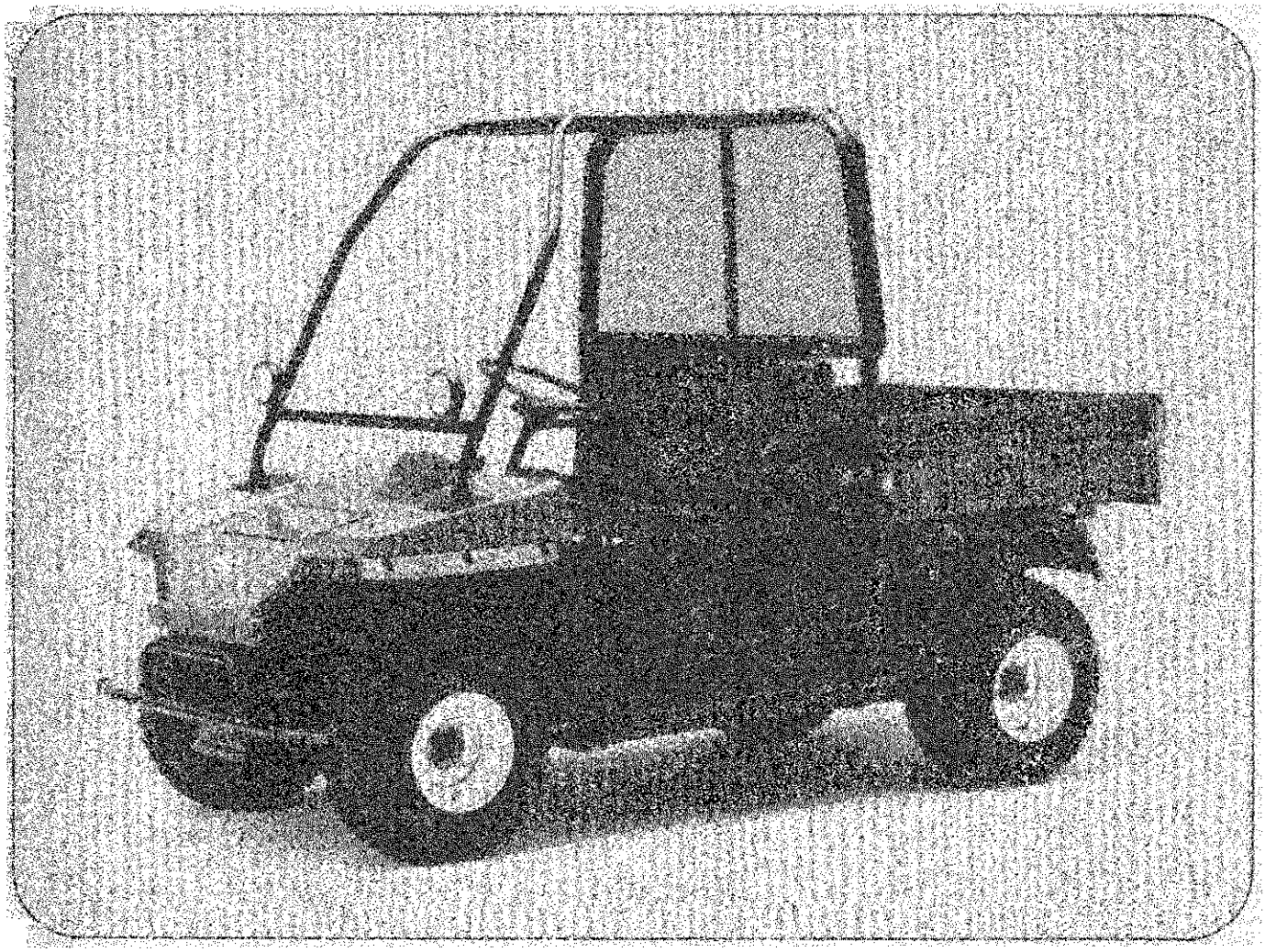
Kawasaki

MULE 1000



Utility Vehicle Service Manual

Quick Reference Guide

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

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

Kawasaki

MULE 1000

Utility Vehicle

Service Manual

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

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

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Second Edition (5) : Dec. 5 , 1995 (M)

PLEASE DO NOT TAMPER WITH NOISE CONTROL SYSTEM

(US Model only)

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



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

Brake Shoes or Pads
Clutch Friction Material
Gaskets
Insulators

SAFETY INSTRUCTIONS

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

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

How to Use this Manual

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

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

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

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

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

WARNING

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

CAUTION

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

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

NOTE

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

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

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

1

General Information

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Before Servicing

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

Especially note the following:

(1) Dirt

Before removal and disassembly, clean the vehicle. Any dirt entering the engine or other parts will work as an abrasive and shorten the life of the vehicle. 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 vehicle. 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, start them all in their holes and tighten them to a snug fit. Then tighten them evenly in a cross pattern. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter 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

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

(5) Force

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

(6) Edges

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

(7) High-Flash Point Solvent

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

(8) Gasket, O-Ring

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

(9) Liquid Gasket, Non-Permanent Locking Agent

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

(10) Press

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

(11) Ball Bearing

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

(12) Oil Seal and Grease Seal

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

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

(13) Seal Guide

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

(14) Circlip, Retaining Ring

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

(15) Cotter Pin

Replace any cotter pins that were removed with new ones, as removal deforms and breaks them.

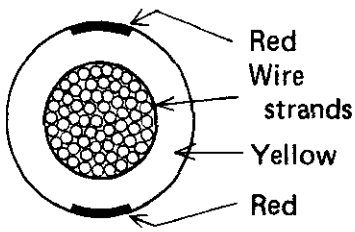
(16) Lubrication

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.

(17) Electrical Wires

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

Wire (cross-section)	Name of Wire Color	Picture in Wiring Diagram
	Yellow/red	

(18) 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.

(19) Inspection

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

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

(20) Service Data

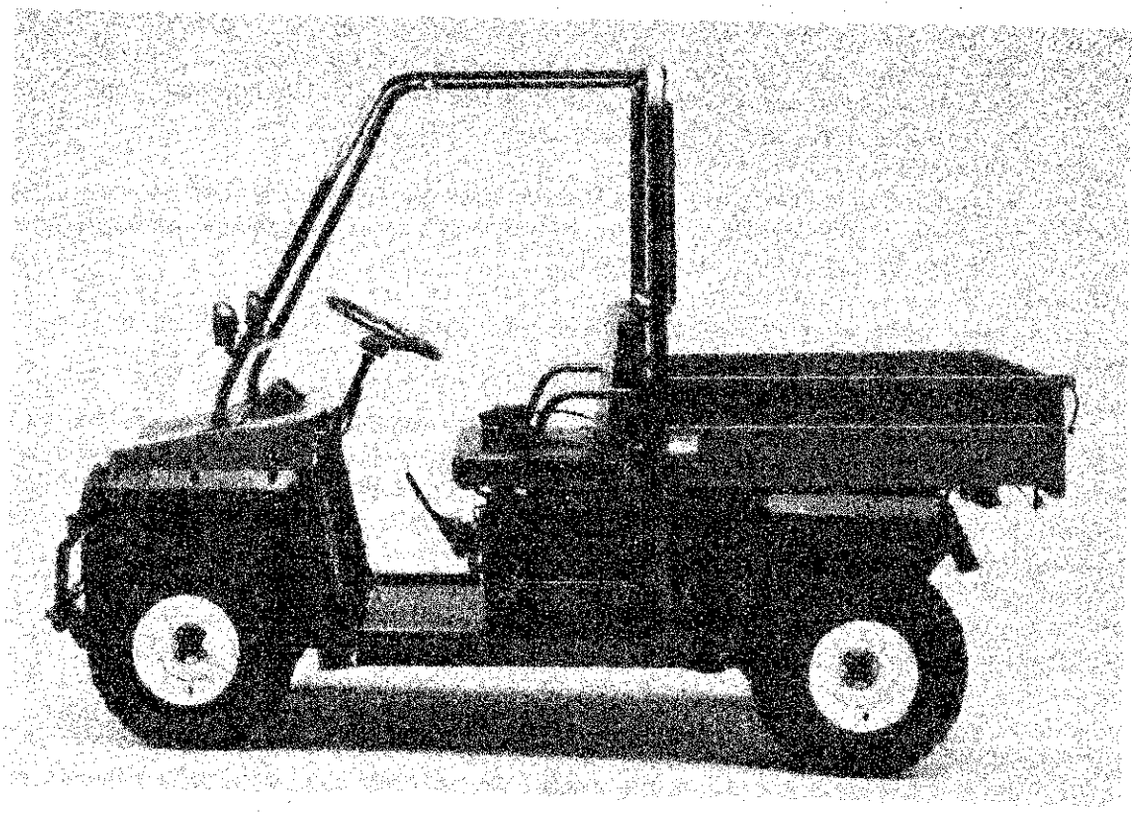
Numbers of service data in this text have following meanings:

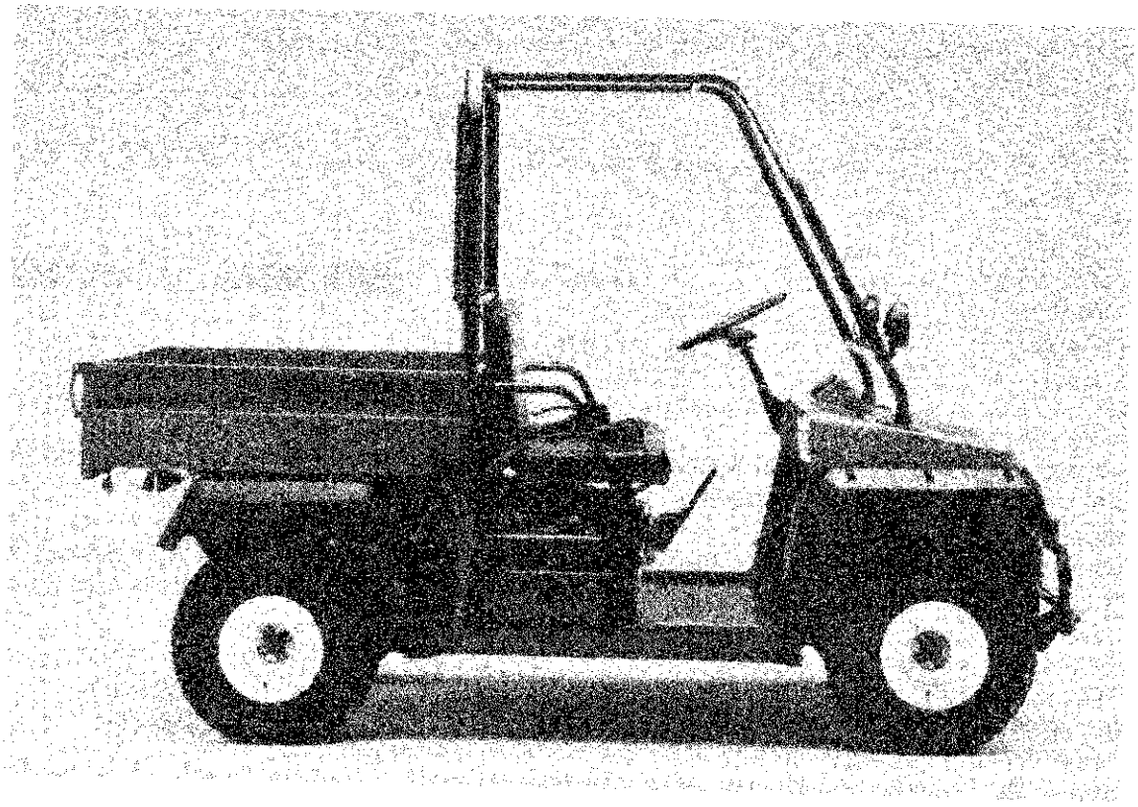
"Standards": Show dimensions or performances which brand-new parts or systems have.

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

Model Identification

KAF450-B1





General Specifications

Items			KAF450-B1
Dimensions:			
Overall length			2 760 mm
Overall width			1 315 mm
Overall height			1 830 mm
Wheelbase			1 785 mm
Track:	Front		965 mm
	Rear		1 030 mm
Ground clearance			205 mm
Seat height			790 mm
Dry weight			483 kg
Curb weight:	Front		208 kg
	Rear		292 kg
Fuel tank capacity			17.0 L
Cargo bed (L x W x H)			1 040 x 1 140 x 270 mm
Performance:			
Minimum turning radius			4.1 m (Chassis: 4.4 m): Differential mode 4.5 m (Chassis: 4.8 m): Locked axle mode
Engine:			
Type			4-stroke, DOHC, 2-cylinder
Cooling system			Liquid-cooled
Bore and stroke			72.5 x 55.0 mm
Displacement			454 mL
Compression ratio			9.6
Carburetion system			Carburetors, Keihin CVK30 x 2
Starting system			Electric starter
Ignition system			Battery and coil (Transistorized)
Timing advance			Electronically advanced
Ignition timing			From 10° BTDC @1 000 r/min (rpm) to 30° BTDC @3 500 r/min (rpm)
Spark plug:		US	NGK D6EA or ND X20ES-U
		Other than US	NGK DR6EA or ND X20ESR-U
Cylinder numbering method			Left to right, 1-2
Firing order			2-1
Valve timing:	Inlet	Open	15° BTDC
		Close	35° ABDC
		Duration	230°
	Exhaust	Open	40° BBDC
		Close	10° ATDC
		Duration	230°

Items			KAF450-B1
Lubrication system			Forced lubrication (wet sump)
Engine oil:	Grade		SE or SF class
	Viscosity		SAE 10W40, 10W50, 20W40, or 20W50
	Capacity		4.0 L
Drive Train:			
Primary drive system:	Type		Belt drive torque converter
	Reduction ratio		3.5 – 0.98
Transmission gear ratio:	Forward		1.863 (25/21 x 36/23)
	Reverse		1.643 (24/20 x 21/24 x 36/23)
Final drive system:	Type		Gear
	Reduction ratio		5.153 (67/13)
Overall drive ratio:	Forward		9.411
	Reverse		8.300
Frame:			
Type			Tubular frame
Caster (rake angle)			6.1°
Camber			1.7°
Trail			28 mm
Tire: Front and rear			22 x 11.00-10, Tubeless
Steering type			Rack and pinion
Suspension:	Front	Type	Strut
		Wheel travel	100 mm
	Rear	Type	Semi-trailing
		Wheel travel	105 mm
Brake type: Front and rear			Drum (Hydraulic)
Parking brake type			Drum (Mechanical internal expansion)
Electrical Equipment:			
Battery			12 V 19 Ah
Headlight:	Type		Sealed beam
	Bulb		12 V 35 W x 2
Tail/Brake light			12 V 8/27 W x 2
Alternator:	Type		Three-phase AC
	Rated output		20A @5 000 r/min (rpm), 14 V
Load Capacity:			
Maximum vehicle load (including occupants and cargo)			467 kg
Maximum cargo bed load			227 kg

Specifications are subject to change without notice.

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.**

FREQUENCY / OPERATION	Whichever comes first ➡ / Every ⬇	First Service	Regular Service	
		After 1 000 km of use	Every 5 000 km of use	Every 10 000 km of use
CHASSIS				
Steering--check		•	•	
Steering and drive shaft ball joint dust boots--check		•	•	
Brake pedal play--check*		•	•	
Parking brake lever--check		•	•	
Brake hose and pipe--check		•	•	
Brake fluid level--check		•	•	
Brake wear--check*			•	
Tire wear--check*		•	•	
Battery--check			•	
Brake light switch--check		•	•	
Seat belt--check			•	
General lubrication--perform*			•	
Bolts, nuts, and fasteners tightness--check		•	•	
Brake fluid--change	2 years			
Brake master cylinder cup and dust seal--replace	2 years			
Brake wheel cylinder assembly--replace	2 years			
Brake hose--replace	4 years			
ENGINE				
Converter belt--check*			•	
Converter driven pulley shoe--check*				•
Spark plug--clean and gap			•	
Air cleaner elements--clean*		•	•	
Valve clearance--check		•		•
Engine oil--change*	1 year	•		•
Oil filter--replace*		•		•
Engine vacuum synchronization--check		•	•	
Throttle pedal play--check		•		•
Idle speed--adjust		•	•	
Fuel system cleanliness--check*				•
Radiator hose, connections--check	1 year	•		•
Spark arrester--clean			•	
Coolant--change	2 years			
Fuel hose--replace	4 years			

• = Clean, adjust, lubricate, torque, or replace parts as necessary.
* = 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, and the parts requiring use of a non-permanent locking agent or liquid gasket.
Letters used in the "Remarks" column mean:
L : Apply a non-permanent locking agent to the threads.
M : Apply a molybdenum disulfide lubricant (grease or oil) to the threads and seated surface, or washer.
O : Apply engine oil.
S : Tighten the fasteners following the specified sequence.
SS: Apply silicone sealant to the threads.

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Cooling System:				
Radiator fan switch	25	2.5	18.0	
Coolant temperature switch	7.8	0.80	69 in-lb	SS
Water pump cover bolts	9.8	1.0	87 in-lb	
Water pump drain plug	7.8	0.80	69 in-lb	
Engine Top End:				
Cylinder head cover bolts	9.8	1.0	87 in-lb	
Camshaft sprocket bolts	15	1.5	11.0	L
Camshaft cap bolts	12	1.2	104 in-lb	
Valve adjusting screw locknuts	25	2.5	18.0	
Rocker Shafts	39	4.0	29	
Camshaft chain tensioner bolts	12	1.2	104 in-lb	
Chain tensioner cap bolt	4.9	0.50	43 in-lb	
Cylinder head bolts: 10 mm dia.	39	4.0	29	S
6 mm dia.	9.8	1.0	87 in-lb	
Belt Drive Torque Converter:				
Drive pulley cover bolts	13	1.3	113 in-lb	
Drive pulley bolts	93	9.5	69	
Ramp weight shaft stop bolts	13	1.3	113 in-lb	
Ramp weight roller shaft stop bolts	13	1.3	113 in-lb	
Drive pulley fan bolts	9.8	1.0	87 in-lb	
Driven pulley bolt	93	9.5	69	L
Driven pulley coupling bolts	13	1.3	113 in-lb	
Engine Lubrication System:				
Engine oil drain plug	29	3.0	22	
Oil filter mounting bolt	25	2.5	18.0	L
Oil filter	18	1.8	13.0	O
Oil pressure switch	15	1.5	11.0	SS
Oil pressure switch adapter	20	2.0	14.5	
Oil pressure relief valve	15	1.5	11.0	L
Oil pump cover bolts	9.8	1.0	87 in-lb	L
Oil passage plug	9.8	1.0	87 in-lb	

Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Oil pipe banjo bolts: 14 mm dia.	34	3.5	25	
8 mm dia.	12	1.2	104 in-lb	
6 mm dia.	7.8	0.80	69 in-lb	
Oil pipe mounting bolt	9.8	1.0	87 in-lb	
Engine Removal/Installation:				
Engine mounting bolts	44	4.5	33	
Engine bracket bolts	44	4.5	33	
Rear end sub-frame mounting bolts	44	4.5	33	
Engine Bottom End/Crankshaft:				
Connecting rod cap nut	36	3.7	27	
Starter motor clutch coupling Allen bolts	34	3.5	25	L
Crankcase bolts: 6 mm dia.	12	1.2	104 in-lb	
8 mm dia.	27	2.8	20	S
Transmission/Final Drive:				
Reverse switch	15	1.5	11.0	
Neutral switch	15	1.5	11.0	
Shift drum bearing stop bolts	9.8	1.0	87 in-lb	L
Shift drum cam mounting Allen bolt	12	1.2	104 in-lb	L
Gear positioning lever nut	9.8	1.0	87 in-lb	
Transmission case bolts: 6 mm dia.	12	1.2	104 in-lb	
8 mm dia.	25	2.5	18.0	
Crankcase/transmission case bolts	12	1.2	104 in-lb	
Final gear bolts	29	3.0	22	L
Drive shaft cap bolts	25	2.5	18.0	
Wheels/Tires:				
Wheel nuts	52	5.3	38	
Front axle nuts	37	3.8	27	
Brakes:				
Brake hose banjo bolts	25	2.5	18.0	
Brake pipe nipples	22	2.2	16.0	
Reservoir clamp bolt	5.9	0.60	52 in-lb	
Master cylinder piston stop bolt	8.8	0.90	78 in-lb	
Master cylinder push rod locknut	18	1.8	13.0	
Front axle nuts	37	3.8	27	
Rear axle nuts	195	20.0	145	M
Brake panel mounting bolts:				
Front 8 mm dia.	27	2.8	20	
Rear 10 mm dia.	44	4.5	33	
Wheel cylinder mounting bolts and nuts	7.8	0.80	69 in-lb	

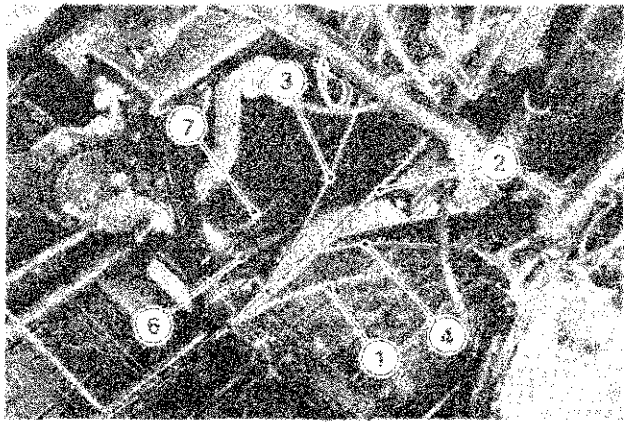
Fastener	Torque			Remarks
	N-m	kg-m	ft-lb	
Bleed valves	5.9	0.60	52 in-lb	
Suspension:				
Strut (Front shock absorber)				
mounting nuts: Upper	44	4.5	33	
bolts: Lower	98	10.0	72	
Rear shock absorber mounting bolts:				
Upper	44	4.5	33	
Lower	98	10.0	72	
Front suspension arm pivot bolts	98	10.0	72	
Front suspension arm joint nuts	34	3.5	25	
Rear suspension arm pivot bolts	98	10.0	72	M
Steering:				
Steering wheel mounting nut	52	5.3	38	
Steering gear assembly mounting bracket bolts	52	5.3	38	
Tie-rod end locknuts	49	5.0	36	
Tie-rod end joint nuts	34	3.5	25	
Rack guide spring cap locknut	39	4.0	29	
Frame:				
Front guard mounting bolts	44	4.5	33	
Rear bottom sub-frame mounting bolts	69	7.0	51	
Rear right sub-frame mounting bolts	69	7.0	51	
Rear end sub-frame mounting bolts	44	4.5	33	
Seat belt mounting bolts	27	2.8	20	
Front bar component mounting bolts: Upper	44	4.5	33	
Lower	26	2.7	19.5	
Front bar component mounting bracket bolts	44	4.5	33	
Rear bar component mounting bolts	44	4.5	33	
Side bar mounting bolts	44	4.5	33	
Electrical System:				
Spark plugs	14	1.4	10.0	
Alternator rotor bolt	69	7.0	51	
Alternator stator mounting bolts	12	1.2	104 in-lb	

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

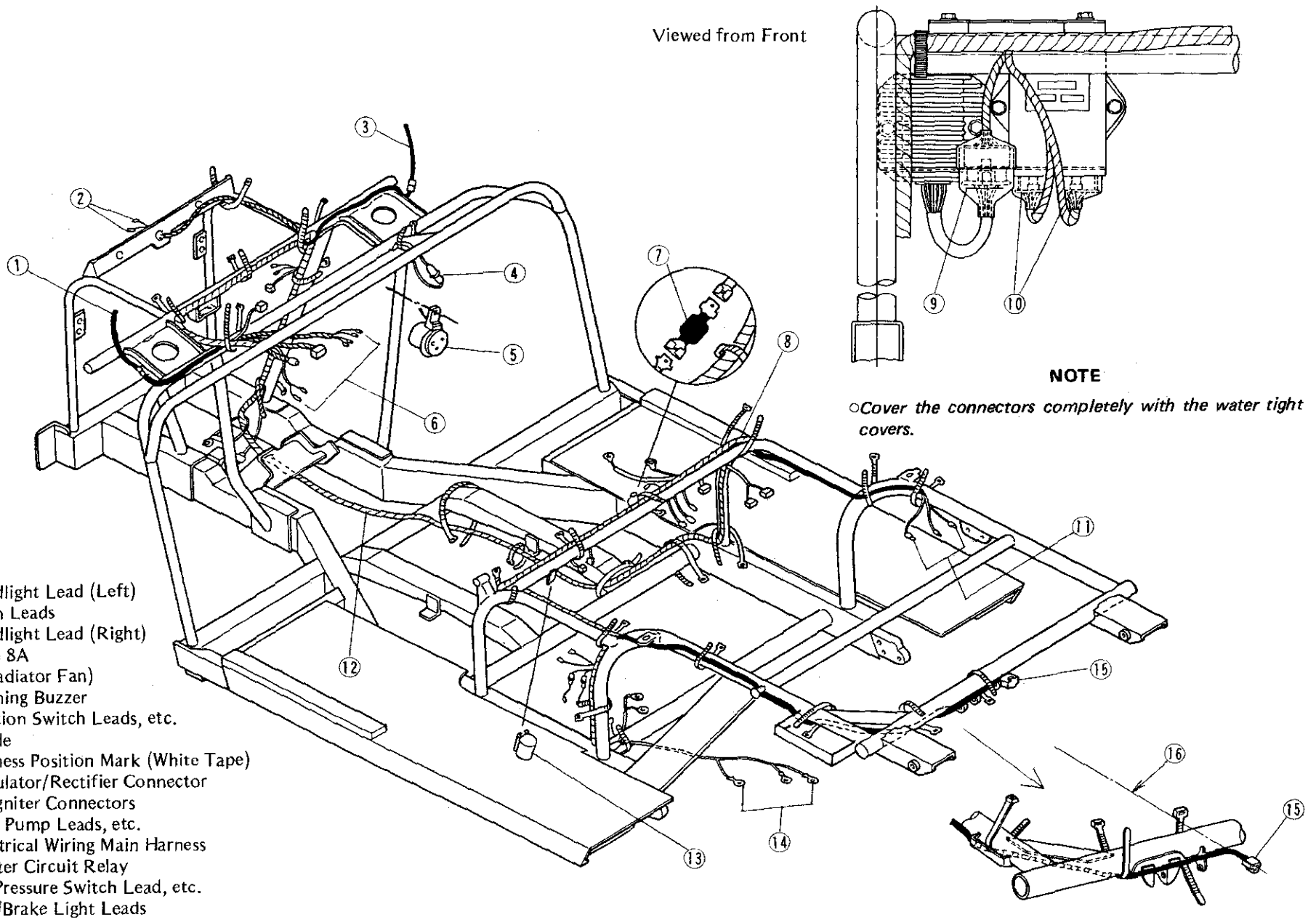
General Fasteners:

Threads dia. (mm)	Torque		
	N-m	kg-m	ft-lb
5	3.4 – 4.9	0.35 – 0.50	30 – 43 in-lb
6	5.9 – 7.8	0.60 – 0.80	52 – 69 in-lb
8	14 – 19	1.4 – 1.9	10.0 – 13.5
10	25 – 34	2.6 – 3.5	19.0 – 25.0
12	44 – 61	4.5 – 6.2	33 – 45
14	73 – 98	7.4 – 10.0	54 – 72
16	115 – 155	11.5 – 16.0	83 – 115
18	165 – 225	17.0 – 23.0	125 – 165
20	225 – 325	23 – 33	165 – 240

Cable, Wire, Hose, and Pipe Routing



1. Speedometer Cable
2. Transmission Shift Cable
3. Throttle Cable
4. Differential Shift Cable
5. Choke Cable
6. Parking Brake Cable (Left)
7. Parking Brake Cable (Right)
8. Frame Pipe
9. Skid Plate

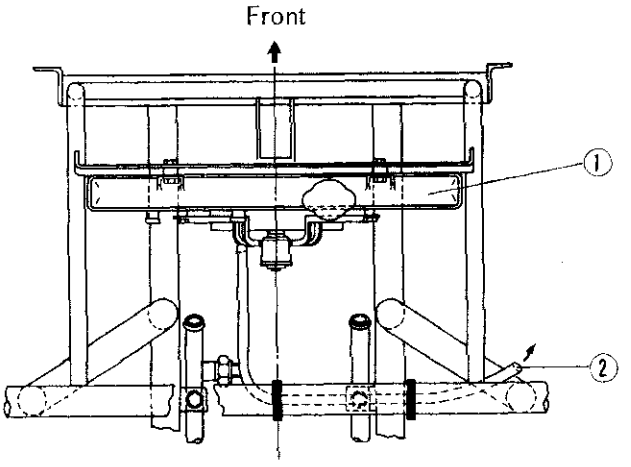


1. Headlight Lead (Left)
2. Horn Leads
3. Headlight Lead (Right)
4. Fuse 8A (Radiator Fan)
5. Warning Buzzer
6. Ignition Switch Leads, etc.
7. Diode
8. Harness Position Mark (White Tape)
9. Regulator/Rectifier Connector
10. IC Igniter Connectors
11. Fuel Pump Leads, etc.
12. Electrical Wiring Main Harness
13. Starter Circuit Relay
14. Oil Pressure Switch Lead, etc.
15. Tail/Brake Light Leads
16. Vehicle Center Line

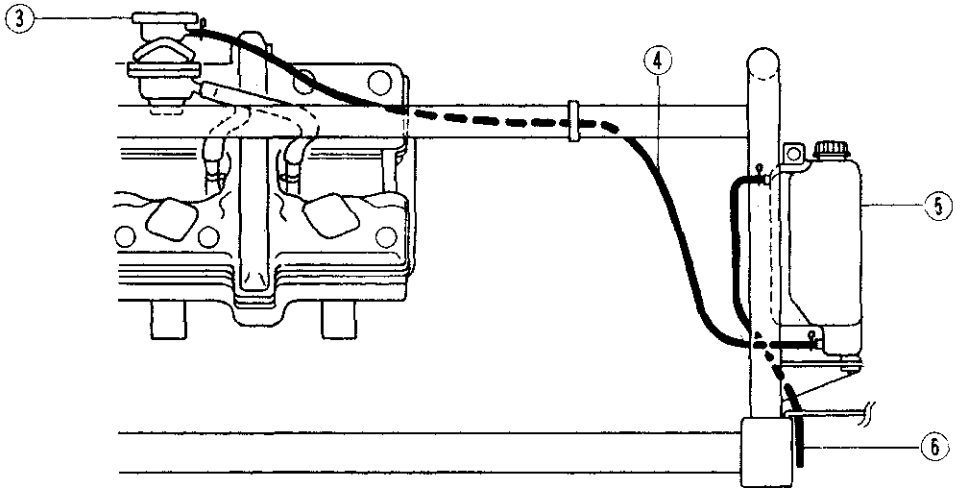
NOTE

○Cover the connectors completely with the water tight covers.

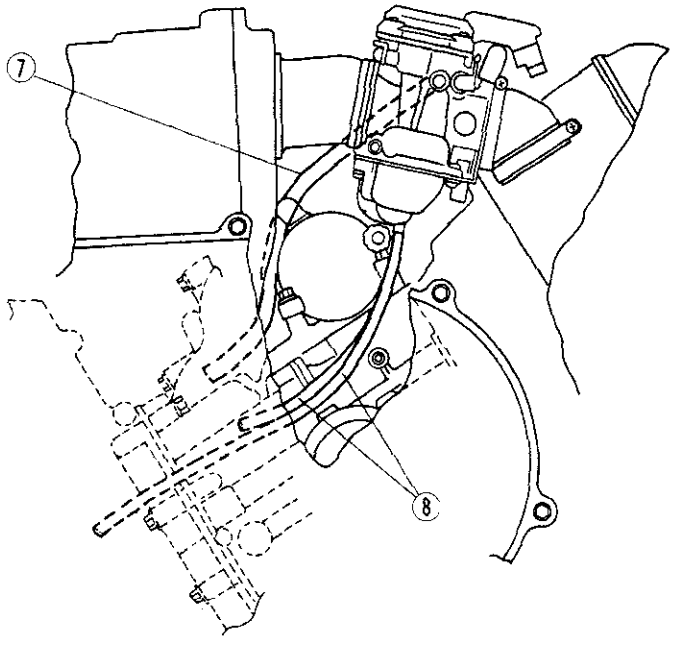
Viewed from Top



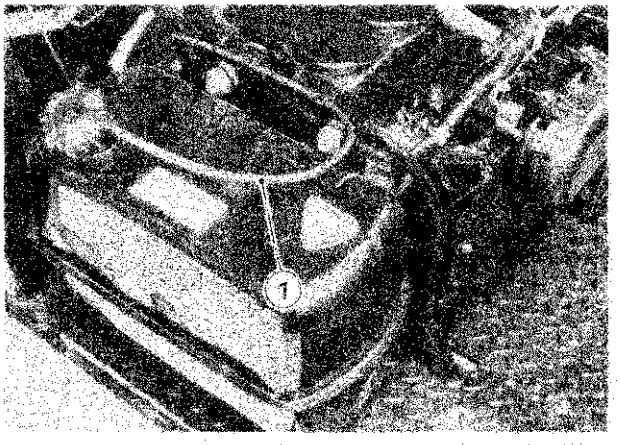
Viewed from Front

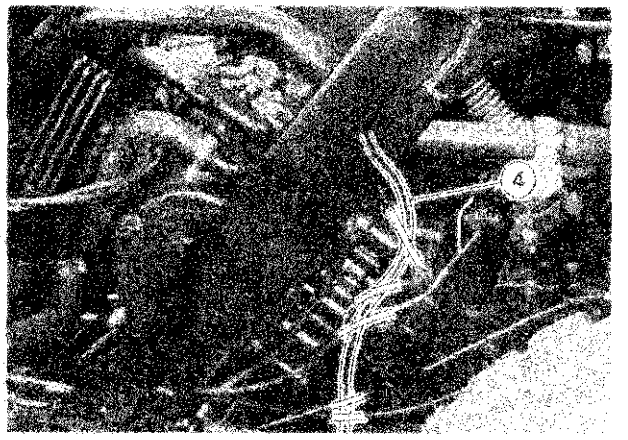


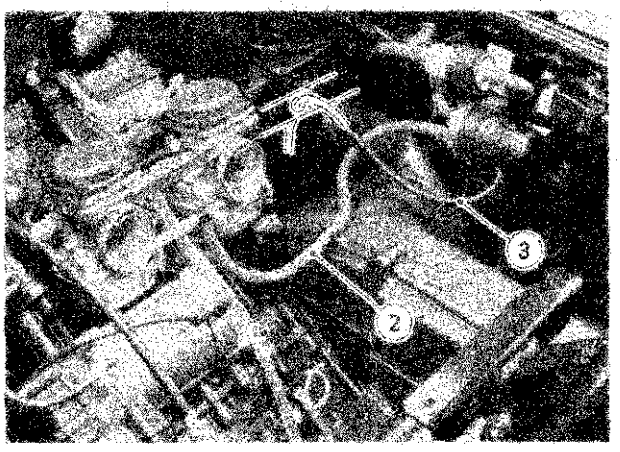
Viewed from Right

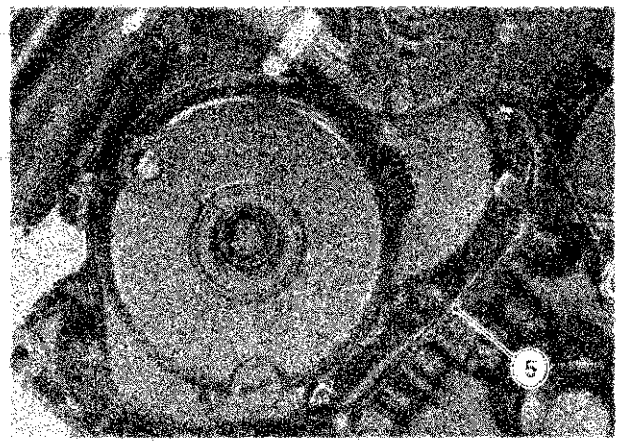


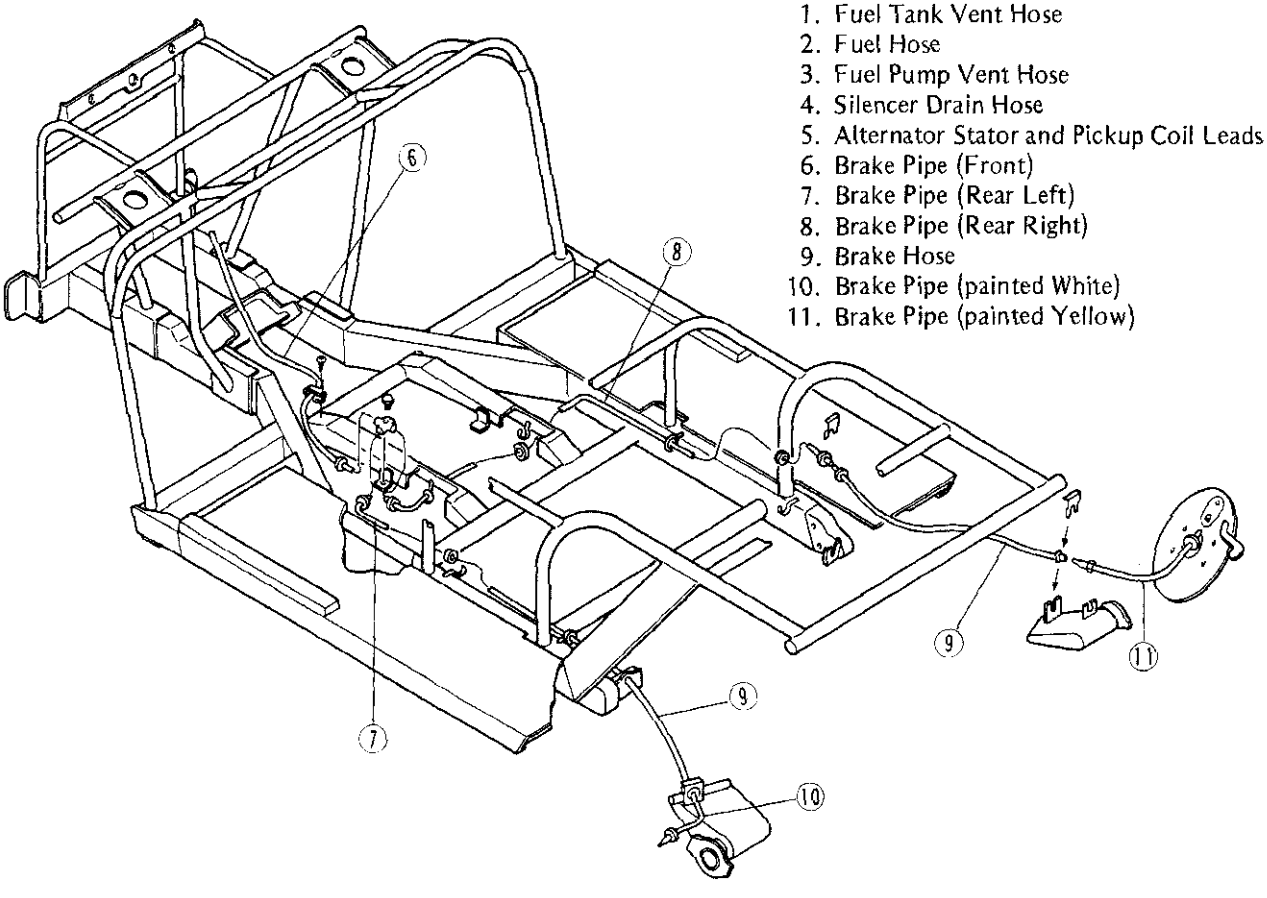
1. Radiator
2. Radiator Breather Hose
3. Thermostat Cap
4. Reservoir Tank Hose
5. Reservoir Tank
6. Reservoir Tank Overflow Hose
7. Carburetor Vent Hose
8. Carburetor Overflow Hoses





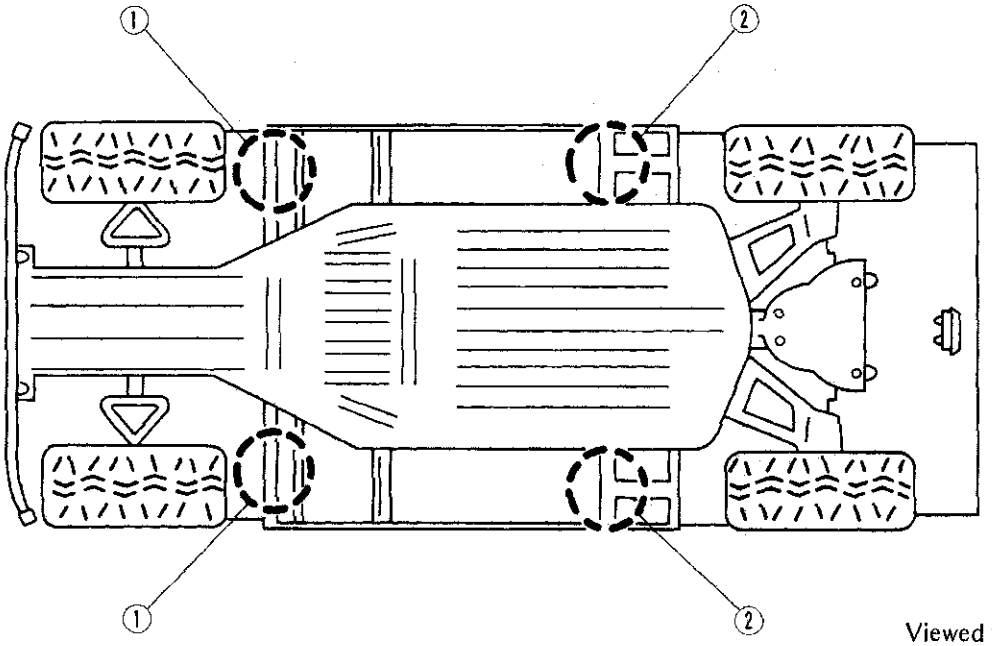






1. Fuel Tank Vent Hose
2. Fuel Hose
3. Fuel Pump Vent Hose
4. Silencer Drain Hose
5. Alternator Stator and Pickup Coil Leads
6. Brake Pipe (Front)
7. Brake Pipe (Rear Left)
8. Brake Pipe (Rear Right)
9. Brake Hose
10. Brake Pipe (painted White)
11. Brake Pipe (painted Yellow)

Vehicle Jack and Support Locations



Viewed from Bottom

① for Front End of Vehicle
② for Rear End of Vehicle

NOTE

- *When the vehicle is to be jacked up only at the front end, be sure to apply the parking brake to lock the rear wheels and prevent the vehicle from moving.*
- *When the vehicle is to be jacked up only at the rear end, be sure to block the front wheels.*
- *After the vehicle is jacked up be sure to support it on the suitable stands. It may result in a hazardous condition to work on the vehicle raised on a jack alone.*
- *Use jacks which have a load capacity of 500 kg or more.*

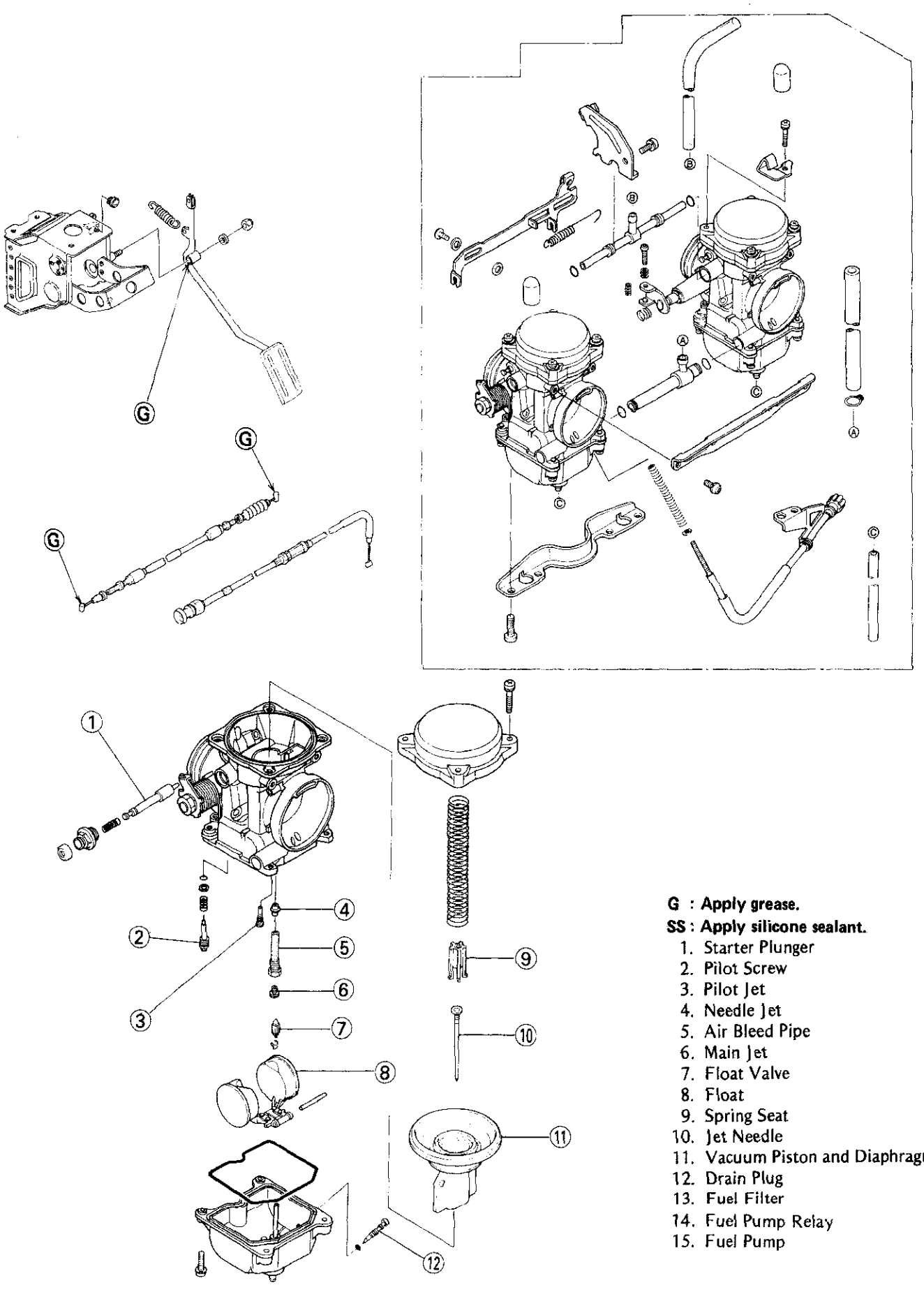
Fuel System

2

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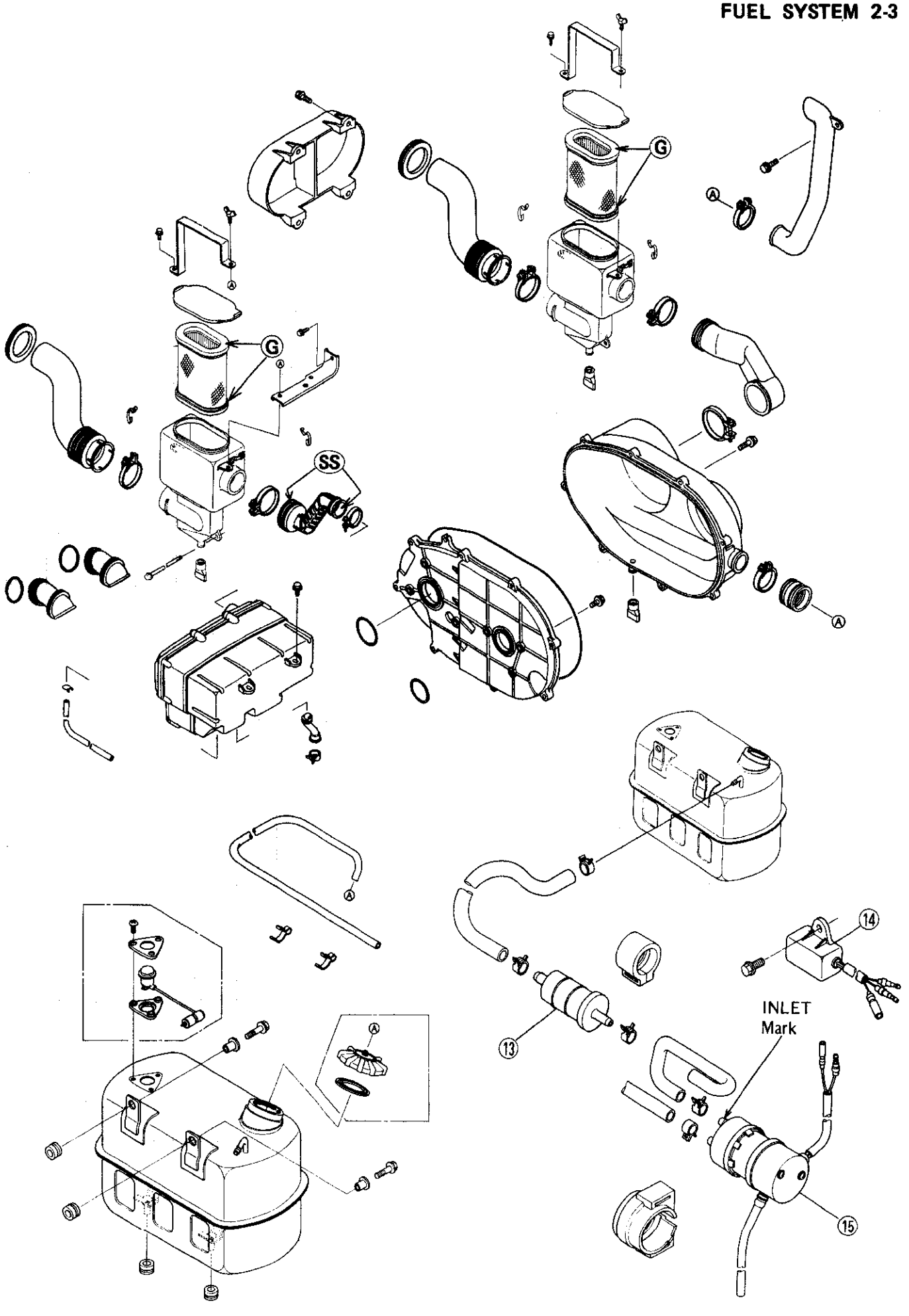
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Exploded View



G : Apply grease.
SS : Apply silicone sealant.

1. Starter Plunger
2. Pilot Screw
3. Pilot Jet
4. Needle Jet
5. Air Bleed Pipe
6. Main Jet
7. Float Valve
8. Float
9. Spring Seat
10. Jet Needle
11. Vacuum Piston and Diaphragm
12. Drain Plug
13. Fuel Filter
14. Fuel Pump Relay
15. Fuel Pump


G
G
SS
A
A
A
A
A
14
13
15
INLET
Mark

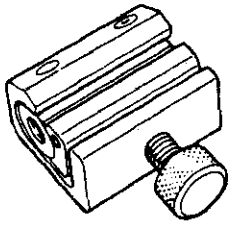
Specifications

Item			Standard
Throttle Pedal Free Play			10 – 20 mm
Choke Cable Play			2 – 3 mm
Carburetors:			
Make/Type			Keihin/CVK30
Setting:	Main jet:	Standard	Left: #102, Right: #105
		Option	#92, 95, 98, 100, 108, 110
	Main air jet		#100
	Jet needle		N36T
	Pilot jet		#35
	Pilot air jet		#165
	Pilot screw		2 turns out
	Starter jet		#52
	Service fuel level		–0.5 ±1 mm
	Float height		17.0 mm
Synchronization			2.7 kPa (2 cmHg) or less difference between cylinders

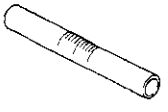
Special Tools

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

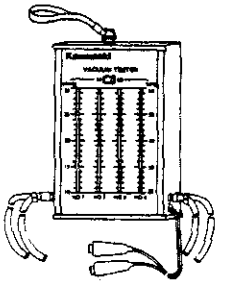
Pressure Cable Luber: K56019-021



Fuel Level Gauge: 57001-1017



Vacuum Gauge: 57001-1198

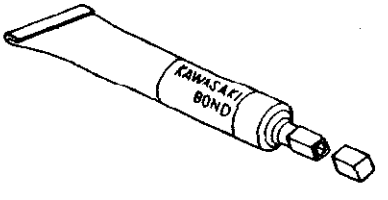


NOTE

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

Sealant

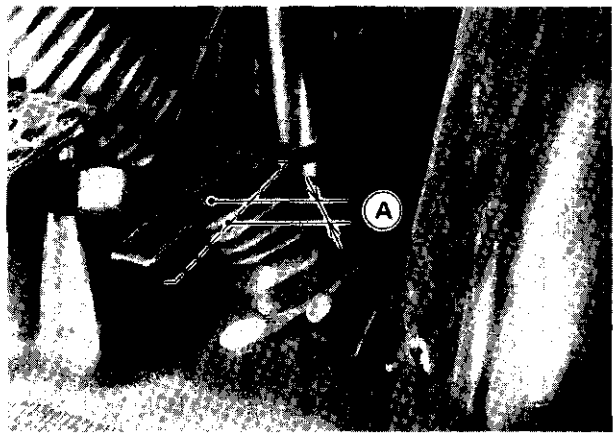
Kawasaki Bond (Silicone Sealant): 56019-120



Throttle Pedal and Cable

Throttle Pedal Play Adjustment

●Check throttle pedal free play.
★If free play is not correct, adjust it.

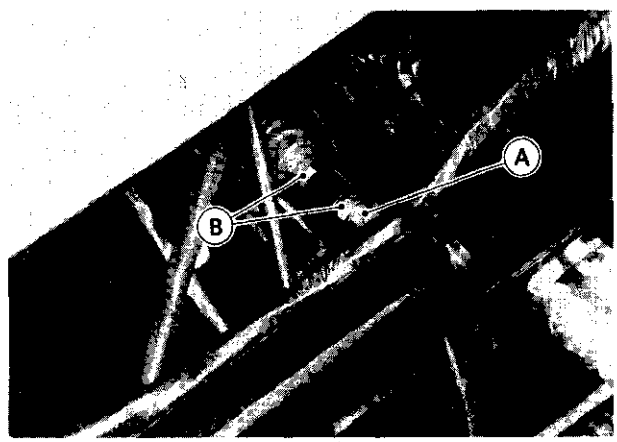


A. Throttle Pedal Free Play

Throttle Pedal Free Play

Standard: 10 – 20 mm

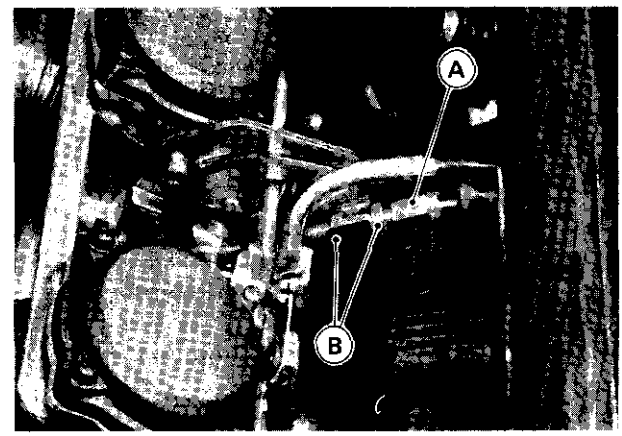
●Loosen the mounting nuts and slide the adjuster to obtain the correct amount of play.
●Tighten the mounting nuts.



A. Adjuster B. Mounting Nuts

NOTE

○*If the throttle pedal free play cannot be adjusted by using the adjuster at the throttle pedal, use the adjuster at the carburetors. Do not forget to securely tighten the adjuster mounting nuts.*



A. Adjuster B. Mounting Nuts

●Start the engine.
●With the transmission in neutral, operate the throttle pedal a few times to make sure that the idle speed does not change.
★If idle speed does change, the throttle cable may be improperly adjusted, incorrectly routed, or it may be damaged.
●Correct any of these condtions before riding.

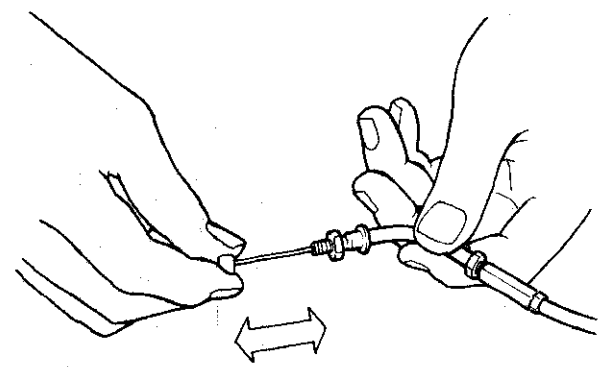
WARNING

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

Throttle Cable Inspection

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

Cable Inspection



★If the cable does not move freely after lubricating, or if the cable is frayed, or if the housing is kinked, replace the cable.

Throttle Cable Lubrication

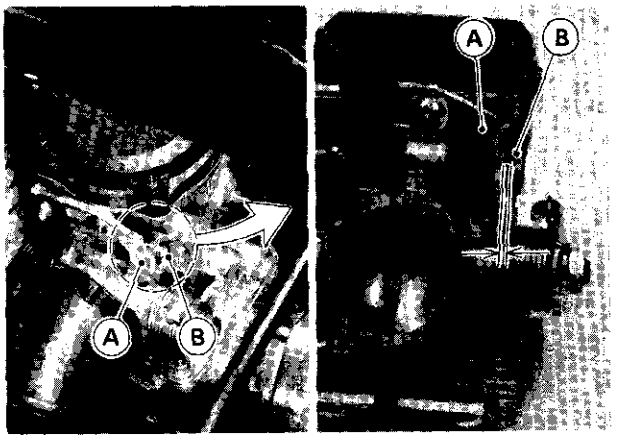
●Whenever the cable is removed and in accordance with the Periodic Maintenance Chart, lubricate the cable (see Appendix chapter).

Choke Cable

Choke Cable Play Adjustment

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

★If cable play is not correct, adjust it.



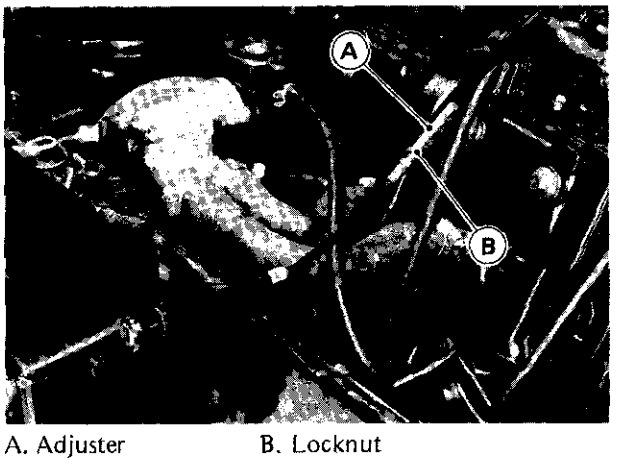
A. Starter Plunger Lever B. Starter Plunger

Choke Cable Play

Standard: 2 – 3 mm

●Loosen the locknut and turn the adjuster to obtain the correct amount of play.

●Tighten the locknut.

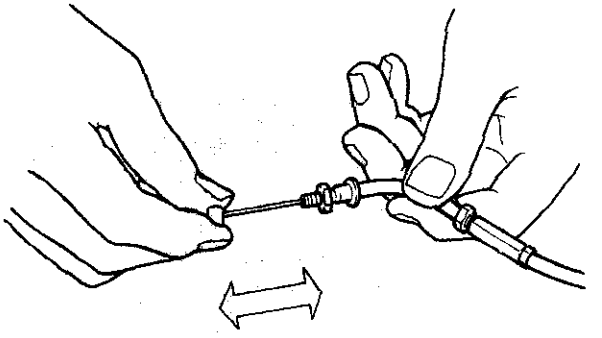


A. Adjuster B. Locknut

Choke Cable Inspection

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

Cable Inspection



★If the cable does not move freely after lubricating, or if the cable is frayed, or if the housing is kinked, replace the cable.

Choke Cable Lubrication

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

Carburetors

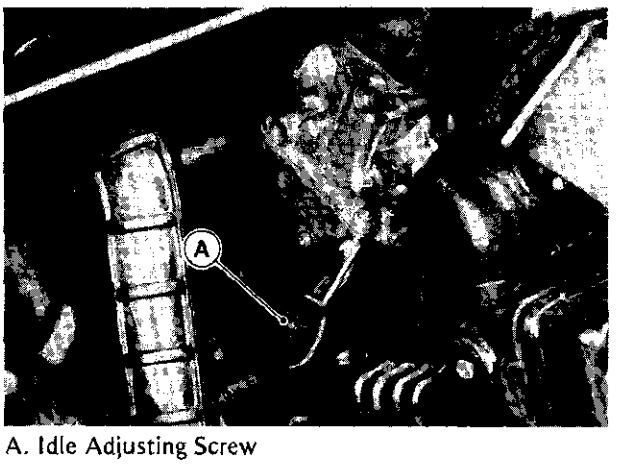
Idle Speed Adjustment

●Start the engine and warm it up thoroughly.

●Turn the idle adjusting screw to obtain the slowest smooth idle speed.

Idle Speed (for reference)

Standard: 800 ±50 r/min (rpm)

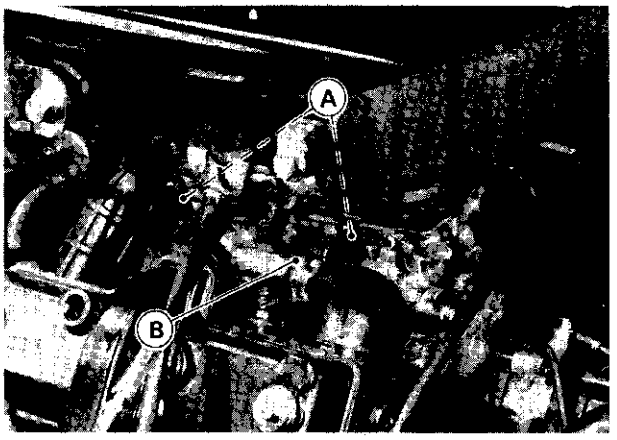


A. Idle Adjusting Screw

●Operate the throttle pedal a few times to make sure that the idle speed does not change. Readjust if necessary.

Carburetor Synchronization

●Warm up the engine and adjust idle speed.
●Attach the vacuum gauge set (special tool: P/N 57001-1198) to the vacuum hose fittings on the carburetors.



A. Vacuum Hose Fittings B. Adjusting Screw

●Start the engine and let it idle to measure the engine intake vacuum.
★If the intake vacuum difference between the cylinders exceeds the limit, synchronize the carburetors.

Carburetor Synchronization Vacuum

2.7 kPa (2 cmHg) or less difference between cylinders

●Turn the adjusting screw to synchronize the carburetors.
●Adjust idle speed.

Fuel Level Adjustment

WARNING

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

●Remove the carburetors, and hold them upright on a stand.
●Connect a fuel tank to the carburetors with a suitable hose.
●Connect the fuel level gauge (special tool) to the open end of the carburetor overflow hose.
●Hold the gauge vertically against the side of the carburetor body so that the "zero" line is several millimeters higher than the bottom edge of the carburetor body.
●Hold the fuel tank to feed fuel to the carburetor, then turn out the carburetor drain plug a few turns.
●Wait until the fuel level in the gauge settles.
●Keeping the gauge vertical, slowly lower the gauge until the "zero" line is even with the bottom edge of the carburetor body.

NOTE

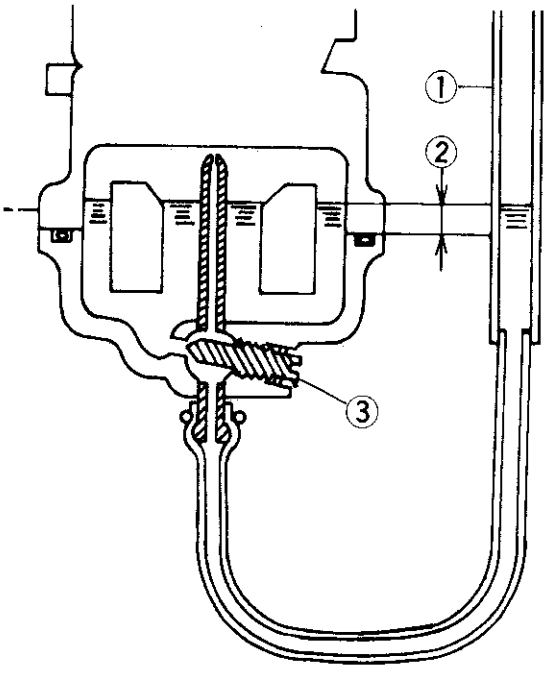
○*Do not lower the "zero" line below the bottom edge of the carburetor body. If the gauge is lowered and then raised again, the fuel level measure shows somewhat higher than the actual fuel level. If the gauge is lowered too far, dump the fuel out of it into suitable container and start the procedure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

●Read the fuel level in the gauge and ompare it to the specification. Screw in the carburetor drain plug.
●Remove the fuel level gauge.
●Inspect the fuel level of the other carburetor in the same manner.
★If the fuel level of either carburetor is incorrect, adjust it.

Fuel Level

0.5 ±1 mm above the bottom edge of carburetor body

Fuel Level Measurement

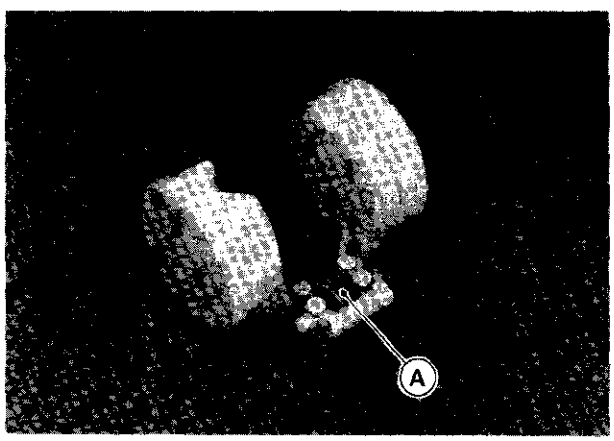


1. Fuel Level Gauge: 57001-1017
2. Fuel Level
3. Drain Plug

- Drain the fuel out of the carburetors into a suitable container.
- Remove the float bowl by taking out the screws with lockwashers.
- Bend the tang on the float arm very slightly to change the float height. Increasing the float height lowers the fuel level and decreasing the float height raises the fuel level.

Float Height

17.0 mm

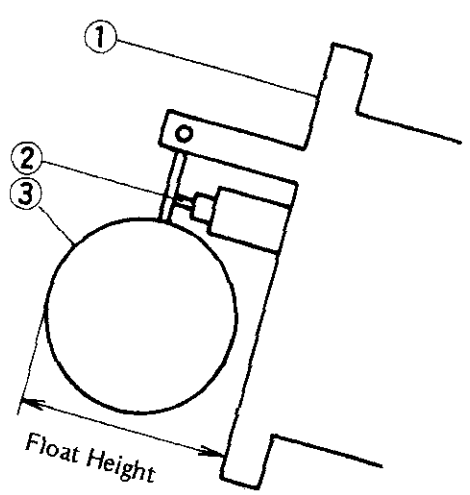


A. Tang

- Assemble the carburetor, and recheck the fuel level.

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

Float Height Measurement-Keihin Carburetor



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

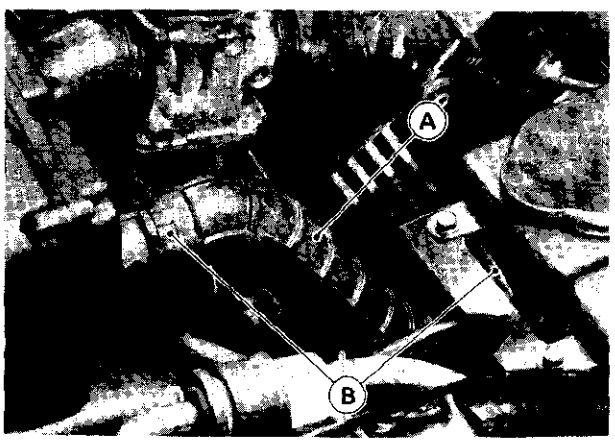
Fuel System Cleanliness Inspection

WARNING

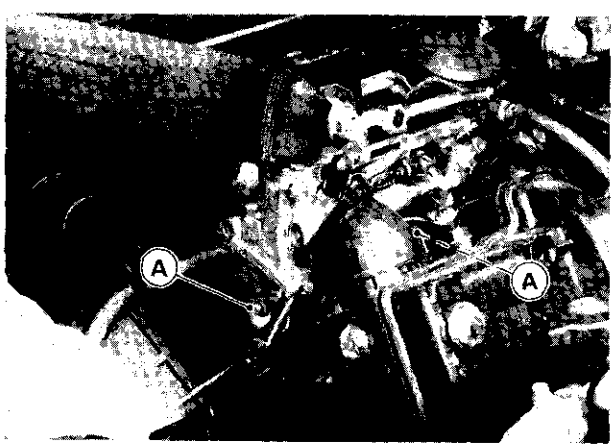
○**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

- Run the open ends of the carburetor overflow hoses into a suitable container.
- Turn out each drain plug a few turns and drain the float bowls.

○Remove the air duct from the carburetor air cleaner with a long screw driver to access the left carburetor.



A. Air Duct B. Clamps



A. Drain Plug

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

★If any water or dirt appeared during the above inspection, check and clean the fuel system.
Carburetors
Fuel Filter
Fuel Tank

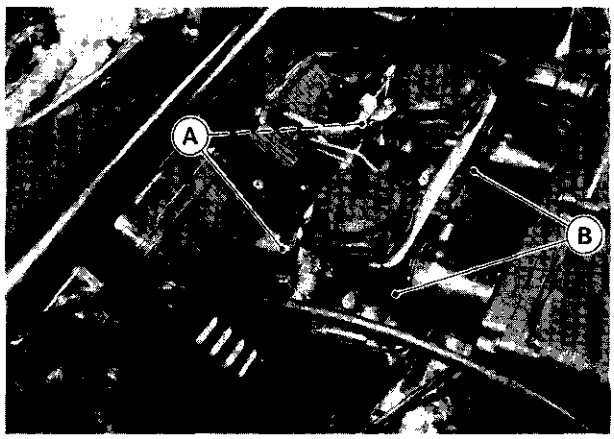
- Apply silicone sealant to both ends of the air duct and install it with the clamps.

Carburetor 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.**

●Remove the following.
Cargo Bed (tilt up)
Carburetor Holder Clamps (loosen)
Spring Bands (slide back)
Throttle Cable (from carburetors)
Choke Cable (from carburetors)
Carburetors



A. Clamps B. Spring Bands

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

WARNING

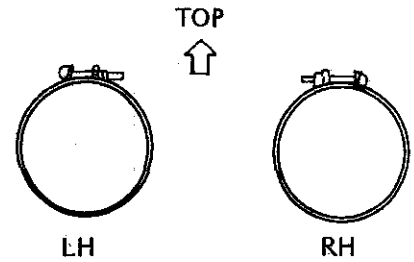
○**If dirt or dust is allowed to pass through into the carburetors, the throttle may become stuck, possibly causing an accident.**

CAUTION

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

Carburetor Installation

●Be sure to route the hoses correctly.
●Check fuel leakage from the carburetors.
●Position the carburetor holder clamps as shown.



WARNING

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

○Adjust the following items if necessary.
Idle Speed
Carburetor Synchronization
Throttle Cable (Throttle Pedal Play)
Choke Cable Play

Carburetor Disassembly

CAUTION

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

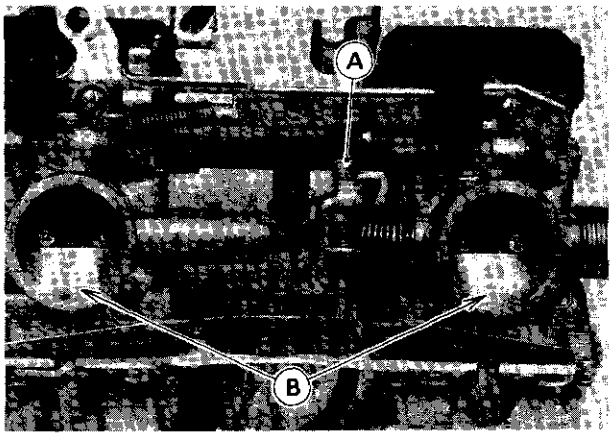
●Turn in the pilot screw and count the number of turns until it seats fully but not tightly, and then remove the screw. This is to set the screw to its original position when assembling.

Carburetor Assembly

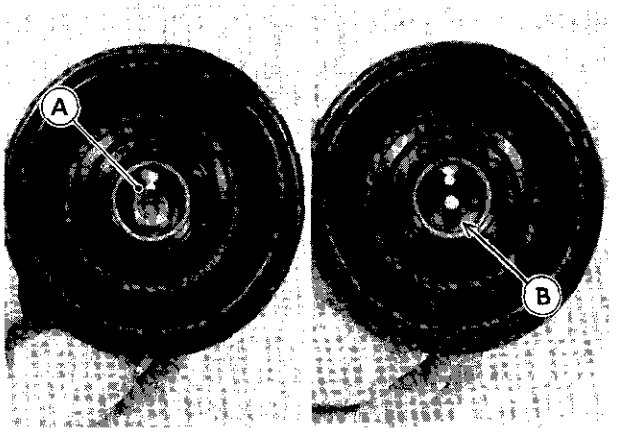
●The center lines of the carburetor bores must be parallel both horizontally and vertically. If they are not, loosen the mounting screws and align the carburetors on a flat surface. Retighten the mounting screws.
●After assembling the choke mechanism, check to see that the choke shaft slides right to left smoothly without abnormal friction.

CAUTION

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

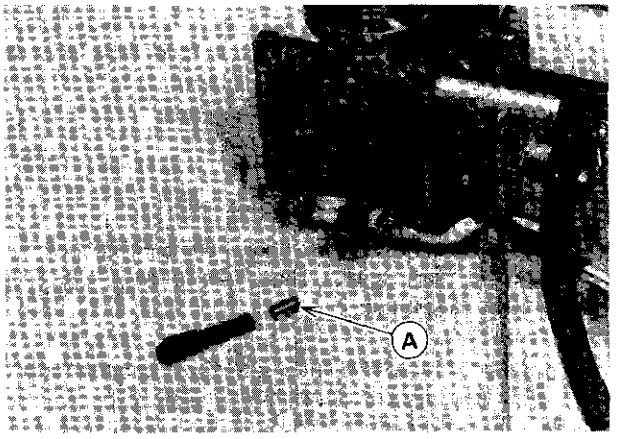


A. Balance Adjusting Screw B. Clearance



A. Spring Seat B. Guide

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



A. Small End

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

CAUTION

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

•Slip the needle through the hole in the center of the vacuum piston, and put the spring seat on the top of the needle. Turn the seat so that it aligns with the guide at the bottom of the vacuum piston.

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

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

Carburetor Cleaning

WARNING

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

CAUTION

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

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

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

○**Do not use wire or any other hard instrument to clean carburetor parts, especially jets, as they may be damaged.**

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

Carburetor Inspection

WARNING

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

- Remove the carburetors.
- Before disassembling the carburetors, check the fuel level.

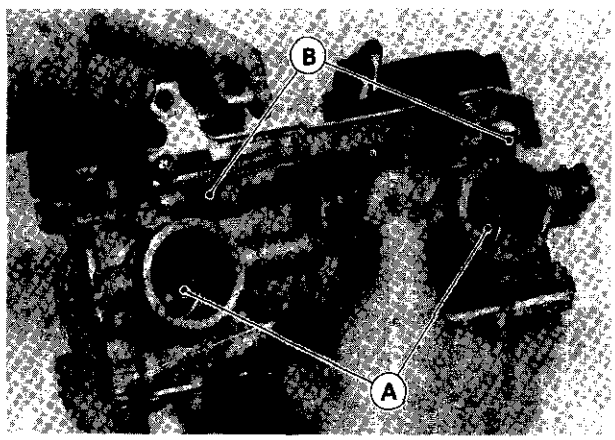
★If the fuel level is incorrect, inspect the rest of the carburetor before correcting it.

○Move the choke shaft left and release it to check that the starter plungers move smoothly and return by spring tension.

★If the starter plungers do not work properly, replace the carburetors.

○Turn the throttle cable pulley to check that the throttle valves move smoothly and return by spring tension.

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



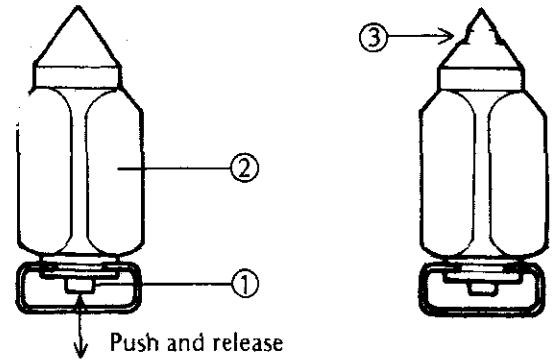
A. Throttle Valves B. Starter Plungers

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

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

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

Float Valve Wear



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

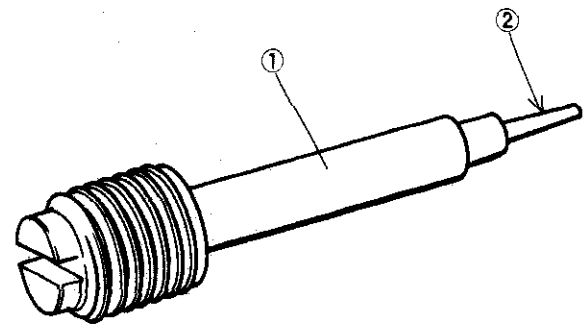
★If the plastic tip is damaged, replace the needle.

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

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

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

Pilot Screw

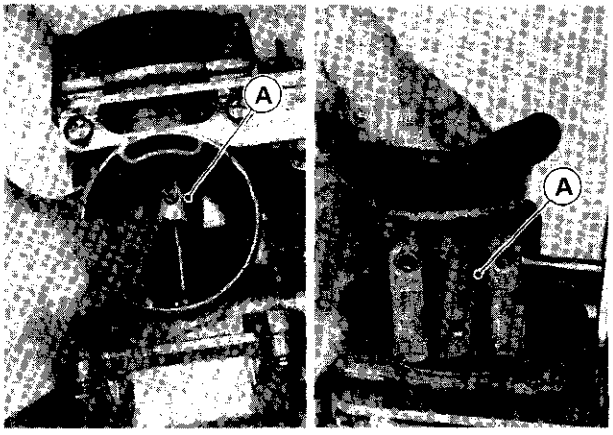


1. Pilot Screw 2. Tapered Portion

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

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

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



A. Vacuum Piston

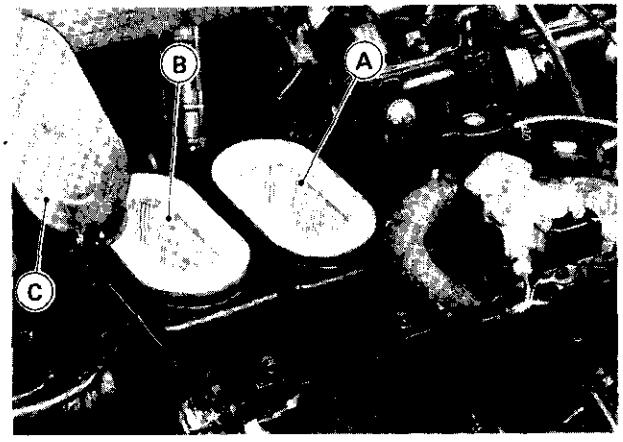
Air Cleaners

Air Cleaner Element Removal

●Remove the following.
Seat
Air Cleaner Housing Caps
Air Cleaner Elements

NOTE

○*The left air cleaner housing and element is used for the carburetor air cleaner system.*
○*The right air cleaner housing and element is used for the belt dirve torque converter air cleaner system.*



A. Element for Carburetors
B. Element for Converter
C. Cap

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

WARNING

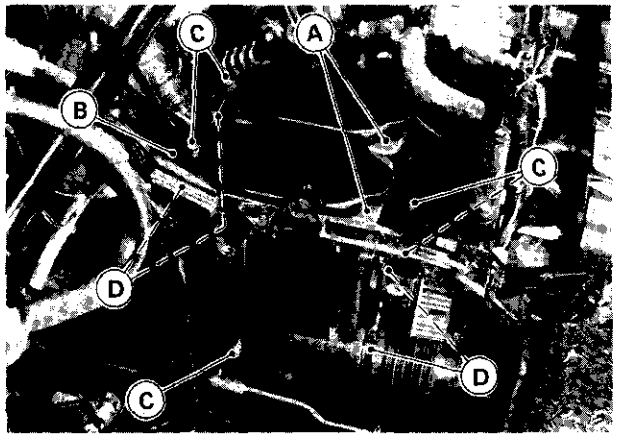
○**If dirt or dust is allowed to pass through into the carburetors, the butterfly valves may become stuck, possibly causing an accident.**

CAUTION

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

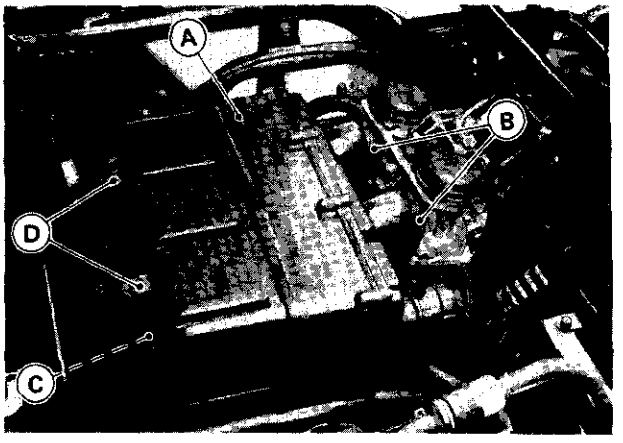
Air Cleaner Removal

●Remove the following.
Seat
Fuel Tank
Air Duct Clamps (loosen)
Air Cleaner Housing Mounting Bolts
Air Cleaner Housing Bracket Bolt
Bracket
Air Cleaner Housings



A. Air Cleaner Housings
B. Bracket
C. Mounting Bolts
D. Clamps

●Remove the following to remove the silencer in the carburetor air cleaner system.
Cargo Bed (tilt up)
Air Duct Spring Bands (slide back)
Breather Hose Clamp (loosen)
Silencer Mounting Bolts
Silencer



A. Silencer
B. Spring Bands
C. Breather Hose Clamp
D. Mounting Bolts

●Cover the carburetor intakes with a lint-free, clean cloth to keep dirt out of engine.

WARNING

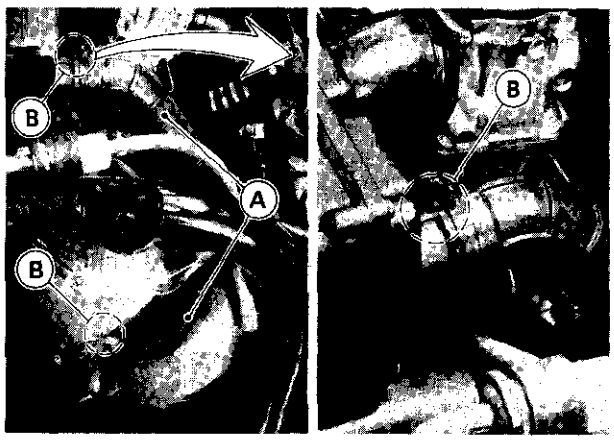
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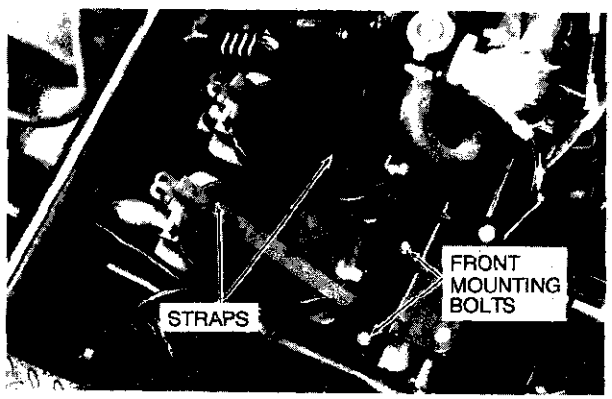
Air Cleaner Installation

- Apply silicone sealant over the rivets in the air cleaner housings.
- Apply grease to both ends of the air cleaner elements and install them.
- Apply silicone sealant to both ends of the air duct between the silencer and the left air cleaner housing and install it with the clamps.
- Be sure to route the hoses correctly.
- If the air ducts were removed, install them being careful to follow bending direction or installation marks.



A. Air Ducts B. Align marks.

- Install the air cleaner housing caps and snap the clips over the ends of the caps.
- Place the straps over the air cleaner housing caps and secure them at the front with the housing mounting bolts.



- Secure the straps and air cleaner housing caps at the rear to the mounting bracket with the wing bolts.

Air Cleaner Element Cleaning

NOTE

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

- Clean each element by tapping it lightly to loosen dust.
- Blow away the remaining dust by applying compressed air from the outside to inside (from the clean side to the dirty side).
- Inspect the element before installing it.

Air Cleaner Element Inspection

- Visually check the element for tears or breaks. Check the sponge gaskets also, and the element frame.
- ★If the element or gasket has any tears or breaks, replace the element.
- ★If the element frame is damaged or distorted, replace the element.
- ★If the sponge gasket comes loose, stick it back on with an adhesive sealant.

Fuel Filter

Fuel Filter Removal

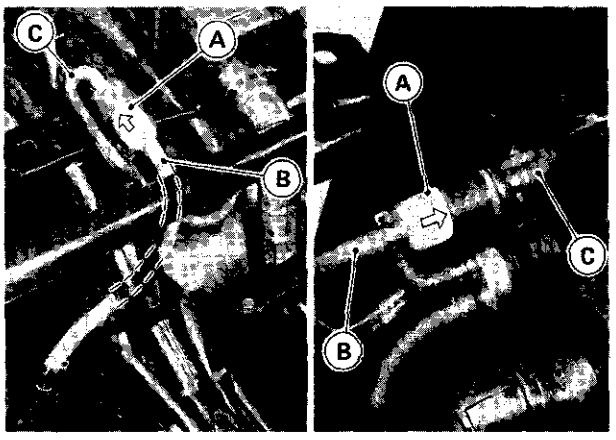
- Remove the following.
  Cargo Bed (tilt up)
  Fuel Filter
○Pull the filter off the hoses. Be prepared for fuel spillage.

WARNING

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

Fuel Filter Installation

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



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

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

Fuel Filter Inspection

●Visually inspect the fuel filter.

★If the filter is clear with no signs of dirt or other contamination, it is OK and need not be replaced.

★If the filter is dark or looks dirty, replace it. Also, check the rest of the fuel system for contamination.

Fuel Pump

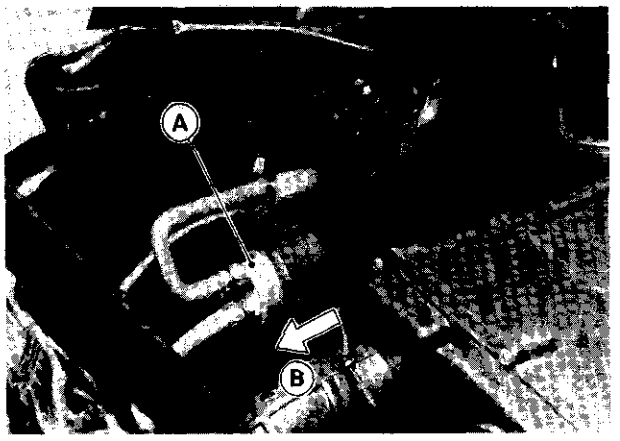
Fuel Pump Removal

●Remove the following.
Cargo Bed (tilt up)
Fuel Filter
Fuel Pump Leads (disconnect)
Fuel Hose (from pump)
Fuel Pump with Rubber Damper

○Pull the fuel hose off the pump. Be prepared for fuel spillage.

WARNING

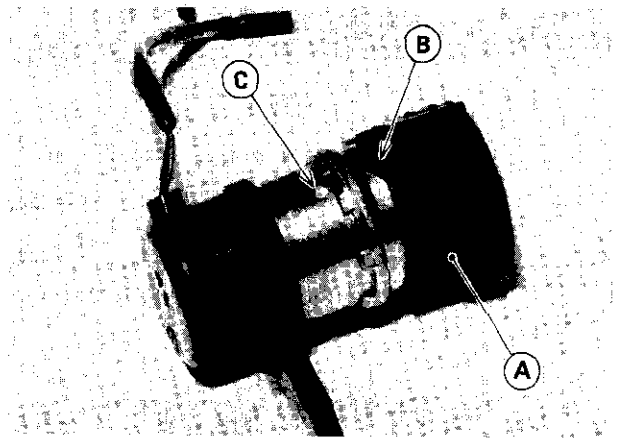
○**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**



A. Fuel Pump
B. Pull for removal.

Fuel Pump Installation

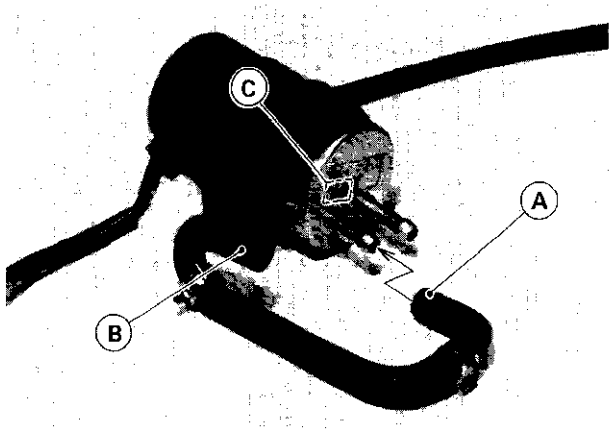
●Install the rubber damper to the pump so that the projection on the damper aligns with the paint mark on the pump.



A. Rubber Damper
B. Projection
C. Paint Mark

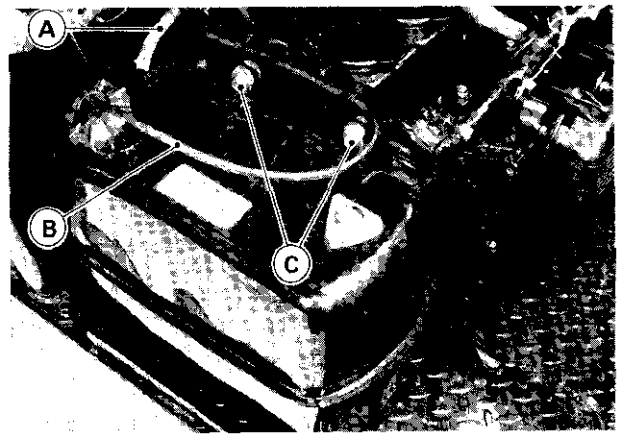
●Connect the fuel hose from the filter to the fitting marked INLET, and the hose to the carburetors to the another fitting.

○For the fuel hose between the pump and filter, connect the small inside diameter end to the pump and the large end to the filter.

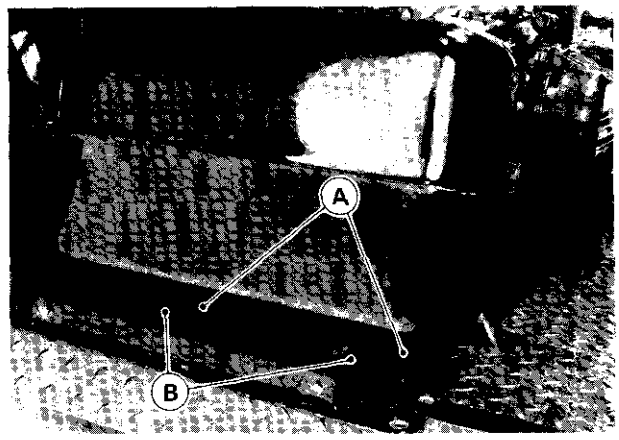


A. Small Inside Dia. End (10.8 mm)
B. Large Inside Dia. End (13 mm)
C. INLET

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



A. Fuel Hose
B. Vent Hose
C. Mounting Bolts



A. Projections
B. Rubber Mounts

●Remove the tank cap and pour out the fuel into a suitable container.

Fuel Tank

Fuel Tank Removal

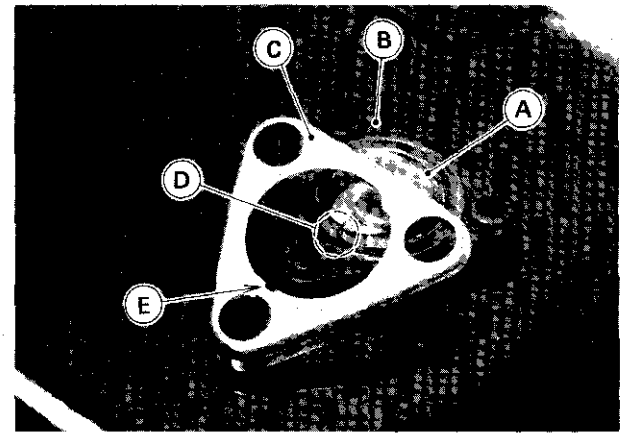
WARNING

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

●Remove the following.
Seat
Fuel Hose (from tank)
○Pull the fuel hose off the tank. Be prepared for fuel spillage.
Air Vent Hose
Fuel Tank Mounting Bolts
Fuel Tank
○Lift up the tank to free the projections on the tank from the rubber mounts on the foot platform.

Fuel Tank Installation

●Be sure to install the rubber dampers in place.
●Be sure to route the hoses so they will not be kinked or stretched.
●Install the fuel level gauge.



A. Fuel Level Gauge
B. Gasket (Face this side up)
C. Holder
D. Projection
E. Notch

○Install the gasket with the correct side facing up.
○Install the gauge holder so that the notch on the holder fits to the projection on the gauge.

Fuel Tank Cleaning

- Remove the fuel tank and drain it.
- Remove the fuel level gauge.
- 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 agea. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents to clean the tank.**

- Pour the solvent out of the tank.
- Dry the tank with compressed air.

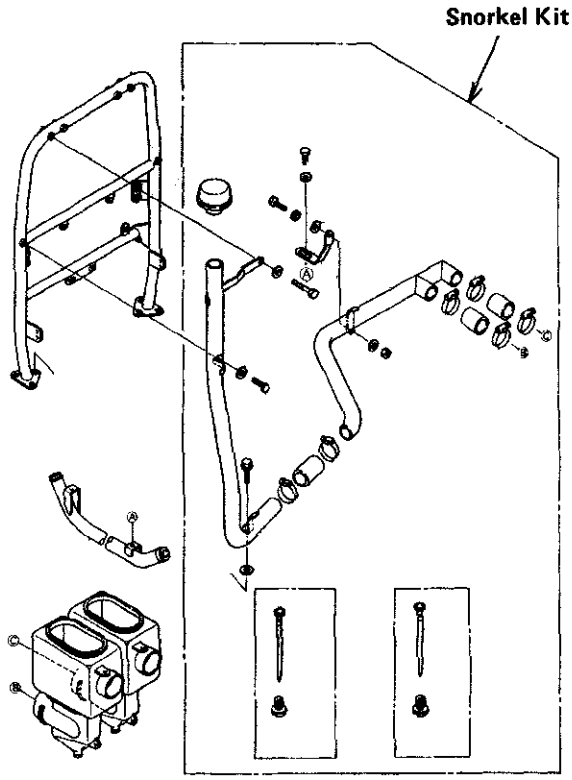
Fuel Tank Inspection

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

★Replace the gaskets if they are damaged.

- Blow the air vent in the tank cap free with compressed air.

Snorkel Kit (Optional Parts)



Cooling System

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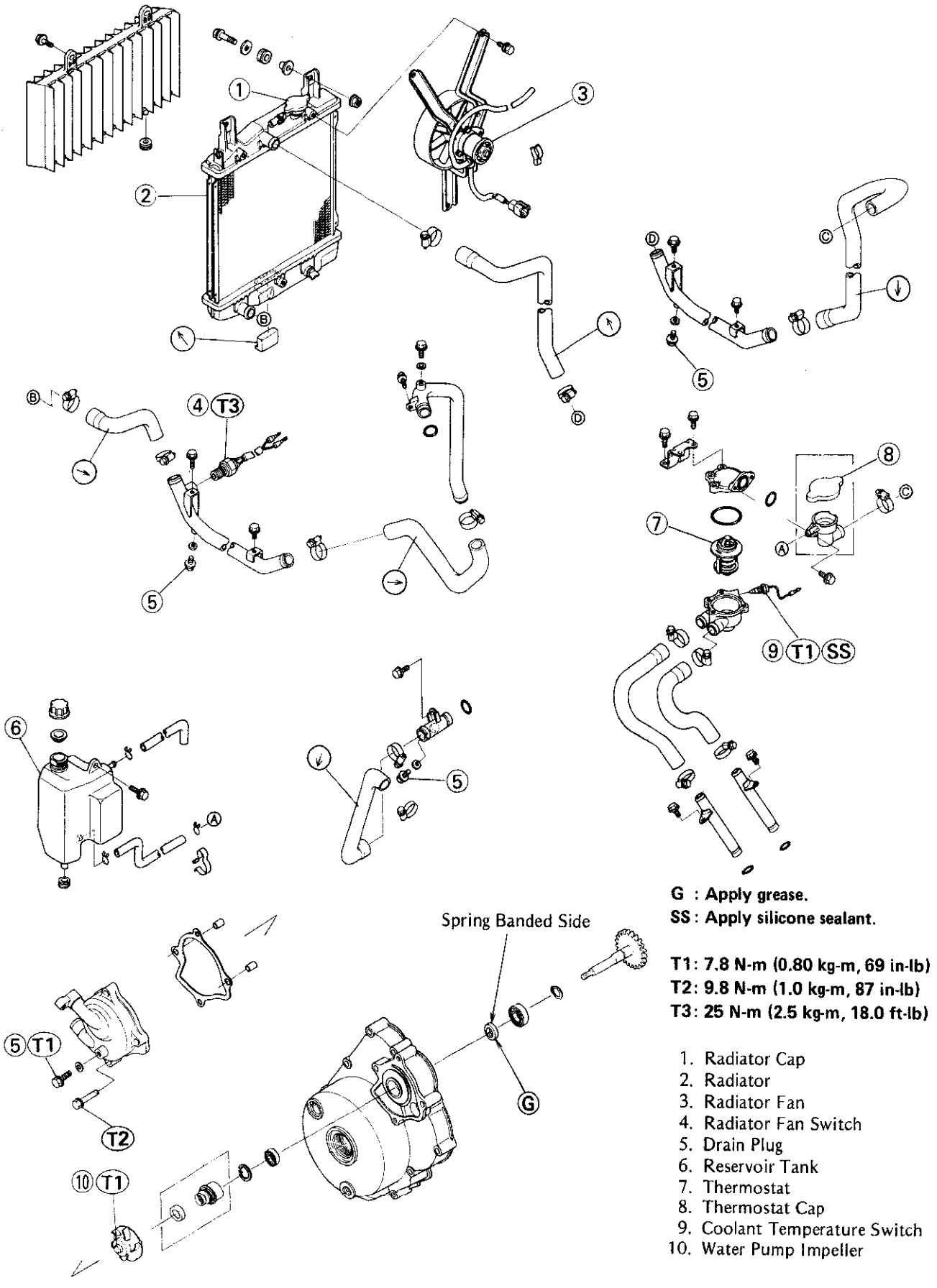
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Exploded View



G : Apply grease.
SS : Apply silicone sealant.

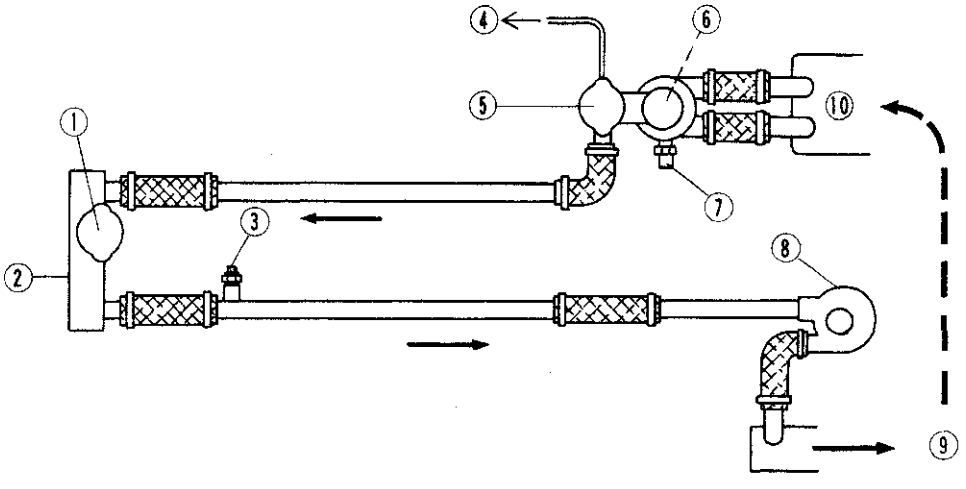
T1: 7.8 N-m (0.80 kg-m, 69 in-lb)
T2: 9.8 N-m (1.0 kg-m, 87 in-lb)
T3: 25 N-m (2.5 kg-m, 18.0 ft-lb)

1. Radiator Cap
2. Radiator
3. Radiator Fan
4. Radiator Fan Switch
5. Drain Plug
6. Reservoir Tank
7. Thermostat
8. Thermostat Cap
9. Coolant Temperature Switch
10. Water Pump Impeller

Specifications

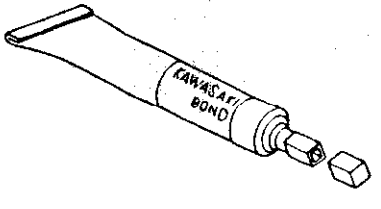
Item		Standard
Coolant:		
Type (recommended)		Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)
Mixed ratio		Soft water 50%, coolant 50%
Freezing point		−35°C (−31°F)
Total amount		2.5 L
Thermostat Cap:		
	Relief pressure	93 – 123 kPa (0.95 – 1.25 kg/cm², 14 – 18 psi)
Thermostat:	Valve opening temperature	80 – 84°C (176 – 183°F)
	Valve full opening lift	More than 8 mm @95°C (203°F)

Coolant Flow Chart



Sealant

Kawasaki Bond (Silicone Sealant): 56019-120



Coolant

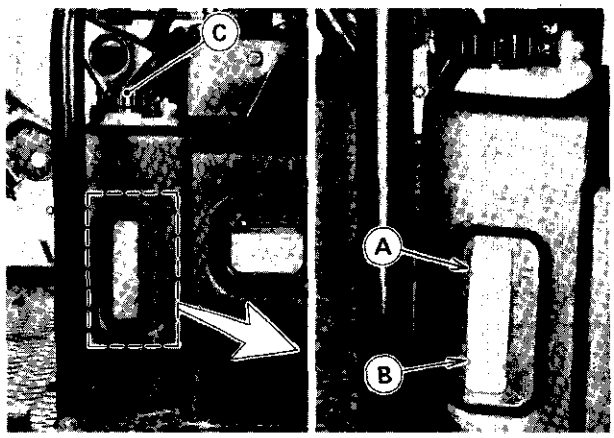
Coolant Level Inspection

●Check the coolant level in the reservoir tank. The coolant level should be between the "F" and the "L" marks.

NOTE

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

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



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

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

CAUTION

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

○**If coolant must be added often, or the reservoir tank has run completely dry; there is probably leakage in the cooling system. Check the system for leaks.**

Coolant Inspection

●Visually inspect the coolant in the reservoir tank.

★If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.

★If the coolant gives off an abnormal smell when changing, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.

NOTE

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

Coolant Change (Draining and Filling)

CAUTION

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

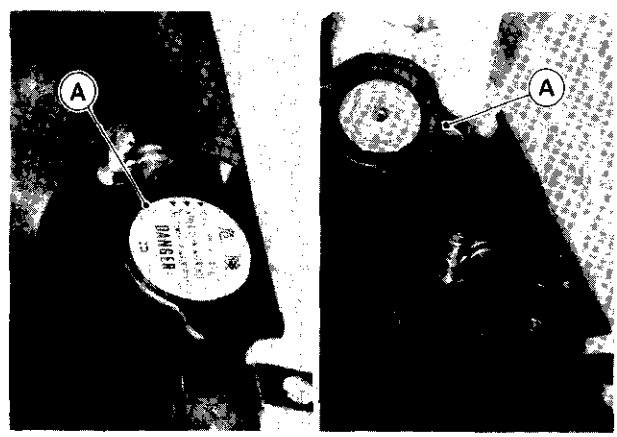
WARNING

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

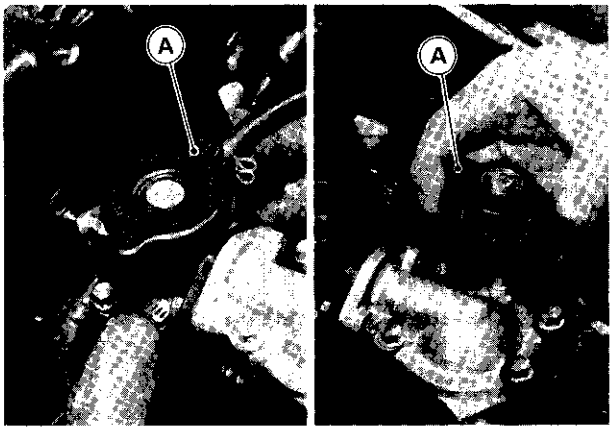
○**Coolant on tires will make them slippery and can cause an accident and injury. Immediately wipe up or wash away any coolant that spills on the frame, engine, or other painted parts.**

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

●Remove the following.
Maintenance Cover
Seat
Battery Cover
Radiator Cap
Thermostat Cap

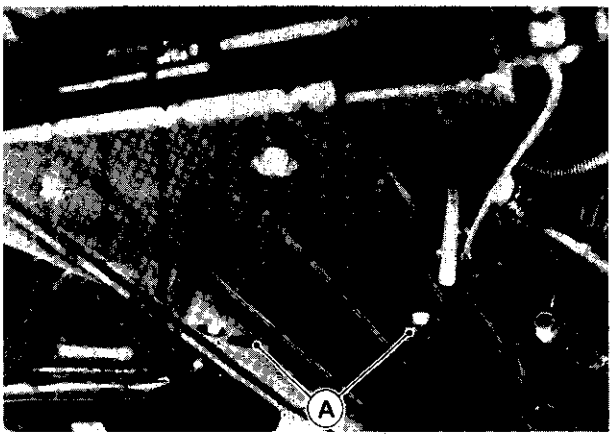


A. Radiator Cap

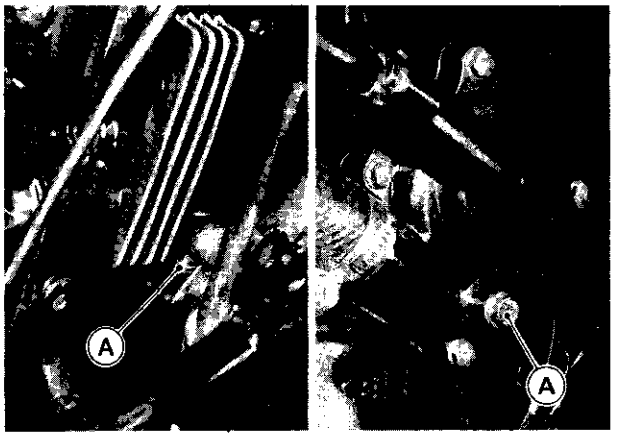


A. Thermostat Cap

- Place a container under each drain plug.
- Drain the coolant from the radiator and engine by removing the drain plugs.

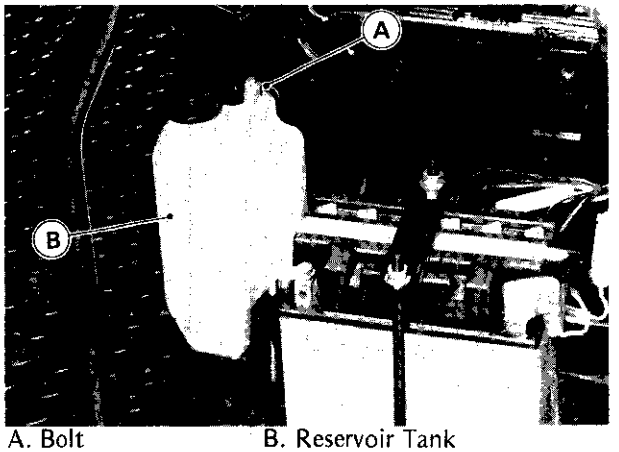


A. Drain Plugs



A. Drain Plug

- Remove the reservoir tank mounting bolt and pour out the tank into a container.

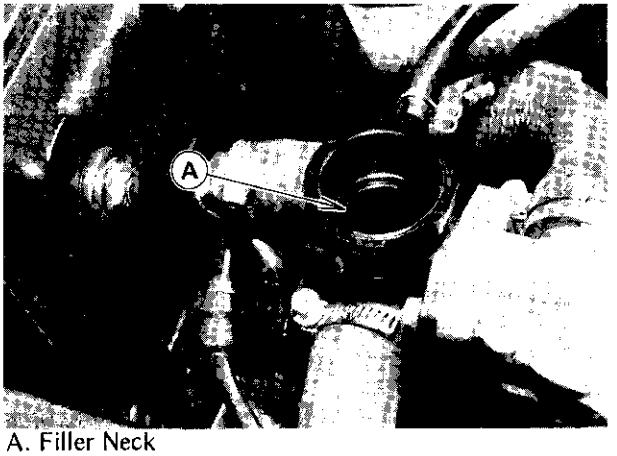


A. Bolt B. Reservoir Tank

- Inspect the coolant deterioration.
- Install the drain plugs. Always replace the gasket with new one, if it is damaged.
- Fill the radiator and engine up to the top of the filler neck at the thermostat housing with coolant.

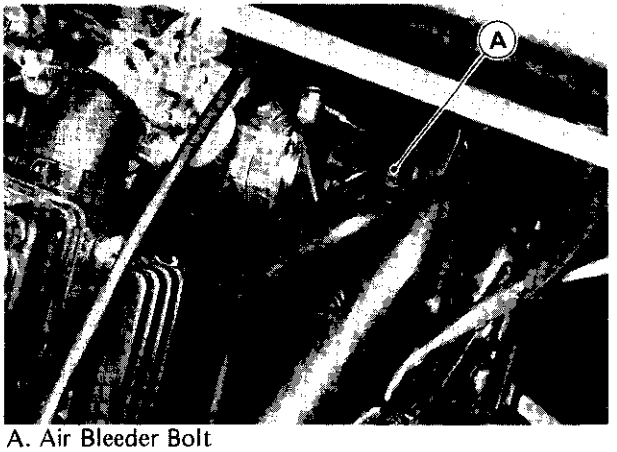
NOTE

○*Pour in the coolant slowly so that it can expel the air from the engine and radiator.*



A. Filler Neck

- Loosen the air bleeder bolt and the coolant begins to flow out the air bleeder bolt hole (that is, when the remaining air has been forced out). Tighten the bleeder bolt.



A. Air Bleeder Bolt

- Add coolant up to the top of the filler neck.
- Fill the reservoir tank up to the "F" mark with coolant, and install the cap.
- Check the cooling system for leaks.
- Install the radiator and thermostat caps. Do not change their positions.
- Start the engine, warm it up thoroughly, and then stop it.
- Check the coolant level in the reservoir tank after the engine cools down.
- ★If the coolant level is low, add coolant up to the "F" mark through the reservoir tank opening.

CAUTION

○**Soft or distilled water must be used with the antifreeze (see below for antifreeze) in the cooling system.**
○**If hard water is used in the system, it causes scales accumulation in the water passages, and considerably reduces the efficiency of the cooling system.**

NOTE

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

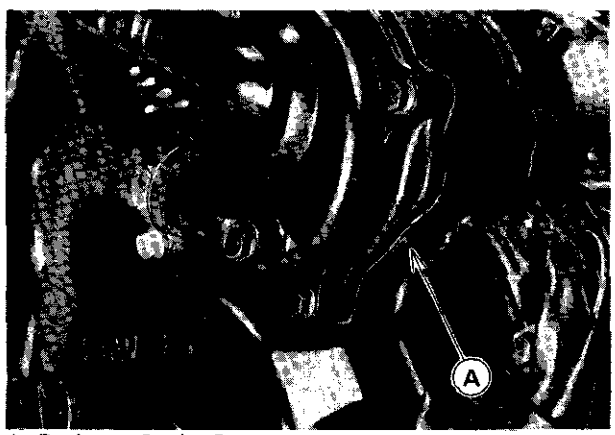
Coolant

Type:	**Permanent type of antifreeze for aluminum engines and radiators**
Mixed Ratio:	**Soft water 50%, coolant 50%**
Freezing Point:	**−35°C (−31°F)**
Total Amount:	**2.5 L**

Mechanical Seal Inspection (Visual Leak Inspection)

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

- Check the water pump body drainage outlet passage for coolant leaks.
- ★If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal.
- ★If there are no apparent leaks, pressure test the system.



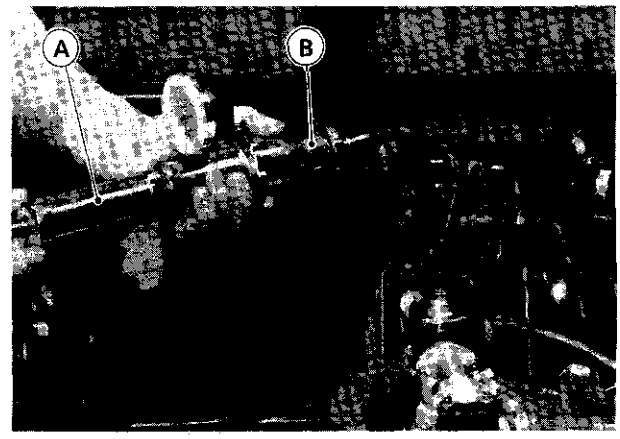
A. Drainage Outlet Passage
: at the bottom of the pump body

Cooling System Pressure Test

CAUTION

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

- Remove the thermostat cap, and install a cooling system pressure tester on the filler neck.
- Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.
- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kg/cm², 18 psi).
- Watch the gauge for at least 6 seconds.
- ★If the pressure holds steady, the system is all right.



A. Pressure Tester B. Adapter

- Remove the pressure tester, replenish the coolant, and install the thermostat cap.
- ★If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the cylinder liner O-ring leak.

Cooling System Flushing

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

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

CAUTION

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

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

Radiator and Fan

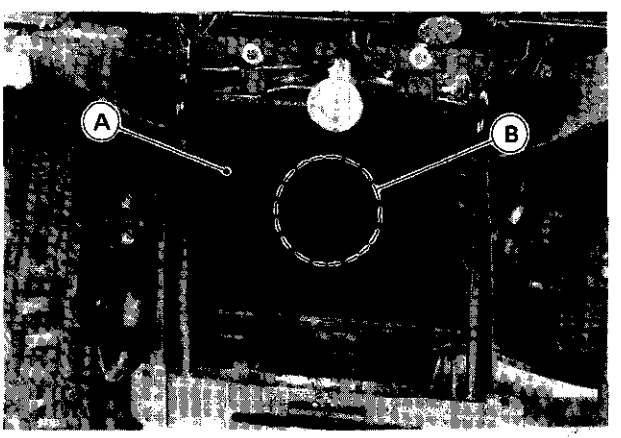
Radiator and Fan Removal

•Disconnect the battery leads from the terminals.

WARNING

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

•Wait until the coolant cools down, and then drain the coolant (see Coolant Change).
•Remove the following.
Front Bar Component
Front Fender Upper
Front Guard
Radiator Screen
Radiator Mounting Bolts
Radiator Hose Clamps (loosen)
Radiator and Fan
○Do not touch the radiator core directly. This could damage the radiator fins, resulting in loss of cooling efficiency.



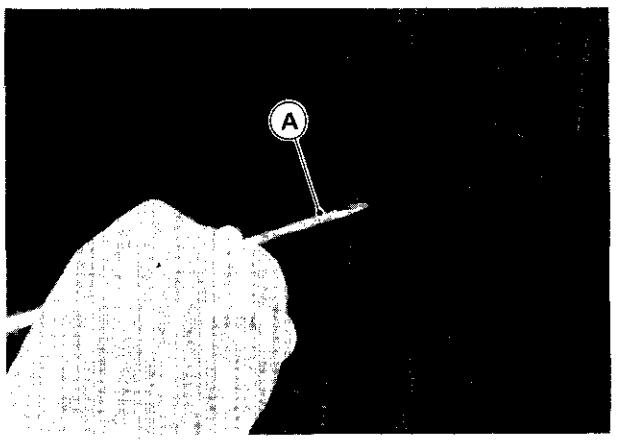
A. Radiator B. Fan

Radiator and Fan Installation

•Fill the cooling system with the coolant and bleed the air from the system (see Coolant Change).

Radiator Inspection

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

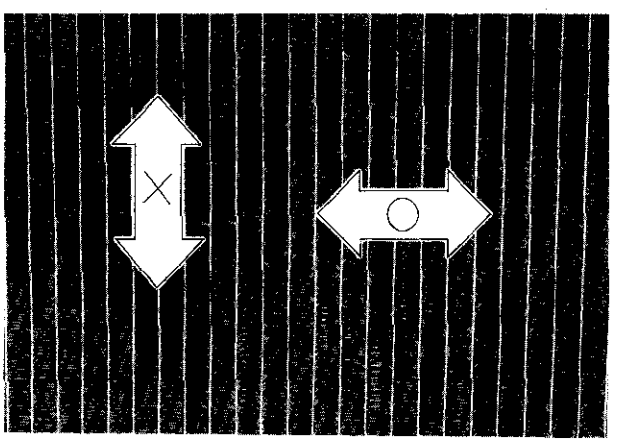


A. Thin Screwdriver

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

Radiator Cleaning

When cleaning the radiator with a steam cleaner, be careful of the following to prevents radiator damage.
•Hold the steam gun at least **0.5 m** from the radiator core.
•Run the gun horizontally following the core fin direction holding it perpendicular to the core surface.



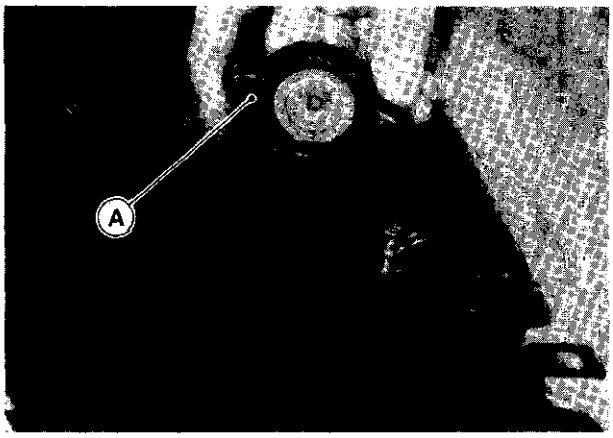
Radiator and Thermostat Caps

Radiator and Thermostat Cap Removal

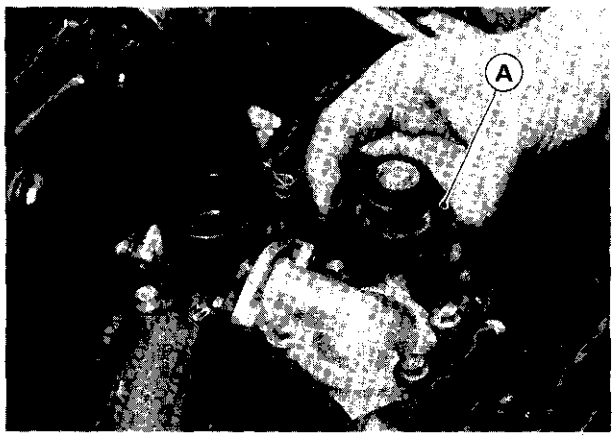
- Wait for the coolant temperature to drop before removing the radiator and thermostat caps.
- Remove the following.
  Maintenance Cover (for Radiator Cap)
  Seat (for Thermostat Cap)
- Turn the cap counterclockwise to the first stop. Wait a few seconds for the pressure to release. Then turn it counterclockwise to remove the cap.

WARNING

○To avoid burns do not remove the radiator and thermostat caps when the coolant is still hot. Wait until it cools down.



A. Radiator Cap



A. Thermostat Cap

Radiator and Thermostat Cap Installation

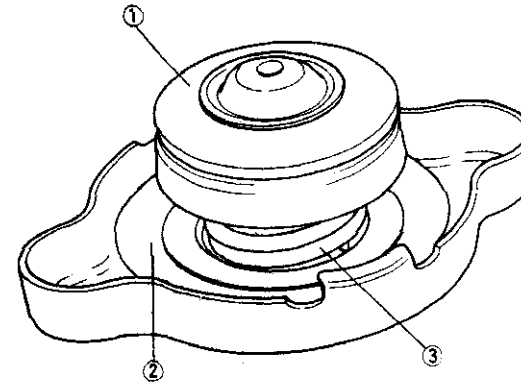
- The radiator and thermostat caps must be installed in two steps. First turn the cap clockwise to the first stop. Then turn clockwise to tighten the rest of the way.

Thermostat Cap Inspection

- Check the condition of the valve spring, and the top and bottom valve seals of the cap.
- Check the condition of the top and bottom sealing seats in the filler neck. They must be smooth and clean for the cap to function properly.

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

Thermostat Cap



1. Bottom Valve Seal
2. Top Valve Seal
3. Valve Spring

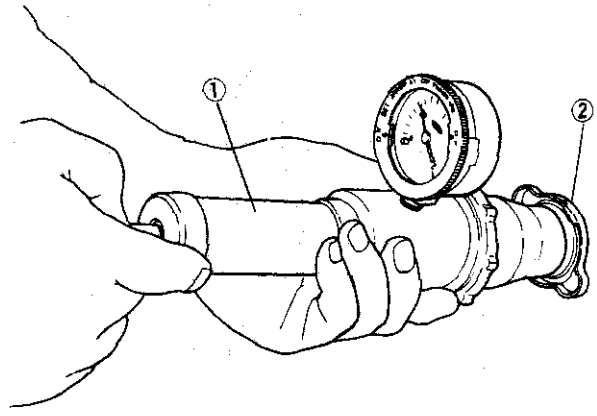
- Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.
- Install the cap on a cooling system pressure tester.
- Watching the pressure gauge, pump the pressure tester to build up the pressure. The cap must retain the pressure at least 6 seconds. Also the cap must open at the specified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

Thermostat Cap Relief Pressure

93 – 123 kPa
(0.95 – 1.25 kg/cm², 14 – 18 psi)

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

Thermostat Cap Test

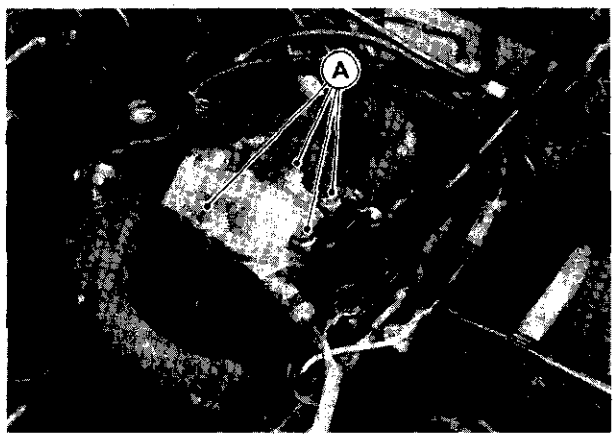


1. Pressure Tester
2. Thermostat Cap

Thermostat

Thermostat Removal

- Drain the coolant until the level of it is low enough to remove the thermostat after the coolant has had time to cool (see Coolant Change).
- Remove the following.
  Thermostat Housing Cover Bolts
  Thermostat



A. Thermostat Housing Cover Bolts

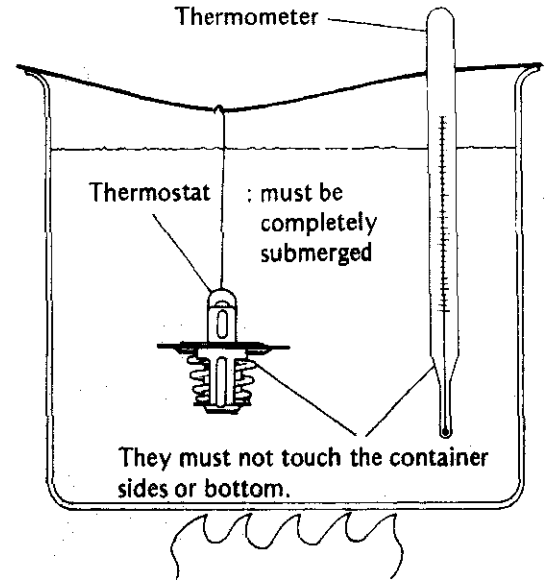
Thermostat Installation

- Fill the cooling system with the coolant and bleed the air from the system (see Coolant Change).

Thermostat Inspection

- Inspect the thermostat valve at room temperature.
- ★If the valve is open, replace the valve with a new one.
- To check valve opening temperature, suspend the thermostat and an accurate thermometer in a container of water.
- Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.
- Watch the valve. As soon as the valve starts to open, note the temperature.
- ★If it is out of the specified range, replace the thermostat.

Valve Opening Temperature Measurement



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

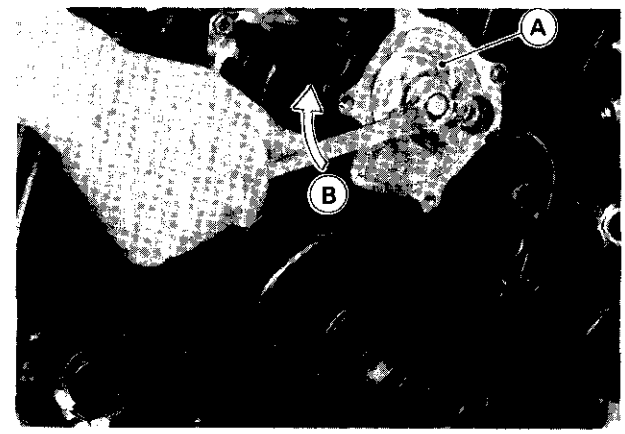
Water Pump

Water Pump Disassembly

- Before removing the left engine cover, remove the pump impeller by it turning clockwise. Hold the alternator rotor bolt if necessary.

NOTE

○*The impeller has a left-handed thread, therefore it must be turned clockwise to remove it.*

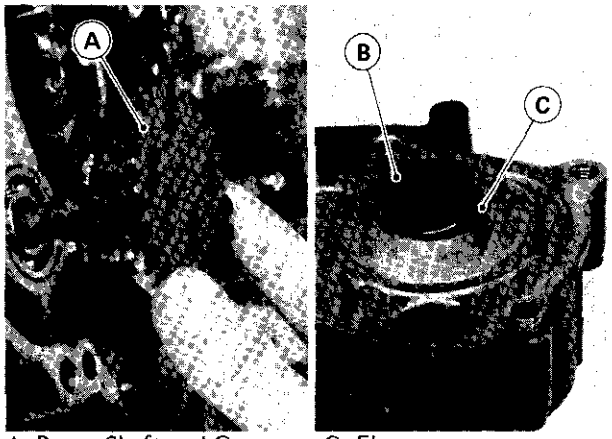


A. Impeller B. Turn to remove.

●Remove the water pump shaft and gear.

CAUTION

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



A. Pump Shaft and Gear
B. Mechanical Seal
C. Flange

●Pull the mechanical seal out of the left engine cover with a sharp hook, after prying the flange off.

Water Pump Assembly

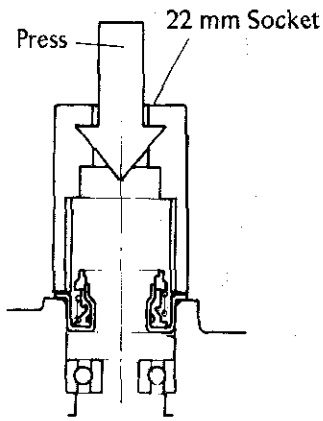
●Replace the mechanical seal and the oil seal with new ones if they were removed.
●Apply high temperature grease and install the oil seal as shown.

NOTE

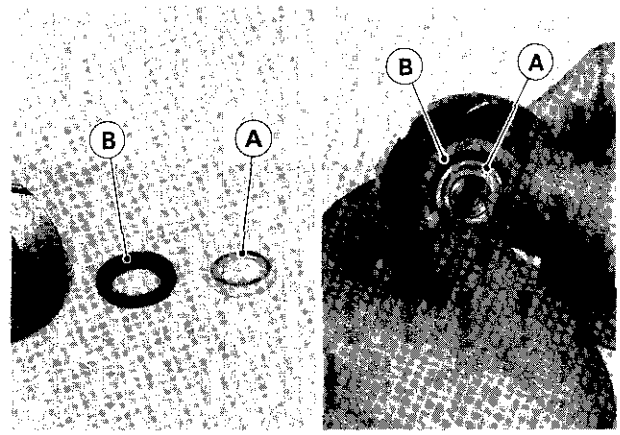
○*Since the replacement mechanical seal has an adhesive coated body, do not apply a liquid gasket to the exterior surface of the body.*

●Press the seal body into the hole by using a 22 mm socket until it stops at the bottom surface of the engine cover.

Mechanical Seal Assembly



●Clean the sliding surface of the mechanical seal with a high flash-point solvent, and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.
●After applying coolant to the surfaces of the rubber seal and sealing seat, install the seal and seat into the impeller with finger pressure until they bottom out.



A. Sealing Seat
B. Rubber Seal

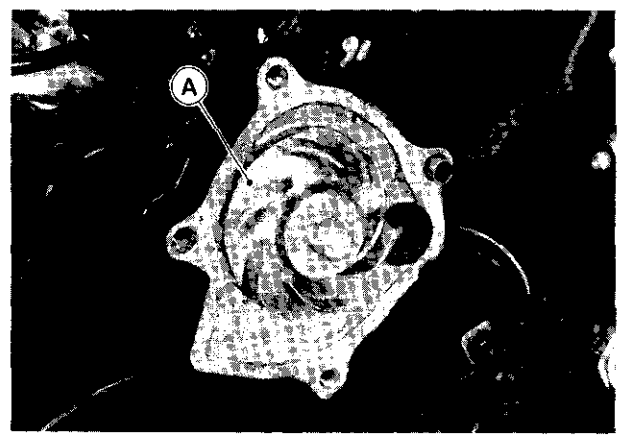
●Torque the following.
Pump Impeller

NOTE

○*The impeller has a left-handed thread, therefore it must be turned counterclockwise to install it.*

Pump Impeller Inspection

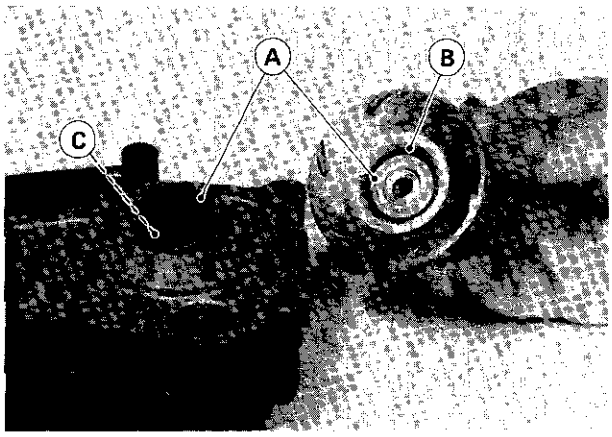
●Visually check the impeller.
★If the surface is corroded, or if the blades are damaged, replace the impeller.



A. Impeller

Mechanical Seal Inspection

●Visually inspect the mechanical seal.
★If any one of the parts is damaged, replace the mechanical seal as a unit.
○The sealing seat and rubber seal may be removed easily by hand.



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

Hoses and Pipes

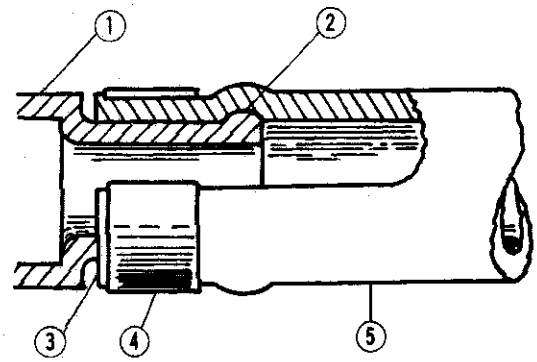
Hose and Pipe Removal

●Drain the coolant after it has had time to cool (see Coolant Change).

Hose and Pipe Installation

●Be sure to install the O-ring on each pipe fitting which is mounted onto the cylinder, cylinder head, or water pump.
●Install the hoses and pipes being careful to follow bending direction or installation marks. Avoid sharp bending, kinking, flattening, or twisting.
●Install the clamps as near as possible to the hose end to clear the raised rib on the fitting. This will prevent the hoses from working loose.
○The clamp screws should be positioned correctly to prevent the clamps from contacting anything.

Hose and Clamp Installation



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

●Fill the cooling system with the coolant and bleed the air from the system (see Coolant Change).

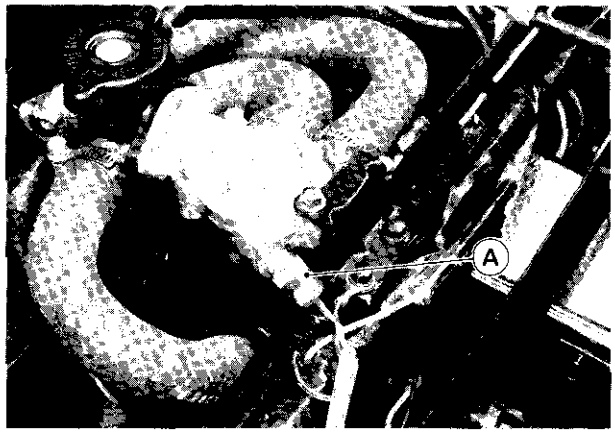
Hose Inspection

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

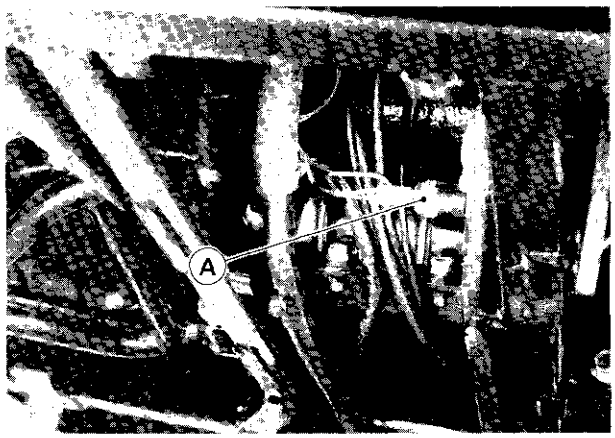
Radiator Fan Switch and Coolant Temperature Switch

Switch Removal

●Drain the coolant after it has had time to cool (see Coolant Change).
○To remove the coolant temperature switch, drain the coolant until the level of it is low enough to remove the switch.



A. Coolant Temperature Switch



A. Radiator Fan Switch

Switch Installation

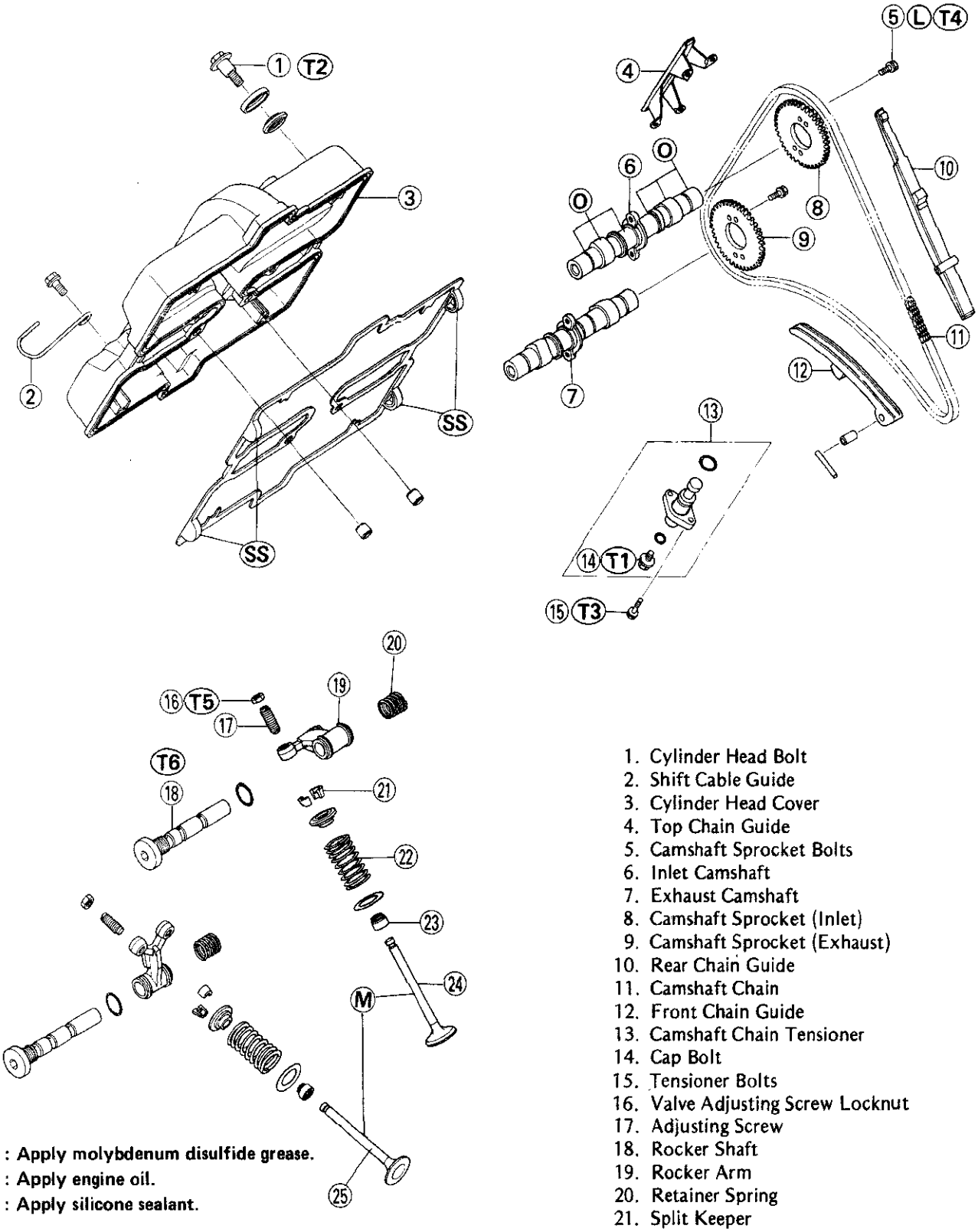
- Apply a silicone sealant to the following.
  Coolant Temperature Switch
- Torque the following.
  Radiator Fan Switch
  Coolant Temperature Switch
- Fill the cooling system with the coolant and bleed the air from the system (see Coolant Change).

Engine Top End

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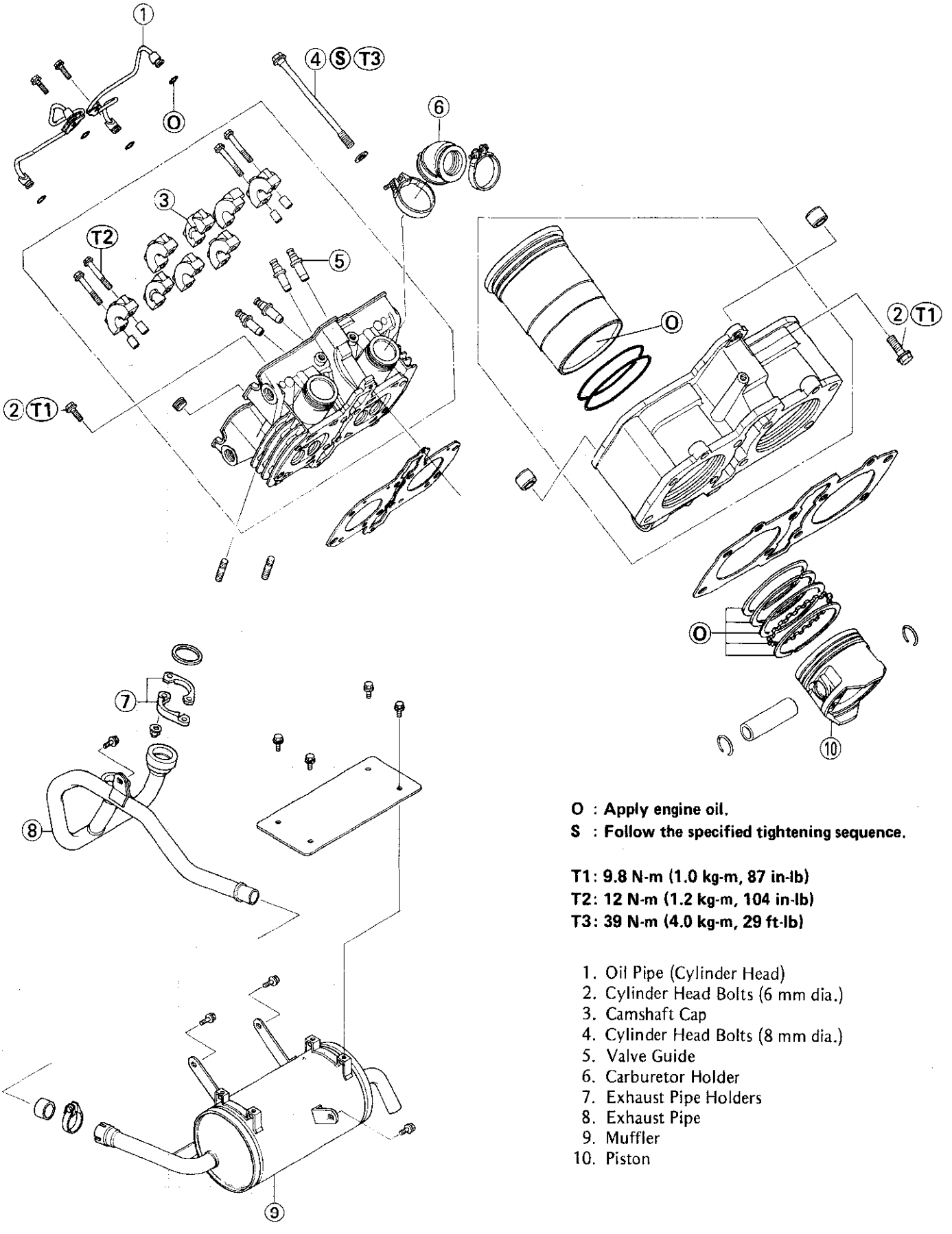
Exploded View



M : Apply molybdenum disulfide grease.
O : Apply engine oil.
SS : Apply silicone sealant.

T1 : 4.9 N-m (0.50 kg-m, 43 in-lb)
T2 : 9.8 N-m (1.0 kg-m, 87 in-lb)
T3 : 12 N-m (1.2 kg-m, 104 in-lb)
T4 : 15 N-m (1.5 kg-m, 11.0 ft-lb)
T5 : 25 N-m (2.5 kg-m, 18.0 ft-lb)
T6 : 39 N-m (4.0 kg-m, 29 ft-lb)

1. Cylinder Head Bolt
2. Shift Cable Guide
3. Cylinder Head Cover
4. Top Chain Guide
5. Camshaft Sprocket Bolts
6. Inlet Camshaft
7. Exhaust Camshaft
8. Camshaft Sprocket (Inlet)
9. Camshaft Sprocket (Exhaust)
10. Rear Chain Guide
11. Camshaft Chain
12. Front Chain Guide
13. Camshaft Chain Tensioner
14. Cap Bolt
15. Tensioner Bolts
16. Valve Adjusting Screw Locknut
17. Adjusting Screw
18. Rocker Shaft
19. Rocker Arm
20. Retainer Spring
21. Split Keeper
22. Valve Spring
23. Oil Seal
24. Inlet Valve
25. Exhaust Valve



O : Apply engine oil.
S : Follow the specified tightening sequence.

T1: 9.8 N-m (1.0 kg-m, 87 in-lb)
T2: 12 N-m (1.2 kg-m, 104 in-lb)
T3: 39 N-m (4.0 kg-m, 29 ft-lb)

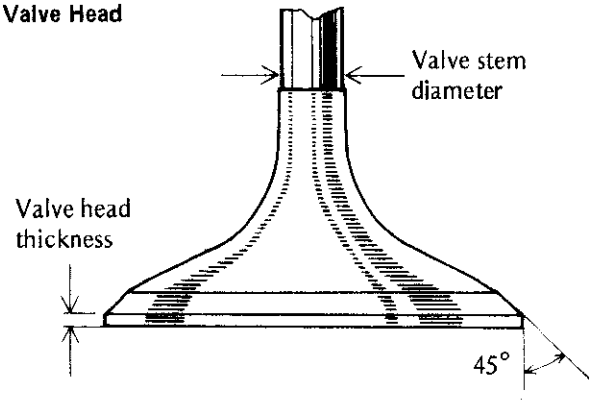
1. Oil Pipe (Cylinder Head)
2. Cylinder Head Bolts (6 mm dia.)
3. Camshaft Cap
4. Cylinder Head Bolts (8 mm dia.)
5. Valve Guide
6. Carburetor Holder
7. Exhaust Pipe Holders
8. Exhaust Pipe
9. Muffler
10. Piston

Specifications

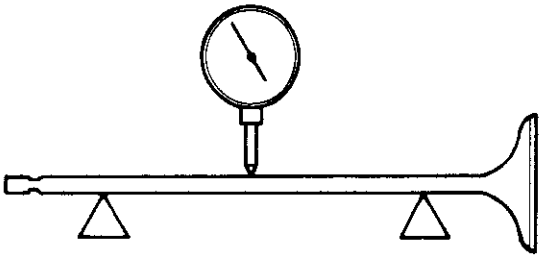
Item		Standard	Service Limit
Cylinder Head, Valves:			
Valve clearance	Inlet	0.13 – 0.18 mm	– – –
(when cold):	Exhaust	0.18 – 0.23 mm	– – –
Cylinder head warp		– – –	0.05 mm
Valve head thickness:	Inlet	0.5 mm	0.25 mm
	Exhaust	1 mm	0.7 mm
Valve stem bend		Less than 0.02 mm TIR	0.05 mm TIR
Valve stem diameter:	Inlet, Exhaust	5.500 – 5.512 mm	5.58 mm
Valve/valve guide clearance (wobble method):			
	Inlet	0.03 – 0.09 mm	0.23 mm
	Exhaust	0.08 – 0.14 mm	0.27 mm
Valve seating surface:			
Outside diameter:	Inlet	28.3 – 28.5 mm	– – –
	Exhaust	24.0 – 24.2 mm	– – –
Width:	Inlet, Exhaust	0.5 – 1.0 mm	– – –
Valve spring free length		40.4 mm	39 mm
Valve seat cutting angle:	Inlet, Exhaust	32°, 45°, 60°	– – –
Camshaft:			
Cam height:	Inlet, Exhaust	34.326 – 34.466 mm	34.23 mm
Camshaft bearing oil clearance		0.030 – 0.071 mm	0.16 mm
Camshaft journal diameter		24.950 – 24.970 mm	24.92 mm
Camshaft bearing inside diameter		25.000 – 25.021 mm	25.08 mm
Camshaft runout		not more than 0.04 mm TIR	0.1 mm TIR
Camshaft chain 20-link length		127.0 – 127.4 mm	128.9 mm
Rocker arm inside diameter		12.500 – 12.518 mm	12.55 mm
Rocker shaft diameter		12.466 – 12.484 mm	12.44 mm
Cylinder Compression:		(usable range) 890 – 1,370 kPa @380 r/min (rpm) (9.1 – 14.0 kg/cm², 129 – 199 psi)	
Cylinder Block, Piston:			
Cylinder inside diameter		72.494 – 72.506 mm	72.6 mm
Piston diameter		72.435 – 72.450 mm	72.29 mm
Piston/cylinder clearance		0.044 – 0.071 mm	– – –
Oversize piston and rings		+ 0.5 mm	– – –

Item		Standard	Service Limit
Piston ring/groove clearance:	Top	0.03 – 0.07 mm	0.17 mm
	Second	0.02 – 0.06 mm	0.16 mm
Piston ring groove width:	Top	1.02 – 1.04 mm	1.12 mm
	Second	1.01 – 1.03 mm	1.12 mm
	Oil	2.51 – 2.53 mm	2.61 mm
Piston ring thickness:	Top, Second	0.97 – 0.99 mm	0.9 mm
Piston ring end gap:	Top, Second	0.2 – 0.35 mm	0.7 mm

Valve Head

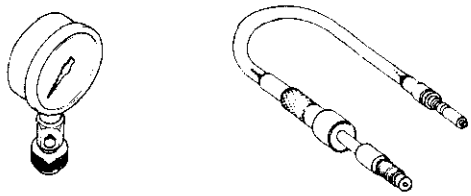


Valve Stem Bend

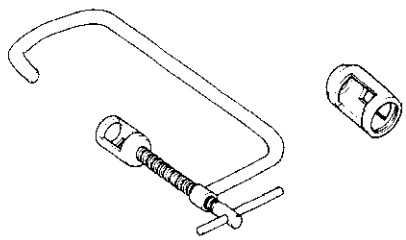


Special Tools

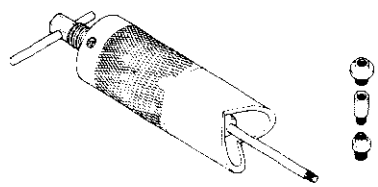
Compression Gauge: 57001-221
Adapter: 57001-1183



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



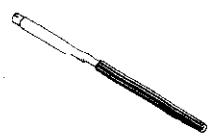
Piston Pin Puller Assembly: 57001-910



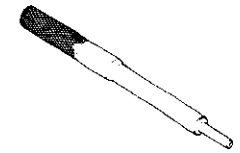
Valve Seat Cutter 32° - φ28 57001-1119
Valve Seat Cutter 32° - φ30 57001-1120
Valve Seat Cutter 45° - φ24.5 57001-1113
Valve Seat Cutter 45° - φ30 57001-1187
Valve Seat Cutter 60° - φ30 57001-1123



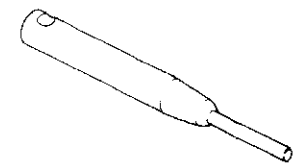
Valve Guide Reamer: 57001-1079



Valve Guide Arbor: 57001-1021



Valve Seat Cutter Holder: 57001-1125

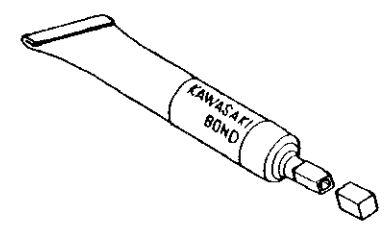


Bar: 57001-1128



Sealant

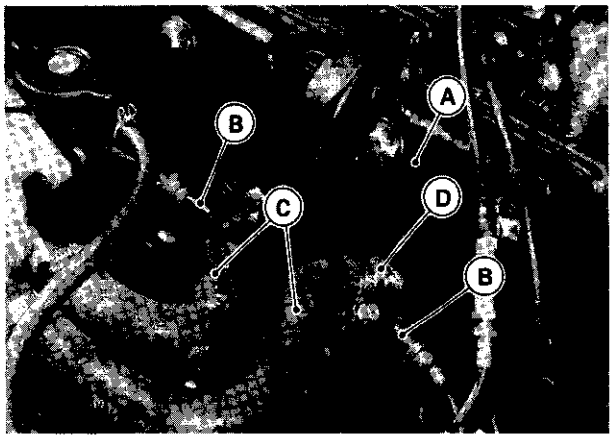
Kawasaki Bond (Silicone Sealant): 56019-120



Cylinder Head Cover

Removal

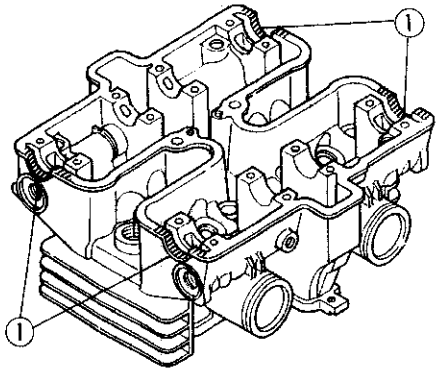
●Remove the following.
Seat
Cargo Bed
Coolant
Cooling Hose Ends with Pipes
Spark Plug Caps
Head Cover Bolts (6)



A. Head Cover
B. Plug Caps
C. Cooling Hoses
D. Cooling Pipe

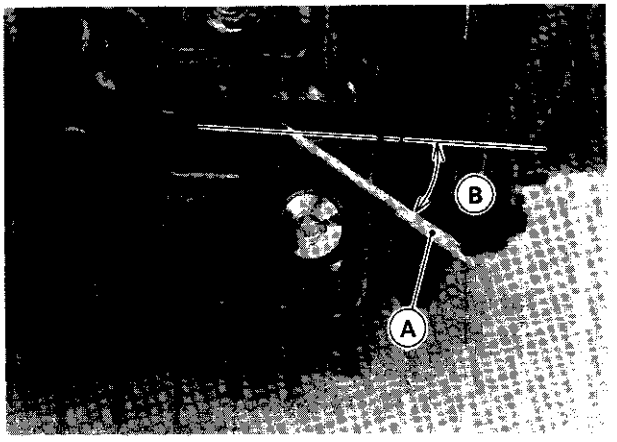
Installation

●Note the following.
○Apply silicone sealant.



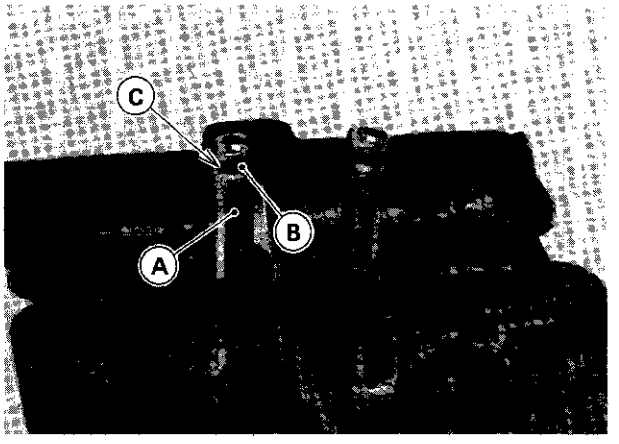
1. Applied Areas

○Install the shift cable guide.



A. Guide
B. 30°

○Check parts for wear or damage.
O-rings
Knock Pins
○Apply grease.
O-rings



A. Cooling Pipe
B. O-ring
C. Apply grease.

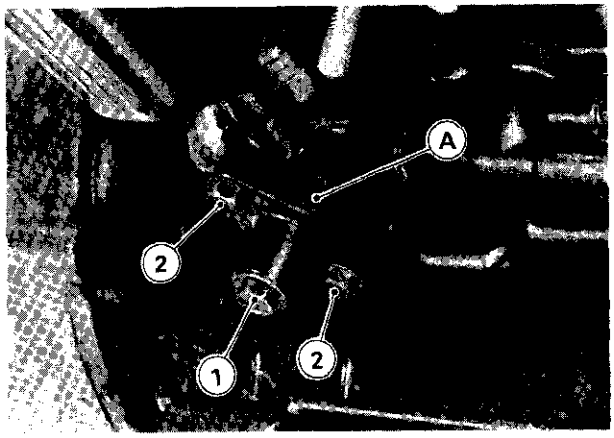
○Torque the following.
Head Cover Bolts

Camshaft Chain Tensioner

Removal

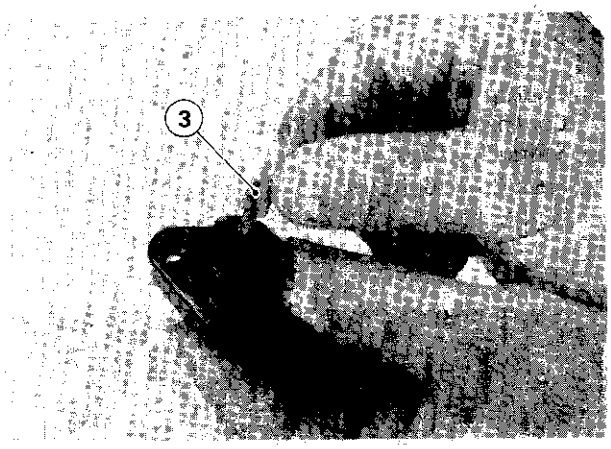
●Remove the following.
Seat
Cargo Bed
Battery Cover
Muffler
Exhaust Pipe

●Remove the following
1. Cap Bolt (Loosen)
2. Mounting Bolts



A. Chain Tensioner

3. Attach the rod holder plate.

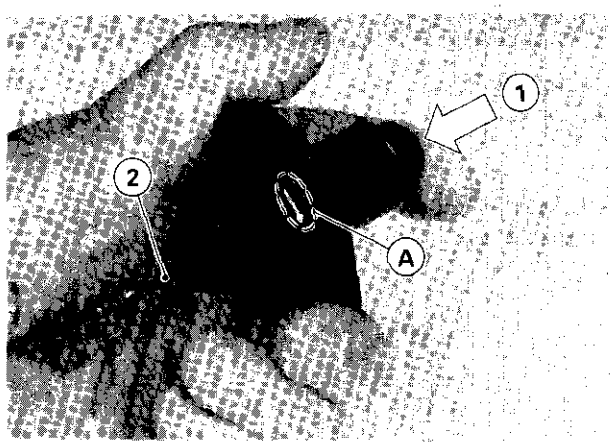


NOTE

○*To make the procedure easy, use a holder plate to keep the rod from pushing out. A replacement chain tensioner (spare parts) has a push rod holder plate.*

Installation

●Remove the cap bolt and O-ring.
○Perform the following.
1. Compress the push rod.
2. Turn the push rod clockwise until the rod stops.

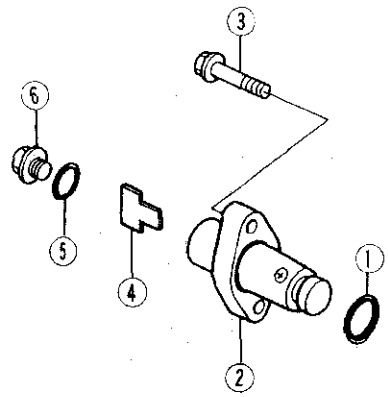


A. Turn clockwise.

CAUTION

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

●Install the tensioner body.
1. O-ring
2. Tensioner Body
3. Mounting Bolts
4. Holder Plate (Remove)
5. O-ring
6. Cap Bolt



○Torque the following.
Mounting Bolts
Cap Bolt

Camshafts and Sprockets

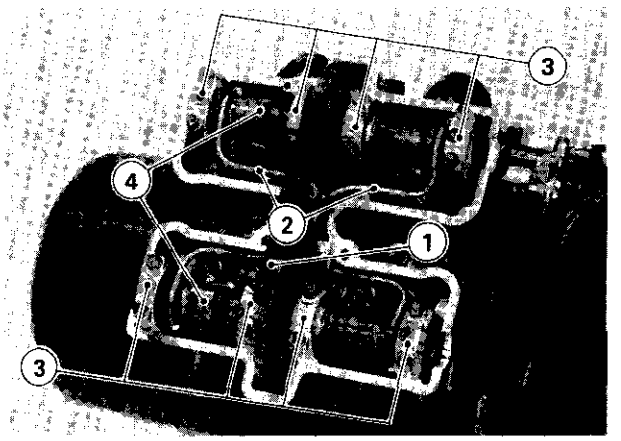
Camshaft Removal

●Remove the following.
Seat
Cargo Bed
Cylinder Head Cover
Camshaft Chain Tensioner

NOTE

○*Before removing the chain tensioner, position the crankshaft at #2 piston TDC.*

●Remove the following.
1. Top Chain Guide
2. Oil Pipes
3. Camshaft Caps
4. Camshafts



CAUTION

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

NOTE

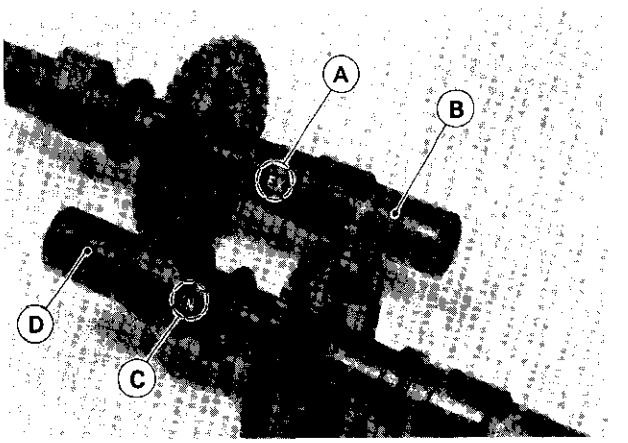
○*Stuff a clean cloth into the chain tunnel to keep any parts from falling into the crankcase.*

Camshaft Installation (Including Chain Timing Procedure)

●Note the following.
○Apply engine oil.
All Cam Parts
All Cam Journals

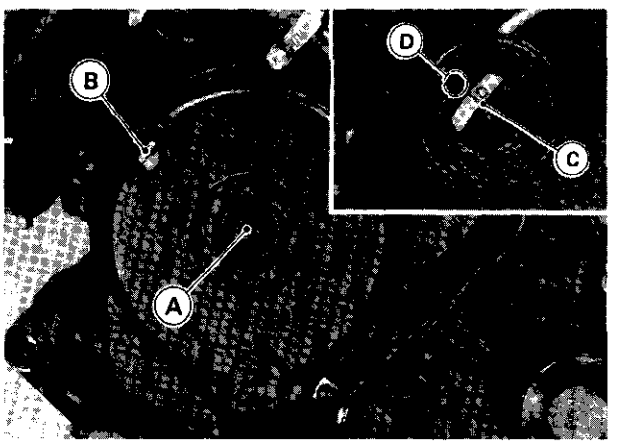
NOTE

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



A. EX Mark
B. Exhaust Camshaft
C. IN Mark
D. Inlet Camshaft

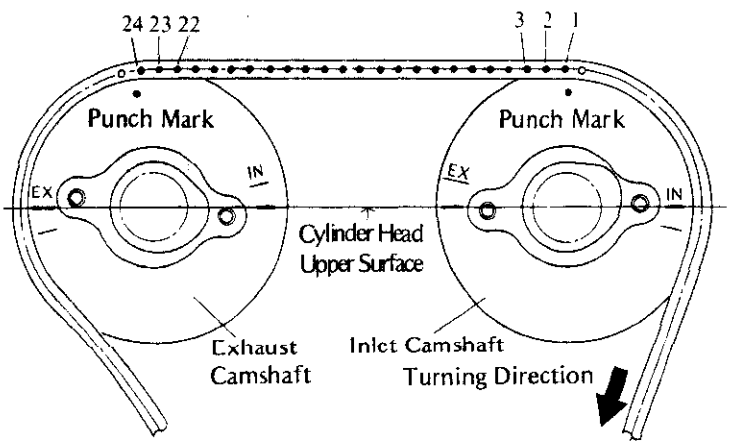
○Position the crankshaft at #2 piston TDC.



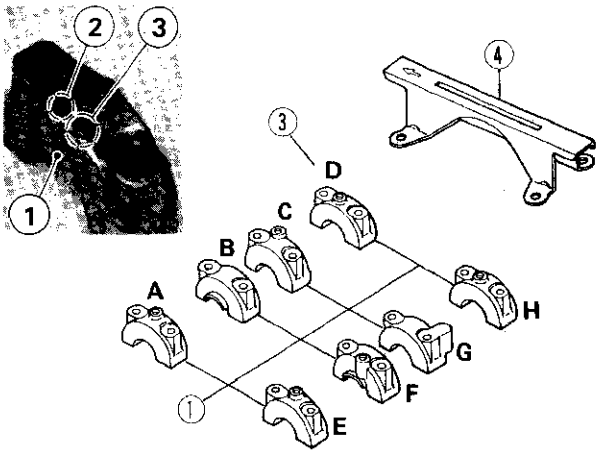
A. Turn the crankshaft.
B. Inspection Window
C. TDC Mark (#2 Piston)
D. Timing Mark

○Engage the camshaft chain sprocket with the camshaft chain.

Left Side View



○Install the camshaft caps.
○Install the top chain guide.

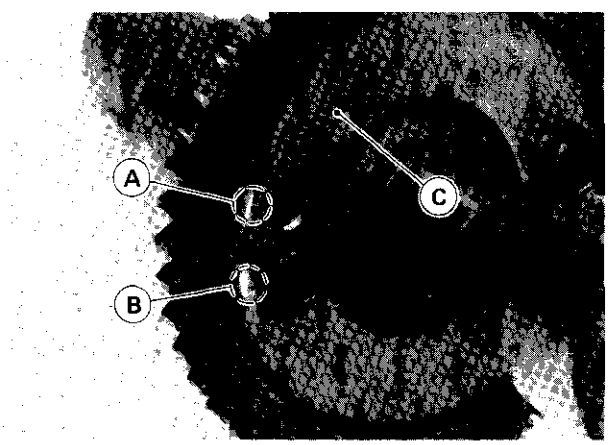


1. Camshaft Caps
2. Arrow: Toward the front.
3. Location Mark
4. Top Chain Guide

○Torque the following.
Camshaft Cap Bolts
Top Chain Guide Bolts
○Apply engine oil.
Oil Pipe O-rings

Camshaft Sprocket Installation

●Note the following.
○The inlet and exhaust sprockets are identical.
Inlet sprocket used mark "I"
Exhaust sprocket used mark "E"

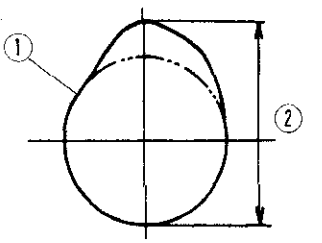


A. For Inlet Camshaft
B. For Exhaust Camshaft
C. Sprocket

○Apply non-permanent locking agent.
Sprocket Bolts
○Torque the following.
Sprocket Bolts

Cam Height Measurement

●Measure the cam height.
Use the micrometer.
★If the measurement is under the service limit, replace the camshaft.



1. Camshaft
2. Cam Height

Cam Height

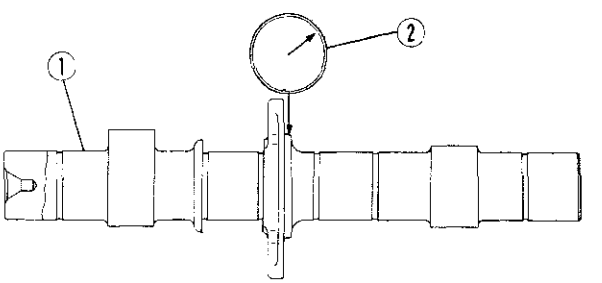
Standard:	**34.326 – 34.466 mm**
Service Limit:	**34.23 mm**

Camshaft Runout

●Measure the runout.
Use the dial gauge.
★If the runout exceeds the service limit, replace the camshaft.

Camshaft Runout

Standard:	**Less than 0.04 mm TIR**
Service Limit:	**0.1 mm TIR**



1. Camshaft
2. Dial Gauge

Camshaft Bearing Oil Clearance Inspection

●Measure each clearance between the camshaft and the cap.
Use the plastigage (Press Gauge).

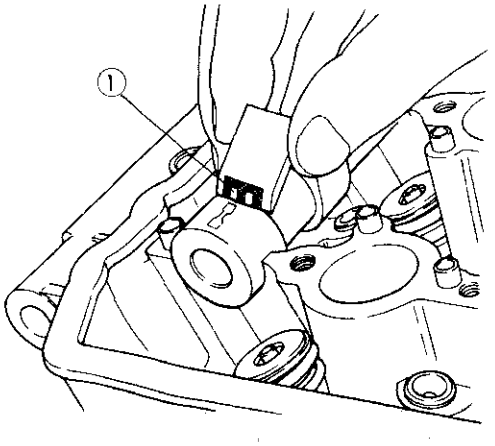
NOTE

○*Tighten the cap bolts to the specified torque (see Exploded View).*
○*Do not turn the camshaft when the plastigage is between the journal and camshaft cap.*

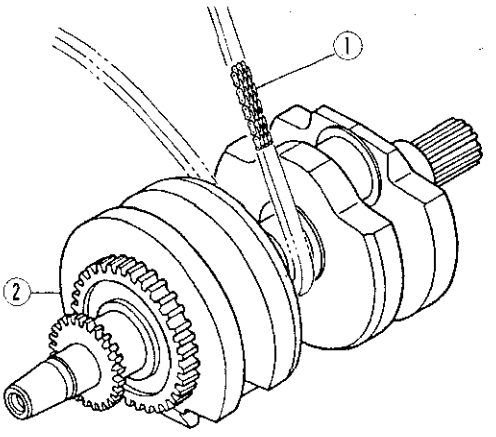
★If the clearance exceeds the service limit, replace the camshaft and measure the clearance again.
★If the clearance still remain out of the limit, replace the cylinder head.

Camshaft Bearing Clearance

Standard:	**0.030 – 0.071 mm**
Service Limit:	**0.16 mm**



1. Plastigage Width



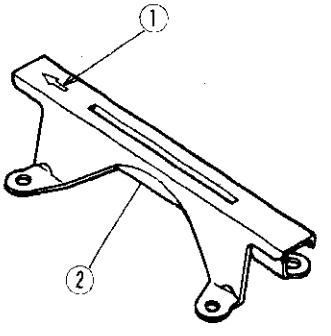
1. Camshaft Chain 2. Crankshaft

Top Chain Guide Removal

●Remove the cylinder head cover.
●Remove the bolts and take off the guide.

Top Chain Guide Installation

●The arrow on the guide must point toward the front.



1. Arrow 2. Top Chain Guide

Camshaft Chain and Guides

Camshaft Chain Removal

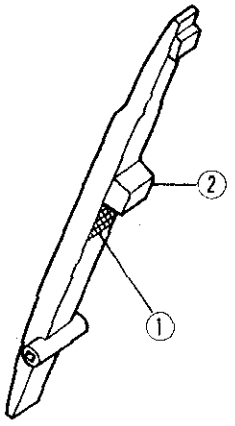
●Split the crankcase (see Engine Bottom End/Crankshaft chapter).
○Pull the crankshaft and take the chain out of the crankshaft.

Rear Chain Guide Removal

●Remove the cylinder head.
●Pull the guide off the cylinder.

Rear Chain Guide Installation

●Install the guide as shown.



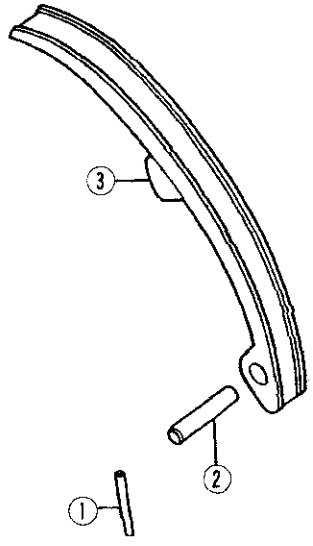
1. "199" Mark
2. Rear Chain Guide

Front Chain Guide Removal

●Split the crankcase.
●Pull the small and pivot pins out of the upper crankcase, and take off the guide.

Front Chain Guide Installation

●Install the guide and pins as shown.



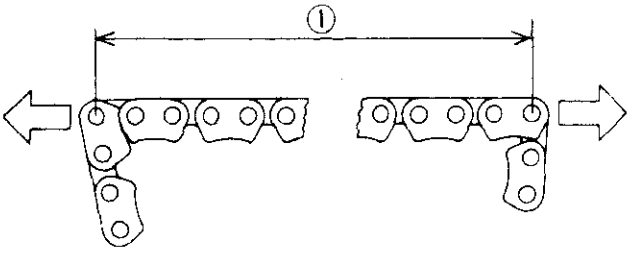
1. Small Pin
2. Pivot Pin
3. Front Chain Guide

Camshaft Chain Wear

●Measure the 20-link length.
Hold the chain taut with a force of about 5 kg.
★If the measurement exceeds the service limit, replace the chain.

Camshaft Chain 20-link Length

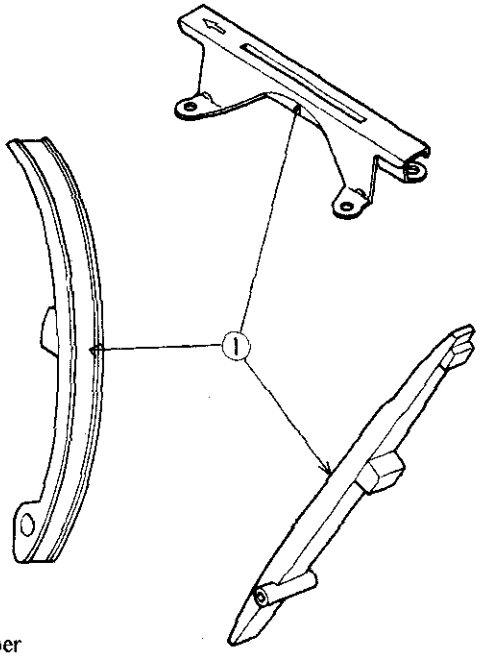
Standard:	**127.00 – 127.4 mm**
Service Limit:	**128.9 mm**



1. 20-link Length

Camshaft Chain Guides Wear

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

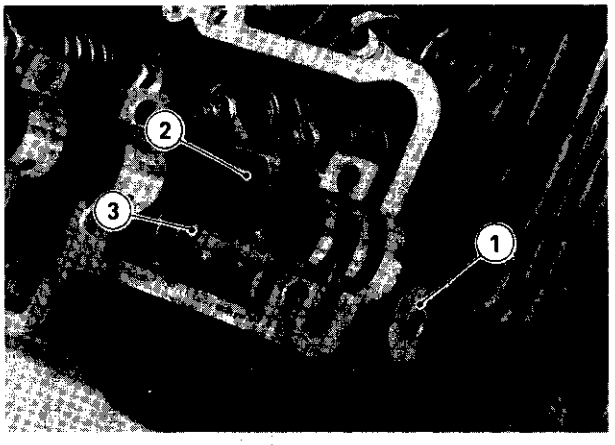


1. Rubber

Rocker Arms and Shafts

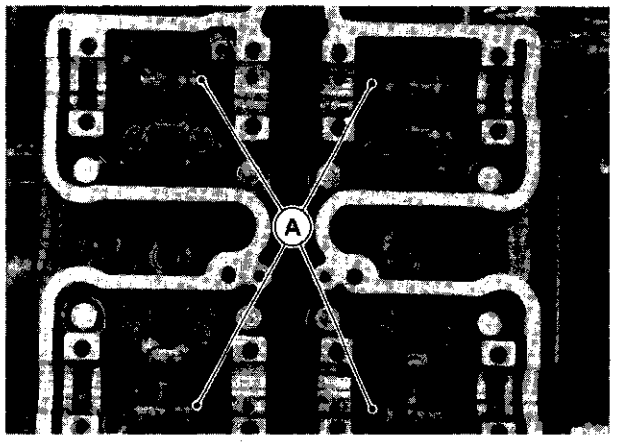
Removal

●Remove the camshafts.
●Remove the following.
1. Rocket Shafts
2. Rocker Arms
3. Springs



Installation

●Note the following.
○Install the retainer springs.



A. Springs

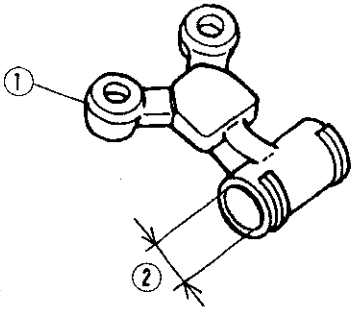
○Blow the rocker arm oil passage clean with compressed air.
○Check parts for wear or damage.
Rocker Shaft O-ring
○Torque the following.
Rocker Shaft

Rocker Arm Inside Diameter

★If the measurement exceeds the service limit, replace the rocker arm.

Rocker Arm Inside Diameter

Standard:	**12.500 – 12.518 mm**
Service Limit:	**12.55 mm**



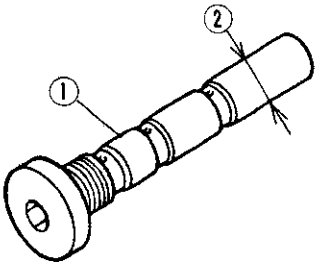
1. Rocker Arm
2. Inside Diameter

Rocker Shaft Diameter

★If the measurement exceeds the service limit, replace the rocker shaft.

Rocker Shaft Diameter

Standard:	**12.466 – 12.484 mm**
Service Limit:	**12.44 mm**

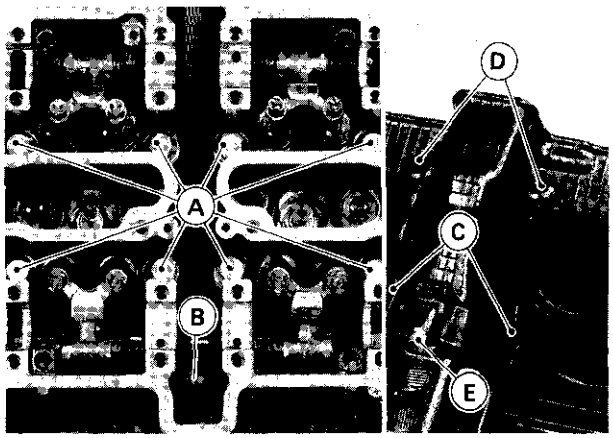


1. Rocket Shaft
2. Diameter

Cylinder Head

Removal

●Remove the following.
Cylinder Head Cover
Exhaust Pipe
Camshaft Chain Tensioner
Camshafts
Carburetors
●Unbolt the following.
Cylinder Head Bolts
Oil Pipe Banjo Bolts

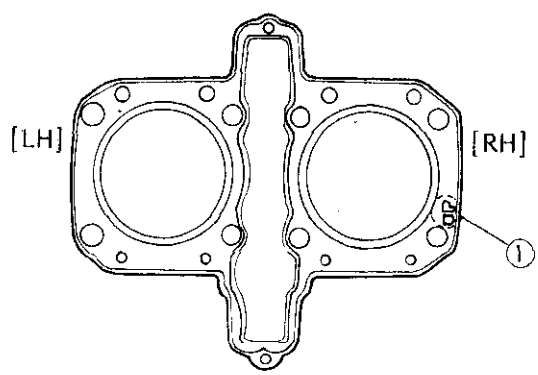


A. ϕ10 mm Bolts
B. ϕ6 mm Bolt (Do not forget)
C. Oil Pipes
D. Banjo Bolts
E. ϕ6 mm Bolt

○Remove the thermostat housing if necessary.

Installation

●Note the following.
○Install the cylinder head gasket.
Replace it with new one.
Mark UP facing up.

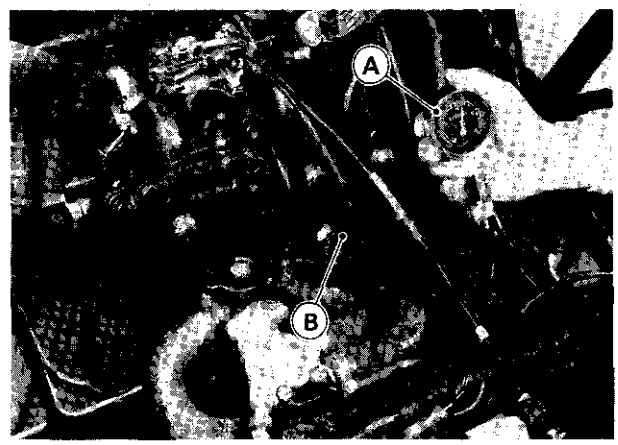


1. UP Mark

○Torque the following.
Cylinder Head Bolts
Oil Pipe Banjo Bolts

Cylinder Compression Measurement

●Parform the following.
○Warm up the engine.
○Remove the cargo bed.
○Remove the seat.
○Remove the spark plugs.
○Attach the compression gauge and adapter (special tools) firmly into the spark plug hole.



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

○Hold the throttle wide open and crank the engine with the starter.
○When the gauge stops rising, stop cranking and read the gauge.

Cylinder Compression

Usable Range: 890 – 1370 kPa @380 r/min (rpm); (9.1 – 14.0 kg/cm², 129 – 199 psi)

NOTE

○***Use the battery which is fully charged.***

★If cylinder compression is higher than the specified range, check the following.
○Carbon build-up on the cylinder head combustion chamber
○Carbon build-up on the piston head
★If cylinder compression is lower than the specified range, check the following.
○Valve not seating properly
○Piston/cylinder clearance excessive
○Gas leakage around the cylinder head gasket
○Valve clearance too small

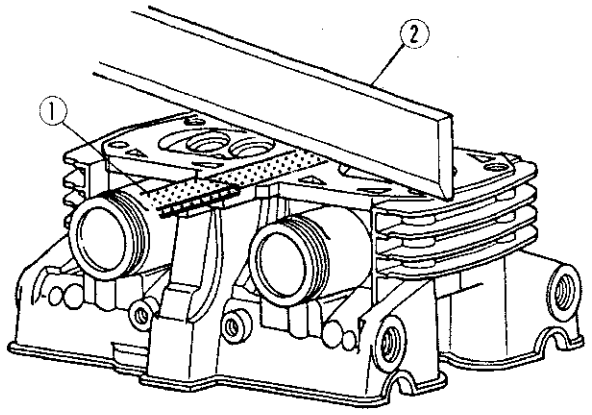
Cylinder Head Warp

★If warp exceeds the service limit, repair the mating surface.

★Replace the cylinder head if the mating surface is badly damage.

Cylinder Head Warp

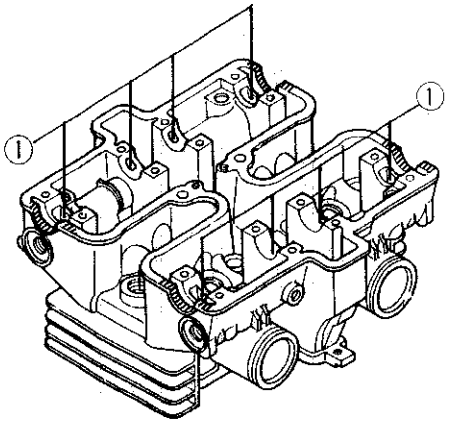
Service Limit: **0.05 mm**



1. Thickness Gauge
2. Straightedge

Cylinder Head Cleaning

●Blow the oil passages clean with compressed air.

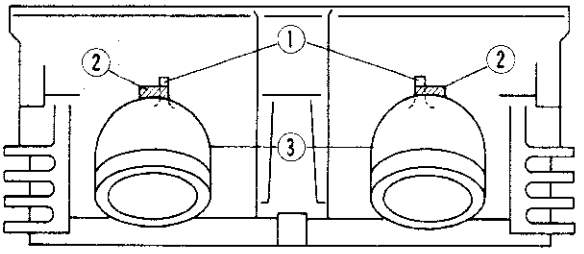


1. Oil Passage

Carburetor Holders

Installation

●Install the carburetor holders so that the projections are aligned with the cylinder head marks.



1. Marks
2. Projections
3. Carburetor Holders

Valves

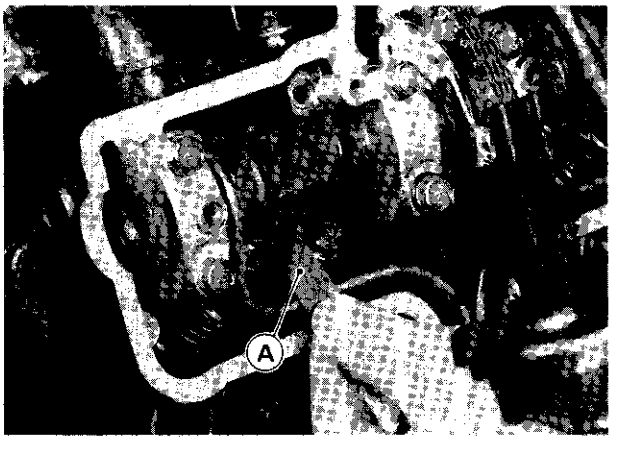
Valve Clearance Adjustment

NOTE

○*Valve clearance must be checked and adjusted when the engine is cold (at room temperature).*

●Remove the following.
Cargo Bed
Seat
Coolant
Thermostat with Bracket
Cylinder Head Oil Pipes
Cylinder Head Cover
Left Engine Cover Caps

●Using a thickness gauge, measure the valve clearance between the rocker arm and the cam.



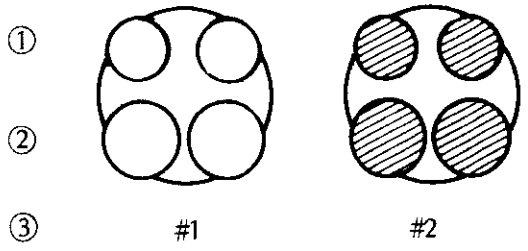
A. Thickness Gauge

Valve Clearance (between Cam and Rocker Arm)

Standard:	**Inlet:**	**0.08 – 0.13 mm**
	Exhaust:	**0.12 – 0.17 mm**

○**When positioning #2 piston TDC at the end of the compression stroke:**
inlet and exhaust valve clearance of #2 cylinder

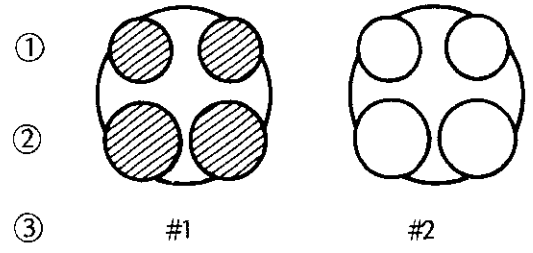
Measuring Valves



1. Exhaust Valves
2. Inlet Valves
3. Cylinder Numbers

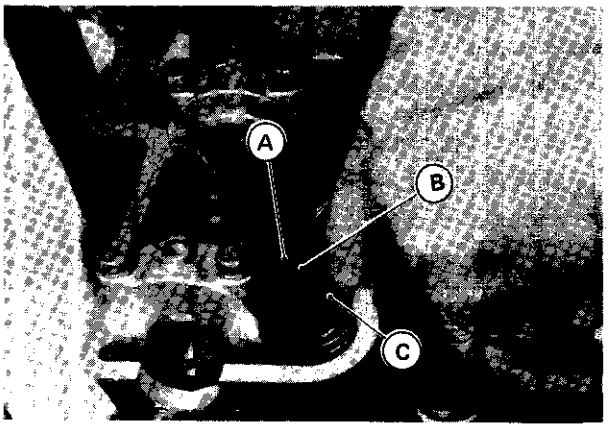
○**When positioning #1 piston TDC at the end of the compression stroke:**
inlet and exhaust valve clearance of #1 cylinder

Measuring Valves



1. Exhaust Valves
2. Inlet Valves
3. Cylinder Numbers

●Valve clearance can be measured between the valve stem and the adjusting screw. In this case, the valve clearance specification is the following.



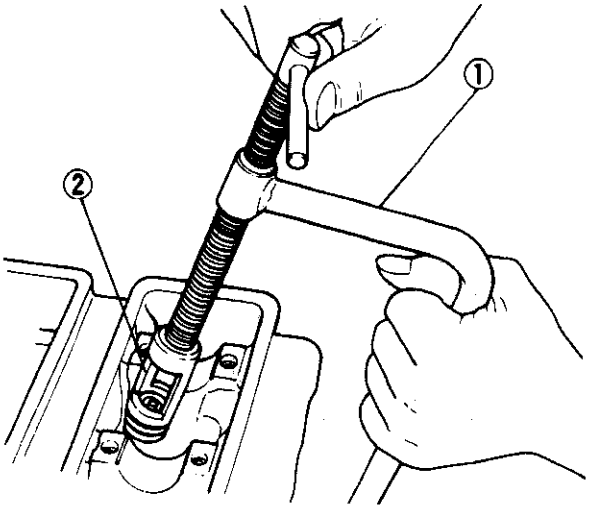
A. Adjusting Screw
B. Locknut
C. Thickness Gauge

Valve Clearance (between Valve Stem and Adjusting Screw)

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

★If the valve clearance is not within the specified range, adjust the valve clearance.
●Perform the following to adjust the valve clearance.
○Loosen the valve adjusting screw locknut.
○Turn the valve adjusting screw until the correct clearance is obtained.
○Holding the valve adjusting screw with the valve adjuster (special tool).
○Install the removed parts.
●Note the following.
○Torque the following.
Adjusting Screw Locknut

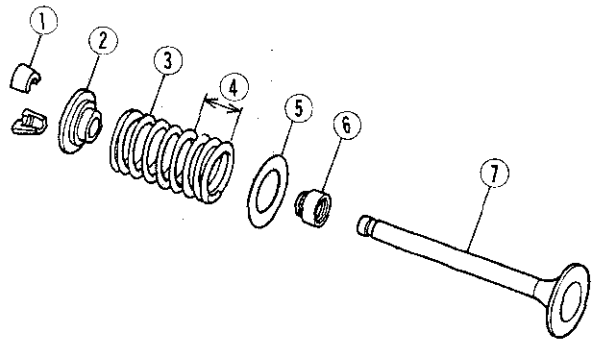
Valve Removal
●Perform the following.
Using the valve spring compressor assembly and adapter (special tools).



1. Valve Spring Compressor Assembly: 57001-241
2. Adapter: 57001-1019

Valve Installation

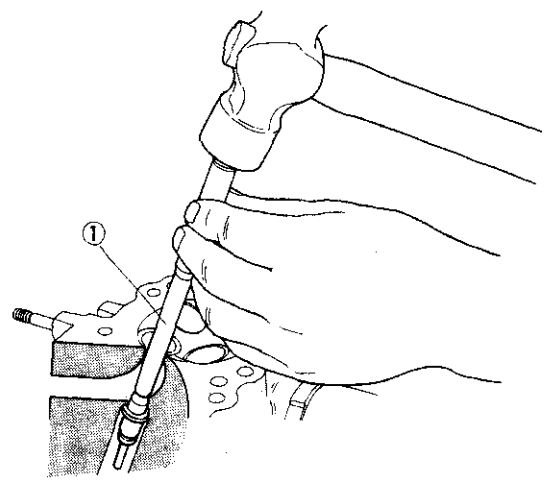
●Note the following.
○Apply molybdenum disulfide grease.
Valve Stem
○Install the spring.
Closed coil end faces downwards.



1. Split Keepers
2. Retainer
3. Spring
4. Closed Coil End
5. Spring Seat
6. Oil Seal
7. Valve Stem

Valve Guide Removal

●Note the following.
○Using the vlave guide arbor (special tool).



1. Valve Guide Arbor: 57001-1021

NOTE

○*Heat the area around the valve guide to 120 – 150°C (248 – 302°F).*

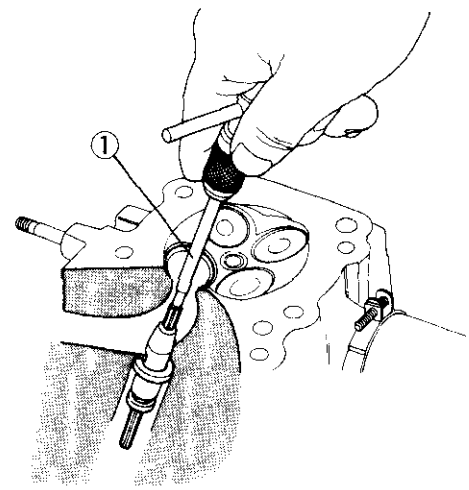
Valve Guide Installation

●Note the following.
○Using the valve guide arbor (special tool).
Drive the valve guide.
○Apply engine oil.
Valve guide outer surface

NOTE

○*Heat the area around the valve guide hole to 120 – 150°C (248 – 302°F).*

○Using the valve guide reamer (special tool).
Ream the valve guide.



1. Valve Guide Reamer: 57001-1079

Valve Face Contact Inspection

●Check the valve face seating surface width.
○Measure the seat width.
No build-up carbon (white portion) of the valve face.
★If the valve face seating surface width is not within the specified range, replace the valve with a new one.

Valve Seat Outside Diameter

★If the outside diameter of the seating pattern on the valve seat is too large or too small, repair the valve seat.

Valve Seating Surface Outside Diameter

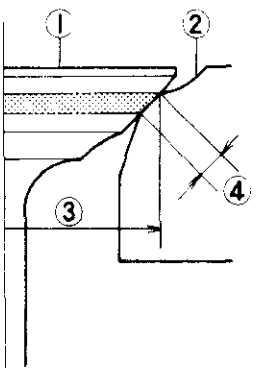
Standard:	**Inlet:**	**28.3 – 28.5 mm**
	Exhaust:	**24.0 – 24.2 mm**

Valve Seat Width Inspection

●Check the valve seating surface width.

○Measure the seat width.

No build-up carbon (white portion) of the valve seat.

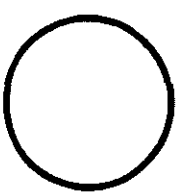


1. Valve
2. Valve Seat
3. Seating Surface Outside Diameter
4. Seating Surface Width

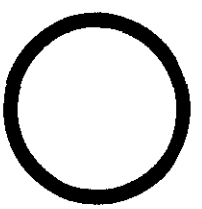
Valve Seating Surface Width (IN and EX)

Standard: 0.5 – 1.0 mm

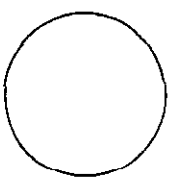
★If the valve seating surface width is not within the specified range, repair the valve seat.



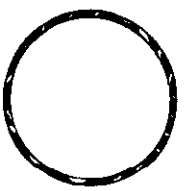
1. Good



2. Too wide



3. Too narrow



4. Uneven

Valve Seat Repair (Valve Lapping)

●Using the valve seat cutters (special tools).

Repair the valve seat.

Valve Seat Cutters

Inlet Valves:	**32° – φ30.0**	**57001-1120**
	45° – φ30.0	**57001-1187**
	60° – φ30.0	**57001-1123**
Exhaust Valves:	**32° – φ28.0**	**57001-1119**
	45° – φ24.5	**57001-1113**
	60° – φ30.0	**57001-1123**

Holder and Bar

Holder:	**57001-1125**
Bar:	**57001-1128**

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

Seat Cutter Operating Care:

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

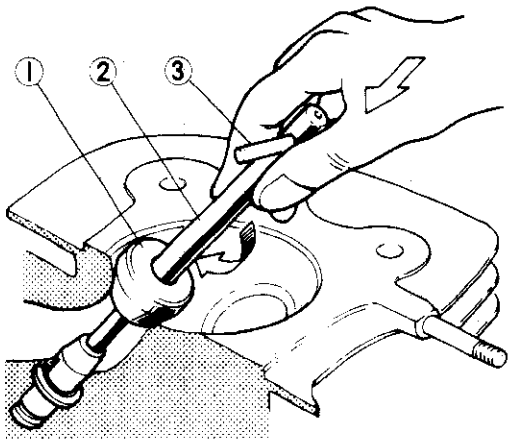
NOTE

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

5. Setting the valve seat cutter holder in position, operate the cutter in one hand in one direction. 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.*



1. Cutter
2. Cutter Holder
3. Bar

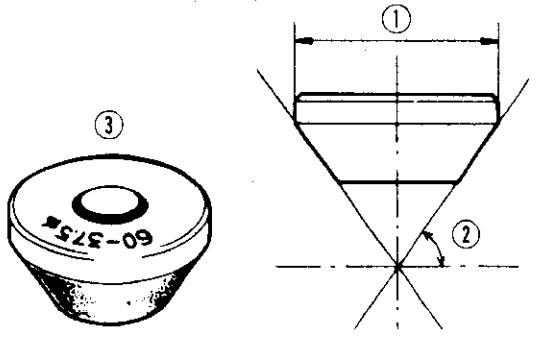
6. After use, wash it with washing oil and apply thin layer of engine oil before storing.

Marks Stamped on the Cutter:

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

60° . . . . . Cutter angle

37.5φ . . . . . Outer diameter of cutter



1. Outer Diameter of Cutter
2. Angle of Cutter
3. Cutter

Operating Procedures:

- Coat the seat with machinist's dye.
- Use a 45° cutter and grind the seating surface only until it is smooth.

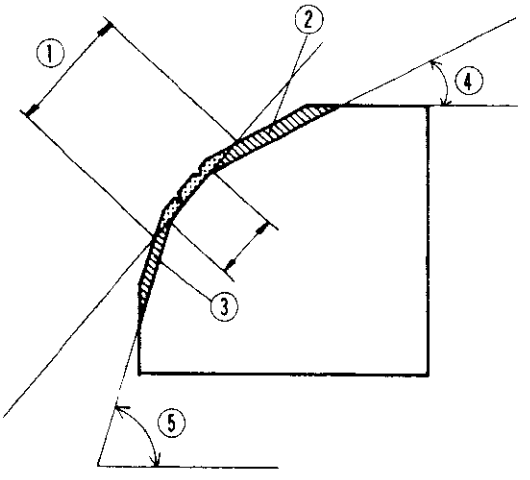
CAUTION

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

- Measure the outside diameter of the seating surface.
- ★If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.
- ★If the outside diameter of the seating surface is too large, make the 32° grind described below.
- ★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.
- Grind the seat at a 32° angle until the seat O.D. is within the specified range.
- ○To make the 32° grind, use a 32° cutter, and grind the seating surface.
- ○While pressing down very lightly. Check the seat after each turn.

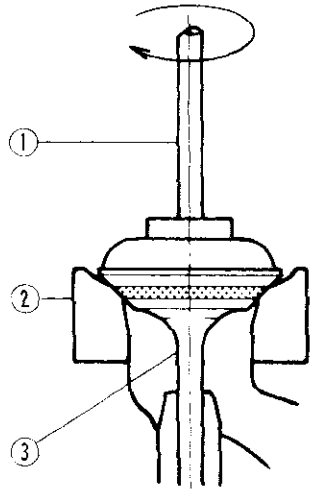
CAUTION

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



1. Widened width of engagement by machining with 45° cutter
2. Ground volume by 32° cutter
3. Ground volume by 60° cutter
4. 32°
5. 60°

○After making the 32° grind, return to the seat O.D. measurement step above.
●To measure the seat width, measure the width of the 45° angle portion of the seat at several places around the seat.
★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.
★If the seat width is too wide, make the 60° grind described below.
●Grind the seat at a 60° angle until the seat width is within the specified range.
○To make the 60° grind, use a 60° cutter, and grind the seat surface while pressing down lightly.
○After making the 60° grind, return to the seat width measurement step above.
●Lap the valve to the seat, once the seat width and O.D. are within the ranges specified above.
○Put a little coarse grinding compund on the face of the valve in a number of places around the valve head.
○Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
○Repeat the process with a fine grinding compound.
●The seating area should be marked about in the middle of the valve face.
★If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
●Be sure to remove all grinding compound before assembly.
●When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Adjustment).



1. Lapper
2. Valve Seat
3. Valve

Measuring Valve-to-Guide Clearance (Wobble Method)

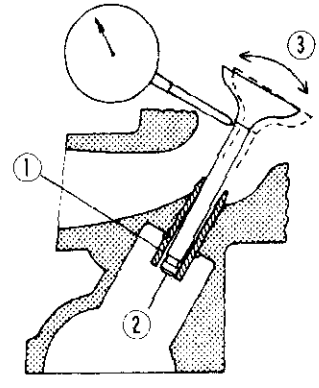
If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method, as indicated below.
●Insert a new valve into the guide against the stem perpendicular to it as close as possible to the cylinder head mating surface.
●Move the stem back and forth to measure valve/valve guide clearance.
●Repeat the measurement in a direction at a right angle to the first.
★If the reading exceeds the service limit, replace the guide.

NOTE

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

Valve/Valve Guide Clearance (Wobble Method)

	Standard	Service Limit
Inlet	0.03 – 0.09 mm	0.23 mm
Exhaust	0.08 – 0.14 mm	0.27 mm

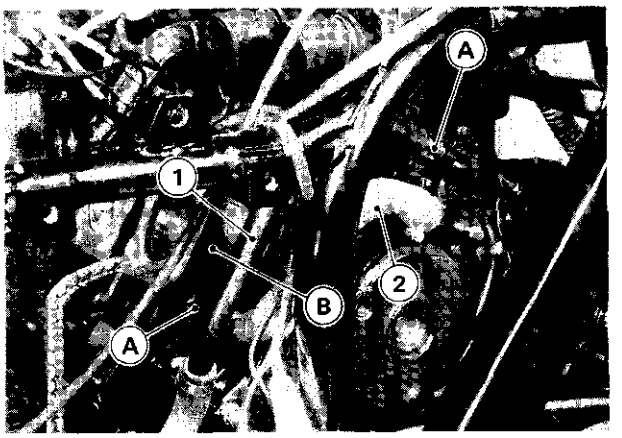


1. Valve Guide
2. New Valve
3. Move the Valve.

Cylinder and Pistons

Cylinder Removal

●Remove the following.
Cylinder Head
1. Cooling Pipe
2. Cooling Hose

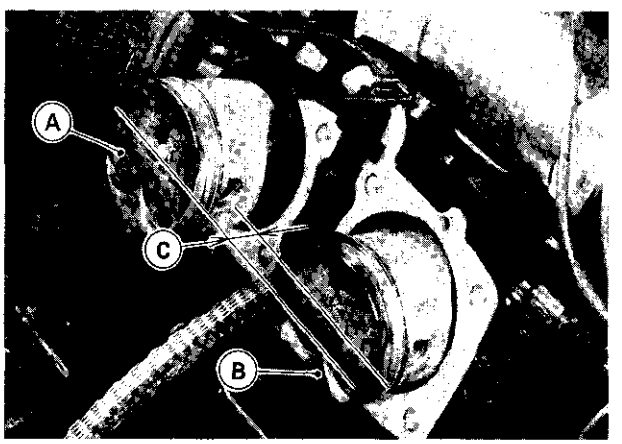


A. Bolts B. Cylinder

●Take the cylinder out of the crankcase.

Cylinder Installation

●Note the following.
○Set the piston position as shown.

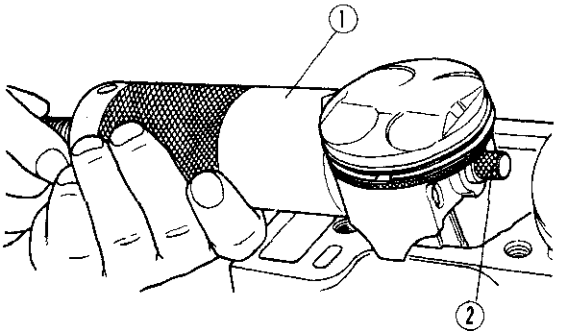


A. Right Hand Piston
B. Left Hand Piston
C. Difference

○Replace the cylinder base gasket.
○Install the cylinder block.
Insert Right to Left
○Check the parts.
Cylinder Base Knock Pins

Piston Removal

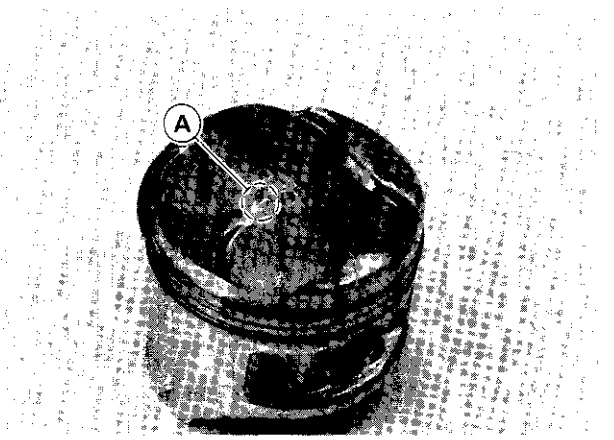
●Note the following.
○Place a cloth under the pistons.
○Use the special tool.



1. Piston Pin Puller Assembly: 57001-910
2. Adapter

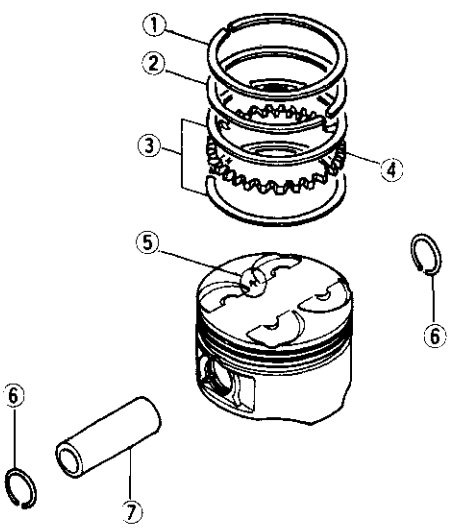
Piston Installation

●Note the following.
○Arrow must point toward the front (Exhaust Side).



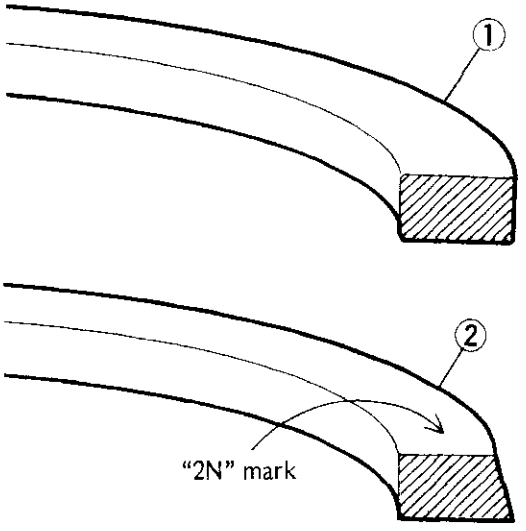
A. Arrow

○Set the piston ring openings as shown.



1. Top Ring
2. Second Ring
3. Oil Ring Steel Rails
4. Oil Ring Expander
5. Arrow
6. Snap Ring
7. Piston Pin

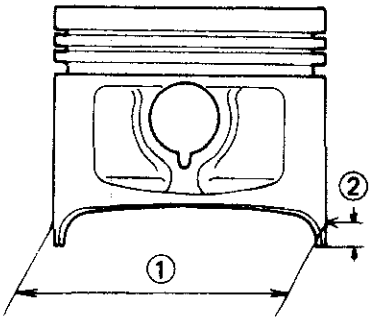
○Piston Rings are identical.



1. Top Ring
2. 2nd Ring

Piston Outside Diameter

Standard:	**72.435 – 72.450 mm**
Service Limit:	**72.29 mm**



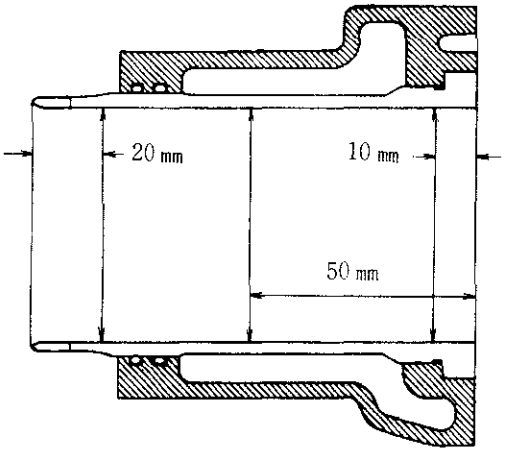
1. Piston Outside Diameter
2. 5 mm up from bottom

Cylinder Inside Diameter

●Measure the cylinder inside diameter.
Side-to-Side and front-to-back
each of the 3 positions (total of 6 measurements)

Cylinder Inside Diameter

Standard:	**72.494 – 72.506 mm**
Service Limit:	**72.6 mm**



Piston Diameter

●Measure the piston outside diameter.
5 mm up from the bottom of the piston.

Piston/Cylinder Clearance

●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.

★If the piston/cylinder clearance is greater than the specified range, use a large piston or bore to the next larger oversize.

Piston/Cylinder Clearance

Standard:	**0.044 – 0.071 mm**

Piston Ring and Ring Groove Wear

●Check for uneven ring groove wear.

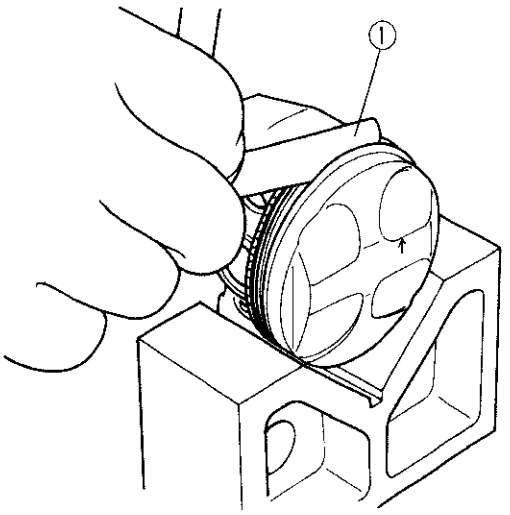
○The rings should fit perfectly parallel to the groove surfaces.

★If not, the piston must be replaced.

●With the piston rings in their grooves, make several measurements with a thickness gauge to determine piston ring/groove clearance.

Piston Ring/Groove Clearance

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



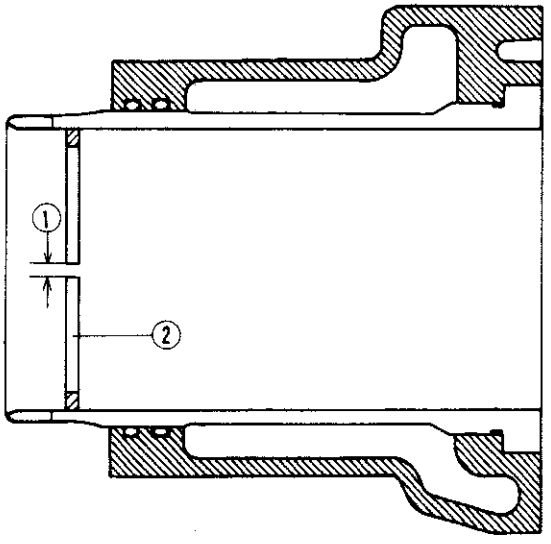
1. Thickness Gauge

Piston Ring End Gap

●Measure the ring end gap.
Set the ring close to the bottom of the cylinder.
Use the thickness gauge.

Piston Ring End Gap (Top & Second)

Standard:	**0.2 – 0.35 mm**
Service Limit:	**0.7 mm**

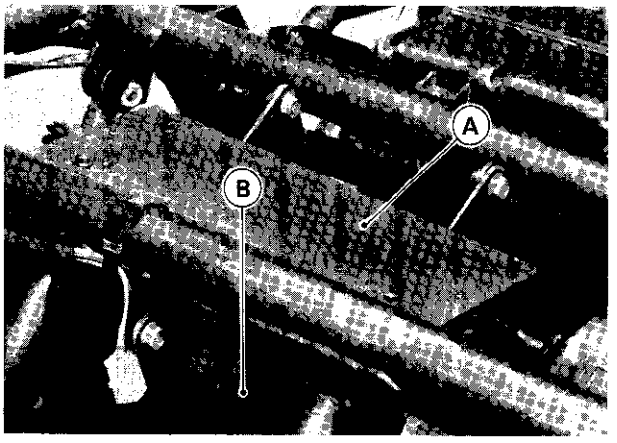


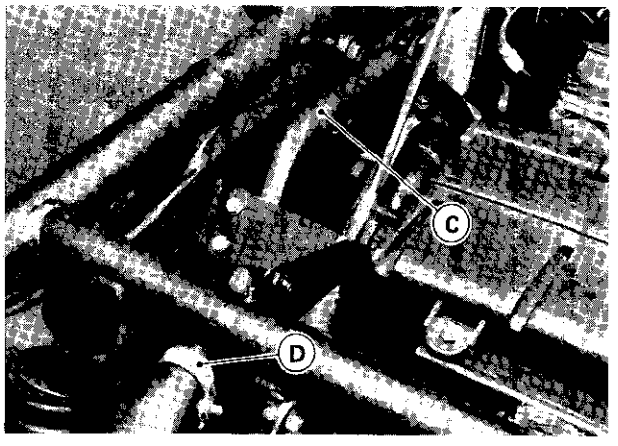
1. Gap
2. Piston Ring

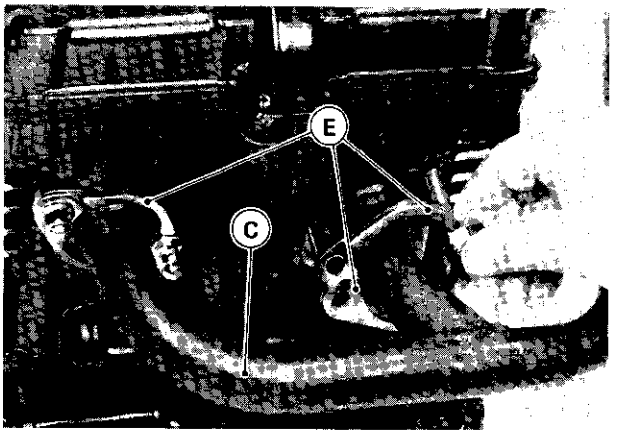
Exhaust Pipe and Muffler (Including Spark Arrester)

Removal

●Remove the following.
Cargo Bed
Seat
Battery and Case
Exhaust Pipe Clamp
Muffler Cover
Muffler
Exhaust Pipe Holder
Exhaust Pipe







A. Muffler Cover
B. Muffler
C. Exhaust Pipe
D. Exhaust Pipe Clamp
E. Exhaust Pipe Holder

Installation

●Note the following.

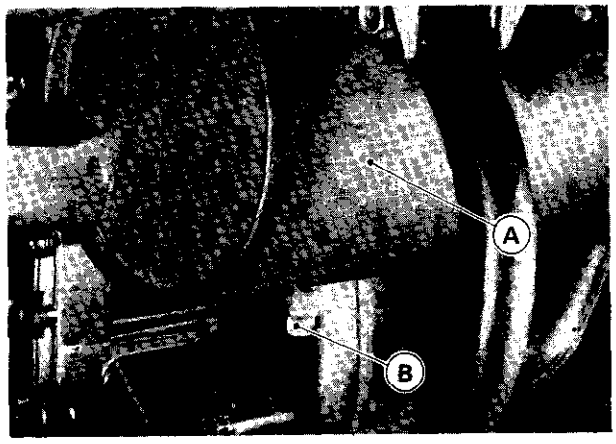
○Replace the exhaust gasket with new ones.

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 from the muffler.



A. Muffler B. Drain Plug

●Apply the parking brake.

●In an open area away from combustible materials, start the engine with the gear shift lever in the N(neutral) position.

●Raise and lower engine speed while tapping on the muffler with a rubber mallet until carbon particles are purged from the muffler.

WARNING

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

●Stop the engine.

●Install the drain plug.

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.

Belt Drive Torque Converter

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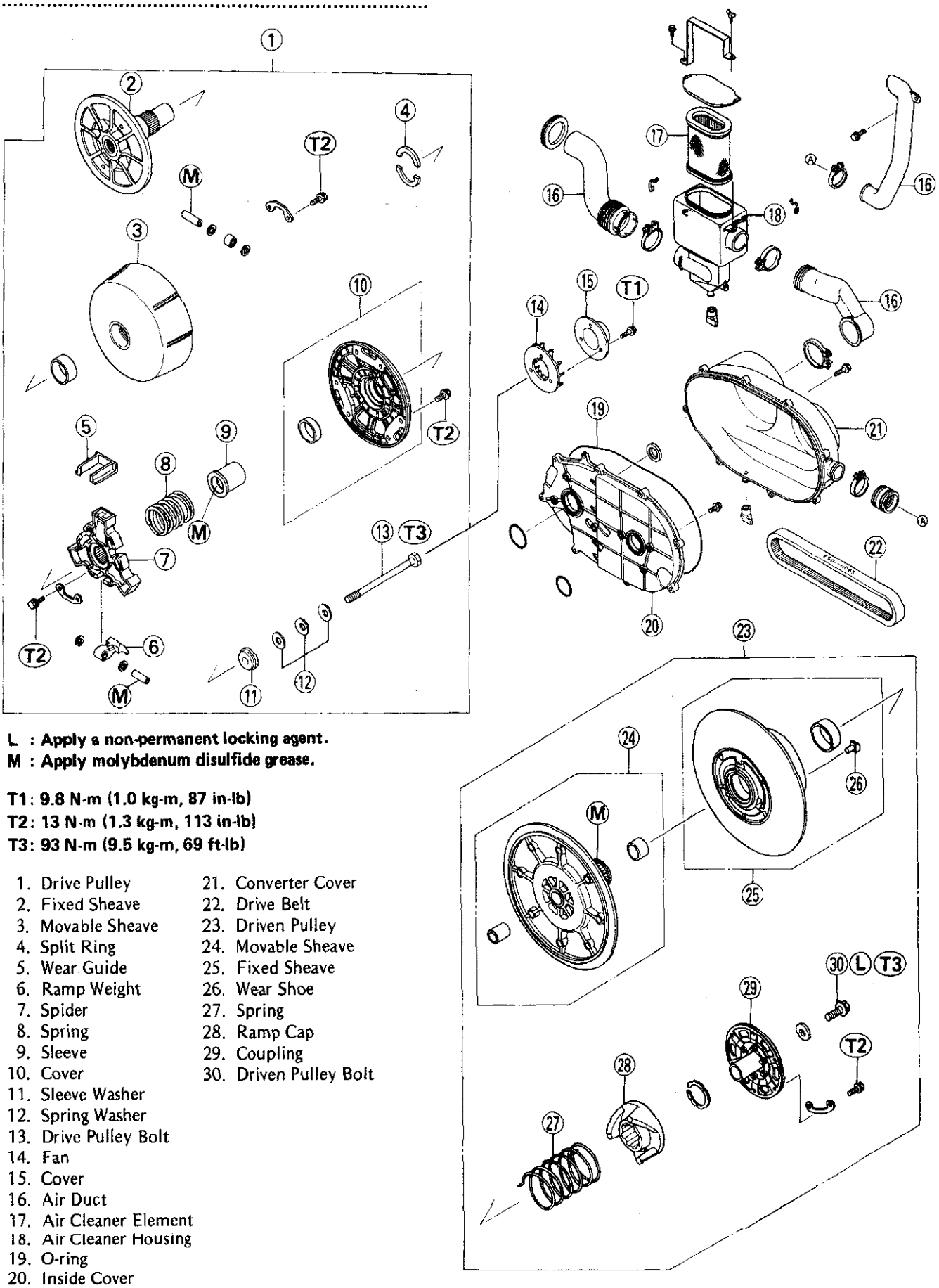
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Exploded View



L : Apply a non-permanent locking agent.
M : Apply molybdenum disulfide grease.

T1: 9.8 N-m (1.0 kg-m, 87 in-lb)
T2: 13 N-m (1.3 kg-m, 113 in-lb)
T3: 93 N-m (9.5 kg-m, 69 ft-lb)

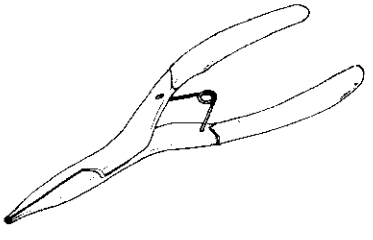
1. Drive Pulley
2. Fixed Sheave
3. Movable Sheave
4. Split Ring
5. Wear Guide
6. Ramp Weight
7. Spider
8. Spring
9. Sleeve
10. Cover
11. Sleeve Washer
12. Spring Washer
13. Drive Pulley Bolt
14. Fan
15. Cover
16. Air Duct
17. Air Cleaner Element
18. Air Cleaner Housing
19. O-ring
20. Inside Cover
21. Converter Cover
22. Drive Belt
23. Driven Pulley
24. Movable Sheave
25. Fixed Sheave
26. Wear Shoe
27. Spring
28. Ramp Cap
29. Coupling
30. Driven Pulley Bolt

Specifications

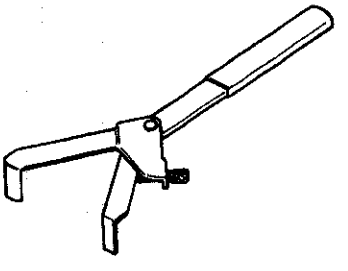
Item	Standard	Service Limit
Drive Belt:		
Belt width	30.6 – 31.8 mm	29 mm
Drive Pulley:		
Spring free length	69.5 mm	66 mm
Driven Pulley:		
Spring free length	140 mm	133 mm
Wear shoe width	— — —	11 mm

Special Tools

Circlip Pliers: 57001-144



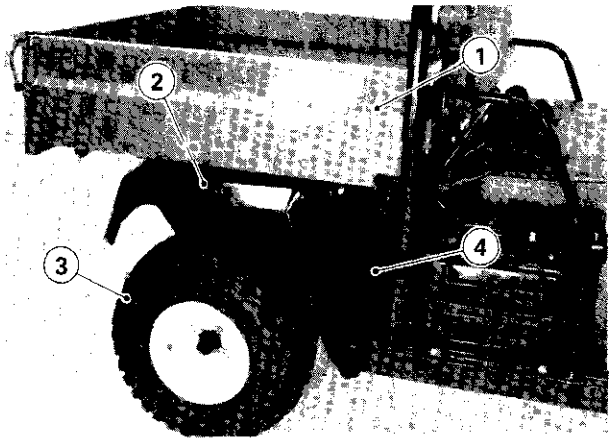
Clutch Holder: 57001-1243



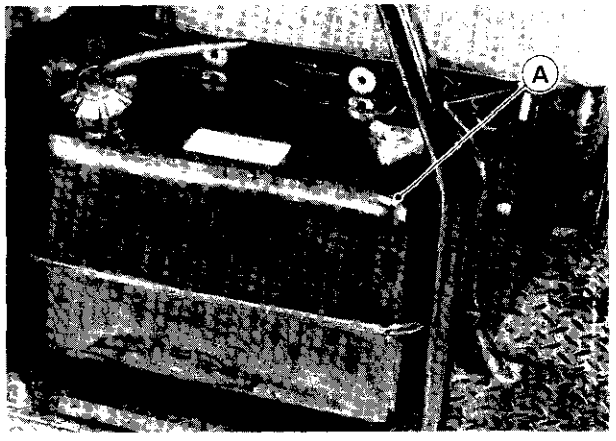
Converter Cover

Removal

●Remove the following.
1. Cargo Bed
2. RH Rear Fender
3. RH Rear Wheel
4. Rear Right Side Sub Frame



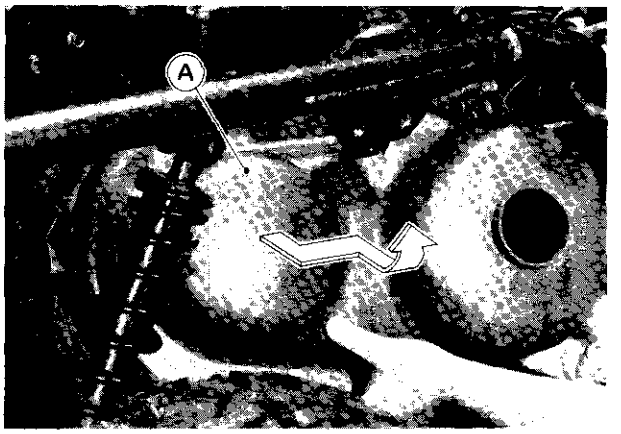
Fuel Pump & Filter with Bracket
Air Ducts (2)
Fuel Tank (Move it forward)



A. Fuel Tank

Belt Converter Cover Bolts (8)

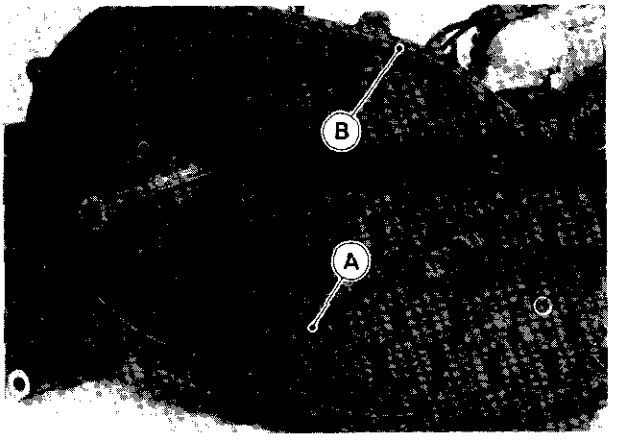
●Pull the cover out of the engine.
Push the cover forward.
Pull the front of the cover out first.



A. Cover

Installation

●Note the following.
○Check parts for damage.
O-ring (Install it onto the inside cover)



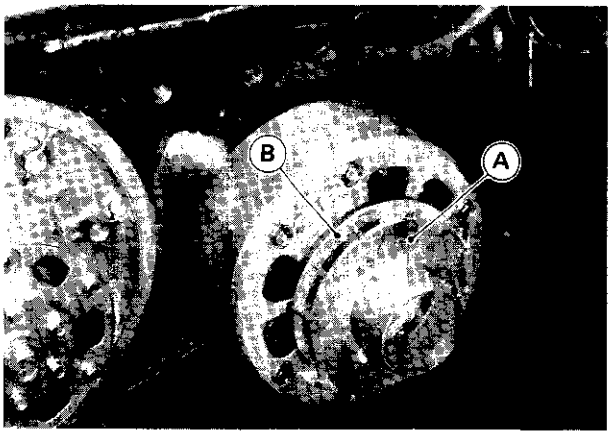
A. Inside Cover B. O-ring

○Torque the following.
Sub Frame Bolts

Belt

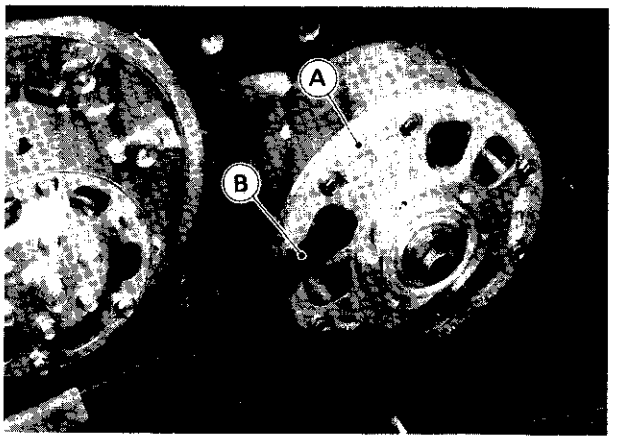
Removal

●Remove the converter cover.
●Remove the drive pulley bolt.
Cooling fan and cover



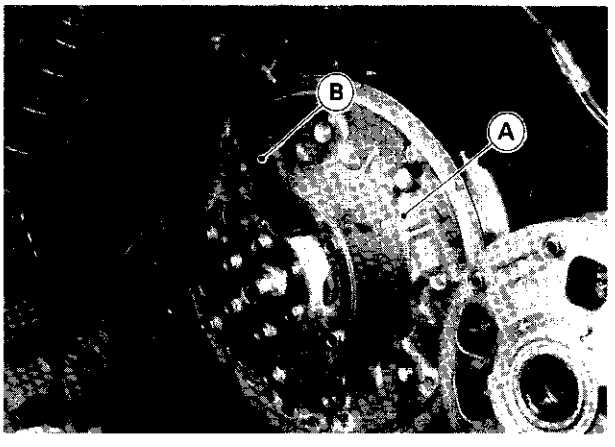
A. Cover B. Fan

Use the special tool.



A. Drive Pulley
B. Clutch Holder: 57001-1243

●Remove the driven pulley bolt.
Use the special tool.



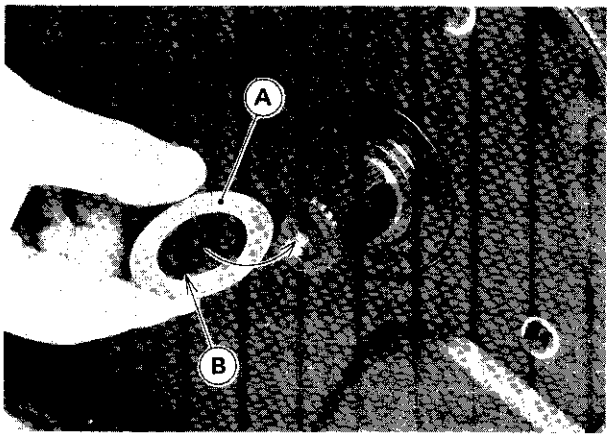
A. Driven Pulley
B. Clutch Holder: 57001-1243

○Remove the belt together with the drive and driven pulley.

Installation

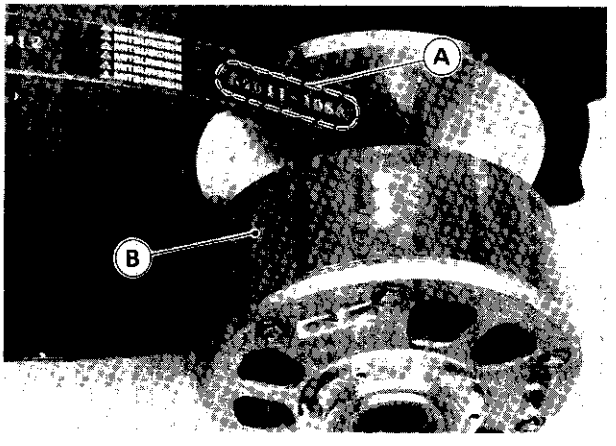
●Note the following.

1. Drive Pulley Spacer
Chamfer side facing inwards.



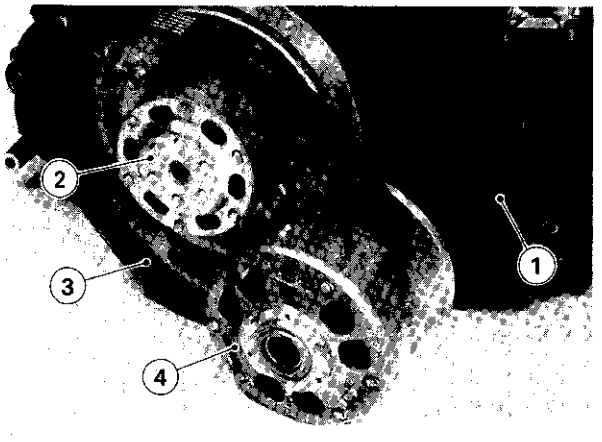
A. Spacer B. Chamfer Side

2. Driven Pulley
Fit the driven shaft.
3. Belt
The direction of the belt rotation as shown.

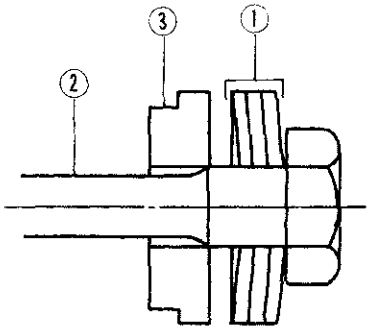


A. Parts Number B. Drive Pulley

4. Drive Pulley
Fit the crankshaft.



○Drive Pulley Bolt with Spring Washers
Install the spring washers (3) as shown.

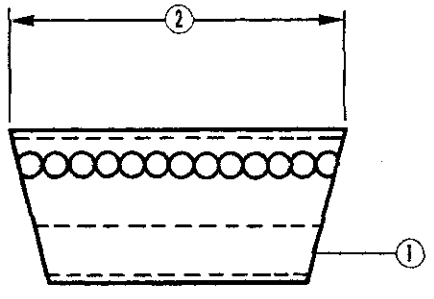


1. Spring Washers
2. Drive Pulley Bolt
3. Sleeve Washer

○Check parts for wear or damage.
Belt
Pulley's Sheaves Surface
Spring Washer
○Apply a non-permanent locking agent.
Driven Pulley Bolt
○Torque the following.
Driven Pulley Bolt
Drive Pulley Bolt
Cooling Fan Bolts

Inspection

●Remove the belt.
●Measure the width of the belt.

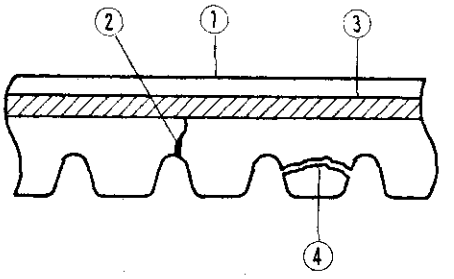


1. Belt
2. Width

Belt Width

Standard:	**30.6 – 31.8 mm**
Service Limit:	**29 mm**

●Check for wear, cracks, or breaks.

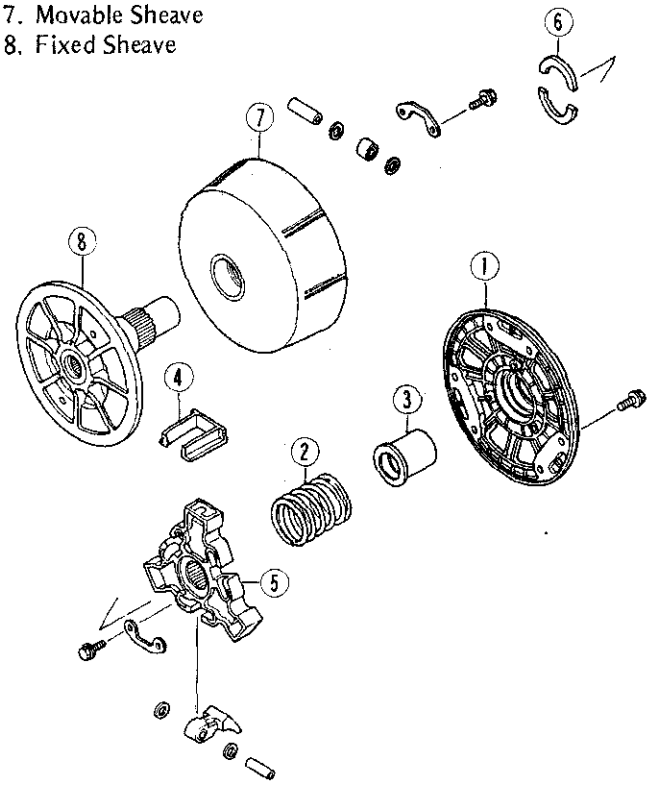


1. Belt
2. Crack
3. Kevlar Cord
4. Broken

Drive Pulley

Disassembly

●Remove the following.
1. Cover
2. Spring
3. Sleeve
4. Wear Guide
5. Spider Assembly (Push in if necessary)
6. Split Ring
7. Movable Sheave
8. Fixed Sheave

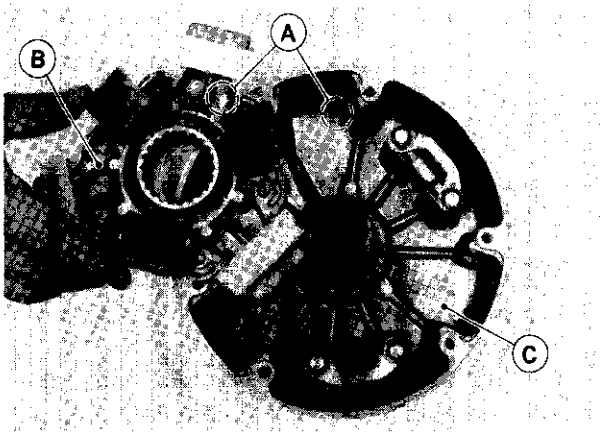


Assembly

●Note the following.

○Spider Assembly

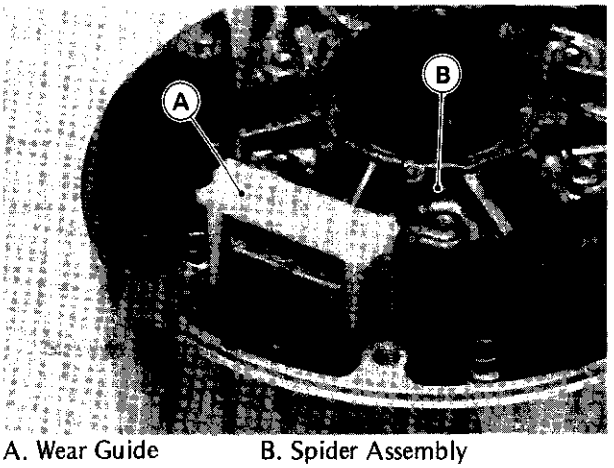
Align the arrows (movable sheave and the spider assembly).



A. Arrow
B. Spider Assembly
C. Movable Sheave

○Wear Guide

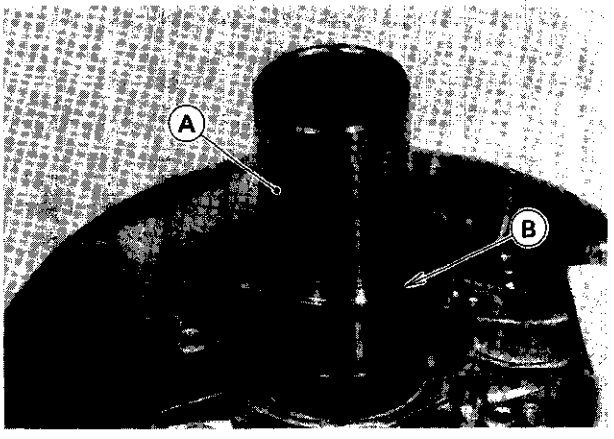
Fit into the correct position.



A. Wear Guide
B. Spider Assembly

○Sleeve

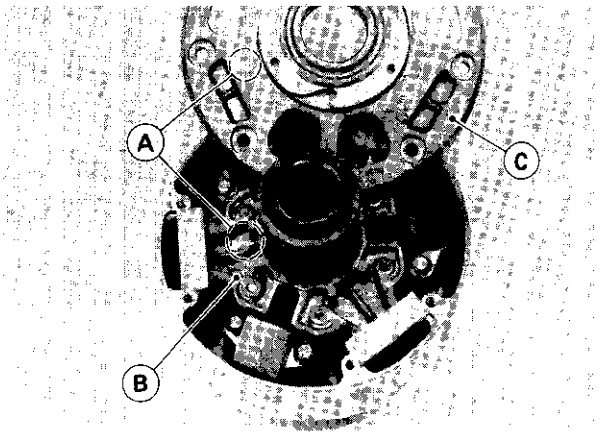
Put the sleeve on the shaft as shown.



A. Sleeve
B. Flange Side down.

○Pulley Cover

Align the arrows (spider assembly and cover).

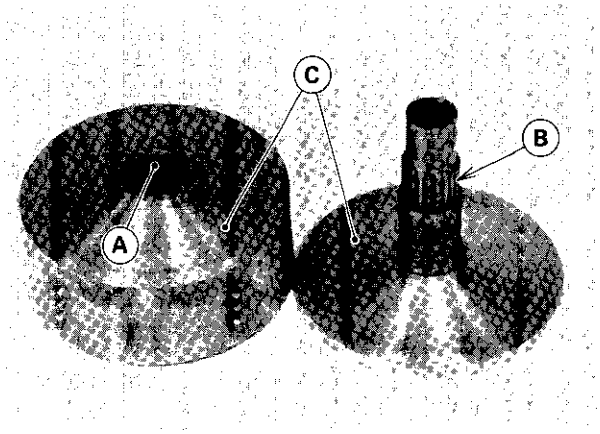


A. Arrows
B. Spider
C. Cover

Bushing and Splined Portion Inspection

★Replace the guide bushing if it is damaged or worn.

★If spline is badly worn, replace the fixed sheave.



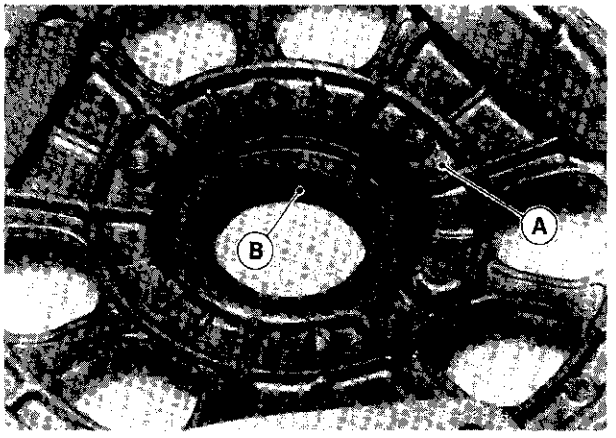
A. Bushing
B. Splined Portion
C. Sheave Surface

Sheaves Surface Inspection

★Replace the sheave if it appears damage.

Pulley Cover Bushing Inspection

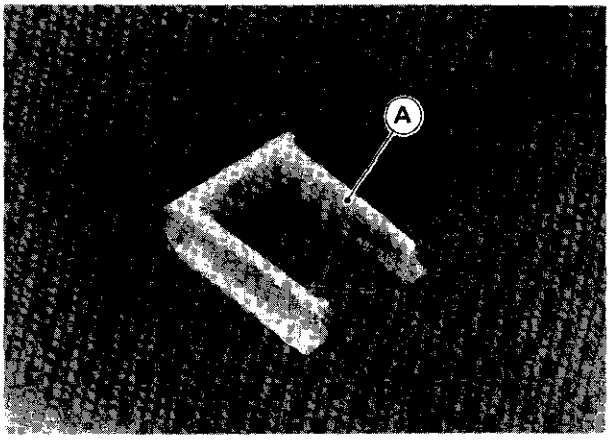
★Replace the guide bushing if it is damaged or worn.



A. Pulley Cover B. Bushing

Wear Guide Inspection

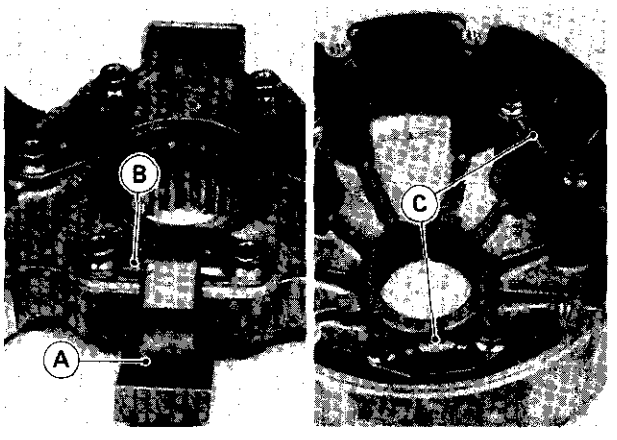
★Replace the wear guide if it is damaged or worn.



A. Wear Guide

Ramp Weight Inspection

★If weight bushing is badly worn, replace the weight.
★Replace the pin if it is damaged or worn.



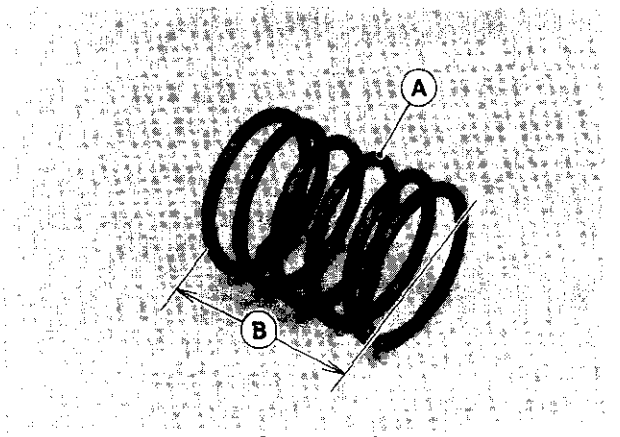
A. Ramp Weight C. Roller
B. Pin

Roller Inspection

★If roller bushing is badly worn, replace the roller.
★Replace the pin if it is damaged or worn.

Spring Free Length Inspection

★If spring is shorter than the service limit, it must be replaced.



A. Spring B. Free Length

Spring Free Length

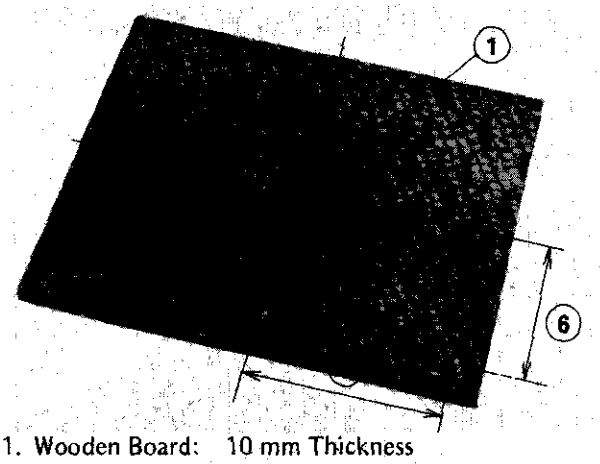
Standard:	**69.5 mm**
Service Limit:	**66 mm**

Driven Pulley

Disassembly

NOTE

○***Make the Driven Pulley Holder (disassembly tool) as shown if necessary.***

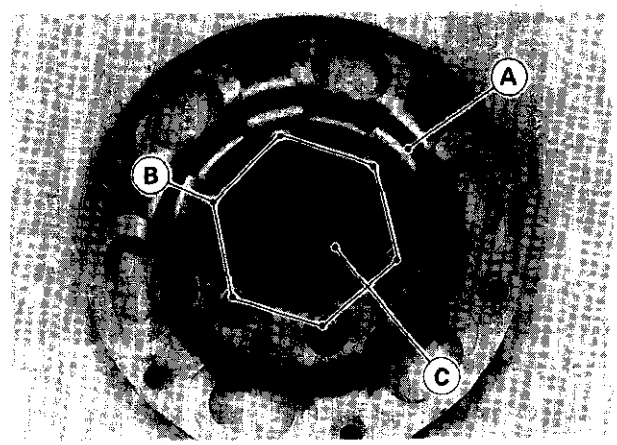


1. Wooden Board: 10 mm Thickness
   500 mm x 500 mm
2. Radius: 80 mm
3. Bolt: φ6 mm ℓ30 mm
4. Stopper Pin: φ8 mm ℓ25 mm
5. Wire: ℓ140 mm
6. 130 mm
7. 150 mm

●Remove the coupling.

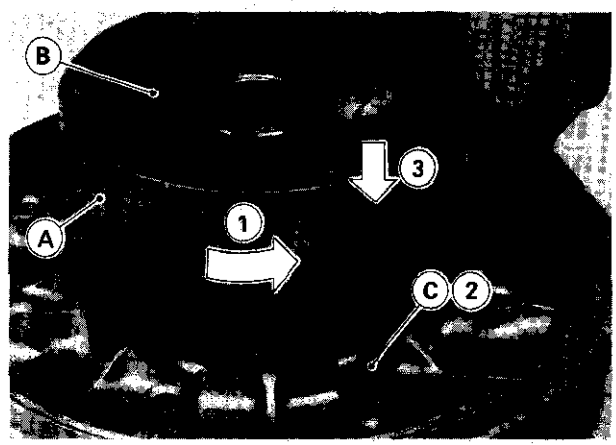
NOTE

○*Do not loosen the coupling inside bolts. The shaft hub and the coupler plate are balanced at the factory.*



A. Coupler Plate
B. Inside Bolts
C. Shaft Hub

●Remove the following.
○Set the pulley on the driven pulley holder.
1. Turn the fixed sheave counterclockwise about 45°.
2. Hold the fixed sheave with stopper.
3. Press the ramp cap.



A. Fixed Sheave
B. Ramp Cap
C. Stopper

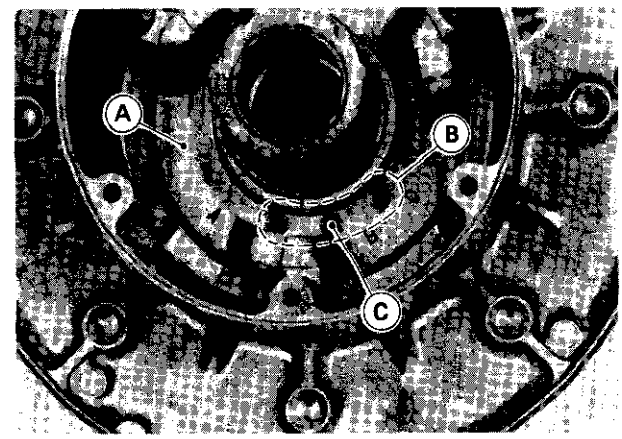
4. Take off the retainer.
5. Release the fixed sheave slowly.
6. Take off the ramp cap and spring.

NOTE

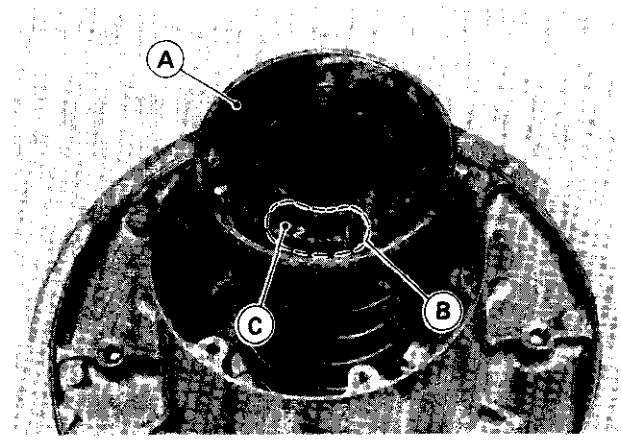
○*Make and record the locations of the spring end fitting holes.*

Assembly

●Perform the following.
○Install the spring and the ramp cap.

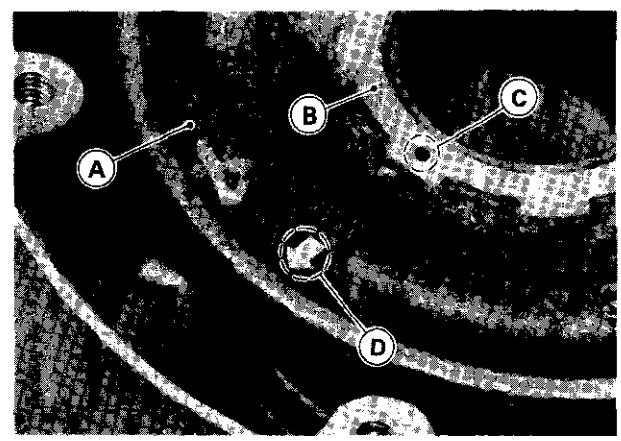


A. Fixed Sheave
B. Holes in Fixed Sheave
C. Use "B" hole.



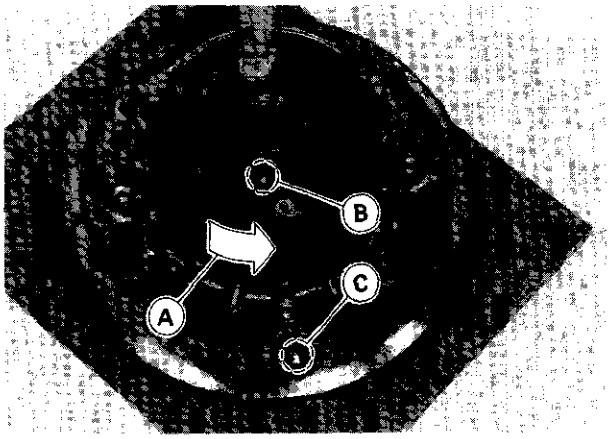
A. Ramp Cap
B. Holes in Ramp Cap
C. Use "2" hole.

Put the ramp cap on the spring.
Align the marks and press the ramp cap onto the movable sheave shaft.



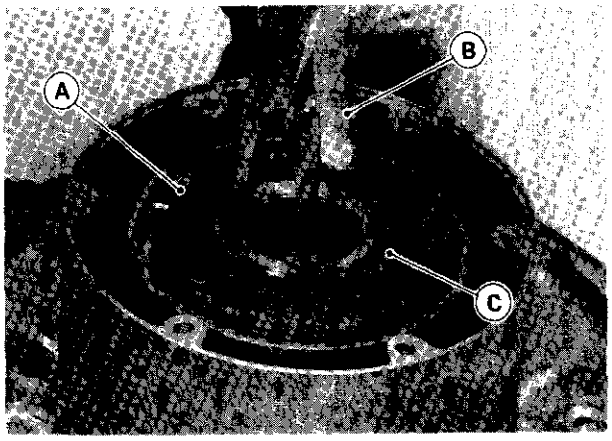
A. Ramp Cap
B. Movable Sheave Shaft
C. Punch Mark
D. Arrow

Set the driven pulley onto the driven pulley holder.
Turn the fixed sheave counterclockwise.
(Pass the fixed sheave arrow to the ramp cap arrow)



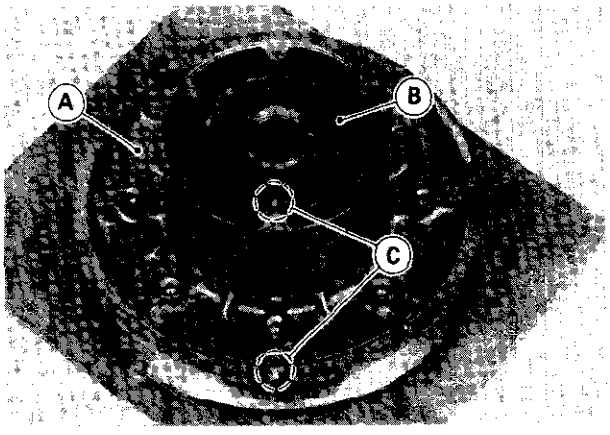
A. Turn fixed sheave.
B. Arrow (Ramp Cap)
C. Arrow (Fixed Sheave)

Hold the fixed sheave with the stopper.
Press the ramp cap to the bottom and install the retainer.



A. Ramp Cap
B. Press.
C. Retainer

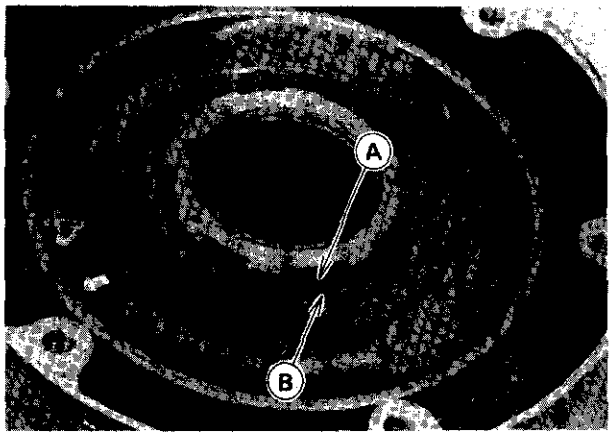
Check the arrows alignment.



A. Driven Pulley.
B. Ramp Cap
C. Align the arrows.

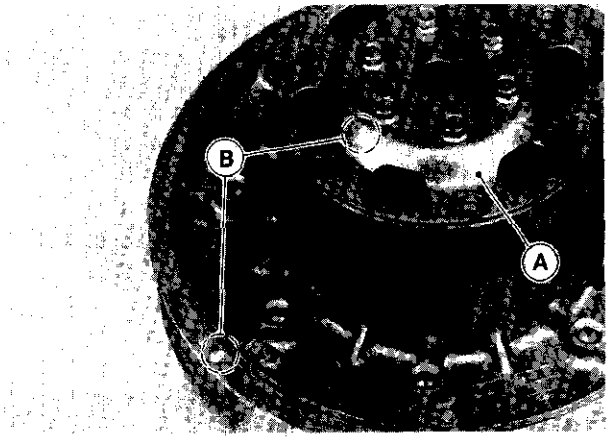
NOTE

○*Install the circlip so that the opening is aligned with a spline groove.*



A. Spline Groove
B. Opening

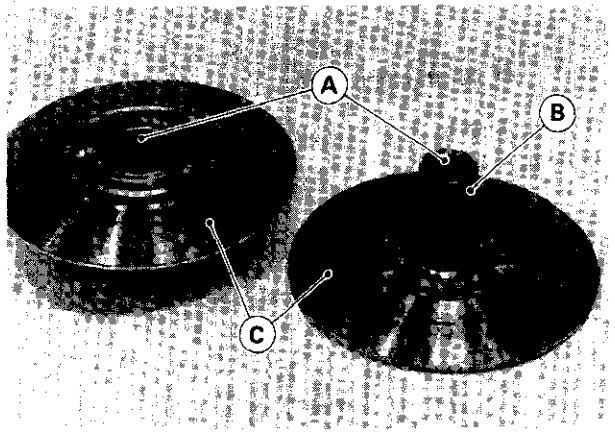
Align the coupling and fixed sheave arrows.



A. Coupling
B. Arrows

Bushing and Splined Portion Inspection

★Replace the guide bushing if it is damaged or worn.
★If spline is badly worn, replace the fixed sheave.



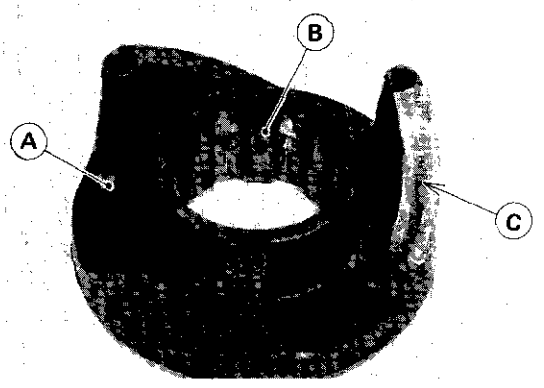
A. Bushings
B. Splined Portion
C. Sheaves Surface

Sheaves Surface Insepction

★Replace the sheave if it appears damage.

Ramp Cap Inspection

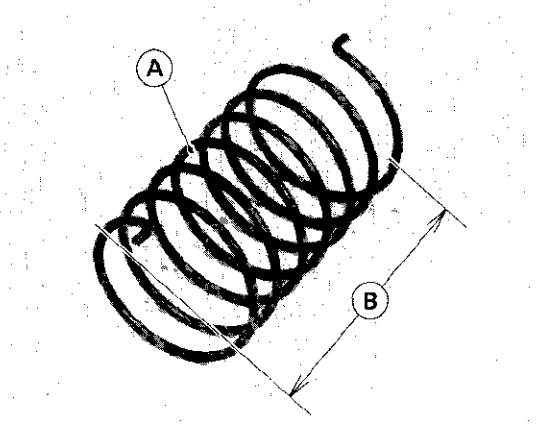
★If the ramp or splined portion are damaged, replace the ramp cap.



A. Ramp Cap
B. Splined Portion
C. Ramp

Spring Free Length Inspection

★If spring is shorter than the service limit, it must be replaced.



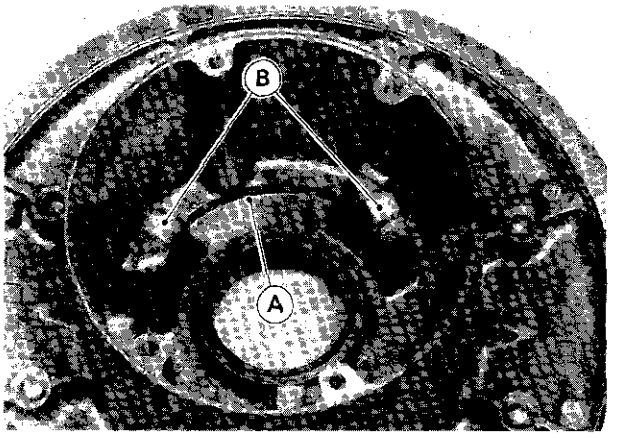
A. Spring
B. Free Length

Spring Free Length

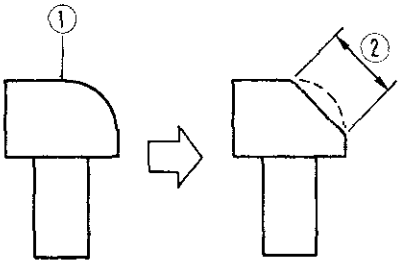
Standard:	**140 mm**
Service Limit:	**133 mm**

Wear Shoe Inspection

★If the contact areas of either shoe is more than the service limit, replace the shoes in the fixed sheave.



A. Fixed Sheave
B. Shoe



1. Shoe
2. Contact Area (width)

Wear Shoe Width

Service Limit:	**11 mm**

Air Cleaner (see Fuel System)

Engine Lubrication System

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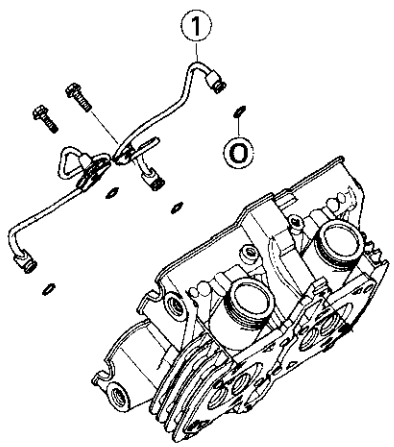
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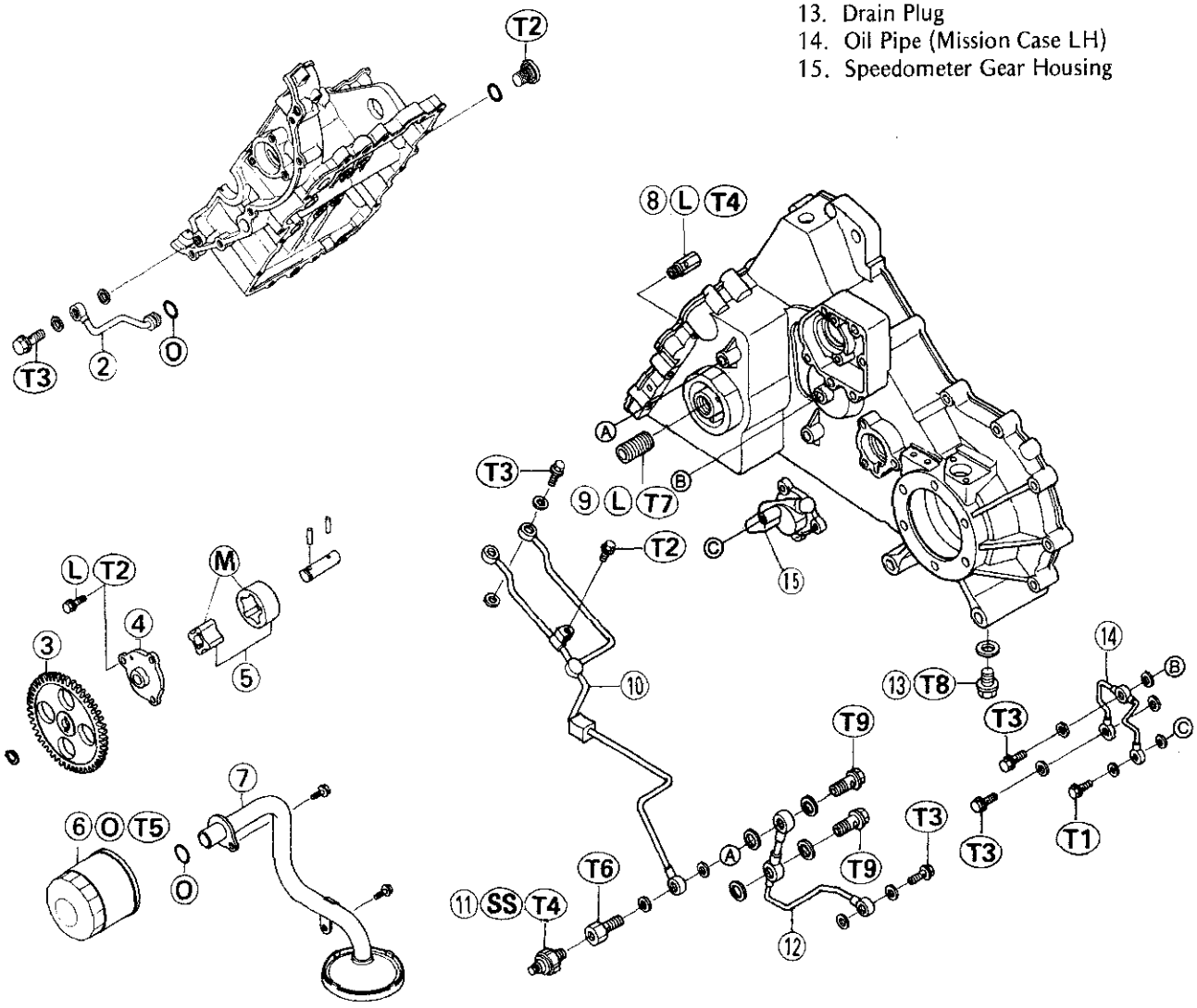
Oil Pressure Switch (see Electrical System) 6-7

Exploded View

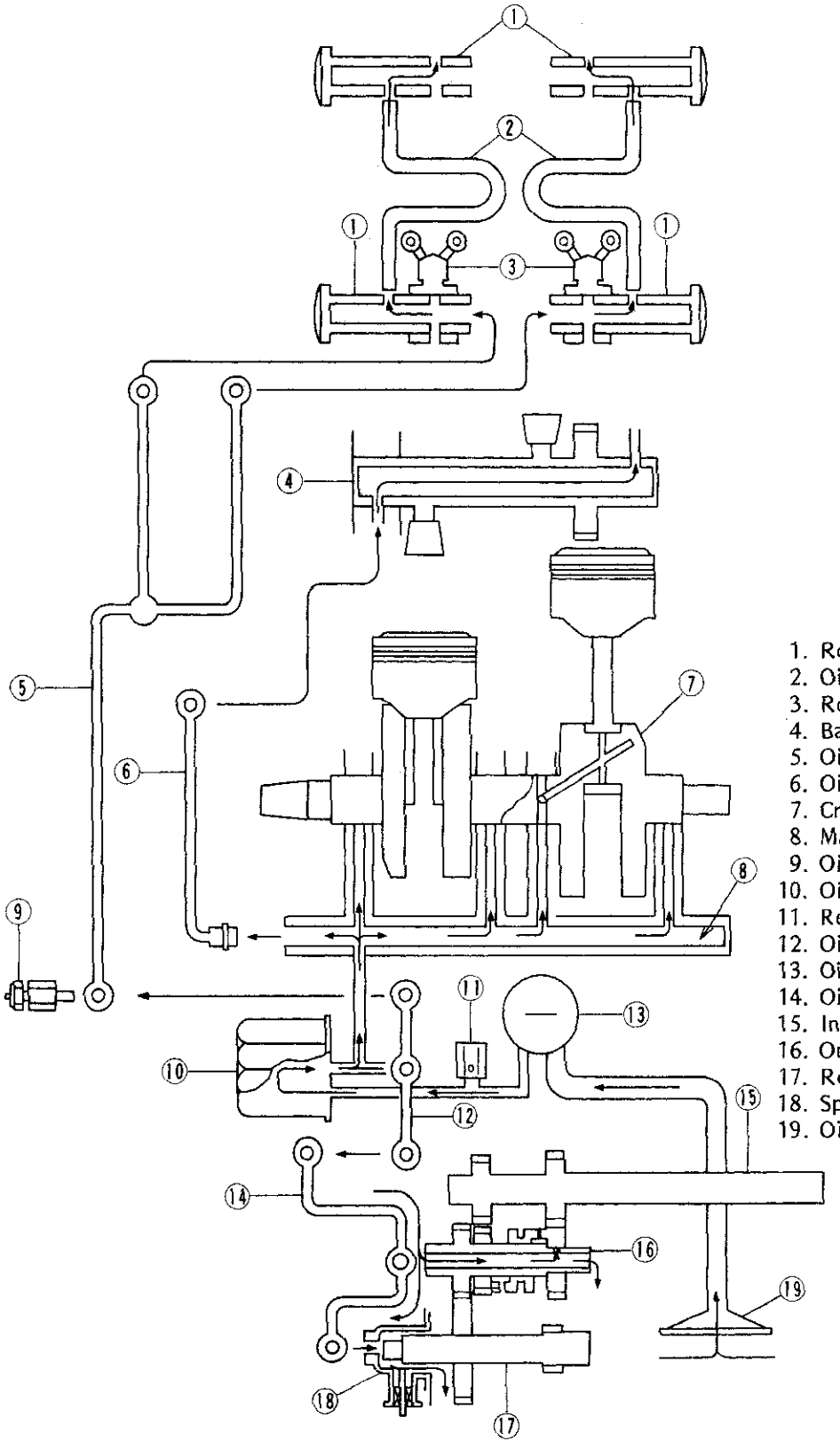


L : Apply a non-permanent locking agent.
M : Apply molybdenum disulfide grease.
O : Apply engine oil.
SS : Apply silicone sealant.
T1: 7.8 N-m (0.8 kg-m, 69 in-lb)
T2: 9.8 N-m (1.0 kg-m, 87 in-lb)
T3: 12 N-m (1.2 kg-m, 104 in-lb)
T4: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T5: 18 N-m (1.9 kg-m, 13.0 ft-lb)
T6: 20 N-m (2.0 kg-m, 14.5 ft-lb)
T7: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T8: 29 N-m (3.0 kg-m, 22 ft-lb)
T9: 34 N-m (3.5 kg-m, 25 ft-lb)

1. Oil Pipe (Cylinder Head)
2. Oil Pipe (Crankcase LH)
3. Oil Pump Gear
4. Oil Pump Cover
5. Oil Pump Rotors
6. Oil Filter
7. Oil Screen
8. Relief Valve
9. Oil Filter Mounting Bolt
10. Oil Pipe (Mission Case Upper)
11. Oil Pressure Switch
12. Oil Pipe (Mission Case Inside LH)
13. Drain Plug
14. Oil Pipe (Mission Case LH)
15. Speedometer Gear Housing



Engine Oil Flow Chart



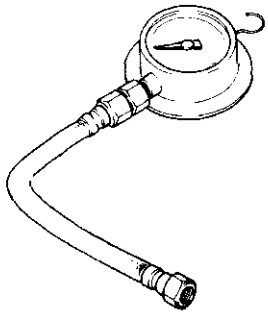
1. Rocker Shafts
2. Oil Pipes
3. Rocker Arms
4. Balancer Shaft
5. Oil Pipe (back side of the cylinder)
6. Oil Pipe (in the alternator cover)
7. Crankshaft
8. Main Oil Passage
9. Oil Pressure Switch
10. Oil Filter
11. Relief Valve
12. Oil Pipe (in the transmission case)
13. Oil Pump
14. Oil Pipe (out of the transmission case)
15. Input Shaft
16. Output Shaft
17. Reduction Shaft
18. Speedometer Gear Housing
19. Oil Screen

Specifications

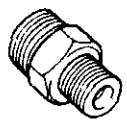
Item	Standard
Engine Oil:	
Grade	SE or SF class
Viscosity	SAE 10W40, 10W50, 20W40, or 20W50
Capacity	3.2 L (when filter is not removed) 3.4 L (when filter is removed) 4.0 L (when engine is completely dry)
Oil Pressure Measurement:	
Oil pressure @3,500 r/min (rpm), oil temp. 90−100°C (194-212°F)	196−294 kPa (2.0−3.0 kg/cm², 29−43 psi)

Special Tools

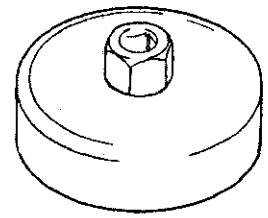
Oil Pressure Gauge: 57001-164



Oil Pressure Gauge Adapter: 57001-1033

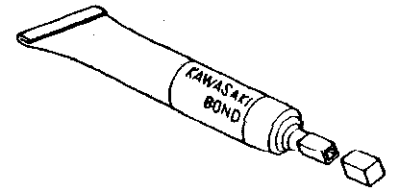


Oil Filter Wrench: 57001-1249



Sealant

Kawasaki Bond (Silicone Sealant): 56019-120



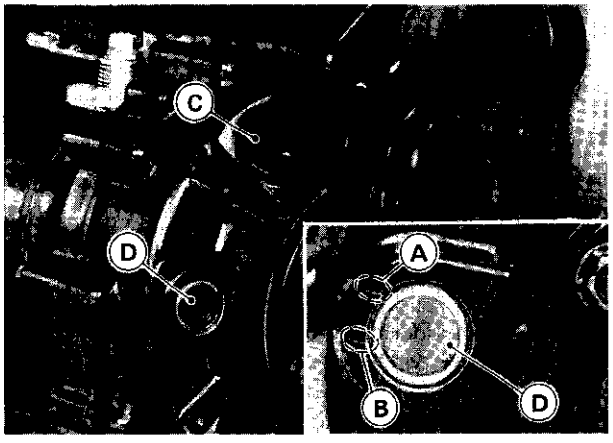
Engine Oil and Oil Filter

WARNING

○Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

Oil Level Inspection

●Situate the vehicle on level ground.
●Check that the engine oil level.
Between the upper and lower level lines in the gauge.



A. Upper Level
B. Lower Level
C. Oil Filler Cap
D. Oil Level Gauge

NOTE

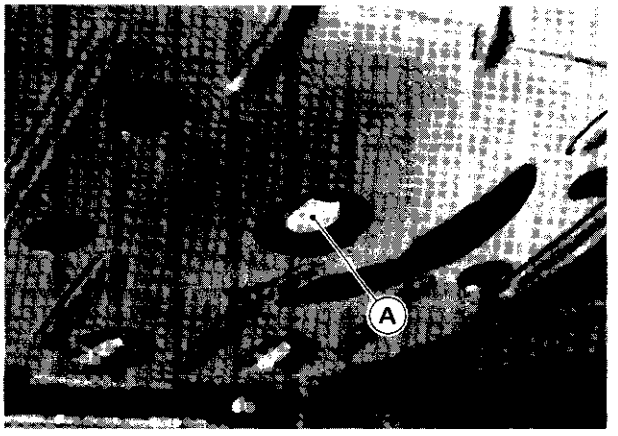
○If the vehicle has just been used, wait several minutes for all the oil to drain down.
○If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.

CAUTION

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

Engine Oil Change

●Set the vehicle on level ground after warming up the engine.
●Remove the engine drain plug.



A. Drain Plug

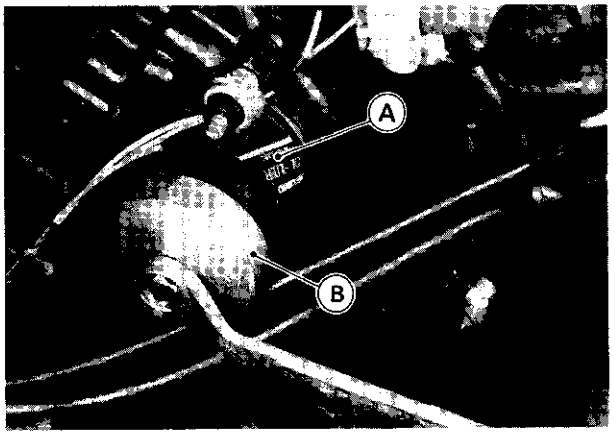
○The oil in the filter can be drained by removing the filter (see Oil Filter Removal).
★Replace the drain plug gasket with a new one if it is damaged.
○Torque the following (see Exploded View).
Oil Filter
Drain Plug
○Pour in the specified type and amount of oil.

Engine Oil

Grade:	**SE or SF class**
Viscosity:	**SAE 10W40, 10W50, 20W40, or 20W50**
Amount:	**4.0 L (engine is completely dry)**
	3.4 L (filter is removed)
	3.2 L (filter is not removed)

Oil Filter Removal

●Drain the engine oil.
●Remove the oil filter.
Use the oil filter wrench (special tool).



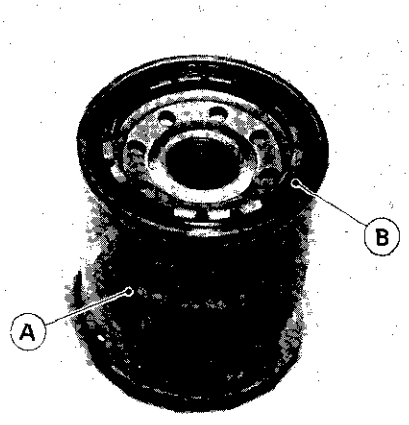
A. Oil Filter
B. Wrench: 57001-1249

NOTE

○*The oil filter bypass valve is assembled in the filter (Do not disassembled).*

Oil Filter Installation

●Note the following.
○Apply oil to the gasket.



A. Oil Filter B. Gasket

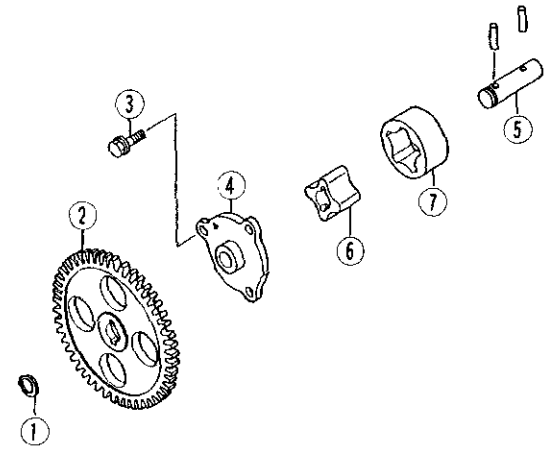
○Torque the following.
Oil Filter (or tighten it with hand(s) about ¾ turns after gasket contacts mounting surface of engine).
○Pour in the specified type and amount of oil.

Oil Pump

Removal

●Remove the following.
Cargo Bed
Water Pump Cover (see Cooling System chapter)
Left Engine Cover (see Engine Bottom End/Crankshaft chapter)
Alternator Rotor (see Electrical System chapter)

1. Circlip
2. Oil Pump Gear
3. Cover Bolts
4. Oil Pump Cover
5. Shaft
6. Inner Rotor
7. Outer Rotor



Installation

●Note the following.
○Check the parts for wear.
Outer Rotor
Inner Rotor
Pins
○Apply a molybdenum disulfied grease.
Outer Rotor (Inside and Outside)

Oil Pressure Measurement

NOTE

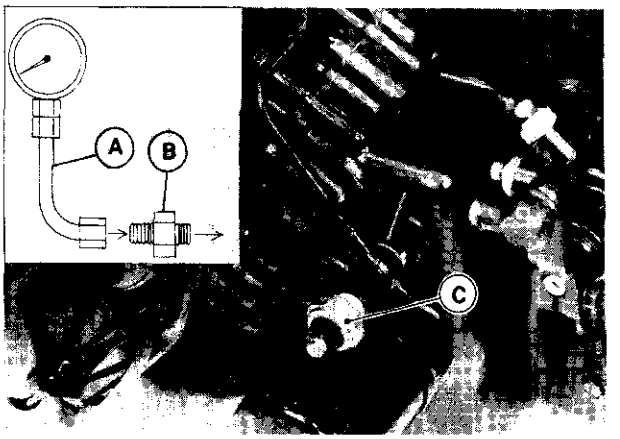
○*Measure the oil pressure after the engine is warmed up.*

●Remove the oil pressure switch.
●Attach the oil pressure gauge and adapter (special tools) to the switch hole.

Oil Pressure

Standard: **196−294 kPa**
(2.0−3.0 kg/cm², 29−43 psi)
@3,500 r/min (rpm)
Oil temperature 90−100°C (194−212°F)

★If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert for wear immediately.



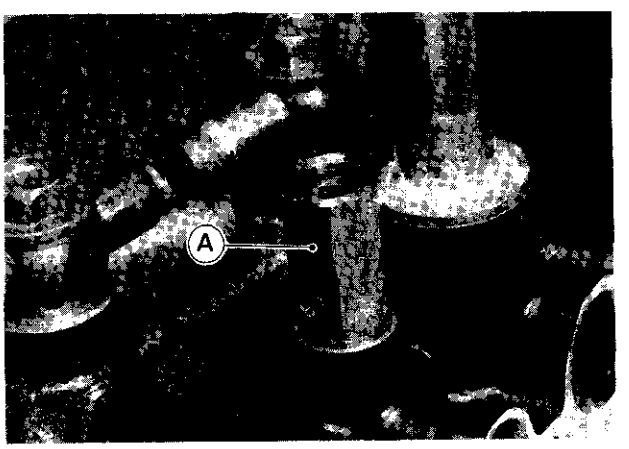
A. Oil Pressure Gauge: 57001-164.
B. Adapter: 57001-1033
C. Oil Pressure Switch

●Note the following.
○Apply silicone sealant.
Oil Pressure Switch Threads
○Torque the following.
Oil Pressure Switch

Relief Valve and Oil Screen

Relief Valve Installation

●Note the following.
○Apply non-permanenet locking agent.

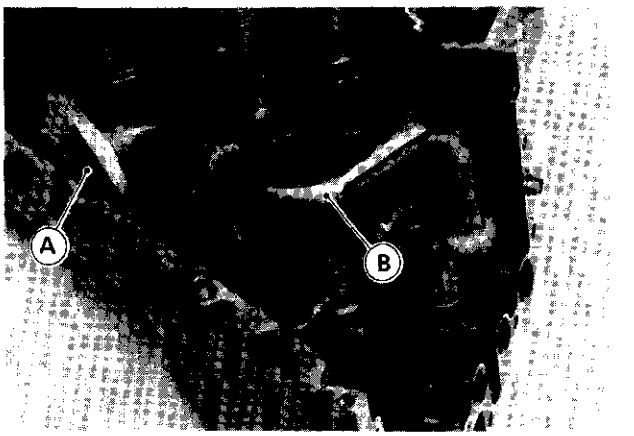


A. Relief Valve

○Torque the following.
Relief Valve

Oil Screen Cleaning and Inspection

●Split the transmission case (see Engine Bottom End/ Crankshaft).
●Clean the screen with high flash-point solvent.



A. Oil Screen
B. Oil Pipe

Oil Pressure Switch

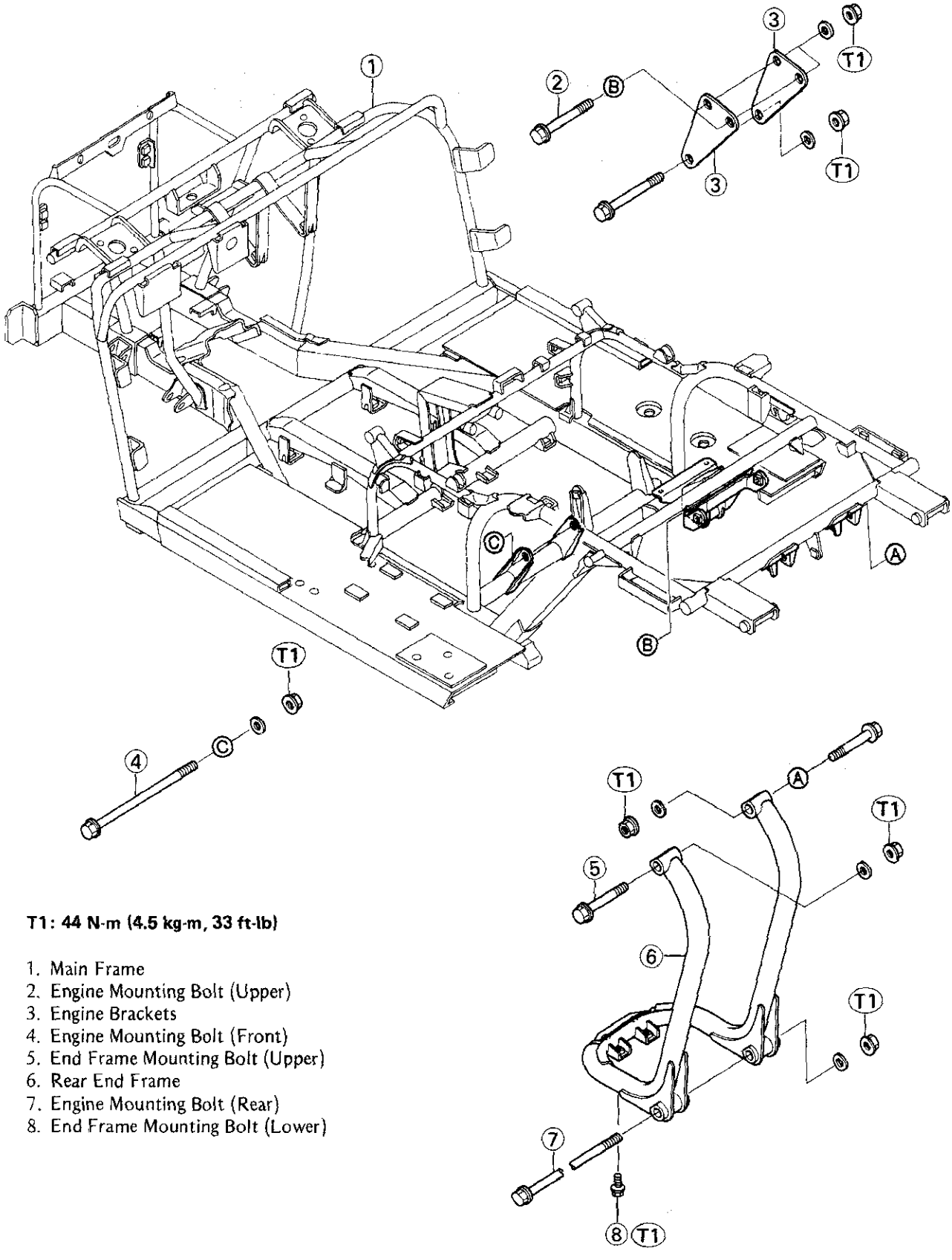
See Electrical System chapter.

Engine Removal/Installation

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Exploded View



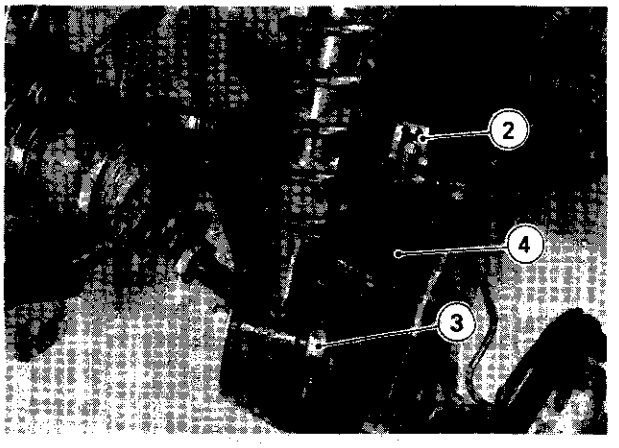
T1: 44 N-m (4.5 kg-m, 33 ft-lb)

1. Main Frame
2. Engine Mounting Bolt (Upper)
3. Engine Brackets
4. Engine Mounting Bolt (Front)
5. End Frame Mounting Bolt (Upper)
6. Rear End Frame
7. Engine Mounting Bolt (Rear)
8. End Frame Mounting Bolt (Lower)

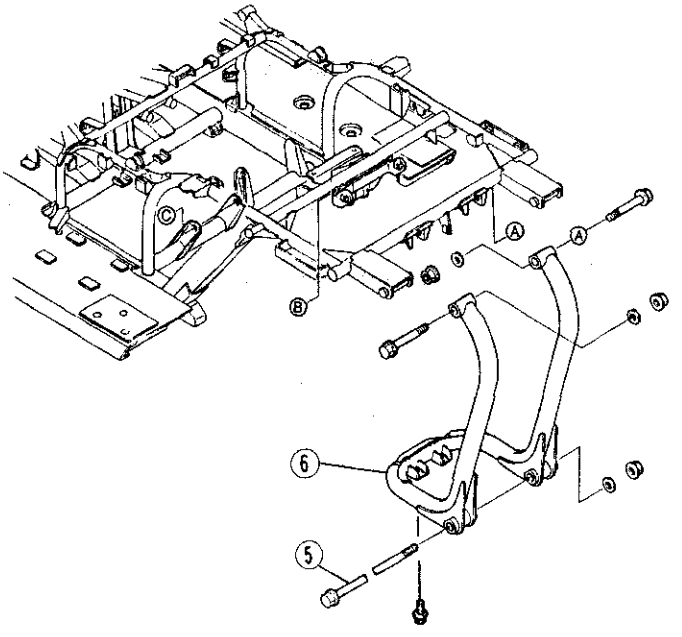
Engine Removal/Installation

Engine Removal

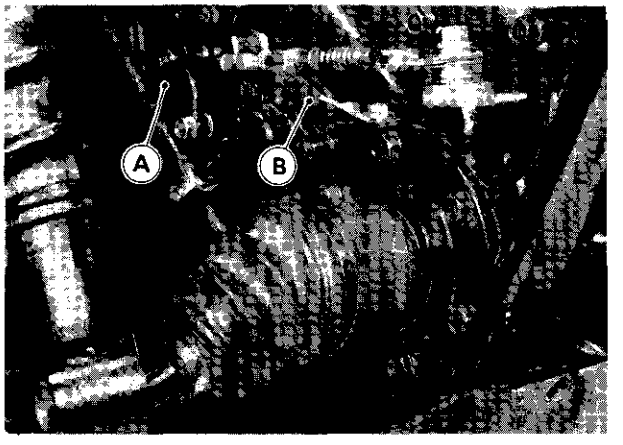
● Remove the following.
  Cargo Bed
  Seat
1. Rear Wheels (see Wheels/Tires chapter)
2. Brake Hose Clamps
3. Rear Shock Absorber Lower Bolts
4. Swing Arms with the Drive Shaft



5. Engine Mounting Bolt (Rear End)
6. Rear End Frame

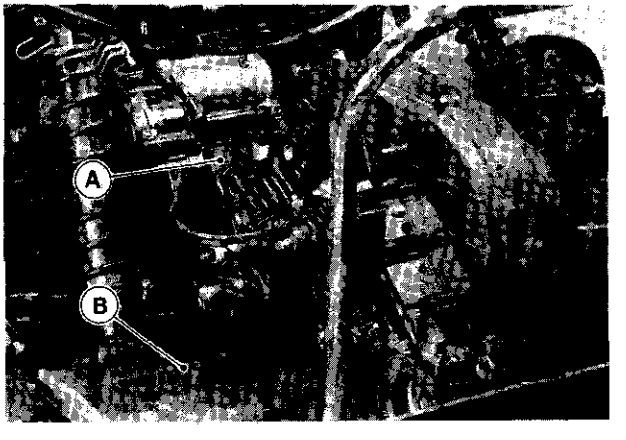


Silencer
Carburetors
Cables
  Shift Cable
  Differential Shift Cable
  Speedometer Cable
Wires
  Neutral Switch Wire
  Reverse Switch Wire
  Alternator Wires
  Starter Motor Wires
  Spark Plug Wires
  Oil Pressure Switch Wire
Cooling Hoses and Pipe
Belt Converter Air Ducts
Thermostat Housing
Differential Shift Cable Bracket



A. Differential Shift Cable B. Cable Bracket

Engine Mounting Bolts
Engine Unit
  Use the handcart.

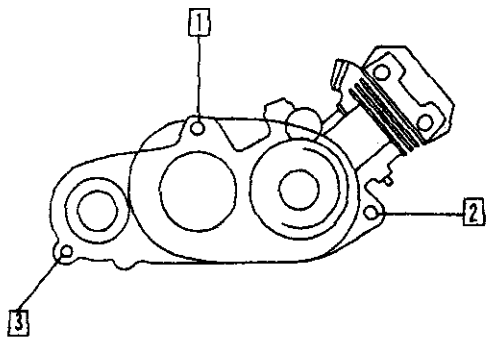


A. Engine B. Handcart

Engine Installation

●Note the following.

○Insert the engine mounting bolt as following.



□ : Number of installing sequence

○Torque the following.

Engine Mounting Bolts

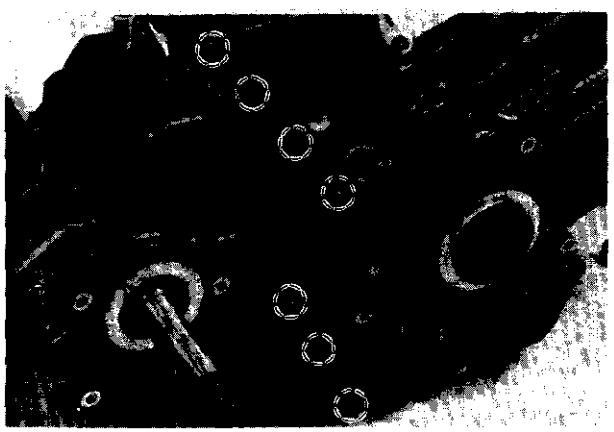
Engine Separation

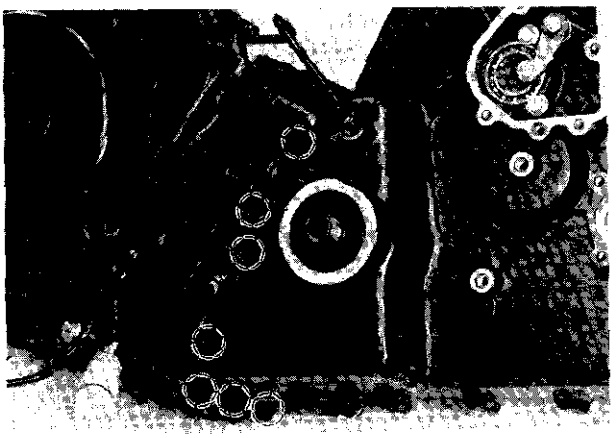
Crankcase and Transmission Case Separation

●Remove the engine (see Engine Removal/Installation).

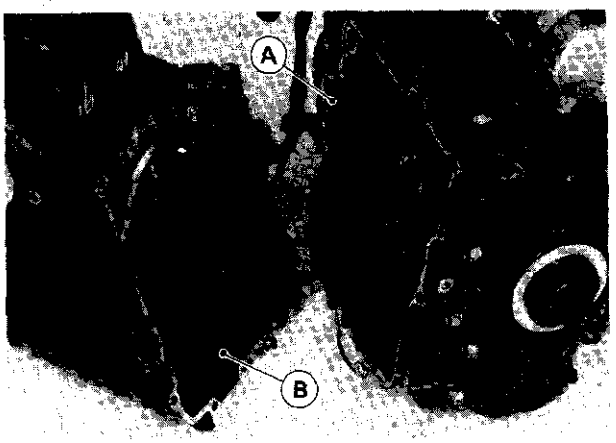
●Remove the following parts.

Belt Converter Assembly
Oil Pressure Switch and Oil Pipe
Oil Filter
External Shift Mechanism Cover
Transmission Case Mounting Bolts
Speedometer Gear Case





●Split the crankcase and transmission case.



A. Crankcase B. Transmission Case

Crankcase and Transmission Case Assembly

●Note the following.

○Replace the gasket with a new one.

○Replace the O-rings with new ones if they are damaged.

○The O-rings must be installed with the flat side facing to the transmission case.

○Apply engine oil to the O-rings.

○Torque the following.

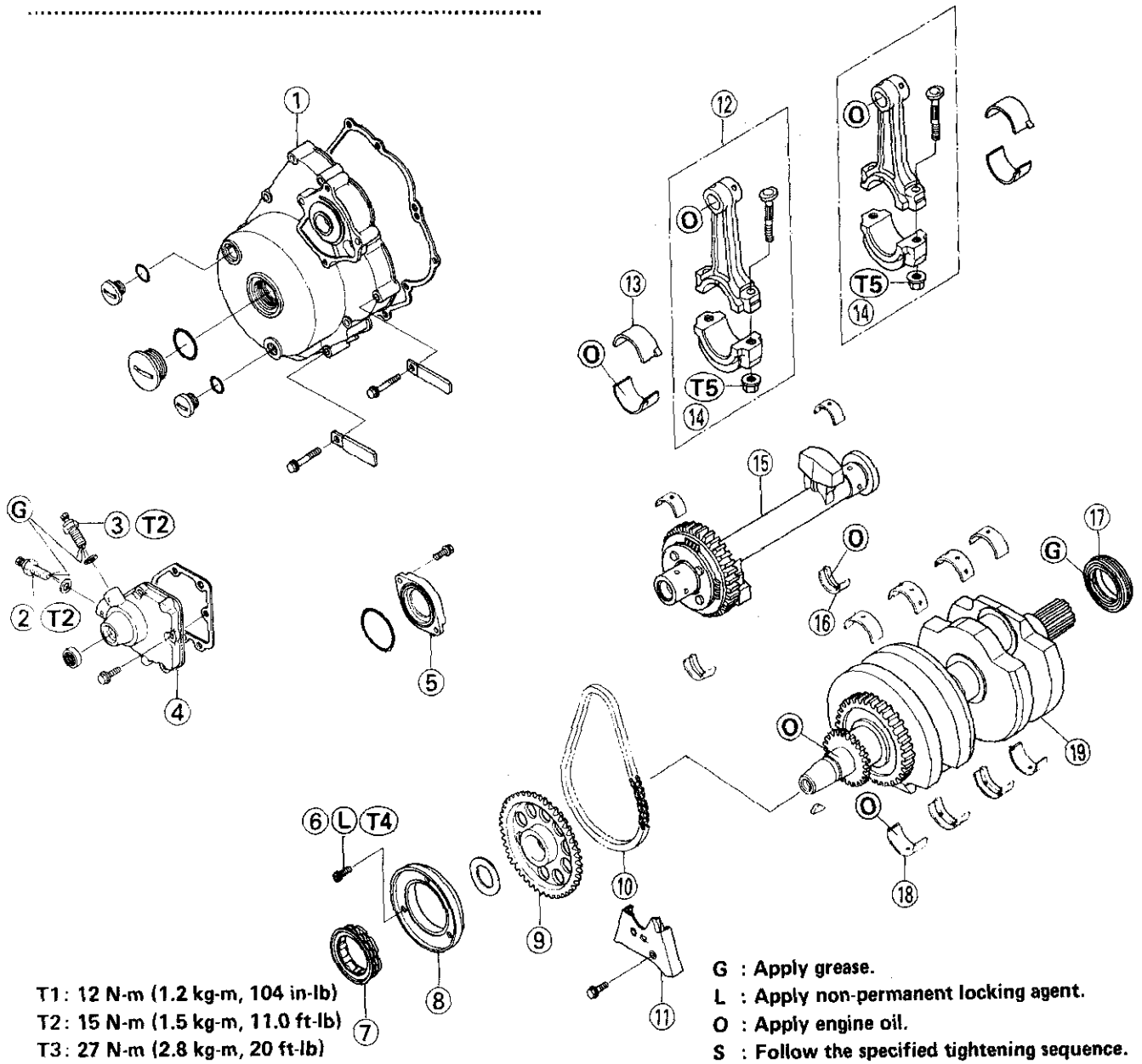
Transmission Case Mounting Bolts
Oil Filter
Oil Pressure Switch
Oil Pipe Banjo Bolt

Engine Bottom End/Crankshaft

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Exploded View



T1: 12 N-m (1.2 kg-m, 104 in-lb)
T2: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T3: 27 N-m (2.8 kg-m, 20 ft-lb)
T4: 34 N-m (3.5 kg-m, 25 ft-lb)
T5: 36 N-m (3.7 kg-m, 27 ft-lb)

G : Apply grease.
L : Apply non-permanent locking agent.
O : Apply engine oil.
S : Follow the specified tightening sequence.

1. Left Engine Cover
2. Reverse Switch
3. Neutral Switch
4. External Shift Mechanism Cover
5. Balancer Shaft Right Side End Cap
6. Coupling Bolts
7. One-way Clutch
8. Coupling
9. Starter Motor Sprocket
10. Starter Motor Chain
11. Chain Guide
12. Connecting Rod
13. Bearing Insert (Con-rod Big End)
14. Cap Nut
15. Balancer Shaft
16. Bearing Insert (Balancer Shaft)
17. Oil Seal
18. Bearing Insert (Crankshaft Main Journal)
19. Crankshaft

Specifications

Item		Standard	Service Limit
Alternator, Starter Mechanism:			
Starter motor chain 20-link length		155.5 – 155.9 mm	159 mm
Crankshaft, Connecting Rods:			
Connecting rod bend		– – –	0.2/100 mm
Connecting rod twist		– – –	0.2/100 mm
Connecting rod big end side clearance		0.13 – 0.38 mm	0.60 mm
Connecting rod big end bearing insert/ crankpin clearance		0.043 – 0.073 mm	0.12 mm
Crankpin diameter:		37.984 – 38.000 mm	37.97 mm
Marking	None	37.984 – 37.994 mm	
	○	37.995 – 38.000 mm	
Connecting rod big end bore diameter:		41.000 – 41.016 mm	– – –
Marking	None	41.000 – 41.008 mm	
	○	41.009 – 41.016 mm	
Connecting rod big end bearing insert thickness:	Brown	1.474 – 1.479 mm	– – –
	Black	1.479 – 1.484 mm	– – –
	Blue	1.484 – 1.489 mm	– – –

Connecting rod big end bearing insert selection:

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert	
		Size Color	Part Number
None	○	Brown	92028-1350
	None	Black	92028-1349
○	○		
	None	Blue	92028-1348

Crankshaft runout		less than 0.035 mm TIR	0.09 mm TIR
Crankshaft main bearing insert/ journal clearance		0.020 – 0.044 mm	0.07 mm
Crankshaft main journal diameter:		35.984 – 36.000 mm	35.96 mm
Marking	None	35.984 – 35.992 mm	
	1	35.993 – 36.000 mm	
Crankshaft main bearing bore diameter:		39.000 – 39.016 mm	– – –
Marking	○	39.000 – 39.008 mm	
	None	39.009 – 39.016 mm	

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

Crankshaft main bearing insert selection:

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

*The bearing inserts for Nos. 2 and 3 journals have oil grooves.

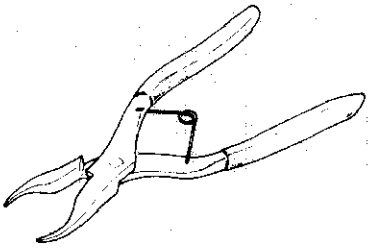
Crankshaft side clearance		0.05 – 0.25 mm	0.45 mm
Balancer Shaft:			
Balancer shaft bearing insert/ journal clearance		0.020 – 0.044 mm	0.08 mm
Balancer shaft journal diameter:		27.987 – 28.000 mm	27.96 mm
Marking	None	27.987 – 27.993 mm	
	○	27.994 – 28.000 mm	
Crankcase bearing bore diameter:		31.000 – 31.025 mm	– – –
Marking	○	31.000 – 31.013 mm	
	None	31.014 – 31.025 mm	
Balancer shaft bearing insert thickness:			
	Brown	1.495 – 1.499 mm	– – –
	Black	1.499 – 1.503 mm	– – –
	Blue	1.503 – 1.507 mm	– – –

Balancer shaft bearing insert selection:

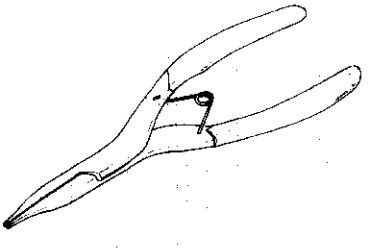
Balancer Shaft Journal Diameter Marking	Crankcase Balancer Shaft Bore Diameter Marking	Bearing Insert	
		Size Color	Part Number
○	○	Brown	92028-1346
	None	Black	92028-1345
None	○		
	None	Blue	92028-1344

Special Tools

Circlip Pliers: 57001-143

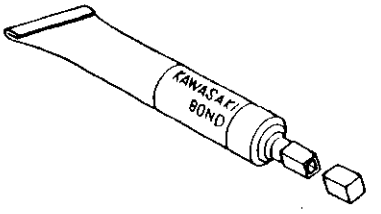


Circlip Pliers: 57001-144

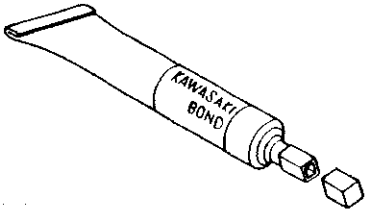


Sealant

Kawasaki Bond (Liquid Gasket-Black): 92104-1003



Kawasaki Bond (Silicone Sealant): 56019-120

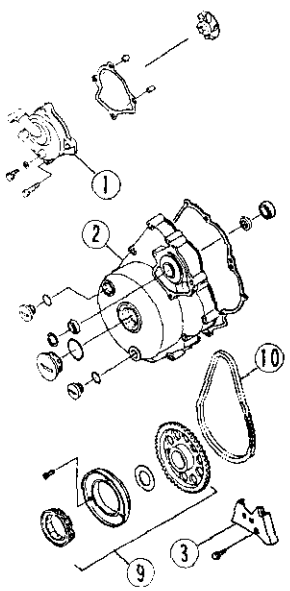


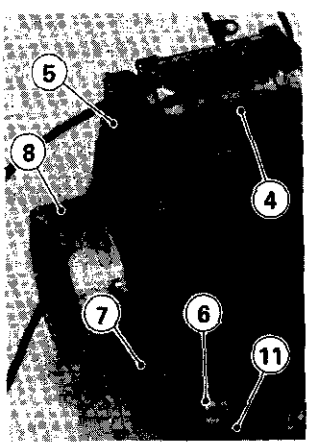
Crankcase

Splitting

- Remove the engine.
- Remove the engine top end.
  - Cylinder Head (see Engine Top End chapter)
  - Cylinder (see Engine Top End chapter)
  - Pistons (see Engine Top End chapter)
- Remove the following.

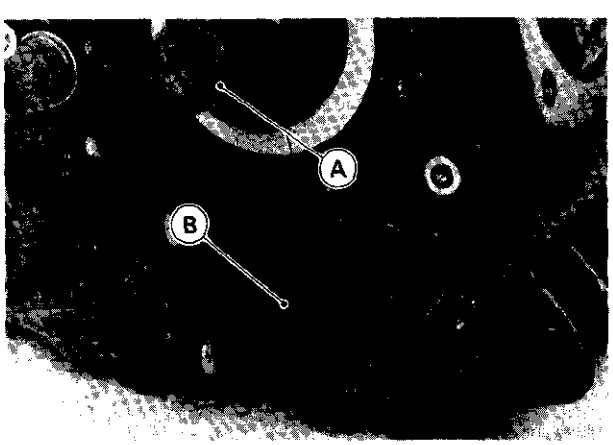
1. Water Pump Cover
2. Alternator Cover (with impeller)
3. Chain Guide
4. Starter Motor
5. Starter Motor Sprocket
6. Oil Pressure Switch and Oil Pipe
7. Oil Pipe
8. Alternator Rotor (see Electrical System chapter).





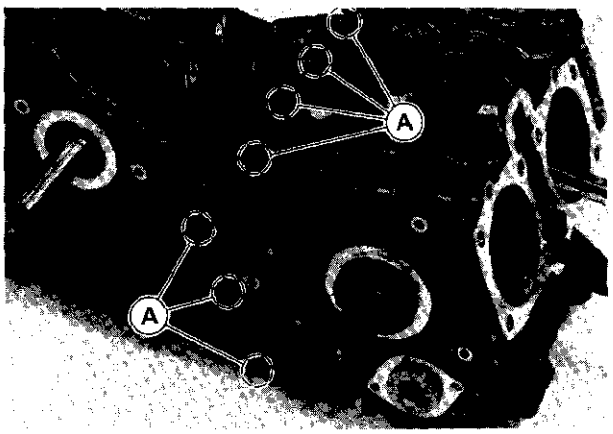
9. Starter Motor Clutch
10. Starter Motor Chain
11. Oil Filter

- Remove the balancer shaft right side end cap.

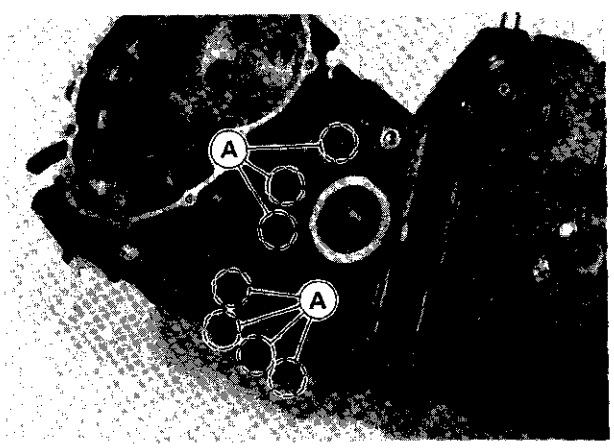


A. Crankshaft RH End B. Cap

- Remove the transmission case mounting bolts.

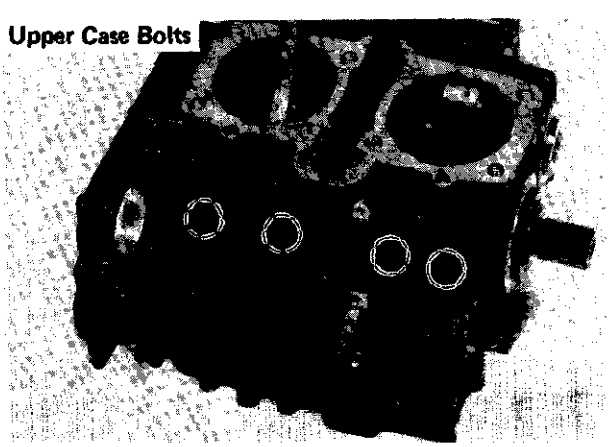


A. Transmission Case Mounting Bolts

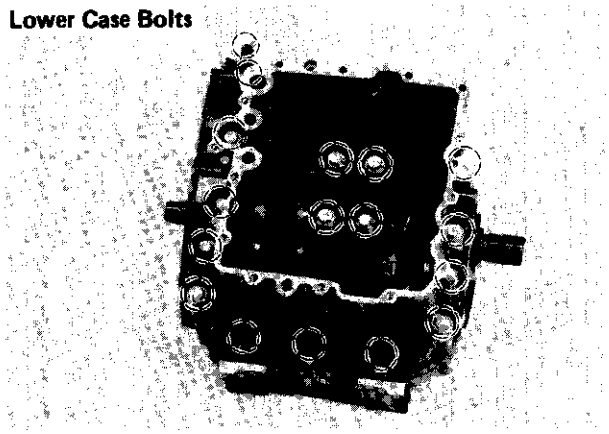


A. Transmission Case Mounting Bolts

- Split the transmission case and the crankcase.
- Remove the crankcase bolts.



Lower Case Bolts



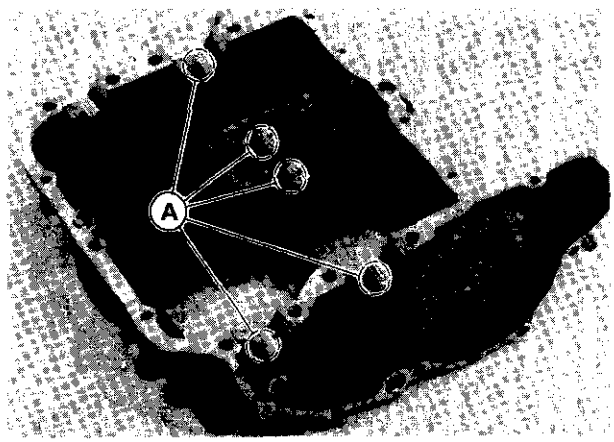
●Split the crankcase halves.

Assembly

CAUTION

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

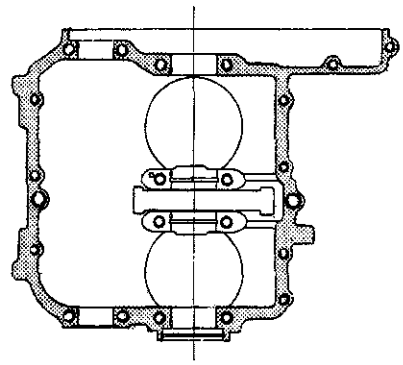
●Note the following.
○Clean off the mating surfaces of the crankcase halves.
○Using compressed air, blow out the oil passages in the crankcase halves.
○Install the crankshaft oil seal.



A. Oil Passage

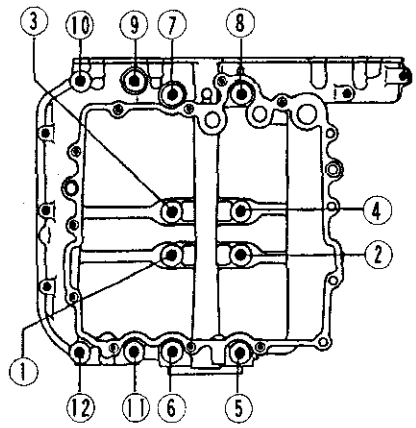
○Apply engine oil.
Main Bearing Inserts
Balancer Shaft Bearing Inserts

○Apply liquid gasket.
Upper Crankcase Half



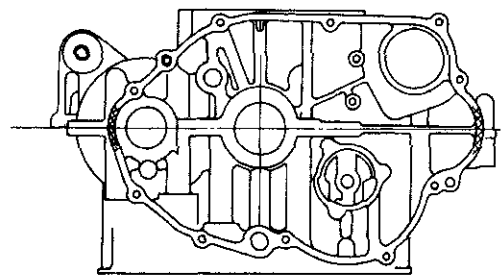
▩ : Liquid Gasket Applied Area

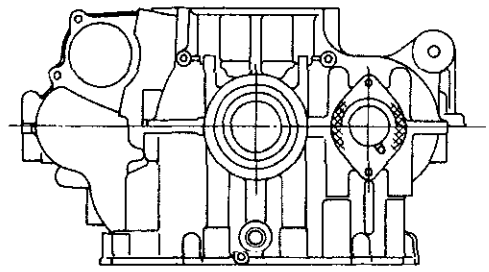
○Following the tightening sequence, torque the 8 mm bolts first to about one half of the specification (see Exploded View), and finally to the specification in the same sequence.



NOTE

○*Apply silicone sealant to the crankcase halves mating surface as following.*





▩ : Silicone Sealant Applied Areas

Crankshaft/Connecting Rods

Crankshaft Installation

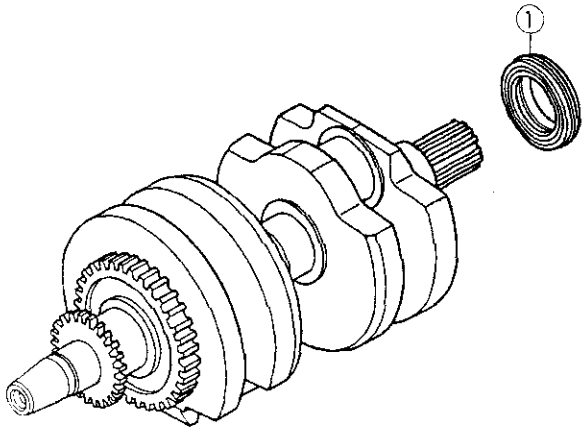
CAUTION

If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage before assembling crankcase to be sure the correct bearing inserts are installed.

- Replace the oil seal with a new one if it is damaged.

NOTE

Apply grease to the lip of the oil seal.



1. Oil Seal

- Apply engine oil.
  Main Bearing Inserts

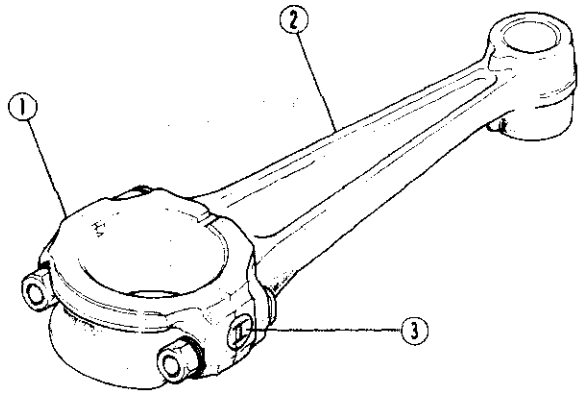
Connecting Rod Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the crankshaft.
- Remove the connecting rods from the crankshaft.

Connecting Rod Installation

CAUTION

To minimize vibration, a pair of connecting rod should have the same weight mark.



1. Big End Cap
2. Connecting Rod
3. Weight Mark, Alphabet

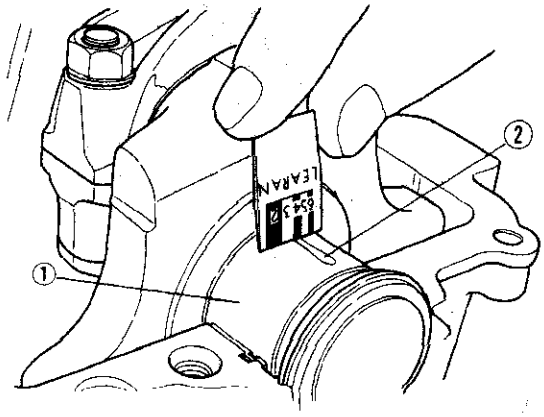
CAUTION

If the connecting rods, bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage before assembling engine to be sure the correct bearing inserts are installed.

- Apply engine oil.
  Bearing Inserts
- Torque the following.
  Big End Cap Nuts

Crankshaft Main Bearing Insert/Journal Wear

- Measure the clearance with a plastigage.



1. Crankshaft Main Journal
2. Plastigage

NOTE

○*Torque the following.*
Crankcase Bolts
○*Do not turn the crankshaft during clearance measurement.*

Crankshaft Main Bearing Insert/Journal Clearance

Standard:	**0.020 – 0.044 mm**
Service Limit:	**0.07 mm**

★If clearance is within the standard, no bearing replacement is required.
★If clearance is between 0.044 mm and the service limit (0.07 mm), replace the bearing inserts with inserts painted blue. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
★If clearance exceeds the service limit, measure the diameter of the crankshaft main journal.

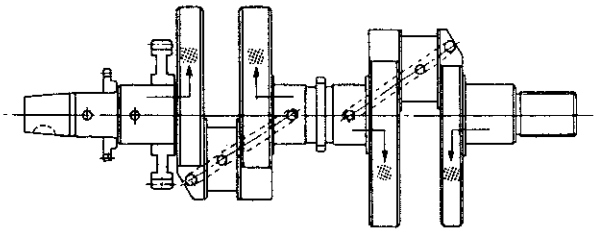
Crankshaft Main Journal Diameter

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

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

Crankshaft Main Journal Diameter Marks

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



▩ : Crankshaft Main Journal Diameter Marks, "1" mark or no mark

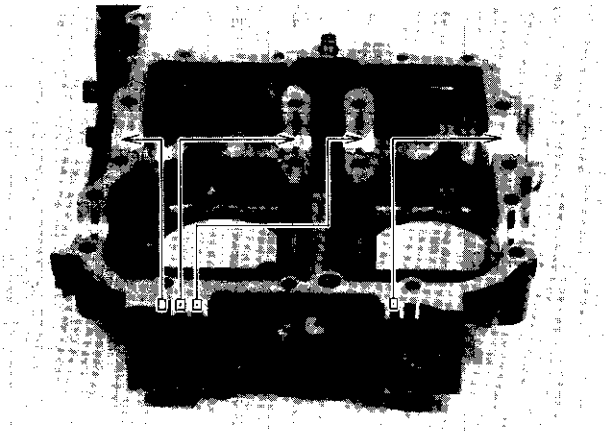
●Measure the main bearing bore diameter, and mark the upper crankcase half in accordance with the bore diameter.

NOTE

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

Crankcase Main Bearing Bore Diameter Marks

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



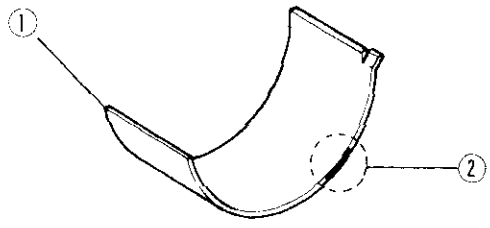
□ : Crankcase Main Bearing Bore Diameter Marks, "○" mark or no mark

Main Bearing Insert Selection

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

*The bearing inserts for Nos. 2 and 3 journals have oil groove.

•Select the proper bearing insert in accordance with the combination of the crankcase and crankshaft coding.



1. Bearing Insert 2. Size Color Mark

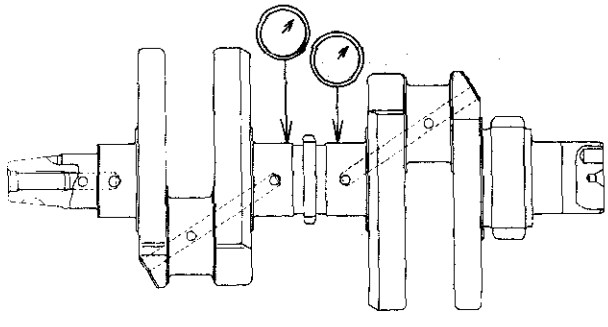
•Install the new inserts in the crankcase halves and check insert/journal clearance with plastigage.

Crankshaft Runout

★If the measurement exceeds the service limit, replace the crankshaft.

Crankshaft Runout

Standard:	**Less than 0.035 mm TIR**
Service Limit:	**0.09 mm TIR**



Crankshaft Side Clearance

•Measure the clearance between the upper crankcase half and the crank web at the No. 2 or No. 3 journal.

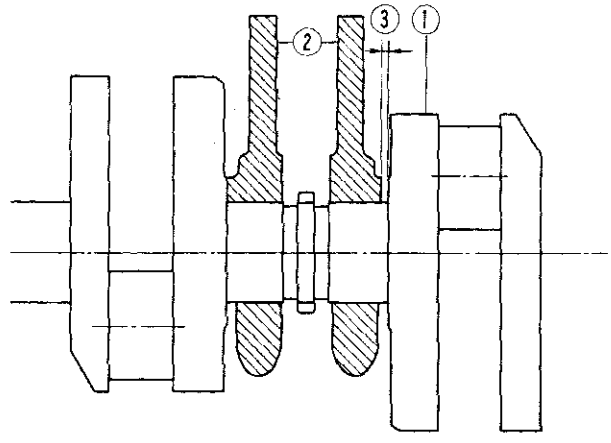
★If the clearance exceeds the service limit, replace the crankcase halves.

NOTE

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

Crankshaft Side Clearance

Standard:	**0.05 – 0.25 mm**
Service Limit:	**0.45 mm**



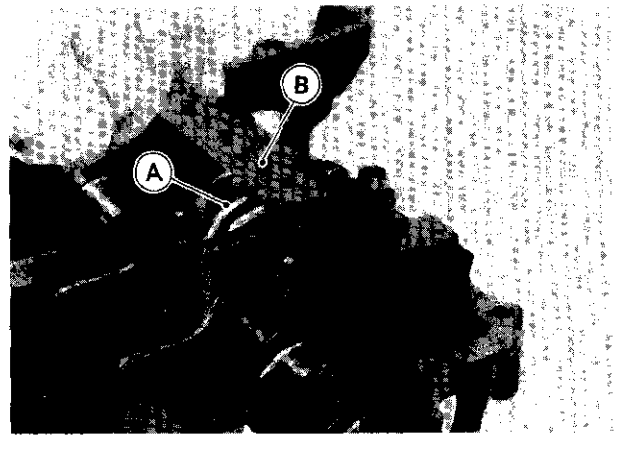
1. Crank Web 3. Clearance
2. Upper Crankcase Half

Connecting Rod Big End Side Clearance

★If clearance exceeds the service limit, replace the connecting rod with a new one and then check clearance again.

Connecting Rod Big End Side Clearance

Standard:	**0.13 – 0.38 mm**
Service Limit:	**0.60 mm**

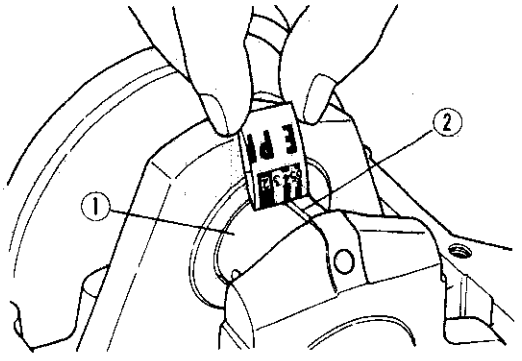


A. Connecting Rod B. Thickness Gauge

★If clearance is too large after connecting rod replacement, the crankshaft must be replaced.

Connecting Rod Big End Bearing Insert/Crankpin Wear

●Measure the clearance with a plastigage.



1. Crankpin 2. Plastigage

NOTE

○*Torque the following.*
Big End Cap Nuts
○*Do not move the connecting rod and crankshaft during clearance measurement.*

Connecting Rod Big End Bearing Insert/Crankpin Clearance

Standard:	**0.043 – 0.073 mm**
Service Limit:	**0.12 mm**

★If clearance is within the standard, no bearing replacement is required.
★If clearance is between 0.073 mm and the service limit (0.12 mm), replace the bearing inserts with inserts painted blue. Check insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
★If clearance exceeds the service limit, measure the diameter of the crankpins.

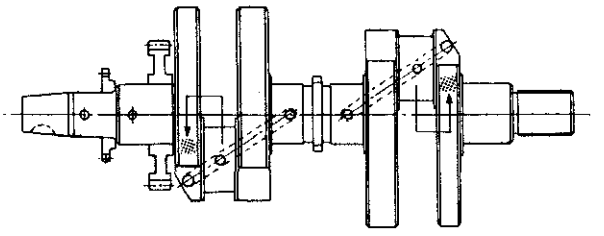
Crankpin Diameter

Standard:	**37.984 – 38.000 mm**
Service Limit:	**37.97 mm**

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

Crankpin Diameter Marks

None:	**37.984 – 37.994 mm**
○ :	**37.995 – 38.000 mm**



▩ : Crankpin Diameter Marks, "○" mark or no mark

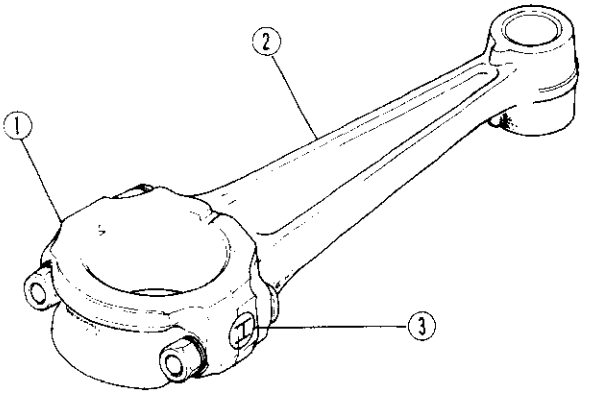
●Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.

NOTE

○*Torque the following.*
Big End Cap Nuts
○*The mark already on the big end should almost coincide with the measurement.*

Connecting Rod Big End Inside Diameter Marks

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

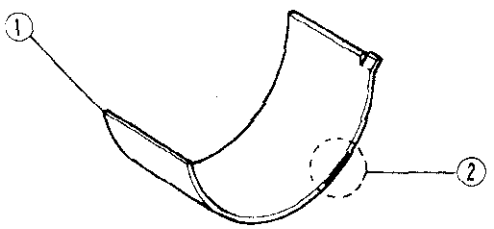


1. Big End Cap
2. Connecting Rod
3. Diameter Mark, "○" mark or no mark

●Select the proper bearing insert in accordance with the combination of the connecting rod and crankshaft coding.

Big End Bearing Insert Selection

Con-rod Big End Bore Diameter Marking	Crankpin Diameter Mark	Bearing Insert	
		Size Color	Part Number
○	None	Blue	92028-1348
	○	Black	92028-1349
	None		
None	○	Brown	92028-1350



1. Bearing Insert 2. Size Color Mark

●Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

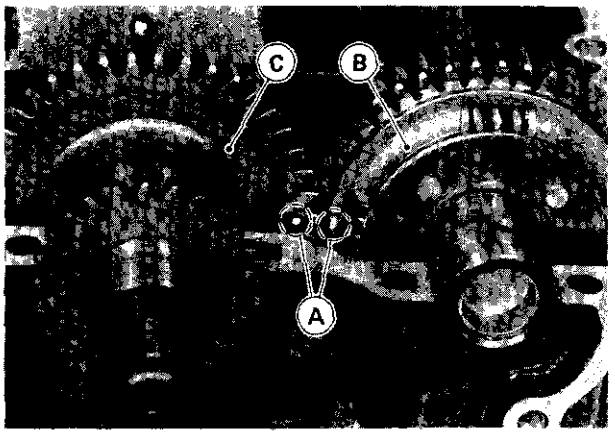
Balancer

Removal

●Split the crankcase.
●Pull the balancer shaft with the balancer gear out of the crankcase.

Installation

●Note the following.
○Apply oil to the inside of the balancer shaft bearing insert.
○Align the timing mark on the balancer gear with the timing mark on the balancer drive gear of the crankshaft.



A. Timing Marks C. Balancer Drive Gear
B. Balancer Gear

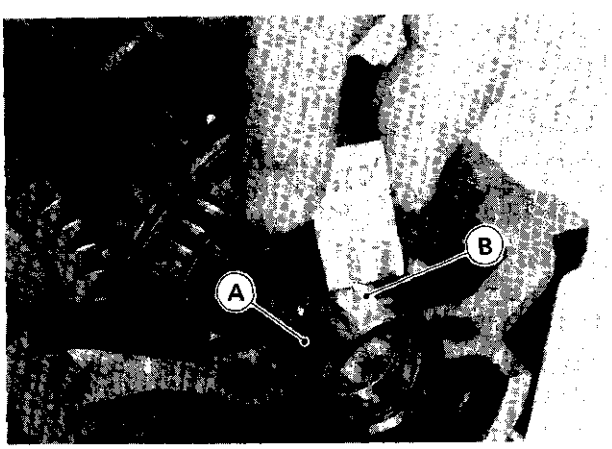
Balancer Shaft Bearing Insert/Journal Wear

●Measure the bearing insert/journal clearance with a plastigage.

NOTE

○*Do not turn the balancer shaft during clearance measurement.*
○*Torque the following.*
Crankcase Bolts

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



A. Journal B. Plastigage

Balancer Shaft Bearing Insert/Journal Clearance

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

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

Balancer Shaft Journal Diameter

Standard:	**27.987 – 28.000 mm**
Service Limit:	**27.96 mm**

★If either journal has worn past the service limit, replace the balancer shaft with a new one.
★If the measured journal diameter is not less than the service limit, but does not coincide with the original diameter markings on the balancer shaft, write new marks on it.

Balancer Shaft Journal Diameter Marks

None:	**27.987 – 27.993 mm**
○ :	**27.994 – 28.000 mm**

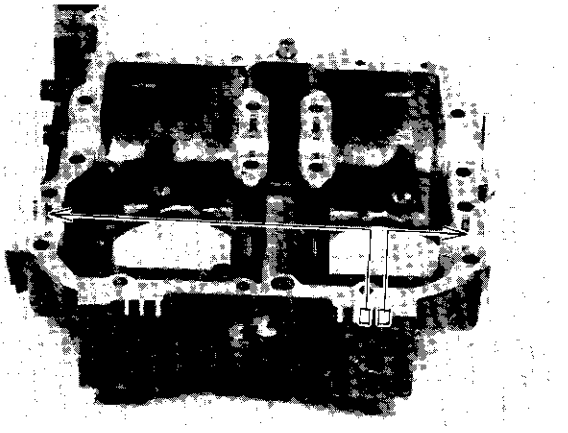
●Put the lower crankcase half on the upper crankcase half without bearing inserts, and tighten the case bolts to the specified torque and sequence (see Crankcase Assembly).
●Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.

NOTE

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

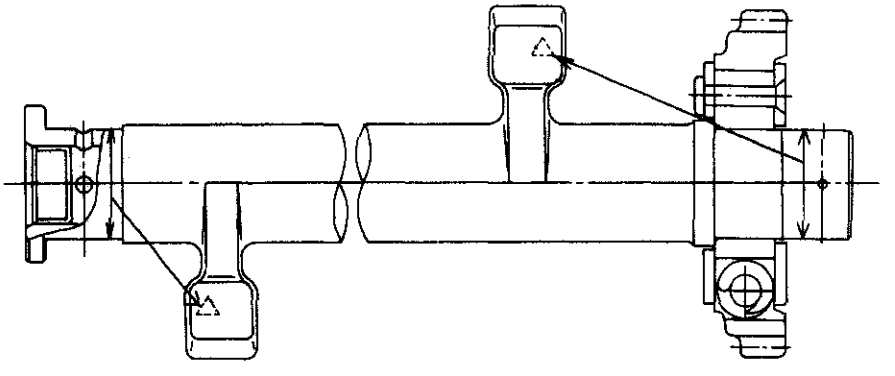
Crankcase Balancer Bearing Bore Diameter Marks

○ :	**31.000 – 31.013 mm**
None:	**31.014 – 31.025 mm**

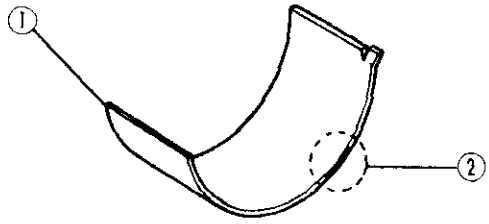


□ : Crankcase Balancer Bearing Bore Diameter Marks, "O" mark or no mark

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



Balancer Shaft Mark Location



1. Bearing Insert 2. Size Color Mark

Bearing Insert Selection

Crankcase Bearing Inside Diameter Mark	Balancer Shaft Journal Diameter Mark	Bearing Insert	
		Size Color	Part Number
○	○	Brown	92028-1346
	None	Black	92028-1345
None	○		
	None	Blue	92028-1344

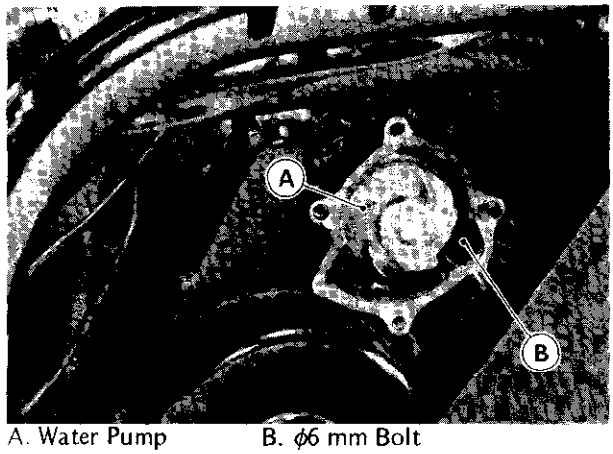
Balancer Gear Inspection

●Visually inspect the balancer gears.
Chipping
Abrasion
Color Change
Other Damage
★If they appear damaged or deteriorated, replace them.

Left Engine Cover

Removal

●Remove the following.
Cargo Bed
Water Pump Cover (see Cooling System chapter)
○Remove the left engine cover bolts.
Do not forget this bolt.



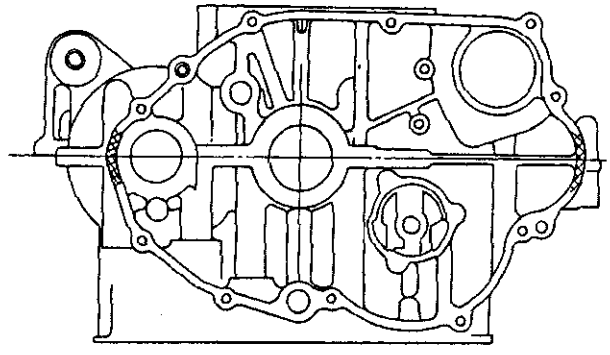
A. Water Pump B. φ6 mm Bolt

Installation

●Note the following.
○Replace the gasket with a new one.

NOTE

○*Apply silicone sealant to the crankcase halves mating surface on the front and rear sides of the left engine cover.*

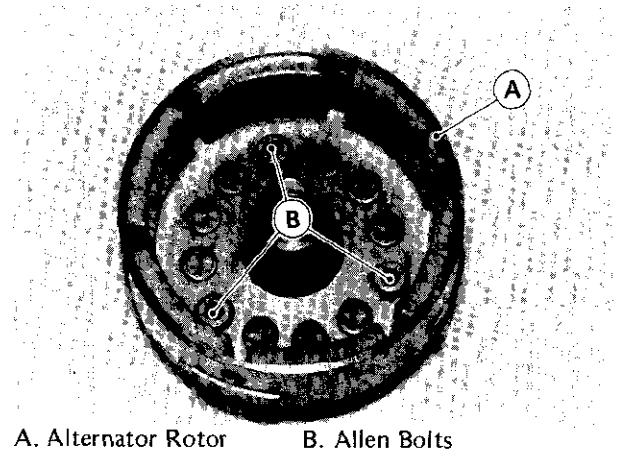


▩ : Silicone Sealant Applied Area

Starter Motor Clutch

Removal

●Remove the following.
Cargo Bed
Water Pump (see Cooling System chapter).
Left Engine Cover
Alternator Rotor (see Electrical System chapter).
Starter Motor Sprocket
Allen Bolts
●Separate the alternator rotor and the one-way clutch assembly.

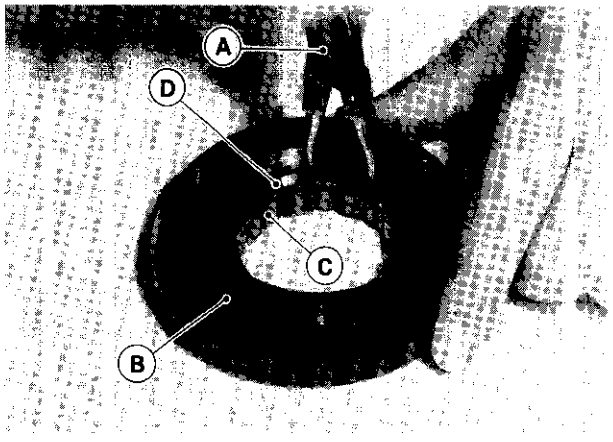


A. Alternator Rotor B. Allen Bolts

●Push the one-way clutch out of the coupling.

Installation

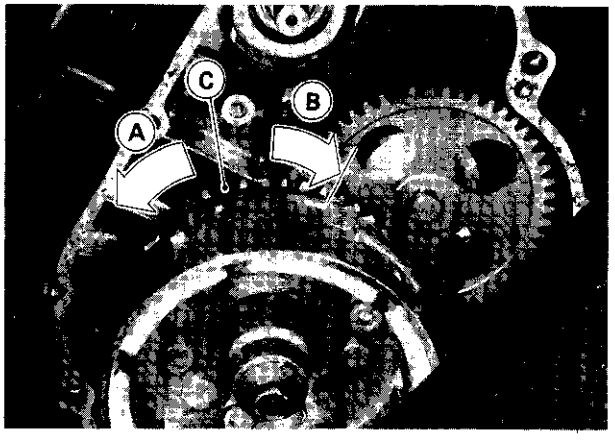
●Note the following.
○Install the one-way clutch.
Use the circlip pliers (special tool).



A. Circlip Pliers
B. Coupling
C. One-way Clutch
D. Circlip

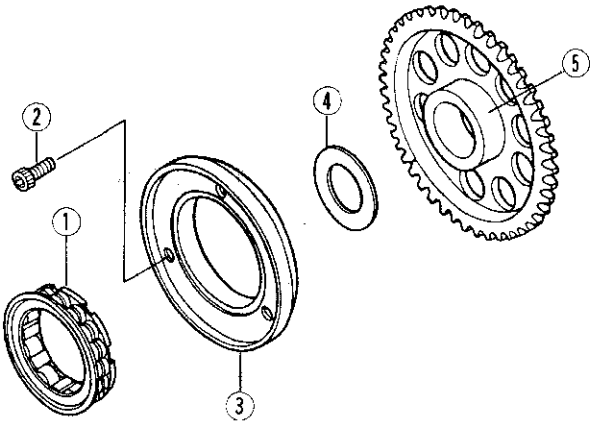
Starter Motor Clutch Inspection

●Remove the following.
Starter Motor Chain
Starter Motor Sprocket
○Turn the sprocket to both sides.



A. Turn freely.
B. Locked.
C. Sprocket

★If the starter motor clutch does not operate as it should or if it makes noise, go to the next step.
●Disassemble the starter motor clutch.
★If the one-way clutch installation is incorrect, reinstall it.
★Visually inspect the clutch parts for damage: one-way clutch, coupling and starter motor clutch gear.
★If there is any worn or damaged part, replace it.

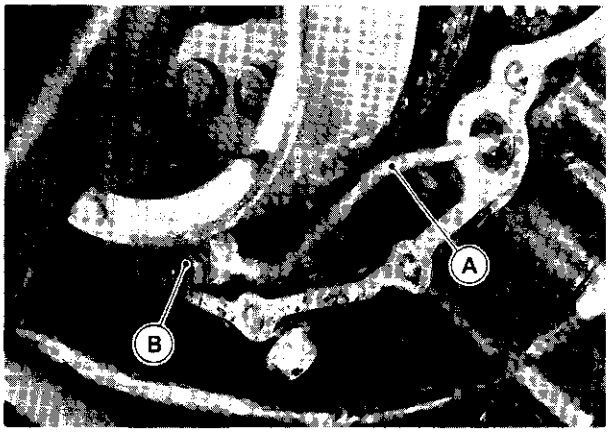


1. One-way Clutch
2. Allen Bolts
3. Coupling
4. Copper Washer
5. Inner Race (Starter Motor Clutch Sprocket)

Starter Motor Chain and Sprockets

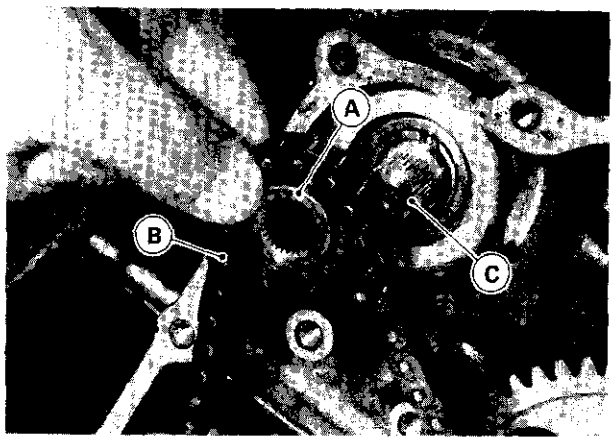
Removal

●Remove the following.
Cargo Bed
Water Pump Cover (see Cooling System chapter)
Left Engine Cover
Chain Guide
Oil Pipe



A. Oil Pipe
B. Banjo Bolt

•Pull the chain with the sprocket out of the starter motor shaft.



A. Sprocket
B. Chain
C. Shaft

Installation

•Note the following.

○Check parts for wear or damage.
O-rings
Copper Washes

○Torque the following.
Banjo Bolt

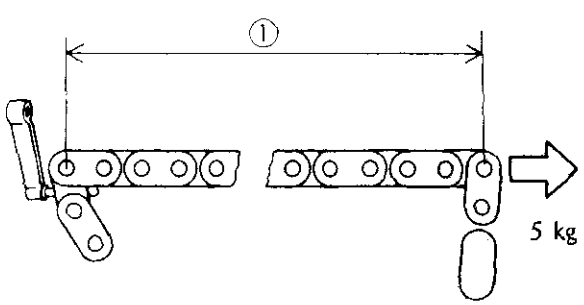
Starter Motor Chain Wear

•Measure the 20-link length.
Hold the chain taut with a force about 5 kg.

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

Starter Motor Chain Wear

Standard: 155.5 – 155.9 mm
Service Limit: 159 mm



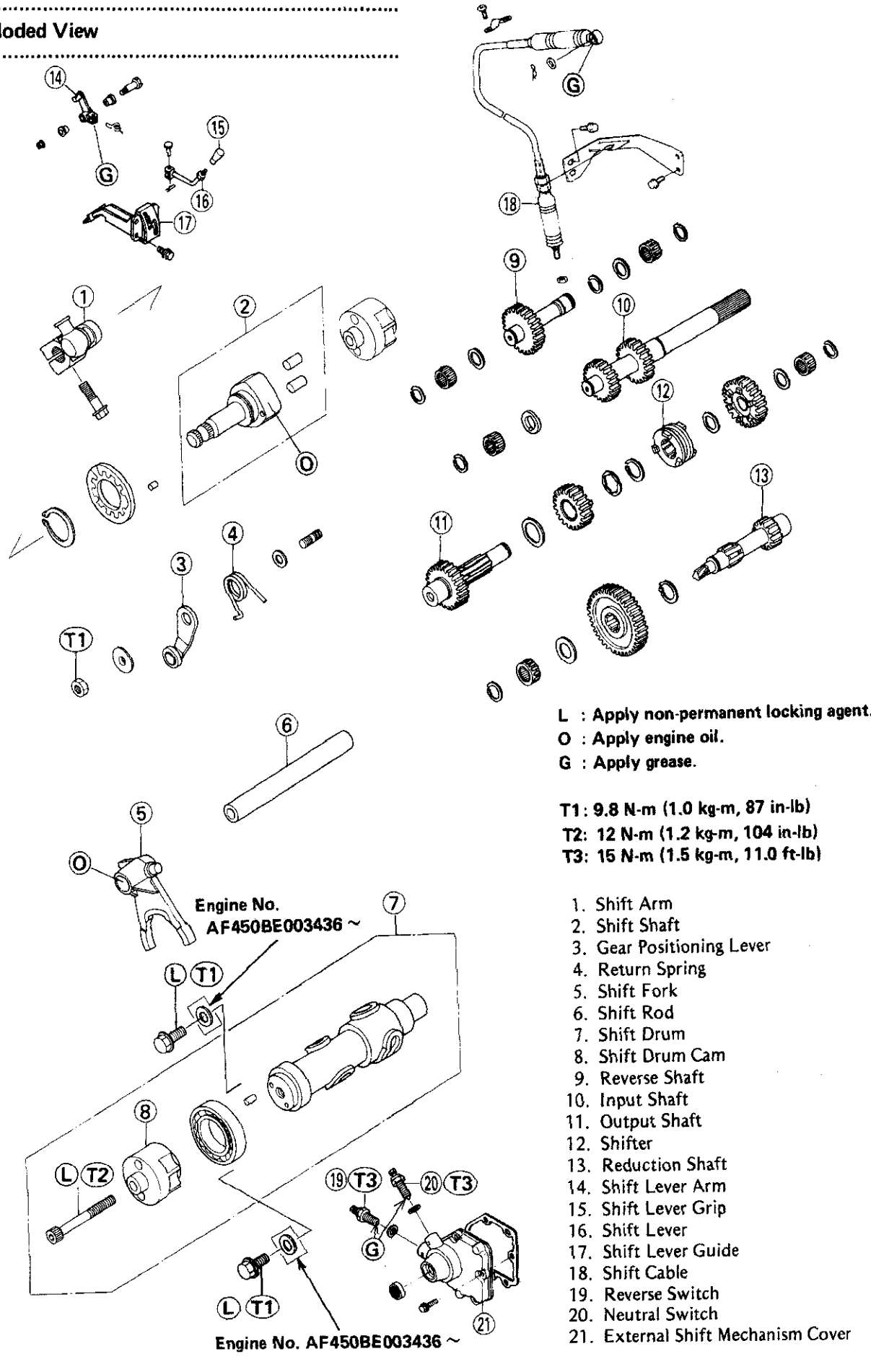
1. 20-Link Length

Transmission/Final Drive

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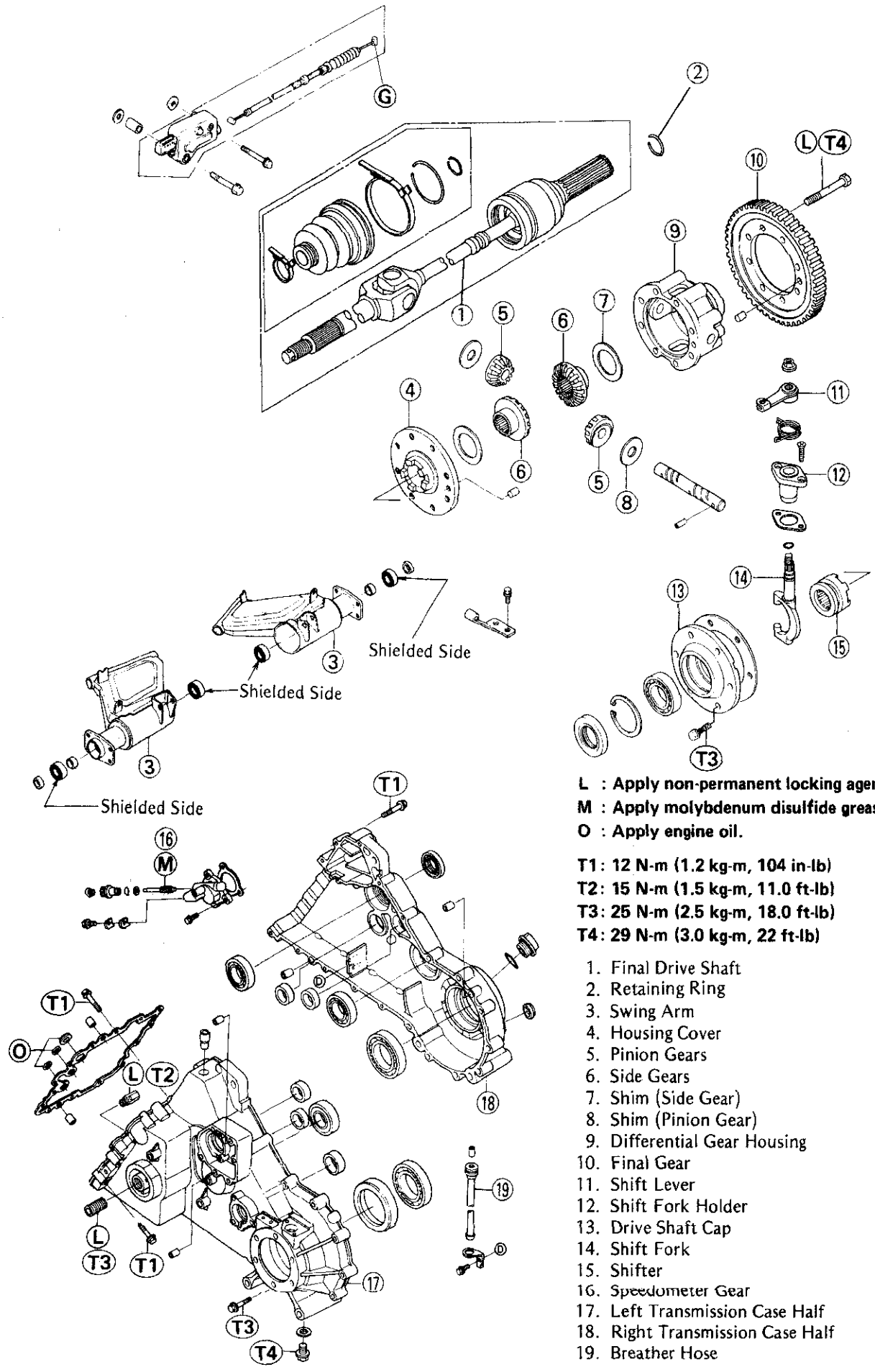
Exploded View



L : Apply non-permanent locking agent.
O : Apply engine oil.
G : Apply grease.

T1: 9.8 N-m (1.0 kg-m, 87 in-lb)
T2: 12 N-m (1.2 kg-m, 104 in-lb)
T3: 15 N-m (1.5 kg-m, 11.0 ft-lb)

1. Shift Arm
2. Shift Shaft
3. Gear Positioning Lever
4. Return Spring
5. Shift Fork
6. Shift Rod
7. Shift Drum
8. Shift Drum Cam
9. Reverse Shaft
10. Input Shaft
11. Output Shaft
12. Shifter
13. Reduction Shaft
14. Shift Lever Arm
15. Shift Lever Grip
16. Shift Lever
17. Shift Lever Guide
18. Shift Cable
19. Reverse Switch
20. Neutral Switch
21. External Shift Mechanism Cover



L : Apply non-permanent locking agent.
M : Apply molybdenum disulfide grease.
O : Apply engine oil.

T1: 12 N-m (1.2 kg-m, 104 in-lb)
T2: 15 N-m (1.5 kg-m, 11.0 ft-lb)
T3: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T4: 29 N-m (3.0 kg-m, 22 ft-lb)

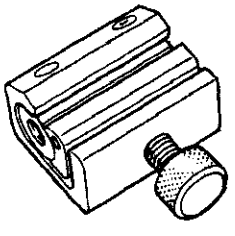
1. Final Drive Shaft
2. Retaining Ring
3. Swing Arm
4. Housing Cover
5. Pinion Gears
6. Side Gears
7. Shim (Side Gear)
8. Shim (Pinion Gear)
9. Differential Gear Housing
10. Final Gear
11. Shift Lever
12. Shift Fork Holder
13. Drive Shaft Cap
14. Shift Fork
15. Shifter
16. Speedometer Gear
17. Left Transmission Case Half
18. Right Transmission Case Half
19. Breather Hose

Specifications

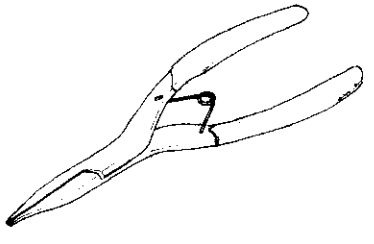
Item	Standard	Service Limit
Transmission:		
Shifter fork groove width	5.05 – 5.15 mm	5.3 mm
Shift fork ear thickness	4.9 – 5.0 mm	4.8 mm
Shift fork guide pin diameter	7.9 – 8.0 mm	7.8 mm
Shift drum groove width	8.05 – 8.20 mm	8.3 mm

Special Tools

Pressure Cable Luber: K56019-021

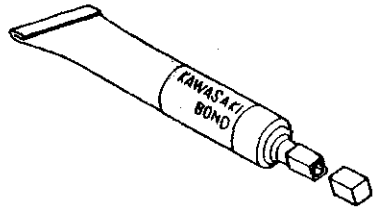


Circlip Pliers: 57001-144



Sealant

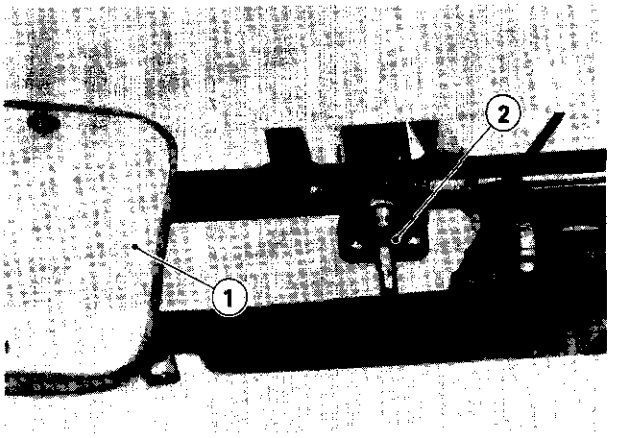
Kawasaki Bond (Liquid Gasket-Black): 92104-1003



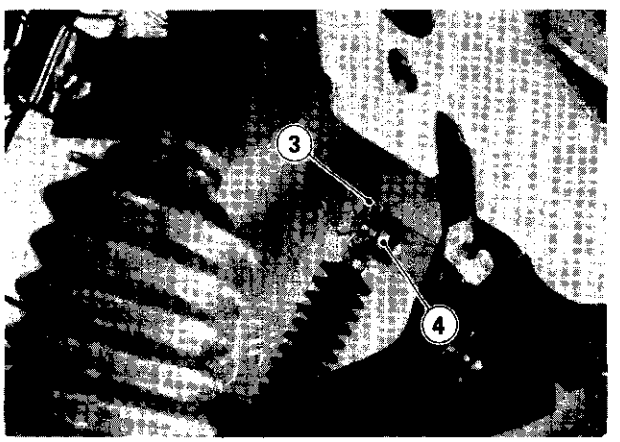
Shift Lever and Cable

Cable Removal

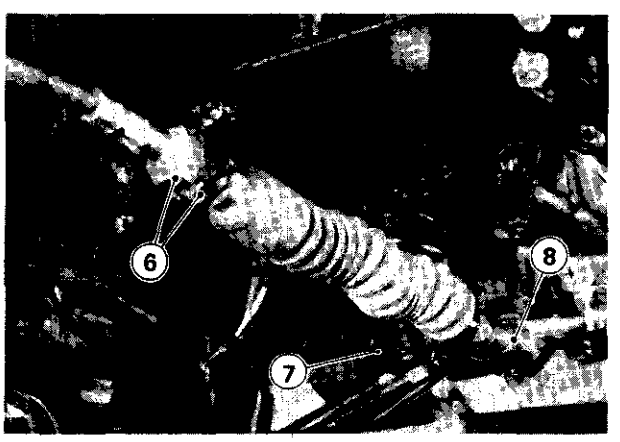
●Remove the following.
1. Maintenance Cover
2. Cable Clamp



3. Clip
4. Cable Upper End



5. Cargo Bed
6. Cable Adjuster Nuts (Loosen)
7. Shift Arm
8. Cable Lower End



9. Front Fender Lower
10. Foot Platform

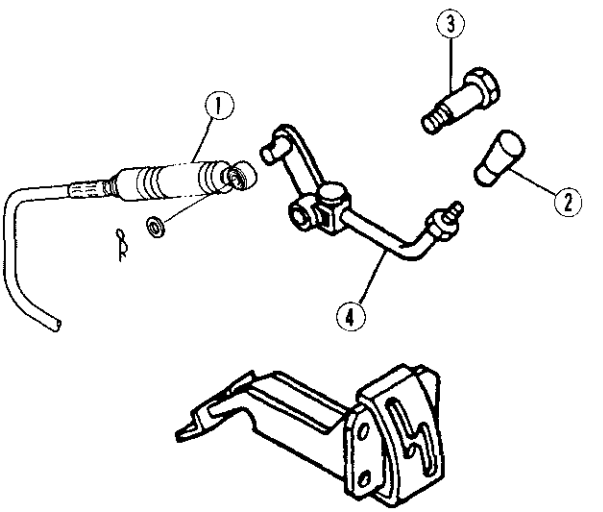
●Pull the cable out of the vehicle.

Cable Intallation

●Installation is reverse of removal. Note the following.
○Adjust the cable after cable installation.

Shift Lever Removal

1. Shift Cable
2. Shift Lever Grip
3. Shift Lever Pivot Bolt
4. Shift Lever Assembly



●Take the shift lever assembly off the lever guide.

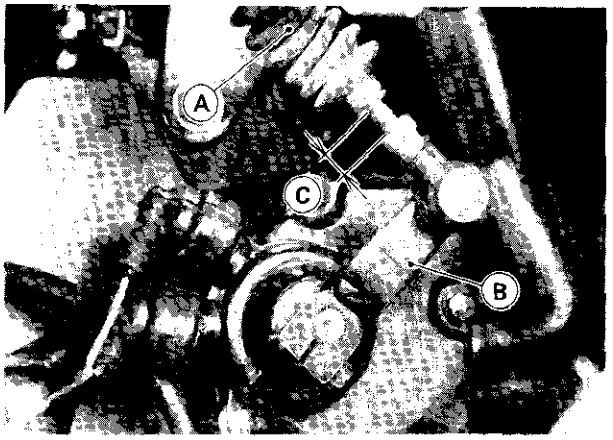
Shift Lever Installation

●Installation is reverse of removal. Note the following.
○Apply grease to the shift lever pivot pin.

Shift Cable Adjustment

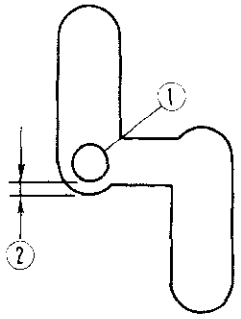
●Lift the cargo bed and secure it.
●Remove the LH rear fender.

Shift Cable Rear End

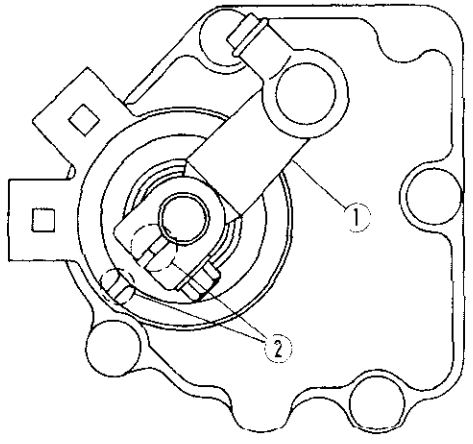


A. Shift Cable
B. Shift Arm
C. About 8 mm

●Check the shift lever and the shift arm synchronization.
○Set the transmission gears in neutral position.
○Check the shift lever play and shift arm position.

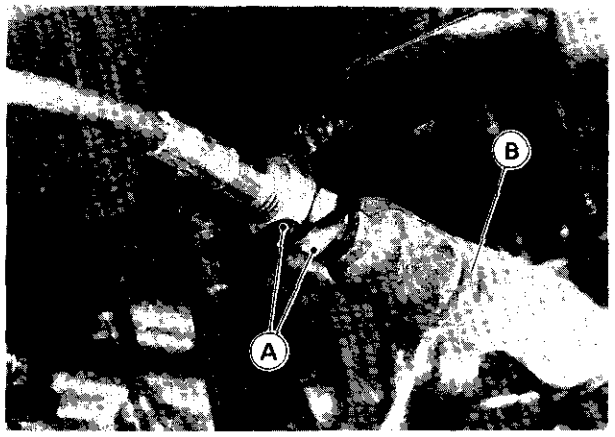


1. Shift Lever (Neutral Position)
2. Play 1.5 – 6.5 mm



1. Shift Arm
2. Align the slit and the mark.

★If shift lever clearance exceeds the specification, adjust the shift cable with the adjuster.



A. Adjuster Nuts
B. Shift Cable

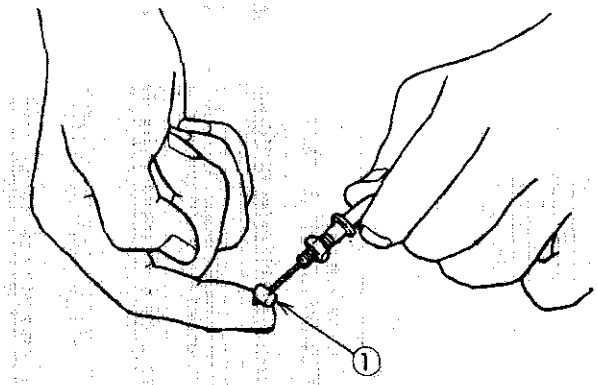
Shift Cable Lubrication

NOTE

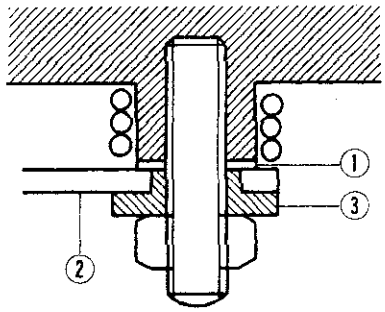
○*Since the shift cable of the transmission is packed with grease and shielded on both sides, it is not required to lubrication.*

Shift Cable Inspection

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



1. Apply grease.



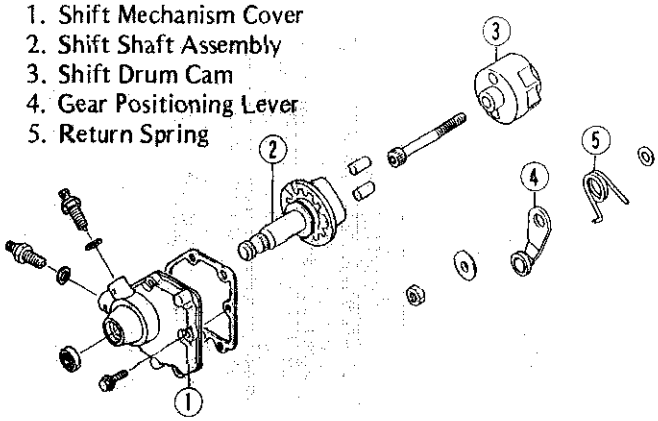
1. Washer
2. Gear Positioning Lever
3. Washer (with stepped portion)

External Shift Mechanism

Removal

●Remove the following.
Shift Lever

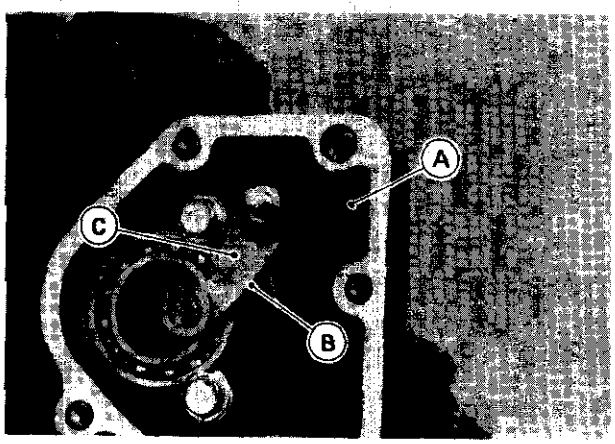
1. Shift Mechanism Cover
2. Shift Shaft Assembly
3. Shift Drum Cam
4. Gear Positioning Lever
5. Return Spring



Installation

●Note the following.

○Install the gear positioning lever and return spring as shown.

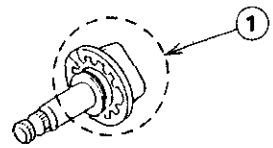


A. Spring Stop
B. Spring End
C. Gear Positioning Lever

○Apply non-permanent locking agent.
Shift Drum Cam Mounting Bolt

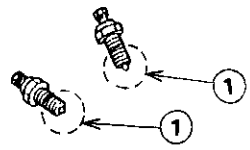
○Check parts for damage.
Knock Pins
Cover Gasket

○Apply engine oil to the shift shaft assembly.



1. Apply engine oil.

○Apply a heavy coat of grease (about 0.1 mL) to the neutral and reverse switch contact points.



1. Apply grease.

Inspection

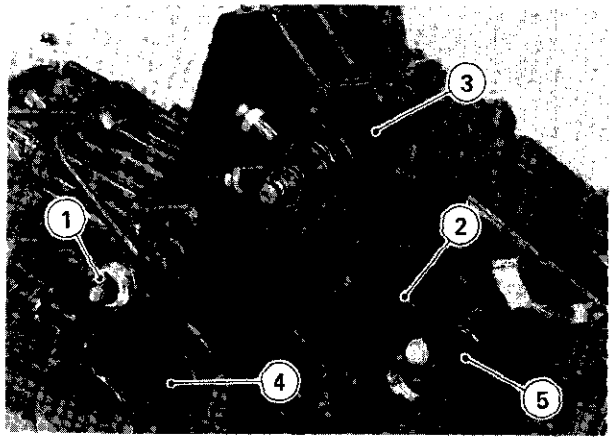
●Check parts for wear or damage.
Shift Shaft Splines
Return Spring
Gear Positioning Lever

★If they are badly worn or if they show any damage, replace them.

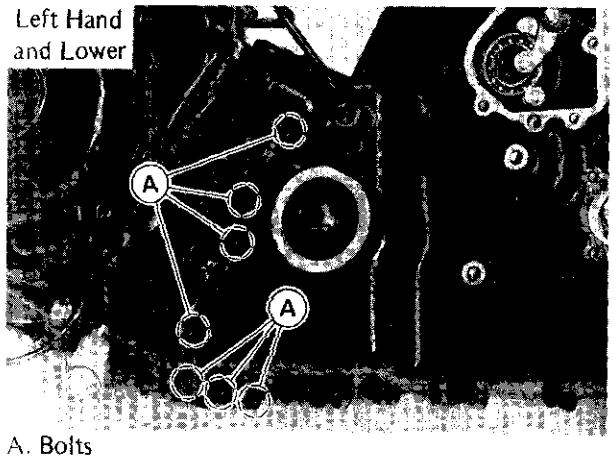
Transmission Case

Splitting

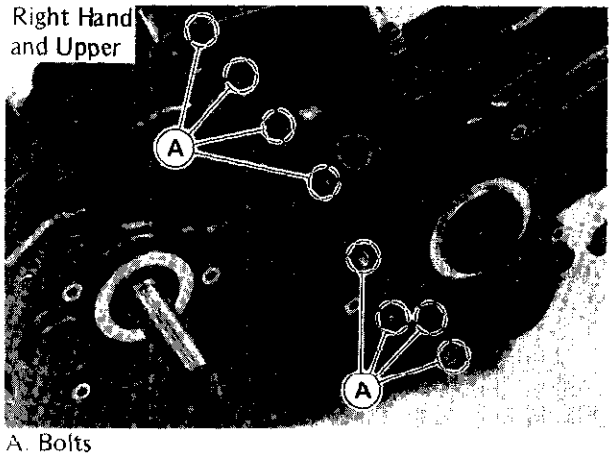
●Remove the following.
Engine
Belt Converter Assembly
1. Oil Pressure Switch
2. Oil Pipe
3. External Shift Mechanism Cover
4. Oil Filter
5. Speedometer Gear Case



●Note the following.
Transmission Case Mounting Bolts



A. Bolts



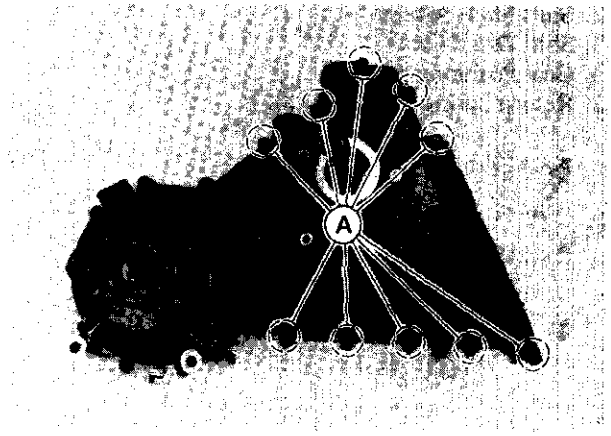
A. Bolts

○Split the transmission case and crankcase.

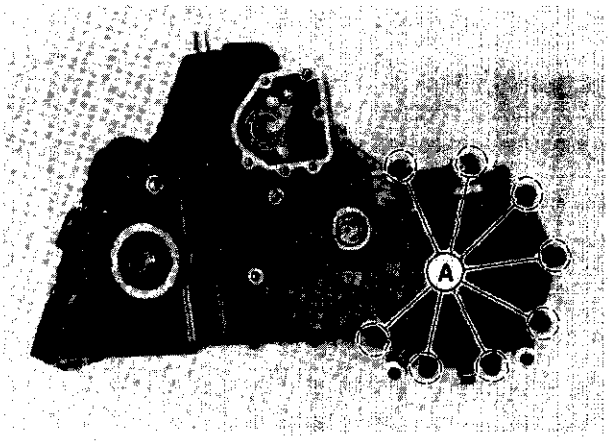


A. Transmission Case B. Crankcase

○Split the transmission case halves.
Transmission Case Bolts

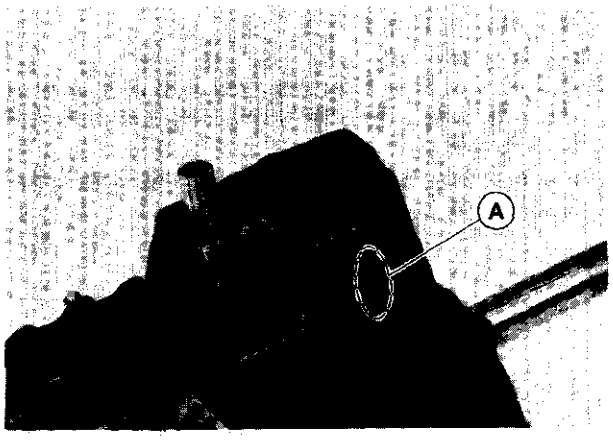


A. φ6 mm Bolts



A. φ8 mm Bolts

Using the pry point.



A. Pry Point

Assembly

•Note the following.

○Install the transmission shafts and differential assembly.

○Apply liquid gasket to the mating surface of the transmission case half.

○Torque the 8 mm case bolts first, and then 6 mm bolts.

○Replace the O-rings with new ones if they are damaged.

○The O-rings must be installed with the flat side facing to the transmission case.

○Apply engine oil to the O-rings.

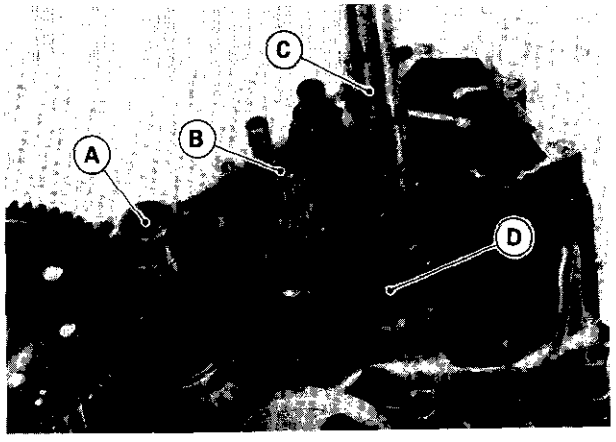
○Replace the gasket with a new one.

○Torque the following (see Exploded View).
Transmission Case Mounting Bolts

Transmission Shafts

Removal

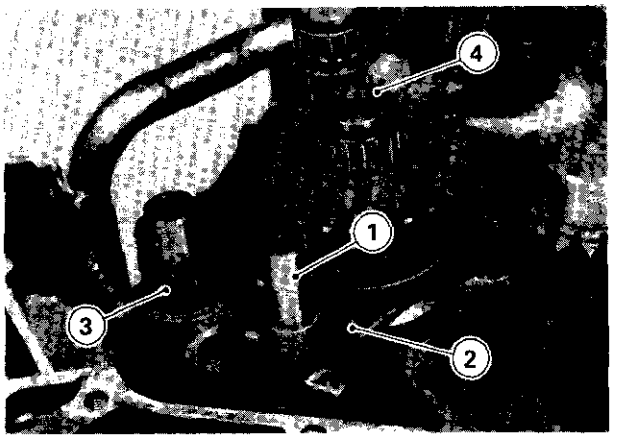
○Remove the transmission shafts.



A. Reduction Shaft
B. Output Shaft
C. Input Shaft
D. Reverse Shaft

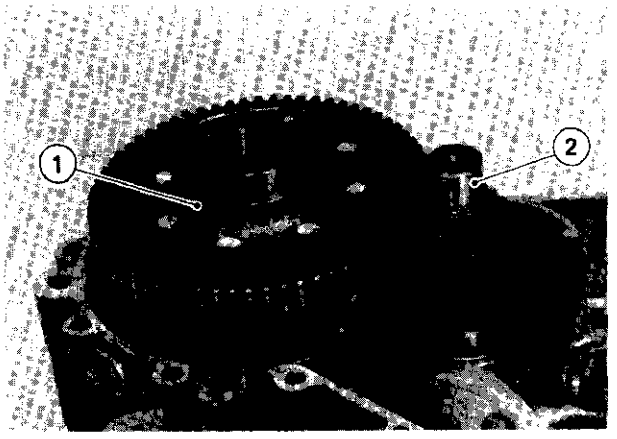
○Remove the output shaft.

1. Shift Rod
2. Shift Fork
3. Shift Drum
4. Output Shaft



○Remove the reduction shaft.

1. Differential Assembly
2. Reduction Shaft



Installation

•Note the following.

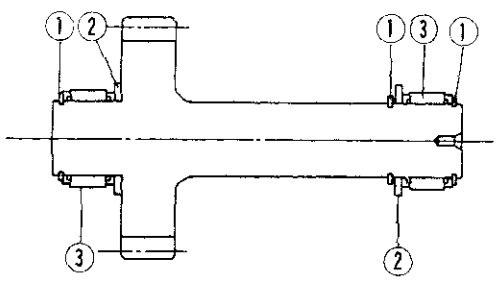
○Apply engine oil.
Sliding Portion of Gears
Bearings

Transmission Disassembly

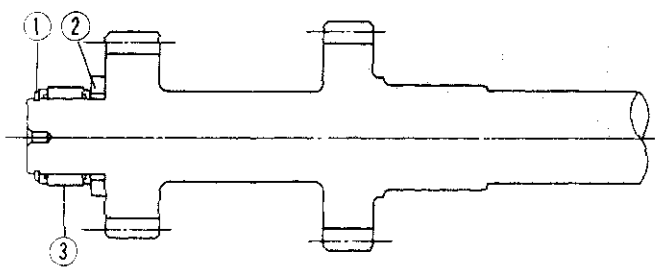
•Note the following.

○Remove the circlips.
Using the circlip pliers (special tool: 57001-144)

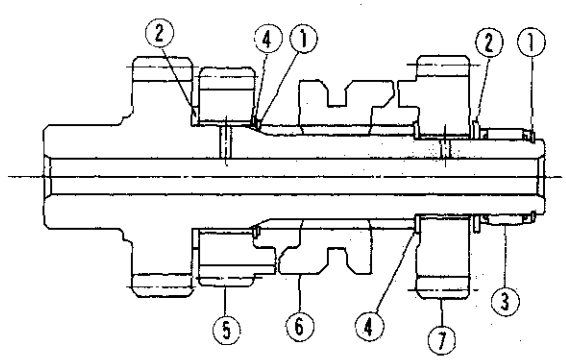
Reverse Shaft



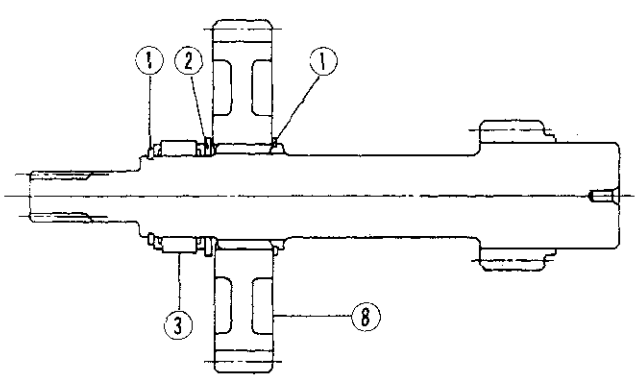
Input Shaft



Output Shaft



Reduction Shaft



1. Circlip
2. Spacer
3. Needle Bearing
4. Washer
5. Reverse Gear
6. Shifter
7. Forward Gear
8. Reduction Gear

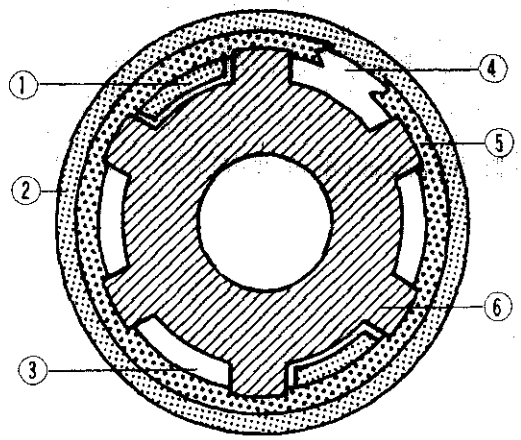
Transmission Assembly

●Note the following.

○Replace any circlips that were removed with new ones.

○Install the circlips so that the opening is aligned with a spline groove.

○Install the toothed washers so that the teeth are not aligned with the circlip opening.



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

Shift Fork Bend

●Visually inspect the shift fork.

★If the shift fork is bent, replace it.

Shift Fork/Shifter Groove Wear

●Measure the thickness of the ears on the shift fork.

★If the thickness is less than the service limit, the shift fork must be replaced.

Shift Fork Ear Thickness

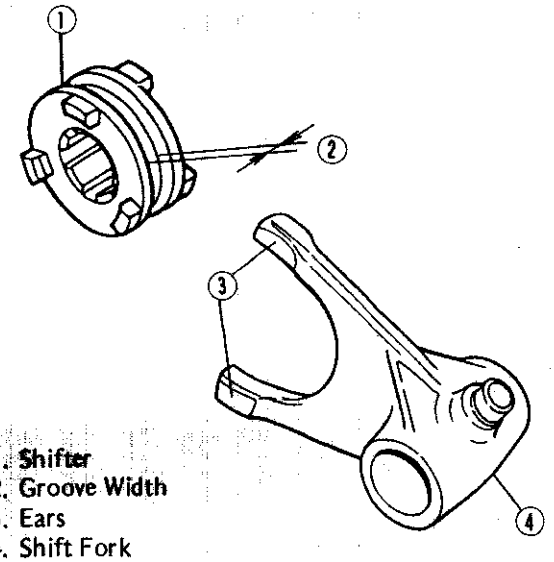
Standard:	**4.9 – 5.0 mm**
Service Limit:	**4.8 mm**

●Measure the width of the shifter fork groove on the shifter.

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

Shifter Fork Groove Width

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



1. Shifter
2. Groove Width
3. Ears
4. Shift Fork

Shift Fork Guide Pin/Shift Drum Groove Wear

●Measure the diameter of the shift fork guide pin.

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

Shift Fork Guide Pin Diameter

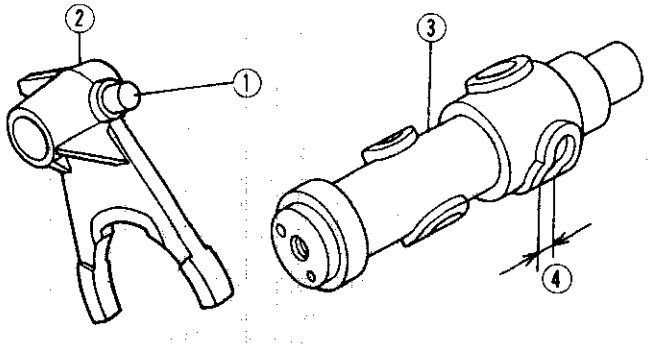
Standard:	**7.9 – 8.0 mm**
Service Limit:	**7.8 mm**

●Measure the width of the shift drum groove.

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

Shift Drum Groove Width

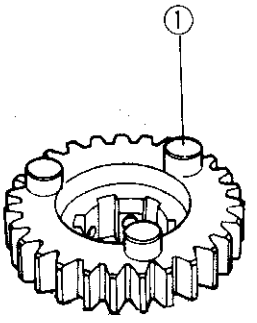
Standard:	**8.05 – 8.20 mm**
Service Limit	**8.3 mm**



1. Guide Pin
2. Shift Fork
3. Shift Drum
4. Groove

Gear Dog Damage

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

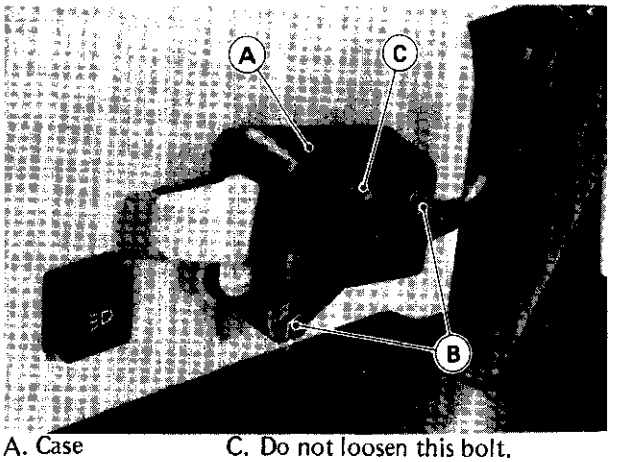


1. Dog

Differential Shift Mechanism

Shift Lever Case Removal

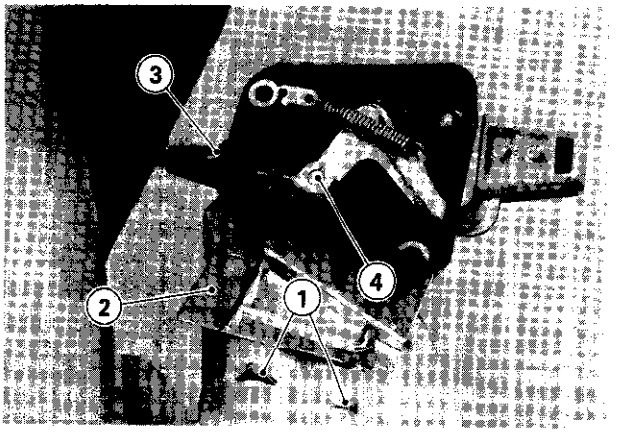
●Remove the case bolts.



A. Case
B. Bolts
C. Do not loosen this bolt.

●Separate the cable from the case.

1. Plate Screws
2. Plate
3. Cable Housing
4. Cable Tip



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.

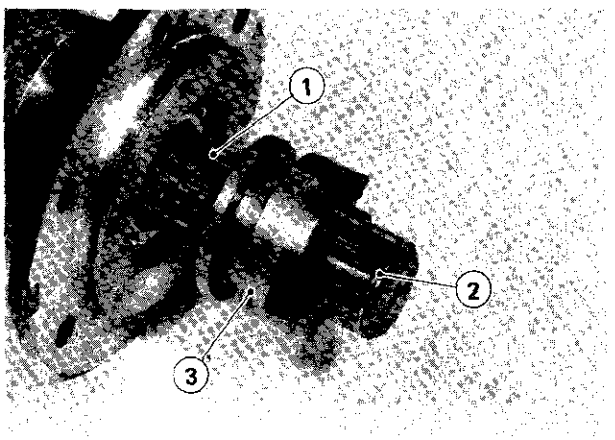
Shift Lever Case Installation

- ●Note the following.
- ●Lubricate the differential cable (see Differential Cable Lubrication).
- ●Adjust the differential cable (see Differential Cable Adjustment).

Shifter and Shift Fork Removal

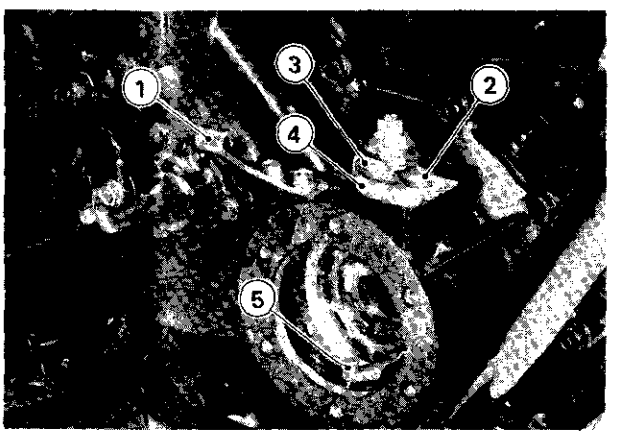
- ●Drain the engine oil (see Engine Lubrication System chapter).
- ●Support the vehicle with jacks.
- ●Remove the shifter.

1. LH Final Drive Shaft (see Final Drive Shaft Removal)
2. Retaining Ring
3. Shifter



- ●Remove the shift fork.

1. Shift Cable Bracket
2. Shift Fork Lever
3. Spring
4. Shift Fork Holder
5. Take the shift fork out of the case if necessary.



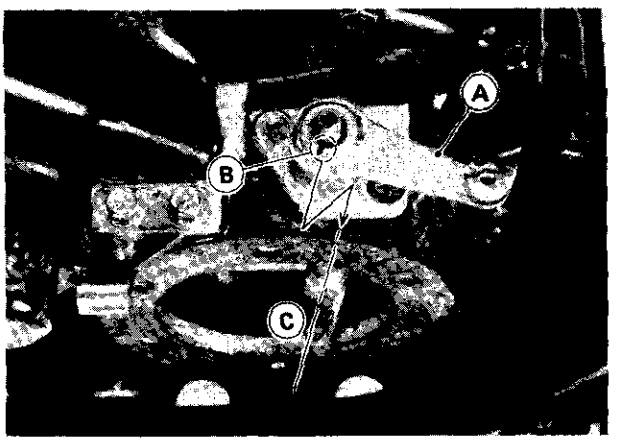
Shifter and Shift Fork Installation

- ●Note the following.

○Check parts for damage.
O-ring
Gasket (Shift Lever Holder)

○Apply grease.
Shift Fork Shaft
O-ring

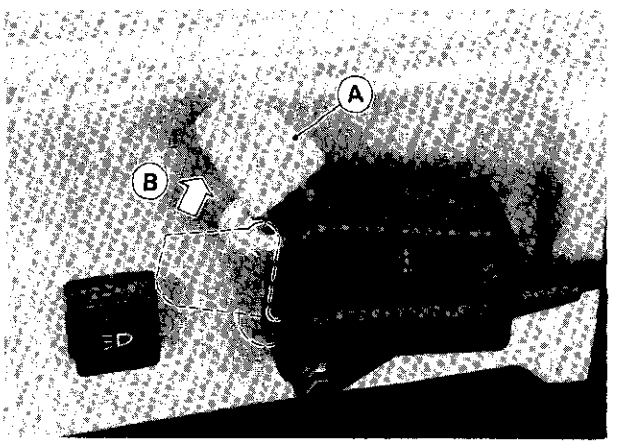
○Install the shift lever.
Align the lever mark to the fork center line.



A. Shift Lever
B. Mark
C. Center Line

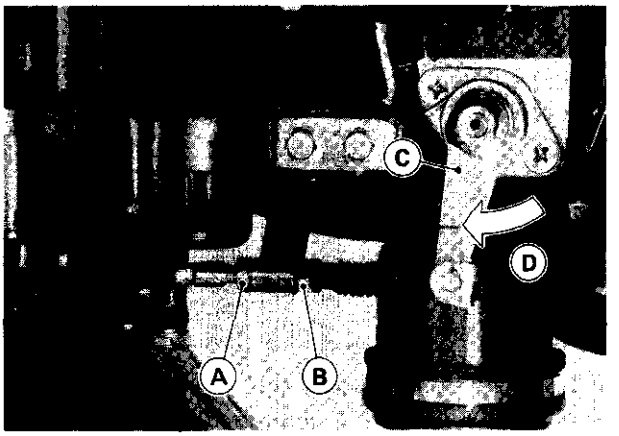
Differential Cable Adjustment

- ●Position differential shift lever.
  "Lock" position



A. Differential Shift Lever B. Lock Position

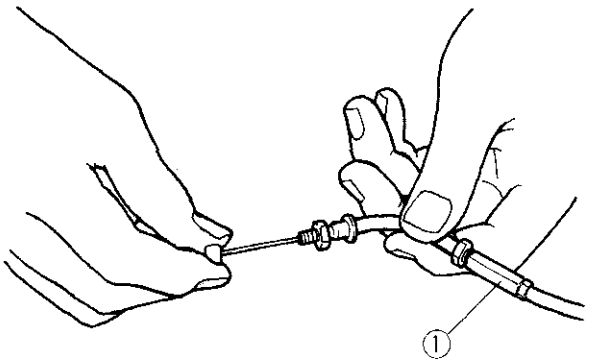
- ●Loosen the cable adjuster mounting nuts.
- ●Push the shift fork lever clockwise.
- ●Turn in the mounting nut A with finger.
- ●Lock the mounting nut B.



A. Mounting Nut A
B. Mounting Nut B
C. Shift Fork Lever
D. Turn clockwise.

Differential Cable Inspection

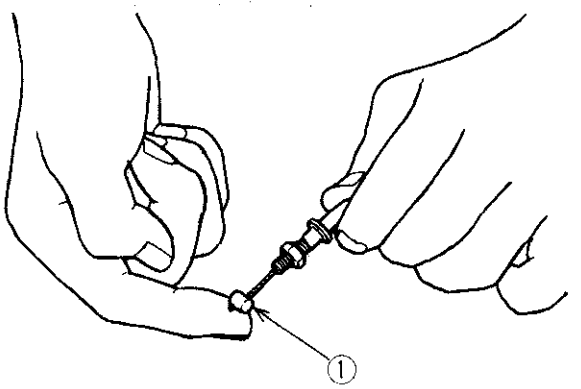
★If cable movement is not free after lubricating, if the cable is frayed, or if the housing is kinked, replace the cable.



1. Differential Cable

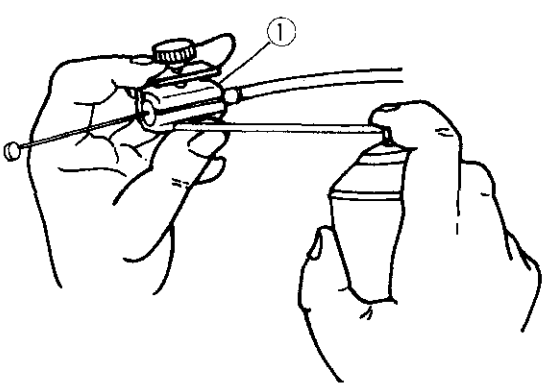
Differential Cable Lubrication

●Apply a thin coating of grease to the cable ends.



1. Apply grease.

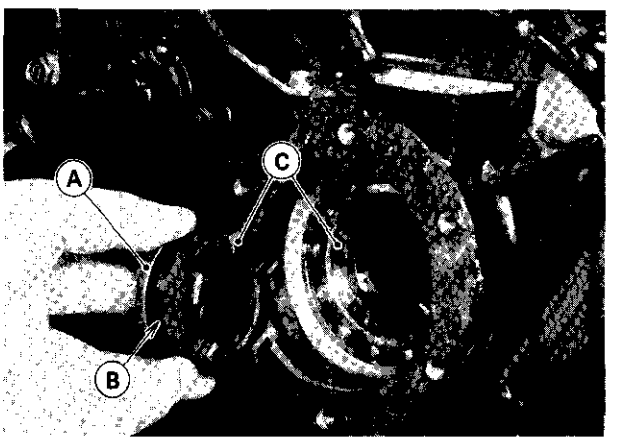
●Lubricate the cable with a penetrating rust inhubitor, such as equivalent.



1. Pressure Cable Luber: K56019-021

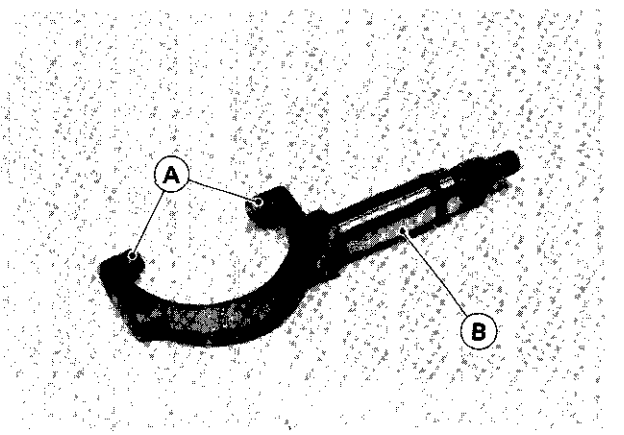
Shifter and Shift Fork Inspection

●Visually inspect the dogs on the shifter.
●Visually inspect the shifter groove.
★If they are damaged or worn excessively, replace them.



A. Shifter
B. Groove
C. Dogs

●Visually inspect the shift fork ears.
★If it is damaged or worn excessively, replace it.

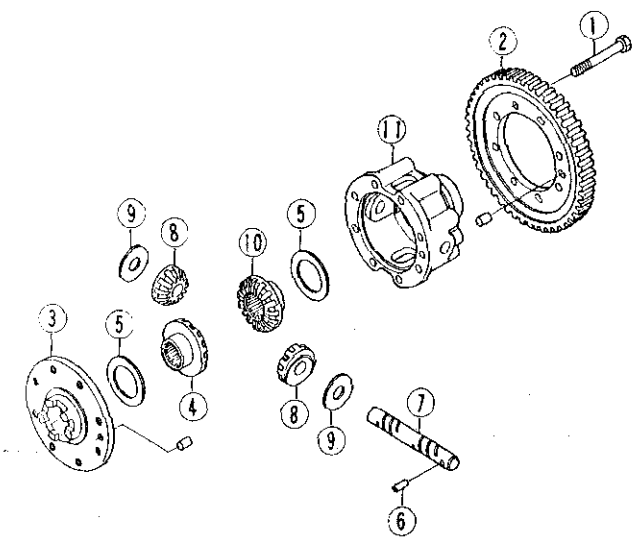


A. Ears
B. Shift Fork

Differential Gears

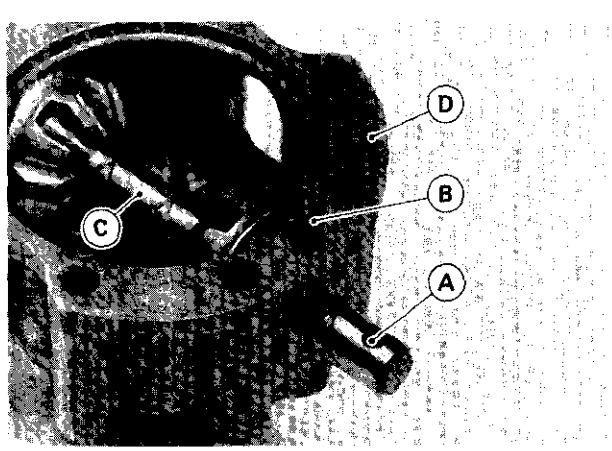
Disassembly

●Remove the following.
1. Gear Bolts
2. Final Gear
3. Housing Cover
4. Left Side Gear
5. Shims
6. Pin (Use the ϕ4.8 mm x 65 mm length rod)
7. Pinion Gear Shaft
8. Pinion Gears
9. Shims
10. Right Side Gear
11. Differential Gear Housing



Assembly

●Note the following.
○Align the pin holes of the pinion gear shaft and the housing.

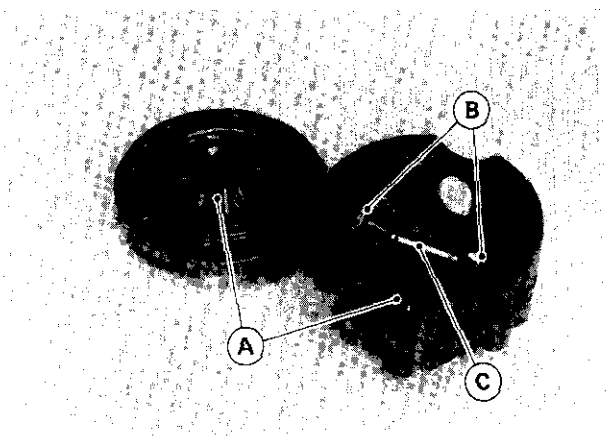


A. Shaft Pin Hole
B. Pin
C. Pinion Gear Shaft
D. Housing

●Replace the pin with a new one.
○Check parts for damage.
Shims
○Torque the following.
Gear Bolts
○Apply non-permanent locking agent.
Gear Bolts

Differential Gear Inspection

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



A. Side Gears
B. Pinion Gears
C. Pinion Gear Shaft

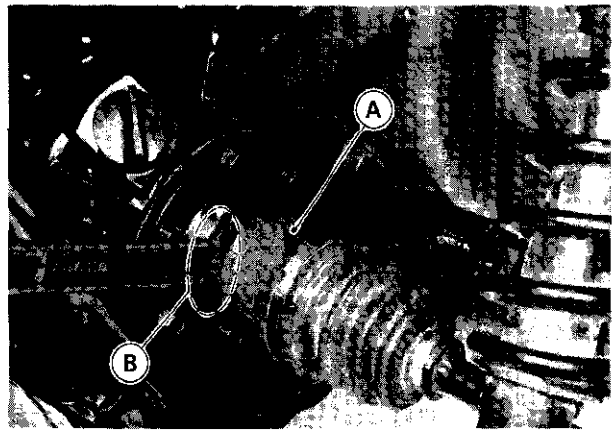
Final Drive Shafts

Drive Shaft Removal

●Remove the following.
Engine Oil (Drain Out)
Rear Wheel (see Wheels/Tires chapter)
Hub Nut
Rear Hub
Rear Shock Absorber Lower Bolt (see Suspension chapter)
Swing Arm Pivot Shaft (see Suspension chapter)
Swing Arm (see Suspension chapter)
Drive Shaft
(Pry the shaft with a metal level if necessary.)

NOTE

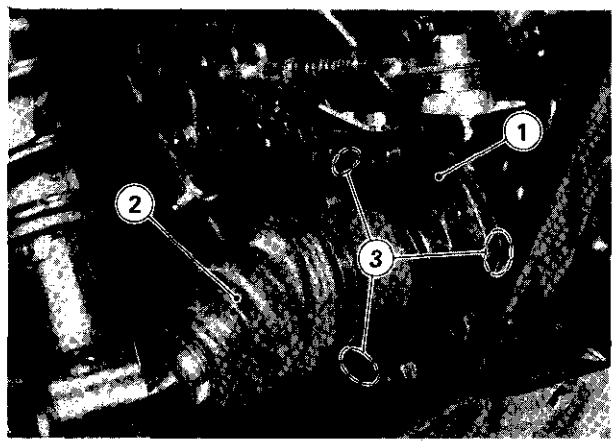
○*Do not push the oil seal by edge of the lever, since push will damage it.*

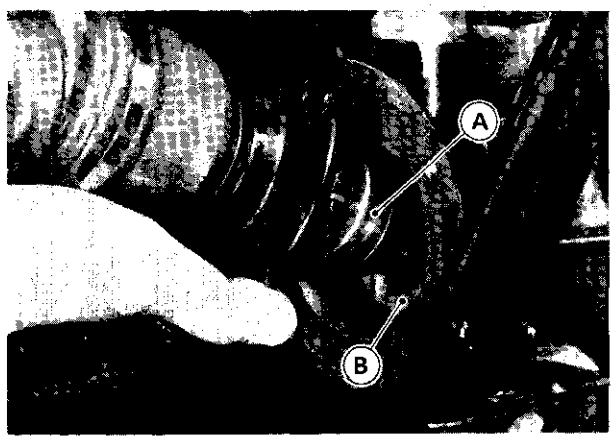


A. Drive Shaft B. Pry here.

○To remove the LH drive shaft, remove the following.

1. Drive Shaft Cap
2. LH Drive Shaft
3. With the pry points
   Move the shaft forward.
   Push the shaft end up.
   Pull the shifter out of the fork.





A. Shifter B. Fork Ears

Drive Shaft Installation

●Mesh the splined portion of the differential assembly and the drive shaft.

○To install the LH drive shaft, install the following.

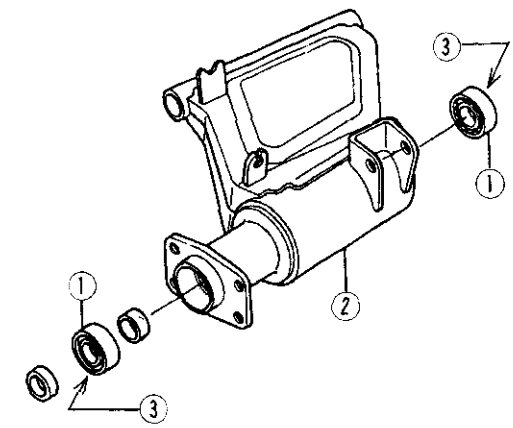
1. Fit the shifter onto the fork ears.
2. Install the drive shaft.
3. Install the drive shaft cap.
4. Torque the cap bolts (see Exploded View).

Drive Shaft Bearing Replacement

●Remove the bearings by tapping the inner race.

NOTE

○*Install the bearings so that the marked or shielded sides face out.*



1. Bearings 3. Shielded Side
2. Swing Arm

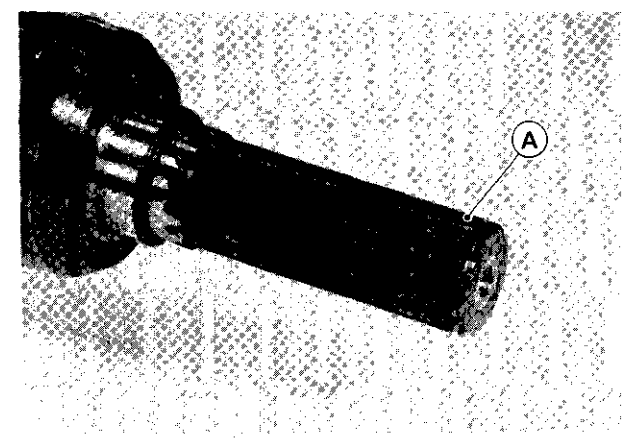
Drive Shaft Inspection

●Visually inspect the splines of the drive shaft.

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

●Check that the universal joint and the ball joint works smoothly without ratting or sticking.

★If it does not, the bearing of the joints are damaged. Replace the drive shaft with a new one.



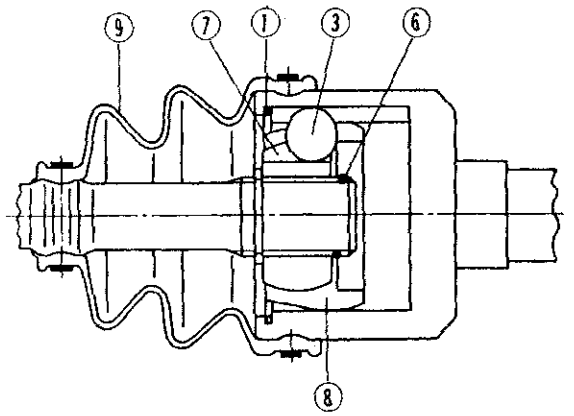
A. Splined Portion

Drive Shaft Ball Joint Rubber Boot Inspection

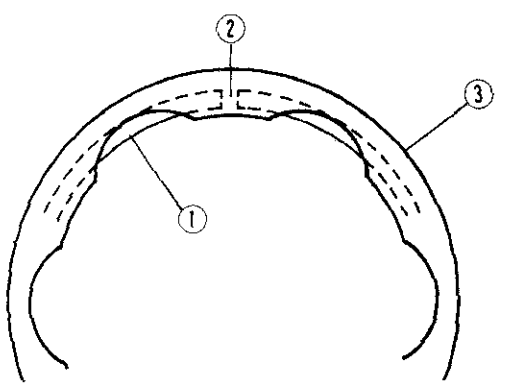
- Visually inspect the rubber boot for damage.
- ★If it is damaged (cracks or holes), replace it with the boot set.

Rubber Boot Replacement

- Remove the drive shaft assembly.
- Unlock the boot band and move the boot toward the universal joint.
  1. Retaining Ring (Big)
  2. Split the shaft and the joint (outer race).
  3. Balls
  4. Turn the cage to half pitch (about 30°).
  5. Pull the cage for the universal joint.
  6. Retaining Ring (Small)
  7. Inner Race
  8. Cage
  9. Rubber Boot
- Discard the used retaining rings and the boot bands.



- Assemble the ball joint, note the following.
  - ○Clean off the ball joint parts with clean cloth.
  - ○Replace the retaining rings and the boot bands with new ones (in the boot set).
  - ○Apply grease (in the boot set) into the outer race (about 30 g).
  - ○Install the retaining ring so that the opening is aligned with a projection.

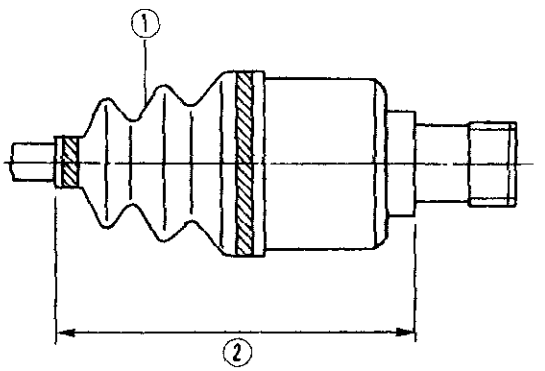


1. Retaining Ring
2. Opening
3. Outer Race

- ○Apply grease to the outside of the ball joint after installing the retaining ring (about 25 g).
- ○Fit the rubber boot onto the outer race.

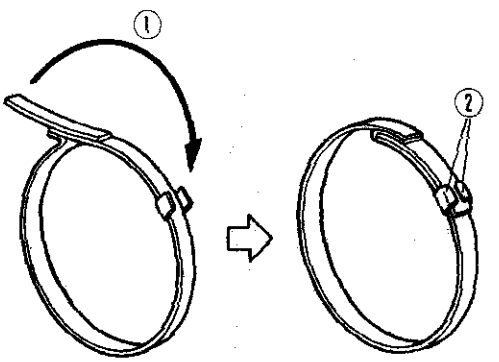
NOTE

- ○***Set the drive shaft for specified position, and slightly open the longer diameter end of the rubber boot to make the inside air pressure atmospheric before the boot is clamped.***



1. Boot
2. 146 mm

- ○Clamp the boot band as shown and bend the tangs securely to hold the band end.

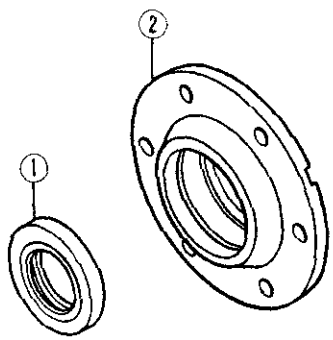


1. Pull
2. Tangs

Oil Seals

Replacement

- Remove the drive shaft.
- Remove the oil seal from the cap.
  Use a hook.



1. Oil Seal
2. Cap

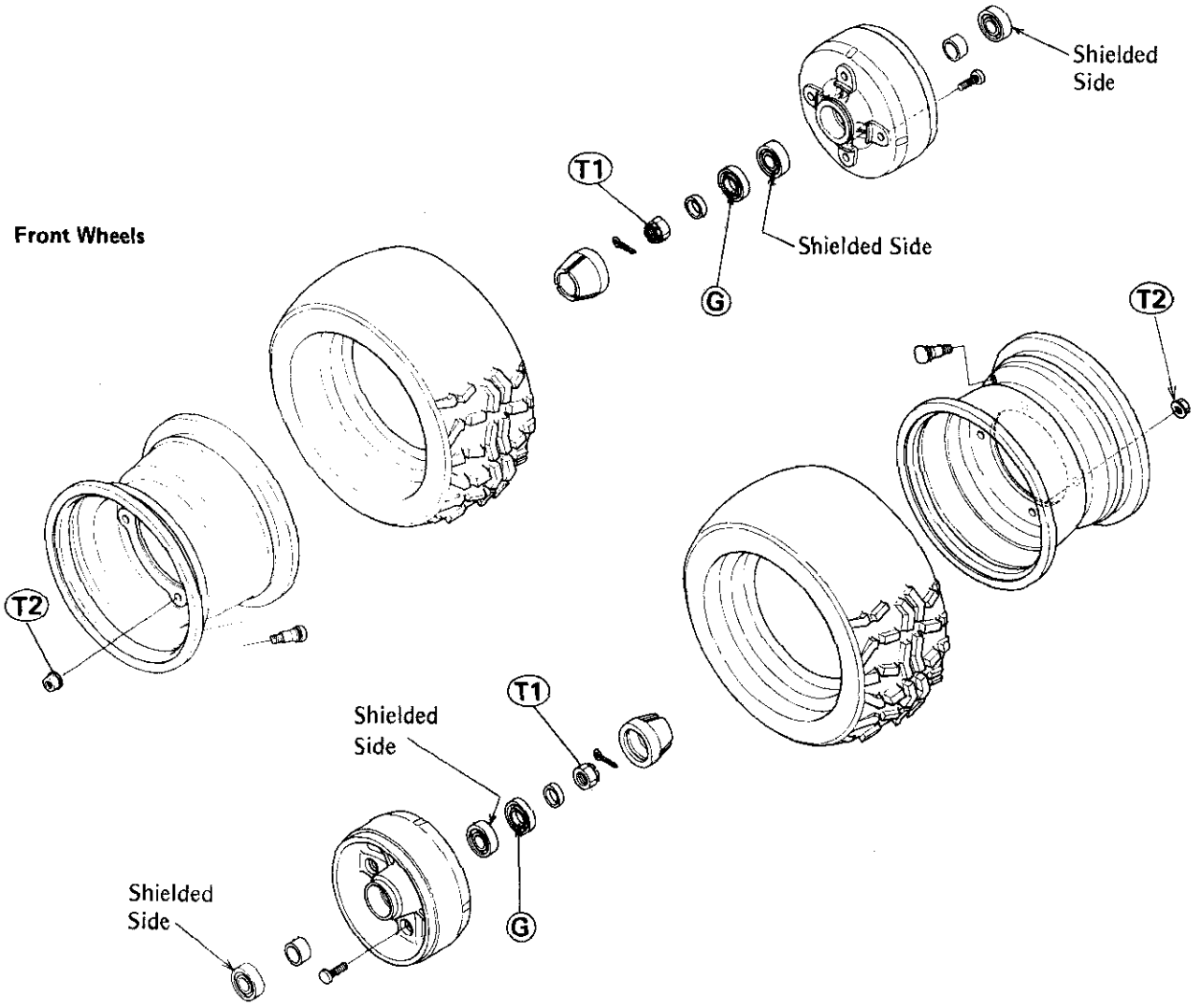
- Press into the oil seal.
  Use the bearing driver set.

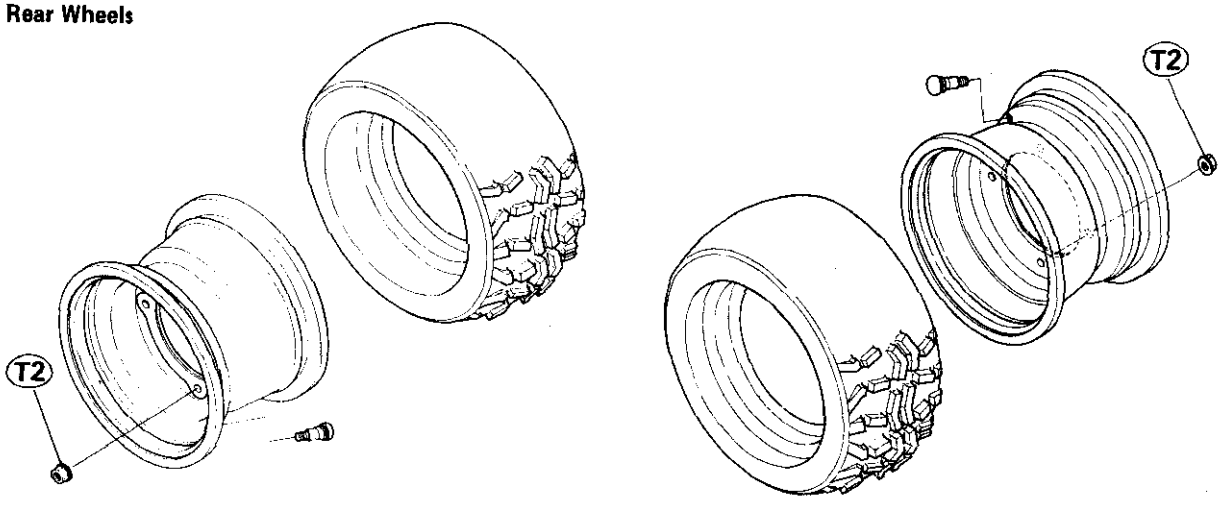
Wheels/Tires

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Exploded View





G : Apply grease.

T1: 37 N-m (3.8 kg-m, 27 ft-lb)
T2: 52 N-m (5.3 kg-m, 38 ft-lb)

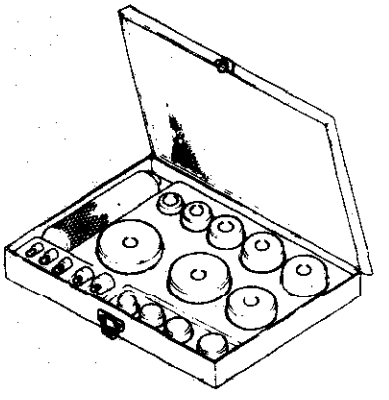
Specifications

Item		Standard
Wheel alignment:		
Caster		6.1° (non-adjustable)
Camber		1.7° (non-adjustable)
Toe-in		−10 ~ +21 mm
Standard tire:		
Front and Rear		22 x 11.00-10 Dunlop KT869 Tubeless
Optional tire:	Radial	22 x 11.00 - 10 4PR Dunlop KT869, STEEL BELTED RADIAL Tubeless
	Mud	22 x 11.00 - 10 4PR Dunlop KT962 Tubeless
Tire payload (maximum)		295 kg @100 kPa (1.0 kg/cm², 15 psi)
Tire air pressure (when cold):		
	Front	80 kPa (0.8 kg/cm², 12 psi)
	Rear	100 kPa (1.0 kg/cm², 15 psi)
Maximum tire air pressure		
(to seat beads, when cold)		250 kPa (2.5 kg/cm², 36 psi)
Tire tread depth		13.2 mm (service limit: 3 mm)

Special Tools

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

Bearing Driver Set: 57001-1129

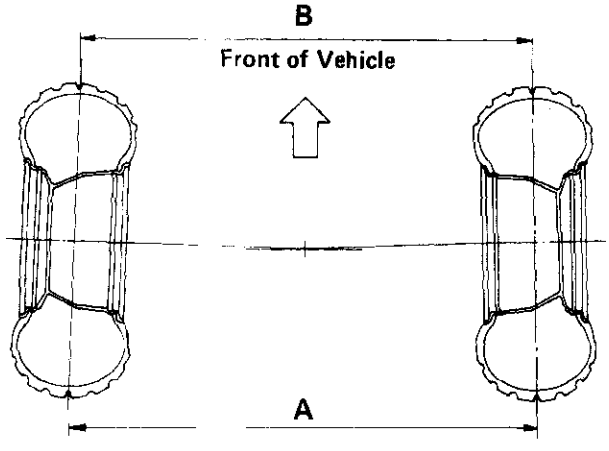


Wheel Alignment

Toe-in is the amount that the front wheels are closer together in front than at the rear at the axle height. When there is toe-in, the distance **A** is greater than **B** as shown. The purpose of toe-in is to prevent 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



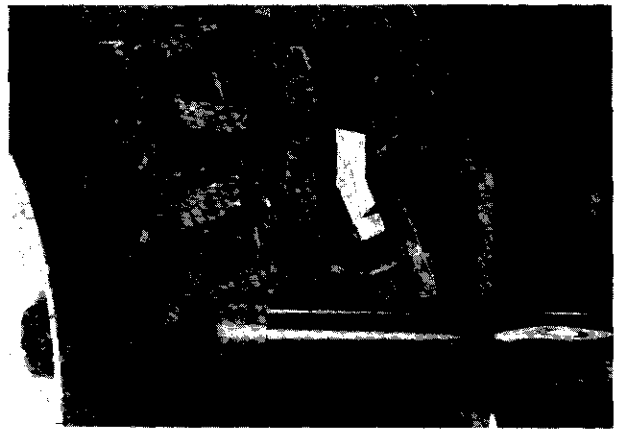
A – B = Amount of Toe-in
(Distance A and B are measured at hub height)

Toe-in Adjustment

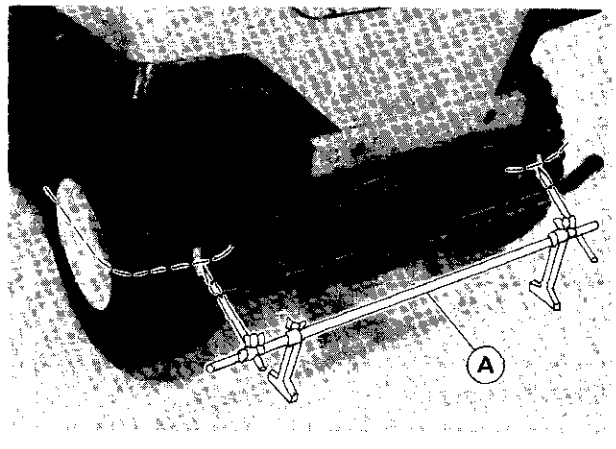
- Lift the front wheels off the ground.
- Apply a heavy coat of chalk near the center of the front tires.



- Using a needle nose scriber, make a thin mark near the center of the chalk coating while turning the wheel.



- Set the wheels so that the marks on the tires are at the front side and at the level of the axle height.
- Ground the front wheels.
- Set the steering wheel straight ahead.
- At the level of the axle height, measure the distance between the scribed lines with a suitable toe-in gauge.

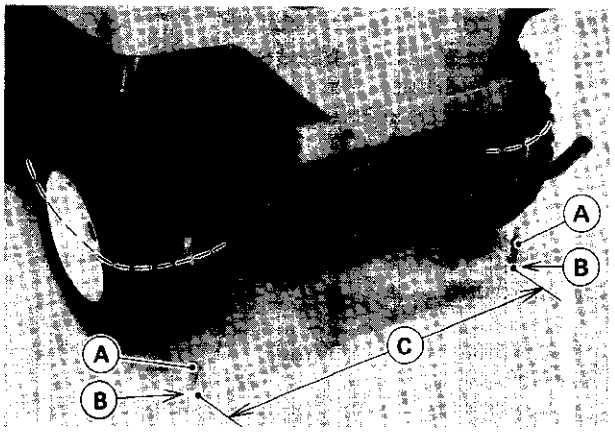


A. Toe-in Gauge (Measure the distance between lines)

- Move the vehicle rearward until the marks on the front tires are at the rear side and at the same level as the axle.
- Measure the distance between the scribed lines.

NOTE

○*If a suitable toe-in gauge is not available, use a plumb bob and a string to measure the distance.*



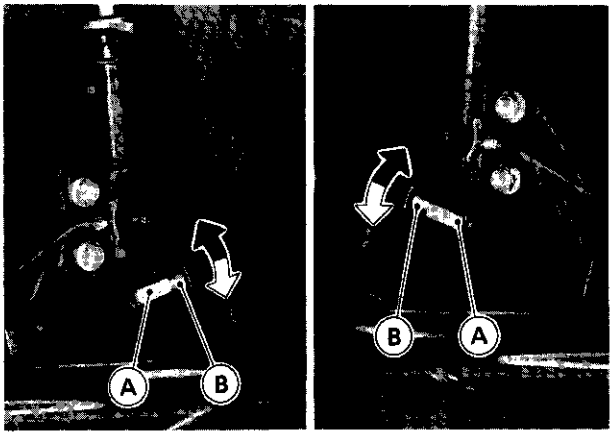
A. Plumb Bob
B. Mark on the floor.
C. Measure the distance between marks.

●Subtract the measurement of the front from the measurement of the rear to get the toe-in.
★If the toe-in is not within the specified range, perform the following procedure.

Toe-in of Front Wheels

Standard: −10 ~ +21 mm

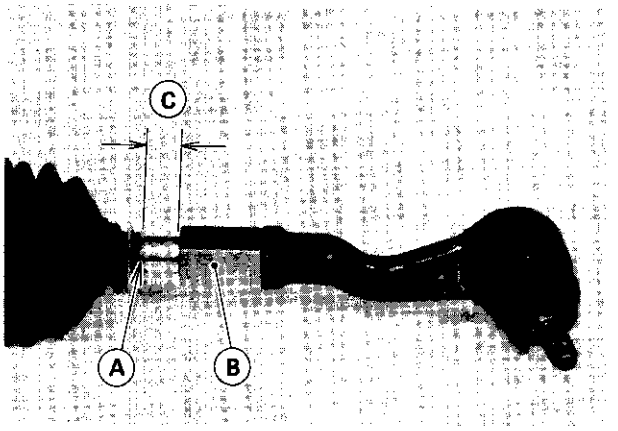
●Loosen the locknuts and turn the adjusting rods the same number of turns on both sides to achieve the specified toe-in.



A. Locknut
B. Adjusting Rod

NOTE

○*The toe-in will be near the specified range, if the length of the tie-rod distance between the rod groove and the locknut is 13 mm on both the left and right tie-rods.*



A. Groove
B. Locknut
C. 13 mm

●Check the toe-in again.
●Torque the following.
Tie-rod End Locknut
●Test ride the vehicle.

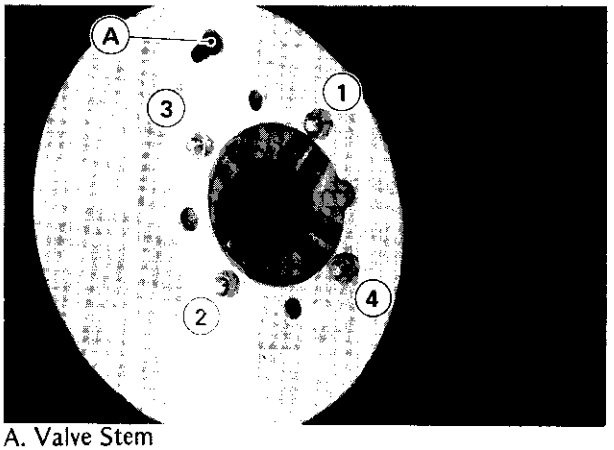
Wheels (Rims)

Wheel Removal

●Loosen the wheel nuts (Do not remove).
●Lift the wheel(s) off the ground.
●Remove the following.
Wheel Nuts
Wheel(s)

Wheel Installation

●Position the wheel so that the valve stem is toward the outside of the vehicle.
●Torque the following.
Wheel Nuts
○Tighten the wheel nuts in a criss-cross pattern.

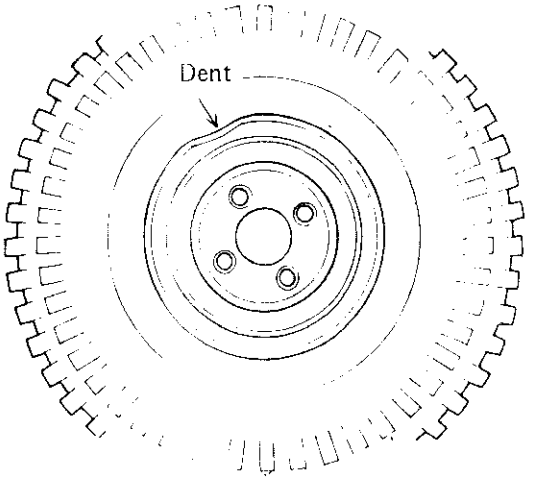


A. Valve Stem

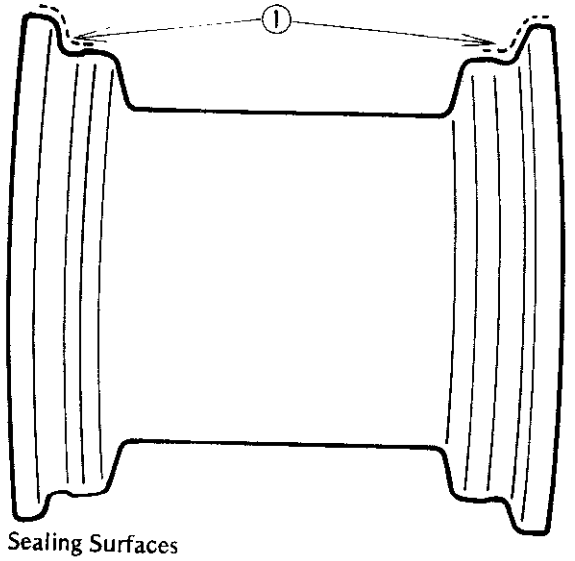
Wheel (Rim) Inspection

- 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.



1. Sealing Surfaces

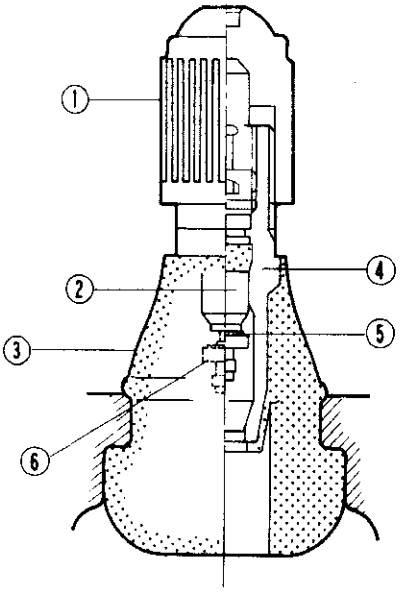
Wheel (Rim) Replacement

- Remove the wheel (see Wheel Removal).
- Disassemble the tire from the rim (see Tire Removal).
- Remove the valve stem and discard it.

CAUTION

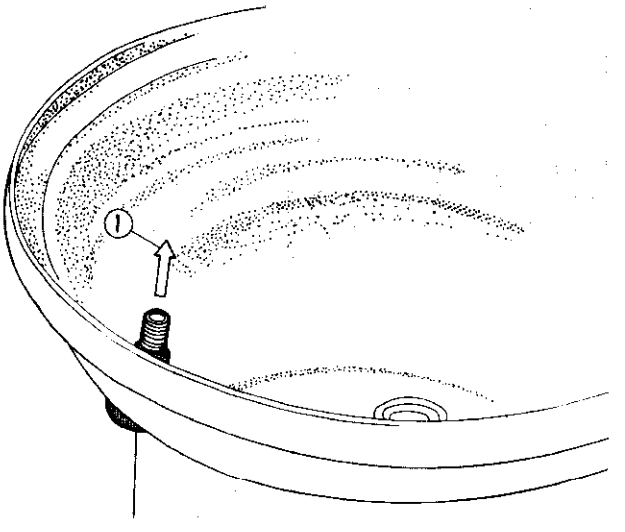
- **Replace the air valve whenever the tire is replaced.**
- **Do not reuse the air valve.**

Air Valve



1. Plastic Cap
2. Valve Core
3. Stem Seal
4. Valve Stem
5. Valve Seat
6. Valve Opened

- Install a new air valve 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.



1. Pull the stem.

CAUTION

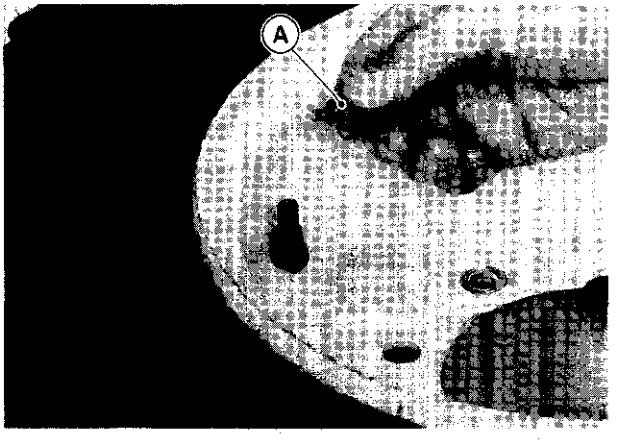
○**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**

●Mount the tire on the new rim (see Tire Installation).
●Install the wheel (see Wheel Installation).

Tires

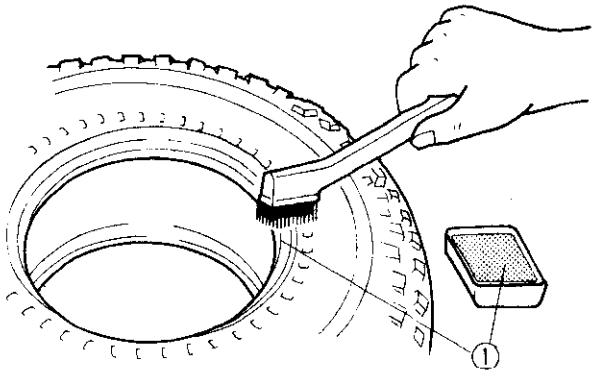
Tire Removal

●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, or water. This helps the tire beads slip off the rim flanges.



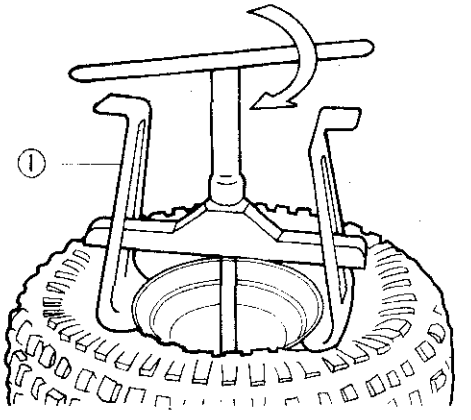
1. Apply lubricant.

CAUTION

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

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

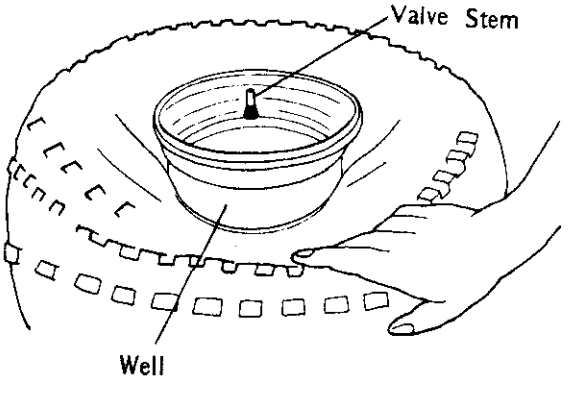
Breaking Tire Bead



1. Bead Breaker

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

Rim Removal



●Lubricate two tire irons with a soap and water solution, or water, then pry the bead.

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, or water.

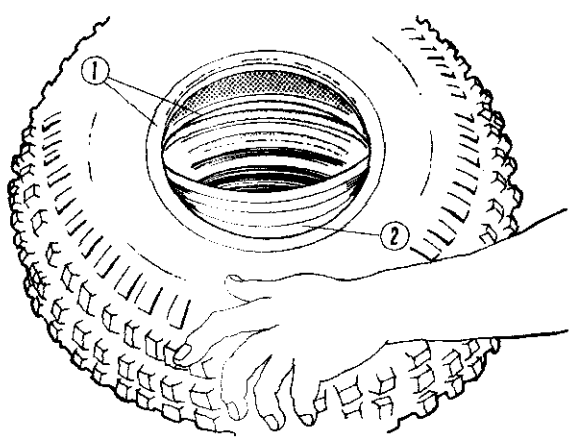
WARNING

○ **Do not use the lubricant other than a water and soap solution, or water to lubricate the tire beads and rim because it may cause tire separation.**

- By hand, slide as much of the first bead as possible over the rim flange.

○ As the bead goes onto the rim, force the bead into the center well of the rim to ease installation.

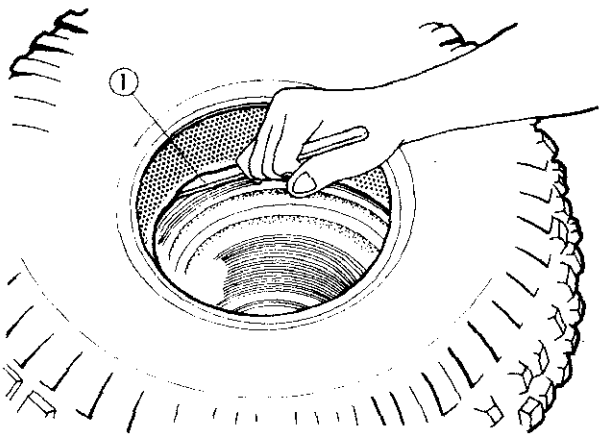
Bead Installation



1. Tire Beads 2. Center Well

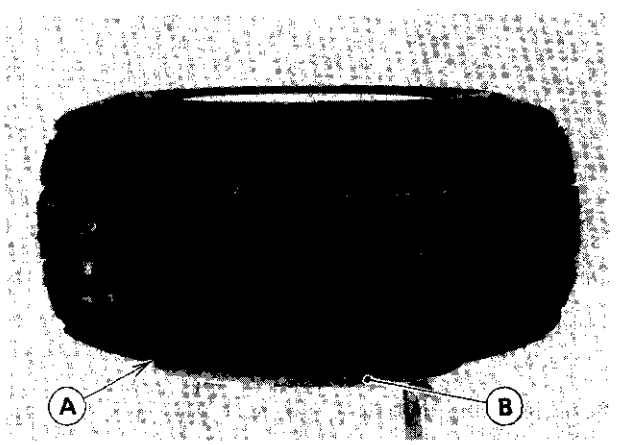
- Use the tire irons to install the rest of the bead.

Bead Installation



1. Tire Irons

- Use the same procedure to install the second bead.
- Lubricate the tire beads again and center the tire on the rim.
- Support the wheel rim on a suitable stand to prevent the tire from slipping off.



A. Rim B. Suitable Stand

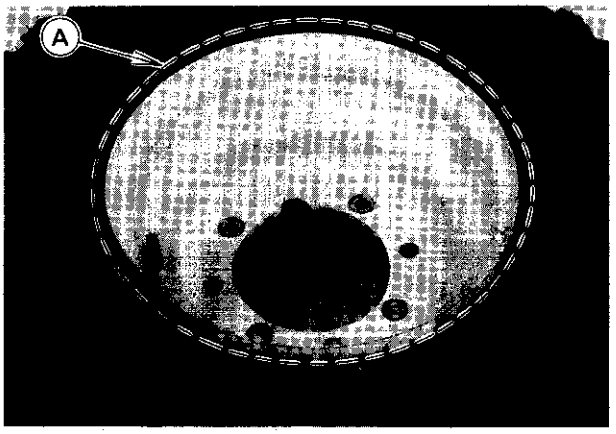
- Inflate the tire until the tire beads seat on the rim.

Maximum Tire Air Pressure
(to seat beads when cold)
Front and Rear: 250 kPa (2.5 kg/cm^2, 36 psi)

WARNING

○ **Do not inflate the tire to more than the maximum tire air pressure. Overinflation can explode the tire with possibility of injury and loss of life.**

●Check to see that the rim lines on both sides of the tire 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.
○Apply a soap and water solution around the tire bead and check for bubbles.

Tire Air Pressure

Front:	**80 kPa (0.8 kg/cm^2, 12 psi)**
Rear:	**100 kPa (1.0 kg/cm^2, 15 psi)**

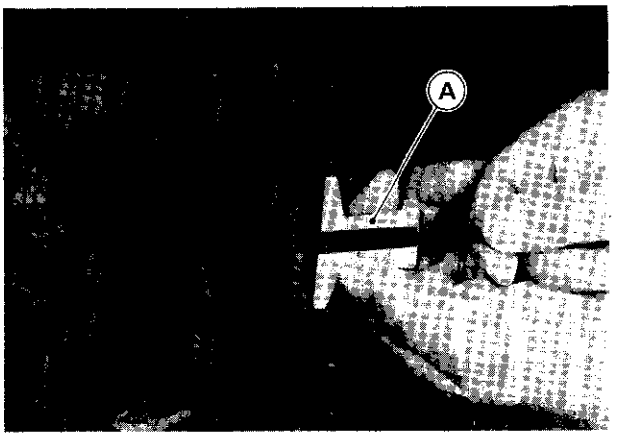
●Check the tire pressure using the air pressure gauge.
●Install the wheel (see Wheel Installation).
●Wipe off the soap and water solution, or water on the tire, and dry the tire before operation.

WARNING

○**Do not operate the vehicle with the water and soap, or water still around the tire beads. They will cause 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.
●Measure the tread depth at the center of the tread with a depth gauge. Since the tire may wear unevenly, take measurements at several places.
★If any measurement is less than the service limit, replace the tire.



A. Depth Gauge

Tire Tread Depth

Standard:	**13.2 mm**
Service Limit:	**3 mm**

Front Wheel Bearings and Grease Seals

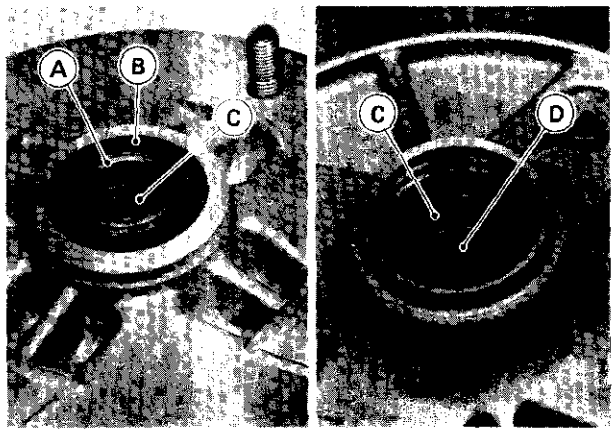
Front Wheel Bearing Removal

●Remove the following.
Front Wheel
Front Brake Drum

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.

Collar
Grease Seal
Wheel Bearings
Spacer



A. Collar
B. Grease Seal
C. Bearing
D. Spacer

○Position the drum on wooden blocks to allow bearing removal.
○Pry the spacer pipe toward one side.
○Drive the bearing out by tapping on the inner race with a hammer and metal rod.
○Drive out the remaining bearing by tapping with a suitable driver.
○The grease seal is tapped out with the bearing.

Front Wheel Bearing Installation

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

Front Wheel Bearing Inspection

●Remove the front brake drum.
●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.

Grease Seal Inspection

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

Brakes

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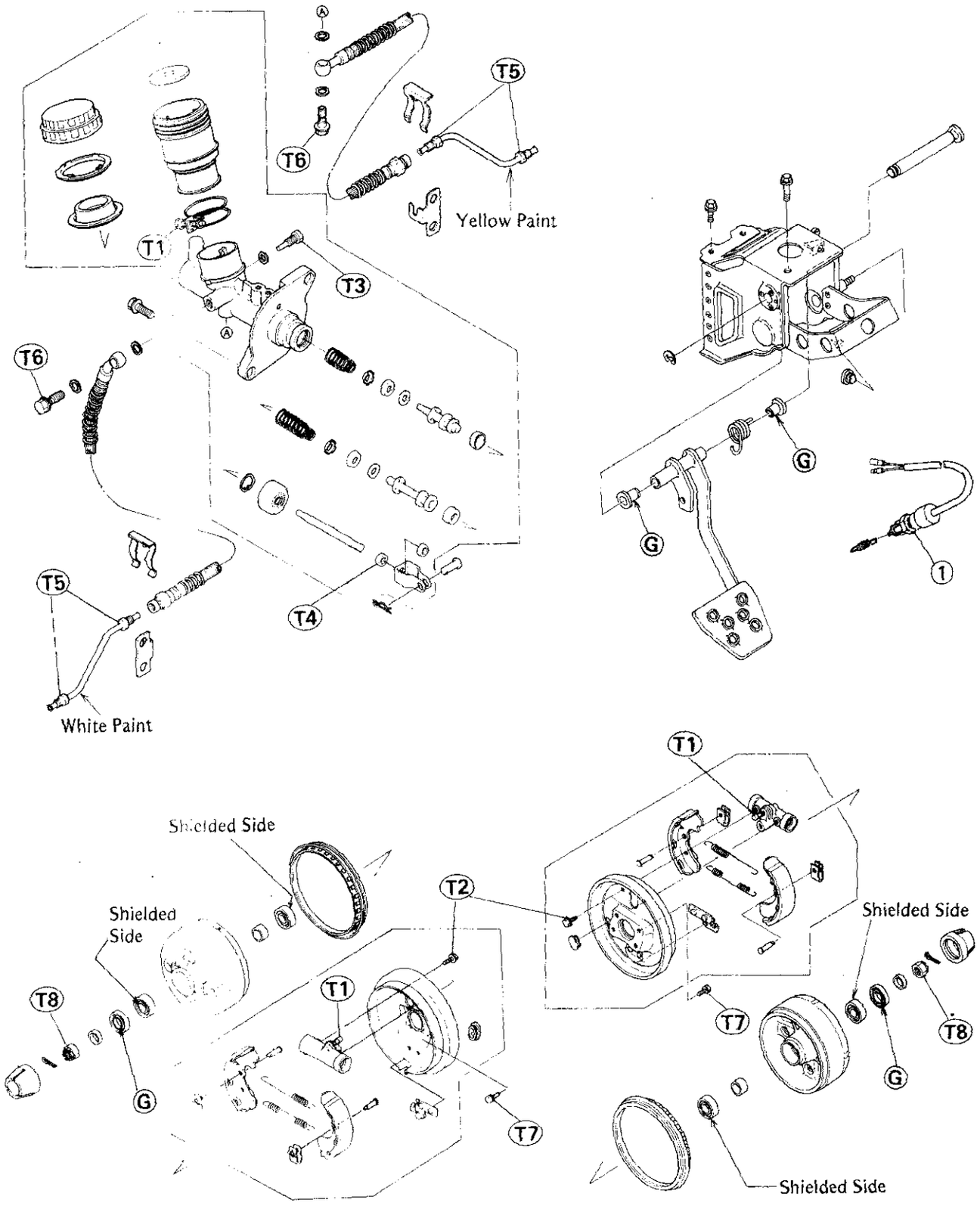
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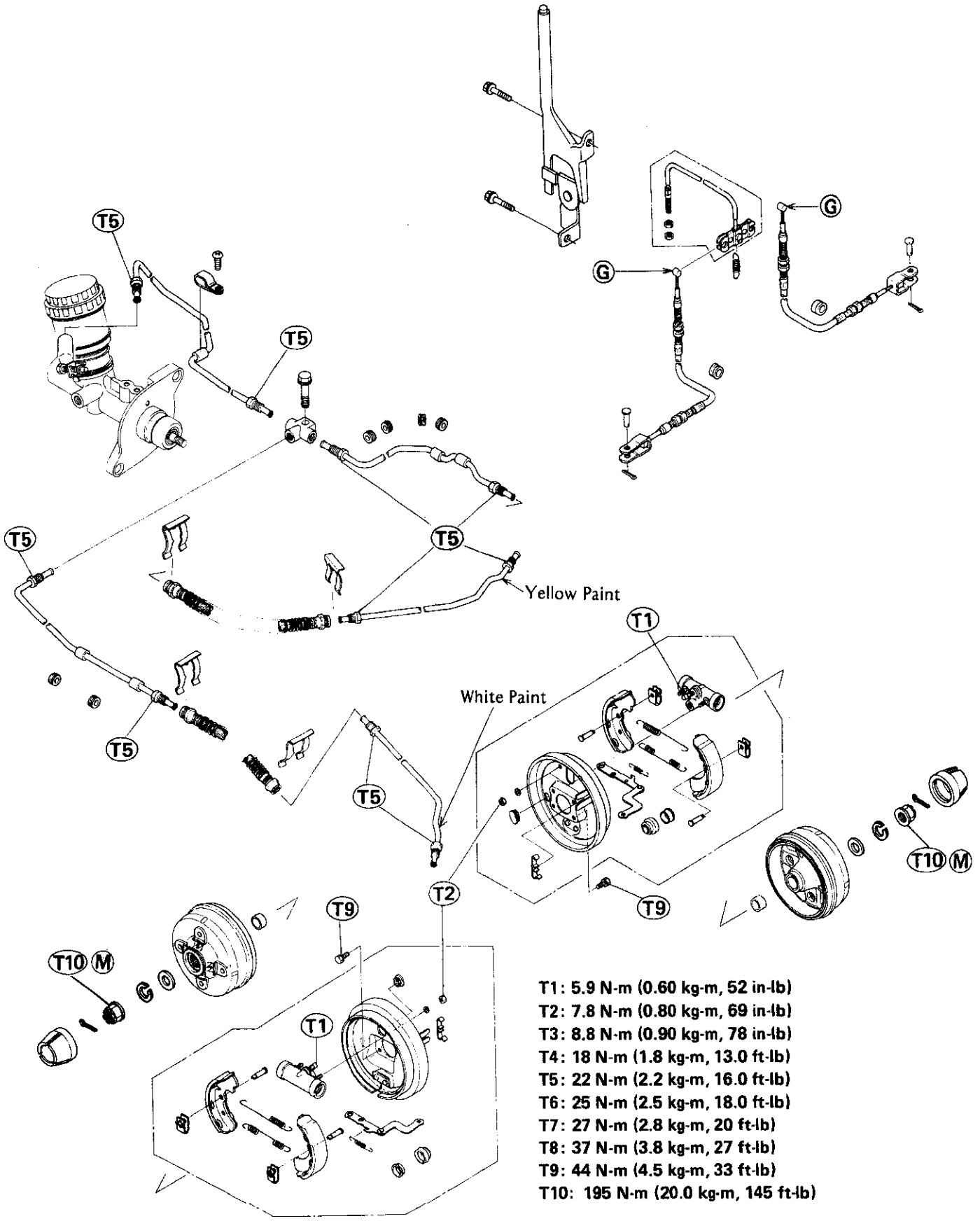
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Exploded View





T1: 5.9 N-m (0.60 kg-m, 52 in-lb)
T2: 7.8 N-m (0.80 kg-m, 69 in-lb)
T3: 8.8 N-m (0.90 kg-m, 78 in-lb)
T4: 18 N-m (1.8 kg-m, 13.0 ft-lb)
T5: 22 N-m (2.2 kg-m, 16.0 ft-lb)
T6: 25 N-m (2.5 kg-m, 18.0 ft-lb)
T7: 27 N-m (2.8 kg-m, 20 ft-lb)
T8: 37 N-m (3.8 kg-m, 27 ft-lb)
T9: 44 N-m (4.5 kg-m, 33 ft-lb)
T10: 195 N-m (20.0 kg-m, 145 ft-lb)

G : Apply grease.
M : Apply molybdenum disulfide grease.

1. Brake Light Switch

Specifications

Item	Standard	Service Limit
Brake fluid: Grade	D.O.T.3	– – –
Brand	Recommended as below.	– – –
Brake pedal free play	10 – 20 mm	– – –
Brake drum inside diameter	180.00 – 180.16 mm	180.75 mm
Brake shoe lining thickness	4.5 mm	1.0 mm
Parking brake lever travel	6 – 10 notches (clicks)	– – –

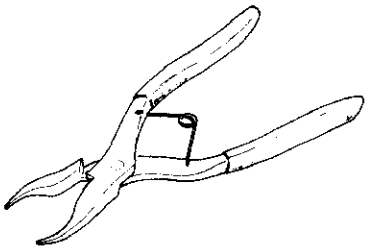
Recommended Brake Fluid

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

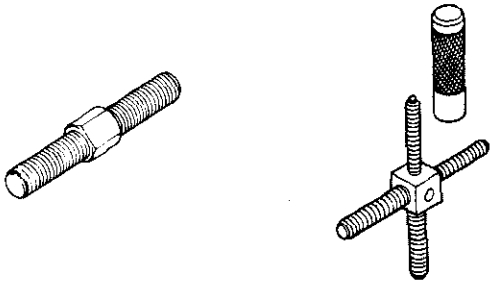
Special Tools

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

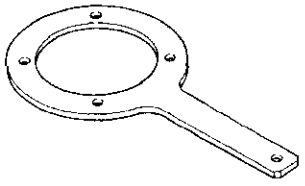
Circlip Pliers: 57001-143



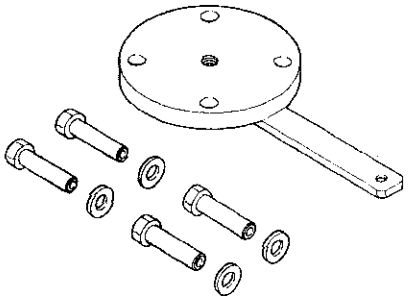
Rotor Puller: 57001-1099 or 1216



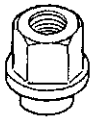
Brake Drum Holder: 57001-1259



Brake Drum Remover: 57001-1260



Brake Drum Pusher: 57001-1261



NOTE

○*The brake drum holder (P/N 57001-1325) can be used instead of the brake drum holder (P/N 57001-1259).*

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

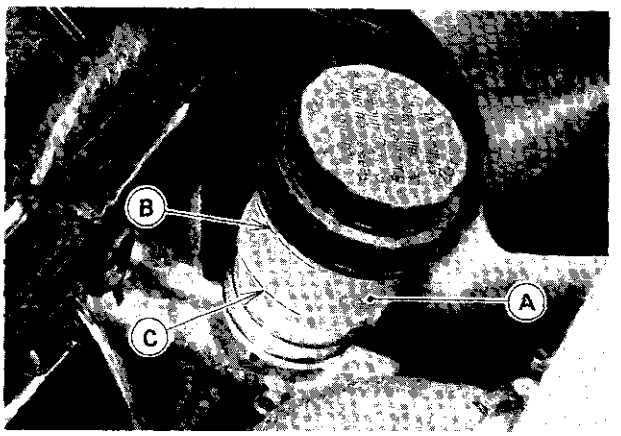
○**Never reuse old brake fluid.**
○**Do not use fluid from a container that has been left unsealed or that has been open for a long time.**
○**Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also 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 wipe up immediately.**

Brake Fluid Level Inspection

●Remove the maintenance cover from the front fender.
●With the vehicle on level ground, check that the fluid level in the reservoir is between the upper (marked MAX) and lower (marked MIN) level lines.



A. Brake Fluid Reservoir
B. Upper Level Line (MAX)
C. Lower Level Line (MIN)

★If the fluid level is lower than the lower level line, check for fluid leaks in the brake lines, and fill the reservoir to the upper level line.

WARNING

○**Change the fluid in the brake system completely if the fluid level is low but the type and brand of the fluid already in the reservoir are unknown.**

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

WARNING

○**If the brake pedal has a soft or "spongy feeling" when it is applied, there might be air in the brake lines or the brake may be defective. Since it is dangerous to operate the vehicle under such conditions, have the brake system serviced immediately.**

●Install the maintenance cover.

Brake Fluid Changing

●Remove the maintenance cover from the front fender.
●Check that there is plenty of fluid in the reservoir.

NOTE

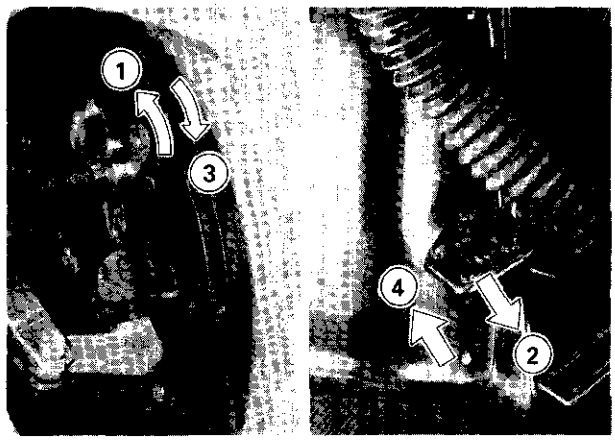
○*The fluid level must be checked several times during the fluid changing and replenished as necessary. If the fluid in the reservoir runs completely out any time during fluid changing, the air bleeding must be done since air will have entered the line.*

●Remove the wheel for extra clearance.
●Connect a clear plastic hose to the bleed valve at the wheel cylinder, running the other end of the hose into a container.

NOTE

○*Start with the rear left or right wheel and finish with the front left or right wheel.*

●Open the bleed valve, apply pressure to the brake pedal, close the valve while the brake is applied, and then quickly release the pedal. Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.



1. Open bleed valve.
2. Apply brake pedal and hold it.
3. Close bleed valve.
4. Release brake pedal.

●Torque the following.
Bleed Valve
●Repeat the previous step for each wheel.
●When brake fluid changing is finished, add the fluid to the upper level in the reservoir.
●Apply the brake forcefully for a few seconds, and check for fluid leakage around the fittings.

WARNING

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

●Install the removed parts.

Brake Line Air Bleeding

●Remove the maintenance cover from the front fender.
●Check that there is plenty of fluid in the reservoir.

NOTE

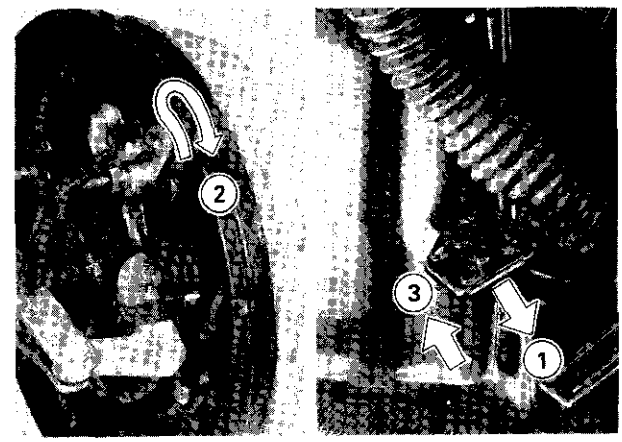
○*The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

●With the reservoir cap off, slowly pump the brake pedal 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.
●Remove the wheel for extra clearance.
●Connect a clear plastic hose to the bleed valve at the wheel cylinder, running the other end of the hose into a container.

NOTE

○*Start with the rear left or right wheel and finish with the front left or right wheel.*

●Pump the brake pedal a few times until it becomes hard to pump. Hold the pedal in the down position. Quickly open (turn counterclockwise) and close the bleed valve. Then release the pedal. Repeat this operation until no more air can be seen coming out into the plastic hose.



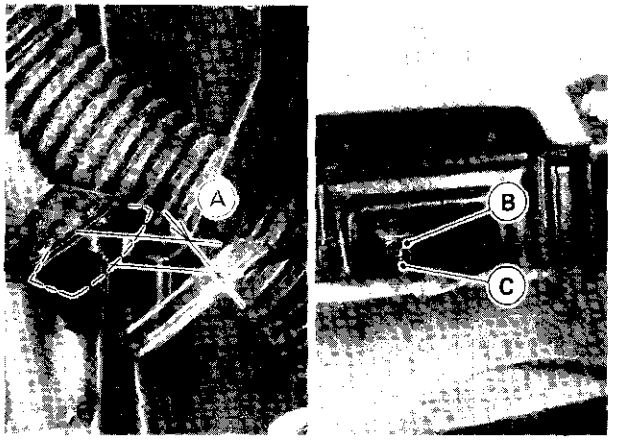
1. Hold brake pedal applied.
2. Quickly open and close bleed valve.
3. Release brake pedal.

●Torque the following.
Bleed Valve
●Repeat the previous step for each wheel.
●When air bleeding is finished, add the fluid to the upper level in the reservoir.
●Apply the brake forcefully for a few seconds, and check for fluid leakage around the fittings.
●Install the removed parts.

Brake Pedal and Master Cylinder

Brake Pedal Play Adjustment

●Check brake pedal free play.
★If free play is not correct, adjust it.



A. Brake Pedal Free Play
B. Locknut
C. Push Rod

Brake Pedal Free Play
Standard : 10 – 20 mm

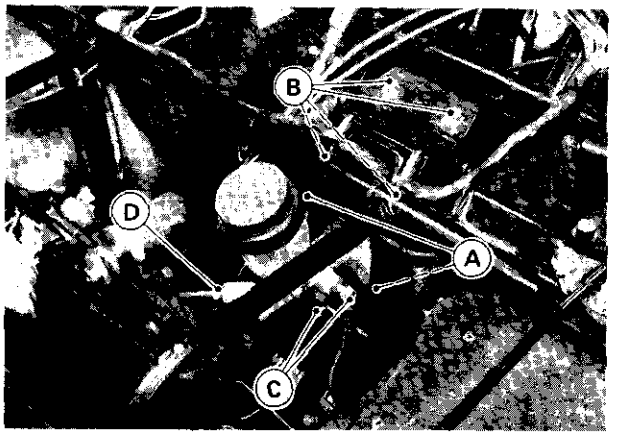
●Loosen the locknut and turn the push rod to obtain the correct amount of free play.
●Tighten the locknut.
●Check for brake drag and braking effectiveness.

WARNING

○**Incorrect adjustment with insufficient free play can cause braking heating and drag. Skidding and loss of control may result.**

Master Cylinder Removal

●Remove the following.
Front Bar Component
Front Fender Upper
Front Fender Upper Stay
Front Fender Inner Upper (Rubber Sheet)
Brake Pipe Nipple
Brake Hose Banjo Bolts
Brake Pedal Bracket Mounting Bolts
Master Cylinder Mounting Bolts



A. Master Cylinder Mounting Bolts
B. Pedal Bracket Mounting Bolts
C. Brake Hose Banjo Bolts
D. Brake Pipe Nipple

●Immediately wipe up any brake fluid that spills.

CAUTION

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

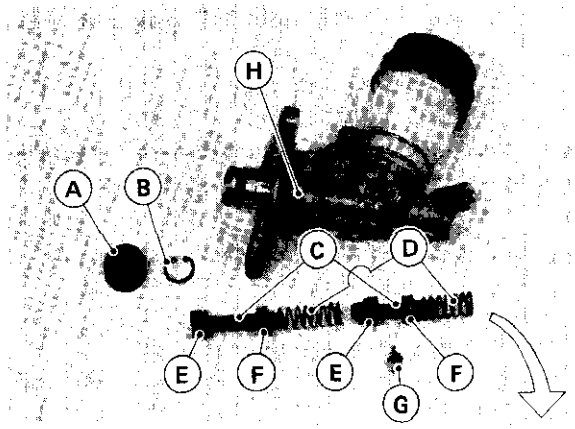
●Install the brake pedal bracket mounting bolts temporarily.

Master Cylinder Installation

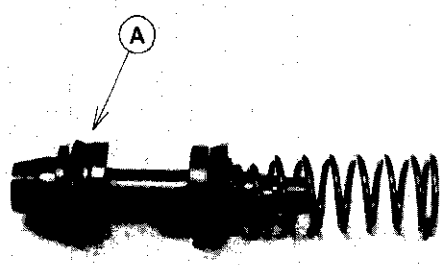
●Use a new flat washer on each side of the brake hose fitting.
●Torque the following.
Brake Pipe Nipple
Brake Hose Banjo Bolts
●Bleed the brake line after master cylinder installation.
●Check that the brake line has proper fluid pressure and no fluid leakage.

Master Cylinder Disassembly

●Push the pistons in all the way with a screwdriver and remove the piston stop bolt.
●Remove the retainer with the circlip pliers (special tool: P/N 57001-143) and remove the pistons.
○Remove the pistons by lightly applying compressed air to where the brake pipe fits into the cylinder.



A. Dust Cover
B. Retainer
C. Pistons
D. Springs
E. Secondary Cup
F. Primary Cup
G. Piston Stop Bolt
H. Master Cylinder



A. Be careful of the secondary cup direction.

Master Cylinder Assembly

- 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.**

- Push the pistons in all the way with a screwdriver and install the piston stop bolt.
- Torque the following.
  Piston Stop Bolt
  Reservoir Clamp Bolt

Master Cylinder Inspection

- Check that there are no scratches, rust or pitting on the inside of the cylinder and on the outside of the piston.
★If the cylinder or piston shows any damage, replace them.
- Inspect the primary cups and secondary cups.
★If a cup is worn, damaged, softened (rotted), or swollen, replace it.
★If fluid leakage is noted at the brake push rod, the secondary cup of the rear piston should be replaced.
- Check the dust cover for damage.
★If it is damaged, replace it.
- Check that the relief and supply ports are not plugged.
★If the small relief port becomes plugged, the brake shoes will drag on the drum. Blow the ports clean with compressed air.
- Check the piston return springs for any damage.
★If the spring is damaged, replace it.

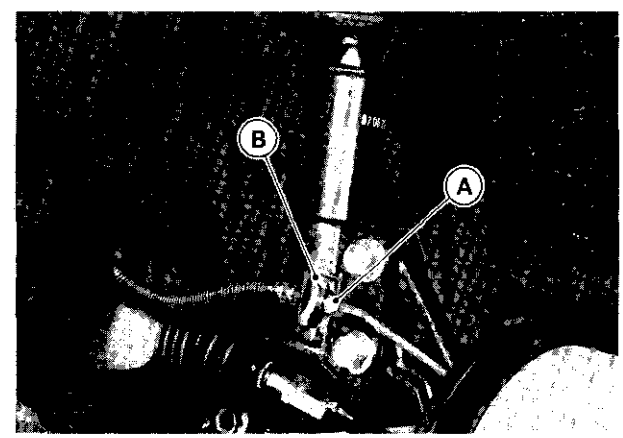
Brake Hoses and Pipes

Brake Hose and Pipe 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 will rust if the plating is damaged.
★Replace the pipe if it is rusted, cracked (especially check the fittings), or if the plating is badly scratched.

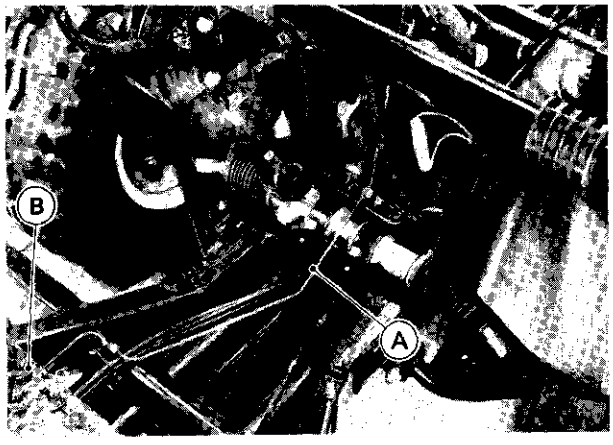
Brake Hose and Pipe Replacement

- To remove the metal pipe, unscrew the metal pipe nipple and pull out the retainer.

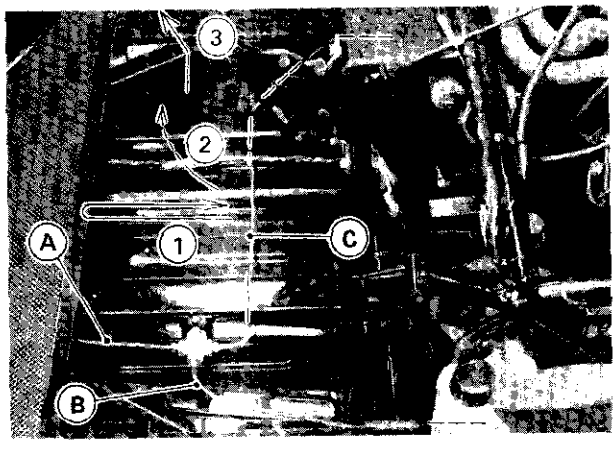


A. Metal Pipe Nipple
B. Retainer

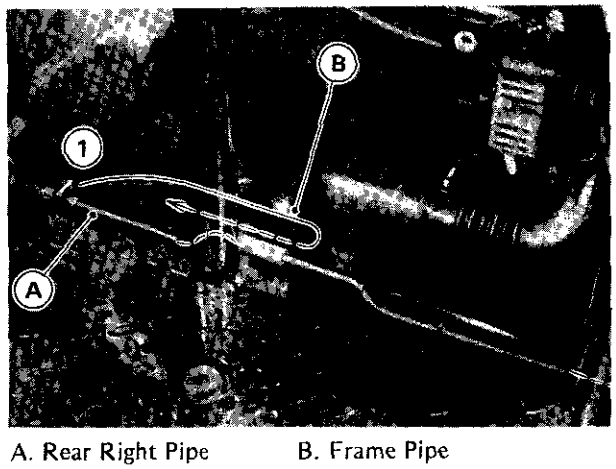
●Remove the following to replace the metal pipes for the rear brakes.
Plate (under the seat)
Foot Platform Center Plate
Front Fender Lower (only for the front pipe)
Fuel Tank (only for the rear right pipe)
○To remove the rear right pipe from the frame, move the pipe forward until the rear end of it clears the frame pipe, back it so that the rear end is run through under the frame pipe, and turn it clockwise. Then pull the front end of the pipe to the front right side of the frame.



A. Front Pipe B. Foot Platform Center Plate



A. Front Pipe C. Rear Right Pipe
B. Rear Left Pipe



A. Rear Right Pipe B. Frame Pipe

●Immediately wipe up any brake fluid that spills.

CAUTION

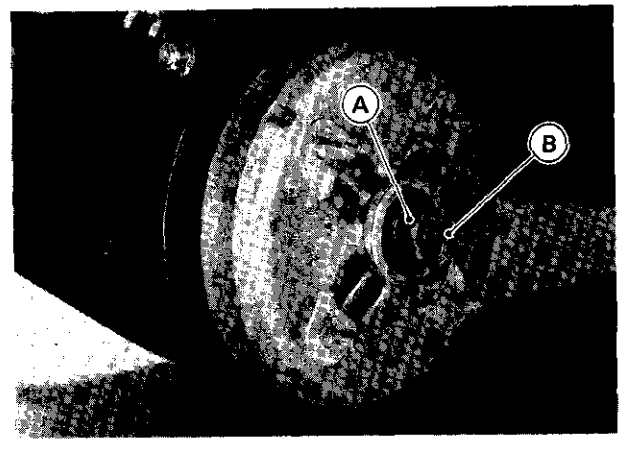
○**Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.**

●The metal pipes at the brake panels are not identical to each other.
Left side pipes: marked white.
Right side pipes: marked yellow.
○Connect the marked end of each pipe to the brake panel (wheel cylinder).
●Use a new aluminum washer for each side of the hose fittings.
●Torque the following.
Brake Hose Banjo Bolts
Brake Pipe Nipples

Brake Drums

Brake Drum Removal

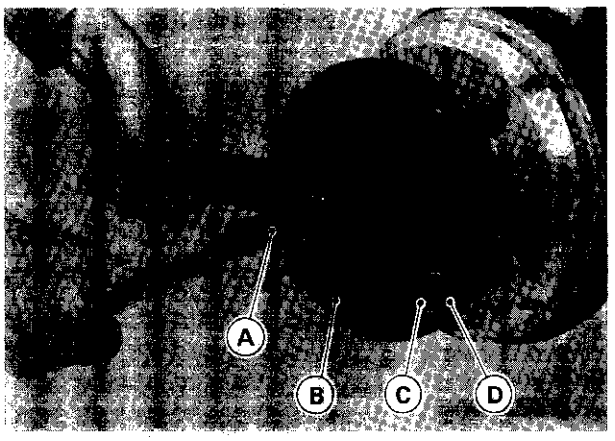
●Remove the following.
Wheel
Cotter Pin
Axle Nut
○Loosen the rear axle nut, while applying the brake, and release the brake.



A. Axle Nut B. Cotter Pin

Brake Drum

●The rear brake drum is press-fitted on the axle. Use the brake drum remover and the rotor puller (special tools) to remove it.
○Mount the brake drum remover on the drum studs with the stud nuts and washers (parts in the remover set).



A. Rotor Puller: 57001-1099 or 1216
B. Brake Drum Remover: 57001-1260
C. Stud Nut
D. Washer

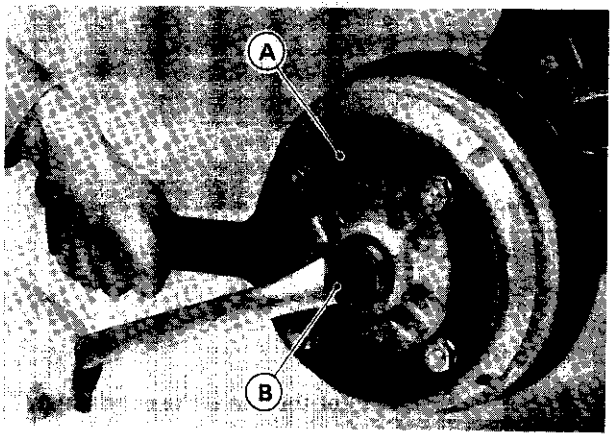
WARNING

○**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 linings material unless a ventilation hood is available and properly used.

Brake Drum Installation

●Observe the following procedure to install the rear brake drum. Replace the drum with a new one if its maximum press-fitting force (torque) is less than the specified value.
○Mount the brake drum holder (special tool) securely to the drum studs with the wheel nuts.
○Using the brake drum pusher (special tool), drive the drum on the axle until the pusher stops.



A. Brake Drum Holder: 57001-1259
B. Brake Drum Pusher: 57001-1261

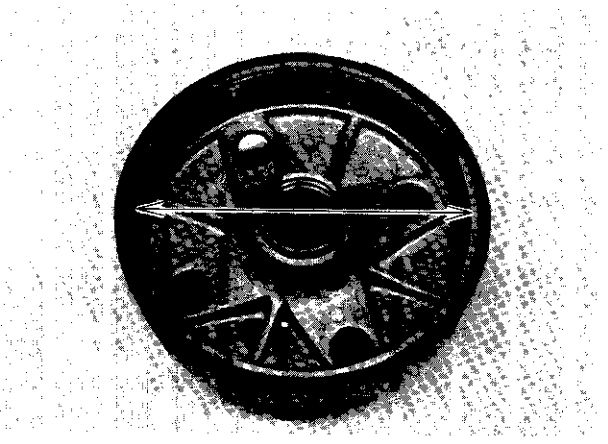
○Apply a molybdenum disulfide lubricant (grease or oil type, either will do) to the threads and the seated face of the axle nut.
○Drive the drum further using the axle nut and washer instead of the pusher until the drum stops. At this time, use a torque wrench to turn the axle nut. Note the driving force (torque) of the nut.
☆The drum must be press-fitted on the axle. If the maximum torque for driving the nut is less than the service limit, the drum will not be tight enough and must be replaced.

Drum Press-fitting Force (Torque)
Service Limit: 20 N-m (2.0 kg-m, 14.5 ft-lb)

☆If the maximum torque for driving the nut is more than the service limit, retighten the nut to the specified torque.
○Remove the brake drum holder.
●Apply a high-temperature grease to the following.
Front Drum Grease Seal Lips
●Torque the following.
Axle Nuts
●Do not press the drum bolts out.
★If the drum bolt is damaged, replace the drum and bolts as a unit.

Brake Drum Wear

●Measure the inside diameter of the drum 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: 180.00 – 180.16 mm
Service Limit: 180.75 mm

Brake Panel Assemblies

Brake Panel Removal

●Remove the following.
Brake Drum

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.**

Brake Shoe Springs
Brake Shoes

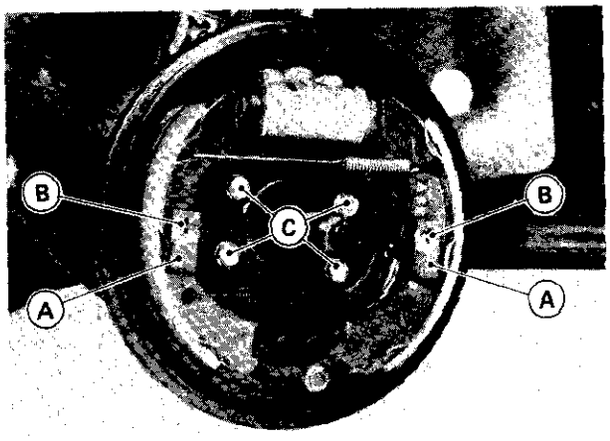
○Push the shoe hold-down spring and twist the pin to remove them.

NOTE

○*Hold the brake shoes with a clean cloth to protect the linings from grease or dirt.*

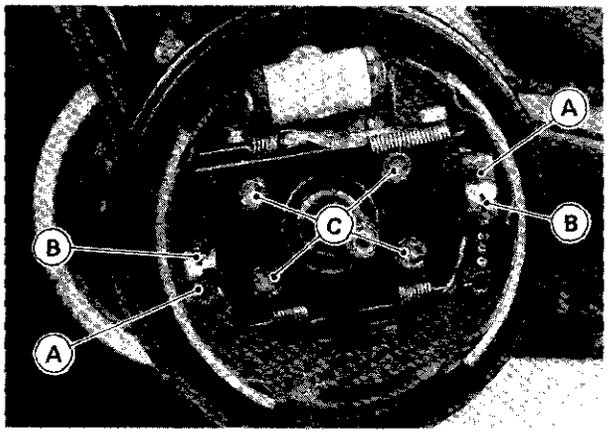
Brake Panel Mounting Bolts
Brake Panel

Front:



A. Hold-down Spring
B. Pin
C. Panel Mounting Bolts

Rear:



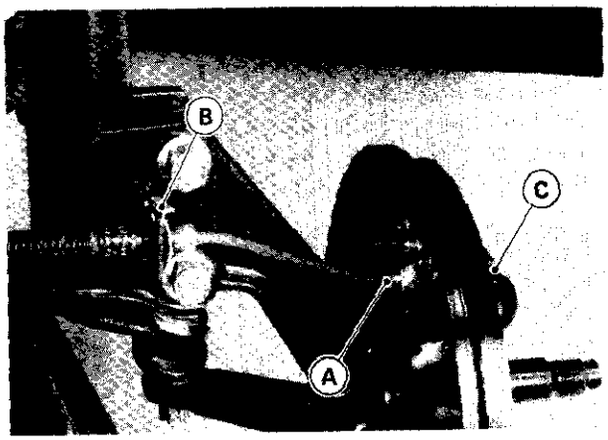
A. Hold-down Spring
B. Pin
C. Panel Mounting Bolts

●Remove the following if the brake panel or brake wheel cylinder is to be free from the brake pipe.
Brake Pipe Nipple
Brake Hose Retainer

○Immediately wipe up any brake fluid that spills.

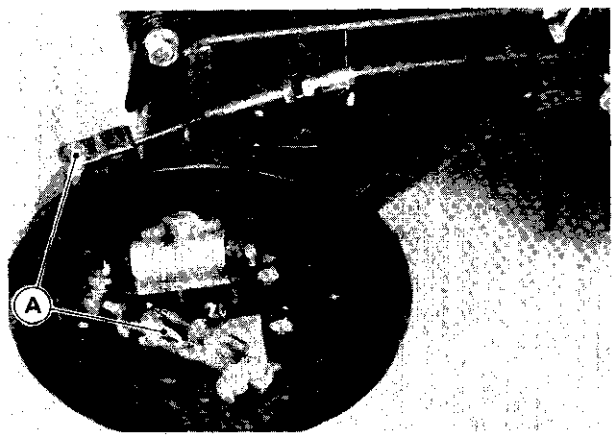
CAUTION

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

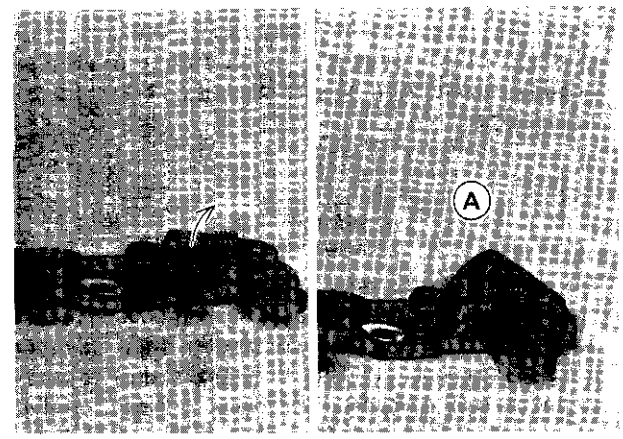


A. Brake Pipe Nipple
B. Retainer
C. Wheel Cylinder

●Remove the following for the rear brake panel removal.
Cotter Pin
Clevis Pin
Parking Brake Lever Linkage



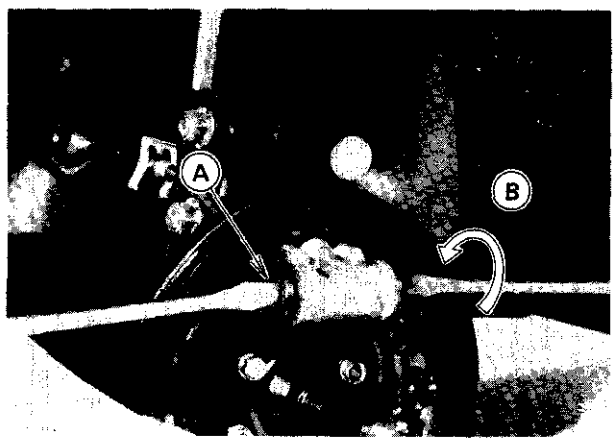
A. Parking Brake Lever Linkage



A. Original Position

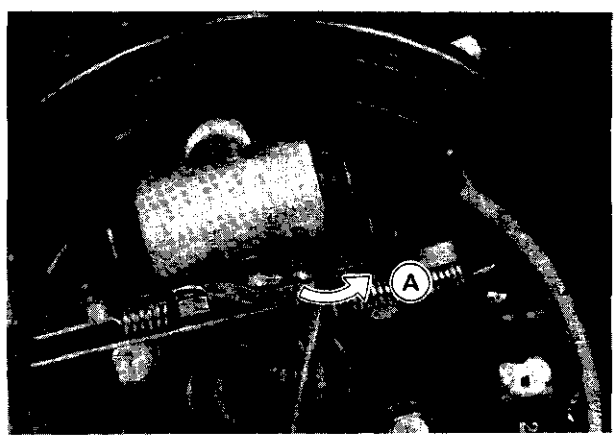
Brake Panel Installation

- Set the brake shoe clearance adjuster so that the drum can be re-installed on the panel assembly.
  - Front brake; turn one of the wheel cylinder ends while pushing it in. Keep the other end from turning until both the ends of the pistons are back in the cylinder completely.



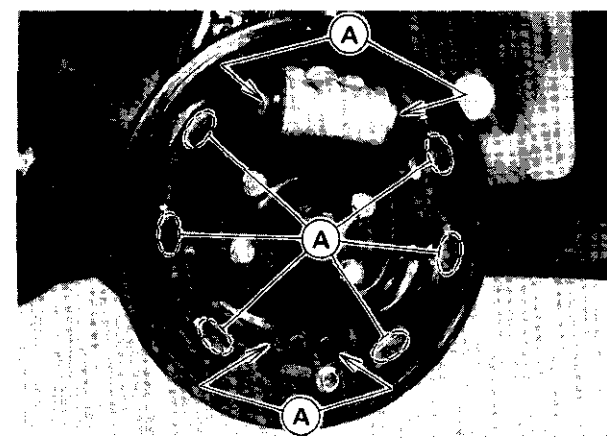
A. Hold the end.
B. Turn the end back to the original position.

  - Rear brake; pry the ratchet lever with a screwdriver to reset the shoe clearance adjuster in its original position.

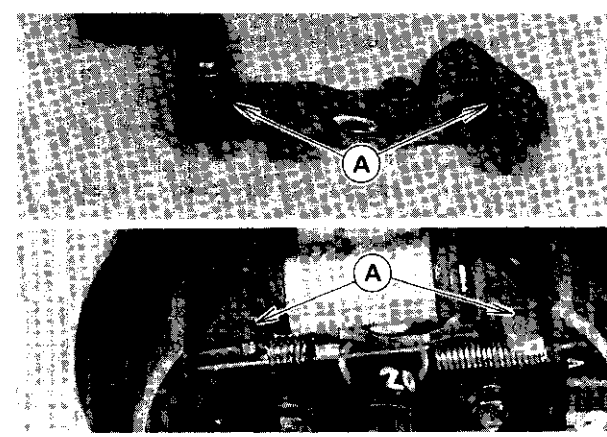


A. Pry the ratchet lever.

- Torque the following.
  - Wheel Cylinder Mounting Bolts
  - Brake Panel Mounting Bolts
  - Brake Pipe Nipple
- Apply a high-temperature grease to the following.
  - Brake Panel and Brake Shoe Contact Points
  - Wheel Cylinder Piston Ends
  - Brake Shoe Anchor Ends
  - Rear brake only:
  - Shoe Clearance Adjuster Pivots
  - Shoe Clearance Adjuster and Shoe Contact Points



A. Apply grease.



A. Apply grease.

- Bleed the brake line after drum installation.
- Check the brake system to be sure there is adequate braking power. Also be sure there is no brake drag, or fluid leakage.

WARNING

○**Do not attempt to drive the vehicle until a complete brake pedal motion is obtained by pumping the brake pedal until the brake shoes contact the drum operating the shoe clearance adjuster until brake shoe to brake drum contact is made. The brake will not function on the first application of the pedal if this is not done.**

- Adjust the parking brake.

Wheel Cylinder Assembly

- 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

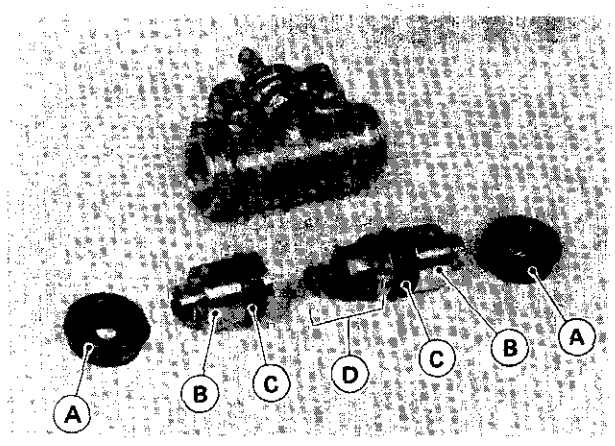
○**Use only brake fluid, isopropyl alcohol, or ethyl alcohol, for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely,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

Wheel Cylinder Inspection

- Check that there are no scratches, rust or pitting on the inside of the cylinder and on the outside of the piston.
★If the 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 there are damaged, replace the cylinder.
- Check the spring for any damage.
★If the spring is damaged, replace the cylinder.

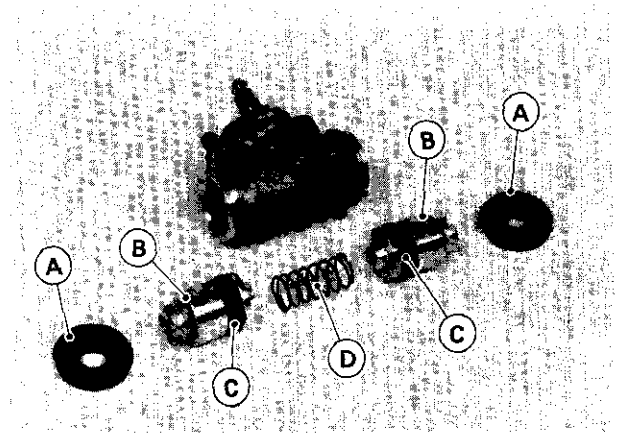
Front brake only:
- Check the brake shoe clearance adjuster for damage.
★If it shows any damage, replace the cylinder.

Front:



A. Dust Cover
B. Piston
C. Cup
D. Shoe Clearance Adjuster

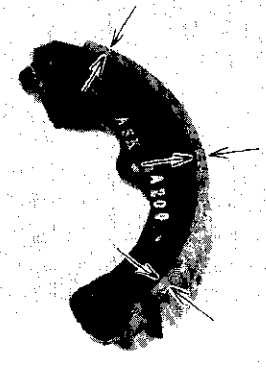
Rear:



A. Dust Cover
B. Piston
C. Cup
D. Spring

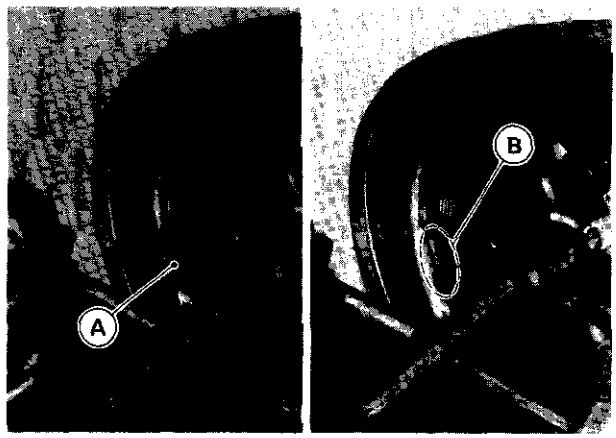
Brake Shoe Lining Wear

- Measure the lining thickness at several points.



NOTE

○*Through the inspection hole on the brake panel, inspect the rear brake shoe lining thickness.*



A. Rubber Cap B. Inspection Hole

Brake Shoe Lining Thickness

Standard:	**4.5 mm**
Service Limit:	**1.0 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 grease with an oilless solvent.

CAUTION

○**Do not use a solvent which will leave on oily residue or the shoes will have to be replaced.**

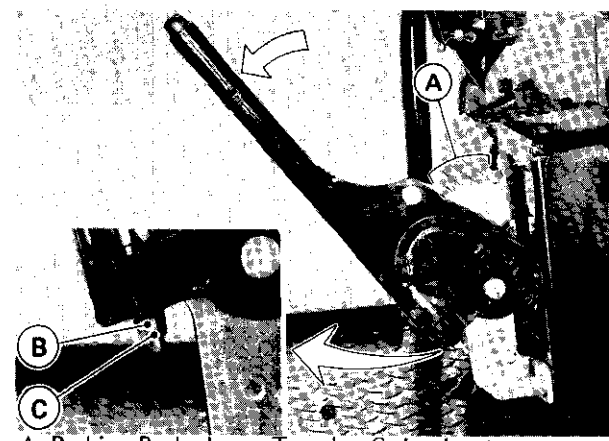
Brake Shoe Spring Inspection

●Visually inspect the brake shoe springs for breaks or distortion.
★If the springs are damaged in any way, replace them.

Parking Brake Lever and Cables

Parking Brake Lever Travel Adjustment

●Check parking brake lever travel.
○Push the parking brake lever forward slowly all way. Count the number of notches (clicks) during lever travel.
★If lever travel is not correct, adjust it.



A. Parking Brake Lever Travel C. Locknut
B. Adjusting Nut

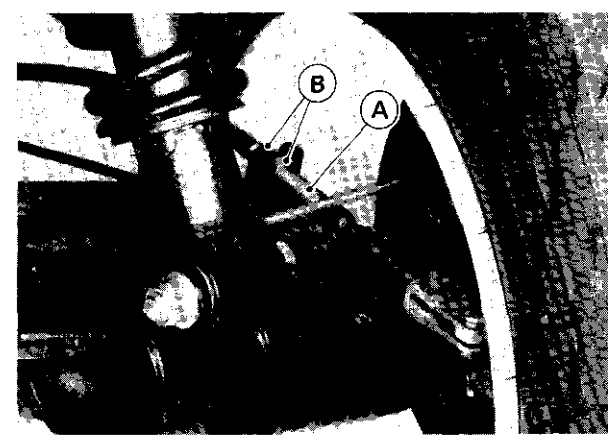
Parking Brake Lever Travel

Standard: 6 – 10 notches (clicks) at 200 N (20 kg)

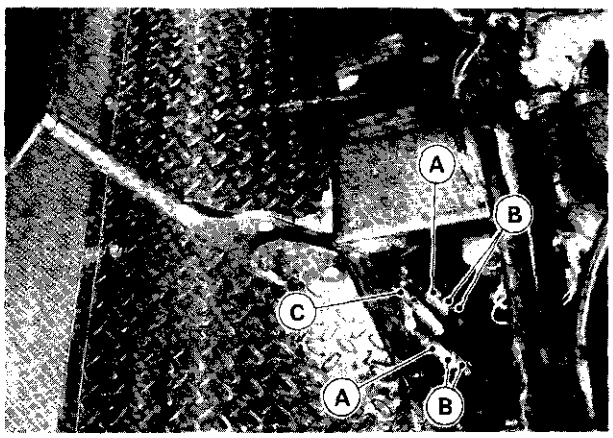
●Release the parking brake and return the lever to its rest position.
●Loosen the locknut and turn the adjusting nut to obtain the correct amount of lever travel.
●Tighten the locknut.

NOTE

○*If the parking brake lever travel cannot be adjusted by using the adjusting nut at the lever, use the adjusters at the rear brake panels and then at the equalizer. Do not forget to adjust both the left and right cables evenly and keep the equalizer horizontal, and then securely tighten the adjuster mounting nuts.*



A. Adjuster B. Mounting Nuts



A. Adjuster
B. Mounting Nuts
C. Equalizer

●Check for brake drag and braking effectiveness.

WARNING

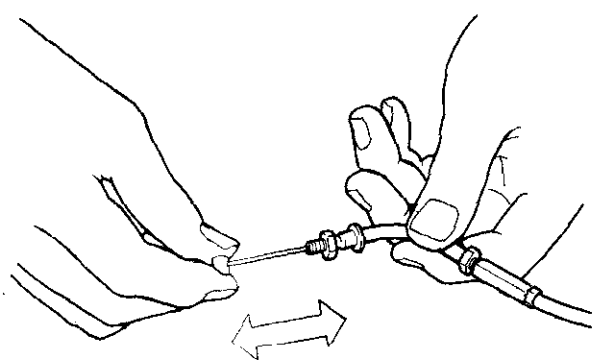
○**Incorrect adjustment with insufficient free play can cause brakes to overheat and drag. Skidding and loss of control may result.**

Parking Brake Cable Inspection

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

★If the cable does not move freely after lubricating, or if the cable is frayed, or if the cable housing is kinked, replace the cable.

Cable Inspection

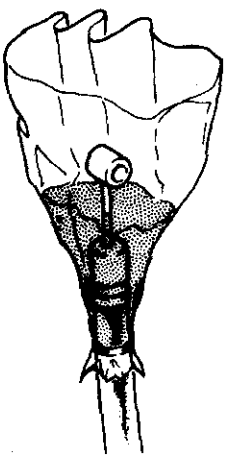


Parking Brake Cable Lubrication

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

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

Cable Lubrication (with Plastic Bag)

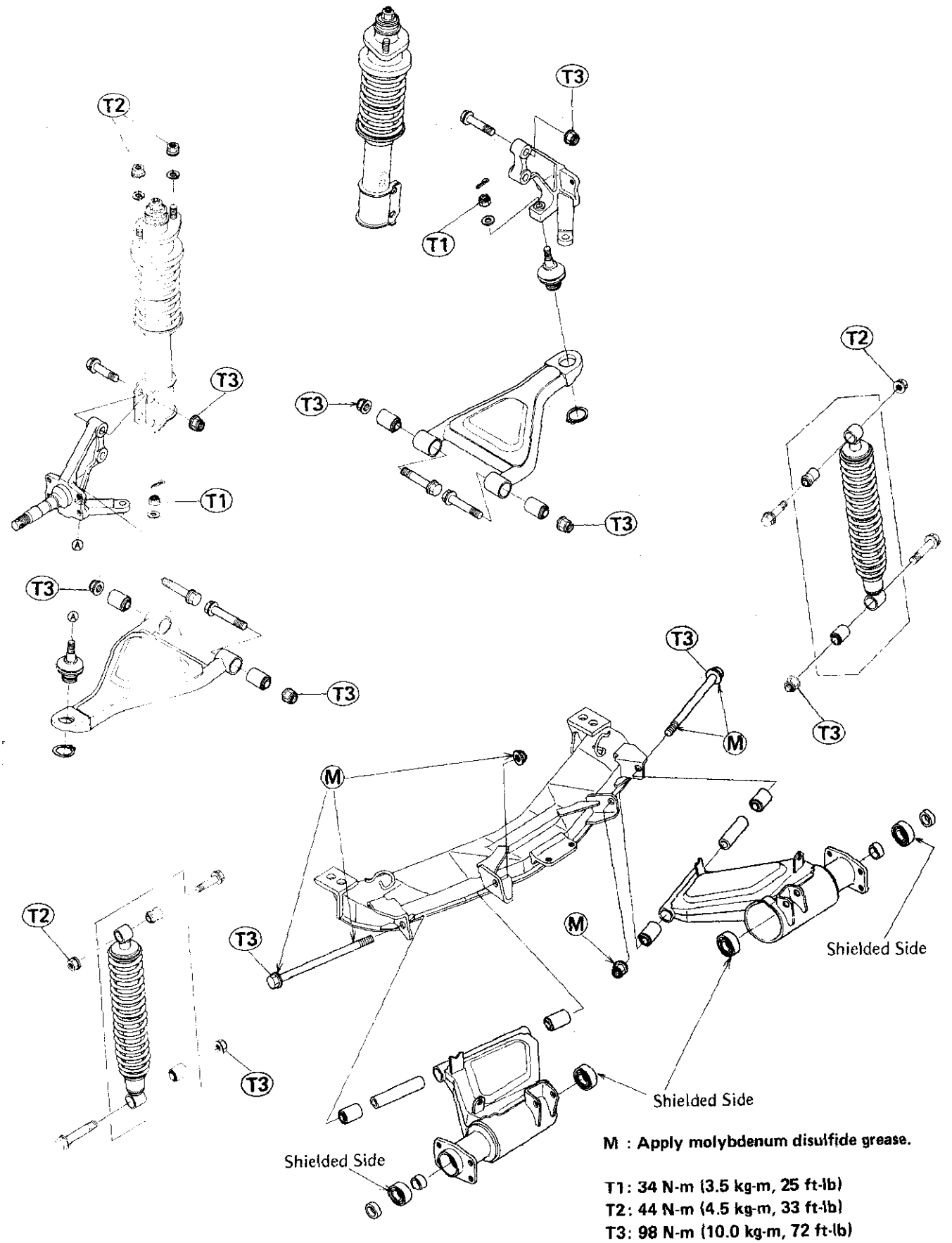


Suspension

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Exploded View



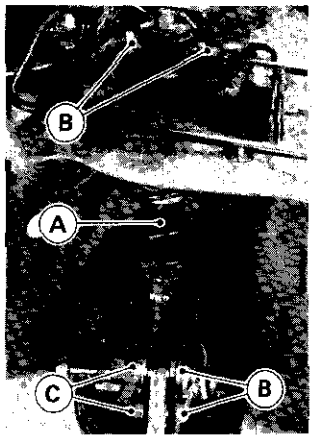
M : Apply molybdenum disulfide grease.

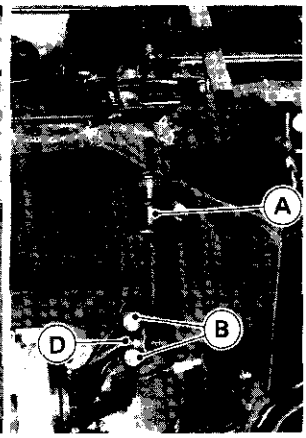
T1: 34 N-m (3.5 kg-m, 25 ft-lb)
T2: 44 N-m (4.5 kg-m, 33 ft-lb)
T3: 98 N-m (10.0 kg-m, 72 ft-lb)

Struts and Shock Absorbers

Strut (Front Shock Absorber) Removal

- Remove the following.
  - Front Fender Upper
  - Front Wheel
- Hold the front brake drum and panel assembly in their position.
- Remove the following.
  - Strut Mounting Bolts and Nuts
  - Strut (Front Shock Absorber)
  - Brake Hose Clamp





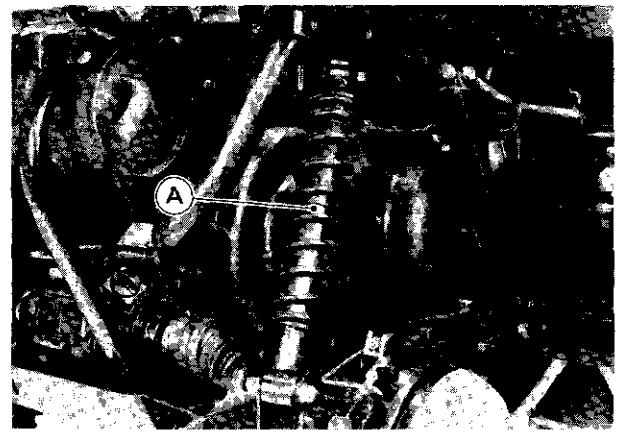
A. Strut
B. Mounting Nuts
C. Mounting Bolts
D. Brake Hose Clamp

Strut (Front Shock Absorber) Installation

- Torque the following.
  - Strut Upper Mounting Nuts
  - Strut Lower Mounting Bolts

Rear Shock Absorber Removal

- Remove the following.
  - Cargo Bed
  - Rear Wheel
  - Rear Fender
- Hold the rear brake drum and panel assembly in their position.
- Remove the following.
  - Shock Absorber Mounting Bolts and Nuts
  - Rear Shock Absorber



A. Rear Shock Absorber

Rear Shock Absorber Installation

- Torque the following.
  - Rear Shock Absorber Upper Mounting Bolt
  - Rear Shock Absorber Lower Mounting Bolt

Shock Absorber Inspection

★If oil leakage is noted at the top of the shock absorber damper unit, the shock absorber should be replaced to renew the oil seal.

- Visually inspect the rubber bushings in the upper and/or lower mountings of the shock absorber.

★If they are worn, cracked, hardened, or otherwise damage, replace them with new ones.

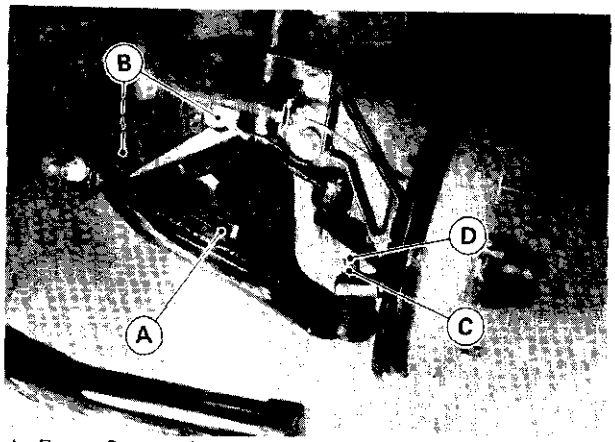
Suspension Arms

Front Suspension Arm Removal

- Remove the following.
  - Front Wheel
- Hold the front brake drum and panel assembly in its position.
- Remove the following.
  - Cotter Pin
  - Suspension Arm Joint Nut
  - Suspension Arm Joint from Knuckle

○Install a suitable nut on the stud of the joint and tap the nut to free the joint from the knuckle.

- Suspension Arm Pivot Bolts and Nuts
- Front Suspension Arm



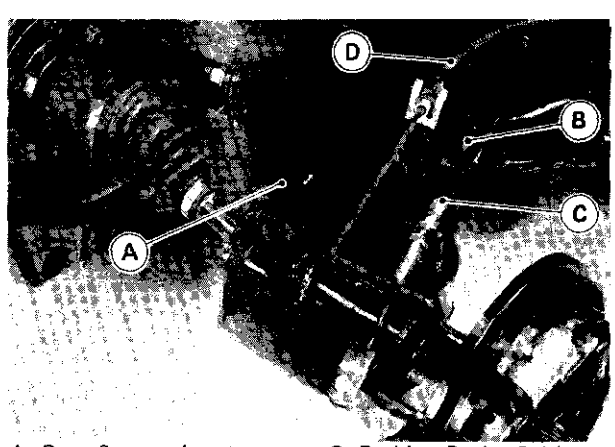
A. Front Suspension Arm
B. Pivot Bolts
C. Joint Nut
D. Cotter Pin

Front Suspension Arm Installation

- Clean the tapered portion of the suspension arm joint and the tapered hole of the steering knuckle, or the tapers will not fit snugly.
- When the suspension arm pivot bolts are tightened, install the arm joint to the steering knuckle to position the arm within its operating range.
- Torque the following.
  Front Suspension Arm Pivot Bolts
  Front Suspension Arm Joint Nut

Rear Suspension Arm Removal

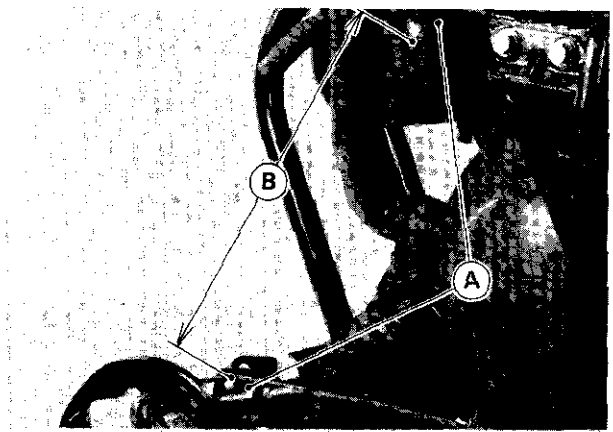
- Remove the following.
  Cargo Bed
  Rear Wheel
  Rear Fender
  Rear Brake Drum
  Rear Brake Panel Assembly
- ○Free the brake hose and the parking brake cable from the suspension arm.
- Hold the suspension arm in its position.
- Remove the following.
  Shock Absorber Mounting Bolts and Nuts
  Rear Shock Absorber
  Suspension Arm Pivot Bolt and Nut
  Rear Suspension Arm



A. Rear Suspension Arm
B. Pivot Bolt
C. Parking Brake Cable
D. Brake Hose

Rear Suspension Arm Installation

- Install the rear suspension arm pivot nut and position the arm within its operating range. Using a rope to keep the inside distance between the bolt holes of the shock absorber mounts between 315 mm and 320 mm.



A. Shock Absorber Mounts
B. 315 – 320 mm

- Torque the following.
  Rear Suspension Arm Pivot Bolt
- ○Apply a molybdenum disulfide grease to the following.
  Pivot Bolt Seating Surface and Threads
  Pivot Nut Threads

Suspension Arm Inspection

- Visually inspect the suspension arm for breaks or distortion.
- ★If the suspension arm is damaged in any way, replace it.
- Remove the parts (wheel, drum, shock absorber, etc.) to allow the suspension arm to swing freely by hand.
- Swing the suspension arm up and down to check for abnormal friction.
- ★If abnormal friction is felt, the rubber bushing may be damaged. Remove the suspension arm to check for rubber bushing damage.
- Check the rubber bushings in the pivots.
- ★Replace any bushings that are worn, cracked, hardened, or otherwise damaged.

Steering

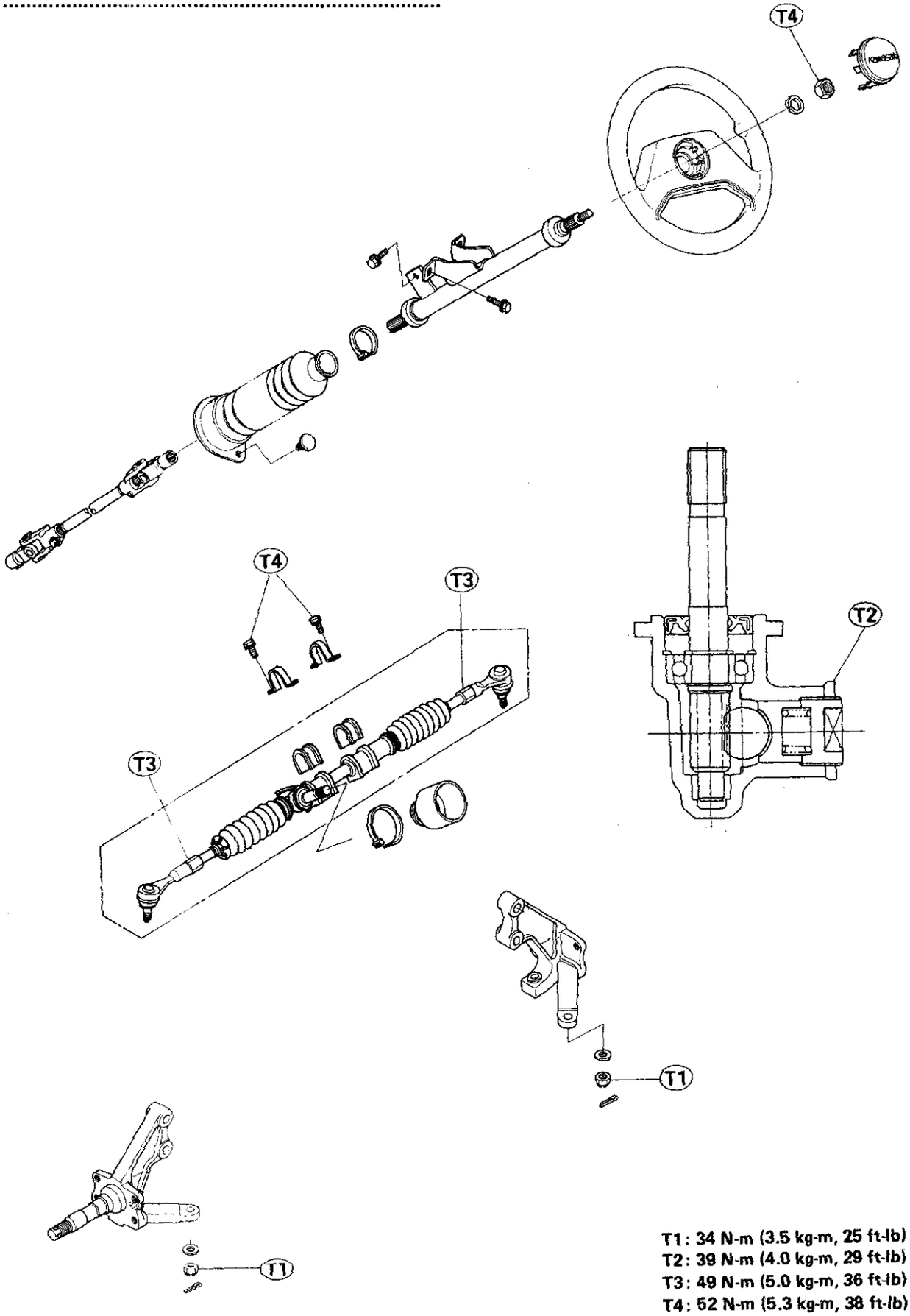
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Exploded View



T1: 34 N-m (3.5 kg-m, 25 ft-lb)
T2: 39 N-m (4.0 kg-m, 29 ft-lb)
T3: 49 N-m (5.0 kg-m, 36 ft-lb)
T4: 52 N-m (5.3 kg-m, 38 ft-lb)

Specifications

Item	Standard
Steering wheel free play	0 – 20 mm
Tie-rod length (distance between groove and locknut)	13 mm

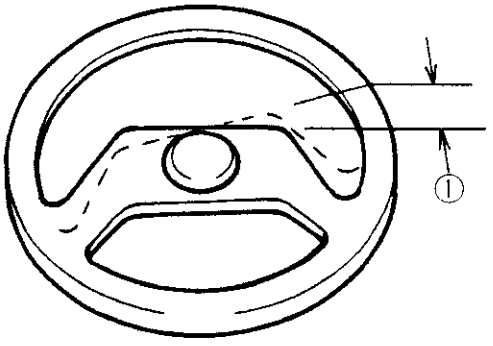
Steering Wheel and Main Shaft Assembly

Steering Wheel Free Play Inspection

●Check steering wheel free play.

○Set the vehicle's front tires straight ahead. Gently turn the steering wheel left and right. The steering wheel free play is the amount of travel in the steering wheel, before the front wheels are turned.

Steering Wheel Free Play



1. Steering Wheel Free Play

Steering Wheel Free Play

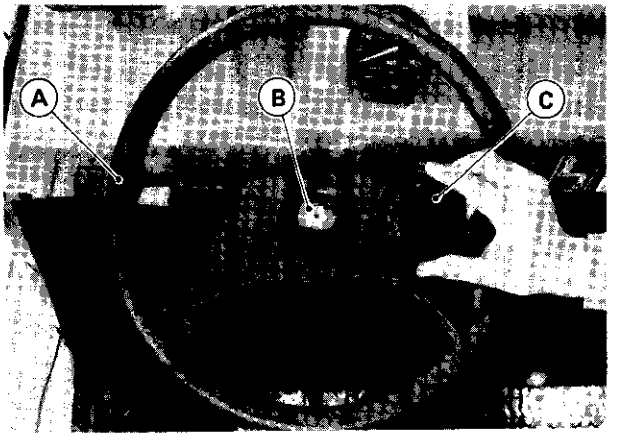
Standard: 0 – 20 mm

★If steering wheel free play is not correct, inspect the following.
- Steering Wheel Mounting Nut
- Intermediate Shaft Clamp Bolts
- Steering Gear Assembly Mounting Bracket Bolts
- Steering Gear Assembly Mounting Rubber Dampers
- Tie-rod End Nuts
- Steering Gear Preload Adjustment

★If the above bolts and nuts are tightened firmly, dampers are in good condition, and the preload is adjusted correctly, the steering gear assembly is damaged and should be replaced as a unit.

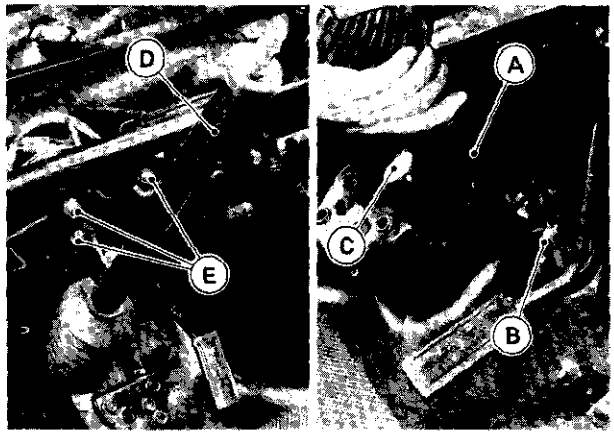
Steering Wheel and Main Shaft Removal

●Remove the following if the steering main shaft is to be disassembled.
- Steering Wheel Cap
- Steering Wheel Mounting Nut and Lockwasher
- Steering Wheel



A. Steering Wheel
B. Mounting Nut
C. Cap

●Remove the following.
- Dust Boot Lower Clamp
- Intermediate Shaft Lower Clamp Bolt
- Front Fender Upper
- Main Shaft Bracket Mounting Bolts

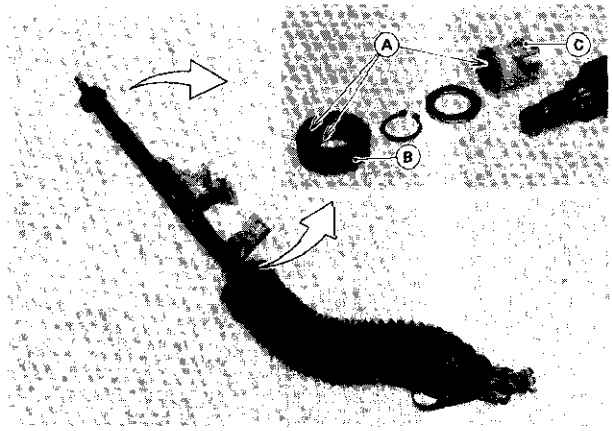


A. Intermediate Shaft
B. Clamp Bolt
C. Dust Boot Clamp
D. Main Shaft Bracket
E. Mounting Bolts

- Remove the following to disassemble the steering main shaft.
  - Dust Boot Clamp
  - Dust Boot
  - Intermediate Shaft Clamp Bolt
  - Intermediate Shaft
  - Dust Covers
  - Circlips and Washers
  - Main Shaft
  - Main Shaft Bushings and Bracket

Steering Wheel and Main Shaft Installation

- Apply grease to the following.
  - Main Shaft Bushings
    (Inside Surface and Flanged End)
  - Dust Cover Lips

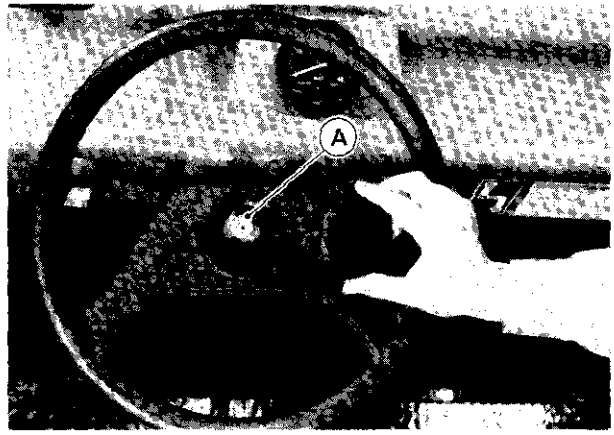


A. Apply grease.
B. Dust Cover
C. Bushing

- Connect the intermediate shaft to the main shaft and the steering gear pinion in any position. Mount the steering wheel on the main shaft temporarily.
- Perform the following.
  - Steering Wheel Centering
- Torque the following.
  - Steering Wheel Mounting Nut

Steering Wheel Centering

- Test ride the vehicle.
- ★If the steering wheel is not straight when the vehicle is traveling in a straight line, perform the following procedure.
- Check the tie-rod length and adjust it if necessary.
- Remove the cap and loosen the steering wheel mounting nut.



A. Steering Wheel Mounting Nut

- Push the vehicle in a straight line but not ride, and stop it without turning the steering wheel.
- Remount the steering wheel so that it is straight ahead.
- Torque the following.
  - Steering Wheel Mounting Nut

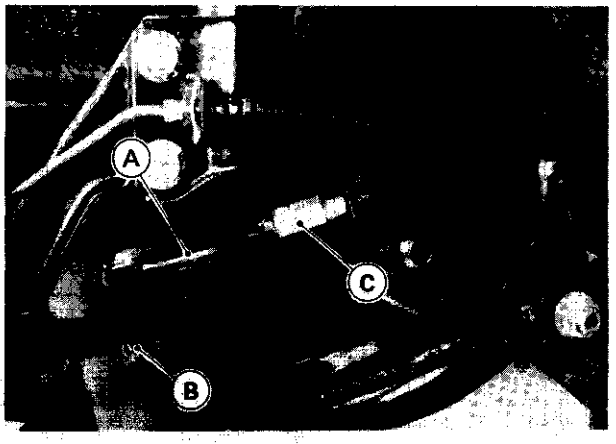
Steering Gear Assembly

Steering Gear Assembly Removal

- Remove the following.
  - Front Fender Lower
  - Front Wheels
  - Cotter Pins
  - Tie-rod End Nuts
  - Tie-rod Ends from Steering Knuckles
- ○Install a suitable nut on the stud of the tie-rod end joint and tap the nut to free the joint from the knuckle.

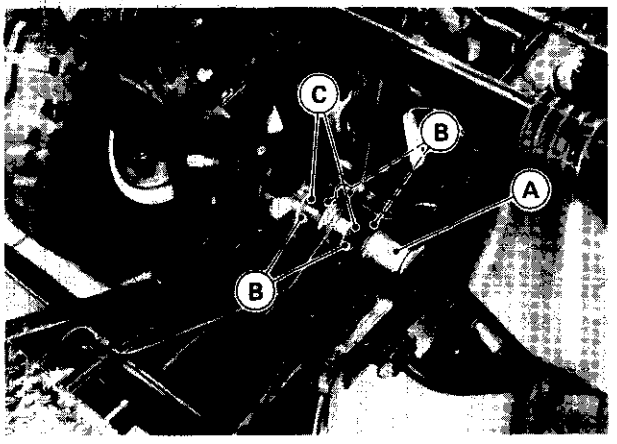
CAUTION

○Do not loosen the tie-rod end locknuts, or the toe-in of the front will be changed.



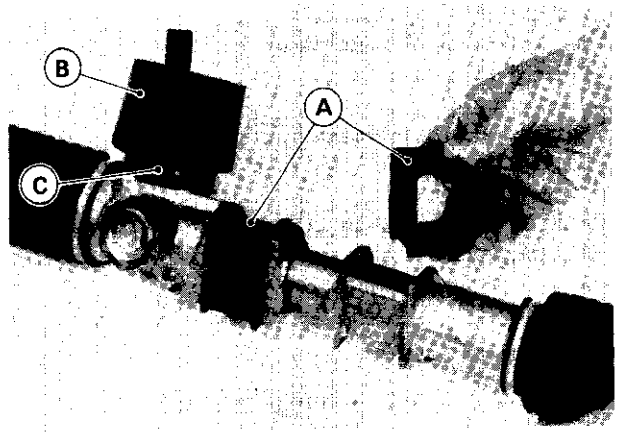
A. Tie-rod End
B. Tie-rod End Nut
C. Locknut

Steering Gear Assembly Bracket Bolts
Steering Gear Assembly and Brackets



A. Steering Gear Assembly
B. Mounting Bolts
C. Brackets

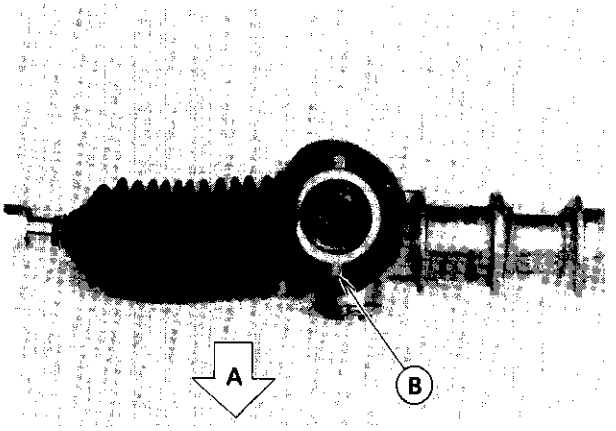
Rubber Dampers
Strip
Dust Boot at Pinion Shaft Housing



A. Rubber Dampers
B. Dust Boot
C. Strip

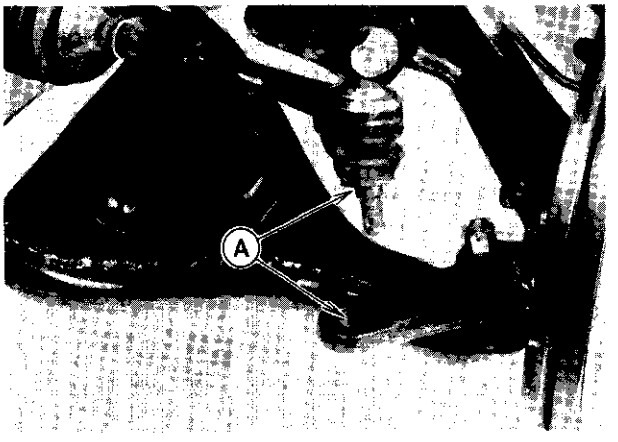
Steering Gear Assembly Installation

- Perform the following.
  Steering Gear Preload Adjustment
- Install the dust boot to the pinion shaft housing so that the hole of the boot is the rear side.



A. Rear
B. Hole

- Clean the tapered portion of the tie-rod end joint and the tapered hole of the steering knuckle, or the tapers will not fit snugly.



A. Clean here.

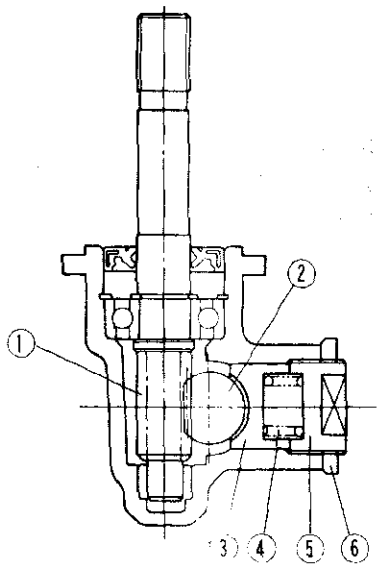
- Torque the following.
  Steering Gear Assembly Bracket Bolts
  Tie-rod End Nuts
- Check the following.
  Tie-rod Length
  Toe-in of Front Wheels

Steering Gear Preload Adjustment

- Loosen the locknut.
- Tighten the rack guide spring cap to 6.9 N-m (0.70 kg-m, 61 in-lb) of torque.
- Return the cap 60 – 70° back.

●Torque the following.
Rack Guide Spring Cap Locknut
○Tighten the locknut while preventing the cap from turning.

Steering Gear Preload



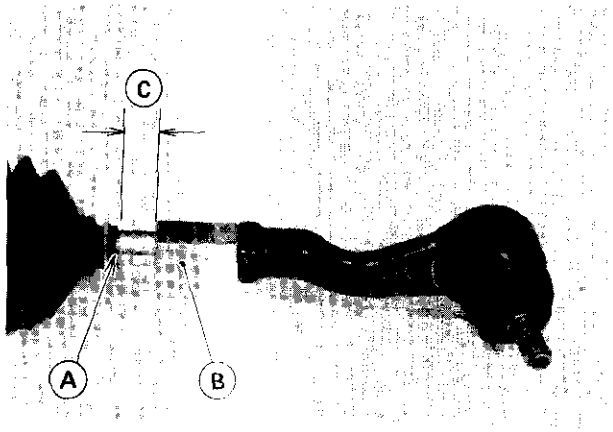
1. Pinion
2. Rack
3. Rack Guide
4. Spring
5. Cap
6. Locknut

Tie-rod Length Adjustment

●Check the length of the tie-rod distance between the rod groove and the locknut. This distance should be the specified value for both the left and right tie-rods.

Tie-rod Length (distance between groove and locknut)

Standard: 13 mm

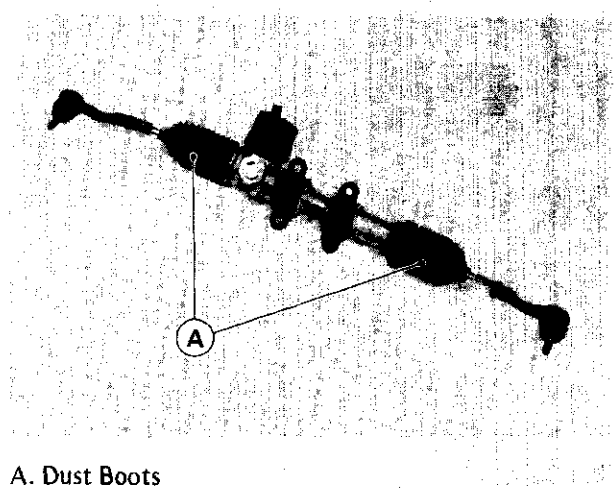


A. Groove
B. Locknut
C. Tie-rod Length

★If it is not, adjust the tie-rod length.
●Loosen the locknut and turn the adjusting rod to achieve the specified value.
●Torque the following.
Tie-rod End Locknut(s)

Dust Boot Inspection

●Visually inspect the dust boots at both the ends of the steering gear assembly.
★If there is any signs of deterioration, cracks, or damage, replace the steering gear assembly.



A. Dust Boots

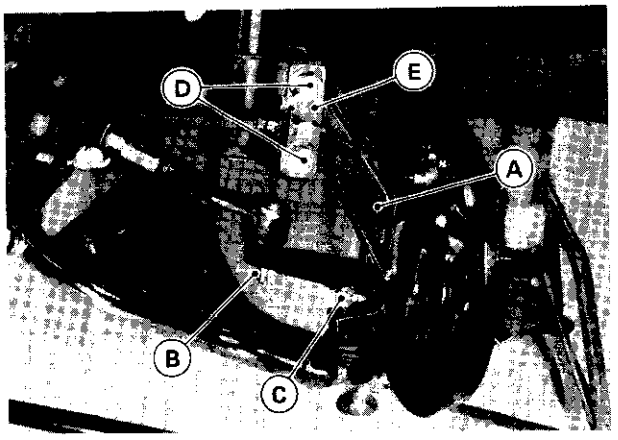
Steering Knuckles

Steering Knuckle Removal

●Remove the following.
Front Wheel
Front Brake Drum
Front Brake Panel Assembly
(with Brake Pipe and Hose)
Cotter Pins
Tie-rod End Nut
Suspension Arm Joint Nut
Suspension Arm Joint and Tie-rod End from Steering Knuckle
○Install a suitable nut on each stud of the tie-rod end joint and the suspension arm joint. Tap the nut to free each joint from the knuckle.

CAUTION

○Do not loosen the tie-rod end locknut, or the toe-in of the front wheels will be changed.

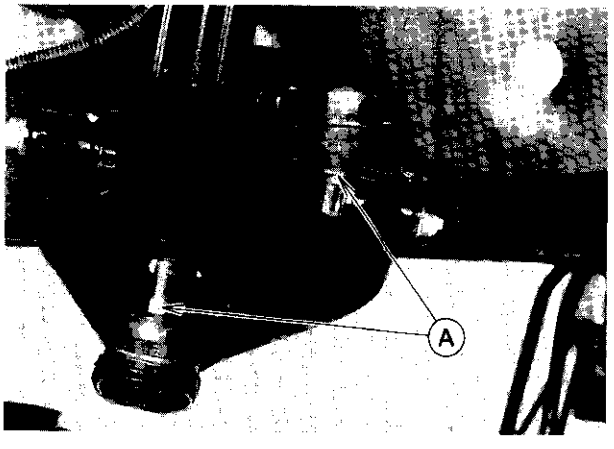


A. Steering Knuckle
B. Tie-rod End Nut
C. Joint Nut
D. Strut Lower Mounting Bolts and Nuts
E. Brake Hose Clamp

Strut Lower Mounting Bolts and Nuts
Brake Hose Clamp
Steering Knuckle

Steering Knuckle Installation

- Clean the tapered portions of the suspension arm joint and the tie-rod end joint and the tapered holes of the steering knuckle, or the tapers will not fit snugly.



A. Clean here.

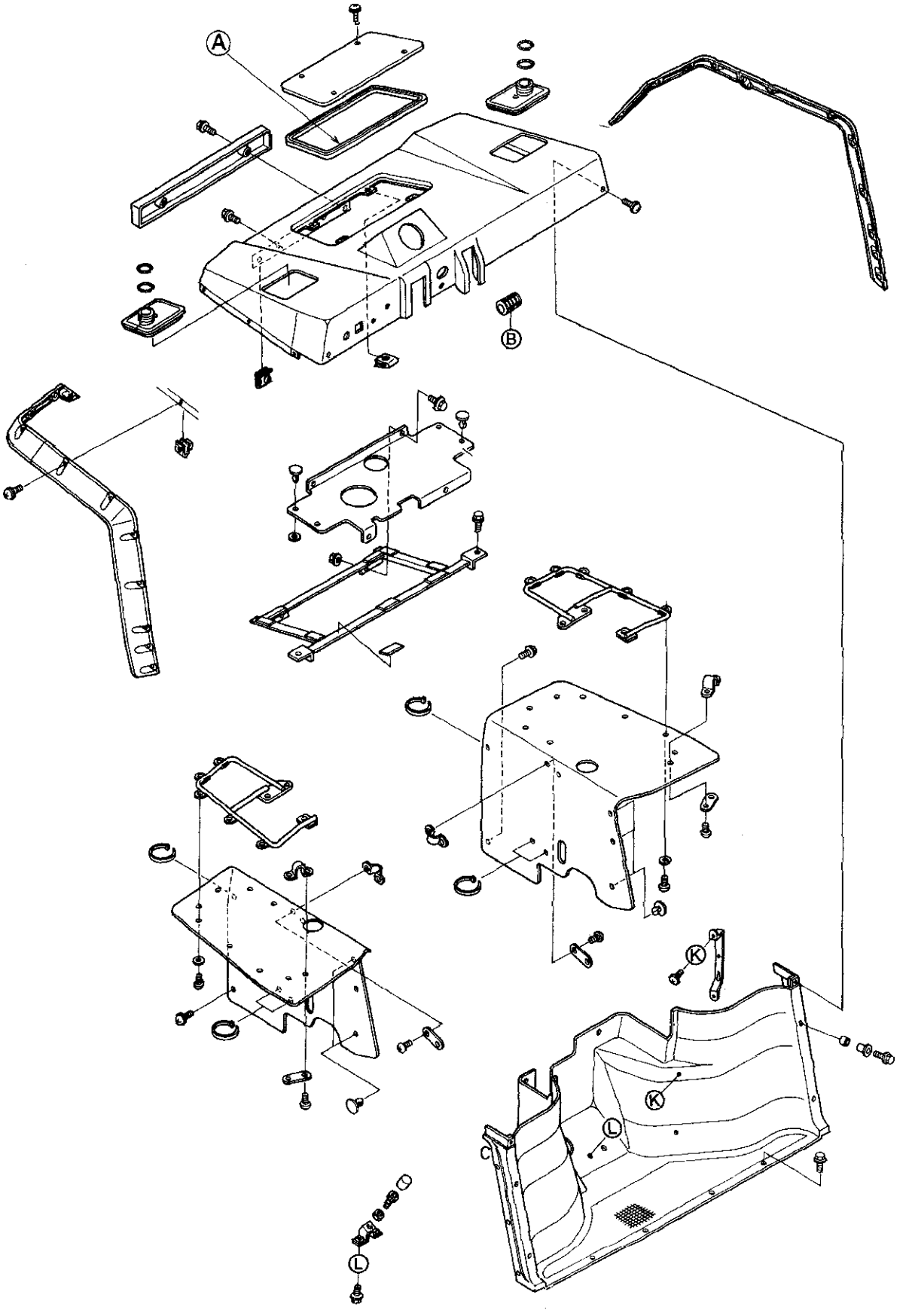
- Torque the following.
  Strut Lower Mounting Bolts
  Suspension Arm Joint Nut
  Tie-rod End Nut
- Check the following.
  Toe-in of Front Wheels

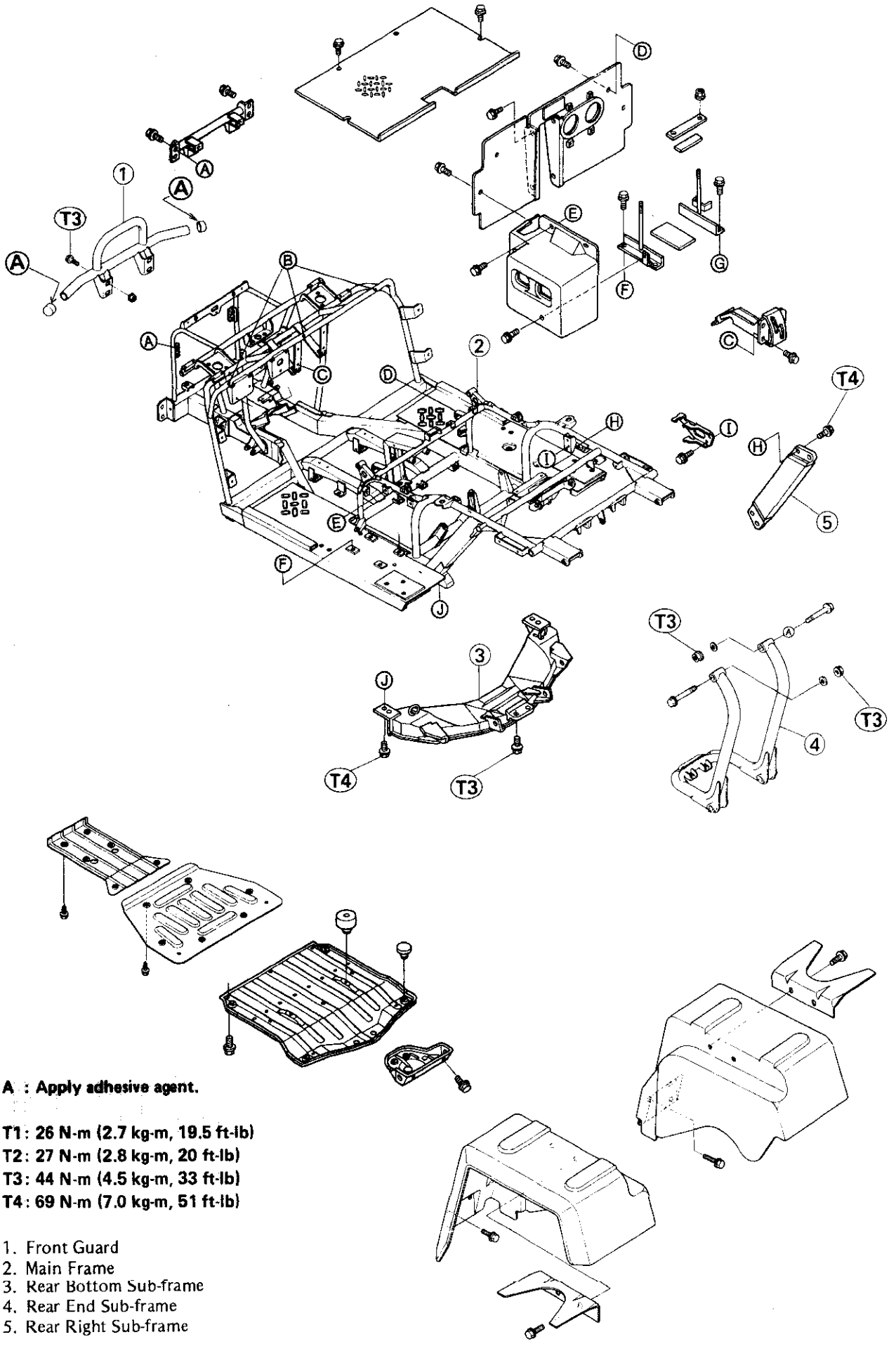
Frame

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    Front Fender Inner Left and Right Installation 14-10

Exploded View

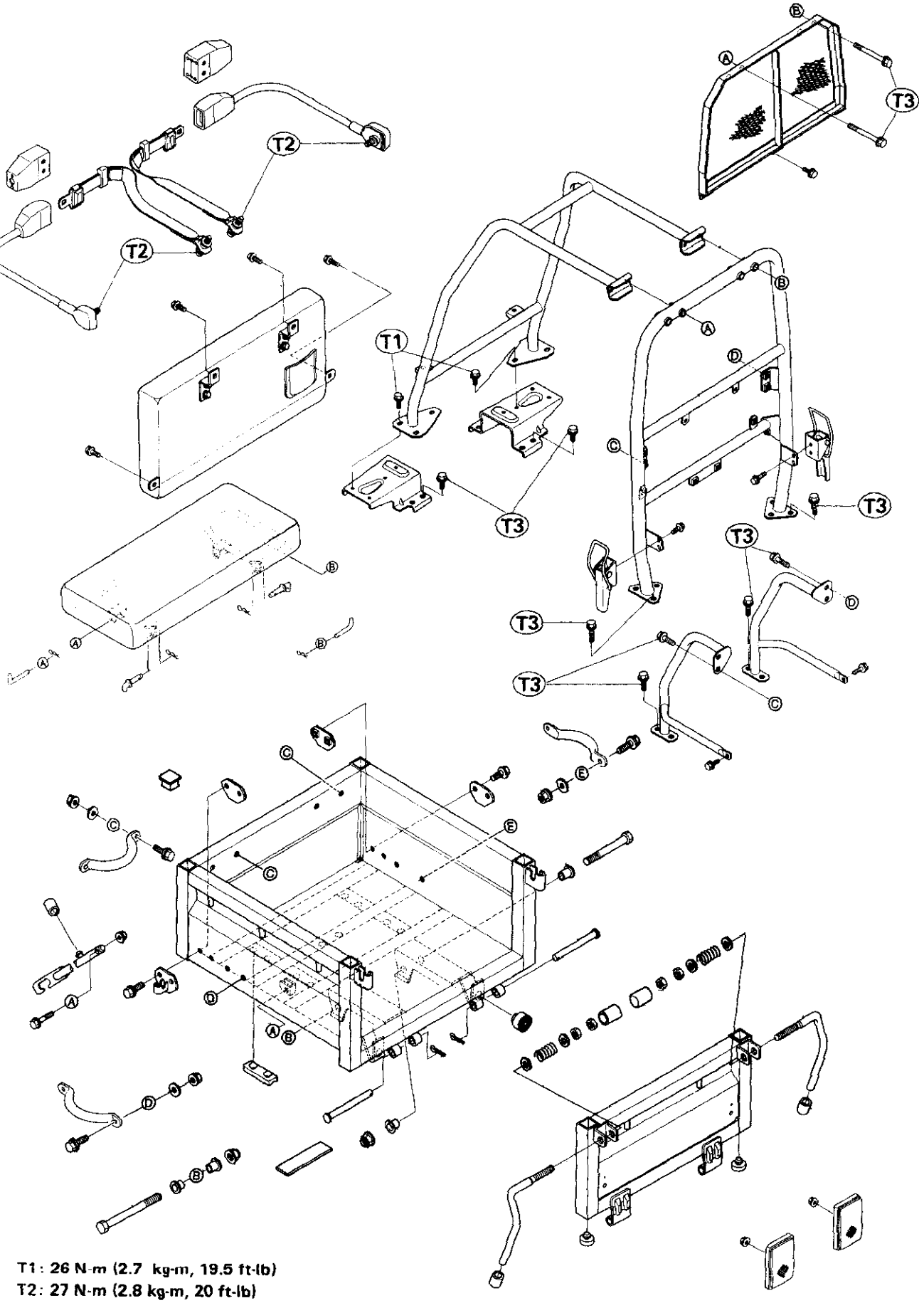




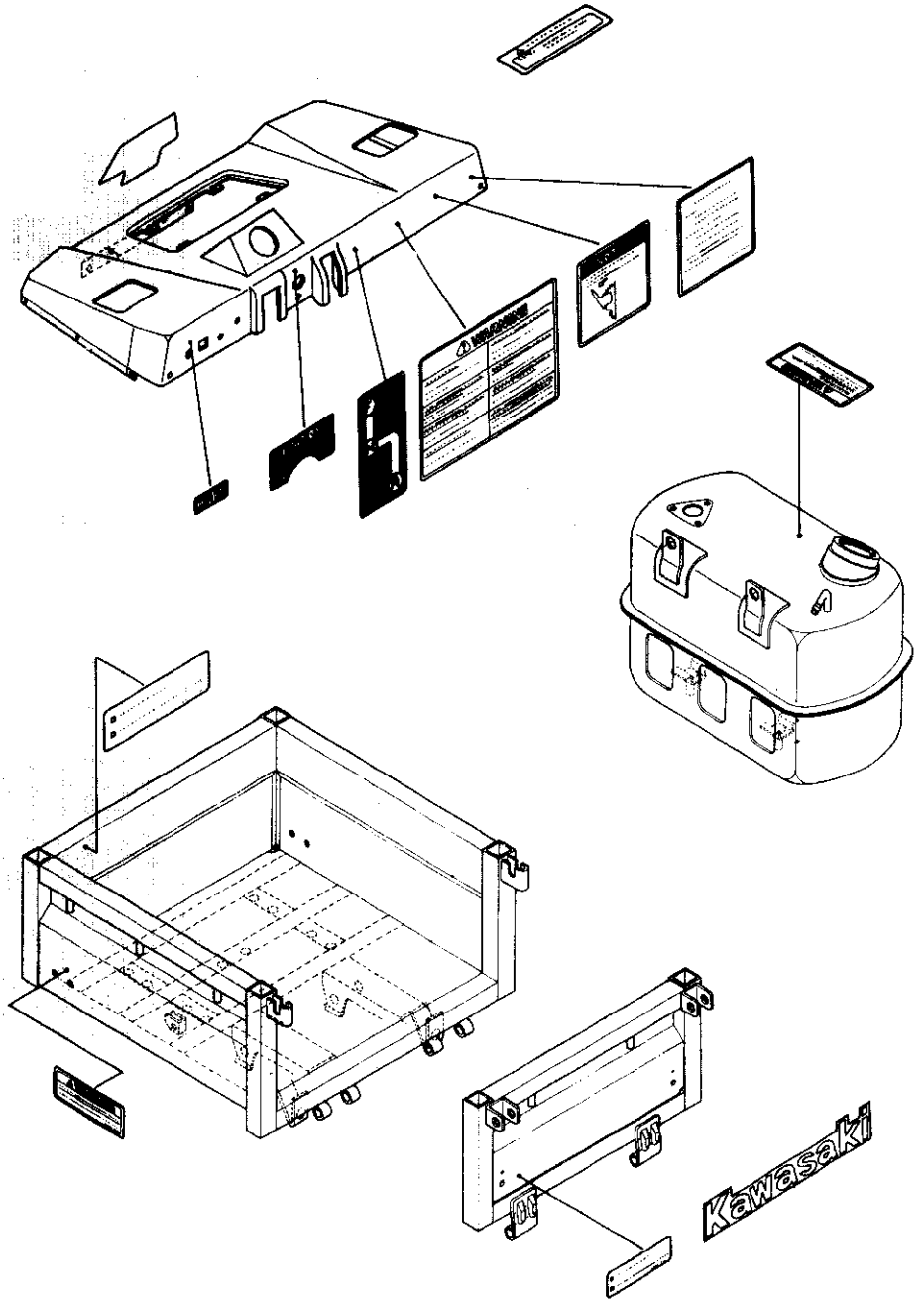
A : Apply adhesive agent.

T1: 26 N-m (2.7 kg-m, 19.5 ft-lb)
T2: 27 N-m (2.8 kg-m, 20 ft-lb)
T3: 44 N-m (4.5 kg-m, 33 ft-lb)
T4: 69 N-m (7.0 kg-m, 51 ft-lb)

1. Front Guard
2. Main Frame
3. Rear Bottom Sub-frame
4. Rear End Sub-frame
5. Rear Right Sub-frame



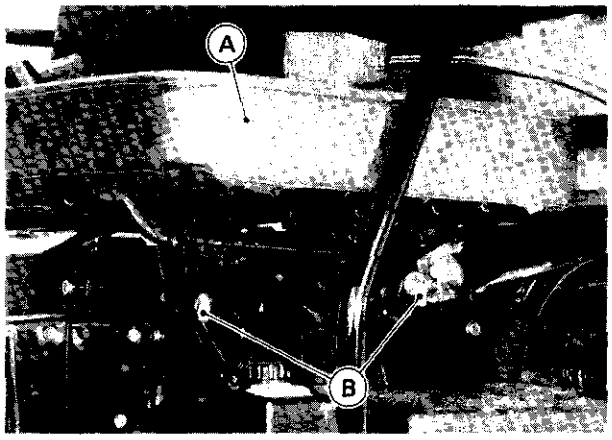
T1: 26 N-m (2.7 kg-m, 19.5 ft-lb)
T2: 27 N-m (2.8 kg-m, 20 ft-lb)
T3: 44 N-m (4.5 kg-m, 33 ft-lb)


Kawasaki

Seat

Seat Removal

- Remove the following.
  - Clips
  - Seat Retaining Pins
  - Seat



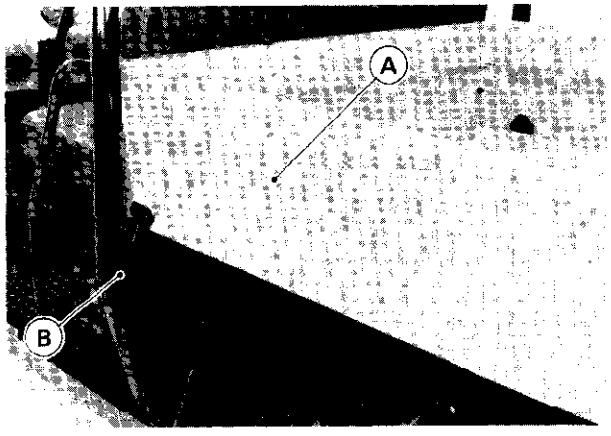
A. Seat
B. Retaining Pins (both left and right sides)

Cargo Bed

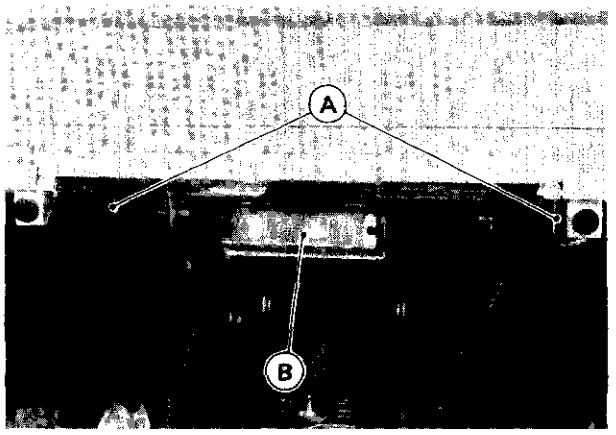
Cargo Bed Removal

- Unlock the front hooks of the cargo bed.
- Remove the following.
  - Tail/Brake Light Assembly Bracket Mounting Bolts
  - Tail/Brake Light Assembly with Bracket
  - Cargo Bed Mounting Bolts and Nuts
  - Cargo Bed

○To prevent damage to the tail/brake light assembly, remove it before removing the cargo bed.



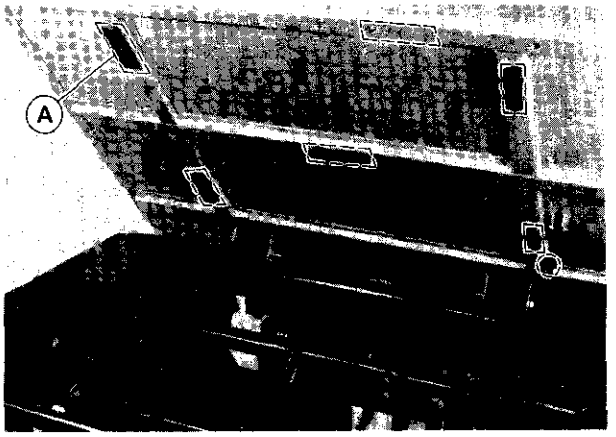
A. Cargo Bed
B. Front Hook (both left and right sides)



A. Mounting Bolts B. Tail/Brake Light Assembly

Cargo Bed Installation

- Install the rubber dampers to the bottom of the cargo bed if they were removed.

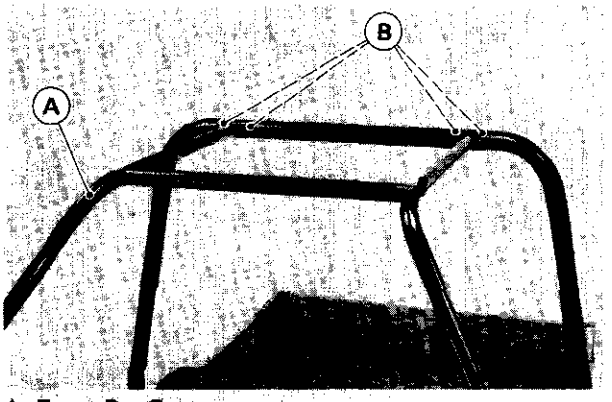


A. Rubber Dampers

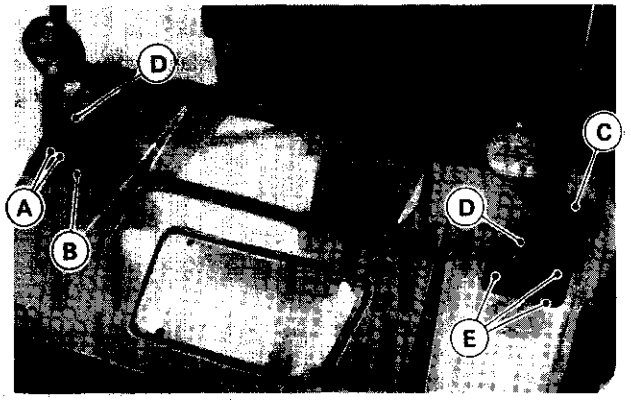
Front and Rear Bar Components

Front Bar Component Removal

- Remove the following.
  - Upper Mounting Bolts
    - (connecting to Rear Bar Component)
  - Spring Bands
  - Dust Covers
- Disconnect the headlight leads.
- Remove the following.
  - Lower Mounting Bolts
  - Front Bar Component



A. Front Bar Component
B. Upper Mounting Bolts



A. Spring Bands
B. Dust Cover (marked 1493)
C. Dust Cover (marked 1492)
D. Headlight Lead
E. Lower Mounting Bolts

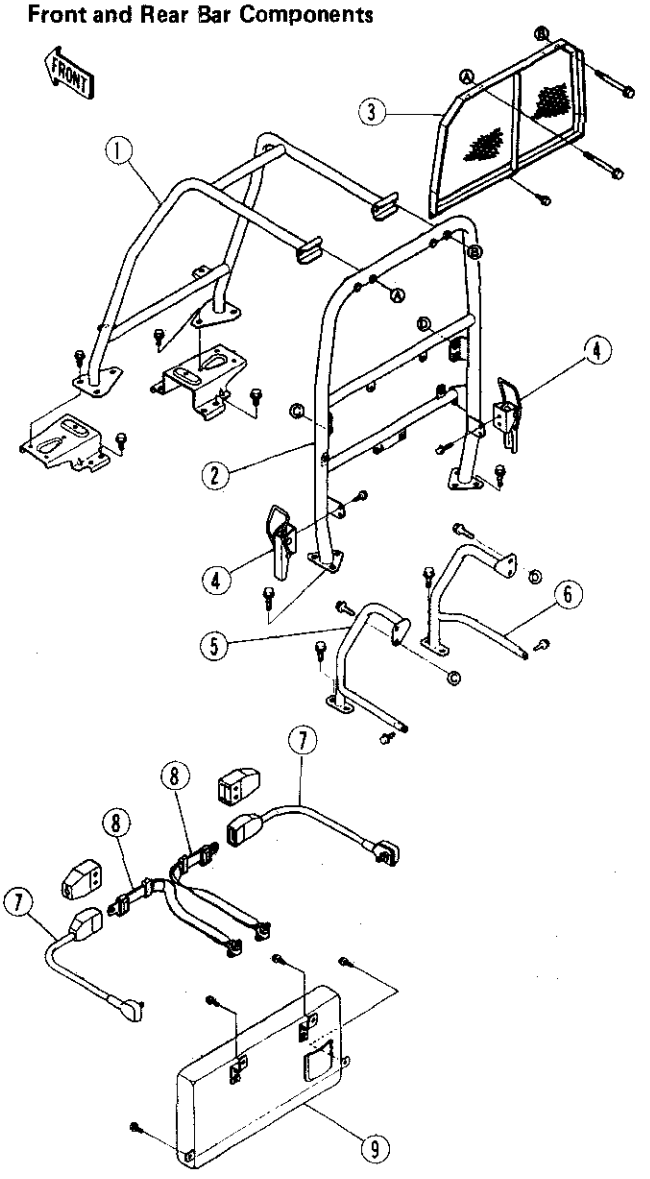
Front Bar Component Installation

- Torque the following.
  - Lower Mounting Bolts
  - Upper Mounting Bolts
- Adjust the following.
  - Headlight Beam

Rear Bar Component Removal

- Unlock the hooks at the front of the cargo bed.
- Remove the following if the rear bar component is to be disassembled.
  - Screen Lower Mounting Bolts
  - Seat Back Mounting Bolts
  - Seat Back
  - Seat Belt Mounting Bolts
  - Seat Belts
  - Side Bar Mounting Bolts
  - Left and Right Side Bars
  - Cargo Bed Front Hook Mounting Bolts
  - Cargo Bed Front Hooks
- Remove the following.
  - Upper Mounting Bolts
    (connecting to Front Bar Component)
  - Screen (if its lower mounting bolts were removed)
  - Lower Mounting Bolts
  - Side Bar Lower Mounting Bolts
    (if the side bars are installed)

Front and Rear Bar Components



1. Front Bar Component
2. Rear Bar Component
3. Screen
4. Cargo Bed Front Hook
5. Side Bar (Left)
6. Side Bar (Right)
7. Seat Belt (Buckle)
8. Seat Belt (Latch)
9. Seat Back

Rear Bar Component Installation

- Torque the following.
  - Lower Mounting Bolts
  - Upper Mounting Bolts
  - Side Bar Upper and Lower Mounting Bolts
    (10 mm diameter)
  - Seat Belt Mounting Bolts

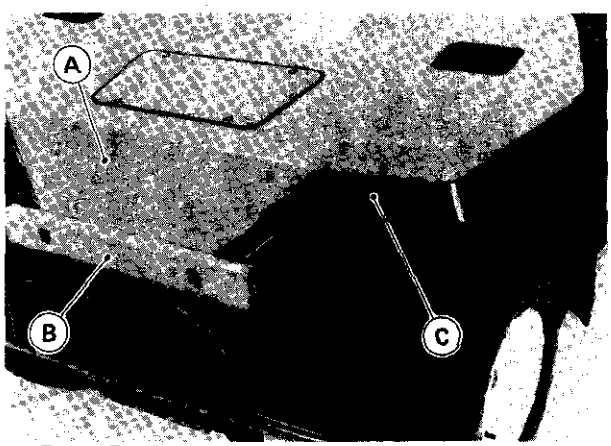
NOTE

○*The seat belt sets for the operator and the passenger are identical.*

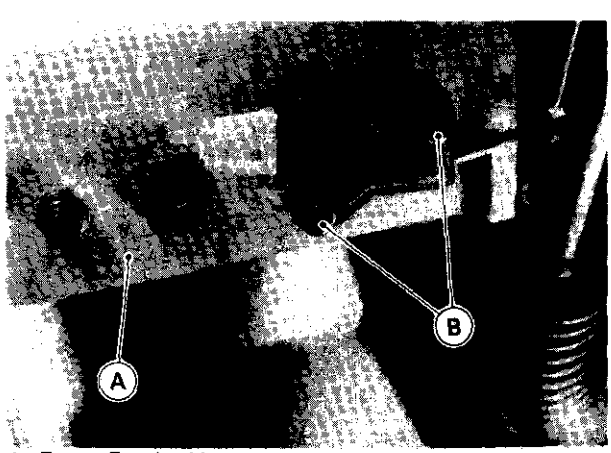
Front Fender Assembly

Front Fender Upper Removal

- Disconnect the electrical wiring connectors.
  - Light Switch Lead Connector
  - Speedometer Lead Connector
  - Horn Button Lead Connectors
- Remove the following.
  - Front Bar Component
  - Differential Shift Lever Case Mounting Bolts
  - Speedometer Cable from Speedometer
  - Flap Mounting Screws
  - Left and Right Flaps
  - Front Cover Mounting Bolts
  - Front Cover
  - Front Fender Upper Mounting Screws
  - Front Fender Upper



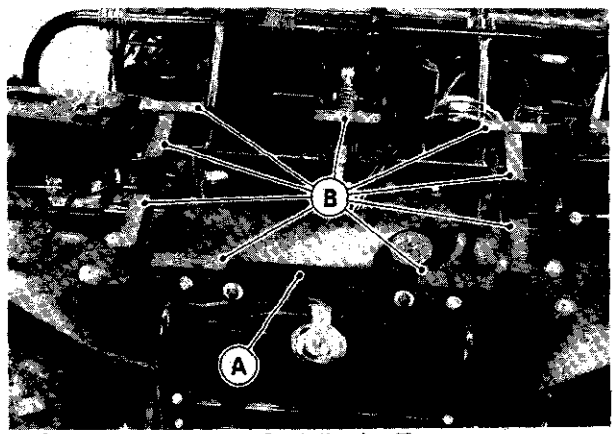
A. Front Fender Upper
B. Front Cover
C. Flaps



A. Front Fender Upper
B. Differential Shift Lever Case Mounting Bolts

Front Fender Upper Installation

- Replace the adhesive tapes on the stay with new ones if they have lost their adhesion or they have been damaged.

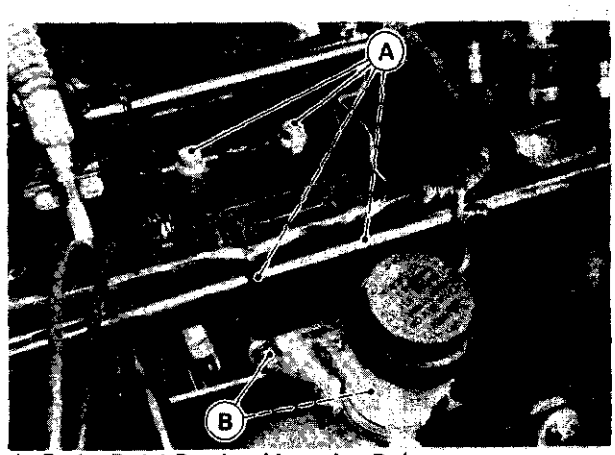


A. Stay
B. Adhesive Tapes

- Stick the seal trimming back on the maintenance cover with an adhesive sealant. The ends of the trimming should fit flush with each other.

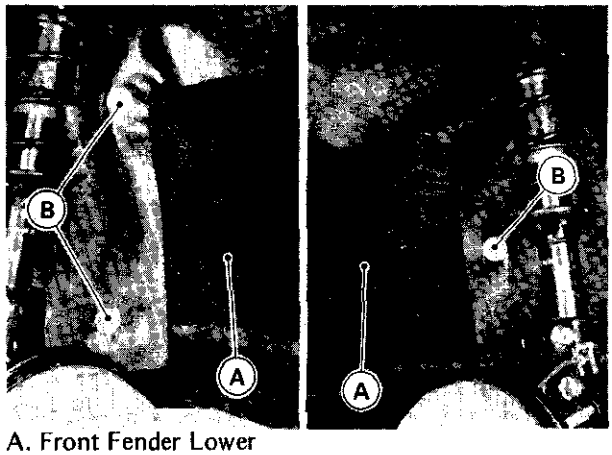
Front Fender Lower Removal

- Remove the following.
  - Steering Wheel and Main Shaft Assembly
  - Front Bar Component
  - Front Fender Upper
  - Front Fender Upper Stay
  - Front Fender Inner Upper (Rubber Sheet)
  - Throttle Cable from Throttle Pedal
- Disconnect the following.
  - Brake Light Switch Leads
- Remove the following.
  - Brake Pedal Bracket Mounting Bolts
  - Master Cylinder Mounting Bolts
- Hold the master cylinder in its position with a rope to prevent brake pipe damage.



A. Brake Pedal Bracket Mounting Bolts
B. Master Cylinder Mounting Bolts

  - Brake Pedal Bracket
  - Clamps
    - (connecting Front Fender Inner Left and Right to Front Fender Lower)
  - Front Fender Lower Mounting Bolts
  - Front Fender Lower



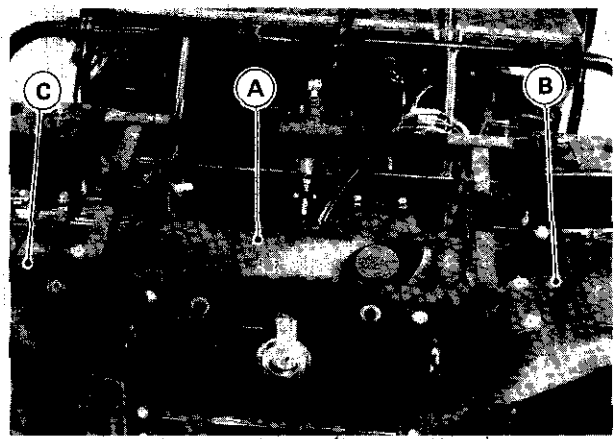
A. Front Fender Lower
B. Clamps (left : 2 and right : 1)

Front Fender Lower Installation

- Adjust the following.
  - Throttle Pedal Free Play
  - Brake Pedal Free Play
  - Brake Light Switch

Front Fender Inner Upper Removal

- Remove the following.
  - Front Bar Component
  - Front Fender Upper
  - Front Fender Upper Stay Mounting Bolts
  - Front Fender Upper Stay
  - Clamps
    - (connecting Inner Upper to Inner Left and Right, and to Front Fender Lower)
  - Front Fender Inner Upper (Rubber Sheet)



A. Front Fender Inner Upper (Rubber Sheet)
B. Front Fender Inner Left (Rubber Sheet)
C. Front Fender Inner Right (Rubber Sheet)

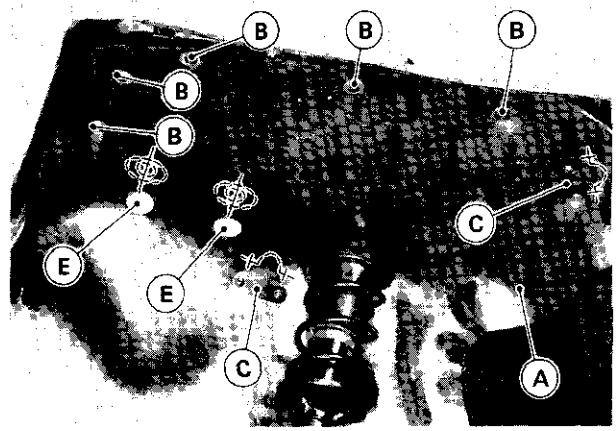
Front Fender Inner Left and Right Removal

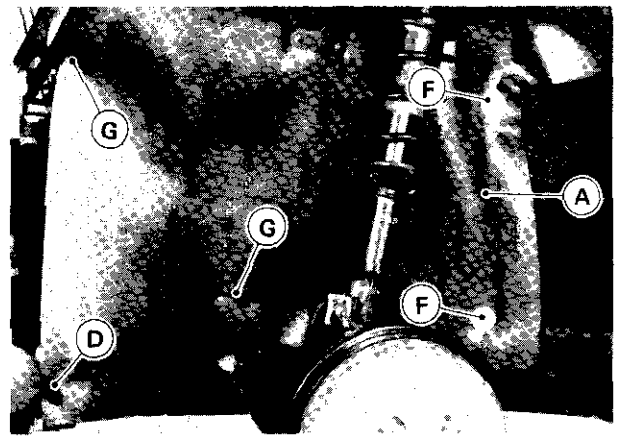
- Remove the following.
  - Maintenance Cover on Front Fender Upper
  - Front Wheel
- Hold the front brake drum and panel assembly in their position.
- Remove the following.
  - Strut (Front Shock Absorber) Lower Mounting Bolts and Nuts
  - Brake Hose Clamp
  - Strips
  - Clamps
  - Screws, Washers, and Brackets
- Disconnect the brake hose from the pipe to free the front fender inner left or right.
  - Immediately wipe up any brake fluid that spills.

CAUTION

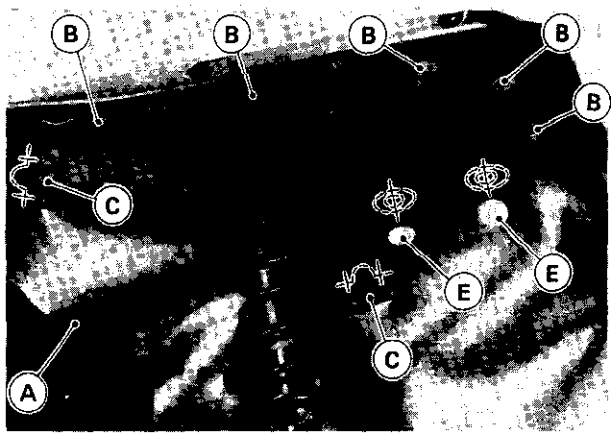
- **Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.**

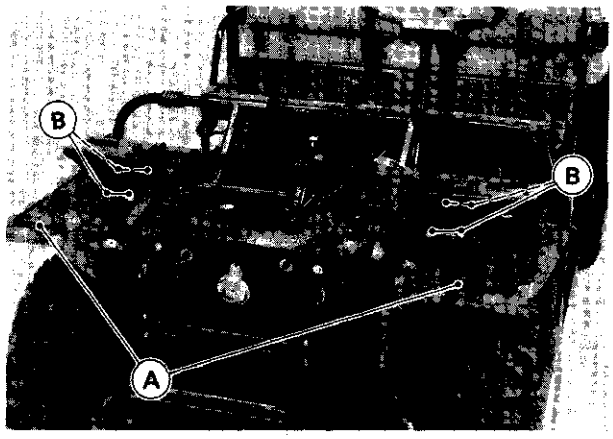
Front Fender Inner Left or Right (Rubber Sheet)



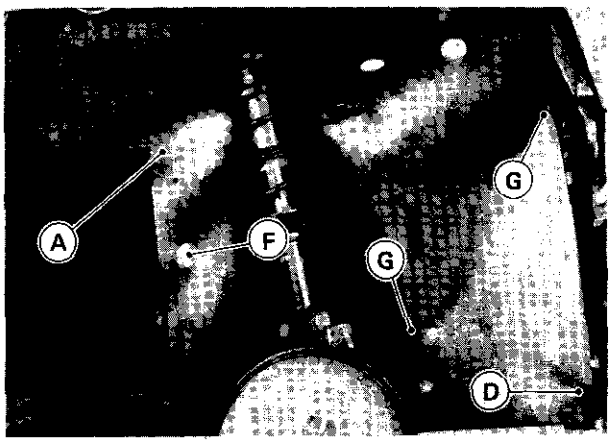


A. Front Fender Inner Left (Rubber Sheet)
B. Screw and Washer
C. Screws and Brackets
D. Screw
E. Clamp and Washer
F. Clamp
G. Strip





A. Front Fender Inner Left and Right Stays
B. Mounting Bolts



A. Front Fender Inner Right (Rubber Sheet)
B. Screw and Washer
C. Screws and Brackets
D. Screw
E. Clamp and Washer
F. Clamp
G. Strip

●Bleed the brake line after installation.

Front Fender Inner Left and Right Installation

●The front fender inner left and right are identical.
●Torque the following.
Stay Mounting Bolts (if removed)
Strut Lower Mounting Bolts
Brake Pipe Nipple

Electrical System

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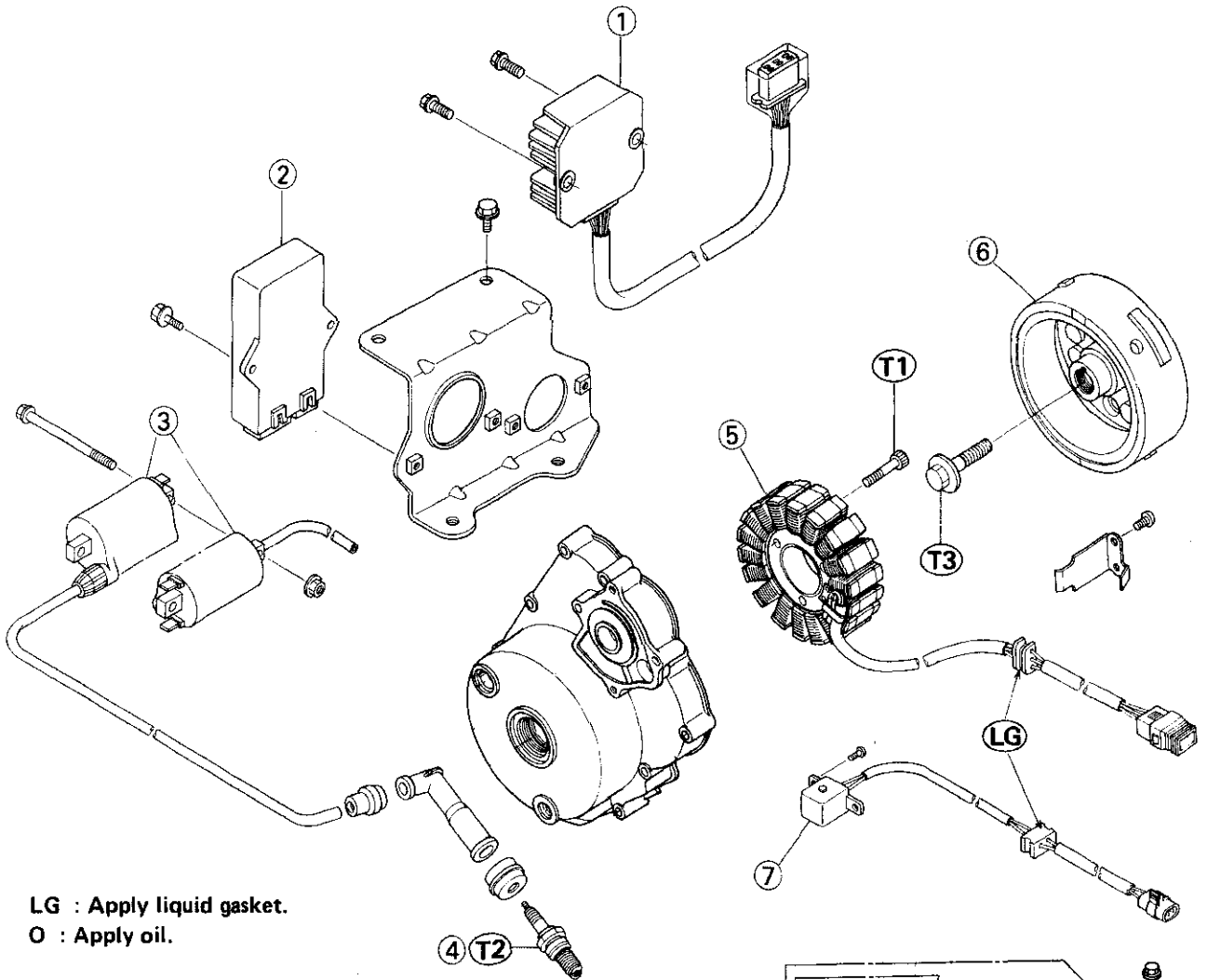
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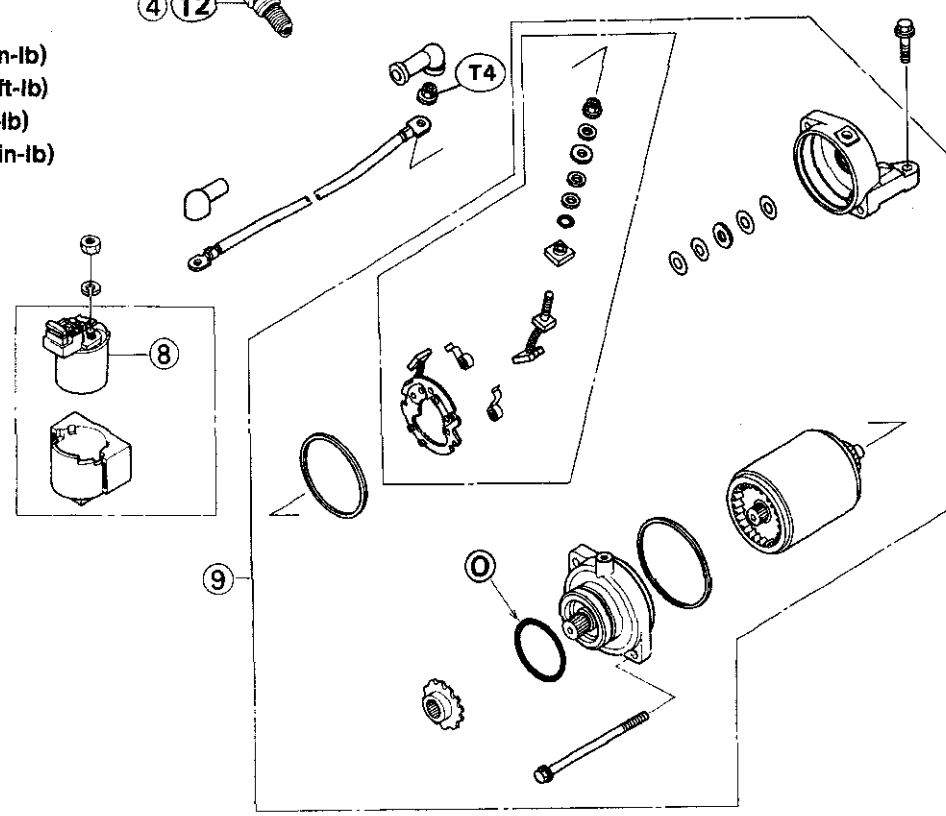
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Exploded View

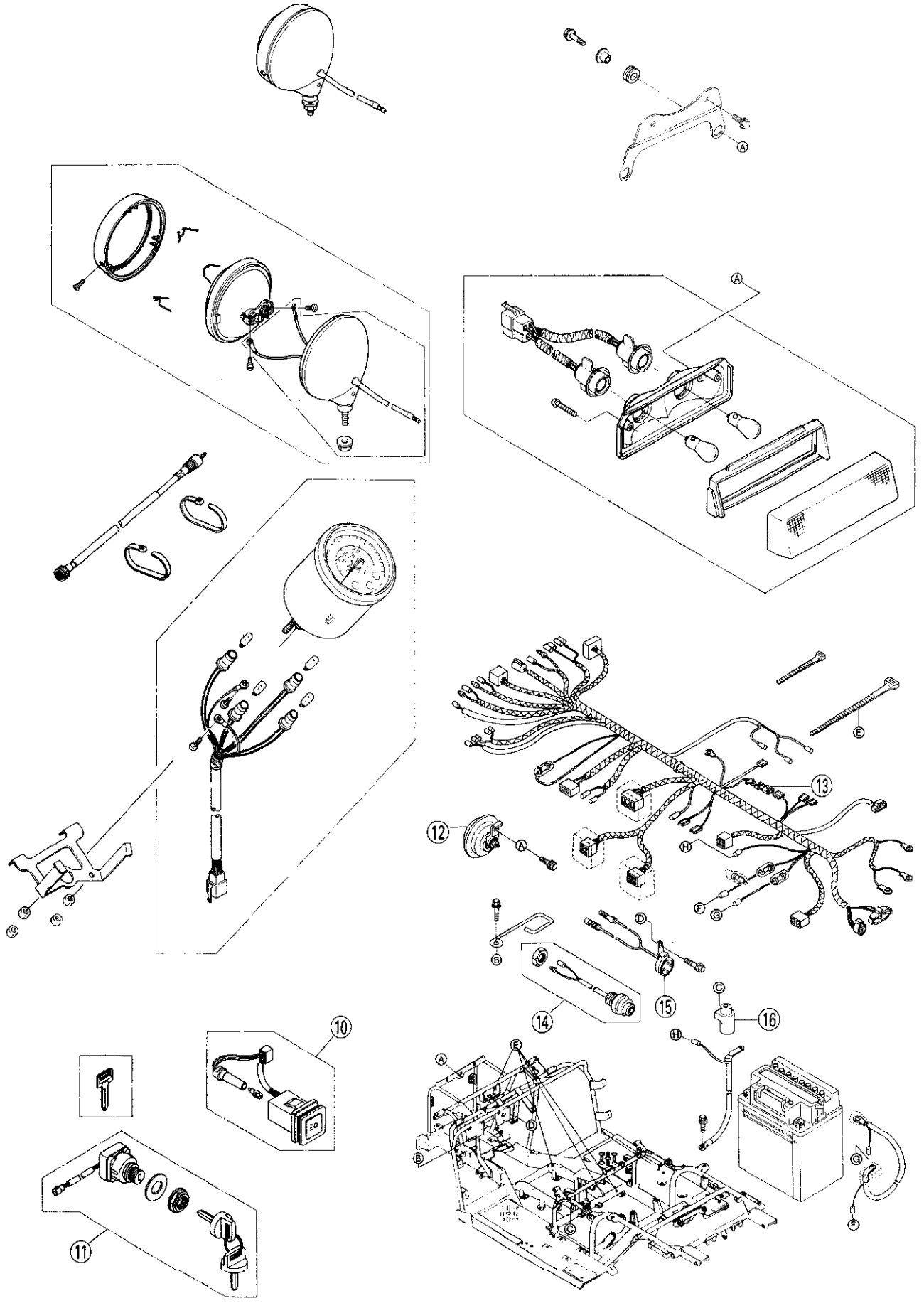


LG : Apply liquid gasket.
O : Apply oil.

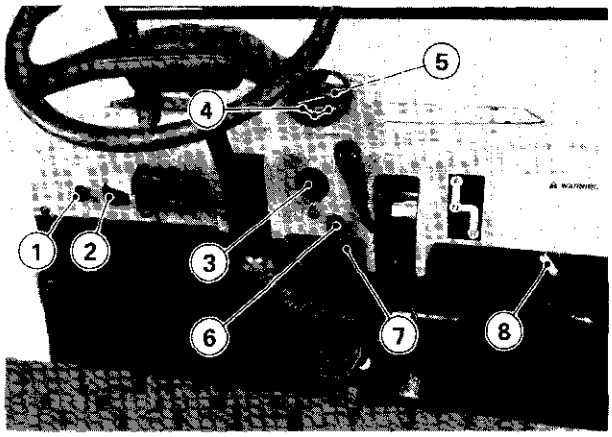
T1: 12 N-m (1.2 kg-m, 104 in-lb)
T2: 14 N-m (1.4 kg-m, 10.0 ft-lb)
T3: 69 N-m (7.0 kg-m, 51 ft-lb)
T4: 4.9 N-m (0.50 kg-m, 43 in-lb)

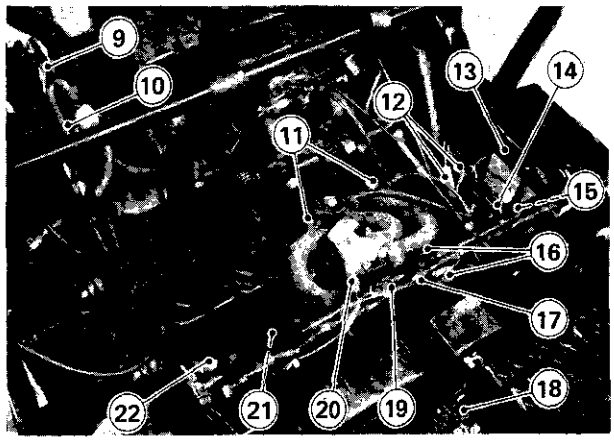


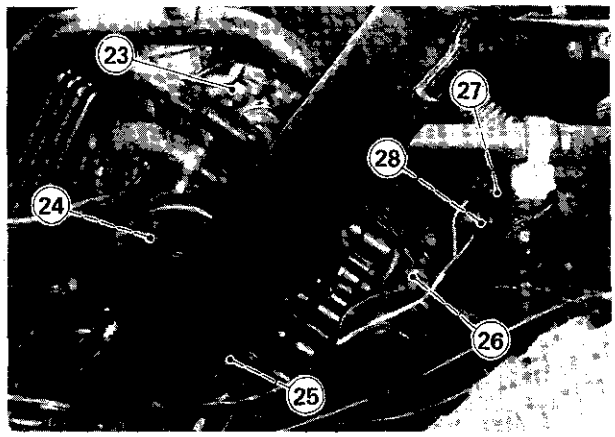
1. Regulator/Rectifier
2. IC Igniter
3. Ignition Coils
4. Spark Plug
5. Alternator Stator
6. Alternator Rotor
7. Pickup Coil
8. Starter Motor Relay
9. Starter Motor
10. Light Switch
11. Ignition Switch
12. Horn
13. Diode
14. Horn Button
15. Warning Buzzer
16. Starter Circuit Relay

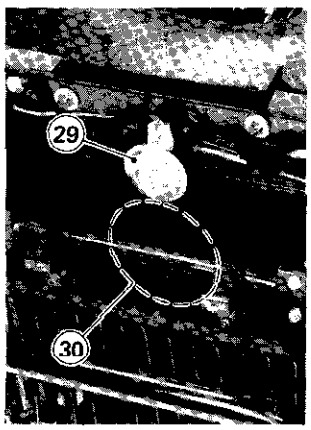

A
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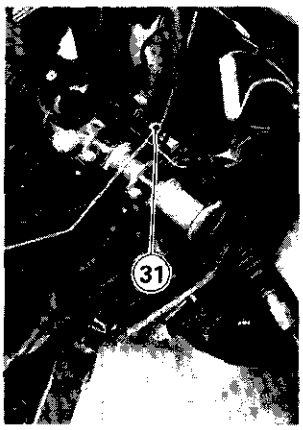
Part Location





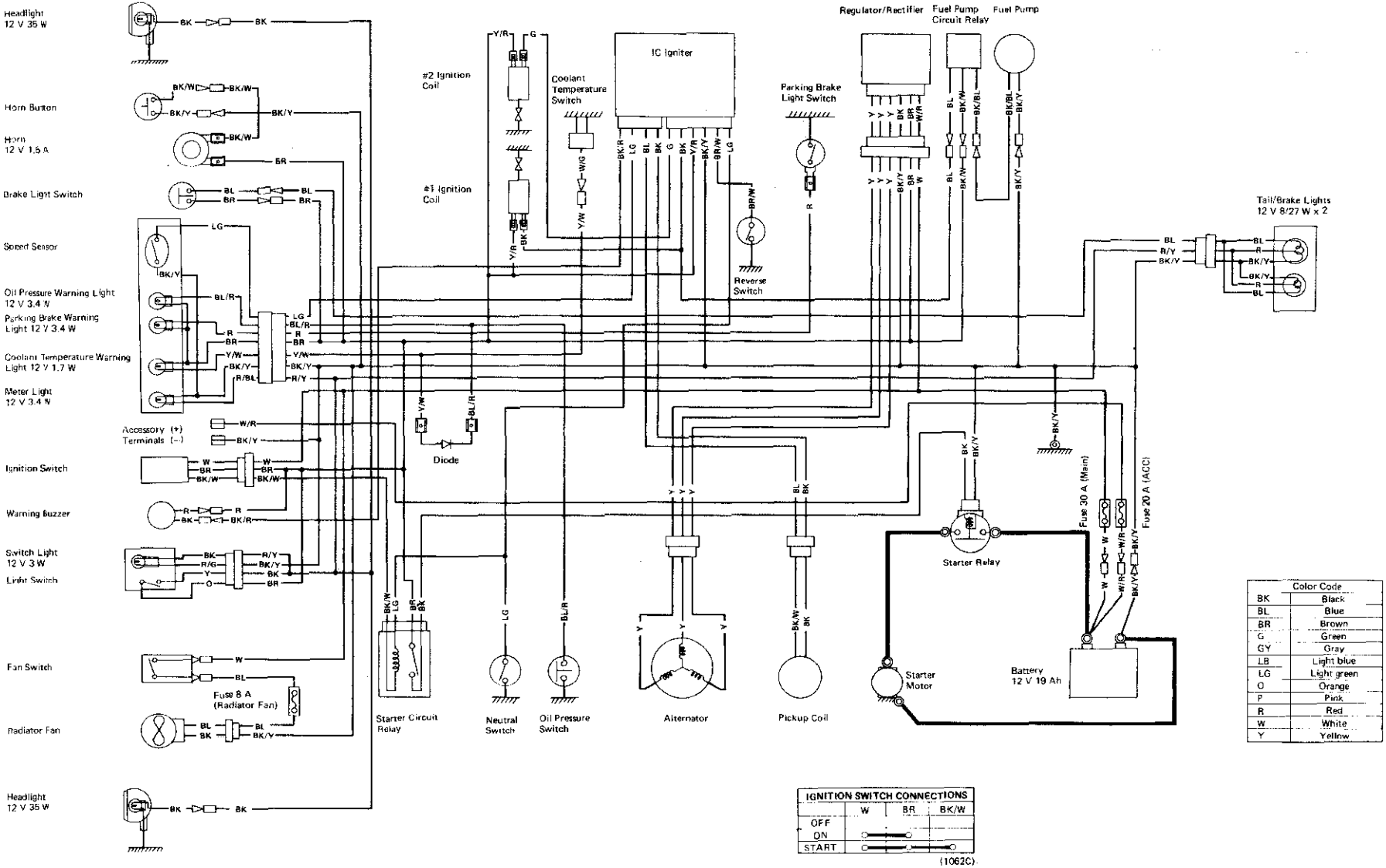






1. Horn Button
2. Light Switch
3. Ignition Switch
4. Warning Lights
5. Speed Sensor (in Speedometer Unit)
6. Warning Buzzer
7. Brake Light Switch
8. Fuse (Radiator Fan)
9. Fuel Pump Relay
10. Fuel Pump
11. Spark Plugs
12. Fuses (Main and Accessory)
13. Battery
14. Starter Motor Relay
15. Starter Circuit Relay
16. Ignition Coils
17. Diode
18. Parking Brake Light Switch
19. Ground Lead
20. Coolant Temperature Switch (110°C)
21. IC Igniter
22. Regulator/Rectifier
23. Starter Motor
24. Alternator
25. Pickup Coil
26. Oil Pressure Switch
27. Neutral Switch
28. Reverse Switch
29. Horn
30. Radiator Fan
31. Radiator Fan Switch (97°C)

Wiring Diagram



IGNITION SWITCH CONNECTIONS			
	W	BR	BK/W
OFF			
ON			
START			

(1062C)

Color Code	
BK	Black
BL	Blue
BR	Brown
G	Green
GY	Gray
LB	Light blue
LG	Light green
O	Orange
P	Pink
R	Red
W	White
Y	Yellow

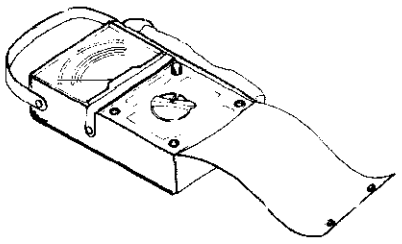
Specifications

Item	Standard	Service Limit
Battery:		
Electrolyte level	Between upper and lower levels	— — —
Specific gravity	1.265 @20°C (68°F)	— — —
Charging System:		
Regulator/rectifier output voltage	Battery voltage — 15 V	— — —
Alternator stator coil resistance	0.3 — 0.6 Ω	— — —
Ignition System:		
Ignition coil:		
Arcing distance	7 mm or more (3-needle method)	— — —
Primary winding resistance	2.3 — 3.5 Ω	— — —
Secondary winding resistance	12 — 18 kΩ	— — —
Spark plug:		
Standard:		
US	NGK D6EA or ND X20ES-U	— — —
Other than US	NGK DR6EA or ND X20ESR-U	— — —
Option (during hot weather):		
US	NGK D7EA or ND X22 ES-U	— — —
Other than US	NGK DR7EA or ND X22ESR-U	— — —
Gap	0.6 — 0.7 mm	— — —
Pickup coil resistance	390 — 590 Ω	— — —
Electric Starter System:		
Starter motor: Carbon brush length	12.0 — 12.5 mm	8.5 mm
Commutator diameter	28 mm	27 mm
Switches:		
Brake light switch	ON after 10 mm pedal travel	— — —
Fan switch: OFF → ON	94 — 100°C (201 — 212°F)	— — —
ON → OFF	84°C (183°F)	— — —
Coolant temperature switch:		
OFF → ON	107 — 113°C (225 — 235°F)	— — —
ON → OFF	103°C (217°F)	— — —

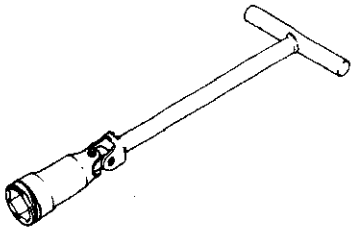
Special Tools

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

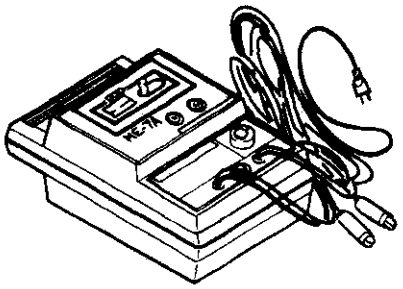
Hand Tester: 57001-983



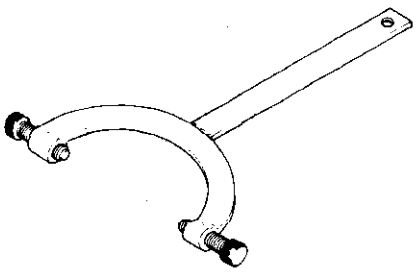
Spark Plug Wrench: 57001-1024



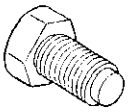
Coil Tester: 57001-1242



Rotor Holder: 57001-1248



Rotor Puller: 57001-1258



Rotor Puller Adapter: 57001-1279

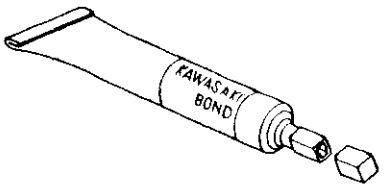


NOTE

○*The flywheel holder (P/N 57001-1313) can be used instead of the rotor holder (P/N 57001-1248).*

Sealant

Kawasaki Bond (Liquid Gasket – Black):92104-1003

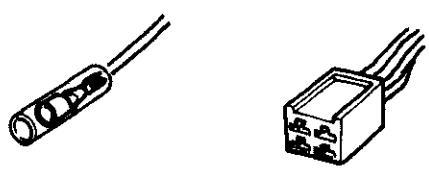


Precautions

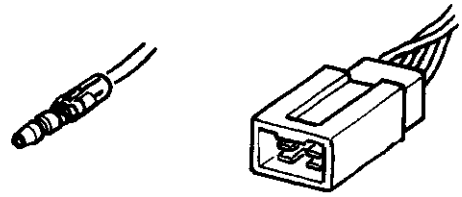
There are numbers of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the ignition switch turned to the start position when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Do not use a meter illumination bulb rated for other than voltage or wattage specified in the wiring diagram, as the meter 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).

Battery

Precautions

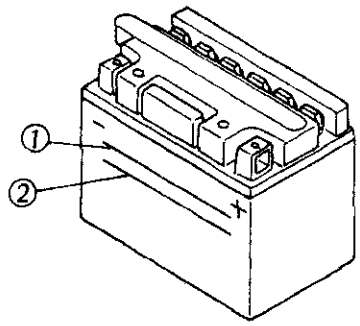
Following a few simple rules will greatly extend the life of the battery.

- When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.
- Never add sulphuric acid solution to the battery. This will make the electrolyte solution too strong and will ruin the battery within a very short time.
- Avoid quick-charging the battery. A quick-charge will damage the battery plates.
- Never let a good battery stand for more than 30 days without giving it a supplemental charge, and never let a discharged battery stand without charging it. If a battery stands for any length of time, it slowly self-discharges. Once it is discharged, the plates sulphate (turn white), and the battery will no longer take a charge.
- Keep the battery well-charged during cold weather so that the electrolyte does not freeze and crack open the battery. The more discharged the battery becomes, the more easily it freezes.
- Always keep the battery vent hose free of obstruction, and make sure it does not get pinched, crimped, or melted shut by contact with the hot muffler. If battery gases cannot escape through this hose, they will explode the battery.
- DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.

Electrolyte Level Inspection

●Remove the battery.
●Visually check the electrolyte level in the battery.
★If the level of electrolyte in any cell is below the lower level line on the battery case, add distilled water only to that cell.
●Install the battery.

Battery Electrolyte Level

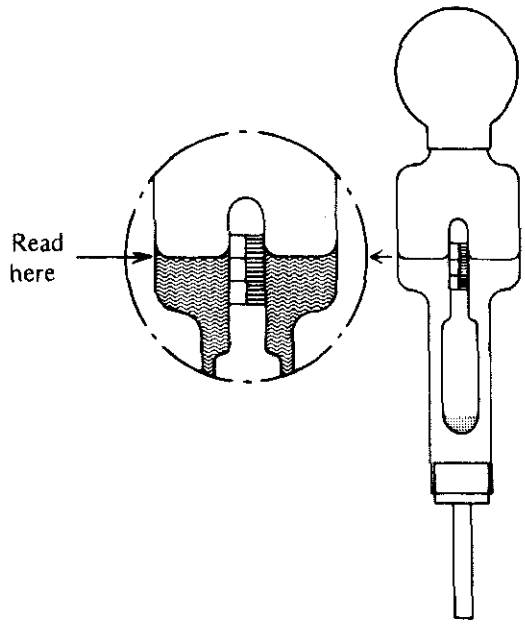


1. Upper Level Line
2. Lower Level Line

Battery Condition

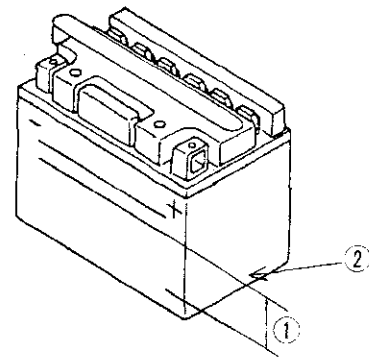
●Before charging, check battery condition by testing the specific gravity of the electrolyte in each cell with a hydrometer.

Hydrometer



●Look for sediment and white sulfation inside the cells on the bottom of the plates.

Battery Condition



1. Sulfation here 2. Sediment here

●See the Battery Troubleshooting Guide in Battery Test Charging.
★If the specific gravity is below 1.200 the battery needs to be charged.

NOTE

○*The specific gravity of the electrolyte varies with changes in temperature, so the specific gravity reading must be corrected for the temperature of the electrolyte.*
○*Celsius: Add 0.007 points to reading for each 10°C above 20°C or subtract 0.007 points for each 10°C below 20°C.*
○*Fahrenheit: Add 0.004 points to reading for each 10°F above 68°F or subtract 0.004 points for each 10°F below 68°F.*

★If the specific gravity of any of the cells is more than 0.050 away from any other reading, the battery will probably not accept a charge. If it generally best to replace a battery in this condition.
★If the specific gravity of all the cells is 1.265 or more the battery is fully charged.

Battery Initial Charging

Before being placed in service, **a new battery should be given an initial charging.**

●Cut off the sealed end of the battery vent hose and remove the filler caps.
●Fill each cell to the upper level line on the battery case with fresh electrolyte at a temperature of 30°C (86°F) or less. Let the battery stand for about 30 minutes before charging.

NOTE

○*If the electrolyte level drops, add electrolyte to the upper level line before charging.*

•Leaving the caps off the cells, connect the battery to a charger, set the charging rate at 1/10 the battery capacity, and **charge it for 10 hours.** For example, if the battery is rated at 18 Ah, the charging rate would be 1.8 A.

WARNING

○**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

CAUTION

○**Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than -normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

○**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

•Turn the charger off, then disconnect it from the battery.

•Check battery voltage. Battery voltage should be 12 – 13 V.

•Check the specific gravity of each cell with a hydrometer (see Battery Condition).

★If the voltmeter or hydrometer readings are below those specified, additional charging is necessary before the battery can be installed.

Battery Ordinary Charging

•Remove the battery.

CAUTION

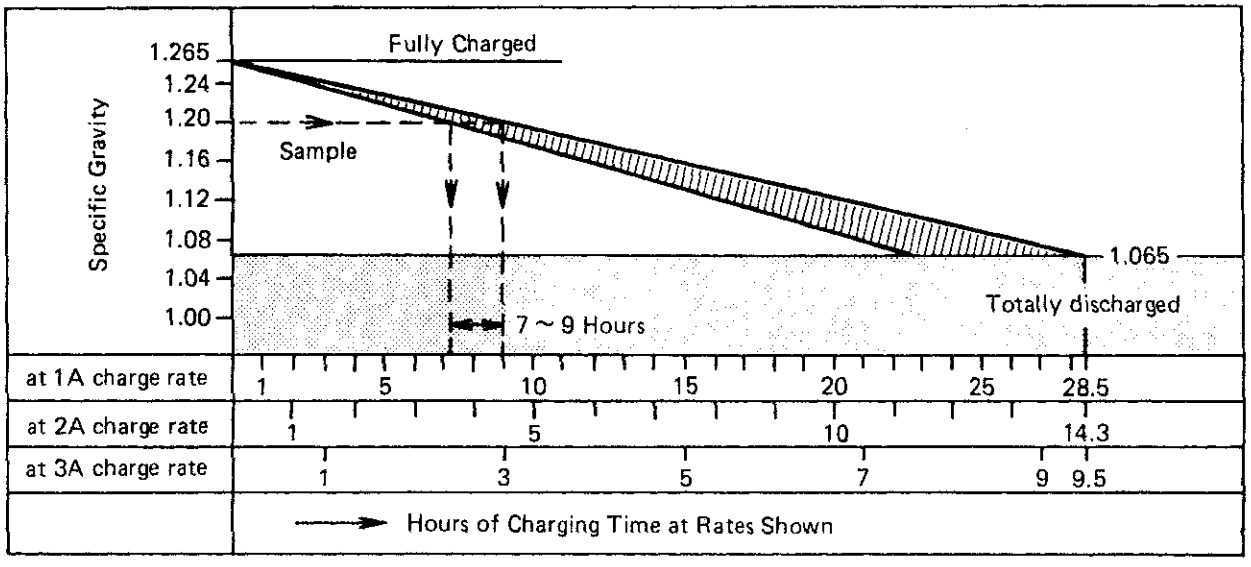
○**Always remove the battery from the motorcycle for charging. If the battery is charged while still installed, battery electrolyte may spill and corrode the frame or other parts of the motorcycle.**

•Clean off the battery using a baking soda-and-water solution. The terminals must be especially clean.

•If any of the cells are low, fill them to the LOWER level line with distilled water only. The electrolyte will expand during charging, and the level will rise.

•Connect a charger to the battery BEFORE plugging it in or turning it on.

Battery Charging Rate/Time Table (12 V 19 Ah)



WARNING

○**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

●Set the charge rate and time according to the battery condition previously determined (see Battery Condition), using the table.

CAUTION

○**Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat which can warp the plates and cause internal shorting. Higher-than -normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting.**

○**If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to lower the temperature, and increase charging time proportionately.**

●Turn the charger off or unplug it, then disconnect it from the battery.

●Check battery condition (See Battery Condition).

★If the battery condition indicates that it is not fully charged, additional charging time is necessary.

Battery Test Charging

●If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the table.

●To test charge a battery, perform the ordinary charging procedure and monitor the battery voltage and other signs as mentioned below.

★If the battery voltage suddenly jumps to over 13 V just after the start of charging, the plates are probably sulfated. A good battery will rise to 12 V immeditely and then gradually go up to 12.5 or 13 V in about 30 min to an hour after the start of charging.

★If one cell produces no gas bubbles or has a very low specific gravity, it is probably shorted.

★If there does not appear to be enough sediment in a cell to short the plates, but that cell has a very low specific gravity after the battery is fully charged, the trouble may be that there is not enough acid in that one cell. In this case only, sulfuric acid solution may be added to correct the specific gravity.

★If a fully charged battery not in use loses its charge after 2 to 7 days; or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

Charging System

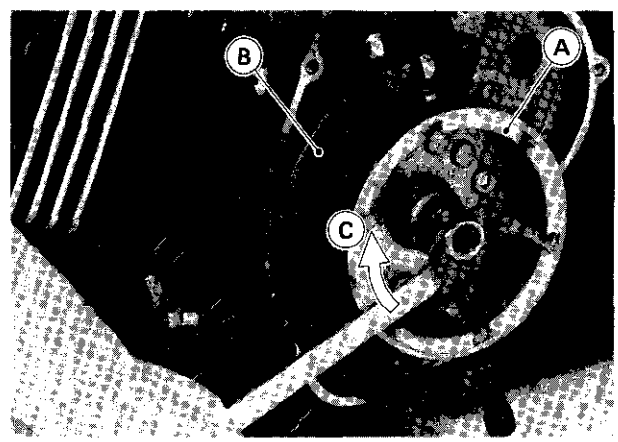
Alternator Rotor Removal

●Remove the following.
Left Engine Cover
Alternator Rotor Bolt

○Hold the alternator rotor with the rotor holder (special tool) and turn the rotor bolt clockwise to loosen it.

NOTE

○*The rotor bolt has a left-handed thread, therefore it must be turned clockwise to remove it.*



A. Alternator Rotor
B. Rotor Holder: 57001-1248
C. Turn to remove.

Battery Troubleshooting Guide

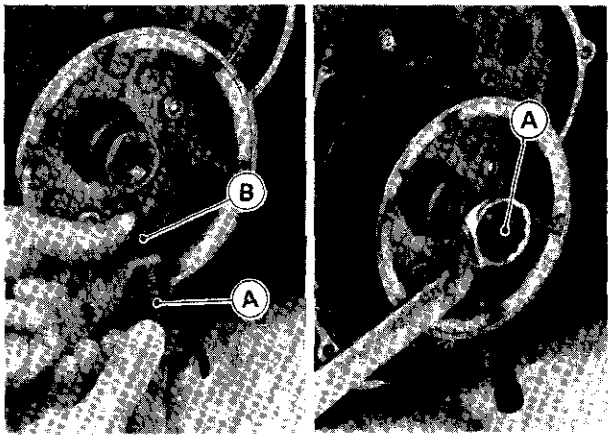
	Good Battery	Suspect Battery	Action
Plates	(+) chocolate color (−) gray	white (sulphated); + plates broken or corroded	Replace
Sediment	none, or small amount	sediment up to plates, causing short	Replace
Voltage	above 12 V	below 12 V	Test charge
Electrolyte Level	above plates	below top of plates	Fill 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

Alternator Rotor

○Using the rotor puller and adapter (special tools), remove the alternator rotor.

CAUTION

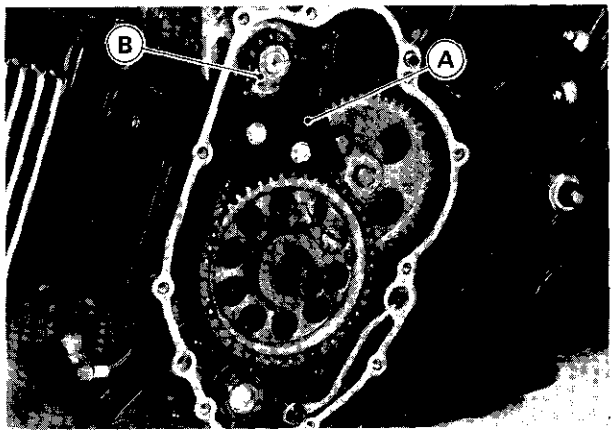
○If the rotor is difficult to remove, turn the puller using a wrench while tapping the head of the puller with a hammer. Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.



A. Rotor Puller: 57001-1258
B. Adapter: 57001-1279

Alternator Rotor Installation

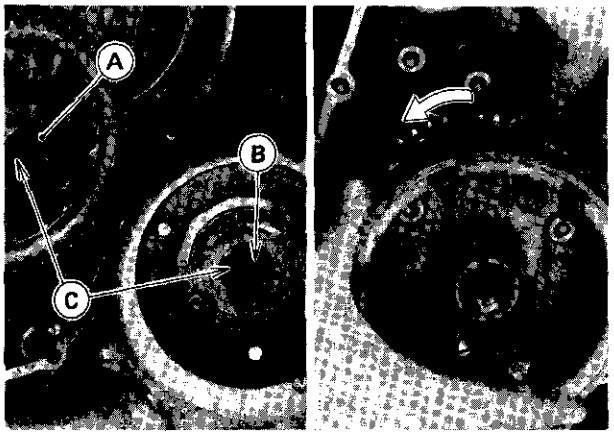
●Remove the following to install the alternator rotor to the crankshaft easily.
Starter Motor Chain Guide Bolts
Starter Motor Chain Guide
Starter Chain Sprocket (small)



A. Starter Motor Chain Guide
B. Starter Chain Sprocket (small)

●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. At this time, turn the starter chain sprocket (large) counterclockwise to fit it into the one-way clutch easily.



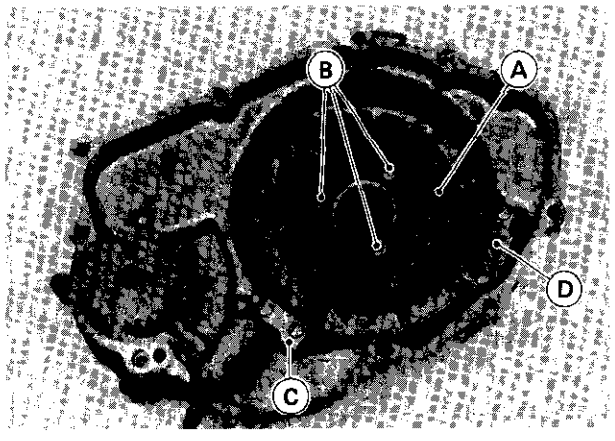
A. Key
B. Groove
C. Clean here.

●Torque the following.
Alternator Rotor Bolt

○Hold the alternator rotor with the rotor holder (special tool) and turn the rotor bolt counterclockwise to tighten it.

Alternator Stator Removal

●Remove the following.
Left Engine Cover
Lead Holder Mounting Screws
Lead Holder
Alternator Stator Mounting Bolts
Alternator Stator

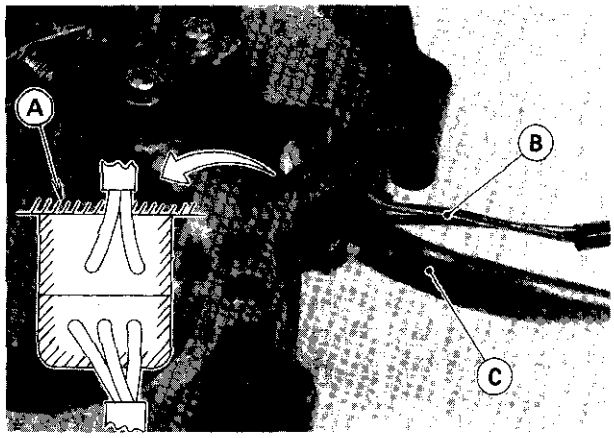


A. Alternator Stator
B. Mounting Bolts
C. Lead Holder
D. Pickup Coil

●Remove the following if the pickup coil is to be removed.
Pickup Coil Mounting Screws
Pickup Coil

Alternator Stator Installation

●Torque the following.
Alternator Stator Mounting Bolts
●Apply liquid gasket to the following.
Grooves on Lead Grommets
Inside Surface of Pickup Coil Lead Grommet



A. Apply liquid gasket.
B. Pickup Coil Leads
C. Alternator Stator Leads

●Install the grommets for the alternator stator leads and the pickup coil leads in that order.
●Install the lead holder so that the stator leads and the pickup coil leads are routed along the left engine cover without rising away from its inside surface.

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.*

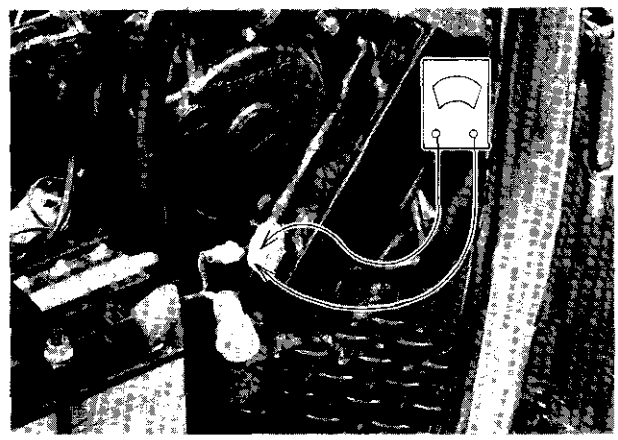
●Warm up the engine to bring the components up to their normal operating temperatures.
●Measure regulator/rectifier output voltage at various engine speeds with the headlight turned on and then turned off.
○Connect a voltmeter across the battery terminals.
★The readings should show nearly battery voltage 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
0.3 – 0.6 Ω



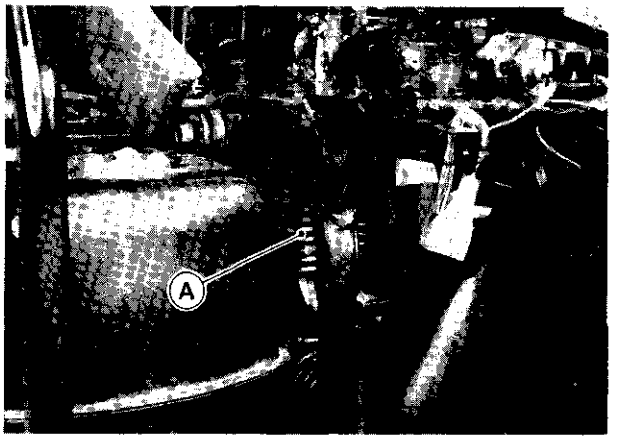
★If the meter does not read as specified, replace the alternator stator.
★If the coil has normal resistance, but the voltage inspect showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Regulator/Rectifier Inspection

The regulator/rectifier used on this vehicle is a solid-state type. Each function can be checked separately, but the regulator/rectifier must be replaced as a unit if either function is faulty.

Rectifier Circuit Test:

- Disconnect the regulator/rectifier connector.
- Zero the ohmmeter, and connect it to leads from the regulator/rectifier.
- Check the resistance in both directions between the leads following the table.



A. Regulator/Rectifier

★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 Circuit Test:

- Disconnect the regulator/rectifier connector.
- Prepare testing tools.

Tools for Regulator Circuit Test

Test light	Bulb rated 12 V and 3 – 6 W
Batteries	○Two 12 V batteries ○One 24 V battery or two 12 V batteries connected in series
Test wires	4 auxiliary wires

CAUTION

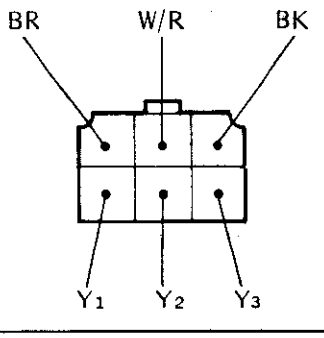
○**The test light limits the current flow through the regulator/rectifier. Do not use an ammeter or multimeter in its place.**

Regulator Circuit Test-1st Step:

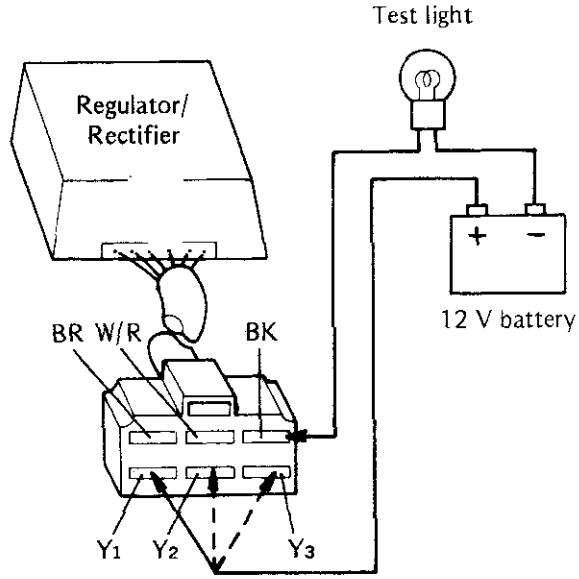
- Connect the test light and the 12 V battery to the regulator/rectifier as shown. Check each yellow lead.

★The test light should not go on. If goes on when any yellow lead is tested, the thyristor is shorted; replace the regulator/rectifier.

Rectifier Circuit Inspection

No.	Connections		Reading	Lead Location	Meter Range
	Meter (+) to	Meter (–) to			
1	Y_1	W/R	∞	Female regulator/rectifier connector 	x 10 Ω or x 100 Ω
2	Y_2				
3	Y_3				
4	Y_1	BK	0 – ½ scale		
5	Y_2				
6	Y_3				
7	W/R	Y_1			
8		Y_2			
9		Y_3			
10	BK	Y_1	∞		
11		Y_2			
12		Y_3			

Regulator Circuit Test-1st Step

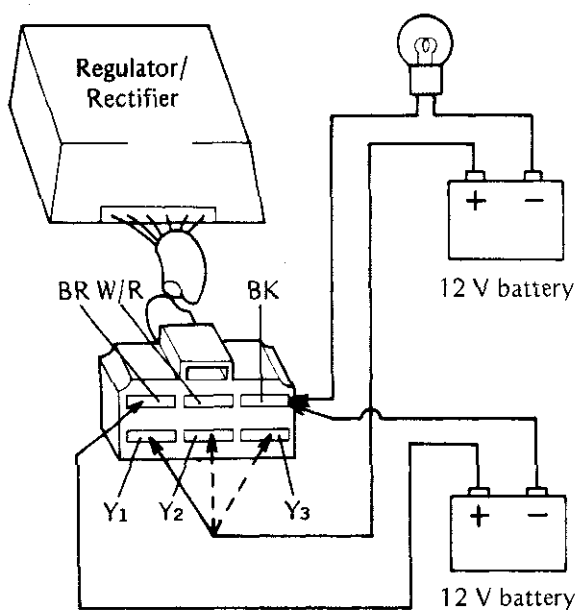


Regulator Circuit Test-2nd Step:

- Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test 1st step."
- Apply 12 V to the voltage monitoring lead. Check each yellow lead.

★The test light should not go on. If it goes on when any yellow lead is tested, the control circuit in the regulator/rectifier is damaged; replace the regulator/rectifier.

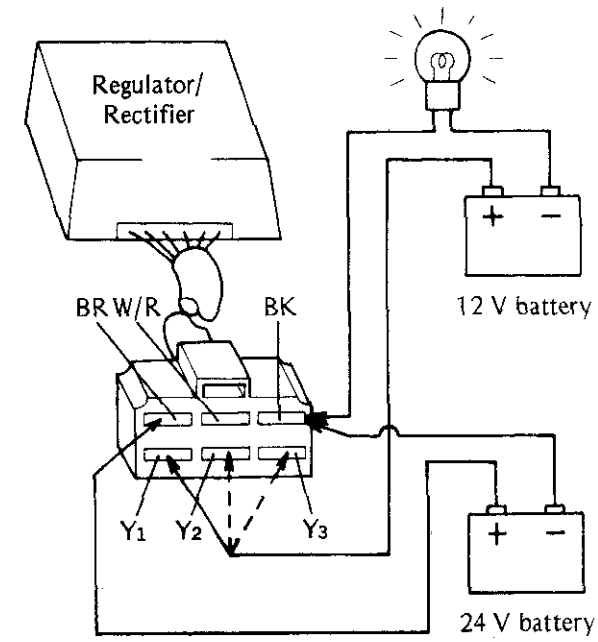
Regulator Circuit Test-2nd Step



Regulator Circuit Test-3rd Step:

- Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test 1st Step."
- Apply 24 V to the voltage monitoring lead. Check each yellow lead.

Regulator Circuit Test-3rd Step



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.**

★The test light should go on at this time. If it does not go on when any yellow lead is tested, the control circuit in the regulator/rectifier is damaged; replace the regulator/rectifier.

Ignition System

WARNING

○**The ignition system produces extremely high voltage. Do not touch the spark plugs, high tension coils, or spark plug leads while the engine is running, or you could receive a severe electrical shock.**

CAUTION

○**Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent IC igniter damage.**

○**Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and IC igniter.**

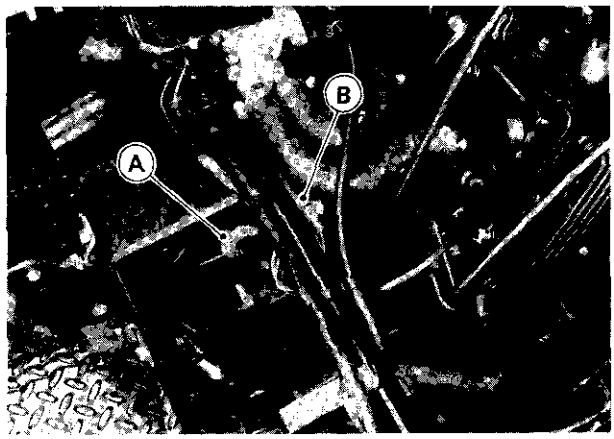
Ignition Coil Installation

●Connect the primary wires to the primary coil terminals as follows:

BK and Y/R wires → #1 Ignition Coil (Front)
G and Y/R wires → #2 Ignition Coil (Rear)

○Y/R wire, and BK or G wire can be connected to either terminal marked black or green.

○The #1 ignition coil and the #2 ignition coil are identical.



A. #1 Ignition Coil B. #2 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 57001-1024).

Spark Plug Installation

●Torque the following.

Spark Plugs

Pickup Coil Removal/Installation

●Pickup coil removal and installation are explained in the alternator stator removal and installation. At this time, the stator itself removal is not necessary. (see Alternator Stator Removal and Alternator Stator Installation).

IC Igniter Inspection

●To inspect the IC igniter internal resistance, perform the following.

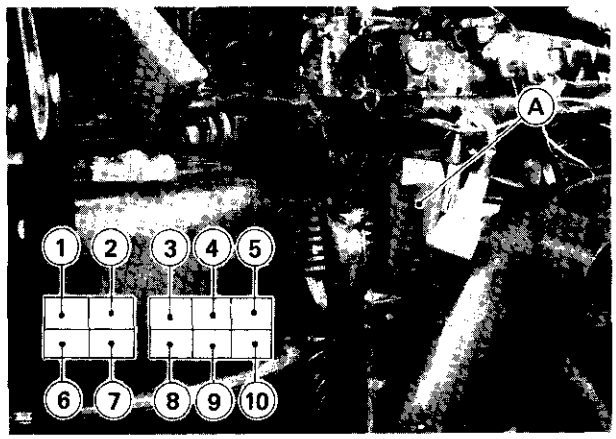
●Set the ohmmeter to the x 1 kΩ range and make the measurements shown in the table.

★If the meter readings are not as specified, replace the IC igniter.

CAUTION

○**Use only Hand Tester 57001-983 for this test. A tester other than the Kawasaki Hand Tester may show different readings.**

○**If a megger or a meter with a large-capacity battery is used, the IC igniter will be damaged.**



A. IC Igniter

Ignition Coil Inspection

Measuring arcing distance:

●Measure the arcing distance with the Kawasaki coil tester (special tool: P/N 57001-1242) to check the condition of the ignition coil.

NOTE

○*Since a tester other than the Kawasaki coil tester may produce a different arcing distance, the Kawasaki coil tester is recommended for reliable results.*

IC Igniter Internal Resistance*

(x 1 kΩ)

Tester (+) Lead Connection \ Tester (−) Lead Connection	1	2	3	4	5	6	7	8	9	10
1		18 – 30	45 – 70	28 – 36	∞	40 – 60	∞	45 – 70	28 – 36	∞
2	160 – 300		4 – 5	3 – 5	∞	8.5 – 13	∞	3 – 5	3 – 5	∞
3	150 – 300	4.5 – 6.5		6.8 – 8.5	∞	10 – 18	∞	0.6 – 2	6.8 – 8.5	∞
4	160 – 300	3 – 5	3 – 5		∞	8.5 – 13	∞	4 – 5	1.6 – 2.6	∞
5	200 – 1000	8.5 – 13	2.8 – 3.6	10 – 15		18 – 30	∞	1.8 – 3	10 – 15	∞
6	160 – 300	9.5 – 13	9.5 – 13	8.5 – 13	∞		∞	8.5 – 13	8.5 – 13	∞
7	200 – 1000	11 – 17	5 – 7	15 – 20	∞	20 – 35		3.4 – 4.6	15 – 20	∞
8	150 – 300	3 – 5	0.8 – 1.8	5 – 6.2	∞	9 – 15	∞		5 – 7	∞
9	160 – 300	3 – 5	3 – 5	1.6 – 2.6	∞	8.5 – 13	∞	4 – 5		∞
10	150 – 300	8.5 – 13	2.8 – 3.6	10 – 15	∞	18 – 30	∞	1.8 – 3	10 – 15	

*Measured with hand tester 57001-983. A tester other than Kawasaki Hand Tester may show different readings.

●Connect the ignition coil (with the spark plug cap left installed at the end of the spark plug lead) to the tester in the manner prescribed by the manufacturer and measure the arcing distance.

Ignition Coil Arcing Distance

7 mm or more

WARNING

○**To avoid extremely high voltage shocks, do not touch the ignition coil body or leads.**

★If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.

●To determine which part is defective, measure the arcing distance again with the spark plug cap removed from the ignition coil.

★If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is not 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.

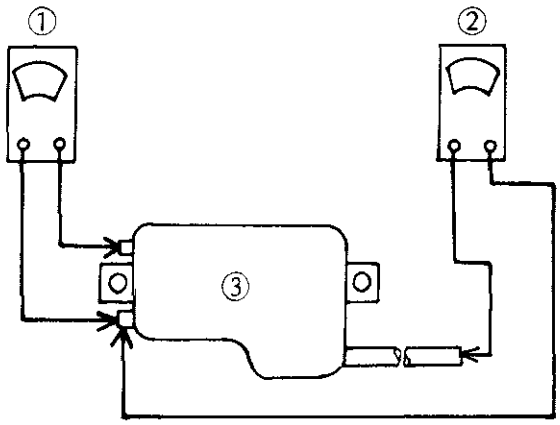
○Set the meter to the x 1 kΩ range, and read the meter.

Ignition Coil Winding Resistance

Primary windings: 2.3 – 3.5 Ω

Secondary windings: 12 – 18 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.

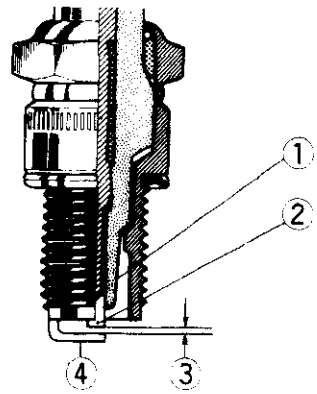
Spark Plug Gap

●Measure the gap with a wire-type thickness gauge.
★If the gap is incorrect, carefully bend the side electrode with a suitable tool to obtain the correct gap.

Spark Plug Gap

0.6 – 0.7 mm

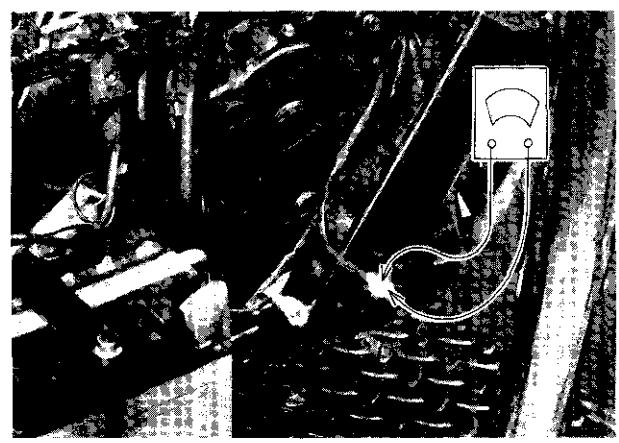
Spark Plug Gap



1. Insulator
2. Center Electrode
3. Plug Gap
4. Side Electrode

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.



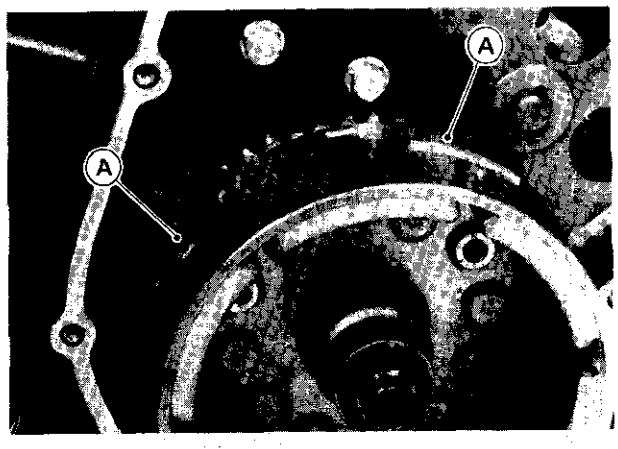
Pickup Coil Resistance

390 – 590 Ω

★If the meter does not read as specified, replace the pickup coil.

Alternator Rotor Projection Inspection

●Check the timing projection for damage such as chipping or grooving.



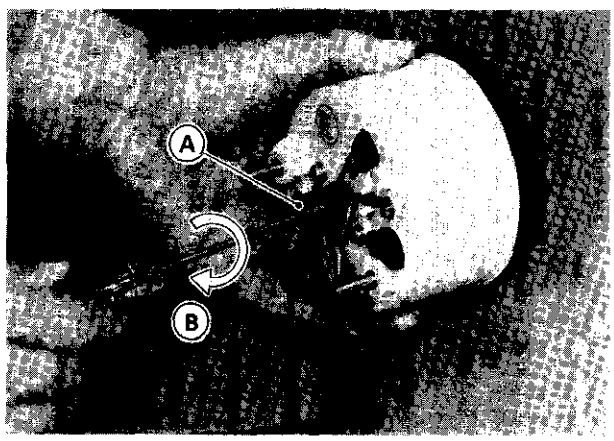
A. Timing Projection

★If the timing projection on the rotor is visibly damaged, replace the alternator rotor.

Speed Sensor Inspection

- Disconnect the following.
  Speedometer Lead Connector
  Speedometer Cable from Speedometer
- Connect an ohmmeter across the speed sensor leads, LG lead and BK/Y lead.
- Using a thin screwdriver, turn the speedometer inner cable fitting slowly and count how may times the speed sensor shows continuity.

★If the ohmmeter does not show continuity 4 times per revolution, replace the speedometer unit.



A. Speedometer Cable Fitting B. Turn slowly.

NOTE

○*The speed sensor continuity can be checked by turning the rear wheels if the speedometer cable is connected. It shows continuity 8 times per revolution of rear wheels.*

CAUTION

○**Place the meter so that the face is up. If a meter is left upside down or sideways for any length of time it will malfunction.**

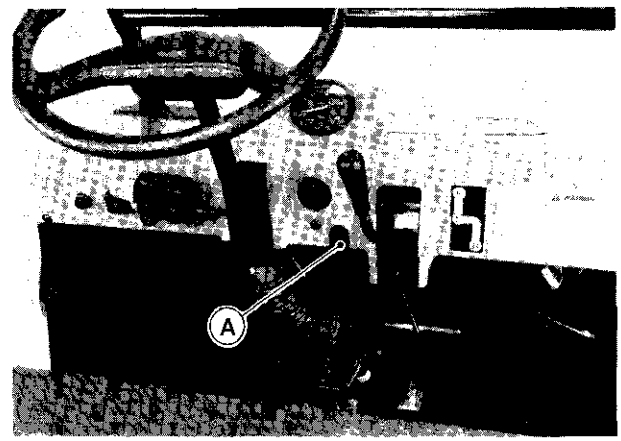
Warning Buzzer Inspection

- Disconnect the warning buzzer leads and connect them to the 12 V battery.

Warning Buzzer Leads

R	→	**Battery (+)**
BK	→	**Battery (–)**

★If the warning buzzer does not sound, replace it.

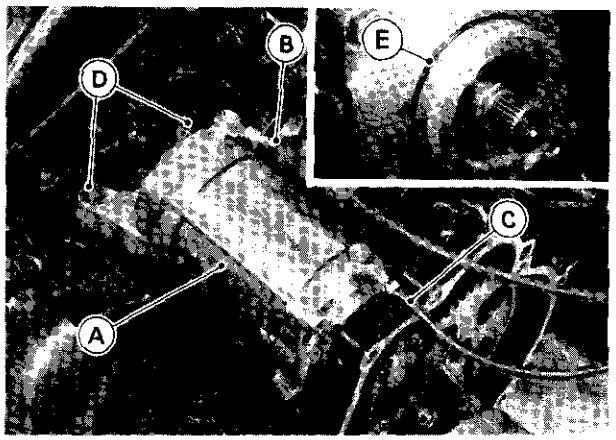


A. Warning Buzzer

Electric Starter System

Starter Motor Removal

- Remove the following.
  Left Engine Cover
  Air Cleaner Silencer
  Carburetors with Cables
  Starter Motor Leads
  Starter Motor Mounting Bolts
  Starter Motor



A. Starter Motor
B. Starter Motor Lead (from Starter Relay)
C. Starter Motor Lead (to Battery Negative Terminal)
D. Mounting Bolts
E. O-ring

CAUTION

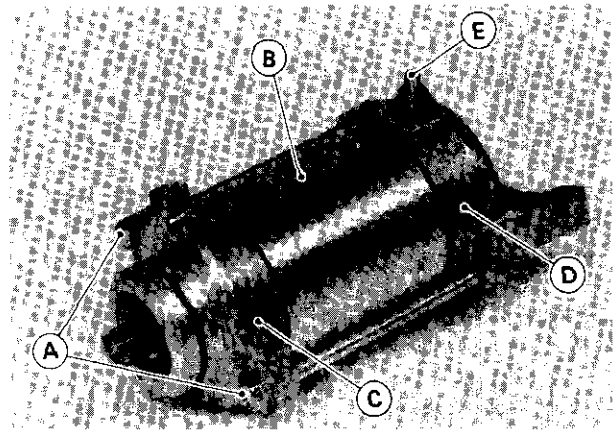
○**Do not tap on the starter motor shaft or body to free the starter motor from the case. Tapping on the shaft or body may damage the motor.**

Starter Motor Installation

●Apply a small amount of engine oil to the O-ring on the starter motor.

Starter Motor Disassembly

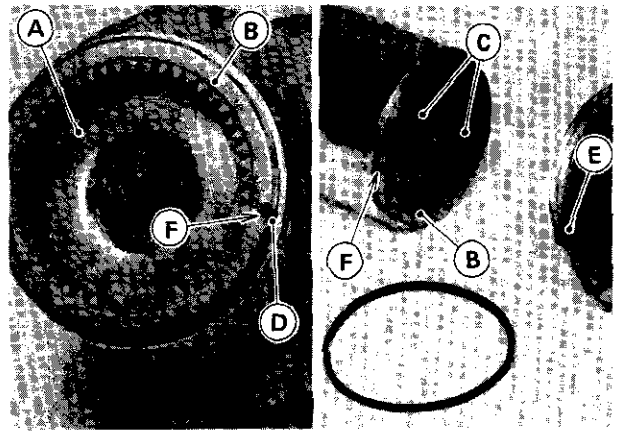
●Remove the following.
Long Bolts
●To maintain the carbon brushes only, remove the RH cover from the yoke. Keep the LH cover and the yoke as a unit to prevent the internal gear and pinions from dropping out.



A. Long Bolts
B. Yoke
C. LH Cover
D. RH Cover
E. (+) Side Brush Terminal

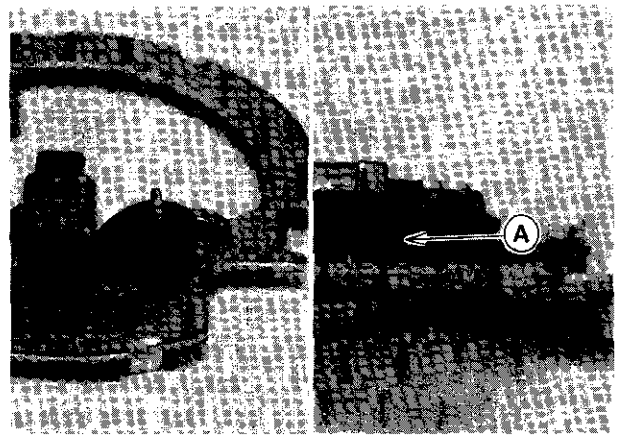
Starter Motor Assembly

●Assemble the internal gear and pinions if the LH cover was removed.
○Grease the pinions.
○Align the notches on the end plate and the internal gear with the projection on the yoke.
○Align the notch on the internal gear with the key on the LH cover.



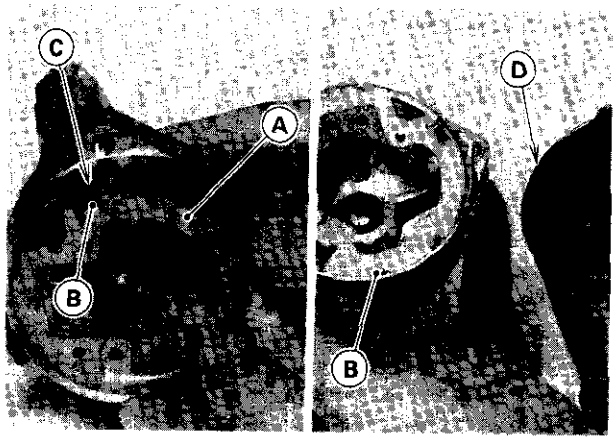
A. End Plate
B. Internal Gear
C. Pinions
D. Projection
E. Key
F. Notch

●Install the brush springs.
○Put the spring down over the post on the brush plate so that it is wound 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.

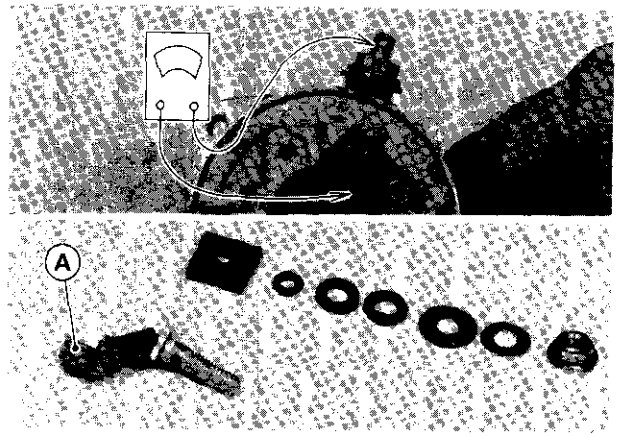


A. Step

●Install the brush plate so that the long vertical tab on the brush plate aligns with the key slot in the RH cover.
●Install the RH cover so that the tab on the brush plate aligns with the notch on the yoke.

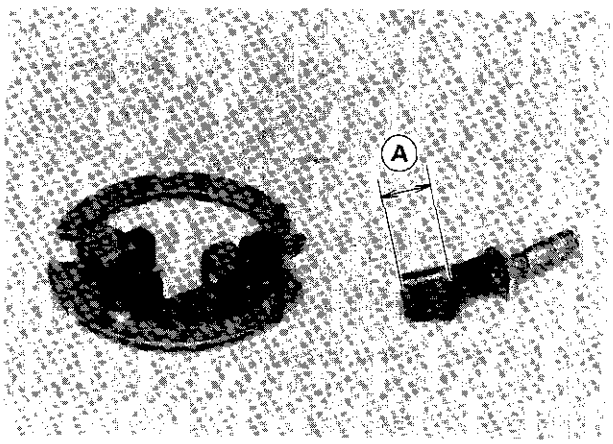


A. Brush Plate
B. Tab
C. Key Slot
D. Notch



A. Brush and Lead Assembly

Carbon Brush Length



A. Brush Length

Carbon Brush Length

Standard:	**12.0 – 12.5 mm**
Service Limit:	**8.5 mm**

Brush Spring Inspection

- Check that the brush springs are in place and snap the brushes firmly into place.

★If not, reinstall or replace the spring.

Brush and Lead Assembly Inspection

- Measure the resistance between the brush and terminal.

★If the resistance is too high or even infinite, the brush and lead assembly is open. Replace the brush and plate assembly.

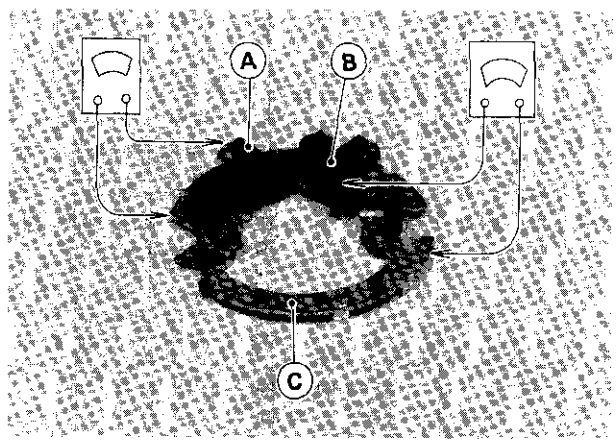
Brush Plate Inspection

- Measure the resistance between the (+) side carbon brush holder and the metal plate.

★If the resistance is less than infinite, the holder has a short. Replace the brush and plate assembly.

- Measure the resistance between the (–) side carbon brush and the metal plate.

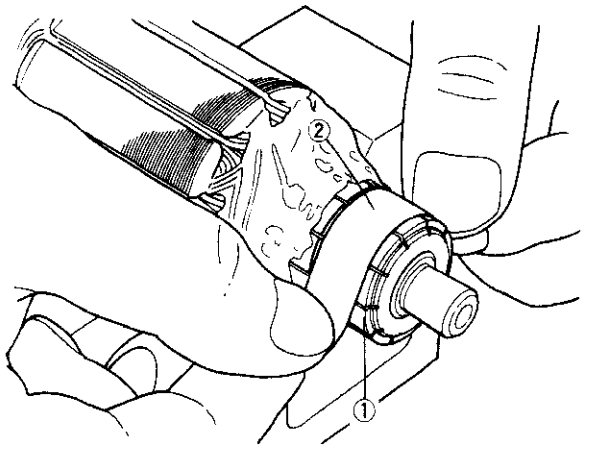
★If the resistance is greater than 0 Ω, the brush assembly has an open. Replace the brush and plate assembly.



A. (+) Side Carbon Brush Holder
B. (–) Side Carbon Brush
C. Metal Plate

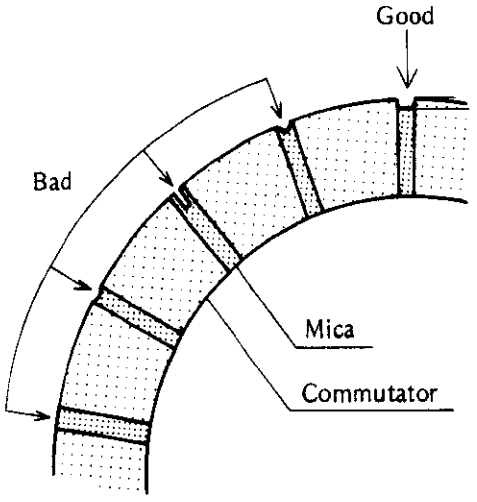
Commutator Cleaning and Inspection

- Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated.

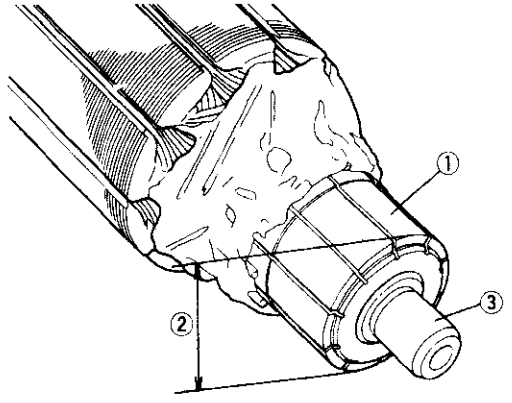


1. Commutator 2. Emery Cloth

Commutator



- Measure the diameter of the commutator.
- ★Replace the starter motor with a new one if the commutator diameter is less than the service limit.



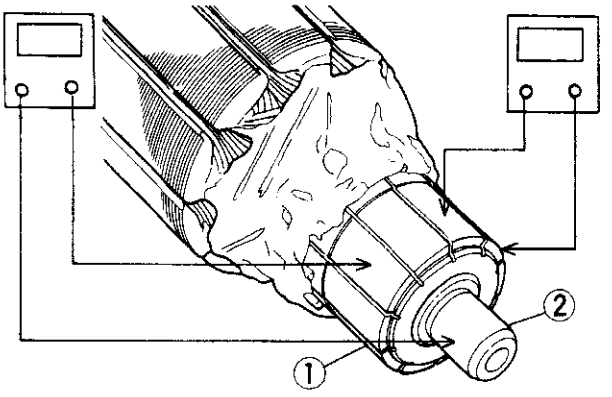
1. Commutator Segment 3. Shaft
2. Diameter

Commutator Diameter

Standard:	**28 mm**
Service Limit:	**27 mm**

Armature Inspection

- Measure the resistance between each segment and all the others.
- ★If the resistance is too high or even infinite, the armature winding has an open circuit. Replace the starter motor.
- Measure the resistance between the commutator and the armature shaft.
- ★If the resistance is less than infinite, the armature is shorted. Replace the starter motor.



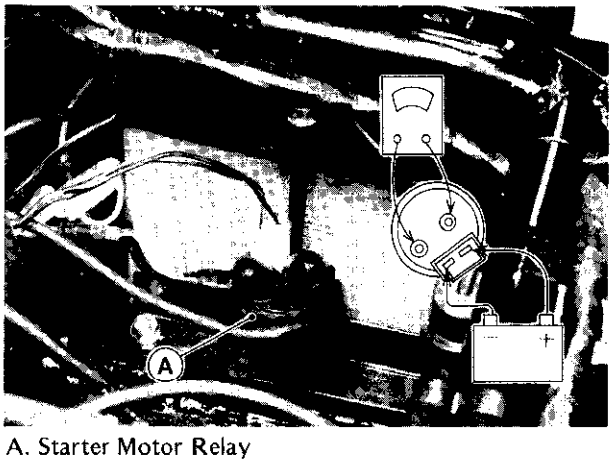
1. Commutator Segment 2. Shaft

Starter Motor Relay Inspection

- Connect an ohmmeter and 12 V battery to the starter motor relay as shown.
- ★If the relay does not work as specified, the relay is defective.

Testing Relay

Meter Range:	**x 1 Ω range**
Criteria:	**When battery is connected → 0 Ω**
	When battery is disconnected → ∞ Ω



A. Starter Motor Relay

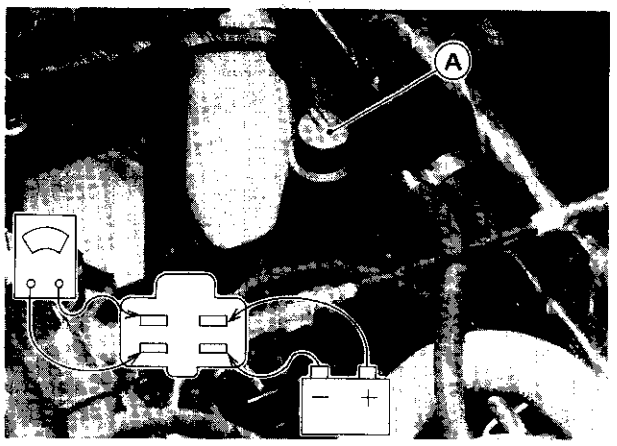
Starter Circuit Relay Inspection

●Connect an ohmmeter and 12 V battery to the relay as shown.

★If the relay does not work as specified, the relay is defective.

Testing Relay

Meter Range: x 1 Ω
Criteria: When battery is connected → 0 Ω
When battery is disconnected → ∞ Ω



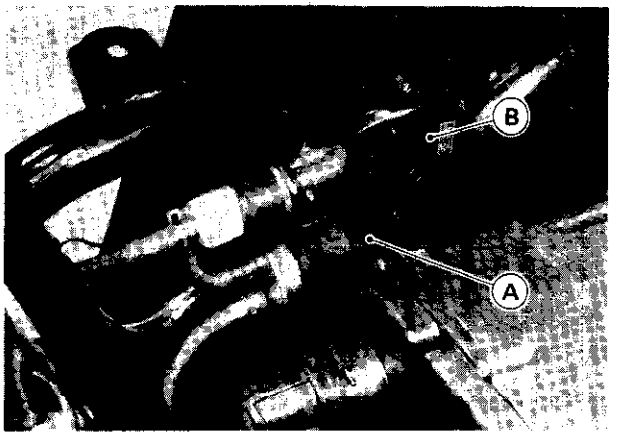
A. Starter Circuit Relay

Fuel Pump and Relay

The fuel pump does not operate when the ignition switch is turned on alone. The pump operates when the engine is running.

When fuel level in the float chamber is low, the fuel pump operates to supply fuel into the float chamber.

When the fuel reaches a certain level, the fuel pressure rises, and stops the fuel pump.



A. Fuel Pump B. Fuel Pump Circuit Relay

Fuel Pump Operation Test

●Remove the fuel pump with fuel filter.

●Prepare a container filled with kerosene.

●Prepare the rubber hoses, and connect them to the pump fittings.

●Connect the 12 V battery to the fuel pump leads.

Fuel Pump leads

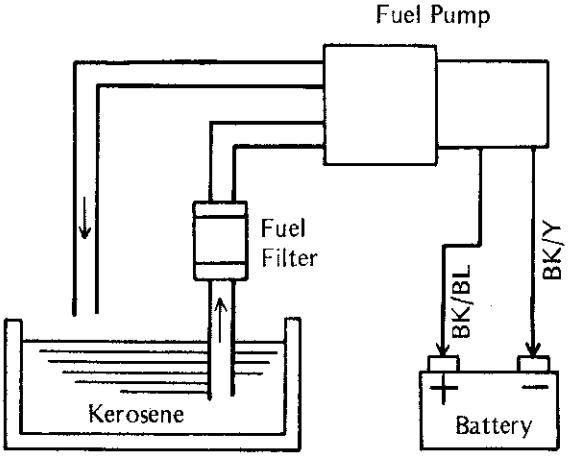
BK/Y → Battery (−)
BK/BL → Battery (+)

★If the pump does not operate, the pump is defective.

●Close the outlet hose while operating the fuel pump.

★If the pump does not stop, the pump is defective.

Fuel Pump Operation Test



Relay Internal Resistance

●Set the ohmmeter to the x 1 kΩ range and make the measurements shown in the table.

★If the meter readings are not as specified, replace the relay.

Relay Internal Resistance

		Tester (+) Lead Connection		
		BK/W	BL	BK/BL
Tester (−) Lead Connection	BK/W		∞	∞
	BL	∞		∞
	BK/BL	∞	More than 10 kΩ	

Radiator Fan Circuit

Radiator Fan Circuit Inspection

- Visually inspect the radiator fan.
- ★If the fan blades or shroud are damaged, replace the fan assembly.
- Pull off the fan switch leads, and connect them with a suitable lead.
- ★If the fan turns, inspect the fan switch.
- ★If the fan does not turn, check the fan motor or wiring.

WARNING

○**Be careful not to touch the fan blades to avoid injury.**

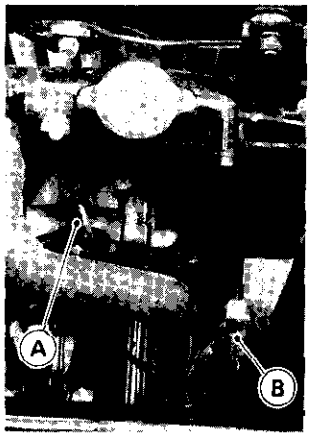
Fan Motor Inspection

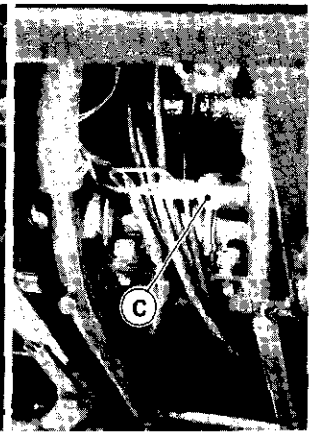
- Pull out the fan connector and connect it to 12 V battery as follows.

Fan Connector (male)

BK	→	**Battery (–)**
BL	→	**Battery (+)**

★If the fan does not turn, replace the fan assembly.



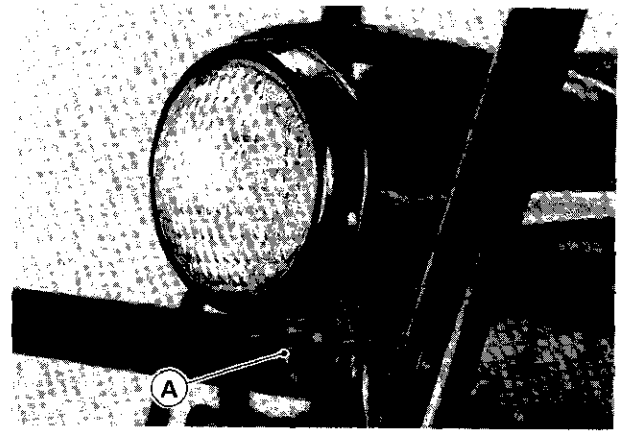


A. Radiator Fan
B. Fan Connector
C. Fan Switch

Lighting System

Headlight Beam Adjustment

- Loosen the headlight mounting nut and tilt the head light to adjust the headlight beam.
- Tighten the mounting nut.



A. Mounting Nut

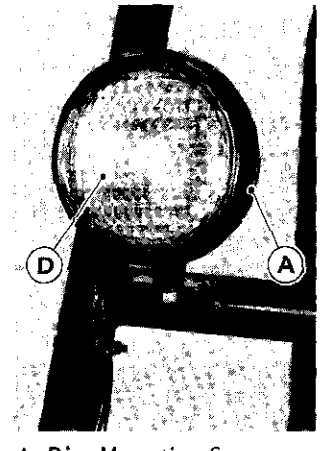
Bulb Replacement

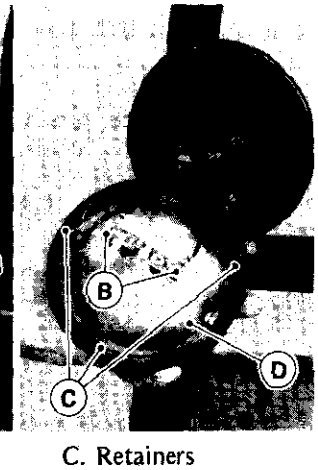
CAUTION

○**Do not use bulbs rated for greater wattage than the specified value, as the meter panel could become warped by excessive heat radiated from the bulbs.**

- Remove and install the sealed type headlight unit.

○Remove the following.
Headlight Rim Mounting Screw
Lead Mounting Screws
Retainers
Headlight Unit





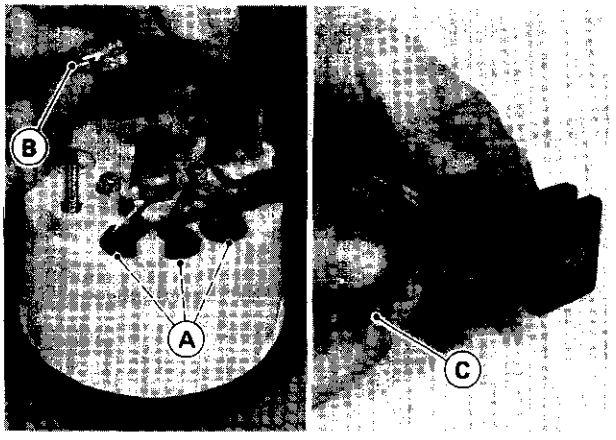
A. Rim Mounting Screw
B. Lead Mounting Screws
C. Retainers
D. Headlight Unit

- Remove the wedge-base type bulbs.

○Pull out the bulbs and sockets, and/or pull the bulbs off the sockets.

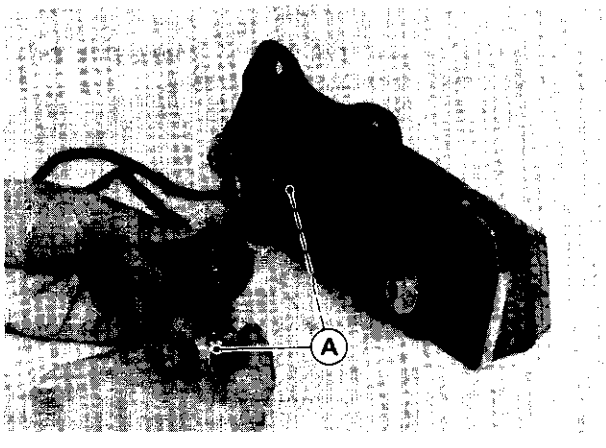
CAUTION

○**Place the meter so that the face is up. If a meter is left upside down or sideways for any length of time it will malfunction.**



A. Warning Light Bulbs
B. Meter Illumination Bulb
C. Light Switch Illumination Bulb

●Remove the lock pin type bulbs.
○Pull out the bulbs and sockets.
○Push the bulb in, turn it counterclockwise, and pull it out of the socket.



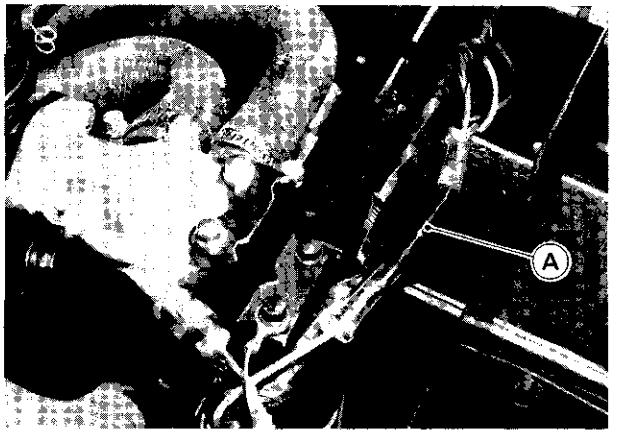
A. Tail/Brake Light Bulbs

Diode Inspection

●Zero the ohmmeter, and connect it to each terminal of the diode to check the resistance in both directions.
★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and it must be replaced.

NOTE

○***The actual meter reading varies with the meter used and the individual diode, but, generally speaking, the lower reading should be from zero to the first ⅓ of the scale.***

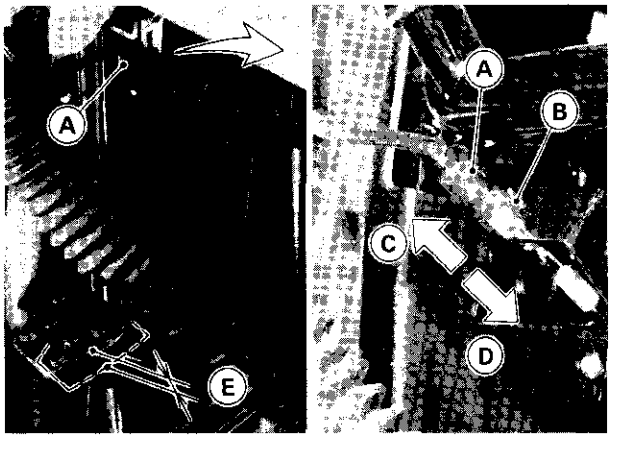


A. Diode

Switches

Brake Light Switch Adjustment

●Check the operation of the brake light switch by depressing the brake pedal. The brake light should go on after about 10 mm of pedal travel.



A. Brake Light Switch
B. Adjusting Nut
C. Lights sooner.
D. Lights later.
E. 10 mm

★If it does not, adjust the brake light switch up or down. To change the switch position, turn the adjusting nut.

CAUTION

○**To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.**

Switch Inspection

- Using the ohmmeter, check to see that only the connections shown in the table have continuity (about zero ohms).
- ★If the switch has an open or short, repair it or replace it with new one.

Ignition Switch Connections

	W	BR	BK/W
OFF			
ON	○	○	
START	○	○	○

Light Switch Connections

	Y	O
OFF		
ON	○	○

Horn Button Connections

	BK/W	BK/Y
Push on	○	○

Brake Light Switch Connections

	BR	BL
When brake pedal is pushed down	○	○

Parking Brake Light Switch

	Switch Terminal	Ground
When parking brake lever is pushed down	○	○

Neutral and Reverse Switch Connections

Gear Position	N Terminal	Ground	R Terminal
Neutral (N)	○	○	
Reverse (R)		○	○

Oil Pressure Switch Connections*

	Switch Terminal	Ground
When engine is stopped	○	○
When engine is running		

*Engine lubrication system is in good condition.

Fan Switch (97°C) Connections*

○**Rising temperature: From OFF to ON at 94 – 100°C (201 – 212°F)**

○**Falling temperature: From ON to OFF above 84°C (183°F)**

ON: Less than 0.5 Ω

OFF: More than 1 MΩ

***Check connections between switch terminals.**

Coolant Temperature Switch (110°C) Connections*

○**Rising temperature: From OFF to ON at 107 – 113°C (225 – 235°F)**

○**Falling temperature: From ON to OFF above 103°C (217°F)**

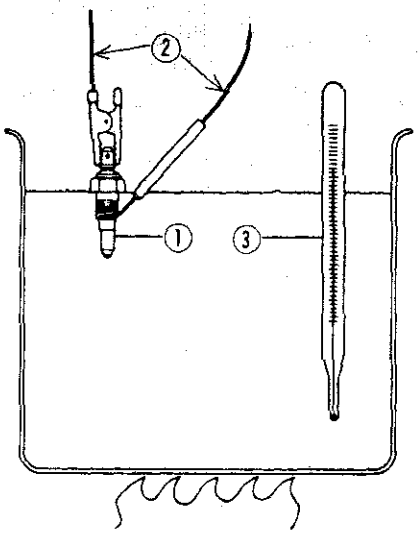
ON: Less than 0.5 Ω

OFF: More than 1 MΩ

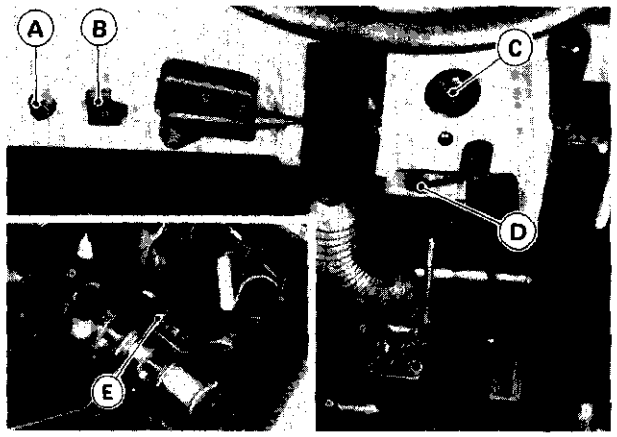
***Check connections between switch lead and body.**

NOTE

○*The fan switch and the coolant temperature switch connections can be inspected as follows.*



1. Suspend the switch in a container of water or oil so that the temperature sensing projection and threaded portion are submerged.
2. Using an ohmmeter, measure the internal resistance of the switch across the terminal and the body at the temperature shown in the table.
3. Thermometer



A. Horn Button
B. Light Switch
C. Ignition Switch
D. Brake Light Switch
E. Fan Switch

Fuses

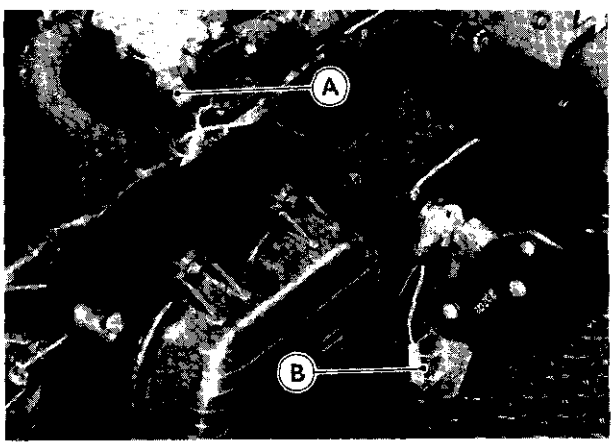
Fuse Inspection

●Inspect the fuse element.

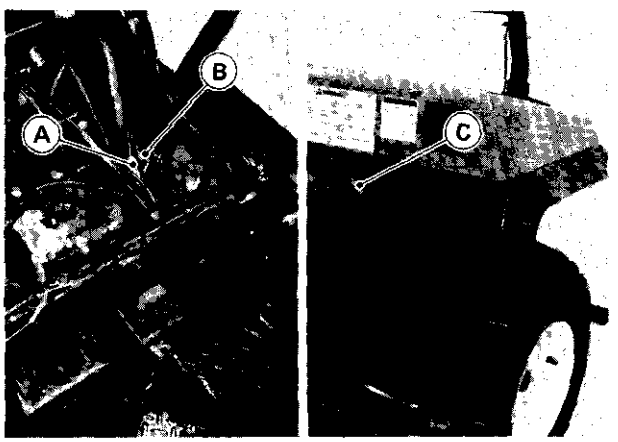
★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

CAUTION

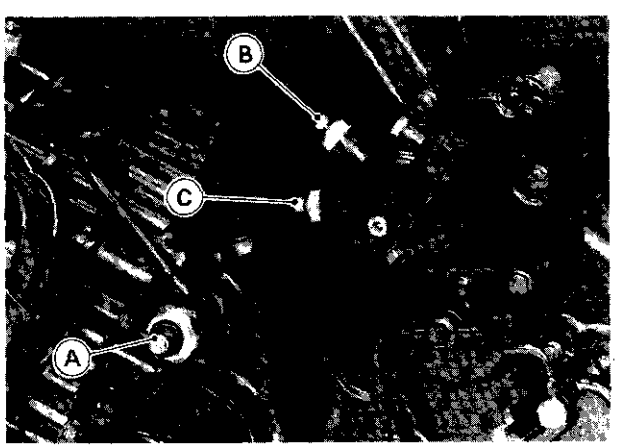
○**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**



A. Coolant Temperature Switch
B. Parking Brake Light Switch



A. Fuse 30A (Main)
B. Fuse 20A (ACC)
C. Fuse 8A (Radiator Fan)



A. Oil Pressure Switch
B. Neutral Switch
C. Reverse Switch

Electrical Wiring

Wiring Inspection

●Visually inspect the wiring for signs of burning, fraying, etc.

★If any wiring is poor, replace the damaged wiring.

●Pull each connector apart and inspect it for corrosion, dirt, and damage.

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

●Check the wiring for continuity.

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

○Measure the resistance between the ends of the leads.

★If the resistance is not 0 Ω, the lead is defective. Replace the lead or the wiring loom if necessary.

Appendix

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Nut, Bolt, and Fastener Tightness 16-6
    Tightness Inspection 16-6
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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
- Wiring open or shorted
- Ignition 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
- Camshaft seizure
- Balancer seizure

No fuel flow:
- Fuel tank air vent obstructed
- Fuel pump trouble
- Fuel pump relay trouble
- Fuel filter clogged
- Fuel line clogged
- Float valve clogged

Engine flooded:
- Fuel level in carburetor float bowl too high
- Float valve worn or stuck open
- Starting technique faulty
- (When flooded, crank the engine with the throttle fully open to allow more air to reach the engine.)

No spark; spark weak:
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- IC igniter trouble
- Pickup coil trouble
- Ignition coil trouble
- Ignition switch shorted
- Wiring shorted or open
- Fuse blown

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed:

Spark weak:
- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Spark plug cap or high tension wiring trouble
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter trouble
- Pickup coil trouble
- Ignition coil trouble

Fuel/air mixture incorrect:
- Pilot screw maladjusted
- Pilot jet, or air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Starter plunger stuck open
- Fuel level in carburetor float bowl too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Air cleaner or silencer duct loose
- Fuel pump trouble

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head warped
- Cylinder head gasket damaged
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Other:
- IC igniter trouble
- Carburetors not synchronizing
- Carburetor vacuum piston doesn't slide smoothly
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging

Poor Running or No Power at High Speed:

Firing incorrect:
- Spark plug dirty, broken, or maladjusted
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- IC igniter trouble
- Pickup coil trouble
- Ignition coil trouble

Fuel/air mixture incorrect:
- Starter plunger stuck open
- Main jet clogged or wrong size
- Jet needle or needle jet worn
- Air jet clogged
- Fuel level in carburetor float bowl too high or too low
- Bleed holes of air bleed pipe or needle jet clogged
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner or silencer duct poorly sealed
- Water of foreign matter in fuel
- Carburetor holder loose
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble

Compression low:
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking:
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- IC igniter trouble

Miscellaneous:
- Throttle valve won't fully open
- Vacuum piston don't slide smoothly
- Brake dragging
- Torque converter slipping
- Overheating
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Balancer mechanism malfunctioning

Vehicle Speed Doesn't Be Limited or Be Limited Too Low:
- Speed sensor trouble
- Reverse switch trouble
- IC igniter trouble
- Wiring damaged

Overheating:

Firing incorrect:
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- IC igniter trouble

Fuel/air mixture incorrect:
- Main jet clogged or wrong size
- Fuel level in carburetor float bowl too low
- Carburetor holder loose
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner or silencer duct poorly sealed

Compression high:
- Carbon built up in combustion chamber

Engine load faulty:
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging

Converter and/or belt excessive heating:
- Belt dirty or worn
- Drive or driven pulley sheave dirty or worn
- Driven pulley spring broken or weak
- Drive pulley spring broken or weak
- Idle speed too high
- Air cleaner clogged, poorly sealed, or missing
- Converter fan damaged

Lubrication inadequate:
- Engine oil level too low
- Engine oil poor quality or incorrect

Coolant incorrect:
- Coolant level too low
- Coolant deteriorated

Cooling system component incorrect:
- Radiator clogged
- Thermostat trouble
- Thermostat cap trouble
- Radiator fan switch trouble
- Fan motor broken
- Fan blade damaged
- Water pump not turning
- Water pump impeller damaged

Over Cooling:

Cooling system component incorrect:
- Radiator fan switch trouble
- Thermostat trouble

Converter Operation Faulty:

Belt slipping:
- Belt dirty or worn
- Drive or driven pulley sheave dirty or worn
- Driven pulley spring broken or weak

Converter engagement speed too low:
- Drive pulley spring broken or weak

Converter engagement speed too high:
- Belt dirty or worn
- Drive or driven pulley sheave dirty or worn
- Drive pulley weight doesn't move smoothly
- Drive pulley movable sheave doesn't move smoothly
- Drive or driven pulley movable sheave bush worn
- Drive pulley weight or roller worn

Shifting too quickly:
- Drive pulley spring weak
- Driven pulley spring weak or incorrect installed (too loose)

Shifting too slowly:
- Belt dirty or worn
- Drive or driven pulley sheave dirty or worn
- Drive pulley weight doesn't move smoothly

Drive pulley movable sheave doesn't move smoothly
Driven pulley spring incorrect installed (too tight)
Driven pulley movable sheave doesn't move smoothly

Gear Shifting Faulty:

Doesn't go into gear:
Shift fork bent or seizure
Gear stuck on the shaft
Gear positioning lever binding
Shift drum bearing damaged
Shift cable maladjusted
Shift cable lubrication inadequate
Shift cable damaged

Jumps out of gear:
Shift fork worn
Gear groove worn
Gear dogs worn
Shift drum groove worn
Gear positioning lever spring weak or broken
Shift fork pin worn
Transmission shaft, and/or gear splines worn
Shift cable maladjusted

Overshifts:
Gear positioning lever spring weak or broken
Shift cable maladjusted

Abnormal Engine Noise:

Knocking:
IC igniter trouble
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
Overheating

Piston slap:
Cylinder/piston clearance excessive
Cylinder, piston worn
Connecting rod bent
Piston pin, piston holes worn

Valve noise:
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn

Other noise:
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring worn, broken or stuck
Piston seizure, damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mounts loose
Crankshaft bearing worn
Camshaft chain tensioner trouble
Camshaft chain, sprocket, guide worn
Loose alternator rotor
Balancer gear worn or chipped
Balancer bearing worn
Starter chain, sprocket, guide worn

Abnormal Drive Train Noise:

Converter noise:
Belt worn
Drive or driven pulley sheave worn
Drive or driven pulley movable sheave bush worn
Drive or driven pulley mount loose
Driven pulley shoe worn
Drive pulley weight or roller side washer worn
Drive pulley weight or roller worn

Transmission noise:
Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

Final drive noise:
Bearings worn
Gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

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

Warning Buzzer Doesn't Sound or Doesn't Stop Sounding:

Warning buzzer trouble
IC igniter trouble
Speed sensor trouble
Wiring damaged

Oil Pressure Warning Light Goes On:

Engine oil pump damaged
Engine oil screen clogged
Engine oil filter clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearings worn
Crankshaft bearings worn
Oil pressure switch damaged
Wiring damaged
Relief valve stuck open
O-ring at the oil pipe in the crankcase damaged

Exhaust Smokes Excessively:

White smoke:
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Engine oil level too high

Black smoke:
- Air cleaner clogged
- Main jet too large or fallen off
- Starter plunger stuck open
- Fuel level in carburetor float bowl too high

Brown smoke:
- Main jet too small
- Fuel level in carburetor float bowl too low
- Air cleaner or silencer duct loose
- Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory:

Steering wheel hard to turn:
- Steering shaft bearing damaged
- Steering shaft lubrication inadequate
- Steering shaft bent
- Steering gear assembly damaged
- Tire air pressure too low

Steering wheel shakes or excessively vibrates:
- Tire(s) worn
- Suspension arm bushing worn
- Steering knuckle joint worn
- Wheel rim warped
- Wheel bearing worn
- Steering wheel mount loose
- Steering bolt or nut loose

Steering wheel pulls to one side:
- Frame bent
- Wheel misalignment
- Suspension arm bent or twisted
- Steering shaft bent
- Steering gear assembly damaged
- Front or rear tire air pressure unbalanced
- Shock absorber unbalanced

Shock absorption unsatisfactory:
- (Too hard)
- Tire air pressure too high
- Shock absorber damaged
- (Too soft)
- Shock absorber oil leaking
- Shock absorber spring weak
- Tire air pressure too low

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.

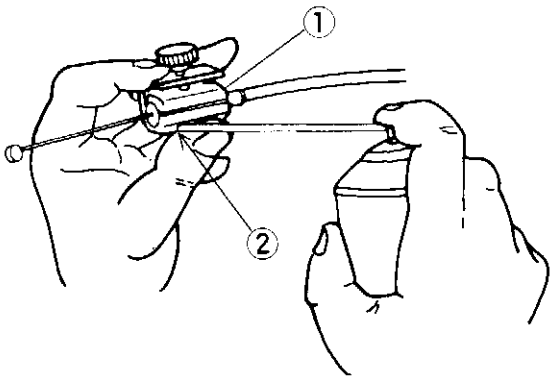
NOTE

○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure spray water, perform the general lubrication.*

Pivots and Points: Lubricate with Grease.
Throttle Pedal Pivot
Brake Pedal Pivot
Shift Lever Pivots
Throttle Cable Ends
Transmission Shift Cable Upper End
Differential Shift Cable Ends
Parking Brake Cable Upper Ends

Cables: Lubricate with Rust Inhibitor.
Throttle Cable
Choke Cable
Differential Shift Cable

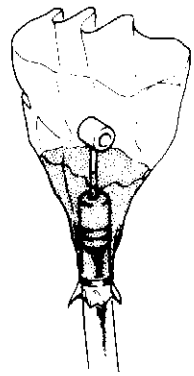
Cable Lubrication



1. Pressure Cable Luber (special tool: P/N K56019-021)
2. Lubricate cables with a penetrating rust inhibitor.

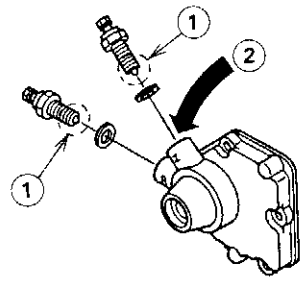
Cable: Lubricate with Motor Oil.
Parking Brake Cables

Cable Lubrication



Cable: Lubricate with High Temperature Grease.
Speedometer Cable

Switch Contact Points : Lubricate with Grease or Oil.



1. Apply a heavy coat of grease (about 0.1 mL).
2. Pour the engine oil (5~10mL) through the hole of the neutral switch.

Nut, Bolt, and Fastener Tightness

Tightness Inspection

●Check the tightness of the bolts and nuts listed here. Also, check to see that each cotter pin is in place and in good condition.

NOTE

○*For the engine fasteners, check the tightness of them when the engine is cold (at room temperature).*

★If there are loose fasteners, retorque them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not in the appropriate chapter, see the basic torque table (see Torque and Locking Agent in the General Information chapter).

For each fastener, first loosen it by ½ turn, then tighten it.

★If cotter pins are damaged, replace them with new ones.

Nut, Bolt, and Fastener to be checked

Wheels:
- Axle Nuts and Cotter Pins
- Wheel Nuts

Brakes:
- Master Cylinder Push Rod Clevis Pin Clip
- Parking Brake Lever Assembly Mounting Bolts
- Brake Pedal Pivot Shaft Clip

Suspension:
- Suspension Arm Pivot Nuts
- Strut Mounting Nuts
- Shock Absorber Mounting Nuts

Steering:
- Steering Wheel Mounting Nut
- Intermediate Shaft Clamp Bolts
- Tie-rod End Nuts and Cotter Pins
- Tie-rod End Locknuts
- Knuckle Pivot Nuts and Cotter Pins
- Steering Gear Assembly Mounting Bolts
- Main Shaft Bracket Mounting Bolts

Frame:
- Front and Rear Bar Component Mounting Bolts
- Front Guard Mounting Bolts
- Skid Plate Mounting Bolts
- Cargo Bed Mounting Nuts
- Seat Retaining Pin Clips
- Seat Belt Mounting Bolts
- Rear Bottom Sub-frame Mounting Bolts
- Rear End Sub-frame Mounting Bolts
- Rear Right Sub-frame Mounting Bolts

Engine:
- Engine Mounting Nuts
- Engine Mounting Bracket Nuts
- Exhaust Pipe Holder Nuts
- Exhaust Pipe Mounting Bolt
- Exhaust Pipe and Muffler Clamp Bolt
- Muffler Mounting Bolts
- Throttle Pedal Pivot Nut
- Transmission Shift Lever Pin Clip
- Transmission Shift Cable Upper End Clip

Unit Conversion Table

Prefixes for Units:

Prefix	Symbol	Power
mega	M	x 1,000,000
kilo	k	x 1,000
centi	c	x 0.01
milli	m	x 0.001
micro	μ	x 0.000001

Units of Mass:

kg	x	2.205	=	lb
g	x	0.03527	=	oz

Units of Volume:

L	x	0.2642	=	gal (US)
L	x	0.2200	=	gal (imp)
L	x	1.057	=	qt (US)
L	x	0.8799	=	qt (imp)
L	x	2.113	=	pint (US)
L	x	1.816	=	pint (imp)
mL	x	0.03381	=	oz (US)
mL	x	0.02816	=	oz (imp)
mL	x	0.06102	=	cu in

Units of Force:

N	x	0.1020	=	kg
N	x	0.2248	=	lb
kg	x	9.807	=	N
kg	x	2.205	=	lb

Units of Length:

km	x	0.6214	=	mile
m	x	3.281	=	ft
mm	x	0.03937	=	in

Units of Torque:

N-m	x	0.1020	=	kg-m
N-m	x	0.7376	=	ft-lb
N-m	x	8.851	=	in-lb
kg-m	x	9.807	=	N-m
kg-m	x	7.233	=	ft-lb
kg-m	x	86.80	=	in-lb

Units of Pressure:

kPa	x	0.01020	=	kg/cm^2
kPa	x	0.1450	=	psi
kPa	x	0.7501	=	cm Hg
kg/cm^2	x	98.07	=	kPa
kg/cm^2	x	14.22	=	psi
cm Hg	x	1.333	=	kPa

Units of Speed:

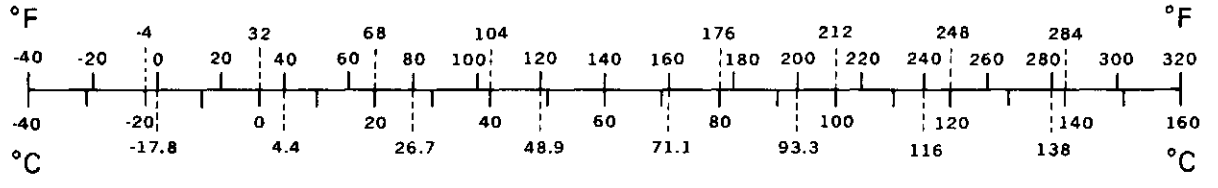
km/h	x	0.6214	=	mph

Units of Power:

kW	x	1.360	=	PS
kW	x	1.341	=	HP
PS	x	0.7355	=	kW
PS	x	0.9863	=	HP

Units of Temperature:

$$\frac{9\,(°C + 40)}{5} - 40 = °F \qquad \frac{5\,(°F + 40)}{9} - 40 = °C$$



MODEL APPLICATION

Model	Beginning Frame No.
KAF450-B1	JK1AFGB1□JB500001

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

Kawasaki
KAWASAKI HEAVY INDUSTRIES, LTD.
Consumer Products Group

Part No. 99924-1107-02