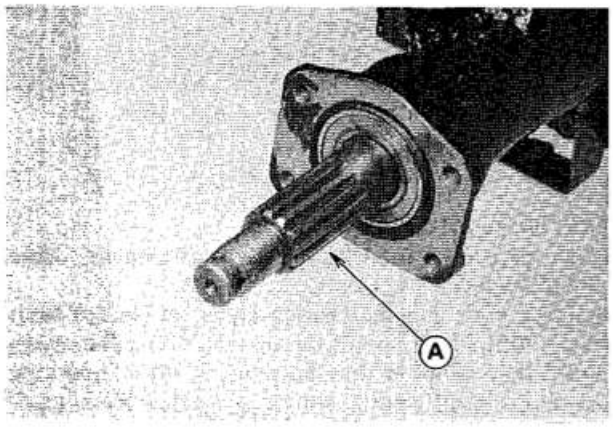


A. Apply grease.

•Tighten the axle shaft pipe mounting bolts to the specified torque (see Exploded View).

Axle Shaft Inspection

•Inspect the condition of the splines at each end of the axle.

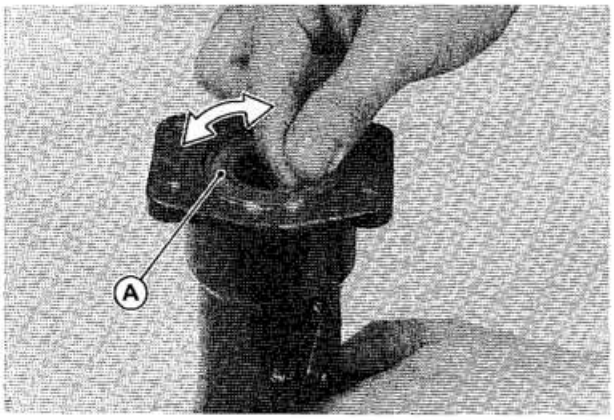


A. Splines

★If the splines are twisted or damaged in any way, replace the rear axle.

Ball Bearing Inspection

•Inspect the axle shaft pipe ball bearings.
○Turn each bearing back and forth while checking for roughness of binding.



A. Bearing Seal

★If roughness or binding is found, replace the bearing.
•Examine the bearing seal of the axle shaft pipe bearing for tears or leakage.
★If the seal is torn or is leaking, replace the bearing.

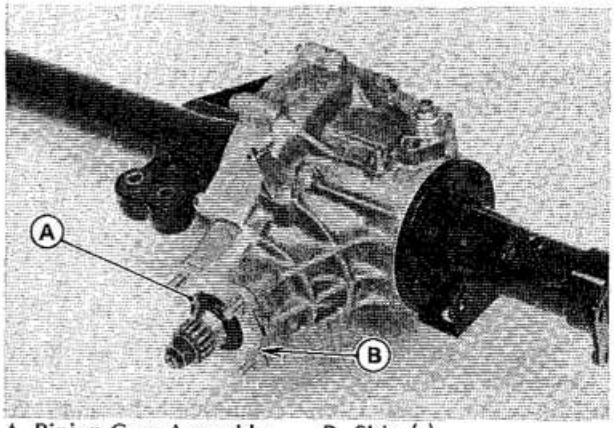
Oil Seal Inspection

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

Final Bevel Gears and Differential Gears

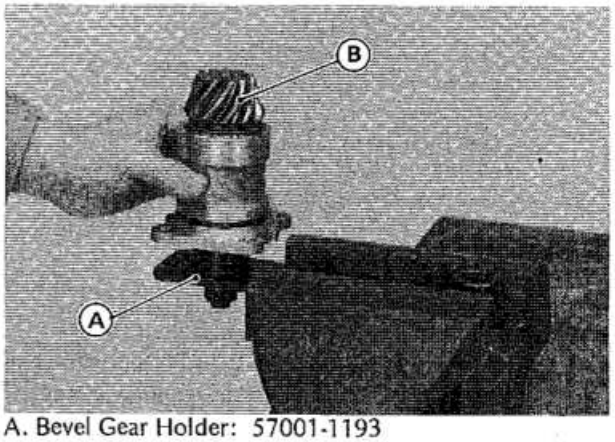
Pinion Gear Disassembly

•Remove the rear axle and propeller shaft (see Rear Axle and Propeller Shaft Removal).
•Pull the pinion gear assembly off the final gear case. The shim(s) comes off with the assembly.
○Pry at the gaps at the left and right of the pinion gear bearing housing flange.



A. Pinion Gear Assembly B. Shim(s)

•Pry open the staking of the pinion gear nut with a small chisel.
•Unscrew the pinion gear nut using the bevel gear holder (special tool) to keep the pinion gear assembly as shown, and remove the pinion gear nut, flat washer, shim(s), and pinion gear joint. The O-ring is between the pinion gear joint and the bearing.



A. Bevel Gear Holder: 57001-1193
B. Pinion Gear

•Pull the pinion gear out of the bearing housing.
•Pry the oil seal off the bearing housing, and remove the tapered roller bearing inner race.

Pinion Gear Assembly

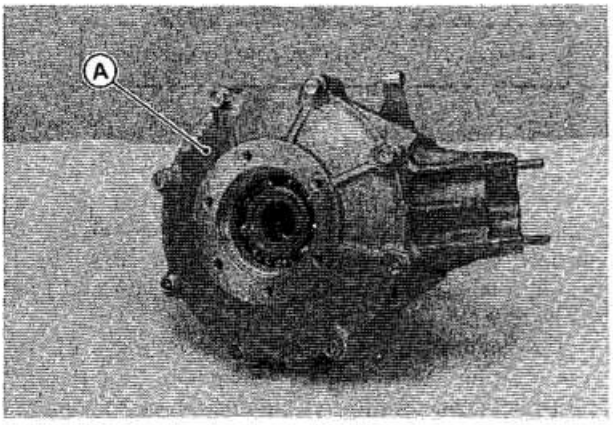
•Pinion gear assembly is the reverse of disassembly. Note the following.
•The pinion gear and ring gear are lapped as a set in the factory to get the best tooth contact. They must be replaced as a set.
•Be sure to check and adjust the pinion gear bearing preload and the bevel gear backlash and tooth contact, when any of the parts which influence these items are replaced (see Final Bevel Gear Adjustment).
○When the pinion gear nut is loosened, even if the propose is not to replace the parts, check and adjust the bearing preload.
•Replace the pinion gear nut with a new one.
•Apply an oil to the threads and seated surface on the pinion gear nut, and tighten them to the specified torque (see Exploded View).
•Stake the head of the pinion gear nut with a punch, to secure the pinion gear nut in place after finishing the bearing preload adjustment.

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 bearings.**

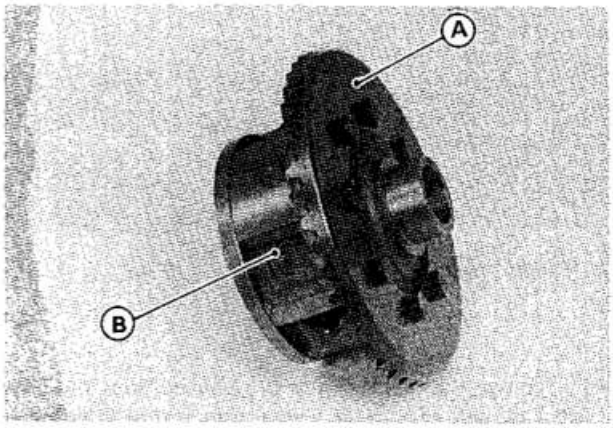
Ring Gear and Differential Gear Disassembly

•Remove the rear axle and propeller shaft (see Rear Axle and Propeller Shaft Removal).
•Remove the pinion gear assembly (see Pinion Gear Disassembly).
•Remove the axle shafts (see Axle Shaft Removal).
•Unscrew the final gear case cover bolts, and pull off the gear case cover. The shim(s) comes off with the cover.



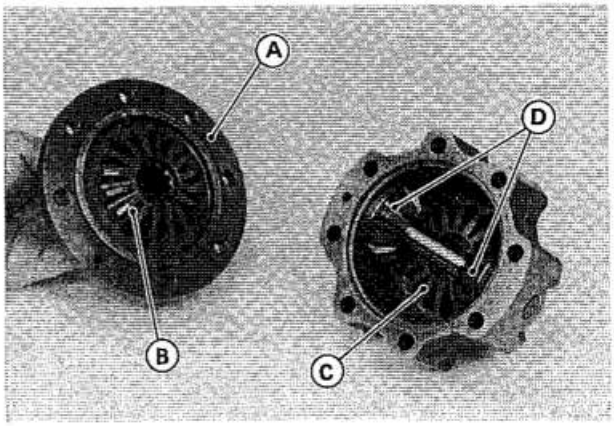
A. Final Gear Case Cover

•Pull the ring gear and differential gear housing out of the case.



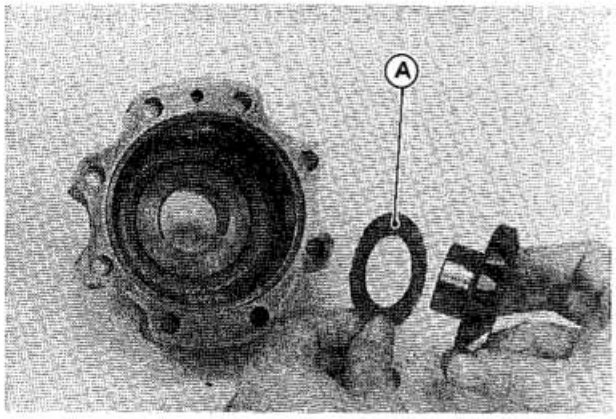
A. Ring Gear
B. Differential Gear Housing

•Remove the bolts and separate the ring gear and differential gear housing cover from the housing. The differential left side gear comes off with the housing cover.



A. Housing Cover
B. Left Side Gear
C. Right Side Gear
D. Pinion Gears

•Drive the retaining pin out of the differential gear housing, and pull the pinion gear shaft off the housing. The pinion gears and right side gear can be removed from the housing. The copper thrust washer is behind each gear.

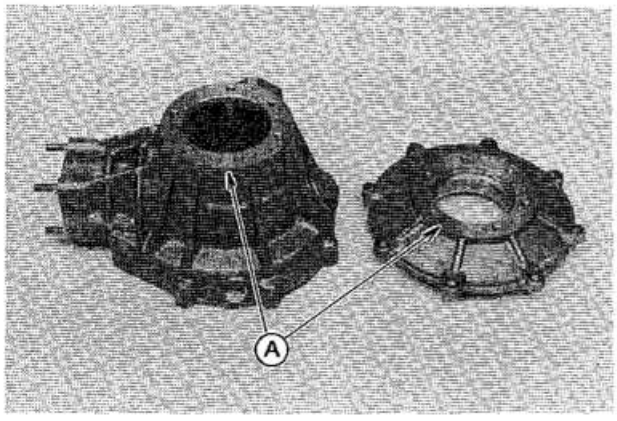


A. Thrust Washer

- To remove the ball bearings press-fitted onto the final gear case and case cover, use a press and bearing driver set (special tool: P/N 57001-1129).

CAUTION

- **Be careful not to scratch the sealing surfaces of the final gear case and case cover during the bearing removal and installation. A scratched sealing surface may allow oil to leak.**



A. Sealing Surfaces

Ring Gear and Differential Gear Assembly

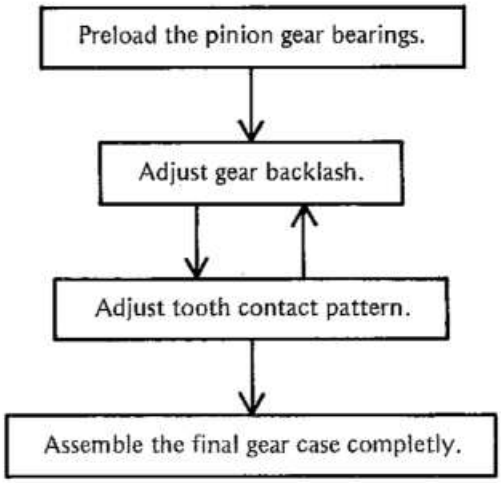
- Ring gear and differential gear assembly is the reverse of disassembly. Note the following.
- The ring gear and pinion gear are lapped together at the factory to get the best tooth contact. They must be replaced as a set.
- Be sure to check and adjust the pinion gear bearing preload and the bevel gear backlash and tooth contact, when any of the parts which influence these items are replaced (see Final Bevel Gear Adjustment).
- Apply a non-permanent locking agent to the threads of the ring gear and differential gear housing assembly bolts, and tighten them to the specified torque (see Exploded View).
- Using a press and the bearing driver set (special tool: P/N 57001-1129), install the ball bearings until they stop at the bottom of their housings.
- Tighten the final gear case cover bolts to the specified torque (see Exploded View).

Final Bevel Gear Adjustment

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

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

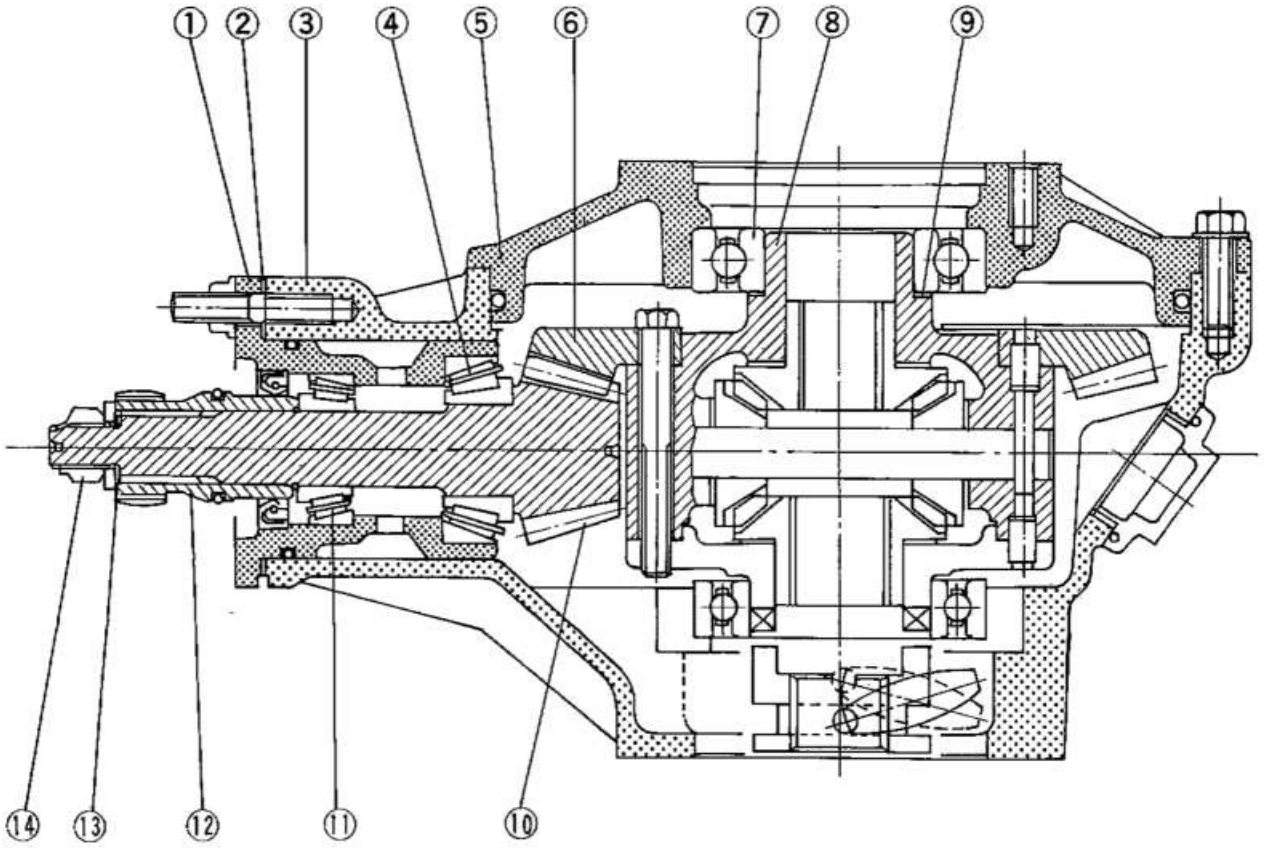
Final Bevel Gear Adjustment Procedure



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

The amount of backlash is influenced by the ring gear position more than by the pinion gear position. Tooth contact location is influenced by pinion gear position more than by ring gear position.

Backlash-Related Parts



1. Pinion Gear Bearing Housing
2. Pinion Gear Shim(s)
3. Final Gear Case
4. Tapered Roller Bearing
5. Final Gear Case Cover
6. Ring Gear
7. Ball Bearing
8. Differential Gear Housing
9. Ring Gear Shim(s)
10. Pinion Gear

Parts which influence the bearing preload only

11. Tapered Roller Bearing
12. Pinion Gear Joint
13. Preload Adjustment Shim(s)
*14. Pinion Gear Nut

*Whenever the nut is loosened, even if the purpose is not to replace the parts.

Shims for Preload Adjustment

Thickness (mm)	Part Number
0.1	92025-1287
0.15	92025-1656
0.2	92025-1288
0.3	92025-1289
0.5	92025-1290
0.6	92025-1291
0.7	92025-1292
0.8	92025-1293
0.9	92025-1294
1.0	92025-1295
1.2	92025-1657
1.3	92025-1282

Ring Gear Shims for Backlash Adjustment

Thickness (mm)	Part Number
0.1	92025-1709
0.15	92025-1710
0.5	92025-1711
0.8	92025-1712
1.0*	92025-1713
1.2	92025-1714

(* : Standard)

Pinion Gear Shims for Tooth Contact Adjustment

Thickness (mm)	Part Number
0.1	92025-1703
0.15	92025-1704
0.5	92025-1705
0.8	92025-1706
1.0*	92025-1707
1.2	92025-1708

(* : Standard)

Preload adjustment

- Assemble the pinion gear bearing housing, and tighten the pinion gear nut to the specified torque (see Exploded View). Do not install the oil seal until the correct bearing preload is obtained.

CAUTION

- **To start with, choose a shim or shims so that the bearings are just SNUG with NO play but also with NO preload.**
- **An over-preload on the bearings could damage the bearings.**

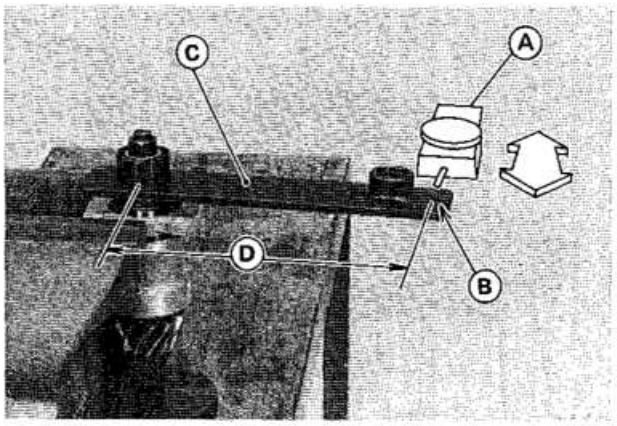
- Apply final gear case oil to the bearings, and turn the gear shaft more than 5 turns to allow the bearings to seat.
- Measure the bearing preload. Bearing preload is defined as the force or torque which is needed to start the gear shaft turning.

NOTE

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

Using Spring Scale:

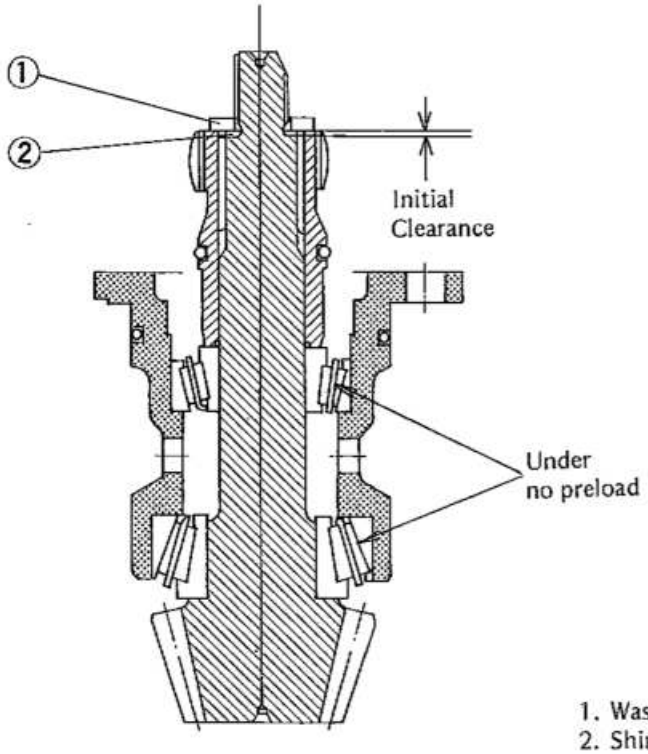
Hook the spring scale on the handle at a point 200 mm apart from the center of the gear shaft. Hold the bearing housing in a vise so that the gear shaft axis is vertical. Apply force to the handle horizontally and at a right angle to it.



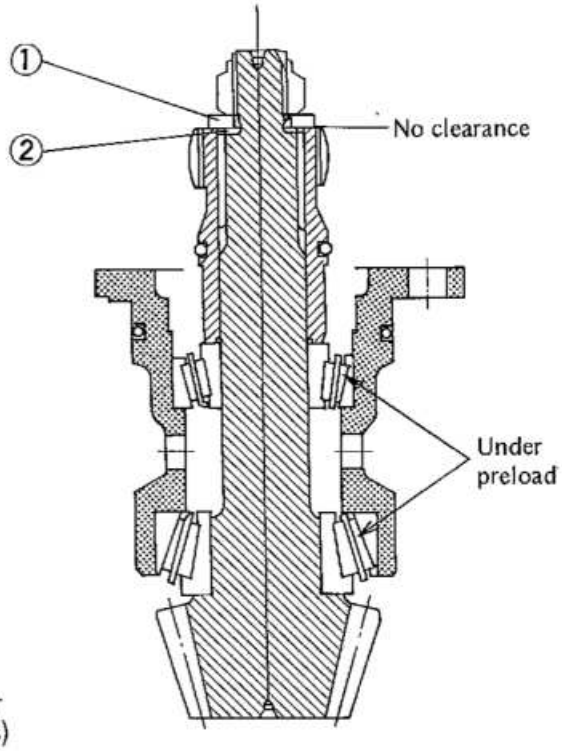
A. Spring Scale
B. Hole
C. Bevel Gear Holder: 57001-1193
D. 200 mm

Preloading Bearings

(A) Before Tightening

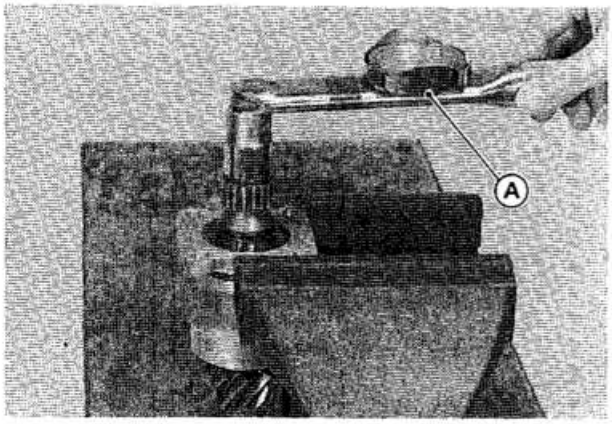


(B) After Tightening



1. Washer
2. Shim(s)

Using Torque Wrench:



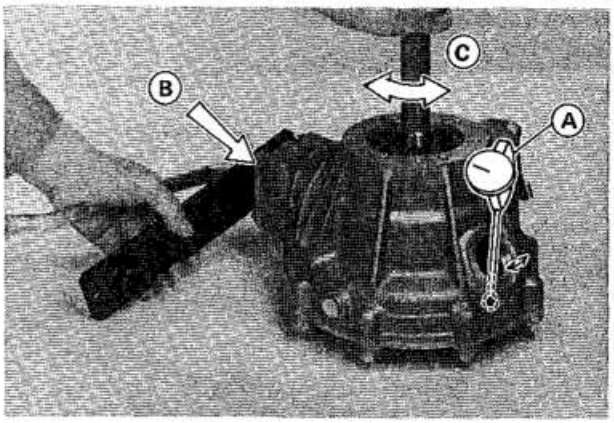
A. Torque Wrench

★If the preload is out of the specified range, replace the shims under the flat washer. To increase preload, decrease the thickness of the shim(s). To decrease preload, increase the thickness of the shim(s).
○Change the thickness a little at a time.
●Re-check the bearing preload, and re-adjust at necessary.

Preload for Pinion Gear Bearings

Using spring scale:	**1.5 – 3.0 N (0.15 – 0.30 kg)**
Using torque wrench:	**0.3 – 0.6 N·m (0.03 – 0.06 kg-m, 2.6 – 5.2 in-lb)**

Backlash adjustment
●Clean any dirt and oil off the bevel gear teeth.
●Install the pinion gear assembly with the standard shim (see the shim tables), and tighten the propeller shaft pipe mounting nuts to the specified torque (see Exploded View) without the propeller shaft housing.
●Install the ring gear and differential gear housing to the final gear case, and put the standard shim (see the shim tables) onto the ring gear.
●Put on the final gear case cover 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 thinner one.
●Set up a dial gauge against a ring gear tooth to check gear backlash.



A. Dial Gauge B. Hold C. Move

●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.
★If the backlash is not within the limit, replace the ring gear shims. To increase backlash, decrease the thickness of the shim(s). To decrease backlash, increase the thickness of the shim(s).
○Change the thickness a little at a time.
●Re-check the backlash, and re-adjust as necessary.

Final Bevel Gear Backlash

Standard:	**0.08 – 0.25 mm (at ring gear tooth)**

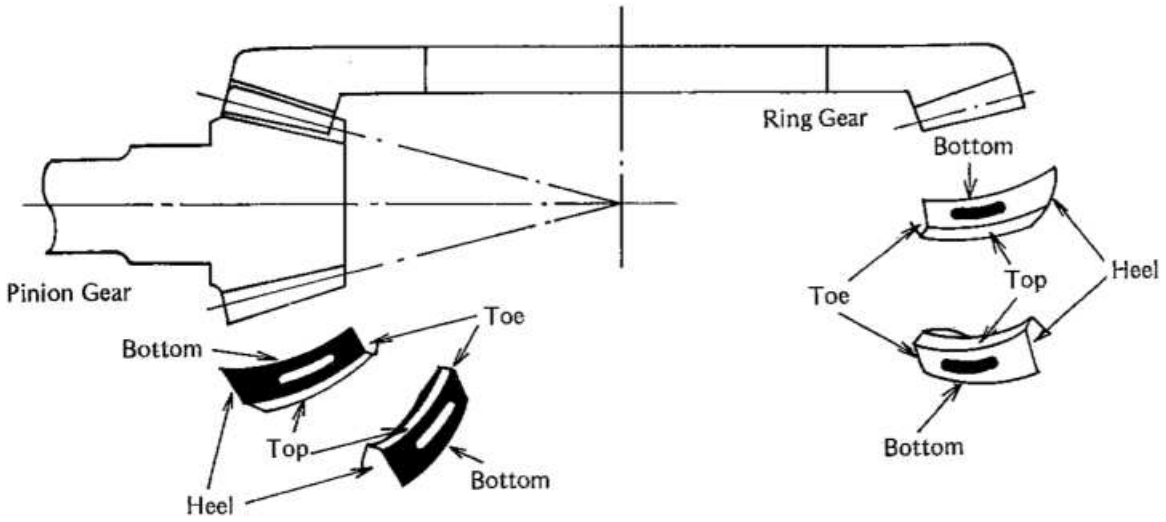
Tooth contact adjustment
●Clean any dirt and oil off the bevel gear teeth.
●Apply checking compound to 4 or 5 teeth on the pinion gear.

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 from automotive supply stores for the purpose of checking differential gear tooth patterns and contact. Use one of these for checking the bevel gears.*

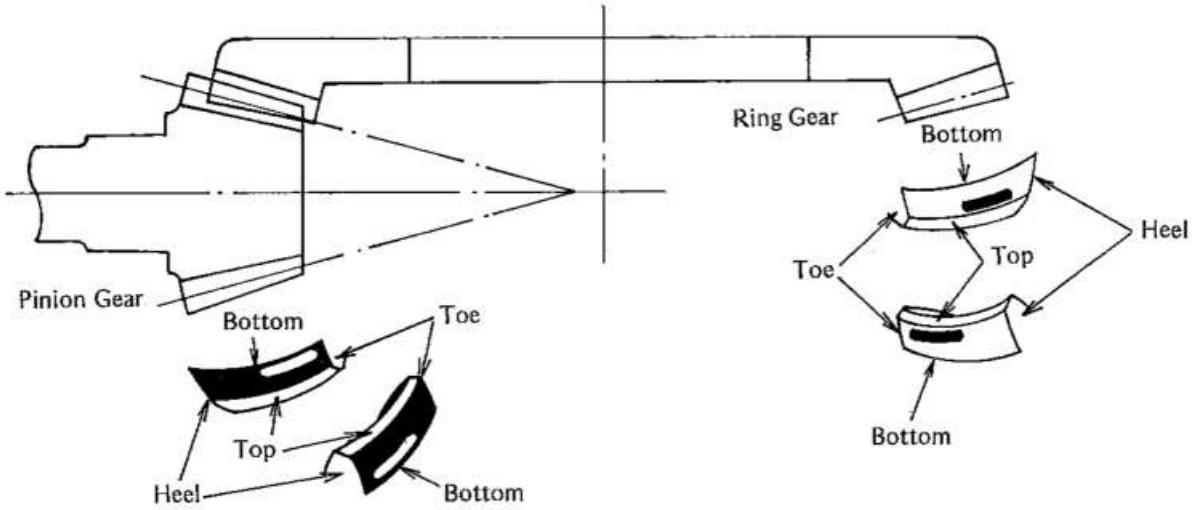
●Install the shim(s) and pinion gear assembly, and tighten the mounting nuts to the specified torque (see Exploded View).
●Install the ring gear and differential gear housing to the final gear case, and put the shim(s) onto the ring gear.
●Put on the final gear case cover and tighten the cover mounting bolts to the specified torque (see Exploded View).

Correct Tooth Contact Pattern

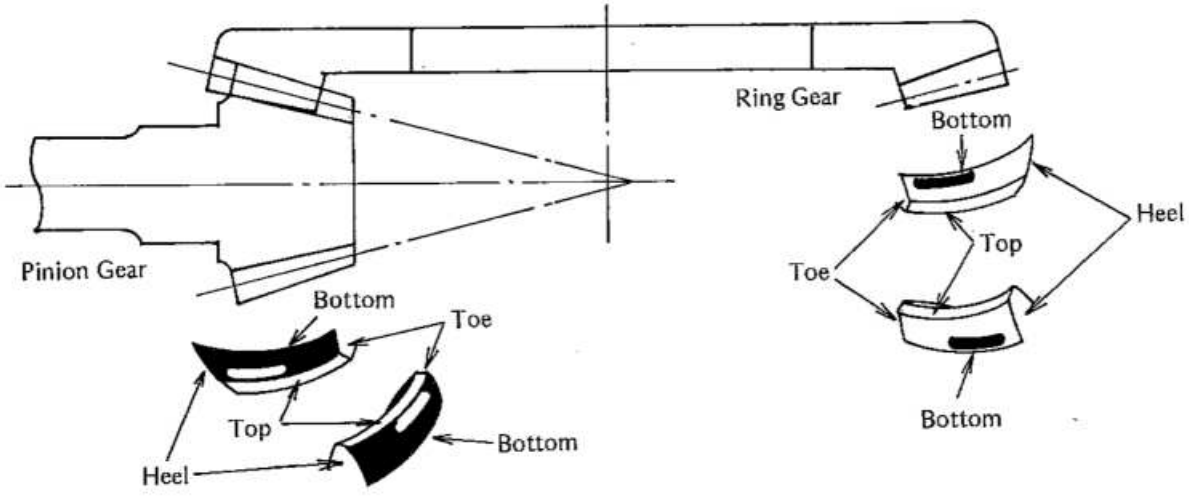


Incorrect Tooth Contact Patterns

Example 1: Decrease the thickness of the pinion gear shim(s) by 0.05 mm to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.



Example 2: Increase the thickness of the pinion gear shim(s) by 0.05 mm to correct the pattern shown below. Repeat in 0.05 mm steps if necessary.



•Turn the pinion gear for one revolution in the drive and reverse (coast) direction, while creating a drag on the ring gear.
•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.
★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), change the ring gear shim(s) to correct the backlash before checking the tooth contact pattern.*

Bevel Gear Inspection

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

Differential Gear Inspection

•Visually check the differential gears for scoring, chipping, or other damage.
★Replace the differential gears as a set if either gear is damaged. Also, inspect the thrust washers, differential pinion gear shaft, and gear housing where the differential gears rub. If they are scored, discolored, or otherwise damaged, replace them.

Tepered Roller 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.

Ball Bearing Inspection

•Inspect the final gear case ball bearings.
○Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than measurement. Clean each bearing in a high flash-point solvent, dry it (do not spin the bearing while it is dry), and oil it with engine oil.
○Spin the bearing by hand to check its condition.
★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.

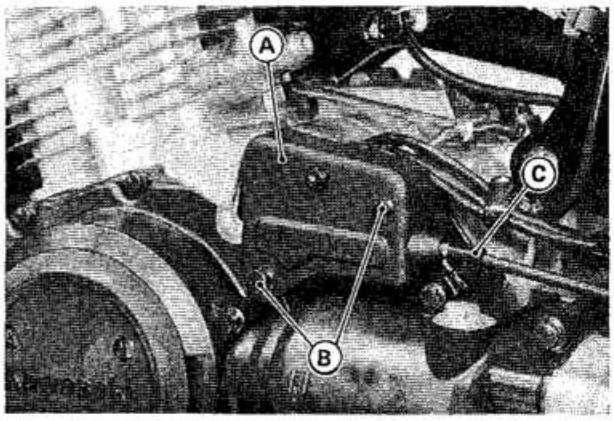
Oil Seal Inspection

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

Differential Shift Mechanism

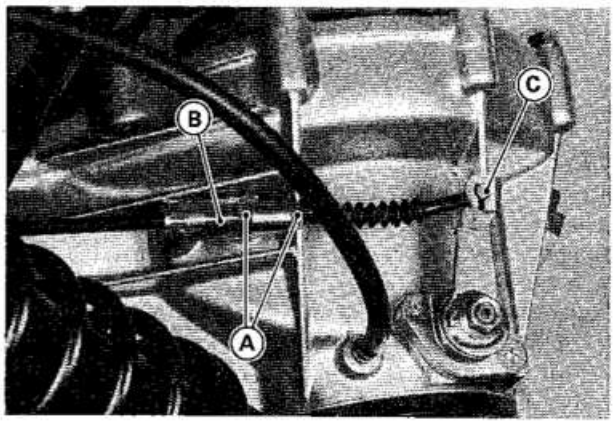
Shift Lever Case and Cable Removal

•Remove two front gear case bolts holding the differential shift lever case.



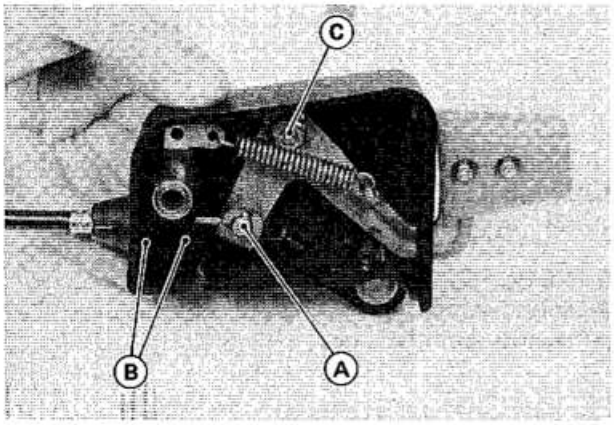
A. Differential Shift Lever Case
B. Remove these bolts.
C. Cable Bracket

•Pry open the cable bracket and free the cable from it.
•Loosen the mounting nuts and take off the cable adjuster from its bracket.
•Pull the cable tip out of the catch on the lever and free the case and cable from the vehicle.



A. Mounting Nuts
B. Adjuster
C. Cable Tip

•Separate the cable from the case.
○Remove the screws and take off the plate.
○Pull the cable housing out of the case and free the cable tip from the catch on the shift lever. Do not lose the rubber seals.



A. Cable Tip
B. Rubber Seals
C. Do not loosen this pivot bolt.

CAUTION

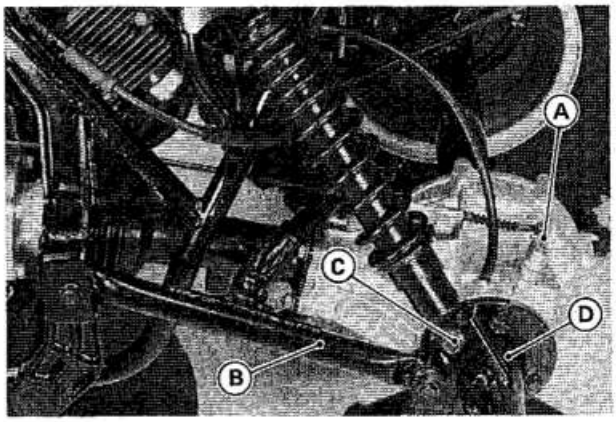
○**Do not loosen the shift lever pivot bolt. Loosening the pivot bolt upsets the position of the special designed collar under the lever, and could cause malfunctioning of the lever action.**

Shift Lever Case and Cable Installation

•Shift lever case and cable installation is the reverse of removal. Note the following.
•Lubricate the differential cable (see Differential Cable Lubrication).
•Tighten the front gear case 8 mm bolt to the specified torque (see Exploded View).
•Adjust the differential cable (see Differential Cable Adjustment).

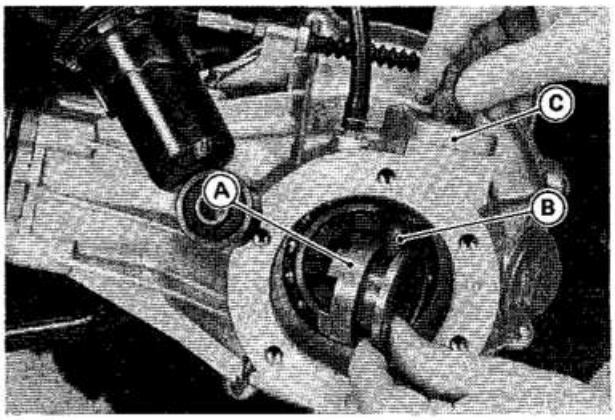
Shifter and Shift Fork Removal

•Drain the final gear case oil (see Final Gear Case Oil Change).
•Support the vehicle with the frame so that the rear axle are free from loads.
•Remove the following parts.
Differential Shift Fork Lever
Rear Left Wheel
Rear Left Drum and Panel
Left Suspension Arm
Left Shock Absorber Lower Mounting Bolt
Left Axle Shaft



A. Differential Shift Fork Lever
B. Left Suspension Arm
C. Shock Absorber Lower Mounting Bolt
D. Left Axle Shaft and Pipe

•Pull the differential shifter off the shift fork ears.

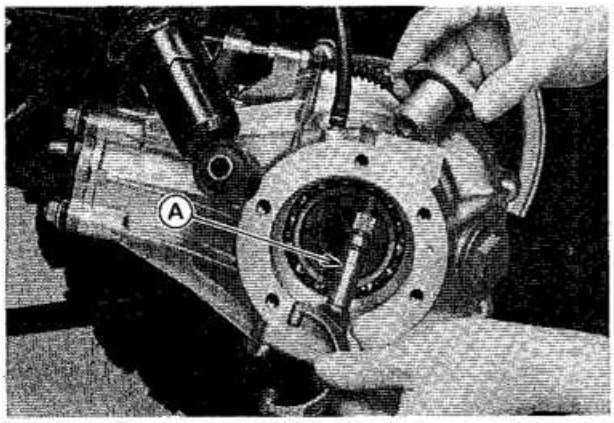


A. Differential Shifter
B. Shift Fork
C. Shift Fork Holder

•Unscrew the shift fork holder screws and pull off the holder with the gasket. Now, the shift fork can be removed.

Shifter and Shift Fork Installation

•Shifter and shift fork installation is the reverse of removal. Note the following.
•Apply grease to the shift fork shaft.



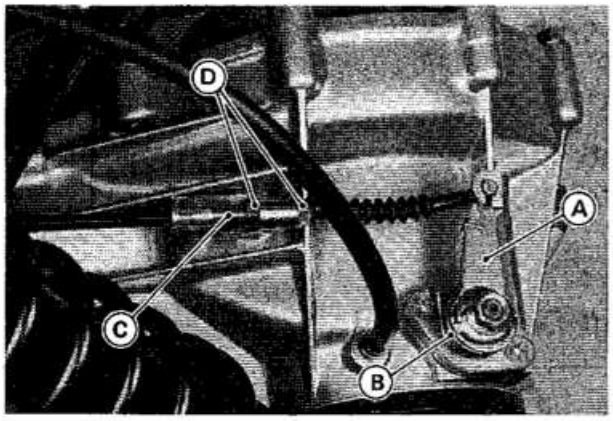
A. Apply grease.

- Tighten the shift fork holder screws to the specified torque (see Exploded View).
- Adjust the differential cable (see Differential Cable Adjustment).

Differential Cable Adjustment

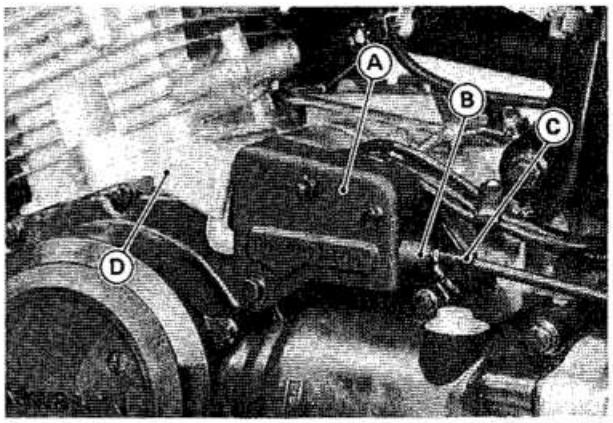
Whenever the differential cable is removed and the differential shift lever play is excessive, adjust the differential cable.

- Push the differential shift lever down all the way to the "LOCK" position.
- Unhook the shift fork lever return spring.
- Remove the shift fork lever nut and take off the lever.



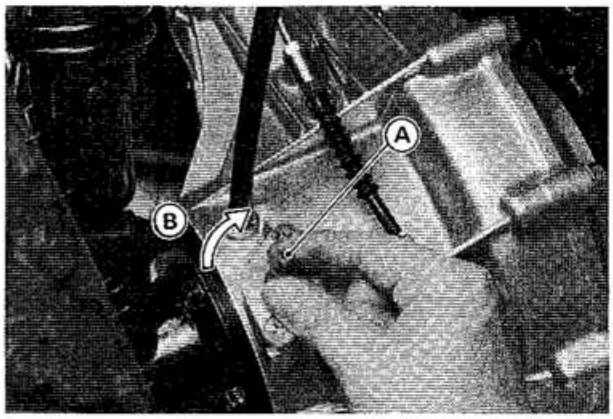
A. Shift Fork Lever
B. Return Spring
C. Cable Adjuster
D. Mounting Nuts

- Loosen the cable adjuster mounting nuts.
- Slide the cable housing forward until the front end of it seats fully into the holder on the case, tighten the cable adjuster mounting nuts without changing the position of the cable housing and clamp the open end of the cable bracket to secure the cable housing in place.



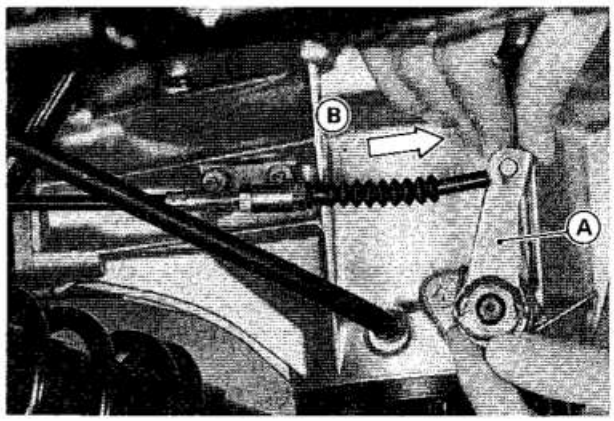
A. Cable Housing
B. Holder
C. Cable Bracket
D. Differential Shift Lever (in "LOCK" position)

- Rotating the rear wheels, shift the rear axle into the locked-axle mode by turning the shift fork shaft clockwise.



A. Shift Fork Shaft
B. Turn clockwise.

- Fit the cable tip into the catch on the shift fork lever and mount the lever onto the shaft pulling the cable taut.



A. Shift Fork Lever
B. Pull the cable taut.

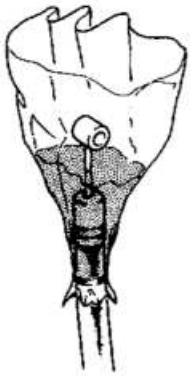
•Hook the shift fork lever return spring.

Differential Cable Lubrication

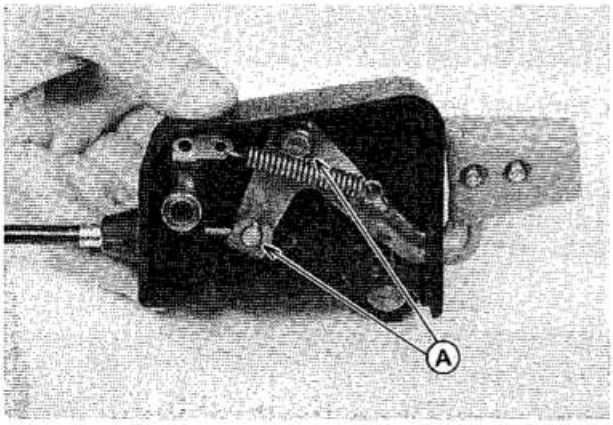
Whenever the differential cable is removed, lubricate the differential cable as follows.

•Lubricate the differential cable by seeping the oil between the cable and cable housing.

Cable Lubrication



•Apply a thin coating of multi-purpose grease to the differential shift lever pivot area and the differential cable ends.

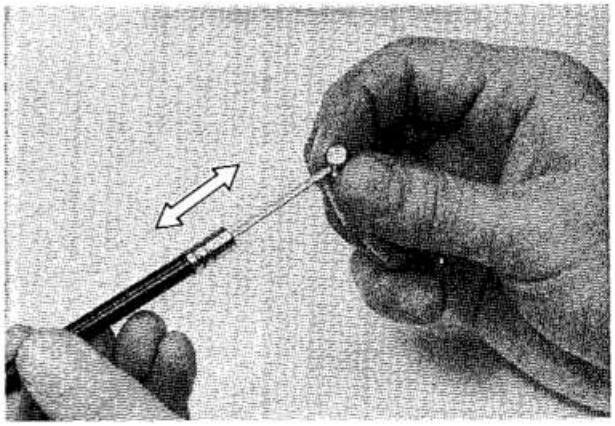


A. Apply grease.

Differential Cable Insepction

•With the differential cable disconnected at the both ends, the cable should move freely within the cable housing.

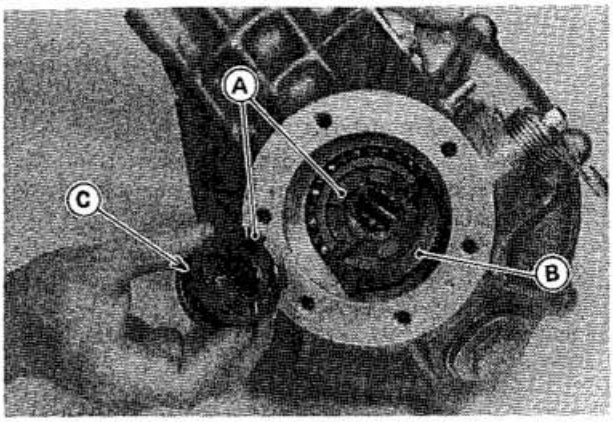
★If cable movement is not free after lubricating (see Differential Cable Lubrication), if the cable is frayed, or if the housing is kinked, replace the cable.



Shifter and Shift Fork Inspection

•Visually inspect the dogs on the shifter and differential gear housing, and the shifter groove, and shift fork.

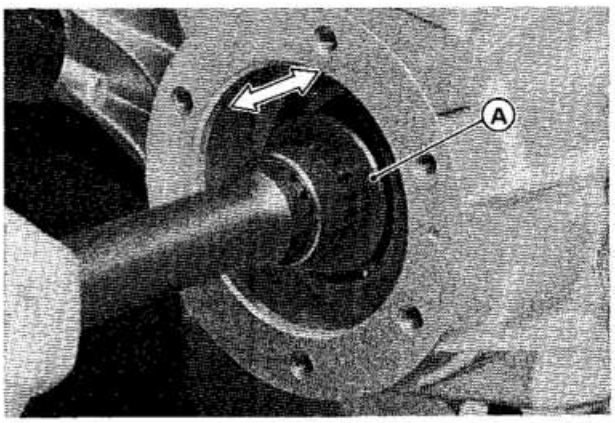
★If they are damaged or worn excessively, replace them.



A. Dogs B. Shift Fork C. Groove

•Check that the shifter slides smoothly on the axle shaft.

★If it does not slide smoothly, repair the splines on the shifter and axle shaft or replace them if necessary.



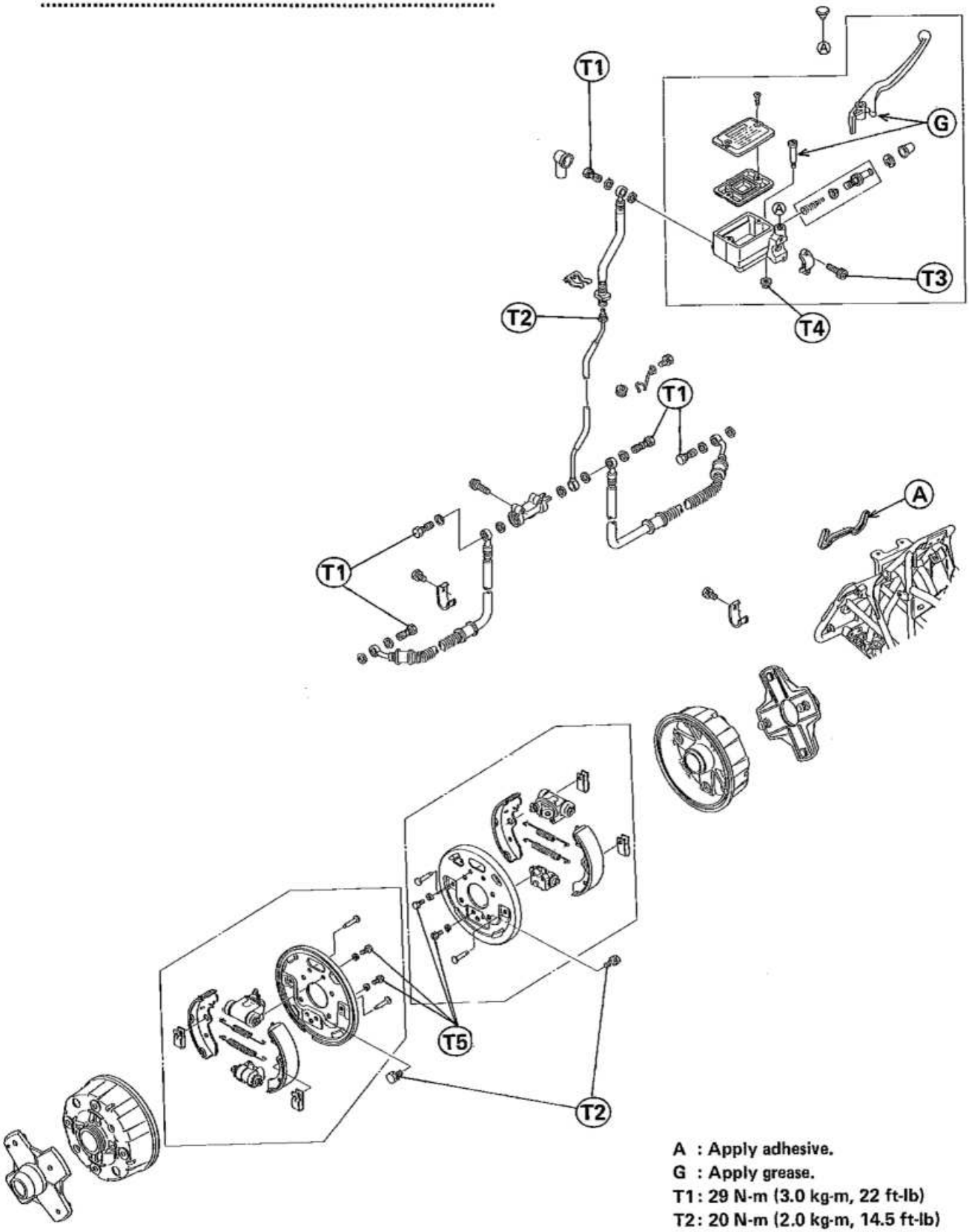
A. Shifter

Brakes

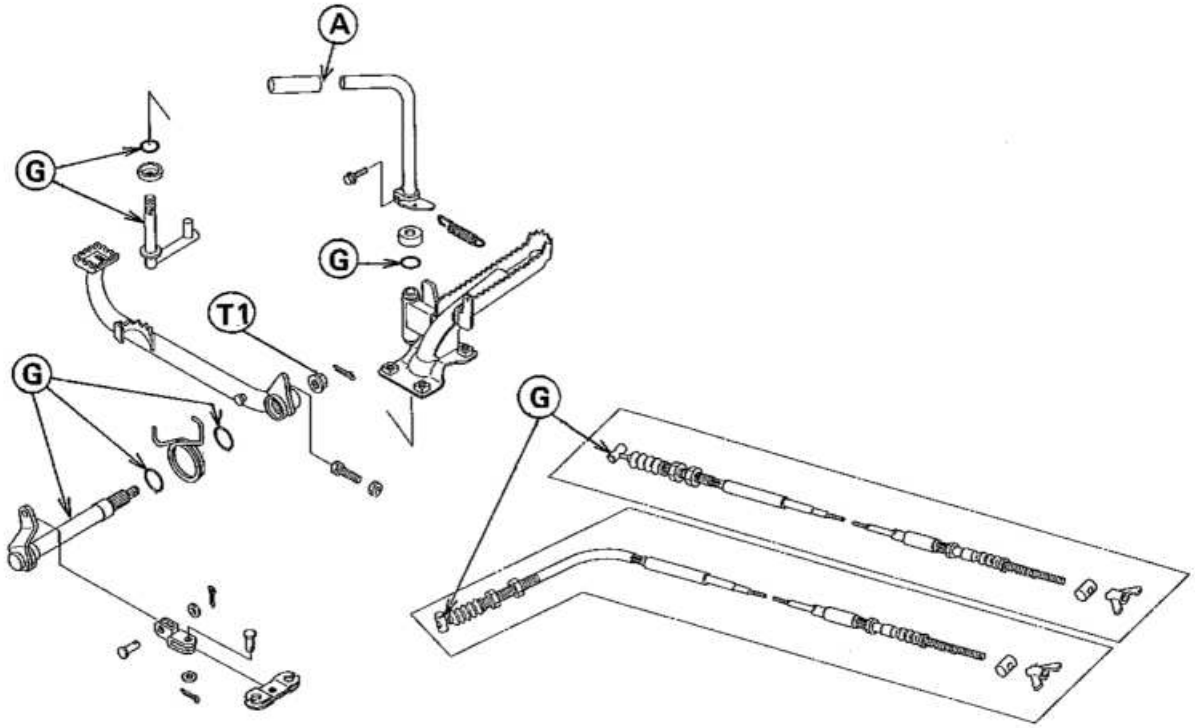
Table of Contents

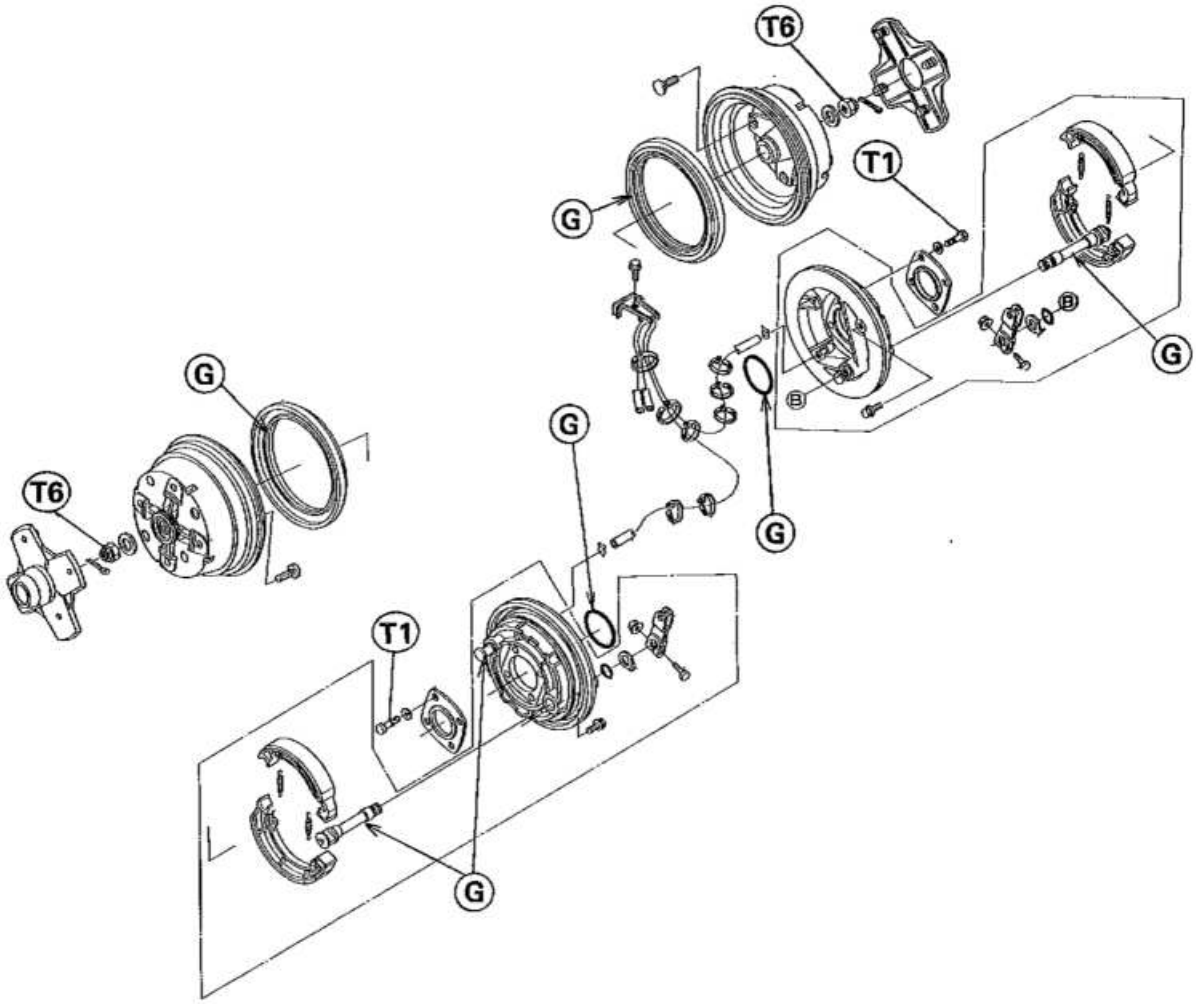
Exploded View 10-2
Specifications 10-4
Special Tool 10-4
Brake Adjustment 10-5
  Front Brake Lever Free Play Inspection 10-5
  Brake Shoe Adjustment 10-5
  Rear Brake Pedal Free Play Inspection 10-6
  Rear Brake Pedal Free Play Adjustment 10-6
  Cam Lever Angle Adjustment 10-7
Brake Fluid 10-7
  Brake Fluid Recommendation 10-7
  Brake Fluid Level Inspection 10-8
  Brake Fluid Changing 10-8
  Brake Line Air Bleeding 10-9
Master Cylinder and Wheel Cylinders 10-10
  Master Cylinder Removal 10-10
  Master Cylinder Installation 10-10
  Master Cylinder Disassembly 10-11
  Master Cylinder Assembly 10-11
  Wheel Cylinder Removal 10-11
  Wheel Cylinder Installation 10-11
  Wheel Cylinder Disassembly 10-11
  Wheel Cylinder Assembly 10-11
  Master Cylinder Inspection 10-11
  Wheel Cylinder Inspection 10-12
  Brake Lever Lubrication 10-12
Brake Hoses 10-12
  Brake Hose Removal 10-12
  Brake Hose Installation 10-12
  Brake Hose Inspection 10-13
Brake Drums 10-13
  Front Brake Drum Removal/Installation 10-13
  Rear Brake Drum Removal 10-13
  Rear Brake Drum Installation 10-13
  Brake Drum Wear 10-13
  Rear Brake Drum Seal Wear 10-14
Brake Panel Assemblies 10-14
  Front Brake Panel Removal/Disassembly 10-14
  Front Brake Panel Assembly/Installation 10-15
  Rear Brake Panel Removal/Disassembly 10-15
  Rear Brake Panel Assembly/Installation 10-15
  Brake Shoe Lining Wear 10-16
  Brake Shoe Spring Inspection 10-16
  Brake Camshaft and Camshaft Hole Wear 10-16
  Brake Panel Lubrication 10-16
Brake Pedal and Cables 10-17
  Brake Pedal and Cable Removal 10-17
  Brake Pedal and Cable Installation 10-18
  Brake Cable Inspection 10-18
  Brake Pedal and Cable Lubrication 10-18

Exploded View



A : Apply adhesive.
G : Apply grease.
T1: 29 N-m (3.0 kg-m, 22 ft-lb)
T2: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T3: 11 N-m (1.1 kg-m, 95 in-lb)
T4: 5.9 N-m (0.60 kg-m, 52 in-lb)
T5: 7.8 N-m (0.80 kg-m, 69 in-lb)
T6: 145 N-m (15.0 kg-m, 110 ft-lb)


A
G
G
T1
G
G


T6
T1
G
G
G
G
G
T6
T1
G

Specifications

Brakes:

Item	Standard	Service Limit
Front Brake Lever Free Play	25 – 30 mm	—
Rear Brake Pedal Free Play	20 – 30 mm	—
Rear Brake Cam Lever Angle	80 – 90°	—
Brake Fluid: Grade	D.O.T.3	—
Brand	Recommended as below.	—
Brake Drum Inside Diameter	160.000 – 160.160 mm	160.55 mm
Brake Shoe Lining Thickness	4.0 mm	2.0 mm
Rear Brake Camshaft Diameter	16.957 – 16.984 mm	16.83 mm
Rear Brake Camshaft Hole Diameter	17.000 – 17.027 mm	17.15 mm

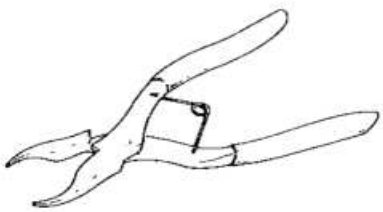
Recommended Brake Fluid

Type	Brand
D.O.T.3	Atlas Extra Heavy Duty Shell Super Heavy Duty Texaco Super Heavy Duty Wagner Lockheed Heavy Duty Castrol Girling-Universal Castrol GT (LMA) Castrol Disc Brake Fluid

Special Tool

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

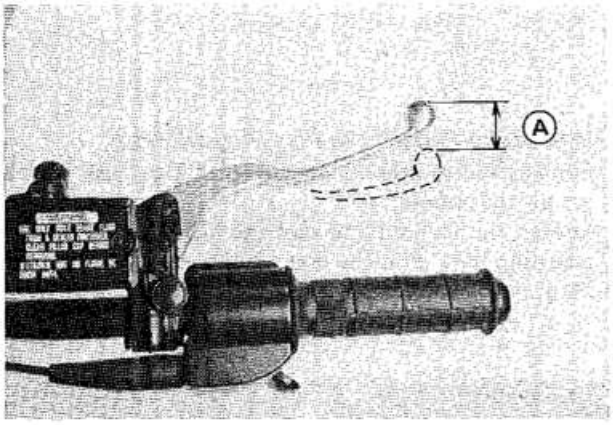
Circlip Pliers: 57001-143



Brake Adjustment

Front Brake Lever Free Play Inspection

•Pull the front brake lever fully until the front brake is dragged firmly. This is the free play.



A. Brake Lever Free Play

★If the front brake lever free play is incorrect, adjust the brake shoe to drum clearance for both front wheels (see Brake Shoe Adjustment).

★If the free play cannot be corrected by adjusting the brake shoes, there might be air in the brake lines and the air bleeding must be necessary (see Brake Line Air Bleeding).

Front Brake Lever Free Play

Standard:	**25 – 30 mm**

•Operate the lever a few times to see that it returns to its rest position immediately upon release.

•Rotate the front wheels to check for brake drag.

•Check braking effectiveness.

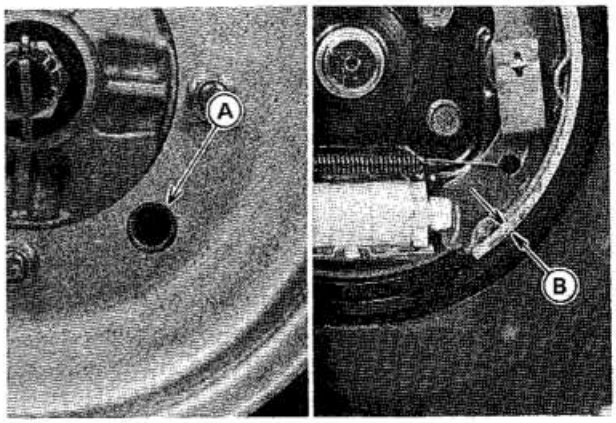
★If there is any doubt as to the conditions of the brake, check the brake parts for wear or damage.

Brake Shoe Adjustment

•Support the vehicle on a stand so that the front wheels are off the ground.

•Pull the rubber cap out of the wheel.

•Through the inspection hole marked "SHOE CHECK", inspect the brake shoe lining thickness at several points.



A. Shoe Check Hole B. Lining Thickness

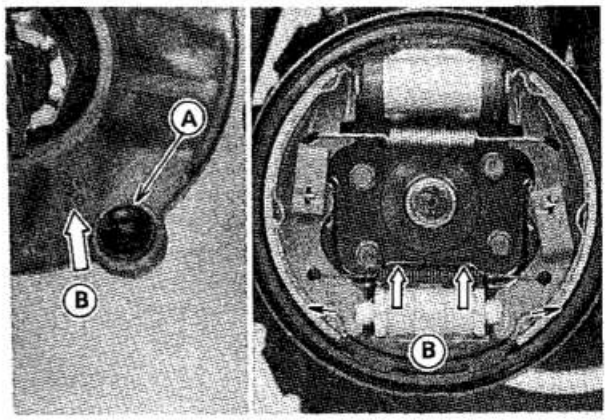
Brake Shoe Lining Thickness

Standard:	**4.0 mm**
Service Limit:	**2.0 mm**

★If any lining thickness is less than the service limit, replace both shoes as a set.

•Apply a brake several times.

•Insert a thin screwdriver through the hole marked "SHOE ADJUST", and turn the brake shoe adjusting wheel in the direction shown below to expand the shoe.



A. Shoe Adjust Hole B. Turn adjusting wheel.

•Continue turning the adjusting wheel until a firm drag is felt when attempting to rotate the wheel.

•Turn back the adjusting wheel until the wheel just turns free and then turn back three clicks more to provide running clearance.

CAUTION

○**Do not adjust the brake shoes too close to the drum. The brake will drag, heat up and lock. The lining will be charred and rendered useless.**

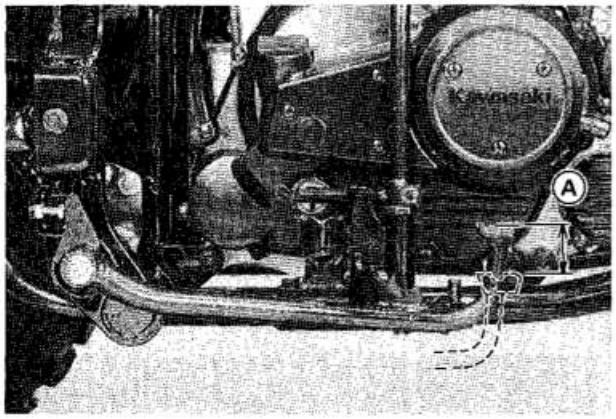
•Apply a brake several times and rotate the wheel to check for brake drag.
•Repeat the previous step one more time for the other shoe.

Rear Brake Pedal Free Play Inspection

•Depress the rear brake pedal lightly by hand. This is the free play.

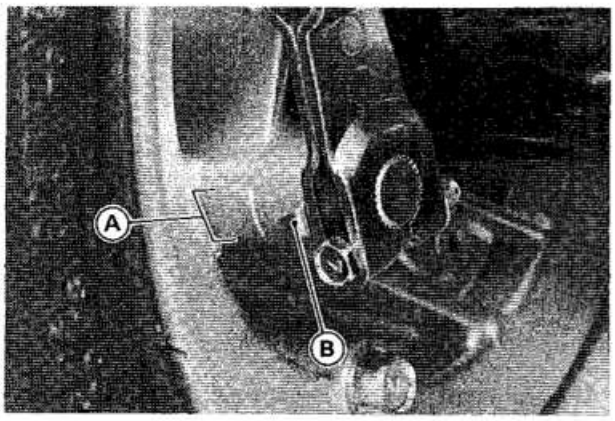
Rear Brake Pedal Free Play

Standard: **20 – 30 mm**



A. Brake Pedal Free Play

•Check each brake lining wear indicator points within the USABLE RANGE when the brake is fully applied.
★If does not, the brake shoes must be immediately replaced and the other brake parts examined.

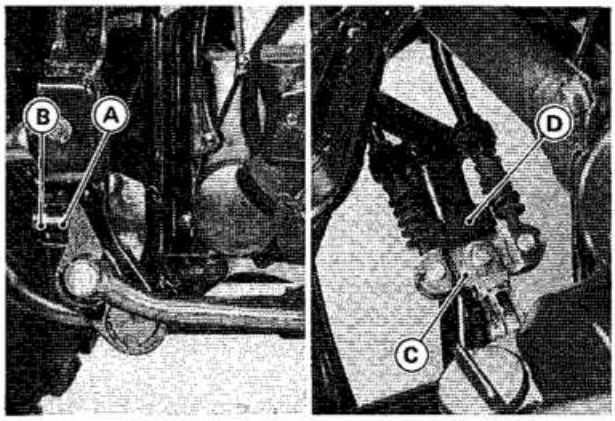


A. USABLE RANGE B. Wear Indicator

★If the rear brake pedal free play is incorrect and each lining wear indicator points within the USABLE RANGE, adjust the rear brake pedal free play (see Rear Brake Pedal Free Play Adjustment).
•Operate the pedal a few times to see that it returns to its rest position immediately upon release.
•Rotate the rear wheels to check for brake drag.
•Check braking effectiveness.
★If there is any doubt as to the conditions of the brake, check the brake parts for wear or damage.

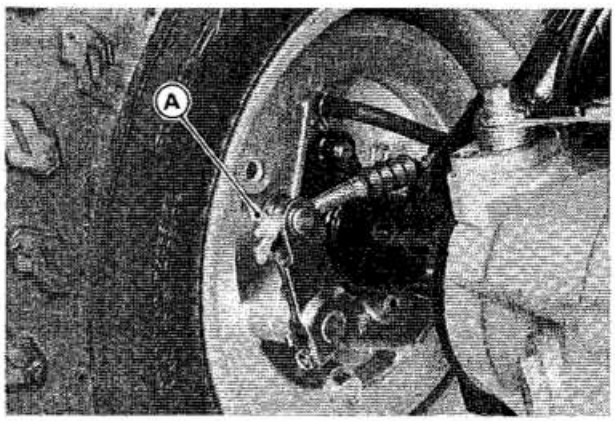
Rear Brake Pedal Free Play Adjustment

•Support the vehicle on a stand so that the rear wheels are off the ground.
•Loosen the locknut and turn the brake pedal position adjusting bolt until the brake cable equalizer stops by the frame bracket.



A. Adjusting Bolt C. Equalizer
B. Locknut D. Bracket

•Shift the rear axle to the unlocked-axle mode.
•Turn the adjuster at the rear end of the cable until a light drag is felt when attempting to rotate the wheel.



A. Adjuster

•Repeat the above step one more time for the other cable.

NOTE

○*If the rear brake cables cannot be adjusted by using the adjusters at the rear ends of the cables, use the adjusters at the equalizer. Do not forget to securely tighten the adjuster mounting nuts.*

•Adjust the brake pedal position to suit you by turning the brake pedal adjusting bolt.
•Tighten the locknut.
•Turn both adjusters at the rear ends of the brake cables until the brake pedal has the correct amount of play. The adjusters must be turned in the same direction and the same number of turns. This will keep the equalizer in the straight ahead position.
•Check the cam lever comes to the proper angle with the brake cable when the brake is fully applied.

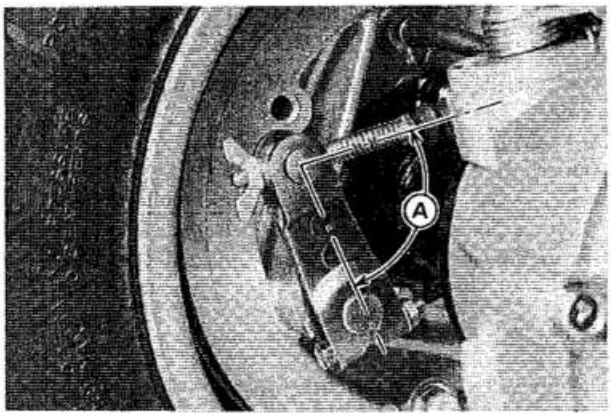
Cam Lever Angle

Standard: **80 – 90°**

★If does not, adjust the cam lever angle (see Cam Lever Angle Adjustment).

WARNING

○**Since a cam lever angle greater than 90° reduces braking effectiveness, cam lever angle adjustment should not be neglected.**



A. Cam Lever Angle (80 – 90°)

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 has a proper angle when the brake is fully applied.

Cam Lever Angle

Standard: **80 – 90°**

•Adjust the rear brake pedal free play (see Rear Brake Pedal Free Play Adjustment).

WARNING

○**When remounting the cam, be sure that the position of the indicator on the serrated shaft is not altered.**
○**A change in cam lever angle is caused by wear of internal brake parts. Whenever the cam lever angle 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.**

Brake Fluid

Brake Fluid Recommendation

Recommended fluids are given in the table below. If none of the recommended fluids are available, use extra heavy-duty brake fluid only from a container marked D.O.T.3.

Recommended Brake Fluid

Type	**D.O.T.3**
Brand	**Atlas Extra Heavy Duty**
	Shell Super Heavy Duty
	Texaco Super Heavy Duty
	Wagner Lockheed Heavy Duty
	Castrol Girling-Universal
	Castrol GT (LMA)
	Castrol Disc Brake Fluid

WARNING

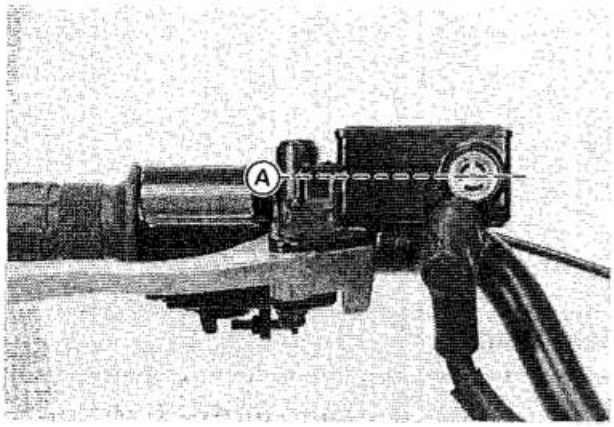
○Never reuse old brake fluid.
○Do not use fluid from a container that has been left unsealed or that has been open for a long time.
○Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause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

CAUTION

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

Brake Fluid Level Inspection

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

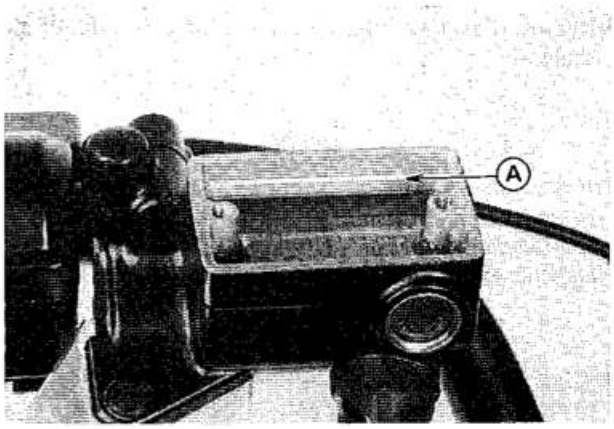


A. Lower Level

★If the fluid level is lower than the lower level, check for the fluid leakage of the brake line, and add the fluid as follows.
○Remove the reservoir cap, and fill the reservoir to the upper level line in the reservoir with the same type and brand of the fluid that already is in the reservoir. And then install the reservoir cap.

WARNING

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



A. Upper Level Line

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

WARNING

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

Brake Fluid Changing

●Remove the front wheels (see Wheel Removal in the Wheels/Tires chapter).
●Remove the reservoir cap, and remove the rubber cap on the bleed valve.
●Attach a clear plastic hose to the bleed valve on the wheel cylinder, 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.
●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.

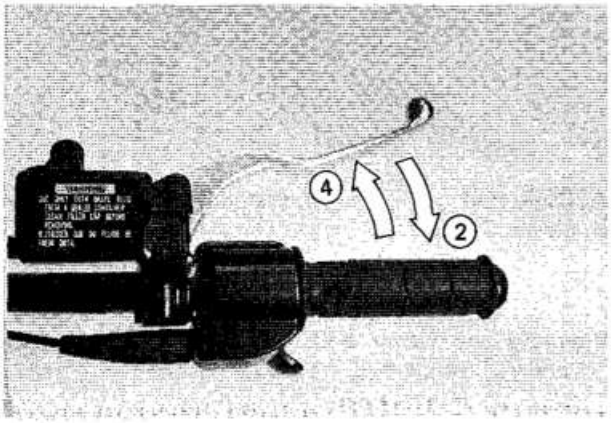
NOTE

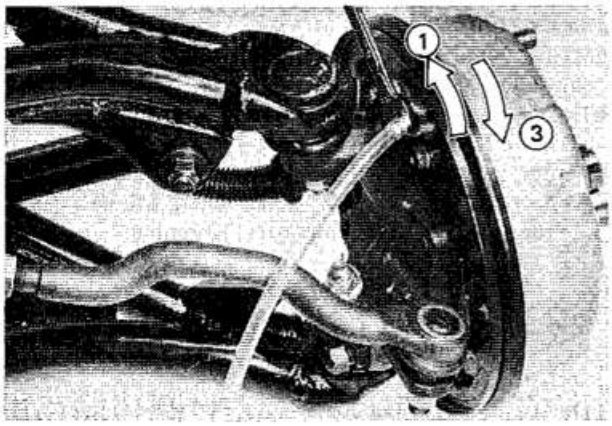
○*Replenish the fluid in the reservoir as often as necessary to keep it from running completely out.*

●Repeat the above 2 steps one more time for the other side.
●Bleed the air from the lines (continue with Brake Line Air Bleeding).

- Tighten the bleed valves to the specified torque (see Exploded View).
- Install the front wheels (see Wheel Installation in the Wheels/Tires chapter).

Filling up Brake Line





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

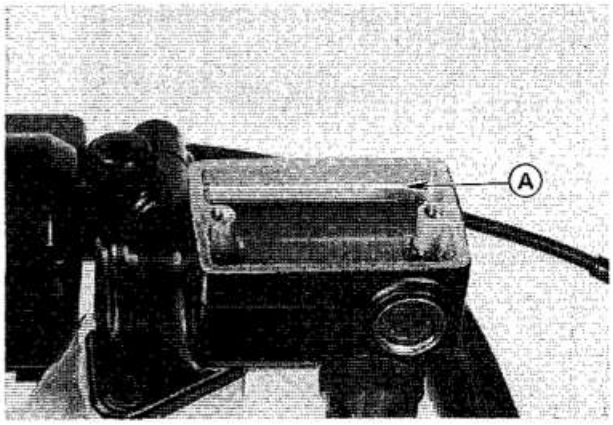
Brake Line Air Bleeding

- Remove the front wheels (see Wheel Removal in the Wheels/Tires chapter).
- Remove the reservoir cap, and check that there is plenty of fluid in the reservoir.

NOTE

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

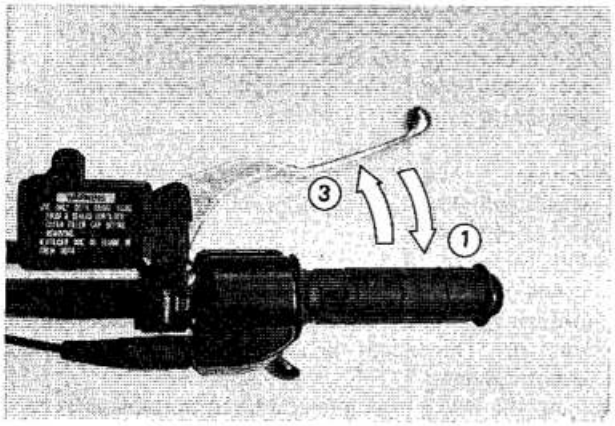
- Connect a clear plastic hose to the bleed valve at the wheel cylinder, running the other end of the hose into a container.
- With the reservoir cap off, slowly pump the brake lever several times until no air bubbles can be see rising up through the fluid from the holes at the bottom of the reservoir.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

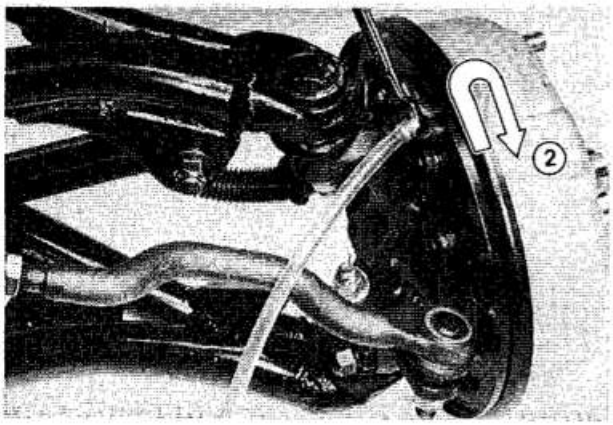


A. Upper Level Line

- Install the reservoir cap.
- Tighten the bleed valves to the specified torque (see Exploded View).
- Apply the brake lever forcefully for a few seconds, and check for fluid leakage around the fittings.
- Install the front wheels (see Wheel Installation in the Wheels/Tires chapter).

Bleeding Brake Line





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

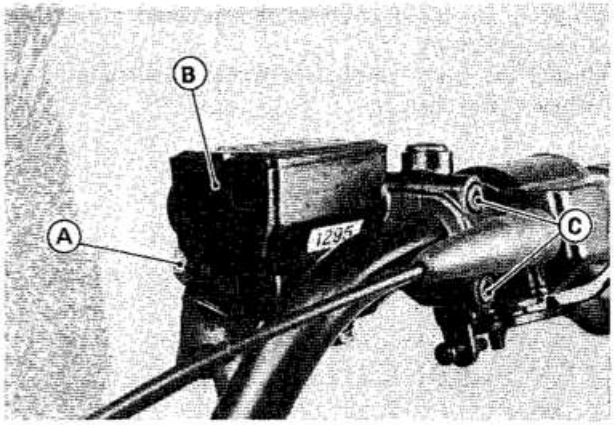
Master Cylinder and Wheel Cylinders

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 an aluminum washer on each side of the hose fitting.
- Immediately wipe up any brake fluid that spills.

CAUTION

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

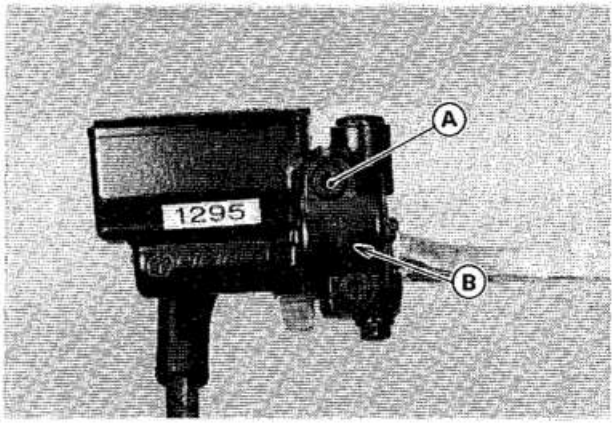


A. Banjo Bolt
B. Master Cylinder
C. Clamp Bolts

- Remove the clamp bolts and take off the master cylinder.

Master Cylinder Installation

- Master cylinder installation is the reverse of removal. Note the following.
- The master cylinder clamp must be installed with the UP mark faced upwards.
- Torque the upper clamp bolt first, and then the lower clamp bolt (see Exploded View). There will be a gap at the lower part of the clamp after tightening.



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

- Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolt to the specified torque (see Exploded View).
- Bleed the brake line after master cylinder installation (see Brake Line Air Bleeding).
- Check that the brake line has proper fluid pressure and no fluid leakage.

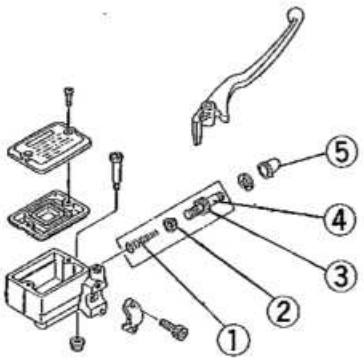
Master Cylinder Disassembly

- Remove the master cylinder (see Master Cylinder Removal).
- Remove the reservoir cap and diaphragm, and empty out the brake fluid.
- Remove the locknut and pivot screw, and remove the brake lever.
- Slide the dust cover out of its place.
- Remove the retainer with the circlip priers (special tool: P/N 57001-143) and pull the piston with secondary cup, and take off the primary cup and spring.

NOTE

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

Master Cylinder



1. Spring
2. Primary Cup
3. Secondary Cup
4. Piston
5. Dust Cover

Master Cylinder Assembly

- Master cylinder assembly is the reverse of disassembly. Note the following.
- Before assembly, clean all parts including the master cylinder with brake fluid or alcohol, and apply brake fluid to the removed parts and the inner wall of the cylinder.

CAUTION

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

- Lubricate the brake lever (see Brake Lever Lubrication).

Wheel Cylinder Removal

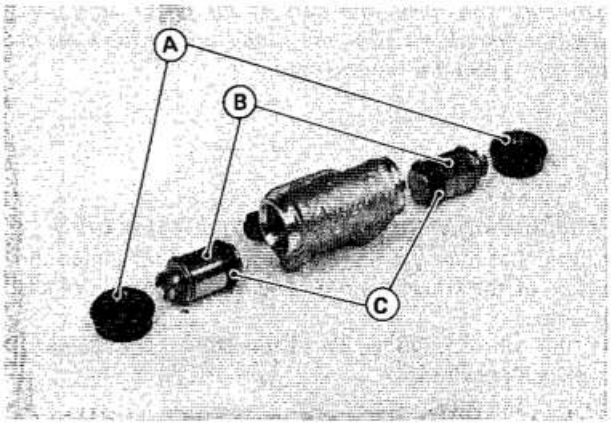
- The wheel cylinders are removed during front brake panel disassembly (see Front Brake Panel Removal/ Disassembly).

Wheel Cylinder Installation

- The wheel cylinders are installed during front brake panel assembly (see Front Brake Panel Assembly/ Installation).

Wheel Cylinder Disassembly

- Remove the wheel cylinder (see Wheel Cylinder Removal).
- Pull the dust covers out of the cylinder.
- Pull the pistons and cups out of the cylinder.



A. Dust Covers
B. Pistons
C. Cups

Wheel Cylinder Assembly

- Wheel cylinder assembly is the reverse of disassembly. Note the following.
- Before assembly, clean all parts including the wheel cylinder with brake fluid or alcohol, and apply brake fluid to the removed parts and the inner wall of the cylinder.

CAUTION

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

Master Cylinder Inspection (Visual Inspection)

- Check that there are no scratches, rust or pitting on the inside of the master cylinder and on the outside of the piston.

★If the master cylinder or piston shows any damage, replace them.

- Inspect the primary cup and secondary cup.

★If a cup is worn, damaged, softened (rotted), or swollen, replace the piston assembly.
★If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cup.
●Check the dust cover for damage.
★If it is damaged, replace it.
●Check that the relief and supply ports are not plugged.
★If the small relief port becomes plugged, blow the ports clean with compressed air.
●Check the piston return spring for any damage.
★If the spring is damaged, replace the piston assembly.

NOTE

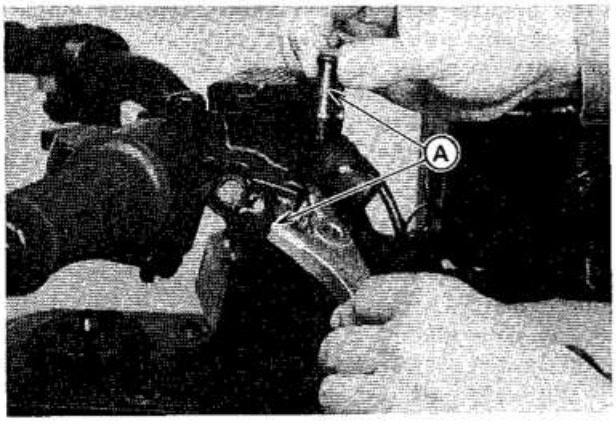
○*The cups and spring are part of the piston assembly. Replace the piston assembly if any one of the cups or the spring requires replacement.*

Wheel Cylinder Inspection (Visual Inspection)

●Check that there are no scratches, rust or pitting on the inside of the wheel cylinder and on the outside of the pistons.
★If the wheel cylinder or piston shows any damage, replace the cylinder.
●Inspect the cups.
★If a cup is worn, damaged, softened (rotted), or swollen, replace the cylinder.
★If fluid leakage is noted at the dust covers, the cylinder should be replaced to renew the cup.
●Check the dust covers for damage.
★If these are damaged, replace them.

Brake Lever Lubrication

Whenever the master cylinder is disassembled, and in accordance with the Periodic Maintenance Chart, perform the following.
●Lubricate the brake lever by applying a light coating of multi-purpose grease to the brake lever pivot screw and the contact with the piston.

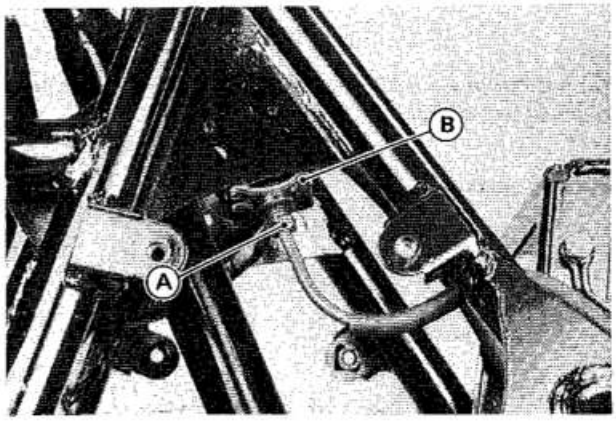


A. Apply grease.

Brake Hoses

Brake Hose Removal

●Remove the banjo bolts at both ends of the brake hose, and pull the hose off the vehicle. There is an aluminum washer on each side of the hose fitting.
●To remove the metal pipe, unscrew the metal pipe nipple and pull out the retainer.



A. Metal Pipe Nipple B. Retainer

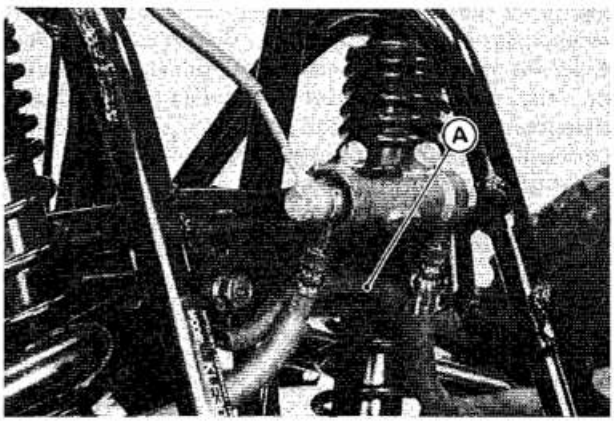
●Immediately wipe up any brake fluid that spills.

CAUTION

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

Brake Hose Installation

●If the hose protector was removed, install it to the frame bracket by applying an adhesive to it.



A. Hose Protector

•Using a new aluminum washer for each side of the hose fittings, tighten the banjo bolts to the specified torque (see Exploded View).
•Tighten the metal pipe nipple to the specified torque (see Exploded View).
•Bleed the air from the brake line (see Brake Line Air Bleeding).

Brake Hose Inspection

•The high pressure inside the brake line can cause fluid to leak or the hose to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.
★Replace it if any cracks or bulges are noticed.
•The metal pipe which feeds the brake fluid to the 2-way joint is made of plated steel, and will rust if the plating is damaged.
★Replace the hose if it is rusted, cracked (especially check the fittings), or if the plating is badly scratched.

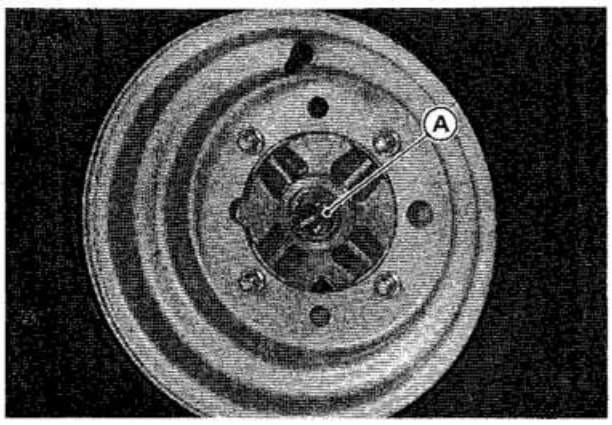
Brake Drums

Front Brake Drum Removal/Installation

•The front brake drums are removed and installed during front hub bearing removal and installation (see Front Hub Bearing Removal and Front Hub Bearing Installation in the Wheels/Tires chapter).

Rear Brake Drum Removal

•Remove the rear wheels (see Wheel Removal in the Wheels/Tires chapter).
•Remove the cotter pins and loosen the axle nuts. Hold the axle from turning by applying the rear brake while loosening the axle nuts.



A. Axle Nut

•Pull each brake drum off the end of the axle.

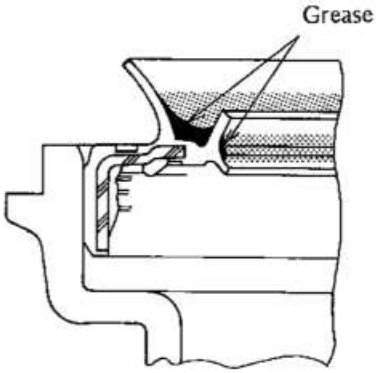
WARNING

○**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:**
1. Never blow brake lining dust with compressed air.
2. If any components are to be cleaned, wash them with detergent, then immediately discard the cleaning solution and wash your hands.
3. Do not grind any brake lining material unless a ventilation hood is available and properly used.

Rear Brake Drum Installation

•Rear brake drum installation is the reverse of removal. Note the following.
•Apply a low-temperature grease to the brake drum seal lip. An example of a low-temperature grease is NOK TOPAS JL152.

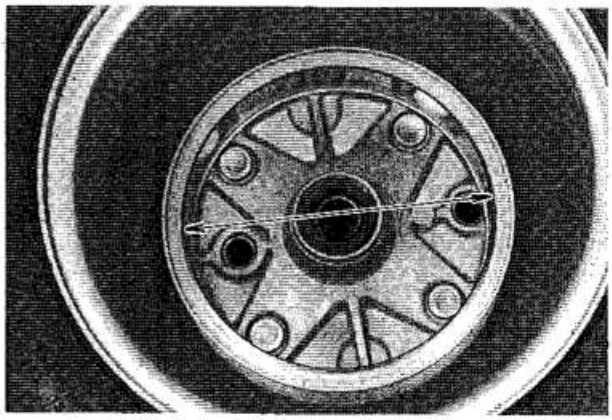
Brake Drum Seal Lubrication



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

Brake Drum Wear

•Measure the inside diameter of the drum.
○Use calipers and measure at several points.



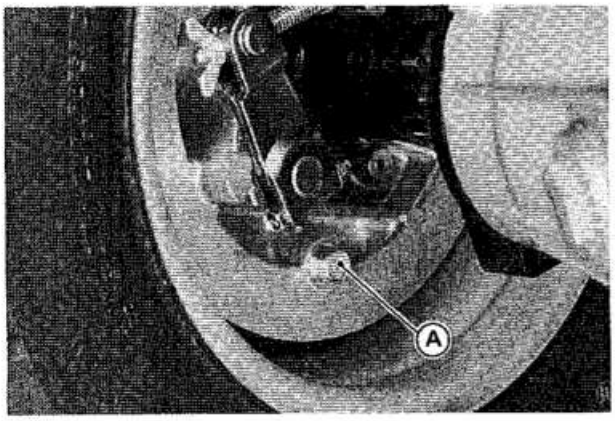
★If any measurement is greater than the service limit, replace the drum.
★If the drum is worn unevenly or scored, lightly turn the drum on a brake drum lathe or replace it. Do not turn the drum beyond the service limit.

Brake Drum Inside Diameter

Standard:	**160.000 – 160.160 mm**
Service Limit:	**160.55 mm**

Rear Brake Drum Seal Wear

Whenever the braking efficiency of the rear brake has decreased, perform the following.
●Remove the drain plug at the bottom of the rear brake panel and check to see if any water comes out.



A. Drain Plug

★If any water drains, the rear brake drum seal is damaged and must be immediately replaced. Also, inspect the other brake parts.

Brake Panel Assemblies

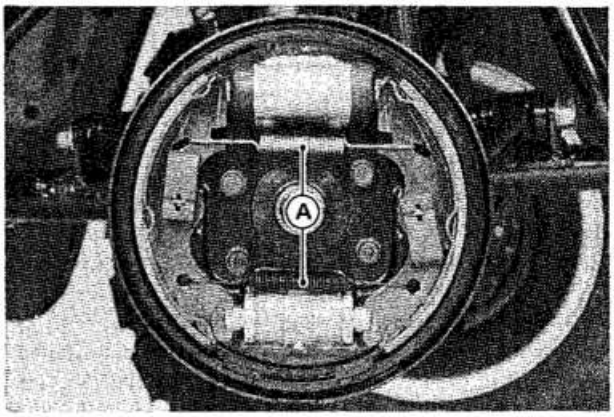
Front Brake Panel Removal/Disassembly

●Remove the front brake drum (see Front Brake Drum Removal).

WARNING

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1. Never blow brake lining dust with compressed air.
2. If any components are to be cleaned, wash them with detergent, then immediately discard the cleaning solution and wash your hands.
3. Do not grind any brake lining material unless a ventilation hood is available and properly used.

●Remove the brake shoe springs.

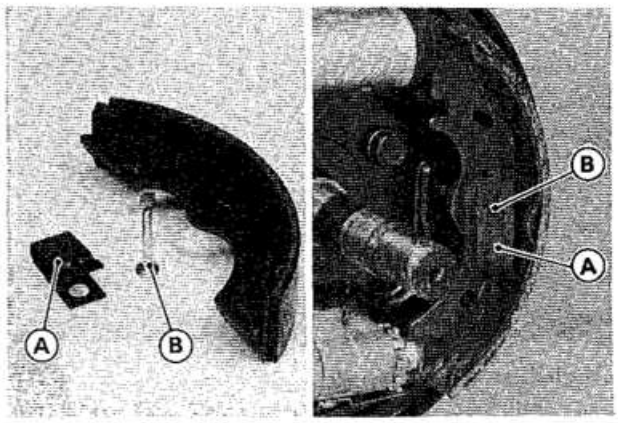


A. Brake Shoe Springs

●Remove the retainers and take off the brake shoes.
○Push the shoe hold-down spring and twist the pin to remove them.

NOTE

○*Hold the brake shoes with a clean cloth to protect the linings from grease and dirt.*

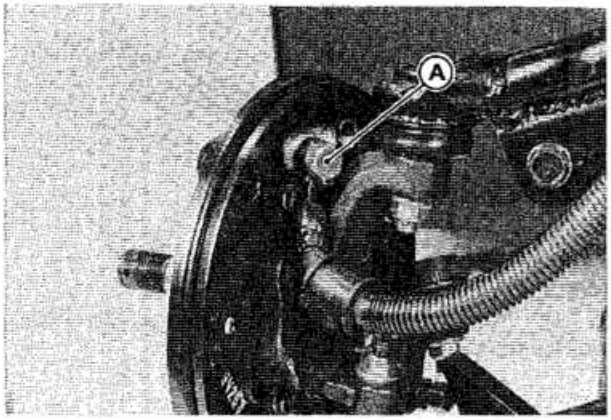


A. Shoe Hold-down Spring B. Pin

•Remove the banjo bolt to disconnect the lower end of the brake hose from the wheel cylinder. There is an aluminum washer on each side of the hose fitting.
○Immediately wipe up any brake fluid that spills.

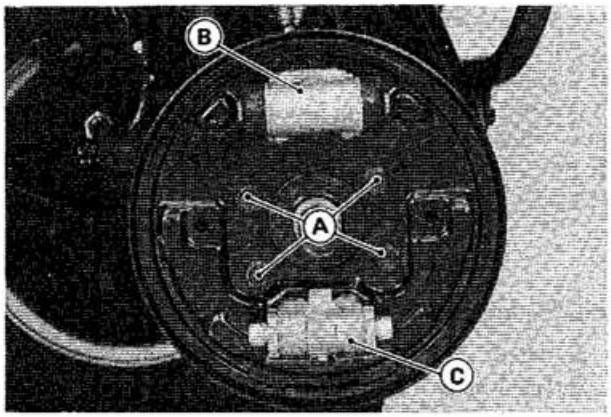
CAUTION

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



A. Brake Hose Banjo Bolt

•Remove the brake panel mounting bolts, and take off the brake panel assembly.



A. Brake Panel Mounting Bolts
B. Wheel Cylinder
C. Shoe Adjuster

•Remove the bolts and take off the brake shoe adjuster.
•Remove the bolts and take off the wheel cylinder.

Front Brake Panel Assembly/Installation

•Front brake panel assembly/installation is the reverse of removal/disassembly. Note the following.
•Tighten the following bolts to the specified torque (see Exploded View).
Wheel Cylinder Mounting Bolts
Shoe Adjuster Mounting Bolts
Brake Panel Mounting Bolts
Brake Hose Banjo Bolt
•Lubricate the brake panel parts (see Brake Panel Lubrication).
•Bleed the brake line (see Brake Line Air bleeding) after brake panel installation.
•Adjust the brake shoe to drum clearance (see Brake Shoe Adjustment).

Rear Brake Panel Removal/Disassembly

•Remove the rear brake drum (see Rear Brake Drum Removal).

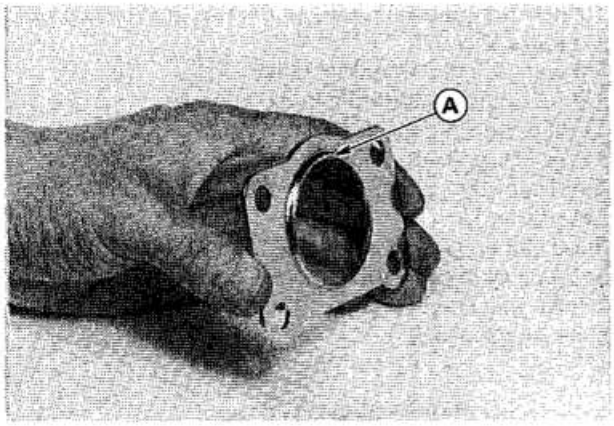
WARNING

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1. Never blow brake lining dust with compressed air.
2. If any components are to be cleaned, wash them with detergent, then immediately discard the cleaning solution and wash your hands.
3. Do not grind any brake lining material unless a ventilation hood is available and properly used.

•Unscrew the adjuster at the rear end of the rear brake cable, and pull the cable out of the joint. Do not lose the joint and spring.
•Remove the brake panel mounting bolts and plate, and take off the brake panel assembly and O-ring.
•Hold the brake shoes, one in each hand with a clean cloth to protect the linings from grease and dirt.
•Pull up on the shoes to remove them from the panel.
•Remove the springs to separate the two shoes.
•Mark the cam and lever so that they can be aligned the same way during assembly.
•Remove the brake cam lever and wear indicator.
•Pull the brake cam out from the inside. Do not lose the dust seal.

Rear Brake Panel Assembly/Installation

•Rear brake panel assembly/installation is the reverse of removal. Note the following.
•Lubricate the rear brake panel parts (see Brake Panel Lubrication).
•Install the wear indicator so that it points to the bottom end of the usable range projection.
•Tighten the brake panel mounting bolts to the specified torque (see Exploded View).
○Apply grease to the O-ring and fit it onto the end of the axle pipe.
○The projected portion of the plate must be faced in.



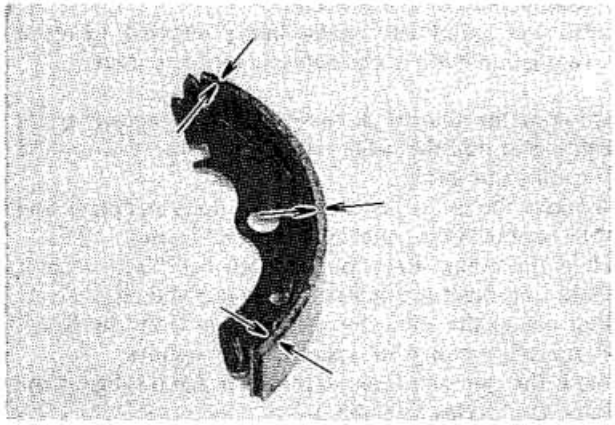
A. Projected Portion

•Adjust the rear brake pedal free play (see Rear Brake Pedal Free Play Adjustment).

Brake Shoe Lining Wear

•Measure the lining thickness.

○Use a caliper or scale, and measure at several points as shown.



Brake Shoe Lining Thickness

Standard:	**4.0 mm**
Service Limit:	**2.0 mm**

★If any measurement is less than the service limit, replace both shoes as a set.

★If the lining thickness is greater than the service limit, do the following before installing the shoes.

•File or sand down any high spots on the surface of the lining.

•Use a wire brush to remove any foreign particles from the lining.

•Wash off any oil or grease with an oilless solvent.

CAUTION

○**Do not use a solvent which will leave an oily residue or the shoes will have to be replaced.**

Brake Shoe Spring Inspection

•Visually inspect the brake shoe springs for breaks or distortion.

★If the springs are damaged in any way, replace them.

Brake Camshaft and Camshaft Hole Wear

•Measure the camshaft diameter.

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

Brake Camshaft Diameter

Standard:	**16.957 – 16.984 mm**
Service Limit:	**16.83 mm**

•Measure the inside diameter of the camshaft hole in the brake panel.

○Use a small hole gauge in several directions inside the hole, and then measure the small hole gauge with a micrometer.

★If any measurement is larger than the service limit, replace the brake panel.

Brake Camshaft Hole Inside Diameter

Standard:	**17.000 – 17.027 mm**
Service Limit:	**17.15 mm**

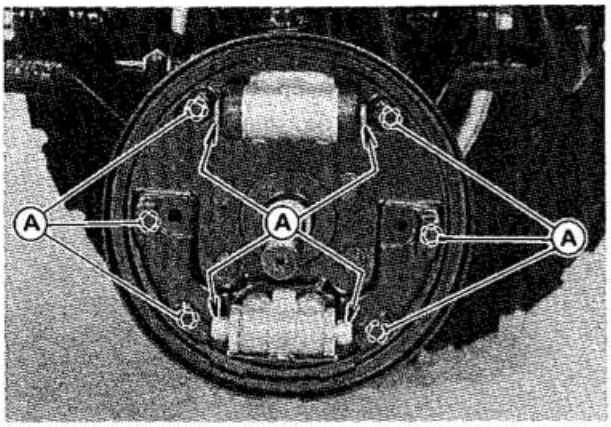
Brake Panel Lubrication

Whenever the brake panel assembly is disassembled, perform the following.

•Clean all old grease out of the brake panel parts with a cloth.

•For the front brake panel, apply a high-temperature grease to the following.

Brake Panel and Brake Shoe Contact Points
Wheel Cylinder Piston Ends
Brake Shoe Adjuster Ends



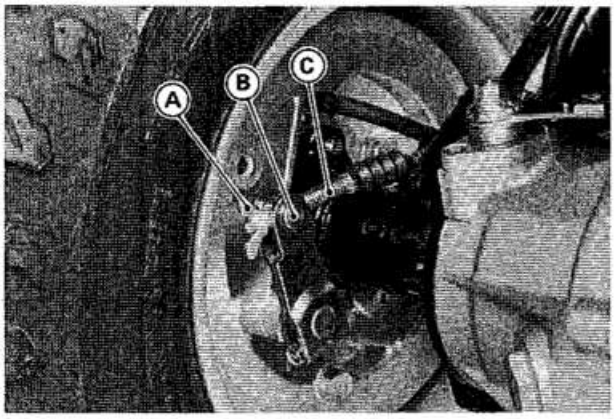
A. Apply grease.

•For the rear brake panel, apply a high-temperature grease to the following.
Brake Shoe Anchor
Spring Ends
Camshaft Groove
Cam Surfaces

Brake Pedal and Cables

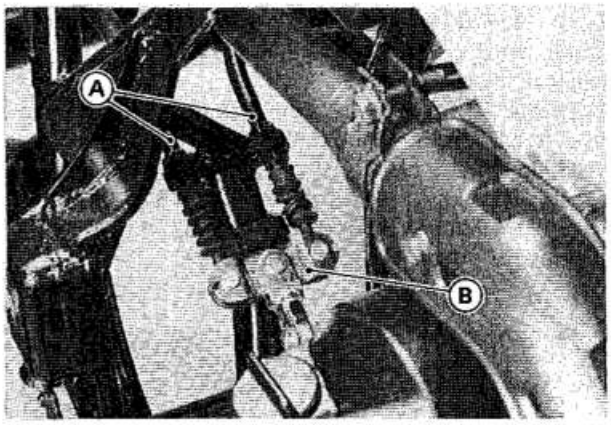
Brake Pedal and Cable Removal

•Remove the brake cables.
○Unscrew the adjusters at the rear ends of the cables, and pull the cable out of the joints and cable mounts. Do not lose the joints and springs.



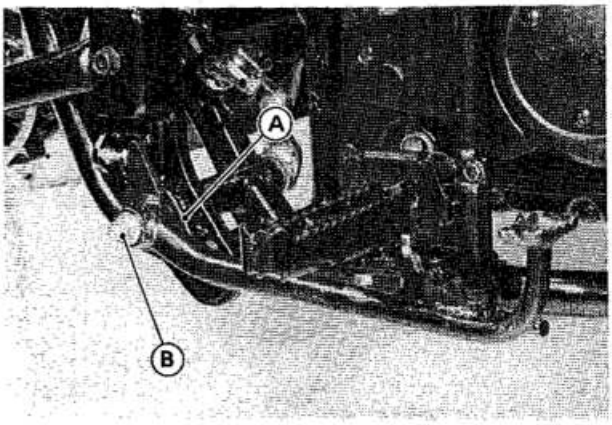
A. Adjuster
B. Joint
C. Spring

○Loosen the mounting nuts, pull the front adjusters of the cables off the mounts, and free the front ends of the cables from the equalizer.



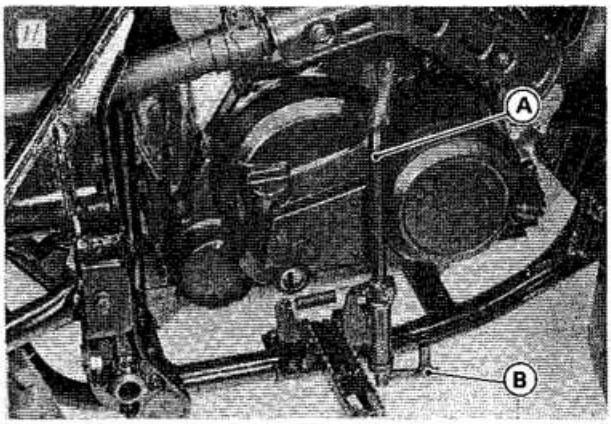
A. Adjusters B. Equalizer

•Remove the brake pedal and lever.
○Unhook the return spring.
○Remove the cotter pin and nut, and pull off the brake pedal and lever. Do not lose the O-rings.



A. Return Spring B. Cotter Pin

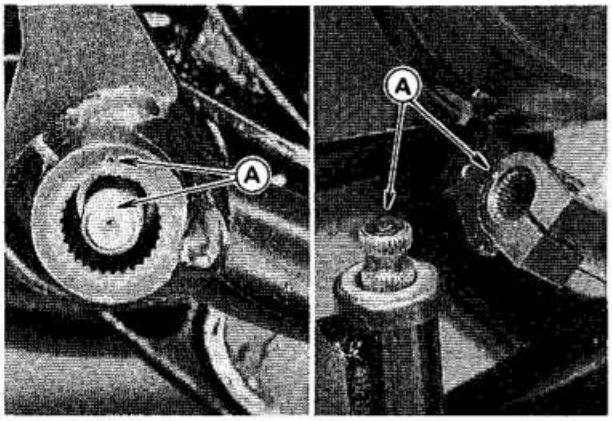
•Remove the parking brake levers.
○Unhook return spring.
○Remove the clamp bolt and pull off the upper and lower levers. Do not lose the O-rings and caps.



A. Upper Lever B. Lower Lever

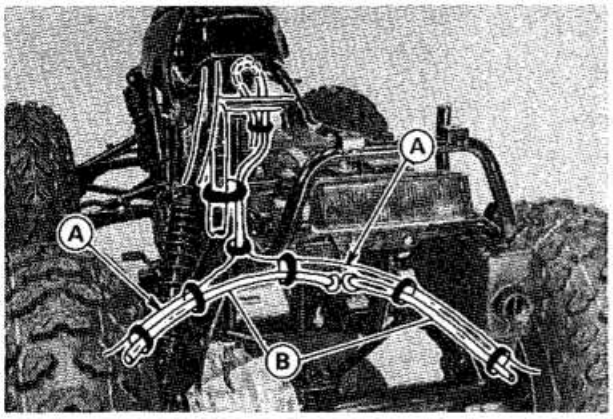
Brake Pedal and Cable Installation

- Brake pedal and cable installation is the reverse of removal. Note the following.
- Lubricate the brake pedal, cables, and/or parking brake lever (see Brake Pedal and Cable Lubrication).
- Install the brake pedal so that the punch mark on the pedal is aligned with the mark on the shaft of the lever.
- Install the upper and lower parking brake levers aligning the punch marks on both levers.



A. Align marks.

- Route the rear brake vent hoses as shown.

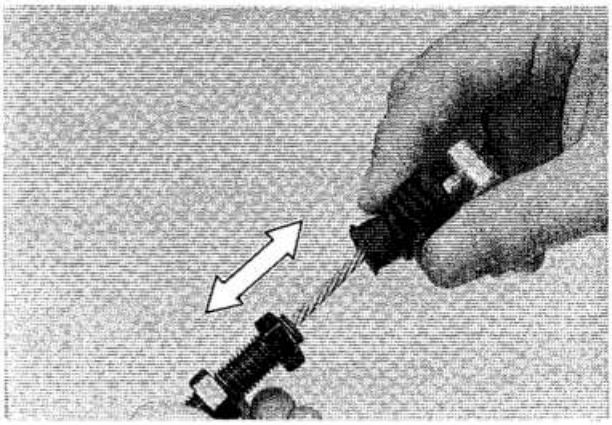


A. Rear Brake Vent Hose B. Brake Cables

- Adjust the rear brake pedal free play (see Rear Brake Pedal Free Play Adjustment).

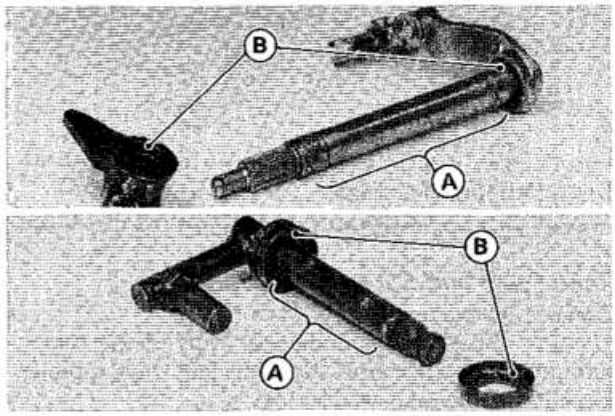
Brake Cable Inspection

- With the brake cable disconnected at the both ends, the cable should move freely within the cable housing.
- ★If cable movement is not free after lubricating (see Brake Pedal and Cable Lubrication), if the cable is frayed, or if the cable housing is kinked, replace the cable.



Brake Pedal and Cable Lubrication

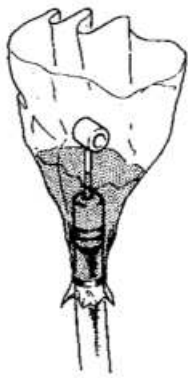
- Clean all old grease out of the brake parts with a cloth.
- Apply a multi-purpose grease to the following:
  Brake Pedal Pivot Shaft
  Parking Brake Lower Lever Shaft



A. Apply grease B. O-rings

- Clean any excess grease from the parts before assembly.
- Lubricate the brake cable by seeping the oil between the cable and cable housing.

Cable Lubrication



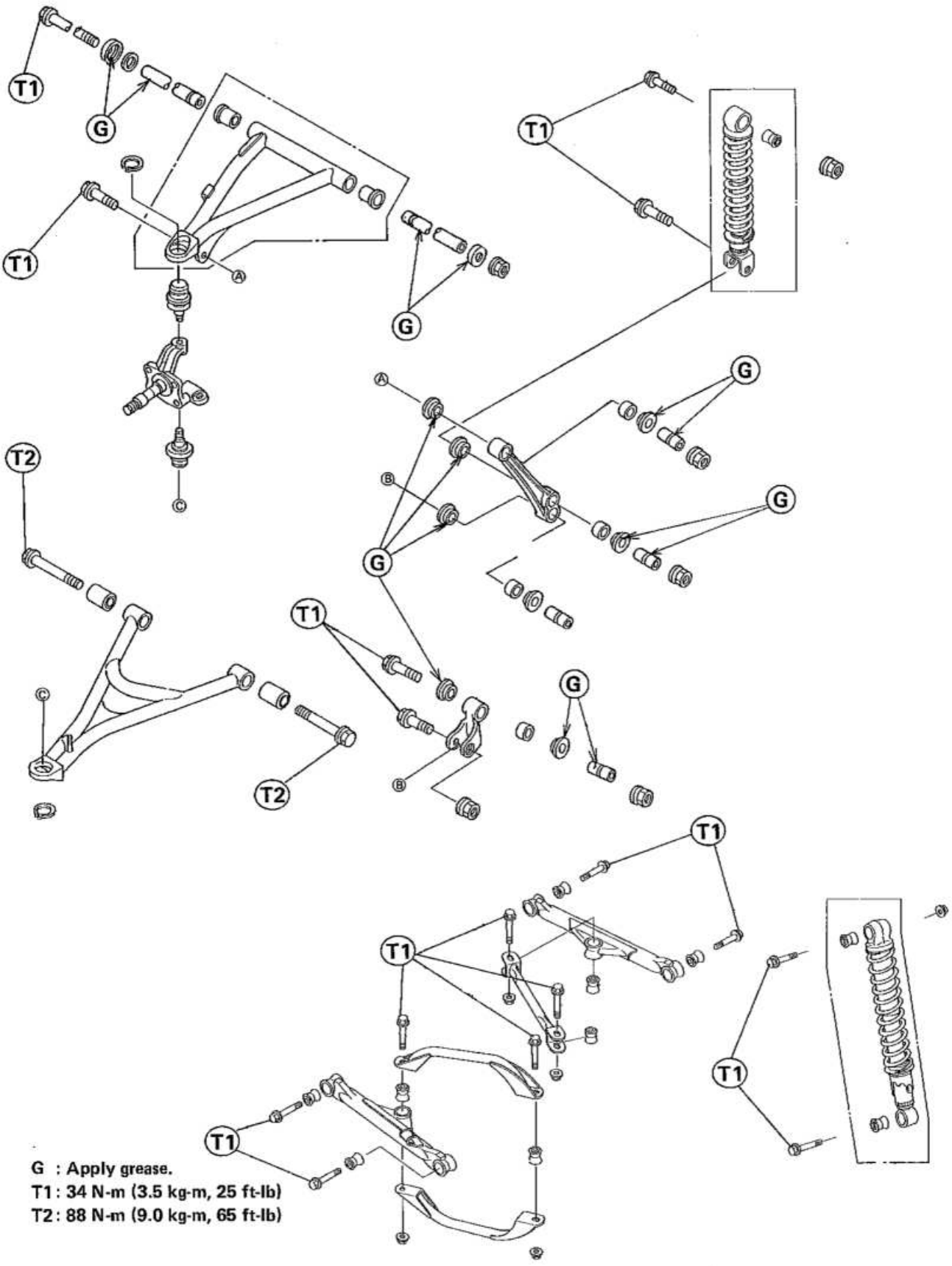
- Oil the following lightly:
  Brake adjusters

Suspension

Table of Contents

Exploded View 11-2
Suspension 11-3
- Shock Absorber Spring Force Adjustment 11-3
- Shock Absorber Removal 11-3
- Shock Absorber Installation 11-3
- Suspension Arm Removal 11-3
- Suspension Arm Installation 11-4
- Suspension Arm Lubrication 11-4
- Shock Absorber and Suspension Arm Inspection 11-4

Exploded View



G : Apply grease.
T1 : 34 N-m (3.5 kg-m, 25 ft-lb)
T2 : 88 N-m (9.0 kg-m, 65 ft-lb)

Suspension

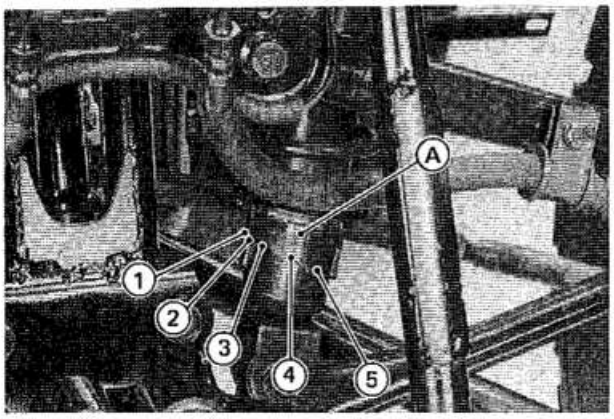
Shock Absorber Spring Force Adjustment

The spring adjusting sleeve on each shock absorber has 5 positions so that the spring can be adjusted for different road and loading conditions.

If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

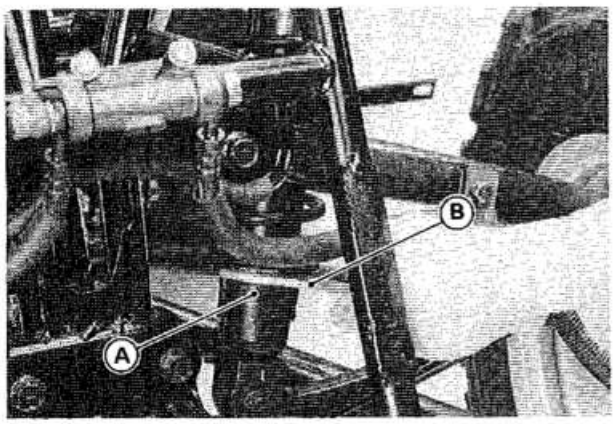
Spring Action

Position	Spring Force	Setting	Load	Road	Speed
1	Stronger	Soft	Light	Good	Low
2	↓	↑↓	↑↓	↑↓	↑↓
3					
4					
5	↓	Hard	Heavy	Bad	High



A. Adjusting Sleeve

•Turn the adjusting sleeve on each shock absorber to the desired position with a hook spanner.



A. Adjusting Sleeve B. Hook Spanner

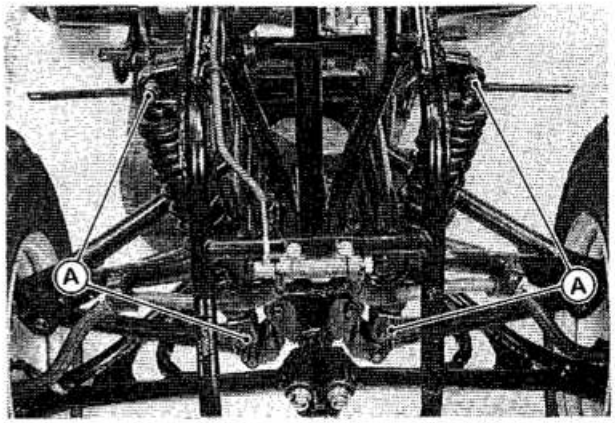
•Check to see that a pair of adjusting sleeves (front two adjusting sleeves or rear two) are turned to the same relative position.

WARNING

○If a pair of adjusting sleeves (front two adjusting sleeves or rear two) are not adjusted equally, handling may be impaired and a hazardous condition may result.

Shock Absorber Removal

•Support the vehicle on a stand so that the front and/or rear wheels are off the ground.
•Remove the upper and lower shock absorber mounting bolts and/or nuts.
•Holding the wheels, pull out the mounting bolts and then shock absorbers.
○Remove the rear wheels (see Wheel Removal in the Wheels/Tires chapter) to remove the lower mounting bolts of the rear shock absorbers easy.



A. Shock Absorber Mounting Bolts

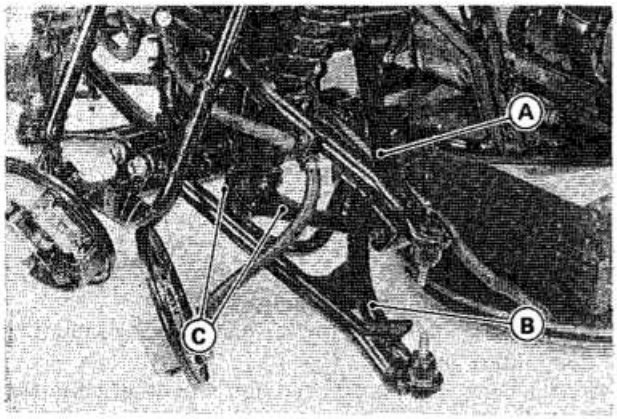
Shock Absorber Installation

•Shock absorber installation is the reverse of removal. Note the following.
•Tighten the upper and lower shock absorber mounting bolts to the specified torque (see Exploded View).

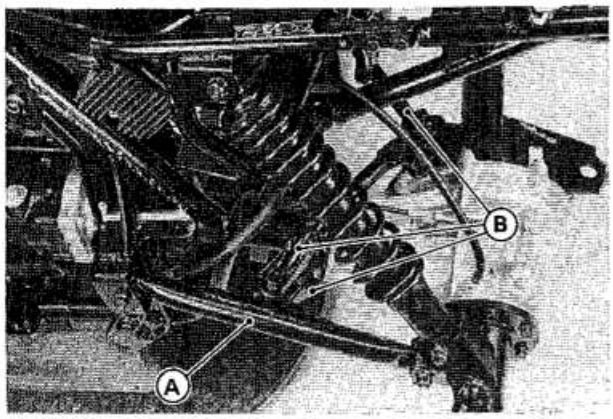
Suspension Arm Removal

•Remove the front and/or rear wheels (see Wheel Removal in the Wheels/Tires chapter).
•To remove the front suspension arms, first remove the following parts.
Brake Drums and Panel Assemblies
Steering Knuckles
Shock Absorber Lower Mounting Bolts
Brake Hose Clamps from Upper Arms

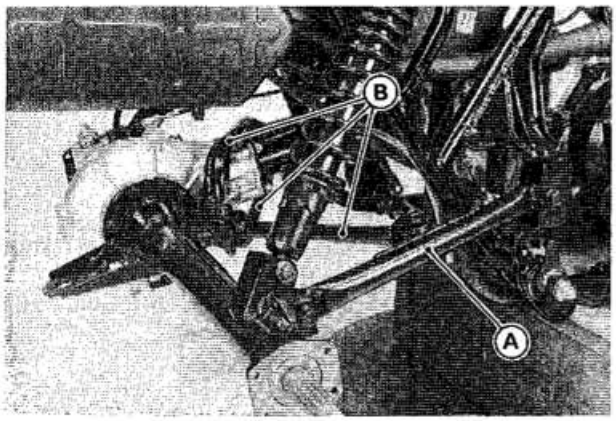
•To remove the rear suspension arms, first remove the final gear case guard.
•Remove the suspension arm pivot bolts and take the suspension arms off the frame.



A. Upper Arm
B. Lower Arm
B. Center Arms



A. Left Arm
B. Center Arms



A. Right Arm
B. Center Arms

Suspension Arm Installation

•Suspension arm installation is the reverse of removal. Note the following.
•Lubricate the suspension arm pivots of the front upper and center arms (see Suspension Arm Lubrication).
•Tighten the suspension arm pivot bolts and shock absorber lower mounting bolts to the specified torque (see Exploded View).

Suspension Arm Lubrication

•Lubricate the suspension arm pivots of the front upper and center suspension arms.
○Remove the front suspension arms.
○Wipe all the old grease out of the sleeves, bushings, and grease seals.
○Apply fresh grease to the sleeves and grease seal lips.

Shock Absorber and Suspension Arm Inspection

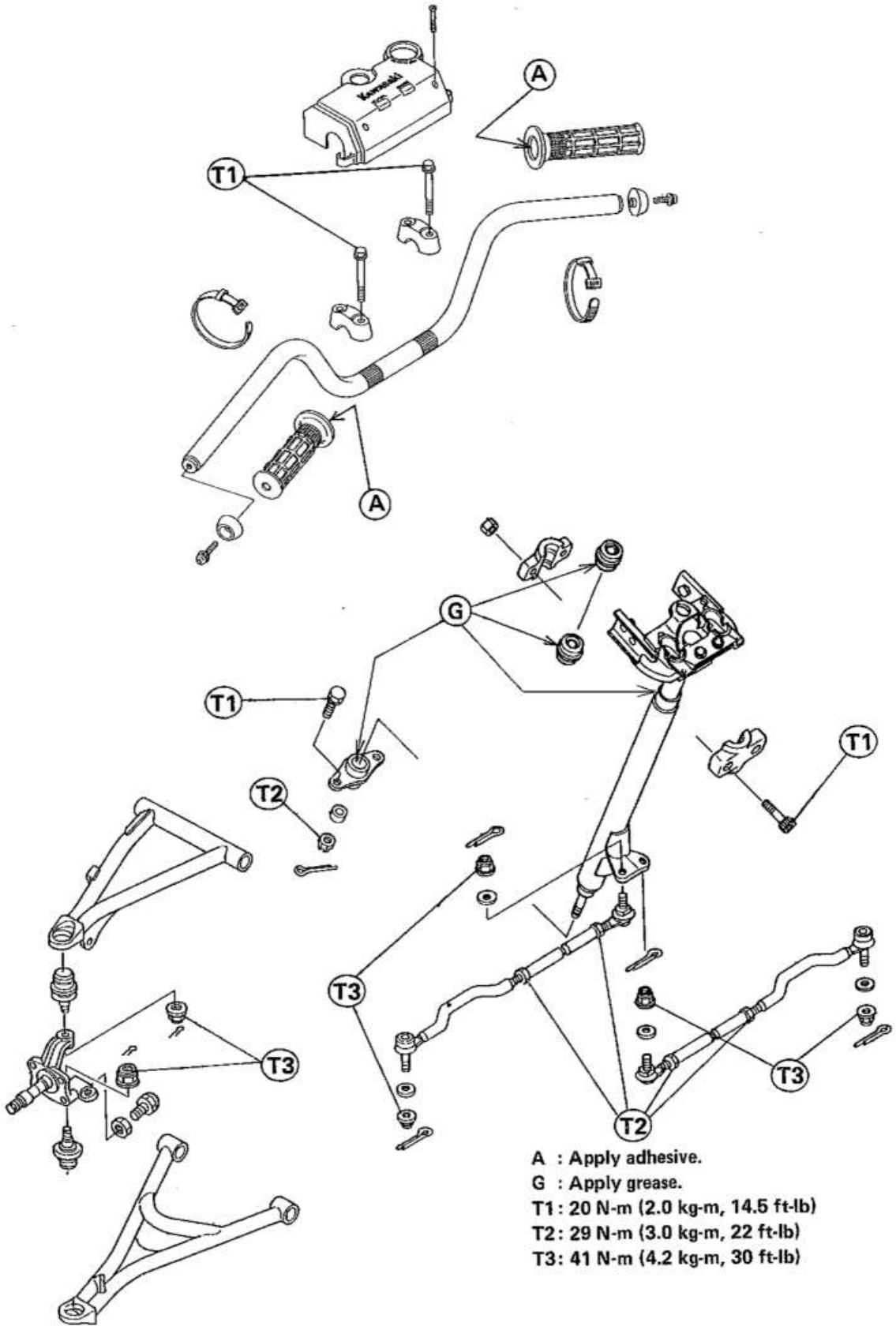
•Visually inspect the rubber bushings in the upper and lower mountings of the shock absorbers, and the ends of the rear and front lower suspension arms.
★If they are worn, cracked, hardened, or otherwise damage, replace them with new ones.

Steering

Table of Contents

Exploded View 12-2
Steering 12-3
- Handlebar Removal 12-3
- Handlebar Installation 12-3
- Handlebar Grip Removal 12-3
- Handlebar Grip Installation 12-4
- Steering Stem Removal 12-4
- Steering Stem Installation 12-4
- Steering Knuckle and Tie-rod Removal 12-5
- Steering Knuckle and Tie-rod Installation 12-5
- Steering Knuckle Stopper Adjustment 12-6
- Steering Inspection 12-6
- Steering Stem Warp 12-6
- Steering Stem Bearing, Tie-rod Bearing, and Steering Knuckle Upper and Lower Joint Inspection 12-6
- Steering Lubrication 12-7

Exploded View

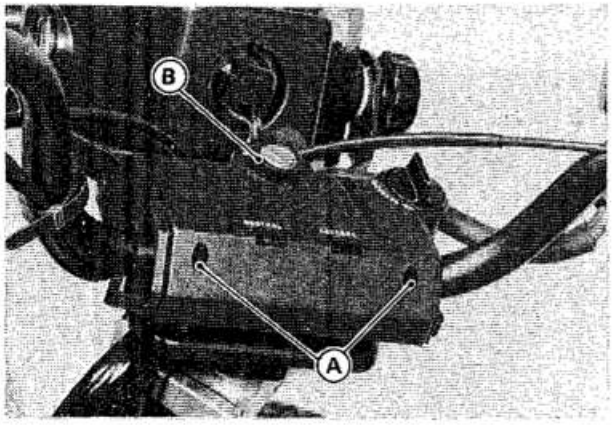


A : Apply adhesive.
G : Apply grease.
T1 : 20 N-m (2.0 kg-m, 14.5 ft-lb)
T2 : 29 N-m (3.0 kg-m, 22 ft-lb)
T3 : 41 N-m (4.2 kg-m, 30 ft-lb)

Steering

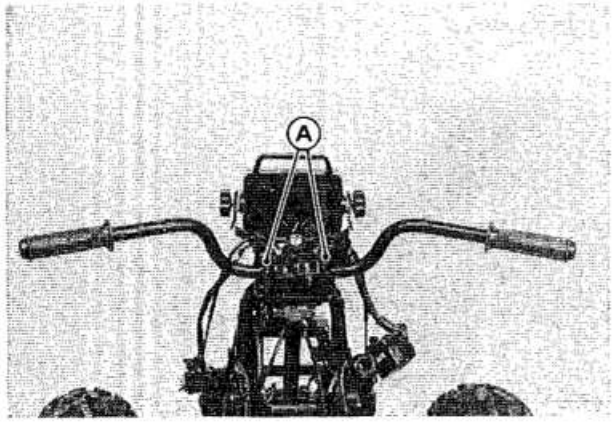
Handlebar Removal

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System chapter).
- Remove the following parts from the handlebar.
  LH Switch Housing
  Throttle Case
  Front Brake Master Cylinder
- Remove the stem head cover screws and ignition switch ring nut, and take off the cover.



A. Screws B. Ring Nut

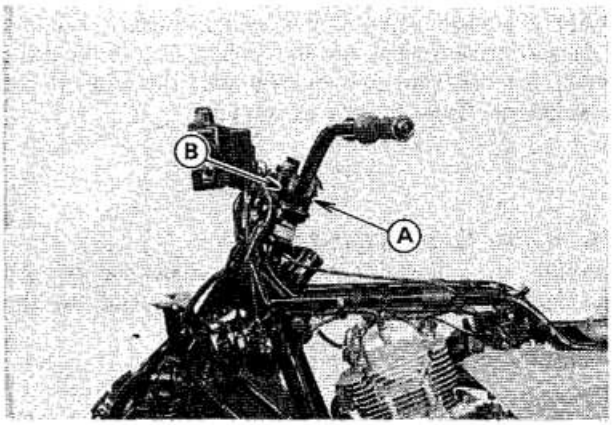
- Remove the handlebar holder bolts and lift off the handlebar.



A. Handlebar Holders

Handlebar Installation

- Handlebar installation is the reverse of removal. Note the following.
- Position the handlebar as shown below before tightening holder bolts.

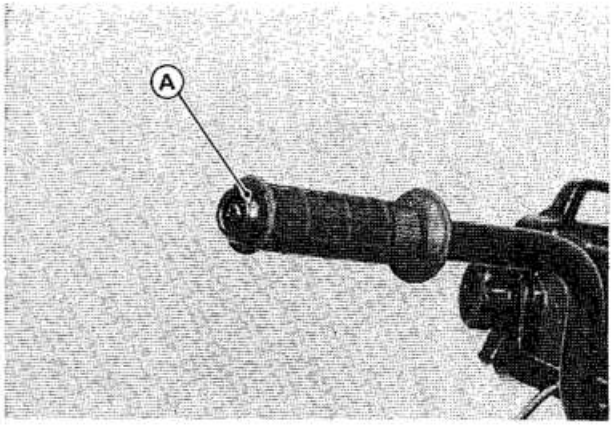


A. No Gap B. Gap

- Tighten the holder rear bolts first and then the front bolts. When the holder is correctly installed, there will be even gap at the front and no gap at the rear after tightening.

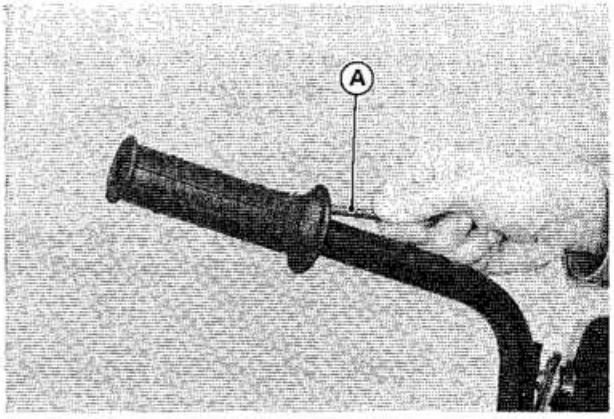
Handlebar Grip Removal

- Remove the screw and take off the plug.



A. Plug

- Slide a thin drift between the grip and the handlebar.



A. Drift

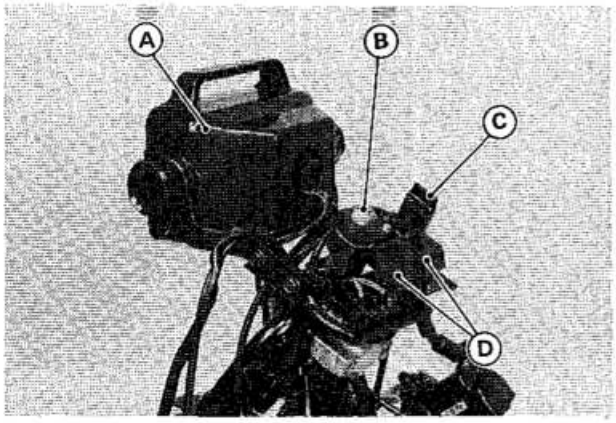
•Apply a small amount of Kawasaki Electric Contact Cleaner or equivalent into the opening next to the drift.
•Pull the drift out and quickly slide the grip off the handlebar. Twist the grip as you pull.

Handlebar Grip Installation

•Apply an adhesive which is recommended by the manufacturer for bonding rubber to metal, to the inside of the grip.
•Slide the grip into position on the handlebar.

Steering Stem Removal

•Remove the following parts.
Front Fender
Fuel Tank
Handlebar
•Remove the following parts from the stem head.
Reverse Knob with Cable
Headlight with Brackets
Ignition Switch
Neutral and Reverse Indicator Light Sockets



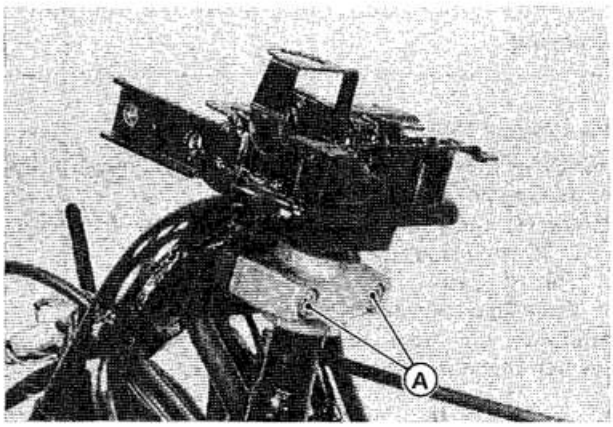
A. Headlight
B. Ignition Switch
C. Reverse Knob
D. Neutral and Reverse Lights

•Remove the cotter pin and remove the tie-rod end nut from each tie-rod at the steering stem.

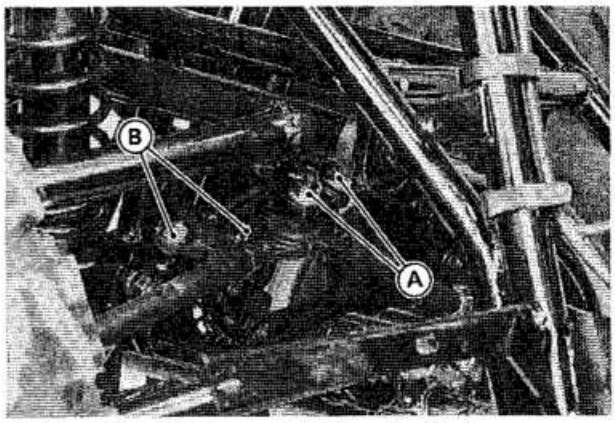
CAUTION

○**Do not loose the locknuts at both end of the tie-rod adjusting sleeve, or the toe-in of the front wheels will be changed.**

•Remove the mounting bolts of the steering stem bearing housing.
•Remove the steering stem clamp Allen bolts, and take off the clamps and grease seals.

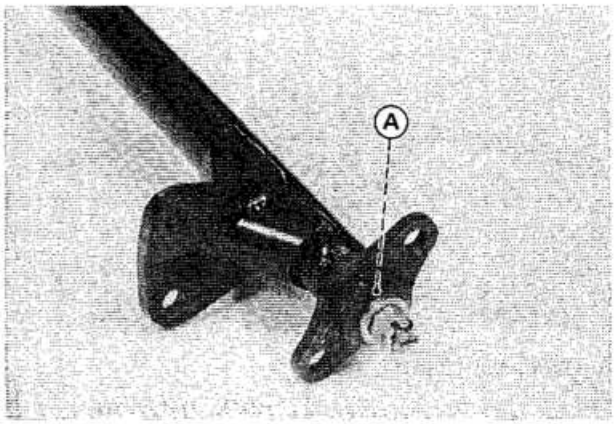


A. Clamp Allen Bolts



A. Tie-rod End Nuts B. Mounting Bolts

•Pull the steering stem out of the frame.
•To remove the steering stem bearing, remove the cotter pin and remove the nut from the bottom end of the steering stem.

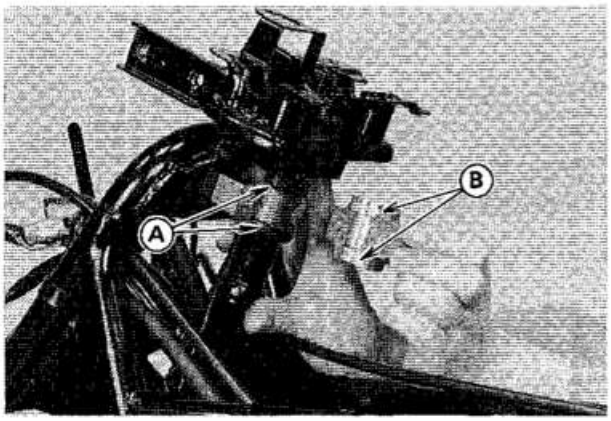


A. Steering Stem Bearing

Steering Stem Installation

•Steering stem installation is the reverse of removal. Note the following.

•Lubricate the steering stem clamp and stem bearing (see Steering Lubrication).
•Install the steering stem clamps so that the ribs on both grease seals fit into the grooves on the steering stem clamps.



A. Ribs B. Grooves

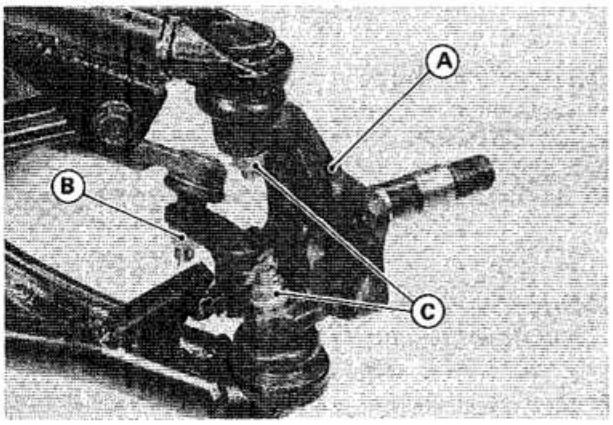
•Tighten the stem bottom end nut, stem bearing housing mounting bolts, stem clamp Allen bolts, and tie-rod end nuts to the specified torque (see Exploded View).
•Inspect the toe-in if necessary (see Toe-in Inspection in the Wheels/Tires chapter).

Steering Knuckle and Tie-rod Removal

•Remove the following parts from the steering knuckle.
Wheel with Hub Assembly
Brake Panel Assembly with Brake Hose
•Remove the cotter pin and remove the tie-rod end nut at the steering knuckle.

CAUTION

○Do not loosen the locknut at both ends of the tie-rod adjusting sleeve, or the toe-in of the front wheels will be changed.



A. Steering Knuckle C. Joint Nuts
B. Tie-rod End Nut

•Remove the cotter pins and remove the steering knuckle upper and lower joint nuts.

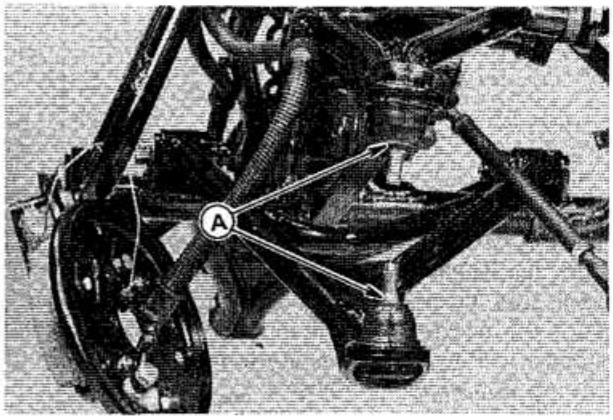
CAUTION

○Do not loosen the locknut of the steering knuckle stopper bolt, or the bolt will be turned. The steering knuckle stopper adjustment may be necessary.

•Pull off the steering knuckle.
•To remove the tie-rod, remove the cotter pin and remove the tie-rod end nut at the steering stem.

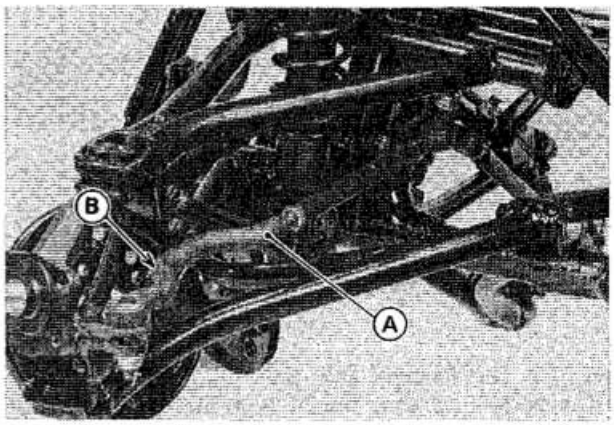
Steering Knuckle and Tie-rod Installation

•Steering knuckle and tie-rod installation is the reverse of removal. Note the following.
•Clean the studs of the steering knuckle upper and lower joints and the tapered holes of the knuckle, or the tapers will not fit sungly.

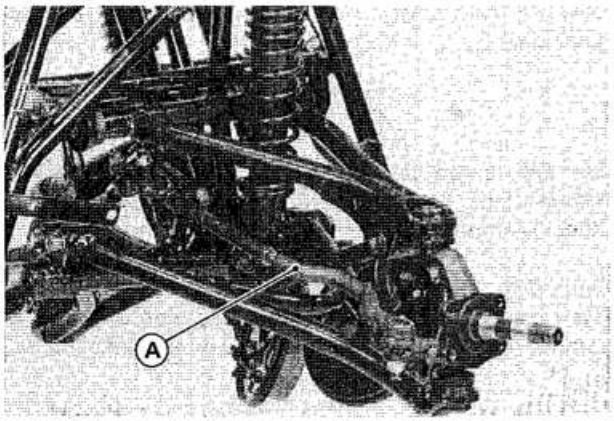


A. Clean.

•The left and right tie-rods must be installed as shown. The tie-rod painted yellow is for the left tie-rod.



A. Left Tie-rod B. Yellow Paint Mark

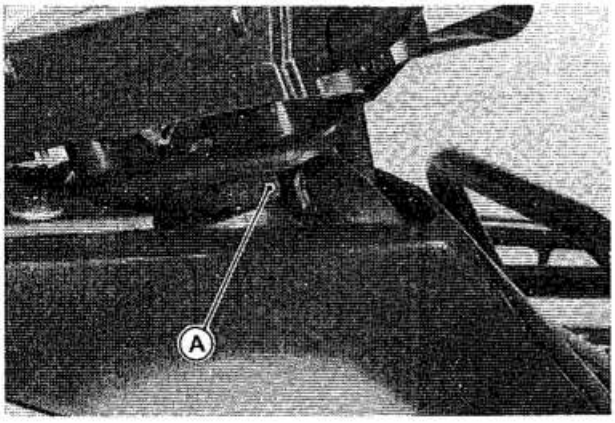


A. Right Tie-rod

•Tighten the steering knuckle upper and lower joint nuts and tie-rod end nuts to the specified torque (see Exploded View).
•Inspect the toe-in if necessary (see Toe-in Inspection in the Wheels/Tires chapter).
•Adjust the steering knuckle stopper if necessary (see Steering Knuckle Stopper Adjustment).

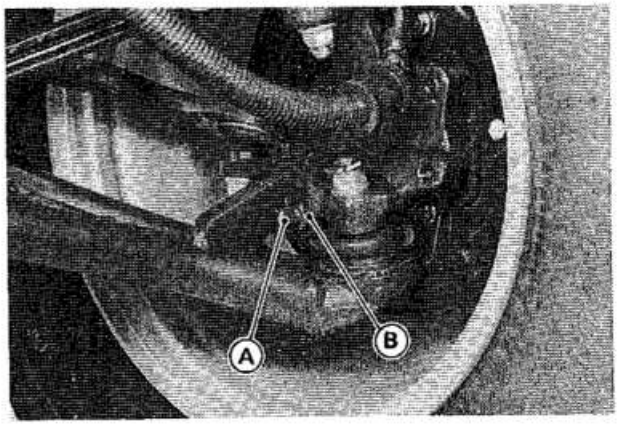
Steering Knuckle Stopper Adjustment

•Turn the handlebar left or right until the edge of the stem stop bracket touches with the frame bracket.
○Turn the handlebar left if the right steering knuckle stopper will be adjusted and turn the handlebar right if the left stopper will be adjusted.



A. Stem Stop Bracket

•Loosen the locknut and turn the steering knuckle stopper bolt so that the head of it touch with the bracket on the lower suspension arm.
•Tighten the locknut securely.



A. Steering Knuckle Stopper Bolt B. Locknut

Steering Inspection

•Turn the handlebar left to right, and check the steering action.
★If the steering action is not smooth, or if the steering binds or catches before the stop, lubricate the steering.

NOTE

○*The cables and wires will have some effect on the steering action which must be taken into account.*

•Check the steering action again.
★If the steering lubrication does not remedy the problem, inspect the steering stem warp and/or steering stem bearing and tie-rod bearings.
★If you feel looseness, or if the steering is turned with the rattle, check the tightness of the bolts and nuts of the steering parts.
•Tighten loose bolts and nuts to the specified torque (see Exploded View), and check the steering action again.
★If the steering action does not change by re-tightening the bolts and nuts, inspect the steering stem bearing, tie-rod bearings, and steering knuckle upper and lower joints.

Steering Stem Warp

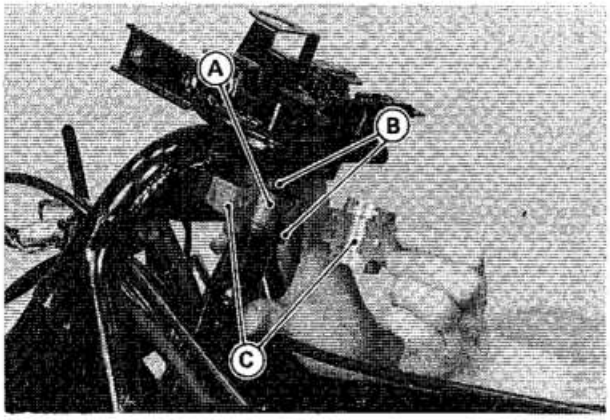
•Remove the steering stem.
•Check the steering stem for straightness.
○Use a straightedge along the stem.
★If the steering stem is bent, replace the steering stem.

Steering Stem Bearing, Tie-rod Bearing, and Steering Knuckle Upper and Lower Joint Inspection

•Inspect each spherical bearing for roughness, excessive play, or seizure.
★If roughness, excessive play, or seizure is found, replace the steering stem bearing, tie-rod, or suspension arm.

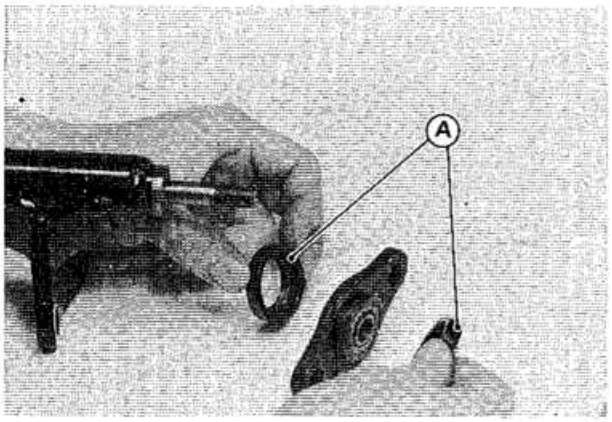
Steering Lubrication

●Lubricate the steering stem clamp.
○Remove the steering stem.
○Wipe all the old grease out of the steering stem, grease seals, and clamps.
○Apply grease to the steering stem and pack the grease seal grooves between the lips with grease.



A. Steering Stem
B. Grease Seals
C. Clamps

●Lubricate the steering stem bearing.
○Disassemble the steering stem bearing.
○Wipe all the old grease out of the steering stem and bearing grease seal.
○Pack the grease seal groove between the lips with grease.



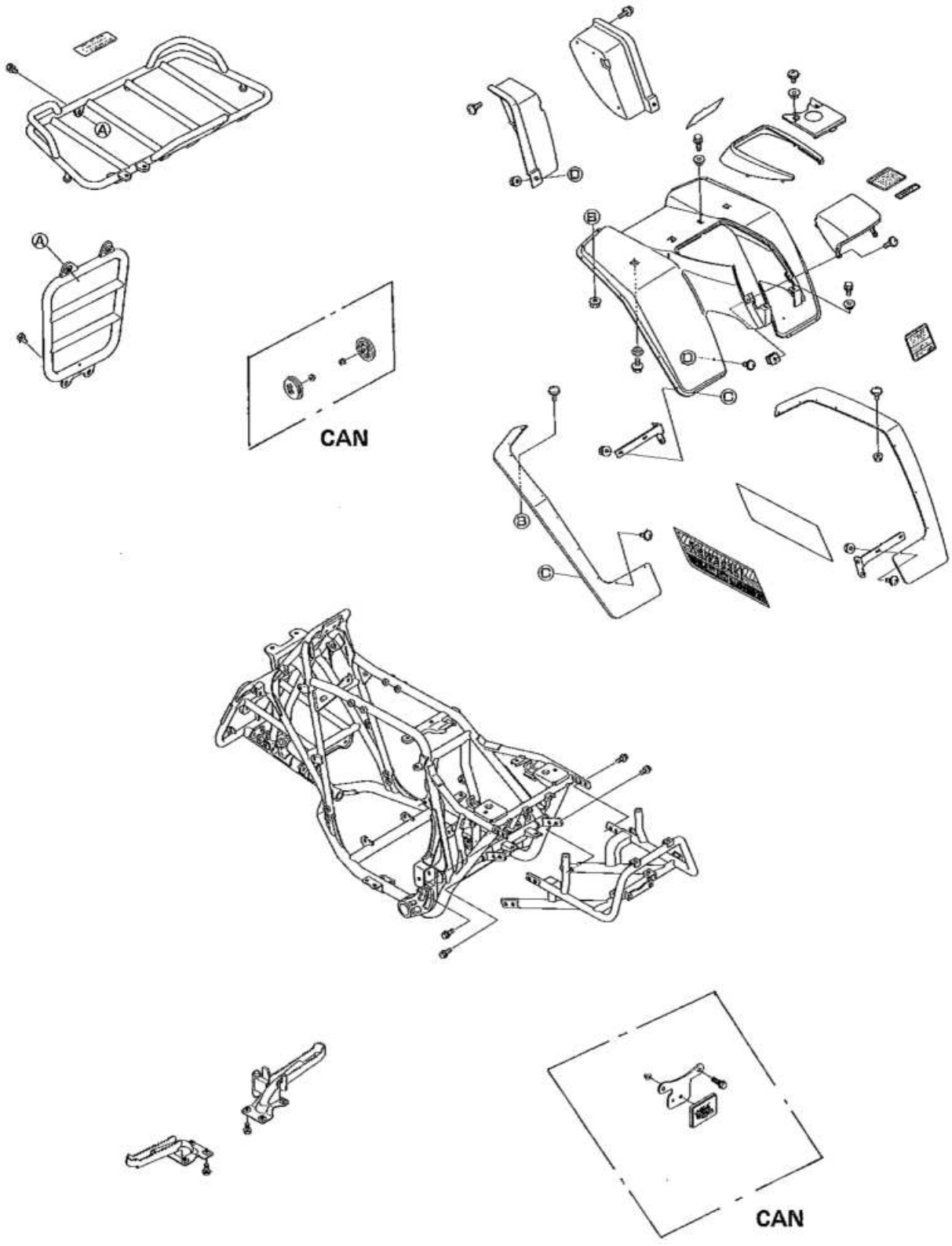
A. Grease Seals

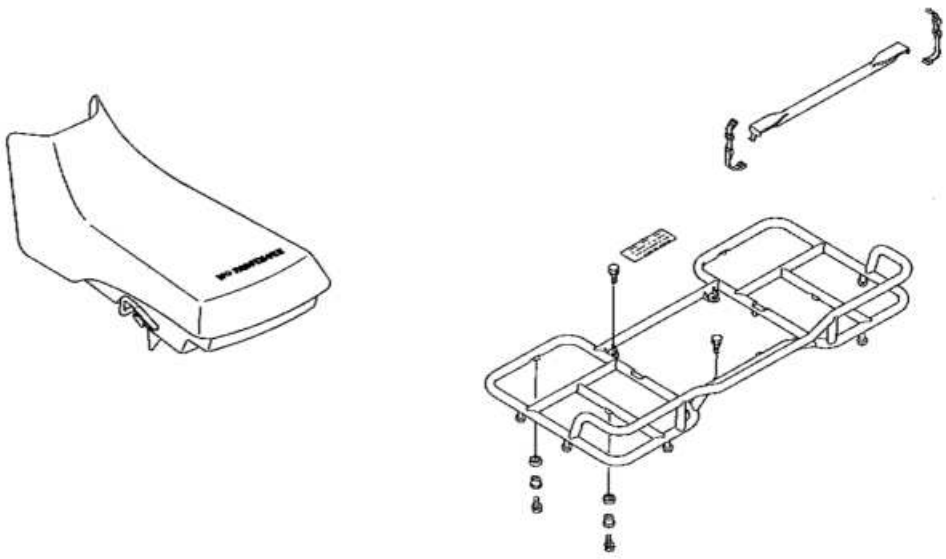
Frame

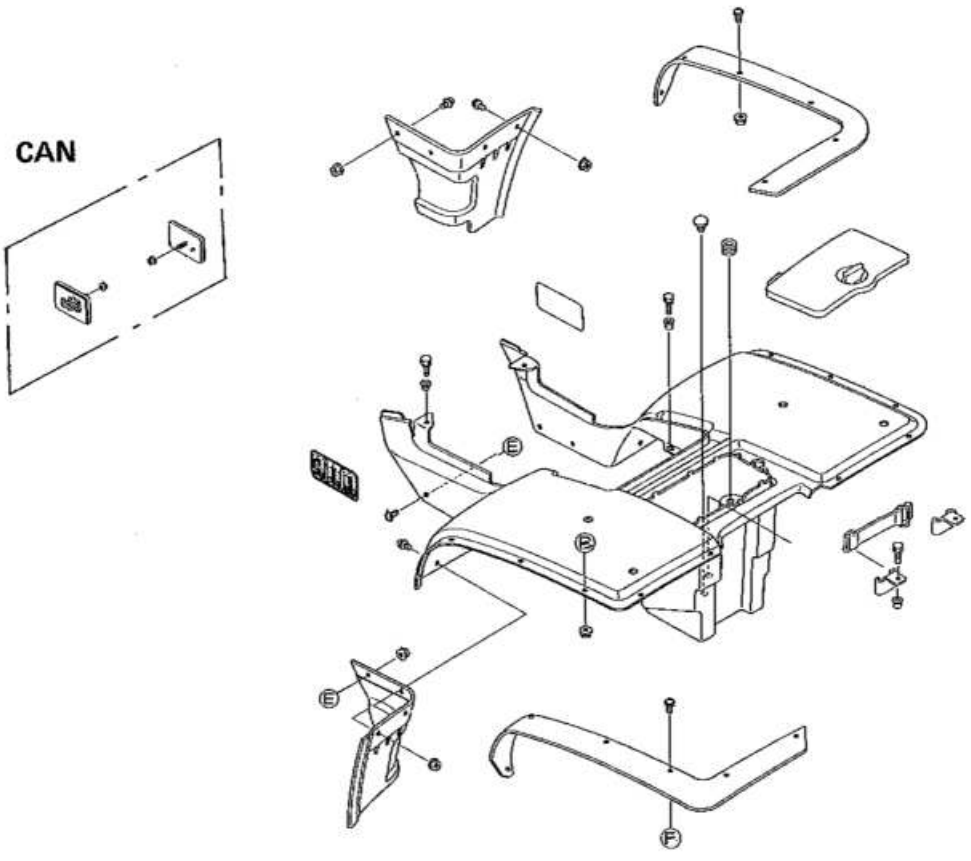
Table of Contents

Exploded View 13-2
Seat 13-4
Seat Removal 13-4
Seat Installation 13-4
Front and Rear Fenders 13-4
Front Fender Removal 13-4
Front Fender Installation 13-5
Rear Fender Removal 13-5
Rear Fender Installation 13-5
Frame Exchange 13-6
Suggested Parts Removal Order 13-6
Suggested Parts Installation Order 13-6
Decals 13-6
Decal Removal 13-6
Decal Application 13-6

Exploded View



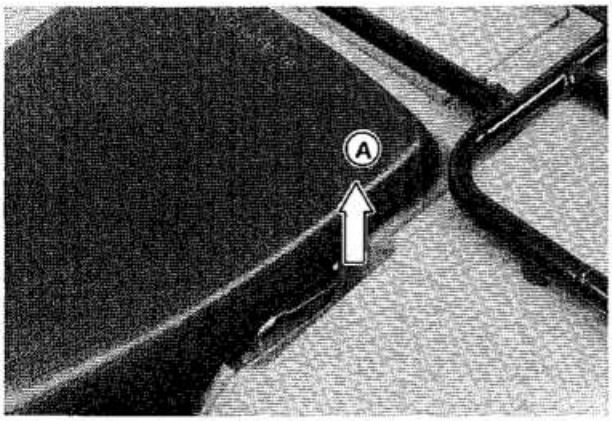



CAN

Seat

Seat Removal

●Pull the seat lock lever up.



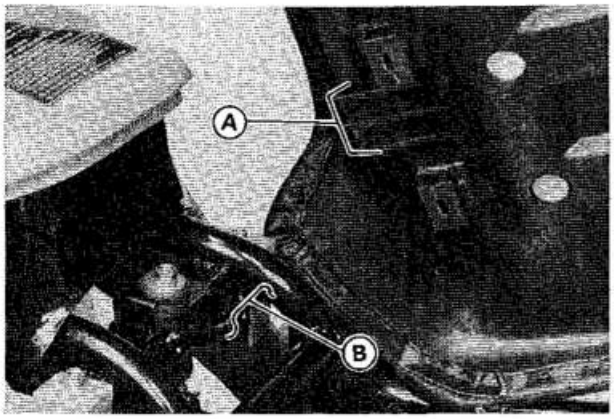
A. Pull.

●Lift the rear of the seat, slide it toward the rear slightly, and lift it off the vehicle.

Seat Installation

●Be sure the rubber dampers are in place on the bottom of the seat.

●Slip the hook on the bottom of the front end of the seat under the brace on the frame.



A. Hook B. Brace

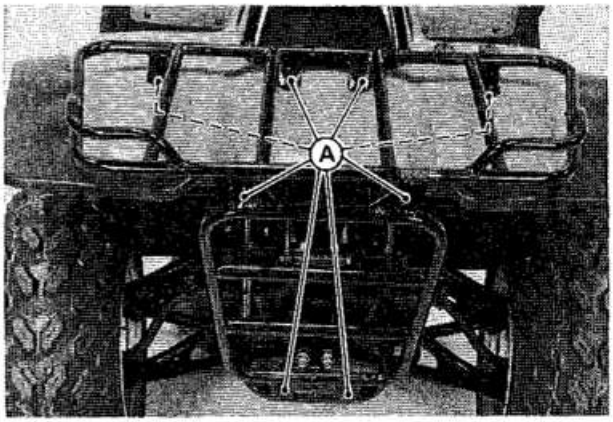
●Push the rear of the seat down so that the seat locks on the bottom of the rear of the seat lock on the catches.

Front and Rear Fenders

Front Fender Removal

●Remove the front carrier and guard.

○Remove the front carrier and front guard mounting bolts, and take off the carrier and guard. The bolts holding the carrier with the front fender have the flanged collars.

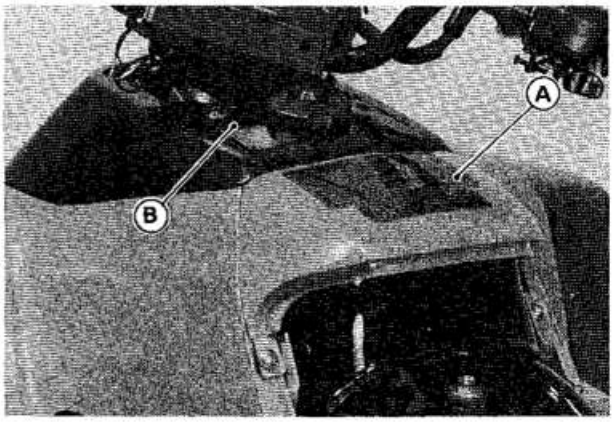


A. Mounting Bolts

●Remove the seat (see Seat Removal).

●Remove the fuel tank covers.

○Remove the mounting screws, flanged collars, and nuts, and pull off the tail cover.

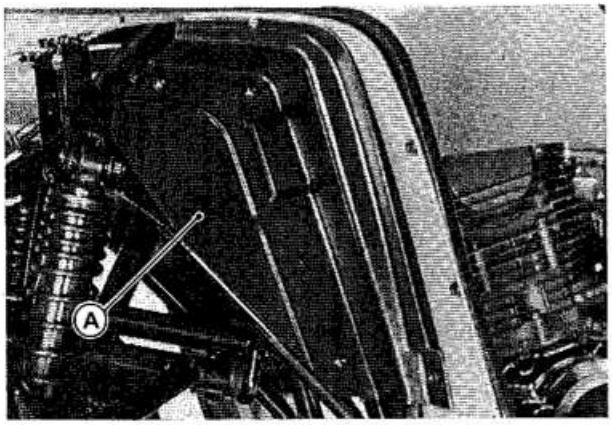


A. Tail Cover B. Upper Cover

○Unscrew the fuel tank cap, remove the mounting bolts and flanged collars, and take off the upper cover.

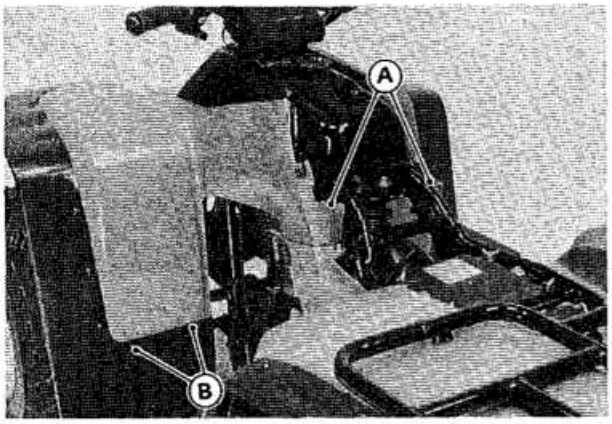
●Remove the front fender side covers.

○Remove the mounting screws and nuts, and take off the side covers.



A. Side Cover

•Remove the front fender.
○Remove the front fender mounting bolts and flanged collars, four screws and nuts of the mud flaps, and take off the front fender.



A. Mounting Bolts
B. Remove these screws (both left and right sides).

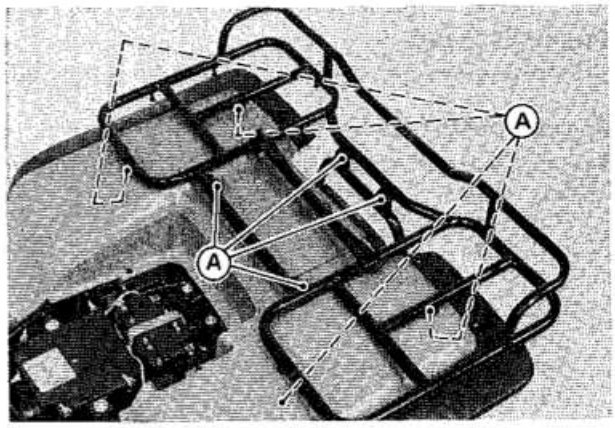
•To remove the mud flaps, take out the screws and nuts.

Front Fender Installation

•Front fender installation is the reverse of removal.

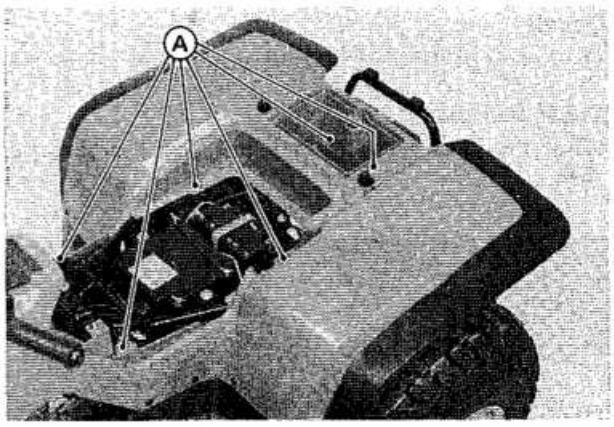
Rear Fender Removal

•Remove the rear carrier.
○Remove the rear carrier mounting bolts and take off the rear carrier. The bolts from the lower side of the fender have the flanged collars and dampers.



A. Mounting Bolts

•Remove the seat (see Seat Removal).
•Remove the rear fender.
○Pull off the storage cover.
○Remove the rear fender mounting bolts and flanged collars and take off the rear fender.



A. Mounting Bolts

•To remove the mud flaps, take out the screws and nuts.

Rear Fender Installation

•Rear fender installtion is the reverse of removal. Note the following.
•Be sure the rubber plug is in place in the bottom of the storage case.

Frame Exchange

Suggested Parts Removal Order

- To exchange the frame, remove the parts in this order.
  - Seat
  - Front and Rear Fenders
  - Fuel Tank
  - Muffler and Exhaust Pipe
  - Battery and Case
  - Air Cleaner
  - Front Suspension and Steering
  - Rear Suspension and Rear Axle
  - Engine with Carburetor
  - Electrical Components
  - Frame Fittings

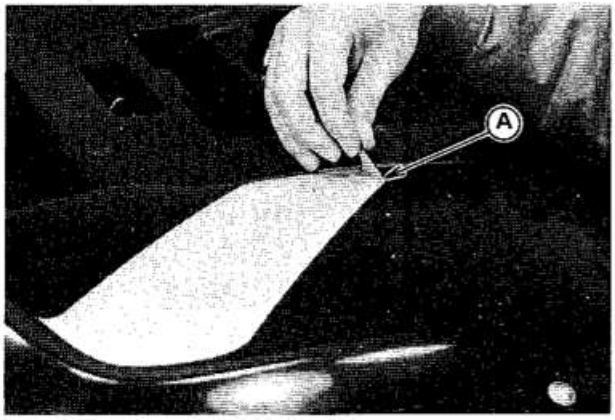
Suggested Parts Installation Order

- To install the parts on the new frame, reverse the order of removal.

Decals

Decal Removal

- Heat the decal gently with a heat gun, heat lamp, or hair drier.



A. Peel slowly.

- Peel up the end of the decal and slowly pull it off, heating the decal as you go.
- Clean off the adhesive left on the vehicle surface with acetone or paint thinner.

WARNING

- **These fluids are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacturer's warnings.**

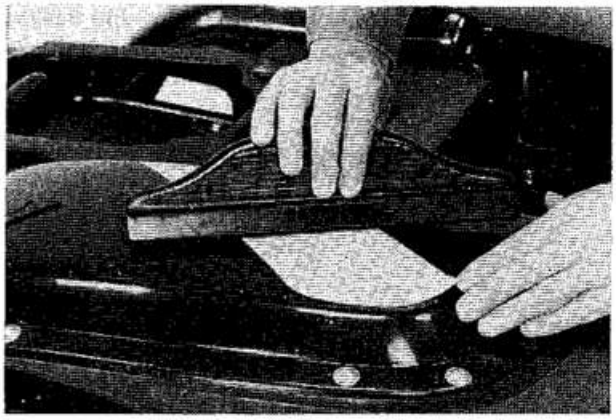
Decal Application

- Clean the surface where the decal is to be applied with acetone or paint thinner.

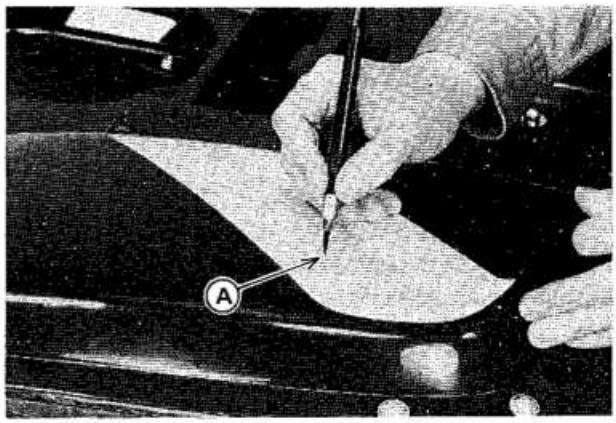
WARNING

- **These fluids are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacturer's warnings.**

- Peel away the end of the decal backing and stick the exposed part of the decal onto the vehicle.
- When you are sure the decal is in the right place, peel the rest of the backing off, holding the decal stretched above the surface where it is to be applied.
- Working from the end which was stuck down first, press the rest of the decal against the surface, little by little, with a squeegee or similar artist's tool.



- Be very careful not to wrinkle the decal or get air bubbles under it.
- If air bubbles do get under the decal, use the following procedure.
- Prick the bubble with a fine needle or slit it with a modeling knife.



A. Slit bubble.

- Use the squeegee to push the air out of the hole in the bubble, and stick the decal tightly to the surface.
- When the entire decal has been applied, go over it several times with the squeegee to burnish it.

Electrical System

Table of Contents

Precautions 14-2
KLF300-A1 Wiring Diagram 14-3
Exploded View 14-4
Specifications 14-6
Special Tools 14-7
Battery 14-7
  Precautions 14-7
  Battery Removal/Installation 14-7
    Battery Removal 14-7
    Battery Installation 14-8
  Electrolyte 14-8
    Electrolyte Level Inspection 14-8
  Battery Charging 14-8
    Battery Condition 14-8
    Battery Initial Charging 14-9
    Battery Ordinary Charging 14-9
    Battery Test Charging 14-10
Charging System 14-11
  Part Removal 14-11
    Alternator Rotor Removal 14-11
    Alternator Rotor Installation 14-11
    Alternator Stator Removal 14-11
    Alternator Stator Installation 14-11
  Charging System Checkout 14-11
    Charging System
      Operational Inspection 14-11
    Stator Coil Resistance 14-12
    Rectifier Circuit Inspection 14-12
    Regulator Circuit Inspection 14-12
Ignition System 14-14
  Safety Instructions 14-14
  Part Removal 14-14
    Engine Stop Switch Removal 14-14
    Engine Stop Switch Installation 14-14
    Ignition Coil Removal 14-14
    Ignition Coil Installation 14-15
    Spark Plug Removal 14-15
    Spark Plug Installation 14-15
    Pickup Coil Removal 14-15
    Pickup Coil Installation 14-15
  Ignition System Checkout 14-15
    Ignition Timing Test 14-15
    Engine Stop Switch Inspection 14-16
    Ignition Coil Inspection 14-16
    Spark Plug Cleaning and Inspection 14-17
    Spark Plug Gap 14-17
    IC Ignitor Inspection 14-17
    Pickup Coil Inspection 14-18
    Alternator Rotor Inspection 14-18
Electric Starter System 14-19
  Part Removal 14-19
    Starter Motor Removal 14-19
    Starter Motor Installation 14-19
    Starter Motor Disassembly 14-19
    Starter Motor Assembly 14-20
    Starter Button Removal 14-22
    Starter Button Installation 14-22
  Starter System Checkout 14-22
    Starter Motor Brush Length 14-22
    Starter Motor Brush Spring Tension 14-22
    Starter Motor
      Commutator Inspection 14-22
    Starter Motor Armature Inspection 14-23
    Brush Assembly Inspection 14-23
    Starter Relay Inspection 14-24
    Starter Circuit Relay Inspection 14-24
    Starter Button Inspection 14-25
Lighting System 14-25
  Bulb Replacement 14-25
    Headlight Bulb Replacement 14-25
    Taillight Bulb Replacement 14-26
  Neutral and Reverse Indicator
    Light Bulb Replacement 14-26
  Part Removal 14-26
    Light Switch Removal 14-26
    Light Switch Installation 14-27
    Neutral and Reverse
      Switch Removal 14-27
    Neutral and Reverse
      Switch Installation 14-27
  Lighting System Checkout 14-27
    Light Switch Inspection 14-27
    Neutral and Reverse
      Switch Inspection 14-27
Ignition Switch 14-28
  Ignition Switch Removal 14-28
  Ignition Switch Installation 14-28
  Ignition Switch Inspection 14-28
Electrical Wiring 14-28
  Wiring Inspection 14-28

Precautions

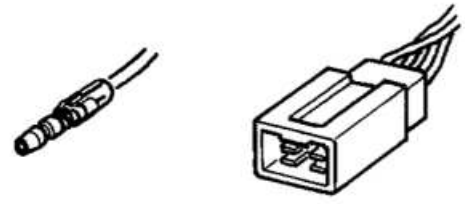
There are numbers of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or 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 indicator bulb rated for other than voltage or wattage specified in the wiring diagram, as the indicator panel could be warped by excessive heat radiated from the bulb.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was brough on by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Electrical Connectors

Female Connectors



Male Connectors

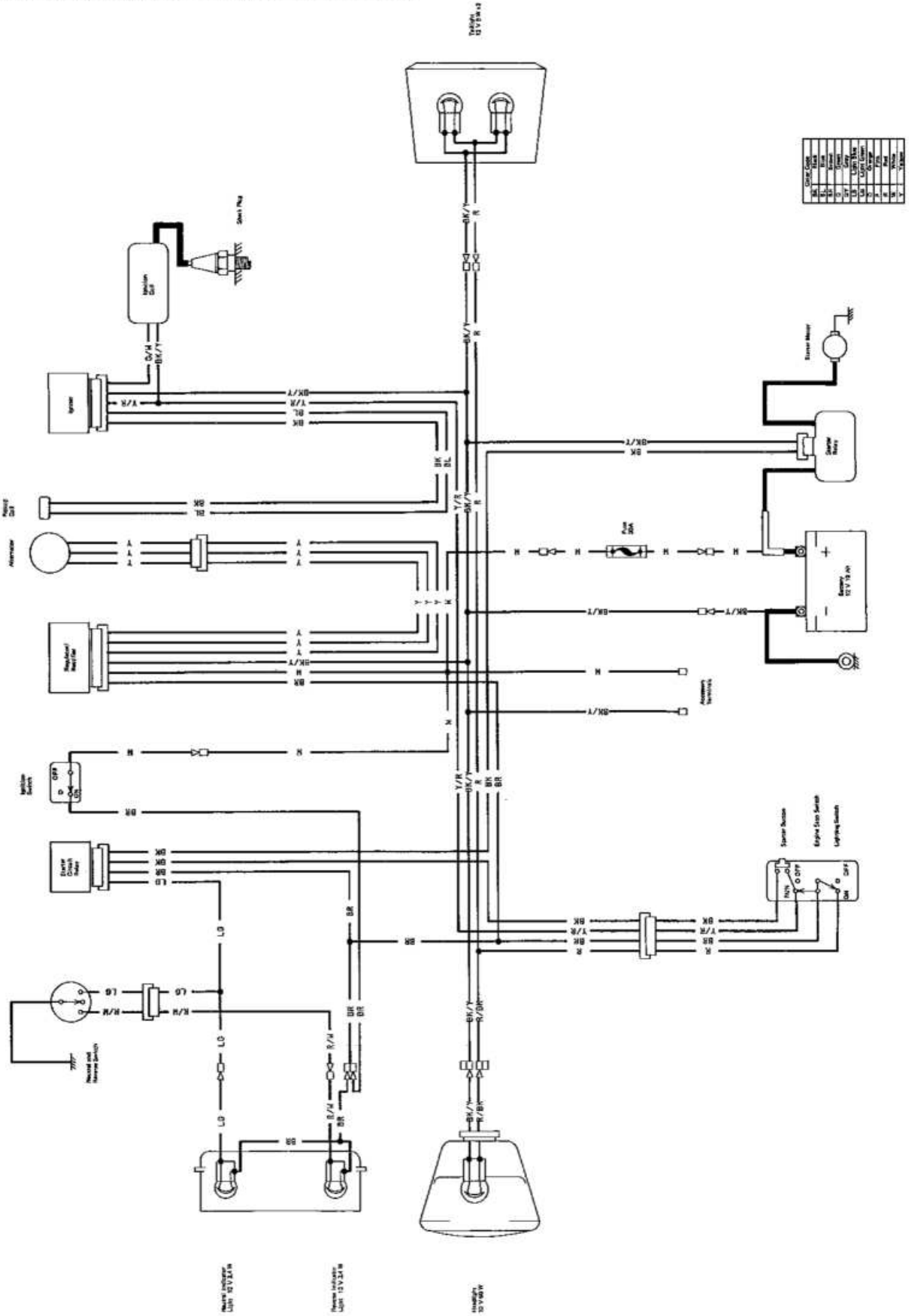


- Color Codes:

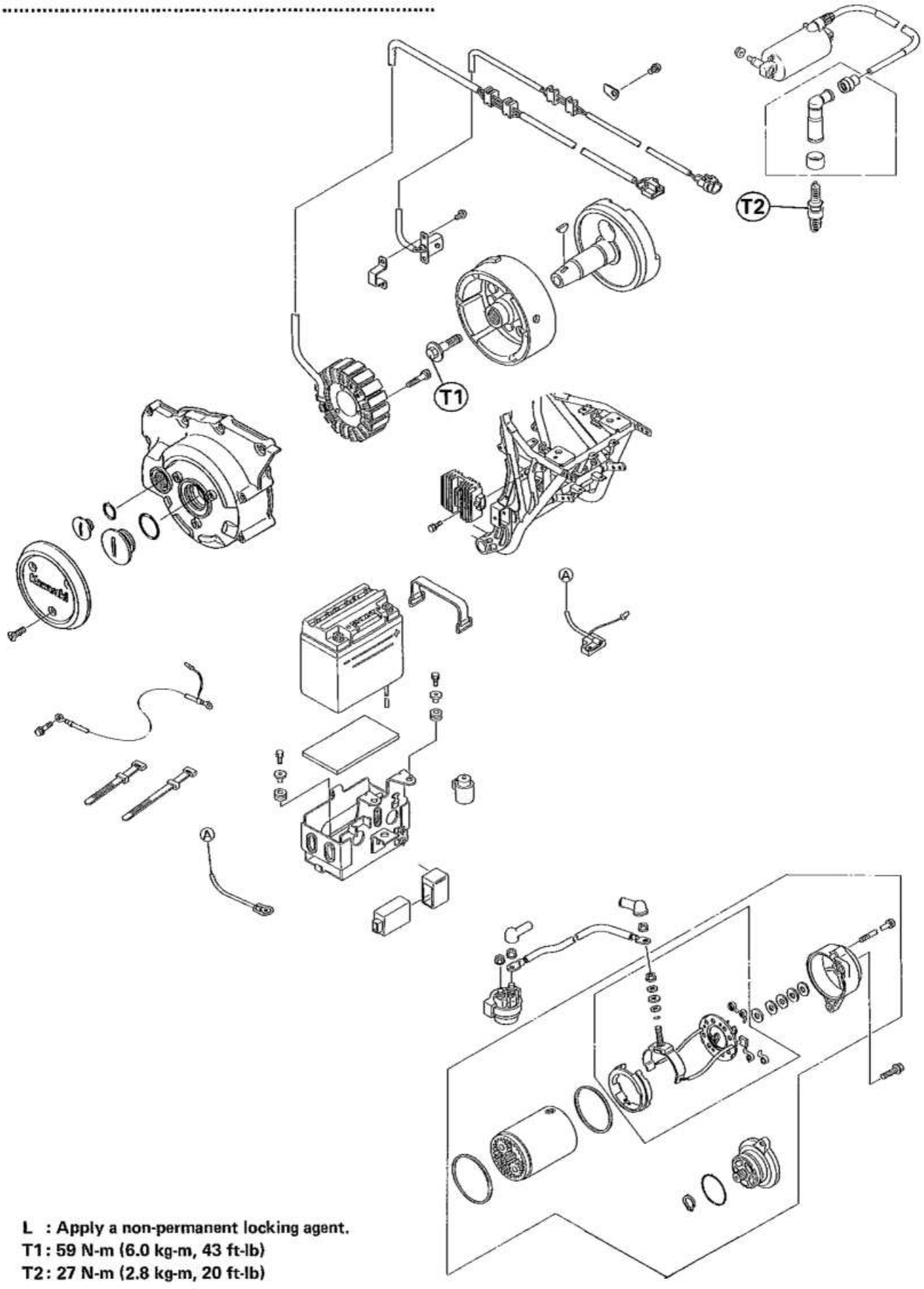
BK	Black
BL	Blue
BR	Brown
CH	Chocolate
DG	Dark green
G	Green
GY	Gray
LB	Light blue
LG	Light green
O	Orange
P	Pink
PU	Purple
R	Red
W	White
Y	Yellow

- Measure coil and winding resistance when the part is cold (at room temperature).

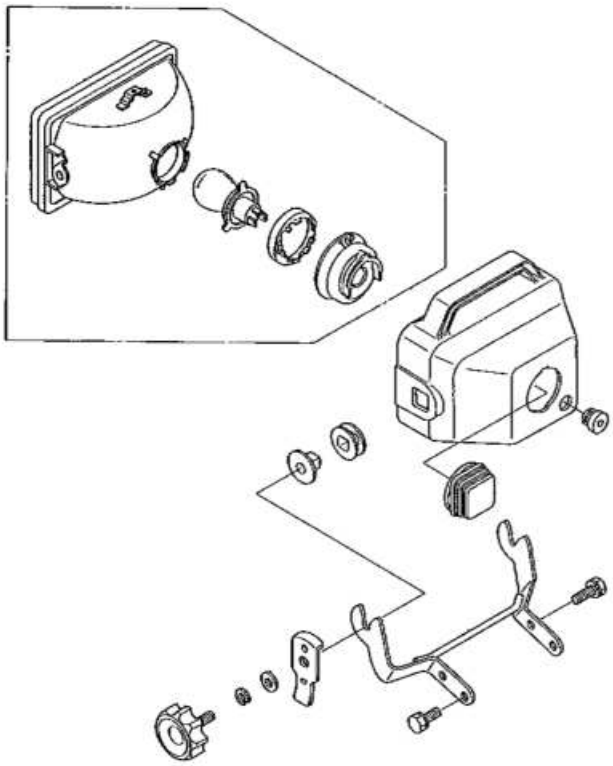
KLF300-A1 Wiring Diagram

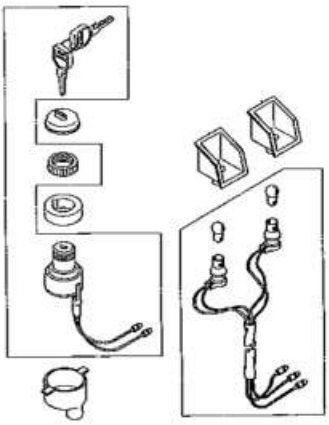


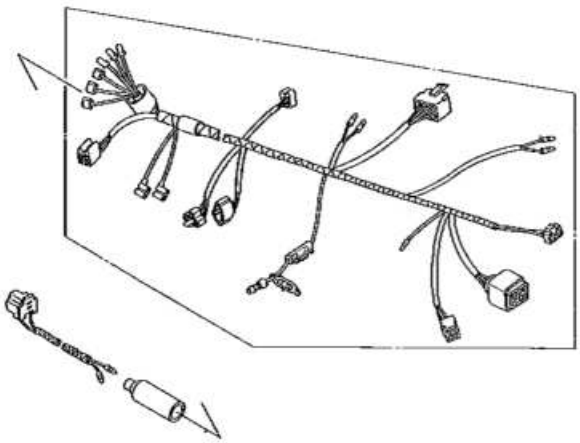
Exploded View

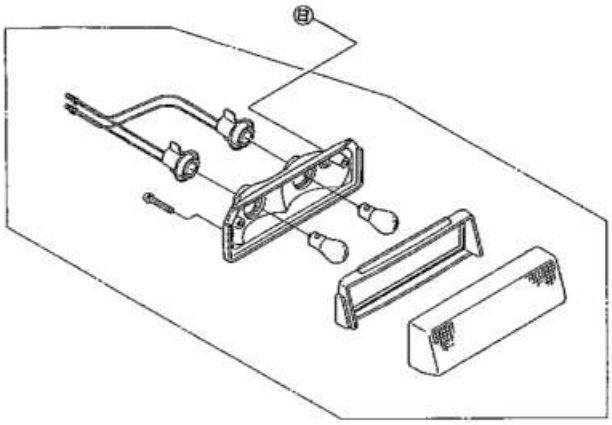


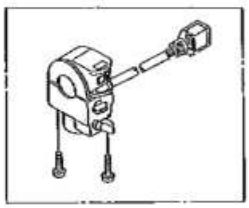
L : Apply a non-permanent locking agent.
T1 : 59 N-m (6.0 kg-m, 43 ft-lb)
T2 : 27 N-m (2.8 kg-m, 20 ft-lb)

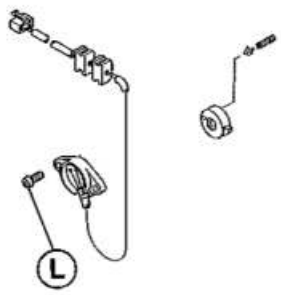


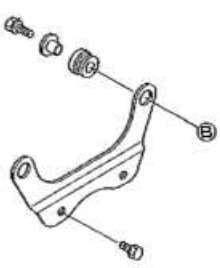









L



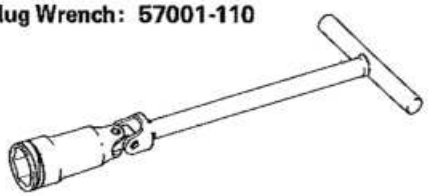
Specifications

Item		Standard	Service Limit
Battery:			
Electrolyte Level		Between level lines	—
Electrolyte Volume		1.15 L	—
Specific Gravity of Electrolyte		1.280 @20°C (68°F)	—
Charging System:			
Regulator/rectifier Output Voltage		Battery voltage – 15 V	—
Charging Coil Resistance		0.2 – 0.8 Ω	—
Ignition System:			
Ignition Coil:	Arcing Distance	7 mm or more	—
	Primary Winding Resistance	1.8 – 2.8 Ω	—
	Secondary Winding Resistance	10 – 16 kΩ	—
Spark Plug:	Type	NGK B8ES	—
		NGK BR8ES (CAN, UK)	—
	Gap	0.7 – 0.8 mm	—
Pickup Coil Resistance		390 – 590 Ω	—
Electric Starter System:			
Starter Motor:	Brush Length	12.0 – 12.5 mm	6 mm
	Brush Spring Tension	680 – 920 g	—

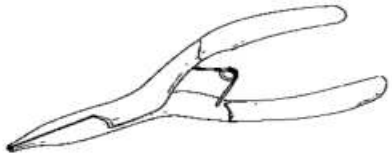
Special Tools

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

Spark Plug Wrench: 57001-110



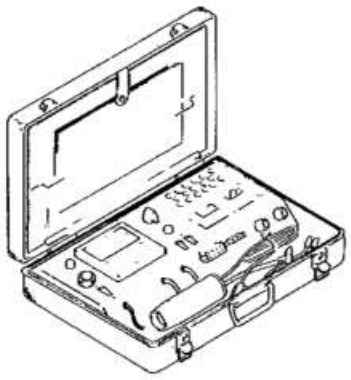
Circlip Pliers: 57001-144



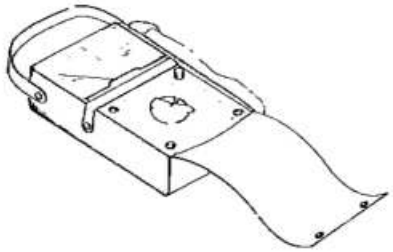
Flywheel Holder: 57001-308



Electrotester: 57001-980



Hand Tester: 57001-983



Rotor Puller: 57001-1099



Battery

Precautions:

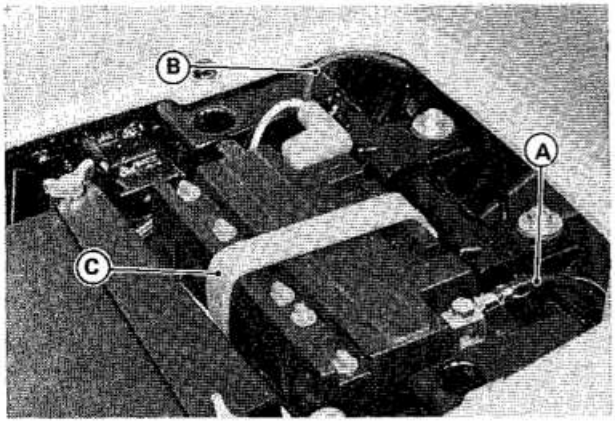
Following a few simple rules will greatly extend the life of the battery.

- When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.
- Never add sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.
- Avoid quick-charging the battery. A quick-charge will damage the battery plates.
- Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulphate (turn white), and the battery will no longer take a charge.
- Keep the battery well-charged during cold weather so that the electrolyte does not freeze and crack open the battery. The more discharged the battery becomes, the more easily it freezes.
- Always keep the battery vent hose free of obstruction, and make sure it does not get pinched, crimped, or melted shut by contact with the hot muffler. If battery gases cannot escape through this hose, they will explode the battery.
- DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.

Battery Removal/Installation:

Battery Removal

- Remove the seat (see Seat Removal in the Frame chapter).
- Disconnect the battery negative (–) cable.



A. Negative Cable
B. Positive Cable
C. Rubber Band

- Disconnect the battery positive (+) cable.
- Unhook the rubber band and remove the battery from the battery case. Do not lose the damper under the battery.

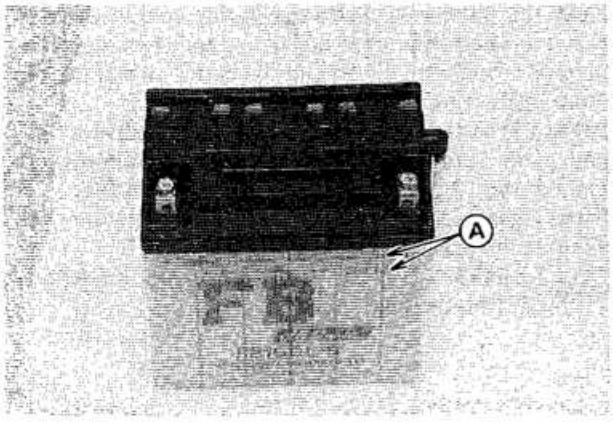
Battery Installation

- Battery installation is the reverse of removal. Note the following.
- Connect the positive (+) cable first and then the negative cable.
- Route the battery vent hose observing the label for the hose routing.

Electrolyte:

Electrolyte Level Inspection

- Visually check the electrolyte level in the battery.



A. Level Lines

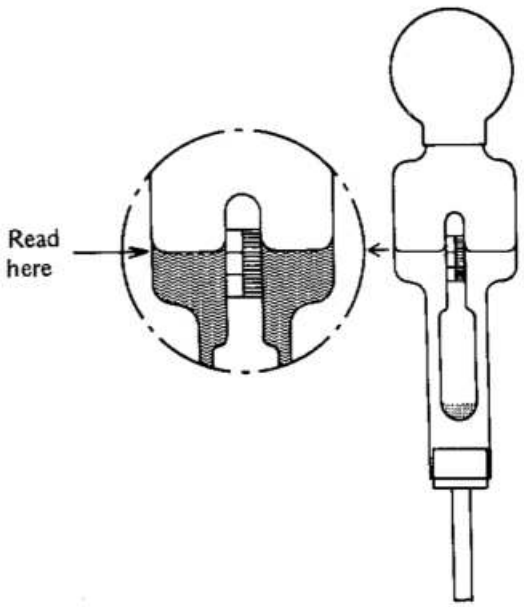
★If the level line of electrolyte in any cell is below the lower level line on the battery case, add distilled water only to that cell.

Battery Charging:

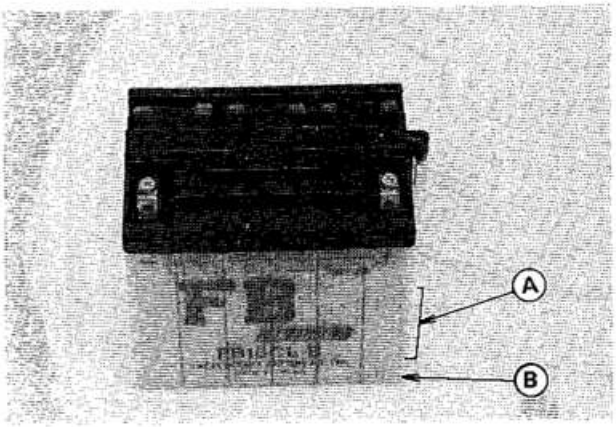
Battery Condition

- Before charging, check battery condition by testing the specific gravity of the electrolyte in each cell.
  - Draw a little fluid from the cell with a hydrometer.
  - Read the level of the electrolyte on the floating scale. This is the specific gravity of the electrolyte.

Hydrometer



- Look for sediment and white sulfation inside the cells on the bottom of the plates.



A. Sulfation here
B. Sediment here

- See the Battery Troubleshooting Guide in Battery Test Charging.

★If the specific gravity is below 1.280, the battery needs to be charged.

NOTE

○*The specific gravity of the electrolyte varies with changes in temperature, so the specific gravity reading must be corrected for the temperature of the electrolyte.*
○*Celsius: Add 0.007 points to reading for each 10°C above 20°C or subtract 0.007 points for each 10°C below 20°C.*
○*Fahrenheit: Add 0.004 points to reading for each 10°F above 68°F or subtract 0.004 points for each 10°F below 68°F.*

★If the specific gravity of any of the cells is more than 0.050 away from any other reading, the battery will probably not accept a charge. If it generally best to replace a battery in this condition.
★If the specific gravity of all the cells is 1.280 or move the battery is fully charged.

Battery Initial Charging

Before being placed in service, a new battery should be given an initial charging.
•Cut off the sealed end of the battery vent hose and remove the filler caps.
•Fill each cell to the upper level line on the battery case with fresh electrolyte at a temperature of 30°C (86°F) or less. Let the battery stand for about 30 minutes before charging.

NOTE

○*If the electrolyte level drops, add electrolyte to the upper level line before charging.*

•Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and charge it for 10 hours. For example, if the battery is rated at 18 Ah, the charging rate would be 1.8 A.

WARNING

○**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

CAUTION

○**Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than -normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

○**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

•Turn the charger off, then disconnect it from the battery.
•Check battery voltage. Battery voltage should be 12 – 13 V.
•Check the specific gravity of each cell with a hydrometer (see Battery Condition).
★If the voltmeter or hydrometer readings are below those specified, additional charging is necessary before the battery can be installed.

Battery Ordinary Charging

•Remove the battery from the motorcycle.

CAUTION

○**Always remove the battery from the motorcycle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the motorcycle.**

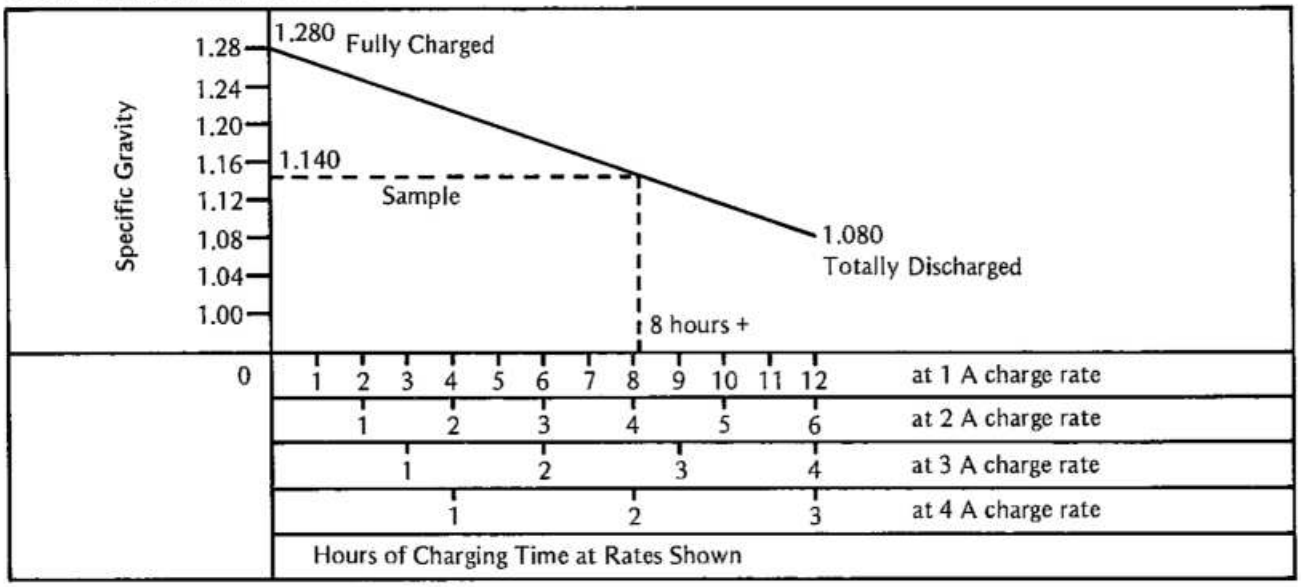
•Clean off the battery using a baking soda-and-water solution.
○Mix one heaping tablespoon of baking soda in one cup of water.
○Be careful not to get any of the cleaning solution in the battery.
○The terminals must be especially clean.
•If any of the cells are low, fill them to the LOWER level line with distilled water only. The electrolyte will expand during charging, and the level will rise.
•Connect a charger to the battery BEFORE plugging it in or turning it on.

WARNING

○**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

•Set the charge rate and time according to the battery condition previously determined (see Battery Condition), using the table.

Battery Charging Rate/Time Table



CAUTION

- **Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than -normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**
- **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

- Turn the charger off or unplug it, then disconnect it from the battery.
- Check battery condition (See Battery Condition).
- ★If the battery condition indicates that it is not fully charged, additional charging time is necessary.

Battery Test Charging

- If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the table.
- To test charge a battery, perform the ordinary charging procedure and monitor the battery voltage and other signs as mentioned below.
- ★If the battery voltage suddenly jumps to over 13 V just after the start of charging, the plates are probably sulfated. A good battery will rise to 12 V immeditely and then gradually go up to 12.5 or 13 V in about 30 min to and hour after the start of charging.
- ★If one cell produces no gas bubbles or has a very low specific gravity, it is probably shorted.
- ★If there does not appear to be enough sediment in a cell to short the plates, but that cell has a very low specific gravity after the battery is fully charged, the trouble may be that there is not enough acid in that one cell. In this case only, sulfuric acid solution may be added to correct the specific gravity.
- ★If a fully charged battery not in use loses its charge after 2 to 7 days; or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

Battery Troubleshooting Guide

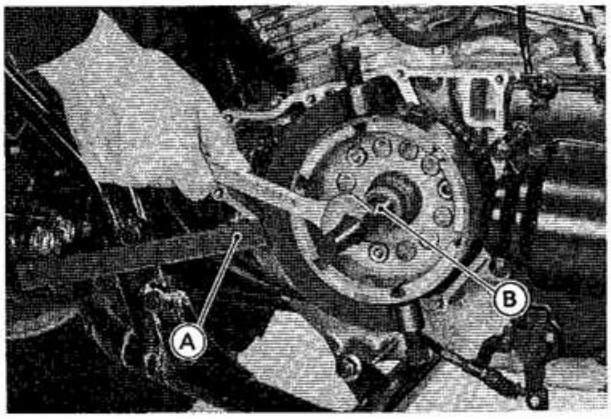
	Good Battery	Suspect Battery	Action
Plates	(+) chocolate color (–) gray	white (sulphated); + plates broken or corroded	Replace
Sediment	none, or small amount	sediment up to plates, causing short	Replace
Voltage	above 12 V	below 12 V	Test charge
Electrolyte Level	above plates	below top of plates	Fill and test charge
Specific Gravity	above 1.200 in all cells; no two cells more than 0.020 different	below 1.100, or difference of more than 0.020 between two cells	Test charge

Charging System

Part Removal:

Alternator Rotor Removal

- Remove the left engine cover (see Left Engine Cover Removal in the Engine Left Side chapter).
- Hold the alternator rotor from turning with the flywheel holder (special tool), and remove the rotor bolt.
- Thread in the rotor puller (special tool) and turn the rotor puller until the rotor is forced off the end of the crankshaft.



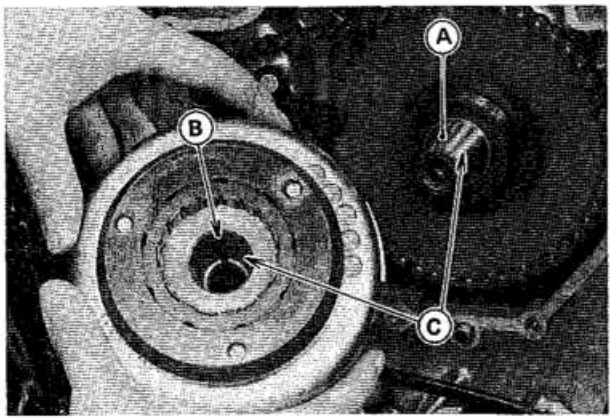
A. Flywheel Holder: 57001-308
B. Rotor Puller: 57001-1099

CAUTION

If the rotor is difficult to remove and a hammer is used to tap the rotor puller, be careful not to strike the rotor itself. Striking the rotor can cause the magnets to lose their magnetism.

Alternator Rotor Installation

- Alternator rotor installation is the reverse of removal. Note the following.

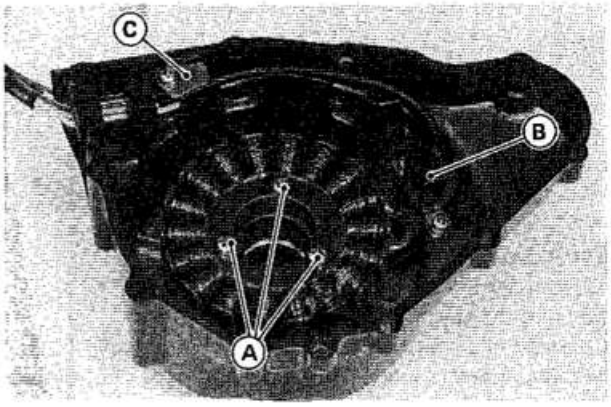


A. Key B. Groove C. Clean.

- Clean the inside of the rotor and the end of the crankshaft thoroughly or the taper will not fit snugly.
- Fit the rotor onto the crankshaft so that the woodruff key fits in the groove in the hub of the rotor.
- Tighten the alternator rotor bolt to the specified torque (see Exploded View).

Alternator Stator Removal

- Remove the left engine cover (see Left Engine Cover Removal in the Engine Left Side chapter).
- Remove the pickup coil (see Pickup Coil Removal).
- Unscrew the mounting screw and take off the wiring holder.
- Unscrew the mounting screws and pull the stator out the left engine cover.



A. Alternator Stator Mounting Screws
B. Pickup Coil
C. Wiring Holder

Alternator Stator Installation

- Alternator stator installation is the reverse of removal.

Charging System Checkout:

Charging System Operational Inspection

- Check battery condition (see Battery Condition).

NOTE

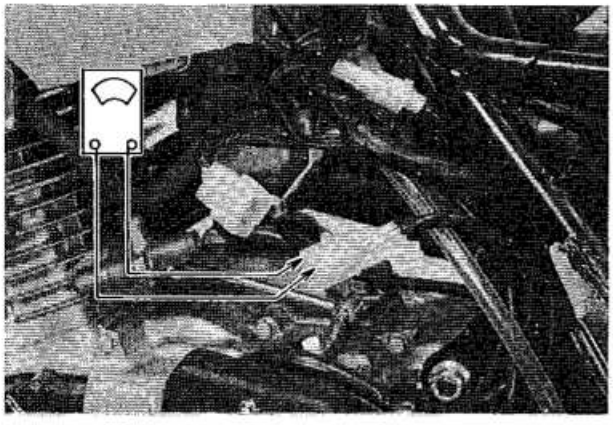
Always check battery condition before condemning other parts of the charging system. The battery must be fully charged in order to conduct accurate charging system tests.

•Warm up the engine to bring the components up to their normal operating temperatures.
•Measure regulator/rectifier output voltage at various engine speeds with the headlight turned on and then turned off.
○Connect a voltmeter across the battery terminals.
★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, or the regulator/rectifier leads are loose or open.
★If the output voltage does not rise as the engine speed increase, then the regulator/rectifier is defective or the alternator output is insufficient for the loads.

Regulator/Rectifier Output Voltage
Battery Voltage – 15 V

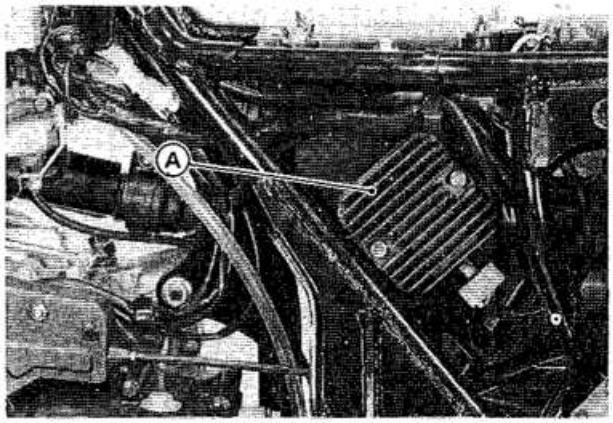
Stator Coil Resistance
•Disconnect the alternator connector.
•Measure the stator coil resistance.
○Connect the multimeter between the yellow leads.
○Set the meter to x 1 Ω range, and read the meter.

Stator Coil Resistance
0.2 – 0.8 Ω



★If the meter does not read as specified, replace the alternator stator.
★If the coil has normal resistance, but the voltage inspect showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Rectifier Circuit Inspection
•Remove the regulator/rectifier.



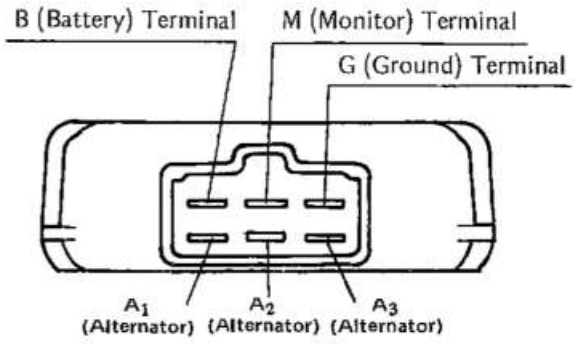
A. Regulator/Rectifier

•Zero the ohmmeter, and connect it to the regulator/rectifier terminals.
•Check the resistance between the terminals following the table.
★The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and must be replaced.

NOTE

○*The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking the lower reading should be from zero to the first ½ of the scale.*

Regulator/Rectifier Terminal



Rectifier Circuit Inspection

No.	Connections		Reading	Meter Range
	Meter (+) to	Meter (–) to		
1	A1	B	∞	x 10 Ω or x 100 Ω
2	A2			
3	A3			
4	A1	G	0 – ½ scale	
5	A2			
6	A3			
7	B	A1		
8		A2		
9		A3		
10	G	A1	∞	
11		A2		
12		A3		

Regulator Circuit Inspection

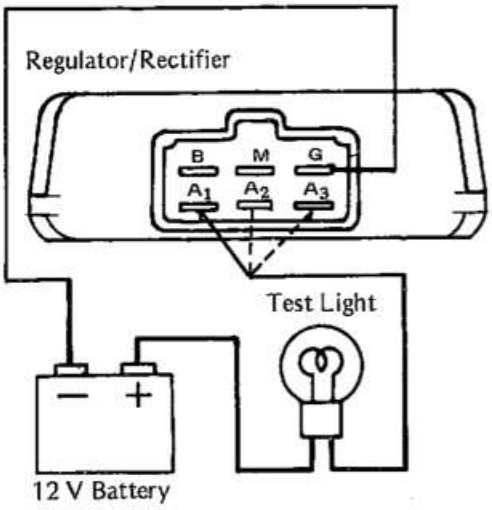
- Remove the regulator/rectifier.
- Prepare the test tools shown.

Tools for Regulator Circuit Test

Test light → Bulb rated 12 V and 3 – 6 W
Batteries → Two 12 V batteries
Test wires → 5 auxiliary wires

- Connect the test light and the 12 V battery to the regulator/rectifier as shown.
- Check A1, A2, and A3 terminals respectively.

Regulator Circuit Test-1st Step

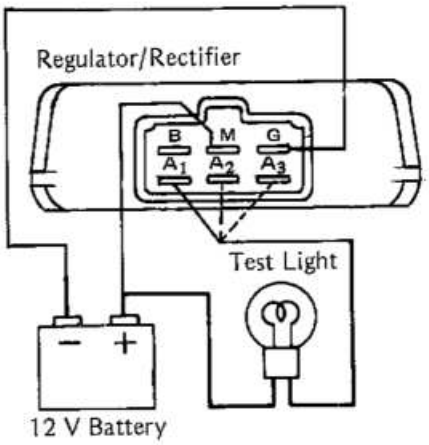


CAUTION

○The test light limits the current flow through the regulator/rectifier. Do not use an ammeter or multimeter in its place.

★If the test light turns on, the regulator/rectifier is defective. Replace it.
★If the test light does not turn on, continue the test.
- Momentarily apply 12 V to the voltage monitoring terminal.
- Check A1, A2, and A3 terminals respectively.

Regulator Circuit Test-2nd Step

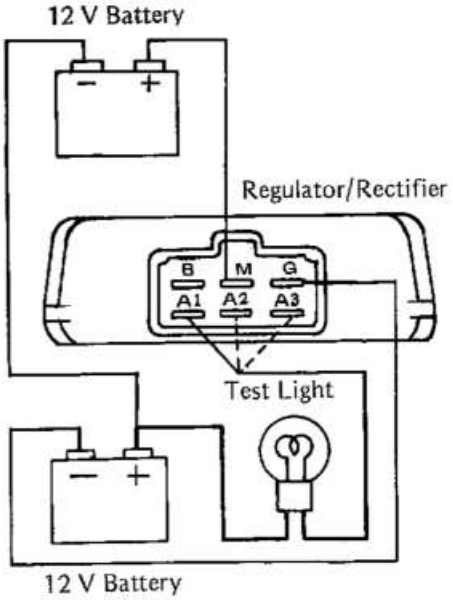


★If the test light turns on, the regulator/rectifier is defective. Replace it.
★If the test light does not turn on, continue the test.
- Momentarily apply 24 V to the voltage monitoring terminal by adding a 12 V battery.
- Check A1, A2, and A3 terminals respectively.

CAUTION

○Do not apply more than 24 V to the regulator/rectifier and do not leave the 24 V applied for more than a few seconds, or the unit will be damaged.

Regulator Circuit Test-3rd Step



★If the test light did not light when the 24 V was applied momentarily to the voltage monitoring terminal, the regulator/rectifier is defective. Replace it.
★If the regulator/rectifier passes all of the tests described, it may still be defective. If the charging system still does not work properly after checking all of the components and the battery, test the regulator/rectifier by replacing it with a known good unit.

Ignition System

Safety Instructions:

WARNING

○**The ignition system produces extremely high voltage. Do not touch the spark plug, high tension coil, or spark plug lead while the engine is running, or you could receive a severe electrical shock.**

CAUTION

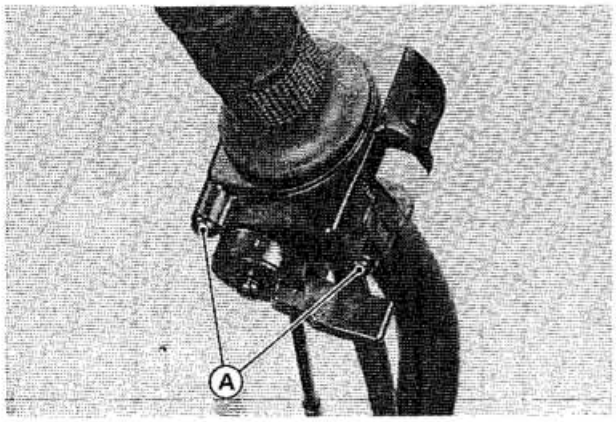
○**Do not disconnect battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. Doing so could cause IC ignitor damage.**
○**Do not install the battery backwards or the IC ignitor could be damaged. The negative side is grounded.**

Part Removal:

Engine Stop Switch Removal

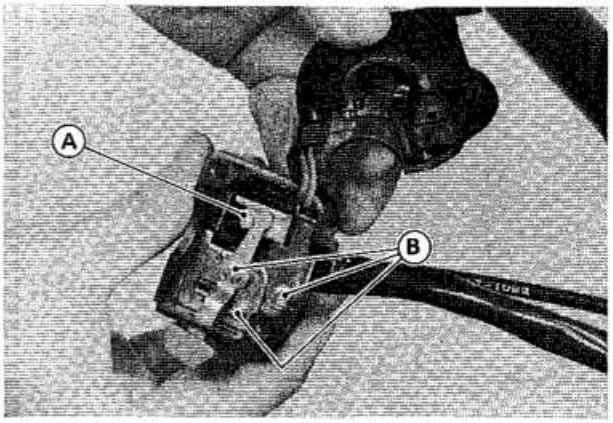
The engine stop switch is inside the LH switch housing. The switch and its component parts are not available separately. However, the switch may be removed for cleaning. Be very careful not to lose any parts or the entire LH switch housing will have to be replaced.

•Take out the screws that clamp the LH switch housing to the handlebar.



A. Screws

•Remove the switch lever screw and take out the lever.

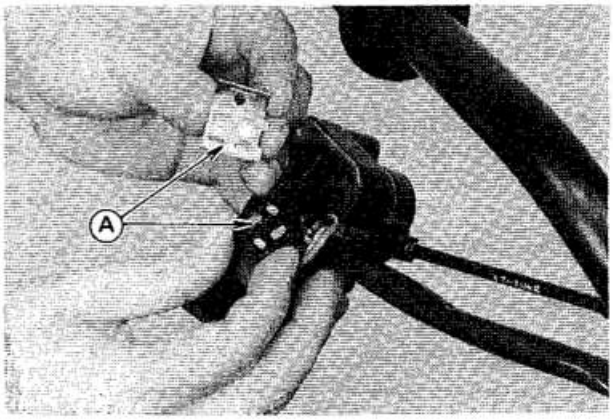


A. Switch B. Remove these screws.

•Remove the wiring clamp screw and starter button holder screw, and pull the switch free of the case.

Engine Stop Switch Installation

•Clean any corrosion or dirt off the contacts.

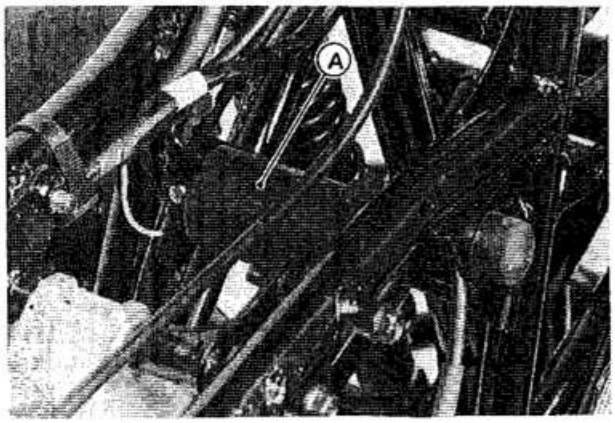


A. Clean.

•Push the switch parts down into the case.
•Install the wiring clamp and starter button holder.
•Put the switch lever in place and fasten it with a screw and washer.
•Assemble the LH switch housing on the handlebar and tighten the screws securely.

Ignition Coil Removal

•Remove the front fender (see Front Fender Removal in the Frame chapter).
•Pull the spark plug lead off the spark plug.
•Disconnect the green/white lead and black/yellow lead from the coil.
•Take off the nuts and remove the coil.

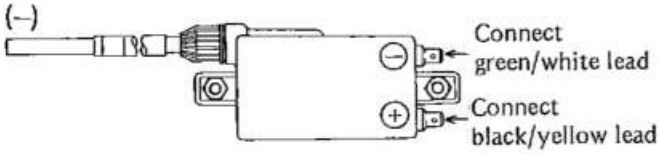


A. Ignition Coil

Ignition Coil Installation

- Ignition coil installation is the reverse of removal. Note the following.
- The + and – markings next to the primary coil terminals on the ignition coil body indicate the polarity of the terminals. The polarity of the spark plug lead is as shown when the primary leads are connected as indicated in the figure. But both the primary wires can be connected with either terminal on the ignition coil without changing the engine performance.

Polarity of Ignition Coil



Spark Plug Removal

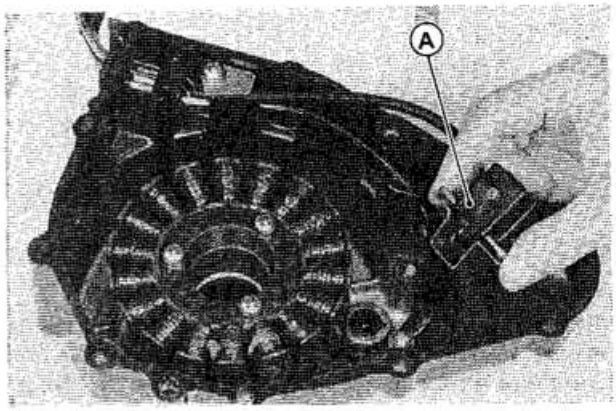
- Carefully pull the spark plug cap from the spark plug and unscrew the spark plug.
- If necessary, use the spark plug wrench (special tool: P/N 57001-110).

Spark Plug Installation

- Installation is the reverse of removal. Note the following.
- Tighten the spark plug to the specified torque (see Exploded View).

Pickup Coil Removal

- Remove the left engine cover (see Left Engine Cover Removal in the Engine Left Side chapter).
- Unscrew the mounting screw and take off the wiring holder.
- Unscrew the mounting screws and take off the pickup coil.



A. Pickup Coil

Pickup Coil Installation

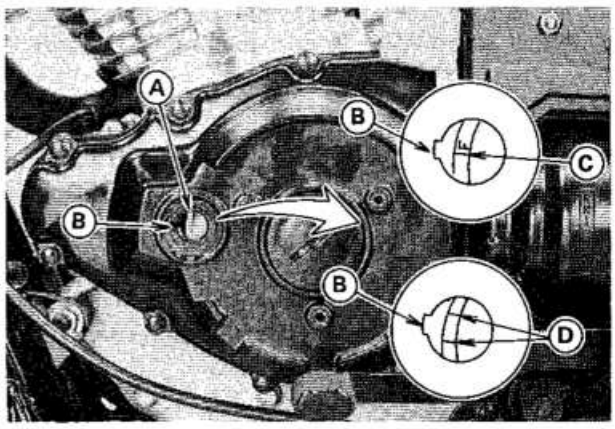
- Pickup coil installation is the reverse of removal.

Ignition System Checkout:

For any ignition system problems, always check the ignition timing first (if the engine will run).

Ignition Timing Test

- Remove the ignition timing inspection plug.
- Attach a timing light and a tachometer in the manner prescribed by the manufacturer.
- Start the engine and aim the timing light at the timing mark on the alternator rotor.
- Run the engine at the speeds specified and note the alignment of the timing marks.



A. Timing Inspection Hole
B. Slot
C. F Mark
D. Advanced Marks

Ignition Timing

Engine speed r/min (rpm)	Slot aligned with:
2,100 and below	F mark on flywheel
4,200 and above	Advanced marks on flywheel

★If the ignition timing is incorrect, replace the IC ignitor.

Engine Stop Switch Inspection

- Disconnect the connectors from the LH switch housing.
- Using an ohmmeter, check to see that only the connections shown in the table have continuity (about zero ohms).

★If the switch has an open or short, disassemble it and clean it (see Engine Stop Switch Removal). Test it again. If it still does not work, replace the LH switch housing.

Engine Stop Switch Connections

	Y/R	BR
RUN		
OFF	○	○

Ignition Coil Inspection

Measuring arcing distance:

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance with the electrotester (special tool: P/N 57001-980).

NOTE

○*Since a tester other than the electrotester of Kawasaki may produce a different arcing distance, the electrotester of Kawasaki is recommended for reliable results.*

- Connect the ignition coil (with the spark plug cap left installed at the end of the spark plug lead) to the tester, and measure the arcing distance.

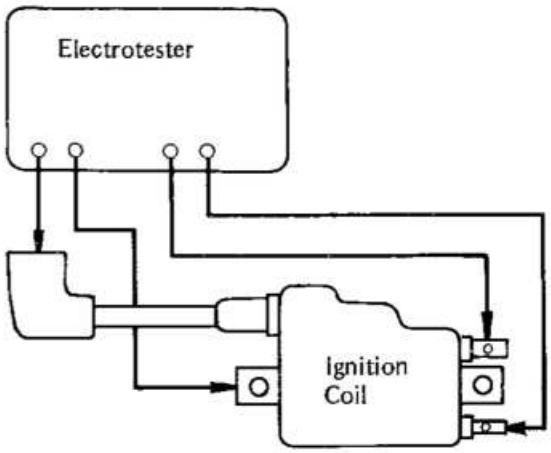
Ignition Coil Arcing Distance

7 mm or more

WARNING

○**To avoid extremely high voltage shocks, do not touch the coil or leads.**

Ignition Coil Test



★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.

Measuring coil resistance:

If the arcing tester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

- Measure the primary winding resistance.

○Connect the multimeter between the coil terminal and the coil core.

○Set the meter to the x 1 Ω range, and read the meter.

- Measure the secondary winding resistance.

○Pull the spark plug cap off the lead.

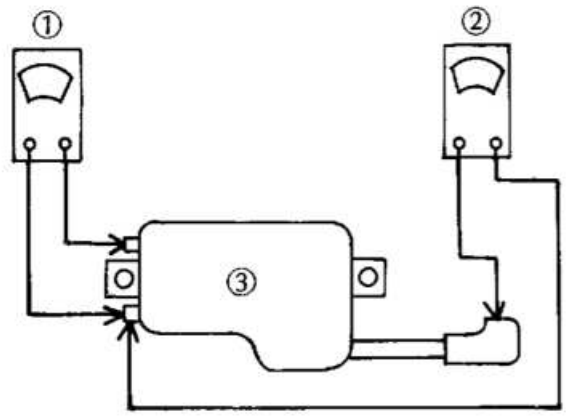
○Connect the multimeter between the spark plug lead and the coil core.

○Set the meter to the x 1 kΩ range, and read the meter.

Ignition Coil Winding Resistance

Primary Windings: 1.8 – 2.8 Ω
Secondary Windings: 10 – 16 kΩ

Ignition Coil Winding Resistance



1. Measure primary winding resistance.
2. Measure secondary winding resistance.
3. Ignition coil

★If the meter does not read as specified, replace the coil.
★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 lead for visible damage.
★If the spark plug lead is damaged, replace the coil.

Spark Plug Cleaning and Inspection

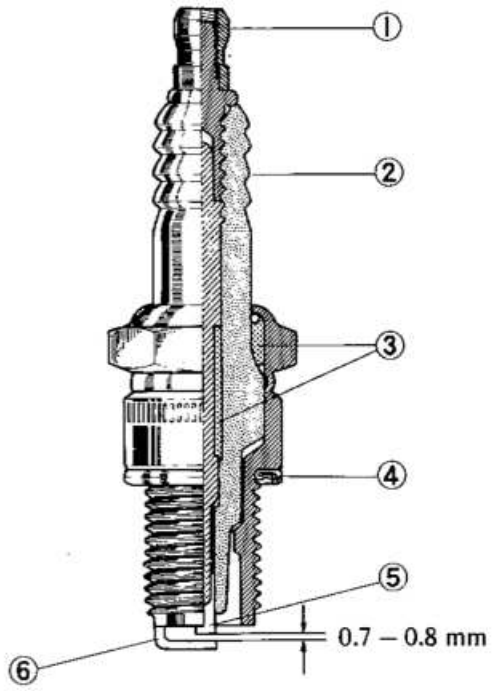
●Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool. If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug or its equivalent.

Spark Plug Gap

●Measure the gap with a wire-type thickness gauge. If the gap is incorrect, carefully bend the outer electrode with a suitable tool to obtain the correct gap.

Spark Plug Gap
0.7 – 0.8 mm

Spark Plug Gap



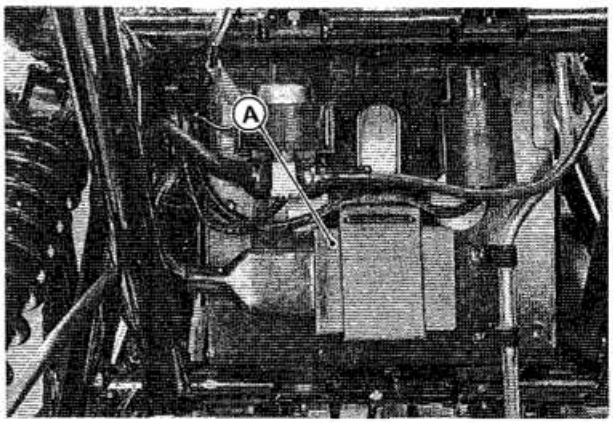
1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center Electrode
6. Side Electrode

IC Ignitor Inspection

●Set the multimeter to the x 1 kΩ range and make the measurements shown in the table.
★If the meter readings do not correspond to the table, replace the IC ignitor.

NOTE

○*Since a tester other than the hand tester of Kawasaki may show different readings, the hand tester of Kawasaki is recommended for reliable results.*



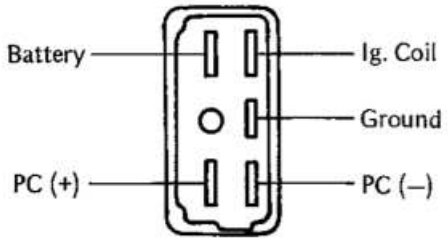
A. IC Ignitor

Internal Resistance of IC Ignitor*

		Tester (–) Lead				
		Battery	Ig. Coil	Ground	PC (+)	PC (–)
Tester (+) Lead	Battery		∞	410 ~ 620 Ω	∞ †	410 ~ 620 Ω
	Ig. Coil	1.1 ~ 1.6 kΩ		300 ~ 460 Ω	∞ †	300 ~ 460 Ω
	Ground	460 ~ 680 Ω	∞		∞ †	0 Ω
	PC (+)	16 ~ 24 kΩ	∞	16 ~ 24 kΩ		16 ~ 24 kΩ
	PC (–)	460 ~ 680 Ω	∞	0 Ω	∞ †	

† The meter needle moves very slightly.
* Measured with hand tester 57001-983.
A tester other the hand tester of Kawasaki may show slightly different readings.

IC Ignitor Terminals

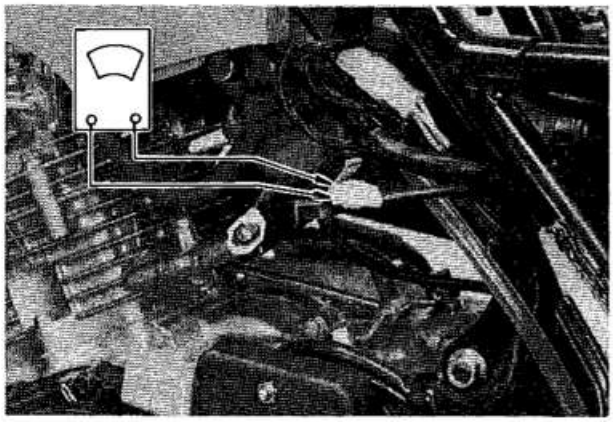


Pickup Coil Resistance
390 – 590 Ω

★If the meter does not read as specified, replace the pickup coil.

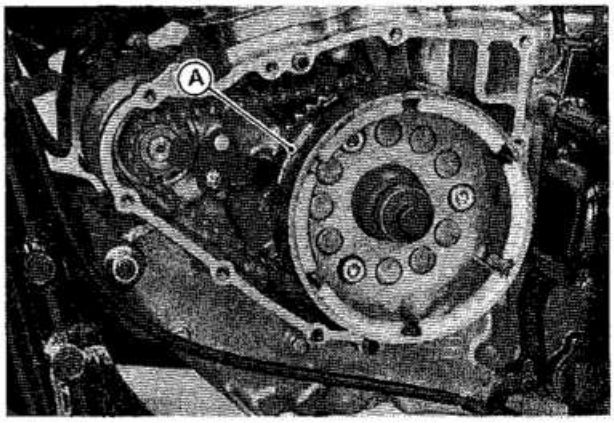
Pickup Coil Inspection

●Measure the pickup coil resistance.
○Connect the multimeter between the black lead and the blue lead.
○Set the meter to the x 10 Ω range, and read the meter.



Alternator Rotor Inspection

●Check the timing projection for damage such as chipping or grooving.



A. Timing Projection

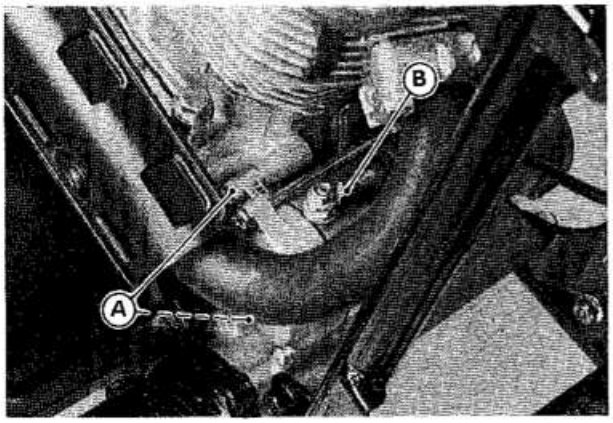
★If the timing projection on the rotor is visibly damaged, replace the alternator rotor.

Electric Starter System

Part Removal:

Starter Motor Removal

- Remove the left engine cover (see Left Engine Cover Removal in the Engine Left Side chapter).
- Remove the starter motor cable.
  - Slide back the rubber cover.
  - Take off the nut and washers, and pull off the cable.
- Remove the starter motor retaining bolts.



A. Bolts B. Starter Motor Cable

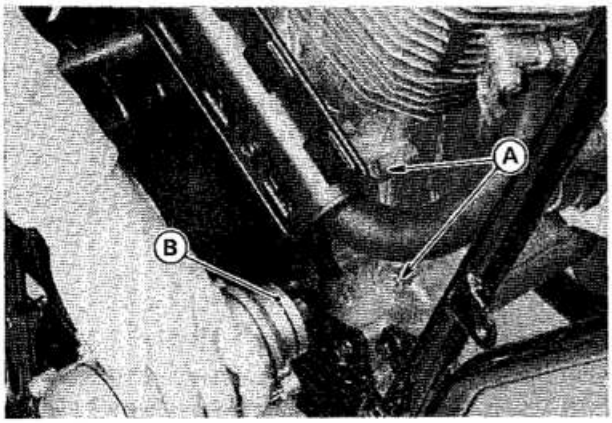
- Gently pry the starter motor out of the engine case.

CAUTION

- **Do not tap the end of the starter motor shaft or the motor may be damaged.**

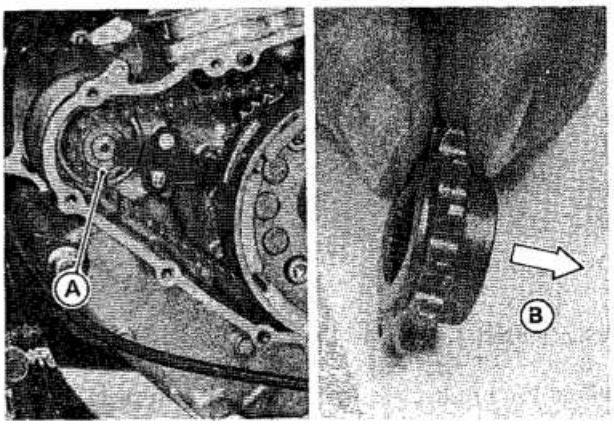
Starter Motor Installation

- Starter motor installation is the reverse of removal. Note the following.
- Clean the starter motor mounting lugs and the crankcase where the lugs touch it, for good electrical contact.



A. Crankcase Surface B. O-ring

- If the O-ring shows any damage or if it is hardened, replace it with a new one.
- Push the starter motor into the case, guiding the sprocket onto the shaft at the same time.



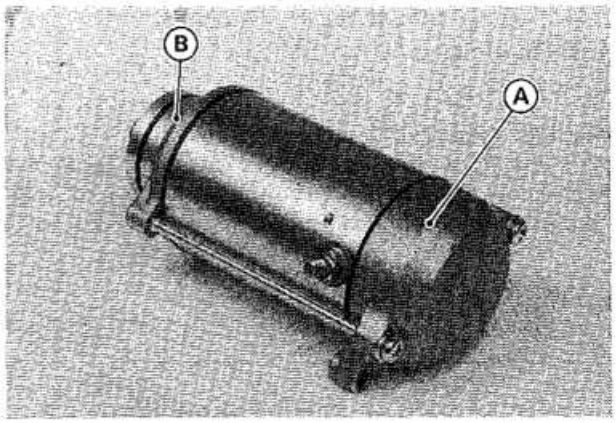
A. Starter Motor Sprocket B. Engine Side

NOTE

- *The protruding side of the sprocket must face in.*

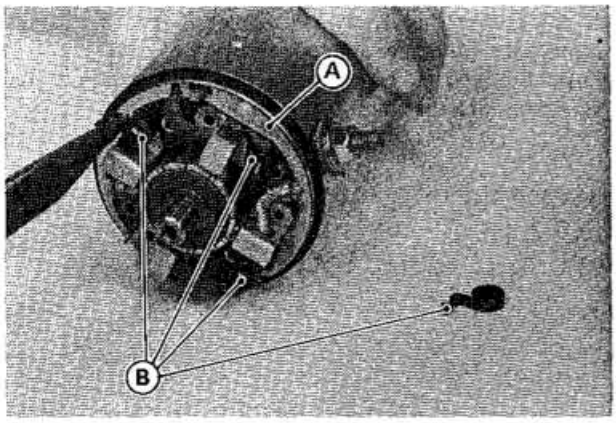
Starter Motor Disassembly

- Remove the starter motor (see Starter Motor Removal).
- Take out the long screws with lock washers.



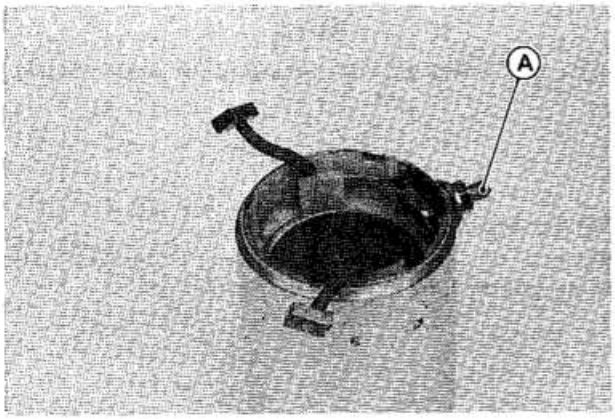
A. Right End Cover B. Left End Cover

- If only the brushes are to be removed, pull off only the right end cover.
- Grasp the brush springs with needle nose pliers, and pull them off the brush plate.
- Raise the brush plate to allow the brushes to clear the end of the commutator.



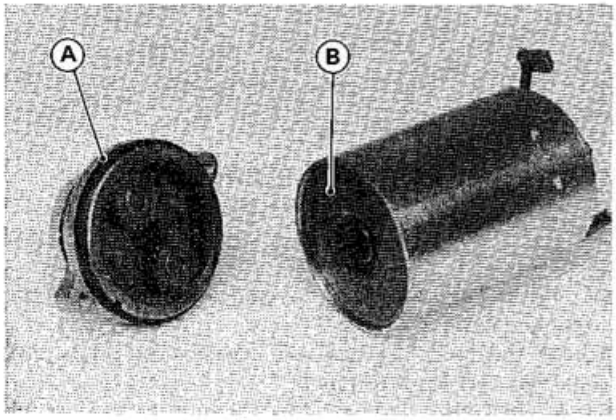
A. Brush Plate B. Springs

- Slip the brushes out of the brush holders on the brush plate.
- Free the brush plate by working the brush leads out of the slots in the plate.
- To remove the positive brushes, first take off the teminal nut with its steel and fiber washers.



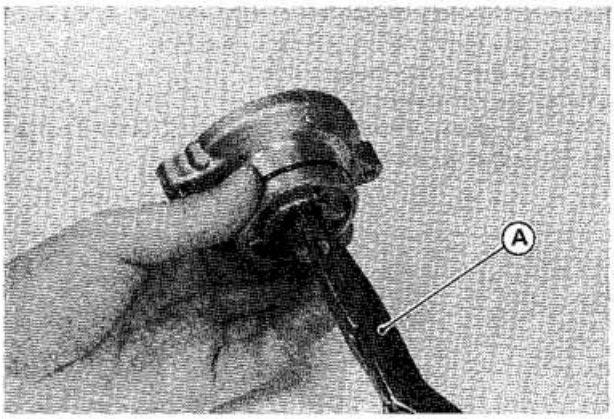
A. Terminal Bolt

- Push the terminal bolt out toward the inside.
- Pull the brush leads to remove the brush assembly.
- To remove the gear set, pull the left end cover off. Be careful not to drop the gears.



A. Left End Cover B. Bearing Plate

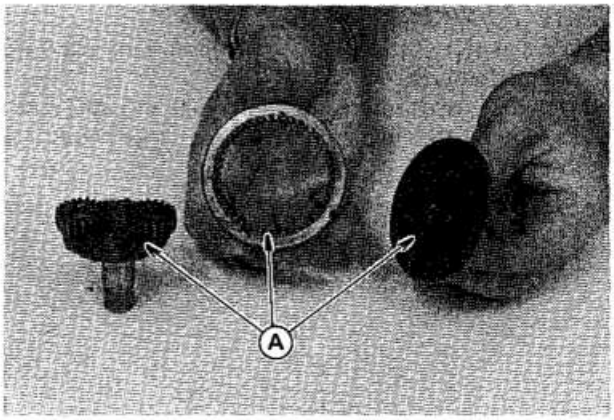
- Push on the armature to remove the left end bearing plate. Be careful not to drop the thrust washers.
- In order to lubricate the gear set bearing, remove the circlip with the circlip pliers (special tool).



A. Circlip Pliers: 57001-144

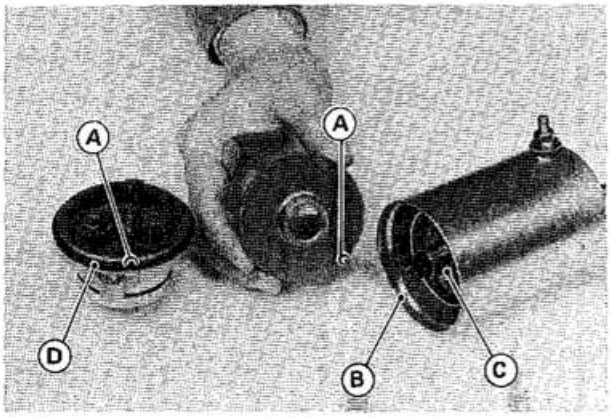
Starter Motor Assembly

- Starter motor assembly is the reverse of removal. Note the following.
- If the gear set was removed, grease the shaft, gears, and bearing plate.



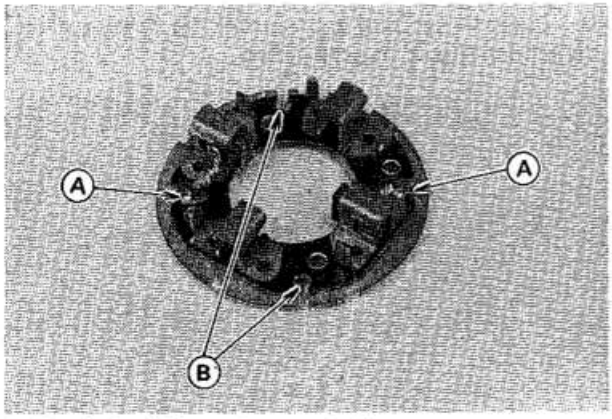
A. Grease.

- Put the thrust washers onto the armature shaft.
- Put the bearing plate into the yoke so that the bearing protrudes toward the armature and the notch aligns with the key in the yoke.



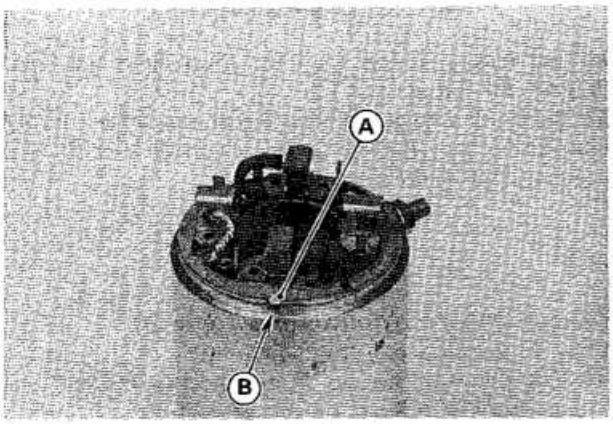
A. Notch
B. Key
C. Thrust Washers
D. O-ring

- Be sure the large O-ring is in place, and push the left end cover into the starter yoke so that the notch on the internal gear aligns with the key in the yoke.
- Push the negative brushes into the holders immediately clockwise from where the brush leads are mounted to the brush plate.



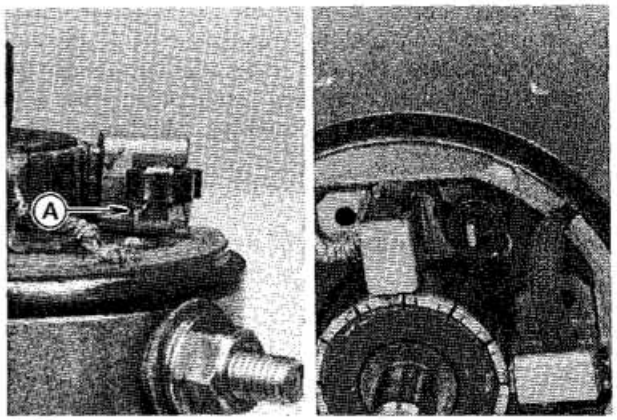
A. Brush Lead Mounting
B. Slots

- Hold the brush plate over the end of the starter and push the positive brush leads through the slots in the brush plate.
- Push the brush plate into place with the tab in the notch as shown.



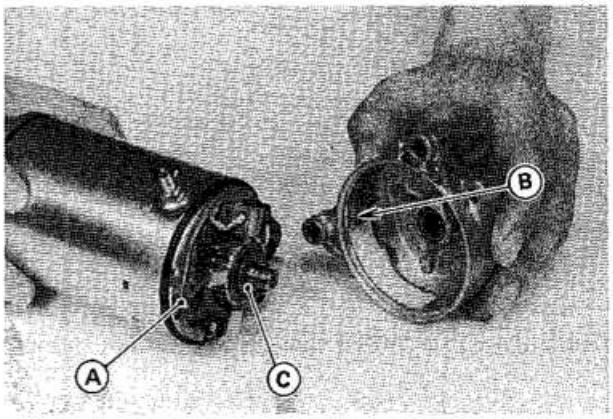
A. Tab
B. Notch

- Install the brush springs.
  - Put the spring down over the post on the brush plate so that it is would clockwise.
  - Twist the "curl" end of the spring clockwise and slip it into the slot in the brush holder.
  - Push the spring down onto the post until it seats against the step.



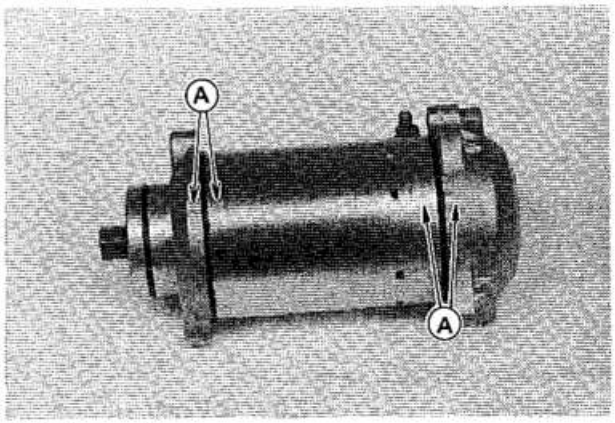
A. Step

- Drop the thrust washers over the end of the armature shaft.
- Install the right end cover so that the long vertical tab on the brush plate aligns with the key slot in the cover.



A. Tab
B. Key Slot
C. Thrust Washers

  - As a further check, these marks should align on the outside of the starter.



A. Align marks.

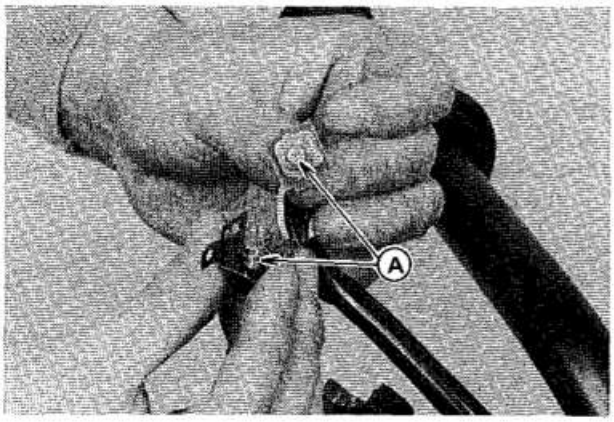
•Tighten the long screws to the specified torque (see Exploded View).

Starter Button Removal

The starter button is inside the LH switch housing. The starter button and its component parts are not available separately. However, the starter button may be removed for cleaning. Be very careful not to lose any parts or the entire switch housing will have to be replaced.

•Remove the engine stop switch (see Engine Stop Switch Removal).

•Pull the starter button free of the LH switch housing.



A. Starter Button Contacts

•Spray the starter button contacts with contact cleaner.

Starter Button Installation

•Starter button installation is the reverse of removal.

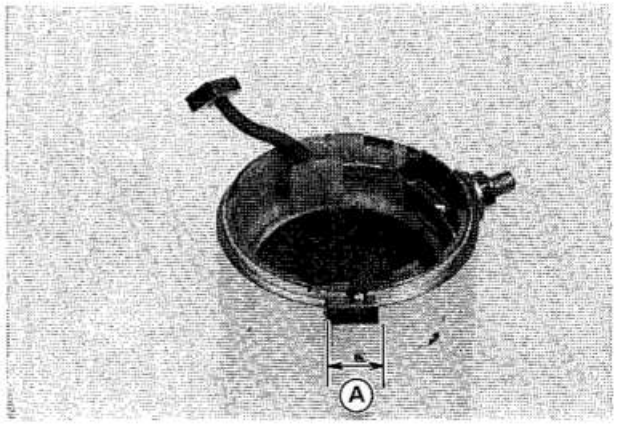
Starter System Checkout:

Starter Motor Brush Length

•Measure the overall length of each brush.

Starter Motor Brush Length

Standard:	**12.0 – 12.5 mm**
Service Limit:	**6 mm**

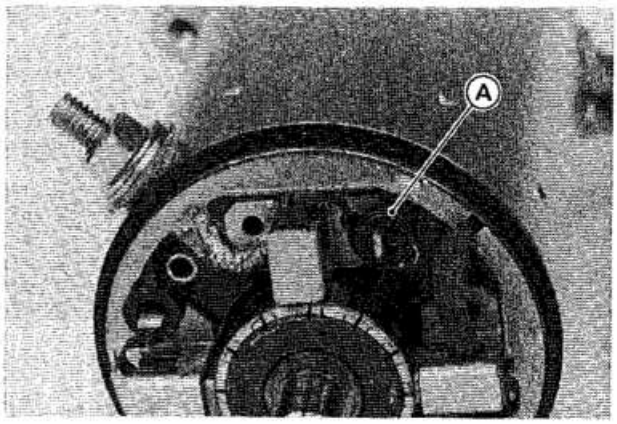


A. Brush Length

★If the brushes are shorter than the service limit, replace them.

Starter Motor Brush Spring Tension

•If a brush spring tension measuring device is available, the tension should be as specified.



A. Brush Spring

Starter Motor Brush Spring Tension

680 – 920 g

★If the tension is less than the lower limit specified, replace the spring.

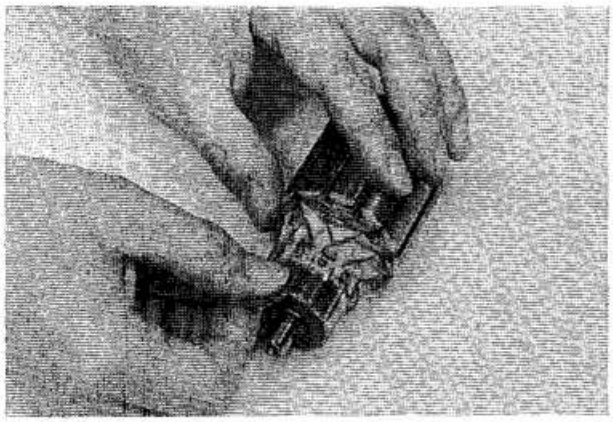
★If the brush springs are able to snap the brushes firmly into place, they may be considered serviceable. If they cannot, replace them.

Starter Motor Commutator Inspection

•Inspect the surface of the commutator.

★If it is grooved dirty, polish it with a piece of very fine sandpaper.

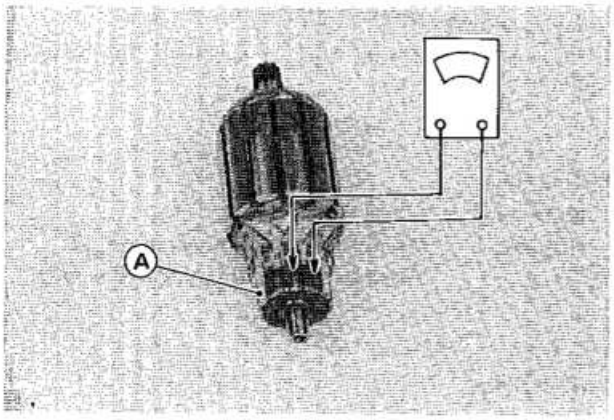
★If the grooves are dirty, clean them carefully.



Starter Motor Armature Inspection

•Measure the resistance between each segment and all the others.

○Use a multimeter set to the x 1 Ω range.

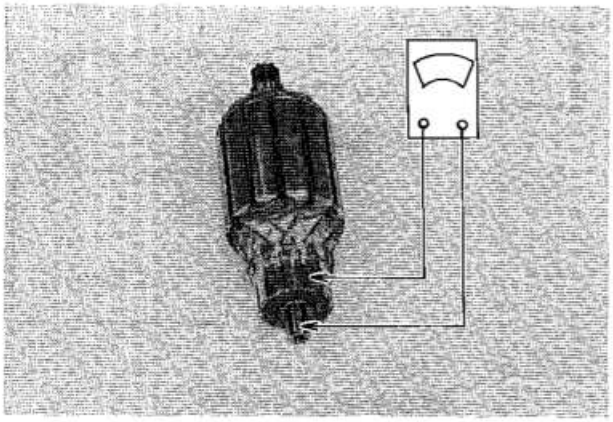


A. Segments

★If the resistance is too high or even infinite, the armature winding has an open circuit. Replace the starter motor.

•Measure the resistance between the commutator and the armature shaft.

○Use a multimeter set to the x 1 kΩ range.

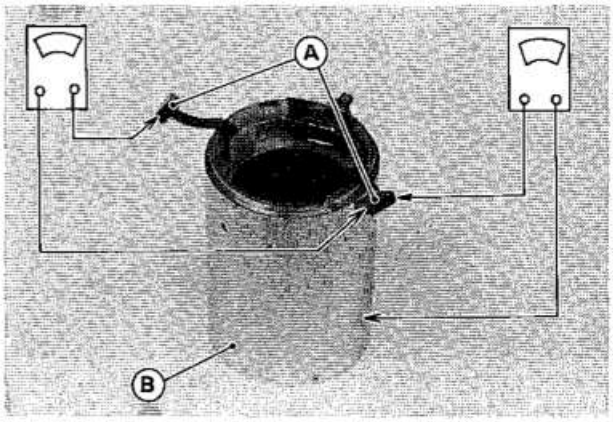


★If the resistance is less than infinite, the armature is shorted. Replace the starter motor.

Brush Assembly Inspection

•Measure the resistance between the two positive brushes.

○Use a multimeter set to the x 1 Ω range.



A. Positive Brushes B. Yoke

★If the resistance is greater than 0 Ω, replace the positive brush assembly.

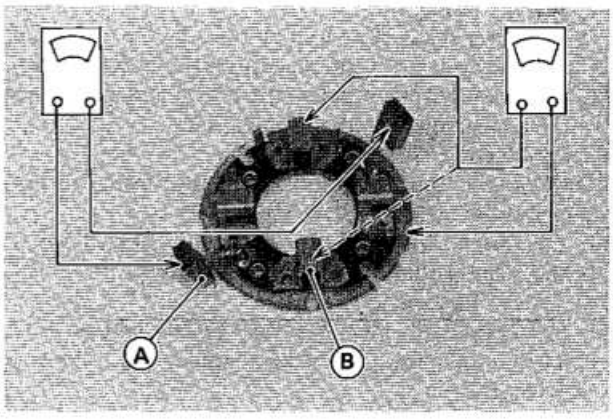
•Measure the resistance between the positive brushes and the starter yoke.

○Use a multimeter set to the x 1 kΩ range.

★If the resistance is less than infinite, the positive brush assembly is shorted to ground. Replace the positive brush assembly.

•Measure the resistance between the negative brushes.

○Use a multimeter set to the x 1 Ω range.

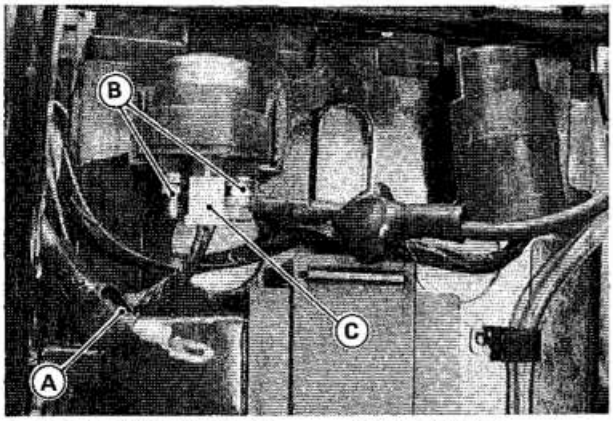


A. Negative Brushes B. Positive Brush Holders

★If the resistance is greater than 0 Ω, replace the negative brush assembly.
•Measure the resistance between the positive brush holders and the plate.
○Use a multimeter set to the x 1 kΩ range.
★If the resistance is less than infinite, replace the negative brush assembly.

Starter Relay Inspection

•Remove the rear fender (see Rear Fender Removal in the Frame chapter).
•Disconnect the black lead to the starter motor.

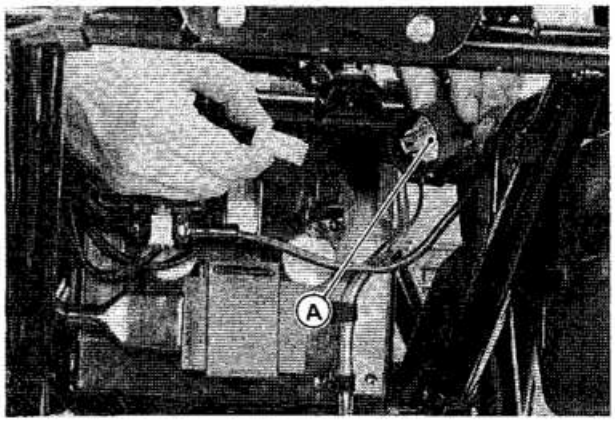


A. Lead to Starter Motor
B. Larger Terminals
C. Small Plug

•Measure the continuity of the relay when activated.
○Connect a multimeter across the larger terminals of the relay.
○Set the meter to the x 1 Ω range.
○Check that the transmission is in neutral.
○Turn on the ignition switch.
○Push the starter button and read the meter.
★If the relay does not click or if the meter reads more than 0 Ω, the relay is defective. Replace it.
★If the relay clicks once but the meter does not read 0 Ω, the relay is defective. Replace it.
★If the relay does not click at all, proceed with the following.
•Disconnect the small plug in the relay.
•Connect a multimeter across the pins in the relay plug.
•Set the meter to the x 1 Ω range, and read the meter.
★If the meter does not read close to 0 Ω, the relay is defective. Replace it.
★If the meter reads close to 0 Ω, the relay may be good. Check the voltage to the relay from the starter button.
•Connect a multimeter across the brown and black leads in the connector from the main harness.
•Set the meter to the 25 V DC range.
•Turn on the ignition switch, push the starter button, and read the meter.
★If the meter reads battery voltage, the circuit is good. If the relay would not click in the previous tests, it is defective. Replace it.
★If the meter reads much less than battery voltage or no voltage at all, the circuit is bad. Check the following.
Starter Button
Starter Circuit Relay
Wiring

Starter Circuit Relay Inspection

•Remove the starter circuit relay that is mounted on the rear of the battery case.



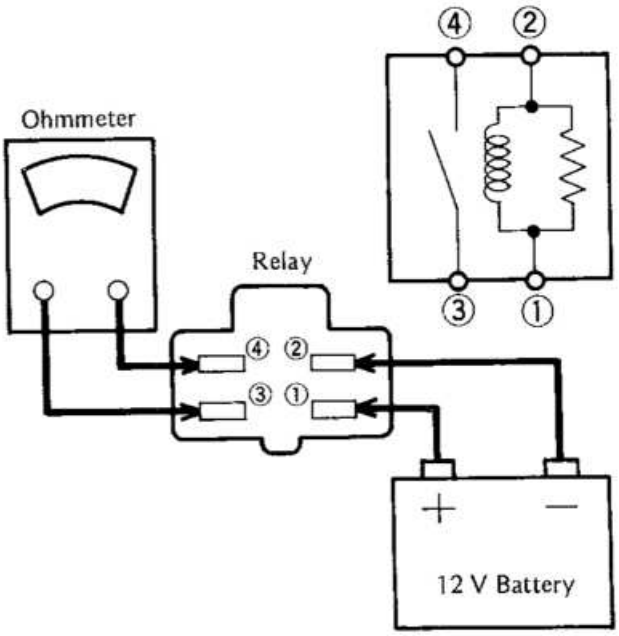
A. Starter Circuit Relay

•Connect an ohmmeter and one 12 V battery to the relay as shown.
★If the relay does not work as specified, the relay is defective.

Testing Relay

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

Testing Relay



① and ② : Relay Coil Terminals
③ and ④ : Relay Switch Terminals

Starter Button Inspection

- Disconnect the connectors from the LH switch housing.
- Turn the engine stop switch to the RUN position.
- Using an ohmmeter, check to see that the connections shown in the table continuity (about zero ohms).

★If the starter button has an open or short, disassemble it and clean it (see Starter Button Removal). Test it again. If it still does not work, replace the LH switch housing.

Starter Button Connections

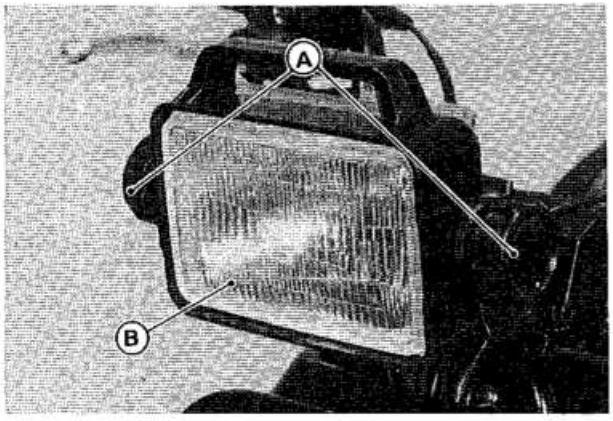
	BK	BR
Pushed	○	○
Released		

Lighting System

Bulb Replacement:

Headlight Bulb Replacement

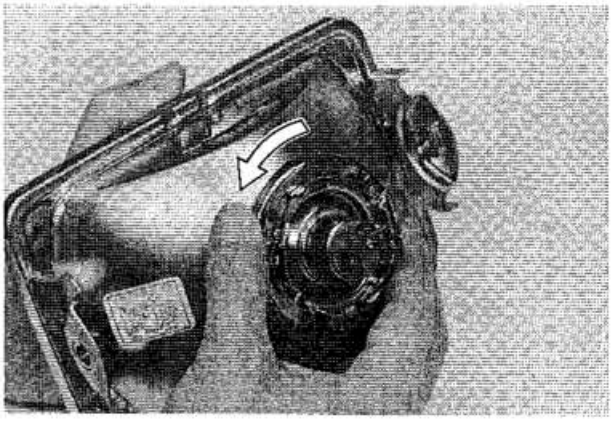
- Remove the headlight mounting knobs, and take the headlight unit off the housing.
- Disconnect the bulb socket from the headlight unit.



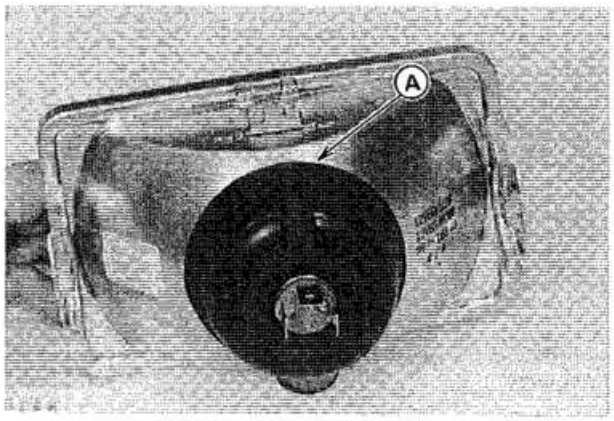
A. Knobs B. Headlight Unit

- Slide back the dust cover and remove the bulb holder and bulb from the headlight unit.

○Turn the holder counterclockwise and pull it out.

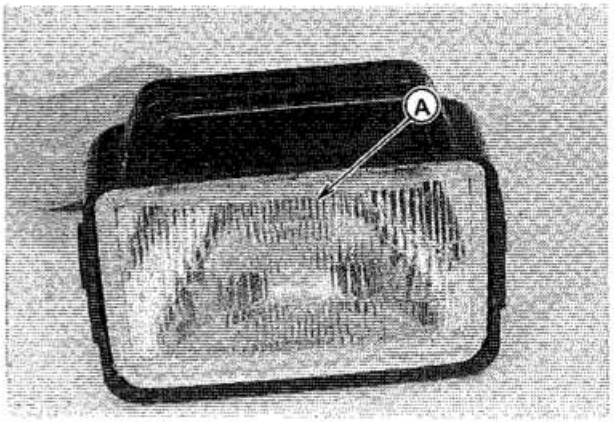


- Be sure the socket is clean.
- Insert the new bulb by aligning the tangs with the catches in the headlight unit.
- Push the holder in, turn it clockwise, and release it. It should lock in position.
- Slide back the dust cover completely as shown in the label behind the unit. The "TOP" mark on the cover must point up.



A. "TOP" Mark

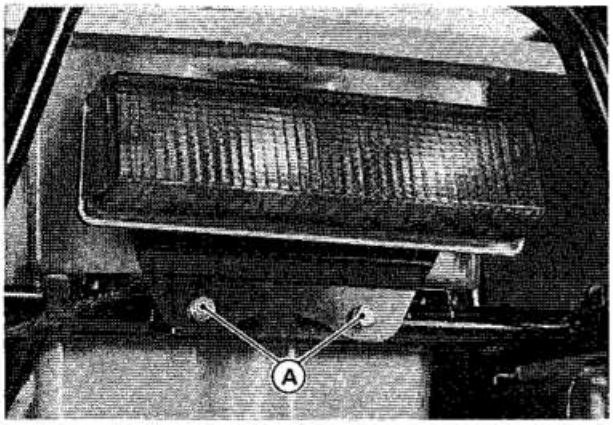
- Install the removed parts in the reverse order of removal noting the following.
- Be sure the flanged collars are in place in the rubber dampers in the headlight housing.
- Install the headlight unit so that the "TOP" mark on the lens points up.



A. "TOP" Mark

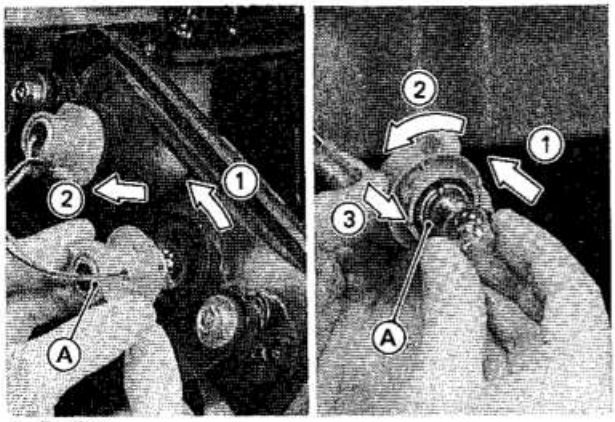
Taillight Bulb Replacement

•Remove the taillight mounting bolts.



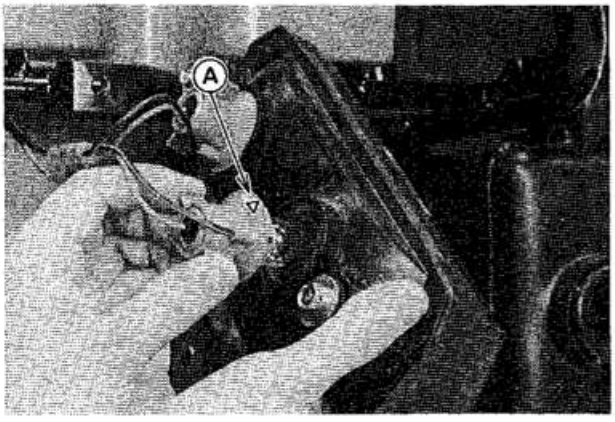
A. Mounting Bolts

•Turn the socket counterclockwise and pull it out.
•Push the bulb in, turn it counterclockwise, and pull it out.



A. Socket

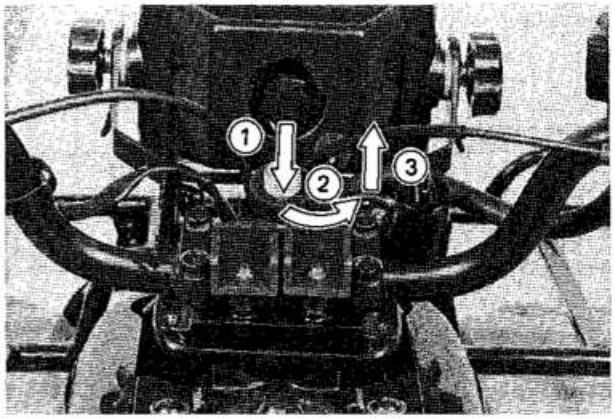
•Be sure the socket is clean.
•Insert the new bulb by aligning the pins with the grooves in the walls of the socket.
•Push the bulb in, turn it clockwise, and release it. It should lock in position.
•Insert the socket by aligning the tangs with the catches in the housing so that the triangular mark points up, and turn it clockwise to lock in position.



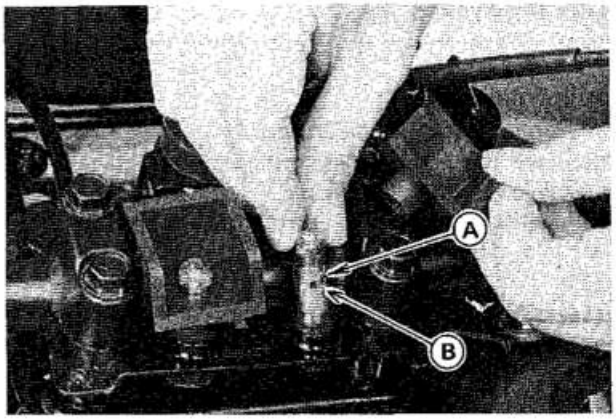
A. Triangular Mark

Neutral and Reverse Indicator Light Bulb Replacement

•Remove the steering stem head cover screws and ignition switch ring nut, and take off the cover.
•Push each bulb down, turn it counterclockwise, and pull it out.



•Be sure the socket is clean.
•Aligning the new bulb's pins with the grooves in the walls of the socket, push the bulb in, turn it clockwise, and release it.



A. Pins B. Grooves

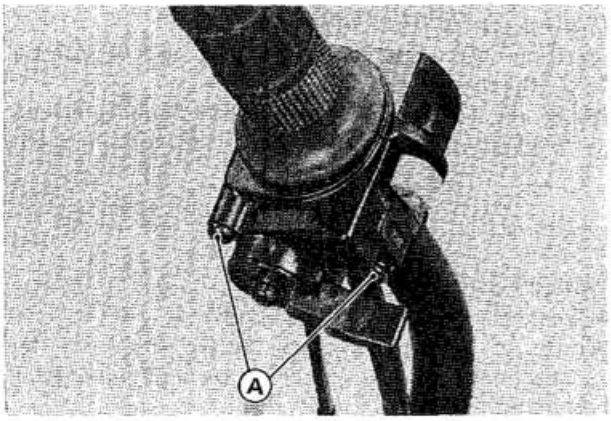
•Fit the rubber boot in the place.
•Replace the stem head cover and screw on the ignition switch ring nut and cover holding screws.

Part Removal:

Light Switch Removal

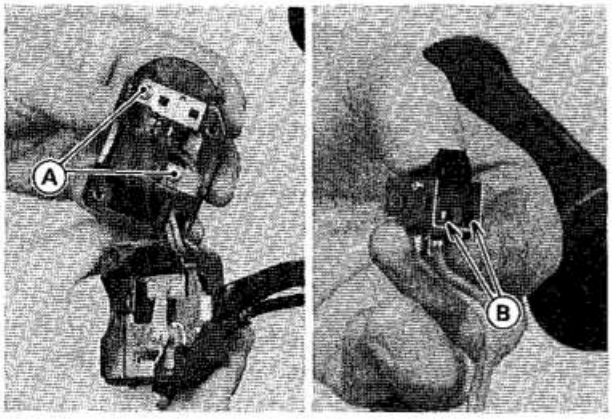
The light switch is inside the LH switch housing. The switch and its component parts are not available separately. However, the switch may be removed for cleaning. Be very careful not to lose any parts or the entire LH switch housing will have to be replaced.

•Take out the screws which clamp the LH switch housing to the handlebar.



A. Screws

•Disconnect the connector from the LH switch housing, and free the LH switch housing from the frame.
•Take out the screws inside the housing, and remove the clamps.



A. Screws B. Switch Contacts

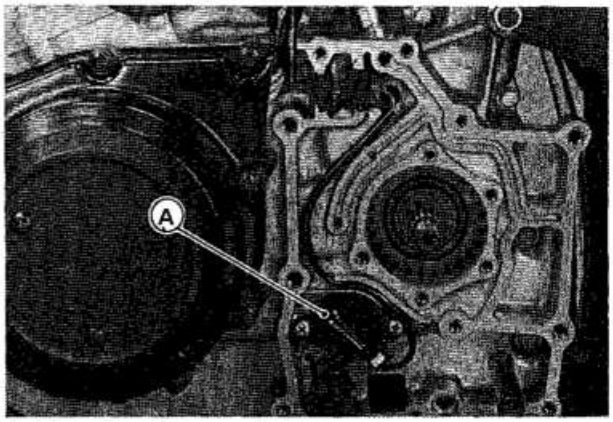
•Take out the switch mounting screw, and remove the switch.
•Spray the switch contacts with contact cleaner while snapping the switch on and off.
○Reassemble the switch in the reverse order of disassembly.

Light Switch Installation

•Light switch installation is the reverse of removal. Be sure to put all the wire clamps in.

Neutral and Reverse Switch Removal

•Remove the front gear case (see Front Gear Case Removal in the Final Drive chapter).
•Disconnect the neutral and reverse switch connector.
•Remove the screws and take off the switch.



A. Neutral and Reverse Switch

Neutral and Reverse Switch Installation

•Neutral and reverse switch installation is the reverse of removal. Note the following.
•Clean any corrosion or dirt off the contacts.
•Apply a non-permanent locking agent to the threads of the switch mounting screws.

Lighting System Checkout:

Light Switch Inspection

•Disconnect the connector from the LH switch housing.
•Using an ohmmeter, check to see that only the connections shown in the table have continuity (about zero ohms).
★If the switch has an open or short, disassemble it and clean it (see Light Switch Removal). Test it again. If it still does not work, replace the LH switch housing.

Light Switch Connections

	BR	R
ON	○	○
OFF		

Neutral and Reverse Switch Inspection

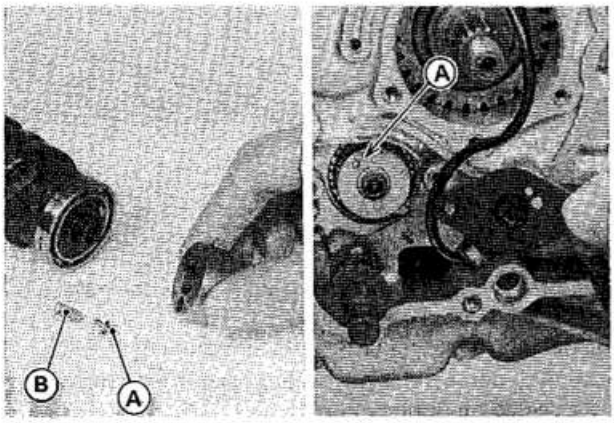
•Disconnect the connector from the neutral and reverse switch.
•Using a ohmmeter, check to see that the connections shown in the table have continuity (about zero ohms).
★If the switch will not close, it may be removed for cleaning (see Neutral and Reserve Switch Removal), or the entire switch may be replaced.

Neutral and Reverse Switch Inspection

Gear Position	G	Ground	R
1st through 5th			
Neutral	○	●	
Reverse		●	○

- Remove the neutral and reverse switch (see Neutral and Reverse Switch Removal).
- Push in the pin in the shift drum stopper and then release it.

★If it does not spring out, it can be disassembled for repair. Disassemble the shift drum stopper and check the contact pin and spring. Replace the damaged part.

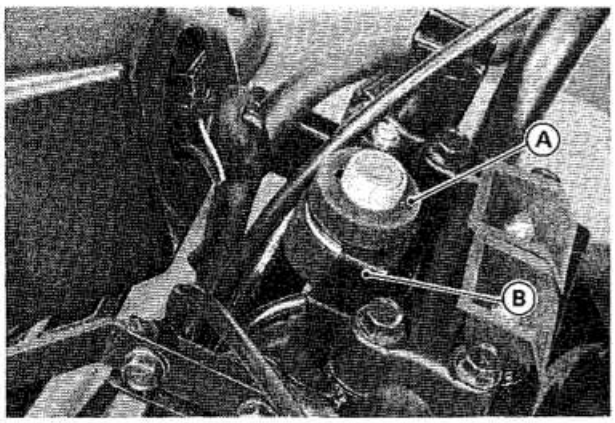


A. Pin B. Spring

Ignition Switch

Ignition Switch Removal

- Remove the steering stem head cover screws and ignition switch ring nut, and take off the cover.
- Pull the rubber damper off the ignition switch, and drop the switch out the bottom of the bracket.



A. Rubber Damper B. Bracket

- Disconnect the wire leads.

Ignition Switch Installation

- Ignition switch installation is the reverse of removal. Note the following.
- Align the notches in the bracket and rubber damper with the protrusion on the side of the ignition switch.

Ignition Switch Inspection

- Disconnect the ignition switch leads.
- Using an ohmmeter, check to see that only the connections shown in the table have continuity (about zero ohms).

★If the switch has an open or short, replace it with new one.

Ignition Switch Connections

	White	Brown
OFF		
ON	●	●
OFF		

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.

Appendix

Table of Contents

Additional Considerations for Racing 15-2
Carburetor 15-2
Spark Plug 15-2
Spark Plug Inspection 15-3
Troubleshooting Guide 15-4
General Lubrication 15-7
Lubrication 15-7
Bolt and Nut Tightening 15-7
Tightness Inspection 15-7
Unit Conversion Table 15-8

Additional Considerations for Racing

This vehicle has been manufactured for use in a reasonable and prudent manner and as a vehicle only. However, some may wish to subject this vehicle to abnormal operation, such as would be experienced under racing conditions. KAWASAKI STRONGLY RECOMMENDS THAT ALL RIDERS RIDE SAFELY AND OBEY ALL LAWS AND REGULATIONS CONCERNING THEIR VEHICLE AND ITS OPERATION.

Racing should be done under supervised conditions, and recognized sanctioning bodies should be contacted for further details. For those who desire to participate in competitive racing or related use, the following technical information may prove useful. However, please note the following important points.

- You are entirely responsible for the use of your vehicle under abnormal conditions such as racing, and Kawasaki shall not be liable for any damages which might arise from such use.
- Kawasaki's Limited Motorcycle Warranty specifically excludes vehicles which are used in competitive or related uses. Please read the warranty carefully.
- Motorcycle racing is a very sophisticated sport, subject to many variables. The following information is theoretical only, and Kawasaki shall not be liable for any damages which might arise from alterations utilizing this information.

Carburetor:

Sometimes an alteration may be desirable for improved performance under special conditions when proper mixture is not obtained after the carburetor has been properly adjusted, and all parts cleaned and found to be functioning properly.

If the engine still exhibits symptoms of overly lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a smaller or larger one. A smaller numbered jet gives a leaner mixture and a larger numbered jet a richer mixture.

Spark Plug:

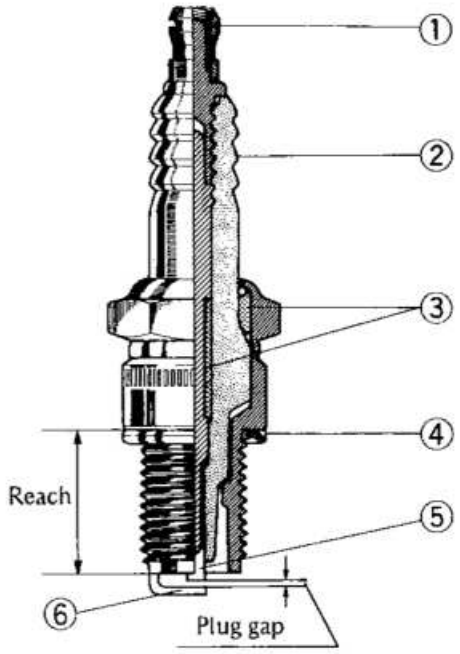
The spark plug ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plug must be used, and the spark plug must be kept clean and adjusted.

Test have shown the plug listed in the Electrical System chapter to be the best plug for general use.

Since spark plug requirements change with the ignition and carburetion adjustments and with riding conditions, whether or not spark plug of a correct heat range is used should be determined by removing and inspecting the plug.

When a plug of the correct heat range is being used, the electrodes will stay hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and plug itself. This temperature is about 400 – 800°C (750 – 1,450°F) and can be judged by noting the condition and color of the ceramic insulator around the center electrode. If the ceramic is clean and of a light brown color, the plug is operating at the right temperature.

Spark Plug

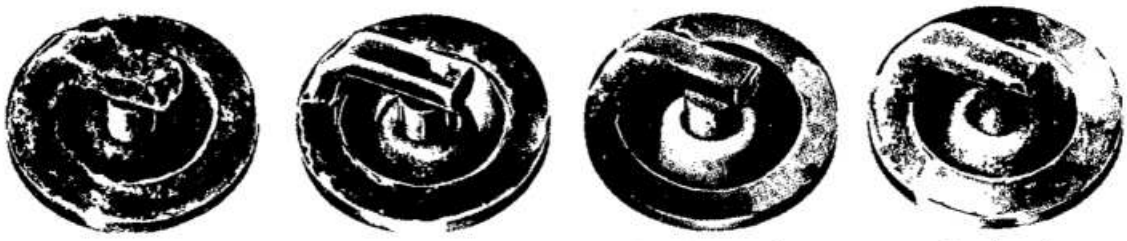


1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center Electrode
6. Side Electrode

A spark plug for higher operating temperature is used for racing. Such a plug is designed for better cooling efficiency so that it will not overheat and thus is often called a "colder" plug. If a spark plug with too high a heat range is used – that is, a "cold" plug that cools itself too well – the plug will stay too cool to burn off the carbon, and the carbon will correct on the electrodes and the ceramic insulator.

The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause preignition and knocking, which may eventually burn a hole in the top of the piston.

Spark Plug Condition



Carbon fouling | Oil fouling | Normal operation | Overheating

Spark Plug Inspection

- Remove the spark plug and inspect the ceramic insulator.
- ★Whether or not the right temperature plug is being used can be ascertained by noting the condition of the ceramic insulator around the electrode. A light brown color indicates the correct plug is being used. If the ceramic is white, the plug is operating at too high a temperature and it should be replaced with the next colder type.

CAUTION

- ○**If the spark plug is replaced with a type other than the standard plug, make certain the replacement plugs have the same thread pitch and reach (length of threaded portion) and the same insulator type (regular type or projected type) as the standard plug.**
- ○**If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.**
- ○**If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.**

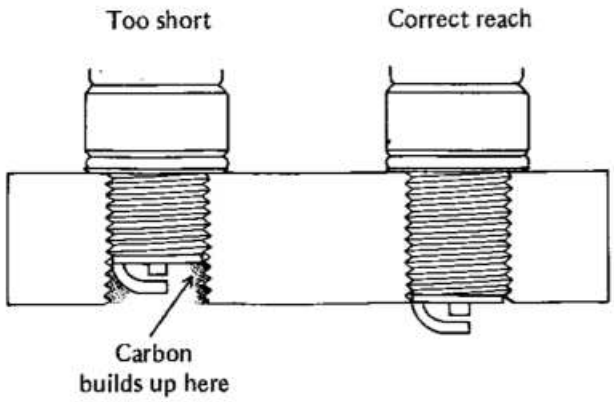
Standard Spark Plug Threads

Diameter	14 mm
Pitch:	1.25 mm
Reach:	19.0 mm

NOTE

- ○*The heat range of the spark plug functions like a thermostat for the engine. Using the wrong type of spark plug can make the engine run too hot (resulting in engine damage) or too cold (with poor performance, misfiring and stalling).*

Plug Reach



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
- Neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Relays not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Fuse blown

Starter motor rotating but engine doesn't turn over
- Starter motor clutch trouble

Engine won't turn over
- Valve seizure
- Rocker arm seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Balancer bearing seizure

No fuel flow
- Tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

Engine flooded
- Fuel level too high
- Float valve worn or stuck open
- Starting technique faulty
- (When flooded, crank with the throttle fully open to allow more air to reach the engine.)

No spark; spark weak
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- Pickup coil trouble
- IC ignitor trouble
- Ignition coil trouble
- Battery voltage low
- Ignition or engine stop switch shorted
- Wiring shorted or open

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed

Spark weak
- 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
- Battery voltage low

Fuel/air mixture incorrect
- Pilot screw and/or idle adjusting screw maladjusted
- Pilot jet, or air passage clogged
- Starter plunger stuck open
- Air cleaner clogged, poorly seated, or missing
- Fuel level too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Air cleaner duct loose

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings 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)

Other
- Vacuum piston doesn't slide smoothly
- Engine oil viscosity too high
- Brake dragging
- Final gear case oil viscosity too high

Poor Running or No Power at High Speed

Firing incorrect
- 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
- Pickup coil trouble
- IC ignitor trouble
- Ignition coil trouble

Fuel/air mixture incorrect
- Main jet clogged or wrong size
- Jet needle or needle jet worn

Air jet clogged
Bleed hole of air bleed pipe or needle jet clogged
Fuel level too high or too low
Air cleaner clogged, poorly seated, or missing
Starter plunger stuck open
Water or foreign matter in fuel
Carburetor holder loose
Air cleaner duct loose
Fuel tank air vent obstructed
Fuel line clogged
Fuel tap clogged

Compression low
Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston rings bad (worn, weak, broken, or sticking)
Piston ring/land clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn or carbon accumulation on the seating surface.)

Knocking
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
IC ignitor trouble

Miscellaneous
Throttle valve won't fully open
Vacuum piston doesn't slide smoothly
Brake dragging
Clutch slipping
Overheating
Engine oil level too high
Engine oil viscosity too high
Final gear case oil viscosity too high

Overheating

Firing incorrect
Spark plug dirty, broken, or maladjusted
Spark plug incorrect
IC ignitor trouble

Fuel/air mixture incorrect
Main jet clogged
Fuel level too low
Carburetor holder loose
Air cleaner poorly sealed, or missing
Air cleaner duct loose
Air cleaner clogged

Compression high
Carbon built up in combustion chamber

Engine load faulty
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Brake dragging

Lubrication inadequate
Engine oil level too low
Engine oil poor quality or incorrect

Clutch Operation Faulty

Clutch slipping
Friction and/or steel plates worn or warped
Clutch housing or shoe linings overworn or worn unevenly
Clutch spring broken or weak
Clutch release maladjusted
Clutch release mechanism trouble
Clutch hub or housing unevenly worn

Clutch not disengaging properly
Friction and/or steel plates warped or too rough
Clutch spring tension uneven
Clutch shoe spring broken or weak
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on crankshaft or drive shaft
Clutch release mechanism trouble

Gear Shifting Faulty

Doesn't go into gear; shift pedal doesn't return
Clutch not disengaging
Shift fork(s) bent or seized
Gear(s) stuck on the shaft
Shift return spring weak or broken
Shift mechanism arm spring broken
Shift return spring pin loose
Shift drum positioning lever binding on pivot bolt
Shift mechanism arm broken
Shift drum damaged

Jumps out of gear
Shift fork(s) worn
Gear groove(s) worn
Gear dogs, dog recesses, and/or dog holes worn
Shift drum groove(s) worn
Shift drum positioning lever spring weak or broken
Shift fork guide pin(s) worn
Shift mechanism arm spring weak or broken
Drive shaft, output shaft, and/or gear splines worn

Overshifts
Shift drum positioning lever spring weak or broken
Shift mechanism arm spring weak or broken

Abnormal Engine Noise

Knocking
IC ignitor trouble
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Incorrect spark plug heat range
Overheating

Piston slap
Cylinder/piston clearance excessive
Cylinder, piston worn
Connecting rod bent
Piston pin, piston holes worn

Valve noise
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn

Other noise
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive

Piston ring(s) worn, broken or stuck
Piston seizure damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mount(s) loose
Crankshaft bearings worn
Primary gear worn or chipped
Camshaft chain tensioner trouble
Camshaft chain, sprocket, guides worn
Balancer bearing worn
Balancer gear worn or chipped

Abnormal Drive Train Noise

Clutch noise
Clutch housing and/or hub damaged
Transmission noise
Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient or too thin
Drive train noise
Bevel gear bearings worn
Propeller shaft bearing worn
Front bevel gear cam damper damage
Bevel gears worn or chipped
Bevel gears maladjusted
Insufficient lubricant

Abnormal Frame Noise

Shock absorber noise
Shock absorber damaged
Brake noise
Brake linings overworn or worn unevenly
Drum worn unevenly or scored
Brake spring(s) weak or broken
Foreign matter in hub
Brake not properly adjusted
Other noise
Brackets, nuts, bolts, etc. not properly mounted or tightened

Exhaust Smokes Excessively

White smoke
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Cylinder head gasket damaged
Engine oil level too high
Black smoke
Air cleaner clogged
Main jet too large or fallen off
Starter plunger stuck open
Fuel level too high
Brown smoke
Main jet too small
Fuel level too low
Air cleaner duct loose
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory

Handlebar hard to turn
Steering stem bearing damaged
Steering stem lubrication inadequate
Steering stem bent
Tire air pressure too low
Handlebar shakes or excessively vibrates
Tire(s) worn
Rim(s) warped
Rear axle runout excessive
Wheel bearing(s) worn
Handlebar mount(s) loose
Steering stem nut and/or stem clamp bolt(s) loose
Handlebar pulls to one side
Frame bent
Wheel maladjustment
Steering stem bent
Front or rear tire air pressure unbalanced
Front or rear shock absorber unbalanced
Shock absorption unsatisfactory
Too hard:
Tire air pressure too high
Shock absorber maladjusted
Too soft:
Shock absorber oil leaking
Shock absorber spring weak
Tire air pressure too low
Shock absorber maladjusted

Brake Doesn't Hold

Air in the brake line
Brake fluid leak
Brake fluid deteriorated
Primary or secondary cup trouble
Master or wheel cylinder scratched inside
Brake not properly adjusted
Linings overworn or worn unevenly
Drum worn unevenly or scored
Oil, grease on lining and drum
Dirt, water between lining and drum
Overheated

Battery Discharged

Battery faulty (e.g., plates sulphated, shorted through sedimentation, electrolyte level too low)
Battery leads making poor contact
Load excessive (e.g., bulb of excessive wattage)
Ignition switch trouble
Regulator/Rectifier trouble
Alternator trouble
Wiring faulty

Battery Overcharged

Regulator/Rectifier trouble
Battery trouble

General Lubrication

Lubrication

- Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.
- Lubricate the points listed below with indicated lubricant.

NOTE

○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure spray water, perform the general lubrication.*

Cables: Lubricate with Motor Oil

- Brake Cables
- Throttle Cable
- Choke Cable
- Reverse Cable
- Differential Shift Cable

Slide Points: Lubricate with Grease

- Brake Cable Ends
- Throttle Cable Ends
- Reverse Cable Lower End
- Differential Shift Cable Ends
- Brake Lever
- Brake Pedal Pivot Shaft
- Throttle Lever Shaft
- Choke Lever

Bolt and Nut Tightening

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.
- ★If there are loose fasteners, retorque them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not listed in the appropriate chapter, see the basic torque table (see Torque and Locking Agent in the General Information chapter). For each fastener, first loosen it by ½turn, then tighten it.
- ★If cotter pins are damaged, replace them with new ones.

Bolts, Nuts, and Fasteners to be checked

Wheels:
- Front Hub Nuts and Cotter Pins
- Rear Hub Nuts and Cotter Pins
- Wheel Nuts

Brakes:
- Master Cylinder Clamp Allen Bolts
- Brake Lever Pivot Screw Nut
- Brake Pedal Nut and Cotter Pin
- Brake Cable Equalizer Cotter Pins

Steeing/Suspension:
- Handlebar Clamp Bolts
- Stem Nut and Cotter Pin
- Stem Clamp Allen Bolts
- Stem Bearing Housing Bolts
- Tie-rod End Nuts and Cotter Pins
- Tie-rod Adjusting Sleeve Locknuts
- Shock Absorber Mounting Bolts and Nuts
- Suspension Arm Pivot Bolts and Nuts
- Steering Knuckle Pivot Nuts and Cotter Pins

Engine:
- Engine Mounting Bolts
- Engine Mounting Bracket Bolts
- Exhaust Pipe Holder Nuts
- Muffler Mounting Bolts
- Muffler Clamp Bolt
- Shift Pedal Bolt

Others:
- Footpeg Mounting Bolts
- Grab Rail Mounting Bolts
- Throttle Case Clamp Screws
- Carrier Mounting Bolts

MODEL APPLICATION

Year	Model	Beginning Frame No.
1986	KLF300-A1	JKALF8A1□GA000001, JKALF8A1□GB500001, or LF300A-000001

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

KAWASAKI
HEAVY INDUSTRIES, LTD.
MOTORCYCLE GROUP

Part No. 99924-1057-01

Printed in Japan